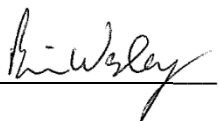




**UG4 LONGWALLS 401 TO 408  
BUILT FEATURES  
MANAGEMENT PLAN  
ESSENTIAL ENERGY**

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1	June 2021	July 2022	Approved	MCO and MSEC	MCO

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## 1.0 INTRODUCTION

The Moolarben Coal Complex (MCC) is an open cut and underground coal mining operation located approximately 40 kilometres north of Mudgee in the Western Coalfield of New South Wales (NSW) (Figure 1).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Yancoal Moolarben [YM] Pty Ltd and a consortium of Korean power companies). MCO, MCM and YM are wholly owned subsidiaries of Yancoal Australia Limited.

The UG4 Underground Mine (UG4) is a component of the approved Moolarben Coal Complex (Figure 2). First workings for UG4 North Mains commenced in October 2020 (Figure 3). Secondary extraction in UG4 of the first Longwall LW401 is scheduled to commence in 2022 (Table 2).

Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 and continue to be carried out in accordance with Project Approval (05\_0117) (Moolarben Coal Project Stage 1) (as modified) and Project Approval (08\_0135) (Moolarben Coal Project Stage 2) (as modified).

This UG4 Longwalls 401 to 408 Built Features Management Plan – Essential Energy (LW401-408 BFMP-EE) forms a part of the Extraction Plan for Longwalls 401 to 408 (herein referred to as Longwalls 401-408) of the approved UG1 Underground Mine.

### 1.1 PURPOSE AND SCOPE

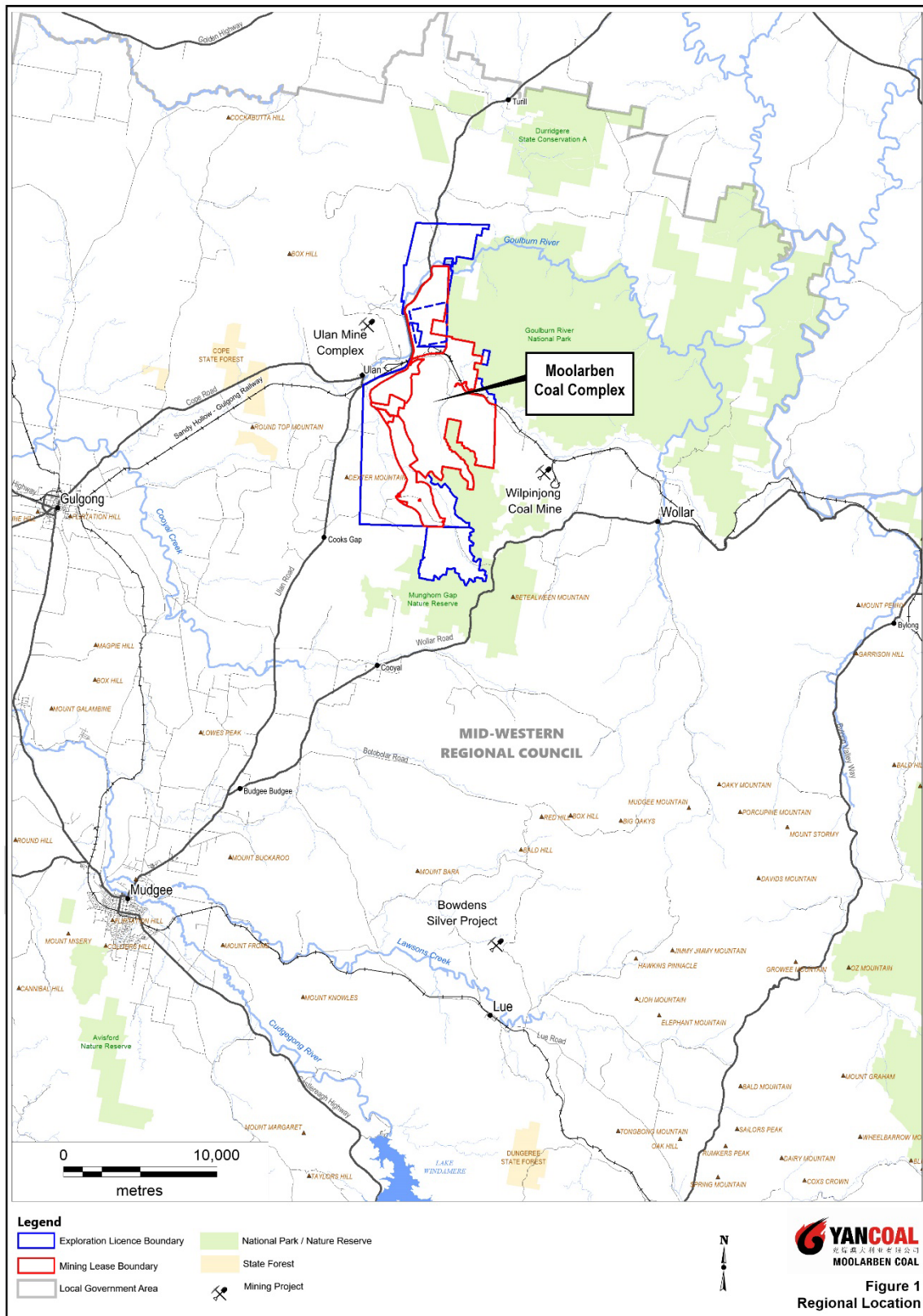
**Purpose:** This LW401-408 BFMP-EE outlines the management of potential subsidence impacts of the proposed secondary workings described in the Extraction Plan on the existing 22 kilovolt (kV) circuit powerline.

**Scope:** This LW401-408 BFMP-EE covers a 22kV powerline in the vicinity of the Study Area<sup>1</sup>, which relates to the extent of subsidence effects resulting from the secondary extraction of Longwalls 401-408 (Figure 4).

<sup>1</sup> Longwalls 401-408 and the area of land within the furthest extent of the 26.5 degree (°) angle of draw and 20 millimetres (mm) predicted subsidence contour. The Essential Energy assets are not located within the Study Area, however may be subject to far field movements (Section 4.3).

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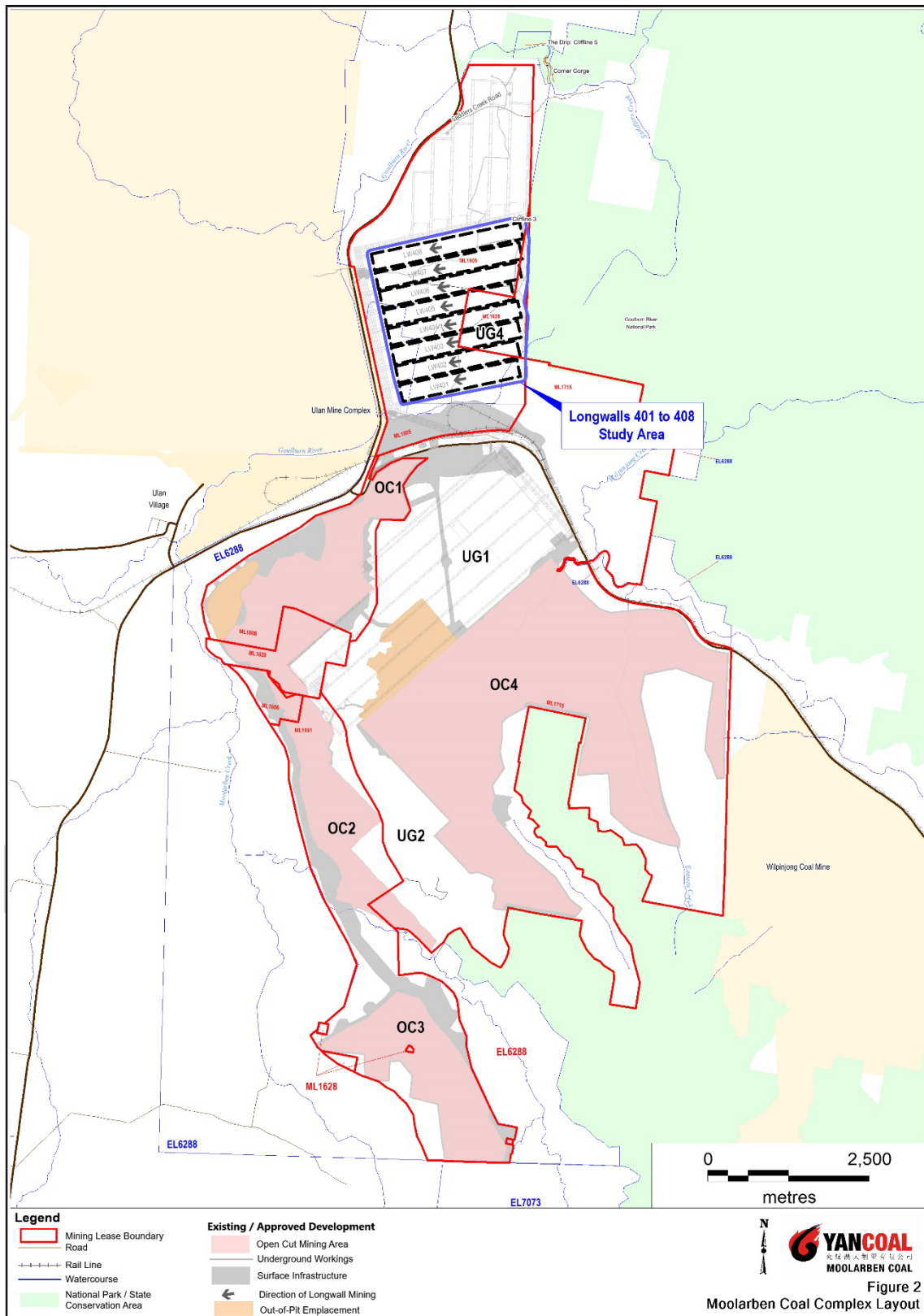
Figure 1 Locality



**YANCOAL**  
 龙信煤业集团有限公司  
**MOOLARBEN COAL**  
 Figure 1  
 Regional Location

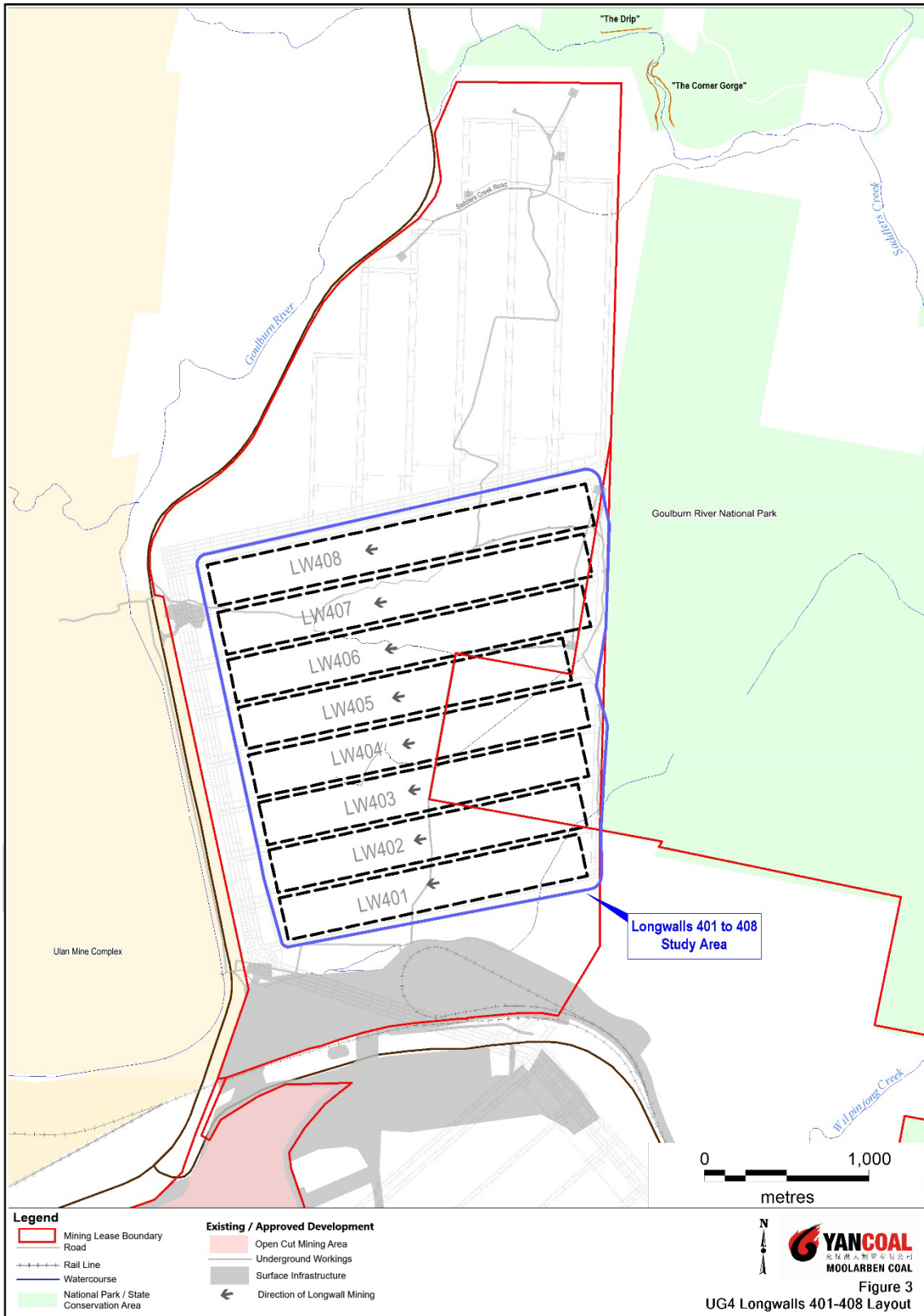
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Figure 2 Moolarben Coal Complex Layout



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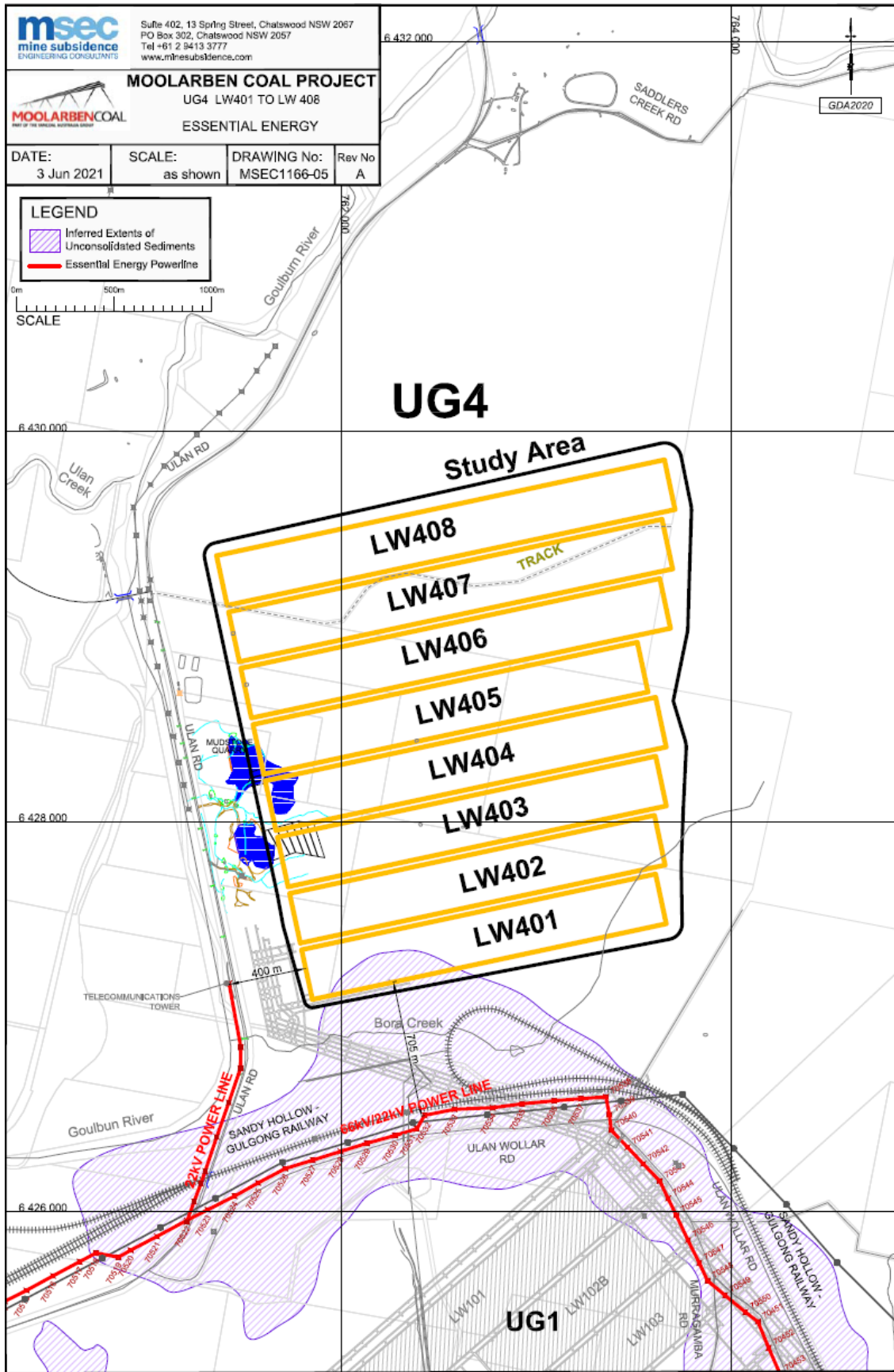
Figure 3 UG4 Longwall 401-408 Layout



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Figure 4 Essential Energy Assets



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## 1.2 SUITABLY QUALIFIED AND EXPERIENCED PERSONS

In accordance with Condition 77(a), Schedule 4 of Project Approval (05\_0117), the suitably qualified and experienced persons that have prepared this LW401-408 BFMP-EE, namely representatives from Mine Subsidence Engineering Consultants (MSEC) and MCO, were endorsed by the Secretary of the Department of Planning and Environment (DPIE).

This LW401-408 BFMP-EE has been prepared in consultation with Essential Energy (**Section 4.4**).

A list of the key responsibilities of MCO personnel in relation to this LW401-408 BFMP-EE, and a list of key contacts, is provided in **Section 11**.

## 1.3 STRUCTURE OF THE LONGWALLS 401-408 BFMP-EE

The remainder of the LW401-408 BFMP-EE is structured as follows:

- Section 2:** Describes the review and update of the LW401-408 BFMP-EE.
- Section 3:** Outlines the statutory requirements applicable to the LW401-408 BFMP-EE.
- Section 4:** Provides baseline data, extraction schedule, revised assessment of the potential subsidence impacts and environmental consequences for Longwalls 401-408, as well as the outcomes of the risk assessment.
- Section 5:** Details the performance measures relevant to Essential Energy assets.
- Section 6:** Describes the monitoring program.
- Section 7:** Describes the management measures that will be implemented.
- Section 8:** Details the performance indicators that will be used to assess against the performance measures.
- Section 9:** Provides a contingency plan to manage any unpredicted impacts and their consequences.
- Section 10:** Describes the Trigger Action Response Plan (TARP) management tool.
- Section 11:** Describes the roles and responsibilities for MCO personnel and key contacts.
- Section 12:** Describes the program to collect sufficient baseline data for future Extraction Plans.
- Section 13:** Describes the Annual Review, audits, regular reporting and improvement of environmental performance.
- Section 14:** Outlines the management and reporting of incidents.
- Section 15:** Outlines the management and reporting of complaints.
- Section 16:** Outlines the management and reporting of non-compliances with statutory requirements.
- Section 17:** Lists the references cited in this LW401-408 BFMP-EE.

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## 2.0 LONGWALLS 401 TO 408 BFMP-EE REVIEW AND UPDATE

In accordance with Condition 5, Schedule 5 of Project Approval (05\_0117), this LW401-408 BFMP-EE will be reviewed as follows:

5. *Within 3 months of the submission of:*
  - (a) *the submission of annual review under condition 4 above;*
  - (b) *the submission of an incident report under condition 7 below;*
  - (c) *the submission of an audit under condition 9 below; or*
  - (d) *any modification to the conditions of this approval (unless the conditions require otherwise),*

*the Proponent shall review and, if necessary, revise the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval*

### 2.1 ACCESS TO INFORMATION

In accordance with Condition 11, Schedule 5 of Project Approval (05\_0117), MCO will make the approved LW401-408 BFMP-EE publicly available on the MCO website.

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### 3.0 STATUTORY REQUIREMENTS

MCO's statutory obligations are contained in:

- the conditions of the NSW Project Approval (05\_0117) (as modified);
- the conditions of Commonwealth Approvals (EPBC 2007/3297, EPBC 2013/6926, EPBC 2008/4444 and 2017/7974);
- relevant licences and permits, including conditions attached to the Environment Protection Licence (EPL) No. 12932 and MLs (i.e. ML 1605, ML 1606, ML 1628, ML 1691 and ML 1715); and
- other relevant legislation.

Obligations relevant to this LW401-408 BFMP-EE are described below.

#### 3.1 EP&A ACT PROJECT APPROVAL

Condition 77(g), Schedule 3 of Project Approval (05\_0117), requires the preparation of a Built Features Management Plan as a component of the Extraction Plan. In addition, Conditions 75, 77(n), 77(p) and 79, Schedule 4 and Condition 3, Schedule 5 of Project Approval (05\_0117) outline general management plan requirements that are applicable to the preparation of this LW401-408 BFMP-EE.

**Table 1** presents these requirements and indicates where they are addressed within this LW401-408 BFMP-EE.

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**Table 1 Management Plan Requirements**

Project Approval (05_0117) Condition	LW401-408 BFMP-EE Section
<b>Condition 75, Schedule 3</b>	
<p>Notes:</p> <ul style="list-style-type: none"> <li>...</li> <li>• The Proponent will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or Public Safety Management Plan (see condition 74 below).</li> <li>• Measurement and/or monitoring of compliance with performance measures and performance indicators is to be undertaken using generally accepted methods that are appropriate to the environment and circumstances in which the feature or characteristic is located. These methods are to be fully described in the relevant management plans. In the event of a dispute over the appropriateness of proposed methods, the Secretary will be the final arbiter.</li> <li>...</li> <li>• Requirements under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961.</li> <li>...</li> </ul>	<p><b>Section 7</b></p> <p><b>Sections 6</b></p> <p><b>Section 9</b></p>
<b>Condition 77(g), Schedule 3</b>	
<p>(g) include a Built Features Management Plan, which has been prepared in consultation with Resources Regulator and the owners of affected public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which:</p> <ul style="list-style-type: none"> <li>• addresses in appropriate detail all items of key public infrastructure and other public infrastructure and all classes of other built features;</li> <li>• has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;</li> <li>• recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and</li> <li>• in the case of all key public infrastructure, and other public infrastructure except roads, trails and associated structures, reports external auditing for compliance with ISO 31000 (or alternative standard agreed with the infrastructure owner) and provides for annual auditing of compliance and effectiveness during extraction of longwalls which may impact the infrastructure;</li> </ul>	<p><b>Section 4.1</b></p> <p><b>Section 4.4</b></p> <p><b>Sections 7 &amp; 9</b></p> <p><b>Section 13.1</b></p>
<b>Condition 77(n), Schedule 3</b>	
<p>(n) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 18 and 19, or where any such exceedance appears likely;</p>	<p><b>Section 9</b></p>
<b>Condition 77(p), Schedule 3</b>	
<p>(p) include a program to collect sufficient baseline data for future Extraction Plans.</p>	<p><b>Section 12</b></p>
<b>Condition 78, Schedule 3</b>	
<p>6. The Proponent shall ensure that the management plans required under conditions 77(g)-(l) above include:</p> <p>(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; and</p> <p>(b) a detailed description of the measures that would be implemented to remediate predicted impacts.</p>	<p><b>Section 4</b></p> <p><b>Section 7</b></p>

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**Table 1 (Continued): Management Plan Requirements**

Project Approval (05_0117) Condition	LW401-408 BFMP-EE Section
<b>Condition 3, Schedule 5</b>	
<p>3. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <p>(a) detailed baseline data;</p> <p>(b) a description of:</p> <ul style="list-style-type: none"> <li>• the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>• the relevant limits or performance measures/criteria;</li> <li>• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;</li> </ul> <p>(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>(d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> <li>• impacts and environmental performance of the project;</li> <li>• effectiveness of any management measures (see c above);</li> </ul> <p>(e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>(f) a program to investigate and implement ways to improve the environmental performance of the project over time;</p> <p>(g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> <p>(h) a protocol for periodic review of the plan.</p>	<p style="text-align: right;"><b>Section 4.1</b></p> <p style="text-align: right;"><b>Section 3</b></p> <p style="text-align: right;"><b>Section 5</b> <b>Section 8</b></p> <p style="text-align: right;"><b>Sections 7 &amp; 9</b></p> <p style="text-align: right;"><b>Sections 6, 8 &amp; 13</b></p> <p style="text-align: right;"><b>Section 9</b></p> <p style="text-align: right;"><b>Sections 6 &amp; 13</b></p> <p style="text-align: right;"><b>Section 14</b></p> <p style="text-align: right;"><b>Section 15</b></p> <p style="text-align: right;"><b>Section 16</b></p> <p style="text-align: right;"><b>Section 9</b></p> <p style="text-align: right;"><b>Section 2</b></p>

### 3.2 OTHER LEGISLATION

The Acts which may be applicable to the conduct of the Moolarben Coal Complex includes, but is not limited to, the:

- *Crown Lands Act, 1989;*
- *Fisheries Management Act, 1994;*
- *Heritage Act, 1977;*
- *Coal Mine Subsidence Compensation Act 2017;*
- *Mining Act, 1992;*
- *National Parks and Wildlife Act, 1974;*
- *Biodiversity Conservation Act, 2016;*
- *Protection of the Environment Operations Act, 1997;*
- *Roads Act, 1993;*
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *Work Health and Safety Act, 2011;* and
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013.*

Relevant licences or approvals required under these Acts will be obtained as required.

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## 4.0 ESSENTIAL ENERGY 22KV POWERLINE

### 4.1 BASELINE DATA

The Essential Energy (EE) infrastructure in the vicinity of Longwalls 401 to 408 comprises of a 22kV powerline supply to a telecommunications tower, approximately 400 m from Longwall 401 at its nearest point. The depth of cover along the western end of Longwall 401 varies from approximately 83 m to 120 m which equates to 3.3 to 5 times the depths of cover from Longwall 401 (MSEC, 2021).

At distances of 400 m or more from the longwalls, the powerline is outside the Study Area and is predicted to experience less than 20 mm vertical subsidence resulting from the Extraction Plan Layout. Whilst the powerline could experience very low levels of vertical subsidence, it is not expected to experience measurable tilts, curvatures or strains. The powerline will experience far-field horizontal movements, as discussed in **Section 4.3**.

The 22kV powerline is fed from a dual circuit 66kV/22kV powerline supported on timber poles located further south along Ulan Road and Ulan Wollar Road, approximately 700m away from Longwall 401 at its nearest point (**Figure 4**).

At changes in the alignment of the 22kV powerline, the timber poles have guy wires for additional lateral restraint. Other powerlines and poles are located further to the north along Ulan Road however these powerlines are privately owned (MSEC, 2021).

### 4.2 LONGWALLS 401-408 EXTRACTION SCHEDULE

Longwalls 401-408 and the area of land within the Study Area are shown on **Figures 3 and 4**. Longwall extraction will occur from the east to the west. The longwall layout includes approximately 260 m panel widths (void) with 35 m width pillars (solid).

The provisional extraction schedule for Longwalls 401-408 is provided in **Table 2**.

**Table 2 Provisional Extraction Schedule**

Longwall	Estimated Start Date	Estimated Duration (months)	Estimated Completion Date
LW401	June 2022	4	October 2022
LW402	November 2022	4	March 2023
LW403	April 2023	4	August 2023
LW404	August 2023	5	January 2024
LW405	February 2024	4	June 2024
LW406	July 2024	5	December 2024
LW407	January 2025	4	May 2025
LW408	June 2025	4	November 2025

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### 4.3 REVISED SUBSIDENCE AND IMPACT PREDICTIONS

Revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings have been prepared by MSEC, incorporating any relevant information obtained since approval. Revised predictions have considered the results from the nearby UG1 longwall extraction.

The development of this LW401-408 BFMP-EE for UG4 has incorporated the revised subsidence predictions and impacts as described in **Section 4.3.1** and **Attachment 1**.

#### 4.3.1 UG4 Revised Subsidence Impacts & Predictions

A summary of the subsidence predictions (MSEC, 2021) is provided below:

- The predicted subsidence movements at the 22kV powerline are expected to be less than typical measurable limits for conventional vertical subsidence, tilt, curvature or strain. However, the powerline may experience far-field horizontal movements. The upper limit of previously observed absolute far-field horizontal movements for sites located greater than 3.3 times the depth of cover from longwalls, is 55 mm.
- The predicted far-field horizontal movements at the 22kV powerline are expected to be bodily movements that are directed across the general alignment of the 22kV powerline towards the extracted goaf area and should be accompanied by very low levels of strain that are in the order of survey tolerance. Relative movement between poles is expected to be negligible. Adverse impact to the 22kV powerline resulting from these potential far-field horizontal movements is considered unlikely.
- The statistical analysis of observed strain data between 200 m and 600 m from extracted longwalls shows a 25% probability of exceedance of 0.5 mm/m tensile and compressive, and a 5% probability of exceedance of approximately 1.5 mm/m tensile and compressive.
- With the location of the 22kV powerline and light poles outside the longwall footprint and the low probability of significant observed strains developing based on statistical analysis, the development of adverse impacts to the 66kV powerline and light poles due to the extraction of Longwalls 401 to 408 is considered unlikely.

It is expected that the 22kV powerline to the communications tower can be maintained in serviceable condition with the implementation of the appropriate monitoring and management strategies (**Sections 6** and **7**).

### 4.4 RISK ASSESSMENT

In accordance with the draft *Guidelines for the Preparation of Extraction Plans* (DP&E and DRE, 2015), potential risks and potential risk control measures and procedures have been considered for the Essential Energy infrastructure in the vicinity of Longwalls 401-408.

The investigation included:

- Confirmation of relevant Essential Energy assets.
- Review of the revised subsidence predictions and potential impacts on Essential Energy assets (including consideration of past experience for UG1 and in the Western Coalfield).

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- Consideration and discussion of the proposed monitoring program, management measures and contingency measures.

The following potential risks were identified:

- The 22kV powerline becomes unserviceable due to mining of Longwalls 401-408 and customers are affected.

A number of risk control measures and procedures were identified.

The proposed risk control measures and procedures have been incorporated where relevant in this LW401-408 BFMP-EE and the program for implementation is summarised in **Table 3**.

MCO considers all risk control measures and procedures to be feasible to manage all identified risks.

**Table 3 Program for Implementation of Proposed Risk Control Measures and Procedures**

Risk Control Measure / Procedure		LW401-408 BFMP-EE Section	Proposed Timing
<b>Baseline Data / Validation</b>			
1	Carry out a baseline inspection of the 22 kV powerline to the telecommunications tower in the vicinity of Longwalls 401-408 Study Area.	<b>Section 6.2</b>	Prior to Longwall 401
2	Installation of UG4 subsidence effect monitoring line and commencement of the subsidence monitoring program for Longwalls 401 - 408.	<b>Section 6</b>	Prior to Longwall 401
<b>Management / Monitoring / Response Measures</b>			
3	Establish key contacts list in the LW401-408 BFMP-EE.	<b>Section 11.1</b>	Complete
4	Include a schedule of times/frequency of communication with Essential Energy for the status of mining of Longwalls 401-408 in the LW401-408 BFMP-EE.	<b>Section 7 and Table 6</b>	Complete
5	Include in the TARP triggers for conditions that may need to be actioned by MCO and/or Essential Energy.	<b>Section 10 and Attachment 2</b>	Complete

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## 5.0 PERFORMANCE MEASURES

The performance measures specified in Table 15, Schedule 4 of Project Approval (05\_0117) relevant to the 22 kV powerline, as a built feature, are listed in **Table 4**.

**Table 4 Built Features Subsidence Impact Performance Measures**

Feature	Subsidence Impact Performance Measure
<b>Other infrastructure:</b>	
Other built features* and improvements, including fences	Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else fully replaced or fully compensated.

**Source:** Table 15 in Schedule 4 of Project Approval (05\_0117).

**Notes:** \* Essential Energy’s 22kV powerline to a telecommunications tower

In accordance with Condition 75, Schedule 4 of Project Approval (05\_0117), MCO must ensure that there is no exceedance of the performance measures listed in Table 15, Schedule 3 of Project Approval (05\_0117), to the satisfaction of the Secretary of the DPIE.

**Section 6** outlines the monitoring that will be undertaken to assess the impact of Longwalls 401-408 against the performance measures in relation to the 22 kV powerline. Management measures for the 22 kV powerline are outlined in **Section 7** and performance indicators for the performance measures are summarised in **Section 8**.

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## 6.0 MONITORING

A monitoring program will be developed in order to monitor the impacts of the extraction of Longwalls 401 and 402 on the 22 kV powerline to identify unsafe conditions or loss of serviceability during or after mining. Key components of the monitoring program are summarised in **Table 5**.

As recommended by MSEC, baseline line condition and monitoring of the pole positions will be implemented (**Table 5**) along the section of the 22kV powerline feed to the telecommunications tower for comparative assessment during extraction of Longwalls 401 and 402 (MSEC, 2021).

**Table 5 22 kV Powerline Monitoring Program Overview**

Monitoring Component	Parameter	Timing/Frequency	Responsibility
<b>Pre-mining</b>			
UG4 subsidence monitoring lines, as described in the UG4 Longwalls 401 to 408 Subsidence Monitoring Program (LW401- 408 SMP).	Installation of survey monitoring program and initial ground survey ('R Line'). Monitoring parameters include: <ul style="list-style-type: none"> <li>• Easting;</li> <li>• Northing ;</li> <li>• Vertical Subsidence;</li> <li>• Tilt;</li> <li>• Tensile Strain; and</li> <li>• Compressive Strain</li> </ul>	Prior to the secondary extraction for Longwall 401	Underground Technical Manager / Registered Mine Surveyor
22 kV circuit powerline – power poles to telecommunications tower within 400m of Longwall 401	Baseline survey –monitoring points at each timber pole.	Prior to the secondary extraction for Longwall 401	Underground Technical Manager / Registered Mine Surveyor / Essential Energy
22 kV circuit powerline – power poles to telecommunications tower within 400m of Longwall 401	Visual inspection of the condition of existing 22 kV circuit powerline (e.g. pole foundations, integrity and function of support clamps or other items). Photo points (including baseline photographic record).	Prior to the secondary extraction for Longwall 401	Underground Technical Manager / Registered Mine Surveyor / Essential Energy
Maintenance inspections.	Condition of existing 22 kV powerline (e.g. land clearance, vegetation clearance, road clearance, pole foundations, integrity and function of support clamps or other items).	As per Essential Energy's routine maintenance schedule.	Essential Energy

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**Table 5 (Continued) 22 kV Powerline Monitoring Program Overview**

Monitoring Component	Parameter	Timing/Frequency	Responsibility
<b><i>During and After Mining</i></b>			
UG4 subsidence monitoring lines, as described in the UG4 Longwalls 401 to 408 Subsidence Monitoring Program (LW401- 408 SMP).	Survey monitoring program for subsidence parameters measured along the 'R Line', including: <ul style="list-style-type: none"> <li>• Easting;</li> <li>• Northing ;</li> <li>• Vertical Subsidence;</li> <li>• Tilt;</li> <li>• Tensile Strain; and</li> <li>• Compressive Strain</li> </ul>	At the completion of Longwall 401 and 402.  Provide a copy of the results of the subsidence parameters measured along the 'R Line' after Longwall 401 and 402 to Essential Energy  <i>(unless otherwise agreed to by Essential Energy)</i>	Underground Technical Manager / Registered Mine Surveyor
22 kV powerline - power poles to telecommunications tower (Subsidence Impact Inspection) within 400m of Longwall 401	Survey & Visual inspection of the condition of existing 22 kV circuit powerline (e.g. pole foundations, integrity and function of support clamps or other items).	If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line'	Underground Technical Manager / Registered Mine Surveyor
22 kV powerline - power poles to telecommunications tower within 400m of Longwall 401  Visual inspection (including structural assessment).	Visual inspection of the condition of existing 22kV powerline (e.g. pole foundations, integrity and function of support clamps or other items).  Photo points (comparisons against baseline photographic record).	At the completion of Longwall 401 and 402  Provide a copy of the results of the visual inspections after each Longwall 401 to Essential Energy  <i>(unless otherwise agreed to by Essential Energy)</i>	Underground Technical Manager and representative of asset owner if required
22 kV powerline – power poles to telecommunications tower	Survey – monitoring points at each timber pole.	At the completion of Longwall 401 and 402  <i>[Inspection sheets provided to Essential Energy if/when movement detected]</i>	Underground Technical Manager / Registered Mine Surveyor

The frequency of monitoring will be reviewed either:

- in accordance with the Annual Review; or
- If monitoring determines there has been no impact to the powerline and/or no exceedance of the performance measures listed in Table 4, MCO in consultation with Essential Energy will review the frequency of this monitoring component; or
- if triggered as a component of the Contingency Plan as outlined in **Section 9** of this LW401-408 BFMP-EE.

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## 6.1 SUBSIDENCE PARAMETERS

Subsidence parameters measured by a survey line ('R Line') (i.e. Easting, Northing, Vertical subsidence, tilt, tensile strain and compressive strain) associated with mining will be measured in accordance with the UG4 Longwalls 401 to 408 Subsidence Monitoring Program (LW401-408 SMP).

In summary, surveys will be conducted to measure subsidence movements in three dimensions using a total station survey instrument.

Prior to mining of Longwall 401, and in consultation with Essential Energy, MCO will undertake a baseline survey of the poles. Unless otherwise agreed with Essential Energy, inspection sheets detailing the outcome of the subsidence monitoring program will be provided to Essential Energy.

## 6.2 SUBSIDENCE IMPACTS

A visual inspection of the 22kV powerline to the telecommunications tower will be conducted prior to secondary extraction of Longwall 401.

In the event monitoring detects ground movements greater than the predicted subsidence monitoring parameters for UG4 and those described in **Section 4.3**, a visual inspection will be conducted by MCO along the 22kV powerline to the telecommunications tower.

Additional opportunistic observations of subsidence impacts will be conducted during routine works by MCO and its contractors.

Where relevant, inspections of subsidence impacts will include photographic record of the impacts from nominated photo points for comparison with baseline photographic records.

It is understood that Essential Energy also conducts routine inspections (including fault and emergency patrols) which would be used for monitoring of the impacts of subsidence if conducted during the course of mining Longwalls 401-408.

Information will be recorded in the LW401-408 BFMP-EE Subsidence Impact Register (**Attachment 3**) and reported in accordance with Project Approval (05\_0117) (**Section 13**).

MCO and Essential Energy will compare the results of the subsidence impact monitoring against the built features performance measure and indicators (**Sections 5 and 8**). In the event the observed subsidence impacts from the Moolarben Coal Complex exceed the performance measure or indicators, MCO and Essential Energy will assess the consequences of the exceedance in accordance with the Contingency Plan described in **Section 9**.

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## 7.0 MANAGEMENT MEASURES

A number of potential management measures in relation to the 22 kV powerline are considered to be applicable. These include:

- alteration of conductor tensions;
- modification to attachment points such as placement of stringing sheaves to earth wires and/or phase conductors; and
- strengthening of pole footings.

In the event management measures are considered to be required, the appropriate action will be determined and implemented in consultation with Essential Energy. A summary of management measures will be reported in the Annual Review. Key management actions and timing is summarised in **Table 6**.

**Table 6 22 kV Powerline Key Management Actions**

Management Measure	Timing/Frequency	Responsibility
<b>Pre-mining</b>		
<b>Notification to Essential Energy</b> prior to commencement of secondary extraction.	Prior to secondary extraction of Longwall 401.	Underground Technical Manager
<b>Visual inspection and survey</b> of 22 kV powerline (baseline) - power poles to telecommunications tower (to identify management measures potentially required pre-subsidence)	Prior to commencement of Longwall 401 extraction.	Underground Technical Manager and representative of asset owner if required
<b>During Mining</b>		
<b>Notification to Essential Energy</b> during longwall mining of Longwall 401 and 402.	If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line' If/when visual monitoring detects subsidence related impacts If/when tilt monitoring detects subsidence related impacts	Underground Technical Manager

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**Table 6 (Continued): 22 kV Powerline Key Management Actions**

Management Measure	Timing/Frequency	Responsibility
<b>During Mining</b>		
Provision of <b>inspection sheets</b> detailing the outcome of the subsidence impact monitoring program to Essential Energy (unless otherwise agreed with Essential Energy).	Following exceedance of the predicted subsidence monitoring parameters and/or subsidence related impact inspections	Underground Technical Manager
<b>Implement TARP (Attachment 2).</b>	During Longwalls 401 and 402	Underground Technical Manager
<b>Post-mining</b>		
<b>Visual Inspection of 22k</b> - powerline power poles to telecommunications tower	Following completion of mining Longwall 401 and 402	Underground Technical Manager
<b>Notification to Essential Energy</b> longwall mining of Longwalls 401 and 402 is completed	Following completion of mining Longwall 401 and 402	Underground Technical Manager

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## 8.0 ASSESSMENT OF PERFORMANCE INDICATORS AND MEASURES

In accordance with Condition 77(d), Schedule 4 of Project Approval (05\_0117), performance indicators have been developed for the performance measures listed in **Table 4 (Section 5)**.

The performance indicators proposed to ensure that the performance measures are achieved in relation to subsidence induced far field movements, include:

- the structural integrity of the 22kV powerline (power poles and transmission lines) is maintained.

Monitoring conducted to inform the assessment of secondary extraction of Longwalls 401-408 against the performance indicators for the performance measures relevant to the 22 kV powerline as a built feature is outlined in **Section 6**.

Assessment of monitoring results against the performance indicators and performance measure would include comparison against the baseline visual inspection to confirm any changes were not present prior to the commencement of mining at UG4, and review of 'R Line' monitoring data to confirm if ground movements in excess of survey accuracy have occurred.

If a performance measure is considered to have been exceeded, the Contingency Plan outlined in **Section 9** of this LW401-408 BFMP-EE will be implemented.

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## 9.0 CONTINGENCY PLAN

In the event the performance measures relevant to the 22 kV powerline as a built feature, summarised in **Table 4**, are considered to have been exceeded or are likely to be exceeded, MCO will implement the following Contingency Plan:

- The observation will be reported to the Underground Technical Manager or the Environmental and Community Manager within 24 hours.
- The observation will be recorded in the Subsidence Impact Register (**Attachment 3**).
- The likely exceedance will be reported in an Incident Report (refer to the Extraction Plan).
- MCO will provide the Incident Report to relevant stakeholders (i.e. DPIE, DPIE-RR and Essential Energy).
- MCO will conduct an investigation to identify and evaluate contributing factors to the exceedance, including re-survey of the relevant subsidence monitoring lines, analysis of predicted versus observed subsidence parameters and a review of the subsidence monitoring program with updates to the program where appropriate.
- An appropriate course of action will be developed in consultation with relevant stakeholders and government agencies including proposed contingency measures (**Section 9.1**), and a program to review the effectiveness of the contingency measures.
- The course of action will be approved by, and implemented to the satisfaction of, Essential Energy and DPIE-RR.
- This LW401-408 BFMP-EE and the performance indicators will be reviewed to adequately manage future potential impacts within the limits of Project Approval (05\_0117).

MCO will comply with the *Coal Mine Subsidence Compensation Act, 2017 (formerly NSW Mine Subsidence Compensation Act, 1961)*; in the event that property damages occur as a result of mining Longwalls 401-408.

### 9.1 CONTINGENCY MEASURES

Contingency measures will be developed in consideration of the specific circumstances of the feature (e.g. the location, nature and extent of the impact, and the assessment of environmental consequences). Potential contingency measures that could be considered in the event the performance measure for the 22 kV powerline is exceeded are summarised in **Table 7**.

**Table 7 Potential Contingency Measures**

Environmental Consequence	Potential Contingency Measures	
	Measure	Description
<b>Impact on:</b>		
<b>Transmission Wires</b>	Stabilisation techniques	Sheaving of conductors and/or earth wires.
	Rebuilding	Construction of new transmission lines.
<b>Poles</b>	Stabilisation techniques	Installation of supports.
	Rebuilding	Construction of new pole(s) or emergency structures.

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## 10.0 TRIGGER ACTION RESPONSE PLAN – MANAGEMENT TOOL

The framework for the various components of this LW401-408 BFMP-EE are summarised in the TARP shown in **Attachment 2**. The TARP illustrates how the various predicted subsidence impacts, monitoring components, performance measures, and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

The TARP comprises:

- baseline conditions;
- predicted subsidence impacts;
- trigger levels from monitoring to assess performance; and
- triggers that flag implementation of contingency measures.

The TARP system provides a simple and transparent snapshot of the monitoring of environmental performance and the implementation of management and/or contingency measures.

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## 11.0 ROLES AND RESPONSIBILITIES

Key responsibilities of MCO personnel in relation to this LW401-408 BFMP-EE are summarised in **Table 8**. Responsibilities may be delegated as required.

**Table 8 Responsibility Summary**

Responsibility	Task
<b>General Manager</b>	<ul style="list-style-type: none"> <li>Ensure resources are available to MCO personnel to facilitate the completion of responsibilities under this LW401-408 BFMP-EE.</li> </ul>
<b>Underground Technical Manager</b>	<ul style="list-style-type: none"> <li>Ensure the LW401-408 SMP is implemented.</li> <li>Ensure monitoring required under this LW401-408 BFMP-EE is carried out within specified timeframes, adequately checked and processed and prepared to the required standard.</li> <li>Undertake relevant monitoring and implementation of management measures summarised in <b>Tables 5</b> and <b>6</b> respectively.</li> </ul>
<b>Environmental and Community Manager</b>	<ul style="list-style-type: none"> <li>Liaise with relevant stakeholders regarding subsidence impact management and related environmental consequences.</li> </ul>
<b>Registered Mine Surveyor</b>	<ul style="list-style-type: none"> <li>Undertake all subsidence monitoring to the required standard within the specified timeframes and ensure data are adequately checked, processed and recorded.</li> </ul>

### 11.1 KEY CONTACTS

The details of key contacts and phone numbers in relation to this LW401-408 BFMP-EE are summarised in **Table 9**.

**Table 9 Key Personnel Contact Details**

Organisation	Position	Contact Name	Phone Number
MCO	Underground Technical Manager	Mr Liam Mildon	<b>02 6376 1614</b>
	Environmental and Community Manager	Mr Trent Cini	<b>02 6376 1436</b>
	Moolarben Coal Hotline		<b>1800 556 484</b>
Essential Energy	Mains Design Manager	Mr Matthew Boyling	<b>0419 846 178</b>
	Essential Energy Fault Line		<b>132 080</b>

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## 12.0 FUTURE EXTRACTION PLANS

In accordance with Condition 77(p), Schedule 4 of Project Approval (08\_0117), MCO will collect baseline data for the future Extraction Plans. In addition to the baseline data collection, consideration of the environmental performance and management measures, in accordance with the review(s) conducted as part of this LW401-408 BFMP-EE, will inform the appropriate type and frequency of monitoring of the assets relevant to the next Extraction Plan.

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### 13.0 ANNUAL REVIEW, REGULAR REPORTING AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

In accordance with Condition 4, Schedule 5 of Project Approval (05\_0117), MCO will conduct an Annual Review of the environmental performance of the Project by the end of March each year, or as otherwise agreed by the Secretary of the DPIE.

The Annual Review will:

- describe the works carried out in the previous calendar year, and the development proposed to be carried out over the current calendar year;
- include a comprehensive review of the monitoring results and complaints records of the Project over the previous calendar year, including a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the EA;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

In accordance with Condition 11, Schedule 5 of Project Approval (05\_0117), the Annual Review will be made available on the MCO website. As described in Section 2, this LW401-408 BFMP-EE will be reviewed within three months of the submission of an Annual Review, and revised where appropriate. In accordance with Condition 8, Schedule 5 of Project Approval (05\_0117), MCO will also provide regular reporting on the environmental performance of the Project on the MCO website.

#### 13.1 AUDITS

In accordance with Condition 9, Schedule 5 of Project Approval (05\_0117), an independent environmental audit was conducted by the end of December 2015 and every three years thereafter. A copy of the independent environmental audit will be provided to the Secretary of the DPIE and made available on the MCO website.

The independent environmental audit will be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of the DPIE.

The independent environmental audit will assess the environmental performance of the Project and assess whether it is complying with the requirements of Project Approval (05\_0117), and any other relevant approvals, and recommend measures or actions to improve the environmental performance of the Project.

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## 14.0 INCIDENTS

An incident is defined in Project Approval (05\_0117) as a set of circumstances that:

- causes or threatens to cause material harm to the environment; and/or
- breaches or exceeds the limits or performance measures/criteria in Project Approval (05\_0117).

In the event that an incident which causes, or threatens to cause, material harm to the environment occurs, the incident will be managed in accordance with the Pollution Incident Response Management Plan.

The reporting of incidents will be conducted in accordance with Condition 7, Schedule 5 of Project Approval (05\_0117).

MCO will notify the Secretary of the DPIE, and any other relevant agencies immediately after MCO becomes aware of the incident which causes or threatens to cause material harm to the environment. For any other incident associated with the project, MCO will notify the Secretary and any other relevant agencies as soon as practicable after becoming aware of the incident. Within seven days of the date of the incident, MCO will provide the Secretary of DPIE and any relevant agencies with a detailed report on the incident. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

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## 15.0 COMPLAINTS

MCO maintains a Community Complaints Line (Phone Number: 1800 556 484) that is dedicated to the receipt of community complaints. The Community Complaints Line is publicly advertised and operates 24 hours per day, seven days a week, to receive any complaints from neighbouring residents or other stakeholders.

MCO has developed a Community Complaints Procedure which details the process to be followed when receiving, responding to and recording community complaints. The Community Complaints Procedure is supported by a Complaints Database.

The Community Complaints Procedure is a component of the MCO Environmental Management Strategy which requires the recording of relevant information including:

- the nature of complaint;
- method of the complaint;
- relevant monitoring results and meteorological data at the time of the complaint;
- site investigation outcomes;
- any necessary site activity and activity changes;
- any necessary actions assigned; and
- communication of the investigation outcome(s) to the complainant.

In accordance with Condition 11, Schedule 5 of Project Approval (05\_0117), the complaints register will be updated monthly and made available on the MCO website.

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## 16.0 NON-COMPLIANCES WITH STATUTORY REQUIREMENTS

A protocol for the managing and reporting of non-compliances with statutory requirements has been developed as a component of MCO’s Environmental Management Strategy and is described below.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with the Moolarben Coal Complex.

The Environmental and Community Manager (or delegate) will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in **Section 14**, MCO will notify the Secretary of the DPIE, and any other relevant agencies, of any incident associated with MCO.

A review of MCO’s compliance with all conditions of Project Approval (05\_0117), mining leases and all other approvals and licenses will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on the MCO website.

As described in **Section 13.1**, an independent environmental audit was conducted by the end of December 2015 and undertaken every three years thereafter. A copy of the audit report will be submitted to the Secretary of the DPIE and made publicly available on the MCO website

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## 17.0 REFERENCES

AXYS Consulting Pty Ltd (2017) *Potential Impact of Longwall 101 to 103 on Essential Energy Infrastructure – Risk Assessment Report.*

Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy (2015) *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining.* Version 5. Draft.

Mine Subsidence Engineering Consultants (2015) *Moolarben Coal Complex: Revised Predictions of Subsidence Parameters and Revised Assessments of Subsidence Impacts resulting from the Proposed UG1 Mine Layout Optimisation Modification.*

Mine Subsidence Engineering Consultants (2017a) *Moolarben Coal Complex: Moolarben Project Stage 2 – Longwalls 101 to 103 – Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan.* Report number MSEC867.

Mine Subsidence Engineering Consultants (2017b) *Moolarben Coal Operations: Longwalls 101 to 103 - Subsidence Predictions and Impact Assessments for the Essential Energy Infrastructure.*

Mine Subsidence Engineering Consultants (2020) *Moolarben Project Stage 2- Longwalls 104 to 105 Subsidence Predictions and Impacts Assessments for the Natural and Built Features In Support of the Extraction Plan*

Mine Subsidence Engineering Consultants (2021) *Moolarben Coal Operations – Longwalls 401 to 408 Subsidence predictions and impact assessments for the Essential Energy Infrastructure*

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**ATTACHMENT 1**

**MOOLARBEN COAL OPERATIONS – LONGWALLS 401 TO 408 SUBSIDENCE PREDICTIONS AND  
IMPACT ASSESSMENT FOR THE ESSENTIAL ENERGY INFRASTRUCTURE**

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MCO_BFMP_EE	1	June 22	July 22	MCO	B. Wesley

3<sup>rd</sup> June 2021

Liam Mildon  
Underground Technical Services Manager  
Moolarben Coal Operations Pty Ltd  
Locked Bag 2003  
Mudgee NSW 2850

Ref: MSEC1166-05

Dear Liam,

**RE: Moolarben Coal Operations – Longwalls 401 to 408  
Subsidence predictions and impact assessments for the Essential Energy Infrastructure**

Moolarben Coal Operations Pty Limited (MCO) operates the Moolarben Coal Complex (MCC), which is located approximately 40 kilometres north east of Mudgee in New South Wales (NSW). MCO has been granted approval to develop Stages 1 and 2 of the Moolarben Coal Project (MCP) under the *Environmental Planning and Assessment Act 1979*. Approval for Stage 1 of the MCP (05\_0117) was granted by the Minister for Planning on 6 September 2007. The Stage 1 approval is based on a Preferred Mine Plan General Layout (*Approved Layout*) for Underground Area 4 (UG4).

MCO is currently preparing an Extraction Plan for the extraction of Longwalls 401 to 408 within UG4 as shown in Drawing No. MSEC1166-01. The layout of Longwalls 401 to 408 that incorporates minor shortening of the lengths of the Approved Layout is referred to as the *Extraction Plan Layout* in this report.

This letter report summarises the predicted subsidence movements and the assessed subsidence impacts for the Essential Energy infrastructure based on the Extraction Plan Layout. In doing so this letter considers potential subsidence induced mechanisms of impact and concludes with a summary of the impact assessment.

The locations of the Essential Energy infrastructure are shown in the attached Drawing No. MSEC1166-05.

The Essential Energy infrastructure in the vicinity of Longwalls 401 to 408 comprises a dual circuit 66kV/22kV powerline supported on timber poles located to the south along Ulan Road and Ulan-Wollar Road. At its closet point to Longwalls 401 to 408, approximately 400m from Longwall 401, the dual circuit 66kV/22kV powerline supplies a 22kV feed to a telecommunications tower owned by Telstra. The 66kV/22kV line to the south of Longwall 401 is located along Ulan-Wollar Road at approximately 705 m at its closest point.

At changes in the alignment of the powerlines, the timber poles have guy wires for additional lateral restraint. Other powerlines and poles are located further to the north along Ulan Road however these powerlines are privately owned.

The depth of cover along the western end of Longwall 401 varies from approximately 83 m to 120 m which, at a distance of 400 m, equates to 3.3 to 5 times the depths of cover from Longwall 401 to the 22kV powerline. The powerline to the south along Ulan-Wollar Road is over 7 times the depth of cover from Longwall 401.

**Conventional Subsidence Parameters**

At distances of 400 m or more from the longwalls, the 22kV powerline is outside the Study Area and is predicted to experience less than 20 mm vertical subsidence resulting from the Extraction Plan Layout. Whilst the powerline could experience very low levels of vertical subsidence, it is not expected to experience measurable tilts, curvatures or strains. The powerline will experience far-field horizontal movements, as discussed below.

The dual circuit 66kV/22kV powerline supported on timber poles and a substation located to the south along Ulan Road and Ulan Wollar Road are over 7 times the depth of cover from Longwall 401. At this distance the powerline and substation will not be subjected to measurable conventional mine subsidence ground movements and are unlikely to experience measurable far-field horizontal movements. The potential for non-conventional movements is very low, due to the distances from the longwalls. Subsidence related impacts to the dual circuit 66kV/22kV powerline are unlikely and this powerline is therefore not considered further in this assessment.

### **Far-Field Movements**

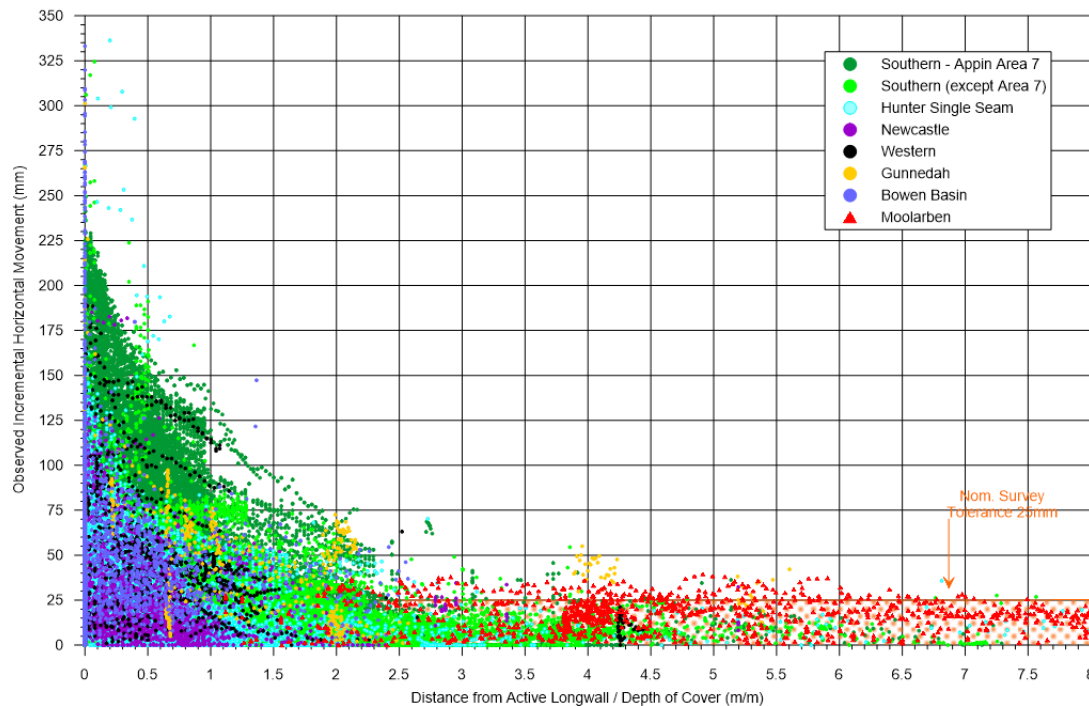
The measured horizontal movements at survey marks which are located beyond the longwall goaf edges and over solid unmined coal areas are often greater than the observed vertical movements at those marks. These movements are often referred to as *far-field horizontal movements*.

Far-field horizontal movements tend to be bodily movements towards the extracted goaf area and are accompanied by very low levels of strain. These movements generally do not result in impacts on natural or built features, except where they are experienced by large structures which are very sensitive to differential horizontal movements.

In some cases, higher levels of far-field horizontal movements have been observed where steep slopes or surface incisions exist nearby, as these features influence both the magnitude and the direction of ground movement patterns. Similarly, increased horizontal movements are often observed around sudden changes in geology or where blocks of coal are left between longwalls or near other previously extracted series of longwalls. In these cases, the levels of observed vertical subsidence and horizontal movement can be slightly higher than normally predicted, but these increased movements are generally accompanied by very low levels of tilt and strain. None of the aforementioned features is present in the vicinity of the powerlines adjacent to Longwalls 401 to 408.

An empirical database of observed incremental far-field horizontal movements has been compiled using available monitoring data from the NSW and Queensland Coalfields, but this database predominately comprises measurements from the Southern Coalfield. The far-field horizontal movements are generally observed to be orientated towards the extracted longwall. At low levels of far-field horizontal movements, however, there is a higher scatter in the orientation of the observed movements.

This database includes available observed far-field horizontal movements that have been measured at Ulan Coal Mine, Moolarben Mine and observed data from other regions where the depths of cover are also relatively shallow compared to the Southern Coalfield of NSW. The observed far-field horizontal movements in the database represent large variations in depth of cover from less than 50 m to greater than 600 m. In order to utilise the observed far-field horizontal data at the Moolarben Coal Complex where depth of cover is relatively shallow, the data has been plotted, as shown in Figure 1, against the distances from the nearest edge of the incremental panel divided by the depth of cover. This plot excludes those cases where higher movements occurred because of multi-seam mining and valley closure effects as these are not applicable to the extraction of Longwalls 401 to 408.



**Figure 1 Observed incremental far-field horizontal movements (mm) from many regions in NSW versus the distance to the nearest edge of the mined panel divided by the depth of cover (m/m)**

As successive longwalls within a series of longwall panels are mined, the magnitudes of the incremental far-field horizontal movements decrease. This is possibly due to the fact that once the in situ stresses in the strata within the collapsed zones above the first few extracted longwalls has been redistributed, the potential for further movement is reduced. The total far-field horizontal movement is not, therefore, the sum of the incremental far-field horizontal movements for the individual longwalls.

Figure 1 shows the upper limit of previously observed absolute far-field horizontal movements for the sites located greater than 3.3 times the depths of cover is less than 55 mm.

The powerline, therefore, is predicted to experience maximum incremental far-field horizontal movements in the order of 55 mm. These horizontal movements are not expected to be associated with measurable tilts, curvatures or strains. With the powerline terminating near the finishing ends of Longwall 401 and 402, it is considered unlikely that measurable far-field horizontal movements would be observed beyond Longwall 402.

### Potential for Non-Conventional Movements

It is believed that most non-conventional ground movements are the result of the reaction of near surface strata to increased horizontal compressive stresses due to mining operations. Some of the geological conditions that are believed to influence these irregular subsidence movements are the blocky nature of near surface sedimentary strata layers and the possible presence of unknown faults, dykes or other geological structures, cross bedded strata, thin and brittle near surface strata layers and pre-existing natural joints. The presence of these geological features near the surface can result in a localised bump in an otherwise smooth subsidence profile and these bumps are usually accompanied by locally increased tilts and strains.

Even though it may be possible to attribute a reason behind most observed non-conventional ground movements, there remain some observed irregular ground movements that still cannot be explained with the available geological information. The term “anomaly” is therefore reserved for those non-conventional ground movement cases that were not expected to occur and cannot be explained by any of the above possible causes.

It is not possible to predict the locations and magnitudes of non-conventional anomalous movements. In some cases, approximate predictions for the non-conventional ground movements can be made where the underlying geological or topographic conditions are known in advance.

The likelihood of non-conventional anomalous movements reduces with increasing distance away from the longwall panels.

The range of potential strains associated with non-conventional movements has been assessed using monitoring data from previously extracted panels in the NSW Coalfields, for single-seam conditions, where the width-to-depth ratios and extraction heights were similar to those of Longwalls 401 to 408. The 95 % confidence levels for the maximum total strains that the individual survey bays *above solid coal* (between 200 m and 600 m from extracted goaf) experienced at any time during mining are 1.6 mm/m tensile and 1.5 mm/m compressive. The 99 % confidence levels for the maximum total strains that the individual survey bays above solid coal experienced at any time during mining are 2.9 mm/m tensile and 3.0 mm/m compressive. The 75 % confidence levels for the maximum total strains that the individual survey bays above solid coal experienced at any time during mining are 0.5 mm/m both tensile and compressive, which is the typical limit of accuracy of strain measurement by conventional survey methods. It is noted that these results comprise a component of survey tolerance and have also been affected by disturbed survey marks and survey errors.

### **Impact Assessments for Essential Energy Infrastructure**

The maximum predicted total subsidence parameters for the Essential Energy infrastructure based on the Extraction Plan Layout are the same as or less than those for the Approved Layout for Longwalls 401 to 408. The potential impacts for the Essential Energy infrastructure, based on the Extraction Plan Layout, therefore, are the same as or lower than those assessed based on the Approved Layout.

The predicted subsidence movements at the 22kV powerline are expected to be less than typical measurable limits for conventional vertical subsidence, tilt, curvature or strain. However, the powerline may experience far-field horizontal movements. The upper limit of previously observed absolute far-field horizontal movements for sites located greater than 3.3 times the depth of cover from longwalls, is 55 mm.

The predicted far-field horizontal movements at the 22kV powerline are expected to be bodily movements that are directed across the general alignment of the 22kV powerline towards the extracted goaf area and should be accompanied by very low levels of strain that are in the order of survey tolerance. Relative movement between poles is expected to be negligible. Adverse impact to the 22kV powerline resulting from these potential far-field horizontal movements is considered unlikely.

The statistical analysis of observed strain data between 200 m and 600 m from extracted longwalls shows a 25% probability of exceedance of 0.5 mm/m tensile and compressive, and a 5% probability of exceedance of approximately 1.5 mm/m tensile and compressive.

With the location of the 22kV powerline outside the longwall footprint and the low probability of significant observed strains developing based on statistical analysis, the development of adverse impacts to the 22kV powerline due to the extraction of Longwalls 401 to 408 is considered unlikely.

### **Recommendations**

Ground monitoring and visual monitoring is recommended along the alignment of the Essential Energy infrastructure for at least the extraction of Longwalls 401 and 402 to check for the potential development of irregular subsidence movements. Further monitoring beyond Longwall 402 may be required if subsidence related movements are identified.

It is recommended that similar monitoring and management strategies developed for UG1 are adopted for UG4, in consultation with Essential Energy, to manage the infrastructure for potential irregular ground movements. These strategies could include visual inspections, surveys, communications protocols and trigger action response plans. Baseline monitoring of the pole positions should be established for later comparison, should subsidence related ground movements be measured to the west of Longwalls 401 and 402. It is expected that the Essential Energy infrastructure can be maintained in a safe and serviceable condition with the implementation of the appropriate monitoring and management strategies.

## Summary

At distances of 400 m or more from the longwalls, the Essential Energy infrastructure are not expected to experience measurable conventional subsidence movements resulting from the extraction of the longwalls. Observed far-field horizontal movements at the location of the powerline are expected to be less than 55 mm.

There is a low probability that significant strains could develop at the location of the powerline due to non-conventional movements, and as a result, the development of adverse impacts to the powerline due to the extraction of Longwalls 401 to 408 are considered unlikely to occur.

Ground monitoring and visual monitoring is recommended for the Essential Energy infrastructure to check for the potential development of irregular subsidence movements for at least the extraction of Longwalls 401 and 402.

It is expected that the potential impacts on the Essential Energy infrastructure can be managed with the implementation of suitable monitoring and management strategies.

Yours sincerely



Peter DeBono

Attachments:

Drawing No. MSEC1166-05 – Longwalls 401 to 408 – Essential Energy Infrastructure



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**MOOLARBEN COAL PROJECT**  
 UG4 LW401 TO LW 408  
 ESSENTIAL ENERGY

DATE: 3 Jun 2021	SCALE: as shown	DRAWING No: MSEC1166-05	Rev No A
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**LEGEND**

- Inferred Extents of Unconsolidated Sediments
- Essential Energy Powerline

0m 500m 1000m

SCALE

6 432 000

762 000

GDA2020

SADDLERS CREEK RD

Goulburn River

# UG4

**Study Area**

LW408

LW407 TRACK

LW406

LW405

LW404

LW403

LW402

LW401

Ulan Creek

ULAN RD

ULAN RD

MUDSTONE QUARRY

400 m

TELECOMMUNICATIONS TOWER

Bora Creek

705 m

Goulburn River

SANDY HOLLOW - GULGONG RAILWAY

22kV/22kV POWER LINE

66kV/22kV POWER LINE

ULAN WOLLAR RD

6 426 000

# UG1

LW101

LW102B

LW103

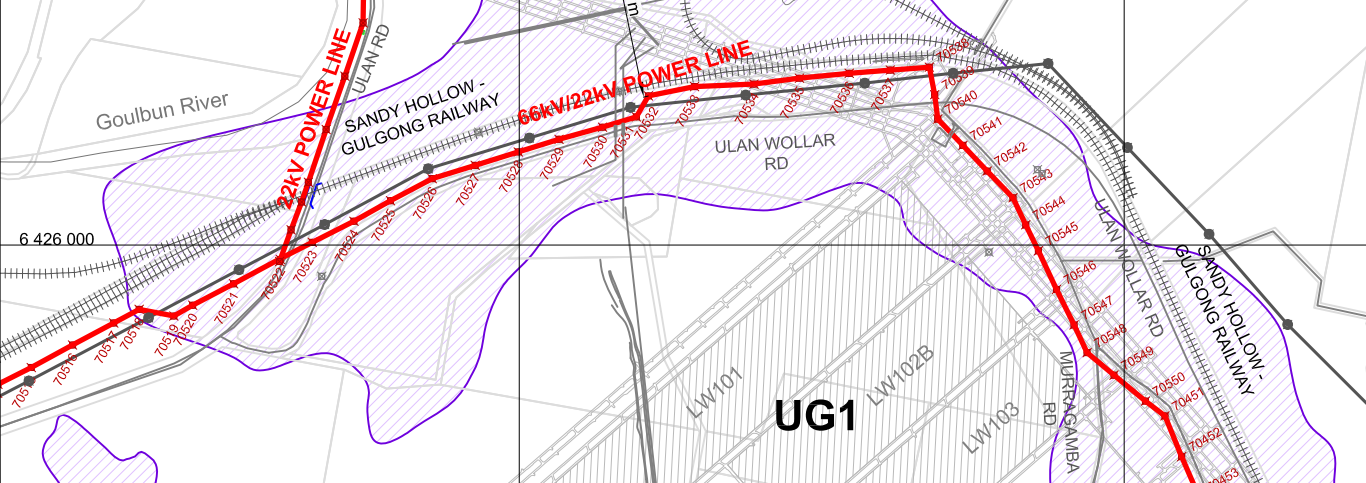
MURRUMBidge RD

ULAN WOLLAR RD

SANDY HOLLOW - GULGONG RAILWAY

MURRUMBIDGE RD

SANDY HOLLOW - GULGONG RAILWAY





**ATTACHMENT 2**

**UG4 LONGWALLS 401 TO 408 BUILT FEATURES MANAGEMENT PLAN – ESSENTIAL ENERGY  
TRIGGER ACTION RESPONSE PLAN**

Document	Version	Issue	Effective	Author	Approved
MCO_BFMP_EE	1	June 22	July 22	MCO	B. Wesley

Condition	Normal		Level 1	Level 2
	Baseline Conditions	Predicted Impacts	Implement Management Measures	Restoration/Contingency Phase
<b>Trigger</b>	Essential Energy 22 kV powerline is safe, serviceable and repairable or as otherwise identified by pre-mining inspection.	Subsidence effects on the Essential Energy 22 kV powerline are within predicted levels.	Monitoring identifies impacts that are greater than predicted, but the performance measure has not been exceeded and is not likely to be exceeded.	If the Performance Measure relevant to the Essential Energy 22 kV powerline has been exceeded, or is likely to be exceeded (i.e. loss of serviceability).
<b>Action</b>	Establish baseline data, including: <ul style="list-style-type: none"> <li>Pre-mining visual inspection.</li> <li>Subsidence survey as per the UG4 Longwalls 401 to 408 Subsidence Monitoring Program.</li> </ul>	Conduct monitoring as described in <b>Section 6</b> , including: <ul style="list-style-type: none"> <li>Survey of power poles associated with the 22kV supply to telecommunications tower.</li> <li>Visual inspection of the condition of existing 22 kV powerline.</li> <li>Subsidence impact inspections, targeting the identification of:               <ul style="list-style-type: none"> <li>surface cracking;</li> <li>surface humps;</li> <li>damage to poles, conductors and/or powerlines;</li> <li>reduced ground clearance;</li> <li>tilting of power poles; and</li> <li>bent cross-arms or insulators.</li> </ul> </li> </ul>	Management measures will be determined and implemented in consultation with Essential Energy (with regard to the specific circumstances of the subsidence impact [e.g. the nature and extent of the impact]). Potential management measures are described in <b>Section 7</b> . Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures. Notifications by exception (i.e. following identification of movement).	Contingency Plan implemented if performance measure (i.e. secondary trigger) is exceeded (with regard to the specific circumstances of the subsidence impact). In summary: <ul style="list-style-type: none"> <li>The observation will be reported to the Underground Technical Manager or the Environmental and Community Manager within 24 hours.</li> <li>The observation will be recorded in the Subsidence Impact Register.</li> <li>The exceedance or likely exceedance will be reported in an incident report.</li> <li>An investigation will be conducted to identify and evaluate contributing factors to the exceedance.</li> <li>An appropriate course of action will be developed in consultation with relevant stakeholders and government agencies.</li> <li>The course of action will be approved by, and implemented to the satisfaction of, relevant stakeholders and government agencies.</li> <li>The Built Features Management Plan – Essential Energy and the performance indicators will be reviewed to adequately manage future potential impacts.</li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>Baseline condition of 22kV powerline to telecommunications tower               <ul style="list-style-type: none"> <li>Prior to commencement of extraction of Longwall 401</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection of the condition of existing 22 kV powerline.               <ul style="list-style-type: none"> <li>Prior to the commencement of Longwall 401</li> <li>At the completion of each Longwall 401 and 402.</li> </ul> </li> <li>Subsidence impact inspection:               <ul style="list-style-type: none"> <li>If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line'</li> <li>If/when visual monitoring detects subsidence related impacts</li> <li>If/when tilt monitoring detects subsidence related impacts</li> <li>At any time in case of fault or emergency and where requested by Essential Energy during Longwall 401 to 408</li> </ul> </li> </ul>	To be implemented as required (i.e. if monitoring identifies impacts that are greater than predicted, but the performance measure has not been exceeded and is not likely to be exceeded).	To be implemented following identification of an exceedance of the performance measure, or if the performance measure is likely to be exceeded (i.e. unsafe or loss of serviceability).
<b>Position of Decision Making</b>	<ul style="list-style-type: none"> <li>Underground Technical Manager.</li> <li>Essential Energy – Transmission Manager.</li> </ul>	<ul style="list-style-type: none"> <li>Underground Technical Manager.</li> <li>Essential Energy – Transmission Manager.</li> </ul>	<ul style="list-style-type: none"> <li>Underground Technical Manager.</li> <li>Essential Energy – Transmission Manager.</li> </ul>	<ul style="list-style-type: none"> <li>Underground Technical Manager.</li> <li>Essential Energy – Transmission Manager.</li> </ul>

Note: kV = kilovolt

Document	Version	Issue	Effective	Author	Approved
MCO_BFMP_EE	1	June 22	July 22	MCO	B. Wesley

**ATTACHMENT 3**

**UG4 LONGWALLS 401 TO 408 BUILT FEATURES MANAGEMENT PLAN – ESSENTIAL ENERGY  
SUBSIDENCE IMPACT REGISTER TEMPLATE**

Document	Version	Issue	Effective	Author	Approved
MCO_BFMP_EE	1	June 22	July 22	MCO	B. Wesley

**UG4 Longwalls 401 to 408 Built Features Management Plan – Essential Energy  
Subsidence Impact Register Template**

Impact Register Number	Built Feature	Impact Description	Does Impact Exceed the Built Feature Performance Measure/Indicators? (Yes/No)	Management Measures Implemented	Were Management Measures Effective? (Yes/No)

Document	Version	Issue	Effective	Author	Approved
MCO_BFMP_EE	1	Dec 21		MCO	I

Document	Version	Issue	Effective	Author	Approved
MCO_BFMP_EE	1	June 22	July 22	MCO	B. Wesley