What is Subsidence?

Mine subsidence refers to any surface ground movements associated with underground mining. Typically, mine subsidence refers to a vertical movement at a particular point. This occurs when material is removed from an underground mine and the earth above the mine adjusts to the altered landscape. Figure 1 below demonstrates a cross view of mine subsidence effects.

The amount of subsidence varies across the area mined beneath, with greatest subsidence occurring towards the centre of the mined area, and gradually reducing to outside the mined area. If subsidence occurs uniformly across an area, it is unlikely that any impacts would be noticed. However, differential subsidence results in tilting and bending of the ground. These differential movements can result in mine subsidence-related impacts to surface features.

Mine subsidence commonly also results in horizontal movements. Differential horizontal movement causes ground strain. Small horizontal movements may be experienced at points on the surface that are some distance away from the mining activity.

Types of Subsidence

Mine subsidence movements can be described using the following parameters:

Vertical Subsidence – this is the lowering of the land and all surface infrastructure. If the infrastructure lowers by the same amount, it would have little or no effect on the structure, unless it is located in a flood prone area. Subsidence develops very gradually, and it is not readily apparent.

Tilt – a small change of slope on the surface arising from the surface lowering unevenly. Generally tilt does not lead to structural damage.

Strain – the tensile stretching or comprehensive squeezing of the land surface as it lowers to the new level, relative to the land surrounding it.

Curvature – the bending of the land surface as it lowers to the new level.

What does this subsidence mean at the surface?

Subsidence can result in a change to surface and sub-surface conditions. The effects of subsidence may not be noticeable because the undulation of the natural surface is much greater and tends to mask subsidence movements.

The level of impact that can occur to surface and sub-surface features depends on the magnitude of movement that occurs, and the sensitivity of each feature to these movements. Some features, such as houses, can be sensitive to ground tilt, curvature and strain.

Regulations

Mine subsidence is tightly regulated in NSW. During the assessment of the Tahmoor South longwalls the potential impacts of subsidence on surface features are to be assessed, including impacts on man-made features (e.g. buildings, pipelines, dams and bridges) and natural environmental features (e.g. rivers, cliffs, aquifers and ecosystems). Extraction Plans must be prepared and approved, outlining what management techniques will be used to keep impacts within acceptable levels.

Many government agencies are involved in the approval of an Extraction Plan including the NSW Department of Planning, Industry & Environment. This provides a whole-of-government approach, which allows all mine subsidence related issues to be considered in the process.

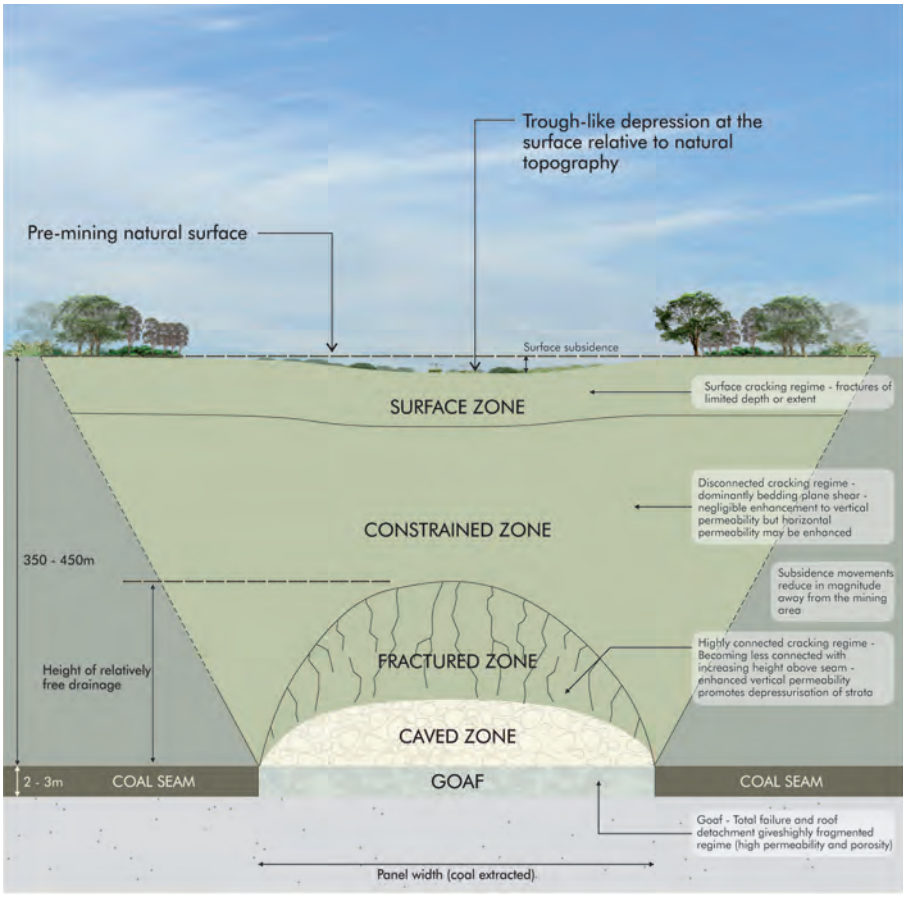

Figure 1: Cross view mine subsidence effects

Subsidence Management

Potential impacts from subsidence have been successfully managed by Tahmoor Coal for many years, including the Main Southern Railway, Picton Industrial Area, houses, shops, agriculture and infrastructure such as water, gas, power and telecommunications infrastructure. Subsidence can be managed in a number of ways, including;

- Mine Design;
- Pre-mining strengthening works;
- Monitoring during mining; and
- Post subsidence remediation works.

Subsidence Impacts from Longwalls

Tahmoor Coal has previously mined longwalls 22 to 32 beneath the township of Tahmoor, Thirlmere and Picton, and observed subsidence impacts between 0.6m to 1.2m.

Following the completion of the Western Domain longwall mining in Picton, mining of Tahmoor South Longwall 1A commenced in the Bargo area in October 2022.

The predicted maximum subsidence for the Tahmoor South longwalls is between 0.8m to 1.6m. Extensive ground monitoring and surveys are undertaken before, during and after mining.

Possible Impacts on Houses & Other Structures

Vertical subsidence is the lowering of the land and the buildings on it. If a whole building lowers by the same amount, it has little or no effect on the building itself. Vertical subsidence varies from very small amounts (less than 20mm) more than 250m away from a mining area, to a maximum of about 1600mm near the middle of a longwall. These changes result in slight tilting and bending of the land and the buildings on it, as well as stretching and compressing.

These changes develop very gradually over many weeks, and they are not readily apparent to the naked eye.

The variation in subsidence movements does, at times result in impacts to houses and other structures, mainly in the form of cracks. The way a structure has been designed and built (for example, wooden house on piers or double brick on a concrete slab) will determine what impact subsidence may have on a structure.

Figure 2: Typical cross section of longwall and mine subsidence

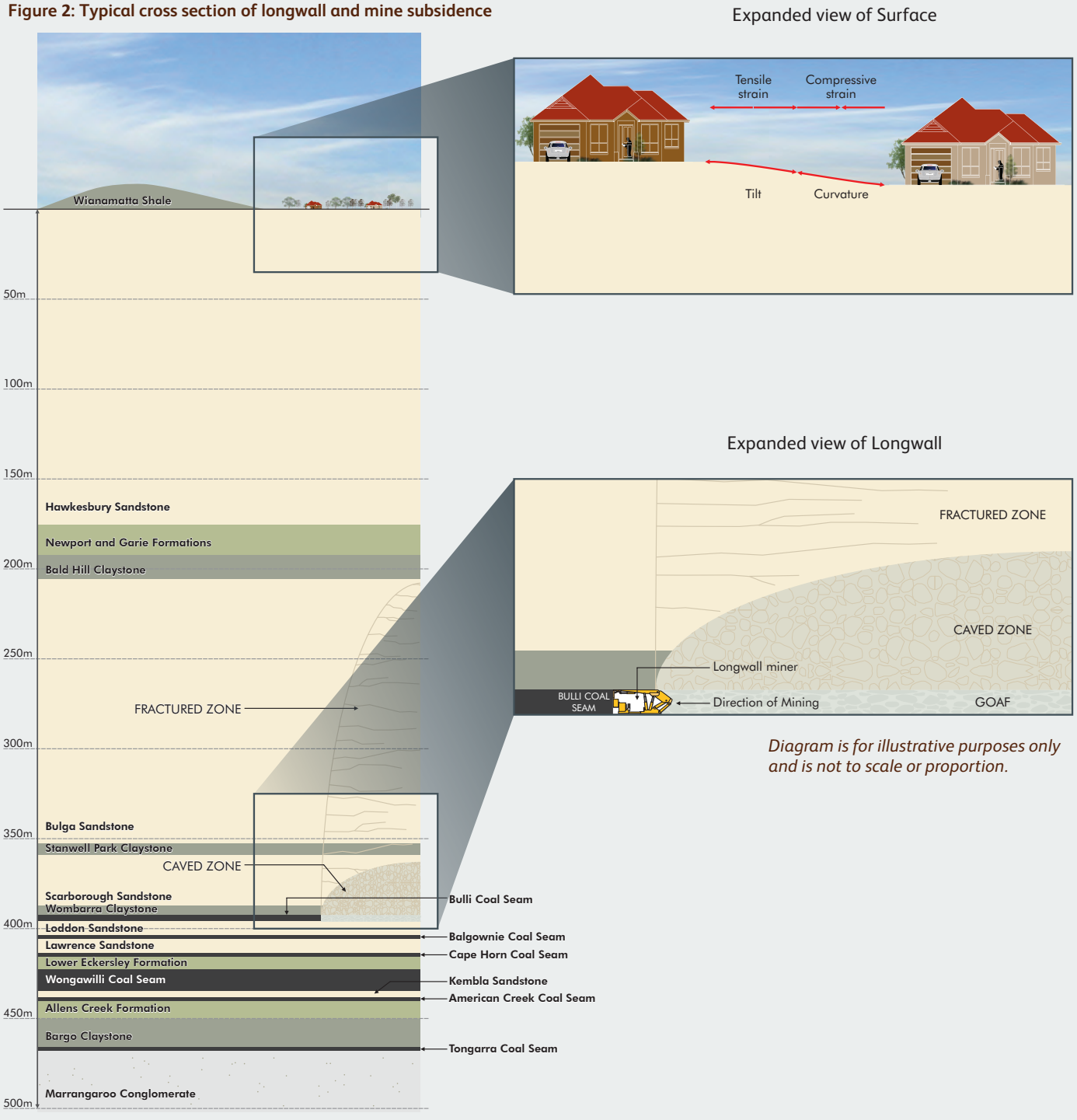

Diagram is for illustrative purposes only and is not to scale or proportion.

Subsidence Monitoring and Management

Tahmoor Coal has previously directly mined beneath or adjacent to more than 1,900 houses and civil structures, commercial and retail properties, the Main Southern Railway and local roads and bridges. Tahmoor Coal has implemented extensive 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. Management strategies for the successful mining beneath structures include:

- Regular consultation with the community before, during and after mining;
- Site-specific investigations for identified properties;
- Implementation of mitigation measures as suggested by specialist engineers;
- Ground surveys along streets; and
- Detailed visual inspections.

Tahmoor Coal has engaged a team of specialists to visually inspect, monitor and survey surface and below surface infrastructure to not only ensure there is no risk to public safety but also monitor change and discuss any concerns residents may have. Our dedicated team includes:

- Mine Subsidence Engineers;
- Structural Engineers;
- Geotechnical Engineers;
- Environmental Specialists;
- Surveyors; and
- Building Inspectors.

Pre-mining inspection

Tahmoor Coal encourages property owners in areas where underground mining is planned in the near future to have a Pre-Mining Inspection (PMI) carried out on their property.

PMIs are free of charge and facilitate a straight forward claims process if a property is impacted by subsidence.

The purpose of a PMI is to determine the condition of a property prior to mining. PMIs are an added protection for property owners to ensure they receive adequate compensation to return their property to its pre-mining condition should it be impacted by subsidence.

The inspector undertaking the PMI will document the condition of the property using photographs and survey levels. Once completed property owners are given a copy of the PMI detailed report. This report can be used as a reference to identify potential damage once mining has occurred.

Property Hazard Inspection

The *Work Health and Safety (Mines) Regulations 2014*, in relation to subsidence, requires Tahmoor Coal to identify and control hazards that may cause harm to people from subsidence. Tahmoor Coal risk management process includes hazard identification via a preliminary risk screening process that involves a visual inspection of each property within the active subsidence area from publicly accessible viewpoints and a more detailed property hazard inspection, where the consent of the property owner is provided.

Tahmoor Coal offers all property owners within the active subsidence area, a free property hazard inspection that will be undertaken by a qualified structural engineer.

How to request a pre-mining inspection and a Property Hazard Inspection

To request a PMI and/or a Property Hazard Inspection simply contact Tahmoor Coal. An inspection time will then be arranged.

Subsidence Damage

The signs of mine subsidence damage to buildings and other structures can range from cracking to walls and jammed doors to more significant structural issues. Generally, buildings damaged by mine subsidence remain safe and serviceable until they are repaired.

The extent of damage will vary depending on the location of the building in proximity to the mine workings and other subsidence related factors.

Duty to Disclose

Impacts to property improvements are covered by the *Coal Mine Subsidence Compensation Act 2017*, however, please consult with your insurance agency and mortgagee to determine if you have an obligation to disclose to them that mining will occur beneath your property.

Under the *Mining Act 1992*, Tahmoor Coal is responsible for providing compensation to property owners for compensable loss with the exception of compensation provided by Subsidence Advisory NSW (SA NSW). This means that Tahmoor Coal has the responsibility for providing compensation for impacts caused by mining within the Tahmoor Mining Leases upon property features that are not man-made. These features can include but are not limited to:

- **Surface of the land;**
- **Crops, trees, grasses and other vegetation;**
- **Stock;**
- **Other business usage; and**
- **Surface drainage.**