Environmental Assessment

Cadia East Project

APPENDIX H

Cadia East Project
Socio-Economic Assessment

Prepared for

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EXECUTIVE SUMMARY

The Cadia East Project (the Project) involves underground mining of the Cadia East resource and would occur in conjunction with ongoing mining at the Cadia Hill Gold Mine (Cadia Hill) and Ridgeway Gold Mine (Ridgeway).

The Project requires the preparation of an Environmental Assessment (EA) in accordance with the requirements of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979*. A socio-economic assessment is required as part of the EA.

From a socio-economic perspective there are three important aspects of the Project:

- the economic efficiency of the Project (i.e. consideration of economic benefits and costs of the proposal);
- the regional economic impacts of the Project (i.e. the economic stimulus that the Project would provide to the regional economy); and
- the distribution of impacts between stakeholder groups (i.e. the equity or social impact considerations) often considered in terms of the impacts on employment, population and community infrastructure.

A benefit cost analysis of the Project identified a range of potential economic costs and benefits of the proposal and placed values on the production costs and benefits. The analysis indicated that the total net quantified production benefit of the Project is likely to be in the order of $1,210 million (M), net present value (NPV). This is above the net production benefits of the currently approved mining operations at the Cadia Valley Operations (i.e. it is a net production benefit specific to the development of the Cadia East orebody).

The net production benefits of the Project are distributed between a range of stakeholders including Cadia Holdings Pty Limited (CHPL) and its shareholders in the form of net profits, the NSW government in the form of royalties and the Commonwealth Government in the form of company tax. The NSW Government also receives additional income by way of payroll tax, while the Commonwealth Government would receive additional revenues in the form of income tax.

The main environmental externality that has been valued is greenhouse gas emissions costs. Adjusting the net production benefits for greenhouse gas emissions costs gives a net benefit of the Project of $709 M NPV. Because other potential incremental environmental impacts of the Project have not been valued, the NPV of $709 M represents a threshold value.

This threshold value is the opportunity cost to society of not proceeding with the Project. Interpreted another way, any other environmental impacts of the Project, after mitigation by CHPL, would need to be valued at greater than $709 M to make the Project questionable from an economic efficiency perspective.

To put this threshold value in some context, every household in the region of Orange, Cabonne and Blayney (OCB) would need to be willing to pay in the order of $34,000 to avoid the identified potential environmental impacts of the Project, to make it questionable from an economic efficiency perspective. The equivalent figure for NSW households is $280.

In total, the average annual stimulus to the regional economy that would be made by the Project is:

- $1,025 M in direct and indirect regional output or business turnover;
- $557 M in direct and indirect regional value-added;
- $165 M in household income; and
- 1,889 direct and indirect jobs.

The sectors most impacted by output, value-added and income flow-ons are likely to be the wholesale trade sector; electricity supply sector; retail trade sector, hotels, cafes and restaurants sector, scientific and technical services sector, law, accounting and marketing sector, banking sector, ownership of dwellings sector, health services sector, personal services sector and road transport sector.

Employment impacts are also likely to be felt across a number of sectors including the mining sector, wholesale and retail trade sectors and services sectors (education, health, community services and personal services).

Towns in the vicinity of the Cadia Valley Operations that can provide the inputs to the production process required by CHPL and/or the products and services required by employees would benefit from the proposal by way of an increase in economic activity. These towns would include Orange, Blayney and Molong. These towns would benefit from any CHPL procurement in the local area.

Changes in the workforce and populations of regions and towns can have implications in relation to access to community infrastructure and human services, which includes for example housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of the population to these services.

During the earlier years of operation, the Project would be part of an integrated operation with Cadia Hill open pit, Ridgeway underground mine and Ridgeway Deeps. In Year 2 (peak employment) this integrated operation would provide up to 204 more jobs than the present Cadia Valley Operations workforce. These additional 204 direct jobs and 240 flow-on jobs are estimated to be associated with a maximum increase in population of 807 people. However, these effects are only likely to be felt during Year 2. After three years, employment levels (and associated population levels) would return to current levels and thereafter decrease to approximately 783 people between Years 10 and 21. As described above, this would result in an average annual stimulus of 1,889 direct and indirect jobs to the regional economy.

Demand would be generated for a peak of up to 280 residences by the migrating direct and indirect workforce. While initially, short-term accommodation may house these families, this housing demand would largely be for detached housing in Orange and a lesser extent in Blayney, Millthorpe, Forest Reefs and Molong. The region has considerable short-term accommodation. In addition, it is estimated that in 2006 there were 2,551 private unoccupied dwellings in the region. A fraction of this being made available to the market would be sufficient to meet the estimated demand.

Recently there has been a number of residential subdivision development applications lodged with the Orange City Council to help address potential demand. Nevertheless, it is expected that the demand for housing generated by employees of Cadia Valley Operations would actually decline after three years to below current levels. Any cumulative impact of the Project on housing in the OCB region is therefore only likely to be short-term.

The increase in population would also generate increased demand for schools. However, in the last intercensal period there has been a decline in the population of school aged children and a reduction in school attendance at primary school, secondary school, TAFE and university. The estimated population profile of children associated with the peak migrating direct and indirect workforce would generally only partially offset the reduction in school attendance at primary school, secondary school, TAFE and university between 2001 and 2006. Nevertheless, depending on housing location of the migrating workforce demand for schools may be high for schools such as Orange High School and Bletchington Public which are already at or near capacity. Because schools are required to enrol students that reside in each school zone, any temporary influx of students in excess of infrastructure capacity at individual schools may be accommodated via use of temporary infrastructure.

Demand for preschool places increased between 2001 and 2006 despite a reduction in the regional population of children in this age group. The Project would add demand for up to 21 preschool places.

The increased population in the region would also increase demand for public health facilities in the region. However, the OCB region is well serviced by the health sector already and with the development of the new Orange hospital, the region would continue to be well serviced. Population is also a key driver in the provision of health services by Greater Western Area Health Service (GWAHS) and so even if the population growth exceeds expectations of the GWAHS, at worst there may be temporary lag between population growth and the provision of additional services.

Increase in population as a result of Project would increase demand for community and recreation facilities as the Cadia Valley Operations workforce regularly uses a range of community infrastructure in the OCB region and also participates strongly in community clubs and groups in the local area. Nevertheless, to date there has been few issues in relation to community and recreation facilities. When surveyed both the Cadia Valley Operations workforce and regional population did not appear to be experiencing significant shortages in access to community infrastructure.

With regard to recreation facilities and open space, a recent recreation needs study for Orange found that Orange has an extremely high level of premier parkland in comparison with other Local Government Areas and that there appears to be adequate capacity in existing sporting and parkland facilities to meet expected population increases into the future.

Cessation of the Project after 21 years of operation would lead to a reduction in regional economic activity. The significance of these cessation impacts would depend on:

- the degree to which any displaced workers and their families remain within the region, even if they remain unemployed;
- the economic structure and trends in the regional economy at the time; and
- whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

Given these uncertainties it is not possible to foresee the likely circumstances within which cessation of the Project would occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Project would bring to the region, to strengthen and broaden the region's economic base.

H1 INTRODUCTION

Cadia Holdings Pty Limited (CHPL), a wholly owned subsidiary of Newcrest Mining Limited (Newcrest), is the proponent for the development of the Cadia East Project (the Project). The Project is located at the Cadia Valley Operations, some 25 kilometres (km) south-west of Orange, in the Central Tablelands of New South Wales (NSW).

Mining at the Cadia Valley Operations commenced at the Cadia Hill Gold Mine (Cadia Hill) in 1998. The Ridgeway Gold Mine (Ridgeway) commenced production in 2002. A significant extension of Ridgeway, called Ridgeway Deeps, is currently under construction. The development and construction workforce for Ridgeway Deeps forms part of the current Cadia Valley Operations workforce, which consists of approximately 1,100 CHPL personnel and on-site contractors.

Approximately 24 million tonnes per annum (Mtpa) of ore is mined at the Cadia Valley Operations and in 2007/2008 approximately 716,000 ounces of gold and 61,000 tonnes (t) of copper was produced by Cadia Hill and Ridgeway. Mineral concentrate containing gold and copper is pumped approximately 30 km from the Cadia Valley Operations to the nearby town of Blayney, where it is dewatered and then loaded onto trains for transport to Port Kembla on the eastern seaboard.

Cadia Hill is scheduled to cease operation in 2013. With the Ridgeway Deeps extension, Ridgeway is scheduled to cease operations in 2017.

In the mid-1990s, CHPL's exploration program in the Cadia Valley identified a zone of low grade gold/copper mineralisation up to a distance of approximately 2.5 km east of the Cadia Hill open pit. The area of mineralisation is known as Cadia East and has been the subject of extensive exploration over the last decade and development planning over the past two years.

The Project would involve development of an underground mine to extract approximately 450 million tonnes (Mt) of ore over a period of 21 years. The ore contains gold, copper and some molybdenum. Development of the Project would occur in conjunction with the ongoing operation of the existing Cadia Hill and Ridgeway operations, and if approved, the Project would extend the life of the Cadia Valley Operations to approximately 2030.

The key Project extensions to the approved Cadia Valley Operations would include:

- underground mining of the Cadia East deposit using a panel caving mining method at a rate of up to 27 Mtpa and the development of an associated 255 hectare (ha) subsidence zone above the underground mining area;
- development of underground crushing, handling and incline conveyor systems to transfer ore and waste rock mined from the Cadia East orebody to the Cadia Valley Operations ore processing facilities;
- development of supporting infrastructure for the underground mine including multiple ventilation shafts, personnel and equipment access systems;
- upgrade of the existing Cadia Valley Operations ore processing facilities and associated stockpiles and materials handling equipment to accommodate the harder ore from Cadia East and enable a total Cadia Valley Operations ore processing rate of up to approximately 27 Mtpa;
- construction and operation of a molybdenum recovery plant with a capacity of up to 460,000 tonnes per annum (tpa) and trucking of molybdenum products off-site;
- placement of additional waste rock produced by the Project (approximately 11.4 Mt) in the existing South Waste Rock Dump;

- raising of the existing Northern Tailings Storage Facility (NTSF) and Southern Tailings Storage Facility (STSF) embankments to accommodate approximately 450 Mt of Cadia East tailings to be produced over the life of the Project;
- augmentation and upgrade of the existing Cadia Valley Operations water management/supply system including development of additional pipeline/pumping systems and raising of the Rodds Creek Water Holding Dam;
- obtaining additional mining leases to facilitate the Project extensions of the STSF, NTSF, subsidence zone and Rodds Creek Water Holding Dam;
- re-alignment of a 1.1 km section of Cadia Road;
- construction of a new dewatering facility to the east of Blayney (to be known as the CVO Dewatering Facility);
- maintaining the existing Blayney Dewatering Facility to provide standby additional processing capacity during the peak production period from Year 3 to Year 7 and the decommissioning of this facility if it is deemed redundant after this time;
- installation of a new concentrate pipeline and return water pipeline between the Cadia Valley Operations and the CVO Dewatering Facility;
- increased rail transportation of dewatered mineral concentrate from Blayney to the eastern seaboard;
- augmentation, relocation and upgrade of supplementary surface facilities including workshops, administration and site access roads; and
- other associated modifications to existing infrastructure, plant, equipment and activities to allow mining of the Cadia East deposit and integration with the approved Cadia Valley Operations.

H1.1 PREVIOUS SOCIO-ECONOMIC ASSESSMENTS AND COMMUNITY SURVEYS OF CHPL PROJECTS

The potential impacts of Cadia Hill and Ridgeway on the socio-economic environment were documented in separate Environmental Impact Statements (EISs) completed for the Cadia Gold Mine (Newcrest, 1995) and for the Ridgeway Project (CHPL, 2000). These EISs included consideration of the potential socio-economic effects of the development of these mining operations (including cumulative effects of Cadia Hill and Ridgeway) on the local region.

In 2006/2007 Gillespie Economics completed a *Community Impact Review* for the Cadia Valley Operations (Gillespie Economics, 2007) that included:

- an employment and population review;
- a summary of recent regional population and census data trends;
- a review of the observed community infrastructure and socio-economic effects of the Cadia Valley Operations on the local region; and
- completion of surveys in the community including:
  - a community attitudes survey and business and stakeholder surveys (perception of Cadia Valley Operations socio-economic contributions to the local region and community infrastructure impacts); and
  - Cadia Valley Operations employee surveys (demographics, previous residence locations, etc.).

The findings of these previous socio-economic assessments and surveys in the community have been incorporated in this assessment, where relevant.

H1.2 SOCIO-ECONOMIC ASSESSMENT OF THE PROJECT

From a socio-economic perspective there are three important aspects of the Project that can be considered:

- the economic efficiency of the Project (i.e. consideration of economic costs and benefits);
- the regional economic impacts of the Project (i.e. the economic stimulus that the Project would provide to the regional economy); and
- the distribution of impacts between stakeholder groups (i.e. the equity or social impact considerations).

Planning NSW (2002) draft *Guideline for Economic Effects and Evaluation in EIA* identified economic efficiency as the key consideration of economic analysis. Benefit cost analysis (BCA) is the method used to consider the economic efficiency of proposals. The draft guideline identified BCA as essential to undertaking a proper economic evaluation of proposed developments that are likely to have significant environmental impacts.

The draft guideline considers that regional economic impact assessment may provide additional information as an adjunct to the economic efficiency analysis. Economic stimulus to the local economy can be estimated using input-output modelling of the regional economy (regional economic impact assessment).

The draft guideline also identifies the need to consider the distribution of benefits and costs in terms of:

- intra-generational equity effects – the incidence of benefits and costs within the present generation; and
- inter-generational equity effects – the distribution of benefits and cost between present and future generations.

These social impacts are often considered in terms of the impacts on employment, population and community infrastructure (including health services).

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

- a BCA (threshold value analysis) of the Project;
- a regional economic impact assessment of the Project; and
- an employment, population and community infrastructure assessment (including health services).

An extensive regulatory and community consultation programme for the Environmental Assessment (EA) has been undertaken by CHPL and is reported in Section 3 of the EA main text. As described in Section H1.1, this assessment also draws on the results of socio-economic assessments and previous community surveys for the Cadia Valley Operations, where relevant.

H2 BENEFIT COST ANALYSIS OF THE PROJECT

H2.1 INTRODUCTION

For the Project to be economically desirable from an Australian community perspective, it must be economically efficient. Technically, a project is economically efficient and desirable on economic grounds if the benefits to society exceed the costs (James and Gillespie, 2002). For mining projects, the main economic benefit is the producer surplus generated by the mine while the main economic costs relate to environmental costs. The main technique that is used to weigh up these benefits and costs is BCA.

BCA involves the following key steps:

- identification of the base case;
- identification of the proposal and its implications;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates;
- sensitivity testing;
- application of decision criteria; and
- consideration of non-quantified benefits and costs.

The following BCA of the Project is based on financial, technical and environmental advice provided by CHPL and Resource Strategies Pty Ltd.

H2.2 IDENTIFICATION OF THE BASE CASE AND ALTERNATIVES

Identification of the “base case” or “without” scenario is required in order to facilitate the identification and measurement of the incremental economic benefits and costs of the Project. In this study, the “base case” or “without” scenario involves:

- continuation of mining of Cadia Hill, Ridgeway and Ridgeway Deeps for the duration of their respective consented mine lives; and
- continuation of the current use of the lands that would be subject to development as a component of Cadia East (i.e. remnant woodland, forestry, grazing on cleared rural lands).

In contrast to the “base case” scenario, the “with” Project scenario involves:

- underground mining of the Cadia East deposit using a panel caving mining method at a rate of up to 27 Mtpa and the development of an associated 255 ha subsidence zone above the underground mining area;
- development of underground crushing, handling and incline conveyor systems to transfer ore and waste rock mined from the Cadia East orebody to the Cadia Valley Operations ore processing facilities;
- development of supporting infrastructure for the underground mine including multiple ventilation shafts, personnel and equipment access systems;

- upgrade of the existing Cadia Valley Operations ore processing facilities and associated stockpiles and materials handling equipment to accommodate the harder ore from Cadia East and enable a total Cadia Valley Operations ore processing rate of up to approximately 27 Mtpa;
- construction and operation of a molybdenum recovery plant with a capacity of up to 460,000 tpa and trucking of molybdenum products off-site;
- placement of additional waste rock produced by the Project (approximately 11.4 Mt) in the existing South Waste Rock Dump;
- raising of the existing NTSF and STSF embankments to accommodate approximately 450 Mt of Cadia East tailings to be produced over the life of the Project;
- augmentation and upgrade of the existing Cadia Valley Operations water management/supply system including development of additional pipeline/pumping systems and raising of the Rodds Creek Water Holding Dam;
- obtaining additional mining leases to facilitate the Project extensions of the STSF, NTSF, subsidence zone and Rodds Creek Water Holding Dam;
- re-alignment of a 1.1 km section of Cadia Road;
- construction of a new dewatering facility to the east of Blayney (to be known as the CVO Dewatering Facility);
- maintaining the existing Blayney Dewatering Facility to provide standby additional processing capacity during the peak production period from Year 3 to Year 7 and the decommissioning of this facility if it is deemed redundant after this time;
- installation of a new concentrate pipeline and return water pipeline between the Cadia Valley Operations and the CVO Dewatering Facility;
- increased rail transportation of dewatered mineral concentrate from Blayney to the eastern seaboard;
- augmentation, relocation and upgrade of supplementary surface facilities including workshops, administration and site access roads; and
- other associated modifications to existing infrastructure, plant, equipment and activities to allow mining of the Cadia East deposit and integration with the approved Cadia Valley Operations.

CHPL has defined the Cadia East resource and owns the majority of land within the existing and proposed mining leases. CHPL has not at this stage located, at sufficient levels of certainty, any alternate gold resources within the Cadia Valley that could be mined at a similar scale to the Project and hence there are no alternative sites considered.

Mining and processing of the Cadia East mineral resources could potentially take a number of forms. This could include but is not limited to different mining methods, scales, designs, technologies, processes, modes of transport, timing or impact mitigation measures. Therefore a number of alternatives for mining and processing may be possible. However, these may all be considered to be minor variants of the Project rather than alternatives. As a result, this analysis focuses on the Project proposal compared to the base case identified above.

H2.3 IDENTIFICATION OF BENEFITS AND COSTS

Relative to the base case or "without" scenario (i.e. continued existing uses of Project land such as remnant woodland and agriculture), the Project may have the potential incremental economic benefits and costs listed in Table H2.1.

Table H2.1
Potential Economic Benefits and Costs of the Project

	Potential Costs	Potential Benefits
Production	• Opportunity cost of land.	• Sale value of gold, copper and molybdenum.
	• Capital costs of mine development.	• Delayed decommissioning and rehabilitation costs associated with surface infrastructure.
	• Operating costs, including administration, mining, ore processing, transportation, and rehabilitation.	
	• Deferred realisation of residual land value and capital value associated with current Cadia Valley Operations.	
External Impacts	• Impacts on air quality affecting the amenity of neighbouring properties.	
	• Impacts on the quality or quantity of surface water reporting to watercourses.	
	• Disturbance of groundwater flows. • Long-term effects on groundwater quality.	
	• Impacts of operational noise and blasting on the amenity of neighbouring properties.	
	• Impacts of transportation, such as increased traffic on local roads and increased train movements.	
	• Modification of the visual landscape.	
	• Disturbance of Aboriginal and non-Aboriginal heritage sites.	
	• Generation of greenhouse gases.	
	• Loss of agricultural and forestry land.	
	• Disturbance of flora and fauna habitat and individuals.	

The incremental benefits of the Project to society relate to the net production benefits, while the economic costs to society relate to any external or environmental impacts.

It should be noted that the potential external costs of the Project are only economic costs to the extent that they affect individual and community wellbeing through direct use of resources by individuals or non-use[1]. If the potential impacts of the Project are of a limited nature, or are mitigated to the extent where community wellbeing is insignificantly affected, then no external economic costs arise.

[1] *Direct use values* are those that arise from the direct physical use of environmental resources. *Indirect use values or ecosystem function value* is the value of the ecosystem services and functions provided by an environmental resource. Non-use values comprise *option values, quasi-option values, vicarious use values, bequest values* and *existence values*.

H2.4 QUANTIFICATION/VALUATION OF BENEFITS AND COSTS

In accordance with NSW *Treasury Guidelines for Economic Appraisal* (NSW Treasury, 2007), where competitive market prices are available, they have generally been used as an indicator of economic values.

H2.4.1 Net Production Benefits

Production Costs

Opportunity Cost of Land

Even though much of the land subject to the mining proposal has already been purchased by CHPL, there is an opportunity cost associated with using the land for the Project instead of its next best use. An indication of the opportunity cost of the land can be gained from the market value of this land. CHPL estimate this value at $3.3 million (M).

Capital Cost of the Project

Capital costs of the Project are associated with various studies, permitting costs, underground mine development, upgraded ore processing facilities construction, services and utilities, engineering, procurement and construction management and land acquisition, as well as sustaining capital. These capital costs over the life of the Project are estimated at $2.2 billion (B).

Annual Operating Costs of the Mine

The annual operating costs of the Project include those associated with underground mining, ore processing, administration, rehabilitation costs, environmental management and monitoring costs and transport and refining costs. Average annual operating costs of the Project are estimated at $398 M.

While royalties are a cost to CHPL they are part of the overall producer surplus benefit of the mining and processing activity that is redistributed by government. Royalties are therefore not included in the calculation of the resource costs of operating the Project. Nevertheless, it should be noted that the Project would generate royalties in the order of $19 M per annum with total royalties over the life of the Project estimated at approximately $409 M.

Deferred Realisation of Residual Land Value and Capital

Extension of mining at Cadia Valley Operations would also mean that the residual value of land and capital associated with mining at Cadia Hill, Ridgeway and Ridgeway Deeps (estimated at approximately $345 M) that would have been realised in 2017 would now not be realised until the end of mining of the Project in 2030. This is an economic cost of the Project.

Production Benefits

Sale Value of Gold, Copper, Silver and Molybdenum

The Project ore and waste production schedule is provided below in Table H2.2.

The price for gold, copper, silver and molybdenum is determined in a competitive global market and hence is considered to be a reasonable estimate of the gross economic value of these metals. For the purpose of this long range analysis, an average price of A$804 per ounce (/oz) of gold, A$2 per pound (/lb) of copper, A$11/oz of silver and A$16/oz of molybdenum has been used. Average annual revenue from the Project is estimated at $726 M.

Table H2.2
Provisional Cadia East Mine Schedule

Year	Waste Rock (Mt)	Ore (Mt)	Products (includes metals in concentrate)		
			Gold ('000 ounces)	Copper (kt)	Molybdenum (kt)
1 (2010)	1.0	0.2	2.4	0.4	0.0
2	1.0	0.2	2.8	0.4	0.0
3	1.0	4.0	87.7	9.8	0.0
4	1.0	13.8	352.0	34.0	0.2
5	1.0	18.9	482.5	46.3	0.4
6	0.2	19.0	459.8	47.2	0.6
7	0.2	19.0	451.2	53.0	0.9
8	0.2	23.4	506.3	67.9	1.7
9	0.2	27.0	545.3	78.3	1.9
10	0.2	27.0	463.8	78.3	1.9
11	0.2	27.0	463.8	78.3	1.9
12	0.2	27.0	463.8	78.3	1.9
13	0.2	27.0	463.8	78.3	1.9
14	1.0	27.0	463.8	78.3	1.9
15	1.0	27.0	463.8	78.3	1.9
16	1.0	27.0	463.8	78.3	1.9
17	1.0	27.0	463.8	78.3	1.9
18	0.2	27.0	463.8	78.3	1.9
19	0.2	27.0	463.8	78.3	1.9
20	0.2	27.0	463.8	78.3	1.9
21 (2030)	0.2	27.0	463.8	78.3	1.9
Total	**11.4**	**449.5**	**8,455.6**	**1,276.9**	**28.5**

kt = kilotonnes.

The Cadia Valley Operations ore and product schedule, incorporating the Project, is provided in Table H2.3.

Comparison of Tables H2.2 and H2.3 indicates that the relative contribution of the Project to the Cadia Valley Operations production would significantly increase after Year 3, when Cadia Hill would close. From Year 9, all of the Cadia Valley Operations ore production would be from the Project, as Ridgeway Deeps would also be completed.

Table H2.3
Provisional Cadia Valley Operations Schedule (Incorporating the Project)

Year	Cadia Valley Operations		Cadia Valley Operations Products (includes metals in concentrate)		
	Waste (Mt)	Ore (Mt)	Gold ('000 ounces)	Copper (kt)	Molybdenum (kt)
1 (2010)	2.8	24.0	498.6	51.5	0.0
2	1.0	24.0	589.3	51.9	0.0
3	1.0	27.0	663	60.5	0.0
4	1.0	27.0	619	70.5	0.2
5	1.0	27.0	667.1	75.1	0.4
6	0.2	27.0	459.8	47.2	0.6
7	0.2	27.0	451.2	53.0	0.9
8	0.2	27.0	506.3	67.9	1.7
9	0.2	27.0	545.3	78.3	1.9
10	0.2	27.0	463.8	78.3	1.9
11	0.2	27.0	463.8	78.3	1.9
12	0.2	27.0	463.8	78.3	1.9
13	0.2	27.0	463.8	78.3	1.9
14	1.0	27.0	463.8	78.3	1.9
15	1.0	27.0	463.8	78.3	1.9
16	1.0	27.0	463.8	78.3	1.9
17	1.0	27.0	463.8	78.3	1.9
18	0.2	27.0	463.8	78.3	1.9
19	0.2	27.0	463.8	78.3	1.9
20	0.2	27.0	463.8	78.3	1.9
21 (2030)	0.2	27.0	463.8	78.3	1.9
Total	**13.2**	**561.0**	10,565.2	1,495.5	28.5

Delayed Decommissioning and Rehabilitation Costs

Under the base case the surface infrastructure at Cadia Valley Operations would be decommissioned and rehabilitated in 2017 at a cost in the order of $57 M. With the Project, this decommissioning would not occur until after 2030. There is an economic benefit from delaying these costs.

H2.4.2 External Costs and Benefits

The EA main text and specialist appendices provide a detailed consideration of the potential environmental impacts of the Project and the proposed management and mitigation measures. These main potential environmental impacts of the Project are briefly considered below from an economic perspective. Allowance for CHPL expenditure on environmental management, monitoring and mitigation measures has been incorporated in the analysis where relevant (e.g. a general allowance for progressive rehabilitation, management and monitoring costs of $3 M per annum).

Groundwater

Potential impacts on groundwater from the Project primarily relate to:

- The Cadia East underground mine and subsidence zone causing drawdown of groundwater resources during operations and post-closure, and this drawdown adversely affecting other groundwater users (e.g. bore and spring water users) and baseflow to local creeks.
- The Cadia Hill open pit and void created by the Cadia East underground mine and subsidence zone becoming a permanent groundwater sink following mine closure and a saline, and potentially acidic, waterbody forming after a period of 150 to 160 years.

In order to prevent Project-induced impacts on the water supply availability of privately owned bores, CHPL has committed to develop and implement a Groundwater Management Plan for the area potentially affected by the drawdown from the Project. The Plan would include:

- a compilation of the available construction and use information on each existing bore and spring in the potentially affected area;
- details of an inspection of each bore and spring by a suitably qualified hydrogeologist (where permission from the owner was granted);
- details of the groundwater monitoring programme (location, parameters, frequency and reporting) to be used by CHPL to monitor and detect impacts on local aquifers; and
- details of monitoring triggers and corresponding measures to mitigate Project-induced impacts on water supply availability. The mitigation measures could include, but are not necessarily limited to lowering of pumps, deepening of bores, or provision of new bores/alternative water supplies.

In addition, a comprehensive regional monitoring programme would be undertaken, including the construction of additional monitoring bores and monitoring of select springs.

Any residual impacts after implementation of the Groundwater Management Plan would impact the consumer surplus of groundwater users or the producer surplus of these users if the water is used for production. These values could potentially be estimated using market data or the replacement cost method.

Surface Water

The Project is situated within the Cadiangullong Creek catchment. Cadiangullong Creek flows southward through the Cadia Valley to the Belubula River which is a major tributary of the Lachlan River.

Locally, the Cadia East deposit is overlain by the Copper Gully catchment, which is a former tributary of Cadiangullong Creek. Other tributaries of Cadiangullong Creek affected by the existing Cadia Valley Operations and the proposed Project are Cadia Creek and Rodds Creek. Swallow Creek and Flyers Creek run in a north to south direction and are located to the west and east of Cadiangullong Creek, respectively.

In summary the potential impacts on surface water primarily relate to:

- reduction of surface water quality due to runoff, seepage, the release of process water from construction or operation areas, salinity;
- reduced flows in local creeks due to extraction for the Project water supply and loss of groundwater contribution through the formation of a permanent subsidence zone; and
- changes in flows in the Belubula River due to extraction for the Project water supply and loss of baseflow in local creeks (tributaries of the Belubula).

Water management and mitigation measures include:

- The existing Cadia Valley Operations surface water monitoring programme would be expanded to include additional flow gauges and pluviometers (rain gauges) on Flyers and Cadia Creeks.
- CHPL would review and revise the existing Contingency Water Supply Plan required under Condition 43 of the Cadia Hill Development Consent (DA 44/95), to accommodate the unlikely event that the loss of baseflow from Flyers Creek is greater than predicted and significant and adverse impacts on riparian users do occur. The Contingency Water Supply Plan would include details of how and under what circumstances CHPL would provide alternative water supply or other agreed measures.
- CHPL would increase its support of the Flyers Creek landcare group and/or assist with the establishment and support a new independent non-profit environmental organization with the objective of protecting and improving the sustainability of the Flyers Creek catchment area. The organisation would seek to collaborate with the DPI, Lachlan Catchment Management Authority, and other relevant agencies to develop and implement a long-term catchment management plan and implement ongoing water management and agricultural management projects with the involvement of local Flyers Creek landholders.
- Low to medium flows in Cadiangullong Creek would be maintained during the Project life by CHPL releasing water from Cadiangullong Dam in accordance with the existing flow protocols.
- In order to minimise the potential impact of the Project on the non-CHPL owned property on Cadingullong Creek, CHPL would provide alternative stock water (or otherwise agreed alternative measures) to this property during the periods when the water level in Cadiangullong Dam has fallen below the lowest release point on the multi-level off-take and inflows to the dam are occurring (ie. the dam is re-filling but it has not yet reached a point where flow releases can re-commence). Details would be provided in the Contingency Water Supply Plan.
- The existing Integrated Erosion and Sediment Control Plan would be augmented and updated for the Project.

Any residual impacts after implementation of the water management and mitigation measures would impact the consumer surplus of surface water users or the producer surplus of these users if the water is used for production. These values could potentially be estimated using market data or the replacement cost method. Any environmental impacts as a result of reduced water flows in streams could potentially be estimated using the contingent valuation method or choice modelling.

Noise and Blast Vibration

Noise and blasting at the Project and the CVO Dewatering Facility has the potential to impact on sensitive receivers such as nearby residences. In addition, traffic noise generated from Project-related vehicles has the potential to also impact on sensitive receivers.

Noise mitigation and management measures for the existing Cadia Valley Operations are described in the Noise Management Plan:

- regular servicing of the mobile equipment fleet;
- regular maintenance of conveyor belt drives and rollers;
- regular maintenance of underground ventilation fans;
- regular maintenance of reversing alarms on mobile equipment; and
- notification of employees, contractors and visitors to the site of their responsibility to undertake work activities in an environmentally sensitive manner (including minimising noise while on-site or entering and leaving the site).

Noise associated with the new CVO Dewatering Facility would be mitigated by installing a noise-reducing fence at the facility.

Traffic noise mitigation and management measures for the existing Cadia Valley Operations are described in the Noise Management Plan, and are reproduced below:

- employees, contractors and visitors to the site are reminded of their responsibility to drive in a sensible manner while driving to and from the mine, a reduction in speed contributes to a reduction of noise; and
- the majority of heavy vehicle deliveries are scheduled to occur during daytime hours to avoid the night-time period.

Blasting management measures for the existing Cadia Valley Operations are described in the Blasting and Vibration Management Plan:

- The driller and shotfirer will ensure that blastholes are positioned away from cracks and undercuts and are not too close to the face.
- Alter the charge distribution in the blasthole by means such as stem decks or air decks in areas where the face burden is insufficient.
- A maximum of seven rings per blast are fired or timing intervals set for individual blasts.
- If blasting near infrastructure, a thorough risk assessment is completed, controls identified and implemented in a planned manner.
- If a misfire occurs the blast supervisor will determine whether the blast is able to be safely recovered and fired. If refiring does not occur immediately, the blast will be cordoned off and will be fired at the next available blast time. At Ridgeway, the misfire is always cordoned off and fired at the next available blast time.

The Noise Management Plan and Blasting and Vibration Management Plan would be revised for the Project.

Residual noise impacts would impact the consumer surplus associated with affected properties and could be estimated using the property value method. The costs associated with implementation of noise management measures and/or potential property acquisitions for some noise affected properties have been included in the analysis in the years in which they are expected to occur.

Air Quality

Potential air quality impacts include dust generation from the surface activities (e.g. ore handling, emissions from stockpiles, tailings storage lifts) and mine ventilation emissions to the surrounding environment. Dust generation at the CVO Dewatering Facility would primarily occur during the construction stage.

Air quality management measures are currently implemented at the Cadia Valley Operations in accordance with the Dust Management Plan to minimise the generation of wind blown and mine generated dust. The Dust Management Plan includes air quality monitoring requirements, complaints handling procedures, management measures and stakeholder consultation requirements. These management measures would continue to be implemented for the Project. The existing air quality monitoring network would continue to be used for the Project.

The Dust Management Plan includes the following mitigation measures:

- watering of unsealed haul roads and disturbed surfaces (including construction areas);
- restricting the size of disturbed areas as much as practicable;
- collection of fine dust from drilling;
- prevention of truck over-loading;
- regular maintenance of all haul roads;
- enclosure of material transfer points;
- fixed water sprays located on top of the coarse ore stockpiles;
- progressive reshaping and revegetation of waste emplacement areas;
- clear marking of all haul roads; and
- fixed speed limits for all roads around the surface facilities.

CHPL would use real-time monitoring of PM10 concentrations, via a TEOM, to assist in dust management at the Cadia Valley Operations.

During construction of the CVO Dewatering Facility, the above management measures would be implemented, where practicable. In addition, dust gauges would be installed at potentially sensitive receivers in the vicinity of the facility.

Residual air quality impacts would impact the consumer surplus associated with affected properties and could be estimated using the property value method.

Transport

The Project would result in a short term increase in existing traffic levels during the Project construction period and whilst the existing Cadia Valley Operations are operating. After this period, traffic levels would return to levels generally consistent with average existing Cadia Valley Operations traffic. The Levels of Service on local roads and intersections would not change as a result of the Project.

The Project would require the re-alignment of Cadia Road and the construction of a new intersection between Cadia Road and Woodville Road. This intersection would be constructed to maintain the existing level of service.

Although the local road network has sufficient capacity to cater for the Project, CHPL would implement the following mitigation measures:

- all oversized vehicles would have the relevant permits, licences and escorts, as required by the regulatory authorities and the proposed route would be negotiated with the relevant local councils;
- all oversize vehicles loads would be appropriately secured and covered, where necessary; and
- CHPL would continue to investigate the viability of providing an employee shuttle bus service from Orange and Blayney to the Cadia Valley Operations.

Although the local road network has sufficient capacity to cater for the Project, CHPL may extend the sealed section of Cadia Road from the intersection of Woodville Road to the junction with Panuara Road.

The costs of construction and operation of the rail spur at the CVO Dewatering Facility are also included in the capital and operating cost estimates.

European Heritage

The Cadia Valley has a rich history of mining activity dating back to the 1850s. Within the Project disturbance areas, two remnants of historical mining activity are present, namely Little Cadia (a portion of which is within the subsidence zone and zone of influence) and Wire Gully Gold Workings (a portion of which would be inundated by the STSF). Both of these heritage precincts are considered to be of local heritage significance, with some individual items at Little Cadia graded moderate to exceptional.

Mitigation measures would include salvage of moveable heritage items at both Little Cadia and Wire Gully Gold Workings. In addition, archaeological excavations within the Cadia East zone of influence at Little Cadia (including the chimney base and wall structure) would be backfilled and sandbagged for protection from erosion and degradation.

Any residual impacts on European heritage may impact the consumer surplus of visitors to these items as well as people's non-use values. These could potentially be measured through the contingent valuation or choice modelling method.

Aboriginal Heritage

Numerous cultural heritage surveys have been undertaken within the Cadia Valley and surrounds. These surveys have recorded only a limited number of artefacts.

Although cultural heritage sites are relatively rare in the area, one single lithic item (a quality stone flake) and three archaeological 'areas of interest' have been recorded within Project disturbance areas.

The lithic item is located adjacent to the concentrate and return water pipelines to be installed from the Cadia Valley Operations to Blayney. This item would be salvaged prior to the construction of the pipelines. In addition, archaeological excavations would be undertaken at the 'areas of interest' to determine their archaeological significance (if any) and extent of the site.

Any impacts on Aboriginal heritage may impact the consumer surplus of individuals within the indigenous and broader community. These could potentially be measured through the contingent valuation or choice modelling method, although such techniques have limited application to indigenous communities.

Flora and Fauna

Project disturbance areas would include areas of existing clearing associated with agricultural use and areas of remnant or regrowth vegetation that would be removed or significantly altered by the subsidence zone associated with the underground mining. A number of threatened flora and fauna species were identified in the Project area and surrounds.

Any impacts on flora and fauna species would likely affect the non-use economic values (consumers' surplus) of individuals and could potentially be interpreted in an economic context via surveys to elicit the community's willingness to pay to avoid any potential impacts (i.e. the contingent valuation method or choice modelling).

To some extent any impacts on flora and fauna species have been internalised by CHPL's proposed mitigation measures which include the progressive rehabilitation of the surface mine landforms to a combination of native woodland and grazing areas, and commitment to offsets for conservation of flora and fauna.

Allowance for CHPL expenditure on these measures has been included in the analysis in the years when expenditure is expected to occur.

Greenhouse Gas Generation

The Project would generate carbon dioxide (CO_2) emissions predominantly from the use of electricity and diesel in fixed and mobile equipment.

The Project would generate an estimated 40,227 t carbon dioxide equivalent (CO_2-e) per annum of Scope 1 greenhouse gas emissions predominantly from the use of diesel. There would also be an estimated 23.65 Mt CO_2-e of Scope 2 emissions from on-site electricity use over the life of the Project. Scope 3 emissions associated with transport of mineral concentrate (to the eastern seaboard), electricity use, diesel, employee travel and waste disposal would be associated with an estimated 5.11 Mt CO_2-e of Scope 3 emissions over the life of the Project. All these emissions have conservatively been included in the economic analysis.

In order to place an economic value on CO_2-e emissions a shadow price of carbon is required that reflects its social costs. The social cost of carbon is the present value of additional economic damages now and in the future caused by an additional tonne of carbon emissions.

A prerequisite to valuing this environmental damage is scientific dose-response functions identifying how incremental emissions of CO_2-e would impact climate change and subsequently impact human activities, health and the environment on a spatial basis. Once the physical linkages are identified it is possible to begin to place economic values on the physical changes using a range of market and non market valuation methods. A number of different climate and economic modelling tools have been used to attempt to identify the physical impacts of greenhouse gases and the valuation of these impacts. As a result there is a great range in the estimated damage costs of greenhouse gas.

The *Stern Review: The Economics of Climate Change* (Stern, 2006) acknowledged that the academic literature provides a wide range of estimates of the social cost of carbon. It adopted an estimate of US$85 per tonne of carbon dioxide (/t CO_2) for the "business as usual" case, i.e. an environment in which there is an annually increasing concentration of greenhouse gases in the atmosphere.

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

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

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

Tol (2005) in a review of 103 estimates of the social cost of carbon from 28 published studies found that the range of estimates was right-skewed: the mode was US$0.55/t CO_2 (in 1995 US$), the median was US$3.82/t CO_2, the mean US$25.34/t CO_2 and the 95th percentile US$95.37/t CO_2. Tol (2005) also found that studies that used a lower discount rate and those that used equity weighting across regions with different average incomes per head, generated higher estimates and larger uncertainties. The studies did not use a standard reference scenario, but in general considered 'business as usual' trajectories.

Tol (2005) concluded that "it is unlikely that the marginal damage costs of CO_2 emissions exceed US$14/t CO_2 and are likely to be substantially smaller than that". Nordhaus's (2008) modelling using the DICE-2007 Model suggests a social cost of carbon with no emissions limitations of US$30 per tonne of carbon (US$8/t CO_2).

An alternative method to trying to estimate the damage costs of CO_2 is to examine the price of carbon credits. This is relevant because emitters can essentially emit CO_2 resulting in climate change damage costs or may purchase credits that offset their CO_2 impacts. This internalises the cost of the externality at the price of the carbon credit. The price of carbon credits therefore provides an alternative estimate of the economic cost of greenhouse gas. However, the price is ultimately a function of the characteristics of the scheme and the scarcity of permits, etc. and hence may or may not reflect the actual social cost of carbon.

The price of carbon credits under the European Union Emissions Trading Scheme are currently approximately 24/t CO_2, the equivalent of approximately US$38/t CO_2 while spot prices in the Chicago Climate Exchange are in the order of US$3.95/t CO_2.

More recent information on the cost of carbon credits can be obtained from the carbon reduction schemes in Australia. As of July 2008 the spot price under the NSW Government Greenhouse Gas Reduction Scheme was AUS$7.25/t CO_2. Prices under the Commonwealth Governments Greenhouse Friendly Voluntary Scheme were AUS$8.30/t CO_2 and Australian Emissions Trading Unit (in advance of the Australian Government's Emissions Trading Scheme) was priced at AUS$21/t CO_2-e (Next Generation Energy Solutions, pers. comms., 24 July 2008).

A National Emissions Trading Scheme is foreshadowed in Australia by 2010. While the ultimate design and hence liabilities under the scheme are still being finalised, the *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future White Paper* (Australian Government, 2008) has cited a nominal carbon permit price of AUS$23/t CO_2 in 2010 and AUS$35/t CO_2 in 2020 (in 2005 dollars) for a 5 per cent reduction in carbon pollution below 2000 levels by 2020. This is the value profile used in this analysis.

Visual Impacts

The Cadia Valley Operations are currently shielded to a large extent by topographic high points on the east and west sides of the Cadia Valley, and forestry operations to the north and east. Views of the existing operations are available in places, predominantly from the south. CHPL has established visual screens of native trees at strategic locations to screen views from some vantage points.

A limited number of new locations would have views of the Cadia Valley Operations as a result of the Project. The main potential visual impacts resulting from the Project would be from the raises of the NTSF and STSF and formation of the Cadia East subsidence zone.

CHPL would increase screens of native trees in some locations, and in response to community feedback. Cadia Valley Operations progressive rehabilitation costs have been incorporated in the analysis in the years in which expenditure is expected to occur.

Visual intrusion can potentially impact the consumer surplus of affected households (estimated using the property value method) and visitors to surrounding areas (which can be measured via the contingent valuation method).

H2.5 APPLICATION OF DECISION CRITERIA AND THRESHOLD VALUE ANALYSIS

The main decision criterion for assessing the economic desirability of a project to society is its economic net present value (NPV). Economic NPV is the sum of the discounted benefits to society less the sum of the discounted costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to a proposal, because the community as a whole would obtain net benefits.

In a simple framework, the benefits to society of mining relate to the net production benefits, while the economic costs to society relate to any environmental impacts.

Using a 7% discount rate, the Project is estimated to have net production benefits to Australia in the order of $1,210 M NPV. This is in addition to the net production benefits of the currently approved mining operations at the Cadia Valley Operations (i.e. it is a net production benefit specific to the development of the Cadia East orebody).

The net production benefits of the Project are distributed between a range of stakeholders including CHPL and its shareholders in the form of net profits, the NSW government in the form of royalties and the Commonwealth Government in the form of company tax. The State Government also receives additional income by way of payroll tax, while the Commonwealth Government would receive additional revenues in the form of income tax.

The main environmental externality that has been valued is greenhouse gas emissions costs. Adjusting the net production benefits for greenhouse gas emissions costs gives a net benefit of the Project of $709 M NPV. Because other potential incremental environmental impacts of the Project have not been valued, the NPV of $709 M represents a threshold value.

This threshold value is the opportunity cost to society of not proceeding with the Project. Interpreted another way, any other environmental impacts of the Project, after mitigation by CHPL, would need to be valued at greater than $709 M to make the Project questionable from an economic efficiency perspective.

In a regional context, this is equivalent to each household in the Orange, Cabonne and Blayney (OCB) region having a willingness to pay of over $34,000 to avoid any of the residual environmental impacts of the Project, after mitigation by CHPL. The equivalent figure for NSW households is greater than $280.

H2.6 SENSITIVITY ANALYSIS

The Project NPV is based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a BCA can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV. In this analysis, the net production benefit was tested for changes to the following variables:

- opportunity cost of land;
- capital costs;
- operating costs;
- revenues;
- greenhouse gas emissions and cost; and
- residual values.

What this analysis indicated is that the results of the BCA are not particularly sensitive to reasonable changes in assumptions regarding opportunity cost of land, capital costs, greenhouse gas emissions and costs and residual values. While the results are most sensitive to the assumptions regarding operating costs and concentrate revenues, operating costs would need to be greater than 12% higher than predicted for each and every year of Project life to result in a negative NPV. Similarly, the value of gold, copper, silver and molybdenum would need to be more than 10% lower than predicted for each and every year of the Project life for the NPV to be negative.

H3 REGIONAL ECONOMIC IMPACT ASSESSMENT OF THE PROJECT

H3.1 INTRODUCTION

Regional economic impact assessment is primarily concerned with the effect of an impacting agent on an economy in terms of a number of specific indicators, 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 value of business turnover 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).

The construction required for the Project would overlap with Ridgeway Deeps development, and would use existing administration and ore processing facilities where practicable and may also use some of the construction workforce that are already on-site for Ridgeway Deeps. Hence, during construction of the Project, cumulative positive economic effects would occur due to the overlap with the existing Cadia Valley Operations. In this period, the separate effects of the Project would be difficult to quantify.

The total Cadia Valley Operations average employment over the life of the Project would be 880. However, the regional economic impact assessment is focussed on evaluating the average potential incremental economic impacts of the development of the Cadia East orebody over the Project life. Because Project employment would include shared staff with the existing Cadia Valley Operations until Year 9, average employment of the Project from Years 10 to 21 (i.e. 783) was utilised in the assessment. This is considered conservative, as CHPL employment expenditure in the region would be much higher during Project construction.

The economy on which the impact is measured can range from a township to the entire nation (Powell *et al.,* 1985). In selecting the appropriate economy regard needs to be had to capturing the local expenditure and employment associated with the Project but not making the economy so large that the impact of the proposal becomes trivial (Powell and Chalmers, 1995).

For this study, the impacts of the Project have been estimated for the OCB region Statistical Local Areas (SLAs) which are roughly equivalent to the respective Local Government Areas (LGAs).

A range of methods can be used to examine the regional economic impacts of an activity on an economy including economic base theory, Keynesian multipliers, econometric models, mathematical programming models and input-output models (Powell *et al.,* 1985). This study uses input-output analysis.

Input-output analysis essentially involves two steps:

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

Results of recent surveys conducted in the region by Gillespie Economics (2007) to examine *Business and Community Attitudes to Regional Impacts* (Attachment HA) have also been considered in the following assessment.

H3.2 INPUT-OUTPUT TABLE AND ECONOMIC STRUCTURE OF THE REGION

For the study, a 2005 to 2006 input-output table of the regional economy was developed, by Gillespie Economics using the Generation of Regional Input-Output Tables (GRIT) procedure (Attachment HB). A 109 sector input-output table of the regional economy was aggregated to 30 sectors (Figures H3.3, H3.4 and H3.5) and six sectors (Table H3.1 and Figure H3.1) for the purpose of describing the economy.

A highly aggregated 2005 to 2006 input-output table for the regional economy is provided in Table H3.1. The rows of the table indicate 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 H3.1
Aggregated Transactions Table: Regional Economy 2005 to 2006 ($'000)

	Ag, Forestry, Fishing	Mining	Manuf.	Utilities	Building	Services	TOTAL	Household Expenditure	OFD	Exports	Total
Ag, forestry, fishing	22,358	16	33,860	2	103	3,034	**59,373**	5,593	63,193	168,423	**296,581**
Mining	11	27,101	4,137	1,010	342	217	**32,817**	103	8,866	339,383	**381,168**
Manuf.	13,415	8,701	172,494	982	27,880	70,078	**293,549**	68,261	162,334	762,857	**1,287,001**
Utilities	1,471	5,305	12,624	84,817	1,078	17,162	**122,456**	12,890	1,547	47,403	**184,296**
Building	925	1,822	2,308	1,910	51,770	17,687	**76,423**	0	182,084	34,134	**292,640**
Services	24,770	15,287	175,107	4,475	25,051	359,295	**603,985**	644,042	601,682	728,549	**2,578,259**
TOTAL	**62,949**	**58,232**	**400,530**	**93,195**	**106,223**	**467,473**	**1,188,603**	**730,889**	**1,019,706**	**2,080,748**	**5,019,946**
Household Income	72,413	50,335	176,814	12,282	71,965	861,890	**1,245,699**	0	0	0	**1,245,699**
OVA	76,758	193,742	151,084	35,526	27,092	554,499	**1,038,700**	69,846	36,055	3,740	**1,148,341**
Imports	84,461	78,859	558,573	43,294	87,359	694,398	**1,546,944**	465,135	193,717	147,512	**2,353,307**
TOTAL	**296,581**	**381,168**	**1,287,001**	**184,296**	**292,640**	**2,578,259**	**5,019,946**	**1,265,869**	**1,249,478**	**2,232,000**	**9,767,293**
Employment	**2,086**	**845**	**2,527**	**187**	**1,144**	**15,508**	**22,295**				

Note: Totals may have minor discrepancies due to rounding.

Gross regional product (GRP) for the regional economy is estimated at $2,393 M, comprising $1,245 M to households as wages and salaries (including payments to self employed persons and employers) and $1,148 M in OVA.

The employment total was 22,295 people.

The economic structure of the regional economy may be compared with that for NSW through a comparison of results from the input-output model (Figures H3.1 and H3.2). This reveals that the regional agriculture, forestry and fishing sector, mining sector and manufacturing sector (apart from employment) are of greater relative importance than they are to the NSW economy. While the building sector and services sectors are of less relative importance than they are to the NSW economy.

Figure H3.1
Summary of Aggregated Sectors: Regional Economy (2005 to 2006)

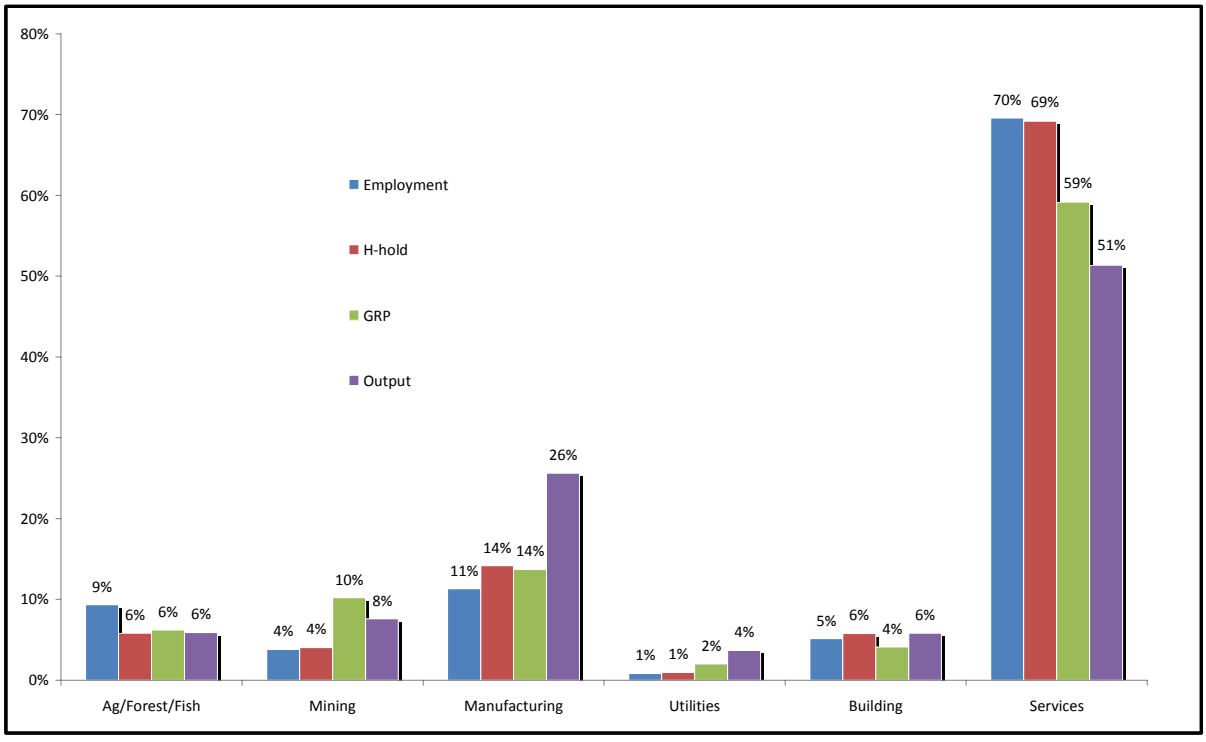
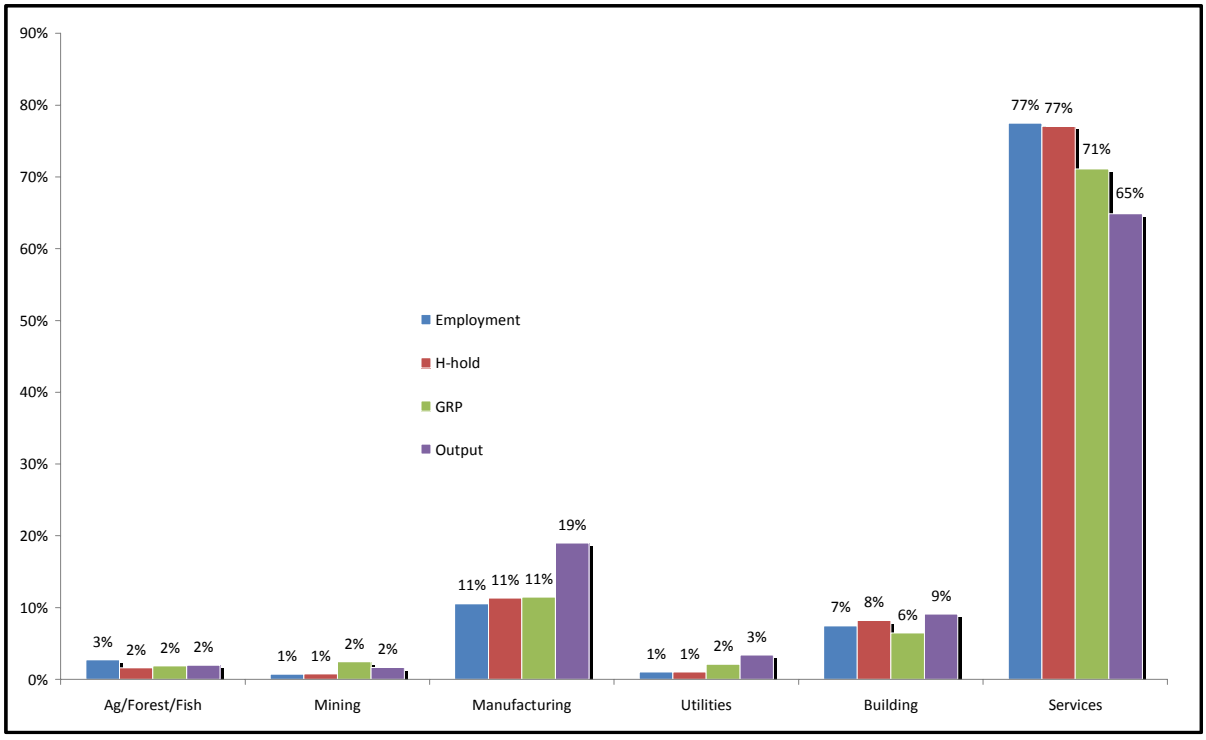


Figure H3.2
Summary of Aggregated Sectors: NSW Economy (2005 to 2006)



Figures H3.3 to H3.5 (results from the input-output model) provide a more expansive sectoral distribution of gross regional output, value-added, household income, employment, imports and exports, and can be used to provide some more detail in the description of the economic structure of the economy.

Important sectors to output are equipment manufacturing, ownership of dwellings, business services, food manufacturing, non-ferrous metal ores mining and retail trade. For value-added, important sectors include ownership of dwellings, non-ferrous metal ores mining, health, business services, retail trade and equipment manufacturing.

With regard to employment the most significant sectors are retail trade sector and health services sector (although the education sector, public administration and accommodation/cafes/restaurants are also important individual sectors). For income the most important sectors are health, businesses services, retail trade and education.

Imports and exports are dominated by non-ferrous metal ores mining, equipment manufacturing and food manufacturing.

Figure H3.3 Sectoral Distribution of Gross Regional Output and Value-Added ($'000)

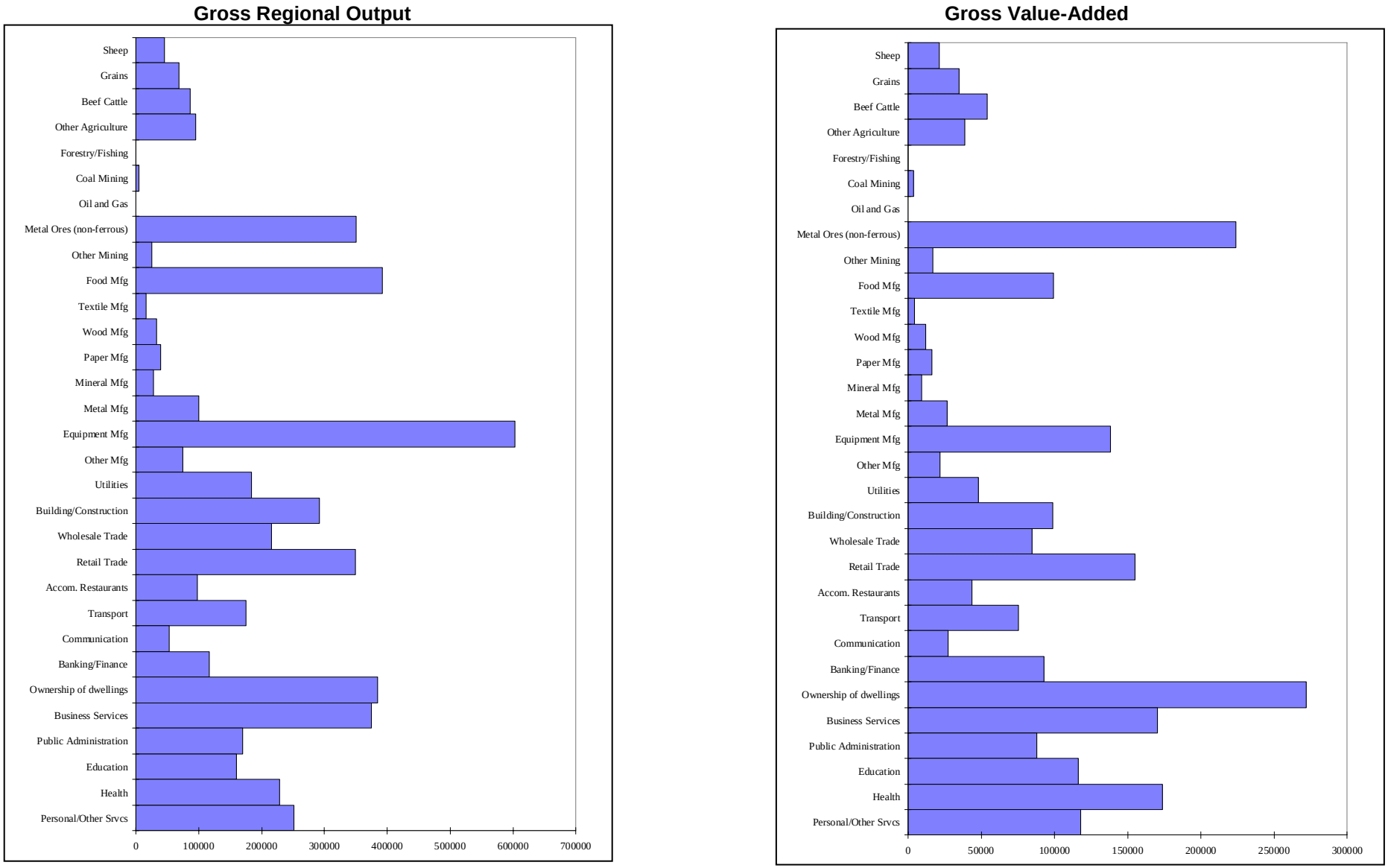


Figure H3.4 Sectoral Distribution of Gross Regional Income ($'000) and Employment (No.)

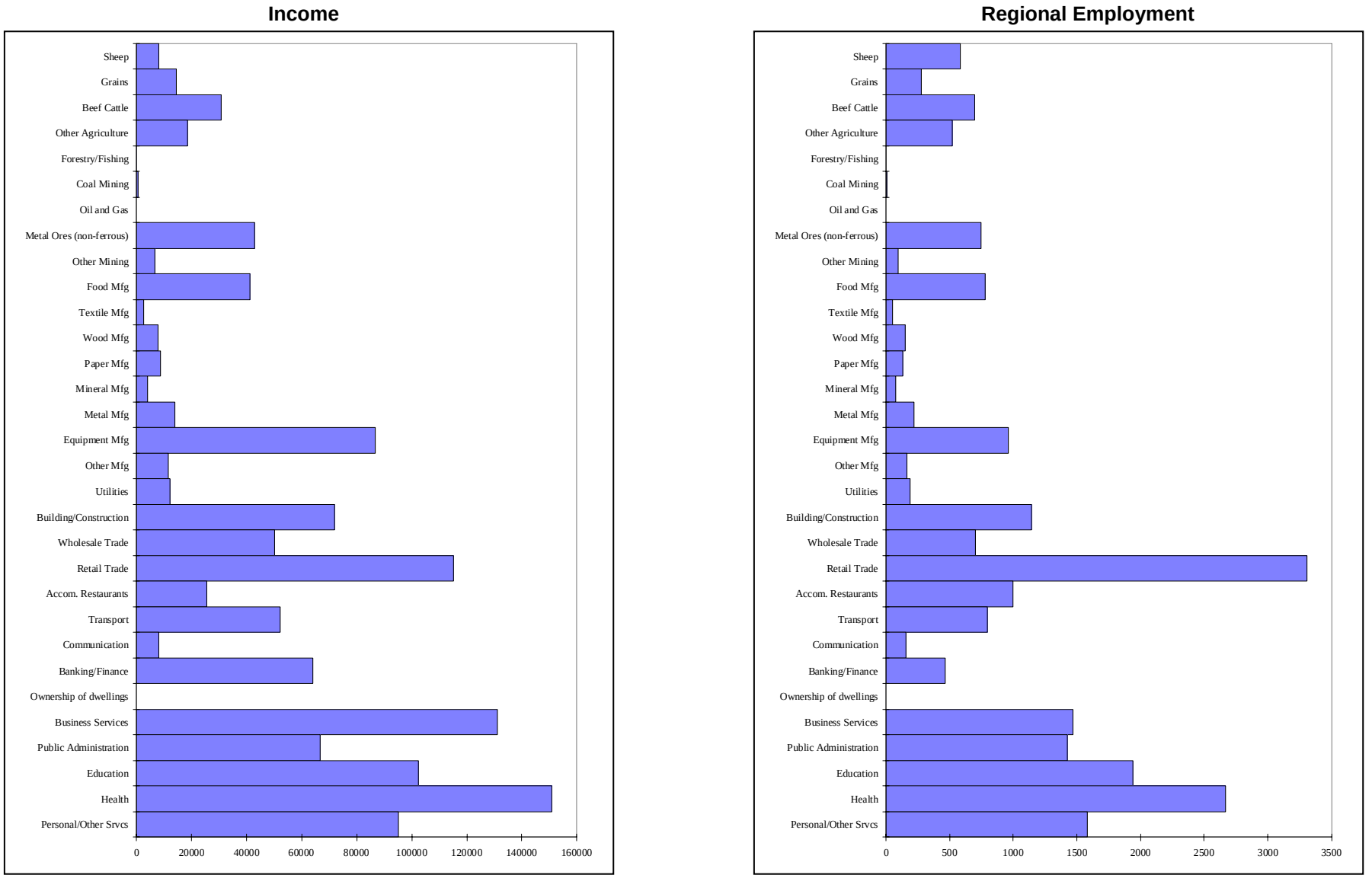
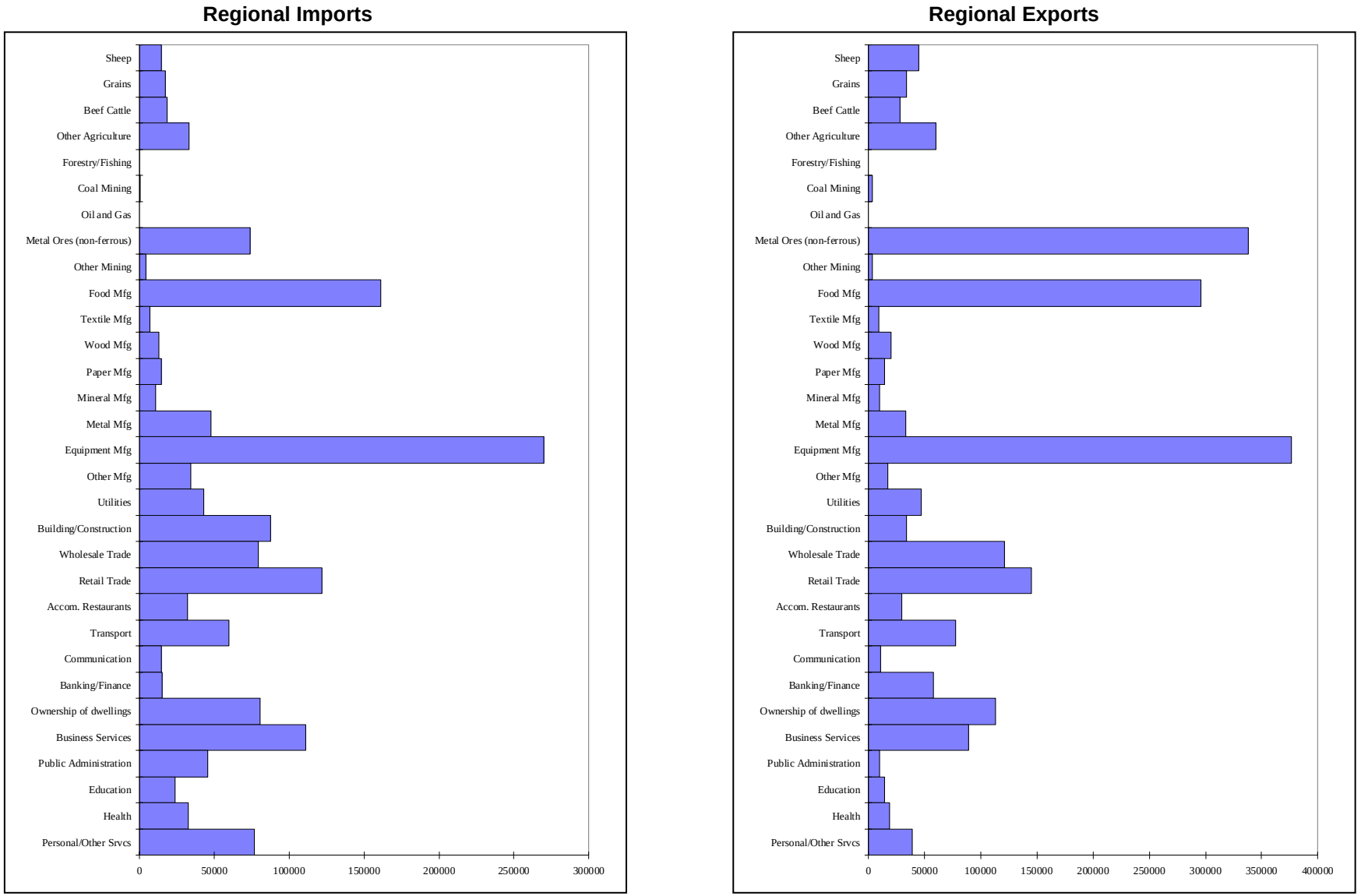


Figure H3.5 Sectoral Distribution of Imports and Exports ($'000)



H3.3 ECONOMIC IMPACT OF THE PROJECT

H3.3.1 Introduction

For the analysis of the operation of the Project, a new Cadia East sector was inserted into the regional input-output table. For this new sector:

- The estimated average annual gross revenue over the life of the Project was estimated from data provided by CHPL and allocated to the *Output* row.
- The difference between average annual revenue and average annual costs was allocated to the *Other value-added* row.
- Average annual direct employment for the Project (years 10 to 21 levels) was allocated to the *Employment* row. The level of employment in years 10 to 21 was used, as in earlier years it is difficult to differentiate between the employment associated with the Project and that associated with existing Cadia Valley Operations.
- Estimated average annual wages was allocated to the *Household income* row.
- Average annual operating costs (less wages) were allocated between imports and total intermediate expenditures in the same proportions as the non-ferrous minerals sector of the regional input-output table.
- Total intermediate expenditure was allocated between 109 sectors in the same proportions as the non-ferrous minerals sector of the regional input-output table.

H3.3.2 Impacts

The total and disaggregated annual impacts of the Project on the OCB region SLAs in terms of output, income, value-added and employment (in 2008 dollars) are shown in Table H3.2.

Table H3.2
Average Annual Regional Economic Impacts of the Project

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	Total Effect
OUTPUT ($'000)	726,362	181,090	117,308	298,398	1,024,760
Type 11A Ratio	*1.00*	*0.25*	*0.16*	*0.41*	*1.41*
VALUE-ADDED ($'000)	400,990	92,671	62,966	155,637	556,627
Type 11A Ratio	*1.00*	*0.23*	*0.16*	*0.39*	*1.39*
INCOME ($'000)	91,611	44,534	29,054	73,588	165,199
Type 11A Ratio	*1.00*	*0.49*	*0.32*	*0.80*	*1.80*
EMPL. (No.)	783[1]	581	525	1,106	1,889
Type 11A Ratio	*1.00*	*0.74*	*0.67*	*1.41*	*2.41*

[1] Employment from Years 10 – 21 of the Project.

Note: Multipliers may have minor discrepancies due to rounding.

In total, the average annual stimulus to the regional economy that would be made by the Project operations is:

- $1,025 M in direct and indirect regional output or business turnover;
- $557 M in direct and indirect regional value-added;
- $165 M in household income; and
- 1,889 direct and indirect jobs.

H3.3.3 Multipliers

The Type 11A ratio multipliers for Project range from 1.39 for value-added up to 2.41 for employment.

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

Capital intensive mining projects also typically have a relatively low ratio multiplier for output and value-added reflecting the relatively high direct output and value-added for the Project compared to that in flow-on sectors.

H3.3.4 Main Sectors and Towns Affected

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

- wholesale trade;
- electricity supply;
- retail trade;
- hotels, cafes and restaurants;
- scientific and technical services;
- other business services;
- law, accounting and marketing;
- banking;
- ownership of dwellings;
- health services;
- personal services; and
- road transport.

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated (Table H3.3).

Table H3.3
Sectoral Distribution of Total Regional Employment Impacts

Sector	Average Direct Effects	Production Induced	Consumption Induced	Total
Primary	0	1	8	9
Mining	783	213	0	996
Manufacturing	0	61	33	95
Utilities	0	24	5	29
Wholesale/Retail	0	67	103	171
Mechanical and other repairs	0	10	18	28
Accommodation, cafes, restaurants	0	11	68	79
Building/Construction	0	24	6	29
Transport	0	21	16	37
Services	0	149	267	417
Total	783	581	525	1,889

Note: Totals may have minor discrepancies due to rounding.

Table H3.3 indicates that direct, production induced and consumption induced employment impacts of the Project on the regional economy are likely to have different distributions across sectors.

The operation of the Project would directly generate an average annual workforce of 783 employees. Production induced employment impacts would mainly occur in the mining sectors and services sectors. Consumption-induced employment flow-ons would mainly occur in the services sectors and wholesale and retail trade sectors.

Consumption-induced impacts are likely to be mainly felt in Orange but also Blayney and Molong. A survey of the workforce at the Cadia Valley Operations in 2006 indicated that 89% of disposable income is spent locally, with 79% of this occurring in Orange, 8% in Blayney and 0.5% in Molong (Gillespie Economics, 2007).

H3.3.5 Business and Community Attitudes to Mining at the Cadia Valley Operations

Businesses in the region would benefit from workforce expenditure as well as direct purchases from CHPL. A survey of business in Orange, Blayney and Molong (Gillespie Economics, 2007) found that 71% considered that their business directly or indirectly benefits from the Cadia Valley Operations (Attachment HA).

When asked the extent to which their business benefits, the majority of respondents (67%) considered that they benefit by up to 5% of business turnover. Some businesses (2%) considered that they benefited by greater than 15% turnover (Attachment HA).

A total of 93% of businesses surveyed considered that the local economy benefits from the Cadia Valley Operations, with 97% of these considering that the benefit to the local economy from the Cadia Valley Operations is medium to high (Attachment HA).

A community attitudes survey (Gillespie Economics, 2007) also examined the extent to which the local economy benefits from the Cadia Valley Operations. A total of 93% of respondents agreed or strongly agreed that the local economy benefits from the Cadia Valley Operations (Attachment HA).

Of those community respondents that agreed, 97% considered that the benefit to the local economy from the Cadia Valley Operations is medium to high (Attachment HA).

All stakeholders interviewed at the time considered that the Cadia Valley Operations has had a positive impact on the local economy. CHPL was considered to have stimulated existing businesses and also resulted in a number of new businesses setting up to service the mine. The expenditure of employees was also seen as stimulating businesses, particularly retail in the main street of Orange. Orange City Council confirmed increased interest in retail development and improvement.

The Cadia Valley Operations was seen as instrumental in the diversification of the regional economy, reducing the reliance on Electrolux (previously Email) which was previously Orange's largest employer, but which has been decreasing in size.

The strong growth in Orange was considered to have also spilled into rural settlements, unlike growth in other areas such as Dubbo which were seen to come at the expense of surrounding rural settlements.

The Cadia Valley Operations was seen by some as indirectly responsible for a new level of up-market restaurants as well as other businesses at a higher socio-economic level.

As one respondent to the Gillespie Economics (2007) Surveys identified "The mine is the best thing that has ever happened to Orange and surrounds".

The following press release from the Chamber of Commerce summarises some of the broad economic benefits that have arisen from the Cadia Valley Operations (Box H1).

Box H1 – Orange Chamber of Commerce Press Release

Ellie Brown, Chamber of Commerce – **Diversity pays off**
By KELLY FITZGERALD
Sunday, 1 October 2006

GREATER diversity in business and the Cadia mine are two reasons why the Orange economy is the strongest it has been in decades, according to local business experts.

Charles Sturt University Western Research Institute CEO Tom Murphy said the economy was significantly stronger than in the early 1990s, when Orange was heavily dependant on Email (now Electrolux) as a major employer.

This was because of mining at Cadia Valley and the expanding education and medical sectors (including the planned new Orange Base Hospital), and increasing business services.

"With Cadia they now have a leg in the strongest industry sector in the Australian economy and the forecast is that they will be there for another 20 years," Mr Murphy said.

"Greater diversity means people investing in Orange are more confident there are not going to be bad patches so they can be more confident investing in Orange."

NSW Real Estate Institute Central West Division chair Chris Gryllis believes the local economy is the strongest it has been in the past 40 years.

He said the mine had the biggest impact on the economy by providing more work for associated trades such as engineering and electricians, and also providing hundreds of jobs and high disposable incomes for employees.
Mr Gryllis said there had been strong residential development for some time and there were hardly any vacant commercial premises in the city, combined with a growing demand for good quality office space.

"These are the golden days of Orange," he said.

Orange Chamber of Commerce president Ellie Brown believes the key to Orange's economic success is the fact the city is not putting all its eggs in one basket.

"If you look at its growth over time, Orange has been a city where it relied on one major employer, but now there is a broad spectrum of big employers so if one industry falls away or closes down it doesn't mean the end of the city," she said.

Mrs Brown and local chamber members will meet State Government ministers on October 15 to talk about what Orange needs to continue its economic growth.

"Orange will only get stronger, but we need to work on our infrastructure to make sure Orange is a great place to do business," she said.

"That means lobbying the government for communication infrastructure like broadband access and better transport and roads."

These types of positive regional economic impacts and business impacts associated with the existing Cadia Valley Operations would continue with the development of the Project.

H3.3.6 Cessation of the Project

The Project would ensure that at least part of the stimulus to the regional economy currently provided by the Cadia Valley Operations would continue well into the future. Conversely, cessation of the Project in 2030 would potentially result in a contraction in regional economic activity.

The magnitude of the regional economic impacts of cessation of the Project would depend on a number of interrelated factors 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 cessation of the Project would depend on whether the workers and their families affected would leave the region. If it is assumed that some of the workers remain in the region, for example those originally sourced from the region, then the impacts of cessation of the Project would not be as severe compared to a greater proportion of the workforce leaving the region. 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 cessation of the Project would approximate the direct effect plus production induced effect identified in Table H3.2. However, if additional displaced workers and their families leave the region, then impacts would be greater and would begin to approximate the total effects in Table H3.2.

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

Should 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 a region's capacity to expand its factors of production by attracting investment and labour from outside the region (Bureau of Industry Economics, 1994). This can depend on a region's natural endowments. The OCB region has a history of mining and it is therefore possible that over time new mining developments would occur, offering potential to strengthen and broaden the economic base of the region and hence buffer against impacts of the cessation of individual activities.

The regional economic impetus of the Project, following on from the stimulus from existing Cadia Valley Operations, may also stimulate a 'virtuous cycle' of growth. This theory of regional economic growth suggests that places that are able to attract population immigration (e.g. associated with mining and manufacturing proposals) create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Local authorities should endeavour to capitalise on the prosperity of the region during mining activity at the Cadia Valley Operations to strengthen and broaden the region's economic base.

This may be achieved through regional development analysis and planning to assess the region's competitive advantages and facilitate the targeting and attraction of complementary and other business activities and ventures for the region.

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

Nevertheless, because of the long time frame of the Project, it is not possible to foresee the likely circumstances within which cessation of the mining activity would occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Project would bring to and retain in the region.

H4 COMMUNITY INFRASTRUCTURE ASSESSMENT

H4.1 INTRODUCTION

Changes in the workforce and populations of regions and towns may have implications in relation to access to community infrastructure and human services, which includes for example housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of the population to these services.

The objective of the Community Infrastructure Assessment (CIA) is to examine the potential impacts of the Project on the existing community infrastructure in the region as a result of employment and population change associated with the Project.

The methodology for carrying out the CIA was to:

- analyse the existing socio-economic environment of the region;
- analyse the likely magnitude of the Project workforce and associated population including estimated flow-on employment and population effects;
- consider the impacts of estimated employment and population change on community infrastructure based on Australian Bureau of Statistics (ABS) data, research and consultation; and
- recommend impact mitigation or management measures for any substantive impacts that are identified.

The results of a recent survey, conducted by Gillespie Economics (2007), to examine *Attitudes to Community Infrastructure* (Attachment HC) have also been included in the following assessment.

The geographic scope of the CIA was the OCB region SLAs which tend to provide the residential location for the majority (93%) of the existing workforce (Gillespie Economics, 2007).

The assessment draws on a range of consultation with various agencies and bodies, press releases and reports as well as data provided by CHPL, the ABS Censuses, and information from Section H3 on the regional economic impacts of the Project.

H4.2 ORANGE, CABONNE AND BLAYNEY REGION

This section gives a profile of the OCB region to provide a context within which the development can be seen and the community infrastructure impacts of the Project can be assessed.

H4.3 POPULATION

The OCB regional population had been growing over time, albeit at a rate less than that for NSW as a whole. However, in the last intercensal period, population remained static, while the NSW population increased by 3.4% (Table H4.1). A decline in population occurred in the Orange SLA with population of Cabonne and Blayney growing in the last intercensal period (Table H4.1).

Table H4.1
Total Population Growth for OCB Region SLAs

SLA	1996	2001	2006	Growth 96-01	Growth 01-06
Orange	33,964	35,521	34,969	4.6%	-1.6%
Cabonne	11,944	11,888	12,215	-0.5%	2.8%
Blayney	6,025	6,141	6,364	1.9%	3.6%
Total	51,933	53,550	53,548	3.1%	0.0%
NSW	6,038,696	6,371,745	6,585,732	5.5%	3.4%

Source: ABS (1996, 2001, 2006).

Population levels in the 0 to 44 age group declined while population levels in age categories above 44 grew (Table H4.2).

Table H4.2
OCB Region Population Growth by Age Bracket

Population Age	Orange-Cabonne-Blayney				
	1996	2001	2006	Growth 96-01	Growth 01-06
0-4 years	4,007	3,982	3,741	-0.6%	-6.1%
5-11 years	5,955	5,962	5,730	0.1%	-3.9%
12-17 years	5,165	5,172	5,125	0.1%	-0.9%
18-19 years	1,354	1,448	1,339	6.9%	-7.5%
20-24 years	3,268	2,976	2,926	-8.9%	-1.7%
25-34 years	6,873	6,879	6,131	0.1%	-10.9%
35-44 years	7,646	7,651	7,387	0.1%	-3.5%
45-54 years	6,410	7,111	7,224	10.9%	1.6%
55-64 years	4,656	5,166	6,039	11.0%	16.9%
65-74 years	3,760	3,860	4,171	2.7%	8.1%
75-84 years	2,086	2,374	2,717	13.8%	14.4%
85 years and over	655	845	943	29.0%	11.6%
Overseas	98	124	76	26.5%	-38.7%
Total	**51,933**	**53,550**	**53,549**	**3.1%**	**0.0%**

Source: ABS (1996, 2001, 2006).

The number of children in the OCB region in the 0 to 4 age group, 5 to 11 age group and 12 to 18 age group, declined. This was particularly pronounced in the Orange SLA (Tables H4.3 and H4.4).

Table H4.3
Children in SLAs of the OCB Region

Children Age	Orange			Cabonne			Blayney		
	1996	2001	2006	1996	2001	2006	1996	2001	2006
0 to 4	2,682	2,720	2,482	857	799	800	468	463	459
5 to 11	3,818	3,886	3,666	1,451	1,341	1,336	686	735	728
12 to 18	3,981	4,023	3,879	1,332	1,268	1,270	596	653	676
Total	**10,481**	**10,629**	**10,027**	**3,640**	**3,408**	**3,406**	**1,750**	**1,851**	**1,863**

Source: ABS (1996, 2001, 2006).

Table H4.4
Children in the OCB Region

Children Age	1996	2001	2006	Growth 96-01	Growth 01-06
0 to 4	4,007	3,982	3,741	-0.6%	-6.1%
5 to 11	5,955	5,962	5,730	0.1%	-3.9%
12 to 18	5,909	5,944	5,825	0.6%	-2.0%
Total	**15,871**	**15,888**	**15,296**	**0.1%**	**-3.7%**

Source: ABS (1996, 2001, 2006).

H4.3.1 Housing

In 2006 there was around 19,804 occupied dwellings in the region, 3.2% more than in 2001 (Table H4.5). OCB region SLAs all experienced growth in the number of occupied dwellings that was greater than the level of population growth, reflecting the shift in demographics, namely a growth in the adult population.

Table H4.5
Comparison of Occupied Housing Type in OCB Region

Occupied Housing Type	1996	2001	2006	Growth 96-01	Growth 01-06
Separate Houses	16,121	16,978	17,890	5.3%	5.4%
Semi Detached	808	898	490	11.1%	-45.4%
Flat, Unit apartment	893	985	1,202	10.3%	22.0%
Other Dwelling	293	222	212	-24.2%	-4.5%
Not stated	146	107	10	-26.7%	-90.7%
Total	**18,261**	**19,190**	**19,804**	**5.1%**	**3.2%**

Source: ABS (1996, 2001, 2006).

Most occupied dwellings are separate houses and the number of these (as well as flat/units/apartments) has been growing over time (Table H4.6). The number of occupied semi-detached and other dwellings has been declining.

Table H4.6
Total Occupied Dwellings in OCB Region

SLA	1996	2001	2006	Growth 96-01	Growth 01-06
Orange	11,876	12,654	12,886	6.6%	1.8%
Cabonne	2,180	2,209	2,402	1.3%	8.7%
Blayney	4,205	4,327	4,516	2.9%	4.4%
Total	**18,261**	**19,190**	**19,804**	**5.1%**	**3.2%**

Source: ABS (1996, 2001, 2006).

The level of total unoccupied private dwellings in the OCB region was 2,551 in 2006 (Table H4.7).

Table H4.7
Dwelling Count 2006

	Orange	Blayney	Cabonne	OCB Region
Occupied private dwelling	13,449	2,447	4,650	20,546
Unoccupied private dwelling	1,430	411	710	2,551
Non-private dwelling	56	9	16	81
Total	**14,935**	**2,867**	**5,376**	**23,178**

Source: ABS (1996, 2001, 2006).

The number of houses being purchased continued to increase substantially while houses being rented and fully owned declined in the last intercensal period (Table H4.8).

Table H4.8
Comparison of Home Ownership in OCB Region

	1996	2001	2006	Growth 96-01	Growth 01-06
Renting	5,343	5,573	5,492	4.3%	-1.5%
Being purchased	4,397	4,964	6,378	12.9%	28.5%
Fully owned	8,129	8,356	7,465	2.8%	-10.7%
Other	189	205	147	8.5%	-28.3%
Not stated	566	644	1,064	13.8%	65.2%
Total	**18,624**	**19,742**	**20,546**	**6.0%**	**4.1%**

Source: ABS (1996, 2001, 2006).

H4.3.2 Household Type

The number of couples with children has been declining, while all other household types have increased (Table H4.9).

Table H4.9
Comparison of Household Type in OCB Region

	1996	2001	2006	Growth 96-01	Growth 01-06
Couple with no children	4,565	4,980	5,419	9.1%	8.8%
Couple with children	6,802	6,607	6,306	-2.9%	-4.6%
One parent family	2,009	2,148	2,224	6.9%	3.5%
Other family	195	200	208	2.6%	4.0%
Lone household	4,137	4,765	5,116	15.2%	7.4%
Group household	539	511	527	-5.2%	3.1%
Other household	369	546	743	48.0%	36.1%
Total	**18,616**	**19,757**	**20,543**	**6.1%**	**4.0%**

Source: ABS (1996, 2001, 2006).

H4.3.3 Education

The percentage of the population with all types of higher education continued to grow (Table H4.10), with engineering, management and commerce and health being the most significant areas of study (Table H4.11).

Table H4.10
Increase in Higher Education of the OCB Region Workforce

	1996	2001	2006	Growth 96-01	Growth 01-06
Post graduate degree	303	445	648	46.9%	45.6%
Graduate diploma and graduate certificate	489	438	448	-10.4%	2.3%
Bachelor degree	1,853	2,828	3,431	52.6%	21.3%
Advanced diploma and diploma	2,582	2,229	2,700	-13.7%	21.1%
Certificate	5,358	7,116	8,165	32.8%	14.7%
Inadequately described	410	595	707	45.1%	18.8%
Not stated	4,281	3,764	4,406	-12.1%	17.1%
Total	**15,276**	**17,415**	**20,505**	**14.0%**	**17.7%**

Source: ABS (1996, 2001, 2006).

Table H4.11
Field of Study

	1996	2001	2006	Growth 96-01	Growth 01-06
Natural and physical sciences	319	364	439	14.1%	20.6%
Information technology	129	233	279	80.6%	19.7%
Engineering and related technologies	2,564	2,996	3,073	16.8%	2.6%
Architecture and building	1,025	1,119	1,171	9.2%	4.6%
Agriculture, environmental and related studies	989	1,055	1,139	6.7%	8.0%
Health	1,863	2,052	2,385	10.1%	16.2%
Education	1,370	1,469	1,712	7.2%	16.5%
Management and commerce	2,289	2,474	3,129	8.1%	26.5%
Society and culture	716	1,013	1,441	41.5%	42.3%
Creative arts	216	321	424	48.6%	32.1%
Food, hospitality and personal services	626	825	1,034	31.8%	25.3%
Mixed field programmes	0	12	21	NA	75.0%
Field of study inadequately described	107	122	177	14.0%	45.1%
Field of study not stated	3,074	3,350	4,082	9.0%	21.9%
Total	**15,287**	**17,405**	**20,506**	**13.9%**	**17.8%**

Source: ABS (1996, 2001, 2006).

There is a range of private and public primary schools available in Orange and surrounding settlements. Generally at public primary school level there is considered to be overall excess capacity, although a couple of individual schools may be considered at or close to capacity such as Bletchington Public and Canobolas Public (Bruce Inward, Acting School Education Director, Western NSW Region, pers. comms., 21 September 2008). Bletchington Public, in particular, has been identified from the workforce survey (Gillespie Economics, 2007) as being one of the main public primary schools in Orange that the children of the Cadia Valley Operations workforce attend.

There are four main public high schools in the region, Orange High School, Canobolas High School, Molong Central School and Blayney High School. There is spare capacity at Canobolas High School, Molong Central School and Blayney High School. However, Orange High School is at or near capacity (Bruce Inward, Acting School Education Director, Western NSW Region, pers. comms., 21 September 2008). Orange High School is identified in the employee survey as one of the main high schools attended by the children of the Cadia Valley Operations workforce (Gillespie Economics, 2007). This school was upgraded in 1992/93 to convert demountables to permanent buildings and has a capacity of 1,100 students. While capacity at Orange High School could be expanded further by use of demountable buildings, this would be at the expense of open space. The NSW Department of Education is operating a network with the other high schools in the region which includes video conferencing, use of other technology and super Wednesday where some students attend a different school. This has enabled 11 new Higher School Certificate subjects to be added to the curriculum and for all high schools to enjoy the curriculum benefits that normally accrue only to the larger and more populated high schools.

The NSW Department of Education has available land to build another school if demand warrants it. However, both Canobolas and Orange High School would both need to be at capacity for it to be considered. This is currently not the case and preliminary forecasts in 2007 suggested a decline in the future school aged population.

There are also a number of non-government schools in the region. In 2006 non-government schools accounted for 30% of all infants/primary school enrolments and 44% of all secondary school enrolments. The non-government school sector has expanded recently with the opening of the Orange Anglican Grammar School in the first school term of 2007. The School currently caters for students from Transition (4 year olds) to Year 6. The first intake of Year 7 students will take place in 2010, with progression to Year 12 by 2015. Approximately 35% of the children of the Cadia Valley Operations workforce are estimated to attend non-government schools (Gillespie Economics, 2007).

Reflecting the declining OCB regional population in the younger age groups, attendance at most education establishments has declined in the last intercensal period (Table H4.12). The exception is preschool where attendances increased while the population of this age group declined (Table H4.12).

Table H4.12
Attendance at Educational Establishments

	1996	2001	2006	Change 96-01	Change 01-06
Pre-school	782	822	1,012	40	190
Infants/Primary:					
• Government	4,148	3,999	3,667	-149	-332
• Catholic	1,299	1,279	1,168	-20	-111
• Other Non-Government	341	412	399	71	-13
Total	**5,788**	**5,690**	**5,234**	**-98**	**-456**
Secondary:					
• Government	2,651	2,606	2,284	-45	-322
• Catholic	878	900	876	22	-24
• Other Non-Government	713	820	940	107	120
Total	**4,242**	**4,326**	**4,100**	**84**	**-226**
Technical or Further Educational Institution:					
Full-time student:					
• Aged 15-24 years	273	375	221	102	-154
• Aged 25 years and over	105	140	99	35	-41
Part-time student:					
• Aged 15-24 years	426	525	419	99	-106
• Aged 25 years and over	728	921	590	193	-331
Full/Part-time student status not stated	12	3	15	-9	12
Total	**1,544**	**1,964**	**1,344**	**420**	**-620**
University or Other Tertiary Institution:					
Full-time student:					
• Aged 15-24 years	327	440	353	113	-87
• Aged 25 years and over	89	99	141	10	42
Part-time student:					
• Aged 15-24 years	63	76	80	13	4
• Aged 25 years and over	424	432	406	8	-26
Full/Part-time student status not stated	6	3	4	-3	1
Total	**909**	**1,050**	**984**	**141**	**-66**
Other Type of Educational Institution:					
• Full-time student	45	29	48	-16	19
• Part-time student	94	161	138	67	-23
• Full/Part-time student status not stated	5	0	0	-5	0
Total	144	190	186	46	-4
Type of educational institution not stated	2,210	1,824	3,617	-386	1,793
Overseas visitors	98	124	77	26	-47
TOTAL	**15,717**	**15,990**	**16,554**	**273**	**564**

Source: ABS (1996, 2001, 2006).

H4.3.4 Employment

Despite the total population in the intercensal period being static (Table H4.1), the population of working age (15 years and over) has grown, as has employment. This growth in employment has been greater than the growth in the total labour force participation, resulting in a declining unemployment rate over time (Table H4.13).

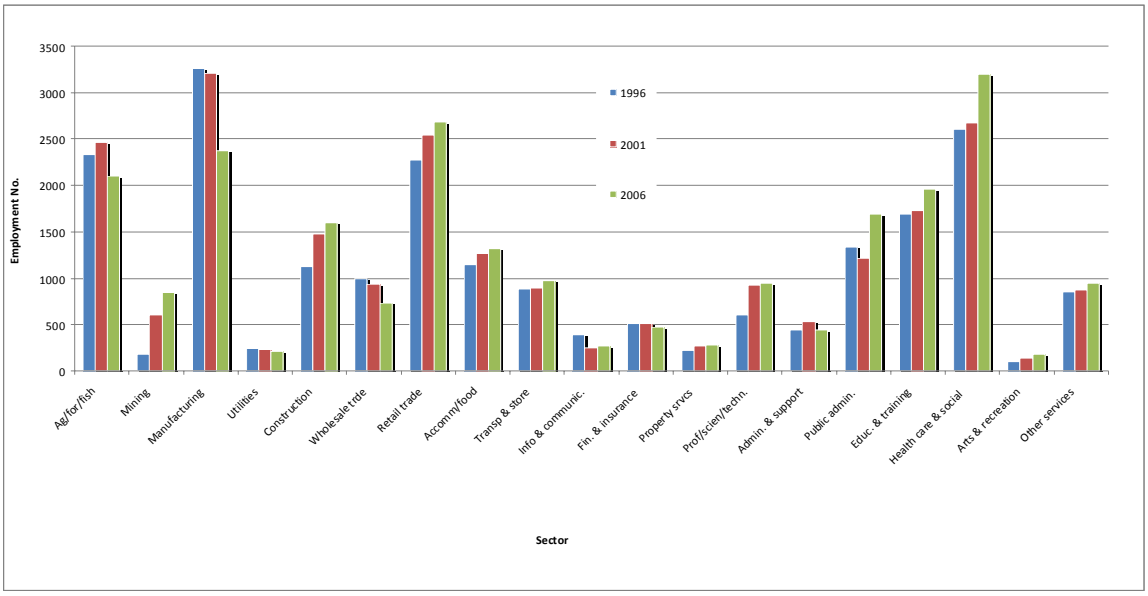
Health and social assistance is the principle industry sector in the OCB region in terms of employment, followed by retail trade, manufacturing, agriculture and education and training.

Sectors that experienced employment growth from 1996 to 2006 include mining, construction, retail trade, accommodation/food, property services, professional/scientific/ technical, education and training and health and social assistance.

The transport and storage sector, information and communication sector and public administration sector experienced growth in the last intercensal period after declines in the previous intercensal period.

The agriculture/forest/fishing sector, manufacturing sector, utilities sector, wholesale trade sector, finance and insurance sector and administration and support sector experienced a decline in employment in the last intercensal period (Figure H4.1).

Figure H4.1 – OCB Region Employment by Industry



Managers and professionals are the main occupation groups (each 16% of the workforce) followed by technicians and trade workers (14% of the workforce), labourers (14%) and clerical/admin workers (13%) (Table H4.14). The highest percentage growth was in community and personal service workers (21%) followed by professionals (11.6%) (Table H4.15).

Table H4.13
Employment Status by SLA

Employment Status	Orange			Cabonne			Blayney			OCB Region		
	1996	2001	2006	1996	2001	2006	1996	2001	2006	1996	2001	2006
Persons aged 15 years and over	25,658	27,181	27,121	8,968	9,116	9,469	4,592	4,609	4,872	39,218	40,906	41,462
Labour force status(a)												
Employed, worked full-time(b)	9,676	10,278	9,880	3,375	3,504	3,733	1,948	1,732	1,802	14,999	15,514	15,415
Employed, worked part-time	3,882	4,164	4,532	1,161	1,391	1,515	548	633	770	5,591	6,188	6,817
Employed, away from work(c)	774	990	952	320	365	366	141	181	181	1,235	1,536	1,499
Employed	*14,332*	*15,432*	*15,364*	*4,856*	*5,260*	*5,614*	*2,637*	*2,546*	*2,753*	*21,825*	*23,238*	*23,731*
Unemployed, looking for work	1,281	1,214	957	376	250	212	223	214	197	1,880	1,678	1,366
Total labour force	*15,613*	*16,646*	*16,321*	*5,232*	*5,510*	*5,826*	*2,860*	*2,760*	*2,950*	*23,705*	*24,916*	*25,097*
Not in the labour force	9,540	9,679	9,359	3,613	3,386	3,286	1,671	1,708	1,777	14,824	14,773	14,422
% Unemployment(d)	8.2	7.3	5.9	7.2	4.5	3.6	7.8	7.8	6.7	7.9	6.7	5.4
% Labour force participation(e)	60.9	61.2	60.2	58.3	60.4	61.5	62.3	59.9	60.6	60.4	60.9	60.5
% Employment to population(f)	55.9	56.8	56.7	54.2	57.7	59.3	57.4	55.2	56.5	55.7	56.8	57.2

Source: ABS (1996, 2001, 2006).

Table H4.14
Occupation Employment by LGA

Occupation Group	Orange			Cabonne			Blayney		
	1996	2001	2006	1996	2001	2006	1996	2001	2006
Managers	1,610	1,724	1,817	1,379	1,416	1,400	529	549	546
Professionals	2,282	2,550	2,729	636	669	817	272	274	352
Technicians and trades workers	2,124	2,226	2,328	592	696	729	381	354	381
Community and personal service workers	1,037	1,176	1,412	271	338	401	153	179	235
Clerical and administrative workers	2,207	2,189	2,167	520	561	668	264	262	291
Sales workers	1,528	1,700	1,628	259	303	370	134	155	194
Machinery operators and drivers	1,107	1,301	1,112	328	351	388	285	275	315
Labourers	2,075	2,282	1,947	693	814	748	554	450	392
Inadequately described or not stated	362	284	225	178	112	89	65	48	43
Total	**14,332**	**15,432**	**15,365**	**4,856**	**5,260**	**5,610**	**2,637**	**2,546**	**2,749**

Source: ABS (1996, 2001, 2006).

Table H4.15
Occupation Employment for the OCB Region

Occupation Group	1996	2001	2006	Growth 96-01	Growth 01-06
Managers	3,518	3,689	3,763	4.9%	2.0%
Professionals	3,190	3,493	3,898	9.5%	11.6%
Technicians and trades workers	3,097	3,276	3,438	5.8%	4.9%
Community and personal service workers	1,461	1,693	2,048	15.9%	21.0%
Clerical and administrative workers	2,991	3,012	3,126	0.7%	3.8%
Sales workers	1,921	2,158	2,192	12.3%	1.6%
Machinery operators and drivers	1,720	1,927	1,815	12.0%	-5.8%
Labourers	3,322	3,546	3,087	6.7%	-12.9%
Inadequately described or not stated	605	444	357	-26.6%	-19.6%
Total	**21,825**	**23,238**	**23,724**	**6.5%**	**2.1%**

Source: ABS (1996, 2001, 2006).

H4.3.5 Income

The number of gross family weekly incomes in the higher income brackets has increased significantly in the last two intercensal periods in the region (Table H4.16).

Table H4.16
OCB Region Income Distribution – Gross Household Weekly Family Income

Weekly Family Income	1996	2001	2006	Growth 96-01	Growth 01-06
Negative/nil income	87	51	102	-41.4%	100.0%
$1 - $149	138	48	170	-65.2%	254.2%
$150 - $349	1745	1089	588	-37.6%	-46.0%
$350 - $499	2133	1780	1130	-16.5%	-36.5%
$500 - $649	1422	928	1449	-34.7%	56.1%
$650 - $799	1557	1453	727	-6.7%	-50.0%
$800 - $999	1659	1531	1049	-7.7%	-31.5%
$1,000 - $1,399	1765	2362	2808	33.8%	18.9%
$1,400 - $1,999	940	1922	2153	104.5%	12.0%
$2,000 - $2,499	195	702	1011	260.0%	44.0%
$2,500 or more	94	321	1216	241.5%	278.8%
Not stated	1753	1666	1718	-5.0%	3.1%
Total	**13488**	**13853**	**14121**	**2.7%**	**1.9%**

Source: ABS (1996, 2001, 2006).

H4.3.6 Health Facilities and Services

The OCB region is serviced by a range of health facilities and services. Hospitals in the OCB region serviced by the Greater Western Area Health Service (GWAHS), include:

- Blayney Hospital and Health Service;
- Bloomfield Hospital;
- Orange Base Hospital;
- Canowindra Health Service;
- Cudal Health Service; and
- Molong Health Service.

A range of mental and other health services are also provided in the region.

Recent developments in the region include a cardiac catheter laboratory at Orange Base Hospital.

In addition, the Orange Base Hospital Redevelopment and the Orange Private Hospital Precinct were approved by the NSW Department of Planning in October 2008 and November 2008, respectively.

The OCB region is well serviced by health facilities and associated services, with 14.4% of employment in the region being in these sectors compared to 10.7% for NSW (Table H4.17). For all sub-sectors of health employment, the OCB region has a higher percentage of employment than for NSW.

Table H4.17
Employment in Health Facilities and Services

Health Care and Social Assistance	OCB Region	%	NSW	%
Health care and social assistance, nfd	130	0.6%	9,400	0.3%
Hospitals	1,323	5.9%	94,187	3.4%
Medical and other health care services	771	3.5%	85,108	3.1%
Residential care services	450	2.0%	44,648	1.6%
Social assistance services	547	2.4%	59,618	2.2%
Total	***3,221***	***14.4%***	***292,961***	***10.7%***
Total Employment	**22,342**		**2,748,394**	

Source: ABS (2006).
nfd = not further defined.

H4.3.7 Community and Recreational Services

While the OCB region is serviced by a range of community and recreation services, the proportion of employment in arts and recreation services is lower than for NSW as a whole (Table H4.18). Personal and other services (e.g. hairdressing salons, business and professional associations, police services) in the OCB region have employment proportions the same as for NSW (Table H4.18).

Table H4.18
Employment in Community and Recreation Services and Personal and Other Services

Arts and Recreation Services	OCB Region	%	NSW	%
Arts and recreation services, nfd	3	0.0%	1,740	0.1%
Heritage activities	6	0.0%	4,424	0.2%
Creative and performing arts activities	17	0.1%	8,122	0.3%
Sports and recreation activities	126	0.6%	18,873	0.7%
Gambling activities	12	0.1%	4,799	0.2%
Total	***164***	***0.7%***	***37,958***	***1.4%***
Personal and other services	**443**	**2.0%**	**54,759**	**2.0%**

Source: ABS (2006).
nfd = not further defined.

H4.4 CADIA EAST WORKFORCE AND POPULATION CHANGE

The main drivers for impacts on community infrastructure are changes in employment and population and the spatial distribution of these changes in employment and population.

Employment that is directly generated by the Project may be sourced from:

- the local region either from:
  - the unemployment pool; or
  - workers from other industries; and
- in-migration or commuters.

Sourcing labour from the local region has minimal direct impact on local community infrastructure and services since it results in no changes to the regional population and hence demand. It may, however, have an indirect impact on some local community infrastructure and services where changes in employment status or income results in changes in demand for some particular services (e.g. health services).

Whether local labour is sourced from the unemployment pool or from other industries, it can reduce unemployment levels - directly in the case of employing unemployed people and indirectly via the filter effect[2], where labour is sourced from other industries.

The impact of commuter workers would depend on the extent to which they integrate into regional communities.

In-migration resulting in population change is likely to have the greatest potential impact on demand for community services and infrastructure with this impact dependent on the new residential location of the migrating workforce and their families.

As well as direct employment and population changes, the Project may also generate indirect labour demand through expenditure by employees in the local region and expenditure by CHPL in the local region on other inputs to production. This induced demand for labour may also have consequences for population change and demand for community infrastructure and services.

To facilitate consideration of potential community infrastructure impacts this section explores the likely direct and indirect employment and population effects of the Project, drawing on the experience of the Cadia Valley Operations.

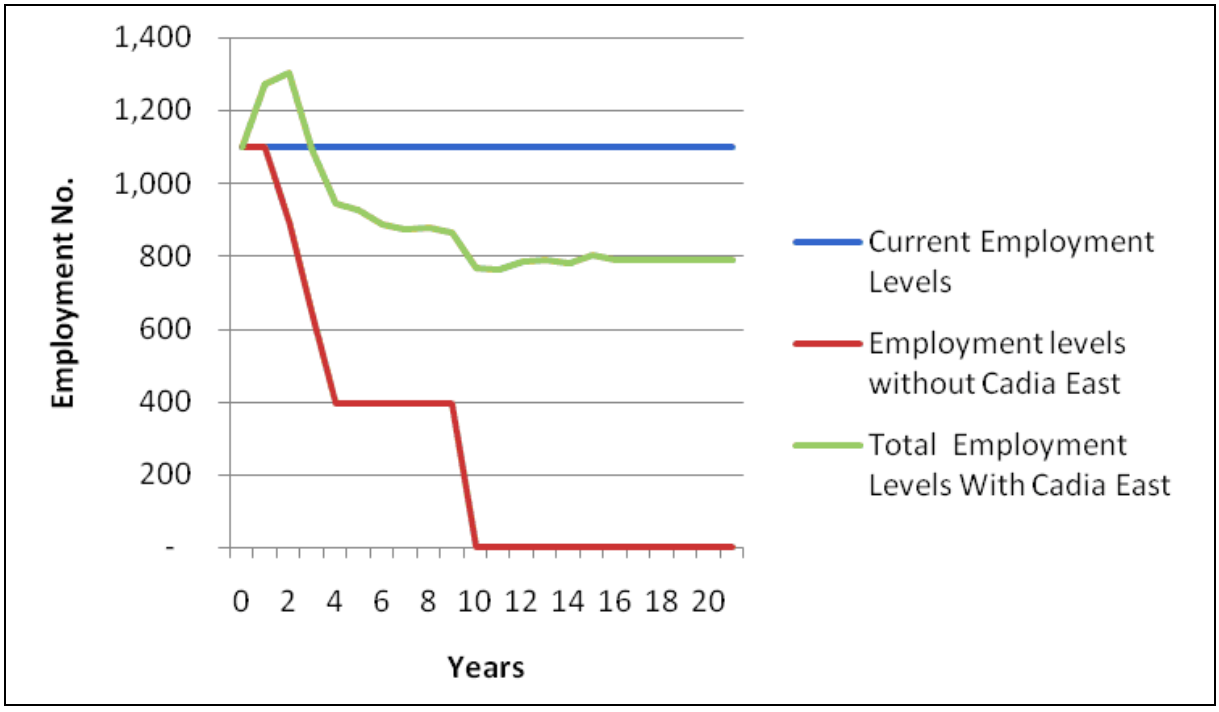
H4.4.1 Direct Workforce and Population Change

Cadia East would operate for approximately 21 years and would require a workforce of approximately 783 people, between years 10 to years 21. However, in the earlier years of operation, the Project would be part of an integrated operation with Cadia Hill open pit, Ridgeway underground mine and Ridgeway Deeps. During these years it is difficult to separate out the employment specifically related to Cadia East as administration and ore processing employment would service all mines. Nevertheless, from a CIA perspective, what is important is the additional employment and population that would occur over and above the estimated existing direct employment level of Cadia Valley Operations of approximately 1,100 people (including on-site contractors and CHPL employees). While the long-term average workforce of the Cadia Valley Operations over recent years has been around 950 people, this has recently increased due to the construction workforce associated with the development of Ridgeway Deeps. This is similar to the level of employment that has been observed during prior construction peaks associated with the initial development of Cadia Hill and Ridgeway.

Compared to current direct employment levels, the greatest impact of the integrated mining operation would occur in Year 2 when cumulative direct employment is estimated to reach 1,304. This is approximately 204 above current levels (Figure H4.2).

[2] The filter effect refers to the situation where labour is sourced from other industries in the region making jobs available in those industries which are subsequently filled by people either from the unemployment pool or other industries with the latter making jobs available in that industry, etc.

Figure H4.2 – Total Cadia Valley Operations Workforce over Time Relative to Current Workforce



A survey of the Cadia Valley Operations workforce in 2006 (Gillespie Economics, 2007) indicated that 56% migrated into the OCB region. However, it is considered likely that a higher percentage of the additional direct workforce required for the Project would need to be sourced from outside the region. This is because of the tighter labour market in the region as reflected by the declining unemployment rate. Also, farmers in the OCB region have been one of the main sources of local labour for Cadia Valley Operations, and it is likely that a lot of the available resource in this sector is already working at Cadia Valley Operations.

For this analysis it is assumed that 65% of the additional 204 workers at Cadia Valley Operations in Year 2 are sourced from outside the region.

Based on the workforce survey in 2006, migrating workforce is likely to have the following characteristics:

- 97% are likely to locate within the OCB region;
- 60% would be couples with children, 21% would be a couple without children, 15% would be single without children and 4% would be single with children;
- Those families with children would have on average 2.2 children; and
- 29% of children would be between 0 and 4 years of age, 42% would be between 5 and 11 years of age, 20% between 12 and 17 years of age and 9% 18 years or older.

Based on this information the peak migrating population associated with the direct workforce is estimated in Table H4.19.

Table H4.19
Population Characteristics of Migrating Mine Workforce
Located in the OCB Region

Family Structure	Worker	Partner	Children	Total
Single without children	19	0	0	19
Couple without children	27	27	0	54
Single with children	5	0	11	16
Couple with children	77	77	170	324
Other	0	0	0	0
Total	**129**	**104**	**181**	**414**

Note: Totals may have minor discrepancies due to rounding.

H4.4.2 Indirect Workforce and Population Change

From Table H3.2 it is estimated that there would be 1.41 flow-on jobs for each direct job. However, this assumes that all direct labour migrates into the region. If as assumed above, 65% of direct labour migrates into the region then it is relevant to only include 65% of the consumption-induced flow-ons. This gives 1.18 flow-on jobs for every direct job. Hence the 204 additional direct jobs would be associated with 240 indirect jobs.

Again it is assumed that 35% of these jobs are filled by locals and 65% by in-migration. Assuming this influx of indirect workers exhibit normal family characteristics for the State (i.e. it is assumed that most migrate from other areas in NSW), then the peak migrating population associated with the indirect workforce is estimated at 393 people.

Hence in total the maximum increase in population associated with the Cadia Valley Operations is 807.

H4.5 COMMUNITY INFRASTRUCTURE IMPACT ASSESSMENT

H4.5.1 Context of Employment Change

Figure H4.2 reports an estimated 204 increase in direct jobs at the Cadia Valley Operations. Assuming 65% of these are filled by migrating workforce the flow-on jobs are estimated at 240, giving a total increase in employment in the region of 444. This represents a 1.9% increase in the regional employed labour force. This is equivalent to 31% of the employment growth experienced between 1996 and 2001 and 90% of employment growth experienced between 2001 and 2006. However, as identified in Figure H4.2, this peak would only last for one year and only the first three years of Cadia East's operation would lead to an increase in employment levels over existing levels. After three years, employment levels would return to current levels and thereafter decline to a long-term average of around 783 once Cadia Hill and Ridgeway Deeps are completed.

H4.5.2 Context of Population Change

To understand the likely impact of the Project on community infrastructure and services it is necessary to consider the predicted population change within the context of the recent intercensal population change of the region.

From Table H4.1, it is evident that population levels have stagnated in the last intercensal period and that the Project would help offset recent population decline in the Orange SLA. The additional peak direct population growth associated with the Project is equivalent to 0.8% of the regional population, while including maximum predicted peak flow-on population growth increases this to 1.5%. However, as identified in Figure H4.2, this peak would only last for one year and a general increase in population associated with the Project construction would only last for approximately three years.

H4.5.3 Housing Impacts

Demand would be generated for a peak of up to 280 residences by the migrating direct and indirect workforce. While initially, short-term accommodation may house these families, the Cadia Valley Operations workforce survey (Gillespie Economics, 2007) indicates this housing demand would largely be for detached housing (90%) in Orange and to a lesser extent in Blayney, Millthorpe, Forest Reefs and Molong.

The region has considerable short-term accommodation including 16 motels, six caravan parks, four farm-stays, nine hotels and pubs offering accommodation, 35 complexes offering self contained accommodation and 35 Bed & Breakfasts and Guesthouses.

In addition, it is estimated that in 2006 there were 2,551 private unoccupied dwellings (Table H4.7). A fraction of this being made available to the market would be sufficient to meet the estimated demand. Furthermore, it is expected that the demand for housing generated by employees of Cadia Valley Operations would actually decline after three years to below current levels. Any cumulative impact of Cadia East on housing in the OCB region is therefore only likely to be short-term.

Orange City Council previously advised that there is no shortage of readily available residential land supply. There is almost always 10 years supply of residential land approved but not constructed (1800 lots). Approximately 150 to 200 houses per year is normal take-up. Recently there has been a number of residential subdivision development applications lodged with Orange City Council (e.g. a 40 residential lot subdivision at Burrendong Way and a 72 lot subdivision in the city's north) to help address potential demand. Cabonne Shire Council has also been undertaking its own rural residential subdivisions at Molong and Canowindra, to meet the demand for rural residential properties.

Nevertheless, because of higher relative wages in the mining sector, the demand for rental accommodation and to purchase is likely to be at the higher end of the market where supply may be more limited. In a properly functioning land market, any excess demand would result in an increase in rental and house prices, making it more attractive for housing developers and signalling them to provide more accommodation. However, any increase in rental prices has the potential to adversely affect existing rental tenants. This impact is likely to be short-term, with downward pressure on prices long-term as total employment at Cadia Valley Operations is predicted to decrease below existing levels once Cadia Hill and Ridgeway Deeps close.

H4.5.4 Education and Training

An estimated age profile of children associated with the peak migrating direct and indirect workforce is provided in Table H4.20.

Table H4.20
Influx of Children Compared to Recent Population Change

Age	Direct Migrating Children	Indirect Migrating Children	Total	Change in OCB Region Population 01-06	Change in School Attendance 01-06
0 to 4 years of age	53	25	78	-241	190 Preschool
5 to 11 years of age	76	36	112	-232	-456 Primary School
12 to 17 years of age	36	33	70	-47	-226 Secondary School
18 years and older	16	9	26	-109	-686 TAFE and University
Total	**181**	**103**	**286**	**-629**	

Note: Totals may have minor discrepancies due to rounding.

For this analysis it is assumed that children aged 0 to 4 increase demand for child care or preschool places, children aged 5 to 11 increase demand for primary school places while children aged 12 to 17 place demand on secondary school places. Children aged 18 and older are assumed to place demand on TAFE or University places.

The population of children in all age groups has declined in the last intercensal period. This is reflected in a decline in attendance at primary school, secondary school and tertiary education establishments. The only exception is the 0 to 4 age group where population has declined, and yet preschool attendance has increased.

The likely impact of the Project on educational establishments can be inferred from a comparison of the peak estimate of children population change from expansion of the Cadia Valley Operations and the recent decline in attendance numbers at educational establishments (Table H4.20). This indicates the estimated peak potential growth in children numbers at primary school, secondary school and university age is less than the recent decline in attendance numbers. This indicates that these existing educational establishments in aggregate are likely to have some spare capacity. Nevertheless, demand may be highest for schools such as Orange High School and Bletchington Public, which are already at or near capacity.

Preschools have had an increase in attendance despite population decline. However, the estimated peak population increase in the 0 to 4 age bracket (78) as a result of the Cadia Valley Operations expansion in the early years of the Project is less than the intercensal population decline in this age bracket. Based on averages in the OCB region in the order of 27% of children in this age group attend preschool and hence the Project would generate demand for in the order of 21 preschool places.

The NSW Department of Education had advised that strategies to utilise spare capacity in the overall education system rather than building additional capacity in specific locations is the focus of the Department's strategy for dealing with any population growth in the OCB region. Nevertheless, because schools are required to enrol students that reside in each schools zone, any temporary influx of students in excess of infrastructure capacity at individual schools would be accommodated via use of temporary infrastructure such as demountables.

Any temporary influx of students to non-government schools is likely to be able to be accommodated within the recently increased capacity of non-government schools in the Orange region.

Any increase in the child aged population can also have positive education benefits such as more teachers, reduced class sizes and broader curriculum.

H4.5.5 Health

There is potential for the Project to increase the demand for public health facilities in the region such as for hospitals, General Practitioner Medical Services, Dental, Physiotherapy, Chiropractors, Optometrists, etc. via the anticipated increase in population. However, the OCB region is well serviced by the health sector already and with the redevelopment of the Orange Base Hospital and development of the new Orange Private Hospital Precinct, the region would continue to be well serviced. Population is a key driver in the provision of health services by the GWAHS and so even if the population growth exceeds expectations of the GWAHS, at worst there may be temporary lag between population growth and the provision of additional services.

The Project also has the potential to indirectly positively impact on public health through the provision of employment opportunities and the reduction in unemployment. Prolonged unemployment can generate a range of personal and social problems including increased drug and alcohol dependency and increased demand for health services (University of NSW, 2006). Providing opportunities to reduce unemployment can be therefore be beneficial.

H4.5.6 Community and Recreation Facilities

Increase in population as a result of the Project would increase demand for community and recreation facilities. As identified in the Cadia Valley Operations workforce survey (Gillespie Economics, 2007), the CHPL workforce regularly uses a range of community infrastructure in the OCB region. The most used services are doctors, hospitals, pools and library, followed by childcare.

The Cadia Valley Operations workforce also participates strongly in community clubs and groups in the local area with 51% being members of sporting clubs and 11% belonging to a hobby or recreation club (Attachment HC).

The additional workforce as a result of the Project is expected to exhibit similar characteristics.

Nevertheless, to date there have been few issues in relation to community and recreation facilities. When surveyed both the Cadia Valley Operations workforce and regional population did not appear to be experiencing significant shortages in access to community infrastructure.

The majority (75%) of the Cadia Valley Operations workforce felt that they had not experienced any community infrastructure shortages (Attachment HC). Those who did consider that they had experienced community infrastructure shortages identified hospitals and childcare as the main infrastructure/services that shortages had been experienced in (Gillespie Economics, 2007).

Only 5% of respondents to the community attitudes survey agreed or strongly agreed that their access to community services and infrastructure had been adversely affected by Cadia Valley Operations employees (Gillespie Economics, 2007) (Attachment HC).

For these 5% of respondents who considered that their access to community infrastructure had been adversely affected the most commonly mentioned effect was real estate, followed by schools and then sporting clubs, childcare, law enforcement and health care (Gillespie Economics, 2007).

With regard to recreation facilities and open space a recent recreation needs study for Orange (Insite Economic and Social Planning, 2008) found that:

- Orange has an extremely high level of premier parkland in comparison with other LGAs and that there is limited demand for the expansion of Orange City Council's open space network with the exception of local and environmental needs in urban release areas.
- There appears to be adequate capacity in existing sporting and parkland facilities to meet expected population increases into the future. The upgrading and expansion of existing sporting facilities combined with improved management and facility allocation should result in no new outdoor sporting complexes being required.
- Given the population projections, community profile and existing facility supply, it is anticipated that the greatest demand in the Orange LGA over the next 5 to 10 years would be for an indoor leisure centre and year round swimming facilities.

H5 CONCLUSION

The Project is estimated to generate net production benefits of in the order of $1,210 M. This is above the net production benefits of the currently approved mining operations at the Cadia Valley Operations (i.e. it is a net production benefit specific to the development of the Cadia East orebody). The main environmental externality that has been valued is greenhouse gas costs. Adjusting the net production benefits for greenhouse gas costs gives a net benefit of the Project of $709 M NPV. Because other potential incremental environmental impacts of the Project have not been valued, the NPV of $709 M represents a threshold value.

This threshold value is the opportunity cost to society of not proceeding with the Project. Interpreted another way, any other environmental impacts of the Project, after mitigation by CHPL, would need to be valued at greater than $709 M to make the Project questionable from an economic efficiency perspective.

To put this threshold value in some context, every household in the OCB region would need to be willing to pay in the order of $34,000 to avoid the identified potential environmental impacts of the Project, to make it questionable from an economic efficiency perspective. The equivalent figure for NSW households is greater than $280.

The Project would also stimulate ongoing regional economic activity over a 21 year time frame.

In total, the average annual stimulus to the regional economy that would be made by the Project is:

- $1,025 M in direct and indirect regional output or business turnover;
- $557 M in direct and indirect regional value-added;
- $165 M in household income; and
- 1,889 direct and indirect jobs.

The sectors most impacted by output, value-added and income flow-ons are likely to be the wholesale trade sector; electricity supply sector; retail trade sector, hotels, cafes and restaurants sector; scientific and technical services sector; law, accounting and marketing sector; banking sector; ownership of dwellings sector; health services sector; personal services sector and road transport sector.

Employment impacts are also likely to be felt across a number of sectors including the mining sector; wholesale and retail trade sectors and services sectors (education, health, community services and personal services).

Towns in the vicinity of the Cadia Valley Operations that can provide the inputs to the production process required by CHPL and/or the products and services required by employees would benefit from the proposal by way of an increase in economic activity. These towns would include Orange, Blayney and Molong. These towns would benefit from any CHPL procurement in the local area.

Changes in the workforce and populations of regions and towns can have implications in relation to access to community infrastructure and human services, which includes for example housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of the population to these services.

During the earlier years of operation, the Project would be part of an integrated operation with Cadia Hill open pit, Ridgeway underground mine and Ridgeway Deeps. In Year 2 (peak employment) this integrated operation would provide up to 204 more jobs than the present Cadia Valley Operations workforce. These additional 204 direct jobs and 240 flow-on jobs are estimated to be associated with a maximum increase in population of 807 people. However, these effects are only likely to be felt during Year 2. After three years, employment levels (and associated population levels) would return to current levels and thereafter decline to approximately 783 people between Years 10 and 21. As described above, this would result in an average annual stimulus of 1,889 direct and indirect jobs to the regional economy.

Demand would be generated for a peak of up to 280 residences by the migrating direct and indirect workforce. While initially, short-term accommodation may house these families, this housing demand would largely be for detached housing in Orange and a lesser extent in Blayney, Millthorpe, Forest Reefs and Molong. The region has considerable short-term accommodation. In addition, it is estimated that in 2006 there were 2,551 private unoccupied dwellings in the region. A fraction of this being made available to the market would be sufficient to meet the estimated demand. Recently there has been a number of residential subdivision development applications lodged with the Orange City Council to help address potential demand. Nevertheless, it is expected that the demand for housing generated by employees of Cadia Valley Operations would actually decline after three years to below current levels. Any cumulative impact of Cadia East on housing in the OCB is therefore only likely to be short-term.

The increase in population would also generate increased demand for schools. However, in the last intercensal period there has been a decline in the population of school aged children and a reduction in school attendance at primary school, secondary school, TAFE and university. The estimated population profile of children associated with the peak migrating direct and indirect workforce would generally only partially offset the reduction in school attendance at primary school, secondary school, TAFE and university between 2001 and 2006. Nevertheless, depending on housing location of the migrating workforce demand for schools may be high for schools such as Orange High School and Bletchington Public which are already at or near capacity. Because schools are required to enrol students that reside in each school zone, any temporary influx of students in excess of infrastructure capacity at individual schools may be accommodated via use of temporary infrastructure, such as demountables.

Demand for preschool places increased between 2001 and 2006 despite a reduction in the regional population of children in this age group. The Project would add demand for up to 21 preschool places.

The increased population in the region would also increase demand for public health facilities in the region. However, the OCB region is well serviced by the health sector already and with the redevelopment of the Orange Base Hospital development of the new Orange Private Hospital Precinct, the region would continue to be well serviced. Population is also a key driver in the provision of health services by GWAHS and so even if the population growth exceeds expectations of the GWAHS, at worst there may be temporary lag between population growth and the provision of additional services.

Increase in population as a result of Project would increase demand for community and recreation facilities as the Cadia Valley Operations workforce regularly uses a range of community infrastructure in the OCB region and also participates strongly in community clubs and groups in the local area.

Nevertheless, to date there has been few issues in relation to community and recreation facilities. When surveyed both the Cadia Valley Operations workforce and regional population did not appear to be experiencing significant shortages in access to community infrastructure.

With regard to recreation facilities and open space, a recent recreation needs study for Orange found that Orange has an extremely high level of premier parkland in comparison with other LGAs and that there appears to be adequate capacity in existing sporting and parkland facilities to meet expected population increases into the future.

Cessation of the Project after 21 years of operation would lead to a reduction in regional economic activity. The significance of these cessation impacts would depend on:

- The degree to which any displaced workers and their families remain within the region, even if they remain unemployed.
- The economic structure and trends in the regional economy at the time.
- Whether other mining developments or other opportunities in the region arise that allow employment of displaced workers.

Given these uncertainties it is not possible to foresee the likely circumstances within which cessation of the Project would occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Project would bring to the region, to strengthen and broaden the region's economic base.

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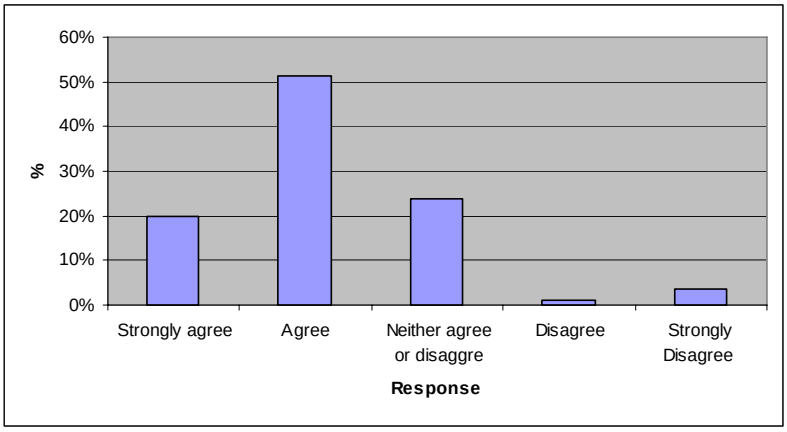
Attachment HA

Business and Community Attitudes to Regional Impacts (Source: Gillespie Economics, 2007)

Businesses in the region would benefit from workforce expenditure as well as direct purchases from CHPL. A survey of business in Orange, Blayney and Molong found that 71% considered that their business directly or indirectly benefits from the Cadia Valley Operations.

Business Survey (BS) Q5. Your business directly or indirectly benefits from the Cadia Mines n=80

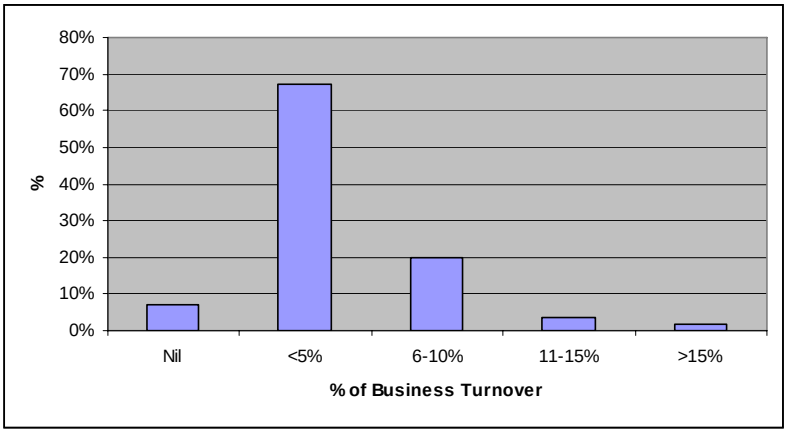
Response	Percent
Strongly agree	20%
Agree	51%
Neither agree or disagree	24%
Disagree	1%
Strongly disagree	4%
Total	**100%**



When asked the extent to which their business benefits, the majority of respondents considered that they benefit by up to 5% of business turnover. Some businesses benefits by greater than 15% turnover.

BS Q7. To what extent is the turnover of your business attributable to the Cadia Mines n=55

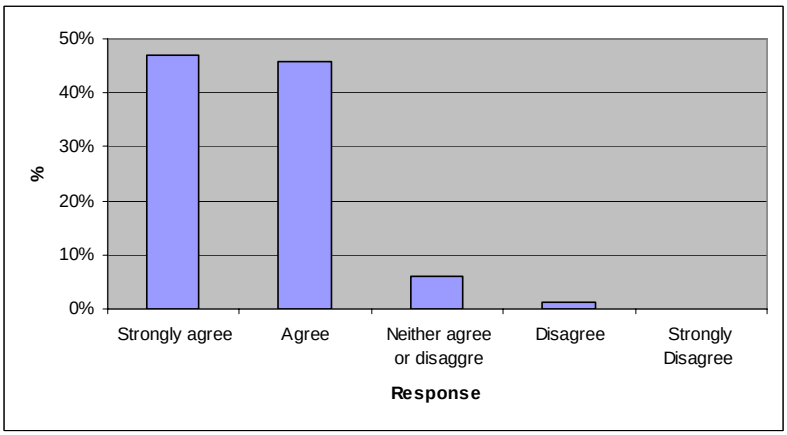
Response	Percent
Nil	7%
<5%	67%
6-10%	20%
11-15%	4%
>15%	2%
Total	**100%**



93% of businesses surveyed considered that the local economy benefits from the Cadia Valley Operations and with 97% of these considering that the benefit to the local economy from the Cadia Valley Operations is medium to high.

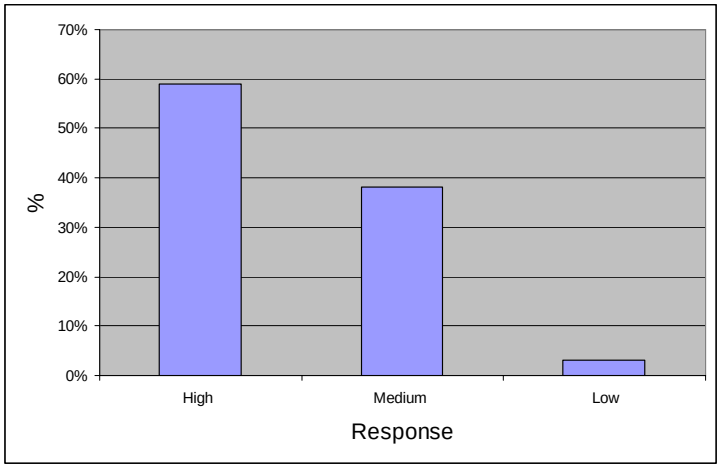
BS Q3. The local community benefits from the Cadia Mines n=81

Response	Percent
Strongly agree	47%
Agree	46%
Neither agree or disagree	6%
Disagree	1%
Strongly disagree	0%
Total	**100%**



BS Q4 How significant do you think the contribution of the Cadia Mines is to the local economy n=78

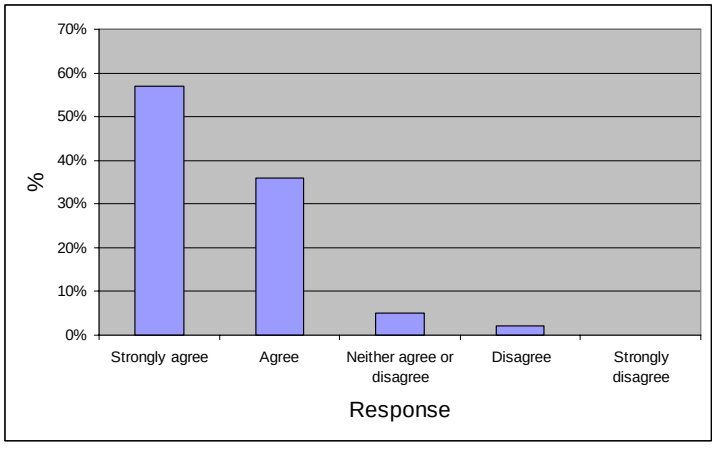
Response	Percent
High	59%
Medium	38%
Low	3%
Total	**100%**



A community attitudes survey also examined the extent to which the local economy benefits from the Cadia Valley Operations. 93% of respondents agreed or strongly agreed that the local economy benefits from the Cadia Valley Operations.

Community Attitudes Survey (CAS) Q1. The local economy benefits from the Cadia Mines n=300

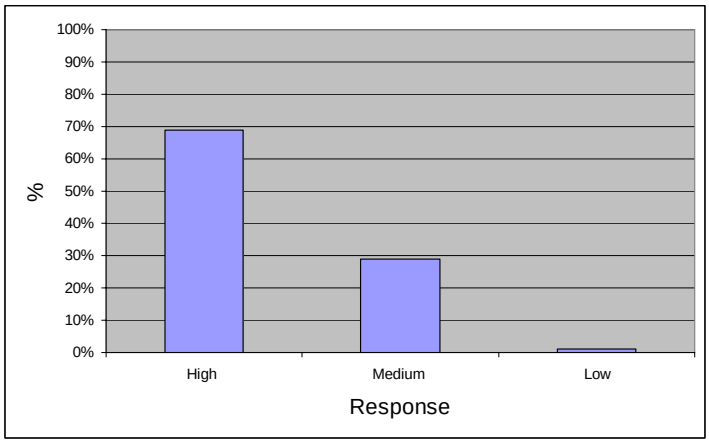
Response	Percent
Strongly agree	57%
Agree	36%
Neither agree or disagree	5%
Disagree	2%
Strongly disagree	0%
Total	**100%**



Of those community respondents that agreed, 98% considered that the benefit to the local economy from the Cadia Valley Operations is medium to high.

CAS Q2: If strongly agree or agree to Q 1, how significant do you think the contribution of the Cadia Mines is to the local economy n=280

Response	Percent
High	69%
Medium	29%
Low	1%
Total	**100%**



Attachment HB
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 non-ferrous metals and building and construction sectors. 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. It also means that the method should be used by an analyst who is familiar with the economy being modelled, or at least someone with that familiarity should be consulted.

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). That 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 HB-1 (Powell and Chalmers, 1995).

Table HB-1
The GRIT Method

Phase	Step	Action
PHASE 1		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).

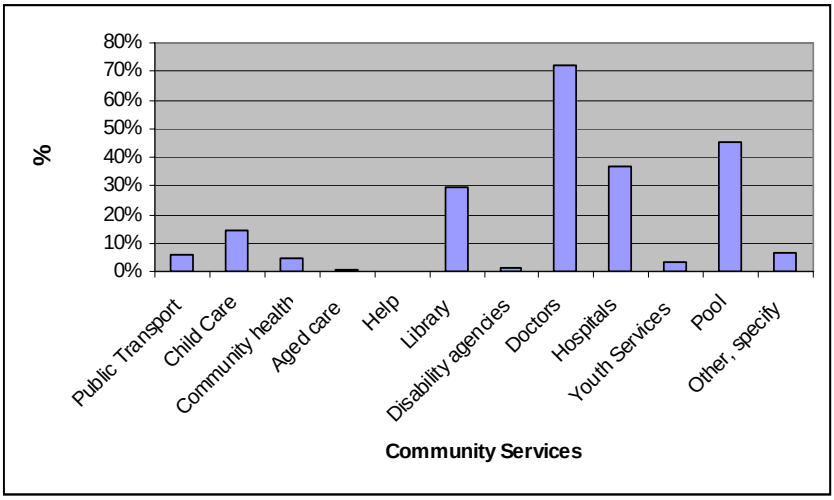
Attachment HC

Attitudes to Community Infrastructure (Source: Gillespie Economics, 2007)

As identified in the Cadia Valley Operations workforce survey, the mines workforce regularly uses a range of community infrastructure in the Orange, Cabonne and Blayney (OCB) region. The most used services are doctors, pools, hospitals, library, followed by childcare.

Employee Survey (ES) Q19 Community Services Regularly Used n=369

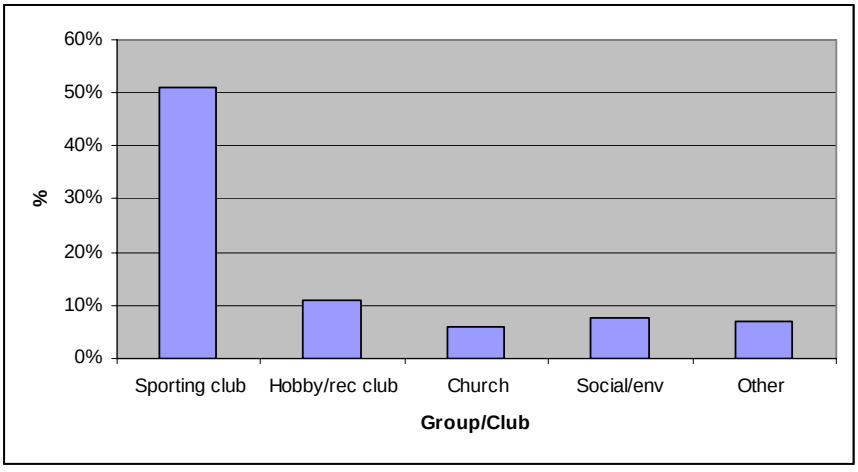
Community Services	Percent
Public Transport	6%
Child Care	15%
Community health	5%
Aged care	1%
Help	0%
Library	30%
Disability agencies	1%
Doctors	72%
Hospitals	37%
Youth Services	3%
Pool	45%
Other, specify	7%



The Cadia Valley Operations workforce also participates strongly in community clubs and groups in the local area with 51% being members of sporting clubs and 11% belonging to a hobby or recreation club.

ES Q20. Community Clubs and Groups in the Local Area that Respondents are Members Of n=369

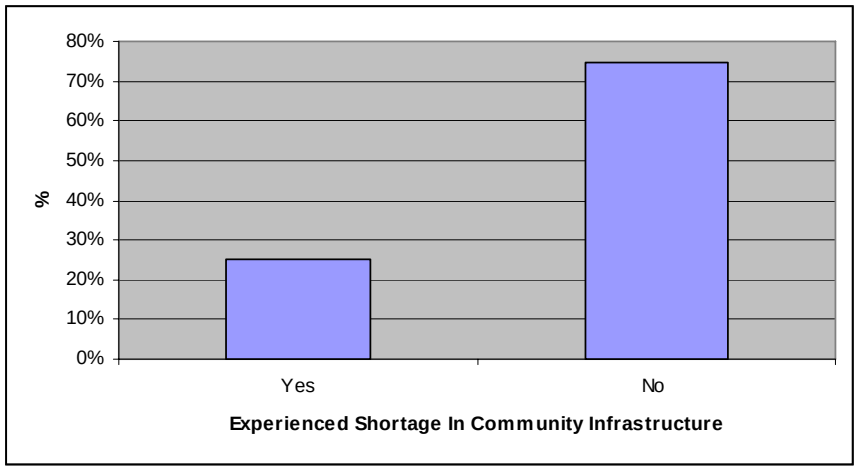
Clubs/Groups	Percent
Sporting club	51%
Hobby/rec club	11%
Church	6%
Social/env	8%
Other specify	7%



Nevertheless, when surveyed both the Cadia Valley Operations workforce and regional population did not appear to be experiencing significant shortages in access to community infrastructure.

ES Q21. Cadia Valley Operations Employees Experienced Shortages in Community Infrastructure n=358

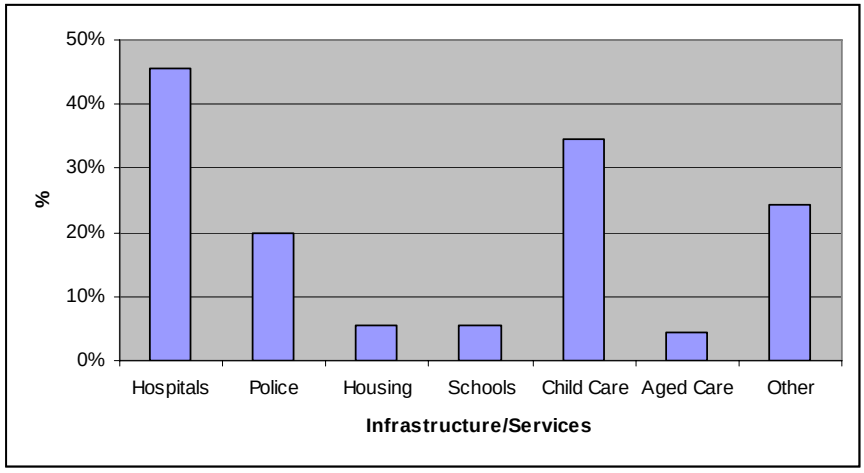
Response	Percent
Yes	25%
No	75%
Total	**100%**



The majority (75%) of the Cadia Valley Operations workforce felt that they had not experienced any community infrastructure shortages. Those who did consider that they had experienced community infrastructure shortages identified hospitals and childcare as the main infrastructure/services that shortages had been experience in.

ES Q22. Infrastructure or Services that Shortages Have Been Experienced In n=90

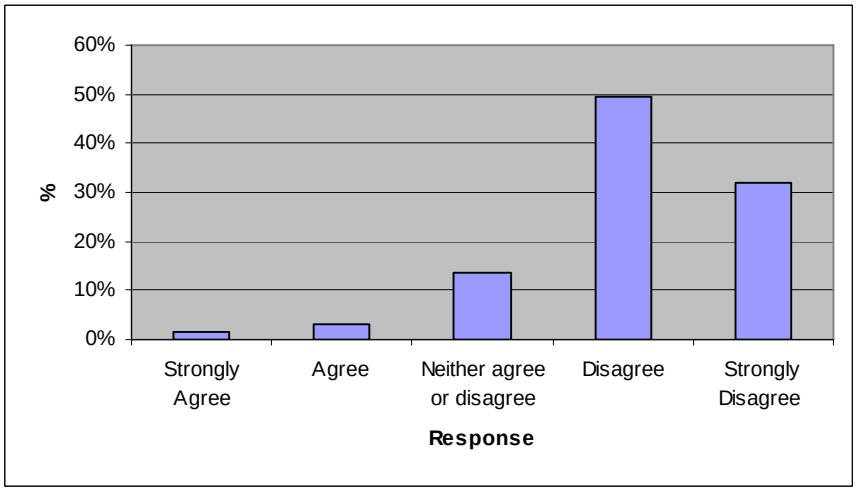
Infrastructure/ Services	Percent
Hospitals	46%
Police	20%
Housing	6%
Schools	6%
Child Care	34%
Aged Care	4%
Other, Specify	24%



Only 5% of respondents to the community attitudes survey agreed or strongly agreed that their access to community services and infrastructure had been adversely impacted by Cadia Valley Operations employees.

Community Attitudes Survey (CAS) Q6: Cadia Valley Operations employees and their families residing in the local region have adversely affected your access to community services and infrastructure n = 300

Infrastructure/ Services	Percent
Strongly agree	2%
Agree	3%
Neither agree or disagree	14%
Disagree	50%
Strongly disagree	32%
Total	**100%**



For these 5% of respondents who considered that their access to community infrastructure had been adversely impacted the most commonly mentioned impact was real estate, followed by schools and then sporting clubs, childcare, law enforcement and health care.

CAS Q7: If strongly agree or agree to Q 6, to which of the following has your access been adversely affected n=300

Infrastructure/ Services	No.
Sporting clubs	4
Child care	4
Real estate	11
Schools	5
Health care	2
Law enforcement	4
Other	2