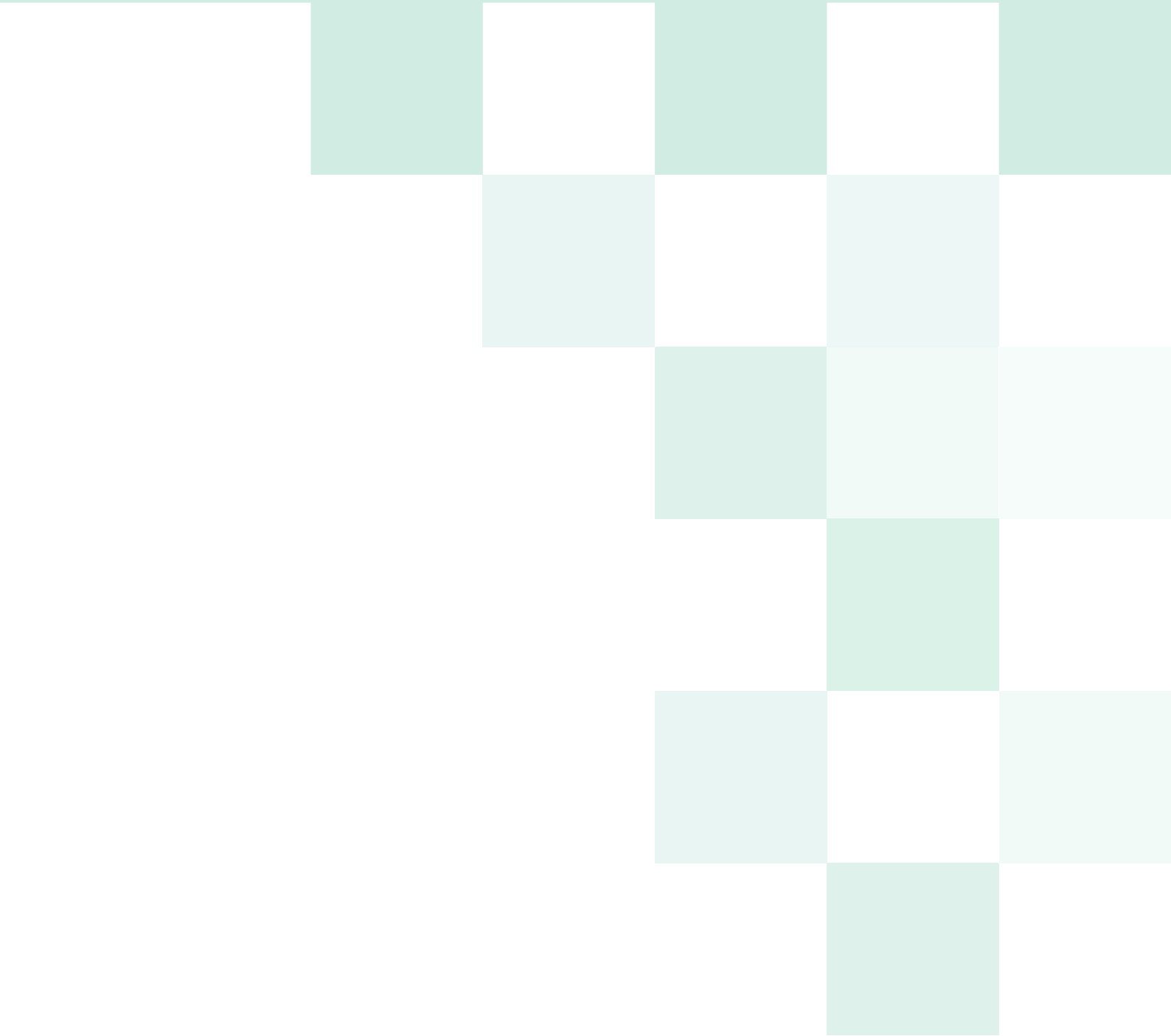


# Appendix 4

## Greenhouse Gas & Energy Assessment



Bulga Coal Management Pty Ltd

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**Bulga Open Cut Western Mining  
Limit Modification  
Greenhouse Gas and Energy  
Assessment**

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July 2012



# **Bulga Open Cut Western Mining Limit Modification Greenhouse Gas and Energy Assessment**

**Prepared by**  
**Umwelt (Australia) Pty Limited**  
**on behalf of**  
**Bulga Coal Management Pty Ltd**

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## Executive Summary

The proposed Bulga Open Cut Western Mining Limit Modification (the proposed modification) will involve further development of the open cut mine within the existing CCL775 ML area.

Approval for the proposed modification is being sought as a modification to the current approval pursuant to Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report has been prepared as part of the environmental assessment process required under the EP&A Act, and it includes greenhouse gas emission projections, an evaluation of the potential climate change impacts and mitigation options. The scope of the greenhouse gas and energy assessment (GHGEA) includes:

- estimating the total greenhouse gas emissions and energy use associated with the proposed modification;
- estimating greenhouse gas emissions associated with transporting coal products to domestic and international markets;
- estimating greenhouse gas emissions associated with the combustion of coal products by electricity generators;
- estimating greenhouse gas emissions associated with the combustion of coal products by steel manufacturers;
- qualifying how the proposed modification may contribute to climate change;
- estimating the impact of the proposed modification's emissions on State, National and International greenhouse gas emission targets; and
- identifying management and mitigation options to reduce the impact of the proposed modification in relation to greenhouse gas emissions and energy use.

The proposed modification does not change the quantity of coal extracted from the Approved Project, therefore it does not generate 'new emissions' (i.e. those emissions which have not already been considered and approved by the NSW Government). The proposed modification will allow the Approved Project to maintain its current approved extraction rate. The proposed modification will not change the cumulative greenhouse gas emissions impact of the Approved Project, however, the GHGEA has quantified and evaluated the greenhouse gas emissions that are expected to be associated with the proposed modification.

Greenhouse gas modelling found that the proposed modification may produce the following greenhouse gas emissions at its maximum ROM extraction rate of 12.2 Mtpa:

- approximately 720,000 t CO<sub>2</sub>-e Scope 1 emissions per annum;
- approximately 90,100 t CO<sub>2</sub>-e Scope 2 emissions per annum; and
- approximately 20,000,000 t CO<sub>2</sub>-e Scope 3 emissions per annum. Scope 3 emissions will be generated by third parties during product transport and consumption activities (e.g. electricity generators and coking facilities).

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Analysis of the greenhouse gas inventory found that the proposed modification's greenhouse gas inventory is dominated by Scope 3 emissions. Approximately 96 per cent of the proposed modification's greenhouse gas emissions occur downstream of the project, and are generated by third parties. Bulga Coal Management is in direct control of only approximately 3.4 per cent of the greenhouse gas emissions associated with the proposed modification. The GHGEA found that the proposed modification:

- will increase short term annual greenhouse gas emissions over the expected emissions from the current Approved Project, as the proposed modification allows the maximum extraction rate to be maintained (the extraction rate is expected to fall under the current approval);
- will not increase the approved life-of-mine emissions; and
- will not change the cumulative greenhouse gas emissions impact of the Approved Project.

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## APPENDICES

- A Proposed Modification’s Operating Emission Calculations**
- B Decommissioning and Closure Calculations**

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# 1.0 Introduction

The Bulga Coal Complex (BCC) is located in the Upper Hunter Valley to the south-east of the Bulga village and north of the village of Broke. The BCC is located within the Singleton Local Government Area (LGA) and is approximately 12 kilometres south-west of Singleton in the Upper Hunter Valley of New South Wales (NSW). The BCC includes an open cut coal mine, an underground coal mine, a coal handling and preparation plant (CHPP), workshop facilities and administrative buildings.

The current development approval for the open cut operations at the BCC, DA 41-03-99, allows for the extraction of approximately 140 million tonnes of raw coal at a maximum extraction rate of 12.2 million tonne per annum (Mtpa). Due to logistical constraints, current Bulga Surface Operations (BSO) will not be able to meet extraction rate targets towards the end of the Approved Project. The proposed modification will allow Bulga Coal Management (BCM) to improve productivity and meet its maximum approved extraction rate of 12.2 Mtpa. The proposed modification will not change the approved life-of-mine (LOM) total resource extracted.

BCM seeks to modify development consent DA 41-03-99 pursuant to Section 75W (S75W) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to extend the approved open cut operation within the existing disturbance area.

The proposed modification does not change the quantity of coal extracted from the Approved Project, therefore it does not generate 'new emissions' (i.e. those emissions which have not already been considered and approved by the NSW Government). The proposed modification will allow the Approved Project to maintain its current approved extraction rate. It will increase the expected annual greenhouse gas emissions over the short term; however, will not increase the approved LOM emissions. The proposed modification will not change the cumulative greenhouse gas emissions impact of the Approved Project.

Whilst the proposed modification does not generate new emissions, the GHGEA has quantified and evaluated the expected greenhouse gas emissions that are expected to be associated with the proposed modification.

## 1.1 The Proposed Modification

The proposed modification will provide for the continuation of existing mining activities in the Bulga Pit. This will involve extending the Bulga Pit to the west, to re-mine through the shallower Whybrow Pit void. Mining operations will occur largely within the currently approved disturbance footprint and coal extraction will not exceed the currently approved maximum rate of 12.2 Mtpa.

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## 2.0 Assessment Framework

### 2.1 Objectives

The objective of this assessment is to evaluate the greenhouse gas and energy use implications of the proposed modification. Specific objectives of this assessment are to:

1. quantify the potential Scope 1, 2 and 3 emissions associated with the proposed modification;
2. qualify the potential impacts of the proposed modification greenhouse gas emissions on the environment; and
3. describe the measures to be implemented on site to minimise the greenhouse gas emissions of the proposed modification.

Energy consumption is also considered as it is strongly associated with greenhouse gas emissions, and is an important component of the *National Greenhouse and Energy Reporting (NGER) Act 2007*.

### 2.2 Scope

The scope of the GHGEA includes:

- estimating the total greenhouse gas emissions and energy use associated with the proposed modification;
- estimating greenhouse gas emissions associated with transporting coal products to domestic and international markets;
- estimating greenhouse gas emissions associated with the combustion of coal products from the proposed modification by electricity generators;
- estimating greenhouse gas emissions associated with the combustion of coal products by steel manufacturers;
- qualifying how the proposed modification may contribute to climate change;
- estimating the impact of the proposed modification's emissions on State, National and International greenhouse gas emission targets; and
- identifying management and mitigation options to reduce the impact of the proposed modification in relation to greenhouse gas emissions and energy use.

### 2.3 Definitions and Sources

The GHGEA assessment framework is based on the methodologies and emission factors contained in the *National Greenhouse Accounts Factors (NGA Factors) (2011)*. The assessment framework also incorporates the principles of *The Greenhouse Gas Protocol (The Protocol) (World Resources Institute/World Business Council Sustainable Development, 2004)*.

The GHGEA has not used the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (the NGERs Determination) as a framework, as the scope of the GHGEA includes emission sources and data constraints that are outside the reporting requirements specified in the NGERs Determination. The NGA Factors draw on the NGERs Determination; however, the NGA Factors have a general application to the estimation of a broader range of greenhouse gas inventories (DCC, 2009) that are more suited to environmental impact assessment.

The Protocol provides an internationally accepted approach to greenhouse gas accounting. The Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality. **Table 2.1** contains concepts and definitions relevant to the GHGEA.

**Table 2.1 – Glossary of Terms (The Protocol)**

<b>Concept</b>	<b>Definition</b>
Greenhouse gases	The greenhouse gases covered by The Protocol include: <ul style="list-style-type: none"> <li>• Carbon dioxide</li> <li>• Methane</li> <li>• Nitrous oxide</li> <li>• Hydrofluorocarbons</li> <li>• Perfluorocarbons</li> <li>• Sulphur dioxide</li> </ul>
Scope 1 emissions	Direct emissions which occur from sources that are owned or controlled by the reporting entity, e.g. fuel use, fugitive emissions. Scope 1 emissions are emissions over which entities have a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the reporting entity. Scope 2 emissions can be measured easily and can be significantly influenced through energy efficiency measures.
Scope 3 emissions	Indirect emissions are emissions which are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another reporting entity, e.g. outsourced services. Scope 3 emissions are only estimates and may have a relatively high level of uncertainty, unreliability and variability.

## 2.4 Assumptions and Exclusions

The calculations in this report rely directly on data provided by BCM. The report has been written with the assumption that the energy consumption and operational data is complete and accurate. Umwelt has not undertaken physical testing and/or auditing to verify the accuracy of the data provided by BCM.

All methodologies and calculations have been made assuming that all operations will continue as described in **Section 1.1**.

## 2.5 Impact Assessment Methodology

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors (2011). Fugitive emissions from the open cut operation have been calculated using a State based emission factor (as described in the NGA Factors 2011), rather than using site specific data.

Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators (AGO, 2007). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the NGA Factors (2011).

## 2.6 Data Sources

The calculations in this report are based on activity data projections developed by BCM during the mine planning process.

A detailed schedule for closure and decommissioning was not available for the BSO or the proposed modification. In its absence, the detailed schedule for another Xstrata operation, which is a comparatively similar sized operation, has been referred to for decommissioning and closure data.

**Table 2.2** below presents the source of activity data used for the GHGEA.

**Table 2.2 – Source of Activity Data**

<b>Activity data</b>	<b>Source</b>
Fugitive emissions	Bulga – Maximum extraction limit
On-site fuel consumption	Bulga – 5 year average diesel consumption
Electricity consumption	Bulga – 5 year average electricity consumption
Construction materials	N/A
Waste landfill	N/A
Product transport	Bulga – haulage distances
Decommissioning and closure data	Similar sized operation in the Hunter Valley

A detailed description of activity data are provided in **Appendix A** and **Appendix B**.

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## 3.0 Impact Assessment Results

As discussed in **Section 1.0**, the proposed modification is not expected to generate 'new emissions' or change the cumulative greenhouse gas emissions impact of the existing Approved Project. The results presented in this section have been included to quantify the likely greenhouse gas emissions associated with the proposed modification. The greenhouse gas emission forecasts in this section are not generated as a proposed consequence of the proposed modification and should not be interpreted as emissions over and above emissions already associated with the Approved Project.

A GHGEA will often consider the individual stages of a project as mitigation options can be developed for the construction, operation and closure stages of a project. The following sections present the results of the impact assessment for the operations and closure phases of the proposed modification. The proposed modification does not include a design and construction phase. A detailed description of GHGEA calculations are provided in **Appendix A** and **Appendix B**.

### 3.1 Operations Phase

The greenhouse gas calculations for the operations phase of the proposed modification made the following assumptions:

- the diesel use intensity of the proposed modification will average 0.005 kL per ROM tonne;
- the electricity use intensity of the proposed modification will average 8.33 kWh per ROM tonne;
- 76 per cent of product coal is thermal quality and will be combusted by electricity generators;
- 24 per cent of product coal is coking quality and will be consumed in coking plants;
- all product coal is transported 92 kilometres to the port of Newcastle via train; and
- all product coal is shipped an average of 9,500 kilometres to either Japan and Korea.

The operational calculations do not include minor fuel sources and inconsequential Scope 3 sources such as business travel, employee commuting, wastewater management emissions etc. These are not expected to be major contributors to emissions.

#### 3.1.1 Greenhouse Gas Emissions

The proposed modification's total operating emissions are summarised in **Table 3.1**.

##### **Scope 1**

The proposed modification is forecast to generate up to 3,600,000 t CO<sub>2</sub>-e Scope 1 emissions from combusting diesel and releasing fugitive emissions over the life of the operation. At a maximum production rate of 12.2 Mtpa, annual Scope 1 emissions are forecast at approximately 720,000 t CO<sub>2</sub>-e per annum.

**Table 3.1 – Total Greenhouse Gas Emission Summary for the Proposed Modification\***

Stage	Scope	Source	Source totals (t CO <sub>2</sub> -e)	Scope totals (t CO <sub>2</sub> -e)
Operations	Scope 1 (Direct)	Stationary diesel use	841,625	3,587,213
		Transport fuel use	0	
		LPG Use	588	
		Fugitive emissions	2,745,000	
	Scope 2 (Indirect)	Electricity	450,180	450,180
	Scope 3 (Indirect)	Product use	95,096,864	99,939,588
		Associated with energy extraction and distribution	150,241	
Product transport		4,692,483		
			<b>Total</b>	<b>103,976,981</b>
Decommissioning and closure	Scope 1 (Direct)	Stationary diesel use	13,884	13,884
		Transport fuel use	0	
	Scope 2 (Indirect)	Electricity	0	0
	Scope 3 (Indirect)	Associated with energy extraction and distribution	1,059	1,059
			<b>Total decommissioning and closure</b>	<b>14,943</b>

\* Refer to **Appendix A** and **Appendix B** for further detail on calculations

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## Scope 2

The proposed modification is forecast to generate up to 450,200 t CO<sub>2</sub>-e Scope 2 emissions from consuming electricity over the life of the operation. At a maximum production rate of 12.2 Mtpa, annual Scope 2 emissions are forecast at approximately 90,100 t CO<sub>2</sub>-e per annum.

## Scope 3

The proposed modification is forecast to be associated with approximately 100,000,000 t CO<sub>2</sub>-e Scope 3 emissions over the life of the operation. At a maximum production rate of 12.2 Mtpa, annual Scope 3 emissions are forecast at approximately 20,000,000 t CO<sub>2</sub>-e per annum. Scope 3 emissions will be generated by third parties during product transport and consumption activities (e.g. electricity generators and coking facilities).

**Table 3.1** demonstrates that the proposed modification's greenhouse gas inventory is dominated by Scope 3 emissions. Approximately 96 per cent of the proposed modification's greenhouse gas emissions occur downstream of the mine, and are generated by third parties. (e.g. electricity generators and coking facilities).

BCM are in direct control of only approximately 3.4 per cent of the greenhouse gases associated with the proposed modification.

Scope 2 and 3 emissions have been included in the GHGEA to demonstrate the potential upstream and downstream impacts of the proposed modification. It is important to note that proposed modification's Scope 2 and Scope 3 emissions should not be viewed as emissions that are 'over and above' National and global proposed modifications. All Scope 2 and 3 emissions identified in the GHGEA are attributable to, and may be reported by, other sectors.

### 3.1.2 Energy Use

The proposed modification is forecast to consume approximately 14,000,000 GJ from diesel oil, LPG and grid electricity over the life of the operation.

## 3.2 Decommissioning and Closure Phase

The following assumptions were made to estimate the greenhouse gas emissions from the closure phase of the proposed modification:

- all areas not progressively rehabilitated will be rehabilitated on mine closure;
- open cut operations do not generate emissions from old workings; and
- 30 per cent of all closure costs are attributable to diesel consumption.

### 3.2.1 Greenhouse Gas Emissions

The proposed modification is forecast to generate approximately 13,900 t CO<sub>2</sub>-e Scope 1 emissions from combusting diesel during the decommissioning and closure phase. The closure phase is also forecast to be associated with approximately 1,100 t CO<sub>2</sub>-e Scope 3 emissions. Scope 3 emissions will be generated by third parties through activities such as extracting, refining and transporting diesel.

The proposed modification's total decommissioning and closure emissions are summarised in **Table 3.1**.

### 3.2.2 Energy Use

The proposed modification is forecast to consume approximately 200,000 GJ during the decommissioning and closure phase. It has been assumed that all energy will be sourced from diesel.

### 3.3 Data Exclusions

The activities and emission sources listed in **Table 3.2** have been excluded from the GHGEA as they were considered immaterial, variable and incidental for the purposes of this report. Petrol is rarely used by BCM's current operations. The proposed modification may only use very small volumes of petrol in operations that are incidental to the extraction of coal.

Based on annual NGERS reporting, industrial processes and waste water handling only generate a very small proportion of BCM's greenhouse gas inventory. The inclusion of these two emission sources would not significantly change the final greenhouse gas inventory (refer to **Table 3.2**).

Greenhouse gas emissions generated by waste transferred to local landfill were excluded from the analysis as the likely emissions were considered to be immaterial. The inclusion of this emission source would not significantly change the final greenhouse gas inventory (refer to **Table 3.2**).

Greenhouse gas emissions from employee travel and business travel are often excluded from greenhouse gas inventories. Given the nature of the proposed modification, the expected emissions from business travel (i.e. flights, taxis and hire cars) will be immaterial to the final greenhouse gas inventory (refer to **Table 3.2**).

**Table 3.2 – Data Exclusions**

Emissions source	Scope	Description	Reason for exclusion
Combustion of fuel for energy	Scope 1	<ul style="list-style-type: none"><li>Small quantities of fuels such as petrol</li></ul>	Emissions immaterial in context of overall project emissions
Industrial processes	Scope 1	<ul style="list-style-type: none"><li>Sulphur hexafluoride (high voltage switch gear)</li><li>Hydrofluorcarbon (commercial and industrial refrigeration)</li></ul>	Emissions immaterial in context of overall project emissions
Waste water handling (industrial)	Scope 1	<ul style="list-style-type: none"><li>Methane emissions from waste water management</li></ul>	Emissions immaterial in context of overall project emissions
Solid waste	Scope 3	<ul style="list-style-type: none"><li>Solid waste to landfill</li></ul>	Emissions immaterial in context of overall scope 3 emissions
Business travel	Scope 3	<ul style="list-style-type: none"><li>Employees travelling for business purposes</li></ul>	Emissions immaterial in context of overall scope 3 emissions
Employee travel	Scope 3	<ul style="list-style-type: none"><li>Employees travelling between their place of residence and the Bulga site</li></ul>	Emissions immaterial in context of overall scope 3 emissions

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## 4.0 Impact Assessment Summary

The greenhouse gas emissions associated with the proposed modification have the potential to impact the physical environment and the greenhouse gas reduction objectives of National and International governing bodies. As discussed in **Section 1.0**, the proposed modification is not expected to generate 'new emissions' or change the cumulative greenhouse gas emissions impact of the Approved Project. The proposed modification will not change the current Approved Project's impact on:

- future climate change projections;
- national greenhouse gas reduction targets; or
- international greenhouse gas targets.

If the proposed modification were to extract additional coal beyond the approved production capacity of Approved Project, and was assessed as a new project approval, the impact of the proposed modification would still be minimal.

### 4.1 Impact on National Policy Objectives

The Federal Government has committed to reduce Australia's greenhouse gas emissions to 25 per cent below 2000 levels by 2020 if the world agrees to an ambitious global deal to stabilise levels of greenhouse gases in the atmosphere at 450 parts per million CO<sub>2</sub>-e or lower (DCCEE, 2010).

If the world is unable to reach agreement on a 450 parts per million target, Australia will still reduce its emissions by between 5 and 15 per cent below 2000 levels by 2020 (DCCEE, 2010).

If Australia is able to meet the 5 per cent reduction target by 2020, the nation will be generating approximately 525 Mt CO<sub>2</sub>-e of Scope 1 greenhouse gas emissions per annum (National Greenhouse Gas Inventory, 2010). If the proposed modification is still operating in 2020, it may be producing up to 0.14 per cent of National emissions and is unlikely to limit the Federal Government achieving its objectives.

### 4.2 Impact on International Objectives

International greenhouse gas reduction targets have not yet been agreed and/or formalised. However, the Copenhagen Accord (the Accord), provides some direction for international greenhouse gas objectives. The Department of Climate Change and Energy Efficiency (DCCEE) 2011, states that the Accord is an international agreement under the UNFCCC with the following objectives:

- to hold any increase in global temperature to below 2 degrees celsius;
- to specify, side by side, emissions targets for developed countries and actions to reduce emissions by developing countries;
- to develop a framework for National and International monitoring of what developed and developing countries will do; and
- to provide considerable financing to support emissions reductions and adaptation in developing countries.

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Australia has formally registered its support for the Accord and is encouraging its fast and full implementation (DCCEE 2011). Under the Accord, Australia has committed to reducing its 2020 national greenhouse gas inventory by 5 per cent (based on the 2000 inventory).

DCCEE 2011 states that the Government will not increase Australia's emissions reduction target above 5 per cent until:

- the level of global ambition becomes sufficiently clear, including both the specific targets of advanced economies and the verifiable emissions reduction actions of China and India;
- the credibility of those commitments and actions is established; and
- there is clarity on the assumptions for emissions accounting and access to markets.

Australia's International objectives align with its National objectives. If the proposed modification is unlikely to limit the Federal Government achieving its national objectives, then the proposed modification is unlikely to limit the Federal Government achieving its International objectives.

## 5.0 Management and Mitigation

This section presents the current BCM management and mitigation undertaken at the BCC, and the commitment to continue these through the life of the proposed modification.

### 5.1 Sustainable Development Policy

BCM is committed to the Xstrata Coal Sustainable Development Policy which specifically requires on-going consideration of greenhouse gas emissions and energy use. To assist XC meet its Sustainable Development Policy requirements, BCM must prepare Annual Sustainability Plans and adhere to XC Sustainable Development Standards and Protocols.

The XC Sustainability Policy states in part:

'We aim to preserve the long term health, function and viability of the natural environments affected by our operations. To achieve this:

- we act as responsible stewards of our owners assets and operate to leading practice and environmental standards;
- we eliminate, mitigate or remediate the environmental impacts of our activities;
- we continually improve the efficiency with which we use raw materials, energy and natural resources;
- we reduce our direct and indirect greenhouse gas emissions and work with other organisations, governments and groups to address climate change; and
- we work with our stakeholders to mitigate the environmental impacts of our product life cycle and supply chain.'

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## 5.2 Greenhouse Gas Mitigation Strategy

BCM has an obligation to adhere to legal requirements to manage greenhouse gas emissions and energy use. The *Energy Efficiency Opportunities Act 2006* and the *Energy and Utilities Administration Act 1987* require BCM to participate in the Energy Efficiency Opportunities (EEO) and Energy Savings Action Plan (ESAP) Programs respectively.

BCM currently mitigate Scope 1 and 2 emissions through energy efficiency initiatives and will continue to do so through the life of the proposed modification. BCM is unable to directly manage Scope 3 emissions as BCM does not have operational control of the facilities that transport and/or consume coal products.

### 5.2.1 Energy Efficiency

The energy efficiency of mining operations is driven by energy use and productivity. Energy efficiency is maximised when highly efficient equipment is operated at optimal capacity. BCM's mine planning process optimises operational productivity through scheduling, haul ramp design and equipment selection. BCM currently participate in the (EEO) and ESAPs and will continue to do so for the life of the proposed modification.

#### 5.2.1.1 Energy Efficiency Opportunities

AZSA Holdings (the Parent Company of BCM) triggers the energy use thresholds of the EEO Program and it is therefore required to undertake energy efficiency assessments and report the progress of energy efficiency projections. BCM currently complete energy efficiency assessments, undertake energy efficiency planning and assist AZSA Holdings to report on the progress of nominated energy efficiency projections. BCM will continue to participate in the EEO Program and undertake the following activities to improve energy use efficiency:

- develop an EEO project and communication plan;
- evaluate energy use for the proposed modification;
- identify and investigate potential EEOs; and
- implement, track, communicate and report on EEOs.

#### 5.2.1.2 Energy Savings Action Plans (ESAPs)

BCM is listed on the Energy Savings Order and must develop ESAPs under the *Energy and Utilities Administration Act 1987*. BCM currently develops ESAPs and the current process will continue and incorporate the energy use activities for the proposed modification.

BCM will continue to monitor energy use to evaluate ESAPs every four years and submit ESAP progress reports annually.

### 5.2.2 Scope 3 Emissions

BCM is not in a position to manage Scope 3 emissions directly, however, XC manages a significant product stewardship and market development program which aims to mitigate the downstream impacts of its products.

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The XC Climate Change Strategy includes a number of product stewardship and market development commitments. These commitments include:

- contributing to the research, development and demonstration of low emissions technologies;
- developing strategic alliances in the area of capacity building to support the long term commercial application of low emission technologies;
- understanding the full 'lifecycle' emissions of products, including exploration, mining, processing, refining, fabricating, use and disposal;
- incorporating lifecycle analysis into our business planning, product procurement and project management processes;
- working with government and key stakeholders to understand and adapt to the potential physical impacts of climate change;
- developing alliances and collaborating with customers, both domestic and international, in demonstrating the sustainable use of coal through new power generation technologies;
- establishing and formalising the process for the development of a \$20M XC Greenhouse Gas Budgeted programme to be spent over the life of the operation to support a range of internal and external funded initiatives which will support Low Emission Technologies, Coal Beneficiation and Greenhouse Gas Abatement;
- supporting ongoing projects such as CS Energy Oxyfuel;
- progressing the Wandoan Carbon Transport and Storage Project; and
- continuing to investigate the participation in other projects which encourage and promote Low Emission Technology Deployment Measurement and Evaluation.

## 6.0 Conclusion

The proposed modification is a relatively small project when compared to many open cut coal mining operations. Given the proposed modification's size and energy use profile, the forecast greenhouse gas emissions generated by the proposed modification are at the lower end of the open cut coal operations scale across Australia.

The proposed modification does not change the quantity of coal extracted from the Approved Project, therefore does not generate 'new emissions' which have not been previously considered and approved by the DP&I. The proposed modification will allow the Approved Project to maintain its current extraction rate. It will increase the expected annual greenhouse gas emissions over the short term, however, the proposed modification will not increase the approved life-of-mine emissions. In addition, the proposed modification will not change the cumulative greenhouse gas emissions impact of the Approved Project.

While the proposed modification is forecast to generate significant total greenhouse gas emissions, approximately 96 per cent of greenhouse gas emissions will occur downstream when coal products are combusted by electricity generators and/or coking plants.

The GHGEA concludes that the proposed modification is unlikely to impact on National and International greenhouse gas policy objectives due to the relatively small contribution it will make to National and International emissions.

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# **APPENDIX A**

## **Proposed Modification's Operating Emission Calculations**

### Stationary Diesel Use

Activity Data	Energy Use		Emission Factors		
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
kL	GJ/kL	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
313,723	38.6	12,109,708	69.2	0.1	0.2
			t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)			837,992	1,211	2,422
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>			<b>841,625</b>		

### LPG Use

Activity Data	Energy Use		Emission Factors		
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
kL	GJ/kL	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
382	25.7	9,818	59.6	0.1	0.2
			t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)			585	1	2
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>			<b>588</b>		

### Fugitive Emissions

Activity Data	Energy Use		Emission Factors		
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
ROM (t)	-	-	kg CO <sub>2</sub> -e/ROM t	kg CO <sub>2</sub> -e/ROM t	kg CO <sub>2</sub> -e/ROM t
61,000,000	N/A	N/A	N/A	45	N/A
			t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)			N/A	2,745,000	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>			<b>2,745,000</b>		

## Electricity

Activity Data	Energy Use	Emission Factors		
		CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
GJ	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
1,830,000	1,830,000	246	N/A	N/A
		t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)		450,180	N/A	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>				<b>450,180</b>

## Product Use

Activity Data		Emission Factors		
		CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
Product	Product (t)	t CO <sub>2</sub> -e/t	t CO <sub>2</sub> -e/t	t CO <sub>2</sub> -e/t
Black coal	29,670,400	2.51533	N/A	N/A
Coking coal	9,369,600	2.18430	N/A	N/A
		t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)		95,096,864	N/A	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>				<b>95,096,864</b>

## Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
Purchased energy	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
Diesel	12,109,708	5.3	N/A	N/A
LPG	9,818	5.0	N/A	N/A
Electricity	1,830,000	47.0	N/A	N/A
		t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)		150,241	N/A	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>				<b>150,241</b>

## Product Transport

Activity Data				Emission Factors		
				CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
Transport mode	Product (t)	Distance (km)	Tonne km (tkm)	kg CO <sub>2</sub> -e/tkm	kg CO <sub>2</sub> -e/tkm	kg CO <sub>2</sub> -e/tkm
Rail	39,040,000	92	3,591,680,000	0.0054	N/A	N/A
Ship	39,040,000	9,500	370,880,000,000	0.0126	N/A	N/A
				t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)				4,692,483	N/A	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>				<b>4,692,483</b>		

## **APPENDIX B**

# **Decommissioning and Closure Calculations**

The greenhouse gas emissions for the closure phase of the proposed modification are based on closure costs of similar operations in the Hunter Valley. Diesel consumption activity data has been calculated from closure cost data, using a net diesel cost of \$1.10/litre (after the Fuel Tax Credit).

### Stationary Diesel Use

Activity Data	Energy Use		Emission Factors		
			CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
kL	GJ/kL	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
5,175	38.6	199,755	69.2	0.1	0.2
			t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)			13,824	20	40
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>			<b>13,884</b>		

### Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
Purchased energy	GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ	kg CO <sub>2</sub> -e/GJ
Diesel	199,755	5.3	N/A	N/A
Electricity	N/A	47.0	N/A	N/A
		t CO <sub>2</sub> -e	t CO <sub>2</sub> -e	t CO <sub>2</sub> -e
Breakdown of individual GHG emissions (t CO <sub>2</sub> -e)		1,059	N/A	N/A
<b>Total GHG emissions (t CO<sub>2</sub>-e)</b>		<b>1,059</b>		