LW104

END OF PANEL REPORT

NARRABRI MINE

Comments	Author	Authorised By	Date
LW104 End of Panel Report	S Farrar	D Ellwood	November 2015

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1. INTRODUCTION

Narrabri Mine received Subsidence Management Plan (SMP) approval (10/9000) for Longwall Panels (LW) 101 to 105 in April 2012. The SMP was developed as part of the Extraction Plan for LW101 to LW105 at the Narrabri Mine. The Extraction Plan, approved on 27 March 2012, is required by the Department of Planning and Environment's (DP&E) consent (PA 08_0144). This end of panel report has been prepared to satisfy the SMP approval, specifically Condition 18, for the fourth Longwall Panel completed at the Narrabri Mine, known as LW104. The specific requirements of Condition 18 are outlined in Table 1.

Table 1: SMP 10/9000 Approval Conditions

SMP Approval Condition	Section Addressed
18. Within 4 months of the completion of each longwall panel, an end of panel report must be submitted to the Director General. The end of panel report must:	This entire document
(a) include a summary of the subsidence and environmental monitoring results for the applicable longwall panel;	Section 3
(b) include an analysis of these monitoring results against the relevant: • impact assessment criteria; • monitoring results from previous panels; and • predictions in the SMP and EA;	Section 4
(c) identify any trends in the monitoring results over the life of the activity; and	Section 5
(d) describe what actions were taken to ensure adequate management of any potential subsidence impacts due to longwall mining.	Section 4

2. BACKGROUND

LW104 at Narrabri Mine was mined over a period of 8 months, from first coal to completion of the panel. Extraction of LW104 commenced in November 2014 and was completed in August 2015. Table 2 provides a summary of the LW104 mining parameters.

Table 2: LW104 Mining Parameters

LW103	Parameters
Target Seam	Hoskissons Seam
Seam Thickness	4.5m to 9.5m
Length	2,932m
Face Width	295.6m
Void	306.4m
Extraction Height	4.3m
Chain Pillar Width	35m
Cover Range	170m to 220m
Commenced	30 November 2014
Completed	4 August 2015
Coal Extracted	5.4 Million Tonnes

2.1 Impacts

The surface area affected by the extraction of LW104 comprises mine owned land holdings used historically for livestock grazing and cropping. The surface topography is flat to slightly undulating with slopes of 2˚ – 5˚ and topographic relief ranging from 271m AHD to 296m AHD. Pine Creek (an ephemeral creek) and one of its tributary, one public road (known as Greylands Road) and one 11kV electricity transmission line are directly impacted by the extraction of LW104, refer to Attachment 1. The mine site infrastructure, Kamilaroi Highway and Northern Branch Railway Line are >1.9km to the east of LW104 and are considered to be outside the limits of far-field displacement and strain as outlined in the Extraction Plan.

The Extraction Plan predicted low impacts to the surface features as a result of mining LW104. Water ponding was predicted to occur above LW104. Ponding did occur as predicted during August 2015, which did result in some out-of-bank, refer to Section 4.2.1 for more details. Trees along Greylands Road and along the ephemeral creek have not been impacted by subsidence as occurred in LW101 and LW102, refer to Section 4.2.1 for more details.

3. SUBSIDENCE MONITORING RESULTS

Narrabri Mine has established a subsidence monitoring program, required as part of the Extraction Plan for Longwall Panels LW101 to LW105, to quantify subsidence parameters and to identify subsidence related impacts to environmental and built features. Subsidence monitoring results are reported to the Principal Subsidence Engineer at the Division of Resources and Energy (DRE). The subsidence monitoring program consists of the following elements and is presented as Attachment 2:

- A transverse subsidence line across longwall panels LW101 to LW105;
- A full-length longitudinal line over LW101 and LW102 with reduced monitoring extending over the starting and finishing point of each remaining longwall block (LW103 – LW105);
- A survey line along the riparian management zone of Pine Creek and Pine Creek Tributary No.1;
- Four additional survey cross lines perpendicular to Pine Creek Tributary No 1 to establish lateral movement impacts; and
- Survey markers on the 11kV power poles for monitoring of tilt and strain to poles over LW101 to LW104.

Aerial Laser Scanning (ALS) surveys have been conducted at Narrabri Mine as they are considered to provide a more thorough understanding of subsidence development. The intention is to phase out the longitudinal monitoring with ALS surveys should it prove to be an adequate monitoring technique. To date, Narrabri Mine has completed six surveys: November 2008 (baseline), 31 December 2012, 25 July 2013, 2 December 2013, 3 October 2014 and 25 March 2015. The March 2015 survey imagery is included as Figure 1.

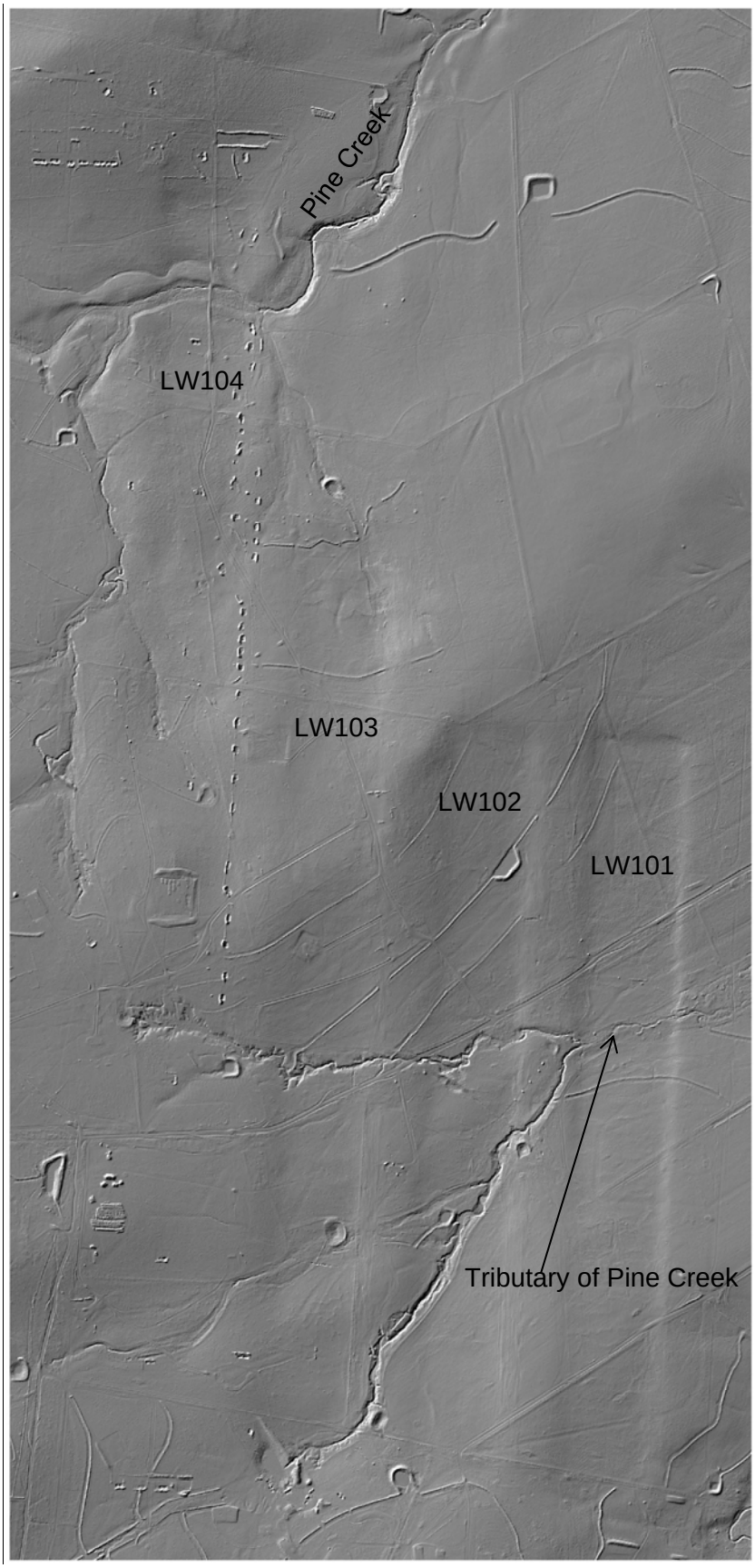


Figure 1: ALS Survey Image of LW101-LW104, March 2015

Table 3 outlines all of the longitudinal surveys undertaken up to 20 October 2015 at the Narrabri Mine.

Table 3: Subsidence Monitoring Lines

Monitoring Line	Panel	Installation Date	Survey Date(s)	Survey(s) Completed	Comments
101 –Centreline	101	April & May 2012	9/08/2012, 17/08/2012, 27/08/2012, 6/09/2012, 2/10/2012, 9/10/2012, 6/11/2012, 10/12/2012, 15/01/2013, 18/02/2013, 22/03/2013, 11/04/2013, 6/05/2013, 26/09/2013, 12/03/2014, 10/09/2014, 17/03/2015	17	All points surveyed
102 – Centreline	102	April & May 2012	31/07/2013, 6/08/2013, 9/08/2013, 19/08/2013, 22/08/2013, 26/08/2013, 25/09/2013, 24/10/2013, 19/11/2013, 31/12/2013, 21/01/2014, 4/03/2014, 6/11/2014, 21/05/2015	14	All points surveyed
103 North – Centreline	103	April & May 2012	11/03/2014, 17/03/2014, 24/03/2014, 31/03/2014, 8/04/2014, 5/05/2014, 3/11/2014, 5/06/2015	8	All points surveyed
103 South - Centreline	103	April & May 2012-	2/10/2014, 7/10/2014, 23/10/2014, 29/04/2015	4	All points surveyed
104 North – Centreline	104	August 2014	10/12/2014, 17/12/2014, 23/12/2014, 29/12/2014, 6/01/2015, 15/01/2015, 15/07/2015	7	All points surveyed-
104 South – Centreline	104	December 2013 & January 2014	17/07/2015, 20/07/2015, 6/08/2015, 2/09/2015, 15/10/2015	5	All points surveyed-
105 North – Centreline	105	December 2013 & January 2014	-	-	Baseline surveys completed
105 South – Centreline	105	December 2013 & January 2014	-	-	Baseline surveys completed
A - Crossline	101 – 106	April & May 2012	13/11/2012, 3/12/2012, 14/12/2012, 7/02/2013, 21/2/2013, 13/08/2013, 19/09/2013, 1/10/2013, 23/10/2013, 31/10/2013, 6/11/2013, 28/04/2014, 24/06/2014, 7/07/2014, 25/07/2014, 12/08/2014, 28/10/2014, 28/05/2015, 4/06/2015	19	All points surveyed

Monitoring Line	Panel	Installation Date	Survey Date(s)	Survey(s) Completed	Comments
B – Pine Creek Tributary 1 (PC1)	101 – 103	April & May 2012	21/11/2012, 3/12/2012, 4/01/2013, 18/06/2013, 21/10/2013, 11/11/2013, 2/12/2013, 13/05/2014, 16/09/2014, 30/09/2014, 30/10/2014, 30/04/2015	12	All points surveyed
C – Dam Wall	REMOVED				
D – Pine Creek (PC)	104 & 105	December 2013 & January 2014	24/12/2014, 29/12/2014, 6/01/2015, 15/07/2015, 8/10/2015, 12/10/2015, 20/10/2015	7	All points surveyed
E – PC1 Crossline 1	101 & 102	April & May 2012	4/01/2013, 7/01/2013, 16/01/2013, 18/06/2013, 17/10/2013, 21/10/2013, 23/10/2013, 13/05/2014, 30/10/2014, 30/04/2015	10	All points surveyed
F – PC1 Crossline 2	102	April & May 2012	11/02/2013, 21/02/2013, 25/02/2013, 18/06/2013, 31/10/2013, 6/11/2013, 11/11/2013, 13/05/2014, 30/10/2014, 30/04/2015	10	All points surveyed
G – PC1 Crossline 3	102 & 103	April & May 2012	18/06/2013, 25/11/2013, 2/12/2013, 4/12/2013, 13/05/2014, 9/09/2014, 11/09/2014, 16/09/2014, 30/04/2015	9	All points surveyed
Power Poles	101 – 105	19 & 21 March 2013	29/04/2013, 1/05/2013, 6/05/2013, 13/05/2013, 17/05/2013, 26/08/2013, 19/09/2013, 29/10/2013, 18/11/2013, 9/12/2013, 16/12/2013, 24/12/2014, 31/12/2014, 2/01/2014, 20/01/2014, 17/09/2014, 3/10/2014, 8/10/2014, 14/10/2014, 22/09/2015	20	Pole 2 to Pole 7

Table 4 compares the predicted subsidence parameters to all of the measured subsidence parameters for data available to 20 October 2015.

Table 4: Subsidence Parameters – Predicted and Measured

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Line 101 – Centre of LW101		
Subsidence (m)	2.44	2.633
Tilt (mm/m)	47	29.1 – 46.3
Tensile Strain (mm/m)	11 – 22^	8.7 – 20.7
Compressive Strain (mm/m)	14 – 28^	7.5 – 26.6
Angle of Draw (°, Degrees)	22.5 – 26.5	20.2
Line 102 – Centre of LW102		
Subsidence (m)	2.44	2.694
Tilt (mm/m)	41	43.7
Tensile Strain (mm/m)	10 – 20^	20.5
Compressive Strain (mm/m)	12 – 24^	46.7
Angle of Draw (°, Degrees)	22.5 – 26.5	20.8
Line 103 – Centre of LW103 – Northern		
Subsidence (m)	2.44	2.688
Tilt (mm/m)	35	40.2
Tensile Strain (mm/m)	8 – 16^	18.8
Compressive Strain (mm/m)	10 – 20^	27.9
Angle of Draw (°, Degrees)	22.5 – 26.5	18.1
Line 103 – Centre of LW103 – Southern		
Subsidence (m)	2.44	2.524
Tilt (mm/m)	35	30.3
Tensile Strain (mm/m)	8 – 16^	9.3
Compressive Strain (mm/m)	10 – 20^	8.5
Angle of Draw (°, Degrees)	22.5 – 26.5	20.2
Line 104 – Centre of LW104 – Northern		
Subsidence (m)	2.44	2.756
Tilt (mm/m)	32	48.4
Tensile Strain (mm/m)	7 – 14^	42.6
Compressive Strain (mm/m)	8 – 16^	42.3
Angle of Draw (°, Degrees)	22.5 – 26.5	18.7
Line 104 – Centre of LW104 – Southern		
Subsidence (m)	2.44	2.614
Tilt (mm/m)	32	30.3
Tensile Strain (mm/m)	7 – 14^	7.5
Compressive Strain (mm/m)	8 – 16^	6.1
Angle of Draw (°, Degrees)	22.5 – 26.5	18.7
Line A – Cross Panel Survey Line		

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Subsidence (m)	2.44	2.620*
Tilt (mm/m)	47	56.3*
Tensile Strain (mm/m)	11 – 22^	19.1*
Compressive Strain (mm/m)	14 – 28^	26.7*
Angle of Draw (°, Degrees)	22.5 – 26.5	24.2*
Line B – Pine Creek Tributary 1		
Subsidence (m)	2.44	2.587*
Tilt (mm/m)	47	54.8*
Tensile Strain (mm/m)	11 – 22^	13.1*
Compressive Strain (mm/m)	14 – 28^	11.0*
Gradient Change (%)	Up to 6	5.47*
Line D – Pine Creek		
Subsidence (m)	2.44	2.650*
Tilt (mm/m)	32	32.9*
Tensile Strain (mm/m)	7 – 14^	10.6*
Compressive Strain (mm/m)	8 – 16^	15.0*
Gradient Change (%)	Up to 6	3.29*
Line E – Pine Creek Tributary 1 Crossline 1		
Subsidence (m)	2.44	1.013*
Tilt (mm/m)	47	26.9*
Tensile Strain (mm/m)	11 – 22^	9.2*
Compressive Strain (mm/m)	14 – 28^	2.9*
Line F – Pine Creek Tributary 1 Crossline 2		
Subsidence (m)	2.44	2.698*
Tilt (mm/m)	41	59.1*
Tensile Strain (mm/m)	10 – 20^	6.6*
Compressive Strain (mm/m)	12 – 24^	21.7*
Line G – Pine Creek Tributary 1 Crossline 3		
Subsidence (m)	2.44	1.388*
Tilt (mm/m)	47	28.7*
Tensile Strain (mm/m)	11 – 22^	10.1*
Compressive Strain (mm/m)	14 – 28^	11.4*
Power Poles		
Pole 2		
Subsidence (m)	0	0.046
Dynamic Tilt (mm/m)	0	9.09
Final Tilt (mm/m)	0	8.44

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Conductor length change between poles 2-3 (m)	0.13	-0.59
Conductor Clearance Loss (m)	0.77	+0.56
Pole 3		
Subsidence (m)	2.18	2.085
Dynamic Tilt (mm/m)	30	66.3
Final Tilt (mm/m)	12	53.1
Conductor length change between poles 3 - 4 (m)	0.28	-0.81
Conductor Clearance Loss (m)	1.10	1.52
Pole 4		
Subsidence (m)	2.11	2.063
Dynamic Tilt (mm/m)	25	74.23
Final Tilt (mm/m)	15	32.8
Conductor length change between poles 4 - 5 (m)	0.13	0.48
Conductor Clearance Loss (m)	0.07	+1.20
Pole 5		
Subsidence (m)	0.31	0.238
Dynamic Tilt (mm/m)	2	25.66
Final Tilt (mm/m)	2	24.35
Conductor length change between poles 5 - 6 (m)	0.024	0.97
Conductor Clearance Loss (m)	0.30	+1.84
Pole 6		
Subsidence (m)	1.41	1.645
Dynamic Tilt (mm/m)	27	132.48
Final Tilt (mm/m)	27	132.48
Conductor length change between poles 6 - 7 (m)		1.03
Conductor Clearance Loss (m)	1.30	1.01
Pole 7		
Subsidence (m)	2.42	2.614
Dynamic Tilt (mm/m)	3	215.91
Final Tilt (mm/m)	3	24.88
Conductor Clearance Loss (m)	1.71	-

* - subsidence development incomplete.

^ - values for ‘smooth’ and ‘discontinuous’ (i.e. crack affected) subsidence profiles.

Based on Table 4, several subsidence prediction exceedances have occurred above LW104 as follows:

- The maximum subsidence measurements for the northern and southern monitoring lines in LW104 were within +/- 15% of the predicted value of 2.44 m with a maximum measured value of 2.756 m, refer to Figure 2 and Figure 3.
- The maximum tilt measurements recorded for LW104 exceeded the maximum predicted value of 32 mm/m, refer to Figure 4 and Figure 5. However, 97% of all values were within the predicted range.
- The maximum tensile strain measurements for LW104 exceeded the range of predicted values of 8 mm/m (smooth profile) and 16 mm/m (discontinuous or crack affected profiles), refer to Figure 6 and Figure 7. However, 95% of the recorded values were within the predicted range.
- The maximum compressive strain measurements for LW104 exceeded the range of the predicted values of 10 mm/m (smooth profile) and 20 mm/m (discontinuous or crack affected profiles), refer to Figure 6 and Figure 7. However, 98% of the recorded values were within the predicted range.

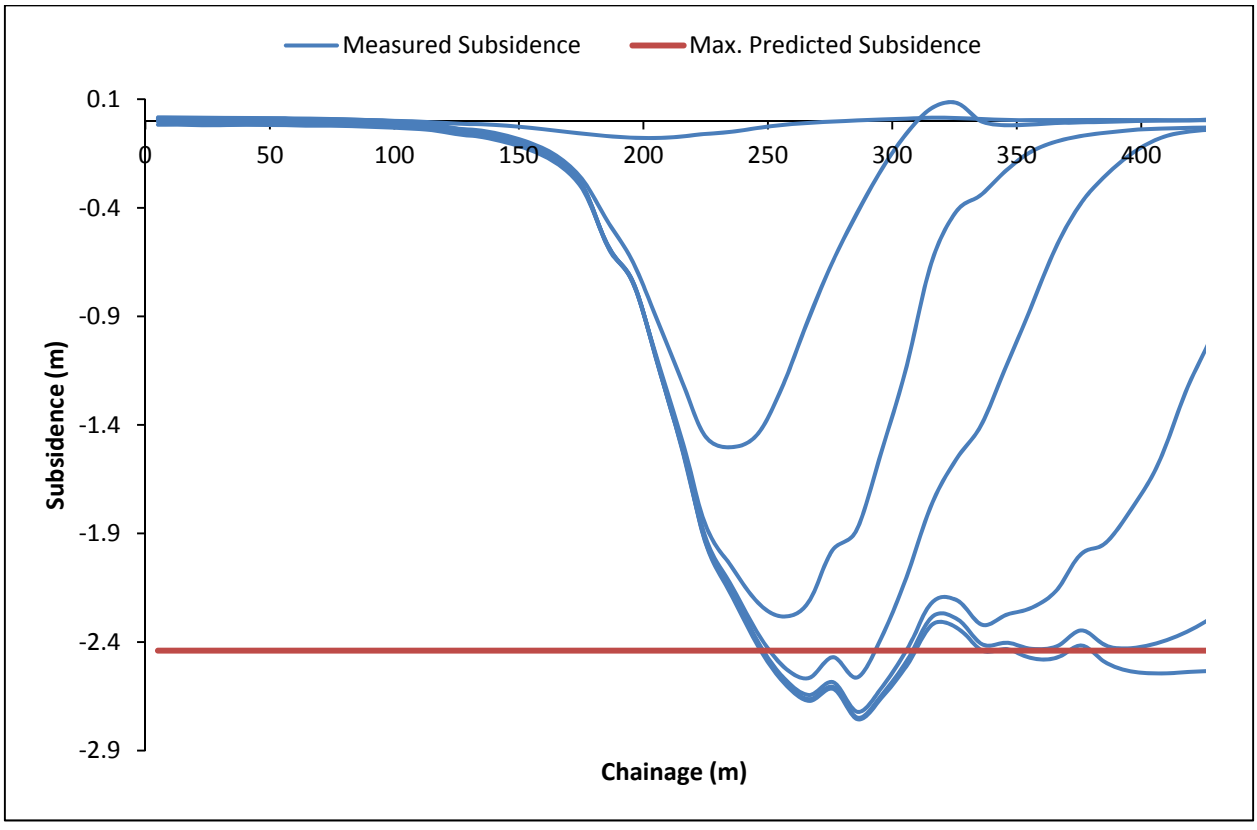


Figure 2: LW104 (North) Subsidence

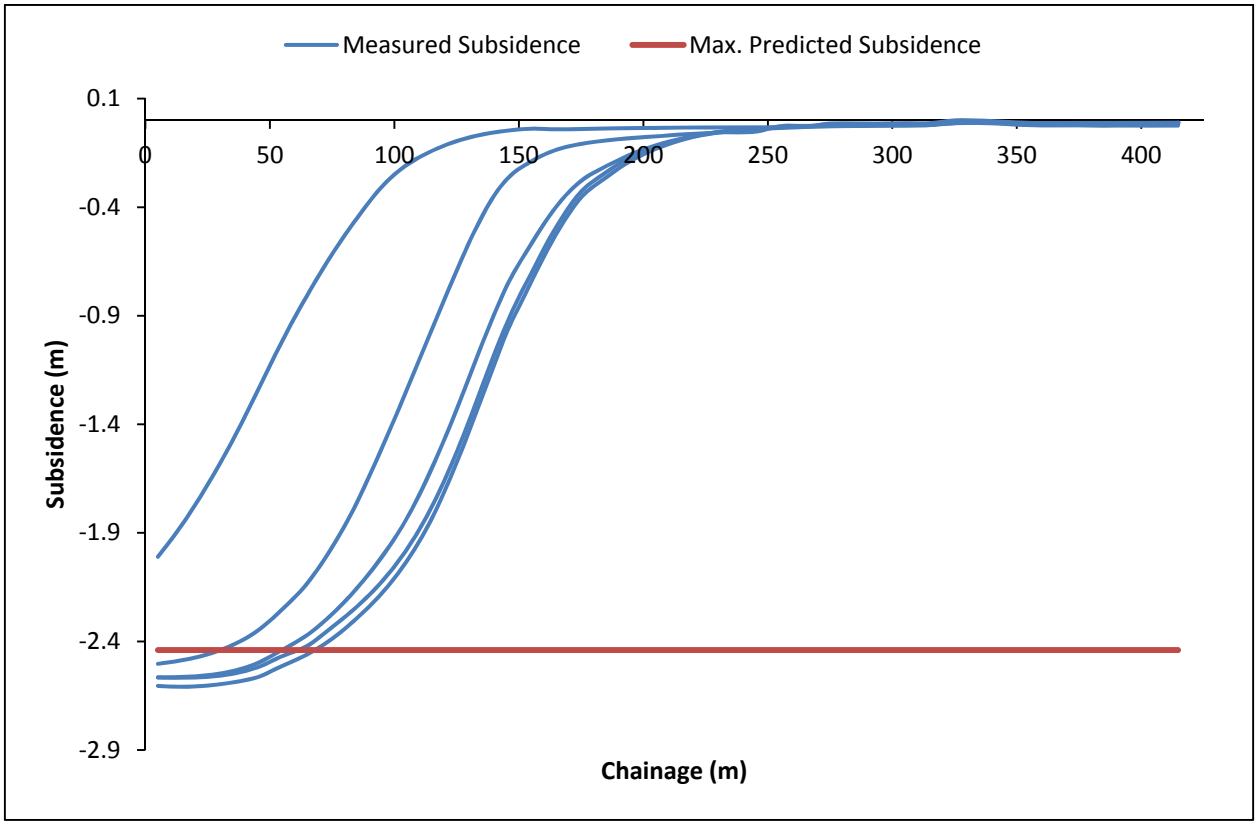


Figure 3: LW104 (South) Subsidence

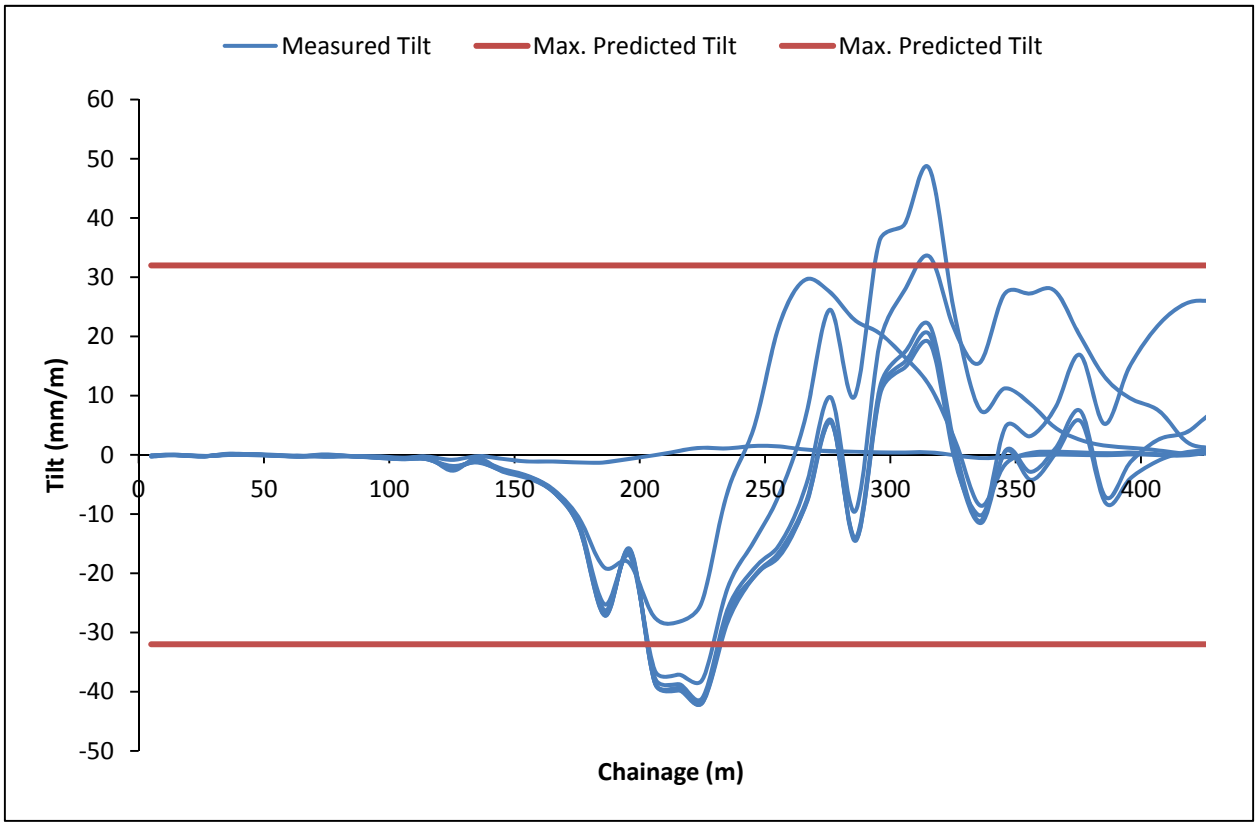


Figure 4: LW104 (North) Tilt

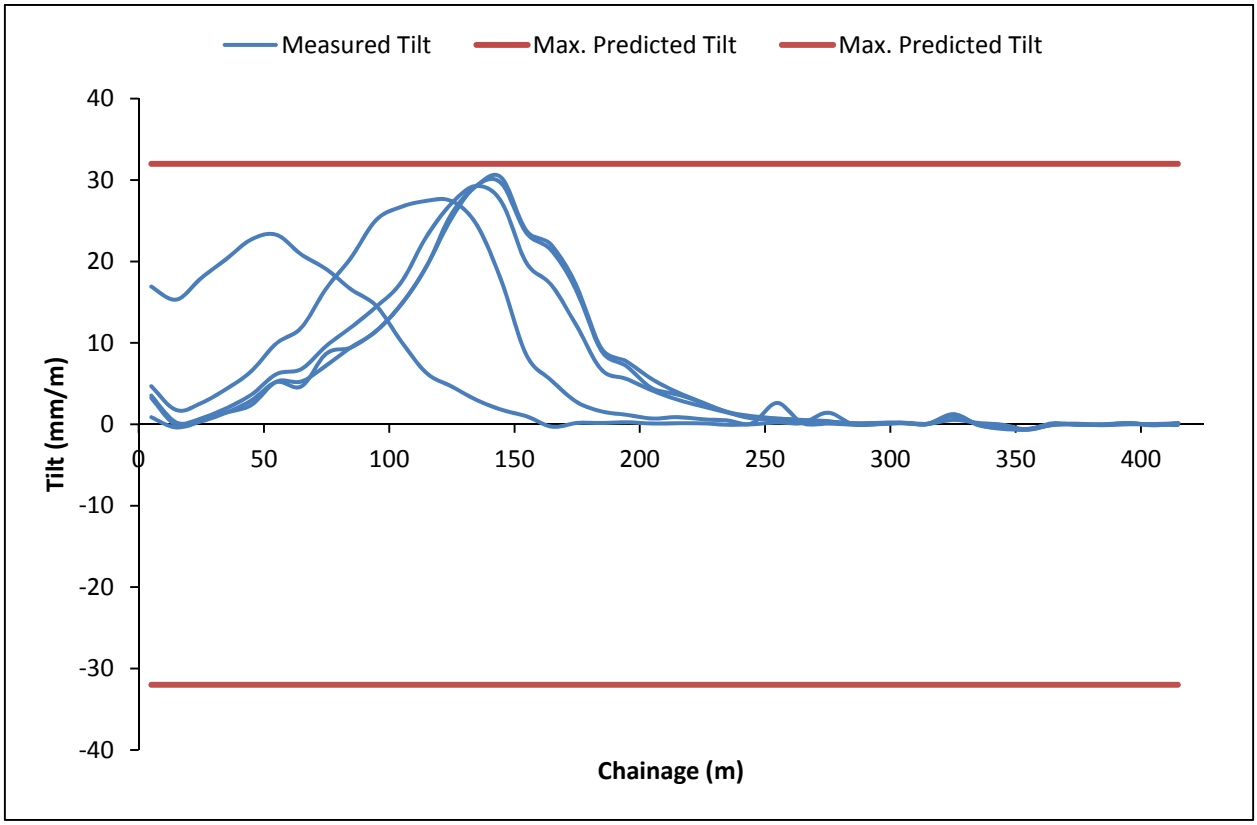


Figure 5: LW104 (South) Tilt

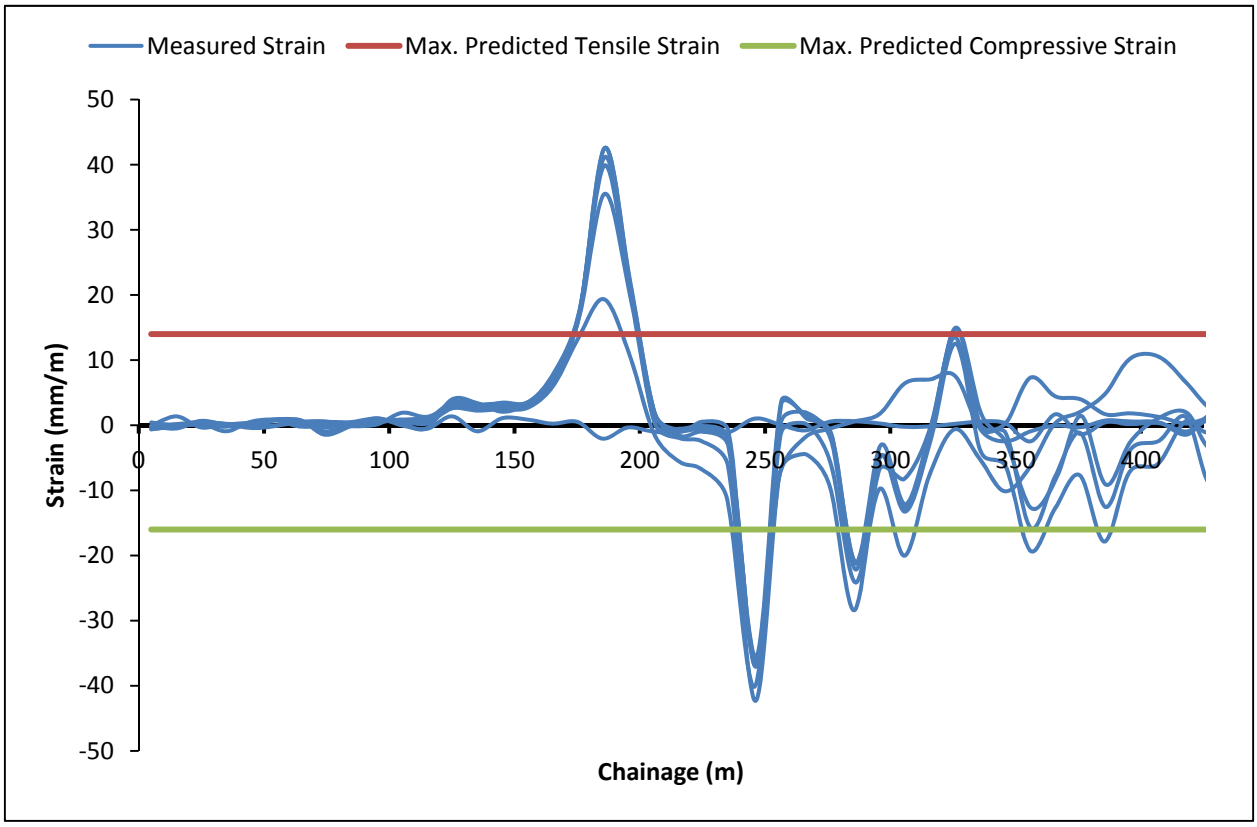


Figure 6: LW104 (North) Strain

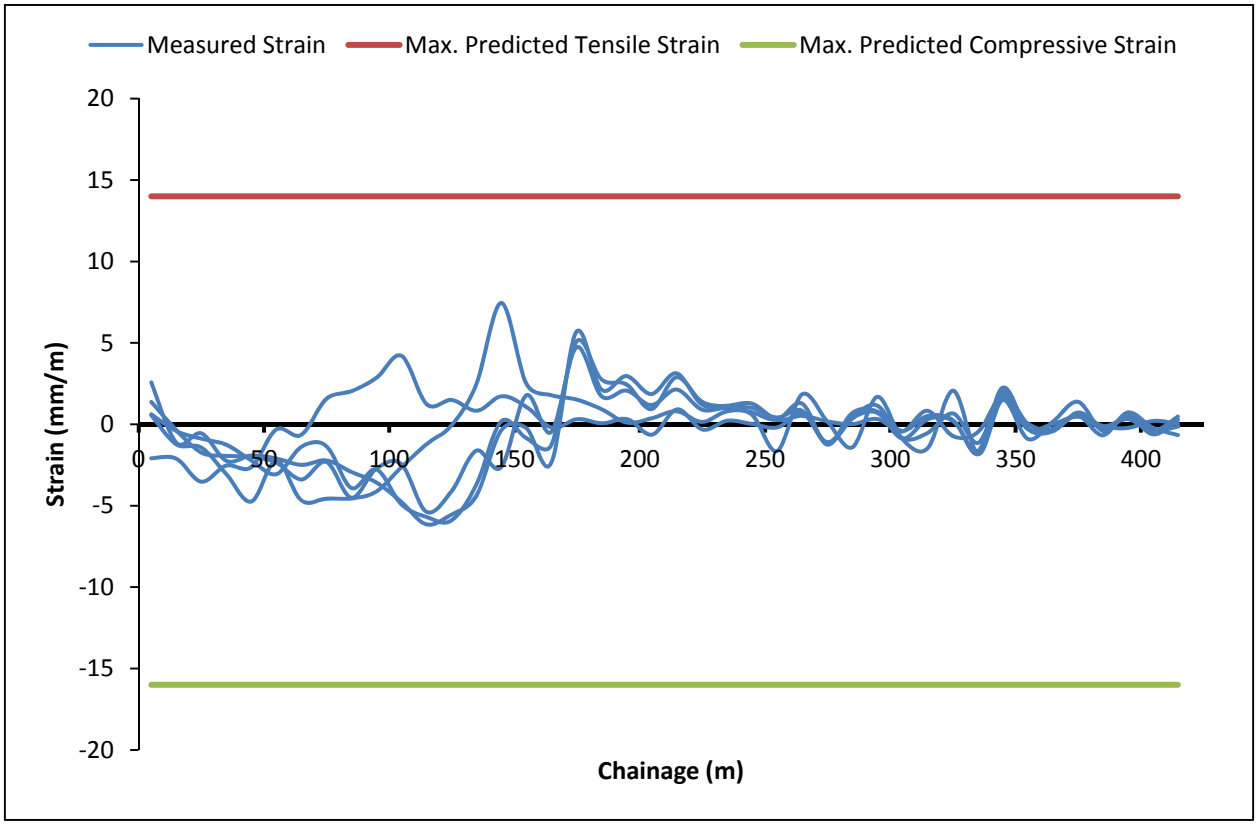


Figure 7: LW104 (South) Strain

4. SUBSIDENCE IMPACTS

4.1 Monitoring Results from Previous Panels

Refer to Table 3 and Table 4 for the subsidence monitoring undertaken above LW101 to LW104 up to and during the extraction of LW104. Measured maximum subsidence results are as follows: LW101 was recorded to be 2.633m; LW102 was recorded to be 2.694m; LW103 was recorded to be 2.688m; and LW104 was recorded to be 2.756m. The maximum tensile strains for LW101 to LW104 ranged from 7.5 – 42.6 mm/m; the maximum compressive strains for LW101 to LW104 ranged from 6.1 – 46.7 mm/m; and the maximum tilts for LW101 to LW104 ranged from -46.3 – 48.4 mm/m. The maximum subsidence results to date show general consistency between LW101-LW104.

4.2 Predictions in the SMP and EA

4.2.1 Natural Features

Pine Creek and Tributaries

Water ponding has been observed in LW104 in Pine Creek, refer to Photo 1. The ponding was predicted to occur in the Stage 2 Longwall Project Environmental Assessment for the

Narrabri Mine, and is generally limited to within the banks of the ephemeral creeks, although some out of bank ponding has occurred.

The mine is continuing the current management measures for the larger ponding area in LW101 of pumping water downstream. Water quality samples are collected monthly from the ponded water. The results are monitored to ensure parameters are not increasing above the baseline levels in the ponded water as this may affect the soils in the area. The results indicate water quality parameters, including pH, EC, TSS, Oil & Grease, and turbidity, are within the range of background levels for the mining area. Baseline information was collected for soils in the ponding area of LW101 as part of the monitoring requirements outlined in the Extraction Plan, including electrical conductivity and soil moisture distribution mapping using EM31/38 sensors. A ponding management plan is being developed and should be provided to DRE and OEH by the end of December 2015 for comment.

Photo 1: Ponding at LW104 within Pine Creek

For the ponding of water in LW104 it is expected that the system will naturally re-adjust to changes as a result of subsidence to reach a dynamic equilibrium. Maximum gradient change measured along Pine Creek is 3.29%. Small reaches of the creek have increased or decreased in gradient at the upstream and downstream extent of ponding but the channel bed appears stable (relative to the natural system). Some trees are stressed as a result of water ponding

Groundwater Resources

Narrabri Mine has an extensive groundwater monitoring program consisting of 43 monitoring wells. The monitoring can be summarised as follows:

- Nine licenced production wells that Narrabri Mine monitors for water levels and/or water quality in the Namoi River alluvium (WB2, WB3a, WB3b, WB4, WB5a, WB5b, WB6a, WB6b and WB7);
- Twenty nine standpipe piezometers that Narrabri Mine monitors for water levels and quality within and surrounding the mining lease (P1-P19, P28-P34, P47, P50 & P51); and
- Eleven vibrating wire piezometers (VWP) that Narrabri Mine monitors for water levels within and surrounding the mining lease (P21-P27, P35-P37, P40 & P44-P46).

The eleven VWP's include four life-of-mine groundwater monitoring wells that have been installed as required by the Water Management Plan for the Longwall Project.

P47 is a life-of-mine standpipe piezometer targeting the Garrawilla Volcanics to the north of LW102. There are two more VWP's and two more standpipe piezometers to be installed as part of the life-of-mine monitoring program.

A calibration of the groundwater model developed as part of the Groundwater Assessment undertaken as part of the Stage 2 Longwall Project EA was undertaken and report in May 2015. The calibration report concluded the following:

- All Hoskissons Seam vibrating wire hydrographs show a strong effect from the NM. The sharp decline in water level is clear at the monitoring sites P21, P22, P23, P24, P25, P26, P27, P35, P36, P37, P38 and P40. The measured water level in these bores reveals that the mining induced the water level to fall more than 100 m from the start of the main heading until the end of extraction of LW101 and LW102.
- Multi-level vibrating wires P40, P44, P45 and P46 were installed in 2012. The lower depths in P40 at 346 m and 357 m (Hoskissons Seam and Arkarula Formation) show mining effects. Also, P44 at depth 134 m (Digby Formation) shows a decline in the water level due to mining from 225 mAHD in August 2012 to 218 mAHD in August 2014. The Napperby and Pamboola Formations are unaffected at this location.
- The calibration results of the simulation model show that the model performs reasonably well in representing the values and the patterns of the groundwater level for both steady state and transient conditions.
- The model replicates very well the water level in all Hoskissons Seam monitoring sites that recorded the largest mining-induced drawdown effects to date.
- The predicted average mine inflows to LW101, LW102 and LW103 are expected to be around 0.5, 0.7 and 1.0 ML/day respectively. These rates agree very well with the average measured mine inflows of 0.6 and 1.0 ML/day for the mining periods April 2012 to March 2013 and April 2013 to March 2014, respectively.
- The model results reveal that the NM has no discernible impact on stream base flow and the variations are due almost entirely to natural conditions.

- The previous prediction of the effects of brine re-injection is unlikely to be materially different, due to similarity of hydraulic conductivities in the previous model and the current model, and good prediction of mine inflows with the previous model.

The results of life-of-mine water level monitoring required by the Water Management Plan for the Longwall Operation are provided in Appendix 1. The results indicate that the extraction of the LW104 has not impacted upon water levels surrounding the mine site.

Groundwater inflow monitoring results are described in the Narrabri Mine 2014-2015 Annual Environmental Management Report (AEMR). Groundwater inflows were predicted to vary from 0.22ML/day in the first year to approximately 3.83ML/day in Year 18. During the AEMR reporting period the average daily inflow was calculated to be 1.220ML/day, comprising 1.155ML/day of mine dewatering and 0.066ML/day of pre-drainage water. It should also be noted that while 1.155ML/day was pumped from the underground 1.080ML/day was fed underground for operations and a portion of this water would be captured in the mine dewatering volumes.

Threatened or Protected Species

No threatened or protected species were impacted by the extraction of LW104.

Natural Vegetation

As reported previously, large trees have been impacted by subsidence above LW101 and LW102. Narrabri Mine can report only a small area of trees, approximately 8 individual trees were impacted in Pine Creek overlying LW104. Some trees are also showing signs of stress from the ponded water in LW104 however, the mine is continuing to pump the ponded water downstream. A ponding management plan is being developed and will be provided to DRE and OEH for comment by the end of December 2015. The trees impacted in LW104 are within the indirect impacts predicted for trees in the Biodiversity Offset Strategy developed by the mine.

Land Surface

Informal visual observations in the subsidence area were undertaken as part of general duties, in addition to the formal inspections of Greylands Road, required by the Extraction Plan when undermining the road. Surface cracks observed were typically 50mm to 100mm wide with some cracks widths up to 200 mm (refer to Photo 2). The cracks were within the predicted range. No ploughing has been undertaken in LW104 and only limited ploughing has occurred in LW102 as below average rainfall and mild conditions over the extraction period meant very little soil moisture was available for seed propagation, refer to Photo 3. Additional ploughing and seeding will be undertaken above LW104 when conditions improve.

Photo 2: Surface Crack in LW104

Photo 3: Ploughing Above LW102

4.2.2 Public Utilities

Roads

One public road was undermined during the extraction of LW104, known as Greylands Road. Narrabri Mine developed a management plan, known as the Greylands Road Management Plan (GRMP), for this road in consultation with Narrabri Shire Council (NSC) in accordance with Condition 14 of SMP approval 10/9000. The management approach for Greylands Road was approved by DRE on 19 October 2012 and both Narrabri Mine and NSC signed the GRMP, which formalised the management measures to be implemented, on 6 November 2012.

The GRMP was revised during the extraction of LW104. Following an inspection by NSC it was requested that an amended plan be submitted for approval to close Greylands Road under a Traffic Control Plan (TCP) until the road is purchased to minimise risks to public safety. Both Narrabri Mine and NSC signed the revised GRMP on 9 April 2015. The purchase of Greylands Road is progressing with the Crown Lands division of NSW Trade and Investment however, this was not finalised during the extraction of LW104.

Culverts

No culverts were undermined during the extraction of LW104.

Electricity Transmission Lines

Narrabri Mine developed a management plan, known as the Essential Energy Management Plan (EEMP), to manage subsidence impacts to the 11kV power line that traverses LW101 to LW105. The EEMP was agreed to by Essential Energy on 4 February 2013 and approved by DRE as satisfying the requirements of SMP 10/9000 Condition 14 on 12 March 2013. Narrabri Mine implemented the EEMP on 19 and 21 March 2013 by installing sheaves/rollers on the 11kV power line. The line remains disconnected where it tee's off from the main line.

During the extraction of LW104 this power line was undermined during July 2015. The lessee of the mine owned "West Haven" property has vacated the property and as such no further action is required by the mine. Survey monitoring of the power poles and conductor clearances was undertaken refer to Table 4.

Narrabri Mine is investigating options for the removal of the 11kV power line, subject to the approval of Essential Energy.

Telecommunications Lines

No telecommunications infrastructure exists within the Extraction Plan area for LW101 to LW105.

4.2.3 Farm Land and Facilities

Agricultural Utilisation or Agricultural Suitability of Farm Land

No areas of LW104 were ploughed and only limited areas of land over LW102 were ploughed during the extraction of LW104, refer to Section 4.2.1. No other areas of agricultural utilisation were impacted during the extraction of LW104 as the ponding that occurs in Pine Creek is generally limited to within the creek banks.

Farm Buildings or Sheds

No farm buildings or sheds were undermined during the extraction of LW104.

Fences

Fences and gates were undermined during the extraction of LW104. Narrabri Mine has excluded all stock from the active mining area by erecting a fence outside of the subsidence zone to the east of LW101. Any fences/gates required post-mining will be reinstated.

Farm Dams

Two small farms dam were undermined in LW104. Rainfall in late August 2015 at the mine refilled these dams refer to Photo 4. Subsidence has not impacted on the function of these dams.

Photo 4: Farm Dam above LW104

Soil Conservation Works

Six contour banks, or parts thereof, were undermined during the extraction of LW104. The subsidence impacts to the contour banks did not affect their functionality. However, should remediation works be required, Narrabri Mine will either reinstate the contour banks or remove a section to avoid water ponding.

Wells or Bores

The groundwater data indicates that no private wells were impacted by the extraction of LW104 (refer to Section 4.2.1). No mine installed monitoring bores were directly impacted by the extraction of LW104.

Access Tracks

Access tracks were impacted by the extraction of LW104 however most were in relation to access for mine infrastructure such as boreholes which are now decommissioned. Access tracks along the perimeter of former farm paddocks will be reinstated once mining is complete.

4.2.4 Industrial, Commercial and Business Establishments

Mine Infrastructure

Pipelines connecting gas drainage wells were undermined during the extraction of LW104 however no impacts on this infrastructure were recorded. All gas drainage infrastructure in the active mining area is inspected and maintained to ensure subsidence does not adversely impact this equipment. Narrabri Mine also decommissions gas drainage infrastructure when it is no longer required. The Personal Emergency Device (PED) cable buried around LW101 to LW105 was not impacted by the extraction of LW104.

4.2.5 Other Significant Features

Areas of Archaeological and/or Heritage Significance

Ten previously identified cultural heritage sites are located above LW104 being Sites 10b, 37-42 and 133-135. Site 10b is a grinding groove site that lies above the chain pillar between LW104 and LW105. Sites 37, 134 and 135 are isolated artefacts. Sites 38-42 and 133 are artefacts scatters. Sites 10b, 38 and 39 are listed as being of high archaeological significance. All sites are located adjacent to the ephemeral creeks. The Extraction Plan developed for LW101 to LW105 outlines that the artefact scatters and isolated artefacts occur on actively degrading surfaces and it is assumed that most of the artefacts have already been displaced by slope-wash, stock movement, land clearance, ploughing, harrowing and vehicular traffic. There would be very few artefacts in their original depositional context or provenance and the direct impact of subsidence (vertical or horizontal displacement) is likely to be minimal. The plan outlines that the main impact may occur as a result of subsidence remediation works.

The sites outlined above have not been impacted by subsidence apart from vertical displacement and as described above, the artefacts are considered unlikely to be located in their original positions. Photo 5 is of Site 10b which was not predicted to be impacted by subsidence as it is located on sandstone floaters and although there is cracking in the immediate vicinity of Site 10b it remains unaffected. This site will be reassessed following the extraction of LW105. Sites 38 and 39 have not been affected apart from vertical displacement. The mine will engage representatives from the Registered Aboriginal Parties (RAPs) to be present during site remediation works that may impact upon sites previously identified at the mine.

Photo 5: Site 10b, Grinding Grooves, located on the chain pillar between LW104 & LW105

5. TRENDS IN MONITORING RESULTS

Subsidence monitoring results for LW101 to LW104 show that measured subsidence is closer to 64% of the cutting height of 4.3m with 38% of the measured maximum values exceeding the predicted subsidence levels based on 58% of the cutting height of 4.2m. However, measured values are within 15% of the maximum predicted levels. The results also indicate that the Garrawilla Volcanics and Basalt Sill have not reduced subsidence through spanning behaviour.

6. CONSULTATION

Narrabri Mine applied to revise the Extraction Plan for LW101 to LW105 to include LW106 during the extraction of LW104. This required consultation with the following organisations:

- Division of Resources and Energy (DRE);
- Department of Planning and Environment (DP&E);
- Office of Environment and Heritage (OEH);
- Narrabri Shire Council (NSC);
- NSW Maritime and Road Services (RMS);
- Essential Energy; and
- The Registered Aboriginal Parties (RAPs).

In addition, Narrabri Mine also undertook the following consultation:

- NSW Crown Lands (part of NSW Trade and Investment) in relation to the purchase of the portion of Greylands Road that traverses the mine site;
- Narrabri Mine Community Consultative Committee (CCC) which includes providing subsidence measurement results; and
- DRE in relation to subsidence results.

On 11 August 2015 representatives from DRE and the Environment Protection Authority (EPA) attended site to undertake an Annual Environmental Management Report (AEMR) inspection. During this inspection the representatives were taken to the subsidence area and observed the impacts that have occurred above LW101 to LW104.

The mine owned “West Haven” property, which has been provided with an alternative power supply as required by the Essential Energy Management Plan (EEMP), has been vacated by the tenant and no further action is required by the mine for this property.

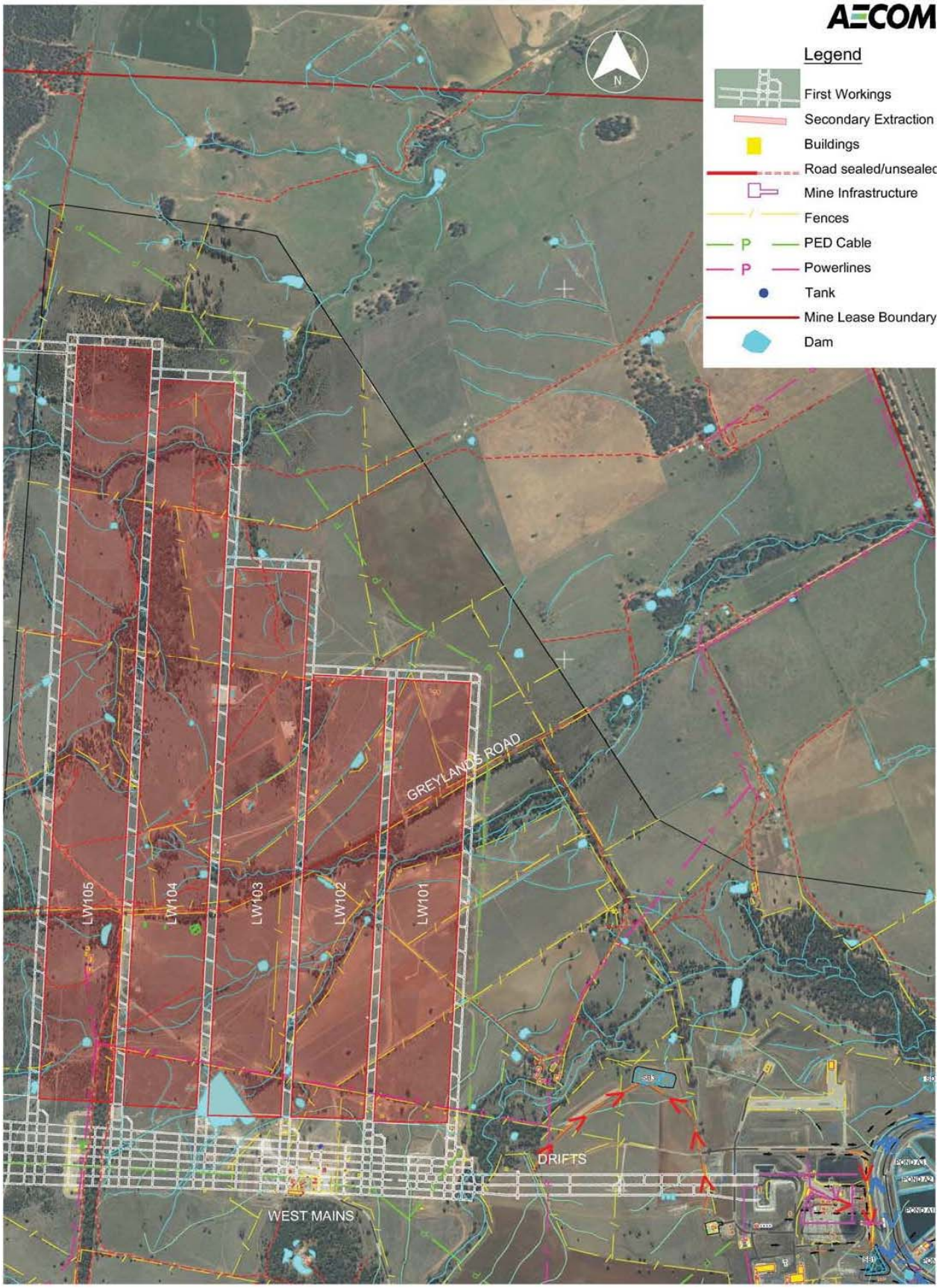
6.1 Community Complaints

No community complaints were received in relation to subsidence and subsidence related impacts during the extraction of LW104. An enquiry was noted from a neighbouring property owner in relation to creek flows out of rain periods which the mine clarified was creek water being pumped from the ponding area in LW104.

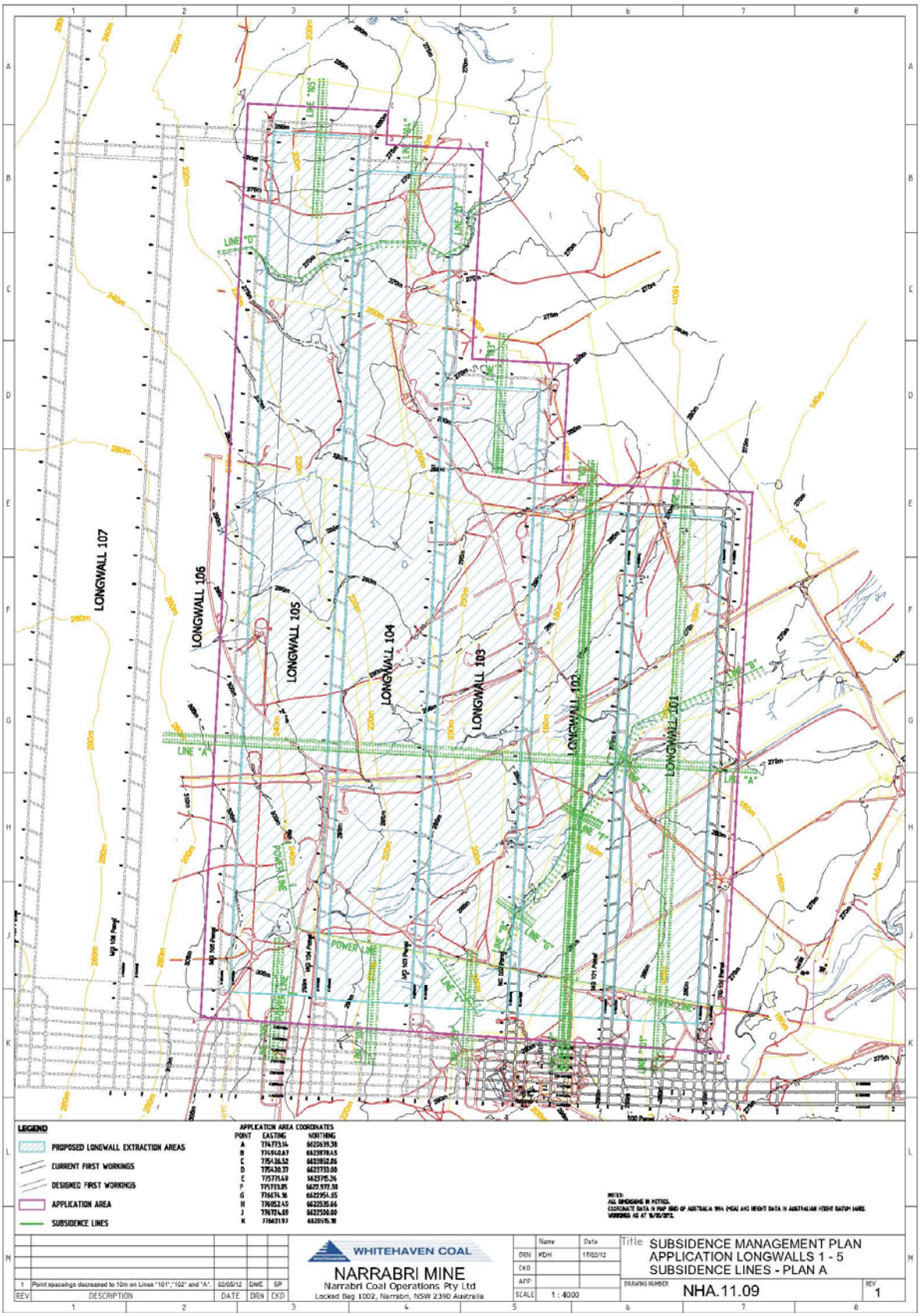
6.2 Narrabri Mine Community Consultative Committee

Narrabri Mine’s Community Consultative Committee (CCC) receives updates on the progress of the mine at the quarterly meetings including subsidence levels and impacts. Copies of the Narrabri Mine CCC meeting minutes are available on the Whitehaven Coal website.

Attachment 1: Narrabri Mine LW101 to LW105 Extraction Plan Area



Attachment 2: Narrabri Mine Subsidence Monitoring Lines LW101 to LW105



Appendix 1: Narrabri Mine Groundwater Monitoring Results

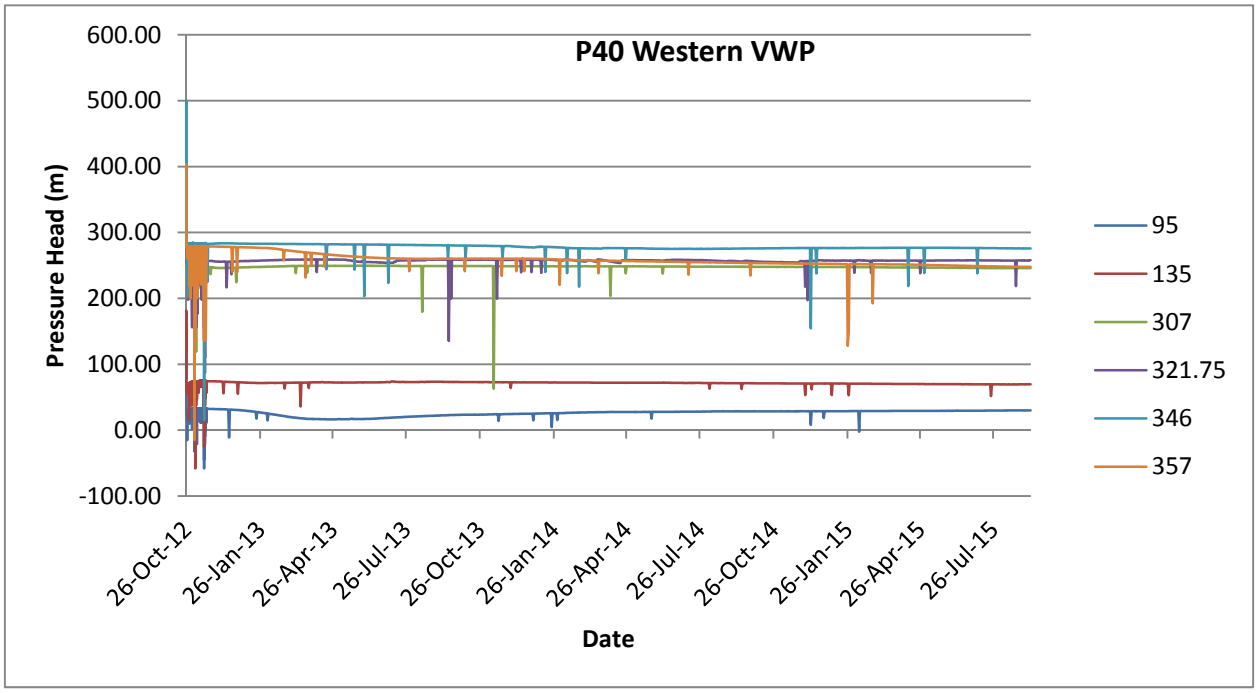


Figure 1: P40 Monitoring Results

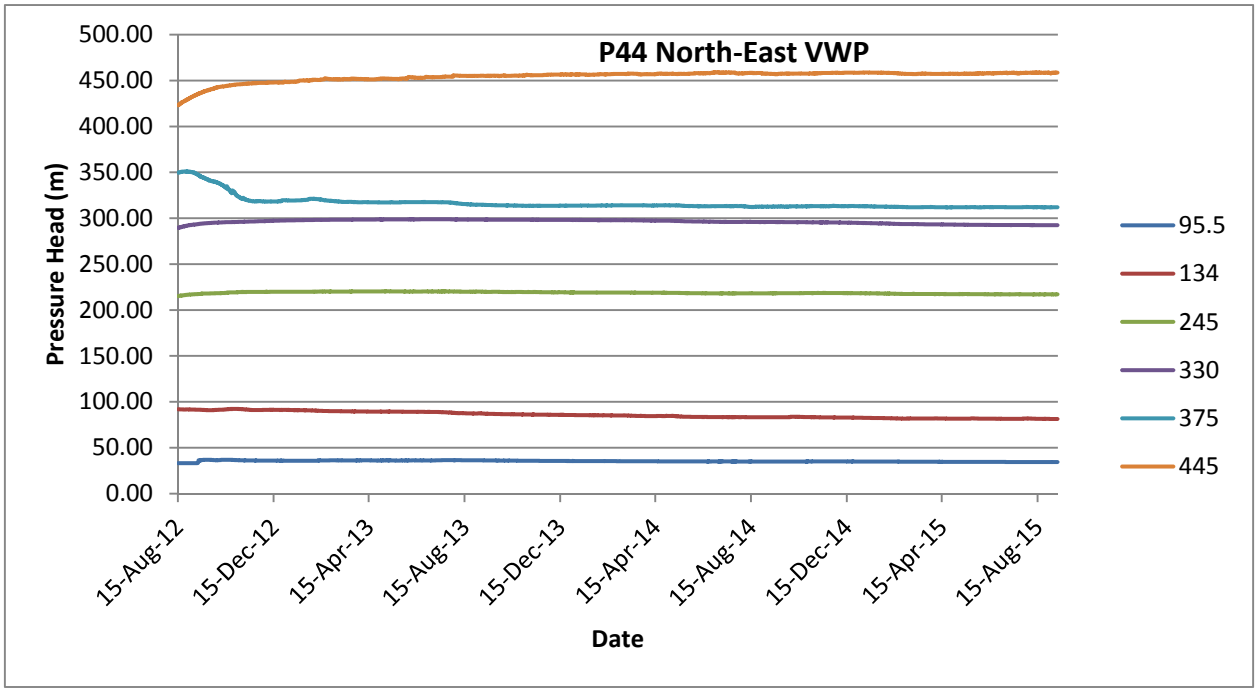


Figure 2: P44 Monitoring Results

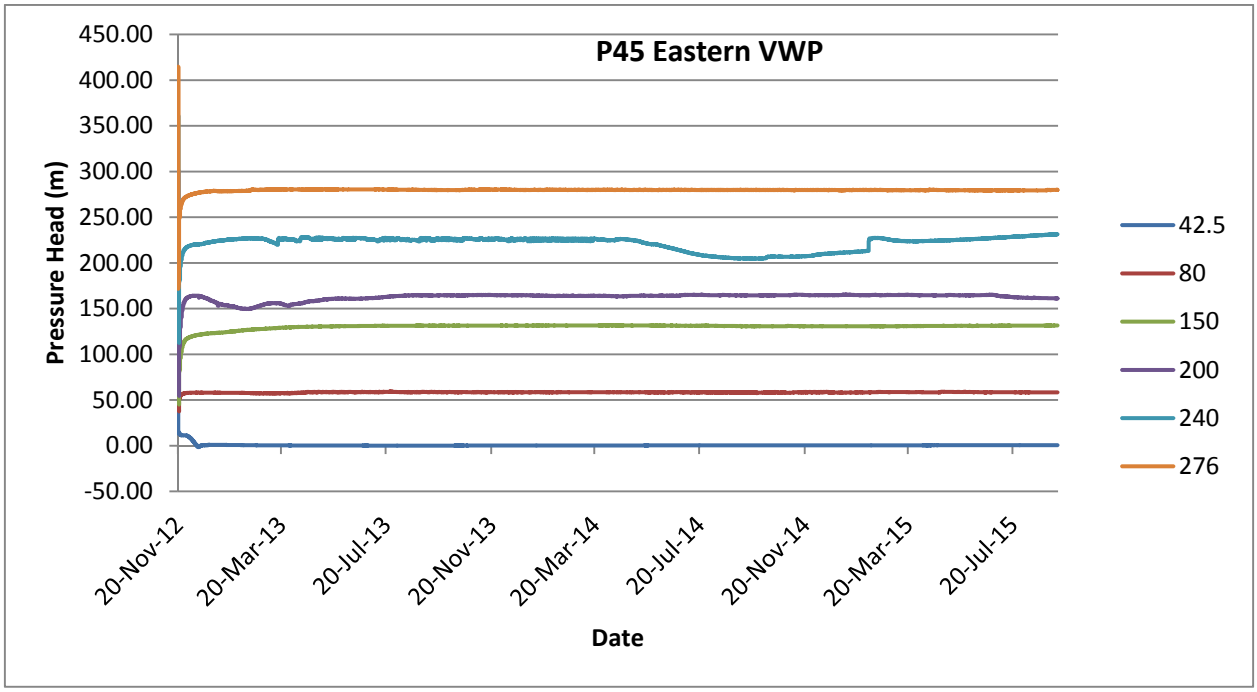


Figure 3: P45 Monitoring Results

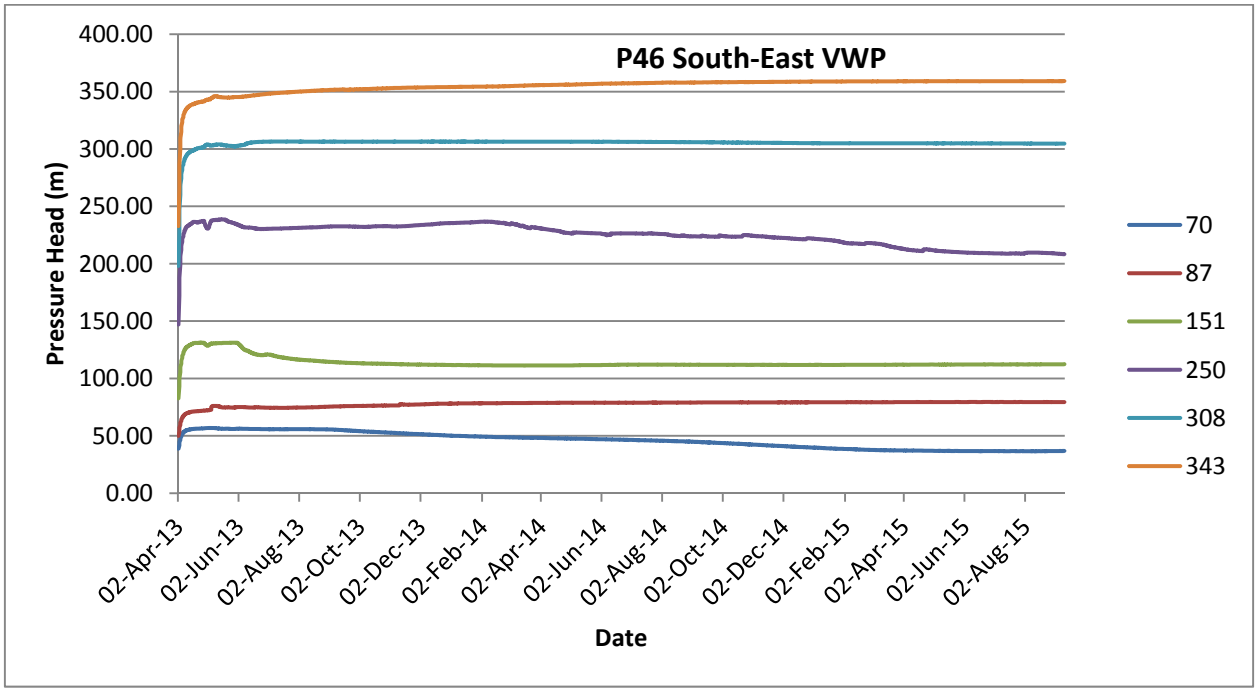


Figure 4: P46 Monitoring Results

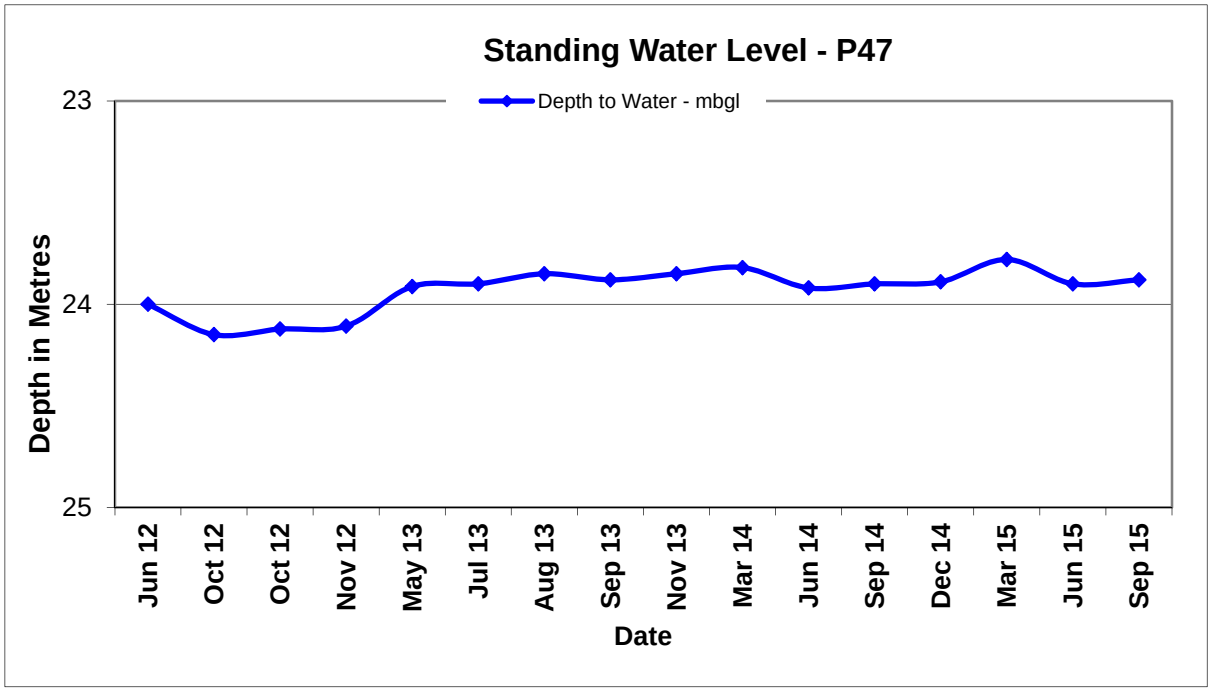


Figure 5: P47 Monitoring Results