

BULLI SEAM OPERATIONS

REGIONAL SEISMIC EVENT MONITORING

8 September 2025

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DOCUMENT CONTROL

Applicant:	Illawarra Coal Holdings Pty Ltd
Mine:	Bulli Seam Operations Appin Mine
Name of operator:	Gear M Illawarra Met Coal Pty Ltd trading as GM ³
Project approval:	MP08_0150
Mining leases:	Consolidated Coal Lease 767, Coal Lease 388, Mine Lease 1382, Mine Lease 1433, Mine Lease 1678 and Mine Lease 1847
Document Title:	BSO Regional Seismic Event Monitoring Program

NAME OF PERSONS AUTHORISING THIS PLAN

NAME	TITLE	DATE
Gary Brassington	Director Sustainability and Government	

DOCUMENT REVISIONS

REVISION	DESCRIPTION OF CHANGES	DATE
1	Original document	July 2021
1.1	Minor Administrative updates	January 2023
2	Updated for Longwalls 712 to 716 Extraction Plan	September 2025

PERSONS INVOLVED IN PREPARATION OF THIS PLAN

NAME	TITLE	EXP (YEARS)
Bruce Blunden	Manager Approvals	35
Cody Brady	Principal Approvals	10

1. OVERVIEW OF THE EXTRACTION PLAN

Illawarra Coal Holdings Pty Ltd (ICHPL) operates the Bulli Seam Operations (BSO) Appin Mine located in the Southern Coalfield of New South Wales (NSW). Appin Mine has been operating since 1962 and includes the merged Appin, West Cliff and Tower Collieries. Appin Mine surface access facilities are located along Appin Road (near the town of Appin) and Douglas Park Drive (Douglas Park). Mining is currently underway in the Appin Area 7 (AA7) mining domain under the approved Longwall 709 to 711 and 905 Extraction Plan.

Appin Mine incorporates underground mining operations which extract coal using the longwall mining method from the Bulli Seam, producing high quality hard coking coal for steel production. Run-of-Mine (ROM) coal is extracted from the Appin underground mining operations and delivered directly to the West Cliff Coal Preparation Plant (WCCPP) by winder and conveyor or is transported from the Appin East Pit Top via truck along Appin and Wedderburn Roads to the WCCPP. Processed coal (clean coal product) from the WCCPP is transported by road to the Port Kembla Coal Terminal (PKCT) for shipping to domestic and international customers, or to BlueScope Steel or other local customers.

In September 2009, ICHPL submitted an Environmental Assessment (EA) for its BSO Project to the then NSW Department of Planning and Infrastructure (DoPI) for the continuation of existing underground coal mining operations for Appin Mine and West Cliff Mine. A Preferred Project Report (PPR) for the removal of the North Cliff, Area 2 and the majority of the Area 3 mining domains from the BSO Project Application resulted in removal of most of the proposed mining beneath the then Dharawal State Conservation Area and all 226 upland swamps previously identified within the Application Area.

On 22 December 2011 the Planning and Assessment Commission (PAC), under delegation of the Minister for Planning (now the Secretary of the Department of Planning, Housing and Infrastructure DPHI), 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.

2. PURPOSE AND SCOPE

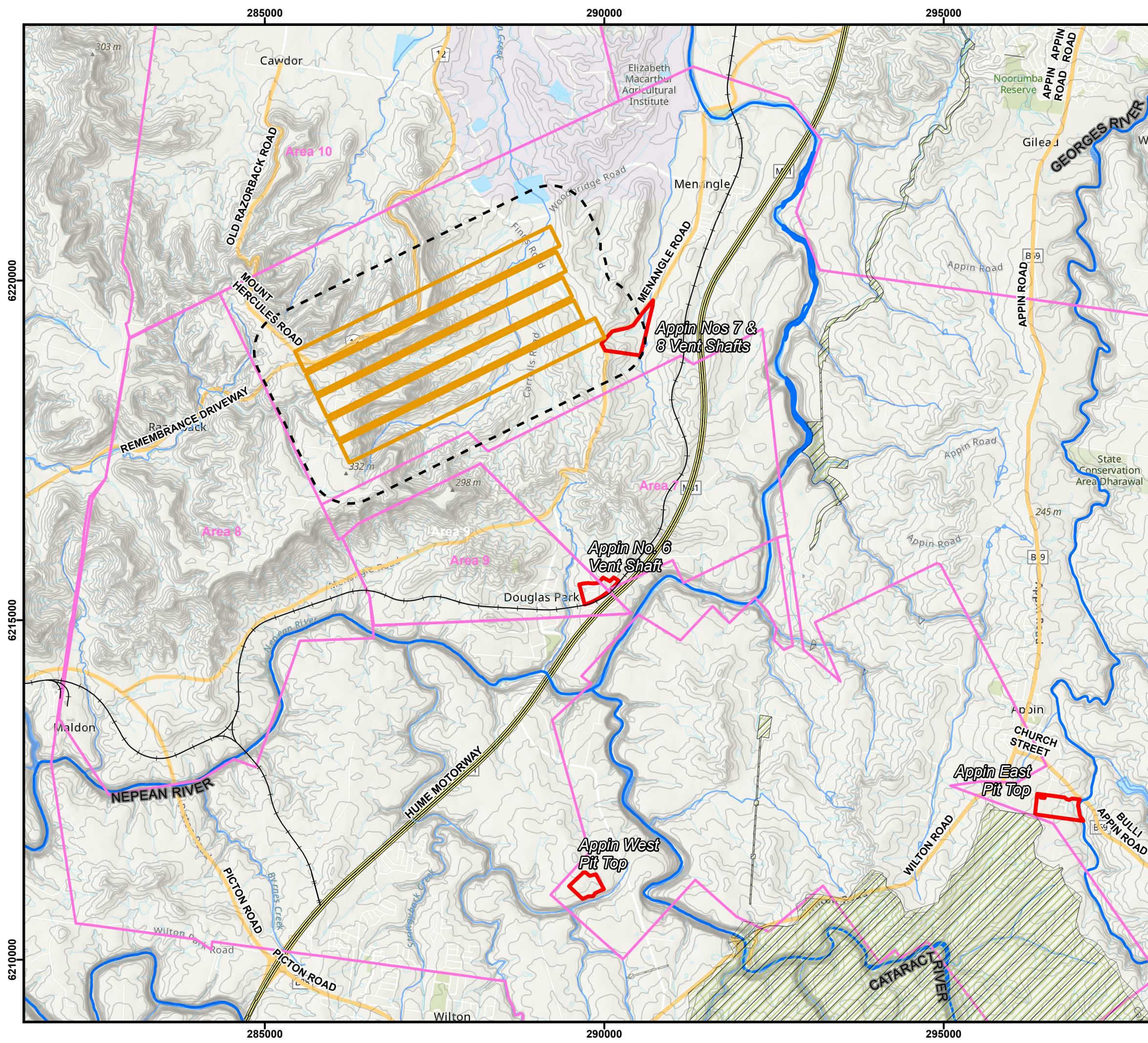
Condition 5 of Schedule 3 of the Project Approval MP 08_0150 requires the preparation of an Extraction Plan to manage the potential subsidence effects, impacts and/or environmental consequences associated with the extraction of coal from the approved areas. This Extraction Plan has been prepared to support the extraction of coal from five longwalls to the north of the approved Longwall 711 which include Longwalls 712 to 716 within the AA7. This Extraction Plan outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences in the BSO underground mining area during the extraction of Longwalls 712 to 716 (including Longwalls 712, 713, 714, 715 and 716) at Appin Mine.

The location of the Longwalls 712 to 716 Study Area within the BSO is shown in Figure 1. The General Arrangement of Longwalls 712 to 716 is shown in Figure 2.

The purpose of this Regional Seismic Event Monitoring Program (RSEMP) is to provide the framework of ICHPL's seismic monitoring across its Bulli Seam Operations in accordance with Condition 5(n), Schedule 3 of the BSO Approval.

The objectives of the RSEMP are to:

1. Monitor seismic events in the region of the BSO.
2. Analyse and locate seismic events in the region of BSO.
 - a) Earthquake magnitude.
 - b) Earthquake hypocentre (latitude, longitude and depth).
3. Assess the relationship between seismic events and mining.
4. Improve the understanding of the relationship between underground mining and seismic events.



GM³ Bulli Seam Operations

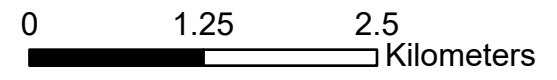
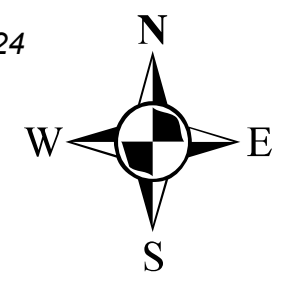
Appin Area 7 Longwall 712-716 Figure 1

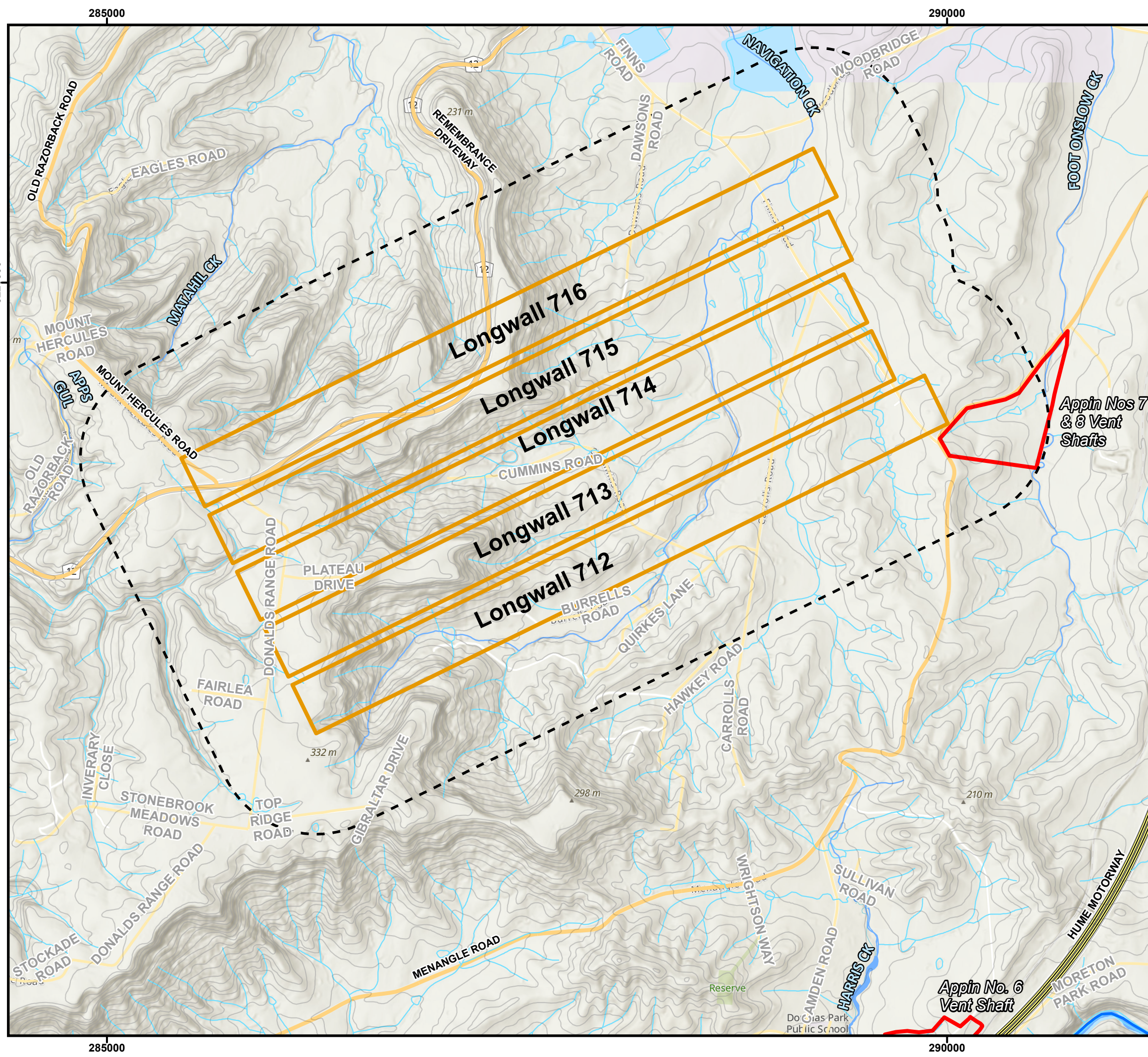
- Longwalls 712 - 716
- 10m Contours
- 600m study area
- Mining Domains
- ICH Surface Operations
- Main Roads
- Highways
- 10m Contours
- Rivers
- Tributaries
- Creeks
- Railway Lines
- Metropolitan Special Area



Date: November, 2024
Author: L. Nile

Version 1
Horizontal Datum
MGA - Zone 56





GM³

**Appin Area 7
Longwall 712-716
Figure 2**

- Longwalls 712 - 716
- 600m study area
- ICH Surface Operations
- Main Roads
- Minor Roads
- Highways
- Rivers
- Tributaries
- Creeks
- 10m Contours



Date: November, 2024
Author: L. Nile

Version 1
Horizontal Datum
MGA - Zone 56

0 0.5 1 Kilometers

3. STATUTORY REQUIREMENTS

Extraction of coal from Appin Mine will be in accordance with the conditions set out in the BSO Approval.

3.1 Consultation

Revision 1 of this RSEMP has been developed in consultation with:

- Department of Planning, Housing and Infrastructure (DPHI);
- Mining, Exploration and Geosciences; and
- Resource Regulator.

Version 1.0 of the RSEMP was provided to agencies for comment during the consultation phase of the Appin Longwalls 709 to 711 and 905 Extraction Plan, in July 2021. No comments were received on the management plan.

Revision 2 of this RSEMP will be sent to the aforementioned agencies for consultation as part of the Longwalls 712 to 716 Extraction Plan application.

ICHPL will make the RSEMP and associated documentation publicly available on the ICHPL website in accordance with Condition 11, Schedule 6 of the BSO Approval.

3.2 BSO Approval

Condition 5 (n), Schedule 3 of the BSO Approval requires the preparation of a RSEMP which includes analysis of outcomes and proposed triggers for review of potential correlations with mining operations.

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

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

The BSO RSEMP fits within the overall structure of IMC BSO Environmental Management Strategy (EMS) which is shown in Figure 3.

Table 1 Management Plan Requirements

Project Approval Conditions	Relevant RSEMP Section
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;	Section 3
(c) a description of the measures that would be implemented to comply with the relevant statutory, limits, requirements or performance measures/criteria;	Section 6
(d) a program to monitor and report on the: - impacts and environmental performance of the project; - effectiveness of any management measures (see c above);	Section 6
(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;	
(g) a protocol for managing and reporting any: - incidents; - complaints; - non-compliances with statutory requirements; and - exceedances of the impact assessment criteria and/or performance criteria; and	Section 7.5
(h) a protocol for periodic review of the plan.	Section 7.7

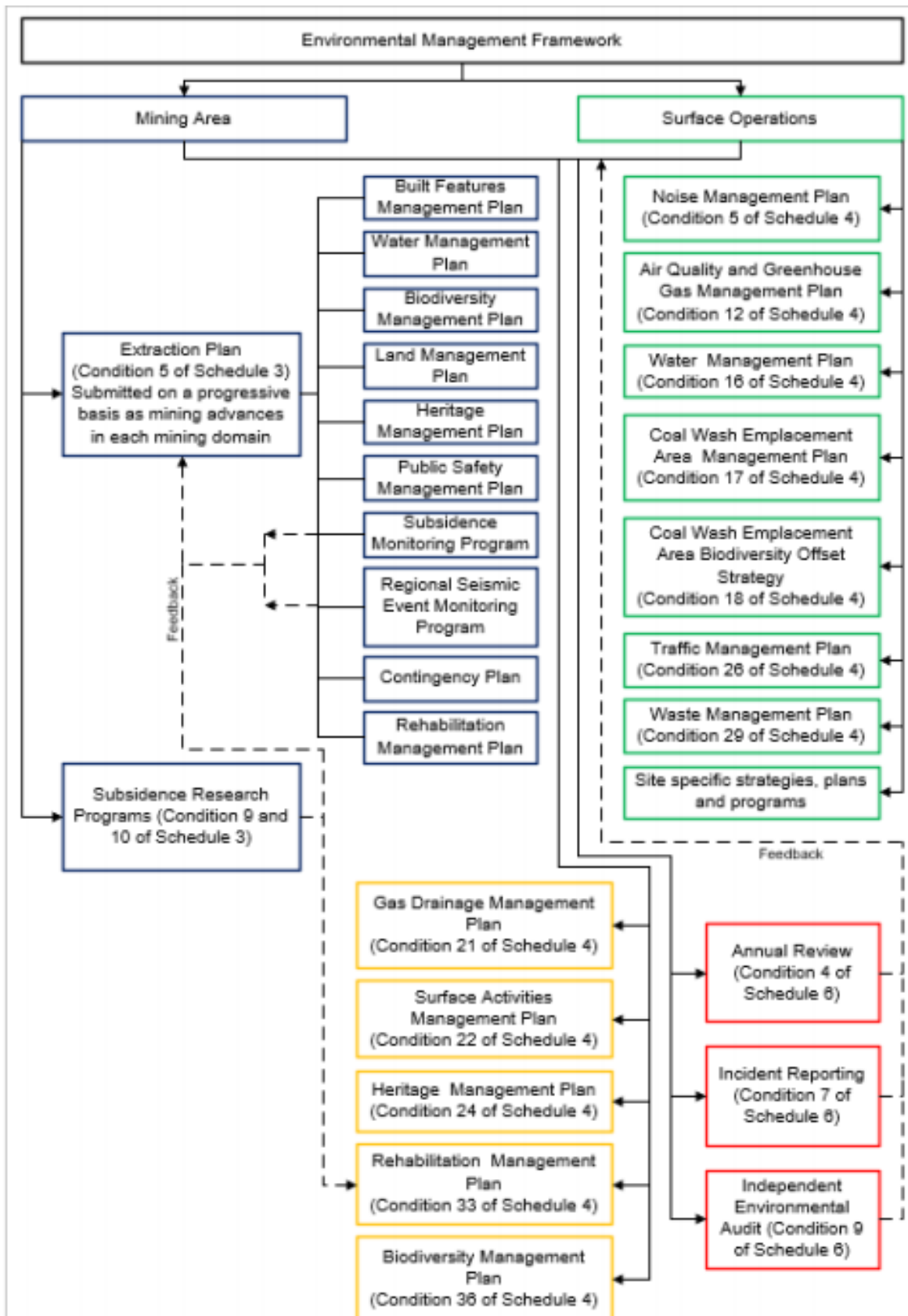


Figure 3: Appin Environmental Management Framework

4. DEFINITION

The following section is sourced from the GA Earthquake Hazard website <https://www.ga.gov.au/scientific-topics/community-safety/earthquake>

4.1 Magnitude

The size or magnitude of earthquakes is determined by measuring the amplitude of the seismic waves recorded on a seismograph and the distance of the seismograph from the earthquake. These are converted to a magnitude, which is a measure of the energy released by the earthquake. For every unit increase in magnitude, there is roughly a thirty-fold increase in the energy released. For instance, a magnitude 6.0 earthquake releases approximately 30 times more energy than a magnitude 5.0 earthquake, while a magnitude 7.0 earthquake releases approximately 900 times (30x30) more energy than a magnitude 5.0.

Earthquake magnitude was traditionally measured on the Richter scale. It is often now calculated from seismic movement, which is proportional to the fault area multiplied by the average displacement on the fault.

4.2 Location

The earthquake location is also known as its focus or hypocentre which is represented by the latitude, longitude and depth below the surface.

4.3 Effects

The amplitude of the shaking caused by an earthquake depends on many factors, such as the magnitude, distance from the epicentre, depth of focus, topography and the local ground conditions.

Earthquake effects, based on human observation, are rated using the Modified Mercalli (MM) intensity scale, which ranges from I (imperceptible) up to XII (total destruction) (Table 2).

In Australia, earthquakes with magnitudes of less than 3.5 seldom cause damage, and the smallest magnitude earthquake known to have caused fatalities is the magnitude Mw 5.4 (ML5.6) Newcastle earthquake in 1989. However, magnitude 4.0 earthquakes occasionally topple chimneys or result in other damage which could potentially cause injuries or fatalities.

Table 2: The Modified Mercalli Intensity (MMI) Scale

Intensity	Shaking	Description
I	Not felt	Not felt except by a very few under especially favourable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.

Intensity	Shaking	Description
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

5. SCOPE

The Australian plate is the fastest moving continental land mass on Earth and is colliding into the Pacific plate to Australia's north and east, and the Eurasian Plate to the northwest. This generates mainly compressive stress in the interior of the Australian continent, which is slowly building up across the plate as it moves northeast about 7 cm per year. Australia's earthquakes are caused by the sudden release of this stress when rocks deep underground break and move along a fault line.

The scope of this Monitoring Plan is to locate seismic events in the vicinity of BSO and assess if there is any correlation between events and mining.

6. REGIONAL SEISMIC MONITORING PROGRAM

This RSEMP consists of:

- Seismic Monitoring
- Analysis
- Reporting

6.1 Seismic Monitoring

The Appin mine seismic monitoring network installed for ICHPL by the Seismology Research Centre (SRC) now comprises of eight seismic monitoring stations. Five sites were installed at Appin (APPIN), Cawdor (CAWDR), Finns Rd (FINNS), Gilead (GLEAD) and Maldon (MALDN) between late November 2013 and mid-February 2014.

In April 2018 the Appin mine seismic network was upgraded further with three additional stations installed and the site at APPIN relocated. These newer stations are located closer to the currently working areas of the mine and are named LW703, LW707 (Ex-APPIN), LW710 and LW903 after the longwalls they are located above. These new sites have been installed with the latest generation Kelunji Gecko recorders and Lennartz MkIII seismometers. 4G modems were installed at the original seismic monitoring stations during 2023 and early 2024 in anticipation of the 3G network shutdown which occurred in October 2024.

Table 3 below specifies the equipment installed at each site in addition to ancillary equipment such as solar/power equipment and enclosures.

Table 3: Seismic monitoring network

Site	Recorder	Sensor (s)	Modem
CAWDR, FINNS,	Kelunji EchoPro 6-channel seismic recorder	Guralp CMG-6T-1 weak motion seismometer	Netcomm EC21AU 4G Cellular Router

Site	Recorder	Sensor (s)	Modem
LW707, MALDN		Guralp CMG-5TC strong motion accelerometer	
GLEAD	Kelunji EchoPro 6-channel seismic recorder	Guralp CMG-40-T weak motion seismometer Guralp CMG-5TC strong motion accelerometer	Netcomm EC21AU 4G Cellular Router
LW703, LW710, LW903	Kelunji Gecko Seismic Recorder	Lennartz Le 3D lite MkIII seismometer	Robustel R1511 4G Cellular Router

Seismic and state of health data is sent from all stations back to the SRC observatory and is used in conjunction with other seismic networks that feed into the observatory to locate local earthquakes.

Figure 4 is a map showing the location of the recorders that make up the ICHPL seismic network. Recorders may be relocated from the southern most extent of the seismic network (or additional units added to the network) as Appin Mine extends northwards upon the advice of seismology experts.



Figure 4: ICHPL Appin Mine Seismic Monitoring Network

6.1.1 *Analysis*

ICHPL will engage SRC who are qualified seismologists to analyse the seismic events and provide the location of the locus. Micro-seismic events associated with the formation of the goaf as part of the longwall mining process will be located, as well as significant events, earthquakes (Magnitude >1). SRC report the location of the events to IMC on a monthly basis.

SRC also analyse the distribution of events and the locations of mining to determine if there is any relationship between mining and the seismic events.

7. PLAN ADMINISTRATION AND REPORTING

7.1.1 Reporting

ICHPL will use qualified seismologists to monitor and analyse seismic events in the region of the BSO. The report will summarise the seismic events located during the period and the relationship to mining, based on the analysis. The incidence of seismic activity and the relationship to mining is dependent on the analysis of events over a period of time. It is not expected that a relationship can be determined based on a single event. A summary of the annual report will be included in the Annual Review for BSO.

7.1.2 Annual Review

An Annual Review will be prepared and submitted in accordance with Condition 4, Schedule 6 of the BSO Approval. The Annual Review will review the performance of the BSO to the satisfaction of the Secretary of the DPHI and will:

- describe the development (including any rehabilitation) that was carried out in the past financial year, and the development that is proposed to be carried out over the following year;
- include a comprehensive review of the monitoring results and complaints records of the project over the past financial year, which includes a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria;
 - requirements of any plan or program required under this approval;
 - monitoring results of previous years; and
 - relevant predictions in the EA;
- identify any non-compliance over the past financial year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the project;
- identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the current financial year to improve the environmental performance of the BSO.

7.2 Roles and Responsibilities

Statutory obligations applicable to this Plan are identified and managed via an online compliance management system.

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

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

Manager Approvals

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

Principal Approvals

- Document any changes to the Plan, recognising the potential for those changes to affect other aspects of the Plan.
- Provide regular updates to ICHPL on the results of the Plan.
- Arrange information forums for key stakeholders as required.
- Prepare any report in accordance with the Plan.
- Maintain records required by the Plan.
- 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 Plan.
- Organise audits and reviews of the Plan.
- 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.
- Check surveys required by this Plan are conducted and record details of instances where circumstances prevent these from taking place.

Coordinator Environment

- 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 Plan.
- 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 Plan.

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 Coordinator Environment any nonconformances identified with the Plan, or ideas aimed at improving the Plan.
- Conduct inspections in a safe manner.

7.3 Resources Required

The Manager Approvals provides resources sufficient to support this Plan.

Equipment may be needed for this Plan. 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.

7.4 Training

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

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

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

7.5 Complaints

GM3 has a readily accessible contact point through a 24-hour toll-free Community Call Line (1800 102 210) and email address (community@gm3.au). The number is displayed on the GM³ website, prominently on ICHPL Projects and Mine sites in a position visible by the public as well as on publications, letters and other correspondence provided to the local community. The call line is for all complaints and general enquiries regarding environmental or community issues associated with ICHPL operations.

Community complaints and enquiries may also be received in person by any employee of ICHPL, with details to be immediately shared with the Community Team for investigation. All complaints received in relation to Dendrobium Mine will be 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. 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 GM³ website.

7.6 Distribution

ICHPL will make the Extraction Plan and other relevant environmental documentation publicly available on the GM³ website (Condition 11, Schedule 6).

Individual management plans will be developed in consultation with, and copies will be provided to, the relevant Government agencies and stakeholders as detailed in the appropriate Plan.

7.7 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 (IEA) report; or
- any modification to the conditions of the BSO approval (unless the conditions require otherwise).

If significant deficiencies in this Extraction 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