Ashton Coal Operations Pty Ltd

Subsidence Risk Assessment for the Mining of Longwalls 1-8 Upper Liddell Seam (ULD)

AR1151 - Revision 1

Report dated – 1 March 2012

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1 INTRODUCTION

The objective of this subsidence risk assessment is to identify subsidence related hazards associated with mining Longwalls 1 to 8 (LW1-8) in the Upper Liddell Seam (ULD) with the Bowmans Creek diversion in place at the Ashton Coal Project (ACP) and to determine what subsidence related controls, if any, are required to reduce or eliminate any identified hazards to tolerable levels as far as practicable.

This risk assessment was carried out on 2nd August 2011 and was undertaken to support and guide the preparation of an Extraction Plan for LW 1 to 8 in the ULD Seam. The Extraction Plan forms part of the Environmental Management Strategy, is required by the ACP development consent and provides a framework for the management of subsidence impacts associated with ACOL's underground mining activities.

This risk assessment was undertaken following project approval of the Bowmans Creek diversions (DA 309-2001-11-i) and was undertaken on the assumption that the construction of the Bowmans Creek diversions will be completed and associated management plans in place prior to extraction of ULD LW6 to 8.

1.1 PARTICIPANTS

Participants in the risk assessment are listed in **Table 1**.

Table 1 - Risk Assessment Participants

	Name	Company and Position	Relevant Years Experience
1	Ken Mills	SCT Operations Pty Ltd Director / Senior Geotech	31 Years
2	Don Kay	MSEC Director	35 Years
3	Paul Anink	Marine Pollution Research Pty Ltd Principal	36 Years
4	John-Paul King	PEA Pty Ltd Director / Senior Ecologist	15 Years
5	Liz Wyatt	Insite Heritage Pty Ltd Archaeologist	6 Years
6	Paul Lambert	Geotechnical Solutions Engineering Geologist	20 Years
7	Craig Shultz	RPS Aquaterra Principle Hydrologist	32 Years
8	Chris Gippel	Fluvial Systems Director	30 Years
9	Steve Perrens	Evans and Peck Principal	40 Years
10	Colin Dove	Comms Network Solutions Pty Ltd Director / Engineer	30 Years
11	Chris Evans	Lindsay & Dynan Civil Engineer	5 Years
12	Amanda Kerr	AECOM Senior Environmental Engineer	11 Years
13	Gabriel Wardenburg	AECOM Professional Environmental Scientist	3 Years
14	Phil Fletcher	Ashton Coal Technical Services Manager	18 Years
15	Cassandra Ferguson	Ashton Coal Environmental Co-ordinator	6 Years

1.2 FACILITATOR QUALIFICATIONS

Shane Chiddy holds an Associate Diploma in Engineering (Electrical), is an Officer of the Institution of Engineers (Australia) and is a member of the Maintenance Engineering Society of Australia (MESA). He has also completed Conveyancing Law through Macquarie University and Establish the Risk Management Systems (Mine 7033 - G3) through Queensland University.

Prior to commencing his consulting career, Shane Chiddy qualified as an electrician and worked underground for 9 years. He then occupied a number of engineering roles within Rio Tinto, including such roles as Electrical Supervisor, Development Engineer and Senior Production Engineer. This latest role was responsible for the Longwall, underground diesel equipment and conveyors.

Additionally Shane Chiddy has been trained and accredited by John Moubray in the UK as a certified RCM II practitioner, and has conducted a number of extensive Reliability-centred Maintenance II analyses including underground and surface equipment such as Longwalls, Continuous Miners and conveying systems. He has facilitated RCM II analysis and delivered training in the mining, defence and telecommunications industries.

His consulting experience includes the application of Reliability-centred Maintenance II and extensive Risk Management and Project Management assignments. Shane is also experienced in software development and in the development and presentation of training packages.

2 RISK ASSESSMENT

2.1 ASSUMPTIONS AND CONSTRAINTS

The following assumptions and limitations were applied to this risk assessment:

- Bowmans Creek Diversion (BCD) is constructed and operational prior to extraction of LW6 to 8 in the ULD seam;
- A reference to Bowmans Creek, within this assessment, refers to the diverted creek and excludes the excised sections unless otherwise stated;
- The likelihood considered throughout this assessment is based on the impacts being in excess of those already identified and managed under the current Ashton Coal Project (ACP) Development Consent;
- This risk assessment relates to LW 1 to 8 in the ULD seam only; and
- All commitments, including monitoring will proceed as identified in the EA.

Related documents Include:

- AS/NZS ISO 31000:2009 Risk management—Principles and guidelines;
- MDG1010 - Risk Management Handbook for the Mining Industry. Dated May 1997;
- Guidelines for Applications for Subsidence Management Approval, Department of Mineral Resources 2003;
- BCD Environmental Assessment, Evans and Peck 2009;
- BCD Response to Submissions, Wells Environmental, May 2010; and
- Subsidence Management Plan, Pikes Gully LW 5-9, Maunsell AECOM 2009 (Approved as LW 5-6 & MW 7-8 in July 2009 and subsequently varied).

2.2 QUALITATIVE RISK ANALYSIS

This risk analysis has been performed using Qualitative Risk Analysis techniques and has been performed in compliance with the Department of Mineral Resources Guideline MDG1010. A general description of these techniques is provided in **Appendix D**.

The following steps which allowed for the systematic identification of hazards, ranking of risks, and identification of new and/or improved controls were used in the risk assessment workshop:

1. Introduce team to risk assessment plan document, including scope and method of the risk assessment;
2. Break system being assessed down into discrete sub-systems (refer to **Appendix A**);
3. Identify and add potential deviation steps;
4. Review each sub-system and identify loss scenarios (potential impacts, incidents and accidents);
5. For each hazard, evaluate the risk using the risk rank method by determining the probability, consequence, and risk rank of each loss scenario;
6. Identify existing controls for each hazard;
7. Specify additional controls required to control the hazard(s);
8. Close the risk assessment;
9. Document and distribute to the senior representatives of the team for proof reading; and
10. Verification of the assessment by a nominated person.

The group were introduced to the risk assessment process at the commencement of the session by the facilitator. The various steps were explained and the group reviewed the Likelihood, Consequence and Risk Ranking matrix (refer to **Appendix B**).

2.3 RISK RANKING AND CONTROLS

The risk ranking was done with consideration to existing controls being in place.

Controls were developed using the following forms.

- *Avoiding the risk:* By deciding not to start or continue with the activity that gives rise to the risk (where this is practicable). Risk avoidance can occur inappropriately if individuals or organisations are unnecessarily risk-averse. Inappropriate risk avoidance may increase the significance of other risks or may lead to the loss of opportunities for gain.
- *Changing the likelihood of the risk*: to reduce the likelihood of the negative outcomes.
- *Changing the consequences*: to reduce the extent of the losses. This includes pre-event measures such as reduction in inventory or protective devices and post-event responses such as continuity plans.
- *Sharing the risk*. This involves another party or parties bearing or sharing some part of the risk, preferably by mutual consent. Mechanisms include the use of contracts, insurance arrangements and organisational structures such as partnerships and joint ventures to spread responsibility and liability. Generally there is some financial cost or benefit associated with sharing part of the risk with another organisation, such as the premium paid for insurance.
- Where risks are shared in whole or in part, the organisation transferring the risk has acquired a new risk, in that the organisation to which the risk has been transferred may not manage the risk effectively.
- *Retaining the risk.* After risks have been changed or shared, there will be residual risks that are retained. Risks can also be retained by default, e.g. when there is a failure to identify or appropriately share or otherwise treat risks.

The risk assessment worksheet, documenting the above process, including each identified hazard, existing and proposed controls is provided in **Appendix C**.

2.4 AUDIT AND REVIEW

An audit system needs to be in place to ensure all recommendations from this assessment are carried out prior to the required dates identified within the assessment. It is recommended that this Risk Assessment be reviewed within 12 months of approval of the Extraction Plan to ensure all risks have been identified and controls put in place.

APPENDIX A SUB-SYSTEMS ANALYSED

Sub-systems analysed as part of this risk assessment were based on the identification of surface and subsurface features outlined in the SMP Guidelines (Department of Mineral Resources, 2003) and is reproduced below.

Table 2 - Sub-systems Analysed

Sub-system		Step In Process	
1	Natural Features	A	1.01 Catchment areas or Declared Special Areas
		B	1.02 Rivers or creeks (Bowmans Creek, Hunter River and Glennies Creek
		C	1.03 Aquifers or known groundwater resources
		D	1.04 Springs
		E	1.05 Sea or lake
		F	1.06 Shorelines
		G	1.07 Natural dams
		H	1.08 Cliffs or pagodas
		I	1.09 Steep slopes
		J	1.10 Escarpments
		K	1.11 Land prone to flooding or inundation
		L	1.12 Swamps, wetlands or water related ecosystems
		M	1.13 Threatened or protected species
		N	1.14 National Parks
		O	1.15 State Conservation Areas
		P	1.16 State Forests
		Q	1.17 Natural vegetation
		R	1.18 Areas of major geological interest
		S	1.19 Any other feature considered significant
2	Public Utilities	A	2.01 Railways
		B	2.02 Roads (All Types)
		C	2.03 Bridges
		D	2.04 Tunnels
		E	2.05 Culverts
		F	2.06 Water, gas or sewerage infrastructure
		G	2.07 Liquid fuel pipelines
		H	2.08 Electricity transmission lines or associated plants
		I	2.09 Telecommunications lines or associated plants
		J	2.10 Water tanks, water or sewerage treatment works
		K	2.11 Dams, reservoirs or associated works
		L	2.12 Air strips
		M	2.13 Any other public utilities

Sub-system		Step In Process	
4	Public amenities	A	3.01 Hospitals
		B	3.02 Places of worship
		C	3.03 Schools
		D	3.04 Shopping centres
		E	3.05 Community centres
		F	3.06 Office buildings
		G	3.07 Swimming pools
		H	3.08 Bowling greens
		I	3.09 Ovals or cricket grounds
		J	3.10 Race courses
		K	3.11 Golf courses
		L	3.12 Tennis courts
		M	3.13 Visual amenity
4	Farm land and facilities	A	4.01 Agricultural utilisation or agricultural suitability of farm land
		B	4.02 Farm buildings or sheds
		C	4.03 Gas or fuel storage
		D	4.04 Poultry sheds
		E	4.05 Glass houses
		F	4.06 Hydroponic systems
		G	4.07 Irrigation system
		H	4.08 Fences
		I	4.09 Farm dams
		J	4.10 Wells or bores
		K	4.11 Any other feature considered significant including access tracks
5	Industrial, commercial and business establishments	A	5.01 Factories
		B	5.02 Workshops
		C	5.03 Business or commercial establishments
		D	5.04 Gas or fuel storages or associated plants
		E	5.05 Waste storages or associated plants
		F	5.06 Buildings, equipment or operations that are sensitive to surface movements
		G	5.07 Surface mining (open cut) voids or rehabilitated areas
		H	5.08 Mine infrastructure including tailings dams or emplacement areas
		I	5.09 Any other industrial, commercial or business features
6	Areas of archaeological and / or heritage importance	A	6.01 Areas of archaeological and/or heritage significance
7	Items of architectural importance	A	7.01 Items of architectural significance
8	Permanent Survey Control Marks	A	8.01 Permanent Survey Control Marks

9	Residential Establishments	A	9.01 Houses
		B	9.02 Flats or Units
		C	9.03 Caravan Parks
		D	9.04 Retirement or Aged Care Villages
		E	9.05 Associated Structures such as Workshops, Garages, On-Site Waste Water Systems, Water or Gas Tanks, Swimming Pools or Tennis Courts
		F	9.06 Any Other Residential Features of relevance
10	Any Other Item Of Importance	A	10.01 Any Other Item of Importance

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APPENDIX B LIKELIHOOD & CONSEQUENCE TABLES

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Risk Matrix

Loss Type	Hazard Effect/ Consequence				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Harm to People (P)	Slight injury or health effects – first aid/minor medical treatment level	Minor injury or health effects – restricted work or minor lost workday case	Serious bodily injury or health effects – major lost workday case/ permanent disability	Single fatality, permanent total disabilities.	Multiple fatalities
Environmental Impact(E)	Environmental nuisance – unreasonable interference with and environmental value or contamination or pollution with a cost less than $1,000	Minor environmental harm – not trivial or negligible, potential health risks for community or pollution or contamination with costs between $1,000 & $5,000	Serious environmental harm – high local impact or impacts to and area(s) of local conservation value, actual community health impacts or significance or pollution or contamination with a costs between $5k and $50k	Major environmental harm – high impact in district or actual impacts to an area of regional conservation significance, health statistics in community alter as a result of this incident or pollution or contamination with costs between $50k & $500k	Extreme environmental harm – irreversible harm to environmental values of extreme & widespread areas, impacts to conservation areas of national significance, community fatalities or pollution or contamination with costs greater than $500k
Asset Damage & Other Consequential Losses (A)	Slight damage <$0.1M or < 1 shift disruption to operation	Minor damage $0.1M to$1.0M. or 1 Shift – 1 day disruption to operation	Local damage $1.0M to$5.0M. 1day to 1week - disruption to operation	Major damage $5.0M to$30.0M. 1week – 1 month -Partial loss of operation	Extreme damage > $30.0M. > 1 month - Substantial or total loss of operation
Impact on Reputation (R)	Slight impact – public awareness may exist but no public concern	Limited impact – some local public concern	Considerable impact – regional public concern	National impact – national public concern	International impact – international public attention

Likelihood	Likelihood Examples (use only as a guide)	Risk Rating				
A (Almost certain)	Likely that the unwanted event could occur several times per year at this location	**15 (M)**	**10 (H)**	**6 (H)**	**2 (Ex)**	**1 (Ex)**
B (Likely)	Likely that the unwanted event could occur several times per year in the Australian mining industry; or could happen annually	**19 (M)**	**14 (M)**	**9 (H)**	**4 (Ex)**	**3 (Ex)**
C (Possible)	The unwanted event could well have occurred in the Australian mining industry at some time in the past 10 years	**22 (L)**	**18 (M)**	**13 (H)**	**8 (H)**	**5 (Ex)**
D (Unlikely)	The unwanted event has happened in the Australian mining industry at some time; or could happen in 50 years	**24 (L)**	**21 (L)**	**17 (M)**	**12 (H)**	**7 (H)**
E (Rare)	The unwanted event has never been known to occur in the Australian mining industry; or is highly unlikely that it could ever occur	**25 (L)**	**23 (L)**	**20 (M)**	**16 (M)**	**11 (H)**

Risk Rating	Risk Level	Guidelines for Risk Control Barriers
1 to 5	(E) – Extreme	Immediate intervention requied from Senior Management, do not proceed with activity. -
6 to 13	(H) – High	Imperative to eliminate or reduce risk by introduction of controls, do not proceed with activity until reviewed by Senior Management -
14 to 20	(M) – Medium	Corrective action to be determined, do not proceed without authorisation from Shift Coordinator -
21 to 25	(L) – Low	Safe to continue activity once hazards minimised -

APPENDIX C RISK ASSESSMENT WORKSHEETS

The following worksheets record the potential hazards, consequences, existing and proposed controls and risk ranking (based on existing controls) identified during the workshop.

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1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	1.01 Catchment Areas or Declared Special Areas	1	The Application Area does not include any catchment areas or declared special areas and did not require further assessment.							
B	1.02 Rivers or Creeks (Bowmans Creek, Hunter River and Glennies Creek)	1	Water flow and quality changes to Bowmans Creek due to mine subsidence. Changes to channel stability. Flow on environmental impacts result.	Approved creek diversions and mine designed to minimise effects on the creeks and rivers Mine design includes a 40 metre offset from high bank Specialist Surface Water, Groundwater and Geotechnical Studies Existing Surface Water, Groundwater and Land Management Plans	E	3	D	17	Review the existing Surface Water, Groundwater and Land Management Plans and update for ULD where required Review existing consent to align with required management plans Complete Bowmans Creek diversion construction report and management plan Base flow losses from Bowmans Creek are to be accounted for access licence Bowmans Creek diversions are to have a works approval licence before construction (if required)	Ashton Coal Ashton Coal Ashton Coal Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Water flow and quality changes to Hunter River due to mine subsidence. Changes to channel stability. Flow on environmental impacts result. (Steep slopes analysed separately 1.09)	Mine designed to minimise effects on the creeks and rivers Current mine design 200 metre offset to the Hunter River alluvium (Commitment 3.2) Specialist Surface Water, Groundwater and Geotechnical Studies Existing Surface Water, Groundwater and Land Management Plans	E	3	D	17	Review the existing Surface Water, Groundwater and Land Management Plans and update for ULD where required Review existing consent to align with required management plans	Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		3	Water flow and quality changes to Glennies Creek due to mine subsidence. Changes to channel stability. Flow on environmental impacts result. (Steep slopes analysed separately 1.09)	Mine designed to minimise effects on the creeks and rivers Ground water inflows from Glennies Creek are accounted for under access licence Current mine design - 40 metre offset from high bank maintained. Specialist Surface Water, Groundwater and Geotechnical Studies Existing Surface Water, Groundwater and Land Management Plans	E	3	D	17	Review the existing Surface Water, Groundwater and Land Management Plans and update for ULD where required Review additional monitoring of inflows into the mine Review Subsidence Monitoring Plan to incorporate high bank survey. Review the existing mine inrush and inundation risk assessment and associated management plan, (up to 130M litres BCD EA) as part of Clause 88 application for this area (consider underground pumping capacity and surface remediation of the excised creek)	Ashton Coal Ashton Coal Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		4	Water flow and quality changes to minor tributary creeks due to mine subsidence. Changes to channel stability. Flow on environmental impacts result.	EA includes commitments to maintain a free draining landform Existing Surface Water and Land Management Plans Built Features Management Plan	E	2	B	14	Review the existing Surface Water and Land Management Plans and update for ULD where required Final design of Lemington Road to be as per Condition 7.14 Consult with Macquarie Generation over Void 5 drainage path	Ashton Coal Ashton Coal Ashton Coal
C	1.03 Aquifers or Known Groundwater Resources	1	Alluvial ground water level and quality changes due to mine subsidence.	Specialist Surface Water, Groundwater and Geotechnical Studies Existing Groundwater Management Plan, including monitoring programs. End of panel reports, reviewing predicted against actual impacts to groundwater.	E	3	D	17	Review the existing Groundwater Management Plans and update for ULD where required Review additional monitoring of inflows into the mine Base flow losses from Bowmans Creek are to be accounted for access licence Bowmans Creek diversions are to have a works approval licence before construction (if required)	Ashton Coal Ashton Coal Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Hard Rock ground water level and quality changes due to mine subsidence.	Specialist Surface Water, Groundwater and Geotechnical Studies Existing Groundwater Management Plan, including monitoring programs. End of panel reports, reviewing predicted against actual impacts to groundwater	E	1	D	24	Review the existing Groundwater Management Plans and update for ULD where required Review additional monitoring of inflows into the mine Required GW, SW and hard rock licences to be in place	Ashton Coal Ashton Coal
D	1.04 Springs	1	The Application Area does not include any springs and did not require further assessment.							
E	1.05 Sea or Lake	1	The Application Area does not include any seas or lakes and did not require further assessment.							
F	1.06 Shorelines	1	The Application Area does not include any shorelines and did not require further assessment.							
G	1.07 Natural Dams	1	The Application Area does not include any natural dams and did not require further assessment.							
H	1.08 Cliffs or Pagodas	1	The Application Area does not include any cliffs or pagodas and did not require further assessment.							
I	1.09 Steep Slopes	1	Change to steep slopes and potential to cause slope instability, due to mine subsidence. (Hunter River)	None at present	E	2	C	18	Perform assessment of steep slopes along the Hunter River Land Management Plan to include steep slope management Specialist reports to include definitions of Steep Slopes)	Ashton Coal Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Change to steep slopes and potential to cause slope instability, due to mine subsidence. (Glennies Creek)	Mine designed to minimise effects on the steep slopes	R	4	D	12	Perform assessment of steep slopes along the Glennies Creek Land Management Plan to include steep slope management	Ashton Coal Ashton Coal
J	1.10 Escarpments	1	The Application Area does not include any escarpments did not require further assessment.							
K	1.11 Land Prone to Flooding or Inundation	1	Land Prone to Flooding or Inundation changes due to mine subsidence.	EA includes commitments to maintain a free draining landform Existing Surface Water and Land Management Plans Plans prepared identifying flood levels	E	2	D	21	Review Land Management Plan with respect to areas of flooding Prepare a Rehabilitation Environmental Management Plan	Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
L	1.12 Swamps, Wetlands or Water Related Ecosystems	1	Swamps, wetlands or water related ecosystems changes due to mine subsidence. (Hunter River) Surface water changes.	Existing Surface Water and Land Management Plans Flora and Fauna Management Plan	E	2	D	21	Review the existing Surface Water and Land Management Plans Review the existing Flora and Fauna Management Plans and incorporate management of River Red Gum for Hunter River and Bowmans Creek. Monitoring to include temporary sites on the Hunter River (pre and post subsidence monitoring if LW 1 is full length)	Ashton Coal Ashton Coal Ashton Coal Ashton Coal
		2	Swamps, wetlands or water related ecosystems changes due to mine subsidence. (Bowmans Creek) Surface water changes.	Existing Surface Water and Land Management Plans Flora and Fauna Management Plans Monitoring includes the River Red Gums on Bowmans Creek	E	2	D	21	Review the existing Surface Water and Land Management Plans (check aquatic monitoring) Review the existing Flora and Fauna Management Plans and incorporate management of River Red Gum for Hunter River and Bowmans Creek. Bowmans Creek Management plan to include the management of the excised creek channel as riparian woodland	Ashton Coal Ashton Coal Ashton Coal Ashton Coal

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		3	Swamps, wetlands or water related ecosystems changes due to mine subsidence. (Glennies Creek) Surface water changes and steep slope failure.	Existing Surface Water and Land Management Plans Flora and Fauna Management Plans (Steep slopes assessed separately in 1.09 Steep Slopes above)	E	2	D	21	Review the existing Surface Water and Land Management Plans Review the existing Flora and Fauna Management Plans and incorporate management of River Red Gum for Hunter River and Bowmans Creek.	Ashton Coal Ashton Coal Ashton Coal
M	1.13 Threatened or Protected Species	1	Threatened or protected species impacted within the Southern Woodland due to mine subsidence and repair works. (eg Woodland Birds, Micro-bats)	Existing Land Management Plans Flora and Fauna Management Plans Southern Woodland within the Voluntary Conservation Area Monitoring within the underground surface area	E	3	D	17	Review the existing Land Management Plans Review the existing Flora and Fauna Management Plans, include monitoring of the nest trees	Ashton Coal Ashton Coal
		2	Threatened or protected species impacted to the River Red Gum sub population due to mine subsidence. Changes in sub population health.	See 1L2 and 1L3						

1 – NATURAL FEATURES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
N	1.14 National Parks	1	The SMP Application Area does not include any national parks and did not require further assessment.							
O	1.15 State Conservation Areas	1	The Application Area does not include any State Conservation Areas and did not require further assessment.							
P	1.16 State Forests	1	The Application Area does not include any State Forests and did not require further assessment.							
Q	1.17 Natural Vegetation	1	Natural vegetation changes due to mine subsidence. (including Voluntary Conservation Area) – Agreement approved in 2010 Excludes threatened and protected species	Existing Land Management Plans Flora and Fauna Management Plans Southern Woodland within the Voluntary Conservation Area Compliance with Voluntary Conservation Area conditions	E	2	D	21	Review the existing Land Management Plan Review the existing Biodiversity (Flora and Fauna) Management Plan	Ashton Coal Ashton Coal
R	1.18 Areas of Major Geological Interest	1	The Application Area does not include any areas of major geological interest and did not require further assessment.							
S	1.19 Any other feature considered significant	1	The Application Area does not include any other feature considered significant and did not require further assessment.							

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	2.01 Railways	1	The Application Area does not include any railways and did not require further assessment.							
B	2.02 Roads (All Types)	1	Roads (New England Highway) changes due to mine subsidence.	Mine plan – angle of draw maintained outside of the highway road reserve. Existing survey monitoring Pothole Management Plan Built Features Management Plan Geotechnical assessment for pillar stability and potential for potholes (Strata Engineering 2011) Indicated long term stable and non-subsiding. Existing agreements with RTA (WAD)	A	2	E	23	Review potential for valley closure at Bowmans Creek bridge	Ashton Coal
		2	Roads (Property 130 access road as a private road) changes due to mine subsidence.	Property 130 Asset Management Plan Built Features Management Plan	A	2	E	23	Review and update the Property 130 Asset Management Plan – including consultation with land owner and notification to resident	Ashton Coal
		3	Roads (Brunkers Lane) changes due to mine subsidence.	**Note:** Brunkers Lane is to be superseded by the realignment of Lemington Road as a Public Road.						

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		4	Roads (Lemington Road) changes due to mine subsidence.	Built Features Management Plan	P	3	C	13	Final design of Lemington Road to be as per Condition 7.14 Consult with Macquarie Generation over void 5 drainage path Develop management plan in consultation with Ravensworth North, Singleton Council and Mine Subsidence Board Review the Public Safety Management Plan	Ashton Coal Ashton Coal Ashton Coal Ashton Coal
C	2.03 Bridges	1	Bridge (New England Highway) changes due to mine subsidence.	Mine plan – angle of draw maintained outside of the highway road reserve. Built Features Management Plan Subsidence Monitoring Program	A	2	E	23	Review and update the RTA Asset Management Plan Review potential for valley closure at Bowmans Creek bridge	Ashton Coal Ashton Coal
D	2.04 Tunnels	1	The Application Area does not include any tunnels and did not require further assessment.							

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
E	2.05 Culverts	1	New England Highway culvert damaged due to mine subsidence. Loss of usage.	Culvert is not affected by mine subsidence associated with this EP. Built Features Management Plan Subsidence Monitoring Program RTA's monitoring	A	2	E	23	Review and update the RTA Asset Management Plan	Ashton Coal
		2	Lemington Road culvert(s) damaged due to mine subsidence. Loss of usage.	None at present	A	2	D	21	Final design of Lemington Road to be as per Condition 7.14 Consult with Macquarie Generation over Void 5 drainage path Develop management plan in consultation with Ravensworth North, Singleton Council and Mine Subsidence Board Review the Public Safety Management Plan	Ashton Coal Ashton Coal Ashton Coal Ashton Coal
F	2.06 Water, Gas or Sewerage Infrastructure	1	The Application Area does not include any water, gas or sewerage infrastructure and did not require further assessment.							

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
G	2.07 Liquid Fuel Pipelines	1	The Application Area does not include any liquid fuel pipeline and did not require further assessment.							
H	2.08 Electricity Transmission Lines or Associated Plants	1	Damage to Electricity transmission lines due to mine subsidence - transmission lines requires repair, safety issues. Southern 132kV	Built Features Management Plan Development Consent includes a commitment to maintain safe, serviceable and repairable Electricity Transmission Lines.	A	3	D	17	Review the existing Ausgrid Asset Management Plan Perform specific 132kV power line assessment to identify affected power poles and implement recommendations	Ashton Coal Ashton Coal
		2	Damage to electricity transmission lines due to mine subsidence. Transmission lines requires repair. Proposed local 11kV for SEOC (same alignment as the 132 kV offset)	None at present	A	2	E	23	Review the existing Ausgrid Asset Management Plan Include the proposed local 11kV for SEOC within the Built Features Management Plan Perform specific 11kV power line assessment to identify affected power poles and implement recommendations	Ashton Coal Ashton Coal Ashton Coal

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		3	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair, safety issues. Northern 132kV and 66kV	Mine designed to minimise effects on northern 132kV and 66kV powerlines Built Features Management Plan Development Consent includes a commitment to maintain safe, serviceable and repairable – including electricity transmission lines.	A	2	E	23	Review the existing Ausgrid Asset Management Plan	Ashton Coal
		4	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair. Relocated northern 132kV and 66kV (due to SEOC Project)	None at present	A	2	E	23	Review the existing Ausgrid Asset Management Plan Include the relocated Northern 132kV and 66kV power line within the built features management plan Perform specific Northern 132kV and 66kV power line (In relocated position) assessment to identify affected power poles and implement recommendations	Ashton Coal Ashton Coal Ashton Coal

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		5	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair. Local 11kV	Built Features Management Plan Development Consent includes a commitment to maintain safe, serviceable and repairable Electricity Transmission Lines.	A	2	E	23	Review the existing Ausgrid Asset Management Plan Perform specific 11kV power line assessment to identify affected power poles and implement recommendations	Ashton Coal Ashton Coal
I	2.09 Telecommunication Lines or Associated Plants	1	Damage to domestic Telstra Local Network due to mine subsidence. Telecommunication lines requires repair.	Built Features Management Plan (including Telstra Asset Management Plan, property 130 Management Plan, ACOL Asset Management Plan and Ravensworth Operations)	A	2	B	14	Review the existing Telstra Asset Management Plan Review the Property 130 Asset Management Plan Review the existing Ravensworth Operations Asset Management Plan Identify the functions of the local copper network cables, and consult with affected stakeholders	Ashton Coal Ashton Coal Ashton Coal

2 – PUBLIC UTILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Damage to AAPT fibre optic cable due to mine subsidence. Fibre optic line requires repair. Interruption to services result. (Cable is located outside the area of application)	Built Features Management Plan (including the AAPT Asset Management Plan)	A	4	E	16	Review the existing AAPT Asset Management Plan Perform specific assessment identifying base line performance of the of the Fibre Optic Cable	Ashton Coal Ashton Coal
J	2.10 Water Tanks, Water or Sewage Treatment Works	1	The Application Area does not include any public water tanks, water or sewerage treatment works and did not require further assessment.							
K	2.11 Dams, Reservoirs or Associated Works	1	The Application Area does not include any dams, reservoirs or associated works and did not require further assessment.							
L	2.12 Air Strips	1	The Application Area does not include any air strips and did not require further assessment.							
M	2.13 Any Other Public Utilities	1	Disruption to NOW flow gauging station. Loss of data and calibration. Impact to licensed users. (HUAWSP)	Commitment 3.5 to maintain existing surface infrastructure as safe, serviceable and repairable unless the owner agrees in writing and any such damage will be mitigated or remediated by ACOL	A	1	D	24	Review relocating the flow gauging station with NOW Review the existing Telstra Asset Management Plan Develop a NOW Asset Management Plan, before potential impacts to the gauging station	Ashton Coal Ashton Coal Ashton Coal

3 – PUBLIC AMENITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	3.01 Hospitals	1	The Application Area does not include any hospitals and did not require further assessment.							
B	3.02 Places of Worship	1	The Application Area does not include any places of worship and did not require further assessment.							
C	3.03 Schools	1	The Application Area does not include any schools and did not require further assessment.							
D	3.04 Shopping Centres	1	The Application Area does not include any shopping centres and did not require further assessment.							
E	3.05 Community Centres	1	The Application Area does not include any community centres and did not require further assessment.							
F	3.06 Office Buildings	1	The Application Area does not include any office buildings and did not require further assessment.							
G	3.07 Swimming Pools	1	The Application Area does not include any public swimming pools and did not require further assessment.							
H	3.08 Bowling Greens	1	The Application Area does not include any bowling greens and did not require further assessment.							
I	3.09 Ovals or Cricket Grounds	1	The Application Area does not include any ovals or cricket grounds and did not require further assessment.							
J	3.10 Race Courses	1	The Application Area does not include any race courses and did not require further assessment.							
K	3.11 Golf Courses	1	The Application Area does not include any golf courses and did not require further assessment.							
L	3.12 Tennis Courts	1	The Application Area does not include any public tennis courts and did not require further assessment.							
M	3.13 Visual Amenity	1	The Application Area does not include any public visual amenity and did not require further assessment.							

4 – FARM LAND AND FACILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	4.01 Agricultural Utilisation or Agricultural Suitability of Farm Land	1	Changes to the agricultural Utilisation or Agricultural Suitability of Farm Land.	EA includes commitments to maintain a free draining landform Existing Land Management Plan	A	2	C	18	Review Land Management Plan	Ashton Coal
B	4.02 Farm Buildings or Sheds	1	Damage to Farm buildings / sheds due to mine subsidence. Farm buildings / sheds require repair.	MacGen, Property 130 & ACOL Asset Management Plan	A	1	D	24	Review of MacGen, Property 130 & ACOL Asset Management Plan Consultation with stakeholders	Ashton Coal Ashton Coal
C	4.03 Gas or Fuel Storage	1	Damage to Farm Gas or Fuel Storage due to mine subsidence. Gas or Fuel Storage requires repair.	Property 130 Asset Management Plan	A	1	D	24	Review the Property 130 Management Plan, confirm if Gas or Fuel Storage is provided at the site Consultation with stakeholders	Ashton Coal Ashton Coal
D	4.04 Poultry Sheds	1	The Application Area does not include any poultry sheds and did not require further assessment.							
E	4.05 Glass Houses	1	The Application Area does not include any glass houses and did not require further assessment.							
F	4.06 Hydroponic Systems	1	The Application Area does not include any hydroponic system and did not require further assessment.							

4 – FARM LAND AND FACILITIES

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
G	4.07 Irrigation Systems	1	Damage to Irrigation Systems due to mine subsidence. Irrigation Systems requires repair.	Property 130 Asset Management Plan	A	1	D	24	Review the Property 130 Asset Management Plan, to include irrigation systems	Ashton Coal
H	4.08 Fences	1	Damage to fences due to mine subsidence. Fences require repair.	MacGen, Property 130 & Ravensworth Operations Asset Management Plan	A	1	D	24	Review of MacGen, Property 130 & Ravensworth Operations Asset Management Plan, to include fences	Ashton Coal
I	4.09 Farm Dams	1	Damage to Farm dams due to mine subsidence. Reduced storage capacity. Farm dams require repair.	Property 130 Management Plan ACOL Asset Management Plan	A	1	D	24	Review the ACOL & Property 130 Management Plan, to include dams	Ashton Coal
J	4.10 Wells or Bores	1	Loss of water or water quality impacts within private bores in locality	Groundwater Management Plan Groundwater modelling and impact studies	E	2	D	21	Review the Groundwater Management Plan	Ashton Coal
K	4.11 Any other feature considered significant including access tracks	1	Damage to Access Tracks due to mine subsidence. Access Tracks require repair.	Property 130 Asset Management Plan	A	1	E	25	Review the Property 130 Asset Management Plan, to include access tracks	Ashton Coal

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	5.01 Factories	1	The area of subsidence under analysis does not include any factories and did not require further assessment.							
B	5.02 Workshop	1	The Application Area does not include any workshops and did not require further assessment.							
C	5.03 Business or Commercial Establishments	1	The Application Area does not include any Business or Commercial Establishments and did not require further assessment.							
D	5.04 Gas or Fuel Storages or Associated Plants	1	The Application Area does not include any Gas or Fuel Storages or Associated Plants and did not require further assessment.							
E	5.05 Waste Storages or Associated Plants	1	The Application Area does not include any Waste Storages or Associated Plants and did not require further assessment.							
F	5.06 Buildings, Equipment or Operations that are Sensitive to Surface Movements	1	The Application Area does not include any Buildings, Equipment or Operations that are Sensitive to Surface Movements and did not require further assessment. NOW flow gauge telemetry sheds was considered to be outside the area of subsidence							
G	5.07 Surface Mining (Open Cut) Voids or Rehabilitated Areas	1	Damage to Surface Mining (Open Cut) Voids or Rehabilitated Areas, due to mine subsidence	MacGen Asset Management Plan, includes sedimentation dams	E	2	B	13	None Identified	

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
H	5.08 Mine Infrastructure Including Tailings Dams or Emplacement Areas, Shafts and Nitrogen BOC Plant	1	Damage and interruption to the Ashton Coal underground de-watering poly pipeline. Possible production and environmental issues.	Flow monitoring systems and alarms	E	3	C	13	Label all pipelines on the Plans Review of ACOL Asset Management Plan to incorporate tailings pipelines	Ashton Coal Ashton Coal
		2	Damage and interruption to the Ashton Coal Hunter River water supply Poly pipelines. Possible production and environmental issues.	Flow monitoring systems and alarms	A	1	E	25	Review of ACOL Asset Management Plan to incorporate tailings pipelines Label all pipelines on the Plans	Ashton Coal Ashton Coal
		3	Damage to the proposed Ashton Northern (5.5 metre and 4 metre) and Southern ventilation shafts (2 metre) and dewatering borehole due to mine subsidence. Possible production and safety issues.	Mine design Shafts have been designed for the application	A	1	D	24	Subsidence assessment to include proposed Northern (5.5 metre and 4 metre) and Southern ventilation shafts (2 metre) and dewatering boreholes	Ashton Coal
		4	Damage to the Ashton Nitrogen BOC Plant due to mine subsidence. Possible production and safety issues.	Mine design	A	1	D	24	Subsidence assessment to include Ashton Nitrogen BOC Plant ACOL Asset Management Plan to be reviewed and incorporate BOC Plant	Ashton Coal Ashton Coal

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		5	Damage to Narama Dam, loss of water storage. Flow into downstream water systems. Possible safety and environmental hazards.	Monitoring plan in place for the Narama Dam Ashton-2 approval by DSC and I&I	A	2	E	23	Review existing Ravensworth Operations Asset Management Plan, to include Narama Dam Review Ashton-2 approval for ULD seam	Ashton Coal Ashton Coal
		6	Damage to proposed Void 5 Dam, loss of fly ash storage. Flow into downstream water systems. Safety and environmental hazards.	DSC approves dam building standards and will take into account subsidence predictions ACOL currently notify the location of workings to the DSC as part of the Narama Dam (Ashton -2) approval requirements	E	3	E	20	Review existing MacGen Asset Management Plan	Ashton Coal
		7	Damage to MacGen sediment ponds, loss of storage. Flow into downstream water systems. Safety and environmental hazards.	MacGen Asset Management Plan	E	2	C	18	Review the MacGen Asset Management Plan	Ashton Coal
		8	Damage and interruption to the Mount Owen to Ravensworth Operations water supply pipeline. Possible production and environmental issues.	Ravensworth Operations Asset Management Plan	E	2	C	18	Review the Ravensworth Operations Asset Management Plan	Ashton Coal

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		9	Damage and interruption to the Ashton Coal return water / tailings Poly pipelines. Possible production and environmental issues. (Void 4)	MacGen Asset Management Plan ACOL Asset Management Plan Pipelines are labelled on the Subsidence Plans	E	3	C	13	Review the Ravensworth North design of relocated sedimentation dam, required for Lemington Road re-alignment	Ashton Coal
		11	Narama Dam discharge compromised due to change in the flow regime of Bowmans Creek.	EA includes assessment of subsidence impacting the Bowmans Creek flow regime on the Narama Dam discharge	R	2	E	23	Subsidence predictions to include consideration of Narama Dam discharge compromised.	Ashton Coal
		13	Impact on the Ravensworth Underground mine operations. Geotechnical and ground water interactions between mining operations.	Commitment made in EA use subsidence and groundwater experts to assess the western longwall to ensure concurrent operations of the RUM and ACOL underground mines can be undertaken safely	P	2	D	21	Review the Impact on the Ravensworth Underground mine operations, in the subsidence assessment. Consultation with RUM, regarding activities associated with the Western Longwall	Ashton Coal Ashton Coal

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		6	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair. Local 33kV (Ravensworth Operations)	Built Features Management Plan Development Consent includes a commitment to maintain safe, serviceable and repairable Electricity Transmission Lines.	A	2	E	23	Review the existing Ravensworth Operations Asset Management Plan Perform specific 33kV power line assessment to identify affected power poles and implement recommendations Consult with Ravensworth Operations identifying future power line locations	Ashton Coal Ashton Coal Ashton Coal
		7	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair. Proposed 330kV (Ravensworth Operations)	Exiting design includes consideration for Ashton mine subsidence Approval process for the design of infrastructure by MSB	A	2	E	23	Review the existing Ravensworth Operations Asset Management Plan Include the relocated Proposed 330kV (Ravensworth Operations) power line within the built features management plan Consult with MSB, regarding the approval process and payment for monitoring	Ashton Coal Ashton Coal Ashton Coal

5 – INDUSTRIAL, COMMERCIAL AND BUSINESS ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
			ACOL Proposed Goaf Gas Drainage Boreholes and pipelines (including surface infrastructure)	Built Features Management Plan Boreholes and gas well infrastructure has been designed to accommodate subsidence movements (centralised infrastructure effectively outside subsidence zones)	E	2	D	21	Review of Built Features Management Plan, to include ACOL Proposed Goaf Gas Drainage Boreholes and pipelines (including surface infrastructure)	Ashton Coal

6 – AREAS OF ARCHAEOLOGICAL OR HERITAGE IMPORTANCE

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	6.01 Areas of Archaeological and/or Heritage Significance	1	Damage to Archaeological sites due to mine subsidence. There are no known European Heritage Significant sites within the area	Archaeological and Cultural Heritage Management Plan (ACHMP) ACHMP includes development consent (as modified for Bowmans Creek) includes controls for managing items in areas of cultural significance	R	3	C	13	Archaeological and Cultural Heritage Significance management plan (review extension to previous Section 90 time period) Complete New Section 90 for Longwalls 5-8 full surface clearance Amend Section 90 for Longwalls 1-4 Perform an archaeological resurvey of Longwall 1-8 area (in consultation with RAPs)	Ashton Coal Ashton Coal Ashton Coal Ashton Coal
		2	Damage to water hole site (Bowmans Creek) due to mine subsidence. (Grinding grooves).	Mine design does not secondary extract under the grinding grooves ACHMP	R	3	D	17	Include specific reference of the Grinding Grooves in the Subsidence Impact Assessment	Ashton Coal
		3	Damage to Glennies Creek Grinding Grooves and conservation area due to mine subsidence.	Mine design does not secondary extract under the grinding grooves ACHMP Voluntary Conservation Area	R	3	D	17	Include specific reference of the Glennies Creek Grinding Grooves in the Subsidence Impact Assessment	Ashton Coal

7 – ITEMS OF ARCHITECTURAL IMPORTANCE

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	7.01 Items of Architectural Significance	1	The Application Area does not include any Items of Architectural Significance and did not require further assessment.							

8 – PERMANENT SURVEY CONTROL MARKS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	8.01 Permanent Survey Control Marks	1	The Application Area does not include any Permanent Survey Control Mark and did not require further assessment.							

9 – RESIDENTIAL ESTABLISHMENTS

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	9.01 Houses	1	Damage to Houses and property improvements due to mine subsidence. Houses and property improvements require repair. Owner's emotional stress associated with uncertainly of events.	Property 130 Management Plan	A	2	D	21	Review the Property 130 Management Plan, to include houses	Ashton Coal
B	9.02 Flats or Units	1	The Application Area does not include any Flats or units and did not require further assessment.							
C	9.03 Caravan Parks	1	The Application Area does not include any caravan parks and did not require further assessment.							
D	9.04 Retirement or Aged Care Villages	1	The Application Area does not include any Retirement or Aged Care Villages and did not require further assessment.							
E	9.05 Associated Structures such as Workshops, Garages, On-Site Waste Water Systems, Water or Gas Tanks, Swimming Pools or Tennis Courts	1	Damage due to mine subsidence. Houses and property improvements require repair. Owner's emotional stress associated with uncertainly of events.	Property 130 Management Plan	A	2	D	21	Review the Property 130 Management Plan, to include associated structures	Ashton Coal

10 – ANY OTHER ITEM OF IMPORTANCE

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	10.01 Any Other Item of Importance	1	Safety to personnel or stock due to surface cracking caused from mine subsidence. (falls, vehicle accidents, stock injuries, wildlife injury)	Public safety management plan Rehabilitation works Fencing Management plan Warning Signs installed	P	2	D	21	None Identified	
		2	Inflow of water into the Ashton Underground mine. Injuries result.	None at present	P	2	D	21	Review in ULD Clause 88 Risk Assessment the hazard of Inflow event occurring from surface water (ie major flood event)	Ashton Coal
		4	Safety to personnel investigating subsidence, injuries result due to blasting at nearby open cut Narama Mine.	None at present	P	3	D	17	Confirm that Narama Mine have developed a Blasting Management plan, and this plan includes notification to Ashton of impending blasts	Ashton Coal

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APPENDIX D QUALITITATIVE RISK ASSESSMENT METHODOLOGY

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1 DATA USED & HAZARD REDUCTION STANDARD TO BE ACHIEVED

Controls were developed using the following forms.

1. Avoidance – avoid the risk by deciding not to proceed with the activity likely to generate the risk (where this is practicable).
2. Reduction – reduce the likelihood of the event.
3. Reduction – reduce the consequences of the event.
4. Transfer – transfer the risk – involve another party to bear or share some part of the risk.
5. Accept – accept the risk within the organisation and establish an appropriate plan to manage the consequences of these risks if they are to occur.

The above risk control options were applied by reference to the following control methodologies in a hierarchical sequence.

1. Design – to the extent reasonable and practicable ensure that hazards are designed out when new materials, equipment or work systems are being planned for the workplace.
2. Remove the hazard or substitute less hazardous materials, equipment or substances.
3. Adopt a safer process – alter tool, equipment or work practices to make them safer.
4. Enclose or isolate the hazard – provide guards or remote operation and handling techniques.
5. Provide effective ventilation – install local or general exhaust ventilation systems.
6. Establish appropriate administrative procedures. Set up, document and implement new procedures that provide for:
    - Scheduling of the job so that fewer workers are exposed;
    - Routine maintenance and housekeeping procedures;
    - Training on hazards and correct work procedures.
7. Personal Protective Equipment – provide suitable and properly maintained personal protective equipment and training in its use.

2 METHODOLOGY

1.2 RISK ASSESSMENT PROCESS FLOW CHART

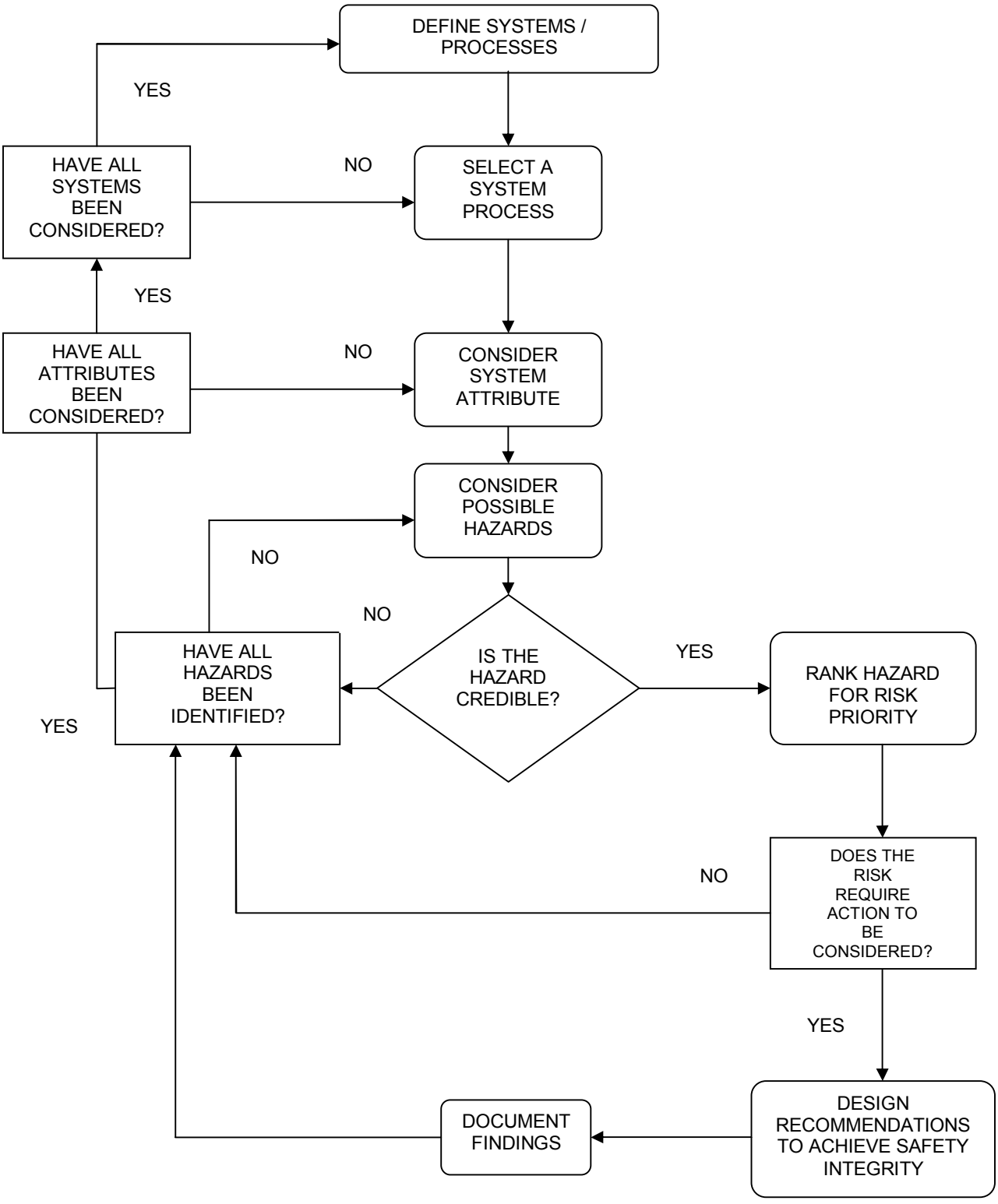

Figure 2.1 Risk Assessment Process Flow Chart