



Centennial Coal

Angus Place



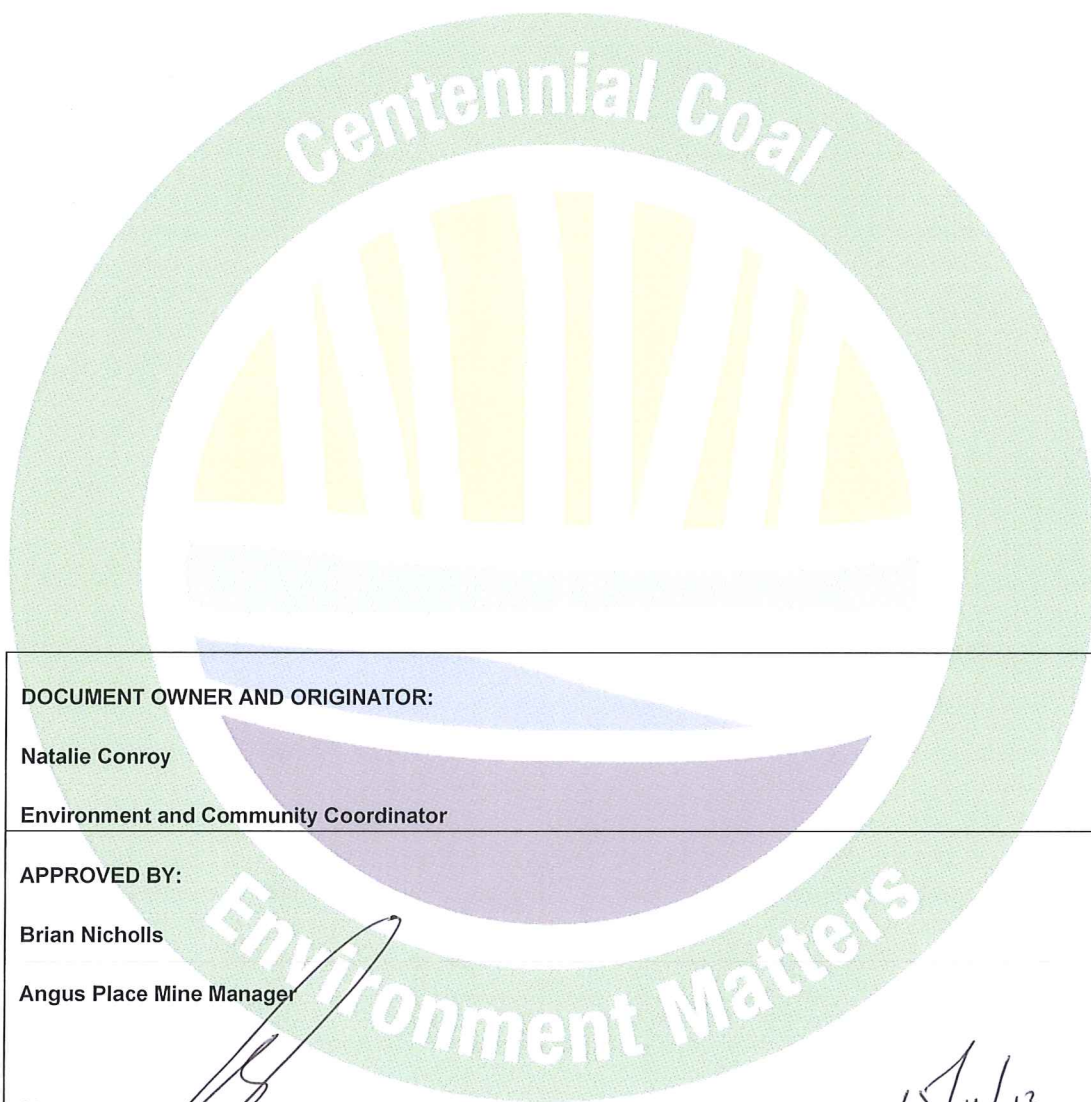
Longwall 900W Powerline Management Plan

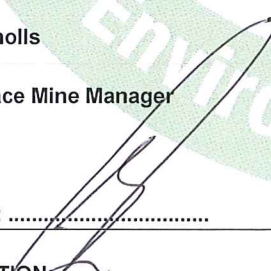
Angus Place Colliery

November 2013



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TABLE OF CONTENTS

1. INTRODUCTION	1
2. PURPOSE	1
3. SCOPE	1
4. REGULATORY REQUIREMENTS	4
4.1. Project Approval and Statement of Commitments	4
4.2. Mining Leases	4
4.3. Longwalls 930 – 980 SMP Approval	5
5. RELEVANT FEATURE(S) AND PREDICTED IMPACTS	6
5.1. Relevant Feature(s)	6
5.2. Predicted Impacts	6
5.2.1. <i>Subsidence Predictions</i>	6
5.2.2. <i>Specialist Powerline Impact Assessment</i>	7
5.2.3. <i>Subsidence Assessment Review</i>	8
6. IDENTIFIED RISKS	9
7. PERFORMANCE MEASURES AND INDICATORS	12
7.1. Performance Measures	12
7.2. Performance Indicators	12
8. MANAGEMENT MEASURES	12
8.1. Endeavour Energy 66kV Powerline	12
8.2. Existing Erosion and Sedimentation Along Powerline Corridor	13
9. MONITORING PROGRAM	13
9.1. Baseline Monitoring.....	13
9.2. Monitoring Subsidence Impacts	13
9.3. Monitoring Environmental Consequences	15
9.4. Success of Remediation Measures.....	15
10. CONSULTATION	17
11. ADAPTIVE MANAGEMENT	17
12. CONTINGENCY PLAN	17
13. ROLES AND RESPONSIBILITIES	19
14. REPORTING	19
15. REVIEW	20
16. REFERENCES	21

Tables

Table 1. Relevant Project Approval Conditions	4
Table 2. Relevant Mining Lease Condition	4
Table 3. Relevant SMP Approval Conditions	5
Table 4. Worst Case Final Subsidence Predictions for 66kV Power Poles	7
Table 5. Risks to Endeavour Energy 66kV Powerline	9
Table 6. Subsidence Monitoring Program	14

Table 7.	Trigger Action Response Plan for Endeavour Energy 66kV Powerline	18
Table 8.	Key Personnel and Accountabilities	19
Table 9.	Primary Contacts.....	20

Figures

Figure 1	Locality.....	2
Figure 2	Endeavour Energy 66kV Powerline.....	3
Figure 3	Powerline Monitoring.....	16

Plates

Plate 1.	Endeavour Energy 66kV Powerline at Angus Place	6
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Appendices

Appendix 1	Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy’s 66kV Feeder 811/2	
Appendix 2	Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy’s 66kV Feeder 811/2	
Appendix 3	Stakeholder Consultation	

Abbreviations

AEMR	Annual Environmental Management Report (now known as Annual Review)
CCL	Consolidated Coal Lease
DgS	Ditton Geotechnical Services
DP&I	NSW Department of Planning and Infrastructure
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy
EA	Environmental Assessment
FCNSW	Forestry Corporation of NSW
ML	Mining Lease
Mtpa	Million Tonnes per Annum
PA	Project Approval
PLSCADD	Power Line Systems CADD
ROM	Run of mine
SMP	Subsidence Management Plan
TARP	Trigger Action Response Plan

1. INTRODUCTION

Angus Place Colliery (Angus Place) is an underground coal mining operation located approximately five kilometres north of the village of Lidsdale, eight kilometres northeast of the township of Wallerawang and approximately 15 kilometres northwest of the city of Lithgow in the Blue Mountains region of NSW. It is bordered by Springvale Colliery to the south, Ivanhoe Colliery to the northwest and Wolgan Valley and Newnes Plateau to the north and east, respectively. The regional locality of Angus Place is shown on **Figure 1**.

Angus Place has been in operation since 1979 and is operated by Centennial Angus Place Pty Ltd, a joint venture company owned in equal share between the Centennial Coal Company Ltd and SK Kores of Korea. Secondary extraction of coal is currently undertaken at Angus Place utilising the longwall method of mining within Mining Lease (ML) 1424 and Consolidated Coal Lease (CCL) 704.

Project Approval PA 06_0021 was granted by the then NSW Department of Planning (now Department of Planning and Infrastructure (DP&I)) on 13 September 2006. This approval allowed for an extension of underground longwall mining operations and an increase in run of mine (ROM) coal production to 3.5 million tonnes per annum (Mtpa). PA 06_0021 has been modified on two occasions. Modification 1 (Mod 1) was approved on 29 August 2011 and allowed for the development and extraction of two additional longwall panels (Longwall 900W and 910) as well as an increase in production limit to 4 Mtpa. Modification 2 (Mod 2) was approved in April 2013 and allowed for the development of underground roadways and the construction and operation of a Ventilation Facility (APC-VS2) and supporting infrastructure.

This *Longwall 900W Powerline Management Plan* (Powerline Management Plan) has been developed in accordance with Schedule 3, Condition 3C(g) of PA 06_0021 (Mod 2) and the *Draft Guidelines for the Preparation of Extraction Plans* (DP&I, 2012). Regulatory requirements applicable to the development of this Plan are outlined in **Section 4**.

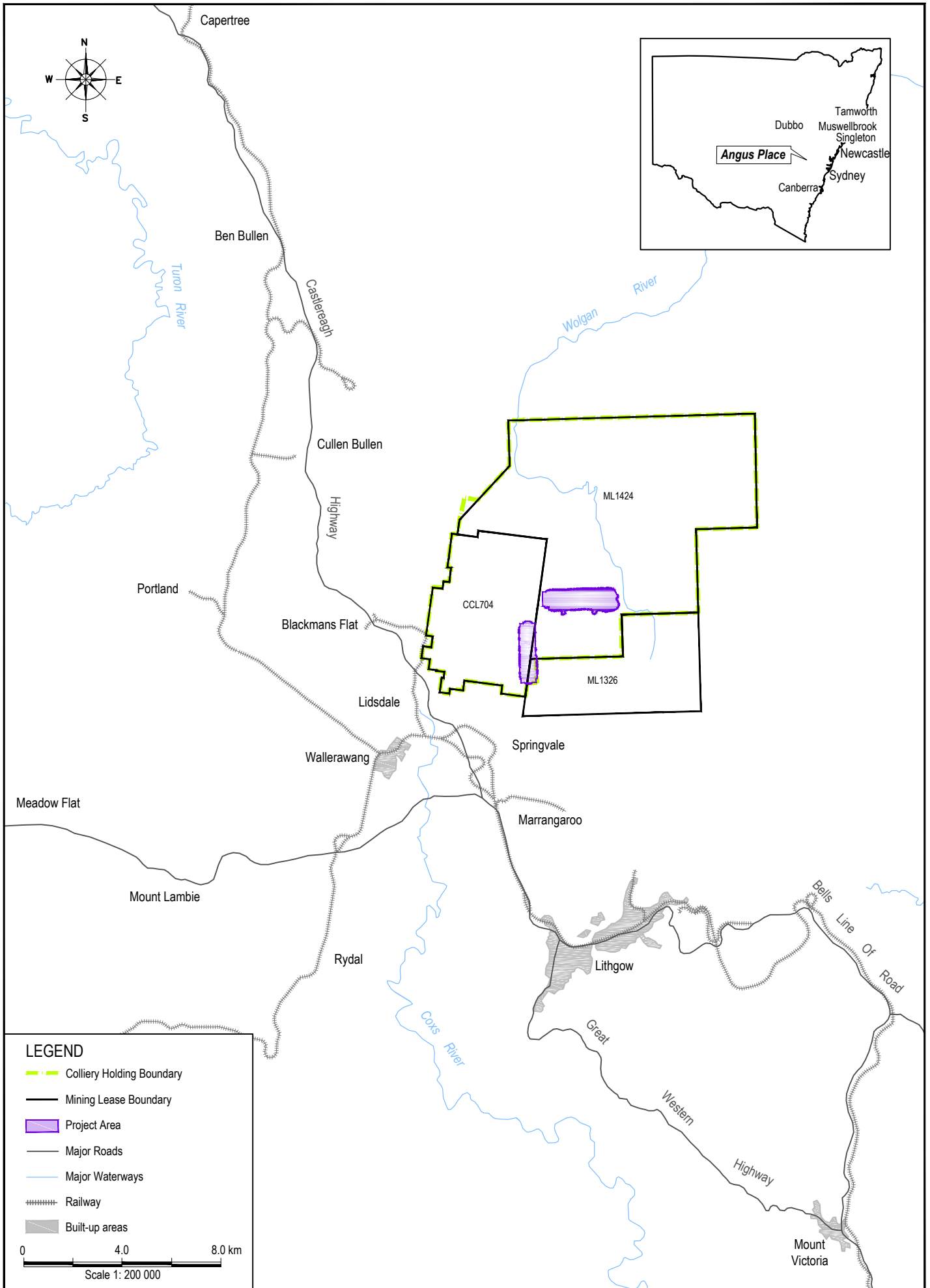
2. PURPOSE

The purpose of this Powerline Management Plan is to outline the monitoring and management measures that will be implemented to minimise the risk of potential subsidence related impact to the Endeavour Energy 66kV powerline that is located above the southern end of Longwall 900W. Required actions and responsibilities are defined to ensure detection of any potential damage from mining induced subsidence.

3. SCOPE

This Powerline Management Plan applies to the Endeavour Energy (formerly Integral Energy) owned 66kV powerline located within the Longwall 900W area (herein referred to as the Project Area). In accordance with the requirements of the *Guidelines for Applications for Subsidence Management Approvals* (2003), published by the NSW Department of Mineral Resources (now the NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS)), this Project Area has been calculated by combining the areas bound by the following limits (see **Figure 2**):

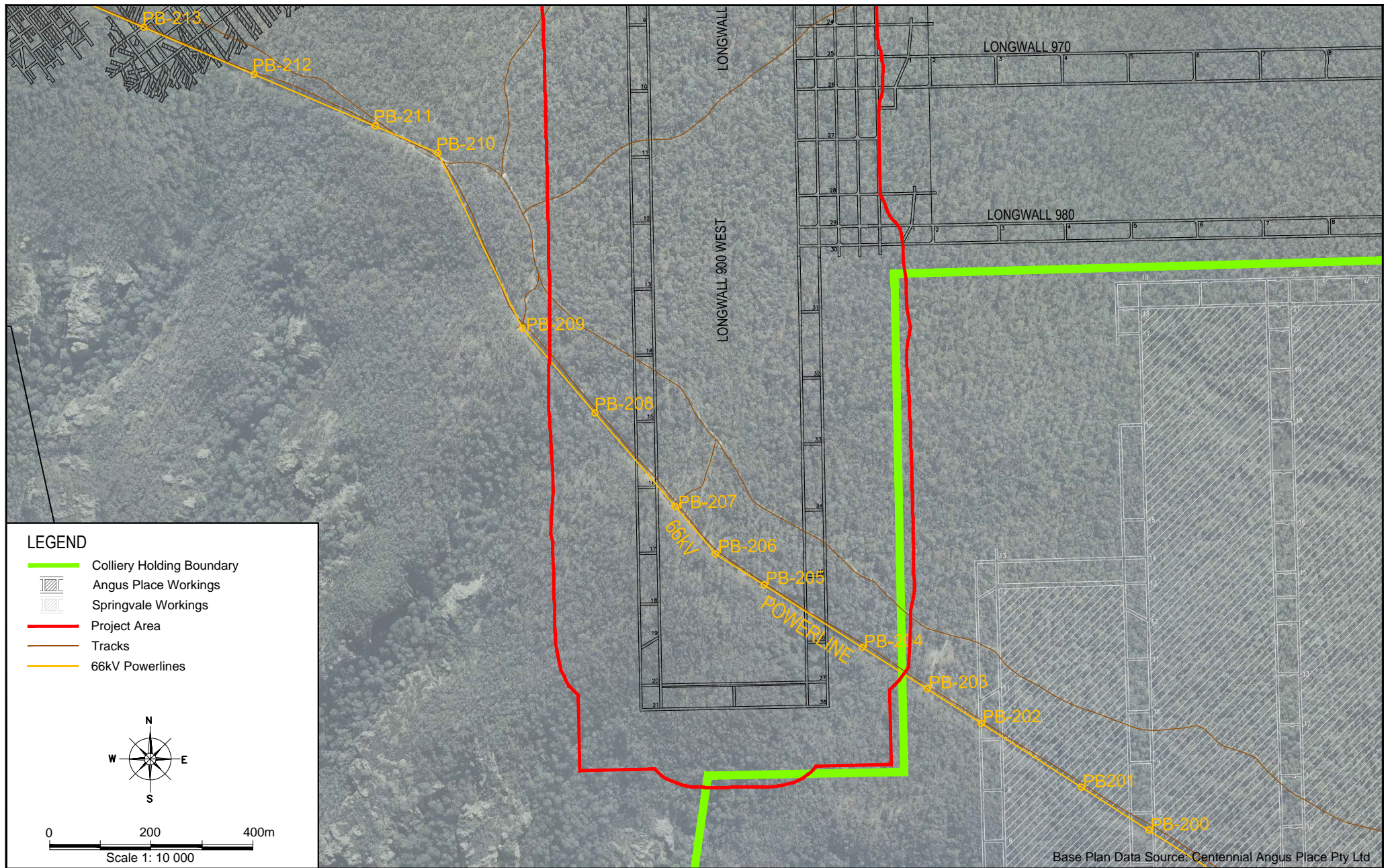
- A 26.5° angle of draw line from the limit of proposed extraction; and
- The predicted limit of vertical subsidence, taken as the 20mm subsidence contour resulting from the extraction of the Longwalls 900W and 910.



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Longwall 900W Powerline Management Plan
Regional Locality

FIGURE 1



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4. REGULATORY REQUIREMENTS

4.1. Project Approval and Statement of Commitments

Project Approval PA 06_0021 (as modified) includes a number of conditions relevant to the preparation and implementation of a Powerline Management Plan for the Project Area. Conditions relating specifically to the preparation of this Plan have been summarised in **Table 1**. This table also outlines the sections where these conditions have been addressed within this document.

There have not been any commitments made by Angus Place in the Statement of Commitments, as appended to PA 06_0021 (as modified) that are relevant to the preparation of this Powerline Management Plan.

Table 1. Relevant Project Approval Conditions

Condition	Condition Requirement	Section Addressed		
Schedule 3, Condition 3A	The Proponent shall ensure that underground mining does not cause any exceedances of the performance measures in Table 1B, to the satisfaction of the Executive Director Mineral Resources. <i>Table 1B: Subsidence Impact Performance Measures</i>	Section 7		
	<table border="1"> <thead> <tr> <th colspan="2"><i>Built features</i></th> </tr> </thead> <tbody> <tr> <td>66kV transmission line.</td> <td>Always safe and serviceable. Damage that does not affect safety of serviceability must be fully repairable, and must be fully repaired, unless the owner agrees otherwise in writing.</td> </tr> </tbody> </table>		<i>Built features</i>	
<i>Built features</i>				
66kV transmission line.	Always safe and serviceable. Damage that does not affect safety of serviceability must be fully repairable, and must be fully repaired, unless the owner agrees otherwise in writing.			
Schedule 3, Condition 3C	<p>The Proponent shall prepare and implement Extraction Plan/s for the second workings in Longwalls 910 and 900W to the satisfaction of the Director-General. Each Extraction Plan must:</p> <p>(g) include the following to the satisfaction of the Executive Director Mineral Resources:</p> <ul style="list-style-type: none"> a Built Features Management Plan, which has been prepared in consultation with the owner/s of potentially affected feature/s, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings. 	This document has been prepared specifically for the purpose of consultation with Endeavour Energy and will be appended to the <i>Longwalls 900W and 910 Built Features Management Plan</i> .		

4.2. Mining Leases

The Endeavour Energy owned 66kV powerline is located above Longwall 900W and associated with two mining tenements, ML1326 and CCL704. These leases include one condition that is relevant to the preparation and implementation of this Powerline Management Plan. This condition and where it has been addressed within this document has been outlined in **Table 2**.

Table 2. Relevant Mining Lease Condition

Mining Lease	Condition Requirement	Section Addressed
ML1326 and CCL704	<p>Transmission Lines, Communication Lines and Pipelines</p> <p>Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the area without the prior written approval of the Director General and subject to any conditions he may stipulate.</p>	Section 5.2

4.3. Longwalls 930 – 980 SMP Approval

In accordance with the requirements of relevant mining tenements, Angus Place received Subsidence Management Plan (SMP) Approval from the then NSW Department of Primary Industries (now DTIRIS) in December 2005 allowing first workings and secondary extraction within Longwalls 930 - 980. This SMP Approval includes a number of conditions relevant to the management of infrastructure at Angus Place. These conditions and where they have been addressed within this Powerline Management Plan are listed in **Table 3**.

While the SMP Approval for Longwalls 930 – 980 does not relate to the subject Longwalls 900W and 910, **Table 3** has been included to demonstrate that the typical conditions associated with an SMP Approval, specifically those already applicable at Angus Place, have been addressed within this document. This section will be reviewed and revised (if necessary) following receipt of SMP Approval for the Project Area.

Table 3. Relevant SMP Approval Conditions

Condition	Condition Requirement	Section Addressed
13	<p>The Leaseholder shall provide to the Mine Subsidence Board, the owners/operators of any infrastructure and the Director Environmental Sustainability and Principal Subsidence Engineer of the Department of Primary Industries, notification within 24 hours of occurrence or identification of the following during the development of subsidence caused by longwall mining. The same information shall also be made available to other relevant stakeholders if requested.</p> <ul style="list-style-type: none"> a) Any observed subsidence impacts adverse to groundwater resources and/or the natural environment that may be affected by longwall mining; b) Any observed subsidence impacts adverse to the serviceability and/or safety of infrastructure and other built structures that may be affected by longwall mining; c) Any significant unpredicted and/or higher than predicted subsidence and/or abnormalities in subsidence development in any surface areas that may be affected by longwall mining; d) Any adverse subsidence impacts reported by any relevant stakeholder; and e) Any other relevant information requiring prompt notification <p>Note: Pursuant to paragraph (e) of the subsidence management condition in the leaseholder's Coal Lease, the SMP is also subject to the requirements for subsidence monitoring and reporting set out in the document '<i>New Approval Process for Management of Coal Mining Subsidence – Policy (2003)</i>'. The monitoring and reporting requirements set out in that document apply, as modified by these conditions.</p>	Section 14
15	<p>Infrastructure – The Leaseholder shall develop a management plan to ensure the safety and serviceability of any infrastructure that may be affected by subsidence arising from longwall mining. The management plan shall be implemented to the satisfaction of the owners/operators of the said infrastructure.</p>	This document

5. RELEVANT FEATURE(S) AND PREDICTED IMPACTS

5.1. Relevant Feature(s)

There is a 66kV suspended powerline located above the commencing (southern) end of Longwall 900W at Angus Place. This powerline runs in a general northwest - southeast direction over the longwall panel and is owned by Endeavour Energy. The powerline is suspended using timber power poles that are approximately 15 m high (see **Plate 1**). There are five poles (204 – 208) located within the Project Area which are separated by distances ranging from 77 m – 266 m. The location of the Endeavour Energy owned 66kV powerline, in relation to the Project Area has been shown in **Figure 2**.



Plate 1. Endeavour Energy 66kV Powerline at Angus Place

5.2. Predicted Impacts

5.2.1. Subsidence Predictions

Ditton Geotechnical Services (DgS) were engaged to prepare a *Subsidence Prediction and Impact Assessment* (DgS, 2010) as a component of the Mod 1 Environmental Assessment (EA) titled *Angus Place Colliery, NSW Modification of Project Approval 06_0021 under Section 75W, Part 3A* (RPS, 2010). DgS (2010) outlines that the poles of the suspended Endeavour Energy 66kV power line are likely to be subject to subsidence of between 0.0 m - 1.0 m, tilts of up to 8mm/m and tensile or compressive strains of up to 2 mm/m. Power line conductor clearance has been predicted to decrease from 0.0 m to 0.69 m due to mine subsidence (DgS, 2010).

The power poles above the panels are predicted to be subject to transient movements towards the south as the face retreats towards the north, and then move back towards the east or west after full subsidence develops. The poles are also predicted to be subject to tensile and compressive strains associated with the subsidence 'wave' as it passes underneath the poles. DgS (2010) state that the transient tilts and strains could range from 50% - 70% of the final values (see **Table 4**), and will be

dependent on face retreat rates. The poles outside the mining limits and within the angle of draw are predicted to generally tilt towards the nearest panel rib side as subsidence develops.

A summary of the worst case final subsidence predictions for the Endeavour Energy 66kV power poles as detailed in the *Subsidence Prediction and Impact Assessment* (DgS, 2010) has been provided in **Table 4**.

Table 4. Worst Case Final Subsidence Predictions for 66kV Power Poles

Pole No.	Easting	Northing	Final Subs S_{max} (m)	Final Tilt T_{max} (mm/m) ^{+#}		Final Tilt direction (grid bearing) (°)	Final Ground Strain & (mm/m)	Final HD $^{*#}$ Base (mm)		Conductor Clearance Loss (m)
				Principle	In-Line			Principle	In-Line	
201	233367	6302160	0	0	0	-	0	0	0	0
202	233172	6302285	0	0	0	-	0	0	0	0
203	233065	6302353	0	0	0	300	0	0	0	0
204	232937	6302435	-0.03	0.3	0.3	319	0	5	5	0.03
205	232743	6302558	-0.72	8.3	6.5	278	-1	133	103	0.69
206	232648	6302619	-1.00	5.5	-2.0	87	-4	-88	-31	0.28
207	232569	6302712	-0.38	7.4	-5.7	89	2	-118	-91	0.62
208	232410	6302896	-0.04	0.4	-0.2	118	-0.1	-6	-4	0.34
209	232267	6303063	0	0	0	84	0	0	0	0.03
210	232101	6303408	0	0	0	-	0	0	0	0
211	231978	6303461	0	0	0	-	0	0	0	0

Negative in-line tilts and horizontal displacements indicate movement in opposite direction to positive in-line values.

+ Transient tilts due to travelling subsidence wave may be assumed to equal the final tilt magnitudes at a given location.

+ Further analysis may be required if marginal conditions indicated.

& Transient strains may be assumed to range from +/- Final values.

* HD Base = Absolute horizontal displacement of pole at ground level.

5.2.2. Specialist Powerline Impact Assessment

During the specific SMP Risk Assessment a number of potential subsidence related risks associated with the Endeavour Energy 66kV powerline were identified by the working group (see **Section 6**). One of the recommended controls to mitigate potential subsidence related risks to the powerline included engaging a specialist engineering consultant to develop an impact assessment for the powerlines and to identify appropriate mitigation methods. Angus Place subsequently engaged Energy Serve to prepare a specific powerline impact assessment, titled *Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013). A copy of the assessment as prepared by Energy Serve has been provided as **Appendix 1**.

To undertake this assessment, Energy Serve used Power Line Systems (PLS) CADD to create pre and post subsidence profiles for the powerline. This modelling was achieved by importing centreline survey data into PLSCADD to create an existing surface profile. PLSCADD was also used to modify the centreline data within the Project Area using the predicted subsidence contours created by DgS (2010) to create a post mining centreline. This data was then used by Energy Serve to model the following:

- Before and after mining ground clearance for statutory clearance and where practical, intermediate scenarios where the subsidence transitions through the site; and

- Structure and conductor loading resulting from translation and rotation effects.

Energy Serve (2013) completed a review of pre and post mining ground clearance for the Endeavour Energy 66kV powerline. This assessment considered changes to ground clearance for poles 205, 206 and 207 as they are predicted to experience the maximum predicted subsidence. Poles 204 and 208 have been predicted to experience <50 mm of subsidence and will therefore not be significantly impacted (Energy Serve, 2013).

The assessment determined that the tension changes for the predicted pole top displacements at pole 205 are minimal and that no remedial action would be necessary to maintain statutory ground clearance. The assessment also stated that the tension changes due to the predicted pole top displacements on poles 206 and 207 would be minimal and no precautionary or remedial action would be necessary for preservation of ground clearance within the Project Area.

Another potential subsidence related issue associated with these spans is the impact of pole top movement for poles 205, 206 and 207 on the loading of structures and conductor tensions. Energy Serve (2013) indicate that the tensions will increase slightly (2 – 3%) following the secondary extraction of Longwall 900W, however they will remain well within the allowable 70% of conductor breaking load. Additionally structure usages are also predicted to increase by 1 – 3% but will remain well within the structure capacities (Energy Serve, 2013).

The specialist assessment completed by Energy Serve (2013) concluded that *“the predicted pole movements and subsidence do not pose a problem with either ground clearance or structural integrity of any poles from 204 – 208, contained within the subsidence footprint. No precautionary action is required and remedial action should not be necessary”* (Energy Serve, 2013).

A report titled *Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy’s 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013a) was also prepared to review the potential subsidence impacts resulting from an increased extraction height within Longwall 900W from 3.25 m to 3.425 m (see **Section 5.2.3**). Energy Serve (2013a) concluded that *“the predicted pole movements and subsidence, associated with the increased height of Longwall 900W, do not pose a problem with either ground clearance or structural integrity of any poles from 204 to 208, contained within the subsidence footprint. No precautionary action is required and remedial actions should not be necessary.”* A copy of this report has been provided as **Appendix 2**.

5.2.3. Subsidence Assessment Review

As a component of the *Longwalls 900W and 910 Integrated SMP/Extraction Plan*, DgS completed a review of the *Subsidence Prediction and Impact Assessment* (DgS, 2010). This review was completed to satisfy the requirement of Schedule 3, Condition 3C(e) of PA 06_0021 (as modified), which requires the proponent to:

“Provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this approval.”

The report titled *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery* (DgS, 2013), incorporated relevant information obtained by Angus Place since the approval of PA 06_0021 (Mod 1) in August 2011, including subsidence monitoring data and observed subsidence effects following the completion of secondary extraction in Longwalls 960 and 970, and a change to the mining height within Longwalls 900W and 910.

The *Subsidence Prediction and Impact Assessment* (DgS, 2010) assessed potential subsidence effects based upon a mining height of 3.25 m. Angus Place will now mine Longwalls 900W and 910 at an extraction height up to 3.425 m. This change has been assessed by DgS (2013) which concluded that “the observed and predicted subsidence impacts and environmental consequences for LWs 960 and 970 have also been consistent with predictions for LWs 900W and 910, and as such, the predicted ‘negligible’ environmental consequences for LWs 900W and 910 are not expected to change from the previous assessment due to the 5% increase in mining height.”

“It is therefore considered that the impact management strategies for the environment and site developments (e.g. access roads and Endeavour Energy 66kV power line) that were outlined in DgS, 2010 are still valid and do not require amendment” (DgS, 2013). The management measures as outlined in **Section 8** are consistent with the impact management strategies outlined in the *Subsidence Prediction and Impact Assessment* (DgS, 2010).

6. IDENTIFIED RISKS

On 25th July 2012 an SMP Risk Assessment was conducted to identify subsidence-related hazards that may affect the environment and community as a result of the extraction of Angus Place Longwalls 900W and 910. This risk assessment was completed in accordance with the requirements of the *Guideline for Applications for Subsidence Management Approvals* (Department of Mineral Resources, 2003) and the *Centennial Coal Risk Management Standard - Management Standard 004* (Centennial Coal, 2008).

Risks were identified and assessed through the review of known surface and sub-surface features within the Project Area. A risk ranking (low, moderate, significant, high or extreme) was assigned to each risk/hazard. There were three potential risks associated with the 66kV powerline identified during the SMP Risk Assessment which related to: potential for subsidence to exacerbate existing erosion along the powerline corridor (moderate risk); potential for subsidence related damage to the Endeavour Energy powerline resulting in financial liability (low risk); and potential for subsidence related impacts to the powerline resulting in bushfires (low risk). Although the maximum consequence for subsidence related erosion was ranked as insignificant, the moderate risk ranking was assigned due to the likelihood of this occurring (ranked as probable) as a result of subsidence along the Endeavour Energy powerline corridor. These risks and the recommended controls have been presented in **Table 5**.

Table 5. Risks to Endeavour Energy 66kV Powerline

Risk	Current Controls	Risk Ranking	Recommended Controls
<p>There is a risk to Angus Place from ::: Existing erosion exacerbated along power line corridor ::: Caused by: Increased slope angle due to subsidence Resulting in: Environmental impacts.</p>	<p>Water Management Plan including Erosion and Sediment Control Plan.</p>	<p>Moderate</p>	<p>Consultation with Endeavour Energy, including visual inspection of powerlines within the Power Lines Management System.</p>
	<p>Visual inspections documented by GSS Environmental 24/07/12.</p>		<p>Investigate monitoring and remedial requirements with Endeavour Energy.</p>

Risk	Current Controls	Risk Ranking	Recommended Controls
<p>There is a risk to Angus Place from: :::Damage to Endeavour Energy powerlines::: Caused by: Subsidence. Resulting in: Financial liability.</p>	<p>Consultation with Endeavour Energy.</p>	<p>Low</p>	<p>A centreline will be installed prior Longwall 900W secondary extraction.</p>
	<p>Subsidence assessment includes predictions for each asset.</p>		<p>Develop Powerlines Management Plan in consultation with Endeavour Energy.</p>
	<p>Locations of power infrastructure identified.</p>		<p>Engage specialist engineering consultant to develop impact assessment on powerlines and identify appropriate mitigation methods.</p>
	<p>No oil bearing assets in application area.</p>		<p>Visual inspection of powerlines to be included in development of Powerlines Management System.</p>
			<p>Subsidence monitoring regime following powerlines across Longwall 900W block.</p>
<p>There is a risk to Angus Place from: :::Damage to Endeavour Energy powerlines::: Caused by: Subsidence. Resulting in: Bushfires.</p>	<p>Subsidence assessment includes predictions for each asset.</p>	<p>Low</p>	<p>Engage specialist engineering consultant to develop impact assessment on powerlines and identify appropriate mitigation methods.</p>
	<p>Locations of power infrastructure identified.</p>		<p>Subsidence monitoring regime following powerlines across Longwall 900W block.</p>
	<p>Consultation with Endeavour Energy.</p>		<p>Review Angus Place Bushfire Management Plan after Powerlines Management Plan and engineering consultant plans have been completed.</p>
	<p>Angus Place Bush Fire Management Plan.</p>		<p>Visual inspection of powerlines to be included in development of Powerlines Management System.</p>
	<p>Endeavour Energy's vegetation controlling systems.</p>		
	<p>No oil bearing assets in application area.</p>		

To further mitigate subsidence-related risks to the 66kV powerline, Angus Place has implemented the 'recommended controls' as outlined in **Table 5**, including the preparation of this Powerlines Management Plan in consultation with Endeavour Energy. To mitigate the risk of subsidence exacerbating erosion along the powerline corridor, Angus Place will undertake the management measures outlined in **Section 8**.

Angus Place has also developed a powerline monitoring program as detailed in **Section 9**. This program includes the installation of subsidence survey lines and visual inspections as per the recommendations of the SMP Risk Assessment. Energy Serve were engaged to prepare a specialist impact assessment, entitled the *Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013). An additional assessment was undertaken which was titled *Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery –*

Clarence Colliery (Energy Serve, 2013a) to assess the potential subsidence impacts associated with an increased mining height within Longwall 900W from 3.25 m to 3.425 m. A summary of the findings from these assessments has been outlined in **Section 5.2.2** and copies of the reports have been provided as **Appendices 1** and **2**.

Angus Place will undertake a review of the *Bushfire Management Plan* prior to the commencement of secondary extraction in Longwall 900W.

7. PERFORMANCE MEASURES AND INDICATORS

7.1. Performance Measures

Subsidence impact performance measures are specified in Schedule 3, Condition 3A of PA 06_0021 (as modified). The performance measures specifically relating to the 66kV transmission line include:

- That the powerline is always safe and serviceable; and
- Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired, unless the owner agrees otherwise in writing.

7.2. Performance Indicators

To establish compliance with the performance measures as outlined in **Section 7.1**, Angus Place has developed a monitoring program. This monitoring program (see **Section 9**), will be used to demonstrate that the environmental performance satisfies the following performance indicators:

- Visual inspections of the 66kV powerline to identify that there are no obvious visual abnormalities; and
- Survey monitoring within the Project Area identifies that subsidence parameters (subsidence, tilt, strain and angle of draw) are within the limits of the prediction model.

8. MANAGEMENT MEASURES

As per the recommendations of the *Subsidence Prediction and Impact Assessment* (DgS, 2010), *Review of Mine Subsidence Impact Of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013) and the SMP Risk Assessment, the management and mitigation measures outlined in **Sections 8.1** and **8.2** will be implemented by Angus Place during the secondary extraction of Longwall 900W.

8.1. Endeavour Energy 66kV Powerline

As specified in **Sections 5.2.1** and **5.2.3**, the predicted subsidence and pole movements do not pose a problem with either ground clearance or structural integrity to any poles within the Project Area (Energy Serve, 2013). Additionally the specialist assessment prepared by Energy Serve (2013) concluded that “no precautionary action is required and remedial action should not be necessary”. Although no precautionary or remedial actions are expected to be required, Energy Serve (2013) recommend that the movement of power poles and the consequent action of the spans should be observed throughout the proposed secondary extraction and subsidence. Accordingly, Angus Place propose to implement a detailed monitoring program for the Endeavour Energy 66kV powerline. This program will be undertaken to confirm that the observed subsidence parameters are consistent with the predictions of DgS (2010) and Energy Serve (2013). This will be achieved by implementing the following measures:

- Implementing a subsidence monitoring program for the 66kV powerline, as detailed in **Section 9.2** that will include;
 - Surveying of the proposed centreline (the ‘I Line’) that will be installed at the commencing end of Longwall 900W;
 - Surveying of fixed survey points (reflectors) near the top and base of each power pole associated with the Project Area (poles 201 – 211);
- Implementing a visual inspection program that will include the use of photo monitoring (see **Section 9.2**). In the event that any obvious abnormalities are identified during an inspection a survey will be triggered;

- Angus Place will prepare and distribute the results of each survey to relevant stakeholders (see **Section 14**);
- In the unlikely event that subsidence monitoring and/or visual inspections identify that a performance indicator has been exceeded, Angus Place will implement the contingency measures as detailed in the Trigger Action Response Plan (see **Table 6**); and
- Following completion of subsidence in the vicinity of the 66kV powerline, the final sags in the spans will be assessed to determine if they need to be corrected.

8.2. Existing Erosion and Sedimentation Along Powerline Corridor

As outlined in **Section 6**, Angus Place completed an SMP Risk Assessment at the commencement of the Angus Place *Longwalls 900W and 910 Integrated SMP/Extraction Plan* to identify potential subsidence related hazards that may result from the secondary extraction of longwall panels within the Project Area. A risk that was identified during the risk assessment and relevant to the preparation of this Powerline Management Plan is the “*potential for subsidence to exacerbate existing erosion along the powerline easement*”. Although the predicted maximum consequence for subsidence related erosion along the powerline corridor was ranked as being insignificant, this risk was assessed as being ‘moderate’ as a result of the expected likelihood of this erosion occurring (ranked as probable).

A number of ‘recommended controls’ were identified during the SMP Risk Assessment that could be used to mitigate potential subsidence related risks. As outlined in **Table 5**, a recommendation was made to mitigate the exacerbation of existing erosion along the powerline corridor by Angus Place, which outlined a commitment to “*investigate monitoring and remedial requirements with Endeavour Energy*”. Prior to the commencement of secondary extraction within Longwall 900W and at the convenience of Endeavour Energy, Angus Place propose to undertake a joint inspection of the 66kV powerline corridor to assess the condition of the existing erosion. During/following this inspection, both companies can commence discussions with regard to an agreeable management approach.

9. MONITORING PROGRAM

9.1. Baseline Monitoring

Baseline monitoring of the land within the Project Area will be undertaken prior to the commencement of secondary extraction within Longwall 900W. Baseline data will be obtained by Angus Place using a combination of the following methods:

- Installation of a subsidence monitoring line (the “I” Line) that will be used to monitor the angle of draw, subsidence, tilt and strain. The line will be surveyed prior to secondary extraction in Longwall 900W to establish pre-mining data;
- Installation of fixed survey points (reflectors) near the top and base of each power pole. These points will be used to monitor subsidence, relative pole movement, change in sag/tensions and variation of anchorage conditions. These points will be surveyed twice prior to secondary extraction within Longwall 900W to establish reliable pre-mining data; and
- A visual inspection program will be undertaken by Angus Place that includes the use of photo monitoring points prior to the commencement of secondary extraction in Longwall 900W to establish the pre-mining condition of the Endeavour Energy 66kV powerline.

9.2. Monitoring Subsidence Impacts

The Endeavour Energy 66kV powerline will be monitored pre and post mining for evidence of any subsidence related impacts. **Table 6** provides a summary of the subsidence monitoring program that will be undertaken to manage this feature. **Figure 3** illustrates the location of proposed subsidence monitoring that is relevant to the 66kV powerline. Additional detail pertaining to subsidence monitoring

methodology relevant to the Project Area can be found in the *Longwalls 900W and 910 Subsidence Monitoring and Reporting Program*.

Table 6. Subsidence Monitoring Program

Monitoring Method	Parameter	Frequency
Subsidence survey line	Subsidence, tilt, strain and angle of draw	Prior and post secondary extraction within Longwall 900W.
Fixed survey points	Subsidence, relative pole movement ¹ , change in sag/tensions ² and variation of anchorage conditions ³	<p>Powerline monitoring will be undertaken at the following frequency:</p> <ul style="list-style-type: none"> • Twice prior to commencement of secondary extraction in Longwall 900W; • When secondary extraction of Longwall 900W reaches the following chainages: CH2000, CH1890, CH1820, CH1730, CH1530 (see Figure 3); • Three months after CH1530 survey; at the completion of secondary extraction within Longwall 900W; and • Six monthly until no significant⁴ difference between successive surveys is detected.
Visual inspections (including photo monitoring)	Presence or absence of visual abnormalities	<p>Photo monitoring and visual inspections of the powerline will be undertaken at the following frequency:</p> <ul style="list-style-type: none"> • Prior to the commencement of secondary extraction in Longwall 900W; • Weekly from commencement of secondary extraction until Longwall 900W reaches chainage CH1450 (when all poles within the Project Area have been undermined); • Monthly for three months; • Bi-monthly for two inspections; and • Tri-monthly for three inspections.

¹ The relative movement i.e. lean will be determined through a comparison of the bearing and distance (horizontal projection) between the top and bottom reflector from one survey to the next. Total lean will be referenced against the baseline survey bearing and distance.

² A comparison between the 3D coordinates of the reflector at the top of one pole to the next will determine a baseline distance between each pole at the level of the wire attachment point. A change in distance between the tops of the poles will indicate a change in sag and tension of the wires between the two relevant power poles.

³ Variations to anchorage conditions will be measured at a specific point placed on each anchor point. 3D coordinates will be determined for the mark and its movement relative to the reflector at the top of the pole calculated and compared to the baseline survey. The change in slope distance between the anchor point and the top of the pole should indicate any change in anchor tension.

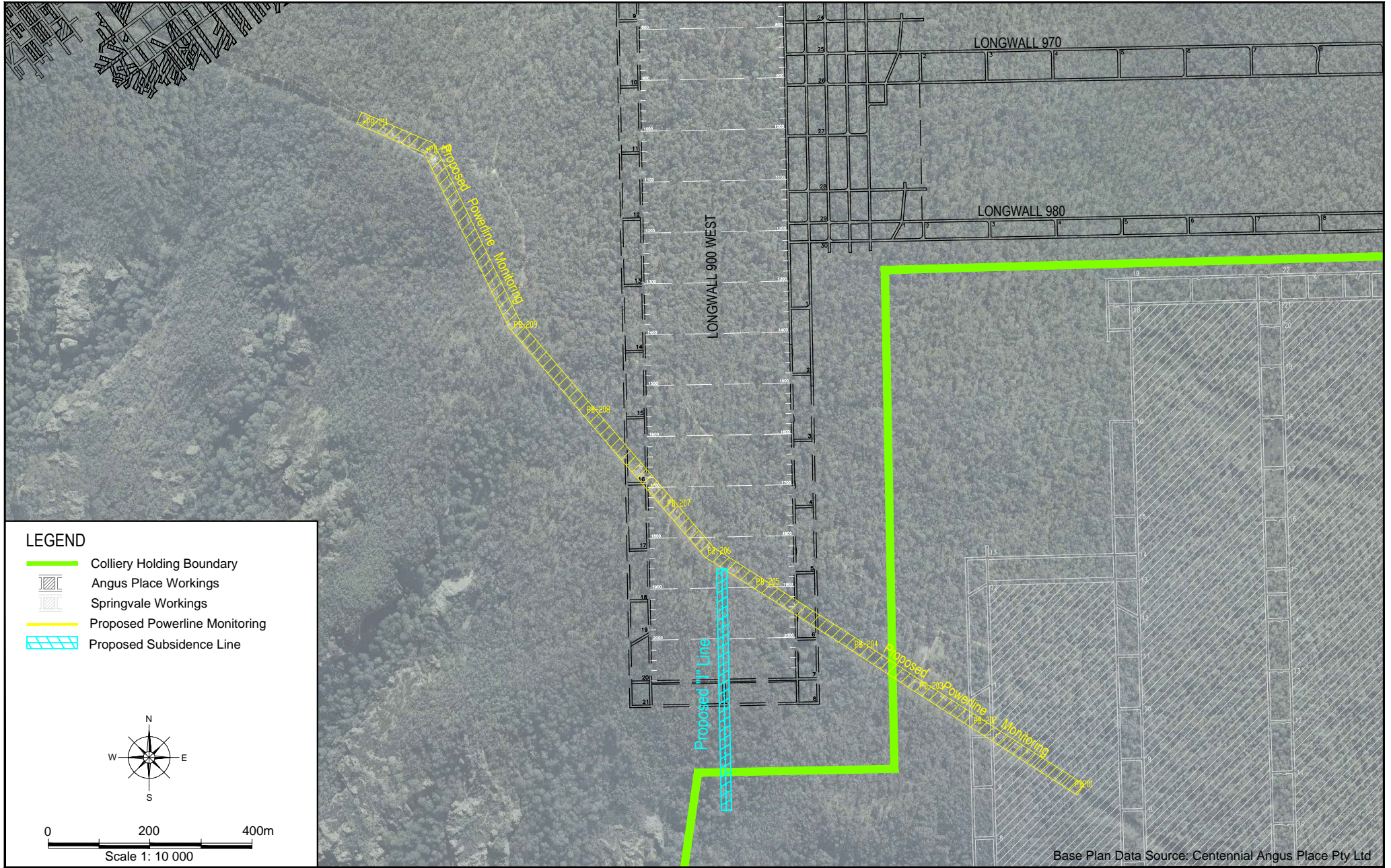
⁴ Significant is defined as being 1.5 times the difference in results from the two baseline surveys.

9.3. Monitoring Environmental Consequences

Angus Place will implement the monitoring program as specified in **Table 6** to monitor the development of predicted subsidence associated with the Endeavour Energy 66kV powerline (see **Section 5.2**). A contingency plan has been developed as a component of this Powerline Management Plan to outline management measures that will be implemented in the event that predicted environmental consequences are exceeded (see **Section 12**).

9.4. Success of Remediation Measures

In the event that remediation of the 66kV powerline is required, Angus Place will undertake rehabilitation in consultation with relevant NSW Government Agencies, Endeavour Energy and the Forestry Corporation of NSW (FCNSW). During consultation and prior to implementation of any remedial measures, Angus Place will determine the ongoing monitoring requirements.



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10. CONSULTATION

In accordance with Schedule 3, Condition 3C(g) of PA 06_0021 (as modified), this Powerline Management Plan was provided to Endeavour Energy as part of the consultation process on 28 August 2013. No comments have been received from Endeavour Energy regarding this Powerline Management Plan.

In November 2013 this Powerline Management Plan was updated to include the relevant findings as presented in the *Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013a) and the *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery* (DgS, 2013) (see **Sections 5.2.2** and **5.2.3**). This plan was subsequently re-submitted to Endeavour Energy for consultation on 15 November 2013.

Evidence of the consultation undertaken during the preparation of this Powerline Management Plan has been provided as **Appendix 3**.

11. ADAPTIVE MANAGEMENT

Angus Place has developed an adaptive management approach that is designed to avoid repetition of any unpredicted subsidence impacts and/or environmental consequences. This approach will include the monitoring and periodic evaluation of environmental consequences against the performance indicators defined in **Section 7.2**; the implementation of the contingency plan (see **Section 12**) in the event that a performance indicator is exceeded; and the review of this Powerline Management Plan as necessary (see **Section 15**).

12. CONTINGENCY PLAN

A TARP has been developed using the performance indicators for the 66kV powerline, as outlined in **Section 7.2**. In the event that subsidence monitoring and/or visual inspections identify that a performance indicator has been exceeded, Angus Place will implement the contingency measures as detailed in the TARP (see **Table 7**).

Table 7. Trigger Action Response Plan for Endeavour Energy 66kV Powerline

Aspect/Category	Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Endeavour Energy 66kV Powerline	Subsidence	Trigger	Survey monitoring along the 'I Line' identifies that measured subsidence parameters (subsidence, tilt and strain) are less than the limits specified by the prediction model (DgS 2010).	Survey monitoring along the 'I Line' identifies that measured subsidence parameters (subsidence, tilt and strain) are up to, but do not exceed the limits of the prediction model (DgS 2010).	Survey monitoring along the 'I Line' identifies that measured subsidence parameters (subsidence, tilt and strain) exceed the limits of the prediction model (DgS 2010).
		Response	No response required. Continue monitoring program.	No response required. Continue monitoring program.	If subsidence associated with the powerline exceeds the limits of the prediction model, notify the Director-General of DP&I, DTIRIS, Endeavour Energy and the FCNSW of exceedance of subsidence predictions. Investigate exceedance of subsidence prediction model. Identify and implement remedial actions in consultation with relevant stakeholders, if necessary (e.g. undertake review of Powerline Management Plan).
		Trigger	Survey monitoring of fixed survey points (reflectors) on relevant power poles identify that measured subsidence and/or relative pole movements are less than the limits specified by the prediction models (DgS 2010, Energy Serve 2013).	Survey monitoring of fixed survey points (reflectors) on relevant power poles identify that measured subsidence and/or relative pole movements are up to, but do not exceed the limits of the prediction models (DgS 2010, Energy Serve 2013).	Survey monitoring of fixed survey points (reflectors) on relevant power poles identify that measured subsidence and/or relative pole movements exceed the limits of the prediction models (DgS 2010, Energy Serve 2013).
		Response	No response required. Continue monitoring program.	No response required. Continue monitoring program.	If subsidence associated with the powerline exceeds the limits of the prediction model, notify the Director-General of DP&I, DTIRIS, Endeavour Energy and the FCNSW of exceedance of subsidence predictions. Investigate exceedance of subsidence prediction model. Identify and implement remedial actions in consultation with relevant stakeholders, if necessary (e.g. undertake review of Powerline Management Plan).
	Evidence of damage	Trigger	Visual inspections of the site identify that there is no evidence of abnormalities to the powerline.	Visual inspections identify potential evidence of abnormalities to the powerline i.e. changes to powerline ground clearance or pole verticality.	Visual inspections identify evidence of abnormalities to the powerline i.e. obvious changes to powerline ground clearance or pole verticality.
		Response	No response required. Continue monitoring program.	Review previous photographic evidence to identify if there have been visual changes to the powerline since the commencement of secondary extraction in Longwall 900W i.e. pole verticality. If the review of photographic evidence identifies that there are no abnormalities, continue monitoring program. If abnormalities are identified, undertake survey monitoring to identify if measured subsidence and/or relative pole movements are within the limits of the prediction models (DgS 2010, Energy Serve 2013). If measured subsidence and/or relative pole movements are within the limits of the prediction models, report the results to the stakeholders specified in Table 9 . Continue monitoring program. If measured subsidence and/or relative pole movements are beyond the limits of the prediction models, undertake management as outlined for Condition Red responses.	Undertake survey monitoring to identify if measured subsidence and/or relative pole movements are within the limits of the prediction models (DgS 2010, Energy Serve 2013). If measured subsidence and/or relative pole movements are within the limits of the prediction models, report the results to the stakeholders specified in Table 9 . Continue monitoring program. If measured subsidence and/or relative pole movements are beyond the limits of the prediction models, notify the Director-General of DP&I, DTIRIS, Endeavour Energy and the FCNSW of exceedance of subsidence predictions. Erect warning signs and danger tape in immediate area. Investigate exceedance of subsidence prediction model. Identify and implement remedial actions in consultation with relevant stakeholders, if necessary.

13. ROLES AND RESPONSIBILITIES

The responsibility for implementation, monitoring and review of the Powerline Management Plan lies with the Environment and Community Coordinator. The ultimate responsibility for the implementation of the Powerline Management Plan lies with the Mine Manager, who shall make appropriate resources available. The roles and responsibilities for this Powerline Management Plan are outlined in **Table 8**.

Table 8. Key Personnel and Accountabilities

Position	Responsibility
Mine Manager	<ul style="list-style-type: none"> Ensuring that sufficient resources are available to implement and execute the requirements of this Plan; and Reporting triggers/non-conformances to external stakeholders.
Environment and Community Coordinator	<p>Implementation, monitoring and review of this plan, including:</p> <ul style="list-style-type: none"> The carrying out of inspections; The installation and maintenance of signage; Reporting triggers/non-conformances internally to the Mine Manager as appropriate; Consulting with Endeavour Energy regarding any serviceability issues arising from subsidence; Consultation during the review process with relevant stakeholders and distributing this Powerline Management Plan; Coordinating any remediation work as required in consultation with Endeavour Energy and the FCNSW; Co-ordinating the generation and submission of formal reporting requirements outlined in this Plan (e.g. End of Panel Reports and the Annual Environmental Management Report); and Reviewing this Powerline Management Plan.
Endeavour Energy	<ul style="list-style-type: none"> Undertake inspections as required with Environment and Community Coordinator; and Determine appropriate remedial measures in conjunction with Environment and Community Coordinator, if required.

14. REPORTING

In accordance with the requirements of the *Draft Guidelines for the Preparation of Extraction Plans* (DP&I 2012), Angus Place will submit the following reports to the DP&I and DTIRIS during the secondary extraction of Longwalls 900W and 910:

- Bi-monthly Subsidence Impact Reports - These reports will be submitted following the regular monthly inspections if any new subsidence impacts are identified; and
- Six-monthly Environmental Monitoring Report - This report will include:
 - a comprehensive summary of all impacts, including a revised characterisation according to the relevant TARP and any proposed actions resulting from the relevant TARP (see **Section 12**);
 - an assessment of compliance with relevant performance indicators (see **Section 7.2**); and

- a comprehensive summary of all quantitative and qualitative environmental monitoring results.

The Annual Environmental Management Report (AEMR)/Annual Review will be made available on the Centennial Coal website and will include subsidence monitoring results, performance against subsidence predictions and identification of any subsidence related environmental impacts identified during the reporting period.

In accordance with the requirements of Schedule 5, Condition 6 of PA 06_0021 (as modified), Angus Place will notify the Director-General of DP&I, Endeavour Energy and any other relevant agencies of any powerline management related incident, resulting from the extraction of Longwalls 900W and 910 as soon as practicable after becoming aware of the incident. Within seven days of the incident, the Proponent shall provide the Director-General of DP&I and any relevant agencies with a detailed report on the incident.

Angus Place will also prepare an End of Panel Report to encompass all environmental and subsidence monitoring, including a comparison of actual impacts with predicted subsidence impacts. This report will be submitted to DTIRIS within three months of secondary extraction being completed in each longwall panel.

Following the completion of each survey as outlined in **Table 6**, survey results will be compiled into a report that will be distributed to representatives of Endeavour Energy, Energy Serve and Angus Place. Contact details for the relevant representatives have been provided in **Table 9**.

Table 9. Primary Contacts

Company	Contact	Title	Contact Details
Endeavour Energy	Rod Joyce	Operational Planning	T: 02 9853 6823
			E: Rod.Joyce@endeavourenergy.com.au
Energy Serve	Kevin Rugg	Principal Consultant	T: 02 6885 3224
			E: kevin@energyserve.com.au
Angus Place	Alan Mellor	Mine Surveyor	T: 02 6354 8702
			E: Alan.Mellor@centennialcoal.com.au
	Natalie Conroy	Environment and Community Coordinator	T: 02 6354 8938 E: Natalie.Conroy@centennialcoal.com.au

15. REVIEW

This Powerline Management Plan will be reviewed in the event that the following occur:

- Endeavour Energy raise issues that necessitate a review;
- There are changes to the management requirements (e.g. changes to related approvals);
- Where unpredicted impacts or consequences have required implementation of contingency actions under this plan; or
- Monitoring, incident, or audit processes demonstrate that a review is warranted.

Any amendments to the Powerline Management Plan will be undertaken in consultation with Endeavour Energy and relevant stakeholders. Following any changes a copy of the amended Powerline Management Plan will be forwarded to the Executive Director Mineral Resources of DTIRIS and the Director-General of the DP&I for approval.

16. REFERENCES

Centennial Coal (2008) *Centennial Coal Risk Management Standard (Management Standard – 004)*.

DgS (2010) *Subsidence Prediction and Impact Assessment, Report no ANP_002/1*.

DgS (2013) *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery*. Report No. ANP-002/7.

Department of Mineral Resources (2003) *Guideline for Applications for Subsidence Management Approvals*.

DP&I (2012) *Draft Guidelines for the Preparation of Extraction Plans*.

EnergyServe (2013) *Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery*.

Energy Serve (2013a) *Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery*.

RPS (2010) *Angus Place Colliery, NSW Modification of Project Approval 06_0021 under Section 75W, Part 3A*.

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Appendix 1: Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder

CENTENNIAL COAL
Angus Place Colliery
Wolgan Road, Lidsdale

Review of Mine Subsidence Impact
Of Longwall 900W on Endeavour Energy's
66kV Feeder 811/2 – Springvale Colliery-Clarence Colliery

2 May, 2013

Amendment A

Disclaimer

Due to the unpredictable nature of mine subsidence, Energy Serve is unable to accurately determine the behaviour of powerlines under the influence of such movements. This report and the recommendations contained herein are based on the information provided and are intended to be sufficiently conservative to cater for the range of expected movements.

It is not practical to predict the dynamic nature of the subsidence or all the possible intermediate outcomes hence it is recommended that regular inspection and monitoring is undertaken during and following longwall mining in the vicinity of the powerlines in question.

Energy Serve will not be liable or responsible for any damage, loss of revenue, loss of production or unsafe conditions caused by mine subsidence on powerlines.

Contents

Amendments	2
Background.....	3
Methodology	3
Predicted Subsidence at Pole Locations	4
Results	4
Existing Ground Clearance Issue outside Subsidence Area	4
Ground Clearance	5
Pole & Conductor Loading.....	5
Summary.....	7
Recommendations	7
Endeavour Energy Consultation & Approval	7
Appendix A – 66kV Feeder relative to Longwall 900 West (LW900W).....	8
Appendix B – Plan & Profile – Pre-subsidence	9
Appendix C – Plan & Profile – Post-subsidence.....	12
Appendix D – Section Usage Report – Existing	15
Appendix E – Section Usage Report – Post-subsidence.....	17
Appendix F – Structure Usage Report – Existing.....	19
Appendix G – Structure Usage Report – Post-subsidence	24
Appendix H – Endeavour Energy – David Mate – Email 25 March 2013.....	29

Amendments

Draft	Draft for client review	01/11/2012
Final Draft	Final Draft for client review	25/01/2013
Amendment A	Endeavour Energy consultation included	01/05/2013

Background

Energy Serve has been commissioned by GSS Environmental on behalf of Centennial Coal – Angus Place Colliery to review the impact of the proposed mining of the Longwall 900 West (900W) on Endeavour Energy's 66kV 811/2 Feeder.

This feeder is generally 66kV delta suspension construction, however, there are four in-line or angle strain structures within the six spans potentially impacted by the predicted subsidence.

The suspension structures have a significant capacity to absorb the pole movements. A potential subsidence related issue can be the strain structures subject to longitudinal movement, as this can have a significant effect on conductor tensions and thereby ground clearances.

Appendix A shows the 811/2 Feeder in relation to the proposed Longwall 900W and other workings associated with the Centennial Coal - Angus Place Colliery.

The data used to conduct this review included:

- Centreline survey of the existing natural surface conducted by Cramer, Elliston & Hayes (Lithgow) Surveyors;
- Record of structure details and photos collected by Cramer, Elliston & Hayes; and
- Subsidence report by Ditton Geotechnical Services Pty Ltd (DgS) for Longwalls 910 & 900 West including predicted subsidence contours plus surface translation and rotations at each structure.

Methodology

The centreline survey data was imported into PLSCADD to create an existing surface profile. PLSCADD was then also used to modify the centreline data within the 900W subsidence contours to create a post-subsidence centreline. The two sets of data were used to create pre- and post-subsidence profiles under the powerline.

The impact of longwall mining includes not just vertical subsidence at the surface. Structures at or near the surface also experience translational and rotational movements which may be transient in nature as the longwall mining progresses past the point of concern. However some residual translation and rotation will remain depending on the relative position of the pole in relation to the direction and sides of the longwall cut.

Pole structures are particularly sensitive to rotational impacts due to the relative height of the pole above ground. What seems like a minimal rotation at ground level will get multiplied into significant movements at the pole top. These movements are critical to pole top and conductor loadings as well as inter-circuit clearances. A small pole top movement can result in substantial conductor tension and load changes.

PLSCADD has been used to model the following:

- Before & after ground clearance for statutory clearance and where practical, intermediate scenarios where the subsidence transitions through the site; and
- Structure and conductor loading due to the abovementioned translation and rotation effects.

The PLSCADD powerline software has the capability of modelling the impact on installed systems. The effect of pole movement and/or splicing in or cutting out of conductor can be modelled with a high degree of confidence.

Predicted Subsidence at Pole Locations

The following table of predicted subsidence, translation and rotations were supplied by DgS. See Table 12, p37 of DgS Report No. ANP-002/1

Pole ID	Final Subsidence due to 900W (mm)	Final Tilt Towards Longwall due to 900W (mm/m)	Final Tilt Along Axis of Longwall due to 900W (mm/m)	Predicted Horizontal Movement Towards Longwall due to 900W (mm)	Predicted Horizontal Movement Along Main Axis of Longwall due to 900W (mm)
201	0	0	0	0	0
202	0	0	0	0	0
203	0	0	0	0	0
204	30	0.3	0.3	5	5
205	720	8.3	6.5	133	103
206	1000	5.5	-2.0	-88	-31
207	380	7.4	-5.7	-118	-91
208	40	0.4	-0.2	-6	-4
209	0	0	0	0	0
210	0	0	0	0	0
211	0	0	0	0	0

Results

The maximum predicted surface subsidence to be experienced by the 66kV feeder is 1000mm at Pole 206. Subsidence is predicted to extend over a total route length of 970 metres but will exceed 200 mm over a distance of 360 metres only, impacting Poles 205-206-207.

Appendix B contains Plan & Profile Sheets showing the existing mains at a maximum operating temperature of 85°C and the pre-subsidence ground profile.

Existing Ground Clearance Issue outside Subsidence Area

It is apparent that there is more than enough ground clearance throughout the subsidence area to allow for the predicted vertical subsidence.

However, in the span between Poles 209 & 210, it is evident that there is insufficient clearance in the vicinity of Pole 210.

Appendix A shows that Pole 210 is not within the predicted subsidence area for Longwall 900W and has not been impacted by subsidence due to other mine workings. It is located outside any past or future subsidence area.

Endeavour Energy may wish to review the attached profile (Appendix B) and consider taking remedial action. The existing lines do not meet statutory clearance at 65°C.

Ground Clearance

It can be seen that the maximum projected subsidence occurs in the vicinity of poles 205, 206 & 207 with up to 1000mm vertical displacement predicted at Pole 206 and 720mm at Pole 205.

The excess ground clearance in these spans is more than sufficient to cater for the progressive subsidence impacting each pole. It is likely, in any case, that pole 206 and the surface between 205 & 206 will commence subsiding before pole 205 reaches its final level.

The predicted subsidence at poles 204 & 208 are less than 50mm and will therefore not be significantly impacted.

A potential subsidence related issue associated with the 66kV powerline may be conductor tension changes due to pole head movement, particularly at pole 205 due to its being located on the side of the subsidence area, and predicted to experience the highest horizontal displacement and tilt.

Appendix C indicates that the tension changes for the predicted pole top displacements at pole 205 are minimal and that no remedial action appears to be necessary to maintain statutory ground clearance.

Figures 1, 2 & 3 show the pole tops for structures 205, 206 & 207 respectively.

Likewise, the tension changes due to the predicted pole top displacements on poles 206 & 207 are also minimal and no precautionary or remedial action is necessary for preservation of ground clearance within the 900W subsidence footprint.



Figure 1 - Structure 205 pole top

Pole & Conductor Loading

Another potential issue with these spans is the impact of pole top movement of poles 205, 206 & 207 on the loading of structures and conductor tensions.

Appendices D & E include Pre & Post-subsidence Section Usage reports. The tensions increase slightly (2-3%) but remain well within the allowable 70% of conductor breaking load.

Appendices F & G include Pre & Post-subsidence Structure Usage reports. Structure usages also increase slightly (1-3%) but remain well within structure capacities. Maximum usage is < 75%.



Figure 2 - Structure 206 pole top



Figure 3 - Structure 207 pole top

Summary

The check survey has indicated an existing ground clearance issue between poles 209 & 210. This span is outside the current and any previous subsidence areas. Endeavour Energy may wish to follow this up.

The predicted pole movements and subsidence do not pose a problem with either ground clearance or structural integrity of any of the poles from 204 to 208, contained within the subsidence footprint. No precautionary action is required and remedial action should not be necessary.

Recommendations

It is not recommended that any precautionary actions be taken.

The movement of these poles and the consequent action of the spans should be observed throughout the proposed mining and subsidence in order to validate the predictions and ensure clearances have been maintained at all times and structure loadings have not been exceeded.

Following completion of the subsidence in this vicinity the final sags in the spans should be assessed as to whether they need to be corrected.

In any case the powerline should be closely monitored throughout the mining / subsidence process to ensure no unexpected hazards arise and statutory clearances are maintained.

Endeavour Energy Consultation & Approval

Following review and endorsement by Centennial Coal, this report was submitted to Endeavour Energy (EE) for consideration. It was initially uncertain as to who within EE would provide the final approval on behalf of EE.

The identification of the existing clearance issue caused an immediate reaction and action is underway to address this problem.

Once the appropriate officer was identified, the report was assessed by David Mate and approved by email. A copy of the email approval and precedent trail of emails is included in Appendix H.

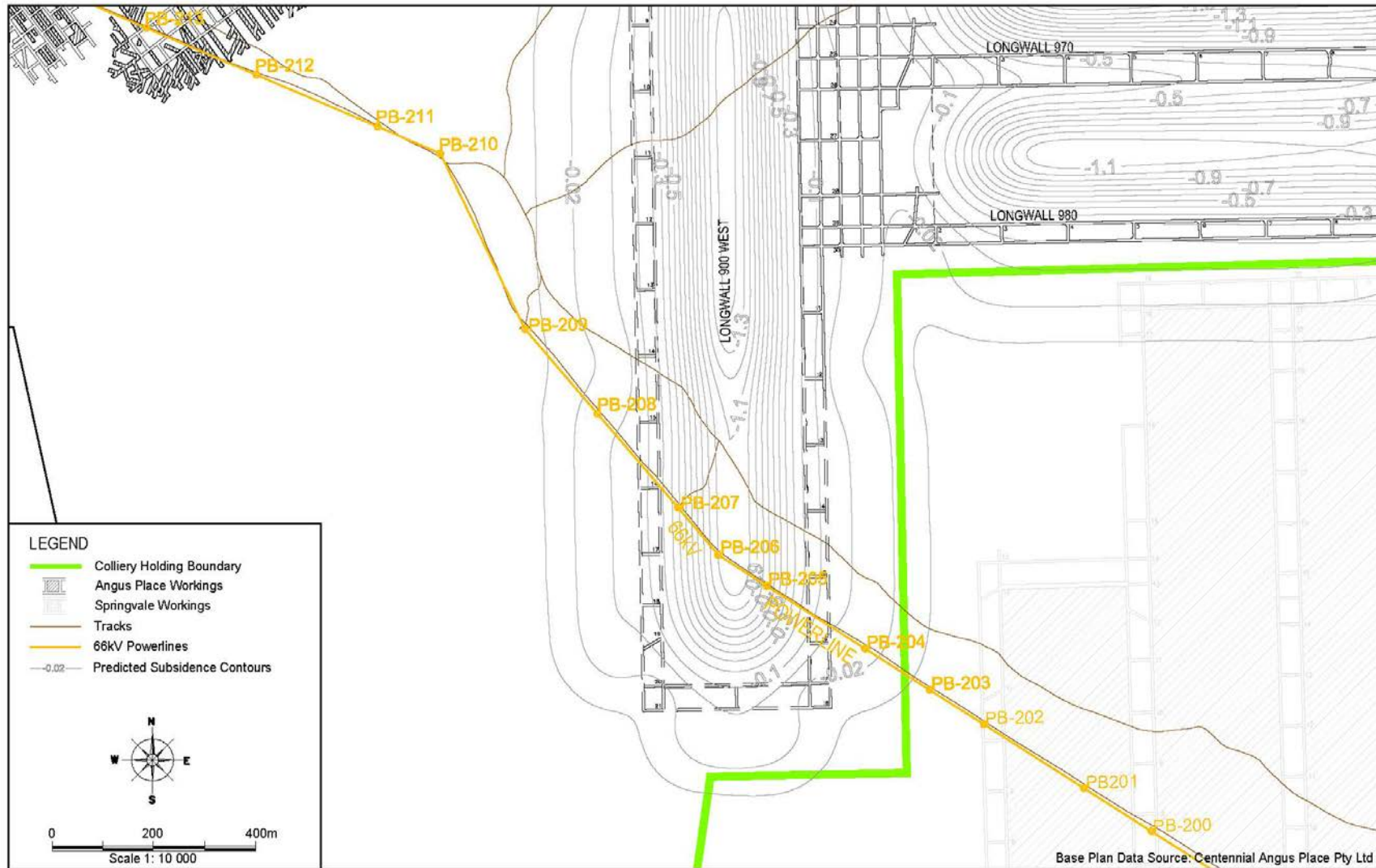
No remedial action is required.

Monitoring of the powerline is recommended throughout the mining / subsidence process, as detailed above.



Kevin Rugg
Principal Consultant

Appendix A – 66kV Feeder relative to Longwall 900 West (LW900W)

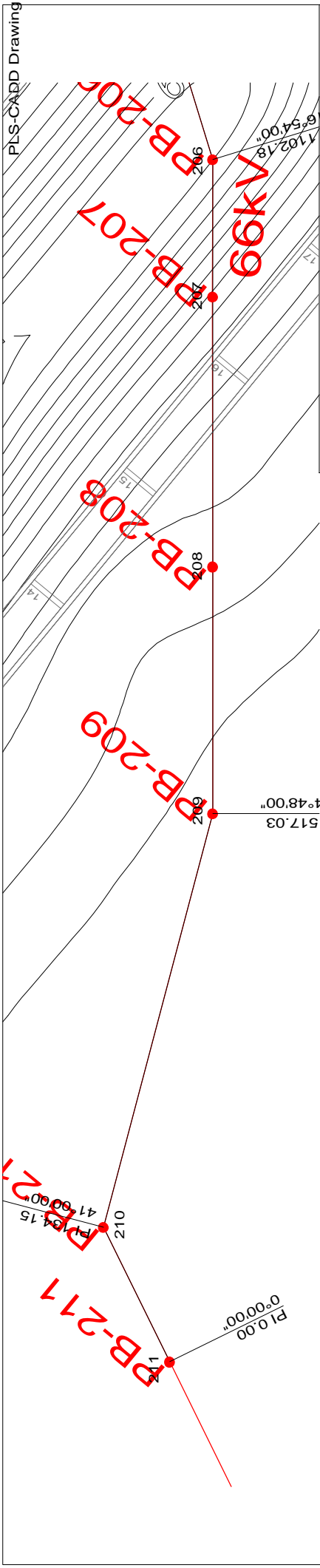


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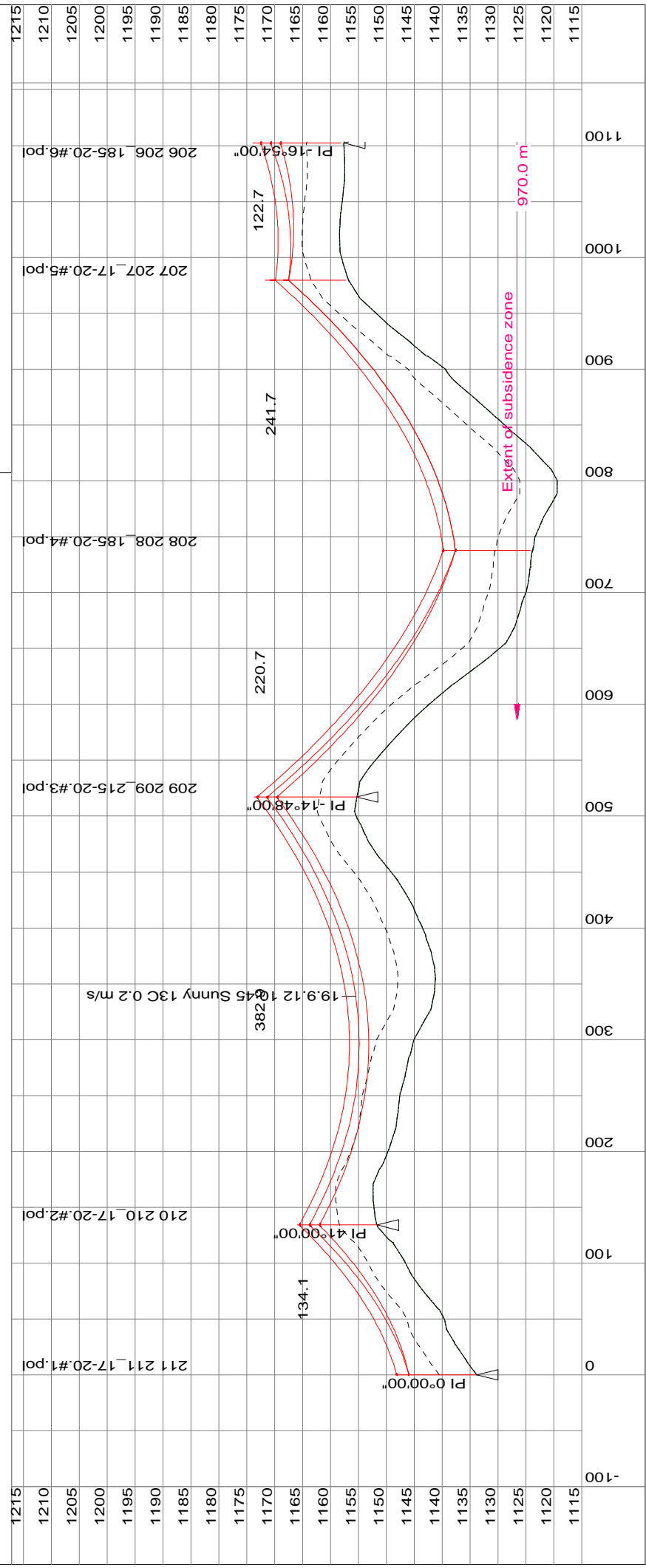


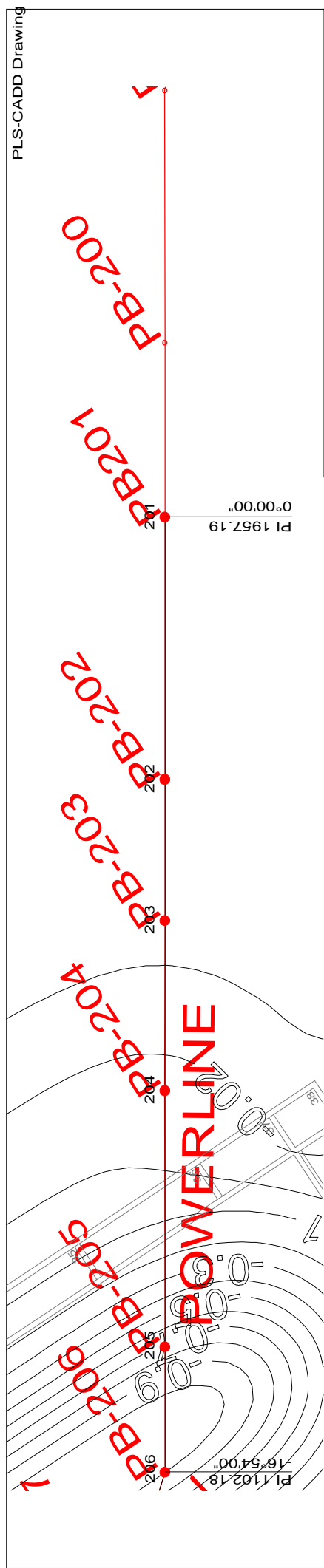
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Appendix B – Plan & Profile – Pre-subsidence

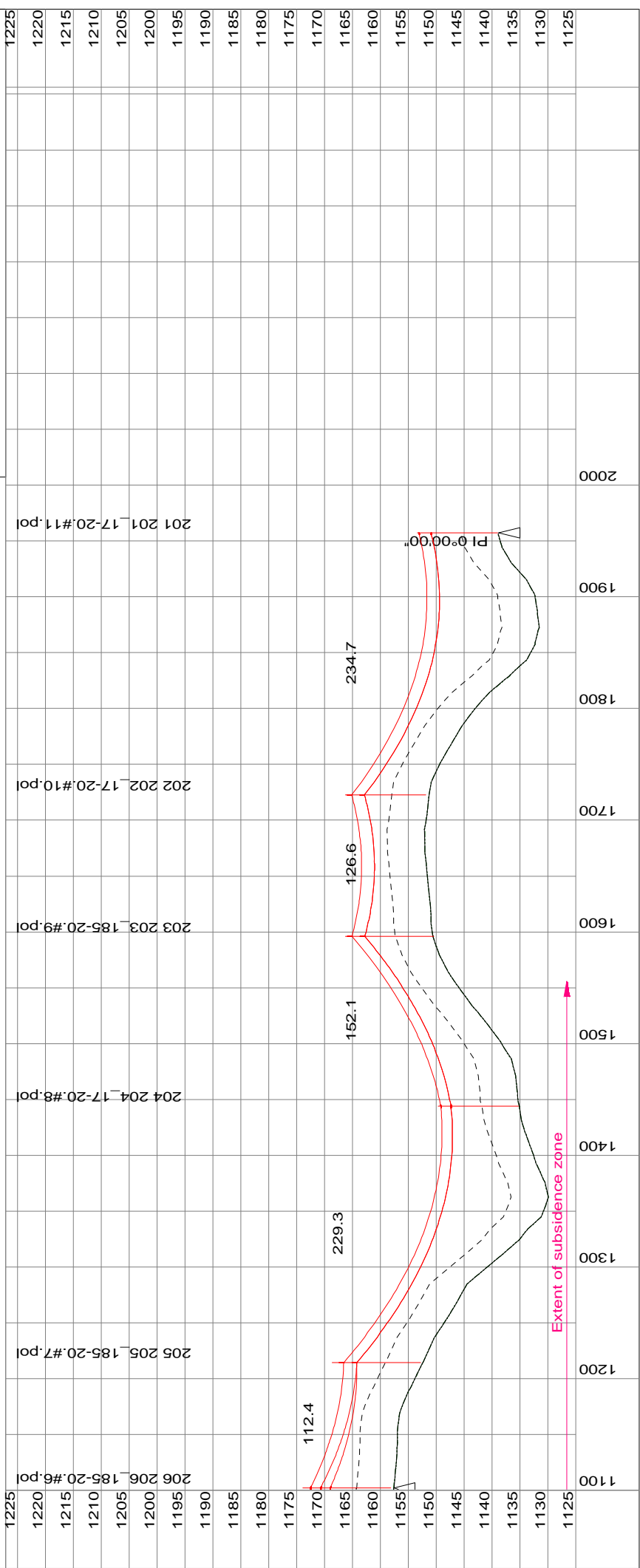
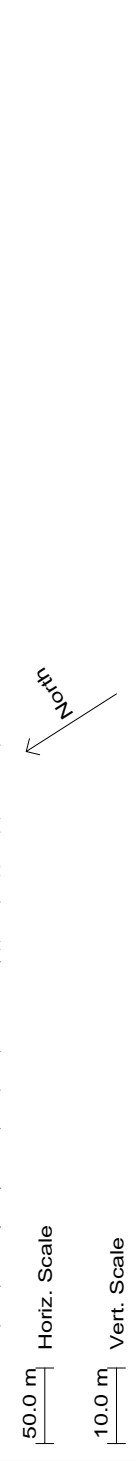


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Page 1/2

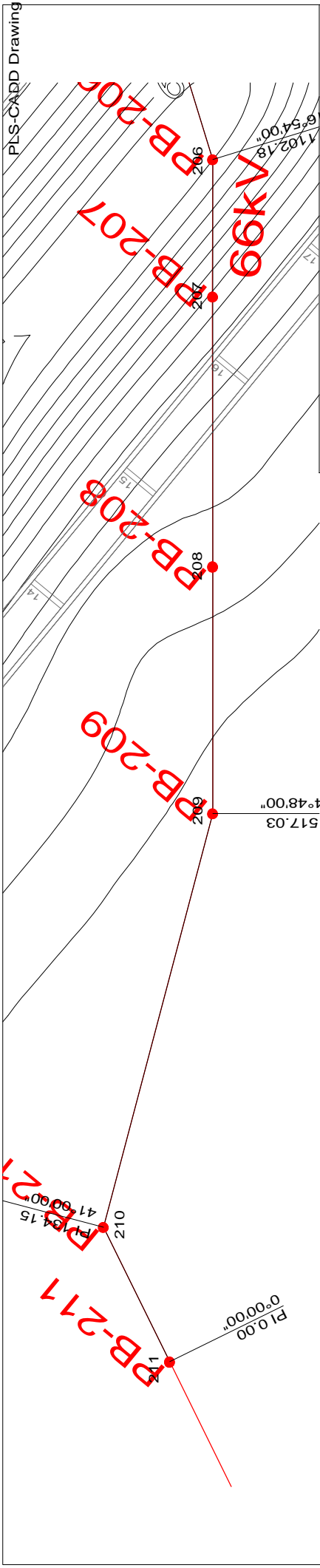




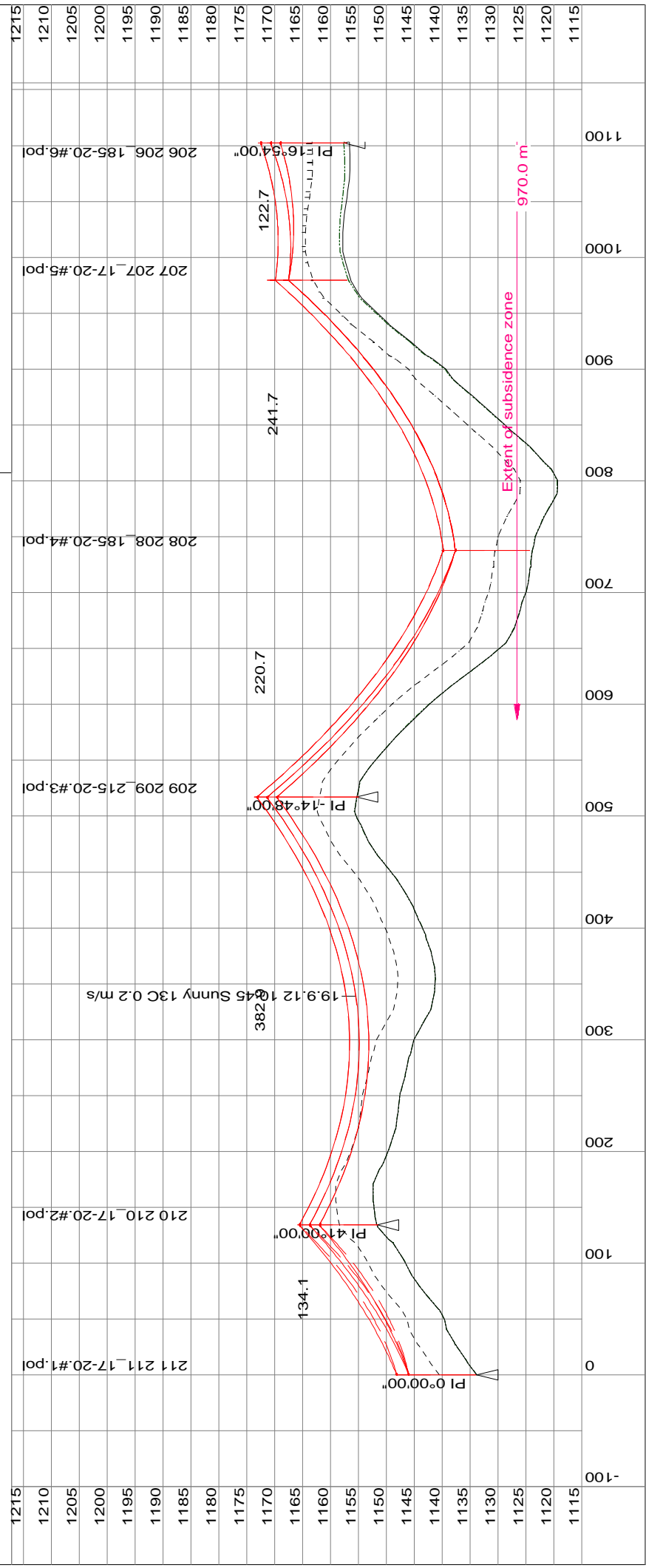
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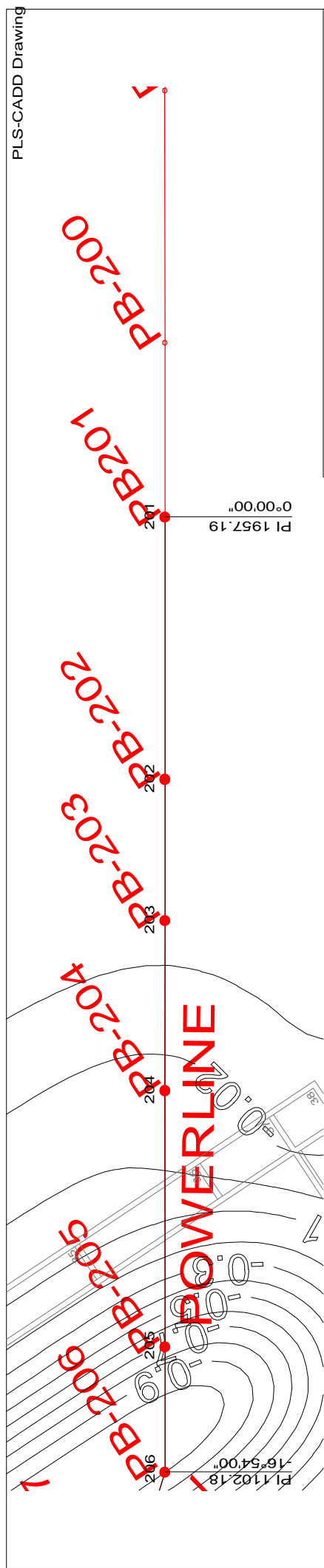
Appendix C – Plan & Profile – Post-subsidence



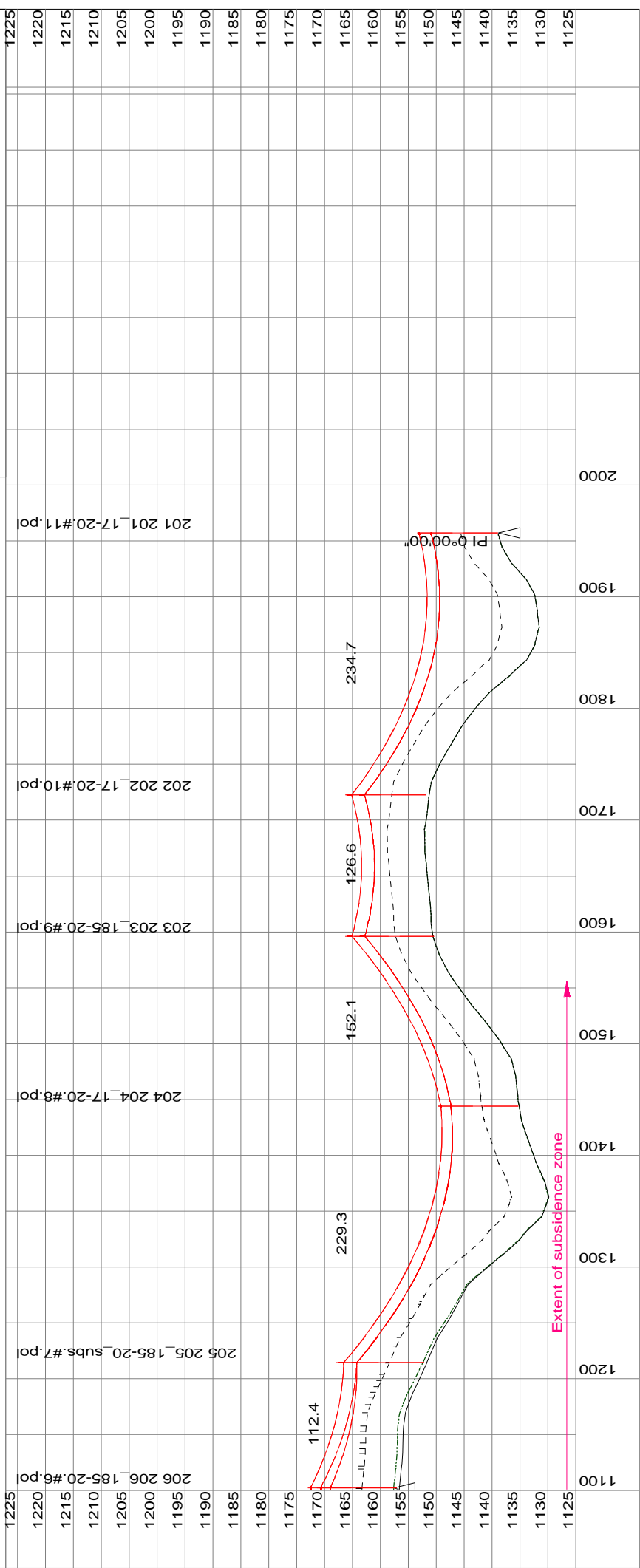
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 Post subs + pole mvts
 1/11/2012
 Page 1/2



ANGUS PL 66 20121101
 Post subs + pole mvts
 1/11/2012
 Page 2/2



50.0 m
 10.0 m
 Horiz. Scale
 Vert. Scale



Appendix D – Section Usage Report – Existing

Section Usage Report

Sec Cable No. Name	From Str.	To Str.	Percent Usage	OK/ NG
4 lemon	208	206	49.8	OK
5 lemon	206	204	48.9	OK

0 section violations OK

Check Section Summary

* designates highest percent of allowable capacity.

Sec Cable No. Name	From Str.	To Str.	WC No.	Weather Case No.	Condition Description	Allowable % of Ultimate	Actual % of Ultimate	Allowable Tension (N)	Actual Tension (N)	Allowable Catenary (m)	Actual Catenary (m)	% of Allowable Capacity	OK or NG.
4 lemon	208	206	7	Limit 1000	Initial RS	70.0	34.8	31386.2	1342.3	1342.3	49.8	OK *	
5 lemon	206	204	7	Limit 1000	Initial RS	70.0	34.3	30867.1	1324.2	1324.2	48.9	OK *	

Appendix E – Section Usage Report – Post-subsidence

PLS-CADD Version 12.10x64 3:58:23 PM Thursday, 1 November 2012
 Energy Serve
 Project Name: 'c:\users\kevin rugg\documents\energy serve\gss environmental\angus place\pls\angus pl 66 20121101.DON'
 Line Title: 'Post subs + pole mvts'

Section Usage Report

Sec Cable No. Name	From Str.	To Str.	Percent Usage	OK/NG
4 lemon	208	206	53.9	OK
5 lemon	206	204	51.9	OK

0 section violations OK

Check Section Summary

* designates highest percent of allowable capacity.

Sec Cable No. Name	From Str.	To Str.	WC No.	Weather Case No.	Condition Description	Allowable % of Ultimate	Actual % of Ultimate	Allowable Tension (N)	Actual Tension (N)	Allowable Catenary (m)	Actual Catenary (m)	% of Allowable Capacity	OK or NG.
4 lemon	208	206	7	Limit 1000	Initial FE	70.0	37.8	34020.6	34020.6	1456.5	1456.5	53.9	OK *
5 lemon	206	204	7	Limit 1000	Initial FE	70.0	36.3	32737.4	32737.4	1405.2	1405.2	51.9	OK *

Appendix F – Structure Usage Report – Existing

PLS-CADD Version 12.10x64 4:01:13 PM Thursday, 1 November 2012
 Energy Serve
 Project Name: 'c:\users\kevin rugg\documents\energy serve\gss environmental\angus place\pls\angus pl 66 20121101.DON'
 Line Title: 'Existing'

Structure Locations and Usage Report

Structure Number Name	Station	Line Angle	Prohib Req	Extra Cost	Zone Pos	Structure Strength Usage	Insulator Swing Usage	Minimum Required Vertical Load	Pole Tip or Deflection Usage	OK or NG
	(m)	(deg)				(%)	(%)	(UpLift)	(%)	
208 208_185-20.#4.pol	737.77	0.00		0		73.7	0.0	OK		OK
207 207_17-20.#5.pol	979.45	0.00		0		53.1	32.0	OK		OK
206 206_185-20.#6.pol	1102.18	-16.90	Y	0		69.8	0.0	OK		OK
205 205_185-20.#7.pol	1214.53	0.00		0		43.2	49.5	OK		OK
204 204_17-20.#8.pol	1443.82	0.00		0		69.4	0.0	OK		OK

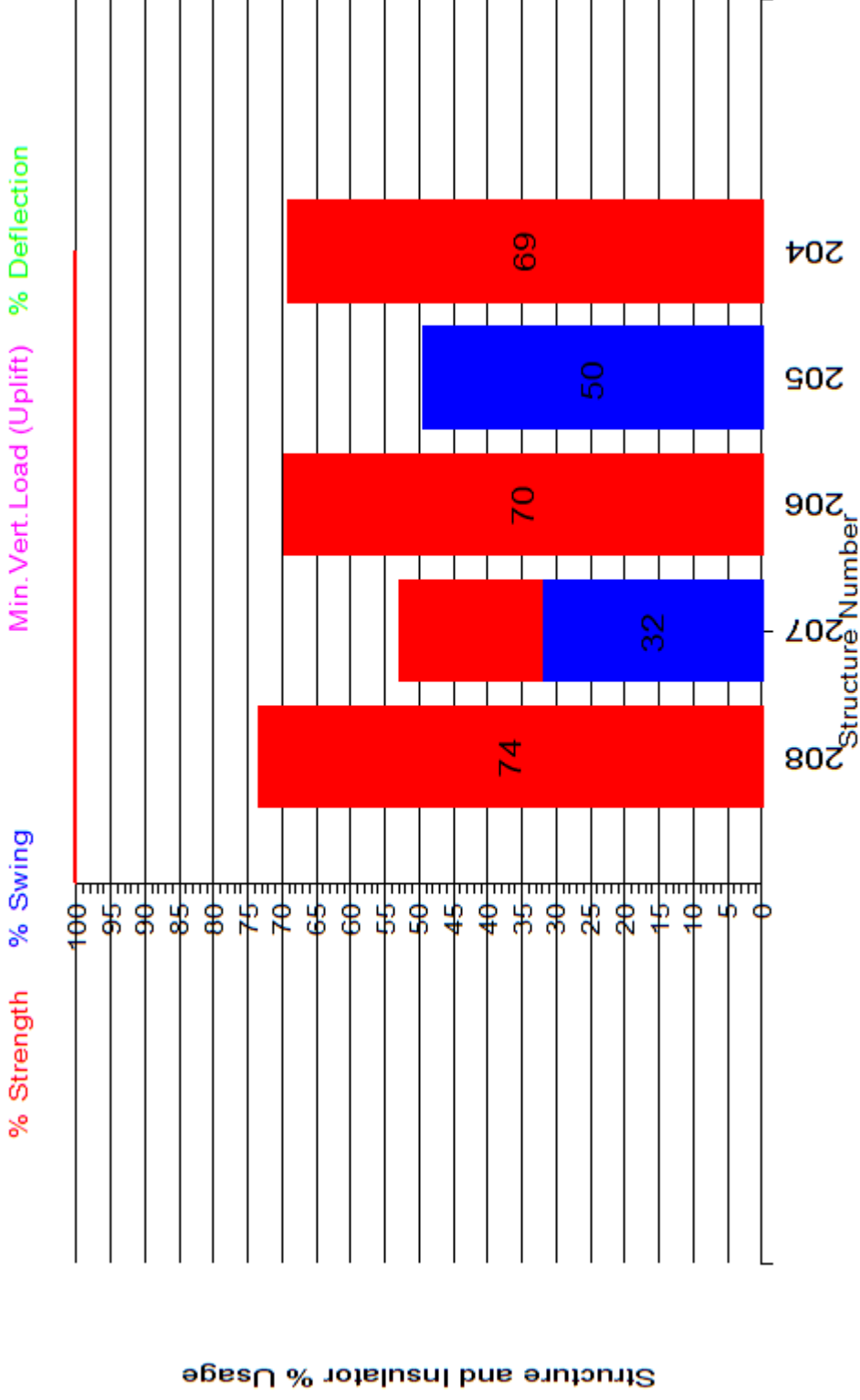
0 structure violations, 0 structure warnings OK

Multiple Structure Suspension Insulator Swing Angles and V-String Load Angles

Str. #	Set #	Phase #	Swing Cond. #	Weather Case Description	Wire Condition	Min. Allowed (deg)	Max. Allowed (deg)	Min. Calc. (deg)	Max. Calc. (deg)	% of Allowed Swing	OK
207	3	1	1	Hot 85	Creep RS	-90.0	90.0	-4.0	-4.0	4.5	OK
		2	1	Hot 85	Creep RS	-90.0	90.0	2.7	2.7	3.0	OK
		3	1	Hot 85	Creep RS	-90.0	90.0	-2.6	-2.6	2.9	OK
		1	2	Swing 210	Initial RS	-90.0	90.0	-16.6	5.7	18.4	OK
		2	2	Swing 210	Initial RS	-90.0	90.0	-7.8	15.3	17.0	OK
		3	2	Swing 210	Initial RS	-90.0	90.0	-14.2	7.2	15.8	OK
		1	3	Swing 500	Initial RS	-90.0	90.0	-28.8	18.8	32.0	OK
		2	3	Swing 500	Initial RS	-90.0	90.0	-21.2	28.0	31.1	OK
		3	3	Swing 500	Initial RS	-90.0	90.0	-26.1	19.7	29.0	OK
		1	4	Cold 0	Initial RS	-90.0	90.0	-5.9	-5.9	6.5	OK
		2	4	Cold 0	Initial RS	-90.0	90.0	4.0	4.0	4.5	OK
		3	4	Cold 0	Initial RS	-90.0	90.0	-3.7	-3.7	4.2	OK
205	3	1	1	Hot 85	Creep RS	-90.0	90.0	-6.4	-6.4	7.1	OK
		2	1	Hot 85	Creep RS	-90.0	90.0	4.5	4.5	5.0	OK
		3	1	Hot 85	Creep RS	-90.0	90.0	-4.1	-4.1	4.6	OK
		1	2	Swing 210	Initial RS	-90.0	90.0	-27.6	8.1	30.7	OK
		2	2	Swing 210	Initial RS	-90.0	90.0	-12.3	26.3	29.3	OK
		3	2	Swing 210	Initial RS	-90.0	90.0	-23.1	10.7	25.7	OK
		1	3	Swing 500	Initial RS	-90.0	90.0	-44.4	29.5	49.3	OK
		2	3	Swing 500	Initial RS	-90.0	90.0	-34.3	44.6	49.5	OK
		3	3	Swing 500	Initial RS	-90.0	90.0	-40.0	30.1	44.4	OK
		1	4	Cold 0	Initial RS	-90.0	90.0	-11.5	-11.5	12.8	OK
		2	4	Cold 0	Initial RS	-90.0	90.0	8.5	8.5	9.4	OK
		3	4	Cold 0	Initial RS	-90.0	90.0	-7.2	-7.2	8.0	OK

Multiple Structure Minimum Vertical Load (Uplift) Summary

Str. #	Set #	Phase #	Swing Cond. #	Weather Case Description	Wire Condition	Min. Req. Vert. Load (N)	Vert. Load Wind From Left (N)	Vert. Load Wind From Right (N)	Vert. Load Wind From Right (N)	Vert. Load Margin
207	3	1	1	Hot 85	Creep RS	0	2967	2967	2967	OK
		2	1	Hot 85	Creep RS	0	2901	2901	2901	OK
		3	1	Hot 85	Creep RS	0	3069	3069	3069	OK
		1	2	Swing 210	Initial RS	0	3982	3982	3982	OK
		2	2	Swing 210	Initial RS	0	3858	3858	3858	OK
		3	2	Swing 210	Initial RS	0	4172	4172	4172	OK
		1	3	Swing 500	Initial RS	0	4246	4246	4246	OK
		2	3	Swing 500	Initial RS	0	4107	4107	4107	OK
		3	3	Swing 500	Initial RS	0	4459	4459	4459	OK
		1	4	Cold 0	Initial RS	0	4175	4175	4175	OK
		2	4	Cold 0	Initial RS	0	4041	4041	4041	OK
		3	4	Cold 0	Initial RS	0	4382	4382	4382	OK
		205		1	1	Hot 85	Creep RS	0	1936	1936
2	1			Hot 85	Creep RS	0	1853	1853	1853	OK
3	1			Hot 85	Creep RS	0	2033	2033	2033	OK
1	2			Swing 210	Initial RS	0	2173	2173	2173	OK
2	2			Swing 210	Initial RS	0	2016	2016	2016	OK
3	2			Swing 210	Initial RS	0	2359	2359	2359	OK
1	3			Swing 500	Initial RS	0	2231	2231	2231	OK
2	3			Swing 500	Initial RS	0	2056	2056	2056	OK
3	3			Swing 500	Initial RS	0	2438	2438	2438	OK
1	4			Cold 0	Initial RS	0	2220	2220	2220	OK
2	4			Cold 0	Initial RS	0	2049	2049	2049	OK
3	4			Cold 0	Initial RS	0	2424	2424	2424	OK



Appendix G – Structure Usage Report – Post-subsidence

PLS-CADD Version 12.10x64 4:04:49 PM Thursday, 1 November 2012
 Energy Serve
 Project Name: 'c:\users\kevin rugg\documents\energy serve\gss environmental\angus place\pls\angus pl 66 20121101.DON'
 Line Title: 'Post subs + pole mvts'

Structure Locations and Usage Report

Structure Number Name	Station	Line Angle	Zone	Prohib	Req	Extra	Cost	Structure Strength Usage	Insulator Swing Usage	Minimum Vertical Load (Uplift)	Deflection	Pole Tip or Deflection Usage	OK or NG
		(deg)						(%)	(%)	(%)	(%)	(%)	
208 208_185-20.#4.pol	737.77	0.00					0	74.7	0.0	OK			OK
207 207_17-20_subs.#5.pol	979.45	0.00					0	60.6	28.8	OK			OK
206 206_185-20_subs.#6.pol	1102.18	-16.90	Y				0	72.8	0.0	OK			OK
205 205_185-20_subs.#7.pol	1214.53	0.00					0	44.7	44.9	OK			OK
204 204_17-20.#8.pol	1443.82	0.00					0	71.4	0.0	OK			OK

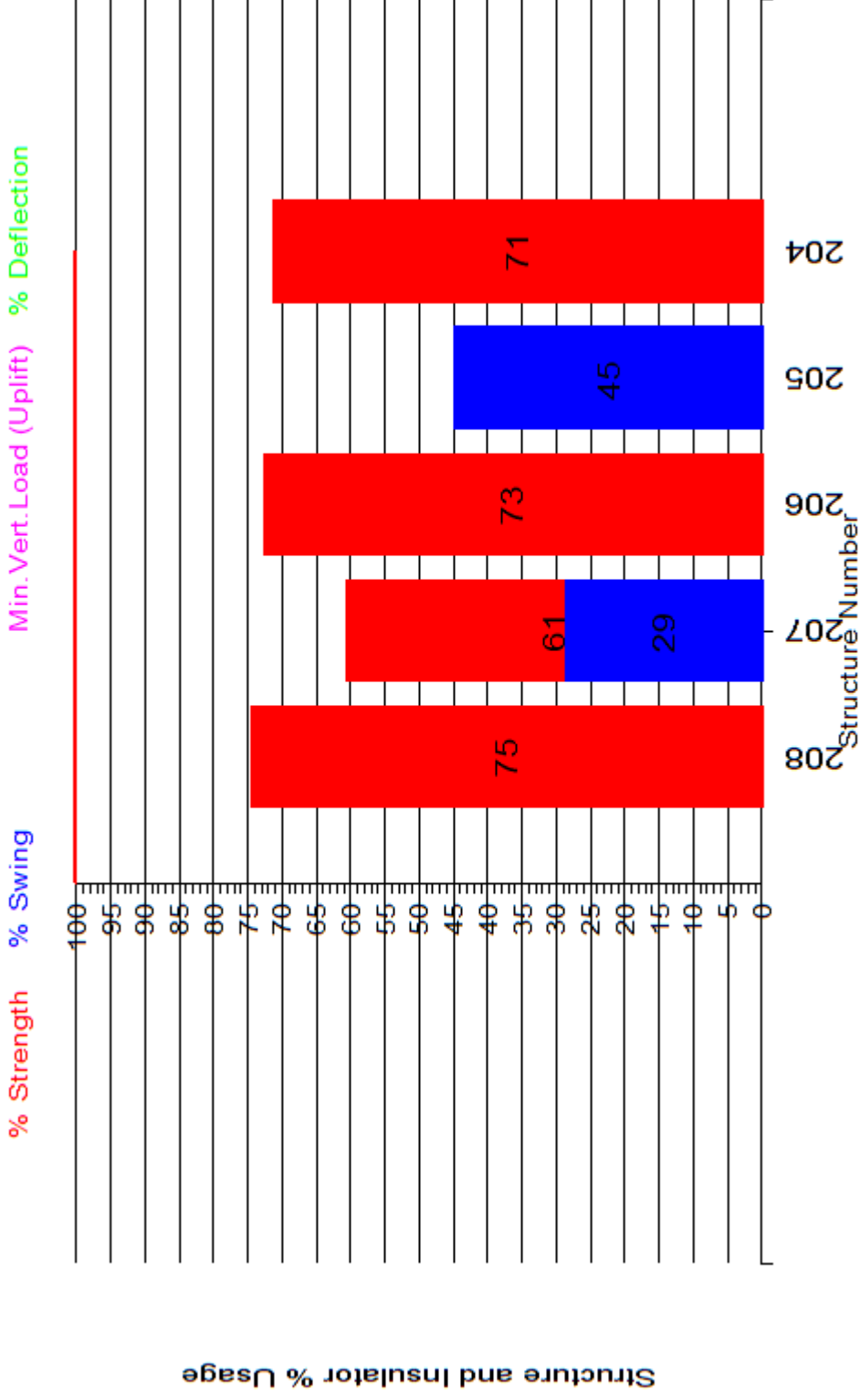
0 structure violations, 0 structure warnings OK

Multiple Structure Suspension Insulator Swing Angles and V-String Load Angles

Str. Set #	Phase #	Swing Cond. #	Weather Case Description	Wire Condition	Min. Allowed (deg)	Max. Allowed (deg)	Min. Calc. (deg)	Max. Calc. (deg)	% of Allowed Swing	OK			
207	3	1	Hot 85	Creep FE	-90.0	90.0	-3.7	-3.7	4.1	OK			
		2	Hot 85	Creep FE	-90.0	90.0	2.9	2.9	3.2	OK			
		3	Hot 85	Creep FE	-90.0	90.0	-2.3	-2.3	2.6	OK			
	205	3	1	Swing 210	Initial FE	-90.0	90.0	-14.9	4.9	16.5	OK		
			2	Swing 210	Initial FE	-90.0	90.0	-6.2	14.1	15.7	OK		
			3	Swing 210	Initial FE	-90.0	90.0	-12.6	6.4	14.0	OK		
		205	3	1	Swing 500	Initial FE	-90.0	90.0	-25.9	16.5	28.8	OK	
				2	Swing 500	Initial FE	-90.0	90.0	-18.1	25.5	28.4	OK	
				3	Swing 500	Initial FE	-90.0	90.0	-23.4	17.4	26.0	OK	
			205	3	1	Cold 0	Initial FE	-90.0	90.0	-5.3	-5.3	5.9	OK
					2	Cold 0	Initial FE	-90.0	90.0	4.2	4.2	4.7	OK
					3	Cold 0	Initial FE	-90.0	90.0	-3.3	-3.3	3.7	OK
205	3	1	Hot 85	Creep FE	-90.0	90.0	-6.5	-6.5	7.2	OK			
		2	Hot 85	Creep FE	-90.0	90.0	3.4	3.4	3.8	OK			
		3	Hot 85	Creep FE	-90.0	90.0	-4.2	-4.2	4.7	OK			
	205	3	1	Swing 210	Initial FE	-90.0	90.0	-25.3	5.2	28.1	OK		
			2	Swing 210	Initial FE	-90.0	90.0	-11.3	22.4	24.9	OK		
			3	Swing 210	Initial FE	-90.0	90.0	-21.2	8.4	23.6	OK		
		205	3	1	Swing 500	Initial FE	-90.0	90.0	-40.4	23.7	44.9	OK	
				2	Swing 500	Initial FE	-90.0	90.0	-30.4	39.3	43.7	OK	
				3	Swing 500	Initial FE	-90.0	90.0	-36.5	25.7	40.6	OK	
			205	3	1	Cold 0	Initial FE	-90.0	90.0	-11.5	-11.5	12.7	OK
					2	Cold 0	Initial FE	-90.0	90.0	6.5	6.5	7.2	OK
					3	Cold 0	Initial FE	-90.0	90.0	-7.3	-7.3	8.1	OK

Multiple Structure Minimum Vertical Load (Uplift) Summary

Str. #	Set #	Phase #	Swing Cond. #	Weather Case Description	Wire Condition	Min. Req. Vert. Load (N)	Vert. Load Wind From Left (N)	Vert. Load Wind From Right (N)	Vert. Load Wind From Right (N)	Vert. Load Margin
207	3	1	1	Hot 85	Creep RS	0	3066	3066	3066	OK
		2	1	Hot 85	Creep RS	0	3006	3006	3006	OK
		3	1	Hot 85	Creep RS	0	3179	3179	3179	OK
		1	2	Swing 210	Initial RS	0	4193	4186	4186	OK
		2	2	Swing 210	Initial RS	0	4087	4086	4086	OK
		3	2	Swing 210	Initial RS	0	4426	4419	4419	OK
		1	3	Swing 500	Initial RS	0	4488	4474	4474	OK
		2	3	Swing 500	Initial RS	0	4364	4361	4361	OK
		3	3	Swing 500	Initial RS	0	4742	4726	4726	OK
		1	4	Cold 0	Initial RS	0	4388	4388	4388	OK
		2	4	Cold 0	Initial RS	0	4275	4275	4275	OK
		3	4	Cold 0	Initial RS	0	4640	4640	4640	OK
		205	3	1	1	Hot 85	Creep RS	0	1968	1968
2	1			Hot 85	Creep RS	0	1887	1887	1887	OK
3	1			Hot 85	Creep RS	0	2061	2061	2061	OK
1	2			Swing 210	Initial RS	0	2224	2245	2224	OK
2	2			Swing 210	Initial RS	0	2074	2059	2059	OK
3	2			Swing 210	Initial RS	0	2401	2412	2401	OK
1	3			Swing 500	Initial RS	0	2315	2353	2315	OK
2	3			Swing 500	Initial RS	0	2170	2142	2142	OK
3	3			Swing 500	Initial RS	0	2518	2539	2518	OK
1	4			Cold 0	Initial RS	0	2274	2274	2274	OK
2	4			Cold 0	Initial RS	0	2087	2087	2087	OK
3	4			Cold 0	Initial RS	0	2461	2461	2461	OK



Structure and Insulator % Usage

Appendix H – Endeavour Energy – David Mate – Email 25 March 2013

From: [David Mate](#)
To: [Kevin Rugg](#)
Subject: RE: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811
Date: Monday, 25 March 2013 12:08:00 PM
Attachments: [image001.png](#)

Hi Kevin,

Based on the information in the report I have no issues in relation to the subsidence at Angus Place.

Regards,
David

David Mate
Overhead & Underground Mains Manager

☎ 02 9853 6010
📞 0413 227 499
📠 02 9853 6021
✉ david.mate@endeavourenergy.com.au

51 Huntingwood Drive, Huntingwood NSW 2148
www.endeavourenergy.com.au



From: Kevin Rugg [<mailto:kevin@energyserve.com.au>]
Sent: Monday, 25 March 2013 11:45 AM
To: David Mate
Subject: RE: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811

Thanks David

That's all good but I am trying to find someone within Endeavour, who will give us the all clear on the subsidence impact assessment.

Cheers

Kevin Rugg

kevin@energyserve.com.au

Energy Serve
Jemtom Pty Ltd
(ABN 36 078 771 650)
Ph. (02) 6885 3224
Fax (02) 6885 3210
Mob 0427 853 224

This message is intended for the addressee named and may contain confidential information. If you are not the intended

recipient, please delete it and notify the sender.

From: David Mate [<mailto:David.Mate@endeavourenergy.com.au>]
Sent: Monday, 25 March 2013 11:35 AM
To: Kevin Rugg
Subject: RE: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811

Hi Kevin,

The current rating of the line has a maximum operating temperature of 62°C, the data has been sent to our regional staff to determine the most suitable way of increasing the clearances.

I will contact the our regional staff later this week to see what progress has occurred.

Regards,
David

From: Kevin Rugg [<mailto:kevin@energyserve.com.au>]
Sent: Monday, 25 March 2013 11:17 AM
To: David Mate
Subject: FW: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811

Hi David

I believe the consideration of the attached report has fallen to you, in regard to the subsidence issues.

Kris Shankar has been following up the ground clearance issue found outside the subsidence zone.

Can you please confirm if this is so and whether any progress has been made?

Cheers

Kevin Rugg

kevin@energyserve.com.au

Energy Serve
Jemtom Pty Ltd
(ABN 36 078 771 650)
Ph. (02) 6885 3224
Fax (02) 6885 3210
Mob 0427 853 224

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender.

From: Kevin Rugg [<mailto:kevin@energyserve.com.au>]
Sent: Friday, 15 February 2013 8:47 AM
To: mark.ezzy@endeavourenergy.com.au
Cc: 'Adam Williams'
Subject: FW: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811

Hi Mark

I sent the email below to David Olley yesterday but I have since been advised that you will be the appropriate Endeavour contact person for this matter.

I have attached the report for your consideration and will follow up with a phone call shortly.

If I miss you, can you please give me a call as soon as convenient.

Cheers

Kevin Rugg

kevin@energyserve.com.au

Energy Serve
Jentom Pty Ltd
(ABN 36 078 771 650)
Ph. (02) 6885 3224
Fax (02) 6885 3210
Mob 0427 853 224

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender.

From: Kevin Rugg [<mailto:kevin@energyserve.com.au>]
Sent: Thursday, 14 February 2013 12:26 PM
To: david.olley@endeavourenergy.com.au
Cc: 'Adam Williams'
Subject: Centennial Coal - Angus Place - Subsidence Impact of Endeavour Energy 66kV Feeder 811

Hi David

I have been engaged by Centennial Coal to undertake a review of potential subsidence impacts on Feeder 811 from the mining of LW900W at Angus Place Colliery.

The arrangement was originally that Centennial Coal were going to liaise with Endeavour Energy but now I have been asked to contact you directly to ensure that the attached report fully addresses Endeavour's requirements/concerns.

I have tried calling you today to discuss the report however there was no answer. I will be out of the office for the rest of today but will call you tomorrow to follow up.

If however, there is a time that best suits you to discuss the report please let me know.

Cheers

Kevin Rugg

kevin@energyserve.com.au

Energy Serve
Jentom Pty Ltd
(ABN 36 078 771 650)
Ph. (02) 6885 3224
Fax (02) 6885 3210
Mob 0427 853 224

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender.

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Appendix 2: Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder

CENTENNIAL COAL
Angus Place Colliery
Wolgan Road, Lidsdale

Addendum to
Review of Mine Subsidence Impact
Of Longwall 900W on Endeavour Energy's
66kV Feeder 811/2 – Springvale Colliery-Clarence Colliery

14 November, 2013

Original Issue

Disclaimer

Due to the unpredictable nature of mine subsidence, Energy Serve is unable to accurately determine the behaviour of powerlines under the influence of such movements. This report and the recommendations contained herein are based on the information provided and are intended to be sufficiently conservative to cater for the range of expected movements.

It is not practical to predict the dynamic nature of the subsidence or all the possible intermediate outcomes hence it is recommended that regular inspection and monitoring is undertaken during and following longwall mining in the vicinity of the powerlines in question.

Energy Serve will not be liable or responsible for any damage, loss of revenue, loss of production or unsafe conditions caused by mine subsidence on powerlines.

Contents

Amendments	2
Background	3
Predicted Subsidence at Pole Locations	3
Results	3
Ground Clearance.....	5
Pole & Conductor Loading	5
Summary	5
Recommendations.....	5

Amendments

Original issue	Final Draft for client review	14/11/2013

Background

Energy Serve has been commissioned by GSS Environmental on behalf of Centennial Coal – Angus Place Colliery to review the impact of the proposed mining of the Longwall 900 West (900W) on Endeavour Energy’s 66kV 811/2 Feeder.

This report is an addendum to the Final Report – Amendment A, dated 2 May 2013. Reference should be made to the final Report for details on methodology and assumptions.

The purpose of this addendum is to review the potential subsidence impacts due to an increase in nominal extraction height in Longwall 900W from 3.25m to 3.425m.

In addition to the data used to prepare the original report, the following report was used to conduct this review:

- “Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery” report by Ditton Geotechnical Services Pty Ltd (DgS) including predicted subsidence contours plus surface translation and rotations at each structure.

Predicted Subsidence at Pole Locations

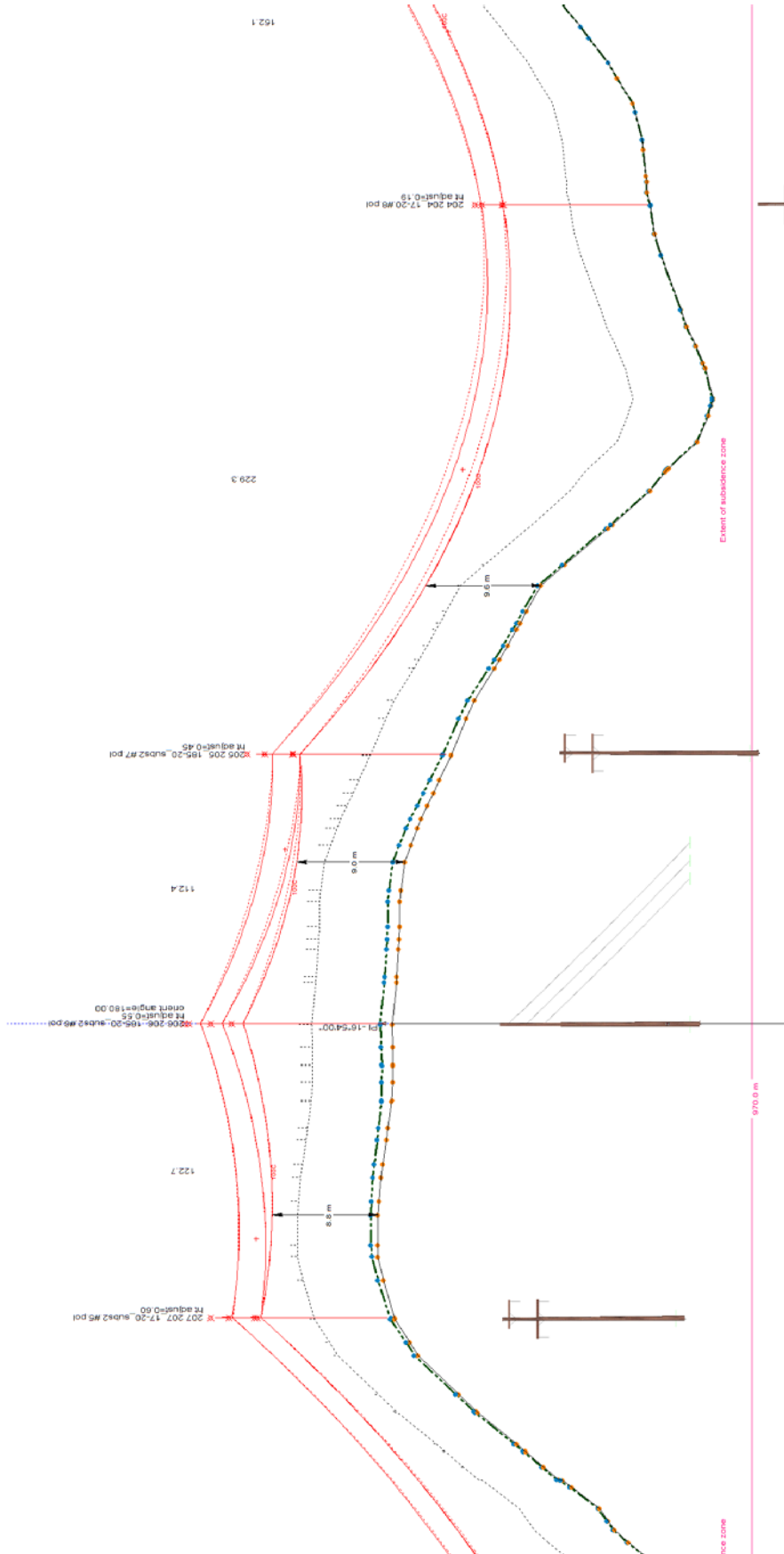
The following table of predicted subsidence, translation and rotations were supplied by DgS. The original and revised predictions are shown below.

Pole ID	Final Subsidence due to 900W (mm)		Final Tilt Towards Longwall due to 900W (mm/m)		Final Tilt Along Axis of Longwall due to 900W (mm/m)		Predicted Horizontal Movement Towards Longwall due to 900W (mm)		Predicted Horizontal Movement Along Main Axis of Longwall due to 900W (mm)	
	Orig	Revised	Orig	Revised	Orig	Revised	Orig	Revised	Orig	Revised
201	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0
203	0	10	0	0.2	0	0	0	3	0	0
204	30	70	0.3	0.6	0.3	0.2	5	9	5	3
205	720	770	8.3	12.5	6.5	6.7	133	201	103	107
206	1000	1080	5.5	8.4	-2.0	-2.1	-88	-135	-31	-34
207	380	410	7.4	10.8	-5.7	-6.0	-118	-173	-91	-96
208	40	80	0.4	0.6	-0.2	-0.1	-6	-10	-4	-2
209	0	10	0	0.2	0	-0.2	0	-3	0	3
210	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0

Results

The maximum predicted surface subsidence to be experienced by the 66kV feeder has increased to 1080 mm at Pole 206. Subsidence is predicted to extend over a total route length of 970 metres but will exceed 200 mm over a distance of 360 metres only, impacting poles 205-206-207. The poles 204, 208 and 209 are within the predicted subsidence area but will be subject to insignificant impact.

The figure below shows the impacted mains at a maximum operating temperature of 100°C and the post-subsidence ground profile, for poles 204 to 207.



Ground Clearance

It can be seen that there is more than adequate ground clearance in spite of the marginally increased subsidence and pole displacements / rotations.

The minimum ground clearance at 100⁰C within the subsidence zone is 8.8 metres.

Pole & Conductor Loading

Another potential issue with these spans is the impact of pole top movement of poles 205, 206 & 207 on the loading of structures and conductor tensions.

Structure usages remain well within structure capacities. Maximum usage is < 75%.

Summary

The predicted pole movements and subsidence, associated with the increased extraction height of Longwall 900W, do not pose a problem with either ground clearance or structural integrity of any of the poles from 204 to 208, contained within the subsidence footprint. No precautionary action is required and remedial action should not be necessary.

Recommendations

It is not recommended that any precautionary actions be taken.

The movement of these poles and the consequent action of the spans should be observed throughout the proposed mining and subsidence in order to validate the predictions and ensure clearances have been maintained at all times and structure loadings have not been exceeded.

Following completion of the subsidence in this vicinity the final sags in the spans should be assessed as to whether they need to be corrected.

In any case the powerline should be closely monitored throughout the mining / subsidence process to ensure no unexpected hazards arise and statutory clearances are maintained.



Kevin Rugg
Principal Consultant

Appendix 3: Stakeholder Consultation



28 August 2013

Rod Joyce
Operations Manager
Endeavor Energy
51 Huntingwood Drive
HUNTINGWOOD NSW 2148

Dear Rod,

Re: Angus Place Colliery Powerline Management Plan

Angus Place Colliery has been preparing an integrated Subsidence Management Plan (SMP)/Extraction Plan for Longwalls 900W and 910 in accordance with regulatory requirements outlined within the Project Approval and Mining Lease conditions.

The Powerline Management Plan attached outlines the monitoring and management measures that will be implemented to minimise the risk of potential subsidence related impact to the Endeavour Energy 66KV powerline that is located in the southern end of Longwall 900W. An overview of the above mentioned regulatory requirements are included within the plan.

Accordingly the document has been provided to Endeavour for review as part of the consultation process for the integrated SMP Extraction Plan. If there are any objections to its content please notify Angus Place by the 13th of September 2013. By default, if no comment or extension request is received by Angus Place by this date it will be assumed there are no objections and the document will be submitted for approval as a component of the integrated Subsidence Management Plan SMP/Extraction Plan for Longwalls 900W and 910.

If you require further information, please contact the Angus Place Environmental Officer, Natalie Conroy on (02)6354 8938 or natalie.conroy@centennialcoal.com.au.

Regards



Brian Nicholls

Mine Manager
Centennial Angus Place



Centennial Coal

Angus Place



15 November 2013

Mr Rod Joyce
Operations Manager
Endeavour Energy
51 Huntingwood Drive
Huntingwood NSW 2148

Dear Rod,

Re: Angus Place Colliery Powerline Management Plan

Angus Place provided Endeavour Energy with a copy of the Longwall 900W Powerline Management Plan on 28 August 2013 as part of the consultation process for the Longwalls 900W and 910 Integrated SMP/Extraction Plan which is being submitted by the end of November.

As a component of the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Angus Place engaged Ditton Geotechnical Services (DgS) to undertake a review of the original *Subsidence Prediction and Impact Assessment* (DgS, 2010) which was prepared as a component of the Environmental Assessment titled *Angus Place Colliery, NSW Modification of Project Approval 06_0021 under Section 75W, Part 3A* (RPS, 2010).

The report titled *Subsidence Assessment Review for the Longwalls 900W and 910 Integrated SMP/Extraction Plan, Centennial Angus Place Colliery* (DgS, 2013), incorporated relevant information obtained by Angus Place since the approval of PA 06_0021 (Mod 1) in August 2011, including subsidence monitoring data and observed subsidence effects following the completion of secondary extraction in Longwalls 960 and 970, and a change to the mining height within Longwalls 900W and 910.

The original *Subsidence Prediction and Impact Assessment* (DgS, 2010) assessed potential subsidence effects for Longwalls 900W and 910 based upon a mining height of 3.25 m. Angus Place will now mine Longwalls 900W and 910 at an extraction height up to 3.425 m. This change has been assessed by DgS (2013) which concluded that "the observed and predicted subsidence impacts and environmental consequences for LWs 960 and 970 have also been consistent with predictions for LWs 900W and 910, and as such, the predicted 'negligible' environmental consequences for LWs 900W and 910 are not expected to change from the previous assessment due to the 5% increase in mining height."

"It is therefore considered that the impact management strategies for the environment and site developments (e.g. access roads and Endeavour Energy 66kV power line) that were outlined in DgS, 2010 are still valid and do not require amendment" (DgS, 2013). The management measures as outlined in Section 8 are consistent with the impact management strategies outlined in the *Subsidence Prediction and Impact Assessment* (DgS, 2010).

Following the completion of this *Subsidence Assessment Review* (DgS, 2013), Angus Place commissioned Energy Serve to also undertake a review of the assessment titled *Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder 811/2 – Springvale Colliery – Clarence Colliery* (Energy Serve, 2013). A report titled *Addendum to Review of Mine Subsidence Impact of Longwall 900W on Endeavour Energy's 66kV Feeder*

811/2 – Springvale Colliery – Clarence Colliery (Energy Serve, 2013a) was also prepared to review the potential subsidence impacts resulting from an increased extraction height within Longwall 900W from 3.25 m to 3.425 m (see Section 5.2.4). Energy Serve (2013a) concluded that “the predicted pole movements and subsidence, associated with the increased height of Longwall 900W, do not pose a problem with either ground clearance or structural integrity of any poles from 204 to 208, contained within the subsidence footprint. No precautionary action is required and remedial actions should not be necessary.”

The enclosed Longwall 900W Powerline Management Plan has been revised to incorporate the findings of DgS (2013) and Energy Serve (2013a), and has subsequently been resubmitted for consultation. Angus Place requests that any feedback is received by 22 November 2013. By default if no comment or extension request is received by Angus Place by this date it will be assumed that there are no objections and the document will be submitted with the Longwalls 900W and 910 Integrated SMP/Extraction Plan.

If you require any further information regarding the enclosed management plan please contact the Angus Place Environment and Community Coordinator, Natalie Conroy by telephone, on (02) 6354 8938 or by email, Natalie.conroy@centennialcoal.com.au.

Yours sincerely



Brian Nicholls
Manager of Mining Engineering
Centennial Angus Place



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