UG4 LONGWALLS 401 TO 408 BUILT FEATURES MANAGEMENT PLAN MID-WESTERN REGIONAL COUNCIL

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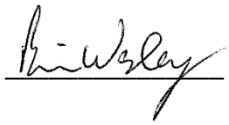
Version	Issue Date	Approval Date	Description	Author(s)	Review Team
1	June 2022	July 2022	Approval	MCO and MSEC	MCO

Approved:  Date: 15/07/2022

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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 – Mid-Western Regional Council (LW401-408 BFMP-MWRC) forms a part of the Extraction Plan for Longwalls 401 to 408 (herein referred to as Longwalls 401-408) of the approved UG4 Underground Mine.

1.1 PURPOSE AND SCOPE

Purpose: This LW401-408 BFMP-MWRC outlines the management of potential subsidence impacts of the proposed secondary workings described in the Extraction Plan on a section of the existing Ulan Road.

Scope: This LW401-408 BFMP-MWRC covers the section of the Ulan Road within and proximal to the Study Area[1] and immediate surrounds, which relates to the extent of subsidence effects resulting from the secondary extraction of Longwalls 401-408 (**Figure 4**).

[1] 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. MWRC infrastructure assets are not located within the Study Area, however may be subject to far field movements (**Section 4.3**).

Figure 1 Locality

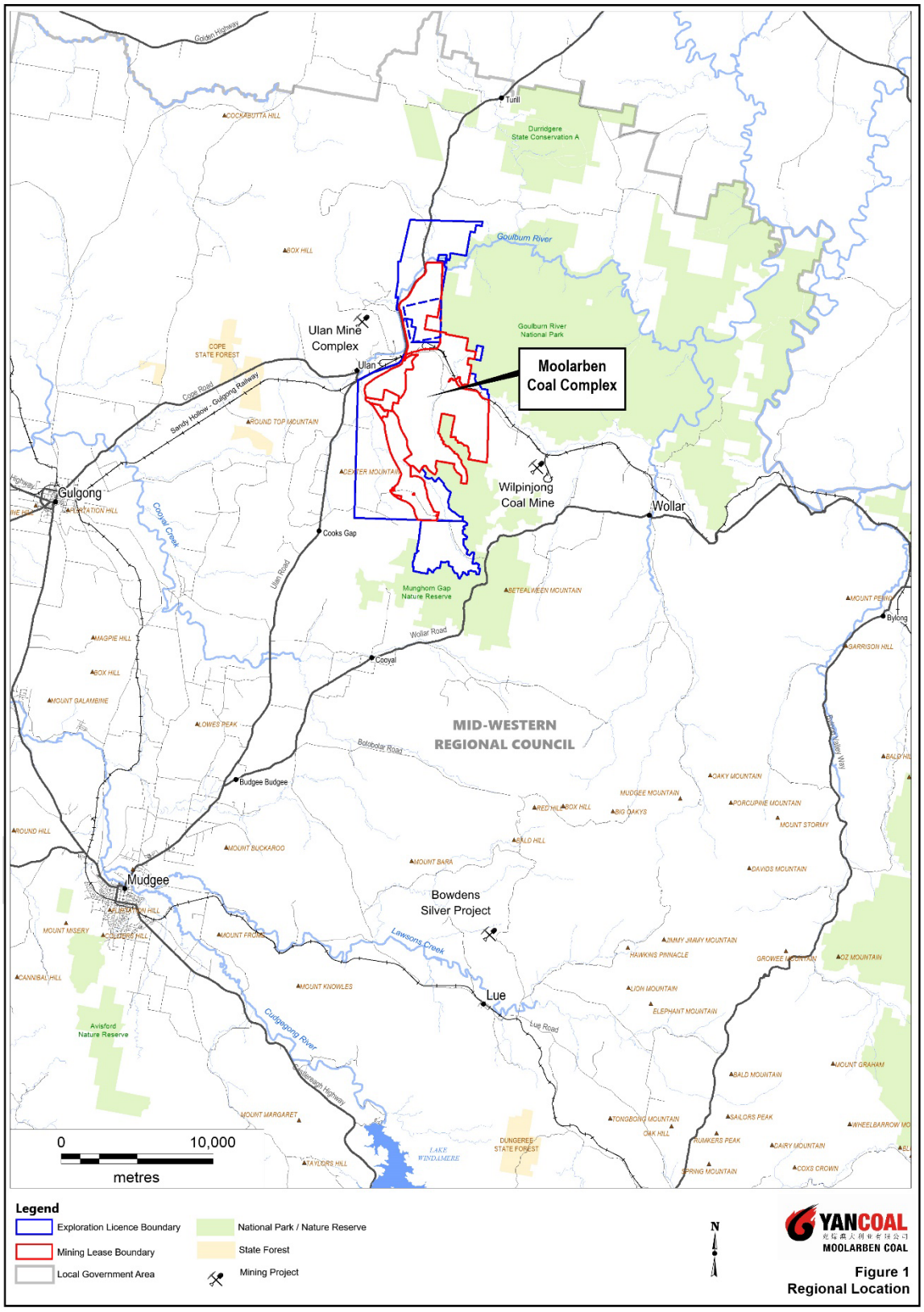

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Figure 2 Moolarben Coal Complex Layout

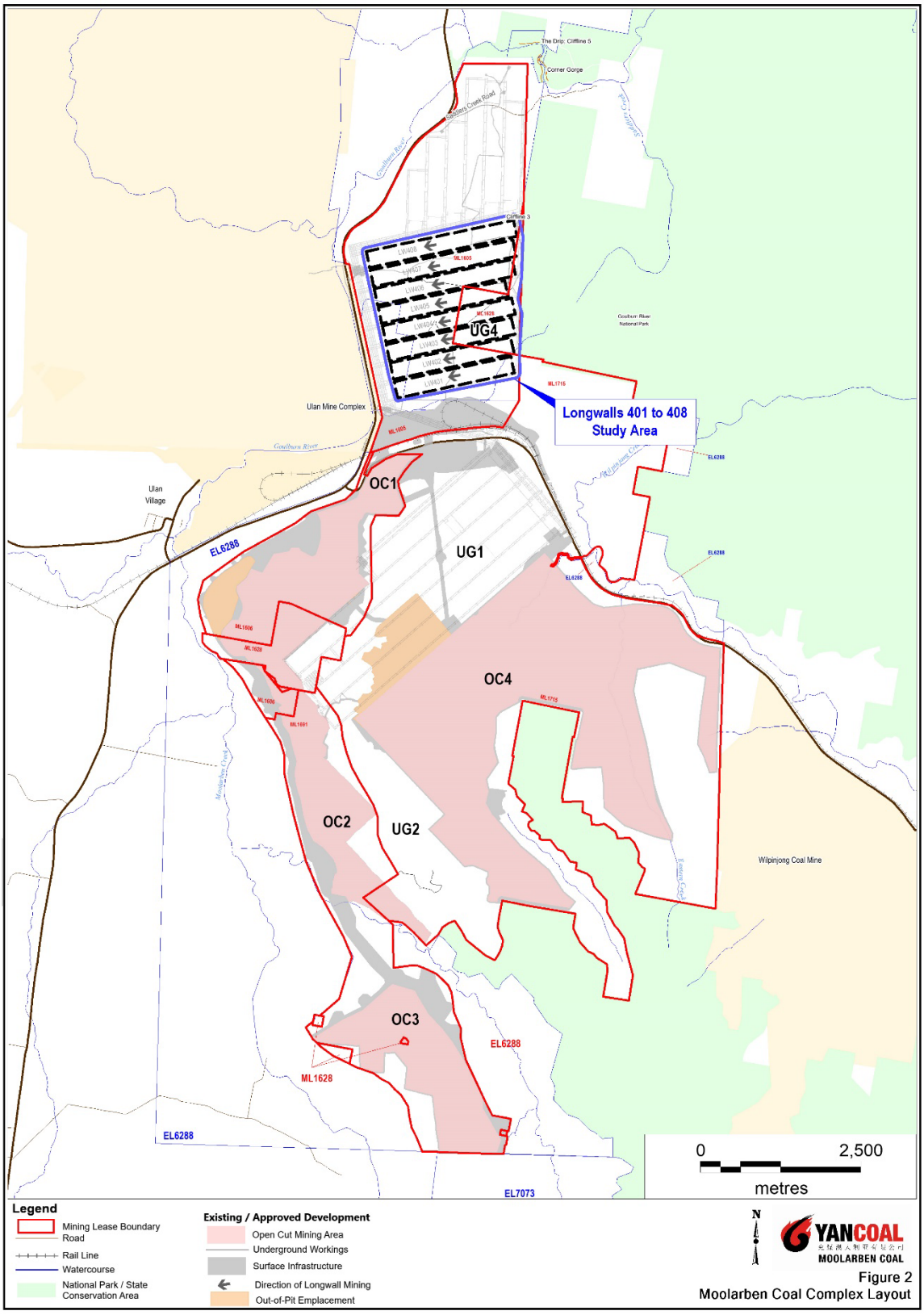


Figure 3 UG4 Longwalls 401 to 408 Layout

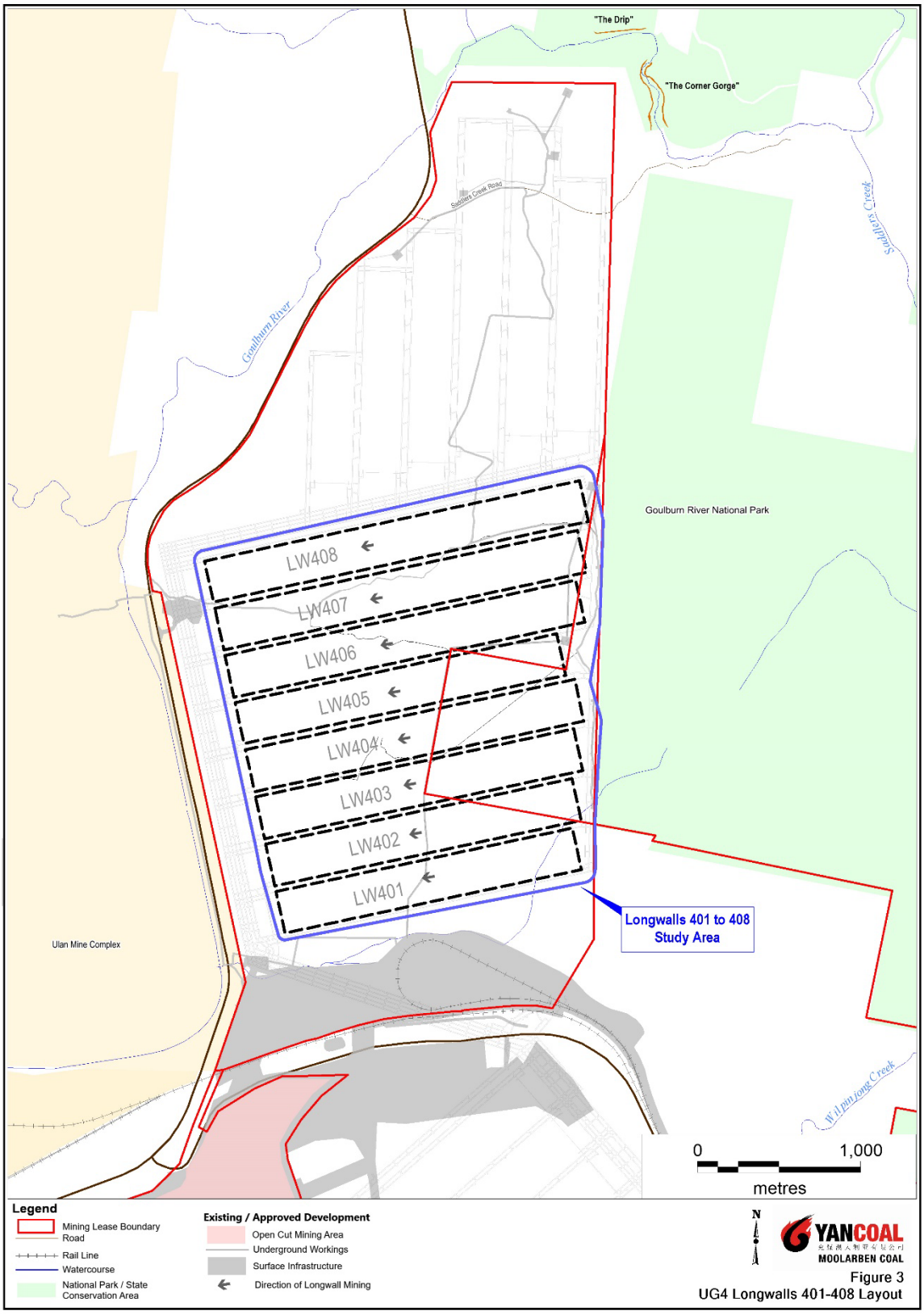
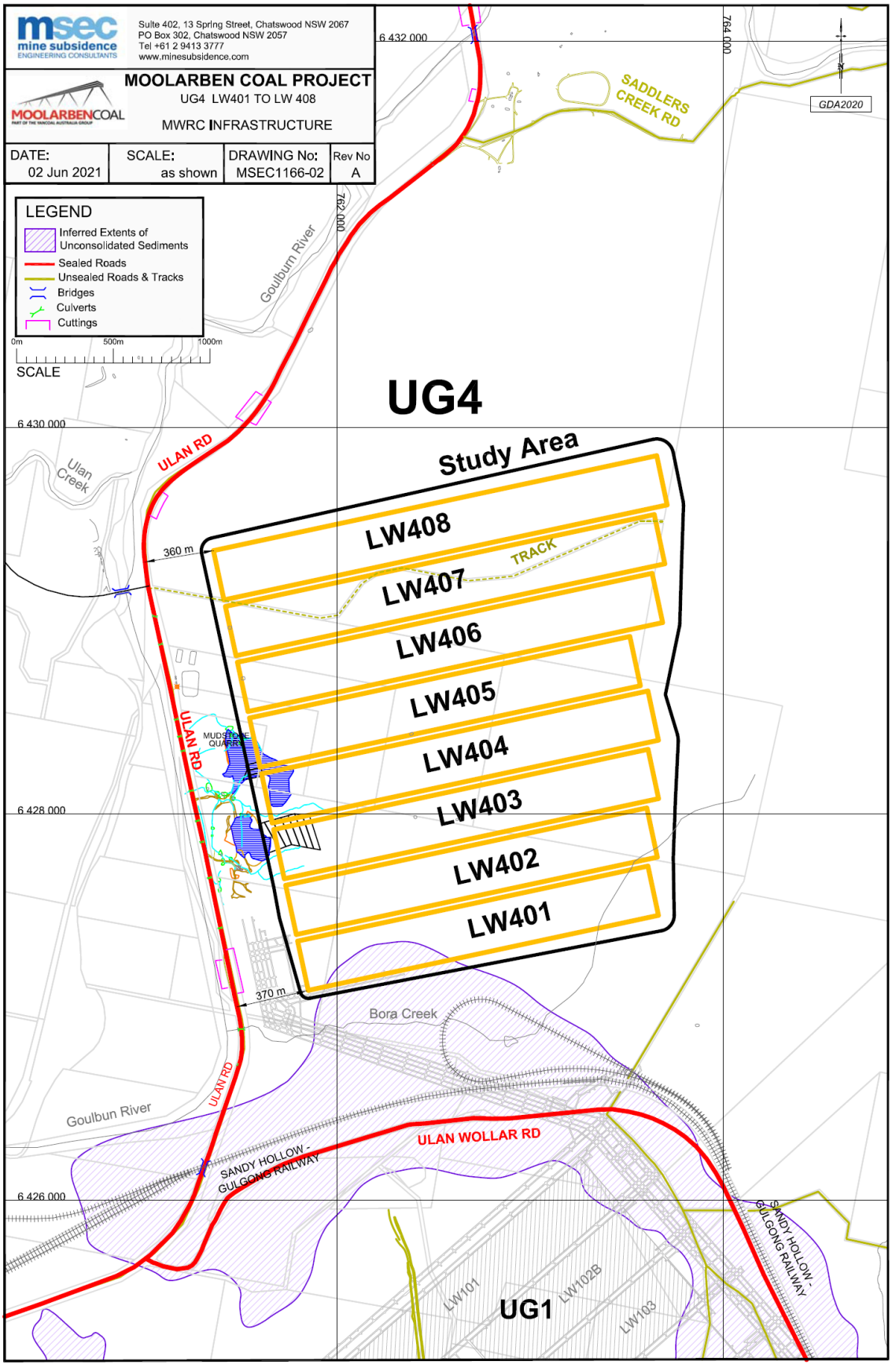


Figure 4 MWRC Assets



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-MWRC, namely representatives from Mine Subsidence Engineering Consultants (MSEC) and MCO, were endorsed by the Secretary of the Department of Planning, Industry and Environment (DPIE).

This LW401-408 BFMP-MWRC has been prepared in consultation with the Mid-Western Regional Council (MWRC) (**Section 4.4**).

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

1.3 STRUCTURE OF THE LONGWALLS 401-408 BFMP-MWRC

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

Section 2: Describes the review and update of the LW401-408 BFMP-MWRC.

Section 3: Outlines the statutory requirements applicable to the LW401-408 BFMP-MWRC.

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 MWRC 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-MWRC.

2.0 LONGWALLS 401 TO 408 BFMP-MWRC REVIEW AND UPDATE

In accordance with Condition 5, Schedule 5 of Project Approval (05_0117), this LW401-408 BFMP-MWRC 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-MWRC publicly available on the MCO website.

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 EPBC 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-MWRC are described below.

3.1 EP&A ACT PROJECT APPROVAL

Condition 77(g), Schedule 4 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-MWRC.

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

Table 1 Management Plan Requirements

Project Approval (05_0117) Condition	LW401-408 BFMP-MWRC Section
Condition 75, Schedule 3	
Notes: *...* • *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).* • *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.* *...* • *Requirements under this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961.* *...*	**Section 7** **Sections 6** **Section 9**
Condition 77(g), Schedule 3	
(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: • *addresses in appropriate detail all items of key public infrastructure and other public infrastructure and all classes of other built features;* • *has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;* • *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* • *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;*	**Section 4.1** **Section 4.4** **Sections 7 & 9** **Section 13.1**
Condition 77(n), Schedule 3	
(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;.	**Section 9**
Condition 77(p), Schedule 3	
(p) include a program to collect sufficient baseline data for future Extraction Plans.	**Section 12**
Condition 78, Schedule 3	
6. The Proponent shall ensure that the management plans required under conditions 77(g)-(l) above include: *a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; and* *b) a detailed description of the measures that would be implemented to remediate predicted impacts.*	**Section 4** **Section 7**

Table 1 (Continued): Management Plan Requirements

Project Approval (05_0117) Condition	LW401-408 BFMP-MWRC Section
Condition 3, Schedule 5	
3. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
a) detailed baseline data;	**Section 4.1**
b) a description of:	
• *the relevant statutory requirements (including any relevant approval, licence or lease conditions);*	**Section 3**
• *the relevant limits or performance measures/criteria;*	**Section 5**
• *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;*	**Section 8**
c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**Sections 7 & 9**
d) a program to monitor and report on the:	**Sections 6, 8 & 13**
• *impacts and environmental performance of the project;*	
• *effectiveness of any management measures (see c above);*	
e) a contingency plan to manage any unpredicted impacts and their consequences;	**Section 9**
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	**Sections 6 & 13**
g) a protocol for managing and reporting any:	
• *incidents;*	**Section 14**
• *complaints;*	**Section 15**
• *non-compliances with statutory requirements; and*	**Section 16**
• *exceedances of the impact assessment criteria and/or performance criteria; and*	**Section 9**
h) a protocol for periodic review of the plan.	**Section 2**

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.

4.0 MID-WESTERN REGIONAL COUNCIL INFRASTRUCTURE

4.1 BASELINE DATA

MWRC infrastructure in the vicinity of Longwalls 401 to 408 includes (**Figure 4**):

- Ulan Road;
- Ulan Road bridge (over the Sandy Hollow Gulgong Railway);
- Ulan-Wollar Road; and
- Ulan Road bridge (over the Goulburn River).

The MWRC also owns infrastructure associated with these roads, such as the road pavement, embankments, tunnels and culverts.

Ulan Road is a sealed bitumen pavement with no kerb and gutter located to the west of Longwalls 401 to 408. The road is approximately parallel with the finishing ends of the longwalls and is approximately 360 m or more from the longwall voids. Features along the road include cuttings in sandstone bedrock, 3 m to 15 m high. Culverts beneath Ulan Road range from 400 mm to 1500 mm diameter concrete pipes with the largest pipes located at Bora Creek to the south west of Longwall 401. The depth of cover along the western side of Longwalls 401 to 408 varies from approximately 83 m to 130 m and the distances to the road from these longwalls equates to 2.9 to 4.5 times the depth of cover (MSEC, 2021).

The bridge over the Sandy Hollow – Gulgong Railway line is over 1 km from the finishing end of Longwall 401. The bridge over the Goulburn River is over 2.3 km from Longwall 408. Ulan-Wollar Road runs adjacent to the Sandy Hollow Gulgong Railway at distances of approximately 800 metres (m) from Longwall 401. Both bridges and Ulan-Wollar Road are not sensitive to far field movements due to their respective distances away from Longwalls 401 to 408 (MSEC, 2021) (**Figure 4**).

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

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 LW401-408 BFMP-MWRC for UG4 has incorporated the revised subsidence predictions and impacts as described in **Section 4.3.2** and **Attachment 1**.

4.3.1 UG4 Revised Subsidence Impacts & Predictions

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

- At distances of over 360 m between the longwalls and Ulan Road, the road will not be subjected to measurable tilts, curvatures or strains; however, the road may experience far-field horizontal movements[2].
- The bridge over the Sandy Hollow – Gulgong Railway line, is over 1 km from the finishing end of Longwall 401 which equates to over 10 times the depth of cover from the longwalls. At this distance the bridge is unlikely to experience measurable subsidence related movements, including measurable far-field horizontal movements[2].
- The bridge over the Goulburn River is unlikely to experience subsidence related movements due to the extraction of Longwalls 401 to 408 and is therefore not considered further in this report
- 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.
- Ulan Road is located outside Study Area and is predicted to experience far-field horizontal movements of up to 55 mm. The predicted maximum far-field horizontal movements are expected to be bodily movements that are accompanied by very low levels of strain.
- Road cuttings along Ulan Road are located near the finishing ends of Longwalls 401 and 408. These cuttings are located adjacent to steep slopes. Down slope movements can occur on slopes that are located over or near extracted longwalls. Such movements may result in an increased likelihood of horizontal movements at the road cuttings. The direction of these movements are also likely to oppose the direction of far-field horizontal movements. Increased horizontal movements would be expected to be minor and unlikely to result in slope failure, rock falls or pavement impact.
- Adverse impacts to the road, culverts and cuttings resulting from the extraction of Longwalls 401 to 408 are considered to be unlikely to occur. Should impacts occur, they are expected to be isolated and of a minor nature and readily repairable.

It is expected that MWRC infrastructure can be maintained in serviceable condition with the implementation of the appropriate monitoring and management strategies (**Sections 6** and **7**).

[2] 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.

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 MWRC infrastructure in the vicinity of Longwalls 401-408.

Given the predicted subsidence impacts for Longwalls 401-408 and the same management measures being proposed as those implemented for UG1 Longwalls 101 – 105, the MWRC was satisfied that a formal risk assessment workshop was not required for the LW401-408 BFMP-MWRC.

The proposed risk control measures and procedures have been incorporated where relevant in this LW401-408 BFMP-MWRC 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-MWRC Section	Proposed Timing
Baseline Data / Validation			
1	Carry out a visual inspection of the Ulan Road cuttings and culverts within 400 m of Longwalls 401 to 408.	**Section 6.2**	Prior to Longwall 401
2	Provide MWRC with a copy of the visual inspection of the Ulan Road cuttings and culverts once carried out, and obtain other available baseline records (where available).	**Section 6.2**	Prior to Longwall 401
3	Installation of UG4 subsidence effect monitoring line and commencement of the subsidence monitoring program for Longwalls 401 - 408.	**Section 6**	Prior to Longwall 401
Management / Monitoring / Response Measures			
4	Establish key contacts list in the LW401-408 BFMP-MWRC.	**Section 11.1**	Complete
5	Include a schedule of times/frequency of communication with MWRC for the status of mining of Longwalls 401-408 in the LW401-408 BFMP-MWRC.	**Section 7 and Table 6**	Complete
6	Include in the TARP triggers for conditions that may need to be actioned by MCO and/or MWRC.	**Section 10 and Attachment 1**	Complete
7	Include a monitoring plan in the LW401-408 BFMP-MWRC to implement visual inspections of the cuttings, pipes/culverts and other furniture during active subsidence associated with Longwalls 401-408.	**Table 5**	Complete

5.0 PERFORMANCE MEASURES

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

Table 4 Built Features Subsidence Impact Performance Measures

Feature	Subsidence Impact Performance Measure
Other infrastructure:	
Roads	Safe, serviceable and repairable unless the owner agrees otherwise in writing.

Source: Table 15 in Schedule 3 of Project Approval (05_0117).

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 Ulan Road. Management measures for the Ulan Road are outlined in **Section 7** and performance indicators for the performance measures are summarised in **Section 8**.

6.0 MONITORING

A monitoring program will be developed in order to monitor the impacts of the extraction of Longwalls 401-408 on the Ulan Road to identify unsafe conditions or loss of serviceability during or after mining. Key components of the monitoring program are summarised in **Table 5**.

Table 5 Ulan Road Monitoring Program Overview

Monitoring Component	Parameter	Timing/Frequency	Responsibility
Pre-mining			
Ulan Road – Visual inspection within 400m of LW401 - LW408	Condition of culverts and cuttings	Prior to the secondary extraction of Longwall 401.	Underground Technical Manager and representative of asset owner if required
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: • Easting; • Northing ; • Vertical Subsidence; • Tilt; • Tensile Strain; and • Compressive Strain	Prior to the secondary extraction of Longwall 401	Underground Technical Manager / Registered Mine Surveyor
During and After Mining			
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: • Easting; • Northing ; • Vertical Subsidence; • Tilt; • Tensile Strain; and • Compressive Strain	At the completion of each Longwall 401-408 Provide a copy of the results of the subsidence parameters measured along the 'R Line' after each Longwall 401 -408 to MWRC *(unless otherwise agreed to by MWRC)*	Underground Technical Manager / Registered Mine Surveyor

Monitoring Component	Parameter	Timing/Frequency	Responsibility
During and After Mining			
Ulan Road – Subsidence impact inspection within 400m of LW401 - 408	Subsidence impact inspections will target the identification of: • impacts to the surface including cracks, buckling and stepping; • impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing, and collapse; • impacts to road cuttings including slope failure, rock falls and pavement impacts; and • visible impacts to furniture.	If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line'. Opportunistic visual observations during routine works by MCO and its contractors. At any time in case of an emergency and requested by MWRC. Provide a copy of the results of the Ulan Road visual inspections after Longwall 408 to MWRC *(unless otherwise agreed to by MWRC)*	Underground Technical Manager
	As per MWRC inspections.	Routinely as per MWRC inspections.	MWRC

The frequency of monitoring will be reviewed either:

- In accordance with the Annual Review; or
- If monitoring determines there has been no impact to MWRC Infrastructure and/or no exceedance of the performance measures listed in Table 4, MCO in consultation with MWRC 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-MWRC.

6.1 SUBSIDENCE PARAMETERS

Subsidence parameters measured by a survey line ('R Line') (i.e. Easting, Northing, vertical subsidence, tilt, tensile strain, compressive 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. Subsidence movements (i.e. Easting, Northing, vertical subsidence, tilt, tensile strain, compressive strain and compressive strain) will be measured along subsidence lines that have been positioned across the general landscape.

Monitoring of subsidence parameters specific to Ulan Road will be measured by a single survey line ('R Line'). Surveys along the 'R Line' will be undertaken prior to extraction of Longwall 401 and at the completion of each Longwall 401-408.

Unless otherwise agreed with MWRC, inspection sheets detailing the outcome of the subsidence impact monitoring program will be provided to MWRC following confirmation of the results.

6.2 SUBSIDENCE IMPACTS

A baseline visual inspection of Ulan Road will be conducted prior to commencement of Longwall 401 to establish the condition of the section roadway cuttings and pipes/culverts within 400m of Longwalls 401 to 408.

The visual inspection will be conducted by MCO and include:

- recording the condition of existing cuttings and pipes/culverts

A copy of the visual inspection report will be provided to MWRC. Other road pavement baseline records (where available) would be provided to MCO.

In the event monitoring identifies ground movement greater than the predicted subsidence monitoring parameters for UG4 and those predictions described in **Section 4.3,** MCO will undertake an inspection of the road for any potential impacts caused by subsidence movements. Opportunistic observations of subsidence impacts will be conducted during routine works by MCO (and its contractors) and MWRC's routine road condition inspections.

Information will be recorded in the LW401-408 BFMP-MWRC Subsidence Impact Register (**Attachment 2**) and reported in accordance with Project Approval (05_0117) (**Section 13**).

MCO and MWRC 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 MWRC will assess the consequences of the exceedance in accordance with the Contingency Plan described in **Section 9**.

7.0 MANAGEMENT MEASURES

The potential management measures in relation to the Ulan Road pavement include:

- mill and/or replace pavement layers; and
- crack sealing/repair.

In the event that repairs are required, traffic control measures such as contra-flow of traffic or partial carriageway closures may be used to divert traffic off one carriageway, lane or shoulder. Repairs would be carried out as soon as practicable in consultation with the MWRC.

The potential management measures in relation to drainage structures (pipes/culverts) and cuttings include:

- point repairs;
- replace sections of pipe/culvert;
- grouting/sealing of cracks; and
- stabilise road cuttings and complete necessary repairs.

The potential management measures in relation to guard rails, marker posts and signage include repairs and/or replacement of furniture. Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures. A summary of management measures (if required) will be reported in the Annual Review. Key management actions and timing is summarised in **Table 6.**

Table 6 Ulan Road Key Management Actions

Management Measure	Timing/Frequency	Responsibility
Pre-mining		
Notification to MWRC prior to commencement of secondary extraction.	Prior to secondary extraction of Longwall 401	Underground Technical Manager
Visual inspection and record (baseline) of Ulan Road culverts and cuttings.	Prior to secondary extraction of Longwall 401	Underground Technical Manager
During Mining		
Visual inspection and record of Ulan Road culverts and cuttings.	If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line'	Underground Technical Manager
Notification to MWRC during longwall mining of Longwalls 401-408	If/when ground surveys identify an exceedance of the predicted subsidence monitoring parameters measured along the 'R Line'	Underground Technical Manager
	If/when visual monitoring detects subsidence related impacts	

Table 6 (Continued): Ulan Road Key Management Actions

Management Measure	Timing/Frequency	Responsibility
During Mining		
Provision of **inspection sheets** detailing the outcome of the subsidence impact monitoring program to MWRC (unless otherwise agreed with MWRC).	Following exceedance of the predicted subsidence monitoring parameters and/or subsidence related impact inspections	Underground Technical Manager
Implement TARP (**Attachment 2**).	During Longwall 401 to 408 extraction.	Underground Technical Manager
Post-mining		
Visual Inspection of Ulan-Wollar Road to identify any post-mining remediation works (if) required.	Following completion of mining Longwall 408	Underground Technical Manager
Notification to MWRC to inform longwall mining of Longwalls 401-408 is completed	Following completion of mining Longwall 408	Underground Technical Manager

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 for Ulan Road in relation to subsidence induced far field movements, include:

- no joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm (when compared against baseline condition) due to UG4 mining;

Monitoring conducted to inform the assessment of secondary extraction of Longwalls 401-408 against the performance indicators (for the performance measures relevant to the Ulan Road 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-MWRC will be implemented.

9.0 CONTINGENCY PLAN

In the event the performance measures relevant to the Ulan-Wollar Road 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 MWRC).
- 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, MWRC and DPIE-RR.
- This LW401-408 BFMP-MWRC 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 NSW *Coal Mine Subsidence Compensation Act, 2017* (formerly *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 Ulan Road is exceeded are summarised in **Table 7**. Temporary road closure procedures (if required) would be developed and carried out in consultation with the MWRC.

Table 7 Potential Contingency Measures

Environmental Consequence	Potential Contingency Measures	
	Measure	Description
Impact on:		
Pavement	Repair road.	Temporary closure of the road and repair of pavement.
Cuttings	Stabilise slope	Temporary closure of the road and repair of road cutting.
Pipes/Culverts	Repair or replace pipe. Repair or rebuild culvert.	Construction of temporary drainage pipe/culvert (if required) and repair or replacement of original pipe/culvert.
Other Furniture (Guard Rail, Marker Posts, Signage)	Repair or replace furniture.	Repair/replace section of guard rail, marker post or signage.

10.0 TRIGGER ACTION RESPONSE PLAN – MANAGEMENT TOOL

The framework for the various components of this LW401-408 BFMP-MWRC 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 performance and the implementation of management and/or contingency measures.

11.0 ROLES AND RESPONSIBILITIES

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

Table 8 Longwalls 401 to 408 Built Features Management Plan – Mid-Western Regional Council Responsibility Summary

Responsibility	Task
General Manager	• Ensure resources are available to MCO personnel to facilitate the completion of responsibilities under this LW401-408 BFMP-MWRC.
Underground Technical Manager	• Ensure the LW401- 408 SMP is implemented. • Ensure monitoring required under this LW401-408 BFMP-MWRC is carried out within specified timeframes, adequately checked and processed and prepared to the required standard. • Undertake relevant monitoring and implementation of management measures summarised in **Tables 5** and **6** respectively.
Environmental and Community Manager	• Liaise with relevant stakeholders regarding subsidence impact management and related environmental consequences.
Registered Mine Surveyor	• Undertake all subsidence monitoring to the required standard within the specified timeframes and ensure data are adequately checked, processed and recorded.

11.1 KEY CONTACTS

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

Table 9 Longwalls 401 to 408 Built Features Management Plan – Mid-Western Regional Council Key Personnel Contact Details

Organisation	Position	Contact Name	Phone Number
MCO	Underground Technical Manager	Mr Liam Mildon	**02 6376 1614**
	Environmental and Community Manager	Mr Trent Cini	**02 6376 1436**
	Moolarben Coal Hotline		**1800 556 484**
MWRC	General Manager	Brad Cam	**02 6378 2850**
	Manager Works	Andrew Kearins	**02 6378 2920 or 0428 725 802**

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 Plan. 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-MWRC, will inform the appropriate type and frequency of monitoring of the assets relevant to the next Extraction Plan.

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-MWRC 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.

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.

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.

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.

17.0 REFERENCES

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 Mid-Western Regional Council 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 MWRC Infrastructure*

ATTACHMENT 1

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

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2nd June 2021

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

Ref: MSEC1166-02

Dear Liam,

RE: Moolarben Coal Operations – Longwalls 401 to 408 - Subsidence predictions and impact assessments for the Mid-Western Regional Council 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. MSEC1166-02. 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 MWRC 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 MWRC infrastructure in the vicinity of Longwalls 401 to 408 includes:

- Ulan Road;
- Ulan Road bridge (over the Sandy Hollow Gulgong Railway); and
- Ulan Road bridge (over the Goulbourn River).

MWRC also own infrastructure associated with this road, such as the road pavement, embankments and culverts.

The locations of the MWRC infrastructure are shown in the attached Drawing No. MSEC1166-02.

Ulan Road is a sealed bitumen pavement with no kerb and gutter located to the west of Longwalls 401 to 408. The road is approximately parallel with the finishing ends of the longwalls and is approximately 360 m or more from the longwall voids. Features along the road include cuttings in sandstone bedrock, 3 m to 15 m high. Culverts beneath Ulan Road range from 400 mm to 1500 mm diameter concrete pipes with the largest pipes located at Bora Creek to the south west of Longwall 401. The depth of cover along the western side of Longwalls 401 to 408 varies from approximately 83 m to 130 m and the distances to the road from these longwalls equates to 2.9 to 4.5 times the depth of cover.

The bridge over the Sandy Hollow – Gulgong Railway line is over 1 km from the finishing end of Longwall 401. The bridge over the Goulburn River is over 2.3 km from Longwall 408. The bridge over the Goulburn River is unlikely to experience subsidence related movements due to the extraction of Longwalls 401 to 408 and is therefore not considered further in this report.

Conventional Subsidence Parameters

At distances of over 360 m between the longwalls and Ulan Road, the road will not be subjected to measurable tilts, curvatures or strains; however, the road may experience far-field horizontal movements, which are discussed below.

The bridge over the Sandy Hollow – Gulgong Railway line, is over 1 km from the finishing end of Longwall 401 which equates to over 10 times the depth of cover from the longwalls. At this distance the bridge is unlikely to experience measurable subsidence related movements, including measurable far-field horizontal movements which are discussed below.

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 Ulan Road 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.

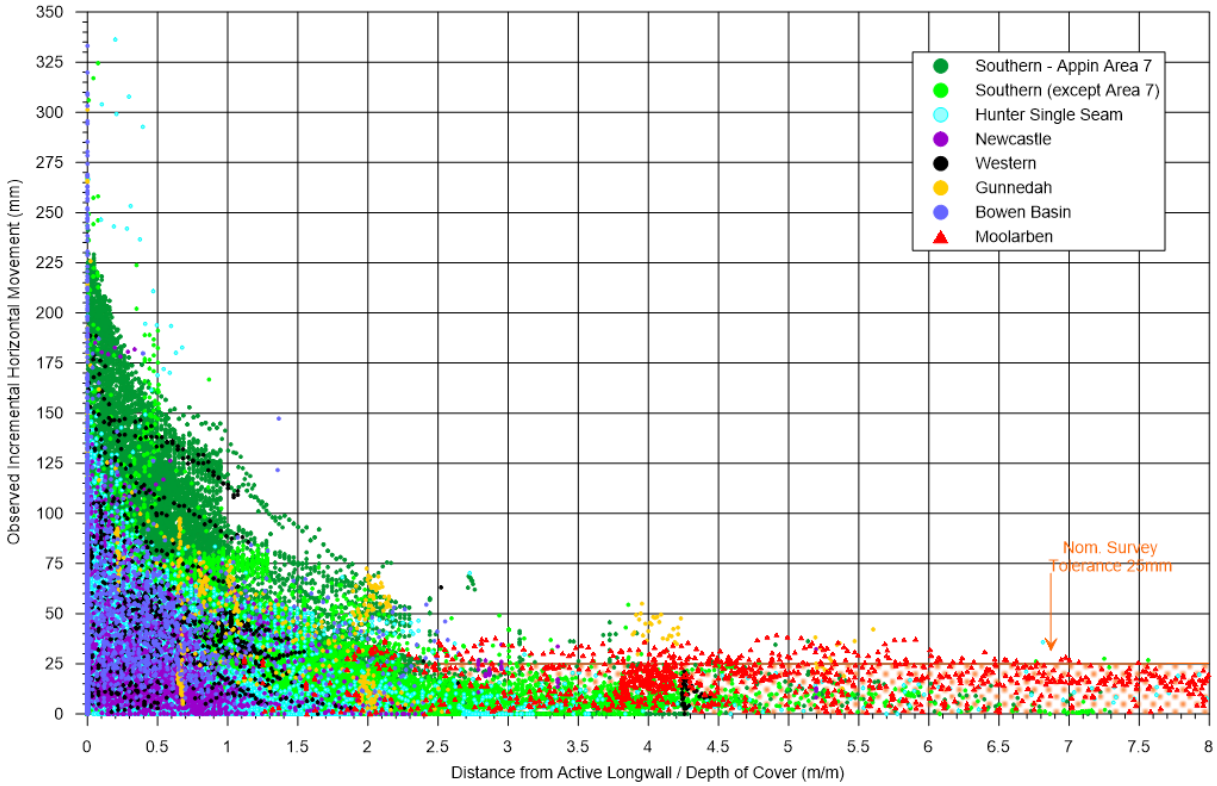

Figure 1 Observed incremental far-field horizontal movements (mm) from many regions in NSW versus the distance to the nearest edge of the mined panel divided by the depth of cover (m/m)

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 2.9 times the depths of cover from longwalls, is less than 55 mm.

Ulan Road, therefore, is predicted to experience maximum incremental far-field horizontal movements in the order of 55 mm due to the extraction of each of Longwalls 401 to 408. These low-level horizontal movements are not expected to be associated with measurable tilts, curvatures or strains.

Influence of Unconsolidated Tertiary Sediments on Horizontal Far-field Movements

There are unconsolidated Tertiary sediments up to 60 m thick, located to the south of Longwall 401 as shown in Drawing No. MSEC1166-02. These unconsolidated sediments are remnants of inactive river or stream channels that have been later filled in or buried by younger sediment that can be stronger or weaker than the original strata.

The presence of these materials can modify the subsidence ground movements beyond the end of the longwalls, (depending on the depth of the channel, and its location with respect to the panel edges). Their presence should result in less subsidence within these areas and reduced far-field movements within and beyond these channels.

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 MWRC Infrastructure

Ulan road is located to the west of the Extraction Plan Layout. The distance from Ulan Road to the Extraction Plan Layout similar to that for the Approved Layout. The potential subsidence movements and impacts based on the Extraction Plan Layout are therefore the same as those based on the Approved Layout.

Ulan Road is located outside Study Area and is predicted to experience far-field horizontal movements of up to 55 mm. The predicted maximum far-field horizontal movements are expected to be bodily movements that are accompanied by very low levels of strain.

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.

Road cuttings along Ulan Road are located near the finishing ends of Longwalls 401 and 408. These cuttings are located adjacent to steep slopes. Down slope movements can occur on slopes that are located over or near extracted longwalls. Such movements may result in an increased likelihood of horizontal movements at the road cuttings. The direction of these movements are also likely to oppose the direction of far-field horizontal movements. Increased horizontal movements would be expected to be minor and unlikely to result in slope failure, rock falls or pavement impact.

Adverse impacts to the road, culverts and cuttings resulting from the extraction of Longwalls 401 to 408 are considered to be unlikely to occur. Should impacts occur, they are expected to be isolated and of a minor nature and readily repairable.

Recommendations

Ground monitoring and visual monitoring is recommended for Ulan-Wollar Road and the cuttings adjacent to Longwalls 401 and 408 to check for the potential development of irregular subsidence movements.

It is expected that the potential impacts on the MWRC infrastructure can be managed with the implementation of the necessary monitoring and management strategies. It is recommended that similar monitoring and management strategies developed for UG1 are adopted for UG4 in consultation with MWRC. These strategies could include visual inspections, surveys, communications protocols and trigger action response plans.

Summary

Ulan Road is located 360 m or more from Longwalls 401 to 408 and is not expected to experience measurable conventional vertical subsidence movements resulting from the extraction of these longwalls. Observed far-field horizontal movements at the location of the road are expected to be less than 55 mm.

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

Ground monitoring and visual monitoring is recommended for the roads and cuttings for each longwall to check for the potential development of irregular subsidence movements.

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

Yours sincerely

Peter DeBono

Attachments:
Drawing No. MSEC1166-02 – Longwalls 401 to 408 – Mid-Western Regional Council Infrastructure

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MOOLARBENCOAL

MOOLARBEN COAL PROJECT

UG4 LW401 TO LW 408

MWRC INFRASTRUCTURE

DATE:	SCALE:	DRAWING No:	Rev No
02 Jun 2021	as shown	MSEC1166-02	A

LEGEND
- Inferred Extents of Unconsolidated Sediments
- Sealed Roads
- Unsealed Roads & Tracks
- Bridges
- Culverts
- Cuttings

0m 500m 1000m
SCALE

6 432 000
764 000
762 000
6 430 000
6 428 000
6 426 000
GDA2020

SADDLERS CREEK RD
Goulburn River
ULAN RD
Ulan Creek
360 m
TRACK
MUDSTONE QUARRY
370 m
Bora Creek
ULAN WOLLAR RD
SANDY HOLLOW - GULGONG RAILWAY

UG4

Study Area
LW408
LW407
LW406
LW405
LW404
LW403
LW402
LW401

UG1
LW101
LW102B
LW103

ATTACHMENT 2

UG4 LONGWALLS 401 TO 408
BUILT FEATURES MANAGEMENT PLAN – MID-WESTERN REGIONAL COUNCIL
TRIGGER ACTION RESPONSE PLAN

Condition	Normal		Level 1	Level 2
	Baseline Conditions	**Predicted Impacts**	**Implement Management Measures**	**Restoration/Contingency Phase**
Trigger	Ulan Road and associated infrastructure is safe, serviceable and repairable or as otherwise identified by pre-mining inspection.	Subsidence effects on Ulan Road. (i.e. far field horizontal movements up to the predicted values)	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 Ulan Road has been exceeded, or is likely to be exceeded (i.e. unsafe or loss of serviceability).
Action	Establish baseline data, including: • Pre-mining visual inspection. • Pre-extraction subsidence survey as per the UG4 Longwalls 401 to 408 Subsidence Monitoring Program.	Conduct monitoring as described in **Section 6**, including: • Ground survey of the subsidence effects monitoring line 'R Line' • Subsidence impact inspections, targeting the identification of: – impacts to the surface including cracks, buckling and stepping; – impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing and collapse; – impacts to road cuttings including slope failure, rock falls and pavement impacts; and – visible impacts to furniture. • Visual inspection of the condition of culverts and cuttings.	Management measures implemented as described in **Section 7** (with regard to the specific circumstances of the subsidence impact [e.g. the nature and extent of the impact]). Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures.	Contingency Plan implemented (with regard to the specific circumstances of the subsidence impact). In summary: • 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. • The exceedance or likely exceedance will be reported in an incident report. • An investigation will be conducted to identify and evaluate contributing factors to the exceedance. • An appropriate course of action will be developed in consultation with relevant stakeholders and government agencies. • The course of action will be approved by, and implemented to the satisfaction of, relevant stakeholders and government agencies. • The Built Features Management Plan – Mid-Western Regional Council and the performance indicators will be reviewed to adequately manage future potential impacts.
Frequency	Prior to commencement of extraction of Longwall 401.	• Ground survey of the subsidence effects monitoring line 'R Line' – Prior to secondary extraction of Longwall 401 – At the completion of each Longwall 401-408. – At any time in case of fault or emergency and where requested by the Mid-Western Regional Council (MWRC). • Subsidence impact inspection: – If/when ground movement exceeds the predicted subsidence monitoring parameters for UG4 during monitoring of the 'R Line' – At any time in case of fault or emergency and where requested by MWRC. – Routinely as per MWRC inspections. • Visual inspection: – Following completion of active mining after Longwall 408.	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).
Position of Decision Making	• Underground Technical Manager. • MWRC – General Manager (or delegate).	• Underground Technical Manager. • MWRC – General Manager (or delegate).	• Underground Technical Manager. • MWRC – General Manager (or delegate).	• Underground Technical Manager. • MWRC – General Manager (or delegate).

ATTACHMENT 3

UG4 LONGWALLS 401 TO 408
BUILT FEATURES MANAGEMENT PLAN – MID-WESTERN REGIONAL COUNCIL
SUBSIDENCE IMPACT REGISTER TEMPLATE

UG4 Longwalls 401 to 408 Built Features Management Plan – Mid-Western Regional Council
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)