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# GREENHOUSE GAS ASSESSMENT

## WELD RANGE IRON ORE PROJECT

PREPARED FOR:

ECOLOGIA ENVIRONMENT

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KEWAN BOND PTY LTD

ENVIRONMENTAL ACCOUNTING  
AND CONSULTING SERVICES

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## CONTENTS

1.	Project Overview .....	3
2.	Global, National and State Strategies .....	4
2.1.	Global Assessment of Climate Change .....	4
2.2.	Australia's Response to Climate Change .....	6
2.2.1.	Mandatory Renewable Energy Target (MRET) .....	6
2.2.2.	Kyoto Protocol Ratification.....	6
2.2.3.	National Greenhouse and Energy Reporting Scheme .....	6
2.2.4.	Carbon Pollution Reduction Scheme .....	7
2.2.5.	Energy Efficiency Opportunities (EEO) .....	7
2.2.6.	Greenhouse Challenge Plus (GCP).....	8
2.3.	Western Australia's Climate Change Strategy.....	8
3.	Greenhouse Assessment Methods .....	10
3.1.	Emission Sources .....	11
3.2.	Energy and Emission Factors .....	12
3.3.	Sensitivity and Accuracy of Results .....	12
4.	Greenhouse Gas Emissions.....	13
5.	Best Practice Greenhouse Gas Emission Management .....	15
6.	Discussion and Recommendations .....	17
7.	Glossary .....	19
8.	References .....	20

## TABLES

Table 1	Global warming potential of greenhouse gases .....	10
Table 2	Emission Factors .....	12
Table 3	Annual and Total Emissions.....	13
Table 4	Power Generation Option Assessment .....	15

## FIGURES

Figure 1	Changes in temperature, sea level and Northern Hemisphere snow cover .....	5
Figure 2	Breakdown of Total Emissions.....	14

## APPENDICES

Appendix 1	Weld Range Iron Ore Project Greenhouse Gas Inventory .....	21
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## 1. Project Overview

Sinosteel Midwest Management Pty Ltd (SMM) proposes to develop a new iron ore mining operation in the Weld Range in the Midwest region of Western Australia. SMM is an incorporated entity, set up by the Sinosteel Midwest Joint Venture (SMJV) to conduct mineral exploration, engineering, environmental and economic studies into the feasibility to mine at Weld Range. ecologia Environment has been engaged by SMM to facilitate the environmental approval process.

The Weld Range Iron Ore Project is located approximately 85 km southwest of Meekatharra and 60 km northwest of Cue in Western Australia. The project has a target reserve of a minimum of 225 million tonnes and it is proposed to ship 15 million tonnes per annum over 6 years, with potential for extending to 15 + years.

Mining will occur at two pits, Beebyn and Madoonga. One pit will be the central pit where mineral processing and train load-out will occur. The other pit will be referred to as a satellite pit from where primary crushed ore will be transported by road train to the central mineral processing location. Once blasted, ore will be loaded onto haul trucks and transported to a run of mine (ROM) pad or dumped directly into the primary crusher feed bin for primary crushing.

The primary crushed ore from the satellite pit will be transported via road train to the centrally located secondary crushing and screening plant located adjacent to the central pit. The secondary crushing plant, located at the mine, will process ore from both the central and satellite primary crushers.

Base load electricity requirements for the proposed facilities are estimated to be 10 MW. Electricity will be generated on site via a stand-alone power station, powered by twelve x 1 MW diesel generators.

The proposed on site activities and infrastructure will require the clearing of vegetation over an estimated 2,833 hectares.

The project will require an estimated 430 km rail link to a proposed deepwater port at Oakajee, north of Geraldton. This infrastructure will be provided by a third party consistent with State Government policy. Ore from the mine will be processed onsite and loaded onto trains for transport to the proposed Oakajee Port for export in capesize vessels.

## 2. Global, National and State Strategies

### 2.1. Global Assessment of Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is the international body responsible for assessing the state of knowledge about climate change. The IPCC provides guidance to the international community on issues related to climate change response. The IPCC's findings provide the rationale for international action on climate change.

According to the Fourth Assessment Report of the IPCC (IPCC 2007):

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level - as indicated in Figure 1.
- Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.
- Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.
- There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades.
- Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.

The 2007 IPCC report also projected the following changes due to climate change by the end of this century:

- Sea level increases of up to 59cm
- Global temperature increases of up to 4.0°C
- Increasingly acidic oceans impacting on fish stocks and marine life
- Shrinking snow cover and glaciers affecting water supplies
- More frequent droughts and heat waves
- More intense tropical cyclones, heavier rains and more natural disasters
- Changes in wind, rain, and temperature patterns affecting agriculture and livestock production and access to water in tropical and subtropical regions

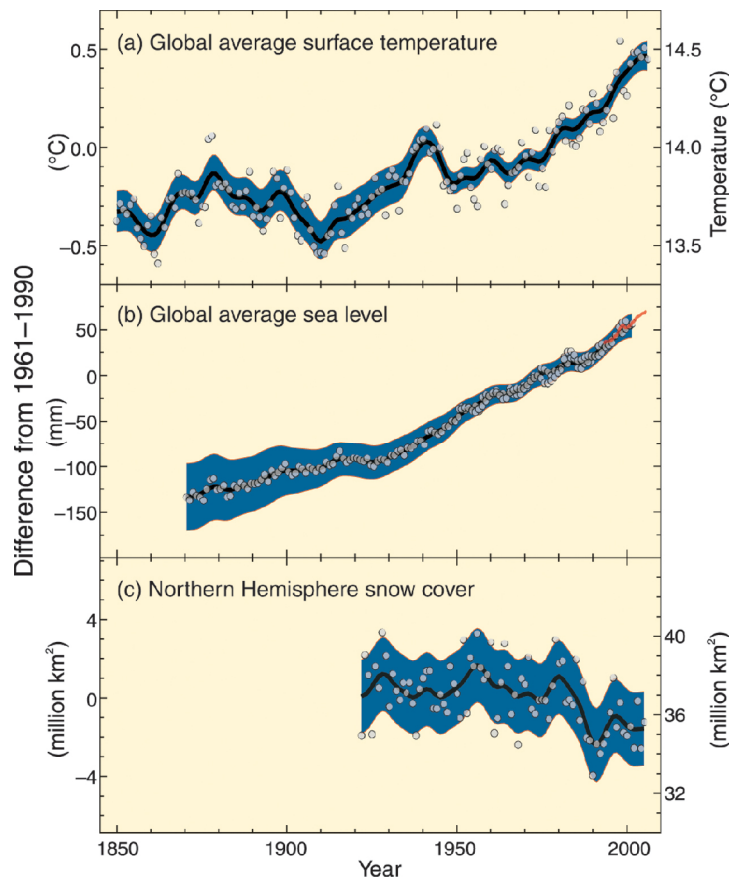
The United Nations Framework Convention on Climate Change (UNFCCC), to which Australia is a signatory, is the basis for developing an international response to climate change.

The Kyoto Protocol to the Convention on Climate Change was developed through the UNFCCC negotiating process. It is an international treaty designed to limit global

greenhouse gas emissions by setting legally-binding emissions targets for developed countries. Under the Kyoto Protocol, industrialised countries are required to reduce the emissions of six greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) on average by 5.2 % below the 1990 levels during the first "commitment period" from 2008 to 2012. There are no emission targets for developing countries such as PNG, however the Protocol's Clean Development Mechanism allows a country with an emission reduction commitment under the Kyoto Protocol to implement an emission reduction project in developing countries and earn saleable certified emission reduction credits.

To date, 180 countries have ratified the Kyoto Protocol (UNFCC website).

Figure 1 Changes in temperature, sea level and Northern Hemisphere snow cover



Source - IPCC AR4 Synthesis Report, 2007

## 2.2. Australia's Response to Climate Change

Australia's national greenhouse gas emissions in 2006 totalled 576.0 million tonnes CO<sub>2</sub>-e (Dept of Climate Change, 2008). A number of initiatives and programmes have been implemented or initiated in an effort to curb Australia's greenhouse gas emissions.

### 2.2.1. Mandatory Renewable Energy Target (MRET)

In 2001 the Australian Government introduced the MRET scheme, which aims to increase the uptake of renewable energy in Australia's electricity supply. In 2007 the Government committed to ensuring that 20 per cent of Australia's electricity supply comes from renewable energy sources by 2020.

### 2.2.2. Kyoto Protocol Ratification

On 3 December 2007, the Prime Minister signed the instrument of ratification of the Kyoto Protocol, and on 11 March 2008 Australia's ratification came into effect. Australia has committed to meeting its Kyoto Protocol target, and has set a target to reduce greenhouse gas emissions by 60 per cent on 2000 levels by 2050 (Australian Dept. of Climate Change).

### 2.2.3. National Greenhouse and Energy Reporting Scheme

The National Greenhouse and Energy Reporting Act 2007 was passed in September 2007 establishing a mandatory corporate reporting system for greenhouse gas emissions, energy consumption and production. The scheme is expected to:

- Provide robust data to underpin the proposed Carbon Pollution Reduction Scheme;
- Reduce the number of greenhouse and energy reports required across State, Territory and Australian Government programmes; and
- Provide corporate level information to the public on greenhouse and energy performance of Australian corporations for the first time.

The first reporting year for the scheme is 1 July 2008 - 30 June 2009. Corporations have until 31 August 2009 to register and until 31 October 2009 to submit their report under the Act.

Corporations will be required to register and report for the 2008-2009 financial year if:

- They have operational control of a facility that emits 25 kilotonnes or more of greenhouse gases (CO<sub>2</sub> equivalent), or produce or consume 100 terajoules or more of energy; or
- Their corporate group emits 125 kilotonnes or more greenhouse gases (CO<sub>2</sub> equivalent), or produces or consumes 500 terajoules or more of energy.

Lower thresholds for corporate groups will be phased in by 2010-11. The final thresholds will be 50 kilotonnes of greenhouse gases (CO<sub>2</sub> equivalent) or 200 terajoules of energy.

(Source - Australian Department of Climate Change - NGERs Reporting and Technical Guidelines)

#### 2.2.4. Carbon Pollution Reduction Scheme

The Australian Government has recently announced the proposed implementation of a Carbon Pollution Reduction Scheme by 2010. A Green Paper was released in July 2008 and a White Paper is expected by the end of 2008. The key mechanics of the scheme currently proposed include:

- The Government sets a cap on the total amount of carbon pollution allowed in the economy by covered sectors
- The Government will issue permits up to the annual cap each year
- Industries that generate carbon pollution will need to acquire a 'permit' for every tonne of greenhouse gas that they emit
- The quantity of carbon pollution produced by each firm will be monitored and verified
- At the end of each year, each liable firm would need to surrender a permit for every tonne of carbon pollution the firm produced in that year
- Firms compete in the market to purchase the number of permits that they require. Firms that value the permits most highly will be prepared to pay the most for them, either at auction, or on a secondary trading market. For some firms, it will be cheaper to reduce emissions than to buy permits
- As a transitional assistance measure, certain categories of firms might receive some emissions permits for free. These firms could use these permits or sell them.

The price of permits is not set by the Government - rather, it emerges from the market. If a firm can reduce carbon pollution more cheaply than the prevailing market price of permits, it will choose to reduce carbon pollution rather than buy permits. The scheme is therefore expected to provide a strong incentive for participants to reduce their own carbon pollution. By making this business decision around whether to reduce carbon pollution or trade in permits, it is anticipated that firms will operate within the overall cap at least cost. (Source - Dept of Climate Change, Carbon Pollution Reduction Scheme website)

Based on the information contained in the Green Paper, it is unlikely that the mining industry (other than coal mining) will classify for any free permits or compensation during the transition phase of the scheme. It is also likely that the acquisition and surrender of permits for emissions associated with diesel consumption are likely to be the responsibility of diesel suppliers. Therefore, the cost of these permits will be simply passed through to the customer.

#### 2.2.5. Energy Efficiency Opportunities (EEO)

The Energy Efficiency Opportunities Act 2006 took effect on 1 July 2006 (with an amendment in March 2007). It aims to improve the identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities.

The Act requires large energy using businesses to:

- Undertake an assessment of their energy efficiency opportunities to a minimum standard in order to improve the way in which opportunities are identified and evaluated; and
- Report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy

(Source - Australian Dept of Resources, Energy and Tourism)

Participation in Energy Efficiency Opportunities is mandatory for corporations that use more than 0.5 petajoules (PJ) of energy per year.

#### 2.2.6. Greenhouse Challenge Plus (GCP)

The Greenhouse Challenge Plus programme requires participants to collect and report information annually on energy consumption, greenhouse gas emissions and actions to improve energy efficiency and/or reduce greenhouse gas emissions.

It is anticipated that the GCP programme may be subsumed by the NGER Scheme, however this is yet to be confirmed.

Businesses are required to be a GCP member in order to claim in excess of \$3 million annually in fuel tax credits. Fuel tax credits are claimed through BAS submission to the Australian Taxation Office. The Australian Taxation Office will confirm with the Greenhouse Challenge Plus team that ABNs of claimants are covered by Greenhouse Challenge Plus agreements.

### 2.3. Western Australia's Climate Change Strategy

Greenhouse gas emissions were 70.4 million tonnes in Western Australia in 2006, which represents 12.2% of Australia's total emissions (Dept of Climate Change - State and Territory Greenhouse Gas Inventories, 2008).

On 6 May 2007, the Premier Hon. Alan Carpenter MLA released a major statement Climate Change: Making Decisions for the Future. The statement outlines a range of new policies and programs that the Government will be implementing to tackle climate change. The Office of Climate Change within the Department of Environment and Conservation was established to support the roles and responsibilities of the Minister for the Environment; Climate Change.

Key features of the Premier's Climate Change Action Statement include:

- a target to reduce emissions by at least 60 per cent below 2000 levels by 2050
- A \$36.5 million Low Emission Energy Development Fund
- A target to increase renewable energy generation on the South West Interconnected System to 15 per cent by 2020 and 20 per cent by 2025
- A clean energy target of 50 per cent by 2010 and 60 per cent by 2020



- State Government purchase of 20 per cent renewable energy by 2010
- A mandatory energy efficiency program that will require large and medium energy users to invest in cost effective energy efficiency measures. In developing the scheme, the State Government will seek to ensure that it is consistent with schemes being implemented in other States and at a national level.
- Investing 8.625 million to help businesses and communities adapt to the impacts of climate change
- The development of new climate change legislation
- A commitment to establishment of a national emissions trading scheme.

The Western Australian Greenhouse Strategy was released in 2004 and is due for review in 2008. The strategy included requirements for major industrial emitters of greenhouse gases to report emissions and emission abatement activities to the government and the public. These elements of the strategy are largely covered by the new National Greenhouse and Energy Reporting Scheme and so are not required separately by the Western Australian government.

WA's Environmental Protection Authority (EPA) considers greenhouse gas emissions and the contribution to global climate change during its project assessment process. The EPA released the WA Guidance Statement for Minimising Greenhouse Gas Emissions in 2002. The Guidance provides advice to proponents, and the public generally, about the minimum requirements for environmental management which the EPA would expect to be met when the Authority considers a proposal during the assessment process. The guidelines recommend that proponents of projects that are likely to result in significant greenhouse gas emissions should:

- Estimate gross emissions likely to be emitted from the proposed project for each year of its operation
- Detail the project lifecycle greenhouse gas emissions and the greenhouse gas efficiency of the proposed project (per unit of product and/or other agreed performance indicators). The parameters should be compared with similar technologies producing similar products or their analogues.
- Indicate the intended measures and efficient technologies to be adopted to minimise or reduce total greenhouse gas emissions in the proposed project.
- Consider a wide range of carbon sequestration options and include intended measures for research and adoption.
- Commit to an ongoing programme of monitoring, investigation, review and reporting of internal and external greenhouse gas abatement measures.
- Consider and advise whether they will join the Commonwealth Government's "Greenhouse Challenge"

### 3. Greenhouse Assessment Methods

An assessment of the greenhouse gas emissions associated with the Weld Range Iron Ore Project was conducted by Kewan Bond Pty Ltd. The assessment involved:

- Identification of the likely sources of greenhouse gas emissions.
- Calculation and interpretation of the likely quantities of greenhouse gases from these sources.
- Identification of emission abatement measures currently planned.

Emissions of greenhouse gases were calculated in accordance with methods provided by the Australian Greenhouse Office (AGO) and Australian Department of Climate Change, which are generally in accordance with the WBCSD / WRI Greenhouse Gas Protocol.

The main greenhouse gases generated by human activities are:

- Carbon dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Nitrous oxide (N<sub>2</sub>O)
- Hydrofluorocarbons (HFC's)
- Perfluorocarbons (PFC's)
- Sulphur hexafluoride (SF<sub>6</sub>)
- Non-methane volatile organic compounds (NMVOC's)
- Carbon monoxide (CO)
- Nitrogen oxides (NO<sub>x</sub>).

These gases differ in their capacity to trap heat and contribute to the greenhouse effect. The capacity of each gas to contribute to global warming is referred to as its 'global warming potential' (GWP) and is measured relative to that of carbon dioxide i.e. carbon dioxide has a GWP of 1, whereas methane has a GWP of 21 because one tonne of methane has the same capacity to contribute to global warming as 21 tonnes of carbon dioxide. The greenhouse gases applicable to fossil fuel combustion and land clearing are provided in Table 1 below with their respective GWP's.

Gas	Global Warming Potential
Carbon dioxide	1
Methane	21
Nitrous Oxide	310

Table 1 Global warming potential of greenhouse gases

Because of the variation in GWP between different gases, the emission factors used to calculate greenhouse gas emissions from the Weld Range Iron Ore Project are stated in terms of carbon dioxide equivalents (CO<sub>2</sub>-e) and consider the various GWP's of the different greenhouse gases.

Estimated greenhouse gas emissions include both direct and indirect emissions. Consistent with Australian and international protocols for reporting greenhouse gases, emissions are separated into Scope 1, Scope 2 and Scope 3 emissions.

Scope 1 emissions are direct emissions from sources within the boundary of an organisation such as fuel combustion and manufacturing processes (Dept of Climate Change - NGA Factors, 2008). For this project, this includes emissions from diesel combustion on site (e.g. Mining equipment and diesel generators).

Scope 2 emissions include indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation. Scope 2 emissions are only applicable to the Project in the scenario whereby electricity is sourced from the Western Australian grid supply.

Scope 3 emissions include all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned or controlled by the organisation. For this Project, this includes emissions associated with the extraction, refinement and delivery of the diesel that is consumed on site.

### 3.1. Emission Sources

The following greenhouse gas emission sources were included in the assessment:

- Decomposition of cleared vegetation
- Fuel consumption by mobile mining equipment
- Fuel consumption by other mobile non-mining equipment
- Fuel consumption by electricity generators and other stationary equipment
- Combustion of Ammonium Nitrate Fuel Oil (ANFO) for blasting

Minor emissions are also expected from the following sources, but are not considered material for the purposes of this assessment:

- Emissions of refrigerant gases
- Emissions from on-site landfill facilities
- Emissions from waste water treatment

### 3.2. Energy and Emission Factors

The methods for calculating the gas-specific emission factor are in accordance with the Australian Dept of Climate Change National Greenhouse Accounts Factors (2008). Energy and emission factors adopted are shown in Table 2.

Fuel type	Energy Content (GJ/kL)	Scope 1 Emission Factor (kg CO <sub>2</sub> -e/GJ)	Scope 2 Emission Factor (kg CO <sub>2</sub> -e/GJ)	Full Fuel Cycle Emission Factor (kg CO <sub>2</sub> -e/GJ)
Diesel (stationary)	38.6	69.5	5.3	74.8
Diesel (Mobile)	38.6	69.8	5.3	75.2
Explosives type				Emission Factor (t CO <sub>2</sub> -e/t product)
ANFO	-	-	-	0.17
Emulsion	-	-	-	0.17

Table 2 Emission Factors

Emissions from vegetation clearing were estimated using the National Carbon Accounting System (NCAS), as recommended by Australia's Department of Climate Change. The NCAS requires the entry of project coordinates and then references a large database of information to estimate carbon stocks per hectare. Changes in carbon stocks from events such as vegetation clearing are regarded as emissions. The NCAS database does not cover all of Australia and some data gaps exist. There was no soil carbon information for the Weld Range project area, and so soil data from the nearby Yalgoo region was sourced from within the database and applied to the project area.

### 3.3. Sensitivity and Accuracy of Results

The calculation of predicted greenhouse gas emissions is subject to various error factors and causes for potential variations in results. These include:

- Factors of error within standard emission factors adopted (e.g. rounding)
- Factors of error within standard calculation and modelling methods adopted
- Variations from assumed gas specifications and flow rates
- Variations from assumed efficiency of plant and equipment

The accuracy of the emission estimates within this study have been greatly increased through the calculation of gas-specific emission factors based on the likely composition of the gas and the application of the latest emission calculation and modelling methods.

## 4. Greenhouse Gas Emissions

Excluding the emissions from vegetation clearing at the beginning of the project, the Weld Range Iron Ore Project is expected to generate annual emissions of 210,823 tonnes CO<sub>2</sub>-e Scope 1 and 16,024 tonnes CO<sub>2</sub>-e Scope 3. The breakdown of these emissions between the broad activities are shown in Table 3.

Scope 1 emissions associated with the project are estimated to be 1,254,753 tonnes CO<sub>2</sub>-e over the six year life of the project. Scope 3 emissions are estimated to be 95,370 tonnes CO<sub>2</sub>-e over the life of the project. Total lifecycle emissions are therefore estimated to be 1,350,123 tonnes CO<sub>2</sub>-e. The majority of these emissions are associated with the consumption of diesel by the mining fleet and the diesel-fired power station, as indicated in Figure 2.

The clearing of vegetation during construction is estimated to result in Scope 1 emissions of 62,383 tonnes CO<sub>2</sub>-e. Although some carbon dioxide will be sequestered from the atmosphere through the revegetation of disturbed areas, this process will take many years and for the purposes of this assessment has not been included in the calculation of net emissions. It is also uncertain whether the vegetation to be cleared would classify as 'forest' under the NGER Scheme and therefore be included in the reported emissions under the scheme and the CPRS (i.e. a potential height of at least two metres and crown cover of at least 20 per cent).

Source	Annual Energy (TJ)	Annual Scope 1 (t CO <sub>2</sub> -e)	Annual Scope 3 (t CO <sub>2</sub> -e)	Annual Total (t CO <sub>2</sub> -e)	Project Total (t CO <sub>2</sub> -e)
Vegetation Clearing <sup>1</sup>	N-A	62,383	0	N-A	62,383
Mining Fleet	1,949	136,031	10,329	146,360	878,162
Ancillary Fleet	177	12,331	936	13,268	79,605
Road Train Haulage	203	14,172	1,076	15,248	80,530
Electricity Generation	695	48,289	3,682	51,971	311,826
Explosives	N-A	TBA	N-A	TBA	TBA
<b>TOTAL</b>	<b>3,023</b>	<b>210,823</b>	<b>16,024</b>	<b>226,847</b>	<b>1,350,123</b>

Table 3 Annual and Total Emissions

<sup>1</sup> Excluded from annual and project totals, as these emissions will only occur once (not annually) and may not be included in the projects emissions profile due to the vegetation not meeting the classification of a forest as defined by the Australian government.

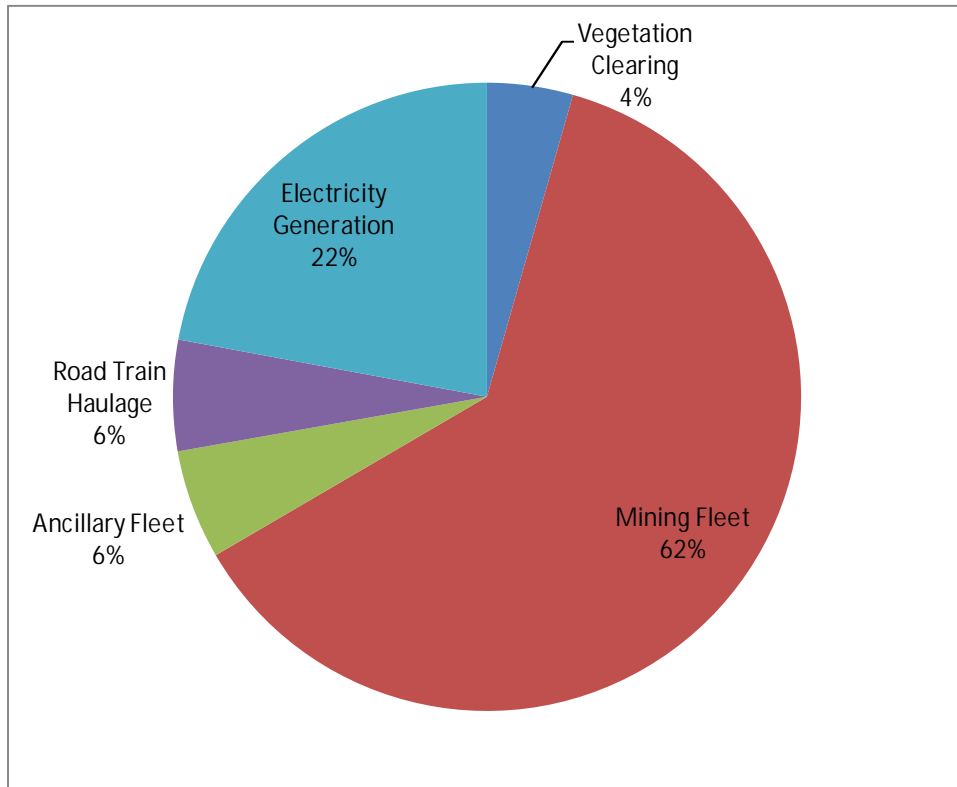


Figure 2 Breakdown of Total Emissions

## 5. Best Practice Greenhouse Gas Emission Management

Opportunities to maximise energy efficiency and minimise greenhouse gas emissions have been focussed largely on the generation of electricity. It is this area where most opportunities for improvement are expected to exist.

The generation of electricity represents a significant cost and a significant proportion of greenhouse gas emissions to the project. SMM therefore commissioned a Power Generation Options Study (Worley Parsons, 2007) to determine the optimal solution for the supply of electricity to the project. The options assessed and the rankings for cost, risk and schedule are provided in Table 4 below:

Alternative	Fuel	Cost Ranking (1=least cost)	Risk Ranking (1=least risk)	Schedule (1=best)
Gas engine power station	Natural Gas	1	3	3
Gas engine power station	LNG	2	3	2
Diesel engine power station	Diesel	3	1	1
Gas engine power station	LPG	4	3	2
Gas turbine power station	Multi fuel	5	2	2
Bulk power from grid	N-A	6	3	4
Wind energy	N-A	7	4	4
Photovoltaic energy	N-A	Not feasible	5	4
Geothermal energy	N-A	Not feasible	5	4

Table 4 Power Generation Option Assessment

The options study made the following conclusions and recommendations:

- It is recommended that the power source be a stand-alone power station, powered by twelve x 1 MW diesel generators, which will provide a reliable, continuous output of 10 MW.
- Although a power station with gas-fired engines would be a cheaper solution, both the piped natural gas and LNG options are currently not feasible because gas supplies are extremely difficult to obtain and are unlikely to be secured before the commissioning date of the mine. However it was recommended that these two options be pursued as a long term alternative. Diesel engines can be

changed out (at some financial penalty) for spark ignition engines if a gas supply is secured.

- LPG is not recommended as a fuel because availability is a problem and it costs more than Diesel.
- Bulk electricity supply by the Power Supply Authority is not recommended because of supply problems and the cost of constructing a connection to the grid, some 380 km away
- Wind turbines do not alter the required size of the power station or the design decisions for the power station as they do not provide base load power supply. Wind turbines may be useful as a fuel and greenhouse gas saving measure and a diesel base-load/wind turbine hybrid system should be further studied to ascertain its economic benefits.
- Photovoltaic cells are not appropriate for this application and are not recommended.
- Geothermal Energy is still in the experimental stage in Australia, where the total installed capacity nationwide is only 150 kW. No further study is recommended.

Following the Power Generation Options Study, SMM commissioned a study into the costs and benefits of operating the recommended diesel power station in parallel with one of four renewable energy options (Worley Parsons, 2008):

- Wind turbines
- Solar thermal power
- Concentrating dish photovoltaic systems
- Flat plate photovoltaic systems

Financial analysis of these options considered future fuel prices, the introduction of a carbon price and a 50% rebate available from the Western Australian government for renewable equipment deployed on new projects. The study found that wind turbines offered significantly superior returns on investment compared to the other three renewable options. According to the study, wind turbines offer the simplest, most robust and least expensive option in terms of capital expenditure for renewable energy. The study recommended that SMM seek budget prices from a reputable wind turbine supplier and conduct a site-specific wind survey. If the project is still feasible with this information, the study recommended that plans be developed for the installation of a single turbine with an output of approximately 2MW and then a submission be made to the government's Remote Renewable Energy Programme for rebate approval.



## 6. Discussion and Recommendations

Annual Scope 1 emissions from the Weld Range Iron Ore Project are estimated to be 210,823 tonnes CO<sub>2</sub>-e. The majority of these emissions are associated with diesel consumption for mining equipment (62% of emissions) and the diesel-fired power station (22% of emissions). If compared against Western Australia's total emissions for 2006, the project would increase the State's emissions by 0.3%. The project is expected to consume approximately 3,023 terajoules (TJ) (3 PJ) of energy per annum.

A number of opportunities for improving energy efficiency and reducing greenhouse gas emissions through the adoption of renewable energy and/or fuels with low greenhouse intensities have been assessed in detail. These assessments concluded that base load power should be generated via 12 x 1MW diesel engine gensets. The assessments also recommended that the options of sourcing supplies of natural gas (via pipeline or LNG) be pursued, with a view to retrofitting the diesel gensets if required. Natural gas has a lower greenhouse intensity compared to diesel. Wind energy was also found to be a viable option to complement the diesel power station and was recommended to be investigated further.

Kewan Bond Pty Ltd supports the continued investigations into energy sources that will result in reduced greenhouse gas emissions.

The scale of the Weld Range Project is likely to trigger participation in a number of government programmes that require collection and reporting of energy and greenhouse gas information. Participation in the following programmes are expected:

National Greenhouse and Energy Reporting Scheme (NGERS) - Registration is required by 31 August 2009. The requirements of this programme are discussed further in Section 2.2.3 and can be found at: <http://www.climatechange.gov.au/reporting/index.html>

Energy Efficiency Opportunities (EEO) - Registration is required within nine months of using more than 0.5 PJ in the one year (the trigger year). An assessment and reporting schedule is then required within 18 months from the trigger year. Assessments are required to be completed within 24 months of the trigger year. Further details of the programme and the required assessments can be found at:  
<http://www.energyefficiencyopportunities.gov.au/>

Greenhouse Challenge Plus (GCP) - It is likely that the requirements of the GCP will be covered by participation in the GCP. However, a formal Greenhouse Challenge Plus Agreement is likely to be required in order to claim more than \$3 million in fuel tax credits. More information on the GCP programme can be found at:  
<http://www.environment.gov.au/settlements/challenge/>

Carbon Pollution Reduction Scheme (CPRS) - The planned introduction of the CPRS in 2010 represents a significant risk to most large energy users. Although the details are yet to be confirmed, the current Green Paper indicates that operations such as the Weld Range Iron Ore Project are unlikely to receive any compensation as part of the CPRS introduction. The project will therefore be faced with increased energy costs that closely mirror the market price for carbon. For example, at \$20 per tonne CO<sub>2</sub>-e, the project could expect energy

costs to increase by \$4.2 million per annum. Under the current project proposal and Green Paper details, it is unlikely that SMM will need to acquire and surrender carbon permits. The point of obligation for acquiring and surrendering permits is proposed to vary between different fuels. For diesel, it is proposed that the suppliers of diesel be responsible for acquiring and surrendering the permits to cover the emissions expected from the eventual combustion of that fuel. The cost of these permits will then be passed directly onto the customer (e.g. SMM). For natural gas, the point of obligation will be the eventual user of the gas. Therefore, if the project eventually sources a supply of natural gas, it may be required to purchase carbon credits.

Additional information on the proposed CPRS can be found within the government's Green Paper, or its summary document - both available at:

<http://www.climatechange.gov.au/greenpaper/index.html>

In order to understand the risks and opportunities associated with each of the above programmes, the following recommendations are made:

- Consider the potential cost of carbon in future financial assessments
- Develop and maintain an accurate energy and greenhouse gas inventory when operations commence - supported by documented energy and greenhouse gas accounting procedures
- Prepare and update emission forecasts for determining potential impacts from a CPRS
- Compile information on opportunities for greenhouse gas abatement and calculate a marginal cost of carbon abatement (in order to decide on whether to implement abatement actions, or pay the higher energy prices depending on the price of carbon)

## 7. Glossary

AGO - Australian Greenhouse Office

CO<sub>2</sub> - carbon dioxide

CO<sub>2</sub>-e - carbon dioxide equivalent

CH<sub>4</sub> - methane

GWP - global warming potential

HFC's - Hydrofluorocarbons

IPCC - The Intergovernmental Panel on Climate Change

LNG - Liquefied natural gas

N<sub>2</sub>O - Nitrous oxide

PFC's - Perfluorocarbons

Scope 1 emissions - cover direct emissions from sources within the boundary of an organisation such as fuel combustion and manufacturing processes.

Scope 2 emissions - cover indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation. Scope 2 emissions result from the combustion of fuel to generate the electricity, steam or heat and do not include emissions associated with the production of fuel. Scopes 1 and 2 are carefully defined to ensure that two or more organisations do not report the same emissions in the same scope.

Scope 3 emissions - include all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned or controlled by the organisation.

SF<sub>6</sub> - Sulphur hexafluoride

UNFCCC - The United Nations Framework Convention on Climate Change

WBCSD / WRI - World Business Council for Sustainable Development / World Resources Institute

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## Appendix 1 Weld Range Iron Ore Project Greenhouse Gas Inventory

	Units	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Total
Vegetation Clearing								
Area to be cleared	Ha	2,833						2,833
<b>Mining Fleet</b>								
Excavator	kL Diesel	10,341	10,341	10,341	10,341	10,341	10,341	62,047
Truck	kL Diesel	40,148	40,148	40,148	40,148	40,148	40,148	240,887
<b>Ancillary Fleet</b>								
Bulldozer	kL Diesel	1,954	1,954	1,954	1,954	1,954	1,954	11,726
Wheel dozer	kL Diesel	576	576	576	576	576	576	3,456
Grader	kL Diesel	402	402	402	402	402	402	2,412
Water cart	kL Diesel	1,039	1,039	1,039	1,039	1,039	1,039	6,235
Crane (20 t)	kL Diesel	2	2	2	2	2	2	14
Crane (50 t)	kL Diesel	2	2	2	2	2	2	14
Forklift/IT	kL Diesel	67	67	67	67	67	67	403
Service truck (25 t)	kL Diesel	16	16	16	16	16	16	96
Excavator (25 t) rockbreaker	kL Diesel	91	91	91	91	91	91	547
Fuel truck	kL Diesel	12	12	12	12	12	12	72
Lightning plants	kL Diesel	148	148	148	148	148	148	888
Light vehicles	kL Diesel	12	12	12	12	12	12	72
Low bed or float	kL Diesel	4	4	4	4	4	4	24
LV's & other non-mining mbl fleet	kL Diesel	250	250	250	250	250	250	1,500
Road Train Haulage	kL Diesel	2,560	5,260	5,260	5,260	5,260	4,180	27,780
Electricity Generation	kL Diesel	18,000	18,000	18,000	18,000	18,000	18,000	108,000
<b>GHG EMISSIONS - SCOPE 1</b>								
Vegetation Clearing	t CO2-e	62,383						62,383
<b>Mining Fleet</b>								
Excavator	t CO2-e	27,862	27,862	27,862	27,862	27,862	27,862	167,171
Truck	t CO2-e	108,169	108,169	108,169	108,169	108,169	108,169	649,016
Total	t CO2-e	136,031	136,031	136,031	136,031	136,031	136,031	816,187
<b>Ancillary Fleet</b>								
Bulldozer	t CO2-e	5,266	5,266	5,266	5,266	5,266	5,266	31,594
Wheel dozer	t CO2-e	1,552	1,552	1,552	1,552	1,552	1,552	9,311
Grader	t CO2-e	1,083	1,083	1,083	1,083	1,083	1,083	6,499
Water cart	t CO2-e	2,800	2,800	2,800	2,800	2,800	2,800	16,799
Crane (20 t)	t CO2-e	6	6	6	6	6	6	39
Crane (50 t)	t CO2-e	6	6	6	6	6	6	39
Forklift/IT	t CO2-e	181	181	181	181	181	181	1,086
Service truck (25 t)	t CO2-e	43	43	43	43	43	43	259
Excavator (25 t) rockbreaker	t CO2-e	246	246	246	246	246	246	1,474
Fuel truck	t CO2-e	32	32	32	32	32	32	194
Lightning plants	t CO2-e	399	399	399	399	399	399	2,393
Light vehicles	t CO2-e	32	32	32	32	32	32	194
Low bed or float	t CO2-e	11	11	11	11	11	11	65
LV's & other non-mining mbl fleet	t CO2-e	674	674	674	674	674	674	4,041
Total	t CO2-e	12,331	12,331	12,331	12,331	12,331	12,331	73,987
Road Train Haulage - Operational Control?	t CO2-e	6,897	14,172	14,172	14,172	14,172	11,262	74,847
Electricity Generation	t CO2-e	48,289	48,289	48,289	48,289	48,289	48,289	289,732
<b>TOTAL SCOPE 1 EMISSIONS</b>	t CO2-e	265,931	210,823	210,823	210,823	210,823	207,913	1,254,753
<b>GHG EMISSIONS - SCOPE 3</b>								
<b>Mining Fleet</b>								
Excavator	t CO2-e	2,116	2,116	2,116	2,116	2,116	2,116	12,693
Truck	t CO2-e	8,213	8,213	8,213	8,213	8,213	8,213	49,281
Total	t CO2-e	10,329	10,329	10,329	10,329	10,329	10,329	61,974
<b>Ancillary Fleet</b>								
Bulldozer	t CO2-e	400	400	400	400	400	400	2,399
Wheel dozer	t CO2-e	118	118	118	118	118	118	707
Grader	t CO2-e	82	82	82	82	82	82	493
Water cart	t CO2-e	213	213	213	213	213	213	1,276
Crane (20 t)	t CO2-e	0	0	0	0	0	0	3
Crane (50 t)	t CO2-e	0	0	0	0	0	0	3
Forklift/IT	t CO2-e	14	14	14	14	14	14	82
Service truck (25 t)	t CO2-e	3	3	3	3	3	3	20
Excavator (25 t) rockbreaker	t CO2-e	19	19	19	19	19	19	112
Fuel truck	t CO2-e	2	2	2	2	2	2	15
Lightning plants	t CO2-e	30	30	30	30	30	30	182
Light vehicles	t CO2-e	2	2	2	2	2	2	15
Low bed or float	t CO2-e	1	1	1	1	1	1	5
LV's & other non-mining mbl fleet	t CO2-e	51	51	51	51	51	51	307
Total	t CO2-e	936	936	936	936	936	936	5,618
Road Train Haulage	t CO2-e	524	1,076	1,076	1,076	1,076	855	5,683
Electricity Generation	t CO2-e	3,682	3,682	3,682	3,682	3,682	3,682	22,095
<b>TOTAL SCOPE 3 EMISSIONS</b>	t CO2-e	15,472	16,024	16,024	16,024	16,024	15,803	95,370
<b>TOTAL EMISSIONS - by activity</b>								
Vegetation Clearing	t CO2-e	62,383						62,383
Mining Fleet	t CO2-e	146,360	146,360	146,360	146,360	146,360	146,360	878,162
Ancillary Fleet	t CO2-e	13,268	13,268	13,268	13,268	13,268	13,268	79,605
Road Train Haulage	t CO2-e	7,421	15,248	15,248	15,248	15,248	12,117	80,530
Electricity Generation	t CO2-e	51,971	51,971	51,971	51,971	51,971	51,971	311,826
<b>TOTAL</b>	t CO2-e	219,020	226,847	226,847	226,847	226,847	223,716	1,350,123
<b>TOTAL EMISSIONS - by Scope</b>								
Scope 1	t CO2-e	265,931	210,823	210,823	210,823	210,823	207,913	1,254,753
Scope 3	t CO2-e	15,472	16,024	16,024	16,024	16,024	15,803	95,370
<b>TOTAL</b>	t CO2-e	281,403	226,847	226,847	226,847	226,847	223,716	1,350,123