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Economic Impact Assessment

BYLONG COAL PROJECT
Environmental Impact Statement

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Bylong Coal Project

Economic Impact Assessment

Prepared for

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EXECUTIVE SUMMARY

This Economic Impact Assessment relates to the preparation of each of the following types of analyses of the Bylong Coal Project (the Project):

- A Benefit Cost Analysis (BCA) of the Project;
- A regional impact analysis of the Project using input-output (IO) analysis for two regions:
  - The regional economy of the Mid-Western Regional Local Government Area (LGA); 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 $596M. This is 37 times the net production benefits of displaced agriculture. Provided the residual environmental, social and cultural impacts of the Project that accrue to Australia are considered to be valued at less than $596M, 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 and historic heritage impacts. These impacts to Australia are estimated at $4M, 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 $165M. Overall, the Project is estimated to have net social benefits to Australia of between $592M and $757M 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 $592M and $757M 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:

- KEPCO in the form of residual net production benefits[1] (after company tax, royalties and VPA payments);

[1] It should be noted that this is not equivalent to profit and hence should not be used to infer profitability of the Project. It is a residual amount after royalties, company tax and the costs of the Voluntary Planning Agreement are subtracted from the estimated producer surplus of the Project.

- the Commonwealth Government in the form of any Company tax payable ($302M present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area[2];
- the NSW Government via royalties ($290M 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 ($4M present value) in the form of voluntary contributions to community infrastructure and services.

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

Greenhouse gas impacts occur across all scales - local, State, National and global - and remain uncompensated. Impacts on ecology, Historic heritage and Aboriginal heritage potentially occur at the local, State and National levels. However, ecological impacts would be counterbalanced by the Project biodiversity offsets. Similarly Aboriginal heritage impacts and Historic heritage impacts will be reduced to some extent by the mitigation strategies in the Aboriginal Archaeological and Cultural Heritage Management Plan and Historic Heritage Management Plan. Any nonmarket benefits associated with employment provided by the Project would largely accrue at the local or State level[3].

Other potential impacts of the Project - agricultural, noise, blasting, air quality, surface and groundwater, road transport and visual impacts - primarily occur at the local level, with costs incorporated into the estimate of net production benefits via acquisition costs of affected properties, acquisition of Water Access Licences and impact mitigation costs. All of these measures mean that those who experience costs have them either mitigated or compensated.

Overall the Project is estimated to have net social benefits to Australia of between $592M and $757M and hence is desirable and justified from an economic efficiency perspective. 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

The 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 during the peak year of construction:

- $297M in annual direct and indirect regional output or business turnover;
- $104M in annual direct and indirect regional value added;
- $55M in annual direct and indirect household income; and
- 863 direct and indirect jobs.

The Project operation is estimated to make up to the following direct and indirect average annual contribution to the regional economy[4] for approximately 23 years:

[2] Note that the company tax rate used in modelling is 28.5% which reflected the expected tax regime as of 1 July 2015. The Commonwealth Government has now adjusted its policy and company tax rates applicable to KEPCO are expected to remain at 30%. 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 7.
[3] It should be noted that the study from which the employment values were transferred, surveyed NSW households only.
[4] Comprising the Local Government Area of Mid-Western Regional Council.

- $624M in annual direct and indirect regional output or business turnover;
- $378M in annual direct and indirect regional value added;
- $72M in annual direct and indirect household income; and
- 830 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 23 years:

- $855M in annual direct and indirect regional output or business turnover;
- $492M in annual direct and indirect regional value added;
- $135M in annual direct and indirect household income; and
- 1,496 direct and indirect jobs.

While the Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.5% and 5.6% of the regional economic activity impacts of the Project.

Fiscal Benefits of Project to Government

The main fiscal benefit of the Project to Governments is:

- $302M (present value) to the Commonwealth Government in company tax;
- $109M (present value) to the Commonwealth Government in personal income tax from Project employees;
- $290M (present value) in royalties to the NSW Government;
- $21M (present value) in payroll tax to the NSW Government.

Significance of the Resource

With regard to the Mining SEPP heads of consideration:

- the resource proposed to be mined is 124 Million tonnes (Mt) of Run of Mine (ROM) coal with product coal being 89% low ash and 11% high ash.
- the Project is a greenfield development in an area which has been recognised to contain a valuable coal resource for more than 30 years, rather than an extension to an existing mine.
- numerous sectors in the regional economy are likely to develop some dependence on the Project as it is expected that all of the operational workforce will live in the region, and hence a material component of their expenditure would flow-on to local businesses. Similarly, a proportion of KEPCO's operational expenditure is likely to be spent in the region with local firms.
- the Project will provide employment opportunities for a direct peak Full time Equivalent (FTE) workforce of up to 800 during construction, or an annual average of 466 in the peak year of construction. During operation, the Project will provide direct employment for up to 470 workers with an average annual direct workforce of 290. 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 $1.3B.
- the Project will generate royalties of $763M in total or $290M present value.

1 INTRODUCTION

1.1 Background

In December 2010 KEPCO Bylong Australia Pty Ltd (KEPCO) acquired Authorisations (A) 287 and 342. Since this time, extensive exploration and mine planning work has been undertaken to determine the most socially and environmentally responsible and economically viable mine plan to recover the known coal resources within the two Authorisations.

In August 2014 KEPCO commissioned WorleyParsons Services Pty Ltd (WorleyParsons) to manage the Project exploration activities, mine feasibility study planning, environmental approvals and ongoing environmental monitoring for the Bylong Coal Project (the Project).

The Project is located wholly within A287 and A342 which are located within the Mid-Western Regional Council (MWRC) Local Government Area (LGA). The closest regional centre is Mudgee, located approximately 55 km south-west of the Project Boundary. The Project is approximately 230 km by rail from the Port of Newcastle. Figure 1.1 illustrates the locality of the Project within New South Wales (NSW). Figure 1.2 shows the regional locality of the Project in relation to the neighbouring town centres, mining authorities, major transport routes and reserves.

KEPCO is seeking State Significant Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the development and operation of the Project. The State Significant Development Application will be supported by an Environmental Impact Statement (EIS) which is being prepared by Hansen Bailey.

1.2 Scope of Economic Assessment

An economic impact assessment is required as part of the EIS. Gillespie Economics has been engaged by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of KEPCO to complete an economic impact assessment for the Project.

This Economic Impact Assessment has been carried out in accordance with:

- the Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 11 November 2014, that relate to economics i.e:
  - The reasons why the development should be approved having regard to biophysical, **economic** and social considerations, including the principles of ecologically sustainable development.
  - An assessment of the likely economic impacts of the development, paying particular attention to:
    - the significance of the resource:
    - economic benefits of the project for the State and region; 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 MWRC LGA; 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 Impact Assessment is based.

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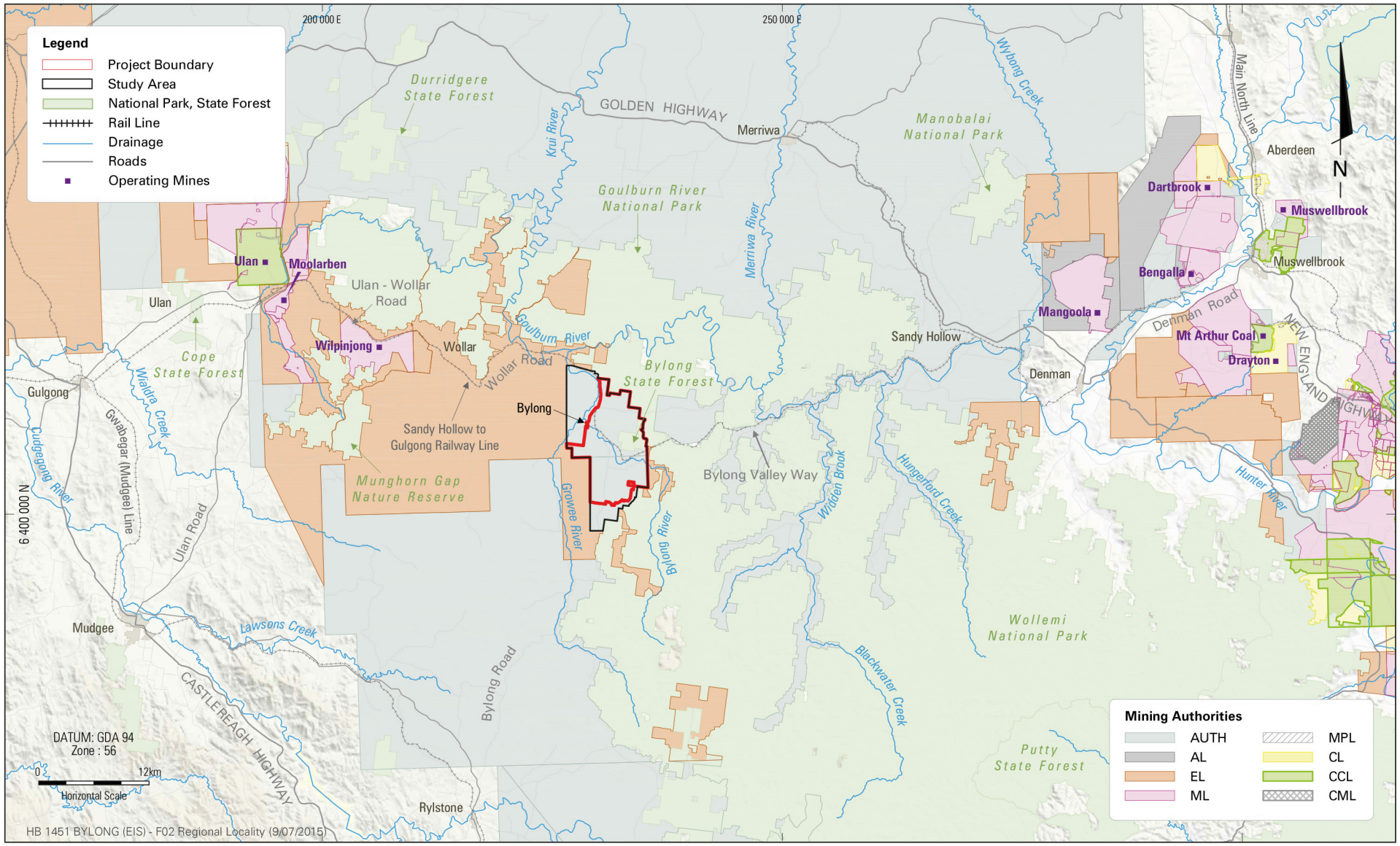
Project Locality

FIGURE 1.1



BYLONG COAL PROJECT

Regional Locality

FIGURE 1.2

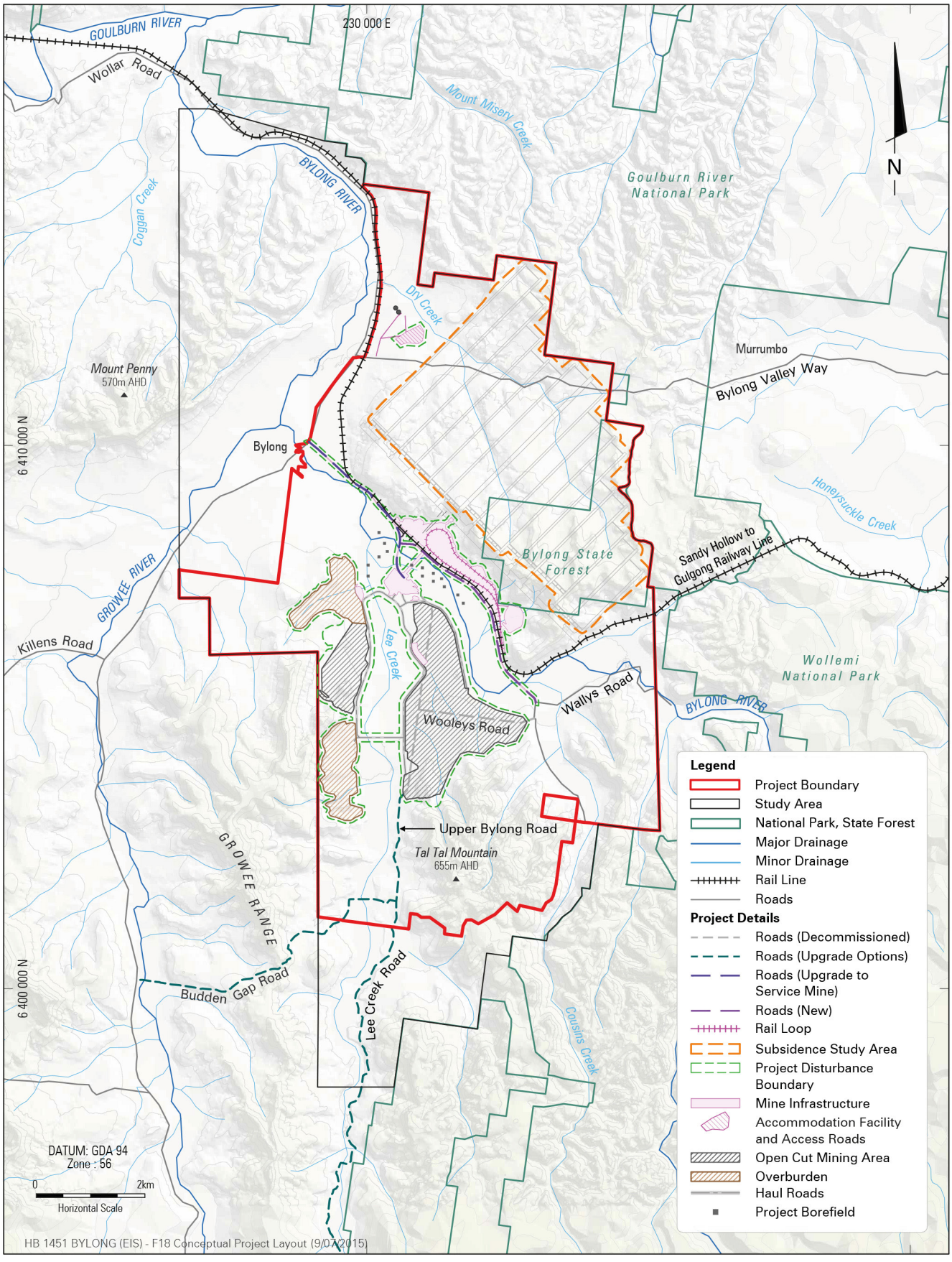
2 PROJECT DESCRIPTION

2.1 Project Scope

The Project life is anticipated to be approximately 25 years, comprising a two year construction period and a 23 year operational period, with underground mining operations commencing in Year 7. Various rehabilitation and decommissioning activities will be undertaken during both the course of, and following the 25 years of the Project. It is noted that further mineable coal resources exist within both A287 and A342.

The Project is to be developed on land within the Project Boundary as illustrated on Figure 2.1. Key features of the Project are conceptually shown on Figure 2.1 and include:

- The initial development of two open cut mining areas with associated haul roads and Overburden Emplacement Areas (OEAs), utilising a mining fleet of excavators and trucks and supporting ancillary equipment;
- The two open cut mining areas will be developed and operated 24 hours a day, 7 days a week over an approximate 10 year period and will ultimately provide for the storage of coal processing reject materials from the longer term underground mining activities;
- Construction and operation of administration, workshop, bathhouse, explosives magazine and other open cut mining related facilities;
- Construction and operation of an underground coal mine operating 24 hours a day, 7 days a week for a 20 year period, commencing mining in around year 7 of the Project;
- A combined maximum extraction rate of up to 6.5 Million tonnes per annum (Mtpa) Run of Mine (ROM) coal;
- A workforce of up to approximately 800 during the initial construction phase and a peak of 470 full-time equivalent operations employees at full production;
- Underground mining operations utilising longwall mining techniques with primary access provided via drifts constructed adjacent to the rail loop and Coal Handling and Preparation Plant (CHPP);
- The construction and operation of facilities to support underground mining operations including personnel and materials access to the underground mining area, ventilation shafts, workshop, offices and employee amenities, fuel and gas management facilities;
- Construction and operation of a CHPP with a designed throughput of approximately 6 Mtpa of ROM coal, with capacity for peak fluctuations beyond this;
- The dewatering of fine reject materials through belt press filters within the CHPP and the co-disposal of dewatered fine and coarse reject materials within OEAs and final open cut voids (avoiding the need for a tailings dam);
- Construction and operation of a rail loop and associated rail load out facility and connection to the Sandy Hollow to Gulgong Railway Line to facilitate the transport of product coal;
- The construction and operation of surface and groundwater management and water reticulation infrastructure including diversion drains, dams (clean, dirty and raw water), pipelines and pumping stations;
- The installation of communications and electricity reticulation infrastructure;
- Construction and operation of a Workforce Accommodation Facility (WAF) and associated access road from the Bylong Valley Way;
- The upgrade of Upper Bylong Road and the construction and operation of a Mine Access Road to provide access to the site facilities;
- Relocation of sections of some existing public roads to enable alternate access routes for private landholders surrounding the Project; and
- Infilling of mining voids, progressive rehabilitation of disturbed areas, decommissioning of Project infrastructure and rehabilitation of the land progressively following mining operations.



BYLONG COAL PROJECT

Key Features of the Project

FIGURE 2.1

For the purpose of the Economic Impact Assessment of the Project, a production profile over time was assumed that ramps up in the early years of operations and ramps down in the latter years, with average annual ROM coal production of approximately 5.4 Mtpa. The indicative production schedule on which the Economic Impact Assessment is based is provided in Table 2.1.

Table 2.1 - Indicative Production Schedule

Project Year	Indicative Year	Open Cut ROM Coal (Mt)	Underground ROM Coal (Mt)	Product Coal (Mt)
3	2018	4.0		2.2
5	2020	5.5		4.3
7	2022	5.0	0.5	4.5
9	2024	3.2	3.3	4.1
12	2027		6.0	4.5
16	2031		5.6	4.9
18	2033		6.3	3.6
21	2036		5.3	3.2
25	2040		6.0	4.1

The technical assessments of environmental, cultural and social impacts on which the Economic Impact Assessment relies were based on maximum levels of ROM coal production of 6.5 Mtpa.

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.

Subsidence

A number of natural and built features have been identified within or in the vicinity of the Subsidence Study Area, including streams, cliffs, steep slopes, local roads, drainage culverts, powerlines, copper telecommunications cables, a quarry, rural building structures, farm dams, archaeological sites, and survey control marks. No privately owned residences occur within the Subsidence Study Area.

To mitigate and manage predicted subsidence related impacts, an Extraction Plan (as required by conditions of Development Consent) will be developed to manage the Project's subsidence impacts. Management measures to be included within the Extraction Plan which will be determined in consultation with the relevant regulatory authority will include (at least):

- Visual monitoring of the surface in the active subsidence zone to identify the presence of material surface cracking and deformations to establish methods for surface remediation. Remediation may include infilling of surface cracks with soil or other suitable materials, or by locally regrading and compacting the surface.
- Remediation of subsidence related impacts to the Bylong Valley Way road pavement and associated drainage structures.
- Re-grading of the drainage lines in the locations where material impacts occur and in areas where ponding needs to be managed; and
- Erosion protection measures as required to stabilise the steeper slopes in the longer term.

Predicted subsidence impacts to specific areas of technical study are discussed within each of these impact assessments completed for the EIS and summarised (as relevant) in the below sections.

Agricultural Production

The areas of agricultural land within the Study Area that are directly affected by the Project are identified in Table 2.2. The Agricultural Impact Statement has predicted that there will be no nett loss to the agricultural land capability on the land overlying the Subsidence Study Area (Scott Barnett and Associates, 2015).

Table 2.2 - Impacted Agricultural Land in the Study Area

Agricultural Domains	Description	Study Area		Project Disturbance Boundary	
		Area (ha)	Area (%)	Area (ha)	Area (%)
A	Arable land- Land suitable for high impact land uses such as cropping including; irrigated cropping; fodder cropping; and improved pastures for grazing. Careful management of limitations is still required for intensive cropping and grazing to avoid environmental degradation.	3,975	39	451	39
B	Extensive Grazing Land –lower slopes and hill grazing, suitable for grazing activities. Some occasional cultivation for fodder and improved pasture establishment may be undertaken on the lower slopes. Not suitable for high intensity agricultural activities such as regular cropping. Specialised management practices required to prevent long-term degradation.	3,805	37	694	60
C	Heavily Timbered - Low carrying capacity, dense vegetation, steep slope and stoniness limit agricultural activities. Domain has limited agricultural value and is generally suited to nature conservation.	1,919	19	15	1
D	Non-agricultural use	618	6	0	0
Total		**10,317**	**100**	**1,160**	**100**

Source: Scott Barnett and Associates (2015)

The Project is located on land subject to the Upper Hunter Strategic Regional Land Use Plan (SRLUP). The Project Disturbance Boundary includes approximately 440.8 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.

A Biodiversity Offsets Strategy (BOS) has also been developed for the Project, of which 2,226 ha is located within the Study Area, and an additional 1,856 ha is located on land beyond the Study Area but within a 10 km radius of the Project Boundary (Cumberland Ecology 2015b). Refer to Table 2.3.

Table 2.3 - Biodiversity Offset Agricultural Domains

Agricultural Domains	Description	Biodiversity Offset Areas		Total Offset Area to be managed for Biodiversity Value	
		(ha)	(%)	(ha)	(%)
A	Arable land- Land suitable for high impact land uses such as cropping including; irrigated cropping; fodder cropping; and improved pastures for grazing. Careful management of limitations is still required for intensive cropping and grazing to avoid environmental degradation.	1,440	35	1,158	30
B	Extensive Grazing Land –lower slopes and hill grazing, suitable for grazing activities. Some occasional cultivation for fodder and improved pasture establishment may be undertaken on the lower slopes. Not suitable for high intensity agricultural activities such as regular cropping. Specialised management practices required to prevent long-term degradation	1,318	32	1,318	35
C	Heavily Timbered - Low carrying capacity, dense vegetation, steep slope and stoniness limit agricultural activities. Domain has limited agricultural value and is generally suited to nature conservation.	1,324	32	1,324	35
Total		**4,082**	**100**	**3,800**	100

Source: Scott Barnett and Associates (2015)

Temporary disturbance impacts will be effectively handled through surface remediation works and rehabilitation works with the impacted land returned to pre-mining condition that is capable of sustaining current land uses.

Direct and permanent (long-term) disturbance impacts on BSAL will be mitigated through the re-creation of BSAL on rehabilitated land. There will be no reduction in the area of BSAL at the completion of mining operations.

Direct and permanent disturbance impacts on the better quality classes of agricultural land (i.e. Land and Soil Classification (LSC) Classes 3 and 4) will be mitigated through the reinstatement of an equivalent amount of this land on the rehabilitated landform.

Overall, there will a spatial change in the distribution of LSC classes with a marginal increase in LSC Class 3 and a marginal decrease in LSC Class 5 within the Project Boundary.

Operational Noise

As a result of the originally predicted noise impacts, noise mitigation measures were further investigated. The investigated considered up to 18 different scenarios including mitigation of sources and the propagation path. Each mitigation scenario was considered for implementation where feasible and reasonable. The adopted noise mitigation measures were:

- Mitigation of fixed and mobile plant sources including excavators, FELs, haul trucks, dozers, long haul dumps, water carts, sizers, crusher, CHPP, transfer stations, ventilation fans and compressors.
- Alteration of haul route and waste emplacement activities for some activities from the north west overburden emplacement area (NW OEA) to the south west overburden emplacement area (SW OEA) from the western open cut mining area (Western Open Cut) during the day under adverse weather conditions.
- Alteration of haul route and waste emplacement activities from the NW OEA to the SW OEA from the Western Open Cut and eastern open cut mining area (Eastern Open Cut) during the night under adverse weather conditions.

The Noise and Blasting Impact Assessment concluded that with the adopted noise mitigation measures, 12 receivers were predicted to be residually affected greater than the relevant assessment criteria (PEL, 2015). Three receivers are predicted to be significantly impacted (receivers 60, 63 and 69), six moderately impacted (receivers 58, 65A, 68, 141, 151 and 158) and impacts were negligible at three (receivers 56, 57A and 57C).

In accordance with the requirements of the *Voluntary Land Acquisition and Mitigation Policy* (DP&E, 2014), the moderately impacted receivers will be subject to voluntary at-property mitigation rights. Significantly impacted receivers will be subject to voluntary at-property mitigation or acquisition rights.

A Noise and Blasting Management Plan will be developed for the Project in consultation with the relevant regulators for construction and operational activities associated with the Project. The Noise and Blasting Management Plan will include a monitoring program including a system of real-time unattended and attended noise monitoring. In addition, the use of predictive meteorology is recommended to allow for operational alterations when adverse conditions are predicted.

Blasting

The Noise and Blasting 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 (PEL, 2015).

A Noise and Blasting Management Plan will be developed for the Project in consultation with the relevant regulators for construction and operational activities associated with the Project.

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).

An Air Quality and Greenhouse Gas Management Plan will be developed for the Project in consultation with the relevant regulators for construction and operational activities associated with the Project. Specific management measures to will include:

- Leading practice dust management for the Project through the use of a real-time and proactive dust management system to minimise dust impacts at privately-owned receivers to the greatest practical extent (detailed in Air Quality and Greenhouse Gas Management Plan);
- The existing meteorological and air quality monitoring includes a TEOM which continuously records concentrations of PM_{10} and $PM_{2.5}$ in the vicinity of the current site office. This will be relocated or augmented with (at least) one additional continuous monitor in Bylong Village and used for real-time dust management; and
- Development of a Blast Fume Management Strategy which will be appended to the Blast Management Plan to address factors known to contribute to fume generation, including geology, meteorological conditions, blast design, product selection, quality and blast crew education, on bench practices and emergency response procedures.

Greenhouse Gases

The Project is predicted to generate in the order of 2.2 Mt of direct carbon dioxide equivalent (CO_2-e) emissions associated with mining (Scope 1 emissions) over the lifetime of the Project. Approximately 1.3 Mt of indirect (Scope 2) CO_2-e emissions associated with on-site electricity consumption and 0.5 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 202.5 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 753 hectares [ha]) and a gain in carbon sequestration as a result of improving the value of vegetation within the biodiversity offsets (Cumberland Ecology 2015a).

A number of measures to minimise greenhouse gas (GHG) emissions will 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 KEPCO annually estimates GHG emissions and energy consumption in accordance with National Greenhouse and Energy Reporting and Energy Efficiency Operations requirements (PEL, 2015).

Water

The Project Boundary is located within the catchment of the Bylong River, a tributary of the Goulburn River, which in turn is a tributary of the Hunter River. The Bylong River drains generally northwards, from the south-east of the Project northwards through the Project Boundary where it joins with the Goulburn River. A number of tributaries feed into the Bylong River throughout the Project Area, including:

- Wattle Creek;
- Cousins Creek;
- Lee Creek;
- Growee River;
- Dry Creek; and
- Coggan Creek (WRM, 2015).

The surface water and alluvial groundwater resources within the Bylong River catchment are managed under Bylong River Water Source of the *Hunter Unregulated and Alluvial Water Sharing Plan 2009* (Hunter Unregulated WSP). The report card for the Bylong River Water Source indicates the area has a total entitlement of 5,843 ML/year which are noted for irrigation purposes. There are 23 groundwater licences and 2 surface water licences in the area for agricultural purposes which is primarily extracted from the Quaternary alluvium and associated surface water. KEPCO has secured 2,535 units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP.

During active mining operation, the mine water management system will capture runoff from areas that would have previously flowed to the receiving waters of Bylong River, Lee Creek and Growee River. The maximum catchment area captured within the mine water management system during active mining operations represents less than 1.3% of the Bylong River catchment; approximately 5.8% of the Lee Creek catchment and less than 0.1% of the Growee River catchment. This represents a small proportion of the total catchment runoff. Surface water captured by the Project from the Bylong River Water Source will be managed according to the requirements of the Water Management Act 2000 as discussed further in the Surface Water Impact Assessment (WRM, 2015).

The groundwater modelling undertaken for the Project has predicted a zone of depressurisation within the Permian coal seam and a zone of drawdown within the alluvial aquifer around the proposed open

cut and underground mining operations. No licenced bores on privately owned land are predicted to be significantly impacted by the Project's groundwater impacts. Therefore, the predicted declines in groundwater levels within the coal seams and within the alluvium has no consequences for private groundwater users and is therefore not considered to a '*significant impact on water resources*' as defined by the Department of Environment's "*Significant impact guidelines 1.3: Coal seam gas and large coal mining developments—impacts on water resources* (DoE, 2013).

It is predicted that pumping will be required from a borefield constructed within the alluvium throughout the life of the Project in order to supplement water supplies within the water management system for the continued operation of the CHPP. Water balance modelling indicates that the water management system will be required to extract up to 931 ML in the initial open cut years from the borefield under an average water balance scenario with demands reducing once the underground mining operations commence.

In addition to the pumping of water from the borefield, the groundwater model has predicted the annual total water take from the alluvial groundwater systems due to mining, averages 153 ML/year (peak of 295 ML/year) with an average total of 3,829 ML over the life of the Project (AGE, 2015). The extensive pumping required from the borefield during the early stages of the Project depressurises the alluvium and results in an increase in flow from the Permian to the alluvium aquifer to a peak of -71 ML/year during Project Year 3. As open cut mining operations progress, the Permian is depressurised around the open cut mining areas, reducing this effect and leading to a reduction in flow from the Permian to the alluvial aquifer.

KEPCO holds sufficient entitlements to account for its predicted water take and water uses from the Bylong River Water Source under average conditions, even if the available water determination (AWD) reduces to less than 80% (AGE, 2015). KEPCO will seek the appropriate water licence under the *Water Act 1912* for its predicted impacts on the Permian coal seam aquifers.

Ecology

The Project Disturbance Boundary will result in the clearing of up to 753 ha of native vegetation including several communities listed as Threatened Ecological Communities (TECs) under the *NSW Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This includes approximately 206 ha of TSC Act listed Box Gum Woodland and Derived Native Grassland, 135 ha of EPBC Act listed Box Gum Woodland and 11 ha of TSC Act listed Hunter Valley Footslopes Slaty Gum Woodland (Cumberland Ecology, 2015).

Additional indirect impacts on the ecological values of remaining vegetation and habitat within the Study Area, include subsidence, fragmentation, edge effects, alteration to wildlife corridors, alteration to hydrological regimes and changes to weed occurrence and feral animal abundance (Cumberland Ecology, 2015).

There will potentially be impacts on a number of flora and fauna species that are known to occur or have been recorded within the Study Area. The woodland vegetation within the Project Boundary provides habitat for a range of threatened species, including numerous threatened flora and fauna species as listed under the TSC Act and/or EPBC Act. A total of seven threatened flora species have known habitat within the Study Area and a further eight have potential habitat. A total of 19 listed fauna species have known habitat within the Study Area and a further 26 have potential habitat.

The Project includes a range of avoidance, mitigation and offset measures. Avoidance measures include significant modifications to the design of the Project to improve biodiversity outcomes. Mitigation measures include the preparation of a Biodiversity Management Plan (BMP) prior to the commencement of construction, to coordinate the implementation of the ecological mitigation measures proposed for the Project including:

- Dust Minimisation to reduce the indirect impacts on vegetation condition and the habitat quality for all native species;
- Noise Minimisation to reduce the potential for disturbance of animals in habitat patches around the Project;
- Visual and lighting management to reduce the potential for disturbance of nocturnal animals via night light emissions around the Project;
- Due diligence inspections for proposed disturbance areas to limit vegetation and habitat loss and as far as practical and ensure safe removal of fauna as required prior to any disturbance occurring;
- Removal (and relocation where practicable) of key habitat features such as tree hollows from the Disturbance Areas;
- Progressive rehabilitation of disturbed areas;
- Implementing a monitoring program and appropriate reference sites; and
- Aquatic mitigation measures relating to ground movements and management of surface water, erosion and sedimentation.

A substantial BOS has also been proposed to offset the predicted residual impacts of the Project. The BOS will protect approximately 3,684 ha of native vegetation. This includes a total of 1,509 ha of TSC Act listed Box Gum Woodland and Derived Native Grassland, 1,271 ha of EPBC Act listed Box Gum Woodland and Derived Native Grassland and 411 ha of TSC Act listed Hunter Valley Footslopes Slaty Gum Woodland. The BOS includes significant areas of known and potential habitat for the suite of Threatened flora and fauna species predicted to be impacted by the Project.

Road Transport

The Traffic Impact Assessment found that the Project will have a minimal impact on the surrounding road network in terms of road traffic. The Bylong Valley Way, Upper Bylong Road and Wollar Road will continue to operate within substantial spare capacity available in the network and at more than reasonable levels of service throughout the life of the Project. Only small impacts to the operation of the Wollar Road / Ulan-Wollar Road and Wollar Road / Ulan Road intersections are anticipated during peak Project traffic periods (Parsons Brinckerhoff, 2015).

The Project proposes to upgrade existing roads and intersections and build new roads and intersections as required. Road upgrades include the widening of Upper Bylong Road between Bylong Valley Way and the open cut MIA, the realignment of Upper Bylong Road to the east, a new access road from Upper Bylong Road to the underground MIA and the improvements to the existing driveway access from Bylong Valley Way to the proposed Workers Accommodation Facility (WAF) (Parsons Brinckerhoff, 2015).

The closure of Upper Bylong Road south of the Open Cut Mine Area may potentially impact the travel from these areas to the Bylong Village. Lee Creek Road is an existing rural road which will be available as an alternative but longer access. KEPCO is considering a number of options to resolve this access impacts for these residents. The options being considered include the potential for upgrading existing roads, including Lee Creek Road or Budden Gap Road or entering into negotioated agreements with the potentially affected landholders to compensate for the access impacts. KEPCO will aim to reach the appropriate agreement with the MWRC and the local landholders in relation to the preferred option. Should the preferred option be to upgrade either of the roads, the planning approvals for this road upgrade will be subject to a separate application with the MWRC (Parsons Brinckerhoff, 2015).

Aboriginal Heritage

An impact assessment has been undertaken on the Aboriginal archaeological sites and cultural features. It has identified that 41 sites/features are at risk of impact from underground mining (11

archaeological sites and 30 cultural features) and 102 sites are at risk of direct impacts within the Project Disturbance Boundary (100 archaeological sites and 2 cultural features).

Table 2.4 identifies the indirectly impacted Aboriginal archaeology sites and proposed management measures. The ochre quarry (RPS Bylong OQ001) has been assessed as being of high regional significance. It is recommended that all reasonable and feasible actions be taken to avoid impacts to this site. If impacts cannot be avoided then engineering solutions to prevent rockfall and cracking are to be considered, in addition to the proposed full archival recording.

For underground mining, pre-mining mitigation is recommended for 45 sites (including archival recording of four sites not to be impacted). Ongoing monitoring of 32 sites/cultural features will need to be undertaken during and post-mining and the mitigation measures to be applied for nine rockshelter sites will be dependent upon the results of the test excavations.

Table 2.4 - Indirectly Impacted Aboriginal Archaeology Sites and Management

Site ID	Site Type	Potential Impact	Regional Significance	Pre Mining Mitigation	Post Mining Mitigation
OQ001	Ochre Quarry	Cracking / Rockfall	High	Archival Recording	Monitoring
GG001, GG002, GG003	Grinding Groove	None	Low	Archival Recording	None Required
GG004	Grinding Groove	Cracking	Moderate	Archival Recording	Monitoring
RS001, RS006, RS007, RS009, RS011, RS013	Rockshelter	Cracking	Low	Test Excavation	Mitigation post mining dependant on results of pre-mining test excavation
RS002	Rockshelter	Negligible	Low	Archival Recording	None Required
RS008, RS010, RS012	Rockshelter	Cracking	Moderate	Test Excavation	Mitigation post mining dependant on results of pre-mining test excavation
RS003	Rockshelter	Blasting	High	Archival Recording	Inspections
CUL004, CUL007	Cultural Feature	Cracking / Rockfall	High	Archival Recording	Monitoring
CUL001, CUL002, CUL003, CUL005, CUL006, CUL008, CUL009, CUL012, CUL013, CUL015, CUL016, CUL017, CUL018, CUL019, CUL020, CUL021, CUL022, CUL023, CUL024, CUL025, CUL026, CUL027, CUL028, CUL029, CUL030, CUL031, CUL032, CUL033	Cultural Feature	Cracking	Moderate	Inspection and Archival Recording	Monitoring

Table 2.5 identifies the directly impacted Aboriginal archaeology sites and proposed management measures. In relation to the Project Disturbance Boundary 102 sites/features will require management. This includes: excavation of two PADs, archival recording of two cultural features, controlled removal of three modified trees and 95 surface artefact sites will require collection. In addition, one rockshelter

immediately adjacent to the Project Disturbance Boundary will require archival recording to develop a pre-mining condition to enable the impacts of blasting to be appropriately managed.

Table 2.5 - Directly Impacted Aboriginal Archaeology Sites and Management

Site ID	Site Type	Potential Impact	Regional Significance	Mitigation
Bylong River PAD 1	PAD	Surface Impact	Moderate	Excavation
AS077	PAD + Artefacts	Surface Impact	Moderate	Excavation
MT005, MT007, MT008	Modified Tree	Surface Impact	High	Conservation by controlled removal
CUL010, CUL011	Cultural Feature	Surface Impact	Moderate	Archival Recording
AS005, AS007, AS011, AS012, AS013, AS014, AS035, AS041, AS043, AS044, AS045, AS046, AS047, AS048, AS049, AS050, AS051, AS052, AS053, AS054, AS055, AS056, AS057, AS058, AS059, AS064, AS067, AS069, AS070, AS071, AS072, AS073, AS074, AS075, AS076, AS092, AS093	Artefact Scatter	Surface Impact	Low	Salvage
RPS Bylong AS10	Artefact Scatter	Surface Impact	Low	Salvage
BE-IF-01, BE-IF-02, BE-IF-03	Isolated Find	Surface Impact	Low	Salvage
RPS Bylong River 1, RPS Bylong IF3, RPS Bylong IF6	Isolated Find	Surface Impact	Low	Collection
IF003, IF004, IF006,IF007, IF008, IF029, IF030, IF032, IF038, IF039, IF040,IF041, IF043, IF044, IF045, IF046, IF047, IF056, IF057, IF058, IF059, IF060, IF066, IF068, IF069, IF070, IF071, IF072, IF073, IF074, IF076, IF077, IF078, IF079, IF080, IF081, IF090, IF091, IF092, IF093, IF094, IF095, IF096, IF097, IF098, IF099, IF100, IF101, IF102, IF103, IF104, IF105, IF106, IF109	Isolated Find	Surface Impact	Low	Collection

An Aboriginal Archaeological and Cultural Heritage Management Plan (AACHMP) will be developed to mitigate and manage any potential impacts. This will include detailed pre-mining and post-mining strategies for all Aboriginal archaeological sites and cultural features including salvage methodologies, archival recording, clearance processes and monitoring requirements (RPS Australia East Pty Ltd, 2015).

Historic Heritage

The Project will directly impact on seven heritage items assessed as having local heritage significance that will require them to be disturbed, demolished or relocated – Our Lady of the Sacred Heart

Catholic Church, Bylong Upper Public School, Upper Bylong Post Office and Store, Bylong Upper Hall, Renfrew Park Remains 1 & 2 and the Cheese Factory Remains (AECOM, 2015).

The Project will partially impact, directly or indirectly, on 12 items assessed as being of local significance – Homestation (visual), Bylong Station Farm Complex (direct and visual), Sunnyside (visual), Bylong Anglican Church and Cemetery (visual), Harley Hill Farm Complex (visual), Bylong Trig Station (visual), Swiss Cottage (visual), Bylong Hall (visual), Tarwyn Park Farm Complex (direct and visual), Cottage Chimney Remains (visual), in addition to landscape areas - the Bylong Valley Cultural Landscape and the National Trust Registered Bylong Landscape Conservation Area (direct and visual) resulting in minor negative impacts (AECOM, 2015).

Mitigation measures proposed for the Project will be detailed in a Historic Heritage Management Plan to guide the management of all items within the Project Boundary and Conservation Management Plans for specific items in order to reduce potential impacts to their cultural significance.

Visual Impacts

The development and operation of the Project will have minimal visual and landscape impacts outside of the immediate local setting of Lee Creek and the Upper Bylong Valley. The location of the proposed open cut mining areas is isolated from the more sensitive view locations, including Bylong Valley Way and surrounding residences, due to topography and to some extent vegetation screening. In addition the life of the Open Cut operations and proposed progressive rehabilitation ensure the visual exposure times of high visual effect is comparatively very limited (2-5 years) when compared to typical Open Cut mining operations.

There may be some potentially high visual impacts on the Bylong Valley Way associated with the initial construction of the WAF. Roadside and facility landscape treatments will provide screening in 1-2 years for the life of the facility. The recommended rehabilitation strategy, proposed final landform, revegetation strategy and other visual mitigation strategies will ensure that a landscape of high visual diversity is retained in the long term (JVP Visual Planning & Design, 2015).

2.3 Other Mitigation Measures

KEPCO proposes to work in partnership with MWRC 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 have been developed to mitigate, offset and compensate for the potential environmental, cultural and social impacts of the Project. A full outline of these measures is provided in Section 8 of the EIS. These measures also include the development of a Voluntary Planning Agreement (VPA) with the MWRC.

Potential Workforce Impacts

- Employment of regional residents preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation;
- 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

Purchase 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 IO 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 projects 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[5] 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-monetary) consideration of the environmental, social and cultural impacts of a project and the proposed means of mitigating the impacts.

[5] 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.

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:

1. Can be readily identified, measured in physical terms and valued in monetary terms;
2. Can be identified and measured in physical terms but cannot easily be valued in money terms; and
3. 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[6] 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 a project 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.

[6] 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 KEPCO 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 Nation 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 or regional 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 Economic Impact Assessment 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[7]:

- ***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 an approximate 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 indication of gross operating surplus[8] together with net indirect taxes and subsidies and a return to

[7] It does not specifically identify direct and indirect tax effects.
[8] 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.

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, which includes production-induced flow-on effects and consumption-induced flow-on effects, 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[9].

Nevertheless, it provides some upper level estimate of secondary net economic benefits to the region. Having regard to this, secondary net benefits are estimated using the above approach for production-induced flow-on effects only.

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.

[9] 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 KEPCO 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.

The majority of the Project Boundary contains cleared agricultural land with native vegetation constituting the remaining area (predominately within the Bylong State Forest and other portions of Crown Land). The predominant agricultural enterprise within the Project Boundary is beef cattle grazing supported by fodder cropping (oats, Lucerne, millet and forage sorghum) and improved pastures on the better quality land and larger holdings. Under the base case, the land required for the Project would continue to be used predominantly for agricultural purposes.

In contrast, the Project (as described in Section 2) comprises mine construction, coal mining, processing and transportation of product coal to the Newcastle port for a period of 25 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 Project were considered by KEPCO in the development of the Project. Section 3 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 KEPCO to be the most feasible alternative for minimising environmental, cultural and social impacts whilst maximising resource recovery and operational efficiency. It is therefore this alternative that is proposed by KEPCO 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 cost of water Opportunity cost of capital equipment Opportunity cost of land Development costs including labour, capital equipment and acquisition costs for impacted properties and offsets[1] Operating costs of mine including labour and mitigation, offsetting and compensation measures Rehabilitation and decommissioning costs at end of the Project life	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	Subsidence impacts Agricultural production impacts[1] Noise impacts Blasting impacts Air quality impacts Greenhouse gas impacts Surface water impacts Groundwater impacts Ecology impacts Road transport impacts Aboriginal heritage impacts Historic 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% and 10%.

The analysis period is 27 years, coinciding with the Project life and including two years of pre-construction. Any impacts that occur after this period are included in the final year of the analysis as a terminal value[10].

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

[10] A terminal value includes ongoing impacts in perpetuity.

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[11]. 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[12]

Production Costs

Opportunity Cost of Land, Capital and Water

There is an opportunity cost associated with using land already in KEPCO ownership, for the Project instead of its next best use (i.e. rural production). KEPCO has acquired significant land holding in the Bylong Valley since acquiring the Project in 2010. KEPCO currently holds approximately 80% of freehold land within the Project Boundary. The remaining 20% of land within the Project Boundary is made up of Crown Land and State Forest and some private freehold land. The acquisition costs of land are estimated at in the order of $98M. This includes premiums paid for land over and above its market prices and therefore encompasses both the agricultural value of land and any consumer surplus held by the owners of that land. This overstates the opportunity cost of land since KEPCO will continue to facilitate agricultural activities on its land which is not required for mining or mining related purposes.

All capital equipment required for the Project will be purchased as part of the development costs of the Project or paid for via contractor payments and indirectly included in the operating costs of the Project.

KEPCO holds 2,535 units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP. This is sufficient to account for the Projects predicted water take and water uses from the Bylong River Water Source. There is an opportunity cost of holding these entitlements which have been included in the BCA by applying an assumed market value of water of $3,000/ML (National Water Commission, 2014).

Development Cost of the Project

Development costs of the Project are associated with underground mining equipment and infrastructure, onsite and offsite surface infrastructure (including a workforce accommodation facility), CHPP, sustaining capital and owners costs (including land acquisitions and environmental impact mitigation, compensation and offset costs). These costs include labour costs during the development of the Project, which reflect the value of labour resources in their next best use. There are no other specific open-cut mining capital costs as open cut mining will be undertaken by a mining contractor and these costs have been included as operating costs.

Total capital expenditure is estimated at $1,331m (refer to Table 4.2) over the Project life[13]. These development costs include an allowance for acquisition of additional land for biodiversity offsets and properties significantly impacted by noise, purchase and installation of real time noise, air quality and vibration monitoring equipment, visual screening and historic heritage protection and restoration. Development costs are included in the economic analysis in the years that they are expected to occur.

[11] Benefit transfer refers to borrowing economic values that have been determined for other study sites.
[12] All values reported in this section are undiscounted Australian dollars unless otherwise specified.
[13] The capital costs are different to those identified for the purpose of estimating the application fee due to definitional differences in the *Environmental Planning and Assessment Regulation 2000* regarding what constitutes capital investment value of a project. Some items identified as capital investment value for the purpose of the application fee are included in this Economic Impact Assessment as operating costs due to the Project subcontracting components of the operation and hence paying ongoing operating costs to subcontractors rather than upfront capital costs. This reflects how the Project will actually be undertaken.

Table 4.2 – Summary of Capital Expenditure (2014 dollars) for the Project

Function Area	Capital Costs $M
UG mining equipment and infrastructure	$419
CHPP (excluding sustaining capital and contingency)	$218
CHPP sustaining capital	$13
Surface infrastructure (excluding sustaining capital)	$378
Surface infrastructure sustaining capital	$92
Owner's costs	$75
Additional mitigation and offsets	$9
Sub-total	**$1,204**
Capitalised development	$126
Total	**$1,331**

Source: RungePincockMinarco (2014) adjusted for additional mitigation and offset costs

Annual Operating Costs of the Project

The operating costs of the Project include those associated with mining (including real time noise, air quality and vibration monitoring, biodiversity offsets management and subsidence 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.

While royalties are a cost to KEPCO, 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 $763M ($290M present value at 7% discount rate).

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

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 $50M.

Production Benefits

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 124 Mt and 90 Mt, respectively, with annual production of up to 6.5 Mtpa ROM coal. Eighty nine percent of the product coal is expected to have low ash content. All coal will be exported.

Both demand for and supply of coal influences current and projected prices. It should be noted that it is not current or historic coal prices that are relevant to the analysis but forecast prices during the 23 years of mining operation. WoodMackenzie (2014) has prepared a detailed product marketability report for the Project and provided price forecasts in US$/t over the mine life. A key finding of the analysis is that Global thermal coal prices are at multi-year lows due to an enduring oversupply. However, this is likely to end soon. WoodMackenzie (2014) expect price recovery over an extended period. These price forecasts together with a USD/AUD exchange rate of 0.84 have been used in the analysis. It should be noted that recent forecasts of the AUD/USD exchange rate are around 0.72 (Westpac, 2015) and hence all other things being equal, the assumed exchange rate in this assessment will understate the revenues and hence economic benefits of the Project.

There is uncertainty around future coal prices (valued in USD) as well as the USD/AUD exchange rate. Therefore, the assumed coal prices have been subjected to sensitivity testing as part of this assessment (see Section 4.6).

Residual Value at End of the Evaluation Period

At the end of the Project, capital equipment and land (excluding offsets) may have some residual value that could be realised by sale or alternative use. Conservatively, it is assumed that capital equipment has zero residual value.

The primary objective of the rehabilitation strategy is to rehabilitate land to its pre-mining land use capability, including an equivalent area that would be classified as Strategic Agricultural Land (SAL) and other land capable of supporting equine activities. Consequently, it is assumed that the land would have a similar post mining value to its current agricultural value i.e. $47M. Sensitivity analysis is undertaken in Section 4.7 in relation to the residual value of agricultural land.

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 of this report. 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.

Subsidence

In economics, subsidence impacts are only relevant to the extent that they impact something of value to the community. As identified in Section 2.2, no privately owned residences occur within the Subsidence Study Area, although a number of infrastructure and natural areas may be impacted. An allowance has been included in the operating costs of the Project for the management and remediation of subsidence impacts on the land surface and infrastructure.

Individual impact assessment reports also considered subsidence impacts and so these potential impacts are included in the considerations below.

Agricultural Production

The Project is located on land subject to the Upper Hunter Strategic Regional Land Use Plan. The proposed open cut and underground coal mining is within a 10,317 ha Study area that incorporates 2,366 ha of Applicant - verified Biophysical Strategic Agricultural Land (BSAL) and 1,933 ha of Government-verified Equine Critical Industry Cluster (CIC) land. This land will be directly (via open cut mining and surface infrastructure) and indirectly (via subsidence) impacted by the Project. The report by the Mining and Petroleum Gateway Panel for the Project identified these impacts as significant.

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 Strategic Agricultural Land and land identified as a part of Equine CIC, 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 KEPCO ownership and the capital cost of land that will be acquired). Conservatively, it is assumed that no agricultural production occurs on this land for the life of the Project, even though it is recognised that KEPCO has employed a Farm Manager and will continue to manage agricultural activities on land that is not required for mining, mining related purposes or as part of the Biodiversity Offset Strategy.

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.

The Noise and Blasting Impact Assessment concluded that with the adopted noise mitigation measures, three receivers are predicted to be significantly impacted, six receivers would be moderately impacted and three receivers would be impacted negligibly.

For properties significantly impacted by noise impacts, a condition of contemporary development consents is for the proponent to purchase the affected properties upon the request of the landowner. These acquisition costs are included in the capital costs of the Project. So instead of the partial property value impacts being incorporated into the BCA, the full acquisition costs[14] are included. This will overstate the economic impact of noise amenity impacts for significantly impacted properties. These acquisition costs are commercial-in-confidence.

Where properties are predicted to be moderately impacted by noise impacts, a condition of contemporary development consents is for at-receiver noise mitigation to be implemented upon request by the landholder. For noise impacts, this can include double glazing of windows and installation of air conditioning units. An allowance has been included in the capital costs of the Project for mitigation at six properties. While these mitigation costs are commercial-in-confidence some indication of the order of magnitude of cost can be gained by applying a notional amount of say $50,000 to the six properties moderately impacted. Assuming these works occur in 2018 (the first year of coal production), the present value of these measures would be in the order of $0.2M. To the extent that these measures mitigate noise, then affected properties are no worse off than they were before and no additional 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, these externality costs of a project would not all be mitigated.

No material aggregate economic efficiency impacts are included in the BCA for receivers that were identified as being negligibly or not impacted under the *Voluntary Land Acquisition and Mitigation Policy* (DP&E 2014). Nevertheless, it is recognised that some residual noise impacts may be experience by property owners in the Bylong Valley. However, these are unlikely to be material from an aggregate economic efficiency perspective.

[14] Which is also likely to include the consumer surplus associated with the properties since acquisition costs tend to be higher than market values.

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, the Noise and Blasting 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 (PEL, 2015). Consequently, no material economic impacts are identified for inclusion in the BCA.

It is recognised that some structures on KEPCO owned land may have some heritage significance (not currently listed but assessed as being of local significance) and have the potential to be impacted by blasting. Refer to the consideration of Historic Heritage impacts below.

Air Quality

The impact of the Project on air quality at nearby properties can potentially be valued using the property value method, where the change in property value as a result of the air quality impacts are estimated.

The assessment of air quality impacts at nearby properties indicated that there are no properties that will be impacted by exceedances of the relevant air quality criteria (PEL, 2015). 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[15] there is may be no threshold at the population level. That is, even at low background concentrations, some 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 for inclusion in the BCA.

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 2.2 Mt of direct carbon dioxide equivalent (CO_2-e) emissions associated with mining (Scope 1 emissions), 1.3 Mt of indirect (Scope 2) CO_2-e emissions associated with on-site electricity consumption and 0.5 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 life of the Project. It is assumed that the loss of carbon sequestration benefits from the clearing of vegetation (approximately 753 ha) would be offset by proposed offsets.

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

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 4.6)[16].

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 (Gayer and Viscusi, 2014). 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%.

Water

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 resources. Water access and use is only permissible with possession of a WAL (except in the case of exemptions such as harvestable rights, native title rights and some stock and domestic rights). Water Sharing Plans that are prepared under the *Water Management Act 2000* 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). Consequently, the market value for water resources can be considered to give a reasonable indication of its economic value in alternative uses such as agriculture, i.e. its opportunity cost.

The main impact of the Project on water relates to pumping from a borefield to supplement supply to the water management system and water take from the alluvial groundwater systems due to mining. KEPCO has secured 2,535 units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP. This is sufficient to account for the Projects predicted water take and water uses from the Bylong River Water Source. There is an opportunity cost of holding these entitlements which have been included in the BCA by applying an assumed market value of water of $3,000/ML (National Water Commission, 2014). This is a use value of the water. Given that water associated with this entitlement 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. The Project will also intercept some surface water run-off that would otherwise go to environmental flows. However, as identified in Section 2, this represents as small proportion of total catchment runoff. No material non-use impacts are therefore likely to arise with respect to this catchment runoff.

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.

[16] It is noted that an alternative approach to valuation is based on the 'replacement cost' approach (Department of Industry, 2014) within a general equilibrium framework. However, this is considered inconsistent with the partial equilibrium approach of this BCA.

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 within the region. 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. The capital costs of offsets are included in the opportunity cost of land for the Project and the capital costs of the Project. The management costs of the offsets, in perpetuity, are included in the operating costs of the Project[17].

Road Transport

The Project will result in additional transport movements associated with the construction and operational workforce and site deliveries. The Traffic Impact Assessment found that the Project will have a minimal impact on the surrounding road network in terms of affecting the capacity of the existing network.

A number of intersection and road upgrades are proposed to be undertaken by KEPCO and form part of the capital costs of the Project.

In addition, as a result of the proposed closure of the southern section of Upper Bylong Road and Wooleys Road to accommodate the Eastern Open Cut Mining Area, KEPCO proposes the construction of the Upper Bylong Road Realignment to provide access for private properties located to the east of the mining areas. The capital cost for the construction of the Upper Bylong Road Realignment is included in the capital costs of the Project). Three properties located to the south of the proposed Open Cut Mining Areas will be affected by the closure of Upper Bylong Road as this is their primary access route to the properties. Whilst Lee Creek Road in its current condition will continue to provide a viable access to these properties, following this route will add time travelling to and from these properties. KEPCO is considering a number of options to address this impact, including upgrade of Lee Creek Road, upgrade of Buddens Gap Road or KEPCO entering into compensation agreements with the three landholders who may be affected. An allowance is included in the capital costs of the Project for the cost of upgrading Budden Gap Road.

The Mid-Western Regional Council has received $14 M in Resources for Regions funding to upgrade 25 km of Wollar Road. This upgrade will provide a more accessible and direct link between the Mid-Western and Hunter mining regions for mining-related traffic and the local community. Consequently, it will provide benefits to the Project. However, the upgrade will occur "with" or "without" approval of the Project and hence is considered part of the base case in the BCA, rather than a cost of the Project. Even if some of the cost were attributable to the Project, it would be a fraction of the $14 M cost. The sensitivity testing undertaken in Section 4.6 includes changes in capital costs well in excess the total cost of the Wollar Road upgrade.

[17] At the time of preparing this report, the biodiversity offset strategy was still being refined and negotiated with the NSW Office of Environment and Heritage. It is normal practice for a biodiversity offset strategy to continue to be refined during the exhibition of the EIS to ensure that they are sufficient to improve or at least maintain biodiversity values within the bioregion. Sensitivity testing for large changes in the overall Project capital and operating costs (which would include any cost changes associated with a refinement to the required biodiversity offsets) is provided in Section 4.7.

Aboriginal Heritage

The main impact of the Project on Aboriginal heritage is on sites of high archaeological significance, although other sites of moderate and low archaeological significance will also be directly or indirectly impacted.

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 AACHMP. 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 and can be considered within the threshold value framework.

Historic Heritage

The Project will directly impact on seven heritage items assessed as having local heritage significance that will require them to be disturbed, demolished or relocated. In addition, 12 items assessed as being of local significance will be partially impacted directly or indirectly with appropriate mitigation measures implemented via the Historic Heritage Management Plan. The former impacts can potentially be valued using non-market valuation methods such as choice modelling while the latter impacts can be potentially valued using the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

No specific non-market valuation study has been undertaken in relation to the seven heritage items assessed as being of local heritage significance that will require demolition or relocation. However, Allens Consulting Pty Ltd (2005)[18] *Valuing the Priceless: The Value of Historic Heritage in Australia,* prepared for the Heritage Chairs and Officials of Australia and New Zealand, found that respondent utility is increased by an increase in the number of heritage places protected — average household willingness to pay across Australia for the protection of additional places from loss was estimated to be $5.53 per person each year for every 1,000 places protected. Indexing this value to 2014 and aggregating it to 79% of the Australian, NSW and Mid-Western Regional LGA households (as reflected by the survey response rate) and converting to a present value using a 7% discount rate gives a non-use economic value of $529,000 per place for the Australian population, $170,000 per place for the NSW population and $594 for the population of the Mid-Western Regional LGA[19].

The impacts of the directly impacted heritage items are therefore estimated at $3.7M for the Australian population, $1.2M for the NSW population and $0.004M for the Mid-Western Regional LGA population. To the extent that some of these impacts are mitigated e.g. via detailed archival recording in accordance with the Heritage Management Plan, this may overstate heritage impacts in relation to items that will be demolished.

A range of mitigation and management measures are proposed in relation to the heritage items that will be partially impacted by the Project. This includes the structural securing of heritage items prior to

[18] Historic heritage places included in this study comprised: buildings (e.g. houses, shops and churches); pioneering huts, farms and shearing sheds; Aboriginal missions; designed gardens and parks; old mines, factories and other industrial sites; railways, roads, bridges and ports; ruins; places that show how people lived and worked; shipwrecks; monuments and memorials dedicated to important historic people and events; and historic streets, suburbs and towns. The historic heritage sites impacted by the Project fit comfortably within this definition and include a public school, cheese factory remains, a church and cemetery, park remains, post office and store, and a hall.

[19] It is recognised that there may be a distance decay relationship where households located closure to the impacted heritage items have higher values than those located further away. However, the study referred to for benefit transfer values did not investigate this issue.

blasting to minimise impacts and restoration works, should any impacts occur. The costs of these mitigation measures are included in the capital costs of the Project.

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

The Visual Impact Assessment found that the development and operation of the Project will have minimal visual and landscape impacts outside of the immediate local setting of Lee Creek and the Upper Bylong Valley, which is predominantly land owned by KEPCO. There may be some potentially high visual impacts on the Bylong Valley Way associated with the initial construction of the WAF, although these would be mitigated by the recommended landscape treatments.

The costs of mitigation measures have been included in the capital costs of the Project, although it is recognised that some residual visual impacts may occur as a result 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 projects' 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)[20]. 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 direct average annual employment for the approximately 290 employees for a period of 23 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[21] gives an estimated $165M (present value) for the nonmarket employment benefits of the Project to NSW households. At a

[20] These are public good values i.e. the sum of values held across all households, for the employment of others, and cannot be meaningfully compared to the private market good values such as wages.
[21] This is consistent with the non-market valuation studies which focused on direct employment.

regional level the benefit would be $1. No National level is reported since the source study did not survey households outside of NSW and extrapolation of the results outside of the survey frame would be questionable. 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.

Refer to Attachment 6 for discussion of the nonuse values of employment.

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 by KEPCO. 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 $807M. Assuming 100% foreign ownership, $596M of these net production benefits would accrue to Australia[22]. 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, compensation and offset, may be assessed. This threshold value is the opportunity cost to Australia 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[23], would need to be valued by the community at greater than the estimate of the Australian net production benefits i.e. greater than $596M. This is equivalent to each household in Australia valuing the residual environmental, social and cultural impacts at $72. 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 $224. The equivalent figure for the region is $64,100.

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 $4M, considerably less than the estimated $596M net production benefits of the Project to Australia.

Overall, the Project is estimated to have net social benefits to Australia of between $592M and $757M (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 $592M and $757M for the Project to be questionable from an Australian economic perspective.

[22] This is the royalty and company tax component of the net production benefits of the Project.
[23] 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 and water	$104	Value of the coal	$4,025
	Opportunity cost of capital	$0	Residual value of capital	$0
	Development costs	$855	Residual value of land	$8
	Operating costs ex royalties	$2,258		
	Decommissioning and rehabilitation costs	$9		
	Sub-total	***$3,226***	***Sub-total***	***4,033***
	Net Production Benefits			**$807 ($596)**
Environmental, social and cultural impacts	Greenhouse gas	$38 ($0.4)	Non-market values of employment	$165
	Agriculture	Included in opportunity cost of land and capital costs (land acquisitions)		
	Noise	Significant impacts included via land acquisition costs and included in capital costs. Moderate impacts included via mitigation costs included in operating costs		
	Blasting	Impacts below amenity criteria		
	Air quality	No property significantly impacted		
	Water	Sufficient water entitlements held. Opportunity cost of holding water entitlements included in opportunity cost of land and water		
	Ecology	Some loss of values but offset. Cost of biodiversity offset included in opportunity costs of land, capital cost of land and operating costs		
	Road transport	Minimal road network impacts. Intersection and road upgrades required and included in capital costs of the Project		
	Aboriginal heritage	Unquantified. Costs of AACHMP included in capital costs		
	Historic heritage	$4 Costs of protecting and restoring heritage items included in capital costs		
	Visual	Cost of mitigation measures included in capital and operating costs		
	Non-market impacts sub-total	**$42 ($4)**		**$165**
NET SOCIAL BENEFITS – including employment benefits				**$931 ($757)**
NET SOCIAL BENEFITS – excluding employment benefits				**$766 ($592)**

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

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 be 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 KEPCO[1]	$0	$0	$0	$211
Net production benefits to Commonwealth Government – Company tax	$0	$21	$302	$302
Net production benefits to NSW Government – Royalties	$0	$290	$290	$290
Net production benefits to local and regional community in the form of voluntary contributions	$4	$4	$4	$4
Secondary net production benefits	$263	$0	$0	$0
Total	***$267***	***$315***	***$596***	***$807***
Non-market Costs and Benefits				
Benefits				
Non-market benefit of employment[2]	$1	$165	$165	$165
Total	***$1***	***$165***	***$165***	***$165***
Residual Costs After Mitigation, Compensation and Offset[3]				
Greenhouse gas emissions	$0	$0	$0	$38
Agricultural impacts - included in capital and opportunity costs of project	$0	$0	$0	$0
Noise impacts -significant impacts included via land opportunity costs and capital costs. Moderate impacts included via mitigation costs included in operating costs	$0 Immaterial*	$0 Immaterial*	$0 Immaterial*	$0 Immaterial*
Blasting - Impacts below amenity criteria	$0	$0	$0	$0
Air quality impacts - No property significantly impacted	$0	$0	$0	$0
Water - Sufficient water entitlements held. Cost included in opportunity costs of land and water	$0	$0	$0	$0
Ecology - Some loss of values but offset. Cost of biodiversity offset included in opportunity cost of land, capital costs and operating costs	$0	$0	$0	$0
Road transport impacts - Minimal road network impacts. Intersection and road upgrades required and included in capital costs of the Project	$0	$0	$0	$0
Aboriginal heritage	Unquantified	Unquantified	Unquantified	Unquantified
Historic heritage[2] - Demolition and relocation of heritage	$0	$1	$4	$4
Historic heritage impacts - Costs of protecting and restoration of heritage items included in capital costs	Immaterial*	Immaterial*	Immaterial*	Immaterial*
Visual impacts - Cost of mitigation measures included in capital and operating costs	Immaterial*	Immaterial*	Immaterial*	Immaterial*
Total	***$0***	***$1***	***$4***	***$42***
NET SOCIAL BENEFITS – including employment benefits	**$268**	**$479**	**$757**	**$931**
NET SOCIAL BENEFITS – excluding employment benefits	**$267**	**$314**	**$592**	**$766**

[1] It should be noted that this is not equivalent to profit and hence should not be used to infer profitability of the Project. It is a residual amount after royalties, company tax and the costs of the Voluntary Planning Agreement are subtracted from the estimated total producer surplus of the Project. Company tax payable by KEPCO was estimated by RungePincockMinarco (2014) based on the Projects projected yearly taxable income. The estimation of taxable income uses accounting principles and is different to the estimation of net production benefits. In particular, taxable income includes the depreciation of capital rather than actual capital costs when they occur.

[2] The non-market benefit of employment and non-market cost of historic heritage 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. The source study for historic heritage values did survey national households.

[3]The approach used in this section is that where impacts do not exist, are offset or compensated for, it is assumed that residual impacts are zero. Where mitigation measures have been used to diminish impacts it is assumed that there may still remain some residual impacts but they are immaterial. 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

4.6.2 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:

- KEPCO in the form of residual net production benefits[24] (after company tax, royalties and VPA payments);
- the Commonwealth Government in the form of any Company tax payable ($302M present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area[25];
- the NSW Government via royalties ($290M 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 ($4M present value) in the form of voluntary contributions to community infrastructure and services.

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

Greenhouse gas impacts occur across all scales - local, State, National and global - and remain uncompensated. Impacts on ecology, Historic Heritage and Aboriginal heritage potentially occur at the local, State and National levels. However, ecological impacts would be counterbalanced by the Project biodiversity offsets. Similarly Aboriginal heritage impacts and historic heritage impacts will be reduced to some extent by the mitigation strategies in the AACHMP and Historic Heritage Management Plan Any nonmarket benefits associated with employment provided by the Project would largely accrue at the local or State level[26].

Other potential impacts of the Project - agricultural, noise, blasting, air quality, surface and groundwater, road transport and visual impacts - primarily occur at the local level, with costs incorporated into the estimate of net production benefits via acquisition costs of affected properties, acquisition of Water Access Licences and impact mitigation costs. All of these measures mean that those who experience costs have them either mitigated or compensated.

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 $294M, comprising royalties, estimated at $290M, present value, and the voluntary contributions to the MWRC, estimated at $4M, present value. However, this is a minimum net production value benefit to the State of NSW. This is because NSW also benefits from company tax payable to the Commonwealth. A conservative estimate of company tax redistributed to NSW is 7% i.e. $21M (refer to Attachment 7). In addition, NSW benefits 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 $315M.

[24] It should be noted that this is not equivalent to profit and hence should not be used to infer profitability of the Project. It is a residual amount after royalties, company tax and the costs of the Voluntary Planning Agreement are subtracted from the estimated producer surplus of the Project.
[25] Note that the company tax rate used in modelling is 28.5% which reflected the expected tax regime as of 1 July 2015. The Commonwealth Government has now adjusted its policy and company tax rates applicable to KEPCO are expected to remain at 30%. 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 7.
[26] It should be noted that the study from which the employment values were transferred, surveyed NSW households only.

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 KEPCO. Quantifiable residual impacts after mitigation, compensation and offsets relate to greenhouse gas emissions and historic heritage. 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 $165M. 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 $7.25M in total and $4M 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. Infrastructure works recently approved through this program include the $14M upgrade of Wollar Road.

In a National BCA framework, $4M 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, water impacts, road transport impacts and visual impacts potentially occur at the local level. Initial bearers of noise, dust, water and agricultural impacts are compensated. Road transport, visual, and blasting impacts will be mitigated. At the local level the non-use economic values held for ecology, greenhouse gas emissions and 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 local 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 production-induced 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 $263M, 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 KEPCO. 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 KEPCO is willing to invest $1.3BM in the Project. It is highly unlikely that a $1.3B 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 KEPCO is required to pay a rehabilitation security deposit to the NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS-DRE) as the holder of a mining authority under the Mining Act. This security deposit is held by DTIRIS-DRE to ensure that the 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 DTIRIS-DRE 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 risks 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. KEPCO will also be required to enter into an appropriate biodiversity offset agreement that includes the payment of a conservation bond that reflects the full cost of implementing the offset strategy.

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 4.4 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[27].

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 and water;
- Development costs;
- Decommissioning and rehabilitation costs;

[27] 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.

- Operating costs;
- Value of coal;
- Residual value of land;
- Greenhouse costs; and
- Historic heritage costs.

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 0.84. 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 greenfields mining operation but is occurring in region where other coal mining operations are occurring 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 a 20% increase in 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 non-market historic heritage impacts. Since mitigation, offset and compensation costs are a small component of 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	941	592	385
INCREASE 20%			
Opportunity cost of land and water	941	592	385
Development costs	906	568	368
Decommissioning and rehabilitation costs	940	591	385
Operating costs	763	463	288
AUD coal value	1,366	879	587
Residual value of land	942	592	385
Historic heritage costs	940	591	384
Global Greenhouse Costs @ $40/Tonne (T)	940	592	385

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land and water	941	592	385
Development costs	975	616	402
Decommissioning and rehabilitation costs	942	592	385
Operating costs	1,119	721	482
AUD coal value	516	304	183
Residual value of land	940	591	385
Historic heritage costs	942	593	386
Global Greenhouse Costs @ $8/T	941	592	385

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	465	314	220
INCREASE 20%			
Opportunity cost of land and water	465	314	220
Development costs	463	312	219
Decommissioning and rehabilitation costs	465	314	220
Operating costs	453	305	214
AUD coal value	574	388	273
Residual value of land	465	314	220
Historic heritage costs	465	314	220
Global Greenhouse Costs @ $40/Tonne (T)	465	314	220

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land and water	465	314	220
Development costs	468	316	222
Decommissioning and rehabilitation costs	465	314	220
Operating costs	478	323	227
AUD coal value	356	240	168
Residual value of land	465	314	220
Historic heritage costs	466	314	221
Global Greenhouse Costs @ $8/T	465	314	220

5 REGIONAL IMPACT ANALYSIS

5.1 Introduction

The BCA in Section 4 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 Mid-Western Regional Local Government Area. This is the region that it is expected that the majority of the Project operational workforce will reside in and that the construction workforce will reside in temporarily.

A 2011 input-output table of the regional economy was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment 8) using a 2011 input-output 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 input-output table of the regional economy was aggregated to 50 sectors and 8 sectors for the purpose of describing the economy.

A highly aggregated 2011 input-output 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 $5,166M. Value-added for the regional economy is estimated at $1,584M, comprising $547M to households as wages and salaries (including payments to self employed persons and employees) and $1,037M in OVA.

The employment total working in the regional economy was 8,689.

The economic structure of the regional economy can be compared with that for NSW through a comparison of results from the respective input-output models (Figures 5.1 and 5.2). This reveals that the agriculture and mining 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. The utilities sectors are of similar relative importance in the regional and 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, the coal mining sector, retail trade sector, construction trade services sector and sheep/grains/beef sectors are the most significant sectors to the regional economy. For value-added, the coal mining sector, ownership of dwellings sector, sheep/grains/beef sectors and retail trade sector are the most significant. The coal mining sector, education sectors, retail trade sector and community care services sectors are the most significant sectors for household income. The coal mining sector,

retail trade sectors, accommodation/restaurants sectors and sheep/grains/beef sectors are the most significant employers in the regional economy. The coal mining sector is also the largest importer and exporter 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	19,927	517	8,908	5	65	1,538	131	257	**31,349**	2,822	34,546	85,192	**153,910**
Mining	30	32,756	4,742	23	226	70	145	52	**38,043**	67	23,664	944,338	**1,006,113**
Manuf.	3,388	17,763	29,256	973	14,336	8,910	3,379	4,580	**82,585**	20,931	10,265	158,966	**272,747**
Utilities	1,641	4,138	2,742	16,789	1,970	2,513	2,735	1,663	**34,191**	10,220	10,975	13,511	**68,897**
Building	2,680	30,002	2,064	2,189	52,434	3,498	8,338	3,819	**105,024**	640	82,844	6,386	**194,894**
Trade/Accom	4,315	12,697	12,581	836	3,824	8,811	8,720	7,884	**59,668**	140,647	17,150	56,052	**273,518**
Bus.Srvcs	7,016	41,227	23,346	2,249	16,273	27,670	50,744	21,608	**190,131**	124,014	20,822	82,781	**417,748**
Public/Pers Srvcs	1,206	9,945	3,232	634	1,857	4,231	9,504	7,500	**38,108**	77,143	125,733	36,794	**277,778**
TOTAL	**40,203**	**149,045**	**86,870**	**23,697**	**90,985**	**57,240**	**83,695**	**47,363**	**579,098**	**376,485**	**326,000**	**1,384,020**	**2,665,603**
Household Income	25,900	164,193	36,353	10,473	36,669	74,719	76,179	122,290	**546,776**	0	0	0	**546,776**
OVA	55,539	524,330	47,223	23,140	21,747	57,760	155,305	49,358	**934,401**	56,953	10,163	35,452	**1,036,970**
Imports	32,268	168,545	102,301	11,587	45,494	83,798	102,568	58,768	**605,328**	261,102	50,327	0	**916,757**
TOTAL	**153,910**	**1,006,113**	**272,747**	**68,897**	**194,894**	**273,518**	**417,748**	**277,778**	**2,665,603**	**694,540**	**386,491**	**1,419,472**	**5,166,105**
Employment	864	1,348	518	108	591	2,027	1,000	2,232	**8,689**				

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

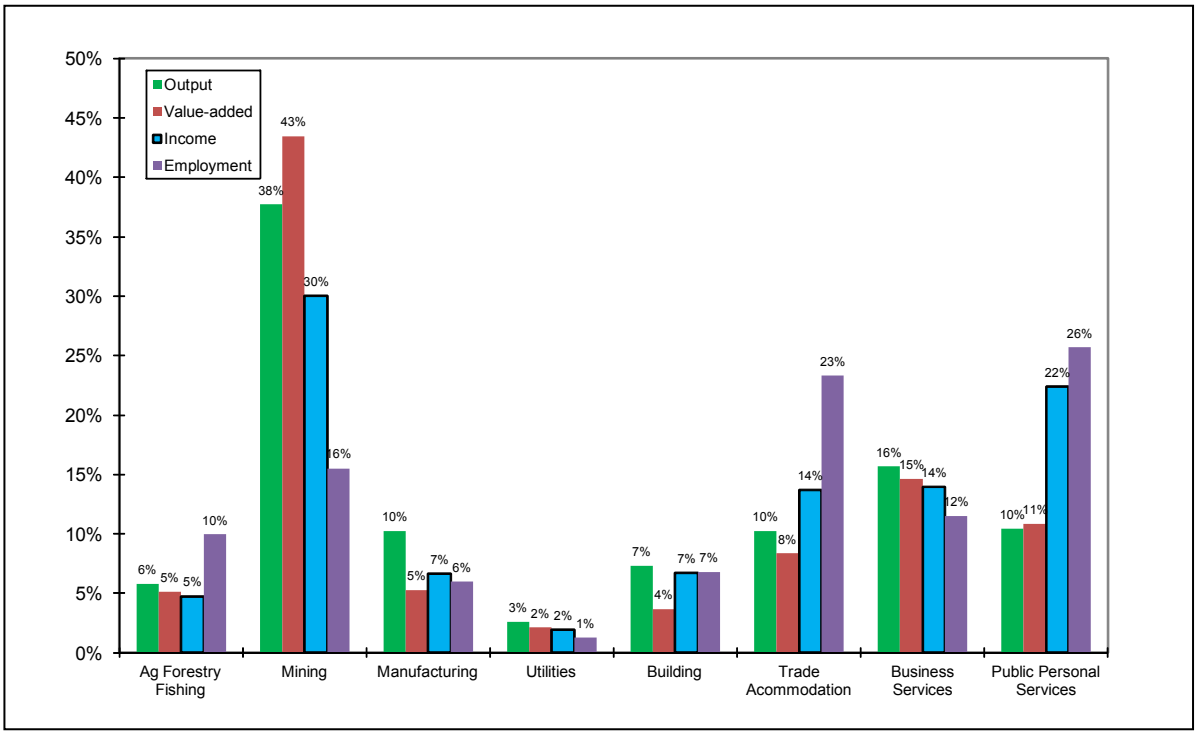


Figure 5.2 - Summary of Aggregated Sectors: NSW Economy (2011)

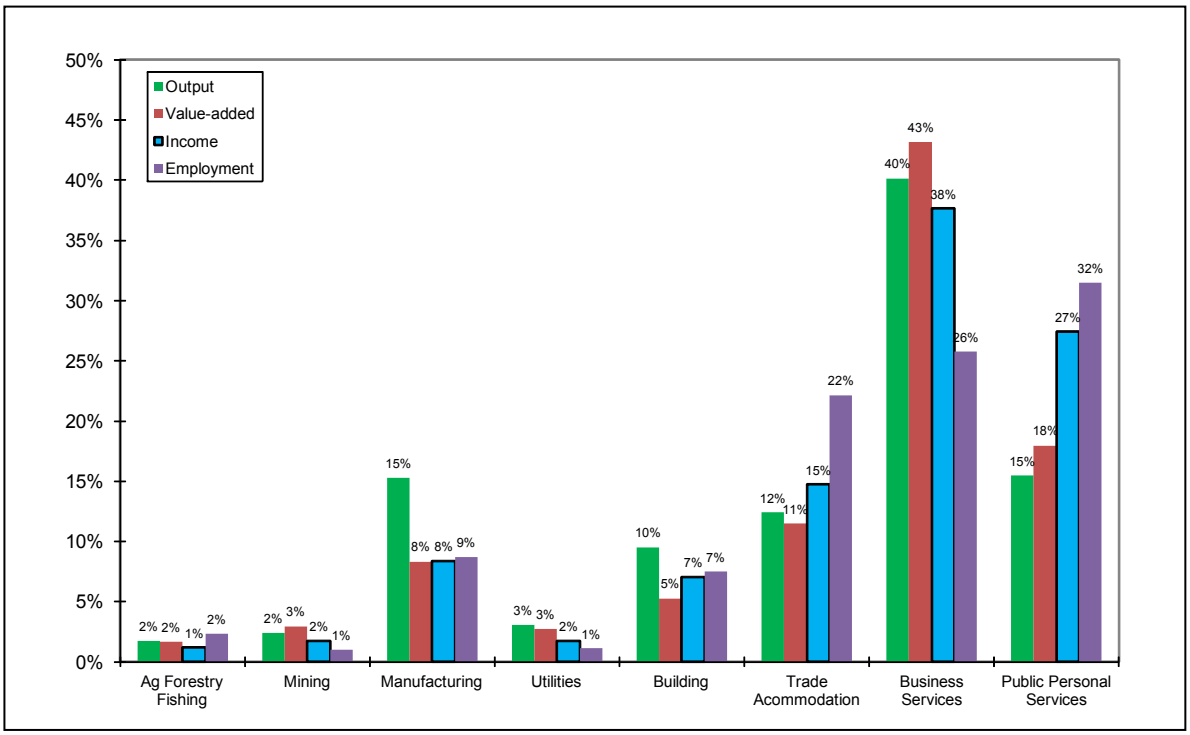


Figure 5.3 Sectoral Distribution of Gross Regional Output and Value Added ($'000)

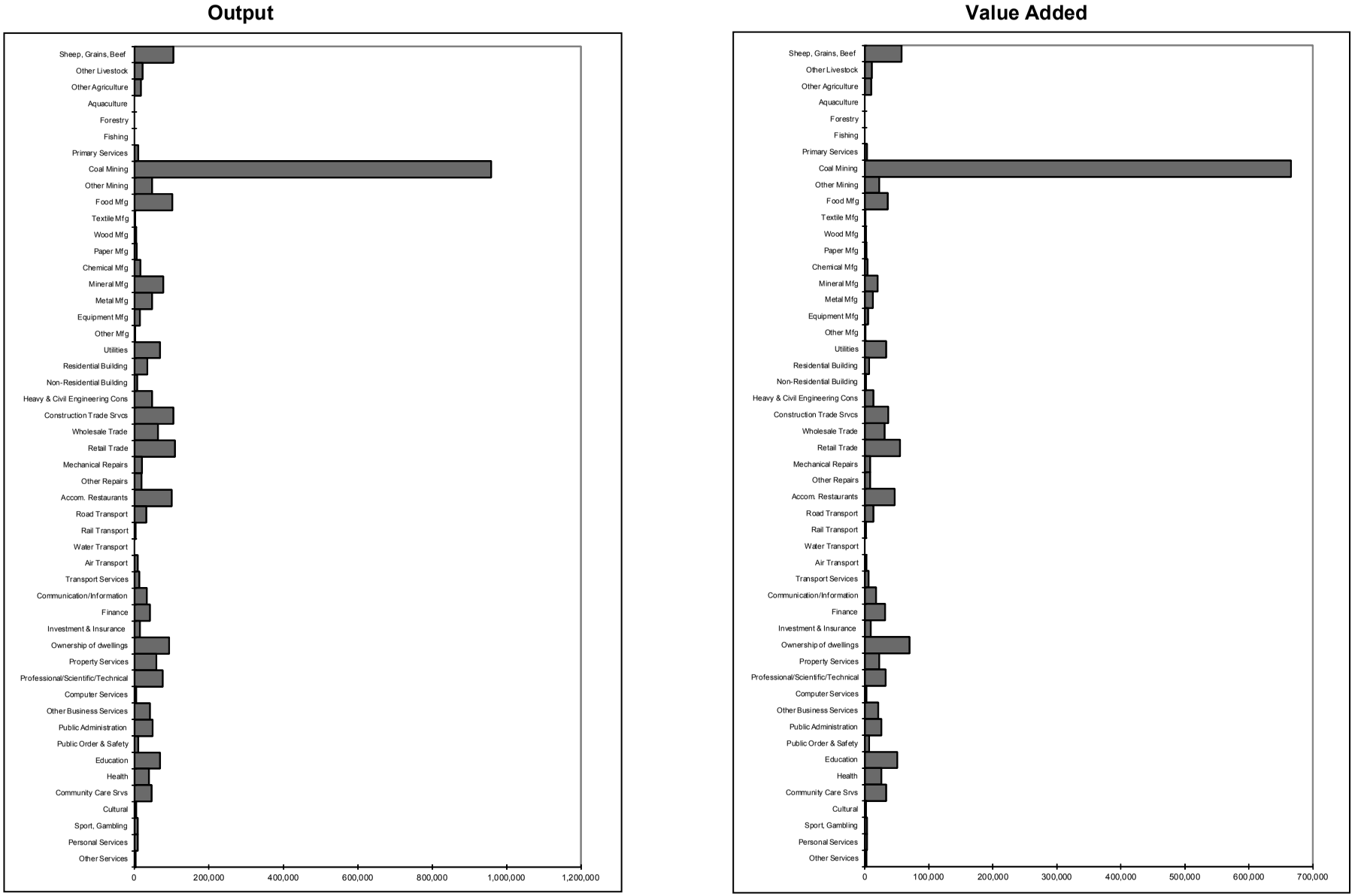


Figure 5.4 Sectoral Distribution of Income ($'000) and Employment (No.)

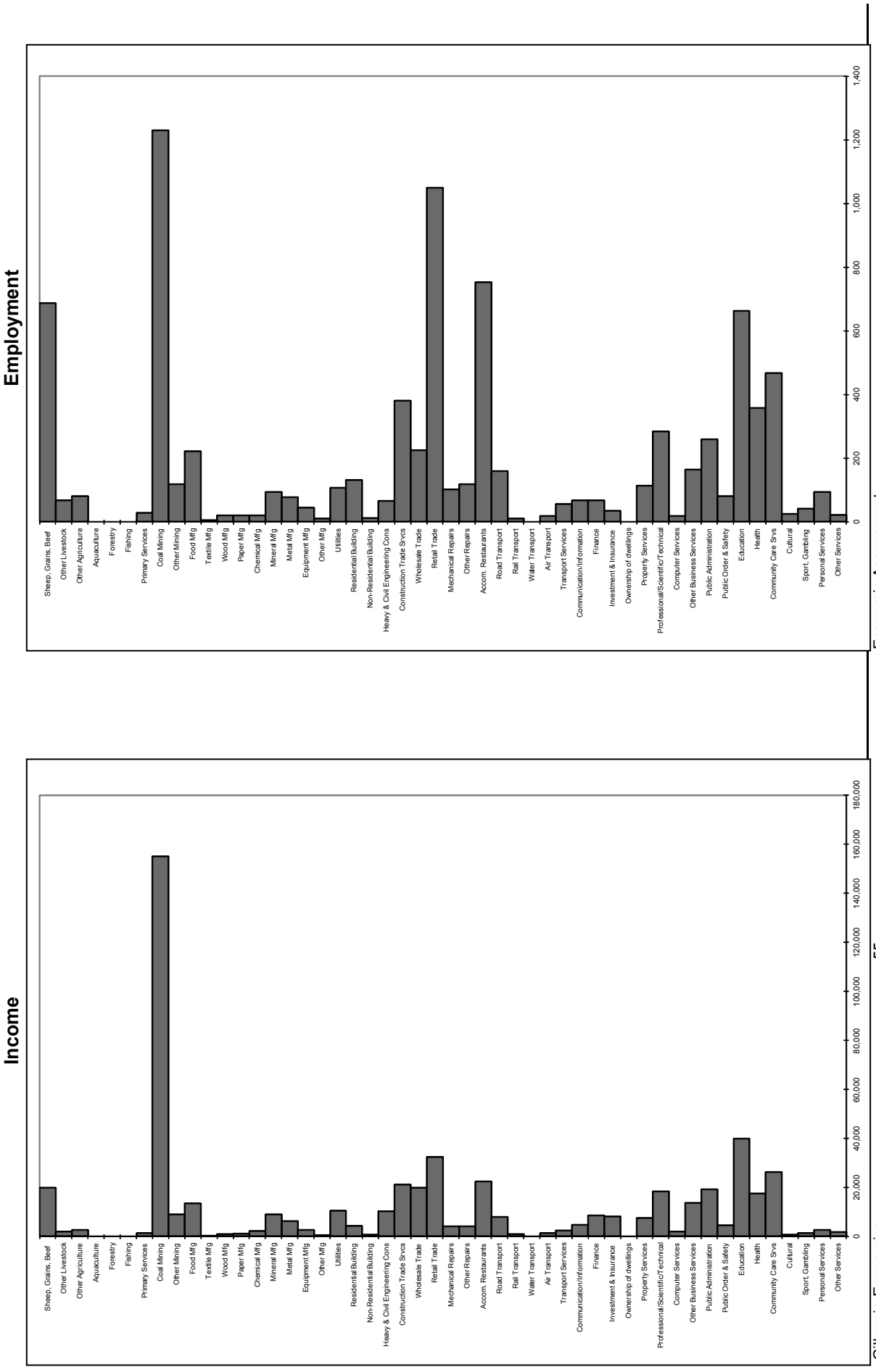


Figure 5.5 Sectoral Distribution of Imports and Exports ($'000)

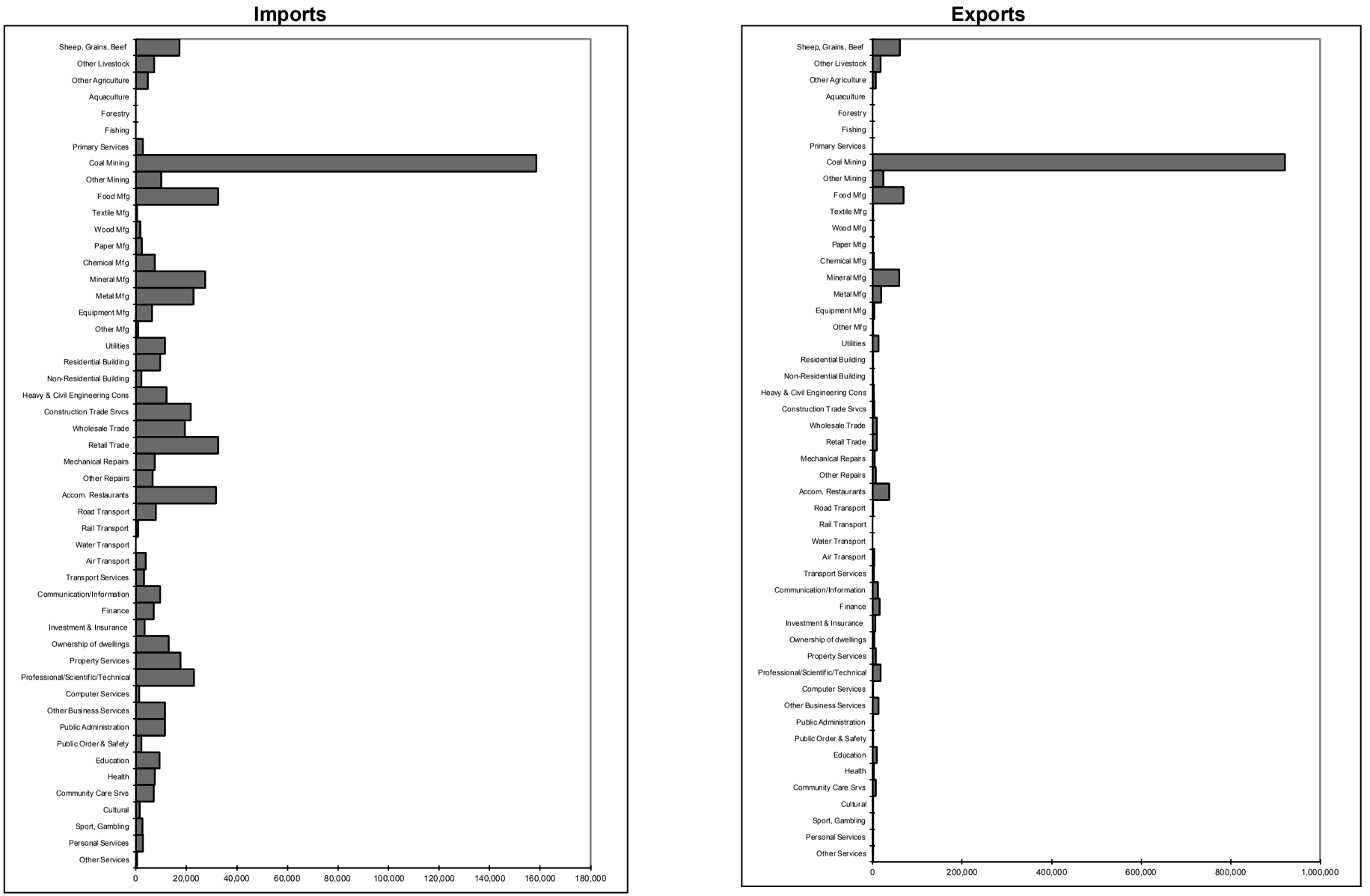
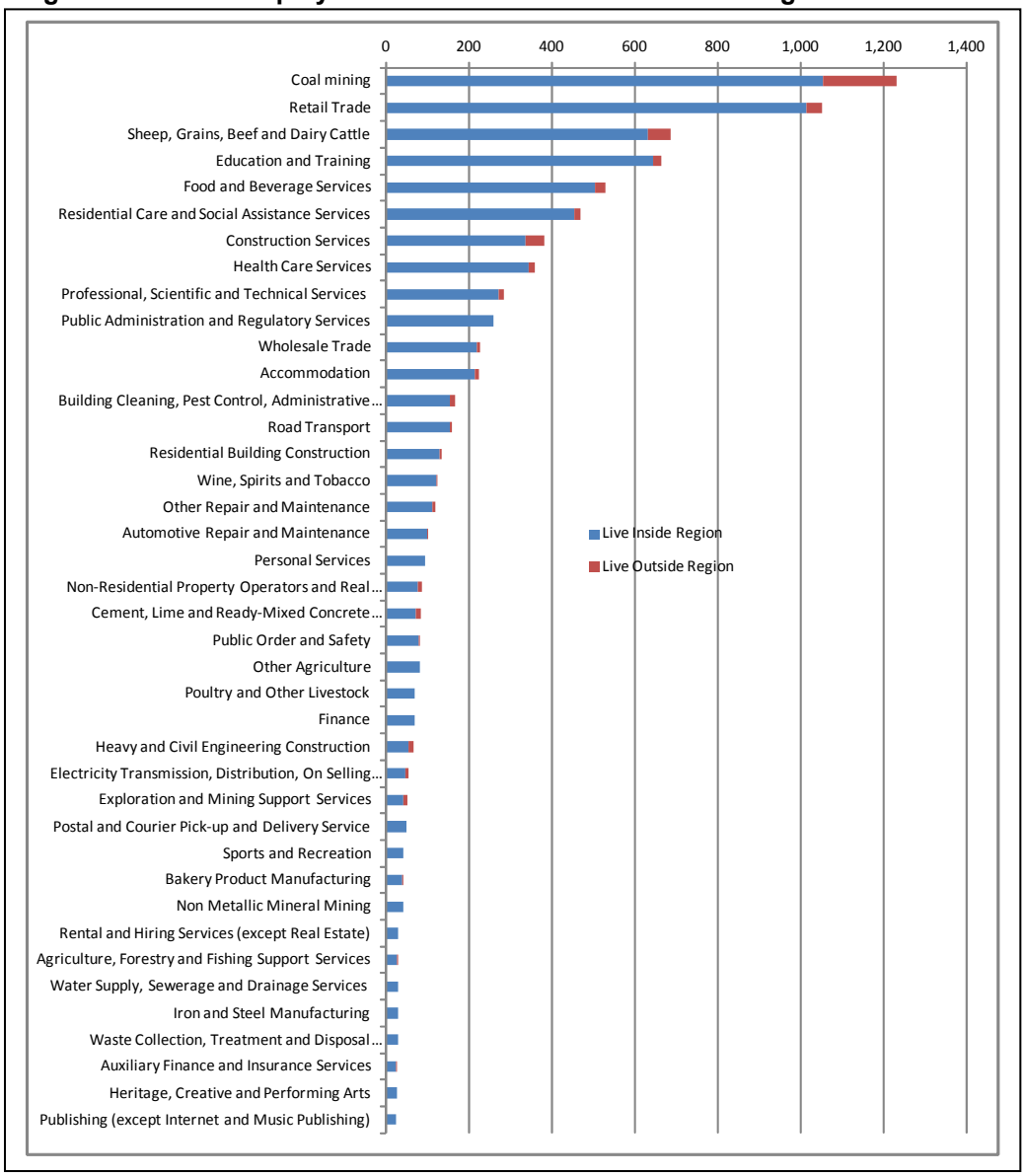


Figure 5.6 shows the top 40 individual industry sectors by employment number for the MWRC LGA. The five most significant employment providers in the region are the coal sector, retail trade sector, sheep/grains/beef/dairy sector, education and training and food and beverage services sector. The coal mining sector and construction services sector have the greatest proportion of employees residing outside the region at 14% and 12%, respectively.

Figure 5.6 - Main Employment Sectors in the Mid-Western Regional Council LGA



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

5.3 Expenditure During Mine Construction and 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. In addition, during construction and operation, mining projects provide additional economic activity from expenditure on inputs to production and by employees, which in turn generates induced economic activity.

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 construction and operation phase of a project;
- the expenditure profile and residential location of the construction and operation 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 Construction Expenditure

During construction, regional expenditure from the Project is estimated to potentially mainly occur within five sectors of the economy:

- the *heavy and civil engineering construction sector* which includes businesses involved in the mine site construction and on-site assembly of heavy electrical machinery;
- *construction services* which includes businesses involved in site preparation services such as earthworks and mine site preparation;
- the *other property services sector* which includes businesses involved in the leasing of industrial machinery, plant or equipment;
- the *agriculture, mining and construction machinery, lifting and material handling equipment manufacturing sector*; and
- *other machinery and equipment manufacturing sector*.

Year 1 and Year 2 of construction will be associated with a peak full-time equivalent (FTE) workforce of 650 and 800, respectively. The annual average FTE construction workforce for these years[28] is estimated at 344 and 466. Ninety percent of the construction workforce is assumed to be non-local hires[29] who will temporarily reside in a purpose built Workforce Accommodation Facility (WAF) and relocated to outside the region when not working. Economic activity associated with construction phase will therefore largely be associated with production expenditure rather than consumption expenditure.

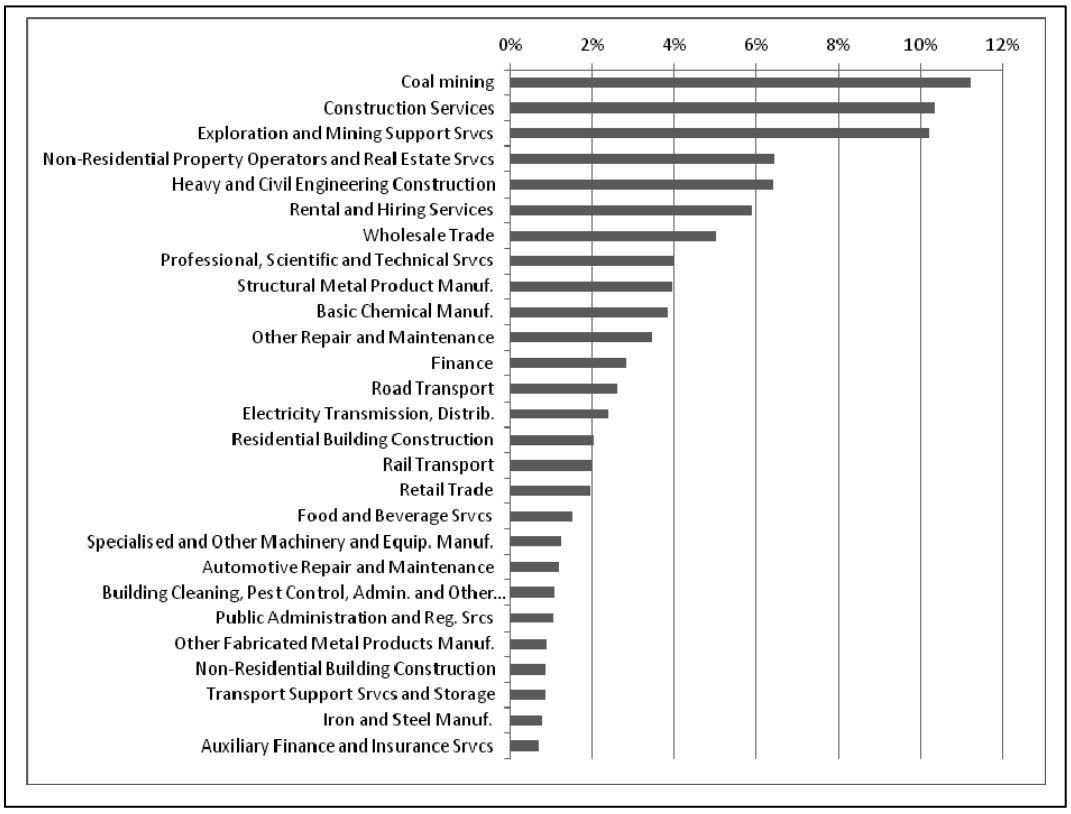
5.3.3 Mine Operation Expenditure

The Project is a greenfield development and hence there is uncertainty about the specific businesses that are located in the region that are likely to directly benefit from the Project operation expenditure. However, 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 input-output table. This has been developed based on the expenditure pattern of the coal mining sector in a NSW input-output table and the application of location quotients[30] to assess the

[28] Excluding WAF operation workforce.
[29] Given the recent economic downturn in the mining sector a higher percentage may be local hires with greater regional economic impacts if these people would otherwise have been unemployed or underemployed.
[30] 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

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 5.7.

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

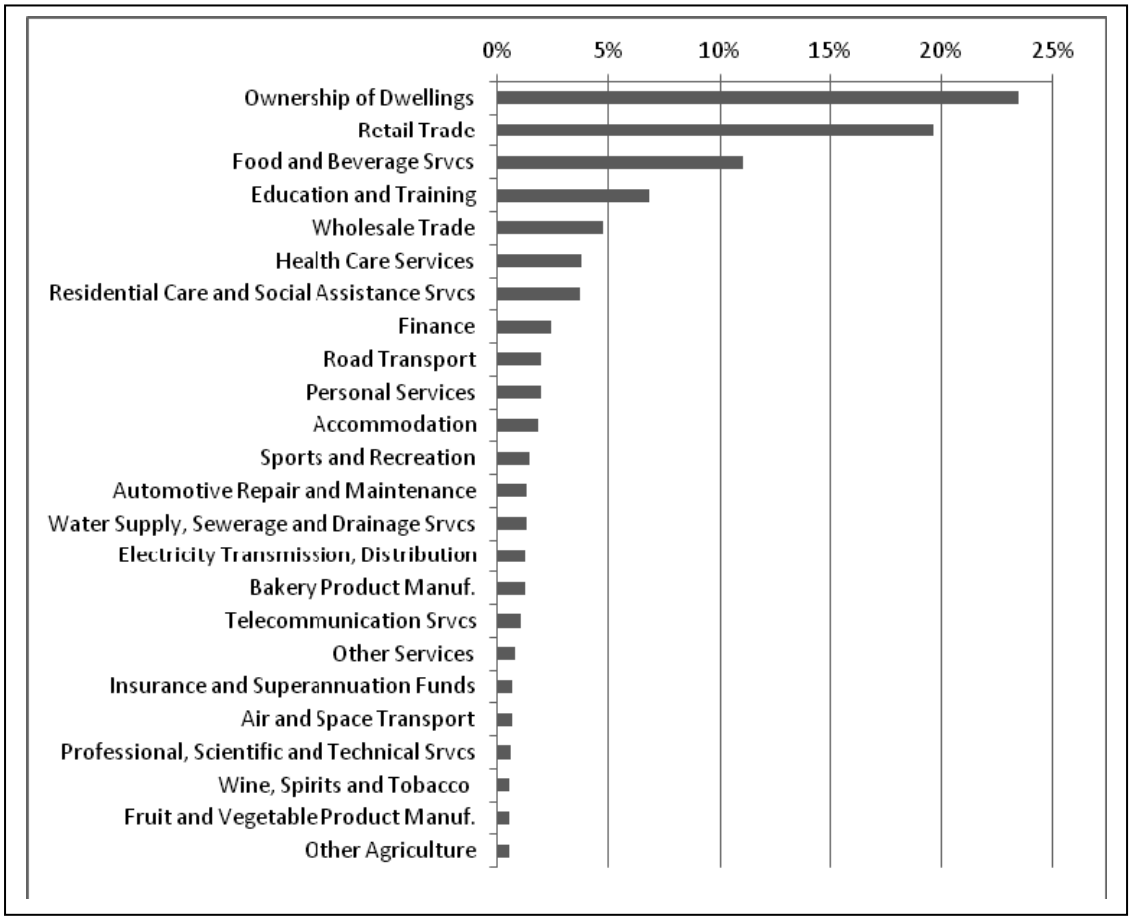


Economic activity in the region will also arise from the expenditure of the mine workforce in the region. It is estimated that the Project will have an average annual operational workforce of 290[31]. Fifteen percent are estimated to be local hires with the remainder migrating into the region. An indication 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 input-output 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.

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. (this sentence needs to be on the previous page)

[31] Although there will be a peak operational workforce of 470.

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



5.4 Economic impact of the Project

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

5.4.1 Construction phase

Introduction

The main construction phase is associated with the development of the mine infrastructure areas, open pits, rail loop, rail loading facility and the CHPP and will occur in the first two years of the Project. A later construction phase for underground operation will occur in Years five and six of the Project however will have a fraction of the total workforce at that time. This analysis is of the initial construction phase.

Impact on regional economy

Given the largely specialist nature of capital equipment and the relatively small size of the regional economy for the purpose of this analysis an assumption is made that all such purchases and the leasing of machinery are made outside the regional economy. Thus regional economic activity from

the Project construction phase primarily relates to the *heavy and civil engineering construction sector*, the *construction services sector* and *residential building sector (for the WAF).*

The average annual construction workforce required for the Project during the main construction phase is 344 in Year 1 and 466 in Year 2. Based on the input-output coefficients of the *heavy and civil engineering construction sector* and *construction services sector* in the regional economy transactions table (indexed to 2014), approximately $126M and $171M of the development costs would need to be spent in Year 1 and Year 2, respectively, in the construction sectors to result in a direct construction workforce of 344 in Year 1 and 466 in Year 2. The direct and indirect regional economic impact of $171M of expenditure in the construction sectors in the regional economy is reported in Table 5.2.

Impacts

Table 5.2 - Annual Economic Impacts of Construction of the Project on the Regional Economy

	Direct	Production induced	Consumption induced	Total Flow on	Total	Adjusted Total for Non Local Hires
OUTPUT ($'000)	171,000	121,884	42,703	164,587	335,587	297,155
Type 11A Ratio	1.00	0.71	0.25	0.96	1.96	1.74
VALUE ADDED ($'000)	55,665	45,718	23,678	69,396	125,061	103,751
Type 11A Ratio	1.00	0.82	0.43	1.25	2.25	1.86
INCOME ($'000)	30,147	23,762	9,407	33,169	63,315	54,849
Type 11A Ratio	1.00	0.79	0.31	1.10	2.10	1.82
EMPL. (No.)	466	377	202	579	1045	863
Type 11A Ratio	1.00	0.81	0.43	1.24	2.24	1.85

*Direct employment of 466 represents average annual construction employment, although the peak workforce in this year will be approximately 800.

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

Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are located in the region or migrate into the region. Where workers commute from outside the region some of the consumption-induced flow-on effects leak from the region. For the purpose of this analysis it is conservatively assumed that 90% of the construction workforce who reside in the region only during their shift do not expend any significant amount of their income in the region. On this basis the total regional economic impact during construction comprises the direct effects, production-induced effect and 10% of the consumption-induced effect identified in Table 4.2. That is, total annual impact of peak year of construction on the regional economy is estimated at up to:

- $297M in annual direct and indirect regional output or business turnover;
- $104M in annual direct and indirect regional value added;
- $55M in annual direct and indirect household income; and
- 863 direct and indirect jobs.

Multipliers

Multipliers are summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995). There are many types of

multipliers that can be generated from input-output analysis (refer to Attachment 4). 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 adjusted type 11A ratio multipliers for the construction phase of the Project in the regional economy range from 1.74 for output up to 1.86 for value-added.

Main Sectors Affected

Flow-on impacts from the construction phase of the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by flow-ons are likely to be *construction services, wholesale and retail trade, professional, scientific and technical services, residential building, road transport, heavy and civil engineering construction and building cleaning/pest control/administrative and other support services.*

5.4.2 Operational phase

Introduction

For the analysis of the operational phase of the Project, a new Project sector was inserted into the regional input-output table reflecting typical production levels and expenditure. The average annual revenue, operating costs, royalties and gross profit for the new sector was obtained from financial information in the Feasibility Study (RungePincockMinarco 2014). 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 (15% are assumed to already live in the region and the remainder are assumed to migrate into the region[32]);
- non-wage expenditure was initially allocated between total *intermediate sector* expenditure in the regional economy and *imports* based on the proportions in the regional input-output table for the coal mining sector;
- *intermediate sector* expenditure was then allocated between 111 intermediate sectors based on the proportions in regional input-output 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.

Impacts on the regional economy

Economic Activity

The total and disaggregated annual impacts of the Project on the regional economy (in 2014 dollars) are shown in Table 4.3.

[32] KEPCO has indicated that they will expect the operational workforce to reside within one hour's drive of the Project to meet appropriate Health and Safety Requirements. With the proposed upgrade of Wollar Rd, Mudgee will be within one hour's drive of the Project and is expected to accommodate most of the non-local hires workforce. The Project is remote from regional town centres outside of the MWRC LGA that would be able to provide required quantities of alternative accommodation. Other mines in the region are located to the north of the Project with greater access to other town centres outside the MWRC LGA.

Table 5.3 - Economic Impacts of the Project on the Regional Economy

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	468,691	106,155	48,836	154,991	623,682
Type 11A Ratio	1.00	0.23	0.10	0.33	1.33
VALUE ADDED ($'000)	305,426	45,469	27,078	72,548	377,973
Type 11A Ratio	1.00	0.15	0.09	0.24	1.24
INCOME ($'000)	40,600	21,051	10,758	31,809	72,409
Type 11A Ratio	1.00	0.52	0.27	0.78	1.78
EMPL. (No.)	290	309	231	540	830
Type 11A Ratio	1.00	1.07	0.80	1.86	2.86

The Project is estimated to make up to the following annual contribution to the regional economy for 23 years:

- $624M in annual direct and indirect regional output or business turnover;
- $378M in annual direct and indirect regional value added;
- $72M in annual direct and indirect household income; and
- 830 direct and indirect jobs.

Multipliers

The Type 11A ratio multipliers for the Project impact on the regional economy range from 1.24 for value-added up to 2.86 for employment.

Main Sectors Affected

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

- Construction service sector;
- Retail trade sector;
- Coal mining sector;
- Professional, scientific and technical services sector;
- Exploration and mining support services sector;
- Wholesale trade sector;
- Food and beverage sector;
- Non-residential property operators and real estate services sector; and
- Heavy and civil engineering construction 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 5.4).

Table 5.4 - Sectoral Distribution of Employment Impacts on the Regional Economy

	Regional Economy			
Sector	**Average Direct Effects**	**Product.-induced**	**Consump.-induced**	**Total**
Primary	0	2	3	5
Mining	290	35	0	326
Manufacturing	0	25	9	34
Utilities	0	6	2	9
Wholesale/Retail	0	37	81	117
Accommodation, cafes, restaurants	0	14	39	53
Building/Construction	0	62	4	65
Transport	0	24	7	31
Services	0	105	86	191
Total	**290**	**309**	**231**	**830**

Note: Totals may have minor discrepancies due to rounding.

Table 5.4 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.

Impact on the NSW economy

Introduction

The NSW economic impacts of the Project were assessed by inserting a new sector in the NSW input-output table in the same manner described in Section 5.4.2. 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 5.5.

Table 5.5 - NSW Economic Impacts of the Project

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	468,691	217,784	168,768	386,552	855,243
Type 11A Ratio	1.00	0.47	0.36	0.83	1.83
VALUE ADDED ($'000)	305,423	96,017	90,433	186,450	491,873
Type 11A Ratio	1.00	0.31	0.30	0.61	1.61
INCOME ($'000)	40,600	52,707	41,876	94,583	135,183
Type 11A Ratio	1.00	1.30	1.03	2.33	3.33
EMPL. (No.)	290	588	618	1,206	1,496
Type 11A Ratio	1.00	2.03	2.13	4.16	5.16

The Project is estimated to make up to the following total contribution to the NSW economy for 23 years:

- $855M in annual direct and indirect output or business turnover;
- $492M in annual direct and indirect value-added;
- $135M in annual direct and indirect household income; and
- 1,496 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 input-output 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 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. Eighty five per cent of the operation workforce is expected to migrate into the region. Consequently, little 'crowding out' of economic activity in other sectors would be expected as a result of the Project. Crowding out would be most prevalent for NSW.

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 the mining disturbance footprint and biodiversity offsets, and indirectly impacted by Project water requirements. The annual gross value of production and annual net value of production foregone as a result of the Project Disturbance Area and Biodiversity Offset Area are shown in Table 5.6 and 5.7, respectively.

The combined annual gross value of production from the impacted agricultural land is $2.3M per annum. The combined net value of production from the impacted land is $1.1M.

Table 5.6 - Quantum and Value of Agricultural Production within Project Disturbance Boundary

Domain	Crop Production (Tonnes)	Animals Sold (Head)	Gross Value of Production (per annum)	Net Value of Production (per annum)
Domain A	618.77	343	$654,422.25	$271,121.90
Domain B	0.00	237	$164,443.70	$80,375.23
Domain C	0.00	2	$998.84	$430.59
Total	**618.77**	**582**	**$819,864.80**	**$351,927.71**

Source: Scott Barnett and Associates (2015)

Table 5.7 - Quantum and Value of Agricultural Production Within Biodiversity Offset Areas*

Domain	Animals Sold (Head)**	Gross Value of Production (per annum)	Net Value of Production (per annum)
Domain A	1,057	$1,032,846.79	$566,531.14
Domain B	372.13	$312,300.86	$152,643.45
Domain C	124.23	$88,164.64	$38,006.44
Domain D	0	$0.00	$0.00
Total	**$1,553.46**	**$1,433,312.30**	**$757,181.03**

* Denotes areas of land to be managed for biodiversity value i.e. does not include the areas that are currently cultivated exotic monoculture.
**Note: The total head does not include 200 straws semen and 41embryos which are included in the Gross and Net Production
Source: Scott Barnett and Associates (2015)

The maximum gross value lost from agriculture due to Project water requirements is $410,562 per annum and the maximum net value lost is $99,956 per annum during open cut operations (Scott Barnett and Associates 2015).

The regional economic impacts of foregone agricultural production have been estimated using input-output analysis by modelling the direct and indirect effects on the regional economy of a reduction in $2.7M in output from the beef/sheep/grains sector of the regional economy. A comparison of the regional economic impacts of the Project operation and the foregone agricultural production is provided in Table 5.8. The foregone agricultural regional economic activity impacts are between 0.5% and 5.6% of the regional economic activity impacts of the Project.

Table 5.8 – Regional Economic Impacts of the Project and Displaced Agriculture

	Project	Agriculture Land and Water	
	Impact	Impact	% of Project
Annual direct output value ($000)	468,691	2,664	0.6%
Annual direct value-added ($000)	305,426	1,460	0.5%
Annual direct income ($000)	40,600	464	1.1%
Direct employment (No.)	290	16	5.6%
Annual direct and indirect output ($000)	623,682	4,287	0.7%
Annual direct and indirect value-added ($000)	377,973	2,210	0.6%
Annual direct and indirect income ($000)	72,409	775	1.1%
Direct and indirect employment (No.)	830	23	2.7%

If it were to be assumed that agricultural production from the entire Project Disturbance Boundary ceases at the commencement of the Project for perpetuity, the present value of the gross value of production foregone is $10.8 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $4.6 M (using a 7% discount rate). These values are developed as

a conservative worst-case scenario as the mitigation measures and proposed rehabilitation strategy ensures the present value of agricultural production will be forgone for as little time as practicable.

Conservatively assuming that agricultural production from the onsite biodiversity offset areas ceases at the commencement of the Project for perpetuity, the present value of the gross value of production foregone is $18.9 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $10.0 M (using a 7% discount rate).

Conservatively assuming that the predicted maximum loss of water from agriculture under median conditions due to Project water requirements is removed for perpetuity, the present value of the gross value of production foregone is $5.4 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $1.3.

In total, foregone gross value and net value of agricultural production from land and water resources required for the Project is estimated at a present value of $35.1M and $15.9M, respectively (using a 7% discount rate).

The BCA included estimation of the present value of production costs and benefits of the Project over a 27 year evaluation period. The present value of net production benefits of the Project are estimated at $807M, with in the order of $596M 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 $15.9.

The net production benefits of the Project to Australia are therefore 37 times those of displaced agriculture and the allocation of the land resource to the Project results in an improvement in economic welfare.

While there are no thoroughbred breeding activities currently occurring within 10 km of the Project Boundary, approximately 699.90 ha of Equine CIC is mapped within the Project Disturbance Boundary and 515 ha of mapped Equine CIC will be removed from agricultural production for the purposes of biodiversity offsets.

The maximum potential annual gross and annual net value of agricultural production from this land if it were utilised for a purpose which contributes to the equine industry is estimated in Table 5.9 and 5.10.

Table 5.9 - Quantum and Value of Potential Equine CIC within the Project Disturbance Boundary

Domain	Crop Production (Tonnes)	Number Horses (Head)	Gross Value of Production (per annum)	Net Value of Production (per annum)
Domain A	635	211	$2,023,062.77	$991,071.81
Domain B	0	51	$436,979.88	$224,413.09
Domain C	0	0	$0.00	$0.00
Total	**635**	**262**	**$2,460,042.66**	**$1,215,484.90**

Source: Scott Barnett and Associates (2015)

Table 5.10 - Quantum and Value of Equine CIC Land Use Scenario within the Biodiversity Offset Areas

Domain	Number Horses (Head)	Gross Value of Production (per annum)	Net Value of Production (per annum)
Domain A	165	$1,422,912.23	$729,741.82
Domain B	32	$272,731.49	$140,062.54
Domain C	0	$0	$0
Total	**197**	**$1,695,643.72**	**$869,804.36**

Source: Scott Barnett and Associates (2015)

Under a best practice equine land use scenario, the annual Net Value of Production potentially lost as a result of the direct Disturbance within areas of mapped Equine CIC is $1.2 M. The annual Net Value of Production potentially lost as a result of the Biodiversity Offsets Areas within areas of mapped Equine CIC is $0.9 M.

Should, as an absolute worst case, the mapped Equine CIC within the Project Disturbance Boundary be lost for perpetuity, the present value of the gross value of production foregone is $32.4 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $16.0 M (using a 7% discount rate).

Should the mapped Equine CIC within the Biodiversity Offsets Area be lost for perpetuity, the present value of the gross value of production foregone is $22.4 M (using a 7% discount rate) and the present value of the net value of agricultural production foregone is $11.5 M (using a 7% discount rate).

5.5.3 Wage impacts

In the short-run, increased regional demand for labour as a result of the 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 additional labour, the availability of labour resources in the region and the availability and mobility of labour from outside the region. However, because 90% of the construction workforce is estimated to be non-local hires and 85% of the operational workforce is estimated to migrate into the region, wage impacts as a result of the Project alone are 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 would create increased demand for accommodation during both the construction and operation phases. It is expected however that most non-local members of the construction workforce would reside in the purpose built WAF and hence during the construction phase impacts would be minimal.

During the operation phase of the Project, the workforce would reside in private accommodation within the region. This could potentially place some upward pressure housing prices. However, the MWRC has an existing Urban Release Strategy (URS) which takes into account population increases from mining projects (including the Bylong Coal Project) and predicts residential land requirements. Based on the URS, there is sufficient residential land available in Mudgee to meet housing demands of the Project and hence house price impacts should be negated. If sufficient regional accommodation is not initially available (prior Year 6), the WAF could provide temporary accommodation for the operational workforce transitioning into the region and seeking permanent local accommodation.

5.5.6 Mine cessation

As outlined in Section 4.5, the Project would stimulate demand in the regional and NSW economy, for up to 25 years (two years of construction and 23 years of operation), leading to increased business turnover in a range of sectors and increased employment opportunities. Conversely, the cessation of the mining operations in the future would result in a contraction in regional and NSW economic activity.

The magnitude of the regional economic impacts at the 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 5.3. However, if displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table 5.3.

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 activities.

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 not be a cause for concern.

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 $302M present value based on the detailed Financial Appraisal of RungePincockMinarco (2014) which assumes a company tax rate of 28.5%, production of up to 6.5 Mtpa, coal prices as forecast by WoodMackenzie (2014) and an AUD/USD exchange rate of 0.84.

At an estimated average wage rate of $140,000 per person[33] income tax payable per person would be $39,747. With an estimated average annual employment of 290 this equates to $12M pa. The present value (at a discount rate of 7%) of personal income tax from employees of the Project is estimated at $109 M.

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 do not lead to an increase in overall demand in Australia for social infrastructure they simply lead to a redistribution of the location of this demand[34].

6.2 State government

The main financial benefit of the Project to NSW is the royalties paid. These are estimated at $290M present value based on the detailed Financial Appraisal of RungePincockMinarco (2014) which assumes a production of up to 6.5 Mtpa, coal prices as forecast by WoodMackenzie (2014), an exchange rate of 0.84 and an effective royalty rate (after deductions) of 7.8% during open cut operations and 6.9% during underground operations.

In addition, the payroll tax to NSW from the operational employees of the Project is estimated at $21M 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.

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.

[33] This is based on the average wage for the coal mining in the NSW input-output table.
[34] 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.

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 Project will result in a redistribution of the workforce and population within NSW (and potentially within Australia). Social impacts in relation to NSW community infrastructure may occur at the regional level, if government planning and funding reallocation by NSW government agencies lags behind population redistribution. In these situations, users of NSW government provided community infrastructure may experience increased congestion and a reduction in service quality (per person). The Social Impact Assessment provides detailed assessment of community infrastructure issues. The VPA offer which has been discussed with MWRC has been developed to help address local community infrastructure issues.

6.3 Local Government

The Project will result in additional residents in the Mid-Western Regional LGA, particularly during the operational phase of the Project, who will increase the demand for local community infrastructure. However, the impacts on local infrastructure of additional residents should largely be already compensated for through infrastructure contributions levied on developers of residential property. Section 94 of the EP&A Act is a specific means by which councils can levy developer contributions, as a condition of development consent, towards the cost of providing local public infrastructure and facilities required as a consequence of increases in population. Where the Project results in additional land and housing development then payment for additional demand for community infrastructure is recouped via S94 contributions on the housing and land development, in accordance with the principles of nexus and apportionment. Where a mining development does not result in expansion of land release and housing development no additional demand is created beyond what potentially existed prior to the development.

The Social Impact Assessment provides detailed assessment of local community infrastructure issues. The VPA offer 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

The primary target coal resource for the Project is the Coggan Seam. The overlying Ulan Seam and other minor seams will also be intercepted and recovered by open cut mining methods within the Eastern and Western Open Cut Mining Areas. The Coggan Seam and the overlying Ulan Seam dip to the east, with the Open Cut Mining Areas proposed in the western portions where the resource exists closer to the surface and underground mining areas proposed to be extracted in the eastern areas, where topography provides a greater depth of cover.

The Project has an identified mineable ROM coal resource of approximately 124 Mt for 23 years of the mine life. Further coal resources have been identified within the Authorisations held which will be the subject of future exploration and economic feasibility studies. The overburden to coal stripping ratio for the open cut mining areas is on average 5.6 bank cubic metres /ROM tonnes.

The Coggan and Ulan seams to be extracted for the Project are anticipated to produce two product types, as follows:

- 89% low (16%) ash (As Received Basis (arb)); and
- 11% high (22%) ash (arb).

The resource is able to be mined by KEPCO in an economically viable and environmentally sound manner as detailed in the EIS. The net production benefits to Australia from the Project are estimated at $597M (present value).

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

The Project is a greenfield development in a region that has a significant coal mining sector. As identified in Section 3, coal mining is the most significant sector in the regional economy for output, value-added, income and employment. The Project will utilise the existing Sandy Hollow–Gulgong Railway Line which connects with the Main Northern Railway Line at Muswellbrook, for the transport of the product coal to the Port of Newcastle.

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

The Project is a greenfield development, rather than an extension to an existing mine.

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

Mining projects provide linkages to regional economies via the expenditure associated with the projects themselves and the expenditure of employees and contractors.

Ex-post surveys of business and households in relation to mining in other regions confirm 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)[35] 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 existing, expanded or newly established businesses in the region and NSW economy. The greater the levels of expenditure in the regional economy, the greater will be the extent of these linkages. Businesses providing the goods and services required by the Project and its employees and contractors will benefit.

The **degree** to which individual businesses benefit from the Project and develop some degree of "dependence" on the Project is unknown. However, Section 4 identifies that these linkages are likely to span a wide range of sectors of the regional economy.

7.2 Economic benefits

(a) employment generation

Year 1 and Year 2 of the construction period for the Project is predicted to directly employ a peak FTE workforce of 650 and 800, respectively. The annual average FTE construction workforce for these years[36] is estimated at 344 and 466.

During operations, the Project will provide direct employment for up to 470 workers with an average annual direct workforce of 290.

Total (direct and flow-on) employment for the regional economy during the construction and operation phase of the Project was estimated at 863 people (a multiplier of 1.85) and 830 (a multiplier of 2.86), 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.

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 $1.3 billion (B). This is the level of capital investment included in the BCA[37]. A breakdown of this investment is provided in Table 4.2 in Section 4.4.1.

[35] Gillespie Economics (2009) *Cadia East Project Socio-Economic Assessment*.
[36] Excluding WAF operation workforce.
[37] Note that higher capital costs reduce the net benefits of projects as measured using BCA.

The regional economic activity arising from capital expenditure in the regional economy was estimated using IO analysis at in the order of up to:

- $297M in annual direct and indirect regional output or business turnover;
- $104M in annual direct and indirect regional value added;
- $55M in annual direct and indirect household income; and
- 863 direct and indirect jobs.

These particular impacts on the regional economy are likely to be felt for a period of one-year with proportionally less impacts in other years of construction.

In addition, the Project will result in ongoing annual intersectoral expenditure in the regional economy of approximately $121M and $41M in wages to employees. The economic activity in the regional economy from operational expenditure was estimated using IO analysis in the order of up to:

- $624M in annual direct and indirect regional output or business turnover;
- $378M in annual direct and indirect regional value added;
- $72M in annual direct and indirect household income; and
- 830 direct and indirect jobs.

(c) the payment of royalties to the State.

Royalty for coal is charged as a percentage of the value of production (total revenue less allowable deductions). The coal ad valorem royalty rates relevant to the Project are 7.2% for underground mines and 8.2% for open cut mines, although the effective royalty rate after allowable deductions is slightly less.

Royalties for the Project are estimated at $763M in total or $290M present value using a 7% discount rate. These estimates were based on detailed financial modelling of the Project by RungePincockMinarco (2014), based on WoodMackenzie United States dollar price forecasts and a 0.84 exchange rate. The estimates also include an allowance for deductions.

Table 7.1 provides sensitivity testing of royalties from the Project under different price and exchange rate assumptions. The estimated royalties from the Project are most sensitive to a higher AUD/USD exchange rate of 0.90, although forecasts for the longer term exchange rate are at or below the central assumption used in the analysis of 0.84.

Table 7.1 – Royalties to NSW Under Different Assumptions

	Total (undiscounted)	Present Value ($M) at Different Discount Rates		
		4%	7%	10%
Central Assumption (0.84 exchange rate)	763	426	290	205
+ 20% price	915	511	348	246
- 20% price	610	341	232	164
0.75 exchange rate	854	477	325	230
0.80 exchange rate	801	447	304	216
0.90 % exchange rage	397	271	192	397
- 20% production levels	610	341	232	164

8 CONCLUSION

A BCA of the Project indicated that it would have net social benefits to Australia of between $592M and $757M 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 aggregate 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.

The net production benefits of the Project are 37 times those of displaced agriculture.

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[38] for approximately 23 years:

- $624M in annual direct and indirect regional output or business turnover;
- $378M in annual direct and indirect regional value added;
- $72M in annual direct and indirect household income; and
- 830 direct and indirect jobs.

This includes regional multipliers ranging from 1.24 for value-added to 2.86 for employment.

The Project is estimated to make up to the following direct and indirect average annual contribution to the NSW economy for 23 years:

- $855M in annual direct and indirect regional output or business turnover;
- $492M in annual direct and indirect regional value added;
- $135M in annual direct and indirect household income; and
- 1,496 direct and indirect jobs.

While the Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.5% and 5.6% of the regional economic activity impacts of the Project.

The main fiscal benefit of the Project to Governments is:

- $302M (present value) to the Commonwealth Government in company tax;
- $109M (present value) to the Commonwealth Government in personal income tax from Project employees;
- $290M (present value) in royalties to the NSW Government;
- $21M in payroll tax to the NSW Government.

With regard to the Mining SEPP heads of consideration:

[38] Comprising the Local Government Area of Mid-Western Regional.

- the resource proposed to be mined is 124 Mt of ROM coal with product coal being 89% low ash and 11% high ash.

- the Project is a greenfield development, rather than an extension to an existing mine.

- numerous sectors in the regional economy are likely to develop some dependence on the Project as it is expected that all of the operational workforce will live in the region, and hence a material component of their expenditure would flow-on to local businesses. Similarly, a proportion of KEPCO's operational expenditure is likely to be spent in the region with local firms.

- the Project will provide employment opportunities for a direct peak FTE workforce of up to 800 during construction or an annual average of 466 in the peak year of construction. During operations, the Project will provide direct employment for up to 470 workers with an average annual direct workforce of 290. 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 $1.3B.

- the Project will generate royalties of $763M in total or $290M 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[39].

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.

[39] 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:
  - The reasons why the development should be approved having regard to biophysical, **economic** and social considerations, including the principles of ecologically sustainable development.
  - An assessment of the likely economic impacts of the development, paying particular attention to:
    - the significance of the resource:
    - economic benefits of the project for the State and region; and
    - the demand for the provision of local infrastructure and services.
- The provision of economic reasons for why a development should be approved is consistent with the use of BCA. Economic benefits for the State and region is also consistent with BCA as well as economic activity analysis, 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[40] 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.

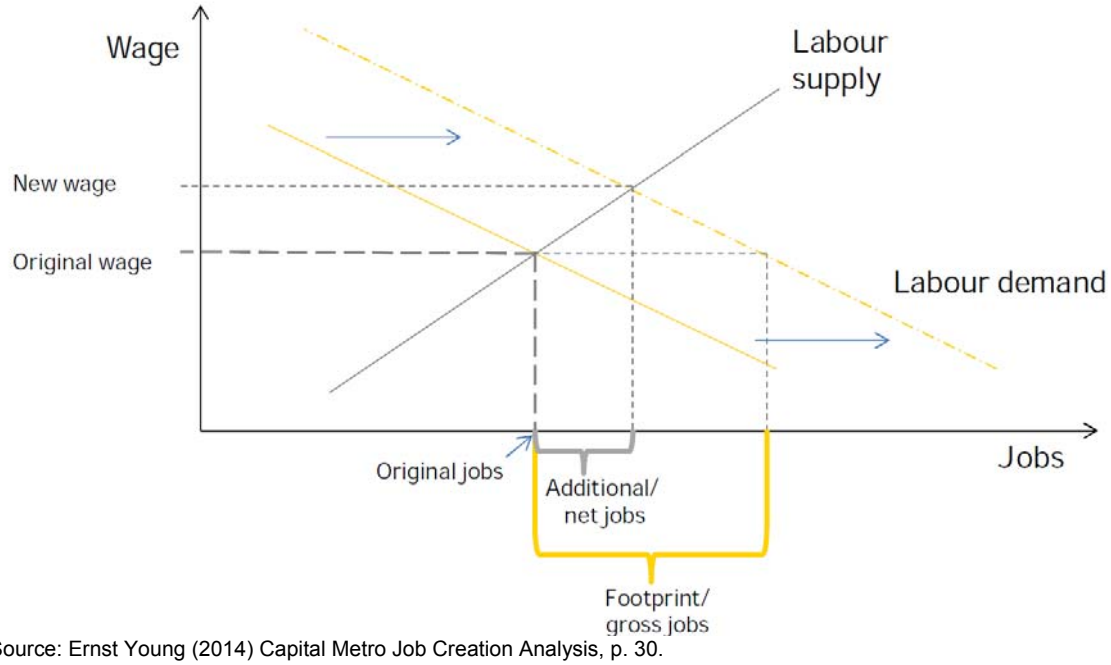
[40] Value-added is the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output.

- CGE modelling can be dynamic or comparative static[41] 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.

[41] 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[42]. 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*;

[42] 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).

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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

- 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 estimated NPV of the Project to Australia pre consideration of environmental impacts is $592M.
- 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)[43]. 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.

[43] 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.
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.
Aboriginal heritage	Defensive expenditure	Cost of preparation and implementation of an Aboriginal Cultural Heritage Management Plan included in the costs of the Project.
Historic heritage	Defensive expenditure Benefit transfer of CM data	Cost of relocating heritage items and fortifying them from impact is included in capital costs. For other impacted item benefit transfer from nonmarket valuations studies was used.
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[44]). 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[45]), 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[46]). This is consistent with the observed behaviour of altruism (Freeman III 2003[47]).

- 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.

[44] Boardman, A., Greenberg, D., Vining, A. and Weimer, D. (2001) *Cost-benefit analysis: concepts and practice*, Prentice Hall, New Jersey.
[45] Portney, P. (1994) The Contingent Valuation Debate: Why Economists Should Care, *Journal of Economic Perspectives* 8:4, 3-18.
[46] 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.
[47] 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[48], 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.

- Submissions to previous mining projects have questioned the use of the company tax rate when estimating the company tax generated from mining projects. One of the studies referred to in these submissions that purports to show an effective tax rate of less than 30% e.g. Richardson and Denniss (2011)[49] 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[50] has rejected GOS as an appropriate denominator for estimating effective tax rates.

- The other study referred to in submissions to previous mining projects to support the claim for effective tax rates of less than 30% is Markle and Shackelford (2009[51]). 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.

[48] Davidson, S. (2014) *Mining Taxes and Subsidies: Official evidence*, A Minerals Council of Australia Background Paper.
[49] Richardson, D. and Denniss, R. (2011) *Mining the truth: The rhetoric and reality of the commodities boom*, prepared for The Australia Institute.
[50] Clark, J., B. Pridmore and N. Stoney. 2007. 'Trends in aggregate measures of Australia's corporate tax level', *Economic Roundup*, Winter, pp 1 – 28)
[51] 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[52]).

- 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.

[52] 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[53]. 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 in submissions to previous mining projects.

[53] 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[54].

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%

- Claims 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%.

[54] Assuming 5 Mtpa of thermal product coal, a coal price of AUD$100/t, employment of 470 with an average wage of $120,000 per annum, land value of $20M and a mine subsidence levy for underground mining of $0.19.