

Comms Network Solutions


TAHMOOR COAL – LONGWALLS LW S1A To LW S6A

**MANAGEMENT PLAN FOR POTENTIAL IMPACTS TO
TPG INFRASTRUCTURE**

Prepared for Tahmoor Coal Pty Ltd

Issue 1: 27th August 2022

AUTHORISATION OF TELECOMMUNICATIONS MANAGEMENT PLAN

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1.0 Introduction

1.1 Background

The Tahmoor Coking Coal Mine (Tahmoor Coal) 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). 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. Tahmoor Coal, trading as Tahmoor Coking Coal Operations, is an owned and operated by SIMEC Mining a member of the GFG Alliance (GFG).

Currently the existing mining operation area in the Western Domain is due to cease in 2022 and Tahmoor Coal has made provision to extend the life of the mine by a further 10 years inside an existing leasehold that has been held for the past 30 years. The new mining area will extend south from the current mine operations centre at Tahmoor towards the town of Bargo. The new area to be developed will be known as Tahmoor South Project Area and the initial longwalls in the mining area within Tahmoor South are LW S1A to LW S6A which are located just north of Bargo and centred along Remembrance Drive. The location of the longwalls LW S1A to LW S6A is shown in Plates 1 and 2 below.

As part of the planning for mining of LW S1A to LW S6A, Tahmoor Coal has identified surface assets which may be affected by the mining operation in the Tahmoor South area. Some of these assets belong to TPG and are part of TPG's infrastructure in the area. It appears that there is an optical fibre cable from Bargo telephone exchange north across proposed longwalls through to the Anglican College at the northern side of the new longwalls.

This proposed Management Plan for TPG assets would be the first interaction Tahmoor Coal has had with TPG infrastructure over the past 20 years of mining in the Tahmoor - Picton area. However, TPG have had previous experience with longwall mining over the past 12 years, through interaction with Illawarra Metallurgical Coal where the Area 7 longwalls, LW703 to LW708, undermined the TPG Sydney-Melbourne optical fibre cable.

Tahmoor Coal has developed knowledge of telecommunications infrastructure and the response of these networks to longwall mining from interaction with both Telstra and NBN. This experience was developed from earlier longwall mining operations including LW22-LW32 and the newer Western Division longwalls LW W1 to LW W4. Currently LW W4 is being extracted prior to Tahmoor Coal moving to this new extraction area for LW S1A to LW S6A. For earlier mining operations Tahmoor Coal has presented previous longwall mining application details to both Telstra and NBN and each company has independently determined their own preferred management plan and monitoring regime for their own networks. This management plan is to consider the monitoring actions to be determined by TPG for their network, allowing for some minor overlap and feedback being provided from the concurrent Telstra monitoring exercise, since the TPG cable occupies some sections of the Telstra conduit network.

In the Southern Project Area, as mentioned above there is a TPG Main optical fibre cable present installed along Remembrance Drive which provides network services to major local customers in the Bargo – Tahmoor area. Refer to location details of the proposed Tahmoor South Project area longwalls LW S1A to LW S6A in Plate 1 and the details of the TPG network identified in the Study Area as shown in Plate 2 below.

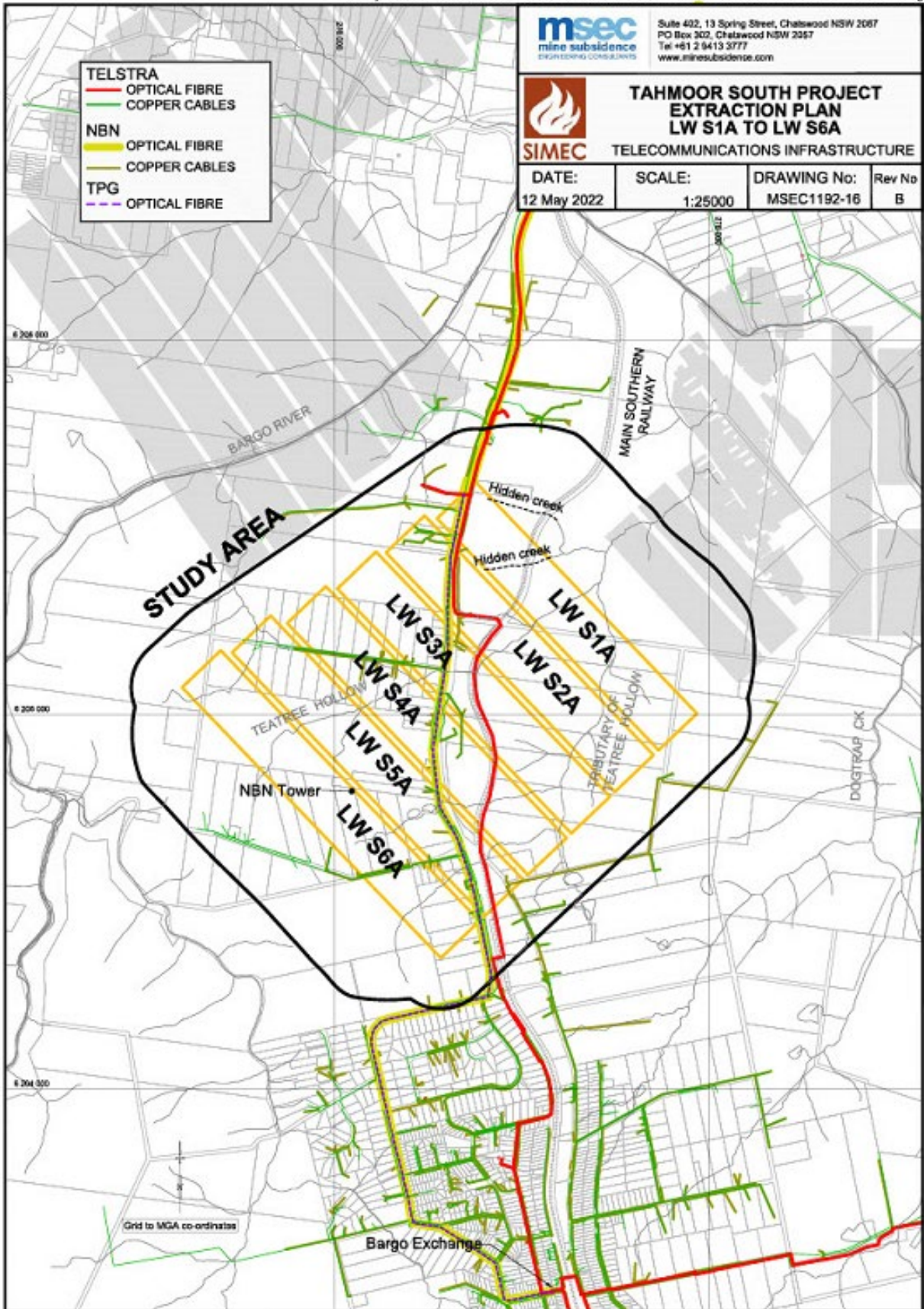


Plate 1: MSEC Drawing 1192-16 Showing Study Area for LW S1A-LW S6A and Telecommunications Services crossing the Study Area. Shows Bargo telephone exchange to the south.



Plate 2:
Tahmoor South Project Area showing route of TPG cable along the western then eastern side of Remembrance Drive and entering the Wollondilly Anglican College at the northern end over the north-east corner of LW S1A

1.2 Purpose & Objectives

This TPG Management Plan (TPG MP) will consider the impact of the ground surface movements, contributed by LW S1A to LW S6A on the assets owned by TPG. Additionally, there is some comment in this management plan regarding potential impacts on the co-located Telstra network. The comments relate to planned monitoring of the Telstra network by Comms Network Solutions Pty Ltd (CNS) who have been involved with previous longwall monitoring where the entire communications network was owned by Telstra. The commitment by CNS to TPG in regard to existing monitoring regimes, as previously adopted and now applied to LW S1A to LW S6A, is to immediately provide any relevant information gained by monitoring the performance of the Telstra network to TPG. This provides the advantage to TPG that CNS field staff engaged by Tahmoor Coal can immediately advise TPG of current ground surface impacts, affecting the co-located Telstra network, which may have implications for the TPG network.

It is recognised that TPG will be responsible for managing potential impacts on their network but this can be augmented by CNS providing current mining status, potential anomalous ground movements and any changes noted within the adjacent Telstra network which may prove to be of assistance to the monitoring regime established for TPG.

The objectives of this TPG MP in relation to TPG plant are to put in place procedures to be followed:

- 1 To ensure the safe and serviceable operation of all surface infrastructure. Public and workplace safety is paramount. Ensure that the health and safety of people who may be present in the vicinity are not put at risk due to mine subsidence;
- 2 To avoid disruption and inconvenience or, if unavoidable, kept to minimal levels;
- 3 To audit and assess the relative risk, for each section of the TPG network exposed to mine subsidence;
- 4 To monitor the impact of mine subsidence and initiate action to mitigate potential damage to the network infrastructure by recording visible changes or changes in transmission characteristics which may affect plant performance;
- 5 To provide a plan of action, should subsidence effects impact on the serviceability or performance of plant;
- 6 To establish a clearly defined decision-making process to ensure timely implementation of risk control measures for high consequence but low likelihood mine subsidence induced hazards that involve potential for serious injury or illness to a person or persons that may require emergency evacuation, entry restriction to an area or suspension of work activities.
- 7 To establish an TPG Response Group (TPG RG) to report, discuss and record impacts on TPG plant and transmission performance (Refer to Section 6.0).

1.3 Scope

Tahmoor Coal commissioned a report by Mine Subsidence Engineering Consultants Pty Ltd (MSEC) in support of the Extraction Plan for LW S1A to LW S6A. Reference No1 –“MSEC Report MSEC1192 Revision A, Subsidence Ground Movement Predictions and Subsidence Impact Assessments for Natural Features & Surface Infrastructure” dated March 2022.

This report identifies a Study Area for LW S1A through to LW S6A that considers mine subsidence impacts bounded by the 20 mm subsidence contour line and 35° Angle of Draw for the longwalls. This Study Area has been identified for LW S1A–LW S6A in MSEC Drawing MSEC1112-18, as shown in Plate 1 and shows the general geographical area proposed for the longwalls.

As mentioned, the new Study Area under consideration is to the north of Bargo and just south of the current Tahmoor Colliery operations area on Remembrance Drive. For consideration in the management plan the following TPG major asset or shared assets are identified:

- a) TPG Main optical fibre cable network north from Bargo telephone exchange north to the Telstra RIM just south of the main entry to Tahmoor Mine. Generally, this cable is installed along the western side of Remembrance Drive up to LW S1A where it crosses Remembrance Drive to the eastern side, (Telstra Main IEN copper and optical fibre cable in same Telstra conduit as TPG main cable);
- b) TPG CAN optical fibre cable from Joint into Wollondilly Anglican College over the north-east corner of LW S1A.

- c) TPG & Telstra Pit and Pipe networks supporting the above TPG cable network through the mining area.

During the extraction of previous longwalls LW22 to LW32 and LW W1 to W3, the mining impacts from mine subsidence on the Telstra optical fibre network, that had occurred have been managed satisfactorily from Telstra's perspective. As mining continues in LW S1A-LW S6A the potential for impacts on the TPG network infrastructure will vary with regard to differing geology and to the different types of telecommunications plant that is exposed to mining as outlined above.

This TPG MP is to be used to assess and protect the performance of the items in the TPG network identified to be most at risk, due to mine subsidence impacts and to ensure that the health and safety of people who may be present on public property or around TPG property, are not put at risk due to mine subsidence. The major items of TPG plant are considered, relative to their location and risk assessed from subsidence impacts from LW S1A to LW S6A

(See Section 4.2 -4.3).

Reference 1, referred to above, in Section 6.10.6 states:-

Tahmoor Coal has developed Subsidence Management Plans in consultation with Telstra for the existing longwalls at Tahmoor Mine to manage potential impacts on telecommunications infrastructure. It is recommended that similar Subsidence Management Plans be developed in consultation with Telstra and NBN, Limited to manage potential impacts on the telecommunications infrastructure within the Subsidence Study Area.

With an appropriate management plan in place, it is considered that potential impacts on the telecommunications infrastructure can be managed during the extraction of the proposed longwalls, even if al subsidence movements are greater than the predictions or substantial non-conventional movements occur.

The above discussion must also include TPG telecommunications assets as TPG have a significant presence in the proposed mining area for LW S1A to LW S6A. Therefore, this management plan for the TPG network will take into consideration the subsidence predictions for longwall LW S1A-LW S6A as well as utilising the experience gained from the management of the Telstra & NBN infrastructure from previous subsidence events due to LW22 to LW32 and LW W1-W3 at Tahmoor Mine.

1.4 Timeframe

Mining is anticipated to commence in October 2022 commencing with LW S1A. Each longwall is around 1800m in length is anticipated to take around 12 months for full extraction leading to completion of LW S6A in late 2026. Therefore, this management plan covering the longwall mining under Telstra plant at Bargo north will continue in operation until completion of mining of LW S6A and for sufficient period of time thereafter to allow for completion of subsidence effects from all longwalls.

1.5 Limitations

The mechanism of mine subsidence and its impact on the Telstra network has now been considered over a large number of longwall mining events in different geographic locations with different types of telecommunications networks present as identified above. The impacts range from undermining of direct buried major interstate optical fibre cables to undermining two pair copper cables servicing one customer. It is known that longwall mining can impact on the transmission characteristics of optical fibre cables, older more brittle lead sheathed cables and aerial cables. In this case the TPG Main and CAN optical fibre cables are located above LW S1A-LW S5A. This cable carries major TPG internet services, data, mobile and telephone traffic between Bargo exchange and TPG customers and forms a major link to maintain all services in the Bargo north area.

Once the mine subsidence is initiated there is no method of halting the subsidence event and hence, if the degree of ground movement begins to damage communications plant, then the impact is generally irreversible and repair work is required. This has been done in the past where, through continuous monitoring of optical fibre cables, vulnerable plant has been identified to be at risk during the event and action has been taken to minimise the risk of any continuing damage to the network. A management plan for TPG assets will not necessarily prevent damage but will limit its impact and put in place actions to be taken, should evidence of significant ground movement indicate the potential for damage to occur

1.6 Definitions.

CAN - Customer Access Network, the cable distribution network which provides communications services direct to customers premises.

Main Cable – Main copper or optical fibre cable providing pairs of copper conductors or fibres between the exchange and the distribution point or cross connect point generally a pillar location. This cable network for the copper network is being superseded as NBN roll out FTTN.

OTDR :- Optical Time Domain Reflectometer, used to determine loss characteristics for transmission systems on optical fibre cables. Generally used for testing transmission quality of individual optical fibres with testing at 1625nm, at higher frequency than transmission systems, to provide early warning of possible transmission loss on the system.

TPG Response Group: (TPG RG) Forum proposed to be convened as necessary (teleconference preferred) to facilitate the implementation and discussions around the operation of this TPG MP. Participants to be from TPG, Tahmoor Coal, MSEC, Communications consultants as required and other Tahmoor Coal technical consultants as necessary. The TPG RG and Tahmoor Coal will arrange discussions and meetings as required and where necessary to also involve Subsidence Advisory NSW and the NSW Resources Regulator to assist in resolution of any issues raised/.

2.0 Consultation

2.1 Consultation with TPG

Colin Dove from CNS has requested details of the TPG Network which have been provided and shown generally in Plate 2, for Tahmoor Coal and for TPG to consider the implications of subsidence ground movement on the TPG Network.

It is planned to provide this management plan to TPG Technology Group where the Network Operations and Service Delivery Sections of TPG can then determine their planned methods to monitor the major parts of the existing TPG network throughout the Study Area.

The principal items of TPG network exposed to ground subsidence impacts area:-

- The 144/48f SMOF within the longwall Study Area. The two cables are tagged as:-
 - i) FNW.OF.144.1NL14807-5.NB57418 crossing longwalls LW S5A to LW S1A along Remembrance Drive
 - ii) PNN.OF024.1.NL14808-5.NB57418, crosses the north-east corner of LW S1A to enter Wollondily Anglican College
- TPG & Telstra Manhole Pit & Conduit network supporting the optical fibre cables

Tahmoor Coal will consult with TPG in relation to mine subsidence effects from mining as required and contact can also be supplemented through CNS who are in the field, monitoring the Telstra network.

Tahmoor Coal and/or CNS will consult with TPG during the extraction of LW S1A through to LW S6A in relation to progress of longwalls, presentation of survey data and potential mine subsidence impacts that may appear to be developing as longwall extraction continues.

3.0 Subsidence Predictions

3.1 Subsidence Predictions (Reference No 1)

This TPG MP will take into consideration the incremental subsidence predictions for LW S1A through LW S6A, as well as drawing on the experience gained from the management of the Telstra infrastructure from previous subsidence events due to LW22 to LW32 and LW W1 to LW W3 more recently at Tahmoor Mine. It is recognised from past experience gained at Tahmoor Mine in monitoring the Telstra network that optical fibre cable is more vulnerable to ground movement predominantly due to the nature of the cable in that it is only able to sustain relatively low ground compressive and tensile strains before the external sheath transfers the strain to the individual fibres within the cable. When this occurs, the individual fibres have limited capacity to tolerate tensile or compressive strains before they cause interruption to or failure of transmission systems. The other concern with optical fibre cables is that these cables have much larger capacity to carry telephone, data and internet services such that any minor interruption to traffic, can cause serious impacts on the overall telecommunications network.

Therefore, the two cables and network to be considered as identified above are:

- a) The 144/48f SMOF within the longwall Study Area. The two cables are tagged as:-
 - i) FNW.OF.144.1NL14807-5.NB57418 crossing longwalls LW S5A to LW S1A along Remembrance Drive
 - ii) PNN.OF024.1.NL14808-5.NB57418, crosses the north-east corner of LW S1A to enter Wollondilly Anglican College
- b) TPG & Telstra Manhole Pit & Conduit network supporting the optical fibre cables
Note this network is considered in the Telstra management plan for LW S1A to LW S6A.

The total subsidence predictions for these two cable locations is as shown below in Table 1 extracted from data in Table 6.18 and Fig. E.08 provided in the MSEC Report 1192 Revision A, March 2022, Reference No 1

**Table 1
Maximum Predicted Total Conventional Subsidence, Tilt & Curvature after the Extraction of each of the Proposed Longwalls as Potentially Impacting TPG Network**

Location of Network	Subsidence mm	Tilt mm/m	Curvature (1/km)	Transverse Strain (Applying a factor of 15 to curvature)
Main optical fibre cable installed along Remembrance Drive Across LW S1A to LW S5A	325 to 1300 (S1A to S5A)	2.5 to 7.0	+0.06to +0.14 -0.06 to -0.20	0.09 to 2.1mm/m tension 0.09 to 3.0mm/m comp
CAN optical fibre cable crossing north-east corner of LW S1A	300	2-4mm/m	+0.02	0.3mm/m tension
TPG & Telstra Manhole Conduit and Pit Network – Considered in Telstra Management Plan (As above for Remembrance Drive)	325 to 1350 (S1A to S5A)	2.5 to 8.5	+0.06to +0.14 -0.06 to -0.20	0.09 to 2.1mm/m tension 0.09 to 3.0mm/m comp

It is proposed that this TPG MP will initiate a broad agreement between TPG and Tahmoor Coal to assist in effectively managing and addressing the monitoring issues, related to the degree of risk, assessed during mining, for the various elements of the TPG network exposed to mine subsidence from LW S1A through to LW S6A extraction.

4.0 Risk Assessment

4.1 NSW 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 *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’).

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.

As outlined in the Guide by the NSW Department of Trade and 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 it is 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 and Environment, Resources Regulator, Mine Safety Operations (MSO, 2017).

The risk management process has been carried out in accordance with guidelines published by the NSW Department of Planning and Environment, Resources Regulator, Mine Safety Operations (MSO, 2017). The following main steps of subsidence risk management have been and will be undertaken, in accordance with the guidelines:

- d) Identification and understanding of subsidence hazards;
- e) Assessment of risks of subsidence;
- f) Development and selection of risk control measures;
- g) Implementation and maintenance of risk control measures, and
- h) Continual improvement and change management.
- i) Each of the above steps have been or will be conducted together with the following processes.
- j) Consultation, co-operation and co-ordination; and
- k) Monitoring and review.

This management plan documents the risk control measures that are planned to manage risks to health and safety associated with the mining of LW S1A to LW S6A in accordance with the WHS laws.

4.2 Risk Assessment Methodology

The following are the assessed relative risks associated with existing TPG plant within the Study Area as shown in Plates 1 and 2. The items of plant have been assessed according to the probability of damage and the consequences resulting from that damage, associated with that general category of plant. The Risk Factors (from Low to High) are shown in the attached Table 2. A summary of all risks as identified below is included in Table 3.

Table 2 Relative Risk Factor for TPG Plant

Risk Assessment Matrix		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	Significant	Significant	High	High	High
	Likely	Moderate	Significant	Significant	High	High
	Moderate	Low	Moderate	Significant	High	High
	Unlikely	Low	Low	Moderate	Significant	High
	Rare	Low	Low	Moderate	Significant	Significant

4.3 Risk Assessments for TPG Infrastructure

a) The 144/48f SMOF CAN cable into Wollondilly Anglican College

i) TPG 144f SMOF CAB Cable -FNW.OF.144.1NL14807-5.NB57418 crossing longwalls LW S5A to LW S1A along Remembrance Drive

The cable is installed generally in Telstra conduit along the western side of Remembrance Drive north from LW S5A through to LW S1A. Over LW S1A the cable crosses to the eastern side of Remembrance Drive to continue to the north.



Plate 3:

Telstra pit on north-east corner of LW S1A showing route of i) TPG CAN OF cable south along eastern side of Remembrance Drive in Telstra conduit and the ii) CAN OF cable crossing Remembrance Drive into the Anglican College

The TPG optical fibre cable is of a more recent design. is reasonably robust and able to sustain hauling tensions of around 2.0kN. Additionally for the entire route across the longwalls the cable is installed in 100mm diameter Telstra conduit. The presence of the cable in the conduit isolates the cable from the ground movement impacts predicted to be 2.1mm/m tension and 3.0mm/m compression along Remembrance Drive.

There is no Telstra optical fibre cable co-located continuously with the TPG cable in the Telstra conduit across longwalls LW S5A to LW S3A. However, in the initial stages of mining of LW S1A and LW S2A over a distance of around 800m there is a direct buried Telstra optical fibre cable F BRGO 101 installed parallel with the conduit route, which will be subject to regular 1625nm OTDR monitoring from Bargo exchange across these two longwalls. Therefore, in the initial say 18 months of mining there will be very close OTDR monitoring data on the older direct buried cable alongside the TPG optical fibre cable, installed in protective conduit. Any transmission loss detected on F BRGO 101 will be immediately advised to TPG for any action that may be required.

Additionally, withing the conduit section of the TPG cable installation over all five longwalls, there will be survey data recorded along Remembrance Drive to provide early indication of any anomalous ground movement that may occur. This survey will be combined with physical inspections by Telstra of their conduit route and their more vulnerable lead sheathed cables during critical subsidence events from each of the six longwalls.

Hence the risk factor for this cable is assessed to be a rare event but with major consequence due to transmission traffic it supports an overall **Significant** risk.

ii) TPG 48f SMOF Cable - PNN.OF024.1.NL14808-5.NB57418, crosses the north-east corner of LW S1A to enter Wollondilly Anglican College

This cable is of similar design to item i) above at around 6 years old and is a reasonably robust haul cable designed for a maximum hauling tension of 2.0kN. In this particular case the exposure to ground subsidence impacts is very limited as it is installed at the very north-east corner of LW S1A. The exposure length at the corner is only around 80m as shown below



Plate 4:
TPG CAN optical fibre cable from northern break-out joint along eastern side of Remembrance Drive and just crossing into the north-east corner of LW S1A before crossing Remembrance Drive to enter the Anglican College. The exposure length is approx. 80m.

Since this cable is located at the starting end of LW S1A and has a very short exposure length and in this location, there will be very minor impacts, hence the risk factor is assessed to be a rare event but with moderate consequence an overall **Moderate** risk.

b) Manhole, Conduit & Pit Network.

As noted above the management of this network is considered in the Telstra management plan for LW S1A to LW S6A.

It is considered that the conduit, manhole & pit network is a critical factor in the performance of the cable network during mine subsidence. Although the possibility of differential movement between the components of this network, due to mine subsidence is low, due to the large geographical extent of the network, its lack of homogeneity and its differing age, it is considered to be an important factor in the overall performance of the entire cable network. The conduit, manhole & pits provide the primary isolation of the cable network from ground movement and strain. In addition, because of the variation in the components and geographic distribution of this network it is also the most difficult item of plant to assess for potential risk of damage.

Within the Study Area for the TPG network these components of the network are located through the entire Study Area along primarily the western side of Remembrance Drive up to LW S1A and then crossing to the eastern alignment. Consequently, the conduit network is subject to all predicted levels of ground movement. As identified in Table 1. The main concern in this network is the performance of the older larger asbestos and cellulose fibre pits, however these are only present outside of the direct mining areas along Remembrance Drive as all larger pits in the Study Area are HDPE pits. All of this conduit network utilises PVC conduit of 100 mm dia. which is considered to be at a low level of risk of damage from ground movement or strain. The risk assessment for the manhole, conduit & pit network along Remembrance Drive is considered to be associated with an unlikely likelihood, minor consequence, and an overall **Low** risk.

4.4 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.

This section of the management plan summarises hazards that have been identified in the mining operation which could raise risks to health and safety of people in the vicinity of TPG and Telstra infrastructure.

Mine subsidence hazards have been identified, investigated and analysed in a systematic manner by examining each aspect of the infrastructure, as described in Section 4.3.1 to 4.3.5 above of this management plan. Each of the infrastructure groups discussed above could potentially experience mine subsidence movements that give rise to risks to the health and safety of people.

The following mine subsidence hazards were identified that could give rise to risks to health and safety due to the extraction of LW S1A to LW S6A:

- a) Temporary loss of telecommunication Main OF cable services north from Bargo exchange and CAN services to Wollondily Anglican College;
- b) Tensile or compressive ground strain acting on manhole, pit and conduit network which may impact TPG cables

The identification and risk assessment process took into account the location of infrastructure relative to LW S1A to LW S6A and the associated timing and duration of the subsidence event, as described in this management plan. Whilst mine subsidence predictions and extensive past experiences from previous mining at Tahmoor Coal were taken into account, the identification and risk assessment process recognised that there are uncertainties in relation to predicting subsidence movements, and uncertainties in how mine subsidence movements may adversely impact TPG infrastructure.

Tahmoor Coal has considered 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 TPG and Telstra infrastructure in general. These details are described in Section 5 of this management plan.

In addition to the risk assessment process outlined in this TPG MP, a Risk Assessment was completed by Tahmoor Coal for LW S1A to LW S6A which included the identification of potential risks to TPG infrastructure (refer to Appendix B).

5.0 Control Procedure

5.1 Overview of Control Procedures

Tahmoor Coal has developed and selected risk control measures in consultation, co-ordination and co-operation with the infrastructure owner in accordance with WHS legislation. In accordance with Clauses 35 and 36 in Part 3.1 of the *Work Health and Safety Regulation 2017* and the guidelines (MSO, 2017), a hierarchy of control measures has been considered and selected where reasonably practicable, using the following process:

1. Eliminate risks to health and safety so far as is reasonably practicable;
2. If it is not reasonably practicable to eliminate risks to health and safety – minimise those risks so far as is reasonably practicable, by doing one or more of the following:
 - a. Substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
 - b. Isolating the hazard from any person exposed to it;
 - c. Implementing engineering controls;
3. If a risk then remains, minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls; and
4. If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment.
5. A combination of the controls set out in this clause may be used to minimise risks, so far as is reasonably practicable, if a single control is not sufficient for the purpose.

There are primarily two different methods to control the risks of subsidence, namely:

- Method A – Selection of risk control measures to be implemented prior to the development of subsidence, (Items 1 and 2 above), and
- Method B – Selection of risk control measures to be implemented during the development of subsidence (Items 3 and 4 above).

Tahmoor Coal considered Method A and Method B risk control measures in relation to managing potential impacts on TPG infrastructure due to the extraction of LW S1A through to LW S6A.

The following considerations have been made by Tahmoor Coal with regards to impact to telecommunication infrastructure:

- Elimination - In this instance, no reasonably practicable controls could be identified that would eliminate the identified risks;
- Substitution - In this instance, no reasonably practicable controls could be identified that will change the environment so the hazards could be substituted for hazards with a lesser risk;
- Isolation - In this instance, no reasonably practicable controls could be identified to isolate a hazard from any person exposed to it;
- Engineering Controls - In this instance, no reasonably practicable controls could be identified to put in place a structure or item that prevents or minimises risks; and
- Administrative Controls - Tahmoor Coal and TPG have developed and implemented Administrative Controls that will put in place procedures to minimise the potential of impacts on the health and safety of people associated with damage to TPG infrastructure.

Tahmoor Coal and TPG have developed a management strategy of detecting early the development of potential adverse subsidence movements in the ground, so that contingency response measures can be implemented before impacts on the safety and serviceability develop. See Table 3 of this TPG MP.

The risk control measures described in this TPG MP have been developed to ensure that the health and safety of people on TPG infrastructure are not put at risk due to mine subsidence. It is also an objective to avoid disruption to services, or if unavoidable, keep disruption and inconvenience to minimal levels.

With respect to the extraction of LW S1A through to LW S6A, no potential hazards have been identified that could reasonably give rise to the need for an emergency response. Of the potential hazards identified, only a complete loss of mobile and fixed line services could possibly give rise to the need for an emergency response. The likelihood is considered remote and would require substantial differential subsidence movements at multiple

locations to develop before such an event occurs.

Mine subsidence movements will develop gradually and there will be ample time to identify the development of potentially adverse differential subsidence movements early, consider whether any additional management measures are required and repair or adjust affected surface features, in close consultation with TPG.

Tahmoor Coal and TPG will review and assess monitoring reports and consider whether any additional management measures are required on a weekly basis. If potentially adverse differential subsidence movements are detected, it is anticipated that a focused inspection will be undertaken in the affected area, and a decision will likely be made to increase the frequency of surveys and/or inspections. Additional management measures may also be implemented. It is therefore expected that, if a potential adverse situation escalates, Tahmoor Coal will be present on site on a more frequent basis to survey or inspect the affected site, and that TPG will be consulted on a more frequent basis.

Notwithstanding the above, if a hazard has been identified that involves potential serious injury or illness to a person or persons on public property or in the vicinity of TPG infrastructure, and cannot be controlled, the immediate response is to remove people from the hazard. If such a situation is observed or is forecast to occur by either Tahmoor Coal or by people on public property, Tahmoor Coal will immediately meet and implement emergency procedures through the TPG Response Group (TPG RG).

5.2 Control for each Infrastructure Groups

There is now information available on the general performance of Telstra telecommunications plant due to ground subsidence caused by longwall mining operations in the past. The current information available is from experience gained at Appin, Tahmoor, Helensburgh, West Wallsend, Camberwell and Broke in NSW. The longwall mining operation at Tahmoor provides a continuing opportunity to gather information on the performance of the network, needed to understand the interaction between ground movement and the Telstra and TPG networks, comprising both robust and also relatively sensitive elements of the network. This information is provided in this TPG MP for the benefit of TPG through the experience gained by CNS in over 22 years of 'in the field' monitoring of Telstra's extensive telecommunications network throughout the large geographic areas identified above.

The general control procedure considered in this TPG MP is to look at each item of plant described in Section 4.2 to 4.3 and determine the practical level of monitoring that can be performed according to the assessed risk factor applied. The monitoring described for the plant identified should be completed during the ground subsidence events occurring at the particular location as the longwall progresses. In addition, Table 3 is a summary of recommendations for monitoring procedures and basic actions to be taken during mining, should the potential for damage be indicated by surface impacts, cable testing or from survey data.

The proposed monitoring methods for each cable are similar and also for the conduit network, they have been discussed further below and summarized in Table 3 to identify easily the proposed management actions for the network during ground subsidence.

5.3 TPG Infrastructure

a) TPG Optical Fibre Cable

i) TPG 144f Main SMOF Cable -FNW.OF.144.1NL14807-5.NB57418 crossing longwalls LW S5A to LW S1A along Remembrance Drive (Risk Factor, **Significant**).

The TPG 144f SMOF Main cable is installed in conduit alongside Telstra Main cables north from Bargo exchange. At the northern end of the Study Area this cable is installed in conduit parallel to the direct buried Telstra cable F BRGO 101 for around 800m across LW S1A to LWS2A. The two cables for the majority of this section of the route are installed within five metres of each other. The TPG cable is a more recent design suitable for cable hauling and is a much more robust hard jacketed cable at more than twice the diameter of the standard construction Telstra cable.



Plate 5:- View south to north end of LW S1A showing TPG OF cable in Telstra conduit and direct buried Telstra IEN cable installed parallel and around 3m-5mm to the west.

Physical inspection of the cable lines during mining will be maintained in this northern area as well as OTDR monitoring from Bargo exchange on the Telstra direct buried cable to provide early warning of any anomalous ground movement around the cable and conduit line.

TPG Network Operations Centre may consider utilising remote OTDR monitoring on this cable to supplement the OTDR detail to be provided from cable testing on the Telstra cable. Due to the importance of these two OF cables an additional monitoring regime will be maintained on these cables consisting of:

- Analysis of survey data by Tahmoor Coal surveyors along the full length of Remembrance Drive; and
- Close in 1625nm OTDR testing on spare fibres in the Telstra cable F BRGO 101 from Bargo exchange, to closely monitor any minor loss that may develop on the more vulnerable Telstra cable. Any minor loss detected at 0.1dB trigger level will be immediately advised to TPG so that a close in test can be arranged on their cable.

This OTDR fibre testing on the Telstra cable across the longwalls will be carried out by CNS from Bargo exchange 'looking' north through the mining area for LW S5A to LW S1A. This specialized individual fibre testing can confirm that there are no or very low levels of transmission loss present on the cable. The trigger levels and actions for the cable monitoring which will be at 1625nm on individual fibres will be set as follows:

- Loss of 0.1dB - The point loss or area of loss should be recorded and an investigation carried out of the direct buried cable line at that location to determine if any ground movement is evident, i.e., ground compression tension over the cable line and analysis of any relevant survey data;

- Loss of 0.5dB -The loss event identified should continue to be continuously monitored and should the loss progress to (+/-) 0.5 dB then the cable should be exposed at the recorded location to attempt to relieve pressure or tension/compression on the cable due to ground strain; and if,
- Loss of 1dB - In the event of the loss on the cable continuing, excepting that cable exposure has not relieved or reduced the transmission loss and that loss continues and exceeds 1.0 dB an interruption cable should be laid and pits installed in preparation for cable cutover of the cable as considered necessary.

With the possibility of interruption cable being installed and cutover discussions with Tahmoor Coal and Subsidence Advisory NSW would be initiated through the TPG RG for responsibility for the permanent reinstatement of the cable to be determined, - Like for Like replacement.

ii) TPG 48f CAN SMOF Cable - PNN.OF024.1.NL14808-5.NB57418, crosses the north-east corner of LW S1A to enter Wollondily Anglican College
(Risk Factor, **Moderate**).

As this cable is exposed to minor ground movement for a very short period of around one month at the commencing end of LW S1A the simplest and most effective monitoring of this section of cable is to maintain weekly physical inspection along the 80m of conduit route.

This should be supplemented by survey data from Tahmoor Coal surveyors for the initial 200m of longwall progress to ensure there is no anomalous ground movement occurring at the initial stage of mining. The inspection and survey data in the initial stages of LW S2A should also be considered for the cable to ensure there is no localized ground movement from the adjacent longwall.

d) Manhole, Conduit & Pit Network

(Risk Factor **Low**).

The cable distribution within the conduit network is obviously subject to a degree of risk of damage in the areas of maximum subsidence which is principally along Remembrance Drive for the TPG cable. The aim of the monitoring is to combine physical inspections of the conduit route with road survey data at the critical impact times for each longwall. For example monitor;-

- The first 200m of LW S1A along Remembrance Drive
- Chainage 200 to 600m of LW S2A along Remembrance Drive
- Chainage 500 to 1000m of LW S3A along Remembrance Drive
- Chainage 900 to 1500 of LW S4A along Remembrance Drive
- Chainage 1100 to end of Panel of LW S5A along Remembrance Drive

The network present generally consists of more recently installed plastic jointing pits and relatively newer uPVC conduit installation. Additionally, advice from Tahmoor Coal should be provided on any infrastructure, road or building damage which is observed or reported to the mine as a result of independent inspections completed by other mine engineering consultants

5.4 Surface Subsidence Survey

The additional control procedure for the TPG & Telstra plant identified above will be supplemented by ground surveys carried out by Tahmoor Coal at agreed time intervals along agreed base lines of Remembrance Drive, as shown in Appendix A -Sheet 2.

The survey data will record the initial RL of the surface prior to mining commencing and then:-

- Incremental subsidence over the agreed period;
- Incremental ground strain over the agreed period; and
- Incremental ground tilt over the agreed period.

The frequency of the survey and the reporting of the results, to the TPG RG are to be agreed by the members of the Group as the longwalls commence and advance into the different areas. The TPG RG should consult and agree on the limits of the survey lines and set the frequency of the survey work.

Refer to the following table – Table 3, which presents a Summary of the TPG, Risk Factors, Monitoring and Actions required for items of plant, which may be impacted by mine subsidence.

Table 3 - Summary of Monitoring Procedures and Actions for TPG Infrastructure

Item of Plant	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
a) i) TPG 144f Main SMOF Cable	Significant	Base line OTDR Testing. Remembrance Drive survey detail available to TPG	OTDR Monitoring of adjacent direct buried Telstra Cable F BRGO 101 from Bargo Exchange. Loss details to TPG If Required by TPG, Remote OTDR Testing by TPG Network Operations on cable over LW S1A to LW S5A	Test Telstra cable @ critical times for each LW Continuous OTDR testing as necessary by TPG Road survey data weekly	Minor transmission loss on FBRGO 101 <0.1db advise TPG Anomalous ground m'vmnt from survey data or reports of damage	TPG Service Delivery to investigate and advise Tahmoor Coal of any proposed remote OTDR monitoring. Localised OTDR testing of Telstra F BRGO 101 alongside TPG cable. Any loss detected by CNS immediately referred to TPG for consideration and action TPG RG maintain check on survey data
a) ii) TPG 48f CAN SMOF Cable	Moderate	Physical Inspection Road survey data	Physical Inspection along cable Route Agreed survey line along Remembrance Drive	Fortnightly / weekly during critical subsidence events at Start of Panels LW S1A and LW S2A.	Ground strain exceeding 1mm/m	Tahmoor Coal to report trigger levels to TPG RG for decision on action to be taken as considered necessary by TPG representatives to protect their cable.
d) Conduit, Manhole & Pit Network	Low	Telstra to inspect conduit m/hole & pits concurrent with Telstra cable inspections Road Survey data at critical times for Remembrance Drive	Monitor conduit, manholes& pits along Remembrance Drive during subsidence period when respective longwalls, are active at particular times along Remembrance Drive.	Prior to mining then as determined by each longwall's progress and as required by TPG RG.	Visual check of active section being monitored. If survey details show anomalous movement check cables in conduit network.	Should surface damage occur or reports of damage, check survey data and check conduit pit and manhole network in particular area. Tahmoor Coal to advise Telstra & TPG RG of any damage evident and maintenance or repair work considered necessary on other infrastructure in the area.

Item of Plant	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
<u>Survey Line</u>	Not Applicable	Permanent marks at approx. 20m intervals along roads & cable lines where network is installed. Permanent Survey Marks installed @ Tahmoor Anglican College	Tahmoor Coal to carry out detail survey, (subsidence, strain and tilt recorded) along Remembrance Drive. Tahmoor Coal to provide survey results to TPG RG and TPG representatives concurrent with mine progress.	To be determined by TPG RG dependent on degree of subsidence occurring and potential hazard to TPG network. Nominal weekly surveys through active subsidence areas	Surveyed ground strain compression or tension above 1mm/m. Ground tilt above 4mm/m	Tahmoor Coal to make survey results available to TPG or their representative & TPG RG following each regular survey of active mining area.

6.0 Implementation

6.1 TPG Response Group (TPG RG) – Roles and Responsibility

Technical resources required to carry out the monitoring as identified In Table 3 are to be provided by Tahmoor Coal or their consultants as required. Tahmoor Coal will provide the survey resources required for the line surveys established on Remembrance Drive around and over LW S1A to LW S6A to determine incremental and total subsidence, strain and tilt during mine subsidence from the longwalls. The survey frequency and reporting is to be reviewed as required by the TPG Response Group (TPG RG).

Prior to commencing any proposed rectification work the TPG representatives will detail the extent of the work and the associated costs to the TPG RG. At that meeting agreement will be reached between Tahmoor Coal, TPG and Subsidence Advisory NSW as to the responsibility for the costs of the proposed work. For emergency work involving work to immediately secure the TPG network, where loss of service to customers or line systems outage is involved, the work will be carried out by TPG as necessary and the discussions regarding costs associated with the emergency repair work resolved at a special meeting of the TPG RG.

The following procedures will be implemented during and after active subsidence of the TPG infrastructure to ensure the continued effective consultation, co-operation and co-ordination of action with respect to subsidence between Tahmoor Coal and TPG and Subsidence Advisory NSW.

The monitoring of the TPG network in accordance with this management plan is to be carried out by Tahmoor Coal, TPG or their representatives and if required CNS for ‘in field’ monitoring. The TPG RG is to be the forum for discussion and resolution of issues raised in the operation of the management plan and discussions on impacts on the telecommunication network. Meetings through teleconferencing preferred, to be arranged as necessary and the TPG RG need only be convened in the event of trigger levels being reached as set out in Table 3, unpredicted ground movement detected by survey or cable faults or damage being recorded within the TPG or Telstra network. Any anomalous ground movement resulting from subsidence over LW S1A to LW S6A and any risk perceived by Tahmoor Coal to the network, due to mining is to be used as a trigger for a meeting of the TPG RG.

The representatives proposed to be involved in the TPG Response Group are (contact details are provided in Section 8):

- **Zina Ainsworth** – Environment and Community Manager, Tahmoor Coal.
- **April Hudson** – Approvals Specialist, Tahmoor Coal.
- **Amanda Bateman** – Environment & Community Officer, Tahmoor Coal
- **Daryl Kay** – Mine Subsidence Engineering Consultants Pty Ltd.
- **Colin Dove** – Consultant Telecommunications Engineer.
- **Matthew Montgomery** – Infrastructure Manager Subsidence Advisory NSW.

The TPG stakeholders are:

- **Neil McLeod** – TPG NSW Project Manager.
- **Philip Price** – TPG External Plant Manager

When required the TPG RG is to appoint a minutes secretary responsible for maintaining all documentation presented to the meeting and responsible for circulating minutes and advising participants of future meetings.

The purpose of the TPG Response Group is to:

- a) Assess monitoring data, including the early detection of potential impacts on health and safety and impacts to TPG infrastructure;
- b) Verify the risk assessments previously conducted;
- c) Ensure the effectiveness and reliability of risk control measures; and
- d) Support the continual improvement and change management.

At any necessary meeting of the TPG RG, TPG are to report incidents recorded in relation to the performance of their network plant and a detailed log is to be maintained of each incident reported to the TPG RG. Full details are to be reported of significant events observed or events which have an impact on the communications networks or the provision of telecommunication services in the area. Tahmoor Coal are to report on the degree of subsidence that has occurred at that time and how closely subsidence is following the predictions made in References No 1.

It is the responsibility of TPG RG to determine if the events recorded are due to the impact of mine subsidence and then determine the degree of responsibility each party has for those events. Should significant risk be identified then either party may call an emergency TPG RG meeting, with one day's notice, to discuss proposed action and to keep other parties informed of developments in the monitoring or maintenance of the TPG and/or Telstra network.

6.2 Communication Plan

The communications plan outlines the feedback to be provided between Tahmoor Coal and TPG during the operation of this management plan:

Tahmoor Coal will provide to TPG details of:

- Summary of ground surveys along monitoring lines as identified in Appendix A
- Exception reporting of impacts observed from visual inspections of telecommunications plant which has relevance to TPG, i.e. inspection of Telstra conduit and pit network carrying TPG cables
- CNS- OTDR reports of any transmission loss identified on adjacent Telstra cables
- Monitoring reports of what has been monitored (as above)
- Direct notification to TPG if any potential adverse changes on surrounding infrastructure is observed such as roads, drainage structures, buildings or on other underground or above ground services

TPG will communicate to Tahmoor Coal:

- Any impact identified on TPG assets during mining.
- Planned new TPG infrastructure to be constructed within the Study Area.

6.3 Audit and Review

This management plan as agreed between parties and 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.

The review process will be conducted to achieve the following outcomes:

- Gain an improved understanding of subsidence hazards based on ongoing subsidence monitoring and reviews, additional investigations and assessments as necessary, ongoing verification of risk assessments previously conducted, ongoing verification of assumptions used during the subsidence hazard identification and risk assessment process, ongoing understanding of subsidence movements and identified geological structures at the mine;
- Revise risk control measures in response to an improved understanding of subsidence hazards;
- Gain feedback from stakeholders in relation to managing risks, including regular input from business or property owners;

- Ensure on-going detection of early warnings of changes from the results of risk assessments to facilitate corrective or proactive management actions or the commencement of emergency procedures in a timely manner; and
- Ensure timely implementation of a contingency plan in the event that the implemented risk control measures are not effective.

Some examples where review may be applied include:

- Poor performance of the TPG plant in regard to mine subsidence, such as interruption or loss of services;
- Any trigger levels being reached or exceeded;
- Favourable performance of the TPG plant in regard to mine subsidence, no observed or recorded impacts;
- Significant variations between actual and predicted subsidence occurring including variations in ground strain observed from survey data; and
- Evidence of significant geological faults or evidence suggesting major “Far field effects” may develop.

Should an audit of the TPG Management Plan be required during that period then a representative is to be appointed by TPG, Tahmoor Coal and Subsidence Advisory NSW to review the operation of the plan and report amendments to the next scheduled meeting of the TPG RG.

6.4 Record Keeping

Should it be necessary to initiate a meeting of the TPG RG, a minutes secretary shall be appointed to keep minutes from the meetings called and advise participants of any future or emergency meetings to be held. The minutes are to include details as reported on the condition of the individual items of TPG plant, the assessment of the degree of ground subsidence that has occurred, any agreements reached and a log of any incidents/damage reported to the meeting involving the telecommunications network. It is anticipated that the TPG RG will remain active as required until late 2026.

7.0 Associated Documents and References

7.1) Appendices

Appendix A (Drawings Extracted from Reference No 1)

Appendix A Sheet 1 - MSEC Dwg No 1192-22 “Predicted Total Subsidence Contours after LW S6A.

Appendix A Sheet 2 - MSEC Dwg No 1192-23 Revision A, “Tahmoor South Project Extraction Plan LW S1A to LW S6A, Proposed Monitoring

Appendix B -
Tahmoor Coal (2021), Risk Assessment Report,
Infrastructure Tahmoor South
Extraction Plan
Longwalls 101A to 106A, November 2021

7.2) References

Reference No 1
The Report MSEC 1192, Revision A, March 2022, titled
“SIMEC Tahmoor South Project
Extraction Plan for Longwalls S1A to S6A,
Subsidence Ground Movement Predictions and Subsidence Impact Assessments for Natural Features & Surface
Infrastructure”

8.0 Contact List.

Contacts of participants involved in TPG Response Group:

Organisation	Contact Name	Title	Postal Address	Telephone / Mobile	Email
Mine Subsidence Engineering Consultants Pty Ltd	Daryl Kay	Director	PO Box 302 Chatswood, NSW, 2057	9413 3777	daryl@minesubsidence.com
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Tahmoor Coal	April Hudson	Approvals Specialist	PO Box 100 Tahmoor NSW	4640 0022, 0466 380 992	April.Hudson@simecgfg.com
Tahmoor Coal	Amanda Bateman	Environment and Community Coordinator	PO Box 100 Tahmoor NSW	4640 0025, 0429 442 811	Amanda.bateman@simecgfg.com
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TPG	Philip Price	NSW External Plant Manager			Philip.Price@tpgtelecom.com.au
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