INTEGRA COAL

Integra Coal Operations Pty Ltd

ABN: 96 118 030 998

Proposed Glennies Creek Open Cut Coal Mine

Socio-economic Assessment

Prepared by

Allen Consulting Group

October, 2007

Specialist Consultant Studies Compendium: Part 9

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Socio-economic Assessment

of the

Proposed Glennies Creek Open Cut Coal Mine

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October, 2007

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EXECUTIVE SUMMARY

This report contains a socio-economic assessment of the proposed Glennies Creek Open Cut Coal Mine in the Hunter Valley, NSW. The analysis is guided by State Government impact assessment requirements and draws upon a range of expert consultant reports addressing various facets of the proposed mine's operation.

Where possible, forecast impacts associated with the mine's operation have been quantified in Net Present Value (NPV) terms over the period 2008 to 2015 and where quantification is not possible, qualitative judgements of the size and nature of possible impacts have been made.

The following table sets out a summary of the range of possible mine-related impacts falling upon the Hunter Statistical Division (SD) (although it is important to note that greenhouse gas emissions impact the environment more broadly).

Socio-economic Assessment Criteria

Criteria	Valued Impacts (NPV@7%) ($ Million)	Qualitative Assessment
Economic Impacts		
Welfare	253.9	—
Environmental and Heritage Impacts		
Noise pollution	0.0	—
Air Quality — Dust	—	Value cannot be determined[2]
Air Quality — Greenhouse Gas	(1.2)	—
Visual impacts	—	No Significant Impact
Groundwater	—	No Significant Impact
Surface Water	(0.2)	—
Flora and Fauna	—	No Significant Impact[1]
Aboriginal Heritage	—	No Significant Impact[1]
Impacts on Community Services		
Primary Education	—	No Significant Impact
Childcare Services	—	No Significant Impact
Garbage and Recycling Collection	—	No Significant Impact
School Bus Services	—	No Significant Impact
Public Road	—	No Significant Impact[1]
Emergency Services	—	No Significant Impact[1]
Glennies Creek Community Hall	—	No Significant Impact
Local Health Services	—	No Significant Impact
Total	***$252.5***	

Note 1: If identified mitigation strategies are implemented.
Note 2: Please see section 5.2.1.

As the table shows, the socio-economic assessment concludes that the quantifiable NPV of the ICO Project is $252.5 million, which is made up of the economic benefit of the operation of the mine valued at $253.9 million and the environmental costs of greenhouse gas emissions and surface water, totalling $1.4 million. Most of the non-quantified impacts are considered significant and do not change the quantified estimate. The impact of air quality (i.e. dust) cannot be determined (see Section 5.2.1).

This conclusion reflects that the proposed mine is a relatively small addition to an area, which is already significantly impacted by the operation of a number of coal mines, and so would have negligible additional environmental or social cost.

As many uncertainties surround the values of the model parameters and assumptions used to derive the quantified estimates, particularly with respect to cost estimates, it is important to determine the robustness of the standard set of results. As a result, a number of model parameters were varied simultaneously around their mean values and the benefit-cost model recalculated 10 000 times to identify the sensitivity of results to these changes.

Using this approach demonstrates that the forecast NPV of the economic contribution to:

- the Hunter SD over the period 2008 to 2015 is 2015 is $252.2 million, and there is a 90% probability that the net benefit will fall within $222.9 million and $287.2 million.
- NSW as a whole over the period 2008 to 2015 is $248.8 million, and there is a 90% probability that the net benefit will fall within $216.1 million and $288.7 million.

This analysis demonstrates that the net benefits generated from the proposed mine are relatively insensitive to variation of key assessment parameters and are always significantly positive (given the relatively small scale of the proposed mine).

In addition to mitigation strategies endorsed in other consultant reports, we suggest that the following mitigation strategies be considered.

- Preference when leasing houses owned by the Proponent for tenants with primary aged children who would attend the Mt Pleasant Public School.
- Consideration of funding support to maintain the current levels of staff and faculties at the Mt Pleasant Public School should enrolments decrease below the relevant funding thresholds as a result of the project.

1 INTRODUCTION

1.1 Background to the Project

R.W. Corkery & Co. Pty. Limited (RWC) on behalf of Integra Coal Operations Pty Ltd (ICO) engaged Allen Consulting Group to undertake a socio-economic assessment of the proposed Glennies Creek Open Cut Coal Mine in the Hunter Valley, NSW.

The socio-economic assessment is guided by the NSW Department of Planning (DoP) Environment Assessment impact requirements. The socio-economic requirements also stem from earlier Departmental Environmental Impact Statement guidelines, presented in **Table 1.1**.

Table 1.1
Socio-economic Environmental Assessment Guidelines

Guideline	Requirement	Relevant Section
Social and Health Issues	The social impact assessment must assess the impact of the whole proposal, including the impact of measures proposed to mitigate other impacts.	
	(a) assess social impacts as a result of changes in employment patterns;	Section 4.2
	(b) assess social impacts resulting from changes in the amenity of the area;	Section 5.3
	(c) assess impacts on the health of the community from any potential changes in air quality, noise and vibration, safety on the roads, and changes to the flooding regime;	Section 5
	(d) assess social impacts of any proposed mitigation measure, including acquisition; and	Section 6
	(e) describe proposals to minimise social impacts, such as maintaining social assets and facilities, and services.	Section 7.3
Economic Issues	(a) assess cost and benefits to the community, taking into consideration environmental impacts as well as the project factors. Describe and qualitatively assess significant non-monetary costs and benefits. If a major issue consider:	
	i. potential economic impacts on market demand; analysis of supply, future demand for the type of material present on the site;	Section 4
	ii. flow-on costs from the need to upgrade any infrastructure; consideration of the offset of s94 contributions or other contributions for the provision or upgrading of infrastructure;	—
	iii. any additional employment as a result of the proposal;	Section 4.2
	iv. potential impact on property values;	Section 4
	v. potential impact on the economic use of land affected by the proposal including agricultural use of the land;	Section 4
	vi. potential impact on the economic use of waters affected by the proposal, eg. downstream water users, economic beneficiaries of clean river systems; and	Section 4, Section 5.4
	vii. ongoing maintenance costs for mitigation works.	—
	(b) outline any proposal for a performance bond. Any bond could consider failure of safeguards resulting in a significant environmental impact.	Section 7.3

Source: Department of Urban Affairs and Planning 2000, Coal Mines and Associated Infrastructure: EIS, Sydney, pp. 36-37

1.2 Proposed Glennies Creek Open Cut Coal Mine

The proposed Glennies Greek Open Cut Coal Mine site is situated 12km north of Singleton, New South Wales (see **Figure 1.1**).

The proposal by ICO is for an open cut coal mine development and involves the following activities.

- Construction of a Project Site access road off Middle Falbrook Road.
- Construction of facilities (contractor office, amenity buildings and workshop) adjacent to the proposed open cut.
- Coal mining by open cut methods within a pit shell covering approximately 90ha, within which drilling has identified three principal coal seams amenable to mining by open cut methods, namely the:
    - Middle / Lower Liddell;
    - Barrett; and
    - Hebden Coal Seams.
- Transportation of mined coal to the Camberwell Coal Handling and Preparation Plant (CHPP) for washing via internal hauls roads. Washing at the Camberwell CHPP is an approved activity under DA 86/2889, and as such, is not included in this socio-economic assessment.
- Temporary stockpiling of Run-of-Mine (ROM) coal, as and when required, at a temporary ROM coal stockpile area located at the top of the open cut ramp or at the existing RL100 ROM Stockpile Area, with subsequent transport to the CHPP. Transportation of coal from the RL100 ROM Stockpile Area and to the Camberwell CHPP is an approved activity under DA 86/2889, and as such, is not included in this socio-economic assessment.
- Highwall/auger mining. During the course of the proposed open cut mining, there may be opportunities to undertake mining from the northern highwall using either highwall or auger mining to extract additional coal. This method of mining would result in underground extraction for a length of no more than approximately 300m from the base of the highwall, although the final distance would depend on the form of mining undertaken.
- Programmed placement of waste rock materials from the open cut, initially to an out-of-pit emplacement, with subsequent placement out-of-pit as well as in-pit in areas where mining has been completed. The proposed out-of-pit emplacement has a disturbance footprint of approximately 43ha.
- Progressive reshaping and rehabilitation of all areas of mining-related disturbance. Overall, the total disturbed area to be rehabilitated is approximately 132ha.

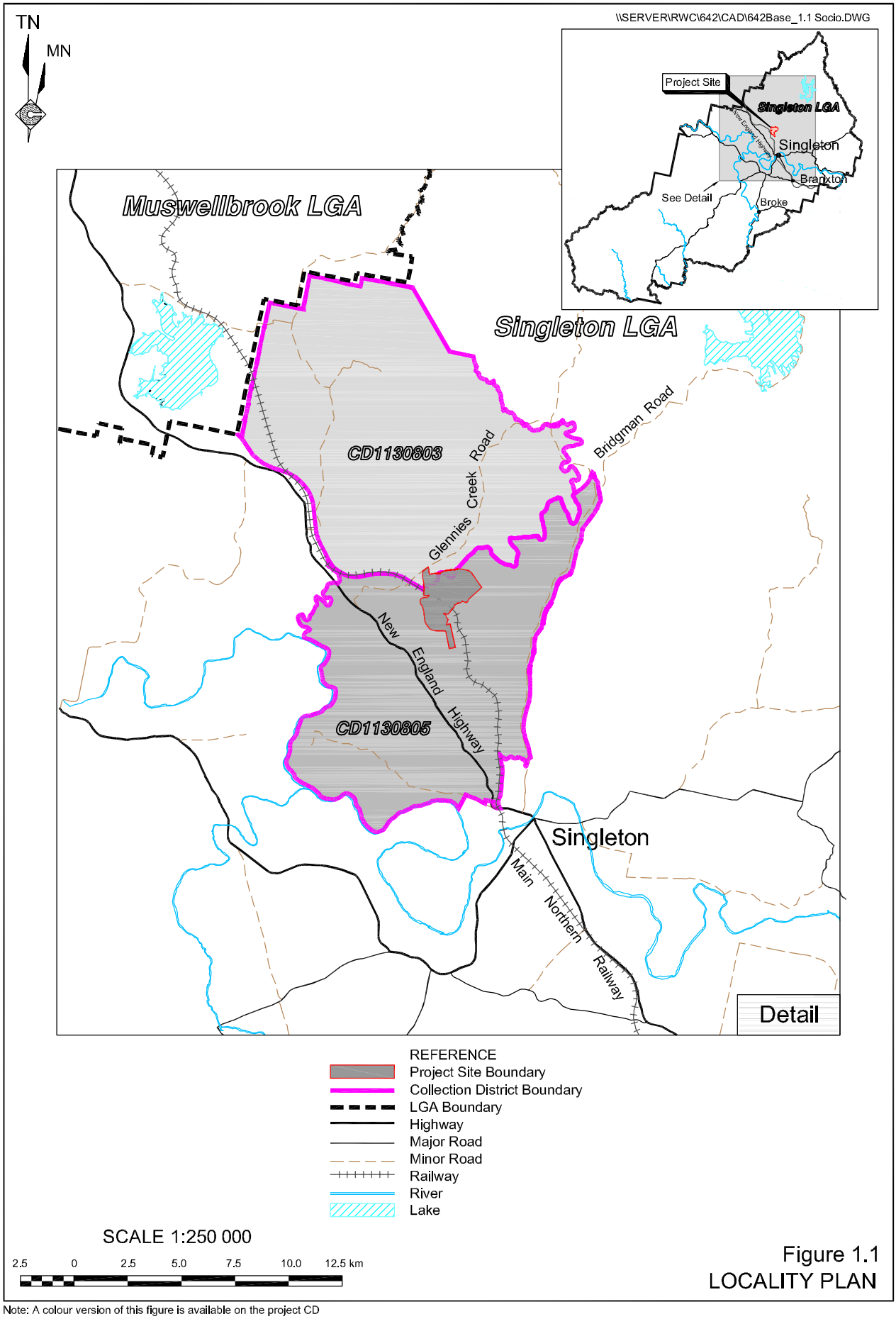

Figure 1.1
LOCALITY PLAN

Note: A colour version of this figure is available on the project CD

- Offset the clearing of approximately 70ha of native vegetation and approximately 56ha of previous rehabilitation vegetation with the following biodiversity offset strategies.

    - Removal of stock, protecting and enhancing 122ha of existing native vegetation on the Proponent's property to the north of Stony Creek Road.
    - Protection (stock exclusion) and enhancement of approximately 18ha of riparian vegetation along Glennies Creek on the Proponent's property.

- Implementation and maintenance of comprehensive systems to manage noise, vibration, air quality, visibility, surface water, groundwater, flora and fauna.

The Project Site (see **Figure 1.2**) incorporates all disturbance associated with proposed mining-related activities, ie. open cut mining, out-of-pit waste rock emplacement, contractor facilities, internal haul routes A, B and C and an access road off Middle Falbrook Road. Also included in the project site are coal transport routes (routes D and E) and the Camberwell CHPP. Transportation of ROM coal up to 4Mtpa to the Camberwell CHPP and processing of that coal, is currently approved under the Camberwell development consent, as is use of haul/transport trucks within the Camberwell mining area.

In addition to the Project Site the Biodiversity Offset Areas will also form part of this application. The Biodiversity Offset Areas, include land which is to be protected, and enhanced to compensate for the proposed clearing of approximately 70ha of native vegetation and 56ha of rehabilitated vegetation for the proposed mining disturbance.

1.3 Structure of the Report

The remainder of this report is structured as follows.

- *Chapter 2* — outlines the socio-economic assessment process used.
- *Chapter 3* — provides a snapshot of Glennies Creek and surrounds.
- *Chapter 4* — details the results of the economic assessment of the proposed Glennies Creek Open Cut Coal Mine.
- *Chapter 5* — details the individual and household social impacts of the proposed Glennies Creek Open Cut Coal Mine.
- *Chapter 6* — details the community and institutional social impacts of the proposed Glennies Creek Open Cut Coal Mine.
- *Chapter 7* — details the results of the overall assessment of the proposed Glennies Creek Open Cut Coal Mine including both economic and social impacts.

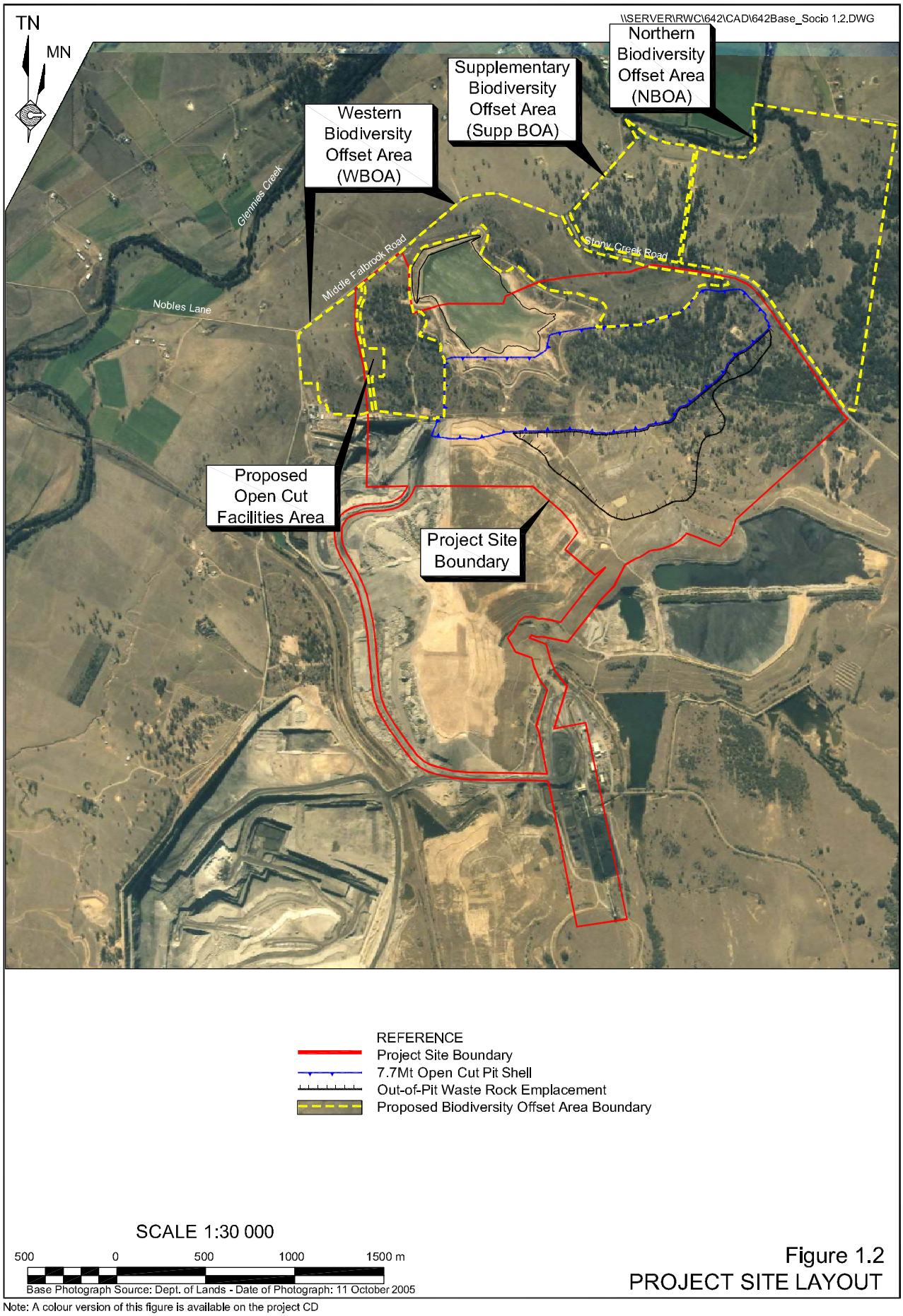

Figure 1.2
PROJECT SITE LAYOUT

Note: A colour version of this figure is available on the project CD

2 SOCIO-ECONOMIC ASSESSMENT PROCESS

2.1 Project Method

The project method was designed to facilitate a comprehensive assessment of the socio-economic impacts of the proposed Glennies Creek Open Cut Coal Mine, and involved four project stages:

- Stage one — information gathering;
- Stage two — community consultation;
- Stage three — assessment of economic impacts; and
- Stage four — assessment of overall socio-economic impacts.

The project method meets the NSW Department of Planning (DoP) Environmental Impact Statement guidelines outlined in **Table 1.1** and addresses the deficiencies of the Mt Owen socio-economic assessment as identified within the report of the Commissioner of Inquiry for Environment and Planning.[1] The Commissioner's report identified a number of community organisations that should be consulted. For the Project these community organisations are:

- Mt Pleasant public school;
- Glennies Creek Community Hall;
- rural fire brigade (the Department of Planning was satisfied that there was no impact from the Mt Owen mine on the rural fire brigade);
- school bus services;
- Mt Olive Mobile pre-school; and
- garbage and recycling services (**Figure 2.1**).

The impacts on these community organisations and facilities have been explicitly assessed. There are no other identified local community organisations that would be significantly impacted by the ICO Project.

2.1.1 Stage One - Information Gathering

The initial stage of socio-economic assessment process was an information gathering exercise. The project team collected information on the following aspects.

- The Department of Planning Director-General's requirements for undertaking a socio-economic assessment as part of an Environmental Assessment.

1 Commissioner of Inquiry for Environment and Planning 2004, Proposed Extension of Coal mining Operations and Associated Infrastructure at the Mt Owen Mine Hebden via Singleton, pp. 66-73.

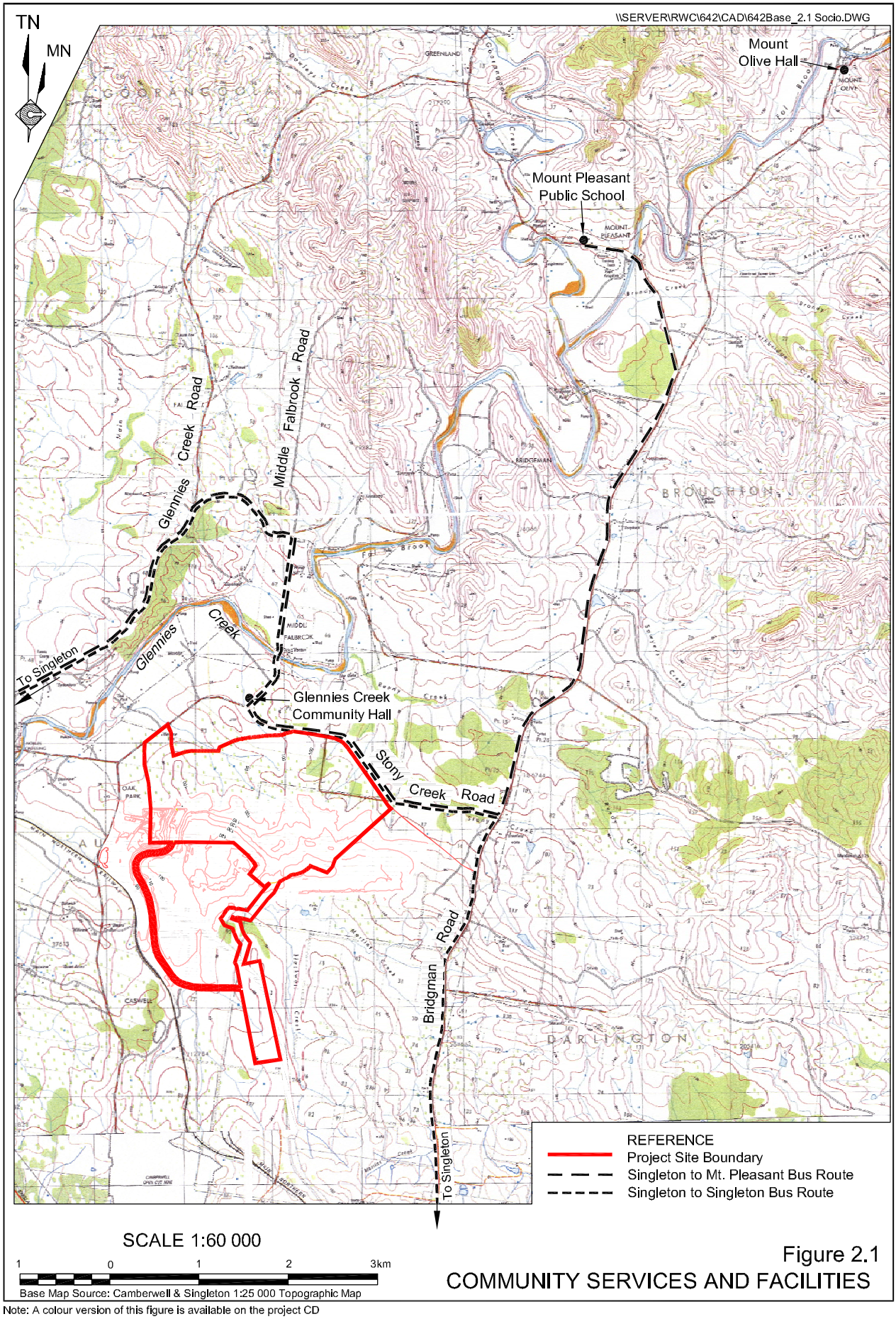

Figure 2.1
COMMUNITY SERVICES AND FACILITIES

Note: A colour version of this figure is available on the project CD

- Socio-economic related studies undertaken in the Glennies Creek and surrounding areas, including past Environmental Assessments — for example, the Mt Owen Environmental Impact Statement and Commission of Inquiry's response.
- Information from ICO on the proposed open cut mine, including:
  - forecast employment;
  - operational costs;
  - profitability;
  - proportion of exports to domestic sales;
  - use of imports in the coal production process; and
  - the impact and acquisition area of the proposed mine, including the number of occupied residences that may be affected.
- Demographic information on the Glennies Creek local area and surrounds, including the Singleton township.
- Information on the coal mining industry in both the Glennies Creek Community Area and surrounds.

The information gathered as part of this stage, in conjunction with the community consultation undertaken in Stage two, forms the basis for cost-benefit analysis, including economic modelling and the assessment and quantification of social impacts of the Project.

2.1.2 Stage Two - Community Consultation

As part of the second stage of the assessment process a member of the Allen Consulting Group project team met with a number of Glennies Creek community stakeholders. Community consultation was undertaken on 6 and 7 April 2005. **Table 2.1** identifies who participated in the consultation process.

Table 2.1
Stakeholders Consulted

Organisation	Stakeholder
Mt Pleasant public school	Andrew Morrow, Principal
Mt Olive mobile pre-school	Leah Giles, Director
Upper Hunter children's mobile outreach services (the Toybox)	Katie Whitely, Manager
Blue Ribbon bus services	Brian Gerthwite, Manager
Glennies Creek Coal Mine Community Consultative Committee	Mary Robinson, Counsellor, Singleton Shire Council Brian Thomas, Counsellor, Singleton Shire Council
Singleton Health Service	Wendy Mason-Jones, Manager
Proposed Glennies Creek Coal Mine Site	Geoff McKenzie, Manager Environment and Safety

2.1.3 Stage Three – Assessment of Economic Impacts

In order to analyse the economic impacts of the proposed Glennies Creek Open Cut Coal Mine a general equilibrium model of the Australian economy — TERM — was used to identify how the impact of the project flow through the economy over time.[2]

Use of the TERM model enables evaluation of a full range of economic impacts across several regions — including the:

- Hunter Statistical Division; and
- New South Wales as a whole.

2.1.4 Stage Four - Assessment of Overall Socio-Economic Impacts

The economic assessment undertaken in stage three is combined with identified social impacts as identified in the Director-General's requirements and the Commissioner of Inquiry's report and from community consultation.

Social economic impacts include assessments undertaken by specialist consultants on the following impacts.

- Air quality — including airborne dust and greenhouse gas emissions.
- Noise and blasting.
- Surface and groundwater capability.
- Visual amenity — undertaken by RWC.
- Aboriginal heritage.
- Traffic capability — undertaken by RWC.
- Flora and fauna.

All socio-economic impacts are assessed in terms of:

- benefits and costs which can be quantified and valued — for example, the benefits of a functioning mine in terms of employment and income; and
- benefits and costs which cannot be quantified — for example, the impact of a reduction in health services in the Glennies Creek Community Area.

The result of this assessment includes an indication of the *net impact* for each issue assessed. The cumulation of the net impacts provides and overall quantified and non-quantified assessment of the impacts of the proposed Glennies Creek Open Cut Coal Mine.

2 An overview of TERM, and the relative advantages of its use, is provided in Appendix A.

This stage also includes recommending appropriate safeguards, mitigation strategies, and offsets to alleviate impacts and/or meet requirements for community contributions during the life of the Project.

3 SNAPSHOT OF GLENNIES CREEK COMMUNITY AND SURROUNDS

This section provides an overview of the demographics and the coal mining industry in the Singleton Local Government Area and the Glennies Creek Community Area.

3.1 Singleton Local Government Area

The Glennies Creek Community is located between the two regional centres of Singleton and Muswellbrook and is part of the Singleton Local Government Area (LGA). The Singleton LGA covers an area of 4895.9 sq km, with a population density of 4.16 people per sq km, compared to 7.95 people per sq km for New South Wales.[3]

3.1.1 Population and Employment

The Singleton LGA has a population of 21 460, with population growth of approximately 3.7% since 1999.[4] Population growth in the Singleton LGA is lower than that of NSW as a whole (4.3%) over the same period.[5] Residents over the age of 45 experience the highest rate of growth — a 12.4% increase in residents aged 45 to 64 and a 10.7% increase in people aged 65 and over. There has been a small decrease in the numbers of children since 1999, a decrease of 2.1% of residents 14 years and younger. **Table 3.1** shows the age distribution among the Singleton LGA population.

Table 3.1
Population Distribution of the Singleton LGA (2001)

Age	Population	Proportion of Total Population
Aged 14 years and below	5286	25%
Aged 15 to 44 years	9349	44%
Aged 45 to 64 years	4844	23%
Aged 65 years and above	1981	8%
Total population	**21 460**	**100%**
Source: Australian Bureau of Statistics 2001, *Census of population and housing, Singleton (A) LGA 17000*, Cat. no. 1379.0.55.001, AusInfo, Canberra		

In 2001, 44% of the population of the Singleton LGA were between the ages of 15 and 44 years, 25% are under 14 years of age, 23% are between the ages of 45 and 64 and 8% were over 65 years.

3 Singleton Council 2004, Singleton Community Social Plan: 2004/05-2009/10, Singleton, p. 11
4 Australian Bureau of Statistics 2003, Regional Profile: Singleton (A), Cat. no. 1379.0.55.001, AusInfo, Canberra.
5 Australian Bureau of Statistics 2004, New South Wales at a Glance, Cat. no. 1301.0, AusInfo, Canberra.

The labour force in the Singleton LGA comprises 9802 people, of which 9253 are employed (67% are employed full-time and 29% are employed part-time) and 549 people are unemployed, with an unemployment rate of 5.6%.[6] The unemployment rate in the Singleton LGA is slightly lower than the NSW unemployment rate of 5.8%.[7]

3.1.2 Industry

The largest single employment industry in the Singleton LGA is the mining industry (see **Table 3.2**), of which coal mines employ 1320 people or (14% of the total employed labour force). The retail trade industry employs 13% of the total employed labour force and the manufacturing industry employs 8% of the total employed labour force.

Table 3.2
Major Industries in the Singleton LGA

Industry	Number Employed	Proportion of Total Employed Labour Force
Mining — Total	1445	16%
Mining — Coal	***1320***	***14%***
Retail Trade	1196	13%
Manufacturing	739	8%
Government Administration and Defence	698	7%
Business Services	647	7%
Construction	626	7%
Agriculture	629	7%
Health and Community Services	553	6%
Wholesale Trade	520	6%
Education	424	5%
Other Industries	1776	18%
Total population	**9253**	**100%**

Source: Australian Bureau of Statistics 2001, op. cit., Table X19A and X19B

3.1.3 Dwellings

The number of people living in a household has been assumed to vary between 1 and 6 people; a weighted average indicates that the average number of people per household in the Singleton LGA is approximately 3 people.

Table 3.3
People living in Households — Singleton LGA

Number of People in a Household	Population	Weighted Average
1 person	1269	0.15
2 people	2072	0.62
3 people	1099	0.52
4 people	1275	0.84
5 people	679	0.56
6 people	247	0.24
Total	**6641**	**2.93**

Source: Australian Bureau of Statistics 2001, op. cit., Table X49.

6 Australian Bureau of Statistics 2001, Expanded Community Profile: Singleton (A) LGA 17000, Cat. no. 2005.0, AusInfo, Canberra.
7 Australian Bureau of Statistics 2004, op. cit., p. 3.

3.2 The Glennies Creek Community

The community most likely to be impacted directly by the Project is residents of a collection of houses (approximately 75) close to and immediately surrounding the Project Site (**Figure 3.1**). Community statistics however, are only available for the larger Australian Bureau of Statistics Collection Districts 1130803 and 1130805 (**Figure 2.1**).

3.2.1 Population and Employment

The Glennies Creek Community Area has an estimated population of 789 people.[8] **Table 3.4** shows the age distribution in the Glennies Creek Community Area.

In 2001, 47% of the population of the Glennies Creek Community Area were between the ages of 15 and 44 years, 21% were between 45 and 64 years, 26% were under the age of 14 years and 6% were over 65 years. The population in the Glennies Creek Community Area is younger than that of the Singleton LGA, with 27% of the population over 45 years, compared to 31% in the Singleton LGA.

Table 3.4
Population Distribution of the Glennies Creek Community Area

Age	Population	Proportion of Total Population
Aged 14 years and below	197	26%
Aged 15 to 44 years	372	47%
Aged 45 to 64 years	169	21%
Aged 65 years and above	51	6%
Total population	**789**	**100%**

Source: Australian Bureau of Statistics 2002(a), *Basic Community Profile NSW CD 1130803, Cat. no. 2001.0,* AusInfo, Canberra. See also, Australian Bureau of Statistics 2002(b), *Basic Community Profile NSW CD 1130805, Cat. no. 2001.0, A*usInfo, Canberra.

In 2001, the total labour force in the Glennies Creek Community Area comprised 380 people of which 359 were employed and 21 people were unemployed, with an unemployment rate similar to that of that of the Singleton LGA or NSW as a whole at 5.5%.[9]

3.2.2 Industry

The largest single employment industry in the Glennies Creek Community Area is the mining industry, including coal mining (see **Table 3.5**), which employs 16% of the employed labour force. The retail trade industry, employs 13% of those employed within the community. The manufacturing and retail trade industries each employ 11% of the employed labour force.

8 Australian Bureau of Statistics 2004, op. cit., p. 3.
9 Ibid.

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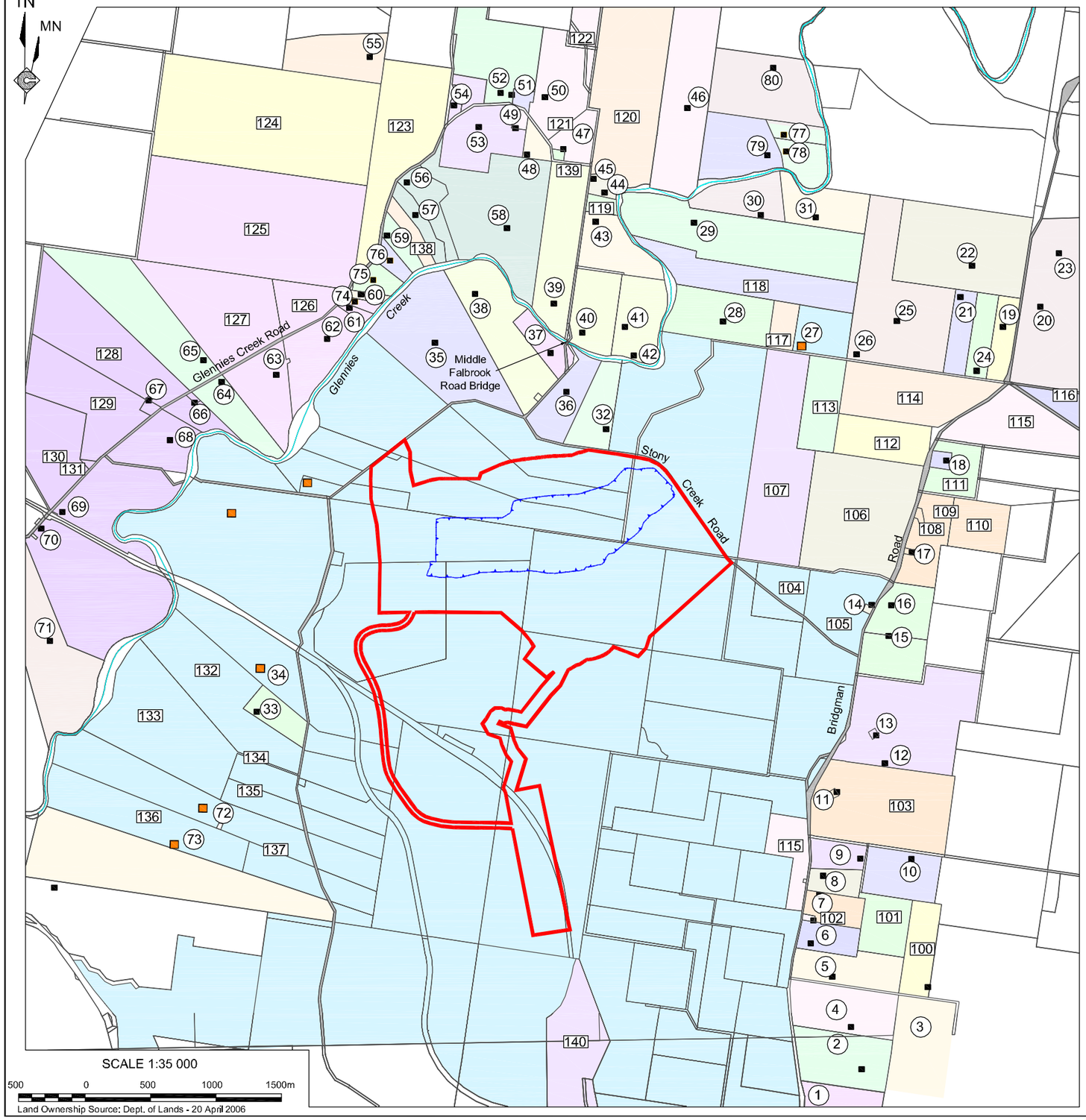


REFERENCE

- Project Site Boundary
- 7.7Mt Open Cut Pit Shell
- Residence - Non-project Related
- Residence - Project Related
- Creek
- Public Road

Land With Residence		Land With Residence	
Reference	**Owner's Name**	**Reference**	**Owner's Name**
	Project Related	61	A.C. Noble
1	L. Cox	62	A.C. Noble
2	D.P. Cox	63	A.C. Noble
3	L. Cox	64	G.J. Donnellan
4	W. Cox	65	G.J. Donnellan
5	D.K. Geelan	66	Glendell Tenements Pty Limited
6	W.B. & N.M. Pendered	67	Glendell Tenements Pty Limited
7	F. Ferraro	68	Glendell Tenements Pty Limited
8	P.K. & K.J. Russell	69	Glendell Tenements Pty Limited
9	M.A. Hoggan	70	Glendell Tenements Pty Limited
10	G.B. & J. Barnett	71	B.H. & R.E. Richards
11	A.H. Lambkin	72	RHA Pastoral Company Pty Ltd
12	W.M. Cooper	73	RHA Pastoral Company Pty Ltd
13	W.M. & G.F. Cooper	74	A.C. Noble
14	A. Garvie	75	M. & G. Smith
15	S.H. Andrews	76	S.J. McInerney
16	S.H. Andrews	77	E.D. & J. Upward
17	S.H. Andrews	78	E.D. & J. Upward
18	G.E. Lamkin	79	M.A. & R.P.Porter
19	B.W. & R.C. Frazer	80	H.M. Upward & Sons
20	D.J. Hamilton	**Vacant Land**	
21	A.J. Cox	100	N.J. Smith
22	D.E.R. Cope	101	W.C. Garland
23	D.J. Hamilton	102	E.J. & B.M. Kleinman
24	J.F. & C.M. Whitney	103	A.H. Lambkin
25	D. Kacunic & C. Jensen	104	RHA Pastoral Company Pty Ltd
26	D. Kacunic & C. Jensen	105	RHA Pastoral Company Pty Ltd
27	Integra Coal Operations	106	R.N. & K. Bell
28	R.E. & W.J. Gardner	107	M.L. Leggett & N.D. Allison
29	C. & D. Kay	108	S.H. Andrews
30	H.L. Castledine	109	S.H. Andrews
31	D. Baker	110	S.H. Andrews
32	B.H. & B.L. Evans	111	D.C. & D.C. Paul
33	R.G. & D.A. Hall	112	G.J. & C.A. Nightingale
34	RHA Pastoral Company Pty Ltd	113	J.,B.A. & M.J. Robison
35	W.E. & A.M. Gardner	114	K.P. & M.L. Roots
36	C.I. Payne	115	State Land Services
37	B.W. & R.A. Cherry	116	G.D. Hamilton & M.L. Gersbach
38	J.H. & M.R. Moore	117	N.A. Breen
39	G.W. & J.H. Cheetham	118	N.J. Carroll & A.D. Castledine
40	G.W. & J.H. Cheetham	119	B.J. Scott & S.G. Hunter
41	G.W. & J.H. Cheetham	120	E.,C.A. & K.L. Meyn
42	G.W. & J.H. Cheetham	121	J.A. Welsh
43	D.R. & M.K. Bridge	122	J.A. Welsh
44	B. & J.M. Moran	123	W.E. & A.M. Gardner
45	B. & J.M. Moran	124	W.E. & A.M. Gardner
46	J.A. Welsh	125	A.C. Noble
47	B.W. & Y.E. Scott	126	A.C. Noble
48	G. Holmes	127	A.C. Noble
49	B. Wilson	128	Glendell Tenements Pty Limited
50	J.A. Welsh	129	Glendell Tenements Pty Limited
51	Hunter Valley Coal Corporation	130	Glendell Tenements Pty Limited
52	Hunter Valley Coal Corporation	131	Glendell Tenements Pty Limited
53	M.A. & D.M. Lancaster	132	RHA Pastoral Company Pty Ltd
54	M.H. & J.A. Westcott	133	RHA Pastoral Company Pty Ltd
55	D. & T.J. Dewar	134	RHA Pastoral Company Pty Ltd
56	I. & P. Hedges	135	RHA Pastoral Company Pty Ltd
57	I. & P. Hedges	136	RHA Pastoral Company Pty Ltd
58	D. & K. Moran	137	RHA Pastoral Company Pty Ltd
59	G.M. Watson	138	E.T. & D.G. Foster
60	RHA Pastoral Company Pty Ltd	139	G.W. & J.H. Cheetham
		140	Four Mile Pty Limited

Land Ownership Information Sourced from Department of Lands

Figure 3.1
LAND OWNERSHIP AND RESIDENCES

Table 3.5
Major Industries in the Glennies Creek Community Area

Industry	Number Employed	Proportion of Total Employed Labour Force
Mining — Total	60	16%
Retail Trade	47	13%
Manufacturing	43	11%
Agriculture	38	10%
Construction	27	7%
Health and Community Services	25	6%
Transport and Storage	24	6%
Wholesale Trade	16	4%
Electricity, Gas and Water Supply	15	4%
Business Services	10	3%
Other Industries	71	20%
Total population	**376**	**100%**

Source: Australian Bureau of Statistics 2002(a), op. cit., Table X26. See also, Australian Bureau of Statistics 2002(b), op. cit., Table 26

3.2.3 Dwellings

The mean household size within the Glennies Creek Community Area is three people per household.[10] This result is similar to that of the Singleton LGA.

The majority of people in the Glennies Creek Community Area are part of a family that consists of a couple with children (62%), 14% of people are part of a couple with no children, 7% are lone parent families and 17% are single. On average, income in the Glennies Creek Community Area for a family/household is approximately $1100 per week, which is higher than the average earnings in NSW of $907 per week.

3.2.4 Glennies Creek Community Dynamics

The area around Glennies Creek is made up of micro-communities that rely on Singleton as a major source of community services and social/recreational activities. Services are, however, also accessible in other nearby locations, for example, Muswellbrook, Mount Olive and St Clair. The fabric of the Glennies Creek Community is difficult to quantify as there is no central township or focus for the community.

The community consultation conducted as part of the Project revealed that the social cohesion of the Glennies Creek Community has decreased over time as the area has changed from a farming region to a mining area with largely non-farming residents. In addition to this an increase in the transient population and tenants rather than owner-occupiers has further reduced social cohesion. Anecdotally it would appear that those people who work in the coal mines surrounding Glennies Creek do not necessarily live in the area surrounding the Project Site.

The current social environment in the Glennies Creek Community is one where individuals access social and recreational services in Singleton and other nearby towns and rarely interact as a community group. Community wide activities have become far less frequent as evidenced by the decreased utilisation of the Glennies Creek Community Hall. On this basis, the Project is not expected to have a significant impact on the social fabric of the Glennies Creek Community Area.

3.3 Coal Mining

3.3.1 Coal Mining in NSW and the Singleton LGA

New South Wales is the second largest producer of black coal in Australia, with black coal mines in NSW producing around 110 million tonnes of coal each year. The value of the coal mined in NSW was over $4.7 billion in 2003-04.[11]

The Singleton LGA has the largest black coal mining sector in NSW, with 15 coal mines in the Singleton LGA. Of these mines, 70% are open cut coal mines and 30% are underground coal mines.[12] In total, coal mines in the Singleton region produce approximately 73 million tonnes of coal each year, making up approximately 66% of all New South Wales black coal production and approximately 26% of all coal production in Australia.[13]

Using these results, the value of the coal mined in the Singleton LGA would have been approximately $3.1 billion in 2003-04.

3.3.2 Coal Mining in the Glennies Creek Community Area

In the Glennies Creek Community Area, there are currently five coal mines in operation, four of which are open cut, see **Table 3.6**. The most recent change in the mining environment in the Glennies Creek Community Area was an extension of the Mt Owen coal mine to increase coal production in the Community Area by 2 million tonnes per year.[14]

Table 3.6
Coal Mines in the Glennies Creek Area

Coal Mine	Mine Type	Raw Production (Mt)	Proportion of Production (Including Proposed)
Glennies Creek Colliery	Underground	1.21	7%
Camberwell Coal Mine	Open Cut	3.91	22%
Rixs Creek Coal Mine	Open Cut	1.84	10%
Ravensworth East Coal Mine	Open Cut	1.98	11%
Mt Owen Coal Mine	Open Cut	7.42	42%
Proposed — Glennies Creek	Open Cut	1.35	8%
Total — Excluding Proposed		**16.36**	
Total — Including Proposed		**17.71**	**100%**

10 Ibid.
11 Australian Bureau of Statistics 2006, Mining Operations 2003-04, Cat. no. 8415.0, AusInfo, Canberra, pp. 29-30.
12 Hunter Valley Research Foundation 2006, Newcastle and the Hunter Region 2005-06: Primary Industry, p. 107.
13 Ibid., See Also, Australian Bureau of Statistics 2006, op. cit., pp. 29-30.
14 Hunter Valley Coal Corporation 2003, Environmental Impact Statement: Mt Owen Operations, p. 1.

Coal mines in the Glennies Creek area produce approximately 17.7 million tonnes of black coal annually, making up approximately 24% of coal production in the Singleton LGA and 6% of coal production in Australia.[15]

The introduction of the proposed Glennies Creak coal mine will provide an additional 1.35 million tonnes or coal to annual production in the area, an increase of 8% to the Glennies Creek area and increase of 2% to coal production in the Singleton LGA.

4 ECONOMIC ASSESSMENT OF THE PROPOSED GLENNIES CREEK OPEN CUT COAL MINE

The first step in the economic assessment involves the identification of the Project's scale and operational parameters, including:

- forecast ROM coal production in kilotonnes;
- clean coal production in kilotonnes;
- forecast operating costs;
- total capital costs;
- forecast employment;
- level of imports used in production;
- forecast average selling cost of coal; and
- forecast revenue.

To determine the broader impact of the operation, these parameters have been incorporated into a dynamic, multi-regional computable general equilibrium (CGE) model of Australia called TERM (The Enormous Regional Model).[16] This is a new multi-regional model, in the style of the Monash Multiregional Forecasting (MMRF) model.[17] Potentially, it can distinguish 166 sectors and the 8 states and territories. However, it is computationally convenient to aggregate the model with the choice of aggregation determined by the focus of the study. For the application reported in this paper, we have used a three-region aggregation of the master database with Hunter, the rest of NSW, and the rest of Australia.[18] The TERM model is explained in greater detail in **Appendix 1**.

15 Hunter Valley Research Foundation 2006, op. cit., p. 1.7. See Also, Australian Bureau of Statistics 2006, op. cit., pp. 29-30.
16 The model is described in M. Horridge, J. Madden, and G. Wittwer 2003, 'Using a highly disaggregated multi-regional single-country model to analyse the impacts of the 2002-03 drought on Australia', Centre of Policy Studies Working Paper G-141, available from http://www.monash.edu.au/policy/elecpapr.htm.
17 F. Naqvi, and M. Peter 1996, 'A Multiregional, Multisectoral model of the Australian Economy with an Illustrative Application', Australian Economic Papers, Vol. 35, pp. 94-113. Such models are commonly used by State and Territory Governments to assess the economic contribution of leisure activities — see NSW Treasury and The Centre for Regional Economic Analysis (University of Tasmania) 1997, The Economic Impact of the Sydney Olympic Games, Treasury Research Paper 97-10, Sydney.
18 In 'bottom-up' regional modelling, we treat each region within the database and theory of the model as a separate economy, with its own production functions, household demand systems and industry-level investment behaviour. 'Top-down' representations take the results from a given economy (in this case, South-East NSW) and distribute the outcomes using mostly exogenous shares of the economy's activity. For a description of the preparation of the master database see M. Horridge, J. Madden, and G. Wittwer 2003, op. cit.

Consistent with NSW Treasury guidelines, the total costs and benefits are expressed:

- as net present values over 9 years — the life of the project plus one year (i.e. the period in which all quantifiable costs and benefits fall); and
- using a 7% real discount rate, with estimates reflecting as current year expenditure equivalents (i.e. all 'net present values' are calculated from a 2007 base year).[19]

4.1 Revenue, Income and Welfare

The operation is expected to capture net revenues (i.e. total project revenue minus total project costs) as shown in **Figure 4.1**.

Table 4.1
Expected Costs and Revenue ($ million)

	YE June 2007	YE June 2008	YE June 2009	YE June 2010	YE June 2011	YE June 2012	YE June 2013	YE June 2014	YE June 2015	Total
Operating Costs	5.0	36.7	40.7	40.5	40.5	40.5	40.5	21.4	0	265.7
Capital Costs	0.5	5.0							0.5	6.0
Total Revenue	**0**	**50.4**	**52.7**	**50.2**	**50.2**	**50.2**	**50.2**	**25.8**	**0**	**329.7**
Net revenue	**-5.5**	**8.7**	**12.0**	**9.7**	**9.7**	**9.7**	**9.7**	**4.5**	**-0.5**	**58.1**

The mine's total net revenue would be $58.1 million. With a real discount rate of 7%, the underlying revenue stream reflects a project revenue NPV of $240.9 million.

There are wider flow-on benefits for the Hunter SD associated with the operation of the mine.

Operation of the mine would increase community income — i.e. gross regional product (GRP) and gross domestic product (GDP) — due to the operation of the mine and the revenue obtained from the export of coal. As shown in **Figure 4.1**, in percentage terms the impact is significant for the Hunter SD, relative to the national perspective.

While GRP/GDP estimates are often quoted as the ultimate economic impact, household expenditure (i.e. aggregate consumption) is considered the best indicator of overall economic welfare:

- Through to 2015, the Hunter region is expected to average $38.8 million per year higher household expenditure than would have otherwise been expected, and an extra $40.0 million per year for all of NSW. This additional income is offset in part by a decline in household welfare of $21.8 million per year in the rest of Australia (reflecting the attraction of economic activity to Glennies Creek from elsewhere in the economy).
- In NPV terms, assuming a real discount rate of 7%, the above represents $253.9 million and $250.5 million in extra household expenditure for the Hunter region and all of NSW respectively, and a decline in household expenditure of $134.6 million for the rest of Australia. Therefore, in aggregate, the national NPV of additional welfare created because of the operation of the mine is forecast to be $115.9 million.

Figure 4.1
Gross Regional/Domestic Product (% change)

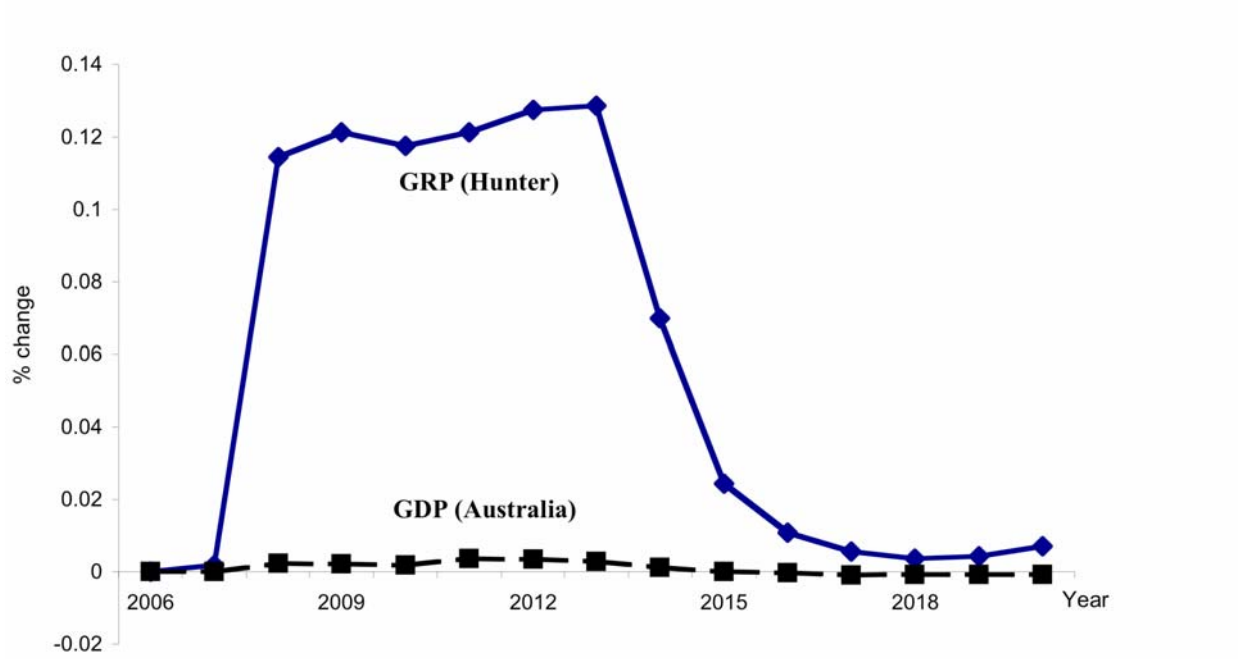


Table 4.2
Economic Impacts of the Proposed Glennies Creek Open Cut Coal Mine ($ million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Hunter Region	0.6	47.7	53.3	51.1	54.8	59.6	62	26.9	-7.1
Rest of NSW	-0.5	-12.5	-18.2	-21.1	11.7	11.1	7.2	12.7	20.9
Rest of Australia	-1.1	-16.8	-19.2	-17.4	-27.1	-33.6	-37.7	-28.5	-15.1
Total	**-1**	**18.4**	**15.9**	**12.6**	**39.4**	**37.1**	**31.5**	**11.1**	**-1.3**

4.2 Employment

Employment is affected by demographic factors, the wages available in the market and the scale of economic activity.

As shown in **Figure 4.2**, during the mine's operations employment and real wages would be stimulated, but after the mine ceases operations aggregate employment would actually be negative until real wages adjust to a sustainable equilibrium level.

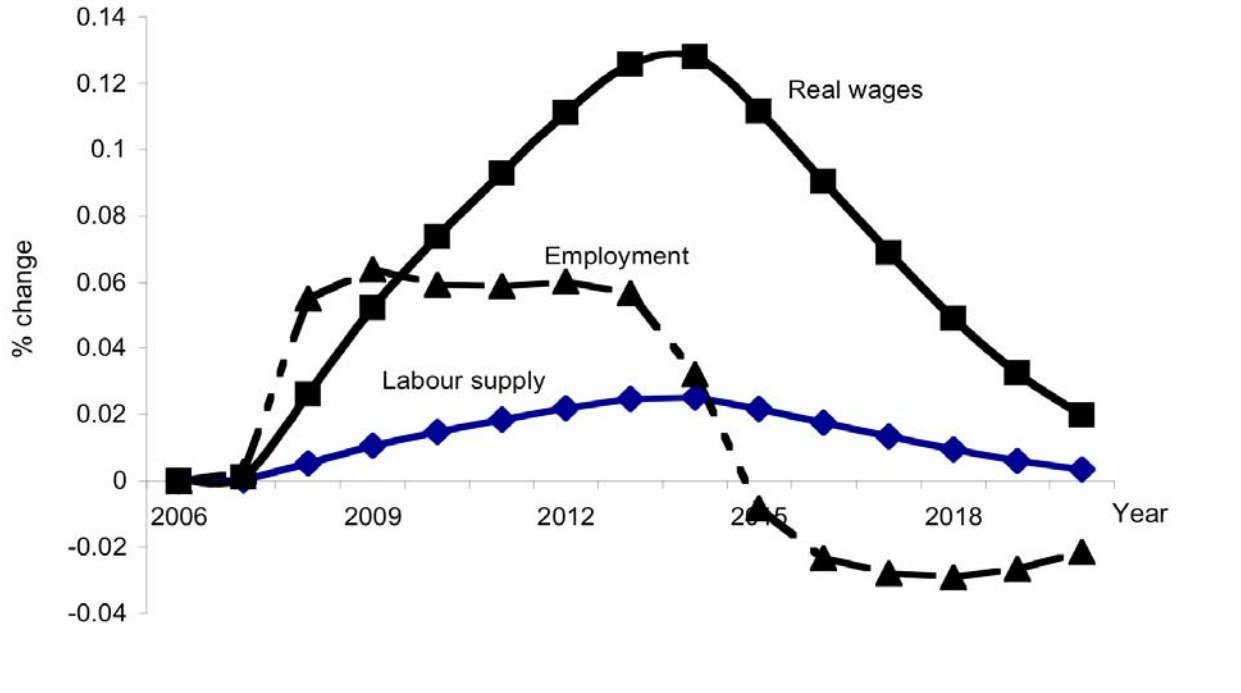
Looking at full time employment (FTE) impacts associated with the operation of the mine, **Table 4.3** shows that the Hunter region initially benefits, but the increased real wages has a negative effect after 2014 as the mine ceases operation.

[19] NSW Treasury 1999, *Economic Appraisal: Principles and Procedures Simplified*, TPP 99-1, NSW Government, Sydney.

Table 4.3
Employment Impacts (FTE) as a Result of the ICO Project

	2007	2008	2009	2010	2011	2012	2013	2014	2015	Avg
Hunter Region	7	140	164	153	153	158	150	86	-23	110
Rest of NSW	-1	-24	-41	-57	202	184	137	109	100	68
Rest of Australia	-5	-55	-82	-80	-94	-116	-130	-107	-62	-81
Total	**0**	**61**	**41**	**15**	**261**	**226**	**158**	**88**	**15**	**96**

Figure 4.2
Changes in Labour and Wages as a Result of the ICO Project (% change)



However, during the life of the mine, an average of 110 FTE jobs will be created in the Hunter, and an additional 68 in the rest of NSW. These are partially offset by a forecast decline of 81 FTE jobs outside of NSW. The net impact is an average of 96 additional FTE jobs per year during the mine's operation.

5 ENVIRONMENTAL AND HERITAGE IMPACTS

This chapter highlights the social impacts of the proposed Glennies Creek Open Cut Coal Mine. Social impacts have been considered in two forms, including:

- environment and heritage impacts, including:
  - noise pollution;
  - air quality;

  - visual impacts;
  - surface and groundwater;
  - flora and fauna; and
  - Aboriginal heritage;
- impacts on community services, including;
  - primary education;
  - childcare services;
  - garbage and recycling services;
  - school bus services;
  - public road and rail services;
  - emergency services;
  - the Glennies Creek Community Hall; and
  - local health services.

The environmental and heritage impacts of the proposed Glennies Creek Open Cut Coal Mine have been detailed in this section and the impacts on community services are detailed in Section 6.

5.1 Noise Pollution

Nature of Impact

Heggies Australia Pty Ltd completed a specialist consultant assessment on noise and blasting. The criteria that would be used to establish Noise Impact Assessment zones are shown in **Table 5.1**.

Table 5.1
Project Noise Impact Assessment Zones

Assessment Criteria	**Project Specific Criteria**	**Noise Management Zone**		**Noise Affectation Zone**
		Marginal	**Moderate**	
Intrusive LAeq(15minute) Amenity LAeq(period)	Rating background level plus 5dB(A) INP based on existing industrial level	1 to 2dB(A) above project specific criteria	3 to 5dB(A) above project specific criteria	>5dB(A) above project specific criteria
Note 1: Daytime 7:00am to 6:00pm, Evening 6:00pm to 10:00pm and Night-time 10:00pm to 7:00am.				

The noise assessment identified the following impacts.

- One property, Residence 32 (**Figure 3.1**), would experience noise impacts greater than 5dB(A) above the Noise Assessment Criteria

- A second residence, Residence 36, would experience noise impacts greater than 5dB(A) above the Noise Assessment Criteria during the day and between 1dB(A) and 5dB(A) above the Noise Assessment Criteria during the evening.
- Four residences (Residence 5, 6, 7 and 8) would experience noise impacts between 1dB(A) and 5dB(A) above the Noise Assessment Criteria during the evening.
- The impact on private vacant land includes:
  - three properties would experience marginal noise levels above the Noise Assessment Criteria (between 1dB and 2dB) during the daytime only;
  - two properties would experience moderate noise levels above the Noise Assessment Criteria (between 3dB and 5dB) during the daytime and evening; and
  - two properties would experience noise levels above the set threshold (greater than 5dB) during the daytime and evening.

Quantifying Noise Impacts

Economic noise research has sought to quantify the potential benefits of reducing noise. This research has largely focused on the reduction in perceived effects of noise exposure. The benefits are usually expressed in terms of willingness to pay for/accept improvements/deterioration in the noise environment.

While there is no (direct) market for noise, different noise levels have an affect on prices in other markets, in particular on the price for housing. As people are willing to pay for quiet, they trade money for noise 'indirectly' through the housing market (e.g. rental and sales prices). Take two otherwise identical properties that differ only in the amount of noise. Since people experience the adverse effects of excessive noise, the noisy house/apartment will attract a lower rental payment or lower sale price than the quiet one. The difference revealed in such transactions between the prices of the noisy and quiet place can be used, after controlling for other effects, to calculate per decibel value of noise. Estimates using this technique vary considerably:

- while somewhat dated, a study of noise in Newcastle (i.e. a regional city) found a Noise Depreciation Sensitivity Index (NDSI) of 0.2% per dB.[20] NDSI reflects the average fall in the price of noise-affected land for every decibel increase in noise (normally above some minimum threshold);
- in 1995 the NSW EPA's assessment of a number of noise value studies concluded that the mean for more reliable estimates is approximately 0.25% per dB;[21] and
- a more recent summary of the literature by Morrison found that Australian NDSI estimates range from 0.2% to 1.8%, and overseas studies report NDSIs from 0.21% to 1.26% with a mean of 0.71%.[22]

20 G. McCalden and W. Jarvine 1977, Trucks in Suburbs: The Social and Economic Impacts of Bulk Road Haulage on Urban Communities, DATEC Cooperative, Newcastle.
21 Cited in M. Morrison 2002, 'Valuing noise impacts using hedonic pricing and stated preference methods: What does the evidence tell us?' Acoustics Australia, vol. 30, no. 2, pp. 55-60.

While most of these studies calculate the willingness to pay from a deviation from some base level of background noise, a simplifying approach endorsed by the European Commission's Working Group on Health and Socio-economic Aspects is to apply the estimates (e.g. the NDSI per dB change) at all initial noise levels, and regardless of the size of any change brought about.[23]

In this case, the forecast noise assessments in years 1, 3 and 6 were compared to the background levels for both day and night. **Table 5.2** shows the cumulative forecast increase in noise levels across all properties, which are forecast to experience an increase in noise levels.

Table 5.2
Cumulative Increases in Noise (dB(A))

Year	Day	Evening	Night	Average
1	64	42	2	36
3	39	38	3	27
6	32	26	3	20

Note that the noise impacts in adverse winter have not been included in the analysis as they are intermittent events. It is expected that the inclusion of the adverse winter noise impacts would have a negligible impact on the overall value of noise impacts.

Assuming a NDSI of 0.25% per the average noise level identified in the **Table 5.2**, and an average property value of $300 000 equates to a cost of $27 000 in year one. This expected decline in property value is used as a proxy for the capitalised cost of noise.

As noise levels are forecast to fall in years 3 and 6, the capital costs are forecast to fall to $20 250 and then $19 500. Again, at the completion of the mine's operations noise levels will fall to pre-mine levels and so the capital costs of $19 500 will fall away. The fall in capital costs are reflected as benefits in those years (see **Table 5.3**).

Table 5.3
Value of Noise Impacts

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cost	$27000	0	0	0	0	0	0	0	0
Benefit	0	0	$6750	0	0	$7500	0	0	$12750

Using a 7% discount rate the NPV of the noise costs is negative $3 489, which can be rounded to a zero impact when expressed in millions of dollars.

22 Ibid.
23 Working Group on Health and Socio-economic Aspects 2003, Valuation of Noise: Position Paper, European Commission, Brussels, 4 December.

5.2 Air Quality

5.2.1 Dust from Blasting

Nature of Impact

Holmes Air Sciences Pty Ltd completed a specialist consultant assessment of air quality, including dust from blasting. The criteria for the air quality assessment included:

- 50 $\mu g/m^3$ for 24-hour average PM_{10} for the Project considered alone;
- 150 $\mu g/m^3$ for 24-hour average PM_{10} for the Project considered with the contributions of other sources;
- 30 $\mu g/m^3$ for annual average PM_{10} due to the Project and other sources;
- 90 $\mu g/m^3$ for annual average TSP concentrations due to the Project and other sources;
- 2 g/m^2/month for annual average deposition (insoluble solids) due to the Project considered alone; and
- 4 g/m^2/month for annual average predicted cumulative deposition (insoluble solids) due to the Project and other source levels.

The assessment found that over the life of the Project:

- three residences, Residence 32, 33 and 42 would be impacted by dust levels exceeding the 24-hour average PM10 assessment criterion of 50 $\mu g/m^3$ for the Project alone in Years 1 and 3;
- two residences, Residences 32 and 36 would be impacted by dust levels exceeding the annual average 2 g/m^2/month (insoluble solids) deposition level assessment criteria from the Project alone in Year 1; and
- two residences, Residences 32 and 33 would be impacted by dust levels exceeding the annual average PM10 concentration of 30$\mu g/m^3$ assessment criteria from the Project and other sources.

Overall, was noted that emissions from the ICO Project make a small contribution to the overall dust levels.

Quantifying Airborne Dust Impacts

Worldwide epidemiological studies have shown that increases in particle pollution are associated with adverse health outcomes, including:

- increases in daily mortality;
- increases in hospital admissions and emergency room attendances (particularly in relation to respiratory and cardiovascular disease); and
- exacerbation of respiratory symptoms and asthma.[24]

24 See NSW EPA 2002, Regulatory Impact Statement: Proposed Protection of the Environment Operations (Clean Air – Domestic Solid Fuel Heaters) Regulation 2002, Sydney, p. 3.

People shown to be susceptible to the effects of particle pollution include the elderly; those with existing respiratory disease, such as asthma and bronchitis; people with cardiovascular disease; people with infections such as pneumonia; and children.

The NSW EPA notes Australian epidemiological studies with the following findings.

- Sydney, a 25μg/m^3 increase in PM_{10} was found to be associated with a 2.6% increase in daily mortality.
- Brisbane, an increase in PM_{10} of 10μg/m^3 was associated with an increase in daily mortality of between 1.2% and 1.3%.
- Melbourne, a statistically significant association between asthma attendances and days with high levels of particles has been observed.
- Sydney, increases of 3% for chronic obstructive pulmonary disease and 2.5% for heart disease have been found for an increase in PM_{10} of approximately 25μg/m^3.[25]

The National Environment Protection Council notes that there are no safe threshold concentrations dust with a diameter of 10μm or smaller (PM_{10}); even low levels may adversely affect human health.[26] The quantity of total emissions across all properties is shown in the **Table 5.4**.

Most epidemiological studies have concentrated on the short-term, or acute, health effects arising from exposure to particulate matter (e.g. short-term respiratory problems and asthma attacks). Several studies however have found an association between long-term exposure to particulate matter and adverse health effects, although this is still an area of much uncertainty.

There is no accepted value that can be placed upon dust emissions in a non-urban setting.[27] As a result, no dollar value has been ascribed to the costs associated with dust emissions.

Table 5.4
Predicted Dust Emissions

	2008	2009	2010	2011	2012	2013	2014
Total particulate emissions (kg) ('000)	1371	1371	1285	1285	1285	1285	344
Particulate emissions PM_{10} and smaller (kg) ('000)	358	358	335	335	335	335	90

25 Ibid.
26 National Environment Protection Council 1998, Ambient Air Quality Final Impact Statement for the National Environment Protection Measure, NEPC, Adelaide.
27 The NSW EPA has previously estimated the avoided health costs per tonne reduction in PM_{10} emissions to be approximately $33 300 in the Sydney area. However, this estimate is not appropriate given the differences in population density.; the population density of the Sydney area is on average 329.1 per sq. km compared to the population density of the Glennies Creek area of 2.9 per sq. km.

5.2.2 Greenhouse Gas Emissions

Nature of Impact

Holmes Air Sciences Pty Ltd completed a specialist consultant assessment of air quality, including greenhouse gas emissions.

The assessment found that the Carbon Dioxide emissions released during the mining operations are small compared to the Carbon Dioxide emissions released during the combustion of the coal proposed for extraction. Forecast greenhouse gas emissions directly associated with the mining operations are shown in **Table 5.5**. It is unlikely that there will be any significant greenhouse gas-related issues from blasting emissions.

Table 5.5
Predicted Greenhouse Gas Emissions

	2007	2008	2009	2010	2011	2012	2013	2014
GhG emissions (T)	0	33000	33000	33000	33000	33000	33000	4411

Note that there were two estimations of the predicted greenhouse gas emissions. For 2008, one estimation was equal to 33 000 GhG and the second estimation was equal to 43 500 GhG. For the purposes of the modelling we have used the initial estimate of 33 000 in 2008. The difference to the modelling in using the second estimation is expected to be marginal.

Quantifying Greenhouse Gas Impacts

Those parties facing the prospect of future greenhouse gas emission constraints have strong incentives to focus on opportunities for accessing low cost abatement. This can entail a combination of in-house emission reduction effort and, under emission trading arrangements, paying others to undertake abatement on their behalf. Opportunities for trading under the Kyoto Protocol, have led to development of forward markets that reflect the expectations of buyers and sellers about the costs and need for abatement in the future. Recent trading history of higher quality Kyoto-compliant certificates suggests a range of between US$3 and US$7 per tonne, with a weighted average value of around US$6 per tonne. We note however, that some Australian State authorities are using estimates of A$15 per tonne.

Assuming an average abatement cost of A$8 (i.e. US$6 at an exchange rate of 0.75 cents), the costs of the greenhouse gas emissions is shown in the **Table 5.6**. Assuming a discount rate of 7%, the NPV of greenhouse gas emissions is forecast to be $1.2 million.

Table 5.6
Cost of Greenhouse Gas Emissions ($M)

	2007	2008	2009	2010	2011	2012	2013	2014
GhG abatement costs	0	0.3	0.3	0.3	0.3	0.3	0.3	0.0

5.3 Visual Impacts

R.W. Corkery and Co. Pty. Limited completed the specialist consultant assessment on visual impacts. The visual status was assessed based on three criteria:

- full visibility of the entire Project Site;
- partial visibility, this may be visibility of only a portion of the Project Site, or alternatively, visibility of only the waste rock emplacement; and
- no visibility.

The assessment found that the degree that an individual is impacted by alterations to the visual landscape generally depends on the individual and the personal values that they place on the various aspects of that landscape. Taking this into account and the fact that the Project Site is adjacent to existing mining operations, the impact of the proposal on the existing visual amenity of the area is not considered to be significant.

5.4 Surface Water and Groundwater

5.4.1 Surface Water

Nature of Impact

PSM Australia Pty Ltd completed a series of specialist consultant assessments of surface water impacts. The scope of the assessment included the following components.

- Surface water assessment.
- Dirty water assessment.
- Final void water assessment.
- Drainage structures assessment.

The surface water assessment found that at the completion of mining it is estimated that the following volumes of dirty and clean water would report to the following destinations.

- 571m^3/day of dirty water to the proposed open cut final void prior to backfilling.
- 74m^3/day of dirty water to the Camberwell North Pit sump.
- 109m^3/day of clean water to natural drainage.

The dirty water reporting to the Camberwell North Pit sump and the clean water reporting to natural drainage would report to their respective destinations irrespective of the ICO Project. However, the 571m^3/day of dirty water that would report to the proposed open cut final void is currently clean water in the form of rainfall or surface reserves that reports to natural drainage. This water could be used for other purposes if not for the ICO Project.

Quantifying Surface Water Impacts

Using forecast surface water usage, valued at $200 per ML, and a real discount rate of 7%, the cost of water lost to natural drainage is $0.2 million in net present value.

5.4.2 Groundwater

Nature of Impact

Australasian Groundwater and Environmental Consultants Pty Ltd completed a specialist consultant assessment on groundwater impacts. The scope of the assessment included the following objectives.

- Assess potential cumulative impact of the proposal and other existing and approved mines (including the Camberwell, Rix Creek, Ashton, Glendall, Ravensworth East and Mount Owen coal mines) on groundwater.
- Delineate the boundary of the depressurisation trough associated with advance dewatering and mining.
- Assess the expected inflow of groundwater to the mine.
- Assess the impacts of any final landform on the groundwater regime.
- Assess the highest groundwater table at the Project Site.

The assessment found that simulated inflows to the proposed Glennies Creek Open Cut Coal Mine varied between approximately 40m^3/day and 260m^3/day, see **Table 5.7**.

Table 5.7
Groundwater Assessment Results

Year	Simulated Inflows (m^3/day)
2008	44
2009	61
2010	176
2011	261
2012	113
2013	44

However, the specialist consultant report identifies that groundwater salinity from the Permian aged aquifers is between two and three times too saline for agricultural use. Groundwater from the Permian aquifers has a conductivity of between 7 280µS/cm to 10 280µS/cm. The maximum conductivity for stock water is approximately 5 000µS/cm.

On this basis, it can be assumed that the groundwater reporting to the final void would be unlikely to have a significant impact on useable groundwater stocks.

5.5 Flora and Fauna

5.5.1 Flora

Geoff Cunningham Natural Resource Consultants Pty Ltd completed the specialist consultant assessment on the impacts of the ICO Project on local flora. The methodology for the flora assessment included a total of 39 sample sites from which the variation in species density and composition was determined. All species of tree, shrub and ground cover present on the Project Site were recorded. A further 17 sample sites within the northern biodiversity offset area and four sample sites within the Glennies Creek biodiversity offset area were also assessed to allow a comparison between the Project Site and the biodiversity offset areas.

The ICO Project Site is inhabited by several flora communities, see **Table 5.8**. There is a large area of the Narrow-leafed Ironbark, Spotted Gum and Grey Box Community that span over the Project Site and the biodiversity offset area. There is a relatively small area of Bull Oak community within the Project Site and communities of similar species — Swamp Oak and River Oak— present in the Northern Biodiversity Offset Area.

Table 5.8
Flora Communities within the Project Site and Biodiversity Off-set Areas

Community	Project Site		Biodiversity Off-set Areas[1]
	Total Area[1]	Area to be disturbed[1]	
Tussock Grasslands	32ha	8ha	64ha
Narrow-leaved Ironbark – Spotted Gum – Grey Box Community	117ha	70ha	10ha
Bull Oak Forest Community	22ha	—	—
Swamp Oak Community	—	—	35ha
River Oak Riparian Community	—	—	11ha
Disturbed / Rehabilitated land	151ha	57ha	—
Note 1: Areas are approximate only			

Mitigation strategies, including establishing biodiversity offset areas adjacent to the Project Site, were identified by the specialist consultant and are outlined in this report in Section 7.3. Given the adoption of these mitigation strategies, along with the specialist consultant's identification that no threatened or endangered species are present on the Project Site, it is unlikely that the ICO Project will have a significant impact on flora in the Glennies Creek area.

5.5.2 Fauna

Countrywide Ecological Service (CES) completed a specialist consultant assessment on the impacts of the ICO Project on local fauna. The methodology for fauna assessment on the ICO Project included an assessment of potential impacts (for example, the survival of the species) on identified threatened and vulnerable species. There are a number of threatened and vulnerable species of fauna on the ICO Project Site, see **Table 5.9**.

Table 5.9
Fauna Species Identified within the Project Site

	Number of species			Threatened species
	Native	Exotic	Total	
Amphibians	9	0	9	—
Birds	42	1	43	Grey-crowned Babbler
Mammals	18	6[1]	24	Eastern Freetail Bat Eastern Bent-wing Bat Brush-tailed Phascogale Grey-headed Flying Fox
Reptiles	11	0	11	—
Note 1: Two exotic species, the European Red Fox and the Feral Cat, are also listed as Key Threatening Processes				

The five threatened species listed above were identified as potentially being impacted by the ICO Project. The impacts for each threatened species includes the following.

- *Grey-crowned Babbler* — the proposed activity may result in the removal of native vegetation may affect the observed family of Grey-crowned Babblers.
- *Eastern Freetail Bat* — the proposed activity is unlikely to significantly affect the availability of foraging habitat for this species in the area around the Project Site.
- *Eastern Bent-wing Bat* — the proposed activities do not impact upon any cave directly or indirectly. The project is thus unlikely to impact upon any viable local populations of this species.
- *Brush-tailed Phascogale* — the proposed activities may remove some of the exclusive home range of the species. The extent of the impact on the species will depend on the timing of the clearing and the effectiveness of rehabilitation.
- *Grey-headed Flying Fox* — considering the mobility of this species it is unlikely the removal of the open woodland foraging habitat would significantly impact on this species life cycle.

Mitigation strategies, including establishing two biodiversity offset areas beyond the Project Site, were identified by the specialist consultant and are outlined in this report in Section 7.3. Given the adoption of these mitigation strategies, it is unlikely that the ICO Project will have a significant impact on fauna in the Glennies Creek area.

5.6 Aboriginal Heritage

HLA Envirosciences Pty Ltd completed a specialist consultant assessment of Aboriginal Heritage within the Project Site. The methodology for Aboriginal archaeological sensitivity included an assessment of the following three criteria.

- The presence of unknown surface archaeological materials.
- The probability of undetected surface archaeological materials.
- The probability of subsurface archaeological materials.

Table 5.10 shows the details the results of the Aboriginal heritage assessment.

Table 5.10
Aboriginal Heritage — Archaeological Sensitivity of Areas Examined

Low or Nil Archaeological Sensitivity	Moderate Archaeological Sensitivity	High Archaeological Sensitivity
The entire study area aside from those outlined as of high sensitivity	No areas were considered of moderate sensitivity	19 areas (GC1 to GC19) are considered of high sensitivity

Of the nineteen areas found to be of high archaeological sensitivity, all cases were either artefact scatters situated on disturbed or heavily eroded soils. These areas have been highlighted as of high sensitivity. However, it should be noted that this allocation of sensitivity was purely based on the fact that Aboriginal objects are protected under the *National Parks & Wildlife Act (1974)*, regardless of their specific location. No evidence was found to suggest these sites were surface manifestations of a larger buried archaeological deposit.

Mitigation strategies for the extent of high archaeological sensitivity Aboriginal artefacts were identified by the specialist consultant and are outlined in this report in section 7.3. Given the adoption of these mitigation strategies, it is unlikely that the ICO Project will have a significant impact on Aboriginal heritage in the Glennies Creek area.

6 IMPACTS ON COMMUNITY SERVICES

The proposed Glennies Creek Open Cut Coal Mine has been assessed on the basis that it may have impacts on the following Glennies Creek community services.

- Primary education.
- Childcare services.
- Garbage and recycling collection services.
- School bus services.
- Public roads.
- Emergency services.
- The Glennies Creek community hall.
- Local health services.

Each of these services is detailed in the sections below.

6.1 Primary Education

The Mt Pleasant Public School is the sole primary education provider in the Glennies Creek Community Area (**Figure 2.1**). Established in 1880, Mt Pleasant Public School has been operating with a 3-teacher structure with 1 administration assistant for more than 10 years. Currently there are 58 students enrolled, of which the majority come from the Mt Pleasant catchment area - including the Glennies Creek Community Area. The school currently has the following facilities.

- Two fixed class rooms.
- One portable class room.
- One fixed library.
- One portable administration office.

There are 10 students in attendance at the Mt Pleasant Public School from the Glennies Creek Community Area, with an additional 3 potential students (nearing primary school age).

There are several funding thresholds that the Mt Pleasant Public School may be affected by if students were to leave the Glennies Creek area, including:

- less than 55 students — potential reduction of 1 full-time teacher to 1 part-time teacher;
- less than 55 students — potential loss of 1 portable classroom; and
- less than 52 students — potential loss of full-time administration assistant.

The Mt Pleasant Public School currently has 58 students and would potentially lose funding if 4 students left. Additional to this point is the issue of future growth in the area; the catchment zone for the school has continued to be impacted by coal mines. As a result of the Mt Owen coal mine, two children left the Mt Pleasant Public School. Not only is there a larger presence of mines but a decline in the number of new families that come to the area as a result of the mines.

The number of students, if any, who may leave the Glennies Creek area as a result of the ICO Project cannot be determined. However, if four students left the school as a result of the Project, there could be a potential impact on the provision of school services.

6.2 Childcare Services

There are two main childcare facilities that service families in the Glennies Creek area — Mt Olive Mobile Pre-School and Toybox (upper Hunter children's mobile outreach service).

6.2.1 Singleton Mobile Pre-School

The Singleton mobile pre-school runs weekly pre-school care every Thursday from the Mt Olive Hall (**Figure 2.1**). On this day, the two staff from Singleton take equipment to the Mt Olive Hall where parents bring their children for care between 9am and 3pm.

The Mt Olive pre-school provides services to families in Glennies Creek, Mt Olive, Lake St Clair and to some degree the Singleton township, although other services are provided in Singleton. The Department of Community Services funds the organisation, with additional funding in fees of $25 per day per child.

The Mt Olive service has the capacity for 16 children, however at present only 10 of these positions are currently occupied. On advice from the acting Director of the Singleton Mobile Preschool, a revaluation of services in the Glennies Creek Community Area would be undertaken if the number of children enrolled in the service falls below 8 children.

The number of children who may leave the Glennies Creek Community Area as a result of the Project cannot be determined. However, if four students left the school as a result of the Project, there could be a potential impact on the provision of school services.

6.2.2 Upper Hunter Children's Mobile Outreach Service

The upper Hunter children's mobile outreach service, also known as 'Toybox' is a children's playgroup service that operates throughout the 5 Shires of the upper Hunter Valley, servicing 312 children at 19 rural venues each fortnight. Toybox provides a playgroup service once a fortnight at the Mt Olive Hall.

The Mt Olive service provides playgroups to families in Glennies Creek, Mt Olive and Singleton. The organisation receives approximately $160 000 in funding from the Department of Community Services, with additional funding in fees of $2 per family each fortnight for the cost of hiring the hall facilities.

Toybox currently has 18 children enrolled in the Mt Olive service, for which a proportion of families are from Singleton. The Director of Toybox has advised that services are expected to service an average of 6 children per fortnight to remain viable. If a service is continually running under this average then the continuation of the service may be subject to a review.

Currently, an average of 12 children per fortnight from within the ICO acquisition and impact zones may leave the service as a result of their property being acquired for a potential impact on the continued provision of this service to result. The number of children who may leave the Glennies Creek Community Area as a result of the Project can not be determined. However, it is noted that attendance would be required to fall by 12 children before the service would come under review. This is considered to be unlikely. On this basis it can be assumed that the ICO Project will not have a significant impact on the continued running of the Toybox service.

6.3 Garbage and Recycling Services

Garbage and recycling services are provided by the Singleton Shire Council and are provided to all households within the Singleton LGA regardless of location within the Shire. On this basis, it can be assumed that the ICO Project is unlikely to have a significant impact on garbage and recycling services in the Glennies Creek area.

6.4 School Bus Services

Blue Ribbon bus service is the sole operator of school bus services in the Singleton LGA. There are two services that run through Glennies Creek. The services include:

- Singleton to Singleton Service — through Camberwell, Glennies Creek and Falbrook; and
- Singleton to Mt Pleasant — through Camberwell, Glennies Creek and Falbrook to the Mt Pleasant Public School **(Figure 2.1)**.

Currently the school bus routes service 35 to 40 school children each. There would need to be a substantial drop in the number of children who use the services to impact the continuous running of the routes. The Ministry of Transport annually review bus services for their effectiveness and cost effectiveness.

The Director of Blue Ribbon Bus Services advised that there had been a small drop in numbers on the two routes as a result of the introduction of the Mt Owen and Lemington Coal Mines. However, the reduction in students did not result in the reduction in either bus service.

On this basis, it can be assumed that the ICO Project is unlikely to have a significant impact on school bus services in the Glennies Creek Community Area.

6.5 Public Roads

There are two possible access routes to the Project Site, including:

- from the Singleton region via Bridgman Road, Stony Creek Road and Middle Falbrook Road; and
- from the New England Highway via Glennies Creek Road, Nobles Lane and Middle Falbrook Road.

The estimated additional vehicle movements on Middle Falbrook Road as a result of the ICO Project are shown in **Table 6.1**.

Table 6.1
Estimated Vehicle Movements During Mining Operations

Activity	Vehicle Type	Estimated Daily Vehicle Movements		
		Site Establishment	Mining Operations	
			Average	Maximum
Equipment / supplies deliveries	Semi-trailer, rigid truck	0 to 6	2 to 4	4
Workforce[7]	Passenger vehicles	Up to 40	80*	120
Miscellaneous	Various light vehicles	-	4	10
TOTAL	**Heavy**	**6**	**4**	**4**
	Light	**40**	**84**	**130**

One round trip = 2 movements
Assumes 365 days per year operations
*Assumes 1.5 employees/vehicle

Existing average vehicle movements on Stony Creek Road have been measured at 550 movements per day. The Project is expected to add an additional average of 88 movements per day for an estimated average of 638 vehicle movements per day on this road. This anticipated traffic volume is well within the RTA criteria of >6 000 per day for a road such as Stony Creek Road.

On this basis, it can be assumed that the ICO Project is unlikely to have a significant impact on public roads in the Glennies Creek area in the long term. There may be some short to medium term impacts on the two access roads during construction of the ICO Project. Also, there will be public road closures for blasting, however, a number of mitigation strategies have been proposed to alleviate pressure of closures from blasting on public roads. Given the implementation of an approved traffic management plan and mitigation strategies as outlined in Section 7.3, it is unlikely that the ICO Project will have a significant impact on fauna in the Glennies Creek area.

6.6 Emergency Services

Ambulance and Police services are provided from Singleton and service the entire Singleton LGA, including the Glennies Creek Community Area.

The Rural Fire Service is based in the area around Glennies Creek. The Rural Fire Service is a volunteer emergency service and draws on members of the community for its sustainability. There may be a potential impact on the Rural Fire Service if a volunteer fire fighter who currently lives in the impact or acquisition zones of the project and leaves the area as a result.

Also, there may be an impact on public road access for emergency services around the Project Site as a result of road closures for blasting. As part of the Blast Management Plan, blast monitors will be stationed on Stony Creek Road and will be able to suspend blasts to allow emergency vehicles to pass.

On this basis, it can be assumed that the ICO Project is unlikely to have a significant impact on emergency services in the Glennies Creek Community Area.

6.7 Glennies Creek Community Hall

The Glennies Creek Community Hall (see **Figures 2.1** and **6.1**) is currently not in use as a result of issues with public liability insurance and associated costs. Currently, only one person sits on the management committee, with a sole role to continue maintenance of the Glennies Creek Community Hall.

On this basis, it can be assumed that the ICO Project is unlikely to have a significant impact on the Glennies Creek Community Hall. However, the rejuvenation of the hall and assistance with funding could be a mitigation strategy for ICO to consider as a means to contributing to the Glennies Creek community.

6.8 Local Health Services

The Singleton Hospital provides health services to the Glennies Creek community. The hospital is situated in Singleton and services the entire Singleton LGA. The Singleton Hospital has 53 beds and provides a number of health services, including:

- emergency services;
- allied health services — including physiotherapy and social work; and
- outreach services — including orthopaedic, ophthalmology, personal hygiene and home and community care.

The Singleton Hospital treat a number of patients as a result of coal mine accidents and treat a number of patients for asthma, an identified issue in the Singleton LGA.

As the Singleton Hospital services the entire Singleton LGA and numerous patients each year, it is unlikely that the ICO Project would have a significant impact on the Singleton Hospital and local health services in the Glennies Creek Community Area.

7 OVERALL SOCIO-ECONOMIC ASSESSMENT

Benefit-cost analysis (BCA) is the most comprehensive of economic appraisal techniques, qualifying in money terms all the major costs and benefits of an option. The key strength of BCA is that it considers, on a consistent basis, the benefits and costs of alternative projects. Thus the outcomes for a range of options are translated into comparable terms that facilitate evaluation and decision-making.

It is well recognised however, that it is not possible to always quantify all – or even most – costs and benefits associated with a given alternative. This is particularly the case in areas of health, education, social welfare, etc where the outputs are often not readily measurable in monetary terms. In these situations, Cost Effectiveness Analysis is an alternative approach to economic appraisal. It compares the costs of different options with the same or similar outputs, and is useful where the major benefits cannot be valued in money terms.

Figure 7.1
The Glennies Creek Community Hall

Note: This Figure is presented in colour on the Project CD

Nevertheless, a robust assessment of options requires all costs and benefits to be clearly described even if quantification and valuation are difficult. In terms of the analysis, we would expect, based on the scope of the options, the project would be comparing:

- benefits and costs which can be quantified and valued — for example, the benefits of a functioning mine in terms of welfare and income; and
- benefits and costs which cannot be quantified, but a qualification can be made on the extent of the impacts — for example, impacts on garbage and recycling collection services cannot be quantified, yet it can be determined that there will be no significant impacts on garbage and recycling collection services as a result of the ICO Project.

7.1 Socio-economic Assessment

Benefit-cost analysis has been used as the basis for the overall socio-economic assessment of the proposed Glennies Creek Open Cut Coal Mine, **Table 7.1** shows the results. The assessment has been undertaken for the Hunter statistical division, although it is important to note that greenhouse gas emissions impact the environment more broadly.

The socio-economic assessment concludes that the quantifiable net impact of the ICO Project is $252.5 million, which is made up of the economic benefit of the operation of the mine valued at $253.9 million and the environmental costs of greenhouse gas emissions and surface water, totalling $1.4 million. Most of the non-quantified impacts are considered significant and do not change the quantified estimate. The impact of air quality (i.e. dust) cannot be determined (see Section 5.2.1).

For those social impacts that cannot be quantified a qualitative assessment has been completed, with a value judgement on the extent of the social impacts. From this assessment, it can be concluded that no unquantifiable social impacts would have a significant impact on the Glennies Creek Community as a result of the ICO Project.

There may be some localised impacts (for example, noise, dust, visual amenity, public road access and Aboriginal heritage) that will adversely impact specific landowners and other groups, but these impacts can be ameliorated with the mitigation strategies outlined in the Environmental Assessment and summarised in Section 7.3.

7.2 Sensitivity Analysis

As many uncertainties surround the values of the model parameters and assumptions, particularly with respect to cost estimates, it is important to determine the robustness of the standard set of results.

Table 7.1
Socio-economic Assessment Criteria

Criteria	Valued Impacts (NPV@7%) ($ Million)	Qualitative Assessment
Economic Impacts		
Welfare	$253.9	—
Environmental and Heritage Impacts		
Noise pollution	$0.0	—
Air Quality — Dust from Blasting	—	Value cannot be determined[2]
Air Quality — Greenhouse Gas	($1.2)	—
Visual impacts	—	No Significant Impact
Groundwater	—	No Significant Impact
Surface Water	($0.2)	—
Flora and Fauna	—	No Significant Impact[1]
Aboriginal Heritage	—	No Significant Impact[1]
Impacts on Community Services		
Primary Education	—	No Significant Impact
Childcare Services	—	No Significant Impact
Garbage and Recycling Collection	—	No Significant Impact
School Bus Services	—	No Significant Impact
Public Road	—	No Significant Impact[1]
Emergency Services	—	No Significant Impact[1]
Glennies Creek Community Hall	—	No Significant Impact
Local Health Services	—	No Significant Impact
Total	***$252.5***	

Note 1: If identified mitigation strategies are implemented
Note 2: Please see section 5.2.1.

In this study, a number of parameters were varied simultaneously around their mean values and the benefit-cost model recalculated to identify the sensitivity of results to these changes. The input parameters that were varied for the analysis are shown in the **Table 7.2**.

Table 7.2
Values Used to Test the Sensitivity of Results

Input variable	Unit	Min.	Max.	Mean
Real discount rate	%	4	10	7
Greenhouse gas abatement costs	US$/T	3	7	6
Exchange rate	A$/US$	0.7	0.8	0.75
Pre-mine value of noise-affected properties	$	200 000	450 000	300 000
Noise Depreciation Sensitivity Index (NDSI)	% of land value per db	0.2	0.25	0.71
Value of welfare estimates from TERM	%	70	110	100
Cost of water	$/ML	180	220	200

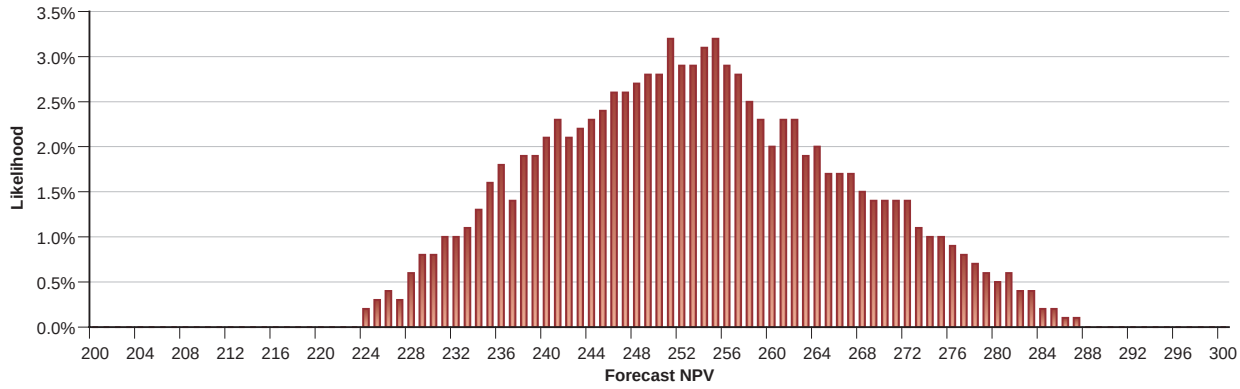
Given the large variability in estimate damage costs it is prudent to question whether the assumed mean cost of $252.5 million will accurately reflect the mean cost of future events. A sensitivity analysis around these input variables provides us with a measure of confidence about the evaluation results.

The software program *@Risk* was used to undertake the analysis. This program calculates a probability distribution of NPV outcomes based on multiple iterations — in this case 10 000 iterations — using different values for each of the input variable. The range of possible values

for the variables is specified by assuming a particular probability distribution for each variable, together with a corresponding mean value. In this analysis, a triangular probability distribution was assumed for each of the input variables. The minimum, maximum and mean values for these distributions are specified in the table above. The mean values are equivalent to the 'best bet' values used to calculate the standard set of results.

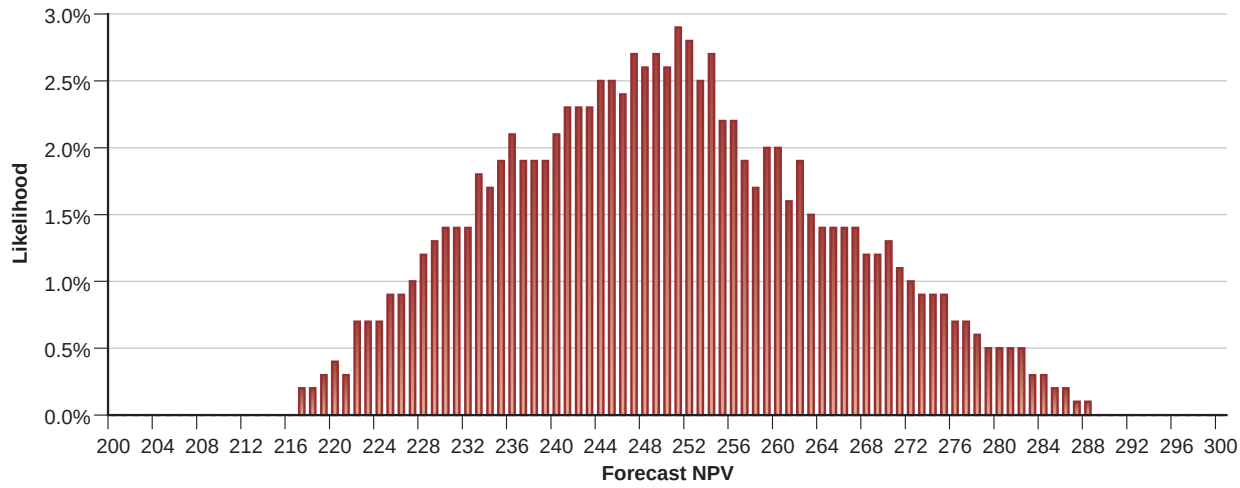
Using this approach demonstrates that the forecast NPV for the Hunter SD over the period 2008 to 2015 is $252.2 million, and there is a 90% probability that the net benefit will fall within $222.9 million and $287.2 million. This result is shown in **Figure 7.1**.

Figure 7.2
Probability of Particular NPV Results for the Hunter Statistical Division



Using this approach demonstrates that the forecast NPV for NSW as a whole over the period 2008 to 2015 is $248.8 million, and there is a 90% probability that the net benefit will fall within $216.1 million and $288.7 million. This result is shown in **Figure 7.2**.

Figure 7.3
Probability of Particular NPV Results for New South Wales



The generally lower NPV results for NSW as a whole in comparison to the Hunter SD reflect that the construction and operation of the mine will to a minor degree contract the non-Hunter regions as economic activity is drawn to the new mine. The contraction is, however, trivial in comparison to the total size of the non-Hunter economy.

The results represented in the two charts demonstrate that the project will produce positive NPV benefits for the Hunter Statistical Division and NSW as a whole and that, within the risk parameters described in the table above, there is no chance that the project will have a negative NPV value for either the Hunter SD or NSW as a whole.

Of the possible project impacts identified in this report, which have not been quantified, the only potentially significant sensitivity risk is associated with the Mt Pleasant Public School. As noted in section 6.1, if 4 of the current 58 students (6.9%) were to leave the area Mt Pleasant Public School could lose:

- 1 full-time teacher, replaced by 1 part-time teacher; and/or
- 1 portable classroom.

If a further 3 students left (a total decline of 12.1%) there would also be a potential loss of a full-time administration assistant.

While these are possible changes, they are not technically costs. Rather, such changes should be considered as a transfer of resources from Mt Pleasant Public School to other schools, reflecting the lower need for resources at Mt Pleasant Public School. In effect, the school's resources would be reduced to match the lower demand.

Of course, such a transfer would be considered as a cost by the school community, particularly if it were seen as a harbinger of further school downsizing to the degree that the school's operations were ultimately threatened.

It is difficult to accurately predict the risks associated with a reduction of school attendees arising from the Project, and a consequent reduction of resources. This risk should be acknowledged, but not viewed as imminent.

7.3 Mitigation Strategies

Mitigation strategies should be considered to reduce costs when the benefits of doing so exceed the costs, subject to the constraint of overall project viability. Mitigation strategies should always be directed at addressing the particular problems identified, even as a compensation mechanism.

Mitigation strategies endorsed in the Environmental Assessment include the following.

Air Quality

The Proponent would undertake the following mitigation measures to reduce Project dust emissions.

- Only the minimum area required for the continuing operation of the proposed open cut would be disturbed.
- Rehabilitation would be completed as soon as practicable once an area is no longer required for mining operations. Soil stockpiles not required for more than 3 months would be re-vegetated.
- Water sprays and water carts would be utilised to keep coal stockpiles and coal handling areas in a moist condition.
- Water carts would be used within the proposed open cut, along haul routes and in other areas to minimise the generation of dust.
- Creation of minor roads and access tracks during soil stripping, mining operations and rehabilitation would be kept to a minimum and would be watered as above.
- During drilling operations, dust aprons, dust extraction systems and water injection or sprays would be utilised as required.
- During blasting, adequate stemming of all blast holes would be used at all times.
- Negotiation of an appropriate arrangement with the owners of Residences 32 and 36.

Noise and Vibration

The Proponent would undertake the following mitigation measures to reduce Project noise emissions.

- Restrict hours of open cut mining operation to 7.00am to 10.00pm.
- Use noise mitigated mobile equipment which complies with sound power levels identified by Heggies Australia.
- Limit evening mining operations, where practicable, to the deeper sections of the open cut.
- Sequence construction of the out-of-pit waste rock emplacement, and those portions of the in-pit waste rock emplacement that are above the existing ground surface such that during day time operations material would be preferentially placed at the margins of the emplacement to create an acoustic bund, while during evening operations material would be preferentially placed immediately behind the acoustic bund.

- Preferentially place waste rock within those portions of the in-pit waste rock emplacement that are deepest within the open cut during evening operations.
- Construct acoustic bunds adjacent to haul roads where appropriate and practicable.
- Undertake construction activities such as tree clearing and soil stripping during day time operations only.
- Monitor noise levels at potentially affected residences where appropriate and practicable.
- Refine on-site noise mitigation measures and operating procedures, ie. based upon monitoring results.
- Inform residents that the existing complaints line for Glennies Creek Colliery (1800 505 361) would apply to the open cut mine.
- Encourage all residents to contact site management with issues of concern.
- Consult with potentially affected residents to identify issues of concern.
- Promptly respond to any issues of concern.
- Consider acoustic mitigation at residences where exceedances of the Project specific criteria are substantiated by monitoring.
- Consider negotiated agreements with landowners where exceedances of the Project specific criteria are substantiated by monitoring.
- Restrict blasting between the hours of 9.00am and 5.00pm on weekdays, unless blasts outside this time are required for misfire re-blast, emergency or safety reasons.
- Undertake blast design and implementation by a suitably qualified blasting engineer and experienced shot-firer.
- Monitor each blast at representative surrounding residences.
- Refine blast mitigation measures and operating procedures ie. based upon monitoring results.
- Review site specific blasting procedures to manage airblast and ground vibration impacts through modification of the blast design, as required.

Visual Impacts

The Proponent would undertake the following mitigation measures to reduce the impacts of the construction of the ICO Project Site on visual amenity.

- Construction of an approximately 4m high visual amenity bund to screen the proposed open cut from users of Stony Creek Road. The bund would be constructed and rehabilitated early during the initial phase of mining.

- Haul routes would be constructed as far as possible such that headlights from haul trucks are not directed towards residences. Haul Route B would be constructed below the crest of the waste rock emplacement such that the haul trucks are screened from residences to the north and east of the Project Site.
- The waste rock emplacement would be progressively reshaped and rehabilitated as mining activities progress. This would reduce the visual impact pf the Proponents activities by blending the waste rock emplacement with the surrounding landforms.
- The Proponent would consider any request by a potentially affected resident for assistance to create a visual screen on private land through planting of vegetation and / or landscaping where such a screen would provide adequate visual areolation of the visual impact of the Proponents' activity.

Surface Water and Groundwater

There are no mitigation strategies required to minimise impacts of the ICO Project on surface water and groundwater reserves.

Flora and Fauna

The Proponent would undertake the following mitigation measures to reduce the impacts of the construction of the ICO Project Site on local flora and fauna.

- Flora design, operational safeguards and rehabilitation strategies include the following.
  - The out-of-pit waste rock emplacement has been designed to ensure as much as possible of the footprint of the emplacement lies on previously disturbed land or on Tussock Grassland rather than impacting the Narrow-leaved Ironbark – Spotted Gum – Grey Box or Bull Oak Communities.
  - The out-of-pit waste rock emplacement has been designed to avoid a large stand of Bull Oak Forest Community, as well as a stand of old trees with hollows along an east-west orientated road reserve, in the eastern portion of the Project Site.
  - The mine access road has been located so as to avoid a stand of Bull Oak Forest Community to the west of the Possum Skin Dam.
  - The open pit facilities area has been positioned to avoid an area of Narrow-leaved Ironbark – Spotted Gum – Grey Box Community to the southwest of Possum Skin Dam.
  - The extent of clearing undertaken would be the minimum required to permit ongoing mining operations.
  - All areas to be cleared would be clearly defined and marked.
  - All clearing and topsoil stripping would be undertaken in campaigns on an as-needs basis.

- Where practicable, vegetation material to be relocated would be directly transferred to an active rehabilitation area.
- Progressive rehabilitation of all disturbed surfaces would be undertaken.
- Topsoil would not be removed from the Project Site. This would ensure the Class 5 noxious weed "Onion Grass" is not removed from site in accordance with Division 2 of the Noxious Weeds Act 1993 (NSW).
- Noxious weed control programs would be instigated and maintained within the Project Site and the Biodiversity Off-set Areas.
- A rehabilitation strategy would be implemented, including the replanting of the *Acacia decora* (Western Golden Wattle). The precise species mix would be determined in a detailed Rehabilitation Management Plan that would be prepared prior to the commencement of mining operations.
- Where practicable, seed from the Project Site and surrounding areas would be collected and propagated for use during rehabilitation.

- Fauna design, operational safeguards include the following.
  - The out-of-pit waste rock emplacement has been designed to ensure as much as possible of the footprint lies on previously disturbed land or cleared grazing land. Specifically the waste rock emplacement has been designed to avoid a large stand of Bull Oak Forest Community, as well as a stand of old trees with hollows along an east-west orientated road reserve in the eastern portion of the Project Site.
  - The mine access road and open pit facilities have been located so as to avoid a stand of Bull Oak Forest Community and an area of Narrow-leaved Ironbark – Spotted Gum – Grey Box Community to the west of the Possum Skin Dam.
  - Removal of native vegetation, including areas of regenerated vegetation, would be minimised.
  - Removal of large, mature trees would be conducted in late spring and early autumn to avoid spring nesting birds and over-wintering bats.
  - Mature trees with hollows would be inspected prior to removal for arboreal mammals, nesting birds and roosting bats. Where located, such nests would be relocated to an appropriate location.
  - Vegetation with a diameter >30cm or hollows, both standing and already fallen, would be relocated to areas that will not be disturbed including the Biodiversity Off-set Areas.
  - Stock would be removed from of the Project Site and Biodiversity Off-set Areas to allow regeneration to occur. Regeneration of the grassy understorey within the Narrow-leaved Ironbark – Spotted Gum – Grey Box Community would improve the habitat patch quality for Grey-crowned Babblers.
  - Enhancement of the Biodiversity Off-set Areas and undisturbed areas of the Project Site, including replanting and weed control, would commence as soon as practicable.

- A pest control program across the Project Site and Biodiversity Off-set Areas would be implemented as soon as practicable. This program would target in particular those species listed as Key Threatening Processes under the Threatened Species Conservation Act 1995 (TSC Act) and the EPBC Act (European Red Fox and Feral Cat).
- Waste rock emplacements would be planted with species consistent with the existing communities.
- Erection of nesting boxes for the Brush-tailed Phascogale in two living in trees along Glennies Creek at 30m intervals and between 3m and 5m from the ground.

Aboriginal Heritage

The Proponent would undertake the following mitigation measures to reduce the impacts of the construction of the ICO Project Site on Aboriginal heritage.

- Ground disturbing work would not be undertaken in areas where an Aboriginal heritage assessment ha s not been completed.
- An Aboriginal Heritage Management Plan for sites GC1 to GC19 would be developed in conjunction with local Aboriginal groups. This would include identification of an appropriate 'keeping place' for the recovered artefacts.
- In the case of any further Aboriginal objects being uncovered at any time during the course of the Project, work in the area would cease immediately and Proponent would contact the DECC for advice. A Management Plan would then be developed in conjunction with local Aboriginal groups.
- All staff and contractors would be made aware of their responsibilities through an induction program with regards to Aboriginal archaeological items under the *National Parks and Wildlife Act 1974*.
- Should the Aboriginal communities decide that further cultural salvage (beyond the protection of known sites) of the study area would not be required, a cultural 'offset' could be negotiated with the Aboriginal communities to benefit the communities in general, and promote Aboriginal heritage and culture in the wider community.
- Copies of site cards for all unregistered sites would be supplied to the DECC once this Aboriginal heritage report is finalised and submitted with the final Environmental Assessment.

Public Roads

The Proponent would undertake the following mitigation measures to reduce the impacts of the construction of the ICO Project Site on public roads.

- Minimising the duration of road closures for blasts.
- Timing of blasts as far as practicable to avoid peak traffic periods and school bus timetables.

- Notification in local media outlets and via signs on Stony Creek Road of approximate planned closure times.
- Notification 30 to 60 minutes prior to a blast of updated closure times via automated SMS text messages to residents and others who request to be included on the notification list.
- Co-ordination of blasting times as far as practicable with Ashton Coal Operations Pty Ltd to ensure that both Glennies Creek and Stony Creek Roads are not closed at the same time.
- Control of the blasts such that the blast monitors stationed on Stony Creek Road may suspend the blast to allow Emergency vehicles to pass.
- Development of a Blast Management Plan consistent with the above to ensure the safety of employees and the public.

Primary Education

In the event that the ICO Project does result in a reduction in the number of students attending the Mt Pleasant Public School then a number of mitigations measure could be considered.

- Preference when leasing houses owned by the Proponent for tenants with primary aged children who would attend the Mt Pleasant Public School.
- Consideration of funding support to maintain the current levels of staff and faculties at the Mt Pleasant Public School should enrolments decrease below the relevant funding thresholds as a result of the project.

We note that this mitigation approach would only be needed in the event of the specified changes in resourcing of Mt Pleasant Public School.

APPENDICES

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Appendix 1

Approach to Economic Modelling

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Limitations of Input-Output Analysis

All economic activity affects those directly involved, and to some degree has flow-on implications for other parties.

One approach to analysing such flow-on impacts to industry has been to use input-output (IO) analysis that relies on simple multiplier analysis (i.e. expenditure of $X means a flow-on impact of Y multiplied by $X).

While such multiplier analysis provides some insight as to the Western Institute's broader economic contribution, the technique used lacks broader credibility because of the number of simplifying assumptions required. Indeed, the Bureau of Transport Economics has stated (in reference to the analysis of the economic impact of infrastructure investment, but equally applicable to the analysis of an industry or organisation's economic contribution):

> The misuse of input–output (IO) analysis makes the estimation of aggregate employment effects look deceptively easy.
>
> An IO analysis can provide an estimate of the total employment requirement of an infrastructure investment. This is quite different from estimating the effect on aggregate employment. As explained above, labour required for an infrastructure investment will displace employment elsewhere in the economy. The displacement arises from constraints on government budgets and economic resources.
>
> Input–output analysis ignores these constraints, and so cannot validly estimate the effect on aggregate employment. …
>
> Many discussions of infrastructure investments draw on IO estimates of employment requirements. All too often, they gloss over or fail to mention the displacement effects, as, for instance … Language such as the number of jobs 'created' invites misinterpretation of the estimates as net gains in aggregate employment. …
>
> Further potential for obfuscation exists in induced-consumption 'multipliers'. Some IO analyses of infrastructure projects add to the project's employment requirement an additional employment gain derived from these multipliers. The assumed scenario runs so: an infrastructure project uses workers, all of whom would be jobless in the project's absence; by increasing aggregate employment, the project also increases total labour income; workers devote part of their additional income to consumption; the increased production of consumer goods provides jobs for still more workers, who, in turn, increase their consumption; and so on. In some IO analyses, induced consumption generates much more employment than the project does directly through its labour requirement (BTCE 1996c, p. 33).[28]

28 Bureau of Transport Economics 1999, Facts and Furfies in Benefit-Cost Analysis: Transport, AusInfo, Canberra, pp. 50-51.

In effect, IO analysis is a 'partial equilibrium' analysis that focuses on the results for one market at a time. However, there often exist market interactions and thus market feedbacks. For example, pricing outcomes in one market usually have effects in other markets, and these effects, in turn, create ripples throughout the economy, perhaps even to the extent of affecting the price-quantity equilibrium in the original market. To represent this complex set of economic relationships, it is necessary to go beyond IO analysis and use a model that permits viewing many markets simultaneously.

An Economy-wide Perspective — TERM

To address the concerns associated with IO analysis, the proposed Glennies Creek Open Cut Coal Mine has been analysed by using a 'general equilibrium' model of the NSW and national economies (the TERM model as outlined in Chapter 4). While this is an inherently conservative approach, it is more consistent with the reality of the marketplace.

The method used to assess the economy-wide impact of the proposed mine was to undertake a 'with and without' analysis whereby the direct mine-related impacts were withdrawn from the economy to identify what impact that would have.

Capturing all significant impacts, while ensuring that the overlap of effects does not result in double counting, is a critical requirement of cost benefit analysis. A network of relationships and interactions characterise a market economy, and it is important to distinguish between actual resource and welfare impacts and their reverberation along the value chain.

As an example, if $100 worth of resources was bought and on-sold 5 times, while representing $500 worth of economic activity within the economy (and possibly affecting 5 different stakeholders), this activity would nevertheless represent a *net* change in consumption of $100. Taking profits into account, $100 worth of consumption may well represent the conversion of $80 worth of labour, materials and processed inputs, and $20 in margins payable to business operators as a return on capital and risk-taking, together with payments to government in the form of taxes.

Economic models provide a tool for keeping track of these price, production and tax relationships within an economy (see **Figure A.1**), and netting out 'transfer' effects. They are powerful tools for estimating the likely net impacts of policy changes at an economy-wide and industry level.

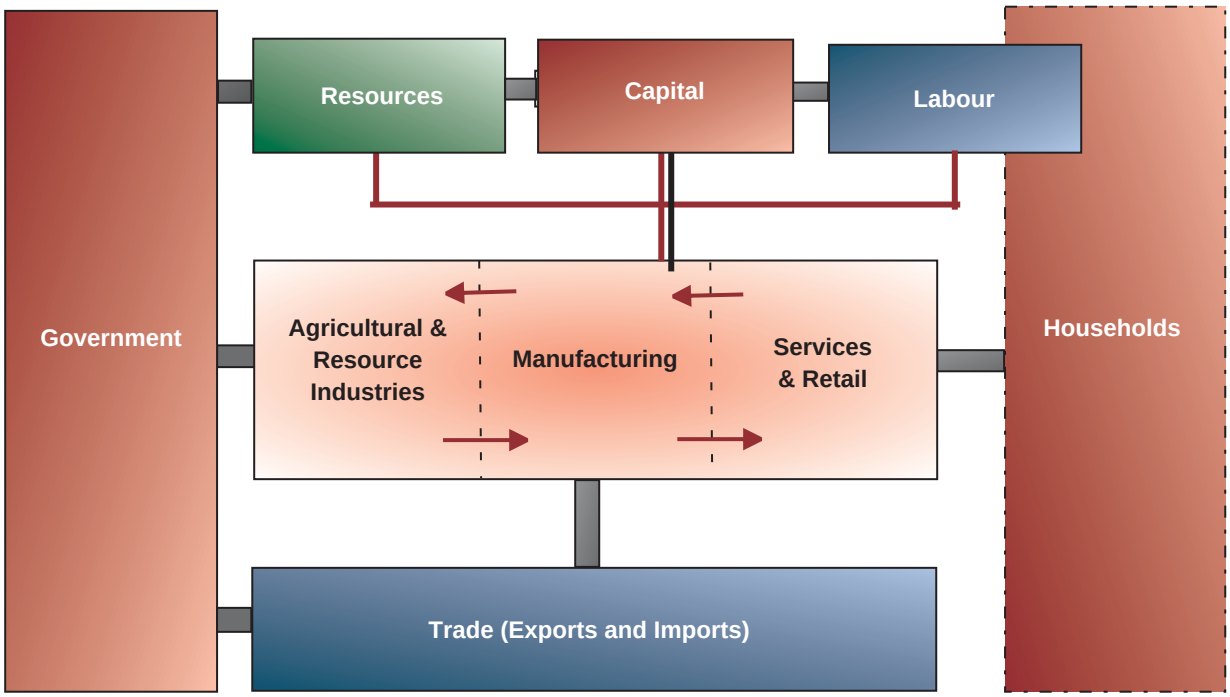
TERM is a dynamic, multi-regional computable general equilibrium model of Australia[29] in the style of the Monash Multiregional Forecasting (MMRF) model.[30]

TERM is a 'bottom-up' computable general equilibrium model of the Australian economy, which treats each region as a separate economy. It is built on data supplied by the Australian Bureau of Statistics, complemented by date from other sources further detailing the inter-industry and production relationships within the Australian economy.

29 M. Horridge, J. Madden, and G. Wittwer 2003, 'Using a highly disaggregated multi-regional single-country model to analyse the impacts of the 2002-03 drought on Australia', Centre of Policy Studies Working Paper G-141, available from http://www.monash.edu.au/policy/elecpapr.htm.

30 F. Naqvi, and M. Peter 1996, 'A Multiregional, Multisectoral model of the Australian Economy with an Illustrative Application', Australian Economic Papers, Vol. 35, pp. 94-113. Such models are commonly used by State and Territory Governments to assess the economic contribution of leisure activities — see NSW Treasury and The Centre for Regional Economic Analysis (University of Tasmania) 1997, The Economic Impact of the Sydney Olympic Games, Treasury Research Paper 97-10, Sydney.

Figure A.1
Stylised Interactions in a General Equilibrium Model



The defining feature of TERM, in comparison to other computable general equilibrium models, is its ability to handle a greater number of regions and sectors. The TERM database distinguishes 144 sectors and 57 regions (nearly corresponding to the Australian Statistical Divisions). The high degree of regional detail makes TERM a useful tool for examining the regional impacts of shocks that may be region-specific. The theory of TERM is much the same as that in national dynamic CGE models such as MONASH.[31] Each industry in TERM selects inputs of labour, capital and materials to minimise the costs of producing its output. The levels of output are chosen to satisfy demands and demands reflect prices and incomes. Investment in each industry reflects rates of return and capital reflects past investments and depreciation. However, instead of a commodity being produced by a single national industry, in TERM model the commodity is produced by an industry in each region. Instead of having two sources of supply (domestic and imported), in TERM commodity users have many sources of supply (each region in the chosen aggregation plus imports). Instead of having a single government and a single household, TERM has a national government, state governments (in this application, NSW and the rest of Australia) and a household in each region.

Regions in TERM are specified as separate economies, linked by trade. TERM imposes a fixed exchange rate and free trade between regions, and common external tariffs. In this sense, TERM remains a national model, rather than international. This means that behaviour in foreign markets is determined outside the model (i.e. exogenously).

31 See P. Dixon and M. Rimmer 2002, Dynamic General Equilibrium Modelling for Forecasting and Policy: a Practical Guide and Documentation of MONASH, Contributions to Economic Analysis 256, North-Holland Publishing Company, Amsterdam.

The benefits and costs that result from the TERM model are presented in terms of their net present value (NPV) to aid comparability. Timing can have an important impact on costs and benefits. An obvious example of this is where discrete events exist that can significantly affect costs or potential benefits. However, there are also subtle factors that can affect the calculation of costs and benefits associated with the timing of policy implementation. Key factors in this category (that can be treated as 'variables' in a cost benefit modelling context) are:

- the effect of time preference or 'discount rates' (i.e. the rate at which future costs and benefits are discounted relative to those in an earlier period); and
- changes in the pattern of costs and benefits (e.g. to changes in growth forecasts for the number of students).

Importantly, the effect of discounting in cost benefit analysis is to place a higher weighting on near term outcomes and a diminishing weighting on outcomes that occur further into the future. By accentuating early year costs and benefits over delayed costs and benefits, discounting will tend to bias consideration of timing in favour of actions that have the effect of bringing forward a net benefit, or delaying a net cost. Thus, the distribution of these costs and benefits over time is also important.

Appendix 2

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