CENTENNIAL

CENTENNIAL COAL

Clarence Colliery

ANNUAL REVIEW

April 2023

Annual Review Title Block

Name of Operation	Clarence Colliery
Name of Operator	Clarence Colliery Pty Ltd
Development Consent/ Project Approval #	DA 504-00
Name of holder of Development Consent/ Project Approval	Centennial Coal Company Pty Limited
Mining Lease #	CCL705, ML1353, ML1354, ML1583, ML1721, (A307, A416, A451, EL5072)
Name of Holder of Mining Lease	Coalex Pty Ltd & Clarence Coal Investments Pty Ltd
Water License #	WAL 36479, WAL 41882
Name of Holder of Water License	Coalex Pty Ltd & Clarence Coal Investments Pty Ltd
RMP Start Date	1 August 2022 to perpetuity (RMP Version 1.0 dated 29 July 2022)
Annual Review Start Date	1 January 2022
Annual Review End Date	31 December 2022

I, certify that this audit report is a true and accurate record of the compliance status of Centennial for the period 1 January to 31 December 2022 and that I am authorised to make this statement on behalf of Centennial Clarence.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(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.*

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).*

Name of Authorised Reporting Officer	Craig Gillard
Title of Authorised Reporting Officer	Managing Director & CEO
Signature of Authorised Reporting Officer	
Date	28 April 2023

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1 STATEMENT OF COMPLIANCE

The compliance status of Clarence Colliery in 2022 is provided in **Table 1-1**. There were six (6) non-compliances during the Reporting Period.

Table 1-2 presents a summary of the non-compliances.

Table 1-1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Development Consent 504-00	**No**
Mining Lease (ML) 1353	Yes
ML 1354	Yes
ML 1583	Yes
ML 1721	Yes
CCL 705	Yes
Authorisation (A) 307	Yes
A 416	Yes
A 451	Yes
Exploration Lease (EL) 5072	Yes
Environmental Protection Licence (EPL) 726	**No**
Water Access Licence (WAL) 36479	Yes
WAL 41882	Yes
Subsidence Management Plan (SMP) Approvals	Yes
Statement of Commitments	Yes

Table 1-2: 2022 Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
EPL 726	L2.1	Exceedance of concentration limits specified in L2.4	**Low**	LDP002 did not comply with EPL water quality limits on several occasions during the Reporting Period in January, March, July, October, November and December	**Section 7.3.2** and **Section 11**
DA 504-00	Schedule 3 Condition 9(b)	Surface Water Impact Assessment Criteria			

Note: Compliance Status Key for Table 1-2

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-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)

2 INTRODUCTION

Clarence Colliery is an underground coal mining operation located within the NSW Western Coalfields (**Figure 2-1**). Up to 3 million tonnes per annum (Mtpa) of coal is extracted from the Katoomba Seam using the bord and pillar partial extraction method, supplying coal to both domestic and export markets. Up to 300,000 tonnes per annum (tpa) of coal products are transported by road in total. Operations at Clarence Colliery commenced in 1979.

Clarence operates under two Lithgow City Council (LCC) development consents and one State Government development consent. Development Consent IRM.GE.75 was granted in 1976 to allow the extraction of coal from the Katoomba Seam and was modified in 1993 to amend the reject emplacement areas (REAs) proposed in the original Environmental Impact Statement (EIS). Development Consent 174/93 was granted in 1994 to extend underground coal mining operations and upgrade REAs, water management facilities and ancillary structures within the Clarence Colliery Pit Top and was amended in 2019 to allow changes to REA III design. Development Consent DA 504-00 was granted in 2005 to expand operations and convert four explorations tenements into a new mining lease (ML 1583). There have been nine modification applications, the most recent modification 9 (MOD9) was granted in November 2022.

The Clarence Colliery holding includes Consolidated Coal Lease (CCL) CCL 705 and mining leases ML 1353, ML 1354, ML 1583 and ML 1721. Clarence Colliery undertake exploration activities in accordance with Exploration Licence (EL) 5072 and Authorisation (A) A307, A416 and A451. Underground mining at Clarence is undertaken in accordance with approved Subsidence Management Plans[1] (SMPs) which are prepared to satisfy the requirements of relevant mining authorities. Clarence operates under Environmental Protection Licence (EPL) 726, issued under the *Protection of the Environment Operations Act 1997* (POEO Act). The licence has an anniversary date of 1 January and allows four licenced discharge points (LDPs) and requires three dust monitoring points.

2.1 SCOPE

This Annual Review (AR) details the compliance and environmental management performance of Clarence over the Period 1 January 2022 to 31 December 2022. It has been prepared to demonstrate the sites performance and community engagement activities for Clarence. The AR has been prepared in accordance with the *Annual Review Guideline* (DPIE 2015), and satisfies:

- Schedule 5, Condition 5 of DA 504-00;
- Schedule A, General Terms of Approval of IRM. GE 76; and
- Reporting requirements of Extraction Plans / Subsidence Management Plans.

Subject to approval from the DPE, this AR will be available at the Clarence website https://www.centennialcoal.com.au/operations/clarence/

[1] MOD 7 approved the incorporation of Extraction Plan conditions to DA 504-00 to apply to areas that are not covered by an existing Subsidence Management Plan (refer to **Section 3.1.2**).

2.2 MINE CONTACTS

The contact details for the personnel responsible for environmental management and community relations at Clarence are provided in **Table 2-1**.

Table 2-1: Clarence Environmental Contact Details

Name	Position	Contact Details
Brian Nicholls	Mine Manager	T: 02 6353 8033
		E: brian.nicholls@centennialcoal.com.au
Matt Ribas	Environment & Community Coordinator	T: 02 6353 8039
		E: matt.ribas@centennialcoal.com.au
Community Information and Complaints Line		T: 02 6353 8010

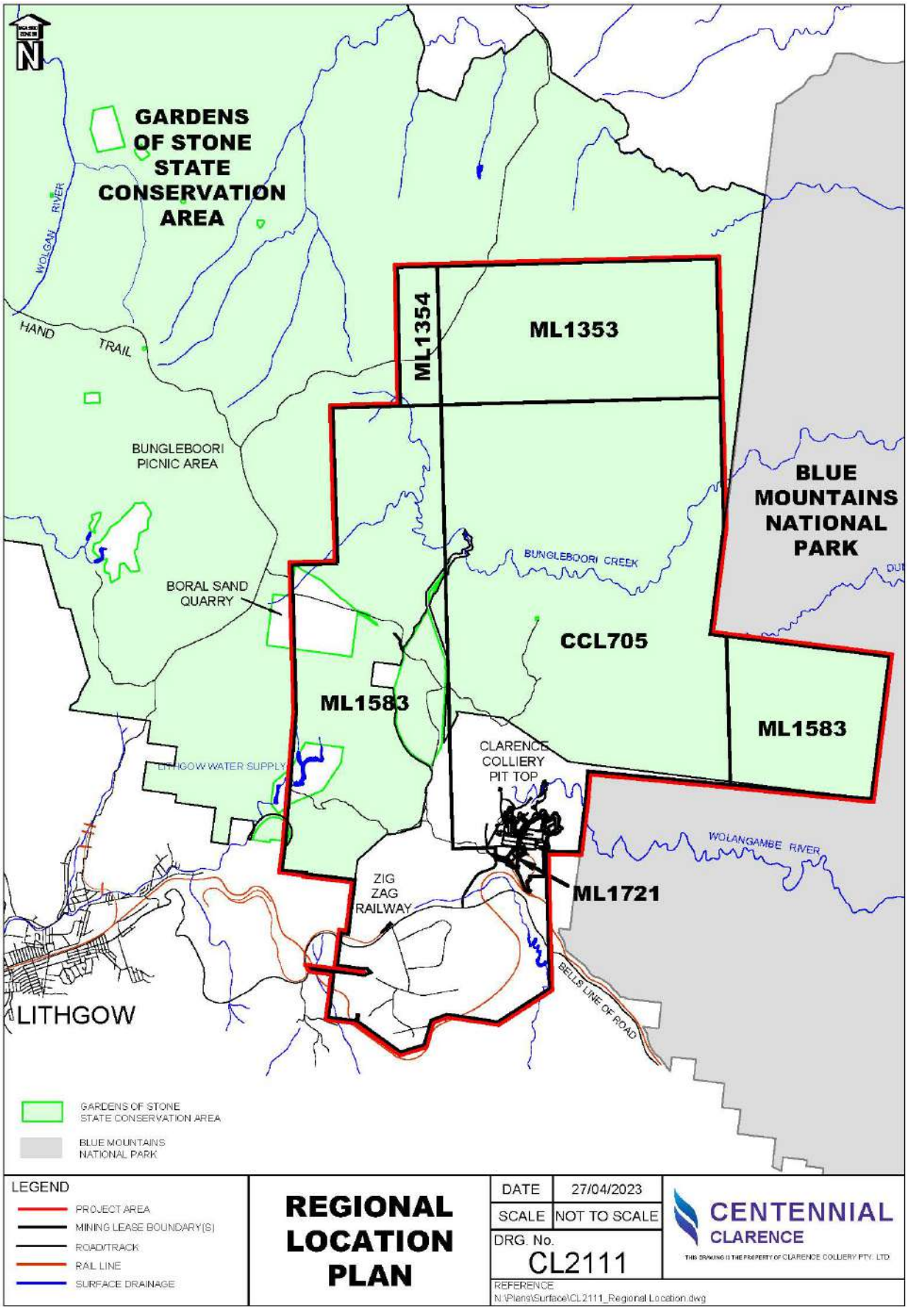


Figure 2-1: Regional Context & Site Layout

3 APPROVALS

3.1 PROJECT APPROVALS, MINING AUTHORISATIONS, AND OTHER LICENCES

A summary of Project Approvals, Mining Authorisations, and other Licences relevant to Clarence Colliery is provided in **Table 3-1**. Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at the Clarence Colliery website.[1]

Table 3-1: Environmental Approvals held by Clarence Colliery

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
Development Consent - Lithgow City Council			
IRM.GE.76	Original development consent – construction of surface infrastructure and mining operation	Perpetuity	No
	MOD 1 – amend the REAs		
	MOD 2 – REA 3 decommissioning and rehabilitation		
Development Consent 174/93	Extension of underground coal mining and surface REAs.	Perpetuity	No
	MOD 1 - Relocation of REA 5 access and associated vegetation clearing		
Project Approval - NSW Department of Planning and Environment (DPE)			
Development Approval DA 504-00	Extension of the Clarence Underground Coal Mine	31/12/2026	Yes (refer to Section 3.1)
	MOD 1 – Increased road haulage (withdrawn)		
	MOD 2 – REA VI		
	MOD 3 – Road haulage to the west		
	MOD 4 – Road haulage to Mt Piper Power Station		
	MOD 5 – Manning increase		
	MOD 6 – CCR transfer to Chabon via rail		
	MOD 7 – Addition of Extraction Plan conditions		
	MOD 9 - Temporary Coal Transport Modification		
Subsidence Management Plans			
SMP	700 Area (Variation 6)	01/06/2025	No
SMP	900 Area (Variation 6)	24/12/2025	Yes (refer to Section 6.8)
SMP	800 Area (Variation 7)	24/12/2025	No

[1] https://www.centennialcoal.com.au/operations/clarence/

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
Mining Leases – NSW Resource Regulator (RR)			
ML 1353	Title to Northern Mining Area includes some surface land, some environmental conditions	21/07/2036	Yes (refer to **Section 3.1.1**)
ML 1354	Title to Mining Area adjacent to ML1353 includes some surface land, some environmental conditions	21/07/2036	Yes (refer to **Section 3.1.1**)
ML 1583	Title to 700 & 800 Area Workings include some surface land, some environmental conditions	9/07/2027	Yes (refer to **Section 3.1.1**)
ML 1721	Surface Lease to some of the Pit Top Area includes some environmental conditions	7/12/2036	Yes (refer to **Section 3.1.1**)
Consolidated Coal Leases (CCL) - RR			
CCL705	Title to Central Workings includes some surface land, some environmental conditions	20/12/2026	Yes (refer to **Section 3.1.1**)
Exploration Authorisations - RR			
Exploration Licence (EL) EL5072	Exploration License for 800 area	31/07/2022[1]	No
Authorisation 307	Exploration License for Southern areas of Workings	24/08/2019[1]	No
Authorisation 416	Exploration License for Western area of Workings	24/08/2025	No
Authorisation 451	Exploration License for Northern area of Workings	24/08/2019[1]	No
Rehabilitation Management Plan (RMP) – RR			
RMP	RMP as required by the Mining Amendment Regulation & DA 504-00	Perpetuity (Version Date 29/07/2022)	Yes (refer to **Section 3.1.1**)
Annual Rehabilitation Report & Forward Program (ARR&FP) – RR			
ARR&FP	ARR&FP as required by the Mining Amendment Regulation	1/07/2024	Yes (refer to **Section 3.1.1**)
Environmental Protection Licence - NSW Environment Protection Agency (EPA)			
EPL726	Environment Protection License	Renewed Annually 1st of January	No
Water Licences – DPE Water			
Bore Licences			
CLRP1	10BL161964	Perpetuity	No
CLRP2	10BL161965		No
CLRP3	10BL602213		No

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
CLRP4	10BL161962		No
CLRP5, CLRP7, CLRP10	10BL602211		No
CLRP6	10BL602212		No
CLRP 12	10BL604063		No
CLRP 11, 13, 14	10BL604099		No
CLRP 17, 20	10BL605316		No
CC114	10BL602819		No
HV1, HV2, HVU1, HVU2	10BL603337		No
Bore Licence	10BL605494		No
CLRP18,22	10BL605612		No
Bore Licence	10BL156676		No
Bore Licence	10BL161963		No
Water Supply Works			
Surface Licence Main Dam	10WA118714	30/06/2024	No
WAL 36479	10WA118758	11/12/2027	No
Water Supply Works	10WA10715	18/05/2026	No
Water Access Licence			
Water Access Licence	10AL122285	Perpetuity	No
Water Access Licence	WAL41882		No
Water Access Licence	WAL36479		No
Joint Water Supply Works			
Joint Water Supply Works	10WA103852	29/07/2027	No
Joint Water Supply Works	10UA103853	29/07/2027	No
Surface Authority			
Surface Authority	10SA001409	30/09/2017	No

Approval	Description	Expiry Date	Change during Reporting Period (Y/N)
Threatened Species Licenses – DPE Biodiversity, Conservation and Science Directorate (BCS)			
Section 95 Certificate C0002449	Installation and operation of two shallow piezometers within Paddys Swamp	31/12/2026	No
Threatened Species Licence C0003012	Installation and operation of one shallow piezometer within Oleria Swamp	22/09/2022	No
Threatened Species Licence C0004884	Installation of two shallow piezometers and two soil moisture probes within Pagoda Swamp	31/12/2026	No
Threatened Species Licence C0006510		31/12/2026	No
State Rail Authority			
Q648-100	Access Agreement	Life of Rail Loop	No
Forestry Corporation of NSW			
PB54303	Occupation Permit (Lv2)	Renewed Annually	No
WorkCover Authority NSW			
NDG020999	Dangerous Goods Permit	Perpetuity	No
NSW EPA			
RML 5078394	Radiation Management Licence	08/02/2023	No

Notes: [1] Expired ELs, renewals sought.

3.1.1 Changes During the Reporting Period

The following changes to Approvals, Mining Tenements, and other Licences occurred during the Reporting Period.

- On 2 July 2021, the Department of Regional NSW - RR commenced its Rehabilitation Reforms through an amendment to the Mining Regulations 2016 (Mining Regulations), via the NSW Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 (Mining Amendment Regulation).

  The Rehabilitation Reforms have effectively superseded the previous requirement under a Mining Lease to prepare a Mining Operations Plan (MOP) for any mining activity to be undertaken and to hold an appropriate security for the rehabilitation activities required to achieve the final landform.

To satisfy the Rehabilitation Reforms and Condition 29, Schedule 3 of DA 504-00, Clarence prepared a Rehabilitation Management Plan (RMP). The RMP also satisfies the requirements of its various mining leases.

The RMP was prepared in accordance with the NSW Resources Regulator (NSW RR) Form and Way-Rehabilitation Management Plan for Large Mines (NSW RR, July 2021) required under the Mining Regulation 2016 and submitted on the 29 July 2022 via the NSW RR Portal.

Annual reporting requirements in the RMP will be reported in the Annual Rehabilitation Report and Forward Program (ARR&FP) and submitted using the online form accessible via the NSW Resource Regulator's mine rehabilitation portal. The ARR&FP also sets out WCS the three-year forecast for mining and rehabilitation schedule.

- On 16 August 2022, Clarence received variations (which took effect on 17 October 2022) for all mining authorisations (including, ML 1353, ML 1354, ML 1583, ML 1721 and CCL705) to align with the prescribed standard conditions in the Mining Regulation 2016, Schedule 8A, Part 2.
- On the 17 November 2022, Modification 9 (MOD9) to DA 504-00 was granted by the DPE to re-instate its temporary ability to truck increased coal volumes (up from 100,000 tpa to 200,000 tpa) directly to Mount Piper Power Station from the Clarence Colliery until 31 December 2023.

3.1.2 Extraction Plan / Subsidence Management Plan Status

Subsidence Management Plans (SMP's) were a condition of the mining leases and approved under the Mining Act 1992. Underground mining at Clarence Colliery is undertaken in accordance with approved SMP's which are prepared to satisfy the requirements of relevant mining authorities (refer to **Table 3-1**).

DA 504-00 (MOD7) included the addition of conditions for future secondary extraction at Clarence to be undertaken in accordance with an approved Extraction Plan. At the time of preparing this 2022 Annual Review, a new Extraction Plan for 700 Shortwall Areas was under preparation and anticipated for submission into the DPE for approval in the next Reporting Period.

3.2 ANNUAL REPORTING REQUIREMENTS

Appendix 1 provides a checklist of statutory reporting requirements and performance conditions addresses within the Annual Review.

In accordance with Condition 11, Schedule 5 of DA 504-00 a copy of the 2022 Annual Review, once approved by the DPE, will be provided on the Clarence website: https://www.centennialcoal.com.au/operations/clarence/

4 OPERATIONS SUMMARY

4.1 PRODUCTION

Details of production and associated waste generated by the site for the report period and next reporting is provided in **Table 4-1**. A summary of the other operations and coal processing, handling and transport relevant to Clarence Colliery is provided in **Table 4-2**. There were no inconsistencies between the approved limit and actual production for the Reporting Period.

Table 4-1: Production Summary & Forecast

Material	Approved Limit	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock / Overburden	N/A	N/A	N/A	N/A
ROM Coal	3,000,000 TPA	1,654,309 (T)	1,576,995 (T)	1,800,782 (T)
Coarse reject	250,000 TPA*	143,652 (T)	199,636 (T)	118,144 (T)
Fine reject (tailings)	N/A	0	0	0
Saleable Product	N/A	1,532,536 (T)	1,421,793 (T)	1,800,782 (T)

TPA = Tonnes Per Annum.
*Approval limit of 250,000T Coarse Coal Rejects (CCR) applies to emplacement within REA IV only.

Table 4-2: Other Operations

Approved Operation	Approved Limit	Previous Reporting Period (Actual)	This Reporting Period (Actual)
Hours of Operation	24/7	24/7	24/7
Transport (rail)	N/A	1,936,232 (T)	1,216,293 (T)
Transport (road)	300,000 TPA*	148,435 (T)	163,970 (T)

24/7 = 24hrs a day/7 days a week.
TPA = Tonnes Per Annum.
* in accordance with Condition 7AA in Schedule 2 of DA 504-00, until 31 December 2023, Clarence may transport up to 300,000 tonnes of coal by road per calendar year in total, including up to 200,000 tonnes of coal by road per calendar year to the Mount Piper Power Station or to the Lidsdale Siding, and up to 200,000 tonnes of coal by road per calendar year to locations north of Sydney or Eastern NSW

Table 4-3: Coal Processing, Handling and Transport Summary

Month	Product Transported via Rail	Product Transported via Road
January 2022	30,806	12,692
February 2022	101,737	15,884
March 2022	88,648	16,188
April 2022	183,519	11,514
May 2022	108,863	15,770
June 2022	81,780	16,378
July 2022	22,184	14,858
August 2022	91,278	23,028
September 2022	128,354	10,868
October 2022	97,970	9,576
November 2022	149,372	9,652
December 2022	131,782	7,562
Total 2022	**1,216,293**	**163,970**

4.2 MINING OPERATIONS

During 2022, the following mining activities included:

- 800 Area:
    - Development of the 805 panel continued;
    - Development of the 804 panel re-commenced;
    - Extraction of the 822 panel was commenced and completed;
    - Extraction of the 821 panel was commenced;
- 900 Area:
    - Development of the 906 panel was completed;
    - Extraction of the 906 panel was commenced;
    - Development of the 919 panel was commenced;
    - Development of the 915 panel was completed; and
    - Extraction of the 915 panel was completed

The mining activities completed during the Reporting Period are displayed in **Plan 1**.

REA V stage 1 remained in operational use during the 2022 reporting period with all the activities undertaken being within the HRA consent conditions as submitted Aug 2016.

4.3 EXPLORATION

The Clarence Colliery 900 West Exploration Program was commenced with two exploration boreholes completed during the 2022 reporting period.

The program consists of four (4) boreholes, titled CLRP40 – CLRP43, planned across the north-west of the Clarence title area, within ML 1583. Each borehole within the program will intersect and recover the Katoomba seam as a minimum. All recovered coal core will be analysed for coal quality. Select core samples will be taken for geotechnical analysis and each borehole will be geophysically logged.

All drill sites will be rehabilitated following drilling and boreholes sealed appropriately.

4.4 LAND DISTURBANCE

There was no land disturbance outside of the REA V stage 1 design boundary and construction was completed as per the HRA consent conditions.

4.5 CONSTRUCTION

There were no construction activities at the site during the Reporting Period.

4.6 NEXT REPORTING PERIOD

During 2023, the following mining activities plan to be undertaken:

- Development of the 804 panel;
- Development of the 805 panel;
- Extraction of the 801 South panel;
- Extraction of the 906 panel;
- Development of the 919 panel.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 5-1 summarises the outcomes of the 2021 Annual Review, including actions issued by the relevant government departments and actions taken by Clarence.

The DPE provided feedback of the 2021 Annual Review regarding additional reporting requirements for future Annual Reviews to address community concern in relation to the status and management of biodiversity areas and the reporting of greenhouse gas management measures.

Table 5-1: Actions from Previous Annual Review

Action Required	Requested By	Action Taken	Annual Review Section
Regulator Requirements			
Report on the status of the long-term security arrangement for biodiversity offsets required by the development consent for the mine. Please include information on the type(s) of long-term security arrangements that have been implemented and/or are to be implemented for the mine.	DPE	Western Region Biodiversity Offsets Strategy (WR-BOS) approved by DPE.	**Section 6.6.6**
Report on greenhouse gas emissions for the Reporting Period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. Please ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same.	DPE	Dedicated section included within 2022 AR.	**Section 6.5**
Report all reasonable and feasible steps undertaken during the Reporting Period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine.	DPE	Dedicated section included within 2022 AR.	**Section 6.5**

6 ENVIRONMENTAL PERFORMANCE

Clarence implements an Environmental Management Strategy, including management plans, procedures and monitoring programs that provide a framework for managing environment and community risks and impacts.

To measure compliance with site approvals and licences, Clarence undertakes a comprehensive monitoring program. The environmental monitoring program is shown in **Figure 6-1**.

This section provides a summary of environmental performance in the Reporting Period, including:

- Section 6.1 – Meteorological Summary
- Section 6.2 – Noise
- Section 6.3 – Blasting
- Section 6.4 – Air Quality
- Section 6.5 – Greenhouse Gas Monitoring
- Section 6.6 – Biodiversity
- Section 6.7 – Heritage
- Section 6.8 – Subsidence
- Section 6.9 – Other Matters; including:
    - Section 6.9.1 – Waste

Note, there are separate sections for reporting the environmental performance for water (**Section 7**), rehabilitation (**Section 8**), and community aspects (**Section 9**).

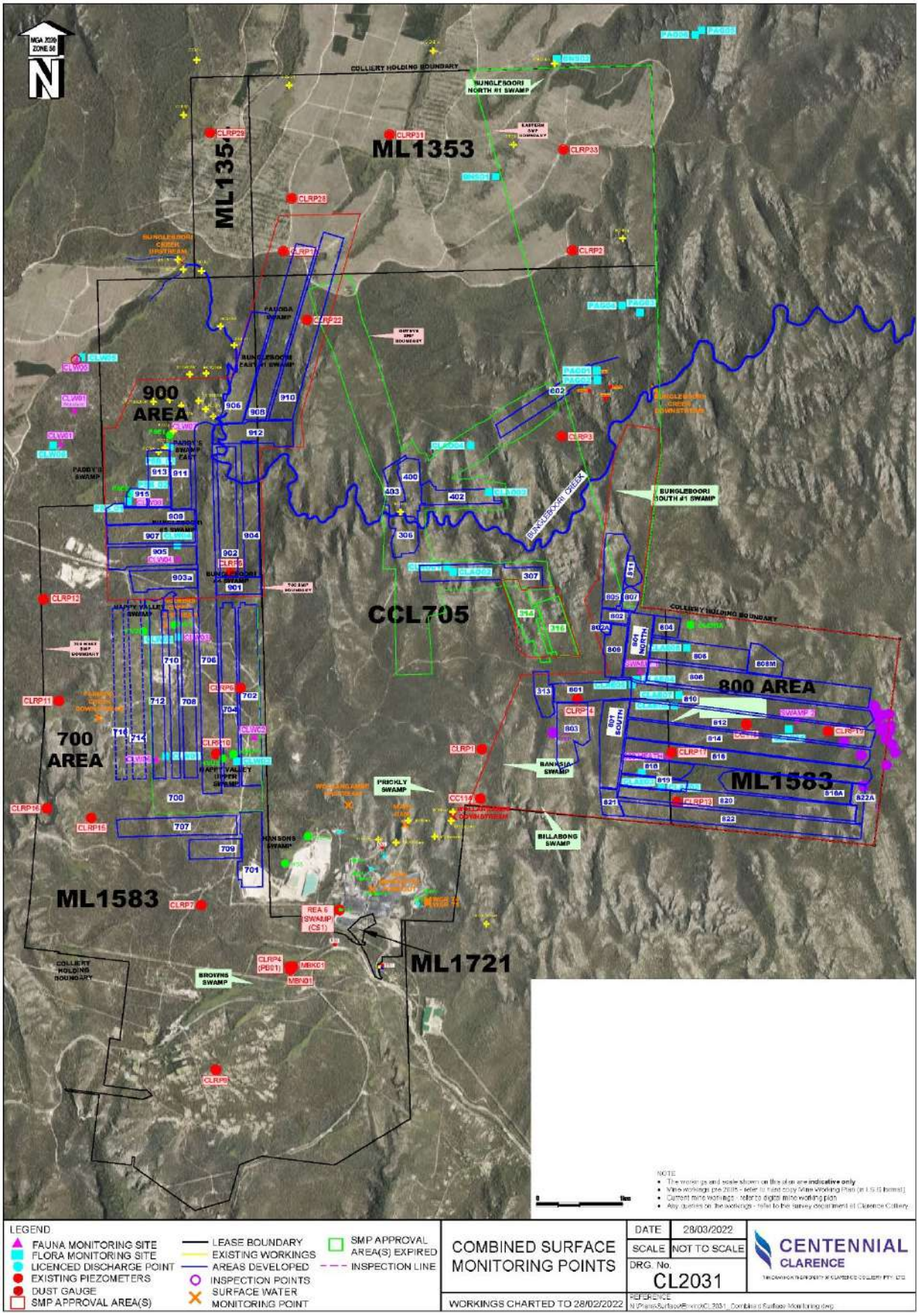


Figure 6-1: Clarence Environmental Monitoring Program

6.1 METEOROLOGICAL SUMMARY

Meteorological monitoring is undertaken at the Clarence Automated Weather Station (AWS). The weather station is required under M5.1 of EPL726 and Schedule 3, Condition 17 of DA 504-00.

A meteorological summary is presented below in **Table 6-1** and graphically in **Figure 6-2.** Clarence recorded a total rainfall of 1556.4mm during the Reporting Period. July had the highest rainfall of 247.2mm, with the lowest rainfall recorded, 65.6mm during December. The minimum temperature at Clarence Colliery was during July at -2.5°C. The maximum recorded temperature was 30.03°C during January.

Wind direction and speed is continuously measured at the Clarence AWS. The wind direction was predominantly from the west-south-westerly direction throughout the Reporting Period. These trends are displayed in **Figure 6-3.**

Table 6-1: Meteorological Summary at Clarence Colliery

Month (2022)	Rainfall (mm)	Cumulative Rainfall (mm)	Min Temperature (Deg C)	Max Temperature (Deg C)
January	181.4	181.4	10.5	30.0
February	103.6	285	7.4	28.5
March	317.4	602.4	8.5	26.1
April	105.8	708.2	6.3	22.7
May	97	805.2	8.1	20.8
June	12.6	817.8	-1.1	13.7
July	247.2	1065	-2.6	15.4
August	68	1133	-1.1	16.8
September	114.4	1247.4	0.6	17.7
October	151	1398.4	4.1	13.9
November	92.4	1490.8	2.8	16.1
December	65.6	1556.4	5.7	21.5

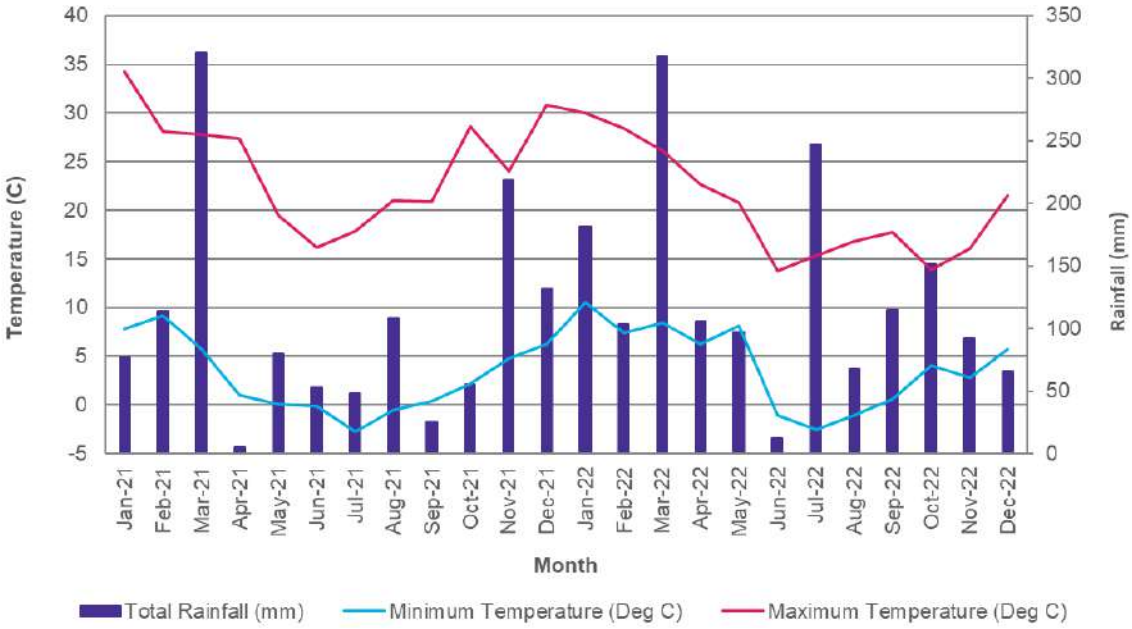


Figure 6-2: 2022 Rainfall and Temperature Summary

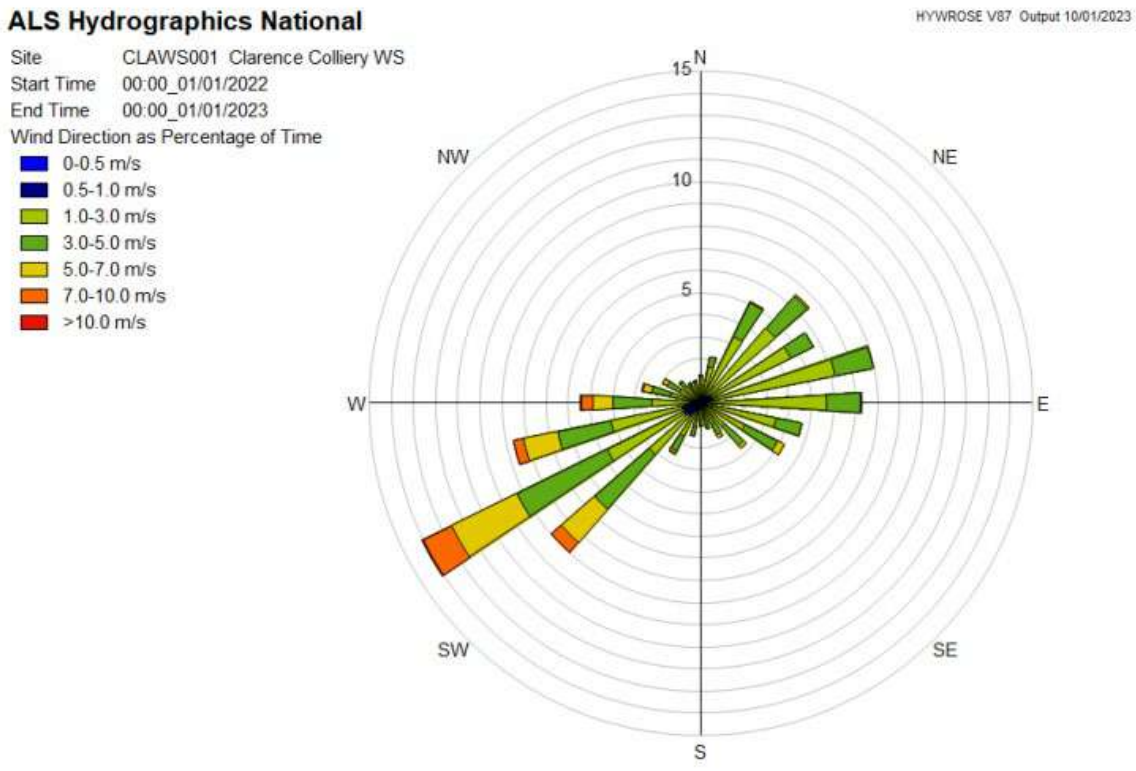


Figure 6-3: Wind Rose Plot for Clarence AWS 2022

6.2 NOISE

6.2.1 Environmental Management

Clarence Colliery manages noise in accordance with the Western Region Noise Management Plan (WRNMP) dated February 2021. This plan was approved by DPIE 15 Feb 2021. The following sources of noise identified in the WRNMP are relevant for Clarence Colliery operations:

- Operation of mobile equipment – e.g. trucks, dozers, loaders;
- Coal handling and preparation plant (CHPP);
- Train loading operations and rail loop;
- Coal transporting activities – e.g. overland conveyors, haul trucks, rail; and
- Ventilation fans.

Key noise mitigation measures for Clarence Colliery include:

- Maintaining all plant and equipment to manufactures specifications.
- Operate mobile plant in a quiet, efficient manner and regular training of operators.
- Installation of frequency modulated reversing alarms or “quakers” on mobile plant to replace reversing alarms.
- Installing acoustic enclosures around processing plants.
- Switching off vehicles and plant when not in use.

6.2.2 Environmental Performance

In accordance with DA 504-00 and EPL 726 noise monitoring is undertaken annually at CNM1 as required by the WRNMP. Clarence annual monitoring (attended) commenced on Tuesday 29 November 2022 and concluded on Wednesday 30 November 2022. Supplementary attended noise monitoring was also conducted at C3.

The noise assessment and analysis of the measured data has shown that Clarence Colliery noise emission levels followed the noise limits at all monitoring locations during the day, evening and night-time noise monitoring periods during the survey.

Table 6-2: 2022 Attended Noise Monitoring Results

Receiver ID	Time of Day	Performance criteria dB(A) Laeq (15 min)	Performance during the Reporting Period (actual) dB(A)L
CNM1	Day	38	38
	Evening	36	<33
	Night	35	<35**

Notes: (a) The noise criteria do not apply where the Applicant and the affected landowner have reached a negotiated agreement in regard to noise, and a copy of the agreement has been forwarded to the Planning Secretary and EPA. (b) Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017) ** Based on the measured estimated contribution at C3 at Clarence operations were not audible during the measurement.

6.2.3 Comparison Against Predictions

Noise modelling emissions were completed for MOD2 Environmental Assessment for REA 6 (2013). MOD2 EA predicted noise emissions will not significantly increase or decrease during construction of REA VI and will be similar to the typical emissions during mine operations. Noise emissions from construction activities are predicted to fall considerably within the relevant construction noise criteria (GHD 2013).

The Clarence Colliery Modification 5 Statement of Environmental Effects (SEE) (EMM 2019) was prepared to modify DA 504-00 to increase the number of full-time equivalent personnel at Clarence Colliery from 300 to 400. This SEE is being used as the two subsequent modification reports are to implement transfer of Coarse Coal Reject (CCR) to Charbon Colliery (MOD 6) and to provide extraction plan conditions for the site moving forward (MOD 7). These two projects have not yet been implemented at Clarence and therefore the predictions are not yet applicable.

Section 7.4 of the SEE states that the modification does not include any demolition of surface activities which may general additional noise or vibration impacts. Therefore, the noise environment should remain unchanged from previous years (EMM 2019).

For MOD9, a modification report prepared by James Bailey & Associates Pty Ltd (JBA). Previous modifications have assessed the noise impacts of truck haulage from Clarence, including up to 40 truck movements per day as proposed by this Modification. Consistent with the findings of previous assessments, the proposed additional truck movements from Clarence would not increase the approved noise levels in a 15 minute assessment period. Rather, the trucks movements will be experienced over a greater number of days per year. Accordingly, the predicted noise levels from Clarence to receptors, expressed as LAeq, 15min level for direct comparison with the DA 504-00 noise criteria, would therefore remain unchanged (JBA 2022).

There were no exceedance of the noise criteria during the Reporting Period. The noise predictions in MOD2, MOD5 and MOD9 were upheld during the Reporting Period.

6.2.4 Long Terms Analysis

A summary of exceedances recorded at Clarence Colliery over the last 5 years is presented below in **Table 6-3**. There have been no exceedances at Clarence Colliery during this time period.

As displayed in **Figure 6-4** to **Figure 6-6** , the attended noise monitoring results have not exceeded the relevant noise criteria since 2017.

Table 6-3: Summary of Exceedances from CNM1 2018 – 2022

	2018	2019	2020	2021	2022	Total
Day	0	0	0	0	0	0
Evening	0	0	0	0	0	0
Night	0	0	0	0	0	0

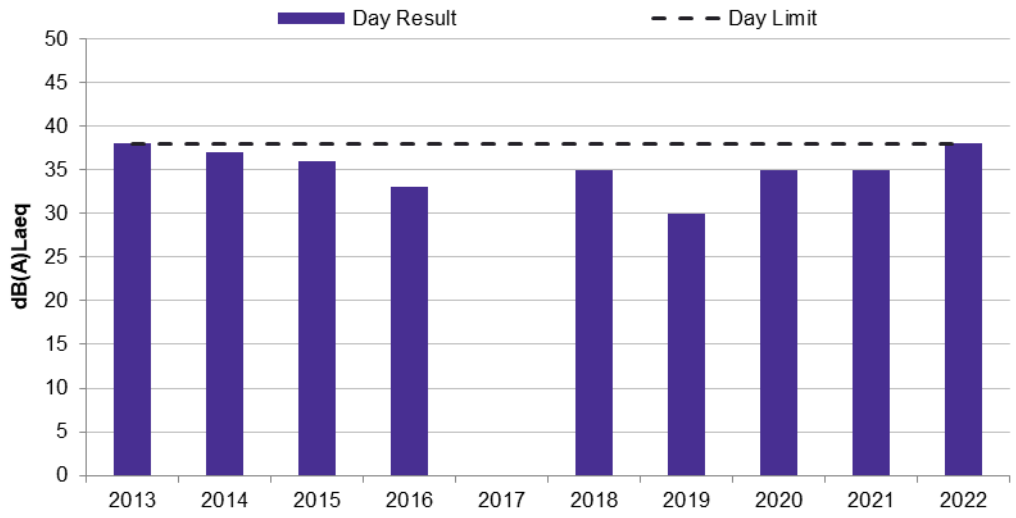


Figure 6-4: Day Noise Monitoring Summary (2013 to 2022)

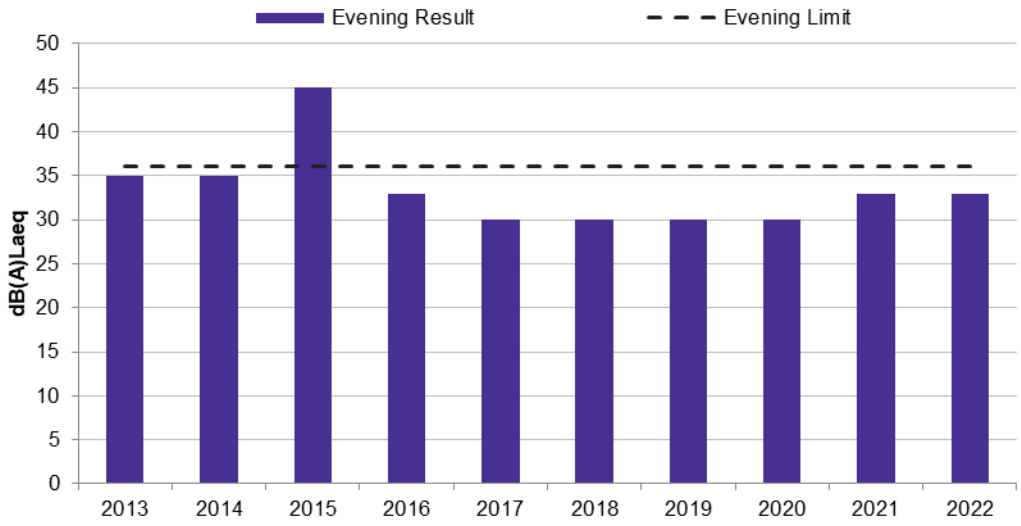


Figure 6-5: Evening Noise Monitoring Summary (2013 to 2022)

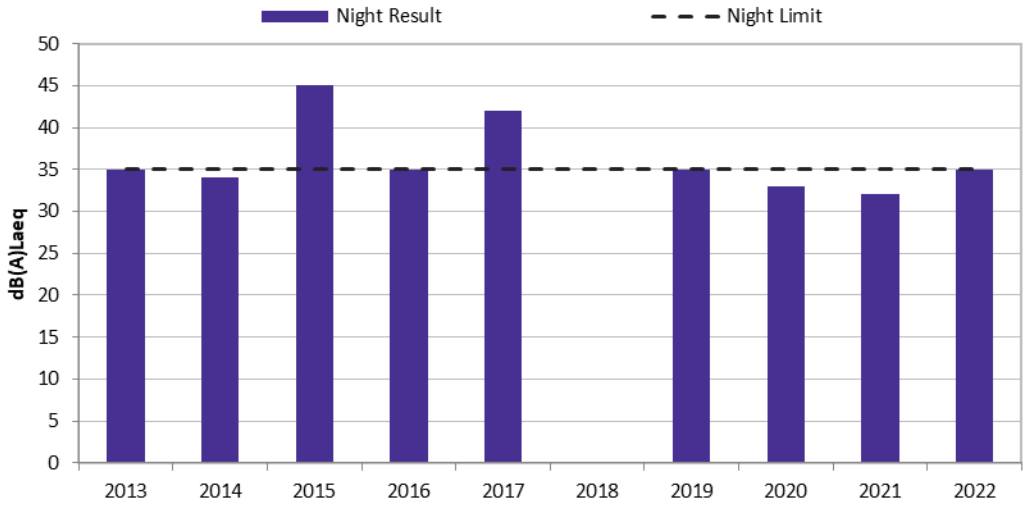


Figure 6-6: Night Noise Monitoring Summary (2012 to 2022)

6.2.5 Implemented / Proposed Improvements

Clarence Colliery has previously installed a reinforced noise barrier at the rotary breaker to shield the hopper to mitigate any potential noise from this source.

Noise management controls are considered effective based upon compliance with the noise criteria. Clarence will continue to implement the WRNMP.

A sound power level assessment was proposed to be conducted during the 2022 reporting period to determine possible areas of improvement associated with the equipment currently in service at Clarence. This monitoring assessment was postponed during the reporting period and will now be undertaken in 2023.

6.3 BLASTING

There was no blasting carried out at Clarence Colliery in the 2022 Reporting Period.

6.4 AIR QUALITY

6.4.1 Environmental Management

Clarence Colliery monitors air quality aspects in accordance with the *Western Region Air Quality and Greenhouse Gas Management Plan, 2021* (AQGHGMP), as required by Condition 14 Schedule 3 of DA 504-00. Impact assessment criteria for air quality aspects is outlined in Condition 13, Schedule 3 of DA 504-00. Monitoring requirements are also specified in Condition M2.2 of EPL 726.

Key dust mitigation measures for Clarence Colliery operations include:

- Signage to display speed limits on all unsealed roads in the surface facilities area;
- A water truck on unsealed areas during use or windy conditions; and
- Water sprays (sprinkler system) on main roads and the coal product stockpile during dry and windy conditions.

All mitigation measures identified in the AQGHGMP are utilised as required and implementation of appropriate dust controls are triggered by a range of methods, including:

- Dust monitoring results, indicating an elevated level of dust beyond the site boundary;
- Site inspections and observation of visible dust plumes; and
- Meteorological data from the Pit Top weather station.

Clarence Colliery operates in accordance with the Trigger Action Response Plan (TARP) provided in Section 5.2 of the AQGHGMP.

As required by the AQGHGMP, current dust monitoring consists of:

- Three dust deposition gauges, collected monthly; and
- High Volume Air Sampler (HVAS) which measures PM_{10} and total suspended particulate (TSP), operating over two months of a calendar year.

The Air Quality Monitoring Locations at Clarence Colliery are displayed in **Figure 6-7** and outlined in **Table 6-4**.

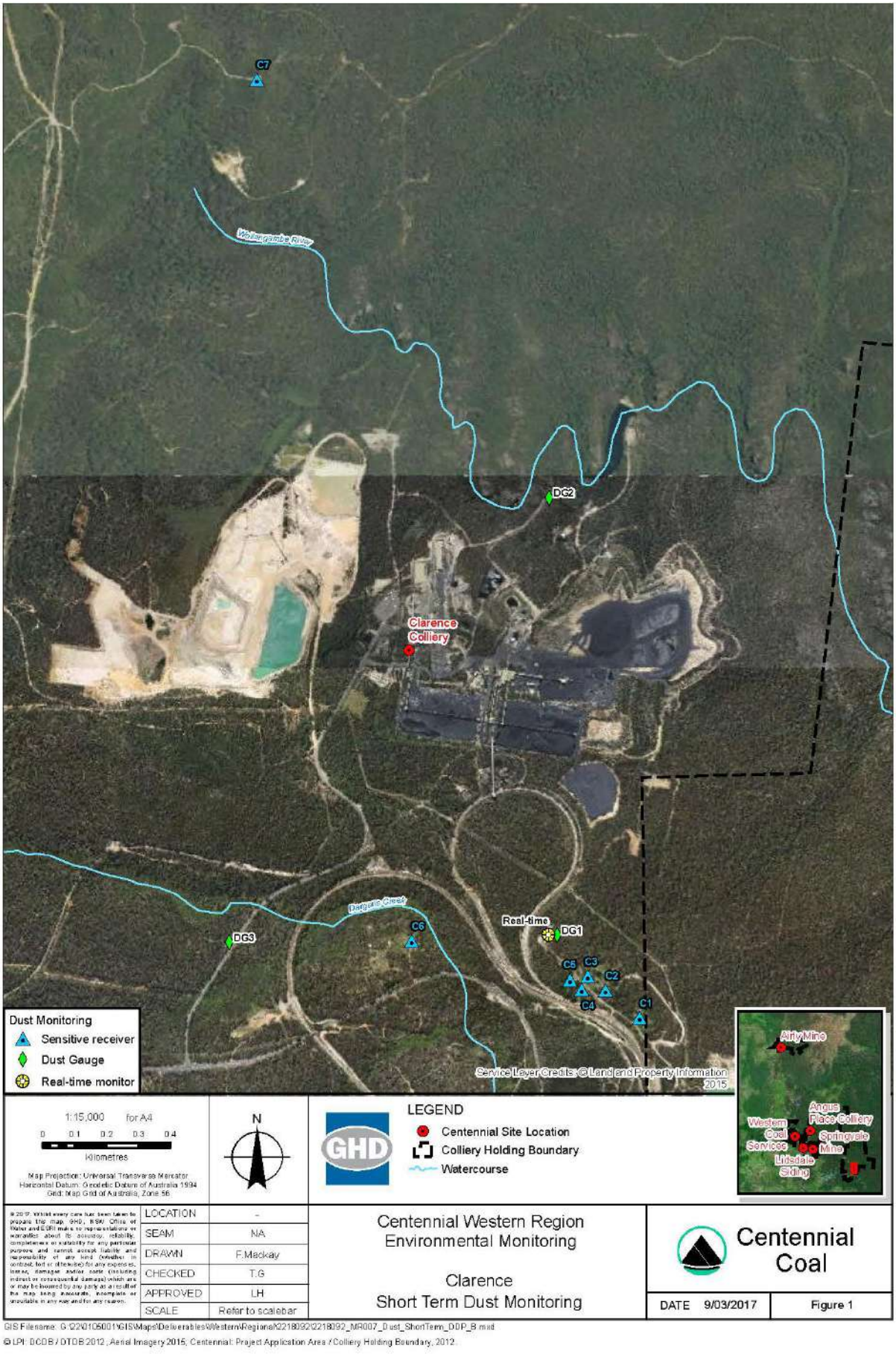


Figure 6-7: Clarence Air Quality Monitoring Locations

Table 6-4: Clarence Colliery Air Quality Monitoring Locations

Monitoring Point Reference	Description / Location
DG1	Located south-east of Clarence Operations
DG2	Located on the northern side of Clarence Operations
DG3	Located south-west of Clarence
TEOM	Located south-east of Clarence Operations

6.4.2 Environmental Performance

Schedule 3, Condition 13 of DA 504-00 provides the air quality criteria at any residence on privately owned land in **Table 6-5**, **Table 6-6** and **Table 6-7**.

Table 6-5: Long Term Criteria for Deposited Dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month

Table 6-6: Short Term Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Particulate matter < 10 µm (PM_{10})	24-hour	50µg/m^3

Table 6-7: Long Term Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Total suspended particulate matter (TSP)	Annual	90µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	25µg/m^3

Notes: (a) Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method. (b) The air quality criteria in Tables above do not apply where the Applicant and the affected landowner have reached a negotiated agreement in regard to air quality, and a copy of the agreement has been forwarded to the Planning Secretary and EPA.

Depositional Dust

A summary of monthly data for insoluble solids at DG1, DG2 and DG3 is shown in **Table 6-8**. The deposition dust results for 2022 ranged from between <0.1 g/m^2/month and 2.3 g/m^2/month, with the lowest being at DG2 during the month of January and the highest being at DG3 during the month of September. **Figure 6-8** displays the rolling annual average of dust deposition for 2022.

The annual averages for deposited dust are below the annual criterion of 4g/m^2/month (**Table 6-8** and **Figure 6-8**) and remain complaint with the limits in the DA 504-00 and the AQGHGMP.

DG2 is the background dust gauge while DG1 and DG3 are the compliance monitoring points. The AQGHGMP stipulates air quality criteria of no more than a 2 g/m^2/month increase above the background dust gauge. The maximum increase against the background was 2.0g/m^2/month recorded by DG3 in September, which is below the air quality criteria (i.e. no more than 2g/m^2/month increase).

Table 6-8: Monthly Summary of Insoluble Solids g/m^2/month during 2022

Month	DG1	DG2	DG3	Criteria
January	0.2	<0.1	0.6	maximum 2g/m^2/month increase against the background (DG2)
February	0.2	0.1	0.4	
March	0.2	0.2	0.2	
April	0.2	0.1	0.4	
May	0.2	0.3	0.3	
June	0.2	0.3	0.5	
July	0.3	*	0.5	
August	0.3	0.3	1.5	
September	0.5	0.3	2.3	
October	0.6	0.6	1.0	
November	0.5	0.1	0.7	
December	1.7	0.5	1.2	
Annual Average	**0.4**	**0.3**	**0.8**	4 g/m^2/month

Notes: *Depositional Dust Gauge D2 damaged during the month of July, no sample available results for the July

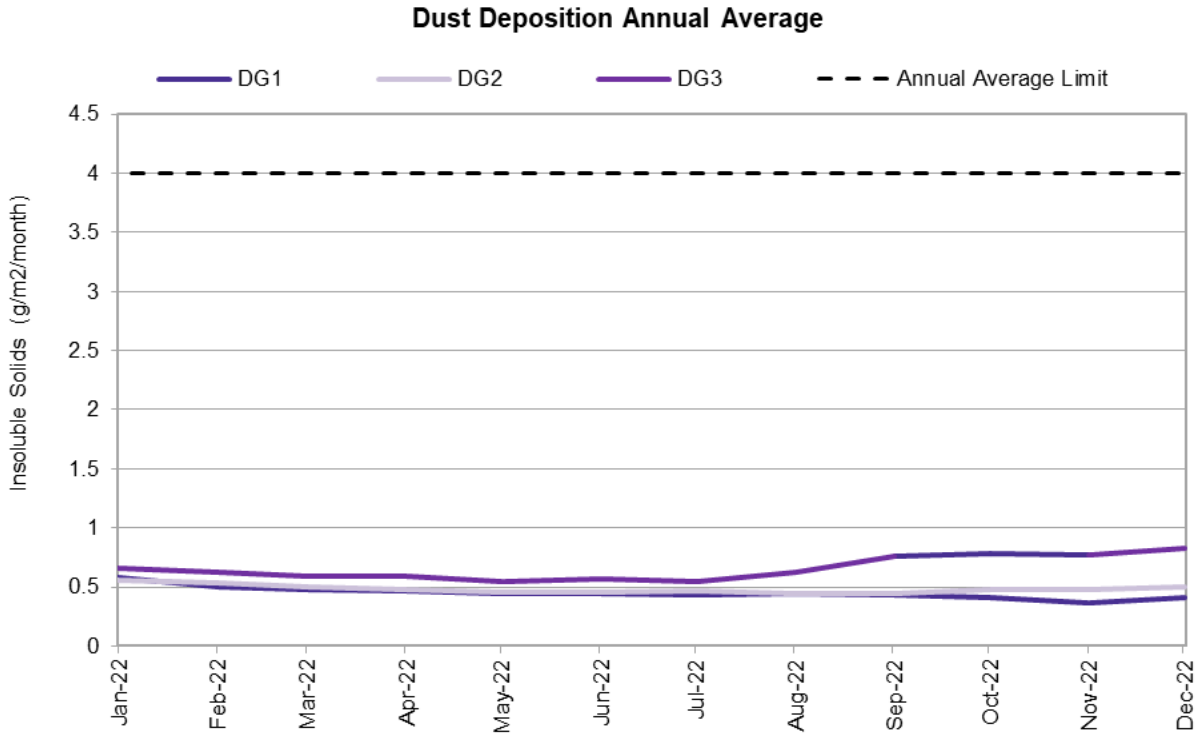


Figure 6-8: 2022 Depositional Dust Annual Results

PM_{10} and TSP

Real time air quality monitoring for PM_{10} utilises a TEOM unit (as shown on **Figure 6-7**).

Table 6-9 presents the PM_{10} and TSP monitoring results obtained during the Reporting Period. **Figure 6-9** and **Figure 6-10** displays the monitoring results for 2022, including the rolling annual average, of PM_{10} and TSP respectively.

The 24hr average and annual average results for PM_{10} are below the criterion of 50µg/m^3 and 25µg/m^3 respectively (**Table 6-9** and **Figure 6-9**) and remain complaint with the limits in DA 504-00 and the AQGHGMP.

The annual average results for TSP are below the criterion of 90µg/m^3 (**Table 6-9 and Figure 6-10**) and remain complaint with the limits in DA 504-00 and the AQGHGMP. The TEOM unit PM_{10} data capture rate was 83% during the Reporting Period, primarily due to power outages, damaged filters and equipment tampering by unknown persons.

Table 6-9: 2022 Results Particulate Matter

	Criteria (µg/m^3)	Maximum (µg/m^3)	Mean (µg/m^3)
24hr PM_{10} (short term)	50	36.6	N/A
PM_{10} (long term)	25	N/A	4.4
Estimated TSP[1]	90	N/A	13.6

[1] A ratio of PM_{10} and TSP is used to estimate TSP contributions. For Clarence a ratio of 0.40 is used to calculate compliance with the TSP criteria from the PM_{10} data.

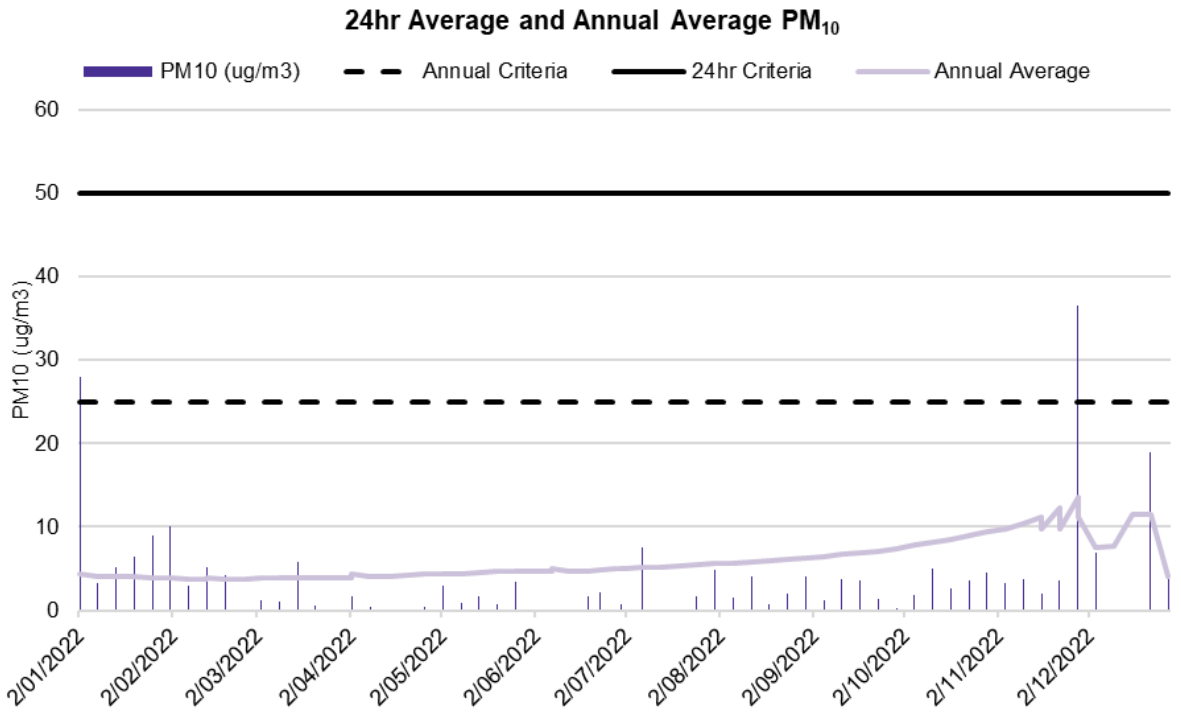


Figure 6-9: 24hr and Annual Average PM_{10}

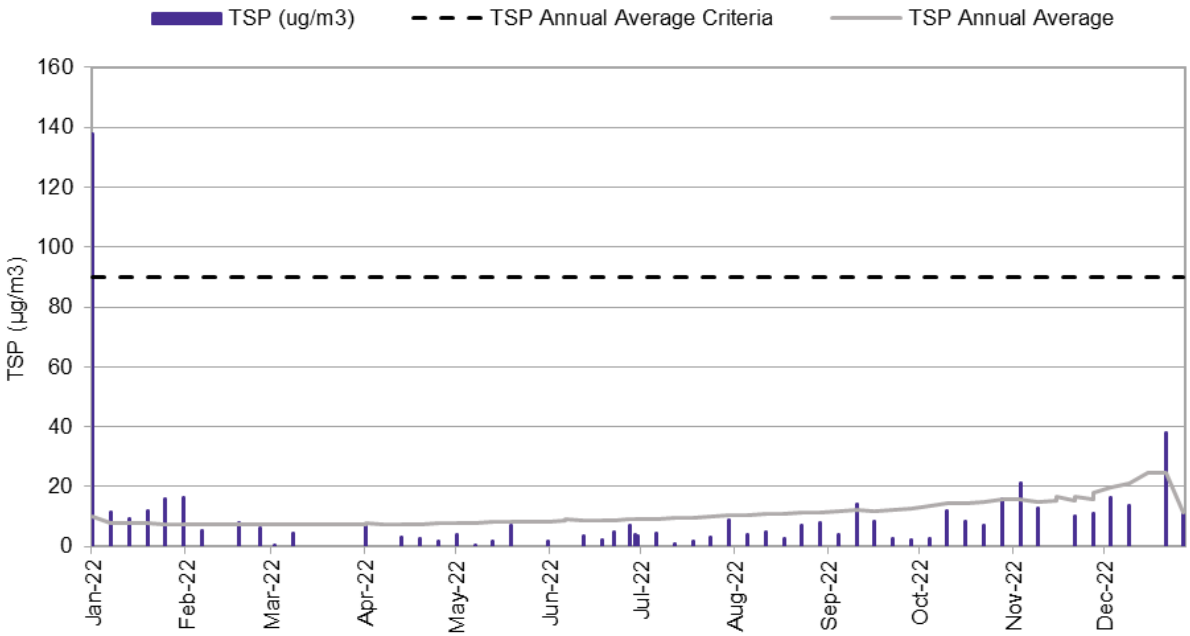


Figure 6-10: Annual TSP Summary Results at HVAS

6.4.3 Comparison Against Predictions

Dispersion modelling predictions of dust deposition rates and TSP and PM_{10} were completed for the MOD2 Environmental Assessment for Reject Emplacement Area (REA) VI by SLR (2013) and are shown in **Table 6-10**.

The results of the air quality modelling (SLR, 2013) show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM10, PM2.5 and dust deposition) were below the applicable impact assessment criteria at all assessment locations for all modelled scenarios (GHD 2013).

The modification report for MOD9, identified there will be a small increment in particulate emissions from the additional trucks being loaded and unloaded, however this is unlikely to result in an exceedance of air quality criteria (JBA 2022).

All air quality monitoring results are well below annual criteria and consistent with predicted results.

Table 6-10: Predicted Air Quality Concentrations

Parameter	Averaging Period	Assumed Background Ambient Level	Predicted Air Quality Concentrations (Background + Project)[1]
Deposited Dust[2]	Annual	2 g/m²/month	2.1 g/m²/month
TSP[3]	Annual	18.5 µg/m³	20.9 µg/m³
PM_{10}[4]	24-hour	43.3 µg/m³	44.2 µg/m³
	Annual	9.4 µg/m³	10.5 µg/m³

[1] Maximum increment due to Clarence Colliery operations at identified sensitive receiver locations (GHD, 2013)
[2] Project criterion – 2 g/m²/month (incremental), 4 g/m²/month (cumulative)
[3] Project criterion – 90 µg/m³
[4] Project criterion – 50 µg/m³ (24-hour averaging period), 25 µg/m³ (annual averaging period)

6.4.4 Long Terms Analysis

Table 6-11 provides a summary of air quality monitoring results for the previous 5 years from 2018 to 2022, including the annual averages for deposition dust (insoluble solids), PM_{10} and TSP. Note, 2019 was affected by regional drought and bushfire events.

A summary of air quality exceedances recorded at Clarence Colliery over the last five (5) years is displayed in **Table 6-12**.

Air quality monitoring during the Reporting Period confirmed dust deposition, TSP and PM_{10} results were below their respective 24hr and annual average criteria and are consistent with long term data trends and predications.

Table 6-11: Long Term Air Quality Monitoring Summary (2018 - 2022)

Monitoring Location	Annual Averages					Development Consent Criteria (Annual Average)
	2018	2019	2020	2021	2022	
Insoluble Solids (g/m²/month)						
DG1	1.2	1.5	1.1	0.6	0.4	4 g/m²/month
DG2	1.6	1.2	1.2	0.6	0.3	
DG3	2.1	1.1	0.6	0.7	0.8	
PM_{10} (µg/m³)						
Real-time	7.04	14.95	5.76	9.35	4.4	25 µg/m³
TSP (µg/m³)						
Real-time	9.61	17.76	7.92	17.98	10	90 µg/m³

Table 6-12: Exceedances for Particulate Matter

	2018	2019	2020	2021	2022
24hr PM_{10} (short term)	0	1[1]	0	0	0
PM_{10} (long term)	0	0	0	0	0
TSP	0	0	0	0	0

[1] Exceedance due to extraordinary events i.e. bushfires

6.4.5 Implemented / Proposed Improvements

Dust emission controls are considered effective based upon compliance with the air quality criteria during the Reporting Period.

Clarence Colliery will continue to implement the AQGHGMP.

6.5 GREENHOUSE GAS MONITORING

6.5.1 Environmental Management

Condition 23, Schedule 3 of DA 504-00 requires Clarence Colliery to monitor greenhouse gas emissions generated by the development, as well as investigate ways to reduce greenhouse gas emissions on site and report on these investigations in the Annual Review.

Greenhouse gas (GHG) reporting and management measures are provided in the AQGHGMP. GHG emissions from Clarence Colliery will continue to be monitored and reported annually in accordance with the *Commonwealth Government National Greenhouse and Energy Reporting Scheme* (NGERS) established by the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).

In accordance with the AQGHGMP (2021), in addition to tracking energy demand and GHG emissions per tonne of ROM coal produced, measures to minimise GHG emissions, to the greatest extent practicable, are implemented. These include:

- Cost effective measures to improve energy efficiency;
- Regular maintenance of plant and equipment to minimize fuel consumption; and
- Consideration of energy efficiency in plant and equipment selection

6.5.2 Environmental Performance

Table 6-13 reports the Scope 1 Emissions (Direct) and Scope 2 Emissions (Indirect) in tonnes CO2-e produced for the current period and compares these against EIS predictions.

Table 6-13: Summary of GHG Emissions Reporting for 2018 to 2022

Emission Source	Estimated Emissions (tonnes CO_2-e)					Predicted Emissions
	FY18	FY19	FY20	FY21	FY22	
Scope 1 Emissions						
Fuel combustion	2,448	2,512	2,602	2,516	2,501.2	*1,419*
Oil/Grease consumption	114	135	123	79	58.9	*124*
SF_6	0	0	0	0	0.2	*0.2*
Fugitives - CH_4	0	0	0	0	0	*13,689*
Fugitives - CO_2	9,977	11,797	9,573	9,303	8,059	
Total Scope 1	**2,473**	**3,403**	**5,306**	**7,572**	**8,701**	***15,233***
Scope 2 Emissions						
Electricity consumption	41,050	39,488	40,911	39,456	39,555	*40,911*
Total Scope 2	**41,050**	**39,488**	**40,911**	**39,456**	**39,555**	***40,911***
Total Greenhouse Gas Emissions						
Scope 1 and 2 Emissions	**53,589**	**53,932**	**53,209**	**51,354**	**50,174**	***56,144***

6.5.3 Comparison Against Predictions

Table 6-13 summarises greenhouse gas emissions predicted for the project in the Clarence Colliery - Modification 6 Greenhouse gas assessment (EMM, 2020), with comparison to actual emissions during the current and previous reporting periods.

During the 2022 Reporting Period the calculated Scope 1 and Scope 2 GHG emissions for Clarence were 8,701 (t CO_2-e) and 39,555 (t CO_2-e) respectively and the combined total GHG emissions 50,174 (t CO_2-e) were approximately -11% less than the 56,144 (t CO_2-e) as predicted in the EIS (EMM, 2020).

It is noted there have been subsequent project modifications, however MOD 7 involved administrative condition changes to provide extraction plan conditions for the site moving forward and therefore no change to predicted emissions.

For MOD9, a modification report was prepared by James Bailey & Associates Pty Ltd (JBA) which identified there would be an incremental increase in (scope 3) GHG emissions resulting from the additional truck movements required (as opposed to this coal being transported by rail), however this increase will be immaterial in relation to NSW's or Australia's total GHG emissions (JBA, 2022). There was no associated change to the predicted scope 1 or scope 2 emissions for the project (as presented in **Table 6-13)**.

6.5.4 Long Term Analysis

Table 6-13 presents a summary of GHG emissions reported over the last five (5) years. Based on the information reported, GHG emissions have been below EIS estimates for the project and have generally been decreasing year on year.

6.5.5 Implemented / Proposed Improvements

Mitigation measures to minimise to the greatest extent practicable GHG emissions from Clarence included regular maintenance of plant and equipment to minimise fuel consumption and consideration of energy efficiency in plant and equipment selection/phase.

6.6 BIODIVERSITY

6.6.1 Environmental Management

Ecology monitoring, assessment and reporting are currently managed through the Western Region Biodiversity Management Plan (WRBMP). At the time of preparing this 2022 Annual Review, the WRBMP was still under consideration with DPE. Management measures within the WRBMP specific to Clarence include, but not limited to access management, bushfire management, erosion control, salinity management, preclearance surveys and waste management.

Eight native vegetation communities have been mapped as occurring within the Clarence Colliery holding. Two of these communities include the Temperate Highland Peat Swamps on Sandstone community which is listed under the EPBC Act.

This community is commensurate with the Newnes Plateau Shrub Swamps and Newnes Plateau Hanging Swamps, with Newnes Plateau Shrub Swamps listed as an Endangered Ecological Community (EECs) under the Biodiversity Conservation Act 2016 (BC Act). Within the mining area, the partial extraction technique ensures minimal subsidence of less than 100 mm. It is therefore extremely unlikely that mining at Clarence Colliery will have an impact on the local flora and ecological communities.

A flora monitoring program was setup as part of the Subsidence Management Plan (SMP) process to verify that this is the case and to identify any natural variations. Risk and potential impacts to threatened flora over the mining area is managed through the SMPs, Extraction Plans and the WRBMP.

6.6.2 Environmental Performance

Clarence has obligations for the management and monitoring of offset sites and undertakes monitoring in accordance with the Subsidence Management Plans for Flora and Fauna. The results of this monitoring are detailed in the following sections.

Flora Monitoring

During the Reporting Period, Gingra Ecological Surveys (GES) completed flora monitoring across six broad areas; Clarence East (Eastern SMP area), Clarence West (also known as the '700 area'), Outbye, 800 Area, 900 Area and Pagoda Swamp. Flora monitoring occurred in Summer, Autumn and Spring in 2022. The results of the Spring flora monitoring are summarised below with the complete reports provided in **Appendix 3**.

A new site was established in February 2021. This is in Pagoda Swamp, which is located to the south of Waratah Ridge, south-west of Mount Horne. Locations of the sites and their sampling dates are provided in **Table 6-14.**

Table 6-14: 2022 Flora Survey Sites

Site	Location	Type	Easting (GDA)	Northing (GDA)
Clarence East				
PAG_01	Gorilla Rock	Impact	246753	6300035
PAG_02	Gorilla Rock	Impact	246755	6299924
PAG_03	Waratah East	Impact	247251	6300707
PAG_04	Waratah East	Impact	246938	6300784
PAG_05	Waratah North	Control	247962	6303960
PAG_06	Waratah North	Control	247888	6303910
BNS_01	Bungleboori North Swamp	Impact	245582	6302273
BNS_02	Bungleboori North Swamp	Impact	246290	6303633
Clarence West				
CLW_01	Heath	Impact	241774	6295584
CLW_02	Swamp	Impact	242596	6295527
CLW_03	Happy Valley Swamp	Impact	241923	6296954
CLW_04	Hanging swamp	Impact	241904	6298016
CLW_05	Pine Swamp	Control	240804	6300186
CLW_06	Heath—Paddys Creek Ridge	Control	240472	6299171
Outbye				
CLAO_01	S of Bungleboori Creek	Impact	245023	6297763
CLAO_02	S of Bungleboori Creek	Impact	245092	6297707

Site	Location	Type	Easting (GDA)	Northing (GDA)
CLAO_03	N of Bungleboori Creek	Impact	245504	6298627
CLAO_04	N of Bungleboori Creek	Impact	245294	6299168
800 Area				
CLAE_01	Gully N of Dumbano Fire Trail dam	Impact	248971	6295894
CLAE_02	Heath ridge	Impact	247495	6295216
CLAE_03	Heath ridge	Impact	247271	6295388
CLAE_04	Secret Swamp	Impact	247203	6296462
CLAE_05	Secret Swamp	Impact	247159	6296404
CLAE_06	Olearia Swamp	Impact	247648	6296165
CLAE_07	Olearia Swamp	Impact	247701	6296288
CLAE_08	Olearia Swamp	Impact	247789	6296830
900 Area				
PSB_01	Paddys Swamp Branch	Impact	241338	6298523
PSB_02	Paddys Swamp Branch	Impact	241404	6298617
PS_03	Paddys Swamp (lower)	Impact	241822	6299156
Pagoda Swamp				
PAS_01	Pagoda Swamp	Impact	242878	6300496

The entire study area was subject to the Gospers Mountain bushfire, which burnt through the area from November to December 2019. Most sites were affected by very high intensity fire, but fire intensity at a small number of plots was patchier with small areas of shrubs and ground cover plants remaining unburnt. Plots with some unburnt patches included PAG_01, PAG_03, PAG_05, CLAO_01, CLAO_03 and CLAO_04. At the swamp sites the bushfire had burnt above ground vegetation with only very localised patches of surface peat consumption. No deep consumption of peat deposits was observed in the study area (GES 2022).

Clarence East & Clarence West Heath & Pagoda Sites

- At PAG_01 and PAG_03 some *Actinotus helianthi* plants had died and *Stylidium graminifolium* plants had leaf discoloration due to waterlogging.
- At PAG_02 Acacia asparagoides plants were affected by leaf predation.
- At PAG_03 leaf damage was observed on *Phyllota squarrosa* plants due to browsing. Senescent *Actinotus helianthi* plants were also observed at PAG_04.
- at PAG_04 *Caustis pentandra* plants had branch dieback.
- At PAG_05 *Banksia ericifolia* and *Banksia penicillata* plants were suffering leaf predation due to insect attack. Severe dieback of *Stylidium lineare* plants was also observed, due to waterlogging.
- At PAG_06 *Banksia penicillata* plants were suffering leaf predation due to insect attack.
- At CLW_01 *Phyllota squarrosa* plants showed signs of leaf predation. Several other plant species at this site had dieback associated with waterlogging.

- At CLW_06 *Leptospermum trinervium* plants had leaf dieback due to waterlogging. Leaves of *Mirbelia rubiifolia* and *Xanthorrhoea media* were suffering leaf discoloration due to waterlogging.
- Species richness at the two plots surveyed in spring 2022 were similar to previous records, apart from at PAG_01 where species richness was slightly higher than previous records.

Clarence East and West Swamp Sites

- At CLW_02 *Poa sieberiana* subsp. *cyanophylla*, *Grevillea acanthifolia*, *Patersonia fragilis* and *Lomandra filiformis* subsp. *coriacea* plants had dieback due to waterlogging.
- No signs of disease were recorded at CLW_03.
- At CLW_04 *Olearia quercifolia* plants were affected by severe dieback due to a fungal pathogen.
- At CLW_05 one *Leptospermum grandifolium* plant had leaf discoloration due to waterlogging, *Juncus continuus* plants had dead stems, a *Eucalyptus pauciflora* sapling had leaf dieback and *Celmisia longifolia* plants had been browsed.
- No signs of plant disease were observed at either of the BNS_01 or BNS_02 plots.
- Whilst there was a decline in species richness in autumn 2022 compared to summer counts, the levels are within the previously recorded range and consistent with normal post-fire trends.
- In spring 2022 species richness was lower. The very wet conditions meant that small ground layer plants had either died or were difficult to detect due to the saturated conditions.

Clarence Outbye

- There was a single instance of plant disease at the Outbye plots CLAO_01 in autumn 2022 where several *Isopogon anemonifolius* plants had died due to waterlogging.
- The species richness counts for CLAO_01 and CLAO_02 recorded in autumn and spring 2022 were similar to levels recorded in spring 2021.

Clarence 800 Area

- At CLAE_01 *Banksia spinulosa* plants had leaf yellowing due to waterlogging.
- Two plant species at CLAE_02 were showing signs of leaf dieback and yellowing associated with waterlogging, *Conospermum taxifolium* and *Banksia spinulosa*. At the other heath site CLAE_03, *Isopogon anemonifolius* plants had dark discoloration due to waterlogging.
- At CLAE_04 *Banksia spinulosa* plants had leaf yellowing due to waterlogging.
- At CLAE_06 and CLAE_08, *Olearia quercifolia* plants were in good condition, with no signs of dieback or leaf damage.
- Apart from the few identified impacts of the prolonged wet weather conditions, plant health was good.
- Table 3 shows some species richness figures following the 2013 and 2019 bushfires. The levels in spring 2022 were similar to 2021 levels with the exception of CLAE_04 and CLAE_08 where species richness was lower in spring 2022.

Clarence 900 Area

- Sites were established along different sections of Paddys Swamp in the Clarence 900 area in November 2014. This area was affected by the October 2013 bushfire. The sites burnt again in December 2019.
- There are a range of human disturbance factors already operating in the vicinity of the two sites in the upper catchment (PSB_01 and PSB_02) of Paddys Swamp. This includes drainage works associated with earlier operation of the sand quarry 600 meters to the south, extensive new clearing of the quarry and a trail bike track to the north of PSB_01.
- Site PS_03 is located in the main section of Paddys Swamp, in an area substantially free of past human disturbance, although an old, defunct pipeline passes by the eastern edge of the swamp.
- Species richness at the Paddys Swamp sites in spring 2022 was within the previously recorded range and similar to levels recorded in autumn 2022.
- Plant health less satisfactory than previous records with several instances of waterlogging associated plant disease. At PSB_01 *Banksia marginata* plants were suffering from leaf predation. Eucalypt saplings which had emerged following the 2019 bushfire were severely impacted with several dead *Eucalyptus radiata* plants.
- At PS_03 *Baumea rubiginosa* plants had leaf yellowing.

Pagoda Swamp

- A new monitoring survey plot was established at Pagoda Swamp in February 2021. During 2021 mining operations approached the southern end of this Swamp.
- Nineteen plant species were recorded within the plot in summer 2021, 26 species were recorded in autumn 2021 and 20 species were recorded in spring 2021 when the Swamp was exceptionally wet. In summer 2022, 26 species were again recorded. There was some vegetation damage with shrubs being pushed over by water during a November storm. In June 2022 sixteen species were recorded, followed by 21 species in spring 2022.

Plant condition in spring 2022 was affected by record high rainfall with many instances of leaf yellowing and death due to waterlogging with the period of above average rainfall now reaching 33 months in duration and very wet months in January, March and July. Plant disease associated with pathogens was limited to very few observations.

The occurrences of exotic plant species in 2022 were consistent with a post-fire decline with limited new germination in response to the high rainfall. Occurrences of weeds continue to be at plots with a disturbance history involving proximity to clearing and pine plantation, logging, feral animals and recreational use.

As the plots were all bush fire affected, with most sites suffering a very high intensity fire in December 2019, future surveys will be necessary to determine whether the recovery trajectory continues to be consistent with past events, or whether particular plots have a different trajectory due to factors other than fire intensity. The trajectory following the October 2013 had indicated that ecosystem function across the study area was normal. On the current trajectory following the December 2019 bushfire it is indicated that ecosystem functioning at recent and historic undermined plots being no different to control plots.

There have been no indications of residual effects of subsidence in areas undermined previously, particularly in the Clarence East area where mining occurred in 2019-20. The patterns of species richness, species composition and plant disease relate strongly to bush

fire impacts and recovery and the persistent wet conditions with almost three years above average rainfall. There is no indication of a mining effect (GES, 2022).

Fauna Monitoring

Fauna monitoring during the Reporting Period at Clarence Colliery was undertaken by Biodiversity Monitoring Services (BMS) (**Table 6-15**). Fieldwork for the 700 Area (Eastern, Western and Outbye), 800 Area (Eastern Portion) and 900 Area were partially completed in the Reporting Period due to access constraints. The complete fauna monitoring reports are included in **Appendix 4**.

Table 6-15: 2022 Fauna Survey Sites

Site Name	Easting	Northing	Landscape	Establishment date	Undermining date
Clarence East Area					
Heath 1	245245	6299216	Pagoda heath above steep-sided valley	Autumn 2008	1998 (development)
Heath 2	245294	6297667	Woodland below Pagoda heath in steep-sided valley	Autumn 2008	1998 (development)
Gully	245497	6298910	Woodland above steep-sided valley	Autumn 2008	1999 (development)
Clarence 800 Area					
800 Swamp 1	247193	6296433	Heath Swamp within steep-sided valley	Autumn 2009	Dec 2013 (development)
800 Swamp 2	248940	6295833	Woodland with small patches of hanging swamp within steep-sided valley	Autumn 2009	June 2015 (development), June 2016 (extraction)
800 Heath	247448	6295310	Ridgetop heathland	Autumn 2009	April 2018 (extraction), development unknown
Clarence 900 Area					
A North	241839	6299342	Heath Swamp within steep-sided valley	Spring 2014	October 2022
B South	241374	6298571	Woodland moving into heath swamp within shallow-sided valley	Spring 2014	August 2022 (extraction)
CLW01	240634	6299166	Pagoda heath above steep-sided valley	Spring 2006	Spring 2018 (extraction)
CLW04	241899	6297998	Heath swamp within steep-sided valley	Spring 2006	April 2015 (development) Nov 2015 (extraction)
CLW05	240772	6300158	Heath swamp within steep-sided valley	Spring 2006	December 2018

Site Name	Easting	Northing	Landscape	Establishment date	Undermining date
Nine Mile	242000	6301270	Heath Swamp within steep-sided valley	Autumn 2018	NA
Paddy's Swamp	241375	6299055	Heath Swamp within steep-sided valley	Autumn 2018	July 2022
Clarence West Area					
CLW01	240634	6299166	Pagoda heath above steep-sided valley	Spring 2006	Mid 2018 (extraction)
CLW02	242610	6295587	Heath swamp within shallow-sided valley	Spring 2006	March 2010 (extraction)
CLW03	241840	6297085	Heath swamp within steep-sided valley	Spring 2006	Sept 2010 (development), Dec 2010 (extraction)
CLW04	241899	6297998	Heath swamp within steep-sided valley	Spring 2006	April 2015 (development), November 2015 (extraction)
CLW05	240772	6300158	Heath swamp within steep-sided valley	spring 2006	December 2018
CLW06	241657	6295513	Pagoda heath above steep-sided valley	spring 2006	March 2011 (development), December 2011 (extraction)
Nine Mile Swamp	242000	6301270	Heath Swamp within steep-sided valley	autumn 2018	NA
Paddy's Swamp	241375	6299055	Heath Swamp within steep-sided valley	autumn 2018	NA

Clarence 800 Area

Terrestrial Fauna Monitoring at the three Clarence 800 (ML 1583) Area sites was unable to be conducted in autumn, spring and summer 2022. The only access to the 800 Area is via the Wollangambe/Dumbano Fire Trail. The condition of the trail has degraded due to the adverse weather throughout 2022. Large stretches of bog hole and saturated ground meant the road in was unable to be traversed for survey work in throughout 2022. As such, there is no data to update that of the 2021 report (BMS 2022).

Clarence Outbye Area

Terrestrial Fauna Monitoring at the three sites (in the Clarence Outbye Area were unable to be conducted in autumn, spring and summer 2022. The only access to the Heath 1 and Gully is via Waratah Ridge Road. Waratah Ridge Road has been closed since February due to the Wartime Remnants Clean up Project. This hazardous materials clean-up is being undertaken across the entrance to the fire trail that leads out to two of the Outbye sites. Alternative access via Glow Worm Tunnel Road would still not facilitate access, though access along this road was also restricted by wet weather in autumn. The only access to Heath 2 site is via the Wollangambe/Dumbano Fire Trail.

The condition of the Wollangambe/Dumbano Trail has degraded due to the adverse weather throughout 2022. Large stretches of bog hole and saturated ground meant the road in was unable to be traversed for survey work in throughout 2022. As such, there is no data to update that of the 2021 report (BMS 2022).

Clarence 900 Area (Panels 913 and 917)

The 900 Area sites were surveyed between the 16th and 20th May, the 31st October and 4th November, and 28th November and 9th December 2022.

The results from the survey of the Clarence Colliery 900 Area in 2022 show that the assemblages found are more typical of that found throughout Newnes Plateau than we would expect after extensive fires swept through the area in December 2019. The timing of the survey was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed, though reduced survey efforts of some sites used in analyses were experienced in 2022 due to access issues.

Species richness was on average for reptiles and amphibians, and on the lower side of average for birds and mammals. Richness for all four groups declined since last year. Bird and mammal Simpson's were stable, possibly showing the slightest decline over time. Mammal Simpson's and richness are relatively stable over the long term, but trapping rates declined sharply post fire. They had been tracking up since the State Mine fire, but the Gospers Mountain fire reset the system.

Recovery of small mammal captures was tracking in advance of the previous fire, but stalled in 2022. Reptile Simpson's and richness were average, noting that wet survey conditions in 2021-22 did not favour this group. Low numbers in 2014 are due to the fact surveys only began in spring 2014, so survey effort was greatly reduced. Despite the wet conditions, amphibian diversity indices showed no growth in 2022. Reduced access/survey effort and cool conditions may explain this (BMS 2022).

Swamps in this area had peat mostly consumed and canopy layers were fully burnt, so finding Blue Mountains Water Skink in 2021 was surprising. This species was found again in 2022, with three records across the two 900 Area swamps. The availability of rock outcropping near 900 North means refugia for small mammals allowed some to survive the fire, particularly Antechinus.

Bat species richness and activity were very low in 2022, but this is expected with cold wet conditions. As is often the case with fire, once the vegetation and associated food source is wiped out, there is a delay in seeing return of species to the landscape. There were sufficient numbers and diversities of these fauna groups to be able to calculate a set of diversity indices that form part of the baseline monitoring database. Above average rainfall in most months since fire appears to have helped start the regeneration process on the Plateau. Fauna results have followed with overall abundance down, but most functional groups represented (BMS 2022).

Given the low levels of subsidence from previous mining at Clarence Colliery, and the predicted low levels (30mm) of subsidence for 900 Area, the risk of adverse impacts on fauna within this area is considered to be low. The monitoring of recovery from fire within those sites mined and un-mined will be an important tool in the on-going assessment of mining activities (BMS 2022).

Clarence West Area

The CLW sites were surveyed between the 9th May and 3rd June 2022, 10th October and 11th November 2022, and 28th November and 9th December 2022.

The results from the survey of the Clarence Colliery Western SMP Area in 2022 show that the assemblages found are more typical of that found throughout Newnes Plateau than we would expect after extensive fires swept through the area in December 2019. The timing of the survey was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed, though park closure and weather conditions caused access issues for 5 sites across autumn and spring this year.

Most diversity parameters have remained stable over the long term, except bird and amphibian species richness which have increased. Most diversity parameters that have remained within levels of expected variation still declined sometime in 2017-2019, with native non-bat mammal species richness the only measure to show an all time low in the drought/fire period (2020). Small mammal capture rates almost returned to pre fire levels in 2019, six years post fire, but crashed in 2020 to an all time low. This is likely due to the lack of rocky refugia proximal to the CLW sites, combined with the severity of the peat burning in many of the swamps and the frequency of fire.

Bat activity was down in 2022, though species richness was still within the normal level of variation, suggesting the invertebrate food source that this group relies on may have experienced low activity due to cold/wet conditions. As is often the case with fire, once the vegetation and associated food source is wiped out, there is a delay in seeing return of species to the landscape.

There were sufficient numbers and diversities of these fauna groups to be able to calculate a set of diversity indices that form part of the baseline monitoring database. Above average rainfall in most months since fire appears to have helped start the regeneration process on the Plateau. Fauna results have followed with overall abundance down, but most functional groups represented.

Given the low levels of subsidence from previous mining at Clarence Colliery, the risk of adverse impacts on fauna within this area is considered to be low. Statistical analysis of fauna populations in the CLW areas suggest changes in diversities are primarily due to climatic changes, though some evidence of lower diversity measures in undermined sites is shown.

The differences seen this year were similar to last year, but different to previous years (except bird Simpson's), so continued monitoring of these indices will tell whether we have evidence of ongoing change due to mining, or simply a temporal anomaly. At present, there appears to be little conclusive evidence of subsidence impacts upon the fauna diversity at CLW Area (BMS 2022).

Aquatic Ecology Monitoring

As required by the Clarence Colliery Water Management Plan (May 2017), Marine Pollution Research Pty Ltd (MPR) were commissioned to undertake the biannual (Autumn and Spring) stream health monitoring in 2022, to assess the possible effects on aquatic ecology of:

- Wollangambe River below the Clarence Colliery Licensed Discharge Point 2 (LDP2).
- The upper Bungleboori Creek catchment; and
- The upper Carne and Dingo Creek catchments.

The stream health surveys are being conducted using standardised methods applied to other Centennial Coal stream health studies in the Coxs and Wolgan River upper catchments. A summary of the stream health results for Wollangambe River are provided below. For the complete report and all of the aquatic ecological monitoring completed during the 2022 Reporting Period refer to **Appendix 5**.

Wollangambe River

Leading up to both the autumn and spring 2022 aquatic ecology surveys, Clarence Colliery and the Wollangambe area was subject to above average rainfall with some major wet weather events causing large amounts of runoff and associated increases in LDP discharge. Discharge rates generally increased in times of greater rainfall and maintained more consistent rates of between 10-20 ML/day for most of 2022 (MPR 2023).

For five of the seven Clarence aquatic ecology monitoring sites, water quality in the Wollangambe River is influenced by the contribution of LDP002 discharges. For the most part, the 2022 seasonal survey water quality results were mostly within the ANZG (2018) default guideline values (DGVs) for slightly disturbed upland rivers and followed a similar pattern to that noted for previous years, however the upstream and reference sites produced values outside the DGV range owing to the naturally acidic, very low conductivity runoff from catchments containing swamps (MPR 2023).

The 2022 macroinvertebrate indices results varied between sites; while the autumn 2022 macroinvertebrate diversity, Signal and EPT index values were mostly consistent with, or improved compared to recent surveys (and within or above their respective LTM ranges), the spring 2022 survey results returned relatively low diversity values at all sites except WGRswamp, WGRdown and WGRXdown-edge, and low EPT values at WGRup, WGRtrib1 and WGRXdown-riffle sample (MPR 2023).

6.6.3 Comparison Against Predictions

Sections 5.6 and 5.7 of the 1993 EIS (R. W. Corkery & Co. 1993) for the Clarence Colliery Northern Extension discuss the predicted effects on flora and fauna to be caused by the development. The EIS concludes that the impacts on flora and fauna by underground mining would be minor, if any occurs at all. Section 6.6.2 concludes that there have not been any measurable impacts at those sites monitored, caused by mining activities within the lease area during the Reporting Period.

6.6.4 Long Terms Analysis

Long-term analysis of the threatened species is presented below for the Clarence 900 Area (Panels 913 and 917) (see **Table 6-16** and **Figure 6-11**) and the Clarence West (CLW) Area (see **Table 6-17** and **Figure 6-12**).

It is observed that the number of threatened species in the Clarence 900 Area has varied over the years, but remains fairly stable over the long term. Whilst in the CLW Area the number of threatened species has been increasing over time, peaking in spring 2018.

For the complete fauna monitoring reports and long term analysis refer to **Appendix 4**.

Table 6-16: Threatened species in 900 Area in autumn (A) and spring (S) over time

Category	2014		2015		2016		2017		2018		2019		2020		2021		2022	
	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S
Woodland-dependent bird species (%)	-	-	-	-	-	-	64.5	65.4	64.9	74.5	65.6	72.7	75.0	71.1	82.8	77.4	73.1	75.8
Declining bird species (%)	-	-	-	-	-	-	6.5	7.7	2.7	8.5	9.4	6.8	4.2	7.9	10.3	9.7	3.8	6.1
Threatened species	-	4	3	7	4	4	5	8	5	7	5	5	6	4	6	3	4	3

Table 6-17: Threatened species in CLW Area in autumn (A) and spring (S) over time

Category	2014		2015		2016		2017		2018		2019		2020		2021		2022	
	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S
Woodland-dependent bird species (%)	-	-	-	-	-	-	65	59	59	63	63	64	61	60	70	66	64	62
Declining bird species (%)	-	-	-	-	-	-	5	7	7	9	8	8	3	7	10	8	8	6
Threatened species	4	5	3	6	3	6	7	7	9	11	6	6	8	7	7	9	7	10

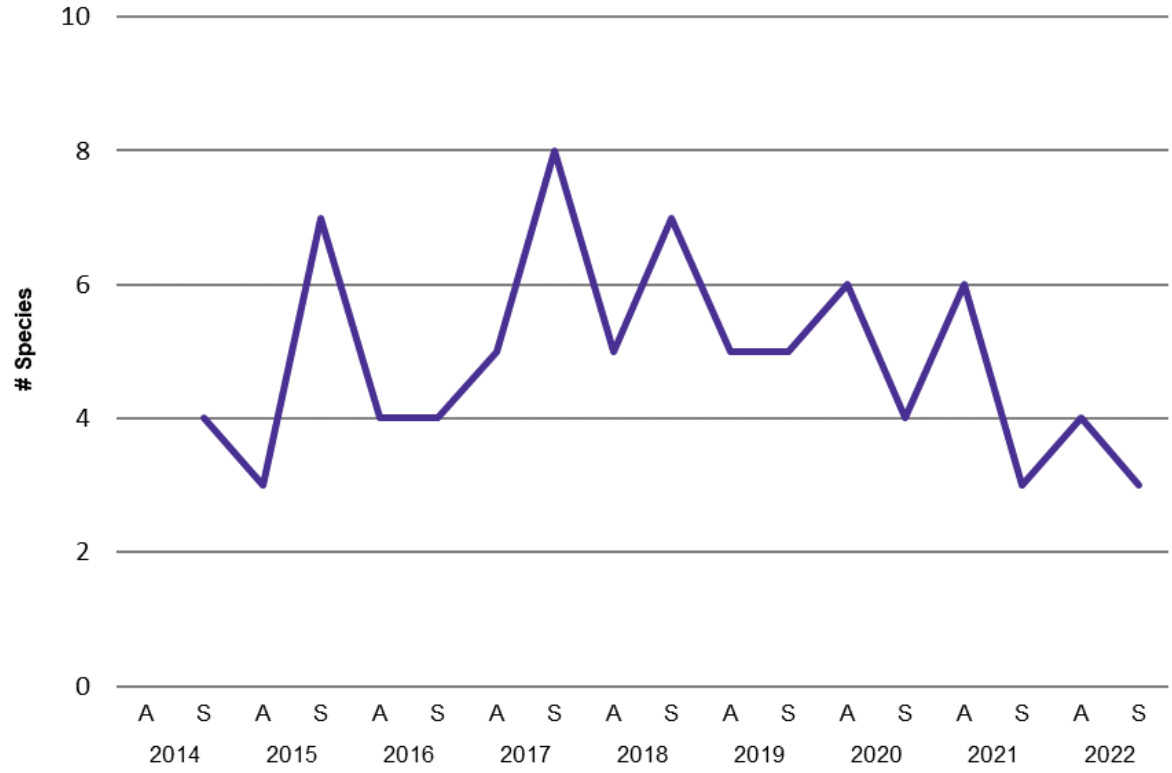


Figure 6-11: Number of threatened species in the 900 Area over time

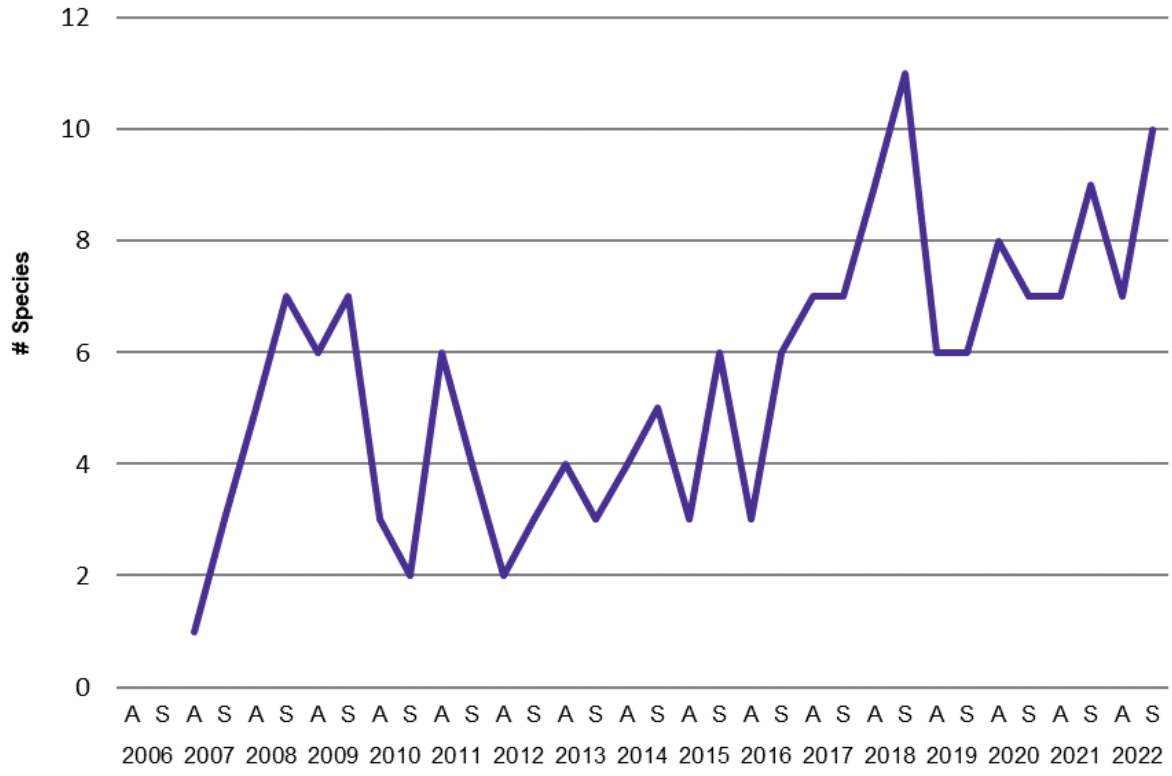


Figure 6-12: Number of Threatened Species in the CLW Area over time

6.6.5 Implemented / Proposed Improvements

Monitoring and inspections during the next Reporting Period will be undertaken to assess the effectiveness of the management measures for Clarence Colliery in accordance with the revised WRBMP, subject to its approval from the DPE.

Further consultation with DPE regarding the latest revision to the WRBMP (Version 6), will be undertaken during the next Reporting Period. Revision of the WRBMP to be undertaken in the next Reporting Period as required.

6.6.6 Biodiversity Offsets

In accordance with Schedule 3, Condition 12A, Clarence has provided a suitable offset for the clearing of 4.1 hectares of Newnes Plateau Narrow-leaved Peppermint- Silvertop Ash layered open forest and the loss of related biodiversity values including threatened species. This offset is part of the Western Region Biodiversity Offset Strategy (WRBOS).

The WRBOS identifies retirement 204 ecosystem biodiversity offset credits by Clarence. Clarence's biodiversity offset requirements will be satisfied with the retirement of land utilising a Conservation Agreement in perpetuity under the *Biodiversity Conservation Act 2016*.

The conservation agreement for Carinya Lot 163 (**Figure 6-13**) was finalised in October 2020. Clarence Colliery submits an Annual Management report to BCS for the Carinya offset area as required by the WRBOS.

A draft Conservation Bond calculation was submitted to the Secretary with the WRBOS. The Conservation Bond is proposed to include the completion of management actions for the first 10 years of the WRBOS. The site has no active restoration. Management activities are limited to limiting human disturbance and maintaining site security, weed management, pest management and ecological monitoring.

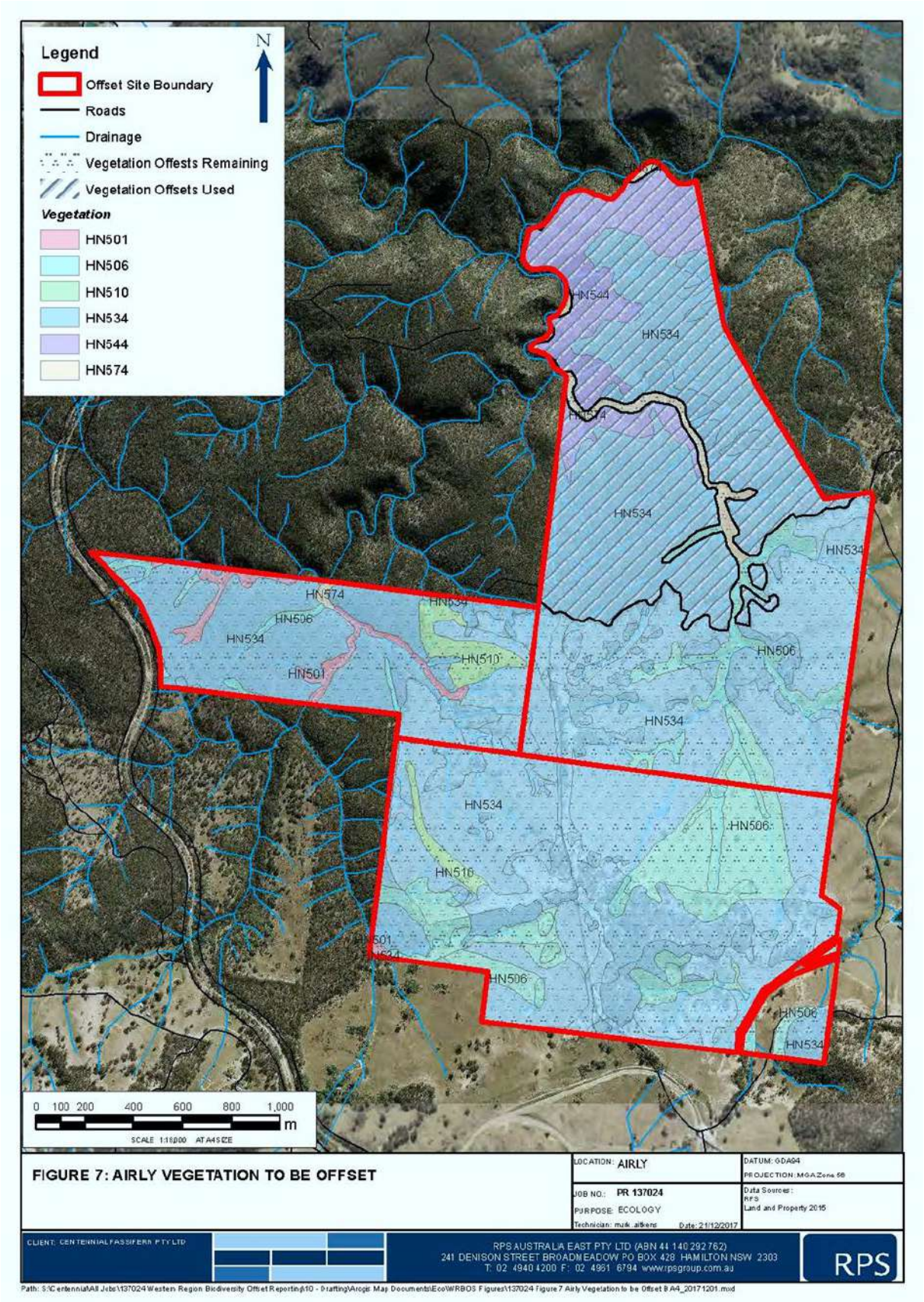


Figure 6-13: Carinya Offset Site & BioMetric Vegetation Types (BVTs)

6.7 HERITAGE

6.7.1 Environmental Management

Clarence Colliery manages Aboriginal heritage in accordance with the Western Region Aboriginal Cultural Heritage Management Plan (WRACHMP) dated September 2021. The WRACHMP was approved by DPE in 2021. WCS manages European heritage in accordance with the Historic Heritage Management Plan (HHMP) dated June 2018. The HHMP was approved by DPE in 2018 and satisfies Condition 30, Schedule 3 of DA 504-00.

The WRACHMP identified forty-seven registered Aboriginal Heritage Information Management System (AHIMS) items within the Clarence Colliery Lease Boundary.

In accordance with the WRACHMP monitoring program, Clarence Colliery will record the condition of the site before mining (baseline survey and baseline check) and the condition of the site after mining (post mining initial condition) and post mining (secondary condition check) and thus has been separated into three phases.

- Phase 1: Baseline recording (prior to site being undermined)
- Phase 2: Post mining initial condition (immediately after undermining)
- Phase 3: Post mining secondary condition (approximately 8 months after undermining)

There are no heritage items within the Clarence Lease Boundary which are listed on the Commonwealth Heritage Register, on the NSW State Heritage Register (SHR), or the s170 registers (state owned items). There are no known unlisted heritage items in the Clarence Lease Boundary (HHMP 2018).

6.7.2 Environmental Performance

During the Reporting Period, Phase 1, Phase 2 and Due Diligence inspections were undertaken as required by the WRACHMP, inducing:

- **Phase 1**: RPS were engaged by Centennial Coal Company Limited to prepare a baseline recording report of AHIMS sites 45-1-0185, 45-1-0186, and 45-1-0188 that are located over the 915 and 919 panels. The Phase 1 inspection was conducted on 22 February 2022.
- **Phase 2**: RPS were engaged by Centennial Coal Company Limited to conduct a Phase 2 inspection of AHIMS sites 45-1-2872, 45-1-2874 and 45-1-2875 that are located over the 915 panel. The Phase 1 inspection was conducted on 7 December 2021 with the Phase 2 inspection completed on the 10 October 2022.
    - Phase 1 and Phase 2 visual inspection have now been completed. No mining related impacts have been observed.
- **Due Diligence:** RPS were engaged by Centennial Coal Company Limited to prepare an Aboriginal heritage due diligence assessment letter report for proposed 900 subsidence line installation at the Clarence. The visual inspection of the proposed subsidence line was conducted on 7 December 2021 with Centennial Environment and Community Officer, Isobel J. Standfast and Registered Aboriginal Party Sharon Brown (Gundungurra Tribal Council Aboriginal Corporation).
    - Three isolated artefacts and one artefact scatter were identified during the visual inspection of the proposed subsidence line (AHIMS sites 45-1-283, 45-1-2872, 45-1-2874 and 45-1-2875). The ground visibility was moderate to high with exposed surfaces and vehicle track disturbance. The ground surfaces

were inspected with Registered Aboriginal Party Sharon Brown for stone artefacts. Additionally, the trees in the open woodland were inspected for modified/scar trees, however, no trees showed signs of cultural modifications.

- **Due Diligence:** Umwelt (Australia) Pty Ltd (Umwelt) were engaged by Centennial Coal Company Pty Limited (Centennial) to undertake an Aboriginal Heritage Due Diligence Assessment to assess the potential impacts associated with proposed construction of a new dewatering bore and ancillary infrastructure (Project Area) at the Clarence Colliery. A visual inspection of the Project Area was undertaken by Umwelt on 6 December 2022.
    - Through a review of environmental and archaeological context for the Project Area, no Aboriginal sites are located within the footprint of the proposed works, and the Project area itself generally retains low archaeological potential.

For the complete Phase 1, Phase 2 and Due Diligence inspection reports refer to **Appendix 6**.

6.7.3 Comparisons Against Predictions

Page 114 of the 900 Area SMP Written Report (2013) states that Clarence Colliery has identified no discernible impacts on the surface of previously mined areas using the partial extraction mining methods, and as such it is expected that mining in the 900 Area will also have no impacts on any Aboriginal cultural heritage sites. A similar statement is made in the 800 Area SMP Report (2011).

During the Reporting Period Phase 2 inspections above 915 panel confirmed no mining related impacts have been observed at 45-1-2872, 45-1-2874 and 45-1-2875, therefore the SMP predictions are upheld.

6.7.4 Long Term Analysis

There have been no recorded impacts to Aboriginal Heritage items at Clarence.

6.7.5 Implemented / Proposed Improvements

The Western Region Aboriginal Cultural Heritage Committee (ACHC) Meetings were held in May and October 2022. Clarence Colliery will continue to undertake Western Region ACHC Meetings in the next Reporting Period.

Clarence Colliery will continue to manage and monitor Aboriginal Cultural Heritage in accordance with the WRAHMP.

The pre-clearance permit systems in the WRAHMP provides the land disturbance due diligence process, implemented by the site and is considered appropriate for the management of Aboriginal heritage items.

6.8 MINE SUBSIDENCE

6.8.1 Environmental Management

Clarence Colliery currently operates under several Subsidence Management Plans (SMP). During 2022, the following SMP applications and variations occurred:

- 900 Area - A variation to the 900 Area SMP was submitted on 28th of February 2022. This was Clarence's sixth variation and sought a modification to the extraction layouts of the 906, 915 and 917 panels within the 900 area. This variation also requested the extension of the 900 Area SMP expiry date to the 24th December 2025 to coincide with

the expected completion of extraction in the 900 Area SMP. This 900 Area SMP variation received approval on 12th April 2022

- 800 Area – There were no SMP variations to the 800 Area in the 2022 Reporting Period. The last variation to the 800 Area SMP was submitted on 5th March 2021. This was Clarence's seventh variation and sought a modification to the extraction layouts of the 818A, 822 and 801S panels within the 800 area and requested the extension of the 800 area SMP expiry date to the 24th December 2025. This was approved on the 13th May 2021.
- 700W Area – There were no SMP variations to the 700W Area in the 2022 Reporting Period. The last variation to the 700 Area SMP was submitted on 11th of May 2021. This was Clarence's sixth variation and requested the extension of the 700W area SMP expiry date to the 1st June 2025. Approval for this variation was granted on 28th May 2021.

A request to reduce environmental monitoring associated with expired SMPs was submitted to the NSW Resource Regulator on the 21st March 2014. A response was received 2nd April 2015. The approval to reduce environmental monitoring in the Eastern Area was not forthcoming and monitoring was completed throughout 2016, 2017, 2018, 2019, 2020, 2021 and 2022, again showing no impacts from subsidence. Clarence is currently reviewing environmental monitoring being undertaken for consultation with the NSW Resource Regulator.

6.8.2 Environmental Performance

During 2022, the following mining activities included:

- Development of the 804, 805 and 919 panels;
- Extraction of the 821 and 822 panels; and
- Development and Extraction of the 906 and 915 panels.

Clarence Colliery in accordance with SMP approvals, also submits a Subsidence Management Status Report (SMSR) each quarter to the NSW Resource Regulator.

During the Reporting Period, the following subsidence monitoring was undertaken:

- Annual survey of the 800A line on the 16th February 2022 and an 822 Panel post extraction survey on the 8th December 2022;
- 800G line surveyed on the 10th February 2022;
- 800J line surveyed on the 10th February 2022;
- 800I line surveyed on the 8th February 2022;
- 800D line surveyed on the 11th January 2022;
- 800E line surveyed on the 10th January 2022;
- Resurvey of the 700A line on the 28th June 2022;
- Resurvey of the 700B line on the 28th June 2022;
- Resurvey of the 700F line on the 22nd December 2022;

- 900B line was due for an annual survey during the SMSR March-June 2022 quarter, however due to an Australian Defence Force munitions clean-up program access was not available. The 900B line was surveyed 28th August 2022;
- The 800B, 800C, 800D and 800E lines were due for an annual survey during the SMSR March-June 2022 quarter, however due to damage to surface access tracks, access was not available. Track repairs were being arranged and these lines will be resurveyed at the next available opportunity.
- The U, H and I lines were due for an annual survey during the SMSR March-June 2022 quarter, however due to an Australian Defence Force munitions clean-up program access was not available to these subsidence lines. These lines will be resurveyed at the next available opportunity.
- 900A line surveyed 16th October 2022;
- 900D line surveyed 18th July 2022;
- 903 line surveyed 20th October 2022.
- 707, W and Z lines were due for an annual survey during the 2022 year, however was not surveyed due to resourcing priorities and track damage. Track repairs are being arranged and these lines will be resurveyed at the next available opportunity.

Subsidence Monitoring

Subsidence monitoring results from previously extracted panels are discussed in detail in the SMSR's. A summary of 2022 results are provided below. Subsidence charts from the surveys of the lines carried out in 2022 are provided in **Appendix 7**.

Subsidence and environmental monitoring have been carried out generally in accordance with the relevant Subsidence and Environmental Monitoring Programs required under the various SMP approvals.

All subsidence results during 2022 are below the 100mm maximum predicted with the exception of 900D line results.

- From survey results obtained on 18th July 2022 on the 900D line, maximum subsidence of 104mm was recorded and eight marks have reached or exceeded the 100mm threshold. It is noted that these results have an acceptable error of +/- 25mm for survey monitoring of this type.

- Despite exceeding the approved 100mm subsidence limit, no evidence of environmental harm was observed. The following actions were taken in response to this exceedance:

    - All stakeholders as required by the Clarence Colliery 900 Area SMP approval were notified;

    - A follow up visual inspection for any signs of environmental harm in the vicinity of the subsidence line was conducted; none were found.

    - An investigative geotechnical report was commissioned to examine reasons for the greater than predicted subsidence. It was identified that relatively soft floor (as a consequence of reduced interburden thickness localised in the area of 908/910 Panel) was a contributing factor.

- The subsidence data relating to the 908 and 910 Panels was incorporated into the Clarence subsidence model to accurately inform future panel design. Consideration is now given to interburden thickness.

Flora and fauna monitoring have shown no measurable impact from mining.

No effect of land subsidence has been observed from the monitoring conducted over 2022.

Groundwater impact has been minimal with the main effects being at seam level. Piezometric height has decreased in the seam level aquifers as expected. There has been no adverse impact on upper aquifers (i.e. above the Mt York Claystone) as a consequence of mining activities (including the Clarence aquifer). Piezometers and inspections within swamps have found no impact from mining.

Surface water quality monitoring indicates no adverse impact from mining with upstream and downstream results for Farmers Creek (700 Area).

Cliffline and pagoda photographic monitoring, combined with visual surface inspections, has found no evidence of any mining related impact.

6.8.3 Comparisons Against Predictions

The panel geometry and mine plan is designed around the need to achieve subsidence that is limited to a value well within that considered to be characteristic of 'elastic' overburden behaviour (i.e. no caving to surface), which is defined as 100±25 mm (SEA, 2005). This limit is conditioned within Development Consent DA 504-00 Schedule 3, which states that: 'The Applicant shall ensure that surface subsidence generated by the development does not exceed the criteria listed in Table 1 (First Workings – 20mm subsidence, 1.0mm/m tilt, 1.0mm/m horizontal strain. Partial Extraction – 100mm subsidence, 3.0mm/m tilt, 2.0mm/m horizontal strain).' It should be noted that 900D line is outside of DA 504-00.

6.8.4 Long Term Analysis

All subsidence results for the past 5 years since 2018-2022 have been below the 100mm maximum predicted (with the exception of the older panels within the Eastern Area and the recent 900D exceedance as discussed above).

6.8.5 Implemented / Proposed Improvements

Clarence Colliery will continue to implement the approved SMPs during the next Reporting Period. DA 504-00 (MOD7) included the addition of conditions for future secondary extraction at Clarence to be undertaken in accordance with an approved Extraction Plan. At the time of preparing this 2022 Annual Review, a new Extraction Plan for the 918/920 Areas was under preparation and anticipated for submission into the DPE for approval in the next Reporting Period.

6.9 OTHER MATTERS

6.9.1 Waste

Condition 24, Schedule 3 of DA 504-00 states Clarence Colliery must minimise the amount of waste generated by the development to the satisfaction of the Planning Secretary. During the Reporting Period the following items are collected to minimise waste to landfill including, waste oil, oily water and oil filters, paper and cardboard packaging, scrap steel, other recyclables (e.g. glass and plastics) and solid wastes.

All general waste is collected by licensed waste contractor for disposed at Licensed land fill site. **Table 6-18** provides a summary of the waste recycled and disposed during the reporting period with a comparison on waste consumed over the last 5 years.

In 2022, 516.208 tonnes of waste was sent offsite for disposal with 219.93 tonnes of recycled waste, at a total yield recycling rate of 42.44%. This compares to a recycling rate of 39.65% in 2021 and 45.7% in 2020. Total offsite waste has been decreasing since 2019.

Table 6-18: Waste Summary

	2018	2019	2020	2021	2022
Recycling					
Hazardous Recycled (Waste Oil, Oily Water / kL, Batteries, Oil Filters / tonnes)	82.280	31.658	31.400	23.704	21.102
Non-Hazardous Recycled (Paper & Cardboard, Scrap Steel / tonnes)	256.925	310.661	280.858	230.343	197.991
Total Waste Recycled	**339.205**	**342.319**	**312.258**	**254.047**	**219.093**
Disposal					
Hazardous Disposal (Oily Rags / tonnes)	9.908	30.934	24.533	16.322	15.840
Non-Hazardous Disposal (Mixed Solid Waste / tonnes)	373.169	377.450	346.126	370.365	281.275
Total Waste Disposal	**383.077**	**408.384**	**370.659**	**386.687**	**297.115**
Total Offsite Waste					
Waste recycled and disposed	**722.282**	**750.703**	**682.917**	**640.734**	**516.208**
Percentage Waste Recycled	*46.96%*	*45.60%*	*45.72%*	*39.65%*	*42.44%*

7 WATER MANAGEMENT

Clarence Colliery have developed a site-specific Water Management Plan (WMP) as part of a Regional Water Management Plan (RWMP) to address Conditions 5, 6, 6A, 6B, 7, 8, 9, 10, 11 and 12 of Schedule 3, of DA 504-00. The DPE approved the WMP in May 2017. The WMP has been developed to address the approvals and licensing requirements through the completion of the following:

- Collate and review existing information and studies relating to the operation of the water management system at Clarence Colliery;
- Establish an understanding of the water management system at the site;
- Categorise the existing conditions that are specific to water management requirements;
- Identify the clean, dirty, and contaminated water management systems and maximise the separation of these systems;
- Undertake a review of the capacity of dirty and contaminate surface water storages in accordance with Managing Urban Stormwater: Soils and Construction, Volume 1, and Volume 2E (Landcom 2004; DECC 2008);
- Undertake a water quality assessment and review existing water quality assessment criteria;
- Manage water discharged from the site, in terms of volume and quality, to a level that is acceptable for environmental management and community expectations and in accordance with EPL conditions;
- Minimise water discharges from the premises by maximising, where practicable, opportunities for the reuse and recycling of water on site;
- Determine the future water management requirements; and
- Review and develop water monitoring requirements.

7.1 WATER LICENSES

Clarence Colliery holds two water access licenses (WAL), in which **Table 7-1** displays passive take/inflows and active pumping against entitlements. It is noted that water takes are reported over the financial year (i.e. the Water Year), which is from 1 July 2021 to 30 June 2022. During the Reporting Period, WAL36479 was compliant with the assigned entitlement. WAL41882 was inactive during the Reporting Period.

Table 7-1: Water Licenses and Take

Licence	Water sharing plan, source and management zone	Entitlement (ML)	Passive take/inflows (ML)	Active pumping (ML)	TOTAL (ML)
WAL36479	Sydney Basin Richmond Groundwater Source	6,623	0	5,503	5,503
WAL41882	Sydney Basin Coxs River Groundwater Source	1,095	0	0	0

7.2 WATER BALANCE

A site water balance model has been developed for Clarence Colliery to quantify water transfers within the site under existing operational conditions using various rainfall patterns (GHD 2022). A schematic of the overall water management system is presented in **Figure 7-1**. A summary of the predicted average annual inputs and outputs for the Clarence Colliery water management system for the 2022 calendar year is provided in **Table 7-2**. Results were based on the predicted average site conditions in 2022.

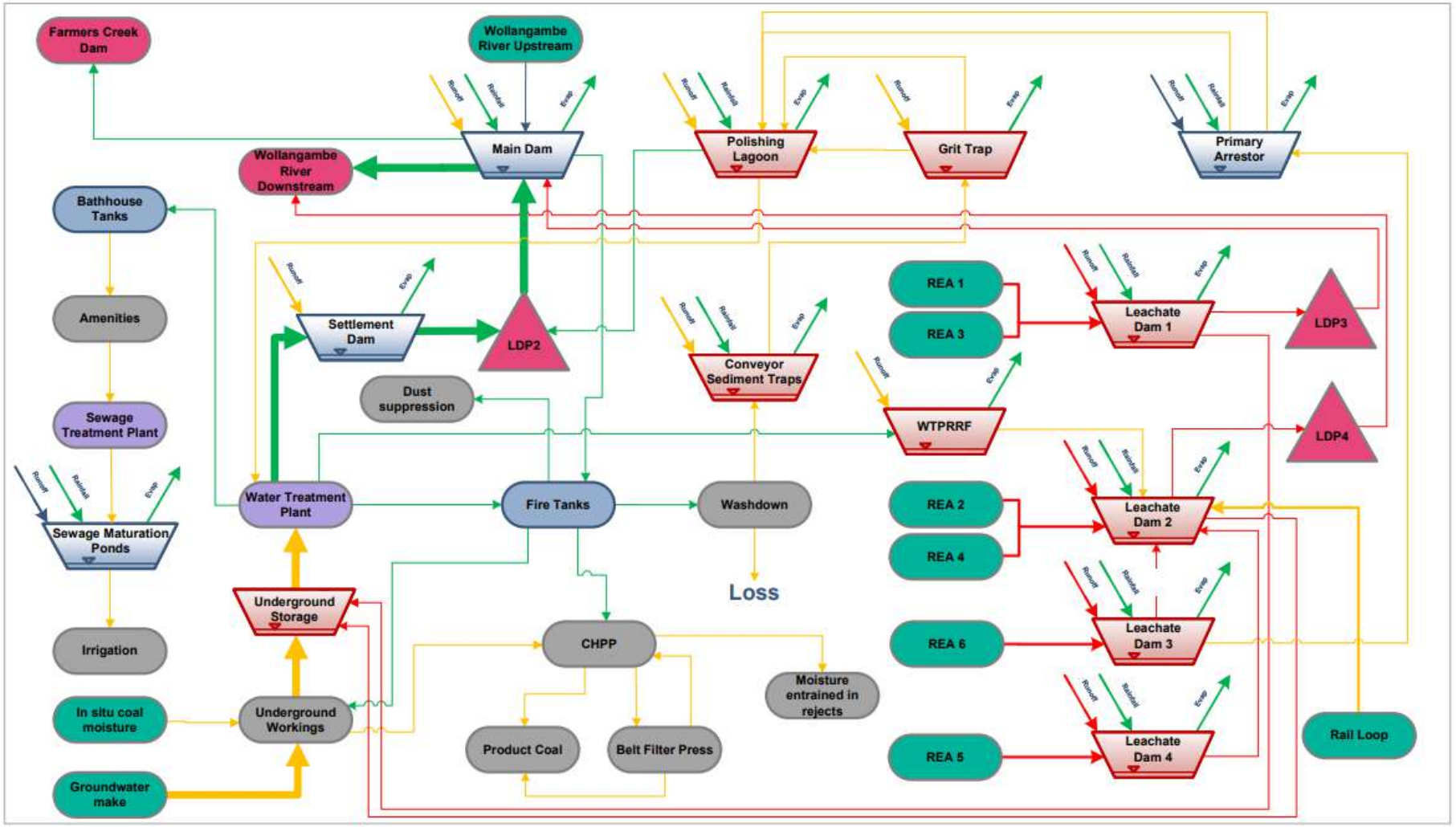
Table 7-2 shows that the largest transfer at Clarence Colliery is the dewatering of groundwater inflows to the underground workings to the WTP and discharge to the Wollangambe River via LDP002. Main Dam is located downstream of LDP002, which is where site operational demands of approximately 600 ML/year on average are extracted under 10WA103852[3]. Water from the Main Dam is pumped to the three fire tanks for use as process water (e.g. underground process water and washery make-up water) and as a permanent supply of water for fire-fighting purposes.

Table 7-2: Site Water Balance – Clarence Colliery

Clarence Colliery 2022 Water Balance	Volume (ML)
Water Sources (Inflows)	
Direct rainfall onto storages	14
Catchment runoff	329
Groundwater inflows into underground workings	6005
In-situ coal moisture	188
Transfers from Main Dam	833
Total Inputs (rounded)	**7369**
Water Loss (Outflows)	
Evaporation from storages	14
Discharge through LDP002	6926
Discharge through LDP003	0
Discharge through LDP004	0
Irrigation	18
Dust suppression losses	265
Wash down losses	27
Coal product	569
Moisture entrained in reject material	75
Total Outputs (rounded)	**7895**
Change in Storage	
Total Change in Storages	**-527**
Water Balance	
Change in water inventory (inputs – outputs – change in storage)	**0**

[3] Clarence holds joint water supply works approval 10WA103852 with Lithgow City Council (LCC) and water use approval 10UA103853, linked to Water Access Licence WAL26195 for 1293 units for the transfer of water stored in Main Dam to Farmers Creek Dam as part of the Clarence Water Transfer Scheme.

Figure 7-1: Site Water Management Schematic



7.3 SURFACE WATER

7.3.1 Environmental Management

The water management system at Clarence Colliery is comprised of clean, dirty, coal contact and leachate water. Sources of water at the site include rainfall, catchment runoff and groundwater inflow to the underground mine workings.

Surface water monitoring is undertaken in accordance with the Clarence Colliery Water Management Plan, Development Consent DA 504-00 and Environment Protection Licence 726 requirements.

The site has also developed trigger action response plans (TARP) to identify and manage potentially adverse impacts, as well as assist with managing the site's surface water during storm events.

Surface water monitoring at Clarence Colliery includes:

- **Discharge water quality monitoring** monthly during discharge events as per the requirements of EPL 726 and the WMP at Licensed Discharge Point (LDP) LDP002, LDP003 and LDP004.[4]
- **Discharge volume monitoring** is undertaken at LDP002 continuously in accordance with the requirements of EPL 726. Discharges through LDP003 and LDP004 are estimated.
- **Monthly surface water quality monitoring** at the following locations including Main Dam; Polishing Lagoon, Leachate Dam 1, Leachate Dam 2, Farmers Creek below Lithgow Dam No. 2, Farmers Creek at Cooerwull Road Bridge, Wollangambe River US, Wollangambe River DS (note this monitoring point is also water quality monitoring Point 9 identified by EPL 726).
- **Quarterly surface water quality monitoring** at the following locations including Farmers Creek US and Farmers Creek DS.
- **Stream health monitoring** including watercourse stability monitoring (only if triggered by subsidence greater than predictions) and aquatic ecology monitoring (see **Section 6.6**).

Surface water monitoring results are compared against relevant concentration limits or criteria.

Water quality limits are specified by EPL726 for LDP002, LDP003 and LDP004. These limits do not apply to discharges from LDP003 and LDP004 when the discharge occurs solely as a result of rainfall measured at the site which exceeds 56 mm over any consecutive five-day period.

EPL 726 also specifies a volumetric limit of 25,000 KL/day for discharges through LDP002. However, discharges through LDP002 may exceed this limit on any day where greater than 10 mm of rainfall is recorded on site.

Performance criteria have also been developed for the Wollangambe River and Farmers Creek, and form the basis of the TARP in the WMP. Water quality monitored at the Wollangambe River DS monitoring site is assessed against site specific guideline values (SSGVs). SSGVs are based on a review of ANZECC (2000) default guideline values (DGVs)

[4] Note that EPL 726 specifies monitoring requirements and concentration limits for LDP001, however this LDP is not currently used and hence has been excluded from the monitoring program.

and water quality observed at reference sites. Water quality monitored at Farmers Creek is assessed against the 80th percentile historical concentrations for Farmers Creek**.**

The key surface water monitoring, as specified in EPL 726, is required at four locations as detailed in **Table 7-3**.

Table 7-3: Surface Water Discharge Monitoring Locations

Monitoring Point Reference	Description / Creek Catchment
LDP002	Discharge from the Water Treatment Plant via drainage channel to Main Dam. The Polishing Lagoon also discharges from this point however only after high rainfall events.
LDP003	Discharge from Leachate Dam 1 to Main Dam.
LDP004	Discharge from Leachate Dam 2 to the Wollangambe River downstream of Main Dam.
Wollangambe River DS (EPL Point 9)	Wollangambe River downstream of LDP002 (and main dam).

7.3.2 Environmental Performance

Discharge Water (LDP002)

As required by EPL 726 conditions and the WMP, water discharged from LDP002 is tested monthly (with some additional analytes tested monthly during discharge) and analysed against the applicable concentration limits. During the Reporting Period LDP002 discharged daily. A summary of LDP002 water quality sampling results from discharge events during the Reporting Period are presented in **Table 7-4**.

Long term water quality monitoring results and trends for LDP002 are provided in **Appendix 8**.

During the Reporting Period water quality monitoring for LDP002 has been undertaken in accordance with EPL726 and the WMP. LDP002 did not comply with EPL water quality limits on several occasions during the Reporting Period in January, March, July, October, November and December. As required by EPL726 and the WMP, exceedances of the EPL limits for LDP002 were reported to the EPA. For further information refer to **Section 11**. [5]

Table 7-4: Summary of Water Quality Results at LDP002

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 Limit
Physiochemical						
pH	12	12	6.5	8.20	8.5	6 – 8.5
Electrical Conductivity (µs/cm)	12	12	231	346	572	N/S

[5] The non-compliances are reported in **Table 1.1** (Statement of Compliance) and **Section 11.**

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 Limit
Total Suspended Solids (mg/L)	12	12	0	8.25	**46**	30
Major Ions						
Chloride (mg/L)	12	12	11	18.9	25	25
Sulfate (mg/L)	12	12	79	102.3	149	250
Nutrients						
Total Fluoride (mg/L)	12	12	LOR	0.04	0.1	1
Total Nitrogen (mg/L)	12	12	LOR	0.17	**0.9**	0.25
Total Phosphorus (mg/L)	12	12	LOR	0.01	**0.06**	0.02
Dissolved Metals						
Arsenic (mg/L)	12	12	LOR	LOR	LOR	0.013
Boron (mg/L)	12	12	LOR	LOR	LOR	0.1
Cadmium (mg/L)	12	12	LOR	LOR	0.0002	0.0002
Chromium (mg/L)	12	12	LOR	LOR	LOR	0.001
Cobalt (mg/L)	12	12	0.0007	0.0072	**0.0683**	0.0025
Copper (mg/L)	12	12	LOR	LOR	0.0001	0.0014
Iron (mg/L)	12	12	LOR	LOR	LOR	0.3
Lead (mg/L)	12	12	LOR	LOR	LOR	0.0034
Lithium (mg/L)	12	12	0.012	0.02	0.024	0.1
Manganese (mg/L)	12	12	0.006	0.05	0.36	0.5
Mercury (mg/L)	12	12	LOR	LOR	LOR	0.00006
Nickel (mg/L)	12	12	0.003	0.016	**0.133**	0.011
Silver (mg/L)	12	12	LOR	LOR	LOR	0.0005
Zinc (mg/L)	12	12	LOR	0.009	**0.047**	0.008
Selenium (mg/L)	12	12	LOR	0.13	0.6	0.005
Other						
Oil and Grease	12	12	LOR	LOR	LOR	10

Notes: *N/S = Performance criteria or site-specific guideline values are not specified within either the Clarence Colliery Water Management Plan (2017) or EPL 726. LOR means limit of reporting. The **bolded** text indicates a non-compliance at least once with WMP and EPL726 limits.

Discharge Water (LDP003)

As required by EPL 726 conditions and the WMP, water discharged from LDP003 is tested monthly during discharges and analysed against the applicable concentration limits.

During the Reporting Period LDP003 discharged on 3 days during the month of July in 2022. Rainfall recorded on site between the 3-7 July was 195.2mm. A summary of LDP003 water quality sampling results from discharge events during the Reporting Period are presented in **Table 7-5**.

During the Reporting Period water quality monitoring for LDP003 has been undertaken in accordance with EPL 726 and the WMP. LDP003 complied with EPL water quality limits during the Reporting Period in consideration of the of rainfall measured at the site exceeding 56 mm prior to the discharge.

Table 7-5: Summary of Water Quality Results at LDP003

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 limit
Physiochemical						
pH	1	1	5.3	5.3	**5.3**	6 – 8.5
Electrical Conductivity (µs/cm)	1	1	1811	1811	1811	N/S
Total Suspended Solids (mg/L)	1	1	115	115	**115**	30
Major Ions						
Chloride	1	1	2	2	2	25
Sulfate	1	1	79	79	79	250
Nutrients						
Total Fluoride (mg/L)	1	1	0.1	0.1	0.1	1
Total Nitrogen (mg/L)	1	1	1.0	1.0	**1.0**	0.25
Total Phosphorus (mg/L)	1	1	0.06	0.06	0.06	0.02
Dissolved Metals						
Arsenic (mg/L)	1	1	LOR	LOR	LOR	0.013
Boron (mg/L)	1	1	LOR	LOR	LOR	0.1
Cadmium (mg/L)	1	1	0.0007	0.0007	**0.0007**	0.0002
Chromium (mg/L)	1	1	LOR	LOR	LOR	0.001
Cobalt (mg/L)	1	1	0.385	0.385	**0.385**	0.0025
Copper (mg/L)	1	1	0.006	0.006	**0.006**	0.0014
Iron (mg/L)	1	1	0.08	0.08	0.08	0.3
Lead (mg/L)	1	1	LOR	LOR	LOR	0.0034

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 limit
Lithium (mg/L)	1	1	0.031	0.031	0.031	0.1
Manganese (mg/L)	1	1	1.26	1.26	1.26	0.5
Mercury (mg/L)	1	1	LOR	LOR	LOR	0.00006
Nickel (mg/L)	1	1	1.01	1.01	**1.01**	0.011
Silver (mg/L)	1	1	LOR	LOR	LOR	0.0005
Zinc (mg/L)	1	1	1.09	1.09	1.09	0.008
Selenium (mg/L)	1	1	LOR	LOR	LOR	0.005
Other						
Oil and Grease (mg/L)	1	1	LOR	LOR	LOR	10

Notes: *N/S = Performance criteria or site-specific guideline values are not specified within either the Clarence Colliery Water Management Plan (2017) or EPL 726. LOR means limit of reporting. The **bolded** text indicates a non-compliance with WMP and EPL726 limits, however these limits do not apply when the discharge occurs solely as a result of rainfall measured at the site which exceeds 56 mm over any consecutive five-day period. As the site recorded 195.2mm of rainfall from 3-7 July 2022 therefore the limits do not apply.

Discharge Water (LDP004)

As required by EPL 726 conditions and the WMP, water discharged from LDP004 is tested monthly during discharges and analysed against the applicable concentration limits.

During the Reporting Period LDP004 discharged for 2 days during the month of January and 4 days during the month of July in 2022. Rainfall recorded on site from 8-12 January 2022 was 81.2mm and 195.2mm of rainfall from 3-7 July 2022. A summary of LDP004 water quality sampling results from discharge events during the Reporting Period are presented in **Table 7-6**.

During the Reporting Period water quality monitoring for LDP004 has been undertaken in accordance with EPL 726 and the WMP. LDP004 complied with EPL water quality limits during the Reporting Period in consideration of the of rainfall measured at the site exceeding 56 mm prior to the discharges.

Table 7-6: Summary of Water Quality Results at LDP004

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 limit
Physiochemical						
pH	2	2	**3.1**	3.15	**3.2**	6 – 8.5
Electrical Conductivity (µs/cm)	2	2	630	722.5	815	N/S

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL726 limit
Total Suspended Solids (mg/L)	2	2	**34**	38.00	**42**	30
Major Ions						
Chloride	2	2	LOR	LOR	LOR	25
Sulfate	2	2	**296**	328.5	**361**	250
Nutrients						
Total Fluoride (mg/L)	2	2	LOR	0.20	0.20	1
Total Nitrogen (mg/L)	2	2	LOR	0.10	0.20	0.25
Total Phosphorus (mg/L)	2	2	LOR	0.02	**0.03**	0.02
Dissolved Metals						
Arsenic (mg/L)	2	2	LOR	LOR	LOR	0.013
Boron (mg/L)	2	2	LOR	LOR	LOR	0.1
Cadmium (mg/L)	2	2	**0.0057**	0.00605	**0.0064**	0.0002
Chromium (mg/L)	2	2	0.001	0.003	**0.005**	0.001
Cobalt (mg/L)	2	2	**2.35**	2.73	**3.11**	0.0025
Copper (mg/L)	2	2	**0.101**	0.165	**0.228**	0.0014
Iron (mg/L)	2	2	LOR	2.44	**2.44**	0.3
Lead (mg/L)	2	2	**0.016**	0.019	**0.021**	0.0034
Lithium (mg/L)	2	2	0.028	0.04	0.055	0.1
Manganese (mg/L)	2	2	**5.54**	8.77	**12.00**	0.5
Mercury (mg/L)	2	2	LOR	LOR	LOR	0.00006
Nickel (mg/L)	2	2	**5.27**	6.05	**6.82**	0.011
Silver (mg/L)	2	2	LOR	0.01	**0.01**	0.0005
Zinc (mg/L)	2	2	**6.46**	7.10	**7.73**	0.008
Selenium (mg/L)	2	2	0.01	0.01	0.01	0.005
Other						
Oil and Grease (mg/L)	2	2	LOR	LOR	LOR	10

Notes: *N/S = Performance criteria or site-specific guideline values are not specified within either the Clarence Colliery Water Management Plan (2017) or EPL 726. LOR means limit of reporting. The **bolded** text indicates an non-compliance at least once with WMP and EPL726 limits, however these limits do not apply when the discharge occurs solely as a result of rainfall measured at the site which exceeds 56 mm over any consecutive five-day period. As the site recorded 81.2mm of rainfall from 8-12 January 2022 and 195.2mm of rainfall from 3-7 July 2022 therefore the limits do not apply.

LDP002, LDP003 and LDP004 Discharge Volumes

The volume of water discharged is required to be monitored daily at the licenced discharge points LDP002, LDP003 and LDP004 in accordance with EPL 726. The total volume discharged from LDP002 may exceed 25,000kL/day on any day where greater than 10mm of rainfall is recorded at the premises, for that day.

Table 7-7 provides the discharge volume results for the Annual Review period. **Figure 7-2** displays the daily discharge volumes for LDP002 during the reporting period.

Table 7-7: LDP002, LDP003 and LDP004 Discharge Volumes

Discharge Point	No. of Measurements made	Lowest result (KL)	Mean result (KL)	Highest result (KL)	EPL Limit (KL/day)	Comments
LDP002	365	3,356.2	16,768.8	42,767.1[1]	25,000	Continuous Monitoring
LDP003	3	N/A	491	843[2]	N/A	Discharge in July
LDP004	6	N/A	2800	5391[3]	N/A	Discharge in January & July

[1] All occasions where discharge was >25,000Kl/day coincided with >10mm of rainfall, and included the following dates 6-8 March (144.6mm), 3-5 July (161.2mm), 8 October (14.4mm, over 24hr period), and 14 November (34.8mm)
[2] Estimate during discharge over 3 days in July of 843KL.
[3] Estimate during discharge over 2 days in January of <1000KL. Estimate during discharge over 4 days in July of 5391KL.

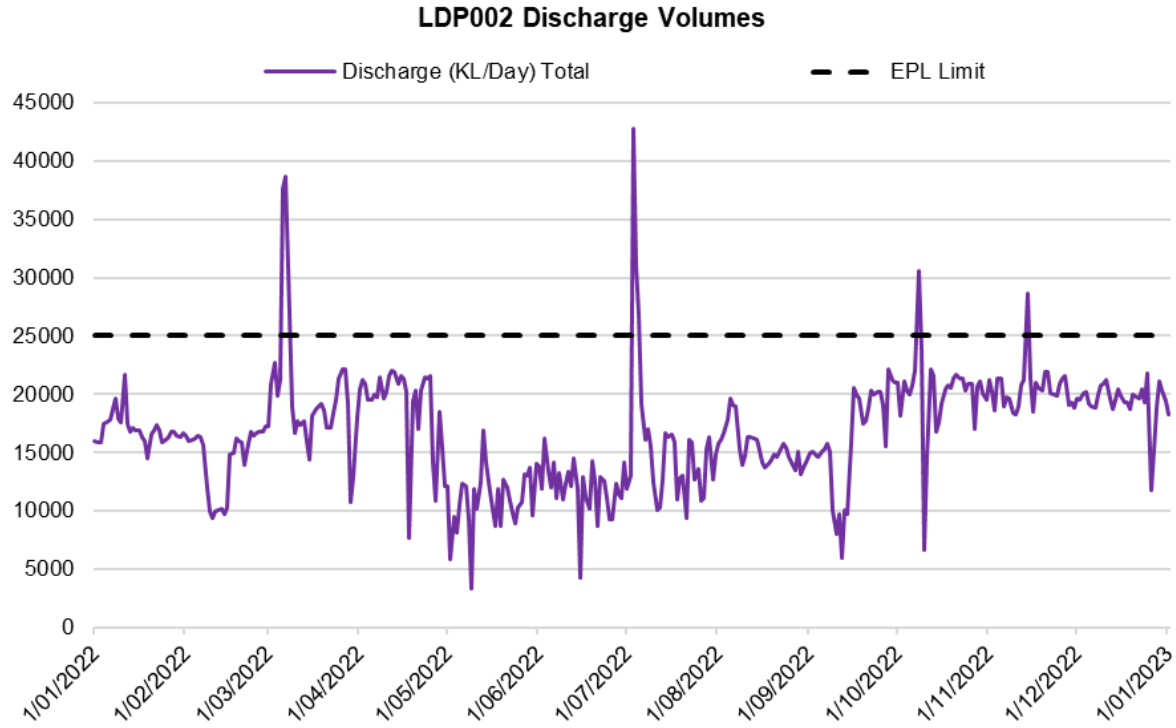


Figure 7-2: Summary of LDP002 Daily Discharge Volumes

Wollangambe Downstream Water Quality (EPL Point 9)

Wollangambe Downstream (EPL Point 9) is located downstream of LDP002 in the Wollangambe River. The requirement to undertake water quality monitoring at this point was introduced into EPL 726 in March 2017.

Water quality criteria is not specified in EPL 726 for EPL Point 9. The WMP (May 2017) specifies site-specific guideline values (SSGVs) that are based on a review ANZECC (2000) default guideline values (DGVs). DGVs for a species protection level of 99% were used for the Wollangambe River due to high conservation value of the receiving environment within the Blue Mountains National Park.

Table 7-8 below summarises the water quality monitoring results against SSGVs during the Reporting Period. Water quality monitoring results are presented graphically in **Appendix 8.**

Table 7-8: Summary of Water Quality Results at Wollangambe River Downstream

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	SSGV limit
Physiochemical						
Dissolved Oxygen	12	12	7.1	8.63	9.9	N/S
Electrical Conductivity	12	12	**184**	268	**313**	100
pH	12	12	**5.5**	7.0	8.5	5.7 - 9.0
Temperature	12	12	6.3	12.71	17.2	N/S
Total Suspended Solids	12	12	0	2.17	9	25
Turbidity	12	12	0.6	3.97	12	25
Major Ions						
Bicarbonate	12	12	10	18.3	36	N/S
Carbonate	12	12	LOR	LOR	LOR	N/S
Hydroxide	12	12	LOR	LOR	LOR	N/S
Total Alkalinity	12	12	10	18.3	36	N/S
Calcium	12	12	23	30.0	37	N/S
Chloride	12	12	13	15.2	18	N/S
Magnesium	12	12	6	8.0	11	N/S
Potassium	12	12	2	2.3	3	N/S
Sodium	12	12	3	3.7	6	N/S
Sulfate	12	12	62	78.1	101	N/S
Total Hardness	12	12	82	107.8	138	N/S
Nutrients						
Ammonia	12	12	LOR	0.02	0.06	0.32
Nitrate	12	12	LOR	0.20	**1.04**	0.03
Nitrite	12	12	LOR	LOR	LOR	N/S

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	SSGV limit
Nitrate + Nitrite	12	12	0.01	0.20	**1.05**	0.1
Total Fluoride	12	12	LOR	LOR	LOR	N/S
TKN	12	12	LOR	0.18	1	N/S
Total Nitrogen	12	12	LOR	0.36	**1.5**	0.24
Total Phosphorus	12	12	LOR	0.01	**0.04**	0.02
Dissolved Metals						
Aluminium	12	12	0.03	0.05	0.09	0.11
Arsenic	12	12	LOR	LOR	LOR	0.001
Barium	12	12	0.015	0.02	0.02	0.011
Beryllium	12	12	LOR	LOR	LOR	N/S
Boron	12	12	LOR	LOR	LOR	0.05
Cadmium	12	12	LOR	LOR	LOR	0.0001
Chromium	12	12	LOR	LOR	LOR	0.00001
Cobalt	12	12	0.007	0.017	0.023	N/S
Copper	12	12	LOR	0.00025	0.003	0.001
Iron	12	12	LOR	0.25	0.41	0.8
Lead	12	12	LOR	LOR	LOR	0.001
Lithium	12	12	0.012	0.01	0.017	0.001
Manganese	12	12	0.087	0.14	0.21	1.2
Mercury	12	12	LOR	LOR	LOR	0.00006
Molybdenum	12	12	LOR	LOR	LOR	0.001
Nickel	12	12	0.02	0.03	0.017	0.008
Silver	12	12	LOR	LOR	LOR	0.00002
Selenium	12	12	LOR	LOR	LOR	N/S
Strontium	12	12	0.04	0.05	0.06	0.004
Vanadium	12	12	LOR	LOR	LOR	N/S
Zinc	12	12	0.018	0.03	0.05	0.012
Total Metals						
Aluminium	12	12	0.07	0.15	0.26	N/S
Arsenic	12	12	LOR	LOR	LOR	N/S
Barium	12	12	0.016	0.019	0.023	N/S
Beryllium	12	12	LOR	LOR	LOR	N/S
Boron	12	12	LOR	LOR	LOR	N/S
Cadmium	12	12	LOR	LOR	LOR	N/S
Cobalt	12	12	0.011	0.017	0.023	N/S

Pollutant	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	SSGV limit
Copper	12	12	LOR	0.001	0.003	N/S
Iron	12	12	LOR	0.25	0.41	N/S
Lead	12	12	LOR	LOR	LOR	N/S
Manganese	12	12	0.12	0.18	0.25	N/S
Nickel	12	12	0.03	0.04	0.058	N/S
Mercury	12	12	LOR	LOR	LOR	N/S
Molybdenum	12	12	LOR	LOR	LOR	N/S
Selenium	12	12	LOR	LOR	LOR	N/S
Silver	12	12	LOR	LOR	LOR	N/S
Strontium	12	12	0.034	0.049	0.066	N/S
Vanadium	12	12	LOR	LOR	LOR	N/S
Zinc	12	12	0.03	0.06	0.10	N/S
Other						
Oil and Grease	12	12	LOR	LOR	LOR	N/S
Dissolved Organic Carbon	12	12	2	3	5	N/S
Total Organic Carbon	12	12	1	2	3	N/S

7.3.3 Comparisons Against Predictions

Section 3.8.3 of the WMP (Version 3) discusses discharge frequency predictions for each of the Licenced Discharge Points at Clarence.

Discharge frequency for each LDP location has been estimated from the water balance modelling. Scenarios assessed included a future conditions which considered minor differences in groundwater predictions. The accuracy of the annual exceedance probability of discharge from the site water balance model are limited by the daily rainfall record, daily time step of the hydraulic simulations and the use of the sub-module, the Australian Water Balance Model (AWBM). Therefore, these estimates should be considered as relative indicators only and are unlikely to reflect the actual design performance of these water management structures.

Discharge frequency has been assessed through the use of a cumulative probability distribution. The modelling indicates that LDP002 discharge are predicted to be mostly within a typical discharge rate of 17 ML/day to 20 ML/day (50^{th} percentile is equal to 0.5 cumulative frequency), although discharges due to rare rainfall events are expected in less than 5% of years.

Modelling predicts discharges through LDP003 are likely to occur often with an estimated daily maximum of up to 29 ML/day under rare rainfall conditions. Modelling predicts that discharges through LDP004 were simulated to occur in approximately 25% of years under future

conditions, with an estimated daily maximum discharge of up to 36 ML/day under rare rainfall conditions.

During the Reporting Period discharge volumes from LDP002 were within predicted expectation. Discharge volumes from LDP003 and LDP004 were below predicted expectation.

Modification 2 (MOD2) of DA 504-00 was for the establishment of reject emplacement area (REA) VI to the south of the 'Run of Mine' (ROM) area, upgrade facilities and increase personnel. MOD2 was approved in June 2014. MOD2 predicted all rainfall falling directly on REA VI will be captured in the leachate management system described above and will not have the potential to impact upon the quality of water entering the Newnes Plateau Hanging Swamp (NPHS).

7.3.4 Long Term Analysis

Long-term water quality results for the period 2018 to 2022 at LDP002 and Wollangambe Downstream (EPL Point 9) are provided in **Appendix 8**, including comparison against their relevant water quality criteria or guideline values.

A five-year summary of water quality and water volume discharge exceedances from LDP002 is presented in **Table 7-9**. It is important to note that these exceedances are of a minor nature, and the limits are extremely low to ensure neutral or beneficial impact to the surrounding environment. It is therefore determined that these exceedances have not resulted in material harm to the environment, as reported to the relevant government agencies within the reporting period.

Table 7-9: 5 Year Water Quality and Volume Exceedance Summary

Reporting Period	LDP002 Water Quality	LDP002 Water Volume	Total Exceedances
2018	10	0	10
2019	5	0	5
2020	7	0	7
2021	7	0	7
2022	6	0	6

7.3.5 Implemented / Proposed Improvements

Clarence completed a review of the WMP in September 2021 (Version 2) to incorporate regulator comments, responses to actions from the 2020 Independent Environmental Audit (IEA) and Modification 6 (MOD 6). During this Reporting Period the WMP (Version 3) was revised in June 2022 to include Leachate Dam 4 and response to regulator comments. At the time of preparing the 2022 Annual Review WMP (Version 3) had not been approved.

Further consultation with DPE regarding the latest revision to the WMP (Version 3) will be undertaken during the next Reporting Period.

The site will continue to focus on improvements to the water management and monitoring system to ensure ongoing compliance with the WMP's SSGVs and EPL limits applicable to Clarence Colliery.

Centennial has been working closely with the EPA for several years as part of a Pollution Reduction Program (PRP) focused on discharges into the Wollangambe River. Clarence has

committed to the cessation of discharge via LDP002 and is working with the EPA, the Lithgow City Council and DPE to meet this obligation.

Clarence is dedicated to ensuring compliance in our wide range of environmental performance indicators and takes any non-compliances very seriously. As with all exceedances, non-compliances or incidents that have occurred at Clarence Colliery, a complete and detailed report has been supplied to the EPA and DPE for the Reporting Period.

7.4 GROUNDWATER

As part of the development consent, Clarence was required to establish several environmental monitoring programs. These programs include the Clarence Water Management Plan (WMP) (Version 1) and the Clarence 800 Area Subsidence Management Plan (SMP).

The WMP and SMP detail intensive monitoring programmes that have been implemented to monitor potential impacts from underground mining on the groundwater regime, and in particular, the Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS) which are Endangered Ecological Community under the *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999*.

Clarence Colliery engaged EMM Consulting Pty Ltd (EMM) to undertake a review of groundwater monitoring undertaking during the Reporting Period. Summaries from EMM are provided throughout the following sections, with their complete report provide in **Appendix 9**.

EMM's groundwater data analysis presents a review of observed anomalies and possible mining-induced groundwater-related impacts during the reporting period (01 January 2022 to 31 December 2022). Any observed impacts that exceed trigger levels set out in the WMP and SMP are also identified so that appropriate management or engineering solutions may be implemented.

7.4.1 Environmental Management

As required by the WMP, the groundwater monitoring program at Clarence Colliery includes 18 vibrating wire piezometers (VWPs) and 17 standpipes. All VWPs are continuously logged for piezometric head and groundwater levels. Groundwater levels are recorded every three hours using installed loggers in monitoring standpipes. Data is downloaded every two months.

The groundwater monitoring network is established to detect potential impacts to groundwater systems due to mining and subsidence. The network consists of the following:

- **Swamp piezometers**: are installed in eleven swamps above mining operations to detect potential mining-related impacts on the swamp groundwater regimes. Groundwater data loggers record groundwater levels on a daily basis.
- **Open borehole standpipe piezometers** (standpipe piezometers): are installed within the perched and shallow groundwater systems to detect potential mining-related impacts on the Clarence Aquifer (Shallow groundwater system). Groundwater data loggers record groundwater levels on a daily basis.
- **Vibrating wire piezometers** (VWP): a network of VWPs measure pore pressure in multiple hydrogeological horizons above the Katoomba Seam to detect mining-related impacts within the shallow and deep groundwater systems. Additionally, VWPs are used to detect any mining induced hydraulic connectivity between the shallow and deep groundwater systems. Data is recorded by data loggers on a daily basis.

Following download, data is analysed for any trends or potential mining related impacts and presented in in the Subsidence Management Status Report (SMSR) submitted to relevant stakeholders every 4 months as required by the SMP. At the time of the preparation of the Annual Review the latest SMSR report was submitted in November, summarising the results until 31st October 2022.

7.4.2 Environmental Performance

Swamp Piezometers

Ten swamp piezometers and three shallow piezometers (targeting the Burralow Formation and Banks Wall Sandstone) were installed during 2022. These piezometers were installed to collect baseline monitoring data for proposed mining developments. Data loggers were installed in the three shallow piezometers (PA1, PA6 and PA3) in mid-December 2022. Therefore, limited data is available and trends at PA1, PA6 and PA3 have not been discussed in this report.

Hydrographs for monitoring sites have been compared to daily CRD (mm) to distinguish between meteorological trends and potential mining impacts. The dashed red vertical lines indicate the reporting period (1 January 2022 to 31 December 2022).

General groundwater level trends and trigger status during the reporting period are detailed in **Table 7-10**. A general overview of historical observations, mining history and hydrographs for swamp piezometers is provided in the EMM report (**Appendix 9**).

Table 7-10: Swamp Piezometer Trigger Status 2022

Bore ID	Target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CS1	Swamp sediments	Decommissioned – piezometer damaged by bushfire.
MW05	Swamp sediments	No trigger – increasing trend.
HVU1	Swamp sediments	No trigger level defined in the WMP – stable trend.
HS1	Swamp sediments	No trigger – fluctuating with rainfall.
HS2	Swamp sediments	No trigger – fluctuating with rainfall.
HS3	Swamp sediments	No trigger – fluctuating with rainfall.
PSE1	Swamp sediments	No trigger – exceeds trigger level however, there has been no significant fall in groundwater level and no indication of mining related impacts. Groundwater levels are highly variable, trending with the CRD and peaking with rainfall.
PSE2	Swamp sediments	No trigger – exceeds trigger level however, there has been no significant fall in groundwater level and no indication of mining related impacts. Groundwater levels are highly variable, trending with the CRD and peaking with rainfall.

Bore ID	Target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
OS1	Swamp sediments	No trigger – slight increasing trend.
PG1	Swamp sediments	No trigger – stable trend.
PG2	Swamp sediments	No trigger – exceeds trigger level however there has been no significant fall in groundwater level and no indication of mining related impacts. Groundwater levels are stable, peaking with rainfall.
CSP1 (BSE1)	Swamp sediments	No trigger level defined – stable trend, still settling due to recent instalment.
CSP2 (BSE2)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
CSP4 (PHS1)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
CSP5 (PHS2)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
MU1 (CSP6)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
MU2 (CSP7)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
UD1 (CSP8)	Swamp sediments	No trigger level defined in the WMP – slight decreasing trend.
UD2 (CSP9)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
BN1 (CSP10)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.
BN2 (CSP11)	Swamp sediments	No trigger level defined in the WMP – stable trend, still settling due to recent instalment.

Shallow Groundwater System

Standpipe piezometer groundwater levels have been reviewed against their respective trigger values in the WMP. Where triggers have occurred, the groundwater level response has been assessed against the TARP to determine if a mining impact has occurred and if further investigation is required.

General comments on historical observations and mining history for open borehole standpipe piezometers and hydrographs are provided in EMM's report (**Appendix 9**). Comments on groundwater level trends and standpipe piezometer trigger status during the reporting period are detailed in **Table 7-11**.

Table 7-11: Open borehole standpipe piezometer trigger status (2022)

Bore ID	Target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CLRP4	Banks Wall Sandstone	No trigger – increasing trend.
CLRP5	Banks Wall Sandstone	No trigger – increasing trend.
CLRP7	Banks Wall Sandstone	No trigger – increasing trend.
CLRP8	Banks Wall Sandstone	No trigger level defined in the WMP – increasing trend.
CLRP10	Banks Wall Sandstone	Below the trigger value from early August 2019 until late April 2022. Increasing trend throughout the reporting period, corresponding to the CRD.
CLRP15	Burra-Moko head Formation/Caley Formation	No trigger – groundwater levels show an increasing trend.
CLRP28	Banks Wall Sandstone	No trigger level defined in the WMP – increasing trend.
CLRP31	Banks Wall Sandstone	No trigger level defined in the WMP – increasing trend.
CC113	Banks Wall Sandstone	No trigger level defined in the WMP – decommissioned.

Vibrating Wire Piezometers

VWP piezometric pressures have been reviewed against their respective trigger values in the WMP. Where triggers have been realised, the piezometric response has been assessed against the TARP to determine if a mining impact has occurred and if further investigation is required.

General comments on historical observations, mining history and hydrographs for VWP's are provided in EMM's report (**Appendix 9**). Each VWP contains several piezometers (piezo) which target certain formations and depths. This along with comments on piezometric pressure trends and trigger status are detailed in **Table 7-12**.

Table 7-12: Vibrating Wire Piezometer Trigger Status (2022)

VWP ID	Piezo number & target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CLRP1	#1 Katoomba Seam (175 m bgl)	No trigger – stable trend.
	#2 Burra-Moko head Formation/Caley Formation (150 m bgl)	No trigger – slight increasing trend, likely due to above average rainfall.

VWP ID	Piezo number & target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
	#3 Banks Wall Sandstone (100 m bgl)	No trigger – increasing trend, likely due to above average rainfall.
	#4 Banks Wall Sandstone (60 m bgl)	No trigger – increasing trend, likely due to above average rainfall.
CLRP2	#1 Katoomba Seam (276 m bgl)	Communication was lost with this piezo in August 2007 due to mining.
	#2 Banks Wall Sandstone (190 m bgl)	Exceeded trigger level from 1/11/14 to 10/03/2022. Increasing trend during the reporting period likely due to above average rainfall.
	#3 Banks Wall Sandstone (130 m bgl)	Exceeded trigger level from 30/12/17 to 18/01/2022. Increasing trend during the reporting period likely due to above average rainfall.
	#4 Banks Wall Sandstone (70 m bgl)	No trigger – increasing trend, likely due to above average rainfall.
CLRP3	#1 Burra-Moko head Formation/Caley Formation (198 m bgl)	No trigger – stable trend.
	#2 Banks Wall Sandstone (138 m bgl)	No trigger – stable trend.
	#3 Banks Wall Sandstone (85 m bgl)	No trigger – stable trend.
CLRP6	#1 Burra-Moko head Formation/Caley Formation (160 m bgl)	Communication with this piezo was lost in October 2011.
	#2 Banks Wall Sandstone (100 m bgl)	Limited data due to logger issues, not enough data available to determine trends.
	#3 Banks Wall Sandstone (60 m bgl)	Limited data due to logger issues, not enough data available to determine trends.
CLRP11	#1 Burra-Moko head Formation/Caley Formation (165 m bgl)	Limited data due to logger issues, not enough data available to determine trends. The logger was replaced in February 2023.
	#2 Burra-Moko head Formation/Caley Formation (134.5 m bgl)	Limited data due to logger issues, not enough data available to determine trends. The logger was replaced in February 2023.
	#3 Banks Wall Sandstone (74.5 m bgl)	Limited data due to logger issues, not enough data available to determine trends. The logger was replaced in February 2023.
	#4 Banks Wall Sandstone (61 m bgl)	Limited data due to logger issues, not enough data available to determine trends. The logger was replaced in February 2023.

VWP ID	Piezo number & target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CLRP12	#1 Burra-Moko head Formation/Caley Formation (230 m bgl)	Access restrictions due to nearby sand quarry – decommissioned.
	#2 Burra-Moko head Formation/Caley Formation (180 m bgl)	
	#3 Banks Wall Sandstone (120 m bgl)	
	#4 Banks Wall Sandstone (100 m bgl)	
CLRP13	#1 Burra-Moko head Formation/Caley Formation (240 m bgl)	No trigger levels defined in the WMP. Depressurisation in early May, likely due to the mining of panel 822 40m south of CLRP13. Stable after depressurisation.
	#2 Burra-Moko head Formation/Caley Formation (210 m bgl)	No trigger levels defined in the WMP. Pressure increase in early May and stabilisation from late May, trending towards pressure before the increase in early May. Likely due to the mining of panel 822 40m south of CLRP13.
	#3 Banks Wall Sandstone (140 m bgl)	No trigger levels defined in the WMP. Slight increasing trend.
	#4 Banks Wall Sandstone (110 m bgl)	No trigger levels defined in the WMP. Stable trend.
	#5 Banks Wall Sandstone (80 m bgl)	No trigger levels defined in the WMP. Increasing trend.
CLRP14	#1 Burra-Moko Head Formation (220 m bgl)	No trigger – Slight increasing trend, likely due to above average rainfall.
	#2 Burra-Moko Head Formation (185 m bgl)	No trigger – Stable trend.
	#3 Banks Wall Sandstone (130 m bgl)	Communication was lost with this piezo in December 2018.
	#4 Banks Wall Sandstone (100 m bgl)	Communication was lost with this piezo in April 2019.
CLRP15	#1 Burra-Moko Head Formation (160 m bgl)	No trigger levels defined in the WMP. Stable trend.
	#2 Burra-Moko Head Formation (130 m bgl)	No trigger levels defined in the WMP. Increasing trend.
	#3 Banks Wall Sandstone (90 m bgl)	No trigger levels defined in the WMP. Sharp increase in early July likely due to rainfall, slow decline thereafter.
	#4 Banks Wall Sandstone (60 m bgl)	No trigger levels defined in the WMP. Malfunctioned in 2019.

VWP ID	Piezo number & target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CLRP16	#1 Burra-Moko Head Formation (115 m bgl)	No trigger levels defined in the WMP. Stable trend.
	#2 Burra-Moko Head Formation (70 m bgl)	No trigger – Stable trend.
CLRP17	#1 Burra-Moko Head Formation (200 m bgl)	Communication was lost with this piezo in October 2015.
	#2 Burra-Moko Head Formation (170 m bgl)	No trigger – slight depressurisation response in August 2021 from mining Panel 818A. Gradual increase during the reporting period.
	#3 Banks Wall Sandstone (70 m bgl)	No trigger – gradual increase during the reporting period.
CLRP18	#1 Burra-Moko Head Formation/Caley Formation (230 m bgl)	Exceeded trigger value from 2/08/17 to 10/04/22. Increasing trend, likely due to above average rainfall.
	#2 Banks Wall Sandstone (75 m bgl)	Communication was lost with this piezo in February 2021.
CLRP19	#1 Burra-Moko Head Formation (170 m bgl)	Exceeded trigger value from 1/1/21 continuing throughout the reporting period. Depressurisation response in August 2021 due to mining Panel 818A. Continued declining trend during the reporting period.
	#2 Burra-Moko Head Formation (120 m bgl)	No trigger – Stable trend.
	#3 Banks Wall Sandstone (90 m bgl)	No trigger – Gradual increase during the reporting period.
CLRP22	#1 Burra-Moko Head Formation (220 m bgl)	Communication was lost with this piezo in November 2020 due to subsidence.
	#2 Banks Wall Sandstone (90 m bgl)	Exceeded trigger value from 1/1/19 to 29/09/22. Gradual increase during the reporting period.
CLRP27	#1 Katoomba Seam (275 m bgl)	No trigger levels defined in the WMP. Stable trend.
	#2 Caley Formation (220 m bgl)	No trigger levels defined in the WMP. Inconsistent data, possibly unsaturated.
	#3 Caley Formation (190 m bgl)	No trigger levels defined in the WMP. Fluctuating, decreasing trend.
	#4 Banks Wall Sandstone (130 m bgl)	No trigger levels defined in the WMP. Fluctuating, no trend apparent.
	#5 Banks Wall Sandstone (90 m bgl)	No trigger levels defined in the WMP. Communication was lost with this piezo in August 2021 due to a malfunction.

VWP ID	Piezo number & target formation	Trigger status and trend during the reporting period (1 January 2022 – 31 December 2022)
CLRP29	#1 Katoomba Seam (260 m bgl)	No trigger levels defined in the WMP. Increasing trend, possibly due to above average rainfall.
	#2 Katoomba Seam (248 m bgl)	No trigger levels defined in the WMP. Increasing trend, possibly due to above average rainfall.
	#3 Caley Formation (189 m bgl)	No trigger levels defined in the WMP. Increasing trend, due to above average rainfall.
	#4 Banks Wall Sandstone (70 m bgl)	No trigger levels defined in the WMP. Increasing trend, due to above average rainfall.
CLRP33	#1 Katoomba Seam (287 m bgl)	No trigger levels defined in the WMP. Slight increasing trend.
	#2 Caley Formation (276 m bgl)	No trigger levels defined in the WMP. Slight increasing trend.
	#3 Burra-Moko Head Formation (236 m bgl)	No trigger levels defined in the WMP. Stable trend.
	#4 Banks Wall Sandstone (67 m bgl)	No trigger levels defined in the WMP. Stable trend.
CC114	#1 Burra-Moko Head Formation (165 m bgl)	No trigger – stable trend.
	#2 Burra-Moko Head Formation (135 m bgl)	No trigger – stable trend.
	#3 Banks Wall Sandstone (75 m bgl)	No trigger – increasing trend.
	#4 Banks Wall Sandstone (45 m bgl)	No trigger – slight increasing trend.
CC115	#1 Burra-Moko Head Formation (270 m bgl)	No trigger – depressurisation response in August 2021 due to mining of panel 818A. Increasing trend plateauing towards the end of the reporting period.
	#2 Burra-Moko Head Formation (200 m bgl)	No trigger – depressurisation response in August 2021 due to mining Panel 818A.Increasing trend following depressurisation.
	#3 Banks Wall Sandstone (170 m bgl)	No trigger – depressurisation response in August 2021 due to mining Panel 818A. Stable during the reporting period.
	#4 Banks Wall Sandstone (120 m bgl)	No trigger – increasing trend.

REA III GROUNDWATER MONITORING PROGRAM

Three groundwater monitoring piezometers were installed (REA302, REA304 and REA305) with REA III in 2016. All piezometers were drilled at least 2 – 2.5m below the base of REA III. Currently, groundwater level is measured quarterly, and the water is sampled for quality bi-annually. A summary of the last 12 months quality data is displayed below in **Table 7-13**. REA III standing water heights are displayed in **Appendix 9**.

Table 7-13: Summary of REA III Groundwater Monitoring Results

Parameter	REA302		REA304		REA305	
mg/L	Jun-22	Dec-22	Jun-22	Dec-22*	Jun-22	Dec-22
Ph (Ph units)	6.0	7.01	6.5	-	3.0	3.72
Sulfate as SO4	510	423	410	-	788	680
Electrical Conductivity	953	936	948	-	1277	1180
Dissolved Aluminium	0.02	<0.01	0.08	-	45.8	34.3
Dissolved Arsenic	<0.001	<0.001	<0.001	-	0.002	0.004
Dissolved Beryllium	0.013	0.005	0.001	-	0.183	0.165
Dissolved Barium	0.013	0.013	0.022	-	0.016	0.018
Dissolved Cadmium	0.0002	0.0005	0.0002	-	0.0167	0.0159
Dissolved Chromium	<0.001	<0.001	<0.001	-	0.002	0.002
Dissolved Cobalt	0.728	0.295	0.029	-	9.40	6.18
Dissolved Copper	0.003	<0.001	<0.001	-	0.082	0.108
Dissolved Lead	<0.001	<0.001	<0.001	-	0.030	0.022
Dissolved Lithium	0.055	0.043	0.016	-	0.381	0.363
Dissolved Manganese	6.10	2.47	0.452	-	8.93	5.85
Dissolved Molybdenum	<0.001	<0.001	<0.001	-	<0.001	<0.001
Dissolved Nickel	1.88	0.782	0.146	-	22.8	15.6
Dissolved Selenium	<0.01	<0.01	<0.01	-	0.04	0.02
Dissolved Strontium	0.170	0.138	0.308	-	0.347	0.297
Dissolved Vanadium	<0.01	<0.01	<0.01	-	<0.01	<0.01
Dissolved Zinc	1.48	0.634	0.181	-	22.3	14.8
Dissolved Iron	0.0	<0.05	0	-	0	3.18

Notes: * No sample available for December analysis due to possible obstruction in the bore. To be further investigated in the next Reporting Period.

7.4.3 Comparison Against Predictions

Page 87 of the 900 Area SMP Written Report (2013) discusses the groundwater environment at the time of the submission and discusses predicted impacts. The Aurecon (2013) report referenced in the document concludes that the proposed mining will have no significant impact on the groundwater regime on both a local and regional scale provided subsidence is maintained at the predicted low levels. Consequently it is highly unlikely that there will be an impact to the shallow groundwater regime in areas adjacent to the proposed mining areas.

As discussed within **Section 6.8**, subsidence remined within the predicted low levels. The results reported above in **Section 7.4.2**, groundwater levels remained unimpacted by mining activities during the Reporting Period.

As predicted in MOD2, groundwater flow will originate from the south-west of the site in the area surrounding the access road to the mine and has minimal potential to be disrupted by the establishment of REA VI. However the western portion of the REA VI is proposed to be located in close proximity to the southern portion of the NPHS posing a greater risk to the NPHS. As described in Section 7.4, excavation for the establishment of the REA VI will be restricted to ensure no disruption to groundwater seepage to the hanging swamp.

7.4.4 Long Term Analysis

Where groundwater triggers are investigated and found to be a result of mining related activity as defined in the Clarence Water Management Plan, this is considered an exceedance. A five-year summary of exceedances is presented in **Table 7-14**.

Table 7-14: 5 Year Groundwater Exceedance Summary

Reporting Period	Groundwater Levels	Groundwater Quality	Total Exceedances
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0

7.4.5 Implemented / Proposed Improvements

The Clarence Colliery WMP will be updated during the next reporting period to include the most current groundwater model and TARP triggers will be reviewed and updated where required based on the model.

8 REHABILITATION

Clarence Colliery manages rehabilitation in accordance with the Rehabilitation Management Plan (RMP).

The RMP was prepared in accordance with the NSW Resources Regulator (NSW RR) Form and Way-Rehabilitation Management Plan for Large Mines (NSW RR, July 2021) required under the Mining Regulation 2016 and submitted on the 29 July 2022 via the MSW RR Portal.

The RMP also satisfies Condition 29, Schedule 3 of DA 504-00, and the requirements of ML1353, ML1354, ML1583, ML1721 and CCL705. The RMP describes the management of rehabilitation at the Clarence Colliery. The RMP is available on the website https://www.centennialcoal.com.au/operations/clarence/

The Forward Program sets out the three-year forecast for both proposed surface disturbance and rehabilitation schedule for Clarence Colliery.

This section addresses the annual rehabilitation reporting requirements for the Annual Review as required by Condition 5, Schedule 5 of DA 504-00. Annual reporting requirements in the RMP will be reported in the Annual Rehabilitation Report and Forward Program (ARR&FP) and submitted using the online form accessible via the NSW Resource Regulator's mine rehabilitation portal.

8.1.1 Summary of Rehabilitation

Table 8-1: Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual) 2021 (ha)	This Reporting Period (Actual) 2022 (ha)	Next Reporting Period (Forecast) 2023 (ha)
A. Total mine footprint[1]	101.72	101.72	102.76
B. Total active disturbance[2]	76.76	76.76	76.73
C. Land being prepared for rehabilitation[3]	0	0	1.07
D. Land under active rehabilitation[4]	24.96	24.96	24.96
E. Completed rehabilitation[5]	<0	0	0

Notes: [1] **Total Mine Footprint:** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands. Please note that subsidence remediation areas are excluded. [2] **Total Active Disturbance:** includes all areas requiring rehabilitation [3] **Land being prepared for rehabilitation:** includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development. [4] **Land under active rehabilitation:** includes areas under rehabilitation and being managed to achieve relinquishment – includes 'ecosystem and land use establishment' and 'ecosystem and land use sustainability [5] **Completed rehabilitation**: requires formal sign off from DRE that the area has successfully net the rehabilitation land use objectives or completion criteria

At the end of the Reporting Period, total of approximately 24.96 hectares (ha) of native woodland rehabilitation had been completed at Clarence Colliery across REAs I, II, III, IV and VI. Rehabilitation activities on REA II were completed in 1996, while REA I and III were rehabilitated in 2002. The rehabilitation of REA IV started in late 2012 with final completion in late 2016. Rehabilitation works on of REA VI started in 2019 with approximately 2.0 ha established.

Final land use at Clarence Colliery is not specified under tenement and Developmental Consent conditions. The post-mining land use goal is to provide a low maintenance, geotechnically stable and safe landform that is commensurate with the surrounding area.

The preferred post-mining land use is to return disturbed areas around Clarence Colliery to a woodland/forest community commensurate with the adjacent native vegetation. Some water bodies and drainage structures will be maintained to manage surface water flows and provide water resources for native fauna.

For further information refer to the RMP.

8.1.2 Rehabilitation Monitoring

The 2022 monitoring survey involved the established six rehabilitation monitoring sites and three control (analogue) sites used in recent years (**Table 8-2**).

Annual rehabilitation monitoring has been undertaken at Clarence since 2012, tracking rehabilitation success against previous completion criteria and informing any maintenance requirements. Centennial have undertaken a Rehabilitation Review to establish a site-specific monitoring program to support the ongoing refinement of rehabilitation objectives and completion criteria assessment, and alignment with associated guidelines. This includes transitioning Centennial operations to the NSW Biodiversity Assessment Method ('BAM', OEH 2020) to align with new rehabilitation objectives and completion criteria assessment (refer to the RMP).

Analogue sites are a central component of the rehabilitation monitoring program at Clarence and are used to derive target benchmarks against which rehabilitation performance can be assessed, particularly with reference to species diversity, assemblages and vegetation structure. The analogue sites are located in nearby areas of undisturbed native vegetation representative of local vegetation type and condition, and generally mapped as 'Exposed Blue Mountains Sydney Peppermint – Silver-top Ash Shrubby Woodland'.

Each monitoring site consists of a standardised 50m long transect, with a nested 10m x 30m plot and 1m x1m quadrats. To facilitate repeated measurements over time, all sites were permanently located with metal star pickets at the start and end points of the 50m line, and their geographical coordinates recorded using a GPS (±3m accuracy).

An overview of the monitoring program is presented in **Table 8-2** and **Figure 8-1**.

Table 8-2: Clarence Rehabilitation Monitoring Sites

Site Code	Type	Rehabilitation Establishment	Slope (deg)	Coordinates (GDA94 Zone 56)	
				Easting	Northing
RHB 1	Rehabilitation	2002	12	244291	6294105
RHB 2	Rehabilitation	1996	12	244563	6293796
RHB 3a	Rehabilitation	2002	17	244665	6294303
RHB3b	Rehabilitation	2002	22	244752	6294210
RHB 4b	Rehabilitation	2016	20	244299	6293670
RHB 6a	Rehabilitation	2019	20	243889	6293733
ANA 1	Analogue	N/A	3	244632	6293686

Site Code	Type	Rehabilitation Establishment	Slope (deg)	Coordinates (GDA94 Zone 56)	
				Easting	Northing
ANA 2	Analogue	N/A	12	244659	6294391
ANA 3	Analogue	N/A	10	244521	6294450

Gingra Ecological Surveys (GES) was commissioned by Clarence Colliery to undertake the 2022 annual rehabilitation monitoring. A summary of the 2022 rehabilitation monitoring program is provided below with the complete report provided in **Appendix 10**.

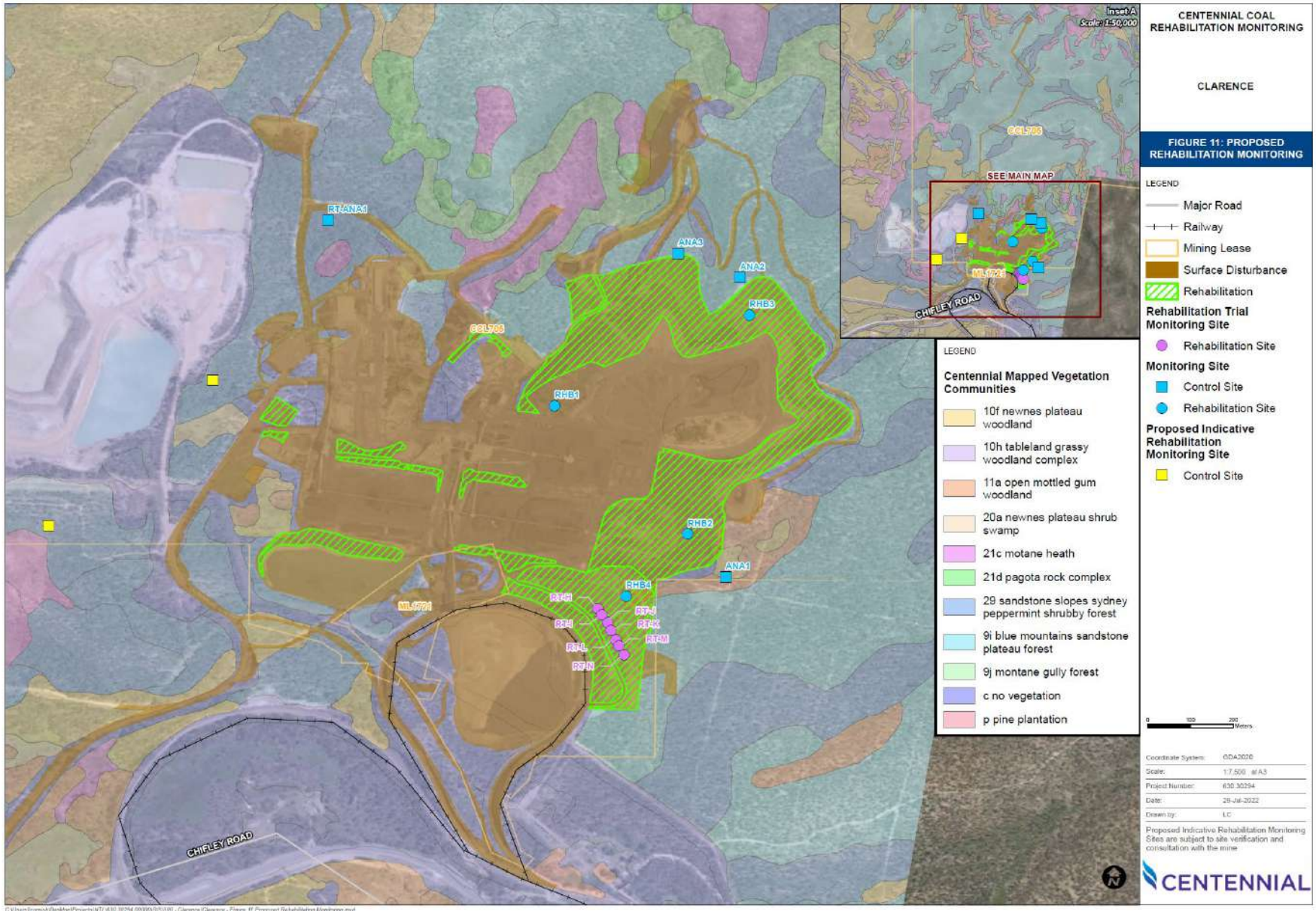
The rehabilitation monitoring program has been designed to measure the progress of rehabilitation against the objectives and completion criteria developed for the RMP. In accordance with the RMP criteria, results are presented according to the three main attributes of the Biodiversity Assessment Method (BAM), namely: composition, structure and function.

The native plant species composition of the rehabilitation areas is trending towards that of analogue sites. The presence of a number of difficult to propagate species such as members of the Ericaceae family including *Brachyloma daphnoides*, *Epacris pulchella, Leucopogon lanceolatus* and *Monotoca scoparia* is an indicator of the success of rehabilitation (GES, 2023).

Table 13 of the RMP presents draft completion criteria for a number of parameters. For vegetation composition the RMP suggests that the presence of 1 tree species, 2 shrub species and 6 ground layer species characteristic of the target vegetation type represents an adequate degree of floristic diversity to meet a completion criterion. The BAM data collected in 2022 shows that half of rehabilitation plots meet this criterion with the number of tree, shrub and ground layer species being comparable to analogue plots. At RHB 1, RHB 4B and RHB 6, tree diversity was low, which may indicate a need for supplementary seeding or planting of tubestock to improve eucalypt diversity. Shrub and ground layer diversity was at least adequate at all rehabilitation plots with levels comparable to or exceeding those at the analogue plots (GES, 2023).

The rehabilitation area currently provides woodland habitat of varying age and structure suitable for the bird species which inhabit the bushland areas surrounding the mine. The proximity of this more intact bushland means that a range of woodland birds were recorded opportunistically during the field survey, including Australian Magpie, Australian Raven, Pied Currawong, Crimson Rosella, Yellow-Tailed Black Cockatoo, Superb Lyrebird, Whitethroated Treecreeper, White-eared Honeyeater, Rufous Whistler, Superb Fairy-wren and Grey Shrike-thrush. The area also supports native mammals with Eastern Grey Kangaroo scats being observed during the field survey (GES, 2023).

Figure 8-1: Clarence Colliery Rehabilitation Monitoring



8.2 DECOMMISSIONING

There were no decommissioning activities at Clarence Colliery during the Reporting Period.

8.3 OTHER REHABILITATION ACTIVITIES

There were exploration activities undertaken at the site during the reporting period. These works included two exploration boreholes completed on the Newnes Plateau (see **Section 4.3**).

Other rehabilitation management and maintenance activities undertaken during the reporting period include:

- Ongoing monitoring, site inspections identifying weeds, erosion and sediment control, pest species; and
- Weed control was undertaken.

8.4 REHABILITATION TRIALS AND RESEARCH

Clarence Colliery proposes to undertake trials to improve ground cover within existing rehabilitation areas during the LOM. These trials will involve supplementary planting of native grasses and shrubs. Species may include but not be limited to: Basket Grass *(Lomandra longifolia*), Poa Tussock (*Poa labillardierei*), *Rytidosperma pallidum* (*Joycea pallida*), Sunshine Wattle (*Acacia terminalis*), Silky Hakea (*Hakea sericea*), Red-stemmed Wattle (*Acacia rubida*), Yellow Tea Tree (*Leptospermum polygalifolium*) and *Geranium solanderi*.

In addition to these trials, SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Clarence to implement a rehabilitation trial within Reject Emplacement Area 4 (REA 4) at the colliery. The results of the proposed trials will be used to identify suitable methods for the rehabilitation of REA 3. The trial design will test the most effective methods to minimise erosion, maximise biodiversity and promote long term cost effective rehabilitation. This will be completed by trailing a variety of:

- Erosion control products;
- Ameliorants including Nitrohumus® and topsoil stripped from REA 5; and
- Native seed species endemic to the Newnes Plateau

The rehabilitation trial forms part of a 'High Risk Activity Notification' process to allow for operational activities in preparation for the rehabilitation and decommissioning of REA 3. Monitoring reports are delivered annually to capture the following:

- Estimated soil loss from each trial area, with a comparison to the average soil loss rates (year 1 only)
- Ecological trends
- Assessment of rehabilitation performance against prescribed criteria (as set out in the Clarence Mining Operations Plan 'MOP')
- Recommendations for any necessary remedial works and/or changes to treatment that provide cost effective improvements to rehabilitation performance

Appendix 11 describes the methods and results of the annual monitoring survey undertaken within REA4 in December 2022 (SLR, 2023). A summary of the annual monitoring survey of this rehabilitation trial is provided below.

Monitoring data collected at year three (2022) has been compared to baseline data from 2019 and data from year one (2020) and year two (2021), enabling comparison of several rehabilitation techniques (growth medium, erosion control and supplementary planting) applied at the seven trial plots.

Results of the surveys suggest that Site K (vital polykelp with cover crop) and Site L (jute mesh, cover crop) are currently performing the best, and Site H (straw mulch without cover crop) and Site N (no treatment, cover crop) are performing the worst.

The EFA data continues to return a strong improvement from the previous results, however, most of the components are below the values required to meet MOP completion criteria. Additionally, the trial plots are generally stable and there are currently minimal remediation actions recommended. The next annual monitoring survey will be required in November-December 2023.

It is recommended that the analogue site is re-surveyed in future annual monitoring events, to allow comparison of results to areas of natural bushland (and target vegetation for the rehabilitation) over time.

8.5 NEXT REPORTING PERIOD

In 2023, the following major activities will be conducted:

- Material balance considering change of excavation depths in REA 5;
- Consider pit top rehabilitation material balance;
- Continued annual rehabilitation monitoring across REAs 1, 2, 3 and 4; and
- Continued progressive rehabilitation of Reject Emplacement Area REA 3.

9 COMMUNITY CONSULTATION

Clarence Colliery consults with the community through forums such as, the Clarence Colliery Community Consultative Committee and community organised events. Meetings of the Clarence Colliery Community Consultative Committee (CCC) were held on:

- 15 February; and
- 20 September.

Representatives of the Lithgow and Clarence community, appointed community representatives, relevant government organisations and company representatives attended the meetings. A detailed presentation was provided to attendees at each CCC meeting on the Mine's production, geological update, subsidence results, environmental monitoring, Extraction Plan updates, approval updates and upcoming projects. Key agenda items discussed in 2022, included:

- Environmental compliance and community complaints summary;
- Environmental performance summary;
- Update on the REA III fines removal project;
- Update on Clarence pipeline project associated with planned cessation of discharge from LDP002;
- Update on MOD 7 and MOD 8;
- Update on proposed Extraction Plan; and
- Aboriginal cultural heritage monitoring update

Extensive community consultation with landowners in and around the Clarence Colliery mining lease area is undertaken. As there are no current or proposed workings underneath private properties, no mining related subsidence has been reported or measured. In general, the Clarence Colliery community consultation has been conducted during the CCC meetings.

Clarence Colliery continues to support the local community through various sponsorship avenues to the following community activities, groups, and associations in 2022.

9.1 COMMUNITY COMPLAINTS

During the 2022 Reporting Period, there were no community complaints received. **Table 9-1** below summarises the annual community complaints received by Clarence Colliery since 2017.

A complaint register is made publicly available on the Centennial Coal website in accordance with Schedule 5 Condition 11 of DA 504-00
https://www.centennialcoal.com.au/operations/clarence/

Table 9-1: Record of Annual Community Complaints for 2017 to 2022

Community Complaints						
Year	**Air**	**Water**	**Noise**	**Waste**	**Other**	**Total**
2017	0	0	1	0	1	2
2018	0	0	0	0	1*	1
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0

*Related to trucks driving on Bells Line of Road – was not confirmed that Centennial Clarence was the source of this complaint.

10 INDEPENDENT ENVIRONMENTAL AUDIT

The three yearly Independent Environmental Audit (IEA) was conducted from November-December 2020. The IEA found that Clarence was compliant with 88% of conditions across 11 approvals and a total of 260 conditions. A total of 30 recommendations were given to address the identified non-compliances. A response to the IEA recommendations was submitted to DPIE in February 2021 and an update provided in the 2021 Annual Review.

A summary of the remaining actions from the IEA and their status is provided in **Table 10-1**.

Table 10-1: Non-Compliance Findings and Action Status from 2020 IEA Report

IEA Recommendation	Response to Recommendation	Status at end of Reporting Period
R8 CLA IEA 2020 Advise BCD of the current status of the long-term security for the biodiversity offset for the clearing of 4.1 hectares of Newnes Plateau Narrow-leaved Peppermint – Silver-top Ash Layered Open Forest and the loss of related biodiversity values, including for threatened species.	Centennial will advise BCD as recommended.	**Complete** Addressed in Section 3 of the Western Region Biodiversity Offset Strategy.
R9 CLA IEA 2020 Asses opportunities to consistently achieve night noise impact assessment criteria in DA504 Sch 3 – 15 (Noise Impact Assessment Criteria) and EPL L5.1 (Noise Limits)	A study has been undertaken – a suggestion was to move the monitoring point to a place closer to that of the receptors. Clarence will consult with regulatory authorities regarding this.	**Complete (and ongoing)**
R14 CLA IEA 2020 Place the 2020 EMS on the CC website and provide copies of, or links to, the 2020 EMS to relevant agencies, Council, and the CCC.	Actioned.	**Complete (and ongoing)** All documents are on the Centennial Coal website.

IEA Recommendation	Response to Recommendation	Status at end of Reporting Period
R17 CLA IEA 2020 Following approval of revised management plans, completion of ARs and the IEA; provide copies of the documents, or links to the documents, to Council, the relevant agencies, CCC and on the CC website.	Noted.	**Complete (and ongoing)** Approved Management Plans, Annual Reviews and IEA documents are on the Centennial Coal website.
R20 CLA IEA 2020 Arrange an annual on site meeting over the life of the project, to inspect the results of rehabilitation works, with invitations to representatives from Council, the Department of Conservation and Land Management, National Parks and Wildlife Service and Department of Mineral Resources (or equivalent agency).	Regulatory authorities (Resources Regulator, EPA, Local Council) visit site at least annually. Clarence will investigate whether this is sufficient to meet this condition, and if not, will implement such an annual meeting.	**Not yet complete**
R22 CLA IEA 2020 To improve rehabilitation performance, undertake progressive rehabilitation of REAs including: • Assess the status of current cumulative rehabilitation areas against forecasts in the 2018 -2022 MOP Amendment A and report in ARs. • Implement recommendations from the 2020 annual rehabilitation monitoring report. Continue to conduct an annual independent review of rehabilitation performance by competent persons and implement recommendations.	Results of the annual monitoring will be presented in the Annual Review and discussed against the MOP forecasts.	**Complete (and ongoing)** Rehabilitation monitoring is conducted annually by an independent contractor. The MOP was superseded by the RMP in 2022. The RMP includes a monitoring program which will be implemented in 2023.
R23 CLA IEA 2020 Consult with the Soil Conservation Service (now within DPIE) during topsoil stripping and stockpiling associated with Reject Emplacement Area and V; or seek that approval that this condition is not required for future work	Consultation has been achieved through the HRA process – Clarence will investigate whether this condition is still relevant.	**Partially completed** Relevance of condition not yet confirmed.
R29 CLR IEA 2020 Increase security deposit to $285,000 to meet the Notification Assessment for rehabilitation obligations for ML 1583 (DRG, 8 October 2020).	This is related to the separation of ML1583 from the man Clarence RCE. Centennial will respond to this appropriately.	**Complete**

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the 2022 calendar year Reporting Period there were a total of 6 reportable incidents and non-compliances (excluding community complaints).

Table 11-1 provides a summary of the incidents and non-compliances, including the actions taken by Clarence Colliery in response to the incident/non-compliance.

Table 11-1: Incidents and Non-Compliances during the Reporting Period

Compliance[6]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 1	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On 19 January 2022, a routine monthly grab sample was taken from LDP002, in which a dissolved zinc result of 0.012mg/L exceeded the compliance limit of 0.008mg/L. Due to the very small concentration of the exceedance, it was determined that no actual and/or potential material harm has been caused to the environment.	A follow up sample was taken at the discharged point on Wednesday 2 February 2022.	**Complete**
Non-Compliance 2	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On 7 Match 2022, a routine monthly grab sample was taken from LDP002, in which the following exceedances were detected: • Dissolved cobalt result of 0.0683mg/L, the compliance limit is 0.0025mg/L • Dissolved nickel result of 0.133, the compliance limit is 0.011mg/L • Dissolved zinc result of 0.047mg/L, the compliance limit is 0.008mg/L • TSS result of 48mg/L, the compliance limit is 30mg/L. Due to the very small concentration of the exceedance, it was determined that no actual and/or potential material harm has been caused to the environment.	The flow through the site Water Treatment Plant (WTP) was reduced to restrict the amount of water being discharged via LDP002 as much as practicable during the rainfall event.	**Complete**

[6] See Compliance Status Key beneath Table 1-2 for risk level, colour code and description.

Compliance[6]	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-Compliance 3	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On 13 July 2022, a routine monthly grab sample was taken from LDP002, which showed an elevated reading of Total Nitrogen of 0.8mg/L against the EPL limit 0.25mg/L. It is noted that within the 14-day period before the non-compliance, over 200mm of rain was recorded on site.	The Water Treatment Plant operation was ensured to be functioning as designed.	**Complete**
Non-Compliance 4	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On 19 October 2022, a routine monthly grab sample was taken from LDP002, which showed an elevated reading of the following: • Dissolved zinc result of 0.01mg/L, the EPL limit is 0.008mg/L • Total Nitrogen result of 0.4mg/L, the EPL limit is 0.25mg/L.	A re-sample was organised to confirm results. Water Treatment Plant operation was ensured to be functioning as designed.	**Complete**
Non-Compliance 5	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On 16 November 2022, a routine monthly grab sample was taken from LDP002, in which a dissolved zinc reading of 0.01mg/L exceeded the concentration limit of 0.008mg/L. Due to a very small concentration of the exceedance, it was determined that no actual and/or potential material harm has been caused to the environment.	A re-test and re-sample was organised to confirm results. Water Treatment Plant operation was ensured to be functioning as designed.	**Complete**
Non-Compliance 6	Exceedance of concentration limits as per EPL 726, Condition L2.4 and DA 504-00 Schedule 3, Condition 9(b)	On Wednesday 14 December 2022, a monthly routine grab sample was taken from LDP002, in which the following exceedances were detected: • Total Nitrogen results of 0.3mg/L, the EPL limit is 0.25mg/L • Total Phosphorus result of 0.06mg/L, the EPL limit is 0.02mg/L. Due to a very small concentration of the exceedance, it as determined that no actual and/or potential material harm has been caused on the environment.	The Water Treatment Plant operation was ensured to be functioning as designed.	**Complete**

12 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 12-1 presents activities that are currently planned for the next Reporting Period.

Table 12-1: Forecast Operations for 2022

Improvement Actions
• A sound power level assessment was proposed to be conducted during the 2022 reporting period to determine possible areas of improvement associated with the equipment currently in service at Clarence. This monitoring assessment was postponed during the reporting period and will now be undertaken in 2023.
Management Plan Revisions
• Clarence completed a review of the WMP in September 2021 (Version 2) to incorporate regulator comments, responses to actions from the 2020 Independent Environmental Audit (IEA) and Modification 6 (MOD 6). During this Reporting Period the WMP (Version 3) was revised in June 2022 to include Leachate Dam 4 and response to regulator comments. At the time of preparing the 2022 Annual Review WMP (Version 3) had not been approved. Further consultation with DPE regarding the latest revision to the WMP (Version 3) will be undertaken during the next Reporting Period. • Further consultation with DPE regarding the latest revision to the WRBMP (Version 6), will be undertaken during the next Reporting Period. Revision of the WRBMP to be undertaken in the next Reporting Period as required.
Condition Triggers
• In accordance with Condition 13(b) in Schedule 5 of DA 504-00 strategies, plans, and programs required under the consent will be reviewed within three months of the submission of this annual review. If necessary, the strategies, plans, and programs required under the approval will be revised and within 4 weeks of the review the revised documents must be submitted for the approval of the Secretary.
• In accordance with Condition 28 in Schedule 3 of DA 504-00 a Mine Closure Strategy for the Clarence Colliery will be developed in consultation with Council, Resources Regulator, DPE Water and EPA, and to the satisfaction of the Planning Secretary.

13 REFERENCES

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PLANS

Plan Reference	Plan Name
Plan 1	CL2095 – Production for 2022 Shown Monthly
Plan 2	CL2032 – Plan Showing Subsidence Monitoring

ASIA PACIFIC OFFICES

ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449
E: adelaide@slrconsulting.com

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
E: brisbane@slrconsulting.com

CAIRNS
Level 1, Suite 1.06
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090
E: cairns@slrconsulting.com

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
E: canberra@slrconsulting.com

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
E: darwin@slrconsulting.com

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516
E: goldcoast@slrconsulting.com

MACKAY
1/25 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300
E: mackay@slrconsulting.com

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
E: melbourne@slrconsulting.com

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
E: newcastleau@slrconsulting.com

PERTH
Level 1, 500 Hay Street
Subiaco WA 6008
Australia
T: +61 8 9422 5900
E: perth@slrconsulting.com

SUNSHINE COAST
Suite 2, 14-20 Aerodrome Rd
Maroochydore QLD 4558
Australia
T: +61 7 3858 4800
E: SunshineCoast@slrconsulting.com

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
E: sydney@slrconsulting.com

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
E: townsville@slrconsulting.com

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000
E: wollongong@slrconsulting.com

AUCKLAND
201 Victoria Street West
Auckland 1010
New Zealand
T: 0800 757 695
E: auckland@slrconsulting.com

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628
E: nelson@slrconsulting.com

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186
E: wellington@slrconsulting.com

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203
E: singapore@slrconsulting.com

Centennial Coal Company Limited
P O Box 1000
Toronto NSW 2283
www.centennialcoal.com.au