RUSSELL VALE COLLIERY

REVISED PREFERRED UNDERGROUND EXPANSION PROJECT

Extraction Plan for PC07-PC08 and PC21-PC25(Stage 1) and PC27-PC34 (Stage 2) mining

BUILT FEATURES MANAGEMENT PLAN

Revisions

Property	Value
Approved by	Group Environment Manager
Document Owner	Group Environment Coordinator
Effective Date	

Revision history

Version	Date reviewed	Review team (consultation)	Nature of the amendment
Draft 1 (V1)	28/06/2021	Ken Mills (SCT) Stephen Wilson (SCT) Umwelt	Initial Draft for consultation with the Resource Regulator, TfNSW Endeavour Energy & TransGrid.
Draft 2 (V1)	17/09/2021	Robert Faddy-Vrouwe (WCL) Devendra Vyas (WCL	Updated following consultation with TransGrid and Endeavor Energy
Draft 3 (V1)	06/10/2021	Richard Sheehan (WCL) Devendra Vyas (WCL)	Final draft post receipt of consultation outcomes from Surveyor General, TransGrid, and completion of the TfNSW risk assessment.,
Draft 4 (V1)	25/10/21	Richard Sheehan (WCL) Devendra Vyas (WCL)	Document updated post DPIE Extraction Plan submission to address requirements of the TfNSW Letter 21/10/21 detailing the planning of monitoring and pre-emptive work requirements to support the final BFMP for TfNSW submission, and the RR feedback
Draft 5 (V1)	25/10/21	Richard Sheehan (WCL) Devendra Vyas (WCL)	Document updated post DPIE Extraction Plan submission to address requirements of the TfNSW Technical Committee feedback as per feedback provided 23/11/21. Various minor formatting changes to align Table 9 correctly with key function.
Draft 6 (V1)	03/12/21	Richard Sheehan (WCL) Devendra Vyas (WCL)	Document updated post DPIE Extraction Plan submission to address requirements of the TfNSW Technical Committee as per feedback provided 02/12/21.

Version	Date reviewed	Review team (consultation)	Nature of the amendment
Draft 7 (V1)	09/12/21	Richard Sheehan (WCL) Devendra Vyas (WCL) Henk Buys	Document updated post DPIE Extraction Plan submission to address requirements of the TfNSW Technical Committee as per feedback provided 08/12/21 including TfNSW TARP process.
Rev 0	16/02/22	TfNSW Technical Committee	Final provided for TfNSW sign off
(R1) D1	1/04/22	Stephen Wilson (SCT)	Initial Draft for consultation with the Resource Regulator, TfNSW, Endeavour Energy, TransGrid and WaterNSW.
(R1) D2	8/04/22	Richard Sheehan (WCL)	Initial Draft for consultation with the Resource Regulator, TfNSW, Endeavour Energy, TransGrid and WaterNSW.
(R1) D3	24/05/22	Richard Sheehan (WCL)	Update to document following stakeholder feedback.
F1	24/05/22	Richard Sheehan (WCL)	Finalisation for submission to DPE
F1.1	7/10/22	Tom McMahon (WRPL)	Amendments to address minor feedback from Technical Committee

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1 INTRODUCTION

1.1 Overview

This Built Features Management Plan (this Plan) has been prepared in support of an Extraction Plan (EP), as required by ***Condition 10 (g)(ii)/Schedule 2*** of the Project Approval MP09_0013 (the consent). In accordance with ***Condition C10(a)*** of the Development Consent.

This BFMP is intended to manage the potential subsidence impacts of the underground workings proposed in the current EP for Stage 1 (PC07, PC08, PC21-PC25) and Stage 2 (PC27-PC34) on built features to meet the requirements detailed in the ***Condition C10 (g)(ii)*** of the consent. The management of subsidence impacts from further proposed mining will be addressed in subsequent EPs.

This BFMP is also intended to follow the guidelines outlined in Department of Planning, Environment DPE (c2015) (excluding the elements associated with formal risk assessments).

The Stage 1 Built Features Management Plan was prepared by SCT and WCL. The updates associated with the Stage 2 workings have been prepared by WCL with input from SCT and operators of built features.

Wollongong Coal Limited (WCL) operates the Russell Vale Colliery (formerly the NRE No.1 Colliery) located in the Southern Coalfield of New South Wales (NSW). The mine is located at Russell Vale, approximately 8 km north of Wollongong and 70 km south of Sydney, within the local government areas (LGAs) of Wollongong and Wollondilly in the Illawarra region of NSW.

Russell Vale Colliery operates under the current project approval Development Consent MP09_0013 (the approval) granted by the NSW Independent Planning Commission (IPC) on 8 December 2020. The approval, known as the Russell Vale Revised Preferred Underground Expansion Project (UEP), is based on the Revised Preferred Project Report and Response to Second PAC Review by Umwelt dated July 2019.

The approved workings are contained within Consolidated Coal Lease 745 (CCL 745).

In accordance with ***Condition C10(g)(ii)***, Part C of the Development Consent, this Built Features Management Plan (BFMP) has been prepared as a component of the Russel Vale Colliery Extraction Plan for Stage1 and Stage 2 mining to manage the potential impacts to built features located in proximity to the proposed bord and pillar workings defined as being 'second workings' under MP09_0013. This BFMP includes the conditionally approved Stage 1 mining in Panels PC07, PC08 and PC 21 - PC25 and the planned mining in the Stage 2 Panels of PC27-PC34. The Stage 1 consists of two distinct areas. Stage1(b) panels PC07, PC08 are located to the east of Mt Ousley Road (M1 - Princes Motorway) and Stage 1(a) Panel PC21-PC25 are located to the west of Mt Ousley Road and west of previous longwall mining areas. The planned Stage 2 Panels PC27-PC34 are located beyond PC21-25, further to the west of Mt Ousley Road (refer to **Figure 1**).

Section 2 of the main extraction plan document, 'Project Description', provides a full summary of the project, including details on the:

- mine planning and design;
- mining methodologies;

- phasing of the surface infrastructure relating to the project over 2 stages, which are both wholly covered under the extraction plan;
- staging of second workings consistent with conditions of approval and subsidence management plans.

The second workings for the remaining panels approved under Development Consent MP_09_0013 will be mined in a staged approach and will therefore be subject to future Extraction Plans (EP).

1.2 Mine Design and Mining Method

Full details on the EP Area mine design and mining method are outlined within the Main Extraction Plan document. This BFMP covers the mining plan layout found in **Figure 1** and includes:

Stage 1:

Stage one workings are broken up into two stages (stage 1a and Stage 1b) as below and was included in the Etraction Plan 1 (EP1):

- Stage 1(a) - one panel (PC21) and 4 sub-panels (PC22, PC23, PC24 and PC25) to the west of Mt Ousley Road adjacent to the Cataract Storage Reservoir; and
- Stage 1(b) - two panels (PC07 and PC08) to the east of Mt Ousley Road.

Stage 2:

Stage 2 workings will be covered in the Stage 2 Extraction Plan.

- Stage 2 – eight panels (PC27-PC34) located within the UEP approved mining area further to the west of panels PC21-PC25 described above.

1.3 Purpose and Scope

This BFMP has been developed to meet the requirements of, and in compliance with, ***Schedule 2 Condition C10 (g)(ii)*** of the consent, as well as the other relevant conditions and requirements outlined in **Section 2** below. This plan details how WCL will manage potential subsidence risks and impacts to the built features from second workings for this EP. This BFMP applies to the EP assessment areas outlined in **Figure 1** and incorporates the built features above or in the vicinity of Stage 1 panels PC07, PC08 and PC 21 - PC25 and Stage 2 Panels PC27-PC34. These mining layouts are those assessed for subsidence effects and impacts in SCT (2021) and SCT (2022b).

The built features that are addressed in this plan include the key public infrastructure as listed in **Table 1** and key infrastructure owners considered in this document include:

Table 1 – Key public infrastructure and owners

Key/ other public Infrastructure	Key public Infrastructure owner
M1 Princess Motorway (Mt Ousley Road and associated built features (e.g., culverts, embankments)	Transport for NSW (TfNSW) – Roads and Maritime Services (RMS)
Electricity transmission lines, poles, and towers (including angle towers)	TransGrid – 330kV Endeavour Energy –132kV and 2 * 33kV

Key/ other public Infrastructure	Key public Infrastructure owner
Access roads and fire trails	WaterNSW
Permanent survey marks	NSW Surveyor General

The EP Assessment Areas (study area or EP area) are based on a distance of 350m, or overburden depth (equivalent to an angle of draw of 45°) whichever is the greater. A description of the key infrastructure features, an estimate of subsidence effects and an assessment of expected impacts to the features are included in the subsidence assessments for the Stage 1 panels and Stage 2 Panels (SCT 2021 and SCT 2022).

The location of this infrastructure relative to the approved and planned mining and historic workings within the EP areas is shown in **Figure 1**. There are no major built features within the EP areas for panels PC21-PC25 and PC27-PC34. Built Features in these EP areas are limited to Cataract Reservoir and fire trails/access roads. The majority of the major built features/critical infrastructure discussed in this plan are within the EP area for panels PC07 and PC08.

The Cataract Reservoir dam wall (and associated infrastructure) and Telstra infrastructure at Brokers Nose are remote from the UEP extraction areas, and the EP 1 and 2 areas and are not expected to be affected by subsidence movements. Specifically, the Cataract Reservoir dam wall is approximately 8km from EP 2 extraction area, and hence is not considered further within this BFMP.

The management of subsidence impacts from further proposed mining in other areas of the UEP proposed extraction area not covered in the EP 1 plan and approval or EP2 plan will be addressed in subsequent EPs.

Figure 1 – Site Plan of Russell Vale East superimposed on a 1:25000 topographic map with EP Assessment Areas and subsidence monitoring locations.

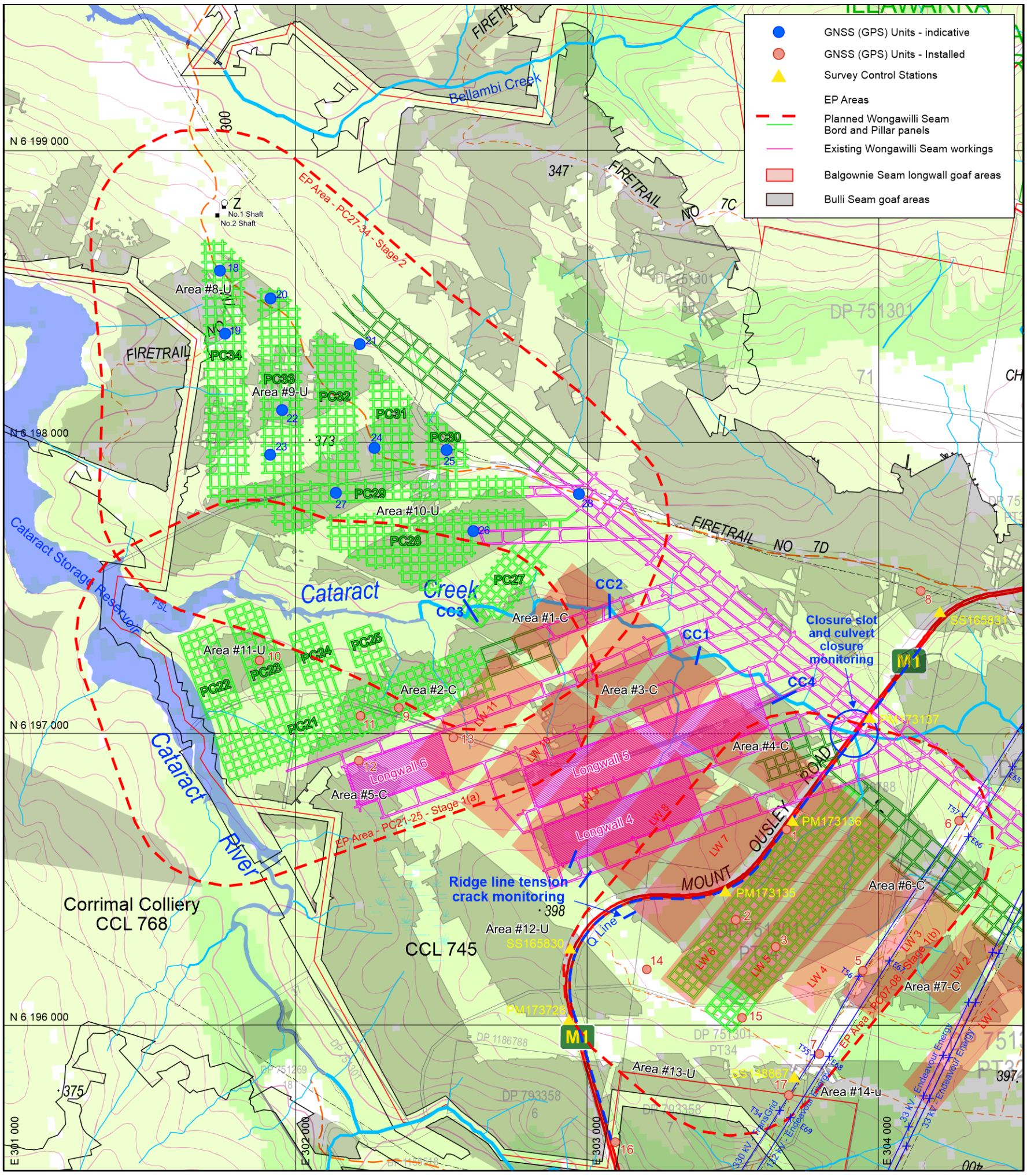


Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

1.4 Report Structure

The remainder of this Plan is structured as follows:

Section 2: Outlines the statutory requirements applicable to the Plan.

Section 3: Outlines the built features baseline data

Section 4: Details the predicted subsidence and baseline conditions within the EP Area.

Section 5: Describes the performance measures and indicators that will be used to assess the Project.

Section 6: Describes the monitoring program.

Section 7: Describes the management, remediation and mitigation measures that will be implemented to reduce potential impacts. This section also details the Contingency Plan to manage any unpredicted impacts and their consequences.

Section 8: Describes the required reporting and communication processes for the management of incidents, complaints and non-conformances.

Section 9: Describes the reporting processes for monitoring

Section 10: Outlines the plan administration requirements.

Section 11: Describes how the Plan will be implemented, managed, reviewed and updated.

Section 12: describes the process of audit and review.

Appendix A: Details the TARPs for the Built Features above the second workings for the key infrastructure agencies.

Appendix B: Details the records of the Consultation undertaken during the development of this plan.

Appendix C: Details the baseline surveys as detailed in Section 3 of this plan including the LIDAR report and GNSS baseline results.

Appendix D: Includes the Transport for NSW Risk Register.

Appendix E: details the Transport for NSW Risk approval page.

2 STATUTORY REQUIREMENTS

2.1 Development Consent Conditions

Condition C10(g)(ii)/Schedule 2 of the State Development Consent (MP09_0013) outlines the requirement to prepare a BFMP for the EP Area for all second workings. **Table 2** below summarises the Development Consent conditions and BFMP requirements.

In accordance with ***Condition C10(c)*** WCL will ensure implementation of this Management Plan as approved by the Secretary.

Table 2 - Development Consent (MP 09_0013) Conditions for BFMP

Condition	Condition Requirement	Section Addressed
C10. (g) (ii)	Built Features Management Plan which has been prepared in consultation with RR, to manage the potential subsidence impacts of the proposed underground workings on built features, and	**Section 2.4.2**
	which has been prepared in consultation with the owner/s of potentially affected feature/s;	**Section 2.4.2**
	addresses in appropriate detail all items of key public infrastructure (with particular consideration of transmission lines and towers (including angle towers), other public infrastructure and all classes of other built features;	**Section 1.3**
	recommends appropriate pre-mining mitigation measures to reduce subsidence impacts;	**Section 3** **Section 7**
	recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate predicted impacts on potentially affected built features in a timely manner, and	**Section 7.5** **Section 8**
	in the case of all key public infrastructure, and other public infrastructure except roads, trails, and associated structures, reports external auditing for compliance with ISO 31000 (or alternative standard agreed with the infrastructure owner), and provides for annual auditing of compliance and effectiveness during extraction which may impact the infrastructure.	**Section 12.1**

2.2 Management Plan Requirements

Condition F5 of the Consent MP09_0013 requires that management plans under this consent to be prepared in accordance with the relevant guidelines as detailed. **Table 3** - details where each component of the ***Condition F5*** is addressed within this BFMP.

Table 3 - Management Plan Requirements

Condition	Condition Requirement	Section Addressed
F5.	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
F5 (a)	a summary of relevant background or baseline data;	**Section 3**

Condition	Condition Requirement	Section Addressed
F5. (b)	details of: (i) the relevant statutory requirements (including any relevant consent, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	**Section 2**
F5. (c)	any relevant commitments or recommendations identified in the document/s listed in condition A2;	**NA**
F5. (d)	a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	**Section 5**
F5. (e)	a program to monitor and report on the: *(i)* impacts and environmental performance of the development; and *(ii)* effectiveness of the management measures set out pursuant to condition F5(c)	**Section 5** **Appendix A - TARPs**
F5. (f)	a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**Section 7.5** **Section 8**
F5. (g)	a program to investigate and implement ways to improve the environmental performance of the development over time;	**Section 6** **Section 12**
F5. (h)	a protocol for managing and reporting any: *(i)* incident, non-compliance or exceedance of any impact assessment criterion or performance criterion; *(ii)* complaint; or *(iii)* failure to comply with other statutory requirements;	**Main Extraction Plan Document** **Section 8 and 9.** **APPENDIX A -** Built Features Trigger Action Response Plan (TARPs)
F5. (i)	public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	**Main Extraction Plan Document and Section 13**
F5. (i)	a protocol for periodic review of the plan.	**Section 12**

2.3 Leases, Licences and Permits

In addition to the Development Consent, second workings undertaken will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue.

In addition to the requirements of the Project Approval, all activities at or in association with the WCL RVC will be undertaken in accordance with the licences, permits and leases which have been issued or are pending as outlined in **Table 4.**

Table 4 Licences, Permits and Leases

LICENCE/APPROVAL	ISSUE DATE	EXPIRY DATE
Consolidated Coal Lease 745 (CCL 745)	27/12/1990	30/12/2023
Mining Lease 1575 (ML 1575).	22/03/2012	22/03/2029
Mining Purposes Lease (ML 271)	09/05/1991	09/05/2033

2.4 Consultation

2.4.1 Consultation During the Environmental Assessment Process

Extensive community and government consultation has been carried out prior to and during the preparation of the various UEP environmental assessments, the Revised Preferred Project Report, the Submissions Report and other project-related assessment documentation. The primary objective of consultation was to keep the community, government agencies and other stakeholders informed and involved during project development process.

Community engagement was carried out in two phases and is summarised in Section 4.1.2 and Section 4.1.3 of the Revised Preferred Project Report.

A complete summary of previous and ongoing government agency and stakeholder consultation is provided in Table 4.5 of the Revised Preferred Project Report. Consulted parties included:

- the Department of Planning, Industry and Environment (DPIE) (now Department of Planning and Environment [DPE])
- NSW Environment Protection Authority (EPA)
- Wollongong City Council (WCC); and
- WaterNSW.

2.4.2 Consultation During the Preparation of the Management Plan

This Plan has been prepared in consultation with the following state agencies and relevant stakeholders and owners of potentially affected features in accordance with **Schedule 2 Condition C10(g)(ii):**

- NSW Resource Regulator (RR)
- Transport for NSW (TfNSW)
- TransGrid
- Endeavour Energy
- WaterNSW
- NSW Spatial Services/ Surveyor General.

Details of the consultation with the above stakeholders is provided in **Table 5** below.

The consultation included in **Table 5** below includes the consultation undertaken in the development of this Plan for the EP 1 (Stage 1 panels PC21 – PC25 and PC7 – PC 8) and EP2.

Further consultation undertaken for the EP 2 (Stage 2 panels PC27 - PC34) will be included in the table below following receipt of comments / consultation undertaken on the draft plan.

Table 5 – Consultation undertaken as part of the preparation of this Management Plan

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
Stage 1		
NSW RR	During consultation with key infrastructure agencies as (TfNSW, Endeavour Energy, and TransGrid) the RR advised they expected compliance with the specific consent conditions. No specific feedback on this management plan or response has been provided during the preparation of this management plan as their specific role in this process is that of an independent observer.	No feedback
DPE (Planning)	Letter to the department advising on the proposed team for the development of the Extraction Plan including its sub-plans.	See DPE response to this letter in **Appendix A** of the Extraction Plan.
TfNSW	Initial correspondence regarding the project identified the need for a preliminary risk assessment. The preliminary risk assessment meeting held on 5 August 2021 resulted in the need for a further detailed risk assessment including the formation of the technical committee. The detailed Risk assessment workshop for Wollongong Coal proposed mining under Mt Ousley was held Friday 17 September 2021. The outcome of this detailed risk assessment is as attached in **Appendix A**. See also letter from TfNSW following on from the Risk Assessment workshop and issue of the final risk assessment prior to the first technical working group meeting. Subsequent to the risk assessment, TfNSW Technical committee (TC) Meeting 2 provided detailed feedback on the document via track changes 02/12/21. Further to TfNSW technical committee Meeting 3, specific feedback was provided in relation to the TfNSW specific management process, which was included in the update of this BFMP to Rev 7.	Specific feedback on the monitoring from the risk assessment has been taken and included in **Section 5 and 6.** **Appendix A contains a copy of the TfNSW Risk Assessment, and minutes from the TfNSW TC meetings.**
TransGrid	A draft copy of the BFMP was provided to TransGrid for review prior to the consultation meeting on the 24 August 2021. Post draft management plan consultation TransGrid (reference number 2021-331) provided a response to WCL as detailed below on Monday 20 September 2021 regarding the	

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	draft plan. Note: No comments or changes were made to the draft plan as included in the feedback Section 5: a. Subsidence prediction due to PC07 & PC08 to be reviewed based on the subsidence records for PC21-25. b. Any changes to the predicted subsidence and impact to TransGrid asset to be notified. Section 7.12: a. What is the tolerance of GNSS system re: vertical, tilt and tower leg separation measurements? b. How tilt of the towers will be monitored? c. How frequently GNSS data will be downloaded and monitored during and after mining? d. Prism to be installed on each legs of affected towers and frequency of survey to be specified. Section 8.2 Trigger Action Response Plan: a. Performance measure TARP is expected to be something similar to attached for 330kV Transmission Line. Specific subsidence values to be included for level 1, 2 3 in TARP, attached Typical TARP has subsidence figures to be used. b. All affected towers are noted in TARP. Section 8.4 Contingency Plan: • No contingency plan is outlined in DRAFT BFMP. Please add the detail of contingency plan in the event of emergency due to large, unexpected subsidence near TransGrid asset.	**Appendix A, and Table 13** **Table 7 and Table 10** **Table 10, Section 6.2** **Section 6, TARP as per Table 13** **Table 10, Section 6.2** **Table 10, TARP as per Table 13.** **See Extraction Plan - Contingency Plan as per C10(ix)**
Endeavour Energy	A consultation meeting was held with Endeavour Energy on 21 July 2021 to discuss the RPUEP Stage 1 EP. The proposed monitoring program was outlined. A draft copy of the BFMP was provided to Endeavour Energy for review 19/07/2021. Subsequent efforts to consult with Endeavour Energy on the 27/09/21, 10/11/21, and 09/12/2021 have not been met with any response or reply. Noted as at the time of finalising this plan that as feedback from Endeavour Energy was outstanding a conservative approach was taken to determining monitoring requirements for the 132kV and 33KV infrastructure via the adoption of performance levels, TARPs, and including the use of the GNSS units via the adoption of the TransGrid levels. This approach is deemed conservative for this Extraction Plan as it is noted	The baseline **(Section 3**), monitoring (**Section 6**) and TARPs (**TARP as per Table 13)** as determined during the consultation process with TransGrid has been applied to the Endeavour Energy assets.

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	that the 132kV and 33KV lines in particular are located further east of the TransGrid HV infrastructure. See **Figure 4**. Hence in addition the baseline **(Section 3**), monitoring (**Section 6**) and TARP's (**TARP as per Table 13)** as determined during the consultation process with TransGrid has been applied to the Endeavour Energy assets.	
WaterNSW	Consultation with WaterNSW undertaken during the TC meeting on the 20 August 2021. WaterNSW advised that they do not have any infrastructure within the extraction area. As such they have requested that WCL provide a copy of the final extraction plan (including this built features management plan) once approved by the secretary of the DPE.	Once approved by the Secretary this plan will be provided to WaterNSW for their records.
NSW Surveyor General – Spatial Service	NSW spatial services were contacted 17 September 2021 with a request to disturb the state and permanent survey marks. An approval was received 20 September 2021 detailing the process to undertake for monitoring and reporting. See **Appendix B** for the records of this consultation.	**Section 6.3**
Stage 2		
DPE (Planning)	Letter to the department advising on the proposed team for the development of the Extraction Plan including its sub-plans.	See DPE response to this letter in **Appendix A** of the Extraction Plan.
NSW RR	No specific comments provided in response to Stage 2 bord and pillar workings.	Refer to response to NSW RR outlined in Appendix B.
TfNSW	Following initial consultation via the Technical Committee (TC 07) outlining the EP 2 project a technical memo was circulated regarding the risk of the extraction associated with the Stage 2 EP 2 on TfNSW assets. This memo was subsequently endorsed by the TC in May 2022. Meeting and presentation to EE representatives on the 11 May 2022 at TfNSW TC meeting (TC 08). Presentation included detail on with the status of the Stage 1 extraction as was covered in the conditionally approved EP 1, the non-subsiding mining methodology, the scope of the EP2 proposed extraction, subsidence results associated monitoring to date, recommendations to TfNSW, and a summary of background information presented previously in consultation for EP1.	Refer to TfNSW TC memo and endorsement, in addition to the presentation – Appendix B

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	The revised BFMP was provided for TC review and endorsement with confirmation of endorsement for EP2 anticipated in June 2022.	
TransGrid (TG)	Meeting and presentation to TG representatives on the 17 May 2022. Presentation included detail on the status of the Stage 1 extraction as was covered in the conditionally approved EP 1, the non-subsiding mining methodology, the scope of the EP2 proposed extraction, subsidence results associated monitoring to date, recommendations to EE, and a summary of background information presented previously in consultation for EP1. Following the presentation, a copy of the draft plan was provided to allow for detailed review and subsequent endorsement of the key risk control measures. No further response had been received to the requests for review and endorsement at the time of this plan being finalised for DPE submission.	Refer to the TG presentation and correspondence– Appendix B
Endeavour Energy (EE)	Meeting and presentation to EE representatives on the 25 May 2022. Presentation included detail on the status of the Stage 1 extraction as was covered in the conditionally approved EP 1, the non-subsiding mining methodology, the scope of the EP2 proposed extraction, subsidence results associated monitoring to date, recommendations to EE, and a summary of background information presented previously in consultation for EP1. Following the presentation, a copy of the draft plan was provided to allow for detailed review and subsequent endorsement of the key risk control measures. During the course of the discussion the following matters were raised. • Detail on the location of the current mining and approximate timing for mining in the areas/ panels adjacent to the 132KV and 33KV lines. • Details regarding the subsidence monitoring network for the 132KV and 33KV networks, • Details regarding the subsidence monitoring network • Request for additional GNSS monitoring stations to be considered in the 33KV corridor, noting existing strain in the poles at the current western junction (north of workings) and eastern junction points (south of the proposed workings).	Refer to the presentation and correspondence – Appendix B

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	• Request to establish reporting of TARP triggers to the group attending the online presentation. No further response had been received to the requests for review and endorsement at the time of this plan being finalised for DPE submission.	
WaterNSW	***Cataract reservoir and Cataract Dam:*** Figure 1 of the Built Features Management Plan (BFMP) indicates Cataract Reservoir (Cataract River and Cataract Creek arms) are near the proposed mining areas particularly domain PC21-PC25. Section 1.3 states that Cataract Reservoir and fire trails/access roads are built features located within the extraction plan area. However, Table 7 and related Figure 4 do not list Cataract Reservoir in the list of built features and there is no assessment of the impact on Cataract Reservoir and any monitoring proposed to demonstrate performance and compliance with performance measures set for Cataract Reservoir. The risk assessments presented in the appendices also do not address this issue. It is also stated that the Cataract Reservoir dam wall (and associated infrastructure) are remote from the EP areas and are not expected to be affected by subsidence movements. As such the dam wall is not considered further within this BFMP. It is recommended that: • The distance of the Cataract dam wall (and associated infrastructure) be stated clearly and cross reference assessments presented in the extraction plan subsidence predictions documentation in relation to potential impacts including potential for far field movements. • An assessment of impacts due to the proposed extraction on Cataract Reservoir be presented including cross referencing with assessments presented in extraction plan subsidence prediction documentation. Based on this, a subsidence and environmental monitoring program and management measures must be developed and included in the BFMP to demonstrate compliance against performance measures set for Cataract Reservoir. If such assessments and monitoring are presented in other EP reports like the Surface and Groundwater Water Management Plan, they must be cross referenced in the BFMP.	**Section 1.3** **Subsidence Assessment (Appendix D of the main EP)** **Subsidence Assessment (Appendix D of the main EP)** **Subsidence monitoring program (Appendix M of the main EP)** **Water management plan (Appendix G of the main EP)** **Section 6.4 of the BFMP.**

Stakeholder	Consultation Feedback	Relevant section where feedback is addressed in this Plan
	Access Roads and Fire Trails: Fire Road 7D and Fire Road 7M and the gate and fencing on the intersection of Fire Road 7D and Mount Ousley Road are within the proposed EP area. Some sections of the fire roads are relatively steep and may be impacted by subsidence especially Fire Road 7M. Fire trail 7M has a creek crossing over bedrock. The Bellambi Creek causeway on 7D is concrete with asphalt approaches. Some other creek crossings on 7D are either rock or concrete fords and approaches. The armoured creek crossings of Fire Road 7D may be damaged by subsidence if it is significant. All these armoured/rigid creek crossings could be impacted by subsidence. It is recommended that the BFMP consider the above and specifically include a monitoring and surveillance program for the above listed features on Fire Road 7D and 7M.	**Included in the subsidence assessment (Appendix D of the main EP).** **Section 6.1.3 of Public Safety Management Plan (Appendix F of the main EP).**
NSW Surveyor General – Spatial Services	Correspondence was received 11 May 2022 detailing the process to undertake for monitoring and reporting. See **Appendix B** for the records of this consultation.	**Section 6.3**

3 BASELINE DATA

The monitoring program includes baseline surveys of the infrastructure to be monitored as agreed to during consultation and feedback process. The survey methods include the following:

- LIDAR of the wider area
- GNSS continuous subsidence monitors
- Attended ground-based surveys.

Pre mining baselines will be established for all of the sites and features listed in **Table 7** prior to second workings in the Stage 1 panels with baseline data for built features as presented in **Appendix C**.

All baseline reporting for TfNSW will be provided to TfNSW, TransGrid, Endeavour Energy and the NSW RR in a single consolidated report prior to the commencement of mining or other agreed time (see Appendix C).

A review of the EP 1 and EP 2 monitoring network was carried out in association with a site inspection and the actions required to complete the installation of the monitoring network as required for second workings are detailed in **Table 6** with the date of implementation, and as part of the network in **Table 7**.

Table 6- Actions to be completed prior to baseline monitoring

Action	Responsibility	Status and Date completed
Install continuous subsidence monitoring units (GNSS units) to monitor subsidence. Action: progressively install GNSS units in identified locations prior to second workings. Action: Requirement for an additional GNSS unit was identified during the TfNSW risk assessment and (ID GNSS 16) beyond the ridge to inform movements at the bridge to act as an early warning system.	WCL	Progressively installed and commissioned July/ August 2021 GNSS 10 was installed and commissioned 23/12/21. GNSS 16 subsequently installed 13/10/2021.
Reinstate Q-Line M1 southbound pavement survey line and complete survey or assess alternatives	WCL	Completed 14/11/2021
28/10/21 TFNSW and WCL attend pre- mining survey of M1 to identify if mill or mill and resheet of the slot is required, check function, and review opportunities to incorporate works in conjunction with other road closures / road works, to minimise disruption. Action: Reinstate crack meters at Cataract Creek M1 pavement slot and install remote telemetry for continuous monitoring.	WCL	Joint WCL/ TfNSW inspection 28/10. Unit replaced 14/11/2021 Unit telemetry provided 24/11/2021.

Action	Responsibility	Status and Date completed
Action: Complete a risk assessment and carry out subsequent trim of ARL2 slopes where required.	TfNSW	Joint WCL/ TfNSW inspection 28/10 identified works required. TfNSW Completed 14/11/21. Risk subsequently confirmed as acceptable by TC
Monitoring prisms in the culvert were installed prior to the previous longwall mining. Joint inspection 28/10 identified the need to revise the location of the previously installed survey points. Action: Repair and replace survey points within Cataract Creek culvert to agreed locations.	WCL	Replacement survey points progressively installed prior to new baseline survey 20/12/2021.
Monitoring pins (prisms at the bridge) were installed prior to the previous longwall mining. Action: Inspect and replace as required the prisms prior to mining of PC07-08 and carry out a survey to a establish baseline.	WCL	Prisms replaced where required and new baseline survey completed 14/11/2021
Trigger action Response plans detailing the limits that apply to the various components of the monitoring network in association with specific actions are required to be developed in consultation with key infrastructure agencies. Action: Develop TARPs for key infrastructure agencies with appropriate trigger points for various actions.	WCL	TARPs finalised via direct consult with the TfNSW/WCL TC
The monitoring network for the TransGrid and Endeavour Energy towers was required to be developed in association with the TARPs. Action: Install survey points/ prisms on the 330KV TransGrid towers T54, 55, 56, & 57, carry out baseline survey and install GNSS meters.	WCL	GNSS meters Installed July to August 2021 Specifically, GNSS 17 near T54 installed after TransGrid consultation feedback. Survey prisms surveyed progressively w/c 06/12/2021 with baseline survey

Action	Responsibility	Status and Date completed
		subsequently completed.
Install survey points/ prisms on the Endeavour Energy 132KV towers E66 to E69 in same easement as the 330kV line and 33KV line pylons in the easement to the East. Carry out the baseline monitoring survey.	WCL	Installed and surveyed progressively w/c 06/12/2021 with baseline survey subsequently completed.
EP 2		
Endeavour Energy Install two additional GNSS Meters (GNSS #30, GNSS #31) in the 33KV network corridor relative the proposed underground workings and mine plan considering the existing strain points on the pylons at either end of the 33KV network (north and south) where the line turns to the west and east respectively. Establish a group email for the identified representatives of the Endeavor Energy asset maintenance and maintenance team as per attendance from the consultation for this plan.	WCL	July 2022

Table 7 - Subsidence Monitoring Baselines (Note: see Figure 4 - Built Features Monitoring Locations for illustration of location of monitoring sites)

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
Natural and Built Features								
GNSS #1	Continuous Subsidence Monitoring	Mt Ousley Road	General subsidence - Mt Ousley Road & valley closure	3D, +/- <20mm	303689	6196670	15 July 2021	Established prior to second workings in panels PC07 & PC08
GNSS #2	Continuous Subsidence Monitoring	Mt Ousley Road & Upland Swamp CCUS1	General subsidence - Mt Ousley Road & at Swamp CCUS1 (including Bulli & Balgownie goaf)	3D, +/- <20mm	303514	6196360	15 July 2021	Established prior to second workings in panels PC07 & PC08
GNSS #3	Continuous Subsidence Monitoring	General subsidence at Upland Swamp CCUS1	General subsidence & at Swamp CCUS1 (including Bulli & Balgownie goaf)	3D, +/- <20mm	303651	6196268	15 July 2021	Established prior to second workings in panels PC07 & PC08
GNSS #5	Continuous Subsidence Monitoring	TransGrid 330kV Powerline tower T56, Endeavour Energy 132kV Tower E67	General subsidence & at powerlines (Including Balgownie goaf)	3D, +/- <20mm	303950	6196186	15 July 2021	Established prior to second workings in panels PC07 & PC08
GNSS #6	Continuous Subsidence Monitoring	TransGrid 330kV Powerline tower T57, Endeavour Energy 132KV Tower E66	General subsidence & at powerlines	3D, +/- <20mm	304281	6196701	15 July 2021	Established prior to second workings in panels PC07 & PC08
GNSS #7	Continuous Subsidence Monitoring	TransGrid 330kV Powerline tower T55,	General subsidence & at powerlines	3D, +/- <20mm	303801	6195901	July- August 2021	Established prior to second workings in panels PC07 & PC08

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
		Endeavour Energy 132kV Tower E68						
GNSS #8	Continuous Subsidence Monitoring	Mt Ousley Road	General subsidence & valley closure	3D, +/-<20mm	304149	6197488	July- August 2021	Established prior to second workings in panels PC07 & PC08
GNSS #9	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	General subsidence (including Bulli goaf #2) above PC21	3D, +/-<20mm	302357	6197088	July- August 2021	Established prior to second workings in panels PC21 – PC25
GNSS #10	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	General subsidence (including Bulli goaf #11) above PC23	1D, +/-<20mm	301879	6197250	23 December 2021	Established prior to second workings in panels PC21 – PC25
GNSS #11	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	At Swamp CCUS5 (Bulli goaf #2) above PC21	3D, +/-<20mm	302226	6197060	July- August 2021	Established prior to second workings in panels PC21 – PC25
GNSS #12	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	At Swamp CRUS1 (including the edge of Bulli & Wongawilli goaf) South of PC21	3D, +/-<20mm	302220	6196907	July- August 2021	Established prior to second workings in panels PC21 – PC25
GNSS #13	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	At Swamp CCUS4 (including Balgownie goaf) South of PC21	3D, +/-<20mm	302544	6196986	July- August 2021	Established prior to second workings in panels PC21 – PC25

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
GNSS #14	Continuous Subsidence Monitoring	Mt Ousley Road	At Swamp CCUS19 (Bulli pillars) West of PC08	3D, +/-<20mm	303209	6196190	July- August 2021	Established prior to second workings in panels PC07 & PC08
GNSS #15	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	At Swamp CCUS3 (Bulli pillars)	3D, +/-<20mm	303535	6196024	July- August 2021	Established prior to second workings in panels PC07 & PC08
GNSS #16	Continuous Subsidence Monitoring	Picton Road / M1 interchange Bridge.	General subsidence between second workings panels and RMS infrastructure at Picton Road interchange.	3D, +/-<20mm	303100	6195598	13 October 2021	Established prior to second workings in panels PC07 & PC08
GNSS #17	Continuous Subsidence Monitoring	TransGrid 330kV Tower T54 & Endeavour Energy 33KV Tower E69	General subsidence & at powerlines	3D, +/-<20mm	303696	6195759	6 December 2021	Established prior to second workings in panels PC07 & PC08
GNSS # 30	Continuous Subsidence Monitoring	General monitoring to inform expected subsidence at PC07 & PC08	General subsidence (including Bulli goaf #2) above PC21	3D, +/-<20mm	302443	6197114.	June 2022	Established prior to second workings in panels PC22 – PC25
GNSS # 31	Continuous Subsidence Monitoring	Endeavour Energy 33kV General subsidence	Endeavour Energy 33kV General subsidence & at powerlines	3D, +/-<20mm	302443	6197114.	June 2022	Established prior to second workings in panels PC22 – PC25
GNSS # 32	Continuous Subsidence Monitoring	Endeavour Energy 33kV General subsidence	Endeavour Energy 33kV General subsidence & at powerlines	3D, +/-<20mm	302443	6197114.	June 2022	Established prior to second workings in panels PC22 – PC25

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
LIDAR	Baseline Subsidence survey	Russell Vale East Coverage - including Mt Ousley Road, Picton Road interchange, Illawarra Escarpment and Powerlines	General subsidence - all surface features	3D, +/- 200mm	NA	NA	31 August 2021	Survey prior to second workings
Hi res survey measurement	Baseline valley closure	Cataract Creek CC1, CC2, CC3 and CC4	Valley closure (subsidence) at CC1-CC4	1D, +/- 3mm	NA	NA	Installed – 28/02/2013 Resurveyed – 3/08/21	Completed resurvey prior to second workings
Infrastructure - TfNSW								
Mt Ousley Rd Carriageway General	1. GNSS 1, 2, 8, 14, 16 2. CC1- CC4 3. Pavement Line (Q-Line) survey 4. Pre-mining visual inspection	Mt Ousley Road – carriageway General	General Pavement Condition	1. 3D, +/- <20mm 2. 1D, +/-3mm 3. 3D, +/- 15mm 4. Visual condition survey 5. Drive through visual inspection at traffic speed	NA	NA	Prior to secondary workings PC07 PC08	1. Pre-mining baseline data collection from GNNS meters 2. Attended survey of cataract creek valley closure points CC1-CC4 3. Carry out pre mining baseline attended Q-line pavement survey. 4. Undertake a baseline condition visual survey of the carriageway before mining with TfNSW. 5. Drive through visual inspection at traffic speed.

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
Mt Ousley Rd - **Carriageway Cataract Creek**	1. GNSS 1, 2, 8, 14, 16 2. CC1- CC4 3. Crack meter at M1 pavement slot (East and West)	Mt Ousley Road – Carriageway / Cataract Creek	General Pavement Condition – Cataract Creek	1. 3D, +/- <20mm 2. 1D, +/- 3mm 3. 1D, +/ - 1mm	NA	NA	14 November 2021	1. Pre-mining baseline data collection from GNNS meters. 2. Attended survey of cataract creek valley closure points CC1- CC4. 3. Check condition of crack meters (east and West and replace where required, 4. Establish pre mining baseline prior to adjacent secondary workings with crack meter. **Note** schedule any works with other road closures / road works if possible.
Mt Ousley Rd **Ridge (P46)**	1. GNSS 1 and 16. 2. Ridge crack survey points - (SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS) 3. Attended Q line survey after repairs/ installation	Carriageway / Tension Zone @ ridge (P46)	Carriageway - Tension Zone	1. 3D, +/- <20mm 2. 1D, +/ - 3mm 3. 3D, +/-15mm	NA	NA	14 November 2021	1. Data from relevant GNNS units on either side (GNSS 1 and GNNS 16) 2. Re-establish survey points and carry out baseline Q line survey 3. Ridge crack survey points as above (SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS).

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
Mt Ousley Rd – **ARL 2, ARL3 Slopes**	1. GNSS 1, 2, 8, 14, 16 2. Visual survey with TfNSW to support risk assessment.	ARL2 – 955771/ 95770/ 13482 ARL3 – 10839/ 13483/ 13484/ 13485	Carriageway – slopes monitoring	3D, +/-<20mm	NA	NA	14 November 2021	1. Pre-mining baseline data collection from GNNS meters 2. TfNSW to carry out slope risk assessment for ARL2 and ARL3 cuttings and groom cuttings opposite PC 08 prior to mining as required
Mt Ousley Rd – • **Picton Rd interchange bridge** • **Steel Arch and Culvert** over cataract river ((B7932) • **Culvert over Cataract** River (B814)	1. GNSS 1, 2, 8, 14, 16 2. Attended baseline survey of established survey points.	Picton Rd interchange bridge (B7926) Steel Arch over Rocky Creek (B7932) Culvert over Cataract River (B814)	Picton Rd interchange bridge, Steel arch, Cataract River Culvert	3D, +/-<20mm 3D, +/-2mm 1D, +/ - 1mm	NA	NA	14 November 2021.	1. Install additional GNSS unit (WCL ref # GNSS 16) at location beyond the ridge to inform movements at the bridge to act as an early warning system. 2. Monitoring prisms at the bridge inspected, replaced (If required prior to carrying out baseline survey). 3. Visual Inspection of Steel Arch over Rocky Creek (B7932), and Culvert over Cataract River (B814) with TfNSW.

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
Mt Ousley Rd – **Cataract Creek Culverts**	1. GNSS units 1, 2, 8, 14, 16 2. Visual Observations 3. Baseline attended survey of prisms	Mt Ousley Road – Cataract Creek Culverts	Monitor culvert condition and joints	3D, +/-<20mm NA 1D, +/ 1mm	NA	NA	20 December 2021	1. Pre-mining baseline data collection from GNNS meters 2. Conduct walk through of culverts with TfNSW for visual survey 3. Repair /replace survey points to agreed locations with TfNSW at the three locations within each culvert, and carry out baseline survey
Mt Ousley Road **Mono Pole Structure**	N/A	Mono Pole Structures – E.g., signs	Not required – RA identified no change to existing risk	NR	-	-	NR	NR
Mt Ousley Road **VMS**	N/A	None in the area	Not required – no assets identified in the EP area.	NR	-	-	NR	NR
Infrastructure – TransGrid and Endeavour Energy								
TG - 330KV EE -132KV	**GNSS #5, 6, 7, and 17**	TransGrid 330kV towers Endeavour Energy 132kV towers	Baseline - Documentation of pre- mining conditions.	3D, +/- 3mm	TBC	TBC	July 2022	Establish prisms and carry out baseline prior to second workings PC 07/08

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
EE - 33 KV	**GNSS #30, 31**	Endeavour Energy 33kV pylons	Baseline - Documentation of pre-mining conditions.	3D, +/- 3mm	TBC	TBC	July 2022	Establish prisms and carry out baseline prior to second workings PC 07/08
Survey of ground and footing monitoring marks	Baseline attended survey of prisms	TransGrid 330kV towers Endeavour Energy 132kV towers and 33kV poles	Baseline - Documentation of pre-mining conditions.	1D, +/- 3mm	see tower number	see tower number	6 December 2021	Establish prisms and carry out baseline prior to second workings PC 07/08
Survey of tower legs – 330 and 132KV	Baseline attended survey of prisms	TransGrid 330kV towers Endeavour Energy 33kV pylons and 132kV towers	Baseline - Documentation of pre-mining conditions.	1D, +/- 3mm	see tower number	see tower number	6 December 2021	Establish prior to second workings PC 07/08
Leg diff measurements - 330 and 132KV	Baseline attended survey of prisms	TransGrid 330kV towers Endeavour Energy 33kV pylons and 132kV towers	Baseline - Documentation of pre-mining conditions.	1D, +/- 3mm	NA	NA	6 December 2021	Establish prisms on each of the legs of the four identified effected towers prior to second workings PC 07/08
Survey of pylons - 33KV lines	Baseline attended survey of prisms	Endeavour Energy 33kV pylons	Baseline - Documentation of pre-mining conditions.	1D, +/- 3mm	TBD	TBD	6 December 2021	Establish baseline survey prior to second workings PC 07/08
Visual inspections of two 33kV lines	Visual Observations	Endeavour Energy 33kV pylons	Baseline - Inspection of visual condition of powerlines, poles, surface cracking and photographic records	NA	NA	NA	6 December 2021	Complete prior to second workings

Monitoring Site	Monitoring Program	Built Feature/ Aspect	Purpose	Data & Accuracy	Location		Date of Install/ Survey	Baseline
					Easting	Northing		
Permanent Survey Control Stations								
Permanent marks (PM) • PM173136 • PM173135 • PM 173728 • PM 173137 **State Survey marks (SS)** • SS 165830 • SS 165831 • SS 14867	Baseline attended survey	Permanent survey marks State Survey markers	Baseline survey to determine current position and establish if survey point remains in place	1D, +/- 3mm	**PM** 6196460 6196701 6196010 6197074 **SS** 6196263 304221 DNF	**PM** 303478 303708 302939 6197074 **SS** 302944BC 6197423 DNF	May 2022	Complete prior to second workings

Notes: DNF- Survey station could not be located during baseline survey. Application to deregister survey station provided to NSW lands (8/6/2022).

4 PREDICTED IMPACTS

The main hazards to the built features were identified in the EP risk assessment as being public safety associated with impacts to Mt Ousley Road and the Electricity Transmission Lines. These hazards are expected to be minor and manageable with the appropriate risk control measures in place for the approved mining of in PC21, 22-25, PC07 - PC08, and PC27-PC34. The secondary workings panes are noted to abut the high water mark for the Cataract Reservoir but subsidence related impacts are not expected to result in any connectivity to stored waters within the Reservoir nor will the low levels of predicted subsidence (<100mm) have any material or observable impacts on storage volume or extent.

Second workings in Stage 1(a) panels PC21-PC25 do not have any overlying built features (e.g. Mt Ousley Road, high voltage electricity transmission lines). The EP approval for Stage 1 mining requires PC21 to be mined and demonstrate that subsidence movements are within predicted levels and impacts are expected to be less than subsidence impact performances measures of MP09_0013 before mining in PC21, 22-25, PC07 - PC08, and PC27-PC34can commence. Due to their greater distance from these built features, and low levels of predicted subsidence effects, the mining of panels PC 27-PC34 are not predicted to have any impact on the built features located to the east of PC21.

Potential subsidence hazards associated with mining the remainder of the approved panels is planned to be addressed in future EPs and is not considered in this BFMP.

Figure 2 (a and b) – Site Plan and Working overlay showing previous workings and Bulli Goaf for the EP Areas

2a (Stage 1a and 1b)

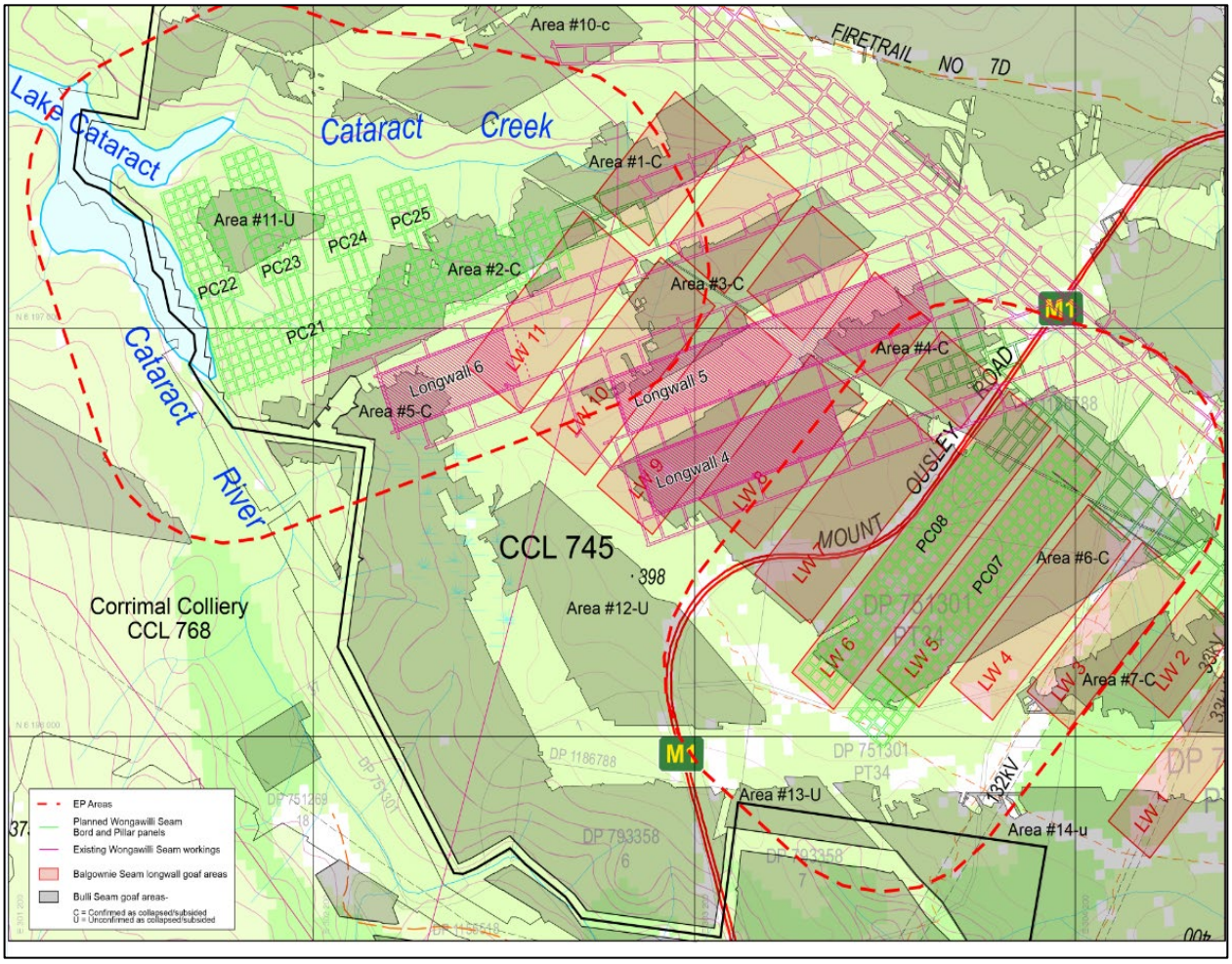
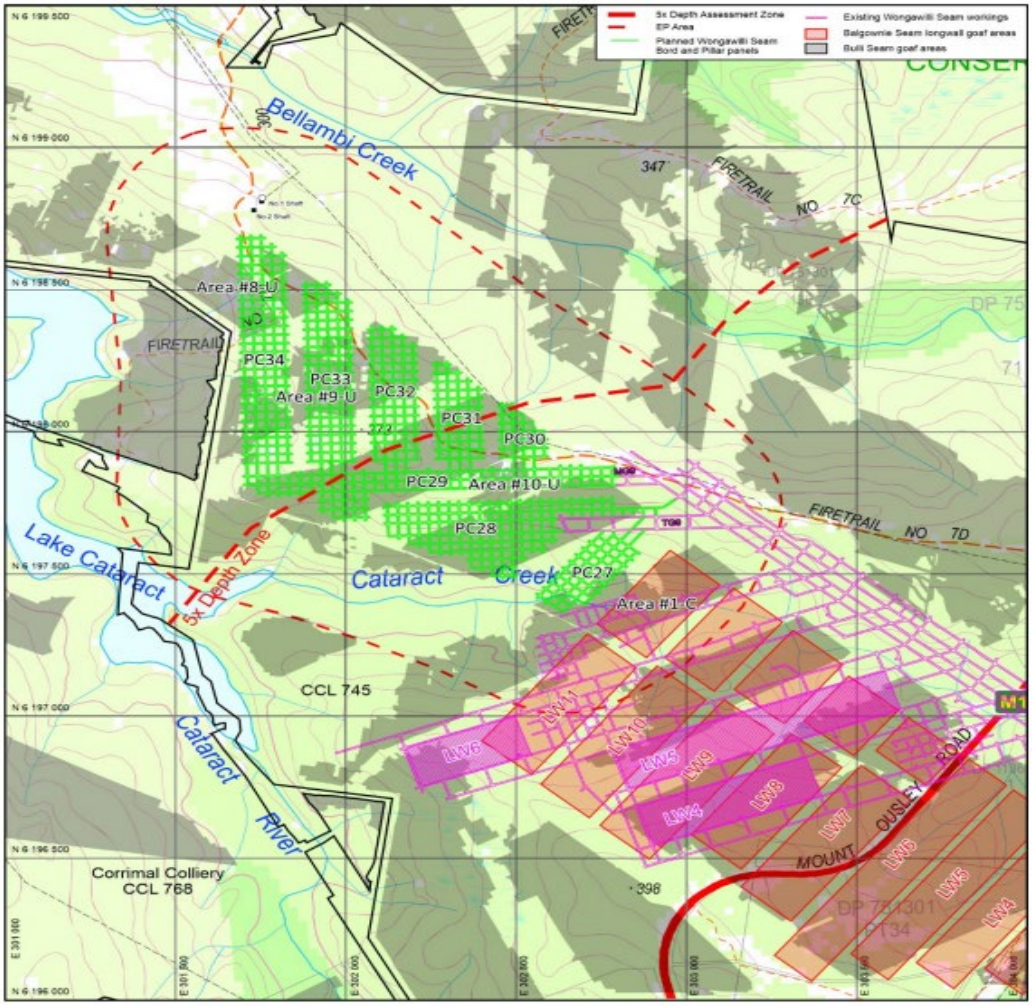


Figure 2b (Stage 2)



4.1 Transport for NSW Infrastructure

Low-level subsidence below the straight section of Mt Ousley Road to the south of the Cataract Creek crossing are expected, but the magnitude of this movement is expected to be less than a few tens of millimetres and much less than the movements that were observed during the period of mining Longwalls 4 and 5. Impacts are expected to be barely perceptible. Near real-time monitoring of the closure across Cataract Creek is planned to manage these movements.

As shown on Figure 1, Mount Ousley Road is outside the Stage 2 EP Area however about half of the planned Stage 2 mining is within the 5 X Depth zone (up to 1.8km) used by TfNSW to assess risk to their assets. As such, a formal risk assessment of the potential impacts on Mount Ousley Road and associated structures from the planned mining would generally be required.

However, as a formal risk assessment was conducted for this critical infrastructure during preparation of the current Built Features Management Plan (BFMP) for Stage 1 mining. SCT, as a member of the TfNSW Technical Committee (TC) that manages the monitoring of and impacts to Mount Ousley Road, has advised the TC that a further formal risk assessment is not considered necessary for the Stage 2 panels and the proposed Stage 1 BFMP management measures,

together with the proposed Stage 2 subsidence monitoring, is suitable to manage any potential impacts from the planned mining in PC27-34.

4.2 Electricity transmission lines and towers

The four electricity transmission lines (330kV, 132kV, 2 * 33kV) located between Mt Ousley Road and the Illawarra Escarpment are located to the east more than 150m from the approved mining in PC07 and PC08. There is no potential for subsidence movements from the mining of PC07 and PC08 to impact the structural integrity or operation of the towers. Nevertheless, near real time three-dimensional monitoring of the towers has been installed as detailed in **Section 3 and 6**.

4.3 Other built Infrastructure

4.3.1 Telstra infrastructure

There is no potential for subsidence movements from the approved mining of PC07, PC08 to impact on the Telstra infrastructure located adjacent to Brokers Nose. This infrastructure is approximately 1.4km to the east of PC07 and located on the opposite side of main heading pillars in the Bulli Seam. As a result, Telstra infrastructure is not considered further in this plan.

4.3.2 State Survey Marks

State survey control stations are designed to be stable reference points and there is the potential for their position to move because of subsidence.

There are no survey control stations within the EP Area for PC27-34 but there six state survey or permanent marks along the edge of Mount Ousley Road approximately 1km to the east of the planned mining in PC27.

These include permanent marks PM173135, PM173136, and state survey marks SS165830 within the EP Area for PC07-08 in the Stage 1 EP), positioned along the Mt Ousley Road easement from north to south. and three additional marks PM 173137 PM173728, and SS165831. State Survey mark SS 14867 was located approximately 200m to the East of PC07, but was unable to be relocated during baseline surveys for Stage 1. An application to deregister the survey mark has been submitted to NSW Lands (8/6/2022).

Survey marks within 1km of the planned mining are likely to susceptible to ongoing low-level far-field subsidence movements from the multi-seam environment at RVE. Including the additional marks in the existing BFMP for survey control stations is recommended to manage the potential subsidence impacts to these additional public utilities.

Small vertical movements associated with low level subsidence may affect some permanent survey marks. The process of disturbance for the survey marks is detailed in **Section 6.3**.

4.3.3 Cataract Reservoir

The majority of the planned mining in PC27-34 is within the current Notification Area around the Cataract Storage Reservoir administered by Dams Safety NSW (previously NSW Dams Safety Committee). However, most of the planned mining is outside the 35° angle of draw (0.7 depth) marginal zone with no mining planned directly below the FSL of the Cataract Reservoir.

Subsidence effects and impacts to the FSL from the planned mining are expected to be imperceptible for all practical purposes. No perceptible changes to the extent of the FSL are expected. No changes to water quality in the reservoir are expected. Any changes to water

quantity flowing into the mine are expected to be negligible and no additional conductive cracking is expected.

The proposed monitoring of groundwater inflows to underground workings (refer to the GWMP) has been considered by WaterNSW to be sufficient to detect potential connectivity between the underground workings and stored water within the reservoir (refer to Appendix B). As a result, the Cataract Reservoir is not considered further in this plan.

4.3.4 Fire Trails and associated infrastructure

The access gates to Fire Road 7D on Mount Ousley Road and the Bellambi Creek Crossing on Fire Road 7D are well outside the EP Area and are not considered further in this plan as no perceptible impacts are expected to these features.

The southern section of Fire Road 7D has a creek crossing over exposed bedrock and some steeper sections. These features are located over a goaf area in the Bulli Seam workings of Corrimal Colliery to the west of PC34 near the western edge of the EP Area. This goaf area formed in the 1950's is isolated from the Bulli Seam workings above PC27-34 by a 40m wide barrier of solid coal. Subsidence effects and impacts to these features are expected to be imperceptible.

5 PERFORMANCE MEASURES AND OBJECTIVES

The proposed workings are not considered to have any potential to perceptibly impact on built features. Wollongong Coal's primary objective is to prevent subsidence impacts through ensuring the long-term stability of the workings during and post extraction in accordance with the bord and pillar mine design as required by MP09_0013.

The subsidence impact performance measures are specified in Table 7 and ***Condition C7*** of the Development Consent (MP 09_0013) which are of relevance to this BFMP are outlined in **Table 8.**

Table 8 - Subsidence Impact Performance Measures

Feature - Built	Performance Measure
Key Public Infrastructure M1 Princes Motorway (formally known as Mt Ousley Road), Electricity transmission lines and towers (330kV, 132kV, 2x33kV) and telecommunication lines	Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable and must be fully repaired.
Other Infrastructure Access roads, fire trails and other public infrastructure and built features	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable and must be fully repaired or else replaced or fully compensated.

The performance indicators in **Table 9** below are designed to ensure that the above performance measures are conformed with during second workings under the extraction plan.

The following features as included in **Table 9** are further detailed in **Section 6.1**.

Table 9 - Subsidence Impact Performance Indicators

Feature - Built	Performance Indicator	Monitoring
<u>Key Public Infrastructure:</u> M1 Princes Motorway (formally known as Mt Ousley Road)	**M1 / Mt Ousley Rd**	
	- No vertical subsidence or horizontal ground movements that result in unacceptable ride quality. - No slot closure at Cataract Creek leading to unacceptable ride quality. - No tension crack development leading to unacceptable ride quality and weakening of pavement due to water ingress.	**Vertical Subsidence** - GNSS Units real time monitoring 1,2, 8, 14, 16. **Pavement Movement**: - GNSS Units – relative movement between 14<->16 and 2<->16. - Survey Relative to baseline Pavement Southbound - Q-Line survey Pavement Ridge – Tension crack survey points.

Feature - Built	Performance Indicator	Monitoring
	- No actual mining related damage to TfNSW infrastructure	(SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS). **Valley Closure** - Cataract Creek: Relative movement between GNSS 1<->8 and 2<->8. - Pavement Cataract Ck - Compression (slot) monitoring (continuous). **Survey relative to baseline** - CC1-CC4 surveys - Pavement Q-Line survey - TfNSW drive through inspections at traffic speed by TfNSW. **Reporting** – via the scheduled monthly TC during second workings - Status reports
	Picton Interchange Bridge/ Structures	
	- Bridge Engineer - No actual mining related damage to bridge	- M1 South GNSS Unit 16 - Bridge Prism Surveys – compare to baseline - TfNSW drive through inspections. - Reporting – via the scheduled monthly TC during second workings
	Culverts	
	- Negligible visible distortion or damage to culverts.	- GNSS unit 1,2 8. - Relative movement between GNSS 1<->8 and 2<->8. - Slot closure on northbound and southbound carriageways - Crackmeter - TfNSW drive through inspections. - Attended survey of culvert survey points - General condition inspection of culvert and any movements at joints. - Reporting– via the scheduled monthly TC during second workings

Feature - Built	Performance Indicator	Monitoring
	Slopes	
	- Negligible observed changes in cuttings - Strains ≤0.5mm/m in pavement at Cataract Creek.	- GNSS units - Relative movement between GNSS 1<->8 and 2<->8. - Cuttings and embankment surveys, - Visual slope inspection as required - Crackmeters at Cataract Creek. - Reporting– via the scheduled monthly TC during second workings.
Key Public Infrastructure: *TransGrid 330KV HV line Transmission towers*	- No observable surface deformations - No actual mining related damage to TransGrid infrastructure o Separation between tower legs o Tilt o Above predicted maximum vertical subsidence	- GNSS Units- GNSS # 5, 6, 7, 17., - Subsidence prediction due to PC07 & PC08 to be reviewed based on the subsidence records for PC21. - Quarterly attended prism surveys of the HV Towers during second workings for panels PC07 - PC08. - Reporting – six monthly during baseline and at least quarterly during second workings for panels PC07 - PC08.
Key Public Infrastructure: *Endeavour Energy 132kV towers* *33kv Pylons*	- No observable surface deformations - No actual mining related damage to Endeavour Energy infrastructure o Separation between tower legs o Above predicted maximum vertical subsidence	- GNSS Units o GNSS Units- GNSS # 5, 6, 7, 17 re the 132KV. o GNSS units – GNSS #31, 32 - Subsidence prediction due to PC07 & PC08 to be reviewed based on the subsidence records for PC21 - Quarterly attended surveys of the 132kV Towers during second workings for panels PC07 - PC08 - Reporting – six monthly during baseline and at least quarterly during second workings for panels PC07 - PC08.
Other Infrastructure: Access roads and fire trails	No cracking greater than 10mm and no noticeable instability or traffic (foot/vehicular) impedance	- Inspection as per the PSMP
Other Infrastructure: Permanent survey marks	General movement of survey markers	- Monitored via NRTK survey every 6 months during second workings under survey points.

Feature - Built	Performance Indicator	Monitoring
		- The monitoring will continue until the mine workings has been completed and the subsidence has ceased. - Completion of secondary workings via completion of an NSW Spatial Services End of Project Applicant Compliance Statement.

6 MONITORING PROGRAM

This section presents monitoring, triggers and responses that will be undertaken to manage the identified risks and potential impacts on built features.

6.1 TfNSW – M1 Princess Motorway/ Mt Ousley Road

TfNSW undertook a preliminary risk assessment, the outcome of which indicated that there are risks to TfNSW that exceed the preliminary acceptability limits (See **Appendix B**). This risk assessment aims to resolve these matters.

ARUP has assessed the risks through a workshop with relevant stakeholders to determine impacts of the mining activities on the road infrastructure, functionality and road safety, and identify appropriate risk mitigation measures.

Since the expected subsidence is less than 100mm which is likely to have no perceptible impacts to TfNSW assets (refer to **Section 4**), the focus of this risk assessment addresses the contingency case if subsidence of greater than 100mm results.

The two stages of mining being stage 1(a) for PC21-PC25 and stage 1(b) for PC07-08 were considered separately due to their proximity to TfNSW assets and the corresponding risk.

In view of the low anticipated ground movements and impacts on TfNSW infrastructure, the principal monitoring instrumentation for the road are the continuous monitoring devices (GNSS, Crackmeters). These provide pseudo real time monitoring, reported in status reports in accordance with the monitoring plan. Manual surveys are only activated by triggers in the electronic monitoring systems and End of Panel (EoP) surveys.

In addition to the above, TfNSW Road inspectors do twice weekly drive through inspections carried out at traffic speed. Any defects identified to TfNSW infrastructure will be reported by exception.

For each End of Panel report (EoP report), a consolidated assessment of all monitoring results for TfNSW built features would be included.

Although not part of the monitoring plan, reports to the TMC by members of the public will be acted upon and if they are potentially mining related will be reported to the Technical Committee for action.

6.1.1 PC21-PC25

For PC21-PC25, the only assets within five times the depth of cover, is a section of the Mt Ousley Road carriageway and small culverts.

The worst-case subsidence is not considered to present a credible risk to these assets (i.e., the level of possible impacts is predicted to be insignificant).

6.1.2 PC07-PC08

A total of 24 risks were identified for the mining in PC07-PC08 considering a scenario of worst-case subsidence. Thirteen events were not considered to present a credible risk (i.e. the level of possible impacts is insignificant). The residual risk profile has no extreme or high risks.

For PC07-08, the assets considered in the TfNSW specific risk assessment include:

- The M1 Carriageway including that 100m section at Cataract Creek, and the ridgeline tension zone (P46.)
- Bridges/ structures (B7926 (Picton Road Bridge), B7932 (Steel Arch Culvert) and B814 (Cataract River Culvert).
- Culverts (Cataract Creek Culverts, Multiple Culverts).
- Cuttings and Embankments. (Slopes > 5m high and those slopes closer to TfNSW infrastructure than a distance equal to twice slope height) Slopes ARL2 – 955771/ 95770/ 13482, ARL3 – 10839/ 13483/ 13484/ 13485.
- Mono pole structures, e.g. road signs, noise walls, barriers. ono pole structures (e.g. road signs, ITS structures), noise walls, barriers.
- Variable Message Sign (VMS).

The key hazard during second workings are expected to be ground closure at the existing road crossing across Cataract Creek. This closure will be monitored by:

- Near real-time monitoring of GNSS stations (GNSS 1, 2, 8, 14 and 16).
- Quarterly closure measurements across Cataract Creek at four locations, referred to as CC1-CC4.
- Continuous monitoring of pavement compression slot closure as installed in pavement slot at the crossing point on the low point of Mt Ousley Road where it crosses Cataract Creek via the 'cack meter'.
- Periodic inspections of the geometry of the Cataract Creek culvert (if triggered by movements in the GNSS units) via the installed 3D prisms.
- Periodic surveys of the cracks at the ridge top to the south of Cataract Creek via existing ridge crack survey lines (SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS) if triggered by movements in the GNSS units or crackmeters.

An initial survey would be carried out prior to mining to confirm a new baseline for the proposed mining and monitoring frequencies as detailed in **Table 7** in addition to detail of continuous monitoring post installation.

Any significant movement as determined by the performance criteria in **Table 9** and the specific TARP in **Table 15-18** would be regarded as a trigger for further investigations including visual inspection and survey of differential leg movements & position compared to baseline to review compliance with the performance criteria in **Table 9**.

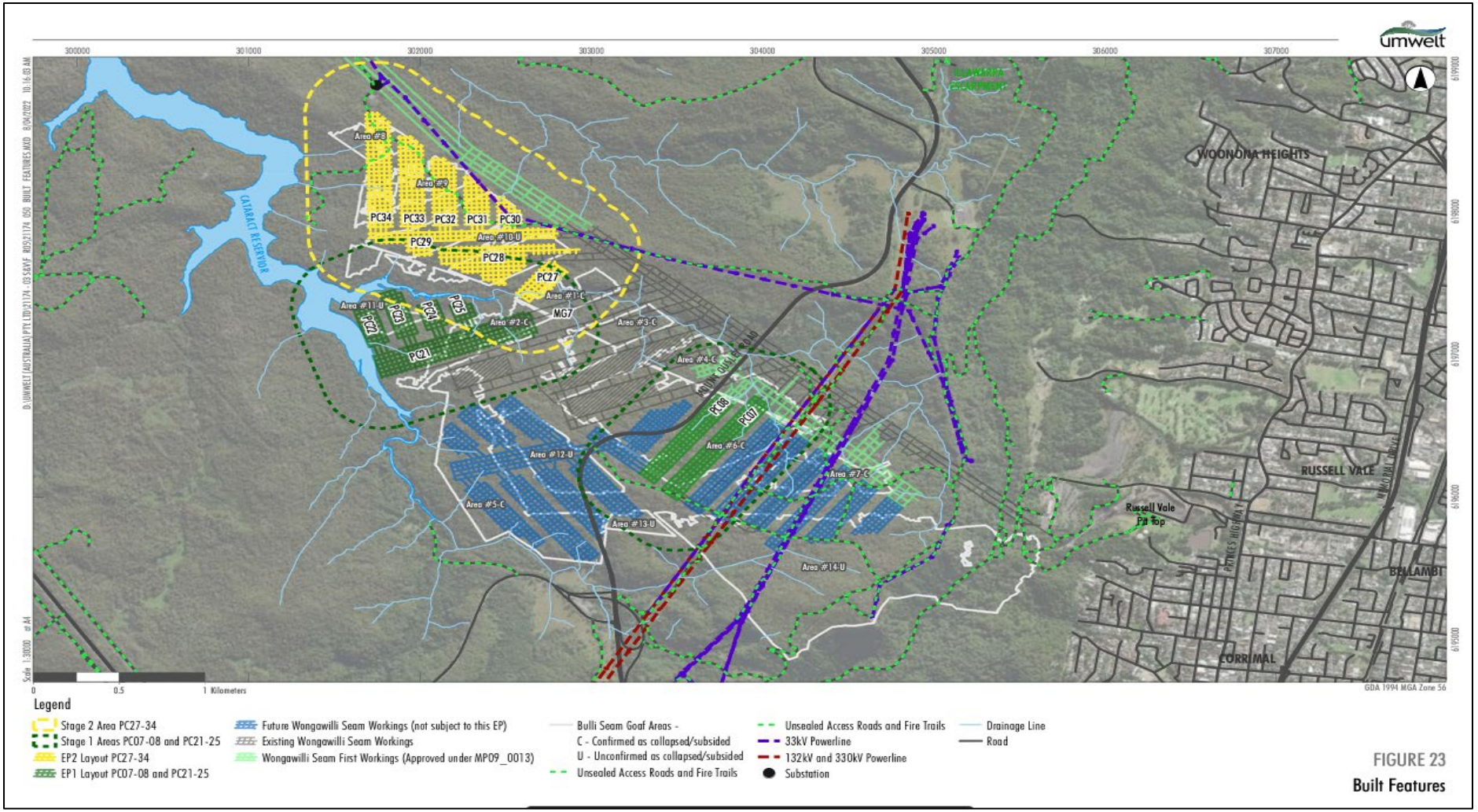
A trigger of 30mm of closure on any of the monitoring systems would be regarded as significant. This level of closure would trigger further investigations and a technical committee meeting to determine the cause of the movement and nature of any impacts.

6.1.3 PC27-PC34

Advice to the TC (SCT 2022a) suggests the BFMP for Stage 1 is suitable for Stage 2 mining in PC27-PC34 and a formal risk assessment is not necessary for the planned mining in these panels. Stage 2 mining is more remote from the Mt Ousley Road than the areas assessed in the Stage 1 risk assessment, so the risk assessment for Stage 1 captures any risks associated with Stage 2. The nature of the bord and pillar mining system is such that vertical subsidence is expected to be less than 100mm over the majority of the planned panels and no significant, localised or far-field, horizontal movements are expected either directly above the mining area or remote from it. No significant subsidence impacts are expected directly above the panels to be mined or at the Mt Ousley Road approximately 1km to the east. On this basis, a further formal risk assessment for the planned Stage 2 mining in PC27-PC34 is not considered necessary.

The BFMP for the Stage 1 mining is considered generally suitable for monitoring and managing any subsidence effects and impacts during the planned mining in PC27-PC34. Additional GNSS units at strategic points above the planned Stage 2 mining, to expand the monitoring network, are recommended although these are primarily to monitor subsidence effects at natural features and not considered critical to the management of subsidence impacts to the major built features over RVE.

Figure 3 – Key Built Features in RVE EP Areas (Source Umwelt 2022)



6.2 Transmission Lines and Towers

SCT (2021) notes that the 330kV, 132kV and two 33KV powerlines appear from the detailed review of historic workings and subsidence monitoring plans to have been in place when the Balgownie Seam longwall panels were mined resulting in additional, incremental vertical subsidence of up to 1.3m.

6.2.1 TransGrid 330kV Transmission Lines and Towers

The key hazard for the 330 kV high voltage electricity transmission lines and towers is recognised to be differential movements of the legs of the electricity transmission towers. This plan covers the monitoring for the TransGrid 330KV line towers described as T54, T55, T56, & T57.

An initial survey would be made prior to mining to confirm a new baseline for future mining and monitoring frequencies for the survey points on the towers are detailed in **Table 7.**

Monitoring to be undertaken during second workings in panels PC07 and PC08 as detailed in **Table 10** includes:

- Quarterly surveyed measurements to determine tilt of the towers or differential movement of individual legs via a prism to be installed on each of the legs of affected towers.
- Absolute vertical subsidence movement of the tower measured by near real-time GNSS monitoring (tolerance level of +/- <20mm in 3D).
- Quarterly Lidar (+/-200mm).

Any significant movement as determined by the performance criteria in **Table 9** and the specific TARP in **Table 13** would be regarded as a trigger for further investigations including visual inspection and survey of differential leg movements & position compared to baseline to review compliance with the performance criteria in **Table 9**.

6.2.2 Endeavour Energy 132kV and 33KV Transmission Line Towers and Pylons

The key hazard for the Endeavour Energy 132kV high voltage (HV) transmission lines and towers is recognised to be differential movements of the legs of the electricity transmission towers. The key hazard for the 33KV lines and pylons is recognized to be the vertical subsidence movement of the pylons.

This plan covers the proposed monitoring for the Endeavour Energy 132KV towers E66 to E69 and located in an easement directly adjacent to the TransGrid 330 KV easement to the east of the M1, and the 33KV pylons for the two 33KV lines in the easement following a similar alignment located in a separate easement further to the East.

An initial baseline survey would be undertaken prior to mining to confirm a new baseline for future mining as detailed in **Table 7** and monitoring frequencies for the survey points are detailed in **Table 10.**

Monitoring to be undertaken during secondary extraction of panels PC 07 and PC 08 as per **Table 10** includes:

- Quarterly surveyed measurements to determine vertical movement via a prism to be installed on each tower of the 132KV and 33KV lines.
- Absolute vertical subsidence movement of the towers measured by near real-time GNSS monitoring (tolerance level of +/- <20mm in 3D).

- Quarterly Lidar (+/-200mm)

Any significant movement as determined by the performance criteria in **Table 9** and the specific TARP in **Table 13** would be regarded as a trigger for further investigations including visual inspection and survey of differential leg movements & position compared to baseline to review compliance with the performance criteria in **Table 9**.

6.3 Permanent and State Survey Control Marks

The strategy to manage subsidence impacts is to notify the asset owner via an NSW Spatial services Survey mark removal application. The movement of the affected permanent survey marks is monitored by NRTK survey every six months during second workings. This monitoring will continue until the mine workings has been completed and the subsidence, if any, has ceased.

At the completion of second workings WCL will complete a NSW Spatial Services *End of Project Applicant Compliance Statement* for submission to NSW Spatial Services.

6.4 Access Roads and Fire Trails

The southern section of Fire Road 7D creek crossing and trail monitoring program as detailed in the PSMP expected to be sufficient to identify any impacts against performance indictors in **Table 9**.

In the unlikely event that subsidence impacts do become apparent on any of the listed fire trails or access roads as listed in the WaterNSW special areas access consent (F2020/3092) minor remedial work may be required. Details on such minor remedial repairs as required to be undertaken by WCL in consultation with WaterNSW as soon as possible to maintain them in a working safe and serviceable condition for the listed fire trails and access roads are detailed in the WCL EP Public Safety Management Plan (RVC EC PLN 009).

Table 10 - Subsidence Effects Monitoring Program – Built Features (see Figure 4 - Built Features Monitoring Locations for illustration of location of monitoring sites)

Note: near real-time GNSS readings = hourly readings -plotted as a daily average and filtered weekly

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
General							
Edge of Mt Ousley Road M1 Mt Ousley Rd	GNSS continuous Monitoring **GNSS #1**	General subsidence & valley closure Mt Ousley Pavement	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, GNSS data reviewed weekly during mining Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Status report
PC08 (Bulli & Balgownie goaf) M1 Mt Ousley Rd Upland swamps	GNSS continuous Monitoring **GNSS #2**	General subsidence Mt Ousley Rd Upland Swamp CCUS 1 CCUS 20	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC07 (Bulli & Balgownie goaf) Upland swamps	**GNSS continuous Monitoring** **GNSS #3**	General subsidence Upland Swamp CCUS1	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Status report
TransGrid 330kV tower T56 Endeavour Energy 132KV tower E67. (Balgownie goaf)	GNSS continuous Monitoring **GNSS #5**	General subsidence & at powerlines	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) Baseline or second workings reporting = Status report
TransGrid 330kV KV Powerline tower T57 Endeavour Energy 132KV tower E66	GNSS continuous Monitoring **GNSS #6**	General subsidence & at powerlines	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining**	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger.	RR Subsidence Portal. Website (20 days after period) Baseline or second workings reporting Status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
(Bulli pillars)				• Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)		**Post Mining** Quarterly for 12 months after cessation of mining	
TransGrid 330kV Powerline tower T55 Endeavour Energy 132KV Tower E 68 (solid coal)	GNSS continuous Monitoring **GNSS #7**	General subsidence & at powerlines	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Baseline or second workings reporting Status report Website (20 days after period)
WCL easement (Bulli goaf) M1 Mt Ousley Rd	GNSS continuous Monitoring **GNSS #8**	General subsidence & valley closure	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Monthly status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
PC21 (Bulli goaf #2)	GNSS continuous Monitoring **GNSS #9, #30**	General subsidence	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis, **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC, DPIE, EE, TG Status report
PC23 (Bulli goaf #11)	GNSS continuous Monitoring **GNSS #10**	General subsidence	1D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC, DPIE, EE, TG Status report
PC21 (Bulli goaf #2) Upland swamps	GNSS continuous Monitoring **GNSS #11**	General subsidence Upland Swamp CCUS5	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly	RR Subsidence Portal Website (20 days after period) TC, DPIE, EE, TG Status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
				Post Mining • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)		Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	
South of PC21 (edge Bulli & Wongawilli goaf) Upland swamps	GNSS continuous Monitoring **GNSS #12**	General subsidence Upland Swamp CRUS 1	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC, DPIE, EE, TG Status report
South of PC21 (Balgownie goaf) Upland swamps	GNSS continuous Monitoring **GNSS #13**	General subsidence Upland Swamp CCUS 4 CCUS 3 CCUS 6 CCUS 23	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC, DPIE, EE, TG Status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
West of PC08 (Bulli pillars) M1 Mt Ousley Rd CRUS 19	GNSS continuous Monitoring **GNSS #14**	General subsidence (Bulli pillars) Upland Swamps CCUS 15 CCUS 17 CCUS 18 CCUS 19 CRUS 3	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis. **Post Mining** • Data continued to be recorded on a near real-time basis	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) TC Status report
South of PC07 (Bulli pillars) Upland swamps	GNSS continuous Monitoring **GNSS #15**	General subsidence (Bulli pillars) Upland Swamp CCUS2 CRUS 3	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis. **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) Status report
M1 Mt Ousley Rd RMS Infrastructure-Picton Rd Bridge	GNSS continuous Monitoring GNSS #16	General subsidence between second workings panels and RMS infrastructure at	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis.	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly	RR Subsidence Portal Website (20 days after period) TC Status report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
		Picton Road interchange.		**Post Mining** • Data continued to be recorded on a near real-time basis		Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	
TransGrid 330kV Powerline tower T54 & Endeavour Energy 132KV Tower E69	GNSS continuous Monitoring **GNSS #17**	General subsidence & at powerlines	3D +/- <20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings, **During mining** • During mining GNSS data recorded on a near real-time basis. **Post Mining** • Data continued to be recorded on a near real-time basis • End of Panel Report (inclusive of sub panels)	WCL	**During Mining** GNSS readings prior to second workings, During mining over active mining area GNSS data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining	RR Subsidence Portal Website (20 days after period) Baseline or second workings reporting Status report
Infrastructure –TfNSW							
Mt Ousley Rd Carriageway General Carriageway–Cataract Creek (100m)	**GNSS continuous Monitoring** GNSS # 1,2, 8, 14, 16	General Subsidence	3D +/- <20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings for GNSS units (GNSS, 1, 2, 8, 14, 16). **During mining** • Weekly During mining GNSS data recorded on a near real-time basis as per specific GNNS detail (GNSS, 1, 2 and or 8, 14, 16). **Post Mining** • Data continued to be recorded on a near real-time basis	WCL	**Prior to second workings** • GNSS readings prior to second workings, **During mining** • Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, • As required by TARP trigger. **Post Mining**	RR Subsidence Portal Website (20 days after period) TC Status report End of Panel Report (inclusive of sub panels)

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Carriageway- Mt Ousley Road – tension zone at ridge (P46)				• End of Panel Report (inclusive of sub panels)		• Summary in End of Panel Report (inclusive of sub panels)	
	Cataract Creek Valley Closure CC1 - CC4	Valley Closure/ pavement compression	1D +/-3mm	**Cataract Creek Valley Closure** **During Mining** • Valley closure at Cataract Creek: Relative movement between 1<->8 and 2<->8 • Quarterly survey of CC1- CC4 valley closure, or in response to TARP trigger. **Post Mining** • End of Panel Report (inclusive of sub panels)	WCL	**Cataract Creek Valley Closure CC1-CC4** **During Mining** **GNSS – between 1 and 8 and 2 and 8.** • Quarterly CC1-CC4 **Post Mining** • consolidated in End of Panel Report (inclusive of sub panels)	
	GNSS Relative movement between 14<->16 and 2<->16	Ground movement at tension zone on ridgeline	3D +/- <20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings for GNSS units (GNSS, 1, 2, 8, 14, 16). **During mining** • Weekly During mining GNSS data recorded on a near real-time basis as per specific GNNS detail (GNSS, 1, 2 and or 8, 14, 16). **Post Mining** • Data continued to be recorded on a real time basis • End of Panel Report (inclusive of sub panels)	WCL	**Prior to second workings** • GNSS readings prior to second workings, **During mining** • Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, • As required by TARP trigger. **Post Mining** • Summary in End of Panel Report (inclusive of sub panels)	

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	Crackmeter Across slot on each carriageway	Pavement Compression Slot closure on southbound and northbound carriageways	1D +/- 1mm	**Prior to second workings** • Monthly crack meter readings prior to second workings. **During mining** • Weekly During mining with slot monitoring data recorded on a real time basis. **Post Mining** • Data continued to be recorded on a real time basis. • End of Panel Report (inclusive of sub panels)	WCL	**Prior to second workings** • GNSS readings prior to second workings, **During mining** • Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, • As required by TARP trigger. **Post Mining** • Summary in End of Panel Report (inclusive of sub panels)	
	GNSS Relative movement between 1<->8 and 2<->8	**Valley closure at Cataract Creek:**	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings GNSS data recorded on a near real-time basis as per specific GNNS detail (GNSS 1<->8 and 2<->8) **During mining** • Weekly During mining GNSS data recorded on a near real-time basis as per specific GNNS detail (GNSS 1<->8 and 2<->8 **Post Mining** • Data continued to be recorded on a near real-time basis. • End of Panel Report (inclusive of sub panels)	WCL	**Prior to second workings** • GNSS readings prior to second workings, **During mining** • Mining area GNSS data to be reviewed weekly or as determined by Technical Committee, • As required by TARP trigger. **Post Mining** Summary in End of Panel Report (inclusive of sub panels)	

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	Tension crack survey line survey SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS	Tension crack monitoring	1D ±/- 3mm	**Tension crack survey line survey** **During Mining** • In response to GNSS TARP trigger **End of panel** • Within three months of completion of second workings panel (inclusive of sub panels)	WCL	**Tension crack survey line survey** • TARP reporting • End of Panel Report (inclusive of sub panels) - Within three months of completion of second workings panel (inclusive of sub panels)	
	Q-line southbound pavement line survey	General subsidence and strain along southbound carriageway.	3D +/- 15mm	**Q-line southbound pavement line survey** **During Mining** • In response to GNSS TARP trigger **End of panel** • Within three months of completion of second workings panel (inclusive of sub panels)	WCL	**Q-line southbound pavement line survey** • TARP reporting • End of Panel Report (inclusive of sub panels)- Within three months of completion of second workings panel (inclusive of sub panels).	
	TfNSW Drive through inspection	Drive through inspection by TfNSW Network Inspector -	carried out at traffic speed	**TfNSW Drive through inspection** **During mining and Post Mining** • TfNSW undertake twice weekly drive-through inspections (done at traffic speed).	TfNSW	**TfNSW Drive through inspection** Reporting by exception - report any new potentially mining related defects	
Bridges Picton Rd interchange - B7926 Steel Arch over Rocky Creek Culvert – B7932	GNSS continuous Monitoring **GNSS #16**	**General horizontal ground movements** Between second workings panels and RMS infrastructure at Picton Road interchange, and other bridges.	3D +/-<20mm	**Prior to mining** • Monthly GNSS readings prior to second workings for PC 07 and PC08, **During Mining** • Weekly review during mining of GNSS data readings on a real time basis as per specific GNNS detail (GNSS 16), and monthly in all other areas. **Post Mining**	WCL	**Prior to second workings** • Baseline prior to second workings, **During mining** • Weekly review during mining over active mining area GNSS data reviewed weekly • Monthly in all other areas, or as required by TARP trigger.	RR Subsidence Portal Website (20 days after period) TC Status report End of Panel Report (inclusive of sub panels)

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Culvert over Cataract River – B814				• Quarterly review for 12 months after cessation of mining		**Post Mining** • Quarterly for 12 months after cessation of mining-	
	TfNSW Drive-through inspections:	TfNSW twice weekly drive through inspection	At traffic speed by TfNSW.	**TfNSW Drive-through inspections:** Twice weekly	TfNSW	TfNSW to report on new defects and comment on possible repairs required.	
	Prism Survey Existing monitoring prisms on Picton Rd Bridge. Culverts	**Prism Survey** • Prism X,Y,Z movements between any pair of prisms.	3D ±/-2mm 1D, +/-1mm	**Prior to mining** • Baseline survey **During Mining** • As required by TARP trigger **Post Mining** • End of Panel Report (inclusive of sub panels) - Within three months of completion of second workings panel.	WCL	**During Mining** • As required by TARP • Annual **Post Mining** Within three months of completion of second workings in each panel (inclusive of sub panels)	
	Visual inspection By TfNSW certified Bridge Engineer	General condition of bridge	-	**Visual inspection** After amber trigger and then as determined by TC	WCL	As required by TARP	

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
Culverts Cataract Creek Culverts (North and South)	GNSS continuous Monitoring **GNSS #1, 2, 8, 14, and 16**)	**GNSS** General subsidence and ground movement	3D +/- <20mm	**Prior to Mining** • Quarterly review of continuous GNSS readings prior to second workings for PC 07 and PC08, **During mining** • Weekly review of GNSS data recorded on a near real-time basis over active mining area, and monthly in all other areas, **Post Mining** • Quarterly for 12 months after cessation of mining	WCL	**Prior to second workings** • Baseline prior to second workings, **During mining** • Weekly review during mining over active mining area GNSS data reviewed weekly • Monthly in all other areas, or as required by TARP trigger. **Post Mining** • Quarterly for 12 months after cessation of mining-	RR Subsidence Portal Website (20 days after period) TC Status report End of Panel Report
	Survey • CC1-CC4: quarterly • Q-line • Culvert Prims	**Survey** General subsidence along or nearby culverts	1D, +/- 3mm 3D, +/- 15mm 1D, +/- 1mm	**During Mining** • As required by TARP trigger **Post Mining** • Q-line Survey Within three months of completion of second workings panel. **Post Mining** • Quarterly Cataract creek for 12 months after cessation of mining-.	WCL	• As required by TARP	
	TfNSW Drive-through inspections **Visual inspection**	General condition of culvert and any movements at joints	-	**During mining and Post Mining** **TfNSW Drive through inspections** TfNSW undertake twice weekly drive-through inspections (done at traffic speed).	TfNSW	**TfNSW Drive through inspection** • Reporting by exception - report any new potentially mining related defects • As required by TARP	

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
	By TfNSW Engineer			**Visual inspection** After amber trigger and then as determined by TC		**Visual inspection** After amber trigger and then as determined by TC	
Slopes ARL2 – 955771/ 95770/ 13482 ARL3 – 10839/ 13483/ 13484/ 13485	**GNSS continuous Monitoring** GNSS 1, 2, 8, 14, 16	**GNSS** **Valley closure** at Cataract Creek: Relative movement between 1<->8 and 2<->8 14<->16 and 2<->16 General subsidence GNSS 1, 2, 8, 14, 16	3D +/-<20mm	**Prior to second workings** • Monthly GNSS readings prior to second workings for GNSS units (GNSS1<->8 and 2<->8).and • General Subsidence –GNSS 1, 2, 8, 14, 16 **During mining** • Weekly During mining GNSS data readings on a near real-time basis as per specific GNNS detail (GNSS1<->8 and 2<->8). • General Subsidence – GNSS 1, 2, 8, 14, 16 **Post Mining** • Data continued to be recorded on a near real-time basis. • End of Panel Report (inclusive of sub panels).	WCL	**Prior to second workings** • Baseline prior to second workings, **During mining** • Weekly review during mining over active mining area GNSS data reviewed weekly • Monthly in all other areas, or as required by TARP trigger. **Post Mining** Quarterly for 12 months after cessation of mining-	RR Subsidence Portal Website (20 days after period) TC Status report End of Panel Report (inclusive of sub panels)
	TfNSW Drive-through inspections	General condition of slopes	-	**During mining and Post Mining** **TfNSW Drive through inspections** TfNSW undertake twice weekly drive-through inspections (done at traffic speed).	TfNSW	**TfNSW Drive through inspection** • Reporting by exception - report any new potentially mining related defects • As required by TARP	
	Visual inspection Inspection by geotechnical engineer	Inspection of slope to assess changes from previous condition.		**Visual inspection** After amber trigger and then as determined by TC	WCL	**Visual inspection** After amber trigger and then as determined by TC	

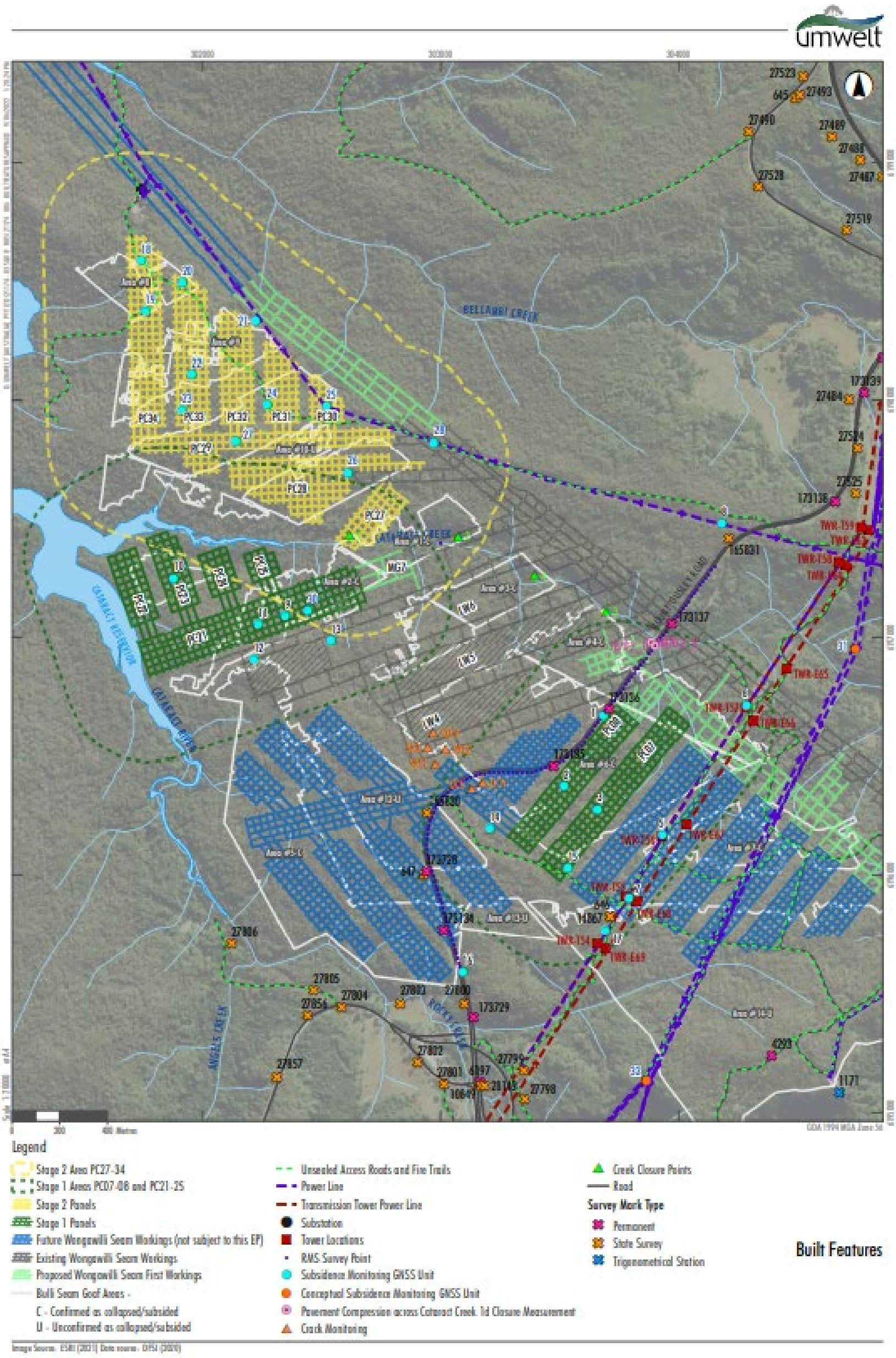
Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
				Carry out visual Inspection of slope to assess changes in slope condition.			
Mono pole structures, e.g. road signs, noise walls, barriers.	N/A	Not required No assets in UEP Area	--	-	WCL -	-	Reporting by exception - report any new potentially mining related defects
Variable Message Sign (VMS).	N/A	Not required No assets in UEP Area	-	-	WCL	-	--
TransGrid Infrastructure							
TransGrid 330kV towers	**GNSS #5, 6, 7, and 17** Tower survey points	• General Subsidence • Leg diff measurements • Tilt	3D, +/- <20mm 1D ±2mm 0.5mm/m	**Before mining** Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly **During Mining** Continuous GNSS Data review weekly **Tower Survey** After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	RR Subsidence Portal Website (20 days after period) **Baseline** – 6 monthly **Second Workings (PC07 - PC08**) - at least quarterly during second workings for panels PC07 - PC08.
Visual inspections and photos	Endeavour Energy Infrastructure	• Inspect for visual damage with TransGrid (as required)	n/a	After each panel during secondary extraction under easements or annually (if requested) As required by GNSS TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Website (20 days after period) **Baseline** – 6 monthly

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
							Second Workings (PC07 - PC08) - at least quarterly during second workings for panels PC07 - PC08.
Endeavor Energy infrastructure							
Endeavour Energy 132kV Towers	**GNSS #5, 6, 7, and 17** Tower survey points	**Towers** • General Subsidence (GNSS) • Leg diff measurements • Tilt	3D, +/- <20mm 1D ±2mm 0.5mm/m	**Before mining** Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly **During Mining** Continuous GNSS Data review weekly Quarterly LIDAR **Tower Survey** After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Website (20 days after period) **Baseline** – 6 monthly **Second Workings (PC07 - PC08)** - at least quarterly during second workings for panels PC07 - PC08. End of Panel(including sub panel) Report
Endeavour Energy 33KV Pylons	**GNSS #31, 32** Tower survey points Pylon survey points	**Towers** • General Subsidence (GNSS) • Tilt	3D, +/- <20mm 1D ±2mm 0.5mm/m	**Before mining** Review of PC 21 subsidence data against predictions Continuous GNSS Data review monthly **During Mining** Continuous GNSS Data review weekly Quarterly LIDAR **Tower Survey** After each panel or annual or by TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Website (20 days after period) **Baseline** – 6 monthly **Second Workings (PC07 - PC08)** - at least quarterly during second workings for panels PC07 - PC08.

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
							End of Panel (including sub panel) Report
Visual inspections and photos	Endeavour Energy Infrastructure	Inspect for visual damage with TransGrid and Endeavour Energy (as required)	n/a	After each panel during secondary extraction under easements or annually (if requested) As required by GNSS TARP trigger	WCL	Within 3 months after each panel or annual or TARP survey*	Email to Endeavour Energy, TransGrid, DPE, RR (in status report) Website (20 days after period) **Baseline** – 6 monthly **Second Workings (PC07 - PC08)** - at least quarterly during second workings for panels PC07 - PC08. End of Panel (including sub panel) Report

Location	Monitoring Site & system	Purpose	Data & Accuracy	Monitoring Frequency & Duration	Resp.	Reporting Frequency	Reporting Timing & Distribution
State and Permanent Survey Marks							
Permanent marks (PM) and state survey mark (SS)	PM173135 PM173136 PM173728 PM173137 SS165830 SS14867 SS16583	Inspect for subsidence impacts	3D, ±2mm	Monitored via NRTK survey every 6 months during secondary workings.	WCL	Within 3 months after each relevant secondary workings panel or annual or TARP survey	Website (20 days after period) **Baseline** – 6 monthly **Second Workings (PC07 - PC08)** - at least quarterly during second workings for panels PC07 - PC08. End of Panel (including sub panel) Report

Figure 4 - Built Features Monitoring Locations (source: Umwelt 2022)



7 MITIGATION AND MANAGEMENT MEASURES

7.1 General

Controls to mitigate and manage potential subsidence hazards include:

1. the nature of the proposed bord and pillar mining system causing low levels of disturbance and low levels of subsidence
2. the staged sequence of mining, initially Stage 1(a) in PC21 remote and to the west of the Mt Ousley Road to demonstrate the subsidence outcomes from the mining method and geometry and then Stage1(b) in PC07-PC08 below previously extracted Balgownie Seam longwall panels between stable chain pillars. Further mining of other approved panels under MP09_0013 in future EPs.
3. a review of mine plan records and previous subsidence monitoring associated with mining longwall panels in the Balgownie and Wongawilli Seams.

Further controls include the comprehensive monitoring program to measure the actual levels of subsidence against the low levels of subsidence expected. This monitoring program has been developed in consultation with infrastructure owners following risk assessments and agreement of risk control measures and management processes and actions. The monitoring program includes high precision, near real-time GNSS monitoring at key locations, conventional ground survey techniques of infrastructure and LIDAR surveys of the broader area.

7.1.1 Mining Technique

The bord and pillar mining system is designed to have pillars that are long-term stable and cause only very low levels of ground disturbance and surface subsidence. The stability of this pillar system for the RPUEP layout has been confirmed by peer review (*B. Hebblewhite, 2020*).

7.1.2 Sequencing of Mining

As approved, a staged sequence of mining is in place with Stage 1(a) and Stage 1(b) outlined in **Section 1.2** above. The first phase (Stage 1(a)) of second workings (PC21-PC25) is to the west of Mt Ousley Road in an area that is remote from subsidence sensitive infrastructure and separated from them by previous longwall mining in the Wongawilli Seam.

Surface subsidence will be monitored directly above these panels using a combination of near real-time GNSS monitoring and LIDAR to confirm the low levels of subsidence expected.

The second phase (Stage1(b)) of second workings in PC07 and PC08 is planned directly below two previously mined Balgownie Seam longwall panels. PC08 is adjacent to the Mt Ousley Road but not directly under it. The 330kV and 132kV powerlines are within the EP area for PC07-PC08 but located more than 150 to the east of PC07, some 265m above the Bulli Seam mining horizon and 295m above the Wongawilli Seam mining horizon. The 33kV powerlines are approximately 250m further to the east of 330kV and 132kV powerlines and outside the EP area for PC07-PC08.

EP 2 Stage 2 second workings (PC27-PC34) may be undertaken concurrently with Stage 1a (PC21-PC25) and Stage 1b (PC07-PC08) EP 1 second workings, pending approval to commence.

7.1.3 Review of mine plans and previous subsidence

Panels PC07 and PC08 are located directly below previously extracted longwall panels in the Balgownie Seam and areas in the Bulli Seam indicated as being fully extracted. The vertical interburden thickness between the Bulli Seam and the Balgownie Seam is in the range 5-10m. There is no potential for there to be marginally stable pillars left in the Bulli Seam above these panels after the Bulli Seam has been subjected to incremental longwall extraction 5-10m below.

A review of the subsidence monitoring from the period of longwall mining in the Balgownie Seam indicates that the subsidence observed is consistent with the Bulli Seam having fully subsided. This information indicates that there is no potential for further collapse of pillars in the Bulli Seam above or close to PC07 and PC08. Further detail supporting this conclusion is provided in the EP Subsidence Assessment Reports (SCT 2021and SCT 2022b).

7.2 TfNSW Mitigation Measures

The risk mitigation measures resulting from the TfNSW risk assessment are summarised below and in detail in the **Table 10** Monitoring program as shown in **Figure 4**:

- Undertake a baseline condition survey of the carriageway before mining.
- Reinstate or assess alternatives to the Q-Line survey on southbound carriageway.
- Check condition of crack meters and replace if necessary.
- Check the physical condition of the expansion slot, replace as required, and establish continual monitoring.
- Mill or mill and resheet the slot where identified as required by TfNSW. Note schedule any works with other road closures / road works if possible.
- Assess during mining, the nature of any movements (perform crack sealing if required).
- Assess post mining, if crack sealing is sufficient or if further treatment is required.
- Monitoring pins (prisms at the Picton Road interchange bridge) were installed prior to longwall mining. Inspect and replace as required prior to mining of PC07-08 and establish baseline.
- Install additional GNSS unit beyond the ridge to inform movements at the bridge to act as an early warning system.
- Monitor GNSS and undertake subsequent survey of Cataract Creek culverts if trigger levels reached.
- Use precondition assessments of the culverts from longwall mining as baseline.
- Undertake risk assessment to ensure the ARL of slopes does not change as a result of mining, slopes to be groomed to required risk level prior to mining.
- Use GNSS monitoring to provide early warning of impacts to the slopes.
- TfNSW undertake twice weekly drive-through inspections (done at traffic speed), report on new defects, and repair as necessary.
- Develop TARP with trigger points for various actions.

The risks and mitigation measures identified in this risk assessment are addressed and managed in this Built Features Management Plan by inclusion in the baseline (**Section 3**), monitoring (**Section 6**) and TARPs (**Appendix A**).

7.3 RVC Environmental Management System

RVC operate under the RVC Environmental Management Strategy (EMS) (RVC EC STD 001) which provides a framework to ensure activities at WCL are undertaken in an environmentally responsible manner and in general accordance with the following:

- Russell Vale Revised Preferred Underground Expansion Project development consent MP09_0013;
- ISO14001 Environmental Management Standard; and
- Legislative and other requirements.

While the EMS includes general requirements for the reporting and management of incidents, the EP provides specific requirements in relation to the management of subsidence related impacts associated with the mining covered by the EP and the EP requirements (including the requirements set out in this management plan) prevail to the extent of any inconsistency between documents. **Figure 7** outlines the WCL Environmental Management Process.

7.4 Trigger Action Response Plan

The Trigger Action Response Plan (TARP), as presented in **Appendix A**, has been designed specifically for this BFMP to illustrate how the various predicted subsidence impacts, monitoring components, performance measures, and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

The TARP system provides a simple, transparent, and useable record of the monitoring of environmental performance and the implementation of management and/or contingency measures.

The TARP is designed with consideration of baseline conditions and predicted indirect impacts and comprises the following:

- Trigger levels from monitoring to assess performance; and
- Triggers that flag implementation of contingency measures.

Table 11 below outlines the trigger level definitions to be applied to the TARPs established under this EP.

Table 11 - Extraction Plan Trigger Levels

TRIGGER LEVEL	DESCRIPTION
Level 1	Monitoring indicates performance criteria are satisfied. Operations continue as normal.
Level 2	Minor or persistent changes in monitoring results indicate potential alteration of the environment (could be natural or mining related) or impacts outside of predictions. Internal investigation of potential causes required to determine if there is potential to cause material harm due to mining operations. Exceedances of subsidence triggers may result in implementation of adaptive management measures.
Level 3	Significant change in monitoring results indicates a likely alteration of the environment (could be natural or mining related) or impacts outside of predictions.

TRIGGER LEVEL	DESCRIPTION
	Investigation into potential causes required to determine if material harm has been caused due to mining operations. External notification of *potential* incident required for Performance Measures TARPs. Exceedances of subsidence triggers likely to result in implementation of adaptive management measures.

The TARPs as referred to in **Appendix A** have been developed to address the specific built features for the key public infrastructure:

- Mt Ousley Road and the Mt Ousley Rd/ Picton Rd Interchange
- TransGrid 330KV power lines and towers
- Endeavour Energy 132 powerlines and towers

The TARP process has been developed in consultation with the above stakeholders. Specifically, the TransGrid TARPs have been adopted for the Endeavour Energy 132kV powerlines and towers as they are located further away from the second workings in PC07-PC08 panels.

Figure 5 below provides a flow chart covering the Performance Measure TARP Process.

Figure 5 - TARP Process

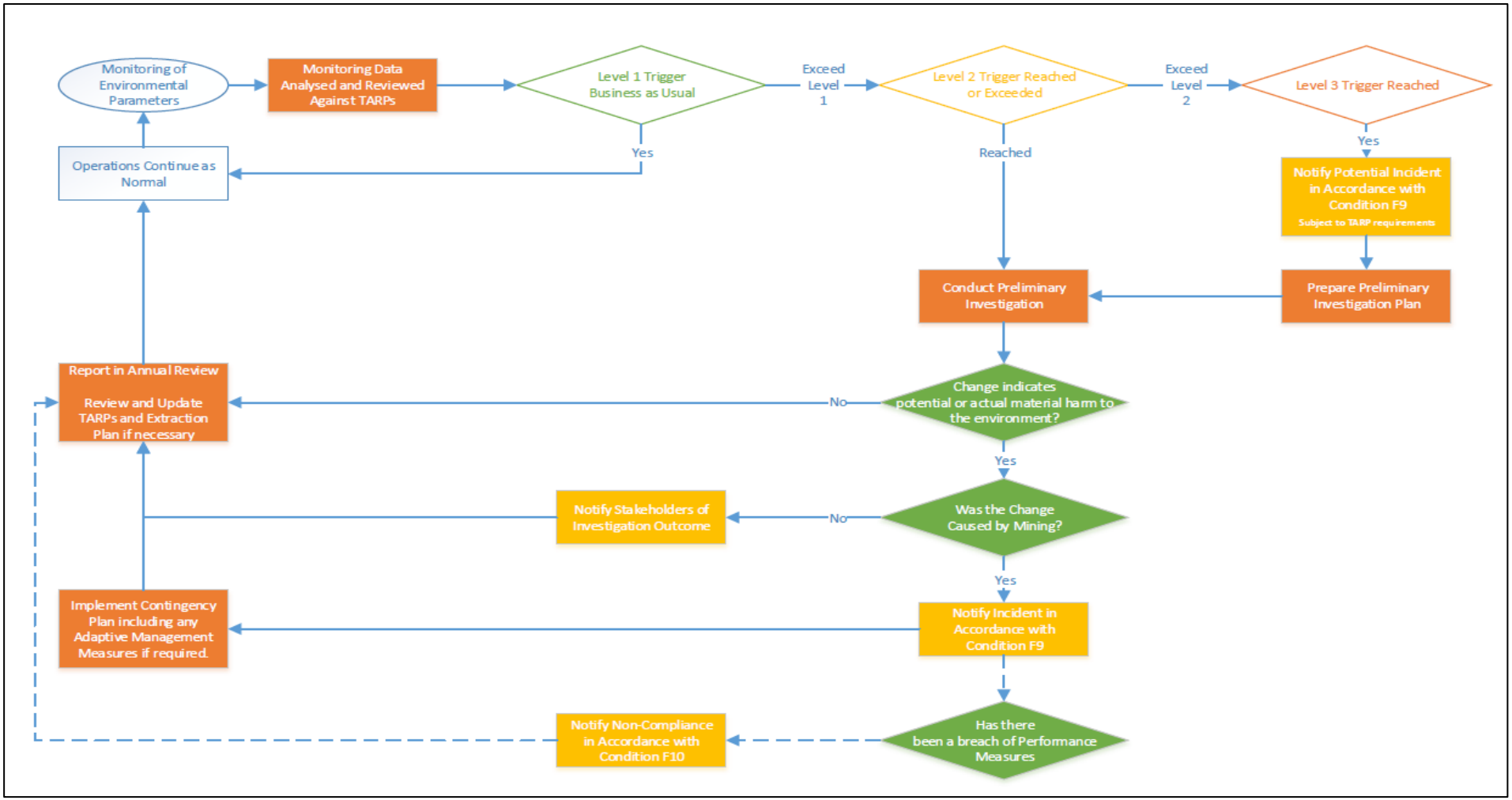


Figure 6 – TfNSW TARP Process

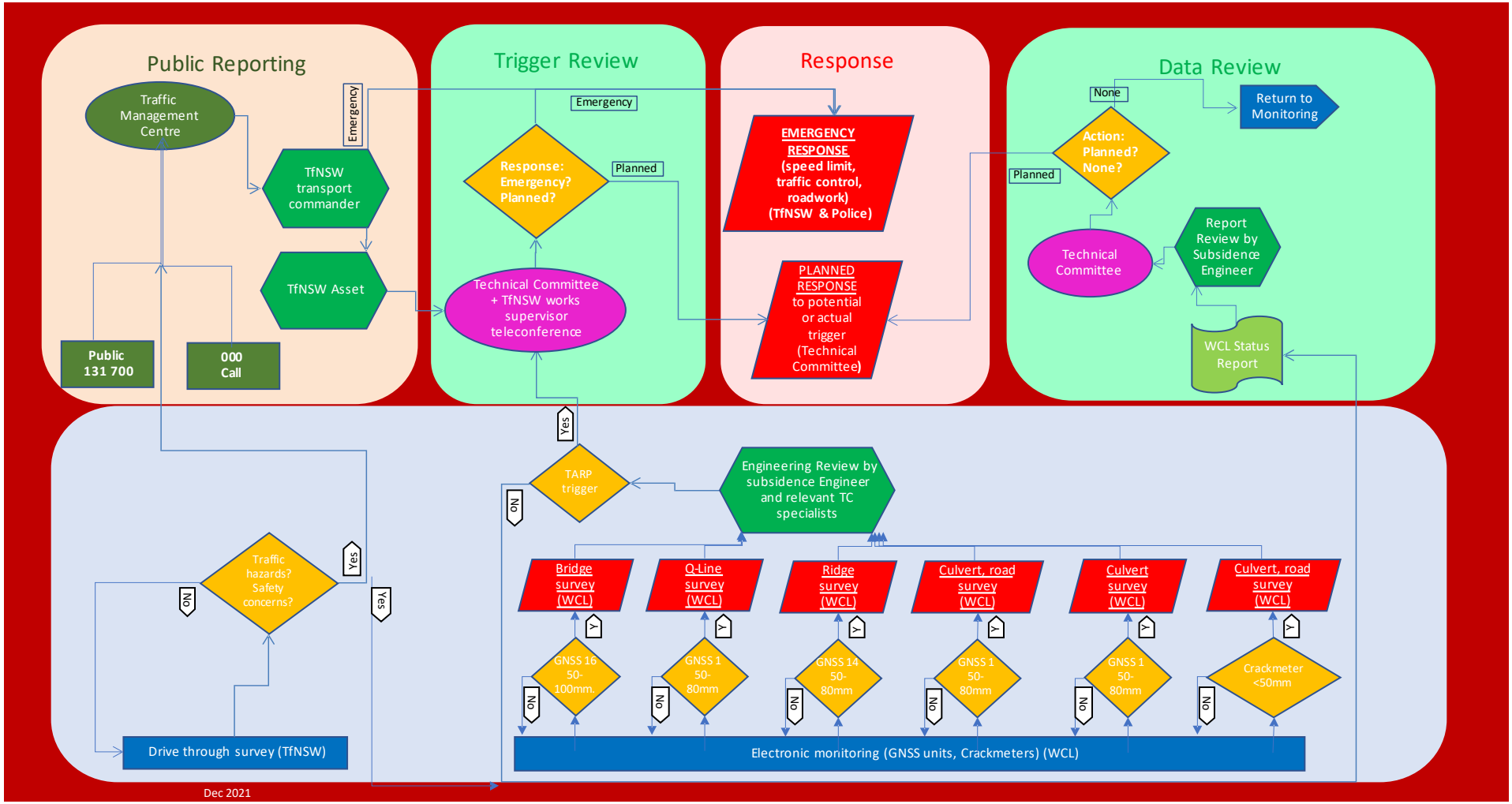
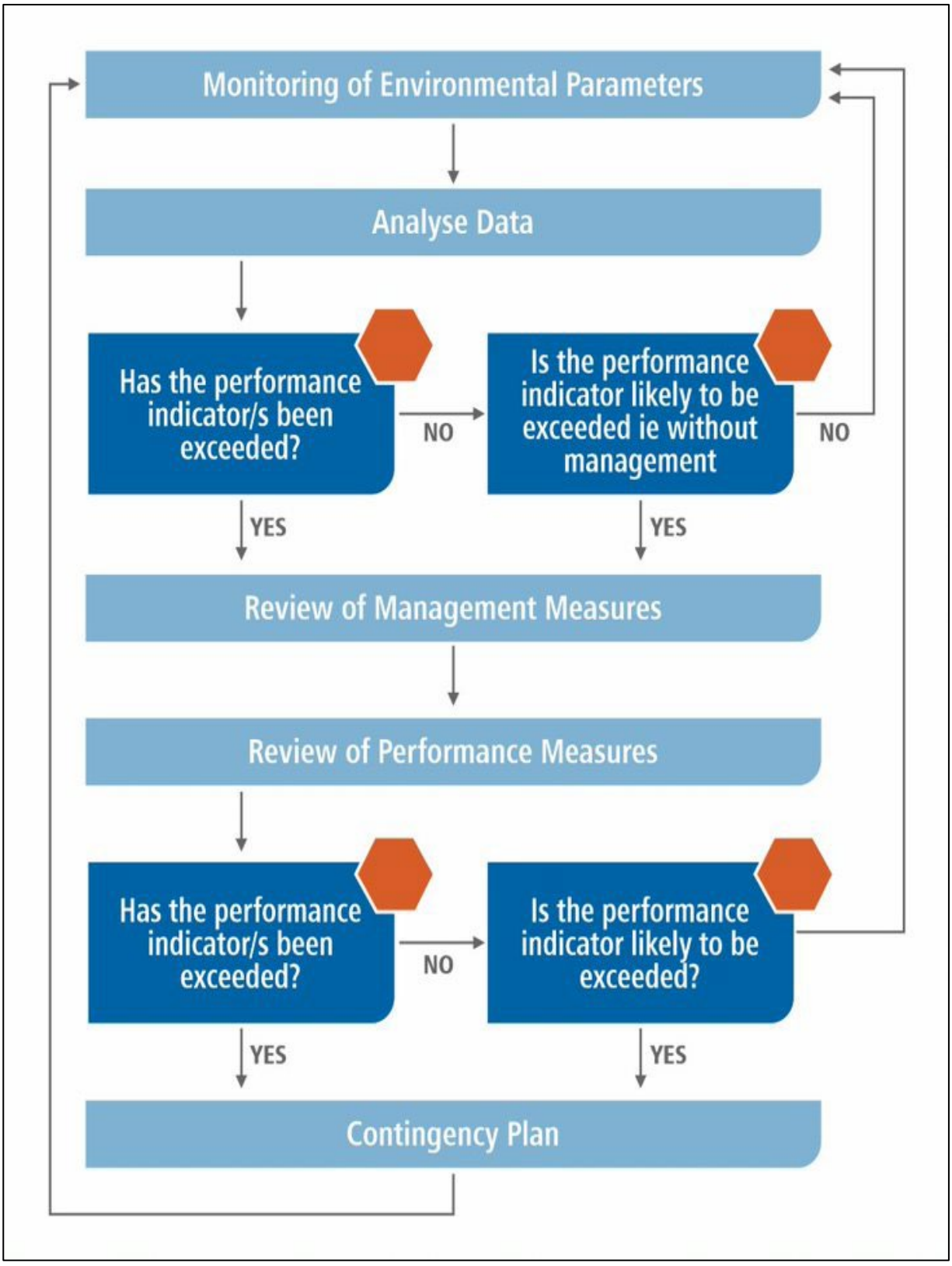


Figure 7 – Environmental Management Process



7.4.1 Adaptive Management

Due to the nature of the proposed bord and pillar mining, adaptive management measures and TARPs are designed to identify circumstances where observed subsidence effects and/or impacts differ from those predicted. Departures from these predictions may indicate the potential for exceedances of performance criteria.

Where investigations triggered by the Performance Measure TARPS indicate that the changed conditions of sites have been, or are likely to have been, caused by mining operations, the response to these impacts include adaptive management measures to ensure further impacts to the site will not occur or be mitigated or that impacts to other sites do not occur in the future.

Adaptive management measures to be implemented in the event of a clear linkage between the mining authorised under the development consent or EP and any impacts to the built features described in this plan, will include a review of the design and layout of future mining within areas that may potentially impact on such items to avoid a recurrence of any such impacts. These adaptive management measures include:

- stop mining and investigate causes of the exceeding of subsidence predictions.
- undertake a review of the panel design parameters in consultation with the resource regulator.

The Contingency Planning process set out in **Section 7.5** also covers this process.

The TARPS in **APPENDIX A** contain adaptive management measures for subsidence which inform decisions regarding underground mining operations, should higher than predicted vertical subsidence effects be observed. The purpose of these adaptive management measures is to implement additional measures where necessary to:

- enable potential impacts associated with higher than predicted subsidence impacts to be monitored; and/or
- the implementation of changes in mining operations to prevent performance criteria from being exceeded.

WCL will assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in this consent in accordance with ***Condition F4*** of **Schedule 2**. Any exceedance of the Subsidence criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding offsetting actions taken. Where any exceedance of these criteria and/or performance measures has occurred, WCL will at the earliest opportunity:

- take all reasonable and feasible steps to ensure the exceedance ceases and does not re-occur;
- consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;
- within 14 days of the exceedance occurring, submit a report to the Secretary describing these remediation options and any preferred remediation measures or other course of action; and
- implement remediation measures as directed by the Planning Secretary,

to the satisfaction of the Secretary.

7.5 Contingency Plan

Condition F5(f) requires WCL to establish a contingency plan to manage any unpredicted impacts and their consequences, and to ensure that ongoing impacts reduce to levels below relevant performance measures or criteria as quickly as possible.

The following section details the process that WCL will implement to ensure compliance with ***Condition F5(f)***.

In the event that observed parameters or impacts exceed, or are considered likely to exceed, the performance measures detailed in **Section 5** of this Plan, WCL will implement the following Contingency Plan:

- The observation will be reported to WCL's Group Environmental Manager as soon as possible, or within 24 hours.
- The observation will be recorded.
- WCL will report any exceedance of the performance measure to the DPE and the relevant built features stakeholder/s as soon as practicable after WCL becomes aware of the exceedance in accordance with the relevant TARPs.
- WCL will assess the exceedances referred to in the TARPs of this document and where appropriate, implement safety measures in accordance with the appropriate Management Plans.
- The Group Environmental Manager will investigate any potential contributing factors and identify an appropriate action plan to manage the identified impact(s), in consultation with specialists and/or relevant agencies if necessary.
- WCL will identify any appropriate action plan to manage the identified impact(s), in consultation with other specialists and/or key stakeholders.
- WCL will submit the proposed course of action to DPE for approval.
- WCL will implement the approved course of action to the satisfaction of the DPE.
- WCL will continue to monitor performance with the new action plan in place and, if successful will formalise these actions as part of the Management Plan.
- WCL will monitor the function of the Built Features monitoring network to ensure that the ability to assess and monitor impacts as may be associated with mining is maintained.
- Where identified, suitable replacement units or equipment such as standby GNSS units would be sourced or made available to ensure minimal disruption to the function of the network.

Contingency measures will be developed in consideration of the specific circumstances of the issue and the assessment of consequences in consultation with the key infrastructure stakeholders to identify and implement appropriate remedial measures which includes commitments to mitigate, repair, replace or compensate predicted impacts on potentially affected built features in a timely manner.

Some contingency measures are included in TARPs. As an example, for Mt Ousley Road, the TfNSW TARP includes - Red level Action = speed restrictions and/or bridge closures – enforced by traffic commander and NSW police.

Other contingencies for major triggers or emergencies have been discussed during consultation with the asset owners of the 330kV (TG), 132kV and 33KV (EE) powerlines with measures to be identified and subsequently implemented via direct consultation with the asset owners in association with a Red (Level 3) TARP action.

8 COMMUNICATIONS PROTOCOL

Specific Built Features agency reporting with regard to the monitoring program and in the case of exceedance of performance measures is detailed for the asset as below.

8.1 TransGrid 330 kV Powerlines and Towers

In the instance that there are any changes to the predicted subsidence as recorded via the GNSS meters and or subsequent impact to TransGrid assets as recorded via the quarterly attended surveys during second workings in panels PC07 - PC08, TransGrid is to be notified.

The Notification would be via the TransGrid emergency line 1800 027 253, quoting the following project details

- TransGrid Reference Number: 2021-331
- Location: Russell Vale Colliery
- TransGrid: Transmission Line 11 Dapto 330kV – Sydney South 330kV

8.2 Endeavour 132 kV and 33 kV powerlines and Towers and Poles

In the instance that there are any changes to the predicted subsidence as recorded via the GNSS meters and or subsequent impact to Endeavour Energy assets as recorded via the quarterly surveys during second workings in panels PC07 and PC08, Endeavour Energy is to be notified.

The Notification for an Amber (Level 2) TARP would be via notification to the Endeavour Energy asset Energy management and maintenance groups via a specific group email alert.

The notification for a Red (Level 3) TARP would be via the Endeavour Energy emergency line 131 003, quoting the following project details:

- Location: Russell Vale Colliery,
- Locality of power lines and poles – Cataract.
- Endeavour Energy: Transmission Line – Towers

Follow up with the group as above at the next available opportunity during business hours.

8.3 Surveyor General - Permanent Survey Marks

In the instance that a variation was required to the information regarding the impacts described in the Surveyor General application to disturb or remove permanent survey marks WCL notes the following requirements in accordance with the Surveying and Spatial Information Regulation 2017:

- If a minor variation to this approval is required, then notification of that variation needs to be sent to the Office of the Surveyor-General by commenting on SO-559 in the DCS Spatial Services Customer Hub.
- If there are any major variations to the subject proposal, this consent is nullified and a new Survey Mark Removal application must be lodged for assessment by the Surveyor-General.

- Where possible, provide at least 30 business days notification before the proposed removal or replacement of survey marks (Permanent Survey Marks or Cadastral Reference Marks) thereby extending the timeframe of 14 days minimum under Clause 90 of the Surveying and Spatial Information Regulation 2017.

8.4 TfNSW - Mt Ousley Road/ M1

A TC has been formed to manage subsidence impacts to critical TfNSW infrastructure. The TC comprises members from TfNSW, WCL, and their consultants as appropriate. SES and NSW Police may also attend TC meetings from time to time. Meeting agenda items may include: BFMP - monitoring plan/TARP, pre-emptive works and review of subsidence data and TfNSW specific asset monitoring results.

In the instance that there are any changes to the predicted subsidence as recorded via the GNSS meters and or subsequent impact to TfNSW assets as recorded via the quarterly surveys during second workings TfNSW is to be notified via the Traffic Management Centre (TMC).

The TMC responds in accordance with TfNSW incident response protocols. TfNSW Works Supervisor inspects site and acts in accordance with these protocols and if the incident is confirmed, informs the Asset Manager who will request a TC meeting to determine appropriate action as per the process outlined below.

- WCL will set up teleconferencing facilities with phone in numbers and call cards.
- First response to any trigger is a site inspection.
- Green (Level 1) – normal operation of TfNSW infrastructure – infrastructure managed in accordance with normal asset management procedures.
- Amber (Level 2) and red (Level 3) triggers - relate to behaviour of TfNSW infrastructure that could lead to risks to infrastructure, safety or network availability. Technical specialists may determine other triggers from monitoring information and alert TC members and Works Supervisor–see also response flow chart.
- Grey triggers - relate to the performance of the continuous monitoring systems. The behaviour of the TfNSW infrastructure is not directly at risk as a result of a grey trigger, but the ability to assess its current and likely future behaviour is. Grey triggers are reported in accordance with the service agreements by the GNSS provider or via identification from review of the continuous monitoring results. Corrective actions and downtime would be recorded in the subsidence monitoring status report.
- Due to interactions between monitoring elements and ultimate need to protect the assets, this TARP is based on infrastructure elements to be protected.
- 'After mining', 'end of mining' and similar terms mean after completion of the panels covered by this BFMP.
- Reporting is by way of monthly status reports.
- The GNSS units and 'crackmeters' are the primary monitoring system. They monitor TfNSW infrastructure in pseudo real time and are reported in the status reports or on a trigger exceedance. Other monitoring systems are triggered by triggers in the primary monitoring system and end of panel (EoP) survey requirements in the monitoring plan. Reporting of these systems is in EoP reports and status reports.

- The automated monitoring systems (GNSS units and crackmeters) are the main monitoring/control system. It is carried out in pseudo (near) real-time (approximately hourly measurements averaged daily and filtered weekly). Amber trigger response times are geared to this frequency. Red (Level 3) triggers need urgent response in all cases.
- Slot closure is the total slot closure due to mining impacts and is net of any pre-mining movement, temperature, creep and other effects.
- Identification of defects may be via the general public to TfNSW and subsequently the TC.
- Repair or rectification works as required would be as agreed with TfNSW TC meeting and may include further asset specific monitoring or repairs.
- Where the TARP for the Picton Rd overpass is triggered, the independent Bridge Engineer will be contacted to be involved in further response including review of the survey data.

8.5 WaterNSW Fire Trails and Access Roads

Noting the dam wall as being some 8km away the details regarding the reporting protocol for WaterNSW assets including the WaterNSW Fire Trails and Access Roads, and the identified concrete causeways is as per the PSMP.

Table 12 – TFNSW Technical Committee Contact List

Organisation	Position	Name		Notification required for		
		Name	Contact details	Amber	Red	Grey
Talis Consultants on behalf of TfNSW	Technical Committee Chair	Martin Upitis	0416 275 739	Y	Y	N
TfNSW	Pavement Maintenance Planner	Cyril Gunaratne	0429 667 012	Y	Y	N
AECOM	Senior Geotechnical Engineer	Henk Buys	0448 997 500	Y	Y	N
TfNSW	Area Maintenance Manager	Matt Boys	02 6492 9540	Y (Pavement only)	Y (Pavement only)	N
TfNSW	Bridge Maintenance Planner	Dony Castro	0403 098 092	Y (Bridge Only)	Y (Bridge Only)	N
WCL	Group Environment Manager	Richard Sheehan	0449 665 084	Y	Y	N
WCL	RVC Environmental Superintendent	Simon Pigozo	0402 480 559	Y	Y	N
SCT	Principal Geotechnical Engineer	Ken Mills	0417 674 436	Y	Y	N
CARDNO	Bridge Engineer	Richard Woods	0414 246 238	Y (Bridge Only)	Y (Bridge Only)	N

9 INCIDENTS, COMPLAINTS AND NON-CONFORMANCES

9.1 Incidents

The Development Consent (MP09_0013) defines:

- An 'incident' to be "*an occurrence or a set of circumstances that causes or threatens to cause material harm and which may or not be or cause a non-compliance*". Examples may include a breach of specific development consent criteria or performance measure.
- Exceedance or non-compliance as "an occurrence, set of circumstances or development that is a breach of this consent".

In both circumstances, an Incident or Non-Compliance must be attributable to the development approved under the development consent.

Incidents and associated reporting requirements will be managed through established procedures set out in **Section 4.2** of the EP. All incident notification related to built features will be sent to DPI, the Resources Regulator and relevant infrastructure owner/operator.

9.2 Complaints Handling

Complaints will be managed through established WCL procedures and as required by ***Schedule 2 Condition 17 (x)*** of the Development Consent, by where a copy of a complaints register (updated on a Monthly basis) will be kept on the WCL website.

A summary of complaints will be available to regulatory authorities on request and provided in the Annual Environmental Management Reports (AEMRs).

10 REPORTING

The Reporting Framework set out in Section 5.2 of the EP will apply to the implementation of this plan in association with the specific triggers for regular and or incident/ TARP related reporting as detailed in **Sections 5, 6, 7** of this plan.

This reporting framework as detailed in **Table 10** includes regular review and or reporting at the following frequencies:

- Incident reporting;
- Weekly review;
- Monthly status reports or as otherwise required to support TfNSW TC meetings;
- Six monthly during baseline and at least quarterly during second workings for panels PC07 – PC08 for Endeavour Energy and TransGrid assets;
- End of each panel (including sub panels) of approved secondary workings;
- Impact reporting (in the event of an observed impact associated with the development covered by the EP); and
- Annual Review reporting requirements.

10.1 TfNSW Monitoring

Status reports would be presented via the scheduled monthly (at current time) TC during second workings for TfNSW and will contain the following:

- Reporting period
- Panel being extracted
- Length/area of extraction
- Progress since last report
- Maximum total and incremental subsidence in the period and location
- Incidents
- Actions

For each instrument the following information will be detailed:

- ID including name and number
- Monitoring Frequency
- Maximum result in the reporting period
- TARP Status
- Comment

For TfNSW, status reports are issued generally monthly, and then weekly during active mining in PC07 and PC08 or as determined by the TfNSW TC.

This report would be reviewed by the TfNSW TC including TfNSW team members, WCL subsidence specialist, and appointed bridge engineer.

11 PLAN ADMINISTRATION

11.1 Roles and Responsibilities

Environment and community management is regarded as part of the responsibilities of all Colliery personnel. The roles and function of the main personnel responsible for the implementation of environmental and community management including the plans, procedures and action plans contained in this BFMP are outlined in WCL's Management Operating System.

11.2 Resources Required

In accordance with the WCL SYS POL 003 Environmental Policy, Management shall ensure that the appropriate resources are made available to achieve the implementation of this Plan.

It is the role of the Group Environment Manager to ensure that these requirements are communicated to WCL Management.

11.3 Training

Staff training will consist of three levels of applicable to different types of staff:

- Level 1 – High level training on environmental legislative requirements (management staff);
- Level 2 – Operational level training (project managers, supervisors, surface personnel, control room operators); and
- Level 3 – Basic awareness of environmental management (underground staff, all personnel).

Targeted Training will be provided as required for all workers relevant to their activities where they are undertaking an activity with a high risk of potential environmental impact to provide them with the knowledge, skills and awareness to minimise environmental impacts in accordance with the conditions of the Development Consent Condition A28 of the Development Consent.

The Group Environment Manager/Site Environment Representative will review the training program and monitor its implementation.

11.4 Inductions

All personnel, including contractors, sub-contractors and staff, are required to attend a compulsory site induction that includes an environmental component prior to commencement on site. The Environment Manager or delegate will conduct the environmental component of the site induction.

The environmental component will include an overview of:

- Relevant details of this BFMP, including purpose and objectives.
- Key environmental issues (e.g. activities with potential to result in environmental impacts).
- Consent Conditions, relevant licences, and permits.
- Specific management requirements and responsibilities, and risk control/ mitigation measures.
- Incident response and reporting requirements.

A record of all environmental training and inductions will be maintained and kept on site. The Environmental Manager may authorise amendments to the induction where required to address project modifications, legislative changes or amendments to this BFMP or related documentation.

The Environment Manager or authorized delegate will review and endorse the induction program and monitor its implementation.

12 AUDIT AND REVIEW

12.1 Annual Review

In accordance with ***Condition F11*** of the Development Consent, an Annual Review of the environmental performance of the UEP is prepared.

The Annual Review will:

- Describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year.
- Include a comprehensive review of the monitoring results and complaints records of the Project over the previous calendar year, including a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria
  - requirements of any plan or program required under this consent
  - monitoring results of previous year/s
  - relevant predictions in the document/s listed in condition A2(c).
- Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence.
- Evaluate and report on:
  - the effectiveness of the noise and air quality management systems; and
  - compliance with the performance measures, criteria and operating conditions of this consent.
- Identify any trends in the monitoring data over the life of the Project.
- Identify any discrepancies between the predicted and actual impacts of the UEP and analyse the potential cause of any significant discrepancies.
- Describe what identified measures will be implemented over the next calendar year to improve the environmental performance of the development.

Copies of the annual review will be submitted to DPE, WCC, WSC and made available to the CCC and any interested person upon request and will be made public via listing on the website.

12.2 Auditing

In accordance with ***Condition F13***, an Independent Environmental Audit will be undertaken by a suitably qualified auditor and include experts in any field specified by the Secretary within 12 months of the approval and every three years after that within 12 months of the approval and every three years after that.

13 RECORDS AND DOCUMENT CONTROL

13.1 Plan revision

In accordance with ***Condition F7***, this BFMP will be reviewed within three months of:

- The submission of an incident report under ***Condition F9***.
- The submission of an annual review under ***Condition F11***.
- The submission of an independent environmental audit under ***Condition F13***; or
- The approval of any modification of the conditions of the development consent (unless the conditions require otherwise).
- In accordance with the prescribed extraction plan staging and or prior to future Extraction Plans.
- The suitability of existing strategies, plans and programs required under the development consent will be reviewed by WCL.

In accordance with ***Condition F8***, if necessary, to either improve the environmental performance of the project, cater for a modification or comply with a direction, the strategies, plans and programs required under the Development Consent will be revised, to the satisfaction of the Planning Secretary.

Where revisions are required, the revised document incorporating the relevant updates as above will be submitted to the Planning Secretary for approval within 6 weeks of the review.

Revisions to any documents listed within this Plan will not necessarily constitute a revision of this document.

Any revisions undertaken will be the responsibility of WCL and any notifications will be sent accordingly to TransGrid, Endeavour Energy, TfNSW, and DPE.

During the next major update of the plan as would likely be associated with subsequent extraction plans, further consultation with the identified stakeholders will be sought and the plan will be amended accordingly.

13.2 Record Keeping and Control

Environmental records are to be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

All records of the EMS will be stored so that they are readily retrievable and suitably protected from deterioration or loss. Archiving will be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

WCL will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on WCL's computer system, website, and hard copy at the Russell Vale Colliery, 7 Princes Highway, Corrimal NSW 2518.

13.3 Information Access

Before the commencement of construction until the completion of all rehabilitation required under this consent WCL will ensure the information and documents as stipulated in ***Condition F17*** and the EMS, are made publicly available on its website as they are obtained, approved or as otherwise stipulated within the conditions of this consent.

This information must be kept up to date to the satisfaction of the planning secretary.

13.4 Public sources of Information

To assist the public and other stakeholders in understanding the impacts from the development, including monitoring results, newsletters and updates, and in accordance with ***Condition F5 (i)***, WCL will:

- publish information on the company website;
- notify the local community through the Russell Vale CCC;
- contact individuals by direct notification (email subject to registration of interest) where relevant.

Information required to be published in accordance with ***Condition F17,*** such as CCC minutes, current statutory approvals and complaints register will also be included on the company website.

This information will be updated as required.

14 REFERENCES

DPE c2015 "Guidelines for the Preparation of Extraction Plans" Draft 5 - undated and unpublished guidelines prepared by the then Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy circa 2015.

B.K. Hebblewhite Consulting 2020 "Peer Review – Russell Vale Colliery Assessment of Risk of Pillar Failure" Letter Report No. 2003/03.1(final) to Ron Bush dated 7 April 2020.

SCT 2020 "IESC 2019-108: Quantitative Assessment of Risk of Pillar Failure in Russell Vale East Area" - SCT Report WCRV5111 Rev4 - 12 June 2020.

SCT 2021 "Russell Vale Colliery: Subsidence Assessment for PC07-08 and PC21-25 Extraction Plan" - SCT Report WCRV5285 – Rev3 - 23 June 2021.

SCT 2022a "Russell Vale Colliery: Advice to TfNSW Technical Committee Regarding a Risk Assessment and Built Features Management Plan for Stage 2 Extraction Plan at Russell Vale East" – SCT Letter Report WCRV5393A – 3 March 2022.

SCT 2022b "Russel Vale Colliery: Extraction Plan Subsidence Assessment for PC27-34 (Stage 2) Mining" SCT Report 5385 – Draft2 – 4 March 2022.

TfNSW 2021 "Major Projects MP09_0013-PA-2 – Proponent Request for Advice- Russell Vale Underground Expansion (CEMP)" Letter from Transport for NSW to Richard Sheehan dated 10 February 2021.

15 GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviations	
BCD	Biodiversity Conservation Department – now incorporated into Environment, Energy and Science Group,
BFMP	Built Features Management Plan
CCC	Community consultative committee
DPE	Department of Planning and Environment
EP	Extraction Plan
kV	Kilovolt
LGA	Local Government Area
MSB	Mine Subsidence Board
IPC	Independent Planning Commission
ROM	Run of Mine
RPPR	Revised Preferred Project Report
RR	Resource Regulator
RVC	Russell Vale Colliery
TfNSW	Transport for NSW (incorporates former RMS)
TARP	Trigger Action Response Plan
UEP	Underground Expansion Project
USWMP	UEP EP Upland Swamp Monitoring Program
WNSW	WaterNSW
WCL	Wollongong Coal Limited

Terms	Definition
Baseline data	Monitoring conducted over time to collect a body of information to define specific characteristics of an area (e.g., species occurrence or noise levels) prior to commencement of a specific activity.
Bord and pillar	Mining method comprising of a series of self-supporting roadways (or bords) within the coal seam leaving a grid of pillars of unmined coal which are designed to be stable in the long term.
Development Consent	Russell Vale Revised Underground Expansion Project MP09-0013.
First Workings	Involves the development headings or roadways which will provide access to the coal resource. They are developed using continuous miners with integrated roof and rib bolting rigs. First workings leave the coal pillars intact, and the overlying strata fully supported.
Incident	An occurrence or set of circumstances that cause or threaten to cause material harm and which may or may not be or cause a non-compliance.
Land	Has the same meaning as the definition of the term in section 1.4 the EP&A Act, except for where the term is used in the noise and air quality conditions in PART B of

Terms	Definition
	this consent where it is defined to mean a whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of the development consent.
Longwall	A secondary extraction method of mining coal that continuously removes the coal from the working face onto a series of conveyors that transfer the coal to the surface. As the coal is cut away (a 'shear'), both the longwall machine (known as a 'shearer') and the hydraulic roof supports advance forward ready for the next shear.
Material Harm	Is harm to the environment that: • Involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • Results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (such loss includes the reasonable cost and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment) This definition excludes "harm" that is authorised under either this consent or any other statutory consent.
Mine operations	The carrying out of mining, including the extraction, processing, stockpiling and transportation of coal on the site and the associated removal, storage and/or emplacement of vegetation, topsoil, overburden and reject material.
Minor	Not very large, immaterial.
Negligible	Small and unimportant, such as not to be worth considering.
Non-compliance	An occurrence, set of circumstances or development that is a breach of the development consent.
Pillar Extraction	A continuous miner system of mining whereby coal pillars are systematically extracted.
Pillar Run	A large-scale progressive collapse of coal pillars in a short period of time.
Public Infrastructure	Linear and related infrastructure and the like that provides services to the general public such as roads, railways, water supply infrastructure, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc.
Privately-owned Land	Land that is not owned by a public agency or a mining, petroleum or extractive industry company (or its subsidiary or related party).
Public infrastructure	Linear and related infrastructure and the like that provides services to the general public, such as roads, railways, water supply, drainage, sewage, gas supply, electricity, telephone, telecommunications etc.
Rehabilitation	The restoration of a landscape and especially the vegetation following its disturbance.
Second Workings	Extraction of coal from bord and pillar workings.
Strain	The change in the horizontal distance between two points divided by the original horizontal distance between the points.
Subsidence	The totality of subsidence effects, subsidence impacts and environmental consequences of subsidence impacts.

Terms	Definition
Subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, such a vertical and horizontal displacement, tilt, strain and curvature.
Subsidence impacts	Physical changes to the ground and its surface caused by subsidence effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and upsidence and surface depressions or troughs.
Tilt	The difference in subsidence between two points divided by the horizontal distance between the points.
Upsidence	Relative upward movement, or uplift, created by the horizontal compression and buckling behaviour of the rock strata in the vicinity of a valley floor.
Valley closure	A phenomenon whereby one or both sides of a valley move horizontally towards the valley centreline, due to changed stress conditions beneath the valley and its confining land masses

APPENDIX A - Built Features Trigger Action Response Plan (TARPs)

Table 13 – TransGrid TARP

Aspect	Monitoring			Trigger			
	Sites	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
330KV Transmission Line 11 Dapto to Sydney South and Towers	• **330KV** Single Circuit – Suspension Towers: 54, 55, 56, & 57.	• Observable surface deformations - ***LIDAR*** • Separation between tower legs – **prism/ point Survey** • Vertical subsidence – **GNSS # 5, 6, 7, 17** • Tilt – prism/ point Survey	**Prior to second workings** • conduct baseline survey Prism/ point - Survey and • GNSS continuous reading prior to second workings **During second workings within 350m of sites** • Prism/ point - Survey After each panel or annual or by TARP trigger and • LIDAR – Quarterly and • GNSS - continuous During mining over active secondary extraction area GNSS *data reviewed weekly* *Monthly in all other areas,* or as required by TARP trigger. **Post mining** - 12 months after completion of each panel.	**Observations within predictions.**			
				Continuous Monitoring • <20 mm vertical subsidence (GNSS) **Attended Survey** • No observable surface deformations • <5 mm leg vertical differential; and • Tilt <1mm/m.	• Data and report to: - TransGrid • RR subsidence portal	•Within 1 week following collection & processing of data, document report quarterly during secondary extraction.	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations potentially exceed predictions.			
				Continuous Monitoring •Vertical subsidence >20 mm (GNSS) **Attended Survey** • Separation between tower legs (10 to 20 mm) and/or •Tilt >1mm/m • Observable surface deformations	• Notify the following key stakeholders within 24hours of becoming aware of the trigger: - TransGrid - Principal Subsidence Engineer RR. • Continue consultation with TransGrid	• Notify the Key Stakeholders, as appropriate, within 24hrs of becoming aware of the trigger	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations continue to exceed predictions.			
				Continuous Monitoring • Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm) **Attended Survey** • Separation between tower legs (>20mm) and/or • Tilt >1mm/m • Observable surface deformations	• Notify the Key Stakeholders, as appropriate: - TransGrid - Principal Subsidence Engineer RR. Implement adaptive management and contingency measures e.g. • Confirm readings • Cease underground mining immediately and review mining options. • Undertake additional 3D survey and check against pre-mining data and review against predictions. • TransGrid and RVC to undertake joint visual inspections accordingly. • Liaise with TransGrid regarding any action/s required. • RVC to review mine planning for future mining areas to avoid further impacts	• Notify the Key Stakeholders, as appropriate, immediately following awareness of trigger being met	• Russell Vale Colliery (Environmental Manager) •Survey Manager

Table 14 – Endeavour Energy TARP – 132 KV

Aspect	Monitoring			Trigger			
	Sites	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
132KV Transmission Line 132 kV transmission line tower	• **132 kV Single Circuit - Tower No. E66 to E69**	• Observable surface deformations - ***LIDAR*** • Vertical subsidence – **GNSS # 5, 6, 7, 17** • Tilt – **prism/ point Survey** • Separation between tower legs – **prism/ point Survey.**	**Prior to second workings** • conduct baseline survey Prism/ point – Survey and • GNSS continuous reading prior to second workings **During second workings within 350m of sites** • Prism/ point - Survey After each panel or annual or by TARP trigger and • LIDAR – Quarterly and • GNSS - continuous During mining over active secondary extraction area with data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post mining** • 12 months after completion of each panel.	**Observations within predictions.**			
				GNSS unit - <20 mm vertical subsidence **Attended Survey** • No observable surface deformations and/or • <5 mm leg vertical differential and/pr • Tilt <1mm/m.	• Data and report to: - Endeavour Energy • RR subsidence portal	• Within 1 week following collection & processing of data, document. • Report quarterly during secondary extraction.	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations potentially exceed predictions.			
				GNSS unit • vertical subsidence >20 mm **Attended Survey** • Observable surface deformations and / or • Tilt >1mm/m and/or • Separation between tower legs (10 to 20 mm)	• Notify the following key stakeholders within 24hours of becoming aware of the trigger: - Endeavour Energy - Principal Subsidence Engineer RR. • Continue consultation with Endeavour Energy. • Continue monitoring and increase the review of subsidence monitoring data to weekly. • Undertake a review of the panel design parameters in consultation with Geotechnical advice. • Inform key stakeholders of potential impact. • Undertake site inspection of surface area to document and photograph any observed changes / impacts. • Carry out attended survey. • Investigate potential cause of observed changes in site condition and, if identified as potential caused by mining, review mining geometry until relative movement is controlled.	• Notify the Key Stakeholders, as appropriate, within 24hrs of becoming aware of the trigger:	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations continue to exceed predictions.			
				GNSS units • Vertical subsidence greater than 100mm (> 100 mm) **Attended Survey (132 kV Towers)** • Observable surface deformations and/ or	• Notify the following key stakeholders, as appropriate: - Endeavour Energy - Principal Subsidence Engineer RR. **Monitoring and remediation action**	• Notify the Key Stakeholders, as appropriate, **immediately following awareness** of trigger being met:	• Russell Vale Colliery (Environmental Manager) •Survey Manager

Aspect	Monitoring			Trigger			
	Sites	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
				• Separation between tower legs (>20mm) and/or • Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm)	• Implement adaptive management and contingency measures e.g. o Confirm readings. o Continue monitoring and increase the review of Subsidence monitoring data for that area to daily. o Stop mining in the impacted area immediately and investigate causes of the increased subsidence. o Undertake a review of the panel design parameters in consultation with Geotechnical advice. o Contact Endeavour Energy to undertake joint site inspection of surface area to document and photograph any observed changes / impacts. • Investigate potential cause of observed changes in site condition. Where the investigation identifies mining as a likely cause of the changes: o Liaise with Endeavour Energy regarding any action/s required. o RVC to review mine planning for future mining areas to avoid further impacts		

Table 15 – Endeavour Energy TARP – 33 KV

Aspect	Monitoring			Trigger			
	Sites	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
33KV Transmission Line 33KV line pylons within span between 132 KV tower E66-E69.	**33KV pylons within span between 132 KV tower E66-E69.**	• Observable surface deformations – ***LIDAR*** • Vertical subsidence – **GNSS # 31, 32** • Tilt – **prism/ point Survey**	**Prior to second workings** • conduct baseline survey Prism/ point – Survey and • GNSS continuous reading prior to second workings **During second workings within 350m of sites** • Prism/ point - Survey After each panel or annual or by TARP trigger and • LIDAR – Quarterly and • GNSS - continuous During mining over active secondary extraction area with data reviewed weekly Monthly in all other areas, or as required by TARP trigger. **Post mining** • 12 months after completion of each panel.	**Observations within predictions.**			
				GNSS unit – • <50 mm vertical subsidence **Attended Survey** • No observable surface deformations and/or • Tilt <1mm/m.	• Data and report to: - Endeavour Energy • RR subsidence portal	• Within 1 week following collection & processing of data, document. • Report quarterly during secondary extraction.	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations exceed or potentially exceed predictions.			
				GNSS unit • vertical subsidence >50 mm **Attended Survey** • Observable surface deformations and / or • Tilt >1mm/m	• Notify the following key stakeholders within 24hours of becoming aware of the trigger: - Endeavour Energy - Principal Subsidence Engineer RR. • Continue consultation with Endeavour Energy. • Continue monitoring and increase the review of subsidence monitoring data to weekly. • Undertake a review of the panel design parameters in consultation with Geotechnical advice. • Inform key stakeholders of potential impact. • Undertake site inspection of surface area to document and photograph any observed changes / impacts. • Carry out attended survey. • Investigate potential cause of observed changes in site condition and, if identified as potential caused by mining, review mining geometry until relative movement is controlled.	• Notify the Key Stakeholders, as appropriate, within 24hrs of becoming aware of the trigger:	• Russell Vale Colliery (Environmental Manager) •Survey Manager
				Observations continue to exceed predictions.			
				GNSS units • Vertical subsidence greater than 100mm (> 100 mm) **Attended Survey (33 kV Towers)** • Observable surface deformations and/ or	• Notify the following key stakeholders, as appropriate: - Endeavour Energy - Principal Subsidence Engineer RR. **Monitoring and remediation action**	• Notify the Key Stakeholders, as appropriate, **immediately following awareness** of trigger being met:	• Russell Vale Colliery (Environmental Manager) •Survey Manager

Aspect	Monitoring			Trigger			
	Sites	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
				• Vertical subsidence greater than predicted maximum (Upper 95% CL – identified as 100mm)	• Implement adaptive management and contingency measures e.g. o Confirm readings o Continue monitoring and increase the review of Subsidence monitoring data for that area to daily. o Stop mining in the impacted area immediately and investigate causes of the increased subsidence. o Undertake a review of the panel design parameters in consultation with Geotechnical advice. o Contact Endeavour Energy to undertake joint site inspection of surface area to document and photograph any observed changes / impacts. • Investigate potential cause of observed changes in site condition. Where the investigation identifies mining as a likely cause of the changes: o Liaise with Endeavour Energy regarding any action/s required. o RVC to review mine planning for future mining areas to avoid further impacts.		

Table 16 – Transport for NSW TARP - M1/ Mt Ousley Rd

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
M1/ Mt Ousley Rd Carriageway General Carriageway– Cataract Creek (100m) Carriageway- Mt Ousley Road – tension zone at ridge (P46)	**GNSS** GNSS 1, 2, 8, 14, 16	**GNSS** • **Vertical Subsidence** monitoring (real time) GNSS 1, 2, 8, 14, 16). • **Valley closure at Cataract Creek**: Relative Hz movement between 1<->8 and 2<->8. • **Ground movement at tension zone**: Relative Hz movement between 14<->16 and 2<->16.	**GNSS** • Real time monitoring • Data reviewed weekly during mining over active mining area or as required by TARP trigger or TC. • Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	**Observations within predictions** **GNSS** • **GNSS 1, 2, 8, 14, 16** Vertical subsidence not greater than 50mm • **Valley Closure - GNSS 1<->8, 2<->8** Relative Hz movement between units not greater than 30mm • **Ground Movement -GNSS 14<->16 and 2<->16** Relative Hz movement between units not greater than 30mm **Crackmeter:** Closure not greater than 30mm. **Survey** Quarterly CC1-CC4 or as determined by TC **Drive through survey:** No reports of potential or actual mining related damage to TfNSW infrastructure.	Continue to monitor as per monitoring plan	Ongoing	WCL
	Crackmeter • Across slot on each carriageway	**Crackmeter** • Slot closure on southbound and northbound carriageways	**Crackmeter** • Real time monitoring • Data reviewed weekly during mining over active mining area or as required by TARP trigger or TC. • Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	**Observations exceed or potentially exceed predictions.** **GNSS** • **GNSS 1, 2, 8, 14, 16** Vertical subsidence > 50mm, not greater than 100mm • **GNSS 1<->8 and 2<->8** Relative HZ movement between units > 30mm but not greater than 100 mm.	**GNSS 1, 2, 8, 14, 16 (subsidence)** • Carry out Q-Line survey • Carry out CC1-CC4 survey **GNSS 1<->8 and 2<->8** • Carry out Q-Line survey • Carry out CC1-CC4 survey • Carry out visual road inspection	**Q-Line Survey** • Within 7 days **CC1-CC4 Survey** • Within 7 days **Visual road inspection** • Within 7 days **SXC1-SXC2, SXC3 – SXC4 and QCN – QCS Survey**	**WCL** • Q-Line Survey • CC1-CC4 Survey • Visual road inspection • General **TfNSW**

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
	Drive-through inspections: • At traffic speed by TfNSW.	**Drive-through inspections:** • TfNSW to report on new defects and comment on possible repairs required.	**Drive-through inspections:** • Twice weekly	• **GNSS 14<->16 and 2<->16** Relative Hz movement between units > 30mm but not greater than 100 mm. **Crackmeter** >30mm, not greater than 100mm closure. **Drive through inspections** Reports of potential mining related damage to TfNSW infrastructure.	**GNSS 14<->16 and 2<->16** • Carry out SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS survey • Carry out visual road inspection **Crackmeter** • Carry out Q-Line survey • Carry out CC1-CC4 survey • Carry out visual road inspection **Drive through inspections** • Inspect and determine cause of damage **General** • Review underground mining • Review results of Q-Line/CC1-CC4/Tension Crack monitoring surveys • Commence investigation into potential red trigger exceedance • Check slot closure and consider re-cutting slot. • Technical Committee to meet to review monitoring data to decide on and to direct proactive action	• Within 7 days **Drive-through inspections** • In accordance with TfNSW protocols **General** • Inform the Technical Committee within 7 days or 14 days noting trigger actions • Investigation commences immediately • Notify DPE of potential exceedance	• Visual road inspection
	Survey • **CC1- CC4** • **Q-Line survey** • **Tension crack monitoring** SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS	**Survey** • **CC1- CC4:** Valley closure at Cataract Creek • **Q-Line survey:** General subsidence and strain along southbound carriageway. • **Tension crack monitoring:** Relative movement between monitoring points.	**Survey** • **CC1-CC4:** Quarterly or as determined by TC • **Q-line Survey:** After amber trigger and then as determined by TC • **Tension crack monitoring:** After amber trigger and then as determined by TC				
	Observations exceed amber trigger or impact to structural integrity and or serviceability of infrastructure occurs.						
				• **GNSS 1, 2, 8, 14, 16** Vertical subsidence greater than 100mm • **GNSS 1<->8 and 2<->8** Relative Hz movement between units greater than 100 mm. • **GNSS 14<->16 and 2<->16** Relative Hz movement between units greater than 100 mm. • **Crackmeter** Greater than 100mm closure. • **Drive through inspections** Reports of actual mining related damage to TfNSW infrastructure.	• Implement adaptive management and contingency measures e.g • Stop mining and review mining options • TfNSW to inspect pavement • TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police • Carry out surveys and inspections as for amber trigger • Commence investigation into exceedance	• TfNSW pavement inspection and traffic commander notification within 2hrs • Inform the Technical Committee within 24 hours • WCL Investigation commences immediately • Notify DPE within 48 hours • Notify RR with written confirmation within 48hours	WCL

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency	Level	Action/Reporting	Timing	Responsibility
					• TFNSW TC to meet to review monitoring data to decide on and to direct proactive action • WCL and TfNSW to undertake visual inspections if safe to do so		

Table 17 – Transport for NSW TARP - M1 Bridges

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
Bridges Picton Rd interchange - B7926 Steel Arch over Rocky Creek Culvert – B7932 Culvert over Cataract River – B814	**GNSS** • GNSS 16	**GNSS** • Absolute horizontal ground movements	**GNSS** • Real time monitoring • Data reviewed weekly during mining over active mining area or as required by TARP trigger or TC. • Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	**Observations within predictions**			
				• **GNSS16** Absolute horizontal ground movements no greater than 30mm. • **Drive through survey:** No reports of potential or actual mining related damage to TfNSW infrastructure	Continue to monitor as per monitoring plan	Ongoing	WCL
	TfSNW Drive-through inspections: • At traffic speed by TfNSW.	**TfNSW Drive-through inspections:** • TfNSW to report on new defects and comment on possible causes and action.	**TfNSW Drive-through inspections:** • Twice weekly	**Observations potentially exceed predictions.**			
				• **GNSS 16** Total horizonal movement greater than 30mm. • **Drive through survey:** Report of potential or actual mining related damage to bridge.	• **GNSS 16** Carry out prism survey of the bridge Carry out visual bridge inspection • **Drive through survey:** TfNSW to report on new defects and comment on possible causes and action. **General** • Review underground mining. • Bridge Engineer to review prism survey results and bridge inspection report and assess impacts on bridge. • Commence investigation into potential red trigger exceedance. • Technical Committee to meet to review monitoring data to decide on and to direct proactive action. • WCL and TfNSW to undertake visual inspections.	• **Drive through survey:** In accordance with TfNSW protocols • **Prism survey and inspection** Within 7 days • **Visual bridge inspection** Within 7 days **General** • Inform the Technical Committee within 7 days noting trigger actions • Investigation commences immediately • Notify DPE of potential exceedance	• **WCL** Undertake prism survey and visual bridge inspection with specialists as required • **TfNSW** review specialists reports and or survey outcome as required
	Prism Survey • Existing monitoring prisms on Picton Rd Bridge.	**Prism Survey** • Prism X,Y,Z movements distance as measured between any pair of prisms.	**Prism Survey** • After amber trigger and then as determined by TC.				
	Visual bridge inspection • By TfNSW certified Bridge Engineer	**Visual bridge inspection** • General condition of bridge	**Visual bridge inspection** • After amber trigger and then as determined by TC	**Observations continue to exceed predictions.**			
				• Structural defects noticeable. • Advice from bridge engineer that bridge has become unsafe or is in an unserviceable condition.	• Implement adaptive management and contingency measures e.g. • Stop mining and review mining options • TfNSW/bridge specialist to inspect bridge	• TfNSW/bridge specialist inspection and traffic commander notification within 2hrs • Inform the Technical Committee within 24 hours	**WCL** Engage bridge specialist for inspection and review **TfNSW**

Monitoring Site	Monitoring Details			Trigger			
	Instrument	Parameters	Frequency after Trigger	Level	Action/Reporting	Timing	Responsibility
					• TfNSW to notify Traffic commander via TMC to enforce bridge and road closure – enforced by traffic commander and NSW police Commence investigation into exceedance • Technical Committee to meet to review monitoring data to decide on and to direct proactive action • WCL and TfNSW to undertake visual inspections	• Investigation commences immediately • Notify DPE within 48 hours • Notify RR with written confirmation within 48hours	Inspection and Engineering review with specialist

Table 18 – Transport for NSW TARP - M1 Culverts

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
Culverts Cataract Creek Culverts Multiple Culverts	**GNSS** • GNSS 1, 2, 8	**GNSS** • General vertical subsidence • Valley closure at Cataract Creek: Relative movement between GNSS 1<->8 and 2<->8.	**GNSS** • Real time monitoring Data reviewed weekly during mining over active mining area. • Data reviewed monthly in all other areas, or as required by TARP trigger.	**Observations within predictions**			
				• **GNSS 1,2,8** Vertical subsidence not greater than 100mm • **GNSS 1<->8, 2<->8** Relative Hz movement between units not greater than 30mm. • **Crackmeter:** Closure not greater than 30mm closure. • **Drive through survey:** No reports of potential or actual mining related damage to TfNSW infrastructure.	Continue to monitor as per monitoring plan	Ongoing	WCL
				Observations exceed / potentially exceed predictions.			
	Crackmeter • Across slot on each carriageway	**Crackmeter** • Slot closure on southbound and northbound carriageways	**Crackmeter** • Real time monitoring • Data reviewed weekly during mining over active mining area or as required by TARP trigger or TC. • Data reviewed monthly in all other areas, or as required by TARP trigger or TC.	• **GNSS 1, 2, 8** Vertical subsidence > 100mm, not greater than 280mm • **GNSS 1<->8 and 2<->8** Relative Hz movement between units > 30mm but not greater than 100 mm. • **Crackmeter** >30mm, not greater than 100mm closure. • **TfNSW Drive through survey**	**GNSS 1, 2, 8** • Carry out prism survey of culvert • Commence CC1-CC4 monitoring • Carry out visual culvert inspection **GNSS 1<->8 and 2<->8** • Carry out prism survey of culvert • Commence CC1-CC4 survey • Carry out visual culvert inspection **Crackmeter** • Carry out prism survey of culvert	**Prism survey of culvert** • Within 7 days **CC1-CC4 Survey** • Within 7 days **Visual culvert inspection** • Within 7 days **Drive-through inspections:** • In accordance with TfNSW protocols **General**	WCL • Prism survey of culvert • CC1-CC4 Survey • Visual culvert inspection • General TfNSW • Carry out visual culvert inspection

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
	Culvert prism survey Existing monitoring prisms on culverts	**Culvert prism Survey** General subsidence along or nearby culverts Deformation of culverts	**Culvert prism Survey** • After amber trigger and then as determined by TC.	Reports of potential mining related damage to TfNSW infrastructure.	• Commence CC1-CC4 survey • Carry out visual culvert inspection **TfNSW Drive through survey** • Inspect and determine cause of potential damage **General** • Review underground mining • Commence investigation into potential exceedance • Technical Committee to meet to review monitoring data to decide on and to direct proactive action • Consider carrying out deformation analysis on culvert based on culvert prism survey and set upper limit for culvert deformation. • WCL and TfNSW to undertake visual inspections	• Inform the Technical Committee within 7 days noting trigger actions • Investigation commences immediately • Notify DPE of potential exceedance.	
	CC1-CC4: Quarterly • Survey of closure points	**CC1-CC4: Quarterly** • Cataract creek valley closure monitoring	**CC1-CC4: Quarterly** • Carry out cataract creek survey				
	Visual inspection By TfNSW Engineer	**Visual inspection** General condition of culvert and any movements at joints	**Visual inspection** After amber trigger and then as determined by TC	**Observations continue to exceed predictions.**			
				• **GNSS 1, 2, 8** Vertical subsidence greater than 280mm • **GNSS 1<->8 and 2<->8** Relative Hz movement between units greater than 100 mm. • **Crackmeter** Greater than 100mm closure. • **Culvert deformation analysis** Deformation exceeds permissible deformation upper limit. • **Drive through survey** Reports of significant actual mining related damage to TfNSW infrastructure.	• Implement adaptive management and contingency measures e.g. • Stop mining and review mining options. • TfNSW to inspect pavement • TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police • Carry out prism survey of culvert if safe to do so • Commence investigation into exceedance • Technical Committee to meet to review monitoring data to decide on and to direct proactive action • Consider strengthening culvert • WCL and TfNSW to undertake visual inspections if safe to do so	• TfNSW pavement inspection and traffic commander notification within 2hrs • Inform the Technical Committee within 24 hours • Investigation commences immediately • Notify DPE within 48 hours • Notify RR with written confirmation within 48hours	• WCL

Table 19 – Transport for NSW TARP - M1 Slopes

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
Slopes ARL2 – 955771/ 95770/ 13482 ARL3 – 10839/ 13483/ 13484/ 13485	**GNSS** • GNSS 1, 2, 8, 14, 16	**GNSS** • Valley closure at Cataract Creek: Relative movement between 1<->8 and 2<->8 GNSS 14<->16 and 2<->16 • General vertical subsidence	**GNSS** • Real time monitoring • Baseline readings measured prior to second workings • Data reviewed weekly during mining over active mining area • Data reviewed monthly in all other areas, or as required by TARP trigger.	**Observations within predictions.**			
				• **GNSS 1, 2, 8, 14, 16** Vertical subsidence <150mm • **GNSS 1<->8, 2<->8** Relative Hz movement between units not greater than 50mm • **GNSS 14<->16 and 2<->16** Relative Hz movement between units not greater than 50mm • **Drive through survey** No reports of potential or actual mining related damage to TfNSW infrastructure.	Continue to monitor as per monitoring plan	Ongoing	WCL
				Observations potentially exceed predictions.			
	Drive-through inspections: At traffic speed by TfNSW.	**Drive-through inspections:** TfNSW to report on new defects and comment on possible repairs required.	**Drive-through inspections:** Twice weekly	• **GNSS 1, 2, 8, 14, 16** Vertical subsidence >150mm • **GNSS 1<->8, 2<->8 and GNSS 14<->16 and 2<->16** Relative Hz movement between units greater than 50mm. • **Drive through inspections** Reports of actual mining related damage to TfNSW infrastructure.	**GNSS 1, 2, 8, 14, 16 (subsidence),** **GNSS 1<->8 and 2<->8, GNSS 14<->16 and 2<->16** • Carry out Q-Line survey • Carry out visual slope inspection • Carry out SXC1 – SXC2, SXC3 – SXC4 and QCN – QCS survey **Drive through inspections** • Inspect and determine cause of damage Carry out visual Inspection of slope to assess changes in slope condition. **General** • Review underground mining • Commence investigation into potential red trigger exceedance • Consider trimming or stabilising affected slope (rockfall mesh, barriers etc)	• Inform the Technical Committee within 7 days or 14 days noting trigger actions • Investigation commences immediately • Notify DPE of potential exceedance	WCL
	Visual slope inspection Inspection by geotechnical engineer	**Visual slope inspection** Inspection of slope to assess changes from previous condition.	**Visual slope inspection** • After amber trigger and then as determined by TC.				

Monitoring Site	Monitoring Details			Trigger			
	Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
					• Technical Committee to meet to review monitoring data to decide on and to direct proactive action • WCL and TfNSW to undertake visual inspections;		
				Observations continue to exceed predictions.			

				• **Drive through inspections**
				Reports of significant ground movement or failure at slopes.
					• Implement adaptive management and contingency measures e.g.
					  • Stop mining and review mining options
					  • TfNSW to inspect pavement and slope
					  • TfNSW to notify Traffic commander via TMC to enforce immediate speed restriction – enforced by traffic commander and NSW police
					  • Carry out slope visual inspection to identify nature and scale of issues and possible solutions
					  • Commence investigation into exceedance
					  • Technical Committee to meet to review monitoring data to decide on and to direct proactive action
					  • WCL and TfNSW to undertake visual inspections
						• TfNSW pavement inspection and traffic commander notification within 2hrs
						• Inform the Technical Committee within 24 hours
						• Investigation commences immediately
						• Notify DPE within 48 hours
						• Notify RR with written confirmation within 48 hours
							• WCL

Table 20 - Continuous Monitoring TARP (Grey Triggers)

Monitoring Details			**Trigger**			
Instrument	**Parameters**	**Frequency after Trigger**	**Level**	**Action/Reporting**	**Timing**	**Responsibility**
GNSS 1, 2, 8, 14, 16 Crackmeter	Instrumentation functioning	After loss of power or signal	**Observations within predictions.**			
			GNSS units and crackmeters functioning	Continue to monitor as per monitoring plan	Ongoing	WCL
			Loss of power or signal from any instrument	Identify and rectify cause Report in next status report	Within 24 hours of loss	WCL

APPENDIX B – Consultation

Stage 1

- TfNSW – Finalised Risk Assessment Report *(20211008 TfNSW PC07-08 and PC21-25 Risk Report – Issued)*
- TransGrid – Presentation and Letter response to draft BFMP submission including TARP
- Endeavour – Presentation and correspondence
- WCL to EE BFMP Consultation Meeting Minutes 21.07.2021
- Surveyor general correspondence and disturbance approval
- WCL and TfNSW Meeting Minutes 10.11.2021 and 24.11.2021

Stage 2

- Technical Committee – correspondence prepared by SCT (3.03.2022) regarding risk assessment and built features management plan for Stage 2 Extraction Plan at Russell Vale East
- AECOM Memo 04.04.2022
- TfNSW – Presentation regarding EP1 subsidence results to date and EP2 proposed extraction via continued monthly TC.
- TransGrid – Presentation regarding EP1 subsidence results to date and EP2 proposed extraction.
- Endeavour Energy – Presentation regarding EP1 subsidence results to date and EP2 proposed extraction.
- WaterNSW – consultation and feedback records.

Wollongong Coal Limited - Russell Vale East Extraction Plan for Stage1 (PC21-25 and PC07-08) and Stage2 (PC27-34) Mining

Subsidence Overview for Consultation with TRANSGRID

Update for 18/05/2022

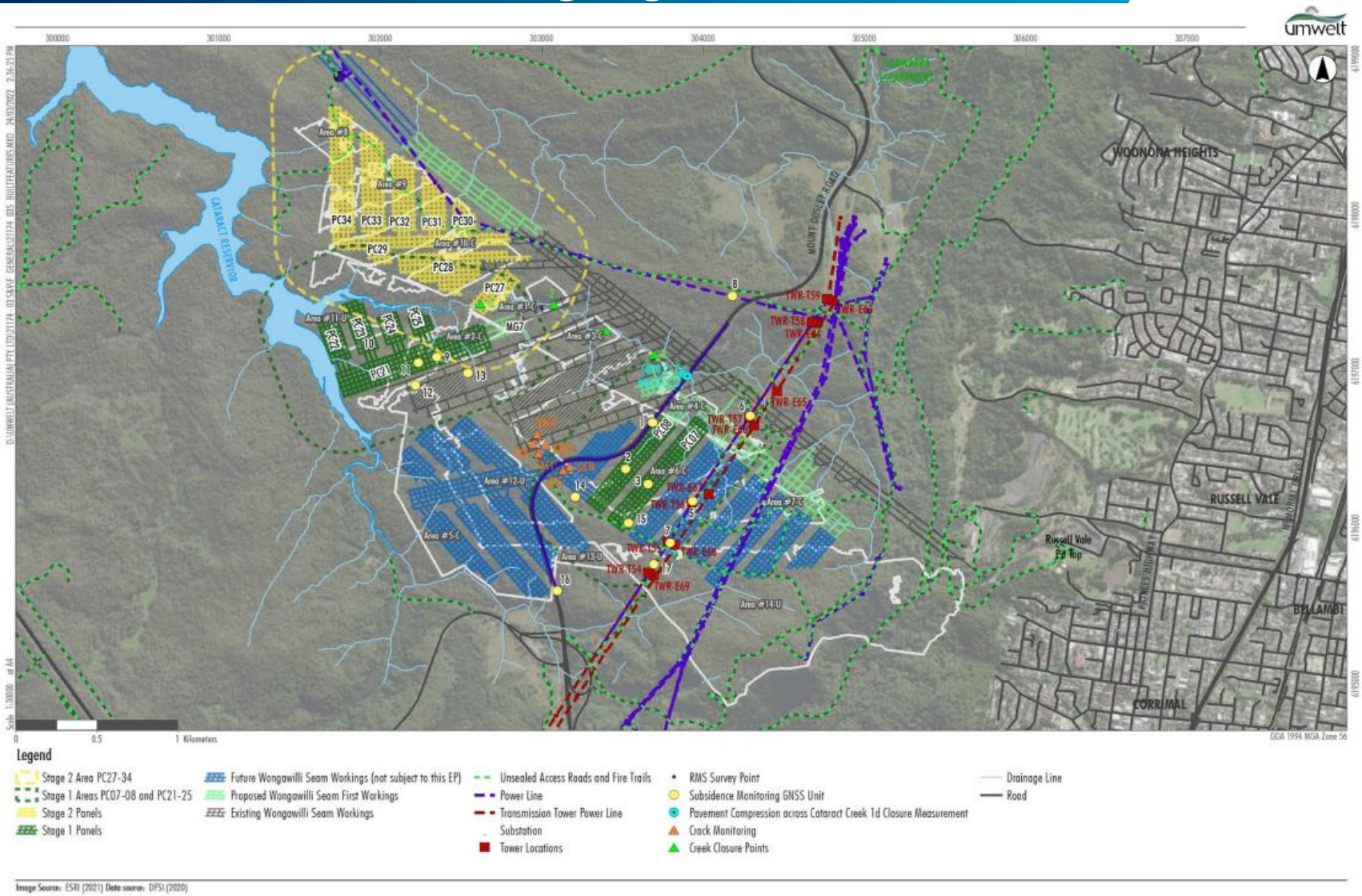
Geotechnical research, consulting, field services and instrumentation for mining and civil industries.

SCT

Overview of Presentation

- Key Messages
- Site Description
  - Scope of Stage1 and Stage2
  - Previous mining and subsidence context and proposed monitoring
  - Surface features with approved existing and additional monitoring
- Subsidence Monitoring Results to Date
- Recommendations to TransGrid
  - Appropriateness of BFMP and RA requirements
- Background Information (previously presented)

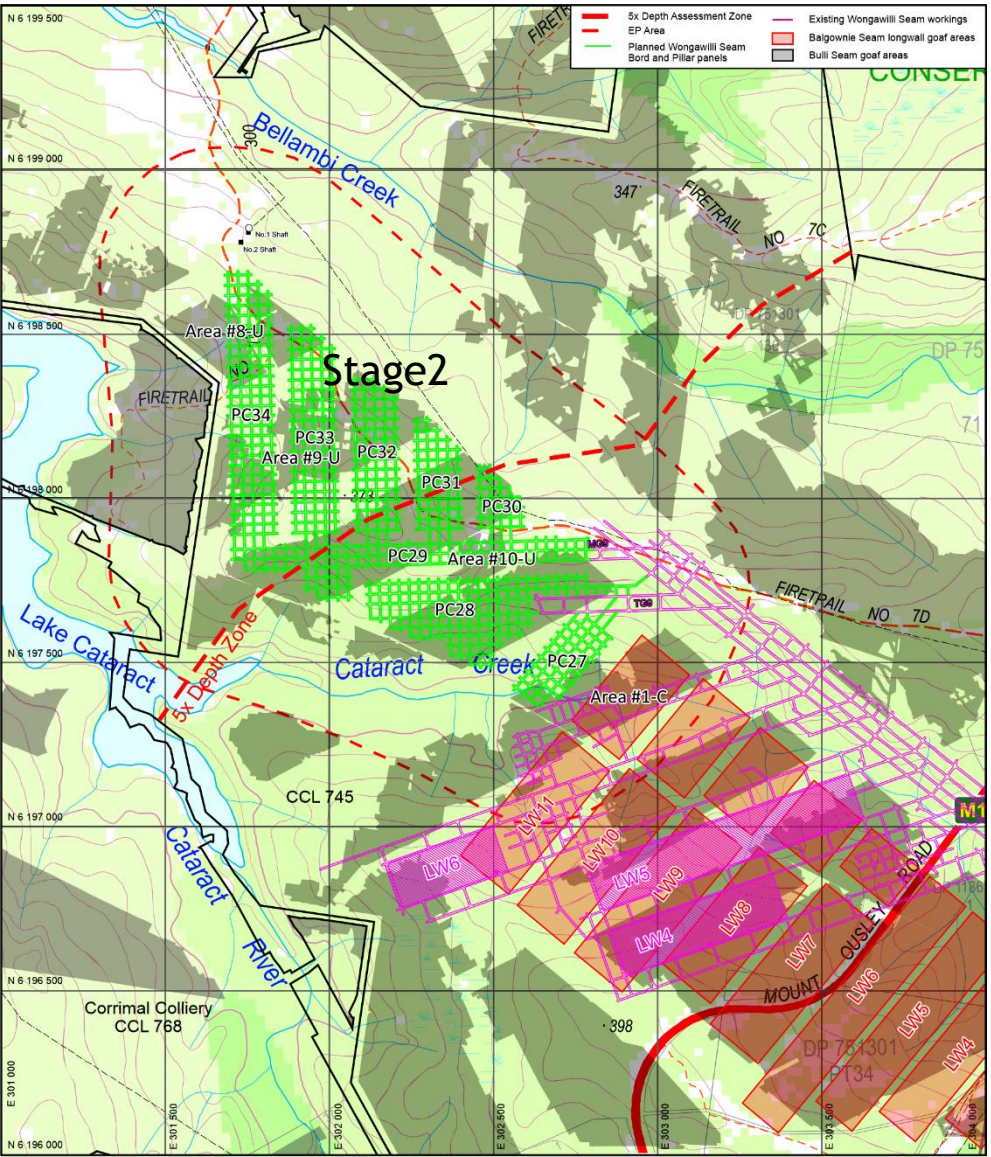
Built Features Monitoring Network and Extraction Plan Staging



Key Messages

- Planned Stage2 mining is further to west of Stage1 (a) i.e. more remote from major infrastructure
- No perceptible subsidence movements and impacts expected at 330, 132 and 33kV powerlines
- No change to subsidence expectation of less than 100mm over majority of RVE area with any impacts expected to be imperceptible for all practical purposes
- No change to the approved monitoring for built features - additional GNSS units in Stage2 area primarily for monitoring of natural features (swamps) and to confirm status of Bulli Seam Goaf areas.
- Existing BFMP is considered suitable for Stage2, formal Risk Assessment is not considered necessary
- The approved subsidence monitoring for the mining to date indicates subsidence is less than as expected i.e. ±20mm at all GNSS unit locations
- No change to contingency for managing potential for generally greater than 100mm subsidence by staging extraction and revising mining layout if required (adaptive management measures)
  - Stage 1(a) – (PC21-25) Remote from infrastructure
  - Stage 1(b) – (PC07-08) Offset from infrastructure
  - Mining in Stage 1(b) (PC07 & PC08) can only commence once subsidence confirmed as less than 100mm in PC21
  - Flexible mining system that can be modified to reduce potential for subsidence
  - TfNSW Technical Committee managing any subsidence effects and impacts to Mount Ousley Road
- No change to very low potential for legacy mining impacts that exist irrespective of planned mining. Subsidence effects and impacts managed by:
  - LIDAR surveys of whole RVE area
  - Underground observations of mining conditions

Site Description – Stage2



LOCALITY:

Stage2 (PC27-34) mining is further to west than Stage1 in Approved Extraction Plan (EP1)
i.e. more remote from major infrastructure of Mount Ousley Road and 330kV and 132kV high voltage powerlines to east

Only minor infrastructure above Stage2:

- Fire trails (Water NSW)
- Mining related infrastructure (e.g. 33kV powerline) owned by WCL

Site Description – Stage1 and Stage2

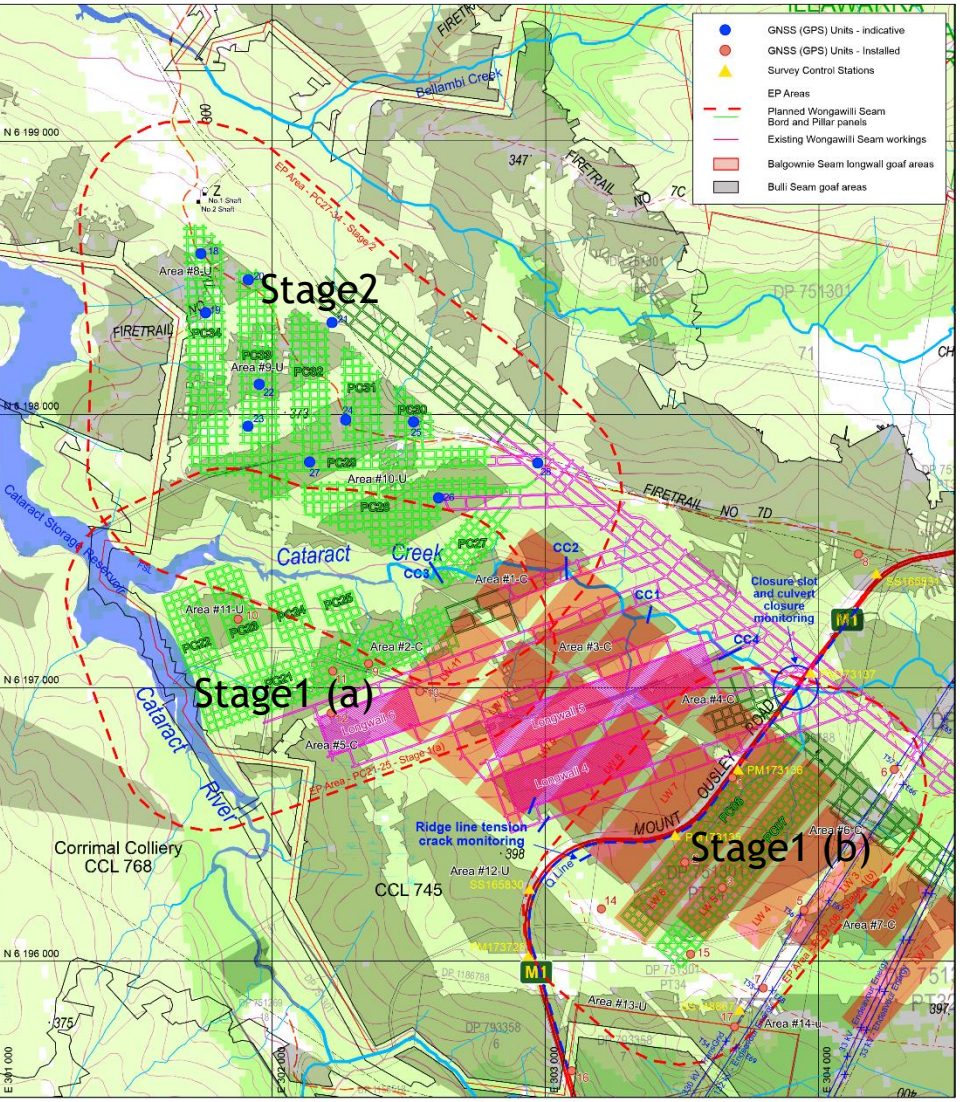


Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

SCOPE of EXTRACTION PLANS

- EP1 = Stage1 (a) – PC21-25 and Stage1 (b) – PC07-08
- EP2 = Stage 1 (a) and Stage1 (b) and Stage 2 (PC27-34)
- EP1 approved mining in Stage 1(a) (below area where no built features) to prove mining method in PC21 results in less than 100mm subsidence before mining in Stage1 (b) (PC07-08) adjacent to major infrastructure can proceed

Site Description – Stage1 and Stage2

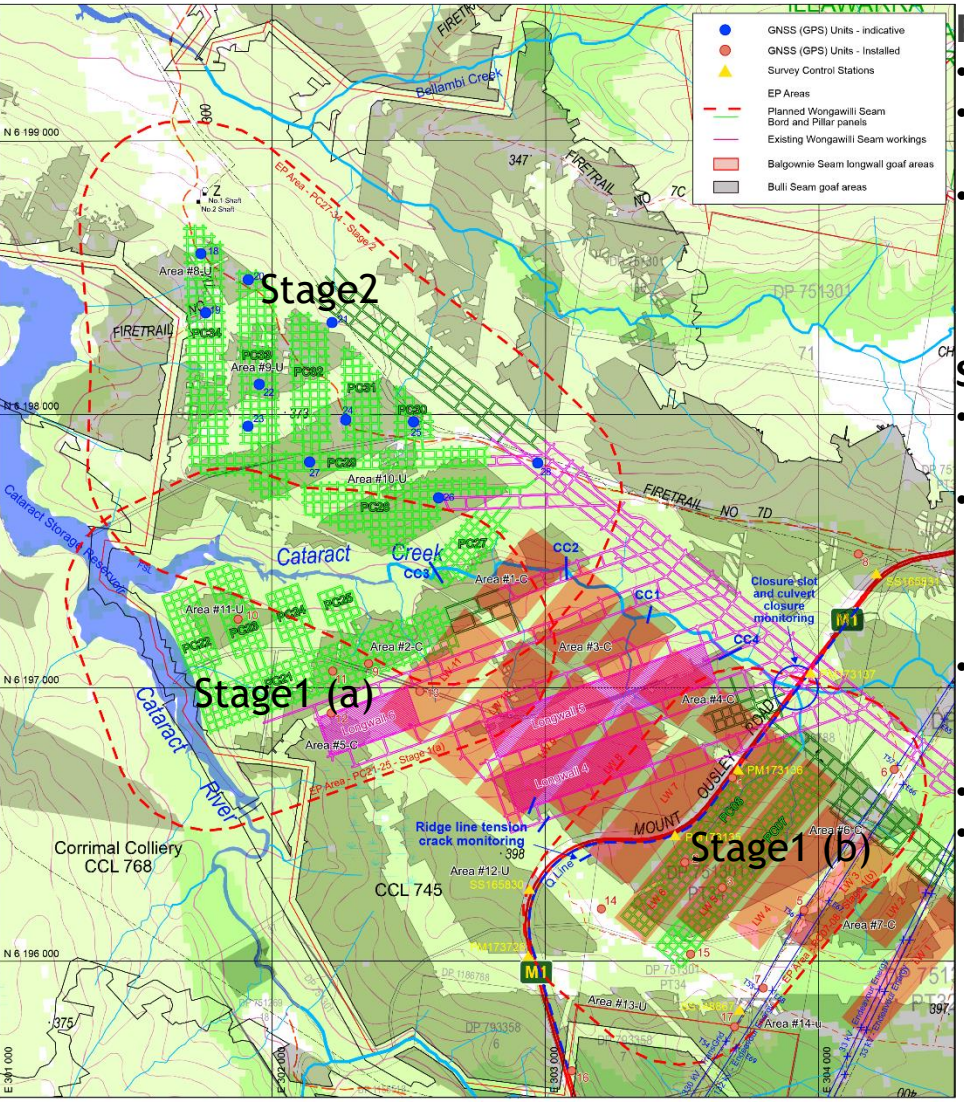


Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

PREVIOUS MINING CONTEXT:

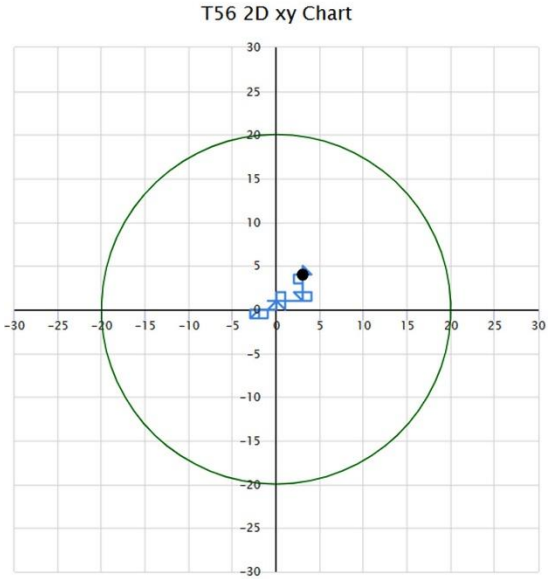
- Three seams of mining with complete mining records
- Subsidence monitoring data available for Balgownie and Wongawilli Seams
- Maximum cumulative subsidence of 3.7m in small areas – Maximum incremental subsidence = 1m from Bulli, 1.4m from Balgownie and 1.8m from Wongawilli Seam

SUBSIDENCE MONITORING FOR STAGE1 AND STAGE2:

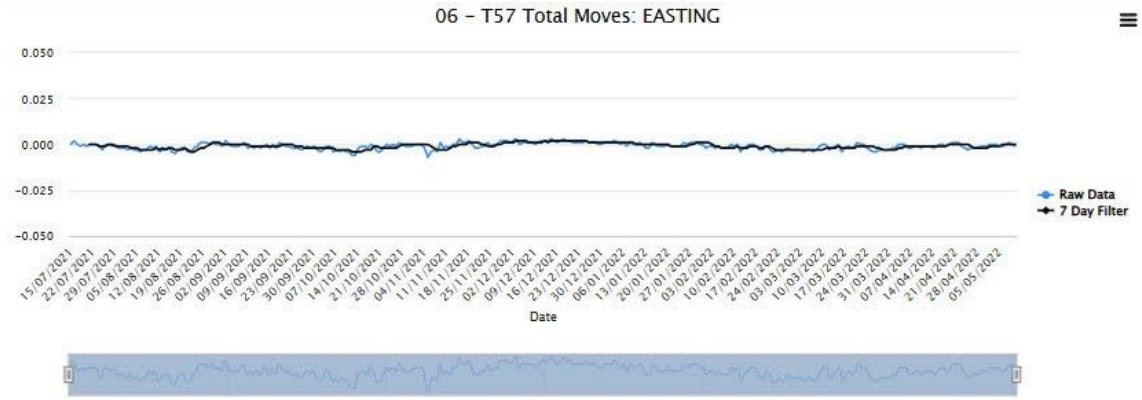
- As approved in EP1 for Stage1 (a) and (b) with additional GNSS units above Stage2 panels
- In addition to the continuous GNSS point and Mount Ousley Road pavement slot closure monitoring, periodic attended ground surveys and regular visual inspections of the road, the approved monitoring includes:
- GNSS units #5, #6, #7 & #17 that provide measurements of vertical and horizontal movements nears towers T56 & E67, T57 & E66, T55 & E68 and T54 & E69 on 330kV and 132kV lines.
- Periodic ground surveys of tower base geometry and tilt.
- GNSS units #3 & #15 (above PC08) that also provide measurements of vertical and horizontal movements between PC07 and the powerline easements.

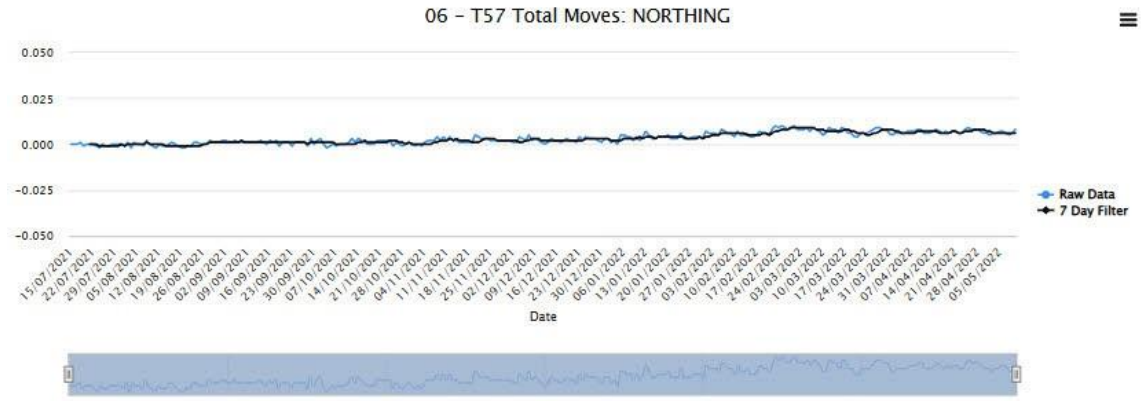
Subsidence Monitoring Results to Date - GNSS #5 near T56 & E67

- The latest monitoring data (7 day moving average) for all GNSS units indicates movements within tolerance of the equipment i.e. ± 20mm
- GNSS #5 near T56 and E67 shows maximum vertical movements of +9mm and total horizontal movement of 5mm



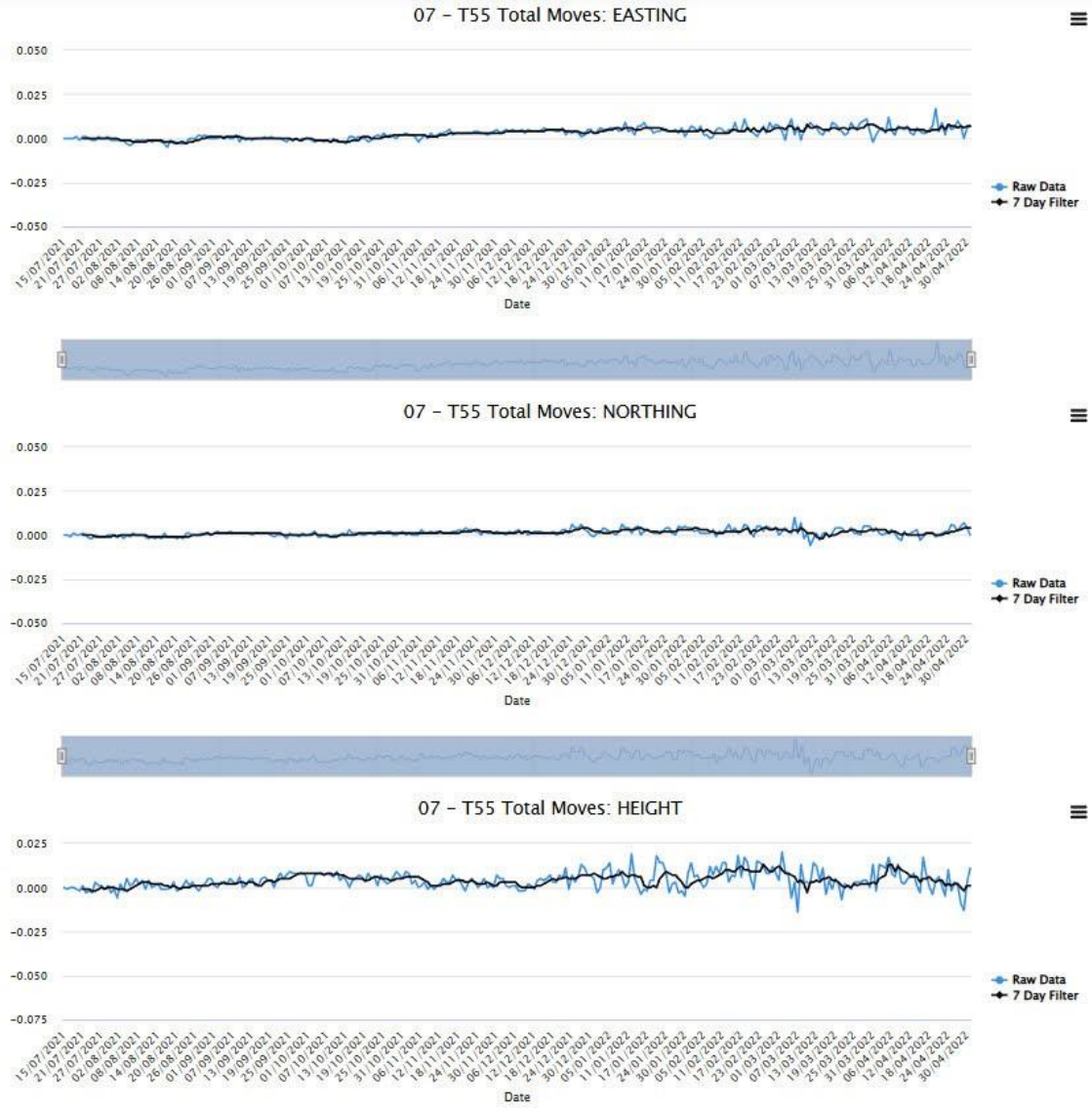
Subsidence Monitoring Results to Date - GNSS #6 near T57 & E66





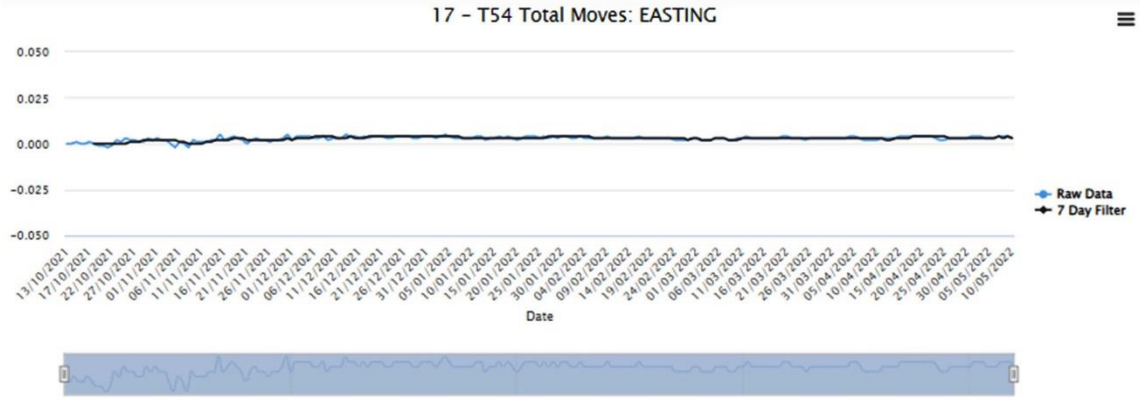
- GNSS #6 near T57 and E66 shows maximum vertical movements of +7mm and -7mm

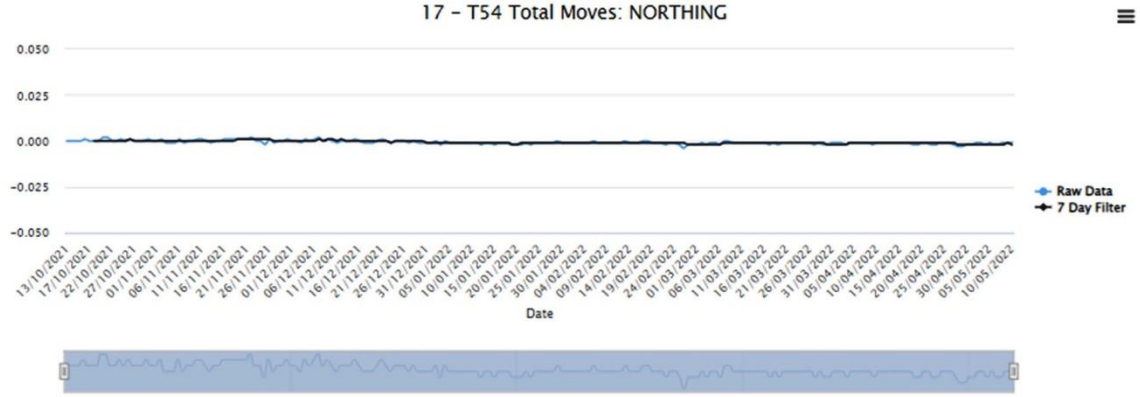
Subsidence Monitoring Results to Date - GNSS #7 near T55 & E68

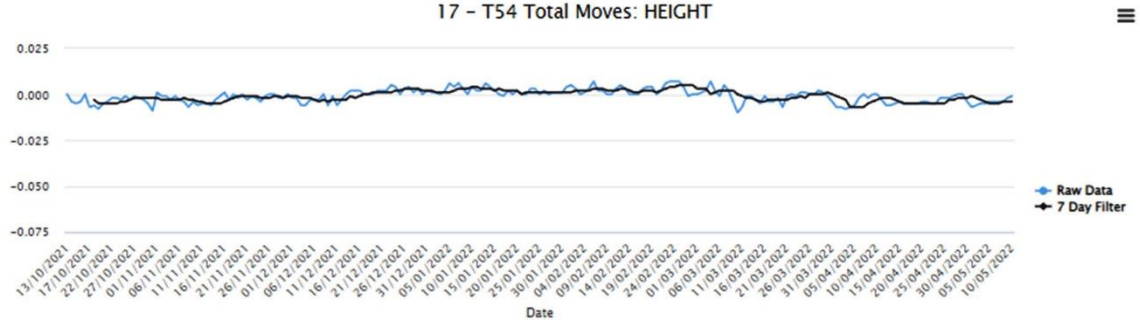


- GNSS #7 near T55 and E68 shows maximum vertical movements of +13mm and -3mm

Subsidence Monitoring Results to Date - GNSS #17 near T54 & E69







- GNSS #17 near T54 and E69 shows maximum vertical movements of +5mm and -7mm

Recommendations to TransGrid

- Stage2 mining is more remote from Mount Ousley Road and the 330kV,132kV and 33kV powerlines than the areas assessed in the Stage1 mining risk assessment, so the risk assessment for Stage1 captures any risks associated with Stage2, and as such a formal risk assessment is not considered necessary

- The existing BFMP approved for Stage1 mining (updated with additional inclusions to strengthen the risk control and monitoring details) is considered suitable for Stage2 mining.

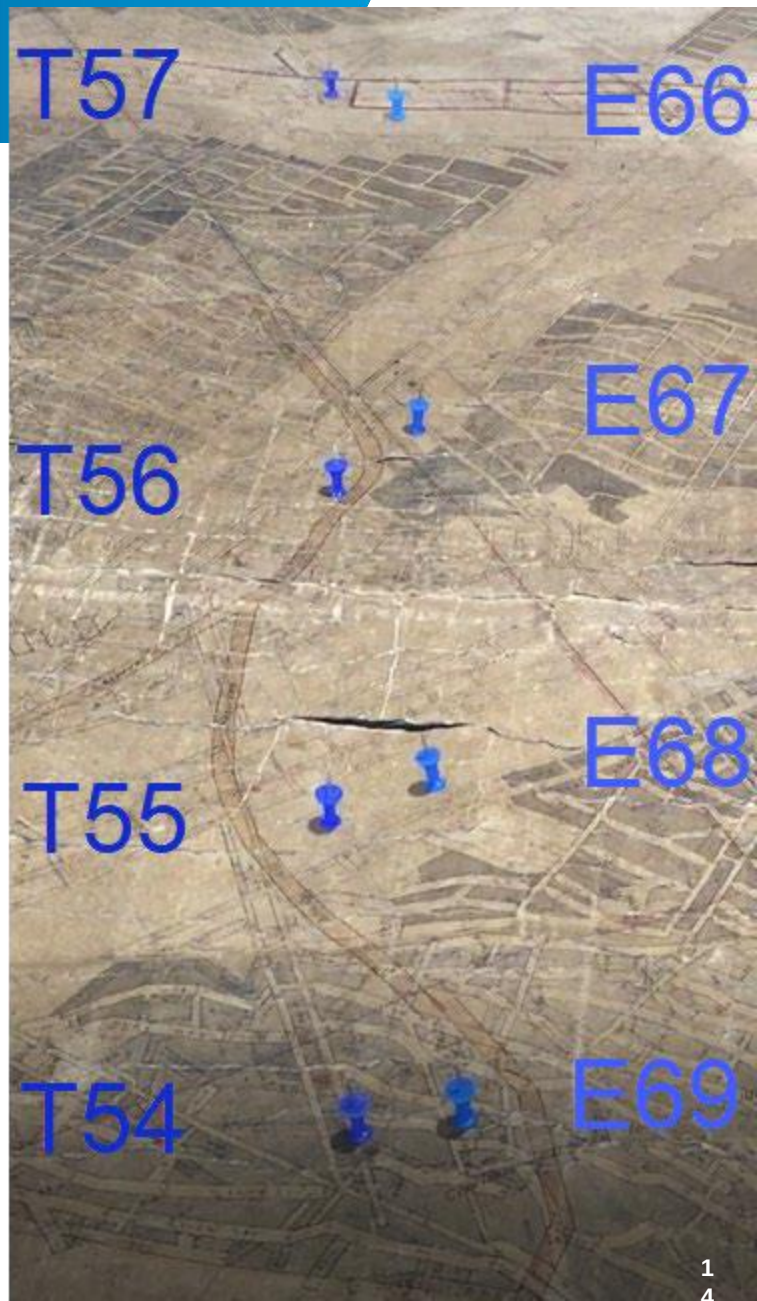
Background Information
(as previously presented during the preparation of EP1)

The following slides are included for context as background information as they relate to information previously presented in the preparation of the Extraction Plan and its Built Features Management Plan for the Extraction Area EP1.

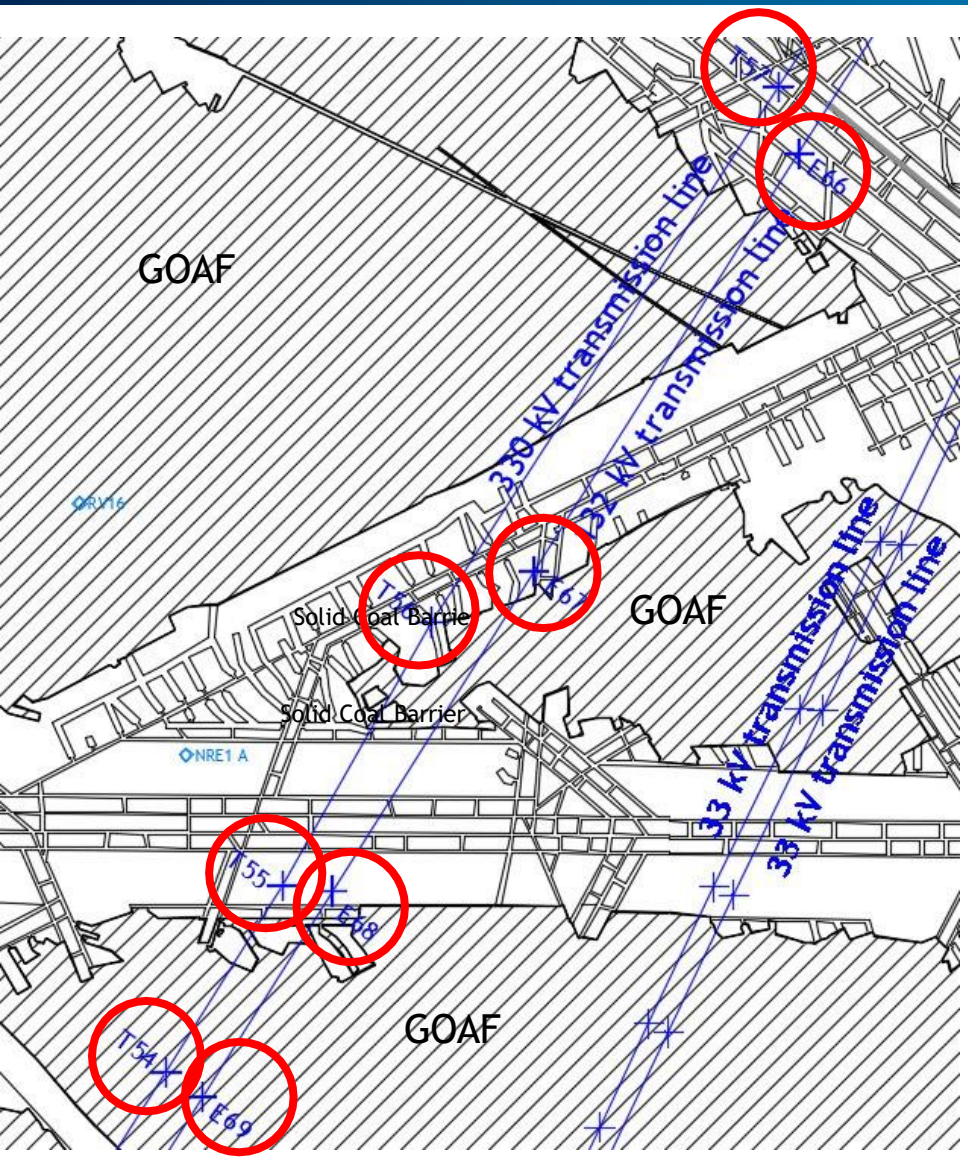
Legacy Subsidence:
Bulli Seam Mine Working Plan

The very small risk of further subsidence from legacy mining is an existing risk.

Proposed mining does not substantially change this existing risk.

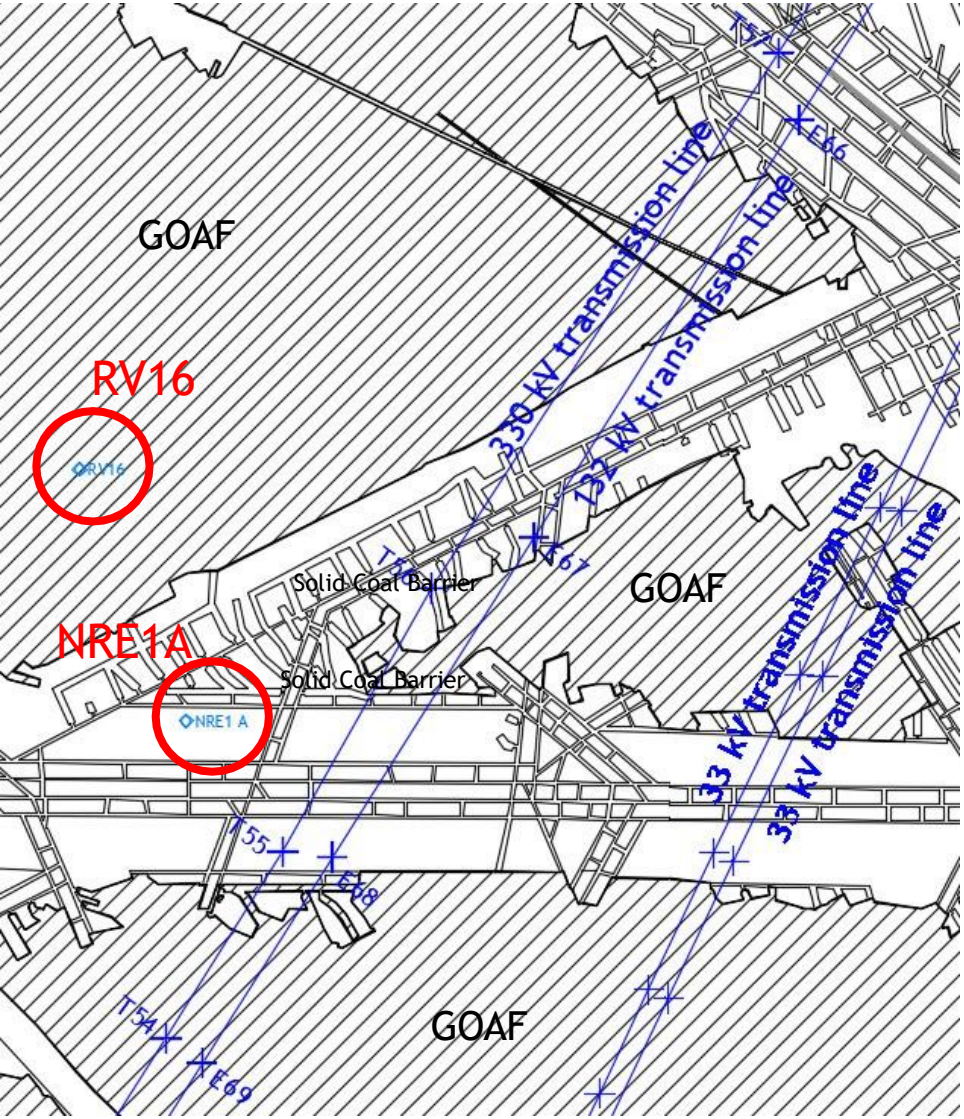


Bulli Seam Workings relative to Power Transmission Lines



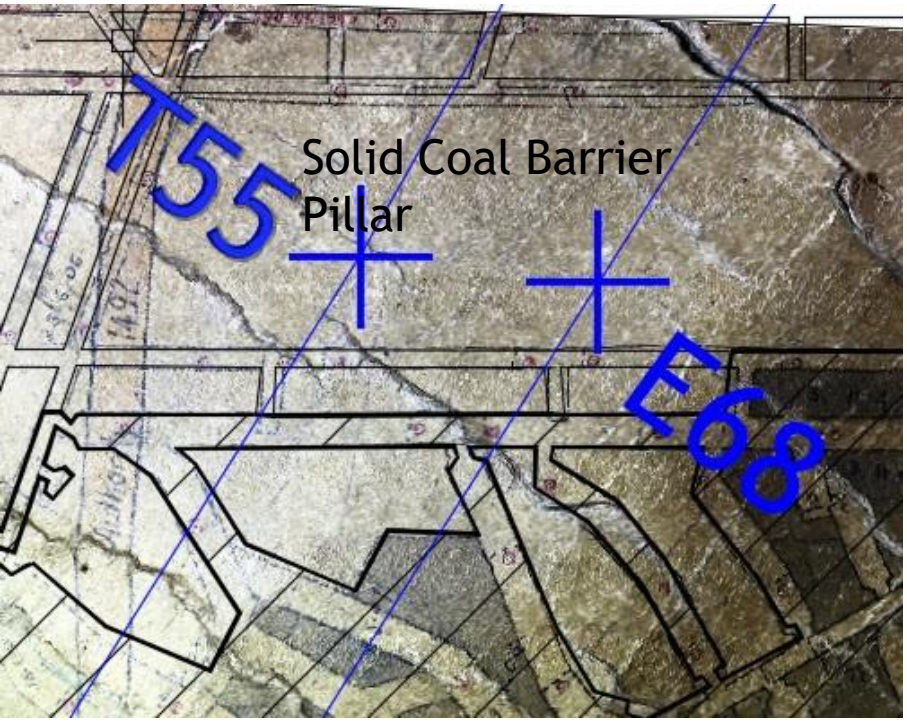
- T57 and E66 over Bulli Seam main heading pillars:
  - Long-term stable
  - No potential for subsidence impacts from planned mining
- T56 and E67 over edge of Bulli Seam main heading pillars in area fully subsided by Balgownie Seam longwalls:
  - Long-term stable after previous subsidence of 1.37m
  - Isolated by cracks from previous subsidence
  - No potential for subsidence impacts from planned mining
- T55 and E68 over Bulli Seam main headings
  - Long-term stable
  - No potential for subsidence impacts from planned mining
- T54 and E69 over Bulli Seam goaf (circa 1914)
  - Remote from planned mining
  - Long-term stable
  - No potential for subsidence impacts from planned mining

Bulli Seam Workings relative to Power Transmission Lines



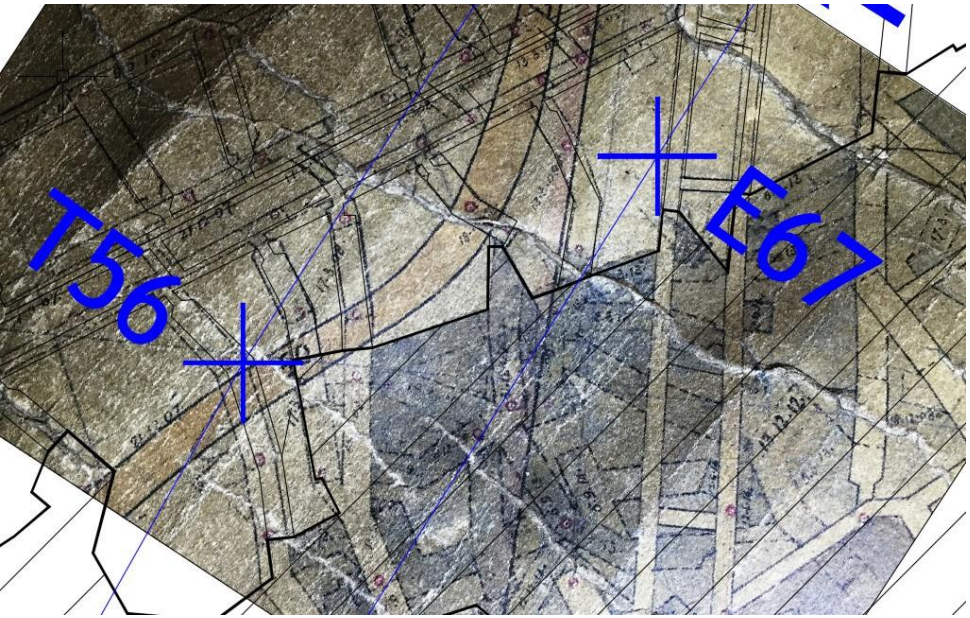
- Borehole RV16 confirms Bulli Seam fully extracted and goaf collapsed at this location
- Borehole NRE1A confirms Bulli Seam solid coal barrier pillar intact at this location
- Comparison of Mine Working Plan with ACAD plan indicates accuracy of workings of a few metres which is insignificant compared to the 250-350m overburden depth

Details of Bulli Seam Workings below Towers T55 and E68



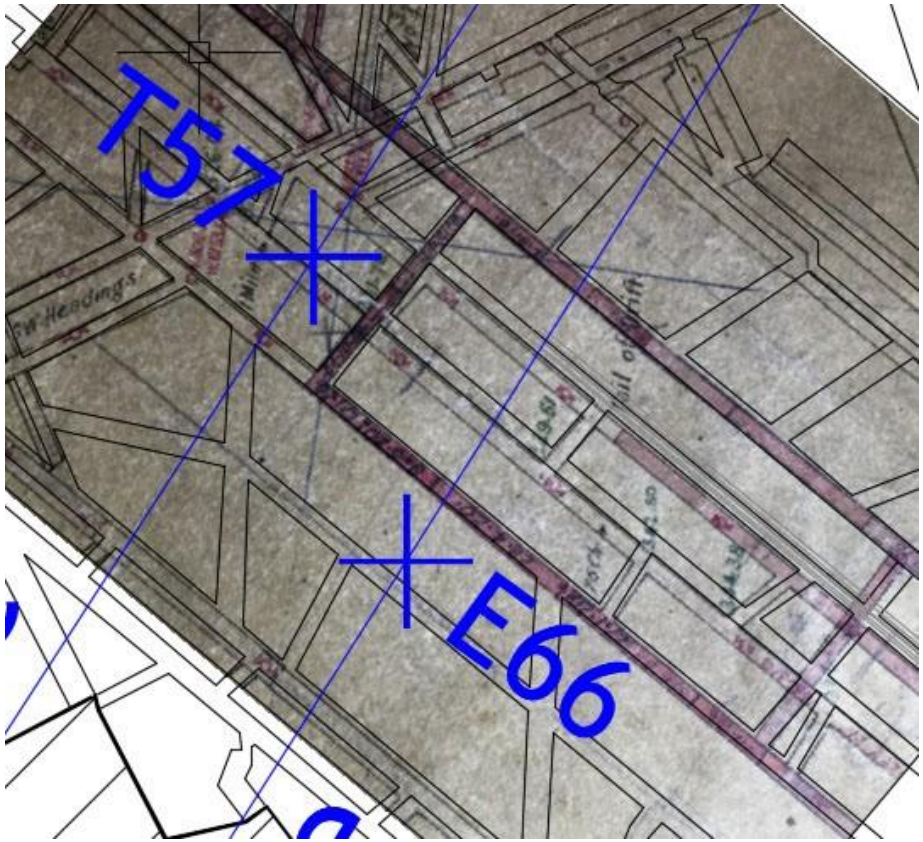
- T55 and E68 above solid coal barrier pillar
- Detailed plan of workings showing survey stations (red circles) and reduced level information
- Adjacent goaf areas extracted circa 1904

Details of Bulli Seam Workings below Towers T56 and E67



- T56 and E67 near the edge of a Bulli Seam goaf area – subsequently mined under by Longwall 3 in Balgownie seam in 1972
- Detailed plan of workings showing survey stations (red circles)
- Roadways formed circa 1907
- Pillars extracted circa 1912

Details of Bulli Seam Workings below Towers T57 and E66



- T57 and E66 above main headings coal pillars in Bulli Seam (and Balgownie Seam and coal barrier in Wongawilli Seam)
- Detailed plan of workings showing survey stations (red circles) coordinate values and reduced level heights
- The presence of documented survey points is indicative of a methodical survey process.

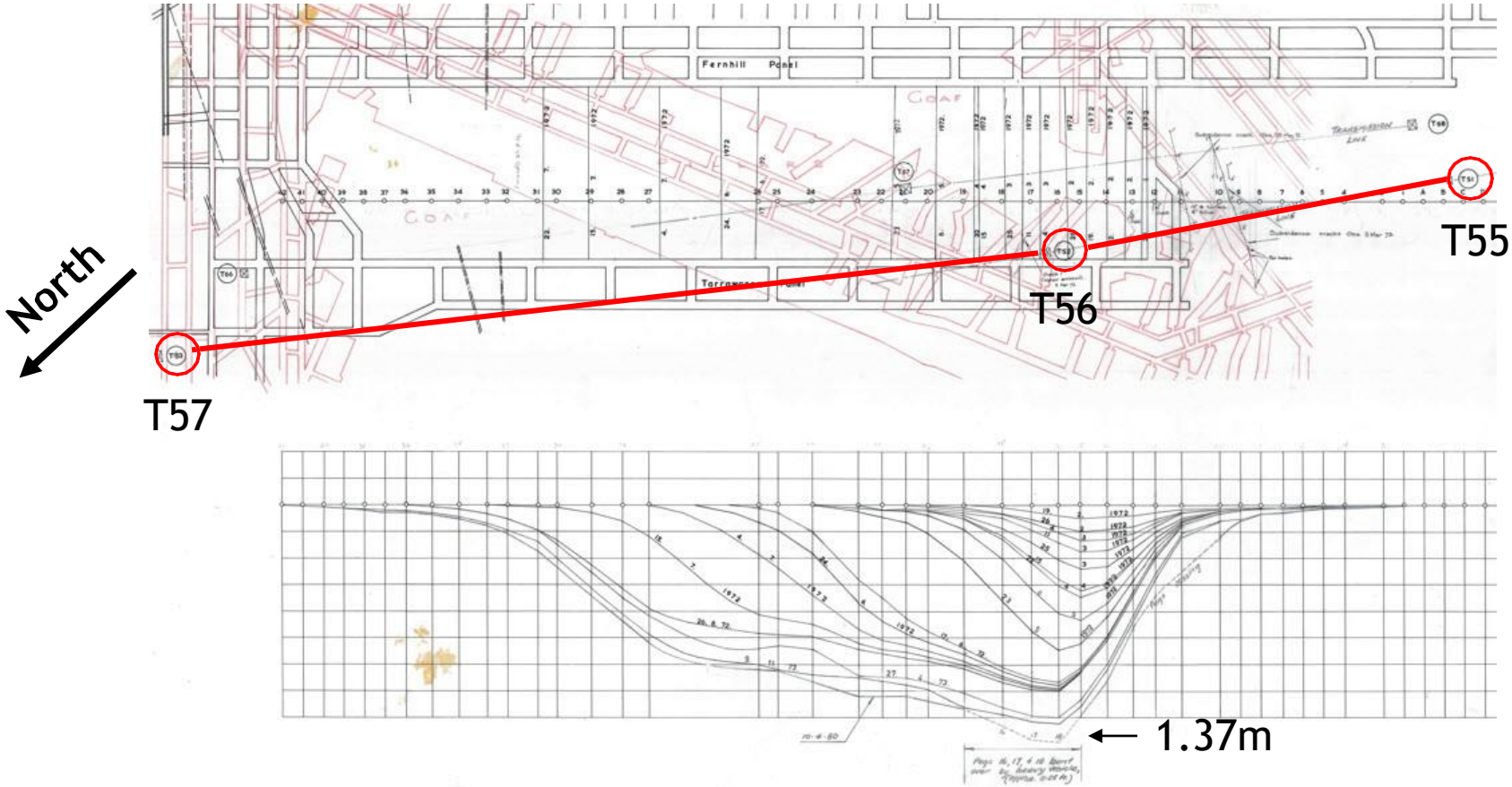
Power Transmission Lines Predate Balgownie Seam Mining

1951

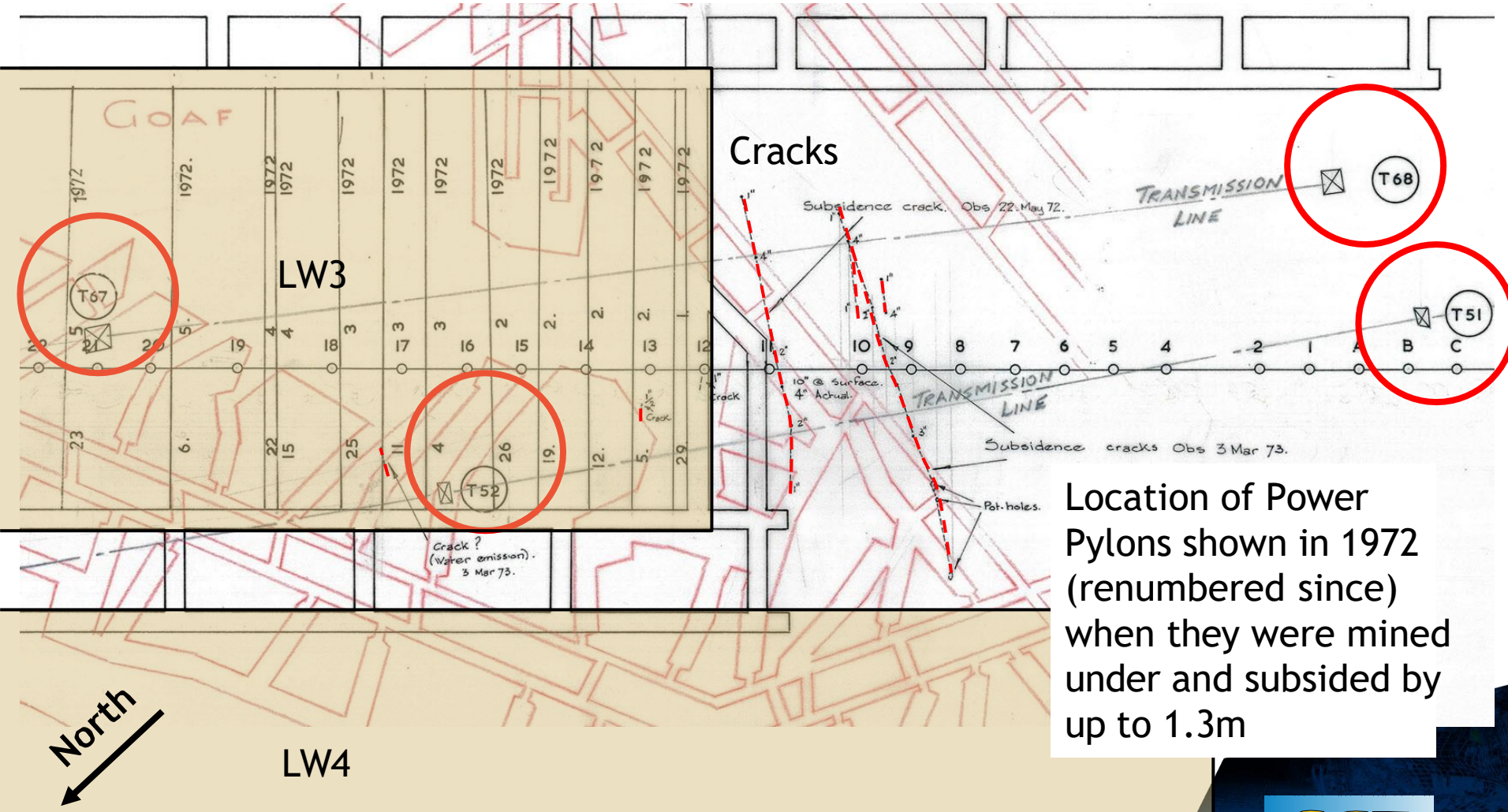
1961

Aerial photographic evidence that 330kV & 132kV powerlines were constructed after Bulli Seam mining but approximately 10 years before Towers T56 and E67 were undermined by Longwall 3 in the Balgownie Seam in 1972

Balgownie Seam Subsidence – LW3



Power Transmission Lines 1972
Balgownie Seam Mining and Cracks

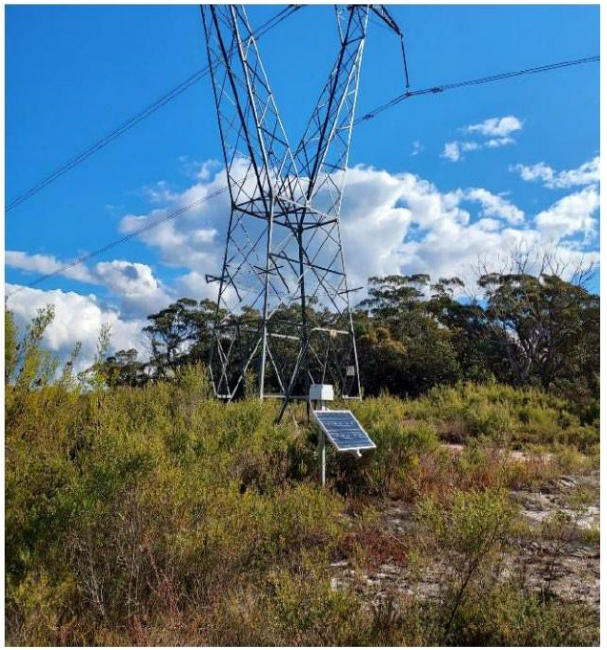


Location of Power Pylons shown in 1972 (renumbered since) when they were mined under and subsided by up to 1.3m

Subsidence Monitoring: Examples GNSS Units

Site 2

Site 7



Site 8

Wollongong Coal Limited - Russell Vale East Extraction Plan for Stage1 (PC21-25 and PC07-08) and Stage2 (PC27-34) Mining

Subsidence Overview for Consultation with ENDEAVOUR ENERGY

Update for 26/05/2022

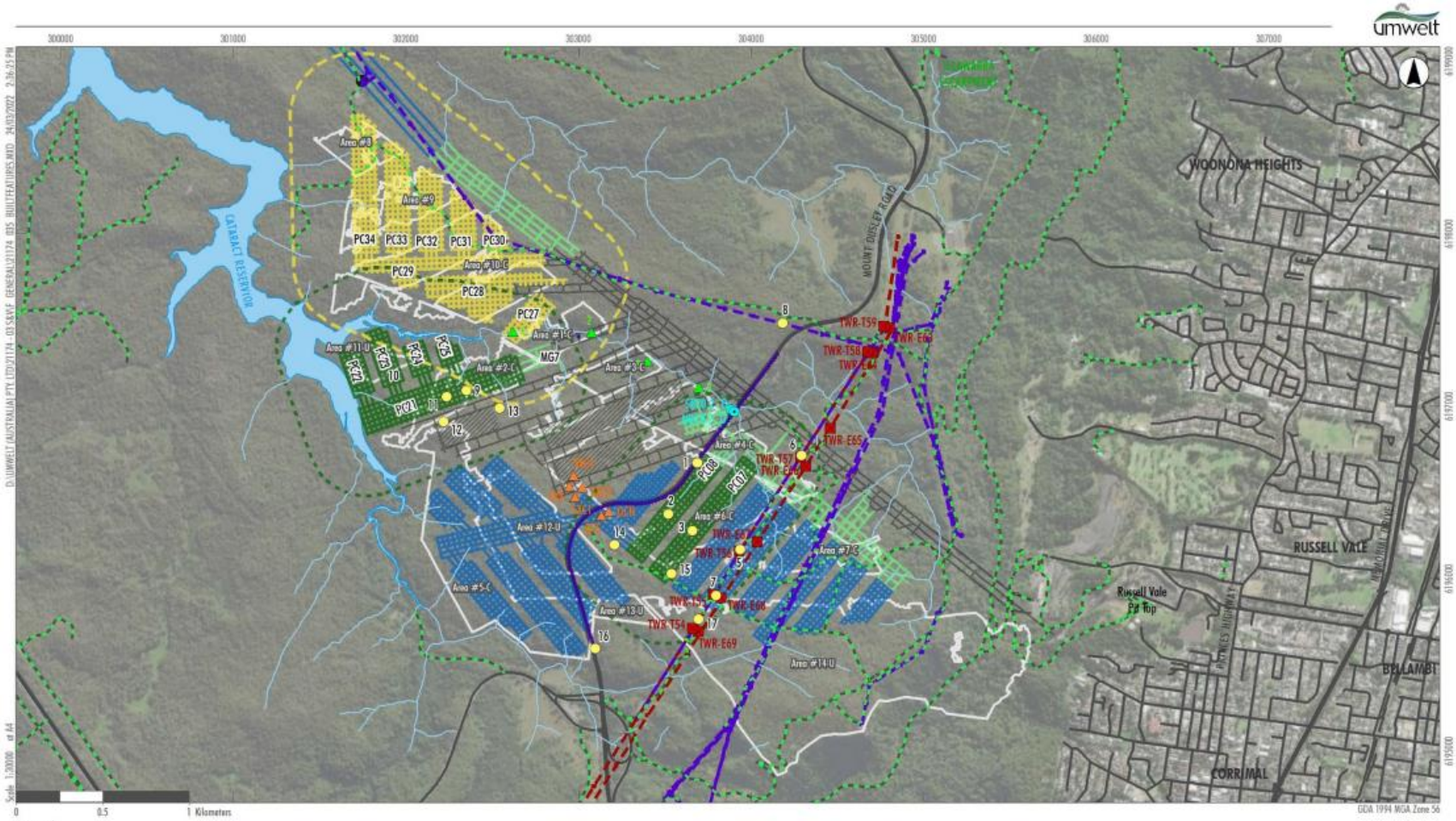
Geotechnical research, consulting, field services and instrumentation for mining and civil industries.

SCT

Overview of Presentation

- Key Messages
- Mining progress to date
- Site Description
  - Extraction area overview
  - Scope of Stage1 and Stage2
    - Note: Planned Stage 2 mining addressed in (EP2) is further to west of that area addressed in EP1 is Stage 1 (a) i.e. more remote from major infrastructure.
    - Stage 1b has not commenced mining due to conditional approval for EP1 – hence mining in Stage 1(b) (PC07 & PC08) can only commence once subsidence predictions are confirmed relative to subsidence results for PC21.
    - This review to address above requirements is underway at this time, noting approved subsidence monitoring for the mining to date indicates subsidence is less than as expected i.e. ±20mm at all GNSS unit locations.
  - Previous mining and subsidence context and proposed monitoring
  - Surface features with approved existing and additional monitoring
- Subsidence Monitoring Results to Date
- Recommendations to Endeavour Energy
  - Appropriateness of BFMP and RA requirements
- Background Information (previously presented)

Built Features Monitoring Network and Extraction Plan Staging

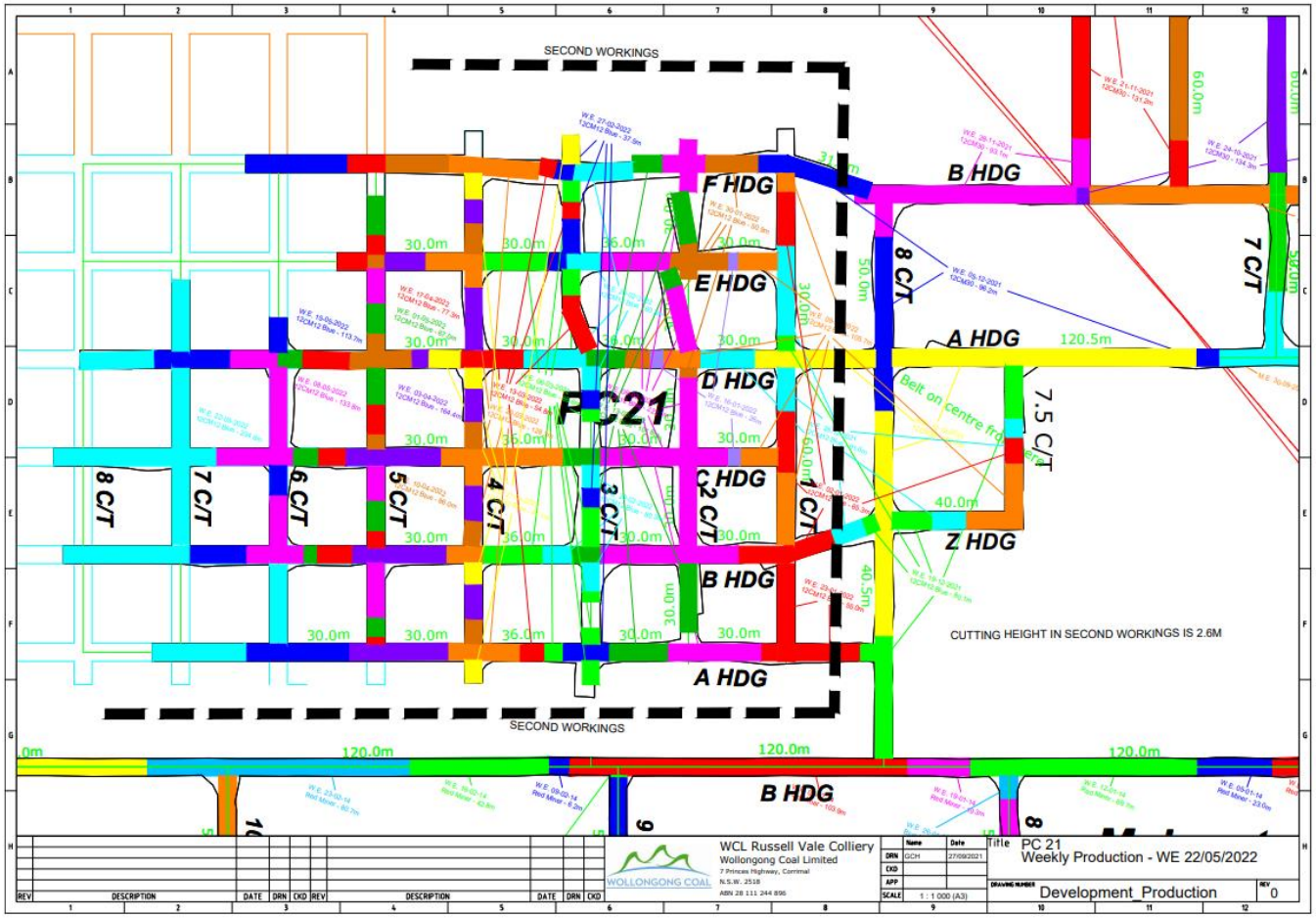


Key Messages

With regard to Stage 2 Extraction Plan (EP2)

- No perceptible subsidence movements and impacts expected at EE 132, 33KV and TG 330kV powerlines
- No change to subsidence expectation of less than 100mm over majority of RVE area with any impacts expected to be imperceptible for all practical purposes
- No change to the approved monitoring for built features - additional GNSS units in Stage2 area primarily for monitoring of natural features (swamps) and to confirm status of Bulli Seam Goaf areas.
- Existing BFMP as previously consulted and approved as per EP1 has received minor updates, and is considered suitable for the EP 2 - formal Risk Assessment is not considered necessary
- The approved subsidence monitoring for the mining to date indicates subsidence is less than as expected i.e. ±20mm at all GNSS unit locations.
- No change to contingency for managing potential for generally greater than 100mm subsidence by staging extraction and revising mining layout if required (adaptive management measures)
  - Stage 1(a) – (PC21-25) Remote from infrastructure
  - Stage 1(b) – (PC07-08) Offset from infrastructure
  - Flexible mining system that can be modified to reduce potential for subsidence
- No change to very low potential for legacy mining impacts that exist irrespective of planned mining. Subsidence effects and impacts managed by:
  - LIDAR surveys of whole RVE area
  - Underground observations of mining conditions

Current Mining Progress – EP 1 – Panel PC21



Site Description – Stage1 and Stage2

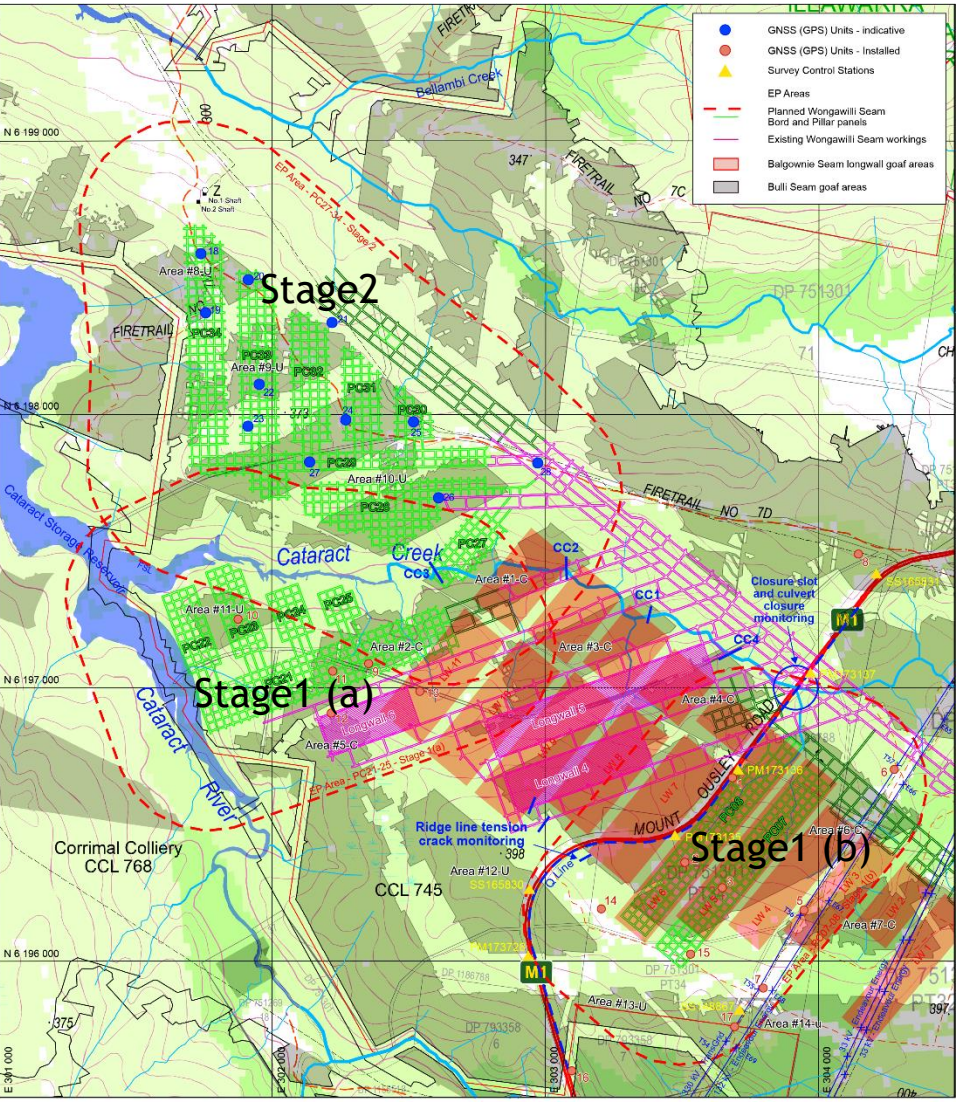


Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

SCOPE of EXTRACTION PLANS

- EP1 = Stage1 (a) – PC21-25 and Stage1 (b) – PC07-08
- EP2 = Stage 1 (a) and Stage1 (b) and Stage 2 (PC27-34)
- EP1 approved mining in Stage 1(a) (below area where no built features) to prove mining method in PC21 results in less than 100mm subsidence before mining in Stage 1(b) (PC07-08) adjacent to major infrastructure can proceed

Site Description – Stage1 and Stage2

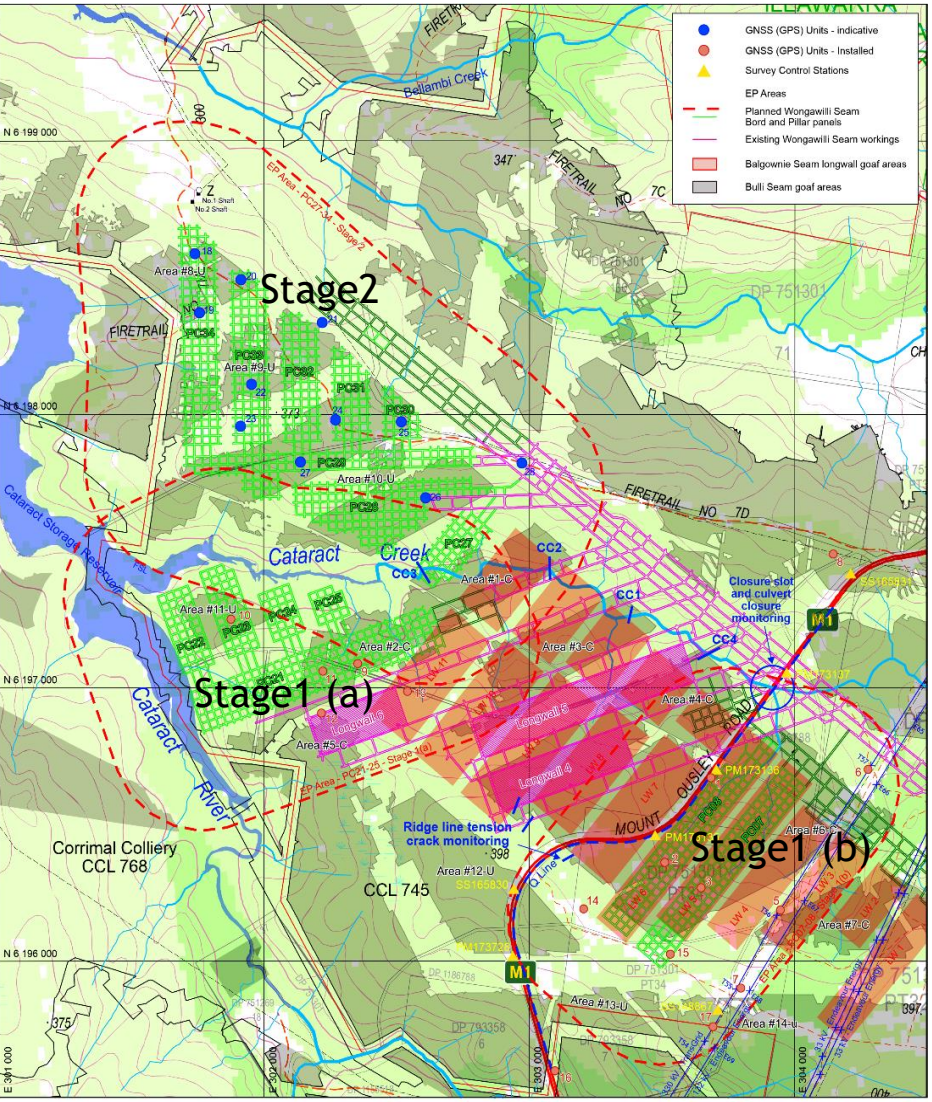


Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

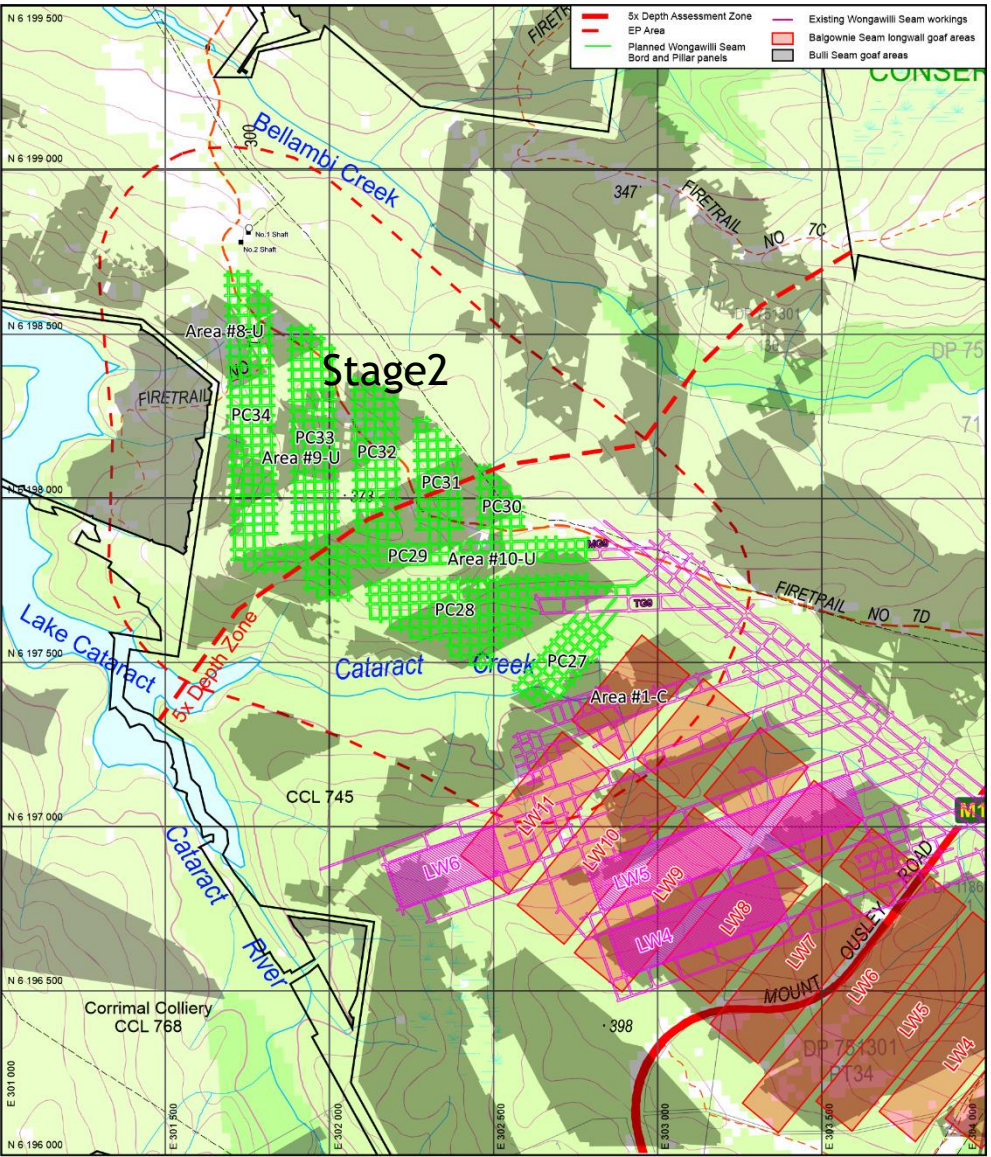
PREVIOUS MINING CONTEXT:

- Three seams of mining with complete mining records
- Subsidence monitoring data available for Balgownie and Wongawilli Seams
- Maximum cumulative subsidence of 3.7m in small areas – Maximum incremental subsidence = 1m from Bulli, 1.4m from Balgownie and 1.8m from Wongawilli Seam

SUBSIDENCE MONITORING FOR STAGE1 AND STAGE2:

- As approved in EP1 for Stage1 (a) and (b) with additional GNSS units above Stage2 panels
- In addition to the continuous GNSS point and Mount Ousley Road pavement slot closure monitoring, periodic attended ground surveys and regular visual inspections of the road, the approved monitoring includes:
- GNSS units #5, #6, #7 & #17 that provide measurements of vertical and horizontal movements nears towers T56 & E67, T57 & E66, T55 & E68 and T54 & E69 on 330kV and 132kV lines (33kV more remote).
- Periodic ground surveys of tower base geometry and tilt.
- GNSS units #3 & #15 (above PC08) that also provide measurements of vertical and horizontal movements between PC07 and the powerline easements.

Site Description – Stage2



LOCALITY:

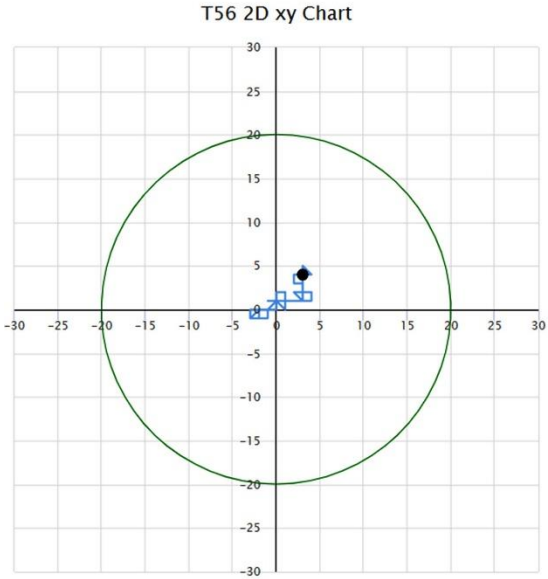
Stage 2 (PC27-34) mining is further to west than Stage1 in Approved Extraction Plan (EP1)
i.e. more remote from major infrastructure of Mount Ousley Road and 330kV,132kV and 33kV powerlines to east

Only minor infrastructure above Stage 2:

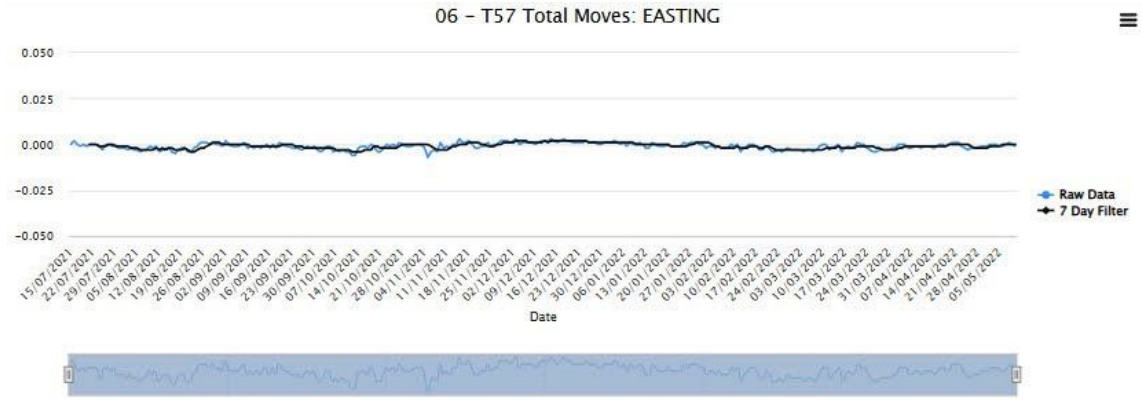
- Fire trails (Water NSW)
- Mining related infrastructure (e.g. 33kV powerline) owned by WCL

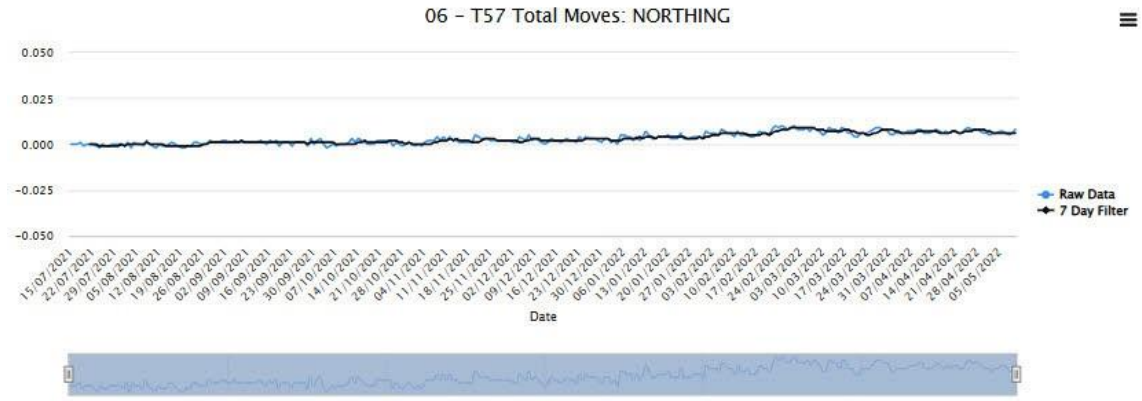
Subsidence Monitoring Results to Date - GNSS #5 near T56 & E67

- The latest monitoring data (7 day moving average) for all GNSS units indicates movements within tolerance of the equipment i.e. ± 20mm
- GNSS #5 near T56 and E67 shows maximum vertical movements of +9mm and total horizontal movement of 5mm



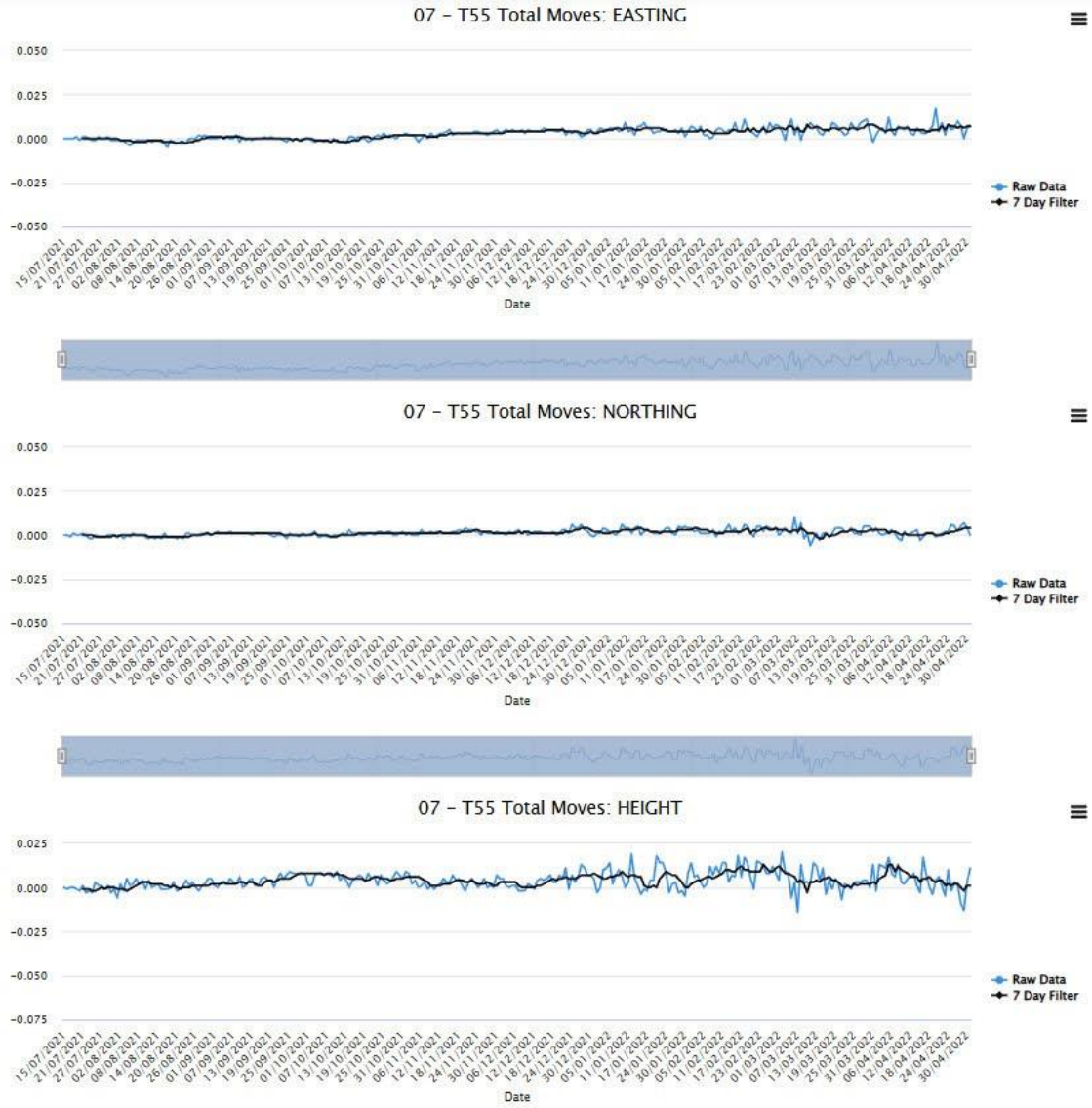
Subsidence Monitoring Results to Date - GNSS #6 near T57 & E66





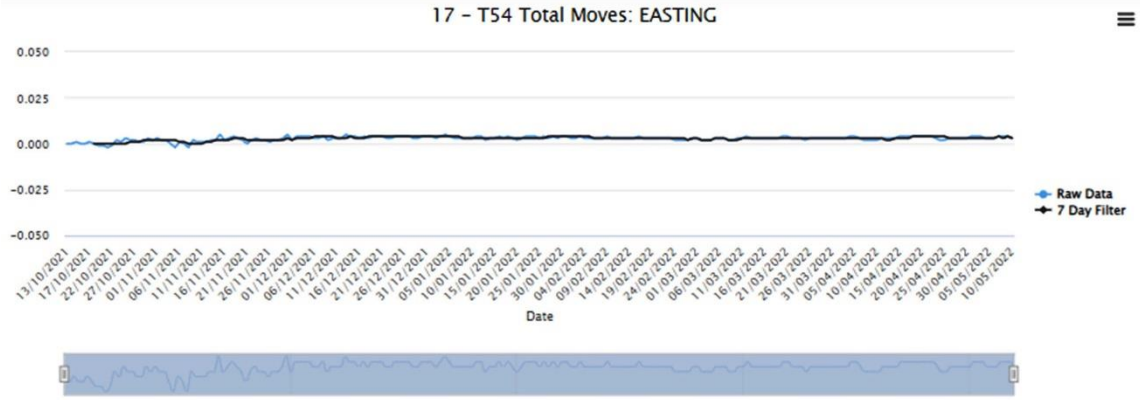
- GNSS #6 near T57 and E66 shows maximum vertical movements of +7mm and -7mm

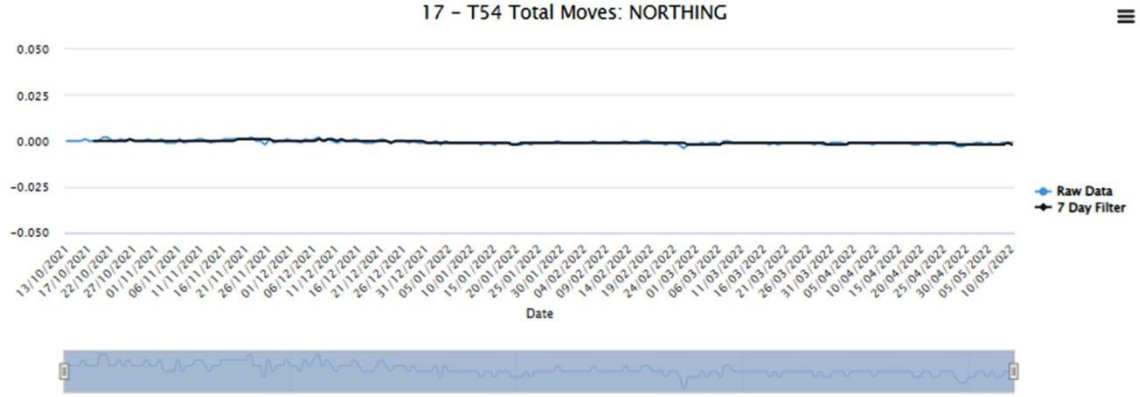
Subsidence Monitoring Results to Date - GNSS #7 near T55 & E68

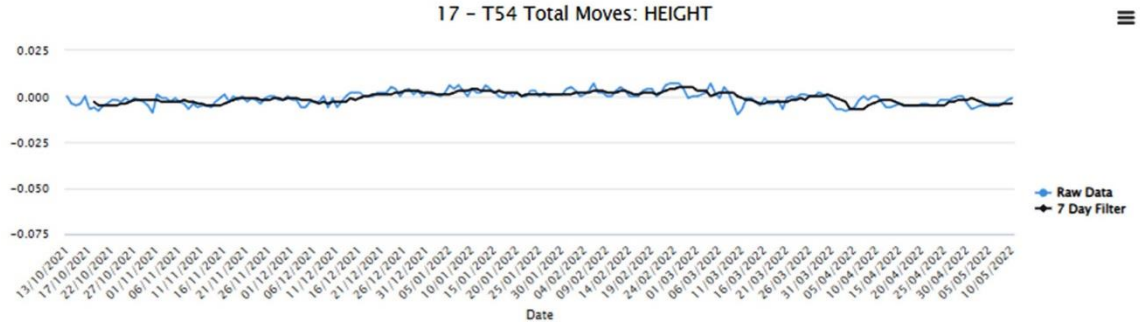


- GNSS #7 near T55 and E68 shows maximum vertical movements of +13mm and -3mm

Subsidence Monitoring Results to Date - GNSS #17 near T54 & E69





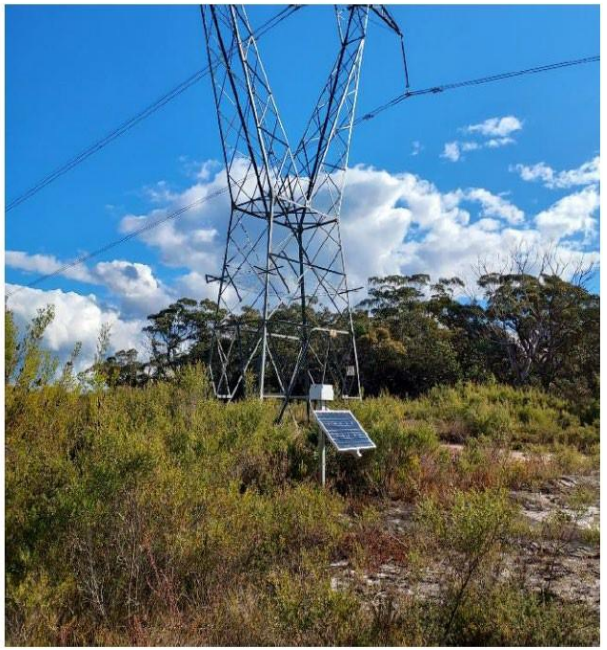


- GNSS #17 near T54 and E69 shows maximum vertical movements of +5mm and -7mm

Subsidence Monitoring: Examples GNSS Units

Site 2

Site 7



Site 8

Recommendations to Endeavour Energy

Summary

- Stage2 mining is more remote from Mount Ousley Road and the 330kV,132kV and 33kV powerlines than the areas assessed in the Stage1 mining risk assessment, so the risk assessment for Stage1 captures any risks associated with Stage2, and as such a formal risk assessment is not considered necessary.

- The existing BFMP approved for Stage1 mining (updated with additional inclusions to strengthen the risk control and monitoring details) is considered suitable for Stage2 mining.

The Next Steps

Next Steps

- In order to commence second workings in EP 1 panels PC22-25, and PC07 - PC08, WCL is required to gain confirmation via consultation from each of the key infrastructure operators (Endeavour Energy, TfNSW, TransGrid) that the risk control measures proposed in the BFMP are adequate and hence that the plan can be endorsed.
- As BFMP includes consideration of assets for TG, and TfNSW in addition to EE, a copy of the management plan in word with the relevant sections concerning risk management, mitigation, monitoring and Trigger Action Response Plans (TARP's) and contingency measures for EE highlighted has been provided for ease of review on 20/5/22.
- With regard to the draft BFMP document once it is deemed that the plan satisfactorily addresses the key risks to EE infrastructure WCL will finalise and seek EE sign off and endorsement of the plan via the sign off page in Appendix E.
- If during the review you have any request for any additional details please contact WCL Environmental Manager Richard Sheehan as per the details below.

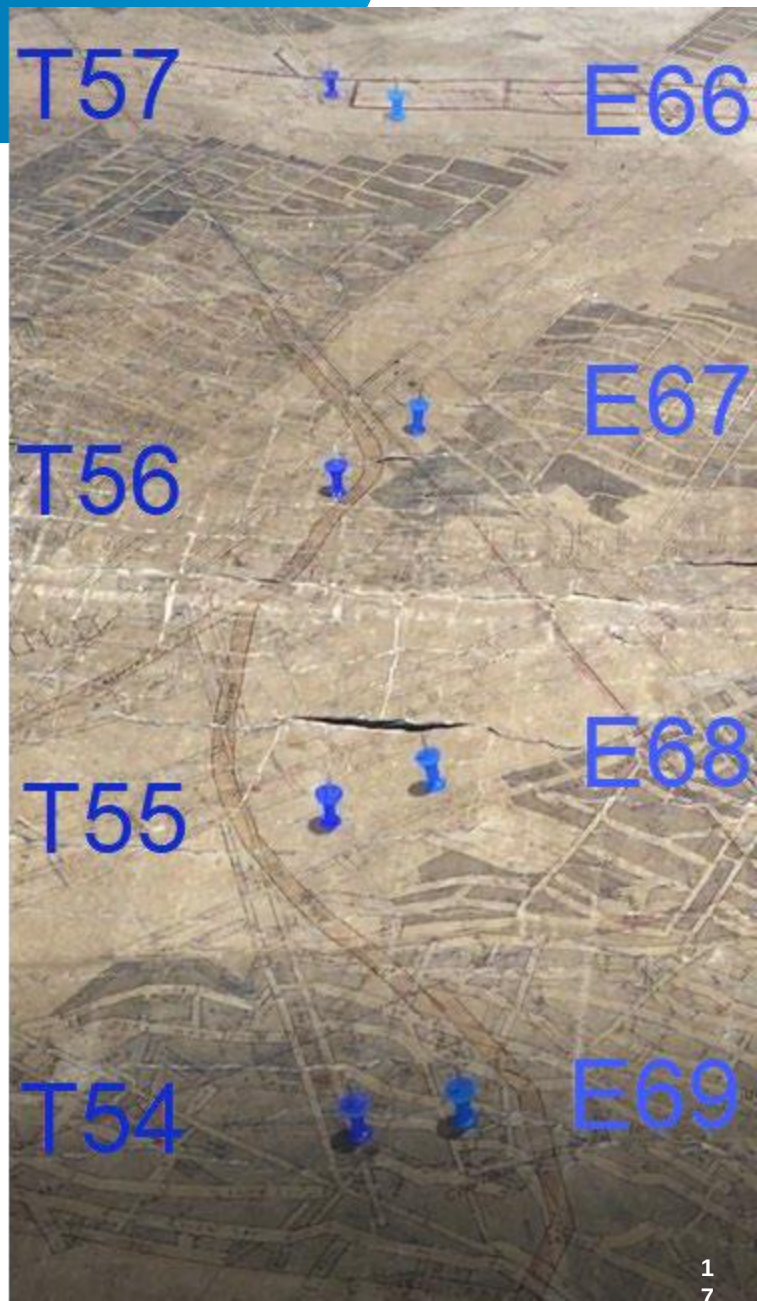
Background Information
(as previously presented during the preparation of EP1)

The following slides are included for context as background information as they relate to information previously presented in the preparation of the Extraction Plan EP1 and its Built Features Management Plan for the Extraction Area 1 Stages 1(a) and 1(b).

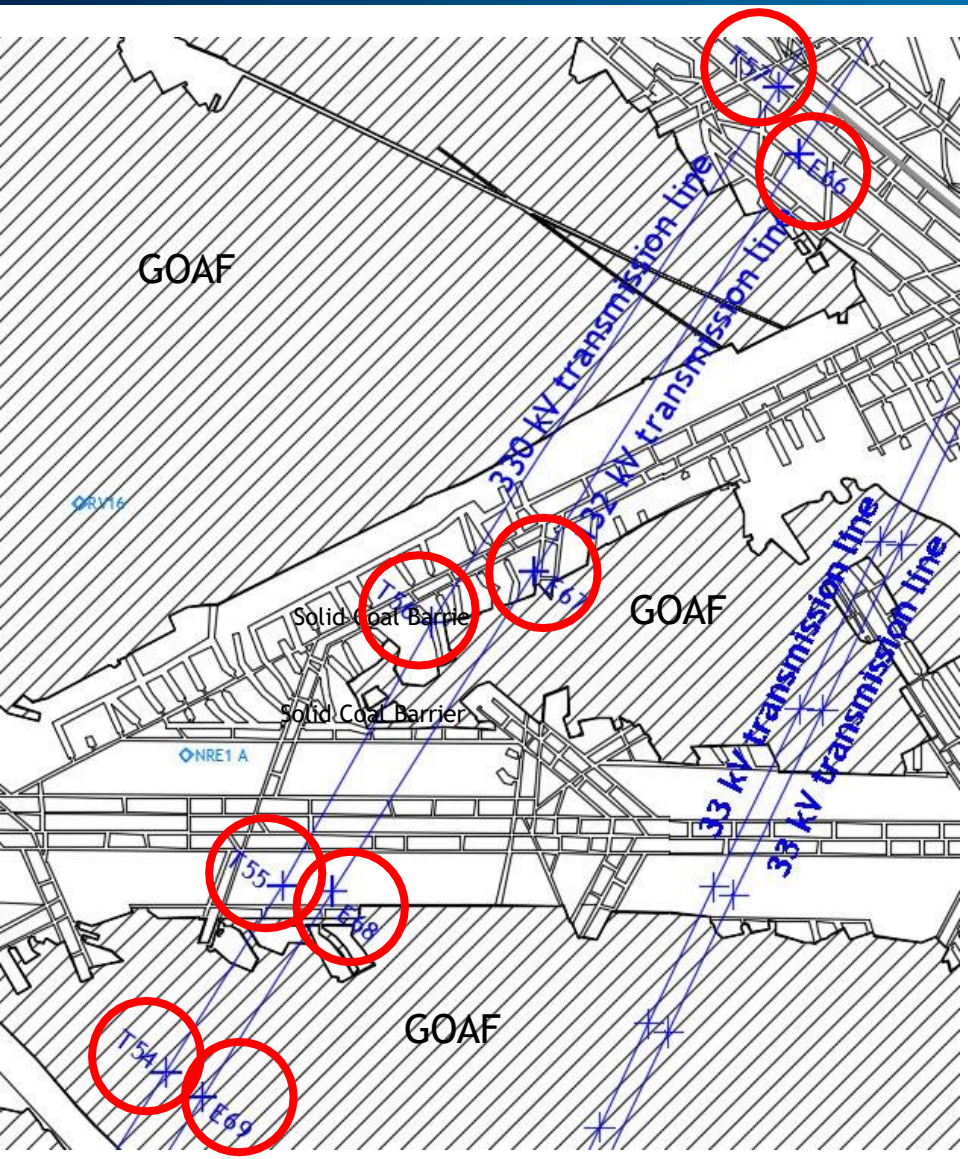
Legacy Subsidence:
Bulli Seam Mine Working Plan

The very small risk of further subsidence from legacy mining is an existing risk.

Proposed mining does not substantially change this existing risk.

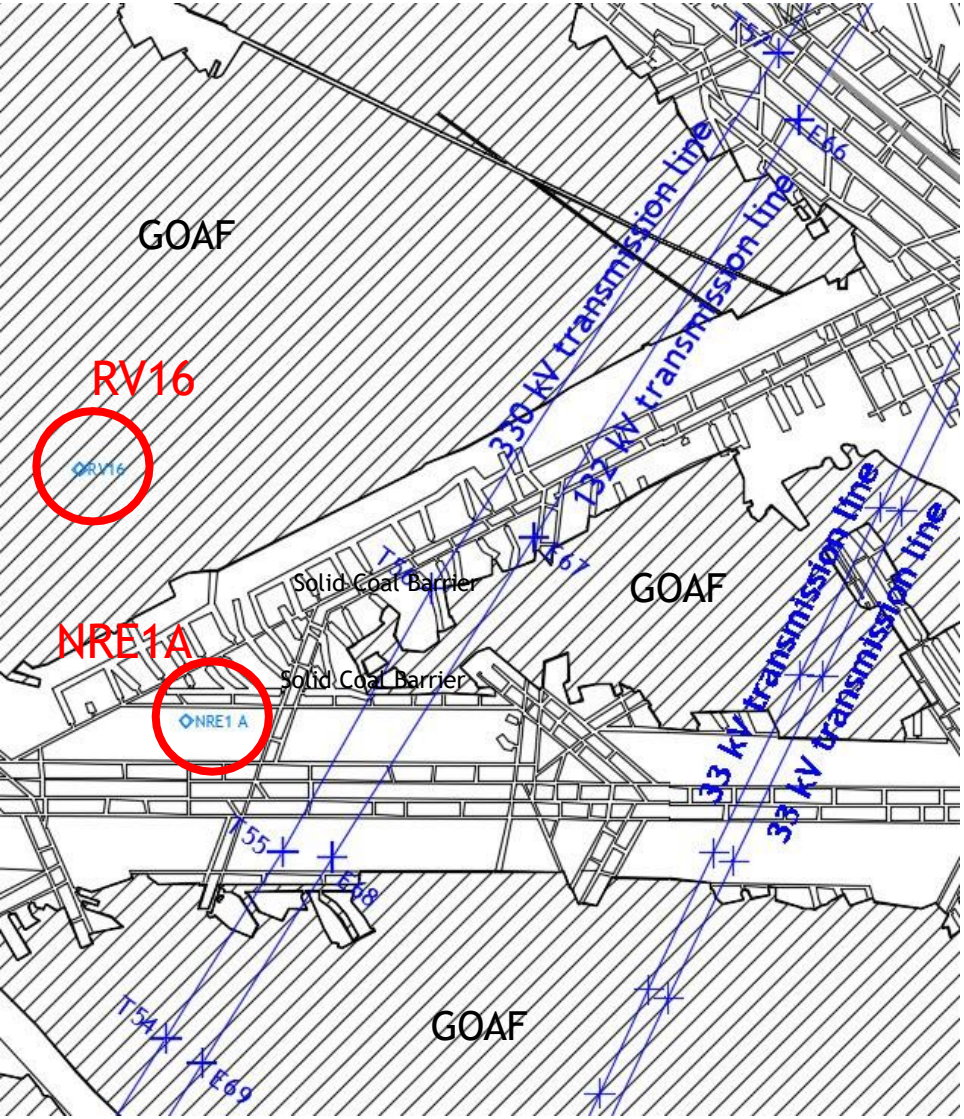


Bulli Seam Workings relative to Power Transmission Lines



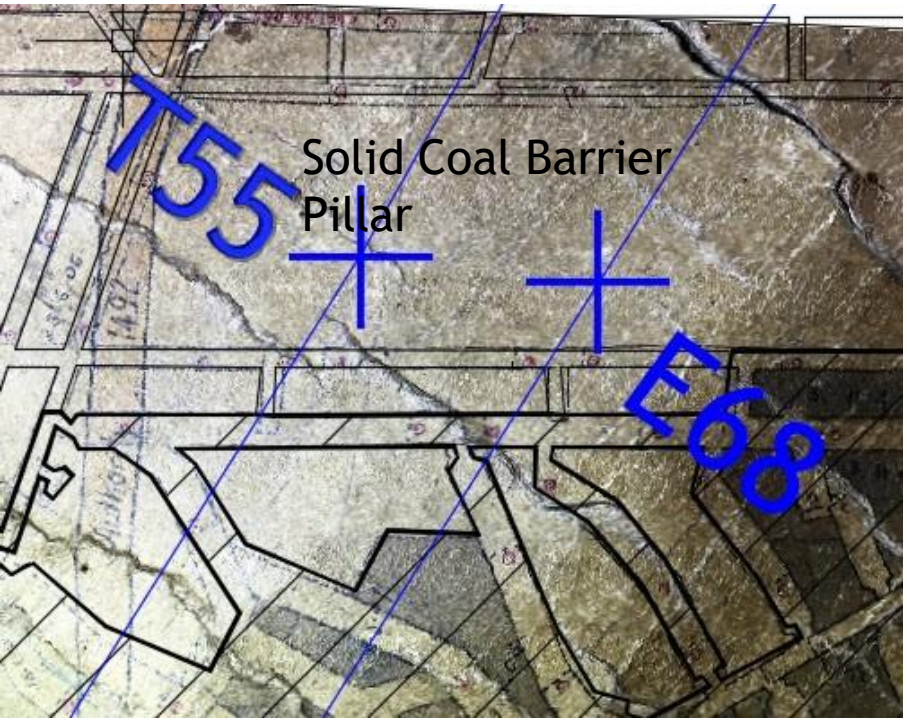
- T57 and E66 over Bulli Seam main heading pillars:
  - Long-term stable
  - No potential for subsidence impacts from planned mining
- T56 and E67 over edge of Bulli Seam main heading pillars in area fully subsided by Balgownie Seam longwalls:
  - Long-term stable after previous subsidence of 1.37m
  - Isolated by cracks from previous subsidence
  - No potential for subsidence impacts from planned mining
- T55 and E68 over Bulli Seam main headings
  - Long-term stable
  - No potential for subsidence impacts from planned mining
- T54 and E69 over Bulli Seam goaf (circa 1914)
  - Remote from planned mining
  - Long-term stable
  - No potential for subsidence impacts from planned mining

Bulli Seam Workings relative to Power Transmission Lines



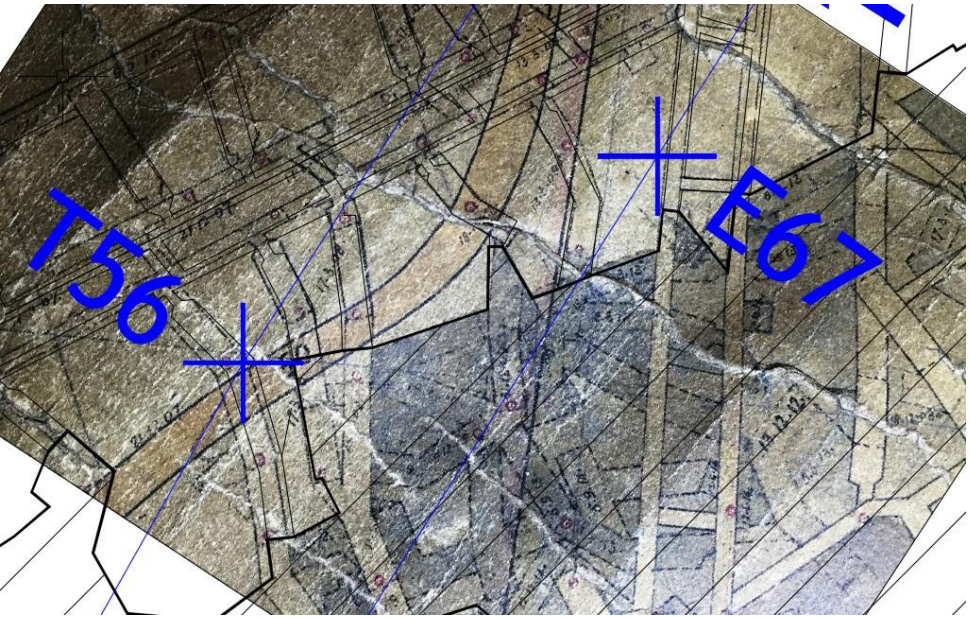
- Borehole RV16 confirms Bulli Seam fully extracted and goaf collapsed at this location
- Borehole NRE1A confirms Bulli Seam solid coal barrier pillar intact at this location
- Comparison of Mine Working Plan with ACAD plan indicates accuracy of workings of a few metres which is insignificant compared to the 250-350m overburden depth

Details of Bulli Seam Workings below Towers T55 and E68



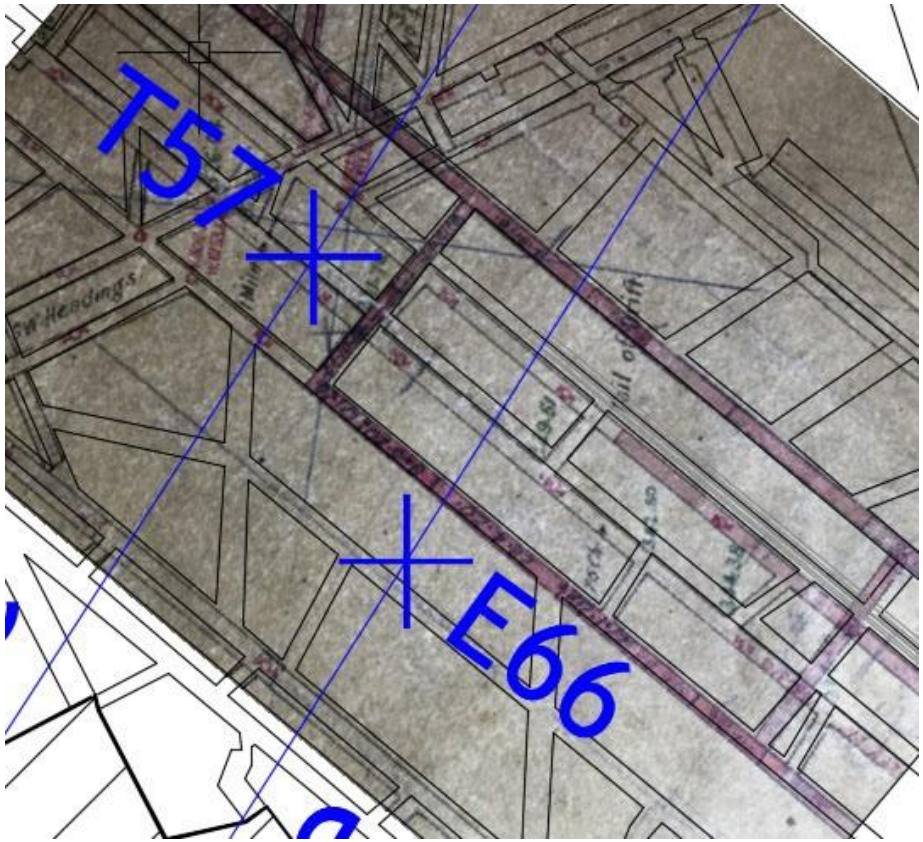
- T55 and E68 above solid coal barrier pillar
- Detailed plan of workings showing survey stations (red circles) and reduced level information
- Adjacent goaf areas extracted circa 1904

Details of Bulli Seam Workings below Towers T56 and E67



- T56 and E67 near the edge of a Bulli Seam goaf area – subsequently mined under by Longwall 3 in Balgownie seam in 1972
- Detailed plan of workings showing survey stations (red circles)
- Roadways formed circa 1907
- Pillars extracted circa 1912

Details of Bulli Seam Workings below Towers T57 and E66



- T57 and E66 above main headings coal pillars in Bulli Seam (and Balgownie Seam and coal barrier in Wongawilli Seam)
- Detailed plan of workings showing survey stations (red circles) coordinate values and reduced level heights
- The presence of documented survey points is indicative of a methodical survey process.

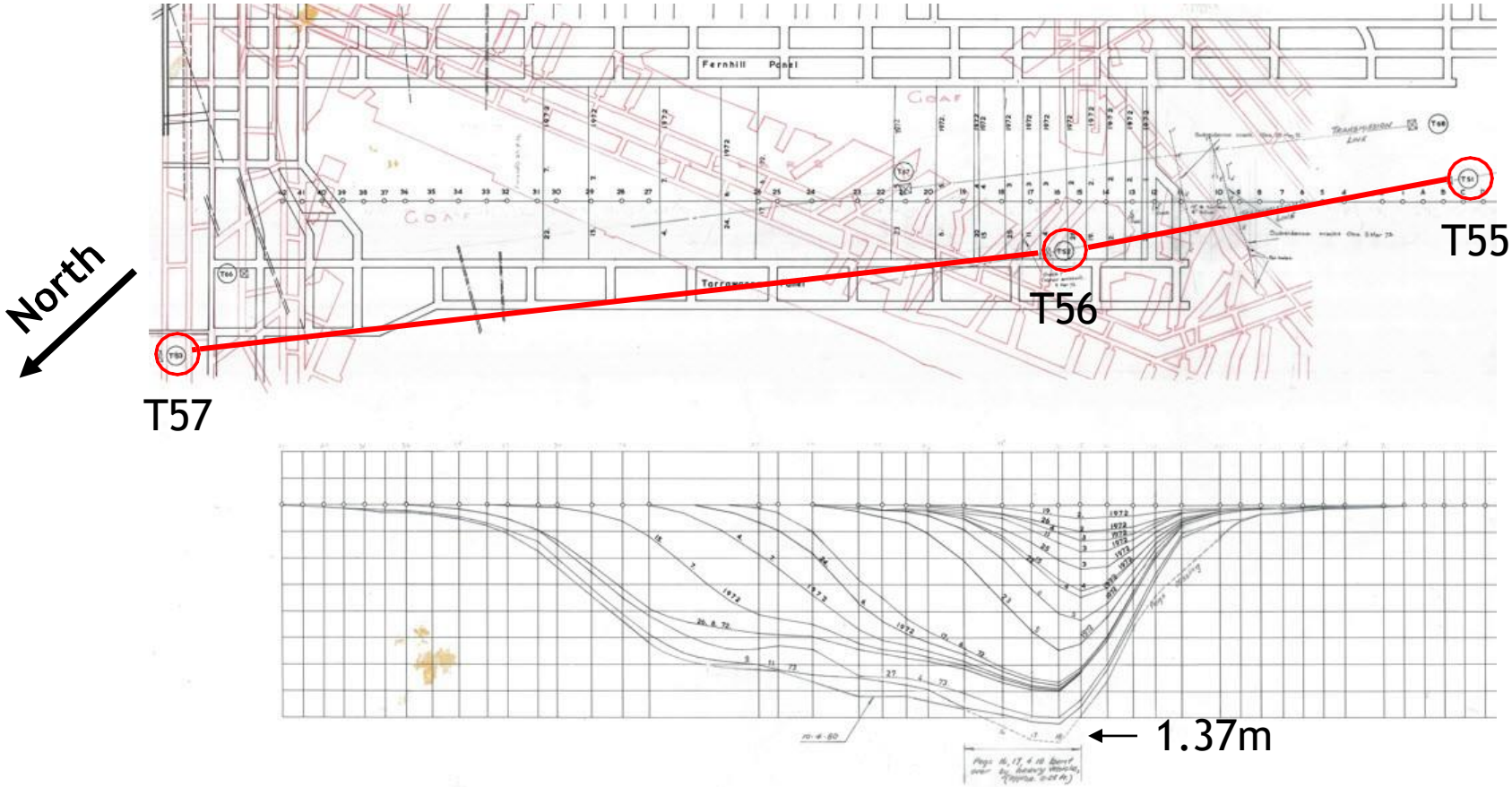
Power Transmission Lines Predate Balgownie Seam Mining

1951

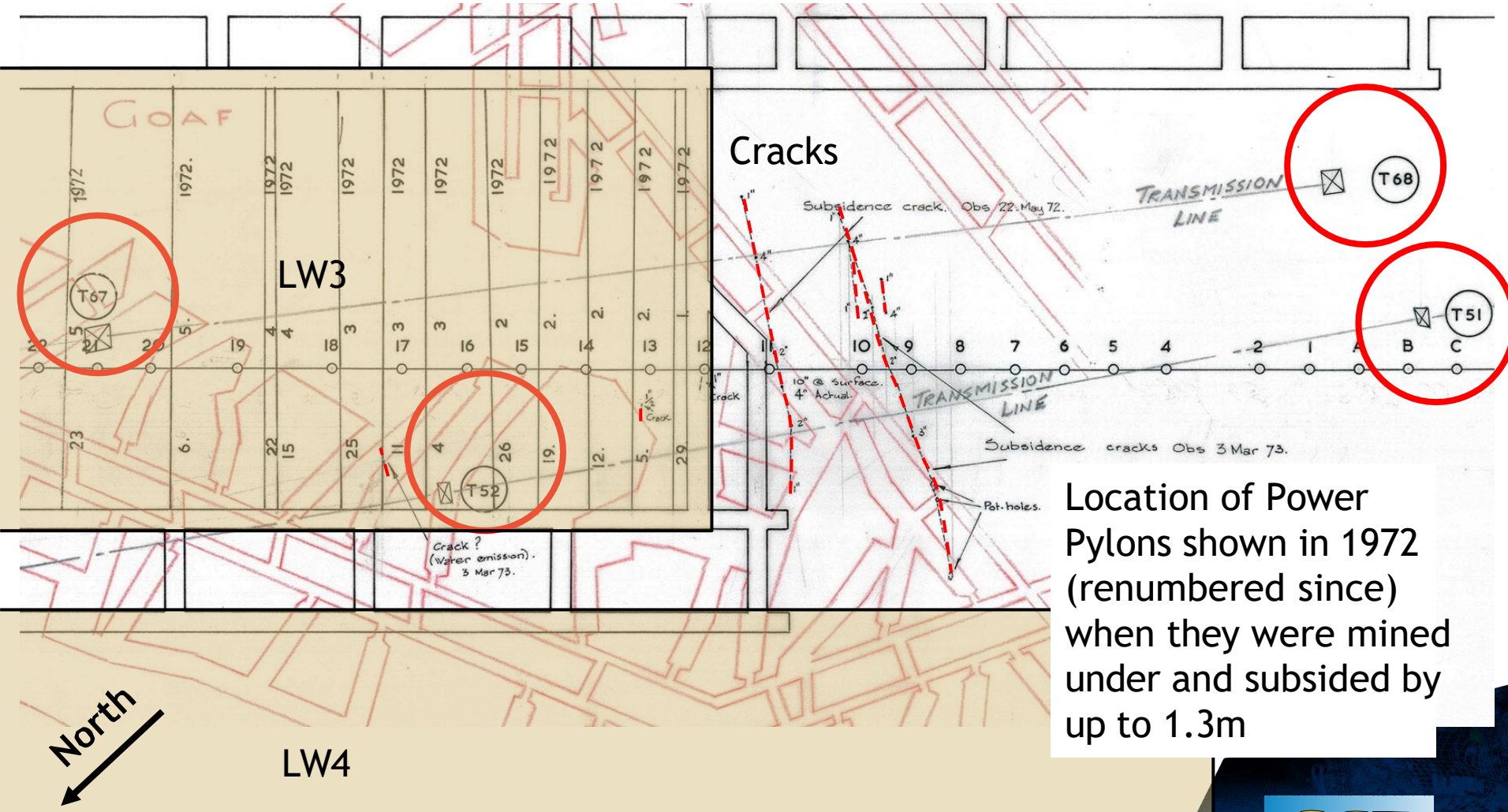
1961

Aerial photographic evidence that 330kV & 132kV powerlines were constructed after Bulli Seam mining but approximately 10 years before Towers T56 and E67 were undermined by Longwall 3 in the Balgownie Seam in 1972

Balgownie Seam Subsidence – LW3



Power Transmission Lines 1972
Balgownie Seam Mining and Cracks



Location of Power Pylons shown in 1972 (renumbered since) when they were mined under and subsided by up to 1.3m

Wollongong Coal Limited - Russell Vale East Extraction Plan for Stage1 (PC21-25 and PC07-08) and Stage2 (PC27-34) Mining

Subsidence Overview for Consultation with TfNSW

Update 11/05/2022

Geotechnical consulting, research and instrumentation for mining and civil industries.

SCT

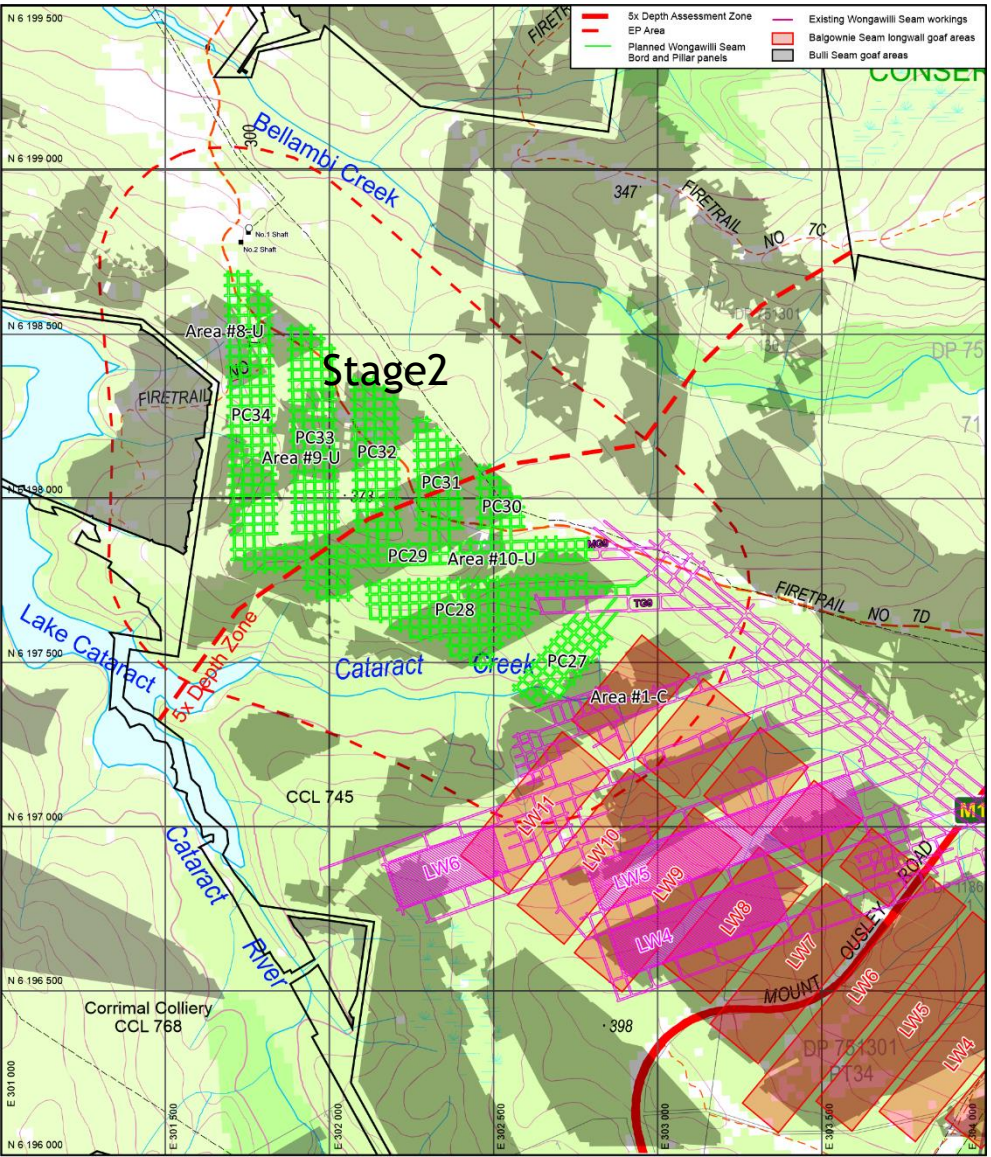
Overview of Presentation

- Key Messages
- Site Description
  - Scope of Stage1 and Stage2
  - Previous mining and subsidence context and proposed monitoring
  - Surface features with approved existing and additional monitoring
- Subsidence Monitoring Results to Date
- Recommendations to Technical Committee
  - Appropriateness of BFMP and RA requirements

Key Messages

- Planned Stage2 mining is further to west of Stage1 (a) i.e. more remote from major infrastructure
- No change to subsidence expectation of less than 100mm over majority of RVE area with any impacts expected to be imperceptible for all practical purposes
- No change to the approved monitoring for built features - additional GNSS units in Stage2 area primarily for monitoring of natural features (swamps) and to confirm status of Bulli Seam Goaf areas.
- Existing BFMP is suitable for Stage2 and formal Risk Assessment is not required
- The approved subsidence monitoring for the mining to date indicates subsidence is less than as expected i.e. ±20mm at all GNSS unit locations
- No change to contingency for managing potential for greater than 100mm by staging extraction and revising mining layout if required (adaptive management measures)
  - Stage 1(a) – (PC21-25) Remote from infrastructure
  - Stage 1(b) – (PC07-08) Offset from infrastructure
  - Mining in Stage 1(b) (PC07 & PC08) can only commence once subsidence confirmed as less than 100mm in PC21
  - Flexible mining system that can be modified to reduce potential for subsidence
  - TfNSW Technical Committee management process involving TfNSW, RR and subsidence specialist
- No change to very low potential for legacy mining impacts that exist irrespective of planned mining. Subsidence effects and impacts managed by:
  - LIDAR surveys of whole RVE area
  - Underground observations of mining conditions

Site Description – Stage2



LOCALITY:

Stage2 (PC27-34) mining is further to west than Stage1 in Approved Extraction Plan (EP1)
i.e. more remote from major infrastructure of Mount Ousley Road and 330kV and 132kV high voltage powerlines

Site Description – Stage1 and Stage2

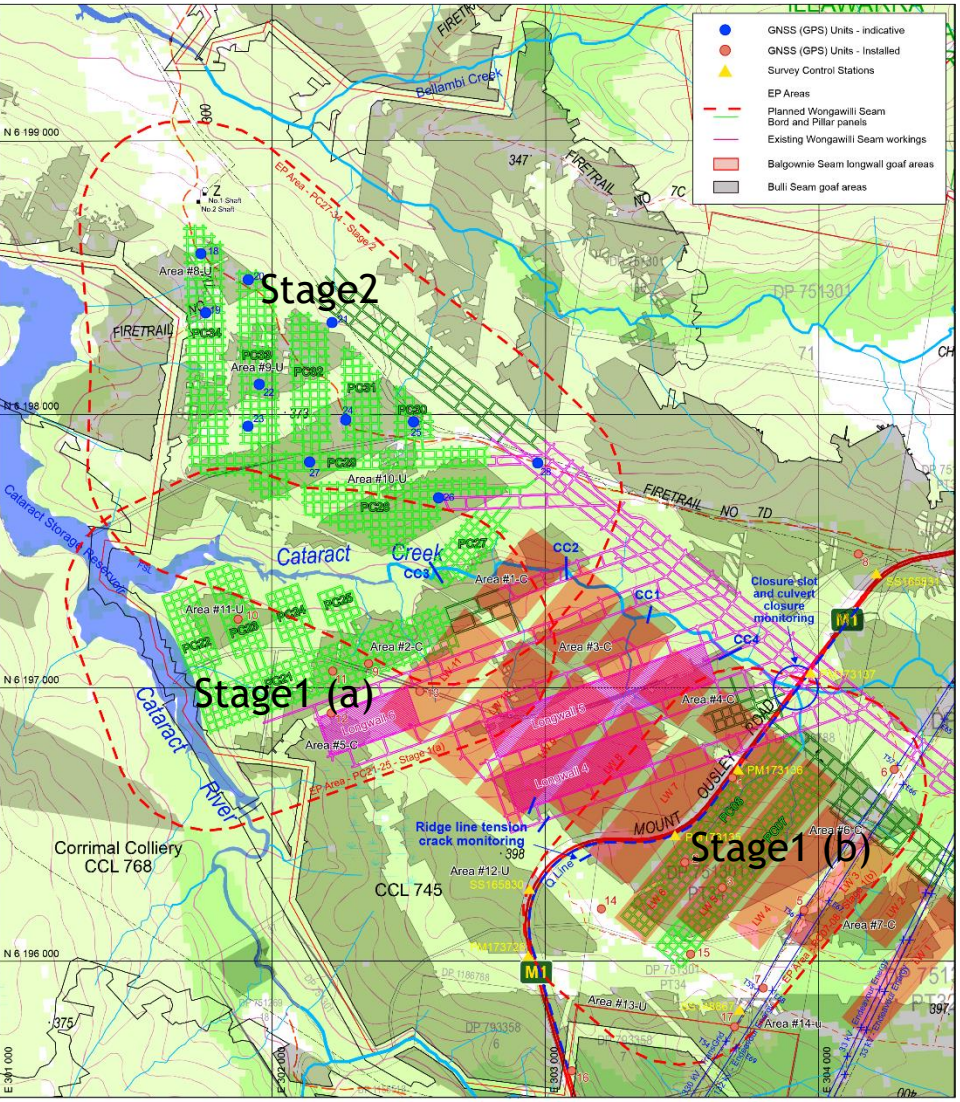


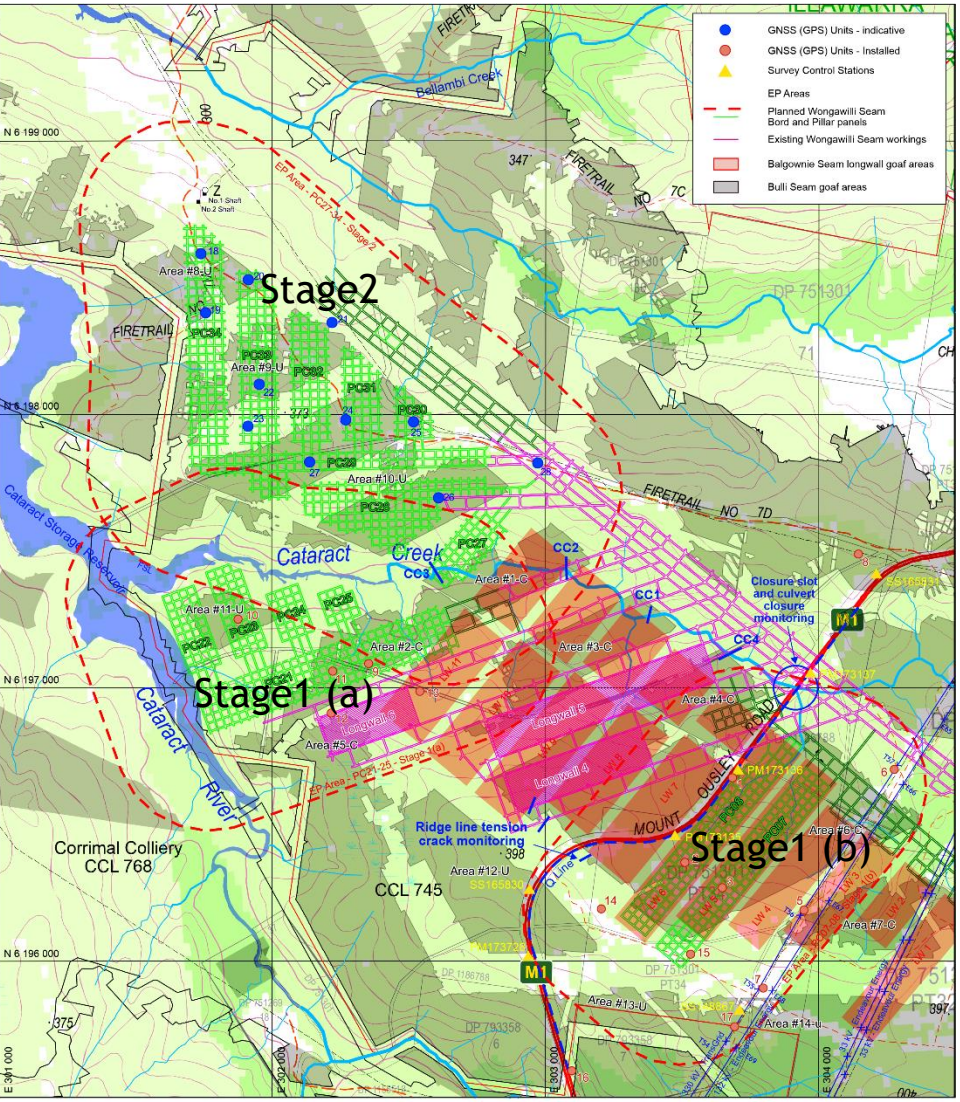
Figure 1: Site plan of Russell Vale East superimposed on a 1:25 000 topographic map with EP Assessment Areas and subsidence monitoring locations.

SCOPE of EXTRACTION PLANS

- EP1 = Stage1 (a) – PC21-25 and Stage1 (b) – PC07-08
- EP2 = Stage 1 (a) and Stage1 (b) and Stage 2 (PC27-34)

- Mining approved in Stage 1(a) (where no built features above) to prove mining method in PC21 results in less than 100mm subsidence before mining can proceed in Stage1 (b) (PC07-08) adjacent to major infrastructure

Site Description – Stage1 and Stage2



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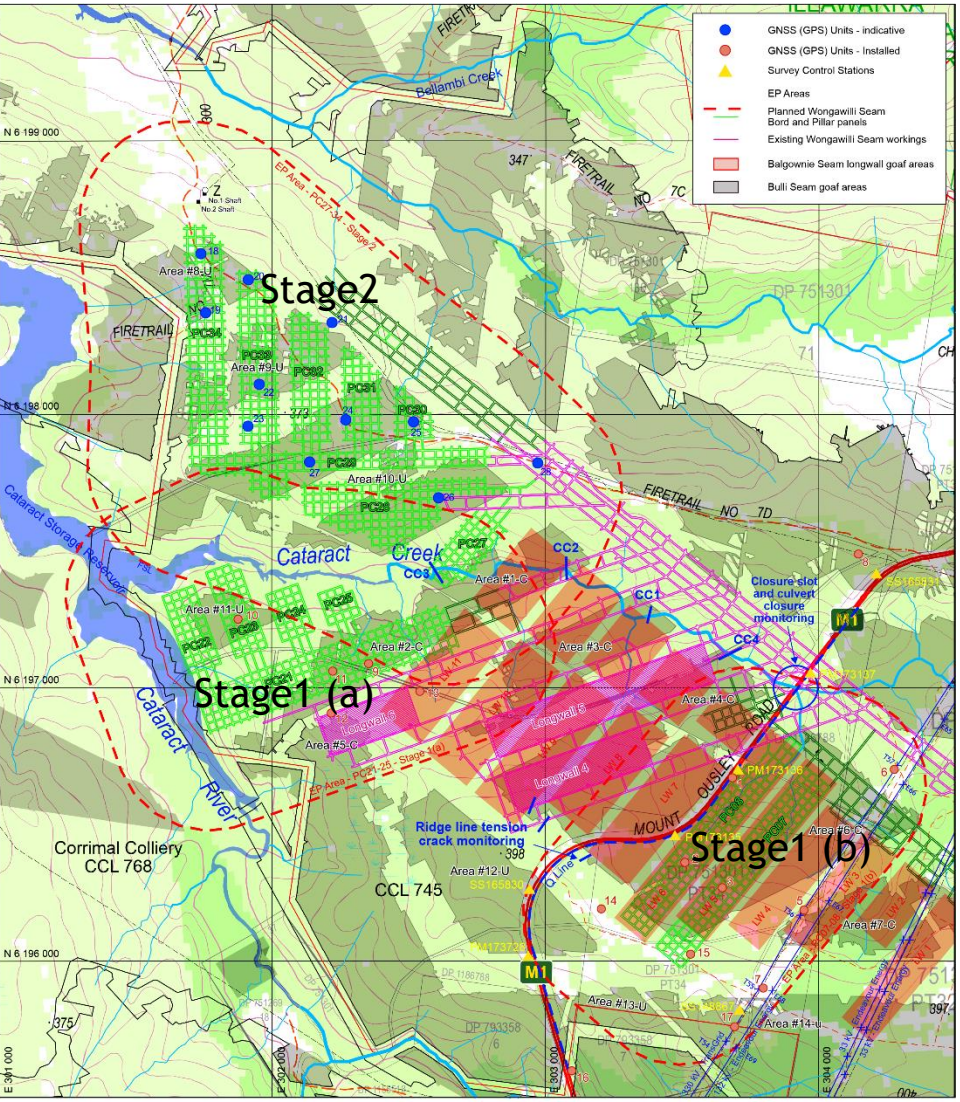
Site Description – Stage1 and Stage2



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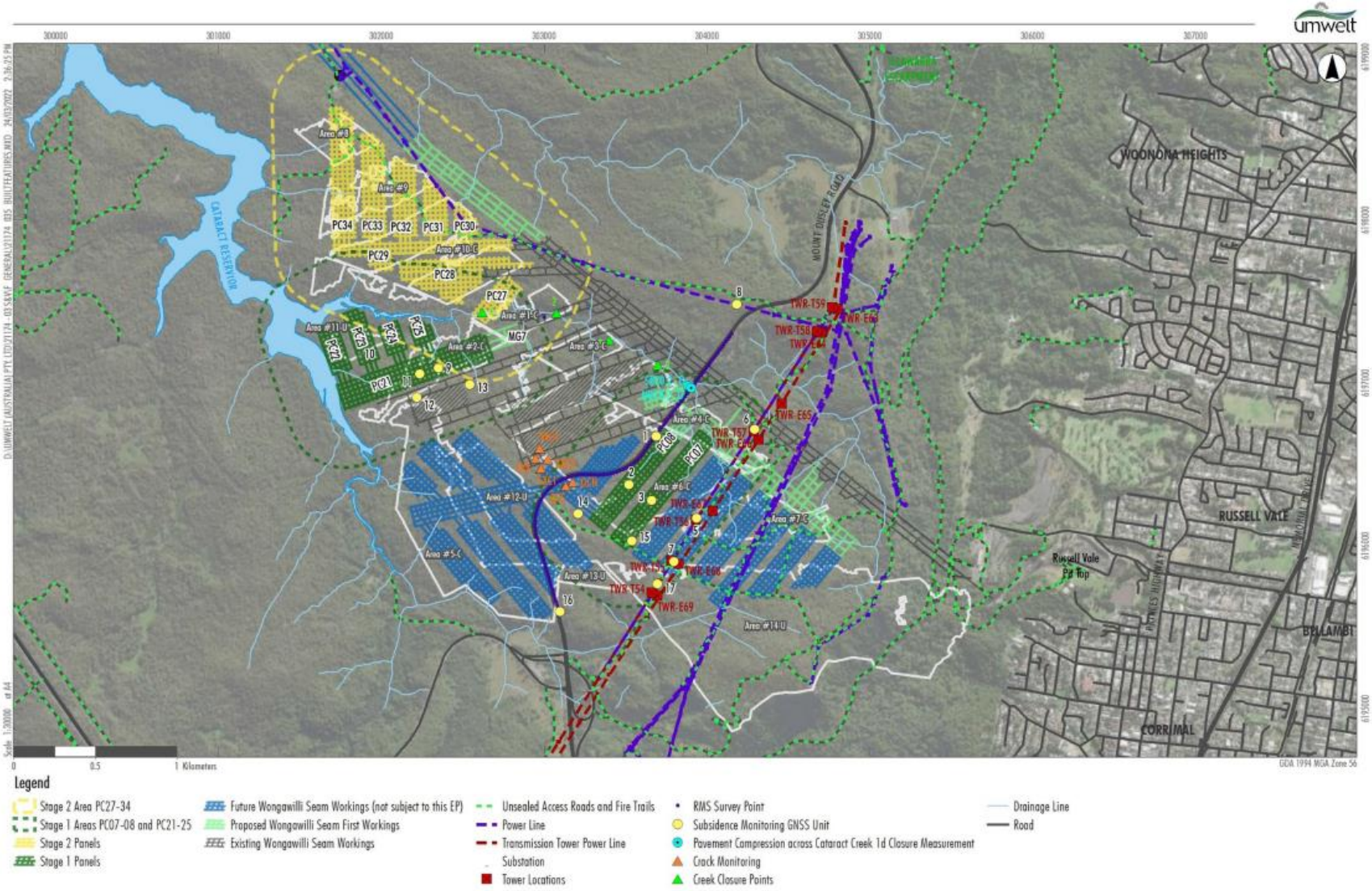
PREVIOUS MINING CONTEXT:

- Three seams of mining with complete mining records
- Subsidence monitoring data available for Balgownie and Wongawilli Seams
- Cumulative subsidence to maximum of 3.7m in small areas – Maximum incremental subsidence = 1m from Bulli, 1.4m from Balgownie and 1.8m from Wongawilli

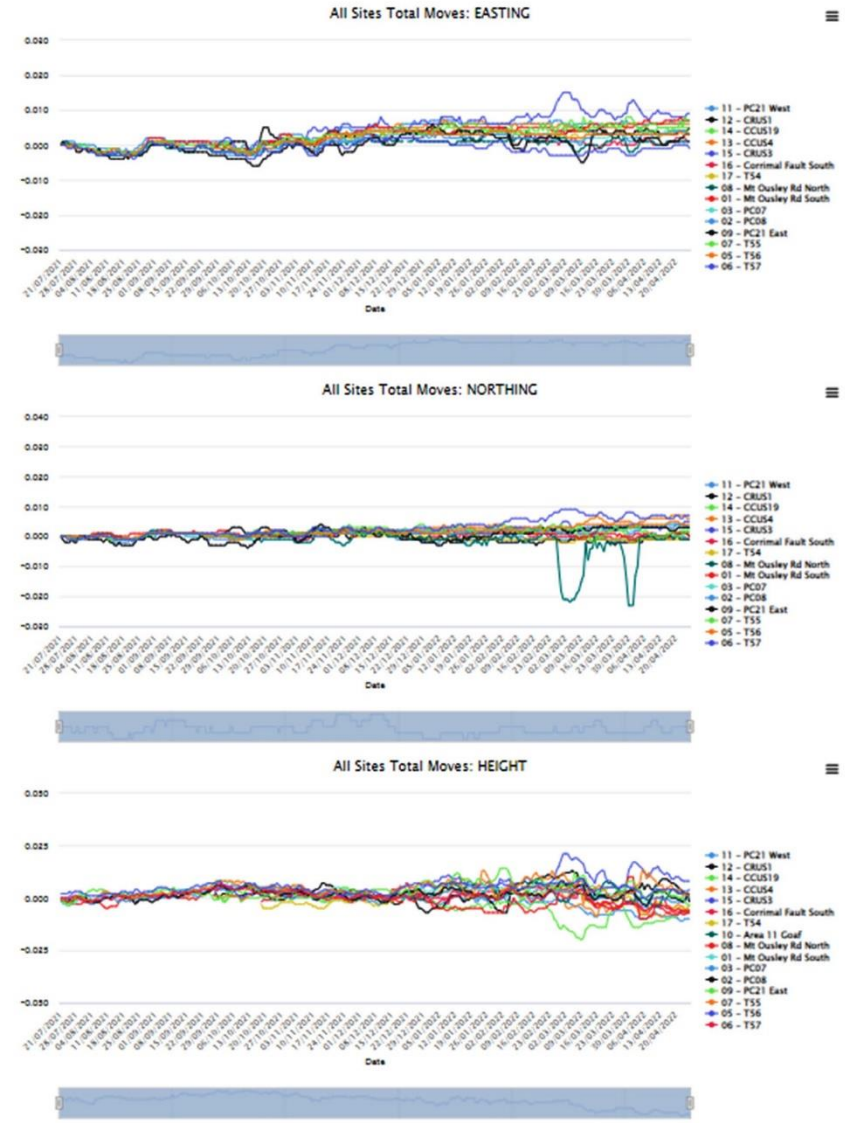
SUBSIDENCE MONITORING FOR STAGE1 AND STAGE2:

- As approved in EP1 for Stage1 with additional GNSS units above Stage2 panels
- In addition to the continuous GNSS point and pavement slot closure monitoring the approved monitoring includes:
- Periodic attended ground surveys of the road pavement, closure measurements across Cataract Creek, measurements in Cataract Creek culverts and tension cracks at ridgeline as well as at Picton Road interchange bridge and nearby culverts
- GNSS measurements provide measurements of vertical and horizontal movements
- Visual inspections by TfNSW

BF Monitoring Network



Subsidence Monitoring Results to Date



- The latest monitoring data (7 day moving average) for all GNSS units indicates movements within tolerance of the equipment i.e. ± 20mm
- GNSS units #9 and #13 near the current and recent mining in PC21 and Maingate 6 panel show maximum vertical movements of +14mm and -9mm

Recommendations to Technical Committee

- Stage2 mining is more remote from Mount Ousley Road than the area assessed in the Stage1 risk assessment, so the risk assessment for Stage1 captures any risks associated with Stage2, and as such a formal risk assessment is not considered necessary

- the existing BFMP approved for Stage1 (with additional inclusions) is suitable for Stage2

AECOM

AECOM Australia Pty Ltd
Level 21, 420 George Street
Sydney NSW 2000
PO Box Q410
QVB Post Office NSW 1230
Australia
www.aecom.com

Memorandum

+61 2 8934 0000 tel
+61 2 8934 0001 fax
ABN 20 093 846 925

To	Martin Upitis
CC	Cyril Gunaratne, Matt Boys, Dony Castro, David Looney (TfNSW) Richard Sheehan, Devendra Vyas (WCL) Richard Woods (CARDNO)
Subject	Extension of current BFMP to PC 27-34 (Stage 2) Mining (EP2)
From	Henk Buys
File/Ref No.	60668343 / 1.2
Date	04-Apr-2022

At the request of the TfNSW Technical Committee (TC) AECOM has reviewed the WCL RVC Extraction Plan, Subsidence Assessment for PC 27-34 (Stage 2) Mining (EP2 report).

Purpose

The BFMP for Extraction Plan PC07-08 and PC21-25 (EP1) has been signed off by TfNSW and it is proposed that the BFMP be extended to incorporate management of infrastructure during EP2 extraction. The purpose of this review is:

- To assess whether a further risk assessment is appropriate in accordance with TfNSW procedures or if the risk assessment carried out for the BFMP would be sufficient
- To assess whether the current BFMP is suited for management of TfNSW infrastructure EP2 extraction.

In order to make these assessments the EP2 report has been reviewed to assess whether the severity of impacts as a result of extraction of EP2 would be more or less severe than EP1 and whether there is a need for any change in the management of TfNSW infrastructure.

The approximate location of PC7-8 and PC21-25, covered by the existing BFMP relative to the EP2 panels are shown in Figure 1. It can be seen from the figure that the EP2 panels are further from TfNSW infrastructure than the EP1 panels, sometimes substantially so.

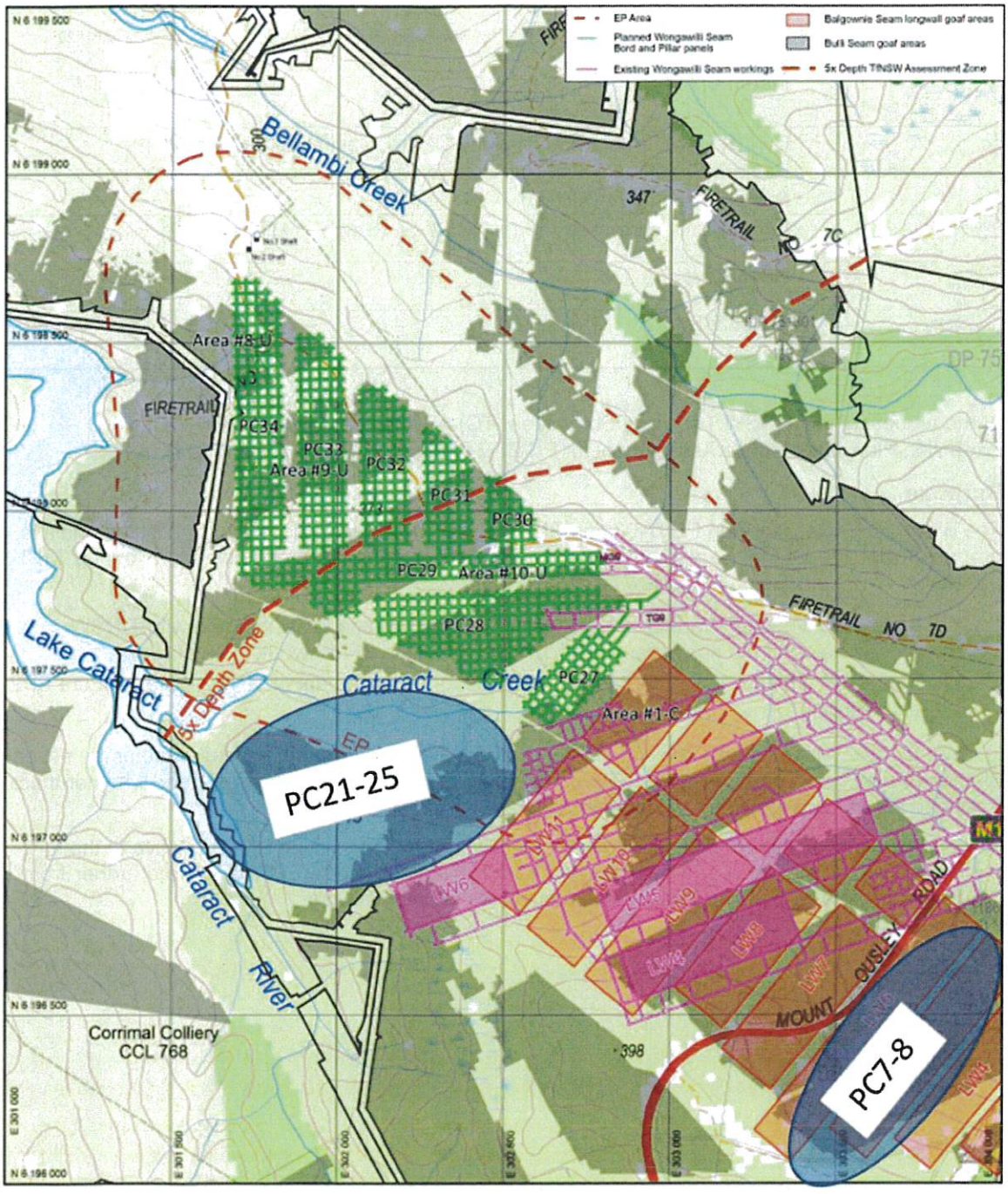


Figure 1: Site plan superimposed on 1:25,000 topographic map.

Nature of EP2 impacts

The EP2 report indicates that no perceptible impacts are expected to TfNSW infrastructure. See the following sections:

- Summary
- Section 2 (Conclusions and Recommendations)
- Section 3.6.2 (Surface features and surface infrastructure)
- Figure 5 (Contours of estimated subsidence and surface features)

The report indicates that there is the possibility of some horizontal movement downslope from the ridge towards Cataract Creek, but that these are legacy movements associated with earlier mining. This is essentially the same advice provided in the current BFMP. See the following EP2 sections:

- 4.2.3 (Horizontal movements)
- 4.2.4 (Unconventional subsidence effects)

The EP2 report indicates that impacts are anticipated to be less than for EP1. See the following sections:

- Summary
- Section 2 (Conclusions and Recommendations)

Performance measures and trigger level recommendations in the EP2 report are in line with those in the BFMP and TARP for EP1. See the following section:

- Section 4.4.3 (Recommendation for performance indicators)

The EP2 report recommends extending the existing EP1 monitoring program to cover EP2 activities. See the following sections:

- Summary
- Section 2.4 (Recommendations)

The EP2 report indicates that a formal assessment is not considered necessary for Stage 2 mining. See section below:

- Section 5.3 (Subsidence impact assessment – Built features and infrastructure)

Discussion and conclusions □ Need for separate risk assessment

The description in the EP2 report of mining related ground movements, their drivers, magnitude and consequences are similar to those in the EP1 report. The mining method proposed (bord and pillar) is the same for the two EPs and the basic panel configuration is similar.

From the EP2 report it is evident that the geology and scale and nature of ground movements at the bord and pillar panels are similar. Also, the type of risks associated with the proposed EP2 extraction are the same as for EP1. However, due to the greater distance of EP2 from TfNSW infrastructure, the EP2 report indicates that the risk levels for these risks are lower than for EP1.

Hence AECOM concurs with SCT (both members of the TfNSW TC) that a separate risk assessment is not required as part of EP2 extraction.

□ Extension of BFMP requirements to include EP2 extraction

A risk assessment was carried out for EP1 and identified a number of risks for TfNSW infrastructure. The EP1 BFMP was subsequently developed to manage these risks and included a monitoring plan and TARP. As the risks are fundamentally the same for both EPs and as the impacts due to extraction at EP2 are expected to be even less than the minor impacts anticipated from EP1, it is considered appropriate that the risk assessment, monitoring regime and TARP for EP1 be extended to manage mining impacts resulting from extraction associated with EP2.

Important information about this Geotechnical Memo

Client details, scope and reliance

AECOM has prepared this report for the use of the Client and for a specific purpose, each as expressly stated in the report. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this report. This report has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM's

findings represent its reasonable judgment within the time and budget context of its commission and utilising the information available to it at the time.

No section or element of this report may be removed, reproduced, electronically stored or transmitted in any form by parties other than those for whom the report has been prepared without the written permission of AECOM. All sections in this report must be viewed in the context of the entire report/document including, without limitation, any assumptions made, and disclaimers provided. No section in this report may be excised from the body of the report without AECOM's prior written consent.

Unless explicitly stated in the scope of work, this report does not provide data or advice on the contamination status of the site or adjacent sites.

Standard of care

AECOM has prepared this report using the standard of reasonable skill, care and diligence required of a consultant performing the same or similar Services. The report should be read in full. No warranty, expressed or implied, is made as to the professional advice included in this report.

Data sources

AECOM may have relied on information provided by the Client and third parties (Information Providers) to produce this report and arrive at its conclusions. AECOM has not verified information provided by the Information Providers (unless specifically agreed as part of AECOM's scope of work) and we assume no responsibility and make no representations with respect to the adequacy, accuracy or completeness of such information. AECOM assumes no responsibility for inaccuracies in reporting by the Information Providers including, without limitation, by the Client's employees or representatives or for inaccuracies in any other data source whether provided in writing or orally used in preparing or presenting the report.

Variability in conditions and limitations of data

Subsurface conditions are formed through a variety of natural processes and can be altered by human activities. The behaviour of the ground, groundwater and contaminants are complex and conditions can vary across a particular site. As a result, subsurface conditions cannot be exhaustively defined by investigations at discrete locations. Therefore, it is unlikely that the results and assessments expressed in this report will represent conditions at any location removed from the specific points of sampling. The precision with which conditions can be inferred depends largely on the uniformity of subsurface conditions and on the frequency and method of sampling as constrained by factors such as project budget and time limitations and physical constraints.

Furthermore, subsurface conditions can change over time, which should be considered when interpreting or using the data within this report.

Verification of opinions and recommendations

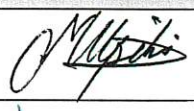
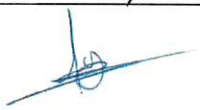
The opinions and recommendations in this report apply to the proposed development and the site existing at the time of our investigation and cannot necessarily apply to changes in the proposed development or site changes of which AECOM is not aware and has not had the opportunity to evaluate. Our recommendations should be considered to be preliminary and subject to verification during project implementation. If conditions encountered at the site are subsequently found to differ significantly from those anticipated, AECOM must be notified and be provided with an opportunity to review the recommendations.

Henk Buys
Technical Director
henk.buys@aecom.com

Mobile: +61 0448 997 500
Direct Dial: +61 2 8934 0127

AECOM

Endorsed by Technical Committee for TfNSW (TC) in Their Area of Expertise

Organisation and Position	Member	
TC Chair Person	Martin Upitis	
TfNSW Pavement Maintenance Planner, South East	Cyril Gunaratne	
TfNSW Bridge Maintenance Planner, South East	Dony Castro	
AECOM – Technical Director, Ground Engineering	Henk Buys	
Cardno – Senior Principal - Bridges	Richard Woods	
WCL Subsidence Specialist	Ken Mills	
WCL Environmental Manager	Richard Sheehan	
WCL Technical Services Manager	Devendra Vyas	

RVF22/403#40
MAAG0013970

Mr Simon Pigozzo

Via: Major Project Portal / Email

Dear Mr Pigozzo

Re. Extraction Plan - Russell Vale Underground Expansion - RVC Revised UEP Extraction Plan

I refer to your request of 20 April 2022 for advice regarding the Russell Vale Underground Expansion - RVC Revised UEP Extraction Plan. The Resources Regulator has reviewed the request.

Limitations
The Extraction Plan is assessed and determined by DPIE under the conditions of the development consent. The Resources Regulator provides advice to DPIE to assist in the determination. In view of the high-level uncertainties in relation to the magnitude, nature, location, timing and duration of subsidence development due to the highly complicated conditions at the subject site as well as the existence of the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08, we suggest that the Approving Authority consider and enforce relevant Conditions of Approval to ensure that the proposed mining of PC07 and PC08 be subject to:

1. The Proponent's undertaking of a specific review of the subsidence monitoring and any other relevant data collected during the mining of extraction panels PC21 to PC25 and PC27 to PC34. The objectives of the review are to up-date the Proponent's understanding of risks to the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08 and, if warranted as a result of the review, to up-date the Proponent's risk management plans for the Key Public Infrastructure. The aforementioned review must include the representatives of the infrastructure operators, and

2. The infrastructure operators' endorsement of the Proponent's proposed risk management plans for the Key Public Infrastructure following the above-mentioned review.

Please note:
- The Key Public Infrastructure mentioned above is identified in Condition C7 of the Development Consent (i.e. MP09_0013, dated 8 December 2020);

- The aforementioned review may take place towards the end or after the completion of mining of extraction panels PC21 to PC25 and PC27 to PC34, and

- In discussing the Sequencing of Mining, the Proponent states that "Stage 2 second workings (PC27-PC34) may be undertaken concurrently with Stage 1a (PC21- PC25) and Stage 1b (PC07-PC08) second workings." In this case, it is critical to mine extraction panels PC21 to PC25 and PC27 to PC34 prior to the review as recommended above, considering the potentially severe consequences and any resulting community outrages if the Key Public Infrastructure is adversely affected by subsidence.

In addition, the holder of relevant mining leases is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator pursuant to the conditions of the mining leases under the Mining Act 1992. The holder of the mining leases must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this 'RUSSELL VALE COLLIERY REVISED UNDERGROUND EXPANSION PROJECT, EXTRACTION PLAN, STAGES ONE and TWO - PC07, PC08 & PC21 to PC25 and PC27 to PC34 , RVE EC PLN 010 (dated 30 November 2021) ' is updated where necessary.

Regulatory requirements if approved

The authorisation holder is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator under the conditions of the mining lease and the *Mining Act 1992*. The authorisation holder must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this Extraction Plan is updated where necessary.

The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulation as well as other WHS regulatory obligations.

Subsidence associated with the proposed Extraction Plan will be regulated by under relevant provisions of WHS laws in particular Clause 33 and Clause 67 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* relating to High Risk Activities and Subsidence.

Background

The NSW Resources Regulator is responsible for compliance and enforcement of the Extraction Plan is so far as it relates to requirements under the Mining Act 1992 and Work Health and Safety legislation. This role principally relates to rehabilitation, workplace safety and public safety.

The Mining Act Inspectorate within the Resources Regulator undertake risk-based compliance and enforcement activities in relation to obligations under the *Mining Act 1992*. This includes undertaking assessment and compliance activities in relation to mine rehabilitation activities and determination of security deposits.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Contact

Should you require any further information or clarification, please contact the Office of the Executive Director (ED.ResourcesRegulator@planning.nsw.gov.au)

Yours sincerely,

Peter Day
Executive Director
Resources Regulator
13 May 2022

Inspired People.
Dedicated Team.
Quality Outcomes.

Our Ref: 21174_Peter Day re NSWRR submission_V1.0

31 May 2022

Peter Day
Executive Director
NSW Resources Regulator

E| ED.ResourcesRegulator@planning.nsw.gov.au

Dear Peter

RE: NSW Resources Regulator Comments on Russell Vale Colliery Revised UEP Extraction Plan (RVF22/403#40, MAAG0013970)

I refer to your letter to Simon Pigozzo dated 13 May 2022 regarding the Russell Vale Colliery (RVC) revised Extraction Plan for the approved Russell Vale East mining area.

Thank you for providing a response, as requested by Wollongong Coal Limited (WCL) on 20 April 2022, for the revised Extraction Plan.

The extraction plan was revised to include extraction of the 'Stage 2' area, panels PC27–34. Based on the comments in the letter, we have assumed that the Resources Regulator has no specific concerns regarding the draft Extraction Plan insofar as it relates to the 'Stage 2' mining area (panels PC27–34).

As detailed in the current conditional approval of the 'Stage 1' Extraction Plan, mining is currently only approved in panel PC21 with further mining in PC22–25 and in PC07 and PC08 being subject to a review of subsidence monitoring in PC21 to confirm impact predictions. A minimum of 12 months groundwater monitoring within CCUS1 and the endorsement of the extraction plan by relevant infrastructure owners in the vicinity of PC07–08 is also required before mining can commence in PC07 and PC08.

A detailed submission to the Department of Planning and Environment is currently being prepared regarding the proposed approach to satisfying the subsidence monitoring requirements of this conditional approval.

Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

David Holmes
Principal Environmental Consultant

E| dholmes@umwelt.com.au

cc Department of Planning and Environment

Umwelt (Australia) Pty Limited

ABN 18 059 519 041

T| 1300 793 267
E| info@umwelt.com.au

www.umwelt.com.au

Spatial Services
Level 14, McKell Building 2-24 Rawson Place, Sydney NSW 2000
Tel 1300 211 253 | TTY 1300 301 181
ABN 81 913 830 179 | www.customerservice.nsw.gov.au

Matt Copeland
Wollongong Coal
7 Princes Highway, Corrimal, NSW, 2518
Cataract NSW 2560
Email: mcopeland@umwelt.com.au

Survey Mark Removal (SMR) Application: Granted (conditional)

Dear Matt,

Re: Underground Coal Mining

Your Reference: TBC SMR Application reference: SO-1466

Locality: Cataract, 2560 LGA: Wollongong

Please quote the SMR Application reference SO-1466 in any correspondence.

Your request to remove the Survey Marks detailed in your application has been considered and granted with the following conditions:

1. This consent must be read in conjunction with the documents listed below (available for download at DCS Spatial Services Customer Hub):
   - Appendix A - BFMP_ EP _Stage1 and Stage2_RevD2V2_Clean.pdf
   - Appendix B – NRTK Monitoring Survey.pdf

2. A monitoring survey must be carried out at 6 monthly intervals for the survey marks outlined in Appendix A. This monitoring survey will allow DCS Spatial Services to assess the impact of underground mining on the State Control Network and State Cadastre, and therefore to update the Survey Control Information Management System (SCIMS) with valid coordinates for the benefit of the local community. Specific to this monitoring survey:

   - An example of appropriate network design and survey technique is outlined in Appendix B which outlines requirements for compliance with Surveyor-General's Direction No.12 (SGD12) and Technical Specifications for NSW Secondary Control Surveys. In general, the monitoring survey is to achieve Class D horizontally and vertically in order to confidently measure and assess any local subsidence. Any variation to the agreed survey strategy must be communicated and agreed to by DCS Spatial Services beforehand.

   - Data must be submitted to DCS Spatial Services after each monitoring survey. DCS Spatial Services must be consulted on data submission requirements and details.

   - The monitoring survey is to continue until measurable subsidence has ceased and been agreed to by DCS Spatial Services.

3. Replacement works are required if survey marks are found to have been affected by measured subsidence are to occur once measurable subsidence has ceased and been agreed to by DCS Spatial Services. Requirements for the replacement works will be specified at a later date by DCS Spatial Services however, will generally consist of the affected marks being replaced with a mark of equivalent type.

4. Regarding the State Cadastre, if significant damage to the State Cadastre has been determined through the results of the monitoring survey, rectification works must be carried out in the form of a Plan of Redefinition or similar. This work must be carried out by a NSW Registered surveyor and lodged with NSW Land Registry Services in accordance with Surveyor General's Direction No.11 (SGD11)**.** This will be agreed to by DCS Spatial Services and Wollongong Coal before work is to be carried out.

5. A post construction field inspection is conducted upon the completion of the project and submitted to the Office of the Surveyor-General by the Project Data Submission in the DCS Spatial Services Customer Hub. The template for a Survey Mark Audit Schedule can be found in the POSI Resource Pack under *Surveyor-General's Direction No.11*.

6. Upon the completion of the project, an End of Project Applicant Compliance Statement and all required deliverables are submitted to the Office of the Surveyor-General by the Project Data Submission in the DCS Spatial Services Customer Hub.
   The template for an End of Project Applicant Compliance Statement can be found in the POSI Resource Pack under *Surveyor-General's Direction No.11*.

Please note:

- During the interim period of mark destruction to the re-establishment of new survey marks and/or lodgement of Plan of Survey Information Only, your contact details will be provided to any persons from the public enquiring about the loss of survey infrastructure. If contacted by any such person then the applicant must supply any relevant information that may assist in their inquiry (such as survey data that may assist in defining GDA, AHD or the cadastre).
- If a minor variation to this approval is required, then notification of that variation needs to be sent to the Office of the Surveyor-General by commenting on SO-1466 in the DCS Spatial Services Customer Hub.
- If there are any major variations to the subject proposal, this consent is nullified and a new Survey Mark Removal application must be lodged for assessment by the Surveyor-General.
- SCIMS survey mark data can be obtained free of charge from the SIX Maps - SCIMS Online facility within the DCS Spatial Services Portal by logging in or registering a new "SIX" user account.

- Where possible, provide at least 30 business days notification before the proposed removal or replacement of survey marks (Permanent Survey Marks or Cadastral Reference Marks) thereby extending the timeframe of 14 days minimum under Clause 90 of the *Surveying and Spatial Information Regulation 2017*.
- For all future requests to remove a survey mark, please make a Survey Mark Removal application by logging in or registering a new customer account on the DCS Spatial Services Customer Hub.

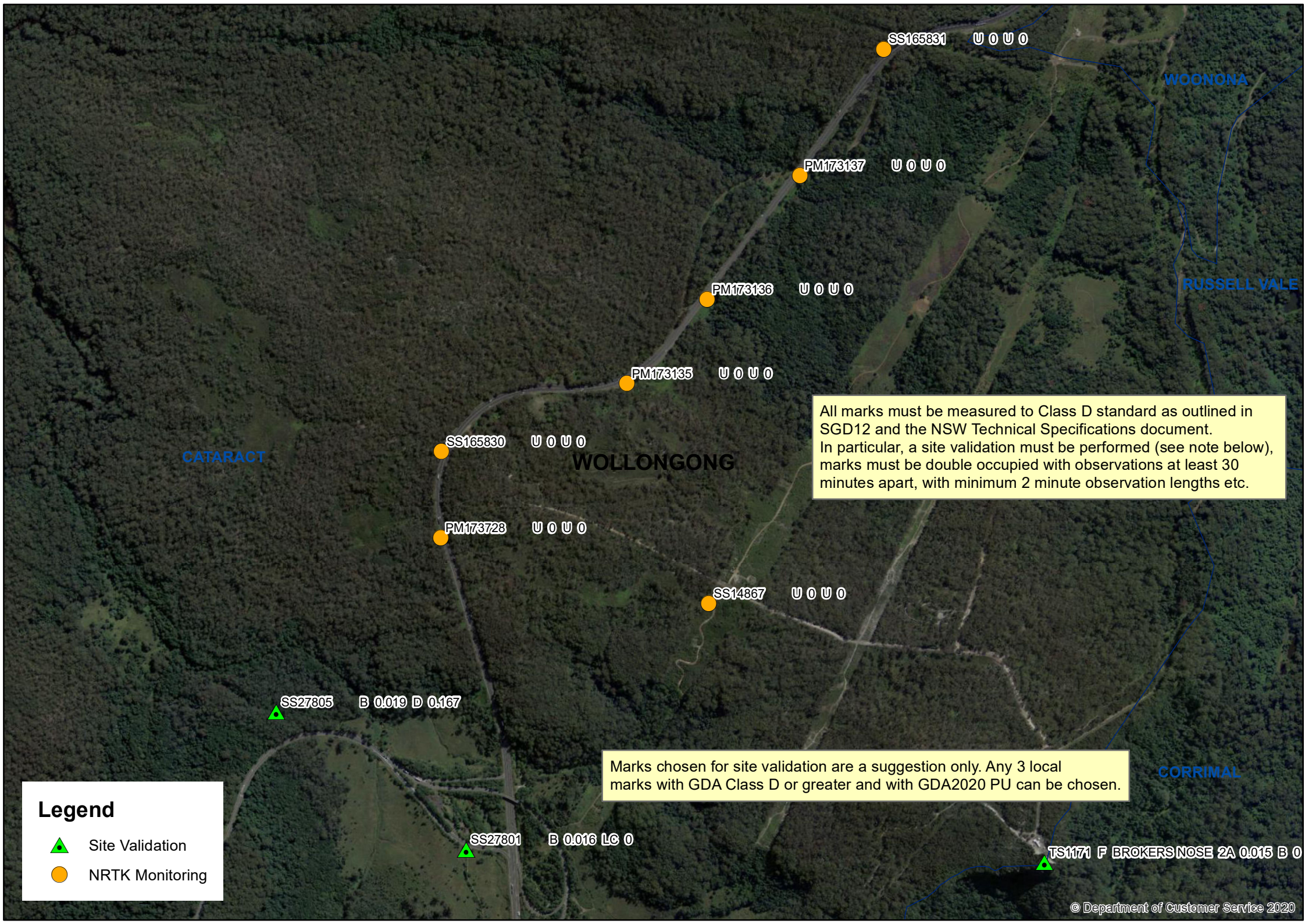
If you have any concerns regarding this matter, please add a comment to request SO-1466 through the DCS Spatial Services Customer Hub.

Yours sincerely,

Tom Bernstein

For Thomas Grinter
Surveyor-General of NSW (Acting)

11 May 2022


SS165831 U 0 U 0
WOONONA
PM173137 U 0 U 0
PM173136 U 0 U 0
RUSSELL VALE
PM173135 U 0 U 0
All marks must be measured to Class D standard as outlined in SGD12 and the NSW Technical Specifications document.
In particular, a site validation must be performed (see note below), marks must be double occupied with observations at least 30 minutes apart, with minimum 2 minute observation lengths etc.
SS165830 U 0 U 0
CATARACT
WOLLONGONG
PM173728 U 0 U 0
SS14867 U 0 U 0
SS27805 B 0.019 D 0.167
Marks chosen for site validation are a suggestion only. Any 3 local marks with GDA Class D or greater and with GDA2020 PU can be chosen.
CORRIMAL
SS27801 B 0.016 LC 0
TS1171 F BROKERS NOSE 2A 0.015 B 0
Legend
Site Validation
NRTK Monitoring
© Department of Customer Service 2020

Trescinda Brown

From: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Sent: Tuesday, 17 May 2022 1:14 PM
To: Nicholas Robinson; Girja Sharma
Cc: Trescinda Brown
Subject: RE: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Follow Up Flag: Follow up
Flag Status: Completed

Hi Nick

Thank you for providing WaterNSW the opportunity to review the Russell Vale State 1 and Stage 2 Extraction Plan (EP) draft Built Features Management Plan (BFMP). WaterNSW has reviewed the draft BFMP and has the following comments and recommendations:

Cataract Reservoir and Cataract Dam

Figure 1 of the Built Features Management Plan (BFMP) indicates Cataract Reservoir (Cataract River and Cataract Creek arms) are near the proposed mining areas particularly domain PC21-PC25. Section 1.3 states that Cataract Reservoir and fire trails/access roads are built features located within the extraction plan area. However, Table 7 and related Figure 4 do not list Cataract Reservoir in the list of built features and there is no assessment of the impact on Cataract Reservoir and any monitoring proposed to demonstrate performance and compliance with performance measures set for Cataract Reservoir. The risk assessments presented in the appendices also do not address this issue.
It is also stated that the Cataract Reservoir dam wall (and associated infrastructure) are remote from the EP areas and are not expected to be affected by subsidence movements. As such the dam wall is not considered further within this BFMP.

It is recommended that:

- The distance of the Cataract dam wall (and associated infrastructure) be stated clearly and cross reference assessments presented in the extraction plan subsidence predictions documentation in relation to potential impacts including potential for far field movements.
- An assessment of impacts due to the proposed extraction on Cataract Reservoir be presented including cross referencing with assessments presented in extraction plan subsidence prediction documentation. Based on this, a subsidence and environmental monitoring program and management measures must be developed and included in the BFMP to demonstrate compliance against performance measures set for Cataract Reservoir. If such assessments and monitoring are presented in other EP reports like the Surface and Groundwater Water Management Plan, they must be cross referenced in the BFMP.

Access roads and Fire Trails

Fire Road 7D and Fire Road 7M and the gate and fencing on the intersection of Fire Road 7D and Mount Ousley Road are within the proposed EP area. Some sections of the fire roads are relatively steep and may be impacted by subsidence especially Fire Road 7M. Fire trail 7M has a creek crossing over bedrock. The Bellambi Creek causeway on 7D is concrete with asphalt approaches. Some other creek crossings on 7D are either rock or concrete fords and approaches. The armoured creek crossings of Fire Road 7D may be damaged by subsidence if it is significant. All these armoured/rigid creek crossings could be impacted by subsidence.

It is recommended that the BFMP consider the above and specifically include a monitoring and surveillance program for the above listed features on Fire Road 7D and 7M.
Please feel free to contact me if you wish to discuss.

Regards

Ravi

Ravi Sundaram
Mining Catchment Specialist

WaterNSW
PO Box 398, Parramatta NSW 2124
Level 14, 169 Macquarie Street
Parramatta NSW 2150
T: 02 9865 2507
M.: 0428 226 152/ 0451 510 194
ravi.sundaram@waternsw.com.au
www.waternsw.com.au

Note: Please contact me by email or on my mobile until further notice as I may be working remotely.

From: Nicholas Robinson <nrobinson@umwelt.com.au>
Sent: Monday, 9 May 2022 2:41 PM
To: Girja Sharma <Girja.Sharma@waternsw.com.au>
Cc: Trescinda Brown <tbrown@umwelt.com.au>; Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Subject: Re: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Hi Girja,

I've just received an out of office email from Ravi. Is the below request something that you are able to provide a response on in Ravi's absence?

regards
Nick Robinson

From: Nicholas Robinson <nrobinson@umwelt.com.au>
Sent: Monday, May 9, 2022 1:56 PM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Cc: Girja Sharma <Girja.Sharma@waternsw.com.au>; Trescinda Brown <tbrown@umwelt.com.au>
Subject: Re: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Thanks Ravi, apologies for chasing that up. For some reason, we (Umwelt) are not receiving updates from the Major Projects Portal when a response is uploaded.

On a related note, we also need to consult with "owners of potentially affected features" on the Built Features Management Plan (BFMP). Previously on Stage 1, WCL carried out consultation with WaterNSW on the BFMP through the Technical Committee meeting (August 2021) and was advised that there was no WaterNSW infrastructure within the extraction plan area.

I've attached a copy of the tracked changes Stage 1 and 2 BFMP. Can you please advise whether WaterNSW needs to review and comment on this plan due to the presence of WaterNSW infrastructure in the Stage 2 area, and, if a review is required, please provide comment to round-out WaterNSW consultation on this revision of the extraction plan and MPs?

Thanks in advance.

regards,
Nick Robinson

From: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Sent: Friday, May 6, 2022 3:50 PM
To: Nicholas Robinson <nrobinson@umwelt.com.au>
Cc: Girja Sharma <Girja.Sharma@waternsw.com.au>; Trescinda Brown <tbrown@umwelt.com.au>
Subject: RE: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Nick
We have already responded to DPE on this proposal (refer attached letter).
Regards
Ravi

From: Nicholas Robinson <nrobinson@umwelt.com.au>
Sent: Friday, 6 May 2022 11:10 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Cc: Girja Sharma <Girja.Sharma@waternsw.com.au>; Trescinda Brown <tbrown@umwelt.com.au>
Subject: Re: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Hi Ravi,

I hope you are well. I'm updating our consultation documentation this morning with the view to providing WCL with a status update of how consultation is progressing. Are you able to provide a status update for how the WaterNSW reviews of the management plans in support of the WCL Russell Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan are progressing? Thanks in advance.

Regards
Nick Robinson

From: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Sent: Tuesday, April 12, 2022 11:44 AM
To: Nicholas Robinson <nrobinson@umwelt.com.au>
Cc: Girja Sharma <Girja.Sharma@waternsw.com.au>
Subject: RE: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Thanks Nick.
I have downloaded the documents and will review and provide comments within the next two weeks.
Regards
Ravi

From: Nicholas Robinson <nrobinson@umwelt.com.au>
Sent: Tuesday, 12 April 2022 10:54 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>
Subject: 21174 - Wollongong Coal Limited Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan (MP09_0013) WaterNSW Consultation.

Good morning Ravi,

We are currently assisting Wollongong Coal Limited (WCL) with their extraction plan for Stage 2 workings at the Russell Vale Colliery (RVC) Underground Expansion Project (UEP). As with the Stage 1 workings, these 'second workings' have been designed to be long term stable with subsidence impacts of less than 300 mm and less than 100 mm below coastal upland swamps. The proposed management measures to be implemented for the Stage 2 workings are largely identical to those which are being implemented for the Stage 1 workings subject to minor changes associated with features specific to the Stage 2 area. We expect that the level of impact to areas assessed under the management plans to be similar to or less than that for the Stage 1 workings, i.e. imperceptible.

As required by the development consent (MP09_0013), WCL is required to consult with WaterNSW on the revision of the following management plans:

- the Extraction Plan
- Water Management Plan (including Groundwater Management Plan)
- Swamp Monitoring Program
- Public Safety Management Plan.

As the proposed management practices remain largely identical to those on which WCL has previously consulted in relation to the Stage 1 Extraction Management Plan, we are seeking to turn around the consultation of these management plans as quickly as possible. Please see below a link for the holder of this email address to access the consolidated clean and tracked changes PDFs to the complete package of Stage 1 and Stage 2 Extraction Plan.

https://umwelt.sharefile.com/f/fof277b1-eee7-4685-b053-ba47728ad395

The holder of this email address should also have received an email from *Umwelt Admin* (sharefile@umwelt.com.au) granting access to the folder 21174 - *WCL RVC UEP Stage 1 and 2 for Review and Consultation* which contains the files. The individual management plans are included as appendices. We hope that the provided tracked changes versions will allow for a streamlined consultation processes for the Extraction Plan changes. These files have also been forwarded to DPE, to conduct their own review of the project and are being uploaded to the NSW Major Project Portal.

If you have any questions, please do not hesitate to contact Trescinda Brown or me by phone on the number below or by email (please CC: ems-nsw@umwelt.com.au).

Nick Robinson

Senior Environmental Consultant – Operational Environmental Support NSW

Umwelt (Australia) Pty Limited
Phone: 1300 793 267

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APPENDIX C – Baseline Survey and Data Report

1 AUDIT AND REVIEW

1.1 Scope of monitoring

This baseline report covers the installation of the monitoring points as detailed in the Built Features Management Plan for the UEP Extraction Plan 1 (EP 1) covering stages 1a (PC 21-25) and 1b (PC 07 – PC 08).

1.2 Baseline Monitoring Installation

The reporting period covers the installation of the survey points as below in table 1, the baseline survey where required, and the continuous monitoring of the GNSS units and pavement closure slot (crack meter) from the date of installation.

Table 1: Baseline Monitoring Installation and survey.

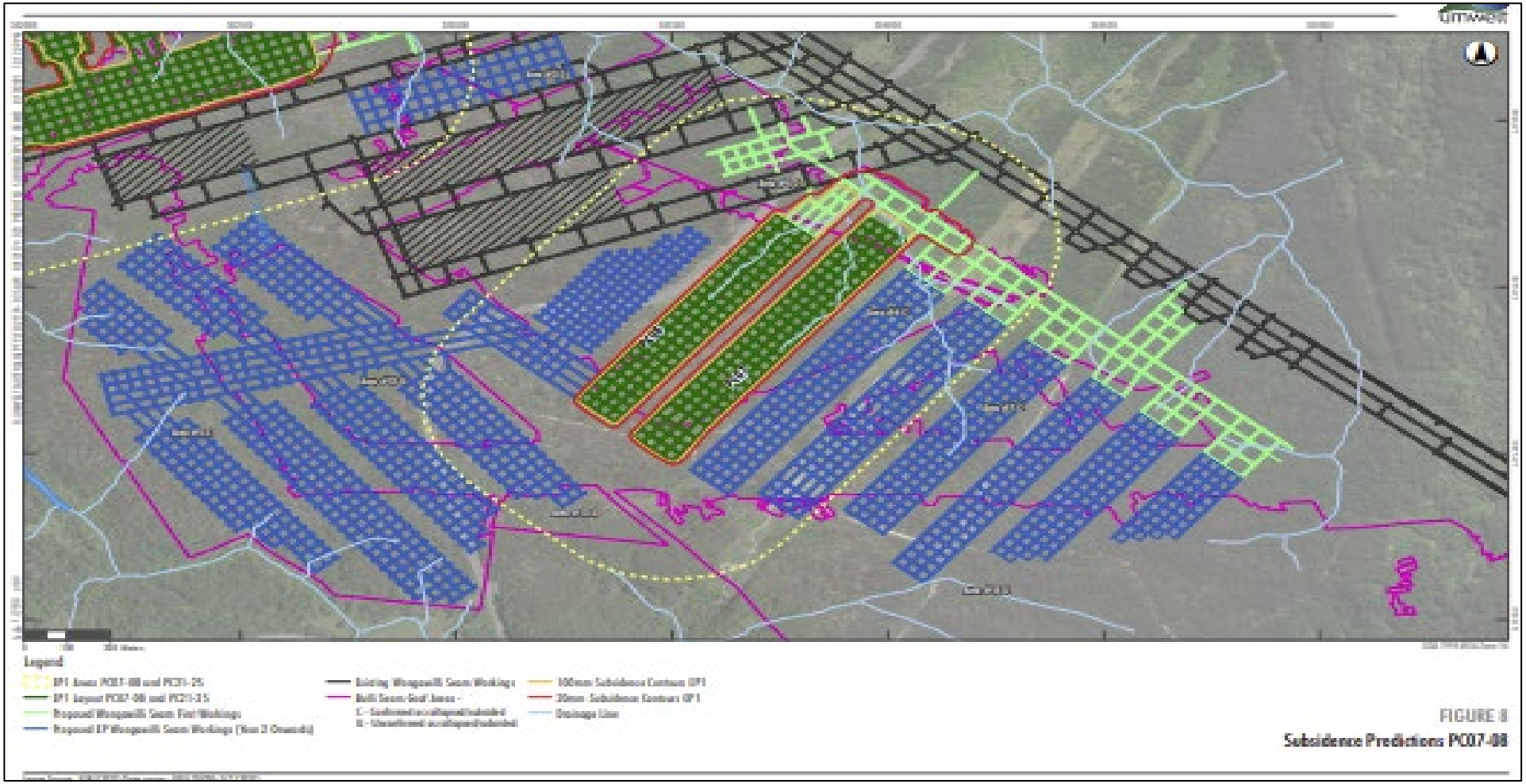
Action	Responsibility	Status and Date completed
Install continuous subsidence monitoring units (GNSS units) to monitor subsidence. Action: progressively install GNSS units in identified locations prior to second workings. Action: Requirement for an additional GNSS unit was identified during the TfNSW risk assessment and (ID GNSS 16) beyond the ridge to inform movements at the bridge to act as an early warning system.	WCL	Progressively installed and commissioned July/ August 2021 GNSS 10 was installed and commissioned 23/12/21. GNSS 16 subsequently installed 13/10/2021.
Reinstate Q-Line M1 southbound pavement survey line and complete survey or assess alternatives	WCL	14/11/2021
28/10/21 TFNSW and WCL attend pre- mining survey of M1 to identify if mill or mill and resheet of the slot is required, check function, and review opportunities to incorporate works in conjunction with other road closures / road works, to minimise disruption. Action: Reinstate crack meters at Cataract Creek M1 pavement slot and install remote telemetry for continuous monitoring.	WCL	Joint WCL/ TfNSW inspection 28/10. Unit replaced 14/11/2021 Unit telemetry provided 24/11/2021.
Action: Complete a risk assessment and carry out subsequent trim of ARL2 slopes where required.	TfNSW	Joint WCL/ TfNSW inspection 28/10 identified works required. TfNSW Completed 14/11/21. Risk subsequently confirmed as acceptable by TWG

Action	Responsibility	Status and Date completed
Monitoring prisms in the culvert were installed prior to the previous longwall mining. Joint inspection 28/10 identified the need to revise the location of the previously installed survey points. Action: Repair and replace survey points within Cataract Creek culvert to agreed locations.	WCL	Replacement survey points progressively installed 20/12/2021 prior to new baseline survey.
Monitoring pins (prisms at the bridge) were installed prior to the previous longwall mining. Action: Inspect and replace as required the prisms prior to mining of PC07-08 and carry out a survey to a establish baseline.	WCL	Prisms replaced where required and new baseline survey 14/11/2021
Trigger action Response plans detailing the limits that apply to the various components of the monitoring network in association with specific actions are required to be developed in consultation with key infrastructure agencies. Action: Develop TARP's for key infrastructure agencies with appropriate trigger points for various actions.	WCL	TARP's Finalised via direct consult with TWG
The monitoring network for the TransGrid and Endeavour Energy towers was required to be developed in association with the TARPs. Action: Install survey points/ prisms on the 330KV TransGrid towers T54, 55, 56, & 57, carry out baseline survey and install GNSS meters.	WCL	GNSS meters Installed July August Specifically, GNSS T54 (unit 17) installed after TransGrid consultation feedback. Survey prisms surveyed progressively w/c 06/12/2021 with bassline survey subsequently completed.
Install survey points/ prisms on the Endeavour Energy 132KV towers E66 to E69 and 33KV pylons in this same location on the 33KVV easement and carry out the baseline survey	WCL	Installed and surveyed progressively w/c 06/12/2021 with bassline survey subsequently completed.

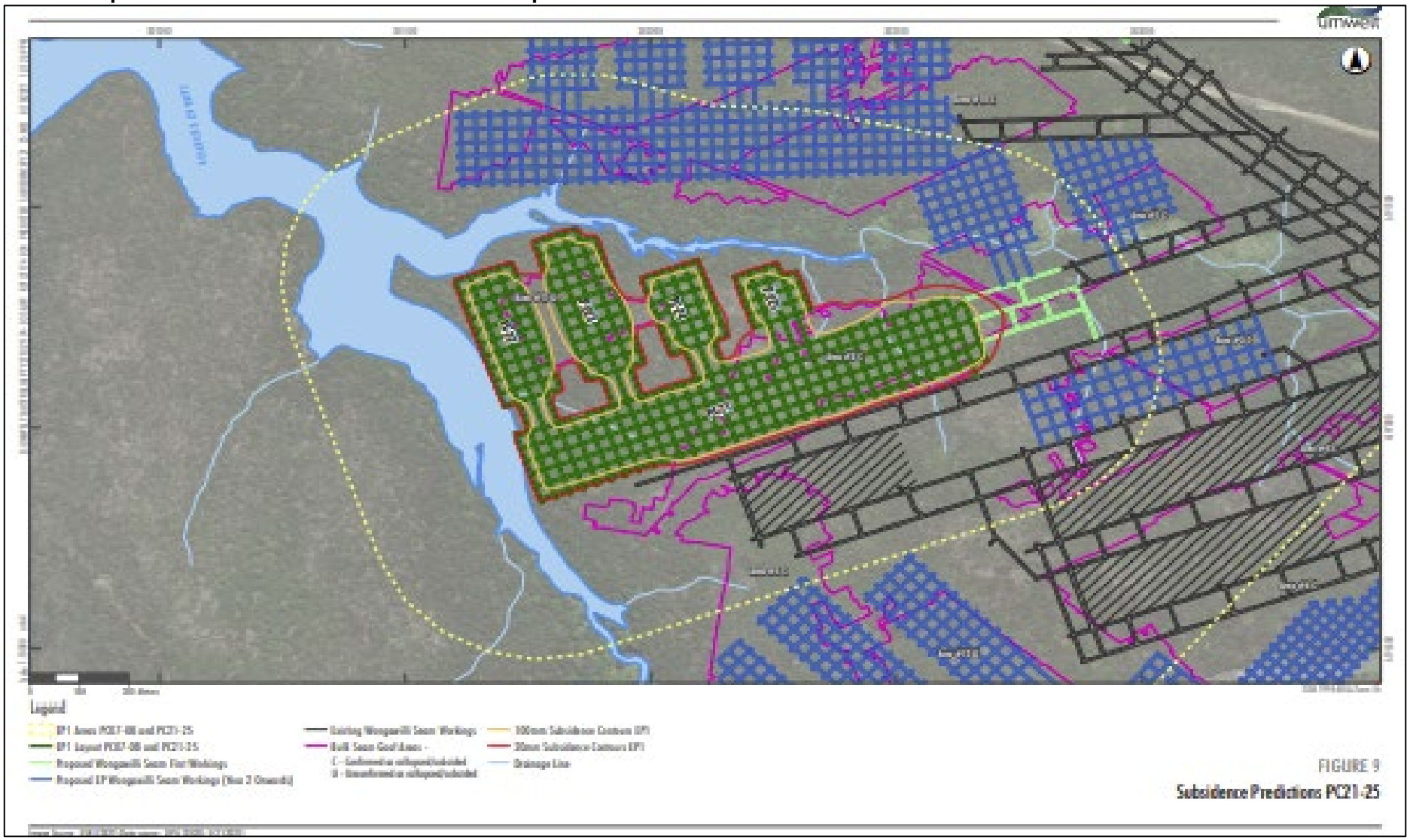
2 PROPOSED EXTRACTION PLANNING

2.1 UEP EP 1 Planned Extraction

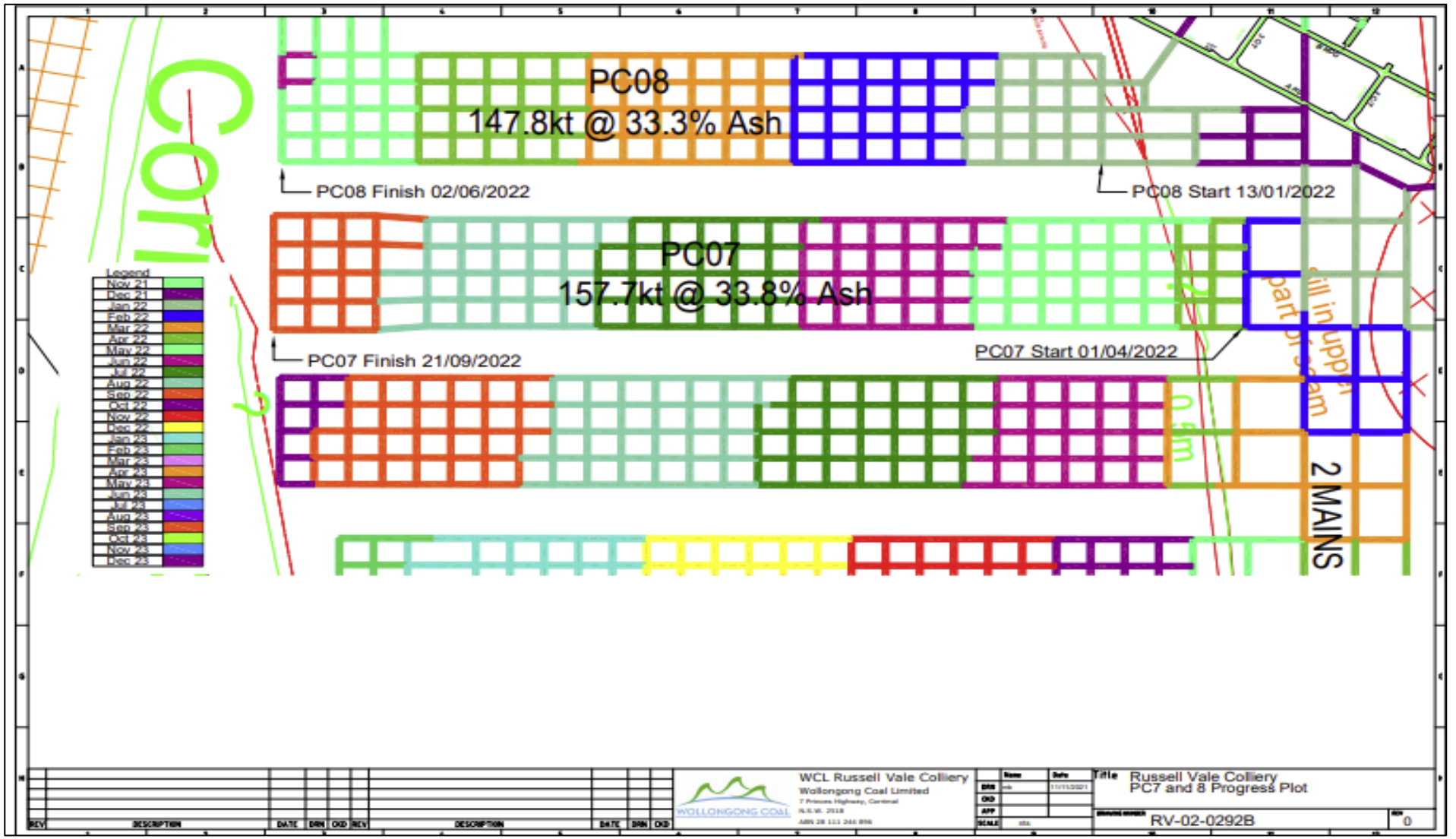
2.1.1 Proposed Extraction area and subsidence predictions PC07-08



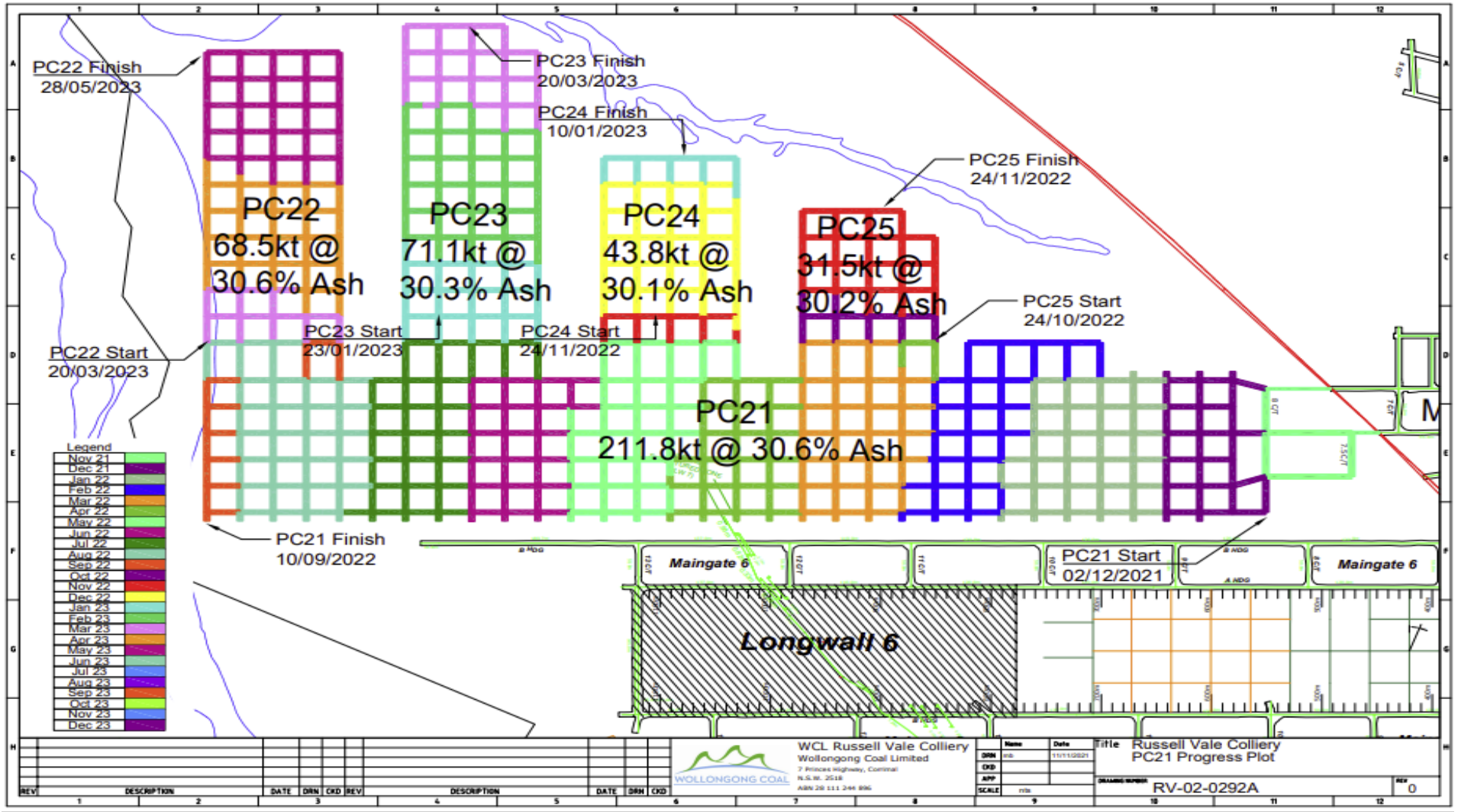
2.1.2 Proposed Extraction area and subsidence predictions PC 21-25



2.1.3 PC07-PC 08 Planned Progress Plot

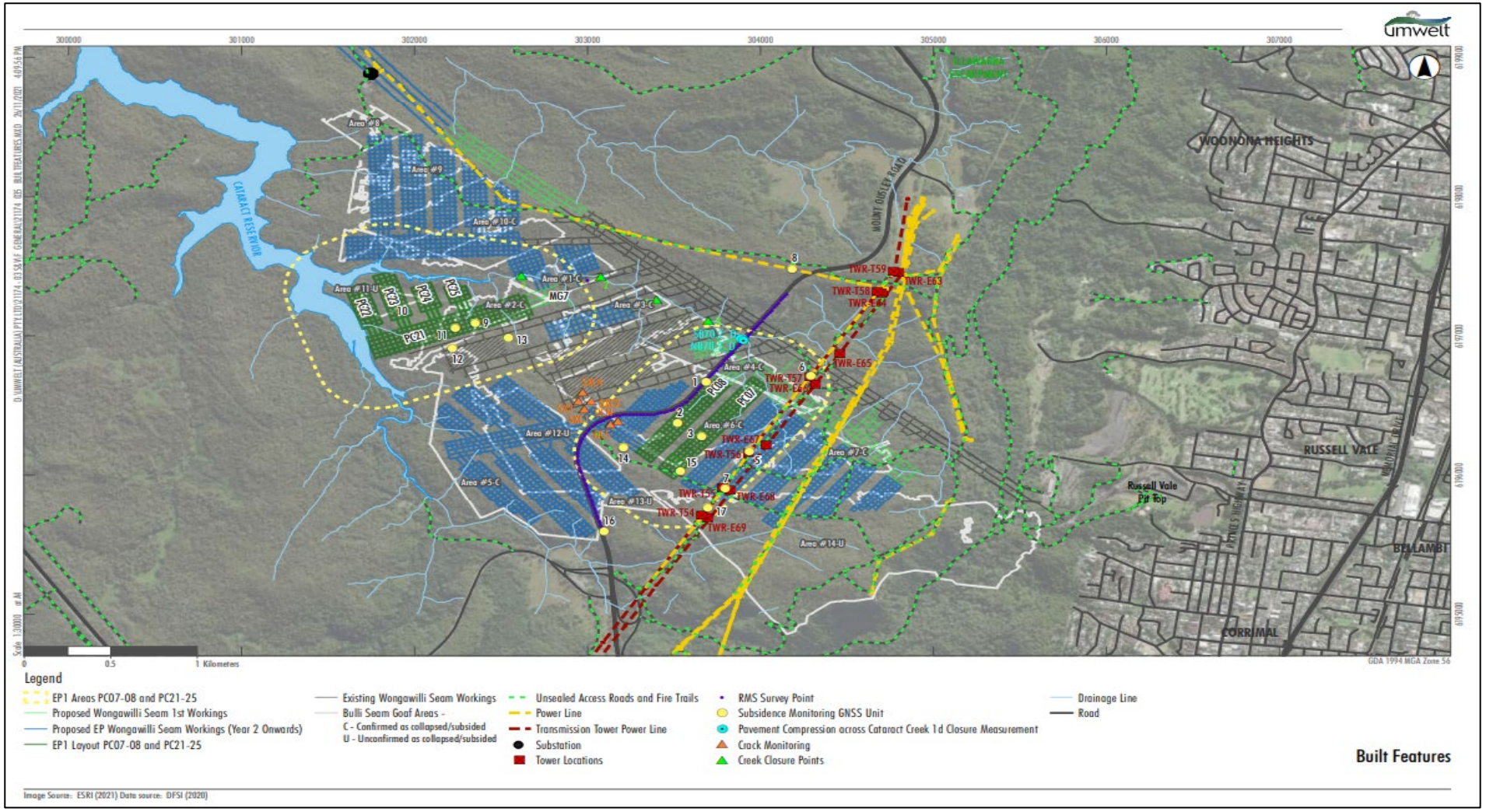


2.1.4 PC07-PC 08 Planned Progress Plot

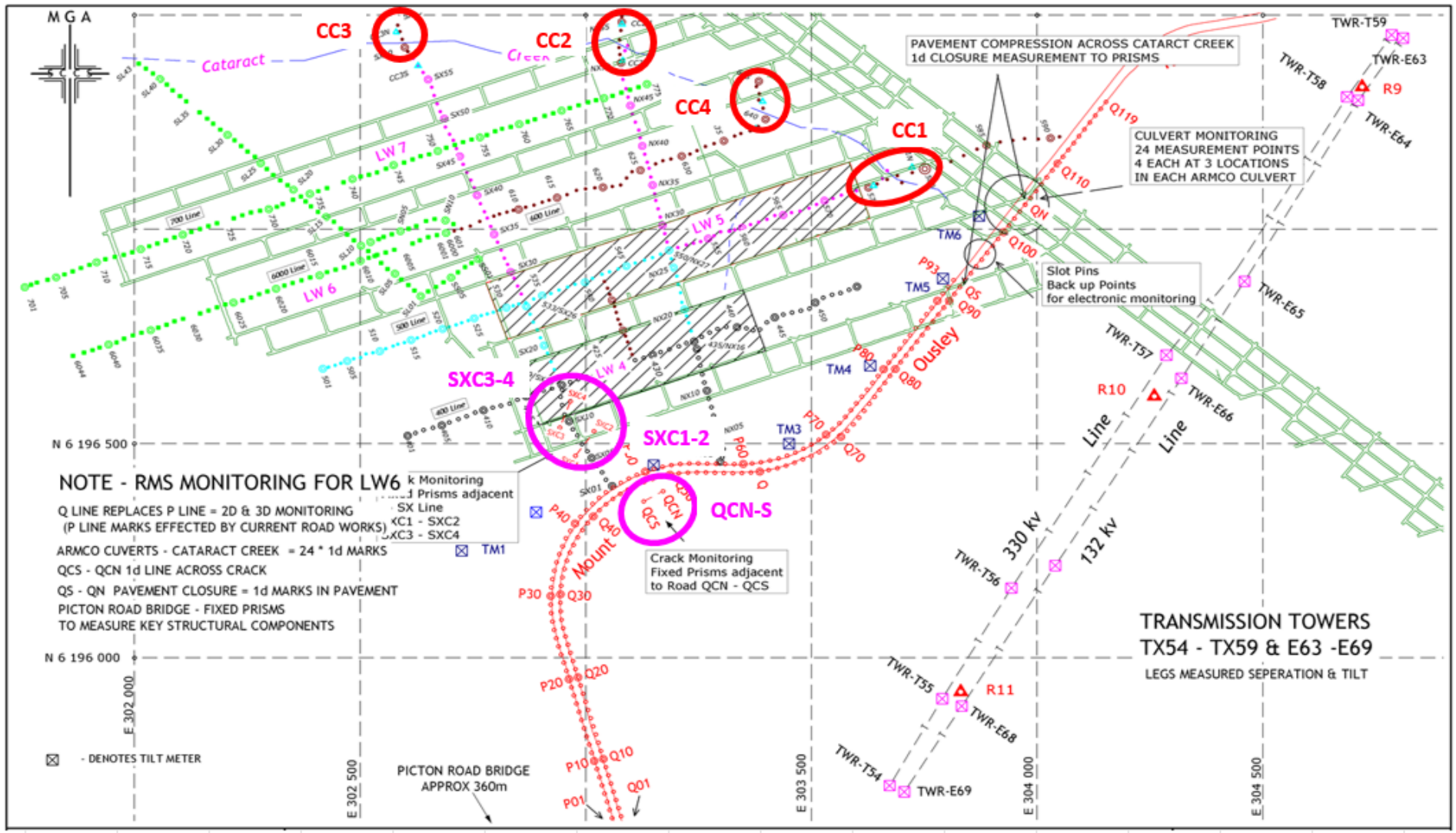


3 UEP MONITORING

3.1 UEP Subsidence Monitoring



3.2 Previous Monitoring network for LW 6.



3.3 UEP Swamp Subsidence Monitoring Program_GNSS

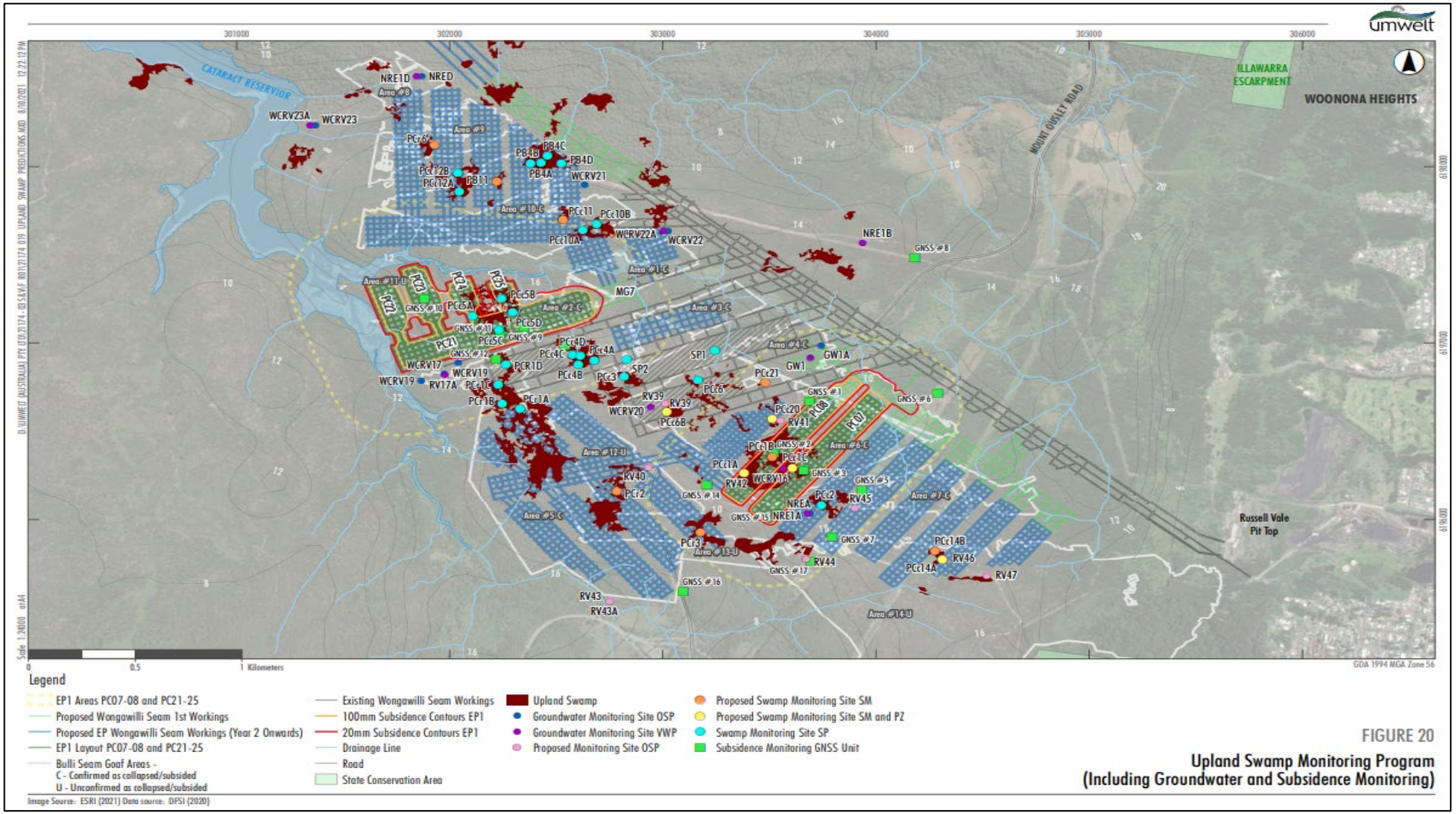


FIGURE 20
Upland Swamp Monitoring Program
(Including Groundwater and Subsidence Monitoring)

4 BASELINE

4.1 LIDAR Baseline Survey Report for the Russell Vale East EP Area

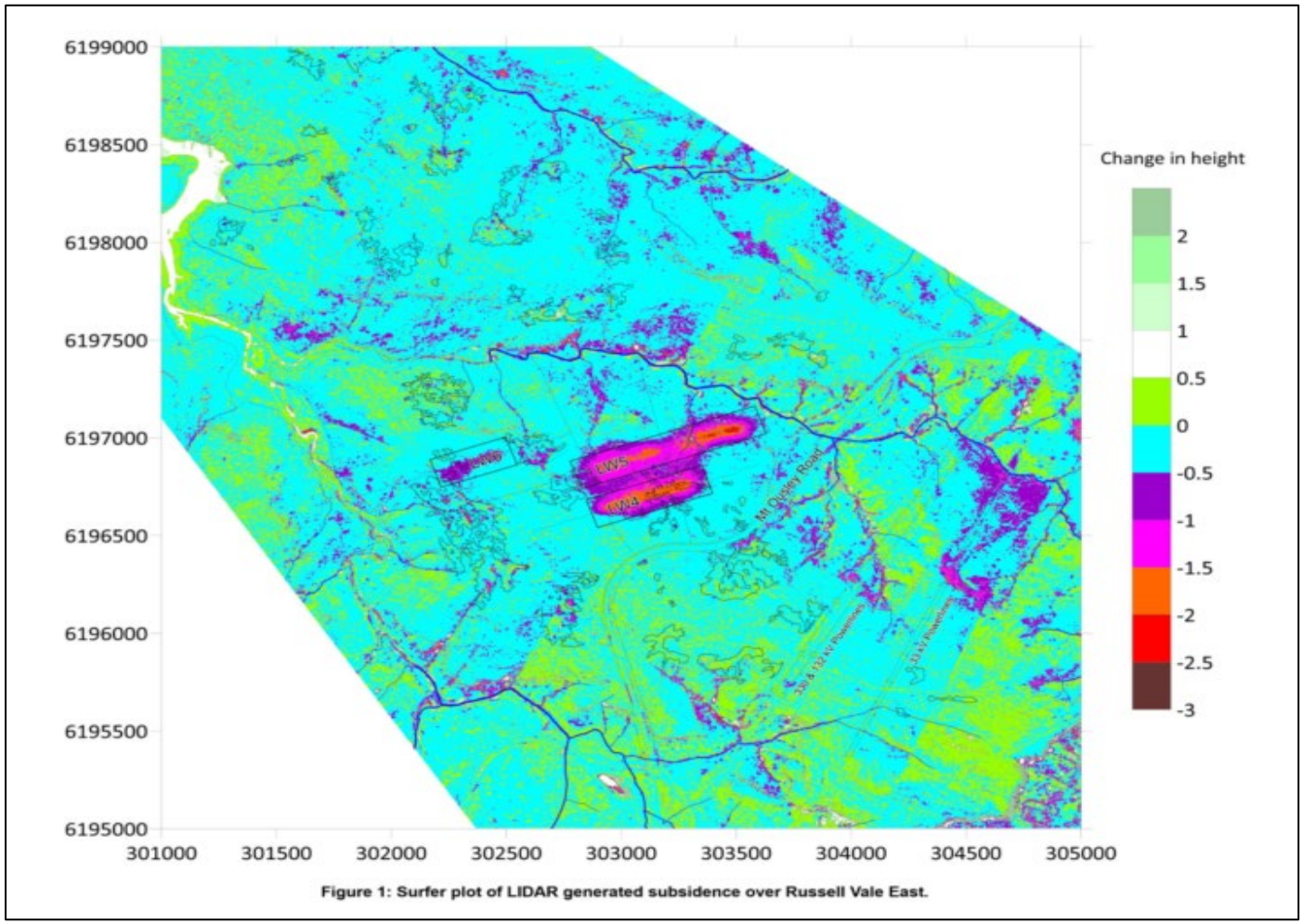


Figure 1: Surfer plot of LIDAR generated subsidence over Russell Vale East.

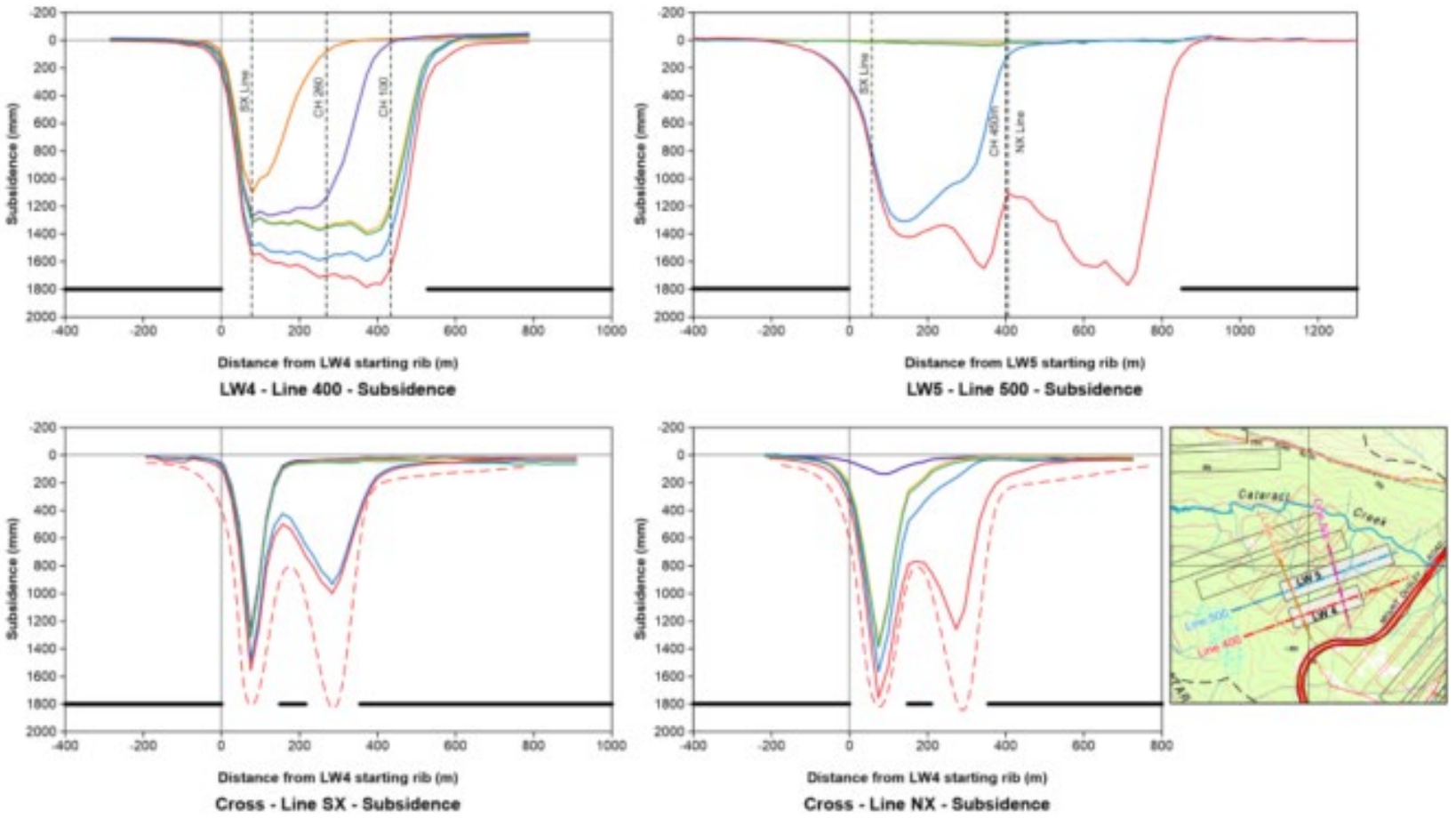
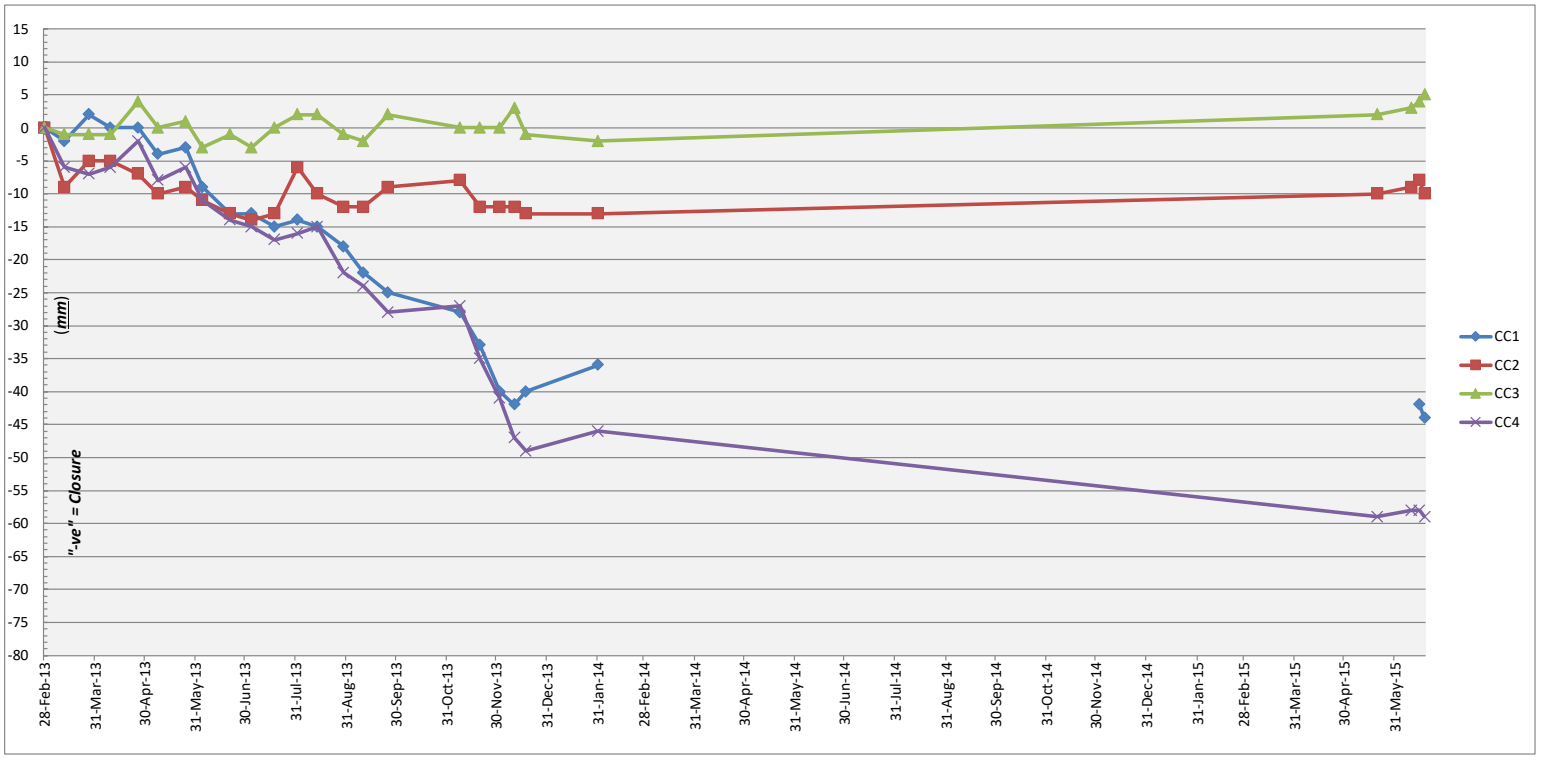


Figure 3: Measured vertical subsidence profiles over Longwalls 4 and 5.

4.2 Cataract Creek and Tension Crack - Survey measurement.

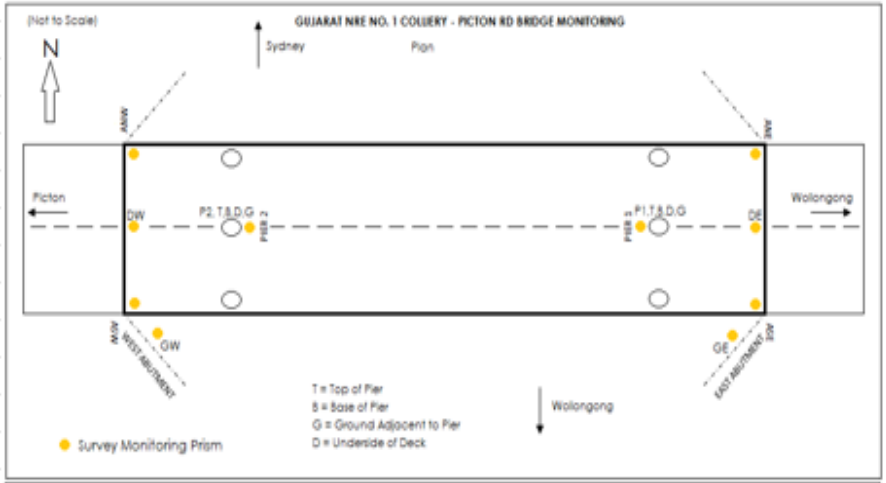


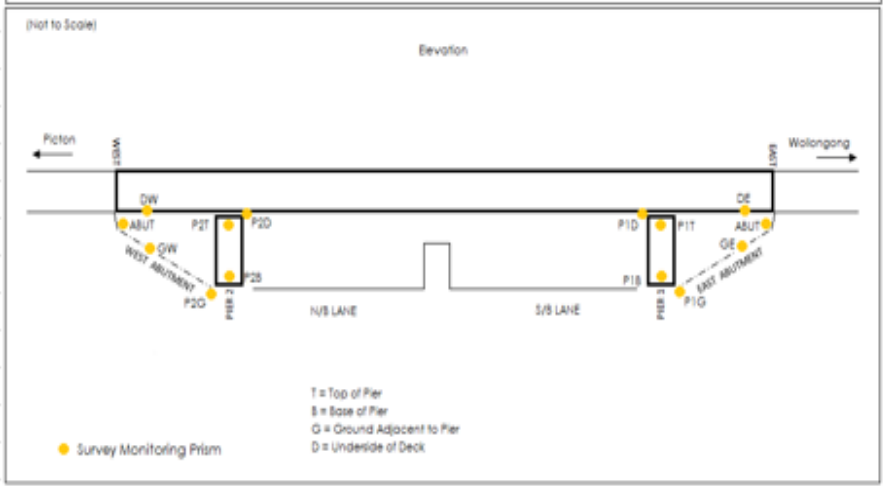
Tension Cracks - Link to Historical Data *(where available)*

Line	Prisms	13/08/2014 Original Base Dist (m)	21/10/2015 Mea Dist (m)	21/10/2015 Δ Dist (mm)	4/08/2021 Mea Dist (m)	4/08/2021 Δ Dist (mm) Total	4/08/2021 Δ Dist (mm) Incremental
QCN-S	QCN-QCS	48.833	48.829	-4	48.836	3	7
SXC1-2	SXC1-SXC2	N/A	N/A	N/A	70.576		
SXC3-4	SXC3-SXC4	N/A	N/A	N/A	65.402		

4.3 Picton Rd M1 Overpass Bridge – Survey Baseline

	Wollongong Coal - M1 PICTON BRIDGE			
Date	14/12/2021			
No.	Easting	northing	RL	Mark Name
	303108.724	6195285.279	311.980	West North abutment
	303109.354	6195274.755	311.706	West south Abutment
	303109.443	6195274.242	311.276	West south Tomato stake
	303109.129	6195280.017	312.616	West Soffit
	303122.642	6195278.299	311.874	West North column top
	303122.610	6195278.778	307.470	West North column bottom
	303122.806	6195275.324	311.867	West Middle top
	303122.818	6195275.290	307.717	West Middle Bottom
	303123.032	6195271.654	311.620	West South column top
	303123.022	6195271.858	307.410	West South column bottom
	303123.332	6195275.102	312.334	West Middle Soffit
	303157.593	6195259.050	313.012	East column top
	303158.031	6195258.519	312.631	East column bottom
	303170.249	6195257.393	313.479	East North Abutment
	303170.151	6195246.479	312.325	East south Abutment
	303170.858	6195251.538	313.843	East Soffit





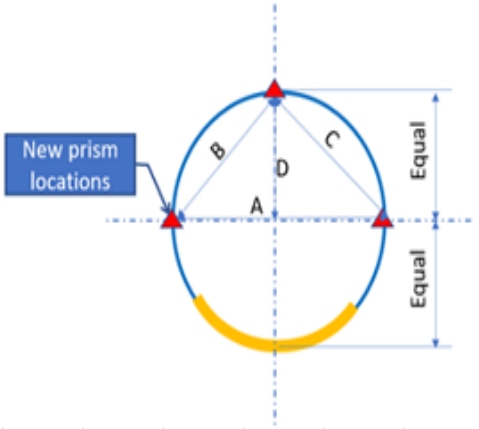
4.4 M1 Cataract Creek Culvert - Survey Baseline

Wollongong Coal - M1 culvert

SYDNEY

North Culvert Spreadsheet references distances between prisms

Prism set	West End	Metres	Middle	Metres	East End	Metres
	North Prism - Middle Prism	1.623	North Prism - Middle Prism	1.955	North Prism - Middle Prism	1.459
	Middle Prism - South Prism	1.622	Middle Prism - South Prism	1.85	Middle Prism - South Prism	1.922



Dimensions A, B, C, D to be reported during monitoring program:

DOWN STREAM

South Culvert Spreadsheet references distances between prisms

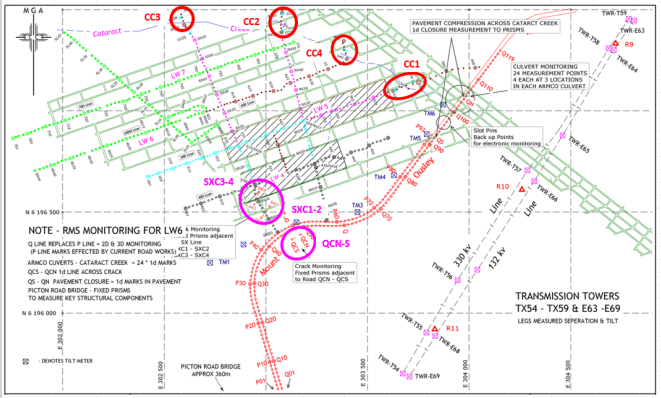
Prism set	West End	Metres	Middle	Metres	East End	Metres
	North Prism - Middle Prism	1.56	North Prism - Middle Prism	1.677	North Prism - Middle Prism	1.669
	Middle Prism - South Prism	1.629	Middle Prism - South Prism	1.746	Middle Prism - South Prism	1.604

WOLLONGONG

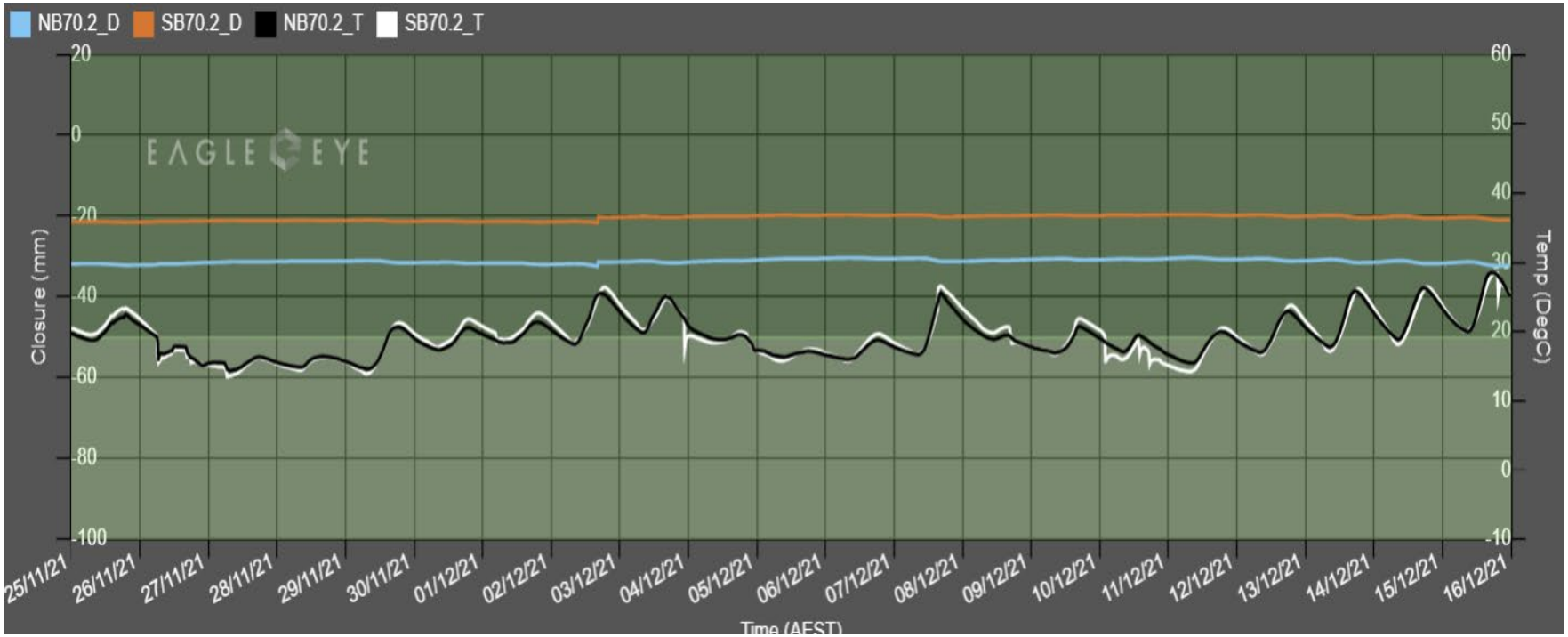
4.5 Q-line Baseline

Date 14/12/2021 — Wollongong Coal - M1 Q Line

No.	Easting	northing	RL	Mark Name	No.	Easting	northing	RL	Mark Name	No.	Easting	northing	RL	Mark Name
1000	304152.892	6197298.804	346.499	Q120	1048	303605.491	6196561.929	343.111	Q73	1096	302950.248	6196070.806	377.517	Q26
1001	304140.978	6197282.940	344.486	Q119	1049	303593.154	6196546.287	344.906	Q72	1097	302955.236	6196051.512	375.966	Q25
1002	304129.022	6197266.960	342.501	Q118	1050	303579.841	6196531.591	346.683	Q71	1098	302960.690	6196032.443	374.441	Q24
1003	304117.008	6197250.973	340.514	Q117	1051	303565.631	6196517.362	348.215	Q70	1099	302967.502	6196013.695	372.895	Q23
1004	304105.049	6197234.958	338.511	Q116	1052	303550.269	6196504.387	349.731	Q69	1100	302973.132	6195994.631	371.302	Q22
1005	304093.145	6197218.917	336.517	Q115	1053	303534.153	6196492.393	351.334	Q68	1101	302978.758	6195975.558	369.707	Q21
1006	304081.539	6197202.805	334.404	Q114	1054	303517.364	6196481.576	352.808	Q67	1102	302984.341	6195956.578	368.107	Q20
1007	304069.519	6197186.779	332.471	Q113	1055	303499.462	6196472.503	354.367	Q66	1103	302990.011	6195937.331	366.490	Q19
1008	304057.617	6197170.868	330.563	Q112	1056	303481.166	6196464.606	355.909	Q65	1104	302995.613	6195918.269	364.887	Q18
1009	304045.660	6197154.877	328.764	Q111	1057	303462.742	6196456.883	357.585	Q64	1105	303001.236	6195899.194	363.291	Q17
1010	304033.751	6197138.897	327.042	Q110	1058	303444.006	6196450.043	359.236	Q63	1106	303006.870	6195880.090	361.688	Q16
1011	304021.723	6197122.898	325.410	Q109	1059	303424.955	6196444.111	360.913	Q62	1107	303012.490	6195861.001	360.095	Q15
1012	304009.690	6197106.900	323.969	Q108	1060	303405.480	6196439.759	362.587	Q61	1108	303018.115	6195841.929	358.478	Q14
1013	303997.791	6197090.957	322.659	Q107	1061	303385.897	6196436.148	364.256	Q60	1109	303023.720	6195822.834	356.822	Q13
1015	303985.870	6197074.979	321.448	Q106	1062	303366.007	6196433.915	365.900	Q59	1110	303029.319	6195803.760	355.058	Q12
1016	303973.942	6197058.981	320.295	Q105	1063	303346.183	6196432.748	367.505	Q58	1111	303034.910	6195784.730	353.184	Q11
1017	303961.871	6197042.994	319.266	Q104	1064	303326.245	6196432.414	369.044	Q57	1112	303040.507	6195765.666	351.269	Q10
1018	303949.906	6197026.856	318.362	Q103	1065	303306.265	6196432.804	370.535	Q56	1113	303046.103	6195746.557	349.363	Q09
1019	303937.866	6197010.890	317.660	Q102	1066	303286.344	6196433.483	372.079	Q55	1114	303051.703	6195727.493	347.478	Q08
1020	303925.805	6196994.829	317.111	Q101	1067	303266.407	6196434.154	373.642	Q54	1115	303057.280	6195708.479	345.607	Q07
1021	303913.759	6196978.796	316.667	Q100	1068	303246.571	6196434.357	375.167	Q53	1116	303062.867	6195689.395	343.745	Q06
1022	303901.805	6196962.652	316.385	Q99	1069	303226.564	6196433.742	376.648	Q52	1117	303068.465	6195670.335	341.873	Q05
1023	303889.748	6196946.674	316.230	Q98	1070	303206.651	6196432.327	377.921	Q51	1118	303074.048	6195651.261	339.991	Q04
1024	303877.664	6196930.673	316.105	Q97	1071	303186.933	6196429.114	378.964	Q50	1119	303079.646	6195632.203	338.093	Q03
1025	303865.377	6196914.864	316.184	Q96	1072	303167.488	6196424.597	379.960	Q49	1120	303085.009	6195613.936	336.307	Q02
1026	303853.374	6196898.820	316.319	Q95	1073	303147.682	6196418.630	380.996	Q48	1121	303090.699	6195594.516	334.385	Q01
1027	303841.315	6196882.759	316.626	Q94	1074	303127.380	6196411.361	382.003	Q47					
1028	303829.250	6196866.707	317.031	Q93	1075	303108.119	6196402.379	383.098	Q46					
1029	303817.298	6196850.697	317.553	Q92	1076	303090.893	6196392.969	384.078	Q45					
1030	303805.298	6196834.703	318.185	Q91	1077	303076.621	6196384.101	384.884	Q44					
1031	303800.643	6196828.944	318.467	Q90	1078	303060.470	6196372.451	385.802	Q43					
1032	303793.374	6196818.743	318.937	Q89	1079	303045.095	6196359.788	386.729	Q42					
1033	303781.468	6196802.810	319.844	Q88	1080	303030.579	6196346.111	387.707	Q41					
1034	303769.546	6196786.901	320.854	Q87	1081	303016.988	6196331.541	388.633	Q40					
1035	303757.606	6196770.984	321.983	Q86	1082	303004.443	6196316.005	389.547	Q39					
1036	303745.616	6196755.032	323.233	Q85	1083	302992.908	6196299.712	390.331	Q38					
1037	303733.773	6196739.150	324.620	Q84	1084	302982.472	6196282.777	390.833	Q37					
1038	303721.959	6196723.239	326.148	Q83	1085	302973.305	6196265.015	390.978	Q36					
1039	303709.997	6196707.334	327.716	Q82	1086	302965.227	6196246.744	390.631	Q35					
1040	303697.986	6196691.572	329.297	Q81	1087	302958.519	6196228.005	389.801	Q34					
1041	303686.068	6196675.472	330.948	Q80	1088	302953.064	6196208.798	388.638	Q33					
1042	303674.154	6196659.573	332.485	Q79	1089	302948.682	6196189.390	387.181	Q32					
1043	303662.724	6196643.288	334.185	Q78	1090	302945.860	6196169.682	385.616	Q31					
1044	303651.239	6196627.122	335.764	Q77	1091	302944.261	6196149.927	383.978	Q30					
1045	303639.942	6196610.741	337.456	Q76	1092	302944.039	6196130.083	382.271	Q29					
1046	303628.480	6196594.446	339.289	Q75	1094	302944.894	6196110.184	380.639	Q28					
1047	303617.198	6196577.981	341.228	Q74	1095	302946.637	6196090.363	379.094	Q27					



4.6 Expansion Crack Baseline

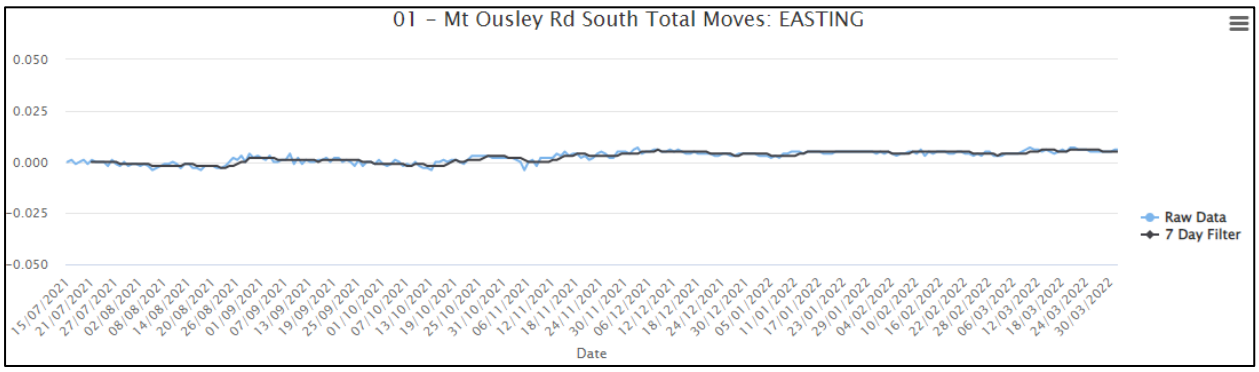


GNNS sites.

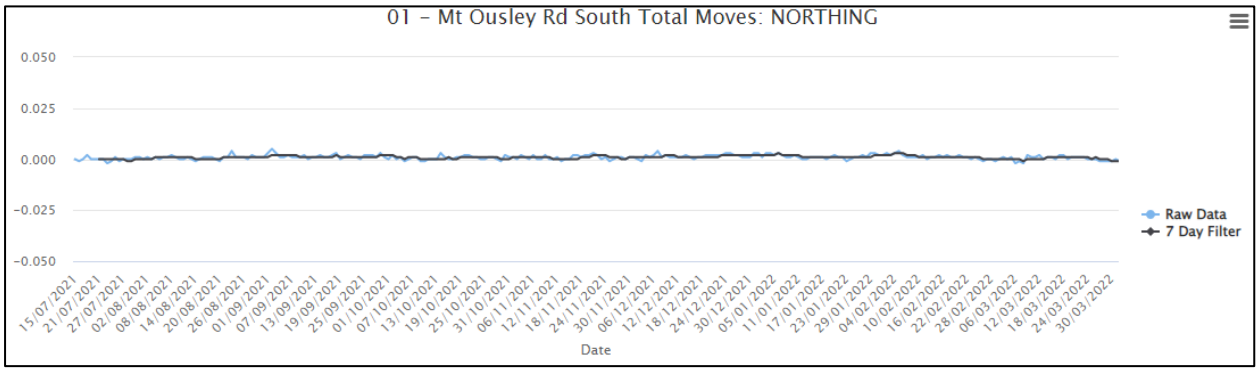
Note: install date for GNSS 10 for PC23 (Bulli goaf #11) – December 2021

GNSS #1- Mt Ousley Road South (CCUS 20)

Easting



Northing



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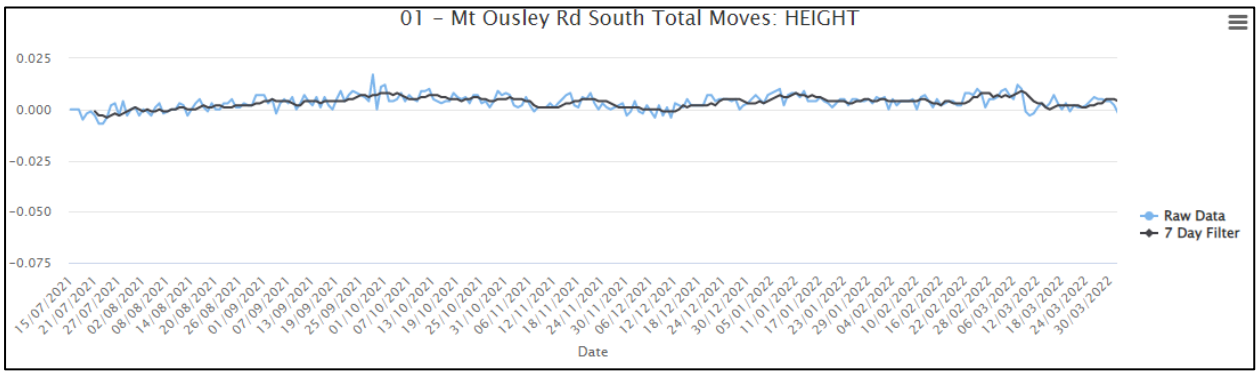
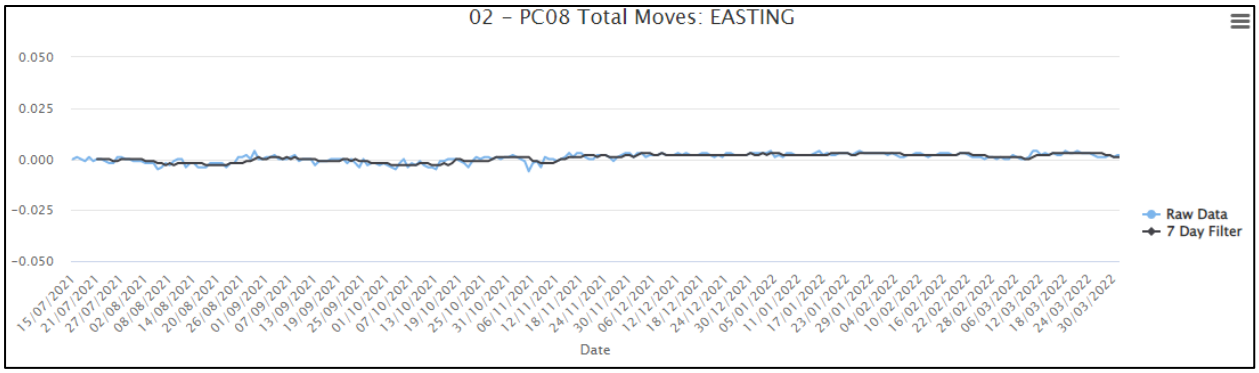
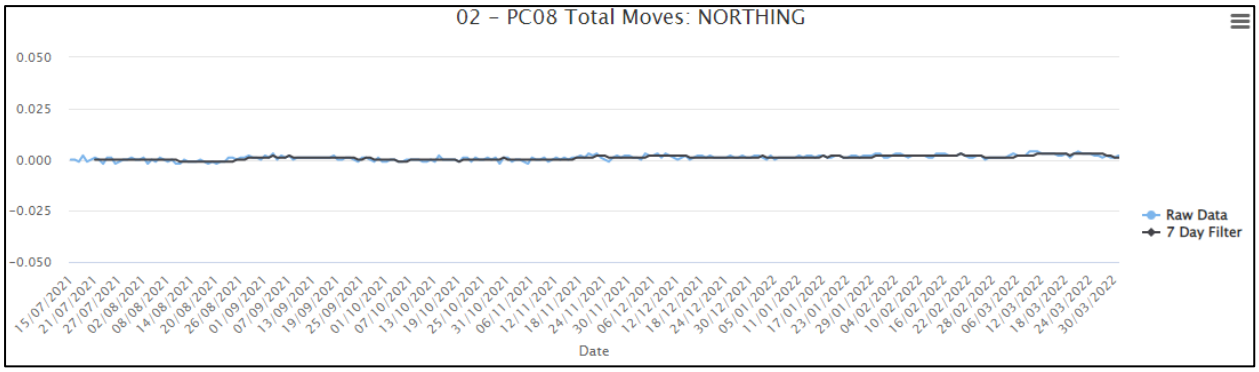


GNSS #2 - PC08 (Bulli & Balgownie goaf)/ CCUS1/ CCUS 20)

Easting



Northing



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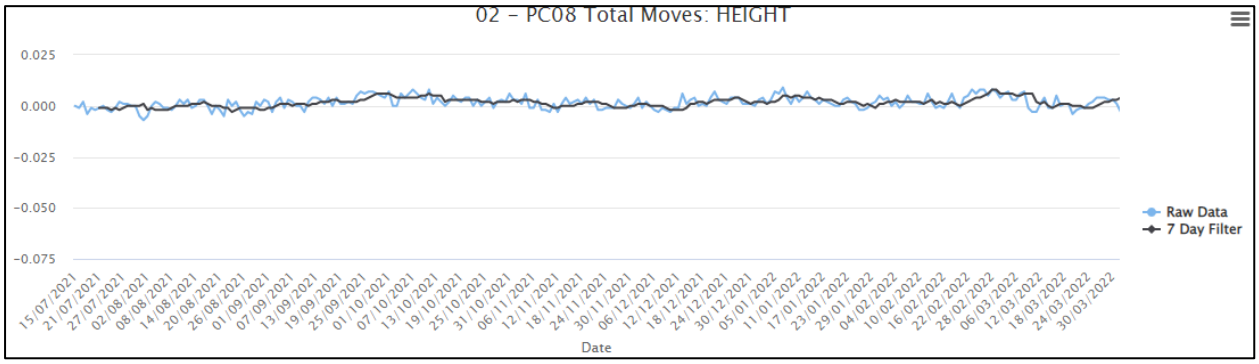
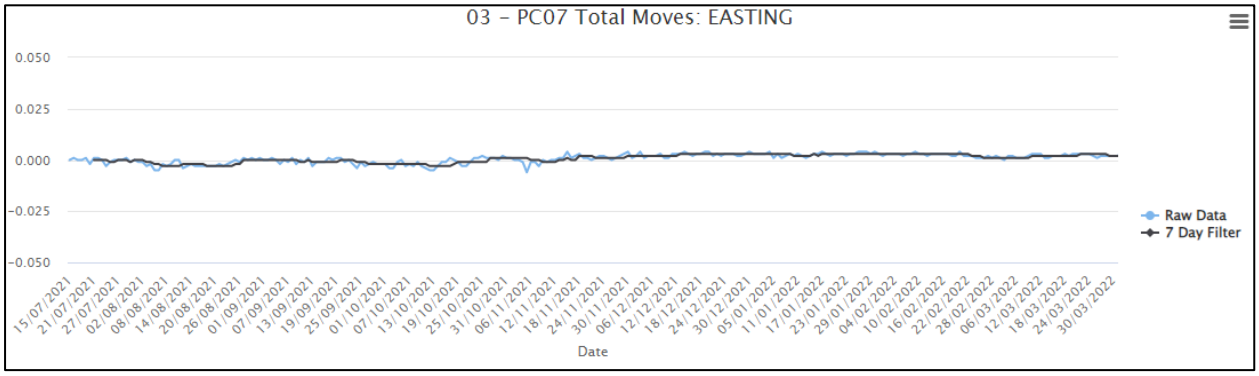
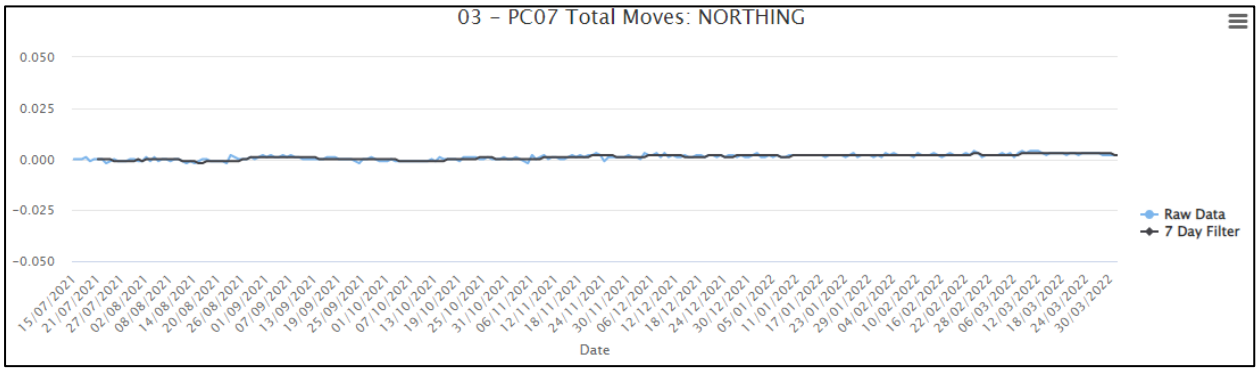


GNSS #3 - PC07 (Bulli & Balgownie goaf)/ CCUS2 and CCUS 1)

Easting



Northing



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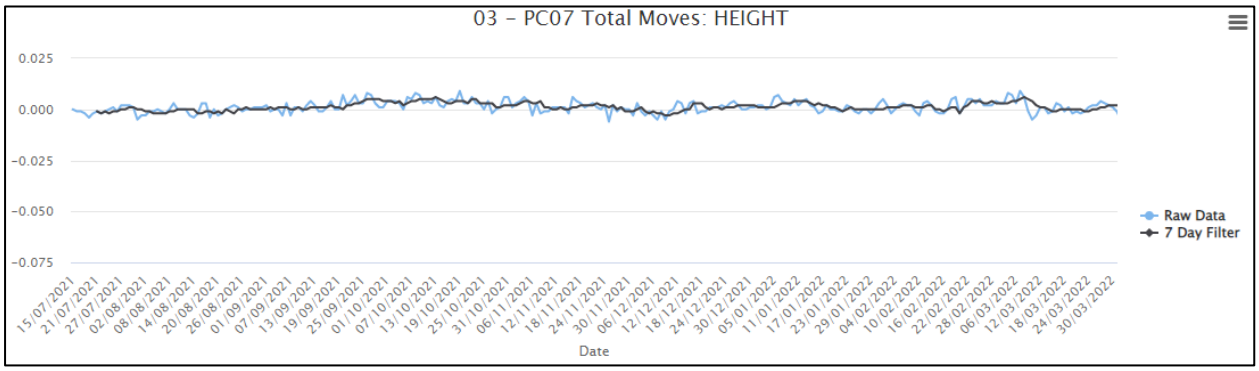
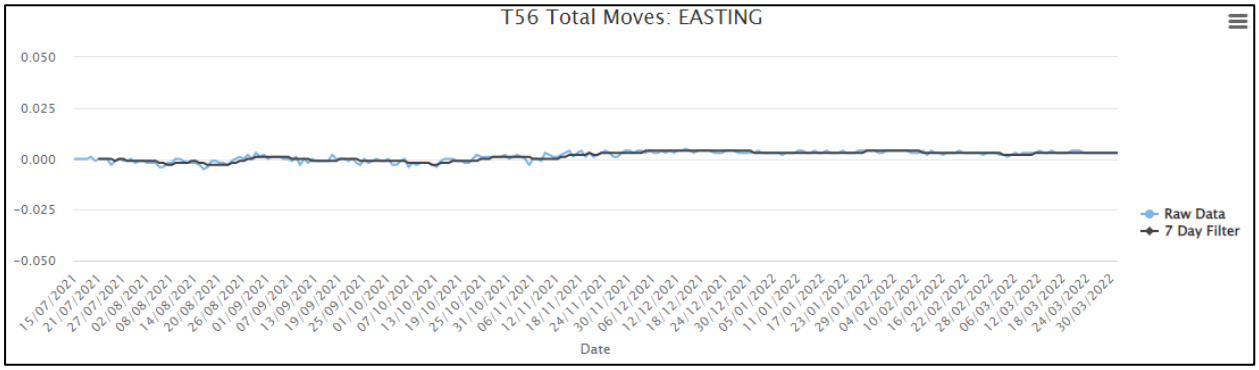


GNSS #5 - TransGrid 330kV tower T56, Endeavour Energy 132 KV tower E69 and 33KV pylons (Balgownie goaf).

Easting



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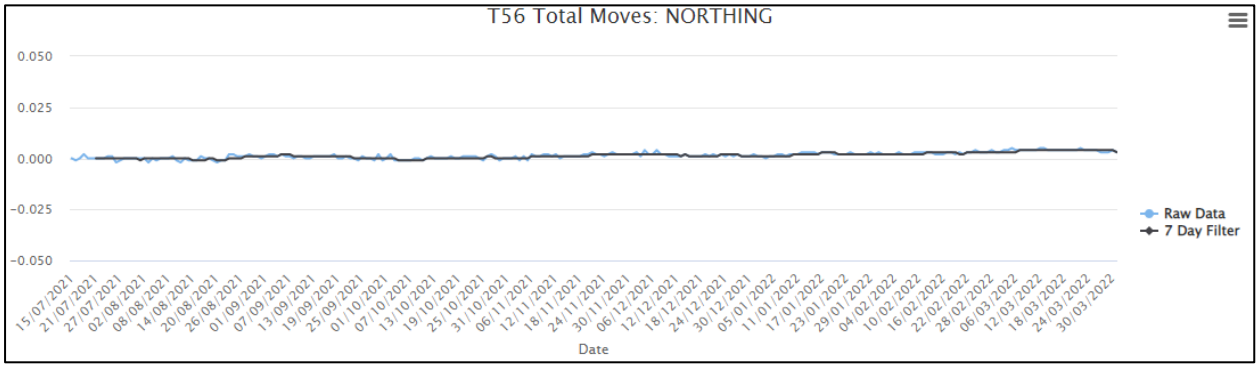

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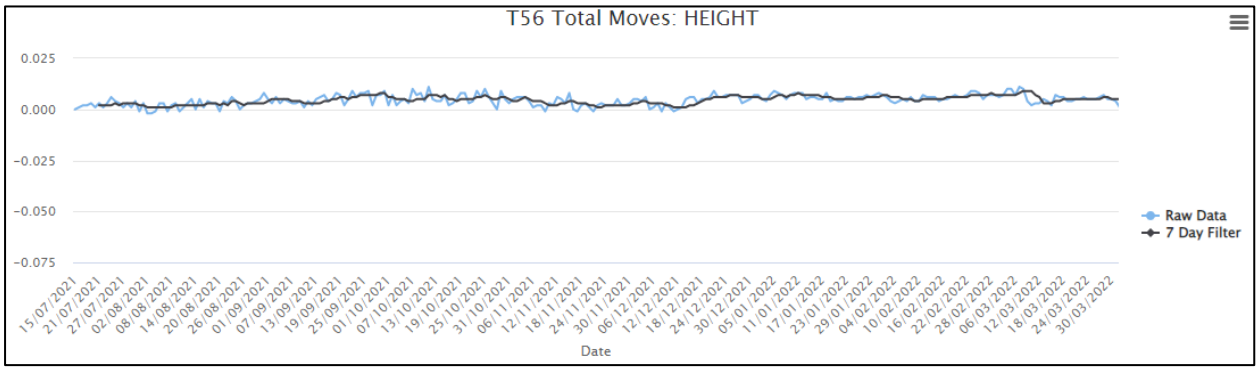
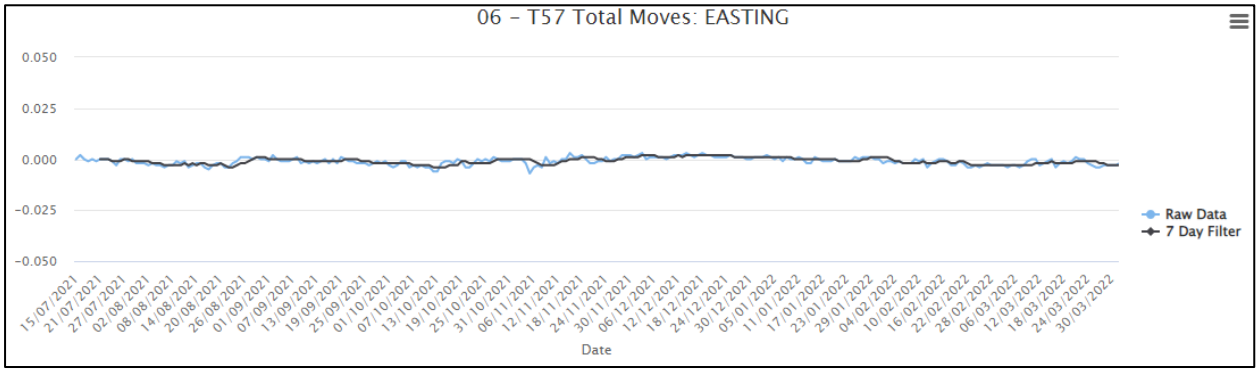


GNSS #6 - TransGrid 330kV tower T57, Endeavour Energy 132 KV tower E66 and 33KV pylons, (bulli pillars).

Easting



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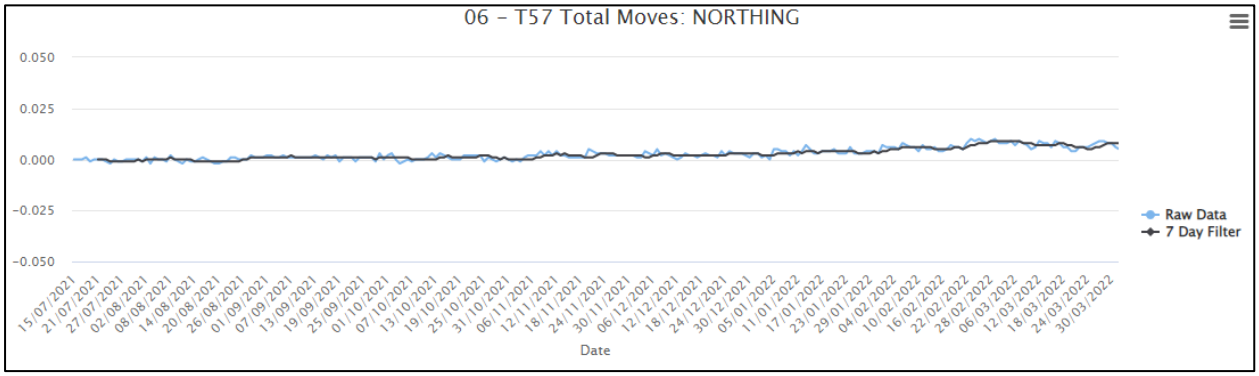

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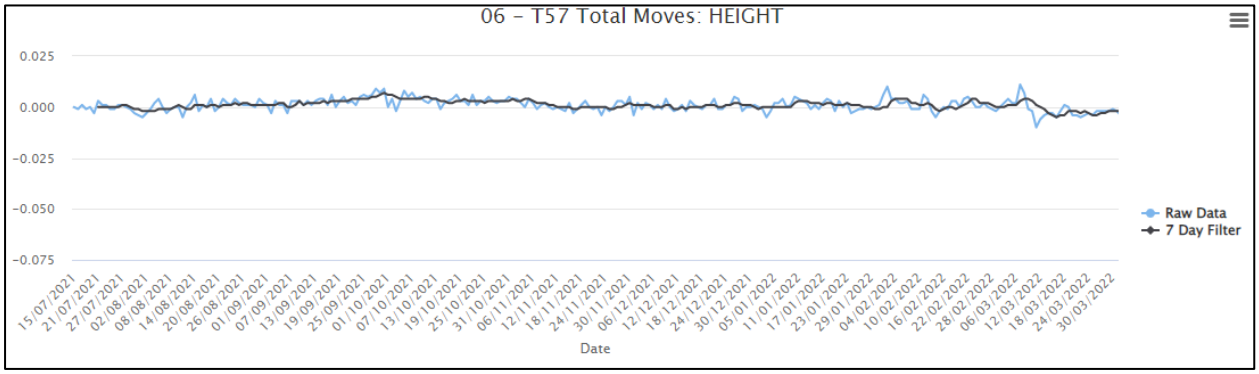
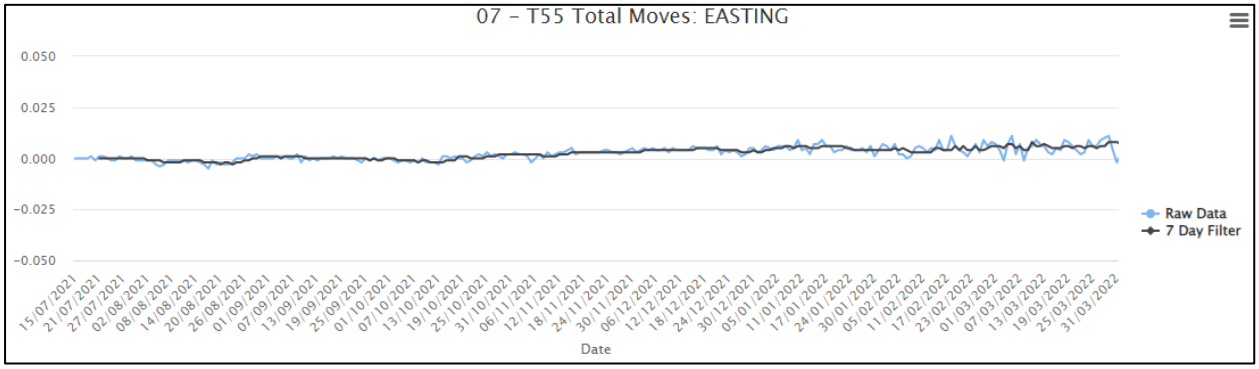


GNSS #7 – TransGrid 330kV tower T55, Endeavour Energy 132 kV tower E68 and 33KV pylons (solid coal).

Easting



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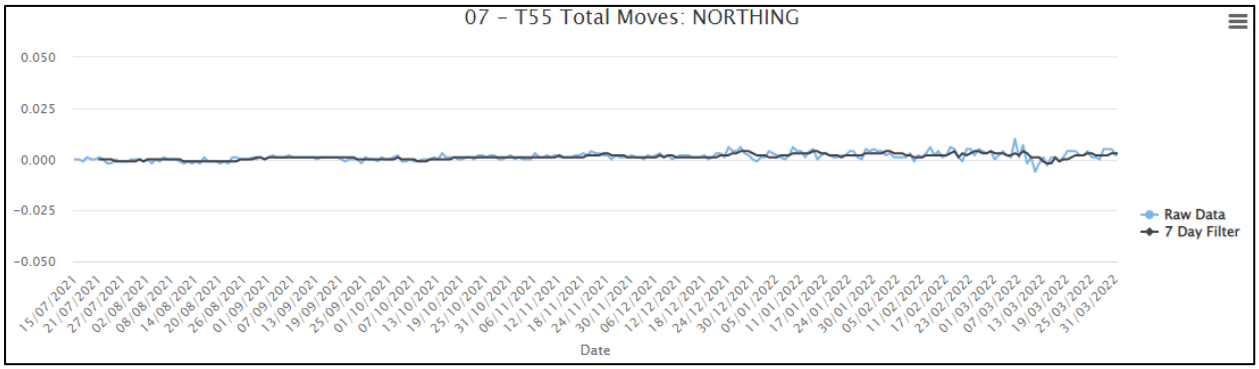

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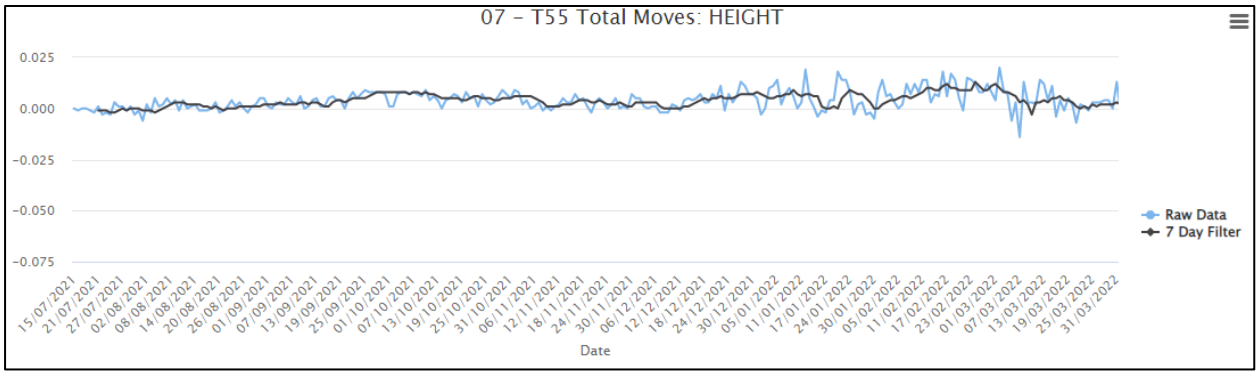
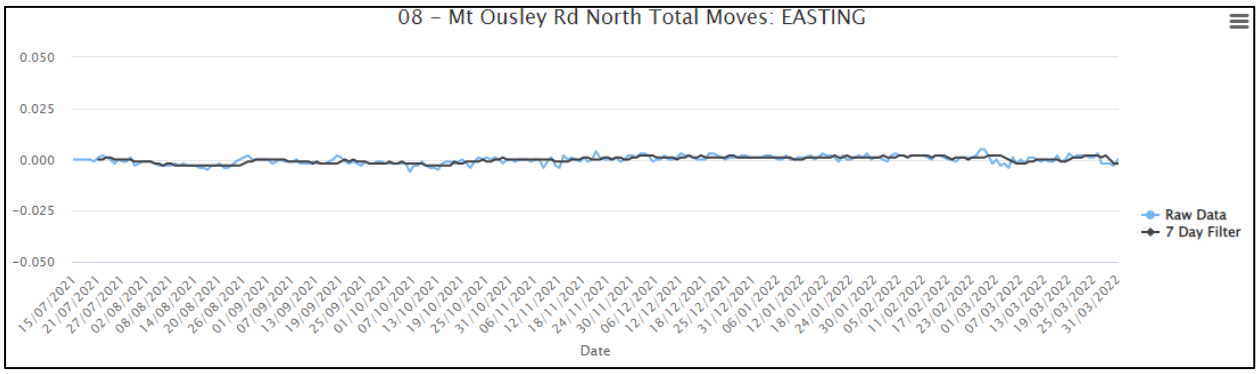


GNSS #8 – Mt Ousley Rd north (Bulli goaf).

Easting



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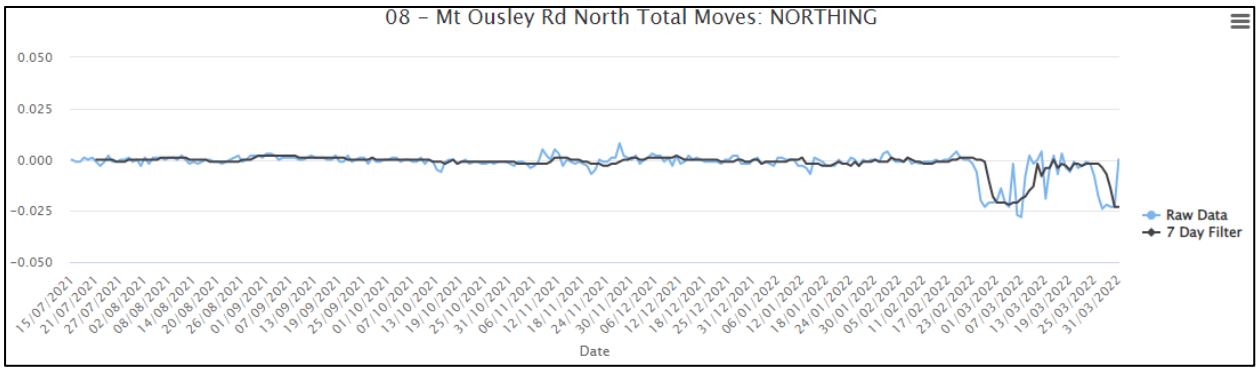

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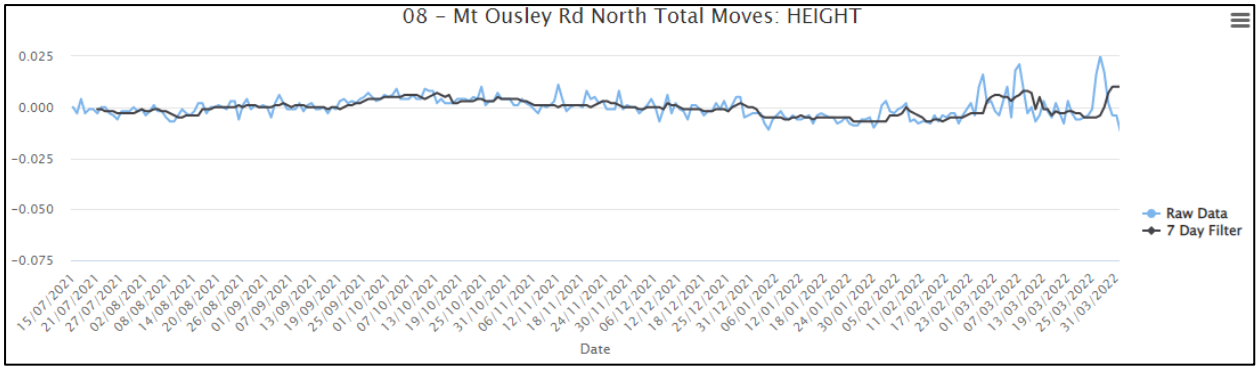
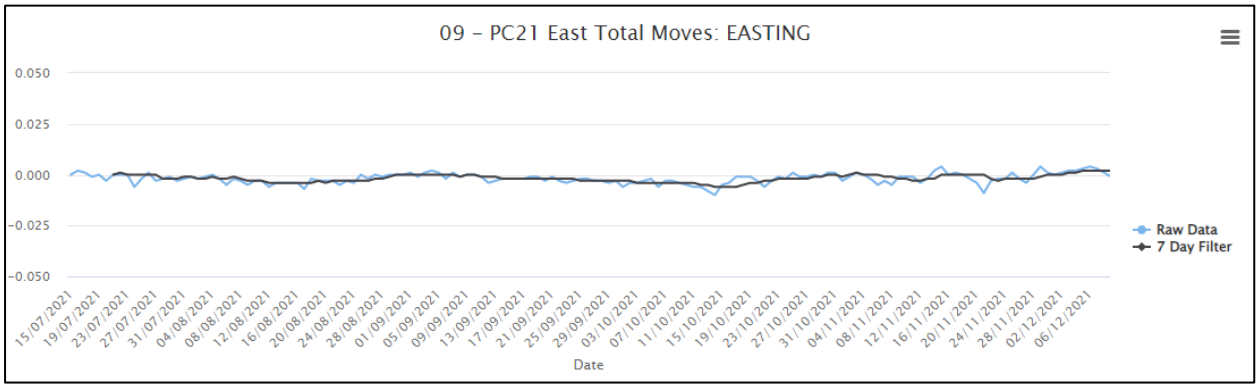


GNSS #9 - PC21 East (Bulli goaf #2)

Easting



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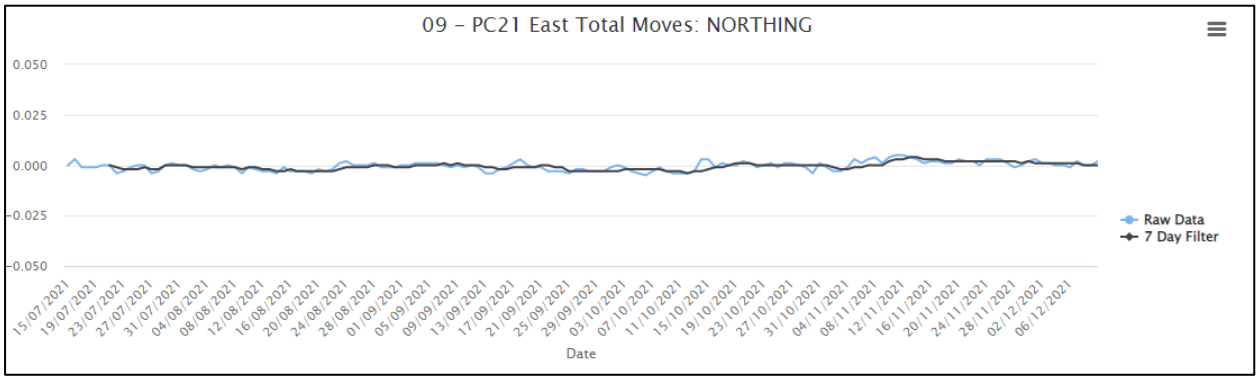

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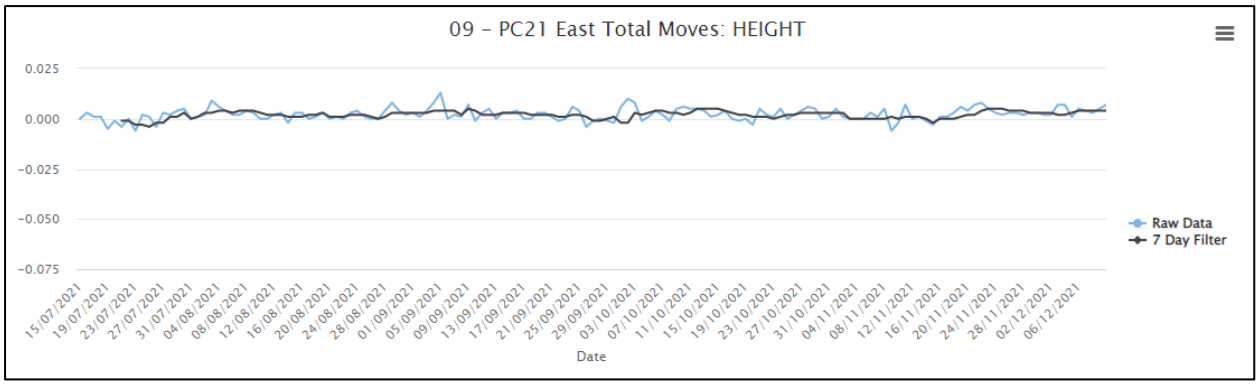
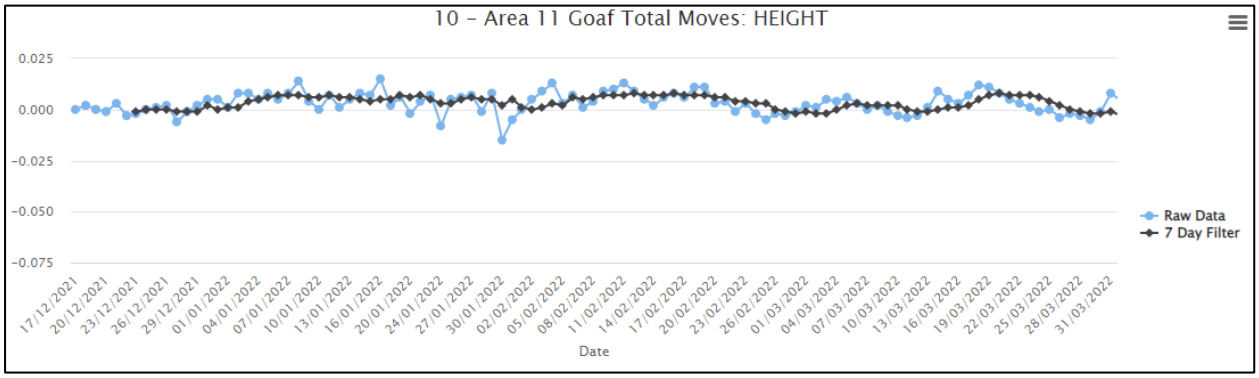


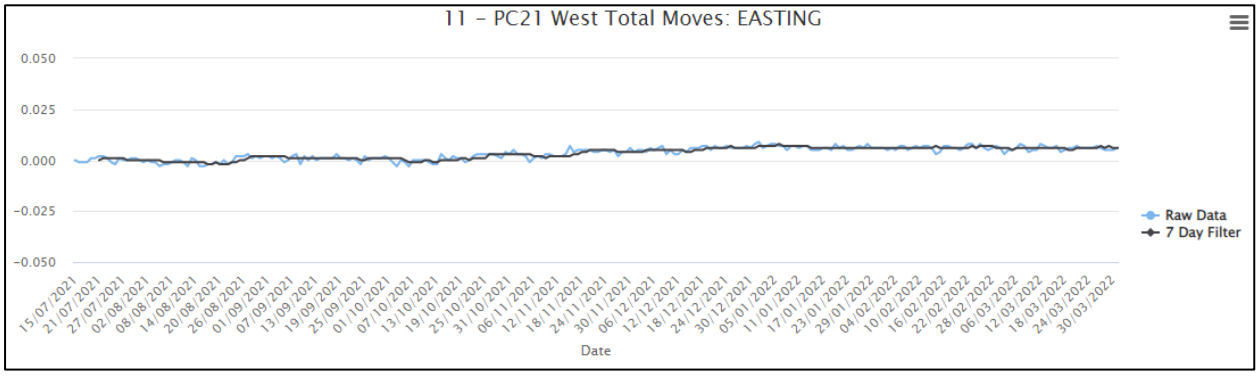
GNSS #10 PC23 (Bulli goaf #11)

Height



GNSS #11 - PC21 west (Bulli goaf #2)/ CCUS 5)

Easting



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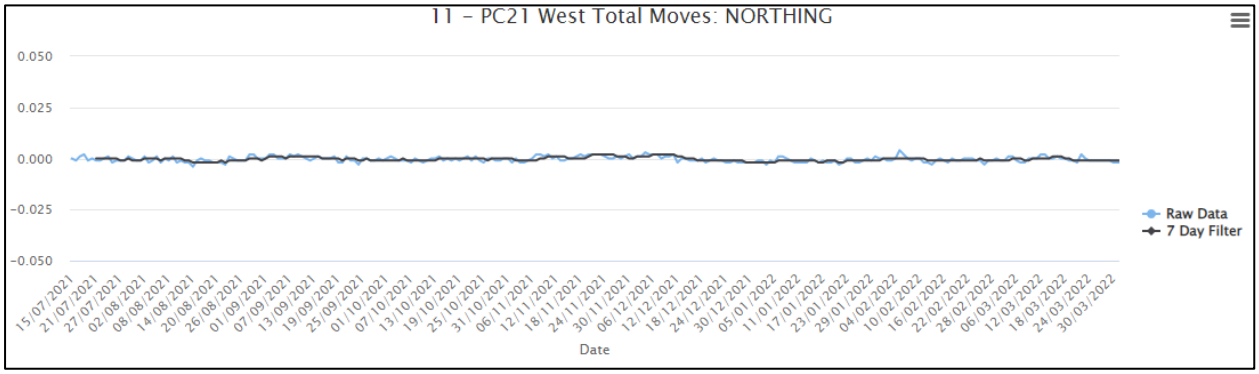

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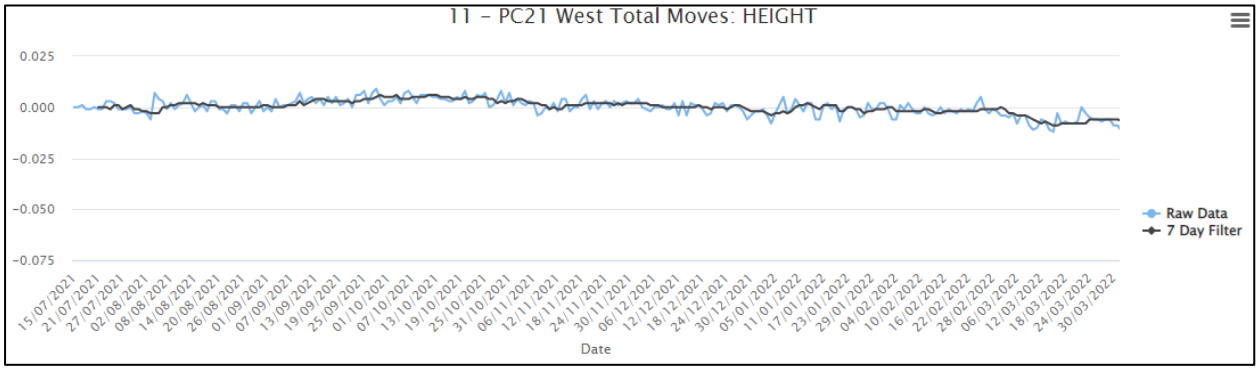
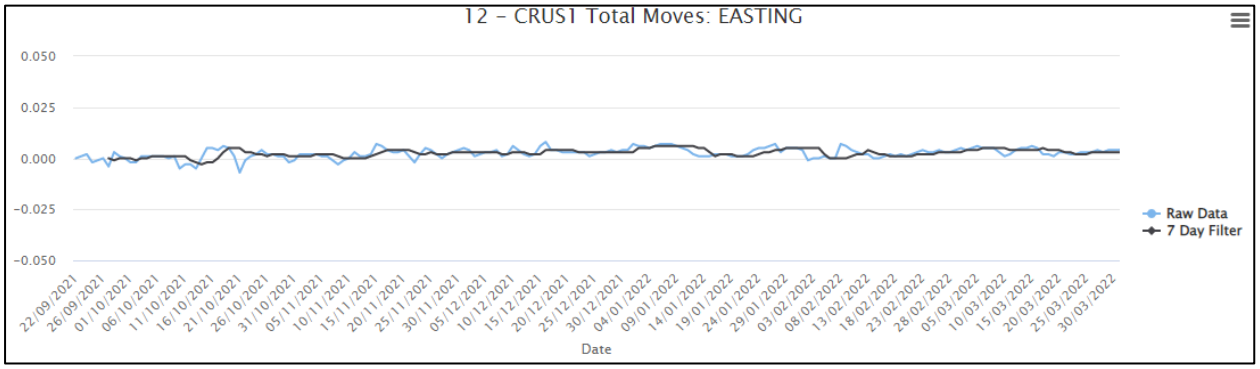


GNSS #12 - South of PC21 (edge Bulli & Wongawilli goaf, CRUS 1)

Easting



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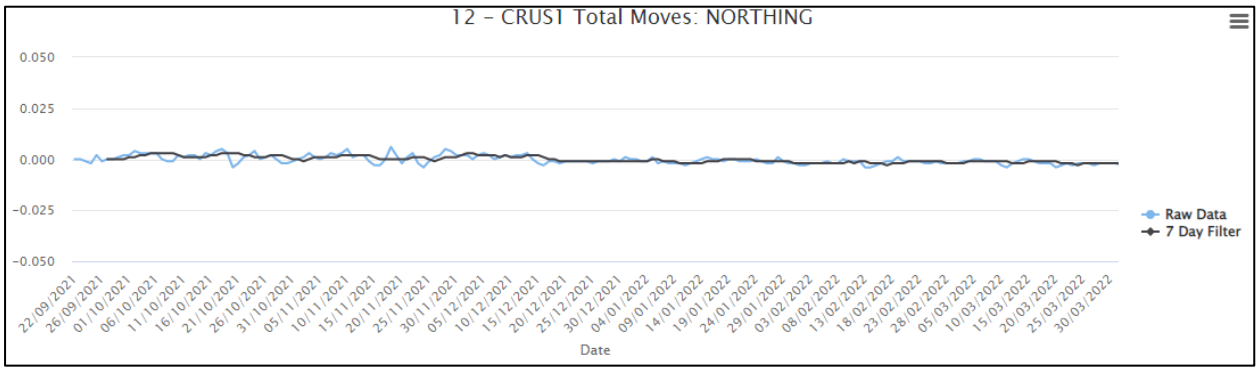

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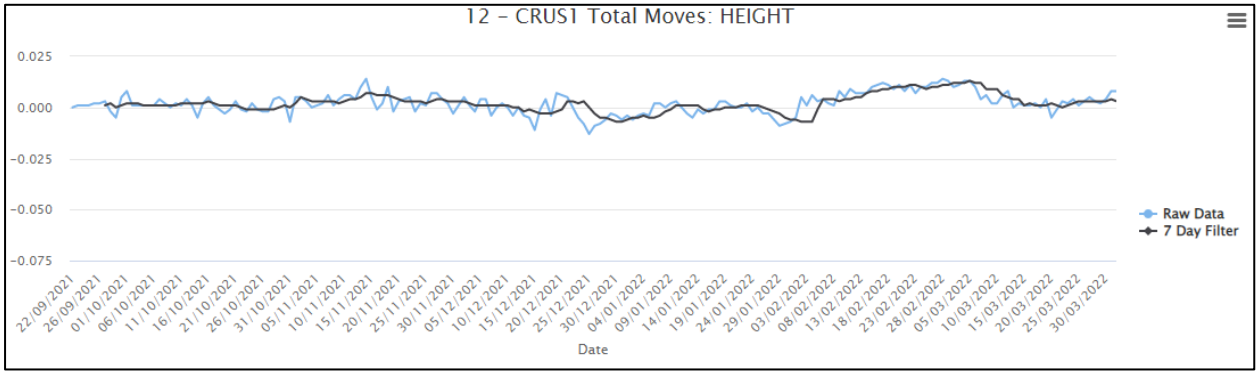
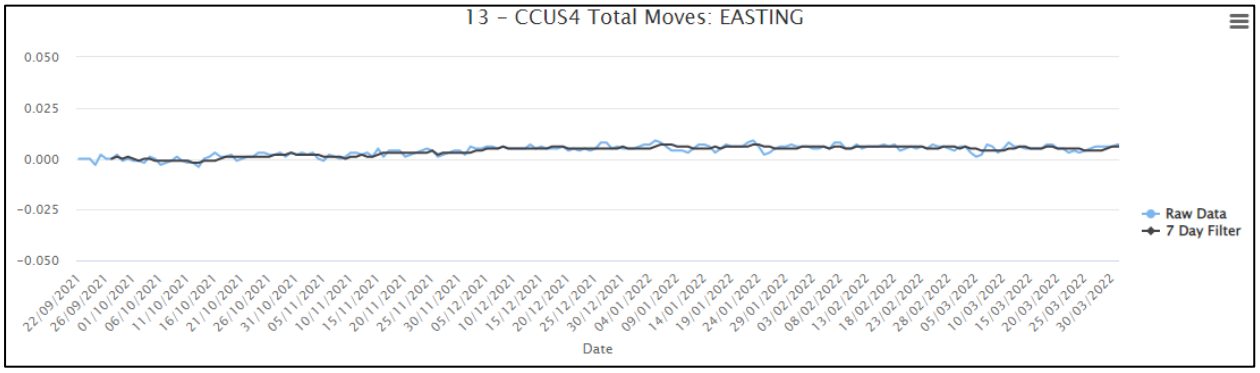


GNSS #13 - South of PC21 (Balgownie goaf)/ CCUS 4/ CCUS 3/CCUS 6/ CCUS 23)

Easting



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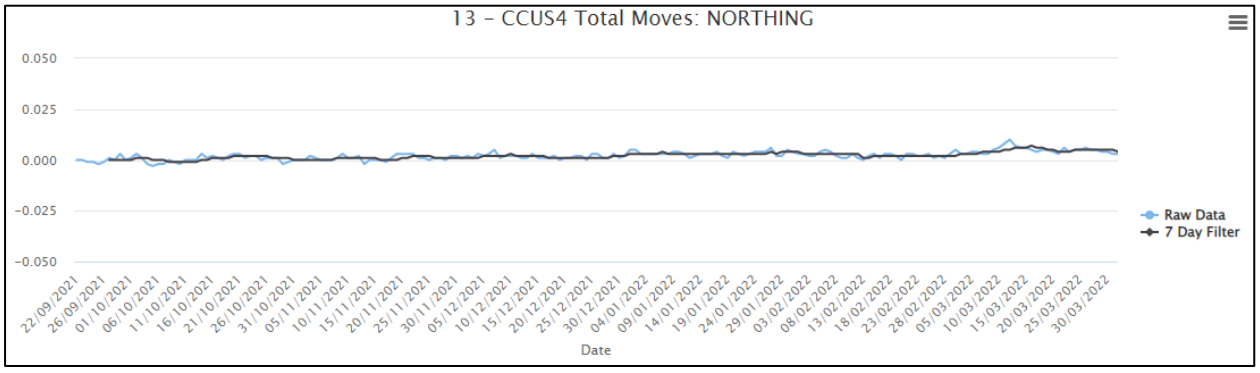

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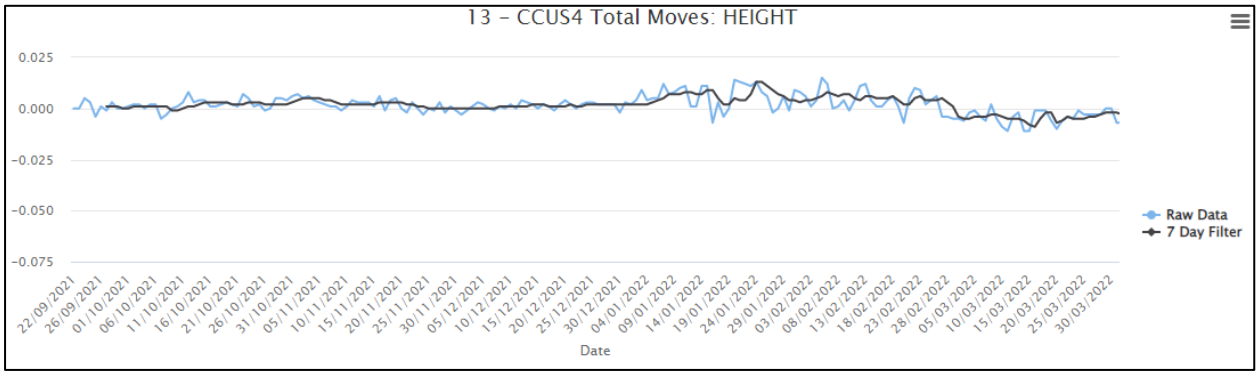
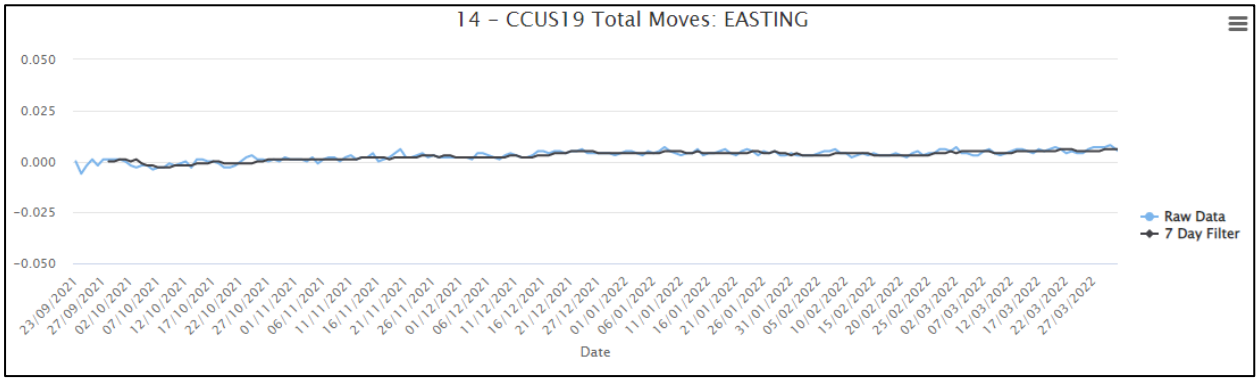


GNSS #14 - West of PC08 (Bulli pillars, CRUS 19/ CCUS 15/ CCUS 14/ CCUS 17/CCUS 18/ CCUS 19/ CRUS 3)

Easting



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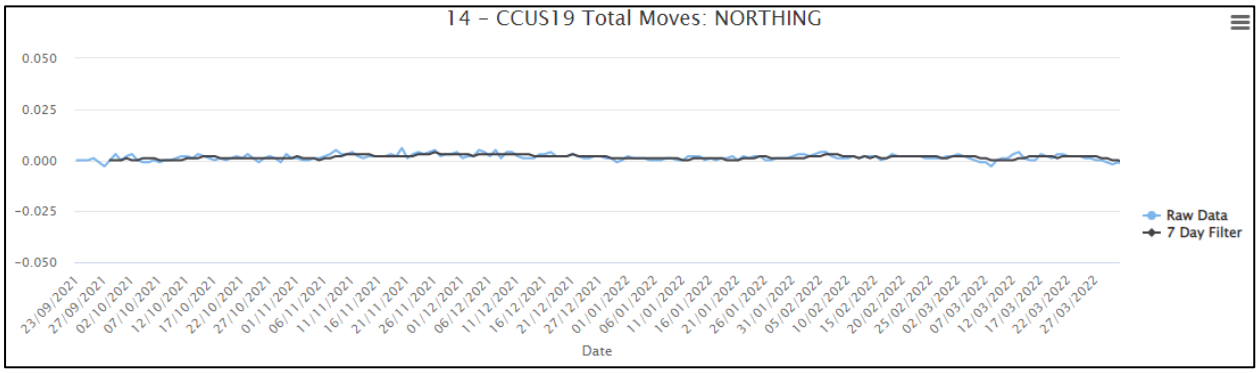

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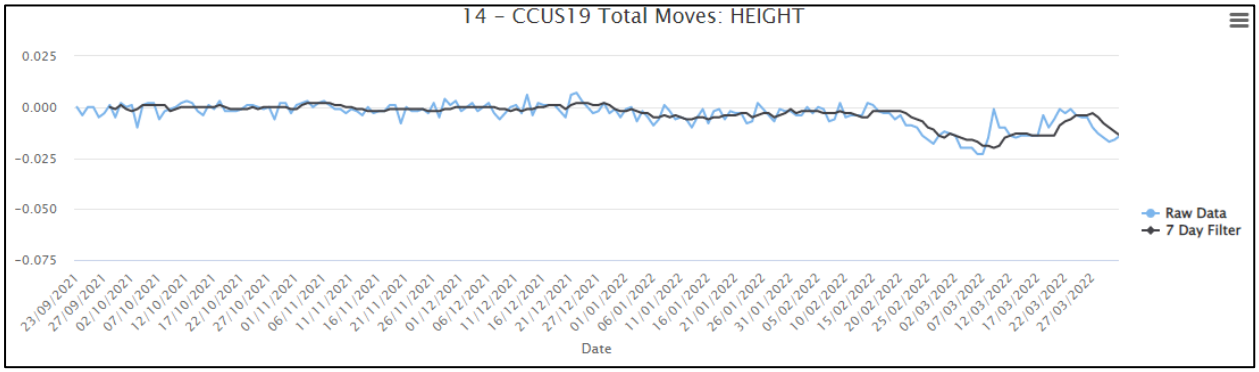
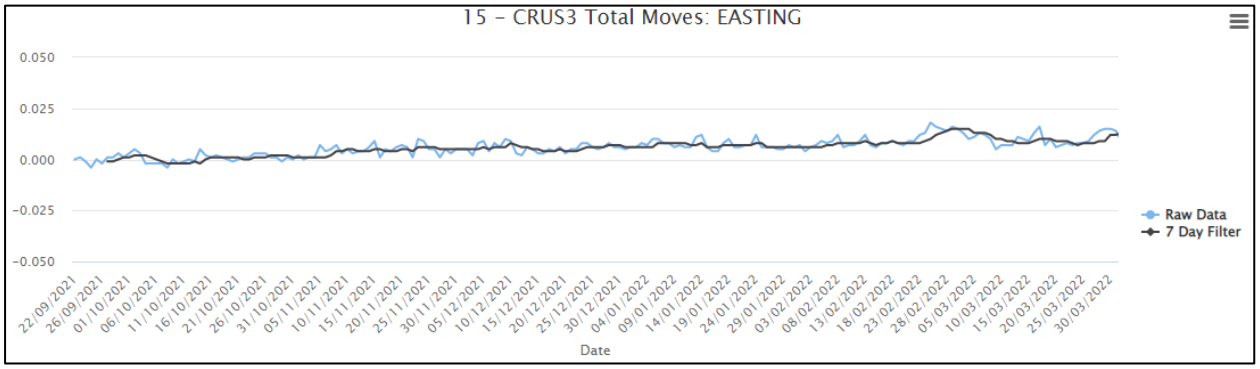


GNSS #15 - South of PC07 (Bulli pillars, CRUS 3/ CCUS2)

Easting



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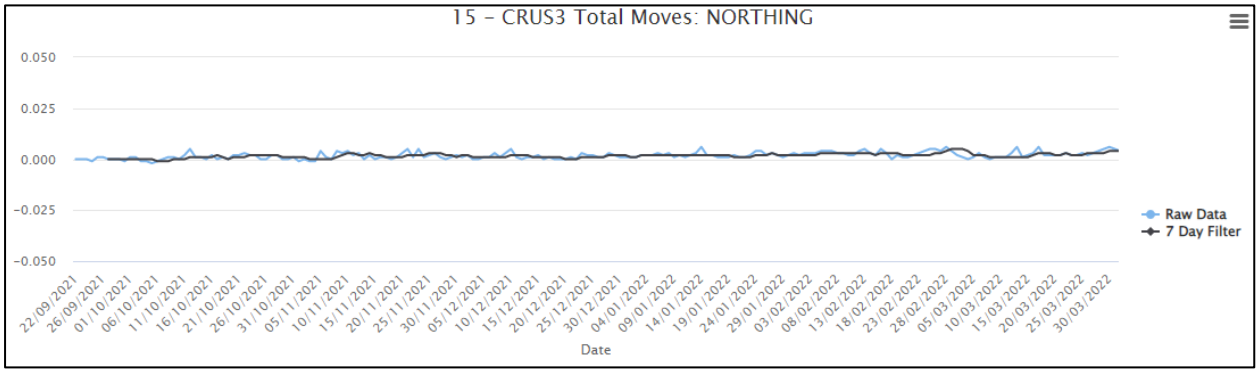

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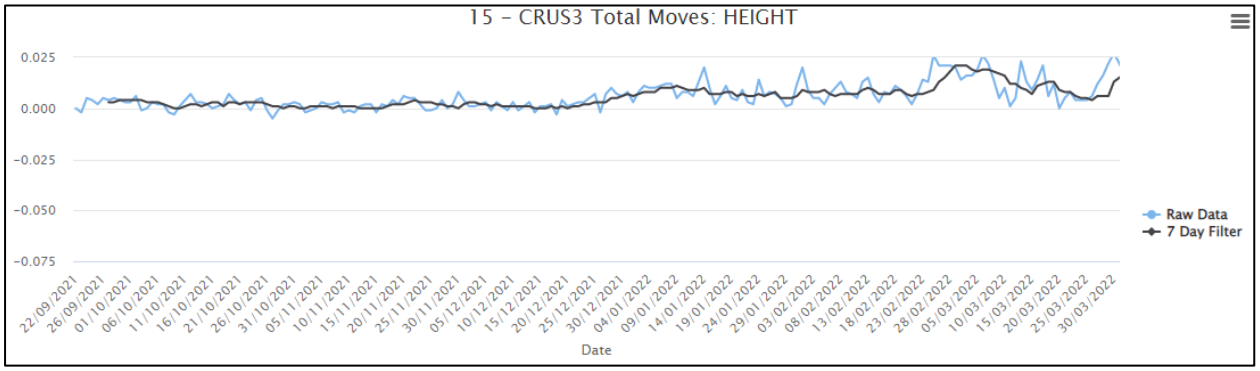
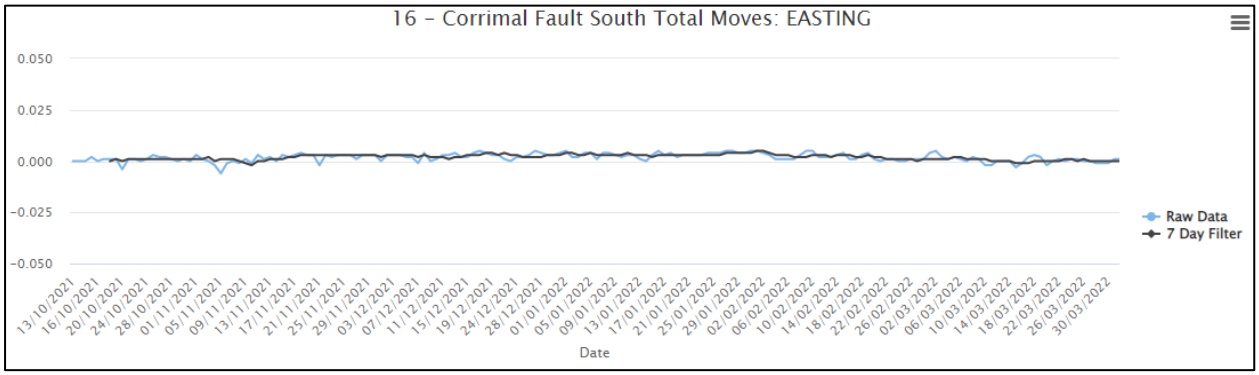


GNSS #16 - RMS Infrastructure/ Corrimal Fault South

Easting



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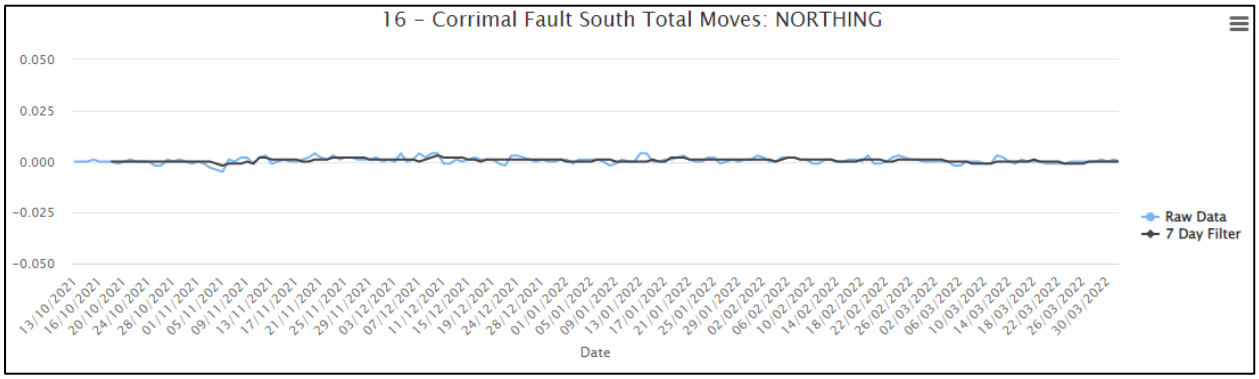

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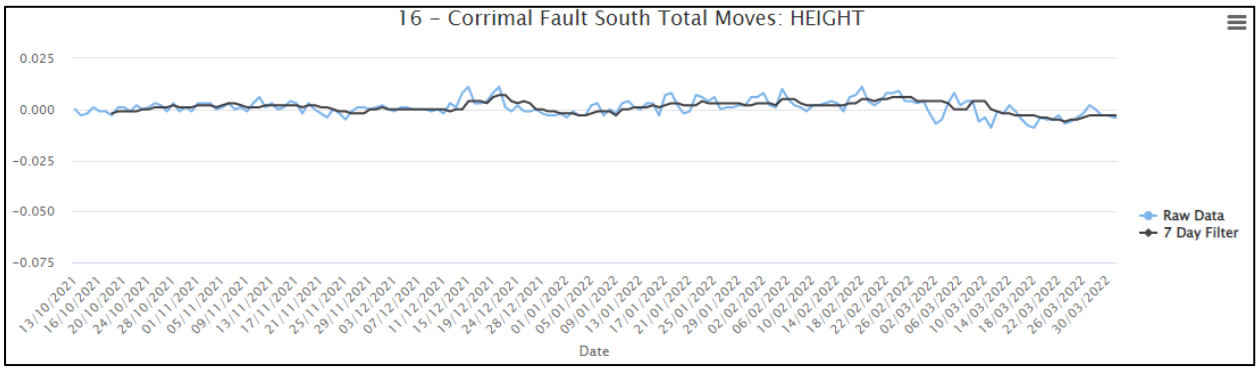
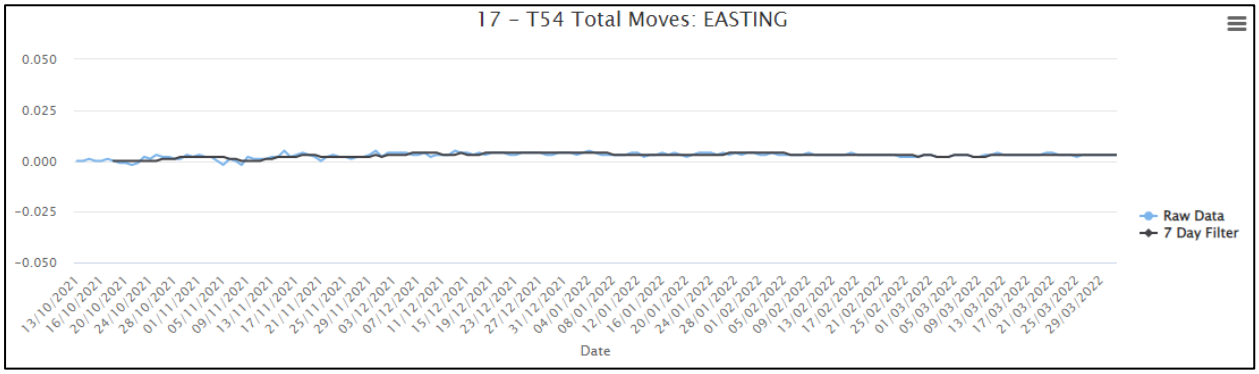


GNSS #17 - TransGrid 330kV Tower 54, Endeavour Energy 132kV E69 Powerline Towers & 33KV pylons

Easting



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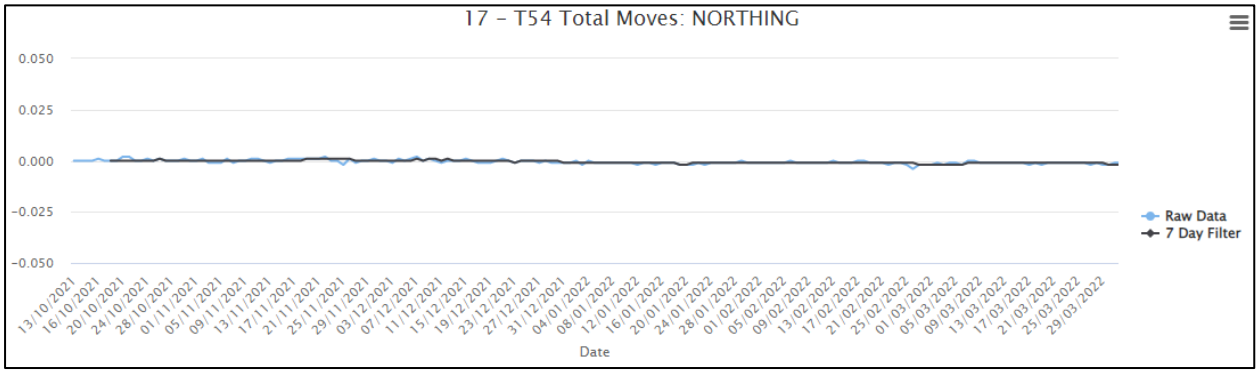

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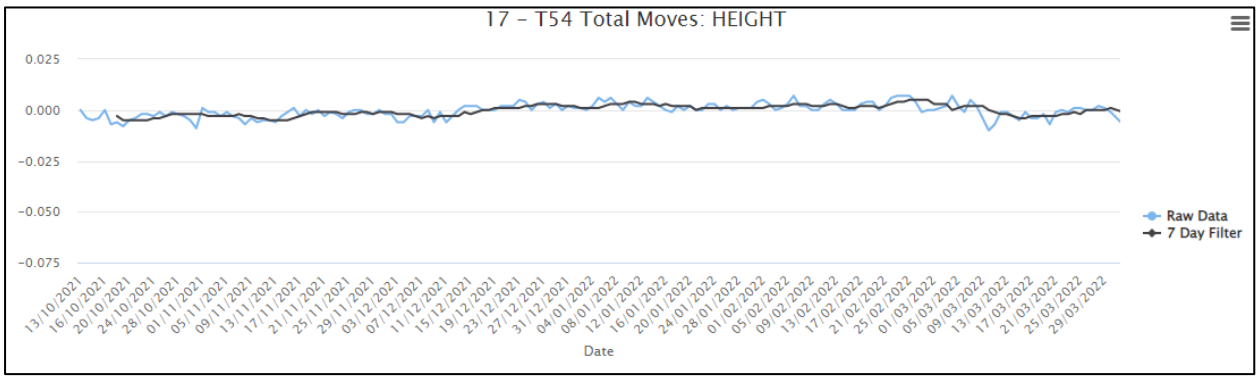

5 ATTACHMENT 1: LIDAR REVIEW REPORT

APPENDIX D – TFNSW RISK REGISTER

<TfNSW risk register excel spreadsheet_ final>

APPENDIX E – KEY PUBLIC INFRASTRUCTURE OPERATORS APPROVAL

The following sections are included to allow for the Key Public Infrastructure Operators to approve the monitoring program and key risk control measures within this Built Features Management Plan and allow for sign off endorsing the plan.

Transport for New South Wales

Recommended by the Technical Committee for TfNSW (TC) in Acknowledgement of Their Contribution to the Management Plan in Their Area of Expertise.

Organisation and Position	Member
TfNSW WCL UEP Technical Committee (TC) Chairperson	Martin Upitis
TfNSW Pavement Maintenance Planner, Southeast	Cyril Gunaratne
TfNSW Bridge Maintenance Planner, Southeast	Dony Castro
AECOM – Technical Director, Ground Engineering	Henk Buys
WCL Subsidence Specialist	Ken Mills
WCL Environmental Manager	Richard Sheehan
WCL Technical Services Manager	Devendra Vyas
CARDNO – Senior Bridge Engineer/ Principal – Bridges	Richard Woods

Authorisation of Management Plan

17/2/22	17.02.2022
.....	Devendra Vyas
Authorise on behalf of TfNSW	*Authorise on behalf of WCL:*
Position: Director Regional Assets South	**Position:**
.....	Technical Services Manager
Authorised for mine panels	**Authorised for mine panels:**
.....	.....

TransGrid

Authorisation of Management Plan

…… *Authorise on behalf of TransGrid* **Position**: …… **Authorised for mine panels:** ……	Devendra Vyas *Authorise on behalf of WCL:* **Position:** Technical Services Manager **Authorised for mine panels:** ……

Endeavour Energy

Authorisation of Management Plan

…… *Authorise on behalf of Endeavour Energy* **Position**: …… **Authorised for mine panels:** ……	Devendra Vyas *Authorise on behalf of WCL:* **Position:** Technical Services Manager **Authorised for mine panels:** ……