



**CULLEN VALLEY MINE
ANNUAL REVIEW 2021**

1 JANUARY 2021 TO 31 DECEMBER 2021

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Annual Review Title Block

Name of operation:	Cullen Valley Mine
Name of operator:	Shoalhaven Coal Pty Ltd (trading as Castlereagh Coal)
Development consent:	DA-200-5-2003 (as modified)
Name of holder of development consent:	Shoalhaven Coal Pty Ltd
Mining leases:	EL 5712, EL 6007, EL 8618, EL 8619, ML 1455, ML 1488, ML 1556, ML 1557
Name of holder of mining leases:	Shoalhaven Coal Pty Ltd
Water licence:	80WA706148
Name of holder of water licence:	Shoalhaven Coal Pty Ltd
MOP start date:	12 February 2021
MOP end date:	19 August 2025
Annual Review start date:	1 January 2021
Annual Review end date:	31 December 2021
I, Kyle Egan, certify that this audit report is a true and accurate record of the compliance status of Cullen Valley Mine for the period 1 January 2021 to 31 December 2021, and that I am authorised to make this statement on behalf of Shoalhaven Coal Company Pty Limited. Note. <i>a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i> <i>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i>	
Name of authorised report officer:	Kyle Egan
Title of authorised report officer:	General Manager, Manager Mining Engineering
Signature of authorised report officer:	
Date:	31/03/2022

1.0 Statement of Compliance

This Annual Review provides a summary of the Cullen Valley Mine (CVM) operations environmental performance over the period 1 January to 31 December 2021 (referred to hereafter as the reporting period).

It is noted that an Independent Environmental Audit (IEA) was due to be undertaken during the 2021 reporting period. In accordance with Schedule 6, Condition 6 of the Development Consent, CVM is required to undertake an Independent Environmental Audit (IEA) every 5 years. Due to circumstances surrounding change in ownership of CVM during the reporting period, and extension to provision of the Audit sought from DPIE and was granted until 18 March 2022 and submitted on the 14 March 2022.

The IEA identified non-compliances with the EPL, Development Approval and the 2003 Environmental Impact Statement mitigation measure commitments. Further details regarding the status of the non-compliances identified by the IEA are located in **Appendix 3**. A copy of the 2021 IEA will be made available on the CVM website.

The compliance status for the reporting period is summarised in **Table 1.1**. A total of three (3) non-compliances occurred during the report period. The non-compliances recorded during the report period have been ranked according to the risk matrix included in **Table 1.2** and a brief description of each is provided in **Table 1.3**.

Table 1.1 Statement of Compliance

Relevant approval	All conditions complied with?
Development Approval DA-200-5-2003	No – Refer to Table 1.3
Environmental Protection Licence EPL 10341	No – Refer to Table 1.3
Exploration Licence (EL) 5712	Yes
EL 6007	Yes
EL 8618	Yes
EL 8619	Yes
Mining Lease (ML) 1455	No – Refer to Table 1.3
ML 1488	No – Refer to Table 1.3
ML 1556	No – Refer to Table 1.3
ML 1557	No – Refer to Table 1.3
Water Access Licence 27898	Yes
Water Supply Work Approval (80WA 706148)	Yes

Table 1.2 Compliance Status Key for Table 1.3

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Source: Annual Review Guideline (NSW Government, 2015).

Table 1.3 Non-Compliances During the Reporting Period

Relevant Approval	Condition No.	Description (Summary)	Compliance Status	Comment and Proposed Action	Where Addressed in Annual Review
Development Approval DA-200-5-2003 EPL 10341	Schedule 4 Condition 27 L6.1	One odour complaint associated with sub-surface heating areas at CVM.	Non-compliant	One subsurface heating complaint was received by CVM during the report period (refer to Section 9.2). Shoalhaven Coal has implemented a number of management measures and undertake regular inspections of the area. During 2022, CVM will continue to monitor for subsurface heating and undertake treatment measures in accordance with the updated Plan of Works (Section 6.9). In addition, CVM will implement a program to trial an irrigation methodology agreed to with the Resources Regulator, to extinguish the worst affected area, whilst also considering compaction methods where appropriate, and further capping of areas of lower concern with overburden rehabilitation materials existing, and liberated from the remnant mining area.	Section 6.8 and Section 9.2
Development Approval DA-200-5-2003	Schedule 6 Condition 8	Only one Community Consultative Committee (CCC) meeting was held.	Non-compliant	During the 2018 CCC meeting it was agreed that only one CCC meeting would be held annually while CVM remains on care and maintenance. As such only one of the required two CCC meetings for CVM were held by Shoalhaven Coal during the reporting period. As part of DPIE's review of the 2019 Annual Review and subsequent correspondence DPIE advised Shoalhaven Coal that: - the matter to be a technical non-compliance - noted as such in the Annual Review and - expects the CCC to resume bi-annual meetings in the event of changes to the operational status of the mine or other extenuating circumstances. CVM intends to resume twice yearly CCC meeting in 2022.	Section 9.1
ML 1455, ML 1488, ML 1556, ML 1557	Condition 4 (Compliance Report) Condition 3(1) (AEMR)	Failure to submit an AEMR/EMR in the timeframe approved by the Director-General.	Non-compliant	The Annual Review report was submitted late due to an administrative oversight.	NA

2.0 Introduction

Shoalhaven Coal Pty Ltd owns the Cullen Valley Mine (CVM), an open cut coal mine located approximately 30 kilometres (km) north-west of Lithgow in New South Wales (NSW) ((refer to **Appendix 1, Figure 1**). Cullen Valley Mine is Operated by Castlereagh Coal a wholly owned subsidiary of Shoalhaven Coal Pty Ltd.

Underground mining commenced at CVM formerly Tyldesley Colliery around 1904 and continued up until the 1960s when the workings were abandoned. Open cut operations were conducted on the site between 1948 and 1953. Modern open cut operations began at CVM after 19 August 1999 when the Lithgow Coal Company was granted Mining Lease (ML) 1455 by the then Minister for Mineral Resources. Mining commenced on site in May 2000 following a four month construction phase.

Following the identification of additional open cut coal reserves, a further Environmental Assessment and Development Application was lodged for an extension of the mine in April 2003 (i.e. DA-200-5-2003). The lease extension area lies along the western side of Tyldesley Hill adjacent to the main western railway line. Approval of the Development Application was granted by the then Department of Planning and Infrastructure (DPI) on 19 August 2004.

CVM has previously supplied coal under contract to the Mount Piper Power Station. However, with the failure of the mine to secure a supply contract in 2007, it was proposed to place the operation on a care and maintenance program until such time as sufficient contracts were awarded that would make the operation of the mine viable once again. Coalpac Pty Ltd purchased the Lithgow Coal Company Pty Ltd, which owned the CVM, in January 2008 and the previous plans to place the mine on care and maintenance were discarded. Recommencement of the open cut mining operations occurred in February 2008. Mining of the available approved area at CVM was completed in early December 2012. Any remaining stockpiled ROM coal was transported to the Invincible Colliery during February 2013 and processed through the Invincible Coal Crushing Plant. The CVM was then placed under care and maintenance.

Shoalhaven Coal purchased the mine from Coalpac's administrators in May 2015. In November 2021 Shoalhaven Coal Pty Ltd was sold via a 100% share transaction to an all-Australian locally based ownership team who continued to operate the Colliery under a care and maintenance arrangements until the end of the reporting period.

2.1 Mine Contacts

The Manager Mining Engineering is responsible to the regulatory authorities for all aspects of environmental management and compliance. The Manager Mining Engineering contact details are included in **Table 2.1** below.

Table 2.1 Key Personnel Responsible for Environmental Management

Name	Role	Company	Contact details
Kyle Egan	General Manager, Manager Mining Engineering	Castlereagh Coal	Invincible Colliery Castlereagh Highway Cullen Bullen, NSW 2790 M 0432 892 862
Almudena Bryce	Environmental Manager and Community Liaison Officer	Castlereagh Coal	Invincible Colliery Castlereagh Highway Cullen Bullen, NSW 2790 M 0418 436 866

2.2 Annual Review Requirements

Condition 5 of Schedule 6 of the CVM Development Approval-200-5-2003 (as modified) requires an Annual Review (AR) to be prepared and submitted to the Director General of the Department of Planning, Infrastructure and Environment (DPIE) and relevant agencies. This report has been prepared in accordance with the *NSW Government Annual Review Guidelines* (NSW Government, 2015) and details the operational and environmental management activities at CVM during the reporting period. The reporting obligations contained in the Development Approval along with an explanation of where each requirement is addressed within this document are provided in **Table 2.1**.

Table 2.1 Development Approval (200-5-2003) Conditions for the Annual Review

Conditions		Addressed in Section
Schedule 6 – Environmental Management, Monitoring, Auditing and Reporting: Annual Report		
5.	The Proponent shall submit an AEMR to the Director- General and relevant agencies. This report must:	This document
	a) identify the standards and performance measures that apply to the project;	Relevant sections throughout Section 6.0
	b) include a detailed summary of the complaints received during the past year, and compare this to the complaints received in the previous 5 years;	Section 9.2
	c) include a detailed summary of the monitoring results for the project during the past year;	Relevant sections throughout Section 6.0
	d) include a detailed analysis of these monitoring results against the relevant: • impact assessment criteria/limits; • monitoring results from previous years; and • predictions in the EA;	Relevant sections throughout Section 6.0

Conditions		Addressed in Section
	e) identify any trends in the monitoring results over the life of the development;	Relevant sections throughout Section 6.0
	f) identify any non-compliance during the previous year;	Section 1.0, Section 11.0
	g) describe what actions were, or are being, taken to ensure compliance.	Section 6.0, Section 11.0

3.0 Approvals

The operations at CVM during 2021 were regulated by a range of leases, licences and approvals from various State government authorities as listed in **Table 3.1**.

Table 3.1 Environmental Approvals Held by CVM

Approval	Date Granted	Expiry Date	Status
Development Approval (DA-200-5-2003)	19 August 2004	19 August 2025	Current
Environment Protection Licence (EPL) 10341	10 December (anniversary date)	Annually	Current
Exploration Licence (EL) 5712	10 April 2000	10 April 2019	Renewal application submitted – determination pending.
EL 6007	8 October 2002	8 October 2024	Current
EL 8618	12 July 2017	12 July 2023	Current
EL 8619	12 July 2017	12 July 2023	Current
ML 1455	19 August 1999	18 August 2020	Renewal application submitted – determination pending
ML 1488	21 June 2001	20 June 2022	Current
ML 1556	20 September 2004	19 September 2025	Current
ML 1557	20 September 2004	19 September 2025	Current
Water Supply Work Approval 80WA 706148	16 January 2012	5 July 2025	Current

3.1 Status of Management Plans

In accordance with the DA-200-5-2003, CVM is required to implement a range of environmental management plans.

In accordance with the requirements of the *Protection of the Environment Operations Act 1997*, CVM also reviewed and updated the Pollution Incident Response Management Plan (PIRMP) during December 2021. The updated PIRMP has been placed on the Castlereagh Coal website.

In February 2022, a new suite of management plans was submitted to the DPIE and various agencies for consultation. Approval of these management plans will enable CVM to transition from Care and Maintenance to an operational status allowing the resumption of mining of remnant coal resources at the CVM site during the next reporting period.

Care and maintenance activities at CVM are undertaken in accordance with an approved Care and Maintenance (C&M) MOP (Umwelt, 2020). The CVM MOP was updated and submitted to the NSW Resources Regulator for approval on 13 November 2020 and was approved in early 2021.

In February 2022, an Addendum to the Care and Maintenance MOP was submitted to the Resources Regulator to enable CVM to transition from Care and Maintenance to an operational status, allowing the resumption of mining of remnant coal resources at the CVM site during the next reporting period. The MOP

Addendum was approved by the Resources Regulator on the on 28 February 2022 for the period until the 2 July 2022.

4.0 Operations Summary

4.1 Mining Operations

CVM remained in care and maintenance and as such no production occurred during the reporting period. A summary of the production figures and mining activity for 2021 and the forecast production for 2022 is provided in **Table 4.1**.

Table 4.1 Production Summary

Material	Approved Limit (specify source)	2020 Previous reporting period (Actual)	2021 This reporting period (Actual)	2022 Next reporting period (forecast)
Waste rock/overburden (Mbcm)	Not specified	0	0	0.725
Coal works/Coal mining (Mt)	0-2 Mtpa Coalworks (EPL) 0.5-2 Mtpa Mining for Coal (EPL) 1 Mtpa (DA)	0	0	0.450
Coarse reject	Not specified	0	0	0
Fine reject	Not specified	0	0	0
Saleable coal (Mt)	Not specified	0	0	0.450

4.1.1 Waste Rock/Overburden

As the site has been in care and maintenance during the report period, with no mining activities undertaken. Therefore, no waste rock or overburden was produced.

4.1.2 ROM Coal

As the site has been in care and maintenance during the report period with no mining activities undertaken. Therefore, no coal was handled or produced.

4.1.3 Coarse Reject

As the site has been in care and maintenance during the report period with no mining activities undertaken. Therefore, no coal reject material was produced.

4.1.4 Fine Reject (tailings)

As the site has been in care and maintenance during the report period with no mining activities undertaken. Therefore, no tailings were produced.

4.1.5 Saleable coal

As the site has been in care and maintenance during the report period with no mining activities undertaken. Therefore, no tailings were produced.

4.2 Other Operations

During the reporting period, other works undertaken included works to treat subsurface heating which included the excavation and compaction of surface material (refer to **Section 6.8**).

4.3 Section 240 Notice and Updated MOP

On 13 November 2020 an updated MOP and Plan of Works (POW) were submitted to the NSW Resources Regulator for approval to address Section 240 Notice NTCE0005373. The Notice requirements addressed within the MOP and POW included the investigation and treatment of subsurface heating areas, continued rehabilitation of areas impacted by subsurface heating and management of erosion areas associated with subsurface heating impacts. The MOP was subsequently updated and approved in February 2022 covering the period until 2 July 2022 after which the MOP will be replaced by a Rehabilitating Management Plan.

During 2021, a further two Section 240 Notices were served upon CVM by the Resources Regulator following planned inspections of landform establishment activities during May 2021, with compliance dates of 28 February 2022. Notice NTCE0008974 directed an assessment of rehabilitation materials, quantities, changes in inventories and shortfall projections at completion of mining activities and a report demonstrating how the directions have been met. Notice NTCE0008975 directed an assessment of surface water management systems associated with the final landform, including an assessment of the adequacy of the current systems, capacity, construction methods and effectiveness of materials used for rock armouring and a report demonstrating how the directions have been met.

Consultant specialists from Umwelt and Golder were engaged in late December 2021 to undertake the works associated with the two Notices. An update on these works will be provided in the 2022 Annual Review.

4.4 Next Report Period

Currently there are plans to restart operations at CVM to mine approximately 450,000 tonnes of remnant coal during the next reporting period.

CVM has also consulted closely with the Resources Regulator regarding the management of areas of heating within formerly rehabilitated areas at the mine, see **Section 6.8**.

5.0 Actions Required from Previous Annual Review

Following submission of the 2020 Annual Review to DPIE on 31 March 2021, DPIE advised in correspondence dated 27 April 2021, that the Annual Review was considered to generally satisfy the requirement of the Approval in relation to Annual Reviews. The Department noted the reported non-compliances with the Consent as outlined in the Annual Review but indicated no further information was required. Additionally, DPIE requested that the Annual Review be made publicly available on the company website. A copy of the 2020 Annual Review is available on the Castlereaugh Coal website.

6.0 Environmental Performance

In accordance with the Annual Review Guidelines (DPE, 2015), this section describes the environmental monitoring and management measures undertaken at CVM during the report period. **Section 3.1** details the environmental management plans which have been prepared for the operation.

A range of environmental monitoring is required to be undertaken by the Development Consent, EPL and CVM management plans. **Appendix 1, Figure 3**, shows the CVM environmental monitoring locations.

6.1 Summary of Performance Against EIS Predictions

CVM has been the subject of two Environmental Impact Statements (EIS) in the last 20 years of operations. The results of environmental monitoring conducted during the reporting period are compared to the predictions of these EIS's.

The Feldmast Coal Project for open cut and underground operations to the north-east and north-west of Cullen Bullen was assessed in the EIS dated February 1997 (International Environmental Consultants, 1997). The CVM Lease Extension Project involved expanded operations further to the north-west of the original mining area adjacent to the Wallerawang-Gwabegar Railway line and was assessed in the EIS dated April 2003 (International Environmental Consultants, 2003).

Environmental monitoring undertaken includes noise, air quality, surface water and groundwater quality, and biodiversity. Below is a summary of predictions from the two EIS's completed for the site. **Table 6.1** provides a summary of CVM environmental performance against the EIS predictions for the reporting period. It is noted that modelling undertaken for the respective EIS's assumed mining operations were being undertaken. As noted previously, CVM is in care and maintenance and there were no mining operations during the reporting period.

6.1.1 Noise Predictions

The Feldmast EIS (1997) predicted that with construction of the noise bund, noise from open cut operations was expected to result in an increase in existing background levels measured at the Hillcroft property (Hillcroft) of no more than 5 dB(A). The construction of a private access road between the mine and Mudgee Road to bypass Cullen Bullen was completed during the construction phase and was expected to minimise truck noise. The bypass around Cullen Bullen and noise bund were constructed, significantly reducing traffic and noise impacts on the town and nearby properties.

In the 2003 EIS and approved extension to mining operations, noise exceedances of 2-4 dB(A) were predicted to occur at Red Springs during temperature inversion conditions. Noise exceedances of 4-7 dB(A) were also predicted at Hillcroft during temperature inversion conditions. At Forest Lodge, exceedances of 1 dB(A) (calm), 5dB(A) (south wind) and 5dB(A) (temperature inversion) were predicted in Years 9 and 10 of the extension operations. Exceedances of 3 dB(A) (calm), 10dB(A) (south wind) and 5dB(A) (temperature inversion) were also predicted during years 9 and 10 at the 25 acre allotments to the north of the mine. *NB: These are exceedances of the 35 dB(A) criteria.*

6.1.2 Air Quality Predictions

The Feldmast EIS (1997) predicted annual average TSP concentrations from background levels plus mine emissions to be $48 \mu\text{g}/\text{m}^3$ at the closest residences to the mine, which is well below the $90 \mu\text{g}/\text{m}^3$ annual average goal. Predicted PM_{10} concentrations were $24 \mu\text{g}/\text{m}^3$ (background plus mine emissions) and this is well below the annual average goal of $30 \mu\text{g}/\text{m}^3$. $\text{PM}_{2.5}$ concentrations from mine emissions were predicted to be $0.5 \mu\text{g}/\text{m}^3$ at the closest residence.

Modelling of dust deposition in the worst-case scenario predicted that no long-term adverse air quality impacts at the closest residential area as a result of mine operations.

The 2003 EIS predicted that nearby residences and those in Cullen Bullen were unlikely to experience unacceptable long-term impacts on air quality from the mine extension operations. It was predicted that short-term impacts could occur if emissions from the mine extension operations were combined with elevated levels from other sources.

6.1.3 Water Quality Predictions

Given the water management system contains and treats water within storage ponds prior to discharge, the Feldmast EIS (1997) predicted that EPA discharge criteria would be met. All water within the Lithgow Seam was proposed to be drained within the mining area. Groundwater systems below the Lithgow Seam were expected to be unaffected by the project.

The 2003 EIS predicted that the water management system for containment and reuse of all runoff from disturbed areas would ensure that EPA licence criteria for surface water quality would be met. The project was expected to use underground water within the old Tyldesley underground workings which collects subsurface water contained within the coal measures. Groundwater systems below the Lithgow Seam were expected to be unaffected by the project.

6.1.4 Groundwater Predictions

During the 2017 report period, a review of the groundwater regime in the vicinity of CVM was undertaken which resulted in the development of a standalone CVM Water Management Plan (Umwelt, 2017b). For the purposes of this report, the results of the 2021 groundwater monitoring have been compared to the groundwater trigger levels contained in the CVM Water Management Plan (Umwelt, 2017b).

6.1.5 Biodiversity Predictions

Only one threatened plant species, Capertee Stringybark, was found to occur in the study area during the Feldmast EIS (1997). The EIS predicted that no local population of Capertee Stringybark would be placed at risk of extinction as a result of the proposed mining operations. The 2003 EIS made similar predictions and concluded that there would not be a significant effect on Capertee Stringybark as a result of the expansion.

The 1997 EIS predicted that the mining operations were unlikely to cause a significant impact on threatened fauna species found in the study area. Similarly, the 2003 EIS predicted that the expansion was unlikely to have a significant impact on threatened fauna.

A summary of the environmental performance of CVM during the report period as compared to predictions made in the EIS's is provided in **Table 6.1**.

Table 6.1 Summary of Environmental Performance During 2021

Aspect	Development Approval criteria/ EA prediction	Performance during the report period	Trend/key management implications
Noise	Refer to Section 6.1.1	Noise performance is compliant with Development Approval criteria and conforms to EIS predictions. Refer to Section 6.5 .	No noise exceedance recorded during 2021. Historic trends are shown in Section 6.5 .
Air Quality	Refer to Section 6.1.2	Air Quality monitoring conforms to EIS predictions. All results complied with the air quality performance criteria. Refer to Section 6.3 .	A comparison to historic trends for air quality are shown in Section 6.3 and Appendix 2 .
Water Quality	Refer to Sections 6.1.3 and 6.1.4	Surface water quality performance is compliant with Development Approval criteria and conforms to EIS predictions. Refer to Section 6.4.2 . Groundwater monitoring has been compared to trigger levels developed during 2017 in Section 6.4.2 .	Groundwater monitoring was undertaken and is discussed in Section 6.4.2 and Appendix 3 .
Biodiversity	Refer to Section 6.1.5	Rehabilitation areas are generally progressing towards satisfactory completion.	The Biodiversity Monitoring Program continued during 2021

6.2 Meteorological Monitoring

Meteorological monitoring is undertaken at CVM. The CVM weather station (CMET2) is located at the training centre adjacent to the compensatory habitat area (**Appendix 1, Figure 3**). A summary of monthly meteorological monitoring results is provided in **Table 6.3**.

6.2.1 Rainfall

CVM received 713.0 mm of rainfall over 139 rain days during the report period. The highest rainfall occurred during November (155.2mm), while the lowest rainfall was recorded during April (2.6mm). A summary of monthly rainfall data is provided in **Table 6.3**.

6.2.2 Temperature

Air temperature is measured at 2 m and 10 m above ground level. The maximum temperature recorded during the report period was in January (35.79°C @ 2m, 34.41°C @10m) and the lowest temperatures occurred in July (-7.78°C @ 2m), -7.06°C @ 10 m). The minimum and maximum monthly temperature data is provided in **Table 6.3**.

6.2.3 Humidity

The CMET2 humidity sensor was faulty during the reporting period and no valid data is available.

6.3 Air Quality

6.3.1 Environmental Management Measures

CVM's Environmental Management Plan (Coalpac, 2012c), includes an Air Quality Management Plan (AQMP), which defines mitigation measures and monitoring procedures for the management of dust.

The air quality monitoring network at CVM consists of five dust deposition gauges (i.e. CDD1 to CDD5) and one High Volume Air Sampler (HVAS) measuring particulate matter <10 µm (PM₁₀) (**Appendix 1, Figure 3**).

6.3.2 Performance Criteria

The air quality performance criteria specified in DA 200-5-2003 are reproduced in **Table 6.2**.

Table 6.2 Air Quality Performance Criteria

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual average	90 µg/m ³
Particulate matter <10µm (PM ₁₀)	Annual average	30 µg/m ³
	24-hour average	50 µg/m ³
Deposited dust	Annual average (maximum total)	4 g/m ² /month
	Annual average (maximum increase)	2 g/m ² /month

Table 6.3 CVM Weather Station Summary

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No of rain days	Air temp @ 2m		Air temp @ 10m		Humidity (%)	
				Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
January 2021	51.0	51.0	11	5.06	35.79	6.80	34.41	NA	NA
February 2021	55.6	106.6	15	6.19	30.66	7.31	29.40	NA	NA
March 2021	139.0	245.6	14	1.61	30.70	2.23	29.30	NA	NA
April 2021	2.6	248.2	6	-4.58	29.97	-3.58	28.83	NA	NA
May 2021	15.0	263.2	9	-6.41	21.86	-5.74	22.34	NA	NA
June 2021	48.2	311.4	13	-5.59	17.77	-4.40	17.34	NA	NA
July 2021	49.8	361.2	17	-7.78	18.71	-7.06	18.29	NA	NA
August 2021	54.6	415.8	7	-5.14	21.80	-4.20	21.00	NA	NA
September 2021	39.8	455.6	10	-5.11	23.83	-4.18	22.91	NA	NA
October 2021	37.0	492.6	11	-1.50	30.18	-0.69	28.68	NA	NA
November 2021	155.2	647.8	15	1.15	25.49	2.56	24.45	NA	NA
December 2021	65.2	713.0	11	2.72	32.26	3.75	30.57	NA	NA
Total	713.0	-	139	-	-	-	-	-	-

NA = Faulty humidity sensor - no valid data

6.3.3 Environmental Outcomes

6.3.3.1 Dust Deposition

Deposited dust is monitored on a 30 ± 2 day cycle. The annual average criterion for deposited dust ($4 \text{ g/m}^2/\text{month}$) was not exceeded at any of the dust deposition gauges during the reporting period. The annual average dust levels for all locations was less than $2 \text{ g/m}^2/\text{month}$ and therefore complied with air quality performance criteria.

The monthly deposited dust monitoring results for 2021 are shown in **Table 6.4** and is compared with historical results in **Appendix 2**.

Table 6.4 Deposited Dust Monitoring Results

Date	Total Insoluble Solids ($\text{g/m}^2/\text{month}$)				
	CDD1	CDD2	CDD3	CDD4	CDD5
January 2021	0.3	0.4	0.4	0.3	1.6
February 2021	0.3	0.3	0.4	0.2	0.9
March 2021	0.4	0.1	0.2	0.1	2.6
April 2021	0.4	0.6	0.6	0.4	2.2
May 2021	NR	0.2	0.2	0.3	0.9
June 2021	0.1	0.3	0.1	0.1	0.1
July 2021	NR	0.4	0.2	0.2	1.3
August 2021	0.2	0.7	0.2	0.1	0.1
September 2021	0.1	0.3	0.1	0.1	0.3
October 2021	0.1	0.1	0.5	0.1	0.4
November 2021	0.1	1.1	0.1	0.1	0.1
December 2021	0.1	0.2	0.2	0.2	0.2
Annual Average 2021	0.2	0.4	0.3	0.2	0.9

NR – No sample in May and July due to broken bottle and broken funnel respectively

6.3.3.2 Particulate Matter

Monitoring of particulate matter was conducted during 2021. Total suspended particulates are estimated from the PM_{10} concentrations. The annual average criteria for PM_{10} ($30 \mu\text{g}/\text{m}^3$) and TSP ($90 \mu\text{g}/\text{m}^3$) were not exceeded during the report period.

The PM_{10} annual average results for the report period are shown in **Table 6.5**.

Table 6.5 Particulate matter (PM_{10}) and Total Suspended Particulates (TSP) Annual Average Results

Annual Average	$\text{PM}_{10} (\mu\text{g}/\text{m}^3)$	TSP ($\mu\text{g}/\text{m}^3$)*
Annual Average Criterion	30	90
Annual Average 2021	5.6	14.1

* Total suspended particulates are estimated from the PM_{10} concentrations.

A graph of the PM₁₀ and TSP monitoring data for 2021, as well as historical data trends, is shown in **Appendix 2**.

6.3.4 Trends in Data

6.3.4.1 Dust Deposition

Table 6.6 presents the dust deposition annual averages from 2016 to 2021. Graphs of the long-term dust deposition levels are included in **Appendix 2**. The annual averages for depositional dust recorded at CVM during 2021 are well below the performance criteria.

Table 6.6 Annual Averages for Dust Deposition 2016-2021

Reporting period	Total Insoluble Solids (g/m ² /month)				
	CDD1	CDD2	CDD3	CDD4	CDD5
Criteria	4	4	4	4	4
2016	0.2	0.6	0.4	0.6	0.8
2017	0.5	2.6	0.5	0.6	1.3
2018	0.8	0.9	1.0	1.2	1.5
2019	1.3	1.1	1.3	1.7	1.9
2020	0.8	0.9	1.0	1.1	1.9
2021	0.2	0.4	0.3	0.2	0.9

The 2021 annual average dust deposition levels were consistent with the range of averages since 2016. The 2021 annual averages at all monitoring locations are at the lower end of the historical range over the previous five years.

6.3.4.2 Particulate Matter

Table 6.7 presents the particulate matter annual averages from 2016 to 2021. The raw PM₁₀ and TSP 2021 annual averages are within the range of results over the previous five years. The 2021 annual averages for PM₁₀ and TSP are the lowest over the previous five years.

Table 6.2 Annual Averages for PM₁₀ and TSP 2016-2021

Annual Average	PM ₁₀ (µg/m ³)	TSP (µg/m ³)*
2016	8.5	21.2
2017	7.8	24.5
2018	13.7	34.3
2019*	23.4	58.5
2020	11.0	27.5
2020^	9.0	22.0
2021	5.6	14.1

* Annual average significantly influenced by bushfire activity (refer 2019 Cullen Valley Annual Review)

^ Excluding results influenced by extraordinary events

6.3.5 Proposed Improvements

Monitoring of air quality will continue to be conducted during 2022 in accordance with the Air Quality Management Plan (AQMP).

6.4 Water Management

A new site water management plan was submitted to DPIE, EPA and the Resources Regulator for Agency consultation in February 2022. This plan will be adopted as part of the restart of mining operations at CVM.

6.4.1 Surface Water Quality

6.4.1.1 Environmental Management Measures

The surface water management system at CVM utilises a series of settlement dams. The system is primarily operated as a closed loop system. The CVM Water Management System (WMS) incorporates a range of infrastructure to manage clean water runoff from upslope undisturbed catchments, dirty water runoff from disturbed catchments and mine water (i.e. groundwater extracted from former underground workings or water that has come into contact with coal). Whilst CVM is on care and maintenance, mine water is only utilised for dust suppression. Where mine water is utilised for dust suppression it is captured and managed within the dirty water management system. The fundamental principle of the WMS is to minimise interaction of clean, dirty and mine waters and to capture dirty water for re-use and provide controls to treat captured dirty water to a standard suitable for discharge off-site.

The Tyldesley Mine underground workings are also used to store excess water from the WMS. The primary source of water for site use (when required) is from the abandoned and flooded Tyldesley Mine underground workings via the Tilley's Bore (GW01) in accordance with Water Access Licence WAL27898. When required, water is pumped from the workings via the Tilley's Bore to two 150,000 L tanks at CVM. Site water is transferred between site dams through gravity fed water mains.

CVM operates under EPL 10341. The EPL provides water quality criteria and water quality monitoring requirements for water discharges from the two CVM Licensed Discharge Points (LDP's) being LDP 001 and LDP 004, refer to **Appendix 1, Figure 3**. Further discussion regarding water management and erosion and sediment control measures is included in **Section 7.0**.

6.4.1.2 Performance Criteria

Water may be discharged from LDP001 and LDP004 at CVM in accordance with EPL and Development Approval requirements. **Table 6.3** presents the EPL discharge criteria for these discharge points.

Table 6.3 Water Quality Concentration Limits for LDP001 and LDP004 During Discharge

Pollutant	Concentration Limit
Oil & Grease	10 mg/L
pH	6.5 – 8.5
Total suspended solids	30 mg/L

6.4.1.3 Environmental Outcomes/Trends in Data

There were no discharge events from LDP 001 and LDP 004 during the 2021 report period.

6.4.1.4 Proposed Improvements

Monitoring of water quality at the Cullen Valley Mine will continue to be conducted during 2022.

6.4.2 Groundwater Quality

6.4.2.1 Environmental Management Measures

CVM is located on the western escarpment of the Sydney Basin. Aquifers in this area are typically limited to the Lithgow Seam and the Marangaroo Sandstone which underlies the Lithgow Seam. Despite their proximity, there is little observed movement between these aquifers in the Marangaroo Sandstone and the Lithgow Seam (AGE, 2012).

Past open cut and highwall mining at CVM has targeted the Irondale, Lidsdale and Lithgow seams. Underground mining in the area has been largely limited to the Lithgow seam. The Lithgow Seam can be seen in the highwall faces at CVM (some of which are now covered by overburden). Outcrop areas north of the open cut workings represent local recharge points for the Lithgow seam.

Figure 4, Appendix 1 shows the general dip in the strata of the Lithgow seam to the east - northeast and the location of underground workings in the Lithgow seam in the area. The open cut workings in the southern parts of the CVM are hydraulically connected to the former Tyldesley Colliery workings which extend to the east of the southern part of CVM. The water in the Tyldesley Colliery workings is sourced from groundwater inflows (i.e. recharge areas) located up-dip, ingress from areas at CVM where the open cut operations are hydraulically connected to the Tyldesley workings, and infiltration through subsidence cracking associated with pillar extraction and pillar failure in the former workings. Water quality in these workings is monitored at GW01 (East Tyldesley Bore) (refer to **Figure 4, Appendix 1**).

As can be seen from **Figure 4, Appendix 1** the CVM is located up-dip of the Lithgow seam groundwater monitoring bores of CP116, CP115 and CP132 and operates as a recharge point for the Lithgow seam in this area. As mining at CVM extended to the base of the Lithgow Seam and as CVM represents an up-dip recharge point of this aquifer, the open cut at CVM do not intercept any natural groundwater aquifers. Therefore, there are limited depressurisation impacts associated with the CVM open cut pits and any impacts would be associated with interactions with the recharge regime; these impacts are expected to be limited due to the low recharge rates and the generally benign nature of the overburden emplaced adjacent to the outcropping coal seams (Umwelt, 2017b).

6.4.2.2 Performance Criteria

There are no pollutant concentration limits for groundwater specified in the Development Approval or EPL for CVM. The CVM WMP (Umwelt, 2017b) includes trigger values against which groundwater monitoring results are compared. For the purposes of this Annual Review, the groundwater results obtained during the report period have been compared to these trigger values.

The CVM WMP (Umwelt, 2017b) has reviewed the location and target seam for each groundwater monitoring bore and considers the CP115, CP116 and GW01 groundwater monitoring bores are suitable to assess any potential offsite groundwater impacts associated with the operation of CVM. These bores are located down dip of CVM and are also located within appropriate seams. **Table 6.4** shows the trigger level/range for key groundwater monitoring parameters that are specific to bores CP115, CP116 and GW01. Results outside of these ranges are triggers for further investigation. The results of CP115, CP116 and GW01 are also compared to reference bores which are bores that are considered to be representative of background groundwater quality (refer to **Section 6.4.2.4**).

Table 6.4 Groundwater Quality and Level Triggers as Defined in CVM WMP (Umwelt, 2017b)

Bore	Groundwater Level (mAHD) Trigger Range	Analyte			
		pH	EC (us/cm)	Sulphate (mg/L)	Hardness (mg of CaCO ₃ /L)
CP116	890 - 894	Range 5.82 - 7.2	Upper limit 840	Upper limit 140	Upper limit 210
CP115	892 - 896	Range 6.26 - 7.3	Upper limit 970	Upper limit 380	Upper limit 376
GW01 ¹	N/A as bore is located in workings	Range 6.14 - 6.82	Upper limit 939	Upper limit 338	Total Alkalinity ² Upper limit 100 mg of CaCO ₃

¹ Baseline data for GW01 has been obtained from 11 groundwater monitoring events over an 11 month period from 2016-2017 for the trigger levels. The groundwater triggers will be reviewed considering the additional data now available, with any update included in the MOP and Water Management Plan during 2020.

² GW01 has not been monitored for Hardness as part of groundwater quality baseline monitoring. Total Alkalinity has been used as a proxy for Hardness and will be utilised as a trigger for this bore until sufficient baseline data for hardness has been obtained for this bore to develop a trigger value.

Baseline groundwater monitoring programs and associated trigger levels when developed in accordance with ANZECC recommendations require the utilisation of 24 contiguous monthly samples (ANZECC, 2000). The trigger levels for groundwater monitoring at CVM have been developed utilising the groundwater data set which is a limited data set of between nine and eleven annual groundwater samples at each location between the period 2011 – 2017. Monitoring results outside of the values presented in **Table 6.9** will be used for further investigation by CVM personnel. It is noted that monitoring results outside of these values do not necessarily reflect an environmental impact associated with CVM operations, as variations within these bores may be influenced by other factors not associated with site activities. These trigger levels will be reviewed on an annual basis as further monitoring data is collected for each bore.

6.4.2.3 Environmental Outcomes

During the report period, groundwater monitoring was conducted on two occasions (refer to **Table 6.4**). A discussion of the 2021 groundwater monitoring results is included in **Section 6.4.2.4**.

Groundwater monitoring undertaken during the reporting period was affected by damage to the Ben Bullen State Forest caused by the 2019-20 bushfire event which burnt in the vicinity of CVM.

During the November 2021 groundwater monitoring round, access to the Ben Bullen State Forest was restored by the Forestry Corporation of NSW. Bore CP131 was therefore accessible, however the environmental monitoring contractor reported the bore casing was found to be melted to the ground, preventing the cap from being able to be removed for monitoring. Additionally, a bridge which permits access to bore LD001 in the Ben Bullen State Forest was found to be completely removed, most likely due to structural damage caused by the 2019 bushfire event. As a result, the environmental monitoring contractor was unable to access LD001 for monitoring. Consequently, no data was obtained for bores LD001 or CP131 during the 2021 report period. Forestry Corporation of NSW notified Shoalhaven Coal of the bridge replacement in January 2022 allowing LD001 to be sampled early February 2022. Damage to the CP131 bore is being investigated by site personnel toward reestablishment where practical.

6.4.2.4 Trends in Data

The groundwater monitoring program at CVM consists of:

- Impact bores – bores with the potential to identify potential groundwater impact from CVM, specifically CP115, CP116 and GW01; and
- Reference bores – bores that are considered to be representative of background groundwater quality (i.e. are unlikely to be impacted by CVM operations), specifically CP114, CP131, CP 132 and LD001. These bores provide a baseline for comparison with the impact bores.

Standing Water Level

The standing water level in the impact bores during the report period are within the trigger level range, as shown in **Table 6.10**.

Table 6.10 Impact Bores Standing Water Levels and Triggers

Bore	Groundwater Level (mAHD) Trigger Range	May 2021 Groundwater Level (mAHD)	November 2021 Groundwater Level (mAHD)	Complied with Trigger Level?
CP116	890 - 894	893.56	893.63	Yes
CP115	892 - 896	894.27	894.96	Yes
GW01	N/A as bore is located in workings	N/A	N/A	N/A

The long-term standing water level trend in both impact bores (CP116 and CP115) has shown little variation since monitoring commenced in February 2012. Since February 2012, the standing water level has gradually increased until November 2016 after which time it has gradually declined and is increasing slightly since May 2019, as shown graphically in **Appendix 2**. The reference bores of LD001, CP132 and CP131 show slightly greater variability in the long-term standing water level trends, as shown graphically in **Appendix 2**.

pH

The pH results for impact bores CP116, CP115 during the report period were within the trigger level range, as shown in **Table 6.11**. The pH level at GW01 was above the trigger range and historical maximum, based

on a sample size of one. However, the pH results at GW01 are within the ANZECC guidelines' default trigger values (6.5 – 8.0 for freshwater reservoir and lowland river ecosystems, 6.5-7.5 for upland river ecosystems) and as such, the potential for environmental harm associated with these results is expected to be low. Shoalhaven Coal will continue to monitor pH results and no specific investigation is recommended at this time.

In November 2019, pH levels generally decreased at CP116, CP115 and GW01 and have remained at these levels, as demonstrated in **Appendix 2**. pH levels of all reference bores also decreased during this period and are showing similar trends. As such, these results are considered to be reflective of a wider regional trend and not the result of CVM activities.

The pH trend across both impact and reference bores is generally consistent over time, with isolated spikes and declines observed for individual sampling dates as shown graphically in **Appendix 2**.

Table 6.11 Impact Bores pH Levels and Triggers

Bore	pH Trigger Range	May 2021 pH Level	November 2021 pH Level	Complied with Trigger Level?
CP116	5.82 – 7.2	No sample required*	6.58	Yes
CP115	6.26 – 7.3	6.65	6.49	Yes
GW01	6.14 – 6.82	No sample required*	7.33	No

* CP116 and GW01 Sampled annually.

Electrical Conductivity

The electrical conductivity (EC) results for the impact bores during the report period are below the trigger level, as shown in **Table 6.12**.

Table 6.12 Impact Bores Electrical Conductivity Levels and Triggers

Bore	Electrical Conductivity (µS/cm) Trigger Level	May 2021 EC Level (µS/cm)	November 2021 EC Level (µS/cm)	Complied with Trigger Level?
CP116	Upper limit 840	No sample required*	4234	Yes
CP115	Upper limit 970	798	773	Yes
GW01	Upper limit 939	No sample required*	786	Yes

*CP116 and GW01 Sampled annually.

The long-term trend in EC values across the reference bores is mixed, as shown graphically in **Appendix 2**:

- LD001 was inaccessible for monitoring during May 2021. As noted above, a sample was collected for the November 2021 round of monitoring. Based on available data for 2021 and from previous year's, LD001 has shown slight variability with a minimum of 120 µS/cm recorded in 2013 and a maximum of 183 µS/cm recorded during the current reporting period.
- CP114 and CP132 have shown some slight variability with results during the reporting similar to historical results.
- CP131 was accessible; however the bore was destroyed by bushfire activity and was unable to be sampled. It is noted that dry conditions have been observed at this location since 2015.

The long term trend in EC values in the impact bores shows greater variability than reference bores, as shown graphically in **Appendix 2**:

- CP116 monitoring results have continued to increase since April 2014. EC levels increased slightly to 434 $\mu\text{S}/\text{cm}$ in November 2021. This result remains well below the historical maximum of 840 $\mu\text{S}/\text{cm}$.
- CP115 monitoring results exhibit greater variability. The results since April 2014 have ranged from 398 $\mu\text{S}/\text{cm}$ (April 2018) to 901 $\mu\text{S}/\text{cm}$ (May 2020). EC levels decreased to 798 $\mu\text{S}/\text{cm}$ and 773 $\mu\text{S}/\text{cm}$ in May 2021 and November 2021 respectively.
- GW01 EC levels in November 2021 (786 $\mu\text{S}/\text{cm}$) decreased slightly from the previous reporting period and results remain below groundwater trigger levels.

Sulphate

The sulphate levels in the impact bores during the report period are below the trigger level, with the exception of the May 2021 result for CP115, as shown in **Table 6.13**.

Table 6.13 Impact Bores Sulphate Levels and Triggers

Bore	Sulphate (mg/L) Trigger Level	May 2021 Sulphate Level (mg/L)	November 2021 Sulphate Level (mg/L)	Complied with Trigger Level?
CP116	Upper limit 140	No sample required*	96	Yes
CP115	Upper limit 380	384	376	No
GW01	Upper limit 338	No sample required*	267	Yes

*CP131 and GW01 Sampled annually

The long-term sulphate values for the reference bores ranges from 10-25 mg/L at LD001 and 12-28 mg/L at CP114. CP132 shows greater variability with results ranging between 5 mg/L - 145 mg/L. There is a variability of up to 70 mg/L between consecutive samples, as shown graphically in **Appendix 2**. The 2021 result at CP132 of 51 mg/L remains within the historical range.

As discussed within the groundwater study completed for CVM in 2017 (Umwelt, 2017e), the recorded sulphate levels are all well within the ANZECC criteria for drinking water for domestic stock which provide:

No adverse effects to stock are expected if the concentration of sulphate in drinking water does not exceed 1000 mg/L. Adverse effects may occur at sulphate concentrations between 1000 and 2000 mg/L, especially in young or lactating animals or in dry, hot weather when water intake is high. These effects may be temporary and may cease once stock become accustomed to the water. Levels of sulphate greater than 2000 mg/L may cause chronic or acute health problems in stock.

As the sulphate results from CP115 are relatively stable and within ANZECC guidelines, there is no indication of any environmental harm associated with these results. The long-term sulphate values for impact bore CP115 range from 78 mg/L to 396 mg/L. The CP115 May 2021 sulphate result (376 mg/L) was within this historical range. In accordance with the CVM WMP (Umwelt, 2017b) Shoalhaven Coal will continue to monitor sulphate levels however no specific investigation of sulphate levels is required to be undertaken.

The long-term sulphate values for impact bores range from 20 mg/L to 140 mg/L at CP116 and 276 to 315 mg/L at GW01. The GW01 2021 sulphate result (267 mg/L) decreased from the historical maximum recorded in November 2019 and appears to indicate a generally stable around $300 \pm 20\text{mg/L}$, as demonstrated in **Appendix 2**.

Hardness

The hardness levels in the impact bores during the report period are below the trigger level, with the exception being the May and November 2021 results for CP115 and the November 2020 result for GW01, as shown in **Table 6.14**. An analysis of water licenses in the region completed during May 2017 identified that

there were no bore users in the area down-dip of CVM and therefore there are no groundwater bores which would be impacted by increased hardness levels if it were to occur.

Table 6.14 Impact Bores Hardness Levels and Triggers

Bore	Hardness (mg/L) Trigger Level	May 2021 Hardness Level (mg/L)	November 2021 Hardness Level (mg/L)	Complied with Trigger Level?
CP116	Upper limit 210	No sample required*	184	Yes
CP115	Upper limit 376	390	404	No
GW01	Total Alkalinity Upper limit 100 mg of CaCO ₃	No sample required*	116	No

*CP131 and GW01 Sampled annually

** GW01 has not been monitored for Hardness as part of groundwater quality baseline monitoring. Total Alkalinity has been used as a proxy for Hardness and will be utilised as a trigger for this bore until sufficient baseline data for hardness has been obtained for this bore to develop a trigger value.

The long-term trend in hardness values for the reference bores is mixed, as shown graphically in **Appendix 2**:

- LD001 was accessed for one monitoring event during 2021. Results obtained during the reporting period are similar to historical data.
- CP114 shows small variability around 100 mg/L before a result of 350 mg/L in December 2017. Since this time, monitoring results have returned to levels that are typical of the pre-December 2017 spike with a result of 113 mg/L observed for November 2021.
- CP131 was accessible; however the bore was destroyed by bushfire activity and was unable to be sampled. It is noted that dry conditions have been observed at this location since 2015.
- CP132 initially was consistent around a level of 150 mg/L (April 14 to Nov 15), before spiking at 200 mg/L on November 2016 and declining to 46 mg/L in December 2017. Results increased to 210 mg/L in November 2018 with results in November 2019 (213 mg/L) representing a new historical maximum, slightly above the previous maximum of 210 mg/L. The November 2020 monitoring results returned to levels that are more typical of pre-2016 levels, declining to 187 mg/L and remaining at a similar level in November 2021 (180 mg/L).

The impact bores also show different long-term trends in hardness as shown in **Appendix 2**:

- CP116 has declined from an initial level of 210 mg/L before stabilising in April 2014 to a range of 98 mg/L to 128 mg/L (2017). Concentrations increased during November 2018 (134mg/L) and 2019 monitoring (176 mg/L) with a decrease observed in November 2020 (146 mg/L). A slight increase was observed in 2021 with results consistent with historical data.
- CP115 shows an overall increasing trend, from 130 mg/L in August 2011, increasing to 350 mg/L in July 2014 after which the results have remained around 375 mg/L $\pm$ 25 mg/L. During 2018, CP115 decreased in hardness to 338 mg/L in November, before spiking again to 399mg/L in November 2019 which is slightly above the historical maximum. In November 2020, monitoring results returned to pre-2019 levels (368 mg/L). 2020 results were consistent with historical data (390mg/L in May and 404mg/L in November) Monitoring will continue to be undertaken at this bore to monitor hardness.

- GW01 results for hardness were consistent with historical data. Monitoring will continue to be undertaken at this bore to monitor hardness.

Given the restricted baseline dataset, the values for EC and hardness at GW01 were possibly within the range of likely expected values for the bore and are not necessarily indicative of groundwater impact. An analysis of water licences in the region during May 2017 identified that there were no registered bore users in the area down-dip of CVM and thus there are no users which would be impacted by this result.

The 2020 hardness result at GW01 was 116 mg/L, which is 16 mg/L above the trigger level. Given the exceedance of the trigger level minor, CVM is not proposing to initiate a 6 monthly sampling program as per the requirements of the CVM WMP (Umwelt, 2017). CVM will continue to undertake the standard frequency of sampling and review the results of GW01 and take action if needed.

Other Analytes (not required for trigger level assessment as described in the WMP)

Nitrate

Results for 2021 monitoring together with the long-term trends show that both impact and reference bores have very low levels of nitrate. The levels of nitrate are typically less than the laboratory detection limit (shown graphically at **Appendix 2**).

Metals

Results of monitoring undertaken during 2021 for dissolved metals within the impact bores are highly variable. Metals are usually analysed for trends as a group (or groups of metals) rather than on an individual metal basis. This is usually completed where sufficient baseline information is available to analyse potential trends. Given the restricted available dataset, the ability to meaningfully analyse metal results obtained during 2021 and trends in data is therefore limited.

6.4.2.5 Proposed Improvements

Shoalhaven will continue groundwater monitoring during 2022.

6.5 Noise

6.5.1 Environmental Management Measures

CVM's Environmental Management Plan (Coalpac, 2012c) includes a Noise Management Plan (NMP), which details mitigation measures and monitoring procedures for noise management. There were no mining operations during the report period; however, quarterly attended monitoring was conducted at five locations around CVM in accordance with the CVM Environmental Management Plan (Coalpac, 2012c). Noise controls and mitigation measures are implemented to ensure compliance with noise impact assessment criteria.

6.5.2 Performance Criteria

Noise criteria is specified in the Development Approval and EPL 10341. **Table 6.15** and **Table 6.16** summarises the criteria across the Development Approval and EPL 10341.

Table 6.15 Noise Criteria in DA 200-5-2003

Location	Day – L _{Aeq} (15 minute) (dB)	Evening – L _{Aeq} (15 minute) (dB)	Night – L _{Aeq} (15 minute) (dB)	Night - L _{A1} (1 minute) (dB)
Red Springs (east of rail line)	37	35	35	45
Red Springs (west of rail line)	43	38	35	45
Hillcroft (east of rail line)	35	35	35	45
Hillcroft (west of rail line)	43	38	35	45
Forest Lodge	40	40	38	45
Doble Gate	43	38	35	45
Tilley	43	38	35	45

Table 6.16 Noise Criteria in EPL 10341

Location	Day – L _{Aeq} (15 minute) (dB)	Evening – L _{Aeq} (15 minute) (dB)	Night – L _{Aeq} (15 minute) (dB)	Night - L _{A1} (1 minute) (dB)
Red Springs (east of rail line)	35	35	35	45
Red Springs (west of rail line)	43	38	35	45
Hillcroft (east of rail line)	35	35	35	45
Hillcroft (west of rail line)	43	38	35	45
Forest Lodge	40	40	40	45
Doble Gate	43	38	35	45
Tilley	43	38	35	45

6.5.3 Environmental Outcomes

There were no exceedances of the Development Approval or EPL criteria during the report period as shown in **Table 6.17**. On all monitoring occasions, the noise from CVM was inaudible. There were no complaints received regarding noise during the reporting period.

Table 6.17 2021 Quarterly Noise Monitoring Results

Location	Consent Criterion (dB)	EPL Criterion (dB)	Quarter 1 (L _{Aeq} 15min) (dB)	Quarter 2 (L _{Aeq} 15min) (dB)	Quarter 3 (L _{Aeq} 15min) (dB)	Quarter 4 (L _{Aeq} 15min) (dB)
Red Springs (N07)	37	35	IA	IA	IA	IA
Hillcroft (N08)	35	35	IA	IA	IA	IA
Forest Lodge (N10)	40	40	IA	IA	IA	IA
Doble Gate (N09)	43	43	IA	IA	IA	IA
Tilley (N06)	43	43	IA	IA	IA	IA

IA – noise from CVM was inaudible

6.5.4 Trends in Data

The quarterly noise monitoring results for the period 2011 – 2021 are summarised in **Appendix 2**. The results show CVM has largely been inaudible at each noise monitoring location since CVM entered care and maintenance.

6.5.5 Proposed Improvements

There were no noise complaints or non-compliances with noise criteria during the reporting period. Current management measures will continue to be undertaken for care and maintenance activities. Noise monitoring will continue to be undertaken quarterly.

6.6 Biodiversity

6.6.1 Environmental Management Measures

The 2021 Biodiversity Monitoring was undertaken in accordance with the approved CVM Environmental Monitoring Program (Coalpac, 2009), and the CVM Flora and Fauna Management Plan (Coalpac, 2012a). Biodiversity monitoring commenced at CVM in 2012 (Kleinfelder, 2011-2015) and has been undertaken by Umwelt since 2016.

Existing vegetation communities and fauna habitat have been previously characterised during the Ecological Impact Assessment (Cumberland Ecology, 2014). Ongoing monitoring aims to document the condition of vegetation and habitats throughout the CVM Compensatory Habitat Areas and Rehabilitation Zones.

The CVM Compensatory Habitat Areas contains eight monitoring plots located across following three vegetation types:

- Tablelands Dry Woodland – CH1, CH2, CH3, CH5, CH6 and CH8
- Sandstone Dry Ridgetop Woodland – CH7
- Tablelands Sheltered Valley Forest – CH4

The Cullen Valley Rehabilitation Zones contains 15 monitoring plots located across nine rehabilitation areas defined by year:

- 2002 – plot FP5
- 2003 – plots R7, R8, FP9, FP22 and FP10
- 2004 – plot FP10 and FP11
- 2005 – plot FP6
- 2006 – plot 2006NE
- 2009 – plot R5
- 2010 – plot R4
- 2012 – plots R1 and R3
- 2014 – plot 2014NE

6.6.2 Monitoring Methodology

The 2021 biodiversity monitoring was undertaken at the CVM Compensatory Habitat Areas and Rehabilitation Zone monitoring sites as shown on **Figure 5, Appendix 1**. The biodiversity monitoring program for CVM was based on the monitoring requirements documented in the following plans:

- Cullen Valley Mine Flora and Fauna Management Plan (Coalpac, 2012a); and
- Cullen Valley Mine Environmental Monitoring Program (Hansen Bailey, 2009).

In addition to the monitoring requirements stated in the above documents, monitoring undertaken of the Compensatory Habitat Areas and Rehabilitation Zones in 2021 included the following:

- floristic monitoring within fixed plots (20 m x 10 m) every 10 ha;
- fauna surveys to identify the fauna species and habitats quality;
- Clandulla geebung and Capertee stringybark monitoring (biodiversity conservation area);
- vegetation dieback surveys in areas of subsurface heating (further discussed in **Section 6.9**) and
- an assessment against the performance/completion criteria with the CVM C&M MOP (Sedgman, 2015).

A general assessment of compliance of the rehabilitated areas against the biodiversity and rehabilitation performance and completion criteria for CVM is summarised in **Table 8.2**.

6.6.3 Environmental Outcomes/Trends in Data

6.6.3.1 Environmental Conditions

During the 2021 surveys, the Cullen Bullen region was listed as being in “Non-Drought” according to the Combined Drought Indicator (CDI) (DPI 2021) (Plate 6.1). The CDI uses a combination of factors in making this determination including the rainfall index, soil water index, pasture growth index and drought direction index. This comes off the back of conditions in 2017, 2018 and 2019 (DPI 2021) where:

- The region was listed as “Drought Affected (intensifying) in August 2017.

- The region was listed as in “Drought” and in “Intense Drought” from November 2017 to December 2018 before recovering until late 2019.
- The region was listed as in “Drought” and in “Intense Drought” from December 2019 to January 2020.
- The region was listed as “Non-Drought” since August 2020.

These trends are shown in **Plate 6.1** (DPI 2021) for the Cullen Bullen Parish (Roxburgh County). This plate provides the rainfall index, plant growth index and soil water index for this parish, which combines to provide the CDI. This is then categorised into either Intense Drought, Drought, Drought Affected, Drought Recovery or Non-Drought. Of particular relevance in this plate is the rainfall index and plant growth index, which are key measures of community condition and can substantially influence the local vegetation and local water sources leading to varying resource availability for fauna species.

The total annual rainfall recorded at Portland (approximately 7 km south east) in 2020 was 946.4 mm which is above average annual rainfall recorded over the last 117 years (710.7 mm) (BOM 2022).

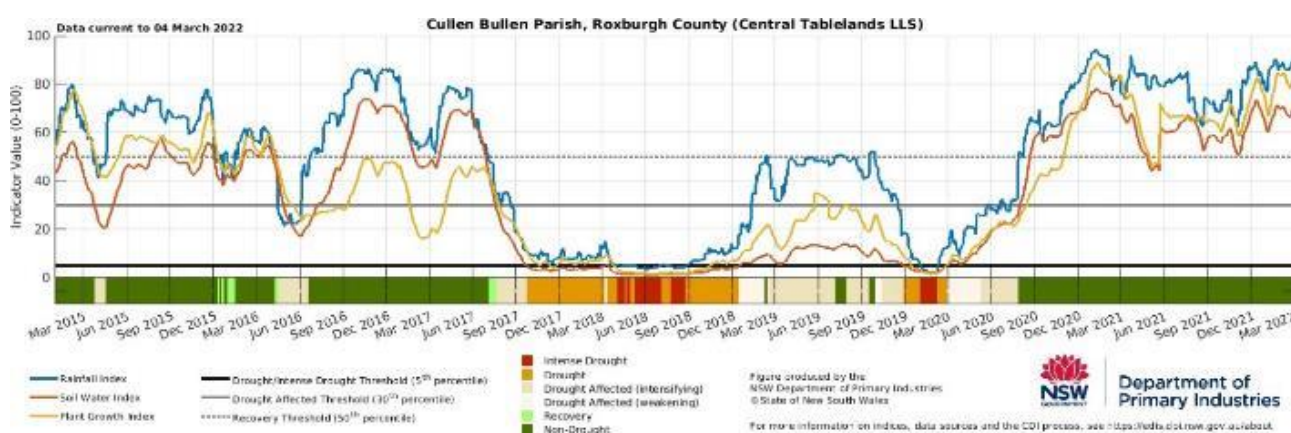


Plate 6.1 Seasonal environmental conditions recorded at Cullen Bullen

© DPI, 2021

6.6.3.2 CVM Compensatory Habitat Areas

Native vegetation within the CH Areas was considered to be in good condition across all woodland and forest habitats with continued recovery from previous drought conditions. Overall floristic composition and vegetation condition for most Compensatory Habitat Area monitoring locations was considered to be similar or have experience a slight decrease in the diversity recorded compared to monitoring in 2020.

Woodland and forest habitats demonstrated continued increases in the cover and diversity of ground layer vegetation. The canopy and midstory layers demonstrated good foliage recovery of persisting individuals, while recruitment of eucalypts and acacias were consistently observed through the CH Area following severe dieback and thinning during the drought. In 2021 bare earth was rarely observed across all Compensatory Habitat Area monitoring locations. In comparison to 2020, ground layer vegetation was present an increase in native species diversity was observed while low lying grassland habitats had experienced a composition shift tending more to semi-aquatic species. The vegetation of the Compensatory Habitat Areas demonstrates minimal degradation due to human influences with the exception of vehicle tracks, minor logging and rubbish dumping by others. Given the above information, no flora management activities are recommended at this time.

The Compensatory Habitat Areas provides habitat for a range of fauna groups including amphibians, birds, reptiles, as well as arboreal and ground dwelling mammals and marsupials. Healthy remnant vegetation continues to provide a number of stable habitats for fauna including foraging resources, woody debris, hollow

bearing trees, fallen timber, escarpment, and large rocky outcrops. Other habitats previously impacted by the drought such as the depletion of permanent water sources have since returned with increased precipitation. These water sources are important for a range of fauna as they provide water for drinking, as well as a range of micro habitats for amphibians and foraging habitat for insectivores such as microbats and birds.

Monitoring of the threatened *Clandulla geebung* (*Persoonia marginata*) recorded approximately 20% or individuals bearing fruit, while no individuals were recorded with flowers likely due to the delayed survey in for 2021 monitoring. These observations indicate that this population is healthy and are continuing to reproduce. A number of individuals were observed extending south beyond the 20 metre limit of the monitoring methodology. Overall, there was no discernible change in this population which suggests that the population is stable and currently not affected by the previous mining activities.

Monitoring in 2021 recorded a decrease in overall fauna species diversity throughout the CH Areas, a large proportion of the decline was attributed to the reduced number of birds. The overall species diversity recorded in 2021 monitoring is still considered to be comparable to previous monitoring events. The continued habitat recovery following the drought breaking as well as availability of diverse habitats structures in proximity to Ben Bullen State Forest and rural areas, as well as a lack of flowering shrub and canopy species has likely contributed to the fluctuations recorded in fauna species diversity (particularly bird species). A decline as such demonstrates how highly mobile fauna will disperse from refuge habitats following the return of favourable environmental conditions. The CH Area continues to support threatened species in 2021, with two threatened species, being greater glider (*Petauroides volans*) listed as vulnerable under the EPBC Act and gang-gang cockatoo (*Callocephalon fimbriatum*) listed as vulnerable under the BC Act and endangered under the EPBC Act. The gang-gang cockatoo has experienced a rapid decline in available habitats throughout its range as a result of the 2019/2020 bushfires. In response to this the Department of Agriculture, Water and the Environment (DAWE) has increased the conservation status of the gang-gang cockatoo from vulnerable to endangered under the EPBC Act. Records of this species following intense bush fire impacts throughout the local area demonstrate the importance of ongoing biodiversity monitoring programs to the survival of a threatened species and identifying refuge habitats during the recovery of burnt vegetation.

6.6.3.3 Rehabilitation Zones

The Cullen Valley Rehabilitation Zones are identified by the year each zone was established being, 2002, 2003, 2004, 2005, 2006, 2009, 2010, 2012 and 2014.

Rehabilitation vegetation at Cullen was found to be recovering and increase vegetative cover across all strata and establishment ages following from the breaking drought conditions in 2020. While the diversity of native ground cover species continued to increase, many species were still recorded in low abundance. This is likely due to many areas have developed hard earth crust lacking topsoil or litter and canopy cover has suppressed understory species from establishing. The presence of die back was limited to adult acacias in the middle and upper strata as a result of natural senescence. Persisting midstory and canopy species were found to be healthy, demonstrating increase foliage cover and stratum development where eucalypts in younger areas are forming an emergent canopy layer. Recruitment of second generation acacias and eucalypts was commonly observed across the majority of monitoring sites in 2021. It is expected that the species within these strata will continue to recover over time.

While the 2021 monitoring observed minor increased or similar cover and abundance of native species compared to 2020, it should be noted that the cover and abundance of these species is expected to decrease slightly in subsequent monitoring events as is typical of native flora species following a period of increased growth after a drought. This trend is expected for vegetation throughout both the CVM Rehabilitation Zones and Compensatory Habitat Areas.

In 2021 evidence of improved ecosystem functionality and developing habitat features was found in most monitoring sites of the CVM Rehabilitation Zones. This has assisted with maintaining the midstory and canopy species as they establish and assisted to develop landscape function. Fallen timber and litter was found to increase across most older monitoring sites (attributed to acacia senescence and growing eucalypts), while the litter layer was building depth at a number of sites and starting to develop to topsoil organics. Observations as such provide an indication of how rehabilitation areas continue to progress towards a self-sustaining ecosystem.

A variety of insects were observed across the rehabilitation areas including detritivores (such as termites, wood roaches and weevils), pollinators (European honeybees and butterflies) and spiders were observed during 2021 monitoring. Ants were commonly observed opportunistically throughout most rehabilitation zones and are important for topsoil development, as well as facilitating the transfer of water, oxygen and nutrients within the soil profile. The presence of trees and shrubs bearing seed, and successional acacia saplings in proximity to those individuals recently senesced, indicates how these areas are progressing toward a self-sustaining condition.

Monitoring in 2021 recorded a decrease in overall fauna species diversity throughout the Cullen Rehabilitation Areas, a large proportion of the decline was attributed to the reduced number of birds. Fauna species diversity of rehabilitation areas was considered to be influenced by age and structure of rehabilitation areas, as well as the recovery of surrounding remnant habitats including the Ben Bullen State Forest as a result of recent bushfires and drought. A decline as such demonstrates how highly mobile fauna will disperse from refuge habitats following the return of favourable environmental conditions. A lack of flowering shrub species was observed during the 2021 monitoring which is likely due to the delayed survey timing and was considered to have contributed to the fluctuations recorded in fauna species diversity (particularly nectivorous woodland birds). Fluctuations in presence highly mobile fauna such as birds, microbats and arboreal mammals that move between habitat patches depending on their condition or in the case of fauna that alter behaviour depending on weather or seasonal conditions.

It is likely that the Cullen Rehabilitation Zones were acting as refuge habitat during the drought and bushfire which had a substantial impact on surrounding remnant woodland habitat. In a landscape context previous monitoring events identified that flowering acacia within these rehabilitation areas provide important food resources for nectarivorous fauna (birds and arboreal mammals in particular) while adjacent remnant vegetation recovers from the effects of fire. In the absence of nectar many arboreal mammals such as gliders and possums will feed on the sap of trees and shrubs. This was particularly evident where sugar gliders (*Petaurus breviceps*) continue to be commonly recorded throughout older Rehabilitation Areas. Compensatory habitat features such as nest boxes provide an artificial substitute for species including a variety of gliders, birds and microbats, which have consistently used the boxes.

6.6.3.4 Clandulla geebung Monitoring

A total of 93 Clandulla geebung specimens were recorded during the 2021 monitoring, previous monitoring in 2017 recorded the highest number of Clandulla geebung plants at 100 specimens, compared to the lowest recording of plants at 65 in 2015. While no flowering specimens were recorded at the time of surveys, 21.5% of plants were observed fruiting, indicating healthy reproductive material.

6.6.4 Proposed Improvements

Monitoring of rehabilitation and compensatory habitat areas will continue in 2022.

6.7 Weeds and Feral Animals

6.7.1 Weeds

6.7.1.1 Rehabilitation Zones

In 2021, the Cullen Rehabilitation Area demonstrated a minor continued presence of weeds during monitoring. Weeds were limited to cosmopolitan species such as catsear (*Hypochaeris radicata*), fireweed (*Senecio madagascarensis*), St John's wort (*Hypericum perforatum*), blackberry (*Rubus fruticosus* spp. aggregate) or Paterson's curse (*Echium plantagineum*) which were found in relatively low abundances throughout most rehabilitation vegetation. Given the current low density of blackberry (*Rubus fruticosus* spp. aggregate) within the rehabilitation areas, it is recommended that hand removal and spraying be conducted as this will prevent further infestations and be more cost effective in the long term. No management intervention is required at this time for other weed species given their current cover and abundance throughout the Rehabilitation Areas.

While studies have shown that bare ground favours the establishment of some weed species via colonisation from surrounding areas, this does not appear to be the case considering CVM Rehabilitation Zones have been established for up to 19 years (2002). Small fluctuations are common when monitoring the presence and management of weeds and generally vary in response to a range of natural variables such as rainfall and drought. The likelihood of exotic species further colonising throughout CVM Rehabilitation Zones is low, given the soil structure, absence of topsoil, and the density of tree and shrub species established in the rehabilitation zone.

6.7.1.2 Compensatory Habitat Areas

Monitoring in 2021 demonstrated an increase in the presence of weeds across all areas of the CVM Compensatory Habitat Areas, however these also corresponded with increased abundance and cover of native species, which this is likely a product of the suitable environmental conditions following recent drought conditions. The majority of weeds recorded in these areas were typically cosmopolitan weed species that are not expected to have an adverse effect on the integrity and function of the natural ecosystem given their current abundance and cover. However, weed species that were recorded consistently throughout the Compensatory Habitat Areas included catsear (*Hypochaeris radicata*), St John's wort (*Hypericum perforatum*), cotoneaster (*Cotoneaster glaucophyllus*), hawthorn (*Crataegus monogyna*), Paterson's curse (*Echium plantagineum*) and blackberry (*Rubus fruticosus* aggregate). Cotoneaster (*Cotoneaster glaucophyllus*), hawthorn (*Crataegus monogyna*) and low abundance of blackberry (*Rubus fruticosus* sp. aggregate) were recorded again in 2021, however these weed species do not appear to be contributing to any environmental degradation as they are; management of these species is not currently required but continued monitoring is recommended.

6.7.2 Feral Animals

6.7.2.1 Compensatory Habitat Area

Two introduced species were recorded within the CH Area during 2021 being the red fox (*Vulpes vulpes*) and rabbit (*Oryctolagus cuniculus*). No management activities are recommended at the present time given the low impact potential that these species may have on the quality of vegetation throughout the CVM Compensatory Habitat Areas.

6.7.2.2 Rehabilitation Area

Three introduced species were recorded within the CVM Rehabilitation Zones during 2021 being the red fox (*Vulpes vulpes*) brown hare (*Lepus capensis*) and rabbit (*Oryctolagus cuniculus*). No management activities

are recommended at the present time given the low impact potential that these species may have on the quality of vegetation throughout the CVM Compensatory Habitat Areas.

6.8 Subsurface Heating

In 2011, the former Department of Resources and Energy (DRE) issued the previous mine owner/operator (Coalpac) with a Section 240 direction requiring a concentrated effort to manage and extinguish subsurface heating in a noise bund and in other areas within ML 1488. The direction also required rehabilitation of heating affected areas. Subsequently, a plan of work was developed and included within the Plan of Works MOP Variation (dated 30 January 2013) and the 2011 to 2015 CVM Care and Maintenance (C&M) MOP.

Following the receipt of Section 240 notices during the report period, CVM engaged an independent consultant with extensive subsurface heating experience to review the current management measures being utilised to manage subsurface heating at CVM. This review informed the MOP (Umwelt, 2020) and Plan of Works (POW).

The POW included in the MOP (Umwelt, 2020) made the following recommendations, being:

- Continue to implement the current subsurface heating management and monitoring measures (i.e. monitoring via heat gun, visual, smell and recording community complaints) and a minimal earthworks/topsoil disturbance treatment approach (i.e. backfill and compact any areas where surface cracking and evidence of subsurface heating is observed).
- Limiting the extent of earthworks and surface disturbance as far as practicable. This minimises any potential loss of topsoil, maximises the available seed bank in the topsoil and assists with the natural recovery of vegetation in the area.
- Undertake an investigation to inform the containment and extinguishing options for subsurface heating (further details of the scope of the investigation are detailed below) and

Due to matters beyond the control of the new Shoalhaven Coal ownership, the investigation works recommended by Umwelt were unable to be satisfactorily completed, however preliminary information provided, combined with further advice from an external expert engaged in December 2021 have led to the development of a proposal to implement a trial irrigation of heating areas to support and supplement the existing treatments as recommended in the POW (Umwelt, 2020).

Subsurface heating at CVM has been observed in five main areas being area R1, F1, F2, F3 and F4 (refer to **Appendix 1, Figure 6**). The active extent of the subsurface heating has been mapped for applicable years.

Mapping of the extent of subsurface heating has occurred since 2016. Previously only hot spots were mapped. In regard to the physical extent of heating areas as shown on **Figure 6, Appendix 1** it is important to note the following:

- 2015 – showed only hot spots at Area R1
- 2016 – showed the area impacted by sub-surface heating, noting that the area was not necessarily showing active signs of heating at that point in time (i.e. the presence of active subsurface heating smell, smoke and /or surface cracking)
- 2017 (revised mapping methodology commenced) – areas shown are those which showed signs of active heating (i.e. temperature, sulphurous smell, smoke, discoloration of the ground, vegetation die back or stress and /or surface cracking). These areas were observed in F1, F2, F3, R1 and a new area F4)

- 2018 – Areas shown are those showing signs of active heating. During the 2018 report period, area F4 was also cleared of vegetation, excavated and compacted as a treatment measure.
- 2019 – Areas shown are those showing signs of active heating. During the report period, area F3 was cleared of vegetation, excavated and compacted as a treatment measure.
- 2020 - Areas shown are those showing signs of active heating. During the report period, area F3 was cleared of vegetation, excavated and compacted as a treatment measure.
- 2021 - Areas shown are those showing signs of active heating.

Table 6.18 shows the area subject to active heating at the time of monitoring.

Table 6.18 Summary of Subsurface Heating Impact Extent (2016 – 2021 monitoring surveys)

Subsurface Heating Area	Area of active subsurface heating during monitoring						2021 Comment
	2016	2017	2018	2019	2020	2021	
F1	-	0.26	0.03	0.78*	1.35*	-	No new areas of active subsurface heating
F2	-	0.28	0	0.76	0.96	0.54	Active subsurface heating extending north along contour
F3	-	0.07	0.19	0.13	0.03	-	No new areas of active subsurface heating
F4	-	0.1	0	0.78*	1.35*	-	No new areas of active subsurface heating
R1	-	0.05	0.46	0.46	0.34	-	No new areas of active subsurface heating
F1	-	0.26	0.03	0.78*	1.35*	-	No new areas of active subsurface heating

*Subsurface heating areas F1 and F4 combined in 2020 – only area of new activity calculated for 2021 monitoring

Active subsurface heating was recorded across all existing management areas. The 2021 extent of active subsurface heating in each area is detailed in **Table 6.19**. Subsequent monitoring surveys will provide further information regarding how rehabilitation responds to subsurface heating impacts.

Table 6.19 Details of Vegetation Response to Subsurface Heating during 2021

Subsurface Heating Area Name	Extent of Active Heating	Vegetation Response
F1	Largely remains in the previously mapped footprint and continues to be joined with Area F4. No discernible boundary to map in 2021.	Small portion (approximately 25m ²) of active heating located between F1 and F4 indicated by continued dieback of eucalypts and acacias and strong smell of gas in the south of the F1 area.
F2	Includes and extends outside of the 2019 mapped footprint. Areas of vegetation die off, warm ground and gas venting mapped in 2021.	Heat impacted Acacia and Eucalypt and groundcover vegetation to the north-east of the F2 Area – upslope and down slope of the access track (refer to Photo). Groundcover and shrubs continue to regenerate on the edge of the heating extent in the south of the F2 Area

Subsurface Heating Area Name	Extent of Active Heating	Vegetation Response
F3	Includes the previously mapped footprint. Areas of warm ground and gas venting. No discernible boundary to map in 2021.	Significant grass growth around previously remediated area. Some dead and dying acacias adjacent to remediated area likely due to subsurface heating and 2019 drought (identified during 2020 monitoring). Acacia and Eucalypt dieback within 2020 active heating adjacent to remediated area of F3 with immature acacias and ground layer dead or dying off. Some healthy vegetation on fringing area.
F4	Includes the previously mapped footprint. No discernible boundary to map in 2021.	Acacias and groundcover vegetation at the edges of existing subsurface heating in the south-east and north-west are recovering. Acacia and Eucalypt dieback in the north-east within 2020 extent of subsurface heating.
R1	Largely remains in the previously mapped footprint. No discernible boundary to map in 2021.	Acacia recovery continued in the south-west edge of remediation. The north-west to north-east of the mapped area demonstrated continued recovery of eucalypts and acacias and groundcover vegetation growth (grasses and forbs). No new areas of vegetation death in the south-east of the 2020 mapped area, however minor cracking and strong smell of gas throughout area (observed up to approx. 150m at monitoring site R5).

CVM continues to observe variation in the level of vegetation regeneration and erosion issues where different subsurface treatment techniques have been implemented. Where aggressive subsurface management measures are applied erosion issues are more prevalent and natural regeneration of vegetation is slower when compared to areas where targeted remediation works have been undertaken. This difference is believed to be due to the presence of woody debris and seed back in the soil in areas where targeted remediation works have been undertaken. Recording of this information helps inform what treatment techniques will be implemented in the future. The ongoing management of these areas will be undertaken with the management measures as detailed in the CVM MOP and Rehabilitation Management Plan to be implemented from July 2 2022.

6.8.1 Environmental Management Measures

The management measures to monitor and treat sub surface heating are detailed in the CVM Care and Maintenance MOP and include:

- weekly monitoring of heating areas (temperature/heat gun, sulphurous smell, smoke, discoloration of the ground, vegetation dieback or stress and/or surface cracking)
- capping of surface cracking using cement
- excavation and compaction of material as required.

6.8.2 Environmental Outcomes and Further Improvements

During 2021, minor repair works (i.e. localised earthworks – excavation of cracks and backfilling with inert material and compacting and filling cracks with concrete) continued in subsurface heating areas with the exception of Area F3.

During 2022, CVM will continue to monitor for subsurface heating and undertake treatment measures in accordance with the updated Plan of Works (**Section 6.9**). In addition, CVM will implement a program to trial an irrigation methodology agreed to with the Resources Regulator, to extinguish the worst affected area, whilst also considering compaction methods where appropriate, and further capping of areas of lower concern with overburden rehabilitation materials existing, and liberated from the remnant mining area.

6.9 Blasting

There was no blasting conducted at CVM during the report period.

6.10 Waste Management

As no mining activities were undertaken during the report period and only minimal staff members on site, minimal quantities of waste, typically office waste, was generated. Sewage from the workshop areas are directed to a septic system which is pumped out by a licensed waste collection and disposal contractor on an as-needs basis.

During the report period only minimal oil and greases were stored on site. Any maintenance works required on machinery and equipment is undertaken within existing bunded areas. Waste oils and grease are collected by a licensed waste recycling contractor on an as needs basis.

All paper and general wastes from workshop areas is disposed of in garbage bins located adjacent to the workshop areas, which are collected by a licensed contractor on an as needs basis.

6.11 Hazardous Material Management

Hazardous material storage tanks containing oils, grease and degreasers have been emptied, isolated and secured. Any excess storage tanks have been removed from the site. Storage tanks remaining onsite have been kept empty during the care and maintenance period.

The above ground self-bunded diesel tank (Transtank) is not currently operational during the care and maintenance period. Up to 35,000L of diesel may be stored in the facility if diesel is required for environmental works on site. Two EPA registered radionuclide fixed radiation gauges (No.s RR20215 and RR21832) have been decommissioned and are stored onsite.

6.12 Heritage

6.12.1 Indigenous Heritage

Previous archaeological surveys did not locate any Aboriginal artefacts or sites within the approved open cut mining area. However, two sites of significance were recorded in close proximity to the approved mining area. A campsite-stone artefact scatter (C-OS-1) and a rock shelter site (C-S-1). A further two sites were identified in surveys undertaken during 2011 and include 45-1-2542 and RSC-OS-1. These sites are located outside of the existing mining area.

6.12.2 Non-Indigenous Heritage

No mining activities were undertaken in proximity of locations of European heritage significance during the report period.

6.13 Greenhouse Gas Emissions

As the site was in care and maintenance during the report period, greenhouse gas emissions were minimal. Emissions are limited to a small fleet of vehicles/equipment which are utilised for care and maintenance works and minor earth works associated with erosion and sediment control and sub-surface heating treatment. CVM is below the trigger thresholds for National Greenhouse and Energy Report System (NGERS) report as a single facility for the reporting period. Pending a proposed restart of mining remnant Coal at CVM in 2022, reinstatement of NGER reporting will be taken into account for the next reporting period.

6.14 Bushfire

A CVM Fire Management Plan (Coalpac, 2012e) has been developed and includes a number of measures to minimise bushfire risk. These measures include:

- fitting fire extinguishers to all earthmoving and mining equipment
- fitting and maintaining efficient exhaust systems and spark arresters to mobile equipment
- advising NSW Rural Fire Service, regulatory authorities and neighbours of any burning-off operations
- facilitating that vehicles with low level exhaust systems do not leave defined tracks in locations and conditions likely to lead to ignition of combustible plant material
- maintaining, at the request of Forestry Corporation NSW, existing fire trails or access roads at the extremities of the lease area, which serve as access for firefighting services as well as establishing a fire break to the limits of operations at the open cut.

6.15 Mine Subsidence

Mining operations at CVM ceased in 2012. There have been no subsidence management measures required to be implemented by CVM during the report period.

6.16 Public Safety

Access to working areas of the CVM open cut are controlled by locked gates. Access to CVM by members of the public is via contact at the mine office where visitors or contractors can only be escorted by site personnel around the site.

7.0 Water Usage

7.1 Water Management System

The water management system at CVM is described within the CVM WMP (Umwelt, 2017b) and also within **Section 6.4** of this document.

7.2 Water Take

Licence and water take information is summarised in **Table 7.1**. During the report period, there was 2.5 ML extracted from Tyllies Bore.

Table 7.1 Water Take During 2021 Reporting Period

Water Licence No.	Water sharing plan, source and management zone (as applicable)	Entitlement	Estimated Take Previous Period – 2020 (ML)	Estimated Take Current Period – 2021 (ML)
80WA706148	Sydney Basin MDB Groundwater Source Water Sharing Plan – NSW Murray Darling Basin porous rock groundwater sources	80 units (ML)	2.5ML	0ML

7.3 Erosion and Sediment Control

7.3.1 Environmental Management Measures

The objective of the CVM water management system is to separate clean water and dirty/mine water. Erosion and sediment control focus on the management of 'dirty' water which is runoff from disturbed areas. The erosion and sediment controls (ESC's) established during mining remains in place whilst the operation is under care and maintenance. These ESC's include dirty water sediment dams, open drainage channels with established vegetation and/or rock armouring and drop structures where required.

7.3.2 Environmental Outcomes and Proposed Improvements

Visual inspections of the water management system and erosion and sediment controls are monitored by the mine manager with repairs undertaken on an as needs basis.

As referenced in Section 4.3, Section 240 Notice NTCE0008974 served by the Resources Regulator directed an assessment of rehabilitation materials, quantities, changes in inventories and shortfall projections at completion of mining activities and a report demonstrating how the directions have been met. Section 240 Notice NTCE0008975 directed an assessment of surface water management systems associated with the final landform, including an assessment of the adequacy of the current systems, capacity, construction methods and effectiveness of materials used for rock armouring and a report demonstrating how the directions have been met. Consultant specialists from Umwelt and Golder were engaged in late December 2021 to undertake the works associated with the two Notices. It is anticipated that the outcomes of these works will provide valuable inputs into the development of the CVM Rehabilitation Management Plan to be implemented by 2 July 2022.

8.0 Rehabilitation

8.1 Status of Mining and Rehabilitation

CVM has operated on a care and maintenance basis since coal mining ceased in December 2012. Previously established rehabilitation areas included 132.8 ha of land mined since the commencement of open cut mining operations.

There was no tree planting or tree seeding undertaken during the report period. An assessment of the status of the existing CVM rehabilitation against the performance indicators and completion criteria as detailed within the CVM CM MOP (Sedgman, 2015) is detailed in **Section 8.3**.

CVM has identified areas where further rehabilitation can potentially be undertaken. These areas are associated with:

- land that has been previously rehabilitated but requires supplementary works to improve the quality and quantity of this vegetation in line with the agreed completion criteria objectives
- infrastructure areas (e.g. coal stockpile pad) which is larger than that required for any future mining operational needs
- shaped and topsoiled emplacement dumps which have not been seeded/planted
- land which has been affected by subsurface heating and has been confirmed via further subsurface heating investigations to be completed during the MOP term to be capable of supporting plant growth and unlikely to be subject to further subsurface heating. The viability of and timing of undertaking the rehabilitation work will in part be informed by ongoing treatment as described in the POW and the success of the trial irrigation and activities associated with the restart of mining remnant coal at CVM.

Previous rehabilitation at CVM has seen the successful germination and growth of native and local grass, shrub and tree species which are representative of the vegetation community types found in the area. Recent rehabilitation has proved successful with multiple tree species including *Eucalyptus*, *Acacia* and *Allocasuarina* being heavily represented.

The status of rehabilitation at CVM is detailed in **Table 8.1**.

Table 8.1 CVM Rehabilitation Status

Mine Area Type	Previous reporting period (actual) 2020 (ha)	This reporting period (actual) 2021 (ha)	Next reporting period (forecast) 2022 (ha)
A. Total mine footprint (all areas including active disturbance areas and rehabilitation areas)	193.9	193.9	193.9
B. Total active disturbance (areas within the footprint still requiring rehabilitation)	56.7	56.7	57.6
C. Land being prepared for rehabilitation	4.4	4.4	4.4
D. Land under active rehabilitation	132.8	132.8	131.9
E. Completed rehabilitation (areas that have achieved completion criteria and have been signed-off by DRE)	0	0	0

8.2 Post Rehabilitation Land Uses

The proposed final land use aims to emulate the pre-mining environment and will enhance local and regional ecological linkages across the site and adjacent areas. The primary objective of site revegetation and regeneration is to create a stable final landform with acceptable post-mining land use and suitability. In the long term, rehabilitation areas will become integrated with adjacent native vegetation communities. Rehabilitation areas will continue to be monitored on an annual basis and will be managed until self-sustaining. Final rehabilitation areas will achieve the rehabilitation completion criteria specified in the approved CVM MOP prior to relinquishment.

8.3 Completion Criteria Assessment

The results of the 2021 biodiversity monitoring program have been compared against the objectives as defined in the CVM C&M MOP (Sedgman, 2015). Monitoring undertaken during 2021 has indicated that the CHA's within CVM are providing consistent native flora and fauna habitat compared to baseline information and previous annual monitoring results.

8.4 Rehabilitation Activities

Although the mine is in care and maintenance, management and monitoring of rehabilitation areas is undertaken in accordance with the approved CVM Flora and Fauna Management Plan (Coalpac, 2012a).

There has been no removal of buildings or other infrastructure and no new rehabilitation areas were established during the 2021 report period.

Table 8.2 provides a general overview of the performance of the rehabilitated area against the biodiversity and rehabilitation performance and completion criteria for CVM. It is noted that there are areas which have been disturbed by mining which are yet to be rehabilitated. These disturbed areas do not form part of the general assessment presented in **Table 8.2**.

Table 8.2 Assessment of CVM Rehabilitation Against MOP Performance Indicators and Completion Criteria

Domain Objectives	Performance indicators	Completion criteria	2021 Status Against Completion Criteria
Revegetation works are undertaken in accordance with the Flora and Fauna Management Plan.	Plant establishment	Planting/seeding is assessed during annual monitoring as becoming successfully established.	Generally satisfied Planting/seeding of existing rehabilitation areas has generally been successful. Supplementary works are required where rehabilitation has been impacted by subsurface heating and no natural regeneration has occurred. The timing of these works will be informed by further investigations.
Established rehabilitation areas to be monitored on an annual basis and managed until self-sustaining.	Species composition	A range of native shrubs, grasses and other understorey species have established through topsoil, seeding or recolonization.	Generally satisfied Exiting rehabilitation areas generally satisfy this criteria. Supplementary works are required where rehabilitation has been impacted by subsurface heating. The timing of these works will be informed by further investigations
	Plant health	More than 75% of trees are healthy and growing as indicated by monitoring.	Satisfied The general health of the trees appears to be heavily influenced by climatic conditions and is mirroring that observed in unmined areas. With the exception of the effect of subsurface heating, more than 75% of the trees are healthy and do not show any abnormal signs of disease, pest impact or ill health requiring intervention.
	Weed establishment	A spraying program for the control of declared plants and other weeds has been implemented on the site.	Satisfied A spraying program for the control of declared plants and other weeds has been implemented on the site where required. In 2021 young blackberry plants were commonly recorded throughout most rehabilitation ages. While no infestations were recorded, future monitoring will determine if management intervention is required to control this species, or any other high threat or priority weed infestation. No weed management works are required at present.

Domain Objectives	Performance indicators	Completion criteria	2021 Status Against Completion Criteria
	Soil conditions	Soil salinity is sufficiently low to allow survival and growth of plant species, soil pH levels are within the range to allow plant growth.	Not monitored as part of the 2021 biodiversity monitoring.
	Fauna habitat structure	Fauna habitat includes a range of vegetation structural habitats, e.g. eucalypts, shrubs, ground cover and a developing litter layer.	Progressing towards satisfactory completion. The existing rehabilitated areas includes a range of vegetation structural habitats including eucalypts, shrubs, ground cover and a developing litter layer. The individual monitoring sites within the Cullen Rehabilitation Area have varying stages and extent of these habitats with some sites meeting the completion criteria while others are progressing towards it. It is suggested that this is a function of the age and the rehabilitation areas would be expected to trend over time to satisfy the completion criteria. Monitoring sites FP11 and FP22 appear to have satisfactorily met the completion criteria. Monitoring sites R4, R5, FP05, FP6, FP9 and FP10 partially satisfy the completion criteria (i.e. leaf litter is still developing and areas of bare ground were observed). Whereas monitoring sites R1, R3, R7, R8 2014NE and 2006NE are progressing toward meeting the completion criteria as the leaf litter was almost absent and the vegetation structure is immature. Overall, the structural habitats of the rehabilitation areas are not comparable to those within the surrounding Compensatory Habitat Areas as the they are not mature enough to contain the range of naturally forming habitats (e.g. hollow-bearing trees) that are present in the surrounding un-mined forests and woodlands. The Rehabilitated Areas are however expected to progress towards the naturally forming habitat features that exist in pre-existing or surrounding landforms over time.

Domain Objectives	Performance indicators	Completion criteria	2021 Status Against Completion Criteria
	Presence of fauna species	Vertebrate surveys demonstrate that bird, mammal, reptile and frog communities are becoming established in rehabilitated sites.	Satisfied The 2020 monitoring demonstrated that bird, mammal, reptile and frog communities are becoming established in the Cullen Rehabilitation Area as a whole. However, when comparing the faunal group assemblages among the individual monitoring sites within the Cullen Rehabilitation Area, not all sites are meeting the completion criteria. This is attributed to the availability of habitats within each site that are specific faunal groups need. Fauna species diversity decreased in 2021 compared with 2020 monitoring. The total number of fauna species recorded in the Cullen Rehabilitation Areas in 2021 similar to those recorded in the CH Areas. This is most likely due to the maturity of the rehabilitated areas and continued habitat recovery following the drought breaking and a lack of flowering shrub and canopy species that has allowed for similar results between Rehabilitation Area and CH Area. It is expected that faunal communities will continue to fluctuate as they establish towards a similar number (i.e. carrying capacity) to those recorded in the surrounding un-mined vegetation as the diversity of habitats progressively improve. Further evidence will be drawn from future monitoring events as remnant vegetation recovers from the effects of bushfire, habitat corridors continue to establish, and permanent habitat features become more frequent.

Domain Objectives	Performance indicators	Completion criteria	2021 Status Against Completion Criteria
	Biodiversity monitoring	Annual biodiversity monitoring indicates that rehabilitation areas are becoming integrated with adjacent vegetation communities	Generally satisfied The age of the rehabilitation area is the dominate factor for this completion criteria. The older are: • Look visually connected to the unmined land (e.g. landform) • The vegetation on the rehabilitation areas is connected to the un-mined land • Fauna species are using the rehabilitation areas The diversity and structure of all rehabilitated areas is expected to continue to mature over time to be similar to the surrounding un-mined forests and woodlands.
Final rehabilitation areas to achieve rehabilitation completion criteria	Vegetation cover	No bare areas that have obviously failed and are greater than 0.5 ha in total area.	Progressing towards satisfactory completion. All Rehabilitation Areas inspected were considered to meet this criteria milestone in 2021, with the exception of areas affected by subsurface heating.
	Tree cover	No treeless areas greater than 0.5 ha are present.	Generally satisfied No treeless area greater than 0.5 ha were observed during the 2021 monitoring, with the exception of areas affected by subsurface heating.

Domain Objectives	Performance indicators	Completion criteria	2021 Status Against Completion Criteria
	Shrub/grass cover	Monitoring and visual estimation show grass or shrub cover to be >50%.	Generally satisfied 2021 monitoring and visual estimation recorded grass and shrub cover to be >50% on the Rehabilitation Zones. It is noted that these are a mix of native ground cover species and exotic cover crop species. This >50% coverage is due to ongoing above average rainfall conditions. In 2020 it was expected that the ground cover layer will begin to decrease however above average rainfall conditions continues to support substantial growth It is also noted that the acacia species in the older rehabilitation areas rehab are naturally dying back (senescence) and as such their prominence will be less in coming years. Recruitment of acacias species however was recorded in majority of the rehabilitation monitoring sites. Many monitoring sites also recorded second generation Eucalyptus spp. Future monitoring will determine how the native species diversity of rehabilitation areas will respond following increased plant growth in response to favourable environmental conditions.

9.0 Community

9.1 CCC Meetings

One community consultation meeting was held in the reporting period on 24 November 2021.

During the November 2021 meeting, an overview of the Manildra Group disposal of ownership of Castlereagh Coal. information was presented on the status of the Invincible Colliery Southern Extension Project, environmental monitoring and performance, rehabilitation and land management works undertaken on site and the proposed activities for 2022.

It was agreed during this meeting that the CCC would meet during Q1 2022 at a time when more information regarding the status of proposed activities was available.

The outcomes of the CCC meeting are detailed in the meeting minutes available on the Castlereagh Coal website.

9.2 Complaints

In accordance with Condition M5 of the EPL, Shoalhaven Coal maintains a complaints register to record and respond to complaints received from the community. The register is included in the Castlereagh Coal website. One complaint was received from the local community during the report period. The complaint was in relation to steam and odour emanating from a subsurface heating area on site. Following the receipt of the complaints, Shoalhaven Coal undertook prompt repair works to manage the subsurface heating steam and odour. A comparison of complaints received between 2011 and 2021 is outlined in **Table 9.1** below.

Table 9.1 Comparison of Complaints

Complaint Type	2011	2012 *	2013	2014	2015	2016	2017	2018	2019	2020	2021
Noise	9	9	1	0	1	0	0	0	0	0	0
Air quality	5	5	2	0	1	0	0	0	0	0	0
Blasting	3	5	0	0	0	0	0	0	0	0	0
Traffic	4	13	0	0	0	0	0	0	0	0	0
Water	0	0	0	2	0	0	0	0	0	0	0
Subsurface Heating	2	0	0	0	0	4	2	3	2	2	1
Other	2	4	2	1	0	0	0	0	0	0	0
Total	25	36	5	3	2	4	2	3	2	2	1

* CVM was placed on care and maintenance in December 2012

10.0 Audit Information

An Independent Environmental Audit (IEA) was due to be undertaken for the 2021 reporting period. In accordance with Schedule 6, Condition 6 of the Development Consent, CVM is required to undertake an Independent Environmental Audit (IEA) every 5 years. Due to circumstances surrounding change in ownership of CVM during the reporting period, an extension to provision of the Audit sought from DPIE and was granted until 18 March 2022. The IEA was completed and submitted on the 14 March 2022.

The IEA identified non-compliances with the EPL, Development Approval and the 2003 Environmental Impact Statement mitigation measure commitments. Non-compliances were found to be of administrative or low risk level.

Further details regarding the status of the non-compliances identified by the IEA are located in **Appendix 3**. A copy of the 2021 IEA is located on the CVM website.

11.0 Incidents and Non-Compliances During the Report Period

There were no environmental incidents causing or threatening material environmental harm at the Cullen Valley Mine during the reporting period. The CVM Pollution Incident Response Management Plan (Umwelt, 2020) was not activated during the reporting period with review of the PIRMP being undertaken in December 2021 (refer to the Castlereagh Coal website). Non-compliances which occurred during the reporting are discussed in in **Section 1.0**.

12.0 Activities to be Undertaken in the Next Reporting Period

Proposed mining activities for the next reporting period involve the mining of approximately 450,000 tonnes of remnant coal from within the approved mining area between March/April 2022 and 31 December 2022.

Additional activities during the 2022 reporting period will include:

- detailed consultation with DPIE, the Resources Regulator and other agencies toward the approval of new management plans required for the restart of mining operations.
- Continued monitoring of subsurface heating and continue treatment of subsurface heating via backfilling surface cracks with cement and capping heating areas will be undertaken consistent with the POW (**Section 6.9**).
- Commencement of a trial irrigation methodology to determine its effectiveness as part of the wider subsurface heating treatments program at CVM.
- Completion of the works required under Section 240 Notices and provision of responses to the Resources Regulator.
- Development and implementation of the Rehabilitation Management Plan for CVM, adopting the outcomes and recommendations relative to the Section 240 Notice reporting outcomes.
- Review forward rehabilitation areas relative to the outcomes of the Section 240 Notice investigation outcomes and proposed remnant mining activities.
- Attend to rehabilitation activities as per **Section 8.5**
- Completion of annual CCC meetings, as agreed with CCC members.

13.0 References

Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000. (ANZECC, 2000) An Introduction to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Commonwealth Government.

CARAS (2022). Cullen Valley Mine Independent Environmental Audit. Prepared for Shoalhaven Coal Pty Limited

Castlereagh Coal (2021). Cullen Valley Mine Pollution Incident Response Management Plan.

Castlereagh Coal (2018). Care and Maintenance Mining Operations Plan Cullen Valley Mine.

Coalpac (2009). Environmental Monitoring Program.

Coalpac (2012a). Cullen Valley Mine Flora and Fauna Management Plan.

Coalpac (2012b). Cullen Valley Mine Species Management Plan (Clandulla Geebung).

Coalpac (2012c). Environmental Management Plan.

Coalpac (2012d). Blast Management Plan.

Coalpac (2012e) Fire Management Plan.

Castlereagh Coal (2018). Cullen Valley Mine Care and Maintenance Mining Operations Plan

Global Acoustics Pty Ltd (2017a). Cullen Valley Mine Environmental Noise Monitoring Quarter 1, 2021. Prepared for Shoalhaven Coal.

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Global Acoustics Pty Ltd (2017c). Cullen Valley Mine Environmental Noise Monitoring Quarter 3, 2021. Prepared for Shoalhaven Coal.

Global Acoustics Pty Ltd (2017d). Cullen Valley Mine Environmental Noise Monitoring Quarter 4, 2021. Prepared for Shoalhaven Coal.

International Environmental Consultants, 1997. Feldmast Coal Project Environmental Impact Statement.

International Environmental Consultants, 2004. Cullen Valley Mine Open Cut Extension Environmental Impact Statement

NSW Government (2015). Annual Review Guideline.

Sedgman (2015) Cullen Valley Mine Care and Maintenance MOP.

Umwelt (2017a). Flora and Fauna Management Plan.

Umwelt (2017b). Water Management Plan Cullen Valley Mine.

Umwelt (2021). 2021 Biodiversity Monitoring Report. Cullen Valley Mine and Invincible Colliery, Draft.

APPENDIX 1

Figures and Plans

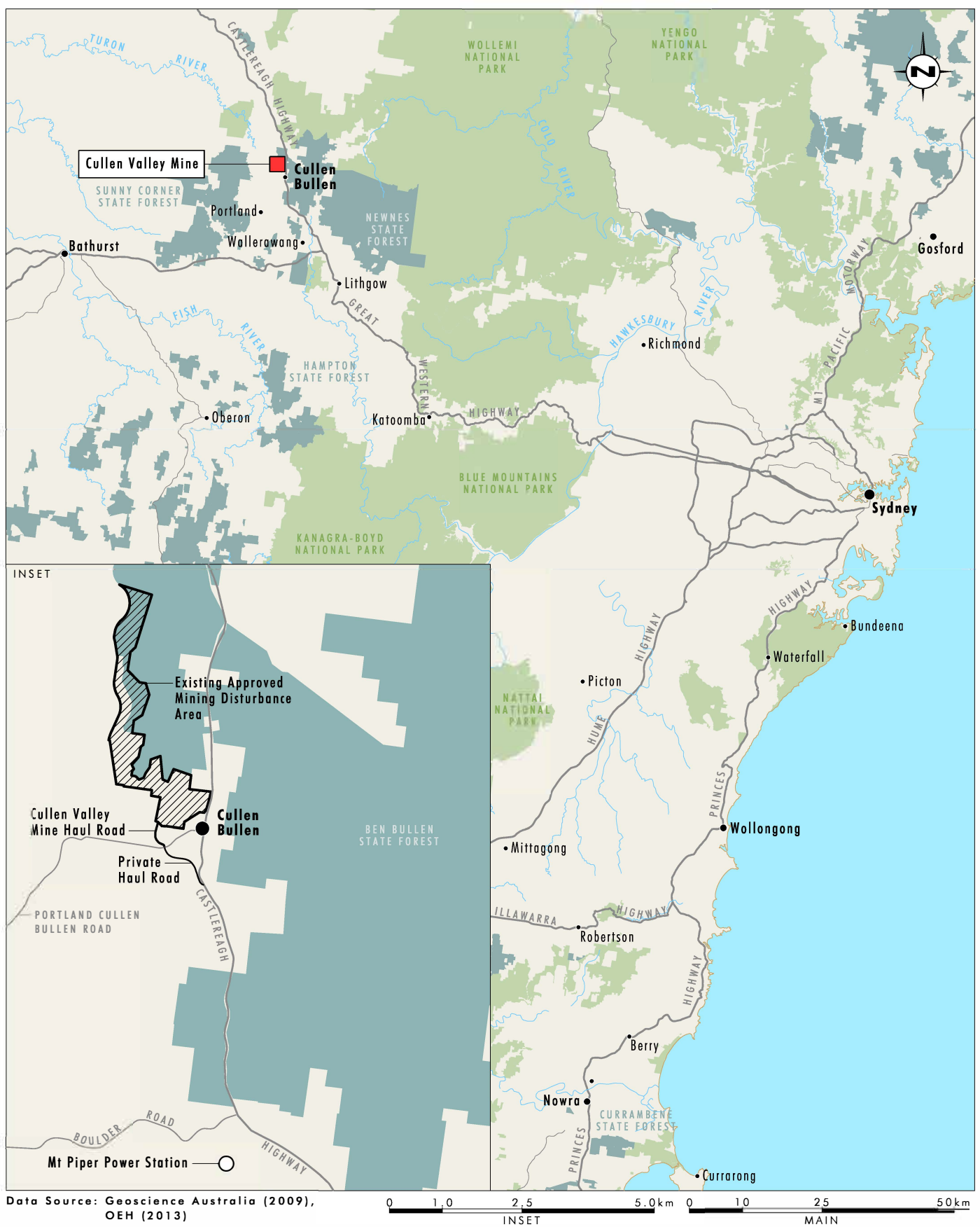
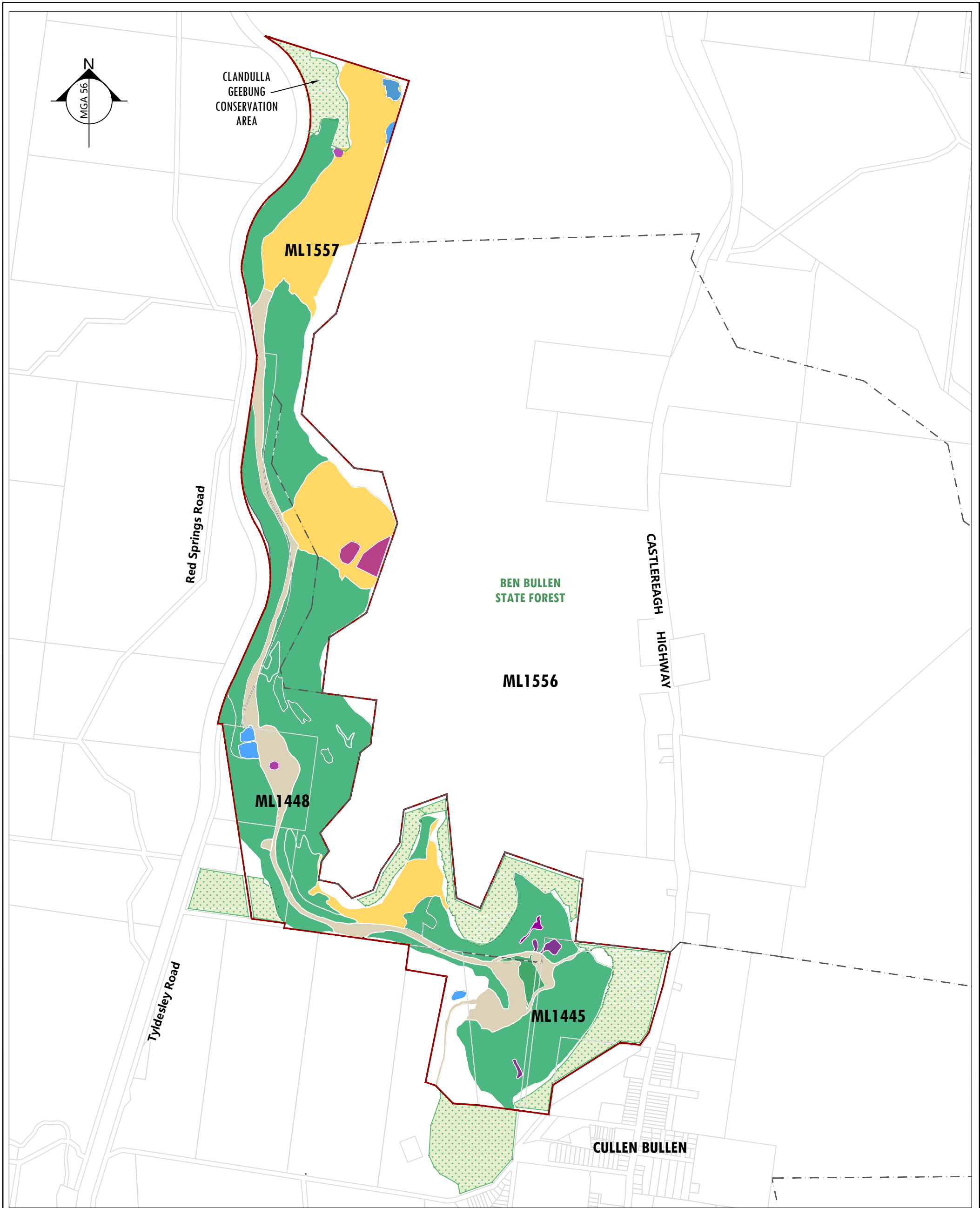


FIGURE 1
Locality Plan
Cullen Valley Mine



LEGEND:

Legend

- Project Approval Boundary
- Extent of mining and rehabilitation activities
- Mining Tenement Authority Boundary

Primary Domains

- 1 - Infrastructure Area
- 3 - Water Management Area
- 4 - Unshaped Emplacement Area
- 5 - Stockpile Area
- 9 - Conservation and Biodiversity Offset Area

Secondary Domains

- 7 - Rehabilitation Area

1:15000 (A3)

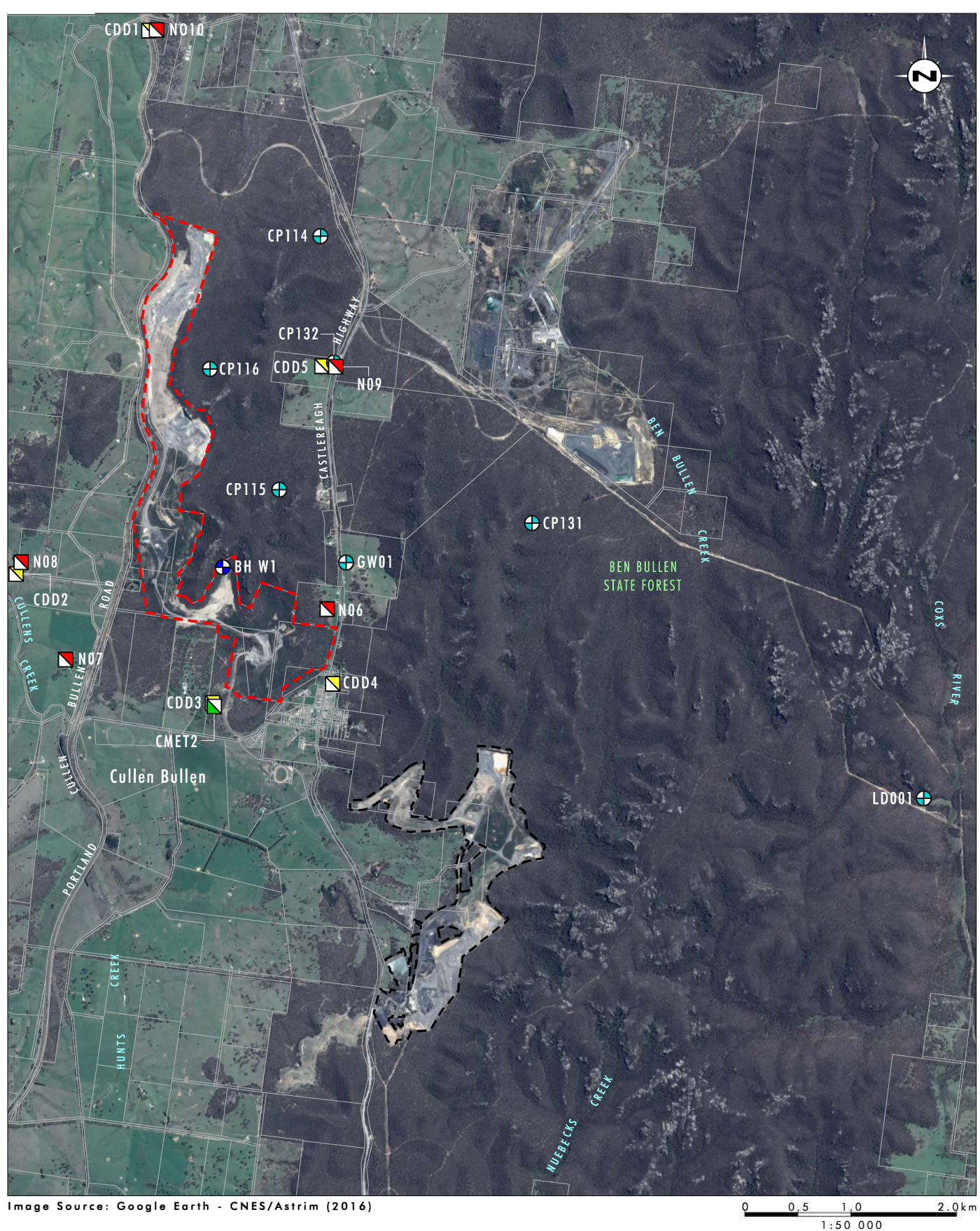
0 100 200 300 400 600 800 1000m

Metres

SURVEY INFORMATION / PLAN NOTES:

- THE SURVEY IS ON MAP GRID OF AUSTRALIA (MGA) CO-ORDINATES (GDA94) ZONE 56.
- CADASTRAL AND STATE FOREST BOUNDARIES NOT BY SURVEY - Supplied by Shoalhaven Coal - March 2022
- COPYRIGHT OF THIS PLAN & ASSOCIATED ELECTRONIC FILES VESTS WITH CEH SURVEY.
- THESE NOTES FORM AN INTEGRAL PART OF THE PLAN AND MUST NOT BE REMOVED FROM THE PLAN.

Disclaimer: CEH Survey Pty. Ltd. does not guarantee the accuracy or completeness of this plan and is not liable for any loss or damage which the user may suffer resulting from the use of this plan.		 CEH SURVEY CONSULTING LAND, ENGINEERING AND MINING SURVEYORS "Astrolabe" 1 Rutherford Lane, LITHGOW 2790 ABN: 68 056 544 551 Office: (02) 6351 2281 Email: survey@ceh.com.au Website: www.ceh.com.au		CLIENT: SSG C/- Julie Barry		PLAN: CULLEN VALLEY MINE Figure 2 - MINING AND REHABILITATION AREAS MARCH 2022			
SCALE: 1 : 15000 ISO full bleed A3 (297.00 x 420.00 MM)		LOCALITY: CULLEN BULLEN NSW 2790		AUTHORISED: G.MUIR/J.STEVENS		DRAWN: D.MACKIE	DATE: 28-03-2022	PLAN No. CVM_PLAN 3_2022	
PLOT DATE/TIME: 28/03/2022 4:11:11 PM D.MACKIE		LGA: LITHGOW CITY							



Legend

- Existing Approved Mining Disturbance Area - Cullen Valley
- Existing Approved Mining Disturbance Area - Invincible

- Depositional Dust Monitoring Point
- Meteorological Station
- Noise Monitoring Point
- Surface Water Monitoring Point
- ⊕ Groundwater Monitoring Point

FIGURE 3

Environmental Monitoring Locations
Cullen Valley Mine

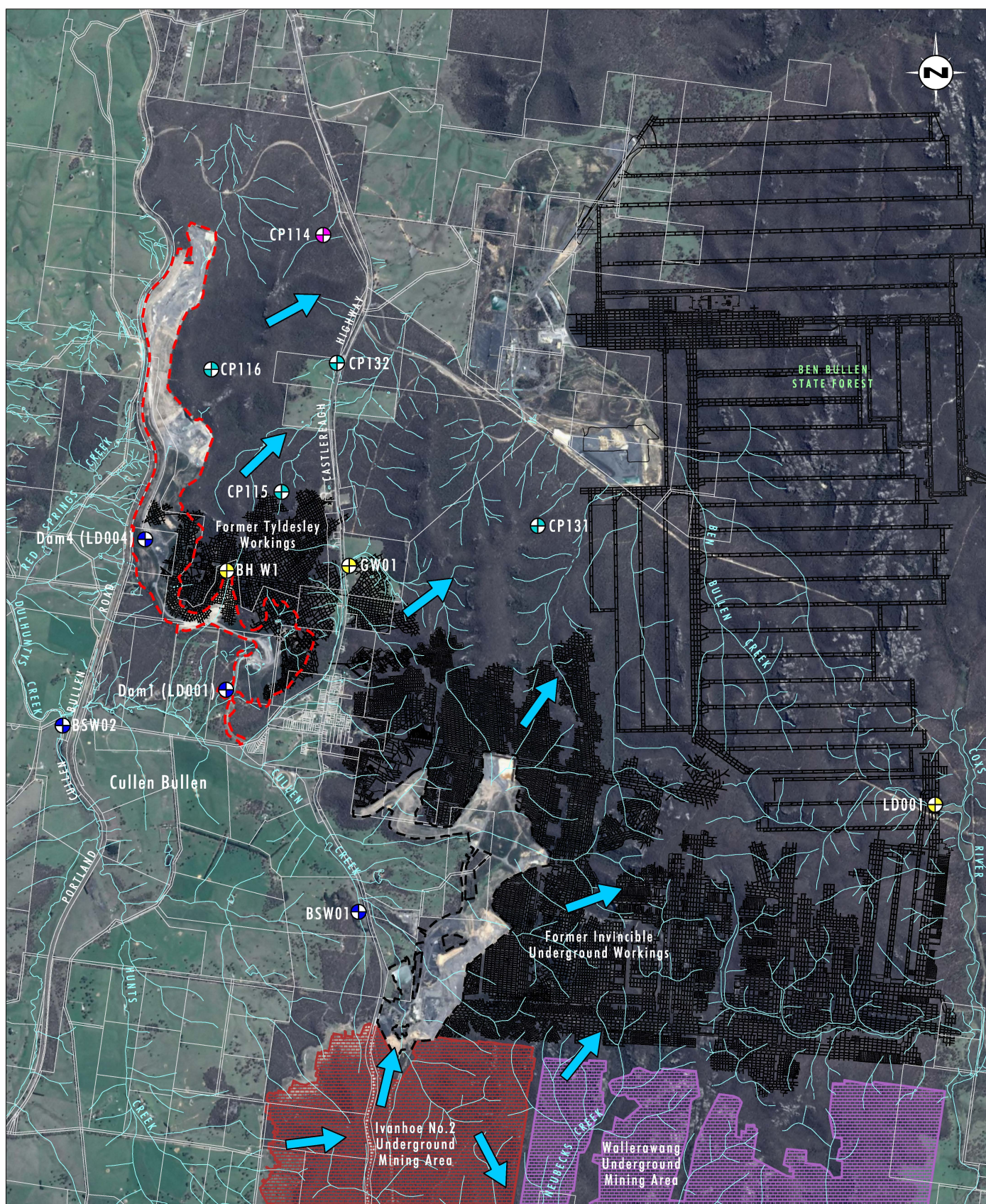


Image Source: Google Earth - CNES/Astrim (2016)
Data Source: LPI (2016), Sedgman (2014)

0 0.5 1.0 2.0 km
1:50 000

Legend

- Open Cut Mining Disturbance Area - Cullen Valley
- Existing Mining Disturbance Area - Invincible
- Direction of Coal Seam Dip
- Former Invincible Underground Workings
- Invincible Project Approval Boundary
- Wallerawang Underground Mining Area

- Groundwater Monitoring Point (Lithgow Seam)
- Groundwater Monitoring Point (Marangaroo Sandstone)
- Groundwater Monitoring Point (Underground Workings)
- Surface Water Monitoring Point (Invincible)

FIGURE 4

Hydrology Context
Cullen Valley Mine

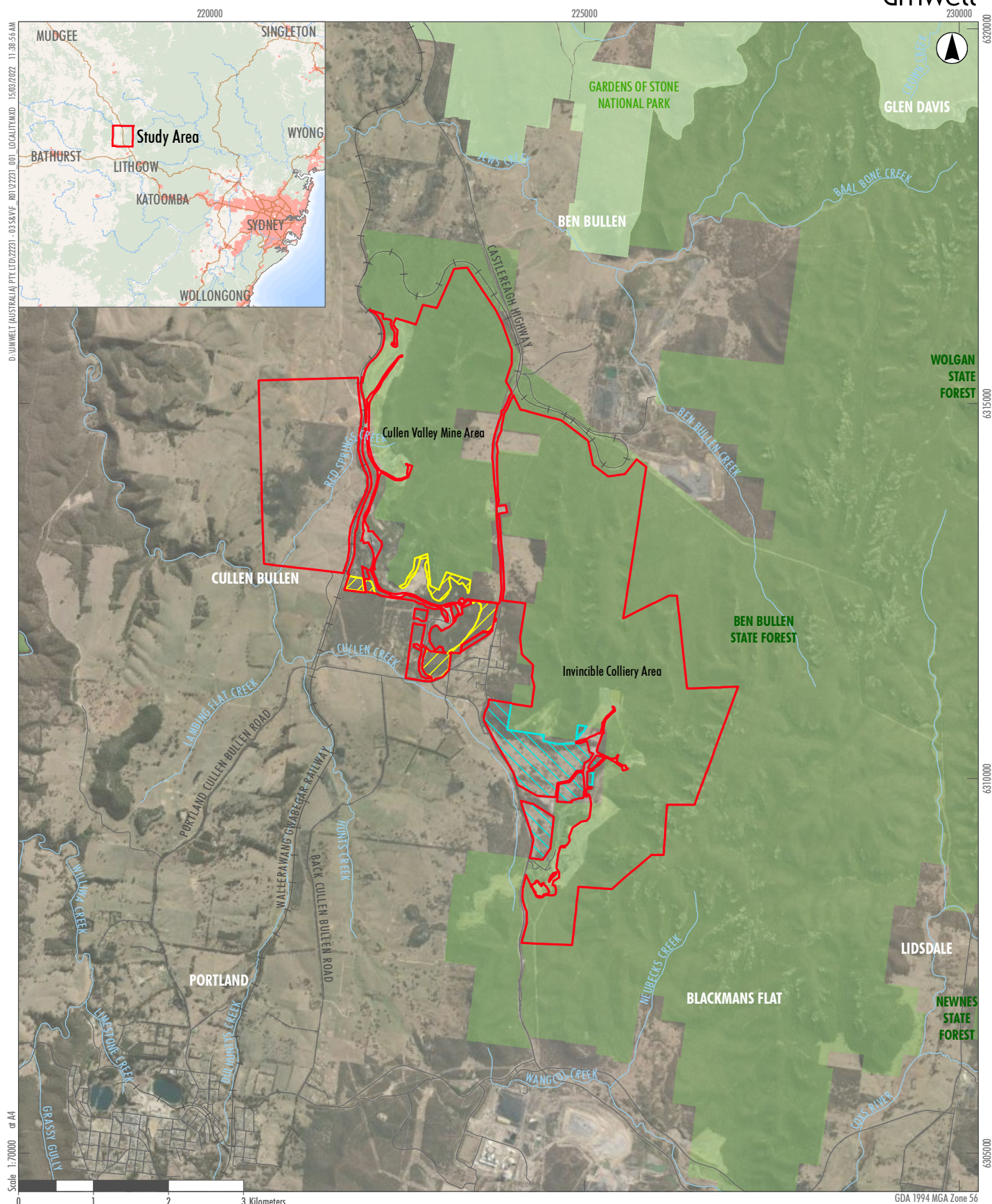
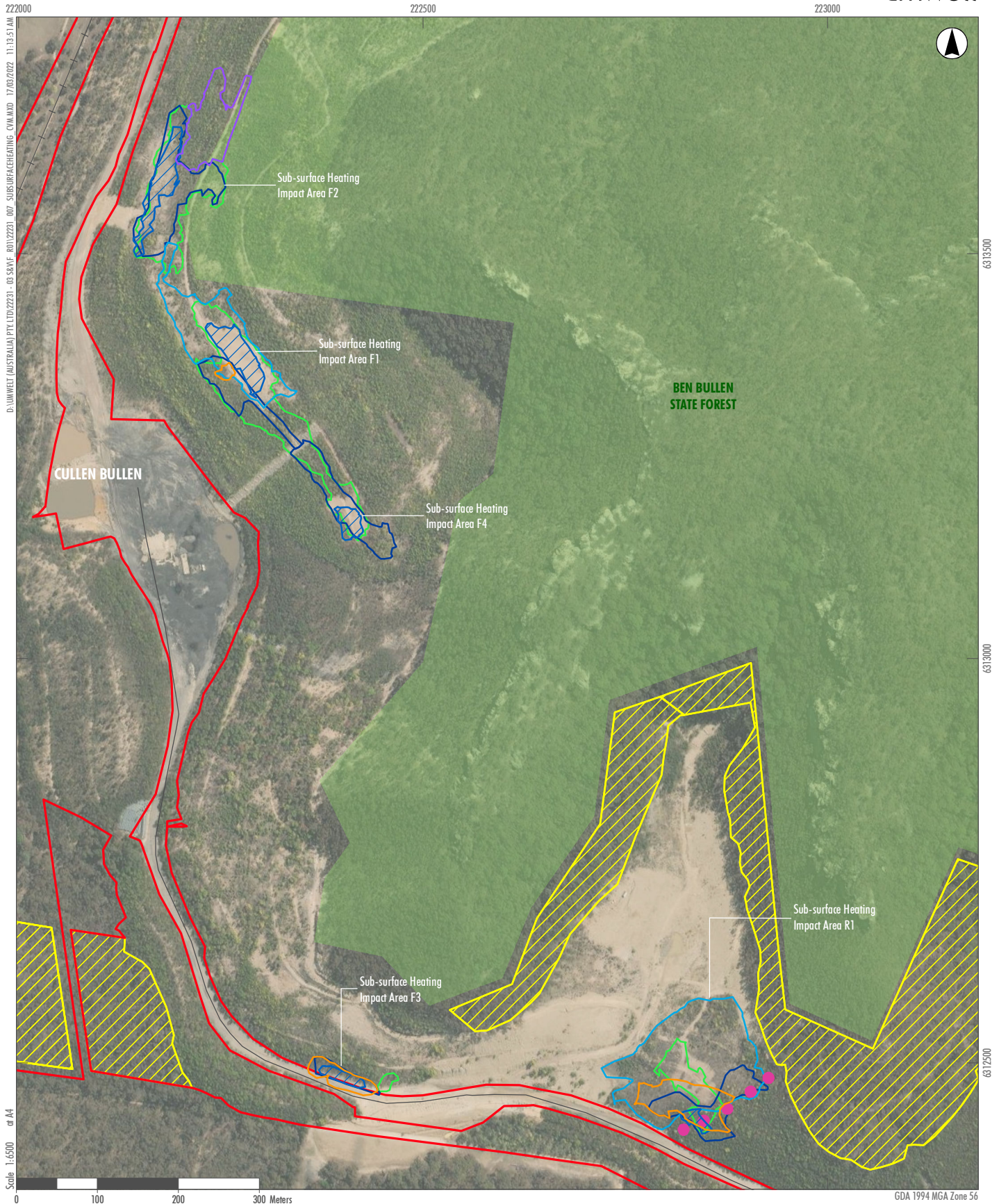


FIGURE 5

Locality of Biodiversity Monitoring



Legend

- Study Area
- Compensatory Habitat Area
- State Forest
- Road
- Railway Line
- Sub-surface Heating Impact Areas - SE Boundary (Kleinfelder 2015)
- Sub-surface Heating Impact Areas 2016
- Sub-surface Heating Impact Areas 2017
- Sub-surface Heating Impact Areas 2018
- Sub-surface Heating Impact Areas 2019
- Sub-surface Heating Impact Areas 2020
- Sub-surface Heating Impact Areas 2021

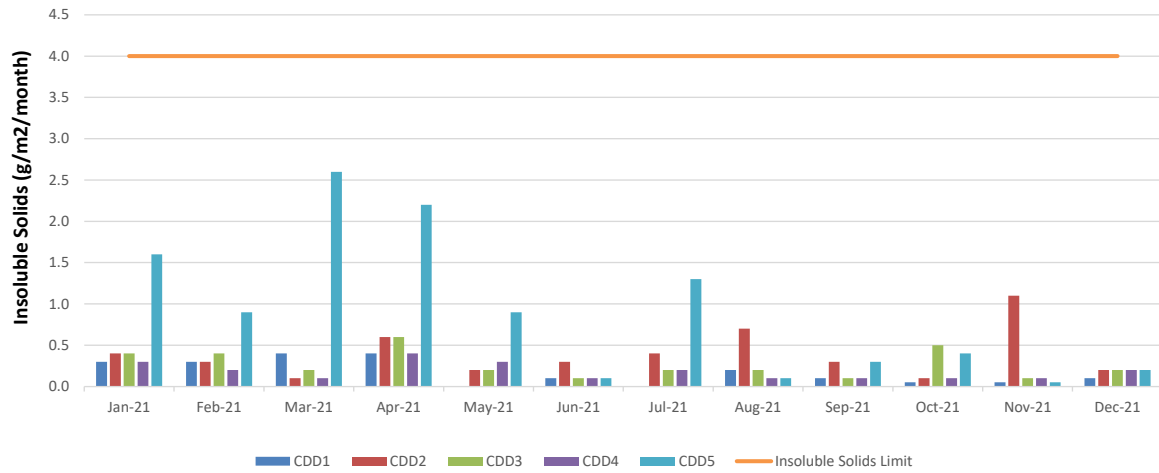
FIGURE 6

Sub-Surface Heating Impact Areas
- Cullen Valley Mine Area

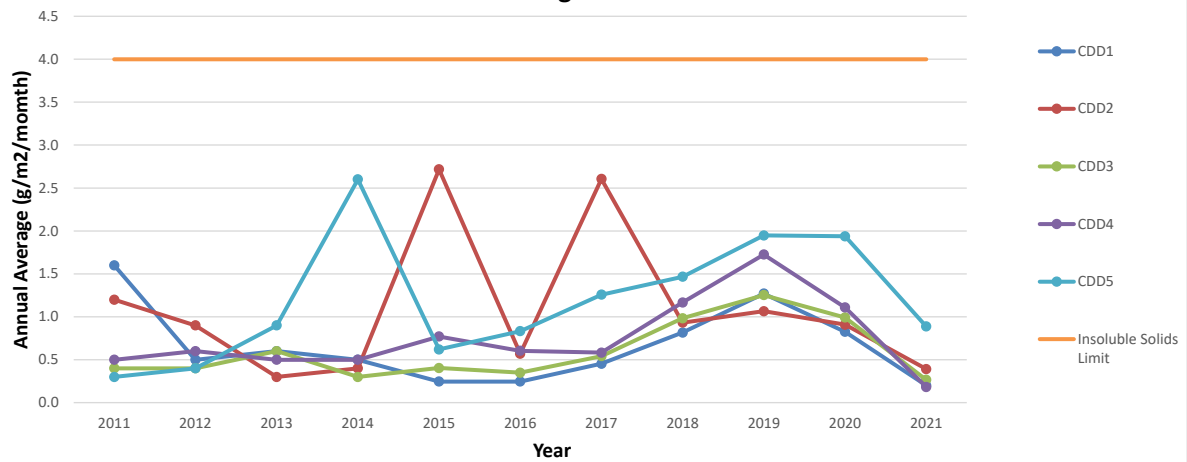
APPENDIX 2

Monitoring Results

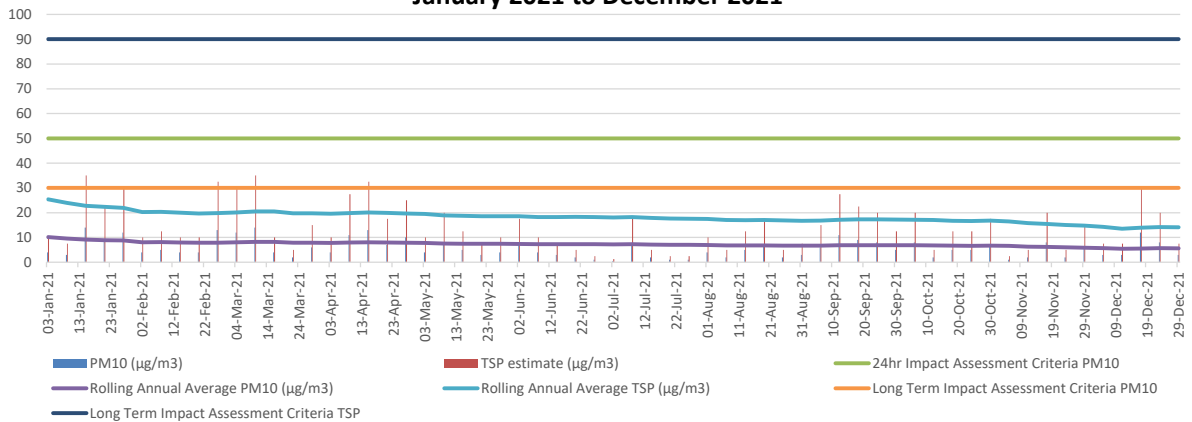
Air Quality - Monthly Insoluble Solids January 2021 to December 2021



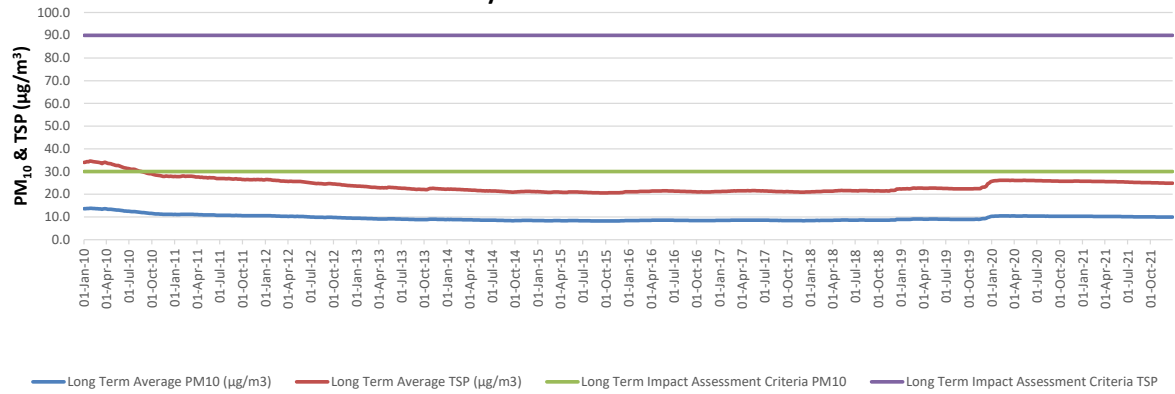
Air Quality - Depositional Dust Annual Averages - 2011 to 2021



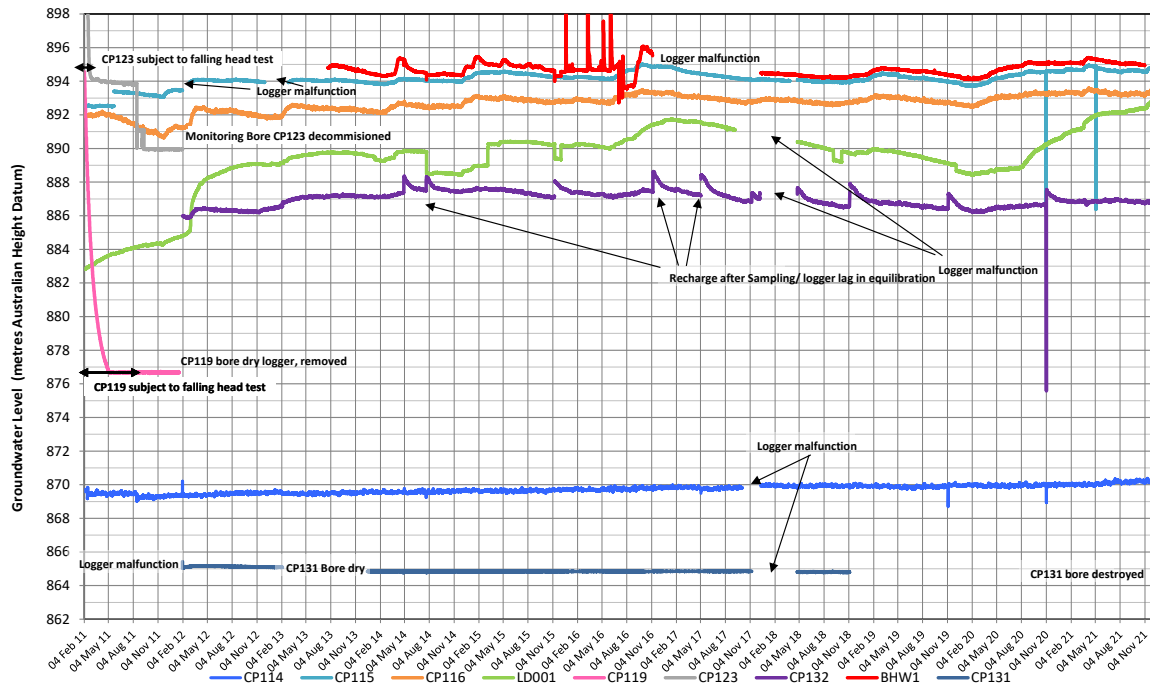
PM10 & TSP 24hr Results January 2021 to December 2021

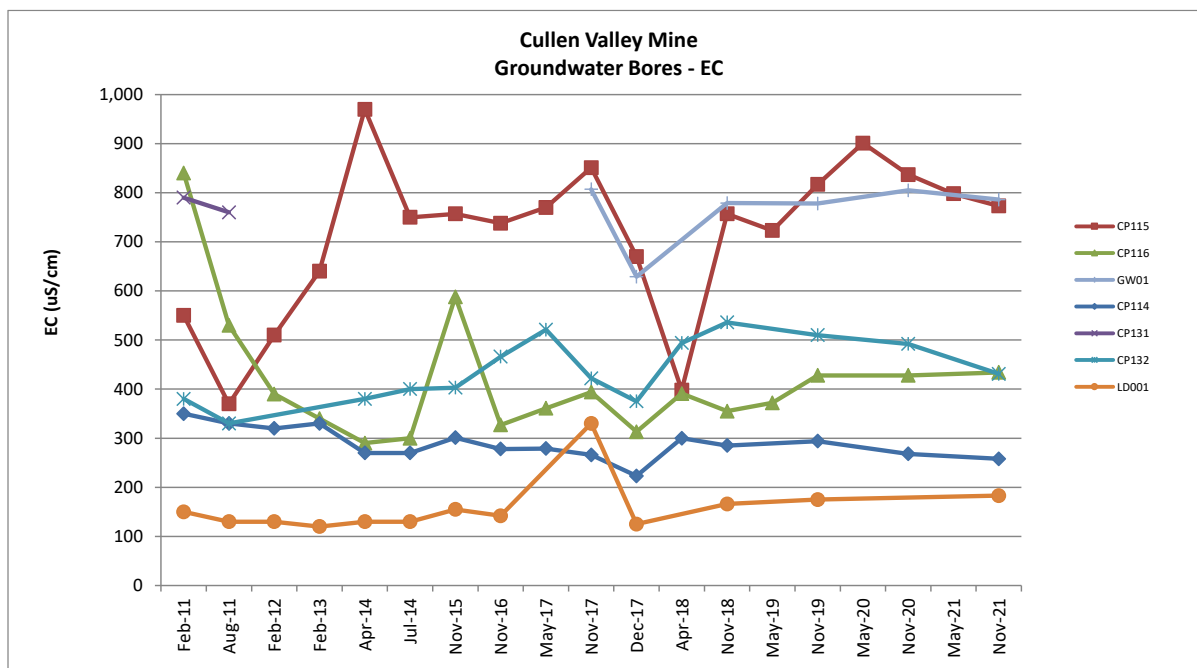
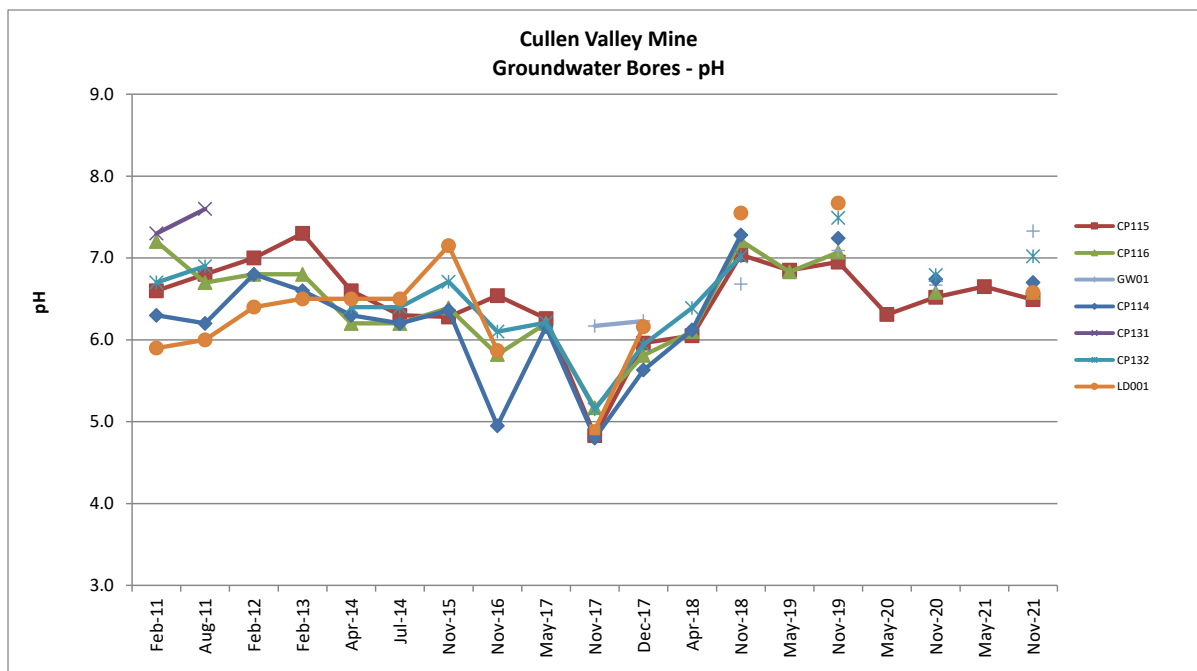


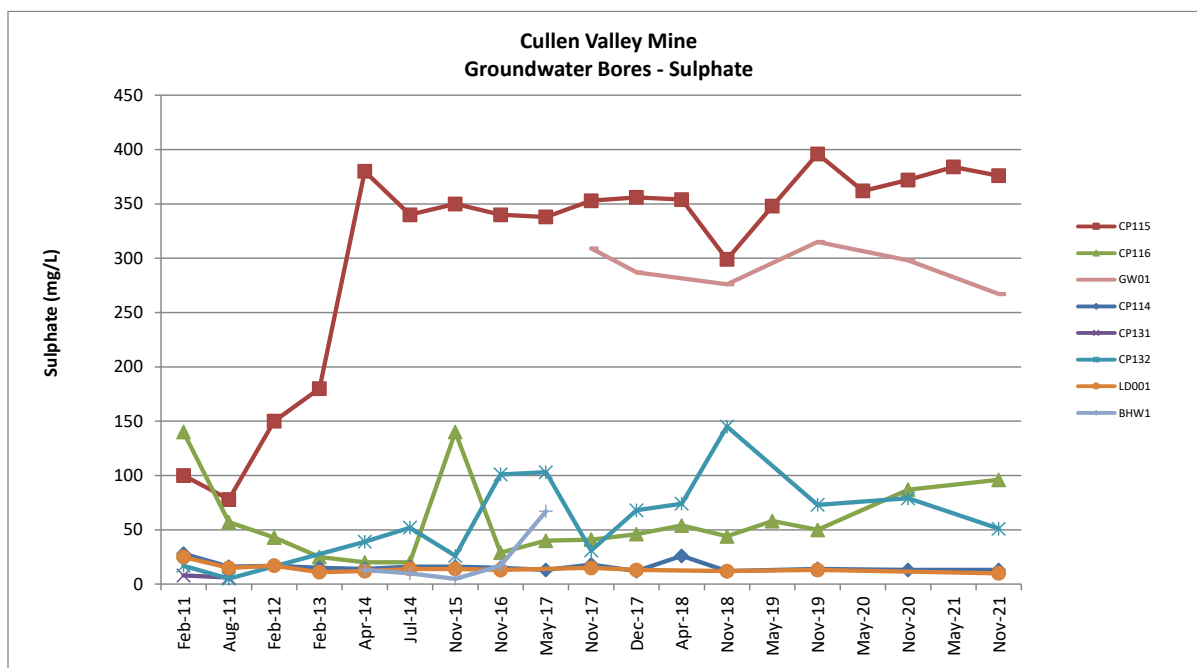
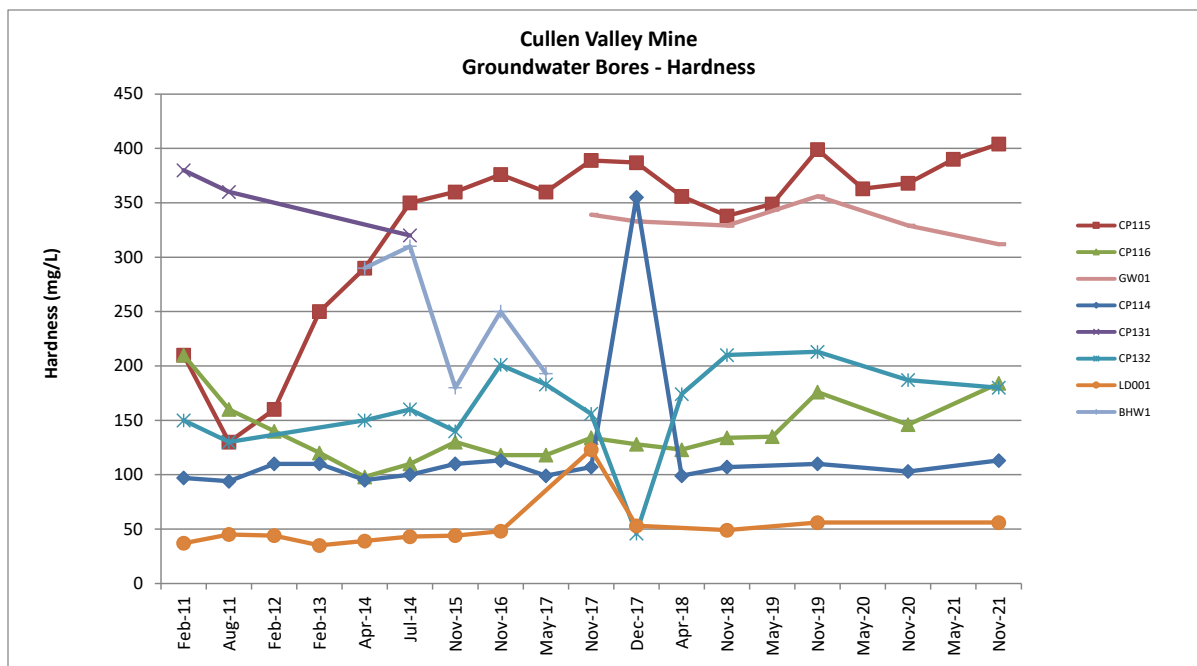
Cullen Valley Mine Long Term Average PM10 & TSP January 2010 to December 2021



Groundwater Hydrographs - Cullen Valley (2011-2021)







**Cullen Valley Mine
Groundwater Bores - Nitrate**

Y-axis: Nitrate (mg/L) (0.0 to 3.5)
X-axis: Date (Feb-11 to Nov-21)

Legend:

- CP115
- CP116
- GW01
- CP114
- CP131
- CP132
- LD001
- BHW1

Key Data Points:

- CP115: 3.0 mg/L (Apr-14)
- BHW1: 3.4 mg/L (Jul-14)

Historical Noise monitoring results for years 2011, 2012, 2015 - 2021 are shown in **Tables A to I**. Contribution from CVM was inaudible for all monitoring undertaken for 2013, and 2014.

Table A 2021 Quarterly Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	36 (IA)	34 (IA)	41 (IA)	35 (IA)
Hillcroft (N08)	35	36 (IA)	36 (IA)	38 (IA)	32 (IA)
Forest Lodge (N10)	40	36 (IA)	31 (IA)	36 (IA)	42 (IA)
Doble Gate (N09)	43	49 (IA)	63 (IA)	43 (IA)	50 (IA)
Tilley (N06)	43	63 (IA)	68 (IA)	48 (IA)	53 (IA)

Table B 2020 Quarterly Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	44 (IA)	35 (IA)	43 (IA)	42 (IA)
Hillcroft (N08)	35	41 (IA)	33 (IA)	30 (IA)	33 (IA)
Forest Lodge (N10)	40	44 (IA)	38 (IA)	26 (IA)	38 (IA)
Doble Gate (N09)	43	52 (IA)	52 (IA)	60 (IA)	54 (IA)
Tilley (N06)	43	61 (IA)	66 (IA)	68 (IA)	63 (IA)

Table C 2019 Quarterly Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	39 (IA)	44 (IA)	41 (IA)	43 (IA)
Hillcroft (N08)	35	40 (IA)	44 (IA)	39 (IA)	38 (IA)
Forest Lodge (N10)	40	36 (IA)	43 (IA)	43 (IA)	32 (IA)
Doble Gate (N09)	43	62 (IA)	54 (IA)	63 (IA)	59 (IA)
Tilley (N06)	43	72 (IA)	67 (IA)	64 (IA)	68 (IA)

Table D 2018 Quarterly Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	34 (IA)	38 (IA)	33 (IA)	40 (IA)
Hillcroft (N08)	35	35 (<20)	39 (IA)	40 (IA)	33 (IA)
Forest Lodge (N10)	40	50 (IA)	27 (IA)	43 (IA)	33 (IA)
Doble Gate (N09)	43	47 (IA)	49 (IA)	50 (IA)	49 (IA)
Tilley (N06)	43	66 (IA)	62 (IA)	68 (IA)	67 (IA)

Table E 2017 Quarterly Noise Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	44 (IA)	33 (IA)	34 (IA)	34 (IA)
Hillcroft (N08)	35	42 (IA)	37 (IA)	29 (IA)	29 (IA)
Forest Lodge (N10)	40	33 (IA)	34 (IA)	31 (IA)	31 (IA)
Doble Gate (N09)	43	47 (IA)	50 (IA)	45 (IA)	45 (IA)
Tilley (N06)	43	65 (IA)	68 (IA)	67 (IA)	67 (IA)

Table F 2016 Quarterly Noise Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	32 (IA)	37 (IA)	36 (IA)	36 (IA)
Hillcroft (N08)	35	40 (IA)	37 (IA)	35 (IA)	35 (IA)
Forest Lodge (N10)	40	32 (IA)	33 (IA)	30 (IA)	36 (IA)
Doble Gate (N09)	43	46 (IA)	52 (IA)	49 (IA)	48 (IA)
Tilley (N06)	43	67 (IA)	66 (IA)	67 (IA)	66 (IA)

Table G 2015 Quarterly Noise Monitoring Results*

Location	Criterion (dB)	Quarter 1 (L _{Aeq})	Quarter 2 (L _{Aeq})	Quarter 3 (L _{Aeq})	Quarter 4 (L _{Aeq})
Red Springs (N07)	37	42 (IA)	32	43 (IA)	41 (IA)
Hillcroft (N08)	35	34	39 (IA) #	35	38 (IA)
Forest Lodge (N10)	40	40	28	40	42 (IA)
Doble Gate (N09)	43	64 (IA)	49 (IA) #	51 (IA) #	49 (IA)
Tilley (N06)	43	66 (IA)	69 (IA) #	66 (IA) #	69 (IA)

IA – noise from the mine was inaudible therefore criteria do not apply

– these measurements were affected by wind speeds > 3m/s² therefore criteria do not apply

Table H 2012 Quarterly Noise Monitoring Results

Location	Criterion (dB)	Quarter 1 (L _{Aeq} 15min)	Quarter 2 (L _{Aeq} 15min)	Quarter 3 (L _{Aeq} 15min)	Quarter 4 (L _{Aeq} 15min)
Red Springs (N07)	37	33	35	30	32
Hillcroft (N08)	35	35	39	32	33
Forest Lodge (N10)	40	<25	30	<25	NM
Doble Gate (N09)	43	IA	IA	IA	IA
Tilley (N06)	43	IA	IA	IA	IA

IA – noise from the mine was inaudible therefore criteria do not apply NM – noise was not measurable

Table I 2011 Quarterly Noise Monitoring Results

Location	Criterion (dB)	Quarter 1 (LAeq 15min)	Quarter 2 (LAeq 15min)	Quarter 3 (LAeq 15min)	Quarter 4 (LAeq 15min)
Red Springs (N07)	37	IA	33	<20	IA
Hillcroft (N08)	35	31	37	30	<20
Forest Lodge (N10)	40	26	<30	<25	<25
Doble Gate (N09)	43	IA	IA	IA	IA
Tilley (N06)	43	IA	IA	IA	IA

IA – noise from the mine was inaudible therefore criteria do not apply

APPENDIX 2

CVM IEA 2021

Responses to Recommendations

Cullen Valley Mine (CVM) - Independent Environmental Audit 2021
Response to Recommendations

IEA Recommendations								
Condition Reference No #	Condition Detail	Condition Type	Risk Level of Non-compliance	Auditor Comments and Recommendations	CVM Response	Target Due Date	Completion Status	Comments - Status Update
Development Consent DA 200-5-2003 Non-compliance Recommendations								
Sch 3 Cond 1	The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.	Administrative	Administrative	The applicant has generally implemented practicable measures to minimise harm to the environment. However, several notices have been issued over the audit period. The applicant should implement reasonable and practical measures to investigate anomalies in the readings even if no harm has been done to the environment.	CVM accepts the recommendation. During the audit period 2016 - 2021, there was no dedicated environmental manger onsite to manage the performance and delivery of consultants undertaken monitoring and associated reporting and followup. CVM has directly employed a full time environmental manager onsite to manage these items toward establishing and maintaining compliance.	28-Feb-22	Completed	
Sch 4 Cond 25	The Applicant shall monitor the air quality impacts of the development at representative locations around the site, using the specified averaging period, frequency, and sampling method in Table 12 to the satisfaction of DEC and the Director-General.	Specific environmental conditions	Administrative	2018 AEMR – A power outage of the HVAS unit caused by thunderstorm resulted in a failure to monitor air quality in accordance with this condition. 2019 AEMR - The 30+/- 2 day monitoring period for depositional dust was exceeded on one occasion (dec). 2020 AEMR - A mechanical fault with the HVAS unit resulted in a failure to monitor air quality in on two occasions. This item has no defined recommendation.	Power outages and mechancial failures are generally beyond control of site personnel, nevertheless a dedicated environmental manger is now employed onsite to manage the operation and performance of of monitoring equipment and consultant technicians engaged to conduct monitoring toward establishing and maintaining compliance.	28-Feb-22	Completed	
Sch 4 Cond 27	The Applicant shall not cause or permit the emission of offensive odour beyond the boundary of the site in accordance with section 129 of the Protection of the Environment Operations Act 1997.	Specific environmental conditions	Low	There have been odour complaints in every year of the audit period regarding subsurface heating. 2016- 4 complaints 2017- 2 complaints 2018- 3 complaints 2019- 2 complaints 2020- 2 complaints 2021- 1 complaint Continue to monitor and implement current subsurface management plan. Consult and review if the situation worsens.	CVM accepts the recommendation. During the audit period, CVM addressed the complaints in consultation with the complainants, whilst undertaking physical inspections and remediation activities on areas found to be the source of odours which are associated with sub-surface heatings on the CVM site. CVM are presently in the process of preparing the new Rehabilitation Management Plans which replace the MOP from 2 July 2022. The RMP will address the sub-surface heating at CVM. CVM has since (Feb 2022) consulted closely with the Resources Regulator to add further measures to address the heating issues at CVM, including trial irrigation and compaction methods to help extingusih / manage heatings, and continued treatment as per the approved methods in addition to further capping / sealing of heating areas with overbruden / rehabilitation materials as remnant mining occurs at CVM. These items will aslo be captrued in the RMP.	2-Jul-22	Open	
Sch 4 Cond 31a	describe the immediate and long-term compensatory habitat proposal, and demonstrate how this proposal would be integrated with the proposed rehabilitation of the site and surrounding areas of remnant vegetation;	Specific environmental conditions	Administrative	An explicit plan covering expected short, medium and long-term should be summarised in AEMR.	CVM will provide an account in the AR of the Annual Biodiversity Monitoring Report outcomes which includes assessment of the Compensatory Habitat, and further, consult with its ecologists toward and required revision if necessary of the management plan which are currently undergoing agency consultation. CVM mananement plans are curently undergoing agency consultation, and requiried changes will be adopted in the appropriate plans.	30-Jun-22	Open	
Sch 4 Cond 31f	set completion criteria for the compensatory habitat proposal.	Specific environmental conditions	Administrative	No completion criteria were found for compensatory habitat. The criteria should be developed and reported in AEMR. Criteria should be developed in in tandem with short, medium and long-term goals.	CVM will provide an account in the AR of the Annual Biodiversity Monitoring Report outcomes which includes assessment of the Compensatory Habitat, and further, consult with its ecologists toward and required revision if necessary of the management plan which are currently undergoing agency consultation. CVM mananement plans are curently undergoing agency consultation, and requiried changes will be adopted in the appropriate plans.	30-Jun-22	Open	

Sch 4 Cond 36a	Within 2 years of the date of this consent, and every 5 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission, and pay the full cost of, an Independent Audit of the compensatory habitat proposal. This audit must be conducted by a suitably qualified, experienced, and independent person whose appointment has been approved by the Director-General;	Specific environmental conditions	Administrative	Previous audit was completed on the 25 Nov 2016 by SLR Consulting Australia. An extension date was granted for the this audit to March 2022. CARAS was endorsed on 15 December 2021 to conduct the current audit period. Date of this audit was 2 February 2022. There item has no defined recommendation.	Castlereagh Coal (CVM) wrote to DPIE on the 15th of December 2021 requesting an extension for completion of the Independent Environmental Audit for CVM stating reasons as to the request. A subsequent extension was granted until 18 March 2022.	18-Mar-22	Open	
Sch 4 Cond 42	For each monitoring/discharge point, the Applicant shall monitor (by sampling and obtaining results by analysis) the concentration of each pollutant in Table 15, using the specified units of measure, frequency, and sampling method.	Specific environmental conditions	Administrative	Monthly water quality monitoring is carried out at discharge points. Monitoring in 2019 and 2020 were affected due to bushfires. No discharge events occurred from 2016 to 2020. This item has no defined recommendation.	CVM employs an external organisation to conduct environmental sampling associated with its monitoring program. During the well documented extreme bushfire conditions in late 2019 / early 2020 directly impacted environmental monitoring preventing access to monitoring sites.	NA	Completed	
Sch 4 Cond 43	Within 6 months of the date of this consent, the Applicant shall prepare (and then implement) a Site Water Management Plan for the development, in consultation with DEC and DPI, and to the satisfaction of the Director-General. This plan must include: (a) the predicted site water usage; (b) a Surface Water Monitoring Program; and (c) an Erosion and Sediment Control Plan.	Specific environmental conditions	Administrative	In 2017 a revised WMP has been sent to DPE for approval, however this is still pending. Monitoring and usage is outlined in AEMRs however they are very brief. Surface Water Monitoring program and Erosion and Sediment control plan are in place. This item has no defined recommendation.	CVM submitted an entire suite of new management plans to DPIE (and other agencies) for agency stakeholder consultation in February 2022 including a Site Water Management Plan. Additional plans / information includes predicted site water usage, surface water monitoring program and a standalone erosion and sediment control plan. CVM will work with agencies to finalise approval of these plans toward the restart of mining remnant coal resources at CVM in early 2022.	30-Jun-22	Open	
Sch 4 Cond 44	The Surface Water Monitoring Program shall include: (a) detailed baseline data on surface water flows and quality; (b) surface water impact assessment criteria; (c) a program to monitor surface water flows and quality; and (d) a program to monitor the effectiveness of the Erosion and Sediment Control Plan.	Specific environmental conditions	Administrative	There is a Surface Water Monitoring Program in the EMP. However, it does not provide much detail on a) and b). Additional information is required. In 2017, a standalone water management plan that included a surface water monitoring program was issued to DPE for approval.	CVM accepts this recommendation. CVM submitted an entire suite of new management plans to DPIE (and other agencies) for agency stakeholder consultation in February 2022 including a Site Water Management Plan which includes a detailed surface water monitoring program. CVM will work with agencies to finalise approval of these plans toward the restart of mining remnant coal resources at CVM in early 2022.	30-Jun-22	Open	
Sch 4 Cond 45	The Erosion and Sediment Control Plan shall: (a) comply with the requirements of the Department of Housing's Managing Urban Stormwater: Soils and Construction manual; (b) identify activities that could cause soil erosion or discharge sediment or water pollutants from the site; (c) describe the location, function and capacity of all erosion and sediment control structures, and nominate which, if any, of these structures would be used as water sources for the development; and (d) describe the measures to minimise soil erosion and the potential migration of sediments to downstream waters.	Specific environmental conditions	Administrative	There is no discussion of compliance with requirements set by Department of Housing's Managing Urban Stormwater. b) Activities that cause erosion are identified in Section 5. c) The locations of structures are outlined but not described in detail. d) Measure to minimise soil erosion are covered in Section 5. This item has no defined recommendation.	CVM submitted an entire suite of new management plans to DPIE (and other agencies) for agency stakeholder consultation in February 2022 including an Erosion and Sediment Control Plan which includes reference to the Blue Book (Landcom), 2004 in Sections 2.4 and 2.5, Structures in Section 2.4 and measures to minimise soils erosion in Sections 2.4 and 2.6. CVM will work with agencies to finalise approval of these plans toward the restart of mining remnant coal resources at CVM in early 2022.	30-Jun-22	Open	

Sch 4 Cond 59	The Applicant shall not cause, permit or allow any waste generated outside the mine to be received at the mine for storage, treatment, processing, reprocessing or disposal, or any waste generated at the mine to be disposed of at the mine, except as expressly permitted by a DEC licence. Note: This condition only applies to the storage, treatment, processing, reprocessing, or disposal of waste that requires a licence under the Protection of the Environment Operations Act 1997.	Specific environmental conditions	Administrative	VENM/ENM dirt have been received at CVM in 2018 and 2019 to help with rehabilitation works. DPE requires an approval and modification of current development consent.	CVM accepts the recommendation. A small quantity spoil from a major infrastructure project in the Sydney Metropolitan Region was imported to assist with rehabilitation works. The spoil was characterised as VENM or ENM in accordance with the NSW EPA Waste Guidelines. The import of all materials from offsite was stopped following correspondence / consultation with DPIE and the Resources Regulator. Should the import of VENM or ENM materials be considered in future, CVM will seek the appropriate approvals / modification in consultation with DPIE and other regulatory agencies.	NA	Completed	
Sch 6 Cond 8	The Applicant shall ensure that there is a Community Consultative Committee to oversee the environmental performance of the development. This committee shall: (a) be comprised of: • 2 representatives from the Applicant, including the person responsible for environmental management at the mine; • 1 representative from Council; and • 4 representatives from the local community, whose appointment has been approved by the Director-General in consultation with the Council; (b) be chaired by an independent person whose appointment has been endorsed by the Director-General; (c) meet at least twice a year; and (d) review and provide advice on the environmental performance of the development, including any environmental management plans, monitoring results, audit reports, or complaints.	Environmental Management, Monitoring, Auditing & Reporting	Administrative	Only one CCC meeting were held per year in 2019 and 2020. DPIE noted this is a technical non-compliance. During 2018 CCC, it was agreed that one CCC meeting held annually while on care and maintenance Table 1.3. Intent to start biannual once mine operations commence. This item has no defined recommendation.	It is anticipated that Cullen Valley Mine will be move from care and maintenance to operational status in early 2022. As such, it is the intent to restart the twice yearly CCC meetings covering both CVM and INV. This matter will be raised with the CCC members at the next meeting on the 15 March 2022.	15-Mar-22	Open	
Environment Protection Licence EPL 10341 Recommendations								
L4.4	For the purpose of condition L4.3: a) Data recorded by the meteorological station as EPA Licence Point 5 must be used to determine meteorological conditions; and b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.	Limit Conditions	Administrative	Meteorological data was sourced from the Bureau of Meteorology's Bathurst weather station in 2016 and 2017. This station is located 45km away and unlikely to be representative of onsite weather conditions. However, a new monitoring system was installed on site in 2018 and carries out the requirements of this condition.	As described, a new met station was installed at the CVM site in 2018. Monitoring data from that site now informs the CVM Met requirements.	NA	Complete	
L6.1	No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997. Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.	Limit Conditions	Low	Complaints regarding odours has been made every year of the auditing period.	CVM accepts the recommendation. During the audit period, CVM addressed the complaints in consultation with the complainants, whilst undertaking physical inspections and remediation activities on areas found to be the source of odours which are associated with sub-surface heatings on the CVM site. Following issue of a 240 Notice by the Resources Regulator regarding heatings (the cause of the adours), CVM responded with an updated MOP and Plan of Works which was approved. CVM has since (Feb 2022) consulted closely with the Resources Regulator to add further measures to address the heating issues at CVM, including trial irrigation and compaction methods to help extingusih / manage heatings, and continued treatment as per the approved methods in addition to further capping / sealing of heating areas with overbruden / rehabilitation materials as remnant mining occurs at CVM.	Ongoing	Open	This item also relates to Sch 4 Cond 27 above.
Generic Recommendations Section 8 Audit Report								

8.1	Update all mgt plans	CARAS recommend that after a prolonged period of care and maintenance, all management plans should be reviewed and updated prior to recommencement of active mining.	CVM accepts this recommendation. CVM submitted an entire suite of new management plans to DPIE (and other agencies) for agency stakeholder consultation in February 2022. CVM will work with agencies to finalise approval of these plans toward the restart of mining remnant coal resources at CVM in early 2022.	30/06/2022	Open	
8.2	Sub-Surface Heating Response Management Plan	The Sub-Surface Heating Response Management Plan should be included in the updated management plans for the operation of CVM. This will address the concerns in regard to nuisance odour from the Site. Our recommendation is that this plan will be implemented as part of the mine recommencement works	CVM are presently in the process of preparing the new Rehabilitation Management Plans which replace the MOP from 2 July 2022. The RMP will address the sub-surface heating at CVM. CVM has since (Feb 2022) consulted closely with the Resources Regulator to add further measures to address the heating issues at CVM, including trial irrigation and compaction methods to help extinguish / manage heatings, and continued treatment as per the approved methods in addition to further capping / sealing of heating areas with overburden / rehabilitation materials as remnant mining occurs at CVM. These items will also be captured in the RMP.	2/07/2022	Open	
8.3	Administrative Non-compliance	The Auditor identified nine (9) administrative non-compliance events, where CVM failed to comply with the consent conditions for the reasons as discussed in Section 7 of this report. Our recommendation is that CVM should engage a dedicated Environmental Manager ('EM'), prior to recommencing of extractive mining operations to ensure the implementation of all practicable measures to prevent and/or minimise any harm that may result from the construction, operation, or rehabilitation of the development3	CVM accepts this recommendation. CVM has directly employed a full time environmental manager onsite to manage these items toward establishing and maintaining compliance.	28/02/2022	Closed	
8.4	Compensatory Habitat	Development Consent DA 200-5-2003 Non-compliance Recommendations	Issue addressed in recommendations and response in Development Consent DA 200-5-2003 Non-compliance Recommendations section above.	NA	NA	
8.5	Site Boundaries and Aboriginal Sites	The identification of the boundaries to Compensatory Habitat Areas and the locations of the Aboriginal Archaeology Sites (referenced in DA: Condition 55 and 56) may have become enveloped in regrowth during the care and maintenance period. Our recommendation is that marking, and signage should be installed to clearly identify these nominated locations.	CVM accepts this recommendation. CVM will investigate existing signage and replace and / or refurbish as required.	30/06/2022	Open	