



SIMEC Mining:

Tahmoor Coking Coal Operations – Longwall 32

Management Plan for Potential Impacts to State Survey Control Marks

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References:-

	AS/NZS 4360:1999 Risk Management
	AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines
Glencore (2017)	Glencore Coal Assets Australia Risk Management Matrix, Glencore, May 2017.
MSO (2017)	Managing risks of subsidence – Guide WHS (Mines and Petroleum Sites) Legislation, NSW Department of Planning & Environment, Resources Regulator, Mine Safety Operations, February 2017.
MSEC (2014)	Tahmoor Colliery Longwalls 31 to 37 - Subsidence Predictions and Impact Assessments for Natural and Built Features in support of the SMP Application. (Report MSEC647, Revision A, December 2014), prepared by Mine Subsidence Engineering Consultants.
SS (2017)	Surveyor-General's Direction No. 11 Preservation of Survey Infrastructure, NSW Department of Finance, Services and Innovation - Spatial Services, Version 3.2, September 2017.

1.0 INTRODUCTION	1
1.1. Background	1
1.2. SS's assets potentially affected by Longwall 32	1
1.3. Consultation	1
1.3.1. Consultation with SS	1
1.3.2. Consultation with Government Agencies & Key Infrastructure Stakeholders	1
1.4. Limitations	2
1.5. Objectives	2
1.6. Scope	2
1.7. Proposed mining schedule	2
1.8. Definition of the active subsidence zone	3
1.9. Compensation	4
2.0 METHOD OF ASSESSMENT OF POTENTIAL MINE SUBSIDENCE IMPACTS	5
2.1. NSW Work Health & Safety Legislation	5
2.2. General	6
2.2.1. Consequence	6
2.2.2. Likelihood	6
2.2.3. Hazard	6
2.2.4. Method of assessment of potential mine subsidence impacts	6
3.0 SUBSIDENCE PREDICTIONS AND ASSESSMENT OF POTENTIAL MINE SUBSIDENCE IMPACTS	7
3.1. Maximum predicted conventional subsidence parameters	7
3.2. Observed subsidence during the mining of Longwalls 22 to 31	7
3.3. Far-field horizontal movements	8
3.4. Summary of Potential Impacts	9
3.4.1. Predicted subsidence movements	10
4.0 MANAGEMENT OF POTENTIAL IMPACTS	12
4.1. Infrastructure Management Group	12
4.2. Mitigation measures	12
4.3. Monitoring measures	12
4.3.1. Surveys directly above and adjacent to Longwall 32	12
4.3.2. Far field monitoring network	12
4.4. Triggers and Responses	13
4.5. Subsidence Impact Management Procedures	13
5.0 REPORTING AND COMMUNICATION PLAN	15
5.1. Consultation, Co-operation and co-ordination	15
5.2. IMG Meetings	15
6.0 AUDIT AND REVIEW	16
7.0 RECORD KEEPING	16
8.0 CONTACT LIST	17
APPENDIX A.	18

Tables

Tables are prefaced by the number of the chapter in which they are presented.

Table No.	Description	Page
Table 1.1	Longwall dimensions	1
Table 1.2	Schedule of mining	2
Table 3.1	Maximum predicted incremental conventional subsidence parameters due to the extraction of Longwall 32	7
Table 3.2	Summary of the risk assessment	10
Table 3.3	Predicted incremental vertical subsidence at the survey control marks due to the extraction of Longwall 32	10
Table 4.1	Risk control procedures during the extraction of Tahmoor Coking Coal Operations' Longwall 32	14

Figures

Figures are prefaced by the number of the chapter or the letter of the appendix in which they are presented.

Figure No.	Description	Page
Fig. 1.1	Diagrammatic representation of the active subsidence zone	3
Fig. 3.1	Observed development of subsidence of survey pegs above the centrelines of Longwalls 24A to 31	8
Fig. 3.2	Observed incremental far-field horizontal movements above goaf or solid coal	9
Fig. 3.3	Observed incremental far-field horizontal movements above solid coal only	9

Drawings

Drawings referred to in this report are included in Appendix B at the end of this report.

Drawing No.	Description	Revision
MSEC945-00-01	Monitoring over Longwall 32	E
MSEC945-00-02	Far Field Monitoring over Longwall 32	B
MSEC945-11-01	Survey control marks	B

1.1. Background

Tahmoor Coking Coal Operations is located approximately 80 km south-west of Sydney in the township of Tahmoor NSW. It is managed and operated by SIMEC Mining. Tahmoor Coking Coal Operations has previously mined 31 longwalls to the north and west of the mine's current location.

Longwall 32 is a continuation of a series of longwalls that extend into the Tahmoor North Lease area, which began with Longwall 22. The longwall panels are located between the Bargo River in the south-east, the township of Thirlmere in the west and Picton in the north. Longwall 32 is located beneath the rural area of Tahmoor and part of the South Picton industrial area. Permanent survey control marks are located within these areas.

A summary of the dimensions of Longwall 32 is provided in Table 1.1.

Table 1.1 Longwall dimensions

Longwall	Overall void length including the installation heading (m)	Overall void width including the first workings (m)	Overall tailgate chain pillar width (m)
Longwall 32	2378	283	39

This Management Plan provides detailed information about how the risks associated with mining beneath the infrastructure will be managed by Tahmoor Coking Coal Operations and the Department of Finance, Service and Innovation, Spatial Services Division (SS).

The Management Plan is a live document that can be amended at any stage of mining, to meet the changing needs of Tahmoor Coking Coal Operations and SS.

1.2. SS's assets potentially affected by Longwall 32

A map showing the locations of SS's survey marks in relation to Longwall 32 is shown in Drawing No. MSEC945-11-01.

As shown in Drawing No. MSEC945-11-01, there are both state and permanent survey marks directly above and adjacent to Longwall 32 that will be directly affected by the extraction of Longwall 32.

The closest CORSnet-NSW station to Longwall 32 is Station ID PCTN, which is located at No. 30 Fairleys Road, Picton at the Picton Sportsground building. The site was verified on 29 April 2016. The CORSnet site is approximately 3.3 kilometres from Longwall 32 at its closest point.

1.3. Consultation

1.3.1. Consultation with SS

Tahmoor Coking Coal Operations consults with SS in relation to mine subsidence effects from mining. This includes consultation during the development of Subsidence Management Plans for previous Longwalls 22 to 31.

Tahmoor Coking Coal Operations will continue to consult as required with SS during the extraction of Longwall 32 in relation to mine subsidence effects from mining.

1.3.2. Consultation with Government Agencies & Key Infrastructure Stakeholders

Government agencies including the NSW Department of Planning & Environment, Resources Regulator, Mine Safety Operations, Subsidence Advisory NSW (Mine Subsidence Board) and key infrastructure stakeholders including Wollondilly Shire Council, Endeavour Energy, Telstra and Jemena have also been consulted as part of the Subsidence Management Plan (SMP) approval process.

1.4. Limitations

This Management Plan is based on the predictions of the effects of mining on surface infrastructure as provided in Report No. MSEC647 by Mine Subsidence Engineering Consultants (MSEC, 2014). Predictions are based on the planned configuration of Longwall 32 at Tahmoor Coking Coal Operations (as shown in Drawing No. MSEC945-11-01), along with available geological information and data from numerous subsidence studies for longwalls previously mined in the area.

Survey marks considered in this Plan have been identified using from SS's Survey Control Information Management System (SCIMS) online portal.

The impacts of mining on surface and sub-surface features have been assessed in detail. However, it is recognised that the prediction and assessment of subsidence can be relied upon only to a certain extent. The limitations of the prediction and assessment of mine subsidence are discussed in report MSEC647 by Mine Subsidence Engineering Consultants.

As discussed in the report, there is a low probability that ground movements and their impacts could exceed the predictions and assessments. However, if these potentially higher impacts are considered prior to mining, they can be managed. This Management Plan will not necessarily prevent impacts from longwall mining, but will limit the impacts by establishing appropriate procedures that can be followed should evidence of increased impacts emerge.

1.5. Objectives

The objectives of this Management Plan are to establish procedures to measure, control, mitigate and repair potential impacts that might occur to SS infrastructure.

The objectives of the Plan have been developed 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 on public property are not put at risk due to mine subsidence;
- Disruption and inconvenience should be kept to minimal levels;
- Monitor ground movements of the permanent survey control marks;
- Notify surveyors and other users that the survey marks are potentially affected by subsidence;
- Provide a forum to report, discuss and record impacts to the surface. This will involve Tahmoor Coking Coal Operations, SS, relevant government agencies and consultants, as required; and
- Establish lines of communication and emergency contacts.

1.6. Scope

The Management Plan is to be used to protect and monitor the condition of the SS infrastructure identified to be at risk due to mine subsidence and to notify surveyors and other users that the survey marks are potentially affected by subsidence.

The major items at risk are the survey control marks.

1.7. Proposed mining schedule

It is planned that Longwall 32 will extract coal working north-west from the south-eastern end. This Management Plan covers longwall mining until completion of mining in Longwall 32 and for sufficient time thereafter to allow for completion of subsidence effects. The current schedule of mining is shown in Table 1.2.

Table 1.2 Schedule of mining

Longwall	Start date	Completion date
Longwall 32	September 2018	September 2019

The above schedule is subject to change due to unforeseen impacts on mining progress. Tahmoor Coking Coal operations will keep the SS informed of changes.

1.8. Definition of the active subsidence zone

As a longwall progresses, subsidence begins to develop at a point in front of the longwall face and continues to develop after the longwall passes. The majority of subsidence movement typically occurs within a distance of 150 m in front of the longwall face to a distance of 450 m behind the longwall face.

This is termed the “active subsidence zone” for the purposes of this Management Plan, where surface monitoring is generally conducted. The active subsidence zone for each longwall is defined by the area bounded by the predicted 20 mm subsidence contour for the active longwall and a distance of 150 m in front and 450 m behind the active longwall face, as shown by Fig. 1.1.

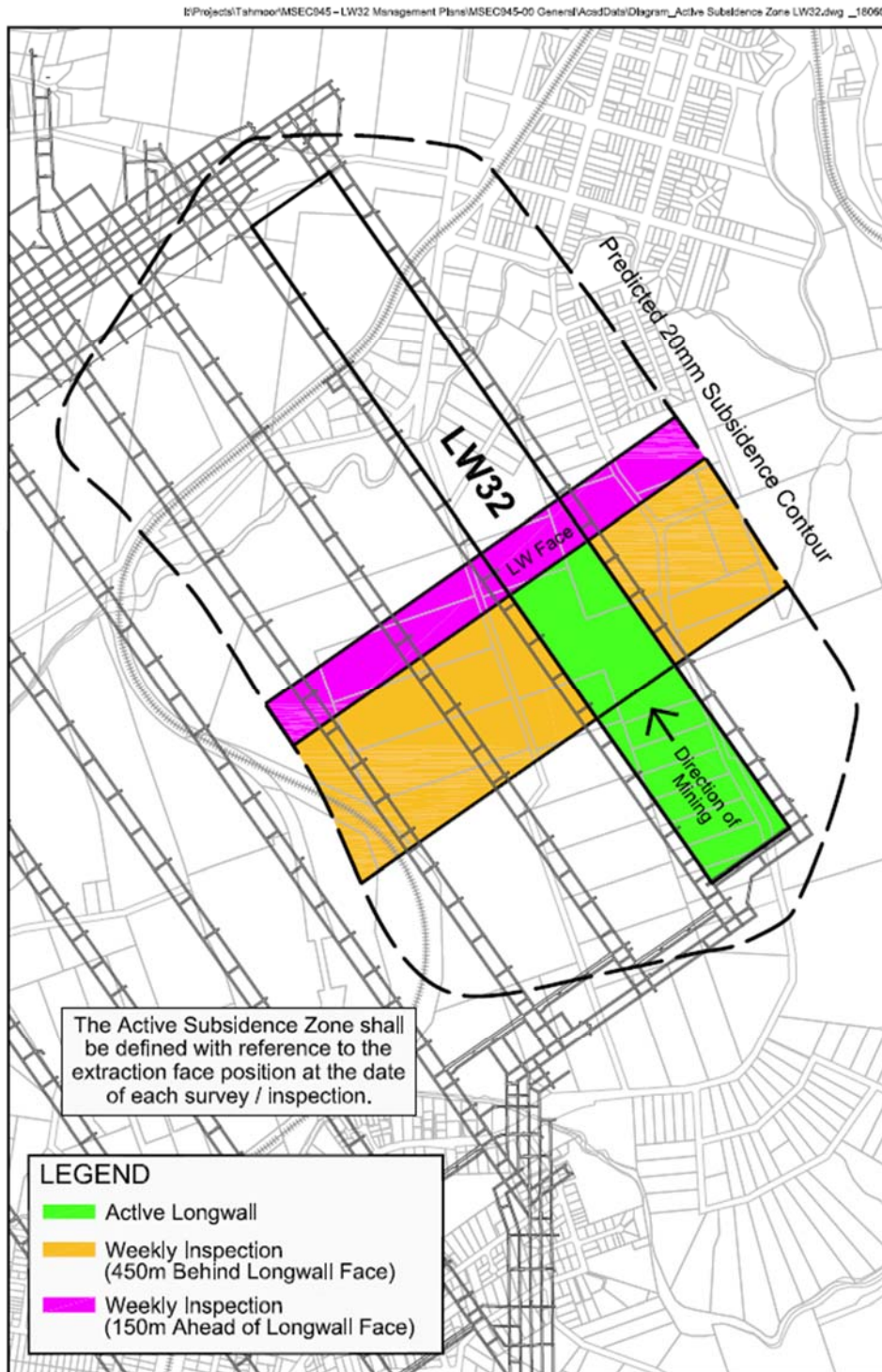


Fig. 1.1 Diagrammatic representation of the active subsidence zone

1.9. Compensation

The Coal Mine Subsidence Compensation Act 2017 (MSC Act) is administered by Subsidence Advisory NSW (Mine Subsidence Board).

Currently, under the Coal Mine Subsidence Compensation Act 2017, any claim for mine subsidence damage needs to be lodged with Subsidence Advisory NSW. Subsidence Advisory NSW staff will arrange for the damage to be assessed by an independent specialist assessor. If the damage is attributable to mine subsidence, a scope will be prepared and compensation will be determined. For further details please refer to **Guidelines – Process for Claiming Mine Subsidence Compensation** at www.subsidenceadvisory.nsw.gov.au.

2.1. NSW Work Health & 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 & 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*
- *reviewing control measures.*

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

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

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

The risk management process has been carried out in accordance with guidelines published by the NSW Department of Planning & 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.

1. identification and understanding of subsidence hazards
2. assessment of risks of subsidence
3. development and selection of risk control measures
4. implementation and maintenance of risk control measures, and
5. continual improvement and change management.

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

1. consultation, co-operation and co-ordination, and
2. 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 Longwall 32 in accordance with the WHS laws.

2.2. General

The method of assessing potential mine subsidence impacts in the Management Plan is consistent with the Australian/New Zealand Standard for Risk Management. The Standard defines the terms used in the risk management process, which includes the identification, analysis, assessment, treatment and monitoring of potential mine subsidence impacts. In this context:-

2.2.1. Consequence

'The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.'¹ The consequences of a hazard are rated from very slight to very severe.

2.2.2. Likelihood

'Used as a qualitative description of probability or frequency.'² The likelihood can range from very rare to almost certain.

2.2.3. Hazard

'A source of potential harm or a situation with a potential to cause loss.'³

2.2.4. Method of assessment of potential mine subsidence impacts

The method of assessing potential mine subsidence impacts combines the likelihood of an impact occurring with the consequence of the impact occurring. In this Management Plan, the likelihood and consequence are combined via the Glencore Coal Assets Australia Risk Matrix to determine an estimated level of risk for particular events or situations. A copy of the Risk Matrix is included in the Appendix of this Management Plan.

The identified risks were also assessed using Glencore's Risk Criteria, which is attached to the Appendix.

¹ AS/NZS 4360:1999 – Risk Management pp2

² AS/NZS 4360:1999 – Risk Management pp2

³ AS/NZS 4360:1999 – Risk Management pp2

3.1. Maximum predicted conventional subsidence parameters

Predicted mining-induced conventional subsidence movements were provided in Report No. MSEC647, which was prepared in support of Tahmoor Coking Coal Operations' SMP Application for Longwalls 31 to 37 and includes prediction due to the extraction of Longwall 32. A summary of the maximum predicted incremental subsidence parameters due to the extraction of Longwall 32 only and the maximum predicted total conventional subsidence parameters due to the extraction of Longwalls 22 to 32, are provided in Table 3.1.

Table 3.1 Maximum predicted incremental conventional subsidence parameters due to the extraction of Longwall 32

Longwall	Maximum predicted subsidence (mm)	Maximum predicted tilt (mm/m)	Maximum predicted hogging curvature (1/km)	Maximum predicted sagging curvature (1/km)
Increment due to LW32 only	700	5.5	0.06	0.12
Total after extraction of LWs 22 to 32	1,225	6.0	0.09	0.13

The values provided in the above table are the maximum predicted conventional subsidence parameters which occur within the general longwall mining area, including the predicted movements resulting from the extraction of Longwalls 22 to 32.

The location of the maximum predicted total subsidence is not directly above Longwall 32. Predicted maximum total subsidence directly above Longwall 32 is approximately 800 mm.

The predicted strains have been determined by analysing the strains measured directly above the previously extracted longwalls at Tahmoor Colliery, referred to as '*above goaf*'. This approach should provide a reasonable indication of the range of potential strains directly above Longwall 32.

The 95 % confidence levels for the maximum total strains that the individual survey bays *above goaf* experienced at any time during mining are 0.9 mm/m tensile and 1.8 mm/m compressive. The 99 % confidence levels for the maximum total strains that the individual survey bays *above goaf* experienced at any time during mining are 1.5 mm/m tensile and 3.5 mm/m compressive.

3.2. Observed subsidence during the mining of Longwalls 22 to 31

The extraction of longwalls at Tahmoor Coking Coal Operations has generally resulted in mine subsidence movements that were typical of those observed above other collieries in the Southern Coalfield of NSW at comparable depths of cover.

However, observed subsidence was greater than the predicted values over Longwalls 24A and the southern parts of Longwalls 25 to 27. Monitoring during the mining of Longwalls 28 to 31 has found that subsidence behaviour has returned to normal levels.

Survey Peg ST14 on Stilton Lane is located above the centreline of Longwall 31. As shown in Fig. 3.1, subsidence developed at an equivalent magnitude to pegs located above previously extracted Longwalls 28 to 30.

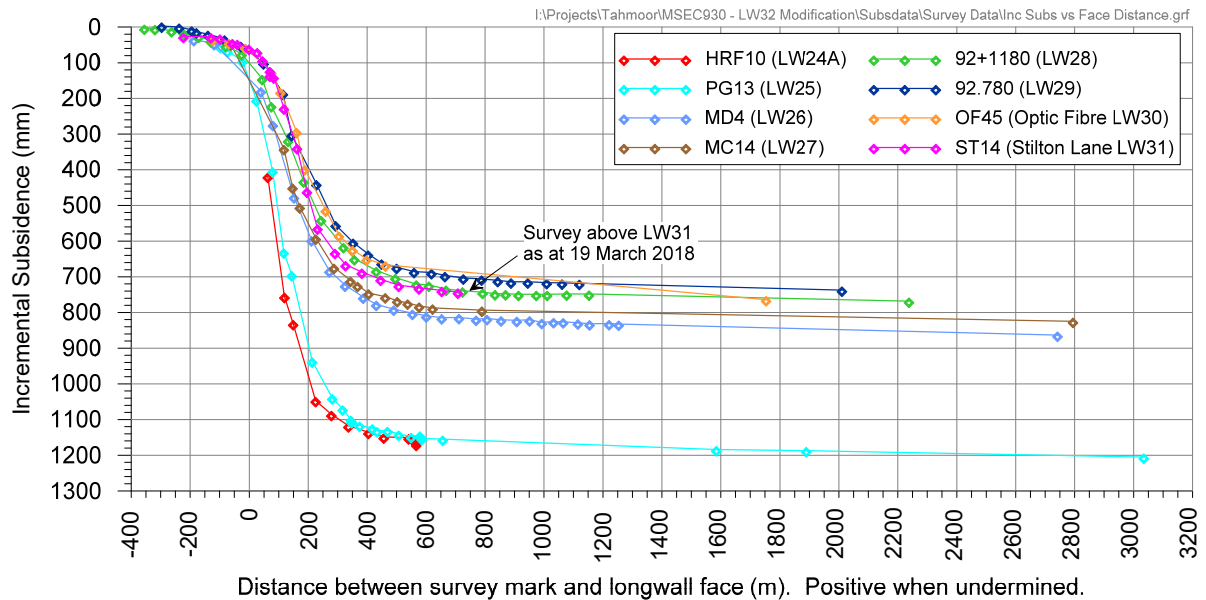


Fig. 3.1 Observed development of subsidence of survey pegs above the centrelines of Longwalls 24A to 31

3.3. Far-field horizontal movements

In addition to the conventional subsidence movements that have been predicted above and adjacent to the longwalls, it is also likely that far-field horizontal movements will be experienced during the extraction of Longwall 32. The predicted far-field horizontal movements have been determined based on the movements measured in the vicinity of the previously extracted longwalls at Tahmoor Coking Coal Operations and at other nearby collieries in the Southern Coalfield.

The observed incremental far-field horizontal movements resulting from the extraction of each longwall, in any location above goaf (i.e. above the currently mined or previously mined longwalls) or above solid coal (i.e. unmined areas of coal) are provided in Fig. 3.2. The observed incremental far-field horizontal movements above solid coal only, i.e. outside the extents of extracted longwalls, are provided Fig. 3.3. The confidence levels, based on fitted Generalised Pareto Distributions (GPDs), have also been shown in these figures to illustrate the spread of the data. It can be seen from Fig. 3.2 and Fig. 3.3 that the magnitude of the observed far-field horizontal movements over solid unmined areas of coal are lower and more consistent than the observed far-field horizontal movements over previously extracted longwalls.

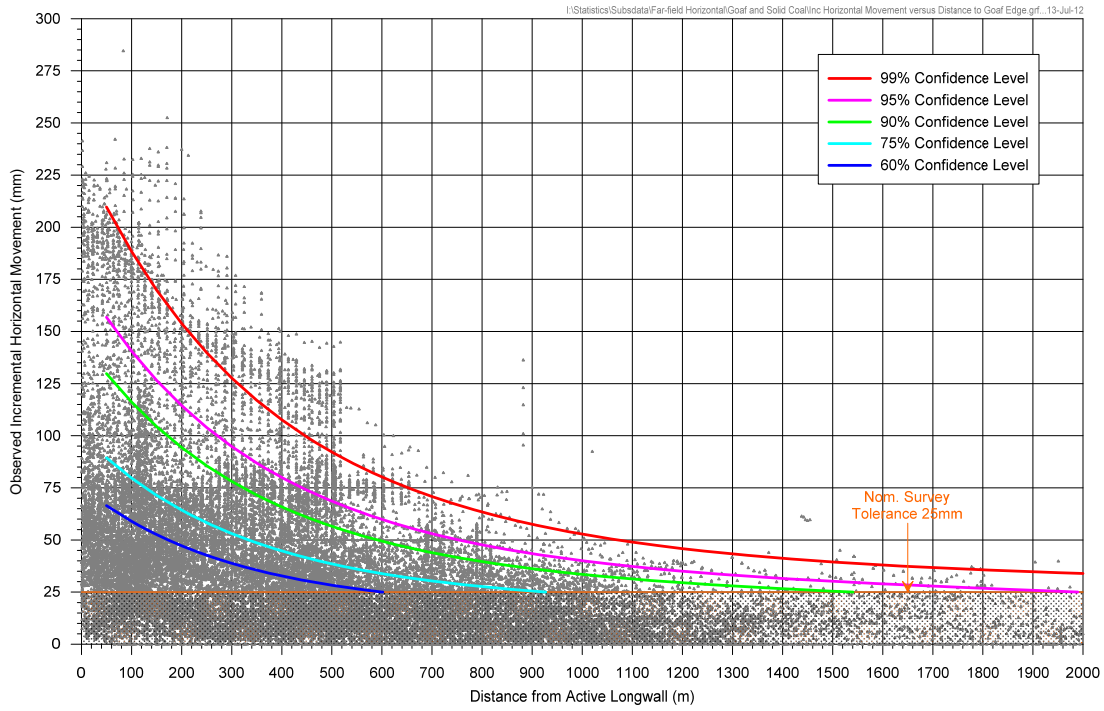


Fig. 3.2 Observed incremental far-field horizontal movements above goaf or solid coal

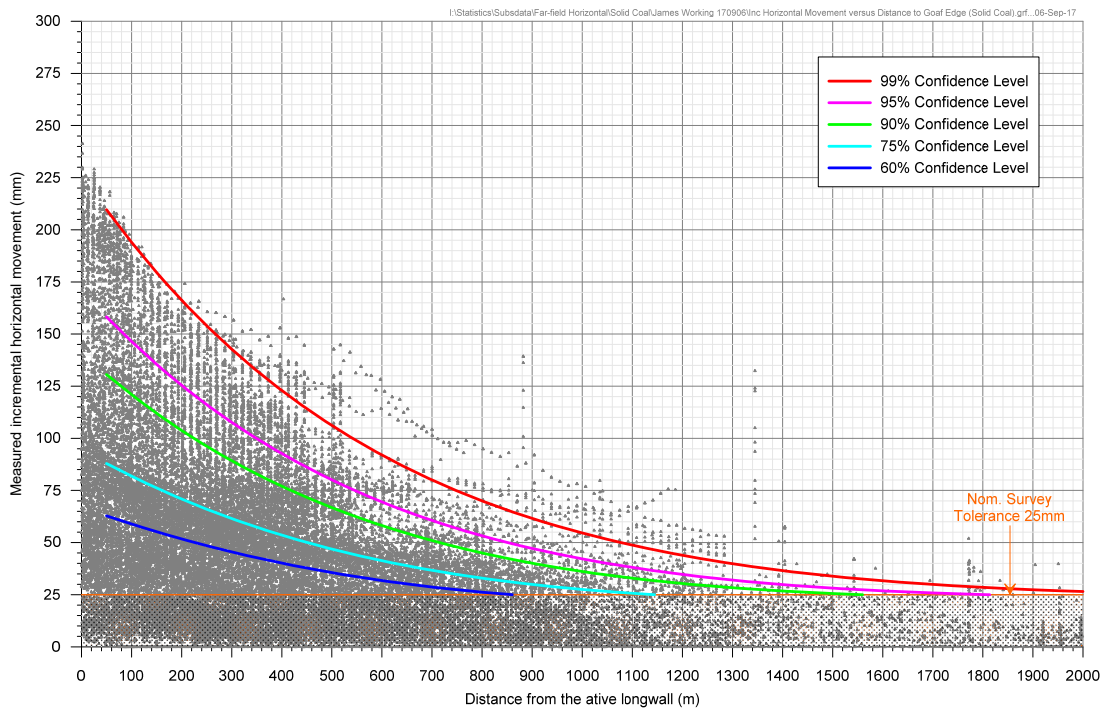


Fig. 3.3 Observed incremental far-field horizontal movements above solid coal only

3.4. Summary of Potential Impacts

The risks associated with the survey control marks are as follows:

- Vertical and horizontal movement of the survey control marks; and
- Use of survey control marks by general surveyors, during and after mining prior to re-calibration.

A summary of the assessed levels of potential impacts on the survey control marks is provided in Table 3.2. The risk assessment has been undertaken in accordance with the Glencore Coal Assets Australia Risk Management Matrix (Glencore, 2017).

Table 3.2 Summary of the risk assessment

Risk	Likelihood	Consequence	Level of potential impact
Movement of survey control marks due to mining	Almost Certain	Minor	Medium
Movement of CORSnet Site PCTN	Rare	Moderate	Low
Use of survey control marks by general surveyors, during and after mining, prior to re-calibration (if not in SCIMS)	Likely	Minor	Medium
Use of survey control marks by general surveyors, during and after mining, prior to re-calibration (notation in SCIMS to indicate that survey marks are subject to mine subsidence)	Rare	Minor	Low
Use of survey control marks by general surveyors, after re-calibration		No risk	

3.4.1. Predicted subsidence movements

There are 13 Permanent Survey Marks and State Survey Marks that are expected to experience vertical subsidence greater than 20 mm due to the extraction of Longwall 32. A summary of the predicted incremental vertical subsidence for each of these survey marks is provided in Table 3.3. Marks noted as destroyed have not been included in the table.

Table 3.3 Predicted incremental vertical subsidence at the survey control marks due to the extraction of Longwall 32

Survey control mark	MGA Easting (m)	MGA Northing (m)	Current status of survey mark	Predicted vertical subsidence due to Longwall 32 (mm)
PM 46947	278986	6212665	Subsidence Area	100
PM 60513	278710	6213970	Subsidence Area	650
PM 60513-1	278713	6213975		650
PM 66466	278085	6213510	Subsidence Area	30
SS 51755	278758	6213747		500
SS 51761	278513	6213695	Subsidence Area	225
SS 144316	279614	6213453		60
SS 20735	279333	6214029		40
SS 126504	279323	6214054		40
SS 175970	279369	6213879		50
SS 175971	279428	6213710		60
SS 175972	279522	6213558		60
MM10403	279909	6212558		150

Under Section 24(1) of the Surveying and Spatial Information Act (2002), a person must not remove, damage, destroy, displace, obliterate or deface any survey mark unless authorised to do so by the Surveyor-General. Spatial Services has introduced a process called “Preservation of Survey Infrastructure” (POSI), which is described in the Surveyor-General’s Direction No. 11 (2017). In accordance with the Direction, Tahmoor Coking Coal Operations is required to make a POSI application to disturb the survey control marks.

There are also several other survey control marks that are located outside the extent of Longwall 32 that are likely to experience either small amounts of vertical subsidence and/or far-field horizontal movements as the longwall is mined. It is possible that other marks that are located up to 3 km outside the limit of vertical subsidence will also be affected by far-field horizontal movements.

The closest CORSnet-NSW station to Longwall 32 is Station ID PCTN, which is located at No. 30 Fairleys Road, Picton at the Picton Sportsground building. The site was verified on 29 April 2016.

The CORSnet site is approximately 3.3 kilometres from Longwall 32 at its closest point. This station is unlikely to experience measurable changes in position due to the mining of Longwall 32, though it is noted that the majority of 3D survey data collected during the mining of previously extracted longwalls has been collected with survey tolerances far in excess of the accuracies of the CORSnet network.

While no measurable changes are expected, it is recommended that detailed analysis be undertaken of the CORSnet readings at the PCTN site during and after mining to monitor for potential mining-induced movement, as part of an ongoing investigation during the mining of future longwalls within the Tahmoor North mining lease.

It will be necessary after completion of Longwall 32, when the ground has stabilised, to re-establish these marks. However, the predicted subsidence parameters shown in Table 3.3 do not represent the final subsidence values that will occur, as further movements are expected to occur following the extraction of future longwalls in the series. Consultation between Tahmoor Coking Coal Operations and SS will be required throughout the mining period to ensure that these survey marks are reinstated at an appropriate time, as required.

4.1. Infrastructure Management Group

The Infrastructure Management Group (IMG) is responsible for taking the necessary actions required to manage the risks that are identified from monitoring the infrastructure and to ensure that the health and safety of people who may be present on public property are not put at risk due to mine subsidence. The IMG develops and reviews this management plan, collects and analyses monitoring results, determines potential impacts and provides advice regarding appropriate actions. The members of the IMG are Tahmoor Coking Coal Operations, SS and Mine Subsidence Engineering Consultants. Subsidence Advisory NSW acts as an observer.

4.2. Mitigation measures

The survey control marks that may be affected by mine subsidence will be noted on SS's Survey Control Information Management System (SCIMS) online portal until such time that they are re-calibrated. SS will be notified via the POSI application process.

4.3. Monitoring measures

4.3.1. Surveys directly above and adjacent to Longwall 32

Monitoring lines have been installed along all streets within the urban area above and adjacent to Longwall 32, as shown in Drawing No. MSEC945-00-01. The monitoring lines have been initially surveyed to provide a baseline reference. Monitoring of street survey lines will be conducted for every 200 m of longwall travel as a minimum for marks located within the active subsidence zone.

4.3.2. Far field monitoring network

Tahmoor Coking Coal Operations has installed a far field monitoring survey network. These include a far field horizontal movement monitoring program to investigate the potential for differential horizontal movements across the Nepean Fault.

- Thirlmere Way Rail Underbridge (89.326 km)
- Connellan Crescent Railway Overbridge (89.080 km)
- Argyle Street Rail Underbridge (86.13 km)
- Picton Viaduct (85.42 km)
- Princes Street Overbridge (85.17km)
- Picton Tunnel (87.85 km)
- Victoria Road Bridge over Stonequarry Creek

The locations of the structures and far field survey marks are shown in Drawing No. MSEC945-00-02. Two pegs have been installed at the Picton Viaduct and Victoria Road Bridge as these structures span the surface expression of the Nepean Fault.

Absolute 3D surveys

Ground pegs were installed at the above locations during the mining of Longwall 31. The pegs will be surveyed in absolute 3D on a monthly basis during the extraction of Longwall 32.

Continuous GNSS Monitoring

The GNSS points are fixed survey stations that continuously measure their absolute horizontal and vertical position in real time. In addition to the absolute 3D ground survey pegs, continuous GNSS monitoring points were installed at seven sites during the mining of Longwall 31.

- Picton Viaduct at 85.42 km – two units
- Picton Tunnel at 87.85 km
- Victoria Road Bridge over Stonequarry Creek
- Sydney Water Picton Water Recycling Plant – three units

The two units at the Picton Viaduct have been installed in the ground at each end of the Viaduct, as this structure spans the surface expression of the Nepean Fault. The locations are shown in Drawing No. MSEC945-00-02.

The GNSS system will record an average reading for each day and the data will be reviewed weekly during active subsidence. A more regular review of the data will be considered if significant absolute or differential movements are observed.

The positions of the GNSS points have been correlated with CORSnet data following the completion of Longwall 31, with no measurable movement observed.

4.4. Triggers and Responses

Once the survey marks have been noted on SS's Survey Control Information Management System (SCIMS) online portal, no further triggers are required.

The completion of Longwall 32 will trigger a review of the status of survey marks on the SCIMS site and re-establishment of survey marks to the satisfaction of Spatial Services.

In the case of the PCTN CORSnet station, Tahmoor Coking Coal Operations will notify SS if measurable mining-induced movements are detected at its GNSS Site 1, which is located above the Picton Railway Tunnel. This will trigger a review of potential mining-induced movements at the PCTN site.

4.5. Subsidence Impact Management Procedures

The risk control procedures are provided in Table 4.1. The procedures include responses if triggered by the monitoring results.

Table 4.1 Risk control procedures during the extraction of Tahmoor Coking Coal Operations' Longwall 32

Infrastructure	Hazard / Impact	Risk	Trigger	Control procedure/s	Frequency	By Whom?
Survey control marks	Movement of survey control marks	Medium	None	Notify SS via POSI application of predicted subsidence movements of the permanent survey control marks	Prior to mining Longwall 32	Tahmoor Coking Coal Operations
	Movement of PCTN CORSnet station	Low	None	Ongoing monitoring and review of far field monitoring network, including GNSS network	Monthly	Tahmoor Coking Coal Operations
			Measurable movement of GNSS Site 1 at Picton Railway Tunnel	Contact SS to conduct review of PCTN site	As required	Tahmoor Coking Coal Operations
	Use of survey control marks by general surveyors, during and after mining, affecting results (prior to re-calibration)	Low / High	None	Provide longwall update	Weekly	Tahmoor Coking Coal Operations
				Provide survey information	As survey results become available	Tahmoor Coking Coal Operations
				Notation in SCIMS that survey control marks are subject to subsidence on receipt of POSI application	Before mining	SS
				Notify SS when subsidence is complete	After mining and subsidence are complete	Tahmoor Coking Coal Operations
				Permanent survey marks re-surveyed	After mining and subsidence are complete	Tahmoor Coking Coal Operations

5.1. Consultation, Co-operation and co-ordination

Consultation, co-operation and co-ordination has taken place between Tahmoor Coking Coal Operations and SS prior to the development of this Management Plan, as detailed in Section 1.3.1.

Tahmoor Coking Coal Operations will contact SS at the completion of Longwall 32.

Tahmoor Coking Coal Operations will contact SS if measurable mining-induced movements are observed at GNSS Site 1 on the Picton Railway Tunnel.

5.2. IMG Meetings

The IMG undertakes reviews and, as necessary, revises and improves the risk control measures to manage risks to health and safety, and potential impacts to structures on the property.

The reviews are undertaken weekly during the period of active subsidence based on the results of the weekly surveys and visual inspections and summarised in the monitoring reports, as described in Section 5.1.

The purpose of the reviews is to:

- Detect changes, including the early detection of potential impacts on SS's infrastructure;
- Verify the risk assessments previously conducted;
- Ensure the effectiveness and reliability of risk control measures; and
- Support continual improvement and change management.

IMG meetings may be held between Tahmoor Coking Coal Operations and SS for discussion and resolution of issues raised in the operation of the Management Plan. The frequency of IMG Meetings will be as agreed between Tahmoor Coking Coal Operations and SS.

IMG Meetings will discuss any incidents reported in relation to the relevant infrastructure, the progress of mining, the degree of mine subsidence that has occurred, and comparisons between observed and predicted ground movements.

It will be the responsibility of the meeting representatives to determine whether the incidents reported are due to the impacts of mine subsidence, and what action will be taken in response.

In the event that a significant mine subsidence impact is observed, any party may call an IMG Meeting, with one day's notice, to discuss proposed actions and to keep other parties informed of developments in the monitoring of the infrastructure.

6.0 AUDIT AND REVIEW

This Management plan has been 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.
- 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.

- Observation of greater impacts on surface features due to mine subsidence than was previously expected.
- Observation of fewer impacts or no impacts on surface features due to mine subsidence than was previously expected.
- Observation of significant variation between observed and predicted subsidence.

Should an audit of the Management Plan be required during that period, an auditor shall be appointed by Tahmoor Coking Coal Operations to review the operation of the Management Plan and report at the next scheduled Plan Review Meeting.

7.0 RECORD KEEPING

Tahmoor Coking Coal Operations will keep and distribute minutes of any IMG Meeting.

8.0 CONTACT LIST

Organisation	Contact	Phone	Email / Mail	Fax
NSW Department of Planning and Environment – Resources Regulator	Phil Steuart	(02) 4063 6484	phil.steuart@planning.nsw.gov.au	-
	Gang Li	(02) 4063 6429 0409 227 986	gang.li@planning.nsw.gov.au	-
Spatial Services, Division of Department of Finance, Service and Innovation	Vittorio Sussanna	(02) 8224 3635	Vittorio.Sussanna@finance.nsw.gov.au	-
Spatial Services, Division of Department of Finance, Service and Innovation A/Senior Surveyor – Survey Operations Metropolitan	Joel Edwards*	(02) 4925 9983	Joel.Edwards@finance.nsw.gov.au	-
Subsidence Advisory NSW	Matthew Montgomery	(02) 4677 1967 0425 275 564	matthew.montgomery@finance.nsw.gov.au	(02) 4677 2040
Mine Subsidence Engineering Consultants (MSEC)	Daryl Kay*	(02) 9413 3777 0416 191 304	daryl@minesubsidence.com	-
SIMEC Mining Tahmoor Coking Coal Operations Environment and Community Manager	Ron Bush	(02) 4640 0156 0437 266 998	Ron.Bush@simecgfg.com	(02) 4640 0140
SIMEC Mining Tahmoor Coking Coal Operations Environment and Community Officer	Belinda Clayton*	(02) 4640 0133 0436 331 630	Belinda.Clayton@simecgfg.com	(02) 4640 0140

APPENDIX A.

Please refer to the following documents:

- Drawing No. MSEC945-00-01 Monitoring over Longwall 32
- Drawing No. MSEC945-00-02 Far field Monitoring over Longwall 32
- Drawing No. MSEC945-11-01 Survey control marks
- Glencore (2017) Glencore Coal Assets Australia Risk Management Matrix, Glencore, May 2017.

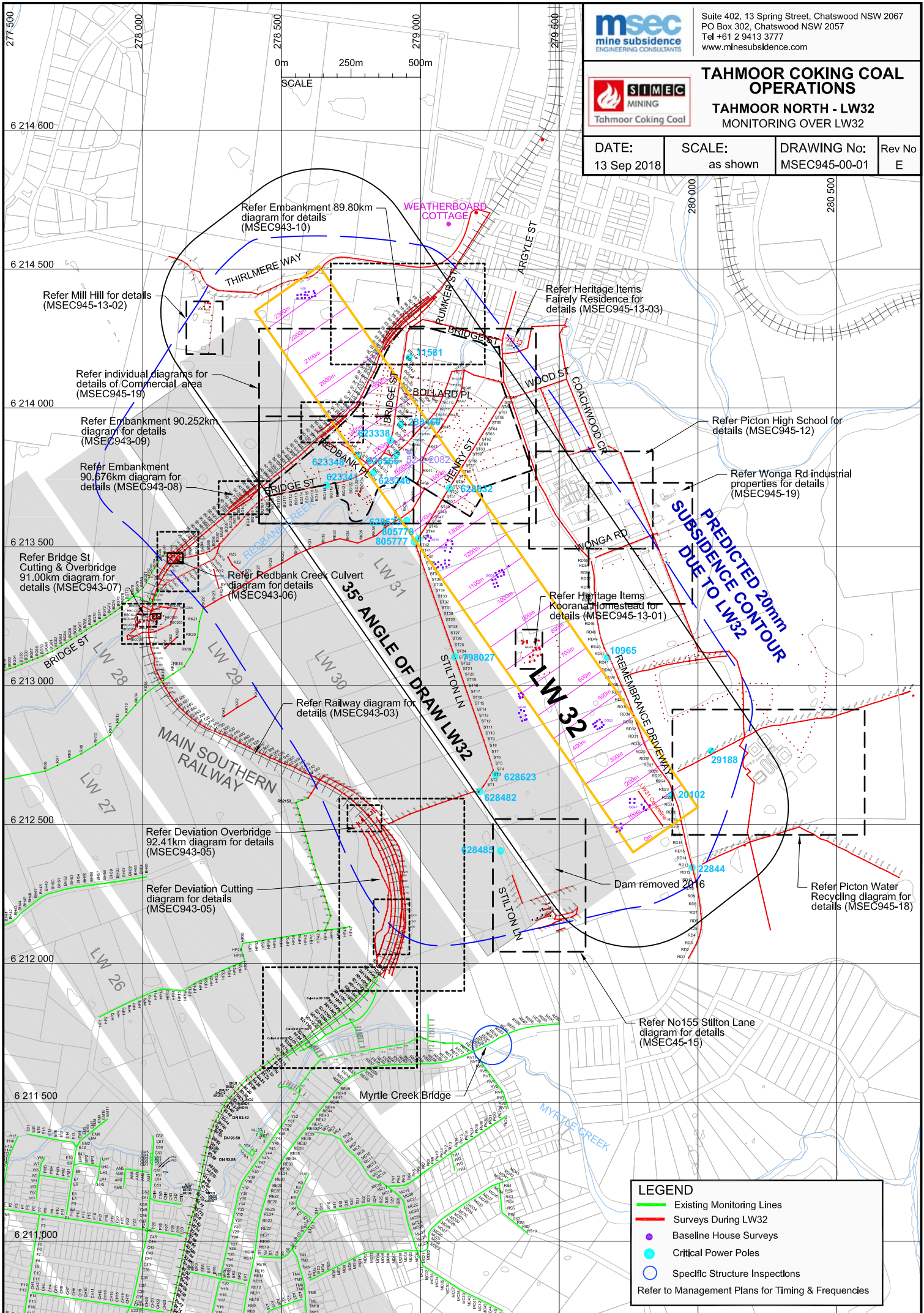


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TAHMOOR COKING COAL OPERATIONS
TAHMOOR NORTH - LW32
MONITORING OVER LW32

DATE: 13 Sep 2018	SCALE: as shown	DRAWING No: MSEC945-00-01	Rev No E
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LEGEND

- Existing Monitoring Lines
- Surveys During LW32
- Baseline House Surveys
- Critical Power Poles
- Specific Structure Inspections

Refer to Management Plans for Timing & Frequencies

**PREDICTED 20mm
 SUBSIDENCE CONTOUR
 DUE TO LW32**

35° ANGLE OF DRAW LW32

- Refer Embankment 89.80km diagram for details (MSEC943-10)
- Refer Mill Hill for details (MSEC945-13-02)
- Refer individual diagrams for details of Commercial area (MSEC945-19)
- Refer Embankment 90.252km diagram for details (MSEC943-09)
- Refer Embankment 90.576km diagram for details (MSEC943-08)
- Refer Bridge St Cutting & Overbridge 91.00km diagram for details (MSEC943-07)
- Refer Redbank Creek Culvert diagram for details (MSEC943-06)
- Refer Railway diagram for details (MSEC943-03)
- Refer Deviation Overbridge 92.41km diagram for details (MSEC943-05)
- Refer Deviation Cutting diagram for details (MSEC943-05)
- Refer No155 Stilton Lane diagram for details (MSEC45-15)
- Refer Picton Water Recycling diagram for details (MSEC945-18)
- Refer Picton High School for details (MSEC945-12)
- Refer Wonga Rd industrial properties for details (MSEC945-19)
- Refer Heritage Items Fairley Residence for details (MSEC945-13-03)
- Refer Heritage Items Koorana Homestead for details (MSEC945-13-01)
- Refer Embankment 89.80km diagram for details (MSEC943-10)
- Refer Embankment 90.252km diagram for details (MSEC943-09)
- Refer Embankment 90.576km diagram for details (MSEC943-08)
- Refer Bridge St Cutting & Overbridge 91.00km diagram for details (MSEC943-07)
- Refer Redbank Creek Culvert diagram for details (MSEC943-06)
- Refer Railway diagram for details (MSEC943-03)
- Refer Deviation Overbridge 92.41km diagram for details (MSEC943-05)
- Refer Deviation Cutting diagram for details (MSEC943-05)
- Refer No155 Stilton Lane diagram for details (MSEC45-15)
- Refer Picton Water Recycling diagram for details (MSEC945-18)



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TAHMOOR COKING COAL OPERATIONS
TAHMOOR NORTH - LW32
 FAR FIELD MONITORING OVER LW32

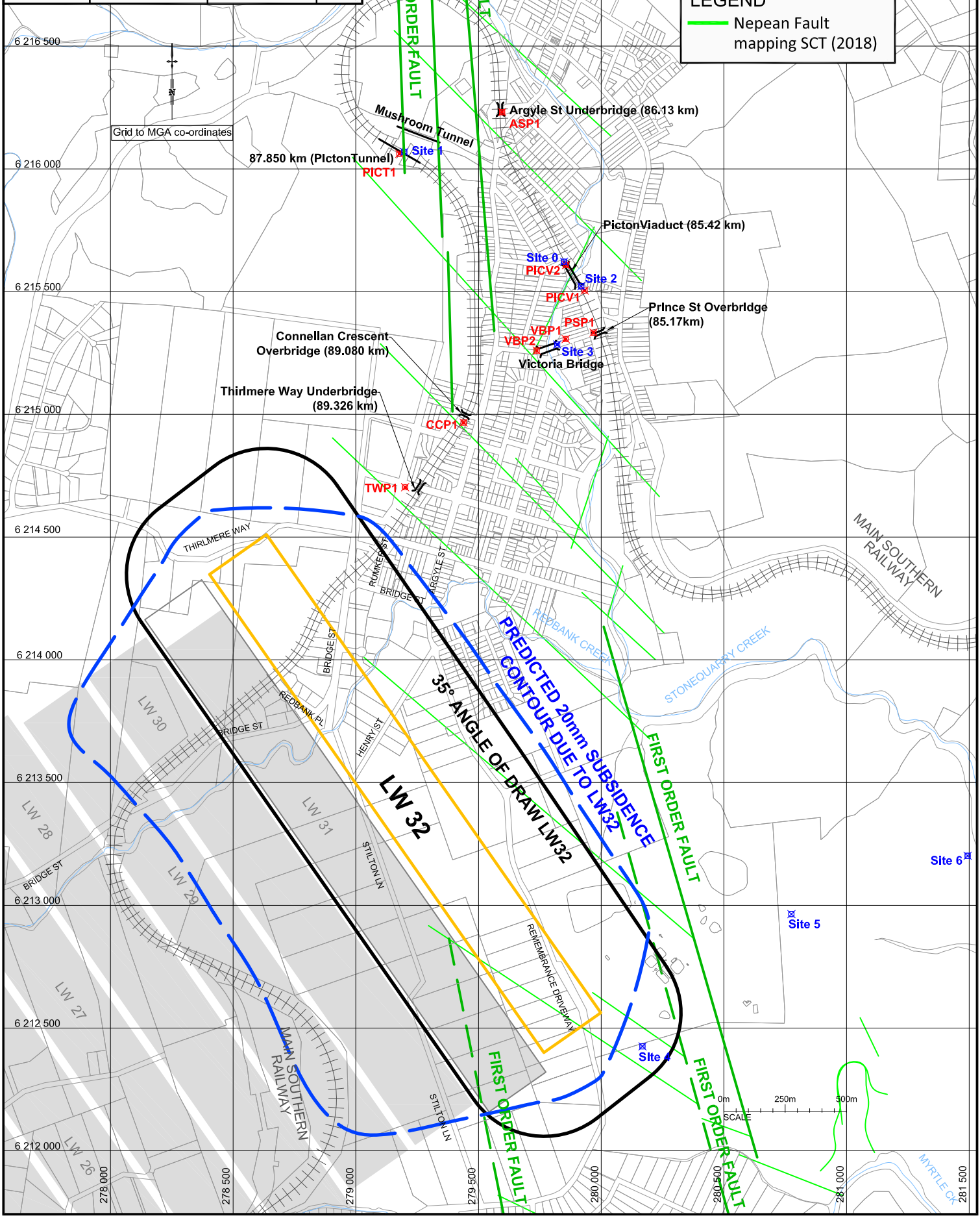
DATE: 26 Jul 2018	SCALE: as shown	DRAWING No: MSEC945-00-02	Rev No C
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LEGEND

- FAR FIELD POINTS
- GNSS POINTS

LEGEND

- Nepean Fault mapping SCT (2018)



Appendix A - GLENCORE COAL ASSETS AUSTRALIA RISK MANAGEMENT MATRIX

GLENCORE COAL ASSETS AUSTRALIA RISK MATRIX

CONSEQUENCE [potential foreseeable outcome of the event]

	Health & Safety	Environment	Financial Impact	Image & Reputation / Community	Legal & Compliance
5 Catastrophic	<ul style="list-style-type: none"> Multiple fatalities Multiple cases of permanent total disability / health effects 	<ul style="list-style-type: none"> Environmental damage or effect (permanent; >10 years) Requires major remediation 	<ul style="list-style-type: none"> >\$600M investment return >\$100M operating profit >\$20M property damage 	<ul style="list-style-type: none"> Negative media coverage at international level Loss of multiple major customers or large proportion of sales contracts Loss of community support Significant negative impact on the share price 	<ul style="list-style-type: none"> Major litigation / prosecution at Glencore corporate level Nationalisation / loss of licence to operate
4 Major	<ul style="list-style-type: none"> Fatality or permanent incapacity / health effects 	<ul style="list-style-type: none"> Long-term (2 to 10 years) impact Requires significant remediation 	<ul style="list-style-type: none"> \$60-600M investment return \$20-100M operating profit \$2-20M property damage 	<ul style="list-style-type: none"> Negative media coverage at national level Scrutiny from government and NGOs Complaints from multiple "final" customers Loss of major customer Loss of community support Negative impact on share price 	<ul style="list-style-type: none"> Major litigation / prosecution at Division level
3 Moderate	<ul style="list-style-type: none"> Lost time / disabling injury / occupational health effects / multiple medical treatments 	<ul style="list-style-type: none"> Medium-term (<2 years) impact Requires moderate remediation 	<ul style="list-style-type: none"> \$6-60M investment return \$2-20M operating profit \$200K-2M property damage 	<ul style="list-style-type: none"> Negative media coverage at local / regional level over more than one day Complaint from a "final" customer Off-spec product Community complaint resulting in social issue 	<ul style="list-style-type: none"> Major litigation / prosecution at Operation level
2 Minor	<ul style="list-style-type: none"> Medical Treatment Injury (MTI) / occupational health effects Restricted Work Injury (RWI) 	<ul style="list-style-type: none"> Short-term impact Requires minor remediation 	<ul style="list-style-type: none"> \$600K-6M investment return \$200K-2M operating profit \$10-200K property damage 	<ul style="list-style-type: none"> Complaint received from stakeholder or community Negative local media coverage 	<ul style="list-style-type: none"> Regulation breaches resulting in fine or litigation
1 Negligible	<ul style="list-style-type: none"> First Aid Injury (FAI) / illness 	<ul style="list-style-type: none"> No lasting environmental damage or effect Requires minor or no remediation 	<ul style="list-style-type: none"> <\$600K investment return <\$200K operating profit <\$10K property damage 	<ul style="list-style-type: none"> Negligible media coverage 	<ul style="list-style-type: none"> Regulation breaches without fine or litigation

LIKELIHOOD [of the event occurring with that consequence]

Basis of Rating	E - Rare	D - Unlikely	C - Possible	B - Likely	A - Almost Certain
LIFETIME OR PROJECT OR TRIAL OR FIXED TIME PERIOD OR NEW PROCESS / PLANT / R&D	Unlikely to occur during a lifetime OR Very unlikely to occur OR No known occurrences in broader worldwide industry	Could occur about once during a lifetime OR More likely <u>NOT</u> to occur than to occur OR Has occurred at least once in broader worldwide industry	Could occur more than once during a lifetime OR As likely to occur as not to occur OR Has occurred at least once in the mining / commodities trading industries	May occur about once per year OR More likely to occur than not occur OR Has occurred at least once within Glencore	May occur several times per year OR Expected to occur OR Has occurred several times within Glencore
5 Catastrophic	15 (M)	19 (H)	22 (H)	24 (H)	25 (H)
4 Major	10 (M)	14 (M)	18 (H)	21 (H)	23 (H)
3 Moderate	6 (L)	9 (M)	13 (M)	17 (H)	20 (H)
2 Minor	3 (L)	5 (L)	8 (M)	12 (M)	16 (M)
1 Negligible	1 (L)	2 (L)	4 (L)	7 (M)	11 (M)

Consequence Category	Consequence Type	Ownership	Action
Cat. 5	Catastrophic Hazard	Divisional / Functional / Operational / Asset Leadership	<ul style="list-style-type: none"> Quantitative or semi-quantitative risk assessment required. Capital expenditure will be justified to achieve ALARP ('As Low As Reasonably Practicable'). Catastrophic Hazard Management Plans (CHMP) must be implemented where practical, Crisis Management Plans (CMP) tested and Catastrophic Event Recovery Plans (CERP) developed.
Cat. 4 (Health & Safety consequence)	Fatal Hazard	Divisional / Functional / Operational / Asset Leadership	<ul style="list-style-type: none"> Glencore SafeWork Fatal Hazard Protocols or appropriate management plans must be applied. Capital expenditure will be justified to achieve ALARP.
Risk Rank	Risk Rating	Ownership	Action
17 to 25	High Risk	Divisional / Functional / Operational / Asset Leadership	<ul style="list-style-type: none"> Install additional HARD and SOFT controls to achieve ALARP. Capital expenditure will be justified to achieve ALARP.
7 to 16	Medium Risk	Operational / Asset Leadership	<ul style="list-style-type: none"> install additional HARD and SOFT controls if necessary to achieve ALARP. Capital expenditure may be justified.
1 to 6	Low Risk	Operational / Asset Leadership	<ul style="list-style-type: none"> Install additional controls if necessary to achieve ALARP. Capital expenditure is not usually justified.

Table 3-3 - Risk Control Effectiveness (RCE)

RCE	Guide
Poor or no existing controls	<ul style="list-style-type: none"> Significant control gaps or no credible control; Either controls do not treat root causes, are non-existent or, if they exist, they are ineffective; Management has no confidence that any degree of control is being achieved due to poor control design; Very limited or no operational effectiveness.
Require improvement	<ul style="list-style-type: none"> Most controls are designed correctly and are in place and effective; Controls may only treat some of the root causes of the risk, and/or are not currently effective and/or there may be an over-reliance on "reactive" controls; Management has doubts about operational effectiveness and reliability; More work is required to improve operating effectiveness.
Satisfactory	<ul style="list-style-type: none"> Controls are well designed and appropriate for the risk; Controls are largely "preventative" and address the root causes; Management believes that they are effective and reliable at all times; Nothing more to be done except review and monitor the existing controls.

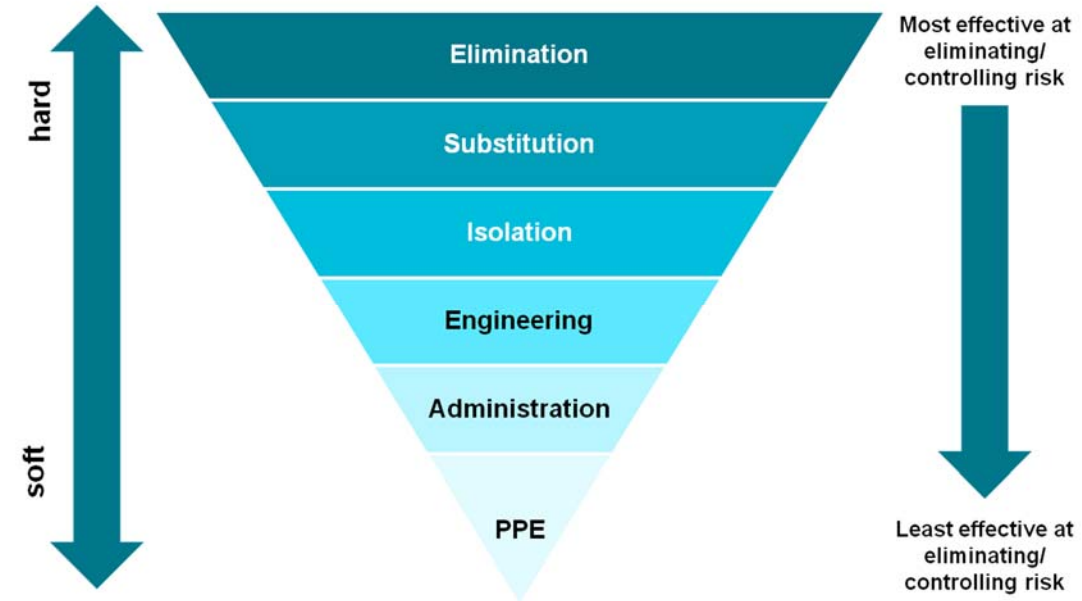


Figure 3-4 – Hierarchy of control

Table 3-4 - Priority for risk treatment authority for continued toleration of risk (applicable for risk assessment level 3 and 4)

Current risk rank	Action	Timing for authority	Authority for continued toleration of current level of risk
23 to 25	The activity must be stopped immediately until action to reduce the level of risk to less than 23 is undertaken or authority to continue is received.	Immediately to within 24 hours.	CE/COO Notification to CE prior to granting of authority to continue
17 to 22	The activity must be stopped immediately until action to reduce the level of risk to less than 17 is undertaken or authority to continue is received.	The activity must be stopped immediately until action to reduce the level of risk to less than 17 is undertaken or authority to continue is received.	Directors/COO Notification to COO prior to granting of authority to continue
10 to 16	Take action to reduce the level of risk to less than 10 or authority to continue is received.	Within 1 month.	General Managers / Operations Managers / Project Managers
7 to 9	Take action to reduce the level of risk to less than 7 or authority to continue is received.	Within 1 month.	Superintendents/ Managers / Project Team
1 to 6	Tolerable risk unless circumstances change	Ongoing control as part of a management system.	N/A