SOUTH32 Illawarra Metallurgical Coal

APPIN MINE AREAS 7 AND 9 LONGWALLS 709 TO 711 AND 905 LAND MANAGEMENT PLAN

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DOCUMENT REVISION LOG

Persons authorising this Plan

Name	Title	Date
Gary Brassington	Manager Approvals	July 2022

Document Revisions

Revision	Description of Changes	Date
ICH Document		
1.0	Original Document	July 2021
1.1	Administrative updates	October 2021
1.2	Updated to address IAPUM advice	July 2022

Persons involved in the review of this Plan

Name	Title	Company	Exp (yrs)
Cody Brady	Principal Approvals	South32	5
Gary Brassington	Manager Approvals	South32	25
Richard Walsh	Superintendent Infrastructure	South32	30+

1. INTRODUCTION

1.1 Project Background

South32 Illawarra Metallurgical Coal (IMC) operates the Bulli Seam Operations (BSO) extracting hard coking coal used for steel production.

On 22 December 2011 the Planning and Assessment Commission (PAC), under delegation of the Minister for Planning, approved BSO (MP 08_0150) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to continue mining operations until 2041.

This Land Management Plan (LMP) supports the Extraction Plan for mining of coal from Longwalls 709 to 711 of Appin Area 7 (AA7) and Longwall 905 of Appin Area 9 (AA9).

1.2 Scope

This LMP has been prepared in accordance with the BSO Approval (MP 08_0150) Condition 5(j), Schedule 3 as follows:

> 5. the proponent shall prepare and implement an extraction plan for first and second workings within each longwall mining domain to the satisfaction of the secretary. each extraction plan must:
>
> j) include a land management plan, which has been prepared in consultation with any affected public authorities, to manage the potential impacts and/or environmental consequences of the proposed second workings on land in general, with a specific focus on cliffs and steep slopes;

1.3 Objectives

The objectives of this LMP are to identify at risk land geomorphology and manage the potential impacts and/or environmental consequences of the proposed workings on the land.

Specific focus will be on cliffs and steep slopes including cliffs of 'special significance' (i.e. longer than 200 m and/or higher than 40 m and cliff-like rock faces higher than 5 m that constitute waterfalls, as defined by BSO approval Condition 1, Schedule 3), and other cliffs flanking the Nepean River, as shown in **Figure 2** and the drawing in MSEC (2021), Drawing No. MSEC1117-08.

1.4 Study Area

The Study Area for the Extraction Plan is defined in accordance with MSEC (2021) as the surface area predicted to be affected by the proposed mining of Longwalls 709 to 711 and 905 and encompasses the areas bounded by the following limits:-

- A 35° angle of draw line from the maximum depth of cover, which equates to a horizontal distance varying between 530 m and 750 m around the limits of the proposed extraction areas for Longwalls 709 to 711 and 905, and
- The predicted limit of vertical subsidence, taken as the 20 mm subsidence contour, resulting from the extraction of the proposed Longwalls 709 to 711 and 905.

Additionally, features potentially sensitive to far field movements, which includes horizontal, valley closure and upsidence movements that may be outside the 20 mm subsidence zone or 35° angle of draw line have been assessed.

The location of the Longwalls 709 to 711 and 905 Study Area within the BSO is shown in **Figure 1**.

1.5 Distribution

The finalised LMP will be distributed to:

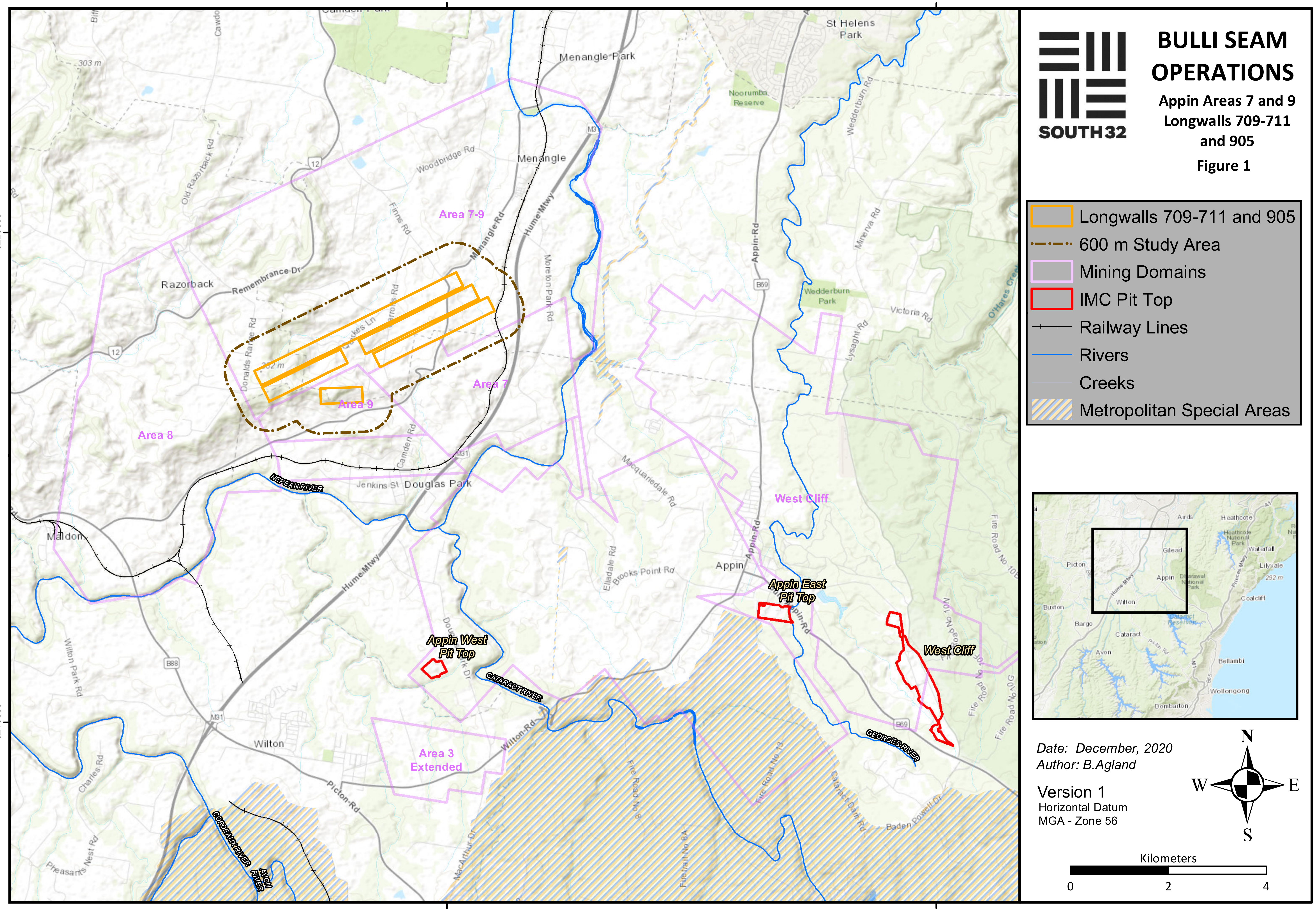
- Department of Planning and Environment (DPE);
- Resources Regulator; and
- Wollondilly Shire Council (WSC).

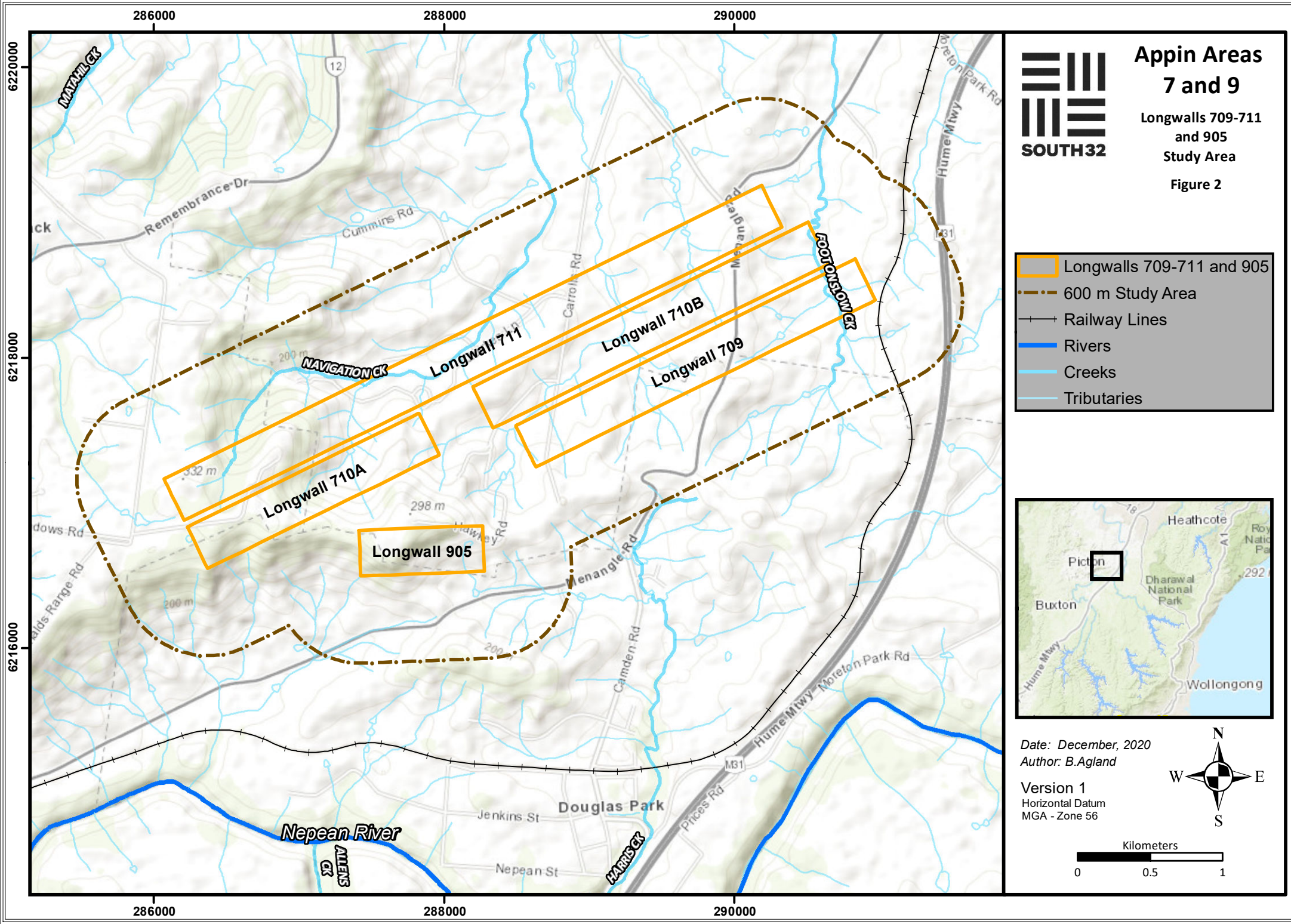
The Project Approval requires this LMP be developed in consultation with any potentially affected public authorities.

The Extraction Plan for Longwalls 709 to 711 and 905 will be developed in consultation with the Resources Regulator and WSC.

Arrangements for individual private properties and assets will be described in the relevant Property Subsidence Management Plans (PSMPs) and or asset agreements to be negotiated with the property owners.

IMC will make the LMP and other relevant environmental documentation publicly available on the IMC website (Condition 11, Schedule 6).


BULLI SEAM OPERATIONS
Appin Areas 7 and 9
Longwalls 709-711 and 905
Figure 1
SOUTH32
Longwalls 709-711 and 905
600 m Study Area
Mining Domains
IMC Pit Top
Railway Lines
Rivers
Creeks
Metropolitan Special Areas
Date: December, 2020
Author: B.Agland
Version 1
Horizontal Datum
MGA - Zone 56
N
S
E
W
Kilometers
0
2
4
290000
300000
6220000
6210000
Area 7-9
Area 7
Area 9
Area 8
Area 3
Extended
West Cliff
Appin East
Pit Top
Appin West
Pit Top
Razorback
Menangle
Menangle Park
St Helens
Park
Douglas Park
Maldon
Wilton
Appin
NEPEAN RIVER
CATARACT RIVER
GEORGES RIVER
CORDEAUX RIVER
AVON RIVER
Hume Mtwy
Appin Rd
Remembrance Dr
Wilton Rd
Picton Rd
Noorumba
Reserve
Wedderburn
Park



Appin Areas 7 and 9

Longwalls 709-711 and 905 Study Area

Figure 2

SOUTH32

Date: December, 2020
Author: B.Agland

Version 1
Horizontal Datum
MGA - Zone 56

2. STATUTORY REQUIREMENTS

Extraction of coal from Longwalls 709 to 711 and 905 will be in accordance with the conditions set out in the BSO Approval, applicable legislation as detailed in Section 2.2 and the requirements of relevant licenses and permits (including conditions attached to mining leases).

2.1 BSO Approval

Condition 5 (j), Schedule 3 of the BSO Approval requires the preparation of a LMP to manage the potential impacts and/or environmental consequences of the proposed workings on land, including a specific focus on cliffs and steep slopes (refer Section 1.3).

This LMP also addresses the requirements detailed in Condition 6, Schedule 3 and Condition 2, Schedule 6 of the BSO Approval as shown in Table 1.

Table 1 Management Plan Requirements

Project Approval Conditions	Relevant LMP section
Condition 6, Schedule 3 The Proponent shall ensure that the management plans required under Condition 5 (g)-(l) above include: i. an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; b) a detailed description of the measures that would be implemented to remediate predicted impacts.	Section 4 Section 7
Condition 2, Schedule 6 The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data; (b) a description of: - the relevant statutory requirements (including any relevant approval, licence or lease conditions); - any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory, limits, requirements or performance measures/criteria;	Section 3 Section 2 Section 5 Section 5 to 8

(d) a program to monitor and report on the:	Section 5 to 8
- impacts and environmental performance of the project;	
- effectiveness of any management measures (see c above);	Section 5 to 8
(e) a contingency plan to manage any predicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	
(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 6
(g) a protocol for managing and reporting any:	
- incidents;	
- complaints;	Section 10
- non-compliances with statutory requirements; and	
- exceedances of the impact assessment criteria and/or performance criteria; and	Section 9
(h) a protocol for periodic review of the plan.	
	Section 10

Due consideration has been given to all BSO Approval Conditions in the preparation of this LMP, including those relating to auditing, rehabilitation and environmental management.

2.2 Legislation and Guidelines

This LMP has been developed with due regard to the requirements of the relevant legislation and advisory documents and guidelines including:

- *Australian Geomechanics Society Landslide Risk Management Guidelines*, 2007.
- *Australian Soil and Land Survey Field Handbook*, 2009.

2.3 Relevant Leases and Licences

The following licences or permits are applicable to South32's operations in AA7 and 9:

- Mining Leases as per Table 2.
- Environment Protection Licence (EPL) 2504 which applies to BSO, including Appin and West Cliff Mines. A copy of the licence can be accessed at the EPA website via the following link http://www.epa.nsw.gov.au/prpoeo/index.htm
- BSO Mining Operation Plan (MOP) 1/10/2020 to 30/09/2024 (V1.3).
- All relevant Occupational Health, Safety, Environment and Community approvals.
- Any additional leases, licences and approvals resulting from the BSO Approval.

Table 2 Appin Mine Leases, Licences and other Reference Documents

Mining Lease - Document Number	Start	Finish
CCL 767	29 Oct 1991	08 Jul 2029
CL 388	22 Jan 1992	22 Jan 2034
ML 1382	20 Dec 1995	20 Dec 2037
ML 1433	24 Jul 1998	23 Jul 2019[1]
ML 1678	27 Sep 2012	26 Sep 2033

The project is located within the mining tenements listed in **Table 2**.

[1] Application for the renewal of Mining Lease 1433 which was lodged with the NSW Department of Planning and Environment – Division of Resources and Geoscience (Division) on 18 July 2018.

3. BASELINE ASSESSMENT

A Major Cliff Risk Assessment was conducted by IMC (2009) for the BSO EA based on information provided by MSEC, Gilbert & Associates, FloraSearch and Biosis Research.

The Cliff Risk Assessment included a description of the BSO mine parameters and likely types of subsidence impacts that might occur, the identification of significant natural features including major cliff lines, cliff lines of special significance, and an assessment of the risk of impacts and consequences to each cliff line. The Study Area for the Major Cliff Risk Assessment included the Longwalls 709 to 711 and 905 Study Area.

A revised baseline assessment of the cliffs, rock outcrops and steep slopes within the Study Area was conducted by MSEC (2021).

The definition of a cliff provided in the project approval (BSO, 2011) are: "*Cliff Continuous rock face, including overhangs, having a minimum height of 10 metres and a minimum slope of 2 to 1, i.e. having a minimum angle to the horizontal of 63º*".

The definitions of cliffs and minor cliffs provided in the NSW DPE Standard and Model Conditions for Underground Mining (DPE, 2012) are:

"*Cliff Continuous rock face, including overhangs, having a minimum length of 20 metres, a minimum height of 10 metres and a minimum slope of 2 to 1 (>63.4º) Minor Cliff A continuous rock face, including overhangs, having a minimum length of 20 metres, heights between 5 metres and 10 metres and a minimum slope of 2 to 1 (>63.4º); or a rock face having a maximum length of 20 metres and a minimum height of 10 metres*"

The cliffs and minor cliffs within the Study Area have been identified from the LiDAR surface level contours and from site investigations and are shown on Figure 2.

Appin Area 7 and 9 Proposed Longwalls Landslide Risk Assessment relating to Mine Subsidence Influences was prepared by GHD to support the Extraction Plan. Section 3 of this report details the assessment methodology and process undertaken to initially categorize landslide risks to properties and features within the Extraction Plan area. From the review of various formats of data and preliminary observations across the Extraction Plan area, the residential sites identified as being within 'steep slope' terrain have been categorised to develop a preliminary appraisal of the existing landslide hazards, site susceptibility and potential impact of mine subsidence upon the existing landslide risk levels.

These categories ranged from Category A (No apparent slope issue relevant to the house structure – not likely to require assessment for slope instability) through to Category F (Sites close to the Razorback escarpment, or on or close to steep mid to lower slopes of the escarpment or steeply sloping ridges forming the foot-slopes of the escarpment – these will be the sites requiring detailed LRM assessment)..

3.1 Cliffs, Steep Slopes and Rock Outcrops

3.1.1 Existing Environment

Cliffs, steep slopes and rock outcrops have been identified within the Longwalls 709 to 711 and 905 Study Area and surrounds at locations described in Table 3.

Table 3 Details of Cliffs within the vicinity of the Study Area (MSEC, 2021)

Cliff reference	Overall length (m)	Maximum height (m)	Description
RR-CL1	25	15	470 m west of Longwall 710A
RR-CL2	50	13	420 m west of Longwall 710A
RR-CL3	30	20	Directly above Longwall 710A
RR-CL4	30	13	150 m south of Longwall 710A and 420 m west of Longwall 905
RR-CL5	90	20	Directly above Longwall 710A
RR-CL6	30	12	Directly above Longwall 905
RR-CL7	35	12	Directly above Longwall 905

The characteristics of cliffs, steep slopes and rock outcrops within the Study Area include:

- Cliffs have been identified in the western part of the Study Area along Razorback Range. These cliffs have formed in the sandstone members of the Wianamatta Group.
- The cliffs have overhang depths ranging between 1 m and 3 m.
- Rock outcrops are defined as exposed rockfaces with heights of less than 10 m or slopes of less than 2 in 1. There are rock outcrops located across the Study Area, primarily along the Razorback Range and the incised creeks and tributaries.
- The steep slopes within the Study Area have been identified along Razorback Range above Longwall 710A, the western end of Longwall 711 and above Longwall 905.
- No individual cliff lines in the Study Area are considered to be sufficiently unique or different to require identification as 'special significance' and thus requiring special consideration in a risk assessment framework.

3.1.2 Harris Creek and Nepean River Cliffs

Cliffs have also been identified along the Nepean River and Harris Creek; however, these features are located outside the Study Area and are at distances of more than 1 km from the proposed longwalls.

3.2 Baseline Recording

3.2.1 Slope Stability Assessment

Steep slopes within the Study Area were identified by MSEC (2021). Slope instability has historically occurred along Razorback Range and Douglas Park Ridge as part of the natural processes that occur in the region.

A slope stability assessment was therefore undertaken at these locations by GHD (2021) to assess the potential effects of longwall mining on the known hazards at these slopes.

Mass movement of steep slopes is unlikely to be induced by the proposed mining activities. Notwithstanding, IMC will develop and implement ongoing monitoring in consultation with potentially affected landowners through the PSMP process. Any mitigation or management measures would also be developed and implemented in consultation with, and agreement of, the affected landowner through this process.

4. PREDICTED IMPACTS

In accordance with the findings of the Southern Coal Field Inquiry (2009) and Independent Expert Panel for Mining in the Catchment (2019a), subsidence impacts are defined as:

- **Subsidence effects** are defined as the deformation of ground mass such as horizontal and vertical movement, curvature and strains.
- **Subsidence impacts** are the physical changes to the ground that are caused by subsidence effects, such as tensile and sheer cracking and buckling of strata.
- **Environmental consequences** are then identified, for example, as a loss of surface water flows and standing pools.

4.1 Subsidence Effects

The potential impacts from mine subsidence include:

- Increase in the profile of slopes as a result of tilting of the landform during generation of the mine subsidence 'bowl'. The increase in tilt represents a marginal adverse influence on potential instability by way of increased likelihood, as discussed in Coffey (2013).
- Re-initiation of previous landsliding through shearing produced by mine subsidence strains being localised along the basal plane of existing landslides and doing so at residual shear strength. The likelihood of the mechanics of this occurring are not considered higher than the potential for downslope displacements under natural conditions, and the generation of a re-mobilised landslide with residual strength over its base.
- Valley closure effects are a process whereby shearing is produced in the rockmass as a result of the phenomenon of lateral straining towards incisions in the landform, such as creek lines, but also man-made civil engineering features such as railway or road cuttings. Strain concentration occurs at these features.
- Alteration of the near-surface groundwater table is potentially a mechanism that modifies the porewater distribution within sloping ground as a result of mine subsidence changing the rockmass permeability during accommodation of mine subsidence.
- Rockfalls are a viable landslide mechanism due to mine subsidence, principally due to the potential for an increase in tilt of marginally stable blocks of bedded cliff-forming sandstone units. In addition, horizontal valley closure displacements routinely occur at the boundaries of geological units, leading to a concentration at bedding planes. The potential for lateral strains induced by valley closure leads to an increase in the likelihood of rockfalls as a result of mine subsidence. The magnitude of critical strains to instigate rockfall instability depends upon the capacity of the rockface to accommodate lateral strains, which is an individual case-by-case assessment.

4.2 Cliffs and Overhangs

4.2.1 Subsidence Predictions

The cliffs and minor cliffs within the Study Area have been identified from the LiDAR surface level contours and from site investigations. Cliffs have been identified in the western part of the Study Area along Razorback Range. These cliffs have formed in the sandstone members of the Wianamatta Group.

A summary of the maximum predicted values of total vertical subsidence, tilt and curvature for the cliffs within the Study Area is provided in Table 4.

There are rock outcrops located across the Study Area, primarily along the Razorback Range and the incised creeks and tributaries. The rock outcrops are located across the Study Area and, therefore, are expected to experience the full range of predicted subsidence movements.

Table 4 Maximum Predicted Vertical Subsidence, Tilt and Curvatures for the Cliffs within the Study Area (MSEC, 2021)

Reference	Maximum predicted total conventional subsidence	Maximum predicted total conventional tilt (mm/m)	Maximum predicted total curvature hogging curvature (km^{-1})	Maximum predicted total conventional sagging curvature (km^{-1})
RR-CL1	<20	<0.5	<0.01	<0.01
RR-CL2	<20	<0.5	<0.01	<0.01
RR-CL3	150	2.0	0.03	<0.01
RR-CL4	125	<0.5	<0.01	<0.01
RR-CL5	225	3.0	0.03	<0.01
RR-CL6	775	4.5	0.01	0.08
RR-CL7	600	4.5	0.03	0.04

Based on the experience of mining beneath cliffs at Tower and Tahmoor Mines, it is estimated that on average between 3 % and 5 % of the total length, or between 1 % and 3 % of the total face area of cliffs that are located directly above the mining area would experience adverse impacts. It is also anticipated that less than 3 % of the total face area of minor cliffs located directly above the proposed longwalls would experience adverse impacts.

Cliffs RR-CL3, RR-CL5, RR-CL6 and RR-CL7 are located directly above the proposed Longwalls 710A and 905. The total length of these cliffs is approximately 185 m and the total face area is approximately 3180 m^2.

There are no building structures or other built features located directly beneath Cliffs RR-CL3, RR-CL5, RR-CL6 and RR-CL7. The risk to public safety, therefore, is considered to be low.

Cliffs RR-CL1, RR-CL2 and RR-CL4 are located outside the mining area at distance varying between 150 m and 470 m. At these distances, the cliffs are not predicted to experience measurable conventional tilts, curvatures or strains. It is not anticipated, therefore, that adverse impacts would occur to Cliffs RR-CL1, RR-CL2 and RR-CL4. However, it is possible that isolated rock falls could occur at these cliffs, but it is expected that this would represent on average less than 1 % of the total length or total face area of the cliffs located outside the mining area.

4.2.2 Environmental Consequences

Environmental consequences of a rock fall could potentially include changes to the visual landscape of the Study Area. A rock fall or landslide may result in the exposure of a fresh face of rock and debris scattered around the base of the cliff. As with naturally occurring instabilities, the exposed fresh rock-face weathers and erodes over time to a point where it blends in with the remainder of the cliff face and in time the vegetation below the cliff regenerates.

Cliff and overhang instabilities as well as surface cracking have potential to impact public safety. Public safety is addressed in the Public Safety Management Plan. Other potential environmental consequences of cliff/overhang instabilities may include impacts on stream water quality, flora and fauna or their habitats, and Aboriginal heritage sites. These potential environmental consequences are addressed in the Water Management Plan, Biodiversity Management Plan and Heritage Management Plan.

The extraction of the proposed longwalls is likely to result in fracturing of the rock outcrops and, where the rock is marginally stable, this could then result in instabilities. Previous experience in the Southern Coalfield indicates that the percentage of rock outcrops that are likely to be impacted by mining is very small, representing on average less than 3 % of the total surface area.

The potential for isolated rockfalls, however, could result in a public safety risk where houses or infrastructure are located beneath large rock outcrops.

IMC has developed a Cliff and Steep Slope Management Plan for Longwalls 701 to 708B and Longwalls 901 to 904. The Management Plan addresses monitoring, response action, reporting and public safety. This management plan will be reviewed and, where required, revised to include the proposed Longwalls 709 to 711 and 905, prior to extraction.

Other Impacts

Although mining is unlikely to significantly increase the risk of cliffs and steep slope instabilities, the cliffs in the area are already inherently unstable. Consequently there is the possibility that a rock fall associated with the cliffs may occur naturally during or following the period of mining.

Natural hazards and mechanisms have been identified as root jacking, tree growth, soil wash-out/erosion, and weathering of rock mass or defects. In a few cases, minor movement such as that induced by mining related non-systematic subsidence could potentially exacerbate or further develop existing hazards by the following mechanisms:

- Altering/steepening the centres of gravity of a dislocated block or boulders.
- Further tilting or steepening of blocks or boulders already at their angle of repose.
- Exacerbating basal crushing on weak seams.

4.3 Steep Slopes

4.3.1 Subsidence Predictions

The steep slopes within the Study Area have been identified along Razorback Range above Longwall 710A, the western end of Longwall 711 and above Longwall 905.

The maximum predicted total subsidence along Razorback Range after the extraction of Longwalls 709 to 711 and 905, as determined by MSEC (2021) is provided in Table 5.

Table 5 Maximum Predicted Vertical Subsidence, Tilt and Curvatures for the Steep Slopes along Razorback Range after the Extraction of the proposed longwalls (MSEC, 2021)

Longwall	Maximum predicted total conventional subsidence	Maximum predicted total conventional tilt (mm/m)	Maximum predicted total curvature hogging curvature (km^{-1})	Maximum predicted total conventional sagging curvature (km^{-1})
709	950	6.0	0.06	0.10
710A	950	6.0	0.06	0.10
710B	950	6.0	0.06	0.10
711	950	7.0	0.08	0.14
905	1150	7.0	0.08	0.14

4.3.2 Environmental Consequences

Slopes outside the Nepean River Valley and the alignments of the creeks would be likely to remain stable during and after mining, and the chance of soil slippage is small (MSEC, 2009).

Past slope failures on the Razorback Range have typically occurred on the upper slopes well above any infrastructure. The visible flow paths and toe lobes do not, in all but a few cases, reach infrastructure which are generally confined to the foot-slopes. The Douglas Park slope failures are smaller in scale and are located on steeper slopes on the sides of hills and on side slopes of ridges.

The steep slopes are more likely to be impacted by the mining-induced curvatures and strains. The potential impacts would generally result from the increased horizontal movements in the downslope direction, causing tension cracks to appear at the tops and along the sides of the slopes and compression ridges to form at the bottoms of the slopes.

There is extensive experience of mining beneath steep slopes in the Southern Coalfield. These include steep slopes along the Cataract, Nepean, Bargo and Georges Rivers. No large-scale slope failures have been observed along these slopes, even where longwalls have been mined directly beneath them. Although no large-scale slope failures have been observed in the Southern Coalfield, tension cracking has been observed at the tops and

along the sides of steep slopes as the result of increased horizontal movements in the downslope direction.

As the slopes along the Razorback range are steep, exhibit natural soil erosion and are predicted to experience the full range of predicted subsidence movements, it is likely that the extraction of the proposed longwalls would result in large surface cracks near the tops and along the sides of these slopes.

While in most cases, impacts on steep slopes are likely to consist of surface cracks, there remains a low probability of large-scale downslope movements. Experience indicates that the probability of mining induced large-scale slippages is extremely low due to the significant depth of cover within the Study Area.

Notwithstanding, slope instabilities, as well as surface cracking, have potential to impact public safety. Public safety is addressed in the Public Safety Management Plan. Other potential environmental consequences of slope instabilities may include impacts on stream water quality, flora and fauna or their habitats, and Aboriginal heritage sites. These potential environmental consequences are addressed in the Water Management Plan, Biodiversity Management Plan and Heritage Management Plan.

If required, remediation works will be undertaken to ensure that mining-induced cracking does not result in significant soil erosion or an increase in water infiltration. In some cases, erosion protection measures may be needed, such as the planting of additional vegetation in order to stabilise the slopes in the longer term.

GHD (2021) conducted a landslide risk assessment for the proposed Longwalls 709 to 711 and 905 concluded that the "*results of the preliminary investigations indicate that the structures located on the identified steep slopes should be able to be effectively managed, using the techniques and management tools available and previously employed in similar geotechnical circumstances, to permit Appin Mine to extract the proposed longwalls*".

5. PERFORMANCE MEASURES AND INDICATORS

The BSO Approval provides subsidence impact performance measures (Condition 1, Schedule 3). Table 6 below details the conditions relevant to the general land surface, cliffs and steep slopes.

The term negligible is defined within the Project Approval as "s*mall and unimportant, such as not to be worth considering*" or as otherwise defined in Table 6 for cliffs of 'special significance' and those flanking the Nepean River.

Table 6 Subsidence Impact Performance Measures (BSO Approval)

Land (Condition 1 Schedule 3)	
Cliffs of 'Special Significance' (i.e. cliffs longer than 200 m and/or higher than 40 m; and cliff-like rock faces higher than 5 m that constitute waterfalls).	Negligible environmental consequences (that is occasional rock falls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 0.5% of the total face area of such cliffs within any longwall mining domain)
Other cliffs flanking the Nepean River.	Negligible environmental consequences (that is occasional rock falls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 0.5% of the total face area of such cliffs within any longwall mining domain).
Other cliffs.	Minor environmental consequences (that is occasional rock falls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 3% of the total face area of such cliffs within any longwall mining domain).

As noted in Sections 4.2.2 and 4.3.2 the environmental consequences of rock falls, fracturing and other impacts may include consequences to other environmental components or systems such as groundwater, biodiversity or heritage. As such a range of other impact performance measures related to those environmental factors are applicable to this LMP, and are discussed in the relevant Management Plan.

In order to mitigate the potential subsidence impacts and environmental consequences from the mining of Longwalls 709 to 711 and 905 monitoring and recording will be undertaken prior to mining, throughout the extraction and at the completion of subsidence (refer Section 6).

In the event that any subsidence impact is recorded, consideration would be given to implementing appropriate management, remediation and/or mitigation measures in consultation with relevant stakeholders (refer Section 6.2) and where agreement of the landholder is provided.

If the subsidence impact performance measures are exceeded, IMC will notify the appropriate stakeholders and with agreement of the landholder, implement the Contingency Plan (Section 8).

6. MONITORING AND REPORTING

6.1 Monitoring Program

General landscape monitoring will be undertaken by IMC as a part of routine subsidence monitoring. This will include inspections of the land and monitoring subsidence movements for comparison with the predictions along selected survey lines. Specific monitoring for slope instability will be added to this program as required.

The monitoring is designed in consideration of surveys undertaken prior to mining, discussions with landholders and infrastructure owners as well as studies by GHD (2021). Monitoring will be undertaken on the Razorback Range and near steep slopes that may be susceptible to failure. Monitoring implemented on private property will be undertaken in consultation and with the agreement of the landowner.

The Landslide Risk Assessment (LRA), GHD (2021) appraised 114 structures that have been identified across the Study Area. The structures are identified by address and MGA co-ordinates in the spreadsheet tabulation presented in Appendix B of GHD (2021). The categorisation descriptions adopted for the structures are illustrated in Table 7.

Table 7 Category descriptors for properties by GHD (2021)

Category	Description
A	No apparent slope issue relevant to the house structure - not likely to require assessment for slope instability.
B	Property, including house, has been assessed previously - may require brief walkover and review.
C	Sites over or close to areas already mined - not likely to require assessment since additional impacts unlikely to influence slope instability.
D	Sites over solid coal - not proposed for mining – not likely to require assessment as additional impacts unlikely to adversely influence slope instability.
E	Sites on gentle slopes on isolated hills or ridges or close to watercourse gullies, but not close to the Razorback Escarpment slopes - likely to require viewing (possibly brief in best circumstances), as whole of site could not be viewed clearly from roadway.
F	Sites close to the Razorback escarpment, or on or close to steep mid to lower slopes of the escarpment or steeply sloping ridges forming the foot-slopes of the escarpment - these will be the sites requiring detailed LRA.
G	LRA recently (2021) conducted for this property.

Depending on the categorisation of each property, as determined by GHD (2021), slope

monitoring will be undertaken as in Table 8 (in consultation with the landowner where necessary).

Table 8 – Cliff and Steep Slope Management

Category	Monitoring Method			
	Observations by Experienced Engineer / Photographic Records	On Ground Survey	Groundwater Monitoring (Piezometers)*	Slope Inclinometers*
A B C D	• 6 months before commencement of mining. • 6 months after completion of mining	No	No	No
E	• 6 to 12 months before commencement of subsidence. • 3 monthly during major subsidence period. • 6 months after completion of subsidence.	No	No	No
F G	• 12 months before commencement of subsidence for visual and on ground survey. • Monthly for visual during major subsidence period. • Monthly for ground survey during major subsidence period for properties determined to be on a steep slope. • Installation of piezometer with data logger (remotely accessed) prior to commencement of subsidence. Monthly readings of piezometer prior to subsidence commencing. Weekly readings of piezometer during major subsidence period and on completion of subsidence. • Use of down borehole inclinometer installed 12 months prior to subsidence, subject to trigger (visual assessment or on ground survey shows landslide movement or high piezometer reading).			

* Note the requirement to use piezometers and slope inclinometers will be assessed on a case by case basis and in consultation with the landowner as part of the PSMP process.

The monitoring program will target those areas of sensitive terrain in close proximity to buildings or other infrastructure, identified as Category F and G and the cliffs identified in Table 3.

Sites and features which have been categorised as requiring further assessment in GHD (2021) are reviewed in detail and the findings of these assessments included in the

PSMP. IMC contracts suitably qualified experts to undertake assessments to inform the PSMP for baseline assessment and monitoring throughout active subsidence. A summary of the assessments and management process which will be undertaken for the 11 houses identified as Category F in GHD (2021) is as follows:

- Structural Assessment - a pre-mining inspection of the property and any dwellings is undertaken by a suitability qualified structural engineer. This report is used as a baseline for the condition of the property (including photographs) and to refer to during active subsidence and post active subsidence to determine if any impacts related to mining have occurred. The structural assessment will indicate if there are any opportunities to complete early structural works to the property to mitigate potential impacts and ensure the property remains safe and serviceable.
- Geotechnical Assessment - a pre-mining inspection of the property and any dwellings will be undertaken by a suitability qualified geotechnical engineer. The purpose of the assessment is to investigate slope risk and condition of existing ground surface features within the property boundary and to identify any existing hazards, as well as potential new hazards that may be created as a result of possible mining induced surface movement; including, subsidence influence, tilting impacts, strain, strength reduction of a slope profile, water concentration and regional landslide processes and mechanisms. A qualitative risk assessment will be undertaken to assess the potential risk of slope instability to the property during the mining influence period. This is then used to assess acceptability and appropriate treatments and/or monitoring requirements for the identified slope hazards.
- Survey of ground and residence – a pre-mining high resolution 2D survey will be undertaken of the property and residence. Fixed survey marks are placed on the grounds and structures to capture a pre-mining baseline profile. During active subsidence and post mining, repeat surveys of the fixed marks will indicate the magnitude of subsidence experienced at the property. This will also inform the structural and geotechnical assessments.

In cases where monitoring is required to manage subsidence and landslide risk to features which may be impacted by subsidence, IMC will use the following monitoring methods (where landowner access is granted) to monitor and manage risks where appropriate:

- Routine visual structural and/or slope assessment as described above.
- Routine high resolution 2D survey as described above.
- Real time 3D Global Navigation Satellite System (GNSS) monitoring – GNSS units provide the absolute positions (vertical and horizontal) and are measured at regular intervals (nominally every 10 seconds) which are used to calculate four-hour running averages.
- Inclinometer monitoring - inclinometers are instruments for measuring relative horizontal displacements affecting the shape of a guide casing embedded in the ground or structure. Inclinometer probes usually measure displacement in two perpendicular planes; therefore, displacement magnitudes and directions (vectors) can be calculated.

The pre-mining assessments are used to inform and establish a specific set of monitoring triggers and management actions for each property. The monitoring data which is routinely collected is assessed by the IMC Structural Review Group to determine the trigger level

and if additional monitoring, management or mitigation measures are required to keep properties safe and serviceable.

IMC Built Structures Management Plan

IMC has a Built Structures Management Plan for each active longwall at Appin Colliery. The objectives of the Management Plan are to establish procedures to measure, control, mitigate and repair impacts that could occur to structures:

- ensure the safety and serviceability of all building structures and infrastructure. Public safety is paramount. Ensure that the health and safety of people who may be present in structures 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 conditions of the building structures and associated infrastructure during mining;
- establish procedures to measure, monitor, control, mitigate and repair building structures and associated infrastructure;
- initiate and coordinate action to mitigate or remedy potential impacts that are expected to occur to the building structures;
- 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 the potential for injury or illness to a person or persons at the properties that may require emergency evacuation, entry restriction or suspension of work activities;
- provide a forum to report, discuss and record impacts to the surface. This will involve IMC, the affected landowner and/or resident, relevant government agencies and consultants, as required; and
- establish lines of communication and emergency contacts.

In addition, specific Management Plans also exist for significant infrastructure e.g., the Main Southern Rail and public roads.

6.2 Reporting

IMC Structural Review Group (SRG)

As part of the Built Structures Management Plan the SRG meets regularly to review the results of all subsidence monitoring associated with the active longwalls at Appin Colliery, currently Longwalls 904 and 709.

The SRG consists representatives of the specialist consultants that inspect/measure/report on the monitoring. The SRG reviews the monitoring data in relation to all built features e.g., private property, public roads, as well as natural features (e.g., steep slopes and cliff lines). The SRG review and issue a weekly report to the Resource Regulator. The Resource Regulator maintains oversight of potential subsidence impacts through this process and maintains the authority under the *Mining Act 1992* to halt or stop mining if an impact, realized or predicted occurs. The weekly report reviews the progress of the longwall, the latest available monitoring data and the response to triggers due to movement or rainfall.

The BSO Project Approval provides subsidence impact performance measures (Condition 3, Schedule 3). In order to mitigate the potential subsidence impacts and environmental consequences from the mining of Longwalls 709 to 711 and 905; monitoring and recording will be undertaken prior to mining, throughout the extraction and at the completion of subsidence.

In the event a subsidence impact is recorded, consideration would be given to implementing appropriate management, remediation and/or mitigation measures in consultation with relevant stakeholders.

If the subsidence impact performance measures are exceeded, IMC will notify the appropriate stakeholders and implement the Contingency Plan as described in the Built Features Management Plan.

Monitoring results will also be presented and reviewed at the monthly IMC Subsidence Management Meeting. However, if the findings of monitoring are deemed to warrant an immediate response the Principal Approvals will initiate the requirements of the Trigger Action Response Plan (TARP).

Monitoring results will be made publicly available in accordance with BSO Approval Condition 8 and 11, Schedule 6 and will also be included in the Annual Reporting Condition 4, Schedule 6.

7. MANAGEMENT AND MITIGATION STRATEGIES

7.1 Properties in Areas of Sensitive Terrain

Sensitive terrain is defined as *areas which may be sensitive to changes in slope conditions and are a reflection of existing conditions in combination with possible changes following longwall mining* in the Study Area.

Monitoring, management and mitigation measures for properties that are located in areas of sensitive terrain will be undertaken where appropriate and in consultation and agreement with the landowner where required. These measures will be provided as part of the BFMP and PSMPs processes.

Mitigation of any subsidence cracks by infilling and re-profiling will be conducted with the approval of the landholder in any areas of high susceptibility (e.g. steep slopes) to minimise the ingress of water into the soil profile.

Where slope instability on areas of sensitive terrain is ongoing or increasing, or where a property exists on a hillside or close to a steep hillside, measures that will be implemented where appropriate with the approval of the landholder to reduce the risk to property resulting from slope instability include:

- The installation of subsoil drains.
- Regrading of slopes and sealing of tension cracks in active landslides.
- Provision of surface water cut-off drains above potential landslides.
- Provision of shear piles through the slide zone.
- Improvements to vegetation including slashing of thick matted grass and planting of suitable trees.
- Removal or re-shaping of the soil slope to reduce loads within the sliding mass.
- Provision of toe support and associated drainage to support the soil mass depending on the scale of the landslide.
- Diverting overland flows around the slide area and providing localised drainage improvements e.g. repair leaking drains or re-direct drains that may discharge into landslide areas, or improvements to septic seep-away systems.
- Redirect stock where tracks are disturbing slope or creating flow paths in landslide areas.
- Restrict grazing in areas where slope instability is indicated by monitoring.

The implementation of management measures will be related to the scale of impacts and the ability for and value in undertaking mitigation measures on a case by case basis, as negotiated with the landowner and described in the relevant PSMP. This means that management measures will be considered and implemented prior to the land performance measure being exceeded.

Management measures will be implemented, as appropriate, to comply with the relevant statutory requirements and the subsidence performance measures.

Under the NSW WHS legislation the mine proprietor is responsible for managing the safety of any landholders in the area of subsidence influence. TThis would include responding to and managing structural damages. Any financial costs incurred will be paid by IMC once

the transitional provisions under the Coal Mines Subsidence Compensation Act 2017 expire at the end of 2022.

7.2 Nepean River Cliff Lines

The Nepean River cliff lines are located outside the Study Area and are at distances of more than 1 km from the proposed longwalls.

IMC currently implements the *Nepean River Cliff lines and Steep Slopes Management Plan*. This management plan will be reviewed and, where required, revised to include the proposed Longwalls 709 to 711 and 905, prior to extraction.

7.3 Harris Creek Cliff Lines

The Harris Creek cliff line is located outside the Study Area and is at distances of more than 1 km from the proposed longwalls. The cliff line is not proposed to be monitored as part of this Extraction Plan.

7.4 Trigger Action Response Plans

The AA7 and 9 Land TARP is shown as Table 9.

Detailed TARPs for individual properties will be developed (if required) during the PSMP process. Monitoring will be undertaken in consultation and with the agreement of the landowner where necessary.

The *Longwall 709 Structures Management Plan* and *Longwalls 905 Structures Management Plan* are included in Attachment A to the LMP. These subordinate documents clearly reference structures with quantitative triggers and commitments to defined corrective actions for Longwalls 709 and 905. Both management plans are considered "live" documents which may be subject to changes by the IMC Structural Review Group to allow for decisive response in managing structures which are subject to subsidence influence to ensure they are safe and serviceable. The Resource Regulator maintains oversight of potential subsidence impacts through this process and maintains the authority under the *Mining Act 1992* to halt or stop mining if an impact, realized or predicted occurs.

The Structures Management Plans will be updated prior to the commencement of each longwall included in the Extraction Plan application.

Table 9 Appin Areas 7 and 9 LMP Trigger Action Response Plan

Landscape Features		
Cliffs and Steep Slopes • Nepean River Cliff Line • Razorback Range Cliffs • Sensitive terrain near built features (Razorback Range) Monitoring locations on private properties to be determined as appropriate/required in consultation with landowner	***Level 1**** • Rock fall from a cliff where the cliff is left mostly intact (<10% length of any single cliff) • Surface movement or rock displacement where any exposed soil surface is stable • Crack at the surface which does not result in ongoing erosion or ground movement • Erosion which stabilises within the period of monitoring without CMA • Crack or fracture up to 100 mm width • Crack or fracture up to 10 m length	• Continue monitoring program • Submit an Impact Report to BCD, DPE and the Resources Regulator • Report in the End of Panel Report • Summarise actions and monitoring in AR
	Level 2* • Rock fall from cliff where the characteristics of the cliff change (>10% length of any single cliff) • Ground disturbance that is unlikely to stabilise within the period of monitoring without CMA • Mass movement of a slope causing areas of exposed soil • Crack or fracture between 100 – 300 mm width • Crack or fracture between 10 – 50 m length	• *Actions as stated for Level 1* • Report trigger to key stakeholders • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades where appropriate in areas as required for public safety (refer PSMP) • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of mining impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
	Level 3* • Cliff collapse (100% length of any single cliff) • Ground disturbance that does not stabilise within the period of monitoring • Mass movement of a slope causing areas of exposed soil that does not stabilise within the period of monitoring • Crack or fracture over 300 mm width • Crack or fracture over 50 m length	• *Actions as stated for Level 2* • Notify BCD,DPE and the Resources Regulator, relevant resource managers and technical specialists and seek advice on any CMA required. • Invite stakeholders for site visit • Develop site CMA (subject to stakeholder feedback). This may include: – Erosion prevention works

		– Establishment of vegetation • Completion of works following approvals, including monitoring and reporting on success • Review the TARP and Management Plan in consultation with key stakeholders *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of mining impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
	Exceeding Prediction • For cliffs of 'special significance' and other cliffs flanking the Nepean River - mining results in more than negligible environmental consequences (i.e. more than occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total impact more than 0.5% of the total face area of such cliffs within any longwall mining domain) • Other cliffs – mining results in more than minor environmental consequences (that is occasional rockfalls, displacement or dislodgment of boulders or slabs or fracturing, that in total impact more than 3% of the total face area of such cliffs within any longwall mining domain)	• *Actions as stated for Level 3* • Make area safe • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide environmental offset if CMAs are unsuccessful

* These may be revised in consultation with DPE and other key stakeholders following analysis of natural variability within the pre-mining baseline data.

8. CONTINGENCY RESPONSE PLAN

In the event the Subsidence Performance Measures detailed in Section 5 of this LMP are considered to have been exceeded, or are likely to be exceeded, IMC will implement a Contingency Plan to manage any unpredicted impacts and their consequences.

This would involve:

- Capture photographic record.
- Notify relevant stakeholders soon as practicable.
- Notify relevant agencies and specialists soon as practicable.
- Offer site visits with stakeholders.
- Contract specialists to investigate and report on changes identified.
- Provide incident report to relevant agencies.
- Establish weekly monitoring frequency until stabilised.
- Updates from specialists on investigation process.
- Inform relevant agencies and stakeholders of results of investigation.
- Develop site CMA in consultation with key stakeholders if required, (pending stakeholder availability) and seek approvals.
- Implement CMA as agreed with stakeholders following approvals.
- Conduct initial follow up monitoring and reporting of CMA completion.
- Review Management Plan.
- Report in regular reporting and Annual Review.

IMC will consult with appropriate specialists, landholders and relevant agencies in order to devise an appropriate response in respect to any identified exceedance.

The development and implementation of contingency measures will be specifically designed to address the circumstances of the exceedance and assessment of environmental consequences.

If the contingency measures implemented by IMC fail to remediate the impact or the Secretary determines that it is not reasonable or feasible to remediate the impact, IMC will provide a suitable offset to compensate for the impact to the satisfaction of the Secretary in accordance with the BSO Approval Conditions 2 and 4, Schedule 3.

9. COMPLAINTS AND COMPLIANCE MANAGEMENT

9.1 Incidents

IMC will notify DPE and any other relevant agencies of any incident associated with the BSO as soon as practicable after IMC becomes aware of the incident. IMC will provide DPE and any relevant agencies with a detailed report on the incident within seven days of confirmation of any event.

9.2 Complaints and Dispute Resolution

IMC has a 24 hour, free call community hotline number (1800 102 210) and email address (illawarracommunity@south32.net) through which all complaints and general enquiries regarding environmental or community issues associated with IMC's operations can be reported.

All complaints received in relation to Appin Mine are managed in accordance with the Handling Community Complaints, Enquiries and Disputes Procedure.

Upon receipt of a community complaint, preliminary investigations will commence as soon as practicable to determine the likely cause of the complaint using information such as activities being undertaken on site at the time or area of the complaint.

An initial response will be provided to the complainant within 24 hours of the complaint being made, with a follow up response being provided as soon as practicable once a more detailed investigation is complete.

A summary of all complaints received during the reporting year will be provided as part of the Annual Review. A log of complaints is also maintained on the South32 website at:

https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.

9.3 Non-Compliance, Corrective Action and Preventative Action

Events, non-compliances, corrective actions and preventative actions are managed in accordance with the Reporting and Investigation Standard and Environmental Compliance/Conformance Assessment and Reporting Procedure. These procedures, which relate to all IMC operations, detail the processes to be utilised with respect to event and hazard reporting, investigation and corrective action identification. The key elements of the process include:

- identification of events, non-conformances and/or non-compliances:
- recording of the event, non-conformance and/or non-compliance in the event management system G360;
- investigation/evaluation of the event, non-conformance and/or non-compliance to determine specific corrective and preventative actions;
- assigning corrective and preventative actions to responsible persons in G360; and
- review of corrective actions to ensure the status and effectiveness of the actions.

Exceedances of or non-compliances with public safety related criteria will be reported to all relevant agencies via the Annual Review or notified in accordance with Section 8.

For any incident, as defined by the BSO Approval, IMC will notify the Secretary and any other relevant agencies as soon as practicable after IMC identifies or is made aware of the incident.

10. PLAN ADMINISTRATION

This LMP will be administered in accordance with the requirements of the Appin Mine Environmental Management Strategy (EMS) and the BSO Approval Conditions. A summary of the administrative requirements is provided below.

10.1 Roles and Responsibilities

Statutory obligations applicable to this Plan are identified and managed via an online compliance management system (TICKIT). The online system can be accessed from the link below:

https://illawarracoal.tod.net.au/login.

The overall responsibility for the implementation of this LMP resides with the Manager Approvals who is the LMP's authorising officer.

Parties responsible for environmental management in AA7 and 9 and the implementation of the LMP include:

Manager Approvals

- Ensure that the requisite personnel and equipment are provided to enable this LMP to be implemented effectively.
- Authorise the LMP and any amendments thereto.

Principal Approvals

- Delegate to an appropriately qualified person the responsibility to document any changes to the LMP, recognising the potential for those changes to affect other aspects of the LMP.
- Provide regular updates to IMC on the results of the LMP.
- Arrange information forums for key stakeholders as required.
- Prepare any report in accordance with the LMP. Maintain records required by the LMP.
- Organise and participate in assessment meetings called to review mining impacts.
- Within 24 hours, respond to any queries or complaints made by members of the public in relation to aspects of this LMP.
- Organise audits and reviews of the LMP.
- Address any identified non-conformances, assess improvement ideas submitted and implement if considered appropriate.
- Arrange for the implementation of any agreed actions. Responses or remedial measures.
- Ensure surveys required by this LMP are conducted and record details of instances where circumstances prevent these from taking place.

Environmental Field Team Coordinator

- Instruct suitable person(s) in the required standards for inspections, recording and reporting and be satisfied that these standards are maintained.
- Investigate significant subsidence impacts.
- Identify and report any non-conformances with the LMP.
- Participate in any other assessment meetings called to review subsidence impacts in the area affected by mining.

Survey Coordinator

- Collate survey data and present in an acceptable form for review at assessment meetings.
- Bring to the attention of the Principal Approvals any findings indicating an immediate response may be warranted.
- Bring to the attention of the Principal Approvals any non-conformances identified with the Plan provisions or ideas aimed at improving the LMP.

Technical Experts

- Conduct the roles assigned to them in a competent and timely manner to the satisfaction of the Principal Approvals and formally provide expert opinion as requested.

Person(s) Performing Inspections

- Formally bring to the attention of the Environment Field Team Coordinator any nonconformances identified with the Plan, or ideas aimed at improving the Plan.
- Conduct inspections in a safe manner.

10.2 Resources Required

The Manager Approvals provides resources sufficient to support this LMP.

Equipment may be needed for the TARPs provisions of this LMP. Where this equipment is of a specialised nature, it will be provided by the supplier of the relevant service. All equipment is to be appropriately maintained, calibrated and serviced as required in operation manuals.

It is the responsibility of the Manager Approvals to ensure that personnel and equipment are provided as required to allow the provisions of this Plan to be implemented.

10.3 Training

All staff and contractors working on IMC sites are required to complete the IMC training program which includes:

- An initial site induction (including all relevant aspects of environment, safety and community).
- Safe Work Methods Statements and Job Safety Analyses, Toolbox Talks and Preshift communications.
- On-going job specific training and re-training (where required).

All training records are maintained by the South32 Training Department.

It is the responsibility of the Manager Approvals to ensure that all persons and organisations having responsibilities under this Plan are trained and understand their responsibilities.

The person(s) performing regular inspections will be under the supervision of the Environment Field Team Coordinator and be trained in observation and reporting. The Environment Field Team Coordinator shall be satisfied that the person(s) performing the inspections are capable of meeting and maintaining this standard.

10.4 Review and Update

In accordance with Condition 5 of Schedule 6 of the BSO Approval, the Extraction Plan will be reviewed, and if necessary revised, within three months, of:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an Independent Environmental Audit report; or
- any modification to the conditions of the BSO Approval (unless the conditions require otherwise).

If significant deficiencies in this Plan are identified in the interim period, the plans will be modified as required. This process has been designed to ensure that environmental documentation continues to meet current environmental requirements, including changes in technology and operational practice, and expectations of stakeholders.

11. REFERENCES

BHPBIC, 2009. *Major Cliff Line Assessment, Bulli Seam Operation Environmental Assessment*. Appendix R.

Coffey Geotechnics, 2013. *Landslide Risk Assessment from Mine Subsidence Effects - Appin Area 9 Proposed Longwalls, Razorback Range, Douglas Park, NSW*. Report prepared for BHP Billiton Illawarra Coal.

GHD, 2021. *Appin Area 7 and 9 Proposed Longwalls Landslide Risk Assessment relating to Mine Subsidence Influences*, March 2021. Report for South32 Illawarra Metallurgical Coal

Mine Subsidence Engineering Consultants, 2009, *Bulli Seam Operations Subsidence Assessment*. Report for BHP Billiton Illawarra Coal.

MSEC 2021, *Appin Longwalls 709 to 711 and 905: Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Extraction of the Proposed Longwalls 709 to 711 and 905 at Appin Colliery*. Report for South32 IMC.

MSEC (2022) *Appin – Area 7 – Longwall 709 Management Plan for Potential Impacts to Building Structures*, MSEC 1064, Rev 3, February 2022.

MSEC (2022) *Appin – Area 9 – Longwall 905 Management Plan for Potential Impacts to Building Structures*, MSEC 1263, Rev 2, June 2022.

12. ATTACHMENTS

Attachment A – Longwall 709 Structures Management Plan and Longwall 905 Structures Management Plan

13. APPENDICIES

Appendix A- GHD, 2021. Appin Area 7 and 9 Proposed Longwalls Landslide Risk Assessment relating to Mine Subsidence Influences