DONALDSON COAL PTY LIMITED

ABEL MINE

Subsidence Management Plan

Public Safety Management Plan
SMP Area 2

December 2012

Document Control

Description

Document No.	Abel SMP Area 2
Title	Public Safety Management Plan
General Description	To manage public safety in any surface areas that may be affected by subsidence from mining in Area 2 at Abel Mine
Key Support Documents	Abel Mine SMP Area 2

Approvals

ORIGINATOR	Kevin Price	Brunskill Pty Limited	Signed	Date
REVIEWED	Tony Sutherland	Position Technical Services Manager – Donaldson Underground Operations	Signed	Date
APPROVED	Charles Spence	Position Manager of Mining Engineering – Abel Mine	Signed	Date
APPROVED	Name Rob Regan	Position Director Mine Safety Operations Department of Trade and Investment, Regional Infrastructure and Services	Signed	Date

Revisions

					Approved	
Version #	**Date**	**Description**	**By**	**Checked**	**Name**	**Signed**
1	December 2012					

The nominated Coordinator for this document is	Manager of Mining Engineering

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1 PURPOSE AND SCOPE

This Management Plan describes the processes developed, including identification of key risks and proposed management strategies, to manage Public Safety in any surface areas that may be affected by subsidence arising from mining (partial and total pillar extraction) by Abel Mine in the Subsidence Management Plan Area 2.

2 RESPONSIBILITIES AND RESOURCES

The Technical Services Manager Donaldson Underground Operations is responsible for monitoring the implementation of this plan.

The Abel Manager of Mining Engineering is responsible for ensuring that sufficient resources are available to implement the requirements of this Plan.

Each of the management strategies developed to manage subsidence allocates responsibilities in relation to their implementation. Relevant personnel will be provided with a copy of appropriate documents. Training will be provided.

3 SUBMISSION

This plan is submitted to the Director Mine Safety Operations for approval.

4 BACKGROUND

The SMP approved area, subject of this Management Plan, consists of total pillar extraction plus partial pillar extraction Panels 20, 21 and 22 to be extracted on retreat as shown shaded on the attached plan. The SMP application was prepared in accordance with the NSW Department of Mineral Resources *New Approval Process for the Management of Coal Mining Subsidence* and SMP Guideline 2003 and the current variation was approved on 3 September 2012.

Mining in the remaining sections of SMP Area 2 will take place in the following panels;

- Panels 19 and 19a under land owned by the Catholic Diocese of Maitland-Newcastle and currently leased by Donaldson Coal, Black Hill Land Pty Limited and one privately owned property and
- Panels 21 and 22 under land owned by the Catholic Diocese of Maitland-Newcastle and currently leased by Donaldson Coal, Black Hill Road, Taylors Road and several privately owned properties.

The current approval covers mining coal by the both partial and total pillar extraction method from the Upper Donaldson Seam at depths of cover ranging generally from 100 to 140 metres.

The layout of the panels has been designed to provide management outcomes of subsidence impacts in line with the Statement of Commitments and Project Approval and to conduct the mining operations in a responsible manner, considering the existing and future environment and the community, while optimising resource recovery in the area in accordance with the principles of ecologically sustainable development.

Maximum subsidence predicted for the total extraction panels is 1530 mm, maximum predicted tilts 40 mm/m and maximum tensile / compressive strains of 18 mm/m while

maximum subsidence for the partial pillar extraction Panels is <150mm, maximum predicted tilts <3 mm/m and maximum tensile / compressive strains of <2mm/m.

The predicted panel subsidence magnitudes above the total extraction panels are likely to result in surface cracks developing within the limits of the extracted panels. Based on the predicted range of maximum transverse tensile strains (i.e. 7 to 14 mm/m), maximum surface cracking widths of between 70 mm and 140 mm could occur above and within the limits of extraction (i.e. goaf).

The predicted range of maximum transverse compressive strains (i.e. 8 to 18 mm/m) may result in shear displacements or 'shoving' of between 80 mm and 180 mm within the central limits of proposed production and extracted main headings panels.

In addition, transient tensile cracks will also probably develop up to 30 m behind the advancing goaf edge of the total pillar extraction panels. The majority of these cracks will generally close in the central areas of the panels where permanent compressive strains develop after mining is completed.

Based on the predicted subsidence magnitudes above partial extraction panels it is assessed that it will be ‘very unlikely’ to cause visual impact or damage (i.e. cracking or erosion) to the surface and existing features above the proposed panels.

The SMP approved area surface is a combination of lightly timbered and cleared grazing land (some previously used for poultry farms). Management measures are proposed to address any predicted environmental impacts, due to subsidence, for the surface above the SMP approved area.

Natural features are generally limited to gently undulating rural terrain, minor tributaries of Viney Creek and some groundwater. A portion of SMP Area 2 is covered by Lower Hunter Spotted Gum – Ironbark Forest, an Endangered Ecological Community. No adverse impacts are predicted for this EEC nor flora and fauna.

Man made features include:

- TransGrid Transmission Towers supporting 330kV transmission lines. The towers are a galvanized, bolted steel frame structures approximately 45m high. The base of the towers are 9m x 9m square with 4 legs encased in a 1m wide x 2m deep cruciform, shaped footing and are partially buried;
- Unguyed, timber poles with bolted steel bracing (Ausgrid) supporting the 132kV transmission line;
- Redundant domestic Telstra copper cable telephone lines;
- Active Telstra copper cable telephone lines (partial extraction);
- Buried water reticulation pipelines and above ground troughs for livestock watering;
- Black Hill Road and Taylors Road (partial extraction)
- An unsealed gravel property access road (Catholic Diocese land); and
- An unsealed gravel track within the TransGrid easement.
- Disused sheds on Catholic land (partial extraction);
- Ausgrid rural 11kV and 415V domestic power lines;
- Buried stock and domestic water supply lines (partial extraction);
- Residential properties (partial extraction);
- Principal residences (Subsidence Control Zone));

- Farm dams (partial extraction);
- Access roads and tracks;
- Various fences, gates and cattle grids; and
- Several buried and capped contaminated material areas.

This Management Plan for Area 2 includes the regular inspection of surface areas, subsidence monitoring and outlines procedures and actions to be implemented to manage the safety of the general public in the surface areas of the SMP approved area that may be affected by subsidence resulting from mining (total and partial pillar extraction) by Abel Mine.

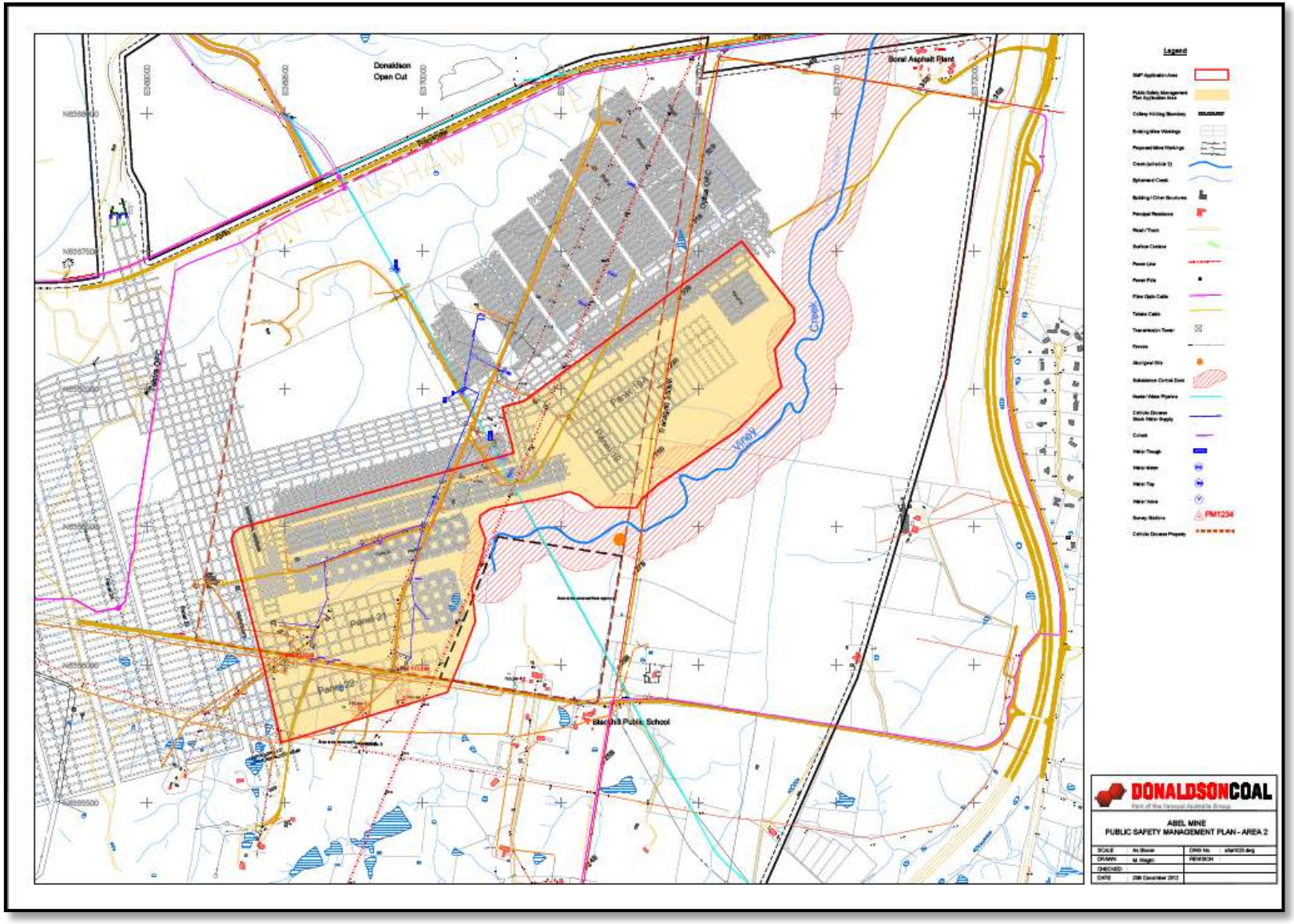

Figure 1 – Abel Mine SMP Area 2

5 APPROACH TO PUBLIC SAFETY MANAGEMENT

The Mine's overall strategy to ensure Public Safety relating to the surface areas that may be affected by subsidence arising from partial pillar extraction is:

1. **Measure baseline information** – Established background data for the surface above the mining area by inspection and in certain areas also subsidence survey.

2. **Regular Monitoring of the effects of mining** – Continue monitoring and inspection of identified key positions relating to the extraction position

3. **Regularly assess and interpret monitoring and inspections** – Monitoring and inspection data is analysed to identify any variations from predictions, unexpected anomalies, visual impact or items presenting potential impact on Public Safety.

4. **Implement Immediate Responses –** If potential impact on Public Safety is observed or reported implement an immediate response including notification to the landowner.

5. **Re-assess any impacts** – where variations and/or impacts are greater than predictions made in the SMP, as nominated in the Trigger, Action and Management Response Plan, additional assessment/investigation of impacts will be undertaken. This will be carried out by specialist consultants, Abel personnel and appropriate stakeholders where required.

6. **Identify and implement remedial actions** – if impacts require mitigation and /or remedial action, these actions will be implemented in conjunction with the landholder and appropriate relevant stakeholder.

6 IDENTIFICATION OF RISKS

The surface to be undermined is described in **Section 4.**

As part of the original SMP Area 2 application process a Risk Assessment was conducted to examine the potential impact created by subsidence on the surface above the total Area 2 mining area. The Maximum subsidence predicted for the pillar extraction panels in the original SMP Area 2 application area ranged between 760 mm and 1,450 mm, maximum predicted strains from 5 to 24 mm/m and tilts from 14 to 36 mm/m excluding areas nominated to be protected. No public safety risks in the high risk category were identified. All risks identified had either existing controls or additional controls / further actions which have been implemented or are available to identify, control or remediate these risks.

The possible Public Safety risks are listed below with a summary of the original SMP Area 2 application Risk Assessment results relating to surface features attached as **Appendix A.** This summary Table in Appendix A has been updated to reflect the change for partial extraction panels with reduced subsidence impacts.

- Damage (cracking) to roads / trails;
- Damage (cracking) to general surface; and
- Tree falls due to subsidence

Note cracking not predicted in the partial extraction panels. Controls, monitoring and remedial actions identified as core items have been addressed in this Management Plan including,

- Regular monitoring of areas posing potential safety risks – monitoring introduced though no high risk areas identified.
- Erection of warning signs along public roads, access roads and walkways – to include mine contact numbers to report damage and be installed prior to commencement of pillar extraction.
- Entry restrictions – identified as part of management actions and remedial measures if Public Safety Risk identified.
- Backfilling of dangerous surface cracks – noted as remedial measure if identified.
- Remediation of any areas with adverse grade impacts or potential ponding (deformation).
- Provision of timely notification of mining progress to the landholder, community and any other stakeholders where management of Public Safety is required – noted as part of management actions.

7 NOTIFICATION, MONITORING AND INSPECTION SCHEDULE

The subsidence from mining, in SMP Area 2 is not expected to have a major impact on the surface. Management of Public Safety is largely controlled by programmed and targeted inspection as well as reviewing predicted subsidence against actual subsidence.

7.1 Notification

Notifications to any landholders, the general public, relevant stakeholders and appropriate authorities either have or will be provided. These include.

- Newspaper advertisements relating to the SMP Application.
- Notification of SMP approvals to relevant parties.
- Signposting of mining area.

7.2 Subsidence Monitoring

A description of the surface, relevant features and improvements above the total extraction panels and partial extraction panels is contained in **Section 4** with locations of these items shown on the attached plan.

Monitoring is conducted as per the various Management Plans and Monitoring Programs submitted, consisting of a combination of subsidence surveys, surface and underground monitoring and inspections and monitoring of ecological conditions.

These Plans and Programs generally focus on intensive monitoring in the initial stages of pillar extraction and the long term monitoring of subsidence effects that may develop over time.

7.3 Subsidence Inspections

Inspections are to be conducted as per the various Management Plans and Monitoring Programs submitted, consisting of a combination of visual and photographic inspections as detailed in the Management Plans and Programs and referenced in **Table 1**.

7.4 Scope and Frequency of Inspections

Regular inspections, at frequencies detailed in the Management Plans and Programs are to be initially concentrated on the current mining area, mining location and subsidence area (based on 26.5 degrees angle of draw). Inspections are concentrated on items identified in the initial pre-mining survey.

Inspections are carried out by experienced persons and follow an inspection checklist to include the items noted above.

At the completion of mining in each panel a full surface inspection will be conducted and results included in the following Subsidence Management Status Report.

Listed below is a schedule of inspections and subsidence survey frequencies of areas of potential Public Safety risk (**Table 1**).

Table 1: Inspection and Survey Schedule

Infrastructure Item	Visual Inspection Frequency	Visual Inspection by	PhotographicMonitoring Frequency	Photographic Monitoring by	Subsidence Survey Frequency	Subsidence Survey by	Comments
• General surface over SMP area	Pre and post mining	Abel Environmental Manager or nomination	Pre and post mining plus if changes noted on visual inspections	Abel survey staff or external survey contractor	Pre and post mining as detailed in Subsidence Monitoring Program to be approved by Principal Subsidence Engineer	Abel survey staff or external survey contractor	
• Specific surface features over current extraction area	Pre and post mining plus weekly during mining	As above	Pre and post mining plus if changes noted on visual inspections	Abel survey staff or external survey contractor	Pre and post mining as detailed in Subsidence Monitoring Program to be approved by Principal Subsidence Engineer	Abel survey staff or external survey contractor	
• Internal roads / trails	Pre and post mining plus weekly during undermining	As above	Pre and post mining plus if changes noted on visual inspections.	As above	Pre and post mining as detailed in approved Subsidence Monitoring Program	As above	
• Infrastructure - Ausgrid 132kV transmission line	Refer to the Ausgrid Management Plan						
• Infrastructure – TransGrid 330kV transmission line	Refer to TransGrid Management Plan						
• Infrastructure – Public Roads	Refer to Black Hill Road and Taylors Road Management Plan						
• Infrastructure – Cu telecommunication cables	Refer to Telstra Management Plan						
• Catholic Diocese land	Internal Management of company leased property						
• Other private properties	Refer to individual Property Subsidence Management Plans						

Results of each survey will be forwarded promptly following completion to the Principal Subsidence Engineer.

8 ACTIONS AND REMEDIAL MEASURES

Abel will install appropriate warning signage, positioned along public and property access roads and property boundaries, prior to the commencement of partial pillar extraction, advising of the potential for subsidence impacts. The objective of the signage is to ensure users of the public and access roads and surrounding area are aware of potential hazards resulting from subsidence. Mine contact details shall be included to enable any damage to be reported.

Visual inspections will identify impacts on access roads or natural features. Inspections and monitoring noted in the relevant Management Plans will identify impacts on infrastructure and improvements.

8.1 Public Safety Issues Identified During Inspections or Monitoring

If these inspections reveal any Public Safety issue (see **Table 2**) that requires remedial works to ensure Public Safety the person conducting the inspection shall :

- Immediately notify the Manager of Mining Engineering and/or Environmental Manager of the findings.

- Erect “NO ROAD” or barrier tape and warning signs if immediate remediation is not possible

- The Manager of Mining Engineering shall immediately notify the District Inspector of Coal Mines, landholder and any infrastructure owner.

8.2 Remediation of Public Safety Issues

Following completion of the above the Manager of Mining Engineering or his nominee shall:

- Arrange inspections of area at regular intervals including installation of appropriate barriers if required, until remediation works are carried out.

- Arrange for remediation works as detailed in **Table 2**. This will require consultation with the Department of Trade and Investment, Regional Infrastructure and Services landholder, possibly Mine Subsidence Board, infrastructure owner, specialist consultants and appropriate stakeholder, as noted in current Management Plans and Programs, to prepare appropriate remediation plan relating to the particular item. Notification to the general public may form a part of the remediation plan.

Table 2: Triggers, Actions and Management Responses – Public Safety

Monitoring / Surface Element	Trigger / Response	Results within predicted / acceptable range	Irregular result	Increased irregular result
Subsidence Monitoring	Trigger	Subsidence results are not greater than 15% above predictions	Subsidence results are greater than 15% but less than 25% above predictions or visible surface impacts above predictions.	Subsidence results are greater than 25% above predictions
	Notification	N/A	Notify Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval.	Notify DTIRIS – Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval.
	Action / Response	Continue to monitor at specified frequency	Conduct field inspections. Review predictions. Obtain opinion from appropriate consultant, review program and consult with PSE	Conduct field inspections. Review predictions. Obtain opinion from appropriate consultant, review program and consult with PSE
	Mitigation / Remediation	N/A	Review mine plan in consultation with landholder, appropriate consultant and PSE	Review mine plan in relation to surface features in consultation with PSE

Monitoring / Surface Element	Trigger / Response	Results within predicted / acceptable range	Irregular result	Increased irregular result
Surface cracking / erosion on internal roads and access tracks (by visual inspection)	Trigger	Surface cracking up to140mm No noticeable increase in erosion	Surface cracking 140-380mm Noticeable increase in level of recent rill erosion along tracks and/or table drains	Surface cracking > 380mm Perceived imminent threat to public safety from anomalous situation (ie adjacent mass movement)
	Notification	N/A	Notify Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval (including Director Environmental Sustainability)	Notify Interagency Committee, Principal Subsidence Engineer (PSE), Mine Safety Operations and appropriate parties under the SMP Approval.
	Action / Response	Maintain warning signs Inspect and isolate by temporary fencing if required. Continue to review and monitor cracks periodically to ensure they do not expand or create a public safety hazard	Note GPS location and orientation of crack or erosion and photograph. Review public safety aspect. Maintain warning signs and erect additional signs and/or temporary fencing in immediate area. Increase monitoring frequency to twice weekly until area has been satisfactorily remediated. Discuss / confirm appropriate level of action/remediation with landholders, and any other relevant Government Department. Review subsidence predictions with consultant, review monitoring program and/or consult with PSE if required.	Note GPS location and orientation of crack or erosion and photograph. Review public safety aspect. Maintain warning signs and erect additional signs in immediate area including barricades and NO ROAD signs. Increase monitoring frequency to daily until area has been satisfactorily remediated and/ or made safe. Site inspection with specialist soil conservationist, landholder and any other relevant Government Department to discuss/confirm appropriate level of action/remediation Undertake detailed review of subsidence predictions with consultant, review monitoring program and consult with PSE

Monitoring / Surface Element	Trigger / Response	Results within predicted / acceptable range	Irregular result	Increased irregular result
	Mitigation / Remediation	Repair by grading, excavation and fill, or by concrete grout if required for erosion control.	Repair cracks by excavation, fill and/or grading, concrete or grout and install drainage structures, if required, in program agreed by landholder and appropriate authorities. Review mine plan in consultation with appropriate consultant and PSE.	Repair cracks by excavation, fill and/or grading, concrete or grout following consultation with landholder, appropriate authorities and specialist consultants Review mine plan in consultation with appropriate consultant and PSE.
Surface cracking, mining induced erosion or deformation of land in other general surface areas (by visual inspection)	Trigger	Surface cracking up to140mm No evidence of mass movement, deformation or slumping. No evidence of accelerated rill or gully erosion	Surface cracking 140-380mm Some minor areas of mass movement, slumping or deformation can be observed (<100 sq m). Surface rilling to a depth of 300mm.	Surface cracking > 380mm Large area of mass movement, slumping or deformation identified. Surface rilling and/or gullying to a depth >300mm.
	Notification	N/A	Notify Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval.	Notify Interagency Committee, Principal Subsidence Engineer (PSE), Mine Safety Operations and appropriate parties under the SMP Approval.

Monitoring / Surface Element	Trigger / Response	Results within predicted / acceptable range	Irregular result	Increased irregular result
	Action / Response	Maintain warning signs Inspect and isolate by temporary fencing if required. Continue to review and monitor cracks periodically to ensure they do not expand or create a public safety hazard	Note GPS location and orientation of crack or erosion and photograph. Review public safety aspect. Maintain warning signs and erect additional signs and/or temporary fencing in immediate area. Increase monitoring frequency to twice weekly until area has been satisfactorily remediated. Discuss / confirm appropriate level of action/remediation with landholders, and any other relevant Government Department. Review subsidence predictions with consultant, review monitoring program and/or consult with PSE if required.	Note GPS location and orientation of anomaly and photograph. Review public safety aspect. Maintain warning signs and erect additional signs in immediate area including barricades and NO ROAD signs. Increase monitoring frequency to daily until area has been satisfactorily remediated and/ or made safe. Site inspection with specialist soil conservationist, landholder and any other relevant Government Department to discuss/confirm appropriate level of action/remediation Undertake detailed review of subsidence predictions with consultant, review monitoring program and consult with PSE
	Mitigation / Remediation	Repair by grading, excavation and fill, or by concrete grout if required for erosion control.	Repair anomaly by excavation, fill and/or grading, concrete or grout and install drainage structures, if required, in program agreed by landholder and appropriate authorities. Review mine plan in consultation with appropriate consultant and PSE.	Repair anomaly by excavation, fill and/or grading, concrete or grout following consultation with landholder, appropriate authorities and specialist consultants Review mine plan in consultation with appropriate consultant and PSE.

Monitoring / Surface Element	Trigger / Response	Results within predicted / acceptable range	Irregular result	Increased Irregular result
Steep slopes damage or instability	Trigger	Visual inspection or monitoring reveals minor cracking (<140mm)	Surface cracking 140 – 380mm or visible instability	Surface cracking >380mm / Visible instability.
	Notification	N/A	Notify Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval.	Notify Principal Subsidence Engineer (PSE), Mine Safety Operations, landholder and appropriate parties under the SMP Approval.
	Action / Response	Field Inspections to assess requirements for additional / increased frequency monitoring	Erect warning signs and barrier tape in immediate area. Review predictions Suitably qualified external consultant to inspect and advise on further action including possible remedial / stabilisation works in consultation with PSE and landholder.	Erect warning signs and barrier tape in immediate area. Arrange inspection with landholder. Suitably qualified external consultant to inspect and advise on further action including possible remedial / stabilisation works.
	Mitigation / Remediation		Repair any cracks promptly with a sand/cement/bottom ash grout or equivalent and installation of erosion controls and surface / sub-surface slope drainage systems. Review mine plan in consultation with appropriate consultant and PSE	Repair any cracks promptly with a sand/cement/bottom ash grout or equivalent and installation of erosion controls and surface / sub-surface slope drainage systems. Review mine plan in consultation with appropriate consultant and PSE

9 REPORTING

Results of subsidence surveys, visual inspections and photographic monitoring are to be reported at each survey to the Principal Subsidence Engineer and landholder, also in the four monthly Subsidence Management Status Reports and the Annual Environmental Management Report.

Additionally, notification will be provided to relevant Authorities of any incident or occurrence as detailed in the Triggers Actions and Management Responses.

10 REVIEW

This plan will be reviewed as necessary including:

- In the event that the Director Mine Safety Operations raises issues that necessitate a review;
- In the event that any of the landholders raise issues that necessitate a review;
- Inspections or monitoring demonstrate that the impacts are such that a review is warranted.

Any review will be conducted in consultation with the Director Mine Safety Operations and landholder. In the event of the management plan being changed a copy will be sent to the relevant agencies.

APPENDIX A – RISK ASSESSMENT RESULTS TABLE – NATURAL FEATURES AND SURFACE IMPROVEMENTS – SMP AREA 2

N.B. The 2010 Risk Assessment from the original SMP Area 2 application has been updated to reflect both completed actions and the change to Partial Extraction for part of the SMP Area 2 (Panels 20, 21 and 22).

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Public Utilities	Electricity transmission lines (overhead / underground) and associated plants	2.04.01	Damage and /or loss of clearance to 330kV TransGrid Power line	1. Subsidence 2. Tilt 3. Strains	1. Cruciform footings 2. Conductor clearance	A	2	C	8	S	1. TransGrid to review structural integrity and design of cruciforms - complete 2. Continue dialogue with TransGrid re – supplied draft Management Plan. – Management Plan completed 3. Investigate need for installation of pulleys on earth wires. - complete 4. Check conductor clearance. - complete 5. Pre-mining survey - complete 6. Subsidence data from Panels 1-4 will be available prior to mining under TransGrid 330kV power lines. - complete 7. Review mine plan if required	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Public Utilities	Roads (all types)	2.01.01	Serviceability of public roads	1. Cracking 2. Steps (Scarps) 3. Change in road profile 4. Reduction in sight distance on road 5. Change in drainage 6. Tree falling	1. Develop road management plan with Cessnock City Council 2. Develop Public Safety Management Plan 3. Ongoing consultation 4. Develop road management plan for 4wd tracks for fire fighting access	P	2	D	12	S	Road Management Plan complete	
Natural Features	Tributaries	1.02.02	Hydraulic connection from surface to underground	1. Connective cracking from stream bed to seam 2. Shallow cover depth 3. Mining height	1. Cover depth is greater than 100m 2. Mining height is less than 3.2m at this location	A	3	C	13	S	1. Mining height can be varied 2. Extraction ratio can be varied 3. Extraction layout has been modified to partial extraction	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Natural Features	Tributaries	1.02.06	Long term impact on aquatic ecosystem	1. Change in flow regime 2. Change in water quality	1. EMP TARPs includes remediation and mine plan review 2. Property Management Plans to be developed 3.No known acid sulphate soils 4.No upward gradient of groundwater	E	3	C	13	S	1. Assess remediation works of contaminated areas - complete 2. Update CAD data with contaminated areas - complete 3. Review contaminated areas studies (Douglas Partners) - complete	Yes

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Residential	Principal dwellings and proposed buildings within Catholic Diocese principal residence area	4.01.01	Damage to principal dwellings	1. Subsidence impacts	1. Mine design and layout 2. Subsidence control zones (SCZ) to the 20mm subsidence contour (assumed 26.5 degrees for design purposes) 3. Pillar Extraction Management Plan (PEMP) including Authority to Mine (ATM) 4. Monitoring arrangements (Subsidence) 5. Mine Subsidence Board inspections to determine tolerable levels 6. Incorporate assessment of vibration into Property Management Plan 7. Mine schedule provides for substantial amount of subsidence data prior to first workings underneath principal dwellings 8. Recalibration of subsidence model after each panel	A	3	C	13	S	1. Review monitoring results regarding angle of draw – in progress 2. Test monitoring of disused houses – Derelict buildings to be demolished in Feb/Mar 2013	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Natural Features	Aquifers, known groundwater resources	1.03.04	Contamination of groundwater through leachate from waste areas	1. Connective cracking		E	3	C	13	S	1. Assess remediation works of contaminated areas - complete 2. Update CAD data with contaminated areas - complete 3. Review contaminated areas studies (Douglas Partners) - complete	Yes
Public utilities	Electricity transmission lines(overhead / underground) and associated plants	2.04.02	Damage and/or loss of clearance to 132kV Ausgrid power line	1. Subsidence 2. Tilt 3. Strains	1. Timber poles more resilient to subsidence impacts	A	3	C	13	S	1. Check conductor clearance - complete 2. Survey pole locations - complete 3. Continual dialogue with Ausgrid to update management plan - complete 4. Pre-mining surveys - complete 5. Investigate need for installation of pulleys on earth wires. - complete	Yes

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Public utilities	Electricity transmission lines(overhead / underground) and associated plants	2.04.03	Damage and/or loss of clearance to 11kV Ausgrid power line	1. Subsidence 2. Tilt 3. Strains	1. Timber poles more resilient to subsidence impacts 2. Power line Management Plan	A	3	C	13	S	1. Check conductor clearance - complete 2. Continual dialogue with Ausgrid to review existing management plan - complete 3. Pre-mining surveys - complete 4. Investigate need for installation of pulleys on earth wires. - complete 5. Ausgrid to review requirement for power line - complete	
Natural Features	Tributaries	1.02.03	Ponding or reversal of flow	1. Tilting 2. Subsidence	1. EMP TARPs includes remediation and mine plan review 2. Property Management Plans to be developed	E	4	B	14	S	1. Mining height can be varied 2. Extraction ratio can be varied – Extraction layout has been modified to partial extraction	Yes
Natural Features	Tributaries	1.02.04	Destabilisation of bank and/or bed	1. Tilting 2. Subsidence 3. Gradient change	1. EMP TARPs includes remediation and mine plan review 2. Property Management Plans to be developed	E	4	B	14	S	1.Include tributary management in PMP – no longer relevant with partial extraction layout	Yes

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Natural Features	Tributaries	1.02.05	Long term effects of change in stream water quality	1. Tilting 2. Subsidence 3. Gradient change 4. Contaminants from waste disposal areas	1. EMP TARPs includes remediation and mine plan review 2. Property Management Plans to be developed	E	3	D	17	M	1. Update CAD data with contaminated areas - complete 2. Review contaminated areas studies (Douglas Partners) - complete	Yes
Public Utilities	State Survey marks	2.07.01	Use of disturbed State Survey Marks	1. Disturbance of State Survey Marks due to subsidence	1. Location of marks known 2. Notify Department of Lands	A	3	D	17	M		
Residential	"Other surface structures"	4.02.02	Exposure to asbestos substances in disused dwellings	1. Subsidence impacts	1. Property Management Plan 2. Further inspections will be conducted prior to mining underneath	P	3	D	17	M	1. Consider independent assessment of asbestos risk - complete	Yes
Natural Features	Tributaries	1.02.01	Cumulative loss of overland flow from tributaries	1. Surface cracking of stream bed	1. EMP TARPs includes remediation and mine plan review	E	4	C	18	M	1. Include visual inspection of stream flow and pool depth in checklist - complete	Yes

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Public Utilities	Culverts associated with Black Hill Road	2.02.01	Serviceability of culverts	1. Cracking 2. Steps (Scarps) 3. Change in road profile 4. Change in drainage	1. Develop road management plan with Cessnock City Council 2. Develop Public Safety Management Plan 3. Ongoing consultation 4. Preliminary inspections of culverts have been undertaken	A	4	C	18	M	1. Add inspection of culverts during mining to checklists – part of Black Hill Road and Taylors Road Management Plan	
Farm Land and Facilities	Agricultural utilisation or agricultural suitability of farm land	3.01.01	Temporary loss of access to grazing area	1. Surface cracking	1. Property Management Plans 2. Ongoing consultation with property owners	A	4	C	18	M	Cracking no longer considered likely with partial extraction layout	Yes
Farm Land and Facilities	Internal access tracks	3.02.01	Damage to internal property access tracks	1. Cracking 2. Steps (scarps) 3. Change in road profile 4. Reduction in sight distance on road 5. Change in drainage 6. Tree falling	1. Develop Public Safety Management Plan 2. Ongoing consultation with property owners 3. Property Management Plans	A	4	C	18	M	1. Ground truthing of surface features - complete	
Farm Land and Facilities	Fences, gates and cattle grids	3.03.01	Damage to fences and/or gates including resulting loss of livestock	1. Strain 2. Subsidence 3.Falling tree	1. Property Management Plans 2. Ongoing consultation with property owners 3. Monitoring arrangements	A	4	C	18	M	No longer considered likely with partial extraction layout	Yes

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Farm Land and Facilities	Capping of remediation areas	3.08.01	Loss of integrity of capping	1. Subsidence impacts	1. Property Management Plans 2. Ongoing consultation with property owners 3. Monitoring arrangements	A	4	C	18	M	No longer considered likely with partial extraction layout	
Farm Land and Facilities	Farm dams	3.04.01	Damage to dams resulting in loss of serviceability and integrity of dam wall	1. Cracking 2. Tilting	1. Dam monitoring and management strategy (DMMS) will be developed for all dams prior to mining impact 2. Statement of commitments to provide water in the event of interruption of supply of water from dam	A	4	C	18	M		
Farm Land and Facilities	Water Reticulation systems	3.07.01	Damage to water reticulation system resulting in loss of service	1. Subsidence impacts	1. Property Management Plan 2. Monitoring arrangements 3. Statement of commitments to provide water in the event of interruption of supply of water from reticulation system	A	4	C	18	M	1. Complete identification of water reticulation systems within SMP Area 2 - complete	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Residential	"Other surface structures"	4.02.01	Damage to other structures	1. Subsidence impacts	1. Mine design and layout 2. Monitoring arrangements (subsidence) 3. Mine Subsidence Board inspections in conjunction with property owners and Abel to determine potential impacts, tolerable levels 4. Management Plan to be developed incorporating responsibilities 5. Incorporate assessment of vibration into property Management Plan 6. Mine schedule provides for substantial amount of subsidence data prior to workings underneath structures 7. Recalibration of subsidence model after each panel	A	5	D	24	M	1. Review monitoring results regarding angle of draw – in progress 2. Test monitoring of disused houses – Derelict buildings to be demolished in Feb/Mar 2013	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Natural Features	Aquifers, known groundwater resources	1.03.02	Additional flow to underground workings	1. Connective cracking	1. Water Management Plan 2. Pumping capacity is approximately 3 times current flows 3. Underground water storage area available	A	4	D	21	L	N/A	
Natural Features	Aquifers, known groundwater resources	1.03.03	Quality change of groundwater inflows through mine workings	1. Aquifer depressurisation	1. Water Management Plan	A	4	D	21	L	N/A	
Natural Features	Natural vegetation	1.08.01	Change in habitat / fauna	1. Falling tree 2. Dieback	1. Mine design 2. Monitoring arrangements 3. Visual inspections 4. TARPs – remediation works	E	4	D	21	L	No longer considered likely with partial extraction layout	
Natural Features	Natural vegetation	1.08.02	Visual impact	1. Falling tree 2. Dieback	1. Mine design 2. Monitoring arrangements 3. Visual inspections 4. TARPs – remediation works 5. Ongoing consultation	R	4	D	21	L	No longer considered likely with partial extraction layout	
Natural Features	Aquifers, known groundwater resources	1.03.01	Reduction in bore yield and adverse effects on groundwater dependent ecosystems	1. Connective cracking	1. No groundwater dependent ecosystems in area 1. No bores in area					L	N/A	

Process	Subprocess	H#	Risk Issue	Causes	Existing Controls	Loss Type	Consequence	Likelihood	Risk Rank	Risk Level	Further Actions	ALARP (Yes/No)
Public Utilities	Telecommunication lines (overhead / underground) and associated plants	2.05.02	Damage to Telstra Local Copper Cables	1. Subsidence	1. Location of cable confirmed	R	5	C	22	L	1. Confirm extent of current service - complete 2. Continual dialogue with Telstra to develop management plan - complete	