Tasman Extension Project

Environmental Impact Statement

APPENDIX O

ENVIRONMENTAL RISK ASSESSMENT

Resource Strategies

DONALDSON COAL

Part of Gloucester Coal

Tasman Extension Project

Environmental Risk Assessment

***Prepared for*:**	**Donaldson Coal Pty Ltd**		
Prepared by:	**Safe Production Solutions**		
Author:	***Dr Peter Standish***		
Date of Team Review:	**18 August 2011**		
Job Number:	**J3007**		
Doc No:	**D5508**	***Version:* 1**	***Date:* 10/02/2012**

SPSolutions
Manage Complexity. Improve Outcomes. Feel in Control.

Safe Production Solutions Pty. Ltd.
ABN: 16 097 038 296
155 Birch Avenue
Dubbo NSW 2830
NSW AUSTRALIA 2830

Tel: +61 2 6885 6611
Fax: +61 2 6885 6011
Web Site: www.spsolutions.com.au
E-mail: sps@spsolutions.com.au

DOCUMENT CONTROL AND DISTRIBUTION

Document No.	D5508
Title	Tasman Extension Project – Environmental Risk Assessment
General Description	Report on the team based risk assessment
Key Supporting Documentation	• AS/NZ 31000:2010 *Risk Management* (Standards Australia, 2010); • HB 203:2006 *Environmental Risk Management – Principles and Process* (Standards Australia, 2006); • MDG1010 *Risk Management Handbook for the Mining Industry* (Department of Primary Industries, 1997); and • Director-General's Requirements for the Tasman Extension Project.

Versions

Version	Date	Description	Created By	Reviewed
A	20/09/11	Draft report for internal review	PNS	BW
0	25/11/11	Draft report for client and specialist review	PNS	BW
1	10/02/12	Finalised report	PNS	BW

Distribution List of Latest Version

User	No. Copies
Donaldson Coal	1 (Electronic)
Resource Strategies	1 (Electronic)
SP Solutions	1 (Electronic)

TABLE OF CONTENTS

List of Figures

List of Tables

List of Attachments

EXECUTIVE SUMMARY

This Environmental Risk Assessment (ERA) identifies risks associated with key potential environmental issues associated with the Tasman Extension Project (the Project). The Project provides for the continuation and extension of operations at the existing Tasman Underground Mine.

On 18th August 2011, a team consisting of Donaldson Coal Pty Ltd and specialist consultants participated in a facilitated ERA workshop. The scope of the workshop was:

> *To conduct a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment.*

The ERA workshop included:

1. Establishing the context including review of supporting information and objectives.
2. Identifying risks via a number of Risk Management techniques, including:
   a. brain writing/storming;
   b. modified hazard and operability analysis, and
   c. keyword (loss generation) techniques
3. Analysis of identified risks and nomination of key potential environmental issues.
4. Ranking of the risks, including consideration of mitigation measures.

Key Potential Environmental Issues

Key potential environmental issues were identified by the ERA team using a voting system, whereby team members were assigned a number of 'votes' to their key issues. The key potential environmental issues identified by the ERA team (Table ES-1) were considered to be key issues for further assessment in the Environmental Impact Statement (EIS). The key potential environmental issues identified in the ERA will be addressed in the EIS and the following specialists reports, included as appendices to the EIS:

- Appendix A Subsidence Assessment.
- Appendix B Groundwater Assessment.
- Appendix C Surface Water Assessment.
- Appendix D Geomorphology Assessment
- Appendix E Aquatic Ecology Assessment.
- Appendix F Flora Assessment.
- Appendix G Terrestrial Fauna Assessment.
- Appendix H Road Transport Assessment.
- Appendix I Noise and Vibration Impact Assessment.
- Appendix J Air Quality and Greenhouse Gas Assessment.
- Appendix K Aboriginal Cultural Heritage Assessment.
- Appendix L Non-Aboriginal Heritage Assessment.
- Appendix M Socio-Economic Assessment.
- Appendix N Preliminary Hazard Analysis.
- Appendix P Land Contamination Assessment.
- Appendix Q Private Driveway/George Booth Drive Review.

Table ES-1 - Key Potential Environmental Issues to be Further Assessed in the EIS

Ref	Description of Issue	EIS Appendix / Section
T097	Subsidence impacts on steep landforms (including cliff lines and steep slopes).	Appendix A and Section 4
T065	Impacts on *Tetratheca juncea* (threatened flora species) population.	Appendix F and Section 4
T096	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.	Appendices A, B and C and Section 4
T001	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.	Appendices A, E, F and G and Section 4
T019	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries).	Appendix H and Section 4
T054	Visual impacts of subsidence related impacts on cliff lines.	Appendix A and Section 4
T066	Impacts on groundwater dependent ecosystems.	Appendices A, B, C and F and Section 4
T042	Project related impacts on known Aboriginal heritage items.	Appendices A and K and Section 4
T043	Project related impacts on unknown Aboriginal heritage items.	Appendices A and K and Section 4
T067	Impacts on fauna as a result of construction and operational activities associated with the new pit top.	Appendix G and Section 4
T080	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.	Appendix I and Section 4
T009	Subsidence related impacts on geomorphology of streams.	Appendices A and D and Section 4

Risk Ranking

Risk ranking was undertaken by the team on loss scenarios based on the key potential environmental issues and a subset of other environmental issues identified. A summary of the risk ranking results is presented in Table ES-2.

With the consideration of potential controls, all of the potential loss scenarios were ranked within the 'Medium - As Low As Reasonably Practicable' (ALARP) or the 'Low' range by the ERA team.

Table ES-2 – Risk Ranking

Environmental Study Area	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	Risk Rank[1]
Subsidence	Subsidence impacts on steep landforms (including cliff lines and steep slopes).	Considered the potential for movement of steep landforms (cliffs or steep slopes) as a result of subsidence and the consequential environmental consequences (for example, disturbance to vegetation/fauna habitat) and public safety implications. Mitigated by the implementation of subsidence control zones to minimise potential impacts on cliff lines and steep slopes, adaptive management[2] and some potential to remediate damage.	24 Low
	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.	Considered the potential visual impacts and public safety implications on Sugarloaf State Conservation Area as a result of subsidence. Mitigated by the implementation of subsidence control zones to minimise potential visual and public safety impacts on cliff lines and steep slopes, adaptive management, some potential to remediate damage and implementation of public safety management plans.	18 Low

Environmental Study Area	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	Risk Rank[1]
	Subsidence related impacts on geomorphology of streams.	Considered the potential for increased sedimentation or change in alignment/gradient and subsequent impacts on biota as a result of impacts on geomorphology of streams (e.g. nick point migration) as a result of subsidence. Mitigated by steep gradients and the presence of rock/boulder bed material in first and second order streams, implementation of subsidence control zones to minimise potential impacts on third order and above streams and streams at shallow depths of cover, adaptive management and some potential to remediate damage.	21 Low
	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.	Considered the potential for connectivity of cracking to the surface and subsequent loss of water from streams and/or near surface groundwater. Discussion noted that this was an issue in areas of shallow depth of cover and that the likelihood of cracking to surface is still the subject of further study. Ranked in consideration of known history of subsidence in similar/nearby strata. Mitigated by the implementation of subsidence control zones to minimise potential impacts in areas of shallow depth of cover, adaptive management and the ability to offset any water loss as a contingency measure (e.g. through purchase of appropriate licences).	17 Low
	Impacts on residences, properties and other built features as a result of subsidence.	Considered impacts on properties and built features, including residences as a result of subsidence. Ranked on a financial rather than environmental impact basis. Mitigated by mine design, implementation of subsidence control zones for built features and compensation for repairs by the Mine Subsidence Board (MSB).	10 Medium
Groundwater	Impacts on groundwater users.	Considered the potential drawdown of aquifers and associated impact on groundwater users (i.e. potential for loss or reduction in groundwater supply). Discussion noted that the majority of groundwater users access the alluvial aquifer associated with Wallis Creek (located outside of mining area). Mitigated by offset of impact through purchase of appropriate groundwater licences and the ability to implement mitigation measures in the event of reduction in supply (e.g. deepening of bore, alternate supply or compensation).	25 Low
Surface Water	Impacts on water quality and flow regime in downstream watercourses as a result of discharge from the new pit top.	Considered potential for impacts on water quality and flow regime in downstream watercourses as a result of uncontrolled or controlled discharge of water from the new pit top. Discussion noted that any controlled discharge from the new pit top would be licensed and would require water to be treated and/or meet quality requirements. Mitigated by re-use and recycling of water in the water management system, ability to store water in historic underground workings and conducting a site water balance.	22 Low
	Impacts on baseflow in streams.	Considered potential impacts on stream baseflows as a result of regional groundwater depressurisation and subsequent impacts on water users. Mitigated by implementation of subsidence control zones for streams, offset of impact through purchase of appropriate water licences and long-term recovery of groundwater levels.	15 Medium
	Impacts on surface water as a result of the sewage treatment facility.	Considered potential impacts on surface water systems and biota as a result of normal operation of the sewage treatment facility. Mitigated by appropriate design of sewage treatment system and disposal of treated effluent in accordance with relevant standard and guidelines.	24 Low

Environmental Study Area	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	Risk Rank[1]
	Impacts on surface water and biota as a result of construction related sediments.	Considered impact on surface water systems and biota as a result of increased movement of sediment generated by construction activities. Mitigated by implementation of erosion sediment controls in accordance with relevant standards and guidelines.	21 Low
	Impacts on surface water and biota as a result of a hydrocarbon spill.	Considered the potential for impacts on surface water systems and biota as a result of a hydrocarbon spill. Mitigated by appropriate hydrocarbon management measures, bunding of hydrocarbon storage areas, Emergency Response and Preparedness Plan and training of site personnel.	24 Low
Biodiversity	Impacts on *Tetratheca juncea* population.	Considered the potential for inadvertent clearing outside of designated disturbance areas during construction or operation that result in an impact on the *Tetratheca juncea* community. Mitigated by the delineation of the *Tetratheca juncea* population, implementation of a 20 m buffer around the population and implementation of appropriate construction and operational management plans for vegetation clearance (including education of construction workers).	18 Low
	Impacts on groundwater dependent ecosystems.	Considered the potential for impacts on groundwater dependent ecosystems as a result of tensile cracking resulting in temporary changes to the near surface groundwater regime. Discussion noted that cracking can either naturally 'heal' or may be able to be remediated, and the ability of the groundwater dependent ecosystems to survive drought conditions. Mitigated by the implementation of subsidence control zones to minimise potential impacts on groundwater dependent ecosystems, adaptive management and some potential to remediate damage.	21 Low
	Impacts on fauna as a result of construction and operation activities associated with the new pit top.	Considered the potential impacts on the Yellow-bellied Glider population as a result of construction and operational impacts associated with the new pit top (e.g. disturbance of potential habitat and noise and lighting impacts). Ranked with (W) and without (W/O) avoidance of a potential roosting tree located in the pit top area. Mitigated by presence of largely continuous vegetation outside the pit top area and the implementation of appropriate construction and operational management plans for vegetation clearance.	18 Low 24 Low[3]
Road Transport	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries)	Considered the potential impacts on road safety and performance of the Project road movements. Discussion noted the community concern relating to cracked windscreens. Mitigated by the implementation of the road transport protocol (including traffic management plan, driver protocols, training and minimum departure times), wheel wash for coal haulage trucks, compensation for damage caused by coal haulage vehicles and construction of the nearby Hunter Expressway.	18 Low
Noise	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.	Considered the potential noise impacts on nearby residences as a result of the new pit top (including construction and operation). Discussion noted the noise monitoring of the existing pit top which shows compliance with the relevant criteria. Mitigated by the distance to the nearest residence and implementation of construction noise management measures.	24 Low

Environmental Study Area	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	Risk Rank[1]
	Noise impacts on nearby residences as a result of the ventilation shaft (including construction and operation).	Considered the potential noise impacts on nearby residences as a result of the ventilation shaft. Discussion noted the noise monitoring at the ventilation fan at the Abel Mine (same design specifications as proposed ventilation fan) indicates relatively low sound power levels. Mitigated by the distance to the nearest residence and implementation of construction noise management measures (e.g. acoustic cladding of raise bore drill rig during construction).	24 Low
Air Quality	Dust impacts on nearby residences as a result of construction and operation associated with the new pit top.	Considered the potential dust impacts on nearby residences as a result of the new pit top (including construction and operation). Mitigated by the distance to the nearest residence and the implementation of dust control measures (e.g. water sprays).	24 Low
Aboriginal Heritage	Project related impacts on known Aboriginal heritage items.	Considered the removal of known Aboriginal objects from surface impacts or damage to Aboriginal objects through subsidence. Mitigated by surveys of the area of impact to determine presence of Aboriginal objects, consultation with Aboriginal stakeholders, mitigation measures as agreed to by Aboriginal stakeholders where impacts cannot be avoided and cultural awareness training.	10 Medium
	Project related impacts on unknown Aboriginal heritage items.	Considered the removal of unknown Aboriginal objects from surface impacts or damage to Aboriginal objects through subsidence. Mitigated by surveys of the area of impact to determine potential for Aboriginal objects, consultation with Aboriginal stakeholders and cultural awareness training.	10 Medium
Visual	Visual impacts of subsidence related impacts on cliff lines	Considered the visual impact associated with visible subsidence impacts to cliffs (e.g. rock fall and/or loss of vegetation). Mitigated by the implementation of subsidence control zones to minimise potential impacts on cliff lines, adaptive management, some potential to remediate damage and the occurrence of natural movement of cliffs.	21 Low

[1] Risk - Ranking basis 1 (highest risk) to 25 (lowest risk). Risk rankings defined as 1 to 6 – High; 7 to 15 - Medium (or ALARP) and 16 to 25 - Low.

[2] Adaptive management would involve the monitoring and periodic evaluation of environmental consequences against the performance measures, and adjustment (if necessary) of the subsidence control zones to achieve the adopted performance measures (e.g. changes to the level of secondary extraction).

[3] This issue/loss scenario is ranked with and without avoidance of a potential roosting tree.

1 INTRODUCTION

This document is an Environmental Risk Assessment (ERA) for the Tasman Extension Project (the Project). The Project provides for the continuation and extension of the existing Tasman Underground Mine.

The existing Tasman Underground Mine is located within ML 1555, approximately 20 kilometres (km) west of the Port of Newcastle in New South Wales (NSW) (Figure 1). The Tasman Underground Mine is owned and operated by Donaldson Coal Pty Limited (Donaldson Coal). Donaldson Coal is a wholly-owned subsidiary of Gloucester Coal Ltd (GCL). Mining operations at the Tasman Underground Mine are currently conducted in accordance with Development Consent (DA-274-9-2002) granted by the Minister for Infrastructure and Planning in March 2004.

The Tasman Underground Mine produces approximately 975,000 tonnes per annum (tpa) of run-of-mine (ROM) coal from the Fassifern Seam. The Tasman Underground Mine is a bord and pillar operation, which uses continuous miners for the development of first workings and secondary extraction.

1.1 AIM AND OBJECTIVES

The aim of the ERA workshop was:

> *To conduct a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment.*

The primary objectives of this ERA were to:

1. identify the key potential environmental issues associated with the Project; and
2. assess the level of risk for a selection of potential loss scenarios associated with the key potential environmental issues.

The ERA team identified the following items as desired outcomes from the process:

1. identification of key potential environmental issues to be addressed in the Environmental Impact Statement (EIS); and
2. a document suitable for inclusion in the EIS and prepared in accordance with Australian Standard/ New Zealand Standard (AS/NZS) 31000:2010 *Risk Management* (Standards Australia, 2010).

A list of key words and their definitions is provided in Attachment A.

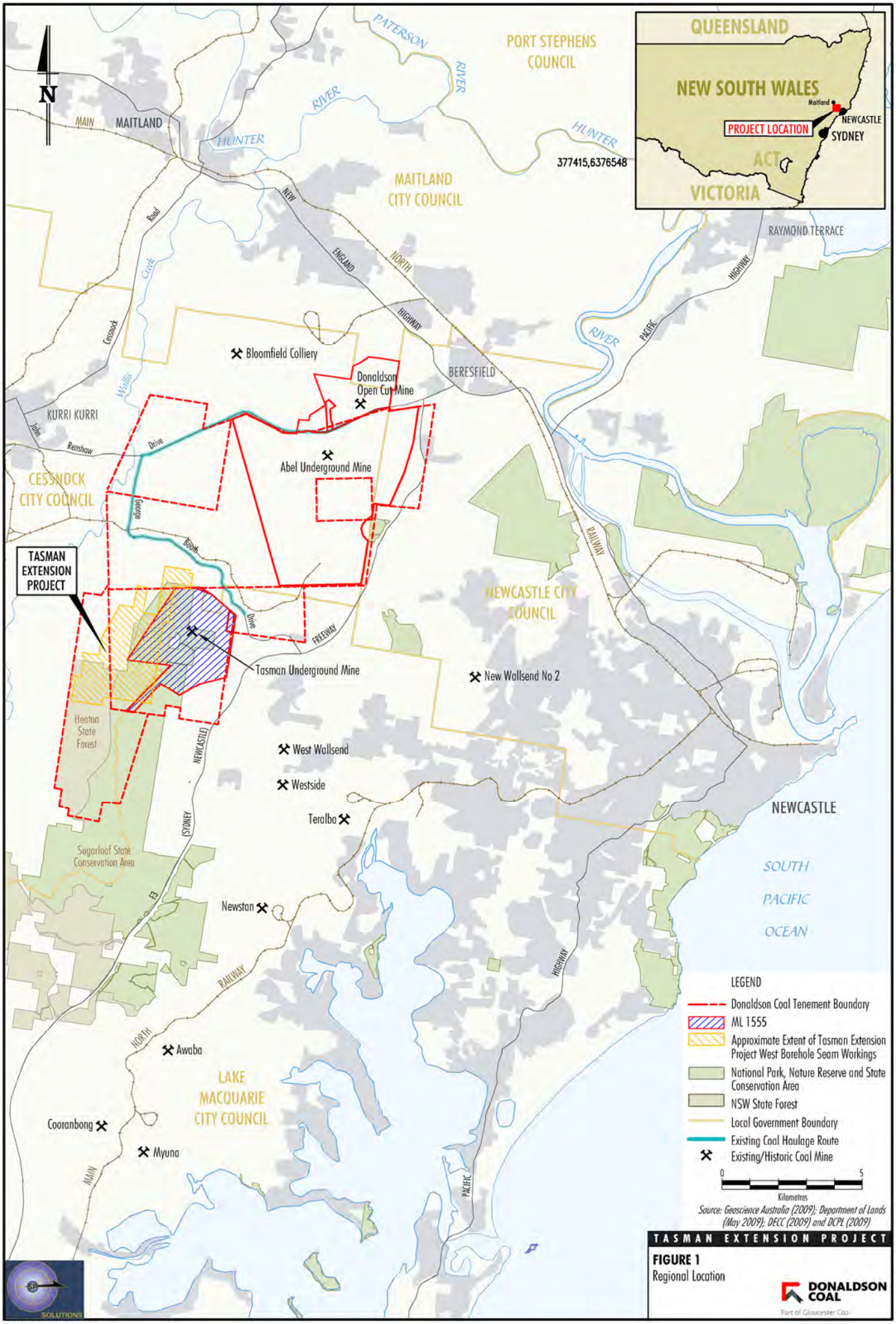
1.2 CLIENT

The client for the ERA is Donaldson Coal, a wholly owned subsidiary of GCL.

1.3 SCOPE

The Director-General's Requirements (DGRs) for the Project include requirements for an ERA, as follows:

> *In addition, the EIS must include a:*
>
> - *risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment*



DCL-09-01 EIS_AppERA_101D

Consistent with the DGRs, the scope of the ERA was:

> *To conduct a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment.*

1.4 CLARIFYING POINTS

The team discussion of the scope raised the following clarifying points:

- Safety issues were not intended to be covered.
- The geographical extent of the Project was understood to include the Project area, which is described in Section 2 of the Main Report of the EIS.

1.5 RISK ASSESSMENT PROCESS

The risk assessment process was based on the framework provided on Figure 2 (based on AS/NZS 31000:2010 (Standards Australia, 2010), MDG1010 *Risk Management Handbook for the Mining Industry* [NSW Department of Primary Industries (DPI), 1997] and HB 203: 2006 *Environmental Risk Management – Principles and Process* [Standards Australia, 2006]).

1.6 RESOURCING, SCHEDULE AND ACCOUNTABILITIES

The following resources were allocated in order to effectively conduct the ERA:

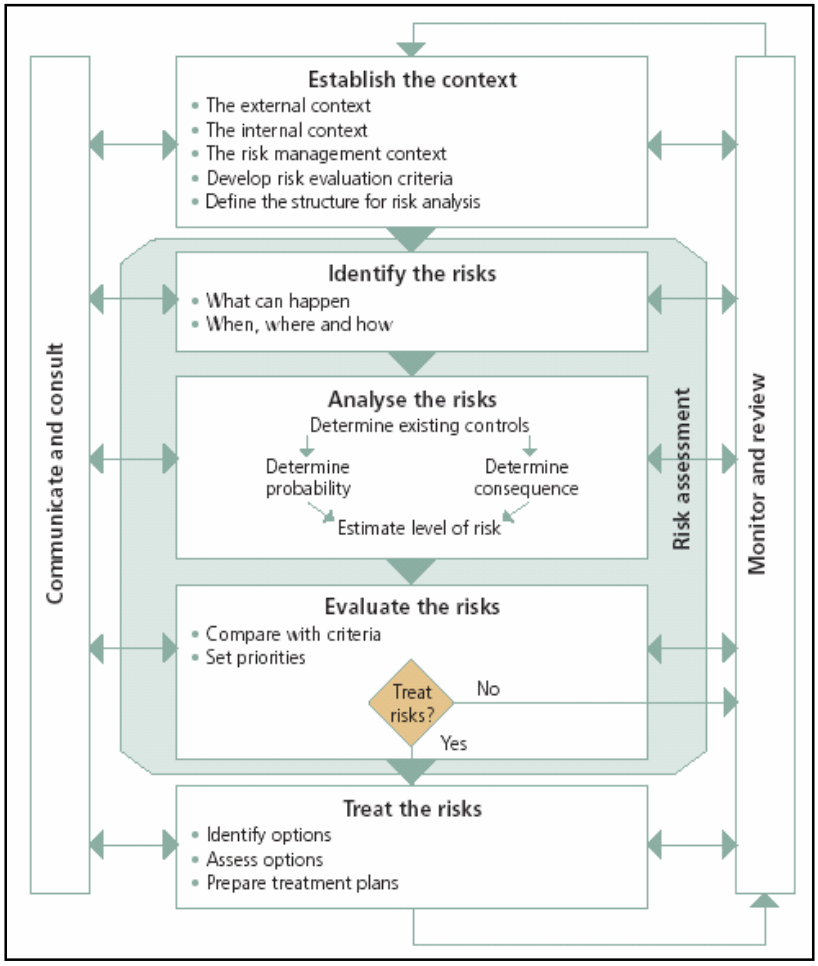
1. a team of personnel with suitable experience and knowledge of coal mining operations and environmental issues in the area associated with the Project;
2. external facilitators for the risk assessment and documentation of assessment results; and
3. aerial photographs, drawings and other supporting information.

The outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall Donaldson Coal management systems so that they are effectively reviewed, implemented and monitored.

1.7 METHOD

1.7.1 Framework

Figure 2 outlines the overall framework utilised for the ERA. This framework is further discussed in Section 1.7.2 with respect to the Project.



Source: after AS/NZS 31000:2010 (Standards Australia, 2010).

Figure 2 - Risk Management Process (AS/NZS 31000:2010)

1.7.2 Key Steps

The key steps in the process included:

1. confirming the scope of the ERA;
2. listing the key assumptions on which the ERA is based;
3. reviewing available data on the Project including reports, plans, maps and aerial photos (both prior to and during the workshop);
4. conducting a team-based risk assessment that:
   a) provides detailed descriptions of the tasks to be undertaken and the proposed method;
   b) identifies hazards and assesses the level of risk; and
   c) develops a list of recommended controls to treat the risk (through prevention, monitoring, management and rehabilitation strategies);
5. preparing a draft report in accordance with AS/NZS 31000:2010 (Standards Australia, 2010) and MDG1010 *Risk Management Handbook for the Mining Industry* (DPI, 1997) standards for review by Donaldson Coal personnel and ERA team members;
6. incorporating comments from Donaldson Coal and the ERA team; and
7. finalising the report and issue as controlled copy for ongoing use.

With respect to the overall framework (Figure 2), steps 1 to 3 above represent the 'establish the context' phase and step 4 represents the 'identify the risks', 'analyse the risks', 'evaluate the risks' and 'treat the risks' phases.

The outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall Donaldson Coal management systems so that they are effectively reviewed, implemented and monitored (Section 5).

1.7.3 External Facilitation

The team was facilitated through the process by ***SP Solutions*** – a company specialising in Risk Assessment and risk management programs. The facilitator, Peter Standish is experienced with underground coal mining and many aspects of environmental monitoring and rehabilitation.

The team was encouraged and 'challenged' to identify a wide range of environmental impacts or hazards including consideration of far-field impacts (i.e. those impacts affecting the environment off-site).

It is important to understand that the outcomes of this ERA:

1. are process driven;
2. challenge current thinking and may not necessarily appear appropriate or reflect 'pre-conceived' ideas; and
3. are the result of the team assembled to review the topic and not the result of any one individual or organisation.

2 ESTABLISH THE CONTEXT

2.1 ORGANISATIONAL CONTEXT

The proponent is Donaldson Coal. Donaldson Coal recognises that it is operating in an environment that requires a genuine commitment to the environment. Donaldson Coal aims to achieve and maintain a high standard of environmental care within all aspects of its operations.

The existing Tasman Underground Mine operates in accordance with Development Consent (DA-274-9-2002) issued under the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) and an overriding Environment Management Strategy developed in conformance with AS/NZS ISO 41001:2004 *Environmental Management Systems* (Standards Australia, 2004).

2.2 PROJECT SUMMARY

The main activities associated with the development of the Project would include:

- continued underground mining of the Fassifern Seam using a combination of total and partial pillar extraction methods within Mining Lease (ML) 1555 (Figure 3);
- underground mining of the West Borehole Seam using a combination of total and partial pillar extraction methods (Figure 3);
- production of ROM coal up to 1.5 million tonnes per annum (Mtpa);
- development of a new pit top facility, associated ROM coal handling infrastructure and intersection with George Booth Drive (Figure 3);
- development of ventilation surface infrastructure;
- continued transport of Fassifern Seam ROM coal from the existing Tasman Underground Mine pit top to the Bloomfield Coal Handling and Preparation Plant (CHPP) via truck on public and private roads (Figure 1) to approximately 2015 (inclusive);
- transport of West Borehole Seam ROM coal from the new pit top to the Bloomfield CHPP via truck on public and private roads;
- progressive development of sumps, pumps, pipelines, water storages and other water management equipment and structures;
- ongoing exploration activities;
- ongoing surface monitoring, rehabilitation and remediation of subsidence effects; and
- other associated infrastructure, plant, equipment and activities.

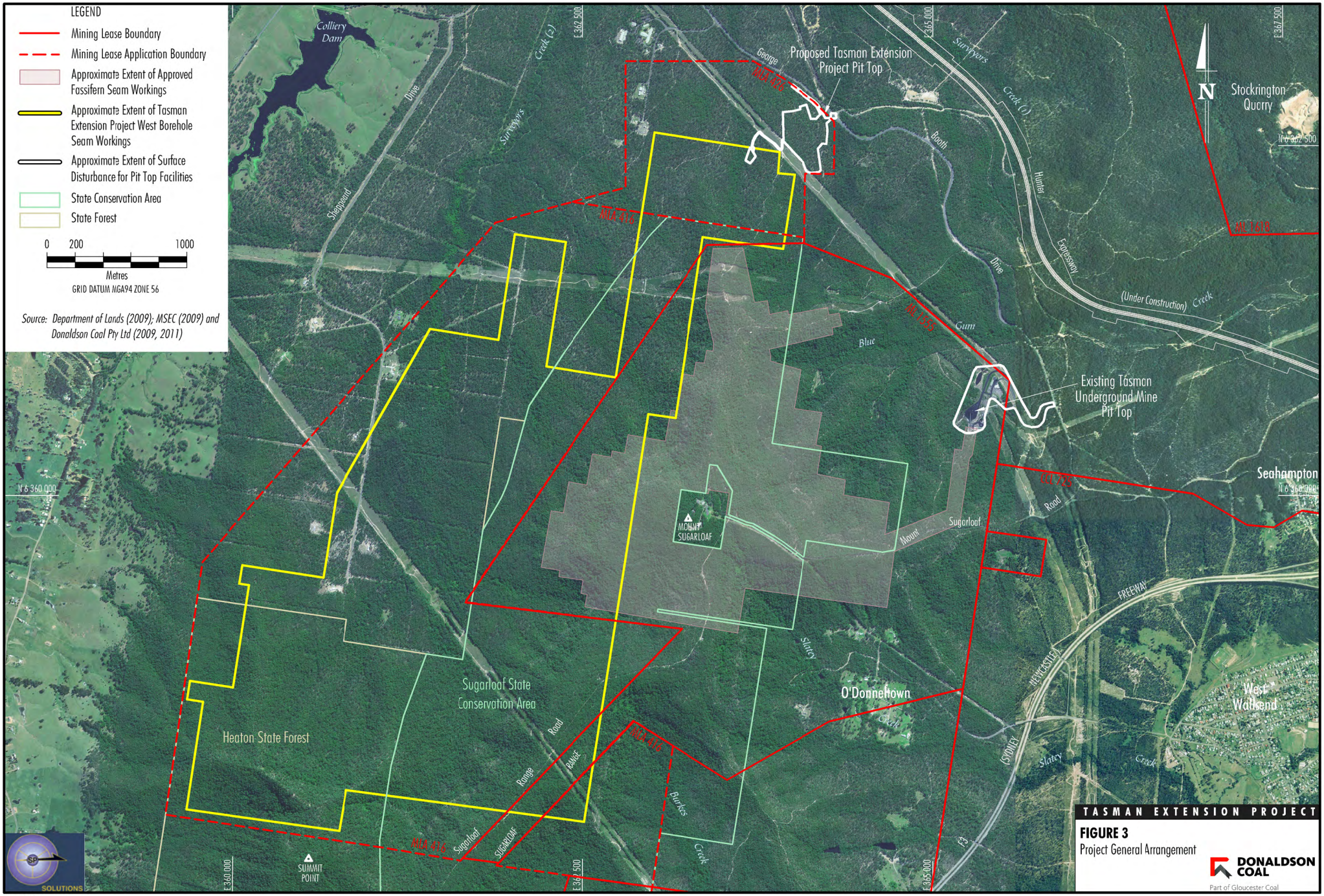
A detailed description of the Project is provided in Section 2 in the Main Report of the EIS.

2.3 RISK MANAGEMENT CONTEXT

This ERA has been conducted in accordance with the DGRs for the Project (Section 1.3).

In addition, the ERA was cognisant of the following documents:

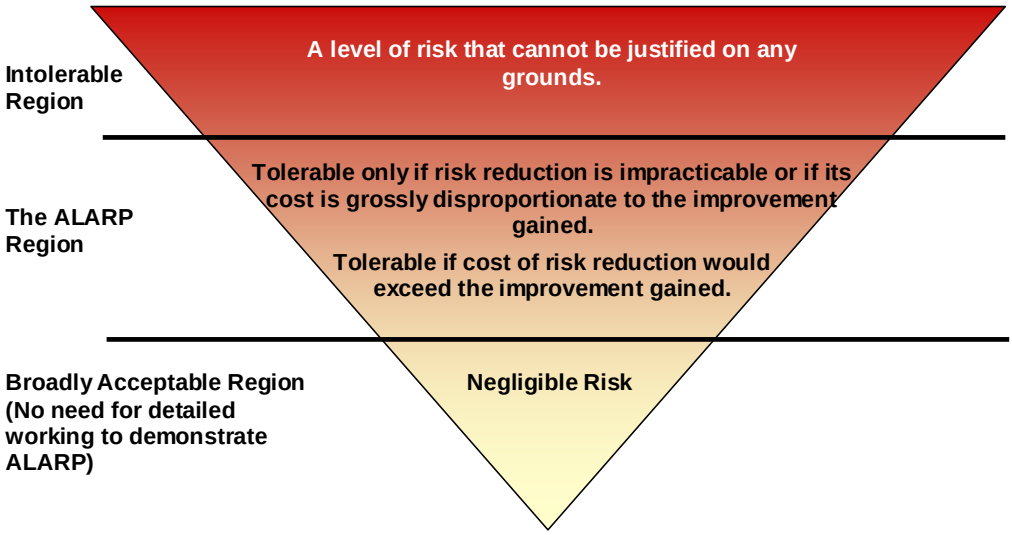
- AS/NZ 31000:2010 (Standards Australia, 2010);
- HB 203:2006 *Environmental Risk Management – Principles and Process* (Standards Australia, 2006); and
- MDG1010 *Risk Management Handbook for the Mining Industry* (DPI, 1997).



DCL-09-01 EIS_AppERA_102E

2.4 RISK CRITERIA

The 'tolerability' of a risk is the willingness to live with a risk to secure benefits, on the understanding that the risk is being properly controlled (HB 203:2006). Treatment measures are introduced to reduce the residual risk to As Low As Reasonably Practicable (ALARP) or lower. Figure 4 schematically shows the three risk management zones *viz*. intolerable, ALARP and broadly acceptable. The middle zone is referred to as the ALARP zone.



Source: after Department of Planning (2011).

Figure 4 – Risk Criteria 'ALARP'

Flying is an example of a risk considered by most people to be a tolerable risk; whilst base jumping (i.e. extreme sport involving jumping from buildings, antennas, bridges or cliffs without a parachute) is generally considered by most people to be an activity which cannot be justified from a risk perspective. This is shown graphically in Figure 4. Intolerable items such as base jumping are at the top of the pyramid where much lower risks, such as flying, sit at the lower end of the ALARP zone (i.e. further risk reduction is impracticable).

The risk ranking matrices used during the ERA workshop are presented in Section 4.1.

3 IDENTIFY RISKS

3.1 OVERVIEW

The identification of risks involved the use of risk assessment 'tools' appropriate for identifying potential loss scenarios associated with the Project. The risk identification process involved:

- Introduction – Before the potential issues were brainstormed it was important that the whole team had a good understanding of the Project – and this was confirmed by the facilitator.
- Brain-writing/storming – This was used to draw out the main issues using the understanding, relevant experience and knowledge of the team. This session also used prompt words to build on the experience base of the team and identify any potential environmental issues and potential loss scenarios.
- Modified Hazard and Operability (HAZOP) analysis – this involved the review of key words (drawn from the Preliminary Assessment for the Project and retrospective analyses of environmental/community related incidents at the existing Tasman Underground Mine) and aerial photographs, and the consequent identification of potential environmental issues at each location during each phase of operation.

3.2 ENVIRONMENTAL RISK ASSESSMENT TEAM

The team met for the ERA workshop at the Donaldson Coal administration offices at the Abel Mine on 18 August 2011. A team based approach was utilised in order to have an appropriate mix of skills and experience to identify the potential environmental issues and potential loss scenarios. Details of the team members and their relevant qualifications and experience are included in Table 1.

Table 1 – ERA Team

Name	Position/Affiliation	Relevant qualifications and experience
Peter Standish	SP Solutions – Facilitator	PhD, B Eng (Hon), Dip Bus Mgt, Risk Analysis Trained. Certificate of Competence as a Manager; 33 years experience in underground and open cut mining operations with operating, managerial and contract management experience. Involved in reviewing environmental conditions and applications for 5 years. Conducting Risk Analyses for 12 years.
Tony Sutherland	Donaldson Coal – Technical Services Manager, Underground / Abel Mine Manager (Acting)	B Eng (Mining), Master of Business and Technology, Certificate of Competence as a Manager, 27 years experience in underground and open cut mining operations with operating and managerial experience; experience with environmental approval process.
Phil Brown	Donaldson Coal – Environmental Manager	Ass Dip Environmental Health, B App Science, M Environmental Studies; 18 years environmental experience in mining and heavy industry.
Steven Ditton	Ditton Geotechnical Services – Subsidence Engineer / Consultant	B E (Civil); 21 years experience in subsidence prediction and assessment.
Steven Perrens	Evans & Peck – Principal	B E (Env), M Eng Sci, PhD; over 40 years experience in environmental hydrology.
Chris Gippel	Fluvial Systems – Director	B Sc, PhD, 30 years environmental experience in hydrology and geomorphology.
Andrew Fulton	RPS Aquaterra – Hydrogeologist	B Sc (Geol), M Sc (Hydrogeology); 14 years industry experience in groundwater management and assessment.
Colin Driscoll	Hunter Eco – Environmental Biologist	B Sc, PhD (in progress); 30 years experience in biodiversity assessment and management, specialising in flora survey and vegetation analysis.
Arthur White	Biosphere Environmental Consultants – Ecologist	B Sc, PhD; over 30 years in biodiversity assessment and management, specialising in fauna survey and assessment.

Name	Position/Affiliation	Relevant qualifications and experience
Ronan Kellaghan	PAEHolmes – Air Quality Scientist	B Sc, M Sc; 10 years industry experience in environmental management sector, 8 years experience in air quality modelling and assessment.
Martin Davenport	SLR Consulting – Acoustic Scientist	B Sc, M Design Science (Audio and Acoustics); 3 years industry experience in noise modelling and assessment.
Ken Hollyoak	Halcrow – Associate	B Sc, M Sc; 30 years experience in road design and traffic analysis.
Evan Elford	Ardill Payne & Partners – Partner	Cert Civil Design; over 30 years experience in civil design and road and infrastructure development.
Josh Hunt	Resource Strategies – Principal	B E (Civil); over 15 years experience in environmental management and project approvals in mining and resource industry.
Clive Berry	Resource Strategies – Senior Environmental Manager	B E (Env); 10 years experience in environmental management and project approvals in mining and resource industry.
Josh Peters	Resource Strategies – Senior Environmental Manager	B Sc (Env); 10 years experience in environmental management and project approvals in mining and resource industry, specialising in heritage and biodiversity related issues.
Joanna Webster	Resource Strategies – Environmental Manager	B E (Env); 3 years experience in environmental management and project approvals in mining and resource industry.

3.3 RISK IDENTIFICATION

3.3.1 Brainstorming

The brainstorming process is intended to allow for a relatively unstructured, free flowing series of issues and ideas to be generated. It is enhanced through the use of key word association processes based on work by Edward de Bono and is intended to generate a wide range of data on losses, controls and general issues related to the Project area.

No 'filtering' of the data is allowed during the process – and the reader should be conscious of the intent of not missing a potential 'left field' loss when reading through the material.

Issues identified during the brainstorming session are presented in Attachment B.

3.3.2 Modified HAZOP

The next 'tool' applied with the team was that of a modified HAZOP. In this process the Project General Arrangement (e.g. Figure 3) was referred to along with a consideration of the phases of operation and the potential impacts that could arise.

The generic key words used in the process representing environmental issue subject areas (generally based on the Preliminary Assessment for the Project) were:

- subsidence;
- surface water;
- groundwater;
- road transport;
- noise;
- air quality;
- biodiversity;

- visual;
- Aboriginal heritage;
- non-Aboriginal heritage;
- socio-economic; and
- rehabilitation/closure.

3.3.3 Identification of Key Environmental Issue Types

The key potential environmental issues were identified through a 'voting' system whereby team members were assigned a number of 'votes' to allocate to what they considered to be the key environmental issues. Key potential environmental issues are those issues with three or more assigned 'votes' and are shown in Table 2.

Table 2 – Key Potential Environmental Issues

Ref	Environmental Issue Subject Area	Description of Issue / Loss scenario	Votes
T097	Subsidence	Subsidence impacts on steep landforms (including cliff lines and steep slopes).	14
T065	Biodiversity	Impacts on *Tetratheca juncea* population.	13
T096	Subsidence	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.	11
T001	Subsidence	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.	8
T019	Road Transport	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries)	7
T054	Visual	Visual impacts of subsidence related impacts on cliff lines	7
T066	Biodiversity	Impacts on groundwater dependent ecosystems.	6
T042	Aboriginal Heritage	Project related impacts on known Aboriginal heritage items.	4
T043	Aboriginal Heritage	Project related impacts on unknown Aboriginal heritage items.	3
T067	Biodiversity	Impacts on fauna as a result of construction and operational activities associated with the new pit top.	3
T080	Noise	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.	3
T009	Subsidence	Subsidence related impacts on geomorphology of streams.	3

The key potential environmental issues identified in the ERA will be addressed in appropriately detailed assessments in the Main Report of the EIS and the specialist reports (where relevant) included as appendices to the EIS, as follows:

- Appendix A Subsidence Assessment.
- Appendix B Groundwater Assessment.
- Appendix C Surface Water Assessment.
- Appendix D Geomorphology Assessment.
- Appendix E Aquatic Ecology Assessment.
- Appendix F Flora Assessment.
- Appendix G Terrestrial Fauna Assessment.
- Appendix H Road Transport Assessment.
- Appendix I Noise and Vibration Impact Assessment.
- Appendix J Air Quality and Greenhouse Gas Assessment.

- Appendix K Aboriginal Cultural Heritage Assessment.
- Appendix L Non-Aboriginal Heritage Assessment.
- Appendix M Socio-Economic Assessment.
- Appendix N Preliminary Hazard Analysis.
- Appendix P Land Contamination Assessment.
- Appendix Q Private Driveway/George Booth Drive Review.

3.3.4 Referred Issue

Issues raised during the ERA workshop brainstorming that were: outside the scope of the ERA; outside of the Project scope; and/or beyond the control of Donaldson Coal were considered 'referred issues'.

Notwithstanding, 'referred issues' may warrant consideration in the development of the EIS and/or may warrant consideration by Donaldson Coal for internal risk management purposes. The referred issues are listed in Attachment C.

Key referred issues noted during the ERA included the adequacy of offset strategy, the reinjection of excess water into historic workings and licensing requirements for impacts on groundwater. These issues will be addressed in the EIS.

4 ANALYSE RISKS

4.1 PROBABILITY AND MAXIMUM REASONABLE CONSEQUENCE

Potential loss scenarios (primarily based on the identified key potential environmental issues) were ranked for risk by the ERA team. A tabular analysis was used for this risk ranking process, based on the probability and consequence of a loss scenario occurring as decided by the ERA team.

The following definition of 'risk' was used:

- the combination of the probability of an unwanted event occurring; and
- the maximum reasonable consequences (MRCs) should the event occur.

Tables 3 to 6 present the ERA matrix tools that were utilised for ranking risks.

Table 3 – Qualitative Measures of Probability

Rank (P)	Probability	Descriptor
A	Almost Certain	Happens often
B	Likely	Could easily happen
C	Possible	Could happen and has occurred elsewhere
D	Unlikely	Hasn't happened yet but could
E	Rare	Conceivable, but only in extreme circumstances

Table 4 – Qualitative Measures of Maximum Reasonable Consequence[1]

Ref (C)	Consequence	Comment
1	Extreme environmental harm	e.g. widespread catastrophic impact on environmental values of an area.
2	Major environmental harm	e.g. widespread substantial impact on environmental values of an area.
3	Serious environmental harm	e.g. widespread and considerable impact on environmental values of an area.
4	Material environmental harm	e.g. localised and considerable impact on environmental values of an area.
5	Minimal environmental harm	e.g. minor impact on environmental values of an area.

[1] Notes: MRC: – The worst-case consequence that could reasonably be expected, given the scenario and based upon experience at the operation and within the mining industry.

The terms localised and widespread were defined for the team session as:

- localised – any effect or impact generally contained within the Project area; and
- widespread – any effect or impact extendingbeyond the general Project area.

Table 5 – Quantitative (Financial) Measures of Maximum Reasonable Consequence

	Asset/Infrastructure
1	More than $50 million loss or production delay
2	$10M to $50M loss or production delay
3	$1M to $10M loss or production delay
4	$100 thousand (k) to $1M loss or production delay
5	Less than $100k loss or production delay

Table 6 – Risk Ranking Table

Consequence (C)	Probability (P)					
		A	B	C	D	E
	1	1 (H)	2 (H)	4 (H)	7 (M)	11 (M)
	2	3 (H)	5 (H)	8 (M)	12 (M)	16 (L)
	3	6 (H)	9 (M)	13 (M)	17 (L)	20 (L)
	4	10 (M)	14 (M)	18 (L)	21 (L)	23 (L)
	5	15 (M)	19 (L)	22 (L)	24 (L)	25 (L)

Notes:

L = Low; M = Moderate; H = High

Risk Numbering:
1 = highest risk, 25 = lowest risk

Legend:

Risk Levels:

	Broadly Acceptable
	ALARP
	Intolerable

4.2 RISK RANKING

Risk ranking was undertaken by the team on loss scenarios based on the key potential environmental issues and a subset of other environmental issues identified and is provided in Table 7.

Table 7 – Risk Ranking Results

Ref	Study	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	C	P	R
T001	Subsidence	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.	Considered the potential visual impacts and public safety implications on Sugarloaf State Conservation Area as a result of subsidence. Mitigated by the implementation of subsidence control zones to minimise potential visual and public safety impacts on cliff lines and steep slopes, adaptive management[2], some potential to remediate damage and implementation of public safety management plans.	4	C	18 Low
T003	Subsidence	Impacts on residences, properties and other built features as a result of subsidence.	Considered impacts on properties and built features, including residences as a result of subsidence. Ranked on a financial rather than environmental impact basis. Mitigated by mine design, implementation of subsidence control zones for built features and compensation for repairs by the Mine Subsidence Board (MSB).	4 ($)	A	10 Medium
T009	Subsidence	Subsidence related impacts on geomorphology of streams.	Considered the potential for increased sedimentation or change in alignment/gradient and subsequent impacts on biota as a result of impacts on geomorphology of streams (e.g. nick point migration) as a result of subsidence. Mitigated by steep gradients and the presence of rock/boulder bed material in first and second order streams, implementation of subsidence control zones to minimise potential impacts on third order and above streams and streams at shallow depths of cover, adaptive management and some potential to remediate damage.	4	D	21 Low
T011	Surface Water	Impacts on water quality and flow regime in downstream watercourses as a result of discharge from the new pit top.	Considered potential for impacts on water quality and flow regime in downstream watercourses as a result of uncontrolled discharge of water from the new pit top. Discussion noted that any controlled discharge from the new pit top would be licensed and would require water to be treated and/or meet quality requirements. Mitigated by reuse and recycle of water in the water management system, ability to store water in historic underground workings and conducting a site water balance.	5	C	22 Low
T014	Groundwater	Impacts on groundwater users.	Considered the potential drawdown of aquifers and associated impact on groundwater users (i.e. potential for loss or reduction in groundwater supply). Discussion noted that the majority of groundwater users access the alluvial aquifer associated with Wallis Creek (located outside of mining area). Mitigated by offset of impact through purchase of appropriate groundwater licences and the ability to implement mitigation measures in the event of reduction in supply (e.g. deepening of bore, alternate supply or compensation).	5	E	25 Low

Ref	Study	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	C	P	R
T019	Road Transport	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries)	Considered the potential impacts on road safety and performance of the Project road movements. Discussion noted the community concern relating to cracked windscreens. Mitigated by the implementation of the road transport protocol (including traffic management plan, driver protocols, training and minimum departure times), wheel wash for coal haulage trucks, compensation for damage caused by coal haulage vehicles and construction of the nearby Hunter Expressway.	4	C	18 Low
T025	Air Quality	Dust impacts on nearby residences as a result of construction and operation associated with the new pit top.	Considered the potential dust impacts on nearby residences as a result of the new pit top (including construction and operation). Mitigated by the distance to the nearest residence and the implementation of dust control measures (e.g. water sprays).	5	D	24 Low
T042	Aboriginal Heritage	Project related impacts on known Aboriginal heritage items.	Considered the removal of known Aboriginal objects from surface impacts or damage to Aboriginal objects through subsidence. Mitigated by surveys of the area of impact to determine presence of Aboriginal objects, consultation with Aboriginal stakeholders, mitigation measures as agreed to by Aboriginal stakeholders where impacts cannot be avoided and cultural awareness training.	4	A	10 Medium
T043	Aboriginal Heritage	Project related impacts on unknown Aboriginal heritage items.	Considered the removal of unknown Aboriginal objects from surface impacts or damage to Aboriginal objects through subsidence. Mitigated by surveys of the area of impact to determine potential for Aboriginal objects, consultation with Aboriginal stakeholders and cultural awareness training.	4	A	10 Medium
T054	Visual	Visual impacts of subsidence related impacts on cliff lines	Considered the visual impact associated with visible subsidence impacts to cliffs (e.g. rock fall and/or loss of vegetation). Mitigated by the implementation of subsidence control zones to minimise potential impacts on cliff lines, adaptive management, some potential to remediate damage and the occurrence of natural movement of cliffs.	4	D	21 Low
T065	Biodiversity	Impacts on *Tetratheca juncea* population.	Considered the potential for inadvertent clearing outside of designated disturbance areas during construction or operation that result in an impact on the *Tetratheca juncea* community. Mitigated by the delineation of the *Tetratheca juncea* population, implementation of a 20 m buffer around the population and implementation of appropriate construction and operational management plans for vegetation clearance (including education of construction workers).	4	C	18 Low
T066	Biodiversity	Impacts on groundwater dependent ecosystems.	Considered the potential for impacts on groundwater dependent ecosystems as a result of tensile cracking resulting in temporary changes to the near surface groundwater regime. Discussion noted that cracking can either naturally 'heal' or may be able to be remediated, and the ability of the groundwater dependent ecosystems to survive drought conditions. Mitigated by the implementation of subsidence control zones to minimise potential impacts on groundwater dependent ecosystems, adaptive management and some potential to remediate damage.	4	D	21 Low

Ref	Study	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	C	P	R
T067	Biodiversity	Impacts on fauna as a result of construction and operational activities associated with the new pit top.	Considered the potential impacts on the Yellow-bellied Glider population as a result of construction and operational impacts associated with the new pit top (e.g. disturbance of potential habitat and noise and lighting impacts. Ranked with (W) and without (W/O) avoidance of a potential roosting tree located in the pit top area. Mitigated by presence of continuous vegetation outside the pit top area and the implementation of appropriate construction and operational management plans for vegetation clearance.	W/O = 4 W = 5	W/O = C W = D	18 Low 24 Low[3]
T078	Noise	Noise impacts on nearby residences as a result of the ventilation shaft (including construction and operation).	Considered the potential noise impacts on nearby residences as a result of the ventilation shaft. Discussion noted the noise monitoring at the ventilation fan at the Abel Mine (same design specifications as proposed ventilation fan) indicates relatively low sound power levels. Mitigated by the distance to the nearest residence and implementation of construction noise management measures (e.g. acoustic cladding of raise bore drill rig during construction).	5	D	24 Low
T080	Noise	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.	Considered the potential noise impacts on nearby residences as a result of the new pit top (including construction and operation). Discussion noted the noise monitoring of the existing pit top which shows compliance with the relevant criteria. Mitigated by the distance to the nearest residence and implementation of construction noise management measures.	5	D	24 Low
T091	Surface Water	Impacts on surface water as a result of the sewage treatment facility.	Considered potential impacts on surface water systems and biota as a result of normal operation of the sewage treatment facility. Mitigated by appropriate design of sewage treatment system and disposal of treated effluent in accordance with relevant standard and guidelines.	5	D	24 Low
T092	Surface Water	Impacts on surface water and biota as a result of construction related sediments.	Considered impact on surface water systems and biota as a result of increased movement of sediment generated by construction activities. Mitigated by implementation of erosion sediment controls in accordance with relevant standards and guidelines.	4	D	21 Low
T093	Surface Water	Impacts on baseflow in streams.	Considered potential impacts on stream baseflows as a result of regional groundwater depressurisation and subsequent impacts on water users. Mitigated by implementation of subsidence control zones for streams, offset of impact through purchase of appropriate water licences and long-term recovery of groundwater levels.	5	A	15 Medium
T095	Surface Water	Impacts on surface water and biota as a result of a hydrocarbon spill.	Considered the potential for impacts on surface water systems and biota as a result of a hydrocarbon spill. Mitigated by appropriate hydrocarbon management measures, bunding of hydrocarbon storage areas, Emergency Response and Preparedness Plan and training of site personnel.	5	D	24 Low

Ref	Study	Description of Issue/Loss Scenario	Ranking Basis/Unwanted Event	C	P	R
T096	Subsidence	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.	Considered the potential for connectivity of cracking to the surface and subsequent loss of water from streams and/or near surface groundwater. Discussion noted that this was an issue in areas of shallow depth of cover and that the likelihood of cracking to surface is still the subject of further study. Ranked in consideration of known history of subsidence in similar/nearby strata. Mitigated by the implementation of subsidence control zones to minimise potential impacts in areas of shallow depth of cover, adaptive management and the ability to offset any water loss as a contingency measure (e.g. through purchase of appropriate licences).	3	D	17 Low
T097	Subsidence	Subsidence impacts on steep landforms (including cliff lines and steep slopes).	Considered the potential for movement of steep landforms (cliffs or steep slopes) as a result of subsidence and the consequential environmental consequences (for example, disturbance to vegetation/fauna habitat) and public safety implications. Mitigated by the implementation of subsidence control zones to minimise potential impacts on cliff lines and steep slopes, adaptive management and some potential to remediate damage.	5	D	24 Low

[1] Risk - Ranking basis 1 (highest risk) to 25 (lowest risk). Risk rankings defined as 1 to 6 – High; 7 to 15 – Medium (or ALARP) and 16 to 25 – Low.

[2] Adaptive management would involve the monitoring and periodic evaluation of environmental consequences against the performance measures, and adjustment (if necessary) of the subsidence control zones to achieve the adopted performance measures (e.g. changes to the level of secondary extraction).

[3] This issue/loss scenario is ranked with and without avoidance of a potential roosting tree.

5 MONITOR AND REVIEW

5.1 NOMINATED CO-ORDINATOR

The nominated client review facilitator is Phil Brown, Environmental Manager, Donaldson Coal.

It is understood the nominee will co-ordinate the inclusion of the key potential environmental issues into the various studies undertaken as part of the EIS and the overall Donaldson Coal management systems.

5.2 COMMUNICATION AND CONSULTATION

Consultation, involvement of personnel (Donaldson Coal and their specialists) and communication of the process and outcomes of the ERA are intended to be achieved by the inclusion of this report and the relevant specialist assessments addressing the key potential environmental issues in the EIS and the overall Donaldson Coal management systems.

5.3 CONCLUDING REMARKS

The risk assessment process conducted by the team was aligned with AS/NZS 31000:2010 (Standards Australia, 2010) and MDG1010 (DPI, 1997), with the intention of identifying the key potential environmental issues for the Project.

An appropriately detailed assessment of the key potential environmental issues will be included in the EIS appendices/sections as presented in Table 8.

Table 8 – Key Potential Environmental Issues to be Further Assessed in the EIS

Ref	Environmental Issue Subject Area	Description of Issue	EIS Appendix/Section
T097	Subsidence	Subsidence impacts on steep landforms (including cliff lines and steep slopes).	Appendix A and Section 4
T065	Biodiversity	Impacts on *Tetratheca juncea* population.	Appendix F and Section 4
T096	Subsidence	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.	Appendices A, B and C and Section 4
T001	Subsidence	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.	Appendices A, E, F and G and Section 4
T019	Road Transport	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries)	Appendix H and Section 4
T054	Visual	Visual impacts of subsidence related impacts on cliff lines	Appendix A and Section 4
T066	Biodiversity	Impacts on groundwater dependent ecosystems.	Appendices A, B, C and F and Section 4
T042	Aboriginal Heritage	Project related impacts on known Aboriginal heritage items.	Appendices A and K and Section 4
T043	Aboriginal Heritage	Project related impacts on unknown Aboriginal heritage items.	Appendices A and K and Section 4
T067	Biodiversity	Impacts on fauna as a result of construction and operational activities associated with the new pit top.	Appendix G and Section 4
T080	Noise	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.	Appendix I and Section 4
T009	Subsidence	Subsidence related impacts on geomorphology of streams.	Appendices A and D and Section 4

The risk rankings indicate that the loss scenarios ranked were within the “Medium - ALARP” or the “Low” range. An appropriately detailed assessment of the key potential environmental issues will be included in the EIS.

SP Solutions would like to thank all of the personnel who contributed to the risk assessment in particular those personnel from Donaldson Coal and Resource Strategies who prepared source material for the team session.

Peter Standish, February 2012

6 REFERENCES

Department of Planning (2011) *Hazardous Industry Planning Advisory Paper No. 4: Risk Criteria for Land Use Safety Planning. January 2011*.

Department of Primary Industries (1997) *MDG1010 Risk Management Handbook for the Mining Industry.* May, 1997.

Standards Australia (2004) *AS/NZS ISO 41001:2004 Environmental Management Systems*.

Standards Australia (2006) *HB 203:2006 Environmental Risk Management – Principles and Process*.

Standards Australia (2010) *AS/NZS 31000:2010 Risk Management*.

ATTACHMENT A – DEFINITIONS

Term	Explanation
Adaptive Management Approach	Involves the following core elements: monitoring of impacts of management or decisions based on agreed performance measures; promoting research, to reduce key uncertainties; ensuring periodic evaluation of the outcomes of implements, drawing of lessons, and review or adjustment, as necessary of the measures or decisions adopted; and establishing an efficient and effective compliance system (refer to *Newcastle & Hunter Valley Speleological Society Inc v Upper Hunter Shire Council and Stoneco Pty Limited* [2010] NSWLEC 48).
ALARP	"As Low As Reasonably Practicable". The level of risk between broadly acceptable and intolerable levels that can be achieved without expenditure of a disproportionate cost in relation to the benefit gained.
Cause	A source of harm.
Control	An intervention by the proponent intended to either Prevent a Cause from becoming an incident or to reduce the outcome should an incident occur.
DGRs	Director-General's Requirements.
EIS	Environmental Impact Statement
ERA	Environmental Risk Assessment.
MDG1010	Department of Primary Industries guideline on risk management (see references in Section 6).
Outcome	The end result following the occurrence of an incident. Outcomes are analogous to impacts and have a risk ranking attached to them.
Personnel	Includes all people working in and around the site (e.g. all contractors, sub-contractors, visitors, consultants, project managers etc.).
Practicable	The extent to which actions are technically feasible, in view of cost, current knowledge and best practices in existence and under operating circumstances of the time.
Referred Issue	Issues that were outside the scope of the ERA; outside of the Project scope; and/or beyond the control of Donaldson Coal.
Residual Risk	The risk associated with an unwanted event after consideration of the existing control measures is taken into account.
Review	An examination of the effectiveness, suitability and efficiency of a system and its components.
Risk	The combination of the potential maximum reasonable consequences arising from a specified hazard together with the probability of the hazard resulting in an unwanted event.

ATTACHMENT B - ISSUE IDENTIFICATION RESULTS

The output from the team's 'brainstorming' is presented below.

Brainstorming and Modified HAZOP Results

Ref	Type of Issue	Description of Issue / Loss scenario
T001	Subsidence	Subsidence related impacts on the recreational and aesthetic values of the Sugarloaf State Conservation Area.
T002	Subsidence	Subsidence related impacts on electricity transmission lines.
T003	Subsidence	Impacts on residences, properties and other built features as a result of subsidence.
T004	Subsidence	Subsidence related impacts on other built features.
T005	Subsidence	Far field subsidence effects.
T006	Subsidence	Subsidence related impacts resulting in collapse of cliffs.
T007	Subsidence	Subsidence related impacts resulting in collapse of talus slopes.
T008	Subsidence	Subsidence related impacts on forestry operations in Heaton State Forest (e.g. damage to access tracks).
T009	Subsidence	Subsidence related impacts on geomorphology of streams.
T010	Subsidence	Subsidence related impacts on hydrology of streams, including localised effects on water quality and/or persistence of low flows.
T011	Surface Water	Impacts on water quality and flow regime in downstream watercourses as a result of discharge from the new pit top.
T012	Surface Water	Subsidence related alteration of surface drainage regimes as a result of surface cracking.
T013	Groundwater	Depressurisation of coal seam aquifers as a result of underground mining.
T014	Groundwater	Impacts on groundwater users.
T015	Groundwater	Subsidence related cracking resulting in draining of shallow perched aquifers.
T016	Groundwater	Saline groundwater in the coal measures rising to the surface following groundwater recovery (100 years +).
T018	Groundwater	Subsidence related cracking resulting in depressurisation of discrete water bearing geological structures (faults, splays, etc.).
T019	Road Transport	Impacts of Project road movements on the safety and performance of the road network (including traffic associated with coal haulage, employees and deliveries).
T021	Noise	Noise impacts associated with construction of the new pit top (includes box cut, drift and 24 hour construction phase).
T022	Noise	Traffic noise impacts associated with Project road movements (including traffic associated with coal haulage, employees and deliveries).
T023	Noise	Vibration from underground blasting activities and/or goafing.
T024	Noise	Vibration associated with coal haulage movements.
T025	Air Quality	Dust impacts on nearby residences as a result of construction and operation associated with the new pit top.
T026	Air Quality	Air quality impacts associated with concurrent operation of two pit tops.
T027	Air Quality	Air quality impacts associated with transport of coal from existing pit top to the Bloomfield CHPP.
T028	Air Quality	Air quality impacts associated with transport of coal from new pit top to the Bloomfield CHPP.
T029	Air Quality	Air quality impacts associated with wind erosion from stockpiles.
T030	Air Quality	Air quality impacts associated with operation of new vent shafts.
T031	Air Quality	Potential for odorous emissions associated with coal self-heating (spontaneous combustion).
T032	Biodiversity	Subsidence related alteration of surface drainage regimes resulting in impacts on flora, fauna and their habitats.
T033	Biodiversity	Loss of water in alluvial aquifers resulting in impacts on ecosystems dependent on groundwater.
T034	Biodiversity	Impacts of vegetation disturbance on flora, ecological communities and fauna habitats.
T036	Biodiversity	Loss of connectivity of endangered ecological communities.
T038	Biodiversity	Dust related impacts on vegetation.
T039	Biodiversity	Weed incursion as a result of Project activities and disturbance.
T040	Visual	Visual amenity impacts on public roads and residences surrounding the pit top locations.
T041	Visual	Impacts from night lighting at the pit top locations.
T042	Aboriginal Heritage	Project related impacts on known Aboriginal heritage items.

Ref	Type of Issue	Description of Issue / Loss scenario
T043	Aboriginal Heritage	Project related impacts on unknown Aboriginal heritage items.
T044	Aboriginal Heritage	Project related impacts on Aboriginal cultural values.
T046	Non-Aboriginal Heritage	Project related impacts on non-Aboriginal heritage.
T047	Socio-Economic	Positive social and economic benefits of the Project (e.g. jobs).
T048	Rehabilitation / Closure	Potential for failure of rehabilitation at existing or new pit top.
T049	Rehabilitation / Closure	Long-term land contamination at decommissioned pit tops.
T050	Other	Greenhouse gas emissions (including scope 3 emissions associated with burning of product coal).
T051	Other	Greenhouse gas liabilities associated with methane emissions as a result of mine activities.
T053	Other	Potential for increased frequency or intensity of bushfires as a result of Project activities.
T054	Visual	Visual impacts of subsidence related impacts on cliff lines.
T055	Other	Public safety impacts as a result of subsidence induced rock falls/rollout.
T057	Other	Impacts on users of Sugarloaf State Conservation Area.
T058	Other	Construction impacts on third party suspended and buried services (e.g. electricity transmission lines).
T061	Other	Impacts on nearby Orica facilities.
T062	Other	Impacts/management of excess fill from construction phase and waste rock from drift construction.
T063	Rehabilitation / Closure	Public safety impacts as a result of existing adits / faces of old pit top (including potential for rock fall).
T065	Biodiversity	Impacts on *Tetratheca juncea* population.
T066	Biodiversity	Impacts on groundwater dependent ecosystems.
T067	Biodiversity	Impacts on fauna as a result of construction and operational activities associated with the new pit top.
T068	Biodiversity	Impacts of vegetation disturbance for services for new pit top (e.g. water, electricity).
T069	Biodiversity	Longer term operational impacts on fauna, particularly nocturnal animals.
T070	Biodiversity	Impacts of rock fall on flora and fauna.
T073	Air Quality	Dust impacts associated with drift construction.
T075	Air Quality	Air quality impacts on flora / fauna as a result of ventilation shafts.
T077	Noise	Noise from auxiliary fan for drift.
T078	Noise	Noise impacts on nearby residences as a result of the ventilation shaft (including during construction and operation).
T080	Noise	Noise impacts on nearby residences as a result of construction and operation associated with the new pit top.
T081	Road Transport	Impacts of construction traffic during commissioning of the new pit top and decommissioning of old pit top.
T083	Road Transport	Effects of coal haulage on other traffic.
T088	Surface Water	Impacts associated with remediation works to streams impacted by subsidence.
T089	Surface Water	Impacts of increased sedimentation / erosion as a result of subsidence induced surface slope movements.
T091	Surface Water	Impacts on surface water as a result of the sewage treatment facility.
T092	Surface Water	Impacts on surface water and biota as a result of construction related sediments.
T093	Surface Water	Impacts on baseflow in streams.
T094	Surface Water	Generation of acid mine drainage from coal stockpiles or waste rock from drift construction.
T095	Surface Water	Impacts on surface water and biota as a result of a hydrocarbon spill.
T096	Subsidence	Impacts on surface water drainage and near surface groundwater as a result of connective cracking between underground workings and the surface.
T097	Subsidence	Subsidence impacts on steep landforms (including cliff lines and steep slopes).
T099	Subsidence	Subsidence impacts on roads and fire trails in the Sugarloaf State Conservation Area.
T103	Subsidence	Subsidence related impacts on third party suspended and buried services (e.g. electricity transmission lines, fibre optic cables).
T104	Biodiversity	Impacts on water availability for fauna.

ATTACHMENT C – REFERRED ISSUES

Referred issues identified during the ERA team's 'brainstorming' are presented below.

Referred Issues

Ref	Type of Issue	Description of Issue / Loss scenario
T017	Groundwater	Licensing of groundwater impacts and reinjection of groundwater.[1]
T037	Biodiversity	Regulatory acceptance of offset strategy for habitat and individual threatened species.[1]
T052	Other	Disposal of Tasman tailings and rejects generated by Bloomfield CHPP.[2]
T056	Other	Expectation of residents with respect to repairs.[1,3]
T059	Other	Design constraints at the new pit top associated with operational and water management design goals and sediment control.[1]
T060	Other	Ability to avoid environmental constraints at the new pit top.[1]
T064	Aboriginal Heritage	Ability to adequately survey disturbance areas for Aboriginal archaeology.[1]
T071	Biodiversity	Regulatory acceptance of offsets to address threatened species loss.[1]
T076	Noise	Noise / dust increases at CHPP due to increased production.[2]
T079	Noise	Consideration of Hunter Expressway on road noise.[1]
T082	Road Transport	Maintenance requirements for public roads.[1]
T084	Road Transport	Hunter expressway interactions with traffic on nearby roads.[2,3]
T085	Groundwater	Availability of water storage within historic workings in the West Borehole seam.[1]
T086	Groundwater	Potential for inrush from nearby workings.[1]
T087	Groundwater	Prediction and management of mine inflows, including inflows from adjacent workings.[1]
T090	Surface Water	Ability to establish suitable subsidence control zones to minimise impacts to 1st and 2nd order streams at low depth of cover.[1]
T098	Subsidence	Approach to determining height of fracturing above underground workings and associated depressurisation of overlying strata.[1]
T100	Subsidence	Interaction between proposed underground workings in West Borehole seam and adjacent historic workings.[1]
T101	Subsidence	Ability to establish suitable subsidence control zones to meet desired performance criteria.[1]
T102	Subsidence	Gross pillar failure event in areas with multi-seam workings.[1]

[1] Outside the scope of the ERA (e.g. control related issue, technical assessment issue, regulatory/legislative issue, operational/safety issue).

[2] Outside of the Project scope.

[3] Beyond the control of Donaldson Coal.

About Your Report

Your report has been developed on the basis of your unique and specific requirements as understood by ***SP Solutions*** and only applies to the subject matter investigated. Your report should not be used or at a minimum it MUST be reviewed if there are any changes to the project and Key Assumptions. ***SP Solutions*** should be consulted to assess how factors that have changed subsequent to the date of the report affect the report's recommendations. ***SP Solutions*** cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

To avoid misuse of the information contained in the report it is recommended you confer with ***SP Solutions*** before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Costly problems can occur when other design professionals develop their plans based on misinterpretations of the report. To help avoid misinterpretations of the report, retain ***SP Solutions*** to work with other professionals who are affected by the report. Have ***SP Solutions*** explain the report implications to professional affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

The report as a whole presents the findings of the site specific assessment and the report should not be copied in part of altered in any way.

SP Solutions is familiar with a variety of techniques and approaches that are used to identify and reduce a broad range of risks over the life of projects and operations. It is common that not all approaches will be necessarily dealt with in your report due to concepts proposed, recommendations by the team at the time or the scope determined by you. Speak with ***SP Solutions*** to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Reporting relies on:

- interpretation of factual information based on judgement and opinion;
- valid and factual inputs supplied by all third parties;
- key assumptions outside the influence of ***SP Solutions***; and
- the result of any team based approach to review the topic and is therefore not the result of any one individual or organisation (including ***SP Solutions***).

As such, any uncertainty may result in claims being lodged against consultants which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from ***SP Solutions*** to other parties but are included to identify where ***SP Solutions'*** responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from ***SP Solutions*** closely and do not hesitate to ask any questions that you may have.

No warranty of representation, either expressed or implied with respect to this document, its quality, accuracy, merchantability or fitness for a particular purpose is made. As a result, this document is provided "as is" and the reader assumes the entire risk as to its quality and accuracy.

In no event will ***SP Solutions*** be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or inaccuracy in the document, even if advised of the possibility of such damages.

The warranty and remedies set forth above are exclusive and in lieu of all others, oral or written or implied. No employee, associate, contractor or other representative of ***SP Solutions*** is authorised to make any modification, extension or addition to this warranty.

