

Telstra Corporation Ltd

Network Integrity
N.S.W.

Tahmoor Coal Pty Ltd.

Tahmoor Colliery.

MANAGEMENT PLAN

LONGWALL MINING (LW 27)
BENEATH TELSTRA PLANT
@ TAHMOOR & THIRLMERE N.S.W.

**Authorised on behalf of
Telstra Corporation Ltd**

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1.0 Introduction

Tahmoor Coal Proprietary Limited at Tahmoor Colliery propose to extend longwall mining activities under Tahmoor and the eastern side of Thirlmere townships in NSW. Tahmoor Colliery has previously mined Longwalls 22-26 in the current series and has currently just completed extraction of LW26 and about to commence extraction of LW27. As part of the planning for mining Longwall 27, Tahmoor Colliery has identified surface assets which may be affected by the mining operation at Thirlmere / Tahmoor. Some of these assets belong to Telstra and are part of Telstra's infrastructure in the area. This management plan will consider the impact of the ground surface movements, contributed by longwall LW27 on these assets owned by Telstra. The new longwall LW27 is planned to commence in October 2012 is approximately 3000 metres in length and located between the old Picton Mittagong railway at Thirlmere on the north western end and the Bargo River at Tahmoor, at the south eastern end. The longwall is generally located to the north of the townships of Tahmoor and Thirlmere. Longwall LW27 extraction will also be mined in the same direction as previous longwalls from south east to north west.

Tahmoor Coal commissioned a report by Mine Subsidence Engineering Consultants Pty Ltd (MSEC) in support of the Subsidence Management Plan (SMP) for longwalls LW27 to 30. The Report MSEC355 Volume 1 dated July 2009 provided the predicted subsidence parameters for the SMP area. This report was titled Volume 1, MSEC Report "The Prediction of Subsidence Parameters and the Assessment of Mine Subsidence Impacts on Natural Features and Items of Surface Infrastructure due to Mining Longwalls 27-30 at Tahmoor Colliery in Support of the SMP Application", Reference No 1. This report identifies an area, to be considered for mine subsidence impacts, bounded by the 20mm subsidence contour line for LW 27 to 30. The general area outlining LW27 is shown in MSEC drawing MSEC567-07-01 attached as Appendix A, Sheets 1, showing the layout of the Telstra optical fibre and copper cable networks in the area under consideration. Additionally Appendix A Sheet 1 MSEC Drawing MSEC567-07-01 shows the location of the newly relocated optical fibre cable from Picton Exchange feeding to the Telstra Mobile Telephone Tower located on the northern goaf edge of LW28

Telstra's Tahmoor telephone exchange is located on the north east corner of Thirlmere Way and Denmead Streets. All of Telstra's main cable network into and out of Tahmoor exchange feeds along Thirlmere Way, north east and south west and to the south along Denmead Street. During the extraction of previous longwalls LW22 to LW26 the mining impacts from mine subsidence on the Telstra network that have occurred have been managed satisfactorily. As mining has continued north of the telephone exchange the potential for impacts on the major network cable infrastructure has reduced since the main optical fibre and copper cables are now clear of mining with the exceptions being along Remembrance Drive and Struan / Park Streets. The existing optical fibre cable network which is the more vulnerable to mining impacts, is located to the west of LW26 along Thirlmere Way and along York Street. These cables located within conduit have now been impacted by LW24 and LW25 without impact. The remaining Telstra cable network potentially impacted by LW27, determined by the 20mm subsidence zone, is located in the following areas :-

- a) Copper junction and main cables from Thirlmere Way north along Remembrance Drive into Struan Street to Pillar P8 and continuing north east along Struan Street to Pillar P20 in Park Avenue.
- b) The distribution cable network to individual customers within the 20mm subsidence zone. This network is distributed across the entire 20mm subsidence zone area. However in general the cables are less than 100 pairs and are non pressurised polyethylene insulated copper cables. This network crosses LW27 primarily along Bridge Street, Tickle Drive, Hilton Park Road East, York Street, Remembrance Drive, Struan Street, Myrtle Creek Avenue, Park Avenue and Moorland Road.

The items of plant affected by ground surface movement therefore include junction and main copper cables from the exchange and the associated subscriber cable distribution network in the Thirlmere / Tahmoor area as well as the manhole, pit and conduit network that supports the entire cable distribution network.

The Mine Subsidence Engineering Consultants Pty Ltd Report, Reference 1, Section 5.18 Telecommunications Services makes the statement that:-

Based on experience during the mining of Longwalls 22 to 25, it is considered that the mining of the proposed longwalls is unlikely to result in any significant impact to the telecommunications infrastructure within the SMP Area. The range of subsidence movements is predicted to be similar to those experienced during the mining of Longwalls 22 to 25. The nature of infrastructure within the SMP Area is similar to that located above Longwalls 22 to 25. It is likely, however, that a small number of adjustments to overhead services connections to houses will be required and it is possible that impacts may occur to the main lead cable along Remembrance Drive.

The main copper cable and some local copper cables cross beneath Myrtle Creek near Remembrance Drive Bridge. The creek crossing is located near the end of Longwall 29. Predictions of closure and upsidence at the Remembrance Drive Bridge due to the extraction of Longwalls 22 to 30 are shown in Table 5.30.

The predictions for LW22 to LW26 which are summarised below in Tables 3.1 and 3.2, show the Maximum Predicted Incremental Subsidence Parameters and the Maximum Predicted Cumulative Subsidence Parameters for LW 22 to LW26. Tables 3.1 & 3.2 for predicted subsidence parameters for LW22-26 conform reasonably with Appendix A Sheet 2 showing subsidence contours for LW22 to LW27. The maximum cumulative subsidence from LW27 is 800mm and for LW26 in Table 3.2 was 930 mm.

A summary of the predicted maximum incremental parameters, due to the extraction of each longwall, is shown in Table 3.1.

Table 3.1 Maximum Predicted Incremental Subsidence Parameters

<i>Subsidence Parameter</i>	<i>LW 22</i>	<i>LW 23</i>	<i>LW 24</i>	<i>LW 25</i>	<i>LW 26</i>
<i>Vertical Subsidence (mm)</i>	503	613	605	631	636
<i>Transverse Tilt (mm/m)</i>	3.5	4.9	4.7	5.0	5.1
<i>Longitudinal Tilt (mm/m)</i>	3.0	3.8	3.5	3.6	3.7
<i>Transverse Tensile Strain (mm/m)</i>	0.4	0.7	0.7	0.8	0.8
<i>Longitudinal Tensile Strain (mm/m)</i>	0.6	0.7	0.8	0.8	0.8
<i>Transverse Compressive Strain (mm/m)</i>	0.9	1.6	1.5	1.7	1.9
<i>Longitudinal Compressive Strain (mm/m)</i>	0.6	0.8	0.6	0.6	0.8
<i>Transverse Hogging Curvature (km⁻¹)</i>	0.03	0.05	0.05	0.05	0.05
<i>Longitudinal Hogging Curvature (km⁻¹)</i>	0.04	0.05	0.05	0.05	0.05
<i>Transverse Sagging Curvature (km⁻¹)</i>	0.06	0.11	0.10	0.11	0.13
<i>Longitudinal Sagging Curvature (km⁻¹)</i>	0.04	0.05	0.04	0.04	0.05

The maximum predicted cumulative subsidence parameters, after the extraction of each longwall, are shown in Table 3.2.

Table 3.2 Maximum Predicted Cumulative Subsidence Parameters

<i>Subsidence Parameter</i>	<i>LW 22</i>	<i>LW 23</i>	<i>LW 24</i>	<i>LW 25</i>	<i>LW 26</i>
<i>Vertical Subsidence (mm)</i>	503	756	866	909	934
<i>Transverse Tilt (mm/m)</i>	3.5	5.0	4.8	5.2	5.2
<i>Longitudinal Tilt (mm/m)</i>	3.0	4.4	4.9	5.1	5.2
<i>Transverse Tensile Strain (mm/m)</i>	0.4	0.7	0.7	1.0	1.3
<i>Longitudinal Tensile Strain (mm/m)</i>	0.6	0.7	0.8	0.9	0.9
<i>Transverse Compressive Strain (mm/m)</i>	0.9	1.6	1.7	1.7	1.8
<i>Longitudinal Compressive Strain (mm/m)</i>	0.6	0.8	0.8	0.8	0.8
<i>Transverse Hogging Curvature (km⁻¹)</i>	0.03	0.05	0.05	0.07	0.09
<i>Longitudinal Hogging Curvature (km⁻¹)</i>	0.04	0.05	0.05	0.06	0.06
<i>Transverse Sagging Curvature (km⁻¹)</i>	0.06	0.11	0.11	0.11	0.12
<i>Longitudinal Sagging Curvature (km⁻¹)</i>	0.04	0.05	0.05	0.05	0.05

It should be noted from Appendix A sheet 2 that the maximum subsidence predicted near the centre of LW27 at the north west and south east ends of the longwall is 800mm taking into account the cumulative subsidence from previous longwalls. However the total cumulative subsidence following future mining of LW30 will increase the LW27

subsidence to approximately 1100mm Therefore it is anticipated that approximately 70% of subsidence (800mm) will occur over LW27 area initially following mining of LW27 with subsidence increasing to 100% (1100mm) following future mining of LW30. The gathering of data during the subsidence impacts from LW24 to LW26 has been a valuable guide for assessing the impacts from LW27 accepting that the levels of subsidence strain and tilt will be similar for LW26 and LW27. Hence it is important to continue to monitor the performance of the Telstra network during the subsidence events from LW27 and continue to review the management plan in the future to account for the past performance of the network.

Reference 1 Section 5.18) Telecommunications Services also states that:-

Tahmoor Colliery and Telstra have developed and acted in accordance with an agreed risk management plan to manage potential impacts to telecommunications infrastructure during the mining of Longwalls 22 to 25. The management plan provides for ground and visual monitoring, which include detailed inspections of pits and cables prior to, during and after mining, and recording of cable pressures for main copper cables.

The management plan also provides for planned responses if triggered by observations of impacts. If impacts occur to the network, Telstra is able to quickly make adjustments and restore communications, if required.

This management plan will continue the agreement between Telstra and Tahmoor Coal to effectively manage and address the monitoring issues related to the associated risk for the various elements of the Telstra network exposed to mine subsidence during LW27.

1.1) 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. 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 copper sheathed cables and aerial cables. In this case since there is no optical fibre cable located within the 20mm subsidence zone then consequently the major risk to disruption of the Telstra network is to a large extent reduced. However as mentioned above there are both older copper junction and main cables which are more vulnerable to sheath damage due to their age and construction and sections of aerial cable. Since monitoring has been performed on the network during LW24 and LW26 subsidence there is now some basis for assessing the performance of the Telstra network from past experience. Generally it has been found that the older lead paper insulated main and junction cables are more vulnerable to ground movement combined with the local aerial copper cable distribution network where it is exposed to ground tilting which can impact on pole movement.

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 Telstra plant, then the impact is irreversible and repair work is required. This has been done in the past where, through monitoring, vulnerable plant has been identified to be at risk and action has been taken to minimise the risk and minimise damage to the network. A management plan for Telstra's 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.

1.2) Objectives

The objectives of this management plan in relation to Telstra's plant are to put in place procedures to be followed :-

- a) To audit and assess the relative risk, for each section of the Telstra network, exposed to mine subsidence.
- b) To monitor the impact of mine subsidence and initiate action to mitigate potential damage to the Telstra infrastructure by recording visible changes or changes in transmission characteristics which may occur to plant.
- c) To provide a plan of action, should the subsidence effects impact on the serviceability or performance of plant.
- d) Provide a forum, *Plan Review Meeting*, to report, discuss and record impacts on Telstra plant and transmission performance. The *Plan Review Meeting* will involve representatives from Tahmoor Colliery, Telstra Network

Integrity Central, The Mine Subsidence Board, Mine Subsidence Engineering Consultants Pty Ltd, and other consultants as required.

1.3) Scope

This management plan is to be used to assess and protect the performance of the items of Telstra's network identified to be most at risk, due to mine subsidence impacts. The major items of plant are considered, according to their location relative to subsidence impacts from LW27. The items of Telstra plant are listed below as items a) to d) and are referred to in the management plan by these reference numbers.

Southern area along Remembrance Drive, Struan Street and Park Avenue

- a) Lead Junction cables C PICT 444 A01 J1-100 and Cable 101 Z01 J1-50 (Both designated T444, 1-100 & 1-50). Installed east along Thirlmere Way from the Exchange to York Street. This cable is jointed at York Street and Thirlmere Way changing configuration into the northern cable along Remembrance Drive to Picton, designated as C PCTN T444 Z01, J1-150/0.90. Current advice from Telstra's Planning Group is that this cable is not carrying traffic north of Thirlmere Way but is still capable of carrying customer services to the rural area between Tahmoor and Picton along Remembrance Drive should additional services be required.
- b) Copper Main cable north along Remembrance Drive, Cables C1 & C7 feeding to Struan Street Pillar P8 and primarily the section across LW27 from Pillar 8 to Pillar P20 in Park Avenue.

Distribution Cable and Pit, Manhole & Pipe Network Supporting Cable Infrastructure

- c) Copper customer distribution cable on the customer side of the pillar providing connection to each customer's premises. This network covers the entire area of the 20mm subsidence zone. The network consists of cable directly buried, in conduit and aerial distribution cable. This network is the most extensive throughout the zone yet potentially mining should have the lowest impact on this network in terms of possible subsidence impacts and number of services potentially affected.
- d) Conduit, manhole and pit network across the entire area of the 20mm subsidence zone, impacts are possible in the areas where maximum ground movement is predicted due to the age and brittle nature of some of the older asbestos cement pits and conduit components of this network.

Telstra Mobile Telephone Tower and Optical Fibre Cable feed

- e) The Telstra Mobile Telephone Tower is located over the old Redbank Railway Tunnel at the northern goaf edge of LW28 as shown in Appendix A sheet 1. Since this management plan is to consider LW27 only the predicted impact on the tower and optical fibre cable connecting the tower to the network is relatively minor. However MSEC have completed predictions for the tower for LW27 to LW30 which will be considered in Sections 2.0) & 3.0) on the following pages.

1.4) Timing

Longwall LW26 was completed in Mid October and LW27 will commence in November 2012. The longwall will then take approximately 12 to 18 months to mine, working to the north west from the south eastern end of the longwall. This management plan covering the longwall mining under Telstra plant at Thirlmere / Tahmoor will continue in operation until completion of mining of longwall LW27 and for sufficient period of time thereafter to allow for completion of subsidence effects. Hence it is proposed that the management plan will be in operation until late 2013 early 2014.

1.5) Definitions

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

Main Cable – Subscriber main copper cable providing pairs of copper conductors between the exchange and the distribution point or cross connect point generally a pillar location, ie Pillar P8.

Local Cable – Subscriber local copper cable providing pairs of copper conductors between the Pillar distribution point and the customer’s premises. This cable may be directly buried, installed in conduit or use aerial distribution to the individual premises.

NI :- Telstra Network Integrity responsible for the protection of the Telstra external plant network.

Pillar – Is the interconnection point between the local cable leading to the customer’s premises and the main cable from the exchange. It provides flexibility within the Customer Access Network to connect new and disconnect cancelled services. The main telephone exchange distribution area is broken up into smaller distribution areas where the individual pillar provides the connection between the exchange and the customer, ie Pillars 1 to 10, P1 to P10.

Plan Review Meeting: Regularly convened forum to be meet (teleconference) to implement this management plan. Participants from Tahmoor Colliery, Telstra, NDCG, Mine Subsidence Engineering Consultants Pty Ltd, Mine Subsidence Board and consultants as required.

2.0) Principal Risks Identified

In relation to the assets identified in 1.3) item a) to d) above, the following are the assessed relative risks associated with existing Telstra plant within the 20mm mine subsidence contour area. 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 Low to High are shown in the attached Table 1.

Table 1
Relative Risk Factor for Telstra Plant

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

a) Lead Junction cable C PCTN 444 M1-150, Installed north along Remembrance Drive.

NOTE: Advice from Telstra Planning Group that cable does not carry inter-exchange services. However the cable is in reasonable condition and may be used to provide customer services to the rural area between Picton and Tahmoor.

This junction cable is a very old lead sheathed paper insulated cable, jointed along Thirlmere Way east of the exchange through to York Street and then jointed into a Pillar (SAH2) at York Street. At the York Street Pillar the cable splits and there is a PCM regenerator which feeds cable pairs in both the Picton section to the north and the Bargo section to the south. Then from York Street north the cable is a 150/0.90 cable to Picton and is installed as a direct buried heavy wire armoured lead cable north along Remembrance Drive.

Since this cable is direct buried north along Remembrance Drive it is exposed to subsidence of around 800mm and strains of + & - 1mm/metre, Refer to Appendix A Sheet 3 showing subsidence predictions for Remembrance Drive. Because of the age of this cable and exposure to movement at pit and manhole locations where the armouring is stripped away there is some vulnerability to subsidence. **As mentioned in the note above the junction cable between Tahmoor and Picton is not currently carrying inter-exchange services however Telstra may bring this cable back into service for rural customers.** Since the cable is not currently carrying services the consequence of any damage is Minor and the likelihood Moderate, hence the risk factor is **Moderate**



Plate 1:

View of manhole at York Street on Remembrance Drive showing lead joint in C PCTN 444 Z01, J1-150/0.90. Cable still has air pressure and joints across LW27 generally are in good condition.

b) Copper Main cable north along Remembrance Drive, Cable C1 feeding to Struan Street Pillar P8 and primarily the section across LW27 from Pillar 8 to Pillar P20 in Park Avenue.

These cables feed the pillars to the east of the exchange and provide the primary connection between the exchange and all subscriber services to the cross connection point, at the pillar. There are two main cables installed along Struan Street to Park Avenue from Remembrance Drive identified as Cable No 1-200 Pair M301-500 and C1-200 Pair 501-600.

These two cables feed east across LW27 in Struan Street, Myrtle Creek Road and Park Avenue and provide main copper pairs to the pillars located to the east of the exchange with the Pillars located on both sides of LW27 within the subsidence zone.

Both cables are subject to subsidence impacts from LW27 along Struan Street, Myrtle Creek Avenue and Park Avenue. These cables have polyethylene or cellular polyethylene insulated pairs and have air filled cores and pass through some manholes and pits which at various times can fill with water hence it is important to maintain the integrity of the air feed system within the sheath, to prevent ingress of water and resulting loss of service.



Plate 2:

Cable 1, Main copper cables to Pillar P20 in River Road, two cables M301-500 and M501-600 installed along the southern side of Park Avenue into the River Road Pillar.

It is considered in the section over LW27 that since both cables are installed within conduit and not directly buried that they are able to move with the subsidence trough that develops as the longwall progresses. Cable 1 is a moisture barrier cable and is reasonably robust with flexible joints and polyethylene insulation both cables are therefore classified as an Unlikely event with Moderate consequence, risk factor **Moderate**.

Distribution Cable and Pit, Manhole & Pipe Network Supporting all Cables

c) Copper customer distribution cable on the customer side of the Pillar, providing connection to each customer's premises, installed within the subsidence zone for LW27

The distribution of telephone services from the pillars are by different methods, generally these cables are installed in conduit however they can be directly buried or use aerial distribution networks. The sections of distribution cable sustaining the highest predicted subsidence from LW27 are in:-

- Bridge Street & Innes Street
- Tickle Drive
- Hilton Park Road, eastern end
- York Street & Remembrance Drive
- Struan Street, Myrtle Creek Avenue and Park Avenue
- Moorland Road

In past experience with subscriber distribution cable at Appin and Tahmoor/Thirlmere there has been no damage reported or observed with the subscriber distribution network with the exception of an old lead junction cable used to feed the distribution network at Appin. The plastic distribution grease filled cables with either polyethylene or cellular polyethylene insulation over copper conductors are of much smaller size than main cables discussed above and are able to tolerate a greater degree of movement due to their smaller size and more flexible nature than the main copper cable. Unlike the main cable they do not generally use rigid lead joints which can fracture when moved, but use openable, in-

opposite directions, there is generally sufficient depth of catenary in the aerial cable to allow for pole movement at the point of attachment of the cable line cable line to move approximately 50-100mm. The experience with previous longwalls however produced some anomalous movements in the areas of Lintina, Courtland, Pandora, Abelia and Janice Drive which did impact on the aerial cable network requiring adjustment of the cable catenary between poles and from poles to individual premises. On the basis of previous experience the risk associated with the aerial cable network is considered as Likely/Minor, **SIGNIFICANT**.

iii) Direct Buried Cable

There was only one section of direct buried local cable located within the subsidence zone along the northern side of Bridge Street east of Innes Street. One section of this cable was undermined by LW26 with no apparent impact on the cable and LW27 will extend the mining further east along the cable. The impacts from LW26 and LW27 are predicted to be similar with initial subsidence from each longwall at approximately 800mm. Refer to Appendix A Sheet 4 showing Subsidence Tilt and Curvature along Bridge Street over LW26 to LW30. The copper cable is a small sized 10/0.64 cable which is a relatively robust and is directly buried in the clay soil through the paddocks on the northern side of Bridge Street and it is not anticipated that the cable will be impacted by LW27 based on LW26 subsidence. There are also a number of instances throughout the subsidence area where the cable lead-in, from the street to the residence, may also be directly buried. Generally these cables are 2 or 6 pair cables and the risk associated with subsidence damage to this type of cable, considering it is generally feeding only one residence is assessed as Unlikely/Minor **LOW**.

d) Conduit, manhole and pit network.

The conduit, manhole and pit network is the 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 extent of the network, its lack of homogeneity and its differing age, it is considered to be an important factor in the performance of the entire cable network. The conduit and pits provide the primary isolation of the cable network from ground movement and strain. In addition because of the variation in the components of this network it is also the most difficult item of plant to assess for potential risk of damage. The main concern in this network is the performance of the older asbestos cement 100mm conduits (A100) and the older asbestos cement pits, which typically perform poorly, in areas where ground movement occurs, such as expansive soils. The main problem identified in this area of the network, is the old asbestos pit and pipe network installed in parts along Remembrance Drive. See also discussion of conduit network in sections c) i) above.

The distribution network is generally installed in smaller asbestos and plastic pits, using small sized PVC conduit (12-50mm dia.) and it is not considered to be, at the same level of risk, as the larger 100mm diameter asbestos conduit and pit network generally carrying the larger main cables.

The risk assessment for the copper distribution network is considered to be Unlikely/Minor **LOW** and for the main copper cable network is assessed as Moderate/Moderate **SIGNIFICANT**.

e) Telstra Mobile Telephone Tower and Optical Fibre Cable F PCTN 3002.

The Telstra Mobile Telephone Tower located above the Redbank Railway Tunnel is a 35 metre steel monopole and as mentioned above the tower is located at the northern goaf edge of LW28. Consequently the tower is predicted to have minor impacts from LW26 (now completed) and LW27. However in September 2012 MSEC in consultation with Tahmoor Colliery and Telstra Networks and Access Technologies Group had a meeting to discuss the predicted impacts on the tower from the current series of longwalls, principally from LW28 which will impose maximum tilt on the tower of 5.2mm/m.

This current Telstra management plan is to consider LW27 impacts on the tower however since the analysis has been completed by MSEC for LW27-LW30 the predicted impacts from LW28 to LW30 will also be included in the general discussion Section 3 e). Monitoring data will then be gathered for the tower from LW27 as longwall mining extends towards and past the tower which will provide the verification for the predictions made for LW28 to LW30. When the Telstra management plan is revised for LW28 this data can then be considered with a view to verify the predictions made for the following longwall series.

Longwall LW27 is predicted to impose a minor tilt of 0.3mm/m on the tower which relates to a 0.1 degree change in tilt angle. It is understood that the operating tolerances of the tower antennae is approximately 1 degree so that the prediction is well inside the tolerance limit of the antennae. Additionally Telstra technicians are able to remotely adjust the Antennae on the tower if signal strength is affected by tower movement and in the instance of greater tower movement for both direction and projection of signal manual adjustment of the antennae frames is also possible. Therefore accepting that the predicted tilt from LW27 is approximately 10% of that tolerable it is considered that the Risk factor is **LOW**, minor consequence, unlikely event.



Plate 4:

View west showing the 30 metre steel Telstra tower located above the Redbank Railway Tunnel with optical cable feed to tower from Picton telephone exchange

The tower and mobile service interface to the Telstra network is via the optical fibre cable F PCTN 3002 12f which is installed along Henry Street to Stilton Lane and then running approximately 1000 metres from Stilton lane across the new railway tunnel to the old tunnel alignment and then direct buried south over the top of the old tunnel for approximately 500 metres. Although the old tunnel will be filled with excavated material from the new tunnel and there has been packing of rock material between brick tunnel lining and the tunnel void there does exist the remote possibility of anomalous ground behaviour in the area over the old tunnel. This is more likely to occur during LW28 and LW29 extraction as these two longwalls will directly impact on the old tunnel alignment. It is therefore considered due to the exposure of the direct buried optical fibre cable for 500 metres over the top of the old tunnel structure that the risk factor for the cable for LW27 extraction is relatively low but there is the possibility of anomalous ground movement, the risk factor will increase with the mining of LW28 and LW29 since the direct buried section of cable is installed at an acute angle across the LW28/LW29 chain pillar. Refer to Appendix A sheet 1. The current risk factor for LW27 however is assessed as an Unlikely event with Major consequence since transmission capacity to the tower could be affected by ground movement along the cable, risk factor **SIGNIFICANT**.

3.0) Control Procedure

3.1) General

As discussed in Item 1.1) above there is now information available on the performance of Telstra plant due to ground subsidence caused by longwall mining operations. The current information available is from, experience gained at Appin, Thirlmere, West Wallsend, Camberwell and Broke in NSW. The longwall mining operation at Thirlmere / 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 plant, comprising both robust and also relatively sensitive elements of the network.

The general control procedure considered in this management plan is to look at each item of plant described in Section 2.0) items a) to e) 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 in Table 2, 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 primary control procedure for monitoring copper cables under air pressure is to visually inspect cables and record the pressure in these cables on a regular basis. The pressure can then be monitored during mine subsidence, to detect any loss of pressure and resultant impact on the pressurised cable network, due to ground movement.

Since there are similar types of cable involved and the proposed monitoring methods for each cable type are similar, they have been grouped together below and in Table 2 to simplify the discussion and management of the network during ground subsidence.

a) Junction Cable. C PCTN 444 Z01, J1-150/0.90 north along Remembrance Drive (Minor/Moderate **Moderate**

The lead Junction cables C PCTN 444 Z01, J1-150/0.90, as mentioned in Section 2.0) is an old lead sheathed paper insulated junction cable installed between Tahmoor and Picton, See Plate 1. The cable is a direct buried, heavy wire armoured cable and the age and condition of the lead sheathing on this cable is the main concern. However as mentioned in 1.3) a) above this cable no longer carries any inter-exchange transmission services so it is not considered an important component of the cable network. The cable currently does not carry any local services out of Tahmoor exchange however the fact that it is not in current use does not preclude Telstra from installing services on the cable in the future to supply customers between Tahmoor and Picton. The cable appears in pits and manholes along Remembrance Drive and these should be inspected regularly to ensure no damage to the cable or joints is visible within the larger pits or manholes. Provided Telstra maintains the air flow on the cable this can also be recorded to indicate the condition of the cable.

b) Copper Main cable north along Remembrance Drive, Cable C1 feeding to Struan Street Pillar P8 and primarily the section across LW27 from Pillar 8 to Pillar P20 in Park Avenue. **Moderate**

The main cable network C1 & C7 from the exchange via Remembrance Drive and Struan Street terminates C7 at Tahmoor Road and C1 continues east along Park Avenue to River Road. Both cables are pressurised air core cables. The air pressure in the cables can be recorded and any changes noted which may show that loss of pressure has occurred due to ground movement. Should loss of pressure or damage occur, repair at the joints or in length repairs, should be carried out immediately, to prevent any water penetration and loss of service on these cables.

c) Copper customer distribution cable on the customer side of the Pillar, providing connection to each customer's premises, covering the LW27 subsidence zone

i) Distribution Cable in Conduit, Risk Factor. (Unlikely/Minor **Low)**

This distribution cable is located throughout various Streets as mentioned crossing LW27, covering services to approximately 100 residences in the area. This network has been audited and over LW27 there is none of the old lead cable present which is located further south in the exchange area. However the cable present should be monitored during subsidence to ensure there is no risk of cable damage from the conduit and pit network. Over the distribution network located in conduit it is anticipated that there will be minor impact on

the cables with the slight risk that ground movement may cause cracking of old asbestos pits and conduit and possible movement of both plastic and asbestos pits, relative to surrounding ground levels. Should this type of ground movement become evident at the surface, (ie cracking of road pavements, footpath movement, kerb movement or house damage) then the cable network in the area should be investigated, to determine if there are any observable impacts on the network. Close liaison should be maintained with the Telstra line maintenance staff to ensure that any abnormal fault incidence in the Tahmoor / Thirlmere area is investigated concurrent with the fault clearance, to ensure there is not a component of ground movement responsible.

ii) Aerial Cable. (Risk Factor (Likely/Minor, **Significant**

This distribution cable is assessed as having a Significant risk factor based on previous experience within the Tahmoor area from longwall mining impacts. It is recommended for the aerial cable within the streets listed below that a regular inspection be carried out during periods of maximum tilt, associated with the subsidence trough from LW27. Inspections should be carried out in the following Streets:-

- Bridge Street & Innes Street
- Tickle Drive
- Hilton Park Road, eastern end
- York Street & Remembrance Drive
- Struan Street, Myrtle Creek Avenue and Park Avenue
- Moorland Road
- Krista Place

The above cables will be inspected during subsidence events as the longwall progresses and any apparent visible strain on the cables reported to Telstra and the plan review meeting for further action to relieve strain on the cable where necessary.

iii) Direct Buried Cable **Low.**

There was only one section of direct buried local cable installed along the northern side of Bridge Street east of Innes Street. This was a relatively small sized copper 10/0.64 cable which is a relatively robust cable. The other incidence of direct buried cable is customer lead-in cable from footpath pits into each customers premises. These locations should be inspected concurrent with other cable and infrastructure inspections being conducted in the area at the time of maximum anticipated subsidence.

d) Conduit, manhole and pit network.

(The risk assessment for the distribution network is assessed as Unlikely/Minor **Low** and for the main copper cable network is assessed as Moderate/Moderate **Significant.**)

The cable distribution network is obviously subject to the greatest risk of damage in the areas of maximum subsidence, since it is exposed for the greatest distance, is not homogenous in nature, is of differing ages, and is installed with varying cover and with varying conduit sizes through varying ground conditions.

As discussed above it is considered that the distribution cable network on the customer side of the pillar is at lower risk of damage due to its smaller diameter, reduced cover to the surface and almost exclusive use of PVC conduit. There is some risk of damage, to the larger asbestos cement pits and conduit in this network, but it is not considered that this alone will expose the distribution cable network and joints to damage.

The main cable network however is considered to have a **Significant** risk factor for the reasons out lined in Section 2.0) item d). Within the predicted 20mm subsidence zone the 2 x asbestos 100mm diameter conduits support the main cable network along Remembrance Drive and Struan Street for a distance of approximately 450 metres and ground movement may impact on these more brittle conduits, causing potential impact on the cables.

For the areas of highest impact from the longwall, along Remembrance Drive north of Bradbury and in Struan Street, it is recommended that the main and junction cables, in this conduit route be physically checked at pits and manholes during subsidence impacts from LW27. This will verify that movement within the pits and manholes does not cause localised damage to the cables particularly where they enter and leave the larger pits and manholes. Additionally the surface area above the conduit will be “walked over”, to note any changes in road pavement or in the footpath area, which may indicate excessive ground strains potentially impacting on the conduit and cable network.

e) Telstra Mobile Telephone Tower (Low) and Optical Fibre Cable F PCTN 3002 (Significant).

MSEC’s Daryl Kay has co-ordinated discussions between MSEC, Tahmoor Colliery and Telstra and has also produced predictions for Subsidence and Tilt on the tower for the series of longwalls LW27-LW30 which were provided in the MSEC Report 355 Reference 1. The details were shown as “Maximum Predicted Cumulative Systematic Subsidence Tilt and Curvature at the Telstra Tower during Extraction of Longwalls 22 to 30”. A copy of the Table is included below.

Maximum Predicted Cumulative Systematic Subsidence, Tilt and Curvature at the Telstra Tower during the Extraction of Longwalls 22 to 30

Longwall	Maximum Predicted Subsidence (mm)	Maximum Predicted Tilt (mm/m)	Maximum Predicted Hogging Curvature (1/km)	Maximum Predicted Sagging Curvature (1/km)
After LW26	< 20	< 0.2	< 0.01	< 0.01
After LW27	65	0.3	< 0.01	< 0.01
After LW28	600	5.2	0.04	0.06
After LW29	950	4.8	0.05	0.06
After LW30	1060	3.8	0.05	0.06

MSEC has also produced a graphical representation of the predictions for tower subsidence and tilt for LW27 as the longwall approaches the tower. The drawing also shows the predicted change in tilt angle of the antennae at the bearing angle of each of the antennae and is attached as Appendix A Sheet 5, “MSEC – Tahmoor Colliery – Longwall 27, Predicted Subsidence and Tilt during Mining”.

The table above show the maximum predicted tilt of the tower from LW27 is 0.3mm/m at ground level which equates to approximately 0.1 degrees of rotation of the top of the tower as shown in Appendix A sheet 5. As indicated by Telstra engineers the trigger for intervention or concern for the transmit and receive signals from the tower is at a tilt of 1.0 degree. Additionally the predicted subsidence from LW27 is 65mm which will not have an impact on the signal penetration range from the tower.

In NSW there is no known monitoring systems installed on Telstra Cellular Mobile Telephone Service (CMTS) towers subject to mine subsidence so the opportunity is available to monitor tower movement during active longwall mining. The monitoring system agreed to between Tahmoor Colliery and Telstra will involve the following elements:-

- i) Ground survey by Tahmoor Colliery of the Main Southern Railway and the extension of Hilton Park monitoring lines across the top of the tunnel at the base of the tower to record subsidence tilt and strain.
- ii) Survey of tower tilt by referencing a survey point at the base of the tower to a point near the top of the tower.
- ii) Continuously monitor changes in tilt by installing tiltmeters on the tower to measure bi-directional changes in tilt. The proposed frequency of data collection is one set of measurements per hour with the data downloaded to a website accessible to Telstra Mobile Coverage Delivery staff. At this stage it is not recommended to install alarms on the automated monitoring system due to the low level of tower tilt predicted for LW27.

The optical fibre cable F PCTN 3002 12f is installed in conduit up to the last 500 metres before the tower then the cable is direct buried over the top of the old tunnel and will cross the chain pillar between LW28 and LW29. Due to the remote possibility for LW27 to affect the transmission capacity into and out of the tower it is however considered necessary to monitor the cable particularly with a view to establish the condition of the spare fibres within the cable prior to and during LW27 impacts on the cable. The cable monitoring will provide valuable data on any changes that may occur in the transmission characteristics of the cable particularly for future mining of LW28 and LW29.

In the unlikely event should Telstra require intervention on the tower to maintain signal direction and strength then Telstra at cost to Tahmoor Colliery will undertake the following actions to secure the transmission capability from the tower:-

- i) Complete remote controlled adjustment of the antennae system by rotating supports attaching the antennae to the tower.
- ii) Manually adjust the antennae frame by packing the bolting assembly if remote controlled adjustment in i) above cannot restore signal capacity and direction.
- iii) Manually adjust the tilt of the tower by adjusting the bolt cage assembly at the base of the tower.

Tahmoor Colliery will establish survey line along the newly relocated optical fibre cable route following completion of the Track Deviation work currently being undertaken at the site. The line will be surveyed during active subsidence from LW27 and reported regularly to Telstra. Additionally Comms Network Solutions Pty Ltd (CNS P/L) will complete 1625nm OTDR testing of the cable F PCTN 3002 from Picton telephone exchange identifying the direct buried cable section most at risk over LW28 & LW29 and recording base line test results for all spare fibres in the cable. The testing is to be repeated on a weekly basis for the cable during the active subsidence in the area from LW27 and the results recorded so that they can be used as a reference for the future longwall mining of LW28 and LW29.

3.2) Surface Subsidence Survey

The control procedure for the Telstra plant should be supplemented by ground surveys carried out by Tahmoor Colliery at agreed time intervals along agreed base lines indicating the :-

- Initial RL of the surface prior to mining commencing
- Incremental subsidence over the agreed period
- Incremental ground strain over the agreed period
- Incremental ground tilt over the agreed period.

It is suggested that the most relevant survey lines for the Telstra plant would be along Remembrance Drive, Struan Street, Park Avenue and Bridge Street as well as the survey lines referred to in section 3.1 e) on the previous page. These survey lines will cover the area of maximum predicted subsidence, impacting on the most important components of the Telstra network. The location of the survey pegs should be negotiated with Telstra Network Integrity, field staff representatives as well as with other utilities, to avoid damage to plant during placement of the survey marks. Note, that the major Telstra network is located on the western side of Remembrance Drive and on the southern side of Struan Street and Park Avenue.

In addition the frequency of the survey and the reporting of the results, to the *Plan Review Meeting*, are to be agreed by the members of the *Plan Review Meeting*, at each regular meeting of the group. The initial meeting should agree on the limits of the survey lines and set the initial frequency of the survey work.

Refer to the following table, Table 2, which presents a Summary of the Telstra Plant, Risk Factor, Monitoring and Actions required for items of plant, which may be impacted by mine subsidence. Note that in the Table 2 items of plant have been grouped according to the monitoring technique outlined above and identified by the item numbers previously assigned items a) to e).

Table 2 - Summary of Monitoring Procedures and Actions

<u>ITEM OF PLANT</u>	<u>Risk Factor</u>	<u>Method</u>	<u>Detail</u>	<u>Monitoring Frequency</u>	<u>Trigger Levels</u>	<u>Actions & Responsibilities</u>
<u>Main Copper & Junction Cables ,Air Pressure</u> <u>a)Lead Junction Cable C PICT 444 J1-150</u> <u>b) C1 M301-500 & M501-600</u>	<p>Moderate</p> <p>Moderate</p>	<p>Record Cable Pressure, Physically Monitor</p>	<p>Record initial cable pressure on cables C1 at pillar manholes through subsidence zone at regular intervals during periods of ground subsidence.</p>	<p>Record cable pressures prior to mining then as required by Plan Review Meeting,</p>	<p>Variation in cable pressure of 5-10Kpa.</p>	<p>C Dove to advise Mark Schneider of loss of pressure on cable. Mark Schneider to advise Plan Review Meeting of proposed action in relation to repair / maintenance on cables.</p>
<u>c)Copper Distribution</u> <u>i)Cable in Conduit</u> <u>ii) Aerial</u> <u>iii) Direct Buried</u>	<p>Low</p> <p>Significant</p> <p>Low</p>	<p>Regular physical checks of cables particularly on aerial cables & general condition of distribution cables</p>	<p>Carry out physical check of cables related to any subsidence damage reported and any anomalous ground movement occurring in the subsidence zone. Complete regular physical inspections of network during critical subsidence events for that particular location. Check available survey data to indicate areas of anomalous subsidence behaviour.</p>	<p>Monitor as required by Plan Review Meeting dependant on survey results provided along roads within the subsidence zone.</p>	<p>Investigate any anomalous subsidence variations from predicted subsidence profile. Carry out regular physical checks on the network</p>	<p>If problems identified in b) above with cable performance C Dove to re-inspect subscriber cables (conduit & aerial) and advise Mark Schneider of results. Mark Schneider to advise Plan Review Meeting & arrange repair / maintenance as required. C Dove to complete regular inspections of network during periods of maximum subsidence at particular locations.</p>

<u>ITEM OF PLANT</u>	<u>Risk Factor</u>	<u>Method</u>	<u>Detail</u>	<u>Monitoring</u>	<u>Frequency</u>	<u>Trigger Levels</u>	<u>Actions & Responsibilities</u>
<p><u>d) Main Copper Conduit, Manhole & Pit Network</u></p> <p>Note distribution cable network covered in item c) above</p>	Significant	Monitor conduit & cable movement in Remembrance Drive north of Struan St & along Struan Street and Park Avenue	Monitor conduit & cable movement in Remembrance Drive, Struan Street and Park avenue during subsidence period from LW27 impacting on this particular area.		Prior to mining then as determined by Plan Review Meeting.	Visual check of section being monitored. If significant surface movement evident check distribution cables.	Should surface damage occur or survey data indicate anomalous movement check conduit pit and manhole network in this area. C Dove to advise Mark Schneider of any damage evident & Mark Schneider to advise Plan Review Meeting of maintenance / repair work proposed.
<p><u>e) Telstra Tower & Optical Fibre Cable F PCTN 3002</u></p>	Low Significant	Survey base line & tower tilt install tiltmeters Survey cable line OTDR Testing	Tahmoor Colliery (TC) to carry out detail survey of Hilton Park Rd extension and base survey and tilt of tower. TC to install continuously recording bi-directional tiltmeters on Tower TC to survey cable line. OTDR Testing @ 1625nm of F PCTN 3002		Initial survey & weekly during critical subsidence events. Tiltmeter continuous record, data available to Telstra via website Initial survey & OTDR test then during critical subsidence events.	Tilt 0.5 degrees by survey or tiltmeter. Ground Strain > 1mm/m, OTDR loss on fibre <0.3dB	TC to advise Telstra Mark Schneider and Rhadhika Anandamohan of trigger on Tower and report to Plan Review Meeting for decision on action to be taken as considered necessary by Telstra representatives to protect the network TC or CNS P/L (Colin Dove) to report trigger levels to plan Review Meeting for decision on action to be taken as considered necessary by Telstra representatives to protect the cable
<p><u>Survey Line</u></p>	Not Applicable	Establish permanent marks at approx 20 metre intervals along roads, cable line and tower base where Telstra network installed	TC to carry out detail survey , (subsidence, strain and tilt recorded) along Remembrance Drive, Struan Street, Park Av. Hilton Park Rd, Tickle Drive and Bridge St & along OF cable line and tower base. Provide survey results to Telstra representatives		To be determined by Plan Review Meeting dependant on degree of subsidence occurring and potential hazard to Telstra plant	Ground strain above 1mm/m and tilt in areas of aerial cable above 2mm/m	TC to make survey results available to Telstra following each regular survey.

4.0) Geological Structures:

Refer to Section 1.8) Reference No 1 and the discussion indicating that there have been extensive drilling investigations to identify geological structures at coal seam level. “*The only known fault is the Nepean Fault, which is located to the east of the proposed longwalls*” However while there is little or no evidence of geological structures related to LW27 the experience gained from longwalls LW24, LW25 and LW26 east of the Main Southern Railway indicates anomalous subsidence behaviour in this area. It has been suggested this excessive ground movement could possibly be related to the presence of the Bargo River Valley or the Nepean Fault. The existing known geological structures are shown on MSEC Drawing MSEC355-09 “Tahmoor Colliery Longwalls 27 to 30 Geological Structures” attached as Appendix A Sheet 6. Should any evidence of unpredicted movement or location of geological structures become apparent during mining of LW27 this should be reported immediately to Telstra. Also during future mining development works or should “Regional or Far Field Horizontal Ground Movements” be recorded, this information should also be immediately reported to the *Plan Review Meeting* for Telstra to consider the impact on their network.

5.0) Resources

Technical resources required to carry out the monitoring as identified In Table 2 are to be provided by Telstra or consultants as required. The costs associated with the monitoring work required for the network are to be reported to the *Plan Review Meeting* and agreement reached as to the responsibility for individual costs. Tahmoor Colliery will provide the survey resources required for the line surveys established on the roads around the tower and along the optical fibre cable line within the subsidence zone to determine incremental subsidence, strain and tilt during mine subsidence from LW27. The initial survey is to be carried out prior to mining operations commencing and the frequency of the survey work is to be reviewed at the regular *Plan Review Meetings*.

Prior to commencing any proposed rectification work the Telstra representatives will detail the extent of the work and the associated costs, to the *Plan Review Meeting*. At that meeting agreement will be reached between Tahmoor Colliery, Telstra and the Mine Subsidence Board as to the responsibility for the costs of the proposed work. In the event of a dispute as to responsibility for the costs, involving work to secure Telstra’s network, where loss of service to customers or line systems outage is involved, the work will be carried out by Telstra and the dispute referred to the next meeting of the *Plan Review Meeting* for further discussion and agreement.

6.0) Roles and Responsibilities

The monitoring of the Telstra network in accordance with this management plan is to be carried out by Telstra with the ground survey component of the monitoring work completed by Tahmoor Colliery. The Management *Plan Review Meeting* is to be the forum for discussion and resolution of issues raised in the operation of the Management Plan and impacts on the Telstra network. This meeting need only be convened in the event of trigger levels being reached, mining induced faults or damage occurring within the Telstra network. Any anomalous ground movement resulting from subsidence over LW27 and any risk perceived by Tahmoor Colliery to the Telstra network due to mining is to be used to prompt an initial *Plan Review Meeting*.

The representatives invited to attend the *Plan Review Meeting* are:-
Belinda Clayton - Community & SMP Coordinator, Tahmoor Coal Pty Ltd, Tahmoor Colliery.
Mark Schneider, Team leader Telstra Network Integrity Services.
Radhika Anandamohan Technology Specialist Telstra Mobile Coverage Delivery NSW & ACT
Darren Bullock, District Supervisor, Southern Coalfields, Mine Subsidence Board
Daryl Kay, Mine Subsidence Engineering Consultants Pty Ltd.
Colin Dove, Consultant Telecommunications Engineer.

When required the *Plan Review Meeting* 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.

At the *Plan Review Meeting* meetings, Telstra is to report incidents recorded in relation to the performance of the Telstra plant and a detailed log is to be maintained of each incident reported to the *Plan Review Meeting*. Full details are to be reported of significant events observed or events which have an impact on the Telstra Network or the provision of Telstra services in the area. Tahmoor Colliery are to report on the degree of

subsidence that has occurred at that time and how closely subsidence is following the predictions made in Reference No 1.

It is the responsibility of this meeting 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 *Plan Review 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 Telstra network.

7.0) Audit and Review

It is anticipated that this plan will be in place for approximately 18 months from the commencement of mining of LW27 through to completion or for a minimum period of three months following final ground settlement after extraction of LW27. Should an audit of the Management Plan be required during that period then a representative is to be appointed by Telstra, Tahmoor Collieries and the Mine Subsidence Board to review the operation of the plan and report amendments to the next scheduled meeting of the *Plan Review Meeting*.

Other factors which may require the management plan to be reviewed are:-

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

8.0) Record Keeping

As required when meeting is initiated the minutes secretary of the *Plan Review Meeting* shall 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 Telstra 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 Telstra network.

9.0) Associated Documents and References

9.1) Appendices

Appendix A (Drawings from Reference 1)

Tahmoor Colliery,
Tahmoor North
Longwall 27,
Drawing No MSEC 567-07-01
Telecommunications Infrastructure Sheet 1 of 6

Tahmoor Colliery, Longwall s 27 to 30,
Drawing No MSEC 355-36
Predicted Total Subsidence Contours
Due to Longwalls 22 to 27 Sheet 2 of 6

Mine Subsidence Engineering Consultants
Predicted Profiles of Systematic Subsidence, Tilt and Curvature
along Remembrance Drive, Resulting from the Extraction
of Longwalls 22-30
MSEC Fig. E.07 Sheet 3 of 6

Mine Subsidence Engineering Consultants Predicted Profiles of Systematic Subsidence, Tilt and Curvature along Bridge Street, Resulting from the Extraction of Longwalls 22-30 MSEC Fig. E.08	Sheet 4 of 6
Mine Subsidence Engineering Consultants Tahmoor Colliery – (Telstra Tower) Longwall 27 Predicted Subsidence and Tilt during Mining	Sheet 5 of 6
Tahmoor Colliery, Longwalls 27-30, Drawing No MSEC 355-09 Geological Structures	Sheet 6 of 6

9.2) References

Reference No 1- MSEC Report No MSEC355 “The Prediction of Subsidence Parameters and the Assessment of Mine Subsidence Impacts on Natural Features and Items of Surface Infrastructure due to Mining Longwalls 27-30 at Tahmoor Colliery in Support of the SMP Application”, Reference No 1.

10.0) Contact List.

Contacts of Participants involved in *Plan Review Meetings*:

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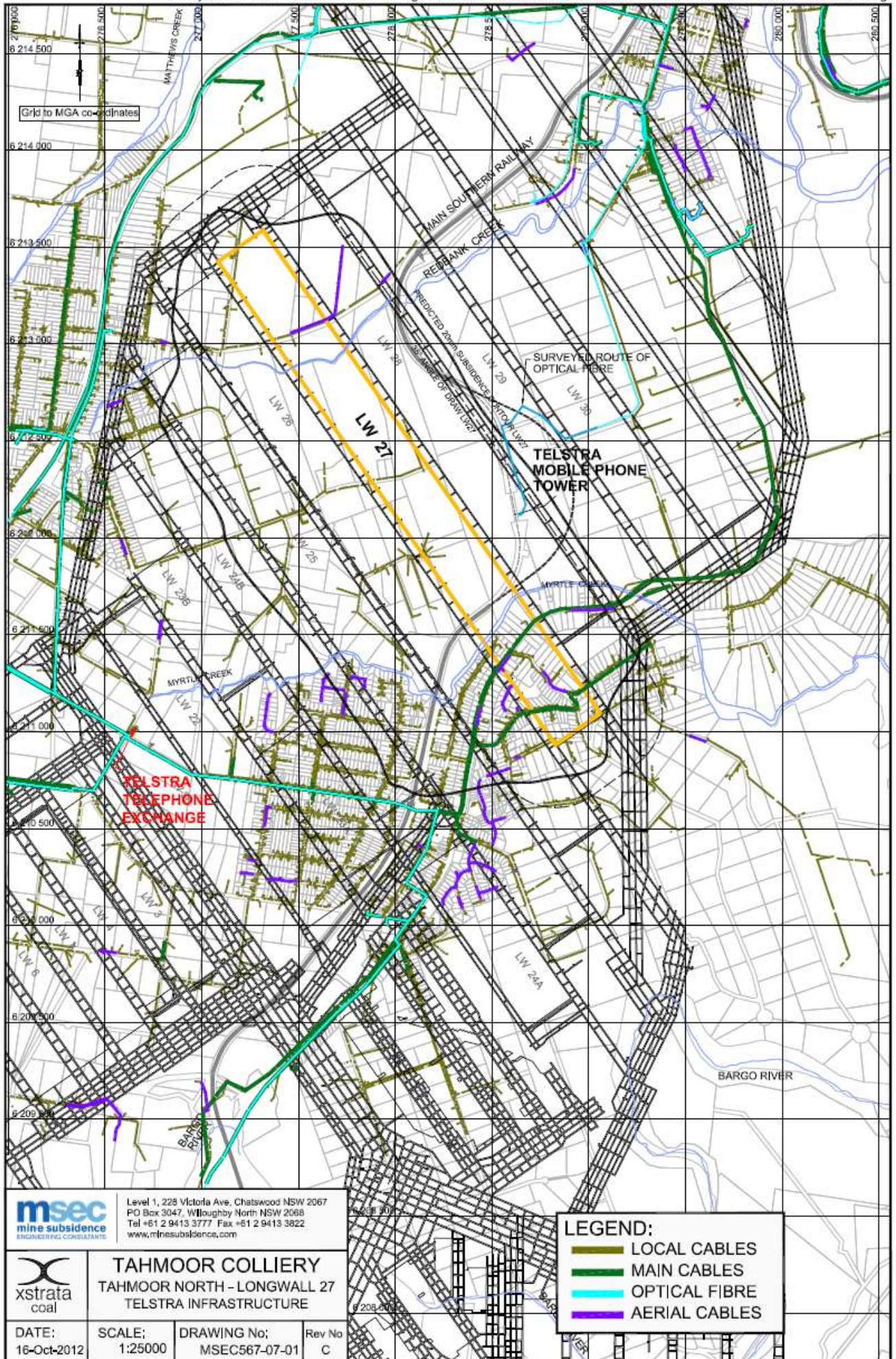
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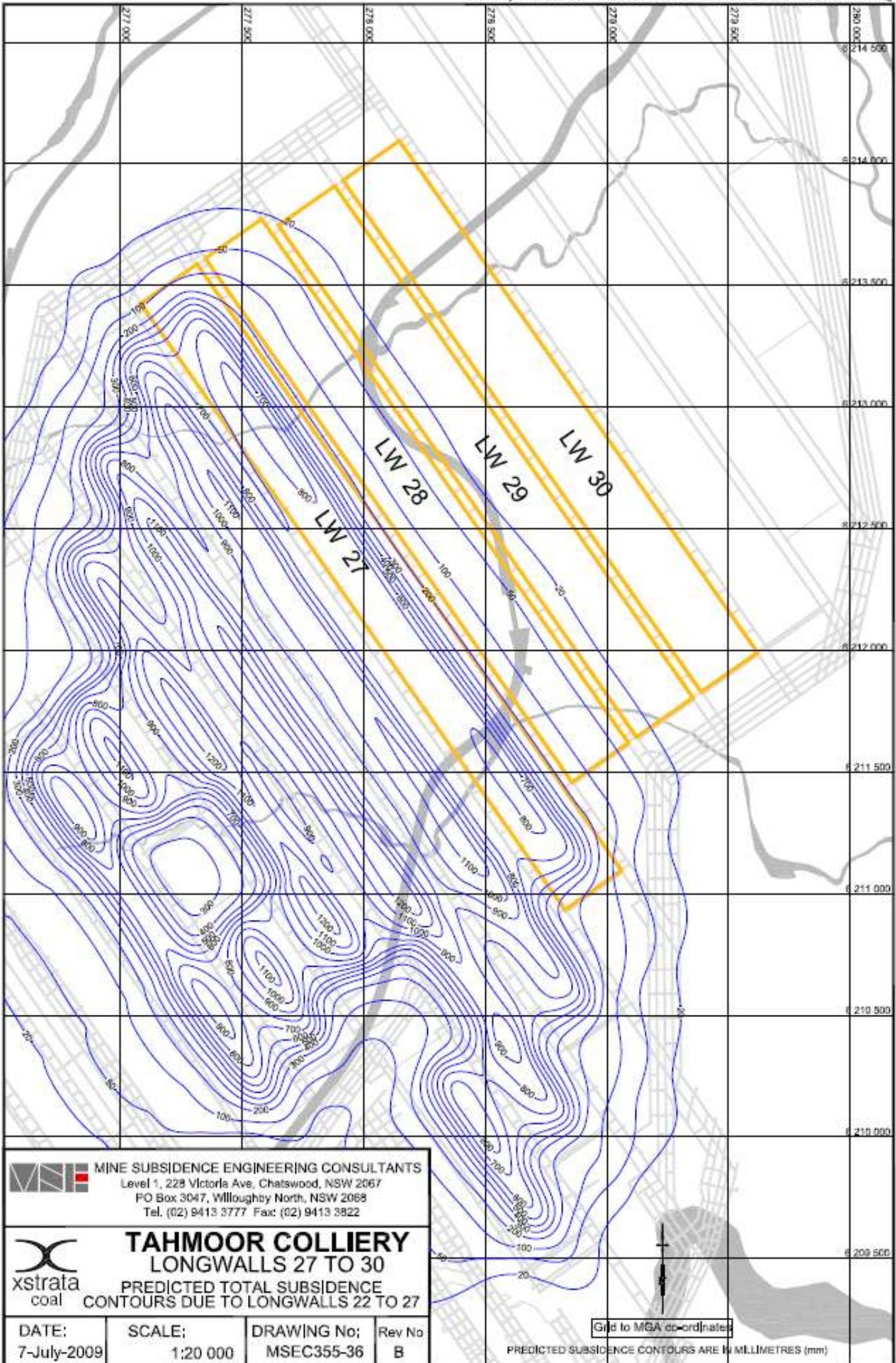
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TAHMOOR COLLIERY
 TAHMOOR NORTH - LONGWALL 27
 TELSTRA INFRASTRUCTURE

DATE: 16-Oct-2012	SCALE: 1:25000	DRAWING No; MSEC567-07-01	Rev No C
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LEGEND:	
	LOCAL CABLES
	MAIN CABLES
	OPTICAL FIBRE
	AERIAL CABLES



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 **TAHMOOR COLLIERY**
LONGWALLS 27 TO 30
 PREDICTED TOTAL SUBSIDENCE
 CONTOURS DUE TO LONGWALLS 22 TO 27

DATE: 7-July-2009	SCALE: 1:20 000	DRAWING No; MSEC355-36	Rev No B
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Grid to MGA coordinates

PREDICTED SUBSIDENCE CONTOURS ARE IN MILLIMETRES (mm)

Predicted Profiles of Systematic Subsidence, Tilt and Curvature along Remembrance Drive Resulting from the Extraction of Longwalls 22 to 30

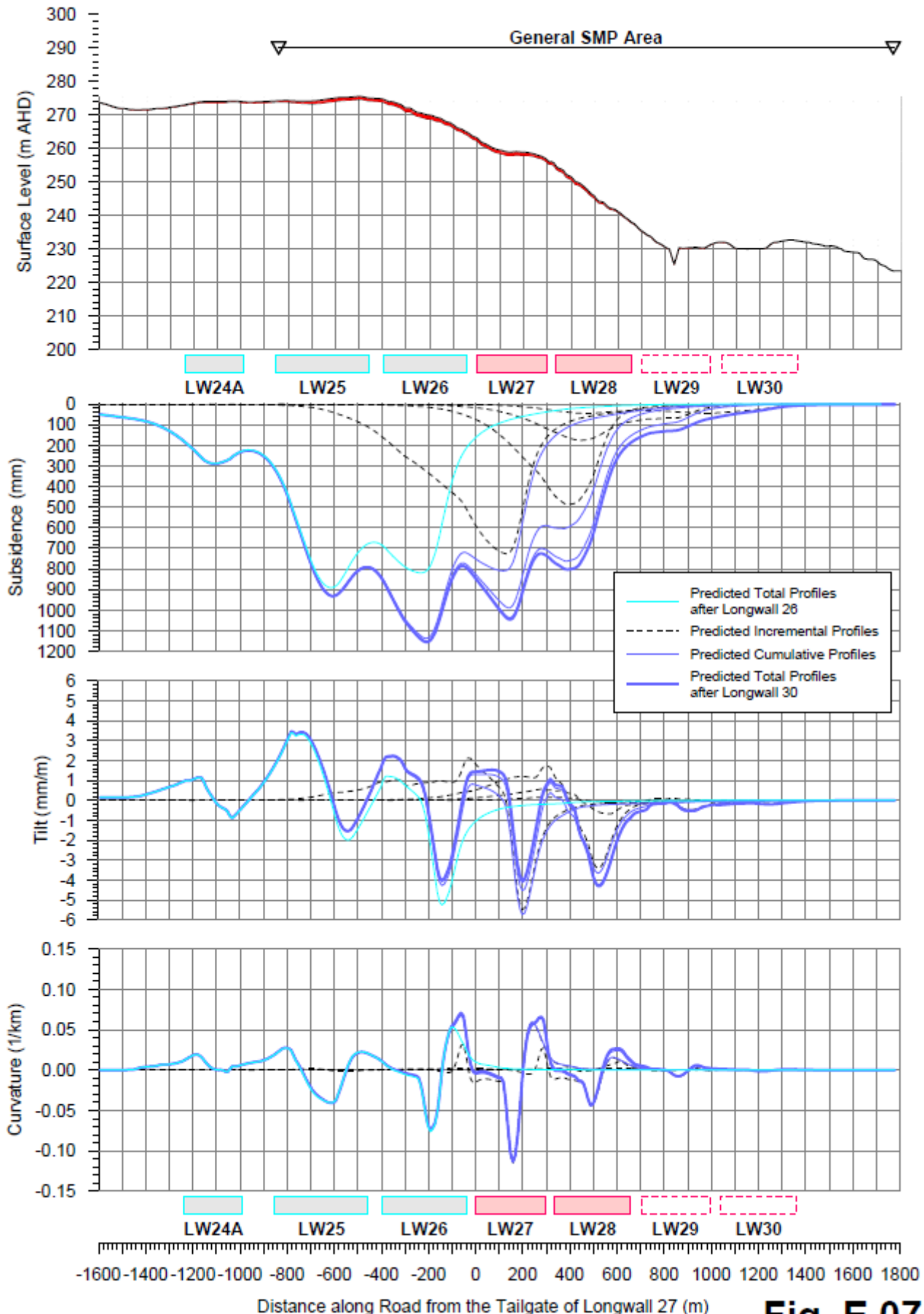
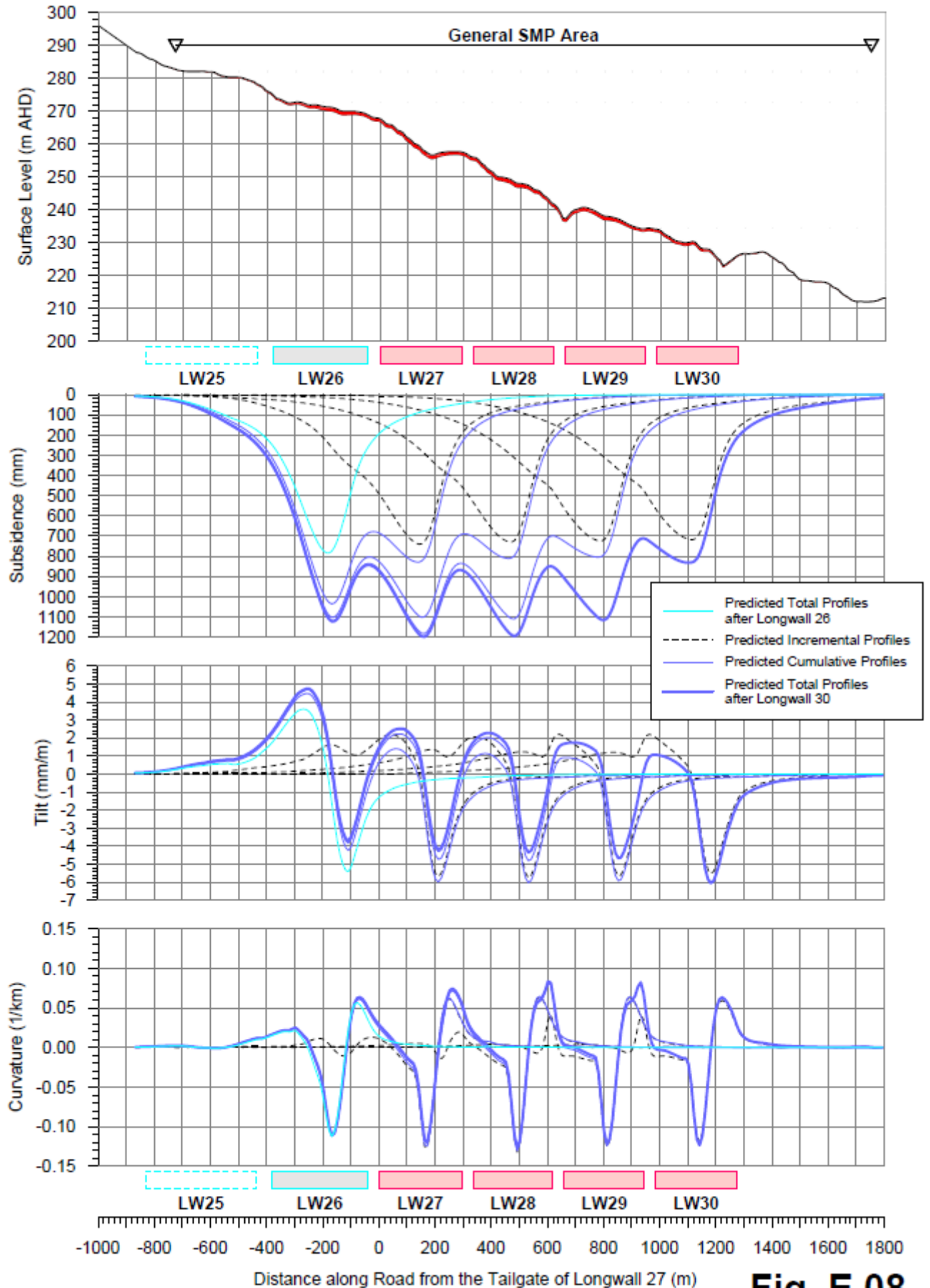


Fig. E.07

Mine Subsidence Engineering Consultants

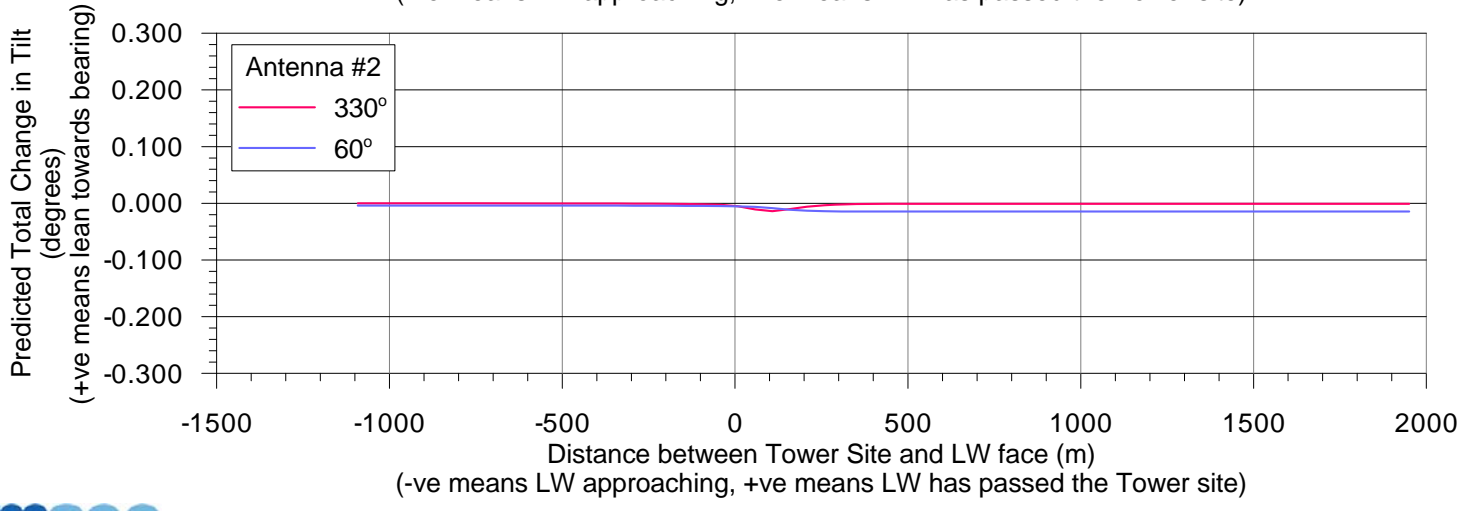
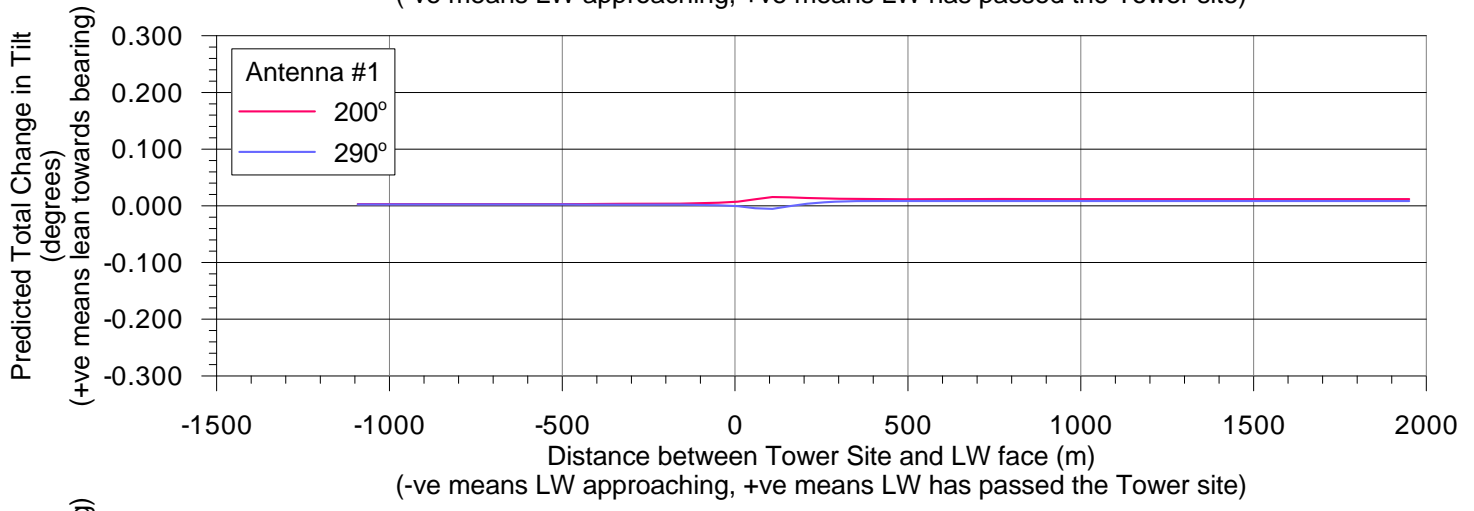
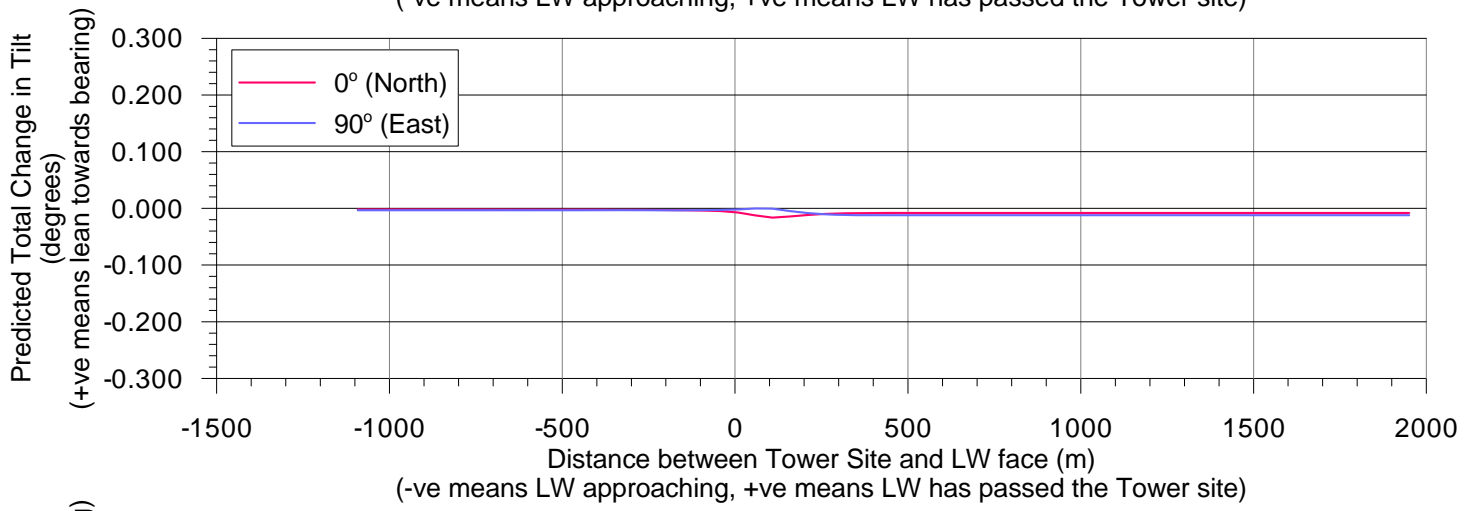
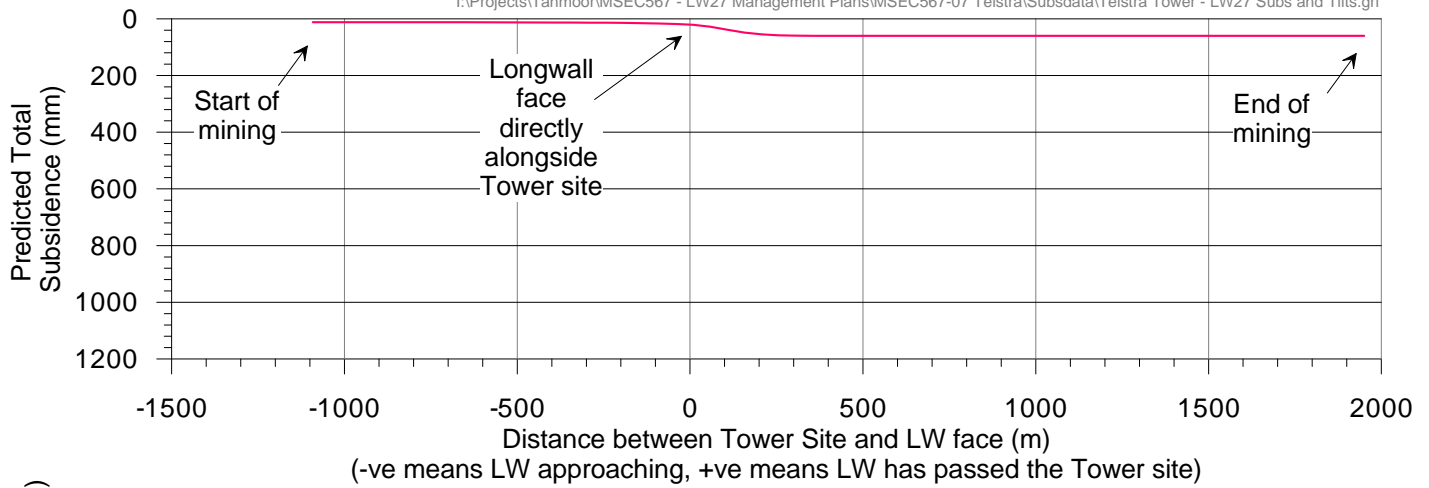
Predicted Profiles of Systematic Subsidence, Tilt and Curvature along Bridge Street Resulting from the Extraction of Longwalls 22 to 30

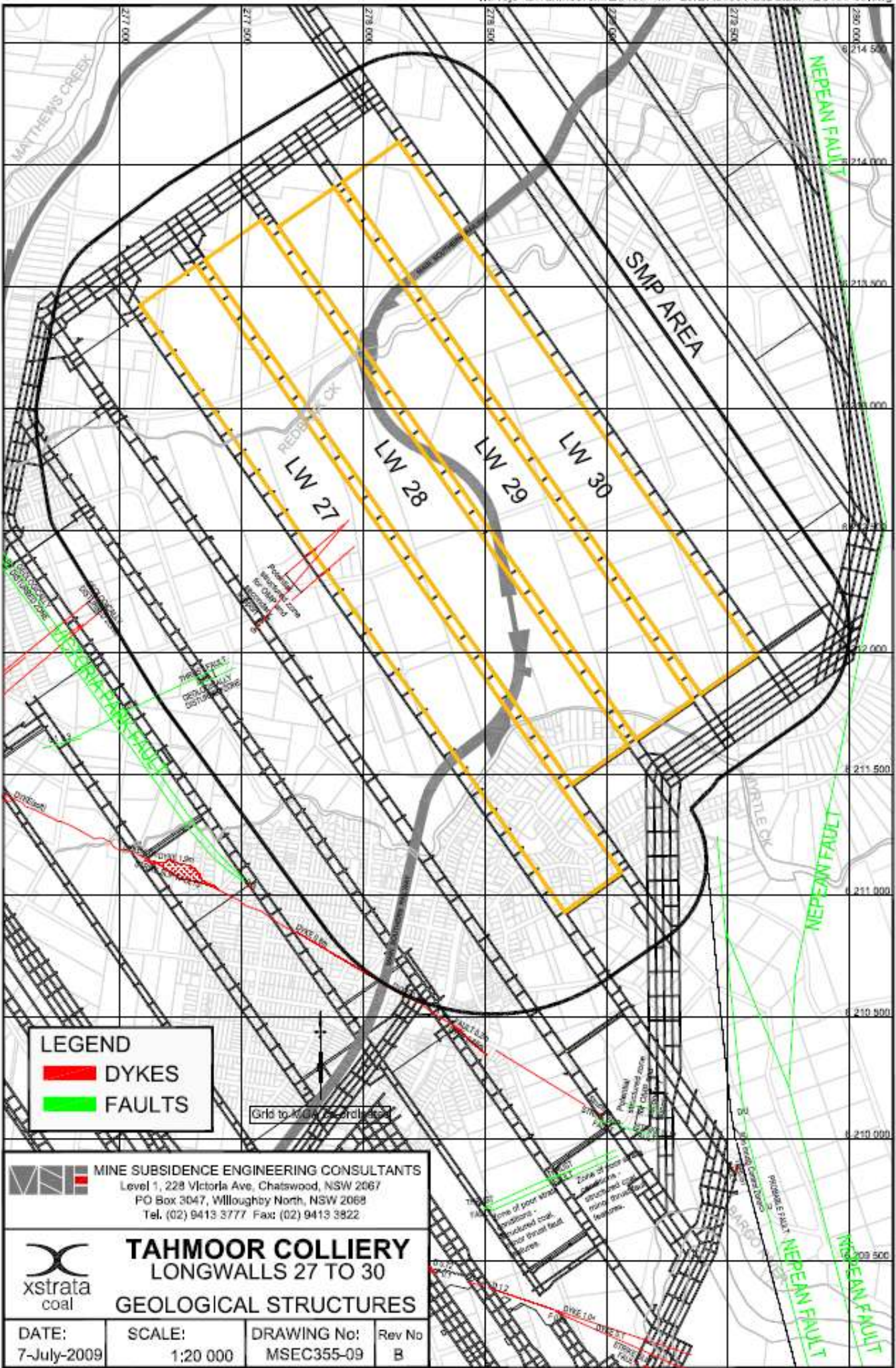


Tahmoor Colliery - Longwall 27

Predicted Subsidence and Tilt during mining

I:\Projects\Tahmoor\MSEC567 - LW27 Management Plans\MSEC567-07 Telstra Tower - LW27 Subs and Tilts.grf





LEGEND

- DYKES
- FAULTS

Grid to MGA 56 coordinate



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TAHMOOR COLLIERY
LONGWALLS 27 TO 30
GEOLOGICAL STRUCTURES

DATE:
7-July-2009

SCALE:
1:20 000

DRAWING No:
MSEC355-09

Rev No
B