SIMEC Mining:

Tahmoor South Longwalls S2A to S6A

Subsidence Management Plan for potential impacts to MKD Machinery, 3165 Remembrance Drive, Bargo

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References:-

AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines

JMA (2023a) *Hazard Identification Report No. R0831: 3165 Remembrance Driveway, Bargo*, JMA Solutions, May 2023.

JMA (2023b) *Pre-Mining Inspection Report No. R0821, 3165 Remembrance Driveway, Bargo*, JMA Solutions, February 2023.

JMA (2023c) *3165 Remembrance Driveway, silo superstructure and machinery shed assessment*, JMA Solutions, Report No. 20230602-R1, 28 July 2023

MSIA (2023) *Workplace Inspection to identify increased risk from Mining Induced Subsidence* from *Tahmoor Mine for MKD Machinery*, Mine Safety Institute of Australia, 16 May 2023.

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 (2022) *Tahmoor South- Longwalls S1A to S6A - Subsidence ground movement predictions and subsidence impact assessments for natural features and surface infrastructure in support of the Extraction Plan Application. (Report No. MSEC1192, Revision A, May 2022)*, prepared by Mine Subsidence Engineering Consultants.

Tahmoor Coal (2023) *Risk Assessment Report – MKD Machinery*. Tahmoor South, June 2023.

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Tables

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

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

Drawings

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

Drawing No.	*Description*	*Revision*
MSEC1193-01-01	Monitoring plan	A
MSEC1193-16-01	No. 3165 Remembrance Drive General Layout	A
MSEC1193-16-02	No. 3165 Remembrance Drive Building Location	A

1.1. Background

Tahmoor Coal Pty Ltd (Tahmoor Coal), owns and operates Tahmoor Mine, an existing underground coal mine located approximately 80 km southwest of Sydney in the Southern Coalfields of New South Wales (NSW). Tahmoor Coal is a wholly owned entity within the SIMEC Mining division of the GFG Alliance group. Tahmoor Coal has extracted 36 longwalls to the north and west of the mine's surface facilities.

Tahmoor Coal received development consent in April 2021 for the Tahmoor South Project, which is an extension of the current Tahmoor Mine underground coal mining within the Bulli seam towards the south of the existing Tahmoor Mine.

Tahmoor Coal received approval in October 2022 for its Extraction Plan for Longwalls S1A to S6A (LW S1A-S6A), which will be the first longwall panels to be extracted in the Tahmoor South domain. The proposed longwalls are located between Tahmoor's surface facilities to the north and the township of Bargo to the south. MKD Machinery at No. 3165 Remembrance Drive, Bargo is located in this area, directly above LW S4A.

The longwall panels are 285 metres in width, with lengths between 1.7 km and 2.0 km. The Bulli Seam is located between 375 metres and 390 metres beneath the surface and the planned mining heights are between 2.1 and 2.2 metres.

This Management Plan provides detailed information about how the risks associated with mining beneath and adjacent to the property will be managed by Tahmoor Coal and MKD Machinery.

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

1.2. MKD Machinery

The location of MKD Machinery in relation to LW S1A-S6A is shown in Drawing No. MSEC1193-16-01. A close-up plan showing the property and MSEC's structure reference labels is shown in Drawing No. MSEC1193-16-02.

A 2023 aerial photograph showing the location of MKD Machinery in relation to LW S1A-S6A is shown in Fig. 1.1.

MKD Machinery is located at No. 3165 Remembrance Drive, Bargo. MKD Machinery is a concrete batching and distribution business and operates 6 days a week. The business shares the address with a rural residence.

The commercial property consists of a site office, cement silo and dry mixing hopper, sedimentation ponds, a conveyor, concrete water tanks, a steel shed and a steel rainwater tank. Some photographs of the structures on the property are provided in Fig. 1.2 to Fig. 1.9.

The property also consists of a new residence, a machinery shed with a first floor residence, a swimming pool, sheds and inground concrete septic tanks. Some photographs of the structures on the property are provided in Fig. 1.10 to Fig. 1.13.

The landowner maintains a grassed air strip for a gyrocopter on the property, as shown in Fig. 1.1. An image of the airstrip is shown in Fig. 1.14.

Photograph courtesy Nearmap

Fig. 1.1 Location of No. 3165 Remembrance Drive, Bargo relative to LW S1A-S6A

Photograph courtesy JMA Solutions

Fig. 1.2 Silo Hopper and small hopper

Photograph courtesy JMA Solutions

Fig. 1.3 Site office

Photograph courtesy JMA Solutions

Fig. 1.4 Hopper and conveyor

Photograph courtesy JMA Solutions

Fig. 1.5 Concrete water tanks

Photograph courtesy MSIA

Fig. 1.6 Sedimentation ponds

Image courtesy Building Inspection Services

Fig. 1.7 Sedimentation ponds and rear concrete block retaining wall

Photograph courtesy JMA Solutions

Fig. 1.8 Internal view of new steel shed

Photograph courtesy JMA Solutions

Fig. 1.9 New steel rainwater tank

Photograph courtesy JMA Solutions

Fig. 1.10 New residence

Photograph courtesy JMA Solutions

Fig. 1.11 Old residence

Photograph courtesy JMA Solutions

Fig. 1.12 Swimming pool

Photograph courtesy JMA Solutions

Fig. 1.13 Buried concrete septic tanks with solar panels in background

Image courtesy Building Inspection Services

Fig. 1.14 Shed and Grassed air strip for gyrocopter

1.3. Consultation

1.3.1. Consultation with business and landowner

Tahmoor Coal has consulted extensively with the landowner at No. 3165 Remembrance Drive, Bargo in relation to mine subsidence effects.

Details regarding consultation and engagement are outlined below:

- Series of newsletters and Tahmoor South Project updates from 01 February 2020 through to current monthly newsletter 2023;
- Invitations to attend Community information sessions via letter box drops dates held 28 April 2020 and 28 July 2022;
- Tahmoor South resident information pack letter box dropped 07 January 2021, 27 January 2021 and 26 August 2021;
- Hazard Identification inspection by structural engineer John Matheson on 10 March 2022;
- Pre-mining inspection by structural engineer John Matheson on 15 September 2022;
- Issued copy of Pre-Mining Inspection report in March 2023;
- Survey installation at property by SMEC in April 2023;
- Workplace inspection by Mark Parcell from Mine Safety Institute of Australia on 16 May 2023;
- Information on structural designs of shed and house requested and supplied in June 2023;
- Site inspection by structural engineer John Matheson and monitoring specialist Rod Sweeting on 20 June 2023; and
- Submission of draft Management Plan for review and comment in July 2023.

Tahmoor Coal will continue to consult regularly with the landowner during the extraction of LW S2A-S6A 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 and key infrastructure stakeholders including Wollondilly Shire Council, Endeavour Energy, Sydney Water, Telstra and Jemena have also been consulted as part of the Extraction Plan 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. MSEC1192 by Mine Subsidence Engineering Consultants (MSEC, 2022). Predictions are based on the planned configuration of LW S1A-S6A at Tahmoor South (as shown in Drawing No. MSEC1193-16-01), along with available geological information and data from numerous subsidence studies for longwalls previously mined in the area.

Infrastructure considered in this Plan has been identified from site visits and aerial photographs and from discussions between Tahmoor Coal representatives and the landowner at No. 3165 Remembrance Drive, Bargo.

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 MSEC1192 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 at No. 3165 Remembrance Drive, Bargo.

The objectives of the Management 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 at No. 3165 Remembrance Drive, Bargo are not put at risk due to mine subsidence;
- Avoid disruption and inconvenience, or, if unavoidable, keep to minimal levels;
- Monitor ground movements and the condition of infrastructure during mining;
- Establish procedures to measure, monitor, control, mitigate and repair infrastructure on the property;
- Initiate action to mitigate or remedy potential significant impacts that are expected to occur on the surface;
- Provide a plan of action in the event that the impacts of mine subsidence are greater than those that are predicted;
- Establish a clearly defined decision-making process to ensure timely implementation of risk control measures for high consequence but low likelihood mine subsidence induced hazards that involve potential serious injury or illness to a person or persons that may require emergency evacuation, entry restriction or suspension of activities at No. 3165 Remembrance Drive, Bargo;
- Provide a forum to report, discuss and record impacts to the surface. This will involve Tahmoor Coal, the landowner at No. 3165 Remembrance Drive, Bargo, relevant government agencies as required, 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 infrastructure at No. 3165 Remembrance Drive, Bargo identified to be at risk due to mine subsidence and to ensure that the health and safety of people who may be present at the property are not put at risk due to mine subsidence. The major items at risk are:

- Buildings and commercial structures;
- Machinery and equipment;
- Services;
- Materials storage and handling;
- Finishes;
- Access and mobility;
- Pavements, fences and gates;
- Swimming pool; and
- Grassed airstrip.

The Management Plan describes measures that will be undertaken as a result of mining LW S2A-S6A only.

1.7. Proposed mining schedule

It is planned that LW S1A-S6A will extract coal working northwest from the southeastern ends. This Management Plan covers longwall mining until completion of mining in LW S6A and for sufficient time thereafter to allow for completion of subsidence effects. The current schedule of mining is shown in Table 1.1.

Table 1.1 Schedule of mining

Longwall	Start Date	Completion Date
LW S1A (complete)	October 2022	June 2023
LW S2A	July 2023	February 2024
LW S3A	March 2024	October 2024
LW S4A	November 2024	June 2025
LW S5A	July 2025	February 2026
LW S6A	March 2026	October 2026

Please note the above schedule is subject to change due to unforeseen impacts on mining progress. Tahmoor Coal will keep the landowner at No. 3165 Remembrance Drive, Bargo informed of changes. LW S1A commenced extraction on 18 October 2022.

1.8. Definition of 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 an area 150 metres in front of the longwall face to an area 450 metres 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 metres in front and 450 metres behind the active longwall face, as shown by Fig. 1.15.

The property at No. 3165 Remembrance Drive, Bargo is located directly above LW S4A. In this case, rates of change in subsidence will increase as each longwall panel approaches the property until the longwall face stops at the finishing end. Rates of change in subsidence will then gradually reduce over time. Monitoring will typically continue for at least one month after the completion of mining but will continue if ongoing adverse changes are observed.

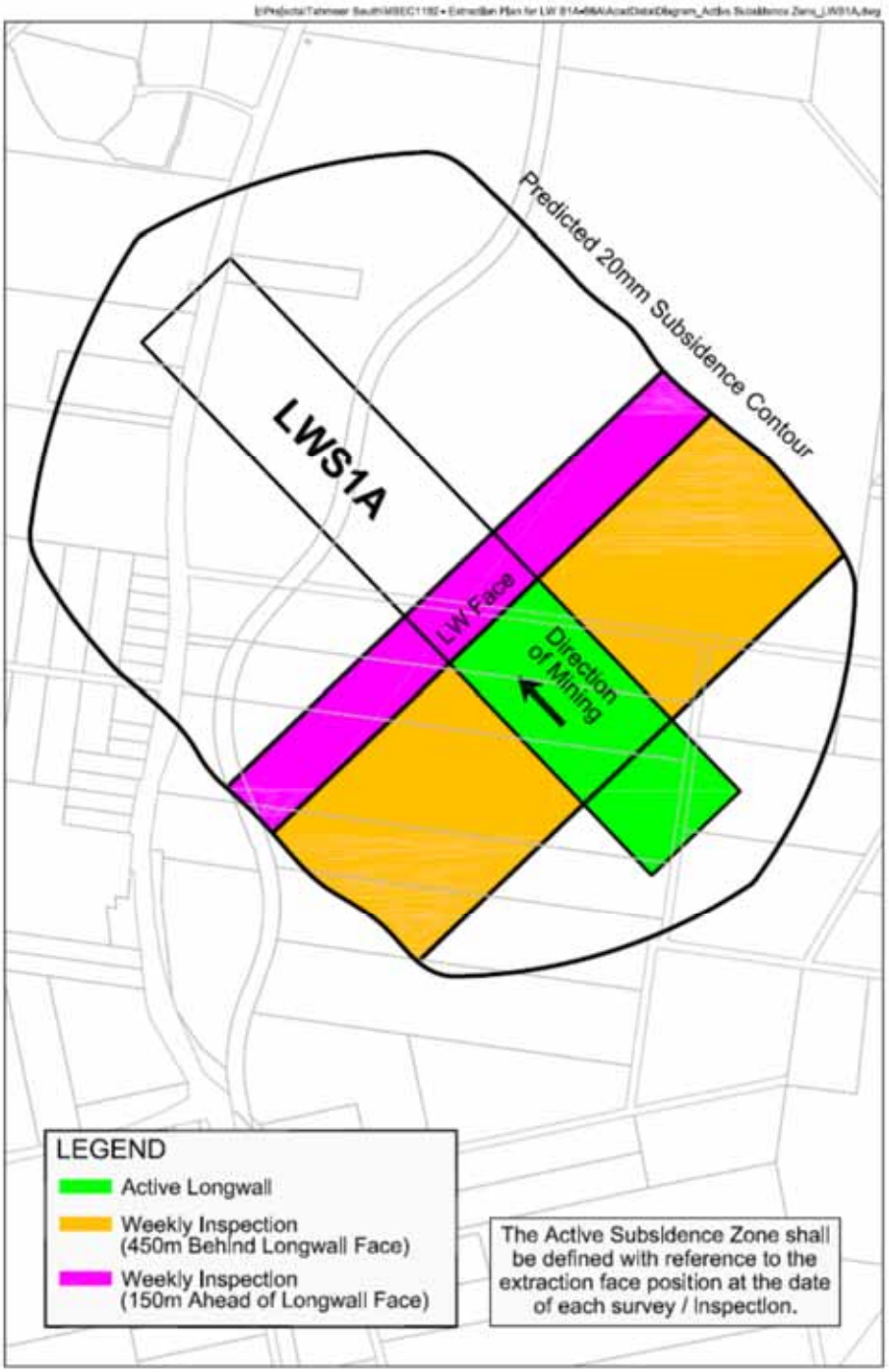

Fig. 1.15 Diagrammatic representation of Active Subsidence Zone

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 2022* commenced on 1 September 2022 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 LW S2A-S6A beneath and adjacent to No. 3165 Remembrance Drive, Bargo 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 (AS/NZS ISO 31000:2009). 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.' The consequences of a hazard are rated from negligible to catastrophic.

2.2.2. Likelihood

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

2.2.3. Hazard

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

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 SIMEC 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.

3.1. Maximum predicted conventional subsidence parameters

Predicted mining-induced conventional subsidence movements were provided in Report No. MSEC1192, which was prepared in support of Tahmoor Coal's Extraction Plan for LW S1A-S6A.

A summary of the maximum predicted values of total conventional subsidence, tilt and curvature, after the extraction of each of the longwalls, is provided in Table 3.1. The predicted ground strains are discussed in Section 3.2. Please refer to Drawing No. MSEC1193-16-02 for map showing locations of each structure.

Table 3.1 Maximum predicted total conventional subsidence, tilt and curvature due to the extraction of LW S1A-S6A at No. 3165 Remembrance Drive, Bargo

Structure (MSEC Reference refer Dwg No. MSEC1193-06-02 for location map)	Description	Maximum predicted total subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km^{-1})	Maximum predicted total sagging curvature (km^{-1})
BRE_515_c01	Hopper	1300	6.0	0.07	0.20
BRE_515_c02	Silo	1300	6.0	0.06	0.20
BRE_515_c03	Shed	1300	6.0	0.07	0.18
BRE_515_c04	Awning	1350	6.0	0.06	0.20
BRE_515_c05	Awning	1350	6.0	0.06	0.20
BRE_515_c07	Shed	1250	4.0	0.05	0.04
BRE_515_c08	Rainwater tank	1150	3.5	0.05	0.04
BRE_515_c09	Dry mixing hopper	1300	6.0	0.06	0.20
BRE_515_c10	Hopper	1350	6.0	0.06	0.20
BRE_515_c11	Concrete water tank	1350	6.0	0.06	0.20
BRE_515_c12	Concrete water tank	1350	6.0	0.06	0.20
BRE_515_c13	Sediment tank	1350	3.5	0.06	0.20
BRE_515_c14	Sediment tank	1350	3.5	0.06	0.19
BRE_515_c15	Sediment pond	1350	3.5	0.06	0.19
BRE_515_c16	Sediment pond	1350	3.5	0.06	0.18
BRE_515_c17	Sediment pond	1350	3.5	0.06	0.16
BRE_515_c18	Sediment pond	1300	3.5	0.06	0.14
BRE_515_c19	Sediment pond	1300	3.5	0.06	0.10
BRE_515_c20	Conveyor	1350	6.0	0.06	0.20
BRE_515_h01	Residence	1300	6.0	0.07	0.20
BRE_515_h02	Residence	1300	6.0	0.09	0.17
BRE_515_p01	Pool	1350	6.0	0.06	0.20
BRE_515_r01	Shed	1300	4.0	0.06	0.20
BRE_515_r02	Shed	1300	4.0	0.06	0.20
BRE_515_t01	Buried Tank	1300	6.0	0.06	0.20
BRE_515_t02	Buried Tank	1350	6.0	0.06	0.20

The predicted tilts provided in the above table are the maxima after the completion of each of the proposed longwalls. The predicted curvatures are the maxima at any time during or after the extraction of each of the proposed longwalls. The values provided in the above table are the maximum predicted total conventional subsidence parameters which occur within 20 metres of the structures. A diagram showing the location of predicted total subsidence contours relative to the property is provided in Fig. 3.1.

Fig. 3.1 Predicted Total Conventional Subsidence Contours after the extraction of LW S6A at No. 3165 Remembrance Drive, Bargo

The majority of the predicted subsidence movements are expected to occur during the extraction of LW S4A. Using the new residence (MSEC Ref. BRE_515_h02) as a guide, a summary of the maximum predicted values of total conventional subsidence due to the extraction of each of the proposed longwalls, is provided in Table 3.2.

Table 3.2 Maximum predicted total conventional subsidence, tilt and curvature due to the extraction of LW S1A-S6A at the new residence

Longwall	Maximum predicted total conventional subsidence (mm)	Maximum predicted total conventional tilt (mm/m)	Maximum predicted total conventional hogging curvature (km^{-1})	Maximum predicted total conventional sagging curvature (km^{-1})
LW S1A	< 20	< 0.5	< 0.01	< 0.01
LW S2A	40	< 0.5	< 0.01	< 0.01
LW S3A	160	1.0	0.01	< 0.01
LW S4A	1000	8.0	0.08	0.19
LW S5A	1250	6.5	0.08	0.20
LW S6A	1350	6.0	0.09	0.20

The longwall by longwall breakdown for the other structures and tanks on the property are similar to those displayed for the new residence above.

It can be seen that minor subsidence movements are predicted to develop during the extraction of LW S1A-S3A. The structures are predicted to experience the majority of subsidence movements during the extraction of LW S4A and LW S5A. Minor ongoing changes are predicted to develop after the extraction of LW S5A.

Subsidence will develop gradually as each longwall face approaches the property from the southeast, passes directly beneath the property and then moves away. Predictions showing the development of subsidence over time at the new residence are shown in Fig. 3.2.

The timing of the periods of active subsidence at each point is based on the current mining schedule, assuming that the longwall face is extracted at a uniform rate from start to finish. As discussed in Section 1.7, the longwall schedule may vary depending on a variety of factors and the predicted timing of subsidence at each point may change.

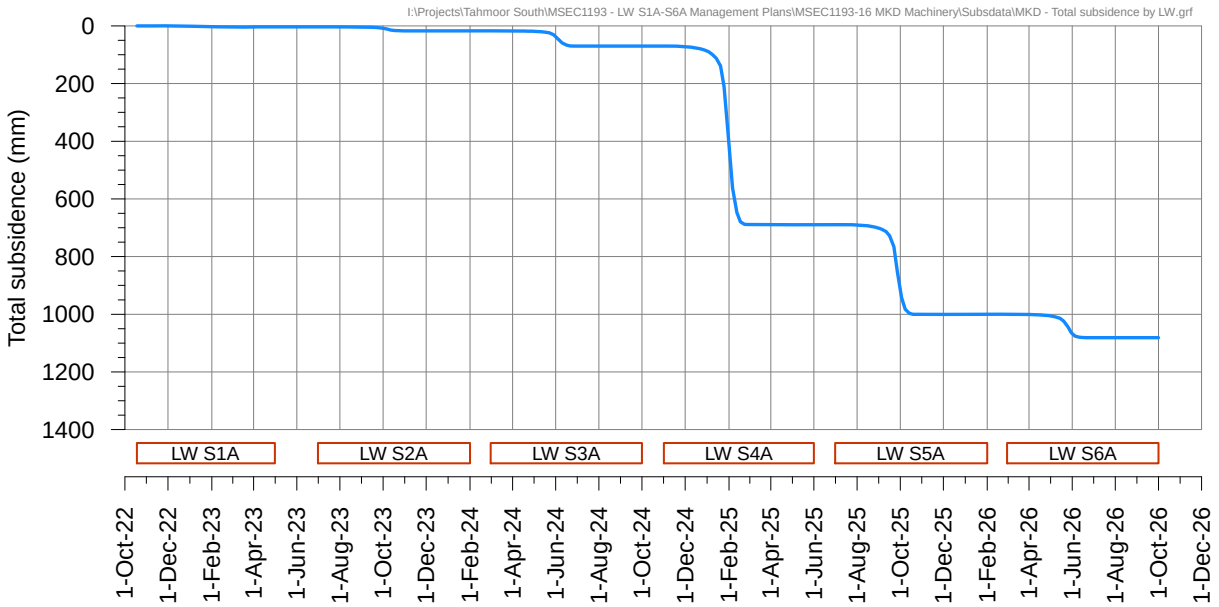

Fig. 3.2 Predicted development of vertical subsidence at the new residence over time during the mining of LWs S1A to S6A

The longwall by longwall breakdown for the other structures on the property are similar to those displayed for the original residence above.

As the property is located above LW S4A in the middle of a series of longwalls, the structures are predicted to experience mining-induced tilts that change in direction with subsidence over time.

Using the silo hopper (MSEC Ref. BRE_515_c02) as a guide, predictions showing the development of subsidence and tilt over time at the silo hopper are shown in Fig. 3.3.

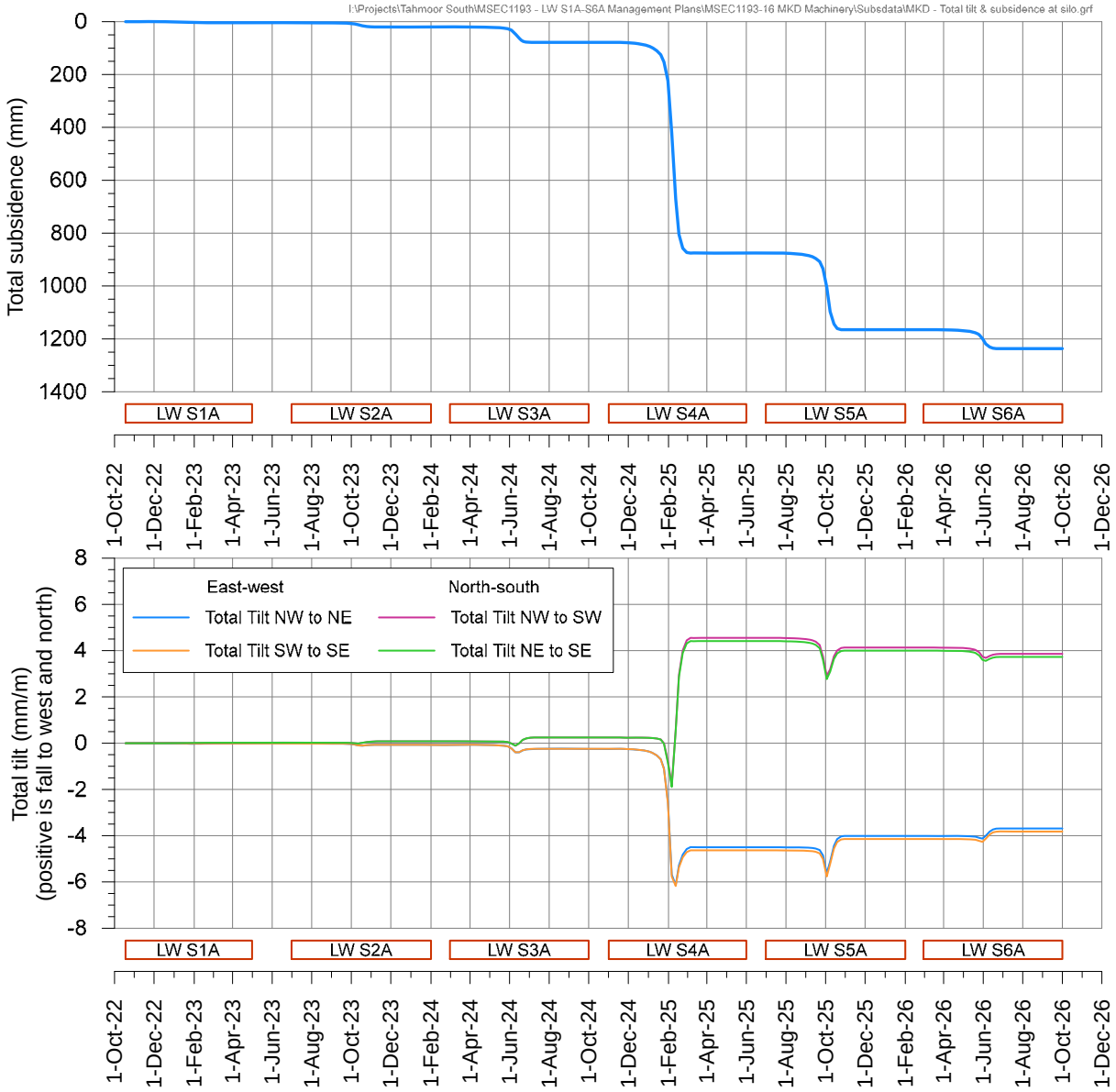

Fig. 3.3 Predicted development of vertical subsidence and tilt at the silo hopper over time during the mining of LWs S1A to S6A

It can be seen that the silo hopper is predicted to initially fall slightly to the north east as LWs S2A and S3A are extracted. The predicted tilt then momentarily reverses in direction as LW S4A approaches the structure before increasing in fall towards the north east after the mining of LW S4A. The tilts are then predicted to reduce slightly as LWs S5A and S6A are extracted.

For each longwall, it can also be seen that transient tilts are predicted during the extraction of each longwall as the longwall face approaches, mines directly beneath and away from the structure.

3.2. Predicted strain

The prediction of strain is more difficult than the predictions of subsidence, tilt and curvature. The reasons for this are that strain is affected by many factors, including ground curvature and horizontal movement, as well as local variations in the near surface geology, the locations of joints at bedrock, and the depth of bedrock. The measurements are also affected by survey tolerance.

It is for this reason that a statistical analysis has been undertaken of ground strains that have been previously measured. The survey database has been analysed to extract the maximum tensile and compressive strains that have been measured along monitoring lines at any time during previous longwall extraction, for bays that were located directly above goaf or the chain pillars that are located between the extracted longwalls, which has been referred to as "*above goaf*".

A histogram of the maximum observed total tensile and compressive strains measured in survey bays above goaf is provided in Fig. 3.4. Confidence levels were determined using the fitted General Pareto Distribution (GPDs), and are shown in blue.

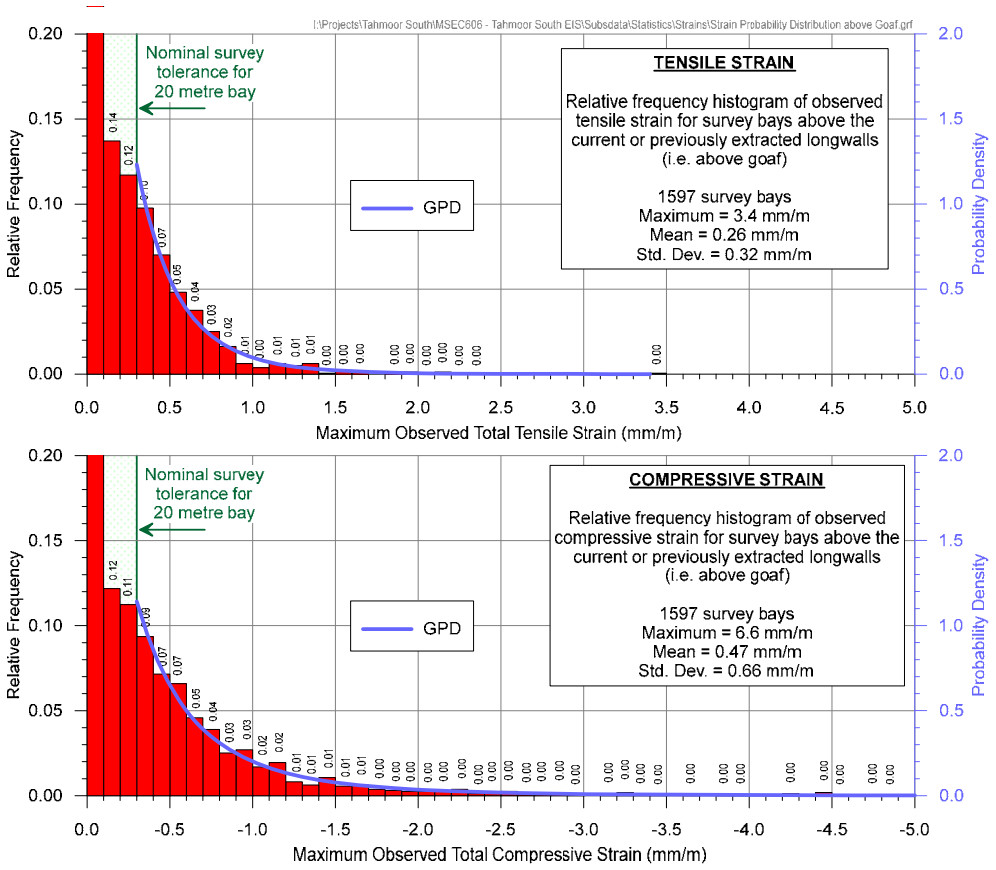

Fig. 3.4 Distributions of the maximum measured tensile and compressive strains for survey bays located above goaf at Tahmoor, Appin and West Cliff Collieries

The statistical analysis shows that ground strains at the property will, on average, be approximately 0.5 mm/m. Given the position of the property above LW S1A-S6A, and predictions of ground curvature at the building, maximum tensile ground strains are likely to be in the order of 1.1 mm/m. Maximum compressive strains are likely to be in the order of 3.0 mm/m.

There is, however, a small likelihood that the property could experience higher than expected ground strains, which could potentially result in adverse impacts on the property. This Management Plan has been developed to manage potential impacts on the property and management methods are discussed later in this chapter.

3.3. Managing public safety

The primary risk associated with mining beneath the property at No. 3165 Remembrance Drive, Bargo is public safety. Tahmoor Coal has previously directly mined beneath or adjacent to more than 2000 houses and civil structures, commercial and retail properties, the Main Southern Railway and local roads and bridges. The experience includes mining beneath the Woolworths petrol station at Tahmoor Town Centre. It has implemented extensive measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

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

In the case of this Subsidence Management Plan, the potential for impacts on public safety has been assessed on a case by case basis for each part of the property in consultation with the landowner and at No. 3165 Remembrance Drive, Bargo. The assessments include an inspection by a structural engineer and a mine subsidence engineer. The findings of the assessments are described in the sections below.

3.3.1. Subsidence impact management process for commercial and business establishments

Tahmoor Coal has developed and acted in accordance with subsidence management plans to manage potential impacts on structures during the mining of Longwalls 22 to 32 and LW W1-W4 at Tahmoor North. The management strategy has been reviewed and updated based on experiences gained during the mining of these longwalls and the strategy for LW S1A-S6A at Tahmoor South includes the following process for business and commercial establishments:

1. Regular consultation with the community before, during and after mining;
2. Site-specific investigations;
3. Implementation of mitigation measures following inspections and assessments by a structural engineer, a mine subsidence engineer, and, if required, a geotechnical engineer or other specialist engineer;
4. Surveys and inspections during mining within the active subsidence area:
   - Detailed visual inspections and vehicle-based inspections along the streets;
   - Ground surveys along streets;
   - Visual inspections of commercial and business establishments; and
   - Specific ground surveys at commercial and business establishments, where recommended by an engineer based on the inspections and assessments;
5. On the basis of the above, there is sufficient time for occupiers of commercial and business establishments to notify Tahmoor Coal or Subsidence Advisory NSW of significant displacement or deflection well before structural failure will occur; and
6. The conclusions are supported by the observation that residents of houses and occupiers of public amenities, industrial, commercial and business establishments have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements at Tahmoor Coal and above other previously extracted longwalls at similar depths of cover. This includes the recent experience at Tahmoor during the mining of Longwalls 22 to 32 and LW W1-W4, which have affected more than 2000 houses and civil structures.

   While severe impacts have previously developed at isolated locations during the mining of Longwalls 22 to 32, there is sufficient redundancy in structural design such that when structures have experienced severe impacts, they have developed gradually with ample time for residents and members of the community to notify Tahmoor Coal or Subsidence Advisory NSW.

While the three (3) most important factors in managing potential impacts to public safety are redundancy in structural design, gradual development of subsidence movements and an effective community consultation program, a number of additional management measures have been or will be undertaken, including site specific investigations, regular surveys and inspections during mining and triggered response measures as detailed in this Management Plan for No. 3165 Remembrance Drive, Bargo.

A flowchart illustrating the subsidence impact management process prior to, during and after each property experiences mine subsidence movements is shown in Fig. 3.5.

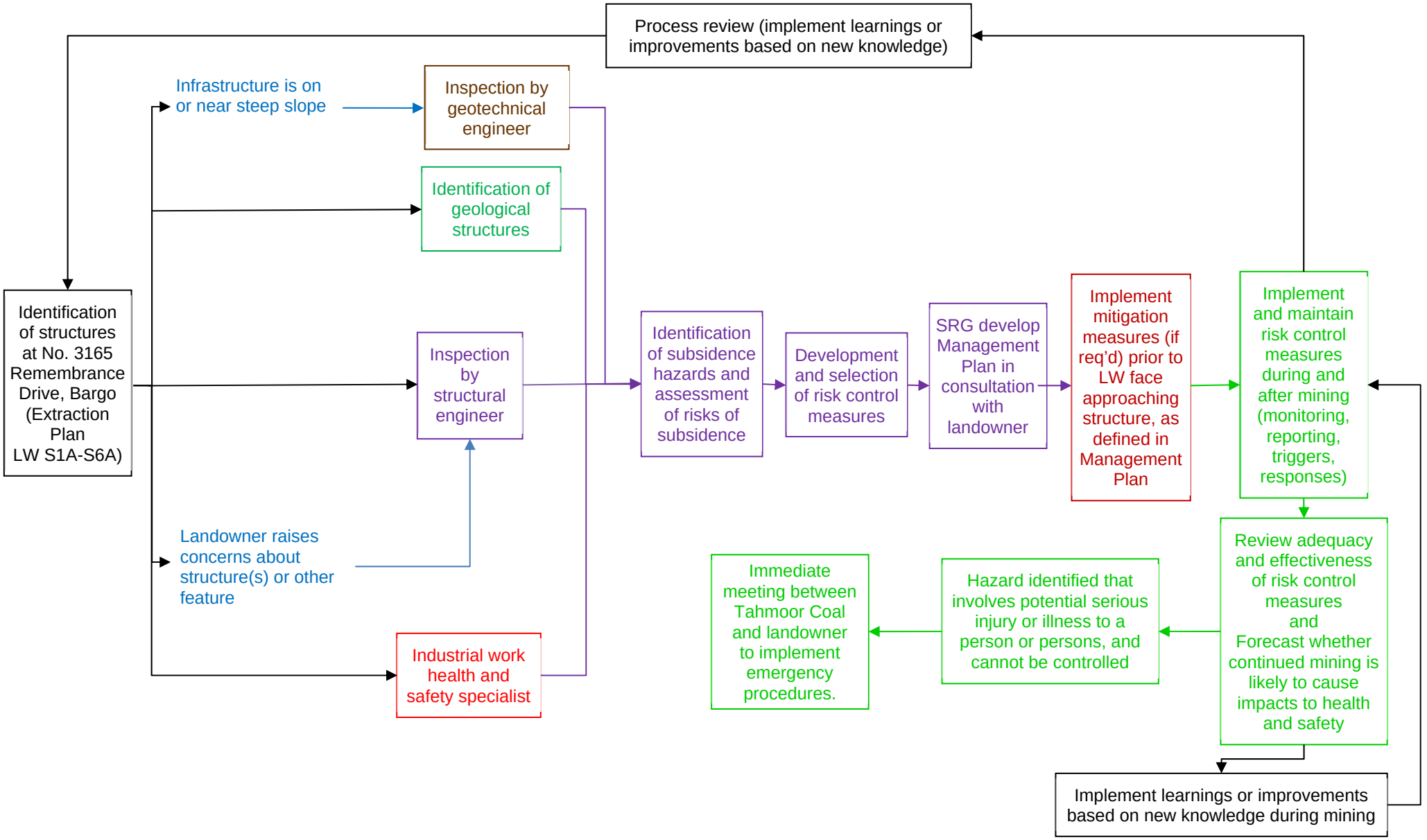

Fig. 3.5 Flowchart for Subsidence Impact Management Process

3.4. Summary of potential impacts

A risk assessment has been held by Tahmoor Coal (2023). A summary of potential impacts on infrastructure at No. 3165 Remembrance Drive, Bargo is provided in Table 3.3.

Table 3.3 Summary of potential mine subsidence impacts

Risk	Likelihood	Consequence	Level of Potential Impact
Structures			
Impacts to building structures	UNLIKELY	MINOR	LOW
Impacts to sedimentation ponds	UNLIKELY	MINOR	LOW
Silo Hopper			
Impacts to hopper resulting in it being unable to operate	UNLIKELY	MODERATE	MEDIUM
Impacts to hopper affecting health and safety	RARE	MAJOR	MEDIUM
Services			
Impacts to general services – pipes	UNLIKELY	MINOR	LOW
Impacts to general services – cables	RARE	MINOR	LOW
Impacts to septic system	UNLIKELY	MINOR	LOW
Impacts to fire protection services	RARE	NEGLIGIBLE	LOW
Impacts to security services	UNLIKELY	MINOR	LOW
Impacts to access and mobility requirements	RARE	NEGLIGIBLE	LOW
Machinery and Equipment			
Impacts to machinery and equipment	UNLIKELY	NEGLIGIBLE	LOW
Finishes			
Impacts to finishes	UNLIKELY	NEGLIGIBLE	LOW
Storage and Materials Handling			
Impacts to shelving	UNLIKELY	NEGLIGIBLE	LOW
External Pavements, Fences and Gates			
Impacts to driveway and concrete hardstand areas, fences and gates	POSSIBLE	NEGLIGIBLE	LOW
Impacts to pool fence	POSSIBLE	MINOR	LOW
Grass airstrip for gyrocopter aircraft			
Damage to grass air strip for gyrocopter	UNLIKELY	MINOR	LOW
Workplace Health and Safety			
Impacts to personnel health and safety in the workplace	RARE	MODERATE	LOW

Additional information on each potential impact is provided below.

3.5. Identification of subsidence hazards that could give rise to risks to health and safety

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

This section of the Management Plan summarises hazards that have been identified in Chapter 3, which could give rise to risks to health and safety of people at No. 3165 Remembrance Drive, Bargo.

Using the processes described in Section 3.3 of this Management Plan, mine subsidence hazards have been identified, investigated and analysed in a systematic manner by examining each aspect of the property, as described in Sections 0 to 0. Each of the aspects below could potentially experience mine subsidence movements that give rise to risks to the health and safety of people:

- The building structure(s);
- The structural steel hopper;
- The concrete plant;
- Items noted during inspection by competent person in workplace health and safety;
- Services to the property, including pipes, cables, fire protection, security, access and mobility;
- Finishes;
- Storage and materials handling;
- External pavements, fences and gates;
- Swimming pool; and
- Grassed airstrip.

The following mine subsidence hazards were identified that could give rise to risks to health and safety at No. 3165 Remembrance Drive, Bargo due to the extraction of LW S2A-S6A:

- Potential mine subsidence damage to building structures, particularly the silo hopper (refer Section 3.6);
- Potential damage or loss of services to the property (refer Section 3.8);
- Potential trips and falls on pavements (refer Section 3.13);
- Potential damage to pool gates and fences (refer Section 3.14); and
- Potential damage to grassed airstrip (refer Section 3.15).

As shown in Table 3.3, the Structures Response Group assessed the likelihood of the above hazards affecting health and safety, and the severity of potential health and safety consequences during the risk assessment as a group, based on the assessed worst case consequence.

The identification and risk assessment process took into account the location of infrastructure relative to LW S2A-S6A and the associated timing and duration of the subsidence event, as described in Sections 1.8 and 3.1 of this Management Plan.

Whilst mine subsidence predictions and extensive past experiences from previous mining at Tahmoor Mine were taken into account, the identification and risk assessment process recognised that there are uncertainties in relation to predicting subsidence movements, and uncertainties in how mine subsidence movements may adversely impact infrastructure at No. 3165 Remembrance Drive, Bargo, as discussed in Section 1.4 and Chapter 3 of this Management Plan.

Tahmoor Coal has considered the outcomes of the hazard identification and risk assessment process when developing measures to manage potential impacts on the health and safety of people, and potential impacts on the property in general. These are described in Chapter 4 of this Management Plan.

3.6. Structures

The structures at No. 3165 Remembrance Drive were inspected by structural engineer John Matheson from JMA Solutions on 10 March 2022 (JMA, 2023a), 15 September 2022 (JMA, 2023b) and 20 June 2023 (JMA, 2023c).

The primary risk associated with mining beneath commercial and business structures is public safety. Occupants of building structures have not been exposed to immediate and sudden safety hazards as a result of impacts that occur due to mining at the depths of cover similar to those found at Tahmoor Mine. This includes the recent experience at Tahmoor Mine, where longwall mining has occurred beneath more than 2000 houses and civil structures. Tahmoor Mine has successfully mined directly beneath commercial structures including concrete batching plants in South Picton during the extraction of Longwalls 22 to 32 and LW W1-W4.

Emphasis is placed on the words “immediate and sudden” as in rare cases, some structures have experienced severe impacts, but the impacts did not present an immediate risk to public safety as they developed gradually with ample time (over a period of months or weeks rather than hours) to relocate occupants.

While the potential for adverse impacts to occur on the building structures is considered to be low, Tahmoor Coal has implemented measures to ensure that the buildings remain safe and serviceable during the mining of the proposed longwalls. The potential for impacts will be managed through regular surveys, visual inspections and triggered responses.

- Weekly surveys along Remembrance Drive and Main Southern Railway during periods of active subsidence;
- Baseline survey around structures, including the residential structures, concreting plant, silo hopper tower, sedimentation tanks, as shown in Fig. 4.1;
- Weekly local 3D surveys during active subsidence around structures with the exception of survey marks where access is restricted inside the Wrecker’s yard during periods of active subsidence;
- Subject to landowner agreement, tiltmeter monitoring of the silo hopper tower;
- Visual inspection of structures during periods of active subsidence,
- Regular consultation with the landowner at No. 3165 Remembrance Drive, Bargo during periods of active subsidence;
- Immediate repair of impacts that affect safety and serviceability of the building structures.
- Repair of impacts after mining; and
- In the worst case / extremely unlikely event that a hazard has been identified at a building or part of a building that involves potential serious injury or illness to a person or persons, and cannot be controlled, Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo will immediately prevent people from entering the hazardous area and repair the impacts relating to the hazard.

Additional details on structures on the property are provided below.

Silo hopper tower

The circular silo hopper comprises a cross-braced structural steel tower supporting a cylindrical hopper. The cross-bracing has been installed symmetrically to all four faces of the tower. The baseplates of the tower legs are bolted onto reinforced concrete piers that are embedded at least one metre into bedrock. A photograph of the tower base is shown in Fig. 3.6.

Photograph courtesy JMA Solutions

Fig. 3.6 Silo hopper tower bolted connections for baseplates of tower legs

The tower could potentially experience adverse impacts due to mine subsidence movements. Mining-induced tilts could result in increased stresses on the structural frame. Additional stresses could be imposed on the structure due to mining-induced curvature or ground strains due to differential movements between the piers, or mining-induced strains on the surrounding concrete slab impacting the tower legs. The structure could experience severe impacts due to non-conventional movements intersecting the structure though the likelihood is considered to be low given the relatively small footprint size.

JMA (2023c) advises that an angle tie is currently missing at the base of the topper on the northern side. Subject to approval by the landowner, Tahmoor Coal will install the missing angle tie prior to the influence of LW S3A, as recommended by the structural engineer (JMA, 2023c).

It is proposed to monitor changes at the hopper during and after mining. These include:

- Survey of pins near or on the base of the tower legs, which were installed prior to the influence of LW S2A;
- Ground survey of survey marks on the concrete slab around the tower, which are proposed to be installed prior to the influence of LW S2A;
- Continuously operating tiltmeters
  Subject to agreement by the landowner, it is planned to install bi-directional tiltmeters on the structural frame to monitor changes in tilt and to detect potential distortion prior to the influence of LW S2A. Tahmoor Coal has previously installed tiltmeters to two hoppers during the extraction of previous longwalls in the South Picton Area. The tiltmeters were found to detect changes due to mining and also detect changes due to loading and unloading of the hoppers; and
- Visual inspections.

In the event that subsidence, tilts, curvature or strains are significantly greater than predicted, potential impacts can be managed to ensure that the silo hopper tower remains safe and serviceable during and after mining:

- Relevelling the footings by jacking and packing one or more baseplates to keep the settling baseplate in the same plane as the other three column bases; and/or
- Adjusting the baseplates by elongating the boltholes and/or installing additional steelwork to tie the baseplates together;
- Installing a stress-relieving saw cut in the concrete ground slab around the tower; and/or
- Temporarily reducing the load carrying capacity of the hopper until the structure is adjusted.

Prior to the influence of LW S3A, it is planned to clean and prepare the base of the silo hopper tower to facilitate future relevelling, if required, subject to approval by the landowner.

Building structures

The main dwelling is predominantly a single-storey brick veneer building on a reinforced concrete raft slab. A second floor is constructed above the double garage (JMA, 2023a). The house is relatively new and in good condition. Tahmoor Coal has extensive experience of mining beneath houses and will implement similar subsidence management and monitoring measures for this house. This includes installation of ground survey marks around the house, visual inspections and consultation with the landowner during mining during periods of active subsidence, and repairs if required to ensure the safety and serviceability of the structure.

The original building structure consists of a steel portal framed machinery shed on a reinforced concrete raft slab with a second storey residential dwelling. Hebel block partition walls have been constructed on the ground and first floor. The Hebel block walls could experience cracking in response to mine subsidence movements. JMA (2023a) advises that it is difficult to determine whether the Hebel block walls are tied to the steel portal frame structure and there are concerns that the steel columns may experience adverse impacts. Subject to approval by the landowner, Tahmoor Coal will provide supplementary support to the isolated, freestanding steel columns by strengthened, as recommended by the structural engineer (JMA, 2023c).

A new steel portal framed shed at the rear of the property has been constructed on a jointed reinforced concrete raft slab. A large metal rainwater tank has been constructed adjacent to the shed. The ground was excavated to form level ground for the rainwater tank, which has resulted in a near-vertical face supporting the external concrete pavement, as shown in Fig. 3.7. JMA (2023a) advises that the excavated vertical face is prone to erosion, which affects the stability of the fill material that supports the slab.

Photograph courtesy JMA Solutions

Fig. 3.7 Excavated soil supporting external pavement adjacent to rainwater tank

The new shed could experience impacts due to mine subsidence such as cracking to the ground slab and apron slab. The steel columns are surface mounted to the slab and the connections at the baseplates could be adjusted in the unlikely event that the structure experiences severe non-conventional movements.

The metal rainwater tank is of ductile construction with a flexible internal liner that retains the rainwater. The tank could experience impacts due to mining-induced tilt, curvature and strain but the likelihood of impacts on structural or water-holding integrity is considered low due to its type of construction.

Tahmoor Coal has extensive experience of mining beneath sheds and tanks and will implement similar subsidence management and monitoring measures for this property. This includes installation of ground survey marks around the house, visual inspections and consultation with the landowner during mining during periods of active subsidence, and repairs if required to ensure the safety and serviceability of the structures.

Concrete batching plant and structures

The concreting plant consists of dry-stacked concrete block retaining walls, jointed reinforced concrete driveway and working slabs and an assortment of loading ramps, aggregate hoppers and conveyors, above-ground concrete water tanks and aggregate bins.

The concrete hardstand areas and concrete block retaining walls could experience impacts due to mine subsidence such as cracking and opening of existing joints.

Tahmoor Coal has extensive experience of mining directly beneath two concreting plants in the South Picton area, which remained safe and serviceable during and after mining. Tahmoor Coal will implement similar subsidence management and monitoring measures for this property. This includes installation of ground survey marks around the house, visual inspections and consultation with the landowner during mining during periods of active subsidence, and repairs if required to ensure the safety and serviceability of the plant.

Sedimentation tanks

The property includes a series of sedimentation tanks, which are used to trap sediments and recycle water that is used to wash down the plant. The ponds have a concrete base and some of the internal walls have been formed in reinforced concrete, with concrete block dry-stacked blocks around the outside the tanks along the retaining wall.

It is possible that differential mine subsidence movements could result in additional cracking of the tanks and mining-induced leakage of water from the tanks onto the surrounding ground surface and neighbouring property.

Potential impacts on the retention tank structures will be managed by ground surveys and visual inspections, consultation with the landowner during mining, and repairs if required to ensure the safety and serviceability of the structures. In the unlikely event that differential mine subsidence movements result in impacts on the integrity of the retention tanks, the wall(s) will be repaired or lined with a waterproof liner.

3.7. Inspection by competent specialist in industrial workplace health and safety

The property was inspected by Mark Parcell from the Mine Safety Institute of Australia on 16 May 2023 (MSIA, 2023). The hazard identification process was undertaken utilising a workplace inspection in consultation and cooperation with the workplace representatives. A range of activities were reviewed and considered against the criteria for a dangerous incident.

No potentially dangerous incidents relevant to workplace health and safety were identified as being unacceptable and the controls which are in place for the control and management of the risks will be sufficient to prevent a dangerous incident resulting from the mining induced subsidence from LW S2A-S6A.

The following items were noted during the inspection (MSIA, 2023):

- Machinery and equipment are free standing and securely fastened;
- A 10,000 L diesel tank is present. The tank is free standing and is not likely to be damaged as a result of any mining induced subsidence;
- The business has a small industrial compressed air system, which is free standing with flexible connections; and
- A number of sediment ponds are present. They are not deemed to be at risk of catastrophic failure as a result of any mining induced subsidence and potential risk of leaking will not present risk of a dangerous incident.

3.8. Services

3.8.1. General Services

There are many services within the property. These services include potable water pipes, wastewater pipes, septic tanks, stormwater pipes, electrical services and communications services.

Pipes and ducts are generally flexible and will be able to withstand the small movements that are predicted to occur. Water, wastewater (including septic tanks), stormwater and gas pipes have been directly mined beneath in many locations in Tahmoor and other locations within the Southern Coalfield and very few impacts have been observed, all of which have been minor.

Cables are extremely flexible and will be able to withstand the small movements that are predicted to occur. Very few impacts have been observed to cables as a result of previous mining. Any impacts to pipes, ducts and cables will generally be easy to repair. Buried pipes are slightly more difficult to repair if they are found to be leaking.

Tahmoor Coal and utilities owners, including Sydney Water, Endeavour Energy, Jemena and Telstra, have developed and acted in accordance with agreed subsidence management plans to manage potential impacts to services during the mining of Longwalls 22 to 32 and LW W1-W4 at Tahmoor North. The management plans provide for ground and visual monitoring of infrastructure and are reviewed periodically.

3.8.2. Fire and security services

The property is fitted with a number of fire protection and security measures. These include smoke detection systems, fire extinguishers and fire egress doors. The likelihood of impacts occurring to fire egress doors is considered very unlikely, though impacts have previously occurred to security doors at other locations above previously extracted longwalls at Tahmoor.

3.9. Machinery and equipment

While impacts could occur to the aggregate hopper and conveyor, both structures are surface mounted on the concrete slabs and appear able to accommodate mine subsidence movements. The hopper and conveyor could move apart or towards each other but the changes are expected to be very small and unlikely to affect the operation of the equipment. The equipment could be adjusted, if required if mine subsidence results in misalignment of the hopper and conveyor.

Baseline level readings will be conducted to measure potential changes due to mining.

3.10. Access and mobility

It is possible that cracks or steps might form in ramps and floors that provide access to the property. The ramps and floors will be visually inspected during the period of active subsidence, and trip hazards will be repaired immediately.

3.11. Finishes

It is possible that mine subsidence movements could result in cracking to floor, wall and ceiling finishes.

If mine subsidence damage occurs and repairs are required, Tahmoor Coal will coordinate repairs with the landowner at No. 3165 Remembrance Drive, Bargo in a manner that will minimise impacts to business operations.

3.12. Storage and materials handling

The mining-induced tilts are unlikely to adversely affect the stability of the racks and shelves on the property, which can be readily relevelled if required.

3.13. External pavements, fences and gates

The external area consists of concrete pavement, asphalt and a gravel driveway.

The concrete slabs and asphalt surface may experience cracking or buckling as a result of mine subsidence, depending on the magnitude of ground strains that occur at this location. If impacts are observed in the pavement, they can be easily repaired. However, it is recognised that any repairs would represent an inconvenience to the business. If mine subsidence damage occurs and repairs are required, Tahmoor Coal will coordinate repairs with the landowner No. 3165 Remembrance Drive, Bargo to minimise impacts to business operations.

The gravel driveway surface may experience buckling as a result of mine subsidence. If impacts are observed along the driveway, they can be easily repaired. Tahmoor Coal will coordinate repairs with the landowner at No. 3165 Remembrance Drive, Bargo in a manner that will minimise impacts to business operations.

There is a mixture of different types of fencing at the property including post and wire fencing.

Fences are generally flexible in construction and can usually tolerate mine subsidence movements in the Southern Coalfield. Damaged fences are relatively easy to rectify by re-tensioning of fencing wire, straightening of fence posts, and if necessary, replacing some sections of fencing. The most vulnerable sections of fences are gates, particularly long gates or those with latches, as they are less tolerant to differential horizontal movements and tilts between the gate posts and the ground.

A sliding security gate has been installed near the entrance to the property. The gate rolls along a bottom roller with a catch at the end. The gate can accommodate some differential horizontal and vertical subsidence movements, but could potentially become jammed if the opening mechanism experiences substantial bending in either the vertical or horizontal direction.

Tahmoor Coal has extensive experience in managing potential impacts on sliding gates at commercial properties in the South Picton area. No impacts were observed during mining. It is proposed to manage potential subsidence impacts on the security entrance gate by implementing the following measures.

- A baseline survey of the alignment of the gate prior to the influence of LW S2A;
- Visual inspections during periods of active subsidence;
- Regular surveys of nearby survey marks along Remembrance Drive;
- Consultation with the landowner on the operation of the gate;
- Regular analysis of the survey results and reports from visual inspections;
- Additional surveys of the alignment of the gate if adverse movements or visual impacts are detected;
- Maintain the alignment of the gate, if required;
- Provide alternative site security on the premises in the event that the gate malfunctions, if required by the landowner.

3.14. Swimming pool, gates and fences

An in-ground fibreglass swimming pool has been constructed in with paved coping and a surrounding jointed reinforced concrete slab.

The pool may experience impacts due to mine subsidence due to mining-induced ground strains or tilt, causing the pool to be out of level and/or affecting the operation of the skimmer box. The pool coping and surrounding slab may also experience cracking as a result of mine subsidence.

The pool fencing and pool gate may experience impacts, which can result in a public health and safety risk. Visual inspections of the pool fence and gates on the property will be carried out by Tahmoor Coal during periods of active subsidence and any impacts affecting the integrity of the fences or gate will be rectified as soon as possible.

3.15. Grassed air strip

The grassed air strip consists of compacted earth. The air strip will experience subsidence movements along with the rest of the property. The main risks associated with mining beneath an air strip are the formation of cracks and humps in the compacted earth, which can be readily and promptly repaired. The landowner advises that the gyrocopter can land on very rough surfaces.

It is proposed to manage potential subsidence impacts on the air strip by implementing the following measures.

- A baseline inspection of the air strip to identify existing ground deformations (if any);
- Visual inspections during periods of active subsidence;
- Regular surveys of nearby survey marks along the Main Southern Railway;
- Consultation with the landowner regarding the performance of the air strip;
- Regular analysis of the survey results and reports from visual inspections; and
- Repair cracks and humps that form along the air strip, if required.

4.1. Structures Response Group (SRG)

The Structures Response Group (SRG) is responsible for providing advice on all technical issues relating to mine subsidence related impacts to infrastructure, and the health and safety of people who may be present at the property, due to the mining of LW S2A-S6A on which decisions are made by the landowner at No 3165 Remembrance Drive, Bargo and Tahmoor Coal. The SRG develops and reviews this management plan, collects and analyses monitoring results, determines potential impacts and provides advice regarding appropriate actions. The members of the SRG are highlighted in Chapter 8.

4.2. Development and selection of risk control measures

Tahmoor Coal has developed and selected risk control measures in consultation, co-ordination and co-operation with the landowner at No. 3165 Remembrance Drive, Bargo in accordance with WHS legislation. In accordance with Clauses 35 and 36 in Part 3.1 of the Work Health and Safety regulation (2017) and the guidelines (MSO, 2017), a hierarchy of control measures has been considered and selected where reasonably practicable, using the following process:

1. Eliminate risks to health and safety so far as is reasonably practicable, and
2. If it is not reasonably practicable to eliminate risks to health and safety – minimise those risks so far as is reasonably practicable, by doing one or more of the following:
   (a) substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
   (b) isolating the hazard from any person exposed to it;
   (c) implementing engineering controls;
3. If a risk then remains, minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls; and
4. If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment.

A combination of the controls set out in this clause may be used to minimise risks, so far as is reasonably practicable, if a single control is not sufficient for the purpose.

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

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

Method A and B risk control measures are described in Section 4.3 to Section 4.7. Prior to selecting Method B risk control measures, Tahmoor Coal has investigated and confirmed that the measures are feasible and effective for the site-specific conditions during the extraction of LW S2A-S6A.

4.3. Selection of risk control measures at No. 3165 Remembrance Drive, Bargo

Based on its own assessments, and the assessments by the structural engineer and workplace health and safety specialist, Tahmoor Coal considered Method A and Method B risk control measures, in accordance with the process described in Section 4.2.

Elimination

In this instance, no reasonably practicable controls could be identified that would eliminate the identified risks.

Substitution

In this instance, no reasonably practicable controls could be identified that will change the environment so the hazards could be substituted for hazards with a lesser risk.

Isolation

In this instance, no reasonably practicable controls could be identified to isolate a hazard from any person exposed to it.

Engineering Controls

In this instance, the following engineering control could be identified to put in place a structure or item that prevents or minimises risks:

- Install missing angle tie to silo hopper tower, subject to approval of landowner;
- Provide supplementary support to isolated steel columns supporting first floor of machinery shed and residence, subject to approval of landowner.

It is further noted that no additional mitigation measures have been recommended to be undertaken prior to the influence of LW S2A-S6A by the workplace health and safety specialist.

Administrative Controls

The following Administrative Controls were identified and selected that will put in place procedures on site to minimise the potential of impacts on the health and safety of people in relation to mining-induced damage to infrastructure at No. 3165 Remembrance Drive, Bargo:

- Implementation of a Monitoring Plan and Trigger Action Response Plan (TARP)
  As described in the Management Plan, Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo have developed and implemented a management strategy of detecting early the development of potential adverse subsidence movements in the ground, so that contingency response measures can be implemented before impacts on safety and serviceability develop. The TARP includes the following:
  - Conduct pre-mining inspection of structures by structural engineer;
  - Conduct pre-mining workplace health and safety inspection;
  - Weekly surveys along Remembrance Drive and the Main Southern Railway during periods of active subsidence;
  - Weekly local 3D surveys during active subsidence around structures, the concreting plant and sedimentation tanks during periods of active subsidence of LW S3A-S5A;
  - Visual inspections at the property during periods of active subsidence of LW S2A-S6A,
  - Immediate repair of impacts that create a serious public safety hazard, including impacts on the operation of the silo hopper tower and the pool gate;;
  - Immediate repair of impacts to all entry and exit doors, and all other doors that must remain operational for security and fire egress reasons, even if further impacts are anticipated;
  - Immediate repair of impacts that impair any essential services;
  - Immediate repair of impacts that impair access and mobility to the property, even if further impacts are anticipated;
  - Repair of mining-induced impacts to the structures, external pavements and fences;
  - In the worst case, as a last resort, advise the landowner at No. 3165 Remembrance Drive, Bargo to restrict entry to an affected part of the property, suspend activities or emergency evacuate the premises.

With the implementation of the above management strategy, Tahmoor Coal will ensure that the health and safety of people at No. 3165 Remembrance Drive, Bargo will not be put at risk due to differential mine subsidence movements due to the extraction of LW S2A-S6A.

4.4. Access to site

The landowner has provided access to No. 3165 Remembrance Drive, Bargo to access the property to enable it to fulfil its commitments under this management plan, which includes monitoring and inspections or the implementation of any required mitigation or repair works, as described in the plan.

It is acknowledged that the landowner has requested minimal interruption to the operation of the business. Tahmoor Coal will provide the landowner at No. 3165 Remembrance Drive, Bargo with reasonable notice prior to entering the property to undertake its obligations under this plan. Tahmoor Coal will carry out its activities on the property safely and comply at all times with all relevant Workplace Health and Safety legislation.

4.5. Monitoring measures

A number of monitoring measures will be undertaken during mining:

4.5.1. Ground surveys along streets and Railway

Survey marks have been placed along Remembrance Drive and the Main Southern Railway adjacent to the fence line of the property, as shown in Drawing No. MSEC1193-01-01.

The survey line consists of pegs spaced nominally every 20 metres. The surveys will measure changes in height and changes in horizontal distances between adjacent pegs. Surveys will be conducted on a weekly basis during the periods of active subsidence of these features during the extraction of LW S2A-S6A.

4.5.2. Structure surveys

The following structure surveys will be conducted at the property:

- Local 3D survey
  Survey marks have been installed around the perimeters of the main structures, concreting yard and sedimentation tanks. Additional survey marks will be installed prior to the influence of LW S2A. The layout of the survey marks is provided in Fig. 4.1. The surveys will measure changes in height and changes in horizontal distances between adjacent pegs in local 3D.

  The purpose of the surveys is to measure subsidence of the structures and identify whether any adverse differential subsidence movements are developing. They will also be used to quantify movements in the event that an impact has been visually observed.

  Survey marks have been installed around the outside perimeter of the structures, to avoid inconvenience of relocating materials and equipment inside the buildings. The survey marks have been installed in natural ground where possible. The marks are flush to the ground so that they do not present a trip hazard.
- Baseline survey of the alignment of the gate prior to the influence of LW S2A.

The landowner has requested that access to the property be minimised to reduce disruption to business operations. Minor subsidence movements are predicted to develop at the property during the mining of LW S2A and LW S6A. While it is proposed to install and baseline survey marks around the property prior to the influence of LW S2A, it is planned to not survey ground marks within the property during periods of active subsidence during the mining of LW S2A and LW S6A. It is considered that potential risks at the property can be adequately managed during the mining of LW S2A and LW S6A with the implementation of the following monitoring measures:

- Baseline survey of survey marks prior to the influence of LW S2A;
- Automated continuous monitoring of tiltmeters on the silo hopper tower;
- Weekly surveys along Remembrance Drive and Main Southern Railway during periods of active subsidence;
- Weekly visual inspections on the property during periods of active subsidence; and
- Additional surveys if adverse changes are detected at the property during mining.

Fig. 4.1 Survey marks at No. 3165 Remembrance Drive, Bargo

4.5.3. Baseline survey of hopper tower

A baseline check of the verticality of the hopper tower will be undertaken prior to the influence of LW S2A as part of a baseline condition assessment. Additional checks can be undertaken during or after mining if concerns are raised from ground surveys or tilt meter monitoring results.

4.5.4. Tiltmeters on hopper tower

Bi-directional tiltmeters will be installed prior to the influence of LW S2A to continuously monitor changes in verticality of the hopper tower during the extraction of LW S2A-S6A.

The data from the tilt meters will be recorded daily and reviewed weekly during the active subsidence period. If issues are identified the recording and reviewing frequency can be increased.

4.5.5. Visual inspections

Visual inspections will be undertaken during the period of active subsidence by an experienced inspector appointed by Tahmoor Coal who is familiar with mine subsidence impacts. The inspector will undertake the following:

- Check for any signs of impact within the silo hopper tower, concreting plant, sedimentation tanks and structures, pavements, fences and gates generally;
- Check for proper operation of all fire egress doors and any trip hazards;
- Check for proper operation of pool gates;
- Check for proper operation of the sliding security gate; and
- Check for cracks and humps forming on the grass sir strip.

4.5.6. Structural inspections

Structural inspections will be undertaken by structural engineer John Matheson if required by the SRG.

4.5.7. Changes to monitoring frequencies

Monitoring frequencies will continue while the property is experiencing active subsidence due to the extraction of LW S2A-S6A. As a general guide, monitoring is likely to continue until each longwall has passed the property by 450 metres. Monitoring, however, may continue if ongoing adverse impacts are observed.

4.6. Triggers and responses

Trigger levels have been developed by Tahmoor Coal based on engineering assessments and consultation with the landowner at No. 3165 Remembrance Drive, Bargo.

Trigger levels for each monitoring parameter are described in the risk control procedures in Table 4.1.

Immediate responses, if triggered by monitoring results, may include:

- Increase in survey and inspection frequencies if required by the SRG;
- Additional surveys and inspections, such as conducting local 3D surveys of structures;
- Repair of impacts that create a serious public safety hazard, including the silo hopper tower and pool gates;
- Timely repair of silo hopper tower if triggered by observations during mining;
- Temporarily reducing the load carrying capacity of the hopper until the structure is adjusted;
- Repair of impacts to all entry and exit doors, and all other doors that must remain operational for security and fire egress reasons, even if further impacts are anticipated;
- Repair of impacts that impair any essential services;
- Repair of impacts that impair access and mobility to the property, even if further impacts are anticipated;
- Repair of impacts to the aesthetic appearance of the property, as required to maintain reputation, even if further impacts are anticipated; and
- In the worst case / extremely unlikely event that a hazard has been identified at a tank or fuel line that involves potential serious injury or illness to a person or persons, and cannot be controlled, Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo will immediately prevent people from entering the hazardous area and repair the impacts relating to the hazard.

The risk control measures described in this Management Plan have been developed to ensure that the health and safety of people who may be present at the property are not put at risk due to mine subsidence. It is also an objective to avoid disruption and inconvenience to business activities, or if unavoidable, keep disruption and inconvenience to minimal levels.

Of the potential hazards identified in Chapter 3, only impacts on the silo hopper tower, building structures, and pool gates could possibly experience severe impacts that could give rise to the need for an emergency response at this property. The likelihood is considered extremely remote and would require substantial differential subsidence movements to develop before such an event occurs.

As discussed in Sections 1.8 and 3.1, mine subsidence movements will develop gradually and there will be ample time to identify the development of potentially adverse differential subsidence movements early, consider whether any additional management measures are required, and repair or adjust affected surface features, in close consultation with the landowner at No. 3165 Remembrance Drive, Bargo.

As documented in Section 4.7, Tahmoor Coal and the SRG will review and assess monitoring results and consider whether any additional management measures are required on a weekly basis. If potentially adverse differential subsidence movements are detected, it is anticipated that a focussed inspection will be undertaken in the affected area, and a decision will likely be made to increase the frequency of surveys and/or inspections. Additional management measures may also be implemented. It is therefore expected that, as a potential adverse situation escalates, Tahmoor Coal will be present on site on a more frequent basis to survey or inspect the affected site, and that the landowner at No. 3165 Remembrance Drive, Bargo will be consulted on a more frequent basis.

Notwithstanding the above, if a hazard has been identified that involves potential serious injury or illness to a person or persons at the property, and cannot be controlled, the immediate response is to remove people from the hazard. If such a situation is observed or is forecast to occur by either Tahmoor Coal or by people at the property, Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo will immediately meet and implement emergency procedures.

The implementation of emergency procedures may include any or a combination of the following:

- Suspension of work activities within the hazardous area; and/or
- Demarcation of workplace to restrict people from entering or working in the hazardous area; or
- In the worst case, emergency evacuation of No. 3165 Remembrance Drive, Bargo.

4.7. Subsidence Impact Management Procedures

The procedures for the management of potential impacts to infrastructure at No. 3165 Remembrance Drive, Bargo are provided in Table 4.1.

Table 4.1 Risk Control Procedures for No. 3165 Remembrance Drive, Bargo during the extraction of Tahmoor South LW S2A-S6A

RISK ISSUE	TRIGGER	CONTROL PROCEDURE/S	FREQUENCY	BY WHOM?
IMPACTS ON BUILDINGS, SILO HOPPERS, COMMERCIAL STRUCTURES, TANKS, WALLS, PAVEMENTS, FENCES AND GATES	None	Undertake structural inspections and assessments before subsidence	Complete	Tahmoor Coal (JMA)
		Undertake workplace health and safety inspection	Complete	Tahmoor Coal (MSIA)
		Clean and prepare base of silo hopper tower for future relevelling if required (subject to access provided by landowner)	Prior to 600m extraction of LW S3A	Tahmoor Coal
		Install missing angle tie to base of silo hopper tower on northern side (subject to access provided by landowner)	Prior to 600m extraction of LW S3A	
		Provide supplementary support to freestanding steel columns supporting first floor of machinery shed and residence (subject to approval by landowner)	Prior to 600m extraction of LW S3A	Tahmoor Coal
		Baseline survey of alignment of sliding gate	Prior to 600m extraction of LW S2A	Tahmoor Coal (SMEC)
		Conduct 2D / Absolute 3D surveys along Remembrance Drive and Main Southern Railway	Baseline survey complete. Monthly 3D / Weekly 2D surveys for pegs within active subsidence zone for LW S2A-S6A: Continue surveys until outside active subsidence zone or one month after end of LW and continue further if ongoing adverse movements are observed. End of LW S2A-S6A.	Tahmoor Coal (SMEC)
		Local 3D survey around perimeter of buildings and commercial structures during active subsidence (refer Fig. 4.1)	Baseline survey prior to 600m extraction of LW S2A End of LW S2A Weekly surveys during periods of active subsidence after 550m extraction for LW S3A-S5A: Continue surveys if ongoing adverse movements are observed. End of LW S2A-S6A.	Tahmoor Coal (SMEC)
		Install tiltmeters on silo hopper tower and monitor changes in tilt	Install and commission prior to 600m extraction of LW S2A Readings every 2 hours	Tahmoor Coal (SweetingConsulting)
		Visually inspect the property, including the structures, hopper, concrete plant, pavements, fences and gates	Baseline pre-mining inspection complete Weekly inspections during periods of active subsidence after 550m extraction for LW S2A-S6A: Continue inspections if ongoing adverse movements are observed. End of LW S2A-S6A.	Tahmoor Coal (BIS)
		Report findings of surveys and inspections to landowner, SRG, Subsidence Advisory NSW, Resources Regulator	Weekly reports during periods of active subsidence after 550m extraction for LW S2A-S6A: Continue reporting if ongoing adverse movements are observed End of LW S2A-S6A.	Tahmoor Coal (MSEC)
		Review and assess monitoring report and consider whether any additional management measures are required	Weekly during periods of active subsidence after 550m extraction for LW S2A-S6A: Continue reporting if ongoing adverse movements are observed	SRG

RISK ISSUE	TRIGGER	CONTROL PROCEDURE/S	FREQUENCY	BY WHOM?
IMPACTS ON BUILDINGS, SILO HOPPERS, COMMERCIAL STRUCTURES, TANKS, WALLS, PAVEMENTS, FENCES AND GATES (continued)	Non-conventional movements identified from weekly surveys or Visual inspections identify impacts to buildings or pavements or Change in distance across diagonal of silo hopper tower exceeds 5mm or Tensile or compressive strain between pegs spaced no closer than 7 m apart on ground slab around silo hopper tower exceeds 0.75mm/m	SRG meet and consider whether any additional management measures are required, including: - structural inspection - relevel hopper tower or adjust baseplate connections - saw cut concrete slab surrounding silo hopper - temporarily reduce materials in hoppers while adjustments are undertaken - increase monitoring and reporting procedures - repair impacts	Within 1 week or earlier if required	SRG
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within one week	Tahmoor Coal
	A hazard has been identified that involves potential serious injury or illness to a person or persons at No. 3165 Remembrance Drive, Bargo and cannot be controlled	SRG, Tahmoor Coal, landowner meet to decide whether any additional management measures are required, including: - suspension of work activities within the hazardous area - demarcation of workplace to restrict people from entering or working in hazardous area - emergency evacuation of workplace	Immediately	Tahmoor Coal
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within 24 hours of decision	Tahmoor Coal
IMPACTS ON SEDIMENTATION TANKS	None	Follow procedures above	-	-
	Impacts observed on water retention tanks	SRG meet and consider whether any additional management measures are required, including: - structural inspection - increase monitoring and reporting procedures including crack width monitoring and local 3D survey - undertake detailed inspections or surveys of impacts - repair impacts - consider installation of waterproof liner	Within 1 week or earlier if required	SRG
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner and Subsidence Advisory NSW)	Within 24 hours	Tahmoor Coal
IMPACTS ON FIRE PROTECTION SERVICES, SECURITY SERVICES, ESSENTIAL SERVICES, ACCESS AND MOBILITY, FINISHES, AND PUBLIC SAFETY HAZARDS	None	Follow procedures above	-	-
	Impacts observed	Repair impacts	Immediately as required by landowner to avoid interruption to operations (target within 24 hours if required)	Tahmoor Coal
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within one week	Tahmoor Coal
	Impacts observed to sliding entrance gate	Repair impacts	As required by landowner to avoid service interruption (target within 24 hours if required)	Tahmoor Coal
		Provide alternative security services while security gate is repaired	As required	
IMPACTS ON MACHINERY AND EQUIPMENT	None	Follow procedures above	-	-
		Baseline precision measurement of levels of hoppers and conveyors	Prior to 600m extraction of LW S2A	Tahmoor Coal
	Substantial adverse subsidence movements observed, or reduced performance by machine observed	SRG meet and consider whether any additional management measures are required, including: - measurement of alignment of machinery - relevel machinery - undertake additional detailed measurements of machinery	As required by landowner to avoid business interruption (target within 24 hours if required)	Tahmoor Coal

RISK ISSUE	TRIGGER	CONTROL PROCEDURE/S	FREQUENCY	BY WHOM?
IMPACTS ON STORAGE AND MATERIALS HANDLING	None	Follow procedures above	-	-
	Substantial tilt of storage shelves and racks observed	SRG meet and consider whether any additional management measures are required, including: - relevel storage shelves - provide additional support to shelving	As required by landowner to avoid interruption to operations (target within 24 hours if required)	Tahmoor Coal
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within one week	Tahmoor Coal
IMPACTS ON SWIMMING POOL AND POOL GATE	None	Visually inspect the swimming pool and pool gate	Baseline inspection (complete) Weekly inspections during periods of active subsidence after 550m extraction for LW S2A-S6A: Continue inspections if ongoing adverse movements are observed. End of LW S2A-S6A.	Tahmoor Coal (BIS)
	Impacts observed	Repair impacts	As required	Tahmoor Coal
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within one week	Tahmoor Coal
	Pool gate won't close	Notify resident and/or landowner, contact Subsidence Advisory NSW to repair gate	Immediately	Tahmoor Coal
		Repair gate	As soon as possible	Tahmoor Coal
IMPACTS ON GRASSED AIR STRIP	None	Visually inspect the grassed air strip	Baseline inspection prior to 600m extraction of LW S2A Weekly inspections during periods of active subsidence after 550m extraction for LW S2A-S6A: Continue inspections if ongoing adverse movements are observed. End of LW S2A-S6A.	Tahmoor Coal (BIS)
	Mining-induced cracks or humps observed	Fill cracks or resurface air strip	As required	Tahmoor Coal
		Notify SRG of trigger exceedance and any management decisions undertaken (incl landowner, Subsidence Advisory NSW, Resources Regulator)	Within one week	Tahmoor Coal

5.1. Consultation, co-operation and co-ordination

Substantial consultation, co-operation and co-ordination has taken place between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo prior to the development of this Management Plan, as detailed in Section 1.3.1.

The following procedures will be implemented during and after active subsidence of the property to ensure the continued effective consultation, co-operation and co-ordination of action with respect to subsidence between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo:

- Reporting of observed impacts to Tahmoor Coal either during the weekly visual inspection or at any time directly to Tahmoor Coal;
- Distribution of monitoring reports, which will provide the following information on a weekly basis during active subsidence:
    - Position of longwall;
    - Summary of management actions since last report;
    - Summary of consultation with the landowner at No. 3165 Remembrance Drive, Bargo since last report;
    - Summary of observed or reported impacts, incidents, service difficulties, complaints;
    - Summary of subsidence development;
    - Summary of adequacy, quality and effectiveness of management process;
    - Any additional and/or outstanding management actions; and
    - Forecast whether there will be any subsidence impacts to the health and safety of people due to the continued extraction of LW S2A-S6A.
- Convening of meetings between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo at any time as required, as discussed in Section 5.2;
- Arrangements to facilitate timely repairs, if required; and
- Immediate contact between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo if a mine subsidence induced hazard has been identified that involves potential serious injury or illness to a person or persons at the property and may require emergency evacuation, entry restriction or suspension of work activities.

5.2. SRG meetings

The SRG undertakes reviews and, as necessary, revises and improves the risk control measures to manage risks to health and safety, and potential impacts to infrastructure.

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 are to:

- Detect changes, including the early detection of potential impacts on health and safety and impacts to infrastructure at the property;
- Verify the risk assessments previously conducted;
- Ensure the effectiveness and reliability of risk control measures; and
- Support continual improvement and change management.

SRG meetings may be held between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo for discussion and resolution of issues raised in the operation of the Management Plan. The frequency of SRG Meetings will be as agreed between Tahmoor Coal and the landowner at No. 3165 Remembrance Drive, Bargo.

SRG 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 emergency SRG 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; and
- Ensure timely implementation of a contingency plan in the event that the implemented risk control measures are not effective.

Some examples where review may be applied include:

- 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; and
- 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 Coal to review the operation of the Management Plan and report at the next scheduled Plan Review Meeting. The Management Plan shall be audited for compliance with ISO 31000, or alternative standard agreed with the landowner at No. 3165 Remembrance Drive, Bargo.

7.0 RECORD KEEPING

Tahmoor Coal will keep and distribute minutes of any SRG Meeting.

8.0 CONTACT LIST

Organisation	Contact	Phone	Email
MKD Machinery	Michael Derrig (landowner)	0408 272 368	mkderrig@bigpond.com
NSW Department of Planning and Environment – Resources Regulator	Ray Ramage	(02) 4063 6485 0442 551 293	ray.ramage@planning.nsw.gov.au
	Phil Steuart	(02) 4063 6484	phil.steuart@planning.nsw.gov.au
Subsidence Advisory NSW	Matthew Montgomery	(02) 4677 1967 0425 275 564	Matthew.Montgomery@customerservice.nsw.gov.au
JMA Solutions	John Matheson*	Ph: (02) 9979 6618 Mob: 0418 238 777	john@jmasolutions.com.au
Mine Subsidence Engineering Consultants (MSEC)	Daryl Kay*	(02) 9413 3777 0416 191 304	daryl@minesubsidence.com
SIMEC Mining Tahmoor Coal Project Manager	Ross Barber*	(02) 4640 0028 0419 466 143	ross.barber@simecgfg.com
SIMEC Mining Tahmoor Coal Approvals Specialist	April Hudson	(02) 4640 0022 0466 380 992	April.Hudson@simecgfg.com
SIMEC Mining Tahmoor Coal Environment and Community	Amanda Fitzgerald*	(02) 4640 0057 0414 848 213	Amanda.Fitzgerald@simecgfg.com
SIMEC Mining Tahmoor Coal Community Liaison Specialist	Amanda Bateman*	(02) 4640 0025 0429 442 811	Amanda.Bateman@simecgfg.com

* denotes member of Structures Response Group

APPENDIX A. Drawings and Supporting Documentation

The following supporting documentation is provided in Appendix A.

Drawings

Drawing No.	*Description*	*Revision*
MSEC1193-01-01	Monitoring plan	A
MSEC1193-16-01	General Layout	01
MSEC1193-16-02	Building Location	01

Supporting Documentation

JMA (2023a) *Hazard Identification Report No. R0831: 3165 Remembrance Driveway, Bargo*, JMA Solutions, March 2022.

JMA (2023b) *Pre-Mining Inspection Report No. R0821, 3165 Remembrance Driveway, Bargo*, JMA Solutions, February 2023.

JMA (2023c) *3165 Remembrance Driveway, silo superstructure and machinery shed assessment*, JMA Solutions, Report No. 20230602-R1, 28 July 2023

MSIA (2023) *Workplace Inspection to identify increased risk from Mining Induced Subsidence* from *Tahmoor Mine for MKD Machinery*, Mine Safety Institute of Australia, 16 May 2023.

Tahmoor Coal (2023) *Risk Assessment Report – MKD Machinery*. Tahmoor South, June 2023.

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SIMEC

TAHMOOR SOUTH PROJECT EXTRACTION PLAN LW S1A TO LW S6A

SUBSIDENCE MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
6 Sep 2022	1:25000	MSEC1193-01-01	A

Series of survey marks (one on each side of bank) above previously extracted longwalls, subject to access by land owners & available lines of sight.

GNSS subject to access by landowners

Refer to MSEC1193-11-02 for Wollondilly Anglican College

Refer to MSEC1193-01-02 for Bridges over Bargo River

Refer to MSEC1247-01 for Tahmoor Mine

Refer to MSEC1193-03 for Wellers Rd Bridge

STUDY AREA

LW S1A
LW S2A
LW S3A
LW S4A
LW S5A
LW S6A

S01 S02 S03 S04 S05 S06 S07 S08 S09 S10 S11 S12 S13 S14 S15 S16

TT9 TT12

Teatree 2
Teatree 3

Railway Viaduct
Wollondilly Anglican College
Tahmoor Colliery
Along Tahmoor Mine property boundary
Poultry Sheds
Wrecker
Igloos
Service Station
Tahmoor Garden Centre
Australian Wildlife Sanctuary
Concrete materials plant
NBN Tower
Picton Weir
Wellers Rd Bridge
Hidden creek

BARGO RIVER ROAD
REMEMBRANCE DR
MAIN SOUTHERN RAILWAY
STRATFORD RD
ROCKFORD ROAD
BARGO RIVER
OLIVE GROVE
FIRE ROAD NO P1
CALOOLA ROAD
TEATREE HOLLOW
YARRAN ROAD
CHARLIES POINT RD
GREAT SOUTHERN RD
ANTHONY ROAD
WELLERS RD
CLAREMONT DRIVE
HOGANS DRIVE
ASHBY CL
LLOYDS WAY
ELVY STREET
HAMBRIDGE ROAD
IRONBARK ROAD
WATTLE STREET
DYMOND ROAD
GOVERNMENT ROAD
MIMOSA STREET
KADER STREET
CAMBALAN STREET
RADNOR ROAD
GWYNN HUGHES
NOONGAH ST
BARGO ROAD
DOG TRAP CK

278 000
276 000
6 208 000
6 206 000

LEGEND

- WATER MONITORING SITE
- PROPOSED MONITORING LINES
- PROPOSED MONITORING PEGS
- PROPOSED CREEK MONITORING PEGS
- PROPOSED CREEK CROSSLINES
- PROPOSED GNSS
- INSTALLED GNSS
- CRITICAL POLES MONITORING WATERCOURSE

Grid to MGA co-ordinates

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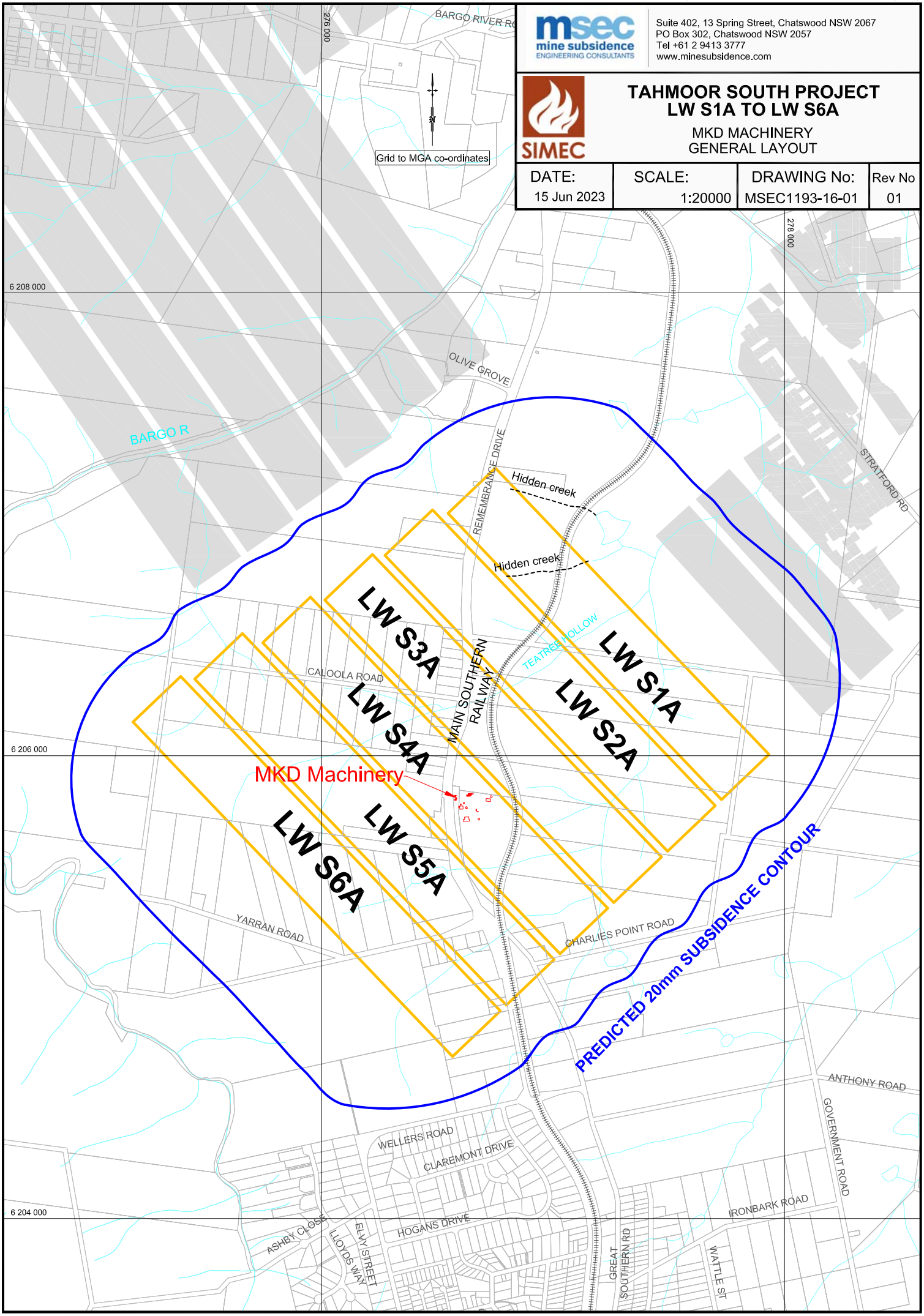
TAHMOOR SOUTH PROJECT
LW S1A TO LW S6A

MKD MACHINERY
GENERAL LAYOUT

DATE:	SCALE:	DRAWING No:	Rev No
15 Jun 2023	1:20000	MSEC1193-16-01	01



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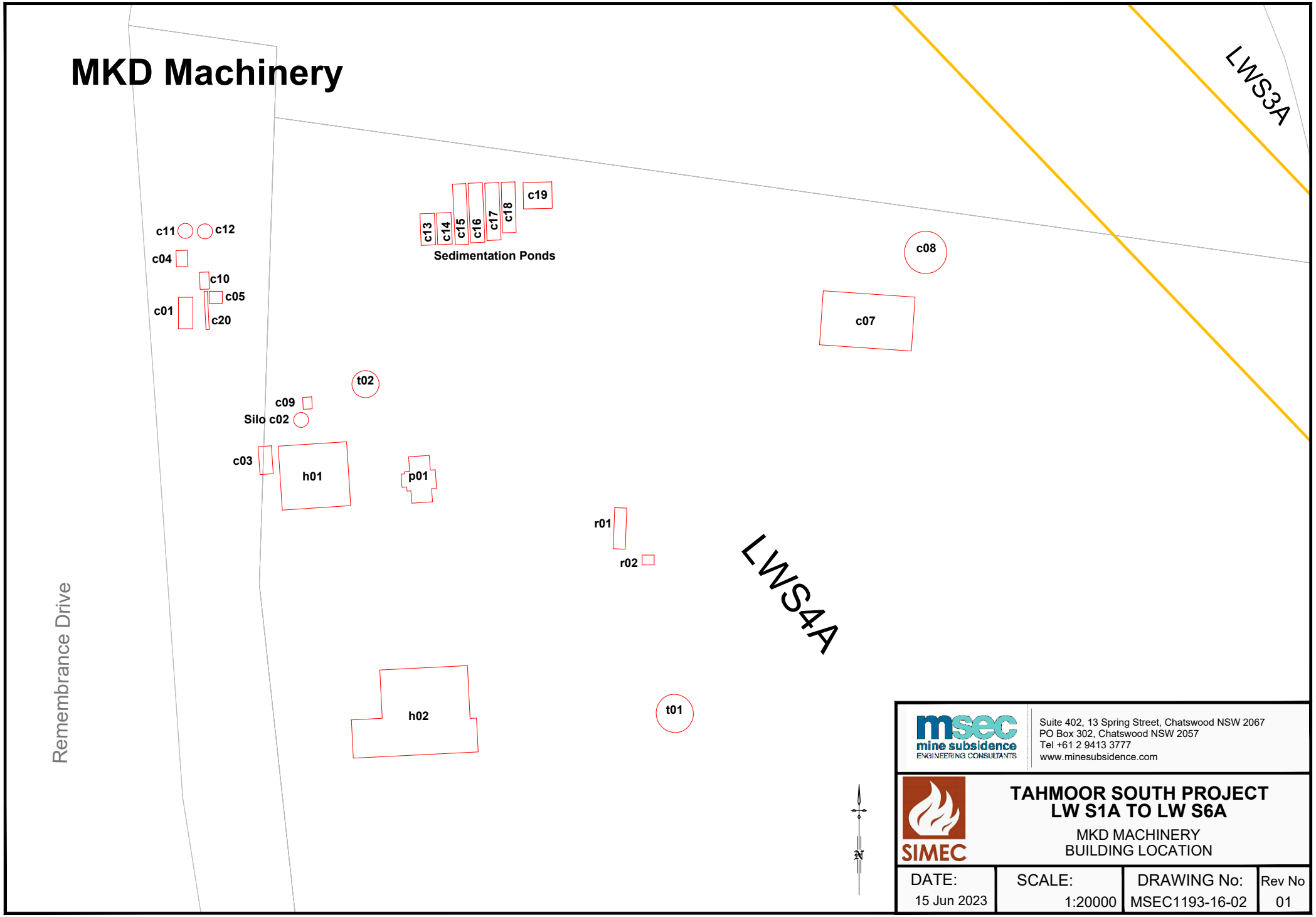
MKD Machinery



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TAHMOOR SOUTH PROJECT
LW S1A TO LW S6A

MKD MACHINERY
BUILDING LOCATION

DATE:	SCALE:	DRAWING No:	Rev No
15 Jun 2023	1:20000	MSEC1193-16-02	01

Tahmoor Coal Pty Ltd
2975 Remembrance Drive, Bargo
PO Box 100, Tahmoor NSW 2573

Our Ref: JMA Solutions 20230501: Hazard Identification Report: 3165 Remembrance Driveway, Bargo.

Date of site visit: 10 March 2022

HIR Report Number: R0831

Figure 1 Main dwelling, in-ground fibreglass pool and surrounding fence, Masonry BBQ structure, in-ground concrete tanks, solar panel array, steel-framed shed structures.

Main dwelling
The main dwelling is predominantly of single-storey brick veneer construction with a concrete-tile, timber-framed roof on a reinforced concrete raft slab. The double garage is surmounted by a loft master bedroom with ensuite bathroom and storage supported by a suspended timber and steel-framed floor.

External structures include:
- An in-ground fibreglass pool with a paved coping and a jointed reinforced concrete concourse slab.
- A brickwork barbeque structure.
- In-ground concrete rainwater tanks.
- Solar panel array.
- Miscellaneous steel-framed sheds.

Structure & Other Hazards identified.
- Main dwelling.
- Paths and driveway.
- Swimming pool perimeter fence and self-closing gates.
- BBQ structure.
- In-ground rainwater tanks.
- Solar cell array.

Recommendations
- Pre-mining baseline and end of panel ground surveys around the perimeter of the dwelling, swimming pool and rainwater tanks.

Repairs or mitigation work required
- No structure mitigation work is required.

Limitations
- This report has been prepared based upon a site visit, which was non-destructive in nature, and observations of the main dwelling, swimming pool and other structures around the main dwelling, that were made from locations that were accessible by foot, at the time of the site visit. The roof, first-floor and wall spaces were not accessible to observe the condition of the roof, floor, and wall framing.
- It has been assumed that this structure was designed and constructed in accordance with the relevant Australian Standards, the BCA (NCC), Ordinance 70 for older structures, and relevant statutory requirements and normal engineering and construction practice current at the time.
- Inference has been drawn concerning the serviceability of the structure from the level of pre-existing structure damage or displacement that has been observed at the time of the site visit.

Figure 2 Cold-formed steel-framed shed, internal ground floor and first floor Hebel block walls and suspended cold-formed suspended steel floor.

Machinery shed and secondary residence.
The building is of metal-clad cold-formed steel portal-frame construction constructed on a reinforced concrete jointed slab. A two-storey residential dwelling has been constructed by erecting internal Hebel block partition walls at ground floor and first floor levels.

It is not known whether the Hebel block walls are tied or connected to the steel wall and floor framing. Therefore, it is not possible to accurately determine the amount to which the Hebel block walls contribute to structure bracing.

External structures include:
- Jointed reinforced concrete ground slabs.

Structure Hazards identified

- The serviceability of the Hebel block walls if adversely impacted by (subsidence) ground tilt, curvature or strain causing significant cracking to develop.
- The serviceability of the cold-formed steel columns if they are adversely impacted by (subsidence) ground tilt, curvature or strain causing a significant exceedance (>10% increase) of the pre-existing dead, live and wind load column loads or eccentricity.

Recommendations

- Survey monitoring around the perimeter of the shed as follows:
    - Survey marks on the external surface of the shed at the four (4) corners and four (4) mid-points of the side walls of the shed.
    - Survey marks on the external surface of the shed at the four (4) corners of the shed at underside of skillion eave gutter.
    - Survey marks on the external surface of the shed at the four (4) corners of the shed at the base of the first-floor walls.
    - Survey marks on the external surface of the shed at the four (4) corners of the shed at underside of the central roof eave gutter.
    - Survey marks top and bottom of free-standing steel columns that support the first-floor structure to monitor differential sidewards movement of the column top relative to the base.
- Visually monitor internal Hebel block walls for the development of cracking and the internal steel columns for the development of local bowing or buckling in the walls of the cold-formed steel columns.

The structural adequacy for the applied loads and the pre-existing eccentricity of first-floor loads is unknown but could be calculated if structural drawings are available. Pre-existing column tilt could be in the order of 3mm/m if the structure was constructed in accordance with Australian Standards and minimal differential settlement has subsequently occurred. In the absence of any further information and as a guide, additional column tilt during active subsidence should be limited to 3mm/m and total column tilt should not exceed 6mm/m.

Repairs or mitigation work required

- Subject to a structural engineering review of the structural drawings.

Limitations

- This report has been prepared based upon a site visit, which was non-destructive in nature, and observations of the machinery shed and secondary residence that have been made from locations that were accessible by foot, at the time of the site visit. The roof, first-floor and wall spaces were not accessible to observe the condition of the roof, floor, and wall framing.
- It has been assumed that this structure was designed and constructed in accordance with the relevant Australian Standards, the BCA (NCC), Ordinance 70 for older structures, and relevant statutory requirements and normal engineering and construction practice current at the time.
- Inference has been drawn concerning the serviceability of the structure from the level of pre-existing structure damage or displacement that has been observed at the time of the site visit.

Figure 3 Photographs of possible hazards in the concrete plant

Concrete plant

The concrete plant comprises the following:

- Perimeter dry-stacked concrete block gravity walls (e.g., second row, right-hand side).
- Jointed reinforced concrete driveway and working slabs. See generally in photographs)
- A tall cement silo and dry-mixing hopper for discharge to transit mixer (top row).
- Adjacent loading ramp (second row left).
- Aggregate hopper and conveyor (second row right).
- Above-ground concrete water tanks (third row left).
- Aggregate bins (third row right).
- Water quality treatment tanks and ponds (fourth row).

Structure Hazards identified

- Cracking and joint opening or joint step-displacement of concrete ground slabs could occur during active subsidence.
- Cement silo could be impacted by ground strain or tilt during active subsidence.
- Truck loading ramp and access platform could be impacted by ground strain and tilt during active subsidence.
- Hoppers and conveyors could be impacted by ground strain and tilt during active subsidence.
- Water tanks could be impacted by ground strain and tilt during active subsidence.
- Water quality tanks and pods could be impacted by ground strain and tilt during active subsidence.

Recommendations

- Weekly survey and visual monitoring of dry-stacked concrete block walls by surveyor and building inspector, respectively, during active subsidence.
- Weekly visual monitoring of ground slabs by building inspector during active subsidence.
- Weekly survey (column tilt and distance between baseplates) and visual monitoring of cement silo by surveyor and building inspector, respectively, during active subsidence.
- Weekly visual monitoring of loading ramp, access platform and aggregate bins by building inspector during active subsidence.
- Baseline and end of panel survey of above-ground water tanks and water quality tanks & ponds plus weekly visual inspection by building inspector.

Repairs or mitigation work required

- Verify pre-existing tilt of dry-stacked concrete block screening walls, all elevations.

Limitations

- This report has been prepared based upon a site visit, which was non-destructive in nature, and observations of the structures that have been made from locations that were accessible by foot, at the time of the site visit.
- It has been assumed that these structures were designed and constructed in accordance with the relevant Australian Standards, the BCA (NCC), Ordinance 70 for older structures, and relevant statutory requirements and normal engineering and construction practice current at the time.
- Inference has been drawn concerning the serviceability of the structure from the level of pre-existing structure damage or displacement that has been observed at the time of the site visit.

Figure 4 Shed and adjacent rainwater tank structures

Shed

A new structural steel portal-framed shed has been constructed on a jointed reinforced concrete slab. The ground adjoining the northern edge of the external ground slab has been excavated to enable the construction of a large metal rainwater tank. The near-vertical face of the excavation is prone to erosion, which could have been impacting stability of the fill material, upon which the slab was constructed.

External structures include:

- Jointed reinforced concrete ground slabs
- Steel rainwater tank.

Structure Hazards identified.

The above-ground rainwater tank is of ductile steel construction above ground level with an internal liner. The tank shell and liner have been founded on a sand/gravel bed. Ground strain could cause the circular tank to distort into an elliptical shape. With an approximate diameter of 9m and height of 2.2m, a bearing pressure of around 22kPa on the sand/gravel base is expected. The amount of ground strain transmitted up into the tank wall is expected to be reflect the depth that the tank wall is embedded into the granular base. Tensile ground strain is not expected to transmit significant levels of force into the tank wall, but compressive ground strain could push the granular base against the tank wall, which could cause vertical bending to occur in the tank wall. Tensile ground strain could cause the internal liner to stretch, however, tensile strains up to 3mm/m are unlikely to rupture the liner unless there are substantial asperities across the base. Compressive ground strain is expected to cause the liner to shorten and possibly gather.

The structural steel portal framed shed is ductile, and experience of subsiding shed structures of similar size in Picton indicates that this structure should not be adversely impacted by similar amounts of subsidence ground movement noting that residual tilt of the structure could present an economic impact rather than a health and safety issue.

Recommendations

- Baseline and end of panel ground survey around the shed and tank structures.
- Visual monitoring of the rainwater tank during active subsidence.

Repairs or mitigation work required

- No repairs or mitigation work is required to the building before subsidence impacts the site.

Limitations

- This report has been prepared based upon a site visit, which was non-destructive in nature, and observations of the main dwelling and external structures that have been made from locations accessible by foot, at the time of the site visit.
- It has been assumed that the main dwelling and the external structures have been designed and constructed in accordance with the relevant Australian Standards, the BCA (NCC), Ordinance 70 for older structures, and relevant statutory requirements and normal engineering and construction practice current at the time.
- Inference has been drawn concerning the serviceability of the structure from the level of pre-existing structure damage or displacement that has been observed at the time of the site visit.

Pre-Mining Inspection Report

Reference: R0821

3165 Remembrance Driveway, Bargo

John Matheson & Associates Pty Ltd | Consulting Engineers

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Revision	Date	Amendments	Author
	14.02.2023	First issue of report	JM

Contents

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This investigation does not include the assessment of any building services such as electrical, gas, plumbing, drainage or stormwater or the presence of pest infestation. Similarly, it does not include the assessment of wall and roof framing or sub floor construction, which was inaccessible unless it is specifically referred to in the above report.

The observations and comments contained within this should not be construed as relieving the design engineer, builder, certifying authorities and customer of their relevant statutory obligations in relation to the relevant structures.

PRE-MINING INSPECTION REPORT

3165 Remembrance Driveway, Bargo NSW

Description of the Improvement: Single-storey brick veneer construction with a loft master bedroom (above garage) bearing upon a reinforced concrete raft slab with a tile-clad, timber-framed roof.

External structures include a gravel driveway leading from Remembrance Driveway up the site, a jointed reinforced concrete driveway slab and parking area, fibre-glass in-ground swimming pool, a two-storey secondary dwelling integrated into the machinery shed, in-ground concrete water tanks, a photovoltaic-cell array, a concrete plant, new steel framed shed and adjacent rainwater tank.

Date of Inspection:	**15 September 2022**
Inspector Name:	**John Matheson**
Client Name:	**Tahmoor Coal Pty Ltd**
Manager Name:	**Amanda Fitzgerald**
Contact phone number:	**4640 0100**

Observations of pre-existing damage

Table 1 Pre-existing internal damage of main dwelling observed during PMI

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
Entry	Wall 1	• NVD	•	•
	Wall 2	• Corner cornice crack at corner junction with wall 3, estimated width w≈0.1mm.	• Cat 0	• 4421
	Wall 3	• Paint crack in top right-hand architrave mitre joint at door to bedroom 4, estimated width w≈0.5mm	• Cat 1	• 4422
	Wall 4	• Paint crack in top left-hand architrave mitre joint at window north of entry door, estimated width w≈0.7mm	• Cat 1	• 4423
	Ceiling	• Crack above wall 4 at an external corner of the cornice to the south of the entry door, estimated width w≈0.3mm.	• Cat 1	• 4424
	Floor	• Timber, T&G flooring over slab squeaks outside bedroom 4, otherwise no visible damage.	• Noted	•
Study	Wall 1	• NVD (Bay windows)	•	•
	Wall 2	• Paint crack along the side of the left-hand window architrave of the eastern-most window, estimated width w≈0.5mm	• Cat 1	• 4425
	Wall 3	• Paint crack at top left-hand corner mitre joint of robe architrave, estimated width w≈0.5mm.	• Cat 1	• 4426
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
WC	Wall 1	• Gaps in the grout between the underside of the cornice and the wall tiles, estimated width up to 1mm, typical for walls 1-4.	• Cat 1	• 4427, 4428
	Wall 2	• Grout gaps around external perimeter of window architraves, width up to 2mm.	• Cat 1-Cat 2	• 4429
	Wall 3	• Grout gap in wall 3-4 corner junction, width w≈1mm.	• Cat 1	• 4430
	Wall 4	• Grout gap in wall 4-1 corner junction, width w≈1mm.	• Cat 1	• 4431
	Ceiling	• NVD	•	•
	Floor	• Tile, tile chips around surround to smart tile, pan fast to floor.	• noted	• 4432
Family	Wall 1	• Paint crack at the top left of GSD architrave mitre joint, w≈1.2mm • Paint crack at the top right of GSD architrave mitre joint, w≈0.5mm • Paint crack left-hand door architrave to media room, w≈1mm • Corner cornice crack at corner junction with wall 2, estimated width w≈0.3mm • Gap in skirting junction at wall 2, estimated width w≈1mm.	• Cat 2 • Cat 1 • Cat 1 • Cat 1 • Cat 1	• 4433, 4434 • 4435 • 4436 • 4437 • 4491
	Wall 2	• NVD	•	•
	Wall 3	• Cracking along edges of timber trim around fireplace, estimated width w≈0.5mm. • Gap in mitre joint, estimated width w≈1mm. • Chimney shot.	• Cat 1 • Cat 1 • noted	• 4438 • 4438 • 4440
	Wall 4	• Gap in skirting junction at wall 1, estimated width w≈1mm.	• Cat 1	• 4492
	Ceiling	• Water stain approximately 350mm off wall 1 cornice outside media room door.	• noted	• 4439
	Floor	• T&G flooring over slab, NVD	•	•
Kitchen	Wall 1	• Corner cornice crack around nib wall at left-hand end of wall 1, estimated width w≈0.1mm. • Pantry doors uneven.	• Cat 0 • noted	• 4441 • 4456
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
	Wall 4	• No wall 4 in kitchen	•	•
	Ceiling	• NVD	•	•
	Floor	• T&G flooring over slab, NVD. • Kitchen cupboards	• - • noted	• - • 4442-4453
Pantry	Wall 1	• Corner cornice crack at corner junction with wall 2, estimated width w≈0.5mm.	• Cat 1	• 4454
	Wall 2	• Chipped edge of bench top in front of sink	• noted	• 4455
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• T&G, NVD.	•	•
Media room	Wall 1	• Paint appears to be either blistering, which could be related to moisture ingress in ceiling in family room above the double doors to the media room. • Gap in skirting junction at wall 2, estimated width w≈2mm.	• Noted • Cat 2	• 4457,4458,4459 • 4493
	Wall 2	• Gap in skirting junction at wall 3, estimated width w≈1mm	• Cat 1	• 4494
	Wall 3	• Gap in skirting junction at wall 4, estimated width w≈1mm	• Cat 1	• 4495
	Wall 4	• Gap in skirting junction at wall 1, estimated width w≈1mm	• Cat 1	• 4496
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
Hallway to bedroom 2	Wall 1	• NVD	•	•
	Wall 2	• Paint crack top right-hand corner door architrave to bedroom 3, width w≈0.3mm	• Cat 1	• 4460
	Wall 3	• Corner cornice crack at corner junction with wall 4, estimated width w ≈0.3mm.	• Cat 1	• 4461
	Wall 4	• Corner cornice crack at corner junction with wall 1, estimated width w ≈0.2mm	• Cat 1	• 4462
	Ceiling	• NVD	•	•
	Floor	• T&G timber flooring above slab, NVD	•	•
Bedroom 2	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Timber, NVD	•	•
B2 WIR	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
Bedroom 3	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
B3 WIR	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
Bathroom	Wall 1	• Intermittent grout gap along underside of cornice against wall tiles, estimated width w≈0.1-1mm.	• Cat 0-Cat 1	• 4463, 4464
	Wall 2	• Intermittent grout gap along underside of cornice against wall tiles, estimated width w≈1mm. • External corner cornice crack estimated width w≈0.1mm. • Intermittent grout gap along underside of cornice against wall tiles, estimated width w≈1mm.	• Cat 1 • Cat 0 • Cat 1	• 4464 • 4465 • 4466
	Wall 3	• Intermittent grout gap along underside of cornice against wall tiles, estimated width w≈1mm. • Corner wall crack at wall 4, estimated width w≈0.5mm.	• Cat 1 • Cat 1	• 4467 • 4469
	Wall 4	• Intermittent grout gap along underside of cornice against wall tiles, estimated width w≈1mm. • Gaps in wall grout around door architrave, estimated width w≈0.5mm.	• Cat 1 • Cat 1	• 4468 • 4470
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD, pan fast to floor.	•	•
Bedroom 4	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
Laundry	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•
Linen cupboard	Wall 1	• NVD	•	•

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD, but door handle loose	• noted	• 4471
	Ceiling	• NVD	•	•
	Floor	• T&G, NVD	•	•
Master bedroom	Wall 1	• NVD, crack between dormer wall and ceiling, estimated width w≈0.3mm	• Cat 1	• 4472
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• Crack at corner of dormer, estimated width w≈0.1mm	• Cat 0	• 4473
	Floor	• Carpet, NVD	•	•
WIR	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• Water damaged ceiling	• noted	• 4474
	Floor	• Carpet, NVD	•	•
Ensuite	Wall 1	• Crack in grout along top of wall tiles, estimated width w≈0.3mm	• Cat 1	• 4475
	Wall 2	• Crack in grout along top of wall tiles, estimate crack width w≈1mm	• Cat 1	• 4476
	Wall 3	• NVD	•	•
	Wall 4	• Crack in grout along top of wall tiles, estimate crack width w≈0.1-1mm	• Cat 0-Cat 1	• 4477, 4478
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD but a gap observed between the bath surround and wall 1, estimated width ≈4mm.	• Cat 2	• 4479
Loft storage	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
Garage	Wall 1	• NVD	•	•
	Wall 2	• Horizontally and vertically cracked cornice south of window, estimated crack width w≈2mm • Vertical crack both sides of pier, estimated width w≈1mm. • Vertical crack between pier and wall, estimated width w≈2mm at top, crack extends along underside of cornice and returns to panel lift door(see external image 4516).	• Cat 2 • Cat 1 • Cat 2	• 4480 • 4481-4485 • 4486, 4516

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
	Wall 3	• Vertical crack between end of 230mm nib wall and 110mm spandrel wall over garage door, estimated width 3mm. • Vertical crack at right-hand end of garage doors, estimated width w≈1mm.	• Cat 2 • Cat 1	• 4487 • 4488, 4489,4490
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•
Garage store	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•

Table 2 Pre-existing internal damage of secondary dwelling observed at ground floor level during PMI first floor damage recorded by images

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
Living	Wall 1	• NVD	•	•
	Wall 2	• NVD	•	•
	Wall 3	• Crack radiating outwards then upwards towards cornice above top left-hand corner of window, estimated width w≈0.5mm • Gap between underside of cornice and wall, estimated width w≈2mm. • Crack above top right-hand end of window, estimated width w≈1.5mm.	• Cat 1 • Cat 2 • Cat 2	• 3710 • 3710, 3711 • 3711
	Wall 4	• Horizontal crack at the top left-hand corner of window, estimated width w≈0.5-1.0mm, crack has previously been repaired and could have been wider than estimated. • Horizontal crack at the top right-hand corner of window, estimated width w≈0.3mm, crack has previously been repaired and could have been wider than estimated.	• Cat 1 • Cat 1	• 3712-3714 • 3715
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•
Kitchen	Wall 1	• NVD	•	•
	Wall 2	• Horizontal & vertical crack above top right-hand corner of window near wall 3, estimated width w≈1mm.	• Cat 1	• 3716
	Wall 3	• Horizontal crack at top left-hand corner of window, estimated width w≈0.1mm but crack appears to have been previously repaired.	• Cat 1	• 3717
	Wall 4	• No wall 4	•	•
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•
Bathroom	Wall 1	• Gap between underside of cornice and wall tiles estimated width w≈1-2mm. • Corner wall grout crack at wall 2, estimated width w≈1mm.	• Cat 2 • Cat 1	• 3718 • 3718
	Wall 2	• Gap between underside of cornice and wall tiles estimated width w≈1-2mm. • Crack between bath and surrounding tile grout. • Corner wall crack at wall 2, estimated width w≈1-1.5mm.	• Cat 2 • Cat 1 • Cat 2	• 3720 • 3719 • 3721
	Wall 3	• Gap between underside of cornice and wall tiles estimated width w≈1-2mm, typical.	•	•

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
	Wall 4	• Gap between underside of cornice and wall tiles estimated width w≈1-2mm, typical, missing door architrave.	•	• 3723
	Ceiling	• Mouldy peeling paint	• noted	• 3722, 3723
	Floor	• Tile, NVD and pan fast to floor	•	•
Laundry	Wall 1	• NVD	•	•
	Wall 2	• Cracking around back-to-back cold-formed steel columns.	•	• 3724
	Wall 3	• NVD	•	•
	Wall 4	• NVD	•	•
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD	•	•
Master bedroom	Wall 1	•	•	• 3725
	Wall 2	•	•	• 3726,3727
	Wall 3	•	•	• 3728
	Wall 4	•	•	• 3729
	Ceiling	•	•	•
	Floor	• Carpet, NVD	•	•
Hallway	Wall 1	• NVD	•	• 3731,3732
	Wall 2	• NVD	•	• 3730
	Wall 3	• NVD	•	• -
	Wall 4	• No wall 4	•	•
	Ceiling	•	•	•
	Floor	• Carpet, NVD	•	•
Bathroom	Wall 1	• Vertical crack in tile grout near wall and racking in corner grout at wall 2. estimated width w≈2mm. • Gaps between cornice and wall tiles, estimated width up to 2mm.	• Cat 2 • Cat 2	• 3733 • 3733
	Wall 2	• Gaps between cornice and wall tiles, estimated width up to 2mm.	• Cat 2	• 3734
	Wall 3	• Gaps between cornice and wall tiles, estimated width up to 2mm.	•	• 3735
	Wall 4	• Gaps between cornice and wall tiles, estimated width up to 2mm.	•	• 3736
	Ceiling	• NVD	•	•
	Floor	• Tile, NVD pan fast to floor	•	•
Lounge room	Wall 1	• Crack at end of cornice at end of wall 1, estimated width w≈1mm.	• Cat 1	• 3740
	Wall 2	• Gaps between Hebel walls and back-to-back cold-formed steel columns, estimated width w≈2mm.	• noted	• 3737
	Wall 3	• NVD	•	• 3738
	Wall 4	• NVD	•	• 3739
	Ceiling	• Cracking in ceiling at the end of wall 1 near ridge	•	•
	Floor	• Carpet	•	•

Internal	Element	Pre-existing damage; NVD = No visible damage	Damage Classification to AS2870: 2011	Camera image
Bedroom 3	Wall 1	• NVD	•	• 3741,3742
	Wall 2	• NVD	•	• 3742,3743
	Wall 3	• NVD	•	• 3743,3744
	Wall 4	• NVD	•	• 3744
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•
Bedroom 2	Wall 1	• NVD	•	• 3745,3746
	Wall 2	• NVD	•	• 3746,3747
	Wall 3	• NVD	•	• 3747,3748
	Wall 4	• NVD	•	• 3748,3749
	Ceiling	• NVD	•	•
	Floor	• Carpet, NVD	•	•

Yours faithfully
John Matheson & Associates Pty Ltd

John Matheson BE (HON) MIE Aust CPEng
Director

Appendix A: Ground floor plan of main dwelling

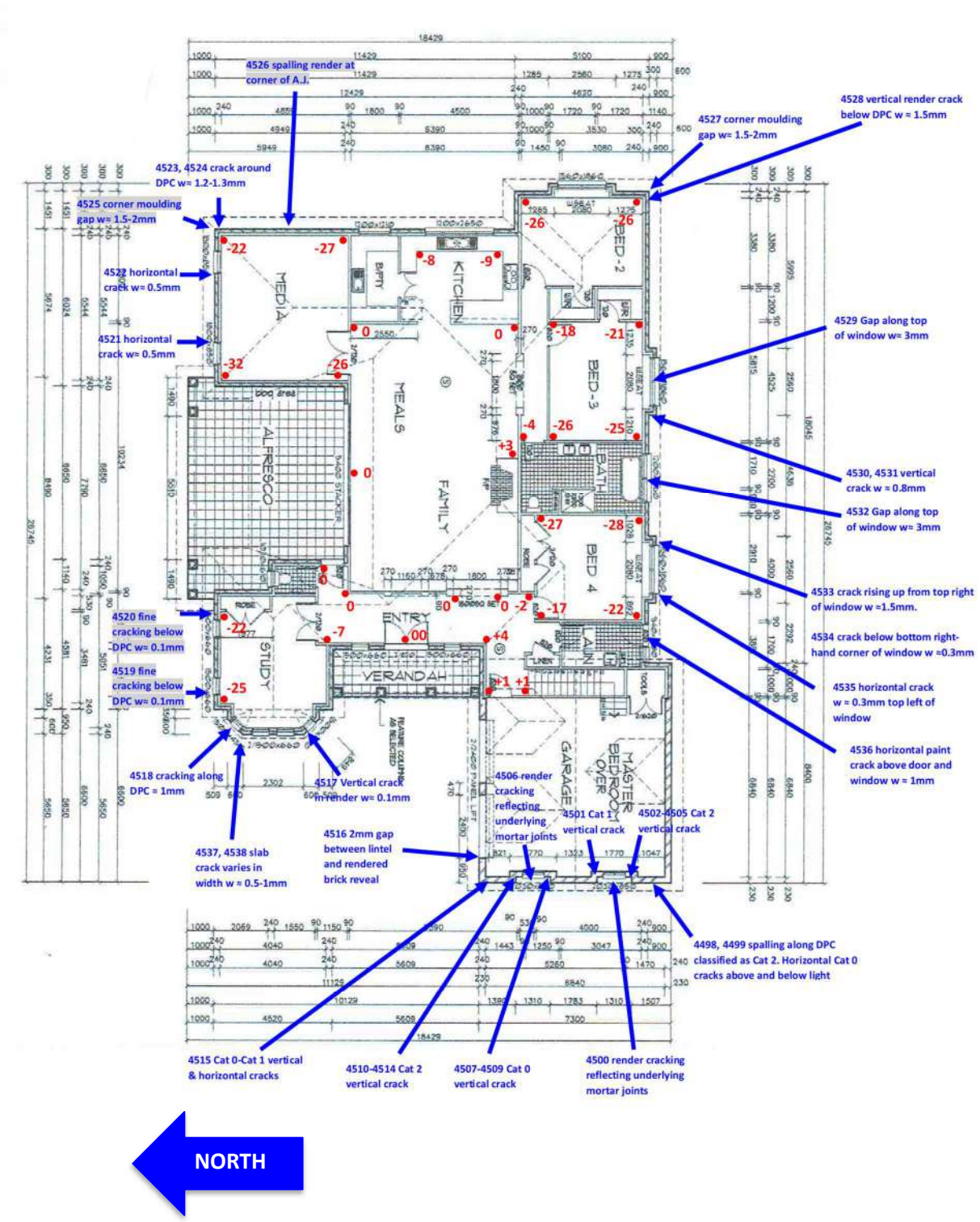

Figure 1 Floor layout plan of main dwelling with site notes and measured internal finished floor levels relative to an assumed datum inside the front entry door. Damage observed around the dwelling noted on plan.

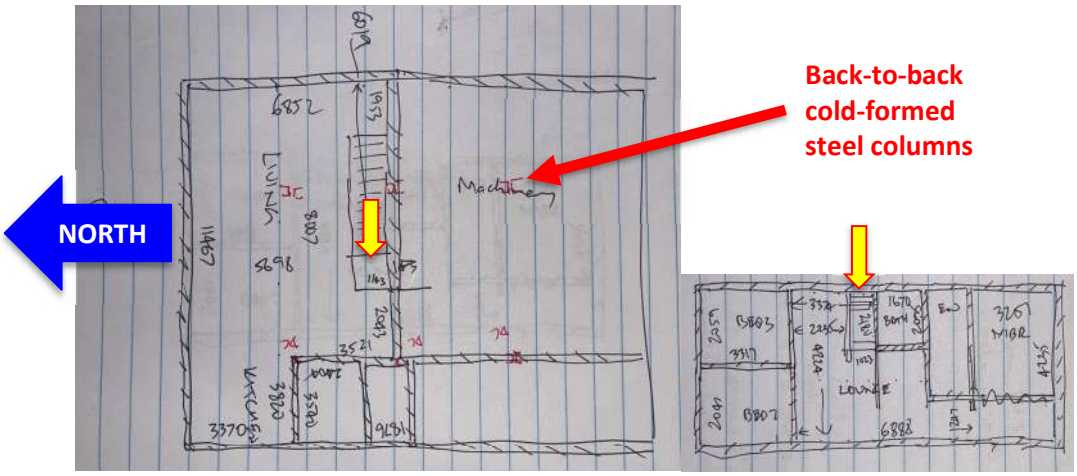

Figure 2 Secondary dwelling and machinery shed floor layout plan (left-frame) and first floor (right-frame), showing Hebel masonry walls at ground floor level.

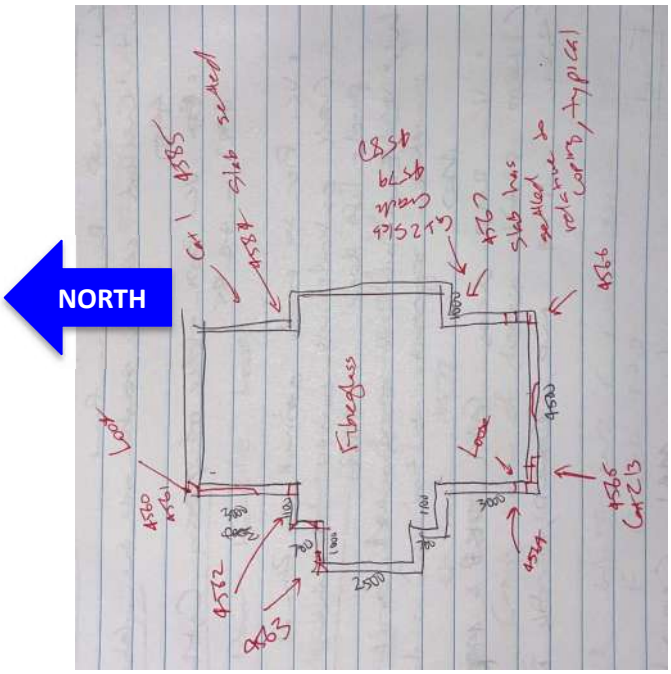

Figure 3 Swimming pool layout plan

Appendix B: Photographs of main dwelling interior

Figure 4: DSC_4421

Figure 5: DSC_4422

Figure 6: DSC_4423

Figure 7: DSC_4424

Figure 8: DSC_4425

Figure 9: DSC_4426

Figure 10: DSC_4427

Figure 11: DSC_4428

Figure 12: DSC_4429

Figure 13: DSC_4430

Figure 14: DSC_4431

Figure 15: DSC_4432

Figure 16: DSC_4433

Figure 17: DSC_4434

Figure 18: DSC_4435

Figure 19: DSC_4436

Figure 20: DSC_4437

Figure 21: DSC_4438

Figure 22: DSC_4439

Figure 23: DSC_4440

Figure 24: DSC_4441

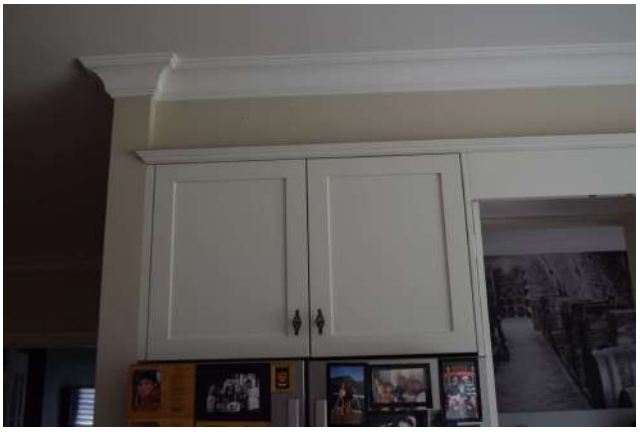

Figure 25: DSC_4442

Figure 26: DSC_4443

Figure 27: DSC_4444

Figure 28: DSC_4445

Figure 29: DSC_4446

Figure 30: DSC_4447

Figure 31: DSC_4448

Figure 32: DSC_4449

Figure 33: DSC_4450

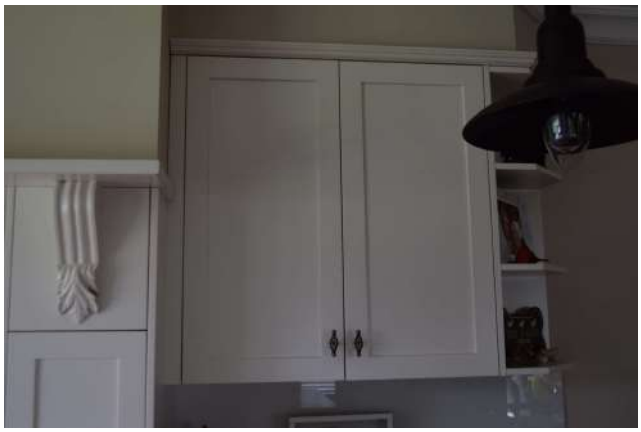

Figure 34: DSC_4451

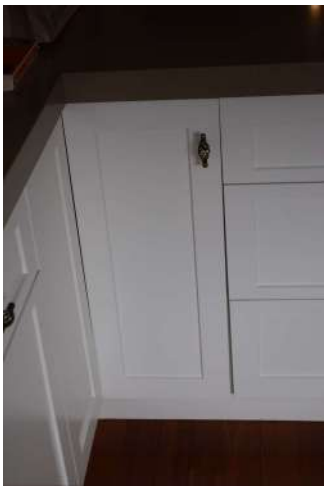

Figure 35: DSC_4452

Figure 36: DSC_4453

Figure 37: DSC_4454

Figure 38: DSC_4455

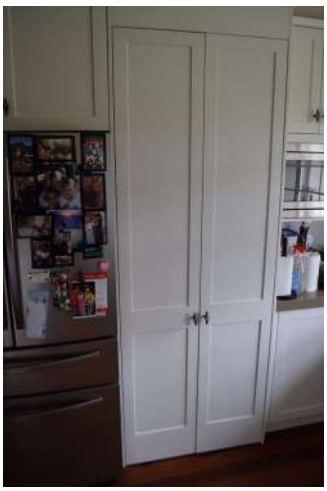

Figure 39: DSC_4456

Figure 40: DSC_4457

Figure 41: DSC_4458

Figure 42: DSC_4459

Figure 43: DSC_4460

Figure 44: DSC_4461

Figure 45: DSC_4462

Figure 46: DSC_4463

Figure 47: DSC_4464

Figure 48: DSC_4465

Figure 49: DSC_4466

Figure 50: DSC_4467

Figure 51: DSC_4468

Figure 52: DSC_4469

Figure 53: DSC_4470

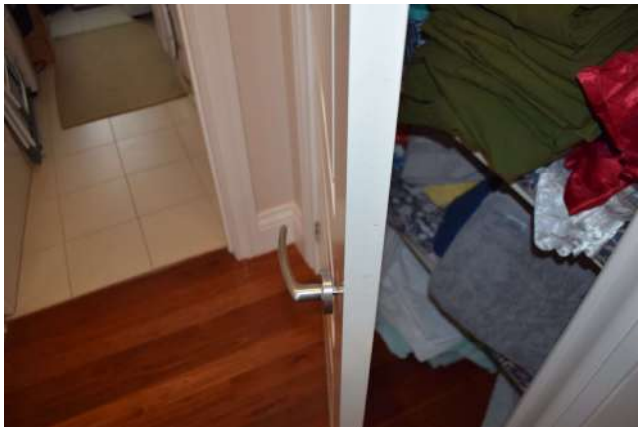

Figure 54: DSC_4471

Figure 55: DSC_4472

Figure 56: DSC_4473

Figure 57: DSC_4474

Figure 58: DSC_4475

Figure 59: DSC_4476

Figure 60: DSC_4477

Figure 61: DSC_4478

Figure 62: DSC_4479

Figure 63: DSC_4480

Figure 64: DSC_4481

Figure 65: DSC_4482

Figure 66: DSC_4483

Figure 67: DSC_4484

Figure 68: DSC_4485

Figure 69: DSC_4486

Figure 70: DSC_4487

Figure 71: DSC_4488

Figure 72: DSC_4489

Figure 73: DSC_4490

Figure 74: DSC_4491

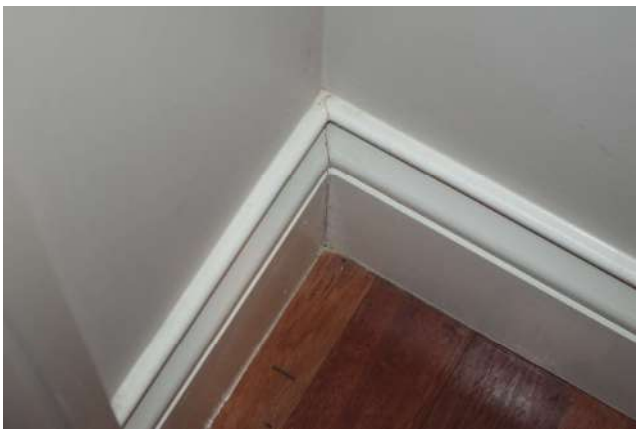

Figure 75: DSC_4492

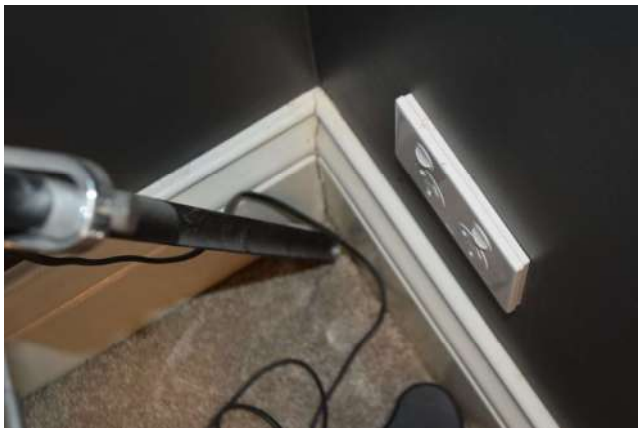

Figure 76: DSC_4493

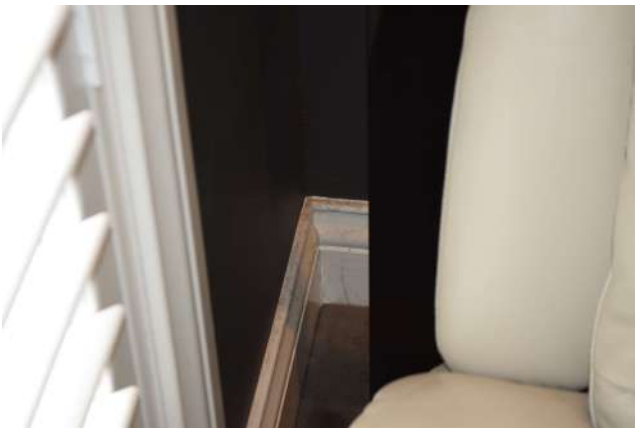

Figure 77: DSC_4494

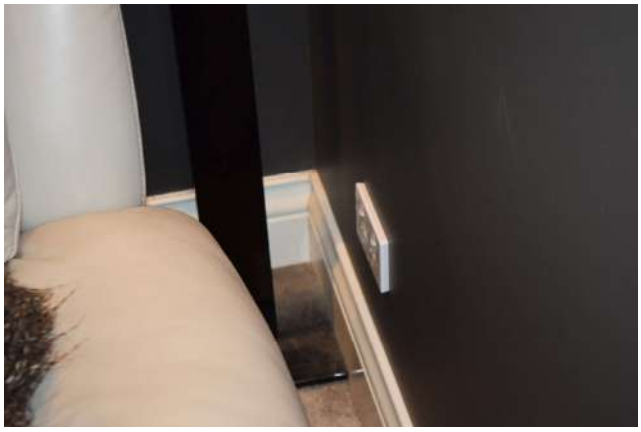

Figure 78: DSC_4495

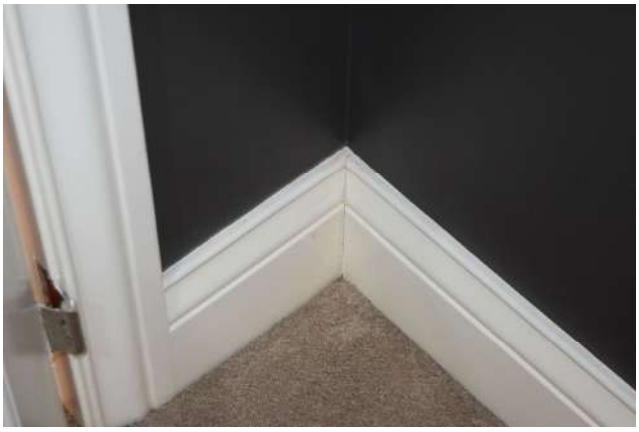

Figure 79: DSC_4496

Appendix C: Main dwelling exterior and external structures

Figure 80: DSC_4498

Figure 81: DSC_4499

Figure 82: DSC_4500

Figure 83: DSC_4501

Figure 84: DSC_4502

Figure 85: DSC_4503

Figure 86: DSC_4504

Figure 87: DSC_4505

Figure 88: DSC_4506

Figure 89: DSC_4507

Figure 90: DSC_4508

Figure 91: DSC_4509

Figure 92: DSC_4510

Figure 93: DSC_4511

Figure 94: DSC_4512

Figure 95: DSC_4513

Figure 96: DSC_4514

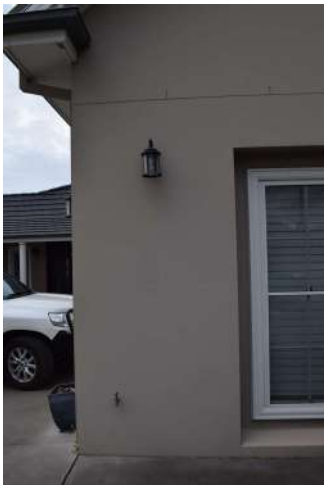

Figure 97: DSC_4515

Figure 98: DSC_4516

Figure 99: DSC_4517

Figure 100: DSC_4518

Figure 101: DSC_4519

Figure 102: DSC_4520

Figure 103: DSC_4521

Figure 104: DSC_4522

Figure 105: DSC_4523

Figure 106: DSC_4524

Figure 107: DSC_4525

Figure 108: DSC_4526

Figure 109: DSC_4527

Figure 110: DSC_4528

Figure 111: DSC_4529

Figure 112: DSC_4530

Figure 113: DSC_4531

Figure 114: DSC_4532

Figure 115: DSC_4533

Figure 116: DSC_4534

Figure 117: DSC_4535

Figure 118: DSC_4536

Figure 119: DSC_4537

Figure 120: DSC_4538

Figure 121: DSC_4539

Figure 122: DSC_4540

Figure 123: DSC_4541

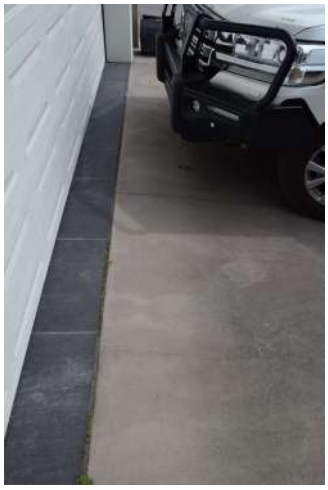

Figure 124: DSC_4542

Figure 125: DSC_4543

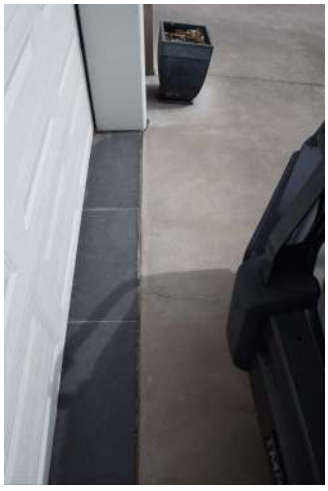

Figure 126: DSC_4544

Figure 127: DSC_4545

Figure 128: DSC_4546

Figure 129: DSC_4547

Figure 130: DSC_4548

Figure 131: DSC_4549

Figure 132: DSC_4550

Figure 133: DSC_4551

Figure 134: DSC_4552

Figure 135: DSC_4553

Figure 136: DSC_4554

Figure 137: DSC_4555

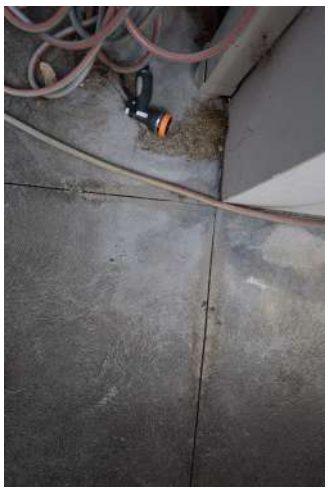

Figure 138: DSC_4556

Figure 139: DSC_4557

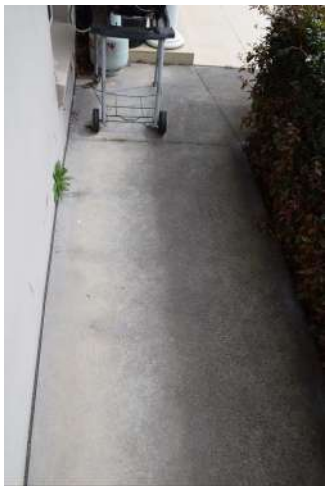

Figure 140: DSC_4558

Figure 141: DSC_4559

Appendix D: Secondary dwelling

Figure 142: DSC_4607

Figure 143: DSC_4608

Figure 144: DSC_4609

Figure 145: IMG_3700

Figure 146: IMG_3701

Figure 147: IMG_3702

Figure 148: IMG_3703

Figure 149: IMG_3704

Figure 150: IMG_3705

Figure 151: IMG_3706

Figure 152: IMG_3707

Figure 153: IMG_3708

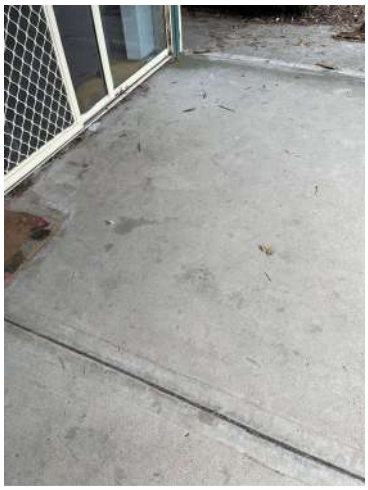

Figure 154: IMG_3709

Figure 155: IMG_3710

Figure 156: IMG_3711

Figure 157: IMG_3712

Figure 158: IMG_3713

Figure 159: IMG_3714

Figure 160: IMG_3715

Figure 161: IMG_3716

Figure 162: IMG_3717

Figure 163: IMG_3718

Figure 164: IMG_3719

Figure 165: IMG_3720

Figure 166: IMG_3721

Figure 167: IMG_3722

Figure 168: IMG_3723

Figure 169: IMG_3724

Figure 170: IMG_3725

Figure 171: IMG_3726

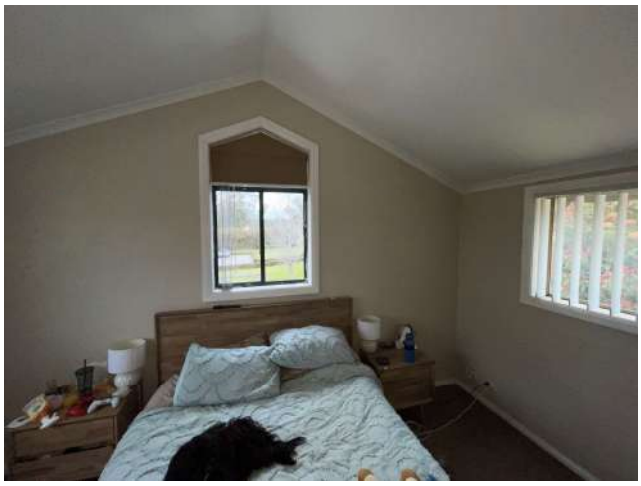

Figure 172: IMG_3727

Figure 173: IMG_3728

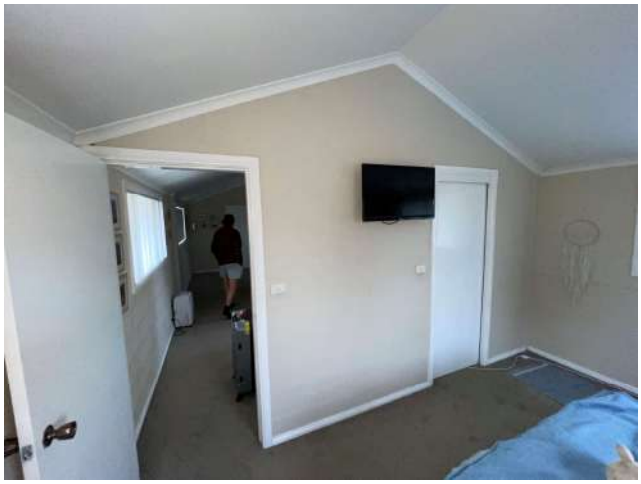

Figure 174: IMG_3729

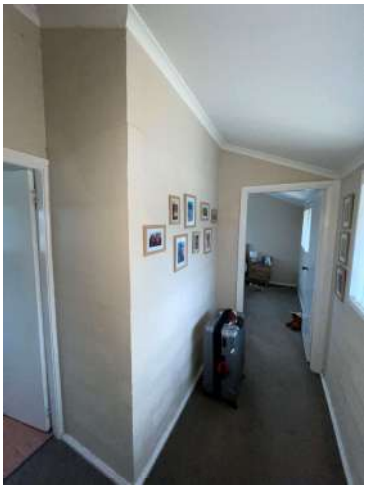

Figure 175: IMG_3730

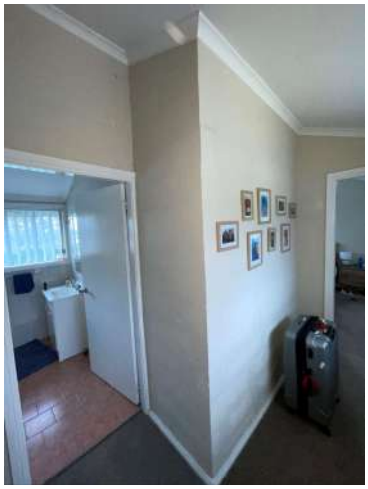

Figure 176: IMG_3731

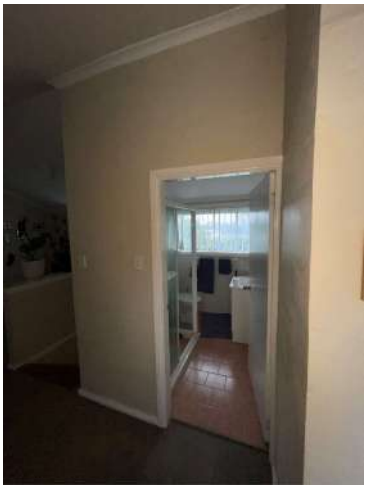

Figure 177: IMG_3732

Figure 178: IMG_3733

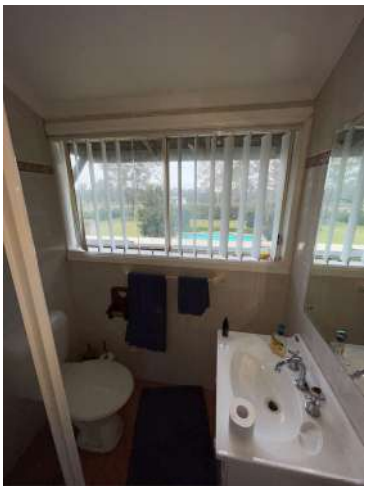

Figure 179: IMG_3734

Figure 180: IMG_3735

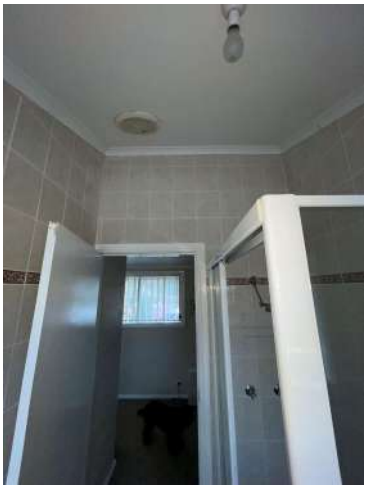

Figure 181: IMG_3736

Figure 182: IMG_3737

Figure 183: IMG_3738

Figure 184: IMG_3739

Figure 185: IMG_3740

Figure 186: IMG_3741

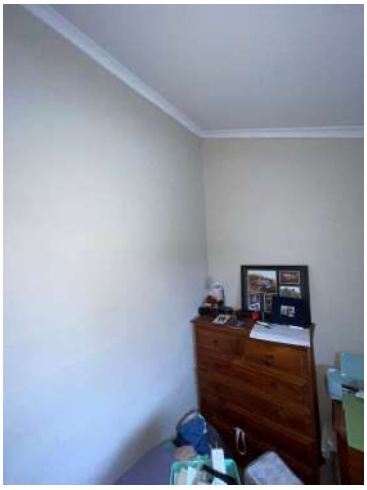

Figure 187: IMG_3742

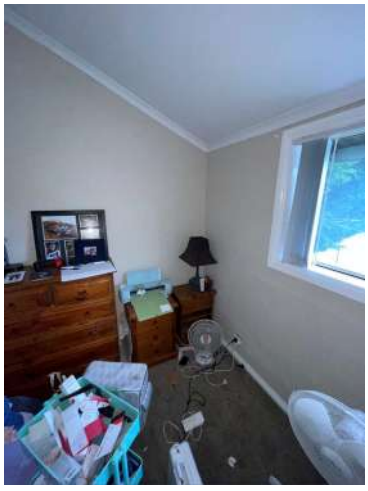

Figure 188: IMG_3743

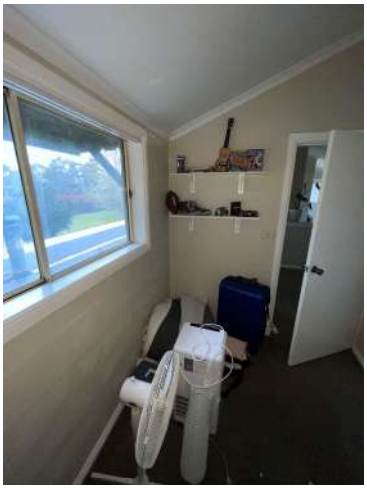

Figure 189: IMG_3744

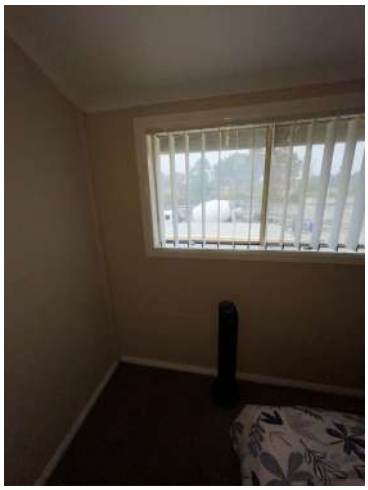

Figure 190: IMG_3745

Figure 191: IMG_3746

Figure 192: IMG_3747

Figure 193: IMG_3748

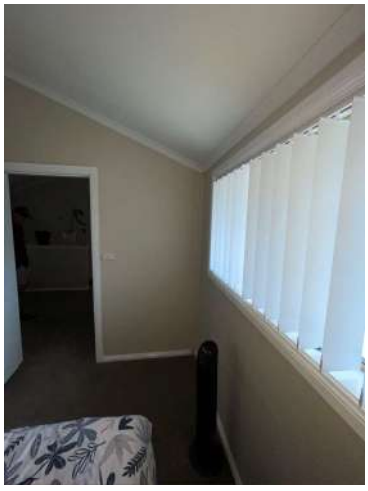

Figure 194: IMG_3749

Figure 195: IMG_3750

Appendix E: Swimming Pool

Figure 196: DSC_4560

Figure 197: DSC_4561

Figure 198: DSC_4562

Figure 199: DSC_4563

Figure 200: DSC_4564

Figure 201: DSC_4565

Figure 202: DSC_4566

Figure 203: DSC_4567

Figure 204: DSC_4568

Figure 205: DSC_4569

Figure 206: DSC_4570

Figure 207: DSC_4571

Figure 208: DSC_4572

Figure 209: DSC_4573

Figure 210: DSC_4574

Figure 211: DSC_4575

Figure 212: DSC_4576

Figure 213: DSC_4577

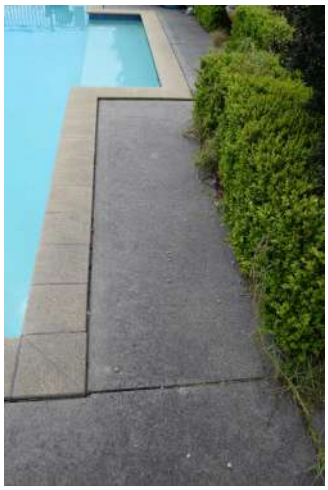

Figure 214: DSC_4578

Figure 215: DSC_4579

Figure 216: DSC_4580

Figure 217: DSC_4581

Figure 218: DSC_4582

Figure 219: DSC_4583

Figure 220: DSC_4584

Figure 221: DSC_4585

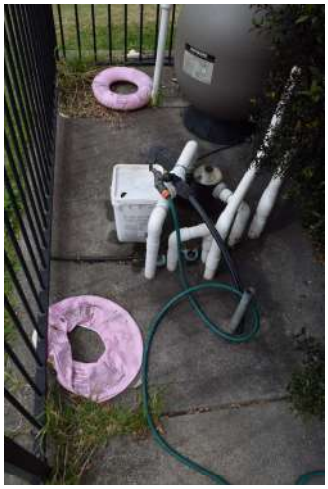

Figure 222: DSC_4586

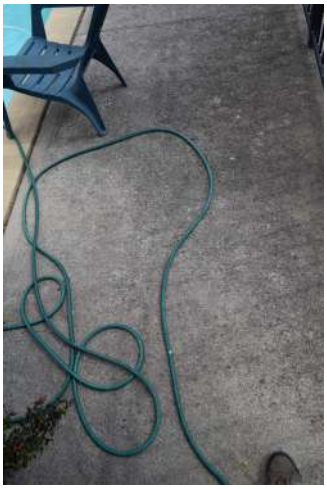

Figure 223: DSC_4587

Figure 224: DSC_4588

Figure 225: DSC_4589

Figure 226: DSC_4590

Figure 227: DSC_4591

Figure 228: DSC_4592

Figure 229: DSC_4593

Figure 230: DSC_4594

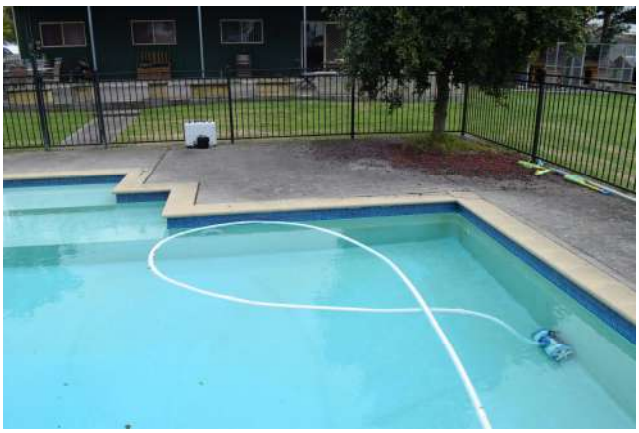

Figure 231: DSC_4595

Figure 232: DSC_4596

Figure 233: DSC_4597

Figure 234: DSC_4598

Figure 235: DSC_4599

Figure 236: DSC_4600

Figure 237: DSC_4601

Figure 238: DSC_4602

Appendix F: Concrete Plant

Figure 239: IMG_3751

Figure 240: IMG_3752

Figure 241: IMG_3753

Figure 242: IMG_3754

Figure 243: IMG_3755

Figure 244: IMG_3756

Figure 245: IMG_3757

Figure 246: IMG_3758

Figure 247: IMG_3759

Figure 248: IMG_3760

Figure 249: IMG_3761

Figure 250: IMG_3762

Figure 251: IMG_3763

Figure 252: IMG_3764

Figure 253: IMG_3765

Figure 254: IMG_3766

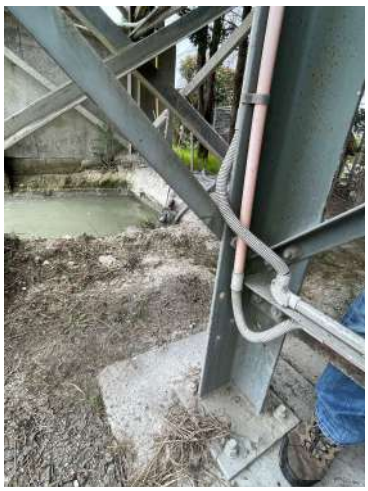

Figure 255: IMG_3767

Figure 256: IMG_3768

Figure 257: IMG_3769

Figure 258: IMG_3770

Figure 259: IMG_3771

Figure 260: IMG_3772

Figure 261: IMG_3773

Figure 262: IMG_3774

Figure 263: IMG_3775

Figure 264: IMG_3776

Figure 265: IMG_3777

Figure 266: IMG_3778

Figure 267: IMG_3779

Figure 268: IMG_3780

Figure 269: IMG_3781

Figure 270: IMG_3782

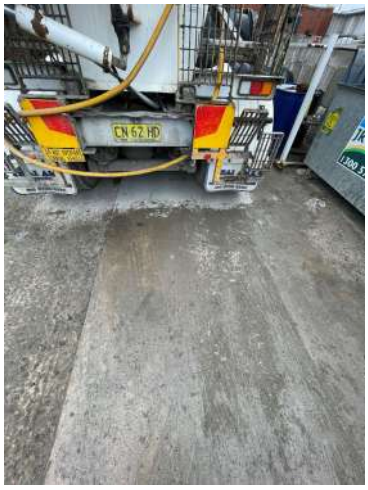

Figure 271: IMG_3783

Figure 272: IMG_3784

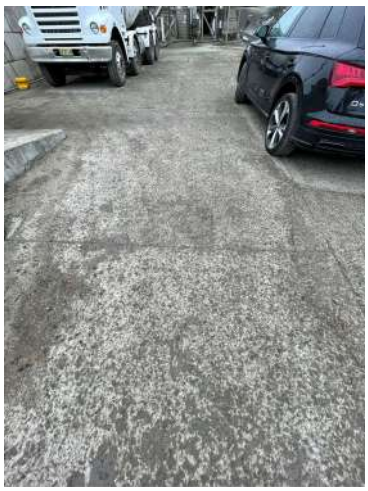

Figure 273: IMG_3785

Figure 274: IMG_3786

Figure 275: IMG_3787

Figure 276: IMG_3788

Figure 277: IMG_3789

Figure 278: IMG_3790

Figure 279: IMG_3791

Figure 280: IMG_3792

Figure 281: IMG_3793

Figure 282: IMG_3794

Figure 283: IMG_3795

Figure 284: IMG_3796

Figure 285: IMG_3797

Figure 286: IMG_3798

Figure 287: IMG_3799

Figure 288: IMG_3800

Figure 289: IMG_3801

Figure 290: IMG_3802

Figure 291: IMG_3803

Figure 292: IMG_3804

Figure 293: IMG_3805

Figure 294: IMG_3806

Figure 295: IMG_3807

Figure 296: IMG_3808

Figure 297: IMG_3809

Figure 298: IMG_3810

Figure 299: IMG_3811

Figure 300: IMG_3812

Figure 301: IMG_3813

Figure 302: IMG_3814

Figure 303: IMG_3815

Figure 304: IMG_3816

Figure 305: IMG_3817

Figure 306: IMG_3818

Figure 307: IMG_3819

Figure 308: IMG_3820

Figure 309: IMG_3821

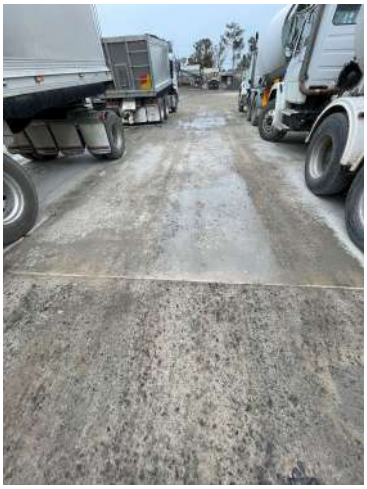

Figure 310: IMG_3822

Figure 311: IMG_3823

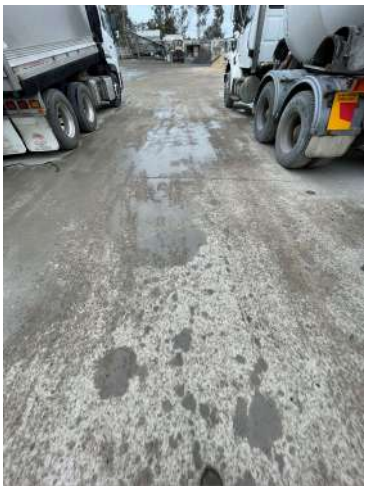

Figure 312: IMG_3824

Figure 313: IMG_3825

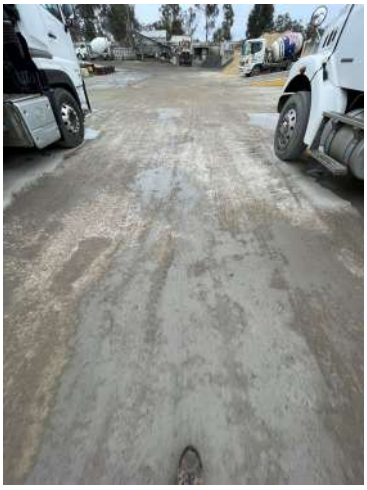

Figure 314: IMG_3826

Figure 315: IMG_3827

Figure 316: IMG_3828

Figure 317: IMG_3829

Figure 318: IMG_3830

Figure 319: IMG_3831

Figure 320: IMG_3832

Figure 321: IMG_3833

Figure 322: IMG_3834

Figure 323: IMG_3835

Figure 324: IMG_3836

Figure 325: IMG_3837

Figure 326: IMG_3838

Figure 327: IMG_3839

Figure 328: IMG_3840

Figure 329: IMG_3841

Figure 330: IMG_3842

Figure 331: IMG_3843

Appendix G: New Shed

Figure 332: IMG_3845

Figure 333: IMG_3846

Figure 334: IMG_3847

Figure 335: IMG_3848

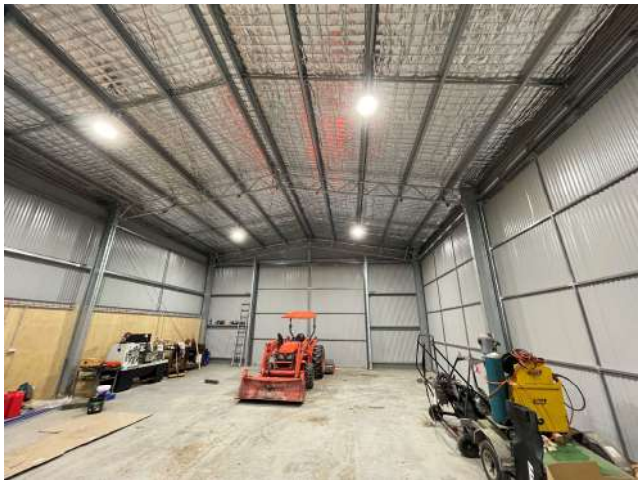

Figure 336: IMG_3849

Figure 337: IMG_3850

Figure 338: IMG_3851

Figure 339: IMG_3852

Figure 340: IMG_3853

Figure 341: IMG_3854

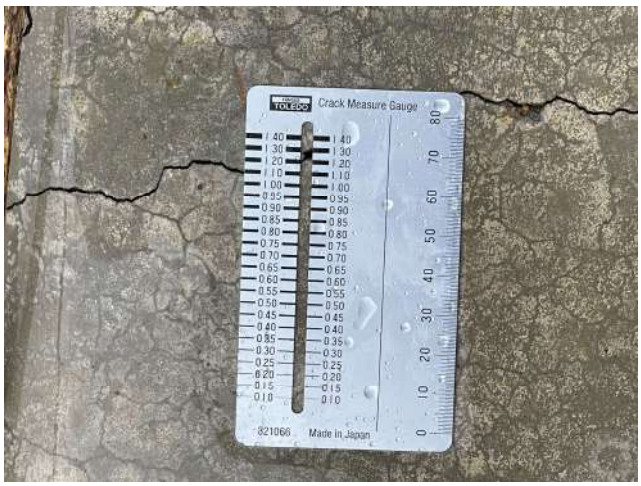

Figure 342: IMG_3855

Figure 343: IMG_3856

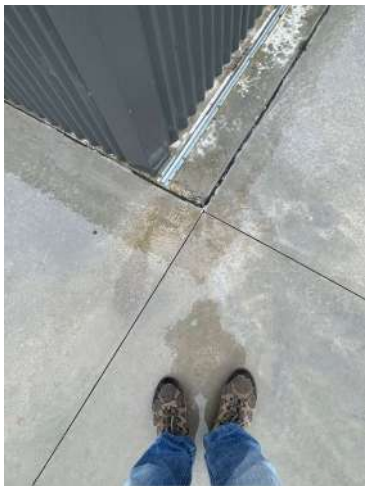

Figure 344: IMG_3857

Figure 345: IMG_3858

Figure 346: IMG_3859

Figure 347: IMG_3860

Figure 348: IMG_3861

Figure 349: IMG_3862

Appendix H: Miscellaneous Structures

Figure 350: DSC_4603

Figure 351: DSC_4604

Figure 352: DSC_4605

Figure 353: DSC_4606

Figure 354: IMG_3844

Figure 355: IMG_3863

Figure 356: IMG_3864

Figure 357: IMG_3865

Figure 358: IMG_3866

Figure 359: IMG_3867

Figure 360: IMG_3868

Figure 361: IMG_3869

Figure 362: IMG_3870

Figure 363: IMG_3871

Tahmoor Coal Pty Ltd
2975 Remembrance Drive, Bargo
PO Box 100, Tahmoor NSW 2573

Our Ref: J M A Solutions 20230602-R1: 3165 Remembrance Driveway, silo superstructure and machinery shed assessment

Date of site visit: 20 June 2023

A structural assessment has been conducted for the cement silo and the machinery shed on the captioned property in Bargo and the preliminary findings are reported in the following.

Silo Structure

The geometry of the silo structure was measured on site during a recent inspection conducted on 20 June 2023 in the company of Mr. Rod Sweeting. The member sizes and the dimensions of the trussed tower frame and external surface of the silo were measured using vernier calipers and laser distance measurement, see **Figure 1**. It was not possible to measure the wall thickness of the silo in the absence of an elevated work platform. However, a wall thickness of 8mm has been assumed for the silo cylinder and the conical hopper and the roof structure is assumed to comprise a structural steel grillage surmounted by a 6mm plate. The structure was fabricated post 2008 and a steel grade 300Plus has been assumed for the tower members and steel grade 250 has been assumed for the silo roof plate, cylinder, and hopper.

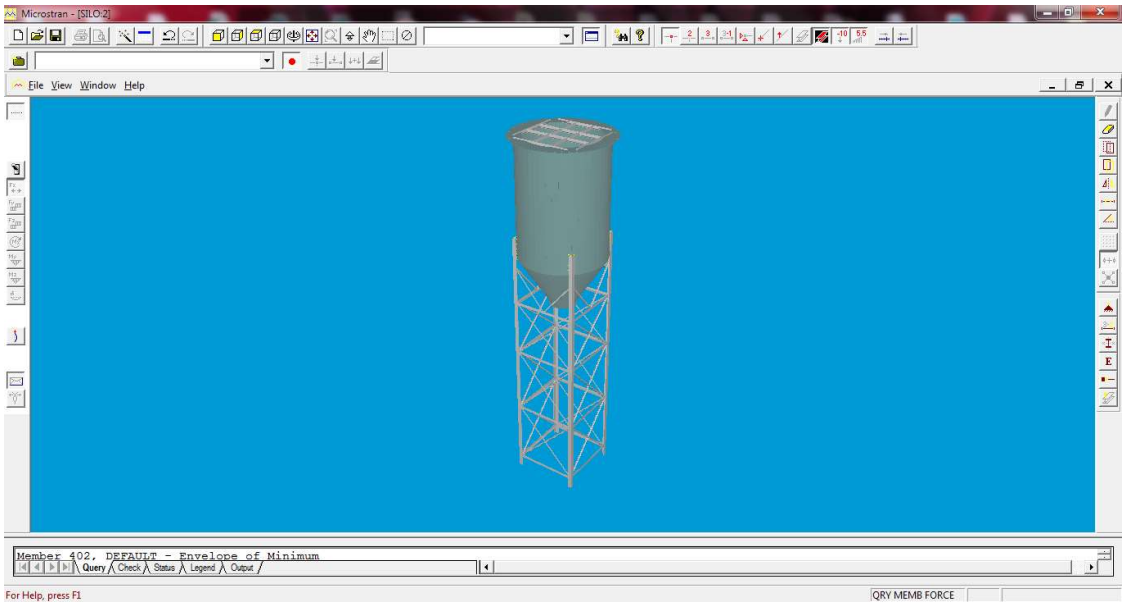

Figure 1 A perspective view of the silo structure that was developed following the site visit.

Structure Loads

The self-weight of the structure was assessed by applying gravity to the structure model determined by site measurement. A live load of 4kPa was applied to the roof plate that is assumed to be supported by a structural steel grillage, which is conservative, however it is a small load compared with the mass of stored cement, with a load estimated to be in the order of 47Tonne based in the silo geometry and a cement unit weight of 1600kg/m3.

Three cases of ground tilt were applied to the structure model where it was apparent that the tilt in the north and south directions were “worst case” combinations, see highlighted areas of predicted tilt in

Figure 2. Furthermore, in addition to the predicted subsidence-induced ground tilt, a construction tilt of 5mm/m was applied in the same general direction as subsidence-induced tilt.

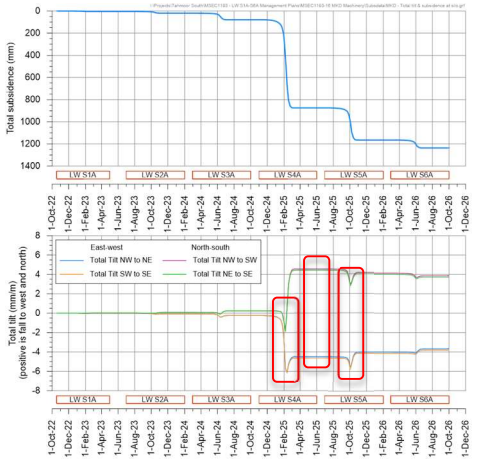

Figure 2 Worst-case tilt scenarios that were simulated by the three-dimensional structure model.

Wind loads were applied in accordance with AS1170.2 in the general direction of maximum tilt so that the maximum column reaction occurred at the same location (northeast column). The earthquake forces have been applied as horizontal forces amounting to 7.1% of the combined mass of the structure and the silo full (47.3tonne) of cement.

AS1170.4 recommends that a live load combination factor of $\psi_c = 0.6$ could be used for storage, however, given that the owner informs that the cement silo is filled daily and that, furthermore, AS3774.1996 Loads on bulk solids containers, does not recommend a reduction of the mass of the bulk solid, the cement silo was assumed to be full in the event of an earthquake.

Two scenarios of earthquake loads were applied to the structure in accordance with AS1170.4. In the first scenario, 100% of earthquake load was applied from south-to-north and 30% of earthquake load was applied from west-to-east so the vector component of earthquake load acted in a similar direction to ground and assumed structure tilt. In the second scenario, 30% of earthquake load was applied from south-to-north and 100% of earthquake load was applied from west-to-east so the vector component of earthquake load acted in a similar direction to ground and assumed structure tilt.

As background to the recent tremors of magnitude 3.0-3.5 that have occurred in the general area, a Hazard Factor formerly known as an acceleration coefficient of 0.095 was used in the calculation of earthquake forces that were applied to the silo. An acceleration of this magnitude is equivalent to an M4.5 earthquake following the work of Gutenberg and Richter. Noting that the Richter scale is a log scale, an M4.5 earthquake is therefore 10-times the magnitude of an M3.5 earthquake.

For the ultimate strength design checks of the tower members, the following load and displacement factors were applied:

i.	Structure self-weight:	1.25
ii.	Live load:	1.8
iii.	Bulk storage:	1.25
iv.	Subsidence-induced tilt:	1.5
v.	Construction tilt:	1.5
vi.	Wind load:	1.0 (Ultimate load)
vii.	Earthquake load:	1.0 (Ultimate load)

Observations and Conclusions

A structure assessment has been conducted for the cement silo superstructure and the supporting reinforced concrete piers, which drawings show have been embedded at least one metre into bedrock.

Ground tilt is expected to cause the elevated mass of the silo to become more eccentric to the supporting structure, than it currently is noting that AS3774 requires for all cylindrical containers other than those with corrugated walls, that the maximum permissible deviation shall be 0.5% grade or 5mm/m tilt, plumb of vertical container walls and centre-line, which is assumed to apply to the supporting tower structure.

Increasing the eccentricity of the structure mass relative to the base is expected to cause an increase in the magnitude of horizontal forces acting on the structure, increasing the magnitude of tension forces in the bracing members, compression in the horizontal angle members and the anterior columns (in the direction of tilt) and a reduction in compression for the posterior columns. The design review indicates that the tower columns, horizontal angles, and cross bracing angles should meet the requirements of AS4100 Steel structures for the predicted tilt assuming that the horizontal angle that is currently missing from the north elevation (just above ground level) is-reinstalled, see **Figure 3**.

Figure 3 Location of missing angle tie indicated by red double-headed arrow.

Ground tilt (as predicted) could cause a 3.1% increase in the magnitude of compressive stress calculated in the vertical elements of the silo cylinder located directly above the supporting columns, which is not a significant increase. Horizontal compressive stress just above the connection between the cylinder and hopper, immediately adjoining the tower column connection, is predicted to increase by 12.2%, which is slightly more than the 10% tolerance interval for a structure design audit. Calculations, which have assumed a silo wall (cylinder and hopper) thickness of 8mm, indicate the cylinder wall should meet the requirements of AS4100 Steel structures.

The design review indicates that the steel angle-members that comprise the silo support tower should meet the requirements of AS4100 for the load combinations that have been modelled, which includes the impact of -3mm/m of compressive ground strain acting diagonally across the base of the tower frame causing the diagonal distance between the baseplates (e.g., NE to SW) to close by around -10mm. However, it is recommended that a Monitoring Review Point trigger of -5mm should be set across the diagonal of the tower frame at pier level, for monitoring purposes.

Table 1 Maximum calculated tensile and compressive stress in silo hopper under full height cement storage

Element	Maximum calculated pre-mining tensile stress (MPa)	Maximum calculated pre-mining compressive stress (MPa)	Maximum calculated tensile stress (MPa)	Maximum calculated compressive stress (MPa)
Hoop elements around cylinder	41.3	-58.9	46.9	-66.1
Vertical elements around cylinder	11.1	-35.9	11.2	-37.0
Hoop elements around conical chute	19.8	-6.8	20.6	-7.6
Radial elements around conical chute	32.9	-32.7	34.0	-33.8

The impact of compressive and tensile ground strain on the ground slab and concrete piers has been considered. Tensile ground strain could develop as the travelling way moves in a southeast to northwesterly direction, initially causing ground extension to develop as the longwall face passes the silo followed by ground compression as the longwall face retreats beyond the property. Ground extension could open slab joints, increase width of pre-existing cracks, or cause new cracks to occur in the ground slabs, which should not have an adverse impact on the concrete piers that support the silo.

Compressive ground strain could reverse the impact of ground extension, tending to close joints and pre-existing and new cracks that opened because of ground extension before significant compressive stresses are generated. Typically, compressive ground strain of -1.5mm/m could occur in an unrestrained concrete ground slab before compression damage becomes apparent. However, if movement is restrained by the silo piers, for example, stress could concentrate in the ground slab around the piers causing localised compression damage to occur in the ground slab.

In terms of horizontal bending of the pier that projects above bedrock level, 0.5mm corresponds to the onset of predicted tension cracking and 5mm corresponds to the ultimate strength of the reinforced concrete pier at the point of failure according to AS3600.

If compressive ground strain impacts the piers that support the silo, they could be pushed towards one another. Based on the work of Carter and Kulhawy and moment curvature analysis of the reinforced concrete pier cross-section, the following observations are made:

i. at a lateral pier deflection of 2.7mm (at the top of the pier), steel reinforcement stress could be around 200MPa with an expected crack width of w=0.3-0.4mm, which is the serviceability limit.
ii. at a lateral pier deflection of 4.8mm (at the top of the pier), the steel reinforcement could be at first yield but the compressive strain in the concrete is expected to be less -0.002 at which point the concrete is expected to reach peak compressive stress.
iii. Further displacement could occur before reaching the ultimate strength of the pier.

For piers spaced diagonally at 3.3m, the serviceability and ultimate strength limits for compressive ground strain impacting the piers are estimated to be in the order of 2 x 2.7mm/3.3m or -1.5mm/m and 2/3 of 2 x 4.8mm/3.3m or -3.0mm/m, respectively. Based on the foregoing, it is recommended that ground strain should be monitored on the surface of the ground slab around the silo during longwall mining with survey marks spaced no closer than 7-metres apart. If tensile or compressive ground strain develops, the opening and closure of slab joints and pre-existing cracks (or development of new cracks) should be monitored by a building inspector and reported. If tensile or compressive ground strain develops and appears likely to exceed an early warning trigger of ±-0.75mm/m, the Tahmoor Subsidence Response Group should meet to discuss whether additional response measures such as cutting a strain alleviating slot into the ground slab around the perimeter of the silo are required.

Machinery Shed Structure

The machinery shed comprises and cold-formed steel portal-framed structure with top hat purlins and girts supporting the external roof and wall cladding, which braces the frame. There is a mezzanine or first floor comprising particle-board flooring supported by cold-formed Z-purlins acting as floor joists, which are supported in turn, by cold-formed steel beams.

The dwelling has been formed by erecting Hebel walls on the ground floor slab up to the underside of the mezzanine floor structure, see left frame in **Figure 4**. The Hebel walls appear to be tied to the cold-formed steel columns at ground floor level and so the mezzanine floor and roof appear to be effectively braced. Hebel walls have been erected at mezzanine level and again they appear to be tied to the ground floor steel columns that continue up to support the high-bay roof, see **Figure 5**.

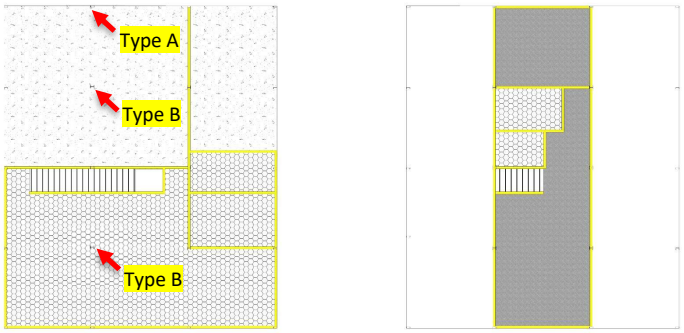

Figure 4 Ground (left) and mezzanine floor (right) internal layout plans showing location of 100mm thick Hebel block walls.

Figure 5 Back-to-back steel columns continue up to support the high-bay roof and are effectively restrained by the Hebel blockwork in the minor-axis direction, major-axis load eccentricity indicated by red arrow.

The metal-clad roof and perimeter walls and the internal panels of Hebel blockwork (panels not tied directly to the external steel-framed walls) clearly provide sufficient lateral bracing to resist the wind load given that these elements are in serviceable condition. The Hebel walls that are attached to the external metal clad walls at ground floor level have already developed up to Category 1 cracking. However, whilst cracking was observed, see JMA PMI report R0821, the uncracked sections of the walls should provide additional lateral bracing capacity.

The Hebel block walls at mezzanine level are supported by timber beams, which are in turn supported by the steel columns by angle seats that have been TEK screwed to the webs of the columns. In one case, several packers were installed between the angle seat and timber beam, see **Figure 6**.

Floor loads have been calculated for the single end C-purlin columns and internal back-to-back C-purlin columns, which are estimated to be 26.4kN and 51.8kN at ultimate, respectively. The axial load (compression) capacity for concentrically loaded single and double C15024 cold-formed steel purlin columns with an effective length of 3.0metres is 56.6kN and 113.2kN (Stramit), respectively, indicating a reserve capacity if the columns are loaded concentrically.

However, the columns are currently loaded with major axis eccentricity by way of bracket connections between the beams and columns, see **Figure 5.** Assuming a design eccentricity of 100mm for the beam reactions, the back-to-back columns appear to satisfy the requirements of AS4600 but since they could be e supporting more load than for which they were designed, there is a small amount of reserve capacity for the potential impact of ground tilt, differential horizontal movement between the top and bottom of the columns or ground movement anomalies. Furthermore, the support of the Hebel block walls at mezzanine level relies on a pair of TEK screws for vertical support, see **Figure 6**.

It is recommended, therefore, that supplementary support should be installed adjacent to the columns that have been identified in **Figure 4**, which are isolated and do not have an alternate load path through adjacent Hebel block walls if an overstress occurred. The props are designated Type A & Type B and could comprise 75x5 SHS posts located adjacent to or sandwiched against and screwed or bolted to the existing columns, with a 10mm baseplate to bear on the ground slab (and 2M12 HD bolts) and a 10mm cap plate to support the timber bearer with 2 M12 coach bolts, see **Figures 6 & 7** for the types of columns where supplementary support is recommended.

Figure 6 Packing between timber beams and angle seat brackets.

Figure 7 Single end column

Yours faithfully,
John Matheson & Associates Pty Ltd

John Matheson
Director

Workplace Inspection
To identify increased risk from Mining Induced Subsidence From Tahmoor Mine

Subject: Workplace Inspection

Prepared For: MKD Machinery
3165 Remembrance Driveway Tahmoor

Date: 16th of May 2023

Report By: Mark Parcell

Purpose

I have been engaged by Tahmoor Colliery to conduct an assessment of workplace health and safety risks in workplaces surrounding Tahmoor Mine to assess increased workplace risks resulting from mining induced subsidence. I am a competent person to conduct this task.

A Competent Person is defined in the NSW Work Health and Safety Regulation 2017 as:

> *(g) for any other case—a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.*

I have a First Class Mine Manager's Certificate of Competency (Queensland with mutual recognition in NSW). I have managed an underground coal mine in Central Queensland and experienced risks resulting from mining subsidence from mining under public roads and other surface infrastructure.

I have a Graduate Certificate of Management of Workplace health and safety and a Masters of Minerals Industry Risk Management. I am competent in hazard identification and was previously employed as a supervisor responsible for carrying out workplace inspections.

I have been conducting inspections of industrial workplaces for over 10 years as part of risk management processes. I have qualifications in auditing and risk management.

Process

The process for conducting the workplace inspections involved:

- A review of legislative requirements,
- A review of the Hazard Management Code of Practice for Hazard Identification,
- Review of the proposed mining activities and anticipated subsidence effects,
- Consultation with business owners/managers/representatives,
- Review of additional information.

A workplace inspection of MKD Machinery Pty Ltd was carried out in consultation with the business owner and manager, Mr Michael Derrig, on Tuesday the 16th of May 2023.

Consultation

Consultation with business owner Mr. Derrig was completed at the time of the inspection. An explanation of the mine location relevant to the business premises was provided. The discussion included the potential effects, health and safety risks and the monitoring process.

A thorough inspection of the workplace was conducted

Legislative Requirements

The NSW Work Health and Safety Act defines a Dangerous Incident as:

> ***37 What is a "dangerous incident"***
> *In this Part, a* ***dangerous incident*** *means an incident in relation to a workplace that exposes a worker or any other person to a serious risk to a person's health or safety emanating from an immediate or imminent exposure to:*
> *(a) an uncontrolled escape, spillage or leakage of a substance, or*
> *(b) an uncontrolled implosion, explosion or fire, or*
> *(c) an uncontrolled escape of gas or steam, or*
> *(d) an uncontrolled escape of a pressurised substance, or*
> *(e) electric shock, or*
> *(f) the fall or release from a height of any plant, substance or thing, or*
> *(g) the collapse, overturning, failure or malfunction of, or damage to, any plant that is required to be authorised for use in accordance with the regulations, or*
> *(h) the collapse or partial collapse of a structure, or*
> *(i) the collapse or failure of an excavation or of any shoring supporting an excavation, or*
> *(j) the inrush of water, mud or gas in workings, in an underground excavation or tunnel, or*
> *(k) the interruption of the main system of ventilation in an underground excavation or tunnel, or*
> *(l) any other event prescribed by the regulations,*

No other dangerous incidents were identified as being applicable from the Regulations that were relevant to the MKD Machinery workplace.

The definition of a dangerous incident is also included in the NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2022, however the additional incidents are not applicable to the activities at non-mining workplaces.

Risk Management

In order to assist duty holders discharge their duties to achieve a level of risk which as reasonably practicable Workcover NSW has published the Code of Practice – Code of practice – how to manage work health and safety risks (nsw.gov.au).

The Code of Practice includes guidance on the risk management process and relevant to this task, how to identify hazards. The following processes are included:

- Inspect the workplace,
- Consult the workers,
- Review available information.

There were no risks that were identified which required a further risk assessment to be carried out.

Hazard Identification

The hazard identification process was undertaken utilising a workplace inspection in consultation and cooperation with the workplace representatives. A range of activities were reviewed and considered against the criteria for a dangerous incident.

No potential dangerous incidents relevant to workplace health and safety were identified as being unacceptable and the controls which are in place for the control and management of the risks will be sufficient to prevent a dangerous incident resulting from the mining induced subsidence.

The hazard identification process considered the activities being carried out at the businesses and the potential for increased risk resulting from mining induced subsidence.

Consideration was given to potential consequences in excess of those predicted by the effects of the subsidence. The controls that were present for the identified hazards are sufficient for the expected subsidence effects and any possible extreme subsidence, which is less likely.

A plan illustrating potential subsidence effects at the business location is below:

Excluded Activities

Major structural considerations (Building structures and cement silos/hoppers,) were specifically excluded from this inspection. This inspection considered the relevant increase in risk from occupational hazards and processes which may be adversely affected by mining induced subsidence. The workplace includes a concrete silo. The silo was securely fastened to the base, however was excluded from this inspection as a Structure.

The silo was securely fixed to the foundation.

General Arrangements

The image below shows the general arrangements at MKD Machinery. No additional risks of serious incidents were identified from the potential impacts of mining induced subsidence. Stability and monitoring of the concrete silos is outside of the scope of this inspection.

General arrangements include a large open area for trucks and loaders to move around the site. Any equipment is free standing and securely fastened. The front barrier wall is made of large concrete blocks, which are flexible but stable.

Fuels, chemicals and oils are contained within free standing containers not likely to be affected by mining induced subsidence.

Settling ponds are large concrete structures not likely to result in a catastrophic release of fluid causing a dangerous incident.

Business Assessment Report

MKD Machinery

BUSINESS REPRESENTATIVE: Michael Derrig, Owner and Manager

Business description: Concrete batching and dispatch.

Address: 3165 Remembrance Driveway, Tahmoor.

The following legend has been used to assist in evaluating the level of risk.

Acceptable risk	Risk present	Area of concern	Potential hazard	Unacceptable risk

	PERFORMANCE CRITERIA	OBJECTIVE EVIDENCE	COMMENTS	Risk
1.	An uncontrolled escape, spillage or leakage of a substance	Storage of quantities of fluids or substances which may create a risk if a leak were to occur as a result of mining induced subsidence.	MKD has a 10,000L diesel tank on site. The tank is free standing and not likely to be damaged by mining induced subsidence.	
2.	An uncontrolled implosion, explosion or fire,	The presence of flammable or explosive materials which may present an increased risk resulting from mining induced subsidence.	No other materials are likely to cause or result in an uncontrolled fire or explosion.	
3.	An uncontrolled escape of gas or steam	The presence of gas or steam at the workplace which may be subject to an increased risk resulting from mining induced subsidence.	There are no gas or steam systems at the business.	

	PERFORMANCE CRITERIA	OBJECTIVE EVIDENCE	COMMENTS	Risk
4.	An uncontrolled escape of a pressurised substance	The presence of pressurised substances which may present an increased risk resulting from mining induced subsidence.	A small industrial compressed air system is present. The system includes a free standing receiver and flexible hose connections. No risk of uncontrolled escape resulting from mining induced subsidence.	
5.	Electric shock	Presence of electrical power and distribution which may be adversely affected by mining induced subsidence.	Electrical power is supplied to the protected distribution board through conduit and distributed to the workplace through electrical cables which are tolerant to small movements.	
6.	The fall or release from a height of any plant, substance or thing	The presence of a risk of something falling from height as a consequence of mining induced subsidence.	There is nothing identified that could fall from height. Refer to other Structure Reports in regard to the stability of the silo.	
7.	The collapse, overturning, failure or malfunction of, or damage to, any plant that is required to be authorised for use in accordance with the regulations,	The presence of plant that may be at risk of collapse, overturning or failure resulting from mining induced subsidence.	The business has a concrete silo. Refer to the structural engineering assessment.	
8.	The collapse or partial collapse of a structure	The presence of a structure that may collapse resulting from mining induced subsidence.	Refer to the structural engineering assessment for the stability of the silos and buildings.	
9.	The collapse or failure of an excavation or of any shoring supporting an excavation	The presence of an excavation or supported excavation which may collapse resulting from mining induced subsidence.	No excavation was identified likely to cause a dangerous incident.	

	PERFORMANCE CRITERIA	OBJECTIVE EVIDENCE	COMMENTS	Risk
10.	The inrush of water, mud or gas in workings, in an underground excavation or tunnel	The presence of any fluid which may result in an inrush resulting from mining induced subsidence.	There is a number of sediment settling ponds. The ponds are not at risk of failure and any potential risk of leaking will not present risk of a dangerous incident.	
11.	Any other event prescribed by the regulations	No other events were identified in the Regulations as Dangerous Incidents	No other additional risks were identified which may cause a dangerous incident resulting from mining induced subsidence.	

Equipment Risk Assessment: Tahmoor Underground - 3165 Remenbrance Driveway Bargo - MKD Machinery

	Step 2: Assess Type; Key Elements-These change depending	Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			
Appendix B	Type of Risk Assessment	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
Tahmoor Underground	Equipment	STRUCTURES - Impacts to structural walls or frames	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	2	D	5	3	Property Damage	* **Site specific Management Plan** * Weekly review and reporting of subsidence effect * Engineering investigation internal design of the shed and install any required mitigation from the report.	Ross Barber	15-Jul-23	
Tahmoor Underground	Equipment	Impacts to structural STEEL HOPPER TOWER	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	3	D	9	4	Health & Safety	* **Site specific Management Plan** * Weekly review and reporting of subsidence effect * Engineering investigation design of the hopper and install any required mitigation from the report * Install tiltmeters prior to 600m extraction of LWS2	Ross Barber	15-Jul-23	Reduce working load of hopper/ jack and pack
Tahmoor Underground	Equipment	Services - Impacts to GENERAL SERVICES – pipes	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	2	E	3	2	Property Damage	* Site specific Management Plan * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	
Tahmoor Underground	Equipment	Services - Impacts to general services – CABLES	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	2	E	3	2	Property Damage	* Site specific Management Plan * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	
Tahmoor Underground	Equipment	Services - Impacts to FIRE PROTECTION SERVICES	Property Damage	Mining Induced Ground Movement or subsidence	* Site specific Management Plan * Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	1	E	1	1	Property Damage	* Site specific Management Plan * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	
		Impacts to WATER RETENTION PONDS	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Environment	2	D	5	2	Environment	* Site specific Management Plan * Weekly review and reporting of subsidence effect * Investigate potential water flow direction * Weekly inspection on ponds	Ross Barber	15-Jul-23	Expected leak before immediate catastropic release.
															15-Jul-23	
		Services - Impacts to SECURITY Services	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	2	D	5	2	Property Damage	* **Site specific Management Plan** * Weekly review and reporting of subsidence effect * Survey front gate alignment survey, inspect mechanism	Ross Barber	15-Jul-23	Motorised front Gate, fences, doors, Second gate in place
		Impacts to ACCESS and MOBILITY Requirements	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	3	Property Damage	1	E	1	2	Property Damage				No preexisting facilities

Equipment Risk Assessment: Tahmoor Underground - 3165 Remenbrance Driveway Bargo - MKD Machinery

	Step 2: Assess Type; Key Elements-These change depending	Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk				Step 10: PMC		Step 11: Treat the Risks			
☐ Appendix B	Type of Risk Assessment	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating	Potential Maximum Consequence	Potential Maximum Category	Treatment plans/tasks (Description)	Task Owner	Due Date	Comments
		Machinery and Equipment	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	1	D	2	2	Property Damage	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect * Develop baseline spirit level alignment measurements	Ross Barber	15-Jul-23	Misalign conveyor or chute, front end loader, existing load cell
		FINISHES - Impacts to finishes	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	1	E	1	2	Property Damage	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	Concrete lining Residential
		STORAGE and materials handling - Impacts to shelving	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	1	D	2	2	Property Damage	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect * Monitor visually	Ross Barber	15-Jul-23	
															15-Jul-23	
		External Pavements, Fences and Gates - Impacts to external concrete slab, fences and gates	Property Damage	Mining Induced Ground Movement or subsidence	* Pre mining WHS inspection * Pre mining building inspection * Monitoring plan (On property, railway and Rememberance Drive) * Visual Inspections and reporting * Trigger Response Action Plan * Temporary Repair if required * SA NSW Claims Process	2	Property Damage	1	C	4		Property Damage		Ross Barber	15-Jul-23	
		Workplace Health and Safety (WHS) Hazards	Health and Safety	Mining Induced Ground Movement or subsidence	* Site specific Management Plan * Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * WHS inspection completed on 16/05/2023	2	Health & Safety	3	E	6			*** Site specific Management Plan** * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	
		Pool Fence	Health and Safety	Mining Induced Ground Movement or subsidence	* Site specific Management Plan * Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * WHS inspection completed on 16/05/2023	2	Property Damage	2	C	8	2	Health & Safety	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	1:4 chance based on previous mining
		Septic	Property Damage		* Site specific Management Plan * Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * WHS inspection completed on 16/05/2023	2	Property Damage	2	C	8	2	Property Damage	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect	Ross Barber	15-Jul-23	Obove ground tanks, inground tanks 3 tanks - 2 underground
		Damage to grass airstrip for ultralight	Property Damage	Mining Induced Ground Movement or subsidence	* Site specific Management Plan * Pre mining WHS inspection * Pre mining building inspection * Monitoring plan * Visual Inspections and reporting * Weekly review and reporting of subsidence effect * Trigger Response Action Plan: * WHS inspection completed on 16/05/2023	2	Property Damage	2	D	5	2	Health & Safety	*** Site specific Management Plan** * Weekly review and reporting of subsidence effect * Take pre mining photo * Monitor and relevel if required * Operator to provide feedback	Ross Barber	15-Jul-23	