LW103

END OF PANEL REPORT

NARRABRI MINE

Comments	Author	Authorised By	Date
LW103 End of Panel Report	S Farrar	D Ellwood	February 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 third Longwall Panel completed at the Narrabri Mine, known as LW103. 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

LW103 at Narrabri Mine was mined over a period of 8 months, from first coal to completion of the panel. Extraction of LW103 commenced in March 2014 and was completed in October 2014. Table 2 provides a summary of the LW103 mining parameters.

Table 2: LW103 Mining Parameters

LW103	Parameters
Target Seam	Hoskissons Seam
Seam Thickness	8.5m to 10.5m
Length	2,197m
Face Width	295.6m
Void	306.4m
Extraction Height	4.3m
Chain Pillar Width	35m
Cover Range	180m to 210m
Commenced	3 March 2014
Completed	20 October 2014
Coal Extracted	3.9 Million Tonnes

2.1 Impacts

The surface area affected by the extraction of LW103 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 276m AHD to 295m AHD. Two ephemeral creeks , one public road (known as Greylands Road) and one 11kV electricity transmission line are directly impacted by the extraction of LW103, refer to Attachment 1. The mine site infrastructure, Kamilaroi Highway and Northern Branch Railway Line are >1.9km to the east of LW103 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 LW103. Water ponding was predicted to occur above LW103. Ponding did occur as predicted during August 2014 but it was generally limited to within the banks of the ephemeral creek, 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 1:

- 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 five surveys: November 2008 (baseline), 31 December 2012, 25 July 2013, 2 December 2013 and 3 October 2014. The October 2014 survey imagery is included as Figure 1.

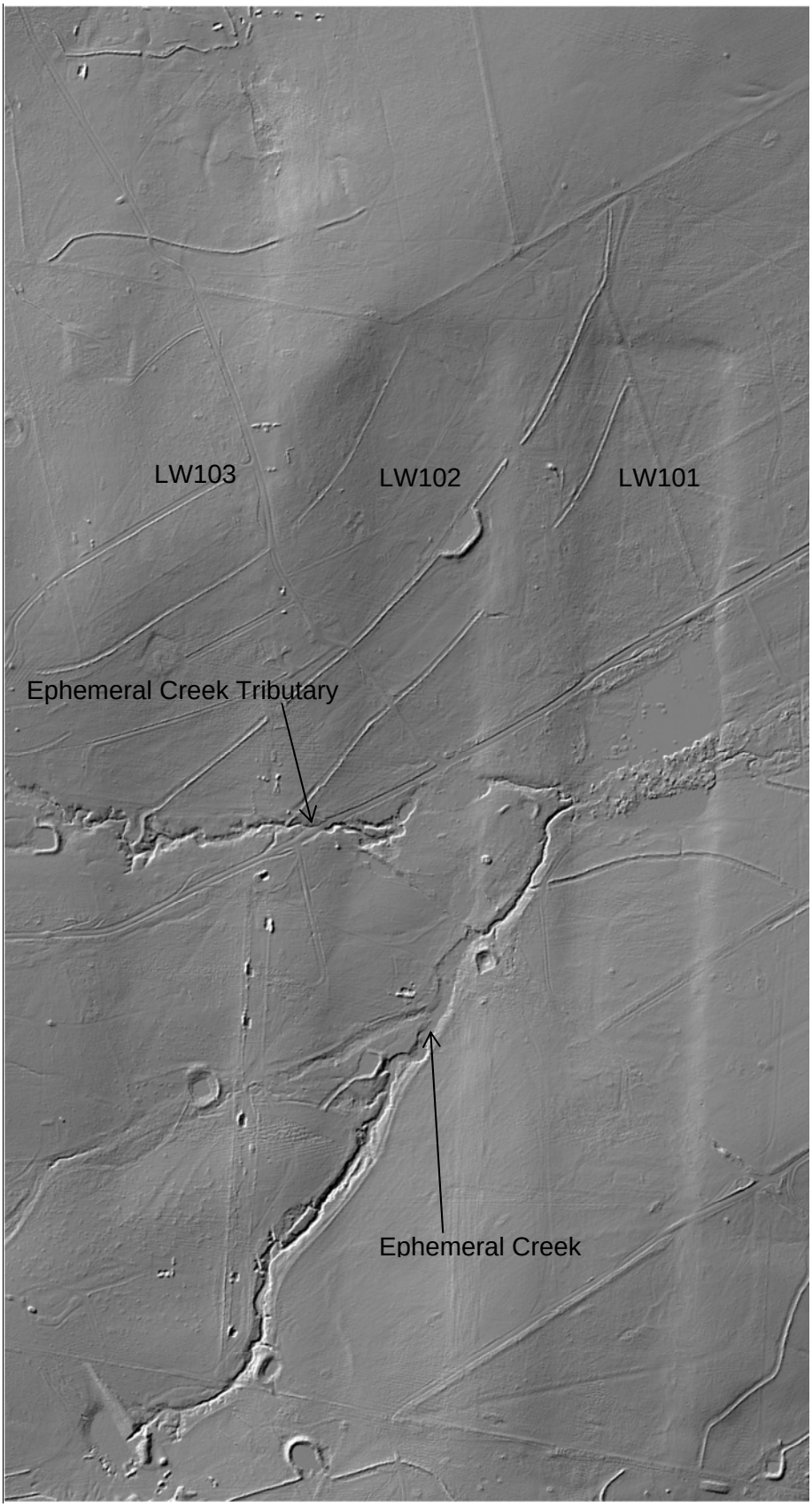


Figure 1: ALS Survey Image of LW101-LW103, October 2014

Table 3 outlines all of the longitudinal surveys undertaken up to 17 December 2014 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	16	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	12	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	7	All points surveyed
103 South - Centreline	103	April & May 2012-	2/10/2014, 7/10/2014, 23/10/2014	3	All points surveyed
104 North – Centreline	104	August 2014	10/12/2014, 17/12/2014	2	All points surveyed
104 South – Centreline	104	December 2013 & January 2014	-	-	-
105 North – Centreline	105	December 2013 & January 2014	-	-	-
105 South – Centreline	105	December 2013 & January 2014	-	-	-
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	16	Surveyed to point 157 of 211
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	10	All points surveyed
C – Dam Wall	103	REMOVED			
D – Pine Creek (PC)	104 & 105	December 2013 & January 2014	-	-	Baseline surveys complete

Monitoring Line	Panel	Installation Date	Survey Date(s)	Survey(s) Completed	Comments
E – PC1 Crossline 1	101 & 102	April & May 2012	4/01/2013, 7/01/2013, 16/1/2013, 18/06/2013, 17/10/2013, 21/10/2013, 23/10/2013, 13/05/2014	8	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	8	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	8	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	19	Pole 2 to Pole 7

Table 4 compares the predicted subsidence parameters to all of the measured subsidence parameters for data available to 17 December 2014.

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	2.665
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	2.671
Tilt (mm/m)	35	40.2
Tensile Strain (mm/m)	8 – 16^	18.8

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Compressive Strain (mm/m)	10 – 20^	23.4
Angle of Draw (°, Degrees)	22.5 – 26.5	18.1
Line 103 – Centre of LW103 – Southern		
Subsidence (m)	2.44	2.448*
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	1.503*
Tilt (mm/m)	32	29.5*
Tensile Strain (mm/m)	7 – 14^	19.4*
Compressive Strain (mm/m)	8 – 16^	40.2*
Angle of Draw (°, Degrees)	22.5 – 26.5	15.8*
Line A – Cross Panel Survey Line		
Subsidence (m)	2.44	2.590*
Tilt (mm/m)	47	56.3*
Tensile Strain (mm/m)	11 – 22^	17.1*
Compressive Strain (mm/m)	14 – 28^	26.7*
Angle of Draw (°, Degrees)	22.5 – 26.5	25.7*
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 E – Pine Creek Tributary 1 Crossline 1		
Subsidence (m)	2.44	1.012*
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	2.665*
Tilt (mm/m)	41	53.5*
Tensile Strain (mm/m)	10 – 20^	6.6*
Compressive Strain (mm/m)	12 – 24^	11.9*
Line G – Pine Creek Tributary 1 Crossline 3		
Subsidence (m)	2.44	1.120*

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Tilt (mm/m)	47	22.2*
Tensile Strain (mm/m)	11 – 22^	8.0*
Compressive Strain (mm/m)	14 – 28^	1.5*
Power Poles		
Pole 2		
Subsidence (m)	0	0.046
Dynamic Tilt (mm/m)	0	9.09
Final Tilt (mm/m)	0	9.09
Conductor length change between poles 2-3 (m)	0.13	-0.59
Conductor Clearance Loss (m)	0.77	+0.76
Pole 3		
Subsidence (m)	2.18	2.085
Dynamic Tilt (mm/m)	30	66.3
Final Tilt (mm/m)	12	50.07
Conductor length change between poles 3 - 4 (m)	0.28	-0.81
Conductor Clearance Loss (m)	1.10	1.38
Pole 4		
Subsidence (m)	2.11	2.061
Dynamic Tilt (mm/m)	25	74.23
Final Tilt (mm/m)	15	31.80
Conductor length change between poles 4 - 5 (m)	0.13	0.02
Conductor Clearance Loss (m)	0.07	+1.40
Pole 5		
Subsidence (m)	0.31	0.183
Dynamic Tilt (mm/m)	2	25.66
Final Tilt (mm/m)	2	19.40
Conductor length change between poles 5 - 6 (m)	0.024	-1.03
Conductor Clearance Loss (m)	0.30	+2.04
Pole 6		
Subsidence (m)	1.41	1.540
Dynamic Tilt (mm/m)	1	129.68
Final Tilt (mm/m)	27	-
Conductor Clearance Loss (m)	1.08	-
Pole 7		
Subsidence (m)	2.42	0.007

Longwall Panels (LW) 101 to LW104		
	Maximum Predicted Extraction Plan	Maximum Measured
Dynamic Tilt (mm/m)	3	215.91
Final Tilt (mm/m)	3	-
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 LW103 as follows:

- The maximum subsidence measurements for Line 103 – Northern (Line 103 – Southern) were within +/- 10% of the predicted value of 2.44 m (2.44 m) with a maximum measured value of 2.671 m (2.448 m), refer to Figure 2 and Figure 3.
- The maximum tilt measurements recorded for LW103 (Line 103 – Northern) exceeded the maximum predicted value of 35 mm/m, refer to Figure 4 and Figure 5 (Line 103 – Southern). However, the exceedances were within 15% of the maximum predicted value, and 96% of all values were within the predicted range.
- The maximum tensile strain measurements for LW103 (Line 103 – Northern) 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 (Line 103 – Southern). However, the exceedances were within 18% of the maximum predicted value, and 97% of the recorded values were within the predicted range.
- The maximum compressive strain measurements for LW103 (Line 103 – Northern) 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 (Line 103 – Southern). However, the exceedances were within 17% of the maximum predicted value, and 95% of the recorded values were within the predicted range.

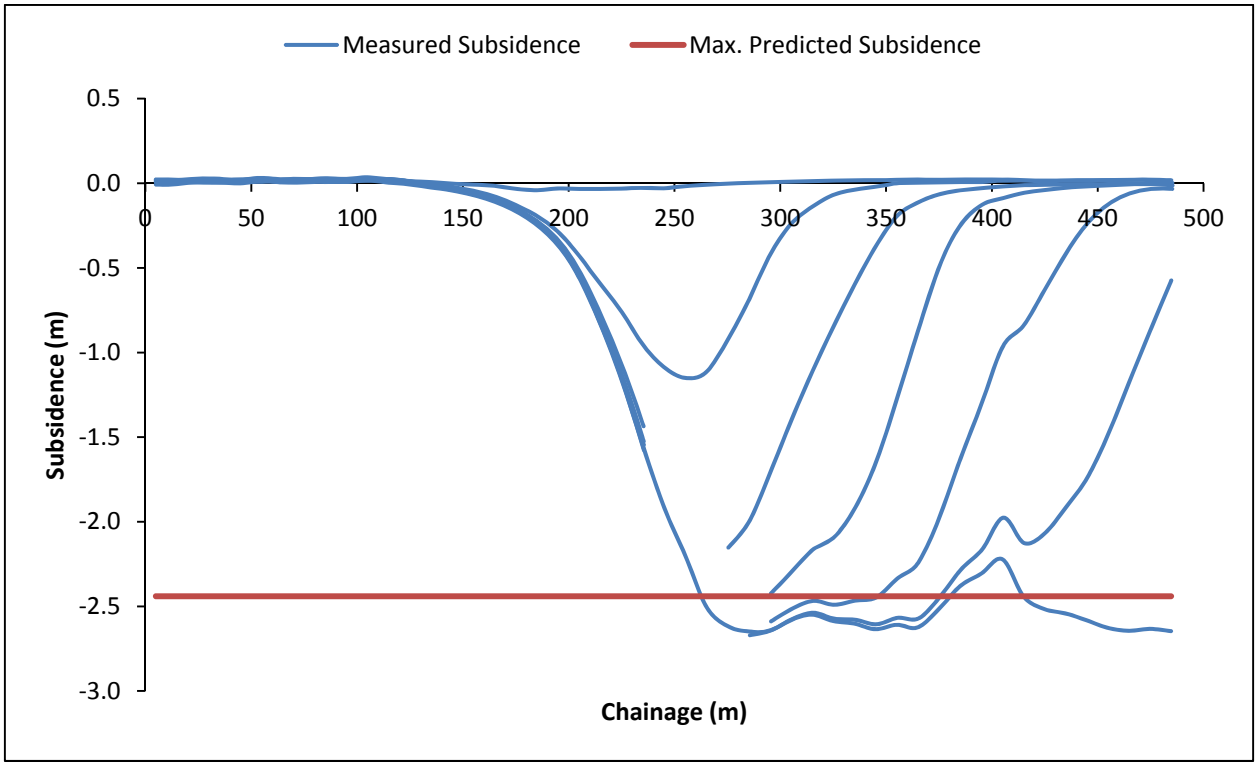


Figure 2: LW103 (North) Subsidence

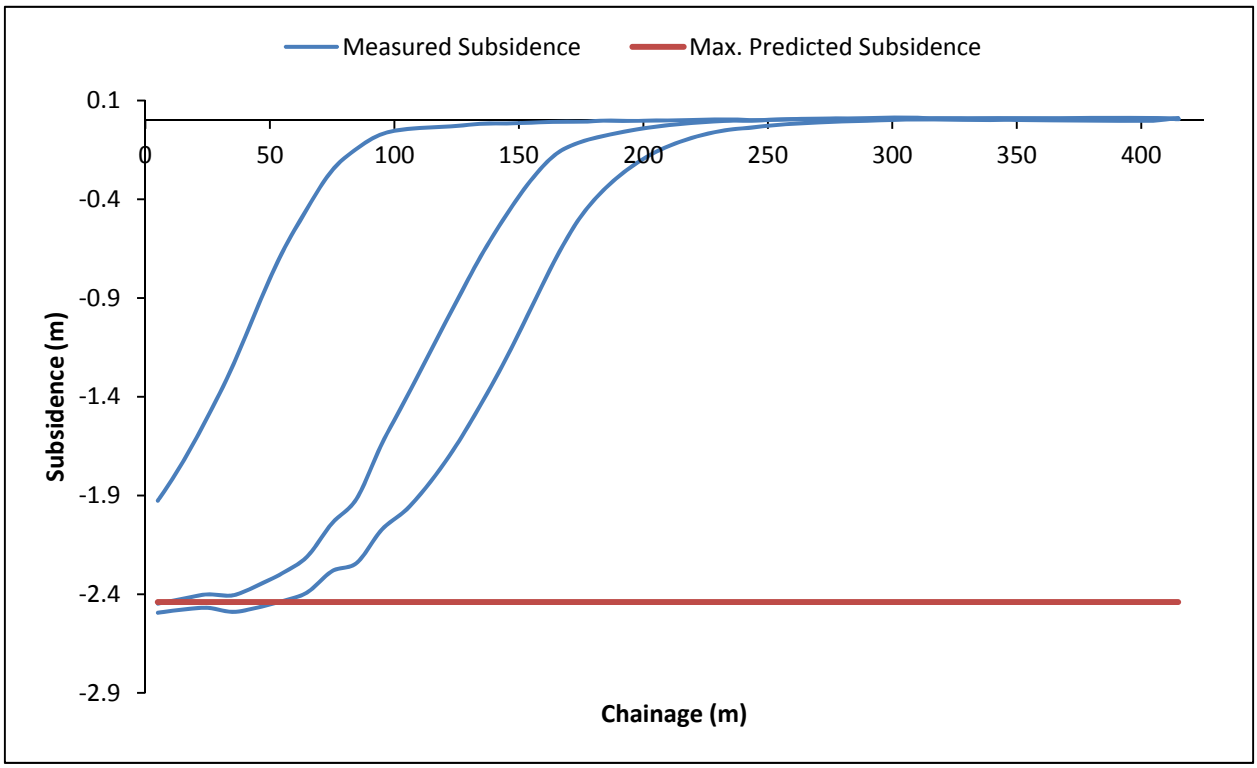


Figure 3: LW103 (South) Subsidence

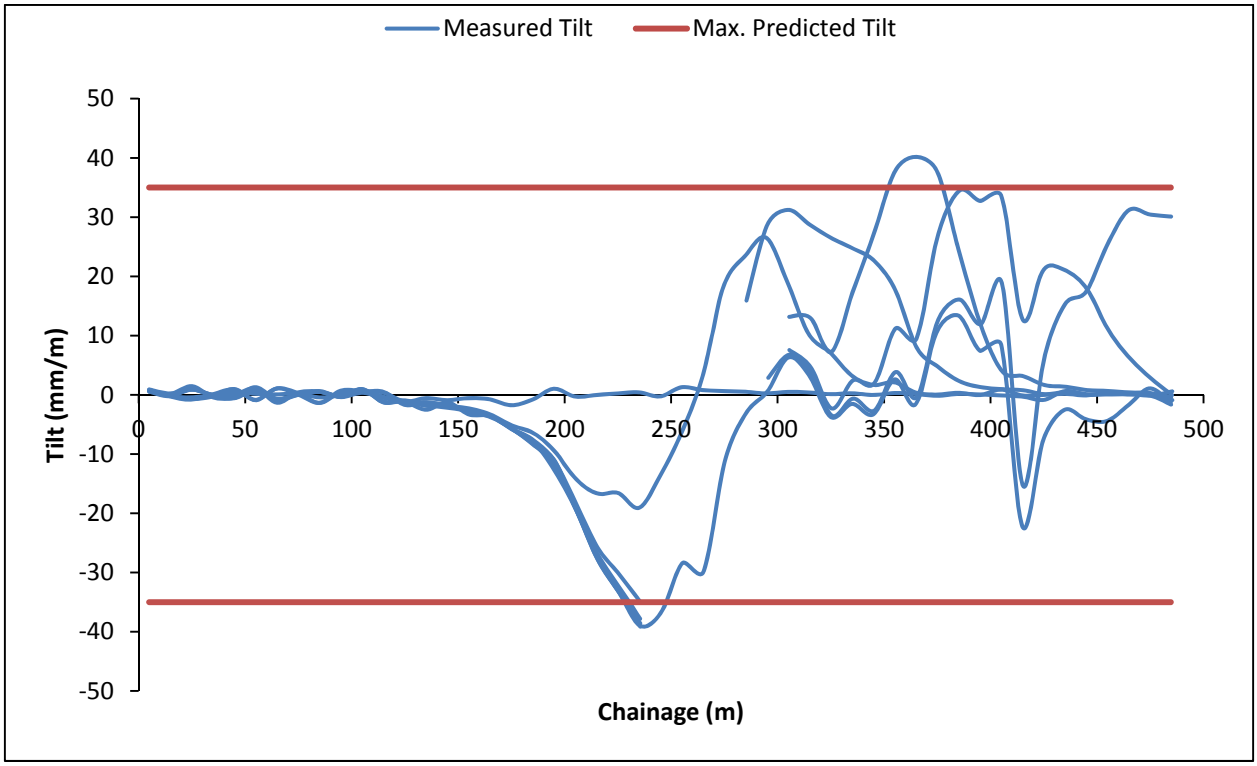


Figure 4: LW103 (North) Tilt

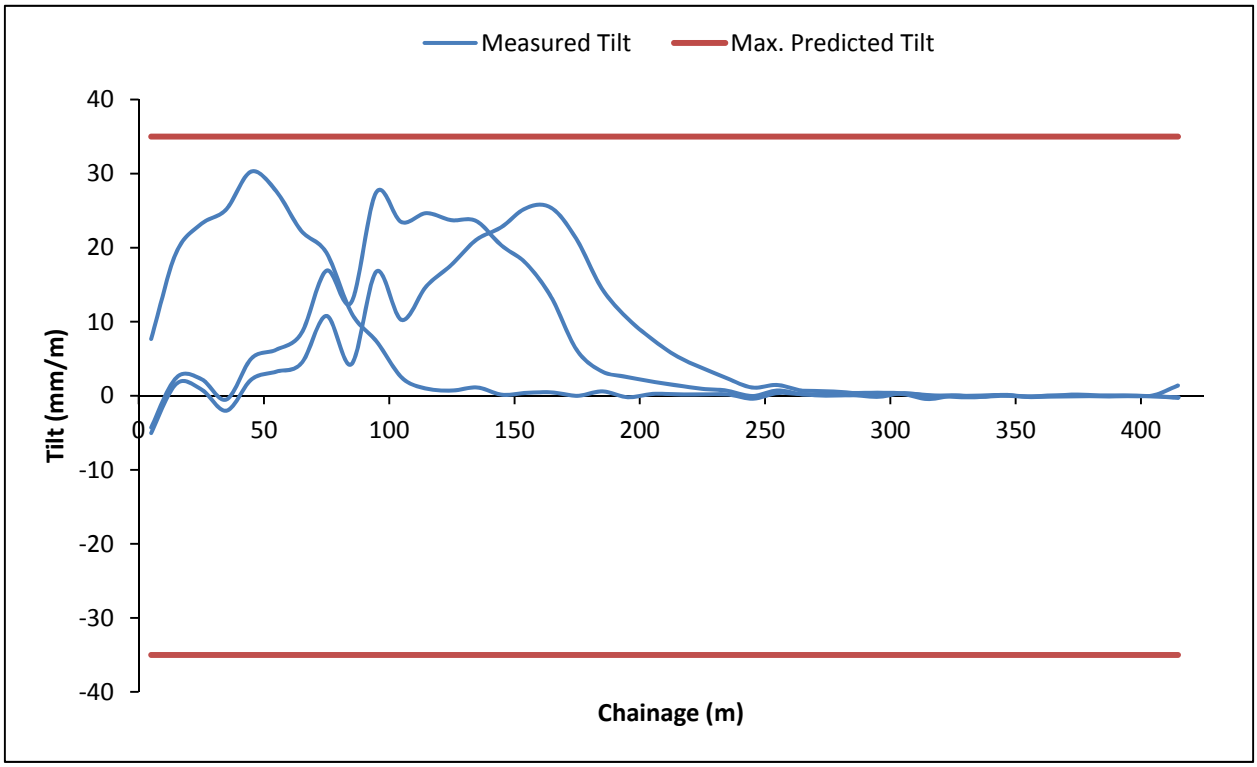


Figure 5: LW103 (South) Tilt

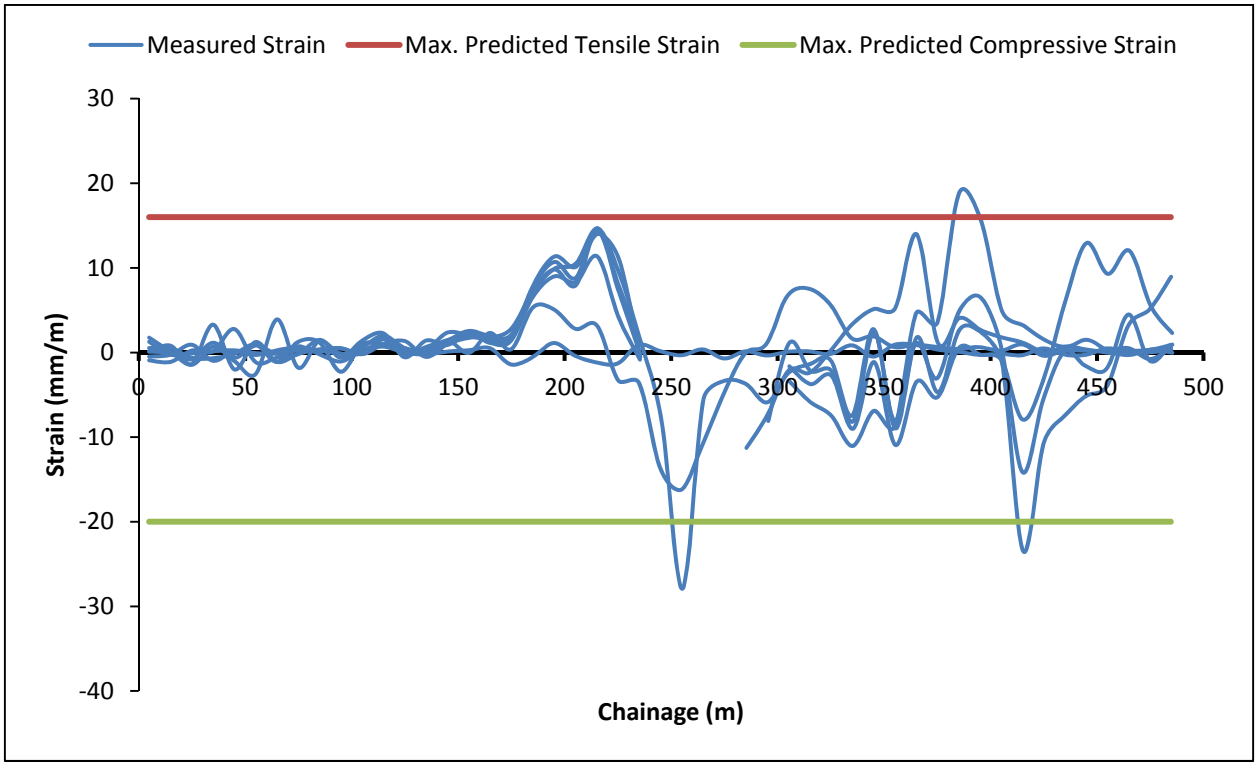


Figure 6: LW103 (North) Strain

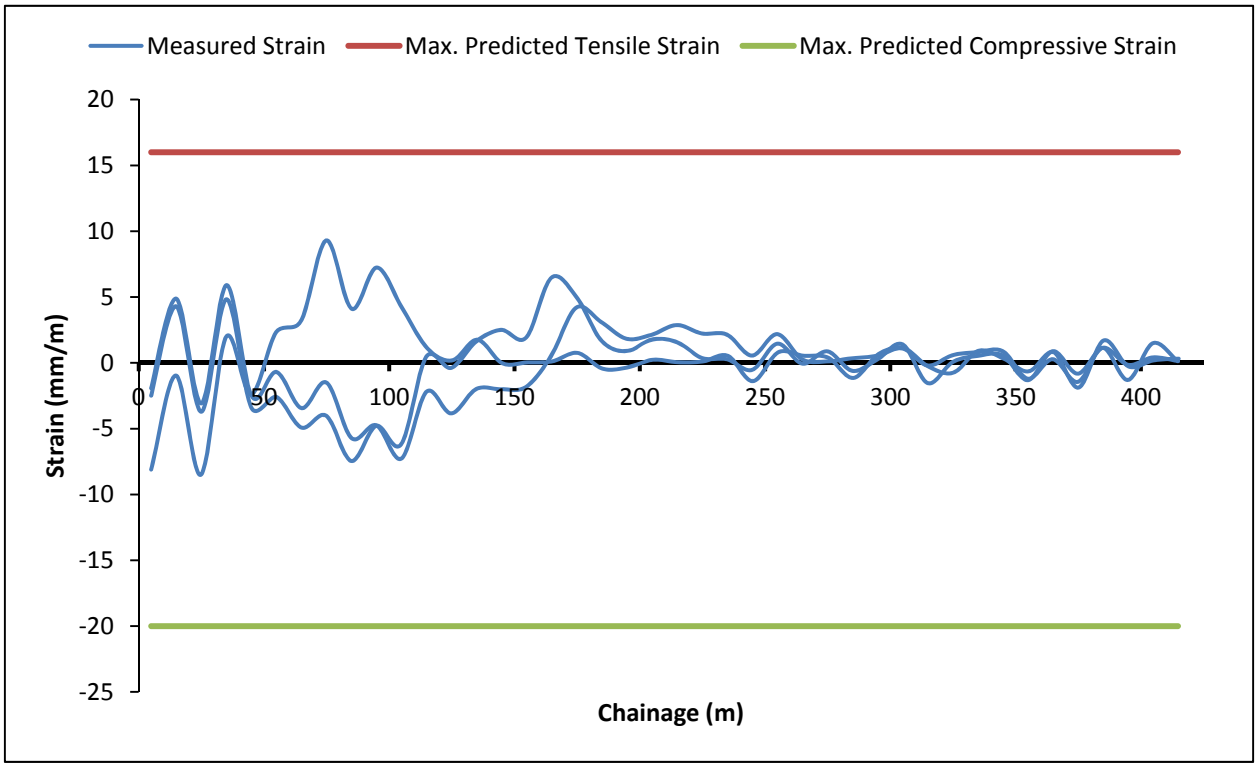


Figure 7: LW103 (South) Strain

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 LW103 during the extraction of LW103. Measured maximum subsidence results are as follows: LW101 was recorded to be 2.633m; LW102 was recorded to be 2.665m; and LW103 was measured to be 2.671m. The maximum tensile strains for LW101 to LW103 ranged from 18.8 – 20.7 mm/m, and the maximum compressive strains for LW101 to LW103 ranged from 23.4 – 46.7 mm/m. The maximum subsidence results to date show general consistency between panels 101-103.

The approved Subsidence Monitoring Program requires subsidence to be monitored above LW101 until movement ceases. Narrabri Mine will undertake another subsidence survey during March 2015 above LW101 to determine if movement has ceased in accordance with the Subsidence Monitoring Program. If it is deemed to have ceased then Narrabri Mine will seek the approval of the Principal Subsidence Engineer at the Division of Resources and Energy to remove the subsidence line from the monitoring programme as required by the Subsidence Management Plan (SMP) approval.

4.2 Predictions in the SMP and EA

4.2.1 Natural Features

Pine Creek and Tributaries

Water ponding has been observed in LW103 in two tributaries of Pine Creek, refer to Photo 1. The ponding in the tributaries of Pine Creek 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.

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 in LW101. 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. Should the ponding of water impact the soils the mine will investigate additional options for management which may include a diversion drain to minimise the level of ponding.

Narrabri Mine is also investigating the option of retaining the ponding areas at the mine with the aim of improving them to become semi-permanent wetland areas to enhance the ecological diversity of the area.

Photo 1: Ponding at LW103 within a Tributary of Pine Creek

For the ponding of water in the tributaries in LW103 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 the tributary of Pine Creek is 5.47%. 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). Monitoring required by the Land Management Plan, developed as part of the Extraction Plan, noted that no remediation works are recommended for the area of ponding within LW101 to LW103.

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 five standpipe piezometers that Narrabri Mine monitors for water levels and quality within and surrounding the mining lease (P1-P5, P7-P13, P15-P16, 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 (P23-P24, P26-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.

The Groundwater Assessment undertaken as part of the Stage 2 Longwall Project EA predicted the following impacts to groundwater resources surrounding the mine site at the end of mining, i.e. Year 29 (2031):

- Permian Coal Measures: In the Hoskissons Coal Seam drawdowns of 1m or more are predicted to extend to a maximum of 20km from the mined areas to the southwest and northeast
- Triassic Formations: In the Napperby Formation drawdowns of 1m or more are predicted to extend to a maximum of 10km from the mined area to the southwest and northwest;
- Jurassic Formations: In the Garrawilla Volcanics drawdowns of 1m or more are predicted to extend to between 5 and 8km to the west of the mined areas. The Pilliga Formation is dry within the Longwall project area and therefore no drawdowns are predicted; and
- Quaternary Alluvium/Colluvium/Regolith: In the alluvium/colluvium/regolith drawdowns of 0.5m are predicted to extend up to 3km to the north but drawdown impact to date has generally been limited to the mining lease.

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 LW103 has not impacted upon water levels surrounding the mine site.

Groundwater inflow monitoring results are described in the Narrabri Mine 2013-2014 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 reporting period the average daily inflow was calculated to be 0.998ML/day, comprising 0.972ML/day of mine dewatering and 0.026ML/day of pre-drainage water. It should also be noted that while 0.972ML/day was pumped from the underground 0.797ML/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 LW103.

Natural Vegetation

As reported previously, large trees have been impacted by subsidence above LW101 and LW102. Narrabri Mine can report that no impacts to trees were recorded during the extraction of LW103. In late November 2014 a report was issued on the tree deaths that occurred in LW101 and LW102, a summary of the findings are included below:

- Increased tree condition in a gradient from LW101 showing the most impact grading to LW103 showing no clear evidence of impact. Conditions that vary in the transition from LW101 to LW102 and then to LW103 include:
    - Increasing depth of cover;
    - Change of soils with a distinct change in texture from heavy clays to lighter soils; and
    - Moister soil conditions associated with the undermining of the target area with LW103.
- Lateral movement of overburden occurred in the top 20 – 30 m, resulting in surface cracks more than 100 mm at about 8 m apart. Evidence of visible root shearing was found and is a likely cause of declining tree condition. It was likely that root shearing is exacerbated by dry conditions, heavy soil texture with associated high consistence, and shallow depth of cover with increased surface impacts including cracking and surface deformation.
- Groundwater level and quality is unlikely to be a contributing factor to the decline in tree health in this particular instance. Analysis of groundwater data showed no apparent fluctuations coinciding with subsidence of the impacted area.
- For LW104 and longwalls further to the west the depth of cover increases and the soil texture becomes lighter and as a result further impacts on trees are expected to be minimal.
- Natural regeneration is occurring over LW101 and LW102 with *Eucalyptus microcarpa* (Grey Box) saplings recorded in both regeneration monitoring plots. *Geijera parviflora* (Wilga) and *Casuarina cristata* (Belah) which were not impacted by the longwall subsidence were also recorded to be emerging.

Narrabri Mine provided the full report to both the Department of Planning and Environment (DP&E) and the Division of Resources and Energy (DRE) on 28 November 2014.

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. Ploughing in LW103 was undertaken during the extraction of LW103 however it is was only limited 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 LW103 when conditions improve.

Photo 2: Surface Crack in LW103

Photo 3: Ploughing Above LW103

4.2.2 Public Utilities

Roads

One public road was undermined during the extraction of LW103, 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 the GRMP which formalised the management measures to be implemented was signed by both Narrabri Mine and NSC on 6 November 2012. As outlined in the GRMP, Narrabri Mine intends to purchase the road as part of its long-term management strategy. The mine has applied to the Crown Lands division of NSW Trade and Investment to purchase the road and the determination is currently pending.

Daily inspections during active subsidence were undertaken as outlined in the GRMP and the Built Features Management Plan, part of the Extraction Plan. In accordance with the GRMP, Greylands Road was inspected by NSC and closed prior to undermining. Typical impacts during undermining are illustrated in Photo 4. Following mining, Narrabri Mine undertook remediation works in the form of stabilising the surface of the road with gravel. The road remains closed to the general public.

Photo 4: Greylands Road during Undermining in LW103

Culverts

No culverts were undermined during the extraction of LW103.

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 LW103 this power line was undermined during September 2014. The lessee of the mine owned "West Haven" property has been provided with an alternative power supply as outlined in the EEMP. Survey monitoring of the power poles and conductor clearances was undertaken as required by the Subsidence Monitoring Program, refer to Table 4.

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

Limited ploughing of the land overlying LW103 was undertaken during its extraction, refer to Section 4.2.1. No other areas of agricultural utilisation were impacted during the extraction of LW103 as the ponding that occurs in the tributaries of Pine Creek is limited to within the creek banks, and therefore doesn't affect any of the surrounding agricultural land.

Farm Buildings or Sheds

No farm buildings or sheds were undermined during the extraction of LW103.

Fences

Fences and gates were undermined during the extraction of LW103. 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

One small farm dam was undermined in LW103. Rainfall at the mine during August 2014 refilled this dam which is now full and holding water. Subsidence has not impacted on the function of this dam.

Soil Conservation Works

Seven contour banks, or parts thereof, were undermined during the extraction of LW103. 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 LW103 (refer to Section 4.2.1). No mine installed monitoring bores were directly impacted by the extraction of LW103.

Access Tracks

Access tracks were impacted by the extraction of LW103 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 LW103 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 LW103.

4.2.5 Other Significant Features

Areas of Archaeological and/or Heritage Significance

Seven previously identified cultural heritage sites are located above LW103 being Sites 12-15 and 29-31. Sites 14 and 29 are isolated artefacts. Sites 12, 13, 15, 30 and 31 are artefacts scatters. 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 31 within the mining area and as can be seen there is no cracking or any other subsidence impact to the site 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 31 Located Within the Mining Area of LW103

5. TRENDS IN MONITORING RESULTS

Subsidence monitoring results for LW101 to LW103 show that measured subsidence is closer to 63% of the cutting height of 4.3m with 42% 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 10% 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 undertook the following consultation in relation to LW103:

- 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;
- Department of Planning and Environment (DP&E) and the Division of Resources and Energy (DRE) in relation to the tree impacts observed in LW101 and LW102 including issuing a report on the results of investigations undertaken into the impacts and the results of impacts above LW103;
- Narrabri Mine Community Consultative Committee (CCC) which includes providing subsidence measurement results and a tour of the subsidence impacted area above LW101 to LW103; and

- DRE in relation to subsidence results.

On 9 October 2014 representatives from DRE, DP&E 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 LW103.

Discussions are ongoing with the resident at the mine owned "West Haven" property which has been provided with an alternative power supply as required by the Essential Energy Management Plan (EEMP).

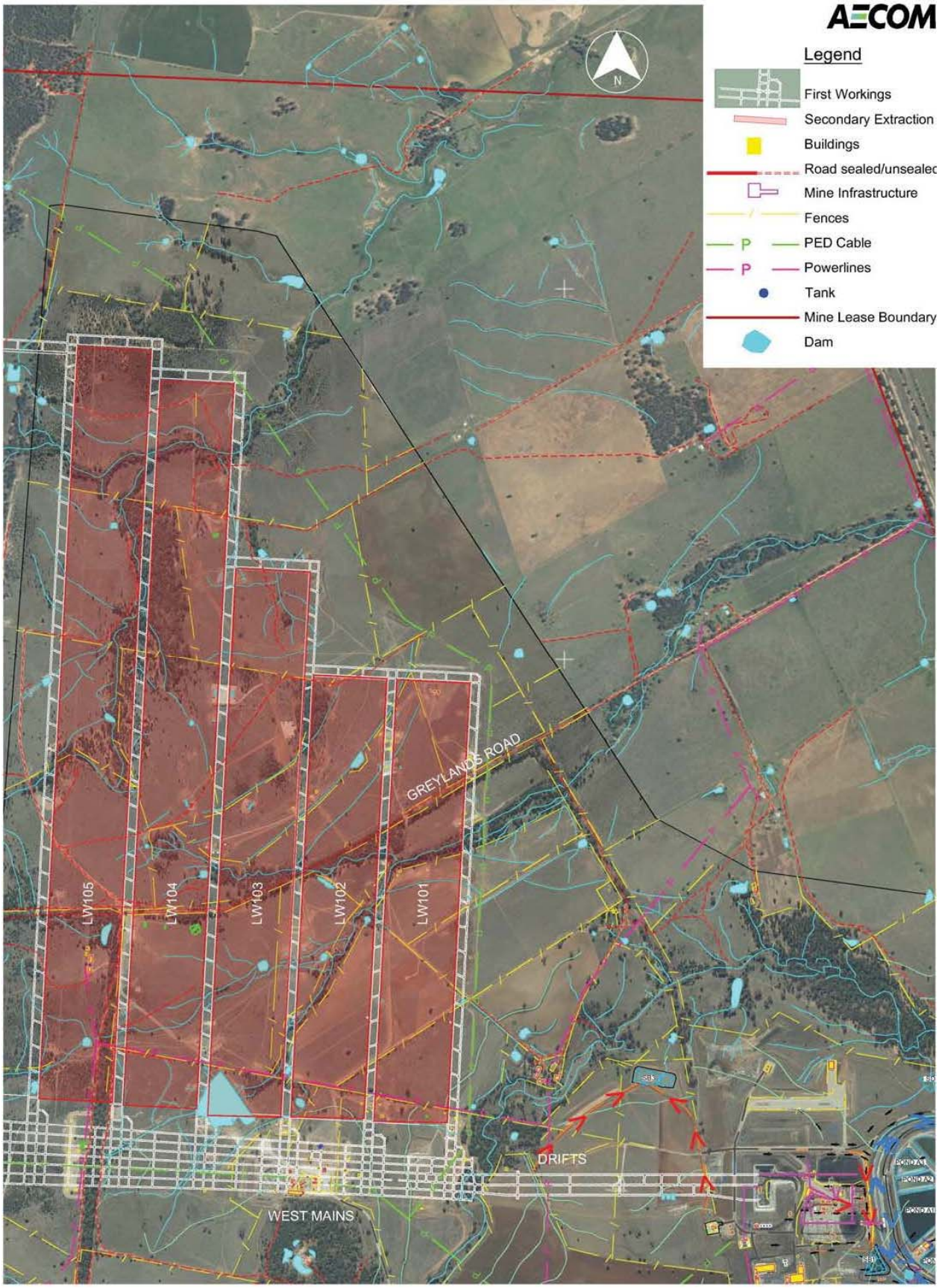
6.1 Community Complaints

No community complaints were received in relation to subsidence and subsidence related impacts during the extraction of LW103.

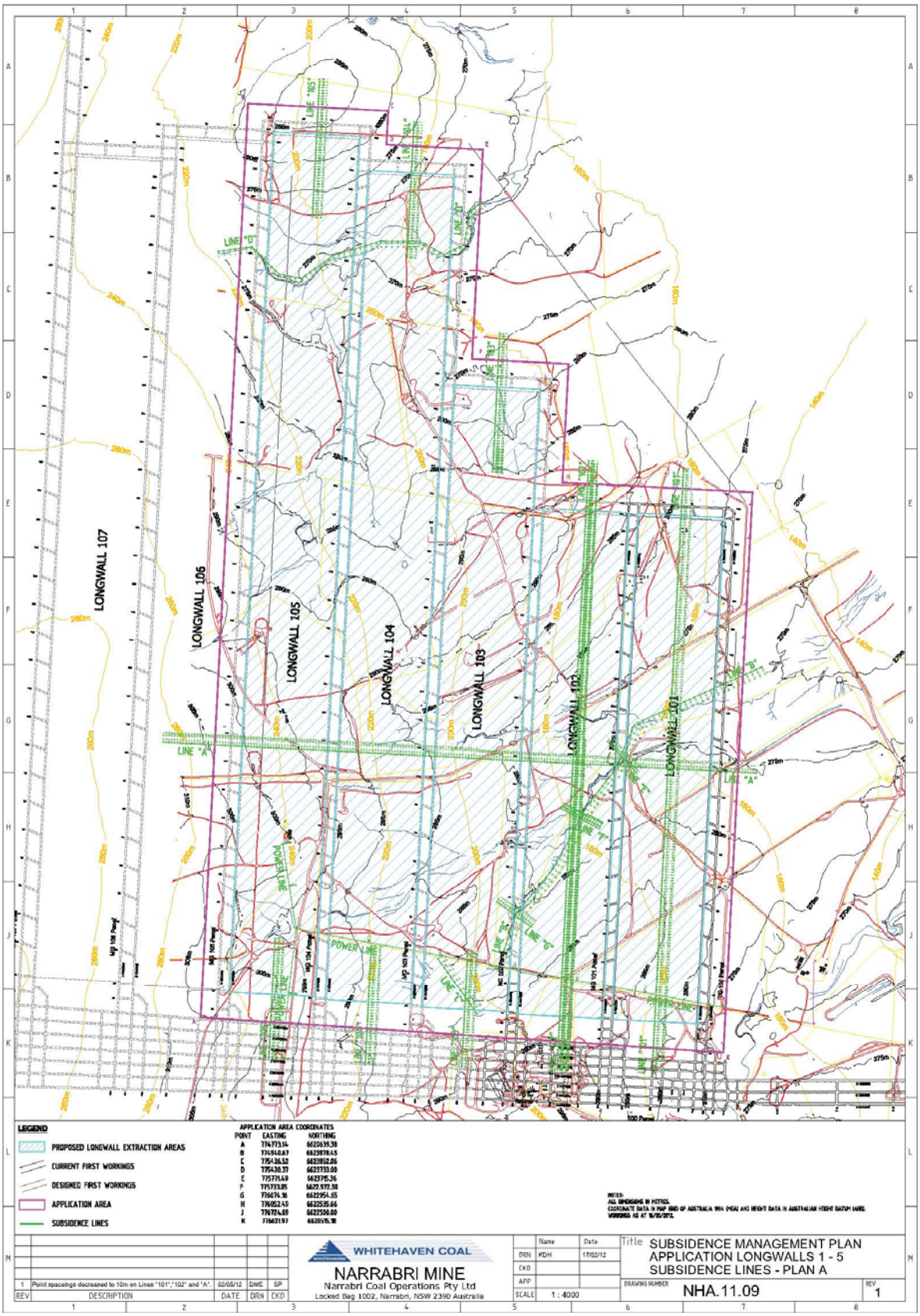
6.2 Narrabri Mine Community Consultative Committee

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 Plan



Attachment 2: Narrabri Mine Subsidence Monitoring Lines LW101 to LW105



Appendix 1: Narrabri Mine Groundwater Monitoring Results

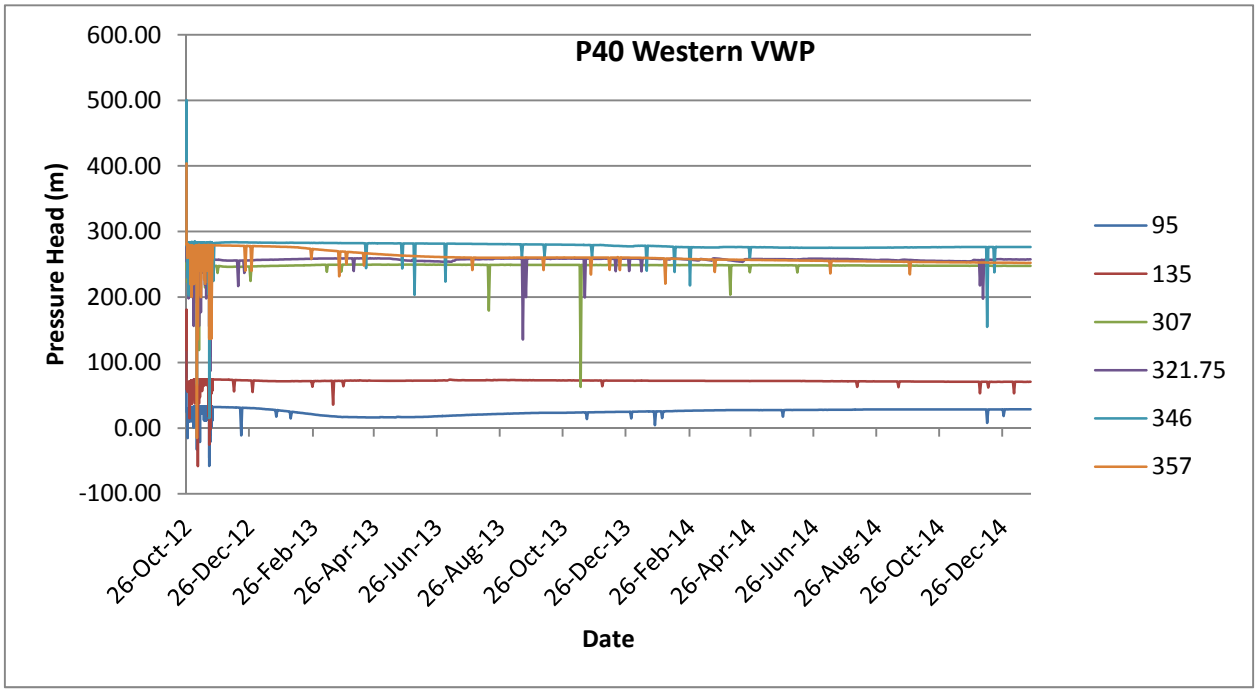


Figure 1: P40 Monitoring Results

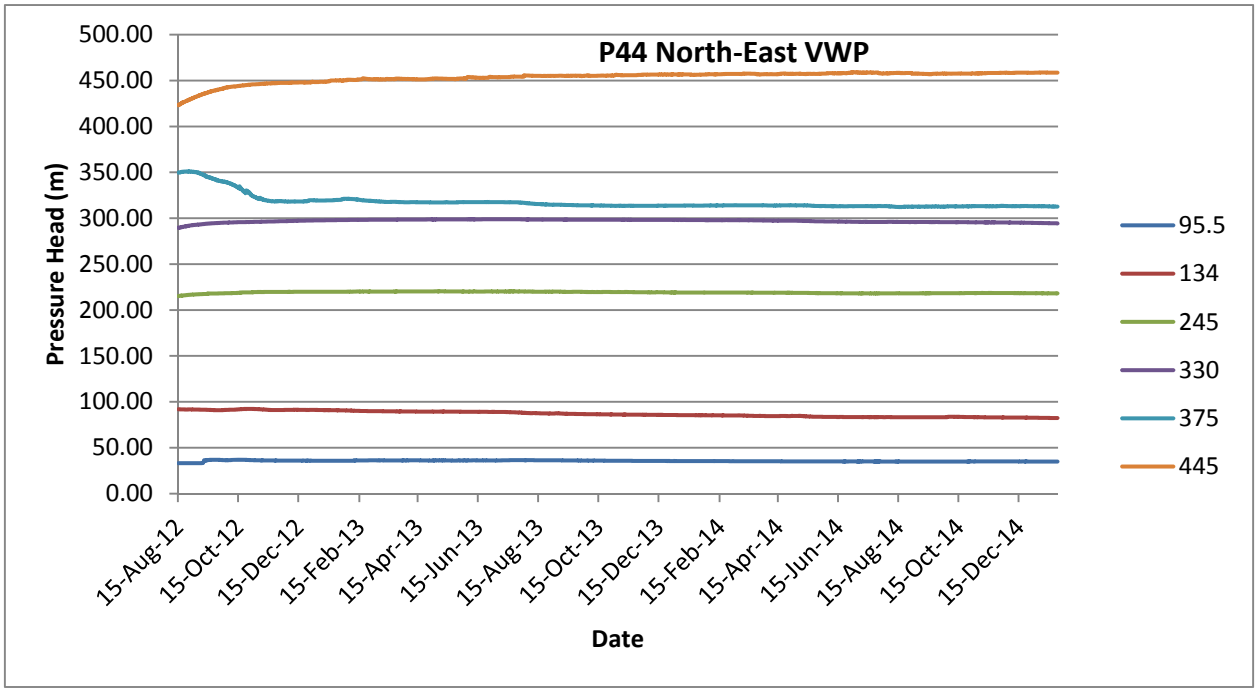


Figure 2: P44 Monitoring Results

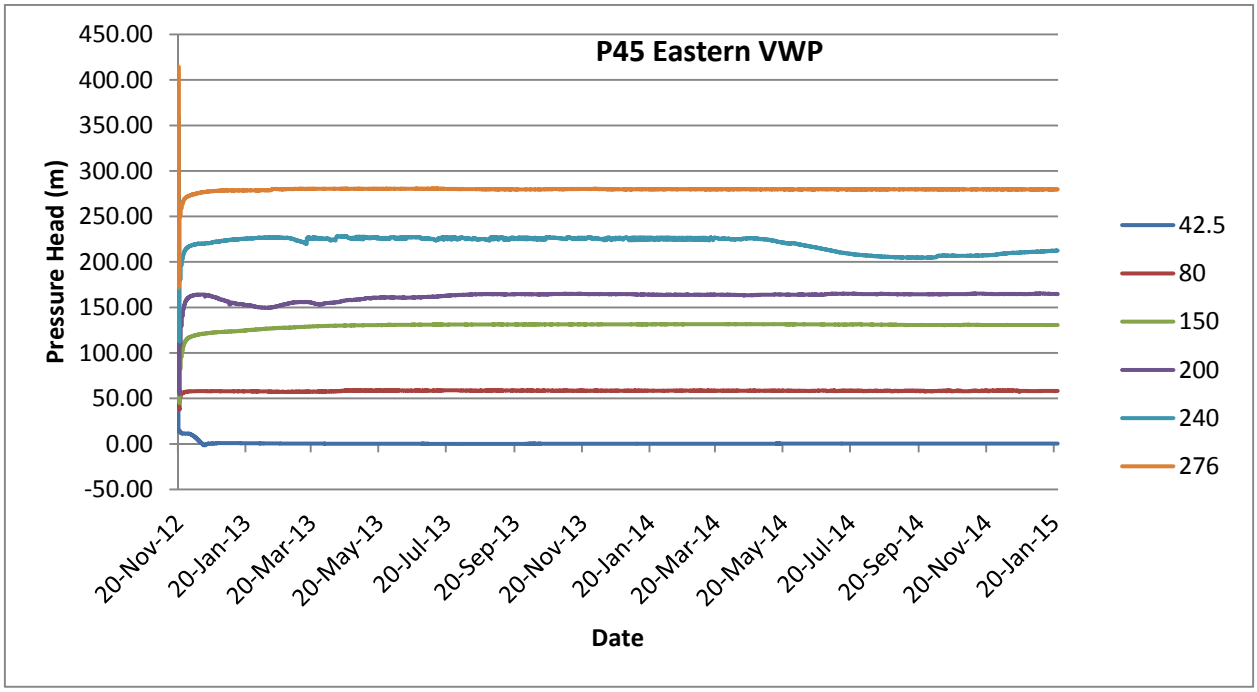


Figure 3: P45 Monitoring Results

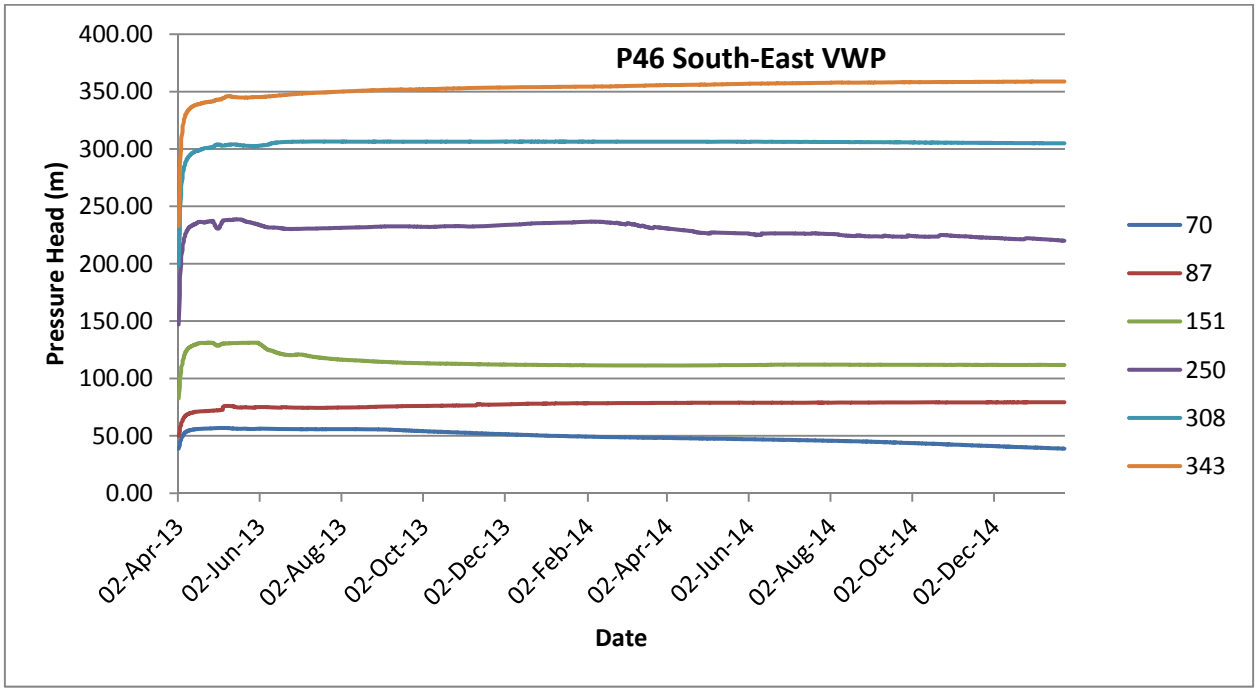


Figure 4: P46 Monitoring Results

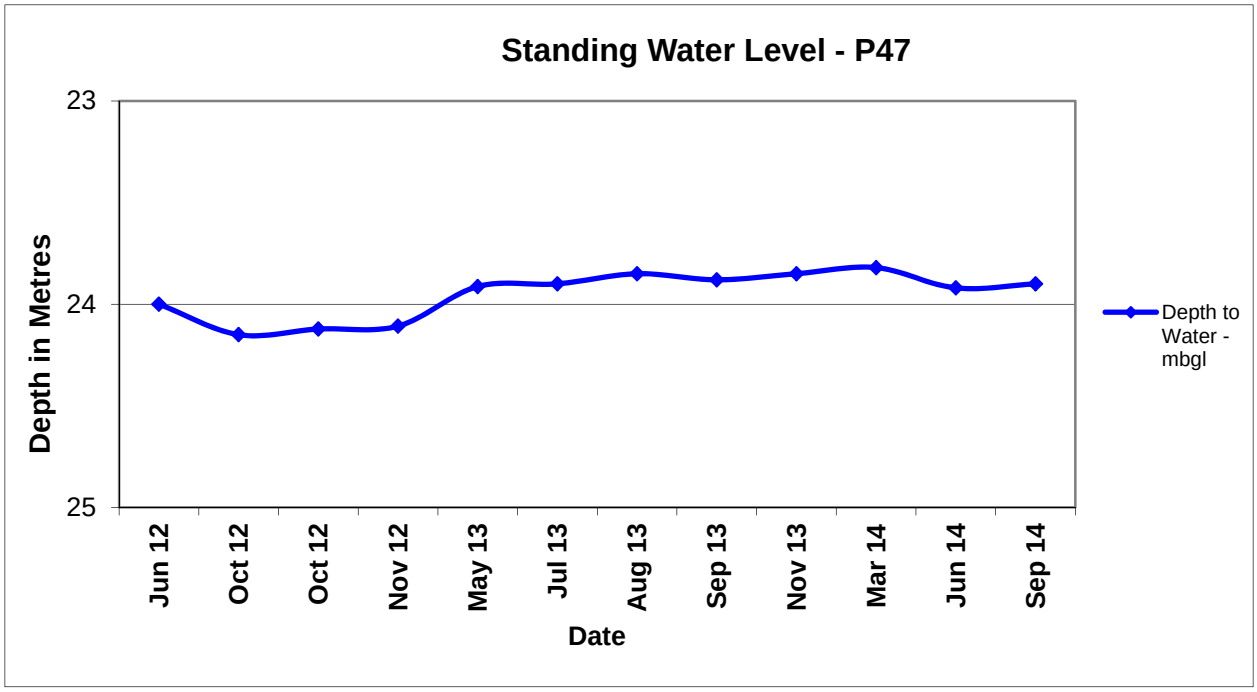


Figure 5: P47 Monitoring Results