

Dendrobium Mine

Environmental Management System



Greenhouse Gas & Energy Efficiency Plan

Review History

Revision	Description of Changes	Date	Approved
0		Nov 04	Bryan Quinn
0.1	Update following PRP9 and Department of Planning Compliance Audit	Oct 06	David Oliver
0.2	Three yearly review as required by Development Consent	Mar 08	David Oliver
0.3	Review as required by the revised Development Consent (issued 8 December 2008)	April 09	Wayne Price
1.0	Updated to reflect FY09 data	Oct 09	IC Environment Coordinator

Persons involved in the April 2009 review of this document include:

Name	Title	Company
Chris Schultz	Environment & Community Manager	Dendrobium Mine
Scott Coleman	Environment & Community Advisor	Dendrobium Mine
Ben O'Brien	Environment Coordinator	Illawarra Coal
William Dove	Head Regional Operations	DECC
Andrew Couldridge	Senior Operations Officer	DECC

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1 INTRODUCTION

1.1 Background

Dendrobium Mine is an underground coalmine which commenced construction in January 2002 following approval from the Minister for Planning on 20 November 2001. Longwall mining commenced at Dendrobium in April 2005. The mine is owned and operated by Dendrobium Coal Pty Ltd, a wholly owned subsidiary of BHP Billiton and is operated on a continuous basis, 24 hours a day and seven days a week.

The mining operations are located immediately adjacent to Mt Kembla, approximately 8km west of Wollongong, NSW, on the Illawarra escarpment. Mt Kembla village, located within 500m of the Pit Top site, has close historical links with coal mining.

The Pit Top facilities have been developed on the site previously known as Nebo Colliery, which was combined with Wongawilli Colliery in 1993 to form Elouera Colliery. The Nebo Portal site was relinquished from the ownership and responsibility of Elouera Colliery in December 2001 to enable Dendrobium Mine to acquire formal responsibility, ownership and identity of the site.

Dendrobium Mine accesses coal from the No. 3 Seam (Wongawilli Seam) of the Southern Coalfield. Three mining areas make up the approved mine plan for Dendrobium and are named Areas 1, 2, and 3.

Dendrobium produces coking coal and is approved to produce up to 5.2 million tonnes per annum with an expected life of mine in excess of 20 years. The Bluescope Port Kembla Steel Works and Whyalla Steel Works are major customers with coal also exported via the Port Kembla Coal Terminal to international customers.

This Greenhouse Gas and Energy Efficiency Plan (GHGEEP) addresses the site specific minimisation opportunities associated with energy usage and greenhouse gas (GHG) emissions associated with the operation of the mine and associated infrastructure. The high level management and mitigation strategies for the Illawarra Coal operations are included in the Illawarra Coal Energy and Greenhouse Gas Management Plan (ICHMP0018). Linkages between the BHP Billiton Global Levels Documents, Illawarra Coal Management Plans and the Dendrobium GHG and Energy Efficiency Plan is outlined in Figure 1.

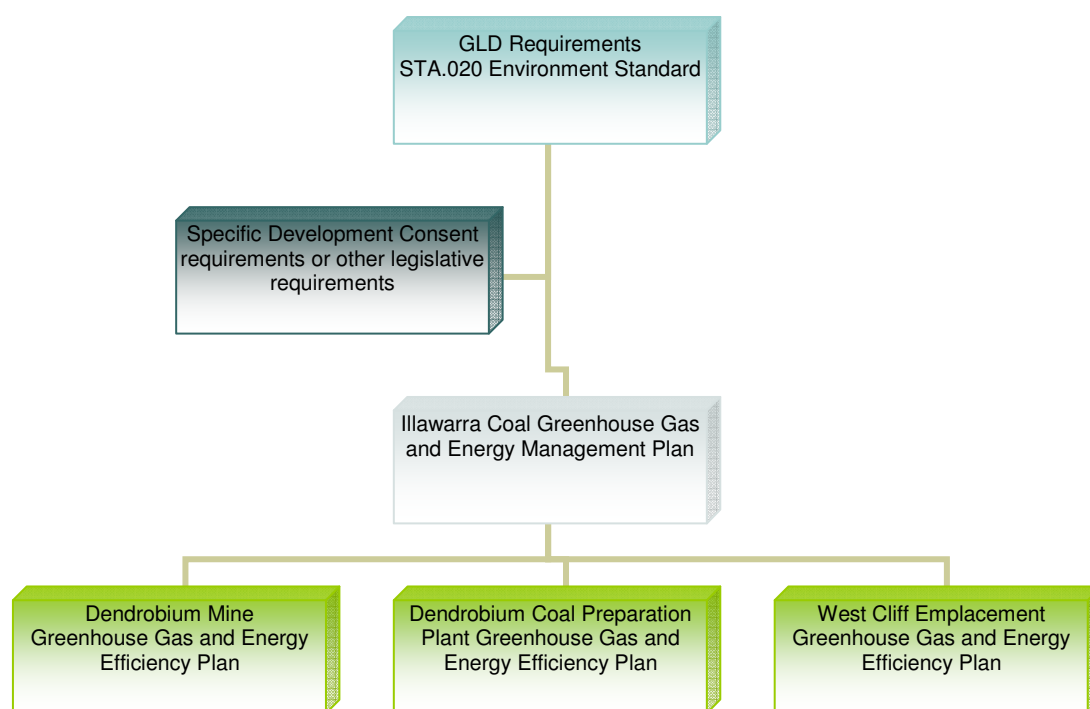


Figure 1: GHG and Energy Management Documentation Structure – Dendrobium Operations

1.2 SCOPE

The scope of this management plan includes the following Dendrobium Mine sites and facilities:

Dendrobium Pit Top - consists of administration building, workshop, machinery and equipment storage areas, people and materials access to the underground workings via the Dendrobium Tunnel, a sedimentation pond and grey water treatment and oil water separation facility.

Kemira Valley Coal Loading Facility – the KVCLF receives coal from underground via the Kemira Valley Tunnel. Coal is transported from underground to KVCLF via a conveyor network. The coal is then fed into a rill tower and deposited onto a 150,000 tonne stockpile from which it is loaded into trains via an enclosed rail-loading chute.

Ventilation Shaft Number 1 - The No.1 ventilation shaft, located within the Metropolitan Special Area administered by Sydney Catchment Authority (SCA), operates as a downcast shaft (i.e. drawing fresh air into the underground workings). The No. 1 ventilation shaft is on land owned by Illawarra Coal.

Ventilation Shafts Number 2 and 3 – Also located within the Metropolitan Special Area and within Mining Lease ML1566. Construction of the No.2 and 3 ventilation shafts was completed

in 2008. The No.2 shaft operates as an additional downcast shaft whilst the No.3 shaft operates as an upcast shaft.

The location of these surface facilities is outlined in Plan 1.

1.3 GHG and Energy Targets

Dendrobium Mine, Illawarra Coal, and BHP Billiton are committed to operating in an environmentally responsible manner. To support this commitment, targets are established at both corporate and asset level with respect to GHG emissions, the current BHP Billiton targets are outlined in Table 1.

Table 1: GHG Emissions Targets (BHPBilliton)

Aspect	Target	Date
BHP Billiton	6% reduction in emissions per unit production (aggregate)	30 June 2012
	13% reduction in carbon based energy use per unit production (aggregate)	30 June 2012

Targets and/or projects relating to GHG emissions and Energy consumption for the Dendrobium Operations are reviewed annually as part of Business Planning (i.e. 1 year outlook) and Business Strategy (i.e. 5 year outlook).

2 OBJECTIVES

The objectives of the GHGEEP, which has been prepared in accordance with the Guidelines for Energy Savings Plans (DEUS 2005), are to:

- Comply with all regulatory and corporate requirements;
- Define roles and responsibilities of site personnel with respect to GHG and energy management;
- Provide an overview of the energy usage and associated GHG emissions for the Dendrobium operations; and
- Describe the Dendrobium Operations GHG and Energy minimisation strategy.

3 RESPONSIBILITIES

It is the responsibility of all employees and contractors to undertake practices to manage and minimise GHG emissions and energy usage according to this plan.

The Environment and Community Manager is responsible for coordinating the implementation of this management plan and for the periodic review of the plan. The Environment and Community Manager will be responsible for ensuring the commitments of the plan are met.

This will include:

- Reviewing data to ensure its integrity;
- Analysis and interpretation of data;
- Identification of potential energy and GHG emission minimisation projects; and
- Production and dissemination of reports and appropriate summaries of information in reports.

The Manager of Electrical Engineering will provide assistance to the Environment and Community Manager with regards to the identification and implementation of targeted energy efficiency and GHG emission reduction initiatives.

4 LEGISLATIVE AND OTHER REQUIREMENTS

4.1 Legislative Requirements

National Greenhouse and Energy Reporting System (NGERS)

The National Greenhouse and Energy Reporting Act 2007 requires that:

- Corporations that may meet or exceed thresholds should be collecting greenhouse gas emissions and energy data.
- Corporations likely to meet thresholds next financial year should be considering setting up GHG and energy accounting and reporting system.

The emissions associated with the NGER Act are Scope 1 (i.e. emissions that occur as a direct result of an activity or series of activities that constitute the facility) and Scope 2 (i.e. emissions associated with the generation of electricity which is consumed by the facility). The NGER Act Reporting Thresholds (i.e. Scope 1 and 2) are outlined in the figure below.

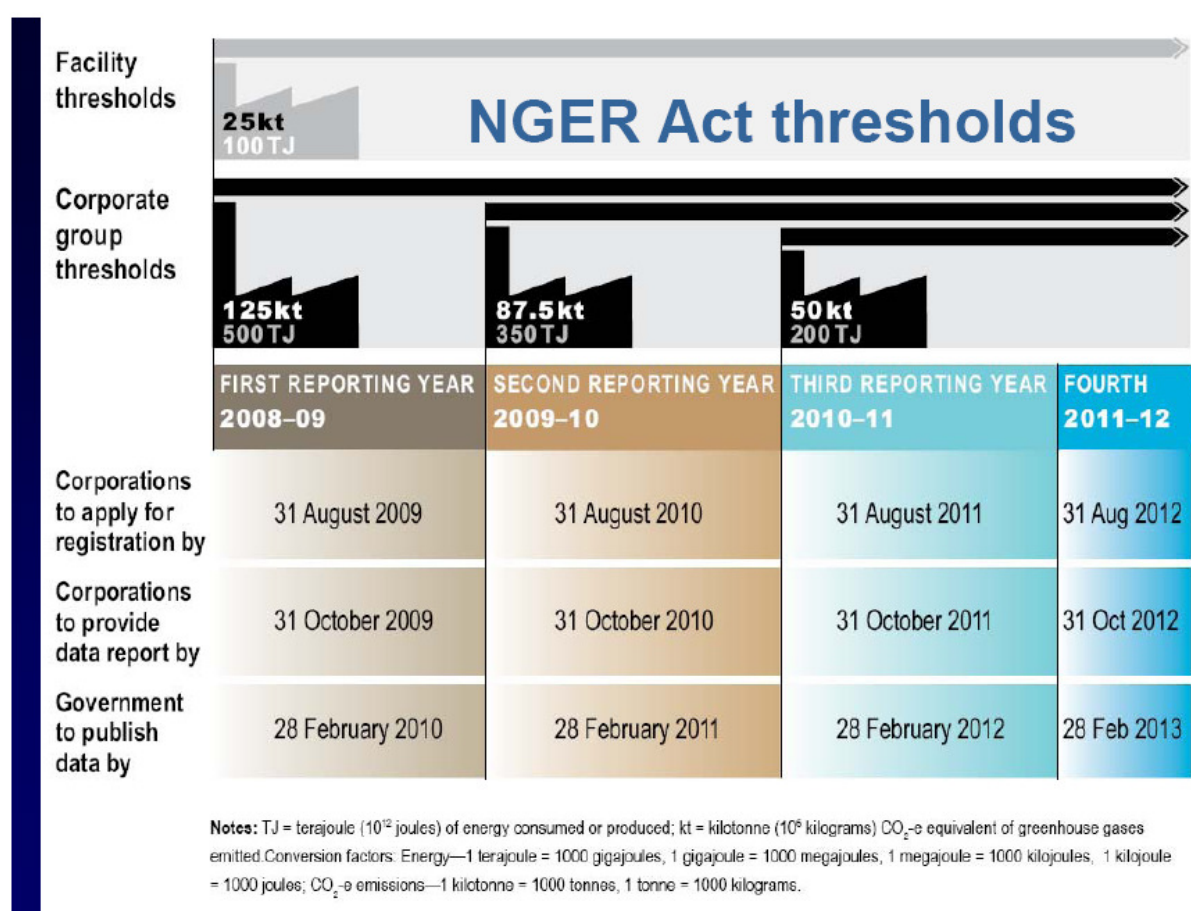


Figure 2: NGER Reporting Thresholds

The data that is required to be reported to the Greenhouse and Energy Data Officer (GEDO) from facilities includes:

- GHG emissions;

- Energy Consumption; and
- Energy Production.

Corporations can be instructed to undertake audits by the GEDO on suspicion of reporting discrepancies; alternatively the GEDO can elect to undertake random audits as required.

Associated Legislation includes the *National Greenhouse and Energy Reporting Regulations 2008* and the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*.

4.2 Development Consent Conditions

Schedule 6 of the Development Consent specifies the compliance requirements for the Dendrobium Operations. The following conditions apply to this Management Plan:

Greenhouse Gases & Energy Efficiency

1. The Applicant shall prepare and implement a Greenhouse and Energy Efficiency Plan for the development.

This plan must:

- a. Be prepared in consultation with DECC and generally in accordance with the Guidelines for Energy Savings Action Plans (DEUS 2005, or its latest version);
- b. Be submitted to the Director-General by 30 April 2009 for approval;
- c. Include a program to monitor greenhouse gas emissions and energy use generated by the development;
- d. Include a framework for investigating and implementing measures to reduce greenhouse gas emissions and energy use at the development;
- e. Include a research program to inform the continuous improvement of the greenhouse gas minimisation measures at the development;
- f. Describe how the performance of these measures would be monitored over time; and
- g. Report on the development's greenhouse gas emissions and minimisation measures in the AEMR to the satisfaction of the Director-General.

2. The Applicant shall implement all reasonable and feasible measures to minimise the greenhouse gas emissions from the development to the satisfaction of the Director-General.

4.3 BHP Billiton and Other Policies and Standards

BHP Billiton operates in accordance with the Health, Safety, Environment and Community (HSEC) Management Standard (STA.009) which covers all operational aspects and activities of its business and the Environment Standard (STA.020) which prescribes the mandatory environmental performance requirements that support the aspiration of zero harm across BHP Billiton.

The HSEC Management System framework is consistent with internationally recognised standards. It aims to set benchmarks for the Company's diverse range of businesses to

develop and implement their own HSEC Management Systems, to provide auditable criteria for these systems and to provide a basis from which to drive continuous improvement.

The GHG and Energy Management Plan has been developed consistent with the principles of the HSEC Management Standard and Environment Standard.

Dendrobium Mine maintains an environmental management system which is certified to ISO14001 standard.

5 SITE ENERGY USE & GHG EMISSIONS

5.1 Energy Usage - Overview

Figure 3 provides an overview of the energy sources and Scope 1 and Scope 2 GHG emissions associated with the Dendrobium Operations.

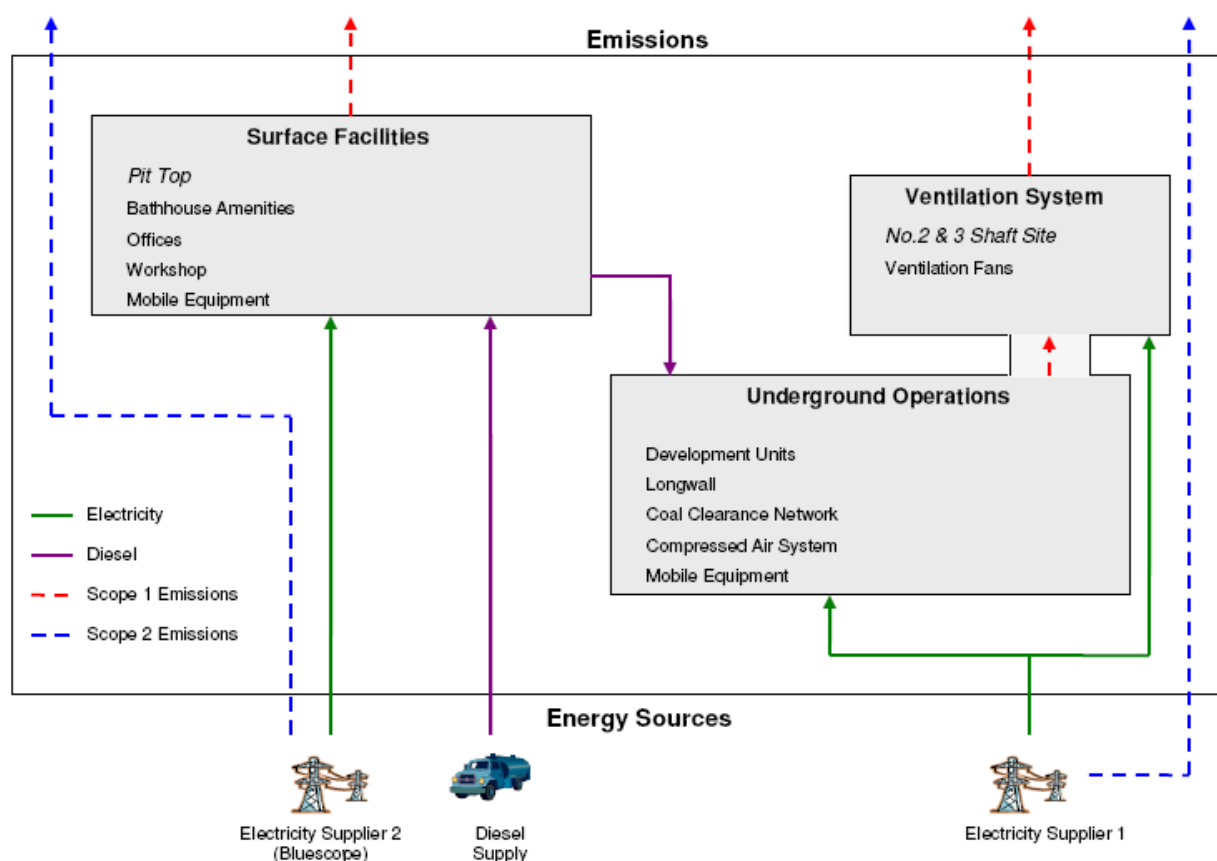


Figure 3: Energy Sources and GHG Emissions – Dendrobium Mine

Energy use for the Dendrobium operations comprises two main components:

- i. Equipment that maintains a relatively static demand regardless of whether the mine is producing coal or not (i.e. fixed component). This includes air compressors (driving underground air pumps) and fixed underground electric pumps used to de-water the mine, and main ventilation equipment that is required to operate 24 hours every day; and
- ii. Equipment that has a moderate to high relationship with mining operations and generally runs when coal is being produced, including conveyors, longwall operations and continuous mining equipment (i.e. variable component). Conveyors have a moderate relationship with production, since these carry a relatively high load even when coal production is interrupted for short periods, while longwall/continuous miner equipment energy use has a high correlation with production.

There are three major factors that affect the energy consumption at Dendrobium which include:

- i. Coal cutting using continuous miners, a longwall shearer and associated extraction conveyors and belt systems, which extract and transfer coal to the surface;
- ii. Continuous compressed air requirements to provide motive power for underground air pumps and other equipment that are served by three compressors. Two of these compressors are constant load, whilst the third is a variable screw compressor, which can unload when required. The compressors supply underground operations via approximately 14km of piping infrastructure; and
- iii. Electrical load of offices, workshops and bathhouses.

5.1.1 Electricity

Dendrobium Mine used a total of 38.344 MWh of electricity for FY09 to extract 3.00 million ROM tonnes. The breakdown of energy consumption for the electricity supplies is shown in Figure 4.

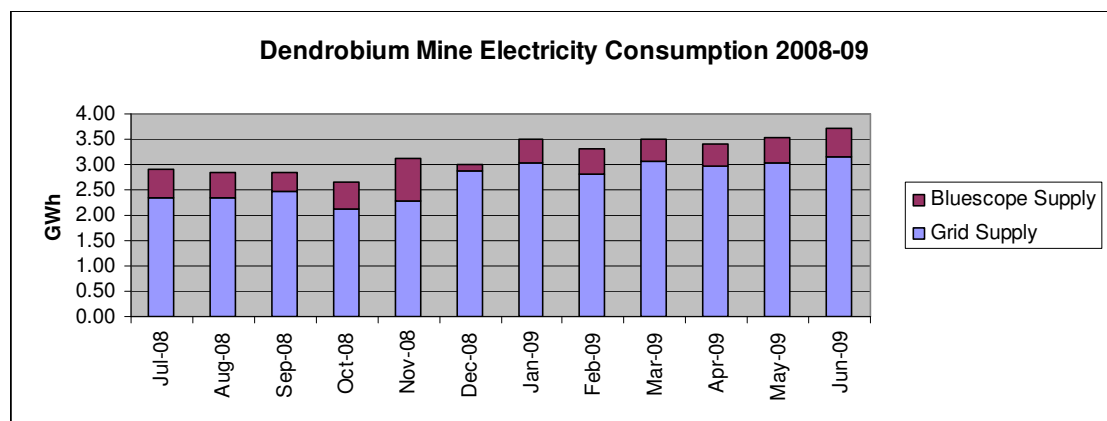


Figure 4: Electricity Usage – Dendrobium Mine

Table 2 outlines the approximate consumption (as a % of total) for each of the key electricity use areas for the Dendrobium operations. As shown in the table, the electricity consumption of the mine ventilation system is considerably higher than the other areas accounting for approximately one third of the total electricity usage.

Table 2: Approximate Consumption (as a % of total) of key electricity use areas

Area	Approximate Proportion of Total*
Compressors	19%
Conveyors	11%
Development	4%
Longwall	18%
Main Vent Fans	33%
Other UG	1%
Surface (Bathhouse etc)	14%

* Percentages taken from Energy Savings Plan (Energetics) (2007)

5.1.2 Diesel

The other significant energy source used at the Dendrobium operations is diesel. Diesel is used by underground mining equipment such as people transporters (i.e. drift runners) and material transporters.

The consumption of underground mining fuel (UMF) is generally dependant on a number of factors including:

- The number of mine personnel working underground at the mine requiring transportation;
- The traveling road distances;
- Gradient and roadway conditions;
- The size and rate of operations of the mine which determines material consumption and supply rates;
- Mine layout; and
- Production plans.

Dendrobium Mine used approximately 716 kilolitres of diesel during FY09 which is a 12.5% increase on FY08. The diesel usage is expected to slightly increase over the operating life of Dendrobium as the mining areas moves further away from the Pit Top facilities, hence increased travel distances and time.

Figure 5 outlines the monthly diesel usage for FY09.

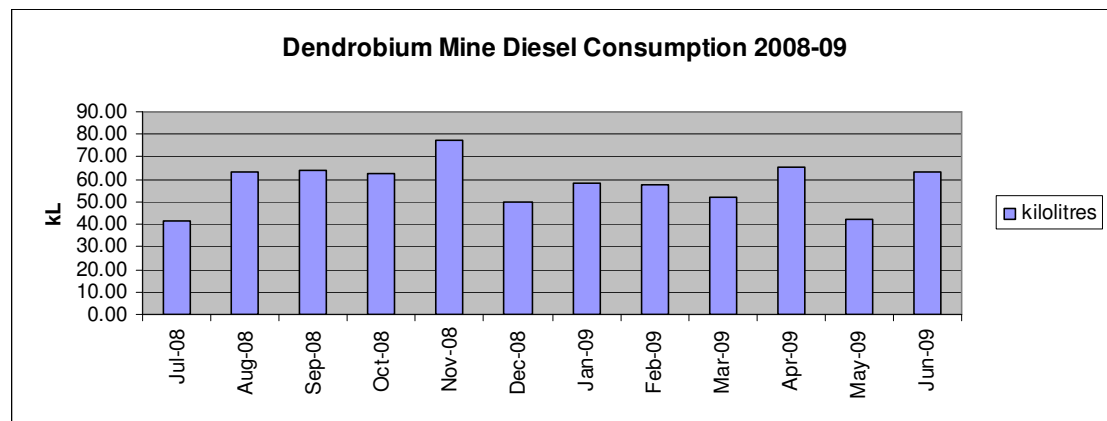


Figure 5: Diesel Consumption – Dendrobium Mine

5.2 Greenhouse Gas Emissions

The GHG emissions associated with the Dendrobium operations are broken into two different categories as follows:

Scope 1

The release of greenhouse gas into the atmosphere as a direct result of an activity, or series of activities (including ancillary activities) those constitute the facility.

Scope 2

Scope 2: The release of greenhouse gas as a result of one or more activities that generate electricity, heating, cooling or steam that is consumed by the facility but that do not form part of the facility.

Total Scope 1 and Scope 2 greenhouse gas emissions for FY09 were 339, 312 t CO₂e and 34,127 t CO₂e respectively

The table below outlines the GHG emissions associated with the Dendrobium operations, and their respective categories, for FY09.

Table 3: GHG Emissions – Dendrobium Operations

Source	Category	Amount (tCO ₂ e)
Emissions from purchased electricity	Scope 2	34,127
Emissions from diesel consumption	Scope 1	1,926
CH ₄ emissions from Ventilation (fugitive)	Scope 1	323,793
CO ₂ emissions from Ventilation (fugitive)	Scope 1	15,514

As shown in Table 3 and Figure 6, Scope 1 emissions contribute in the order of 91%, to the total GHG emissions for the site. This is predominately a result of the mine ventilation system emissions, principally being methane.

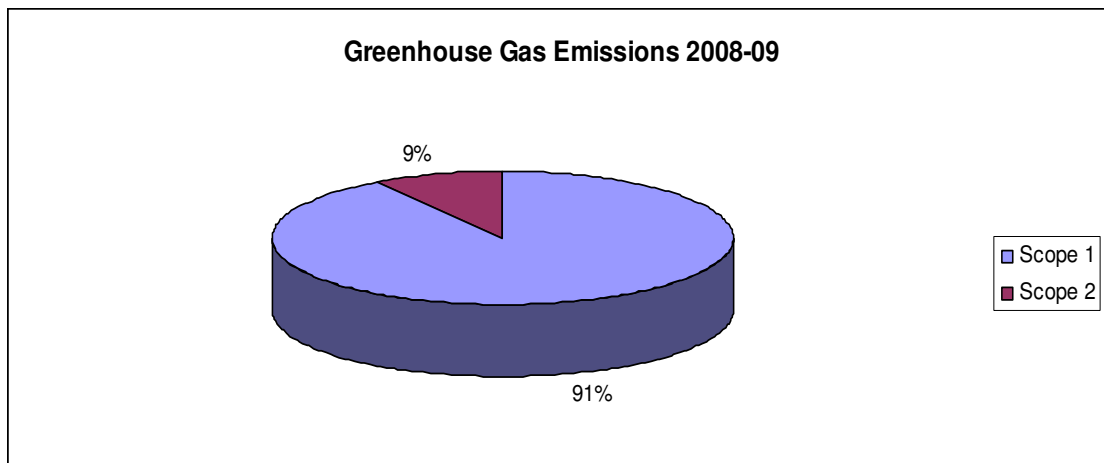


Figure 6: FY09 GHG Emissions – Dendrobium Mine

As detailed in the Illawarra Coal Greenhouse Gas and Energy Management Plan (ICHMP0018), Dendrobium Mine accounts for a relatively small percentage of the total GHG emissions for the Illawarra Coal operations due to relatively low gas concentrations in the Wongawilli Seam compared to the Bulli Seam in which Appin and West Cliff Mines both operate.

6 GHG AND ENERGY MINIMISATION STRATEGY

The key elements of the Dendrobium Mine strategy for GHG and energy use minimisation are depicted in Figure 7.

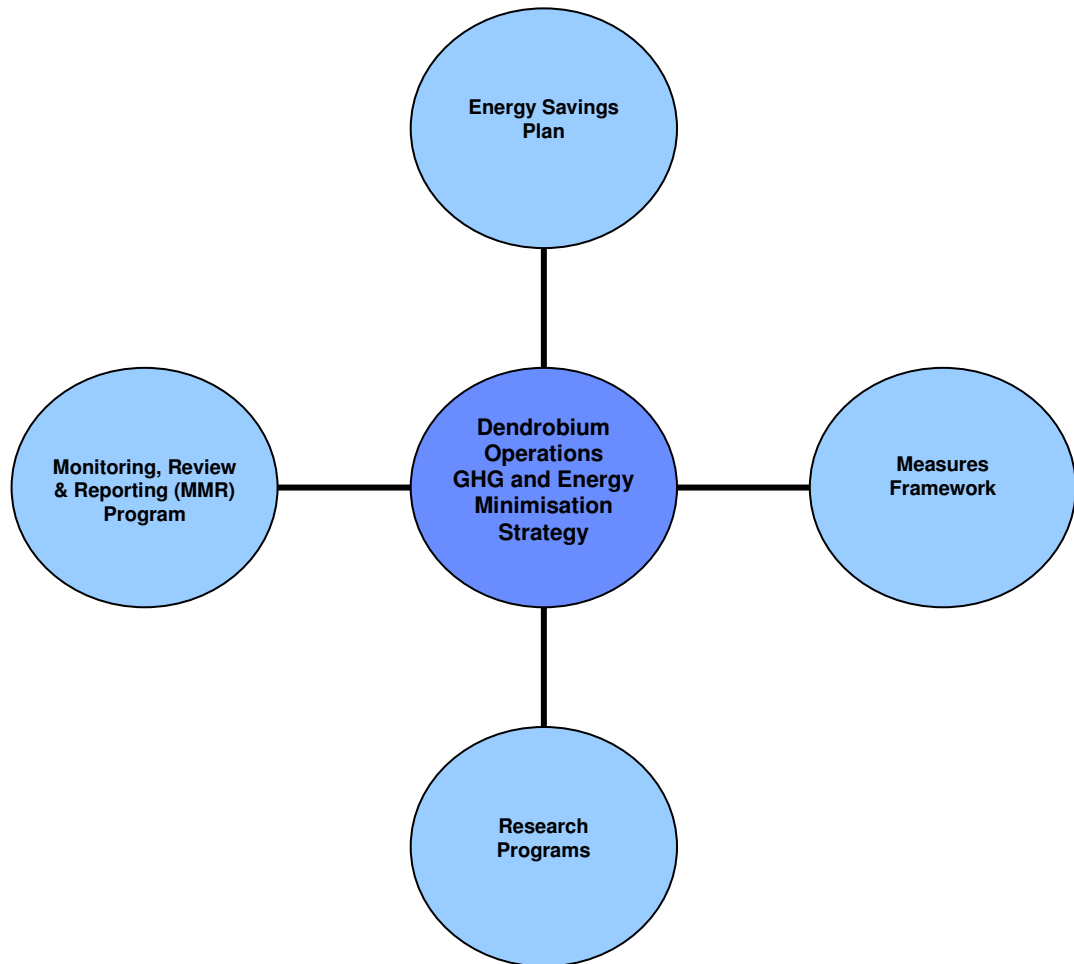


Figure 7: Dendrobium Operations GHG and Energy Minimisation Strategy

These key elements are discussed in more detail in the following paragraphs.

6.1 Energy Savings Plan

A review of the Dendrobium Mine energy management system was conducted by Energetics Pty Ltd in December 2006 in accordance with the '*Guidelines for Energy Savings Plans*' (DEUS 2005). The process for the review is depicted in Figure 8.

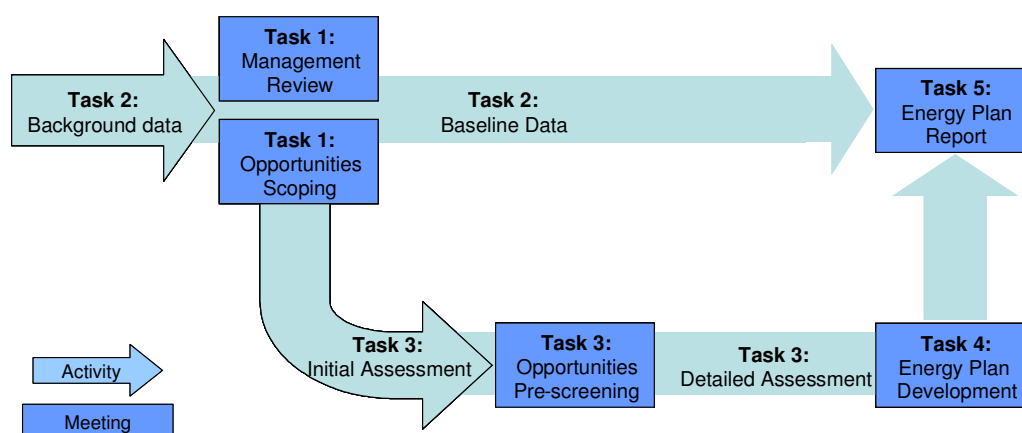


Figure 8: DEUS Review Process

This review has formed the basis of the site specific minimisation strategy at Dendrobium with the identification of potential GHG and energy reduction opportunities. The main elements of the review, and the identified reduction opportunities, are discussed in the following sections.

6.1.1 Management Review

The initial management review, which involved senior mine management, enabled the Dendrobium energy management system to be assessed according to DEUS criteria.

The assessment involved the following key components:

- i. Formation of a suitable review team including representatives from the mine management team and other key individuals;
- ii. Assessment of the current performance of the mine including the identification of strengths and weaknesses of particular key areas (i.e. Management commitment, Operating and maintenance procedures etc);
- iii. Identification of actions needed to improve the energy management systems at Dendrobium.

6.1.2 Opportunities Scoping

Following the management review, key Dendrobium personnel attended a brainstorming workshop, facilitated by Energetics, to review the baseline information and determine the areas that would deliver most value to the site.

The list of opportunities were ranked based on three key criteria including:

- i. Implementability;
- ii. Savings; and
- iii. Costs

6.1.3 Identified Reduction Initiatives

A total of 14 potential initiatives were initially identified. The highest priority opportunities identified during the process are outlined in Table 4.

Table 4: Identified Reduction Initiatives – Dendrobium Mine

Area	Opportunity
Bluescope Supply	Assess the current billing and usage situation. If invoiced on a pro-rata system, it is possible that the site is paying more due to a low power factor created on the other side of the fence. Determine if additional metering would be beneficial, or to redirect power source, or simply to obtain usage information to utilise in an awareness raising process.
VSD Compressors	Assess the potential for VSD driven compressors.
Diesel Usage	Diesel usage information is not detailed: determine how best to meter diesel usage on a per vehicle basis. This could include smart metering at refill points or inline fuel meters on vehicles.
Energy Awareness	Site and Corporate Energy Awareness raising required to support site processes
Compressed Air Pumps	Compressed air pumps are currently manually controlled. Install automatic control or boost awareness programs to ensure these are turned off when not in use.

Significant mitigation projects for the Illawarra Coal operations, such as WestVamp, are discussed in more detail in the Illawarra Coal Greenhouse Gas and Energy Management Plan.

6.1.4 Project Review, Implementation and Reporting

The initiatives identified during the brainstorming workshop, along with any other identified opportunities, are reviewed on an annual basis as per the Environmental Improvement Strategy review process. The annual review involves:

- i. Discussing the identified initiatives with suitable personnel;
- ii. Reviewing the feasibility of the initiatives (i.e. payback period); and
- iii. Progressing any initiative that is deemed to be suitable to be implemented in the next financial year (from an operational perspective) and is feasible to do so.

Any project will be assessed according to the ICHP0124 *Illawarra Coal Capital Approval Process Flowchart - ICHP0124* (see Figure 10). Project documentation is to be prepared in accordance with the *Illawarra Coal Small Projects Handbook – ICHMA0002*.

6.2 Measures Framework

This section describes the principles and processes (framework) for investigating and implementing GHG emissions and energy savings measures as per Condition 1 (d), Schedule 6 of the Development Consent.

6.2.1 Energy Use

Figure 9 outlines the framework for the investigation and implementation of measures to reduce energy use at the Dendrobium operations. This framework details the process for reviewing, implementing and documenting initiatives related to energy use minimisation.

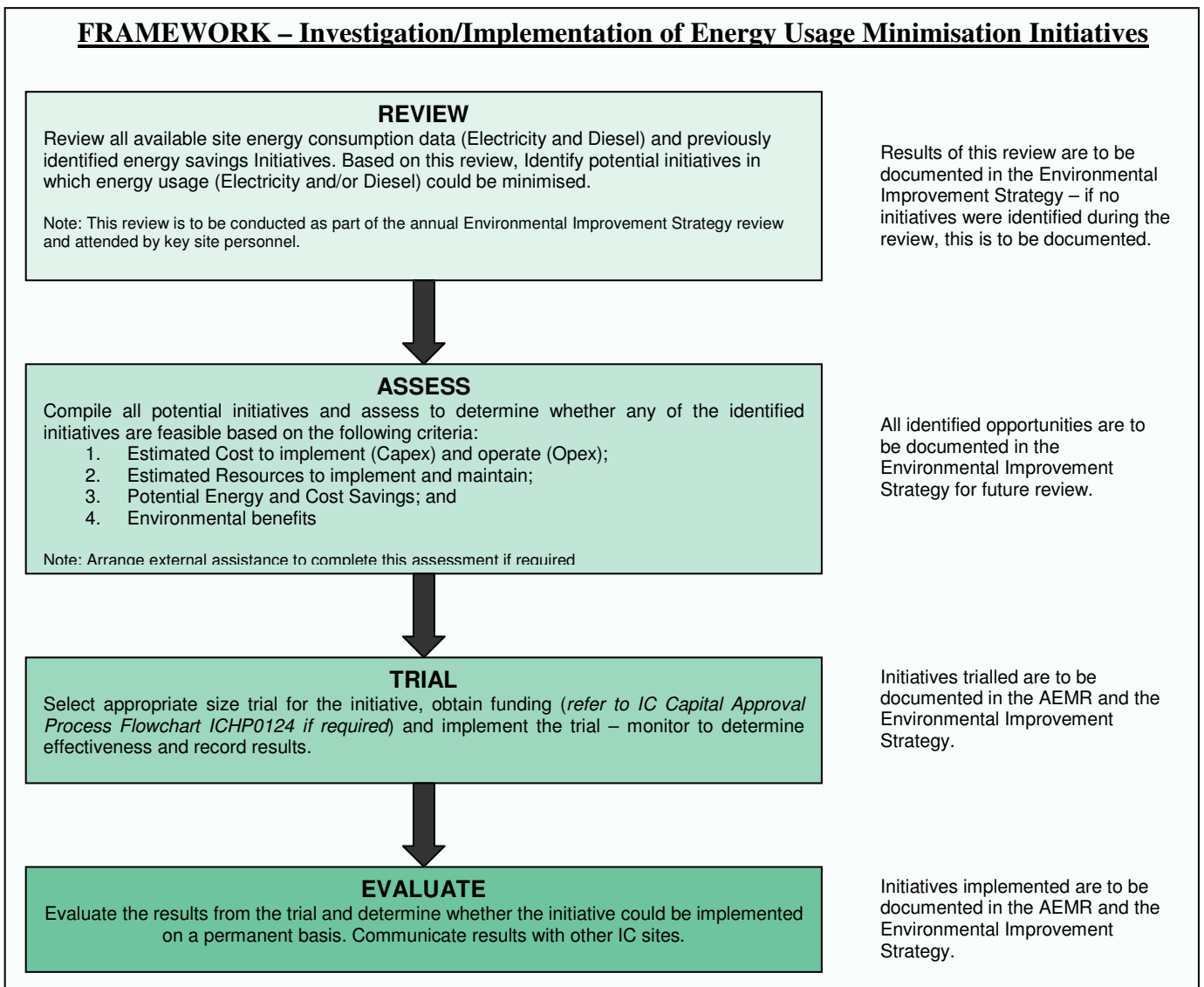


Figure 9: Framework – Identification/Implementation of Energy Minimisation Initiatives (Dendrobium)

6.2.2 GHG Emissions

As previously stated, the majority of GHG emissions (80 to 85%) are associated with mine ventilation emissions to atmosphere.

Dendrobium Mine ventilation emissions exhibit a routine methane concentration of between 0.20 to 0.25% while producing at a rate of 3.0 to 3.5 mt ROM production pa.

Illawarra Coal is currently undertaking a feasibility study for each of the mining operations (which includes Dendrobium Mine) into Mine Ventilation utilisation. Some of the key elements that will be taken into consideration during the feasibility study for the Dendrobium operations include:

- i. Volume and CH₄ concentration of Dendrobium Mine vent air emissions;
- ii. Availability of viable and effective technologies which could effectively utilise, reduce or destroy Dendrobium's current vent air emissions; and
- iii. Availability of a suitable environment for the establishment and servicing of major infrastructure.

6.3 Research Program

Potential research programs to inform the continuous improvement of the GHG minimisation measures for the Dendrobium operations include:

- Research into use of bio-diesel fuel in selected equipment (IC level project).
- Include Dendrobium Mine in IC study into vent air emissions reductions initiatives (IC level project).

6.4 Monitoring, Review and Reporting Program

The monitoring, review and reporting associated with GHG emissions and energy consumption for the Dendrobium operations includes:

- Compliance with BHP Billiton Sustainable Development Policy and Development Consent conditions.
- Monitoring and recording energy use and GHG emissions on a monthly basis.
- Correlation and compilation of energy and GHG data for monthly management review.
- Periodic review of energy and GHG performance at Illawarra Coal's Environmental Management System Team meetings.
- Six monthly reporting of energy and GHG data to BHP Billiton.
- Assessing projects, initiatives and processes for opportunities for GHG and energy efficiency improvements.

- Evaluating projects for inclusion in operating and capital budgets.
- Evaluation and implementation of operational efficiency improvement projects.
- Annual review of the sites GHG and Energy Management Plan.
- Monthly reporting and discussion with senior management on performance against Company and site plan objectives and targets.
- Annual reporting of Energy and GHG data and performance within the Annual Environmental Management Report submitted to government and other stakeholders.
- Establishment and implementation of GHG and Energy monitoring data capture and recording systems compliant with NGERs requirements.

7 REFERENCES

Department of Planning (2008) Notice of Modification – *Dendrobium Development Consent*

Energetics Pty Ltd (2007) – *Dendrobium Mine Energy Savings Plan*

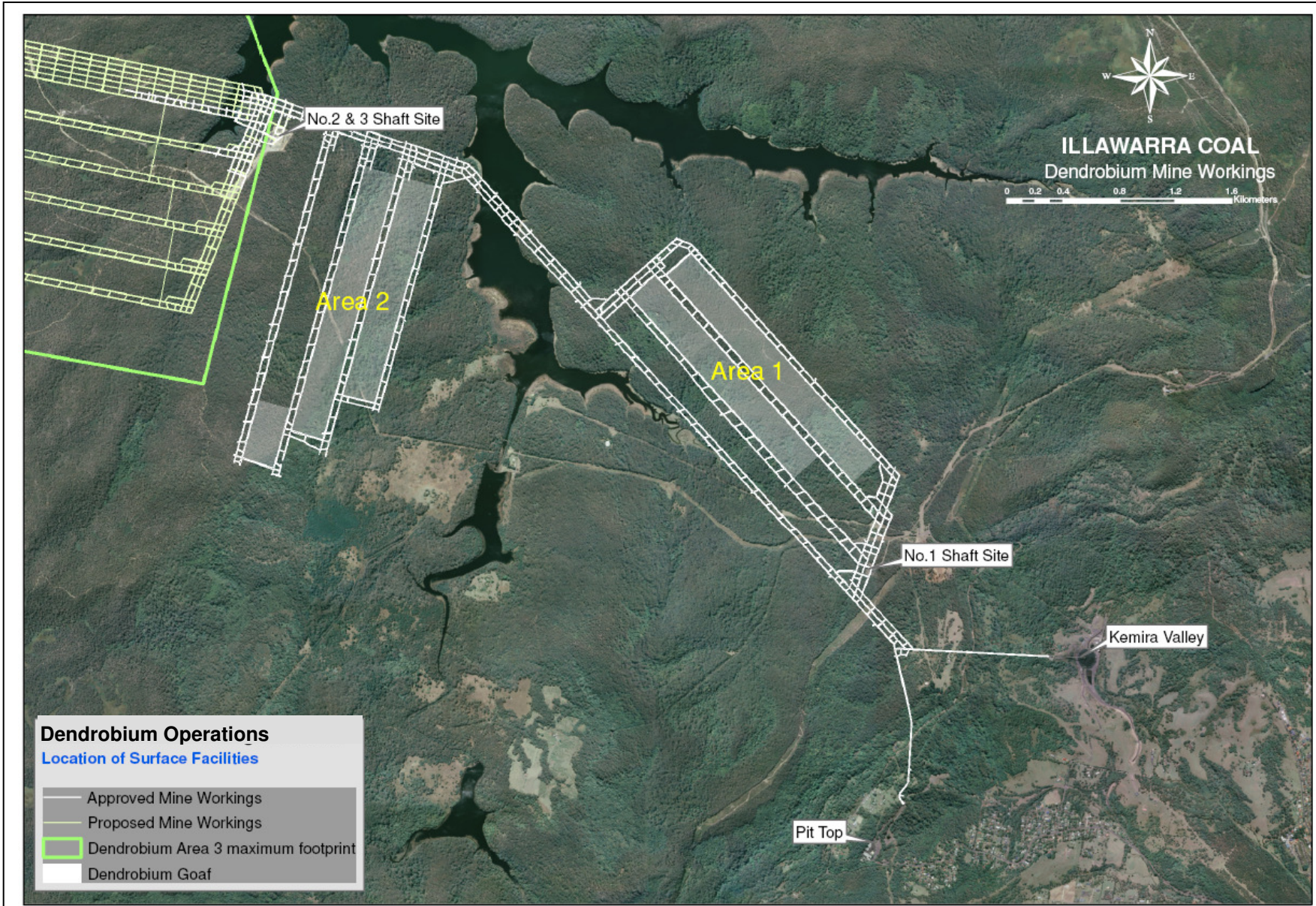
BHP Billiton Illawarra Coal - *Illawarra Coal GHG and Energy Management Plan (ICHMP0018)*

BHP Billiton Illawarra Coal - *Illawarra Coal Capital Approval Process Flowchart (ICHMP0124)*

BHP Billiton Illawarra Coal - *Illawarra Coal Small Projects Handbook (ICHMA0002)*

BHP Billiton Dendrobium Mine - *Environmental Improvement Strategy FY09 –FY13*

PLAN 1: Location of Surface Facilities



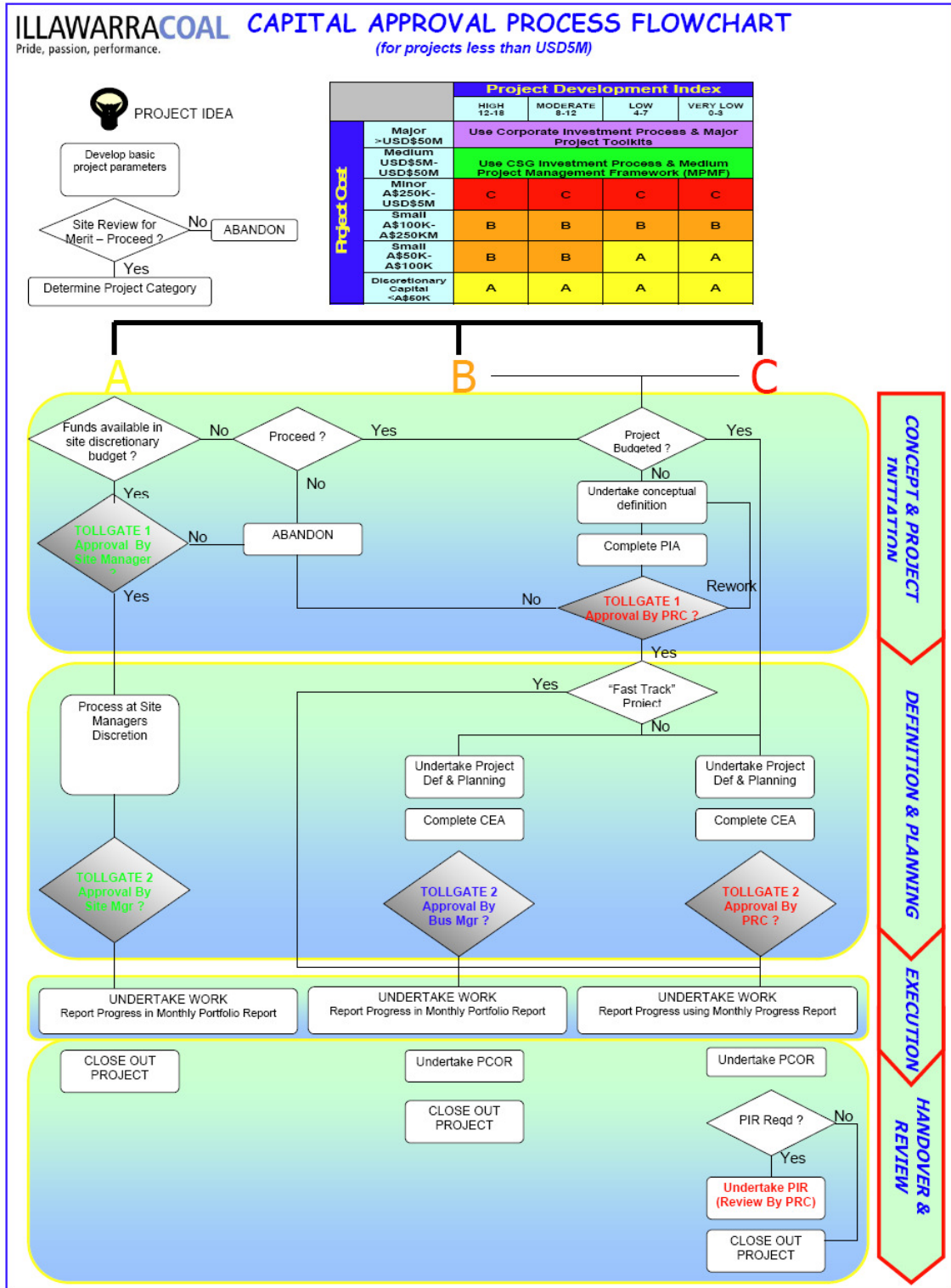


Figure 10: Illawarra Coal Capital Approval Process Flowchart