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Social Impact Assessment

BENGALLA CONTINUATION OF MINING PROJECT

SOCIAL IMPACT ASSESSMENT

REPORT

July 2013

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Bengalla Mining Company Pty Limited (BMC) is seeking a Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the extension of its existing mining operations. This Social Impact Assessment (SIA) forms part of 'The Bengalla Continuation of Mining Project Environmental Impact Statement' (Bengalla EIS) prepared by Hansen Bailey Environmental Consultants to support the application.

This SIA has been prepared in accordance with the Director-General's Environmental Assessment Requirements (DGRs) for the Bengalla Continuation of Mining Project (the Project) issued on 13 March 2012 in accordance with the requirements in Part 2 in Schedule 2 to the *Environmental Planning & Assessment Regulation 2000* (EP&A Regs).

1.2 EXISTING SOCIAL PLANS AND PROCEDURES

BMC has in place an extensive existing range of policies in relation to managing social and community based aspects of its operation including:

- Rio Tinto Relocation Policy Australia (Version 1.3);
- Aboriginal Employment at Rio Tinto Coal Australia;
- Rio Tinto Coal Australia Fatigue Management Framework;
- Priority Relocations – Setting up Your Employee in the Hunter Valley; and
- An existing Voluntary Planning Agreement (VPA) with Muswellbrook Shire Council (MSC).

A discussion in relation to the above mentioned documents is provided in **Section 1.11**.

1.3 THE PROJECT

The Project involves the continuation of mining to the west of the existing extraction limit at a rate of 15 Mtpa for 24 years. The Project will enable the extraction of an additional 316 Mt of ROM coal from the Whittingham Coal Measures.

The Project consists of the following characteristics:

- Open cut mining towards the west at a rate of up to 15 Mtpa ROM coal for 24 years to a total of 316 Mt;
- Continued use of the existing dragline, truck fleet and excavator fleet (with progressive replacement or substitution with equivalent);
- An out of pit Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining;
- Continued use, extension or relocation to existing infrastructure, including administration and parking facilities, in-pit facilities (including dragline shut down and erection pad), helipad, tyre laydown area, explosives and reload storage facility, core shed workshop, roads, reject bin, ROM Hopper, stockpiles, conveyors, water management infrastructure, supporting power infrastructure and ancillary infrastructure;
- Construction and use of various items of new infrastructure (including radio tower, extensions to Main Infrastructure Area (MIA), MTP Staged Discharge Dam and associated water reticulation infrastructure, additional Raw coal stockpile and upgrade to the ROM coal stockpile (along with associated conveyor network) generally as shown on the infrastructure plans;
- Processing, handling and transportation of coal via the (upgraded) CHPP and rail loop for export and domestic sale;
- Continued rejects and tailings co-disposal in the Main OEA and temporary in pit reject emplacement;
- Relocation of a section of Bengalla Link Road after Year 13 near the existing mine access road to facilitate coal extraction;

- The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Staged Discharge Dam and raw water dam); and
- A workforce of up to approximately 900 full time equivalent personnel (plus contractors) at peak production.

The regional location of the Project is shown on **Figure 1**.

1.4 DOCUMENT PURPOSE

Martin Associates P/L has been commissioned by Hansen Bailey, on behalf of BMC, to undertake a SIA for the Project. This assessment will form part of the Bengalla EIS supporting an application for Development Consent under Part 4, Division 4.1 of the EP&A Act.

This SIA has been prepared to assess the potential social impacts of the Project focusing on the community within the Study Area (as described below).

This SIA addresses the DGRs dated 13 March 2012 which included comments to the DGRs from Muswellbrook Shire Council (MSC), as outlined in **Table 1**.

Table 1
Director-General's Requirements Relevant to Social Impacts

DGRs	Section Addressed in SIA or other documents
NSW Planning and Infrastructure - Socio-Economic Impacts	
<ul style="list-style-type: none"> • detailed assessment of the key issues specified below [which include socio-economic impacts], and any other significant issues identified in this risk assessment, which includes: <ul style="list-style-type: none"> – a description of the existing environment, <u>using sufficient baseline data</u>; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and • a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; 	Section 1.8, 6 & 7
Social & Economic – including an assessment of the:	
<ul style="list-style-type: none"> o potential direct and indirect economic benefits of the project for local and regional communities and the State; 	Economic Impact Assessment (Gillespie Economics, 2013)
<ul style="list-style-type: none"> o potential impacts on local and regional communities, including: 	Section 6
<ul style="list-style-type: none"> - increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and 	Section 6
<ul style="list-style-type: none"> - impacts on social amenity; 	Section 6
Muswellbrook Shire Council	
Assessment of social infrastructure and services should explicitly include: <ul style="list-style-type: none"> - Health services: medical, dental and hospital; - Emergency Services: ambulance, fire and rescue, Rural Fire Service, State Emergency Service; - Secondary, vocational and higher education; - Child Care; and - Recreation 	Section 6
Housing affordability and accommodation demand should be addressed for all stages of the project. Assessment should be based on current housing stock and the capacity of rental or existing or approved motel or accommodation to satisfy accommodation demands throughout the project.	Section 6 & 7

1.5 SIA OBJECTIVES

The objectives of this SIA are to:

- To review relevant Local Government policy and guidelines;
- Characterise the existing community, current behaviour and interactions of residents;
- Characterise and report perceptions of the Project by those within the Primary Study Area;
- Assess the potential impacts of the Project on population, temporary accommodation, commuter behaviour and longer term housing;
- Identify the present use of social infrastructure and identify any observed and/or perceived gaps from a community perspective;
- Discuss implications for Muswellbrook township particularly the likely spatial distribution of any non-local operational and construction workforces and their impacts on the community;
- Discuss implications for the broader Secondary Study Area in relative employment and population impacts; and
- Prepare a social management program to mitigate potential and perceived impacts, if required.

1.6 STUDY AREA

The Study Area of this SIA comprises three components:

- The Primary Study Area (**Figure 2**);
- The Directly Affected Area (**Figure 2**); and
- The Secondary Study Area (**Figure 2**).

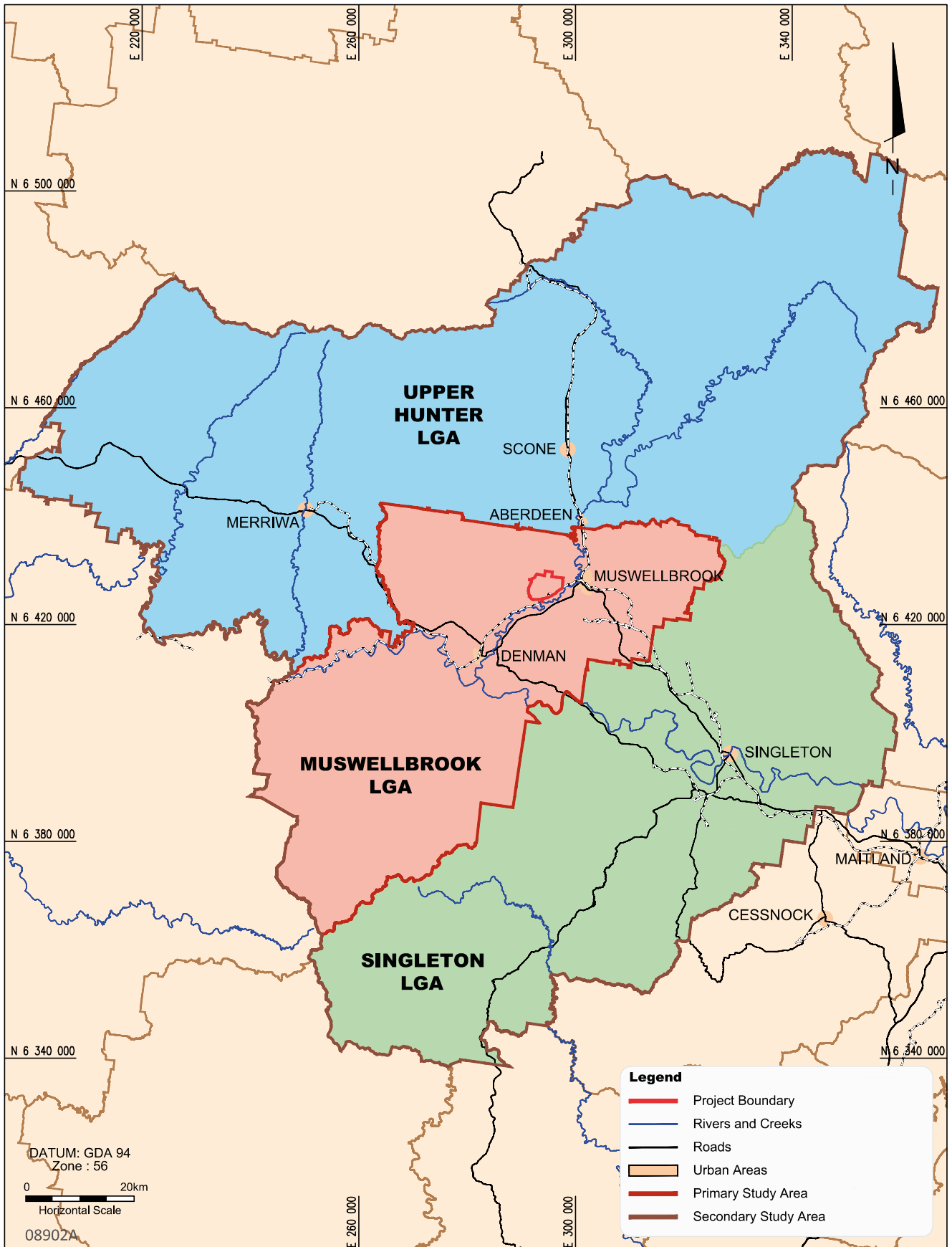
These areas are described in detail below.

The **Directly Affected Area** is made up of:

- Those who live nearby the Project; who will hear, feel, smell or see the Project and its effects on a daily basis; and
- **The Primary Study Area** comprises Muswellbrook Local Government Area (LGA) including the urban centres of Muswellbrook and Denman which is the statistical area most functionally interdependent with the Project.

The Secondary Study Area is the Primary Study Area, Singleton and Upper Hunter LGAs which is the statistical area within which the majority of the operational workforce currently resides.

The Regional and State Benchmark Areas (as the comparative area for demographic statistics) is the Hunter Region (Hunter Statistical Division excluding Newcastle in 2011 Census), which consists of the LGAs within the Secondary Study Area, with the addition of Maitland, Cessnock, Lake Macquarie, Port Stephens, Dungog, Gloucester and Great Lakes LGAs and NSW. Newcastle was not included so that the regional figures would reflect the more rural area areas and characteristics of the Hunter Valley to provide more valid regional comparisons with the Upper Hunter.



BENGALLA MINE

Study Areas

FIGURE 2



1.7 WORKFORCE TERMINOLOGY

Current residents of the Primary Study Area of Muswellbrook Shire who are likely to be employed by the Project are referred to as **Local Workers**. There are also **Non Local Workers** who are those migrating permanently into the Primary Study Area as a result of the Project either as direct or multiplier induced workers.

Also, the relative proximity of the Project to these larger population centres and increasing investment in road infrastructure has meant that Muswellbrook Shire has become increasingly attractive as a commuter worker destination. Consequently, the mining workforce in the Hunter region has considerable propensity to drive rather than to fully relocate when employed in the construction and mining industries, particularly in the short term. These groups need to be recognised in the context of future mine developments. Such groups present difficulties in the estimation of sustainable levels of accommodation and also community infrastructure within the commuter destination local government areas. These commuter groups are considered one subset of **Non Local workers**.

There are two main groups as follows:

Daily Commuters are those workers commuting into the Primary Study Area on a daily basis as a result of the Project either as direct or multiplier induced workers. This group is assumed to create limited demand for local services and facilities.

Work-week commuters are those unaccompanied or single workers commuting to the Primary Study Area and staying in temporary accommodation for more than one night as a result of the Project either as direct or multiplier induced workers. These workers are assumed to create more significant demand for some local services and facilities in line with their unaccompanied or single status such as entertainment and clubs whereas their demand on key services (such as health and education) is more limited.

The assumed travelling times from site for a number of surrounding towns and cities is presented in **Table 2**. Note that some portions of the City of Maitland and Cessnock Shire are considerably less in driving time than those shown in **Table 2**.

1.8 METHODOLOGY

1.8.1 Approach

The methodology for carrying out this SIA was to analyse the baseline community and social environment of the Primary Study Area without the influence of the Project and then consider how the Primary Study Area and especially the township of Muswellbrook will be affected by the Project. The main sources of data for the report were the ABS 2001, 2006 and 2011 Censuses, interviews with key local informants, Muswellbrook Shire Council social planning reports and community attitude surveys of residents (carried out for MSC by Jetty Research within the Primary Study Area in 2011) (MSC, Jetty Research, 2011).

Table 2
Assumed Travelling Times from Site

Location	Distance (km)	Time (minutes)
Newcastle	128	116
Maitland	96.3	85
Cessnock	92.3	85
Singleton	48.7	41
Denman	27.3	27
Scone	25.3	22
Murrurundi	65.5	53

Source: RTA, NSW Website

1.8.2 Existing Workforce

Assumed demographic statistics of the existing workforce are provided in **Table 3**.

Table 3
Composition of Existing Workforce by Residential Location

Locality	BMC Full time equivalent Personnel Data (at Sep-11)	
	Percentage of Total Workforce (%)	Number Of Personnel
Permanent Employees		
Muswellbrook	40	143
Denman	6	20
Primary Study Area (Muswellbrook LGA)	46	163
Scone	20	70
Singleton	15	52
Aberdeen	8	28
Secondary Study Area	89	313
Lower Hunter	5	19
Regional Study Area	94	329
Other NSW	7	26
Total	100	358
Additional Contractors		
Regular full time equivalent contractors (Residence unknown)		212

Source: BMC (2011)

1.8.3 Project Workforce

1.8.3.1 Construction Workforce

The construction workforce is estimated to peak in Year 2 at 218 fulltime equivalent employees. The construction period will be approximately three years (see **Table 4**).

For the purposes of this assessment, it has been assumed that the Project would achieve the maximum 15 Mtpa during Year 4 (assumed to be 2017, should approval be received in late 2013) and hence all necessary infrastructure upgrades will need to be constructed by this time with some exceptions including staged water management infrastructure and the Bengalla Link Road realignment.

Construction of the various Project infrastructure components will require the contract employment of a variety of tradespeople throughout the construction period. The specific construction activities required are broken down in **Table 4**. **Table 5** includes indicative estimates of construction personnel necessary during years 13 and 15 of the Project.

Table 4
Indicative Mine Infrastructure and CHPP Construction Schedule

Infrastructure Construction Component	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Stage 1 - Upgrade to Mine Infrastructure (13 Mtpa)												
Temporary construction administration area												
Existing car park extension												
Covered stores building												
Modification to existing bathhouse												
Construction of new light vehicle workshop												
Earthworks, drainage and water management												
Office Extension (Block F)												
Stage 1 & 2 Upgrade to CHPP (13 Mtpa & 15 Mtpa)												
Relocation of reject bin and associated conveyors												
Conveyor and transfer station civil works												
Installation of stockpile stacker and reclaimers												
Construction of CHPP module 3												
Construction of additional filter house												
Upgrade of existing and construction of new conveyor and												
CHPP commissioning and verification												
Earthworks, drainage and water management												
Relocation of the upgraded ROM bin, primary crusher station and associated earthworks												
Installation of new ROM conveyors and transfer stations												
Installation of new sizing and screening station												

Infrastructure Construction Component	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Stage 2 - Upgrade to Mine Infrastructure (15 Mtpa)												
Hydrocarbon storage area upgrade												
Eastern public carpark and light vehicle carpark extension												
New tyre change facility												
Modification to existing and construction of new bathhouse												
Office Block (Block G)												
Construction of generator compound												
Workshop extension												
Earthworks, drainage and water management												
Other Works												
Refuelling upgrade to 550,000 L												
New tyre storage facility												
Dragline maintenance pad												
Refuelling upgrade to 880,000 L												
Dry Creek Diversion (including CW1 construction, pipeline establishment, pump commissioning, power reticulation and associated earthworks)												
Relocation of the explosives and reload facility												
Indicative Construction Manning Required	-	-	85	195	315	245	160	150	45	85	125	150

Table 5
Indicative Project Components Construction Schedule

Infrastructure Construction Component	Project Timing	Indicative Construction Manning Required
Bengalla Link Road Realignment	Year 13	Up to 50 contract personnel for 1 year
Dry Creek Reinstatement	Year 15	Up to 30 contract personnel for 1 year
Erosion and sediment control structures and water management earthworks	Ongoing to facilitate Project progression	Limited contract personnel

1.8.3.2 Operations Workforce

The operations workforce for the Project is estimated to be approximately 900 full time equivalent employees (plus contractors) at full production. Thus, an increase of approximately 491 full time equivalent employees on the currently approved 400 is required for the Project (see **Table 6**).

It will be assumed that maximum operations employment will first occur in Year 4 (up to approximately 900 people) associated with achieving maximum production of 15 Mtpa. Shift cycles will continue to be 7 am – 7 pm (i.e. 12 hr shifts).

Table 6
Operations Workforce by Year

Workforce/Occupation	Operation Year				
	Year 1	Year 2	Year 3	Year 4	Year 5
ROM Coal Production (Mtpa)	10.7	11.3	13	15	15
Total Operations Labour	400	570	740	891	891

1.8.4 Workforce Assumptions

Two impact scenarios for the operational phase of the Project were assessed as described below in order to:

- Identify and appropriately assess potential social impacts associated with the Project; and
- Assist to develop strategies which will adequately mitigate any potential negative impacts on the Primary and Secondary Study Area and the associated communities.

These scenarios have been selected as they represent both an ‘expected case’ and an alternative case (‘sensitivity analysis’) designed to test the sensitivity of the assumptions utilised for the ‘expected case’. Both assume that there will be some non-local portion of the workforce which will relocate to the Primary Study Area. The key differing factor between scenarios is the extent of changes in the share of commuters (both workweek and daily) and non locals relocating into the Primary Study Area.

1.8.5 Construction Phase

The following assumptions have been utilised regarding the geographical source of the local and non local hires of the construction phase workforces:

- It is assumed that 20% of the construction workforce will be local workers and 80% will be non local workers;
- The 20% local workers are assumed to have the same residential address throughout the period;
- The 80% non local workers are assumed to remain non local throughout the construction phase of the Project. Work week commuters will be accommodated in Muswellbrook or Denman;
- It is anticipated that of the non local workforce approximately 50% will be daily commuters and 50% will be work week commuters; and
- There will be a small permanent construction management group of non - locals who would constitute 5% of the non- local workforce.

1.8.6 Operations Scenario 1 – ‘Expected Case’ based on the current workforce data

1.8.6.1 Direct workforce

The following assumptions have been utilised regarding the geographical source of the local and non local hires of the additional 491 full time equivalent operations employees under Scenario 1. **Table 7** provides the anticipated breakdown of the source location for the workforce:

- 20% of the operational workforce associated with the Project is sourced from the Primary Study Area; and
- 80% of the operational workforce associated with the Project is sourced from outside the Primary Study Area. Of these:
 - 46% will relocate to the Primary Study Area;
 - 43% will reside in the Secondary Study Area; and
 - 11% will reside in the Regional Study Area.

1.8.6.2 Indirect workforce

Non-local hires will predominantly consist of experienced maintenance workers, mine operators and professional staff. Local hires are likely to include mine operators, maintenance workers, local ancillary staff, apprentices, new graduates and unskilled workers.

Under Scenario 1 it is assumed that the indirect workforce will comprise 20% local and 80% non local workers.

Table 7
Scenario 1 Operations Workforce Breakdown

Predicted location of workforce	% of workforce	No. of new employees
Relocate to Primary Study Area	37%	182
Reside in Secondary Study Area	34%	167
Reside in the Regional Study Area	9%	44
Total non local workers	80%	393
Total local workers	20%	98
Total increased workforce	100%	491

Source: Current Workforce breakdown, BMC (2011)

1.8.7 Operations Scenario 2 – ‘Sensitivity Analysis’

1.8.7.1 Direct workforce

The following assumptions have been utilised regarding the geographical source of the local and non local hires of the operations phase workforces under Scenario 2. **Table 8** provides the anticipated breakdown of the source location for the workforce.

Scenario 2 assumes:

- 20% of the operational workforce associated with the Project is sourced from the Primary Study Area; and
- 80% of the operational workforce associated with the Project is sourced from outside the Primary Study Area. Of these:
 - 70% will relocate to the Primary Study Area;
 - 20% will reside in the Secondary Study Area; and
 - 10% will reside in the Regional Study Area.

This sensitivity analysis provides an assessment of the potential impacts to the local housing market and community facilities with a greater increase in the number of relocating permanent workforce into the Primary Study Area with a decrease in projected commuters.

1.8.7.2 Indirect workforce

Under Scenario 2 it is also assumed that the indirect workforce will comprise 20% local and 80% non local and there would be an equal split of work week commuters and daily commuters.

1.8.8 Consultation with Relevant Agencies & Organisations

As part of this SIA consultation has been carried out with Muswellbrook Shire Council (MSC) and other key Muswellbrook community members during September 2012 including:

- Local Businesses and the Chamber of Commerce;
- Principal Muswellbrook High School;
- Muswellbrook Local Health District;
- Real Estate Agents;
- Local developers; and
- Accommodation operators.

Further detail on the Project consultation is provided in the main volume of the EIS.

**Table 8
Scenario 2 Operations Workforce Breakdown**

Predicted location of workforce	% of workforce	No. of new employees
Relocate to Primary Study Area	56%	275
Reside in Secondary Study Area	16%	79
Reside in the Regional Study Area	8%	39
Total non local workers	80%	393
Total local workers	20%	98
Total increased workforce	100%	491

1.9 RELEVANT NSW GOVERNMENT POLICY

1.9.1 Upper Hunter Strategic Regional Land Use Plan

The main purpose of the 'Upper Hunter Strategic Regional Land Use Plan' (Department of Planning and Infrastructure, 2012) (SRLUP) is to protect land in the region which is classified as high-value agricultural land. This mapped land includes the horse breeding industry around Scone and the vineyards near Cessnock.

At the same time, the SRLUP is also said to support "sustainable" growth and certainty for the mining industry in appropriate places. It was reported that 40 per cent of the State's coal reserves are located in the region. Mining, along with coal seam gas, was considered to be able to continue to play a vital role in both the region's and the State's economic and energy future.

This SRLUP also outlines "a comprehensive range of actions aimed at minimising the impacts of mining and coal seam gas development, covering issues such as air quality, noise and community health. In particular, these actions will drive new mining projects to implement world's best practice dust management practices and will ensure that the development assessment process is better equipped to address cumulative impacts" (SRLUP,2012).

Additional detail in relation to the Upper Hunter SRLUP is provided in the Main Volume of the EIS and the Agricultural Impact Statement (Barnett and Associates, 2012).

1.9.2 Upper Hunter Economic Diversification Report

The Upper Hunter Economic Diversification Report (Buchan & Associates, 2011) has been prepared for the NSW Government and the local councils of the Upper Hunter region. The report was released in 2011 following the endorsement of all councils in the Upper Hunter region. It formed part of the Upper Hunter Economic Diversification Project which outlines strategies and initiatives for economic diversification and strengthening local communities in the region.

Four key initiatives for economic diversification are recommended. These were:

- Increasing local populations to build ongoing critical mass for service industries and associated jobs;
- Building on specific industry strengths and local advantages and using these as a foundation for future growth;
- Developing new areas of industry based on emerging opportunities such as agribusiness or renewable energy; and
- Developing knowledge intensive industries including support for renewable energy support systems, education and training and research.

The report also noted that "It should also be recognised that the growth of the mining industry can lead to issues with social polarisation and loss of community cohesion. This can be a result of different attitudes towards the mining industry, the disparity in incomes between workers in the mining and non-mining industries, and the often transient nature of the mining workforce. Communities that are liveable and cohesive are more likely to be attractive as places to live and, therefore, building community cohesion must be seen as a key element of building a resilient and diverse economy" (UHECDR, 2011).

1.10 REVIEW OF RELEVANT MUSWELLBROOK SHIRE COUNCIL LAND USE & SOCIAL POLICIES

There are a number of relevant MSC policies which are relevant to the SIA.

1.10.1 MSC Land Use Policy

The issues, strategic objectives and policy directions of the MSC Land Use Policy is set out in the Council minutes dated 12 September 2011 (MSC Minutes, Land use Policy).The fundamental requirement in the Land Use Policy is to favour intensification of existing and approved mining activities rather than expand the existing footprint of land being used for coal mining :

Key strategic issue of MSC Policy

1. *Intensification of existing and approved mining activities are favoured over an increase in the footprint of mining activities*

This Policy has been considered in relation to the Project. For the SIA there are specific sections of the Policy in sections on strategic objectives and policy directions which are set out below.

1.10.1.1 Strategic Objectives

The overarching strategic objectives that are sought in the MSC Land Use Policy in regard to the use of land for coal mining purposes which are relevant to socioeconomic matters are Parts F and G and for policy directions listed specifically as socio-economic matters numbers 13, 14 and 15.

“F. The impacts of the use of land for coal mining on human health, community services, the market for labour, the market for water, traffic, infrastructure, noise, blasting, dust and vibration are identified and addressed;

G. Coal mining makes a positive contribution to the Shire economy whilst maintaining a balance with the integrity of the natural environment on which the Shire’s agricultural and tourism economies depend. “

“Policy Directions Socio-economic matters

13. Labour force impacts and economic benefit modelling should be undertaken with respect to each proposal to develop land for a coal mining purpose. Regard should be had to local demand and supply rather than modelled on input-output analysis.

14. A proponent of a mining application must make appropriate provision for the training of apprentices sufficient to ensure replacement of the proponent’s workforce for the life of the operation. Any such provision must take into account the workforce requirements of existing operations and the local labour market generally.

15. A proposal to develop land for a coal mining purpose must consider the community’s wishes and views including (without limitation) equity in the provision and distribution of employment, housing and community services and the likely socio-economic impacts of development. A proposal should incorporate strategies to ameliorate adverse impacts.”

1.10.2 MSC Social Plan 2005-2010

The Social Plan 2005-2010 (MSC, 2004) is a now superseded document which focussed on specific target groups for intervention and support by Council. These target groups were children, young people, older people and families. These larger categories were then broken into sub categories based on various vulnerabilities such as disabilities, ethnicity, culture and isolation. An action plan for each group was then framed.

1.10.3 MSC Community Strategic Plan 2011-2021

The MSC Community Strategic Plan 2011-2012 (MSC, online 2012) is the outcome of the NSW Dept of Local Government’s new Integrated Planning approach. The most relevant sections for the SIA come under Environmental Planning Outcomes in its housing sub section.

Housing

Responsible initiatives that attempt to meet the demand for accommodation related to the resources and mining industries.

Strategies

Provide support for affordable and/or aged care housing

(And in relation to)

Community Services

Goal

Ensure that people have access to appropriate accommodation services within the shire.

There are no specific target groups identified as they were in the Social Plan 2005-2010 and no evaluation of outcomes of that Plan.

1.10.4 MSC Section 94a Development Contributions Plan 2010

The section 94A Development Contributions Plan (MSC, 2010) examines the expected rate and type of development likely to occur in the next ten years and relates this to the need for facilities. The expected development and demand for public facilities is contained in the Plan which also provides information on the future residential population of Muswellbrook LGA until 2018.

There is currently only one proposed s94A project in what appears to be the directly affected area of the mine. It is described as a road proposal (for Castlerock Road). There does not appear to be any other facilities listed for contribution in the vicinity of the Project Boundary.

1.10.5 MSC Draft Recreation Needs & Management Strategy July 2011

The most relevant outcome of the Draft Recreation Needs & Management Strategy (MSC, 2011) was the conclusion that the Muswellbrook Shire is well equipped with more than adequate physical recreation facilities for its current and future forecasted population:

“.....these days it is more important to consider the individual trends of different sports and to develop Development Contribution multi-use models for the provision of such activities. Councils can achieve a much more effective provision of opportunities through improved management and maintenance processes than by continually developing new facilities.”

“.....The Muswellbrook Shire is in the enviable position of having an adequate number of sporting facilities for its current and future population.”

According to the authors, the issue facing Council is how to have these facilities better utilised and better managed/maintained.

The report focuses more attention on Denman than Muswellbrook township so to some extent is less relevant to the Project. Nonetheless, it is clear that the need for further physical recreation facilities is considered to be low.

It should be noted that some of the of the sporting clubs in the Muswellbrook Shire commented that their facilities require upgrades to make them attractive to current, and potential new members, and to allow the clubs to bid to host higher level events. As most of these facilities are owned by MSC it was predicted that the users will be looking to MSC to meet these costs.

1.10.6 MSC Voluntary Planning Agreements Policy 2009

The MSC Planning Agreements Policy (MSC, 2009) policy outlines MSC policy on VPAs.

“POLICY STATEMENT

A VPA is a voluntary agreement between one or more planning authorities and a person (the *developer*) under which the developer is required to dedicate land free of cost, pay a monetary contribution, or provide any other material public benefit, or any combination of them, to be used for or applied towards the provision of public infrastructure or another public purpose. A public purpose includes (without limitation) any of the following:

- The provision of (or the recoupment of the cost of providing) public amenities or public services;
- The provision of (or the recoupment of the cost of providing) affordable housing;
- The provision of (or the recoupment of the cost of providing) transport or other infrastructure relating to land;
- The funding of recurrent expenditure relating to the provision of public amenities or public services, affordable housing or transport or other infrastructure;
- The monitoring of the planning impacts of development; and
- The conservation or enhancement of the natural environment. “(MSC, VPA Policy, 2009).

As discussed in **Section 1**, BMC has in place an existing VPA with MSC (2010). The existing VPA is required by Division 6 of Part 4 of the EP&A Act and is stipulated in DA 211/93 (as modified). The existing VPA between MSC and BMC provides annual funding of \$400,000 for the Bengalla Coal Community Fund, \$125,000 for Council Roads Maintenance Fund, \$15,000 for Council Environmental Officer and the engagement of four apprentices.

Discussions with MSC will assist in guiding the scope for the revised VPA that will be established for the Project. The proposed VPA for the Project has now progressed with MSC and further discussion in relation to the proposed VPA is discussed in **Section 7.2.5**.

1.11 REVIEW OF RELEVANT COAL & ALLIED SOCIAL RELATED DOCUMENTS

BMC currently manage social components of the operation in accordance with existing procedures including:

- Rio Tinto Relocation Policy Australia (Version 1.3);
- Aboriginal Employment at Rio Tinto Coal Australia;
- Rio Tinto Coal Australia Fatigue Management Framework; and
- Priority Relocations – Setting up Your Employee in the Hunter Valley.

In addition to the above procedures, BMC currently contributes to a number of local organisations through the Coal & Allied Community Development Fund and the Aboriginal Development Consultative Community which are discussed below.

1.11.1 Coal & Allied Community Development Fund

The Coal & Allied Community Development Fund was established in 1999 to support communities in the Hunter Valley to build community capacity, address development challenges and take advantage of emerging opportunities. Since its inception, the Coal & Allied Community Development Fund has contributed more than \$11 million to projects aimed at providing benefits for the local community. The Coal & Allied Community Development Fund is continuing its long running contributions to building capacity in the Hunter Valley, with the announcement in November 2011 of a \$4.5 Million commitment for disbursement between January 2012 and December 2014 (BMC Annual Review 2011).

1.11.2 Coal & Allied Aboriginal Community Development Fund

In partnership with the Upper Hunter Valley Aboriginal Community Coal & Allied launched the Coal & Allied Aboriginal Community Development Fund (ACDF) (formerly Aboriginal Development Consultative Community) in 2006, investing more than \$3.05 Million in education, training, community and business development projects benefiting the Hunter Valley Aboriginal community since its inception. In 2011 the ACDF invested \$644,958 in 28 projects, partnering with community groups and businesses, supporting projects which will help deliver long term sustainability in the Hunter Valley. The ACDF is a funding program accessible by any Aboriginal person or group in the Upper Hunter Valley region undertaking a project to benefit the wider Aboriginal community.

2 EXISTING POPULATION AND EMPLOYMENT

2.1 INTRODUCTION

This section discusses the changing character of the directly affected area, the current population and employment characteristics of the Primary Study Area and makes comparisons with the Secondary Study Area and other benchmark regions. These characteristics have then been used as the basis for determining the social impacts in the Primary Study Area and Secondary Study Area associated with the Project.

2.2 DIRECTLY AFFECTED AREA

The Directly Affected Area (DAA) is made up of: those communities and/or individual residents who live near the Project. These people currently hear, feel, smell or see the existing Project and its effects on a daily basis and will experience the extension of the mine to the extent determined by other specific studies including noise, vibration, air quality and visual impact assessments. At the moment, the most dominant effect of the mine to the community is that it can be seen from a number of vantage points around Muswellbrook. Much less of the community can hear or feel the effects of mining.

There are also a number of other operating mines and proposed projects which surround the township to the east and south and overlap with the DAA and contribute to the existing setting. Over the last decade with the increasing production of surrounding operations, mining has become much more part of the character of the Muswellbrook township even though Muswellbrook Coal Company has been operating to the east of the town since the last century. Before then the area was perceived as “a rural town with a few coal mines.”

Even though the area still has elements of a rural landscape and character, it is now functioning as one with an essentially urban and industrial form and character. So the character of this area has been changing from one which was predominately rural to a diverse mix of urban, industrial and rural land use. The population within the DAA in 2011 is in the vicinity of 11,800 which makes up almost 75 % of the population within the LGA.

Migration into the area has been a significant component of the growth over the past five years. As shown in **Table 9** the population of the area has been growing steadily over the previous two census periods (2001 to 2011). Even though the proportion of residents migrating into the area as a percentage of total population has not changed significantly, the rate of migration into the area has been significantly higher than at the Hunter Statistical Division (excluding Newcastle). Population has consistently been attracted into the area to live and work as a direct result of the mining and power generation industries and the necessary service workforce.

2.3 POPULATION CHARACTERISTICS

The 2011 population of Muswellbrook LGA (Primary Study Area) was 16,098 which had grown at an annual growth rate of 0.85% for the previous ten years. The annual compound growth rate has remained remarkably stable in the latter part of that period from 2006 - 2011 only slightly increasing to 0.86% per year (ABS, Census 2011). The components of the population are also shown in **Table 10**. The two cohorts which showed growth were the 20-24 and the 55-64 age groups. The school age children cohorts showed little growth which suggests an increase in younger people who are not yet planning families (see **Table 10**).

Table 9
Migration Characteristics of the Resident Population, Directly Affected Area
(Muswellbrook Township, SLA2)

Migration Characteristics	2001 SLA Muswellbrook DAA		2006 SLA Muswellbrook DAA		2011 SLA Muswellbrook DAA	
	No	% of Total Population	No	% of Total Population	No	% of Total Population
Lived at same address 1 year ago	8,018	0.75	8,313	0.74	8,615	0.71
Lived at different address 1 year ago	1,992	0.19	2,002	0.18	2,197	0.18
Lived at same address 5 years ago	5,197	0.49	5,064	0.45	5,370	0.45
Lived at different address 5 years ago	4,067	0.38	4,405	0.39	4,628	0.38
	2001 Hunter SD		2006 Hunter SD		2011 Hunter SD	
Lived at same address 1 year ago	163,058	0.77	177,983	0.79	193,214	0.79
Lived at different address 1 year ago	36,150	0.17	33,258	0.15	34,750	0.14
Lived at same address 5 years ago	106,392	0.51	114,051	0.51	128,567	0.53
Lived at different address 5 years ago	80,079	0.38	83,162	0.37	83,957	0.35

Source: ABS Censuses 2001, 2006, 2011

Table 10
Population Growth and Age Components of the Population- Muswellbrook Shire 2001-2011

Population Age Cohort	Census Year			Trend Projections		% Annual Compound Growth Rates	
	2001	2006	2011	2016	2021	2001-2011	2006-2011
Total Persons	14,796	15,421	16,098	16,740	17,391	0.85%	0.86%
0-4 years	1,182	1,244	1,252	1,296	1,331	0.58%	0.13%
5-14 years	2,473	2,435	2,345	2,290	2,226	-0.53%	-0.75%
15-19 years	1,053	1,087	1,092	1,116	1,136	0.36%	0.09%
20-24 years	895	972	1,096	1,189	1,289	2.05%	2.43%
25-34 years	2,211	2,130	2,342	2,359	2,424	0.58%	1.92%
35-44 years	2,318	2,359	2,300	2,308	2,299	-0.08%	-0.51%
45-54 years	2,003	2,080	2,268	2,382	2,515	1.25%	1.75%
55-64 years	1,278	1,572	1,724	1,971	2,194	3.04%	1.86%
65-74 years	806	876	959	1,033	1,110	1.75%	1.83%
75-84 years	420	492	552	620	686	2.77%	2.33%
85 years and over	157	174	167	176	181	0.62%	-0.82%

Source: ABS Census, 2001, 2006, 2011

2.3.1 Population Projections

Table 11 presents a comparison of actual and projected trend population growth within the Secondary Study Area, Hunter Region and NSW. As shown in **Table 11** and **Figure 3**, Muswellbrook Shire's growth has been similar to Upper Hunter LGA but significantly lower than Singleton LGA. However when compared to the Hunter Valley Region (excluding the City of Newcastle) the amount of growth in the Study Area as a whole has been lower. These figures show that overall more growth has occurred in the Lower Hunter which is indicative of the fact that there is a significant commuter workforce servicing the needs of the Study Area which is based in the Lower Hunter and anecdotal evidence suggests from locations even further afield.

2.3.2 Regional Population Change

Table 12 details projected population and growth rates for the LGAs in the Secondary Study Area from 1996 to 2036. These projections are supplied by the DP&I for each LGA in NSW and use standardised demographic modelling, including expected natural increase in population (i.e. births over deaths) and net migration assumptions.

Similar projections from the Department of Planning show that the population of the Hunter Region excluding Greater Newcastle is projected to increase from 100,000 in 2006 to 128,000 by 2036 (a 28% increase). Annual population increase is projected to be around 1,000 for the first few years of the projection horizon, declining slowly during the 2020s and 2030s to about 800 by 2035-36. These estimates do not include the region of Greater Newcastle including Maitland, Cessnock, Lake Macquarie & Port Stephens LGAs so the estimated population with **Table 10** is not comparable.

In terms of growth rates, these projections show a gradually declining rate, falling from a peak of 1.00% in 2007-08 to 0.64% by 2035-36. Because these rates are lower than those for New South Wales as a whole, the region's share of the State population is expected to decline slightly, from 1.5% in 2006 to 1.4% in 2036.

Table 11
Comparison of Actual & Projected Trend Population Growth within the Secondary Study Area, Hunter Region & NSW

LGA/ Region	2001	2006	2011	2016	2021	% annual Compound Growth/ Year 2001-2011	% annual Compound Growth/Year 2006-2011
Muswellbrook	14,796	15,421	16,098	16,740	17,391	0.85%	0.86%
Upper Hunter	13,069	12,898	13,822	14,016	14,393	0.56%	1.39%
Singleton	20,384	22,071	23,019	24,460	25,777	1.22%	0.84%
Secondary Study Area	48,249	50,390	52,939	55,216	57,561	0.93%	0.99%
Hunter Valley ex. Newcastle	210,543	225,167	243,059	258,772	275,030	1.45%	1.54%
NSW	6,371,745	6,585,736	6,958,812	7,225,831	7,519,364	0.9%	1.1%

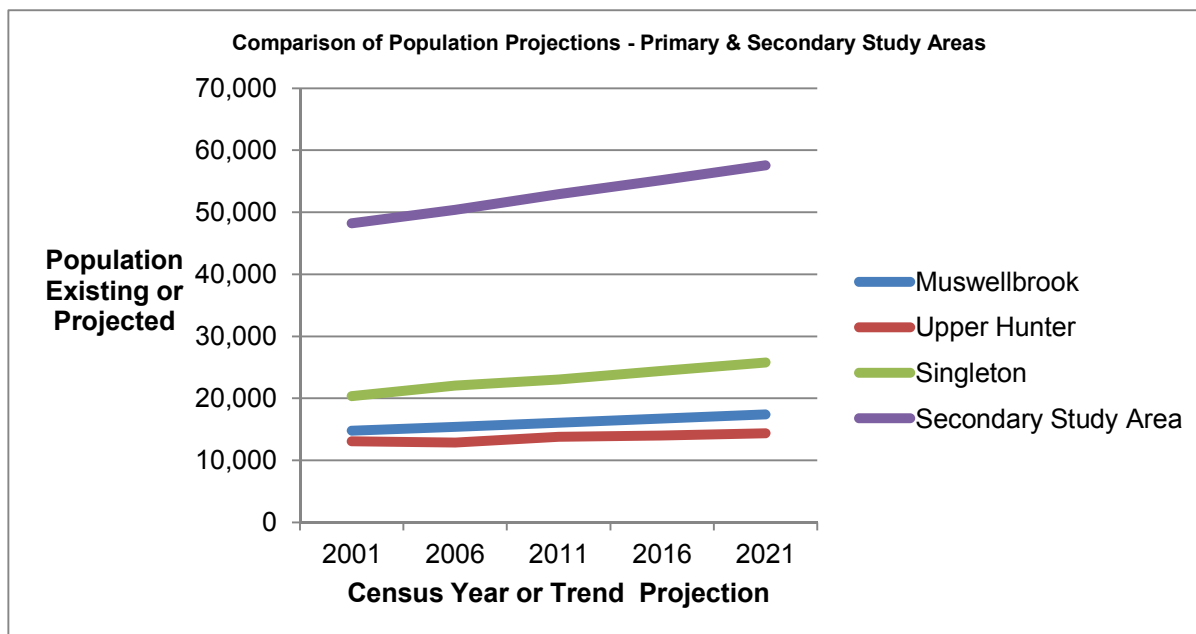
Source: ABS Census, 2001, 2006, 2011 and Martin Associates, 2012

Table 12
Population Projections 1996 to 2036, Secondary Study Area

LGA	Population								
	1996	2001	2006	2011	2016	2021	2026	2031	2036
Muswellbrook	15,700	15,200	15,900	16,300	16,700	17,100	17,500	17,900	18,300
Singleton	20,200	21,200	22,900	24,200	25,700	27,200	28,800	30,300	31,800
Upper Hunter	13,400	13,500	13,600	13,500	13,400	13,300	13,200	13,000	12,900
Total Secondary Study Area	49,300	49,900	52,400	54,000	55,800	57,600	59,500	61,200	63,000

Source: Department of Planning, 2010

Figure 3
Comparison of Population Projections - Primary & Secondary Study Areas



Source: (Martin Associates,P/L ,2012)

2.4 INCOME & OTHER DEMOGRAPHICS

Information presented in **Table 13** shows the income and other demographic differences within the Secondary Study Area over the period 2001 to 2011. Singleton and Muswellbrook LGAs have followed similar trends and in 2011 showed very similar median income characteristics, median mortgage payments and median rents as well as similar median age and household sizes.

In contrast the Upper Hunter population was older and had less income but also had slightly lower median mortgages and rents. The disparity between the Upper Hunter and the other two LGAs has steadily increased over the time series. In comparison to the Hunter region (excluding Newcastle) and also NSW, the difference in median income levels in both Muswellbrook and Singleton LGAs in 2011 was also apparent whilst the median rents being paid were at similar levels.

Table 13
Selected Social and Income Indicators

Social Indicator	Muswellbrook LGA			Singleton LGA			Upper Hunter LGA			Hunter Valley	NSW
	2001	2006	2011	2001	2006	2011	2001	2006	2011	2011	2011
Median age of persons	33	34	34	33	34	35	38	39	39	38	38
Median total personal income (\$/weekly)	369	470	646	394	494	661	340	440	563	531	561
Median total family income (\$/weekly)	967	1,226	1,697	1,086	1,425	1,927	807	1,103	1,392	1,407	1,477
Median total household income (\$/weekly)	827	1,070	1,416	958	1,263	1,687	678	879	1,070	1,159	1,237
Median mortgage repayment (\$/monthly)	867	1,257	1,733	975	1,400	2,000	780	1,100	1,600	1,733	1,993
Median rent (\$/weekly)	110	150	230	130	180	260	93	120	170	240	300
Average number of persons per bedroom	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Average household size	2.7	2.6	2.6	2.8	2.8	2.7	2.5	2.4	2.4	2.6	2.6

Source: ABS Censuses 2001, 2006, 2011 Time Series Profiles

2.5 EMPLOYMENT STRUCTURE

The economy of Muswellbrook has become increasingly diverse. It has important agricultural industries which include thoroughbred racing and wines. It also has a very old coal industry that began in the late 19th Century (the longest existing coal company still in production is Muswellbrook Coal Company established in 1907) and was mainly underground till 1944 when open cut mining commenced. More recently the abundance of coal has resulted in the development of a major hub of power generation for NSW. The LGA also has a rich natural environment with the World Heritage recognised Wollemi National Park.

The 1996 - 2011 Census time series for industry of employment illustrates the economic structure of Muswellbrook Shire and the Secondary Study Area. **Table 14** shows the employment structure for Muswellbrook LGA and **Table 15** shows the employment structure for the Secondary Study Area.

Coal extraction in the Muswellbrook LGA has increased over the last ten years, from 4 million tonnes each year in 2001 to 37 million tonnes in 2011. Recent approvals, proposed modifications and proposed new operations were projected to increase coal production to 80 million tonnes by 2014 (MSC Land Use Policy Document, 2011). Dramatic decreases in the price of both thermal and coking coal coupled with a previously high \$A has led to these forecasts being significantly reduced and the timing of new developments significantly changed (at the time of writing).

Table 14 and **Table 15** show that in 2006 the mining sector accounted for almost 16% of the jobs in the Secondary Study Area, with a total of 3,600 mining jobs. By 2011 this number has grown to 17.5% of the jobs involving over 5,000 jobs. In the same period, the proportion of mining jobs in the Muswellbrook LGA grew from almost 16% to over 21%. In 2011, Muswellbrook LGA, there were 1,576 people counted on Census night with jobs in mining, and 5,094 in the Secondary Study Area, meaning that Muswellbrook LGA comprised almost a third of the mining jobs in the Secondary Study Area. The dependence on a commuting workforce was also emphasised by the 2.6% per year increase in the mining workforce over the fifteen year period 1996-2011 compared to a total population increase for Muswellbrook Shire of 0.85% per year.

Also, the number of mining jobs that were actually located within the Muswellbrook LGA in 2011 could be even larger. In 2006 there were 1,522 mining jobs located in the Muswellbrook LGA (ABS Census 2006 Working Population Profile), while only 1,102 people were counted in the Muswellbrook LGA as having jobs in the mining industry. This is a significant difference at approximately 50%.

When mining support activities are included then the dominance of mining on jobs in the region is highlighted. Estimates using a simple economic base multiplier measuring basic (export oriented) jobs to service sector jobs indicate that in 2011 there were a total of 6,400 mining related jobs in the Secondary Study Area out of total workforce of 23,562 (approximately 27%).

Using ABS industry of employment data (ABS, 2011) within Muswellbrook LGA and the broader Secondary Study Area in 2011, the relationship between one direct basic export oriented sector job and multiplier service jobs was calculated to be 1.2 (Martin Associates P/L, 2012) (i.e. one basic job for every 1.2 service jobs). The majority of service sector jobs were found to be in Singleton LGA which had a generally larger workforce and wider variety of services offered than the other two LGAs further west into the Upper Hunter.

Table 14
Employment Structure Primary Study Area (Muswellbrook LGA) 1996- 2011

Industry	1996		2001		2006		2011	
	Persons	%	Persons	%	Persons	%	Persons	%
Agriculture, forestry & fishing	652	9.98%	667	10.7%	614	8.9%	526	7.1%
Mining	1,068	16.34%	789	12.7%	1,102	15.9%	1,576	21.3%
Manufacturing	490	7.50%	532	8.5%	491	7.1%	409	5.5%
Electricity, gas, water & waste services	479	7.33%	341	5.5%	383	5.5%	332	4.5%
Construction	424	6.49%	432	6.9%	505	7.3%	496	6.7%
<i>Sub Total</i>	3,113	48%	2,761	44%	3,095	45%	3,339	45.1%
Wholesale trade	263	4.02%	287	4.6%	209	3.0%	247	3.3%
Retail trade	551	8.43%	620	10.0%	669	9.7%	683	9.2%
Accommodation & food services	417	6.38%	440	7.1%	473	6.8%	512	6.9%
Transport, postal & warehousing	227	3.47%	223	3.6%	224	3.2%	222	3.0%
Information media & telecommunications	73	1.12%	42	0.7%	40	0.6%	29	0.4%
Financial & insurance services	123	1.88%	75	1.2%	85	1.2%	79	1.1%
Rental, hiring & real estate services	95	1.45%	86	1.4%	118	1.7%	100	1.4%
Professional, scientific & technical services	231	3.53%	183	2.9%	297	4.3%	212	2.9%
Administrative & support services	101	1.55%	175	2.8%	157	2.3%	230	3.1%
Public administration & safety	264	4.04%	236	3.8%	266	3.8%	296	4.0%
Education & training	291	4.45%	334	5.4%	378	5.5%	359	4.9%
Health care & social assistance	353	5.40%	365	5.9%	425	6.1%	509	6.9%
Arts & recreation services	58	0.89%	45	0.7%	65	0.9%	70	0.9%
Other services	200	3.06%	207	3.3%	261	3.8%	334	4.5%
<i>Subtotal</i>	3,247	50%	3,318	53%	3,667	53%	3,882	52.4%
Inadequately described/Not stated	175	2.68%	149	2.4%	167	2.4%	181	2.4%
Total	6,535	100.00%	6,228	100.0%	6,929	100.0%	7,402	100.0%

Source: ABS Census Time series 1996,2001,2006,2011 Time Series Profiles & Martin Associates P/L

Table 15
Employment Structure 1996-2011 Secondary Study Area

Industry	1996		2001		2006		2011	
	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry & fishing	2,670	12.6%	2,714	12.8%	2,386	10.1%	2,205	7.6%
Mining	3,129	14.7%	2,523	11.9%	3,589	15.2%	5,094	17.5%
Manufacturing	1,483	7.0%	1,535	7.2%	1,764	7.5%	1,617	5.6%
Electricity, gas, water & waste services	937	4.4%	734	3.5%	835	3.5%	730	2.5%
Construction	1,293	6.1%	1,401	6.6%	1,553	6.6%	1,615	5.6%
<i>Sub total</i>	<i>9,512</i>	<i>45%</i>	<i>8,907</i>	<i>42%</i>	<i>10,127</i>	<i>43%</i>	<i>11,261</i>	<i>38.8%</i>
Wholesale trade	3,721	17.5%	3,514	16.6%	3,538	15.0%	770	2.7%
Retail trade	1,393	6.6%	1,648	7.8%	1,795	7.6%	2,160	7.4%
Accommodation & food services	1,367	6.4%	1,518	7.2%	1,660	7.0%	1,694	5.8%
Transport, postal & warehousing	932	4.4%	1,003	4.7%	1,031	4.4%	811	2.8%
Information media & telecommunications	342	1.6%	329	1.6%	311	1.3%	103	0.4%
Financial & insurance services	312	1.5%	256	1.2%	262	1.1%	290	1.0%
Rental, hiring & real estate services	313	1.5%	241	1.1%	318	1.3%	341	1.2%
Professional, scientific & technical services	551	2.6%	603	2.8%	773	3.3%	876	3.0%
Administrative & support services	487	2.3%	563	2.7%	696	3.0%	745	2.6%
Public administration & safety	1,347	6.3%	1,154	5.4%	1,238	5.3%	1,171	4.0%
Education & training	1,054	5.0%	1,074	5.1%	1,193	5.1%	1,364	4.7%
Health care & social assistance	1,226	5.8%	1,282	6.1%	1,460	6.2%	1,742	J1 6.0%
Arts & recreation services	428	2.0%	497	2.3%	573	2.4%	226	0.8%
Other services	594	2.8%	675	3.2%	805	3.4%	1,154	4.0%
<i>Sub Total</i>	<i>14,067</i>	<i>1</i>	<i>14,357</i>	<i>1</i>	<i>15,653</i>	<i>1</i>	<i>13,447</i>	<i>46.3%</i>
Inadequately described/Not stated	3,654	17.2%	3,646	17.2%	4,116	17.5%	4,318	14.9%
Total	21,248	1	21,187	100.0%	23,562	100.0%	29,026	100%

Source: ABS Census Time series 1996,2001,2006,2011 Time Series Profiles and Martin Associates P/L

2.6 UNEMPLOYMENT AND CURRENT LABOUR SITUATION

Unemployment in the Primary and Secondary Study Areas is shown in **Figure 4** and **Figure 5**. The unemployment rate in December 2012 in Muswellbrook LGA was 4.7% which represented 412 people. These figures have been trending upward like the Secondary Study Area and the local economy has returned to similar unemployment levels as in 2008 almost 1,000 unemployed in the secondary study area. This is in marked contrast to the situation in June 2012 when it was considered that the local economy was very close to fully employed when any remaining unemployment was considered to represent long term unemployed or structural unemployment.

Also shown in **Figure 4** and **Figure 5** the unemployment rate in the other two LGAs in the secondary study area in December 2012 was still comparatively low compared to Muswellbrook with a December 2012 rate of 2.7 % in Singleton; and 2.7 % in the Upper Hunter Shire; compared to 5.2% at the NSW State level. The dramatic increase in unemployment numbers is likely due to increasing uncertainty about the price of coal in a world market which is increasingly competitive. It is clear that there is some local excess capacity appearing within the Secondary Study Area which would be able to absorb new jobs with unemployed from within the area. As in Muswellbrook LGA, the rate had trended slightly upward and had increased in absolute terms from the previous June quarter by 179 people (from 233 to 412).

These unemployment numbers suggest that there are significant numbers of unemployed people available with appropriate skills to support the Project.

Figure 4
Unemployment Rate Secondary Study Area Breakdown (%)

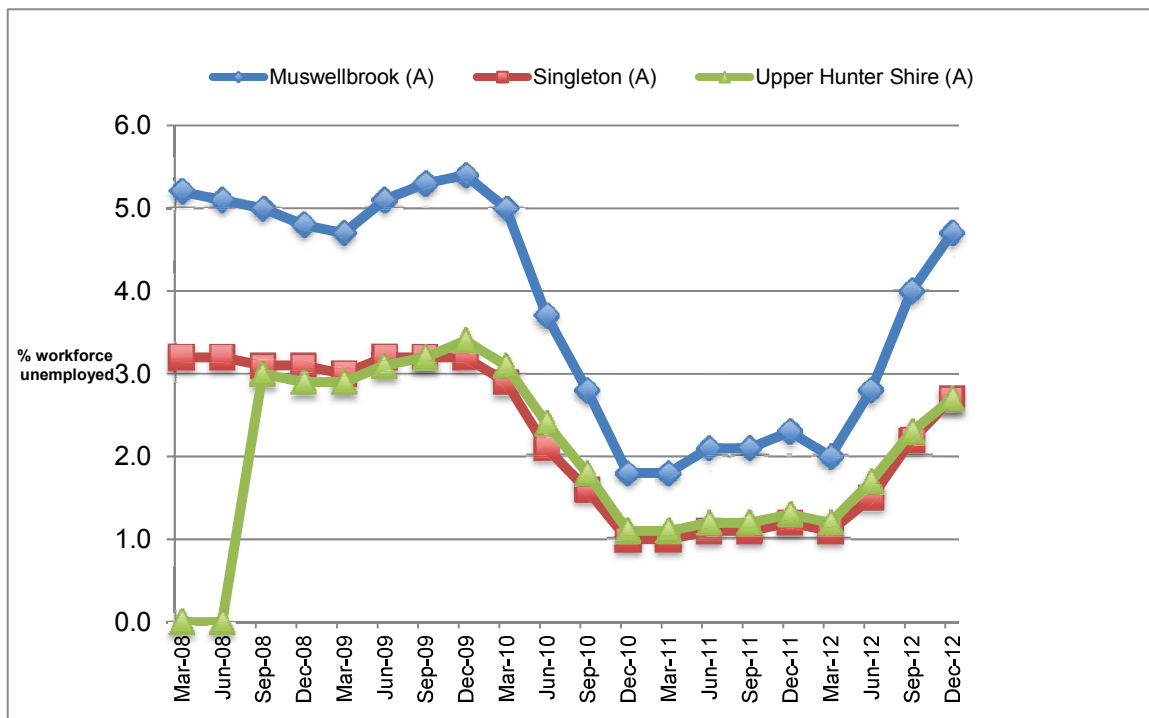
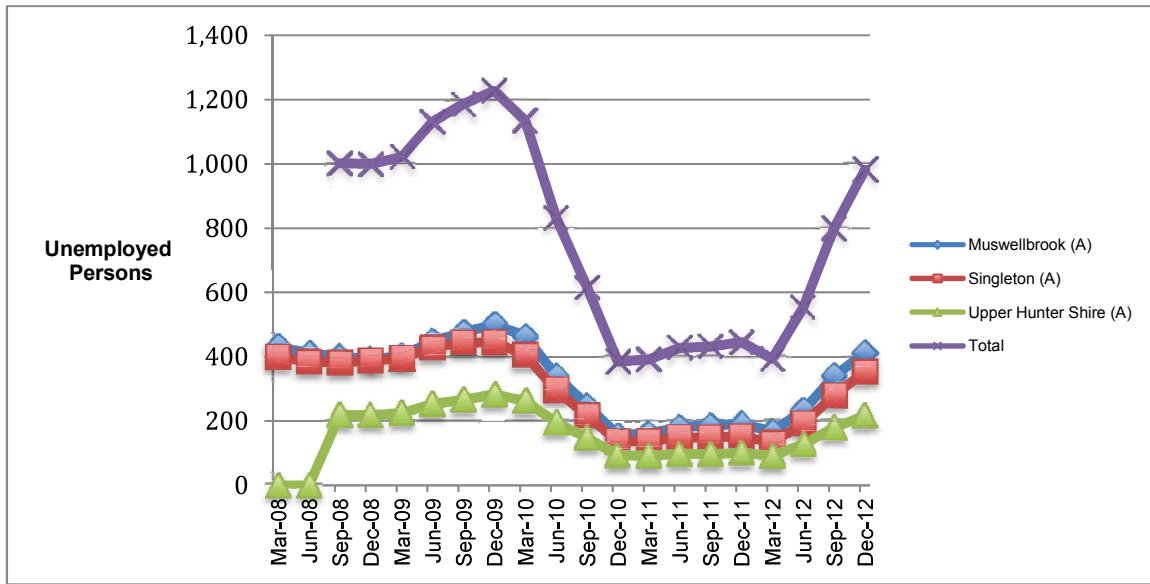


Figure 5
Unemployment Rate Secondary Study Area Breakdown (Total)



3 LAND, HOUSING AND ACCOMMODATION

3.1 INTRODUCTION

This section discusses the current land, housing and accommodation characteristics of the Primary Study Area and makes comparisons with the Secondary Study Area and other benchmark regions. These characteristics have then been used as the basis for determining the social impacts in the Primary Study Area and Secondary Study Area associated with the Project.

3.2 LAND

There are five small to medium developers and one larger investment development company in and around Muswellbrook township. In discussions with local real estate agents it was generally agreed that there is an adequate zoned land suitable for development within the current Muswellbrook Local Environmental Plan (LEP). Previous studies commissioned by the MSC have found there is enough land available to meet population projections until at least 2021 (MSC, 1994).

The biggest existing development is the Eastbrook Links Estate which has already developed 800 lots in 12 stages and has another 1,200 lots planned to complete a development with a total of 32 stages. However, there are constraints on the rate of development of land which include lack of finance and local government constraints on physical infrastructure.

The SRLUP found that Muswellbrook also has adequate employment (industrial service) land available to meet demand over the short term. In Singleton, while there was an adequate supply of zoned employment land, including 298 hectares at Whittingham, there was said to be "a relatively short supply of employment land serviced with infrastructure" (SRLUP, p45).

MSC made a presentation to the Upper Hunter Mining Dialogue Workshop in July 2012 on social impacts of mining and Infrastructure. MSC considered that it had sufficient land at present but would start to encounter land shortages in the medium term. The Council reported that it presently has 1,000 housing blocks still to develop but was concerned about the present very high prices for blocks and with present population projections will run out of suitable land. The issue of mixed housing was discussed which involves families in their so called "dream homes" living close to or next door to "hot bedding miners". There was a significant homelessness problem and much more "crisis housing" was considered to be needed. The Council is currently preparing a Housing Strategy which entails a 30 year vision with a 5 year action plan.

3.3 HOUSING

Trends in the Muswellbrook housing market in the period Sep 2011 to May 2013 are shown in **Figure 6**. Median prices for both separate houses and units have virtually the same median prices which suggests a very buoyant property market particularly attracting investors with relatively high rents and a consistent price of around \$250,000 - \$300,000 which have been yielding strong returns. By far the most common dwelling structure in Muswellbrook LGA is separate houses which made up 87% of the total housing stock of 5,997 dwellings in 2011. Semi detached and townhouses were 3% and flats, units and apartments were at 6% and there were 2% of other dwellings which included caravan parks.

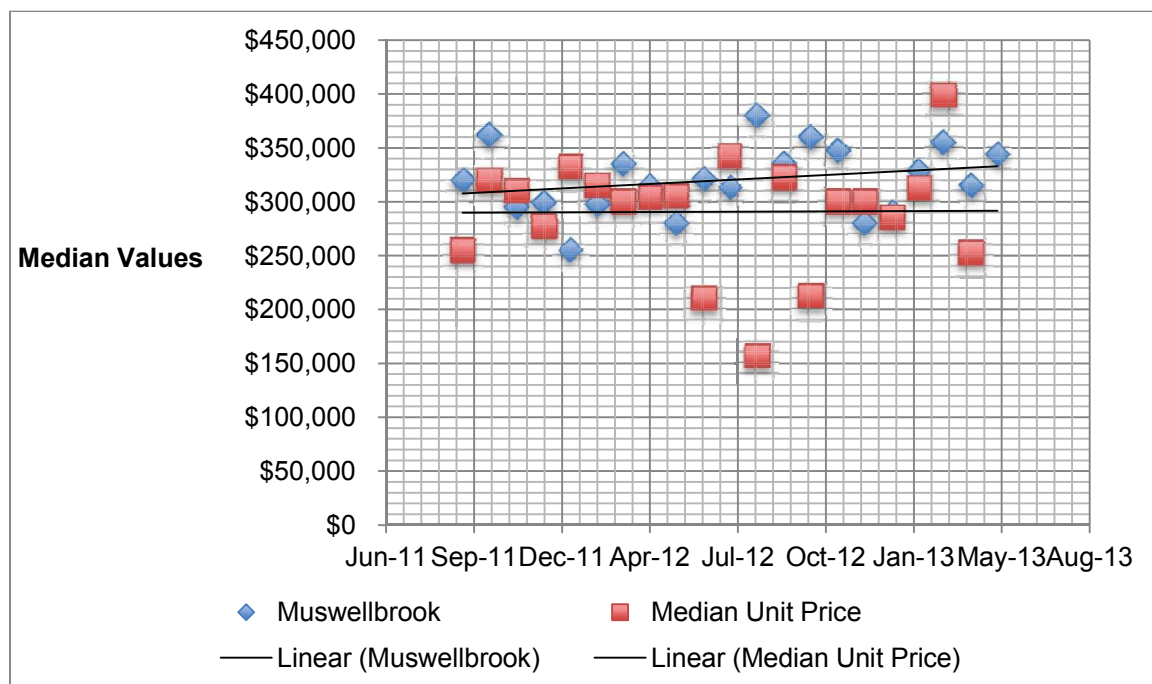
Muswellbrook has a significantly higher proportion of rental housing than the rest of the Secondary Study Area, the region and the State of NSW as shown in **Table 16**. The combination of the high demand for employees in the mining and power industries and health and safety commuting requirements led to a situation where the system was just coping even though it was not considered to be at "critical mass". Within the town of Muswellbrook the rental market for both houses at the cheaper to moderate end of the market and units had been sought after by many individual "mum and dad" small scale investors who were attracted to longer term rental income rather than capital gains. The local market had also been supported by a large development which had relied on investors from Sydney and Melbourne to maintain its impetus (Eastbrook Links Estate).

The higher end of the market particularly in the existing town had not been as strong due to a more subdued level of interest for investors. Once the market price goes over \$400,000, there was found to be far less demand for the property due to the higher mortgage costs compared to rental return.

This is reflected in the Census data on the housing stock set out in **Table 16** which shows housing tenure and total housing stock for the Primary and Secondary Study Area. Note how the percentage of the stock both owned or mortgaged has remained similar across the 2001 to 2012 period at around or above 60% for the Secondary Study Area, and the Region and State in 2011. The exception is that of Muswellbrook LGA which has been consistently drifting lower over the past ten years. Muswellbrook LGA has 35% rental housing and for Muswellbrook township (i.e. recorded as State Suburb and not reported in **Table 16**) the proportion of rental housing is even higher at 37.6% of the total housing stock (ABS Census 2011).

In the period January 2011 to September December 2012, the Muswellbrook LGA had a property and housing situation which was described by one of the local real estate agents as being “as strong as I have ever seen it” (Personal Communication, Lawler, LJ Hooker, Sept, 2012). Since that time the situation has significantly changed with supply considerably exceeding demand particularly for the rental market (personal communication, Lawler LJHooker , June 2013). This is due to world coal prices and uncertainty about the economy particularly in relation to the short term outlook for Chinese energy demand.

Figure 6
Median House and Unit Prices Muswellbrook September 2011 to May 2013



Source: Real Estate Monitor Website 2012

Table 16
Trends in Housing Tenure & Total Housing Stock within the Primary & Secondary Study Area

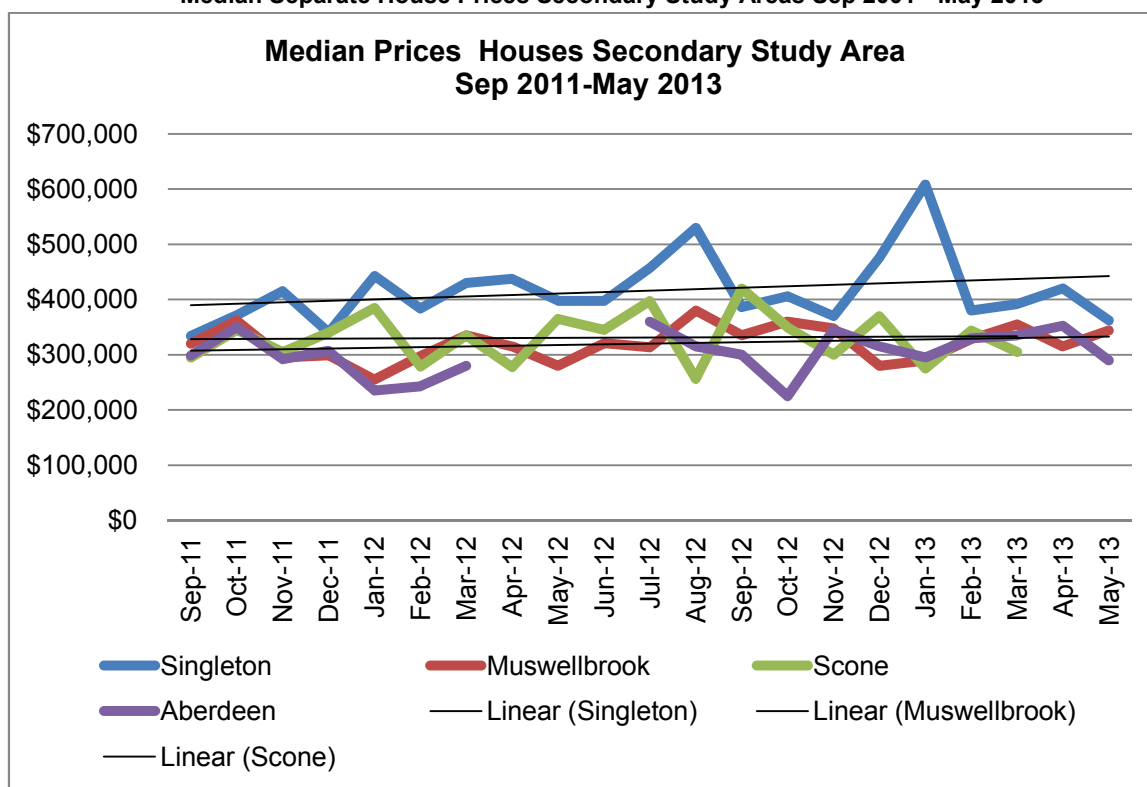
Tenure	Muswellbrook LGA			Upper Hunter LGA			Singleton LGA			Secondary Study Area			Hunter	NSW
	2001	2006	2011	2001	2006	2011	2001	2006	2011	2001	2006	2011	2011	2011
Owned outright	34.90%	29.20%	25.80%	43.90%	37.40%	34.20%	38.80%	31.50%	29.60%	39.20%	32.70%	29.80%	34.2%	33.2%
Owned with a mortgage(a)	24.00%	30.10%	31.00%	19.60%	27.30%	29.50%	27.80%	37.10%	38.00%	23.80%	31.50%	32.80%	35.3%	33.4%
Sub Total	58.90%	59.40%	56.80%	63.50%	64.70%	63.70%	66.60%	68.60%	67.60%	63.00%	64.20%	62.70%	69.5%	66.6%
Rented:														
Real estate agent	14.40%	15.70%	19.30%	9.20%	9.30%	9.80%	12.40%	13.10%	15.10%	12.00%	12.70%	14.70%	15.0%	17.4%
State or territory housing authority	7.30%	6.30%	5.10%	2.50%	2.90%	2.70%	5.40%	4.80%	4.50%	5.10%	4.70%	4.10%	4.0%	4.4%
Person not in same household(b)	6.70%	5.10%	5.10%	9.10%	8.00%	8.30%	5.10%	3.50%	4.00%	7.00%	5.50%	5.80%	4.9%	5.8%
Housing co-operative/community/church group	0.30%	0.50%	1.10%	1.20%	0.80%	0.90%	0.40%	0.20%	0.10%	0.60%	0.50%	0.70%	0.5%	0.7%
Other landlord type (c)	4.50%	2.80%	3.30%	6.60%	4.90%	5.20%	3.40%	2.80%	2.50%	4.80%	3.50%	3.70%	2.0%	1.1%
Landlord type not stated	0.90%	1.50%	1.20%	1.70%	2.90%	2.30%	0.80%	1.00%	0.80%	1.20%	1.80%	1.40%	0.7%	0.6%
Total	34.10%	31.80%	35.00%	30.40%	28.80%	29.20%	27.40%	25.30%	27.10%	30.60%	28.60%	30.40%	27.2%	30.1%
Other tenure type(d)	1.30%	0.90%	0.80%	1.80%	1.20%	1.20%	1.40%	0.50%	0.60%	1.50%	0.90%	0.90%	0.0%	0.0%
Tenure type not stated	5.70%	7.90%	7.40%	4.40%	5.30%	5.90%	4.60%	5.50%	4.80%	4.90%	6.20%	6.00%	0.8%	0.8%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	2.5%	2.6%
Total Housing Stock	5,394	5,642	5,995	5,172	5,195	5,514	6,987	7,638	8,164	17,553	18,475	19,673	88,034	2471276

Source: ABS Census 2001, 2006, 2011

There is some evidence (see **Figure 7** below) to suggest that housing values have peaked in Muswellbrook when compared to other locations within Singleton and Upper Hunter LGAs at July 2012. In 2011-2012, the Singleton and Upper Hunter LGAs have shown a stable or increasing trend in median values whereas Muswellbrook has been trending slightly downward. The current market for housing in Muswellbrook and Singleton in June 2013 is showing increasing supply and decreasing demand. (personal Communication , LJ Hooker Muswellbrook, July 2013).

The supply and demand data for major localities within the Secondary Study Area reported in **Table 17** shows increasing numbers of houses available in both Singleton and Muswellbrook with decreases in demand in both major centres. As shown in **Table 17**, in June of 2013, there were 295 properties for sale in the Muswellbrook township and 356 available in Singleton. Even though the level of demand for housing in Singleton has stayed higher overall compared to Muswellbrook, this significant slackening in demand is also evidence of the beginning of the recent uncertainty brought about by the significant drop in coal prices and the previous high value of the Australian dollar.

Figure 7
Median Separate House Prices Secondary Study Areas Sep 2001 - May 2013



Source: Real Estate.com.au Monitor website, 2013

Table 17
Available Supply and Demand for Houses and Units
Localities within the Secondary Study Area – Nov 2011- Dec 2012

Locality	Muswellbrook		Aberdeen		Scone		Singleton		Singleton Heights		Total	Total
	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand
Nov-11	243	1381	39	349	223	1053	249	1910	1	9	755	4702
Aug-12	229	2112	24	652	162	1215	250	2463	6	150	671	6592
Sep-12	230	1281	29	298	180	1057	254	1714	4	50	697	4400
Dec-12	223	1298	41	373	206	809	309	1580	1	11	780	4071
Jun-13	295	1159	54	351	217	1033	356	1497	1	8	923	4048

Source: Real Estate.com.au & RP source data, 2012

3.3.1 Rental Property

In 2011, there were 2,100 properties being rented in Muswellbrook LGA which as discussed above represents 35% of the total housing stock which is significantly higher than the other LGAs in the Secondary Study Area the region and the State of NSW (see **Table 16**). In Muswellbrook township itself, there were 1,576 properties being rented and the proportion being rented was even higher at 37.6% (ABS Census, 2011). An increasing component of this stock in Muswellbrook is coming from within new residential estates on the fringe of the township.

In the early stages of the largest on-going development, Eastbrook Links Estate, the majority of sales were made to owner occupiers. However increasingly the majority of new stages are being taken up by outside investors for rentals and in most cases housing and land packages are sold before the land in these stages have been fully developed. This situation reflects the present very high demand for any type of rental or short-term accommodation and these new fringe developments appear to have provided the mechanism for high numbers of work week commuters to continue to increase this demand.

Due to the presence of lower socioeconomic groups, Muswellbrook has always tended to have a higher than State proportion of social housing (either through State or territory housing authority or Housing co-operative/community/church group) which is also reflected in the Census tenure data (See **Figure 6**). In 2011, this figure was 6.2% for Muswellbrook LGA and 5.1% for NSW. In the past, this has tended to moderate rental values due to subsidised public housing rents and rent rebates and subsidies in the private sector. However with the acute shortage of rental accommodation, private sector rents have been driven up so that they have increased dramatically and are now well above the regional levels for Local Governments in the Hunter Region outside the City of Newcastle. Families and individuals on fixed incomes or pensions have found it increasingly difficult to pay rents in the private sector if they do not have access to the fully subsidised social housing which is presently operated by Housing NGO's such as Compass. (NSW Rental Reports & personal communication real estate representatives Muswellbrook, September 12)

Compass Housing Services is a non-profit organisation contracted to the government to maintain social housing and operates an office in Muswellbrook to service the public housing available in the town. In comparison to Singleton their presence is considerably less with only a visiting representative in Singleton for three hours once a fortnight. Compass presently operates 179 properties in Upper Hunter LGA, 430 in Muswellbrook LGA and 36 in Singleton LGA and 74% of the tenants have Centrelink as their main source of income. Compass representatives consider that both Muswellbrook and Singleton had experienced an affordable housing crisis (Personal communication, Compass Housing, September 2012).

"There's definitely a crisis, but people who own properties usually go for the lowest risk and the highest rent, and that usually means miners." (CEO, Compass, Singleton Argus, 23/12/11)

In the period December 2012 to July 2013, the situation for rental housing has turned around significantly so that in the last quarter reported from the NSW Office of Housing to Dec 2012) showed rents for units and flats dropping by 13.8%. Local real estate agents reported that there are now (July 2013) a large number of rental properties available and the pressure on rents to continue to decline will intensify. This is due to a very large decline in employment as current mining operations address the current less attractive market conditions.

**Table 18
Median Weekly Rents – December Quarter 2012**

Statistical Local Area SLA 3	All Dwellings			All Dwellings			Separate Houses			Flat/Units		
	Two Bedrooms			Three Bedrooms			Three Bedrooms			Two Bedrooms		
	Median Rents (\$)	Change Qtly (%)	Ann (%)	Median Rents (\$)	Change Qtly (%)	Ann (%)	Median Rents (\$)	Change Qtly (%)	Ann (%)	Median Rents (\$)	Change Qtly (%)	Ann (%)
Upper Hunter includes Muswellbrook & Upper Hunter Shires	260	-7.1	13.9	350	2.9	16.7	343	3.8	10.5	250	-13.8	19.0
Lower Hunter includes Singleton and Cessnock	280	0.0	0.0	350	0.0	2.9	350	0.0	2.9	280	0.0	0.0
REST OF NSW	235	0.0	6.8	300	0.0	0.0	295	1.7	1.7	220	0.0	4.8

notes: (s) 30 or less bonds lodged; (a) 10 or less bonds lodged; (n) not available due to small number

Source: NSW Housing Rental Report 102, December Quarter, 2012

3.3.2 Temporary Accommodation

Data for temporary tourist accommodation for the June Quarter of 2012 and the March Quarter of 2013 is set out in **Table 19**. As shown in **Table 19** the majority of the temporary accommodation rooms are located in the Singleton LGA (323). Muswellbrook has the next highest share within the Secondary Study Area with 269 rooms. The two quarters of data show how the accommodation situation had changed in the December quarter. Occupancy rates for the Secondary Study Area are now lower than the Hunter Regional and NSW rates where as previously these were significantly higher during the June Quarter. As shown in **Table 19** the current occupancy rate in the Secondary Study Area is 48% and if these trends were to continue, the capacity of these facilities will continue to increase. There are now an estimated 403 units available on a daily basis in the Secondary Study Area and 125 units for the Primary Study Area with occupancy rates trending downward.

The motel / hotel industry in Muswellbrook has not seen significant investment to increase the quality or quantity of units available in recent years which is thought to be caused by the generally small scale of the facilities, lack of available finance and also the historically high occupancy rates and high prices which tend to act as a disincentive to expansion due to construction disruption. The downward trend in occupancy rates may now increase the incentive to increase the total stock available and improve quality.

In Muswellbrook itself there are also two caravan/resort parks. The resort park is currently undergoing renovation and has 121 sites including 63 temporary onsite housing units and 7 long term owner residents. This park is has nearly always been full and presently charges \$120 per week. The same owner has just developed a 93 modular unit park adjoining the site which provides a significantly higher quality of accommodation with significantly higher rates targeting the resource industries. This recently developed portion of the park was opened in Sept 2012 and so far has been poorly utilised and has had to reduce prices. The other caravan park has caravan powered sites but also has on site units mainly accommodating long term residents and historically has enjoyed high occupancy. Very few sites were ever available for passing tourists (personal communication, Manager Pinaroo Caravan Park, September 2012). The change in the temporary accommodation will allow more drop in tourists to use these facilities.

In other resource areas of Australia such as Collinsville in Queensland, the issue causing tension has been the development of separate accommodation facilities for a commuter workforce which is perceived as essentially replacing the need for the existing town based facilities leading to a low local "value added" from mining development. These facilities tend to be subsidised by mining companies in other States because they are mandated as part of planning and mining consent conditions. These subsidies have not tended to be utilised and/or required in the NSW mining industry. In Muswellbrook to date there has been minimal development of these facilities even though significant developments have been approved by consent authorities (e.g. MAC Development in South Muswellbrook of 200 workforce units residential village approved by MSC).

The data and information supplied by housing and mining related industry representatives suggested that there were large numbers of mining and contractor personnel who were work week commuters and were using the very cheap end of the market, car pooling, sharing rooms and in some cases also "hot" bedding (i.e. using the same bedroom or bed for workers on alternate 12 hour shifts). The combination of group rental housing in both Muswellbrook township, the new fringe residential estates and the caravan parks was how directly employed mining and particularly contractor personnel were addressing their accommodation issues at weekly rates which were significantly lower than the higher priced hotel/motel rates. Mining services and construction contractors not directly employed were considered to be the main market for this type of accommodation.

Since there has been very significant declines in personnel, there is now considerable capacity in the private rental market as well as in the motel/hotel and other temporary accommodation facilities.

Table 19
Temporary Short Term Tourist Accommodation

Location/ Region	Establishments	Rooms	Bed spaces	Persons employed	Room occupancy rate			
	June Quarter 2012	June Quarter 2012	June Quarter 2012	June Quarter 2012	April	May	June	June Quarter 2012
Muswellbrook	8	248	676	87	58.2	75.9	64.4	66.3
Other Muswellbrook LGA	1	17	38					
Scone	5	120	353	55	69	84.7	73.4	75.8
Scone Region	4	62	173	15	49.9	55.4	47.3	50.9
Singleton	8	324	735	141	61.5	74.1	66.4	67.4
Secondary Study Area	26	771	1,975	298	59.7	72.5	62.9	65.1
	March Quarter 2013	March Quarter 2013	March Quarter 2013	March Quarter 2013	January 2013	February 2013	March 2013	March Quarter 2013
Singleton	8	323	748	131	42.4	49.1	55.8	49.1
Muswellbrook	8	252	693	81	39.1	46.5	54.1	46.5
Muswellbrook Region	1	17						
Scone	5	120	341	54	49.1	49.3	61.0	53.3
Scone Region	4	62	152	13	36.1	44.0	45.7	41.9
Secondary Study Area	26	774	1,934	279	41.7	47.2	54.2	47.7
<i>Hunter (TR) Total</i>	<i>102</i>	<i>4,358</i>	<i>13,190</i>	<i>2,184</i>	<i>53.1</i>	<i>58.1</i>	<i>61.7</i>	<i>57.6</i>
New South Wales	1,388	70,725	190,081	30,004	64.0	67.9	69.1	67.0

ABS Tourist Accommodation Small Area Data, NSW, June Quarter, 2012 & March Quarter 2013

4 COMMUNITY INFRASTRUCTURE

4.1 HEALTH FACILITIES & SERVICES

Healthcare in Muswellbrook LGA is part of the Hunter New England Local Health Network (HNE Health) which has a head office located in Newcastle and a regional office located in Tamworth.

HNE Health is unique, in that it is the only Local Health Network with a major metropolitan centre (Newcastle / Lake Macquarie) as well as a mix of several large regional centres like Singleton and Muswellbrook and many smaller rural centres and remote communities throughout a large service area which has a population of 840,000 people. According to the 2010-2011 Annual Report (HNE, 2010):

“public health facilities includes two tertiary referral hospitals, four rural referral hospitals, 20 community hospitals and Multi Purpose Services, 13 district health services and 55 community health centres, together with a number of mental health and aged care facilities.”

Additionally it states:

“The Hunter New England Local Health District has significant groups of disadvantaged people, including Aboriginal people, people on low incomes, and people living in rural or remote areas, all of whom suffer poorer health than the rest of the population. There are also some alarming trends in lifestyle behaviours and risk factors such as increasing overweight and obesity, low levels of physical activity, poor diet and significant numbers of people who continue to smoke and consume alcohol excessively.”

Muswellbrook LGA is a modest growth area and demand for services was described as “stable” (personal communication, Muswellbrook Cluster, Sept 2012) with a slowly growing young and middle aged working population and a significant elderly resident population so the health care services have been balanced in order to cater to the needs of these two somewhat different demands. According to the Regional Manager of the Upper Hunter Cluster based at Muswellbrook Hospital, the current public organisation is providing services which are operating adequately and within the standards of the NSW Health Department of Health and the Network Strategic Plan. Demand for hospital and community health services is stable and there is currently no undue pressure on service standards due to the growth in the resource industries.

The most significant pressure facing the organisation at the moment is due to workforce demands. There have been significant ongoing difficulties in recruiting and retaining staff especially experienced nurses and to a lesser extent doctors. There are short term residential incentives offered with a residential facility at the Muswellbrook Hospital and plans for its expansion. The situation for nurses was described as “critical” and the situation for doctors “up and down” due in part to overseas recruitment.

This issue was also mentioned in the Annual Report 2010-2011 as follows

“Maintaining and sustaining our health workforce is another major challenge for the Hunter New England Local Health District. As we have significant proportions of staff expected to retire in the next five years, we need to continually review our workforce recruitment and retention strategies to ensure there is an adequate skilled workforce across all parts of the Hunter New England Local Health District into the future.”

Muswellbrook Hospital currently varies between 50 - 100 beds dependent on seasonal demand (personal communication, Muswellbrook Hospital, Sept., 2012).

Brook Medical centre has 14 General Practitioner (GP) doctors full time and part time and there are 27 GPs in the Muswellbrook LGA according to MSC Social Planning representatives. Waiting times to see a GP are considered excessive.

Muswellbrook Community Health Centre offers a range of community based health services to all members of the community. Support services available include:

- Aboriginal Health;
- Audiometry;
- Child and Family Clinic;
- Child Protection and Family Counselling Service (PANOC);
- Community Mental Health;
- Community Nursing;
- Dementia Day Centre;
- Diabetes;
- Dietetics;
- Occupational Therapy;
- Physiotherapy;
- Podiatry;
- Prenatal Education;
- Psychology/Social Work;
- Sexual Assault Service;
- Speech Pathology;
- Women's Health; and
- Young Parent Support.

4.2 EDUCATION SERVICES

4.2.1 Child Care

Child care and Pre-School care was described by MSC social planning representatives as at absolute capacity (personal communication, July, 2012). MSC does not operate any child centres but gives support through coordination and integration within the context of broader social planning for the entire LGA. There are a number of privately run child care centres in Muswellbrook and also in Denman. Total child care places available in Muswellbrook LGA were reported as 119 in Muswellbrook and 30-35 in Denman and a total of 80 pre-school places. The cohort of children of 0-2 age places is particularly critical.

These facilities include:

- Muswellbrook Pre School Kindergarten, catering for children 0 - 5 years;
- Muswellbrook Multi-Care Child Centre, also offering a full range of care for children 0-5;
- Muswellbrook Out Of School Hours Care, which offers child care activities before and after school and during vacation periods;
- Denman Children's Centre, offering child care for children aged 0 - 5 years 4 days a week and pre school for children aged 4 - 5 years 5 days a week and also occasional care; and
- Upper Hunter Family Day Care Scheme, family day care is offered through the Senior Citizens centre.

There are also many smaller centres located in some of the residential estates as well as many informal privately operated family day carers.

4.2.2 Primary Schools

There is a variety of primary schools available in Muswellbrook as set out in **Table 20**. Discussion with MSC planning representatives indicated that enrolments are stable and there are no capacity issues in terms of the services offered. Primary School workforce issues are also not considered a significant issue at the moment.

Table 20
Primary Schools Muswellbrook LGA

School	Enrolment 2011
Denman Public	212
Muswellbrook Christian	17
Martindale Public	19
Muswellbrook Public	601
St James Muswellbrook	291
Muswellbrook South Public	356
St Josephs, Denman	44
Sandy Hollow	48
Total	1,598

4.2.3 Secondary Schools

There are two high schools within the Primary Study Area. Muswellbrook High is the largest facility and there is a Catholic high school in Aberdeen. Muswellbrook students also attend the Scone Grammar school in the Upper Hunter LGA. Discussion with the Principal of Muswellbrook High regarding enrolment indicated that student numbers have reached over 800 for the first time since 2004 and is presently at 850. The school went to over 1,000 students in the 1980's with the construction of Bayswater Power Station and has been generally stable since that time.

Secondary school workforce issues like those in the health services sector are not apparent and service standards are considered to be operating more than adequately. Capacity issues would begin if the enrolment reached 950.

4.2.4 Tertiary Education

Hunter TAFE Muswellbrook Campus is the only tertiary institution available in the Primary Study Area. Muswellbrook TAFE courses cover a range of industry areas including Arts & Media, Access & General Education, Business & Computing, Industry & Natural Resources, Health & Community Services. Muswellbrook Campus is home to the Mining Skills Centre, which offers an innovative full time course for new apprentices in basic engineering, safety and lifestyle skills. The centre can also customise other training based on industry or employer requirements. HunterNet, a network of manufacturing, engineering and consulting companies, is located at Muswellbrook Campus and offers innovative manufacturing solutions through its network.

Muswellbrook TAFE Campus' course offerings and services are delivered in accordance with TAFE NSW, Australia's leading vocational education and training provider. Training of apprentices is identified as a key issue in Muswellbrook Shire and some mining companies have ongoing programs. The MSC identified one issue as ensuring that apprentices are given jobs once they have completed their courses.

4.3 EMERGENCY SERVICES

There is a full range of emergency services in the Primary Study Area including police, ambulance and fire services and all are operating within their service standards. There is an operating Emergency Management Committee for disaster control which is interagency and includes coordination with Muswellbrook Hospital. There is also a network of volunteer bush fire and emergency services personnel coordinated through the Council Disaster Management Plan.

4.4 PUBLIC TRANSPORT

There is an internal local bus public transport system operating in Muswellbrook township but the rest of the LGA is generally dependent on private transport. There is also a local Muswellbrook taxi service. For trips into and out of the Shire there are rail and bus services which follow the New England Highway corridor. There is a commuter train service from Newcastle which is carrying up to 500 per day into the Secondary Study Area. (MSC representatives, July, 2012)

4.5 PHYSICAL INFRASTRUCTURE

4.5.1 Road Network

The New England Highway is the main road artery which connects Newcastle to the Secondary Study Area. There are sections of dual carriageway and more under construction but there are still major bottlenecks caused by single lane sections and many sections under construction. The section of the road through Singleton township causes daily traffic delays and would require a major upgrade and new bypass route in order to adequately address the problem.

Delays along the New England Highway forces peak hour traffic to seek alternatives on the secondary and local road system. As a high percentage of the workforce in Muswellbrook LGA are commuters, the low peak hour levels of service tend to force many commuters into staying in cheap temporary accommodation in Muswellbrook on a shift to shift basis due to mining industry health and safety requirements for direct employee and contractor staff.

4.5.2 Sewerage Treatment

According to the MSC Website dated August 2012, the current sewerage treatment plant for Muswellbrook township is operating at near capacity and requires upgrading. According to MSC representatives, this issue is a significant constraint on the approval of new residential development.

The website reports that:

“The Muswellbrook Sewage Treatment Plant is nearing the end of its working life. With the extensive development that is occurring in the Muswellbrook urban area, and in response to a requirement on Council’s treatment plant licence issued by the Department of Environment and Climate Change (DECC), Council is currently investigating the options available to upgrade the wastewater treatment facility. This may involve improvement of the existing plant or construction of a new plant on the current site or a new site.

Council has commissioned studies into the current treatment process, current and projected flows, and feasibility of the existing and alternative sites. From these studies will come a concept plan for the future upgrade and/or reconstruction of the plant. This will be followed by detailed design and construction of the proposed upgrade works.”

4.6 RETAIL AND HOUSEHOLD SERVICES

Residents of Muswellbrook township have considerable variety for every day services and the township supports the major food and supermarket retailers. Entertainment is more limited compared to Singleton which has a larger department store and also a movie theatre. There are several club and hotel venues which cater to the younger singles who are living in the town as work week commuters or contractors. To date there has been no unusual rise in rowdy or anti social behaviour caused by the presence of many workers using temporary accommodation near town (Personal Communications, Manager Pinnaroo Caravan Perk, Housing Industry rep Eastbrook Links Estate, Sept, 2011).

5 STAKEHOLDER ENGAGEMENT

This section includes a description of community values relating to social issues in the Primary Study Area, primarily sourced from the Project's Stakeholder Engagement Process as documented in the EIS.

5.1 PROJECT STAKEHOLDER ENGAGEMENT

Stakeholder Engagement was undertaken for the Project, which is documented in detail in the EIS. This included specific engagement with members of the Directly Affected Area (DAA), which was undertaken for the Project during preparation of the EIS. The key issues which were raised by stakeholders in the ongoing DAA that relate to social impact include:

- The extent of acquisition liability arising from the Project and potential cumulative issues;
- Noise, blasting and air quality impacts and cumulative environmental issues when combined with other neighbouring mines; and
- Economic and financial issues which include significant differences in worker wage rates and the inflated cost of local housing.

5.2 MUSWELLBROOK SHIRE COUNCIL SURVEY JANUARY 2011

In January 2011, MSC commissioned Jetty Research to conduct a random telephone survey, and parallel online poll, of local residents concerning their vision for the Shire's future in 2020. It was part of a community consultation phase, designed to understand resident sentiment in preparation of a Community based Strategic Plan which would form the basis of a future vision of the Shire in the Forecast year of 2020.

The total sample for the telephone survey was 400 respondents, while 186 respondents had completed the online survey by its February 15th deadline.

It was noted that online respondents were generally younger, more likely to be employed, and more likely to live in an urban setting than those interviewed by telephone. These differences in sample demographics were considered to explain significant differences in response between the two research groups.

The results of the surveys showed a consistent theme in that both groups interviewed with different methods perceived the environmental impact of mines as their number one concern.

Selected results from the surveys are given below:

- **“LIKES:** Respondents predominantly appreciated the region's rural or bush atmosphere and its sense of community. Beyond this telephone and online responses diverged: the former focussing on convenience, family-friendly atmosphere and quiet lifestyle, while the latter were more likely to mention the shire's good infrastructure, central location and healthy economy.
- **DISLIKES:** The environmental impact of the mines was the number one concern of online respondents, and number two for telephone interviewees (behind a lack of recreational activities). Perceived infrastructure deficiencies were also near the top of the “dislike” list for both groups. There was some mention of tension between residents and “fly in” mine workers in the other category.
- **INFRASTRUCTURE NEEDS:** Common infrastructure wish lists among telephone and online respondents included a cinema and/or bowling alley, road improvements, and more community or cultural facilities. Telephone respondents also focussed on a perceived need for improved health care facilities and/or more GPs, more recreational options for youth, better aged care options and improved sporting and swimming facilities. Online participants, meanwhile, were more likely to focus on the need for a CBD bypass, and their desire to see Muswellbrook a tidier and cleaner town.
- **ROADS, TRAFFIC AND PARKING:** Better roads topped the list of both set of respondents. Beyond this view diverged, with telephone respondents focussing mainly on improved rural roads, while online participants were more vehement in their wish for a bypass of Muswellbrook.

- **JOB AND THE ECONOMY:** There was a strong desire by both set of respondents to see an improved retail offering in Muswellbrook. Other themes common to each survey were the need to see more locals employed in local jobs and to provide greater support for local businesses. Online respondents were especially keen to see a broadening of the economy away from mining, and a wish to apply a more tourist-friendly face. There was also a wish to see more tertiary education opportunities, in particular additional TAFE course and a university branch campus.
- **LOCAL ENVIRONMENT:** A need for more parks, reserves and open spaces dominated both surveys. There was also considerable disquiet about the noise and dust being created by the mines, and a desire to see more – and more transparent – monitoring of dust and other pollutants. Beyond these, telephone respondents focussed more on walking and bicycle paths, and the need for improved public transport, while online participants returned to an earlier theme of tidying up Muswellbrook.
- **SAFE, HAPPY, HEALTHY COMMUNITY:** An improved medical service was top of mind for both sets of respondents. Beyond this results diverged, with other popular themes again including more recreational and cultural facilities, increased law and order, improved youth services and aged care facilities, and more employment opportunities for youth. Online respondents were keen to see Muswellbrook promoted as a safe and friendly place, and to control mine pollution.
- **HOUSING MODEL:** When asked whether they would prefer more or less medium- and high-density accommodation, results of both telephone and online surveys were unequivocally in the “greater controls to preserve the look and feel of Muswellbrook”. This finding was consistent across ages, genders, regions and times lived in the shire. **BIG IDEA:** Telephone respondents were additionally asked if what they would do given the opportunity to implement one project, big or small, to improve the Muswellbrook LGA. The four major themes to emerge were: a youth activity centre; cinema; Muswellbrook bypass; and beautification of local parks and gardens. “

The conclusion of the surveys was as follows

- . *.....“it would appear that Muswellbrook Shire residents have a “love/hate” relationship with the mines: appreciating their economic impact, but resenting the (perceived) lack of job opportunities for local employees, the adverse environmental effects, and the negative lifestyle impact the mines have apparently had on many residents’ quality of life. While some respondents suggested that the mines should be shut down, or at least that no more be approved, the majority appeared to be appealing more for a “happy medium”, with Council focussed on leveraging the economic benefits of the mines for the long-term betterment of the local community.” (Jetty Research, 2011)*

6 IMPACTS OF THE PROPOSAL

This Chapter provides an analysis of the expected social impacts of the Project on the community profile, values and perceptions, community infrastructure and services and property prices in the Primary Study Area.

The estimated employment impacts of the Project are based on the Economic Impact Analysis prepared by Gillespie Economics (2013) which has been prepared as another technical assessment to the EIS. It is important to emphasise that multiplier effects are made up of two components- i.e. production induced and consumption induced effects.

“Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are located in the region or migrate into the region. Where workers commute from outside the region some of the consumption-induced flow-on effects leak from the region. Where workers are already located in the region (i.e. unemployed or employed), some of the consumption-induced flow-ons in the region may already be occurring through expenditure of their current wage or unemployment benefits” (Gillespie Economics, 2013).

6.1 CONSTRUCTION PHASE

The housing and population impacts for the construction phase at peak are shown in **Table 21**. As shown in **Table 5** the direct workforce will peak at 315 (FTE) in the first quarter of Year 2 and stay at that level for one quarter before it tapers off and finishes at the end of Year 3. **Table 21** shows that the non local component of the workforce (Columns C,D) for both direct and multiplier workers except for daily commuters (Column E) will require accommodation within the Primary Study Area. As shown in **Table 21**, the maximum amount of semi permanent and / or short term accommodation required is estimated at 90 during the peak quarter. This figure assumes there is group housing of 2 per house/unit and there is no “hot bedding” occurring during this period. This is considered to be a worst case as the average new house in the fringe housing developments have 3 to 4 bedrooms.

The total population increase to Muswellbrook LGA on a working day basis is estimated at 349. As shown in **Table 21** and discussed above (Gillespie Economics, 2013) the impacts on community infrastructure were discounted by 171 due to the high incidence of daily commuting in the construction industry. (Gillespie Economics, 2013) Consequently, the increase in the more permanent population is 174 which represents 1.1% of the 2011 population of the LGA. It should be emphasised that these figures represent the peak which according to the construction schedule will last for one quarter at the start of Year 2.

As discussed above, these estimates have assumed a multiplier of 0.96 multiplier jobs to sustain 1 construction job. The multiplier job estimates from Gillespie Economics take account of the fact that the commuter workforce is using different levels of consumption induced services such as community services and infrastructure at both their home base and also within the Primary Study Area. As the Project is a continuing project, it has also been assumed that there is no overlap between the final stages of construction and the increase in the workforce for the new level of operations.

Table 21
Construction Phase Impacts, Primary Study Area

Construction At Peak	Total Workforce	Local Component	Non Local Component	Work Week Commuters*	Daily Commuters	Total Residential Units** Impact	Population Impact
Direct	218	44	174	87	87	46	181
Multiplier	209	42	167	84	84	44	167
Total Jobs & Impacts	427	85	342	171	171	90	349

* assumes group housing at 2 workers per house/unit and no ‘hot bedding’ (Personal communication - Accommodation reps, Sep 2012)

6.1.1 Impact On Temporary Accommodation

As discussed in **Section 3.3**, the previous situation in the Primary Study Area with the temporary rental, hotel, motel and tourist accommodation was considered to be extremely challenging with virtually no short term rental accommodation available. Occupancy rates had been historically high over the three years up to December 2012 (66.5%) compared to regional and state levels and reported ABS data showed that there was a total of 89 units available out of a total of 269 units in Muswellbrook LGA. There are three caravan parks which were generally at capacity each working night which had been allowing multiple on-site occupancies and provide relatively cheap lower standard accommodation.

There were also 93 new on site resort park units which had been recently completed which are more expensive but which are higher standard. These units currently have high vacancy rates.

The total number of units estimated to be available was estimated at 218 units with an additional 403 units available in the broader Secondary Study Area. The first two quarters of 2013 has seen a significant decrease in demand for all types of accommodation particularly from contractors servicing the mining industry. Occupancy rates in the secondary study area have now dropped below 50% for the first time in over three years (see **Table 22**).

Also, there are now significant numbers of houses and rooms in group rental housing in residential fringe developments which have become available which would also satisfy the needs of the first year of the construction schedule but this type of housing may be less suitable for the shorter term nature of construction work. However, it is now considered that the current supply of short term private and hotel/motel accommodation will be more than adequate to satisfy project construction requirements.

6.1.2 Impact On Community Infrastructure

Local cafes and restaurants in Muswellbrook will be affected by a proportionate increase in business for the duration of the construction phase for those not being supplied by the Project. As a significant proportion of the construction workforce will be commuting to the site on a daily basis and on a work week basis, there will be limited impacts on the various elements of other community infrastructure. There may be slight impacts on the outpatient health services facilities at Muswellbrook Hospital and at the two GP community health centres due to servicing of the normal needs of the construction workforce on a daily basis but these impacts are considered to be manageable within the normal facility planning assumptions.

No significant impacts on local schools are anticipated as the non-local workforce is expected to commute to the site on a daily or weekly basis. However, it was assumed that 5% of the construction workforce will be made up of a permanent senior management group that would move into the Primary Study Area particularly Muswellbrook township. The total demand for schooling and childcare facilities of these employees would not exceed 10 school students and childcare places at the peak of construction which is considered to be well within current planning assumptions.

6.2 OPERATIONS PHASE

As discussed in the methodology section, the analysis considered two scenarios - one based on the current residential locations of the existing workforce and the other in order to consider a situation where there was a higher than expected proportion of the non-local workforce deciding to relocate to Muswellbrook township and reduce dependence on a commuter workforce.

Table 22
Results of Gravity Model

Centre	Population	Time in Minutes	Population of Centre /Time Relative Attraction Factor	Gravity Distribution
Cessnock	67,478	85	794	16.8%
Maitland	50,863	85	598	12.7%
Singleton	23,019	41	561	11.9%
Muswellbrook	16,098	7	2,300	48.6%
Scone	13,822	29	477	10.1%
Total	na	na	4,730	100.0%

Source: Martin Associates P/L, 2012

A theoretical gravity model (which distributes the incoming workforce on the basis of the size of surrounding existing population centres and the time distance to the work site) was used to validate both of the scenarios. The results in **Table 22** of the modelling indicated that the final distribution was more likely to be scenario 1 which was considered to be the “expected case.”

The results for each of the scenarios show the likely housing and total population impacts on the Primary Study Area. Consequent impacts on other components of community infrastructure are then discussed.

6.2.1 Scenario 1- Expected Case

6.2.1.1 Housing and Population Impacts

The estimated housing and population impacts of Scenario 1, which is considered to be the expected case, are set out in **Table 23**. As for the construction phase, the multiplier job estimates from the Economic Impact Analysis have been redistributed to take account of the fact that the commuter workforce would be from different locations within the secondary study area and using different levels of consumption induced services such as community services and infrastructure at both their home base and also within the Primary Study Area.

The combination of workers moving into Muswellbrook LGA and work-week commuters shows a total population increase of 952 and the need for 403 residential units, of which 243 would be for families and/or couples and the remaining 160 to accommodate the needs of singles and work week commuters.

The population increase of 952 is made up of both families/couples at 2.6 per household and single households (788) who will move into Muswellbrook permanently plus single work week commuters from within (92) and outside the secondary study area (73) (i.e. reside in the regional study area).

Table 23
Operations Phase Scenario 1 "Expected Case"

PREDICTED LOCATION OF WORKFORCE	% of Workforce	NO. OF NEW EMPLOYEES AND MULTIPLIER JOBS			Work Week Commuters *	Daily Commuters	Total Housing Units Required Years 1-4		Total Residential Units** Impact	Population Impact
		Direct Jobs	Multiplier Jobs	Total Jobs			Families/Couples	Singles		
Relocated to primary study area	37%	182	217	399	0	0	243	78	321	788
Reside in secondary study area	34%	167	199	366	92	275	0	46	46	92
Reside in the regional study area	9%	44	53	97	73	24	0	36	36	73
Total non local workers	80%	393	469	862	164	299	243	160	403	952
Total local workers	20%	98	20	118	0	0	0	0	0	0
Total increased workforce	100%	491	673	1,164	164	299	243	160	403	952

* Assumes no hot bedding & group housing of 2 workers per residential unit

Table 24
Operations Phase Scenario 2 "Sensitivity Case"

PREDICTED LOCATION OF WORKFORCE	% of Workforce	NO. OF NEW EMPLOYEES AND MULTIPLIER JOBS			Work Week Commuters *	Daily Commuters	Total Housing Units Required Years 1-4		Total Residential Units** Impact	Population Impact
		Direct Jobs	Multiplier Jobs	Total Jobs			Families/Couples	Singles		
Relocated to Primary Study Area	56%	275	377	652	0	0	398	127	525	1288
Reside in Secondary Study Area	16%	79	108	186	47	140	0	23	23	47
Reside in the Regional Study Area	8%	39	54	93	70	23	0	35	35	70
Total Non local workers	80%	393	538	931	116	163	398	185	583	1404
Total Local workers	20%	98	135	233	0	0	0	0	0	0
Total increased workforce	100%	491	673	1164	116	163	398	185	583	1404

* Assumes no hot bedding & group housing of 2 workers per residential unit

6.2.2 Scenario 2 – Sensitivity Case

Table 24 shows the estimates of housing and population impacts for Scenario 2 which is termed the “sensitivity” case in which more of the workforce would move into Muswellbrook LGA permanently and there would be less dependence on commuting.

The combination of workers moving into Muswellbrook LGA and work-week commuters shows a total population increase of 1,404 and the need for 583 residential units of which 398 would be suitable for families and couples and the remaining 185 suitable for singles and work week commuters.

6.3 PERMANENT HOUSING SUSTAINABILITY

In order to understand the significance of these estimates, it is necessary to also consider what a “sustainable” rate of increase for permanent housing would be based on historic growth rates over the most recent Census 5 year period 2006-2011. The sustainable level of increase based on historic growth rates over the past five years are shown in **Table 25**. As shown in **Table 23** for the “expected” case scenario the approximate time lag for the Muswellbrook LGA development sector to be able to produce the estimated number of permanent houses under current constraints using historic growth rates would be just under 3 years. For Scenario 2, the time required would be just under 5 years. The analysis should be considered worst case as there was no allowance made in years 2 to 5 for the use of existing rental housing which currently has high vacancy rates (personal communication, LJ Hooker Muswellbrook, July 2013). Up until September 2013 there was virtually no rental housing available in the primary study area.

The analysis assumes that the needs of singles and work week commuters will be primarily met by group rental housing in existing flats and units within the town and new fringe housing developments. Group housing was assumed to generate 2 residential units per group house. Consequently, given the increasing importance of the fringe housing developments and with a three to four bedroom design, the amount of time required should be considered a “longest” lag time case for both scenarios. The analysis has also assumed that there would be no use of temporary hotel and motel and on site resort accommodation by the operational workforce which as discussed in **Section 3.3.2** has a current vacancy of 224 units in Muswellbrook LGA and 495 in the broader secondary study area.

The results suggest that with the current accommodation situation in the Secondary study area both Scenarios are considered sustainable within the current mine plan with a new workforce scheduled to build up over a period of 4-5 years. Scenario 1 is considered the most likely due to the results of the gravity model discussed above.

Table 25

Sustainability of Predicted Impacts on Permanent Housing

Housing Sustainability	Housing Required for Families and Couples	Singles & Work Week Commuters	Project Impact Predicted Muswellbrook Shire Required	New Permanent Housing required per year	Housing Listed For Sale July 2013	Housing Listed For Rent July 2013	Total Housing Supply Available	Housing Share Secured by Employees Year 1	Balance required Years 2-4	Historic Growth Rate For 2006-2011	Sustainable Rate of New Permanent Housing 1 year	Years Required at Historic Rate	Sustainable Rate 1 year	Sustainable Rate For 4 years	Difference
Scenario 1	248	163	411	102.75	210	220	430	215	196	1.22%/year	75	2.6	75	302	109
Scenario 2	375	175	550	137.5	210	220	430	215	335	1.22%/year	75	4.4	75	302	248

6.4 IMPACTS ON CHILD CARE AND EDUCATION SERVICES

The estimated impacts on child care and education services of both Scenarios are set out in **Table 26**. The results of the analysis suggest that for Scenario 1 and the gradual build-up of the workforce over a period of four years, the impacts will be manageable in all services except child care which is already at capacity.

For the sensitivity case (Scenario 2), like Scenario 1, child care services would be an immediate issue. Also, even though the yearly totals appear moderate, the total impact over four years would put both primary schools and high schools at or near capacity at the end of the third year. Discussion with education representatives suggest that it would necessary to for some schools to start to increase the number of class rooms either using demountables or permanent structures being required (personal communication, Sept 2012).

Child care is an issue of concern in most growing urban and resource based communities throughout Australia. In Muswellbrook the Council has no direct role in providing services but plays an important planning and coordination function.

Again it should be emphasised that the moderate excess capacity in both primary and secondary schools for the expected case would also be affected if there was a further cumulative impact such as significant increase by another project.

Tertiary education in the Muswellbrook TAFE campus is considered to be well targeted to servicing the needs of the mining industry. There is a variety of training programs for other sectors which were considered to offer sufficient capacity for those students who choose to stay in Muswellbrook and Singleton or pursue tertiary university qualifications only available in Sydney and Newcastle or other inter regional locations (personal communications, MSC, July, 2012).

6.5 IMPACTS ON HEALTH SERVICES

The gradual build up of the Project operational workforce over a period of four years will bring about moderate but manageable impacts on the health services presently operating in Muswellbrook LGA. Discussion with the Muswellbrook Cluster Manager of HNE Health indicated that the government services operating from Muswellbrook Hospital including the Community Health Centre were stable and meeting current service standards. So a gradual increase in the resident population as has been the case over the past Census period (0.86%) would have only moderate impacts on these service standards and are within current planning assumptions.

The more difficult issue is related to recruitment and retention of the professional workforce particularly nurses and to a lesser extent doctors. These issues were considered manageable but would take time to address. Short term temporary accommodation in order to assist newly arriving staff is currently under construction. At the moment the issue is not seen as significantly affecting the quality of care standards.

Table 26
Estimates of Impacts on Childcare & Education Services, Primary Study Area

Service	Current Capacity	Estimated % of Population 2016	% School/Student Population	Scenario 1 Expected Case Places required Per Year	Scenario 2 Expected Case Places required Per Year
Child Care	At Full Capacity	7.7%	22.0%	13	22
Primary	Some Excess Capacity	8.2%	23.3%	14	23
High School	Some Excess Capacity	12.1%	34.5%	21	34
Tertiary	Some Excess Capacity	7.1%	20.2%	12	20
Totals Per Year of Build Up		35.2%	100.0%	61	100
Total Increase For Project				243	398

Source: ABS Census 2011 & Martin Associates P/L 2012

The one area that has been a significant problem outside the public health system has been the lack of GPs in the private health care system with just one large service in Muswellbrook which according to the MSC surveys suggested had led to a considerable increase in appointment waiting times. A new private community health centre has recently begun operations and this change will reduce waiting times. The high incidence of commuting in the extension workforce will also tend to mitigate against any increase in these waiting times as these workers tend to use their home communities for routine GP visits.

6.6 IMPACTS ON OTHER COMMUNITY INFRASTRUCTURE

The survey carried out by MSC in 2011 identified a number of other issues of concern to the broader community of the Primary Study Area. The likely impacts of the Project on these issues are outlined below:

6.6.1 Environmental Impact

The environmental impact of mines was the number one concern of online respondents, and number two for telephone interviewees (behind a lack of recreational activities). This issue is addressed in other technical reports as part of the EIS.

6.6.2 Community Cohesion

There was some mention noted of tension between residents and “drive in” mine workers in the category of ‘other issues’ but a relatively small proportion of responses. In contrast to other mining areas of Australia it was not a dominant theme in the results of the surveys. Discussion with representatives of the accommodation and housing representatives in Muswellbrook found that in this case the issue was more about local workers being overlooked for direct mining employment due to what were considered to be “skill deficiencies”.

In other resource areas of Australia such as Collinsville in Queensland, the issue causing tension was the development of separate accommodation facilities for a commuter workforce which essentially replaced the need for the existing town based facilities leading to a low local “value added” from mining development. These facilities tend to be subsidised by mining companies in other States because they are mandated as part of planning and mining consent conditions. These subsidies tend not to be utilised and/or required in the NSW mining industry. In Muswellbrook to date there has been minimal development of these facilities even though significant developments have been approved by consent authorities (e.g. MAC Development in South Muswellbrook of 200 workforce units residential village approved by MSC). Nonetheless in township fringe housing developments in Muswellbrook, there is an increasing proportion of housing which is owned by “out of town” investors who rent as group housing to mining personnel. This practice has also been observed to be increasingly occurring in Singleton LGA. From a social perspective, interviews with key stakeholders indicated that there had been few if any complaints from neighbours concerning any “anti-social” behaviour experienced.

This issue will be exacerbated by the Project as Scenario 1 - the ‘expected case’ will continue the dependence of the Project on a significant number of commuters some of whom will need to live in Muswellbrook to satisfy Occupational Health and Safety requirements (i.e. commuting time during shift times should not exceed one hour).

6.6.3 Impacts On Physical Infrastructure

A high percentage of the workforce in Muswellbrook LGA are commuters. The current low peak hour levels of service on the New England Highway to Maitland and Newcastle tend to force many commuters into staying in temporary accommodation in Muswellbrook on a shift to shift basis due to mining industry health and safety requirements for direct employee and contractor staff. The proportion of commuters is expected to stay approximately in the same proportion for at least the next five years.

Current planned improvements to the east of Singleton will improve two of these sections of the Highway. However the section of the road through Singleton is still a single lane in both directions leading to congestion and traffic delays. To the west of Singleton the road still has extensive sections of single lanes and progress on improving the road has been slow.

6.6.4 Sewerage Treatment

The sustainable rate of new housing development was calculated to be around 75 to 80 houses on a mix of average to larger lot sizes in the fringe developments to the south of Muswellbrook township. The sewerage treatment works is currently reaching its planned capacity and MSC is currently considering options to upgrade these facilities. The lack of capacity acts a significant constraint on the rate of development of new housing (personal communication, MSC, July 2012).

6.7 IMPACT ON AGRICULTURAL INDUSTRIES

Review of the employment trends in both the agricultural and mining industries over the past 15 years suggest that employment recruited from the agriculture sector will be of very marginal significance.

The employment trends of both agriculture and the mining industry during the period 1996 - 2011 for the Secondary Study Area are shown in **Table 27**. As shown in **Table 27** over the 15 year period, even though the relative share of employment in agriculture has declined at a rate of 1.3% per year, it represents a net long term loss of 31 jobs per year. In contrast the mining industry has grown by 3.3 % per year representing 131 jobs per year.

In the most recent intercensal period 2006-2011 the declining trend in agriculture has slightly accelerated but still represents only 36 jobs per year whereas mining has increased by 301 jobs per year. Employment of mining companies to support their supplementary farming and grazing operations may well exceed the size of these losses and may not be recorded as a new job in the agriculture sector.

There are also farmers working within the mining operations which also own and operate smaller family operated farming properties which continue to be viable operations because of the availability of capital to support the farm from higher mining sector wages and salaries. This trend of off farm wage and salary income supporting agricultural enterprises and farm families is indicative of a general trend across Australian agriculture as a whole (Laguna and Ronan, 2009).

Consequently, the impact of mining on the loss of agricultural jobs is considered to be a factor but only a marginal issue as the loss of jobs in agriculture remained at around 10% of the total increase in mining jobs. In the latter period the proportion has dropped further to around 8%. Also there are other factors affecting slow declines in agriculture. Losses in agricultural employment could be entirely explained by productivity and efficiency gains over the 15 year period through technology and the increase in scale of agricultural enterprises. It should also be noted that the agricultural sector employment also includes forestry and fisheries which also further reduces the degree of losses from agriculture itself.

The pattern of unemployment in the primary study area has changed significantly in the six months to June 2013 with an increasing pool of unemployed labour available. The most recent official figure for the unemployment rate was in December 2012 and in Muswellbrook LGA, it was 4.7% which represented 412 people. Since December 2012, there has been a proliferation of announcements by mining companies concerning cutbacks of personnel particularly the contractor workforce. The unemployment figures have also been trending upward in the Secondary Study Area as well as the local economy has returned to similar unemployment levels as in 2008 with almost 1,000 unemployed in the secondary study area. Consequently, it can be argued that the impacts of the Project on the agricultural workforce as a result of the project will be minor.

It should also be emphasised that the BMC continues to operate large farming operations as part of their business models by leasing out extensive areas of land that are not required for mining operations.

6.7.1 Impact On Agriculture Related Tourism Activities

In 2011, there were 582 people or 7.8 % of the local workforce working in the combined sectors of accommodation and food, and arts and recreation services. So local tourism related activities are a significant component of the local economy. The proportion of these tourism related activities which are directly related to agriculture is unclear as a significant component of the workforce maybe counted within the agriculture or processing sectors.

A key informant survey was conducted within the primary study area and the participants considered that the local tourism industry was characterised as having the following components:

- Adventure Tourism (e.g. National Parks);
- Equine Tourism (Horse Stud Tours);
- Gourmet Tourism (Pukara Estate, Hunter Belle Wine & Cheese, Wine Cellar Doors);
- Regional Arts (Regional Art Gallery); and
- Special Events Tourism (Weekend Short Term Spurts, Monthly Local markets).

The industry in Muswellbrook was described as an "immature" market. There was not one destination that was considered to be a stand out destination. The hotel and motel operators interviewed did not really go after the tourism market because the provision of accommodation to mining (particularly contractor industries) has proven to be robust for the last 8-10 years but they admitted that during the peak of mining activities in the 2011-2012 period, it was difficult to accommodate drop-in tourists to the local area and caravan parks had always been full.

The wine industry has been significantly reduced by the oversupply of grapes available so that the local region which once had ten wineries now only has three wineries which provide cellar door tasting facilities. The basis of much of their current revenue comes from local sales to wine clubs and other local outlets with low dependence on drop in tourism. Wholesale delivery of grapes to the lower Hunter and some interstate wineries has also been a significant part of their market.

Local stakeholders see organised tourism in Muswellbrook as patchy and only recently have become involved in the early stages of the development of a Local Tourism Plan ("Upper Hunter Country Tourism") which is supported by the NSW State Tourism body.

The main components of the present industry that are agriculture related are three wineries with cellar door facilities and with some small accommodation facilities, the olive outlet Pukara Estate (owned by Hunter Valley Energy Coal) and several horse studs. So the current size of this market is considered to be quite small in comparison to the Pokolbin area in the lower Hunter and the Mudgee area further west. The interviews of key informants suggested that the visual impact of mining on the landscape is not beneficial to attracting tourists. However, they also recognised that a significant component of their present markets rely on the higher incomes generated from the increasing number of workers in the mining and associated support industries. The impact of the Project was not seen as having a significant effect on these perceptions. Also, there was no current tourist destination identified that would be significantly affected by the Project.

6.7.2 Emergency Services

The impact of the Project will lead to a proportionate increase in the demand for emergency services. However, consultation with housing and accommodation and public health representatives considered that the current delivery is well coordinated and did not foresee impacts which were not manageable within the existing planning assumptions of the major State and local bodies involved.

6.7.3 Other Issues

The proposed Project is not considered to significantly affect the other issues that were identified in the community surveys (Jetty Research, 2011) which included:

- The wish for a cinema and/or bowling alley in Muswellbrook;
- More recreational services for youth and improved sporting and swimming facilities (the Muswellbrook Recreation Study suggested that the town is well endowed with recreational facilities but now require an improved management approach);
- Better aged care options;
- A bypass road for Muswellbrook;
- An improved retail offering in Muswellbrook;
- A broadening of the economy away from mining, and a wish to apply a more tourist-friendly face;
- More tertiary education opportunities, in particular additional TAFE course and a university branch campus; and
- The need for improved public transport.

Table 27
Employment Trends in Agricultural & Mining Industries 1996-2011
Secondary Study Area

Industry	Census Year								Average annual % Growth/year 1996-2011	Average annual % Growth/year 2006-2011
	1996		2001		2006		2011			
	Number	% of Total Employment	Number	% of Total Employment	Number	% of Total Employment	Number	% of Total Employment		
Agriculture, Forestry & Fishing	2,670	13%	2,714	13%	2,386	10%	2,205	8%	-1.3%	-1.6%
Mining	3,129	15%	2,523	12%	3,589	15%	5,094	18%	3.3%	7.3%
Total Employment	21,248	100%	21,187	100.0%	23,562	100.0%	29,026	100%		

ABS Census 1996,2001,2006,2011

6.8 CUMULATIVE IMPACTS

The Upper Hunter Valley contains extensive mining and resource operations and further developments in this sector are expected. As such, nearby current and future developments will operate at the same time as the Project, contributing to cumulative social impacts in the Primary and Secondary Study Areas.

Table 28 describes other mining projects in the Primary Study Area expected to coincide during the construction and early operations period of the Project and how they coincide with the Project.

**Table 28
Other Mining Projects**

Mine / Project	Proximity to the Project	Approval Period	Current Approval Summary	Timing in relationship to Project
Mount Pleasant Project	1 km north	22/12/2020	Open cut coal mine to extract approximately 197 Mt of ROM coal over a period of 21 years at a maximum rate of up to 10.5 Mtpa This project has not commenced mining operations at this time.	It has been assumed that Year 2 of the Mount Pleasant Project coincides with Year 4 (2017) of the Project (assuming approval granted end 2013)
Mt Arthur Coal Mine	2 km south	Open cut until 2022 (2026 if modification granted). Underground until 2030.	Currently operating open cut and underground coal mine to extract from Mt Arthur Coal Complex up to 36 Mtpa ROM coal. The operator has also recently submitted a Modification to PA 06_0091, to facilitate a four year continuation of the open cut mine life from 2022 to 2026 at the currently approved maximum rate of 32 Mtpa with an additional footprint of 400 ha along with other infrastructure changes.	Assumes coal mining continues at currently approved rates to 2038
Mangoola Coal Mine	6 km west	20/11/2029	Currently operating open cut coal mine extracting and processing up to 10.5 Mtpa of ROM coal for a period of 21 years. Project Approval 06_0014 has been modified five times. The operator has also recently submitted a Modification to Project Approval 06_0014, to facilitate an increase in production rates from 10.5 to 13.5 Mtpa along with other associated infrastructure changes. No amendment to the approved project disturbance boundary is sought.	Assumes coal mining continues at currently approved rates to 2038
Drayton Coal Mine	8 km southeast	2017	Currently operating open cut coal mine extracting and processing up to 8 Mtpa of ROM coal.	Ceases operations in 2017
Drayton South Coal Project	13 km south	TBC	Proposed open cut and highwall mining processing up to 7 Mtpa for ROM coal for a period of 27 years within the Drayton South area while continuing to utilise the existing infrastructure and equipment from Drayton Mine. DGRs issued.	As per the Drayton South Environmental Assessment November 2012.
Muswellbrook Coal Mine	7 km east	2015	Currently operating open cut coal mine extracting and processing up to 2 Mtpa of ROM coal to 2015.	No cumulative impacts with the Project.
Dartbrook Underground	9 km northeast	-	Underground coal mine in care and maintenance since 2007.	No information publically available and not addressed within the Social Impact Assessment

Mine / Project	Proximity to the Project	Approval Period	Current Approval Summary	Timing in relationship to Project
West Muswellbrook Project	AL19 located 4 km west	-	Explorations activities currently ongoing within AL19 granted to 09/09/14.	No information publically available and not addressed within the Social Impact Assessment

Source: Hansen Bailey, 2012

A brief assessment of the impacts of these projects are described below.

6.8.1 Cumulative Output And Workforce Impacts

Table 28 shows the development /operation of the mines with their production outputs. As shown in **Table 28**, The Mount Pleasant Project is an approved project and has been assumed to start construction in Year 2 of the Project. The Mount Pleasant Project will be operating at a lower rate than the project (i.e. up to 10.5 Mtpa) and will take until 2023 to reach full production. On the other hand in exactly the same year the Drayton mine will cease operations (at 8 Mtpa) and be replaced by the Drayton South Operation using the same infrastructure and employees however at a slightly lower rate of 7 Mtpa.

All the other mines are presently continuing their operation at the same production rate. So other than the increased workforce resulting from the Project, the net increase leading to the need for any additional workforce is the increase of Mount Pleasant at 10.5 Mtpa less the 1 Mtpa from the reduced Drayton South operation.

6.8.2 Construction Phase Workforce Impacts

Table 29 shows the construction phase of Mount Pleasant Project. Assuming that the construction workforce is of similar magnitude and timing with the peak in the second year then the peak of both construction periods will not coincide leading to more modest workforce impacts.

Nonetheless, using assumptions from the Bengalla case, the cumulative effect would be to increase the total workforce operating in the area by up to 150 FTE jobs which is equivalent to year three of Bengalla.

Local construction labour is now available as local unemployment is now running at 4.7% of the workforce. Nonetheless the specialised skills of construction will mean a high proportion of personnel will be a commuter workforce which in a corresponding way would need to be recruited from outside the Secondary Study Area and thus being more likely to operate as work week commuters.

6.8.3 Cumulative Impacts On Temporary Accommodation

Given the increase in work week commuters and the decrease in local workers, the likely cumulative housing impact on temporary accommodation would be considered to be of the same magnitude as the Bengalla Project. The increased demand for short term and temporary accommodation would thus be 102 units which is considered to be manageable and within the current capacity of the present accommodation situation.

Due to the expected high incidence of commuting among construction workers, other cumulative social impacts such as education, health care services and emergency services are considered to be manageable and within current capacity constraints.

6.8.4 Operations Phase Cumulative Workforce And Housing Impacts

Given the present timing of the Project operations there would be an overlap in the build up of the workforce with the Mount Pleasant Project in 2017.

Using the same assumptions for the expected case scenario for the Project, the cumulative impact would affect the ability of the local housing sector to produce sufficient permanent housing stock at the calculated historic production rate of 75 units per year.

Table 29
Projected Production Rate for Other Projects in Primary Study Area

Project	Year									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bengalla	Production Rate In Mtpa									
Construction		Cons	Cons	Cons	Cons					
Operation	10.7	10.7	11.3	13.0	15.0	15.0	15.0	15.0	15.0	15.0
Mount Pleasant										
Construction				Cons	Cons					
Operation						2	4	6	8	10
Mt Arthur Operations	36	36	36	36	36	36	36	36	36	36
Drayton Operations	8	8	8	8	8					
Drayton South Operations						7	7	7	7	7
Mangoola Operations	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Muswellbrook	7	7	7	7	7	7	7	7	7	7

Source: Hansen Bailey & Martin Associates P/L, 2012

The incremental increase in the total mining workforce resulting from the new Mount Pleasant Project and the reduction of the workforce from Drayton was estimated at 380. Using the same production rate to workforce factor (0.82 new dwellings units per direct job), the estimated number of dwellings required by the cumulative increase using the “expected case” assumption was estimated at 213 dwellings. After existing housing available is subtracted, and allowing for no overlap in 2016, the total cumulative need for new dwellings per year was estimated at 105 dwellings.

6.8.5 Impacts On Community Infrastructure

The cumulative impact on community infrastructure will further exacerbate those identified in the analysis of the Project. Impacts on child care and on some elements of physical infrastructure such as the sewerage treatment facilities will increase demand on facilities which were considered to be at capacity. The cumulative impact on primary and particularly secondary education facilities is considered to be sustainable given the current local economic situation.

The impacts on other elements of infrastructure are considered to be manageable. It should also be emphasised that the cumulative impacts on all community infrastructure for the operational phase have a planning time horizon of at least four to five years before full production which does give State and Local government adequate time for the planning and budgeting of required facilities.

7 MANAGEMENT & MITIGATION PROGRAM

There are a number of direct measures or methods that are available to the proponent to assist in the mitigation of social impacts. These measures can include monetary and non-monetary measures. They include, but are not limited, to the following:

- Statement of Commitments within the EIS;
- VPAs required under the EP&A Act;
- Direct non-monetary assistance to affected organisation(s); and
- Direct negotiation with affected organisation(s).

In addition to the above measures BMC will continue to implement their existing procedures in relation to social aspects of the operation.

This range of measures is reflected in the individual SIA mitigations that are proposed through this section.

7.1 CONSTRUCTION PHASE

The most significant issue associated with the 3 year construction phase of the Project is that of safely accommodating the workforce including the many sub contractors that will require single short term accommodation in a situation where this type of accommodation particularly at the cheaper end of the market is already at or near capacity.

Construction workers operating as work week commuters or staying in the area permanently for short periods may find it hard at peak times during the working week to find suitable accommodation in the present accommodation market. Group rental housing and lower end temporary accommodation offer one solution but total dependence on the private permanent rental market sector to provide accommodation may be unrealistic.

There is considered to be sufficient capacity in hotel and motel accommodation which is suitable for contractor employment because the higher costs of accommodation can be passed onto their clients. The new modular units in one of the caravan parks (93 units) would also be suitable accommodation for the multiplier service contractors.

BMC will provide applicable construction workforce data to assist MSC.

Due to the expected high incidence of commuting among construction workers, other social impacts such as education, health care services and emergency services are considered to be manageable and within current capacity constraints.

7.2 OPERATIONS PHASE

7.2.1 Housing And Accommodation

Similar to the construction phase, the most significant issue identified from this analysis is that of housing and provision of permanent housing for the expanded Project workforce. Given the Project work force requirements and the current supply of new housing coming on to the market, there is considered to be sufficient capacity to cope with the projected workforce requirements.

It is important to understand that employment in the mining industry in the Primary Study Area has grown by 2.6% per year over the last 15 years whilst the population has grown at a more modest rate of 0.85%. This situation recognises that there is a significant workforce within reasonable driving time of Muswellbrook who prefer the choices and higher level of services available and in closer proximity to their families than those currently available in Muswellbrook. The key is to be able to optimise the benefits to both local residents and commuters. As the population of Muswellbrook increases, thresholds for investments in service improvements will also occur.

The results of the analysis estimate that both scenarios are sustainable within the current mine plan with a Project workforce schedule build up period of 4-5 years, provided that there were no cumulative pressures from other unforeseen projects which require significant numbers of new housing. It should be noted that the undeveloped residential zoned land within the Muswellbrook LGA can satisfy the increased demand.

As the Project will continue operation in parallel with the construction period, there is some flexibility and ability to plan for and manage these issues than is possible for the construction phase alone of a new project. As discussed in the previous section, the expected case scenario for permanent housing is considered to be manageable if the workforce build-up was carried out at the estimated sustainable rate of approximately five years.

Accommodation for those directly employed workers operating as work week commuters is considered adequate. One of the caravan parks has recently invested in higher priced on site fully serviced single units and demand so far has been very limited which suggests that the work week commuters have a significant budget constraint. New investment in this segment of the market has been very limited in the Primary Study Area over the last five years and indicates an element of uncertainty within the local investment market. Key stakeholders indicated that the lack of willingness was due to the greater scrutiny in lending policy of financial institutions and also being able to attract and retain a workforce at competitive rates compared to the mining industry.

The private sector rental market for group housing in new residential housing estates utilising investors from outside the region has been a significant stimulus to the local housing market. As discussed in previous sections there is adequate zoned land available for development - for example there are still 1200 blocks to be developed in the EastGate Links development and up to 1600 when other zoned land is included.

Recommended mitigations for Housing and accommodation include:

1. Continue to implement the Rio Tinto 'Relocation Policy' (Australia) for workers employed outside the Secondary Study Area;
2. Consult with the Bengalla Community Consultative Committee (BMCCC) in relation to the Project;
3. Provide applicable operations workforce data to assist MSC in monitoring local housing demand and supply, housing prices and affordability and plan appropriately for land and housing provision;

7.2.2 Childcare

It is recommended that BMC work within the framework prepared by the MSC to develop a community based and coordinated approach to addressing the increasing child care issues.

7.2.3 Other Service And Facilities

With close coordination and based on current capacity, impacts on other community sectors of the expected case scenario such as school and tertiary education, health services and other community facilities and services are considered to be less significant.

7.2.4 Existing Procedures

As discussed in **Section 1.11** BMC will continue to utilise the long running procedures in relation to social components of the operation including:

- Rio Tinto Relocation Policy Australia (Version 1.3);
- Aboriginal Employment at Rio Tinto Coal Australia;
- Rio Tinto Coal Australia Fatigue Management Framework; and
- Priority Relocations – Setting up Your Employee in the Hunter Valley.

These procedures will ensure that BMC continues to assist in managing issues associated with employee relocations to the Muswellbrook LGA (including housing and general assistance), ensuring ongoing Aboriginal employment positions are available for the Project and providing a robust framework for managing fatigue issues primarily associated with shift work.

7.2.5 Voluntary Planning Agreement

BMC should revise the existing VPA with MSC which is proportionate to the impacts of the Project. The VPA could include, but should not be limited to, social mitigation measures which are described in this section and will be proportionate to the identified social and community impacts.

Discussions are progressing with MSC to reach an agreement as to the terms of the VPA however it is BMC's intention to commence proceedings generally consistently with the already established VPA which provides for:

- An annual payment to the Bengalla Coal Community Fund – to be held and distributed under the terms of the Bengalla Coal Community Funding Deed for proposals which have an economic, social or environmental benefit for the community in the Muswellbrook LGA;
- An annual contribution to MSC to assist in funding road maintenance requirements within the Muswellbrook LGA;
- An annual contribution to MSC to assist in funding an Council Environmental Officer; and
- A commitment from BMC to use its best endeavours to engage four apprentices per annum for the life of the mine sourced from residents within the Muswellbrook and Upper Hunter LGAs.

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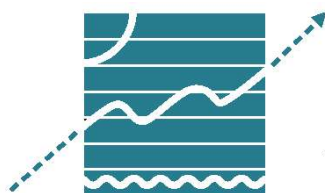
Economic Impact Assessment

Continuation of Bengalla Mine Economic Impact Assessment

Prepared for

**Bengalla Mining Company Pty Limited
C/- Hansen Bailey Pty Limited**

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EXECUTIVE SUMMARY

Gillespie Economics was commissioned by Hansen Bailey Environmental Consultants, on behalf of Bengalla Mining Company Pty Limited to complete an economic impact assessment for the Continuation of Bengalla Mine (the Project). The purpose of the assessment is to form part of an Environmental Impact Statement being prepared to support an application for State Significant Development Consent for the Project under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979*. The Project seeks approval to extract up to 15 million tonnes per annum of Run-Of-Mine coal over a period of 24 years.

From an economic perspective there are two important aspects of the Project that can be considered:

- The economic efficiency of the Project (i.e. consideration of economic costs and benefits of the Project using Benefit Cost Analysis); and
- The economic impacts of the Project (i.e. consideration of the economic activity that the Project would provide to the regional (Muswellbrook, Singleton and Upper Hunter Local Government Areas (LGAs)) and NSW economy using input-output analysis).

A BCA of the Project indicated that it would have net production benefits to Australia of \$1,790M. Provided the residual environmental, social and cultural impacts of the Project that accrue to Australia are considered to be valued at less than \$1,790M, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to quantify the residual environmental impacts of the Project. However, it is evident that the main potential impacts of the Project are internalised into the production costs of the Project through mitigation measures and compensation costs. Other costs not already included in the production costs of the Project include those associated with greenhouse gas costs, surface water, groundwater and Aboriginal heritage. However, these impacts to Australia are estimated at \$24M, considerably less than the estimated net production benefits of the Project to Australia. There may also be non-market benefits from the employment provided by the Project. Overall, the Project is estimated to have net social benefits to Australia of between \$1,766M and \$2,112M, and hence is desirable and justified from an economic efficiency perspective.

While the BCA is primarily concerned with the aggregate costs and benefits of the Project to Australia, the costs and benefits may be distributed among a number of different stakeholder groups at the local, state, National and global level. The total net production benefit will be distributed amongst a range of stakeholders including:

- BMC shareholders in the form of after tax (and after voluntary contributions) profits;
- The Commonwealth Government in the form of any Company tax payable (\$509M present value) and the Minerals Resource Rent Tax from the Project, which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area;
- The NSW Government via royalties (\$778M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the local and regional area; and
- The local and regional community in the form of voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Project may potentially accrue to a number of different stakeholder groups at the local, State, National and global level, however, are largely internalised into the productions costs of BMC.

Noise costs, air quality costs and agricultural production costs will occur at a local level. These have been incorporated into the estimation of net production benefits via acquisition costs for affected properties and mitigation costs. As such, the bearers of these costs are compensated. Road transport impacts would also occur at the local level with the costs of road works included in the estimate of net production benefits. Residual road transport impacts have not been estimated but are expected to be insignificant. Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the opportunity cost of Water Access Licences and reduced flows in rivers. Greenhouse gas costs will occur at the national and global level and will be internalised through payment of the Commonwealth Government's carbon tax. The economic costs associated with the clearing of native vegetation will occur at the State level and would be counterbalanced by the Project biodiversity offset contributions.

Aboriginal archaeological impacts would accrue at the regional or State level while Aboriginal cultural heritage impacts would accrue to local Aboriginal people. Visual impacts will occur at the local level and will be internalised by BMC through the funding of visual mitigation measures. All of these measures mean that those who experience costs have them either mitigated or compensated. Other potential environmental impacts would largely occur at the local level and were found to be insignificant. Any non-market benefits associated with employment provided by the Project would largely accrue at the local or State level.

The non-market costs that accrue to NSW are estimated at less than \$24M. These are considerably less than the net production benefits (and potential non-market employment benefits) that directly accrue to NSW. Consequently, as well as resulting in net benefits to Australia the Project would result in net benefits to NSW. An economic impact analysis, using input-output analysis found that the operation of the Project is estimated to make up to the following contribution to the regional economy for up to 24 years:

- \$1,486M in annual direct and indirect regional output or business turnover;
- \$789M in annual direct and indirect regional value added;
- \$155M in annual direct and indirect household income; and
- 1,745 direct and indirect jobs.

For the NSW economy, the operation of the Project is estimated to make up to the following contribution for up to 24 years:

- \$2,408M in annual direct and indirect regional output or business turnover;
- \$1,223M in annual direct and indirect regional value added;
- \$441M in annual direct and indirect household income; and
- 4,868 direct and indirect jobs.

Cessation of the Project operation would lead to a reduction in economic activity. The significance of these Project cessation impacts would depend on:

- The degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is because continued expenditure by these people in the regional economy (even at reduced levels) contributes to final demand.
- The economic structure and trends in the regional economy at the time. For example, if Project cessation takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing diversified economy.
- Whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

1 INTRODUCTION

1.1 ECONOMIC ASSESSMENT

Gillespie Economics was commissioned by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Bengalla Mining Company Pty Limited (BMC) to complete an economic impact assessment for the Continuation of Bengalla Mine (the Project). The purpose of the assessment is to form part of an Environmental Impact Statement (EIS) being prepared to support an application for State Significant Development Consent for the Project under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The scope of work completed by Gillespie Economics for this assessment included addressing the Director-General's Environmental Assessment Requirements (DGRs) relating to economics, issued on 13 March 2012, including supplementary DGRs received on the 12 July 2012. These indicate that an economic assessment is required as part of the EIS including:

- A detailed assessment of the potential direct and indirect economic benefits of the Project for local and regional communities and the State;
- A description of the measures that would be implemented to minimise the adverse social and economic impacts of the Project, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism¹; 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.

In this respect, consideration was given to the relevant aspects of the Department of Planning and Infrastructure's (DP&I) *Draft Guideline for Economic Effects and Evaluation in EIA* (James and Gillespie, 2002) and the NSW Government (2012) *Draft Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*.

From an economic perspective there are two important aspects of the Project that can be considered:

- The economic efficiency of the Project (i.e. consideration of the economic costs and benefits of the Project); and
- The economic impacts of the Project (i.e. the economic activity that the Project will provide to the regional or NSW economy).

The DP&I's draft guideline (James and Gillespie, 2002) identifies economic efficiency as the key consideration of economic analysis. Benefit Cost Analysis (BCA) is the method used to consider the economic efficiency of proposals. The draft guideline (James and Gillespie, 2002) identifies BCA as essential to undertaking a proper economic evaluation of proposed developments that are likely to have significant environmental impacts. The NSW Government (2012) *Draft Guideline for the use of cost benefit analysis in mining and coal seam gas proposals* also endorses BCA as the appropriate methodology for evaluating mining proposals. This latter guideline does not provide guidance on other forms of economic assessment.

The DP&I's draft guideline indicates that economic impact assessment may provide additional information as an adjunct to the economic efficiency analysis. Economic activity to the regional and NSW economy can be estimated using input-output (I-O) analysis, computable general-equilibrium (CGE) models or macro-econometric simulation models.

¹ This DGR is mainly addressed in the Social Impact Assessment. Mitigation measures that will be implemented to minimise the adverse environmental externalities of the Project (that are considered in this economic impact assessment) are addressed in the respective specialist reports.

It is important not to confuse the results of economic impact assessment, which focuses on indicators of economic activity i.e. direct and indirect output (expenditure/revenue), value-added, income and employment, in a specific region, with the results of BCA which is concerned with the net economic efficiency benefits from the Project.

This study relates to the preparation of each of the following types of analyses:

- A BCA of the Project (Section 2); and
- An economic impact assessment of the Project (Section 3) for two regions:
 - The regional economy comprising the Local Government Areas (LGAs) of Muswellbrook, Singleton and Upper Hunter; and
 - The NSW economy.

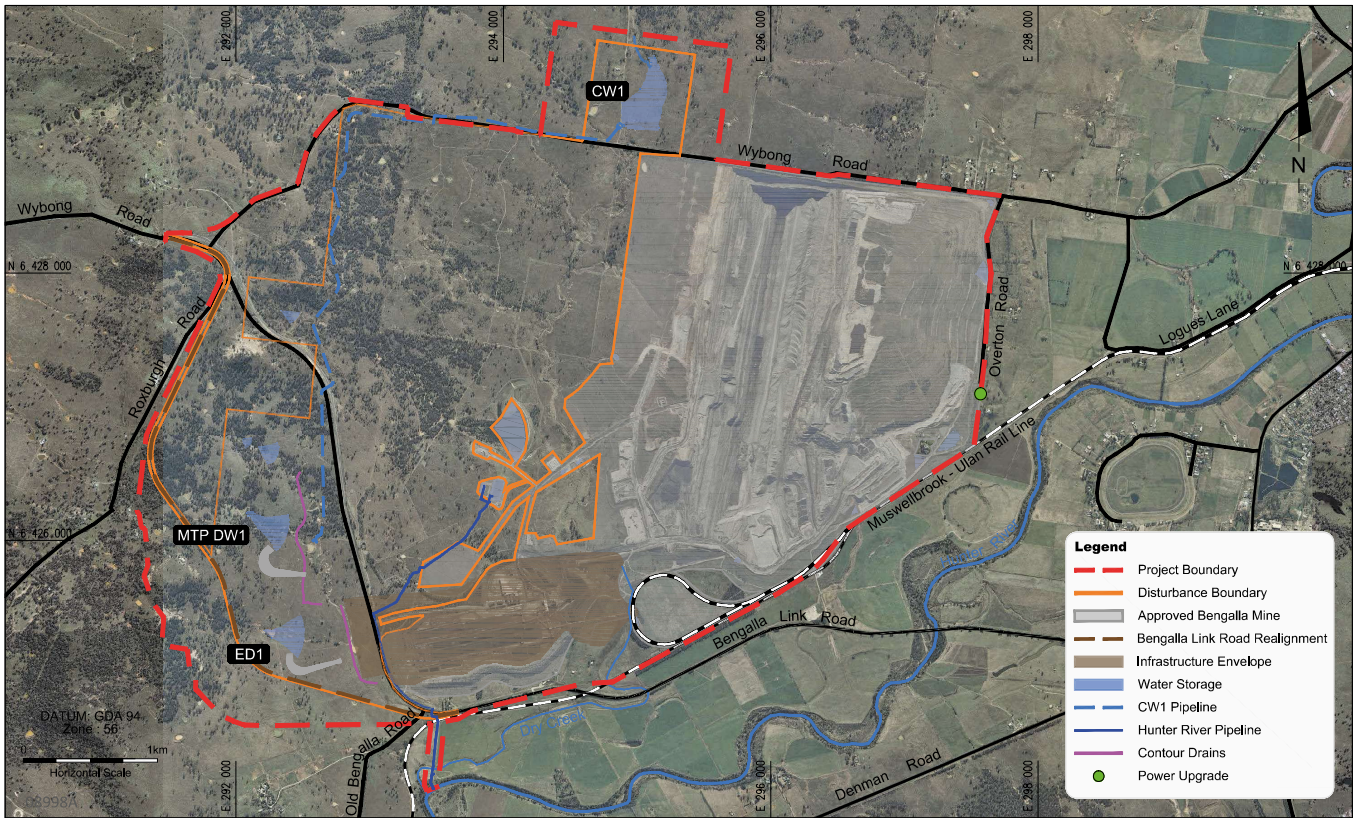
1.2 PROJECT DESCRIPTION

BMC operates the Bengalla Mine (Bengalla) in the Upper Hunter Valley of NSW, approximately 130 km north-west of Newcastle and 4 km west of Muswellbrook (see **Figure 1.1**). BMC is managed by Coal & Allied Bengalla Pty Limited. BMC has successfully operated Bengalla since 1998. The Project will enable mining to continue directly west for a 24 year period at a rate of up to 15 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal (the Project).

The Project generally comprises:

- Open cut mining towards the west at a rate of up to 15 Mtpa ROM coal for 24 years to a total of 316 Mt;
- An out of pit Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining;
- Continued use, extension or relocation of existing infrastructure, including administration and parking facilities, in-pit facilities (including dragline shut down and erection pad), helipad, tyre laydown area, explosives and reload storage facility, core shed workshop, roads, reject bin, ROM Hopper, stockpiles, conveyors, water management infrastructure, supporting power infrastructure, and ancillary infrastructure;
- Processing, handling and transportation of coal via the existing CHPP (to be upgraded) and rail loop for export and domestic sale;
- Continued rejects and tailings co-disposal in the Eastern OEA and temporary in pit reject emplacement;
- Relocation of a 3 km section of Bengalla Link Road during or after Year 15 near the existing mine access road to facilitate coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent realignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Staged Discharge Dam and raw water dam); and
- A workforce of approximately 900 full time equivalent personnel (plus contractors) at peak production;

The Project will generally be undertaken within the Disturbance Boundary as illustrated on Figure 1.2. The infrastructure will be located within the Infrastructure Envelope shown on Figure 1.2 and may be aligned or located differently to what is depicted on the detailed infrastructure plans but will be within the Infrastructure Envelope.



BENGALLA MINE

Conceptual Project Layout

FIGURE 2



2 BENEFIT COST ANALYSIS

2.1 INTRODUCTION

Introduction to BCA

BCA has its theoretical underpinnings in neoclassical welfare economics. Applications in NSW are guided by these theoretical foundations as well as the NSW Treasury (2007). BCA applications within the NSW environmental assessment framework are further guided by the NSW DP&I *Draft Guidelines for Economic Effects and Evaluation in EIA* (James and Gillespie 2002) and the NSW Government (2012) *Draft Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals*.

BCA is concerned with a single objective of the EP&A Act and governments i.e. economic efficiency. It provides a comparison of the present value of aggregate benefits to society, as a result of a project, policy or program, with the present value of the aggregate costs. These costs and benefits are defined and valued based on the microeconomic underpinnings of BCA. In particular, it is the values held by individuals in the society that are relevant, including both financial and non-financial values. Provided the present value of aggregate benefits to society exceed the present value of aggregate costs (i.e. a net present value of greater than zero), the project is considered to improve the well-being of society and hence is desirable from an economic efficiency perspective.

While BCA can provide qualitative and quantitative information on how costs and benefits are distributed, welfare economics and BCA are explicitly neutral on intra and intergenerational distribution of costs and benefits. There is no welfare criterion in economics for determining what constitutes a fair and equitable distribution of costs and benefits. Judgements about equity are subjective and are therefore left to decision-makers.

Similarly BCA does not address other objectives of the EP&A Act and governments. Decision-makers therefore need to consider the economic efficiency implications of a project, as indicated by BCA, alongside the performance of a project in meeting other conflicting goals and objectives of the EP&A Act and government.

Definition of Society

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

As a tool of investment appraisal for the public sector, BCA can potentially be applied across different definitions of society such as a local area, state, nation or the world. However, most applications of BCA are performed at the national level. This national focus extends the analysis beyond that which is strictly relevant to a NSW government planning authority. However, the interconnected nature of the Australian economy and society creates significant spillovers between States. These include transfers between States associated with the tax system and the movement of resources over state boundaries.

Nevertheless, “where major impacts spill over national borders, then BCA should be undertaken from the global as well as the national perspective” (Boardman et al 2001). For mining projects, impacts that spill over national borders include greenhouse gas costs and benefits to foreign owners.

BCA at a sub-national perspective is not recommended as it results in a range of costs and benefits from a project being excluded, making BCA a less valuable tool for decision-makers (Boardman et al 2001).

BCAs of mining projects are therefore often undertaken from a global perspective i.e. including all the costs and benefits of a project, no matter who they accrue to, and then truncated to assess whether there are net benefits to Australia. A consideration of the distribution of costs and benefits can then be undertaken to identify the benefits and costs that accrue to NSW and other regions. However, a project is considered to improve the well-being of society if it results in net benefits to the nation, even if it results in net costs to the local area.

Definition of the Project Scope

The definition of the Project for which approval is being sought has important implications for the identification of the costs and benefits of a project. Even when a BCA is undertaken from a global perspective, and includes costs and benefits of a project that accrue outside the national border, only the costs and benefits associated with the defined project are relevant. For mining projects, typically only the costs and benefits from mining the coal and delivering it to Port or domestic users, are relevant.

Coal is an intermediate good i.e. it is an input to other production processes such as production of electricity and steel making. However, these other production processes themselves require approval and, in BCA, would be assessed as separate projects.

Net Production Benefits

BCA of mining proposals invariably involves a trade-off between:

- The net production benefits of a project; and
- The environmental, social and cultural impacts (most of which are costs of mining but some of which may be benefits).

Net production benefits can be estimated based on market data on the projected financial² value of coal less the capital and operating costs of projects, including opportunity costs of capital and land already in the ownership of mining companies. This is normally commercial in confidence data provided by the proponent. Production costs and benefits over time are discounted to a present value.

Environmental, Social and Cultural Impacts

The consideration of non-market impacts in BCA relies on the assessment of other experts contributing information on the biophysical impacts. The environmental impact assessment process results in detailed (non-monetary) consideration of the environmental, social and cultural impacts of a project and the proposed means of mitigating the impacts.

At its simplest level, BCA may summarise the consequences of the environmental, social and cultural impacts of a project (based on the assessments in the EIS), for people's well-being. These qualitatively described impacts can then be considered alongside the quantified net production benefits, providing important information to the decision-maker about the economic efficiency trade-offs involved with a project.

² In limited cases the financial value may not reflect the economic value and therefore it is necessary to determine a shadow price for the coal.

At the next level of analysis, attempts may be made to value some of the environmental, social and cultural impacts. These environmental, social and cultural impacts generally fall into three categories, those which:

- “Can be readily identified, measured in physical terms and valued in monetary terms;
- Can be identified and measured in physical terms but cannot easily be valued in money terms; and
- Are known to exist but cannot be precisely identified, measured or value” (NSW Treasury 2007).

Impacts in the first and second category can potentially be valued in monetary terms using benefit transfer or, subject to available resources, primary non-market valuation methods. Benefit transfer involves using information on the physical magnitude of impacts and applying per unit value estimates obtained from non-market valuation studies undertaken in other contexts.

Primary non-market valuation methods include choice modelling and the contingent valuation method where a sample of the community is surveyed to ascertain their willingness to pay to avoid a unit change in the level of a biophysical attribute. Other methods include the property valuation approach where changes in environmental quality may result in changes in property value.

In attempting to value the impacts of a project on the well-being of people there is also the practical principle of materiality. Only those impacts which are likely to have a material bearing on the decision need to be considered in BCA (NSW Government, 2012).

Where benefits and costs cannot be quantified these items should be included in the analysis in a qualitative manner (NSW Treasury 2007).

Consideration of Net Social Benefits

The consideration of the net social benefits of a project combines the value estimate of net production benefits and the qualitative and quantitative estimates of the environmental, social and cultural impacts.

In combining these considerations it should be noted that the estimates of net production benefits of a project generally includes accounting for costs aimed at mitigating, offsetting or compensating for the main environmental, social and cultural impacts. This includes the costs of purchasing properties adversely affected by noise and dust, providing mitigation measures for properties moderately impacted by noise and dust, the costs of providing ecological offsets and the cost of purchasing groundwater and surface water entitlements in the water market etc. Including these costs effectively internalises the respective and otherwise, non-monetary environmental, social and cultural costs. To avoid double counting of impacts, only residual impacts, after mitigation, offset and compensation, require additional consideration.

Even when no quantitative valuation is undertaken of the environmental, social and cultural impacts of a project, the threshold value approach can be utilised to inform the decision-maker of the economic efficiency trade-offs. The estimated net production benefits of a project provides the threshold value that the non-quantified environmental, social and cultural impacts of a project (based on the assessments in the EIS), after mitigation, offset and compensation by the proponent, would need to exceed for them to outweigh the net production benefits.

Where the main environmental, social and cultural impacts of a project are valued in monetary terms, stronger conclusions can be drawn about the economic efficiency of a project i.e. the well-being of society.

Any other residual environmental, cultural or social costs that remain unquantified in the analysis³ can also be considered using the threshold value approach. The costs of these unquantified environmental, cultural and social impacts would need to be valued by society at greater than the quantified net social benefit of a project to make it questionable from an economic efficiency perspective.

Steps in BCA

BCA of the Project involves the following key steps:

- Identification of the base case;
- Identification of the Project and its implications;
- Identification and valuation of the incremental benefits and costs;
- Consolidation of value estimates using discounting to account for temporal differences;
- Application of decision criteria;
- Sensitivity testing; and
- Consideration of non-quantified benefits and costs.

What follows is a BCA of the Project based on financial, technical and environmental advice provided by BMC and its' specialist consultants.

2.2 IDENTIFICATION OF THE BASE CASE AND THE PROJECT

Identification of the "base case" or "without" Project scenario is required in order to facilitate the identification and estimation of the incremental economic benefits and costs of the Project.

Under the base case, the current mining operation at Bengalla would cease in 2017 and the residual value of land and capital equipment being used for that operation would be able to be realised by sale or alternative use. Under the base case the additional land required for the Project would continue to be used for rural and other purposes.

In contrast, the Project (as described in Section 1.2) is open-cut mining up to 15 Mtpa of ROM coal for a period of up to 24 years, and delivery of coal to the Port of Newcastle for export or available for domestic use.

At the end of the Project it is assumed that the residual value of capital equipment and land would be realised through sale or alternative use.

BCA is primarily concerned with the evaluation of a project relative to the counterfactual of no project. Where there are a number of alternatives to a project then these can also be evaluated using BCA. However, alternatives need to be feasible to the proponent and to this end a number of alternatives to the Project were considered by BMC in the development of the Project description. Section 4 of the Main Volume of the EIS provides more detail on the consideration of Project alternatives.

The Project assessed in the EIS and evaluated in the BCA is considered by BMC to be the most feasible alternative for minimising environmental and social impacts whilst maximising resource recovery and operational efficiency. It is therefore this alternative that is proposed by BMC and was subject to detailed economic analysis.

³ Including potential impacts that were unknown at the time of the preparation of the EIS or arise during the EIA process due to differences in technical opinions.

2.3 IDENTIFICATION OF BENEFITS AND COSTS

Relative to the base case or “without” Project scenario, the Project may have the potential incremental economic benefits and costs shown in Table 2.1. The main potential economic benefit is the producer surplus (net production benefits) generated by the Project and any non-market employment benefits it provides, while the main potential economic costs relate to any environmental, social and cultural costs.

Table 2.1 - Incremental Economic Benefits and Costs of the Project

Category	Costs	Benefits
Net production benefits	Opportunity costs of capital equipment Opportunity cost of land ¹ Development costs including labour, capital equipment and acquisition costs for impacted properties and offsets ¹ Operating costs of mine including labour and mitigation measures Rehabilitation and decommissioning costs at end of the Project life	Avoided decommissioning and rehabilitation costs in 2017 Value of coal production Residual value of capital equipment and land at end of Project life
Potential environmental, social and cultural impacts	Noise impacts and blasting impacts Air quality and greenhouse gas impacts Surface water and groundwater impacts Agricultural impacts ¹ Geochemical impacts Ecology impacts Road transport impacts Aboriginal heritage impacts Non-Aboriginal heritage impacts Visual impacts	Any non-market benefits of employment Value of ecological offsets

¹ The value of foregone agricultural production is included in the value of land.

It should be noted that the potential environmental, social and cultural costs, listed in Table 2.1, are only economic costs to the extent that they affect individual and community well-being through direct use of resources by individuals or non-use. If the potential impacts do not occur or are mitigated to the extent where community wellbeing is insignificantly affected (i.e. those bearing the costs are fully compensated), then no environmental, social or cultural economic costs should be included in the Project BCA.

2.4 QUANTIFICATION/VALUATION OF BENEFITS AND COSTS

Consistent with NSW Treasury (2007) guidelines, the analysis has been undertaken in real values with discounting at 7 percent (%) and sensitivity testing at 4% and 10%. The analysis period is 25 years. Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural and social impacts have been initially been left unquantified and interpreted using the threshold value method⁴. An attempt has also been made to estimate environmental, cultural and social impacts using market data and benefit transfer⁵.

⁴ The threshold value method uses the value of quantified net production benefits as the amount that unquantified environmental, social and cultural costs would need to exceed to make a project questionable from an economic efficiency perspective.

⁵ Benefit transfer refers to borrowing economic values that have been determined for other study sites.

2.4.1 Production Costs and Benefits⁶

Production Costs

Opportunity Cost of Land and Capital

Under the base case or without Project scenario, the current mining operation at Bengalla would cease in 2017 and the value of land and capital equipment used in that mining operation would be able to be realised through sale or alternative use. There is an opportunity cost associated with continuing to use this land and capital equipment for the Project instead of its next best use. An indication of the opportunity cost of this land and capital equipment can be gained from its market value, estimated at \$61M and \$579M, respectively. The market value of land reflects among other things, the present value of the expected stream of profits from the next best alternative land use (e.g. agriculture).

Development Cost of the Project

Development costs of the Project are associated with the purchase of mining equipment, upgrade of the CHPP, associated conveyors and stockpile areas, upgrades to the existing site infrastructure, construction of a radio tower, relocation of the Explosives Magazine and Reload Facility, relocation of section of Bengalla Link Road, land acquisitions, the interim diversion and realignment of Dry Creek, construction of raw water dams and a clean water dam and sustaining capital. These costs include labour costs during the development of the Project, which reflect the value of labour resources in their next best use.

These incremental development costs over the life of the mine are estimated at \$1.4 billion (B). These development costs include an allowance for acquisition of land for properties adversely affected by noise/dust/vibration and ecological offsets. Development costs are included in the economic analysis in the years that they are expected to occur.

Annual Operating Costs of the Project

The operating costs of the Project include those associated with mine operation (including topsoil and overburden stripping, ROM coal mining and haulage and rehabilitation), plant and infrastructure operations (including CHPP operation), coal delivery (rail freight and Port handling and loading) and general costs (including overheads and administration, marketing and the research levy). These costs include labour costs, which reflect the value of labour resources in their next best use. Average annual operating costs (excluding depreciation and royalties) are estimated at approximately \$559M per annum for the 24 year period.

While royalties are a cost to BMC, they are part of the overall net production benefit of the mining activity that is redistributed by government. Royalties are therefore not included in the calculation of the resource costs of operating the Project. Nevertheless, it should be noted that the Project would generate total royalties in the order of \$1,833M (\$778M present value).

Depreciation has also been omitted from the estimation of operating costs since depreciation is an accounting means of allocating the cost of a capital asset over the years of its estimated useful life. The economic capital costs are included in the development costs of the Project in the years in which they occur.

⁶ All values reported in this section are undiscounted Australian dollars unless otherwise specified.

Rehabilitation and Decommissioning Costs

Decommissioning and rehabilitation costs at the end of the Project life are estimated at \$69M.

Production Benefits*Avoided Rehabilitation and Decommissioning Costs*

At the end of the current approval life in 2017 the site infrastructure area would require decommissioning at an estimated cost of \$49M. With the Project these costs in 2017 would be avoided and hence represent a benefit of the Project.

Value of Coal

Total incremental ROM coal production is estimated at 285 Mt⁷ with peak production at 15 Mtpa ROM. Product coal is thermal coal, primarily for export.

Both demand for and supply of coal influences current and projected prices.

Projected prices for the Project product thermal coal were provided by BMC and averaged AUD\$99/tonne. There is uncertainty around future coal prices (valued in USD) as well as the AUD/USD exchange rate and hence assumed coal prices have been subjected to sensitivity testing (see Section 2.6).

Residual Value at End of the Evaluation Period

At the end of the Project, capital equipment and land (excluding offsets) may have some residual value that could be realised by sale or alternative use. The residual value of capital equipment and land is estimated at \$0M and \$16M, respectively.

2.4.2 Environmental, Social and Cultural Costs and Benefits**Greenhouse Gases**

The Project is predicted to generate in the order of 14.2 Mt of direct carbon dioxide equivalent (CO₂-e) emissions (Scope 1 emissions) over the lifetime of the Project. Approximately 1.9 Mt CO₂-e of Scope 1 emissions will be generated through on-site electricity consumption. The Project will also generate 1.5 Mt CO₂-e of Scope 3 emissions through the transportation of coal to the Port of Newcastle. The economic analysis has included these emissions as a potential environmental cost of the Project.

To place an economic value on CO₂-e emissions, a shadow price of CO₂-e is required that reflects its global social costs. The global social cost of CO₂-e is the present value of additional economic damages now and in the future caused by an additional tonne of CO₂-e emissions. There is great uncertainty around the global social cost of CO₂-e with a wide range of estimated damage costs reported in the literature. An alternative method to trying to estimate the global damage costs of CO₂-e is to examine the price of CO₂-e credits/taxes. Again, however, there is a wide range of prices. For this analysis, a shadow price of AUD\$23/t CO₂-e rising at 2.5 per cent per year in real terms for three years and then remaining constant was used. Sensitivity testing assuming a shadow price from AUD\$8/t CO₂-e to AUD\$40/t CO₂-e was also undertaken (refer to Attachment 1).

⁷ The Project description refers to mining of a total of 316 Mt. The mining of some of this resource is already permitted under the existing approval.

This represents the global social cost of carbon i.e. the cost of carbon emissions to the population of the whole world. In the absence of any studies that have focused on the social damage cost of carbon emissions to Australians, some means of apportioning global damage costs borne by Australians is required. For the purpose of the economic assessment this has been undertaken using Australia's share of global gross domestic product (around 1%). An alternative approach would be Australia's share of world population which is considerably less than 1%.

Agricultural Production

The present value of foregone agricultural production is reflected in land prices. The value of foregone agricultural production, as a result of the Project, has therefore been incorporated into the BCA through inclusion of the full land value (opportunity cost) of affected properties.

Operational Noise

Mining

During Project operation there are three private receivers, situated on two different properties, predicted as being significantly impacted by noise⁸. A further four receivers (excluding residences that are currently entitled to acquisition by other mining developments) will be moderately impacted by noise and fall with the noise management zone for the Project. An additional four properties (excluding residences that are currently entitled to acquisition by other mining developments) will experience mild noise impacts from the Project. There are no additional properties predicted to experience a significant noise impact over more than 25% of vacant land in contiguous landownership.

The impact of Project noise on nearby properties can potentially be valued using the property value method, where the change in property value as a result of the noise impacts are estimated. It is expected that the owners of the property would be granted the opportunity to be acquired via conditions of the Development Consent. Instead of incorporating the partial property value impact on these properties the full cost of acquiring the affected property has been incorporated into the development costs associated with the Project⁹. This value is expected to be an over-estimate of the cost of noise caused by the Project.

Contemporary Development Consent conditions for residences in the moderate noise management zone typically require proponents to provide at receiver noise mitigation on request by the landholder. The costs of these mitigation impacts are included in the development costs of the Project, reported above. It is recognised that to the extent that any residual noise impacts occur, after mitigation, noise costs of the Project included in the BCA will be understated.

Road and Rail Noise

Existing noise levels along Denman Road, including in the town of Muswellbrook are above the road traffic noise criteria. The Project will not significantly increase these noise levels. Consequently, no economic effects have been included in the BCA.

⁸ This excludes residences that are currently entitled to acquisition by other mining developments.

⁹ It is noted that there may also be some consumer surplus losses to these property owners above and beyond changes in property values. Inclusion of the full cost of acquisition is considered likely to more than allow for these consumer surplus losses. Sensitivity testing on capital cost assumptions is also undertaken to determine the impact of changes in assumptions regarding noise impacts.

Existing and future background rail traffic noise levels, in the absence of the Project, are expected to exceed relevant noise criteria at various locations near Muswellbrook, along both the Main Northern Railway and the Ulan Line. Additional rail traffic noise associated with the Project would result in a train noise increase of approximately 0.7 LAeq,24hr at residences near the Ulan Line between the Project and Muswellbrook, and an increase of under 0.5 LAeq,24hr at residences near the Main Northern Railway south east of the Ulan Line Junction. This is considered insignificant. Consequently, no economic costs have been included in the BCA for rail noise impacts.

Blasting

Blasting at the Project has the potential to cause structural damage or human discomfort at properties within 1,600m of the Project. However, all residences within 1,600m of the Project are either owned by BMC, another mining company, entitled to acquisition by another mining company or have been determined to be within the acquisition zone for the Project. Consequently, no additional economic costs have been included in the BCA for blasting impacts.

Air Quality

The Project will result in significant air quality impacts on four properties (excluding residences that are currently entitled to acquisition by other mining developments). An additional three properties (excluding residences that are currently entitled to acquisition by other mining developments) are predicted to experience dust levels above the assessment criteria for more than 25% of the property. In total, the Project will significantly impact on seven properties which will require acquisition.

The impacts on these properties can potentially be valued using the property value method, where the change in property value as a result of the air quality impacts are estimated. Instead of incorporating the partial property value impact on these properties, the full cost of acquiring the affected property has been incorporated into the development costs associated with the Project¹⁰.

Surface Water

The Project is estimated to require up to 2,200ML / year of water from the Hunter River, which will be obtained under appropriate Water Access Licences. The Project will also result in a reduction in the catchment area draining to receiving watercourses of up to 1,074 ML during the Project life and by 376 ML/year after mining. These impacts have been included in the BCA by applying an estimated market value of water of \$2,000/ML.

The Project will discharge up to 1,000 ML/year of saline water into the Hunter River in accordance with the Hunter River Salinity Trading Scheme. The opportunity cost of holding Hunter River Salinity Trading Scheme credits is included in the analysis.

Groundwater

Groundwater drawdown as a result of the Project could potentially result in a change in surface water flows and groundwater users in the surrounding region. Groundwater inflows as a result of the Project are expected to peak at 365 ML/year with an additional 220 ML from the Hunter River Alluvial Aquifer. This impact has been included in the BCA by applying an estimated market value of water of \$2,000/ML.

No privately owned bores are within the zone of depressurisation. Consequently, no economic effects are included in the BCA.

¹⁰ It is noted that there may also be some consumer surplus losses to these property owners above and beyond changes in property values. However, inclusion of the full cost of acquisition is considered likely to more than allow for these consumer surplus losses. Sensitivity testing on capital cost assumptions is also undertaken to determine the impact of changes in assumptions.

Ecology

The Project will disturb 950 ha of vegetation within the Project Boundary, comprising 881 ha of native vegetation and 69 ha of non-native vegetation (with additional areas currently being used of existing infrastructure including the Bengalla Link Road and farm dams). The Project will result in:

- Clearance of 554 ha of NSW and Commonwealth listed ecological communities, including 535 ha of box gum woodland and derived native grassland;
- Removal of 260 ha of potential forest and woodland habitat for the Tiger Orchid and 881 ha of potential forest, woodland and grassland habitat for the Lobed Blue Grass;
- The loss of 270 ha of habitat for nine threatened fauna species;
- Clearing of 9.4 ha of groundwater dependent ecosystems (Hunter Floodplain Box Gum Woodland); and
- Insignificant impacts on Stygofauna as result of groundwater drawdown.

BMC propose to fund biodiversity offsets via the Upper Hunter Biodiversity Plan to compensate for impacts that will occur to native vegetation and threatened species habitats within the Project boundary. An estimated 2,310 ha of land with appropriate offset vegetation would be acquired by the government within a strategically located area of the Upper Hunter Valley and immediate surrounds to the north and west. The cost to fund the offset land acquisition and its management has been included in the capital costs of the Project.

The impacted flora and fauna, is likely to have non-use values to the community that would be lost as a result of the Project. These values could potentially be estimated using non-market valuation methods. Similarly, the provision of offsets is also likely to have non-use values to the community that would be gained as a result of the Project. Provided the values held by the community for the offsets are equal or greater than values that would be lost then no additional economic costs warrant inclusion in the BCA. The Government's offsets policy and the DGRs for the Project requires that offsets maintain or improve biodiversity values.

Road Transport

The traffic impact assessment found that all intersections and roads in the vicinity of the Project will not exceed capacity as a result of the Project. The Project will result in the realignment of the Bengalla Link Road and the cost of this realignment is included in the development costs of the Project. The traffic assessment identifies that this realignment may result in some minor increase in travel times (36 seconds) for those using the road. This may result in some minor increase in travel times and vehicle operating costs to road users which remain unquantified in the BCA but are expected to insignificant.

Aboriginal Heritage

The Project Aboriginal archaeology assessment identified 262 sites that will be impacted by the Project including one stone quarry and three potential scarred trees. The stone quarry is of high archaeological significance and the three scarred trees are of moderate significances. There are also two artefact scatters that are of moderate archaeological significance.

Any impacts on Aboriginal heritage sites may impact the well-being of the Aboriginal community. However, monetisation of these impacts is problematic and so these impacts are best left to consideration as part of the Aboriginal Cultural Heritage Assessment.

Impacts on highly significant Aboriginal heritage sites have been shown to affect the well-being of the broader community (Gillespie Economics, 2009a). Using benefit transfer of the average value per site from Gillespie Economics (2008, 2009a, 2009b) the value of the impact on highly significant Aboriginal sites is estimated at \$16M¹¹. The potential economic non-use values of impacts on sites of moderate or moderate significance have not been estimated in this analysis, but are assumed to be minor.

Non-Aboriginal Heritage

The Project will directly impact four items of historical heritage. None of these items are heritage listed and therefore no significant economic effects would arise with respect to non-Aboriginal heritage that would warrant inclusion in the BCA.

Visual Impacts

There are a number of residences that for periods of time during the Project life may experience moderate to high visual impacts as a result of the Project. This is particularly the case for residences to the west of the mine.

Visual intrusion to surrounding landholders can potentially impact their property value¹². The costs of onsite treatments to reduce visual effects and treatments at viewer locations to reduce visual sensitivity are included in the capital and operating costs of the Project. However, it is recognised that to the extent that any significant residual visual impacts occur, after mitigation, visual impact costs of the Project included in the BCA will be understated.

Non-market Value of Employment

Historically employment benefits of projects that are enjoyed by people other than those who are employed, have tended to be omitted from BCA on the implicit assumption that labour resources used in a proposal would otherwise be employed elsewhere and that there are no costs associated with transferring from one job to another. Where this is not the case and labour resources would otherwise be unemployed for some period of time, Boardman et al (2001) identifies that these labour resources should be valued in a BCA at their opportunity cost (e.g. wages less social security payments and income tax) rather than the wage rate. Adopting this approach would have the effect of increasing the net production benefits of the proposal. In addition, there may be social costs of unemployment that require the estimation of employees' willingness to pay to avoid the trauma created by unemployment (Streeter and Hamilton, 1991). These values have not been included in the Project BCA and so the net social benefits of the Project may be underestimated.

Although employees' willingness to pay to avoid the trauma created by unemployment are omitted from the Project BCA, it has also been recognised that the broader community may hold non-market values (Portney, 1994) for social outcomes such as employment (Johnson and Desvoves, 1997).

In a study of the Metropolitan Colliery in the NSW Southern Coalfields, Gillespie Economics (2008) estimated the value the community would hold for the 320 jobs provided over 23 years at \$756M (present value). In a similar study of the Bulli Seam Operations, Gillespie Economics (2009a) estimated the value the community would hold for the 1,170 jobs provided over 30 years at \$870M (present value). In a study of for the Warkworth Mine extension, Gillespie Economics (2009b) estimated the value the community would hold for 951 jobs from 2022 to 2031 at \$286M (present value).

¹¹ This represents a public good value i.e. the sum of the values held by all households in NSW.

¹² And potentially consumer surplus.

The Project will directly employ on average approximately 665 people for up to 24 years compared to 400 approved direct employees for a further five years (until 2017) under the base case. Using benefit transfer from the more conservative Bulli Seam Operation study and applying the employment value to the estimated incremental direct employment of the Project¹³ gives an estimated \$342M for the non-market employment benefits of the Project. There may be some contention about the inclusion of this value and so the results have been reported both with and without it.

2.5 CONSOLIDATION OF VALUE ESTIMATES

2.5.1 Aggregate Costs and Benefits

The present value of costs and benefits, using a 7% discount rate, is provided in Table 2.2. The main decision criterion for assessing the economic desirability of a project to society is its net present value (NPV). NPV is the present value of benefits less the present value of costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the Project, because the community as a whole would obtain net benefits from the Project.

The Project is estimated to have total net production benefits of \$2,475M, with \$1,790M of these net production benefits accruing to Australia¹⁴. The estimated net production benefits that accrue to Australia can be used as a threshold value or reference value against which the relative value of the residual environmental impacts of the Project, after mitigation, may be assessed. This threshold value is the opportunity cost to society of not proceeding with the Project. The threshold value indicates the price that the community must value any residual environmental impacts of the Project (be willing to pay) to justify in economic efficiency terms the no development option.

For the Project to be questionable from an economic efficiency perspective, all incremental residual environmental impacts from the Project, that impact Australia¹⁵, would need to be valued by the community at greater than the estimate of the Australian net production benefits i.e. greater than \$1,790M. This is equivalent to each household in the region valuing residual environmental impacts at \$41,000. The equivalent figure for NSW and Australian households is \$700 and \$216, respectively.

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to quantify the residual environmental impacts of the Project. From Section 2.4 it is evident that the main potential impacts of the Project are internalised into the production costs of the Project through mitigation measures and compensation costs. Other costs not already included in the production costs of the Project include those associated with greenhouse gas costs, surface water, groundwater and Aboriginal heritage, although from Table 2.2 it is evident that these impacts to Australia are estimated at \$24M, considerably less than the estimated net production benefits of the Project to Australia. There may also be non-market benefits from the employment provided by the Project.

Overall, the Project is estimated to have net social benefits to Australia of between \$1,766M and \$2,112M, and hence is desirable and justified from an economic efficiency perspective.

While the major environmental, cultural and social impacts have been quantified and included in the Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between \$1,766M and \$2,112M for the Project to be questionable from an Australian economic efficiency perspective.

¹³ This is consistent with the non-market valuation studies which focused on direct employment.

¹⁴ This is the net production benefits of the Project minus net profit accruing to overseas shareholders, assuming 42% Australian ownership.

¹⁵ Consistent with the approach to considering net production benefits, environmental impacts that occur outside Australia would be excluded from the analysis. This is mainly relevant to the consideration of greenhouse gas impacts.

Table 2.2
Benefit Cost Analysis Results of the Project (Present Values @7% discount rate)

	Costs		Benefits	
	Description	Value (\$M)	Description	Value (\$M)
Production	Opportunity cost of land	\$44	Avoided decommissioning and rehabilitation costs in 2017	\$35
	Opportunity cost of capital	\$413	Value of coal	\$9,486
	Development costs	\$858	Residual value of land and capital	\$3
	Operating costs	\$5,722		
	Decommissioning and rehabilitation costs	\$13		
	Sub-total	\$7,049	Sub-total	\$9,526
	Net Production Benefits			\$2,475 (\$1,790)
Non-market Impacts	Greenhouse gas impacts	\$194 (\$2)	Non-market values of employment	\$346
	Agricultural impacts	Included in opportunity cost of land and development costs (land acquisitions)		
	Noise impacts	Cost of acquisition and noise mitigation measures are included in development costs.		
	Blasting	Insignificant		
	Air quality impacts	Cost of acquisition is included in development costs		
	Surface water	\$6		
	Groundwater	\$1		
	Ecology	Some loss of values but offset. Cost of biodiversity offset included in development costs		
	Road transport impacts	Cost of realignment of the Bengalla Link Road included in development costs. However, some minor increase in travel time and vehicle operating costs		
	Aboriginal heritage	\$16		
	Non-Aboriginal heritage impacts	Insignificant		
Visual impacts	Some impacts. Costs of mitigation included in development costs			
	Non-market impacts sub-total	\$217 (\$24)		\$346
NET SOCIAL BENEFITS – including employment benefits				\$2,604 (\$2,112)
NET SOCIAL BENEFITS – excluding employment benefits				\$2,258 (\$1,766)

Note: totals may have minor discrepancies due to rounding. When impacts accrue globally, the numbers in brackets relates to the level of impact estimated to accrue to Australia

2.5.2 Distribution of Costs and Benefits

Introduction

As identified above, BCA is only concerned with the single objective of economic efficiency. BCA and welfare economics provide no guidance on what is a fair, equitable or preferable distribution of costs and benefits. Nevertheless, BCA can provide qualitative and quantitative information for the decision-maker on how economic efficiency costs and benefits are distributed.

Intra Generational

The net production benefit shown in Table 2.3 is potentially distributed amongst a range of stakeholders including:

- BMC shareholders in the form of after tax (and after voluntary contributions) profits;
- The Commonwealth Government in the form of any Company tax payable (\$509M present value) and the Minerals Resource Rent Tax from the Project, which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area;
- The NSW Government via royalties (\$778M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the regional area; and
- The local community in the form of voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Project may potentially accrue to a number of different stakeholder groups at the local, State, National and global level, however, are largely internalised into the production costs of BMC.

Noise costs, air quality costs and agricultural production costs will occur at a local level. These have been incorporated into the estimation of net production benefits via acquisition costs for affected properties and mitigation costs. As such, the bearers of these costs are compensated. Road transport impacts would also occur at the local level with the costs of road works included in the estimate of net production benefits. Residual road transport impacts have not been estimated but are expected to be insignificant. Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the opportunity cost of Water Access Licences and reduced flows in rivers. Greenhouse gas costs will occur at the national and global level and will be internalised through payment of the Commonwealth Government's carbon tax. The economic costs associated with the clearing of native vegetation will occur at the State level and would be counterbalanced by the Project biodiversity offsets. Aboriginal archaeological impacts would accrue at the regional or State level¹⁶ while Aboriginal cultural heritage impacts would accrue to local Aboriginal people. Visual impacts will occur at the local level and will be internalised by BMC through the funding of visual mitigation measures. All of these measures mean that those who experience costs have them either mitigated or compensated. Other potential environmental impacts would largely occur at the local level and were found to be insignificant. Any non-market benefits associated with employment provided by the Project would largely accrue at the local or State level¹⁷.

¹⁶ Non-market valuation studies that have surveyed NSW households have found that they value the conservation of highly significant Aboriginal heritage (Gillespie Economics 2008, 2009a, 2009b).

¹⁷ It should be noted that the study from which the employment values were transferred, surveyed NSW households only.

Table 2.3 - Distribution of Benefits and Costs (Present Values at 7% Discount Rate)

Value (\$M)		Distribution			
		Local	State	National	Global
Net Production Benefits					
Net production benefits to BMC	\$1,188	✓	✓	✓	✓
Net production benefits to Commonwealth Government – Company tax	\$509	✓	✓	✓	-
Net production benefits to NSW Government – Royalties	\$778	✓	✓	-	-
Net production benefits to local and regional community in the form of voluntary contributions	Unquantified	✓	-	-	-
Total	\$2,475				
Non-market Costs and Benefits					
Benefits					
Non-market benefit of employment	\$346	✓	✓	-	-
Total	\$346				
Costs					
Greenhouse gas emissions rest of the world ¹	\$192	-	-	-	✓
Greenhouse gas emissions Australia ²	\$2	✓	✓	✓	
Agricultural impacts	Included in opportunity cost of land and development costs (land acquisitions)	✓	-	-	-
Noise impacts	Cost of acquisition and noise mitigation measures are included in development costs.	✓	-	-	-
Blasting	Insignificant	✓	-	-	-
Air quality impacts	Cost of acquisition is included in development costs	✓	-	-	-
Surface water	\$6	✓	-	-	-
Groundwater	\$1	✓	-	-	-
Ecology	Some loss of values but offset. Cost of biodiversity offset included in development costs	✓	✓	-	-
Road transport impacts	Cost of realignment of the Bengalla Link Road included in development costs. However, some minor increase in travel time and vehicle operating costs	✓	-	-	-
Aboriginal heritage	\$16	✓	✓	-	-
Non-Aboriginal heritage impacts	Insignificant	✓	-	-	-
Visual impacts	Some impacts. Costs of mitigation included in development costs	✓	-	-	-
Total	\$217				
Net Social Benefits	\$2,604				

Note: Totals may have minor discrepancies due to rounding.

¹Assuming the global social damage cost of carbon is distributed in accordance with relative share of global gross domestic product.

The non-market costs that accrue to NSW are estimated at less than \$24M. These are considerably less than the net production benefits that directly accrue to NSW through royalties (\$778M). NSW will obtain additional benefits through voluntary contributions to the local and regional community, infrastructure and services provided with a share of Commonwealth Government Company tax and minerals resource rent tax (MRRT) receipts from the Project and dividends to NSW BMC shareholders. There are also additional benefits to NSW from the potential non-market employment benefits (\$346M). Consequently, as well as resulting in net social benefits to Australia the Project would result in net social benefits to NSW.

Intergenerational

Some of the environmental, social and cultural impacts of the Project may be felt by future generations. This is particularly the case for non-market environmental impacts. However, as identified above BCA is not concerned with distributional issues. The consideration of intergenerational equity issues is therefore outside the scope of BCA.

Nevertheless, it should be noted that the costs and benefits in BCA are defined and valued based on the microeconomic underpinnings of BCA. They are based on the values held by individuals in the current generation. There is no way to measure the value that future generations hold for impacts of current day projects as they are not here to express it.

Nevertheless, as identified by Boardman et al (2001) this is not considered a serious problem for BCA because:

- Few policies involve impacts that only appear in the far future. Consequently, the willingness to pay of people alive today can be used to predict how future generations will value them;
- Most people alive today care about the well-being of their children, grandchildren and great grandchildren, whether or not they have yet been born. They are therefore likely to include the interests of these generations to some extent in their own valuations of impacts. Because people cannot predict with certainty the place that their future offspring will hold in society, they are likely to take a very broad view of future impacts; and
- Discounting used in BCA also reduces the influence of costs and benefits that occur a long way into the future.

Furthermore, increased wealth (e.g. royalties and taxes) generated by projects that have a net benefit to the current community can be used to improve the services (e.g. health, school and community services) and environment (e.g. protected areas) that are passed on to future generations.

2.6 SENSITIVITY ANALYSIS

The NPV presented in Table 2.2 is based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a BCA can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV.

In this analysis, the BCA result was tested for 20% (+ and -) changes to the following variables at a 4%, 7% and 10% discount rate:

- Opportunity costs of land;
- Opportunity cost of capital;
- Development costs;
- Operating costs;
- Decommissioning and rehabilitation costs;
- Value of coal;
- Level of Australian ownership;
- Greenhouse costs;
- Surface water impacts;
- Groundwater impacts;
- Aboriginal heritage impacts; and
- Non-market employment impacts.

What this analysis indicates (refer to Attachment 2) is that the results of the BCA are not sensitive to the changes made in assumptions regarding any of these variables. In particular, significant increases in the values used for external impacts such as Aboriginal heritage impacts, greenhouse gas costs, surface water and groundwater impacts did not change the positive sign of the net present value of the Project. Hence the Project's desirability from an economic efficiency perspective is not changed.

The results were most sensitive to any potential decreases in the sale value of coal. A sustained reduction in coal price (over 37%) would be required to make the Project result in a reduction in economic efficiency.

3 ECONOMIC IMPACT ASSESSMENT

3.1 INTRODUCTION

The BCA in Section 2 is concerned with whether the incremental benefits of the Project exceed the incremental costs and therefore whether the community would, in aggregate, be better off 'with' the Project compared to 'without' it. In contrast, the focus of the regional economic impact assessment is the effect (impact) of the Project on the economy in terms of a number of specific indicators of economic activity, such as gross regional output, value-added, income and employment.

These indicators can be defined as follows:

- **Gross regional output** – the gross value of business turnover;
- **Value-added** – the difference between the gross regional output and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output;
- **Income** – the wages paid to employees including imputed wages for self employed and business owners; and
- **Employment** – the number of people employed (including full-time and part-time).

An impacting agent may be an existing activity within an economy or may be a change to a regional economy (Powell *et al.*, 1985; Jensen and West, 1986). This assessment is concerned with the economic impact of average annual production of the Project (i.e. up to 15 Mtpa ROM coal production).

The economy on which the impact is measured can range from a township to the entire nation (Powell *et al.*, 1985). In selecting the appropriate economy, regard needs to be had to capturing the local expenditure and employment associated with the production scenarios, but not making the economy so large that the impact of the proposal becomes trivial (Powell and Chalmers, 1995). For this study, the economic impacts have been estimated for two regions:

- The regional economy comprising the Local Government Areas (LGAs) of Muswellbrook, Singleton and Upper Hunter; and
- The NSW economy.

A range of methods can be used to examine the economic impacts of an activity on an economy including economic base theory, Keynesian multipliers, econometric models, mathematical programming models and input-output models (Powell *et al.*, 1985). Economic base theory and Keynesian multipliers are relatively simple approaches that provide impact measurement only in aggregate terms. Mathematical programming models are especially useful in micro-level studies of firms and industries but become complex for whole economies. Mathematical programming models are therefore sometimes used to estimate direct effects on an industry or sector with input-output analysis used to assess economy-wide effects. Econometric models, particularly those of the general equilibrium type, have the potential to measure economic impacts in a similar way to that of input-output models with relaxation of some of the limitations of input-output analysis (Powell *et al.*, 1985). However, development of these models at the regional scale is complex and there are difficulties associated with estimating a large number of coefficients and parameters when there is virtually no local data available. Input-output analysis assumes full employment with no capacity constraints, and thus prices have no role to play in the input-output model (unlike general equilibrium modelling). However, if the area under study is a small open economy relative to the rest of the nation, where factors of production can easily move into and out of the region and local prices gravitate to external prices (subject to transport margins, etc.), then the input-output model provides a reasonable and cost effective approach to estimating disaggregated impacts by sector at the regional level (Powell *et al.*, 1985; West, undated). This study uses input-output analysis, consistent with DP&I's draft guideline.

Input-output analysis essentially involves two steps:

- Construction of an appropriate input-output table (regional transaction table) that can be used to identify the economic structure of the region and multipliers for each sector of the economy; and
- Identification of the initial impact or stimulus of the Project (construction and/or operation) in a form that is compatible with the input-output equations so that the input-output multipliers and flow-on effects can then be estimated (West, 1993).

The input-output method is based on a number of assumptions that are outlined in Attachment 3. These result in estimated impacts being an upper bound impact estimate.

3.2 INPUT-OUTPUT TABLE AND ECONOMIC STRUCTURE OF THE REGION

A 2012 input-output table of the regional economy was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment 4), an input-output table of the NSW economy (developed by Monash University) as the parent table and ABS 2011 census data on employment by industry in the region. The 109 sector input-output table of the regional economy was aggregated to 30 sectors and 6 sectors for the purpose of describing the economies.

A highly aggregated 2012 input-output table for the regional economy is provided in Table 3.1. The rows of this table indicates how the gross regional output of an industry is allocated as sales to other industries, to households, to exports and other final demands (OFD), which includes stock changes, capital expenditure and government expenditure. The corresponding column shows the sources of inputs to produce that gross regional output. These include purchases of intermediate inputs from other industries, the use of labour (household income), the returns to capital or other value-added (OVA), which includes gross operating surplus and depreciation and net indirect taxes and subsidies and goods and services imported from outside the region. The number of people employed in each industry is also indicated in the final row.

Table 3.1 - Aggregated Transactions Table: Regional Economy 2012 (\$'000)

	Ag, forestry, fishing	Mining	Manuf.	Utilities	Building	Services	TOTAL	Household Expenditure	OFD	Exports	Total
Ag, forestry, fishing	24,250	171	70,285	7	241	3,596	98,549	8,021	68,101	200,562	375,233
Mining	42	192,113	6,276	60,867	1,722	1,150	262,170	374	-173,849	5,012,765	5,101,460
Manuf.	13,759	97,101	126,741	3,743	36,284	72,799	350,428	48,118	205,079	736,066	1,339,690
Utilities	2,777	34,280	16,598	473,737	4,018	22,337	553,747	18,614	12,125	413,115	997,601
Building	2,152	33,922	2,022	11,336	108,610	32,712	190,753	0	426,398	18,364	635,515
Services	25,970	176,752	141,818	18,493	56,814	372,600	792,446	422,470	583,047	837,744	2,635,708
TOTAL	68,949	534,338	363,739	568,184	207,690	505,193	2,248,093	497,597	1,120,901	7,218,616	11,085,207
Household Income	109,263	682,120	263,658	73,109	167,962	1,049,953	2,346,066	0	0	0	2,346,066
OVA	75,587	3,158,100	122,492	173,655	64,873	237,214	3,831,920	93,353	39,633	12,974	3,977,881
Imports	121,433	726,901	589,802	182,653	194,990	843,348	2,659,127	1,100,964	212,941	511,754	4,484,786
TOTAL	375,233	5,101,460	1,339,690	997,601	635,515	2,635,708	11,085,207	1,691,914	1,373,475	7,743,344	21,893,940
Employment	2,127	8,037	2,550	783	1,707	13,455	28,660				

Gross regional product (GRP) or value-added for the regional economy is estimated at \$6,324M, comprising \$2,346M to households as wages and salaries (including payments to self employed persons and employers) and \$3,978M in OVA.

The employment total working in the region was 28,660 people.

The economic structure of the regional economy can be compared with that for NSW through a comparison of results from the respective input-output models (Figures 3.1 and 3.2). This reveals that the agriculture sectors, mining sectors and utilities sectors in the regional economy are of greater relative importance than they are to the NSW economy, while the manufacturing sectors and building sectors are of less relative importance than they are to the NSW economy. Mining sectors are the most significant sectors in the regional economy.

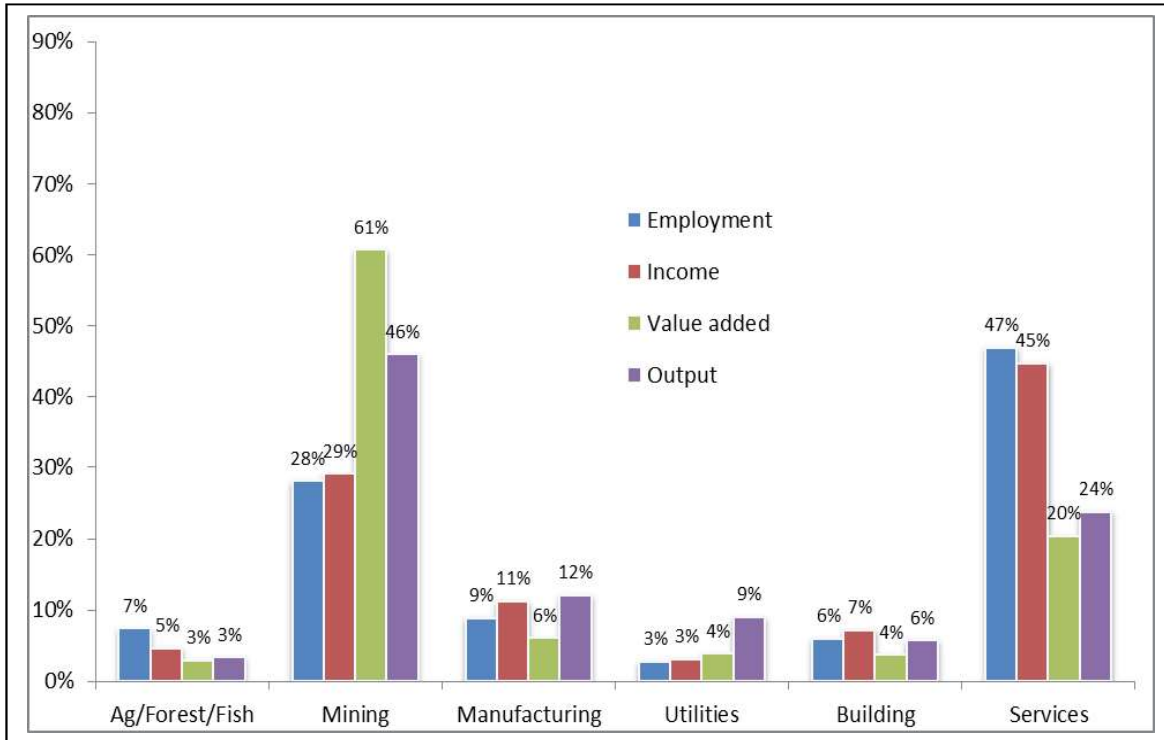


Figure 3.1 - Summary of Aggregated Sectors: Regional Economy

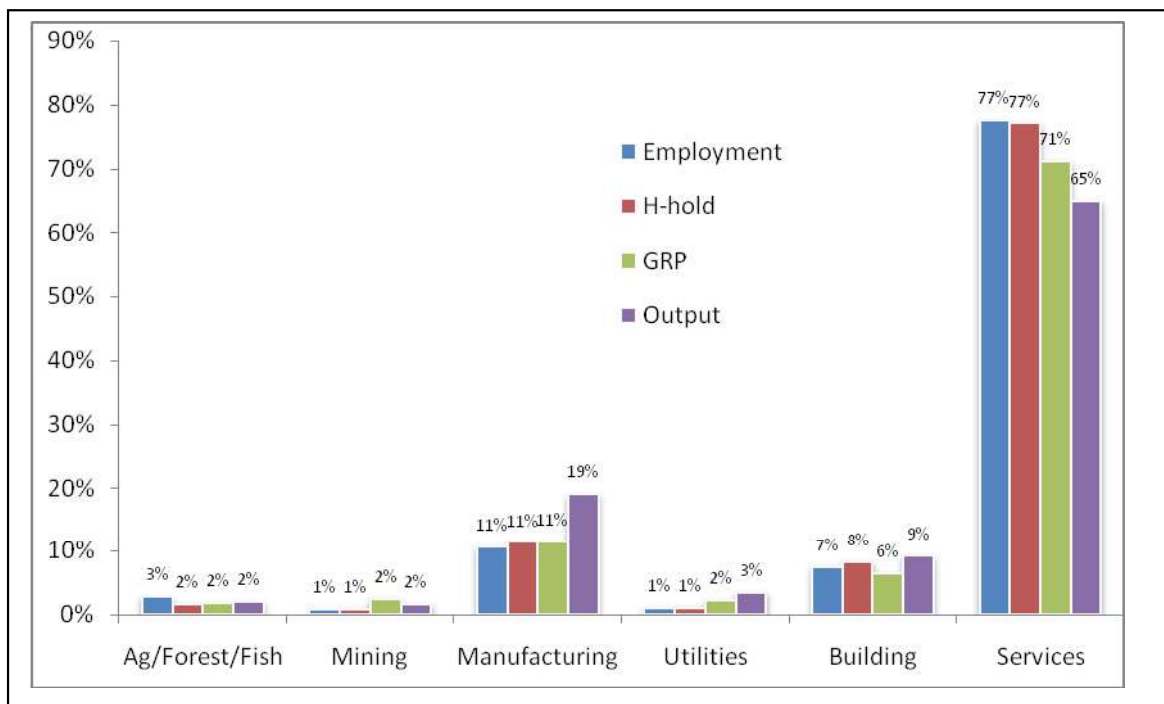


Figure 3.2 - Summary of Aggregated Sectors: NSW Economy

Figures 3.3 to 3.5 provide a more expansive sectoral distribution of gross regional output, employment, household income, value-added, exports and imports, and can be used to provide some more detail in the description of the economic structure of the economy.

What is clear from these figures is that in terms of gross regional output, value-added, income, employment, imports and exports, coal mining is the most significant sector of the regional economy. The next most significant sectors for output and value-added are the utilities sectors, business services sectors and building/construction sectors. For income and employment the next most significant sectors are business services, retail trade and building/construction. The equipment manufacturing sectors, building/construction sectors and business services sectors are the next most significant sectors for imports. The food manufacturing sectors, utilities sectors and wholesale trade sectors are the next most important sectors in the region for exports.

For comparison, the horse breeding and grape growing sectors are located in the other agriculture sector in Figures 3.3 to 3.5, while wine manufacturing is located in the food manufacturing sector.

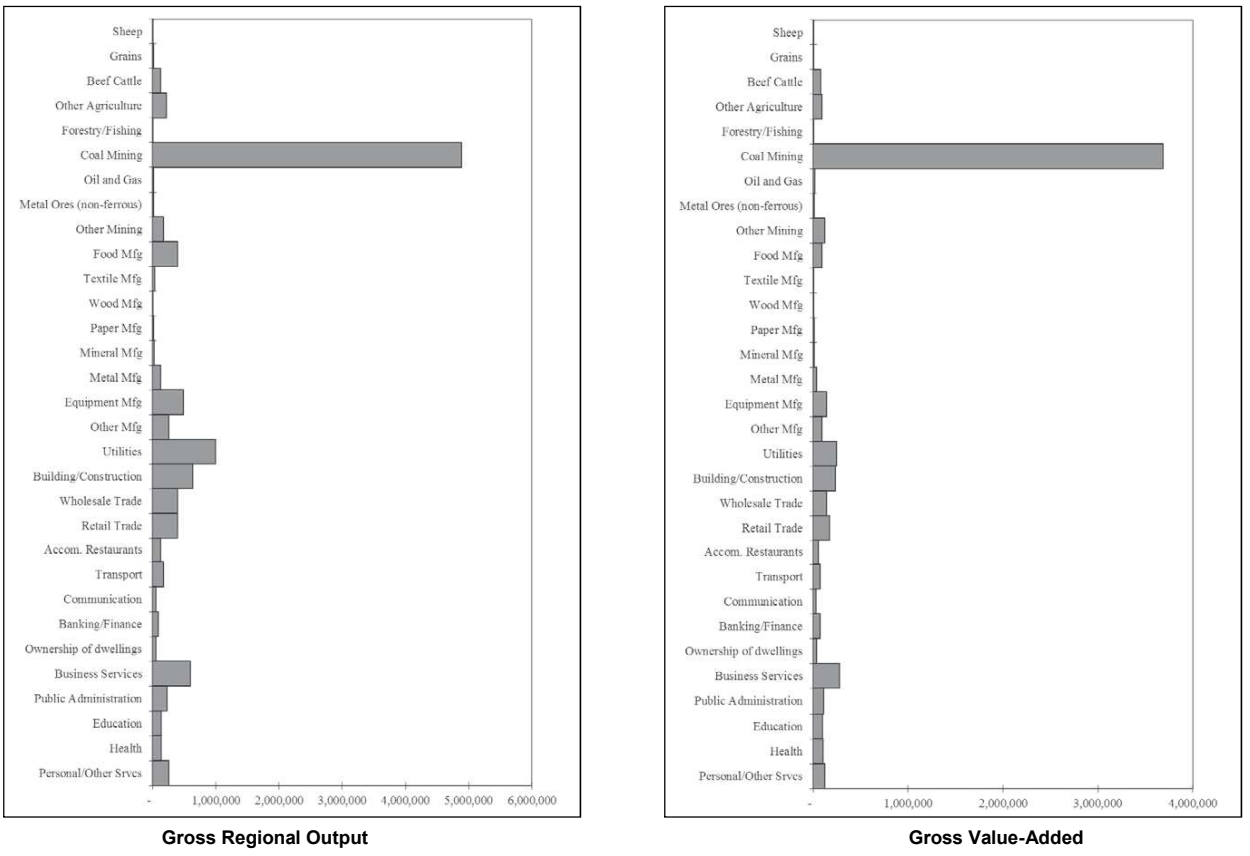


Figure 3.3 Sectoral Distribution of Gross Regional Output and Value-Added (\$'000)

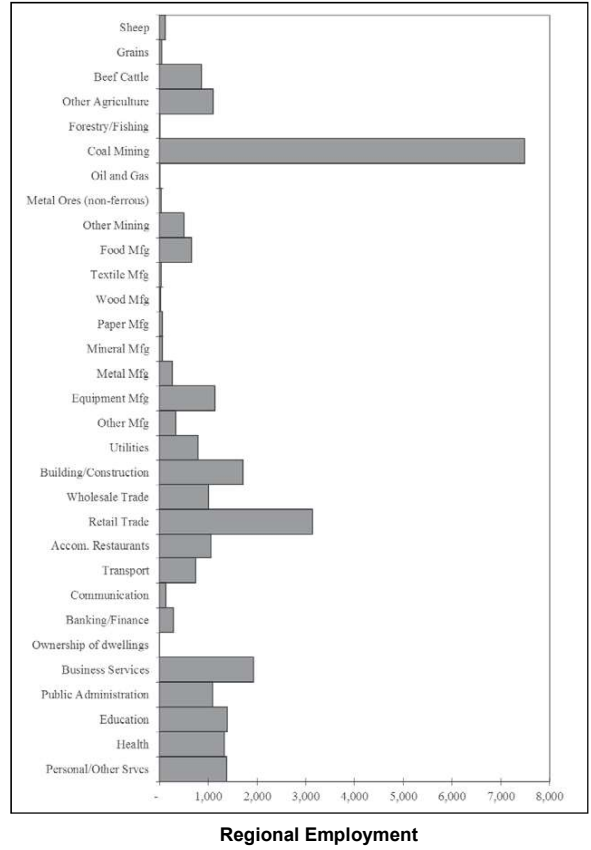
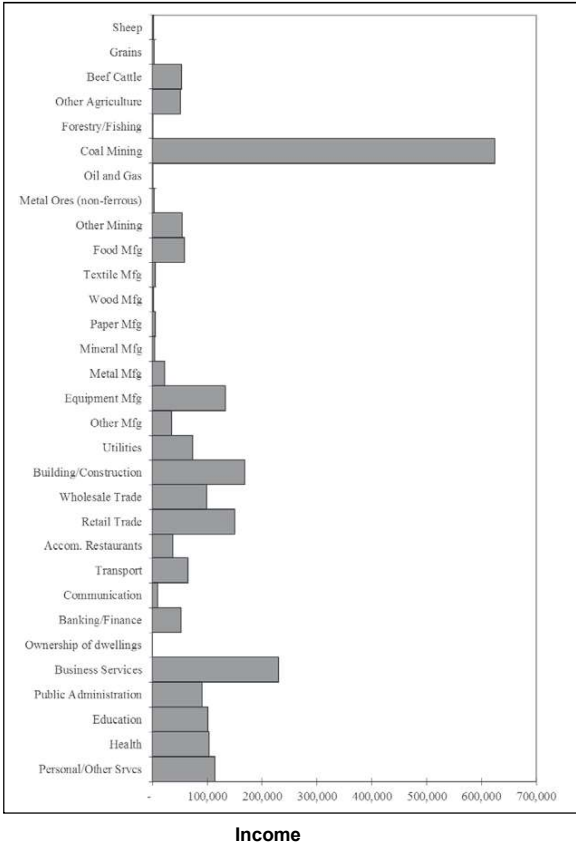


Figure 3.4 Sectoral Distribution of Gross Regional Income (\$'000) and Employment (No.)

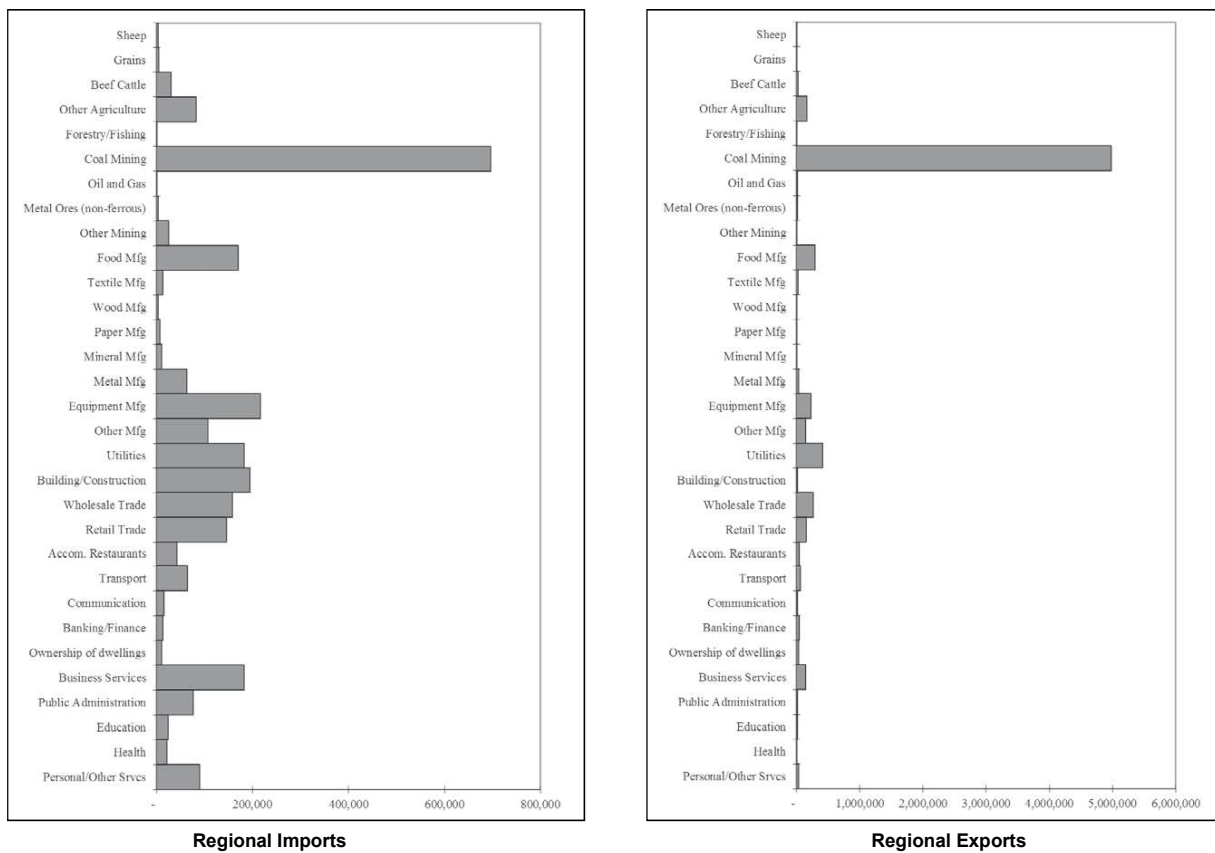


Figure 3.5 Sectoral Distribution of Imports and Exports (\$'000)

3.3 ECONOMIC IMPACT OF THE PROJECT

The revenue, expenditure and employment associated with the construction and operation of the Project would stimulate economic activity for the regional economy, as well as for the broader NSW economy. The regional impacts of both these stimuli are estimated for the indicators of output, value-added, income and employment.

3.3.1 Construction Phase

Introduction

Economic activity associated with the Project construction phase is estimated to potentially mainly occur within five sectors of the economy:

- The *other construction sector* which includes businesses involved in the construction of non-residential buildings and sites, including port terminals;
- The *construction trade services sector* which includes businesses involved in plumbing, electrical, and other trades;
- The *other property services sector* which includes businesses involved in the leasing of industrial machinery, plant or equipment;
- The *agriculture, mining and construction machinery, lifting and material handling equipment manufacturing sector*; and
- *Other machinery and equipment manufacturing sector*.

Impact on the Regional Economy

Given the largely specialist nature of capital equipment and the relatively small size of the regional economy, for the purpose of this analysis an assumption is made that all such purchases and the leasing of machinery are made outside the regional economy. Thus regional economic activity from the Project construction phase primarily relates to the *other construction sector* and *construction trade services sector*.

The average annual construction workforce required for the Project during the peak year of construction (Year 2) is 218, with average annual construction workforce of 70 in Year 1 and 101 in Year 3. Based on the input-output coefficients of the *other construction sector* and *trade services sector* in the regional economy transactions table, approximately \$79M of the development costs in the peak year of construction would need to be spent on the *other construction sector* and *construction trade services sector* within the region to result in a workforce of 208 people. The direct and indirect regional economic impact of this level of expenditure in the regional economy is reported in Table 3.2.

Impacts

Table 3.2 - Regional Economic Impacts of Construction of the Project on the Regional Economy

	Direct	Production induced	Consumption induced	Total Flow on	Total
OUTPUT (\$'000)	79,431	34,846	9,561	44,407	123,838
<i>Type 11A Ratio</i>	1.00	0.44	0.12	0.56	1.56
VALUE ADDED (\$'000)	30,790	14,710	4,432	19,142	49,932
<i>Type 11A Ratio</i>	1.00	0.48	0.14	0.62	1.62
INCOME (\$'000)	13,468	9,142	3,110	12,253	25,721
<i>Type 11A Ratio</i>	1.00	0.68	0.23	0.91	1.91
EMPL. (No.)	218	156	53	209	426
<i>Type 11A Ratio</i>	1.00	0.72	0.24	0.96	1.96

Note: Income only relates to that income that will accrue to local labour. Employment relates to employment working in the region.

In estimating the total regional impacts, it is important to separate the flow-on effects that are associated with firms buying goods and services from each other (production-induced effects) and the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption-induced effects). This is because these two effects operate in different ways and have different spatial impacts.

Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are located in the region or migrate into the region. Where workers commute from outside the region some of the consumption-induced flow-on effects leak from the region. However, this has already been taken into account in this analysis by adjusting the income row of the input-output model to only include the income associated with workers who reside in the region¹⁸.

In total, the peak construction year of the Project is estimated to make up to the following total annual contribution to the regional economy:

- \$124M in annual direct and indirect regional output or business turnover;
- \$50M in annual direct and indirect regional value added;
- \$26M in annual direct and indirect household income; and
- 426 direct and indirect jobs.

Multipliers

Multipliers are summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995). There are many types of multipliers that can be generated from input-output analysis (refer to Attachment 3). Type 11A ratio multipliers summarise the total impact on all industries in an economy in relation to the initial own sector effect (e.g. total income effect from an initial income effect and total employment effect from an initial employment effect, etc).

The Type 11A ratio multipliers for the construction phase of the Project in the regional economy range from 1.56 for output up to 1.96 for employment.

Main Sectors Affected

Flow-on impacts from the construction phase of the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added, income and employment flow-ons are likely to be *construction trade-services, wholesale and retail trade, scientific research, technical and computer services, other property services, other business services, health services and accommodation, cafes and restaurants*.

Impact on the NSW Economy

When the impact of \$79M of expenditure in the *other construction sector* and *construction trade services sector* is assessed for the NSW economy, the impacts are greater because of the larger inter-sectoral linkages and hence multipliers for the larger economy.

¹⁸ Based on ABS 2011 Census data on the residential location of workers.

*Impacts***Table 3.3 - Regional Economic Impacts of Construction of the Project on the NSW Economy**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$'000)	79,431	72,915	83,845	156,759	236,190
<i>Type 11A Ratio</i>	1.00	0.92	1.06	1.97	2.97
VALUE ADDED (\$'000)	30,790	31,461	42,707	74,167	104,957
<i>Type 11A Ratio</i>	1.00	1.02	1.39	2.41	3.41
INCOME (\$'000)	21,943	25,910	24,440	50,350	72,292
<i>Type 11A Ratio</i>	1.00	1.18	1.11	2.30	3.30
EMPL. (No.)	217	292	319	611	827
<i>Type 11A Ratio</i>	1.00	1.35	1.47	2.82	3.82

Based on the above approach, the construction phase of the Project may result in impacts on the NSW economy of up to:

- \$236M in annual direct and indirect output;
- \$105M in annual direct and indirect regional value added;
- \$72M in annual direct and indirect household income; and
- 827 direct and indirect jobs.

The above estimated impacts on the NSW economy are likely to be understated because expenditures in NSW may not be limited to expenditures in the *other construction* sector and *construction trade services* sector. This is because the larger NSW economy is likely to be able to also supply some machinery and equipment manufacturing and machinery leasing that could not be supplied by the smaller regional economies.

3.3.2 Operation Phase

Introduction

For the analysis of the operational phase of the Project, two new sectors were separately inserted in the regional input-output table. The first sector reflected the average annual production under the current approval i.e. up to 10.7 Mtpa ROM. The second reflected the average annual production under the Project i.e. up to 15 Mtpa ROM. The average annual revenue, operating costs and employment levels under each of these scenarios was obtained from financial information provided by BMC. For these sectors:

- The estimated gross annual revenue was allocated to the *Output* row;
- The estimated wage bill of those residing in the region was allocated to the *household wages* row with the remainder allocated to a separate *household wages* row that is not included in the calculation of flow-on effect;
- Non-wage expenditure was initially allocated across the relevant *intermediate sectors* in the economy, *imports* and *other value-added*;
- Allocation was then made between *intermediate sectors* in the regional economy and *imports* based on advice from BMC and regional location quotients;
- Purchase prices for expenditure in the each sector in the region were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National Input-Output Tables;

- The difference between total revenue and total costs was allocated to the *other value-added* row; and
- Direct employment provided by the Project that was allocated to the *employment* row.

Impacts on the Regional Economy

Economic Activity

The total and disaggregated average annual impacts of the current approval and the Project on the regional economy (in 2012 dollars) are shown in Tables 3.4 and 3.5.

**Table 3.4
Economic Impacts of the Current Approval on the Regional Economy (\$2012)**

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$'000)	825,844	181,041	37,952	218,992	1,044,836
<i>Type 11A Ratio</i>	1.00	0.22	0.05	0.27	1.27
VALUE ADDED (\$'000)	454,674	71,058	23,462	94,520	549,194
<i>Type 11A Ratio</i>	1.00	0.16	0.05	0.21	1.21
INCOME (\$'000)	58,428	31,325	12,346	43,671	102,099
<i>Type 11A Ratio</i>	1.00	0.54	0.21	0.75	1.75
EMPL. (No.)	491	462	209	671	1,162
<i>Type 11A Ratio</i>	1.00	0.94	0.43	1.37	2.37

**Table 3.5
Economic Impacts of the Project on the Regional Economy (\$2012)**

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$'000)	1,174,064	254,535	57,621	312,156	1,486,220
<i>Type 11A Ratio</i>	1.00	0.22	0.05	0.27	1.27
VALUE ADDED (\$'000)	657,035	105,600	26,710	132,310	789,345
<i>Type 11A Ratio</i>	1.00	0.16	0.04	0.20	1.20
INCOME (\$'000)	92,146	44,122	18,745	62,867	155,014
<i>Type 11A Ratio</i>	1.00	0.48	0.20	0.68	1.68
EMPL. (No.)	768	659	318	977	1,745
<i>Type 11A Ratio</i>	1.00	0.86	0.41	1.27	2.27

The current approval to mine to 2017 is estimated to make up to the following annual contribution to the regional economy:

- \$1,045M in annual direct and indirect regional output or business turnover;
- \$549M in annual direct and indirect regional value added;
- \$102M in annual direct and indirect household income; and
- 1,162 direct and indirect jobs.

The Project is estimated to make up to the following annual contribution to the regional economy for 24 years:

- \$1,486M in annual direct and indirect regional output or business turnover;
- \$789M in annual direct and indirect regional value added;
- \$155M in annual direct and indirect household income; and
- 1,745 direct and indirect jobs.

Multipliers

The Type 11A ratio multipliers for the Project impact on the regional economy range from 1.20 for value added up to 2.27 for employment.

Capital intensive industries such as coal mining tend to have a high level of linkage with other sectors in an economy thus contributing substantial flow-on employment while at the same time only having a lower level of direct employment (relative to output levels). This tends to lead to a relatively high ratio multiplier for employment. A lower ratio multiplier for income (compared to employment) also generally occur as a result of comparatively higher wage levels in the mining sectors compared to incomes in the sectors that would experience flow-on effects from the Project. Capital intensive mining projects also typically have a relatively low ratio multiplier for output and value-added reflecting the relatively high direct output and value-added compared to that in flow-on sectors.

Main Sectors Affected

Flow-on impacts from the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added and income flow-ons are likely to be the:

- *Services to mining sector;*
- *Agricultural and mining machinery manufacturing sector;*
- *Retail trade sector;*
- *Wholesale trade sector;*
- *Basic chemicals sector;*
- *Scientific, research, technical and computer services sector; and*
- *Road transport sector.*

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated by the Project (Table 3.6).

Table 3.6
Sectoral Distribution of Employment Impacts on the Regional Economy

Sector	Regional Economy			
	Average Direct Effects	Product.-induced	Consump.-induced	Total
Primary	0	1	8	9
Mining	768	147	0	915
Manufacturing	0	186	12	198
Utilities	0	22	4	26
Wholesale/Retail	0	110	88	198
Accommodation, cafes, restaurants	0	6	47	53
Building/Construction	0	10	2	12
Transport	0	46	10	56
Services	0	131	146	277
Total	768	659	318	1,745

Note: Totals may have minor discrepancies due to rounding.

Table 3.6 indicates that direct, production-induced and consumption-induced employment impacts of the Project on the regional economy are likely to have different distributions across sectors. Production-induced flow-on employment would occur mainly in the *manufacturing sectors, mining sectors, services sectors, wholesale/retail trade sectors and transport sectors* while consumption induced flow-on employment would be mainly in *services sectors, wholesale/retail trade sectors and accommodation/cafes/restaurants sectors*.

Businesses that can provide the inputs to the production process required by the Project and/or the products and services required by employees would directly benefit from the Project by way of an increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses also benefit.

Impact on the NSW Economy

Introduction

The NSW economic impacts of the Project were assessed by separately inserting two new sectors in the NSW input-output table in the same manner described in Section 3.2.1. The primary difference from the sectors identified for the regional economy was that a greater level of expenditure was captured by NSW economy compared to the regional economy.

Economic Activity

The total and disaggregated average annual impacts of the current approval and Project on the regional economy (in 2012 dollars) are shown in Tables 3.7 and 3.8.

Table 3.7
NSW Economic Impacts of the Current Approval (\$2012)

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$'000)	825,844	516,063	351,184	867,246	1,693,090
<i>Type 11A Ratio</i>	1.00	0.63	0.43	1.05	2.05
VALUE ADDED (\$'000)	457,030	217,740	178,877	396,616	853,647
<i>Type 11A Ratio</i>	1.00	0.48	0.39	0.87	1.87
INCOME (\$'000)	60,783	139,647	102,366	242,013	302,796
<i>Type 11A Ratio</i>	1.00	2.30	1.68	3.98	4.98
EMPL. (No.)	491	1,507	1,366	2,873	3,364
<i>Type 11A Ratio</i>	1.00	3.07	2.78	5.85	6.85

Table 3.8
NSW Economic Impacts of the Project (\$2012)

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$'000)	1,174,064	723,454	510,975	1,234,429	2,408,493
<i>Type 11A Ratio</i>	1.00	0.62	0.44	1.05	2.05
VALUE ADDED (\$'000)	657,035	305,242	260,267	565,509	1,222,545
<i>Type 11A Ratio</i>	1.00	0.47	0.40	0.86	1.86
INCOME (\$'000)	95,860	195,768	148,943	344,711	440,571
<i>Type 11A Ratio</i>	1.00	2.04	1.55	3.60	4.60
EMPL. (No.)	768	2,112	1,988	4,100	4,868
<i>Type 11A Ratio</i>	1.00	2.75	2.59	5.34	6.34

The current approval to mine to 2017 is estimated to make up to the following annual contribution to the NSW economy:

- \$1,693M in annual direct and indirect regional output or business turnover;
- \$854M in annual direct and indirect regional value added;
- \$303M in annual direct and indirect household income; and
- 3,364 direct and indirect jobs.

The Project is estimated to make up to the following average annual contribution to the NSW economy for 24 years:

- \$2,408M in annual direct and indirect regional output or business turnover;
- \$1,223M in annual direct and indirect regional value added;
- \$441M in annual indirect household income; and
- 4,868 indirect jobs.

The impacts on the NSW economy are substantially greater than for the regional economy, as the NSW economy is able to capture more mine and household expenditure, and there is a greater level of intersectoral linkages in the larger NSW economy.

3.4 MINE CESSATION

As outlined in Sections 3.2 and 3.3, the Project will stimulate demand in the regional and NSW economy, for up to 24 years, leading to increased business turnover in a range of sectors and increased employment opportunities. Conversely, the cessation of the mining operations in the future would result in a contraction in regional and NSW economic activity.

The magnitude of the regional economic impacts of cessation of the Project would depend on a number of interrelated factors at the time, including:

- The movements of workers and their families;
- Alternative development opportunities; and
- Economic structure and trends in the regional economy at the time.

Ignoring all other influences, the impact of Project cessation on the regional economy would depend on whether the workers and their families affected would leave the regional area. If it is assumed that some or all of the workers remain in the regional economy, then the impacts of Project cessation would not be as severe compared to a greater level leaving the area. This is because the consumption-induced flow-ons of the decline would be reduced through the continued consumption expenditure of those who stay (Economic and Planning Impact Consultants, 1989). Under this assumption, the regional economic impacts of Project cessation would approximate the direct and production-induced effects in Table 3.5. However, if displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table 3.5.

The decision by workers, on cessation of the Project, to move or stay would be affected by a number of factors including the prospects of gaining employment in the regional economy compared to other regions, the likely loss or gain from homeowners selling, and the extent of "attachment" to the regional areas (Economic and Planning Impact Consultants, 1989).

To the extent that alternative development opportunities arise in the regional economy, the regional economic impacts associated with mining closure that arise through reduced production and employment expenditure can be substantially ameliorated and absorbed by the growth of the region. One key factor in the growth potential of a region is its capacity to expand its factors of production by attracting investment and labour from outside the region (BIE, 1994). This in turn can depend on a region's natural endowments. In this respect, the regional area is highly prospective with considerable coal resources (NSW DPI, 2010).

It is therefore likely that, over time, new mining developments would occur, offering potential to strengthen and broaden the economic base of the regional area and hence buffer against impacts of the cessation of individual activities.

Ultimately, the significance of the economic impacts of cessation of the Project would depend on the economic structure and trends in regional economy at the time. For example, if Project cessation takes place in a declining economy, the impacts might be significant. Alternatively, if Project cessation takes place in a growing diversified economy where there are other development opportunities, the ultimate cessation of the Project may not be a cause for concern.

Nevertheless, given the uncertainty about the future complementary mining activity in regional economy it is not possible to foresee the likely circumstances within which Project cessation would occur.

4 CONCLUSION

A BCA of the Project indicated that it would have net production benefits to Australia of \$1,790M. Provided the residual environmental, social and cultural impacts of the Project that accrue to Australia are considered to be valued at less than \$1,790M, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

Instead of leaving the environmental, cultural and social impacts unquantified, an attempt was made to quantify them. The main quantifiable environmental impacts of the Project that have not already been incorporated into the estimate of net production benefits, relate to greenhouse gas emissions, Aboriginal heritage impacts and surface water and groundwater impacts. These impacts are estimated at \$217M globally or \$24M to Australia, considerably less than the estimated net production benefits of the Project. There may also be some non-market benefits of employment provided by the Project which are estimated to be in the order of \$346M. Overall, the Project is estimated to have net social benefits to Australia of between \$1,766M and \$2,112M and hence is desirable and justified from an economic efficiency perspective.

While the BCA is primarily concerned with the aggregate costs and benefits of the Project to Australia, the costs and benefits may be distributed among a number of different stakeholder groups at the local, state, National and global level. The total net production benefit will be distributed amongst a range of stakeholders including:

- BMC shareholders in the form of after tax (and after voluntary contributions) profits;
- The Commonwealth Government in the form of any Company tax payable (\$509M present value) and the Minerals Resource Rent Tax from the Project, which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area;
- The NSW Government via royalties (\$778M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the local and regional area; and
- The local and regional community in the form of voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Project may potentially accrue to a number of different stakeholder groups at the local, State, National and global level, however, are largely internalised into the productions costs of BMC.

The non-market costs that accrue to NSW are estimated at less than \$24M. These are considerably less than the net production benefits (and potential non-market employment benefits) that directly accrue to NSW. Consequently, as well as resulting in net benefits to Australia the Project would result in net benefits to NSW.

An economic impact analysis, using input-output analysis found that the operation of the Project is estimated to make up to the following contribution to the regional economy for up to 24 years:

- \$1,486M in annual direct and indirect regional output or business turnover;
- \$789M in annual direct and indirect regional value added;
- \$155M in annual direct and indirect household income; and
- 1,745 direct and indirect jobs.

For the NSW economy, the operation of the Project is estimated to make up to the following contribution for up to 24 years:

- \$2,408M in annual direct and indirect regional output or business turnover;
- \$1,223M in annual direct and indirect regional value added;
- \$441M in annual direct and indirect household income; and
- 4,868 direct and indirect jobs.

Cessation of the Project operation may lead to a reduction in economic activity. The significance of these Project cessation impacts would depend on:

- The degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is because continued expenditure by these people in the regional economy (even at reduced levels) contributes to final demand;
- The economic structure and trends in the regional economy at the time. For example, if Project cessation takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing diversified economy; and
- Whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

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ATTACHMENT 1 – VALUING GREENHOUSE GAS EMISSIONS

To place an economic value on carbon dioxide equivalent (CO₂-e) emissions a shadow price of carbon is required that reflects its social costs. The social cost of carbon is the present value of additional economic damages now and in the future caused by an additional tonne of carbon emissions.

A prerequisite to valuing this environmental damage is scientific dose-response functions identifying how incremental emissions of CO₂-e would impact climate change and subsequently impact human activities, health and the environment on a spatial basis. Only once these physical linkages are identified is it possible to begin to place economic values on the physical changes using a range of market and non market valuation methods. Neither the identification of the physical impacts of additional greenhouse gas nor valuation of these impacts is an easy task, although various attempts have been made using different climate and economic modelling tools. The result is a great range in the estimated damage costs of greenhouse gas.

The *Stern Review: Economics of Climate Change* (Stern, 2006) acknowledged that the academic literature provides a wide range of estimates of the social cost of carbon. It adopted an estimate of United States (US) \$85 per tonne (/t) of carbon dioxide (CO₂) for the "business as usual" case (i.e. an environment in which there is an annually increasing concentration of greenhouse gas in the atmosphere).

Tol (2006) highlights some significant concerns with Stern's damage cost estimates including:

- that in estimating the damage of climate change Stern has consistently selected the most pessimistic study in the literature in relation to impacts;
- Stern's estimate of the social cost of carbon is based on a single integrated assessment model, PAGE2002, which assumes all climate change impacts are necessarily negative and that vulnerability to climate change is independent of development; and
- Stern uses a near zero discount rate which contravenes economic theory and the approach recommended by Treasury's around the world.

All these have the effect of magnifying the social cost of the carbon estimate, providing what Tol (2006) considers to be an outlier in the marginal damage cost literature.

Tol (2005) in a review of 103 estimates of the social cost of carbon from 28 published studies found that the range of estimates was right-skewed: the mode was US\$0.55/t CO₂ (in 1995 US\$), the median was US\$3.82/t CO₂, the mean US\$25.34/t CO₂ and the 95th percentile US\$95.37/t CO₂. He also found that studies that used a lower discount rate and those that used equity weighting across regions with different average incomes per head, generated higher estimates and larger uncertainties. The studies did not use a standard reference scenario, but in general considered 'business as usual' trajectories.

Tol (2005) concluded that "it is unlikely that the marginal damage costs of CO₂ emissions exceed US\$14/t CO₂ and are likely to be substantially smaller than that". Nordhaus's (2008) modelling using the DICE-2007 Model suggests a social cost of carbon with no emissions limitations of US\$30 per tonne of carbon (US\$8/t CO₂).

Tol (2011) surveyed the literature on the economic impact of climate change. Tol (2011) identifies the mean estimated from published studies is a marginal cost of carbon of \$177/t C (\$48/ tCO₂-e) and a modal estimate of \$49/t C (\$13 tCo₂-e) reflecting the fact that the mean estimate is driven by some very large estimates. For peer reviewed studies only, the mean estimate of the social cost of carbon is \$80/tC (\$22/tCo₂-e).

An alternative method to trying to estimate the damage costs of CO₂ is to examine the price of carbon credits. This is relevant because emitters can essentially emit CO₂ resulting in climate change damage costs or may purchase credits that offset their CO₂ impacts, internalising the cost of the externality at the price of the carbon credit. The price of carbon credits therefore provides an alternative estimate of the economic cost of greenhouse gas. However, the price is ultimately a function of the characteristics of the scheme and the scarcity of permits, etc. and hence may or may not reflect the actual social cost of carbon.

In the first half of 2008 the carbon price under the European Union Emissions Trading Scheme was over €20/t CO₂. The average price was €22/t CO₂ in the second half of 2008, and €13/t CO₂ in the first half of 2009. In March 2012, the permit price reduced to under €10 /t CO₂.

In 2008, spot prices in the Chicago Climate Exchange were in the order of US\$3.95/t CO₂. However, the Chicago Climate Exchange cap and trade system ended on December 31, 2010.

In 2011, the greenhouse penalty for benchmark participants in the New South Wales Government Greenhouse Gas Reduction Scheme that fail to reduce emissions rose to \$15.50 t CO₂.

Under the Australian Commonwealth Government's Climate Change Plan (Department of Climate Change and Energy Efficiency 2011) around 500 of the biggest polluters in Australia will need to buy and surrender to the Government a permit for every tonne of carbon pollution they produce. For the first three years, the carbon price will be fixed like a tax, before moving to an emissions trading scheme in 2015. In the fixed price stage, starting on 1 July 2012, the carbon price will start at \$23 a tonne, rising at 2.5 per cent a year in real terms. From 1 July 2015, the carbon price will be set by the market.

Given the above information and the great uncertainty around damage cost estimates, the BCA uses the carbon price proposed by Australian Government's Climate Change Plan i.e. \$23 a tonne, rising at 2.5 per cent a year in real terms for three years, as reflective of the global social damage cost of carbon. From 2015 it is assumed that the carbon price remains constant. A range for the social cost of greenhouse gas emissions from AUD\$8/t CO₂-e to AUD\$40/t CO₂-e was used in the sensitivity analysis described in Section 2.6 of this report.

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ATTACHMENT 2 – BCA SENSITIVITY TESTING

**Table A2-1
Benefit Cost Analysis Sensitivity Testing, Project Australian Net Present Value (\$Millions)**

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	\$3,033	\$2,112	\$1,523
INCREASE 20%			
Opportunity cost of land	\$3,027	\$2,107	\$1,519
Opportunity cost of capital	\$2,976	\$2,063	\$1,480
Development costs	\$2,910	\$2,009	\$1,436
Operating costs	\$2,073	\$1,429	\$1,022
Decommissioning and rehabilitation costs	\$3,035	\$2,115	\$1,526
Coal value	\$4,629	\$3,244	\$2,352
Level of Australian ownership	\$3,193	\$2,213	\$1,587
Residual value of land	\$3,034	\$2,112	\$1,523
Surface water	\$3,034	\$2,112	\$1,523
Groundwater	\$3,033	\$2,112	\$1,523
Aboriginal heritage impacts	\$3,029	\$2,109	\$1,520
Non-market employment benefits	\$3,104	\$2,181	\$1,590
GREENHOUSE COSTS @ \$40/TONNE (T)	\$3,031	\$2,110	\$1,522

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land	\$3,039	\$2,117	\$1,528
Opportunity cost of capital	\$3,090	\$2,161	\$1,566
Development costs	\$3,156	\$2,214	\$1,610
Operating costs	\$3,994	\$2,795	\$2,024
Decommissioning and rehabilitation costs	\$3,031	\$2,109	\$1,520
Coal value	\$1,437	\$980	\$694
Level of Australian ownership	\$2,873	\$2,011	\$1,459
Residual value of land	\$3,032	\$2,112	\$1,523
Surface water	\$3,033	\$2,112	\$1,523
Groundwater	\$3,033	\$2,112	\$1,523
Aboriginal heritage impacts	\$3,037	\$2,115	\$1,526
Non-market employment benefits	\$2,962	\$2,043	\$1,456
GREENHOUSE COSTS @ \$8/T	\$3,035	\$2,113	\$1,524

ATTACHMENT 3 – UNDERLYING ASSUMPTIONS AND INTERPRETATIONS OF INPUT-OUTPUT ANALYSIS AND MULTIPLIERS

1. “The *basic assumptions* in input-output analysis include the following:

- there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between input-output tables for the same country over time have indicated that material input requirements tend to be stable and change but slowly; however, requirements for primary factors of production, that is labour and capital, are probably less constant);
- all products of an industry are identical or are made in fixed proportions to each other;
- each industry exhibits constant returns to scale in production;
- unlimited labour and capital are available at fixed prices; that is, any change in the demand for productive factors will not induce any change in their cost (in reality, constraints such as limited skilled labour or investment funds lead to competition for resources among industries, which in turn raises the prices of these scarce factors of production and of industry output generally in the face of strong demand); and
- there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.

2. The multipliers therefore describe *average effects, not marginal effects*, and thus do not take account of economies of scale, unused capacity or technological change. Generally, average effects are expected to be higher than the marginal effects.

3. The input-output tables underlying multiplier analysis only take account of one form of *interdependence*, namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.

4. The combination of the assumptions used and the excluded interdependence means that input-output multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.

5. The multipliers also do not account for some important pre-existing conditions. This is especially true of Type II multipliers, in which employment generated and income earned induce further increases in demand. The implicit assumption is that those taken into employment were previously unemployed and were previously consuming nothing. In reality, however, not all 'new' employment would be drawn from the ranks of the unemployed; and to the extent that it was, those previously unemployed would presumably have consumed out of income support measures and personal savings. Employment, output and income responses are therefore overstated by the multipliers for these additional reasons.

6. The most *appropriate interpretation* of multipliers is that they provide a relative measure (to be compared with other industries) of the interdependence between one industry and the rest of the economy which arises solely from purchases and sales of industry output based on estimates of transactions occurring over a (recent) historical period. Progressive departure from these conditions would progressively reduce the precision of multipliers as predictive device” (ABS 1995, p.24).

Multipliers therefore do not take account of economies of scale, unused capacity or technological change since they describe average effects rather than marginal effects (ABS, 1995).

Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional output, employment, value-added and income multipliers show the output, employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

Components of the conventional output multiplier are as follows:

Initial effect - which is the initial output stimulus, usually a \$1 change in output from a particular industry (Powell and Chalmers, 1995; ABS, 1995).

First round effects - the amount of output from all intermediate sectors of the economy required to produce the initial \$1 change in output from the particular industry (Powell and Chalmers, 1995; ABS, 1995).

Industrial support effects - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

Production induced effects - the sum of the first round effects and industrial support effects (i.e. the total amount of output from all industries in the economy required to produce the initial \$1 change in output) (Powell and Chalmers, 1995; ABS, 1995).

Consumption induced effects - the spending by households of the extra income they derive from the production of the extra \$1 of output and production induced effects. This spending in turn generates further production by industries (Powell and Chalmers, 1995; ABS, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production-induced effect and consumption-induced effect.

Conventional employment, value-added and income multipliers have similar components to the output multiplier, however, through conversion using the respective coefficients show the employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

For employment, value-added and income, it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

$$\text{Type 1A Ratio Multiplier} = \frac{\text{Initial} + \text{First Round Effects}}{\text{Initial Effects}}$$

$$\text{Type 1B Ratio Multiplier} = \frac{\text{Initial} + \text{Production Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11A Ratio Multiplier} = \frac{\text{Initial} + \text{Production Induced} + \text{Consumption Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11B Ratio Multiplier} = \frac{\text{Flow-on Effects}}{\text{Initial Effects}}$$

Source: Centre for Farm Planning and Land Management (1989).

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ATTACHMENT 4 – THE GENERATION OF REGIONAL INPUT-OUTPUT TABLES

The Generation of Regional Input-Output Tables (GRIT) system was designed to:

- combine the benefits of survey based tables (accuracy and understanding of the economic structure) with those of non-survey tables (speed and low cost);
- enable the tables to be compiled from other recently compiled tables;
- allow tables to be constructed for any region for which certain minimum amounts of data were available;
- develop regional tables from national tables using available region-specific data;
- produce tables consistent with the national tables in terms of sector classification and accounting conventions;
- proceed in a number of clearly defined stages; and
- provide for the possibility of ready updates of the tables.

The resultant GRIT procedure has a number of well-defined steps. Of particular significance are those that involve the analyst incorporating region-specific data and information specific to the objectives of the study. The analyst has to be satisfied about the accuracy of the information used for the important sectors; in this case the coal mining sector. The method allows the analyst to allocate available research resources to improving the data for those sectors of the economy that are most important for the study.

An important characteristic of GRIT-produced tables relates to their accuracy. In the past, survey-based tables involved gathering data for every cell in the table, thereby building up a table with considerable accuracy. A fundamental principle of the GRIT method is that not all cells in the table are equally important. Some are not important because they are of very small value and, therefore, have no possibility of having a significant effect on the estimates of multipliers and economic impacts. Others are not important because of the lack of linkages that relate to the particular sectors that are being studied. Therefore, the GRIT procedure involves determining those sectors and, in some cases, cells that are of particular significance for the analysis. These represent the main targets for the allocation of research resources in data gathering. For the remainder of the table, the aim is for it to be 'holistically' accurate (Jensen, 1980). This means a generally accurate representation of the economy is provided by the table, but does not guarantee the accuracy of any particular cell. A summary of the steps involved in the GRIT process is shown in Table A4-1 (Powell and Chalmers, 1995).

**Table A4-1
The GRIT Method**

Phase	Step	Action
PHASE I	1	ADJUSTMENTS TO NATIONAL TABLE Selection of national input-output table (106-sector table with direct allocation of all imports, in basic values).
	2	Adjustment of national table for updating.
	3	Adjustment for international trade.
PHASE II		ADJUSTMENTS FOR REGIONAL IMPORTS (Steps 4-14 apply to each region for which input-output tables are required)
	4	Calculation of 'non-existent' sectors.
	5	Calculation of remaining imports.
PHASE III		DEFINITION OF REGIONAL SECTORS
	6	Insertion of disaggregated superior data.
	7	Aggregation of sectors.
	8	Insertion of aggregated superior data.
PHASE IV		DERIVATION OF PROTOTYPE TRANSACTIONS TABLES
	9	Derivation of transactions values.
	10	Adjustments to complete the prototype tables.
	11	Derivation of inverses and multipliers for prototype tables.
PHASE V		DERIVATION OF FINAL TRANSACTIONS TABLES
	12	Final superior data insertions and other adjustments.
	13	Derivation of final transactions tables.
	14	Derivation of inverses and multipliers for final tables.

Source: Bayne and West (1988).

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