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MEMBER OF



**Tahmoor Coal Pty Ltd**

# **PUBLIC SAFETY MANAGEMENT PLAN**

**Tahmoor North Western Domain  
Longwalls West 1 and West 2**

**July 2019**

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Document Control

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**APPLICANT:** Tahmoor Coal Pty Ltd

**MINE:** Tahmoor Coal Mine

**DEVELOPMENT APPROVAL:** DA 57/93 (as modified) and DA 67/98 (as modified)

**MINING LEASES:** ML 1376 and ML 1539

**DOCUMENT TITLE:** Tahmoor North Western Domain Longwalls West 1 and West 2 – Public Safety Management Plan

**DOCUMENT NUMBER:** TAH-HSEC-250

**PUBLICATION DATE:** July 2019

**DOCUMENT STATUS:** Final (Version 1)

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# 1 Introduction

## 1.1 Background

The Tahmoor Coal Mine (**Tahmoor Mine**) is an underground coal mine located approximately 80 kilometres (**km**) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (**NSW**) (refer to **Figure 1-1**). Tahmoor Mine produces up to three million tonnes of Run of Mine (**ROM**) coal per annum from the Bulli Coal Seam. Tahmoor Mine produces a primary hard coking coal product and a secondary higher ash coking coal product that are used predominantly for coke manufacture for steel production. Product coal is transported via rail to Port Kembla and Newcastle for Australian domestic customers and export customers.

The Tahmoor Mine has been operated by Tahmoor Coal Pty Ltd (**Tahmoor Coal**) since Tahmoor Mine commenced in 1979 using bord and pillar mining methods, and via longwall mining methods since 1987. Tahmoor Coal, trading as Tahmoor Coking Coal Operations (**TCCO**), is a subsidiary within the SIMEC Mining Division (**SIMEC**) of the GFG Alliance (**GFG**).

Tahmoor Coal has previously mined 31 longwalls to the north and west of the Tahmoor Mine's current pit top location. Tahmoor Coal is currently mining Longwall 32 in accordance with Development Consents and Subsidence Management Plan Approval.

Tahmoor Coal proposes to extend underground coal mining to the north-west of the Main Southern Railway (referred to as the 'Western Domain') which will include Longwalls West 1 (**LW W1**) to West 4 (**LW W4**) at Picton and Thirlmere. The first two longwalls to be mined are LW W1 and Longwall West 2 (**LW W2**) (collectively referred to as **LW W1-W2**), which are the focus of the Extraction Plan and this Public Safety Management Plan (**PSMP**). The Western Domain is within Mining Lease (**ML**) 1376 and ML 1539, as illustrated in **Figure 1-2** of the Extraction Plan Main Document.

## 1.2 Purpose

This PSMP has been prepared to support an Extraction Plan for the secondary extraction of coal from LW W1-W2. This PSMP has been designed to provide the management strategies, controls and monitoring programs to be implemented for the management of potential safety hazards to the public by the secondary extraction of LW W1-W2.

The PSMP includes management of health and safety risk due to:

- Potential subsidence impacts on built features;
- Potential instability of cliff formations or steep slopes caused by subsidence;
- Deformations or fracturing of any land caused by subsidence, and
- Any other impacts of subsidence.

## 1.3 Scope

The Study Area applicable to this PSMP consists of a combination of the Predicted 20 millimetres (**mm**) Total Subsidence Contour and the 35° Angle of Draw Line, as shown on **Figure 1-2**.

This PSMP addresses management measures applicable to the Study Area, such as:

- Monitoring of areas posing safety risks;
- Erection of warning signs and possible entry or use restrictions;
- Backfilling of surface cracks and/or re-profiling of humps and swales on tracks and roads;
- Infilling of pot holes;
- Securing of potentially unstable structures and rock masses;
- Identification of potential flood-related impacts that may pose a risk to public safety; and
- Provision of regular updates regarding mining progress to the community where management of public safety is a significant issue.

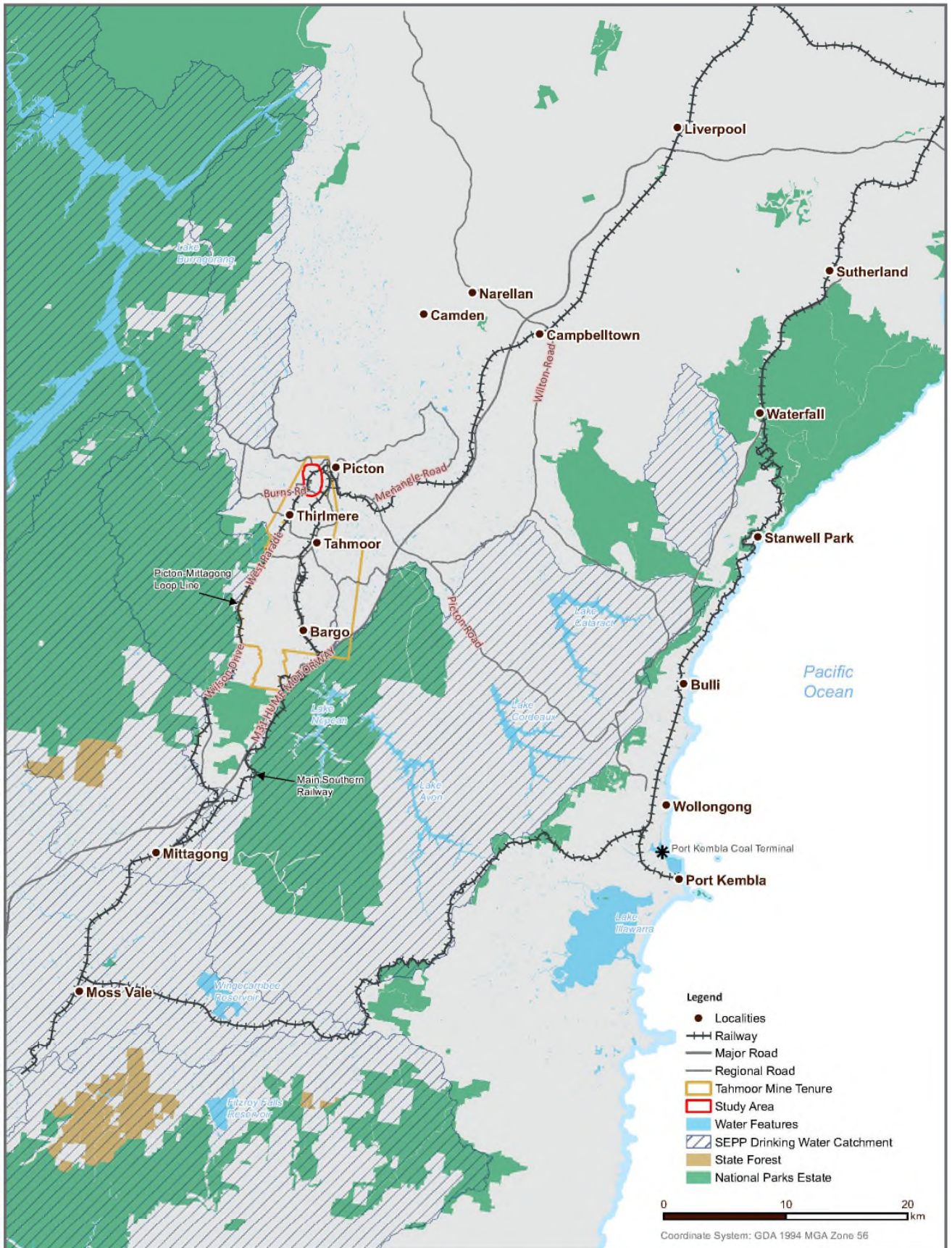
Public safety management within the Study Area is managed by this PSMP and individual Infrastructure Management Plans.

This PSMP also:

- Addresses specific requirements set by DA 67/98 Condition 13H(vii)(g) (refer to **Section 2.1.1**);
- Addresses related regulatory requirements (refer to **Section 2.2**); and
- Addresses the monitoring and management of potential subsidence-related impacts to public safety (refer to **Section 4** and **Section 5**).

This PSMP has been prepared based on the contents of the Subsidence Predictions and Impact Assessment (MSEC, 2019) (**Volume 1**).





## REGIONAL CONTEXT

Tahmoor North Western Domain Longwalls West 1 and West 2 Extraction Plan

**FIGURE 1-1**

Date: 27/05/2019

Data Sources:  
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DOCUMENT FILE PATH



## EXTRACTION PLAN STUDY AREA

Tahmoor North Western Domain Longwalls West 1 and West 2  
Extraction Plan



FIGURE 1-2

Date: 28/05/2019

Data Sources:  
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## 2 Regulatory Requirements

### 2.1 Project Approval

#### 2.1.1 Development Consent

Tahmoor Coal’s operations are conducted in accordance with applicable Commonwealth and State environmental, planning, mining safety, and natural resource legislation. A register of relevant environmental legislative and regulatory requirements is maintained by Tahmoor Coal in a compliance database.

The proposed LW W1-W2 will be operating in the Tahmoor North mining area under Development Consents DA 57/93 and DA 67/93, as discussed further in **Section 3.2.1** of the Extraction Plan Main Document.

DA 67/98 provides the conditional planning approval framework for mining activities in the Western Domain to be addressed within an Extraction Plan and supporting management plans. Conditions relevant to this PSMP from DA 67/98 are detailed in **Table 2-1**.

**Table 2-1 Key Conditions from DA 67/98 regarding Public Safety**

Condition	Condition Requirement		Section Addressed
Performance Measures – Built Features			
13E	<p>The Applicant must ensure that extraction of Longwall 33 and subsequent longwalls does not cause any exceedances of the performance measures in Table 2.</p> <p>Notes</p> <ul style="list-style-type: none"> <li>The Applicant will be required to define more detailed performance measures in the Built Features Management Plans or Public Safety Management Plan.</li> <li>Requirements regarding safety or serviceability do not prevent preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes.</li> <li>Requirements under this condition may be met by measures undertaken in accordance with the <i>Coal Mine Subsidence Compensation Act 2017</i>.</li> </ul>		Section 3 Infrastructure Management Plans
Table 2	Feature	Performance Measure	
	Key Public Infrastructure		
	<ul style="list-style-type: none"> <li>Main Southern Railway;</li> <li>Picton-Mittagong Loop Line; and</li> <li>Electricity transmission lines and towers.</li> </ul>	<ul style="list-style-type: none"> <li>Always safe and serviceable.</li> <li>Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.</li> </ul>	

Condition	Condition Requirement	Section Addressed
	<p>Other Infrastructure</p> <ul style="list-style-type: none"> <li>Electricity distribution lines, poles and associated towers;</li> <li>Unsealed roads and road culverts, fire trails, fences and other built features; and</li> <li>Other public infrastructure.</li> </ul> <p>Privately-owned residences.</p> <p>Other privately-owned built features and improvements, including farm dams, swimming pools, tennis courts, roads, tracks and fences</p>	
	<p>Public Safety</p> <ul style="list-style-type: none"> <li>Negligible additional risk.</li> </ul>	
	<p>Notes:</p> <ul style="list-style-type: none"> <li>The Applicant will be required to define more detailed performance measures in the Built Features Management Plans or Public Safety Management Plan.</li> <li>Requirements regarding safety or serviceability do not prevent preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes.</li> <li>Requirements under this condition may be met by measures undertaken in accordance with the Coal Mine Subsidence Compensation Act 2017.</li> </ul>	
13F	Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the performance measures in Table 2 is to be settled by the Secretary, following consultation with the Resources Regulator. Any decision by the Secretary shall be final.	Noted.
Extraction Plan		
13H(vi)	describe in detail the performance indicators to be implemented to ensure compliance with the performance measures in Table 1 and Table 2, and manage or remediate any impacts and/or environmental consequences;	Section 3 Infrastructure Management Plans
13H(vii)(g)	Public Safety Management Plan which has been prepared in consultation with the Resources Regulator, which ensures public safety and manages access on the site;	This document Section 2.4
13H(vii)(h)	<p>Trigger Action Response Plan/s addressing all features in Table 1 and Table 2, which contain:</p> <ul style="list-style-type: none"> <li>appropriate triggers to warn of increased risk of exceedance of any performance measure; and</li> <li>specific actions to respond to high risk of exceedance of any performance measure to ensure that the measure is not exceeded;</li> </ul>	Infrastructure Management Plans

Condition	Condition Requirement	Section Addressed
	<ul style="list-style-type: none"> <li>an assessment of remediation measures that may be required if exceedances occur and the capacity to implement the measures; and</li> <li>adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Table 1 or Table 2, or where any such exceedance appears likely; and</li> </ul>	
13H(vii)(i)	Contingency Plan that expressly provides for: <ul style="list-style-type: none"> <li>adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Table 1 and Table 2, or where any such exceedance appears likely; and</li> <li>an assessment of remediation measures that may be required if exceedances occur and the capacity to implement those measures; and</li> <li>includes a program to collect sufficient baseline data for future Extraction Plans.</li> </ul>	Infrastructure Management Plans

### 2.1.2 Extraction Plan Guidelines

The Extraction Plan and PSMP have been prepared in accordance with the *Guidelines for the Preparation of Extraction Plans V5* (DPE, 2015), as illustrated in **Table 2-2**.

**Table 2-2 Extraction Plan Guideline Requirements for Public Safety Management Plan**

Extraction Plan Guideline Content Requirements	Section(s) Addressed
An overview of all landscape features, heritage sites, environmental values, built features or other values to be managed under the component plan.	Section 3
Setting out all performance measures included in the development consent relevant to the features or values to be managed under the component plan.	Section 2.1.1, Section 4.1
Setting out clear objectives to ensure the delivery of the performance measures and all other relevant statutory requirements (including relevant safety legislation).	Section 2, Section 3 Infrastructure Management Plans
Proposing performance indicators to establish compliance with these performance measures and statutory requirements.	Section 3.1 Infrastructure Management Plans
Describe the landscape features, heritage sites and environmental values to be managed under the component plan, and their significance.	Section 3 Infrastructure Management Plans
Describe all currently-predicted subsidence impacts and environmental consequences relevant to the features, sites and values to be managed under the component plan.	Section 3 Infrastructure Management Plans
Describe all measures planned to remediate these impacts and/or consequences, including any measures proposed to ensure that impacts and/or consequences comply with performance measures and/or the Applicant’s commitments.	Infrastructure Management Plans
Describe the existing baseline monitoring network and the current baseline monitoring results, including pre-subsidence photographic surveys of key landscape features and key heritage sites which may be subject to significant subsidence impacts (such as significant watercourses, swamps and Aboriginal heritage sites).	Section 4.2 Infrastructure Management Plans

Extraction Plan Guideline Content Requirements	Section(s) Addressed
Fully describing the proposed monitoring of subsidence impacts and environmental consequences.	Section 4.2
Describe the proposed monitoring of the success of remediation measures following implementation.	Infrastructure Management Plans
Describe adaptive management proposed to avoid repetition of unpredicted subsidence impacts and/or environmental consequences.	Infrastructure Management Plans
Describe contingency plans proposed to prevent, mitigate or remediate subsidence impacts and/or environmental consequences which substantially exceed predictions or which exceed performance measures.	Infrastructure Management Plans
Listing responsibilities for implementation of the plan.	Section 6.3 Infrastructure Management Plans
An attached Trigger, Action, Response Plan (effectively a tabular summary of most of the above).	Infrastructure Management Plans
Management of health and safety risks due to potential subsidence impacts on built features	Section 2.4 Infrastructure Management Plans
Management of health and safety risks due to potential instability of cliff formations or steep slopes caused by subsidence	Section 3 Land Management Plan
Management of health and safety risks due to deformations or fracturing of any land caused by subsidence	Section 4
Management of health and safety risks due to any other impacts of subsidence	Section 5

## 2.2 Relevant Legislation

### 2.2.1 Work, Health and Safety Legislation

All persons conducting a business or undertaking (**PCBUs**), including mine operators and contractors, have a primary duty of care to ensure the health and safety of workers they engage, or whose work activities they influence or direct. The responsibilities are legislated in the *Work Health and Safety Act 2011* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations (collectively referred to as the 'WHS laws').

As outlined in the Guide by the NSW Department of Trade & Investment Mine Safety:

*"a PCBU must manage risks to health and safety associated with mining operations at the mine by:*

- *complying with any specific requirements under the WHS laws;*
- *identifying reasonably foreseeable hazards that could give rise to health and safety risks;*
- *ensuring that a competent person assesses the risk;*
- *eliminating risks to health and safety so far as is reasonably practicable;*
- *minimising risks so far as is reasonably practicable by applying the hierarchy of control measures, any risks that are not reasonably practical to eliminate;*
- *maintaining control measures; and*
- *reviewing control measures.*

*The mine operator's responsibilities include developing and implementing a safety management system that is used as the primary means of ensuring, so far as is reasonably practicable:*

- *the health and safety of workers at the mine, and*
- *that the health and safety of other people is not put at risk from the mine or work carried out as part of mining operations."*

Detailed guidelines have also been released by the NSW Department of Planning & Environment, Resources Regulator, Mine Safety Operations (DPE, 2017).

### 2.2.2 Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

The *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* commenced on 1 February 2015 and contains specific regulations in relation to mine subsidence. Clause 13 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the operator of a mine to establish a Safety Management System (**SMS**) for the mine.

A SMS for a mine is the primary means of ensuring the safe operation of a mine. It brings together a number of procedures and policies to enable a mine operator to follow a systematic approach to achieving and monitoring an effective level of health and safety.

The SMS is used as the primary means of ensuring the health and safety of workers at the mine.

Establishing an SMS requires a mine operator to:

- Identify all Principal Mining Hazards (**PMH**);
- Assess the risks;
- Prepare a Principal Hazard Management Plan (**PHMP**) for each PMH; and
- Prepare Principal Control Plans (**PCP**).

Division 2 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the development of PHMP, which requires the mine operator to:

- Identify all principal hazards associated with mining operations or petroleum operations at the mine or petroleum site; and
- Conduct, in relation to each principal hazard identified, a risk assessment that involves a comprehensive and systematic investigation and analysis of all aspects of risk to health and safety associated with the principal hazard.

Under Schedule 1, subsidence is identified as a PMH requiring a PHMP.

### 2.2.3 Subsidence Principal Hazard Management Plan

Tahmoor Coal maintains a Subsidence Principal Hazard Management Plan that is reviewed, revised and updated prior to the commencement of each longwall.

The following factors should be considered when identifying, investigating and analysing subsidence hazards:

- The characteristics of all relevant surface and subsurface features, including any known future developments (e.g. sub-divisions or other improvements) within the area where risk management is required;
- The characteristics of the mining operation, including the rate, method, layout, schedule and sequence of mining operations, the thickness of the seam to be mined, extraction height and cover depth;
- The characteristics of any previously excavated or abandoned workings that may interact with any proposed or existing mine workings;
- The existence, distribution, geometry and stability of significant voids, standing pillars or remnants within any old pillar workings that may interact with any proposed or existing mine workings;

- The characteristics of all relevant geological, hydrogeological, hydrological, geotechnical, topographical and climatic conditions of the area where risk management is required, including the structural, lithological and geotechnical characteristics of the overburden, interburden, floor and roof strata;
- The characteristics of any conditions that may cause elevated or abnormal subsidence or formation of sinkholes; and
- The predicted and actual nature, magnitude, location, distribution, timing and duration of subsidence.

## 2.3 Risk Management

### 2.3.1 Risk Management Process

At the core of an SMS is the process or processes for managing risks, in particular those posed by PMHs. Effectively controlling risks at Tahmoor Mine requires Tahmoor Coal to follow a risk management process, which involves the four steps:

- Identify hazards – find out what could cause harm;
- Assess risks if necessary – understand the nature of the harm that could be caused by the hazard, how serious the harm could be and the likelihood of it happening;
- Control risks – eliminate the risk or, if this is not possible, minimise the risk through risk control measures; and
- Review – review control measures to ensure they are working as planned.

The framework utilised for the risk assessment is the risk management process outlined within AS/NZS ISO 31000.

### 2.3.2 Subsidence Guidelines

The risk management process has been carried out in accordance with guidelines published by DPE (2015). The following main steps of subsidence risk management have been and will be undertaken, in accordance with the guidelines:

- Identification and understanding of subsidence hazards;
- Assessment of risks of subsidence;
- Development and selection of risk control measures;
- Implementation and maintenance of risk control measures, and
- Continual improvement and change management.

Each of the above steps have been or will be conducted together with the following processes:

- Consultation, co-operation and co-ordination, and
- Monitoring and review.

The infrastructure management plans document the risk control measures that are planned to manage risks to health and safety associated with the mining of LW W1-W2 directly beneath or adjacent to built features in accordance with the WHS laws.



Tahmoor Coal has developed and acted in accordance with a risk management process to manage potential hazards due to mine subsidence on built features. The risk management strategy has been reviewed and updated based on experiences gained during the mining of Longwalls 22 to 32 and the strategy for LW W1-W2 includes the following process:

- Regular consultation with owners and operators of built infrastructure before, during and after mining;
- Site-specific investigations;
- Implementation of mitigation measures following engineering inspections and assessments;
- Surveys and inspections during mining within the active subsidence area:
  - Detailed visual inspections of built features;
  - Ground surveys; and
  - Specific ground surveys and visual inspections, where recommended by an engineer based on the inspections and assessments.

### 2.3.3 Identification of Subsidence Hazards

Clause 34 of the *Work Health and Safety Regulation (2017)* requires that the duty holder (in this case Tahmoor Coal), in managing risks to health and safety, must identify reasonably foreseeable hazards that could give rise to risks to health and safety.

Mine subsidence hazards have been or will be identified, investigated and analysed in a systematic manner by examining each aspect of the built features. Each of the aspects below could potentially experience mine subsidence movements that give rise to risks to the health and safety of people:

- Railways;
- Local roads, bridges and culverts;
- Potable water infrastructure;
- Sewerage infrastructure;
- Gas infrastructure;
- Electrical infrastructure;
- Telecommunications infrastructure;
- Built heritage;
- Residential structures; and
- Farm dams.

A description of mine subsidence hazards identified that could give rise to risks to health and safety will be described in each of the individual infrastructure management plans.

Tahmoor Coal has completed a Risk Assessment for built features affected by subsidence from the extraction of LW W1-W2. A copy of the risk assessment is included in **Appendix A-C**.

Tahmoor Coal, in consultation with infrastructure owners, will build upon the risk assessment to assess in detail the likelihood of the identified hazards affecting health and safety, and the severity of potential health and safety consequences during the risk assessment as a group. The results of the risk assessments will be included in each of the individual infrastructure management plans.

The identification and risk assessment process will take into account the location of infrastructure relative to LW W1-W2 and the associated timing and duration of the subsidence event.

Whilst mine subsidence predictions and extensive past experiences from previous mining at Tahmoor Coal will be taken into account, the identification and risk assessment process recognises that there are uncertainties in relation to predicting subsidence movements, and uncertainties in how mine subsidence movements may adversely impact built features. This includes the presence and influence of geological structures and valleys.

Tahmoor Coal will consider the outcomes of the hazard identification and risk assessment process when developing measures to manage potential impacts on the health and safety of people, and potential impacts on built features in consultation with stakeholders.

#### 2.3.4 Subsidence Risk Assessments

For each longwall or series of longwalls within an Extraction Plan, a series of management plans have been developed following risk assessments that include:

- Review of the potential issues likely to result from mine subsidence;
- Review of the potential likelihood and consequence of all identified potential issues;
- The consequent risk levels; and
- The existing and additional management measures and controls to be implemented to the risk, or to minimise the risks so far as is reasonably practicable.

For LW W1 – W2, the following risk assessments have been undertaken:

- LW W1 – W2 - Extraction Plan Risk Assessment held on 12 February 2019;
- LW W1 – W2 - Infrastructure Risk Assessment held on 26 March 2019; and
- LW W1 – W2 – Environmental Features Risk Assessment held on 6 June 2019.

Copies of each of these risk assessments summary reports are provided in **Appendix A-C**.

Additionally, a specific risk assessment for the rail infrastructure (Main Southern Railway Line and Picton – Mittagong Loop Line) is scheduled to be conducted on 30 July 2019.

## 2.4 Consultation

Separate Infrastructure Management Plans will be developed in consultation with the relevant infrastructure owner(s) prior to the influence of subsidence on each relevant feature.

The following infrastructure owners will be consulted with regard to the infrastructure indicated and the relevant Infrastructure Management Plan:

- Endeavour Energy (electrical) - Endeavour Energy Management Plan;
- Sydney Water (potable water) - Sydney Water Potable Water Management Plan;
- Property owner of Stonequarry Wastewater Treatment Plant - Stonequarry Wastewater Treatment Plant Management Plan;
- Jemena (gas) - Jemena Management Plan;
- Telstra (telecommunications) - Telecommunications Management Plan;
- NBNCo (telecommunications) - Telecommunications Management Plan;
- Wollondilly Shire Council (local roads, culverts and bridges) - Wollondilly Shire Council Management Plan;
- Australian Rail Track Corporation (**ARTC**) (Main Southern Railway) - Main Southern Railway Management Plan;

- Railcorp and Transport Heritage NSW - Picton-Mittagong Heritage Railway Management Plan;
- Property owner of Mill Hill – Mill Hill Management Plan; and
- Property manager of Queen Victoria Memorial Home – Queen Victoria Memorial Home Management Plan.

# 3 Potential Public Safety Hazards

## 3.1 Built Features

The primary risk associated with mining beneath built features is public safety.

Tahmoor Coal has extensive experience directly mining beneath or adjacent to built features, including houses and civil structures, public infrastructure, commercial and retail properties, local roads and bridges and the Main Southern Railway.

Tahmoor Coal has implemented extensive subsidence and mitigation measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

Built features identified within the LW W1 – W2 Extraction Plan include:

- Main Southern Railway;
- Picton-Mittagong Loop Line;
- Local roads;
- Potable water infrastructure;
- Sewerage infrastructure;
- Gas infrastructure;
- Electrical infrastructure;
- Telecommunications infrastructure;
- Public amenities, including the Queen Victoria Memorial Hospital (QVMH) complex;
- Structures, including houses, swimming pools and other structures;
- Built heritage sites, including QVMH and Mill Hill heritage house; and
- Permanent survey marks.

The subsidence impacts and management measures for all identified built features are outlined in detail within the following plan:

- Built Features Management Plan.

Detailed subsidence predictions are contained within the following report:

- MSEC (2019), Subsidence Predictions and Impact Assessments Report.

Monitoring requirements for each identified built features are outlined with the following plan:

- Subsidence Monitoring Program.

The measures outlined within this plan for identified built features to specifically monitor safety risks include:

- Regular ground survey;
- Other electronic surveys;
- Site specific inspections of infrastructure items;
- Visual inspections; and
- Photo monitoring points.

Infrastructure Management Plans prepared for each identified built features includes a detailed section on subsidence impact management measures, including:

- Risk assessment and hazard identification;
- Subsidence predictions and impact assessment;
- Management of public safety;
- Management controls;
- Risk control measures;
- Monitoring measures; and
- Trigger and responses.

## 3.2 Cliffs and Steep Slopes

The primary risk associated with mining beneath cliffs and steep slopes is public safety.

Tahmoor Coal has extensive experience directly mining beneath or adjacent to cliffs and steep slopes. Tahmoor Coal has implemented extensive subsidence and mitigation measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

Douglas Partners (2019) define cliffs and steep slopes as:

- Cliff – Slope appears vertical and ranges between 64° and 84°;
- Extreme Slope – need rope access to climb slope and ranges between 45° and 64°;
- Very Steep Slope – Can climb by clutching at vegetation and ranges between 27° and 45°;
- Steep Slope - Walkable with effort and ranges between 18° and 27°;
- Moderate Slope - Walkable and ranges between 10° and 18°; and
- Gentle Slope - Easy walking and ranges between 0° and 10°.

The major natural features with the study area is Matthews Creek, Cedar Creek and Stonequarry Creek. Subsidence can trigger slope failure in the form of local rock face instability due to tilting and bending of the rock mass beds. Overhangs and jointed planes are particularly susceptible to collapse leading to rock falls and toppling failures. The cliffs along Matthews Creek and Cedar Creek are susceptible to natural rock falls caused by undercutting of shale beds. Weathering of sandstone beds have also contributed to localised overhang development.

The cliffs within the LW W1 – W2 Extraction Plan Study Area have been categorised as having an insignificant risk of falls, with less than 3% of cliff lines predicted to be impacted by subsidence.

Steep slopes are defined as an area of land having natural slope ranging between 18° and 45°. Natural steep slopes are located on the side of ridges above the proposed longwalls consists of Wianamatta Shale and along the banks of Matthews, Cedar and Stonequarry Creeks where the near surface lithology is part of the Hawkesbury Sandstone. The subsidence impacts will take place over a broad area and coupled with the depth of overburden and localised changes in slope, will be between insignificant to minor on the steep slopes. The geotechnical assessment has concluded that there will be between a low to moderate assessed pre and post mining risk to property, and hence public safety within the LW W1 – W2 Study Area.

The subsidence impacts and management measures for all identified cliffs and steep slopes are outlined in detail within the following plan:

- Land Management Plan.

The Land Management Plan is supported by the following specialist technical report, specifically considering subsidence risks and public safety considerations for cliffs and steep slopes:

- Douglas Partners (2019), Geotechnical Assessment.

Detailed subsidence predictions are contained within the following report:

- MSEC (2019), Subsidence Predictions and Impact Assessments Report.

Monitoring requirements for cliffs and steep slopes are outlined with the following plan:

- Subsidence Monitoring Program.

The measures outlined within this plan for cliffs and steep slopes to specifically monitor safety risks include:

- Regular ground survey;
- Other electronic surveys;
- Visual inspections; and
- Photo monitoring points.

### 3.3 Subsidence Deformations

The management strategy for surface cracking within the LW W1 – W2 Study Area is to identify any subsidence related impacts through monitoring prior to, during and post-secondary extraction.

The subsidence impacts and management measures for surface deformations are outlined in detail within the following plan:

- Land Management Plan.

Monitoring of surface deformations will be achieved by implementing the following measures:

- Visual inspections; and
- Photo monitoring.

In response to observed subsidence impacts causing surface deformations or surface cracking, Tahmoor Coal will implement the following management measures:

- Install warning signs in the immediate area if the cracking is consider a public safety risk;
- Install danger tape in the immediate area if the cracking is consider a public safety risk;
- Plan and undertake site rehabilitation as soon as practical to remove any ongoing public safety risks. Site rehabilitation measures could include:
  - Backfilling or grout filling of surface cracking;
  - Re-profiling of compression humps;
  - Infilling of pot holes or subsidence related undulations developed; and
  - Securing of unstable structures or natural features, such as rock masses.

### 3.4 Other Subsidence Impacts

Flood modelling has been undertaken by WRM based on the existing topography as surveyed by LiDAR and predicted subsidence movements due to the extraction of the proposed longwalls WRM (2019).

The study found that flows are generally contained within the channels of Matthews Creek, Cedar Creek and Stonequarry Creek within the Study Area. The crest of Barkers Lodge Road may be overtopped during a Probable Maximum Flood (PMF) event. The subsidence resulting from the mining of the proposed LW W1-W2 results in a negligible change in flood levels, flow velocities and flood extent within the catchment area (WRM, 2019)

The subsidence impact assessment and flood study contained within the Water Management Plan has concluded that subsidence impacts within the LW W1 – W2 Study Area would cause an insignificant increase flood risk. Therefore, the potential public safety risk from increased flooding from subsidence impact is consider negligible.

The subsidence impacts and management measures for flooding are outlined in detail within the following plan:

- Water Management Plan.

The Water Management Plan is supported by the following specialist technical report, specifically considering subsidence risks and public safety considerations for flooding:

- WRM (2019), Flood Impact Study.

## 4 Subsidence Monitoring Program

### 4.1 Performance Measures

Performance measures for built features are provided in Table 2 of Condition 13E of DA 67/98 (refer to **Section 2.1.1**). It is anticipated that the performance measures will be achieved during and after mining of LW W1-W2 through the implementation of the various Infrastructure Management Plans.

### 4.2 Monitoring Program

Tahmoor Coal has developed a Subsidence Monitoring Program, which is included in the Extraction Plan for LW W1-W2. The Subsidence Monitoring Program describes the inspection regimes, layout of monitoring points, parameters to be measured, monitoring methods and accuracy, timing and frequencies of surveys and inspections, and recording and reporting of monitoring results.

The Subsidence Monitoring Program is consistent with the monitoring commitments as described in the following plans, which are submitted as part of Tahmoor Coal's Extraction Plan for LW W1-W2:

- Tahmoor Coal – Water Management Plan for LW W1-W2, 2019;
- Tahmoor Coal – Land Management Plan for LW W1-W2, 2019;
- Tahmoor Coal – Biodiversity Management Plan for LW W1-W2, 2019;
- Tahmoor Coal – Heritage Management Plan for LW W1-W2, 2019;
- Tahmoor Coal – Built Features Management Plan for LW W1-W2, 2019; and
- Tahmoor Coal – Public Safety Management Plan for LW W1-W2, 2019.

The Subsidence Monitoring Program will be consistent with detailed Subsidence Management Plans, which will be developed by Tahmoor Coal in consultation with stakeholders prior to the influence of subsidence on each relevant feature. Each of these management plans will describe measures that will be undertaken to monitor subsidence movements and physical changes and/or impacts that occur during mining. The management plans will include:

- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Wollondilly Shire Council Infrastructure, Report No. MSEC1045-02, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Sydney Water Potable Water Infrastructure, Report No. MSEC1045-03, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Stonequarry Wastewater Treatment Plant, Report No. MSEC1045-04, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Jemena Gas Infrastructure, Report No. MSEC1045-05, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Endeavour Energy Infrastructure, Report No. MSEC1045-06, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Telstra and NBNCo Infrastructure, Comms Network Solutions, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to Built Structures, Report No. MSEC1045-12, 2019;



- Tahmoor Coal – LW W1-W2 Property Subsidence Management Plan for potential mine subsidence impacts on Queen Victoria Memorial Home, Report No. MSEC1045-13-01, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for Potential Impacts to No. 675 Thirlmere Way (Mill Hill), Report No. MSEC1045-13-02, 2019;
- Tahmoor Coal – LW W1-W2 Management Plan for extraction of LW W1-W2 beneath the Picton-Mittagong Loop Line, Report No. MSEC1036, 2019; and
- Tahmoor Coal – LW W1-W2 Management Plan for extraction of LW W1-W2 adjacent to the Main Southern Railway, Report No. MSEC1058, 2019.

### 4.3 Baseline Monitoring for Future Extraction Plans.

To assist in the preparation of future Extraction Plans, monitoring of built features, cliffs and steep slopes, and surface deformations as outlined in the Subsidence Monitoring Program would provide sufficient baseline data to assist the preparation of the Extraction Plan for LW W3-W4. Monitoring data collected during the mining of LW W1-W2 would be used in the review of observed subsidence impacts for future Extraction Plans.

# 5 Subsidence Management Strategies

## 5.1 Public Safety Management

The primary risk associated with mining beneath structures is public safety. Historically, residents have not been exposed to immediate and sudden safety hazards as a result of impacts that occur due to mine subsidence movements in the NSW Coalfields, where the depths of cover were greater than 350 metres, such as the case above the proposed longwalls. This includes the recent experience at Tahmoor, which has affected more than 2,000 houses and civil structures.

Emphasis is placed on the words “immediate and sudden” as in rare cases, some structures have experienced severe impacts, but the impacts did not present an immediate risk to public safety as they developed gradually with ample time to relocate residents.

Tahmoor Coal proposes to continue its long established practice of ensuring that built structures and natural features remain safe and serviceable at all times during mining. Tahmoor Coal, in consultation with landowners, routinely studies the potential for impacts on built structures, other infrastructure and natural features to develop management and mitigation measures. These studies draw upon the subsidence management expertise within Tahmoor Coal and its consultant structural, geotechnical, rail and subsidence engineers.

The risk management process following by Tahmoor Coal is implemented through a four-staged process, as described in **Section 5.1.1**.

### 5.1.1 Structures Risk Management Process

#### Stage One

Regular consultation, cooperation and coordination with the community before, during and after mining. This includes letters and door knocking to all residents of structures that will soon be affected by subsidence. The letters offer a free pre-mining inspection and hazard identification inspection by a structural engineer.

#### Stage Two

Site-specific investigations, where they are necessary and appropriate, into the conditions of buildings and associated structures and their surrounding environment (where access is allowed). The site-specific investigations have been and will continue to be undertaken early so that there is adequate time, if required, to arrange additional inspections and/or surveys and implement any mitigation measures before mining-induced impacts are experienced.

For properties located directly above the first 300 m of the commencing end of a longwall, the investigations are targeted to be undertaken prior to extraction or at the latest, they will be undertaken prior to the first 200 m of extraction of the longwall.

The site-specific investigations include the following:

- Identification of structures from aerial photographs and kerbside inspections;
- Front of house risk and visual screening inspections by Tahmoor Coal in company with a structural engineer for all properties that are predicted to experience more than 20 mm of incremental vertical subsidence due to the extraction of each upcoming longwall. The purpose of the inspections is to identify hazards where access has not been granted by the landowner. In some cases, particularly in semi-rural and rural areas, it is difficult to inspect a structure that is remote from the street front. Where these cases involve properties that are located directly above a longwall, Tahmoor Coal has requested access to conduct a pre-mining inspection and hazard identification inspection by a structural engineer;
- Tahmoor Coal will request access to conduct pre-mining geotechnical inspections of structures located on or immediately adjacent to steep slopes that are predicted to experience more than 20 mm of incremental vertical subsidence due to the extraction of each longwall;
- Tahmoor Coal will request access to conduct pre-mining hazard identification inspections by a structural engineer (where access is allowed by the landowner) to properties with structures that have been specifically targeted on the basis that may be more sensitive to mine subsidence movements. These include:
  - Commercial and business establishments, public amenities and public utilities;
  - Structures of heritage significance;
  - Structures that are located above hidden creeks;
  - Structures that are located above mapped geological structures;
  - Structures that are located on or adjacent to steep slopes or that have been recommended for structural inspection by the geotechnical engineer;
  - Structures that have been identified as being potentially unstable or unsafe by landowners (Stage One), or from the front of house inspections (Stage Two);
  - Houses and units located outside the declared Mine Subsidence Districts; and
  - Houses and units estimated to have been constructed prior to the declaration of the Picton Mine Subsidence District as originally declared in 1997 or if outside the original declared boundary, prior to the declaration of the current boundary in 2017.

### **Stage Three**

Implementation of pre-mining mitigation measures following inspections by the geotechnical engineer and the structural engineer, in consultation and agreement with the landowner.

### **Stage Four**

Surveys and inspections during mining within the active subsidence area:

- Detailed visual inspections and vehicle-based inspections along the streets;
- Ground surveys along the streets;
- Specific ground surveys for selected properties, where recommended by the geotechnical engineer or structural engineer due to their proximity to steep slopes or pre-existing condition;
- Visual inspections of residential structures that are either: located on or adjacent to steep slopes, are in poor existing condition (based on the hazard identification inspections), have previously reported impacts, or where recommended by the Structures Response Group;
- Visual inspections of pool fences and gates; and

- Visual inspections of commercial, industrial and business establishments, public amenities and public utilities.

## 6 Review and Improvement

This section of the BFMP describes the key elements of implementation relevant to built features. A description of general reporting requirements, reviews and key responsibilities that are applicable to extraction of LW W1-W2 are discussed in the Extraction Plan Main Document.

### 6.1 Reporting Requirements

Generic reporting requirements for the LW W1-W2 Extraction Plan are discussed in **Section 6.1** of the Extraction Plan Main Document. Specific reporting requirements will be described in the individual infrastructure management plans.

### 6.2 Review and Auditing

This PSMP can be reviewed and updated to continually improve the risk management systems based on audit, review and learnings from the development of subsidence during mining and manage changes in the nature, likelihood and consequence of subsidence hazards.

### 6.3 Roles and Responsibilities

Generic roles and responsibilities applicable for the implementation of the LW W1-W2 Extraction Plan are discussed in **Section 6.3** of the Extraction Plan Main Document. There are no roles and responsibilities specific to the implementation of built features management measures identified for the extraction of LW W1-W2.

## 7 Document Information

This section provides a compiled list of references, terms, and abbreviations used in this document. In addition, this section provides the change information for this document.

### 7.1 References

Department of Planning and Environment (DPE) (2015), Guidelines for the Preparation of Extraction Plans V5.

Douglas Partners (2019), Report on Geotechnical Assessment, Extraction Plan Longwall West 1 and West 2, prepared for Tahmoor Coal.

Mine Subsidence Engineering Consultants (2019), Tahmoor Coking Coal Operations – Longwalls W1 and W2 Subsidence Predictions and Impact Assessments, draft report for SIMEC Mining.

NSW Department of Planning & Environment (2017), Resources Regulator, Mine Safety Operations.

WRM (2019), Matthew Creek Flood Impact Study for LW W1-W2, Prepared for Tahmoor Coking Coal Operations, May 2019, document 1072-05-B1.

### 7.2 Glossary of Terms

The Extraction Plan Main Document provides a compiles Glossary of Terms in **Section 8.3**.

### 7.3 Abbreviations

Abbreviations used in this document are provided below in **Table 7-1**.

**Table 7-1** Abbreviations

Abbreviation	Definition
ARTC	Australian Rail Track Corporation
DPE	NSW Department of Planning and Environment
GFG	GFG Alliance
km	Kilometre/s
LW	longwall
LW W1	Longwall West 1
LW W1-W2	Longwalls West 1 to West 2
LW W2	Longwall West 2
LW W3-W4	Longwalls West 3 to West 4
LW W4	Longwall West 4
m	Metre/s
mm	Millimetre/s
ML	Mining Lease
NSW	New South Wales

Abbreviation	Definition
PCBU	Persons conducting a business or undertaking
PCP	Principal Control Plans
PHMP	Principal Hazard Management Plan
PMH	Principal Mining Hazards
PSMP	Public Safety Management Plan
QVMH	Queen Victoria Memorial Home
ROM	run of mine
SIMEC	SIMEC Mining Division
SMP	Subsidence Management Plan
SMS	Safety Management System
Tahmoor Mine	Tahmoor Coal Mine
Tahmoor Coal	Tahmoor Coal Pty Ltd
TCCO	Tahmoor Coking Coal Operations
THNSW	Transport Heritage NSW

## 7.4 Change Information

Table 7-2 provides the details of document history of this PSMP.

**Table 7-2 Document History**

Version	Date Reviewed	Reviewed By	Change Summary
1.0	July 2019	Ron Bush	New document

# Appendix A – Risk Assessment Report – LW W1-W2 General



# Appendix B – Risk Assessment Report – LW W1-W2 Infrastructure

# Appendix C – Risk Assessment Report – LW W1-W2 Environmental Features