Drayton South Coal Project

Economic Assessment

Prepared for

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EXECUTIVE SUMMARY

This Economic Assessment relates to the preparation of each of the following types of analyses:

- A BCA of the Project;
- A regional impact analysis of the Project using input-output (IO) analysis for two regions:
  - The regional economy comprising the Singleton, Muswellbrook and Upper Hunter Local Government Areas (LGAs); and
  - The NSW economy.
- An assessment of fiscal impacts to Governments; and
- An assessment against economic heads of consideration in the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013* (the Mining SEPP).

BCA

A BCA of the Project indicated that it would have net production benefits to Australia of $330M. Provided the residual environmental, social and cultural impacts of the Project that accrue to Australia are considered to be valued at less than $330M, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

Environmental, social and cultural impacts of the Project have been minimised through Project design and mitigation, offset and compensation measures. The economic value of residual impacts are considered to be immaterial from an aggregated economic efficiency perspective. The main quantifiable environmental impacts of the Project that have not already been incorporated into the estimate of net production benefits via mitigation, offset and compensation costs, relate to greenhouse gas emissions, surface water impacts and groundwater impacts. These impacts to Australia are estimated at less than $1M, 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 $146M. Overall, the Project is estimated to have net social benefits to Australia of between $329M and $475M and hence is desirable and justified from an economic efficiency perspective.

While the main 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 $329M and $475M for the Project to be questionable from an Australian 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:

- The Commonwealth Government in the form of any Company tax payable ($93M present value) 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 ($233M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the regional area;
- Anglo American shareholders in the form of residual net production benefits (after company tax, royalties and voluntary contribution payments); and
- The local community in the form of any voluntary contributions to community infrastructure and services ($3M present value).

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 Anglo American.

Noise, air quality, visual 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 been considered and found not to be material from an aggregate economic welfare perspective. Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the costs of acquisition of Water Access Licences as an indicator of the opportunity cost of water. Where WALs are required to be purchased or are in Anglo American ownership, the previous owner of the WALs has been compensated through acquisition. Greenhouse gas costs will occur at the national and global level and will be uncompensated. The economic costs associated with the clearing of native vegetation will occur at the State and potentially national level to households who value the conservation of biodiversity. These impacts would be counterbalanced by the Project biodiversity offsets which households at the State and potentially national level may also value. Aboriginal heritage impacts will potentially occur to Aboriginal people and NSW or Australian households who value conservation of Aboriginal heritage. These economic costs would be counterbalanced to some extent by the Project Aboriginal Cultural Heritage Management Plan and mitigation strategies however there maybe some residual economic costs. Other potential environmental impacts would largely occur at the local level and were found not to be material from an aggregate economic welfare perspective. Any non-market benefits associated with employment provided by the Project would largely accrue at the local or State level[1].

The costs and benefits of the Project have been considered at the regional and State level and in both cases the economic benefits of the Project have been found to outweigh the economic costs.

Economic Activity Analysis

Economic activity analysis, using IO analysis, estimated that the Project would make up to the following direct and indirect average annual contribution to the regional economy[2] for approximately 15 years:

- $559M in annual direct and indirect regional output or business turnover;
- $220M in annual direct and indirect regional value added;
- $71M in annual direct and indirect household income; and
- 984 direct and indirect jobs.

The Project is estimated to make up to the following direct and indirect average annual contribution to the NSW economy for 15 years:

- $906M in annual direct and indirect regional output or business turnover;
- $393M in annual direct and indirect regional value added;
- $188M in annual direct and indirect household income; and
- 2,085 direct and indirect jobs.

While the Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.2% and 1.2% of the regional economic activity impacts of the Project. The Project mine plan is defined by ridgelines nominated in the 'Drayton South Coal Project

[1] It should be noted that the study from which the employment values were transferred, surveyed NSW households only.
[2] Comprising the Local Government Areas of Muswellbrook, Singleton and Upper Hunter Shire.

Planning Assessment Commission (PAC) Review Report (PAC 2013) and will remain behind the ridgelines nominated by the PAC. Significantly, this at least doubles the buffer setback distance from the Coolmore and Woodlands thoroughbred horse studs and is at least 2 km from the horse stud operational areas.

As such the Project as proposed by Anglo American addresses the stated reasons the PAC refused the previous application. It will:

- Provide a sufficient buffer to protect the horse studs from the impacts of mining;
- Address any potential equine health and horse response to mining operations issues; and
- Have no impact on the viability of operations at Coolmore or Woodlands and no reasonable reason for either horse stud to consider leaving the Hunter region.

The technical studies in the EIS support this and found that the Project will have no adverse impact on equine health or the viability of Coolmore or Woodlands Studs.

Fiscal Benefits of Project to Government

The main fiscal benefit of the Project to Governments is:

- $93M (present value) to the Commonwealth Government in company tax;
- $133M (present value) to the Commonwealth Government in personal income tax from Project employees;
- $233M (present value) in royalties to the NSW Government.

The Project is the continuation of an existing mining operation and hence no additional demand for NSW or local community infrastructure is expected.

Significance of the Resource

With regard to the Mining SEPP heads of consideration:

- the resource proposed to be mined is part of an estimated in-situ coal resource of 556 million tonnes of coal which will produce high-grade export quality thermal coal.
- the Project is an extension and continuation of the existing Drayton Mine and as such the Project can utilise infrastructure servicing the existing Drayton mine which will provide a significant cost saving compared with having to build new infrastructure.
- numerous sectors in the regional economy have some dependence on the Project as 70% of the existing workforce live in the Hunter Region and hence a material component of their expenditure would flow-on to local businesses. Similarly, Anglo American has identified that it spends considerable operational expenditure with local firms.
- the Project will provide continued direct employment for 393 people and 107 contractors. It will also provide indirect employment in the regional economy from employee and Project expenditure.
- the capital investment associated with the Project is estimated at $132M.
- the Project will generate royalties of $423M in total or $233M present value.

1 INTRODUCTION

Gillespie Economics has been engaged by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Coal (Anglo American) to complete an Economic Assessment for the Drayton South Coal Project (the Project). The purpose of the Economic Assessment is to form part of an Environmental Impact Statement (EIS) being prepared by Hansen Bailey to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the continuation of the existing Drayton Mine by the development of an open cut mining operation and associated infrastructure within the Drayton South area.

This Economic Assessment has been carried out in accordance with:

- the Secretary's Environmental Assessment Requirements (SEARs) for the Project that relate to economics i.e.
    - a detailed assessment of the likely economic impacts of the development, paying particular attention to:
        - the significance of the resource;
        - the costs and benefits of the project, identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuations in commodity markets and exchange rates; and
    - the demand for the provision of local infrastructure and services.
- requirements under the *EP&A Act* and *Environmental Planning and Assessment Regulation 2000*;
- the following standards, guidelines and policies:
    - NSW Government (2012) Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals; and
    - NSW Treasury (2007) NSW Government Guidelines for Economic Appraisal.
- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013* (the Mining SEPP) which refers to some specific economic heads of consideration for the consent authority.

Benefit Cost Analysis (BCA), undertaken at a national level, is the primary way that economists evaluate the net benefits of projects and policies. In addition, regional impact analysis using input-output (IO) analysis or computable general equilibrium (CGE) analysis can provide information of interest to decision-makers, particularly regarding regional employment and other indicators of direct and indirect regional economic activity. Refer to Attachment 1 for an introduction to these economic methods and Attachment 2 for the legislative context for economic methods in Environmental Impact Assessment (EIA) in NSW. Costs and revenues to governments (fiscal analysis) may also be of interest to decision-makers.

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

- A BCA of the Project to assess the aggregate wealth effects (economic costs and benefits) of the Project (Section 4);
- A regional impact analysis (Section 5) using IO analysis to assess the economic activity of the Project for two regions:
    - The regional economy comprising the Singleton, Muswellbrook and Upper Hunter Local Government Areas (LGAs); and
    - The NSW economy.

- An fiscal assessment to examine the impact of the Project on Governments costs and revenues (Section 6); and
- An assessment of the impacts of the Project against the heads of consideration in the Mining SEPP (Section 7).

Economic analysis tools of BCA, IO/CGE analysis and fiscal analysis are not mechanised decision-making tools, but rather a means of analysis that provides useful information for decision-makers to consider alongside the performance of a project in meeting other, often conflicting, government goals and objectives. Each of the methods used to analyse the economic effects of the Project are discussed in Section 3. Prior to this, Section 2 outlines the scope of the Project, a summary of the impacts of the Project and the proposed mitigation measures, as assessed in the EIS. This is the information on which the Economic Assessment is based.

2 PROJECT DESCRIPTION

2.1 Project Scope

The Project will allow for the continuation of the existing Drayton Mine for an additional 15 years, by developing an open cut mining area within EL 5460. The Project will extract up to 6.4 Million tonnes per annum (Mtpa) of export quality thermal coal by utilising existing Drayton Mine assets and infrastructure.

The Project addresses the reasons provided by the NSW Planning Assessment Commission (PAC) for the refusal of the previous Drayton South application. The mine plan is behind the natural ridgelines referred to in the '*Drayton South Coal Project PAC Review Report*' (NSW PAC, 2013) for the previous application issued in December 2013. The Project will remain behind the ridgelines nominated by the PAC. Significantly, this at least doubles the buffer setback distance from the Coolmore and Woodlands thoroughbred horse studs and is at least 2 km from the primary operational areas on each property.

The Project generally includes:

- Continuation of operations at Drayton Mine as currently approved with minor additional mining within the existing East, North and South Mining Areas for a period of 15 years;
- Development of a new open cut mining area with EL 5460 mining up to 6.4 Mtpa Run-Of-Mine (ROM) coal;
- Ongoing employment of a workforce of up to 500 full time equivalent employees;
- Utilisation of the existing Drayton Mine equipment fleet;
- Storage of water, and emplacement of tailings and rejects generated by the Project in existing Drayton Mine voids;
- Utilisation of the existing Drayton Mine infrastructure including the CHPP, rail loop and associated infrastructure, workshops, bath houses and administration offices;
- Construction of a transport corridor to the new mining area;
- Continued utilisation of the Antiene Rail Spur off the Main Northern Railway Line to transport product coal to the Port of Newcastle for export;
- Realigning and upgrading a section of Edderton Road;
- Continuation of mutually beneficial arrangements with neighbours AGL Macquarie and Mt Arthur Coal Mine;
- Installation of further water management and power reticulation infrastructure to support the new mining areas; and
- Progressive rehabilitation of disturbed areas as mining operations are completed.

For the purpose of the Economic Assessment of the Project a production profile over time was assumed that ramps up in the early years of production and ramps down in the latter years, with average annual ROM coal production of 4.9 Mtpa[3]. The technical assessments of environmental, cultural and social impacts on which the Economic Assessment relies were based on maximum levels of ROM coal production of 6.4 Mtpa.

[3] For commercial-in-confidence reasons this production profile is not specified in this report.

2.2 Project Impacts

This Section summarises the biophysical impacts of the Project based on the technical assessments in the EIS. It provides the basis for the economic consideration of impacts in latter parts of this report.

Agricultural Production

The areas of agricultural land within the Project Area that is directly affected by the Project is identified in Table 2.1

Table 2.1- Impacted Agricultural Land in the Project Area

Agricultural Domain	Description	Project Area (ha)	Area (ha) directly Impacted by Project
A	Area associated with the creek flats of Saddlers Creek and lower slopes, dryland country suited to fodder cropping as part of a fodder cropping improved pasture rotation or grazed as unimproved pasture	109	19
B	Area associated with creeks flats and lower slopes suited to occasional fodder cropping or pasture improvement or grazed as unimproved pasture	411	298
C	Area associated with lower to mid slopes, require soil conservation works/minimum tillage techniques to establish improved pastures or grazed as unimproved pasture	1,219	838
D	Area associated with steeper slopes, not suited to any cultivation due to erosion risk, restricted to native pasture or aerial semi improved pasture improvement	430	286
Total		**2,169**	**1,441**

Source: Scott Barnett and Associates (2015)

The Project is located on land subject to the Upper Hunter Strategic Regional Land Use Plan (SRLUP). The proposed open cut coal mining is within a Project Boundary area that includes 78.8 ha of verified Biophysical Strategic Agricultural Land (BSAL) (SLR, 2015). This area of verified BSAL will be directly (via open cut mining and surface infrastructure) impacted by the Project.

In additional 2,079 ha of land will be impacted by Offsite Biodiversity Offsets. Refer to Table 2.2.

Table 2.2 - Offsite Biodiversity Offset Agricultural Domains

Agricultural Domain	Description	Area (ha)	Area (%)
X	Area associated with hill slopes and rock outcrops. Shows signs of semi-improved pasture. Suited only to pasture improvement (seeding and fertilising) by aerial means.	1,646	79.1
Y	Area associated with plateau style areas with improved pastures (such as *Pharalisspp*). Suited to pasture improvement with limited soil disturbance. Some rock outcrops occur.	333	16.0
Z	Area associated with timbered steeper drainage lines. Not suited to pasture improvement but offering stock shelter.	100	4.9
Total		**2,079**	**100.0**

Source: Scott Barnett and Associates (2015)

The Project mine plan is defined by ridgelines nominated in the 'Drayton South Coal Project PAC Review Report (PAC 2013) and will remain behind the ridgelines nominated by the PAC. Significantly, this at least doubles the buffer setback distance from the Coolmore and Woodlands thoroughbred horse studs and is at least 2 km from the horse stud operational areas.

As such the Project as proposed by Anglo American addresses the stated reasons the PAC refused the previous application. It will:

- Provide a sufficient buffer to protect the horse studs from the impacts of mining;
- Address any potential equine health and horse response to mining operations issues; and
- Have no impact on the viability of operations at Coolmore or Woodlands and no reasonable reason for either horse stud to consider leaving the Hunter region.

The technical studies in the EIS support this and found that there would be no adverse impacts on the Coolmore and Darley properties (Kannegieter 2015 and Scott Barnett & Associated 2015).

The project disturbance footprint will be rehabilitated to its pre mining land capability, although will be utilised for biodiversity offsets.

Operational Noise

The existing Drayton Mine contributes to the existing noise environment at nearby private rural residences. Noise levels associated with the construction phase of the Drayton South Project are expected to be acceptable at all potentially affected residences, being within the relevant noise impact criteria (Bridges Acoustics, 2015).

During Project operation, there are two residences predicted as being in the Project noise management zone (near the existing Drayton Mine), where marginal to moderate exceedances of applicable noise criteria are predicted. These properties are currently within a noise management zone for the existing Drayton Mine. No additional properties fall are significantly impacted and so fall within an acquisition zone for noise impacts as a result of the Project. Further, there will be no discernible increases above existing background limits on the nearby horse stud properties.

Key mitigation measures proposed for Project noise impacts include:

- Fitting mobile plant with leading practice exhaust silencers and sound attenuation devices;
- Training of dozer operators in techniques to minimise equipment noise; and
- Application of management and mitigation measures at moderately impacted residences, if required.

The existing Drayton Mine noise monitoring network will continue to be operated for the Project and reviewed on a regular basis to ensure it remains representative.

Blasting

The acoustic impact assessment concluded that blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences and structures (Bridges Acoustics, 2015).

Anglo American will update the existing Blast Management Plan for Drayton Mine to include the additional monitoring and management measures for the Project. These management and mitigation measures will include:

- Undertaking a blast monitoring program representative of the closest sensitive receptors to ensure compliance with the relevant blast criteria; and
- Designing blast events to meet relevant overpressure and ground vibration criteria.

Air Quality

The assessment of air quality impacts at nearby properties indicated that there are no properties that will be impacted by exceedances of air quality criteria (PEL, 2015).

Anglo American will update the existing Air Quality Management Plan for Drayton Mine to include the additional monitoring and management measures for the Project. These management and mitigation measures will include:

- Implementation of available measures, including operational responses, to keep visible dust as low as possible from offsite at all times;
- Minimising the area of topsoil clearing ahead of mining activities;
- Use of water tankers, road sweepers to minimise dust emissions from roads and work areas;
- Out-of-pit haul roads to be maintained with chemical dust suppressant;
- Designing blasts to minimise dust emissions;
- Progressively rehabilitating mined areas as soon as practical; and
- Maintaining a real time network to monitor air quality emissions.

Greenhouse Gases

The Project is predicted to generate in the order of 4.6 Mt of direct carbon dioxide equivalent (CO_2-e) emissions associated with mining (Scope 1 emissions) over the lifetime of the Project. Approximately 1.2 Mt of indirect (Scope 2) CO_2-e emissions associated with on-site electricity consumption and 0.4 Mt of indirect (Scope 3) CO_2-e emissions associated with the transport of product coal to Newcastle and on-site diesel and electricity use would also be generated over the lifetime of the Project. In addition there would be 127 Mt of indirect (Scope 3) emissions associated with the use of thermal coal (PEL, 2015)

The Project would result in the loss of carbon sequestration benefits from the clearing of vegetation (approximately 1,441 hectares [ha]) and a gain in carbon sequestration from biodiversity offsets (Cumberland Ecology 2015a).

A number of measures to minimise greenhouse gas (GHG) emissions that are in place for the existing operations of Drayton Mine will continue to be implemented for the Project, including:

- Monitoring of greenhouse gas emissions and energy use and review on a monthly basis. Monitoring results are considered in the internal business planning;
- Energy efficiency and greenhouse gas emission targets being set across all aspects of the operation; and
- Installing electricity meters for key equipment and processes.

The effectiveness of these measures to reduce GHG emissions (and energy consumption) will be monitored, as Anglo American annually estimates GHG emissions and energy consumption in accordance with National Greenhouse and Energy Reporting and Energy Efficiency Operations requirements (PEL, 2015).

Surface Water

During mining, the Project would result in an average take of 114 ML/yr from the Hunter Unregulated and Alluvial Water Source. This water would otherwise make its way into the Hunter River (or associated catchments). Post mining, a water take of 185 ML/yr is estimated to be captured by the final landform. Some groundwater flows to the Hunter Unregulated and Alluvial Water Source would also be impacted by the Project (see below). The percentage of the total share component required by the Project (direct take and groundwater drawdown) for the Saddlers Creek alluvium will range

between 0.38% and 1%, while the total share component required by the Project for the Hunter River alluvium will range between zero and 0.08%.

In addition, Anglo American currently holds two general security Water Access Licenses (WAL1066 and WAL491) totalling 198 units (ML/yr) of volumetric licence water allocation from the Hunter River that will be used to supply the raw water demand if water captured onsite and water from the Drayton Mine were insufficient. The results of the water balance modelling indicate that there is a reasonable probability that these WAL's will not be required to meet the operational demands of the Project.

However, should dry conditions prevail at any time over the Project life, there is at least a 90% chance each year that the existing WAL's will be sufficient for the Project. It also shows that the allocation will not be needed for at least the first 6 years of the operation until the existing inventory (assuming they are not replenished by rainfall) are depleted.

Should very dry conditions (1%ile probability) prevail at any time during the life of the Project, Anglo American proposes to negotiate water sharing arrangements with their neighbours such as AGL Macquarie or Mount Arthur Coal to supply the mine site demand. Alternatively a WAL or a temporary transfer will be acquired on the open market.

Groundwater

Groundwater drawdown as a result of the Project is predicted to be restricted to the immediate vicinity surrounding the proposed mining areas and is not predicted to extend into the Hunter River alluvial aquifer. However, the Project zone of influence is predicted to extend into the Saddlers Creek alluvium, resulting in a reduction in baseflow of up to 130 ML/year, post-mining. Ultimately, this will progressively reduce baseflow in the Hunter River by up to 10 ML/year. However, as identified above in the surface water section the percentage of the total share component required by the Project (direct take and groundwater drawdown) for the Saddlers Creek alluvium will range between 0.38% and 1%, while the total share component required by the Project for the Hunter River alluvium will range between zero and 0.08%.

No private registered bores are located within the predicted zone of influence for the Project.

Water Discharges

No discharge of water from site is proposed for the Project. All water captured on site will continue to be retained in the existing Drayton Mine voids which will continue to be used for the Project, or stored in the existing mine water management system, which will be upgraded to include additional storages required in the Drayton South Area.

Ecology

The additional surface disturbance associated with the Project would involve the clearance of approximately 1,441 ha of vegetation comprising remnant and regenerating forest and woodland and extensive areas of open grassland with scattered trees. This clearing includes 22 ha of NSW and Commonwealth listed Box-Gum Woodland and 248 ha of other NSW listed threatened ecological communities (Cumberland Ecology, 2015a).

A range of measures to avoid, mitigate and offset impacts on biodiversity are proposed including:

- Minimising the extent of vegetation cleared for the Project any one time as far as practical;
- Progressively rehabilitating disturbed areas as mining progresses;
- Conservation of available onsite areas of remnant vegetation;
- The restoration of a significant section of Saddlers Creek, in conjunction with the Hunter Local Lands Service;

- Rehabilitation of all disturbed onsite areas to woodland communities; and
- Acquisition of an offsite property containing suitable remnant open forest and woodland habitats. This property will be secured permanently for conservation and managed under a site-specific management plan to improve and maintain the conservation values of the land (Cumberland Ecology, 2015b).

Road Transport

The Traffic and Transport Assessment found no capacity issues in the surrounding road network as a result of the Project and hence no material economic impacts for inclusion in the BCA (DC Traffic Engineering, 2012).

However, there is an identified need for Edderton Road to be realigned as a result of the Project and other mining activity in the region. The Golden Highway/ Edderton Road intersection will be relocated 5 km to the west of its current location.

Aboriginal Heritage

The Project has the potential to impact Aboriginal heritage sites in Project land disturbance areas. The Aboriginal archaeology assessment identified 156 sites that will be directly impacted by the Project, including three of high significance, 16 of moderate significance and 137 of low significance (AECOM, 2015).

The Drayton Mine Aboriginal Cultural Heritage Management Plan will be revised for the Project to include management and mitigation strategies for the sites that were identified to be impacted. This document will guide the management of Aboriginal cultural heritage within the Project Boundary and will contain the following key components:

- Detailed salvage methodologies to be carried out prior to commencement of the Project;
- Protection and conservation of archaeological sites that are not predicted to be impacted by the Project by fencing, signage, etc; and
- Identification of the storage location (keeping place) and procedure for the care of salvaged artefacts.

Non-Aboriginal Heritage

Two items of non-Aboriginal heritage (a Fence line and a Nissan Hut and Stockyard) were identified within the Project disturbance boundary and will be directly impacted by the Project. Both of these items were identified as being of low significance at a local level.

In addition, two other heritage sites of local significance (Edderton Homestead and Bowfield Homestead) that are located on other mine-owned land in the region will be indirectly impacted by visual impacts as a result of the Project (AECOM, 2015b).

Mitigation measures proposed for the Project will be detailed in a Historic Heritage Management Plan and will include:

- Photographic archival recording of both items to be directly impacted prior to disturbance by the Project;
- Implementation of blast designs and management measures to ensure that Project blasts will not impact on Non-Aboriginal heritage items; and
- Implementation of ‘at-site’ visual mitigation measures such as tree screening to minimise impacts of views to the Project from significant Non-Aboriginal heritage sites (AECOM, 2015b).

Visual Impacts

The Visual Assessment predicted that the visual impact of the Project will be low as the screening effect provided by a number of topographic features and existing vegetation assist in limiting the visibility of Project operations from surrounding viewing locations. This includes ensuring that there will be no direct views of the Project from the primary operational areas of the nearby horse studs (JVP, 2015).

Numerous mitigation measures have been incorporated into the design and operating plans for the Project to minimise visual impacts. These include:

- Ensuring that that the PAC (2013) recommended ridgeline was maintained and that the Project mine plan remains shielded behind this ridgeline from sensitive receptors to the south, including Coolmore and Woodlands horse studs and Hollydene Estate;
- Planting tree screens along the Golden Highway, along the ridgelines and the Edderton Road realignment to minimise views of the Project from various vantage points;
- Progressive rehabilitation of OEAs and disturbed areas;
- Use of compatible tones for building and cladding colours;
- Use of low lux lamps and direction of fixed lights toward the ground, where practical; and
- Implementation of work procedures related to the use of mobile lighting plants to avoid potential for adverse off site lighting impacts.

2.3 Other Mitigation Measures

Anglo American proposes to work in partnership with Muswellbrook Shire Council (MSC) and the local community so that the benefits of the projected economic growth in the region are maximised and impacts minimised, as far as possible. In this respect, a range of general and specific economic impact mitigation and management measures are proposed and would include:

Potential Environmental, Cultural and Social Impacts

- A range of measures to mitigate, offset and compensate for potential environmental, cultural and social impacts of the Project. A full outline of these is provided in Section 8 of the EIS. These measures also include the development of a Voluntary Planning Agreement (VPA) - refer to the EIS Social Impact Assessment (Appendix I of the EIS).

Potential Workforce Impacts

- Provision of ongoing employment for the existing workforce which would be made redundant if the Project is not approved as Drayton Mine would be have to close;
- Employment of regional residents preferentially where they have the required skills and experience and demonstrate a cultural fit with the organisation, to manage regional housing demands and support the local community;
- Working with recruitment, education and training providers in the region to encourage the provision of future employment and training opportunities for skills that would be directly and indirectly generated by mining projects; and
- Participating, as appropriate, in business group meetings, events or programs in the regional community.

Potential Business Impacts

- Purchasing local non-labour inputs to production preferentially where local producers can be cost and quality competitive, to support local industries.

3 ECONOMIC ASSESSMENT METHODS

3.1 Introduction

The economic methods used to assess the Project and its impacts (as specified in Section 2) are outlined below.

3.2 Benefit Cost Analysis

3.2.1 Background

Economic assessment is primarily concerned with identifying changes in aggregate wealth, from a national perspective, associated with alternative resource use patterns. BCA is the standard technique applied to estimate these wealth changes.

BCA has its theoretical underpinnings in neoclassical welfare economics. BCA applications in NSW are guided by these theoretical foundations as well as the NSW Treasury (2007). BCA applications within the NSW EIA framework are further guided by 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 benefits and costs 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.

3.2.2 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 (from mining activities) and benefits to foreign owners from production.

At the national and global level the focus of BCA is on primary costs and benefits i.e. first round impacts. Secondary net benefits that accrue to firms that sell to or buy from the mining project are ignored. This is because in a competitive market, all resources are assumed to be fully employed, and so increases in the production of goods and services required as inputs to the mining project will withdraw labour and raw materials from other industries. The additional net benefits (surpluses) to suppliers to the Project will be offset by decreases in net benefits in other industries and so there is no net secondary benefit to the economy as a whole.

BCA undertaken at a sub-national perspective requires attribution of primary costs and benefits to different geographic scales and results in a number of costs and benefits that accrue to people outside the region of analysis being excluded (Boardman *et al.* 2001). It may also result in additional costs and benefits, such as secondary net benefits, that are normally omitted from BCA, being included. This is because at a regional level, secondary net benefits that accrue to firms within a region may be offset by a reduction in economic activity outside the region of analysis. These secondary net benefits arise from an increase in economic activity in the region and increases in economic activity in a region can be estimated using techniques such as input-output analysis. However, adjustments to indicators of regional economic activity are required to provide an estimate of secondary net benefits in a region. BCA at the sub-national level therefore requires careful consideration of the distribution of the primary costs and benefits and inclusion of secondary net benefits.

BCAs of mining projects are 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 primary and secondary 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.

3.2.3 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 (NSW Treasury, 2007).

3.2.4 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 financial[4] value of the resource 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.

3.2.5 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 EIA process results in detailed (non-

[4] In limited cases the financial value may not reflect the economic value and therefore it is necessary to determine a shadow price for the resource.

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.

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 valued (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). NSW Government (2012) suggests that values that are less than 5% of the quantified net present value of a project are unlikely to be material. Where benefits and costs cannot be quantified these items should be included in the analysis in a qualitative manner (NSW Treasury, 2007).

3.2.6 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 or experiencing visual impacts, the costs of providing ecological offsets and the cost of purchasing groundwater and surface water entitlements in the water market etc. Including these costs in the capital and operating costs of a project effectively internalises the respective and otherwise, non-monetary environmental, social and cultural costs of a project. 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 analysis[5] 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.

3.2.7 Consideration of the distribution of costs and benefits

While BCA, undertaken at different scales, 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 intra and intergenerational equity are subjective and are therefore left to decision-makers.

Nevertheless, it should be noted that the costs and benefits in BCA are defined and valued 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. However, 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.

As identified by the Productivity Commission (2006), a policy option that provides the highest net benefit, as indicated by BCA, would also be consistent with the principles of ecologically sustainable development.

3.1.8 Consideration of other objectives of Government

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.

[5] 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.

The key steps in BCA are summarised in Box 1.

Box 1: Steps in BCA

- Identification of "without" scenario or base case;
- identification of the Project and its implications – the "with" scenario;
- identification of costs (capital expenditures, operating and maintenance costs, labour costs, opportunity costs, harmful effects on other parties and so forth) and benefits (value of outputs, avoided costs, productivity savings, health, social or environmental benefits and so forth);
- quantification of costs and benefits, including adjustment of private financial costs and benefits into economic values; that is, costs and benefits that reflect losses and benefits to the economy as a whole, rather than to individual persons or groups. For example, estimates of 'shadow' prices may be required when market prices do not reflect the true opportunity cost of using a resource;
- calculation of net present value; that is, total benefits less total costs occurring in each time period, discounted to present values;
- application of sensitivity analysis; that is, calculating the net present value using different assumptions about key determinants of costs and benefits;
- consideration of equity issues (identification of groups or communities which loses or gain from the project or program) and 'intangibles' (costs and benefits which cannot be assessed in monetary terms)".

Source**:** Adapted from RAC (1992), p. 36

Section 4 reports on the BCA of the Project at different geographic scales based on the financial, technical and environmental advice provided by Anglo American and its' specialist consultants.

3.3 Regional Impact Analysis

Regional impact analysis is concerned with changes in direct and indirect economic activity to a region, State, or country associated with changes in land and resource use. A range of methods can be used to examine the direct and indirect economic activity impacts of an expenditure on an economy including economic base theory, Keynesian multipliers, econometric models, mathematical programming models and IO 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 IO models with relaxation of some of the limitations of IO 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.

IO analysis assumes full employment with no capacity constraints, and thus prices have no role to play in the IO model (unlike general equilibrium modelling). Refer to Attachment 3 for a comparison of IO analysis and CGE 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 IO 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 IO analysis, which is the most common technique for estimating direct and indirect regional effects.

IO analysis essentially involves two steps:

- Construction of an appropriate IO 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 IO equations so that the IO multipliers and flow-on effects can then be estimated (West, 1993).

The IO method is based on a number of assumptions that are outlined in Attachment 4. Most notably IO analysis assumes that the regional economy has **access to** sufficient labour and capital resources (from both **inside** and **outside** the region) so that an individual project does not result in any regional price changes e.g. wages in other industries or house rentals, which would lead to contractions ("crowding out") of economic activity in other sectors in the region. Any "crowding" out is assumed to occur outside the region where the Project is concentrated and the regional impact analysis is focused. A dynamic CGE approach may overcome the limitation of IO analysis but is unlikely to be warranted at local or regional scale or with small scale impacts.

The consequence of the assumptions of IO analysis, is that IO modelling results provide an upper bound economic activity impact estimate.

IO analysis identifies the economic activity of a project on the economy in terms of four main indicators[6]:

- ***Gross regional output –*** the gross value of business turnover;
- ***Value-added*** – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output. These costs exclude income costs;
- ***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).

These indicators of economic activity are not equivalent to the economic measures of consumer and producer surplus that are relevant in the BCA framework.

Gross regional output is a measure of total revenue or turnover. All costs of production would need to be subtracted to make it approximate the measure of producer surplus. Value-added is an indicator of net value to producers, but unlike the producer surplus measure, it does not take account of all production costs – only non-labour costs are subtracted from revenue. Income or wages paid to employees is a cost to the producer in the BCA framework and is one of the costs subtracted from revenue or output to calculate the producer surplus or net benefit to producers. Employment is a non-financial indicator identifying the physical number of jobs associated with an activity.

Unlike BCA there are no decision rules to identify whether an increase or decrease in economic activity is desirable, although it is often implicitly assumed that more economic activity is good and less economic activity is bad. However, not all economic activity is desirable from a community welfare perspective since it may be associated with say environmental degradation, crime, etc.

While economic activity analysis examines the gross financial and employment activity to an economy that occurs as a result of a project, it can also be used to give an indication of the level of secondary net economic benefits at the regional level. While indicators of flow-on economic activity do not reflect estimates of producer surplus, if household income is subtracted from value-added this gives an

[6] It does not specifically identify direct and indirect tax effects.

indication of gross operating surplus[7] together with net indirect taxes and subsidies and a return to capital inputs. This provides some indication of the secondary net benefits to the region from the Project. However, it is an upper estimate because:

- IO analysis tends to provide an upper estimate of regional economic activity;
- gross operating surplus is gross of some relevant costs such as consumption of fixed capital and land rent payments;
- where businesses do not have excess capacity in their capital equipment some investment may be required to achieve the gross operating surplus[8].

Nevertheless, it provides some upper level estimate of secondary net economic benefits to the region.

As well as providing an indication of gross economic activity in a region and secondary net economic benefits to a region, economic activity analysis can have important links to social impact assessment since changes in income and employment levels can impact population levels and their ability to maintain community infrastructure (schools, hospitals, housing etc), broader community and cultural value systems and inter-relationships.

Section 5 reports on the results of IO analysis to assess the gross economic activity provided by the Project to the regional and State economy. The results of IO analysis are also used in Section 4 to provide an indication of the level of secondary net economic benefits when BCA is undertaken at the regional level.

3.4 Fiscal Impact Assessment

Fiscal impact assessment is concerned with the impacts of projects on government costs and revenues. Projects can generate taxes for different levels of government:

- company tax, personal income tax and goods and services tax for the Commonwealth Government;
- royalties and payroll tax for the State Government; and
- rates and Voluntary Planning Agreement payments at the local government level.

In many cases fiscal impacts represent a series of transfer payments that are not relevant from an economic efficiency (BCA) perspective.

A consideration of gross fiscal impacts is provided in Section 6. It is recognised that some "crowding out" of gross fiscal impacts to governments, particularly tax revenues may occur at the NSW and Australian level, which could only potentially be estimated using methods such as CGE modelling. However, the use of such models is unlikely to be warranted at local or regional scale or with small scale impacts.

[7] Which is the excess of gross output of enterprises over costs incurred in producing that output, but before deducting consumption of fixed capital, dividends, interest, royalties and land rent payments and direct taxes payable.

[8] Where businesses do have excess capacity the approach adopted here may actually understate producer surplus, ceteris paribus, as additional surplus may be able to be generated with few additional operating costs.

4 ECONOMIC ANALYSIS OF THE PROJECT

4.1 Introduction

This Section reports on a BCA of the Project based on financial, technical and environmental advice provided by Anglo American and its' specialist consultants.

4.2 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, coal mining at the Drayton Mine would cease by the end of 2015, with associated rehabilitation and site decommissioning following this. The land required for the Project would continue to be used for agricultural purposes, predominantly beef cattle grazing, with associated remnant vegetation.

In contrast, the Project is as described in Section 2 with mining up to 73.5 Mt of ROM coal over a period of up to 15 years.

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 development of the Project were considered by Anglo American. Section 4 in 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 Anglo American to be the most feasible alternative required for addressing the requirements of the PAC, minimising environmental, cultural and social impacts whilst maximising resource recovery, operational efficiency and ensuring ongoing employment for the existing workforce. It is therefore this option that is proposed by Anglo American and was subject to detailed economic analysis.

4.3 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 4.1. 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 4.1 – Potential 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 biodiversity offsets[1] Operating costs of mine including labour and mitigation, offsetting and compensation measures Rehabilitation and decommissioning costs at end of the Project life	Avoided decommissioning and rehabilitation costs at the end of 2015 Value of coal Residual value of capital equipment and land at end of Project life
Potential environmental, social and cultural impacts of mining, processing and transport to port after mitigation, offsetting and compensation	Agricultural production including equine impacts Noise impacts Blasting impacts Air quality impacts Greenhouse gas impacts Surface water impacts Groundwater impacts Ecological impacts Road/rail transport impacts Aboriginal heritage impacts Non-Aboriginal heritage impacts Visual impacts	Any non-market benefits of employment

[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 4.1 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, compensated or offset to the extent where community wellbeing is insignificantly affected (i.e. costs are borne by the proponent), then no environmental, social or cultural economic costs should be included in the Project BCA apart from the mitigation, compensation or offsetting costs.

4.4 Quantification/valuation of benefits and costs

Consistent with NSW Government (2012) and NSW Treasury (2007), the analysis was undertaken in real values with discounting at 7 percent (%) and sensitivity testing at 4%, 7% and 10%.

The analysis period is 17 years, coinciding with the Project life and including one year pre and post operation. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural and social impacts have initially been left unquantified and interpreted using the threshold value method.

An attempt has also been made to estimate environmental, cultural and social impacts using market data and benefit transfer[9]. However, even with the inclusion of these values, the estimated net social benefits of the Project provide a threshold value that any residual or non-quantified economic costs would need to exceed to make the Project questionable from an economic efficiency perspective.

4.4.1 Production costs and benefits[10]

Production Costs

Opportunity Cost of Land and Capital

Currently all of the land required for the Project is owned by Anglo American (with the exception of a parcel of land required for the proposed relocation of Edderton Road). There is an opportunity cost associated with using this land for the Project instead of its next best use e.g. rural production. An indication of the opportunity cost of the land can be gained from its market value, estimated at $14M. This opportunity cost is assumed to occur in 2015.

The Project will also use a range of capital equipment and infrastructure from the Drayton Mine. There is an opportunity cost associated with using this equipment and infrastructure for the Project instead of using it in its next best use. An indication of the opportunity cost of the capital equipment and infrastructure can be gained from its market value, estimated at $54M. This opportunity cost is assumed to occur in 2015.

Development Cost of the Project

The incremental capital costs over the life of the mine (including contingencies) are estimated at $131M (refer to Table 4.2). Capital costs of the Project are associated with a range of plant and infrastructure development and include an allowance for acquisition of land for the Edderton Road relocation. These capital costs include labour costs during the development of the Project, which reflect the value of labour resources in their next best use. Capital costs are included in the economic analysis in the years of the Project in which they are expected to occur.

Table 4.2 – Summary of Capital Expenditure for the Project

Capital Expenditure	$M
Boxcut	3
Dragline	34
Power Supply	7
Sound Attenuation Equipment	8
CHPP	16
Water Supply	6
Site Communications	1
AGL Macquarie Conveyor Cutting/Connection	1
Plant Control systems/IM	0
On Site Civils (Inc. Haul Road)	22
Fuel and Lubrication Systems	1
Construction Facilities	1
Edderton Road Relocation	12
Land Acquisitions	2
Project Services	0
Contingency (15%)	17
Total	**131**

[9] Benefit transfer refers to borrowing economic values that have been determined for other study sites.
[10] All values reported in this section are undiscounted Australian dollars unless otherwise specified.

Annual Operating Costs of the Project

The operating costs of the Project include those associated with mining (including environmental management), CHPP operation, rail freight, Port handling and loading and general costs (including overheads and administration). These costs include labour costs, which reflect the value of labour resources in their next best use. Average operating costs (excluding depreciation and royalties) are estimated at approximately $286M per annum over the 15 year life of the Project.

While royalties are a cost to Anglo American, 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 $423M ($233M present value at 7% discount rate).

Depreciation has 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.

Rehabilitation and Decommissioning Costs

At the end of the Project life, the mine site will begin to be decommissioned and rehabilitated at an estimated cost of $66M.

Production Benefits

Avoided Rehabilitation and Decommissioning Costs

Under the base case, or "without" Project scenario, decommissioning and rehabilitation costs of approximately $66M would be incurred at the end of 2015. With the Project, these costs will occur in 2031. The avoided costs in 2015 are a benefit of the Project.

Value of Coal

The main economic benefit of the Project is the market value of the coal that is produced.

Total ROM coal and product coal production is estimated at 73.5 Mt and 53 Mt, respectively, with annual production of up to 6.4 Mtpa ROM coal. All of the product coal is expected to have low ash content and will be exported.

Market value of the coal is determined by future predicted coal prices (normally expressed in United States Dollars) and exchange rates during the life of the Project. Historic or current coal prices and exchange rates are not relevant. Projected prices for the Project product thermal coal were provided by Anglo American and are based on the average of the December 2014 Consensus Pricing from 21 financial institutions[11] (UBS, 2014). The assumed price is USD$72/t in 2016, USD$82/t in 2017 and AUD$87/t thereafter. An AUD/USD exchange rate of 0.85 is assumed (UBS, 2014). There is uncertainty around future coal prices and the exchange rate and hence assumed Australian dollar coal prices have been subjected to sensitivity testing (see Section 4.6).

[11] Barclays, BMO Capital, BoA Merrill Lynch, Canaccord, CIBC, CIMB, Citi, Credit Suisse, Deutsche Bank, Dundee, Haywood Securities, HSBC, Investec, Macquarie, Morgan Stanley, RBC, Renaissance Capital, Salman Partmers, Societe Generale, UBS, VTB Capital.

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 primary objective of the rehabilitation strategy is to rehabilitate impacted land to native woodland communities. The remaining land at Drayton South held by Anglo American for the Project will be retained for agricultural landuse.

Conservatively, it is assumed that capital equipment and land has zero residual value. This will understate the benefits of the Project.

4.4.2 Environmental, social and cultural costs and benefits

The environmental, social and cultural impacts of the Project, as assessed in the EIS, are summarised in Section 2. This Section considers these impacts from an economic perspective. Attachment 5 summarises the treatment of the environmental, social and cultural impacts of the Project in the BCA.

Agricultural Production

The Project is will directly impact 2,169 ha of agricultural land, including 78.8 ha of BSAL. In addition 2,079 ha of land will be impacted by Offsite Biodiversity Offsets.

In economics, the significance of these impacts is determined by their opportunity cost which is the foregone net returns from the next best alternative use e.g. agriculture. In a competitive market, the gross economic value of agricultural production is reflected in the prices received for the goods that are produced and the economic costs of production are reflected in the costs of inputs.

In a properly functioning land market, the present value of the potential net financial benefits of future potential agricultural production, including on BSAL, is reflected in land prices.

Unless there is a demonstrated failure in agricultural markets to adequately reflect the scarcity of agricultural products or a failure in land markets to adequately reflect the scarcity of agricultural land, then the market price of land reflects the opportunity cost of using that land for alternative uses.

In this analysis, the opportunity costs of foregone agricultural production, as a result of the Project, has been incorporated in the BCA through inclusion of the full value of land required for the Project (both the opportunity cost of land already in Anglo American ownership and land required to be purchased for the Edderton Road realignment). Conservatively, it is assumed that no agricultural production occurs on this land for the life of the Project, even though it is recognised that Anglo American will continue to manage agricultural activities on land that is not required for Project mining or mining-related purposes.

As discussed in Section 2.1 the Project mine plan is defined by ridgelines nominated in the ‘Drayton South Coal Project PAC Review Report (PAC 2013) and will remain behind the ridgelines nominated by the PAC. This at least doubles the buffer setback distance from the Coolmore and Woodlands thoroughbred horse studs and is at least 2 km from the horse stud operational areas.

As such the Project as proposed by Anglo American addresses the stated reasons the PAC refused the previous application. It will:

- Provide a sufficient buffer to protect the horse studs from the impacts of mining;
- Address any potential equine health and horse response to mining operations issues; and
- Have no impact on the viability of operations at Coolmore or Woodlands and no reasonable reason for either horse stud to consider leaving the Hunter region.

The technical studies in the EIS support this and found that the Project will have no adverse impact on equine health or the viability of Coolmore or Woodlands Studs. In the absence of measurable impacts on equine health or the operations of the Coolmore and Darley properties, no economic impacts are included in the BCA.

Operational Noise

The impact of the 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, or the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

Noise levels associated with the construction phase of the Drayton South Project are expected to be acceptable at all potentially affected residences and hence no economic costs are included in the BCA.

The two residences predicted as being in the Project noise management zone, where marginal to moderate exceedances of applicable noise criteria are predicted, are currently within a noise management zone for the existing Drayton Mine. As such, there will be a continuation of the requirements to apply management and mitigation measures at these properties for the Project. The costs of management and mitigation measures for these properties are included in the capital costs of the Project. While these mitigation costs are commercial-in-confidence, some indication of the order of magnitude of costs can be gained by applying a notional amount of say $50,000 to the two properties moderately impacted. Assuming these works occur in 2016 (the first year of production) the present value of these measures would be in the order of $0.1M. To the extent that these measures mitigate noise, then affected properties are no worse off than they were before and no material externality costs arise that warrant inclusion in a BCA. It is recognised that to the extent that any residual noise impacts occur, after mitigation, the noise costs of the Project included in the BCA will be understated.

There will be no discernible noise increases above existing background noise limits on the nearby horse stud properties and hence no noise impacts on these properties are included in the BCA.

Blasting

Blasting at the Project has the potential to cause structural damage or human discomfort at properties surrounding the Project. These impacts can potentially be valued using the property valuation method, defensive behaviour method or damage cost method. However, acoustic impact assessment concluded that blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences and structures. Consequently, no economic costs have been included in the BCA for blasting impacts.

Air Quality

The air quality assessment indicated that no properties will be impacted by exceedances of air quality criteria as a result of the Project. These criteria are set at levels to protect against health effects and nuisance dust effects (Department of Environment and Conservation 2005). Consequently, it is assumed that there are no material economic costs for inclusion in the BCA.

It is recognised that for many pollutants, such as PM_{10}, while a threshold (as reflected in the Department of Environment and Conservation 2005 guide) exists at the individual level[12] there is may be no threshold at the population level. That is, even at low background concentrations, some

[12] Most people are not at risk of severe acute health effects at current background levels.

vulnerable people are exposed to concentrations that adversely affect health (Department of Environment and Conservation 2005b). Hence any increase in emissions will have some health effects. Following this approach some studies have used benefit transfer to imply a per unit health cost associated with any increase in emissions.

However, Merritt, Cretikos, Smith, and Durrheim (2013) in an analysis of general practice data for rural communities in close proximity to coal mining and coal-fired power generation in the Hunter Valley region of NSW found that there is no significantly higher rates of problems managed or medications prescribed for Hunter region residents compared with the rest of rural NSW. It is therefore unlikely that a single mining project that meets government air quality criteria at nearby properties will have any material health impacts.

Greenhouse Gases

GHG emissions of relevance to the scope of the Project BCA are those attributable to the Project i.e. the mining and transport of coal to Port. For this analysis the BCA has included 4.6 Mt of direct carbon dioxide equivalent (CO_2-e) emissions associated with mining (Scope 1 emissions), 1.2 Mt of indirect (Scope 2) CO_2-e emissions associated with on-site electricity consumption and 0.4 Mt of indirect (Scope 3) CO_2-e emissions associated with the transport of product coal to Newcastle and on-site diesel and electricity use that would be generated over the lifetime of the Project. It is assumed that the loss of carbon sequestration benefits from the clearing of vegetation (approximately 1,441 ha) would be offset by proposed onsite and offsite offsets.

To place an economic value on CO_2-e emissions, a shadow price of CO_2-e is required that reflects its global social costs. The global social cost of CO_2-e is the present value of additional economic damages now and in the future caused by an additional tonne of CO_2-e emissions. There is great uncertainty around the global social cost of CO_2-e with a wide range of estimated damage costs reported in the literature. An alternative method to placing a value on the global damage costs of CO_2-e is to examine the price of CO_2-e taxes, since an efficient tax should reflect the global social cost of CO_2-e. Again, however, there is a wide range of prices. For this analysis, a shadow price of AUD$23/t CO_2-e was used. Sensitivity testing assuming a shadow price from AUD$8/t CO_2-e to AUD$40/t CO_2-e was also undertaken (refer to Section 3.6)[13].

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 GDP (around 1%). An alternative approach would be Australia's share of world population which is considerably less than 1%.

Surface Water

Surface water is a potential input into numerous alternative production processes and so its use for mining has an opportunity cost, i.e. its value in the next best alternative use. In NSW the government has established a market framework to facilitate the allocation of water surface water. Water access and use is only permissible with possession of a WAL (except in the case of harvestable rights, native title rights and some stock and domestic rights). Water Sharing Plans that are prepared under the Water Management Act set the rules by which water is shared between all users, including the environment, in each water management area in NSW. These plans also set rules for water trading, that is, the buying and selling of water licences and also annual water allocations (Montoya 2010).

[13] It is noted that an alternative approach to valuation is based on the 'replacement cost' approach (Department of Industry (2014).

Consequently, the market value for surface water can be considered to give a reasonable indication of its economic value in alternative uses such as agriculture, i.e. its opportunity cost

The opportunity cost of 185 ML/year in perpetuity of diverted run-off and 198 ML/year of volumetric WAL have been included in the BCA by applying an assumed market value of water of $2,000/ML. This is a use value of the water. Given that the WAL water would otherwise be allocated to other uses e.g. agriculture, there are no incremental non-use impacts e.g. aquatic ecology impacts, of using this water for mining instead of alternative uses such as agriculture. However, some non-use impacts may arise in relation to unregulated water take since it would otherwise go to environmental flows. As identified in Section 2, the total share component required by the Project (direct take and groundwater drawdown) for the Saddlers Creek alluvium will range between 0.38% and 1%, while the total share component required by the Project for the Hunter River alluvium will range between zero and 0.08%. No material non-use impacts are therefore likely to arise with respect to unregulated water take.

With regard to WAL, the opportunity cost of holding these entitlements could potentially be defrayed in most years with the unneeded allocations being sold on the temporary water market. Conversely, there may be dry times when additional WALs are required. For simplicity it is assumed that these impacts net out, however they are not likely to be material to the BCA.

Groundwater

Groundwater impacts that result in a reduction in baseflow of rivers potentially have an opportunity cost, as the river baseflow could potentially be used for other purposes. An indication of this opportunity costs has been included in the BCA by applying an assumed market value of water of $2,000/ML to the maximum predicted level of reduction in baseflow, for perpetuity. Some non-use impacts may arise in relation to unregulated groundwater impacts since it would otherwise go to environmental flows. However, as identified above the total share component required by the Project (direct take and groundwater drawdown) for the Saddlers Creek alluvium will range between 0.38% and 1%, while the total share component required by the Project for the Hunter River alluvium will range between zero and 0.08%. No material non-use impacts are therefore likely to arise with respect to unregulated groundwater drawdown.

No private registered bores are located within the predicted zone of influence for the Project and hence no additional economic costs are included in the BCA.

Water Discharges

No discharge of water from site is proposed for the Project and hence no economic costs are included in the BCA apart the costs associated with upgrading the existing mine water management system, to include additional storages required in the Drayton South Area. These costs are included in the capital costs of the Project.

Ecology

The impacted vegetation, and associated 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. However, it is government policy that biodiversity offsets are provided that improve or at least maintain biodiversity values. 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 apart from the capital and operating costs of providing the offsets. These costs are included in the opportunity cost of land and operating costs of the Project.

Road Transport

While the Traffic and Transport Assessment found no capacity issues in the surrounding road network as a result of the Project, and hence no material economic impacts for inclusion in the BCA, there is an identified need for Edderton Road to be realigned as a result of the Project and other mining activity in the region. The apportioned cost of this realignment for the Project has been included in the capital costs of the Project.

The Golden Highway/ Edderton Road intersection will be relocated 5 km to the west of its current location. Whilst this would increase travel distances by approximately 5 km (four minutes travelling time) for traffic travelling from the east, it would shorten travel distances by a similar amount for traffic from the west. As such, the net impact on travel times would be balanced to some degree and hence it is considered that no material impacts arise that warrant inclusion in the BCA.

Aboriginal Heritage

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 preparation of the Aboriginal Cultural Heritage Management Plan.

Impacts on Aboriginal heritage sites have been shown in some instances to reduce the well-being of the broader community (Gillespie Economic 2009a, 2009b, 2010) while in other instances the impact on the community's well-being has been mixed (Windle and Rolfe 2003).

For the purpose of this analysis, the impacts on Aboriginal heritage remains unquantified.

Non-Aboriginal Heritage

Two items of non-Aboriginal heritage that identified within the Project disturbance boundary and will be directly impacted by the Project were identified as being of low significance at a local level and therefore no material economic effects would arise for inclusion in the BCA.

In addition, two other heritage sites of local significance that are located on other mine-owned land in the region will only be indirectly impacted by visual impacts as a result of the Project. The incremental impacts of the Project on these heritage sites are not considered to be material from an aggregate economic welfare perspective.

Visual Impacts

The impact of the Project on visual amenity at 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, or the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

The Visual Assessment predicted that the visual impact of the Project will be low as the screening effect provided by a number of topographic features and existing vegetation assist in limiting the visibility of Project operations from surrounding viewing locations. This includes ensuring that there will be no direct views of the Project from the primary operational areas of the nearby horse studs. Consequently no material economic impacts arise for inclusion in the BCA.

For areas where visual effects may be experienced as a result of the Project, adverse impacts will be mitigated via planting of vegetation screens on-site, along visually exposed roads and at sensitive receptor locations. The location of infrastructure and site operations will also be managed to minimise any potential for indirect impacts associated with dust emissions, blast fume and night lighting.

The costs of these mitigation measures have been included in the capital costs of the Project.

Non-market Value of Employment

In standard BCA, the wages associated with employment are considered an economic cost of production with this cost included in the calculation of net production benefits (producer surplus). Where labour resources used in a project would otherwise be employed at a lower wage or would be unemployed a shadow price of labour is included in the estimation of producer surplus rather than the actual wage (Boardman et al. 2005). The shadow price of labour is lower than the actual wage and has the effect of increasing the magnitude of the producer surplus benefit of a project.

These treatments of employment in BCA relate to the market value or opportunity cost of labour resources. However, BCA also includes non-market values i.e. the values that individuals in a community hold for things even though they are not traded in markets. For example, people have been shown to value environmental resources even though they may never use the resource. These are referred to as existence values and are underpinned by the view in neoclassical welfare economics that individuals are the best judge of what has value to them. As identified by Portney (1994), the concept of existence values should be interpreted more broadly than just relating to environmental resources and may also apply to the employment of others. Refer to Attachment 6.

Empirical evidence for these values was found in three choice modelling studies of mining project in NSW. 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). These studies are considered appropriate for benefit transfer since they relate to coal mining in NSW with the population sampled being NSW households.

The Project will provide continued employment for the approximately 393 direct employees of Drayton Mine for a period of 15 years. Using benefit transfer from the more conservative Bulli Seam Operation study and applying the employment value to the estimated direct employment of the Project[14] gives an estimated $146M for the non-market employment benefits of the Project to NSW households.

In the context of a fully employed economy there may be some contention about the inclusion of this value. Consequently, the results are reported with and without these values.

4.5 Consolidation of value estimates

The present value of costs and benefits, using a 7% discount rate, is provided in Table 4.3. The top half of the Table identifies production costs and benefits of the Project, which includes capital and operating costs associated with the mitigation, offset and compensation of environmental, social and cultural impacts. The bottom of the Table summarises the residual environmental, social and cultural impacts of the Project after mitigation, offset and compensation. Specific mitigation, offset and compensation costs are commercial-in-confidence and hence not separated out from the capital and operating costs of the Project.

The Project is estimated to have total net production benefits of $464M. Assuming 100% foreign ownership, $330M of these net production benefits would accrue to Australia[15]. 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,

[14] This is consistent with the non-market valuation studies which focused on direct employees.
[15] This is the net production benefits of the Project minus net profit accruing to Anglo American.

compensation and offset, 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 Australian 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 Australia[16], would need to be valued by the community at greater than the estimate of the Australian net production benefits i.e. greater than $330M. This is equivalent to each household in Australia valuing the residual environmental, social and cultural impacts at $40. If only households located in NSW hold values for the residual environmental, social and cultural impacts of the Project then the threshold willingness to pay per household would be $124. The equivalent figure for the region is $16,410.

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to quantitatively consider the environmental, social and cultural impacts of the Project. From Table 4.3 it can be seen that most of the potential impacts are internalised into the capital and operating costs of the proponent via mitigation, offset or compensation, and hence are incorporated into the estimate of net production benefits. Other impacts to Australia are estimated at approximately $1M, considerably less than the estimated $330M net production benefits of the Project to Australia.

Overall, the Project is estimated to have net social benefits to Australia of between $329M and $475M (the latter incorporating the non-market benefits of employment), 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 $329M and $475M for the Project to be questionable from an Australian economic perspective.

[16] 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 4.3 - 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	$13	Avoided decommissioning and rehabilitation costs by end of 2015	$62
	Opportunity cost of capital	$50	Value of the coal	$2,999
	Development costs	$107	Residual value of capital	$0
	Operating costs ex royalties	$2,406	Residual value of land	$0
	Decommissioning and rehabilitation costs	$21		
	Sub-total	**$2,597**	***Sub-total***	**$3,061**
	Net Production Benefits			**$464 ($330)**
Environmental, social and cultural impacts	Greenhouse gas impacts	$6 ($0)	Non-market values of employment	$146
	Agricultural impacts	Included in opportunity cost of land and capital costs (land acquisitions)		
	Noise impacts	No properties significantly impacted Two residences moderately impacted. Allowance for mitigation costs included in capital costs		
	Blasting	No material impacts		
	Air quality impacts	No properties significantly impacted		
	Surface water	$1		
	Groundwater	$0		
	Ecology	Some loss of values but offset. Cost of biodiversity offset included in capital costs and operating costs		
	Road transport impacts	No capacity issues. Apportioned cost of realignment of Edderton Rd included in capital costs of the Project		
	Aboriginal heritage	Unquantified		
	Non-Aboriginal heritage impacts	No material impacts		
	Visual impacts	Costs of mitigation included in capital costs of the Project. Residual impacts not material		
	Non-market impacts sub-total	**$7 ($1)**		**$146**
NET SOCIAL BENEFITS – including employment benefits				**$604 ($475)**
NET SOCIAL BENEFITS – excluding employment benefits				**$458 ($329)**

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

* Immaterial does not mean that there will be no impacts but impacts are not likely to amount to more than 5% of the quantified net production benefits of the Project.

4.6 Distribution of costs and benefits

4.6.1 Introduction

As identified in Section 3, 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 and hence the balance of costs and benefits at different geographic scales.

Table 4.4 provides a summary of the distribution of economic costs and benefits at different geographic scales. It should be noted that at the local scale the analysis includes an estimate of secondary net production benefits to the region. These benefits to the region are assumed to offset by losses to the economy outside of the region. For the State, National and Global analysis it is assumed that the secondary benefits are offset within the same geographic region which is more likely at greater regional scales.

Table 4.4 - 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 Anglo American	$0	$0	$0	$134
Net production benefits to Commonwealth Government – Company tax	$0	$7	$93	$93
Net production benefits to NSW Government – Royalties	$0	$233	$233	$233
Net production benefits to local and regional community in the form of voluntary contributions	$3	$3	$3	$3
Secondary net production benefits	$474	$0	$0	$0
Total	***$477***	***$243***	***$329***	***$464***
Non-market Costs and Benefits				
Benefits				
Non-market benefit of employment[1]	$1	$146	$146	$146
Total	***$1***	***$146***	***$146***	***$146***
Costs				
Greenhouse gas emissions	$0	$0	$0	$6
Agricultural impacts	Included in opportunity cost of land and capital costs (land acquisitions)			
Noise impacts	No properties significantly impacted Two residences moderately impacted. Allowance for mitigation costs included in capital costs			
Blasting	No material impacts			
Air quality impacts	No properties significantly impacted			
Surface water	$1	$1	$1	$1
Groundwater	$0	$0	$0	$0
Ecology	Some loss of values but offset. Cost of biodiversity offset included in capital costs and operating costs			
Road transport impacts	No capacity issues. Apportioned cost of realignment of Edderton Rd included in capital costs of the Project			
Aboriginal heritage	Unquantified			
Non-Aboriginal heritage impacts	No material impacts			
Visual impacts	Costs of mitigation included in capital costs of the Project. Residual impacts not material			
Total	**$1**	**$1**	**$1**	**$7**
NET SOCIAL BENEFITS – including employment benefits	**$477**	**$388**	**$475**	**$604**
NET SOCIAL BENEFITS – excluding employment benefits	**$476**	**$242**	**$329**	**$458**

[1] The non-market benefit of employment is smaller at the regional level as there are fewer households to aggregate the estimated per household willingness to pay to. There is no increase in non-market employment benefits at the national or global level as the source study did not survey households outside of NSW and extrapolation of the results outside of the survey frame would be questionable.

4.6.2 Distribution of Global and National Costs and Benefits

The global net production benefit shown in Table 4.3 is potentially distributed amongst a range of stakeholders including:

- Anglo American in the form of residual net production benefits (after company tax, royalties and VPA payments);

- the Commonwealth Government in the form of any Company tax payable ($93M present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area[17];
- the NSW Government via royalties ($233M 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 ($3M present value).

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 Anglo American.

Noise, air quality, visual 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 been estimated and found not to be material from an aggregate economic welfare perspective.

Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the costs of acquisition of WALs as an indicator of the opportunity cost of water. Where WALs are required to be purchased or are in Anglo American ownership, the previous owner of the WALs has been compensated through acquisition.

Greenhouse gas costs will occur at the national and global level and will be uncompensated.

The economic costs associated with the clearing of native vegetation will occur at the State and potentially national level to households who value the conservation of biodiversity. These impacts would be counterbalanced by the Project biodiversity offsets which households at the State and potentially national level may also value.

Aboriginal heritage impacts will potentially occur to Aboriginal people and NSW or Australian households who value conservation of Aboriginal heritage. These economic costs would be counterbalanced to some extent by the Project Aboriginal Cultural Heritage Management Plan and mitigation strategies however the residual economic costs remain unquantified.

Other potential environmental impacts would largely occur at the local level and were found not to be material from an aggregate economic welfare perspective. Any non-market benefits associated with employment provided by the Project would largely accrue at the local or State level[18].

4.6.3 NSW Costs and Benefits

NSW Government (2012) guidelines have a particular focus on the costs and benefits to NSW. Based on the above table the net production benefits that directly accrue to NSW is estimated at $236M, comprising royalties, estimated at $233M, present value, and the voluntary contributions to MSC, estimated at $3M, present value. However, this is a minimum net production value benefit to NSW as NSW also benefits from company tax payable to the Commonwealth. A conservative estimate of company tax redistributed to NSW is 7% i.e. $7M (refer to Attachment 7). In addition, NSW benefits

[17] Note that the company tax rate used in modelling is 28.5% which reflects the expected tax regime as of 1 July 2015. While there is debate about the effective tax rate of mining, Dr Sinclair Davidson (2014) has found that the Australian mining industry pays corporate tax at a rate close to 30% of its taxable income. Refer to Attachment 5.
[18] It should be noted that the study from which the employment values were transferred, surveyed NSW households only.

from the public goods and services provided by the Commonwealth and funded partially by company tax e.g. defence, health services, environmental protection, trade services etc. However, these remain unquantified. The total quantified net production benefits that accrue to NSW are estimated at $243M.

This provides a threshold value against which the environmental, social and cultural impacts to NSW can be compared.

As identified above, all the potential impacts of the Project at least partly accrue to NSW. However, in accordance with Government policy and regulation these impacts are largely mitigated, compensated or offset by the proponent. Quantifiable residual impacts after mitigation, compensation and offsets relate to greenhouse gas emissions. At the NSW level these are estimated at approximately $1M. This is considerably less than the net production benefits that accrue to NSW. In addition there are potential non-market employment benefits of the Project of $146M. Consequently, as well as resulting in net benefits to Australia, the Project would also result in net benefits to NSW.

4.6.4 Regional Costs and Benefits

The first round net production benefits directly accruing to the region relate to the voluntary contribution under the VPA, estimated at $3M (present value). The region indirectly benefits from royalties and company tax which are subsequently used to fund provision of government infrastructure and services across the Australia and NSW, including the local and regional area. The region may also more directly benefit via funding towards infrastructure for mining-affected communities from the NSW Resources for Regions program. However, this would be on a case by case basis requiring application to Government

In a national BCA framework, $3M therefore provides a minimum threshold value against which the environmental, social and cultural impacts to the local area after mitigation, compensation and offset can be compared.

As identified above, agricultural impacts, noise impacts, blasting, air quality impacts, surface water and groundwater impacts, road transport impacts and visual impacts potentially occur at the local/regional level. Initial bearers of noise, dust, water and agricultural impacts are compensated. Road realignment will impact a number of property owners resulting in some having greater travel distances and others having less. While individuals will be differentially impacted, in aggregate these are likely to largely net out. No material visual, blasting or non-Aboriginal heritage impacts are predicted. At the regional level the non-use economic values held for ecology, greenhouse gas emissions and Aboriginal heritage are likely to be less than at the NSW and Australian level. This is because these values are public good values which by definition are the sum of values held by all individuals in the community. At the regional level there is considerably fewer individuals who may hold values for these impacts.

The above analysis deals with the distribution of primary costs and benefits when the BCA is undertaken at a national level. However, if BCA is undertaken at a regional level secondary net benefits become relevant if displacement of resources elsewhere in the economy (i.e. opportunity costs) occurs outside the region of the analysis. Given the small size of the regional economy relative to the Australian economy this is likely to be the case and apart from the VPA, secondary benefits are likely to be the main benefit experience by the region from the Project.

These secondary benefits arise from an increase in economic activity in the region which is reported in Section 5. Extrapolating the difference between value-added and income for flow-on economic activity during operation to the life of the Project (reported in Table 5.2) and discounting at 7% gives secondary economic benefits to the region of $477M, present value.

Benefits to the region are therefore considerably greater than the VPA and greater than environmental, social and cultural impacts at the regional level which are largely mitigated, compensated or offset by the proponent. Quantifiable residual impacts after mitigation, compensation

and offsets relate to greenhouse gas emissions. At the regional level these are estimated at less than $1M. This is considerably less than the benefits that accrue to the region. Consequently, as well as resulting in net benefits to Australia and NSW, the Project would also result in net benefits to the region.

4.7 Risk and sensitivity analysis

The main areas of environmental risks associated with coal mining projects relate to:

- the financial viability of a project from unexpected downturns in coal price and any consequent environmental impacts from premature cessation of operations;
- ecological risk associated with whether the biodiversity offsets will adequately compensate for the direct ecological impacts;
- other environmental, social and cultural impacts estimations and required mitigation measures.

The PAC has previously identified that the financial viability of projects is a risk assumed by the mine owners. Nevertheless, it should be noted that Anglo American is willing to invest $131M in the Project and has a fiduciary responsibility to its shareholders. It is highly unlikely that a $131M investment would take place and then operations would cease, leaving residual environmental impacts at the site. However, the risk that this might occur is mitigated by the fact that Anglo American is required to pay a rehabilitation security deposit to the NSW Department of Resources and Energy as holder of a mining authority under the Mining Act. This security deposit is held by the Department to ensure that legal obligations in relation to rehabilitation and safety of the site can be met following mine closure. If rehabilitation obligations are not met to the satisfaction of the Minister, then the security funds would be used by NSW Department of Resources and Energy to meet the relevant requirements.

The provision of biodiversity offsets can be associated with a number risks, including in relation to the biodiversity benefits of additional management of offsets, success in reconstruction of ecological communities, time-lags between impacts and provision of offsets as well as between management actions and achievement of ecological outcomes. These risk are mitigated through offset ratio requirements in the provision of offsets and commitment to the offset actions prior to the commencement of works under approval. The biodiversity offset package, with an appropriate offset ratio to account for ecological risks is being developed in consultation with the NSW Office of Environment and Heritage, and will be committed to prior to the commencement of the Project.

There is some risk associated with the estimation of environmental, social and cultural impacts of the Project and the level of mitigation measures proposed. However, it should be noted that impacts have generally been assessed based on the maximum annual levels of production and hence are likely to be overstated. Ongoing monitoring will ensure that appropriate mitigation measures are implemented as required.

The NPVs of the Project presented in Table 4.3 and Table 4.3 are 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[19].

[19] Quantitative risk analysis could also potentially be undertaken. However, this requires information on the probability distributions for input variables in the analysis. This information is not available and so the sensitivity testing is limited to uncertainty analysis.

In this sensitivity analysis, the BCA results for Australia and NSW were tested for 20% (+ and -) changes to the following variables at a 4%, 7% and 10% discount rate:

- Opportunity costs of land;
- Opportunity costs of capital equipment;
- Development costs;
- Operating costs;
- Value of coal;
- Greenhouse costs;
- Surface and groundwater impacts.

Results are reported in Tables 4.5 and 4.6. What this analysis indicates is that BCA undertaken at the national level is most sensitive to changes in revenue (reflecting production levels, the value of coal in USD and the AUD/USD exchange rate) and operating costs, with the former impacting royalties and company tax estimates and the latter impacting company tax estimates only. When BCA is undertaken at the NSW level the analysis is most sensitive to changes in revenue (reflecting production levels, the value of coal in USD and the AUD/USD exchange rate).

In this respect, it should be noted that the estimated revenue from the Project is based on an assumed AUD/USD exchange rate of 0.85. At the time of report finalisation the AUD/USD exchange rate was in the order of 0.78 with forecasts suggesting that it will remain at or below this level in the longer term. Consequently, all other things being equal, higher revenue rather than lower revenue is likely. In addition, the production profile assessed for the purpose of the BCA was considerably less than the maximum level for which approval is sought, which again suggests that revenue estimates may be conservative.

The Project is an extension of an existing mining operation and hence operating costs in this location and geological environment are known. Estimates of operating costs of the Project are therefore likely to be a reasonable well known and 20% increases each and every year of the analysis as reported in the sensitivity analysis is highly unlikely.

The sensitivity analysis indicated that the BCA results are not sensitive to changes in capital costs, opportunity costs of land and capital equipment or environmental costs that have not already been internalised into production costs, such as greenhouse gas costs and surface water and groundwater impacts. Since mitigation, offset and compensation costs are a small component the capital and operating costs of the Project, it is unlikely that large changes in these cost levels would have any significant impact on the BCA results.

Under all scenarios examined, the Project has net social benefits to Australia and NSW.

Table 4.5 - National BCA Sensitivity Testing (Present Value $Millions) (Excluding Non-Market Employment Benefits)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	$427	$329	$258
INCREASE 20%			
Opportunity cost of land	$427	$329	$258
Opportunity cost of capital equipment	$427	$329	$258
Development costs	$422	$325	$255
Operating costs	$300	$236	$188
Decommissioning costs	$427	$329	$258
AUD coal value	$681	$527	$415
Surface water	$427	$329	$258
Groundwater	$427	$329	$258
Global Greenhouse Costs @ $40/Tonne (T)	$427	$329	$258

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land	$427	$329	$258
Opportunity cost of capital equipment	$427	$329	$258
Development costs	$432	$333	$261
Operating costs	$591	$458	$361
Decommissioning costs	$427	$329	$258
AUD coal value	$241	$189	$151
Surface water	$427	$329	$258
Groundwater	$427	$329	$258
Global Greenhouse Costs @ $8/T	$427	$329	$258

Table 4.6 - NSW BCA Sensitivity Testing (Present Value $Millions) (Excluding Non-Market Employment Benefits)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	$309	$242	$193
INCREASE 20%			
Opportunity cost of land	$309	$242	$193
Opportunity cost of capital equipment	$309	$242	$193
Development costs	$309	$242	$193
Operating costs	$301	$236	$188
Decommissioning costs	$309	$242	$193
AUD coal value	$382	$299	$239
Surface water	$309	$242	$193
Groundwater	$427	$329	$258
Global Greenhouse Costs @ $40/Tonne (T)	$309	$242	$193

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land	$309	$242	$193
Opportunity cost of capital equipment	$309	$242	$193
Development costs	$310	$242	$193
Operating costs	$321	$251	$200
Decommissioning costs	$309	$242	$193
AUD coal value	$241	$189	$151
Surface water	$309	$242	$193
Groundwater	$427	$329	$258
Global Greenhouse Costs @ $8/T	$309	$242	$193

5 REGIONAL IMPACT ANALYSIS

5.1 Introduction

The BCA in Section 3 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. This section examines regional economic activity impacts of the Project using IO analysis

5.2 Structure of the Regional Economy

For the purpose of the analysis the economy is defined as comprising the Singleton, Muswellbrook and Upper Hunter LGAs. This is the region where the majority of the Project operational workforce will reside in and that the construction workforce will reside in temporarily.

A 2011 IO table of the regional economy was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment 8) using a 2011 IO table of the NSW economy (developed by the Centre for Agricultural and Regional Economics) as the parent table and a 2011 Census employment by industry data for the region. The 111 sector IO table of the regional economy was aggregated to 50 sectors and 8 sectors for the purpose of describing the economy.

A highly aggregated 2011 IO table for the regional economy is provided in Table 5.1. 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 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.

Output for the regional economy is estimated at $23,036M. Value-added for the regional economy is estimated at $7,211M, comprising $2,414M to households as wages and salaries (including payments to self employed persons and employees) and $4,797M in OVA.

The employment total working in the regional economy was 28,671.

The economic structure of the regional economy can be compared with that for NSW through a comparison of results from the respective IO models (Figures 5.1 and 5.2). This reveals that the agriculture, mining and utilities sectors in the regional economy are of greater relative importance than they are to the NSW economy, while the manufacturing sectors, building sectors, trade/accommodation sectors, business services sectors and public/personal sectors are of less relative importance than they are to the NSW economy.

Figures 5.3 to 5.5 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 regional economy.

In terms of output and value-added, the coal mining sector and utilities sector are the most significant sectors to the regional economy. The coal mining sector, utilities sector, wholesale trade sector and education sector are the most significant for income while the coal mining sector, retail trade sector, accommodation and restaurants sectors and education sector are the most significant sectors for employment. The coal mining sector and utilities sectors are also the largest importers and exporters from the region.

Table 5.1 - Aggregated Transactions Table: Regional Economy 2011 ($'000)

	Ag, forestry, fishing	Mining	Manuf.	Utilities	Building	Trade/ Accom	Bus. Srvcs	Public/ Pers. Srvcs	TOTAL	Household Expenditure	OFD	Exports	Total
Ag, forestry, fishing	48,433	3,416	103,611	43	275	3,902	702	844	**161,226**	8,365	52,364	235,820	**457,776**
Mining	79	183,963	9,577	148,528	989	355	540	195	**344,226**	600	168,300	5,501,303	**6,014,429**
Manuf.	7,993	144,663	104,531	6,509	51,218	23,796	13,861	22,878	**375,448**	54,161	64,959	440,330	**934,897**
Utilities	4,504	43,251	12,222	202,417	5,310	9,492	11,080	7,447	**295,724**	35,941	228,555	529,769	**1,089,989**
Building	6,229	144,823	4,358	17,178	142,895	7,977	20,283	21,496	**365,240**	1,415	302,359	27,965	**696,979**
Trade/Accom	11,202	79,851	34,906	11,305	14,685	23,753	28,371	28,590	**232,664**	318,850	41,808	113,458	**706,780**
Bus.Srvcs	19,369	257,391	63,831	28,299	65,258	67,415	151,126	61,114	**713,803**	340,418	43,729	200,740	**1,298,690**
Public/Pers Srvcs	2,976	55,485	7,181	4,100	6,174	10,763	30,776	17,578	**135,032**	158,927	431,159	170,679	**895,796**
TOTAL	**100,784**	**912,842**	**340,217**	**418,378**	**286,804**	**147,453**	**256,739**	**160,144**	**2,623,362**	**918,676**	**1,333,235**	**7,220,064**	**12,095,337**
Household Income	71,399	1,105,177	136,908	94,613	151,335	220,155	275,427	358,801	**2,413,816**	0	0	0	**2,413,816**
OVA	164,751	3,021,640	126,833	341,197	55,040	122,176	427,737	151,332	**4,410,706**	159,887	41,565	184,945	**4,797,102**
Imports	120,842	974,770	330,939	235,801	203,800	216,996	338,787	225,519	**2,647,454**	875,984	205,820	0	**3,729,258**
TOTAL	**457,776**	**6,014,429**	**934,897**	**1,089,989**	**696,979**	**706,780**	**1,298,690**	**895,796**	**12,095,337**	**1,954,547**	**1,580,620**	**7,405,009**	**23,035,513**
Employment	**2,127**	**8,037**	**1,865**	**802**	**1,707**	**4,705**	**3,286**	**6,142**	**28,671**				

Figure 5.1 - Summary of Aggregated Sectors: Regional Economy (2011)

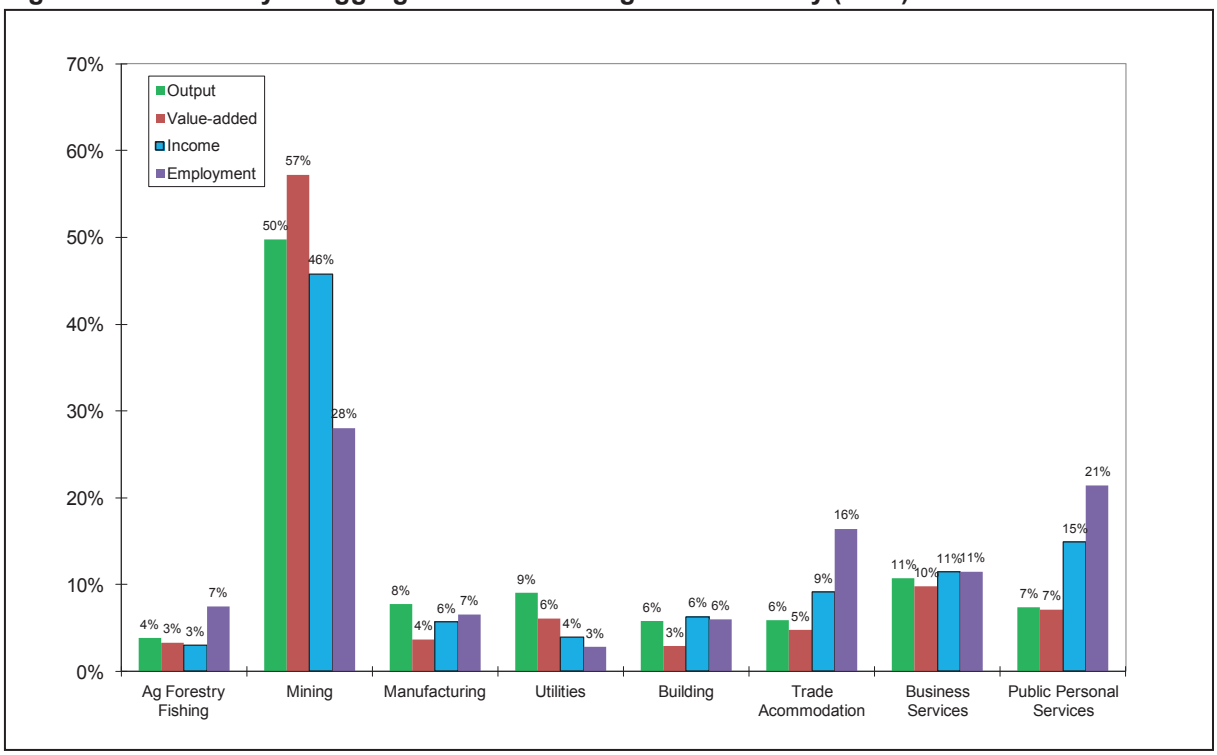


Figure 5.2 - Summary of Aggregated Sectors: NSW Economy (2011)

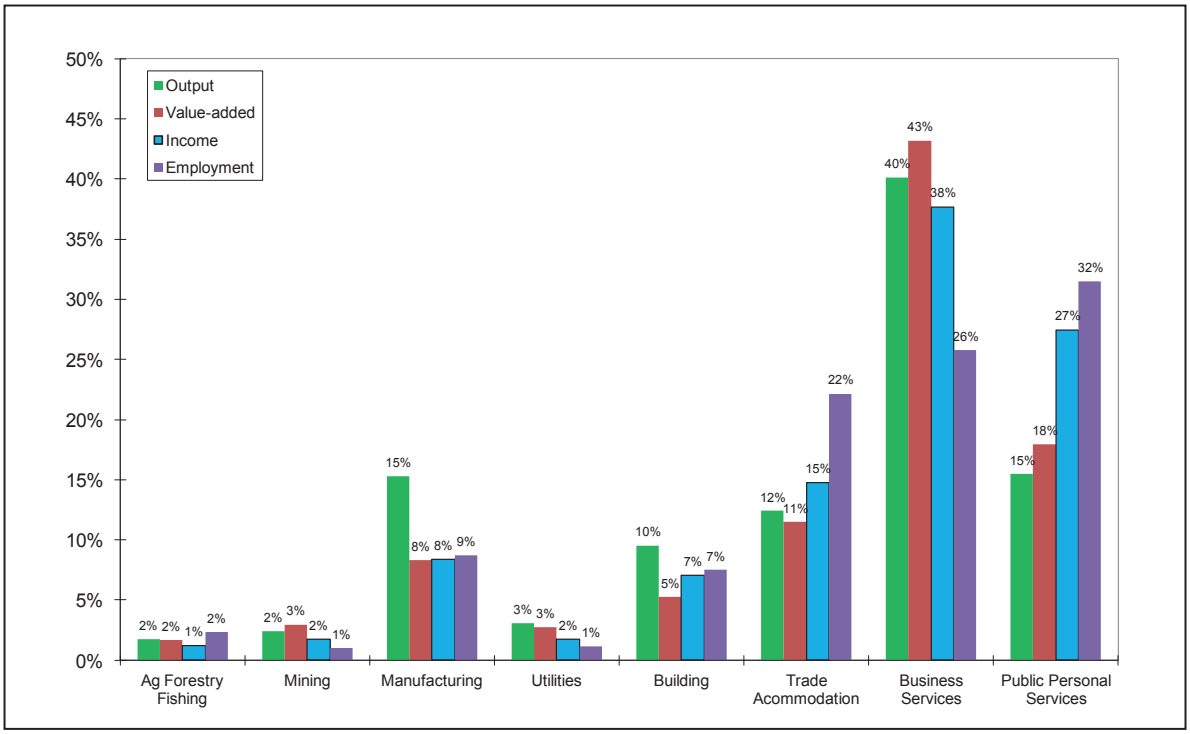


Figure 5.3 Sectoral Distribution of Gross Regional Output and Value Added ($'000)

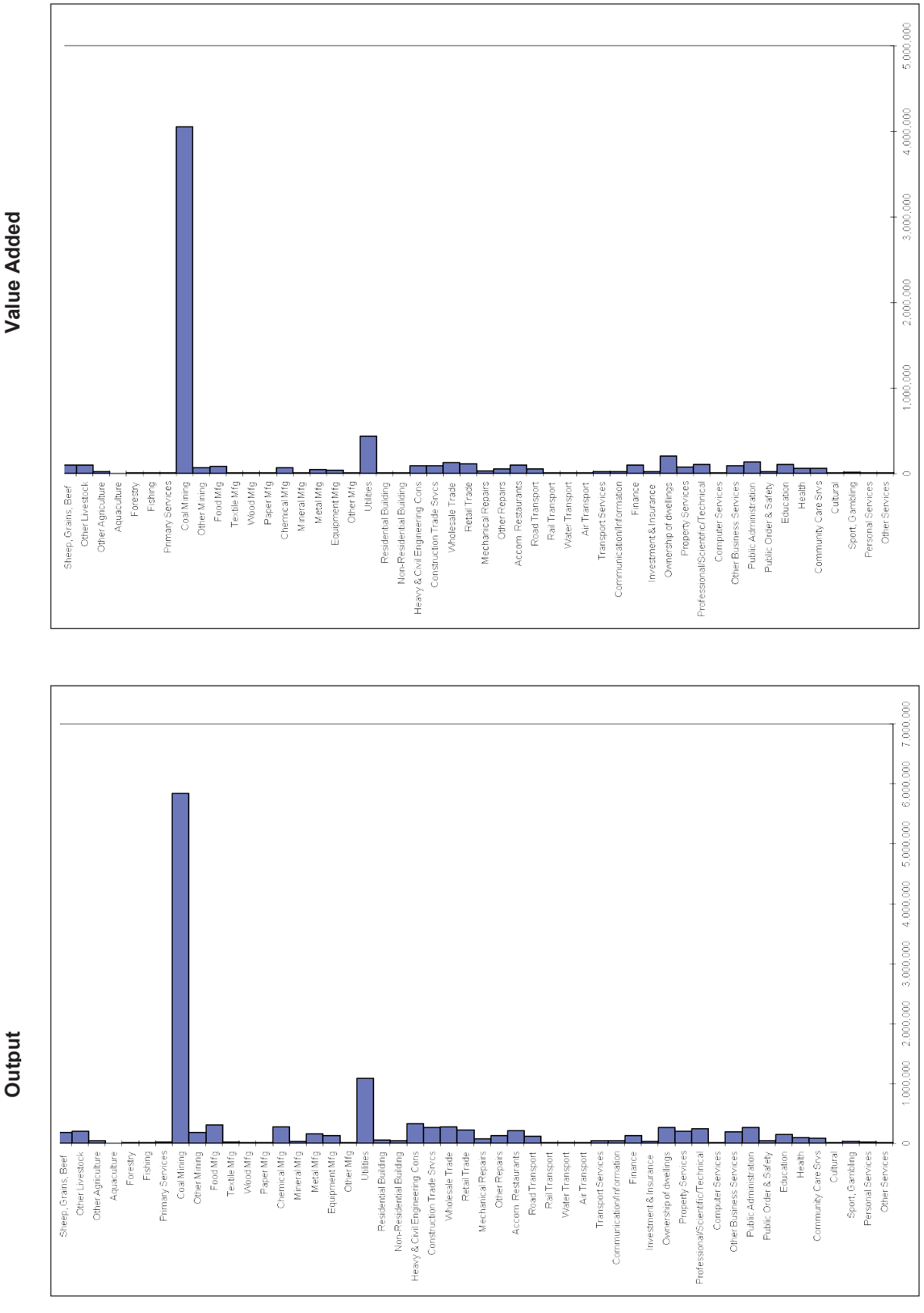


Figure 5.4 Sectoral Distribution of Income ($'000) and Employment (No.)

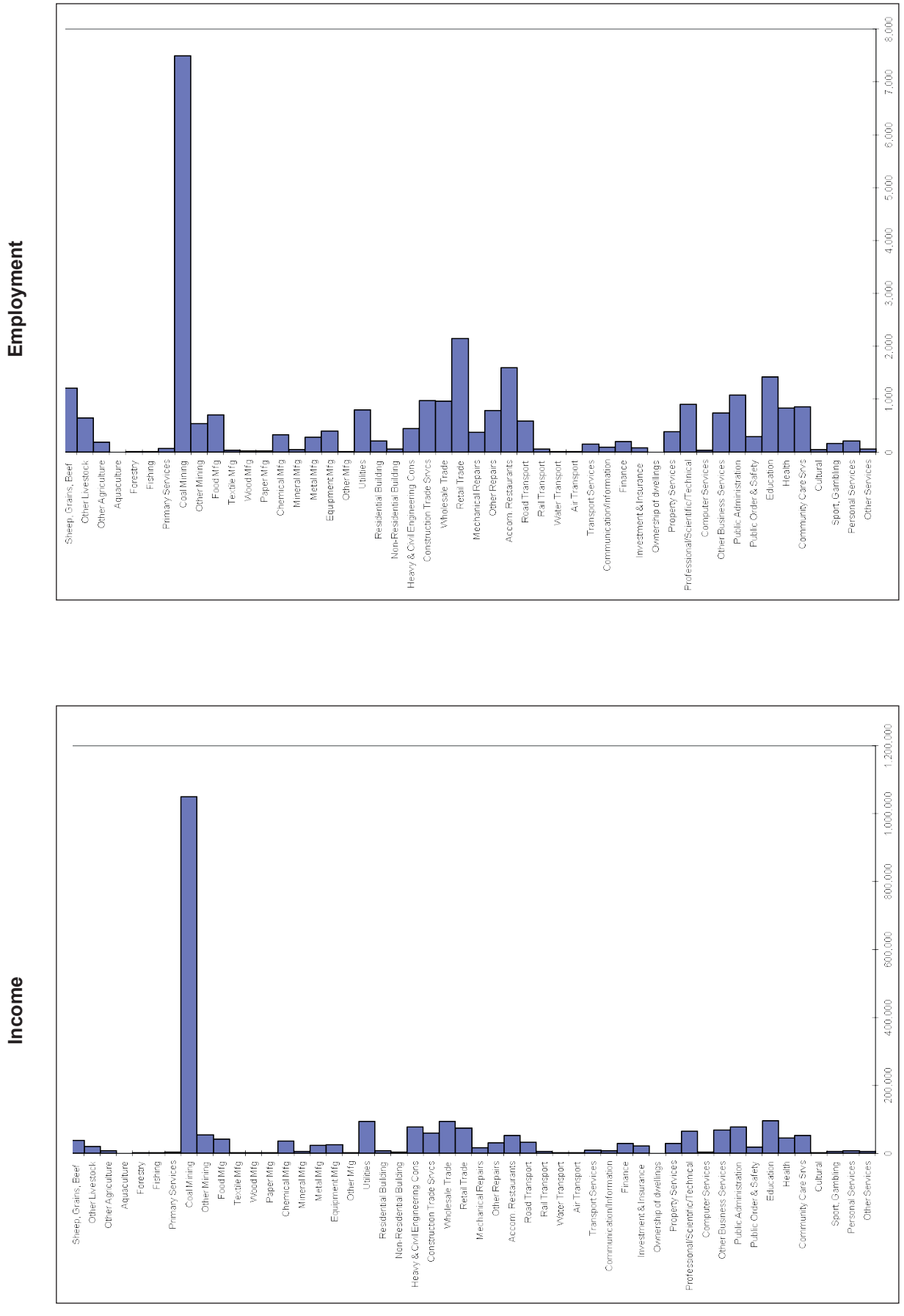
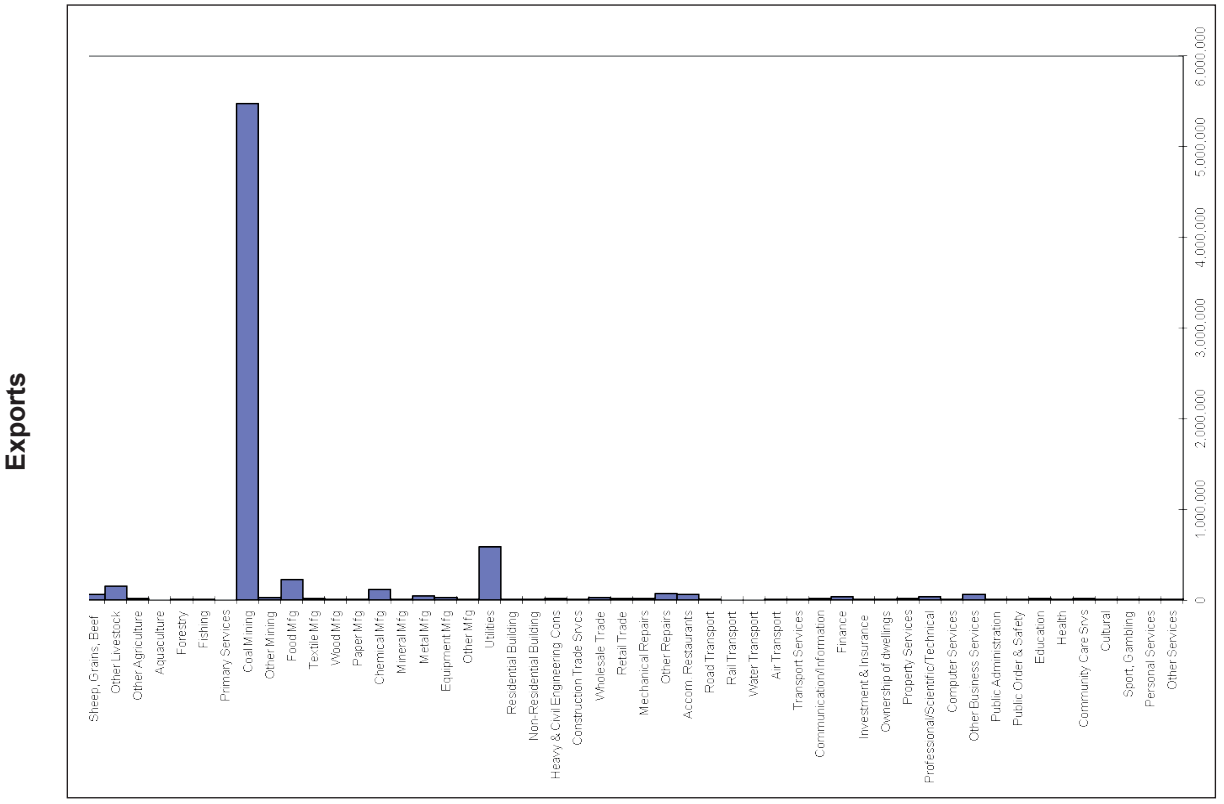


Figure 5.5 Sectoral Distribution of Imports and Exports ($'000)



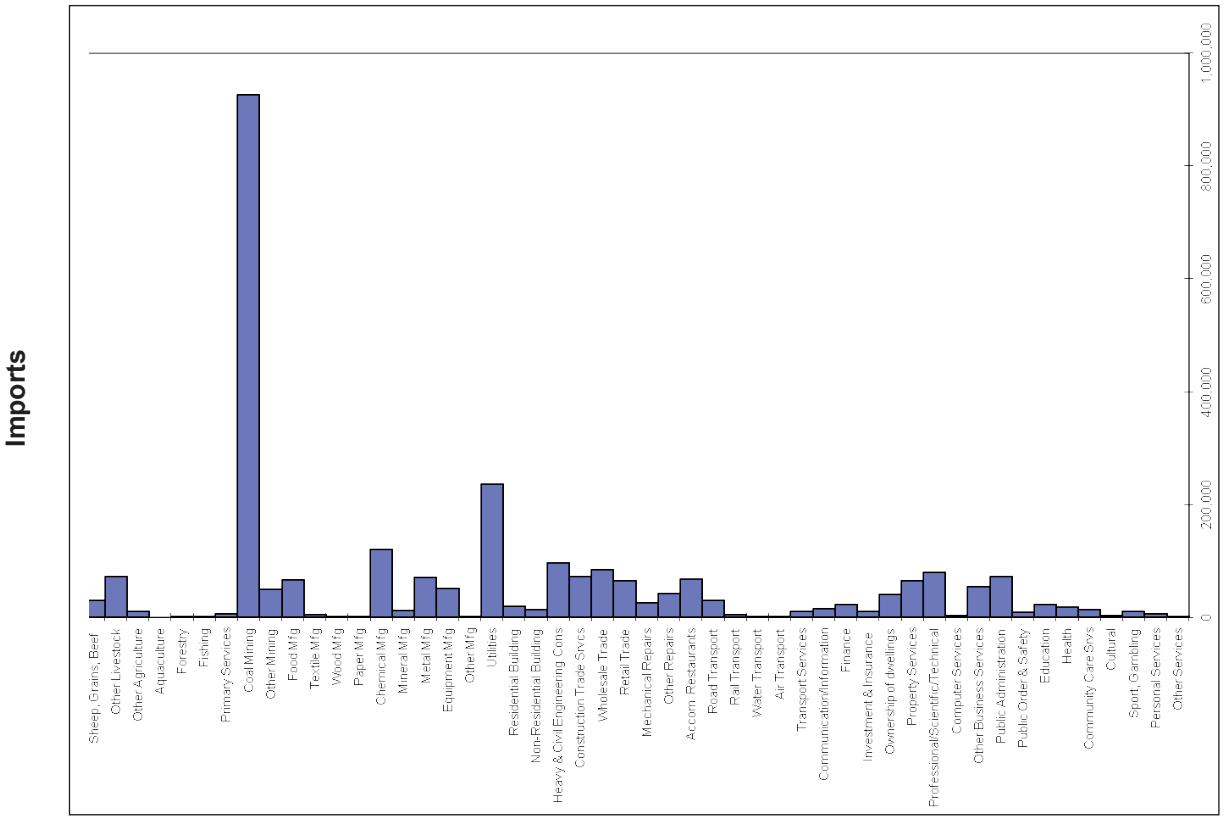
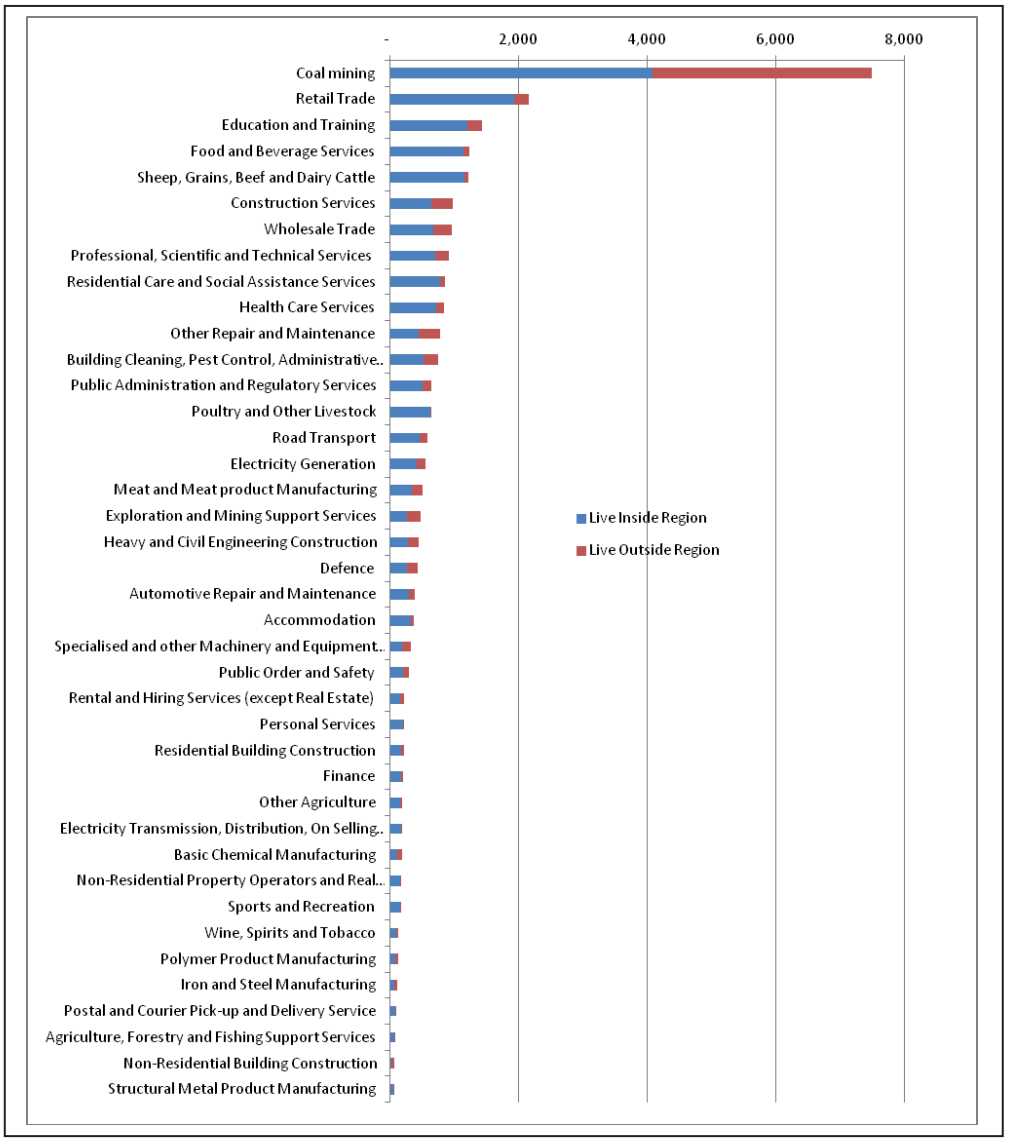


Figure 5.6 shows the top 40 individual industry sectors by employment number for the region. The five most significant employment providers in the region are the coal sector, retail trade sector, education and training sector, food and beverage services sector and sheep/grains/beef and dairy cattle sector. In the top 40 individual industry sectors by employment, 27% of the workforce resides outside the region. For the coal mining sector 45% of those employed reside outside the region.

Figure 5.6 - Main Employment Sectors in the Region



Source: Generated from ABS 2011 census 4 digit employment by industry by place of usual residence data.

5.3 Expenditure During Mine Operation

5.3.1 Introduction

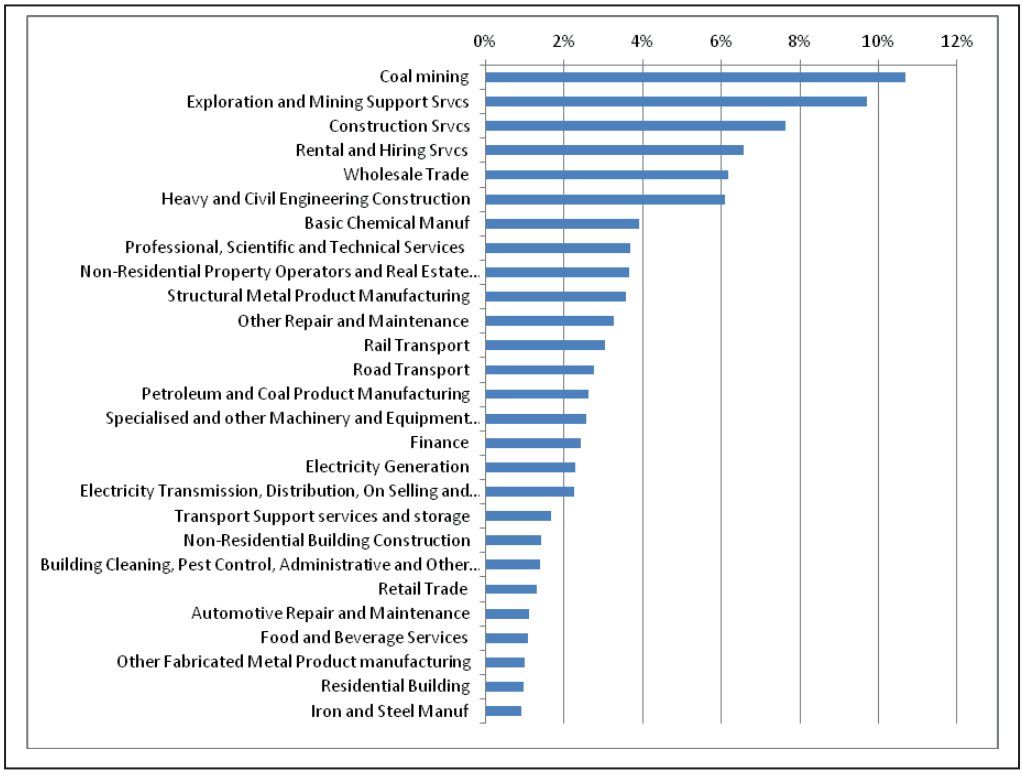
Mining projects provide direct economic activity to regional economies i.e. the output, value-added, income and employment associated with the mining operation. All other things being equal, the economic activity arising from a project will depend on:

- the expenditure profile in the regional economy that is associated with the project;
- the expenditure profile and residential location of the workforce;
- the size of the regional economy and the ability of local businesses to supply inputs to production demanded by mine proponents and the workforce.

5.3.2 Mine Operation Expenditure

The Project is an extension of an existing development. Some indication of the main sectors of the regional economy that may directly benefit from the Project operation can be obtained by examining the regional expenditure pattern of the coal mining sector in regional IO table. This has been developed based on the expenditure pattern of the coal mining sector in a NSW IO table and the application of location quotients[20] to assess the ability of sectors in the regional economy to supply the goods and services demanded. Based on this approach the main sectors in the regional economy to benefit from direct operational expenditure are shown in Figure 45.7.

Figure 5.7 - Percentage of Operational Expenditure in the Region by Sector

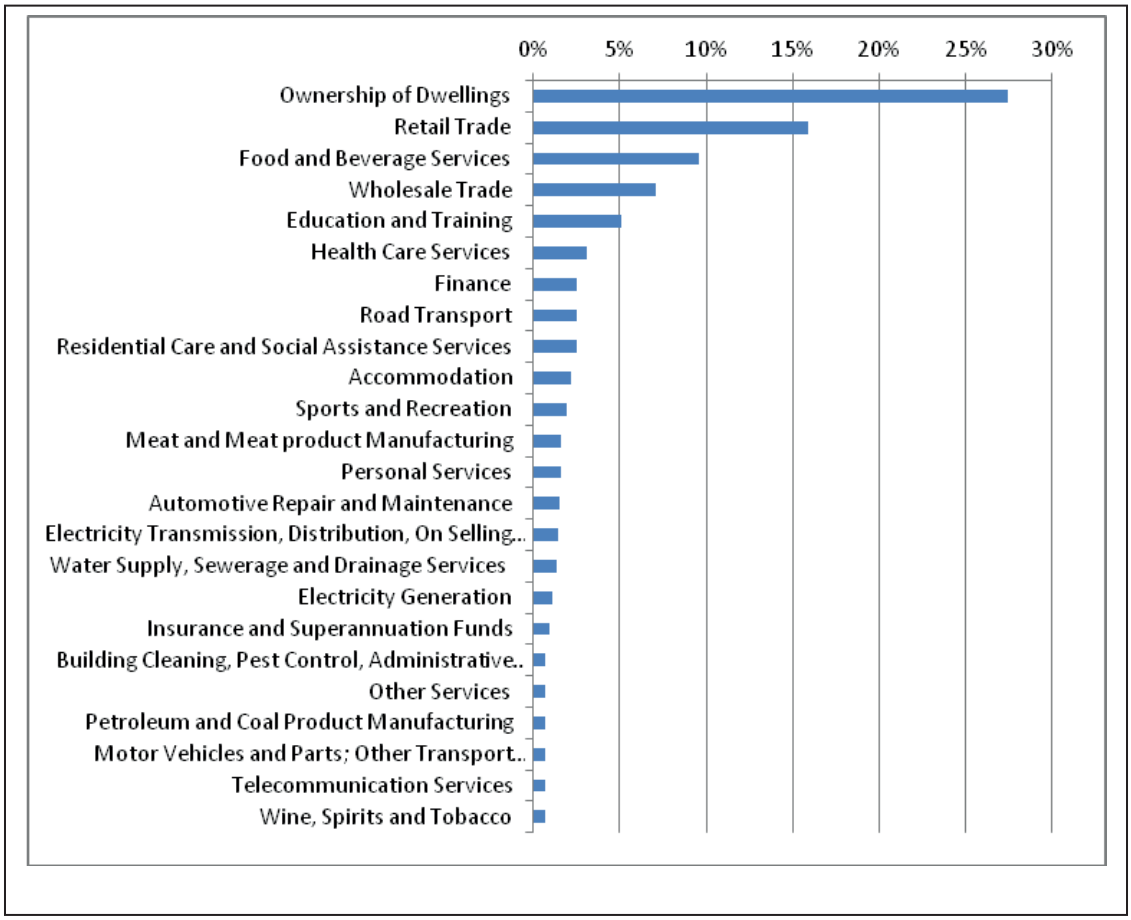


[20] Location quotients are a way of quantifying how "concentrated" an industry is in a region compared to a larger geographic area, in this case NSW. They are calculated by comparing the industry's share of regional employment with its share of NSW employment. A LQ of one indicates that the concentration of an industry's employment in a region is the same as for the state. A LQ of greater than one indicates the region has a greater concentration of employment in an industry compared to NSW and hence the likelihood of this sector in a region being able to provide the goods and services demanded by a Project are greater than where the concentration is less than one.

5.3.3 Mine Employee and Contractor Expenditure

Economic activity in the region will also arise from the expenditure of the mine workforce in the region. It is estimated that the Project will have 393 direct employees and up to 107 contractors. Seventy percent are estimated to live in the region. An indication of the main sectors of the regional economy that may benefit from employee expenditure can be obtained by examining the expenditure pattern of the household sector in the NSW IO table adjusted to the region using location quotients. Based on this approach the main sectors in the regional economy to benefit from direct expenditure of wages in the regional economy are shown in Figure 5.8. The main sectors benefitting from workforce expenditure are the ownership of dwellings sector, retail trade sector, food and beverage services sector and wholesale trade sector.

Figure 5.8 - Percentage of Employee Expenditure in the Region by Sector



5.4 Regional Impact of the Project

5.4.1 Introduction

There is no substantive construction phase associated with the Project and hence this assessment focuses on the revenue, expenditure and employment associated with the operation of the Project. This would provide economic activity for the regional economy, as well as for the NSW economy. The economic activity impacts are estimated for the indicators of output, value-added, income and employment.

5.4.2 Impacts on the Regional Economy

Introduction

For the analysis of the operational phase of the Project, a new Project sector was inserted into the regional IO table reflecting average annual production levels and expenditure. The average annual revenue, operating costs, royalties and gross profit for the new sector was obtained from financial information provided by Anglo American. For this new sector:

- the estimated gross annual revenue from the region was allocated to the *Output* row;
- the estimated wage bill of employees residing in the region was allocated to the *household wages* row (70% live in the region) with the remainder allocated to a secondary household wages row that does not get incorporated into flow-on effects;
- non-wage expenditure was initially allocated between total *intermediate sector* expenditure in the regional economy and *imports* based on the proportions in the regional IO table for the coal mining sector;
- *intermediate sector* expenditure was then allocated between 111 intermediate sectors based on the proportions in regional IO table for the coal mining sector;
- royalties and gross profit were allocated to the *other value-added* row*;*
- direct employment by the Project in the region was allocated to the *employment* row.

Economic Activity Impacts

The total and disaggregated annual impacts of the Project on the regional economy (in 2014 dollars) are shown in Table 5.2.

Table 5.2 - Economic Impacts of the Project on the Regional Economy ($2014)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	362,527	154,262	41,819	196,081	558,608
Type 11A Ratio	1.00	0.43	0.12	0.54	1.54
VALUE ADDED ($'000)	131,240	65,460	23,098	88,557	219,797
Type 11A Ratio	1.00	0.50	0.18	0.68	1.68
INCOME ($'000)	38,514	24,809	8,041	32,849	71,364
Type 11A Ratio	1.00	0.64	0.21	0.85	1.85
EMPL. (No.)	393	418	172	591	984
Type 11A Ratio	1.00	1.06	0.44	1.50	2.50

Note: Contractor employment is located in production induced flow-ons.

The Project is estimated to make up to the following annual contribution to the regional economy for 15 years:

- $559M in annual direct and indirect regional output or business turnover;
- $220M in annual direct and indirect regional value added;
- $71M in annual direct and indirect household income; and
- 984 direct and indirect jobs.

Multipliers

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 Project impact on the regional economy range from 1.54 for output up to 2.50 for employment.

Main Sectors Affected

Production induced and consumption induced 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:

- Construction service sector;
- Retail trade sector;
- Coal mining sector;
- Professional, scientific and technical services sector;
- Exploration and mining support services sector; and
- Wholesale trade 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 5.3).

Table 5.3 - Sectoral Distribution of Employment Impacts on the Regional Economy

	Regional Economy			
Sector	**Average Direct Effects**	**Production-induced**	**Consumption-induced**	**Total**
Primary	0	3	4	8
Mining	393	51	0	444
Manufacturing	0	42	7	49
Utilities	0	10	2	12
Wholesale/Retail	0	51	59	110
Accommodation, cafes, restaurants	0	16	29	45
Building/Construction	0	65	2	67
Transport	0	42	7	49
Services	0	139	61	200
Total	**393**	**418**	**172**	**984**

Note: Totals may have minor discrepancies due to rounding.

Table 5.3 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 services sectors, building and construction sectors, wholesale/retail trade sectors, mining sectors, manufacturing 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.

5.4.2 Impacts on the NSW Economy

Introduction

The NSW economic impacts of the Project were assessed by inserting a new sector in the NSW IO table in the same manner described in Section 5.5.2. The primary difference from the sector 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 annual impacts of the Project on the NSW economy (in 2014 dollars) are shown in Table 5.4.

Table 5.4 - NSW Economic Impacts of the Project

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	362,527	308,514	234,566	543,080	905,607
Type 11A Ratio	1.00	0.85	0.65	1.50	2.50
VALUE ADDED ($'000)	131,240	136,018	125,691	261,709	392,949
Type 11A Ratio	1.00	1.04	0.96	1.99	2.99
INCOME ($'000)	55,020	74,665	58,203	132,867	187,888
Type 11A Ratio	1.00	1.36	1.06	2.42	3.42
EMPL. (No.)	393	833	859	1,692	2,085
Type 11A Ratio	1.00	2.12	2.19	4.31	5.31

The Project is estimated to make up to the following total contribution to the NSW economy for 15 years:

- $906M in annual direct and indirect regional output or business turnover;
- $393M in annual direct and indirect regional value added;
- $188M in annual direct and indirect household income; and
- 2,085 direct and indirect jobs.

5.5 Other economic impacts

5.5.1 Potential contraction in other sectors

Economic impacts for regional and State economies modelled using IO analysis represent only the gross or positive economic activity associated with the Project. Where employed and unemployed labour resources in the region are limited and the mobility of in-migrating or commuting labour from outside the region is restricted there may be competition for regional labour resources, as a result of the individual project, that drives up regional wages. In these situations, there may be some 'crowding out' of economic activity in other sectors of the regional economy.

'Crowding out' would be most prevalent if the regional/NSW economy was at full employment and it was a closed economy with no potential to use labour and other resources that currently reside outside the region. However, the regional and State economy are not at full employment and they each have access to external labour resources. Consequently, 'crowding out' of economic activity in other sectors as a result of the Project would not be expected to be significant, particularly at the regional level. "Crowding out" at the regional level would be less prevalent than at the NSW level, because the regional economy is more of an open economy than the NSW economy.

However, even where there is some 'crowding out' of other economic activities this does not indicate losses of jobs but the shifting of labour resources to higher valued economic activities. This reflects the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society would benefit the most from them. This reallocation of resources is therefore considered a positive outcome for the economy not a negative.

5.5.2 Regional economic impacts of displaced agriculture

The Project will result in a reduction in agricultural activity from land directly impacted by mining and surface infrastructure, and biodiversity offsets. With the primary objective of the rehabilitation strategy being to rehabilitate impacted land to native woodland communities, agricultural production from the Project disturbance area will be lost in perpetuity.

The areas of agricultural land within the Project Area that is directly affected by the Project or will be impacted by Biodiversity Offsets is identified in Table 2.1 and 2.2.

The combined gross value of production from the impacted properties is estimated at $0.8 M per annum based on beef and sheep production. As shown in Table 5.5 this value is 0.26% of the total annual agricultural production of the Hunter Region, 0.01% of NSW and 0.002% of Australia. The net value of foregone agricultural production is estimated at $0.4 M per annum.

Table 5.5 - Value of Total Agricultural Production Impacted and Outputs

Enterprise	Project and Offsite Biodiversity Offset	Hunter Region	NSW	Australia
Wool produced	$0.3 M	$ 3.1 M	$ 641.1 M	$ 1,927.5 M
Sheep slaughtering	$0.1 M	$ 2.8 M	$ 548.3 M	$ 2,328.6 M
Beef slaughtering	$0.4 M	$ 95.5 M	$ 1,487.6 M	$ 6,550.5 M
Total agricultural production	**$ 0.8 M**	**$ 311.7M**	**$ 8,359.2 M**	**$ 39,645.1 M**

Source: Scott Barnett and Associates (2015)

The regional economic impacts of foregone agricultural production have been estimated using IO analysis by modelling the direct and indirect effects on the regional economy of a reduction in $0.8M in output from the beef/sheep/grains sector of the regional economy. A comparison of the regional economic impacts of the Project and the foregone agricultural production is provided in Table 5.6. The foregone agricultural regional economic activity impacts are between 0.2% and 1.2% of the regional economic activity impacts of the Project.

Table 5.6 – Regional Economic Impacts of the Project and Displaced Agriculture

	Project	Agriculture Land	
	Impact	Impact	% of Project
Annual direct output value ($000)	362,527	800	0.2%
Annual direct value-added ($000)	131,240	438	0.3%
Annual direct income ($000)	38,514	161	0.4%
Direct employment (No.)	393	5	1.2%
Annual direct and indirect output ($000)	558,608	1,275	0.2%
Annual direct and indirect value-added ($000)	219,797	656	0.3%
Annual direct and indirect income ($000)	71,364	243	0.3%
Direct and indirect employment (No.)	984	7	0.7%

The BCA included estimation of the present value of production costs and benefits of the Project over a 17 year evaluation period. The present value of net production benefits of the Project are estimated at $464M, with in the order of $330M accruing to Australia. These estimates include an allowance for the opportunity costs of the agricultural land. In contrast, the present value of foregone agriculture in perpetuity is estimated at $8M.

The net production benefits of the Project to Australia are therefore 42 times those of displaced agriculture.

5.5.3 Wage impacts

In the short-run, increased regional demand for labour as a result of the Project (relative to the situation of no Project) could potentially result in some increases pressure on wages in other sectors of the economy. The magnitude and duration of this upward wages pressure would depend on the level of demand for labour, the availability of labour resources in the region and the availability and mobility of labour from outside the region. As shown in Figure 4.6, 45% of labour in the regional coal mining sector resides outside the region and for the Project 30% reside outside the region, reflecting the mobility of labour. Unemployment in the region has also risen to 1,572 or 5.2% in September 2014 (Department of Employment, 2014). Wage impacts are therefore not likely to be significant. Where upward pressure on regional wages occurs it represents at economic transfer between employers and owners of skills and would attract skilled labour to the region leading to downward pressure on wages.

5.5.4 Housing impacts

The Project is a continuation of existing mining operation. No additional workforce is anticipated and hence there will be no additional demand for housing or community infrastructure

5.5.5 Mine cessation

As outlined in Section 5.4, the Project would provide direct and indirect economic activity in the regional and NSW economy for 15 years. 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 area. If it is assumed that some or all of the workers remain in the region, then the impacts of Project cessation would not be as severe compared to a greater level leaving the regional. 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 5.2. However, if displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table 5.2.

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 area (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 region is prospective with other coal resources.

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 projects.

Ultimately, the significance of the economic impacts of cessation of the Project would depend on the economic structure and trends in the regional economy at the time. For example, if the 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 have little impact.

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

6 GOVERNMENT FINANCE

6.1 Commonwealth Government

The main financial benefit from the Project to the Commonwealth Government is company tax and income tax from mine employees.

Company tax on the Project is estimated at $93M present value based on an assumed company tax rate of 28.5%, production of up to 6.4 Mtpa ROM coal, coal prices of USD$72/t in 2016, USD$82/t in 2017 and AUD$87/t thereafter and an AUD/USD exchange rate of 0.85.

At an estimated average wage rate of $140,000 per person[21] income tax payable per person would be $39,747. With average annual number of employees estimated at 393, this equates to $16M pa. The present value (at a discount rate of 7%) of personal income tax from employees of the Project is estimated at $133M. This is conservative since it does not include income tax from contractors.

To the extent that the Project results in some 'crowding out' of other economic activities these represent upper bound estimates of the financial benefit to the Commonwealth Government.

Additional GST revenue to the Commonwealth is likely to be minimal since mining projects do not pay GST on their sales and obtain credits for GST on their inputs. GST would be generated from secondary economic activity generated from expenditure of households and businesses. However as identified earlier, at a national level this secondary economic activity would be negligible.

Community infrastructure that is provided by the Commonwealth Government will be needed generally across Australia to accommodate the population and its growth irrespective of its location. As identified by NSW Government (2012) this means that expense in one area is generally transferred from expense in another. Mining developments generally don't lead to an increase in overall demand in Australia for social infrastructure they simply lead to a redistribution of the location of this demand[22].

6.2 State Government

The main financial benefit of the Project to NSW is the royalties paid. These are estimated at $233M present value based ROM coal production of up to 6.4 Mtpa, coal prices of USD$72/t in 2016, USD$82/t in 2017 and AUD$87/t thereafter, an AUD/USD exchange rate of 0.85 and an effective royalty rate (after allowance for deductions) of 7.8%.

In addition, the payroll tax to NSW from the operational employees of the Project is estimated at $25M present value (at 7% discount rate) based on average wage of $140,000 and payroll tax of 5.45% above a tax free threshold of $750,000. To the extent that the Project results in some 'crowding out' of other economic activities this represent an upper bound estimate of the financial benefit to the NSW Government. However, again it may be considered conservative since it excludes contractor employment.

Various State agencies are responsible for the provision of social infrastructure such as schools and hospitals. Planning and resource allocation for these services is (roughly) on a per capita basis, from financial resources of the State i.e. grants from the Commonwealth, payroll tax, land tax, stamp duty, royalty payments.

Mining Projects in NSW are only likely to indirectly increase demand for community infrastructure in the State as a whole if workers (and associated families) migrate from other states. However, the

[21] This is based on the average wage for the coal mining in the NSW input-output table.
[22] The exception of course is where migrant labour is used, although this is likely to only lead to a marginal increase in overall demand for community infrastructure.

Project is the continuation of an existing mining operation and hence no additional demand for NSW community infrastructure is expected. The Social Impact Assessment provides detailed assessment of community infrastructure issues.

6.3 Local Government

Council may directly benefit from higher Council rates on land used for the Project since rates for mining are generally higher than the landuses that it replaces.

Given that the Project is a continuation of an existing mining activity with no additional workforce there is not expected to be any additional demand for local community infrastructure.

The Social Impact Assessment provides detailed assessment of local community infrastructure issues. The VPA has been developed to help address local community infrastructure issues.

7 STATE ENVIRONMENTAL PLANNING POLICY (MINING, PETROLEUM PRODUCTION AND EXTRACTIVE INDUSTRIES) AMENDMENT (RESOURCE SIGNIFICANCE) 2013

The provisions of the Mining SEPP apply to the Project. This SEPP identifies a number of economic heads of consideration that the decision-maker must consider when making a determination on a mining project. A response to each of these is provided below.

7.1 Significance of the Resource

(a) the size, quality and availability of the resource

Exploration work on the site has identified an estimated in-situ coal resource of 556 million tonnes of coal. The application seeks to extract up to 6.4 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal for a period of 15 years. It would produce in the order of 73.5 million tonnes of ROM coal and 53 million tonnes of high-grade export quality thermal coal.

The resource is able to be mined by Anglo American in a financially viable and environmentally sound manner through continuation and extension of the existing Drayton Mine.

(b) the proximity and access of the land to which the application relates to existing or proposed infrastructure

The Project will utilise the existing infrastructure at the Drayton Mine including the CHPP, rail loop and associated loading infrastructure, workshops, bath houses and administration offices. The existing rail loop will provide access to the Main Northern Railway Line which will be utilised to transport the product coal to the Port of Newcastle for export.

In relation to a previous application, the NSW Department of Trade and Investment identified that the utilisation of existing infrastructure enables the resource to be mined at a considerable discount ($230M) compared to if a new mine operator were mining the resource.

(c) the relationship of the resource to any existing mine

The Project is an extension and continuation of the existing Drayton Mine. It will enable the continuation of employment for approximately 393 employees and 107 contractors working at the Drayton Mine. As described in Section 4.14 of the EIS for the Project, there are also numerous interactions between the existing Drayton Mine and the adjoining Mt Arthur Coal Mine and AGL Macquarie power stations. Continuation of mining at the Drayton Complex will enhance the effectiveness and efficiency of operations at Mt Arthur Coal Mine and AGL Macquarie, and thereby the social and economic benefits to the community from these developments. Continued mining at the Drayton Complex, as proposed by the Project, will facilitate the realisation of these benefits as well as enable the most appropriate mine development and systematic closure and rehabilitation of the existing Drayton Mine.

(d) whether other industries or projects are dependent on the development of the resource

The Project mine plan will enable continued mining of coal at the Drayton Complex. This will in turn enable continued employment for those currently working at the Drayton Mine. Expenditure by Anglo American in the construction and operation of the Project and expenditure by employees would have flow-on effects (linkages) to other businesses in the regional and NSW economy.

As identified by the NSW Department of Trade and Investment in relation to a previous application, local and regionally based industries servicing the existing Drayton Mine would have the opportunity to continue to provide services in support of the Project. This would have flow-on benefits for regional

employment in businesses such as: mine equipment maintenance firms, mining equipment supply firms, coal preparation plant maintenance and supply firms.

Ex-post surveys of business and households in relation to mining in other regions confirms the existence of flow-on economic activity to regional economies. In a survey of businesses and households in the Central West region of NSW, Gillespie Economics (2009)[23] found that:

- 71% of businesses surveyed considered that their business directly or indirectly benefits from mining;
- 93% of businesses surveyed considered that the local economy benefits from mining; and
- 93% of household respondents agreed or strongly agreed that the local economy benefits from the mining.

The Project will similarly provide linkages to other businesses in the regional and NSW economy.

An issue raised by the PAC in response to previous mining proposals is the extent of these flow-ons and the validity of methods for assessing them. This is discussed further below in relation to employment flow-ons. However, with respect to the existing Drayton Mine, Anglo American identifies that 70% of the existing workforce live in the Hunter Region and hence a material component of their expenditure would flow-on to local businesses. Similarly, Anglo American has identified that it spends considerable operational expenditure with local firms including those listed in Table 7.1.

Table 7.1 – Local Firms that Supply the Drayton Mine

Singleton Shire	Muswellbrook Shire
Hansen Bailey	Hitachi Construction Machinery
Mpe	Monadelphous Engineering
Orica Australia Pty Ltd	Atlas Copco Mining & Rock Exca-
Westrac Equipment Pty Ltd	Muswellbrook Nissan Pty Ltd
Expressway Spares Pty Ltd	Resco Open Cut Services Pty Ltd
Tesa Mining Pty Ltd	Subzero Group
Birrana Engineering Pty Ltd	Tutt Bryant Heavy Lift & Shift -
Bradken Mining	Enjoi Pty Ltd
Mining Management Group	Perrett Stemming Services
Mmd Australia Pty Limited	Thomas & Coffey Limited
Blackwoods	Reliable Conveyor Belt Pty Ltd
Power Serve Pty Ltd	Coates Hire Operations Pty Ltd
Maintenance & Proj Engineering	Sgs Australia Pty Ltd
Bureau Veritas Asset Integrity &	Letourneau
Garland Engineering Pty Ltd	Tle
Monadelphous Engineering P/L	Mickala Mining Services Pty Ltd
Singleton Stemming Services Pty	Cummins South Pacific Pty Ltd
Bradken Resources Pty Limited	Hunter Fabrication
Drill Doctors Australia Pty Ltd	Sydney Street Tyre & Battery Cen
Best Tractor Parts Nsw	Airborne Air Conditioning
Valley Scaffolding Services P/L	Teterin Sales P/L Atf Blueblood
Gr & Cc Morgan Pty Ltd	Refrigeration Muswel
Sutton Ford Pty Ltd	Bro-Built Engineering
Kevin & Alana Hughes	Goodyear Earthmover Pty Ltd
Pit Patrol	Robertsons Lifting & Rigging
Lubritene Australia Pty Ltd	Titan Wheels Australia Pty Ltd
Gough & Gilmour Holdings P/L	Connolly Env Mng Consulting
Pegasus Technical Pty Ltd	Logues Transport
Oil Test Pty Ltd	Windscreens O'brien
General Communications Pty Ltd	H & C Goodsell
Cor Cooling Pty Limited	Cme Aust Pty Ltd
Singleton Auto Electrical	Harsco Infrastructure(Hunter
Hunter Valley Rubber Pty Ltd	Challenge Disability Services
Bridgestone Earthmvr Tyres P/L	Muswellbrook Electrical Supplies
Kirkwood Produce Co Pty Ltd	C & F Electronics
All Blast Mine Maintenance	Muswellbrook Auto Body Repairs
Cbc Australia Pty Ltd	Grentell Pty Ltd T/As
Advanced Lubrication Serv P/L	Challenge Tamworth

[23] Gillespie Economics (2009) *Cadia East Project Socio-Economic Assessment*.

Singleton Shire	Muswellbrook Shire
Mines Rescue Pty Ltd	John Buckley Hydraulics Pty Ltd
Radiator Express-Do Not Use See	K Milwain & Sons
Parsons Brinckerhoff Aust P/L	Wear Parts Services Pty Ltd
A C Whalan & Co Pty Ltd	Regional Publishers
Shearer Contracting Pty Ltd	Hunter Valley Printing
Safety Plus Training Pty Ltd	Muswellbrook Steel Supplies
Roseanne Baxter	Kirfield Limited
Hedweld Engineering Pty Ltd	Trevor Hudson & Associates
Komatsu Australia Pty Ltd	John Flood & Co Dnu See Y38248
K & J Haak Engineering Pty Ltd	Muswellbrook Signs-Dnu See Sn
Ymca Of Sydney	

Notwithstanding, the **degree** to which individual businesses are "dependent" is unknown. However, the Mining SEPP does not distinguish between degrees of dependence.

7.2 Economic Benefits as Defined in the Mining SEPP

The Mining SEPP defines economic benefits in terms of employment generation, expenditure (including capital investment) and royalties. Each of these is addressed below. Attachment 2 provides a discussion of these Mining SEPP defined economic benefits in the context of economic theory and economic assessment methods.

(a) employment generation

The Project will continue to provide direct employment for up to 500 workers, including direct employees and direct contractors.

Total (direct and flow-on) employment for the regional and NSW economy during the operation phase of the Project was estimated at 984 (a multiplier of 2.50) and 2,085 people (a multiplier of 5.31), respectively, using IO analysis.

This level of flow-on employment is consistent with the level of flow-on employment reported in other studies of mining projects that use IO analysis. Refer to Attachment 9.

IO analysis which has been used in this report to estimate flow-on economic activity of the Project is not a discredited technique. The main concern that economists have with IO is its use as a substitute for BCA, not its use for estimating direct and indirect regional economic activity impacts. Refer to Attachment 3 for a detailed consideration of the method and its alternatives, and a response to previous criticisms of the method.

Employment estimates using IO analysis provide decision-makers with information on the relative employment footprint/gross jobs of different projects, without going to the second and more complicated and contentious stage of trying to model wage rises and "crowding out" across all other sectors in the economy. The results of IO modelling can therefore be seen as representing an upper bound for the net economic activity associated with a project.

(b) expenditure, including capital investment

The capital investment associated with the Project is estimated to be in the order of $131M. This is the level of capital investment included in the BCA[24]. A breakdown of this investment is provided in Table 4.2 in Section 4.4.1.

[24] Note that higher capital costs reduce the net benefits of projects as measured using BCA.

In addition, the Project will result in ongoing annual expenditure of $231M. The economic activity in the regional economy from operational expenditure was estimated using IO analysis in the order of up to:

- $559M in annual direct and indirect regional output or business turnover;
- $220M in annual direct and indirect regional value added;
- $71M in annual direct and indirect household income; and
- 984 direct and indirect jobs.

(c) the payment of royalties to the State

The Economic Assessment of Project estimated royalties at $423M in total or $233M present value using a 7% discount rate. These estimates were based on:

- a proposed production schedule that is less than the proposed extraction limit i.e. an average of 4.9 Mtpa ROM coal over 15 years;
- an allowance for the major deductions resulting in an effective average royalty rate of 7.8%;
- a coal price of USD$72/t in 2016, USD$82/t in 2017 and AUD$87/t thereafter; and
- an AUD/USD exchange rate of 0.85.

Attachment 10 provides an outline of how royalties are estimated and a discussion of allowable deductions. The main potential deduction is the beneficiation allowance for the washing of coal. Other deductions are negligible. Royalties are charged as a percentage of the value of coal production. Deductions are subtracted from the value of coal production before the application of the royalty rate. They are not subtracted from the royalties themselves. Consequently, an allowance for deductions in the estimation of royalties may reduce the payment amount by between 1% and 5%.

Additional sensitivity testing for royalty calculations are provided below for changes in AUD price levels. The royalty estimates under plus or minus 20% changes in price levels also reflect the level of royalties under plus or minus 20% changes in production levels, exchange rates or price of coal in USD.

Table 7.2 – Royalties to NSW Under Different Price and Exchange Rate Assumptions

	TOTAL (UNDISCOUNTED)	PRESENT VALUE ($M) AT DIFFERENT DISCOUNT RATES		
		4%	7%	10%
CENTRAL ASSUMPTION	$423	$297	$233	$186
+ 20% AUD COAL PRICE	$509	$357	$280	$224
- 20% AUD COAL PRICE	$339	$238	$187	$149

The sensitivity testing for royalties indicates that total royalties from the Project will be between $339M and $509M and at 7% discount rate the present value of royalties will be between $187M and $280M.

8 CONCLUSION

A BCA of the Project indicated that it would have net social benefits to Australia of between $329M and $475M and hence is desirable and justified from an economic efficiency perspective. Environmental, social and cultural impacts of the Project have been minimised through Project design and mitigation, offset and compensation measures. The economic value of residual impacts are considered to be immaterial from an aggregated economic efficiency perspective.

The costs and benefits of the Project have also been considered at the State and regional level and in both cases the economic benefits of the Project have been found to outweigh the economic costs.

Economic activity analysis, using IO analysis, estimated that the Project would make up to the following direct and indirect average annual contribution to the regional economy[25] for approximately 15 years:

- $559M in annual direct and indirect regional output or business turnover;
- $220M in annual direct and indirect regional value added;
- $71M in annual direct and indirect household income; and
- 984 direct and indirect jobs.

The Project is estimated to make up to the following direct and indirect average annual contribution to the NSW economy for 15 years:

- $906M in annual direct and indirect regional output or business turnover;
- $393M in annual direct and indirect regional value added;
- $188M in annual direct and indirect household income; and
- 2,085 direct and indirect jobs.

While the Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.2% and 1.2% of the regional economic activity impacts of the Project. The Project mine plan is defined by ridgelines nominated in the 'Drayton South Coal Project PAC Review Report (PAC 2013) and as such the Project addresses the stated reasons the PAC refused the previous application.

The technical studies in the EIS found that the Project will have no adverse impact on equine health or the viability of Coolmore or Woodlands Studs.

The main fiscal benefit of the Project to Governments is:

- $93M (present value) to the Commonwealth Government in company tax;
- $133M (present value) to the Commonwealth Government in personal income tax from Project employees;
- $233M (present value) in royalties to the NSW Government.

The Project is the continuation of an existing mining operation and hence no additional demand for NSW or local community infrastructure is expected.

[25] Comprising the Local Government Areas of Muswellbrook, Singleton and Upper Hunter Shire.

With regard to the Mining SEPP heads of consideration:

- the resource proposed to be mined is part of an estimated in-situ coal resource of 556 million tonnes of coal which will produce high-grade export quality thermal coal.
- the Project is an extension and continuation of the existing Drayton Mine and as such the Project can utilise infrastructure servicing the existing Drayton mine.
- numerous sectors in the regional economy have some dependence on the Project as 70% of the existing workforce live in the Hunter Region and hence a material component of their expenditure would flow-on to local businesses. Similarly, Anglo American has identified that it spends considerable operational expenditure with local firms.
- the Project will provide continued direct employment for 393 people and 107 contractors. It will also provide indirect employment in the regional economy from employee and Project expenditure.
- the capital investment associated with the Project is estimated at $131M.
- the Project will generate royalties of $423M in total or $233M present value.

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ATTACHMENT 1 – INTRODUCTION TO ECONOMIC METHODS

Benefit Cost Analysis

- Benefit Cost Analysis (BCA) is the primary way that economists evaluate projects and policies.
- BCA evaluates whether the well-being (**economic welfare**) of the community is in aggregate improved by a project. It does this by comparing the costs and benefits of a project to the community.
- The community whose welfare is included is broadly defined as anyone who bears significant costs and benefits of a project. However, in practice most BCA is undertaken at a national level. BCA at a sub-national level is not recommended however if undertaken at this level should provide decision-makers with estimates of all significant effects, including those to non-residents of the sub-national region.
- It is not possible to justify a project on economic grounds without doing a BCA.

Economic Activity Analysis

- Economists also often provide information to decision-makers on the **economic activity** that a project will provide to the regional, state or national economy. This is particularly relevant at the regional level since many regions and towns are experiencing long term decline as a result of structural change in the economy. Additional economic activity can help the prosperity of these regions.
- **Direct** economic activity provided by a project can be estimated from financial and labour estimates for a project. Methods that can be used to estimate **direct** and **indirect** economic activity include IO analysis and CGE modelling. Refer to Attachment 3 for a comparison of these methods and their assumptions.
- While economic activity measures from IO analysis and CGE modelling e.g. direct and indirect output, value-added and income, are generally not measures of benefits and costs relevant to a BCA this information can be of interest to decision-makers[26].

Economic Analysis and Decision-Making

- BCA and IO/CGE analysis are not mechanised decision-making tools, but rather means of analysis that provide useful information to decision-makers.
- Decision-making is multi-dimensional. BCA is concerned with the single objective of **economic efficiency** (economic welfare) while IO analysis and CGE are concerned with the objective of **economic activity** (growth). They do not address equity and other objectives of government. Decision-makers therefore need to consider the economic efficiency and economic activity implications of a project, as indicated by BCA and IO/CGE analysis respectively, alongside the performance of a project in meeting other, often conflicting, government goals and objectives.

[26] It should be noted that it is possible to analyse industry benefits and costs within a general equilibrium framework where impacts are of a sufficient scale that they flow through into multiple sectors in the economy. However, for individual projects a partial equilibrium framework is the preferred approach for the estimation of costs and benefits (US EPA (2010) Guidelines for Preparing Economic Analyses, US EPA).

ATTACHMENT 2 – LEGISLATIVE CONTEXT FOR ECONOMIC ANALYSIS IN EIA

Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation

- The basis for economic analysis under the *Environmental Planning and Assessment* (EP&A) *Act 1979* emanates from:
  - the definition of the term "environment" in the EP&A Act which is broad and includes the social and **economic** environment, as well as the biophysical environment;
  - the "objects" of the EP&A Act which includes *"promoting the social and **economic welfare** of the community"*; and
  - Clause 7(1)(f) of Schedule 2 of the EP&A Regulations which requires environmental assessment to provide "*the reasons **justifying** the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, **economic** and social considerations…"*
- Objects of promoting economic welfare and requirements to justify a project having regard to economic considerations are consistent with the use of BCA. A Note to Clause 7 (1) (f) states that "A cost benefit analysis may be submitted or referred to in the reasons justifying the carrying out of the development, activity or infrastructure."

Secretary's Environmental Assessment Requirements

- The Project SEARs include a requirement for:
  - a detailed assessment of the likely economic impacts of the development, paying particular attention to:
    - the significance of the resource;
    - the costs and benefits of the project, identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuations in commodity markets and exchange rates; and
  - the demand for the provision of local infrastructure and services.
- The identification of economic costs and benefits of the project is consistent with the use of BCA while the demand for the provision of local infrastructure and services is more appropriately dealt with in Social Impact Assessment. The relevance of the significance of the resource in an economic context is discussed further below.

Other Economic Guidelines

- In 2012 the NSW Government prepared the draft *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*. This provides an outline of how to undertake of BCA of mining and coal seam gas proposals and identifies that the proponent has the option to submit a BCA with their development application. It identifies BCA as a tool to inform decision-makers.
- NSW Treasury (2007) *NSW Government Guideline for Economic Appraisal*, provides guidance for Government agencies on how to undertake BCA of significant spending proposals, including proposed capital works, projects and new programs across all public sector agencies. However, many of the principles have broader application.

The State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013

- The Mining SEPP identifies that the consent authority must consider the significance of the resource having regard to:
  - the economic benefits, both to the State and the region including the following matters (without limitation): employment, expenditure including capital investment, and the payment of royalties to the State;
  - any advice from the Director-General of the Department of Trade and Investment, Regional Infrastructure and Services as to the relative significance of the resource in comparison with other mineral resources across the State.
- The Mining SEPP specifically refers to the economic benefits to the State and region and refers to specific economic benefits (**without limitation**) which include:
  - Employment:
    - In standard BCA, employment is generally considered as an economic cost (rather than a benefit), although recent developments in non-market valuation have shown that in addition to the market economic costs of employment to the community the broader community may have non-market values for other people's employment – based on altruism (Refer to Attachment 6);
    - In economic activity analysis, such as IO analysis or CGE modelling, employment is a measure of economic activity rather than a benefit.
  - Expenditure, including capital investment:
    - In standard BCA, capital and other expenditure are economic costs not economic benefits;
    - In economic activity analysis, expenditure provides direct and indirect economic activity in the region, State or Nation, including employment.
  - Royalties
    - In standard BCA, royalties represent one component of the total net production benefit (producer surplus) generated by a project. This component directly accrues to NSW. Other components of the total net production benefit include company tax and net profit.
    - In economic activity analysis, such as IO analysis or CGE modelling, royalties are part of the value-added of a project – a measure of economic activity.
- Economic benefit has a very specific meaning in economics. It relates to producer and consumer surpluses. Producers of goods and services generate producer surpluses by combining resources in ways that increase their value to society. The producer surplus of a mining project essentially relates to revenues less resource costs i.e. net production benefits. Consumer surplus relates to the willingness of consumers to pay for a good or service over and above what they have to pay for it and extend to non-market environmental, cultural and social goods and services.
- The **"without limitation"** provision of the Mining SEPP allows these strictly defined economic benefits (producer and consumer surpluses) that are estimated using BCA to also be taken into account by the decision-maker.

- With respect to the relative significance of the resource, the Mining SEPP refers to:
  - the size, quality and availability of the resource;
  - the proximity and access of the land to which the application relates to existing or proposed infrastructure; and
  - the relationship of the resource to any existing mine; and
  - whether other industries or projects are dependent on the development of the resource.
- While it is possible to qualitatively consider the relative significance of a resource compared to other mineral resources, from an economic perspective the relative significance of a resource, its proximity and access to infrastructure and relationship to any existing mine has no particular meaning. A more “significant” resource has no greater economic claim than a less “significant” resource. What is primarily relevant is whether the benefits of mining that resource outweigh the costs.
- The extent to which industries are dependent on the development of a resource can be modelled using IO analysis or CGE modelling.

ATTACHMENT 3 – INPUT-OUTPUT ANALYSIS AND COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS

Input-Output Analysis

- IO analysis is a cost effective and simple method for estimating the gross market economic activity i.e. financial transactions and employment, in a specified region that is associated with a project.
- IO analysis is the most widely used model for regional impact assessment (West and Jackson 2005).
- IO analysis can be undertaken at the LGA or aggregation of LGAs level.
- IO analysis can provide disaggregation of economic activity impacts across many sectors – 111 sectors based on current National IO tables.
- IO analysis was developed by Wassily Leontief for which he received the Nobel Prize in Economics.
- IO analysis is a static analysis that looks at economic activity impacts in a particular year e.g. a typical year of a projects operation.
- IO analysis has historically been applied at the regional level to assess the economic activity impacts of individual projects.
- IO analysis involves the development of an IO table representing the buying and selling of goods and services in the economy. These fixed average ratios are used to estimate the direct and indirect impacts of a change in expenditure in a region.
- IO analysis identifies the gross direct and indirect additional (positive) regional economic activity associated with a project in terms of a number of indicators of economic activity – output, income, value-added[27] and employment.
- Economic activity measures used in IO are not measures of benefits and costs relevant to a BCA.
- IO analysis does not attempt to examine non-market environmental, social or cultural impacts.
- IO analysis does not depend on the assumption *"that there is a ghost pool of highly skilled yet unemployed people"* in a region as suggested by a Land and Environment Court Judgement.
- The estimation of economic activity impacts in IO analysis are based on a number of simplifying assumptions – most notable is that the regional economy has **access to** sufficient labour and capital resources (from both **inside** and **outside** the region) so that an individual project does not result in any regional price changes e.g. wages in other industries or house rentals, which would lead to contractions ("crowding out") of economic activity in other sectors in the region.
- For the assessment of the impacts of individual projects on small open regional economies, this is a reasonable assumption.
- Nevertheless, the results of IO modelling can be seen as representing an upper bound for the net economic activity associated with a project.

Computable General Equilibrium Modelling

- CGE modelling is an alternative more expensive, complicated but theoretically more sophisticated method for estimating the economic activity associated with a project.

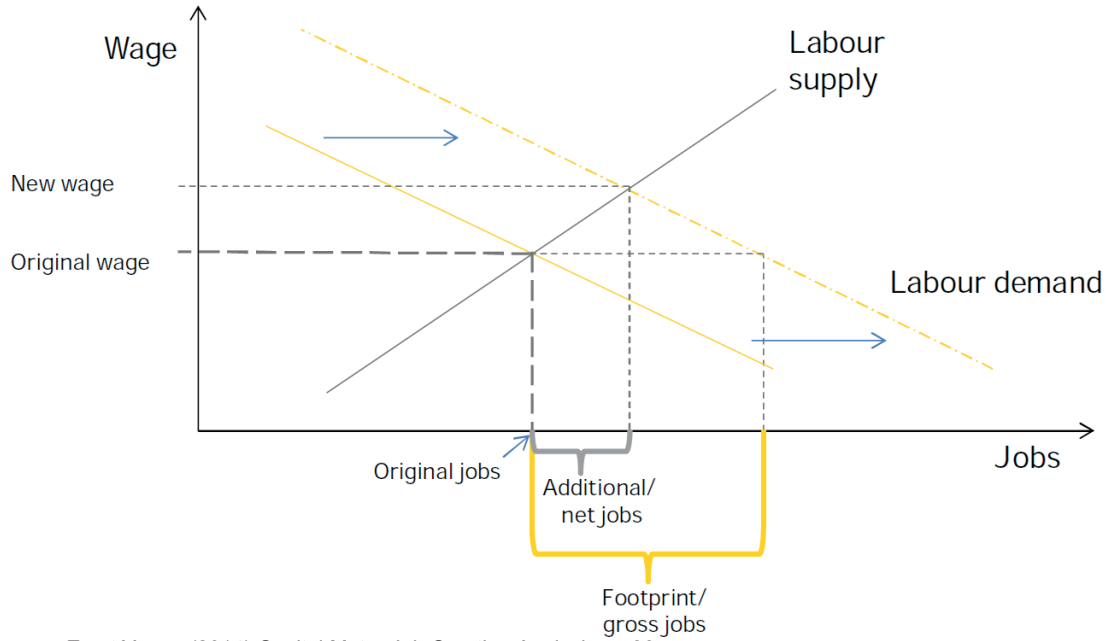
[27] Value-added is the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output.

- CGE modelling can be dynamic or comparative static[28] and has historically been applied at the State and National level for determining the potential economic activity associated with the introduction of major government policy changes and investment in large infrastructure projects.
- CGE modelling can also be undertaken at a regional level but normally at no finer scale than the Statistical Subdivision level.
- CGE modelling estimates the additional net (positive and negative) economic activity associated with a project in terms of a number of economic indicators – including value-added and employment – but also real income, government tax revenue and components of value-added.
- Economic activity measures used in CGE modelling are not generally measures of benefits and costs relevant to a BCA, although CGE modelling can also be used to estimate market costs or market benefits, as part of a BCA, where the magnitude of a project will affect a large number of sectors and the effects will be spread more broadly throughout the economy.
- Economic activity impacts can be disaggregated by sector but this is not normally as disaggregated as in IO analysis.
- CGE modelling does not attempt to examine non-market environmental, social or cultural impacts.
- CGE modelling is underpinned by an IO database as well as a system of interdependent behaviour and accounting equations which are based on economic theory (but mostly without econometric backing at the regional level).
- The equations in CGE models ensure that any change in demand in a region, no matter how small, translates into some change in prices and hence there is always some 'crowding out' of other economic activity in the region.
- At the regional level, CGE results can be very sensitive to changes in these behavioural assumptions.
- 'Crowding out' of other economic activities estimated via CGE modelling does not reflect losses of jobs but the shifting of labour resources to higher valued economic activities.

[28] Comparative static models compare one equilibrium point with another but do not trace the impact path along the way. Dynamic models give year by year impacts of a shock.

Comparison of IO Analysis and CGE Modelling

Figure A3.1 – Comparison of Employment Estimates in IO Analysis and CGE Modelling



Source: Ernst Young (2014) Capital Metro Job Creation Analysis, p. 30.

- Figure A3.1 illustrates the difference between the output of IO analysis and the output of CGE with respect to employment. IO analysis estimates the employment footprint or gross jobs from a project. It can also be taken as an indicator of net jobs from a project where there is no or little upward pressure on wages for the region in question as a result of the individual project and hence no or little crowding out of other economic activity[29]. CGE modelling assumes upward pressure on wages and hence some crowding out of other economic activity in the region. Under this assumption CGE estimates additional net jobs as being less than the employment footprint/gross jobs.
- Which modelling approach best represents the true situation depends on whether and to what extent price changes occur at a regional level as a result of individual projects. This is an empirical issue and would depend on the migration of labour into the region, commuting of labour and timely management of land releases by Councils. Few studies exist that examine this issue.
- IO analysis provides decision-makers with information on the relative employment footprint/gross jobs of different projects, without going to the second and more complicated stage of trying to model wage rises and "crowding out" across all other sectors in the economy.
- Regional economic activity, estimated by IO analysis or CGE modelling, is just one piece of information that decision-makers may take into account in considering a project.

Guidelines

- Both IO analysis and CGE modelling are identified in the DP&I's *draft Guideline for Economic Effects and Evaluation in EIA* (James and Gillespie 2002) as appropriate methods for examining regional economic impacts i.e. impacts on economic activity – the size and structure of an economy.
- Other guidelines to recognise the role of IO analysis include:
  - US Environment Protection Agency (2010) *Guidelines for Preparing Economic Analyses*;

[29] This is akin to the marginal assumption in BCA.

- Australian Bureau of Rural Science (2005) *Socio-economic Impact Assessment Toolkit: A guide to assessing the socio-economic impacts of Marine Protected Areas in Australia*.

- NSW Treasury (2007) identify that IO analysis is commonly used to assess the regional impacts of a project. However, IO analysis is concerned with measuring economic activity, and is not a tool for the evaluation of projects (in the way that BCA is).

Government Applications of IO Analysis

- Applications of IO analysis commissioned by Government agencies include:
  - Department of Sustainability, Environment, Water, Population and Communities (2011) *Assessing the Socio-Economic Impacts of Sustainable Diversion Limits and Water for the Future Investments: An Assessment of the Short-Term Impacts at a Local Scale*
  - NSW Natural Resources Commission (2009) *River Red Gum Assessment: Socio-economic impact assessment*;
  - Victorian Environmental Assessment Council (2007) *River Red Gum Forests Investigation – Socio-Economic Assessment.*
  - Resource and Conservation Division of the NSW Department of Urban Affairs and Planning (1999) Regional Impact Assessments as part of the NSW Comprehensive Regional Assessments under the National Forestry Policy.
  - Reserve Bank of Australia (2012) *Industry Dimensions of the Resource Boom: An Input-Output Analysis.*
  - DECCW (2009) Economic benefits of national parks and other reserves in New South Wales - Summary report, reports the results of numerous studies it and its' predecessors have commissioned on the regional economic impacts of national parks and protected areas.
  - DECCW (2006) *Socio Economic Assessment of the Batemans Bay Marine National Park*
  - DECCW (2006) *Socio Economic Assessment of the Port Stephens – Great Lakes Marine Park*
  - National Parks Service, US Department of the Interior (2014) *2012 National Parks Visitor Spending Effects: Economic Contribution to Local Communities, States and the Nation*.

Criticisms Misrepresented

- The main concern that economists e.g. the Productivity Commission, NSW Treasury and ABS (as quoted by The Australia Institute in numerous submissions to mining projects in NSW) have with IO is its use as a substitute for BCA, not its use for estimating direct and indirect regional economic activity impacts.

  - NSW Treasury (2009) "*Model based economic impact assessment [such as IO analysis] is not a substitute for a thorough economic analysis of a policy. The appropriate method for analysing policy alternatives is benefit cost analysis (BCA)".*

  - The main "abuse" reported by the Productivity Commission is using IO analysis to *"make the case for government intervention"* when BCA is the appropriate method for doing this.

  - ABS's concerns with IO being "*biased*" refer to it being a "*biased estimator of the benefits or costs of a project"*. IO does not estimate benefits and costs but economic activity.

  - Concerns of the Warkworth Judgement with IO analysis being "deficient" related to the data (industry data from surveys undertaken in 2001 and assumptions used (see next dot point)), but more fundamentally for not *"assisting in weighing the economic factors relative to the various environmental and social factors, or in balancing economic, social and environmental*

factors". This is an inappropriate criticism of the IO method, since it does not pretend to do this.

- IO analysis does not depend on the assumption *"that there is a ghost pool of highly skilled yet unemployed people"* in a region as suggested in the Warkworth Judgement. It allows for labour to come from within or outside the region.

Latest Use of IO Analysis

- BAEconomics (2014) in its Economic Impact Assessment for Warkworth Continuation 2014 and Mt Thorley Operations 2014 justifies the use of IO analysis to estimate economic activity associated with the Project.

- Dr Brian Fisher, the Managing Director of BAEconomics is a highly respected resource economist who previously held the positions of Executive Director of the Australian Bureau of Agricultural and Resource Economics (ABARE) and Associate Commissioner of the Productivity Commission. He received an Order of Australia in the Queen's Birthday Honours List in 2007.

ATTACHMENT 4 – UNDERLYING ASSUMPTIONS AND INTERPRETATIONS OF INPUT-OUTPUT ANALYSIS AND MULTIPLIERS

1. "The *basic assumptions* in IO analysis include the following:

- there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between IO 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 IO 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 IO 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 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.

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

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

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

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

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

REFERENCES

Australian Bureau of Statistics (1995) *Information Paper Australian National Accounts Introduction to Input-Output Multipliers*. Cat. No. 5246.0.

Centre for Farm Planning and Land Management (1989) *Consultants report to State plantations impact study.* CFPLM, University of Melbourne.

Jensen, R. and West, G. (1986) *Input-output for Practitioners: Theory and Applications*. Prepared for Department of Local Government and Administrative Services, Local Government and Regional Development Division, Australian Government Publishing Service.

Powell, R. and Chalmers, L. (1995) *The Regional Economic Impact of Gibraltar Range and Dorrigo National Park*. A Report for the NSW National Parks and Wildlife Service.

ATTACHMENT 5 – BCA AND ASSESSMENT OF EXTERNALITIES

Consideration of Externalities in the Economic Assessment

Introduction

- The "perfect" BCA is an ideal. Different situations call for different styles and depths of analysis.
- Valuation of all environmental impacts is neither practical nor necessary.
- In attempting to value impacts, there is 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). The guideline gives an example of impacts of less than $1M being immaterial for a project with an estimated net present value of $20M.
- The BCA of the Project took three approaches to the consideration of environmental costs:
  - Threshold value analysis;
  - Qualitative consideration of impacts and valuation of the main impacts based on market data and benefit transfer; and
  - Additional threshold value analysis to recognise that some impacts may not have been fully valued and incorporated into the analysis.

Threshold Value Analysis

- The first approach used to consider the environmental impacts of the Project was the threshold value method.
- Threshold value analysis is a recognised approach to BCA where it is not possible or pragmatic to attempt to value potential external impacts.
- Threshold value analysis was developed by Krutilla and Fisher (1975)[30]. It is specifically referred to as an appropriate approach in the DP&I's (2002) *Draft Guideline for Economic Effects and Evaluation in EIA,* and is a widely recognised approach.
- Threshold value analysis avoids the sometimes contentious matter of physically quantifying environmental impacts and then placing dollar values on them.
- Threshold value analysis leaves the trade-off between quantified economic benefits and unquantified environmental costs for the decision-maker.
- In the Economic Assessment of the Project, the estimated net production benefits provides a threshold value or reference value against which the relative value of the residual environmental, social and cultural impacts of the Project, after mitigation, offset and compensation, may be assessed. 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.

[30] Krutilla, J.V. and A.C. Fisher (1975) *The Economics of Natural Environments*, Johns Hopkins University Press, Baltimore.

Qualitative consideration of impacts and valuation of the main impacts based on market data and benefit transfer

- The second approach used was to qualitatively consider, and where possible value, the main environmental, cultural and social impacts of the Project for the well-being of people.

- Qualitative consideration of potential impacts and any subsequent valuation of impacts relied on the assessment of biophysical impacts provided in the Project EIS.

- The approach to valuing environmental impacts in the Economic Assessment of the Project is summarised in Table A5.1.

Table A5.1 – Method for Valuing Environmental Impacts in the Economic Assessment of the Project

Impact	Potential Valuation Method	Comment
Greenhouse gas emissions	Damage cost method	Estimate of global social damage cost of carbon from literature and govt policy, adjusted to Australian damage cost.
Agricultural impacts	Property valuation method	Foregone agricultural production is reflected in land values. So acquisition costs of land reflect, among other things, foregone agriculture.
Noise impacts		
Significant	Property valuation method	Cost of acquiring properties identified as being significantly impacted was included in the analysis.
Moderate and low	Defensive expenditure	Noise mitigation costs included in capital costs of project.
Blasting		Vibration and air blast limits for human comfort and structural damage are met, minimal impact is likely to occur to humans or structures.
Significant air quality impacts	Property valuation method	Cost of acquiring properties identified as being significantly impacted was included in the analysis.
Use of surface water	Market value of water	Cost of Water Access Licences included.
Use of groundwater	Market value of water	Cost of Water Access Licences included.
Groundwater drawdown	Defensive expenditure	No impacts on private bores predicted.
Water discharges		Regulated under the Protection of Environment Operations Act 1997.
Flora and fauna	Replacement cost	Capital and operating costs of offsets included in capital and operating costs of the Project. Assumes that offsets levels are sufficient to compensate the community for values lost. This is a requirement of Govt. Policy.
Road transport impacts	Defensive expenditure	No significant capacity issues. Cost of road investment by the proponent included in capital costs of project. Net impacts on travel times assumed to be immaterial.
Aboriginal heritage	Defensive expenditure	Cost of preparation and implementation of an Aboriginal Cultural Heritage Management Plan included in the costs of the Project. Residual impacts unquantified.
Historic heritage	Defensive expenditure Benefit transfer of CM data	Residual impact assumed immaterial.
Visual	Defensive expenditure	Costs of mitigation measures included in the economic analysis.

Additional Threshold Value Analysis

- To the extent that there may be some disagreement about the estimated economic values of the environmental impacts of the Project, the estimated net benefits of the Project provides another threshold value that the residual environmental impacts of the Project after mitigation, compensation and offset would need to exceed to make the Project questionable form and economic efficiency perspective. This again allows the decision-maker to consider any material impacts that it identifies in the course of its consideration that were not valued in the Economic Assessment.

ATTACHMENT 6 – NON-MARKET BENEFITS OF EMPLOYMENT

- In standard BCA, the wages associated with employment are considered an economic cost of production with this cost included in the calculation of net production benefits (producer surplus).

- Where labour resources used in a project would otherwise be employed at a lower wage or would be unemployed a shadow price of labour is included in the estimation of producer surplus rather than the actual wage (Boardman et al. 2005[31]). The shadow price of labour is lower than the actual wage and has the effect of increasing the magnitude of the producer surplus benefit of a project. However, NSW Treasury (2007) states that "in practice such adjustments are not generally made and are not recommended."

- These treatments of employment in BCA relate to the market value or opportunity cost of labour resources.

- However, BCA also includes non-market values i.e. the values that individuals in a community hold for things even though they are not traded in markets. For example, people have been shown to value environmental resources even though they may never use the resource. These are referred to as existence values and are underpinned by the view in neoclassical welfare economics that individuals are the best judge of what has value to them.

- As identified by Portney (1994[32]), the concept of existence values should be interpreted more broadly than just relating to environmental resources.

  "If I derive some utility from the mere existence of certain natural environments I never intend to see (which I do), might I not also derive some satisfaction from knowing that refineries provide well-paying jobs for hard-working people, even though neither I nor anyone I know will ever have such a job?. I believe I do. Thus, any policy change that "destroys" those jobs imposes a cost on me – a cost that, in principle, could be estimated using the contingent valuation method.... Since regulatory programs will always impose costs on someone – taking the form of higher prices, job losses, or reduced shareholder earnings – lost existence values may figure every bit as prominently on the cost side of the ledger as the benefit side (Portney 1994, p. 13).

- The utility (welfare) of individuals may therefore be affected by changes in their own well-being as well as changes in the well-being of others (Rolfe and Bennett 2004[33]). This is consistent with the observed behaviour of altruism (Freeman III 2003[34]).

- Whether people have existence values for the employment of others, as hypothesised by Portney, is an empirical issue. A number of non-market valuation studies have found evidence that people hold existence values for the employment of others:

  - Johnson, F. and Desvouges, W. (1997) Estimating Stated Preferences with Rated-Pair Data: Environmental, Health and Employment Effects of Energy Programs. Journal of Environmental Economics and Management, 34, 75-99, estimated the non-market value of employment effects of energy programs.

[31] Boardman, A., Greenberg, D., Vining, A. and Weimer, D. (2001) *Cost-benefit analysis: concepts and practice*, Prentice Hall, New Jersey.
[32] Portney, P. (1994) The Contingent Valuation Debate: Why Economists Should Care, *Journal of Economic Perspectives* 8:4, 3-18.
[33] Rolfe and Bennett (2004) *Assessing Social Values for Water Allocation with the Contingent Valuation Method,* Valuing Floodplain Development in the Fitzroy Basin Research Reports, Research Report No. 11, Central Queensland University, Emerald.
[34] Freeman III, A. Myrick. (2003) *Economic Valuation: What and Why*. In A Primer on Non-market Valuation, Eds Champ, P., Boyle, K. and Brown, T. Kluwer Academic Publishers, London.

- Adamowicz, W., Boxall, P., Williams, M. and Louviere, J. (1998) Stated Preference Approaches to Measuring Passive Use Values: Choice Experiments Versus Contingent Valuation, American Journal of Agricultural and Economics, 80, 64-75, in a study on the protection of old growth forests included an attribute for forest industry employment losses.
- Morrison, M., Bennett, J. and Blamey, R. (1999) Valuing improved wetland quality using choice modelling, Water Resources Research (Vol. 35, No. 9, pp. 2805-2814) valued irrigation related employment losses as a result of wetland protection.
- Blamey, R., Rolfe, J., Bennett, J., and Morrison, M., (2000) Valuing remnant vegetation in Central Queensland using choice modelling, The Australian Journal of Agricultural and Resource Economics(44(3): 439-56) in a study of broadscale tree clearing in the Desert Uplands of Queensland, Australia included an attribute for jobs lost to the region.
- Do, T.N. and Bennett, J. (2007) Estimating Wetland Biodiversity Values: A Choice Modeling Application in Vietnam's Mekong River Delta, Australian National University, Economics and Environmental Network Working Paper estimated values for the number of farmers affected by a change in wetland management of Tram Chim.
- Othman, J., Bennett, J., Blamey, R. (2004) Environmental values and resource management options: a choice modelling experience in Malaysia, Environ. Dev. Econ. 9, 803–824, valued local employment losses from different conservation management strategies for the Matang Mangrove Wetlands in Perak State, Malaysia.
- Marsh, D. (2010) Water Resource Management in New Zealand: Jobs or Algal Blooms? Presented at the Conference of the New Zealand Association of Economists Auckland 2 July 2010, valued employment losses as a result of improvements in water quality in a dairy catchment in Waikato region of New Zealand the catchment.
- Longo A, Markandya A, Petrucci M (2008) The Internalization of Externalities in the Production of Electricity: Willingness to Pay for the Attributes of a Policy for Renewable Energy, Ecological Economics 67:140-152, in the context of renewable energy projects valued additional electricity sector jobs.
- Colombo, S., Hanley, N., and Requena, J.C. (2005) Designing Policy for Reducing the Off-farm Effects of Soil Erosion Using Choice Experiments, Journal of Agricultural Economics, 56(1), 81-96, valued local employment generated from watershed policies to reduce soil erosion.
- Caparrós A, Oviedo JL, Campos P (2008) Would you choose your preferred option? Comparing choice and recoded ranking experiments. Am J Agricult Econ 90(3):843–855, valued increases in local employment from a NP reforestation program.
- Windle, J. and Rolfe, J. (2014) Assessing the trade-offs of increased mining activity in the Surat Basin, Queensland: preferences of Brisbane residents using non-market valuation techniques, Australian Journal of Agricultural and Resource Economics, 58, pp. 111-129, valued jobs generated by mining developments in the Surat Basin, as well as social impacts of mining developments such as increased housing prices and increase wages in non-mining sectors.

- Three non-market valuation studies have found evidence that people in NSW hold existence values for the employment of others in coal mining projects:

  - Gillespie, R. (2009) Bulli Seam Operations Socio-Economic Assessment, prepared for Illawarra Coal Holdings Pty Ltd.
  - Gillespie, R. and Kragt, M. (2012) Accounting for non-market impacts in a benefit-cost analysis of underground coal mining in New South Wales, Australia, Journal of Benefit Cost Analysis, 3(2): article 4.
  - Gillespie, R. and Bennett, J. (2012) Valuing the Environmental, Cultural and Social Impacts of Open Cut Coal Mining in the Hunter Valley of NSW, Australia, Journal of Environmental Economics and Policy, Volume 1, Issue 3, 1-13.

- The values from these studies are summarised in Table A6.1.

Table A6.1 – Existence Values for Mine Employment

	Mean Implicit Price ($) (95% CI)	Aggregate WTP per Job Year ($) (95% CI)	Coal Mine	Reference
WTP per household per year for 20 years for each year the mine provides 320 jobs	$5.94 $4.96 to $7.22	$8,157 $3,659 to $5,326	Metropolitan Colliery	Gillespie (2009)
WTP per household (once-off) for each year the mine provides 1,170 jobs	$36.21 $29.89 to $43.97	$1,299 $1,037 to $1,578	Bulli Seam Operations	Gillespie and Kragt (2012)
WTP per household (once-off) for each year the mine provides 975 jobs	$27.45 $17.52 to $36.95	$3,546 $2,263 to $4,773	Warkworth	Gillespie and Bennett (2012)

*Implicit prices are aggregated to 50% of NSW households.

- These values are public good values i.e. they are the sum of values held by individual households in NSW. Comparison of public good values to private good values such as wages are meaningless.

- The motivation behind people's willingness to pay for the employment of others is unknown. Split sample analysis undertaken by Gillespie (2009) providing different information to survey respondents on the re-employment prospects of impacted workers did not impact household willingness to pay for the employment provided by the mine. It is possible that respondents were not concerned so much with the prospects of re-employment elsewhere in the economy or net employment impacts but with the 'forced' change to other people's employment. However, further investigation is required to unpack respondent motivations in relation to attributes representing employment.

- Notwithstanding the above justification for the inclusion of non-market employment values in BCA, it is recognised that some people view this as contentious and so the results of the BCA for the Project are reported "with" and "without" the non-use values for employment being included.

ATTACHMENT 7 – COMPANY TAX RATES AND DISTRIBUTION AMONG STATES

Effective Tax Rates for Mining Companies in Australia

- Company taxes represent part of the producer surplus benefit of mining projects that accrue to Australia.

- The current Australian Tax Office (ATO) corporate tax rate is 30% of taxable income but this is expected to be reduced to 28.5% as of 1 July 2015.

- NSW Treasury (2007) *Commercial Policy Framework: Guidelines for Financial Appraisal* requires the use of the prevailing corporate tax rate for government agencies and businesses.

- Financial Appraisal text books such as Mott (1997) *Investment Appraisal*, recommend the use of the full corporate tax rate.

- An analysis of ATO data by Dr Sinclair Davidson[35], Professor of Institutional Economics at RMIT University and a Senior Fellow at the Institute of Public Affairs found that the Australian mining industry pays corporate tax at a rate close to 30% of its taxable income.

- The Australia Institute (TAI) has questioned the use of the company tax rate when estimating the company tax generated from mining projects. One of the studies referred to by TAI that shows an effective tax rate of less than 30% e.g. Richardson and Denniss (2011)[36] calculates the effective tax rate for the mining sector in relation to Gross Operating Surplus (GOS) not taxable income. GOS does not consider the costs of production such as consumption of fixed capital, interest, royalties, land rent payments and direct taxes payable on inputs.

- The Australian Treasury[37] has rejected GOS as an appropriate denominator for estimating effective tax rates.

- The other study referred to by TAI to support its claim for effect tax rates of less than 30% is Markle and Shackelford (2009[38]). In response to the inappropriate quoting of this working paper the authors have issued a press release that states, among other things, that:

    - The purpose of the study was not to precisely calculate rates of tax paid but to provide a broad comparison of effective tax rates across countries. All numbers are appropriately interpreted on a relative – rather than absolute basis.
    - The version of the paper cited is a draft that has not been through a peer review process;
    - It is possible that the data for Australia represents average data for as few as four companies over a five year period. As such we reach no conclusion nor make any comments about individual industries in individual countries. Our purpose in producing the table was to make relative comparisons only;
    - The most recent draft of the report uses a different data source which did not have enough observations to include a number for the mining industry in Australia;
    - We have read the analysis of Professor Sinclair Davison and do not disagree with his conclusions.

[35] Davidson, S. (2014) *Mining Taxes and Subsidies: Official evidence*, A Minerals Council of Australia Background Paper.
[36] Richardson, D. and Denniss, R. (2011) *Mining the truth: The rhetoric and reality of the commodities boom*, prepared for The Australia Institute.
[37] Clark, J., B. Pridmore and N. Stoney. 2007. 'Trends in aggregate measures of Australia's corporate tax level', *Economic Roundup*, Winter, pp 1 – 28)
[38] Markle, K. and Shackelford, D. (2009) Do Multinationals or Domestic Firms Face Higher Effective Tax Rates? National Bureau Of Economic Research, Working Paper Series.

Distribution of Company Tax to NSW

- In Australia the Commonwealth Government collects over 80% of tax revenue but it is responsible for only half of government direct expenditure (Abelson 2012, p. 598[39]).

- State and territory governments raise about 15% of tax revenue but account for some 45% of government direct expenditure (Abelson 2012, p. 598).

- This Vertical Fiscal Imbalance is addressed via intergovernmental grants.

- In 2014/15 Taxation revenue estimate was $368,814M. The source of revenue is provided in Table A7.1.

Table A7.1 - Commonwealth Taxation Revenue by Source ($M)

Taxation Revenue Source	2014/15	%
Income and capital gains levied on individuals	188,050	51.0%
Income and capital gains levied on enterprises (including company tax)	83,140	22.5%
Taxes on employers payroll and labour	738	0.2%
Sales/goods and services tax	58,120	15.8%
Excises and levies	26,939	7.3%
Taxes on international trade	9,270	2.5%
Other sale of goods and services	2,557	0.7%
Total	**368,814**	**100.0%**

Source: Australian Government (2014) Budget 2014-15, http://www.budget.gov.au/2014-15/index.htm.

- The category of Income and capital gains tax levied on enterprises (in Table A7.1) includes company tax, FBT, superannuation taxes, MRRT and the Petroleum resource rent tax. In 2012/13, when these items were reported separately in the Commonwealth Budget Papers, 84% of this category of revenue was from company tax. These proportions are relatively stable over time (refer to Figure 10 in 2012/13 Budget Papers).

- The Commonwealth provides funding to the States and Territories, in key sectors such as health, education, community services and affordable housing, and deliver productivity-enhancing projects and reforms in sectors including infrastructure, and skills and workforce development (Budget papers). In 2014-15, the Commonwealth proposed to provide the States and Territories with payments totalling $101.1B comprising:

  - $46.3B in payments for specific purposes; and
  - $54.9 in general revenue assistance, comprising GST payments of $53.7B and other general revenue assistance of $1.2B.

[39] Abelson, P. (2012) Public Economics: Principles and Practice, McGraw Hill, Australia.

Table A7.2 – Commonwealth Payments to the States (2014-15)

$million	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Total
2014-15									
Payments for specific purposes(a)	13,654	11,166	9,792	5,313	3,171	1,039	755	1,041	46,285
General revenue assistance(b)	16,808	11,853	11,736	2,310	4,956	1,911	1,137	3,166	54,861
Total payments to the States	30,462	23,019	21,527	7,623	8,128	2,950	1,892	4,207	101,147

(a) As State allocations for a small number of programmes have yet to be determined, these payments are not reflected in State totals. As such, total payments for specific purposes will not equal the sum of State totals.

(b) As State allocations for royalties are not published due to commercial sensitivities, these payments are not reflected in State totals. As such, total general revenue assistance will not equal the sum of the State totals.

Source: Australian Government (2014) Budget 2014-15, http://www.budget.gov.au/2014-15/index.htm.

- Payments for specific purposes are funded from revenue sources other than GST. Company tax makes up 22% of this remaining revenue. NSW share of total Commonwealth payments for specific purposes is 13,654/46285 = 29%, so an estimate of company tax redistributed to NSW is 22%*29% i.e. 7%.

- This is a conservative estimate. A higher proportion occurs if it is assumed that all payments for special purposes arise from company tax revenue alone rather than the pool of revenue after adjustment for GST.

ATTACHMENT 8 – THE GRIT SYSTEM FOR GENERATING 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 other 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 A8.1 (Powell and Chalmers, 1995).

Table A8.1
The GRIT Method

Phase	Step	Action
PHASE I		ADJUSTMENTS TO NATIONAL TABLE
	1	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).

REFERENCES

Bayne, B. and West, G. (1988) *GRIT – Generation of Regional Input-Output Tables: Users Reference Manual*. Australian Regional Developments No. 15, Office of Local Government, Department of Immigration, Local Government and Ethnic Affairs, AGPS.

Jensen, G. (1980) The concept of accuracy in regional input-output models. *International Regional Science Review*, 5:2, pp.139-54.

Powell, R. and Chalmers, L. (1995) *The Regional Economic Impact of Gibraltar Range and Dorrigo National Park*. A Report for the NSW National Parks and Wildlife Service.

ATTACHMENT 9 – STUDIES ON THE FLOW-EMPLOYMENT OF THE MINING INDUSTRY

Mining projects provide direct employment opportunities in regional economies. In addition, expenditure on inputs to production and by employees can provide flow-on employment in other sectors of the economy.

All other things being equal, the flow-on employment arising from a project will depend on:

- the expenditure profile associated with a project;
- the size of the regional economy and the ability of local businesses to supply inputs to production demanded by mine proponents;
- the residential location of employees and whether they migrate into the region or already live there and were previously employed or unemployed.

Estimated flow-on employment will also vary based on the modelling approach used i.e. whether primary IO analysis has been undertaken or whether multipliers have been obtained from other studies, and which type of multiplier has been used e.g. Type 1A, Type 1B, Type 11A or Type 11B.

A number of studies have examined the flow-on impacts of mining projects on regional economies and the NSW economy. The results are summarised in Table A9.1.

These studies indicate that:

- for every direct job in mine construction total regional employment impacts range from 1.5 to 1.89; and
- for every operational job total regional impacts range from 1.70 to 4.79.

Table A9.1 – Flow-on Employment of Mining Projects

Construction or operation	Full-time equivalents or Full-time/part time	IIA Multiplier	Method	Region	Project	Reference
Construction	Unspecified	2.73	Borrowed	NSW	Angus Place	Aegis Group (2014)
Construction	Unspecified	4.71	Borrowed	NSW	Bulga Optimisation	Economic Consulting Services (2012)
Construction	Unspecified	1.59	Borrowed	Broke/Bulga	Bulga Optimisation	Economic Consulting Services (2012)
Construction	Unspecified	1.89	Borrowed	Newcastle, Maitland, Cessnock, Singleton, Muswellbrook	Bulga Optimisation	Economic Consulting Services (2012)
Construction	FTE	1.50	IO	Hunter Region	Warkworth Extension Project	Hunter Valley Research Foundation (2009)
Construction	FTE	1.62	IO	Hunter Region	Warkworth Extension Project	Hunter Valley Research Foundation (2009)
Operation	FTE	6.05	IO	NSW	Warkworth and Mount Thorley	BAE (2014)
Operation	Unspecified	3.50	Borrowed	NSW	Bulga Optimisation	Economic Consulting Services (2012)
Operation	Unspecified	3.98	Borrowed	NSW	Angus Place	Aegis Group (2014)
Operation	FTE	4.79	IO	Upper and Mid Hunter	Warkworth and Mount Thorley	BAE (2014)
Operation	FTE	2.37	IO	Singleton LGA	Warkworth and Mount Thorley	BAE (2014)
Operation	Unspecified	1.49	Borrowed	Broke/Bulga	Bulga Optimisation	Economic Consulting Services (2012)
Operation	Unspecified	1.70	Borrowed	Newcastle, Maitland, Cessnock, Singleton, Muswellbrook	Bulga Optimisation	Economic Consulting Services (2012)
Operation	FTE	4.27	Borrowed	Hunter Region	Warkworth Extension Project	Hunter Valley Research Foundation (2009)
Operation	FTE	3.94	IO	Hunter Region	Warkworth Extension Project	Hunter Valley Research Foundation (2009)
Operation	FTE	2.94	IO	Hunter Region	Bloomfield Collieries	Hunter Valley Research Foundation (2008)

References:

Aegis Group (2014) Angus Place Colliery Extension Project, Economic Impact Assessment
Economic Consulting Services (2012) BCM Optimisation Project: Economic Impacts.
Hunter Valley Research Foundation (2009) An Economic Assessment of the Warkworth Coal Resource.
BAE (2014) Economic Impact of Warkworth Continuation 2014 and Mount Thorley Operations 2014,
Hunter Valley Research Foundation (2008) Client briefing: An economic assessment of Bloomfield Collieries, Hunter Region, NSW

ATTACHMENT 10 – GUIDELINE TO ROYALTY CALCULATIONS

- Royalty for coal is charged as a percentage of the **value of production**.
- The **value of production** is equal to the total revenue from the sale of the coal less allowable deductions.
- Deductions will differ from mine to mine.
- Allowable deductions include:
  - Beneficiation costs at a rate of:
    - $3.50 per tonne for coal which has been subject to a full cycle of washing;
    - $2.00 per tonne for coal which has been subject to a simple washing process such as wet jigging;
    - $0.50 per tonne for coal which has been crushed and screened but not subject to a washing process.
  - Levies
    - Coal research levy at $0.04545455/tonne of product coal.
    - Mine Subsidence Levy – the levy rate payable to the Mine Subsidence Compensation Fund for individual underground mines is prescribed in the Mine Subsidence Compensation Regulation 2012. Rates are in relation to each dollar of the land value of a colliery holding. Rates vary from $0.00132 to $0.39006 per dollar of land value.
    - Mines Rescue Levy prescribed under the *Coal Industry Act 2001*.
    - Commonwealth Levy for Long Service Leave is required under the *Coal Mining Industry (Long Service Leave) Payroll Levy Act 1992* (Commonwealth). The levy is a prescribed under the *Coal Mining Industry (Long Service Leave) Payroll Levy Regulations 1993* as 2.7% of eligible wages paid.
  - Bad debts
- The coal ad valorem royalty rates are 6.2% for deep underground mines (coal extracted below 400 metres), 7.2% for underground mines and 8.2% for open cut mines[40]. These rates are applied to the **value of production,** which is the sale value of coal less deductions.
- A sample spreadsheet for the estimation of coal royalties in NSW is provided by the NSW Industry and Investment at the following web address www.resourcesandenergy.nsw.gov.au/__data/assets/excel_doc/0004/434416/Monthly-Ad-Valorem-Coal-31122008-.xls
- Deductions have very little impact on the total estimate of royalties at any given assumed coal price as they reduce the **value of production** that royalty rates are applied to. They are not deducted from the royalty estimates themselves as has been claimed by TAI in submissions to previous mining projects.

[40] Royalty is also payable if the coal reject is used or disposed of for the purpose of producing energy. Coal reject is defined as a by-product of the mining or processing of coal that has energy value of less than 16 gigajoules per dry tonne or contains more than 35% ash by dry weight. The rate of royalty on coal in coal reject is no more than half the rate applicable to coal.

- The main influence of deductions on the **value of production**, to which the royalty rate is applied, is the level of Beneficiation. The impact of different levels of Beneficiation on the effective royalty rate for a 5 Mtpa coal mine is provided in Table A10.1[41].

Table A10.1 – Effective Royalty Rate for a 5Mtpa Coal Mine Under Different Levels of Beneficiation

SCENARIO	OPEN CUT	UNDERGROUND MINE
BASE ROYALTY RATE	8.2%	7.2%
100% CRUSHED AND SCREENED ONLY	8.1%	7.1%
100% SIMPLE WASH	8.0%	7.0%
100% FULL WASH	7.9%	6.9%

- TAI's claim in submissions to previous mining projects that allowance for deductions can reduce the estimate of royalties from a project by 50% is incorrect.

- Including an allowance for deductions reduces estimated royalties by between 1% and 5%.

[41] Assuming 5 Mtpa of thermal product coal, a coal price of AUD$100/t, employment of 450 with an average wage of $120,000 per annum, land value of $20M and a mine subsidence levy for underground mining of $0.19.