



DONALDSONCOAL

Part of the Yancoal Australia Group

**Abel Mine
Subsidence Management Plan
End of Year Report 2013**

31 March 2014

Approved by

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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 for Area 1 and Condition 18 of the Approval Conditions for Area 2 and 3.

A summary of monitoring results for the period January to December 2013 is presented in this report. Pillar extraction was completed in Panels 19, 19A, 21, 22, continued in East Mains and commenced in Panel 23 and 24 during this reporting period.

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

Area 1

SMP Approval was granted for Abel Area 1 (Panels 1 to 14 inclusive plus East Mains) on 27 May 2010. Pillar extraction has continued in East Mains during 2013. A Variation application for SMP Area 1 was submitted on the 8 August 2011 and was approved on the 29 September 2011. This variation was related to Panels 9 – 13 being removed from the SMP approved area.

Area 2

SMP Approval was granted for Abel Area 2 (Panels 14 – 26) on 7 December 2011. A variation was submitted on 19 December 2011 relating to the removal of Panel 14 and the shortening of Panels 15 – 19. The second variation submitted, relating to partial pillar extraction Panel 20 – 22, was approved on the 3 September 2012. A third variation submitted, relating to Panels 19 & 19A, was approved on the 21 December 2012. A fourth variation submitted relating to Panel 22, was approved on the 16 April 2013. Pillar extraction was conducted in the following order during 2013, Panel 21, East Installs, Panel 19A, Panel 22 and Panel 19.

Area 3

SMP Approval was granted for Abel Area 3 (Panels 23 – 26 and part East Install Headings) on 16 July 2013. A variation was submitted to increase the width to part of Panel 24 and was approved on the 23 December 2013. Pillar extraction commenced in Panel 23 and 24 during this period.

Table 1 below provides approval, plus mining commencement and completion dates for the Panels extracted since approval was granted.

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	19 April 2011
Panel 4	27 May 2010	14 March 2011	20 July 2011
Panel 5	27 May 2010	30 May 2011	24 September 2011
Panel 6	27 May 2010	22 September 2011	2 February 2012
Panel 7	27 May 2010	19 November 2011	31 May 2012
Panel 8	7 December 2011	31 March 2012	17 July 2012
Panel 15	7 December 2011	20 February 2012	26 March 2012
Panel 20	3 September 2012	12 September 2012	3 December 2012
Panel 21	3 September 2012	8 November 2012	18 April 2013
East Mains	27 May 2010	18 July 2012	
East Install Headings	7 December 2011	4 December 2012	
Tailgate Headings	7 December 2011	5 June 2012	10 September 2012
Panel 19A	21 December 2012	20 January 2013	25 May 2013
Panel 19	21 December 2012	25 May 2013	7 August 2013
Panel 22	16 April 2013	19 April 2013	19 July 2013
Panel 23	16 July 2013	22 July 2013	
Panel 24	16 July 2013	16 September 2013	

4 SUBSIDENCE AND ENVIRONMENTAL PROGRAMS AND MANAGEMENT PLANS

Subsidence 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, DTIRIS for all Panels extracted to date. In addition underground monitoring programs have been developed and approved for the partial pillar extraction Panels 20 – 22. All required subsidence monitoring lines have been installed and subsidence surveys completed in accordance with the agreed Subsidence Monitoring Programs.

Management Plans have been prepared for the following infrastructure outlined in **Table 2** and have been approved by the Director of Mine Safety Operations.

Table 2 – Approved Management Plans

Infrastructure Owners	Management Plans	Approved
Ausgrid	Ausgrid Powerline Management Plan SMP Area 2 – Tailgate Headings	21 June 2012
	Ausgrid Powerline Management Plan SMP Area 2 - Panels 20 - 22	2 November 2012
	Ausgrid Powerline Management Plan SMP Area 1 – East Mains	12 July 2013
	Ausgrid Powerline Management Plan SMP Area 3	17 July 2013
Telstra	Telstra Corporation Management Plan SMP Area 2 (Panels 21 & 22)	21 December 2012
	Telstra Corporation Management Plan SMP Area 3 (Panels 23 & 24)	17 July 2013
	Telstra Corporation Management Plan SMP Area 3 Optic Fibre (Panels 23 & 24)	6 December 2013
TransGrid	TransGrid Towers Management Plan SMP Area 1	22 March 2012
	TransGrid Towers Management Plan SMP Area 2	16 January 2013
Cessnock City Council	Blackhill Road and Taylors Road Management Plan SMP Area 2	7 December 2012
	Blackhill Road Management Plan SMP Area 3	11 September 2013
Hunter Water	Hunter Water Corporation Water Pipeline Management Plan SMP Area 2	21 June 2012
	Hunter Water Corporation Water Pipeline Management Plan SMP Area 1 – East Mains	12 December 2012

5 SUMMARY OF SUBSIDENCE IMPACTS

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 general in accordance with predicted levels.

5.1 Impacts on General Surface and Roads / Tracks

Surface cracking has occurred generally as predicted on the surface above Panels 19, 19A, 23, 24, and East Mains in the both the cleared and vegetated areas, private access tracks, and sealed private access road, and sealed local government road.

Remedial works have been carried out in consultation and agreement with the landholders and infrastructure owners.

5.2 Impacts on Hunter Water Corporation Waterline

Subsidence Impacts

Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.3 Impacts on Ausgrid Powerlines

Subsidence Impacts

Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.4 Impacts on TransGrid Transmission Towers

Subsidence Impacts

Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.5 Impacts on Blackhill Road

Subsidence Impacts

Impacts were within predictions and infrastructure remained in a safe and serviceable condition.

5.6 Notification under SMP Approval Conditions

No exceedances requiring notification of cracking has been required during this period.

A Post Mining survey conducted over East Install Headings has revealed one minor exceedance for subsidence measuring 1.192m against the predicted 0.9m and tilts of 44mm/m against the predicted 35mm/m. This exceedance is shown in **Table 4**.

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 3**.

A summary of subsidence, strain and tilt results are detailed in **Table 4** with comparison to the SMP predictions.

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

Table 3 – Subsidence Monitoring Survey Dates

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 1	<i>Subsidence survey</i>	7/07/2010	Weekly Surveys	11/02/2011 24/06/2011 1/08/2012
	<i>Subsidence Survey</i>			22/12/2010 21/06/2011 20/06/2012 9/10/2013
	<i>Subsidence survey</i>	23/12/2010	Weekly Surveys	10/06/2011 25/10/2011 9/05/2012
Panel 3	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	23/12/2010		
	<i>Subsidence survey</i>	4/03/2011	Weekly Surveys	24/08/2011 9/05/2011 3/09/2013
Panel 4	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	4/03/2011		
	<i>Subsidence survey</i>	27/05/2011		4/11/2011 2/05/2012
Panel 5	<i>Subsidence survey</i>			

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 5				18/02/2013 14/09/2013
	Visual inspection		Weekly	
	Photographic monitoring	27/05/2011		
Panel 6	Subsidence survey	14/09/2011		1/05/2012 4/09/2013
	Visual inspection		Weekly	
	Photographic monitoring	14/09/2011		
Panel 7	Subsidence survey	8/02/2012		2/08/2012 28/05/2013 13/09/2013
	Visual inspection		Weekly	
	Photographic monitoring	8/02/2012		
Panel 8	Subsidence survey	13/02/2012		31/10/2012 17/05/2013 6/09/2013
	Visual inspection		Weekly	
	Photographic monitoring	13/02/2012		
Panel 15	Subsidence survey	9/02/2012		27/04/2012 14/01/2013 17/05/2013
	Visual inspection		Weekly	
	Photographic monitoring	9/02/2012		
Panel 20	Subsidence	29/08/2012		10/01/2013

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 20	<i>survey</i>			
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	29/08/2012		
Panel 19	<i>Subsidence survey</i>	1/05/2013		14/09/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	1/05/2013		
Panel 19A	<i>Subsidence survey</i>	7/01/2013		4/06/2013 14/09/2013 5/11/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	7/01/2013		
Panel 21	<i>Subsidence survey</i>	7/11/2012		16/05/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	7/11/2012		
Panel 22	<i>Subsidence survey</i>	11/04/2013		30/07/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	11/04/2013		
Panel 23	<i>Subsidence survey</i>	12/07/2013		
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	12/07/2013		
	<i>Subsidence survey</i>	19/02/2013		

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
Panel 24	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	19/02/2013		
East Install Headings	<i>Subsidence survey</i>	14/11/2012		23/01/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	14/11/2012		
Tailgate Headings	<i>Subsidence survey</i>	18/05/2012		19/12/2012 13/06/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	18/05/2012		
East Mains Headings	<i>Subsidence survey</i>	9/07/2012		14/01/2013 30/05/2013
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	9/07/2012		
Blackhill Road	<i>Subsidence survey</i>	19/02/2013	<i>As detailed in Management Plan</i>	Same date as Panel surveys
	<i>Visual inspection</i>		<i>Daily</i>	
	<i>Photographic monitoring</i>	19/02/2013		
Hunter Water Corporation Pipeline	<i>Subsidence survey</i>	7/07/2010 over P1 8/09/2010 over P2	Weekly Surveys	11/02/2011 & 24/06/2011 Over P1 22/12/2010 & 21/06/2011 Over P2
	<i>Visual inspection</i>		<i>As detailed in Management Plan</i>	

Survey / Monitoring Line	Survey / Monitoring Description	Pre – Mining Survey	Survey / Inspection / Monitoring Dates	Post – Mining
	<i>Photographic monitoring</i>			
Ausgrid Power Poles	<i>Subsidence survey</i>	Same date as Panel surveys	Weekly Surveys	Same date as Panel surveys
	<i>Visual inspection</i>		Weekly	
	<i>Photographic monitoring</i>	Same date as Panel surveys		
TransGrid Transmission Towers	<i>Subsidence survey</i>	28/03/2012	<i>As detailed in Management Plan</i>	Same date as Panel surveys
	<i>Visual inspection</i>		Daily	
	<i>Photographic monitoring</i>	28/03/2012		

Table 4 – Comparison of Subsidence Monitoring Results to SMP Predictions

PANEL 1 (W = 120 m; T = 2.35 - 3.0m)			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	0.95 - 1.25m	0.72 - 1.228m	Measured subsidence < predictions
Tensile Strain	10 - 18 mm/m	4 - 12 mm/m (18 mm/m)	Measured tensile strains < predictions.
Compressive Strain	13 - 23 mm/m	5 - 14 mm/m	Measured compressive strains < predictions
Tilt	22 - 40 mm/m	22 - 46 mm/m	Measured tilts < predictions. One exceedance of 15%.
Other		Cracked Joint to Hunter Water Pipeline Repaired 11kv Power Line	All necessary repairs have been carried out.

PANEL 2 (W= 150m ; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.30 - 1.38m	0.977 - 1.041 m	Measured subsidence < predictions
Tensile Strain	18 - 31 mm/m	4 - 6 mm/m (5 mm/m)	Measured tensile strains < predictions
Compressive Strain	23 - 40 mm/m	4 - 7 mm/m	Measured compressive strains < predictions
Tilt	40 - 67 mm/m	22 - 32 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.20 - 1.32m	0.94 - 0.966m	Measured subsidence < predictions
Tensile Strain	13 - 20 mm/m	9 mm/m (15 mm/m)	Measured tensile strains < predictions
Compressive Strain	17 - 25 mm/m	6 mm/m	Measured compressive strains < predictions
Tilt	30 - 45 mm/m	27 mm/m	Measured tilts < predictions
Other			

PANEL 3 (W=160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.33 - 1.34 m	1.003 m	Measured subsidence < predictions
Tensile Strain	19 - 31 mm/m	8 - 9 mm/m (26 mm/m)	Measured tensile strains < predictions
Compressive Strain	24 - 40 mm/m	5 - 7 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	28 - 39 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.26 - 1.27 m	0.884 - 0.982 m	Measured subsidence < predictions
Tensile Strain	14 - 21mm/m	8 mm/m (10 mm/m)	Measured tensile strains < predictions
Compressive Strain	18 - 27 mm/m	4 mm/m	Measured compressive strains < predictions
Tilt	33 - 49 mm/m	30 mm/m	Measured tilts < predictions
Other			

PANEL 4 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27-1.29m	1.065m	Measured subsidence < predictions
Tensile Strain	19 - 31 mm/m	6 - 10 mm/m (37.5 mm/m)	Measured tensile strains < predictions with 1 exceedance of 20% at clay cap.
Compressive Strain	24 - 40 mm/m	6 - 18 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	36 - 60 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.29 - 1.32m	1.054 m	Measured subsidence < predictions
Tensile Strain	14 - 21mm/m	5 mm/m	Measured tensile strains < predictions
Compressive Strain	18 - 27 mm/m	5 mm/m	Measured compressive strains < predictions
Tilt	42 - 67 mm/m	25 - 36 mm/m	Measured tilts < predictions
Other			

PANEL 5 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27-1.43	1.154m	Measured subsidence < predictions
Tensile Strain	14 - 15 mm/m	10 mm/m	Measured tensile strains < predictions
Compressive Strain	15 - 19 mm/m	4 mm/m	Measured compressive strains < predictions
Tilt	41 - 46 mm/m	68 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.42 - 1.43m	1.002 m	Measured subsidence < predictions
Tensile Strain	11 - 15 mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	15 - 18 mm/m	13 mm/m	Measured compressive strains < predictions
Tilt	38 - 46 mm/m	29.8 mm/m	Measured tilts < predictions
Other			

PANEL 6 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.21 - 1.32m	1.215m	Measured subsidence < predictions
Tensile Strain	14 mm/m	8 mm/m	Measured tensile strains < predictions
Compressive Strain	17 - 18 mm/m	21 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	39 - 41 mm/m	89.6 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.32 - 1.42m	1.066 m	Measured subsidence < predictions
Tensile Strain	11 - 14mm/m	9 mm/m	Measured tensile strains < predictions
Compressive Strain	14 - 17 mm/m	7 mm/m	Measured compressive strains < predictions
Tilt	38 - 41 mm/m	30 mm/m	Measured tilts < predictions
Other			

PANEL 7 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	1.27 - 1.32m	0.771m	Measured subsidence < predictions
Tensile Strain	11 - 14 mm/m	5 mm/m	Measured tensile strains < predictions
Compressive Strain	14 - 18 mm/m	2 mm/m	Measured compressive strains < predictions
Tilt	41 mm/m	12 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.32 - 1.43m	1.336 m	Measured subsidence < predictions
Tensile Strain	11 - 15mm/m	23 mm/m	Measured tensile strains < predictions with 1 minor exceedance
Compressive Strain	14 - 18 mm/m	36 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	41 mm/m	42.5 mm/m	Measured tilts < predictions with 1 minor exceedance
Other			

PANEL 8 (W= 160.5 m; T = 2.5 m)			
< 75m Cover	Predicted	Final Measured	Comment
Subsidence	< 1.32m	0.830m	Measured subsidence < predictions
Tensile Strain	14 - 15 mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	17 - 19 mm/m	3 mm/m	Measured compressive strains < predictions
Tilt	42 mm/m	11.4 mm/m	Measured tilts < predictions
Other			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.25 - 1.32m	0.845 m	Measured subsidence < predictions
Tensile Strain	10 - 14mm/m	11 mm/m	Measured tensile strains < predictions with 1 minor exceedance
Compressive Strain	13 - 17 mm/m	6 mm/m	Measured compressive strains < predictions with 1 minor exceedance
Tilt	41 mm/m	33.8 mm/m	Measured tilts < predictions
Other			

PANEL 15 (W= 160.5 m; T = 2.5 m)			
>75m Cover	Predicted	Final Measured	Comment
Subsidence	1.17 - 1.23m	1.164m	Measured subsidence < predictions
Tensile Strain	7 - 12mm/m	15 mm/m	Measured tensile strains > predictions
Compressive Strain	9 - 15 mm/m	13 mm/m	Measured compressive strains < predictions
Tilt	19 - 32 mm/m	49 mm/m	Measured tilts < predictions with 2 minor exceedance
Other			

TAILGATE HEADINGS (W= 80.5 m; T = 2.8 m)			
<110mCover	Predicted	Final Measured	Comment
Subsidence	0.88 – 0.99m	0.241m	Measured subsidence < predictions
Tensile Strain	8 - 9mm/m	2 mm/m	Measured tensile strains < predictions
Compressive Strain	8 - 9 mm/m	2 mm/m	Measured compressive strains < predictions
Tilt	18 - 33 mm/m	7 mm/m	Measured tilts < predictions
Other			

PANEL 20 (W= 128 m; T = 2.7 m)			
>75mCover	Predicted	Final Measured	Comment
Subsidence	150mm	42 m	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	1 mm/m	Measured compressive strains < predictions
Tilt	3 mm/m	2.5 mm/m	Measured tilts < predictions
Other			

PANEL 21 (W= 212 m; T = 2.7 m)			
125mCover	Predicted	Final Measured	Comment
Subsidence	150mm	58mm	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	1 mm/m	Measured compressive strains < predictions
Tilt	3 mm/m	2.1 mm/m	Measured tilts < predictions
Other			

EAST INSTALL HEADINGS (W= 105m; T = 2.7 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	0.9m	1.192m	Measured subsidence > predictions
Tensile Strain	13 – 19 mm/m	11 mm/m	Measured tensile strains < predictions
Compressive Strain	16 - 24 mm/m	8 mm/m	Measured compressive strains < predictions
Tilt	24 - 35 mm/m	44 mm/m	Measured tilts > predictions
Other			

EAST MAINS HEADINGS (W= 125m; T = 2.7 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	1.59m	1.408m	Measured subsidence < predictions
Tensile Strain	10 - 16 mm/m	11 mm/m	Measured tensile strains < predictions
Compressive Strain	13 - 20 mm/m	15 mm/m	Measured compressive strains < predictions
Tilt	49 mm/m	48.6 mm/m	Measured tilts < predictions
Other			

Panel 19A (W= 227.9m; T = 2.6 m)			
100m Cover	Predicted	Final Measured	Comment
Subsidence	1.42m	1.226m	Measured subsidence < predictions
Tensile Strain	8 - 14 mm/m	3 - 12 mm/m	Measured tensile strains < predictions
Compressive Strain	11 - 18 mm/m	4 - 13 mm/m	Measured compressive strains < predictions
Tilt	40 mm/m	44.6 mm/m	Measured tilts < predictions with only a minor exceedance
Other			

PANEL 22 (W= 180.3 m; T = 2.8 m)			
125m Cover	Predicted	Final Measured	Comment
Subsidence	150 mm	44 mm	Measured subsidence < predictions
Tensile Strain	2 mm/m	1 mm/m	Measured tensile strains < predictions
Compressive Strain	2 mm/m	1 mm/m	Measured compressive strains < predictions
Other			

7 PHOTOGRAPHIC MONITORING AND VISUAL INSPECTION SUMMARY AND ANALYSIS

Dates of photographic monitoring and visual inspections are shown in **Table 3**. No impacts 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 January, May and September 2013 and January 2014.

No evidence of impacts has been observed or noted during these inspections and monitoring.

Comparison of pre and post mining photographic monitoring did not reveal any evidence of impact.

8 ENVIRONMENTAL MONITORING SUMMARY AND ANALYSIS

Groundwater

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

A summary of groundwater and surface water quality is provided in **Tables 5** and **6**.

Table 5 – Summary of Groundwater Quality Monitoring Results 1 January to 31 December 2013

Sampling Site	pH	EC ($\mu\text{S}/\text{cm}$)	TSS (mg/L)
6	6.45 – 7.06	807 – 2590	44 – 11600
7	6.78 – 7.38	1280 – 2910	16 – 1620
12	6.07 – 7.12	636 – 11100	14 – 3530
13	7.20 – 7.82	5320 – 12100	22 – 1520
JRD1	8.04 – 8.46	4320 – 4810	9 – 150
JRD2	6.24 – 7.61	242 – 2530	25 – 795

Table 6 – Summary of Surface Water Quality Monitoring Results 1 January to 31 December 2013

Sampling Site	pH	EC ($\mu\text{S}/\text{cm}$)	Turbidity (NTU)	TSS (mg/L)
1	6.59 – 7.32	483 – 1120	10.1 – 62.4	<5 – 28
8	No Sample - dry			
9	Not Sampled			
10	6.98 – 7.81	724 – 2060	5.9 – 59.6	6 – 38
11	6.72 – 8.03	391 – 1260	13.3 – 86.7	5 – 126
FMCU	6.59 – 7.66	202 – 461	13.6 – 69.1	5 – 208
FMCD	6.88 – 7.77	128 – 300	2.8 – 168	5 – 82

9 TRENDS IN MONITORING RESULTS

As noted previously monitoring results in subsidence and environmental areas displayed no discernible trends, nor major variances to previous years.

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

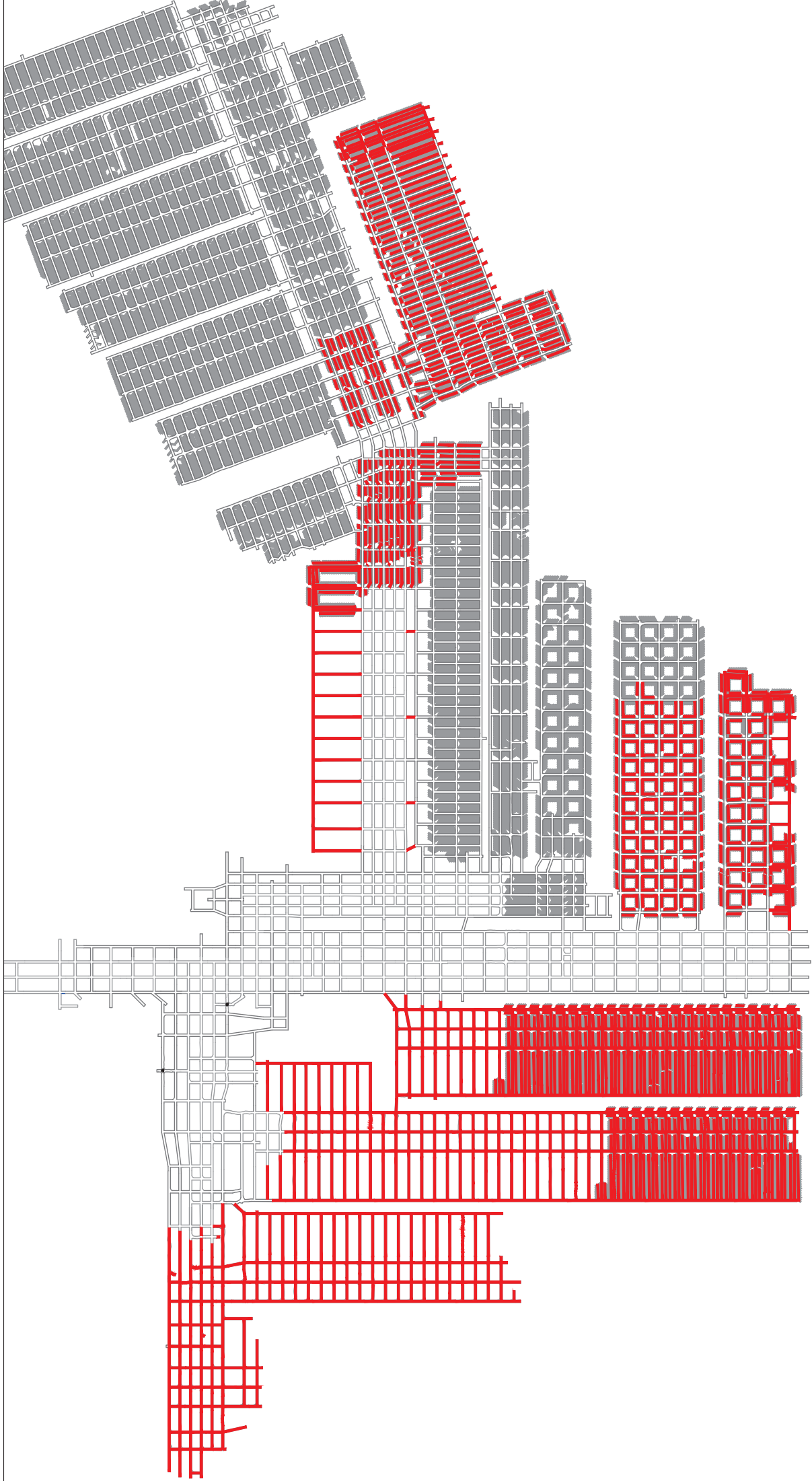
10 MANAGEMENT ACTIONS

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

- 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 Monitoring Programs 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.

Attachment 1

Plan Showing Areas Mined During 2013



AREAS MINED DURING 2013



Part of the Yancoal Australia Group

ABEL MINE
2013

SCALE : N.T.S.
DRAWN : M. Wright
DWG No. : o6p0156.dwg
REVISION :