Abel Mine
Subsidence Management Plan
End of Year Report 2010

31 March 2011

Approved by

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TABLES

ATTACHMENTS

1 INTRODUCTION

This Subsidence Management Plan End of Year Report fulfils the requirements of Condition 19 of the Abel Subsidence Management Plan (SMP) Approval Conditions dated 27 May 2010.

A summary of monitoring results for the period May to December 2010 are presented in this report. Pillar extraction was completed in Panels 1 and 2 during this reporting period and commenced in Panel 3 early in 2011.

Subsidence surveys, photographic monitoring and visual inspections were conducted over all pillar extraction areas in accordance with the approved Subsidence Monitoring Programs with environmental monitoring conducted in accordance with the approved Environmental Management Plan.

2 PURPOSE AND SCOPE

The purpose of this document is to comply with the relevant approval condition which states:

"The Leaseholder shall prepare an end of year report. This report shall be submitted to the Director Environmental Sustainability, within the first three months of the subsequent year. The end of year report must:

(a) include a summary of the subsidence and environmental results for the year;

(b) include an analysis of these monitoring results against the relevant;

- *impact assessment criteria;*
- *monitoring results from previous years; and*
- *predictions in the SMP.*

(c) identify any trends in the monitoring results over the life of the activity; and

(d) describe what actions were taken to ensure adequate management of any potential subsidence impacts due to mining."

3 SMP PILLAR EXTRACTION DURING REPORTING PERIOD

SMP Approval was granted for Abel Area 1 (Panels 1 to 14 inclusive plus East Mains) on 27 May 2010. Pillar extraction was conducted in the following order, completion of Panels 1 and 2, currently extracting Panel 3. Three minor Variation Applications were submitted on 25 June, 18 August and 28 September and approved on 28 July, 26 August and early November respectively. These Variation Applications related to a minor change to the location of Panels 1 and 2, minor change to Panel 2 extent and review of Condition 15 respectively.

Table 1 below provides approval, plus mining commencement and completion dates for the Panels extracted during 2010.

Table 1 – Approval and Extraction Dates

Panel	Approval Date	Extraction Commenced	Extraction Completed
Panel 1	27 May 2010	12 July 2010	22 December 2010
Panel 2	27 May 2010	17 September 2010	12 November 2010
Panel 3	27 May 2010	7 January 2011	Continuing

4 SUBSIDENCE AND ENVIRONMENTAL PROGRAMS AND MANAGEMENT PLANS

Subsidence and Underground Monitoring Programs consisting of a combination of subsidence surveys, visual inspections and photographic monitoring have been developed in consultation with and approved by the Principal Subsidence Engineer, Industry & Investment NSW for all Panels extracted to date. All required subsidence monitoring lines have been installed and subsidence surveys completed in accordance with the agreed Subsidence Monitoring Program.

An Environmental Management Plan (EMP), Public Safety Management Plan and various infrastructure Management Plans relating to Hunter Water Corporation pipeline and Energy Australia powerlines were prepared, submitted to and approved by Industry & Investment for Area 1.

Draft Management Plans were prepared for, and provided for comment to, Catholic Diocese Maitland – Newcastle land, Black Hill Land land and Transgrid powerlines. Consultation is continuing towards finalisation of these plans.

5 SUMMARY OF SUBSIDENCE IMPACTS

Mining operations have been completed in Panels 1 and 2 during 2010 and the following visible affects or impacts on either the general surface or specific surface features.

Visual inspections and photographic monitoring of various surface features were conducted throughout the year.

Survey results for subsidence, tilt and strain during the year were below predicted levels. Mining operations have commenced in Panels 1 and 2 with minor impacts on the general surface in the form of cracking and minor impacts on the Energy Australia powerlines and the Hunter Water Corporation pipeline. One minor impact / irregular result has occurred and is detailed in **Section 5.4**.

5.1 Impacts on General Surface and Roads / Tracks

Surface cracking and some minor ponding has occurred generally as predicted at the surface above Panels 1 & 2 in both the vegetated areas and sealed access road and access tracks.

Remedial works have been carried out in consultation and agreement with the landholder (Catholic Diocese).

5.2 Impacts on Hunter Water Corporation Waterline

Subsidence Impacts

Visual inspection conducted 30 July noted water seeping.

Notification

Notification provided to Hunter Water Corporation on 30 July.

Management Actions

Hunter Water attended site, excavated area and conducted repairs on 30 July.

Noted that impact did not occur to UPVC main supply pipe but connector to former supply.

5.3 Impacts on Energy Australia Powerlines

Subsidence Impacts

a) Visual inspection conducted 4 August on the 11kV / 415V lines noted apparent sag between Poles 17 and 18.

b) Further inspection noted that cross arm on 11kV pole may have twisted.

Notification

a) Notification provided to EA on 4 August.

b) Notification provided to EA on 9 August.

Management Actions

a) EA conducted clearance survey on 6 August and lifted conductors to reinstate clearance on 9 August.

b) EA carried out repairs on 26 August

5.4 Notification Under SMP Approval Conditions 13, 16 and 17

This notification was provided on 6 August 2010 following an irregular result / minor impact relating to surface cracking along an access track.

Minor cracking was observed over Abel Panel 1 area (see attached plan Dwg No a1d0025.dwg) and this cracking increased to a current maximum of 200mm width across an access track where the depth of cover is 105 metres.

This exceeded the SMP Application predictions relating to cracking, where cover was in excess of 80 metres, which were “likely to be in the order of 30 to 150 mm.”

This cracking exceeded the triggers in the following Management Plans and Approval Conditions:

Condition 13 – Environmental Management

Table 4 of the Trigger Actions and Management Responses (Environmental Management Plan) in relation to surface cracking / erosion on roads & access tracks (by visual inspection) notes surface cracking 100-400mm as an irregular result / minor impact trigger requiring notification.

Condition 16 – Public Safety

Table 2 of the Trigger Actions and Management Responses (Public Safety Management Plan) in relation to surface cracking on roads / trails and general surface areas notes surface cracking 100-300mm as an irregular result requiring notification; and

Condition 17 – Incident and Ongoing Management Reporting
Requires notification under the following clauses;

(a) (i) any significant subsidence-induced cracking and/or higher-than-predicted subsidence and/or abnormalities in the development of subsidence, and
(iv) any significant subsidence-induced cracking and/or ground deformation observed in any surface area within the SMP application area.

The Actions/Reponses required under these Management Plans comprise and the current status is :

Action / Response	Current Status
• Note GPS location and orientation of crack or erosion and photograph.	Complete.
• Review public safety aspect.	Reviewed, temporary fences erected
• Maintain warning signs and erect additional signs and/or temporary fencing in immediate area.	Temporary fences erected.
• Arrange inspection with landholder	Arranged and conducted.
• Increase monitoring frequency to twice weekly until area has been satisfactorily remediated.	Monitoring conducted daily.
• Review subsidence predictions with expert consultant, review monitoring program and consult with PSE if required.	Meeting held with subsidence consultant Thursday 5 August.
• Discuss / confirm appropriate level of action / remediation with landholders, and any other relevant Government Department	Action confirmed, remediation completed

There have been no other observed and/or reported subsidence impacts, incidents, service difficulties, community complaints, or any other relevant information.

6 SUBSIDENCE SURVEY SUMMARY AND ANALYSIS

A record of all completed subsidence surveys is shown in **Table 2**. All subsidence, tilt and strain results are within the predicted range.

Additional surveys have also been conducted on areas within the Catholic Diocese of Maitland – Newcastle land.

A summary of subsidence, strain and tilt results are detailed in **Table 3** with comparison to the SMP predictions. All results are below the levels predicted in the SMP.

All required subsidence monitoring lines have been installed and all pre-mining subsidence surveys completed in accordance with the agreed Subsidence Monitoring Programs.

Additional surveys were conducted over the active mining areas at weekly intervals since the start of extraction

Additional inspections have been carried out over the Catholic Diocese land.

Table 2 – Subsidence Monitoring Survey Dates

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 1	Subsidence survey	Installation and pre-mining survey 7/07/2010	Weekly Surveys	
Panel 2	Subsidence survey	Installation and pre-mining survey 8/09/2010	Weekly Surveys	
Hunter Water Corporation pipeline	Subsidence survey	7/07/2010 over P1 8/09/2010 over P2	Weekly Surveys while in active Mining Zone	
Energy Australia powerlines	Subsidence survey	7/07/2010 over P1 8/09/2010 over P2	Weekly Surveys while in active Mining Zone	

Table 3 – Comparison of Subsidence Monitoring Results to SMP Predictions

Panel	Monitoring Item	SMP Prediction	Actual Survey Measurement 2010
Panel 1	Subsidence	1.15m to 1.54m	1.156m
	Strain	11 – 19mm/m	11mm/m
	Tilt	45 – 53mm/m	49mm/m
Panel 2	Subsidence	1.27 – 1.66m	1.017m
	Strain	20-31mm/m	7mm/m
	Tilt	58-75mm/m	31mm/m

7 PHOTOGRAPIC MONITORING AND VISUAL INSPECTION SUMMARY AND ANALYSIS

Dates of photographic monitoring and visual inspections are shown in **Table 4.** **I**mpacts or changes have been noted in either photographic monitoring or visual inspections and these results have been detailed in the Subsidence Management Status Reports submitted in September 2010 and January 2011.

Table 4 – Surface Inspection and Photographic Monitoring Dates

Monitoring / Inspection	Monitoring / Inspection Description	Pre Mining Inspections / Monitoring	Mining Period Inspections / Monitoring	Post Mining Inspections / Monitoring
Panel 1				
General Surface	Visual inspection	7/07/2010	Weekly Surveys	
Roads / tracks	Visual inspection	7/07/2010	Weekly Surveys	
	Photographic monitoring	7/07/2010	Impact related where required	
Panel 2				
General surface	Visual inspection	8/09/2010	Weekly Surveys	
Roads / tracks	Visual inspection	8/09/2010	Weekly Surveys	
	Photographic monitoring	8/09/2010		
General SMP Area				
Hunter Water Corporation pipeline	Visual inspection		Weekly Surveys	
Hunter Water Corporation pipeline	Photographic monitoring			
Energy Australia powerlines	Visual inspection		Weekly Surveys	
Energy Australia powerlines	Photographic monitoring	7/07/2010 over P1 8/09/2010 over P2		

8 ENVIRONMENTAL MONITORING SUMMARY AND ANALYSIS

Groundwater

Monthly monitoring of regional groundwater levels and groundwater quality was undertaken throughout the reporting period in accordance with the Site Water Management Plan and Integrated Environmental Monitoring Plan.

Monthly monitoring of regional groundwater levels and quarterly monitoring of groundwater quality is undertaken in accordance with the Site Water Management Plan. A summary of groundwater monitoring results relevant to Tasman is provided in **Table 5**.

Table 5 - Groundwater Levels - 2009 / 2010

Summary of Groundwater Quality Monitoring Results – 2009/2010

Sampling Site	pH	EC (µS/cm)	TSS (mg/L)
6	6.4 – 7.2	1590 – 8400	51 - 945
7	6.5 – 6.9	2000 – 3590	12 - 551
12	6.5 – 8.2	5330 – 13200	15 - 1380
13	6.5 – 10.9	260 – 14850	12 - 32
JRD1	6.6 – 7.1	2250 – 10230	21 - 106
JRD2	6.3 – 7.9	350 – 2660	15 - 139

Table 6 - Surface Summary of Water Quality Monitoring Results – 2009/2010

Sampling Site^	pH[#]	EC (µS/cm)[#]	Turbidity (NTU)	TSS (mg/L)
1	7.2 to **8.8**	510 to 1580	3.8 to **77**	5 to 22
8	**6.4** to 7.4	630 to 840	5.4 to **74**	<2 to 11
9	7.6 to 8.4	390 to 1770	14 to **71**	19 to **186**
10	7.3 to 8.5	680 to **2610**	3.3 to **57**	3 to 23
11	**6.2** to **8.8**	560 to **2230**	10 to **60**	7 to **72**
FMCU	6.6 to 7.6	280 to 700	28 to **72**	12 to 23
FMCD	7.2 to 7.9	140 to 240	3.8 to **566**	<2 to **360**
ANZECC Trigger Level *	6.5 – 8.5	125 - 2200	6 – 50 (NTU)	-

^ See **Figure 3.1** * ANZECC Chapter 3 – Aquatic Ecosystems – Lowland Rivers in NSW. [#] Field Measurement

Analysis of the results obtained during the reporting period, indicate the following.

- The pH at all sites was slightly acidic to slightly alkaline. Results were generally within the water quality trigger values for Lowland Rivers in NSW (6.5 – 8.5) outlined in the Guidelines for Fresh and Marine Water Quality (ANZECC 2000) although some results were marginally above or below the guidelines.

- The electrical conductivity (EC) results range between 140 to 240µS/cm at FMCD and 680 to 2610µS/cm at Site 10 (Lower Blue Gum Creek). All EC results, with the exception of one recording at Site 10 (2610 µS/cm) and Site 11(Viney Creek) (2230 µS/cm), are within the water quality trigger values for Lowland Rivers in NSW (125 to 2200uS/cm) (ANZECC 2000).

- Table 3.3.3 of the Guidelines advises that higher EC levels may occur in lowland waterways during low flow periods. Flow rates observed at Sites 10 and 11 during the twelve monitoring occasions were predominantly nil to low flow. Furthermore Viney Creek is subject to influence from John Renshaw Drive and the disused poultry farms southwest of the monitoring site. Elevated EC levels have previously been recorded at Sites 10 and 11 and as these sites are not affected by activities

within the Abel surface infrastructure area and no secondary extraction has yet been undertaken within the underground area it is considered that the Abel mine is not having an influence on these EC levels.

- Turbidity results for all sites and total suspended solids (TSS) levels at three sites (Sites 9, 11 and FMCD) exceeded the water quality trigger values for Lowland Rivers in NSW (6 -50 NTU) outlined in the Guidelines for Fresh and Marine Water Quality (ANZECC 2000) and commonly applied TSS criteria (50mg/L).

- Baseline monitoring data results presented in the Water Management Plan show that maximum TSS of 6 430mg/L and an average of 265mg/L had been recorded at FMCD. A maximum of 528mg/L and average of 72mg/L were also recorded at FMCU during baseline monitoring. As for EC, the remaining monitoring sites target the underground mining area. With no secondary extraction having commenced, it is considered that the Abel mine is not having an influence on the turbidity and TSS levels for these sites.

Flora and Fauna

- The dam monitoring indicated that, although there were no impacts from the mining operation, compared to the 2008 baseline survey, there was a much lower overall diversity of frogs across the 84 dams identified for long term monitoring with only a few dams recording more species. Bird diversity did not change significantly. No threatened frogs or birds or individuals of the threatened plant Maundia triglochinoides were identified.

- The sub-tropical rainforest monitoring results indicated no substantial change in floral or faunal diversity to the 2008 baseline monitoring. Specifically, 48 and 46 flora species were identified on the two monitoring transects in 2009 compared to 54 and 51 species in 2008. No threatened flora species were recorded. A total of 49 fauna species were recorded in 2009 compared to 55 species in 2008. Two threatened bat species (Little Bentwing-bat Miniopterus australis and Eastern Freetail-bat Mormopterus norfolkensis) listed as vulnerable under the NSW Threatened Species Conservation Act 1995 were detected during the 2009 survey. No undermining of sub-tropical rainforest occurred during the reporting period or will occur for a number of years.

- Continued monitoring as part of the Pambalong Nature Reserve Monitoring Plan during 2009/2010 representing the second year of monitoring. The monitoring plan is aimed at building a picture of what constitutes normal variation so that any impacts from subsidence in the future can be identified. Monitoring

- During the 2009/2010 monitoring, a total of 99 flora and 99 fauna species were identified within Pambalong Nature Reserve including one fish, five frog, two terrestrial mammal, eight bat and 83 bird species. No significant changes to the vegetation community extent were recorded with weed management continuing to be conducted by the National Parks and Wildlife Service, particularly targeting Water Hyacinth and Blackberry. The Blackberry control appeared to be effective at the time of survey.

9 TRENDS IN MONITORING RESULTS

Routine environmental and survey monitoring on surface features continued with impacts generally within SMP predictions with one minor exceedance of SMP predictions observed as outlined in Section **5.4**. Monitoring generally displayed no discernable negative trends.

Routine and scheduled monitoring will continue as outlined in the various monitoring and management programs.

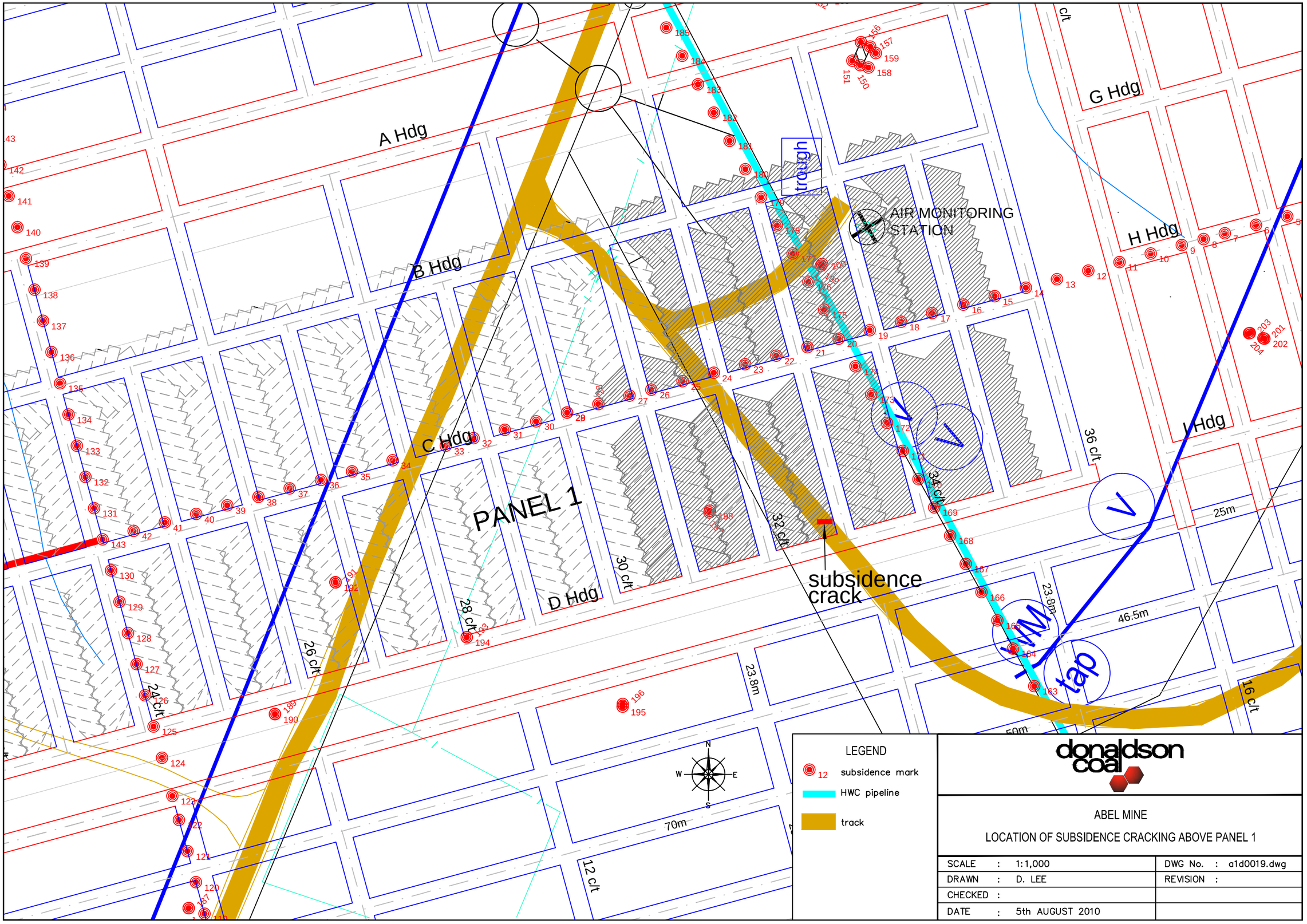
10 MANAGEMENT ACTIONS

Actions taken to ensure adequate management of any potential subsidence impacts due to mining include:

- Additional visual inspection regime initiated over the Catholic Diocese of Maitland Newcastle land plus regular weekly meetings initiated;

- Various monitoring programs, subsidence surveys, visual inspections, photographic monitoring to detect any impact;

- TARPs (Trigger, Action, Response Plans) forming part of approved Public Safety Management Plans and Environmental Management Plan which include mitigation/remediation options and notification procedures relating to subsidence monitoring, surface cracking on both roads / fire trails and vegetated areas and impacts on rock mass / steep slopes and Aboriginal sites.


A Hdg
B Hdg
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PANEL 1
AIR MONITORING STATION
trough
subsidence crack
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V
V
V
36 c/t
34 c/t
32 c/t
30 c/t
28 c/t
26 c/t
24 c/t
23.8m
25m
46.5m
70m
12 c/t
16 c/t
LEGEND
12 subsidence mark
HWC pipeline
track
donaldson coal
ABEL MINE
LOCATION OF SUBSIDENCE CRACKING ABOVE PANEL 1
SCALE : 1:1,000
DRAWN : D. LEE
CHECKED :
DATE : 5th AUGUST 2010
DWG No. : a1d0019.dwg
REVISION :

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W E

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0 100 200 300

METRES

Panel 6

Panel 5

Panel 4

EAST MAINS

EAST INSTALL HEADINGS

TAILGATE HEADINGS

SOUTH EAST MAINS

SOUTH MAINS

Legend

Development

Extraction

donaldson coal

Abel Mine
Production during 2010

SCALE	: 1 : 4,000	DWG No.	: a6p0066.dwg
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DATE	: 30th March 2011		