Volume 8

Balranald Mineral Sands Project

NSW Environmental Impact Statement

Prepared for Iluka Resources Limited
May 2015

Appendix P - Economic Assessment
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Appendix P

Economic Assessment

Balranald Mineral Sands Project

Economic Assessment

Prepared for

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April 2015

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Iluka Resources Limited (Iluka) proposes to develop a mineral sands mine in south-western New South Wales (NSW), known as the Balranald Mineral Sands Project (the Balranald Project). The Balranald Project includes construction, mining and rehabilitation of two linear mineral sand deposits, known as West Balranald and Nepean, located approximately 12 kilometres (km) and 66 km north-west of the town of Balranald, respectively.

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

- A Benefit Cost Analysis (BCA) of the Balranald Project;
- An economic activity analysis of the Balranald Project using input-output (IO) analysis for two regions:
  - the regional economy comprising the LGAs in an approximate 200km radius of the Balranald Project i.e. the Local Government Areas (LGAs) of Balranald, Deniliquin, Hay, Murray, Wakool, Wentworth, Mildura and Swan Hill; 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).

A BCA of the Balranald Project indicated that it would have net production benefits of $148M. Assuming 55% foreign ownership, $132M of these net production benefits would accrue to Australia[1]. Provided the residual environmental, social and cultural impacts of the Balranald Project that accrue to Australia are considered to be valued at less than $132M, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

Instead of leaving the environmental, cultural and social impacts unquantified an attempt was made to quantify them. The main quantifiable environmental impacts of the Balranald 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. These impacts to Australia are estimated at less than $1M, considerably less than the estimated net production benefits of the Balranald Project. There may also be some non-market benefits of employment provided by the Balranald Project which are estimated to be in the order of $16M. Overall, the Balranald Project is estimated to have net social benefits to Australia of between $132M and $148M 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 Balranald Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between $132M and $148M for the Balranald Project to be questionable from an Australian economic efficiency perspective.

While the BCA is primarily concerned with the aggregate costs and benefits of the Balranald 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:

[1] This includes company tax, royalties and the share of residual net production benefits accruing to Australia.

- the Commonwealth Government in the form of any Company tax payable ([redacted] present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area;
- the NSW Government via royalties ($96M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the local and regional area; and
- the local and regional community in the form of voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Balranald 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 Iluka.

Noise costs, air quality costs and agricultural production costs will occur at a local level. These have been incorporated into the estimation of net production benefits via acquisition costs for affected properties and mitigation costs. As such, the bearers of these costs are compensated. Road transport impacts would also occur at the local level with the costs of road works included in the estimate of net production benefits. Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the costs of acquisition of water.

The economic costs associated with the clearing of native vegetation will occur at the State or national level and would be counterbalanced by the Balranald Project biodiversity offsets. Similarly Aboriginal heritage impacts will potentially occur to Aboriginal people and NSW households[2], however, these economic costs would be counterbalanced to some extent by implementation of the recommendations of the archaeological investigation. The cost of providing biodiversity offsets and implementing the recommendations of the archaeological investigation is included in the estimation of net production benefits. Visual impacts will occur at the local level and will be internalised by Iluka through the funding of visual mitigation measures. All of these measures mean that those who experience costs have them either mitigated or compensated.

Greenhouse gas impacts from the Project are global however Australia's response to global warming is at a strategic level rather than on project by project basis. Other potential environmental impacts would largely occur at the local level and were found to be insignificant. Any nonmarket benefits associated with employment provided by the Balranald Project would largely accrue at the local or State level[3].

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

Economic activity analysis, using IO analysis, estimated that the Balranald Project would make up to the following direct and indirect average annual contribution to the regional economy[4] for approximately 8 years:

- $965M in annual direct and indirect regional output or business turnover;
- $300M in annual direct and indirect regional value added;
- $82M in annual direct and indirect household income; and
- 1,289 direct and indirect jobs.

[2] Nonmarket valuation studies that have surveyed NSW households have found that they value the conservation of highly significant Aboriginal heritage (Gillespie Economics 2008, 2009a, 2009b).
[3] It should be noted that the study from which the employment values were transferred, surveyed NSW households only.
[4] Comprising the Local Government Areas of Balranald, Deniliquin, Hay, Murray, Wakool, Wentworth, Mildura and Swan Hill.

The Balranald Project is estimated to make up to the following direct and indirect average annual contribution to the NSW economy for 8 years:

- $720M in annual direct and indirect regional output or business turnover;
- $196M in annual direct and indirect regional value added;
- $58M in annual direct and indirect household income; and
- 771 direct and indirect jobs.

While the Balranald Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.1% and 0.8% of the regional economic activity impacts of the Project.

The main fiscal benefit of the Balranald Project to Governments is:

- [redacted] (present value) to the Commonwealth Government in company tax;
- $16M (present value) to the Commonwealth Government in personal income tax from Balranald Project employees;
- $96M (present value) in royalties to the NSW Government.

With regard to the Mining SEPP heads of consideration:

- the resource proposed to be mined contains 14.4 Mt of heavy mineral with an average assemblage of 12.6% zircon, 13.2% rutile and 61.9% ilmenite.

- Iluka has existing operations in the Murray Basin and theBalranald Project will utilise the existing Hamilton Mineral Separation Plant in Victoria.

- numerous sectors in the regional economy will have some dependence on the Balranald Project as 80% of the workforce is expected in live in the region and hence a material component of their expenditure would flow-on to local businesses. Similarly, considerable operational expenditure will go to firms in the region that are able to provide the goods and services required for the Project.

- the 32-month construction period for the Balranald Project is predicted to directly employ up to 450 people, with the annual average being around 209 workers. During operation, the Balranald Project will provide direct employment for approximately 550 workers, including direct employees and direct contractors. The Balranald Project will also provide indirect employment in the regional economy from employee and Project expenditure.

- the capital investment associated with the Balranald Project is estimated at approximately [redacted].

- the Balranald Project will generate royalties of [redacted] in total or $96M present value.

1 INTRODUCTION

1.1 Overview

Iluka Resources Limited (Iluka) proposes to develop a mineral sands mine in south-western New South Wales (NSW), known as the Balranald Mineral Sands Project (the Balranald Project). The Balranald Project includes construction, mining and rehabilitation of two linear mineral sand deposits, known as West Balranald and Nepean, located approximately 12 kilometres (km) and 66 km north-west of the town of Balranald, respectively.

Iluka is seeking development consent under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Balranald Project, broadly comprising:

- open cut mining of the West Balranald and Nepean deposits, referred to as the West Balranald and Nepean mines, including progressive rehabilitation;
- processing of extracted ore in the project area to produce heavy mineral concentrate (HMC) and ilmenite;
- road transport of HMC and ilmenite from the project area to Victoria;
- backfilling of the mine voids with overburden and tailings, including transport of by-products from the processing of HMC in Victoria back to the project area for backfilling in the mine voids;
- return of hypersaline groundwater extracted prior to mining to its original aquifer by a network of injection borefields;
- an accommodation facility for the construction and operational workforce;
- gravel extraction from local sources for construction requirements; and
- a water supply pipeline from the Murrumbidgee River to provide fresh water during operation.

Separate approvals are being sought for:

- the construction of a transmission line to supply power to the Balranald Project; and
- project components located within Victoria.

1.2 Approval process

The planning approval process for the Balranald Project is complex as it requires a number of approvals in NSW and Victoria, as well as approval from the Commonwealth. In NSW, the Balranald Project requires development consent under Part 4, Division 4.1 of the EP&A Act. Part 4 of the EP&A Act relates to development assessment. Division 4.1 specifically relates to the assessment of development deemed to be significant to the state, known as State significant development (SSD). The Balranald Project is a mineral sands mining development which meets the requirements for SSD. An application for SSD must be accompanied by an environmental impact statement (EIS), prepared in accordance with the NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

An approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is required for the Balranald Project (with the exception of the transmission line which will be subject to a separate EPBC Act referral process). A separate EIS will be prepared to support an application in accordance with the requirements of Part 8 of the EPBC Act.

1.3 Secretary's environmental assessment requirements

This EIS has been prepared to address specific requirements provided in the Secretary's environmental assessment requirements (SEARs) for the SSD application, issued on 2 December 2014. This Economic Assessment has been prepared to address specific requirements for economics in the SEARs and under the EP&A Act.

Table 1.1- Relevant SEARs for this Assessment

Requirement	Section addressed
An assessment of the likely economic impacts of the development, paying particular attention to:	Sections 3 to 6
• the significance of the resource;	Section 6
• economic benefits of the project for the State and region; and	Sections 3 to 6
• the demand for the provision of local infrastructure and services.	Separate Social Assessment
The reasons why the development should be approved having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development	Section 3

1.4 Purpose of this report

Gillespie Economics has been commissioned to undertake aEconomic Assessment for the SSD application for the Balranald Project. The Economic Assessment has been carried out accordance with the SEARs and with reference to the following standards, guidelines and policies:

- DP&I's (2002) *Draft Guideline for Economic Effects and Evaluation in EIA (James and Gillespie 2002);*
- 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*.

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, economic activity analysis using 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. Costs and revenues for governments (fiscal analysis) may also be of interest to decision-makers.

The legislative context for economic analysis in Environmental Impact Assessment (EIA) in NSW is outlined in Attachment 2. This is supportive of:

- BCA; and
- Economic activity analysis.

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

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

- A BCA of the Balranald Project (Section 3);

- An economic activity analysis of the Balranald Project (Section 4) using IO analysis for two regions:

  - The regional economy comprising the LGAs in an approximate 200km radius of the Balranald Project i.e. the Local Government Areas (LGAs) of Balranald, Deniliquin, Hay, Murray, Wakool, Wentworth, Mildura and Swan Hill; and
  - The NSW economy.

- An assessment of fiscal impacts to Governments.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013 (the Mining SEPP) refers to some specific economic heads of consideration for the consent authority which relate to various aspects of BCA and economic activity analysis. Refer to Attachment 2. However, the 'without limitation' requirement of the Mining SEPP means that the more comprehensive outcomes of BCA and economic activity analysis should still be of relevance to decision-makers.

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.

2 PROJECT DESCRIPTION

2.1 Project schedule

The Balranald Project will have a life of approximately 15 years, including construction, mining, backfilling of all overburden material, rehabilitation and decommissioning.

Construction of the Balranald Project will commence at the West Balranald mine, and is expected to take about 2.5 years.

Operations will commence at the West Balranald mine in Year 1 of the operational phase, which will overlap with approximately the last six months of the construction. The operational phase would include mining and associated ore extraction, processing and transport activities, and would be approximately nine years in duration. This would include completion of backfilling overburden into the pits at both the West Balranald and Nepean mines. Construction of infrastructure at the Nepean mine will commence in approximately Year 5 of the operational phase, with mining of ore starting in Year 6, and being complete by approximately Year 8.

Rehabilitation and decommissioning is expected to take a further two to five years following Year 9 of the operational phase.

2.2 Project area

All development for the Balranald Project that is the subject of the SSD application is within the project area. The project area is approximately 9,964 ha, and includes the following key project elements, described in subsequent sections:

- West Balranald and Nepean mines;
- West Balranald access road;
- Nepean access road;
- injection borefields;
- gravel extraction;
- water supply pipeline (from the Murrumbidgee River); and
- accommodation facility.

Within the project area, the land directly disturbed for the Balranald Project is referred to as the disturbance area. For some project elements in the project area, a larger area has been surveyed than would actually be disturbed. This enables some flexibility to account for changes that may occur during detailed design and operation. The project area and disturbance area for each project element are in Table 2.1.

Table 2.1 - Balranald Project, Project Area and Disturbance Area

Project element	Project area (ha)	Disturbance area (ha)
West Balranald mine	3,059	3,059
Nepean mine	805	805
West Balranald access road	128	52 [1]
Nepean access road	173	156 [2]
Injection borefields	5,721	1,214[3]
Gravel extraction	42	42 [4]
Water supply pipeline	29	11
Accommodation facility	7	7
Total	**9,964**	**5,346**

Notes: *1. 60 m wide corridor within project area*
2. 40 m wide corridor within project area
3. 100 m wide corridors within project area
4. 15 m wide corridor within project area

2.2.1 West Balranald and Nepean mines

The West Balranald and Nepean mines include:

- open cut mining areas (ie pit/mine void) that would be developed using conventional dry mining methods to extract the ore;
- soil and overburden stockpiles;
- ore stockpiles and mining unit plant (MUP) locations;
- a processing area (at the West Balranald mine), including a mineral processing plant, tailings storage facility (TSF), maintenance areas and workshops, product stockpiles, truck load-out area, administration offices and amenities;
- groundwater management infrastructure, including dewatering, injection and monitoring bores and associated pumps and pipelines;
- surface water management infrastructure;
- service infrastructure (eg power);
- haul roads for heavy machinery and service roads for light vehicles; and
- other ancillary equipment and infrastructure.

The location of infrastructure at the West Balranald and Nepean mines would vary over the life of the Balranald Project according to the stage of mining.

2.2.2 Injection borefields

The Balranald Project requires a network of injection borefields in the project area for the return of hypersaline groundwater to the Loxton Parilla Sands aquifer. Within each borefield, infrastructure is generally located in two 50 m wide corridors (approximately 350 m apart) and typically comprises:

- a network of pipelines with a graded windrow on either side;
- access roads for vehicle access during construction and operation;
- rows of injection wells, with wells spaced at approximately 100 m intervals; and
- a series of water storage dams to store water during well development.

2.2.3 Access roads

There are two primary access roads within the project area to provide access to the Balranald Project:

- West Balranald access road – a private access road to be constructed from the Balranald Ivanhoe Road to the West Balranald mine.
- Nepean access road – a route comprising private access roads and existing public roads. The southern portion of the road will be a private access road from the northern end of the West Balranald mine to the Burke and Wills Road. Vehicles would then use two public roads, Burke and Wills Road and Arumpo Road. A private access road would be constructed from Arumpo Road to the Nepean mine.

The West Balranald access road would be the primary access point to the project area, and would be used by heavy vehicles transporting HMC and ilmenite. The Nepean access road would primarily be used by heavy vehicles transporting ore mined at the Nepean mine to the processing area at the West Balranald mine.

During the initial construction phase, existing access tracks through the project area from the local road network may also be used temporarily until the West Balranald and Nepean access roads and internal access roads within the project are established.

2.2.4 Accommodation facility

An accommodation facility would be constructed to cater for workers required by the Balranald Project. It would operate throughout the construction and operation phases of the project. The accommodation facility would be located adjacent to the West Balranald Mine near the intersection of the West Balranald access road with the Balranald Ivanhoe Road.

2.2.5 Water supply pipeline

A water supply pipeline would be constructed to supply water from the Murrumbidgee River for operation of the Balranald Project.

2.2.6 Gravel extraction

Gravel would be required during the construction and operational phases of the Balranald Project. Local sources of gravel (borrow pits) have been included in the project area to provide gravel during the construction phase. During the construction phase, gravel would be required for the construction of the West Balranald access road, internal haul roads and service roads, and hardstand areas for infrastructure. Processing operations, such as crushing and screening activities (if required) would also be undertaken at the borrow pits. Gravel for the operational phase would be obtained from external sources.

2.2.7 Workforce

During the construction phase, the Balranald Project would employ a peak construction workforce of approximately 225 people. During the operational phase, a peak workforce of approximately 550 people is anticipated. There would be a short period when there would be an overlap of these workforces as construction is finalised and mining operations commence. During this overlap, it is expected there would be a combined construction and operational workforce of about 450 people.

It is expected that approximately 70% of both the construction and operational workforce would be on-site at any point in time with 30% on scheduled leave periods. Accordingly, the peak construction and operational workforce on-site at anyone point in time is expected to be about 158 people and 385

people respectively. During the overlap of the construction and operational phases, it is expected that there would be approximately 315 people on-site at any one point in time.

2.3 Mitigation Measures

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

Potential Environmental, Cultural and Social Impacts

- A range of measures to mitigate, offset and compensate for potential environmental, cultural and social impacts, including the development of a Voluntary Planning Agreement - refer to Chapter 27 of the EIS.

Potential Workforce Impacts

- Provide advance information about its approach to workforce sourcing, recruitment policies of local people, and work arrangements in relation to such matters as shifts, transport and work, health and safety obligations.

- Work with recruitment, education and training providers in Balranald, Swan Hill and Mildura to encourage the provision (in advance of project commencement) of future employment and training opportunities for skills that would be directly and indirectly generated by mining projects.

- Continue liaison with relevant agencies to ensure that any wider community issues about training and labour availability for 'vacated' local jobs in favour of jobs on the Balranald Project does not become an 'Iluka' issue.

- Participate, as appropriate, in business groups, events or programs as part of a Balranald business association and/or provide training programs directly relevant to project needs or broader industry skills (including programs specifically designed to assist local companies to comply with Iluka's pre-qualification and contractual requirements).

- Participate in a Balranald Shire Council (BSC) mining liaison committee so that relevant project information can be provided and community feedback received.

- The provision of these activities would be supported by Iluka's proposed development of a local employment and business policy. The intent of this policy is to provide relevant commitments to drive Iluka activity in potential areas including:

    - product and service procurement;
    - equitable or contracted procurement;
    - pre-qualification assistance;
    - employment advertising and resourcing;
    - training assistance or participation, and
    - service referrals.

Potential accommodation Impacts

- To address workforce housing and accommodation requirements, Iluka proposes to develop an accommodation facility for the life of the Balranald Project (including construction, operations and rehabilitation phases).

- Iluka proposes to lodge a separate development application with BSC for an accommodation facility in the Balranald town. Approval for a second, alternative site adjacent to the West Balranald mine is being sought as part of the SSD application. In the event that approval is received for both options, Iluka would only construct an accommodation facility at one of the approved locations.

Potential retail, hospitability and community infrastructure

- Have discussions with health and emergency services (ambulance, fire and rescue services) prior to commencement of construction, to ensure that there would be appropriate interface arrangements for operational matters.

- Provide advance briefings about corporate purchasing policies and assistance to become pre-qualified to assist them to tender for the supply and/or delivery of goods and services to Iluka during the construction, operational and rehabilitation/relinquishment periods.

- Provide a conduit between local businesses and major Iluka contractors.

Cumulative impacts

- Continue consultation with Council, Cristal Mining Australia Limited (Cristal) and local accommodation suppliers, to monitor general short-term accommodation usage by Iluka and Cristal and any impacts on other accommodation sectors.

- Consult with Cristal to ensure that potential negative social impacts result from any concurrent stages of project construction and operation are minimised..

3 BENEFIT COST ANALYSIS

3.1 Introduction

3.1.1Introduction to BCA

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 environmental assessment 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 costs and benefits are defined and valued based on the microeconomic underpinnings of BCA. In particular, it is the values held by individuals in the society that are relevant, including both financial and non-financial values. Provided the present value of aggregate benefits to society exceed the present value of aggregate costs (i.e. a net present value of greater than zero), the project is considered to improve the well-being of society and hence is desirable from an economic efficiency perspective.

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

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

3.1.2 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.

BCA at a sub-national perspective requires attribution of 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 producer surpluses, that are normally omitted from BCA, being included. BCA at the sub-national level therefore requires careful consideration of the distribution of costs and benefits.

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

3.1.3 Definition of the project scope

The scope of the project being assessed in a BCA is important to clearly establish. The project being assessed in the EIS includes the:

- construction, operation and rehabilitation of a mineral sands mine, including the extraction of ore from the West Balranald and Nepean deposits;
- processing of extracted ore within the mine disturbance area to produce HMC and ilmenite; and
- transport of HMC and ilmenite by truck along the Sturt Highway to the NSW-Victorian border at Tooleybuc.

The Balranald Project would also result in a number of activities that would be subject to separate approvals in Victoria (i.e. are not part of the Balranald Project assessed in the EIS). The elements of the Balranald Project located in Victoria are predominantly focused on transport and materials handling facilities. In addition, ilmenite from the Project would be upgraded to synthetic rutile in Western Australia.

From an economic perspective these associated activities form part of a larger project aimed at mining of mineral sands and deliver to port for sale. As identified by NSW Treasury (2007, p. 38) "*the scope of the project evaluated should be such that the project is a discrete whole*." While a project may consist of a series of component parts, it is the evaluation of the larger project which is critical (NSW Treasury, 2007). Consequently, for the purpose of the BCA the evaluation is undertaken of the larger project (i.e. the mining of mineral sands, processing and delivery of ilmenite, zircon, rutile and synthetic rutile to port for sale).

This definition of the Balranald Project for which approval is being sought under a number of applications has important implications for the identification of the costs and benefits of the Balranald 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 project, are relevant. Put simply, only the costs and benefits from the mining of the mineral sands and delivery of minerals to port are relevant.

In this regard, it is important to recognise that while minerals are intermediate goods (i.e. they are used as an input into the production of other goods and services), it is not appropriate to include the costs and benefits associated with the downstream use of the mineral concentrates. BCA is a form of partial equilibrium analysis that attempts to isolate the marginal impacts of a particular project, holding all other things equal, including in this case the levels of downstream use of mineral concentrates. The downstream uses of the Balranald Project minerals constitute different projects[5], that have their own sets of costs and benefits and themselves can be subject to BCA.

[5] As identified by NSW Treasury (2007), projects or programs may contain a range of elements related to one another and the point at which a discrete project can be identified will require careful judgement. In this respect, NSW Treasury (2007) cautions against excessive aggregation in project scope (i.e. inclusion of activities in the project scope that can themselves be considered to be separate projects).

3.1.4 Net production benefits

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

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

Net production benefits can be estimated based on market data on the projected financial[6] value of the minerals 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.

3.1.5 Environmental, social and cultural impacts

The consideration of nonmarket impacts in BCA relies on the assessment of other experts contributing information on the biophysical impacts. The EIA process results in detailed (nonmonetary) consideration of the environmental, social and cultural impacts of a project and the proposed means of mitigating the impacts.[7]

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

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

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

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

Primary nonmarket 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.

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

[7] In this case the EIA process is limited to the components of the overall project confined to NSW and so care needs to be taken to also, at least qualitatively or via the threshold value approach, consider impacts that may occur as a result of project components not assessed in this EIS.

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

3.1.5 Consideration of net social benefits

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

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

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

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

Any other residual environmental, cultural or social costs that remain unquantified in the analysis[8] can also be considered using the threshold value approach. The costs of these unquantified environmental, cultural and social impacts would need to be valued by society at greater than the quantified net social benefit of a project to make it questionable from an economic efficiency perspective.

3.1.6 Steps in BCA

BCA of the Balranald Project involves the following key steps:

- identification of the base case;
- identification of the Balranald Project and its implications;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates using discounting to account for temporal differences;
- application of decision criteria;
- sensitivity testing;and
- consideration of non-quantified benefits and costs.

[8]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.

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

3.2 Identification of the base case and the project

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

The project area and surrounding land is zoned for primary production under the Balranald Local Environment Plan 2010 (Balranald LEP). Land uses in and surrounding the project area are primarily agricultural, and include sheep grazing and grain crops. There are also southern mallee conservation areas (SMCAs).Under the base case, the land required for the Balranald Project would continue to be used for rural and conservation purposes.

In contrast, the Balranald Project (as described in Section 2 and expanded in Section 3.1.3 for the purpose of the Economic Assessment) comprises mineral sand mining and processing for a period of eight years, materials handling and transport of minerals to port for export.

At the end of the Balranald 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 Balranald Project were considered by Iluka in the development of the Balranald Project description. Chapter 5 in the Main Volume of the EIS provides more detail on the consideration of Balranald Project alternatives.

The Balranald Project assessed in the EIS and evaluated in the BCA is considered by Iluka 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 Iluka and was subject to detailed economic analysis.

3.3 Identification of benefits and costs

Relative to the base case or "without" Balranald Project scenario, the Balranald Project may have the potential incremental economic benefits and costs shown in Table 3.1.The main potential economic benefit is the producer surplus (net production benefits) generated by the Balranald Project and any nonmarket employment benefits it provides, while the main potential economic costs relate to any environmental, social and cultural costs.

Table 3.1 - Incremental Economic Benefits and Costs of the Balranald Project

Category	Costs	Benefits
Net production benefits	Opportunity costs of capital equipment Opportunity cost of land[1] Development costs including labour, capital equipment and acquisition costs for impacted properties and offsets[1] Operating costs of mine including labour and mitigation measures Rehabilitation and decommissioning costs at end of the Project life	Value ofminerals 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	Greenhouse gas impacts Noise impacts Air quality impacts Surface water impacts Groundwater impacts Ecology impacts Road transport impacts Aboriginal heritage impacts Non-Aboriginal heritage impacts Visual impacts	Any nonmarket 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 2.1, are only economic costs to the extent that they affect individual and community well-being through direct use of resources by individuals or nonuse. 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 Balranald Project BCA apart from the mitigation, compensation or offset costs.

3.4 Quantification/valuation of benefits and costs

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

The analysis period is 14 years, coinciding with the Balranald Project life together with pre mining years and post mining rehabilitation. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural and social impacts have initially been left unquantified and interpreted using the threshold value method[9]. An attempt has also been made to estimate environmental, cultural and social impacts using market data and benefit transfer[10]. However, even with the inclusion of these values, the estimated net social benefits of the Balranald Project provide a threshold value that any residual or non-quantified economic costs would need to exceed to make the Balranald Project questionable from an economic efficiency perspective.

[9] The threshold value method uses the value of quantified net production benefits as the amount that unquantified environmental, social and cultural costs would need to exceed to make a project questionable from an economic efficiency perspective.
[10] Benefit transfer refers to borrowing economic values that have been determined for other study sites.

3.4.1 Production costs and benefits[11]

Production Costs

Opportunity Cost of Land and Capital

There is an opportunity cost associated with using land already in Iluka ownership, for the Balranald Project instead of its next best use (i.e. rural production and conservation). However, Iluka advises that all land required for the Balranald Project will be purchased as part of the development costs of the Project, reported below.

Iluka propose to relocate its Processing Plant currently located at its mining operations south-east of Ouyen, to the Balranald Project and to utilise its existing Mineral Separation Plant at Hamilton, Victoria. There is an opportunity cost associated with using this equipment for the Balranald Project instead of sale. However, there would only be a limited number of potential purchasers of this equipment for reuse in mineral sand mining operations and given the cost of dismantling and relocating it for use by any prospective purchaser the willingness to pay for it is expected to be modest. An indicator of the opportunity cost of using this equipment in the Balranald Project is therefore given by its scrap metal value, estimated at in the order of [redacted].

Development Cost of the Balranald Project

Development costs of the Balranald Project are associated with the purchase of mining equipment, development of the mine site, land acquisitions, development of a workforce accommodation village and transmission line, construction of a rail loading facility in Manangatang, Victoria, and environmental mitigation, compensation and offset costs. These costs include labour costs during the development of the Balranald Project, which reflect the value of labour resources in their next best use.

These incremental development costs over the life of the mine are estimated at approximately [redacted]. These development costs include an allowance for acquisition of land for properties affected by noise and dust, as well as impact mitigation and monitoring costs and ecological offsets. Development costs are included in the economic analysis in the years that they are expected to occur.

Annual Operating Costs of the Balranald Project

The operating costs of the Balranald Project include those associated with mine operation (including environmental management and ongoing mitigation or offset costs), processing of extracted ore, transportation of the HMC to Iluka's mineral processing facilities in Hamilton, Victoria, transportation of ilmenite to the rail loading facility in Manangatang, Victoria, upgrading ilmenite to synthetic rutile, minerals delivery (rail freight and Port handling and loading) and general costs (including overheads and administration). These costs includelabour costs, which reflect the value of labour resources in their next best use.

While royalties are a cost to Iluka, 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 Balranald Project. Nevertheless, it should be noted that the Balranald Project would generate total royalties in the order of [redacted] ($96M 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.

[11] All values reported in this section are undiscounted Australian dollars unless otherwise specified.

The economic capital costsare included in the development costs of the Balranald Project in the years in which they occur.

Rehabilitation and Decommissioning Costs

Towards the end of the Balranald Project life, the mine site will begin to be decommissioned and rehabilitated. This will occur over a two to five year period at an estimated cost of [redacted].

Production Benefits

Value of Minerals

The main economic benefit of the Balranald Project is the market value of ilmenite, zircon, rutile and synthetic rutile.

Rutile has a titanium dioxide content of around 95% and is an important feedstock mineral for the titanium dioxide pigment industry. Titanium dioxide is widely used in the manufacture of paint, paper and plastics. Rutile is also used in the manufacture of welding rods and the production of titanium metal. Titanium is light and strong and is used in the aerospace industry, bio-engineering and some sporting goods.

Ilmenite also contains titanium dioxide and is used as feedstock in the titanium dioxide pigment industry. However, it also contains more iron than rutile, and so has a relative value that is typically 20 to 25% of the rutile selling price.

Finely ground zircon is commonly used for glazes in the ceramic industry. These products include kitchen and bathroom tiles, dinnerware and decorative ceramics. Zircon is also widely used in television screens and computer monitors.

Both demand for, and supply of, these minerals influences current and projected prices.

Demand for these minerals is derived demand, i.e. dependent on demand for the end products within which the minerals are used. This fluctuates considerably based on numerous market factors including the price of the end product, the prices of related end product, income of consumers, expected future prices, population, preferences, etc.

World supply fluctuates depending on price of the end product, prices of factors of production, prices of related goods, expected future prices, the number of suppliers, technology, and the political situation in developing countries where potential deposits are located, etc.

Prices fluctuate considerably and are expected to continue to do so. Iluka has provided a projection of annual revenue that is based on forecast pricing by TZ Minerals International Pty Ltd (TZMI)[12] (in United States (US) dollars) and an assumed AUD/USD exchange rate of [redacted]. TZMI is an independent consulting company, operating since 1994, that works with a wide range of global clients to provide insight and expert advice on mineral sands and other opaque mineral, metal and chemical sectors.

Residual Value at End of the Evaluation Period

At the end of the Balranald Project, capital equipment and land (excluding offsets) may have some residual value that could be realised by sale or alternative use. The residual value of capital equipment and land is estimated at [redacted] and [redacted], respectively.

[12]This information is provided on a fee for service basis and is unable to be made publicly available.

3.4.2 Environmental, social and cultural costs and benefits

Greenhouse Gases

The Balranald Project is predicted to generate in the order of 0.6 Mt of direct carbon dioxide equivalent (CO_2-e) emissions associated with mining (Scope 1 emissions) over the lifetime of the Balranald Project. Approximately 0.5 Mt of indirect (Scope 2) CO_2-e emissions associated with on-site electricity consumption and 0.3 Mt of indirect (Scope 3) CO_2-e emissions associated with the domestic transport of mineral concentrates to port and upstream emissions from electricity consumption and fuel supply would also be generated over the lifetime of the Balranald Project (Environ Australia Pty Ltd 2015). The economic analysis has included these emissions as a potential environmental cost of the Balranald Project. Emissions associated with transport to international markets are omitted as costs and benefits of the Balranald Project are defined up to mineral concentrates being free-on-board.

In addition, the Balranald Project would result in the loss of carbon sequestration benefits from the clearing of vegetation (5,160.4hectares [ha]). It is assumed that the loss of carbon sequestration benefits associated with the clearance of this vegetation would be offset by proposed offsets (28,000 ha).

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 trying to estimate the global damage costs of CO_2-e is to examine the price of CO_2-e credits/taxes. 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-eto AUD$40/t CO_2-e was also undertaken (refer to Section 3.6).

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

Agricultural Land

The Balranald Project will result in the temporarily removal of 3,794 ha of Land and Soil Capability (LSC) Classes 4, 5/6 and 6 from potential agricultural production during the life of the Project (approximately 10 years) and an ongoing reduction in agricultural production in perpetuity from rehabilitation of impacted land to LSC Class 6. In addition, the Balranald Project will require in the order of 28,000 ha of biodiversity offsets which may remove land from agricultural production (refer to Section 4.6.2 for a fuller discussion of agricultural impacts) (SLR Consulting Australia Pty Ltd, 2015).

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 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 Balranald Project, has been incorporated in the BCA through inclusion of the full value of land i.e. project and offsets, required for the Balranald Project.

Operational Noise

The impact of the Balranald 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.

Construction noise limits are predicted to be exceeded at one receptor due to construction of the access road between Nepean and West Balranald mines (EMGA Mitchell McLennan Pty Ltd 2015a). The impacts to this sensitive receptor are expected to be short-term and can be minimised through the modification of construction hours, if required. Consequently, no material economic costs arise for inclusion in the BCA.

Modelling of noise impacts during Balranald Project operation indicate that during adverse weather conditions for all assessment periods and all stages of the mine life, two assessment locations identified as dwellings are predicted to experience noise levels above the operational criterion of 35 dB(A); of these, one is predicted to experience noise levels above the affectation criterion of 40 dB(A). An allowance has been included in the capital costs of the Balranald Project for noise mitigation measures for the moderately impacted dwelling and for acquisition of the other property, if required (EMGA Mitchell McLennan Pty Ltd 2015a). While potential 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 [redacted] to the property moderately impacted. Assuming these works occur in the first year of operation the present value of these measures would be in the order of [redacted]. Property acquisition costs are also commercial-in-confidence but are a small component of the capital costs of the Balranald Project. The inclusion of these acquisition costs in the BCA instead of the partial property value impacts will overstate the economic impacts.

To the extent that measures during construction and operation of the Balranald Project mitigate noise on moderately impacted dwellings, then affected properties are no worse-off than they were before and no material externality costs arise that warrant inclusion in a BCA. It is recognised that to the extent that any residual noise impacts occur, after mitigation, the noise costs of the Balranald Project included in the BCA will be understated.

The privately owned land assessment has identified three land parcels in the affectation zone (EMGA Mitchell McLennan Pty Ltd 2015a). However, the project area covers the majority of the three land parcels and it is therefore expected most of this land would be subject to acquisition and/or compensation agreements irrespective of the noise impact assessment. An allowance is included in the capital cost of the Balranald Project for these costs.

The low frequency assessment identified that criterion will be met at all privately owned receptors. Potential sleep disturbance impacts from operational maximum noise level events have been assessed and are expected to satisfy the relevant criteria for all assessment locations. No additional economic costs are therefore included in the BCA.

Air Quality

The impact of the Balranald 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 air quality impacts are estimated.

However, where air quality criteria (which are set at levels to protect against health effects and nuisance dust effects) are predicted to be exceeded, a condition of contemporary development consents is for the proponent to purchase the affected properties on request of the landowner. The inclusion of these acquisition costs in the BCA instead of the partial property value impacts will overstate the economic impacts.

However, for the Balranald Project, there are no properties that will be impacted by exceedances of air quality criteria (Environ Australia Pty Ltd 2015) and hence no additional costs arise for inclusion in the BCA.

Surface Water

The Balranald Mineral Sands Project Surface Water Management Report (WRM 2015) concludes that there are no local users of surface water that would be impacted by the Balranald Project.

The West Balranald and Nepean mine infrastructure is located outside of the predicted Box Creek and Tin Tin Lake flood extent from an event that exceeds the 1 in 100 AEP event and will have no impact on flooding(WRM 2015).

Parts of the Nepean access road and injection borefields are located within the flood extent of Box Creek and Tin Tin Lake. The Nepean access road will be constructed at existing ground levels, and will therefore not have any impact on predicted flood levels, velocities or flow distributions. It is possible that should a major flood event occur, the Nepean access road may be inundated and non-trafficable for an extended period of time(WRM 2015).

The injection borefields will not impact on flood levels, velocities or flow distributions, as the injection well heads are small and will present little obstruction to flow. The windrows alongside the pipelines are unlikely to impact on peak flood levels, and predicted flood flow velocities are very low within the injection borefield areas, limiting the possibility of infrastructure causing erosion damage(WRM 2015).

The Balranald Project will extract water from the Murrumbidgee Regulated River Water Source under the *Water Sharing Plan (WSP) for the Murrumbidgee Regulated River Water Source 2003*. Approximately 450 ML would be required per annum(WRM 2015). High security unit shares and/or licences would be purchased by Iluka for the Balranald Project in order to supply the required volumes. Extraction would be in accordance with the rules of the WSP. Surface water is a potential input into numerous alternative production processes and so its use for mining has an opportunity cost, i.e. its value in the next best alternative use. In NSW the government has established a market framework to facilitate the allocation of water surface water. Water access and use is only permissible with possession of a water access licence (WAL) (except in the case of harvestable rights, native title rights and some stock and domestic rights). WSPs 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 surface water can be considered to give a reasonable indication of its economic value in alternative uses such as agriculture, i.e. its opportunity cost

The opportunity cost of450 ML/year of volumetric WAL have been included the capital costs of the Project. At an assumed market value of water of $2,000/ML the cost is in the order of $1M. This is a use value of the water. Given that the water would otherwise be allocated to other uses e.g. agriculture, there are no incremental non-use impacts e.g. aquatic ecology impacts, of using this water for mining instead of alternative uses such as agriculture.

Groundwater

A key component of the Balranald Project is de-watering of the Loxton-Parilla Sands and injection of this hyper-saline water into the Loxton-Parilla Sands. At the West Balranald mine this process involves de-watering and subsequent injection of up to 1,300 L/s, whilst at Nepean mine this volume is significantly less at up to 190 L/s. The dewatering rates will vary during the mine life according to the advance rate of the pit, and the depth of the ore relative to the water table. The ore body is much shallower at Nepean resulting in a lower rate of de-watering (Jacobs Group 2015).

The Balranald Project will cause localised changes to the groundwater conditions due to dewatering and injection requirements. While Iluka will abstract and inject groundwater from/to the Loxton-Parilla Sands, modelling indicates drawdown and mounding will occur in both the Loxton-Parilla Sands and the Shepparton Formation. Thus, groundwater abstraction and injection will enhance vertical hydraulic gradients between these formations.

The abstracted groundwater will be a mix of both the Loxton-Parilla Sands and Shepparton Formation groundwaters, and the receiving environment is both the Loxton-Parilla Sands and the Shepparton Formation. An assessment of site water quality suggests there will be no negative change in the water quality receiving environments.

Assessment of the predicted groundwater level fluctuations from drawdown and injection indicates that impacts from groundwater abstraction and reinjection are likely to be minimal. Overall there are few water related impacts as a result of the Balranald Project due to:

- groundwater quality of the target units for abstraction and injection (Loxton-Parilla Sands and Shepparton Formation) already being highly saline, and not suitable for beneficial uses (human drinking water, livestock drinking water and irrigation) without treatment; and
- there are no instances where the maximum change in pre mining groundwater level exceeds 2 m in any nearby registered landholder bore, therefore there is no requirement for 'make good' provisions in accordance with the Aquifer Interference Policy.

Iluka will be required to purchase groundwater allocations from the *WSP for the NSW Murray-Darling Basin Porous Rock Groundwater Sources 2011* for the extraction of 26,000 ML of groundwater. This allocation is likely to be required to be purchased from the NSW government via a controlled allocation order under the *Water Management Act 2000*.

The capital costs of the Project include a provision for licensing of return flows to the Olney Formation and the purchase of groundwater allocations. Ongoing licensing costs are included in the annual operating costs of the Project.

Water balance model predictions indicate de-watering and re-injection used in the Balranald Project will not impact the Murrumbidgee or Murray Rivers (Jacobs Group, 2015). Consequently, no economic costs are included in the BCA.

Ecology

Eleven native vegetation communities were identified within the project area with two additional vegetation types created to recognise highly modified vegetation communities. None of the vegetation types within the disturbance area are listed as threatened ecological communities (TEC) under the *Threatened Species Conservation (TSC) Act 1995* or *Environment Protection and Biodiversity Conservation (EPBC) Act1999*. As such, no significant impact to any TEC will occur as a result of the proposed development (Niche Environment and Heritage 2015a).

The Balranald Project has evolved during the course of the ecological investigations and a suite of measures have been designed to avoid, minimise and mitigate adverse impacts on biodiversity. However, residual impacts remain for vegetation and threatened species habitat, with the project progressively clearing 5,160.4 ha of native vegetation. A further 186.1 ha of exotic pasture and existing cleared land will be progressively cleared for the project. Significant impacts were identified for the Grey-crowned Babbler; Malleefowl; Little Pied Bat; Jewelled Gecko; Mallee Worm-lizard and Western Blue-tongued Lizard. These species are all listed under the TSC Act and the Malleefowl is also listed under the EPBC Act (Niche Environment and Heritage 2015a).

The Balranald Project also has the potential for indirect impacts including dust, noise, sedimentation or erosion in adjacent bushland and weed invasion. However, the impact assessment has used a conservative approach and incorporated buffers into the disturbance area, which will remain largely unaffected over the life of the project, to quantify and assess such impacts(Niche Environment and Heritage 2015a).

Residual impacts will be compensated through a Biodiversity Offset Package. Preliminary calculations presented in the EIS indicate that in the order of 28,000 hectares of offsets would be required. A Biodiversity Offsets Strategy has been included in this assessment and the requirements of the Biodiversity Offset Package have been identified using the BioBanking Credit Calculator and in accordance with the EPBC Act Offset Assessment Guide. The Biodiversity Offset Package will meet the calculated requirements in accordance with NSW and Commonwealth policy, and is currently being prepared in consultation with Office of Environment and Heritage, Department of Environment and other relevant stakeholders (Niche Environment and Heritage 2015a).

The impacted vegetation, and associated fauna, is likely to have nonuse values to the community that would be lost as a result of the Project. These values could potentially be estimated using non-market valuation methods. However, it is government policy that biodiversity offsets are provided that improve or at least maintain biodiversity values. The provision of offsets is also likely to have non-use values to the community that would be gained as a result of the Project. Provided the values held by the community for the offsets are equal or greater than values that would be lost then no additional economic costs warrant inclusion in the BCA apart from the capital and operating costs of providing the offsets. These costs are included in the capital and operating costs of the Project.

Road Transport

The highest traffic generation associated with the construction of the Balranald Project will occur on Balranald-Ivanhoe Road, north of the Sturt Highway and Moa Street in Balranald town. At this location, a peak of approximately 314 additional movements per day are anticipated. This traffic generation is not anticipated to have a material impact upon the capacity and performance of the local road network (EMGA Mitchell McLennan Pty Ltd 2015b).

During operations, the Balranald Project will generate a maximum of approximately 354 vehicle movements per day on the Balranald-Ivanhoe Road north of the Sturt Highway and Moa Street. Similar to construction traffic, the anticipated additional traffic movements during operation would have no material impact on the road network (EMGA Mitchell McLennan Pty Ltd 2015b).

Nevertheless, there are a number of existing deficiencies in the road network that will remedied as part of the Balranald Project (EMGA Mitchell McLennan Pty Ltd 2015b). In addition, Iluka will negotiate equitable road maintenance agreements with the BSC to proportionally fund the ongoing road maintenance requirements for the council roads affected along the product transport route. These costs are allowed for in the capital and operating costs of the Balranald Project.

Aboriginal Heritage

A total of 548 Aboriginal sites were identified across all archaeological investigations for the Balranald Project, including due diligence assessments and the 2012, 2013 and 2014 EIS field programs(Niche Environment and Heritage 2015b). These sites were added to the Balranald Project Aboriginal Heritage Database.

Approximately 76% of the identified Aboriginal sites (417) of these sites are located in or within 100m of the Project Area. 383 Aboriginal sites are located within the Project area. 256 Aboriginal sites were located within the disturbance area(Niche Environment and Heritage 2015b).

An assessment of significance was undertaken for individual sites and the Project area. The Project area has social significance to the Aboriginal community because it contains archaeological sites and traditional resources that establish a link between the past and present Aboriginal use of the land (Niche Environment and Heritage 2015b).

The Project area contains landscapes which have high and moderate archaeological value, but for the most part contains landscapes that are of low archaeological value. The high and moderate value areas include the Box Creek distributary stream of the Lachlan River (at the northern end of the West Balranald mine) and areas of relict lake fringes and depressions associated with the northern injection borefields. These parts of the Project area are significant becausethey may reveal important details about how and when Aboriginal people lived in this area, and how Aboriginal settlement of the area relates to, and informs what is known of Aboriginal history in adjoining areas, including the Willandra Lakes Region World Heritage Area. In particular the areas of high and moderate significance within the Project area may provide a story of how people have utilised the area, and how this utilisation relates to the active and inactive phases of Box Creek's history and the episodic filling history of the lakes as the availability of water changed from the terminal Pleistocene to the present. As well as providing information about the chronology and nature of Aboriginal settlement of the region, the Project area may also provide additional information on the local and regional use and distribution of resources, such as raw materials for making stone tools(Niche Environment and Heritage 2015b).

An impact assessment was completed for the sites and management and mitigation measures considered. As a result of the archaeological investigation the following recommendations were made:

- Preparation of an Aboriginal Cultural Heritage Management Plan;

- surface salvage collection and management of areas based on risk rating for sites directly disturbed as a result of the Project; and
- development of an archaeological research and salvage excavation program (Niche Environment and Heritage 2015b).

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

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

For the purpose of this analysis, the costs of implementing the recommendations of the archaeological investigation have been included in the capital and operating costs of the Project however any residual impacts remain unquantified.

Non-Aboriginal Heritage

No items of non-Aboriginal heritage were identified in the Project area (Landskape Natural and Cultural Heritage Management 2012) and hence there are no non-Aboriginal heritage impacts for inclusion in the BCA.

Visual Impacts

The impact of the Balranald Project on visual amenity at nearby properties can potentially be valued using the property value method, where the change in property value as a result of the noise impacts are estimated, or the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

The EIS prepared for the Balranald Project included a visual impact assessment which considered representative viewpoints surrounding both the West Balranald and Nepean mines. The assessment also took into account transient receptors along four roads surrounding the Balranald Project.

Generally, visual and lighting impacts were considered low to moderate based the distances between viewpoints and mining operations, and screening provided by existing landform and vegetation. A number of visual and lighting impact management measures will be implemented to mitigate and manage impacts during operation of the Balranald Project.

The costs of these mitigation measures have been included in the capital and operating costs of the Project. It is recognised that to the extent that any residual visual impacts occur, after mitigation, the visual costs of the Balranald Project included in the BCA will be understated. However, any residual visual impacts are not expected to be material from an aggregate economic welfare perspective.

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[13]). 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.

[13]Boardman, A., Greenberg, D., Vining, A. and Weimer, D. (2001) *Cost-benefit analysis: concepts and practice*, Prentice Hall, New Jersey.

These treatments of employment in BCA relate to the market value or opportunity cost of labour resources. However, BCA also includes nonmarket 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[14]), 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.

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

The Balranald Project will provide direct employment for approximately 550 people (82 of which will be direct employees of Iluka) for a period of 8 years. Using benefit transfer from the more conservative Bulli Seam Operation study and applying the employment value to the estimated direct Iluka employees of the Balranald Project[15] gives an estimated $16M for the nonmarket employment benefits of the Project to NSW households. At a regional level the benefit would be $0.2M[16]. 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.

3.5 Consolidation of value estimates

3.5.1 Aggregate costs and benefits

The present value of costs and benefits, using a 7% discount rate, is provided in Table 3.2. The main decision criterion for assessing the economic desirability of a project to society is its net present value (NPV). NPV is the present value of benefits less the present value of costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the Balranald Project, because the community as a whole would obtain net benefits from the Balranald Project.

The Balranald Project is estimated to have total net production benefits of $149M. Assuming 55% foreign ownership, $132M of these net production benefits would accrue to Australia[17]. 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 Balranald Project, after mitigation, may be assessed. This threshold value is the opportunity cost to society of not proceeding with the Balranald Project. The threshold value indicates the price that the Australian community must value any residual environmental impacts of the Balranald Project (be willing to pay) to justify in economic efficiency terms the no development option.

[14]Portney, P. (1994) The Contingent Valuation Debate: Why Economists Should Care, *Journal of Economic Perspectives* 8:4, 3-18.
[15] This is consistent with the non-market valuation studies which focused on direct employment.
[16] The benefit is less at the regional level as there are fewer households to aggregate the estimated per household willingness to pay to.
[17] This is the royalties and company tax from the Project together with the share of the residual producer surplus accruing to Australia.

For the Balranald Project to be questionable from an economic efficiency perspective, all incremental residual environmental impacts from the Balranald Project, (including those associated with mining, processing and transport to Western Australia) that impact Australia[18], would need to be valued by the community at greater than the estimate of the Australian net production benefits i.e. greater than $132M. This is equivalent to each household in the region valuing residual environmental impacts at $3,270. The equivalent figure for NSW and Australian households is $50 and $16, respectively.

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to quantitatively consider the residual environmental impacts of the Balranald Project that are associated with mining and transportation within NSW[19]. From Table 3.2 it can be seen that most of the potential impacts are internalised into the operating costs of Iluka Resources via mitigation, offset or compensation, and hence are incorporated into the estimate of net production benefits. Other impacts to Australia are estimated at less than $1M, considerably less than the estimated net production benefits of the Balranald Project to Australia.

Overall, the Balranald Project is estimated to have quantified net social benefits to Australia of between $132M and $148M, 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 Balranald Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between $132M and $148M for the Balranald Project to be questionable from an Australian economic perspective.

[18] 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.

[19] Some residual environmental impacts may also be associated with transport and materials handling outside of NSW. However, these were not assessed in the EIS and therefore have not been quantitatively considered in the BCA. Nevertheless, they are relevant considerations to decision-makers in the context of a national and global BCA and hence should be considered within the threshold value framework.

Table 3.2 - Benefit Cost Analysis Results of the Balranald Project (Present Values @7% discount rate)

	Costs		Benefits	
	Description	**Value ($M)**	**Description**	**Value ($M)**
Production	Opportunity cost of land	[redacted]	Value of minerals	[redacted]
	Opportunity cost of capital	[redacted]	Residual value of capital	[redacted]
	Development costs	[redacted]	Residual value of capital	[redacted]
	Operating costs ex royalties	[redacted]		
	Decommissioning and rehabilitation costs	[redacted]		
	Sub-total	[redacted]	***Sub-total***	[redacted]
	Net Production Benefits			**$149 ($132)**
Nonmarket Impacts in NSW	Greenhouse gas impacts	$19 ($0)	Nonmarket values of employment	$16
	Agricultural impacts	Opportunity cost of foregone agriculture included in capital costs (land acquisitions)		
	Noise impacts	Allowance for acquisition and mitigation measures included in capital costs		
	Air quality impacts	No material impacts		
	Surface water	Cost of water included in capital costs		
	Groundwater	Cost of water and licensing of return flows including in capital costs		
	Ecology	Some loss of values but offset. Cost of biodiversity offset included in capital costs and operating costs		
	Road transport impacts	Required road works and road maintenance costs included in the capital and operating costs of the Project		
	Aboriginal heritage	Unquantified but costs of implementing the recommendations of the archaeological investigations included in capital and operating costs		
	Non-Aboriginal heritage impacts	No material impacts		
	Visual impacts	Costs of mitigation included in capital costs of the Project. Residual impacts not material		
Nonmarket impacts outside NSW	Material handling and transportation	Unquantified but activities regulated		
	Nonmarket impacts sub-total	***$19 ($0)***		***$16***
QUANTIFIED NET SOCIAL BENEFITS – including employment benefits				**$146 ($148)**
QUANTIFIED NET SOCIAL BENEFITS – excluding employment benefits				**$130 ($132)**

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

3.5.2 Distribution of costs and benefits

Introduction

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

Intra Generational

The net production benefit shown in Table 3.2 is potentially distributed amongst a range of stakeholders including:

- Iluka in the form of net production benefits;
- the Commonwealth Government in the form of any Company tax payable [redacted] present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the local and regional area;
- the NSW Government via royalties ($96M present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the local and regional area; and
- the local and regional community in the form of voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Balranald 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 Iluka.

Noise costs, air quality costs andagricultural production costs will occur at a local level. These have been incorporated into the estimation of net production benefits via acquisition costs for affected properties and mitigation costs. As such, the bearers of these costs are compensated. Road transport impacts would also occur at the local level with the costs of road works included in the estimate of net production benefits. Similarly, surface water and groundwater effects will occur at the local level, but have been incorporated into the analysis via inclusion of the costs of acquisition of water.

The economic costs associated with the clearing of native vegetation will occur at the State or national level and would be counterbalanced by the Balranald Project biodiversity offsets. Similarly Aboriginal heritage impacts will potentially occur to Aboriginal people and NSW households[20], however, these economic costs would be counterbalanced to some extent by implementation of the recommendations of the archaeological investigation. The cost of providing biodiversity offsets and implementing the recommendations of the archaeological investigation is included in the estimation of net production benefits. Visual impacts will occur at the local level and will be internalised by Iluka through the funding of visual mitigation measures. All of these measures mean that those who experience costs have them either mitigated or compensated.

Greenhouse gas impacts from the Project are global however Australia's response to global warming is at a strategic level rather than on project by project basis. Other potential environmental impacts would largely occur at the local level and were found to be insignificant. Any nonmarket benefits associated with employment provided by the Balranald Project would largely accrue at the local or State level[21].

[20] Nonmarket valuation studies that have surveyed NSW households have found that they value the conservation of highly significant Aboriginal heritage (Gillespie Economics 2008, 2009a, 2009b).

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

Table 3.3 - Distribution of Benefits and Costs (Present Values at 7% Discount Rate)

Value ($M)	Distribution			
	Local	State	National	Global
Net Production Benefits				
Net production benefits to Iluka	[redacted]	[redacted]	[redacted]	[redacted]
Net production benefits to Commonwealth Government – Company tax	[redacted]	[redacted]	[redacted]	[redacted]
Net production benefits to NSW Government – Royalties	$0	$96	$96	$96
Net production benefits to local and regional community in the form of voluntary contributions	Unquantified	Unquantified	Unquantified	Unquantified
Secondary net production benefits	$482	$0	$0	$0
Total	***$482***	***$102***	***$132***	***$149***
Nonmarket Costs and Benefits				
Benefits				
Nonmarket benefit of employment	$0	$16	$16	$16
Total	***$0***	***$16***	***$16***	***$16***
Costs				
Greenhouse gas emissions	$0	$0	$0	$19
Agricultural impacts	Opportunity cost of foregone agriculture included in capital costs (land acquisitions)			
Noise impacts	Allowance for acquisition and mitigation measures included in capital costs			
Air quality impacts	No material impacts			
Surface water	Cost of water included in capital costs			
Groundwater	Cost of water and licensing of return flows including in capital costs			
Ecology	Some loss of values but offset. Cost of biodiversity offset included in capital costs and operating costs			
Road transport impacts	Required road works and road maintenance costs included in the capital and operating costs of the Project			
Aboriginal heritage	Unquantified but costs of implementing the recommendations of the archaeological investigations included in capital and operating costs			
Non-Aboriginal heritage impacts	No material impacts			
Visual impacts	Costs of mitigation included in capital costs of the Project. Residual impacts not material			
Material handling and transportation outside of NSW	Unquantified but activities regulated			
Total	**$0**	**$0**	**$0**	**$19**
NET SOCIAL BENEFITS – including employment benefits	**$483**	**$118**	**$148**	**$146**
NET SOCIAL BENEFITS – excluding employment benefits	**$482**	**$102**	**$132**	**$130**

Note: Totals may have minor discrepancies due to rounding.

NSW Primary 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 benefit that directly accrues to NSW is the royalties, estimated at $96M, present value. However, this is a minimum net production value benefit to NSW as NSW also benefits from company tax payable to the Commonwealth. A conservative estimate of company tax redistributed to NSW is 7% (refer to Attachment 5). In addition, NSW benefits from the public goods and services provided by the Commonwealth and funded partially be company tax e.g. defence, health services, environmental protection, trade services etc. However, these remain unquantified. The net production benefits to Iluka that accrue to NSW are assumed to be 32% of those that accrued to Australia, in line with the NSW's share of the Australian population. The total quantified net production benefits that accrue to NSW are therefore estimated at $102M.

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 Balranald Project at least partly accrue to NSW. However, in accordance with Government policy these impacts are largely mitigated, compensated or offset by the proponent. Quantified residual impacts after mitigation, compensation and offsets relate to greenhouse gas emissions. At the NSW level these are estimated at less than $1M. This is considerably less than the net production benefits that accrue to NSW. In addition there are potential nonmarket employment benefits of the Project of $16M. Consequently, as well as resulting in net benefits to Australia, the Project would also result in net benefits to NSW.

Regional Economic Costs and Benefits

The net production benefits directly accruing to the region relate to the contributions under the VPA. At the time of preparation of this report, the VPA had yet to be finalised and hence remains unquantified in this analysis. The region would also indirectly benefit from royalties and company tax which are subsequently used to fund provision of government infrastructure and services across the Australia and NSW, including the local and regional area. The region may also more directly benefit via funding towards infrastructure for mining-affected communities from the NSW Resources for Regions program. However, this would be on a case by case basis requiring application to Government.

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

As identified above, agricultural impacts, noise impacts, air quality impacts, surface water and groundwater impacts, road transport impacts and visual impacts potentially occur at the local/regional level. Initial bearers of noise, dust, water and agricultural impacts are compensated. Road works by Iluka aim to mitigate impacts of increased road usage. No material visual or non-Aboriginal heritage impacts are predicted. At the regional level the nonuse economic values held for ecology, greenhouse gas emissions, Aboriginal heritage and employment are likely to be less than at the NSW and Australian level. This is because these values are public good values which by definition are the sum of values held by all individuals in the community. At the regional level there is considerably fewer individuals who may hold values for these impacts.

The above analysis deals with the distribution of primary costs and benefits when the BCA is undertaken at a national level. However, if BCA is undertaken at a regional level, additional costs and benefits may be relevant. At the national level BCA generally omits secondary net benefits which are producer surpluses (i.e. net production benefits) that accrue to those businesses who sell inputs to the Balranald Project and its employees. This is because in a competitive market, all resources are fully employed, and so increases in the production of goods and services required as inputs to the Project will withdraw labour and raw materials from other industries. The additional net production benefits to suppliers to the Project will be offset by decreases in net production benefits in other industries and so there is no net secondary net production benefits to the economy as a whole. However, at a regional level, secondary producer surpluses are 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 producer surpluses are likely to be the main benefit experience by the region from the Balranald Project. These secondary benefits arise from an increase in economic activity in the region.

Section 4.5 examines the flow-on regional economic activity as a result of the Balranald Project. However, none of the indicators used reflect secondary producer surpluses. Producer surplus is the difference between revenues and costs of production. Value-added overstates producer surplus because it includes income paid to employees and imputed wages to owners labour. However, if

income is subtracted from value-added this provides an estimate of gross operating surplus[22] together with net indirect taxes and subsidies and a return to capital inputs. This provides some indication of the secondary producer surpluses to the region from the Balranald Project. However, it is an upper estimate because:

- IO analysis tends to provide an upper estimate of regional economic activity;
- gross operating surplus is gross of some relevant costs such as consumption of fixed capital and land rent payments;
- wherea business does not have excess capacity in its capital equipment some investment may be required to achieve the additional gross operating surplus[23].

Nevertheless, it provides some upper level estimate of secondary economic benefits to the region. Extrapolating the difference between value-added and income for flow-on economic activity during operation to the life of the Project and discounting at 7% gives secondary economic benefits to the region of $482M, present value.

Benefits to the region are therefore likely to be considerably greater than the VPA and greater than environmental, social and cultural impacts at the regional level which are largely mitigated, compensated or offset by the proponent, as required by government regulation. 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 Balranald Project would also result in net benefits to the region.

Intergenerational

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

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

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

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

[22]Which is the excess of gross output of enterprises over costs incurred in producing thatoutput, but before deducting consumption of fixedcapital, dividends, interest, royalties and land rentpayments and directtaxes payable.
[23]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.

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.

3.6 Sensitivity analysis

The NPVs of the Project presented in Table 3.2 and Table 3.3 are based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a BCA can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV[24].

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

- Opportunity costs of land;
- Opportunity costs of capital equipment;
- Development costs;
- Operating costs;
- Decommissioning and rehabilitation costs;
- Mineral value;
- Residual value of capital;
- Residual value of land; and
- Greenhouse costs.

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 minerals 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. Under 20% lower revenue or 20% higher operating costs there would be net social costs to Australia from the Balranald Project. When BCA is undertaken at the NSW level the analysis is most sensitive to changes in revenue (reflecting production levels, the value of minerals in USD and the AUD/USD exchange rate) with 20% lower revenue resulting in net social costs to NSW.

In this respect, it should be noted that for the purpose of the Economic Assessment the revenue from the Balranald Project is based on an assumed AUD/USD exchange rate of [redacted]. At the time of report preparation the AUD/USD exchange rate was in the order of [redacted] with forecasts suggesting that it will remain at or below this level. Consequently, all other things being equal, higher revenue rather than lower revenue is likely.

Estimated operating costs of the Balranald Project were based on a truck and shovel method. As identified in the EIS, Iluka is investigating optimised earth moving techniques for overburden, including in-pit conveyor and a dozer push or bucket wheel excavator. If adopted, these optimised methods

[24]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.

would reduce the numbers of earthmoving equipment required to mine the Balranald Project (i.e. shovels, excavators and haul trucks) and would lead to a reduction in operating costs. Consequently, all other things being equal, lower operating costs rather than higher operating costs are likely.

The analysis is not sensitive to changes in capital costs, opportunity costs of land and capital equipment, decommissioning and rehabilitation cost, residual capital and land costs or environmental costs that have not already been internalised into production costs, such as greenhouse gas costs.

Table 3.4 - National BCA Sensitivity Testing (Present Value $Millions) (Excluding Non-Market Employment Benefits)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	$204	$132	$81
INCREASE 20%			
Opportunity cost of land	$204	$132	$81
Opportunity cost of capital equipment	$203	$131	$80
Development costs	$137	$75	$32
Operating costs	-$69	-$85	-$94
Decommissioning and rehabilitation costs	$194	$125	$75
Mineral value	$675	$506	$381
Residual value of capital	$204	$132	$81
Residual value of land	$205	$133	$81
Global Greenhouse Costs @ $40/Tonne (T)	$204	$132	$81

	4% Discount Rate	7% Discount Rate	10% Discount Rate
DECREASE 20%			
Opportunity cost of land	$204	$132	$81
Opportunity cost of capital equipment	$205	$133	$82
Development costs	$271	$190	$131
Operating costs	$552	$410	$305
Decommissioning and rehabilitation costs	$214	$140	$86
Mineral value	-$169	-$163	-$155
Residual value of capital	$203	$132	$81
Residual value of land	$203	$132	$80
Global Greenhouse Costs @ $8/T	$204	$132	$81

Table 3.5 - NSW BCA Sensitivity Testing (Present Value $Millions) (Excluding Non-Market Employment Benefits)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	$140	$102	$74
INCREASE 20%			
Opportunity cost of land	$140	$102	$74
Opportunity cost of capital equipment	$140	$102	$74
Development costs	$126	$89	$62
Operating costs	$57	$35	$20
Decommissioning and rehabilitation costs	$137	$100	$72
Mineral value	$259	$197	$150
Residual value of capital	$140	$102	$74
Residual value of land	$141	$102	$74
Global Greenhouse Costs @ $40/Tonne (T)	$140	$102	$74

	4% Discount Rate	**7% Discount Rate**	**10% Discount Rate**
DECREASE 20%			
Opportunity cost of land	$140	$102	$74
Opportunity cost of capital equipment	$140	$102	$74
Development costs	$155	$115	$86
Operating costs	$213	$161	$121
Decommissioning and rehabilitation costs	$143	$104	$76
Mineral value	$8	-$3	-$11
Residual value of capital	$140	$102	$74
Residual value of land	$140	$102	$74
Global Greenhouse Costs @ $8/T	$140	$102	$74

4 ECONOMIC IMPACT ASSESSMENT

4.1 Introduction

The BCA in Section 3 is concerned with whether the incremental benefits of the Balranald Project exceed the incremental costs and therefore whether the community would, in aggregate, be better off 'with' the Balranald Project compared to 'without' it. In contrast, the focus of the regional economic impact assessment is the gross effect (impact) of the Balranald Project on the economy in terms of a number of specific indicators of economic activity, such as gross regional output, value-added, income and employment.

These indicators can be defined as follows:

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

An impacting agent may be an existing activity within an economy or may be a change to a local economy (Powell *et al.,* 1985; Jensen and West, 1986). This assessment is concerned with the economic impact of theaverage annual construction and operation of theBalranald Project.

4.2 Economies

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

- The local/regional economy comprising the LGAs of Balranald, Deniliquin, Hay, Murray, Wakool, Wentworth, Mildura and Swan Hill; and
- The NSW economy.

4.3 Method of assessment

A range of methods can be used to examine the economic impacts of an activity on an economy including economic base theory, Keynesian multipliers, econometric models, mathematical programming models and 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 IO analysis used to assess economy-wide effects. Econometric models, particularly those of the general equilibrium type, have the potential to measure economic impacts in a similar way to that of input-output models with relaxation of some of the limitations of input-output analysis (Powell *et al.,* 1985). However, development of these models at the regional scale is complex and there are difficulties associated with estimating a large number of coefficients and parameters when there is virtually no local data available. IO analysis assumes full employment with no capacity constraints, and thus prices have no role to play in the input-output model (unlike general equilibrium modelling). Refer to Attachment 6 for

a comparison of IO analysis and CGE modelling. However, if the area under study is a small open economy relative to the rest of the nation, where factors of production can easily move into and out of the region and local prices gravitate to external prices (subject to transport margins, etc.), then the IO model provides a reasonable and cost effective approach to estimating disaggregated impacts by sector at the regional level (Powell *et al.,* 1985; West, undated). This study uses IO analysis.

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 Balranald 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 7. These result in estimated impacts being an upper bound impact estimate.

4.4 Input-output table and economic structure of the region

A 2011 input-output table of the regional economy was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment8) using a 2011 IO table of the NSW economy (developed by the Centre for Agricultural and Regional Economics) as the parent table and a 2011 Census employment by industry data for the region. The 111 sector IO table of the regional economy was aggregated to 50 sectors and 8 sectors for the purpose of describing the economy.

A highly aggregated 2011IO table for the regional economy is provided in Table 4.1. The rows of this table indicates how the gross regional output of an industry is allocated as sales to other industries, to households, to exports and other final demands (OFD - which includes stock changes, capital expenditure and government expenditure). The corresponding column shows the sources of inputs to produce that gross regional output. These include purchases of intermediate inputs from other industries, the use of labour (household income), the returns to capital or other value-added (OVA - which includes gross operating surplus and depreciation and net indirect taxes and subsidies) and goods and services imported from outside the region. The number of people employed in each industry is also indicated in the final row.

Table 4.1 - 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	116,581	478	69,945	85	346	8,102	850	1,666	**198,053**	12,855	181,984	676,888	**1,069,780**
Mining	72	1,108	9,479	192	608	189	229	163	**12,041**	220	43,887	88,985	**145,134**
Manuf.	30,220	5,206	145,306	10,027	51,789	60,327	23,682	32,573	**359,131**	112,948	107,638	756,253	**1,335,970**
Utilities	9,938	1,951	9,483	59,800	5,818	10,509	12,338	8,259	**118,095**	37,361	149,242	109,652	**414,349**
Building	10,680	6,365	7,585	17,348	127,176	12,650	25,391	17,836	**225,032**	1,857	367,931	30,289	**625,110**
Trade/Accom	31,676	2,657	74,619	8,942	14,210	46,882	49,594	47,860	**276,441**	559,579	130,316	328,897	**1,295,233**
Bus.Srvcs	42,434	9,517	119,308	22,392	56,361	148,226	252,751	122,250	**773,239**	529,689	144,819	566,067	**2,013,813**
Public/PersSrvcs	7,808	1,789	15,230	6,159	6,576	21,702	58,446	53,356	**171,066**	366,339	791,539	194,291	**1,523,235**
TOTAL	**249,411**	**29,071**	**450,956**	**124,945**	**262,884**	**308,586**	**423,280**	**283,964**	**2,133,098**	**1,620,849**	**1,917,355**	**2,751,321**	**8,422,623**
Household Income	147,319	26,900	156,713	43,765	99,072	303,530	345,923	565,647	**1,688,870**	-	-	-	**1,688,870**
OVA	429,967	40,600	241,418	151,025	88,225	324,870	785,871	373,002	**2,434,979**	219,412	59,775	70,476	**2,784,642**
Imports	243,082	48,563	486,883	94,614	174,928	358,246	458,739	300,622	**2,165,676**	847,771	295,994	-	**3,309,441**
TOTAL	**1,069,780**	**145,134**	**1,335,970**	**414,349**	**625,110**	**1,295,233**	**2,013,813**	**1,523,235**	**8,422,623**	**2,688,031**	**2,273,124**	**2,821,798**	**16,205,576**
Employment	5,434	341	2,845	599	1,918	9,417	5,160	11,975	**37,689**				

Output for the regional economy is estimated at $16,206M. Value-added for the regional economy is estimated at $4,474M, comprising $1,689M to households as wages and salaries (including payments to self employed persons and employees) and $2,785M in OVA.

The employment total working in the regional economy was 37,689.

The economic structure of the regional economy can be compared with that for NSW through a comparison of results from the respective IO models (Figures 4.1 and4.2). This reveals that the agriculture sectors, trade and accommodation sectors and public/personal services sectors in the regional economy are of greater relative importance than they are to the NSW economy, while the business services sectors are of less relative importance than they are to the NSW economy. The mining sectors, manufacturing sectors, utilities sectors and building sectorsare of similar relative importance in the regional and NSW economy.

Figure 4.1 - Summary of Aggregated Sectors: Regional Economy (2011)

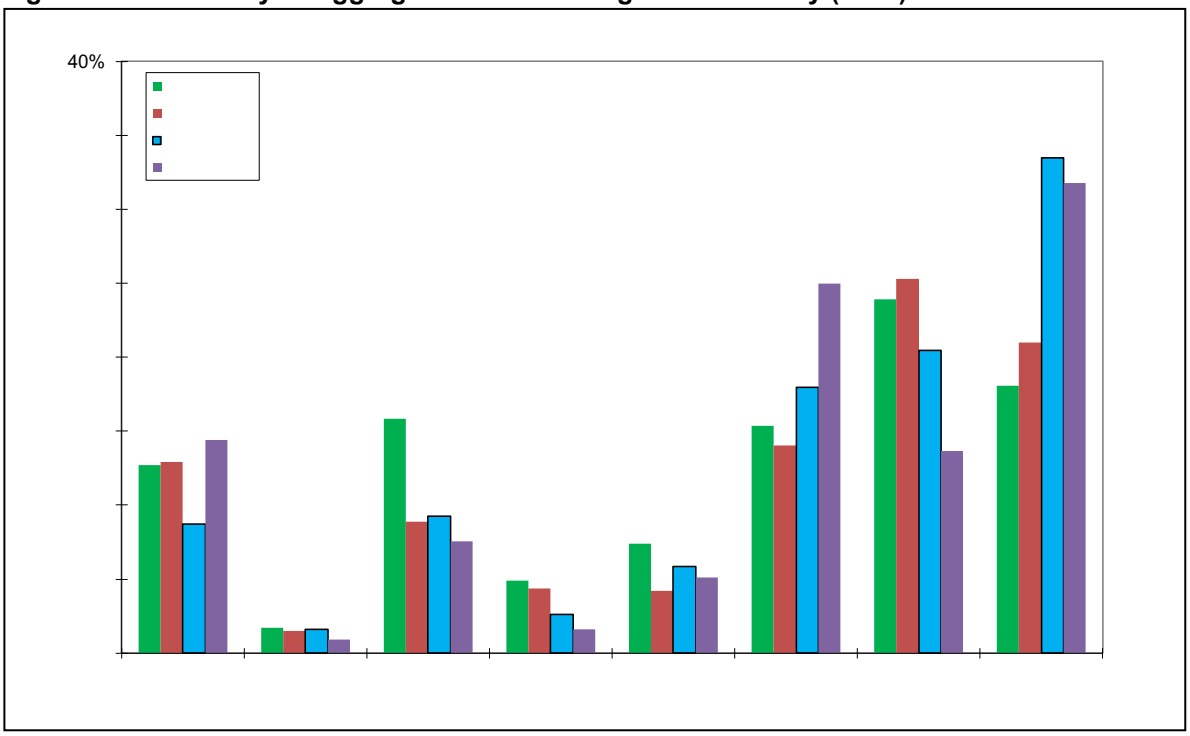
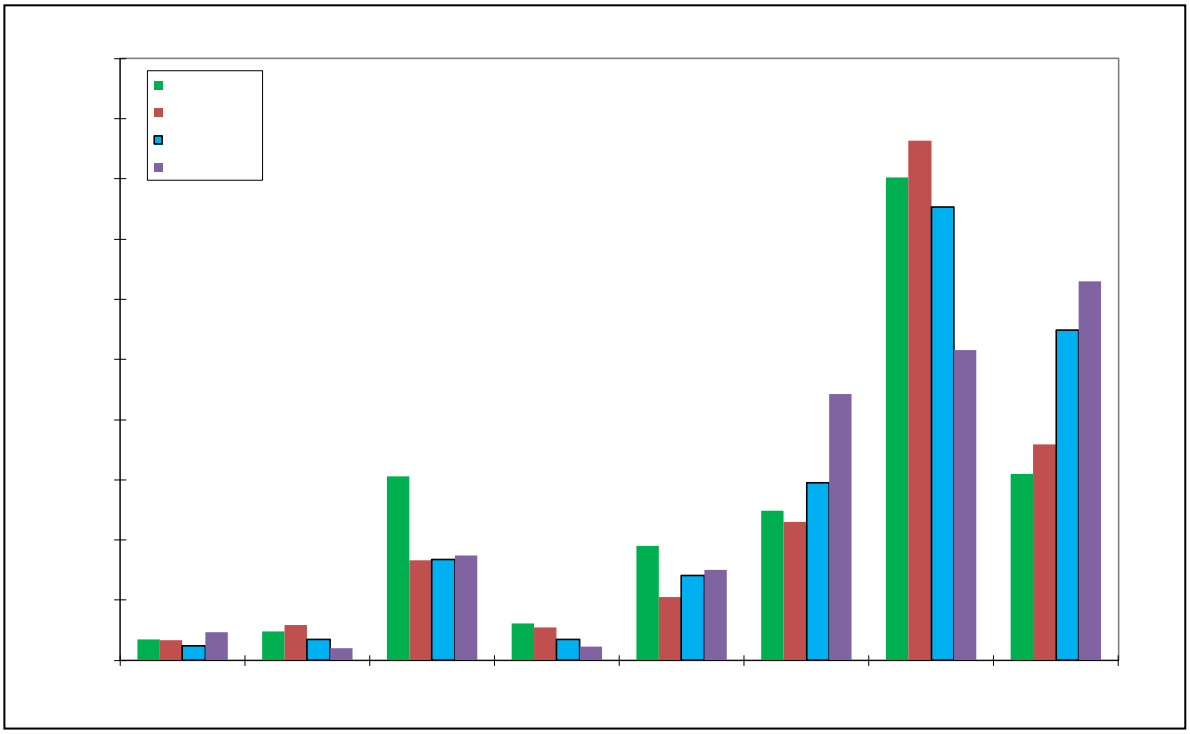


Figure 4.2 - Summary of Aggregated Sectors: NSW Economy (2011)



Figures 4.3 to 4.5 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, retail trade, other agriculture and food manufacturingare the most significant sectors to the regional economy. For value-added, the retail trade sectors, other agriculture sectorsand the ownership of dwellings sectors are the most significant. Theeducation sectors, retail trade sectors, health sectors, public administration sectors, and community care sectors are the most significant sectors for household income. The retail trade sector, accommodation and restaurants sectors,other agriculture sectors and education sectors are the most significant employer in the regional economy. The food manufacturing sectors and other agriculture sectors are the most significant sectors for regional imports and exports.

Figure 4.3 Sectoral Distribution of Gross Regional Output and Value Added ($'000)

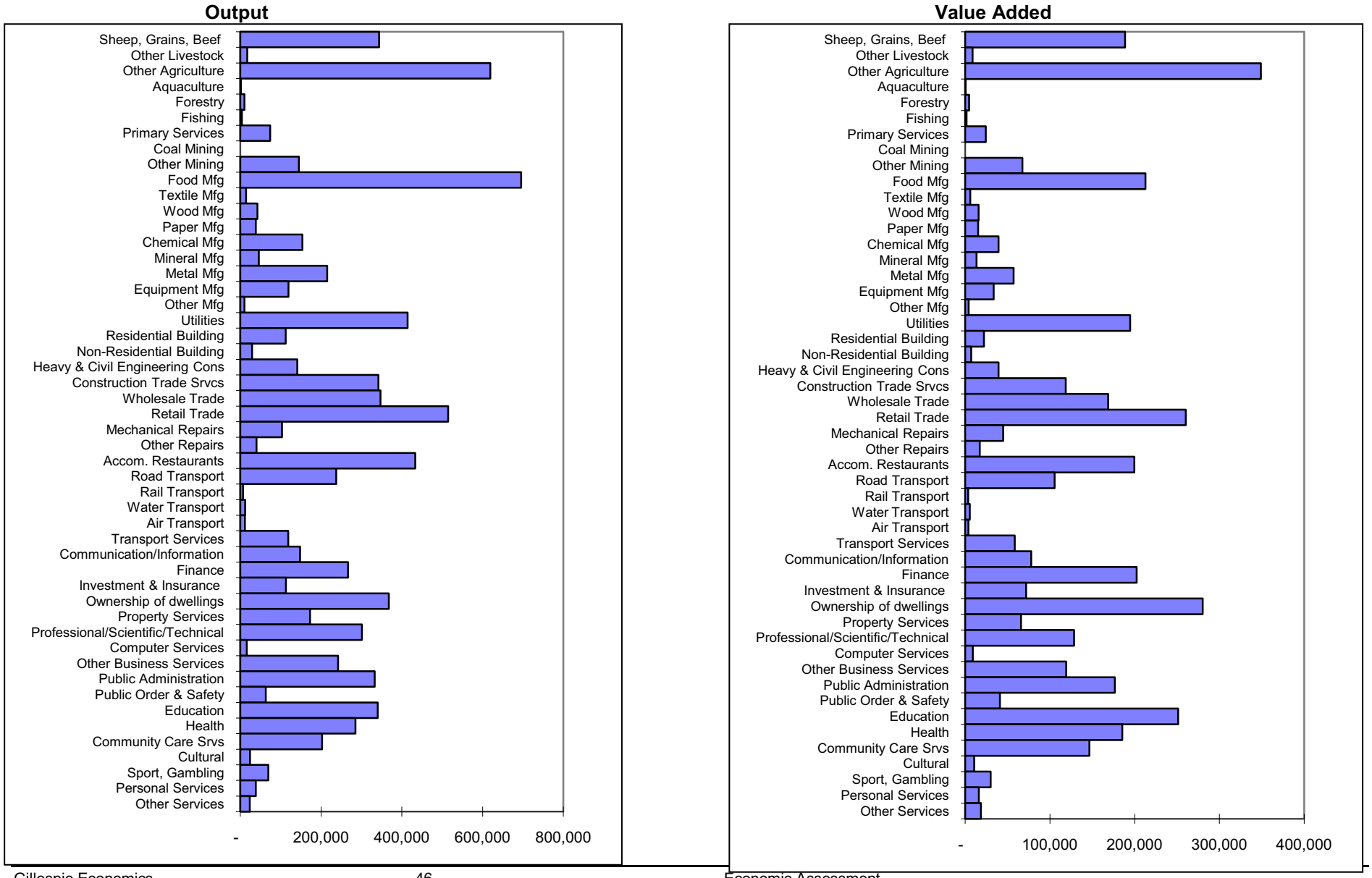
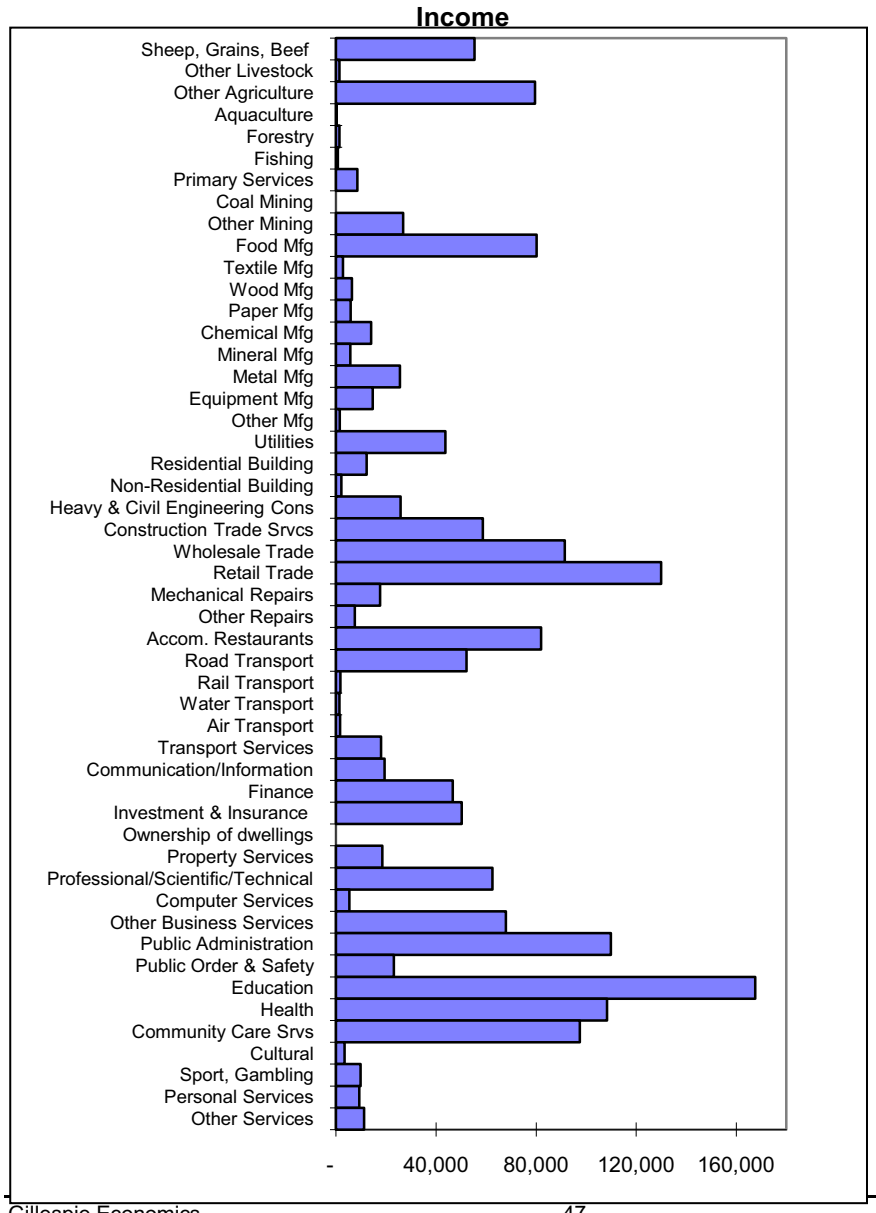


Figure 4.4 Sectoral Distribution of Income ($'000) and Employment (No.)



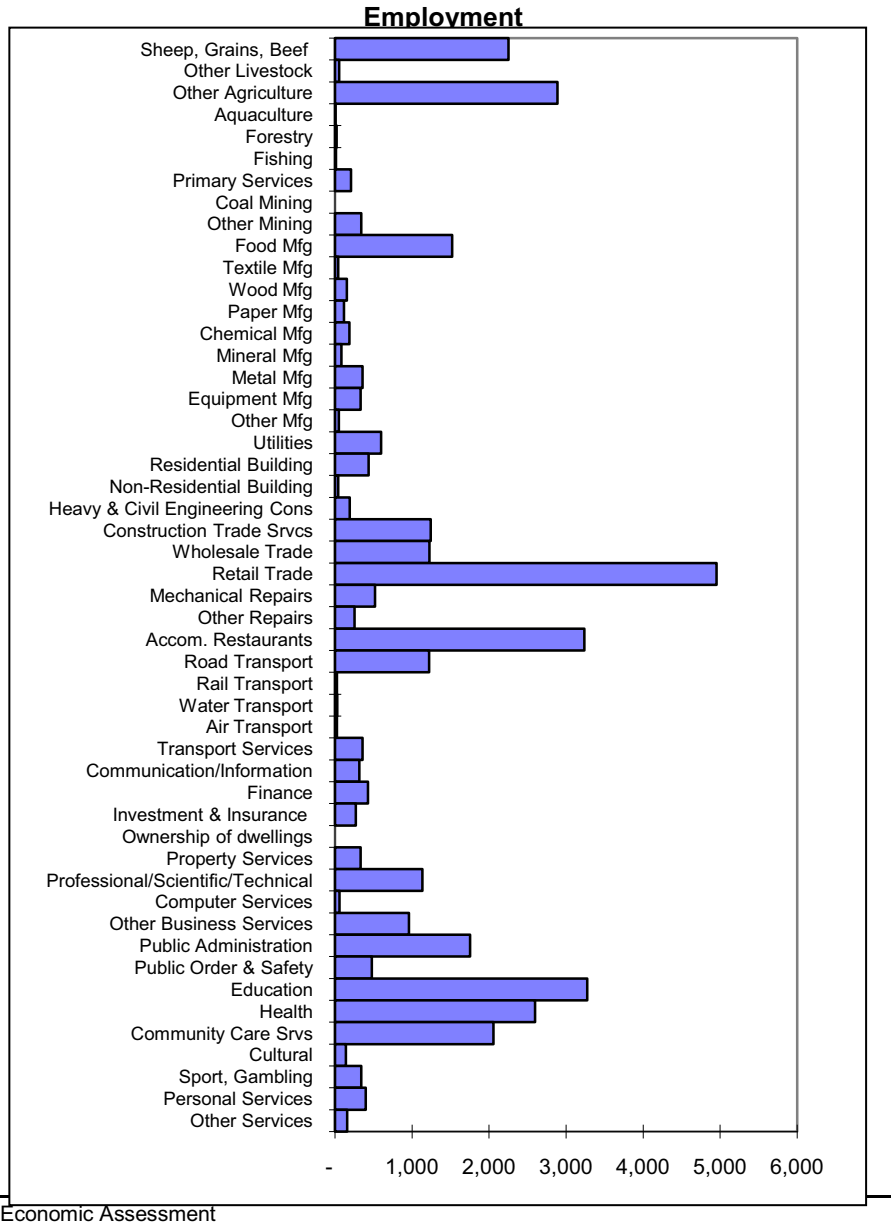
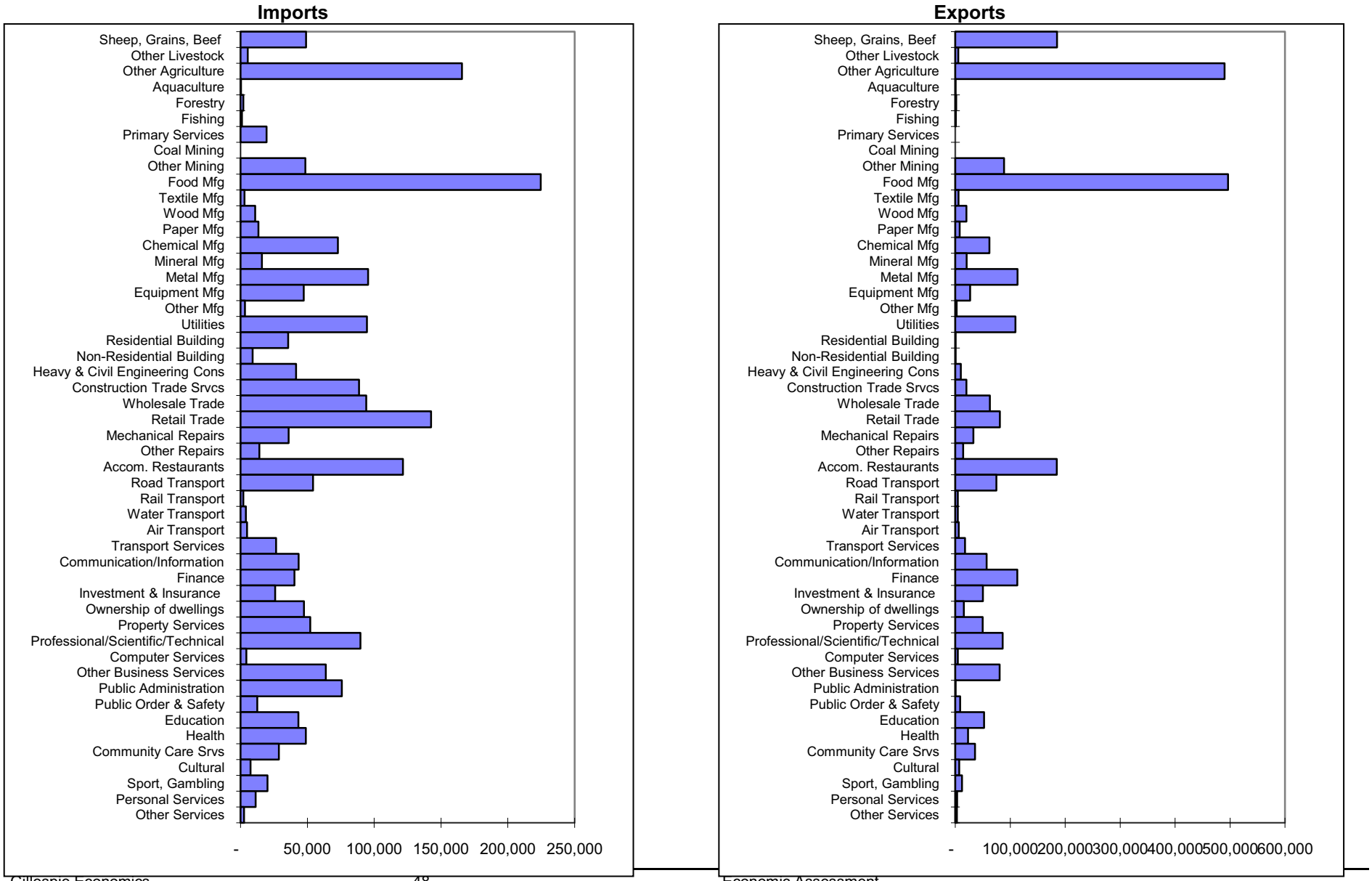


Figure 4.5 Sectoral Distribution of Imports and Exports ($'000)



4.5 Economic impact of the Balranald Project

The revenue, expenditure and employment associated with the construction and operation of the Balranald Project would stimulate 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.

4.5.1 Construction phase

Introduction

The construction phase is associated with the development of West Balranald Mine over a period of 32 months.Economic activity associated with the Balranald Project construction phase is estimated to potentially mainly occur within four sectors of the economy:

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

Impact onregional 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 Balranald Project construction phase primarily relates to the *heavy and civil engineering construction sector* and *constructionservices sector*.

The average annual construction workforce required for the Balranald Project during the 32 months of constructionof the West Balranald mine is 209 (with a peak of 450). 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 $75M per annum of the development costs would need to be spent in these sectorswithin the region to result in a direct workforce of 209people. The direct and indirect regional economic impact of this level of expenditure in the regional economy is reported in Table 4.2.

Impacts

Table 4.2 - Annual Economic Impacts of Construction of the Balranald Project on the Regional Economy

	Direct	Production induced	Consumption induced	Total Flow on	Total
OUTPUT ($'000)	75,422	45,408	15,044	60,452	135,873
Type 11A Ratio	1.00	0.60	0.20	0.80	1.80
VALUE ADDED ($'000)	24,663.4	17,708.8	8,295.2	26,003.9	50,667.3
Type 11A Ratio	1.00	0.72	0.34	1.05	2.05
INCOME ($'000)	12,742	8,179	2,846	11,024	23,766
Type 11A Ratio	1.00	0.64	0.22	0.87	1.87
EMPL. (No.)	209	141	70	211	420
Type 11A Ratio	1.00	0.68	0.33	1.01	2.01

*Direct employment of 209represents average annual construction employment, although the peak workforce will be approximately 450.

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. The regional impacts reported in Table 4.2 assumes 20% of the construction workforce is non-locally sourced and hence their expenditure occurs outside the region.

In total, annual impact of construction of the West Balranald Mine on the regional economy is estimated at up to:

- $136M in annual direct and indirect regional output or business turnover;
- $51M in annual direct and indirect regional value added;
- $24M in annual direct and indirect household income; and
- 420 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 IO analysis (refer to Attachment 7). Type 11A ratio multipliers summarise the total impact on all industries in an economy in relation to the initial own sector effect (e.g. total income effect from an initial income effect and total employment effect from an initial employment effect, etc).

The Type 11A ratio multipliers for the construction phase of the Balranald Project in the regional economy range from 1.80 for output up to 2.05 for value-added.

Main Sectors Affected

Flow-on impacts from the construction phase of the Balranald 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 *construction services, wholesale and retail trade, ownership of dwellings, road transport, heavy and civil engineering construction and food and beverage.*

4.5.2 Operation phase

Introduction

For the analysis of the operational phase of the Balranald Project, a new Balranald Project sector was inserted into the regional input-output table reflecting typical production levels and expenditure. The revenue and expenditure data for the new sectorwas obtained from financial information provided by Iluka for the Balranald Project. For this new sector:

- the estimated gross annual expenditure in 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 with any remainder allocated to a secondary households wages row;
- non-wage expenditure was initially allocated across the relevant *intermediate sectors* in the economy, *imports* and *othervalue-added*;
- allocation was then made between *intermediate sectors* in the regional economy and *imports* based on advice from Iluka and regional location quotients;
- purchase prices for expenditure in the each sector in the region were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National Input-Output Tables;
- royalties and depreciation were allocated to the *other value-added* row*;*
- direct employment by the Balranald Project in the region was allocated to the *employment* row;
- regional contractor mine employment and their wages were relocated from production-induced flow-ons to direct impacts for the purpose of reporting.

Impacts on the regional economy

Economic Activity

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

Table 4.3 - Economic Impacts of the Balranald Projecton the Regional Economy ($2014)

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	618,148	294,752	51,794	346,546	964,694
Type 11A Ratio	1.00	0.48	0.08	0.56	1.56
VALUE ADDED ($'000)	152,657	118,437	28,559	146,996	299,653
Type 11A Ratio	1.00	0.78	0.19	0.96	1.96
INCOME ($'000)	47,438	24,590	9,798	34,388	81,825
Type 11A Ratio	1.00	0.52	0.21	0.72	1.72
EMPL. (No.)	554	496	239	735	1,289
Type 11A Ratio	1.00	0.90	0.43	1.33	2.33

*Direct employment of 554 represents average annual employees and mining contractors. Truck drivers are located in production-induced flow-ons.

** It is assumed that 20% of the direct workforce is non-locally sourced and hence their expenditure occurs outside the region.

The Balranald Project is estimated to make up to the following annual contribution to the regional economy for 8 years:

- $965M in annual direct and indirect regional output or business turnover;
- $300M in annual direct and indirect regional value added;
- $82M in annual direct and indirect household income; and
- 1,289 direct and indirect jobs.

Multipliers

The Type 11A ratio multipliers for the Balranald Project impact on the regional economy range from 1.56 for output up to 2.33 for employment.

Main Sectors Affected

Flow-on impacts from the Balranald 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:

- Road transport sector;
- Professional, scientific and technical services sector;
- Retail trade sector;
- Wholesale trade sector;
- Electricity supply sector;
- Food and beverage sector;
- Ownership of dwellings;
- Electricity transmission sector;
- Residential building sector;
- Construction service sector;
- Education and training sector;
- Building cleaning, pest control, administrative and other support services sector; and
- Health care services.

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 Balranald Project (Table 4.4).

Table 4.4 - Sectoral Distribution of Employment Impactson the Regional Economy

	Regional Economy			
Sector	**Average Direct Effects**	**Product.-induced**	**Consump.-induced**	**Total**
Primary	0	3	4	7
Mining	554	1	0	556
Manufacturing	0	40	11	51
Utilities	0	17	2	19
Wholesale/Retail	0	37	78	115
Accommodation, cafes, restaurants	0	16	36	52
Building/Construction	0	46	2	49
Transport	0	147	7	154
Services	0	188	99	287
Total	**554**	**496**	**239**	**1,289**

Note: Totals may have minor discrepancies due to rounding.

Table 4.4 indicates that direct, production-induced and consumption-induced employment impacts of the Balranald Project on the regional economy are likely to have different distributions across sectors. Production-induced flow-on employment would occur mainly in transport and services 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 Balranald Project and/or the products and services required by employees would directly benefit from the Balranald Project by way of an increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses also benefit.

Impact on the NSWeconomy

Introduction

The Balranald Project occurs within NSW. Direct effects of the Balranald Project therefore fall within NSW. Some of the flow-on impacts will also occur within the NSW economy. These were based on relative population levels of the NSW component of the regional economy and the Victorian component of the regional economy.

Economic Activity

The total and disaggregated annual impacts of the Balranald Project on the NSW economy (in 2014 dollars) are shown in Table 4.5.

Table 4.5 - NSW Economic Impacts of the Balranald Project

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	618,148	86,949	15,279	102,228	720,376
Type 11A Ratio	1.00	0.14	0.02	0.17	1.17
VALUE ADDED ($'000)	152,657	34,938	8,425	43,363	196,020
Type 11A Ratio	1.00	0.23	0.06	0.28	1.28
INCOME ($'000)	47,438	7,254	2,890	10,144	57,582
Type 11A Ratio	1.00	0.15	0.06	0.21	1.21
EMPL.(No.)	554	146	71	217	771
Type 11A Ratio	1.00	0.26	0.13	0.39	1.39

The Balranald Project is estimated to make up to the following total contribution to the NSW economy for 8 years:

- $720M in annual direct and indirect regional output or business turnover;
- $196M in annual direct and indirect regional value added;
- $58M in annual direct and indirect household income; and
- 771 direct and indirect jobs.

4.6 Other economic impacts

4.6.1 Potential contraction in other sectors

Economic impacts for regional and State economies modelled using IO analysis represent only the gross or positive economic activity associated with the Balranald 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 local and regional wages. In these situations, there may be some 'crowding out' of economic activity in other sectors of the regional economy.

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

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.

4.6.2 Regional economic impacts of displaced agriculture

The Project will result in a reduction in agricultural activity from:

- the agricultural disturbance area;
- the biodiversity offsets;
- use of surface water resources.

Agricultural Disturbance Area

The Balranald Project will temporarily remove 3,794 ha of Land and Soil Capability Classes 4, 5/6 and 6 from potential agricultural production during the life of the Project (approximately 10 years). The productivity of these lands is summarised in Table 4.6. The Balranald Project will directly displace $116,230 of direct agricultural revenue per annum and $47,472 of gross margin per annum (SLR Consulting Australia Pty Ltd 2015).

Table 4.6 - Temporary Agricultural Disturbance Area

	LSC	Agricultural Disturbance Area			
Enterprise Type	**Class**	**Ha**	**%**	**Gross Margin**	**Gross Output**
Wheat cropping	4	169	6	$30,251	$79,937
Merino Ewe Enterprise	5 to 6	256	9	$2,028	$4,273
Merino Ewe Enterprise	6	2,302	85	$15,193	$32,021
	Total	**2,727**	**100**	**$47,472**	**$116,230**

Source: (SLR Consulting Australia Pty Ltd 2015).

These areas, together with 1,067ha of southern mallee conservation areas (SMCAs)[25], less 52 ha of final void, will be progressively rehabilitated to LSC Class 6. The productivity of this final landform is summarised in Table 4.7.

Table 4.7 - Post-Mining Land Use

Post Mining Land Use	**Post-Mining Land Use Area**		**Gross Margin**		**Gross Output**
Enterprise Type	**ha**	**%**	**Per ha**	**Total**	**Total**
Merino Ewe LSC Class 6	3,742	100	$6.60	$24,697	$52,051

Source: (SLR Consulting Australia Pty Ltd 2015).

After the final landform and rehabilitation reaches completion there will be a continuing reduction in agricultural productivity of the land of in the order of $22,775 per annum of gross margin (SLR Consulting Australia Pty Ltd 2015).

Biodiversity Offsets

In the order of 28,000 ha of biodiversity offsets will be required for the Balranald Project. Assuming that 28,000 hectares of LSC Class 5/6 grazing land would be permanently removed from agricultural production this would reduce potential agricultural gross margin by$221,760 per annum and output by $467,320 per annum (SLR Consulting Australia Pty Ltd 2015).

Use of Surface Water Resources

The Balranald Project will utilise in the order of 450 ML per annum of water from the Murrumbidgee River under the WSP for the Murrumbidgee Regulated River Water Source. A maximum of 180 ha of irrigated wheat could potentially be farmed using this quantity of water[26] with a gross margin of $664/ha. With this water temporarily not being available for agriculture it is assumed that the equivalent area of land would otherwise be used for dryland cropping with a gross margin of $298 per ha. This results in a reduction in annual gross margin of $66,060 and a reduction in annual output of $164,160 (SLR Consulting Australia Pty Ltd, 2015).

[25]Not used for agriculture.
[26]Irrigated wheat requires 2.5 ML/ha (SLR Consulting Australia Pty Ltd 2015).

Table 4.8- Summary of Direct Agricultural Impacts.

	During Project Operation			Post Project Operation		
Impact	**Enterprise**	**Output**	**Gross Margin**	**Enterprise**	**Output**	**Gross Margin**
Disturbance area	Wheat	$79,937	$30,251	Wheat	$79,937	$30,251
	Sheep	$36,293	$17,221	Sheep	-$15,758	-$7,476
Offset	Sheep	$467,320	$221,760	Sheep	$467,320	$221,760
450 ML WAL	Wheat	$164,187	$66,060	Wheat	0	0
Total		**$747,738**	**$335,292**		**$531,499**	**$244,535**

The direct and indirect regional economic impacts of a reduction of $747,738 in regional agricultural output have been estimated using input-output analysis. A comparison of the regional economic impacts of the Balranald Project and the foregone agricultural production during the Balranald Project operation is provided in Table 4.9. The foregone agricultural regional economic activity impacts are between 0.1% and 0.8 of the regional economic activity impacts of the Balranald Project.

Table 4.9 – Regional Economic Impacts of the Project and Displaced Agriculture

	Project	Agriculture Land	
	Impact	**Impact**	**% of Project**
Annual direct output value ($000)	618,148	748	0.1%
Annual direct value-added ($000)	152,657	410	0.3%
Annual direct income ($000)	47,438	111	0.2%
Direct employment (No.)	554	5	0.8%
Annual direct and indirect output ($000)	964,694	1,228	0.1%
Annual direct and indirect value-added ($000)	299,653	632	0.2%
Annual direct and indirect income ($000)	81,825	190	0.2%
Direct and indirect employment (No.)	1,289	6	0.5%

The BCA included estimation of the present value of production costs and benefits of the Balranald Project. The present value of net production benefits of the Balranald Project to Australia are estimated at $149M, with in the order of $132M 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 $4M.

The net production benefits of the Project to Australia are therefore 38 times those of displaced agriculture.

4.6.3 Wage impacts

In the short-run, increased regional demand for labour as a result of the Balranald 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. 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.

4.6.3 Housing impacts

The Balranald 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 and operation workforce, and local workforce that reside beyond safe commuting distances, would be accommodated at the mine accommodation village limiting adverse impacts on the local and regional housing impacts. Due to the length of the operational phase it has been

assumed that a small proportion (5%) of the operational workforce (and their families) could relocate to the Balranald LGA (probably residing in Balranald town). Continued use of local hotels/motels/caravan parks will also be encouraged throughout operations.

4.6.4 Mine cessation

As outlined in Section 4.5, the Balranald Project would stimulate demand in the regional and NSW economy, for up to 11 years (three years of construction and eight 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 local and regional economic impacts of cessation of the Balranald 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 Balranald Project cessation on the regional area would depend on whether the workers and their families affected would leave the local and regional area. If it is assumed that some or all of the workers remain in the regional area, then the impacts of Balranald Project cessation would not be as severe compared to a greater level leaving the regional area. This is because the consumption-induced flow-ons of the decline would be reduced through the continued consumption expenditure of those who stay (Economic and Planning Impact Consultants, 1989). Under this assumption, the regional economic impacts of the Balranald Project cessation would approximate the direct and production-induced effects in Table 4.3. However, if displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table 4.3.

The decision by workers, on cessation of the Balranald Project, to move or stay would be affected by a number of factors including the prospects of gaining employment in the local and 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 regional area is prospective with other mineral sand 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 Balranald Project would depend on the economic structure and trends in the regional economy at the time. For example, if Balranald Project cessation takes place in a declining economy, the impacts might be significant. Alternatively, if Balranald Project cessation takes place in a growing diversified economy where there are other development opportunities, the ultimate cessation of the Balranald Project would have little impact.

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

5 GOVERNMENT FINANCE

5.1 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 [redacted] present value based on the production profile proposed by Iluka,an assumed company tax rate of 30%, forecast pricing byTZMI (in US dollars) and an assumed AUD/USD exchange rate of [redacted].

At an assumed average wage rate of $145,500 per person, income tax payable per person would be $41,798. With estimated average annual direct employees 82 this equates to $3.4M pa. The present value (at a discount rate of 7%) of personal income tax from direct employees of the Balranald Project is estimated at $16M.

To the extent that the Balranald Project results in some 'crowding out' of other economic activities at the national level these represent upper bound estimates of the financial benefit to the Commonwealth Government from mine employees. However, it can be considered a conservative estimate since it does not include contractors.

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

Community infrastructure that is provided by the Commonwealth Government will be needed generally across Australia to accommodate the population and its growth irrespective of its location. As identified by NSW Government (2012) this means that expense in one area is generally transferred from expense in another. Mining developments generally don't lead to an increase in overall demand in Australia for social infrastructure they simply lead to a redistribution of the location of this demand[27].

5.2 State government

The main financial benefit of the Balranald Project to NSW is the royalties paid. These are estimated at $96M present value based on the production profile proposed by Iluka, forecast pricing by TZMI (in US dollars) and an assumed AUD/USD exchange rate of [redacted].

In addition, the payroll tax to NSW from the operational employees of the Balranald Project is estimated at $3M present value (at 7% discount rate) based on an assumed average wage of $145,500 and payroll tax of 5.45% above a tax free threshold of $750,000. To the extent that the Balranald Project results in some 'crowding out' of other economic activities this represent an upper bound estimate of the financial benefit to the NSW Government from mine employees. However, conservatively it excludes payroll tax associated with contractors.

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.

[27] 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. While some migration of workforce into the region is likely to occur, the Social Assessment identified that most community sectors such as education, health and emergency services have a degree of spare capacity due to recent and continuing population decline in the region. The Social Assessment provides detailed assessment of community infrastructure issues.

5.3 Local Government

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

While the Balranald Project will result in some increased demands on local roads, Iluka will negotiate equitable road maintenance agreements with the BSC to proportionally fund the ongoing road maintenance requirements for the council roads affected along the product transport route.

Iluka will also contribute to the remedying of a number of existing deficiency is the road network.

The Social Assessment provides detailed assessment of local community infrastructure issues. A VPA is being developed in consultation with BSC to address road and community infrastructure issues.

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

The provisions of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013* (the Mining SEPP) apply to the Balranald 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.

6.1 Significance of the resource

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

Exploration drilling has been undertaken at the West Balranald and Nepean deposits since 1998, when the West Balranald deposit was first discovered. The deposits have an approximate north west/south east alignment. The West Balranald deposit consists of a single high grade linear strand of ore 50 to 80 m below the surface with a variable width along its strike length, from 160 m in the south and north to a maximum of 300 m in the centre. Average thickness also varies along strike from approximately 3 m at the southern and northern extremities to 6 m through the central area of the strand. The Nepean deposit consists of a single high grade linear strand 40 to 60 m below the surface with a variable width along its strike length from 130 m in the south to 160 m in the north with average thicknesses varying between 4 to 5 m.

The combined Measured, Indicated and Inferred Resource of the West Balranald deposit (excluding Nepean) contains 12.0Mt of heavy mineral with an average assemblage of 10.8% zircon, 11.9% rutile and 64.1% ilmenite. The Measured Resource makes up 3.8 t of the total Measured, Indicated and Inferred Resource. The combined Indicated and Inferred Resource reported for the Nepean deposit contains 2.4 Mt of heavy mineral with an average assemblage of 14.4% zircon, 14.53% rutile and 59.7% ilmenite.

The resource is able to be mined by Iluka in a financially viable and environmentally sound manner as detailed in the EIS.

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

Iluka's has existing operations in the Murray Basin with mining and concentrating activities at the WRP group of deposits, located 20 km south-east of Ouyen, producing approximately 0.32 Mt of HMC per annum. HMC is transported from the WRP mine to the Hamilton MSP in Victoria by road to Iluka's rail loading facility at Hopetoun, and rail to Hamilton. Further mineral processing of HMC is undertaken at the Hamilton MSP.

Mining at the WRP mine ceased in March 2015. The WRP mine has a predicted HMC feedstock for the Hamilton MSP [redacted], although this would depend on market conditions and demand for products. After this time the existing Hamilton MSP will be reliant on feed from the Balranald Project.

From the Hamilton MSP, product is transported 85 km by rail to the port of Portland, or to Melbourne Port for export or to Iluka operations in Western Australia for further processing. This existing processing infrastructure will also be used by the Balranald Project.

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

The mineral sand resource is located 120 km from Iluka's existing mining operation south-east of Ouyen. Labour and capital resources will be able to be relocated from the WRP mine to the Balranald Project on cessation of the WRP 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)[28] 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.
- 93% of household respondents agreed or strongly agreed that the local economy benefits from the mining

The Balranald 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 Balranald Project and its employees and contractors will benefit.

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

6.2 Economic benefits

(a) employment generation

The 32-month construction period for the Balranald Project is predicted to directly employ up to 450 people, with the annual average being around 209 workers.

During operation, the Balranald Project will provide direct employment for approximately 550 workers, including direct employees and direct contractors.

Total (direct and flow-on) employment for the regional economy during the construction and operation phase of the Balranald Project was estimated at 420 people (a multiplier of 2.01) and 1,289 (a multiplier of 2.33), 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 input-output 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 Balranald Project.

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

(b) expenditure, including capital investment,

The capital investment associated with the Balranald Project is estimated to be in the order of [redacted]. This is the level of capital investment included in the BCA[29]. A breakdown of this investment is provided in Table 6.1.

Table 6.1 – Summary of Capital Expenditure (2014 dollars) for the Balranald Project

Capital Expenditure	**$M**
Mine establishment and preparation	[redacted]
Dewatering infrastructure	[redacted]
Tails storage facility	[redacted]
Site development	[redacted]
Utilities supply and distribution	[redacted]
Camp	[redacted]
Buildings and other	[redacted]
Project management	[redacted]
Environment	[redacted]
MSP upgrade	[redacted]
WCP relocation	[redacted]
Land	[redacted]
Ilmenite separation plant	[redacted]
Nepean access road and mine establishment	[redacted]
Managatang transport facilities and containers	[redacted]
SR Kiln	[redacted]
Mining sustaining capital	[redacted]
Other	[redacted]
Total	[redacted]

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

- $136M in annual direct and indirect regional output or business turnover;
- $51M in annual direct and indirect regional value added;
- $24M in annual direct and indirect household income; and
- 420 direct and indirect jobs.

These particular impacts on the regional economy are likely to be felt for a period of in the order of 32-months.

In addition, the Balranald Project will result in ongoing annual expenditure in the regional economy of approximately $206M. The economic activity in the regional economy from operational expenditure was estimated using input-output analysis in the order of up to:

- $965M in annual direct and indirect regional output or business turnover;
- $300M in annual direct and indirect regional value added;
- $82M in annual direct and indirect household income; and

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

- 1,289 direct and indirect jobs.

(c) the payment of royalties to the State.

The prescribed royalty rate for rutile, zircon and ilmenite is [redacted] ex-mine value (value less allowable deductions).The Economic Assessment for the Balranald Project estimated royalties at [redacted] in total or $96M present value using a 7% discount rate. These estimates were based on detailed financial modelling of the Balranald Project by Iluka, based on TZMI US dollar price forecasts and an assumed [redacted] exchange rate. The estimates also include an allowance for deductions.

Table 6.2 provides sensitivity testing of royalties from the Balranald Project under different price, operating cost and exchange rate assumption. The estimated royalties from the Balranald Project are most sensitive to a 20% reduction in price or a 20% increase in the exchange rate. A change in operating costs has a minor impact on royalty calculations through a change in the level of allowable deductions.

Table 6.2 – Royalties to NSW Under Different Assumptions

	Total (undiscounted)	Present Value ($M) at Different Discount Rates		
		4%	7%	10%
Project Economic Assessment				
Central Assumption	[redacted]	$121	$96	$77
+ 20% price	[redacted]	$151	$120	$96
- 20% price	[redacted]	$91	$72	$58
+ 20% exchange rate	[redacted]	$91	$72	$58
-20% exchange rage	[redacted]	$151	$120	$96
+20% operating costs	[redacted]	$117	$92	$74
-20% operating costs	[redacted]	$126	$100	$80

7 CONCLUSION

A BCA of the Balranald Project indicated that it would have net production benefits of $148M. Assuming 55% foreign ownership, $132M of these net production benefits would accrue to Australia. Provided the residual environmental, social and cultural impacts of the Balranald Project that accrue to Australia are considered to be valued at less than $132M, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

Instead of leaving the environmental, cultural and social impacts unquantified an attempt was made to quantify them. The main quantifiable environmental impacts of the Balranald 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. These impacts to Australia are estimated at less than $1M, considerably less than the estimated net production benefits of the Balranald Project. There may also be some non-market benefits of employment provided by the Balranald Project which are estimated to be in the order of $16M. Overall, the Balranald Project is estimated to have net social benefits to Australia of between $132M and $148M 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 Balranald Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between $132M and $148M for the Balranald Project to be questionable from an Australian economic efficiency perspective.

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

Economic activity analysis, using input-output analysis, estimated that the Balranald Project would make up to the following direct and indirect average annual contribution to the regional economy[30] for approximately 8 years:

- $965M in annual direct and indirect regional output or business turnover;
- $300M in annual direct and indirect regional value added;
- $82M in annual direct and indirect household income; and
- 1,289 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 8 years:

- $720M in annual direct and indirect regional output or business turnover;
- $196M in annual direct and indirect regional value added;
- $58M in annual direct and indirect household income; and
- 771 direct and indirect jobs.

While the Project would result in some displacement of agricultural activity, these economic activity impacts are estimated at between 0.1% and 0.8% of the regional economic activity impacts of the Project.

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

The main fiscal benefit of the Project to Governments is:

- [redacted] (present value) to the Commonwealth Government in company tax;
- $16M (present value) to the Commonwealth Government in personal income tax from Project employees;
- $96M (present value) in royalties to the NSW Government.

With regard to the Mining SEPP heads of consideration:

- the resource proposed to be mined contains 14.4 Mt of heavy mineral with an average assemblage of 12.6% zircon, 13.2% rutile and 61.9% ilmenite.
- Iluka has existing operations in the Murray Basin and theBalranald Project willutilisethe existing Hamilton MSP in Victoria.
- numerous sectors in the regional economy will have some dependence on the Balranald Project as 80% of the workforce is expected in live in the region and hence a material component of their expenditure would flow-on to local businesses. Similarly, considerable operational expenditure go to firms in the region that are able to provide the goods and services required for the Balranald Project.
- the 32-month construction period for the Balranald Project is predicted to directly employ up to 450 people, with the annual average being around 209 workers. During operation, the Balranald Project will provide direct employment for approximately 550 workers, including direct employees and direct contractors. The Balranald Project will also provide indirect employment in the regional economy from employee and Project expenditure.
- the capital investment associated with the Balranald Project is estimated at approximately [redacted].
- the Balranald Project will generate royalties of [redacted] in total or $96M 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 input-output (IO) analysis and computable general equilibrium (CGE) modelling. Refer to Attachment 6 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[31].

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.

[31] 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 Actwhich 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.

Secretary's Environmental Assessment Requirements

- 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 reasons why the development should be approved having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development
- the Environmental Assessment to take into account relevant guidelines, policies, and plans including the Draft Economic Evaluation in Environmental Impact Assessment (DOP). This Draft Guideline identifies that "To conduct a proper economic evaluation of the options associated with a proposed development that is likely to have significant environmental impacts it is essential to undertake a benefit-cost analysis". The guideline also identifies that regional economic impact assessment using input-output analysis or computable general equilibrium modelling may provide additional information as an adjunct to the BCA.
- The SEARs are consistent with the use of BCA to justify the project from an economic perspective while the SEARs and Draft Guideline also provides for economic activity analysis as an adjunct to BCA.

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 *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 nonmarket valuation have shown that in addition to the market economic costs of employment to the community the broader community may have nonmarket values for other people's employment – based on altruism (Refer to Attachment 3);
    - 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. Consumer surplus relates to the willingness ofconsumers to pay for a good or service over and above what they have to pay for it and extend to nonmarket 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 considerthe 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 – NONMARKET 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[32]). 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 nonmarket 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[33]), 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[34]). This is consistent with the observed behaviour of altruism (Freeman III 2003[35]).

- Whether people have existence values for the employment of others, as hypothesised by Portney, is an empirical issue. A number ofnonmarket 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 nonmarket value of employment effects of energy programs.
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[32]Boardman, A., Greenberg, D., Vining, A. and Weimer, D. (2001) *Cost-benefit analysis: concepts and practice*, Prentice Hall, New Jersey.
[33]Portney, P. (1994) The Contingent Valuation Debate: Why Economists Should Care, *Journal of Economic Perspectives* 8:4, 3-18.
[34] 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.
[35] Freeman III, A. Myrick. (2003) *Economic Valuation: What and Why*. In A Primer on Nonmarket Valuation, Eds Champ, P., Boyle, K. and Brown, T. Kluwer Academic Publishers, London.

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 Paperestimated 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 nonmarket 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 nonmarket 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 nonmarket 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 A3.1.

Table A3.1 – Existence Values for Mine Employment

	Mean Implicit Price ($) (95% CI)	Aggregate WTP per Job Year ($) (95% CI)	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 nonmarket 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 4 – BCA AND ASSESSMENT OF EXTERNALITIES

Introduction

- The "perfect" BCA is an ideal. Different situations call for different styles and depths of analysis.
- Valuation of all environmental impacts is neither practical nor necessary.
- In attempting to value impacts, there is the practical principle of materiality. Only those impacts which are likely to have a material bearing on the decision need to be considered in BCA (NSW Government 2012). The guideline gives an example of impacts of less than $1M being immaterial for a project with an estimated net present value of $20M. The estimated NPV of the Balranald Project to Australia pre consideration of environmental impacts was $132M.
- The BCA of the Balranald Project took two approaches to the consideration of environmental costs:
  - Threshold value analysis; and
  - Qualitative consideration of impacts and valuation of the main impacts based on market data and benefit transfer.

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)[36]. 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 Balranald Project, the estimated net production benefits provides a threshold value or reference value against which the relative value of the residual environmental impacts of the Balranald 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.

[36]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 Balranald 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 Balranald Project EIS.

- The approach to valuing environmental impacts in the Economic Assessment of the Balranald Project is summarised in Table A4.1.

Table A4.1 – Method for Valuing Environmental Impacts in the Economic Assessment of the Balranald 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	Acquisition costs included in capital costs of the project.
Moderate and low	Defensive expenditure	Noise mitigation costs included in capital costs of project.
Blasting	Defensive expenditure	No impacts identified.
Significant air quality impacts	Property valuation method	No properties identified as being significantly impacted and requiring acquisition.
Use of surface water	Market value of water	Cost of Water Access Licences included.
Use of groundwater	Market value of water	Cost of Water Access Licences included.
Groundwater drawdown	Defensive expenditure	No impacts on private bores predicted.
Water discharges		Regulated under the Protection of Environment Operations Act 1997.
Flora and fauna	Replacement cost	Capital and operating costs of offsets included in capital and operating costs of the Project. Assumes that offsets levels are sufficient to compensate the community for values lost. This is a requirement of Govt. Policy.
Road transport impacts	Defensive expenditure	No significant capacity issues. Cost of road investment 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. Residual impacts unquantified.
Historic heritage	Defensive expenditure	No significant impacts predicted.
Visual	Defensive expenditure	Costs of mitigation measures included in the economic 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 social 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 5 – COMPANY TAX RATES AND DISTRIBUTION AMONG STATES

Effective Tax Rates for Mining Companies in Australia

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

- The current Australian Tax Office (ATO) corporate tax rate is 30% of taxable income.

- 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[37], Professor of Institutional Economics at RMIT University and a Senior Fellow at the Institute of Public Affairs found that the Australian mining industry pays corporate tax at a rate close to 30% of its taxable income.

- The Australia Institute (TAI) has questioned the use of the company tax rate when estimating the company tax generated from mining projects. One of the studies referred to by TAI that shows an effective tax rate of less than 30% e.g. Richardson and Denniss (2011)[38] 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[39] has rejected GOS as an appropriate denominator for estimating effective tax rates.

- The other study referred to by TAI to support its claim for effective tax rates of less than 30% is Markle and Shackelford (2009[40]). 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.

[37]Davidson, S. (2014) *Mining Taxes and Subsidies: Official evidence*, A Minerals Council of Australia Background Paper.
[38]Richardson, D. and Denniss, R. (2011)*Mining the truth: The rhetoric and reality of the commodities boom*, prepared for The Australia Institute.
[39]Clark, J., B. Pridmore and N. Stoney. 2007. 'Trends in aggregate measures of Australia's corporate tax level', *Economic Roundup*, Winter, pp 1 – 28)
[40]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[41]).

- 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 A5.1.

Table A5.1 - 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 A8.1) 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
  - $54.9B in general revenue assistance, comprising GST payments of $53.7B and other general revenue assistance of $1.2B.

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

Table A5.2 – 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 6 – 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 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 input-output 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[42] 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 nonmarket 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 the Land and Environment Court.
- 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

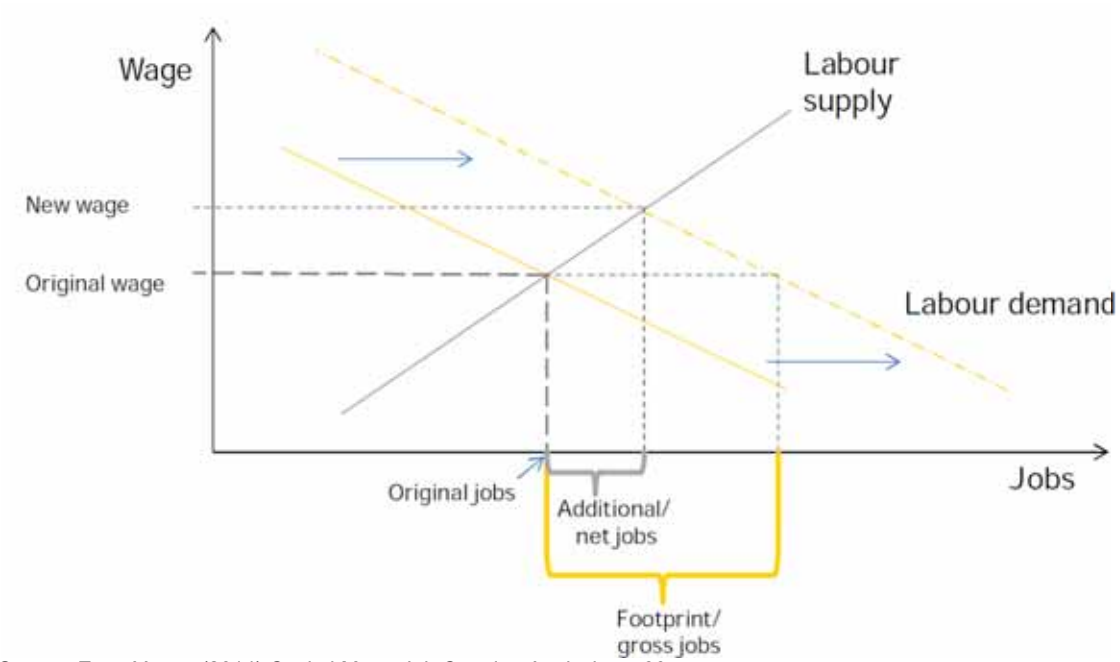
- CGE modelling is an alternative more expensive, complicated but theoretically more sophisticated method for estimating the economic activity associated with a project.
- The CGE modelling can be dynamic or comparative static[43]and has historically been applied at the State and National level for determining the potential economic activity associated with the introduction of major government policy changes and investment in large infrastructure projects.

[42] 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.
[43] 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.

- 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 nonmarket 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.

Comparison of IO Analysis and CGE Modelling

Figure A6.1 – Comparison of Employment Estimates in IO Analysis and CGE Modelling



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

- Figure A6.1 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[44]. 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*;
  - 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*.

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*

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

- 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 TAI 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 and economic activity indicators are not benefits or costs that are relevant to a BCA.

- 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 7 – UNDERLYING ASSUMPTIONS AND INTERPRETATIONS OF INPUT-OUTPUT ANALYSIS AND MULTIPLIERS

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

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

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

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

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

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

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

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

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

Components of the conventional output multiplier are as follows:

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

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

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

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

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

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

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

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

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

A description of the different ratio multipliers is given below.

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

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

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

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

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

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ATTACHMENT 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).

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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 input-output 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 6.05.

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)

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