CENTENNIAL

CENTENNIAL COAL
CLARENCE COLLIERY
ANNUAL REVIEW
January 2020 to December 2020

March 2021

Table 1: Annual Review Title Block

Name of Operation	Clarence Colliery
Name of Operator	Clarence Colliery Pty Ltd
Development Consent/ Project Approval #	DA 504-00
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 #	WAL36479
Name of Holder of Water License	Coalex Pty Ltd & Clarence Coal Investments Pty Ltd
MOP Start Date	1/1/2018
MOP End Date	31/10/2022
Annual Review Start Date	1/1/2020
Annual Review End Date	31/12/2020

I, , certify that this audit report is a true and accurate record of the compliance status of Clarence Colliery for the period 1/1/2020 to 31/12/2020 **and that I am authorised to make this statement on behalf of Centennial Coal Pty Ltd.**

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	GREGORY SHIELDS
Title of Authorised Reporting Officer	DIRECTOR
Signature of Authorised Reporting Officer	
Date	22/3/2021

Contents

Figures

Tables

1 STATEMENT OF COMPLIANCE

Table 2: Statement of Compliance

Licences/Leases/Approvals	Were all conditions of the relevant approval(s) complied with?
Development Consent DA 504	NO
Mining Lease number	YES
Mining Lease (ML) 1353	YES
ML 1354	YES
ML 1583	YES
ML 1721	YES
CCL 705	YES
Authorisation (A) 307	YES
A416	YES
A451	YES
Exploration Lease (EL) 5072	YES
Environmental Protection Licence (EPL) 726	NO
Water Access Licence (WAL) 36479	YES
Subsidence Management Plan (SMP) Approvals	YES
Statement of Commitments	YES

Table 3: Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Page # addressed in Annual Review
EPL 726	L2.4	Water Concentration Limits		Cobalt, Chromium, Nickel, Zinc and Copper Exceedance	Section 16
EPL 726	EPL M2.2	Air monitoring requirements		PH outside range	Section 116

Note: Compliance Status Key for Table 3

Risk Level	Colour Code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium		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-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or Potential for low environmental consequences, but is likely to occur
Administrative		Only to be applied where the non-compliance does not result in any risk of environmental harm (eg 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 1). Clarence Colliery Pty Ltd (Clarence) is a wholly owned subsidiary of Centennial Coal Company Limited, which is a wholly owned subsidiary of Banpu Public Company and has been appointed as the management entity for the Clarence Joint Venture. The Clarence Joint Venture is comprised of a number of wholly owned subsidiaries being Coalex Pty Ltd (51% share), Clarence Coal Investments Pty Ltd (29% share) and Centennial Clarence Pty Ltd (5% share). The remaining 15% share in the Clarence Joint Venture is held by SK Networks Resources Australia Pty Ltd. Operations at Clarence Colliery commenced in 1979. Coal is extracted from the Katoomba Seam using the bord and pillar partial extraction method, supplying coal to both domestic and export markets.

Clarence Colliery is located approximately 15 kilometres east of Lithgow, to the north of Chifley Road (continuation of the Bells Line of Road) and the Main Western Rail Line. Newnes Junction village is located approximately 900 metres to the south-east of the site and contains a small number of residential dwellings. Clarence Village is also located approximately 1.5 kilometres to the south-west of the site.

A number of extractive industries are also located in close proximity to Clarence Colliery including the Hanson Quarry, located immediately to the west and the disused Rocla Quarry located to the south-east of the site respectively. The Newnes Kaolin Project is an approved quarry, which is proposed to be established to the south-east of the site. Land to the east of the site is protected under the Blue Mountains National Park, one of the eight protected areas making up the World Heritage Listed Greater Blue Mountains Area (UNESCO 2013). The Newnes State Forest is located to the north and west of Clarence Colliery. Clarence Colliery is located within the Hawkesbury-Nepean Catchment and discharges water to the Wollangambe River which eventually drains to the Colo River.

The principal components of the existing operations include:

- Construction and operation of pit top facilities:
    - Mine administration and bath house building;
    - Store and workshop building;
    - Water treatment plant;
    - Rail loop and load out facilities;

  - Conveyor systems to transfer coal from the underground mine to the pit top facilities including the load out on the rail loop;
  - Run-of-Mine stockpile area;
  - Ventilation facility;
  - Washed coal stockpile area;
  - Coal Handling and Preparation Plant (CHPP);
  - Various water management structures include storage and leachate dams and irrigation area which forms part of the water management on site;
  - Sewage treatment plant; and
  - A downcast ventilation shaft located on the Newnes Plateau.

- Underground coal mine for extraction from the Katoomba and Lithgow Seams using board and pillar techniques,
- Construction and operation of reject emplacement areas (REAs) I-VI and associated water management infrastructure;
- Extraction of up to 3 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal;
- Transport of up to 300,000 tonnes per annum (tpa) of coal products by road in total, with a maximum 200,000 tpa transported to the west, via the Darling Causeway and the Great Western Highway haulage route.

Table 4: Clarence Contacts

Name	Position	Phone
Kyle Egan	Mine Manager	02 6353 8033
Robert Setter	Environment & Community Coordinator	02 6353 8039
Enquiries and Complaints Line	Daytime Contact	02 6353 8000
	Afterhours Contact	02 6353 8010

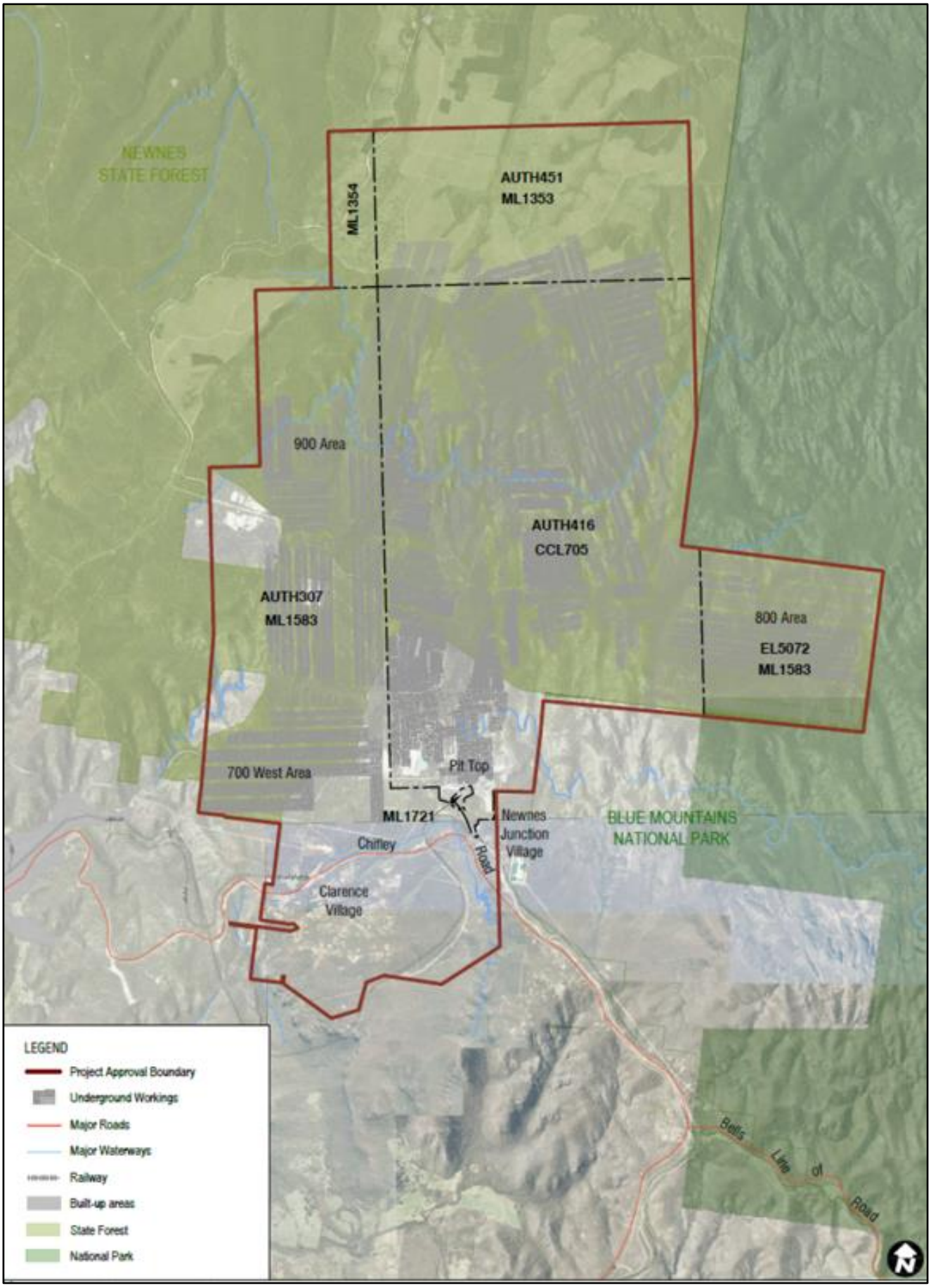


Figure 1. Regional Context

3 APPROVALS

Table 5 includes a list of all of the environmental approvals held by Clarence Colliery under the Environmental Planning and Assessment Act 1979 (EP&A Act), Mining Act 1992, Protection of the Environment Operations Act 1997 (POEO Act), National Parks and Wildlife Act 1974 (NPW Act)/ Threatened Species Conservation Act 1995, Biodiversity Conservation Act 2016, Water Act 1912, Water Management Act 2000 or Radiation Control Act 1990, and any changes made to these approvals during the reporting period.

Table 5: Approvals held by Clarence

Name	Description	Issued By	Issue and Expiry Date	Changes during reporting period (Y/N)
Development Consents				
IRM.GE.76	Original development consent	Blaxland Shire Council	Approved 15/06/1976 - Perpetuity	N
	Modification to amend the REAs	Lithgow City Council	Approved 21/07/1993 - Perpetuity	N
174/93	Extension underground coal mining and surface REAs	Lithgow City Council	Approved 15/02/1994 - Perpetuity	N
DA504-00	Extension of the Clarence Underground Coal Mine	Department of Planning & Environment (DPE)	19/12/2005-31/12/2026	N
Licenses				
Environmental Protection Licence	EPL726	Environment Protection Authority (EPA)	12/08/2016-Renewed Annually 1st of January	Y
Radiation Management Licence	RML5078394	EPA	08/02/2020-08/02/2021	N
Dangerous Goods Licence	NDG020999	WorkCover Authority NSW	05/03/2015- Perpetuity	N
Bore Licence CLRP1	10BL161964	Department of Primary Industries Water' (DPI Water)	13/08/2003-Perpetuity	N
Bore Licence CLRP2	10BL161965	DPI Water	13/08/2003-Perpetuity	N
Bore Licence CLRP3	10BL602213	DPI Water	10/12/2007-Perpetuity	N
Bore Licence CLRP4	10BL161962	DPI Water	13/08/2003-Perpetuity	N
Bore Licence CLRP5, CLRP7, CLRP10	10BL602211	DPI Water	10/12/2007-Perpetuity	N
Bore Licence CLRP6	10BL602212	DPI Water	10/12/2007-Perpetuity	N
Bore Licence CLRP 12	10BL604063	DPI Water	07/06/2010-Prepetuity	N
Bore Licence CLRP 11, 13, 14	10BL604099	DPI Water	05/07/2010-Perpetuity	N
Bore Licence CLRP 15, 16	10BL604098	DPI Water	05/07/2010-Perpetuity	N
Bore Licence - CLRP 17, 20	10BL605316	DPI Water	30/01/2013-Perpetuity	N
Bore Licence CC114	10BL602819	DPI Water	09/03/2009-Perpetuity	N

Name	Description	Issued By	Issue and Expiry Date	Changes during reporting period (Y/N)
Bore Licence CC115	10BL602820	DPI Water	09/03/2009-Perpetuity	N
Bore Licence HV1, HV2, HVU1, HVU2	10BL603337	DPI Water	07/09/2009-Perpetuity	N
Bore Licence	10BL605494	DPI Water	12/12/2013-Perpetuity	N
Bore Licence CLRP18, 22	10BL605612	DPI Water	11/08/2014-Perpetuity	N
Bore Licence	10BL156676	DPI Water	12/05/1995	N
Bore Licence	10BL161963	DPI Water	13/08/2003	N
Surface Licence Main Dam	10WA118714	DPI Water	1/8/2013-30/06/2024	N
Water Supply Works	10WA10715	DPI Water	1/7/2011	N
Water Access Licence	10AL122285	DPI Water	1 July 2018- Perpetuity	N
WAL 36479	10WA118758	DPI Water	23/10/2014 - Perpetuity	N
Surface Authority	10SA001409	DPI Water	30/9/2007 – 30/9/2017	N
Joint Water Supply Works	10WA103852	DPI Water	1/7/2011-29/09/2027	N
Threatened Species Licence	C0003012	Office of Environment and Heritage (OEH)	22/9/2017 - 22/9/2022	N
Section 95 (2) Certificate	C0002449	OEH	2/2/2017 -2/2/2022	N
Authorisations				
Authorisation 307	A307	Department of Planning, Industry and Environment (DPIE)	21/05/2015-24/08/2019	N
Authorisation A416	A416	DPIE	21/05/2015-24/08/2019	N
Authorisation A451	A451	DPIE	27/03/2015-24/08/2019	N
Exploration Licence	EL5072	DPIE	31/7/1996 – 31 July 2022	N
Statutory Approval				
Reject Emplacement Area II	Section 126	DPIE	Approved 19/06/1992	N
Reject Emplacement Area III	Section 126	DPIE	Approved 07/10/1993	N
Reject Emplacement Area IV	Section 100	DPIE	28/03/2011-01/07/2015	N- Note: Renewal not required- REA IV no longer receiving reject material
Reject Emplacement Area IV extension	Section 100	DPIE	18/09/2013-01/09/2017	
Reject Emplacement Area V	HRA	DPIE	HRA Submitted 27/07/2016	N
Reject Emplacement Area VI	Section 100	DPIE	11/08/2014-04/08/2020	N
Leases				
Consolidated Coal Lease	CCL705	DRG	20/12/2005 - 20/12/2026	N

Name	Description	Issued By	Issue and Expiry Date	Changes during reporting period (Y/N)
Mining Lease	ML1353	DRG	21/7/2015-21/07/2036	N
Mining Lease	ML1354	DRG	21/7/2015-21/07/2036	N
Mining Lease	ML1583	DRG	9/07/2006 - 9/07/2027	N
Mining Lease	ML1721	DRG	7/12/2015 - 7/12/2036	N
Mining Operations Plan				
Mining Operations Plan	N/A	DRG	01/01/2018 – 31/10/2022	Y
Subsidence Management Plans				
SMP	900 Area	DRG	22/01/2014 – 31/01/2023	N
SMP	800 Area	DRG	1/11/2013 – 30/10/2021	Y
SMP	700 West Area	DRG	18/06/2012 - 01/06/2021	N
Access Agreement				
Access Agreement	Q648-100	State Rail Authority	10/07/1981-Life of Loop	N
Occupation Permit				
Occupation Permit	PB54303	Forestry Corporation of NSW	21/12/2012 - Renewed Annually	N

3.1 Changes to Approvals during the Reporting Period

3.1.1 Development Consent / Project Approval

There were no changes to development consents or project approvals during the reporting period.

3.1.2 Other Approvals

EPL

A variation to EPL 726 was made in January 2020 and changed the following:

- Condition A2.1: Premises details updated
- Condition P1.2: Removal of LDP001 and update licence point location descriptions
- Condition L2.5: Varied to reflect removal of LDP001
- Conditions O4.1 – O4.2L Varied to reflect removal of LDP001
- Conditions M2.3 and M8.1: Varied to reflect removal of LDP001
- Condition G2.1: Varied to reflect removal of LDP001
- Condition U1.1 – U1.4: PRP completed and removed (Wollangambe Monitoring reports)
- Former Condition U2: Re-numbered and replaced as Condition U1.1 – U1.2 (Discharges into the Wollangambe River
- Current Condition U2: Addition of PRP to implement integrity and management improvement works

SMP Variations

A variation to the SMP Approval for the 800 Area was issued during the reporting period approving Variation 6, authorising the addition of 809 panel.

4 OPERATIONS SUMMARY

The 2020 Clarence production summary is presented in Table 6.

Table 6 : Production Summary

Material	Approved Limit (and source)	Previous Reporting Period (2019 Actual Tonnes)	This Reporting Period (2020 Actual Tonnes)	Next Reporting Period (Forecast 2021 Tonnes)
Waste Rock/ Overburden	N/A	N/A	N/A	N/A
ROM Coal	3,000,000T	1,871,648	2,125,017	2,197,651
Coarse reject	250,000T	61,741	88,239	89,556
Fine reject (Tailings)	N/A	90,000	0	0
Saleable product	N/A	1,804,120	2,039,969	2,107,067

*Approval limit of 250,000T coarse reject applies to emplacement within REA VI only.

Table 7 shows the 2020 Clarence operations Summary

Table 7 : Operations Summary

	Approved Limit (and source)	Previous Reporting Period (2019 Actual)	This Reporting Period (2020 Actual)	Comment (if applicable)
Transport (rail)	Limits based on total extraction	1,704,592	1,936,232	N/A
Transport (road)	300,000T (DA 504-00)*	188,821	148,435	N/A

*200,000 to the West as per approved haulage route DA504 Mod 4

4.1 Exploration

During the reporting period Clarence Colliery drilled nine (9) exploration borehole named CLRP28R, CLRP29, CLRP30, CLRP31, CLRP32, CLRP33, CLRP34, CLRP35 and CLRP36. These boreholes are located in the 900 North area.

4.2 Next Reporting Period

For the 2021 Reporting period, Clarence is forecast to produce approximately 2.2 MT of ROM Coal. Course coal reject is expected to be placed in REA 5 and REA3 fines removal works will continue for the long-term reject management and rehabilitation strategy.

In addition, the 900N Exploration program is scheduled to continue through 2021 for a further 4 bore holes (depending on need).

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 8 : Actions from previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Nil	N/A	N/A	N/A

6 ENVIRONMENTAL PERFORMANCE

In accordance with Schedule 5, Condition 3 of DA 504-00 Clarence operates in accordance with an approved Environmental Monitoring Program. This program was approved by the former NSW Department of Planning on 6 November 2007 (S02/0280).

Clarence operates in accordance with various management plans which outline monitoring requirements. The following table provides a summary of requirements for Clarence as specified under the consent.

Table 9 : Summary of Monitoring Requirements

Monitoring Type	Overview of Monitoring Requirements	Requirement of Approval / Management Plan	Annual Review Section
Air quality	3 x DGs - Monthly 1 x HVAS unit – operating two months over a calendar year	Western Region Air Quality & Greenhouse Gas Management Plan EPL 726	Section 6.1
Subsidence Management Plan	Groundwater Flora Fauna Subsidence	SMP Approvals 800 Area Environmental Monitoring Program 900 Area Environmental Monitoring Program	Section 6.3
Blasting Monitoring	Not undertaken at Clarence	Not required	Section 7
Greenhouse Gas	Not required	Western Region Air Quality & Greenhouse Gas Management Plan	Section 8
Heritage	As required	Western Region Aboriginal and Cultural Heritage Management Plan	Section 9
Meteorological Monitoring	1 weather station - Continuous	DA 504-00 and EPL 726	Section 10
Noise	Annual at 1 location	Western Region Noise Management Plan and EPL 726	Section 11
Rehabilitation	Annual	Clarence Mining Operations Plan 2018-2022 (Rehabilitation Plan)	Section 13
Water	Surface Water Volume & Quality - Groundwater Depth – Bi-monthly	Clarence Water Management Plan EPL 726	Section 12

6.1 Air Quality

Development Consent DA 504-00 specifies dust criteria for Clarence Colliery but does not nominate dust monitoring locations. Condition M2.2 of EPL 726 specifies the monitoring requirements. Current dust monitoring consists of:

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

Table 10 : Description of Air Quality Monitoring

Monitor 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 Operations
HVAS	Located south-east of Clarence Operations

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.

Dust monitoring data indicated that monthly dust deposition results for 2020 ranged from a minimum of 0.07 g/m^2/month at Depositional Dust Gauge 1 to 4.03 g/m^2/month (higher result due to extended exposure time from lack of access during the Gosper's Mountain bushfire) at Depositional Dust Gauge 3. Depositional dust gauge results for 2020 are shown below. The results are all below the annual average air quality criteria of 4 g/m^2/month. Two samples could not be analysed, one at Depositional Dust Gauge 2 and the other at Depositional Dust Gauge 3 due to the bottle being broken.

Table 11 : Air Quality Environmental Performance

Dust Monitor	Approval criteria	Performance during the reporting period	Trend compared to previous years
DG1	2 g/m^2/month Max Annual Average Increase 4 g/m^2/month Total Annual Average	The annual average for DG1 was 1.07 g/m^2/month which is below the prescribed annual average. The maximum increase in annual deposited dust levels has therefore not exceeded 2 g/m^2/month	2020 - 1.07 g/m^2/month 2019 - 1.74 g/m^2/month 2018 - 1.24 g/m^2/month 2017 - 0.79 g/m^2/month 2016 - 0.7 g/m^2/month 2015 - 0.8 g/m^2/month
DG2		The annual average for DG2 was 1.17 g/m^2/month which is below the prescribed annual average. The maximum increase in annual deposited dust levels has therefore not exceeded 2 g/m^2/month	2020 - 1.17 g/m^2/month 2019 - 1.43 g/m^2/month 2018 - 1.60 g/m^2/month 2017 - 0.67 g/m^2/month 2016 - 0.6 g/m^2/month 2015 - 0.9 g/m^2/month
DG3		The annual average for DG3 was 0.62 g/m^2/month which is below the prescribed annual average. The maximum increase in annual deposited dust levels has therefore not exceeded 2 g/m^2/month	2020 - 0.62 g/m^2/month 2019 - 0.93 g/m^2/month 2018 - 2.06 g/m^2/month 2017 - 1.89 g/m^2/month 2016 - 0.7 g/m^2/month 2015 - 2.4 g/m^2/month
HVAS pM10	30 µg/m^3 Annual Average	The Annual Average of 5.76 µg/m^3 was the lowest since 2017 and reflects the higher rainfalls throughout the year.	2020 – 5.76 µg/m^3 2019 - 14.95 µg/m^3 (dust storms and bushfire) 2018 - 7.04 µg/m^3 2017 -1.23 µg/m^3 2016 - 2.96 µg/m^3 2015 - 2.18 µg/m^3
	50 µg/m^3 24 Hour Average	The Annual Average of 14.93 µg/m^3 was the lowest since 2016 and reflects the higher rainfalls throughout the year.	2020 - 14.93 µg/m^3 2019 - 129.97 µg/m^3 (dust storms and bushfire) 2018 - 26 µg/m^3 2017 - 20 µg/m^3 2016 - 5.13 µg/m^3 2015 - 5.1µg/m^3
HVAS TSP	90 µg/m^3 Annual Average	The Annual Average of 7.92 µg/m3 was the lowest since 2016 and reflects the higher rainfalls throughout the year.	2020 – 7.92 µg/m^3 2019 - 17.76 µg/m^3 2018 - 9.61 µg/m^3 2017 - 6.8 µg/m^3 2016 - 12.15 µg/m^3 2015 - 7.02 µg/m^3

The results for the Depositional Dust gauges, PM10 and TSP for the period 2014-2020 are shown in the graphs below.

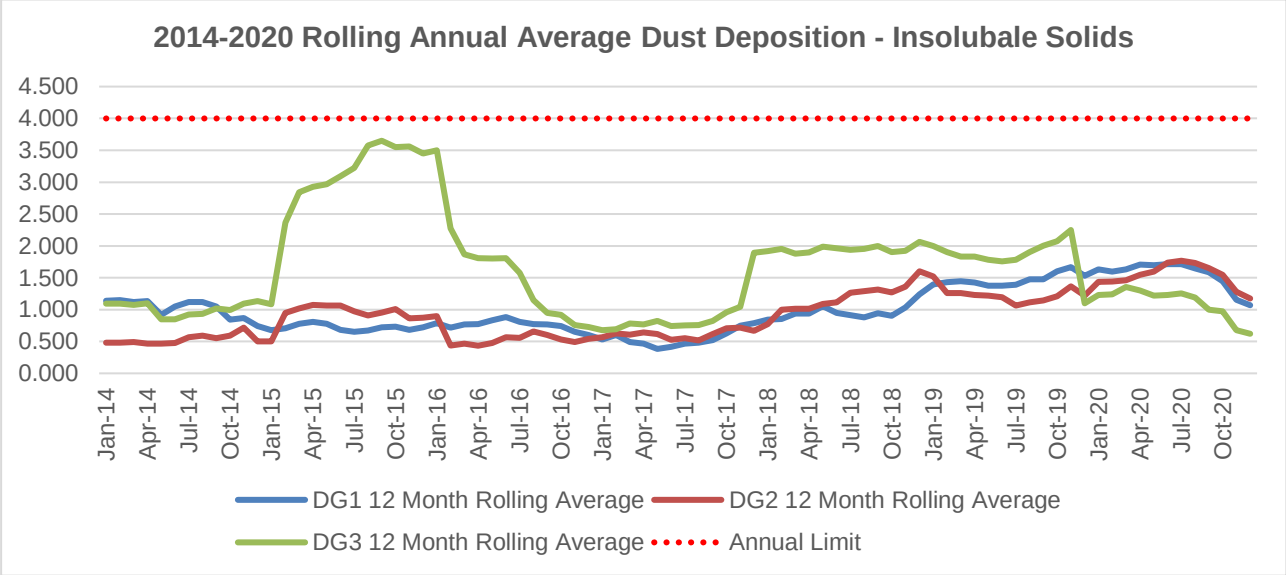


Figure 2. Rolling Annual Average Dust Deposition

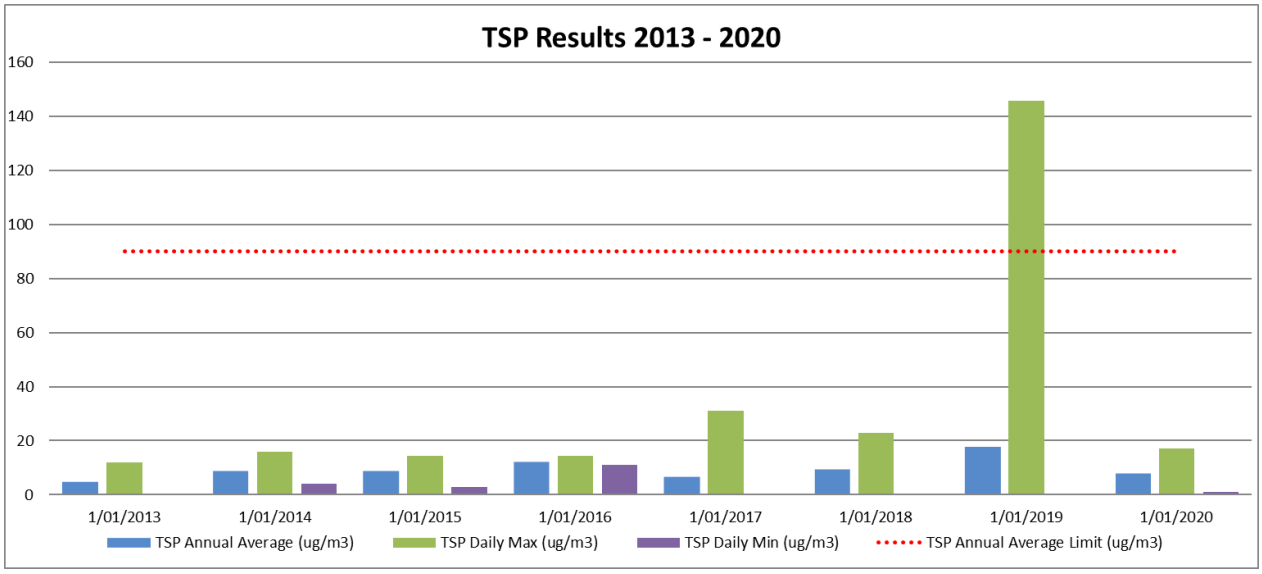


Figure 3. PM10 Results 2013-2020

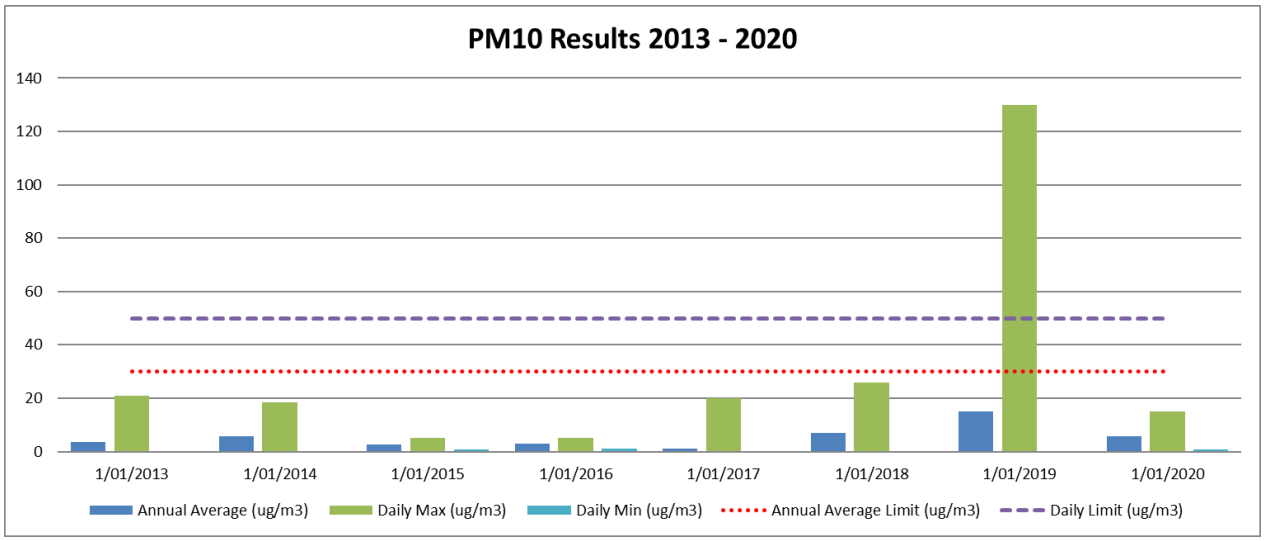


Figure 4. TSP Results 2013-2020

6.2 Biodiversity

Biodiversity Management within Clarence Operational area is restricted during operational activities due to the absence of intact vegetation and the impracticality of conducting surveys or management actions within an active CHPP. Biodiversity management activities are restricted to:

- Bushfire management;
- Erosion management;
- Surface water management;
- Access management;
- Pre-clearance surveys; and
- Weed management.

Once activities in an operational area have ceased, rehabilitation measures can be implemented to restore biodiversity values in accordance with the MOP.

6.2.1 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. The Western Region Biodiversity Offset Strategy 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 will be placed on a land parcel held by Centennial adjacent to the Capertee National Park. This proposal was endorsed by the then OEH in February 2018. DPIE have received quarterly updates on the status of the Strategy and that the Conservation Agreement is yet to be finalised with the Biodiversity Conservation Trust. The area is located at Airly and is presented below.

The retirement of Clarence biodiversity offset is satisfied by land at Carinya Lot 163 (located between the Airly State Forest, Capertee National Park and Mugii Mrum-ban State Conservation Area), making a substantial contribution in connectivity between the existing biodiversity conservation areas.

In 2020 Centennial updated its Western Region Biodiversity Offset Strategy to include Appendix 6 -Carinya Lot 163 Biodiversity Offset Management Plan. It was then submitted to the DPIE and has now been approved.

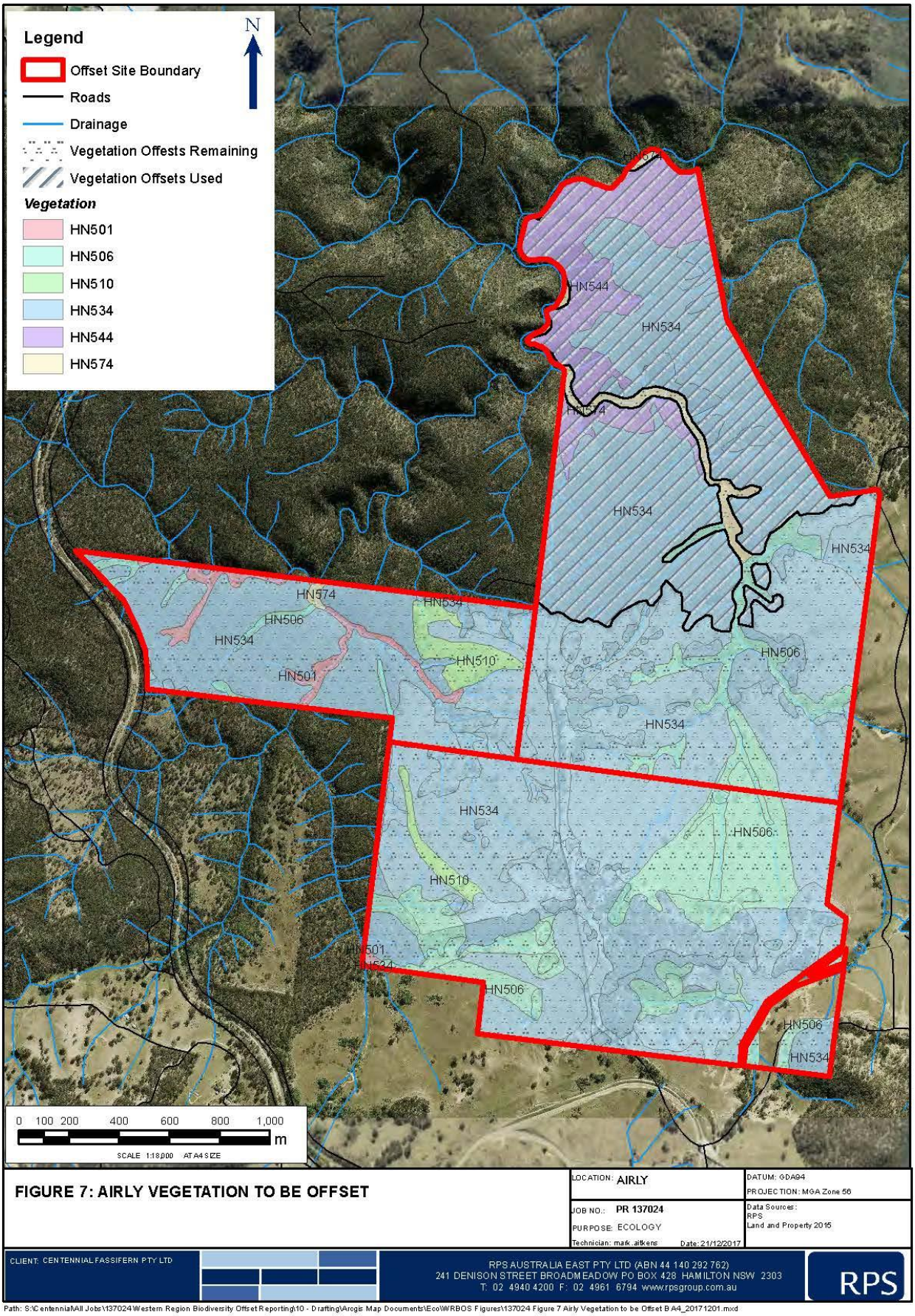


Figure 5. Biodiversity Offsets

6.3 Flora and Fauna Monitoring

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.

6.3.1 Flora

Flora monitoring at pagoda, heath and wet gully sites within the Clarence Colliery Outbye, Eastern and 700 Western SMP Areas was undertaken by Gingra Ecological Surveys.

This report describes monitoring of flora monitoring sites at a range of areas within the Clarence Colliery lease area. Five broad areas are subject to monitoring; Clarence East (Eastern SMP area), Clarence West (also known as the '700 area'), Outbye, 800 Area and 900 Area.

The flora monitoring program commenced at Clarence Colliery in July 2004. Initially, eight sites supporting heath and pagoda complex vegetation were included; six at Clarence East and two at Clarence West. Clarence East includes areas to the north and east of the Clarence Pit Top, in the catchment of the Bungleboori and Wollangambe Creeks. Mining within the Clarence Eastern SMP area was completed in February 2009. Clarence West is located to the north-west of the Clarence Pit Top. The monitoring sites are in the catchments of Farmers Creek or upper Bungleboori Creek. Mining is currently undertaken in the Clarence West SMP area. Subsequently sites in the outbye area which stretches across Bungleboori Creek about 3km south-east of Mount Horne were added to the program. In 2009 eight sites were added in the Clarence 800 Area located in the section of Newnes State Forest which is bordered by Blue Mountains National Park. Another three sites are located along tributaries of Paddys Creek.

During 2016, Gingra Ecological Surveys recommenced monitoring swamp sites in the Clarence East and Clarence West areas. For a period between 2008 and 2013 these swamps were monitored by the University of Queensland.

Locations of the sites are provided in Table 12.

Table 12 : Locations of 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

Site	Location	Type	Easting (GDA)	Northing (GDA)
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
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

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 were observed in the study area.

Previously, in October 2013, an extensive bush fire, known as the State Mine Fire, burnt through the study area. That bushfire was also of high intensity and the vegetation across the study area was showing clear signs of recovery by November 2019, although in many places the tree canopy had not returned to the canopy height and breath of September 2013.

Above average rainfall was recorded from February to April 2020, with over 200 mm recorded on the Newnes Plateau in February. May rainfall was slightly below average. Winter was wetter than average and spring rainfall was consistent with mean rainfall over the past 30 years.

In 2020 mining proceeded to the north-east of Bungleboori Creek towards the Pagoda Swamp area (not subject to systematic flora monitoring) and in the Clarence East area near heath plots CLAE_02 and CLAE_03 and swamp plots CLAE_07 and CLAE_08.

Plant condition in spring 2020 was better than at any previous seasonal monitoring event, reflecting active plant growth following the bushfire and in response to rainfall from February 2020 onwards.

There were new occurrences of exotic plant species in spring 2020, reflecting open ground layer conditions post-fire and a germination response to rainfall. Fleabane (Conyza sp.) was found at several plots where previously it had not been recorded. The majority of occurrences of weeds continue to be at plots with a disturbance history involving proximity to clearing and pine plantation, logging and recreational use.

As the plots were all bush fire affected, with most sites suffering a very high intensity fire, 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 is normal at all undermined plots.

There have been no indications of residual effects of subsidence in areas undermined previously. The patterns of species richness, species composition and plant disease relate strongly to bush fire impacts and recovery and seasonal weather conditions with no indication of a mining effect.

6.3.2 Fauna

Fauna monitoring at Clarence Colliery was undertaken by Biodiversity Monitoring Services. Fieldwork for the 700 Area (Eastern, Western and Outbye), 800 Area (Eastern Portion) and 900 Area was completed.

In 2008 sites were established within both the Outbye and 700 SMP Areas and in 2009 sites were established to commence baseline surveys within the ‘800 Area’ to identify impacts (if any) of mining induced subsidence on native fauna.

Two additional sites were established in 2014 to commence baseline surveys within the 900 Area to identify impacts (if any) of mining induced subsidence on native fauna.

Fauna monitoring undertaken uses the methods of setting traps including Elliot traps, tomahawk cage traps, glider traps and pitfall traps, additional monitoring includes spotlighting, hair funnels, remote cameras, bird surveys, call broadcasting, herpetological searches, bat call detection, animal track recognition and opportunistic observations.

A set of criteria that is used to monitor and compare fauna populations within the SMP Areas over time includes:

- Species richness of faunal groups;
- Diversity indices of faunal groups;
- Capture rates of individual species;
- Population status of species;
- Contribution to the faunal assemblages by threatened species, species dependent upon woodland and by species declining in the Central West;
- Habitat complexity scores; and
- Comparisons between Treatment and Control sites.

6.3.2.1 700 Western SMP Area

- Six long term fauna monitoring sites have been established within the Western SMP Area including:
- CLW01 – Control site, not undermined, pagoda landscape;
- CLW02 – Undermined November 2009, swamp landscape;
- CLW03 – Undermined October 2010, swamp landscape;
- CLW04 – Control site, not undermined, swamp landscape;
- CLW05 – Control site, not undermined, swamp landscape; and
- CLW06 – Undermined November 2011, pagoda landscape.

The Clarence West Area (CLW) is close to the 900 Area and the two 900 sites (A North, B South) are suitable for inclusion as control sites in the CLW analyses as they have not yet been undermined. The use of CLW01 and CLW05 as controls has now ceased as late 2018 saw them undermined or under the influence of drawdown as part of Springvale Colliery's Southern Longwall Area. Through previous discussions with the Environment & Community Coordinator, Clarence have agreed to monitor two replacement control sites - Nine Mile Swamp and Paddy's Swamp. The results from the on-going monitoring surveys of the two additional sites will complement the data from the existing sites. Details for the two new control sites are as follows:

1) *Nine Mile Swamp* - Located to the north east of Bungleboori camping area at the intersections of Nine Mile and Pine Swamps (down swamp of CLW05). The swamp is situated downslope of the (now cleared) pine plantation to the south, and some poisoned pine forest to the north. This site looks to have been affected by the State Mine fire, though this could have been management burning to protect the pine plantation. The swamp is a good representative of Newnes Plateau Shrub Swamp and is to be used as a control site.

2) Paddy's Swamp - Located at the eastern edge of Springvale Colliery near the Clarence 900 Area. The swamp is surrounded by native woodland. The swamp is surrounded by native woodland. This site was heavily affected by the State Mine fire and Gospers Mountain fires. Work started on the sand quarry upstream of the swamp in early 2020. The swamp is a good representative of Newnes Plateau Shrub Swamp and is to be used as a control site.

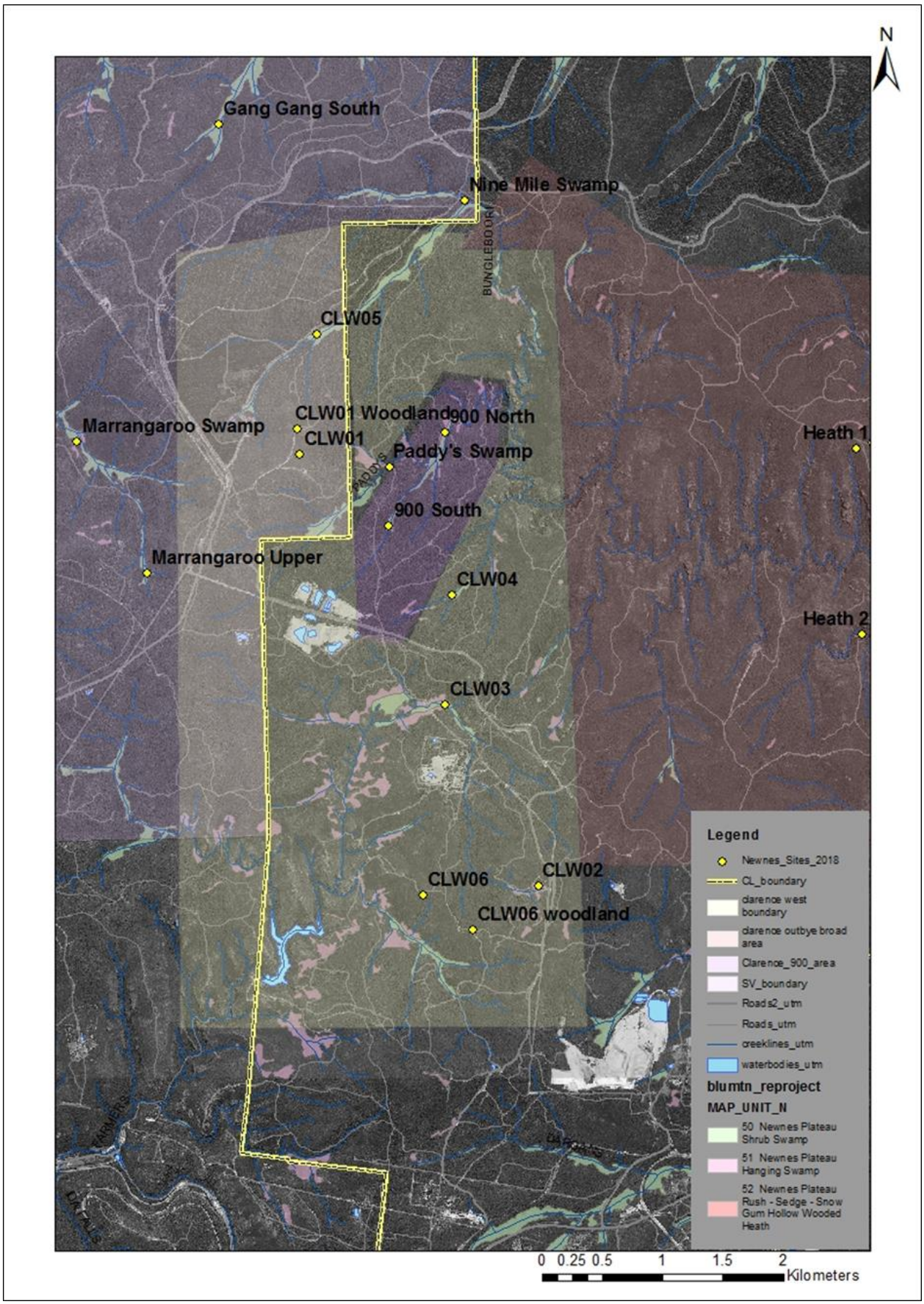


Figure 6. Location of Fauna Monitoring Sites in 700 Western SMP Area

The configuration of survey sites established in 2006 adequately samples the two major environments within Clarence Colliery Western SMP Application Area i.e. pagoda and wetland (swamp). These sites will provide the best possible data for the long-term monitoring of terrestrial vertebrates. The survey techniques used have been successful in locating a wide range of species, though no new species were found in the area this year. Pagoda habitat mainly comprises low heath that is characteristic of pagoda and hilltop environments on Newnes Plateau.

The Western SMP Area appears to be productive, in terms of fauna diversity values. At this stage 25 threatened species are known to occur within the area, and several species that have been located are considered as being of conservation concern in this region e.g. Beautiful Firetail, Rufous Fantail, Long-nosed Bandicoot. The area should be considered heavily disturbed by recreational activities, particularly trail bikes and 4WDs. This must be brought into consideration when assessing any changes.

The major influence upon the fauna populations (and vegetation) within Clarence West has been the State Mine fire that burnt out all the sites in the area. Fire is a natural part of Australian ecosystems and the State Mine fire that burnt the CLW Area in 2013 is typical of a high intensity burn. At this stage, the data obtained provides an important baseline for monitoring the recovery from fire by fauna. This analysis must finish as of spring 2019, because yet another high intensity burn has impacted the Plateau in December 2019. Surveys from 2020 will likely focus on comparing rates of recovery within burnt areas that have been previously mined and those still to be mined or used as controls.

The results from the survey of the Clarence Colliery Western SMP Area in 2020 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. Most diversity parameters have remained stable over the long term, except bird and amphibian indices which have increased. Most diversity parameters that have remained within levels of expected variation still declined sometime in 2017-2019, with 2020 being the lowest on record for native non-bat mammal species richness. This is not surprising considering the rainfall deficit since January 2017. Reptile Simpson's and mammal richness fell in 2020 after the recent fire. Small mammal capture rates finally returned to pre fire levels in 2019, six years post fire, but fell in 2020 to a record 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. It should be noted that bat activity is still within the normal level of variation, suggesting the invertebrate food source that this group relies on are also returning to the landscape. Bat species richness actually increased which could be due to

animals ranging further to find resources post fire. As is often the case with fire, once the vegetation and associated food source is removed, 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.

Nine threatened species were located during 2020, as well several bird species dependent upon woodland habitats. Threatened species included Greater Glider, Eastern False Pipistrelle, Large-eared Pied Bat, Large Bent-winged Bat, Yellow-bellied Sheathtail-bat, Gang-gang Cockatoo, Scarlet Robin, Flame Robin and Giant Dragonfly. This is about average, considering a number of species have been listed since surveys began. Woodland-dependant and declining birds have been dropping slowly over time, with 2017-2020 the lowest on record. Both the State Mine and Gosper's Mountain fires affected the fauna and habitats within the CLW area, with many measured parameters falling after each.

There are some differences between habitat characteristics in mined and non-mined areas, but differences are inconsistent across season and direction of change. Fauna diversities showed some difference by mining impact, but results were inconsistent over season. Bird Simpson's, Evenness and richness were lower in undermined sites. Reptile abundance and richness were lower in undermined sites. On the other hand, mammal Simpson's and Evenness were higher in undermined swamps. There were more significant differences over time, suggesting the magnitude of change in habitat and fauna diversities is more dependent on climatic conditions or fire events. While the survey methodology and effort has not changed dramatically since 2010, the sites used in calculations have changed over time as some sites became undermined. Mining commenced in the CLW Area in November 2009 and is now affecting all of the impact survey sites. Undermining of the two control sites by Springvale began in November/December 2018, so these sites have become impact sites.

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. At present, there appears to be little conclusive evidence of subsidence impacts upon the fauna diversity at CLW Area.

Table 13 : Biodiversity indices over time (700 Western SMP Area)

Group	Diversity index	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

Birds	**Simpson's**	0.86	0.95	0.91	0.92	0.94	0.96	0.94	0.94	0.95	0.97	0.96	0.95	0.95	0.95	0.96
	Species richness	40	72	64	59	63	49	72	62	71	73	69	76	76	61	63
Native Mammals	**Simpson's**	0.70	0.71	0.70	0.82	0.82	0.79	0.77	0.76	0.84	0.86	0.82	0.81	0.85	0.81	0.84
	Species richness	12	13	11	12	14	12	15	13	14	15	13	11	15	12	10
Reptiles	**Simpson's**	NA	0.82	0.86	0.81	0.76	0.75	0.84	0.63	0.82	0.86	0.93	0.73	0.82	0.85	0.67
	Species richness	0	10	10	10	6	5	10	3	9	9	12	9	7	8	11
Amphibians	**Simpson's**	-	-	-	-	0.39	0.40	0.11	0.42	0.57	0.49	0.74	0.78	0.57	0.50	0.56
	Species richness	1	3	3	4	2	2	5	4	8	4	7	7	9	5	9

6.3.2.2 Outbye SMP Area

Three sites have been established within the Outbye SMP Area including:

- Heath North (Heath 1) – Sandstone Plateau Tea Tree – Dwarf Sheoak – Banksia Rock Heath Sandstone Plateau and Ridge Scribbly Gum Silvertop Ash Shrubby Woodland;
- Gully –Shrubland and Newnes Sheltered Peppermint /Brown Barrel Shrubby Forest; and
- Heath South (Heath 2) - Blue Mountains Sydney Peppermint /Silvertop Ash Shrubby Woodland.

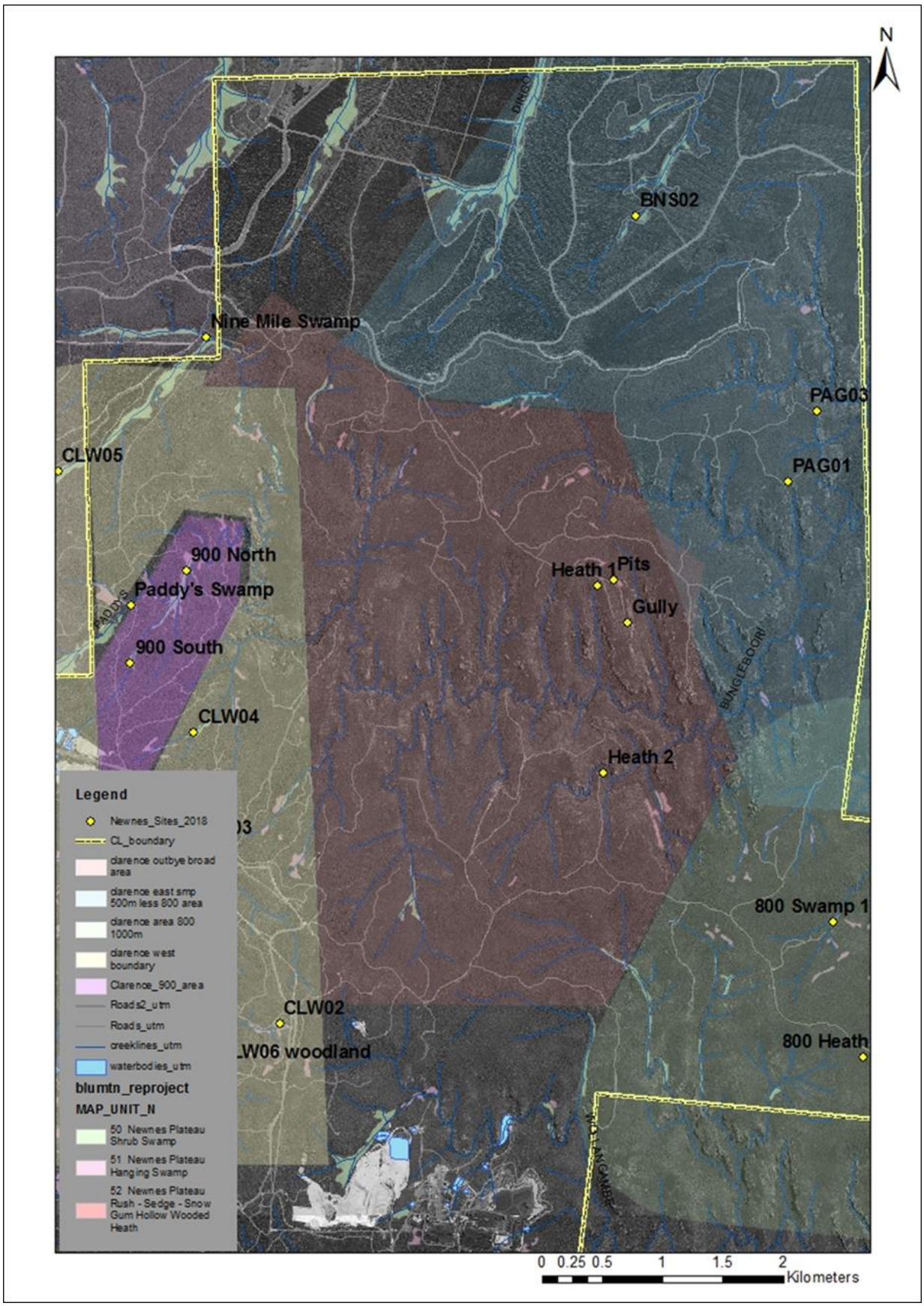


Figure 7. Location of Fauna Monitoring Sites in Outbye SMP Area

The results from the survey of the Clarence Colliery Outbye Area in 2020 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. Most diversity measures have fluctuated slightly over time, but have shown an increase or stable trajectory over the longer term. Bird species richness was the lowest on record probably due to slow regrowth rate in heath areas and the area being burnt twice in six years. Native non-bat mammal numbers declined from last year, but were still approximately equal to the long term average. Simpson's diversity for all groups were up on last year, showing that a variety of species are returning to the landscape (but probably in lower but even numbers). Small mammal trapping rates had only just returned to normal levels after the 2013 State Mine fire. Rates declined in 2020, but not as much as they did after the first fire. Extensive rocky refugia near sites, combined with lower intensity burn in recently burnt vegetation, may have allowed small mammals and reptile to survive the 2019 fire. The proportions of woodland-dependent and declining birds have been depressed the last four years, indicating the dry conditions and fire may have affected the suitability of the habitat for this largely mobile fauna group. We would expect the habitat to become more suitable for woodland species as the fire opens the landscape, but the heath communities prevalent in the Outbye Area may not form optimal habitat for these species anyway. Bat activity is within the normal level of variation, suggesting the invertebrate food source that this group relies on are returning 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.

Five threatened species were located during 2020, as well several bird species dependent upon woodland habitats. Threatened species included Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Scarlet Robin and Giant Dragonfly. This is an increase in the diversity of threatened species since the surveys began, though numbers found typically vary.

The State Mine fire affected the fauna and habitats within the Clarence Outbye Area, with many measured parameters falling between spring 2013 and 2014. Further changes in habitat and fauna diversities were seen after the Gospers Mountain fire. All fauna groups have survived the fire, though individual species responses differ. Statistical analyses suggest these fires, along with drought conditions, are more likely to be driving changes than any impacts from undermining.

Table 14 : Biodiversity indices over time (Outbye SMP Area)

Group	Diversity index	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Birds	**Simpson's**	0.94	0.92	0.88	0.96	0.96	0.91	0.95	0.97	0.95	0.96	0.93	0.88	0.94
	Species richness	45	51	41	48	49	47	47	49	47	53	50	49	39
Native Mammals	**Simpson's**	0.36	0.23	0.39	0.29	0.52	0.47	0.86	0.81	0.80	0.77	0.69	0.6	0.72
	Species richness	7	8	9	8	13	8	9	7	6	9	8	10	8
Reptiles	**Simpson's**	0.67	0.64	0.70	0.67	0.30	0.54	0.37	0.21	0.36	0.28	0.26	0.27	0.45
	Species richness	9	7	8	6	5	7	9	5	9	11	9	9	9
Amphibians	**Simpson's**	-	-	-	-	-	-	-	-	-	0.81	0.18	-	0.34
	Species Richness	2	2	2	1	1	1	3	4	4	4	2	1	2

6.3.2.3 Eastern SMP Area

The three sites are surveyed in the Eastern SMP area:

- *BNS02 (Bungleboori North 1)* – a swamp community/Blue Mountains Sandstone Plateau Forest within the pine forest east of Waratah Ridge Road.;
- *PAG01/02* –This site samples Pagoda Complex and Blue Mountains Sandstone Plateau Forest vegetation, as well as habitats unique to the cliffline environment; and
- *PAG03/04* – a pagoda and steep hill overlooking Bungleboori Creek, similar to PAG01/02.

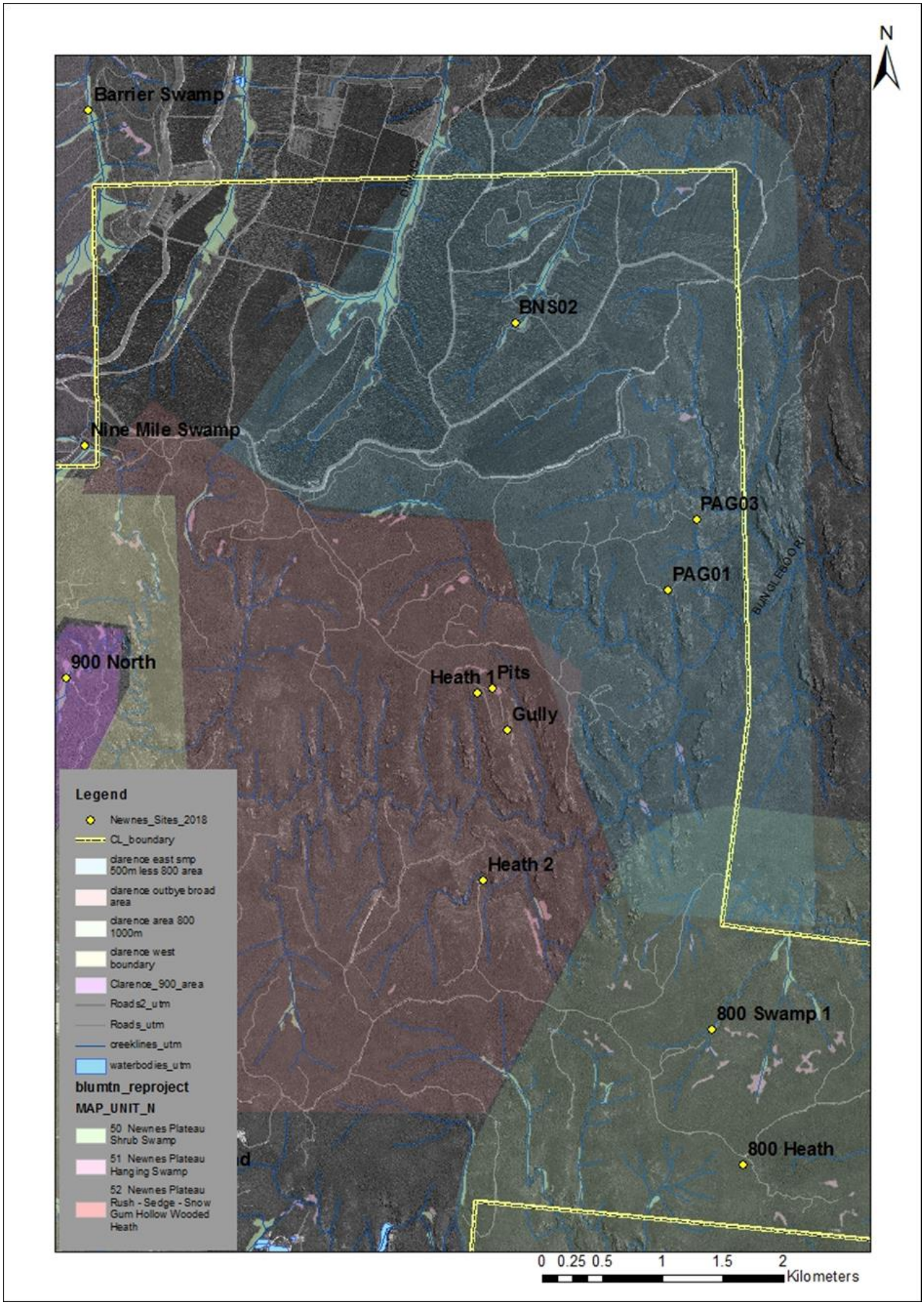


Figure 8. Location of Fauna Monitoring Sites in 700 Eastern SMP Area

The results from the survey of the Clarence Colliery Eastern Area in 2020 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, particularly with Giant Dragonfly being observed for the first time since surveys began. Most diversity measures have fluctuated slightly over time, but have shown an increase or stable trajectory over the longer term. Native non-bat and reptile species richness trend downwards over time, but the decline does not look to be associated with mining activity (from a statistical standpoint). Despite the dry conditions from 2017-2019, mammal and reptile species richness have increased since 2016. Bird species richness peaked in 2018, fell to the second lowest on record in 2019, and showed slight recovery in 2020. Overall bird abundance is still quite low as burnt habitat begins to recover slowly. Mammal trapping rates were starting to recover from the 2013 fire/pine clearing, but recovery seems to have stalled with drought followed by fire. Trapping rates are down, but not as low as they were after the 2013 fire. Extensive rocky refugia near sites, combined with lower intensity burn in recently burnt vegetation, may have allowed small mammals and reptile to survive the 2019 fire. Common Dunnart was a new addition to the area, with one being captured in a pitfall at BNS02 in autumn. Bat activity is within the normal level of variation, suggesting the invertebrate food source that this group relies on are returning 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.

Ten threatened species were located during 2020, as well as several bird species dependent upon woodland habitats. Threatened species included Yellow-bellied Sheathtail-bat, Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, White-throated Needletail, Little Eagle, Gang-gang Cockatoo, Scarlet Robin, Flame Robin and Giant Dragonfly. The number of threatened species is highly variable through time, but current levels are good. Woodland-dependent and declining species were under-represented from 2017-2019. Either the burning of the area, clearing of the pine around BNS02, or the current dry conditions may have discouraged these rarer species, though it has also led to some species uncommon to the Plateau turning up (Little Eagle). We would expect the habitat to become more suitable for woodland species as the fire opens the landscape, but the heath communities prevalent in the Eastern SMP Area may not form optimal habitat for these species anyway.

Fire has definitely affected the fauna and habitats within the Clarence Eastern Area, with the Gospers Mountain fire having a greater impact than the State Mine fire. All fauna groups have survived the fire, though individual species responses differ. Statistical analyses suggest these

fires, along with drought conditions, are more likely to be driving changes than any impacts from undermining.

As extraction in the Eastern SMP Area was completed in 2009, it is evident from the above analyses that there has been little change in the fauna diversity indices measured over the years. At present, the only suggestion of potential impacts from subsidence on the fauna diversity at CLE is lower bird species richness in undermined sites. However, two of three undermined sites had to be added from other areas to allow statistical analysis as only one CLE site has been undermined. An extensive analysis of fauna and habitat data from the Eastern and Outbye SMP Areas1 in 2017 provided the following conclusions:

"Because of the amount of data available, it is possible to assess any impacts from mining activities using the BACI process and, importantly, the Beyond BACI process. Analysis of the data shows that, for both the Eastern SMP and Outbye SMP Areas, there are no significant changes in Simpson's Index of Diversity, population numbers, species richness, trapping rates and woodland-dependent birds. Comparison between data from Impact and Control areas show no significant differences and Bray-Curtis Similarity Indices are relatively high.

Overall it is difficult to relate changes in fauna populations over the years to any quantifiable parameter, including mining activities. The assessment of the data from Clarence Eastern SMP and Outbye SMP Areas shows that mining activities do not appear to be a significant factor in determining changes in fauna populations at Newnes Plateau. It is postulated that fauna population numbers are determined by climate, fire and predators". Feral horses now add to that pressure.

Table 15 : Biodiversity indices over time (Eastern SMP Area)

Group	Diversity index	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Birds	**Simpson's**	0.92	0.84	0.91	0.95	0.95	0.93	0.96	0.95	0.96	0.96	0.93	0.94	0.97	0.96	0.96	0.95
	Species richness	63	50	51	46	54	42	57	53	56	51	54	54	67	68	46	48
Native Mammals	**Simpson's**	0.58	0.42	0.47	0.64	0.78	0.74	0.73	0.51	0.51	0.78	0.76	0.76	0.72	0.81	0.87	0.84
	Species richness	11	13	8	8	11	8	10	8	8	8	7	7	9	10	10	9
Reptiles	**Simpson's**	0.81	0.78	0.77	0.80	0.73	0.76	0.82	0.74	0.75	0.72	0.74	0.76	0.81	0.82	0.68	0.64
	Species richness	13	11	14	8	10	9	10	7	6	5	6	5	8	8	7	6
Amphibians	**Simpson's**							0.56	0.25	NA	0.14	0.67	0.56	0.70	0.51	NA	0.32
	Species richness	1	2	2	2	2	2	3	2	1	2	2	3	3	2	1	4

6.3.2.4 800 Area (Eastern Portion)

Three sites were established in the 800 Area during 2009 and fauna surveys have continued through 2018. The sites are:

- 800 Swamp 1 is located within a Newnes Plateau Shrub Swamp community;
- 800 Swamp 2 Site is located within Exposed Blue Mountains Sydney Peppermint – Silver-top Ash Shrubby Woodland, Newnes Plateau Hanging Swamp community; and
- 800 Heath Site is located within a montane heath vegetation community.

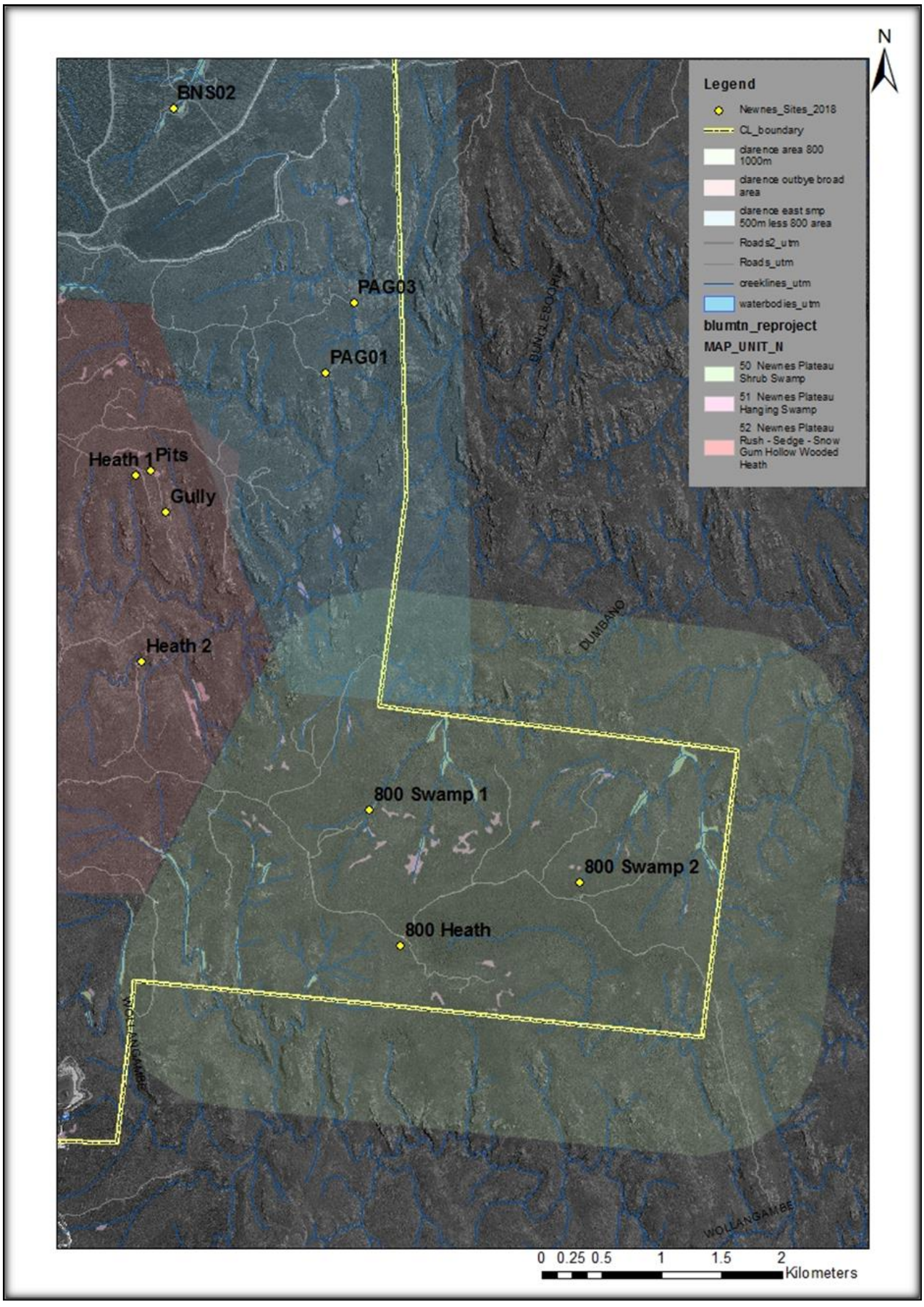


Figure 9. Location of Fauna Monitoring Sites in 800 SMP Area

The results from the survey of the Clarence Colliery 800 Area in 2020 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. Bird Simpson's has declined since 2017, and species richness is within the natural level of fluctuation. Mammal Simpson's and species richness remains average. Reptile richness has declined since 2017, but is at a similar level to before the 2013 fire. Reptile Simpson's is down on the last few years, almost to long term lows seen in 2011. Amphibian Simpson's increased from 2013, but dropped to zero in 2019 with few amphibian found during the dry conditions. Some recovery was seen in 2020. Amphibian species richness remains average. The effects of the fire are not as obvious as long term rainfall deficit. Mammal trapping rates have remained low since the 2013 fire, with recovery hindered by dry conditions and now a second burn. It should be noted that bat activity is still within the normal level of variation, suggesting the invertebrate food source that this group relies on are also returning to the landscape. 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.

Nine threatened species were located during 2020, as well as several bird species dependent upon woodland habitats. Threatened species included Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Little Eagle, Gang-gang Cockatoo, Powerful Owl, Scarlet Robin, Flame Robin and Giant Dragonfly. Giant Dragonfly had a good year after the 2013 fire, and the same trend is apparent this year, with 49 individuals being sighted in 2020. Threatened species and woodland dependent birds appear to have remained quite stable over the years, with the exception of a lull from 2017-2020. There has been an increase in the diversity of threatened species since the surveys began, and despite 2020 being a fire recovery year, five new species were recorded that had not been located in the area previously. Both the State Mine and Gospers Mountain fires affected the fauna and habitats within the Clarence 800 area, with many measured parameters falling after each.

With the inclusion of control data from PAG03, Nine Mile Swamp and Paddy's Swamp, we can now start to analyse the impact of underground mining and development on the surface habitats and associated fauna. There are some differences between habitat characteristics in mined and non-mined areas, but all cover characteristics were higher in undermined sites. Fauna diversities showed differences by mining impact, but those bird, mammal, reptile and amphibian indices that differed were inconsistent over season and direction of change. Eight indices differed, with only

half lower in undermined sites. At this stage there is little conclusive evidence to suggest any impact due to undermining in the 800 Area. There were more significant differences over time, suggesting the magnitude of change in habitat and fauna diversities is more dependent on climatic conditions or fire events.

Given the low levels of subsidence from previous mining at Clarence Colliery, and the predicted low levels (30–100mm) of subsidence for 800 Area, the risk of adverse impacts on fauna within this area is considered to be low. Mining (first workings only) commenced in 800 Area in July 2012 and are now affecting all three survey sites. The monitoring of recovery from fire within mined and un-mined sites will be an important tool in the on-going assessment of mining activities.

Table 16 : Biodiversity indices over time (800 SMP Area)

Group	Diversity index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Birds	**Simpson's**	0.95	0.86	0.93	0.93	0.96	0.95	0.95	0.91	0.92	0.75	0.69	0.81
	Species richness	40	38	39	48	51	53	39	40	50	51	41	38
Native Mammals	**Simpson's**	0.76	0.71	0.67	0.65	0.61	0.84	0.83	0.78	0.82	0.78	0.83	0.82
	Species richness	7	7	9	8	11	8	8	6	9	9	7	8
Reptiles	**Simpson's**	0.78	0.82	0.73	0.76	0.83	0.84	0.90	0.88	0.83	0.83	0.82	0.74
	Species richness	5	6	8	6	10	7	3	9	14	10	10	10
Amphibians	**Simpson's**	0.63	0.67	0.25	NA	-	0.29	0.41	0.29	0.66	0.73	0	0.44
	Species Richness	4	3	4	1	2	2	3	3	3	3	1	4

6.3.2.5 900 Area

Clarence Colliery commenced the monitoring of fauna populations within the area 900 SMP Area, particularly within swamps considered as threatened ecological communities in spring 2014 at two sites:

- Site A North is a monitoring site within a Newnes Plateau Shrub Swamp, Newnes Plateau Hanging Swamp community; and
- Site B South is within an area encompassing both Newnes Plateau Shrub Swamp, Tableland Mountain Gum /Snow Gum /Daviesia Montane Open Forest communities.

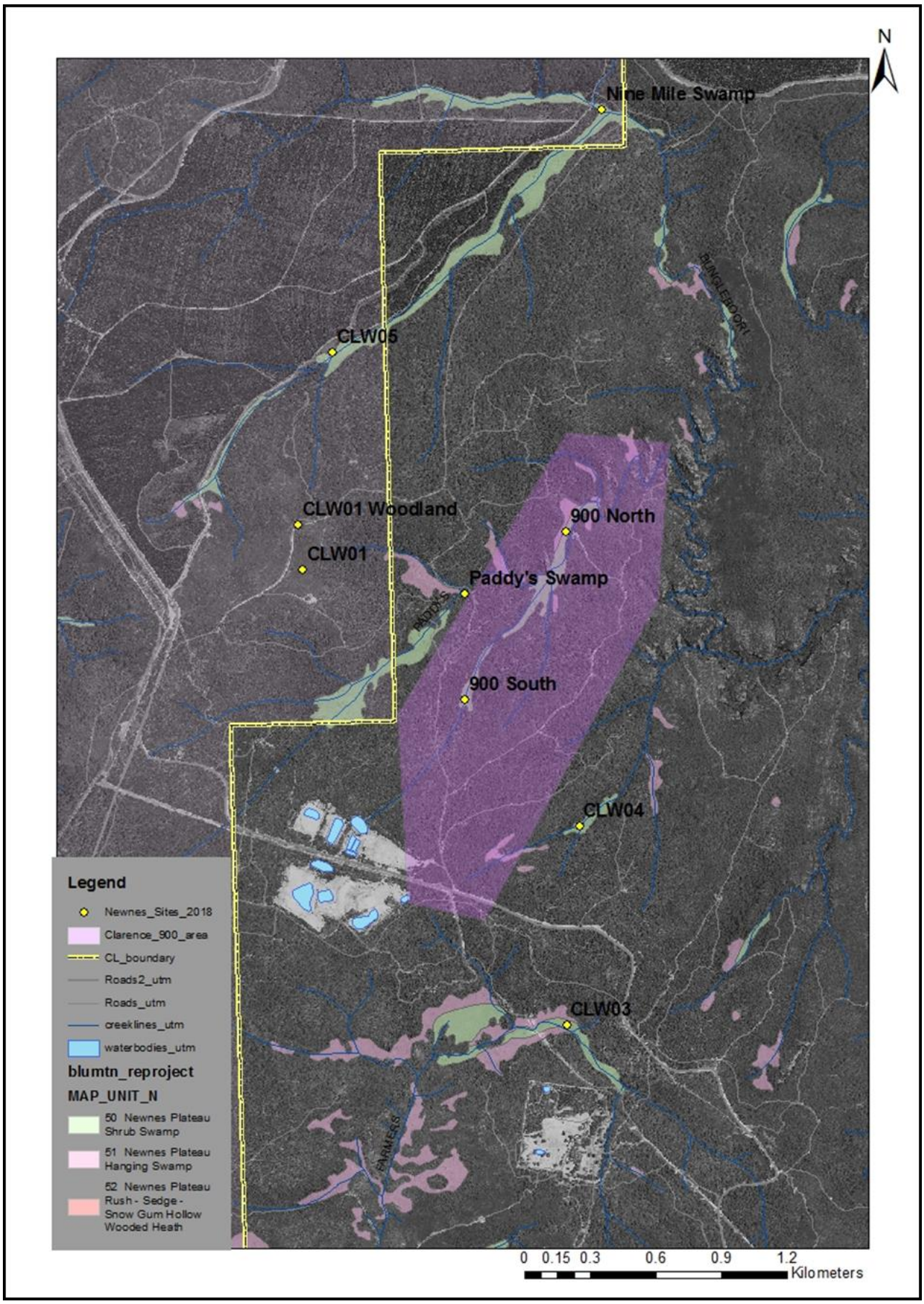


Figure 10. Location of Fauna Monitoring Sites in 900 SMP Area

The results from the survey of the Clarence Colliery 900 Area in 2020 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. Species richness was average for birds and mammals. Bird Simpson's was stable, but overall bird abundance was the lowest on record in 2020. 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 has reset the system. Reptile Simpson's and richness were average, with numbers higher than those seen after the State Mine fire. Low numbers in 2014 are due to the fact surveys only began in spring 2014, so survey effort was greatly reduced. Amphibian richness was average, but Simpson's was the highest on record, probably due to the wet conditions experienced this year.

Swamps in this area had peat mostly consumed and canopy layers were fully burnt, so finding Blue Mountains Water Skink and Giant Dragonfly was surprising. The availability of rock outcropping near 900 North means refugia for small mammals allowed some to survive the fire. Bat species richness is still within the normal level of variation, though activity was reduced, particularly for spring. 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.

Nine threatened species were located during 2020, as well several bird species dependent upon woodland habitats. Threatened species included Eastern Pygmy-possum, Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Gang-gang Cockatoo, Scarlet Robin, Flame Robin, Blue Mountains Water Skink and Giant Dragonfly. This is on the lower end of average for the Area. Despite 2020 being a fire recovery year, six species new to the area were discovered (one introduced). The swamps of the 900 Area have always contained suitable habitat for Blue Mountains Water Skink. Reptile often have lower detection rates due to their cryptic nature and requirement for particular survey conditions, but it is good to finally record two at 900 North swamp. The Gosper's Mountain fire affected the fauna and habitats within the 900 Area, with a number of measured parameters falling.

At this stage, the data obtained cannot be used to monitor any effects from underground mining as none of the 900 Area sites have been undermined. It does, however, provide an important baseline for monitoring the recovery from fire by fauna in the future. It also provides important

data to compare the rates of recovery within areas that have been previously mined and those still to be mined or used as controls.

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.

Table 17 : Biodiversity indices over time (900 SMP Area)

Group	Diversity index	2014	2015	2016	2017	2018	2019	2020
Birds	**Simpson's**	0.967	0.966	0.960	0.965	0.957	0.961	0.955
	Species richness	40	51	50	59	62	51	49
Native Mammals	**Simpson's**	0.786	0.856	0.729	0.799	0.747	0.704	0.763
	Species richness	5	7	7	12	6	10	6
Reptiles	**Simpson's**	NA	0.911	0.750	0.671	0.538	0.727	0.699
	Species richness	1	7	4	9	5	9	7
Amphibians	**Simpson's**	NA	0.167	0.333	0.286	0.417	0	0.479
	Species Richness	1	2	2	2	4	1	3

7 Blasting

No blasting activities are undertaken at Clarence Colliery.

8 Greenhouse Gas

Clarence undertakes monitoring of greenhouse gas emissions for reporting under the National Greenhouse and Energy Reporting (NGER) Program. Under the Program Clarence reports on:

- Greenhouse gas emissions;
- Energy production; and
- Energy consumption.

Of the six greenhouse gases identified in the Kyoto Protocol, Clarence Colliery produces one of these: carbon dioxide (CO_2).

Scope 1 emissions refer to direct emission sources from Clarence. Scope 2 emissions refer to indirect emissions from consumption of energy or heat produced by another organisation.

Table 18 : Clarence 2020 Greenhouse Gas Emissions Summary

Emissions Summary (CO_2-eT) 2020	**Total**
Electricity	40,446
Diesel	2,901
Petroleum Based Oils and Greases (PBOG)	91
SF6	0
Fugitives -	9,460
TOTAL	52,898

Table 19 : Greenhouse Gas Emissions 2013 - 2020

Scope (CO_2-eT)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Scope 1	9,289	9,876	12,116	11,655	12,700	14,117	13,003	12,452
Scope 2	38,380	39,287	39,121	41,523	41,193	39,127	40,455	40,446

To help reduce emissions, Centennial has investigated the feasibility of installing solar panels on site.

9 Heritage (Aboriginal and non-Aboriginal)

9.1 Aboriginal

Clarence undertakes management of Aboriginal Heritage aspect and artefacts in accordance with the Western Region Aboriginal Cultural Heritage Management Plan.

Following a Phase 1 (Pre-mining) inspection that was conducted on 30 May 2019, two post mining inspection were undertaken in 2020, these being a Phase 2 (immediately post mining) and Phase 3 (6 months post mining) inspection. Due to COVID-19 restrictions, the Phase 2 inspection (4th of May 2020) was undertaken solely by a Senior Heritage Consultant. The Phase 3 inspection, however, was conducted by the same Senior Heritage Consultant along with Clarence Centennial Environment and Community Coordinator and local Aboriginal groups, Mingaan, Bathurst Local Aboriginal Lands Council and Wellington Valley Wiradjuri Aboriginal Corporation. Four sites were inspected at each event, these being AHIMS 45-1-0003; 45-1-0130; 45-1-0183 and 45-1-2691, along with 3 new sites identified during the Phase 3 inspection named 45-1-2830; 45-1-2831 and 45-1-2832. These sites will be described in detail below.

9.1.1 AHIMS #45-1-0003

The site was relocated using GPS and a visual inspection and a pedestrian survey were conducted at this location. The grinding grooves, engravings and shelter previously identified during the Phase 1 and Phase 2 recordings were able to be ground-truthed all of which were in the same conduction previously described in the previous reports. Vegetation was minimal throughout the site largely due to the recent bushfires. Much of the damage was observed to be away from the sandstone outcroppings; however nearby sandstone had suffered some fire damage with the surfaces fallen away from the rock.

In addition to the grinding grooves and engravings previously observed, several artefacts were identified on the surface to the immediate north of the shelter and engravings. The artefact scatter encompassed an area of approximately 10 metres x 10 metres. Artefacts comprised chert and quartz flakes.

No mining related impacts were identified during the survey.

9.1.2 AHIMS #45-1-0130

The site was ground-truthed using GPS. The surrounding area has been significantly disturbed by the recent bushfires; no damage was observed to the sandstone overhang; however, nearby vegetation had been significantly reduced. No surface artefacts were identified during the survey.

No damage from mining related activities was observed and the site appears to be in similar condition to the previous inspections.

9.1.3 AHIMS #45-1-0183

No sandstone overhangs or platforms are located at the registered coordinates. The Phase 1 inspection noted extensive vegetation growth which hampered visibility; the Phase 2 inspection had high visibility, yet no sandstone overhangs are located at the registered coordinates.

The survey followed the point of the nearby spur which contained several large sandstone overhangs which could be considered shelters, as there are few other sandstone overhangs in the area it is considered that these are likely the location of AHIMS site #45-1-0183. The site card describes excellent views to the south and south east from the shelter which the overhang identified contains.

After discussions amongst the Registered Aboriginal Parties (RAPs) on site during the Phase 3 inspection, it was decided that the overhangs located at the end of the spur were in fact the correct location of 45-1-0183 and the AHIMS database should be updated to reflect this.

9.1.4 AHIMS #45-1-2691

The visual inspection conducted for the previous recordings was unable to locate the sandstone platform containing the grinding grooves. There is currently no sandstone platform at the registered coordinates, so it is likely that these are incorrect. The recent bushfires have cleared much of the vegetation giving significantly better surface visibility. The current visual inspection was unable to locate any grinding grooves in the vicinity of the registered coordinates despite extensively searching the surrounding area.

9.1.5 AHIMS #45-1-2830 (New Site)

A large sandstone platform was located on the spur which contained several small grinding grooves which were identified as spear tip grinding grooves by the RAPs who participated in the visual inspection. The prominent location holds commanding views from the east around to the west and is in the vicinity of rock shelters and other grinding groove sites.

9.1.6 AHIMS #45-1-2831 (New Site)

A single grinding groove was identified adjacent to a small water hole on the southernmost point of the spur. The groove is larger than the nearby spear tip grinding grooves and is relatively shallow and faint. The adjacent waterhole is filled with debris and soil.

9.1.7 AHIMS #45-1-2832 (New Site)

AHIMS 45-1-2832 comprises a single large axe grinding groove on the top of a broad sandstone overhang. The sandstone platform is approximately 60 metres in the length with a depth of approximately 2 metres

9.2 Non-Aboriginal

Clarence undertakes management of non-aboriginal heritage in accordance with the Western Region Historic Heritage Management Plan.

There are four heritage items and two archaeological sites listed in the Lithgow City Council Local Environment Plan 2014 (LEP) Schedule 5 – Environmental Heritage which are within the Clarence Lease Boundary.

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.

During the reporting period no surface works or additional impacts occurred in the vicinity of any non-aboriginal heritage item

10 Meteorological Monitoring

Meteorological monitoring is undertaken at the Clarence Automated Weather Station. The weather station is required under M5.1 of EPL726 and Schedule 3, Condition 17 of DA 504-00. Figure 11 depicts monthly rainfall as well as monthly minimum and maximum temperatures.

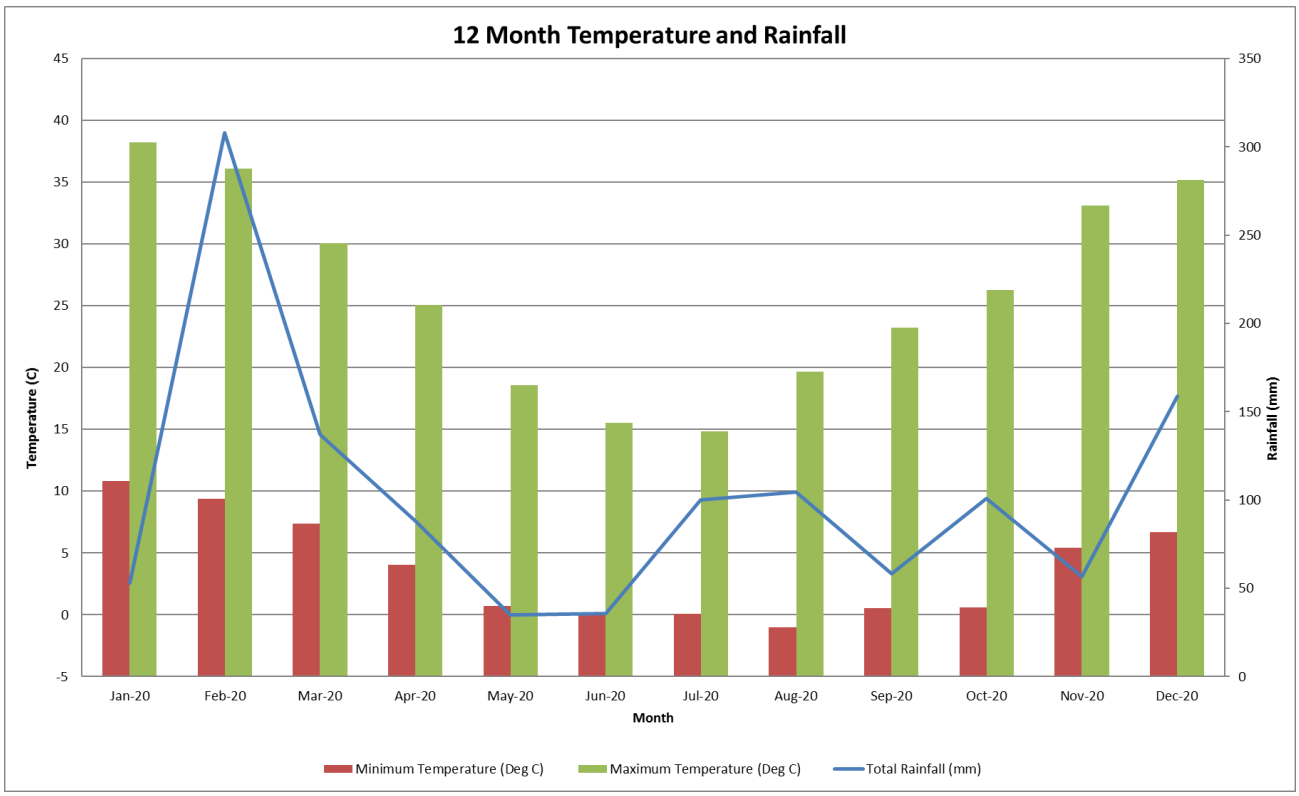


Figure 11. 2020 Temperature and Rainfall trends

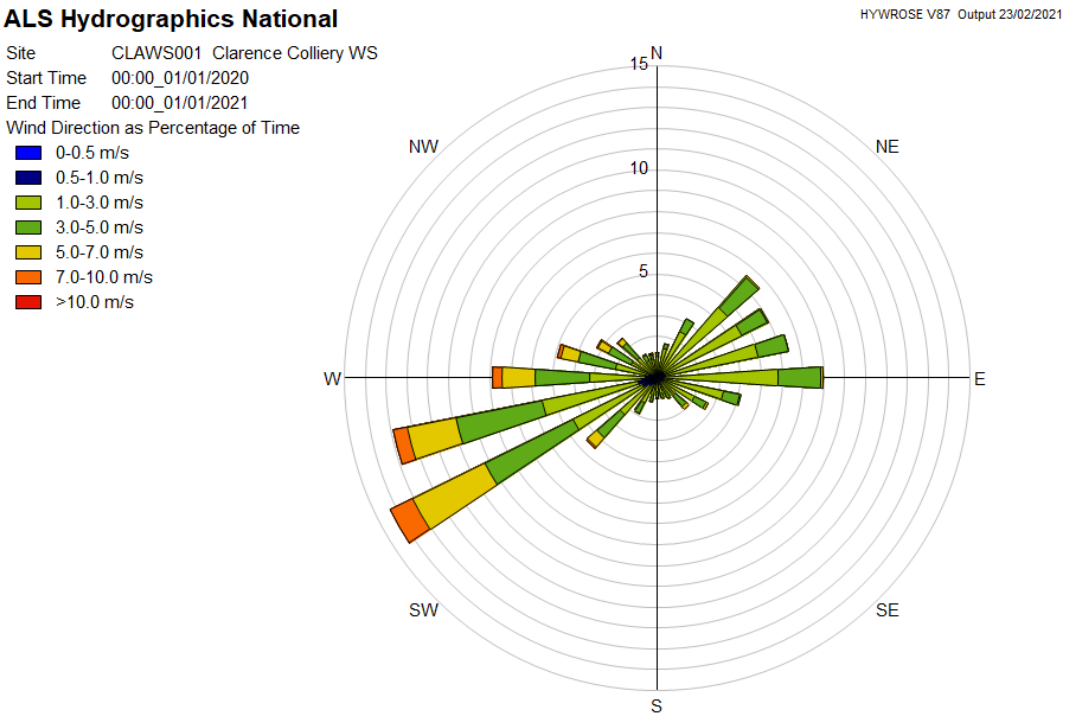


Figure 12. 2020 wind rose plot for Clarence

As seen in Figure 12, results obtained from the Clarence weather station show the predominant wind direction was south- westerly for 2020.

11 Noise Monitoring

Clarence operates in accordance with the Western Region Noise Management Plan.

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.

In accordance with DA504-00 and EPL 726 noise monitoring is undertaken annually at M1. Clarence Annual monitoring (attended) was undertaken over 25th and 26th of November 2020 which demonstrates compliance with the criteria specified in the consent. A summary of the results is provided below.

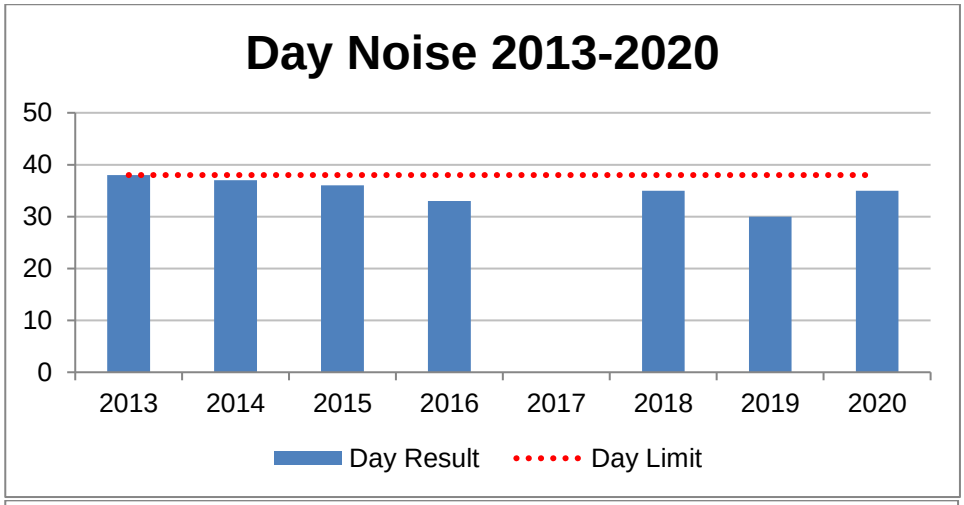
Table 20 : Noise Environmental Performance

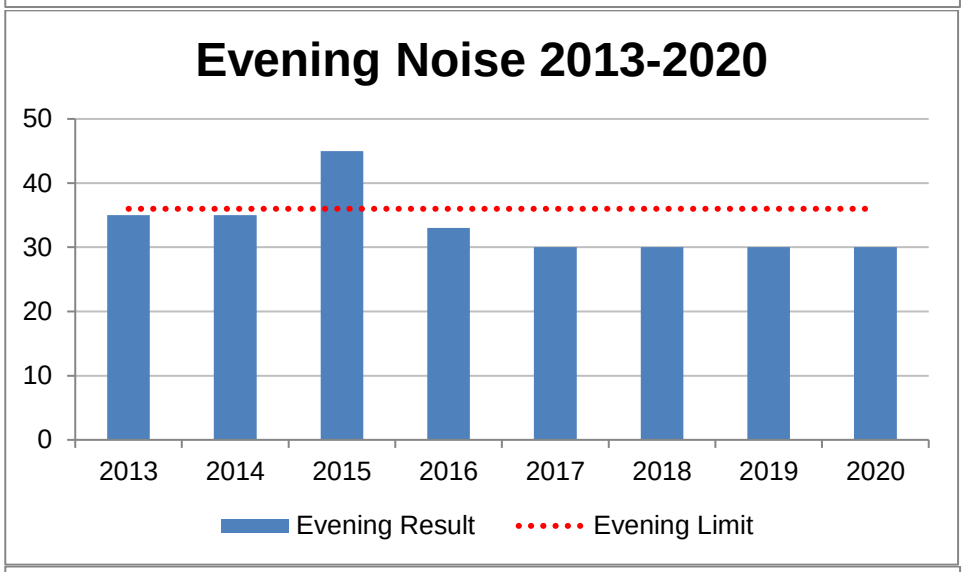
Noise Monitoring location	Time of day	Approval criteria dB(A) $L_{Aeq(15min)}$	Performance during the reporting period (actual) dB(A) $L_{Aeq(15min)}$	Trend compared to previous years dB(A) $L_{Aeq(15min)}$
M1	Day	38	<30 (operations were inaudible)	2020-35 2019-BD 2018-BD 2017-BD 2016-33 2015-36
	Evening	36	<30 (operations were inaudible)	2020-30 2019-BD 2018-BD 2017-30 2016-33 2015-45
	Night	35	35	2020-33 2019-35 2018-NM 2017-42 2016-35 2015-45

*SOURCE: November 2013 Environmental Assessment Clarence Colliery Road Haulage Modification Section 75W Modification to Development Consent DA 504-00

NM – Not measured as Weather conditions exceeded consent parameters.

BD – Below Detection, assigned <30dba for the purposes of graphical representation.





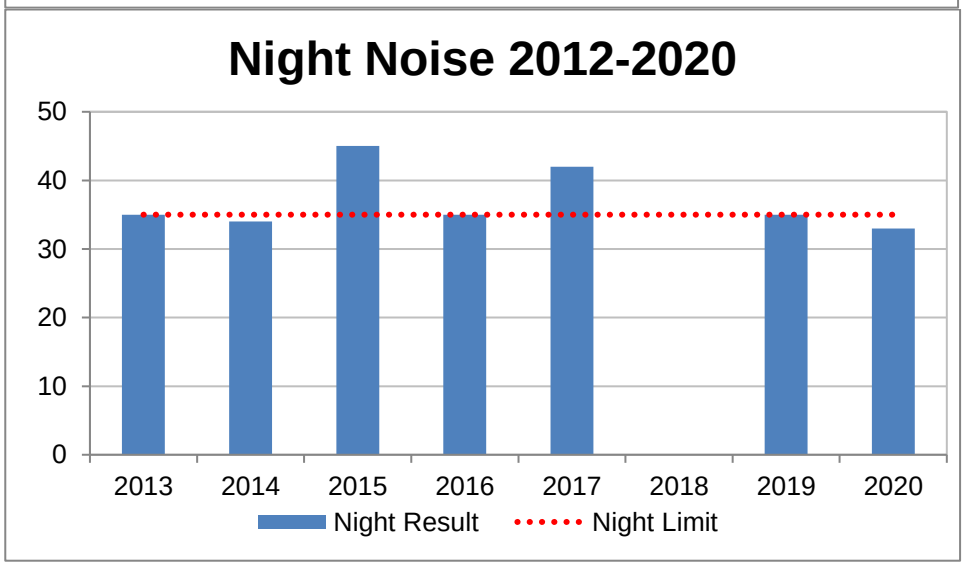


Figure 13. Noise monitoring summary 2013 - 2020

12 WATER MANAGEMENT

Table 21: Water Take

License #	Water source /management zone	Entitlement	Passive take / inflows	Active pumping	TOTAL
WAL36479	Sydney Basin Richmond Groundwater Source	6,623 ML	0	4212.2 ML	4212.2 ML

12.1 Surface Water Monitoring

There is an established surface water quality monitoring program for Clarence. Monitoring requirements adhere to the latest version of EPL 726. Surface water quality monitoring is required at 4 locations as detailed in **Table 22**. Water quality is required to be monitored on a monthly basis (during discharge) and is tested for a range of analytes. pH and Total Suspended Solids (TSS) are required under DA504-00 and an additional 21 parameters are required under the EPL.

Table 22 : Summary of Surface Water 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.
Point 9	Wollangambe River downstream of LDP002 (and main dam).

The following Tables and figures provide data for reporting period and previous years for the discharges from LDP002. Discharge occurred at LDP003 and LDP004 once in 2020 during a rainfall event of >200mm and results are also presented below.

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12.1.1 LDP002 Water Quality

Table 23 demonstrates that pH at LDP002 during 2020 is generally consistent with previous years data.

The TSS levels in LDP002 are generally at or below the detection limit (<LOR). These results are consistent with previous years with all averages being less than 7mg/L (limit 30mg/L).

The average annual results for LDP002 are summarised in Table 24 as reported in the 2020 Annual Return. Figures 14 - 34 provide a graphical comparison to the EPL Limits. Water quality results below detection limit have been graphed at the detection limit.

Table 23 : Surface Water Quality (pH and TSS) at LDP002: 2014-2020

Parameter	2020			2019			2018			2017			2016	2015	2014	EPL Limit
	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Avg	Avg	Avg	
pH	6.3	7.9	8.5	7.0	8.1	8.5	7.4	8.24	8.9	6.2	7.4	8.4	7.4	7.1	7.2	6.0-8.5
TSS	<5	<5	5	5	5	5	5	6	15	<5	5	10	<5	6	7	30

Table 24 : LDP002 Water Quality

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value	EPL Limit
Arsenic (dissolved)	milligrams per litre	12	12	<0.001	<0.001	<0.001	0.013
Boron	milligrams per litre	12	12	<0.05	<0.05	<0.05	0.1
Cadmium (dissolved)	milligrams per litre	12	12	<0.0001	<0.0001	<0.0001	0.0002
Chloride	milligrams per litre	12	12	14	18	21	25
Chromium (dissolved)	milligrams per litre	12	12	<0.001	<0.001	0.002	0.001
Cobalt (dissolved)	milligrams per litre	12	12	0.0008	0.0029	0.0066	0.0025
Copper (dissolved)	milligrams per litre	12	12	<0.001	<0.001	0.004	0.0014
Filterable iron	milligrams per litre	12	12	<0.05	<0.05	<0.05	0.3
Fluoride	milligrams per litre	12	12	<0.1	<0.1	<0.1	1
Lead (dissolved)	milligrams per litre	12	12	<0.001	<0.001	<0.001	0.0034
Lithium (dissolved)	milligrams per litre	12	12	0.017	0.021	0.029	0.1
Manganese (dissolved)	milligrams per litre	12	12	0.013	0.0042	0.0225	0.5
Mercury (dissolved)	milligrams per litre	12	12	<0.000005	<0.00001	<0.00001	0.00006
Nickel (dissolved)	milligrams per litre	12	12	0.003	0.008	0.022	0.011
Nitrogen (total)	milligrams per litre	12	12	<0.1	<0.1	0.4	0.25
Oil and Grease	milligrams per litre	12	12	<5	<5	6	10
pH	pH units	12	12	6.3	7.9	8.5	6.0 - 8.5
Phosphorus (total)	milligrams per litre	12	12	<0.01	<0.01	0.01	0.02
Selenium (total)	milligrams per litre	12	12	<0.01	<0.01	<0.01	0.005
Silver (dissolved)	milligrams per litre	12	12	<0.00001	<0.00001	<0.00001	0.00005
Sulfate	milligrams per litre	12	12	83	109	124	250

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value	EPL Limit
Total suspended solids	milligrams per litre	12	12	<5	<5	13	30
Zinc (dissolved)	milligrams per litre	12	12	<0.005	0.013	0.050	0.008

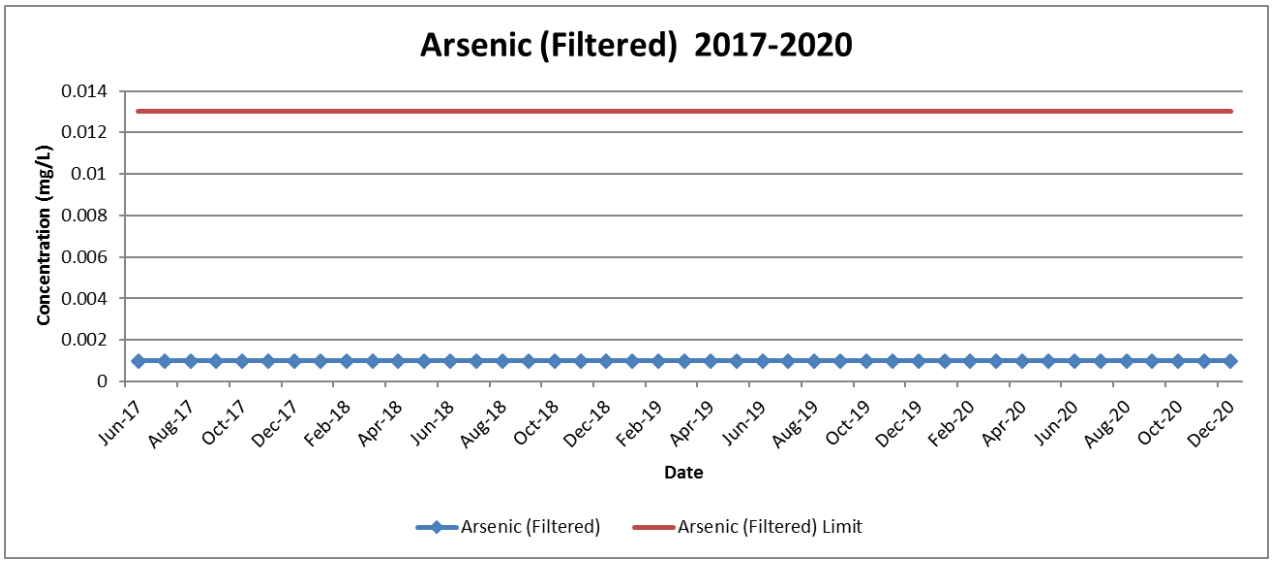

Figure 14. Arsenic June 2017- December 2020

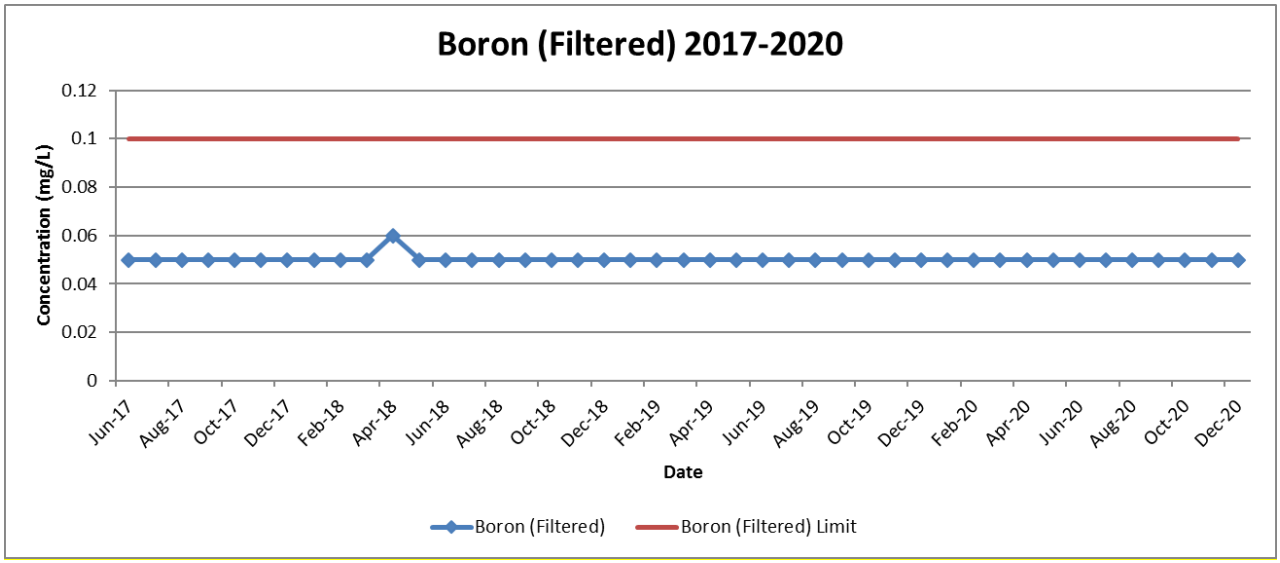

Figure 15. Boron June 2017- December 2020

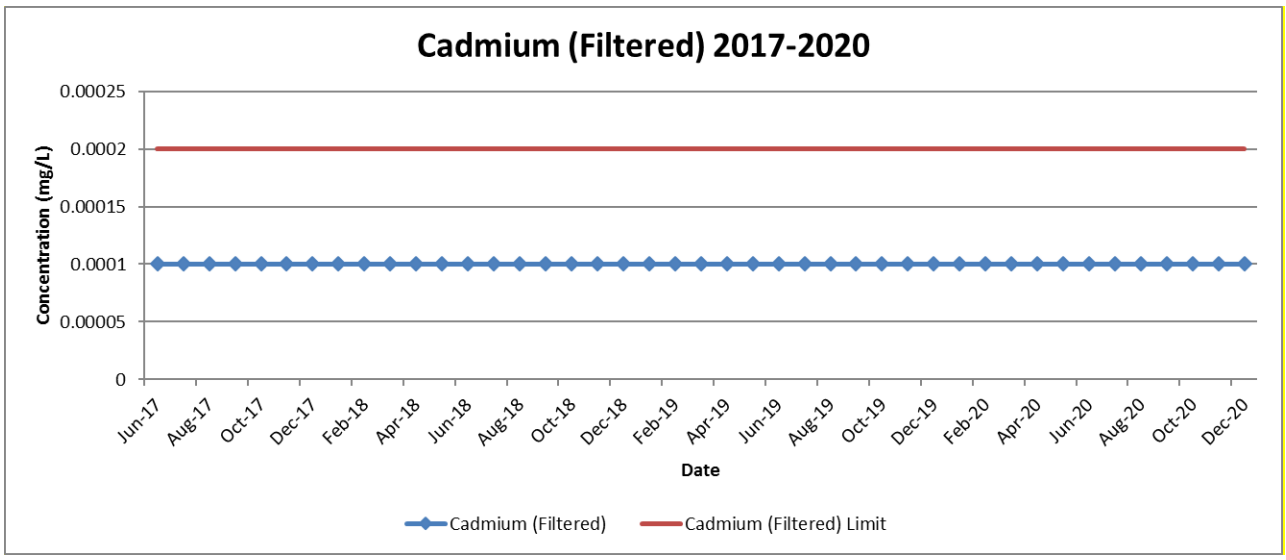

Figure 16. Cadmium June 2017- December 2020

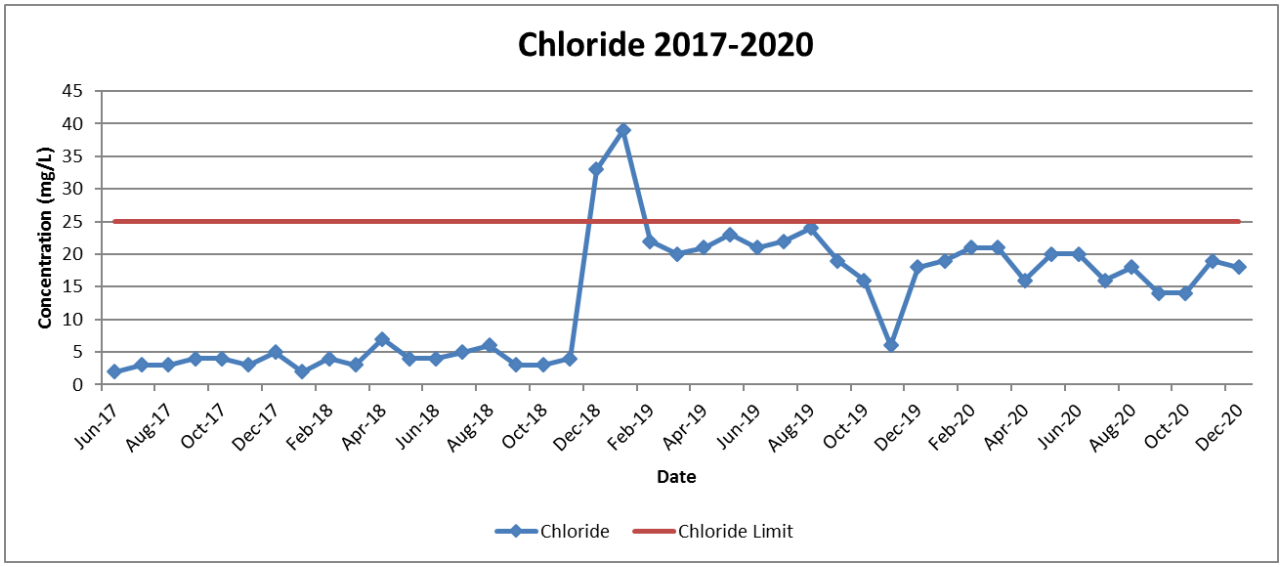

Figure 17. Chloride June 2017- December 2020

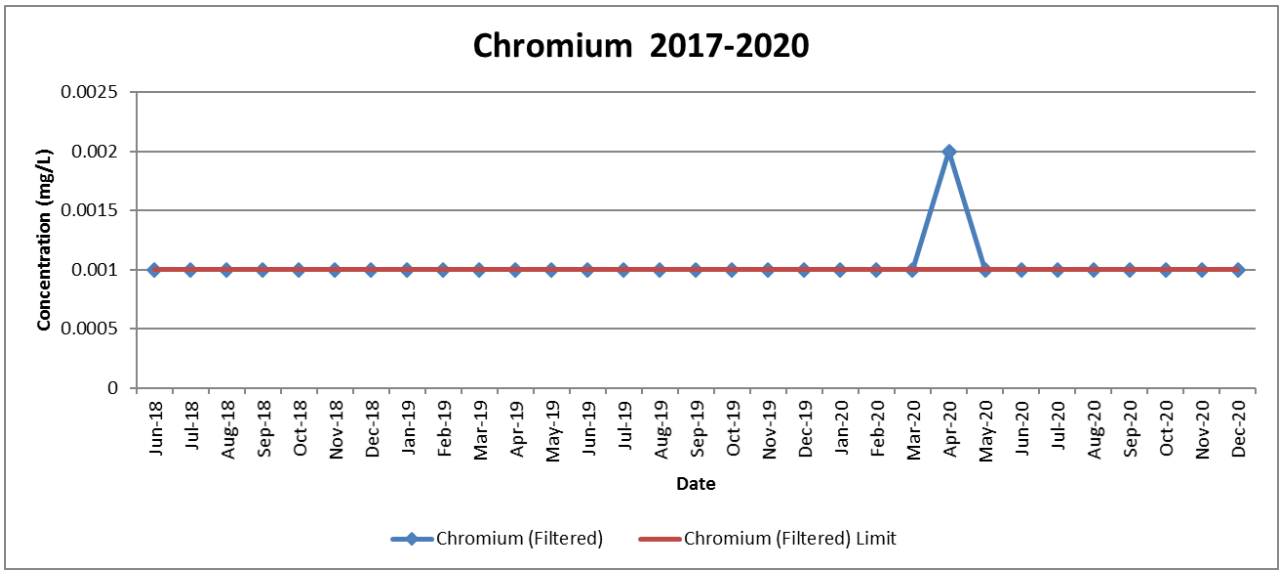

Figure 18. Chromium June 2017- December 2020

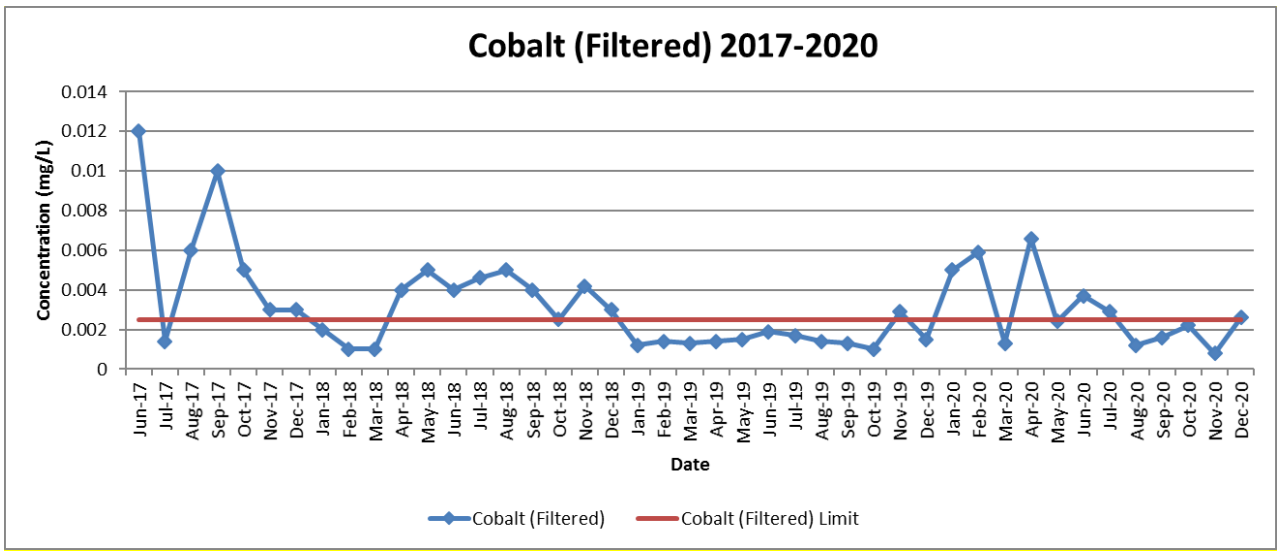

Figure 19. Cobalt June 2017- December 2020

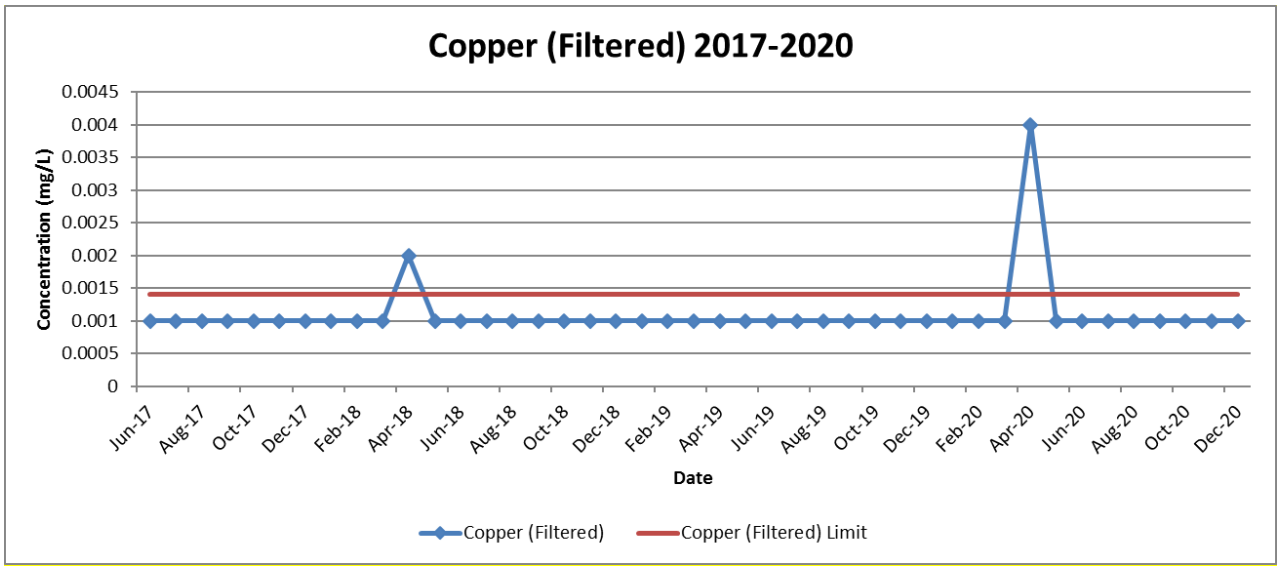

Figure 20. Copper June 2017- December 2020

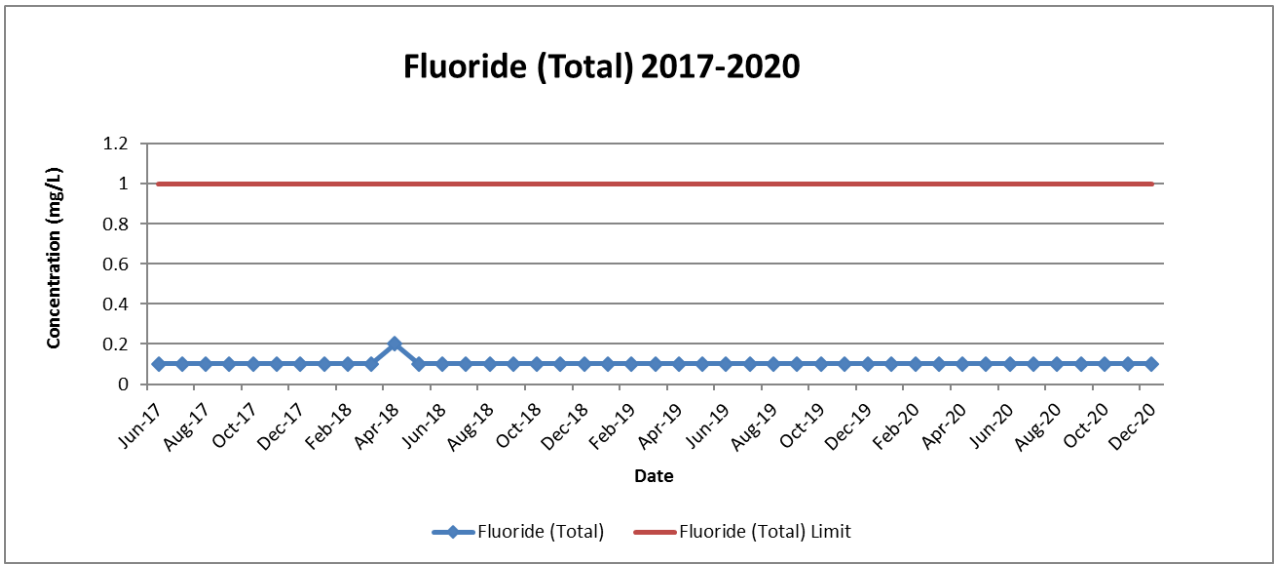

Figure 21. Fluoride June 2017- December 2020

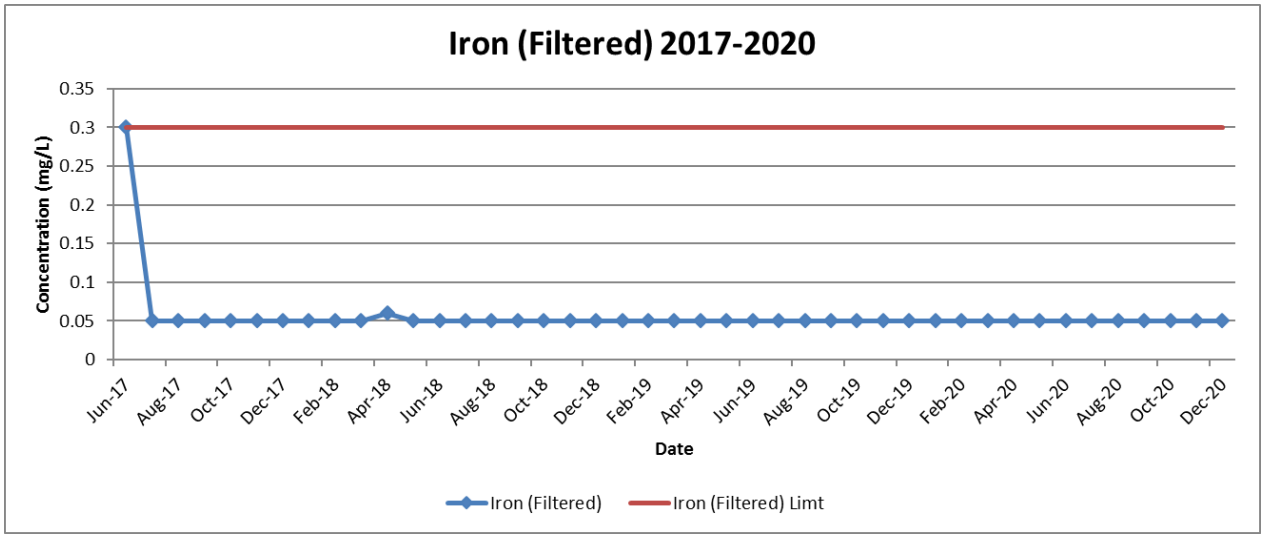

Figure 22. Iron June 2017- December 2020

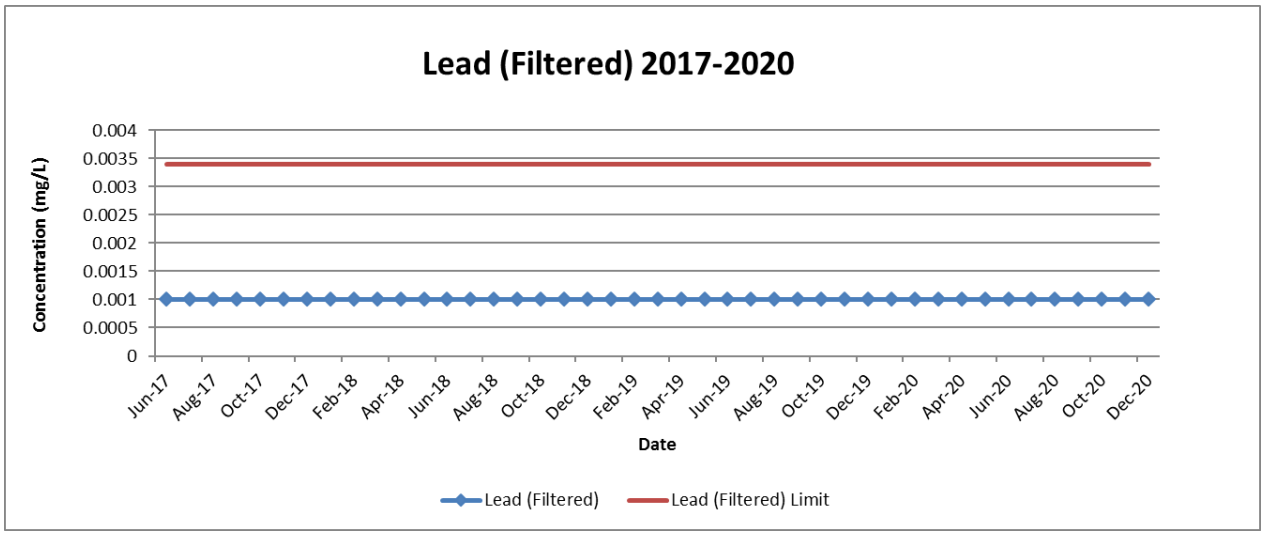

Figure 23. Lead June 2017- December 2020

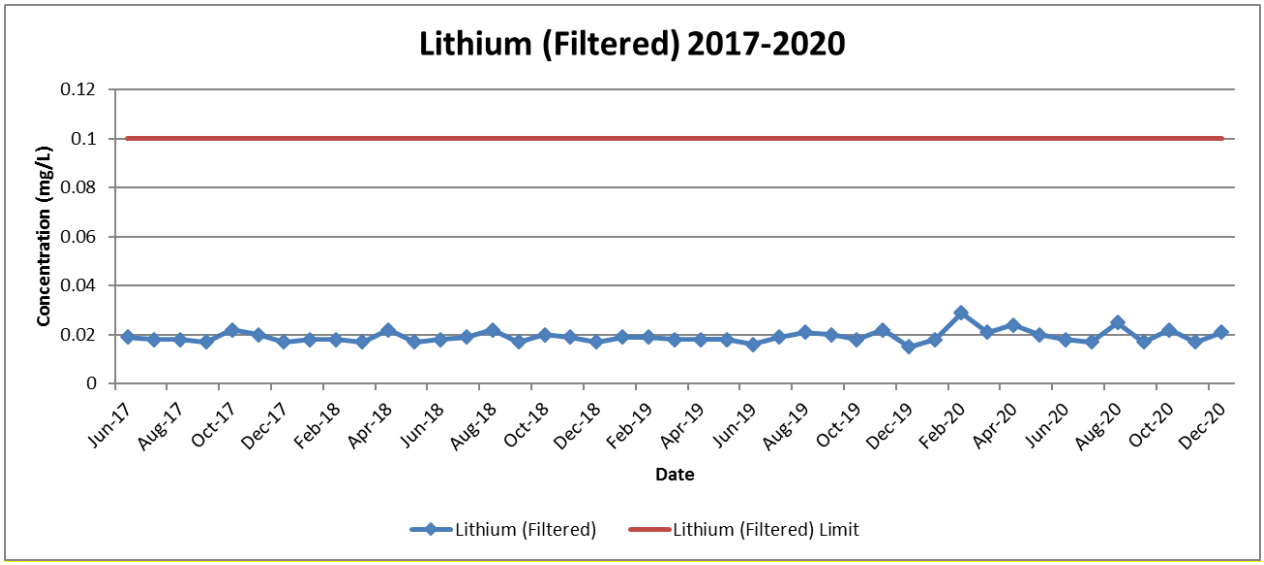

Figure 24. Lithium June 2017- December 2020

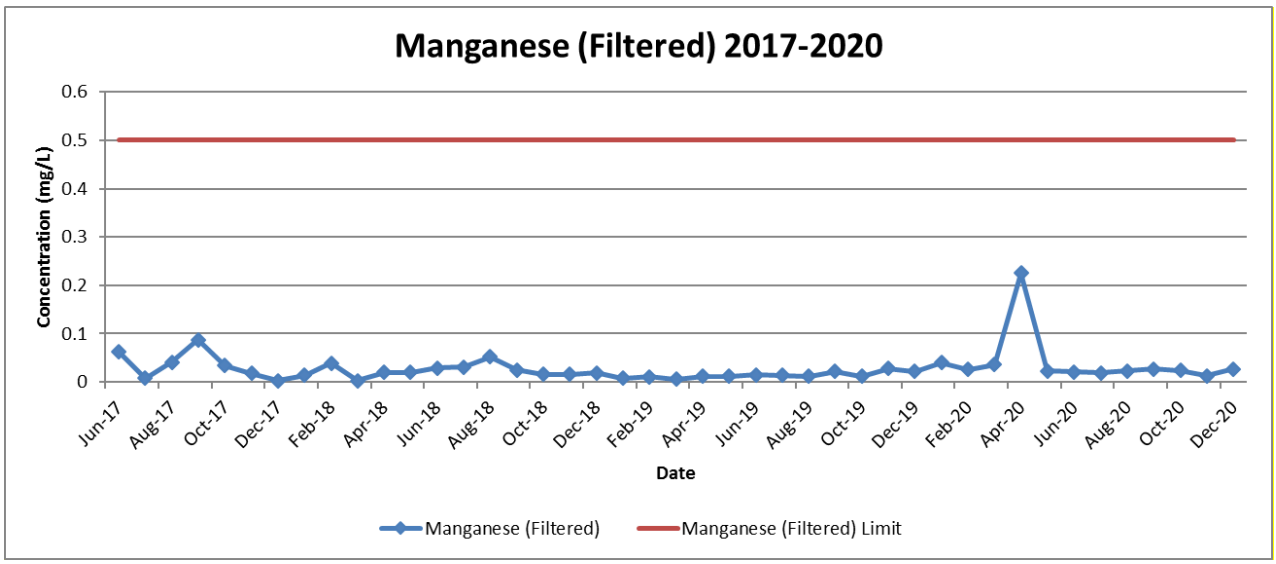

Figure 25. Manganese June 2017- December 2020

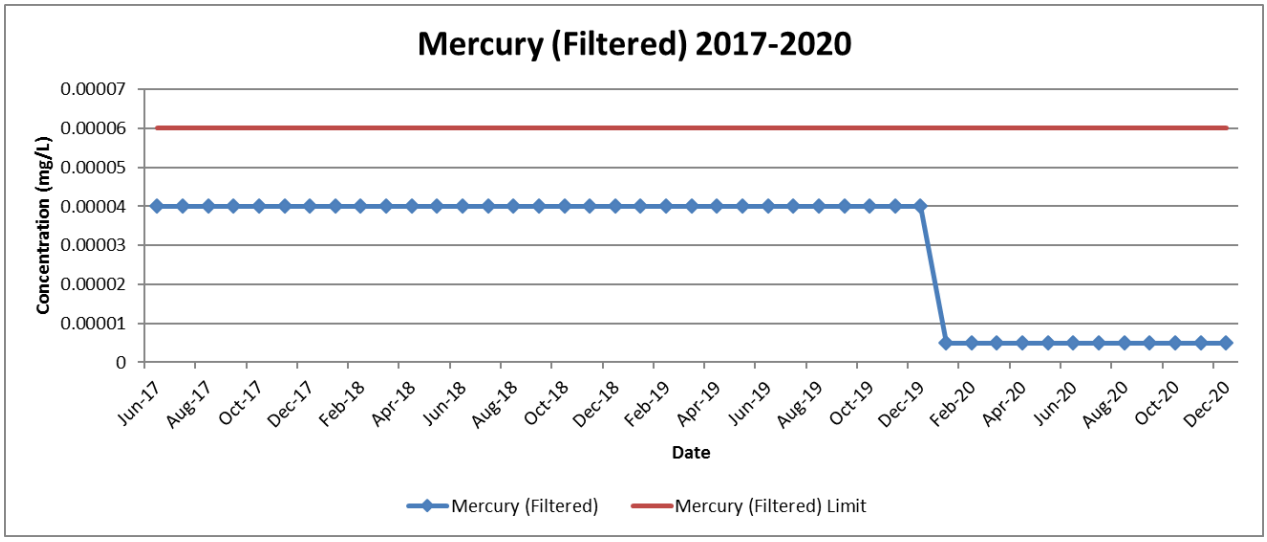

Figure 26. Mercury June 2017- December 2020

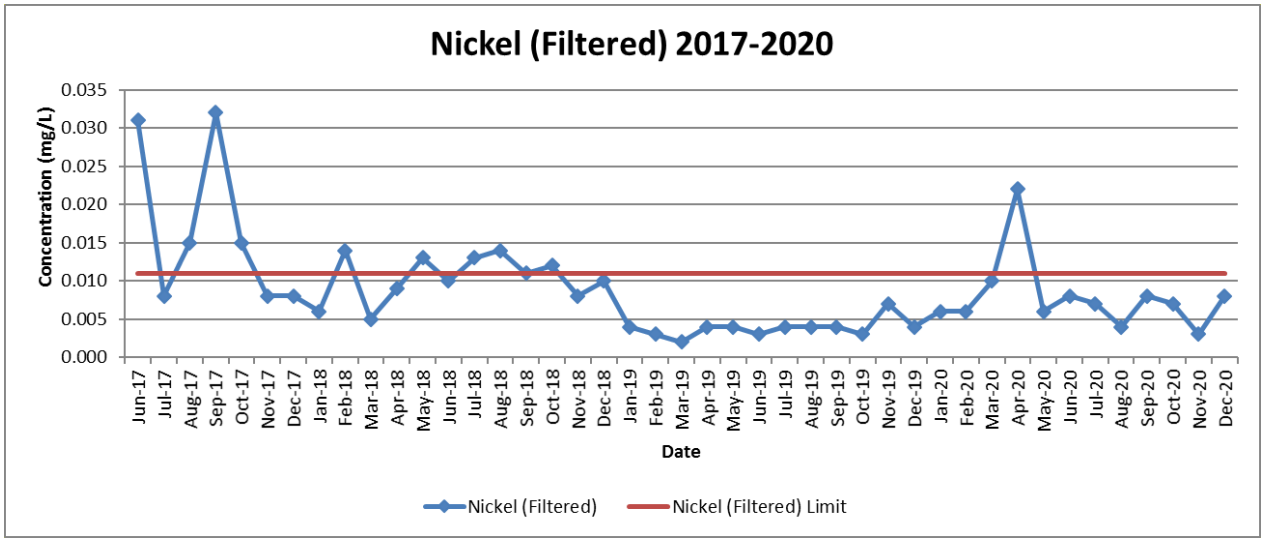

Figure 27. Nickel June 2017- December 2020

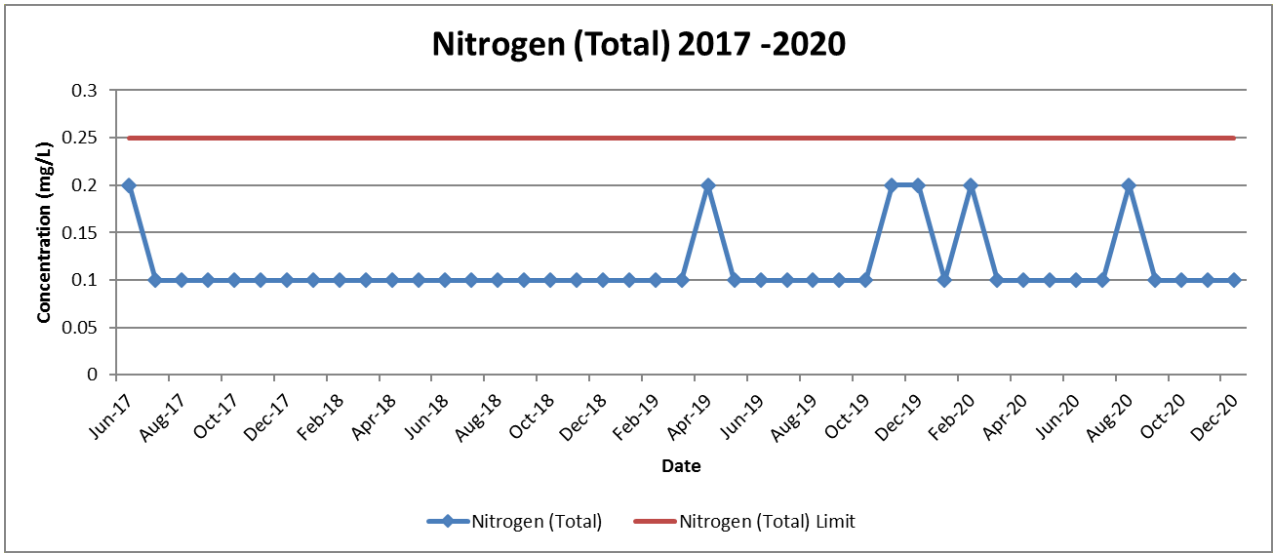

Figure 28. Nitrogen June 2017- December 2020

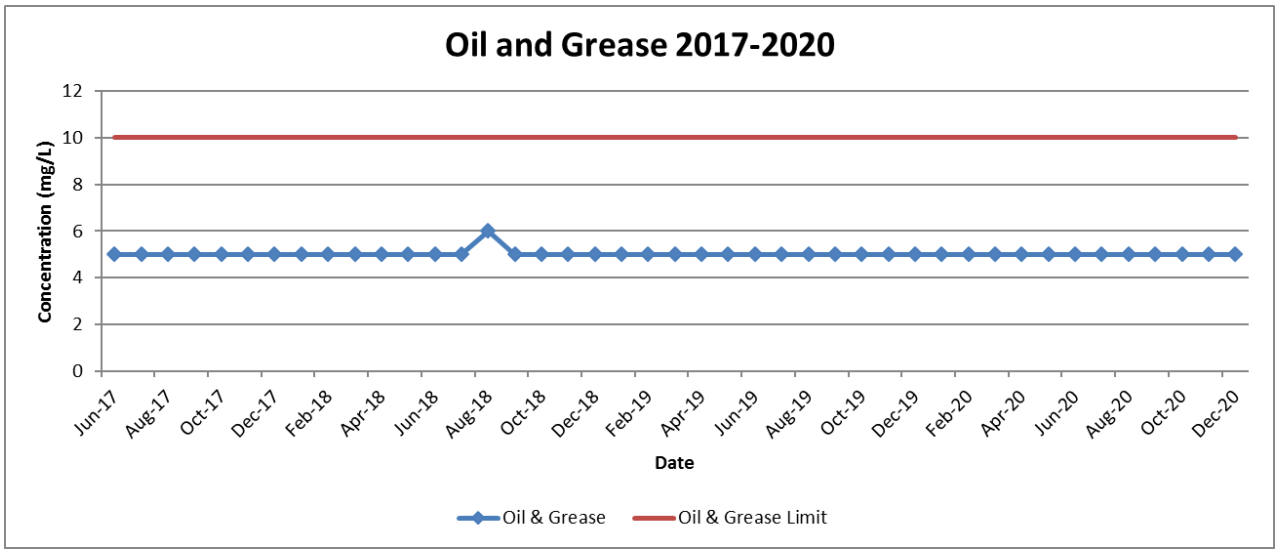

Figure 29. Oil and Grease June 2017- December 2020

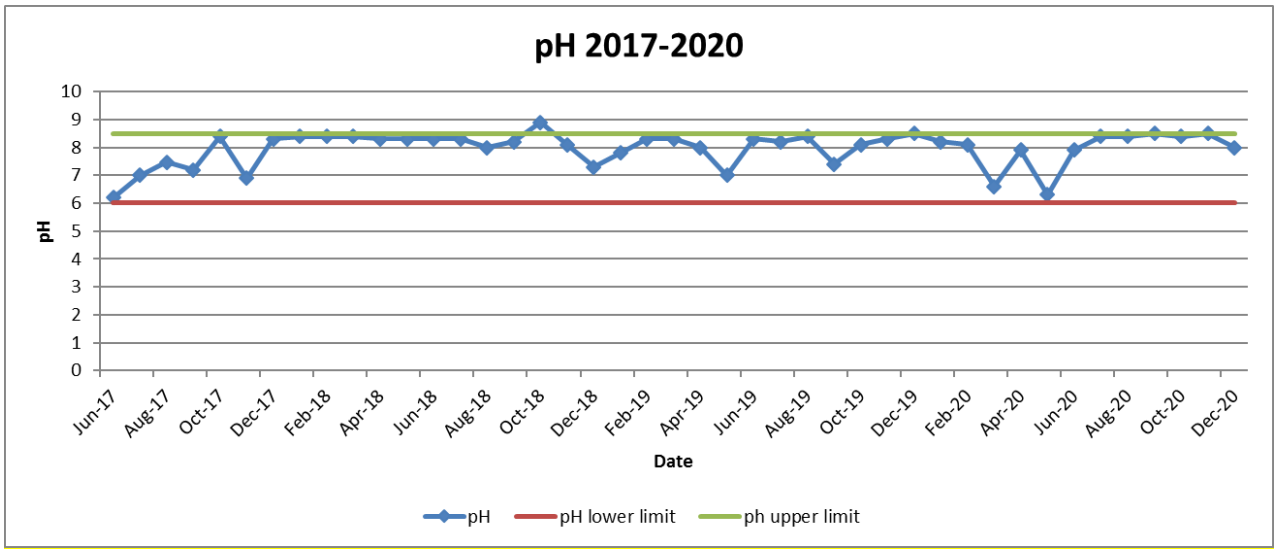

Figure 30. pH June 2017- December 2020

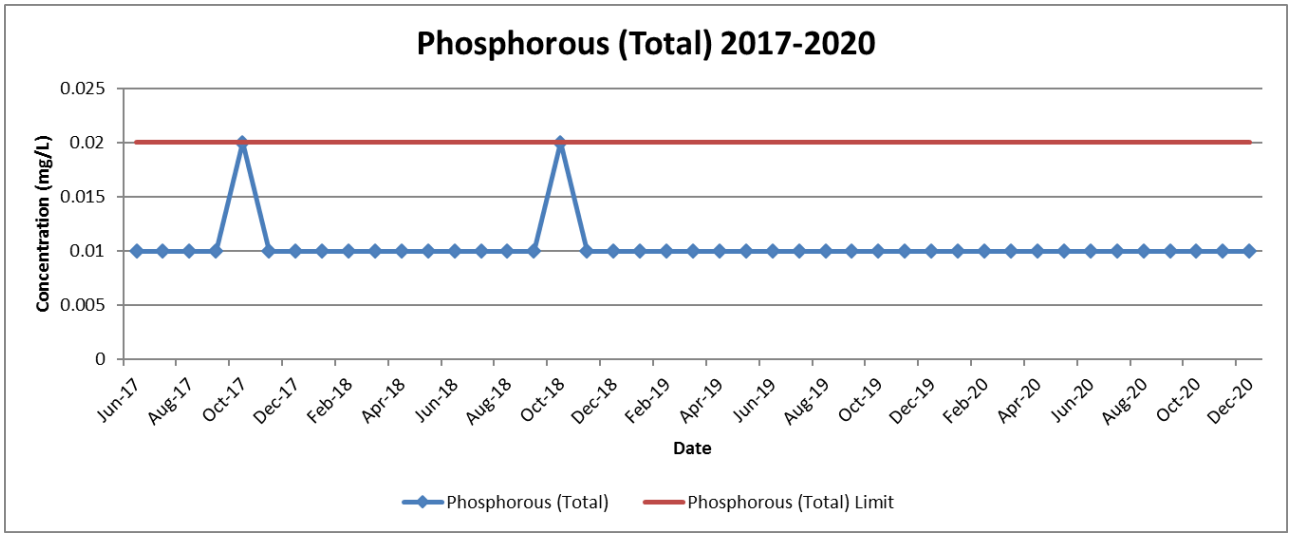

Figure 31. Phosphorus June 2017- December 2020

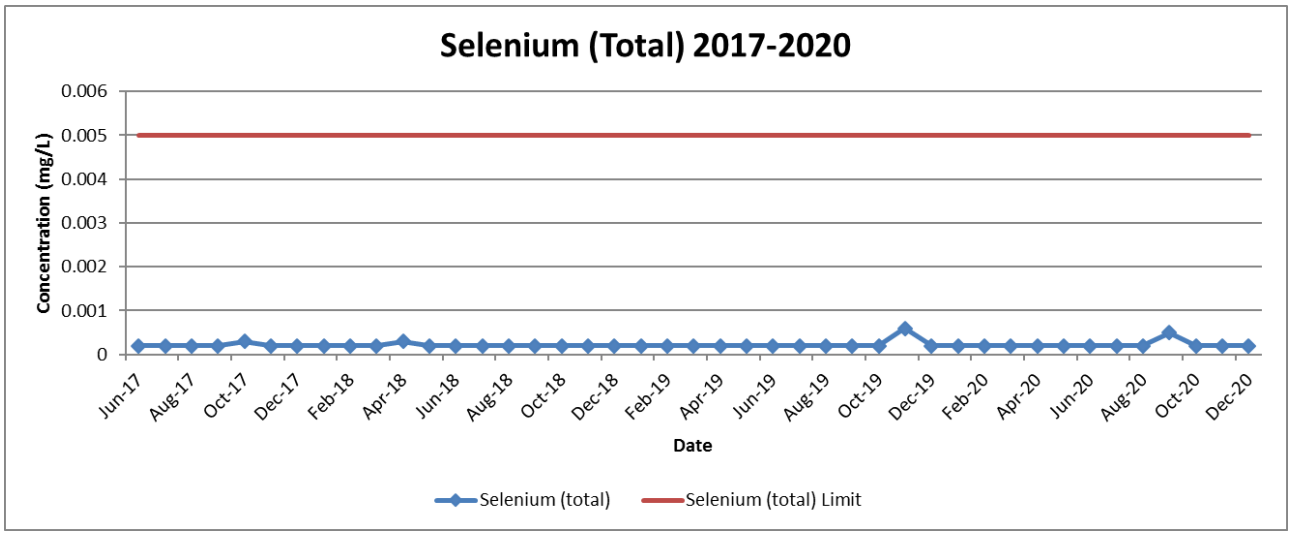

Figure 32. Selenium June 2017- December 2020

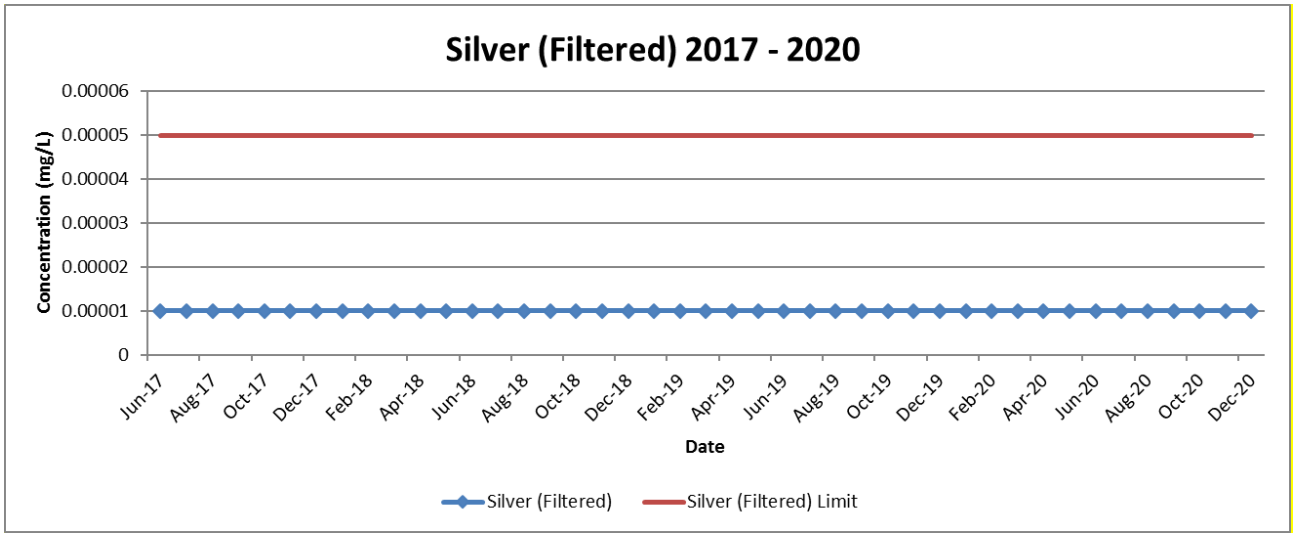

Figure 33. Silver June 2017- December 2020

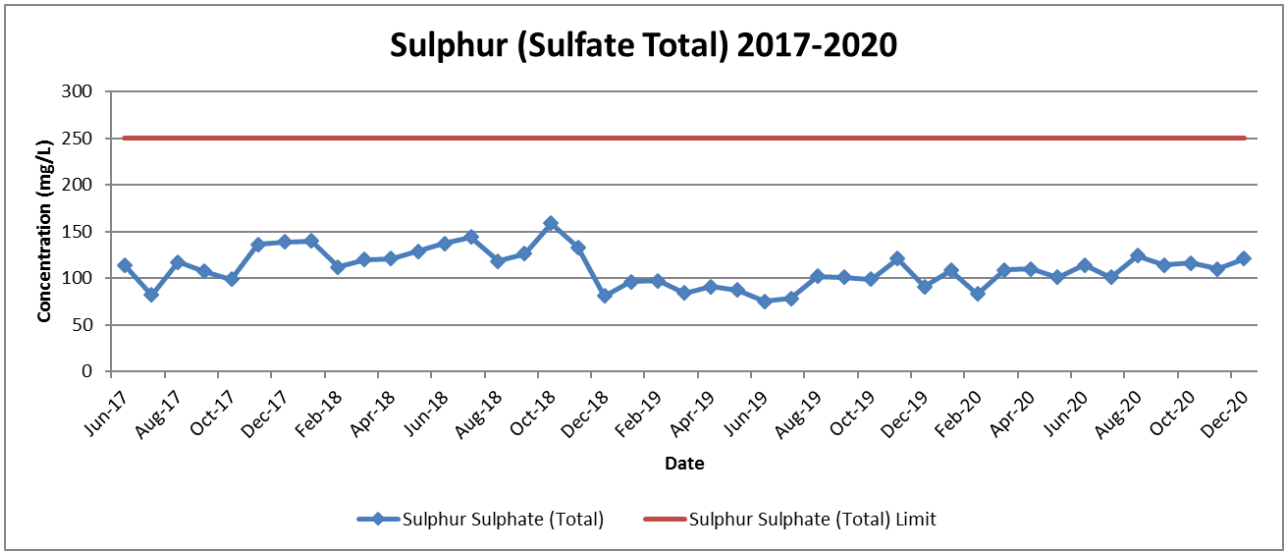

Figure 34. Sulphur June 2017- December 2020

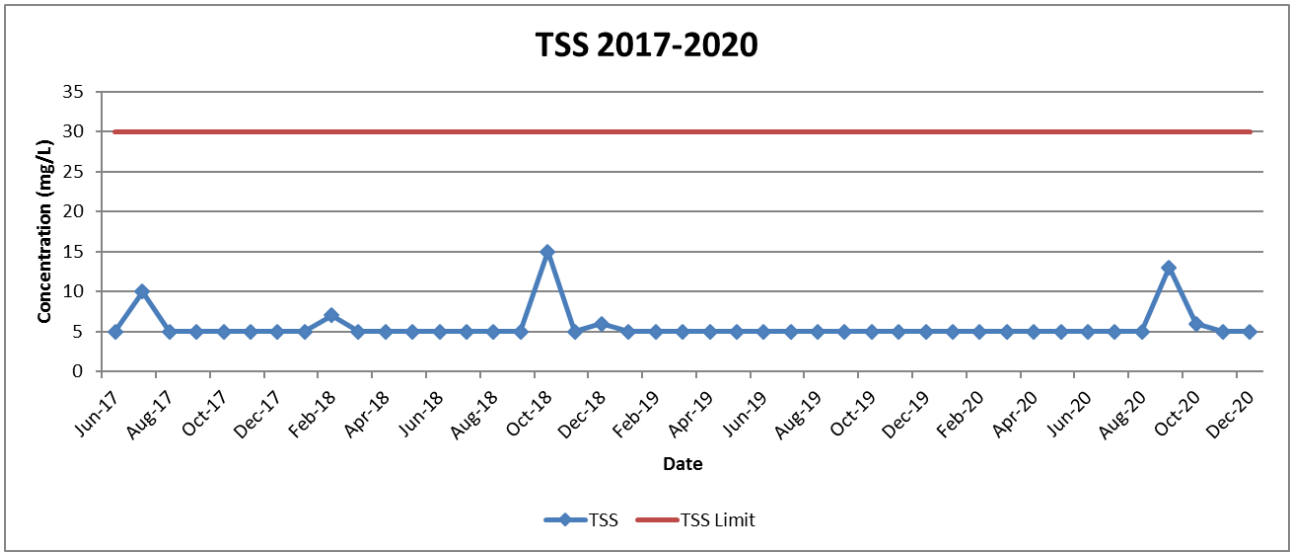

Figure 35. TSS June 2017- December 2020

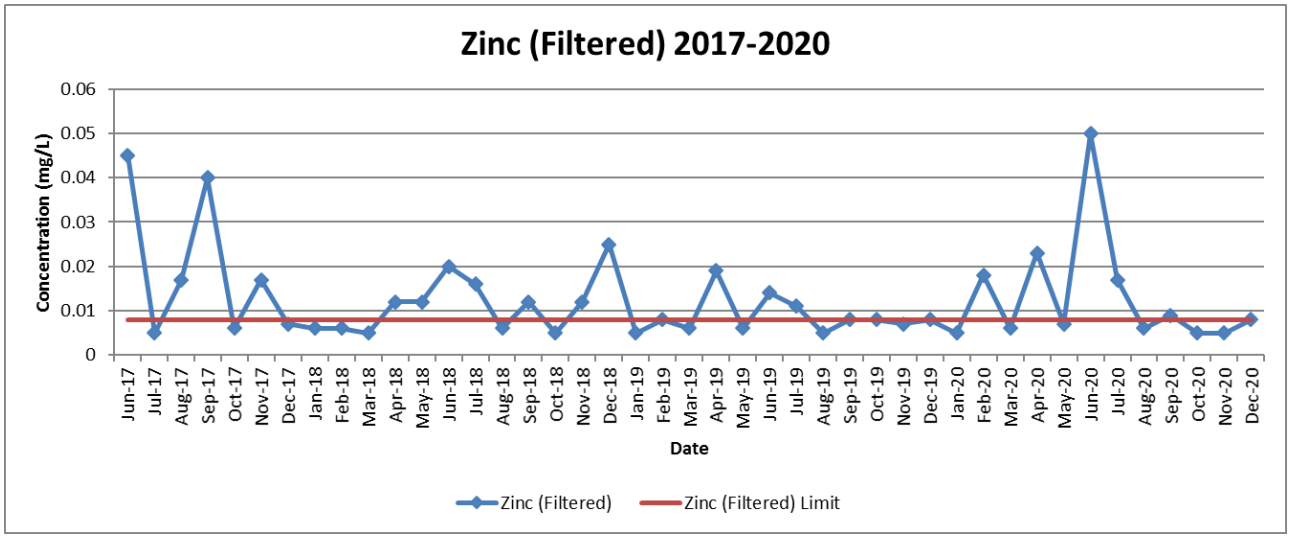

Figure 36. Zinc June 2017 – December 2020

12.1.2 LDP002 Summary

The water monitoring results for LDP002 show an improvement in water quality from 2017 when new limits and analytes were applied to discharges through to the end of 2019. However, the results for 2020 show much more variability than the previous year, particularly in April. During March-April the Water Treatment Plant operator was forced to be offsite due to contracting COVID-19, and the results reflect this. Because of elevated exceedances, particularly in dissolved cobalt and dissolved zinc, the EPA issued Clarence with two Invitation to Show Cause notices, one in July and one in November of 2020. Investigations into pH management at the plant led to the replacement of pH sensors, improvement of calibration techniques, clean water lagoon inflow control and sampling method scrutiny. Improved discharge quality towards the end of 2020 reflects these improvements. Further to the above, Clarence has instigated a review of the plant by an independent water consultant with the aim of finding realistic ways to improve plant efficiency further. This review falls outside of the reporting period and will be discussed in the annual review for 2021.

12.1.3 LDP003 Water Quality

LDP003 discharged once only 2020 during a rainfall event of >200mm in February. This discharge was compliant with the EPL as concentration limits do not apply at LDP003 when the rainfall at the premises exceeds a total of 56mm over any consecutive 5-day period.

Table 25. LDP003 Water Quality

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value
Arsenic (dissolved)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Boron	milligrams per litre	1	1	<0.05	<0.05	<0.05
Cadmium (dissolved)	milligrams per litre	1	1	0.0026	0.0026	0.0026
Chloride	milligrams per litre	1	1	2	2	2
Chromium (dissolved)	milligrams per litre	1	1	0.003	0.003	0.003
Cobalt (dissolved)	milligrams per litre	1	1	0.734	0.734	0.734
Copper (dissolved)	milligrams per litre	1	1	0.050	0.050	0.050
Conductivity	microsiemens per centimetre	1	1	205	205	205
Filterable iron	milligrams per litre	1	1	0.39	0.39	0.39

Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead (dissolved)	milligrams per litre	1	1	0.002	0.002	0.002
Lithium (dissolved)	milligrams per litre	1	1	0.008	0.008	0.008
Manganese (dissolved)	milligrams per litre	1	1	1.96	1.96	1.96
Mercury (dissolved)	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nickel (dissolved)	milligrams per litre	1	1	1.73	1.73	1.73
Nitrogen (total)	milligrams per litre	1	1	1.0	1.0	1.0
Oil and Grease	milligrams per litre	1	1	<5	<5	<5
pH	pH units	1	1	4.8	4.8	4.8
Phosphorus (total)	milligrams per litre	1	1	0.04	0.04	0.04
Selenium (total)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Silver (dissolved)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Sulfate	milligrams per litre	1	1	81	81	81
Total suspended solids	milligrams per litre	1	1	42	42	42
Zinc (dissolved)	milligrams per litre	1	1	3.76	3.76	3.76

12.1.4 LDP004 Water Quality

LDP004 discharged once only 2020 during a rainfall event of >200mm in February. This discharge was compliant with the EPL as concentration limits do not apply at LDP003 when the rainfall at the premises exceeds a total of 56mm over any consecutive 5-day period.

Table 26. LDP004 Water Quality

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value
Arsenic (dissolved)	milligrams per litre	1	1	0.001	0.001	0.001
Boron	milligrams per litre	1	1	<0.05	<0.05	<0.05

Cadmium (dissolved)	milligrams per litre	1	1	0.0011	0.0011	0.0011
Chloride	milligrams per litre	1	1	3	3	3
Chromium (dissolved)	milligrams per litre	1	1	0.001	0.001	0.001
Cobalt (dissolved)	milligrams per litre	1	1	0.385	0.385	0.385
Conductivity	microsiemens per centimetre	1	1	237	237	237
Copper (dissolved)	milligrams per litre	1	1	0.005	0.005	0.005
Filterable iron	milligrams per litre	1	1	<0.05	<0.05	<0.05
Fluoride	milligrams per litre	1	1	<0.1	<0.1	<0.1
Lead (dissolved)	milligrams per litre	1	1	<0.001	<0.001	<0.001
Lithium (dissolved)	milligrams per litre	1	1	0.013	0.013	0.013
Manganese (dissolved)	milligrams per litre	1	1	1.46	1.46	1.46
Mercury (dissolved)	milligrams per litre	1	1	<0.0001	<0.0001	<0.0001
Nickel (dissolved)	milligrams per litre	1	1	1.01	1.01	1.01
Nitrogen (total)	milligrams per litre	1	1	1.2	1.2	1.2
Oil and Grease	milligrams per litre	1	1	<5	<5	<5
pH	pH units	1	1	3.7	3.7	3.7
Phosphorus (total)	milligrams per litre	1	1	0.11	0.11	0.11
Selenium (total)	milligrams per litre	1	1	<0.01	<0.01	<0.01
Silver (dissolved)	milligrams per litre	1	1	<0.00001	<0.00001	<0.00001
Sulfate	milligrams per litre	1	1	74	74	74
Total suspended solids	milligrams per litre	1	1	207	207	207
Zinc (dissolved)	milligrams per litre	1	1	1.27	1.27	1.27

12.1.5 Wollangambe River Downstream (Point 9) Water Quality

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. The EPL sets out the parameters which must be monitored monthly. These are the same parameters as LDP002 however as this is not a discharge point, there are no limits and the requirements are to monitor only. Table 27 summarises the results of the Water Quality Monitoring at Point 9 for 2020.

Table 27 : Water Quality Monitoring Point 9 Results 2020

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value
Arsenic (dissolved)	milligrams per litre	12	12	<0.001	<0.001	<0.001
Boron	milligrams per litre	12	12	<0.05	<0.05	<0.05
Cadmium (dissolved)	milligrams per litre	12	12	<0.0001	<0.0001	0.0002
Chloride	milligrams per litre	12	12	11	17	22
Chromium (dissolved)	milligrams per litre	12	12	<0.001	<0.001	0.001
Cobalt (dissolved)	milligrams per litre	12	12	0.0047	0.0191	0.118
Conductivity	microsiemens per centimetre	12	12	215	305	332
Copper (dissolved)	milligrams per litre	12	12	<0.001	<0.001	<0.000
Filterable iron	milligrams per litre	12	12	<0.001	<0.001	<0.001
Fluoride	milligrams per litre	12	12	<0.1	<0.1	<0.1
Lead (dissolved)	milligrams per litre	12	12	<0.001	<0.001	<0.001
Lithium (dissolved)	milligrams per litre	12	12	0.012	0.016	0.020

Pollutant	Unit of Measure	No. of Samples required	No. of Samples taken	Lowest sample value	Mean of sample	Highest sample value
Manganese (dissolved)	milligrams per litre	12	12	0.048	0.165	0.738
Mercury (dissolved)	milligrams per litre	12	12	<0.000005	<0.0001	<0.0001
Nickel (dissolved)	milligrams per litre	12	12	0.018	0.052	0.297
Nitrogen (total)	milligrams per litre	12	12	<0.1	<0.1	0.3
Oil and Grease	milligrams per litre	12	12	<5	<5	<5
pH	pH	12	12	5.2	6.2	7.4
Phosphorus (total)	milligrams per litre	12	12	<0.01	<0.01	0.02
Selenium (total)	milligrams per litre	12	12	<0.01	<0.01	<0.01
Silver (dissolved)	milligrams per litre	12	12	<0.00001	<0.001	<0.001
Sulfate	milligrams per litre	12	12	54	92	114
Total suspended solids	milligrams per litre	12	12	<5	<5	7
Zinc (dissolved)	milligrams per litre	12	12	0.022	0.067	0.343

12.1.6 LDP002, LDP003 and LDP004 Discharge Volumes

The volume of Water discharged is required to be monitored daily at the licenced discharge points in accordance with EPL 726.Table 28 provides the discharge volume results for the Annual Review period.

Table 28 : LDP Discharge Volumes

Discharge Point	Frequency of Monitoring	No. of Measurements made	Lowest result (kL)	Mean result (kL)	Highest result (kL)	EPL Limit (kL/day)	Comments
LDP002	Daily During	365	134	13,474	19,646	39,239*	Measured constantly

	Discharge						
LDP003	Daily During Discharge	1 Estimate^	<1ML	<1ML	<1ML	No limit applied	1 Discharge in February after >200mm rain event
LDP004	Daily During Discharge	1 Estimate^	<1ML	<1ML	<1ML	No limit applied	1 Discharge in February after >200mm rain event

*High reading occurred during >200mm rain event and was compliant with EPL

^Estimate of volume required under EPL

12.2 Water Balance

Section 5.8 of the Clarence Water Management Plan provides details of the water balance for the sites. The following schematic provides an overview.

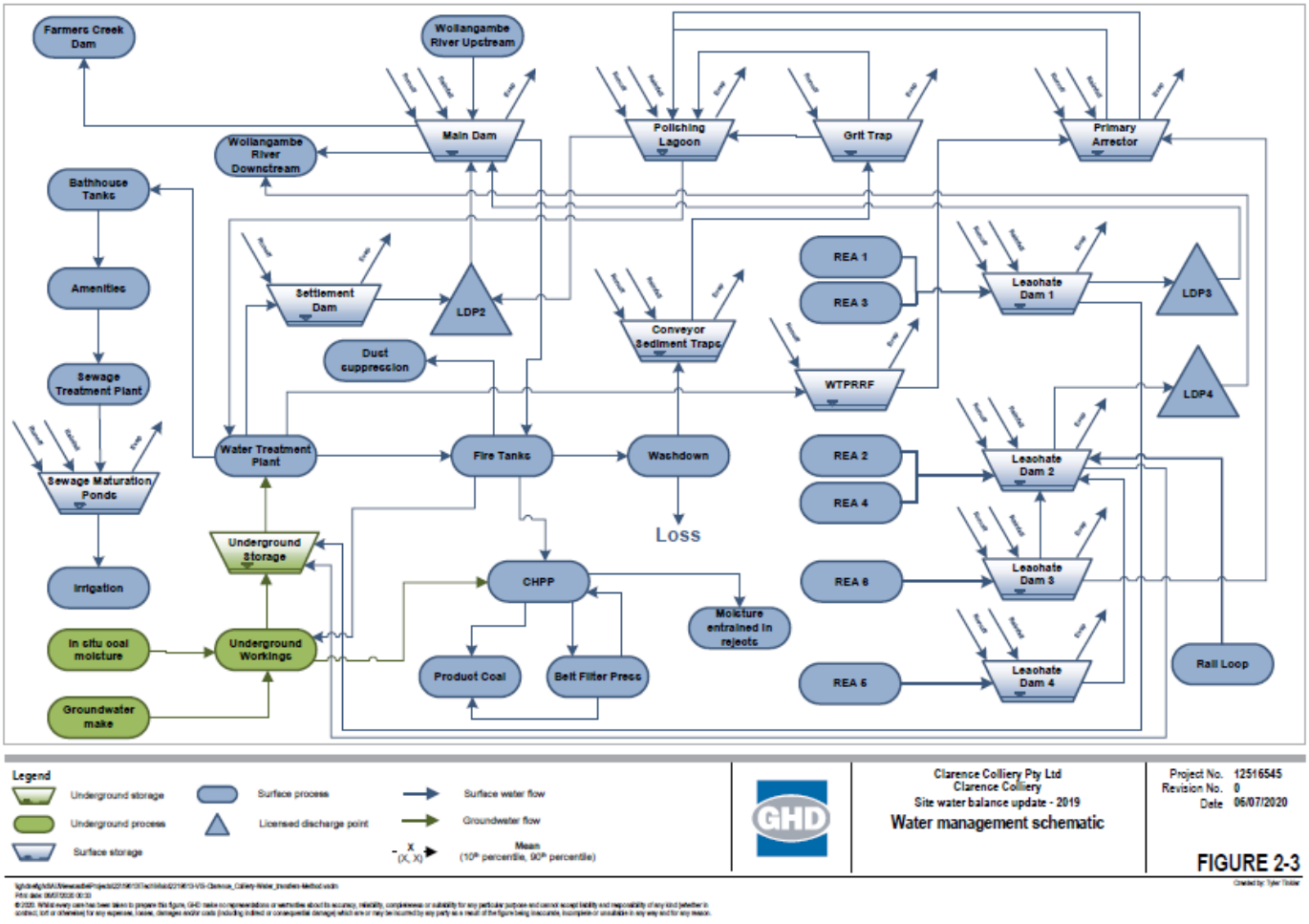

Figure 37. Clarence Water Schematic

The following sections provide a summary of the water management process at Clarence. Additional detail is available in the Water Management Plan located on the Centennial Coal website.

12.3 Dewatering

Dewater underground workings via boreholes;

All underground water is fed directly into the Water Treatment Plant for removal of dissolved metals and pH adjustment if required; and a small portion of water is added to the underground sump from Leachate Dam 1.

12.4 Water Transfer

Leachate water and surface water runoff from the REAs is transferred to Leachate Dam 1 (REA I, REA III), Leachate Dam 2 (REA II, REA IV), Leachate Dam 3 (REA VI) and Leachate Dam 4 (REA IV). Water from the Leachate Dams is gravity fed underground into the Clarence Colliery workings.

Surface water runoff from all areas other than the REA passes through a series of control structures prior to collection in the Polishing Lagoon. From the Polishing Lagoon, water is pumped to the WTP for treatment or directed into Leachate Dam and returned underground to the mine water storage.

All water released off site through LDP002, LDP003 is collected in the Main Dam located on the Wollangambe River. LDP004 discharges to an unnamed tributary to the Wollangambe River. Water from the Main Dam is pumped to the Main Header Tanks for use as process water (e.g. underground process water, washery make-up water) and as a permanent supply of water for firefighting purposes. It is however important to note that only 1 release has from LDP003 or LDP004 have occurred since before 2014.

The CHPP receives up to approximately 2.5 ML/day (typically 1.5 ML/day) of process water from the Main Header Tank (recycled from the Main Dam).

Treated water is also used by Lithgow City Council to supplement the Farmers Creek Reservoirs and then treated for Councils mains water.

Treated underground water plus all surface water runoff is released off-site through LDP002.

The following table provides for the annual recalculation of the water balance as compared to the prediction in the Water Management Plan.

Table 29 : Water Balance 2020

Component	Normal Flow (ML/Day)	Actual Average Flow (ML/Day) 2020
Underground water make	18	ND
Discharge from LDP002	18	13.47
Discharge from LDP003	Only during large rainfall events	<1ML
Discharge from LDP004	Only during large rainfall events	<1ML

Underground Inflow	Not Specified- Rea Runoff 0.6ML	Approx. 0.7
CHP Use	1.4	Approx. 0.8
Underground process/fire fighting water/surface use	2	Approx. 2.2

12.5 Water Management Plan Review

As required under Schedule 3, Condition 12, the following provides a review of the Water Management Plan.

General comments:

- The system described continues to operate at Clarence.

Erosion and Sediment Control Plan:

- The management measures described in the Erosion and Sediment Control Plan continue to be adopted at Clarence Colliery. The water management system is supported by a maintenance program to operate effectively. This is demonstrated by the sites low TSS levels in discharges
- There are no outstanding areas requiring rehabilitation.
- Subsidence levels observed continue to be within predictions not posing any additional sediment control risk.

Surface Water Monitoring Program:

- EPL monitoring requirements are continuing.

Groundwater Monitoring Program:

- The approved monitoring program continues to be undertaken by Clarence Colliery.

Surface and Groundwater Response Plan:

- The surface water monitoring trigger action response plan has been reviewed and is being implemented by Clarence.
- There were no triggers for swamp piezometers during the reporting period.

Following surveys of water management structure sizing in 2019-2020, a full review of the site's water balance was been completed and is included in the current unapproved Water Management Plan (submitted to the Department Feb 2021, outside of reporting period).

12.6 Groundwater Monitoring

Groundwater monitoring sites and the relevant SMP area are outlined in Table 30. A summary of results is presented herein.

Table 30 : Groundwater Piezometers at Clarence

Piezometer	Year Installed	Area
CLRP1	2004	Eastern Area SMP, within 330 Area
CLRP2	2004	Eastern Area SMP, above 611E panel
CLRP3	2006	Eastern Area SMP, above 612 panel
CLRP4	2008	South of mining areas
CLRP5	2008	700 Area SMP, north of 700 area panels
CLRP6	2008	700 Area SMP, above 702/704 panels
CLRP7	2008	700 Area SMP, south of 700 area panels
CLRP10	2008	700 Area SMP, above 706 panel
CC113	2008	700 Area SMP, south of 700 area panels
CLRP8	Existing bore	Clarence Township. Piezo installed 2009
CC114	2009	800 Area SMP Application Area
CC115	2009	800 Area SMP Application Area
HV1	2009	Happy Valley Swamp (700 Area SMP)
HV2	2009	Happy Valley Swamp (700 Area SMP)
HVU1	2009	Happy Valley Upper Swamp (700 Area SMP)
HVU2	2009	Happy Valley Upper Swamp (700 Area SMP)
CLRP11	2010	700 West SMP Application Area
CLRP12	2010	700 West SMP Application Area
CLRP13	2010	800 Area SMP Application Area
CLRP14	2011	800 Area SMP Application Area
CLRP15	2011	Lithgow No.2 Dam
CLRP16	2011	Lithgow No.2 Dam
CLRP17	2013	800 Area SMP Application Area
CLRP18	2014	900 Area SMP Application Area
CLRP19	2013	800 Area SMP Application Area
CLRP22	2014	900 Area SMP Application Area
CLRP29	2020	900 Area SMP Application Area
CLRP33	2020	900 Area SMP Application Area

12.7 Groundwater Monitoring

All groundwater monitoring bores are downloaded every 2 months. 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 numerous stakeholders every 4 months. At the time of the preparation of the Annual Review the latest SMSR report was submitted in November, summarising the results until 31st October 2020.

Open hole monitoring Piezometers

The Banks Wall Sandstone Formation is monitored by eight standpipe monitoring bores. The locations of the open hole monitoring locations in relation to historic mining operations are as follows:

- CLRP4, located above unmined area southwest of Clarence Pit top
- CLRP5, located above Panel 902
- CLRP7, located above unmined area west of Clarence Pit top
- CLRP8, above unmined area at Clarence Village
- CLRP10, located above Panel 706
- CLRP15, located above unmined area adjacent to the Lithgow water supply dam
- CC113 (inactive), above unmined area southwest of Clarence Pit top
- CLRP28, located in the 900 North Area
- CLRP31, located in the 900 North Area

In summary, there have been no observable indications of mining impacts and water levels in the current reporting period reflect the decline of the CRD. CLRP5 saw an accelerated water level decline at the end of 2019. Historically, there have been no observable mining impact. In the reporting period, there has been an abnormal groundwater level decline with water levels changes of up to 3 m. It unlikely to be a direct mining response as current workings are 2 km north and historical mining occurred in the area previously. The cause is unclear and data from the loggers have been confirmed with manual field measurements. A small recovering trend was observed from September 2020. CLRP5 will continue to be monitored.

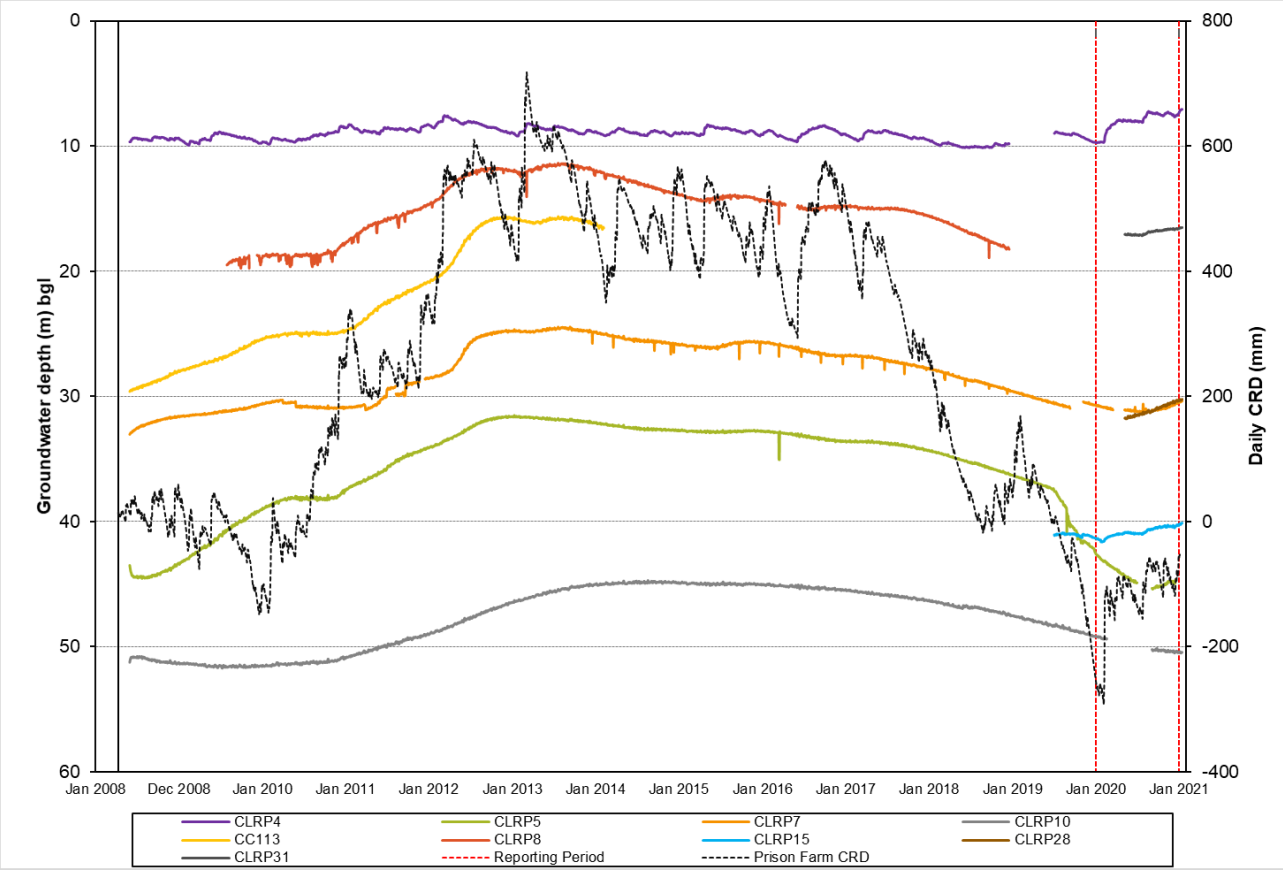

Figure 38. Open Borehole Hydrograph

CLRP4

CLRP4 lies above an unmined area, adjacent to Brown's swamp, and there is no active mining in the vicinity. Water levels have been historically stable around 9 mBGL. The data gap between December 2018 and July 2019 was due to a missing logger. In the reporting period the hydrograph shows an increasing trend.

CLRP5

CLRP5 was undermined by first workings in Panel 902 during December 2013 and January 2014. Pillar extraction occurred in 2015, but no extraction occurred directly beneath CLRP5. In the reporting period, mining in the 900 Area was approximately 2 km north of CLRP5.

Historically, there have been no observable mining impact. In the reporting period, there has been an abnormal groundwater level decline with water levels changes of up to 3 m. It unlikely to be a direct mining response as current workings are 2 km north and historical mining occurred in the area previously. The cause is unclear and data from the loggers have been confirmed with manual field measurements. A small recovering trend was observed from September 2020. CLRP5 will continue to be monitored.

CLRP7

CLRP7 is located above an unmined area south of the undeveloped section of the 700 Area. Declining groundwater levels at CLRP7 appear to be a subdued reflection of the CRD. The

stepped declines are related to groundwater sampling events. The data gap from September 2019 was due to a damaged monument and lost logger. The data from the reporting period shows water levels recovery.

CLRP8

CLRP8 is located above an unmined area in Clarence village and monitors the Clarence Aquifer that is located within the Banks Wall Sandstone Formation. Water level trends reflect a subdued response the CRD and the spiked decreases in water levels are attributed to localised pumping of groundwater for domestic use. No data has been collected from CLRP8 since December 2018 due to private property access restrictions.

CLRP10

Mining occurred in the CLPR10 area during the following periods:

- September 2011, CLRP10 was directly undermined by Panel 706 (first workings only)
- April 2011, pillar extraction occurred in Panel 708, approximately 250 m west of CLRP10
- April 2009, panel 704, approximately 150 m east of CLRP10, was developed, with partial pillar extraction in March 2010
- January and February 2014, pillar extraction occurred in Panel 700, approximately 700 m – 900 m west-southwest of CLRP10.

Historically, there have been no observable mining impacts, and water levels reflect a subdued response to CRD. The data gap was from a corrupted datalogger. The gradual decline continues into the reporting period and is within historical trends.

CLRP15

CLRP15 lies above an unmined area west of the 700 Area between the Lithgow Water Supply dam and historical mine workings. Adjacent to this open borehole is the CLRP15 VWP. From 2012 to 2014 water levels were recorded around 110mBGL, then in mid-June 2014 the logger or hang depths was changed causing the logger to over pressurise. The water levels recorded by the logger between mid-June 2014 to August 2019 do not accurately reflect pressure heads and have been removed from the hydrograph. Furthermore, it is uncertain if water levels prior to June 2014 are reliable as no historical manual measurements are available. The current water level is approximately 41 mbgl and have been confirmed with manual measurements. When compared to the data from the CLRP15 VWP, the VWP sensors that targets the same Banks Wall sandstone formation as the open borehole indicate a standing water level of approximately 20 mbgl. This suggests that the historical water level of 110 mbgl is likely erroneous and has been removed from the hydrograph. That said, the pre-June 2014 trend shown no sudden changes in groundwater level that could be interpreted as a mining impact. This will be discussed further in the CLPR15 VWP section.

During the reporting period, CLRP15 hydrograph displays an increasing trend from February 2020 onwards. Recent manual measurements confirmed the water level is now stable at approximately 40.5 mbgl.

CC113

CC113 was decommissioned in 2014. Historically, water levels reflected a subdued and delayed response to the CRD.

CLRP28

CLRP28 was installed in May 2020 and lies above an unmined area north of the 900 Area.

The hydrograph shows an increasing trend. It is difficult to make a detailed assessment with limited monitoring data.

Multi-level Vibrating Wire Piezometers

VWP target multiple formations targeting units from the shallower Banks Wall Sandstone down to the Katoomba Seam. Monitoring data indicates that depressurisation in the coal seam is generally restricted to sequences below the Mount York Claystone and that there are no adverse effects on the upper aquifers. The VWP sensors are numbers sequentially from the deepest sensor upward; that is, Sensor #1 is the deepest VWP sensor. The sensors target formation abbreviated as follows: Katoomba Seam (KAT), Burra-Moko Head Sandstone/Caley Formation (BMK), Mount York Claystone (MYC) and Banks Wall Sandstone (BW).

CLRP1

CLRP1 lies above an unmined block south of the 300 area. There are no indications of any abnormal trends with no significant changes in pressure heads in the available data. There are a few minor data gaps due to logger failure but on a whole the data is complete. Sensors #3 and #4, which lie above the Mt York Claystone aquiclude, show declining trends in response to the drier climatic conditions. Sensors #1 and #2 below the Mount York Claystone display stable trends.

Pillar extraction was carried out in Panel 330 immediately to the north of this VWP installation in late 2004. This resulted in significant depressurisation of the Katoomba seam, as measured by Sensor #1. There is no indication of permanent mining-related impacts in the three VWP sensors in the higher sequences. Sensor #2 located above the seam roof showed partial depressurisation followed by near complete recovery. Sensor #3 located above the Mount York Claystone aquitard showed a gradual decline and subsequent recovery. Sensor #4 showed no observable impacts from mining. Pressure heads in the upper sequences within the Banks Wall Sandstone Formation (sensors #3 and #4) correlate to the CRD and remain above pre-mining levels.

In the reporting period, mining occurred in the 800 Area, approximately 1.5 km to 2.5 km east of the VWP array. Only spot data is available for the reporting period. Stable pore water pressures were observed in the lower two sensors while the upper sensors in the Banks Wall Sandstone recorded an increase in pore pressure.

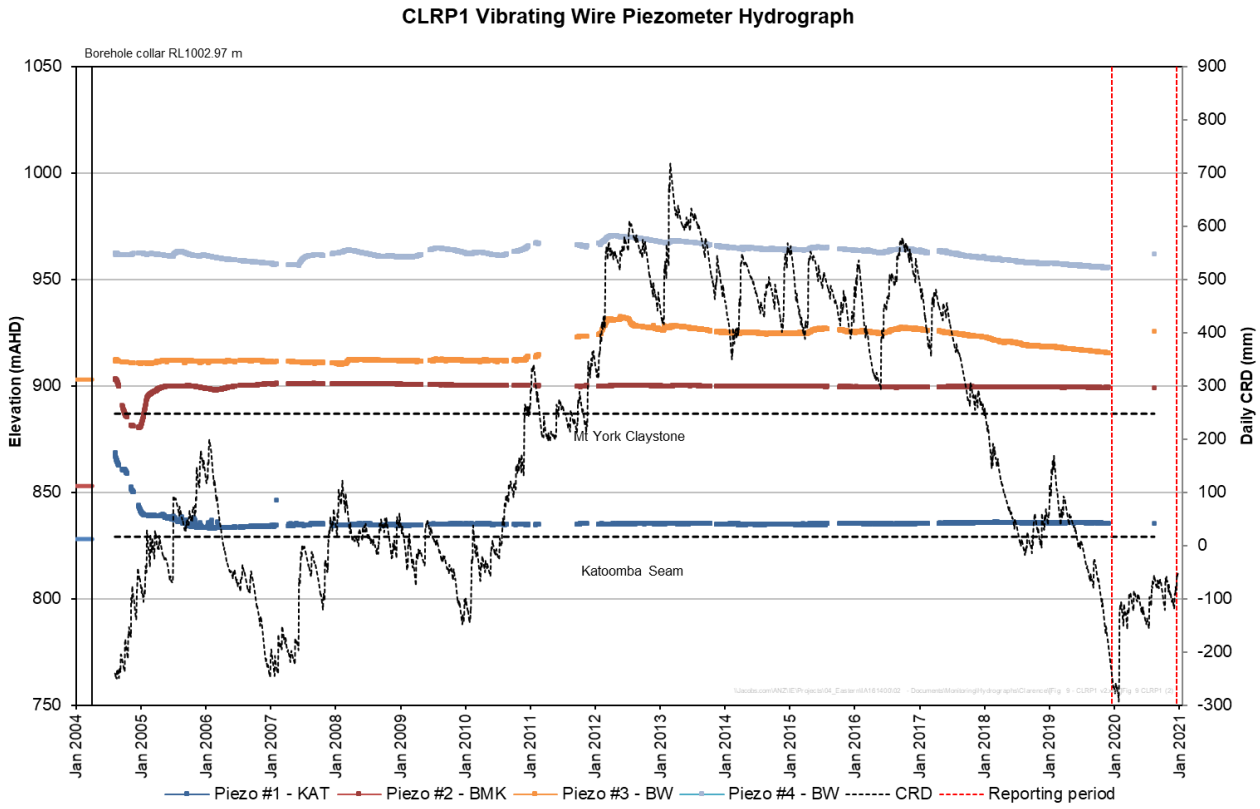

Figure 39. CLRP1 VWP Hydrograph

CLRP2

CLRP2 lies directly above Panel 611E, which was developed in 2007 and extracted in 2008. Total depressurisation was observed in the lowest Sensor #1 in the Katoomba Seam in August 2007 prior to being mined out. Shortly afterwards at Sensor #1 communication was lost. The other three sensors located above the Mount York Claystone showed no negative impacts from mining. Sensors #2 and #3 stabilised at similar pressure heads suggesting they may be hydraulically connected or within the one hydrogeological unit. The cause of the pressure increases observed in sensors #1 to #3 in August 2006 is unknown but it is noted mining occurred in 2006 at Panel 611C approximately 400 m south of the VWP installation. It is likely due to a redistribution of pressure within the units.

In the current reporting period, there was no active mining in the general vicinity. The closest mining activity in the 900 Area is over 3km away to the south west with no observable impact on the groundwater system. The data covers up to November 2020. Pressure heads remained

stable in the reporting period. The upper Sensor #3 showed a slightly increasing trend that may be attributed to the above average rainfall conditions

No mining related impact is visible in the water level.

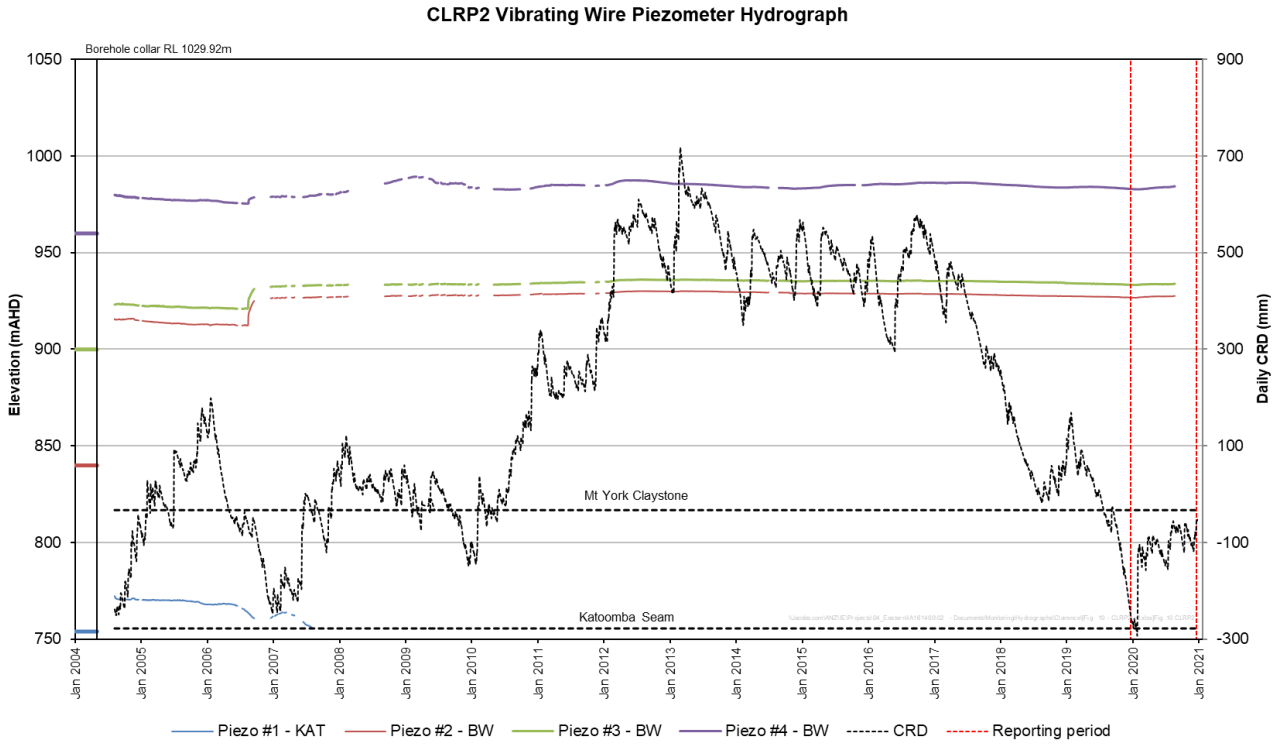

Figure 40. CLRP2 VWP Hydrograph

CLRP3

Current mining is over 3 km from CLRP3 and there are no observable changes in water levels. The three sensors target the Burra-Moko Head Fm/Caley Fm. and Banks Wall Sandstone. It is likely that all three sensors are currently unsaturated.

CLRP3 was undermined by Panel 612 shortly after installation in 2006. Development of the headings in Panel 612 dates back to 2004 and extraction commenced in 2005. The pressure decline evident in all sensors following the first few months of installation is likely due to a normal pressure stabilisation phenomenon following installation. That said, there is insufficient baseline data to determine if the initial pressure decline is due to mining or stabilisation following grouting. Pressures at all sensors have stabilised at heads only marginally above the depths of installation and Sensor #2 is unsaturated (negative pore pressure). Given the lack of any significant pressure fluctuations it is unlikely that sensors #1 and #3 are saturated.

This VWP is located on an exposed, steep ridge with steep valley walls to the north, east and south. Bungleboori Creek flows adjacent to the ridge located 0.5 km away in the eastern valley. The difference between the surface elevation at the VWP and the creek is approximately 160 m

which means Sensor #1 is located approximately 40 m below the creek RL. The relatively small catchment area and the topography suggests groundwater likely drains quickly from the strata following rainfall. This may explain the lack of rainfall response and the unsaturated conditions observed at these sensors. The hydrograph showed a continuation of historical trends during reporting period.

No mining related impact is visible in the water level.

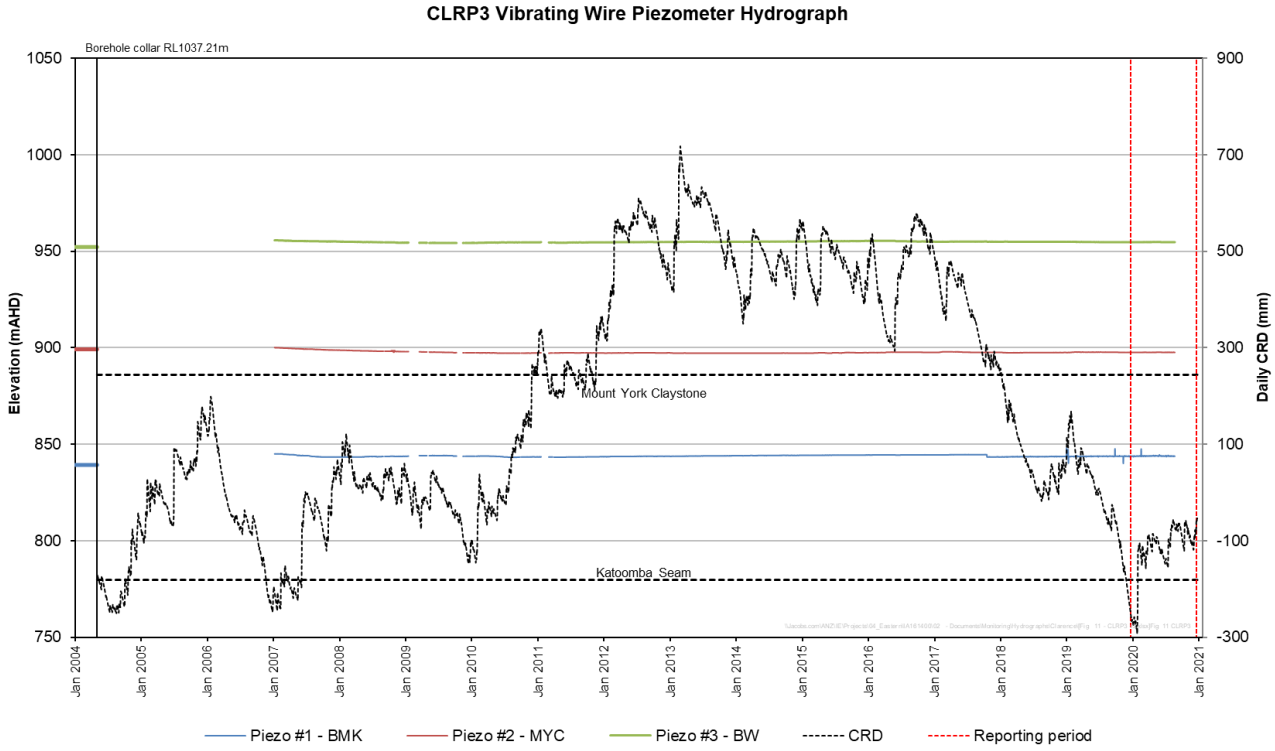

Figure 41. CLRP3 VWP Hydrograph

CLRP6

CLRP6 lies above Panel 702, which was developed in 2008 and extracted in 2009. The CLRP6 area was undermined during the following periods:

- September 2009, the site was directly undermined by partial extraction at Panel 702
- December 2009, in the general vicinity of the site, Panel 704 was partially extracted in December 2009
- during February 2012, first workings of Panel 706, located 250 m to the west of CLPR6

The dataset has been affected by logger/sensor issues and only spot readings can be collected. The deepest Sensor #1 has failed due to instrumental issues. The remaining sensors are functional, but a power issue is preventing the collection of continuous data. Sensors #2 and #3

located above the Mount York Claystone appear to record relatively stable pressure heads indicating no negative mining impacts in the upper aquifer.

There is no active mining in the general vicinity with the closest occurring in the 900 Area 3 km to the north. During the reporting period, only spot data was available. The recent data indicates no impacts from current mining activities and there has been a continuation of slightly declining trends in Sensor #3.

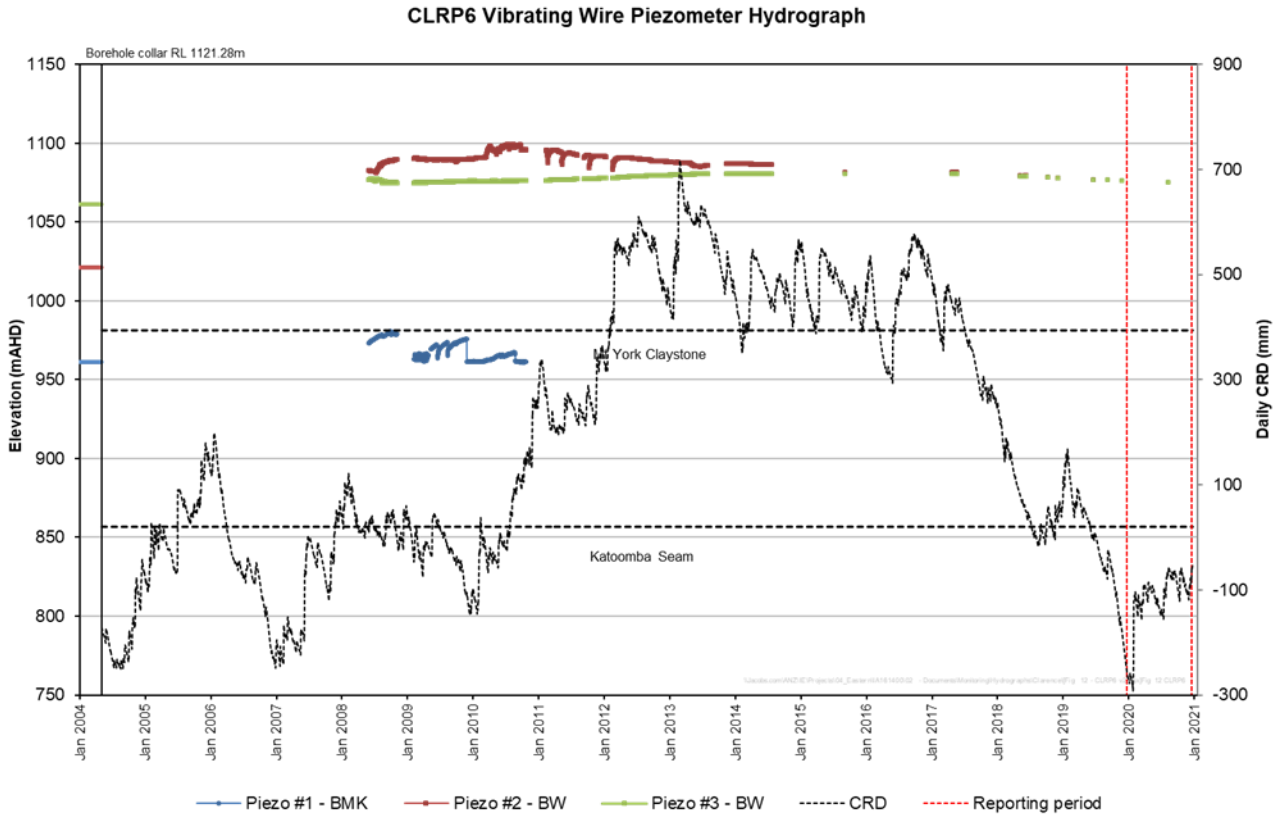

Figure 42. CLRP6 VWP Hydrograph

CLRP11

CLRP11 lies above an unmined area, approximately 700 m west of the 700 Area and there are no indications of mining impacts in the available data. A continuation of stable pressure heads is observed to the last data download, which occurred in July 2019 due to connection issues.

The initial data fluctuation in the first two years following installation can most likely be attributed to sensor stabilisation after grouting. The erratic movement observed at all sensors might suggest the data may be unreliable, but the data has since been stable since 2014. Sensor #1 shows higher pore pressure than Sensor #2, which may be due to an upward regional groundwater gradient or an error with the calibration values or sensor installation. It is likely to be an error as there are no other upward gradients observed in the area.

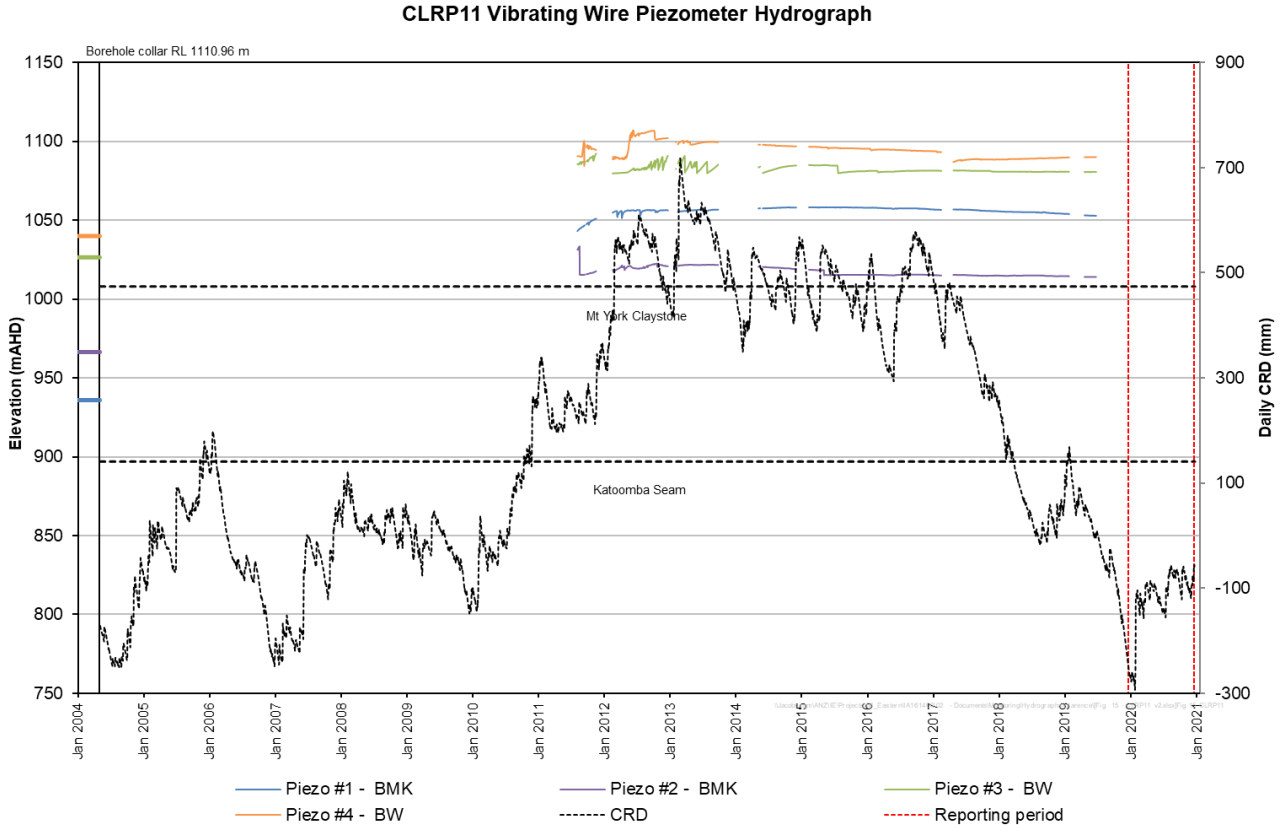

Figure 43. CLRP11 VWP Hydrograph

CLRP12

CLRP12 lies above an unmined area, west of the 700 Area. Most recent workings are located over 5 km from the VWP installation and the historical data shows no impact on the pressure heads.

The closest mining activity adjacent CLRP12 was during July and August 2013, when first workings and pillar extraction occurred in Panel 716 approximately 700 m to the east. No mining impacts were observed at this site during that period. With the exception of Sensor #3 (that has failed), post-2016 data are generally stable. There is a small decline in pressure head at sensors #1 and #2 in September 2018 but given that there was no active mining within the vicinity the cause is uncertain. During the reporting period, access was restricted by the construction around the sand quarry and limited data was available.

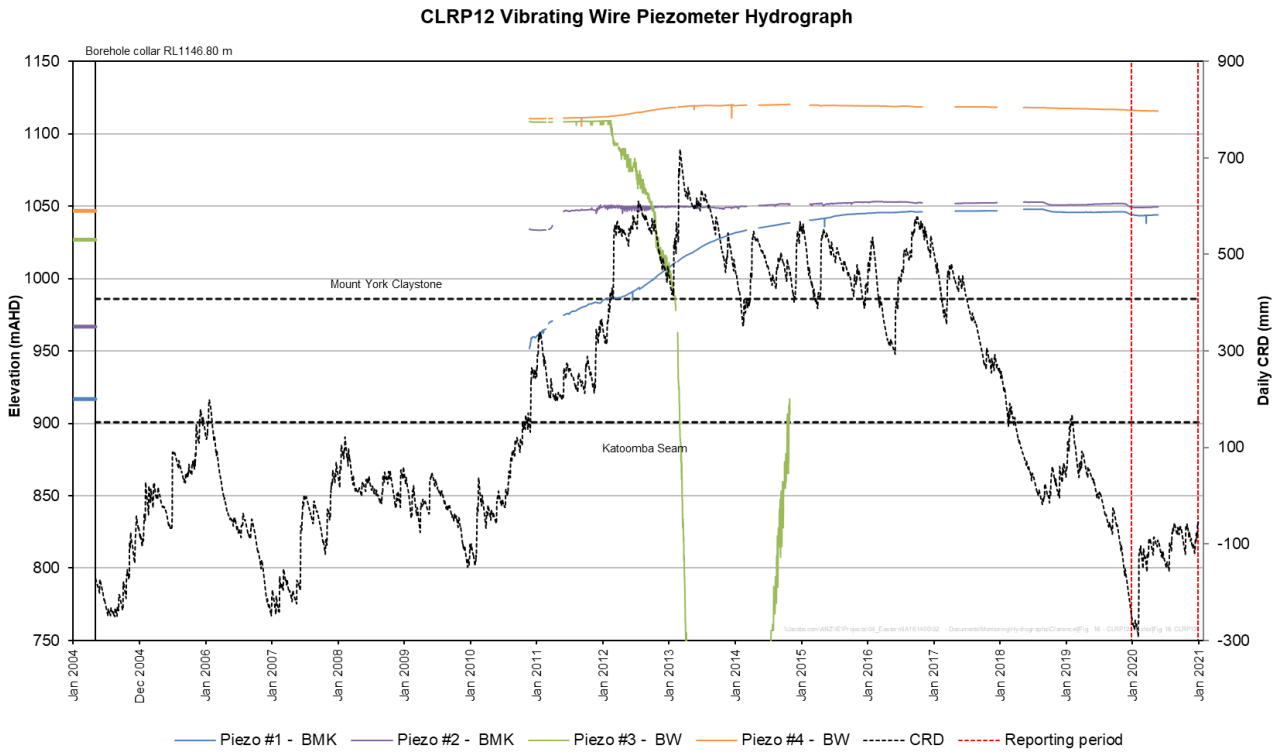

Figure 44. CLRP12 VWP Hydrograph

CLRP13

CLRP13 is located above Panel 820, which was developed in 2018. Abnormal fluctuations are present in the historical dataset that are likely due to faulty dataloggers. Historical data may be unreliable due to the faulty datalogger recordings. The spot data downloaded during the reporting period indicate that piezometric pressures have remained stable at most sensors, with the exception of Sensor #2 that recorded a decrease, and Sensor #5 that recorded an increase.

Pillar extraction occurred at Panel 818, in November 2017, approximately 500 m north of CLRP13. The depressurisation observed at sensors #1 and #2 coincides with pillar extraction in November 2017. This is most likely related to mining and is limited to the strata below the Mount York Claystone. In August 2018, there was a small depressurization event and subsequent recovery in the strata below the Mount York Claystone as the development of Panel 820 progressed.

Only spot data was available during the reporting period, and they indicate that piezometric pressures have remained stable and no mining related impact occurs during the reporting period.

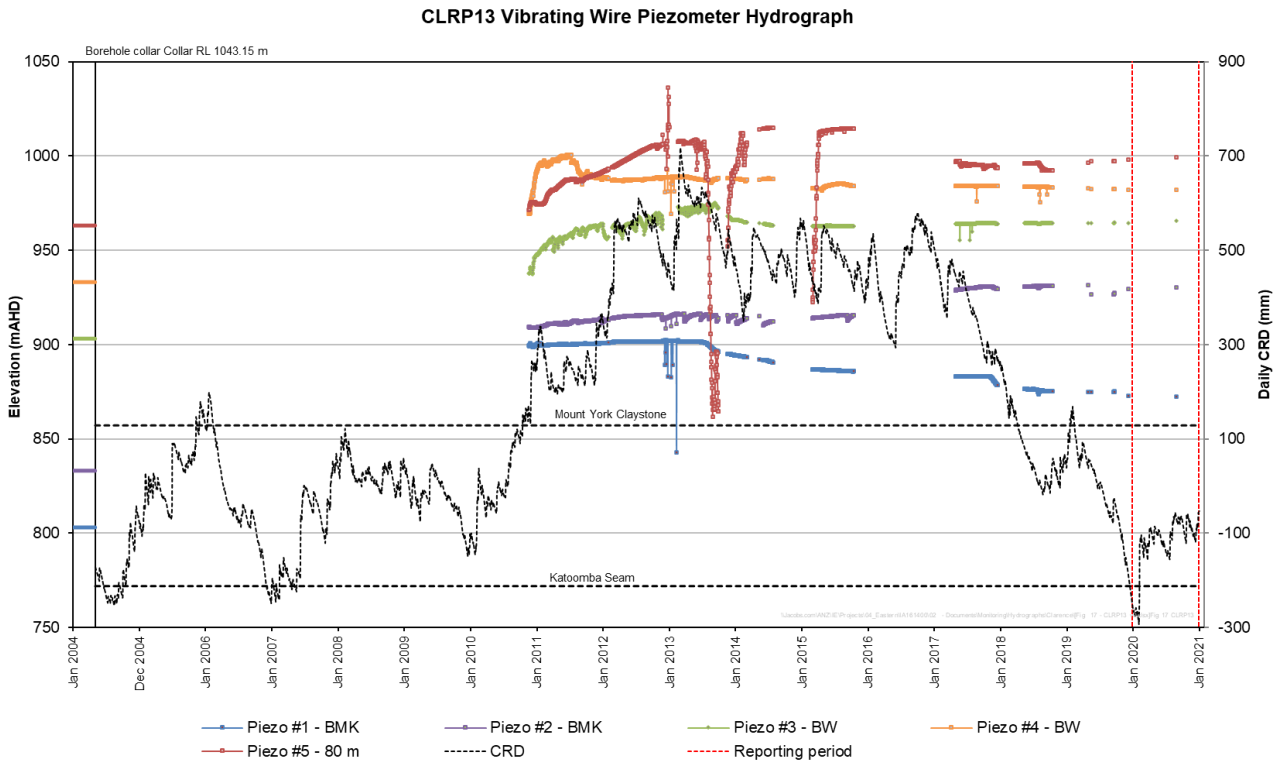

Figure 45. CLRP13 VWP Hydrograph

CLRP14

CLRP14 is located above Panel 801, which has been historically extracted. The two deepest sensors recorded stable water levels and changes to the hydrogeological system are unlikely. The two upper sensors have not recorded data since mid-2019 due to instrumental failure.

Panel 801 was developed in 2013 and extracted in 2014 and no mining response was observed in sensors #1 and #2 located below the Mount York Claystone. Historical records show sensors #1 and #2, stabilising with piezometric heads close to the Mount York Claystone. In 2016, the piezometric pressure in Sensor #1 rose above Sensor #2, which may indicate an upwards hydraulic gradient. Sensor #3 has shown erratic movement and long periods of no data since installation and is difficult to interpret. Sensor #4 located in the Banks Wall Sandstone aquifer has measured a gradual decline in pressure since installation which is likely linked to the prevailing climatic conditions.

In the reporting period, Sensor #1 and #2 displayed relatively stable water levels until October 2020, where a gradual decline in piezometric heads are observed. Around this time, pillar extraction occurred approximately 500 m from the site at Panel 809. No data was available for the sensors in the Banks Wall sandstone. These trends will be monitored further and reviewed in future monitoring rounds.

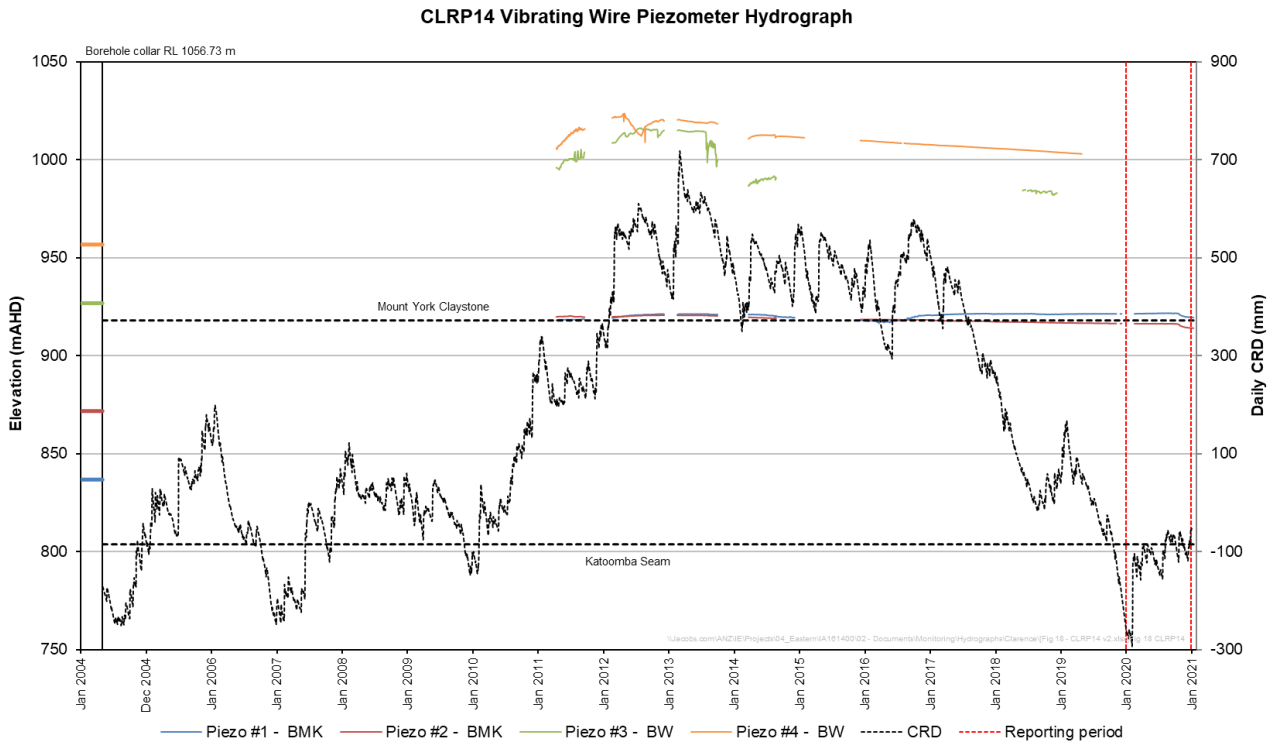

Figure 46. CLRP14 VWP Hydrograph

CLRP15

CLRP15 lies above an unmined block between the Lithgow Water Supply Dam and the Panel 707. The generally stable water level trends suggest there is no observable impact from mining.

Underground mining occurred in the area during the following periods:

July 2012, first workings in Panel 707 occurred at the end of July 2012 and partial extraction was completed in August 2012

August and September 2013, pillar extraction occurred in Panel 716 and approached within approximately 750 m of CLRP15. Mining impact is not apparent in the data, with Sensor #1 recording a stable water level trend. The irregular fluctuation in Sensor #2 is possibly due to instrumental error as Sensor #1's lack of fluctuation and closer proximity to the mining horizon indicate that mining was unlikely to have caused the fluctuations. The lack of observable mining impacts suggests that the groundwater regime between the dam and the mine workings is unimpacted.

The Banks Wall Sandstone Fm. is monitored by sensors #3 and #4 and the data has shown a slowly declining trend with no significant or sudden changes in water levels. The similar pressure heads between these sensors suggest the targeted depths are hydraulically connected.

There is no data available during the reporting period due to faulty loggers.

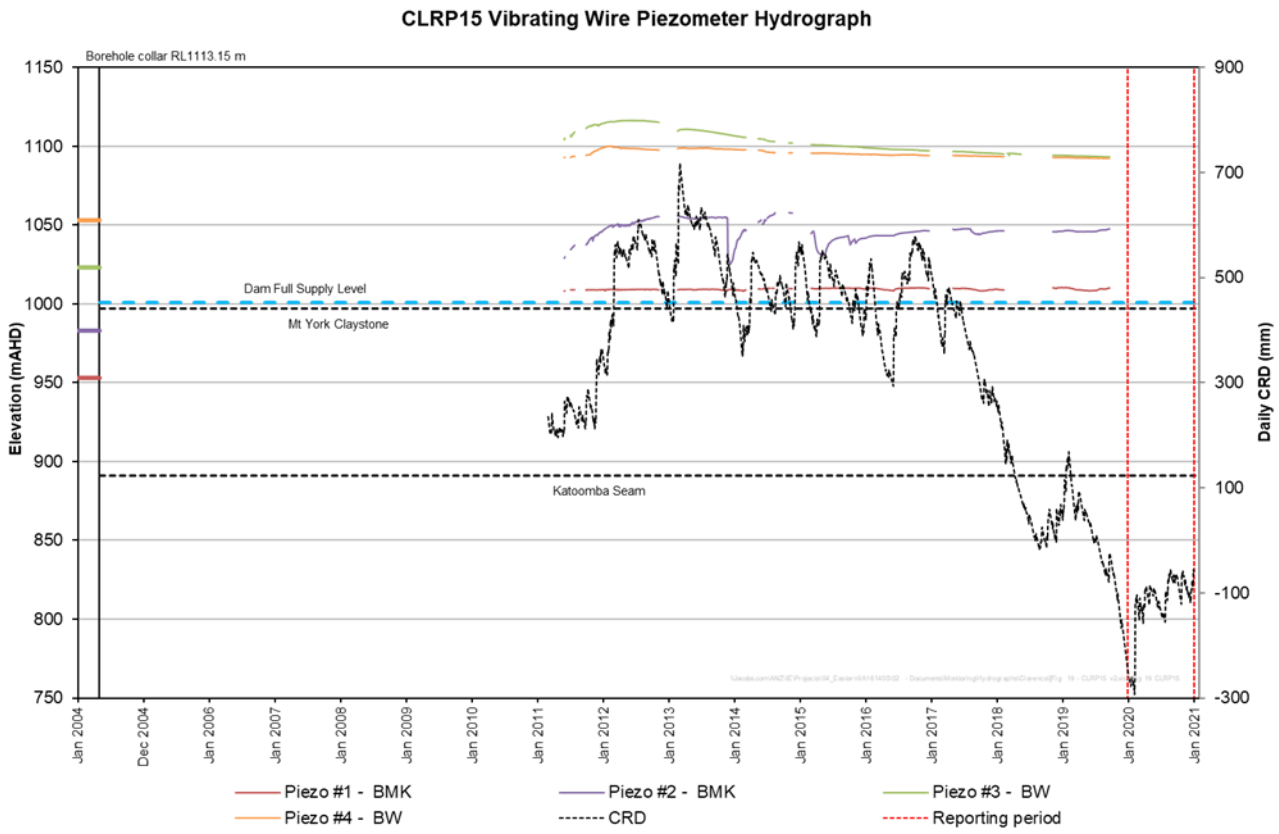

Figure 47. CLRP15 VWP Hydrograph

CLRP16

CLRP16 lies above an unmined area 1 km west of the 700 Area, with the Lithgow Water Supply dam situated between the mine and CLRP16. There was no active mining the in vicinity of CLLPR16 during the reporting period and no mining impacts are evident in the groundwater levels.

The installation depth of Sensor #2 is near the base of the dam and generally shows a level pressure trend about the dam full supply level. It is likely the water level movements are a response to water levels in the dam level. Sensor #1 has stabilised following a period of erratic movements following installation. The fluctuations in Sensor #1 measurements are unlikely to be mining related because when compared with data from Sensor #1 at CLRP15, which is located in the same formation closer to the mining activity, it showed no evidence of mining in the 700 Area.

No data was available for reporting period due to faulty loggers. Given the distance from current working, mining impacts are unlikely.

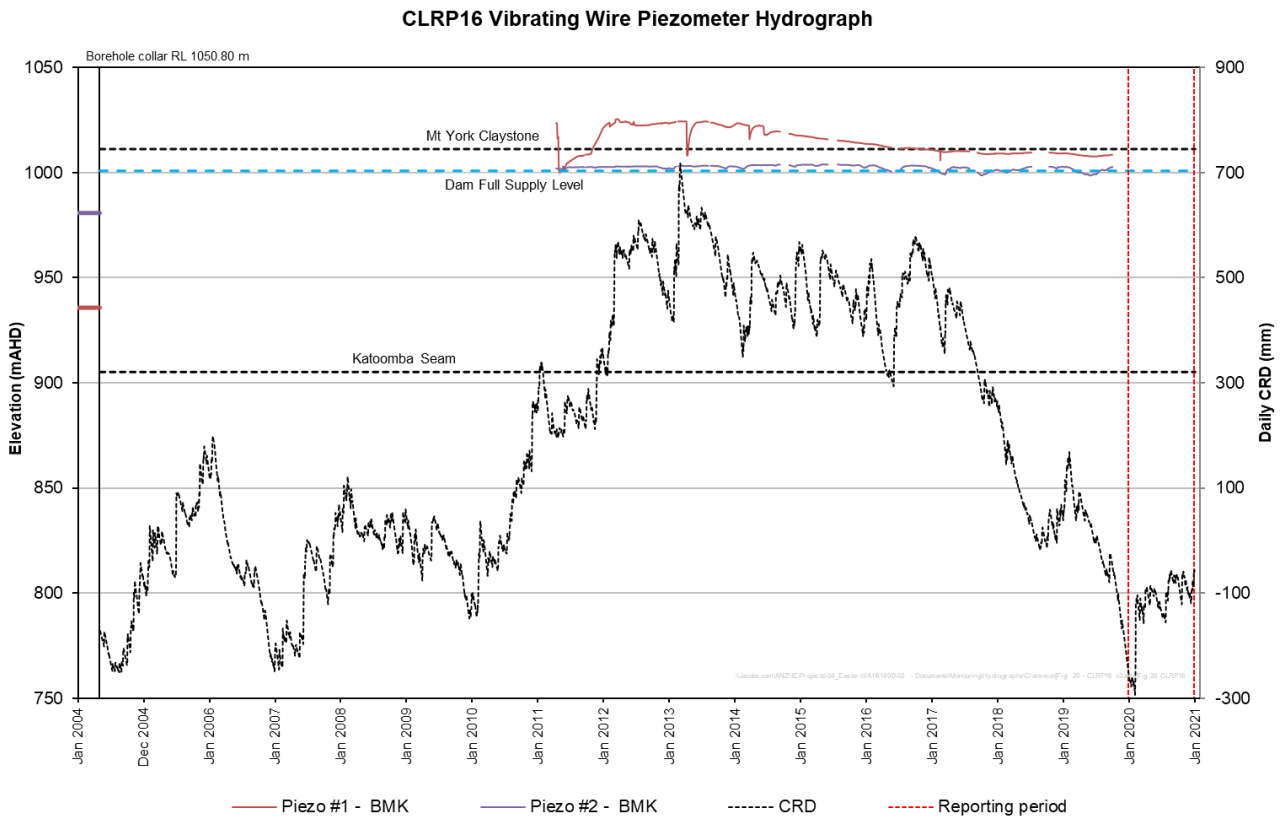

Figure 48. CLRP 16 VWP Hydrograph

CLRP17

CLRP17 is located above Panel 816, which has been mined out. No mining impacts can be seen in the data. Current extraction is being undertaken in Panel 808, which is approximately 1.5km north. Pressure heads remain stable in line with historical observations.

Pillar extraction at Panel 816 occurred directly beneath CLRP17 in September 2017 and no piezometric response was observed. Sensor #1 malfunctioned in October 2015 most likely from instrumental failure before the panel was developed. The stepped response in Sensor #2 in early 2018 is suspected to be an instrumental effect. It is unlikely to be a groundwater response because of the sudden and singular nature of the change and unlikely to be a beam flex because undermining occurred four months prior. Sensor #3 has been unsaturated since installation.

During the reporting period, mine workings in the 800 Area were approximately 1 km away. The stable water level trends indicate there are no discernible mining impacts on the groundwater system.

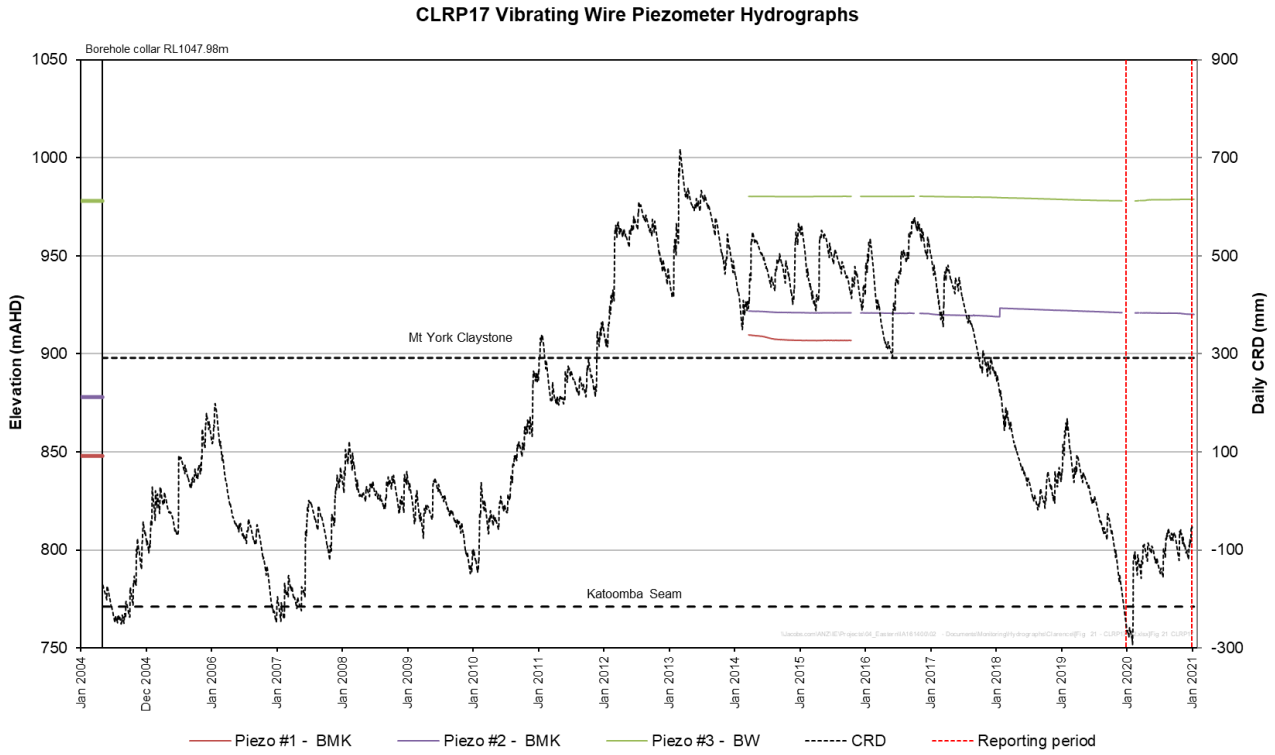

Figure 49. CLRP17 VWP Hydrograph

CLRP18

CLRP18 is located directly above the currently unmined Panel 906, and mining occurred during the reporting at Panels 908 and 910, located approximately 300 m at the closest point.

Following installation both sensors displayed abnormal pressure changes during the first year of stabilisation. The initial readings from Sensor #1 are a typical response to grout curing in a VWP. Sensor #1 recorded a consistent slightly declining trend following its post-grouting stabilisation, while Sensor #2 has remained stable.

During the reporting period, workings in Panel 908 came within 300 m of CLRP18. In May 2020, extraction at Panel 908 passed through a fault zone/structured roof zone, which is connected to CLRP18. This fault intersection is shown as a vertical purple dotted line on the hydrograph. Around that time, Sensor #2 located in the shallow aquifer recorded a slight decline in water pore pressure heads of approximately 2 m over a period of one month. This is less than the trigger condition of greater than 5 m stepped piezometric head loss in an aquifer above the Mt York Claystone. The deeper sensor (ie. Sensor#1) does not show a similar response.

Currently, the decline at Sensor #2 has slowed and Sensor #1 continues to show a stable trend.

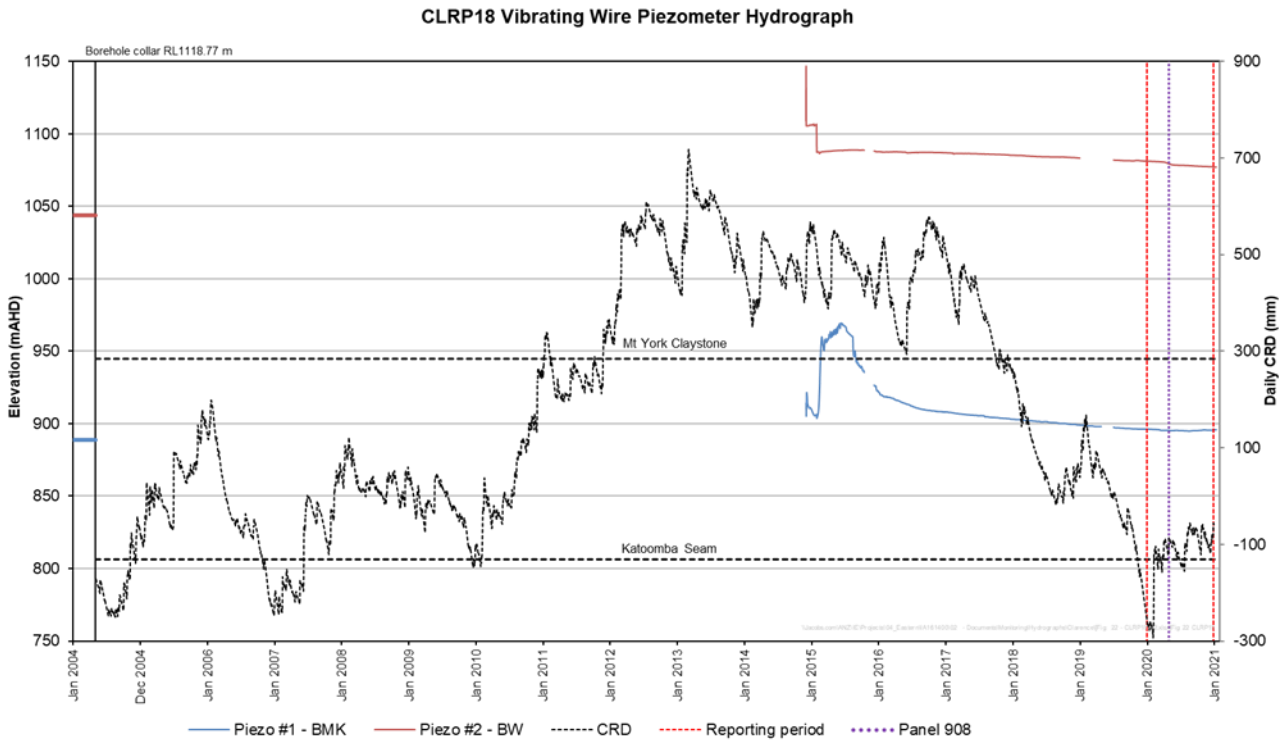

Figure 50. CLRP18 VWP Hydrograph

CLRP19

CLRP19 lies above Panel 812 that has previously been mined out. Mining in the 800 Area was approximately 800 m from CLRP19 at the end of 2020. No mining impacts are visible in the groundwater data, as shown by the stable water levels recorded by the sensors.

Pillar extraction at Panel 812 occurred beneath the CLRP19 in March 2016 and no mining impacts were observed. Sensor #1 was installed 100 m above the working horizon and below the Mount York Claystone. The subsequent gradual decline in pressure recorded at Sensor #1 was most likely due to settlement or regional depressurisation. Sensor #2 located above the Mount York Claystone recorded a stable trend. The slow decline observed in Sensor #3 located in the Banks Wall Sandstone formation is likely attributed to a delayed natural decline following the elevated rainfalls in 2012 to 2013.

The previous data show stable positive pore pressures with no indication of negative mining impacts. In the reporting period, the upper most Sensor #3 observed a continuation of slight decline in piezometric pressure most likely attributed to the dry period prior to the current reporting period.

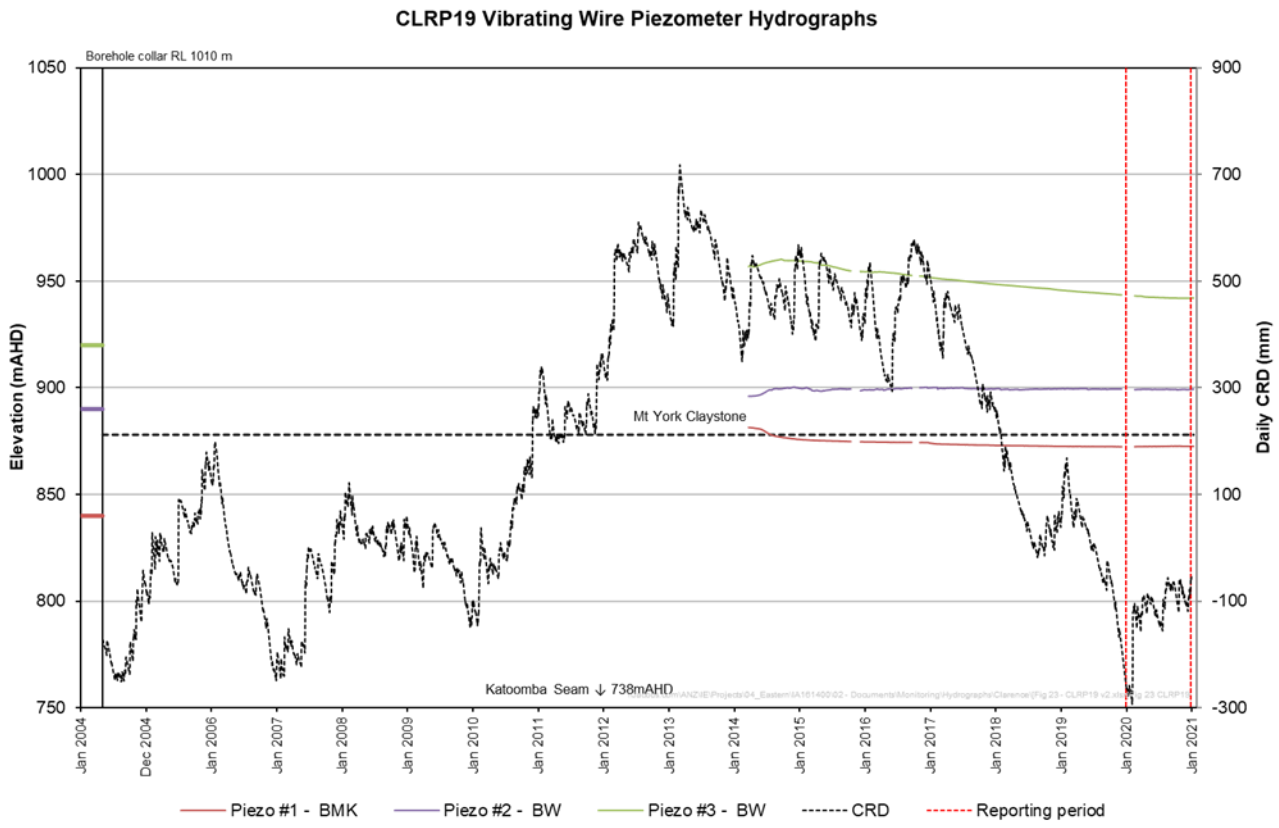

Figure 51. CLRP19 VWP Hydrograph

CLRP22

CLRP22 is located above the Panel 910, which is currently being mined. The coal workings directly under CLRP22 were developed in March 2019 and extracted in April 2020. There were no distinct impacts on the upper aquifer above the Mount York Claystone from the mine workings.

It is difficult to assess potential mining impacts below the Mount York Claystone at this site between February 2017 to March 2019 due to the data gap.

Extraction at Panel 910 occurred directly beneath CLRP22 in April 2020. This event is shown in the hydrograph as the vertical purple dotted line. The upper sensor continued to display historic trends, whereas the deeper Sensor #1 below the Mt York Claystone has shown a drop in piezometric head of approximately 4 m over a period of one month. The sharp decline and the timing suggest the response is influenced by mining. Afterwards, a partial recovery of approximately 1m was observed. The stable response of the upper aquifer above the Mount York Claystone suggests significant drainage from the upper aquifers is highly unlikely and the trigger conditions have not been breached.

In the current reporting period, the data covers up to December 2020 due to a fault in the system. Sensor #1 continues a declining trend after the small recovery. Sensor #2 remains relatively stable with a continuation of the slightly declining historical trend.

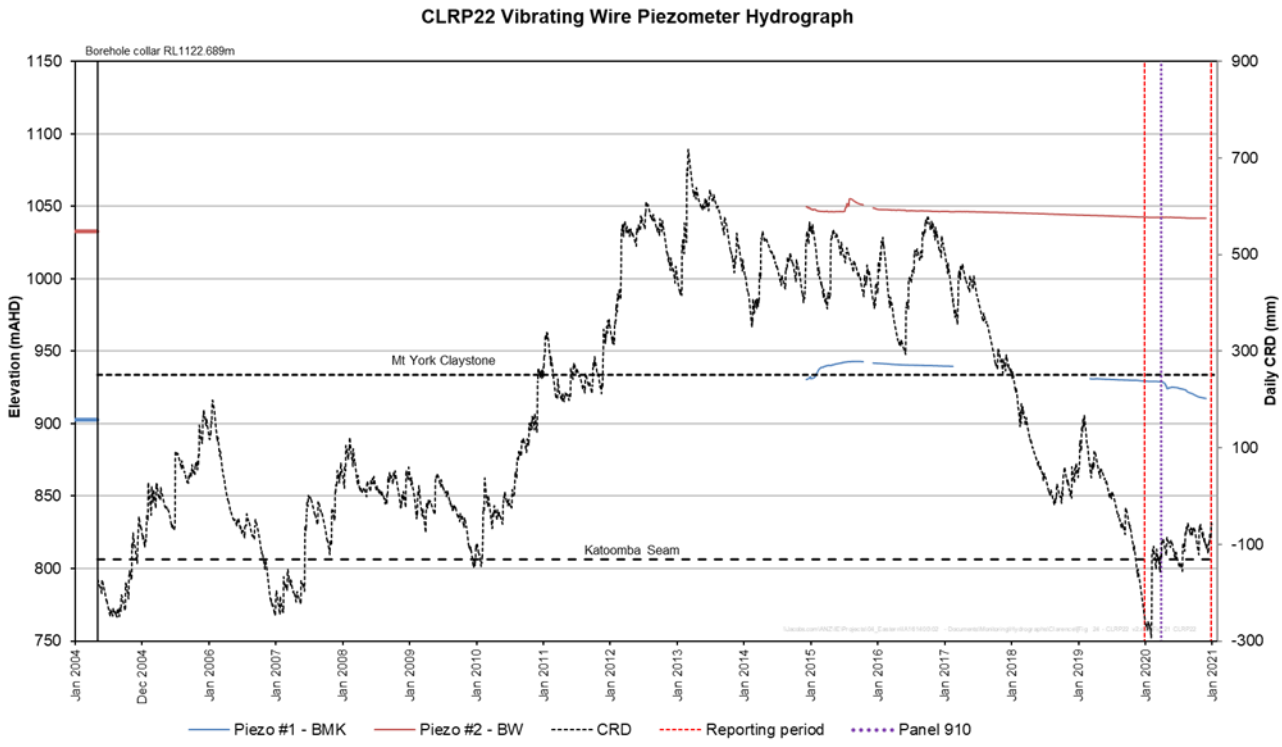

Figure 52. CLRP22 VWP Hydrograph

CLRP29

CLRP29 was installed in May 2020 and is located to the far north of the current mining lease above an unmined area.

Sensors #1 and #2 show a decline at the beginning of the monitoring period, which is due to the grout stabilising after the VWP construction. Following this, the piezometric pressures have remained stable for the remainder of the reporting period.

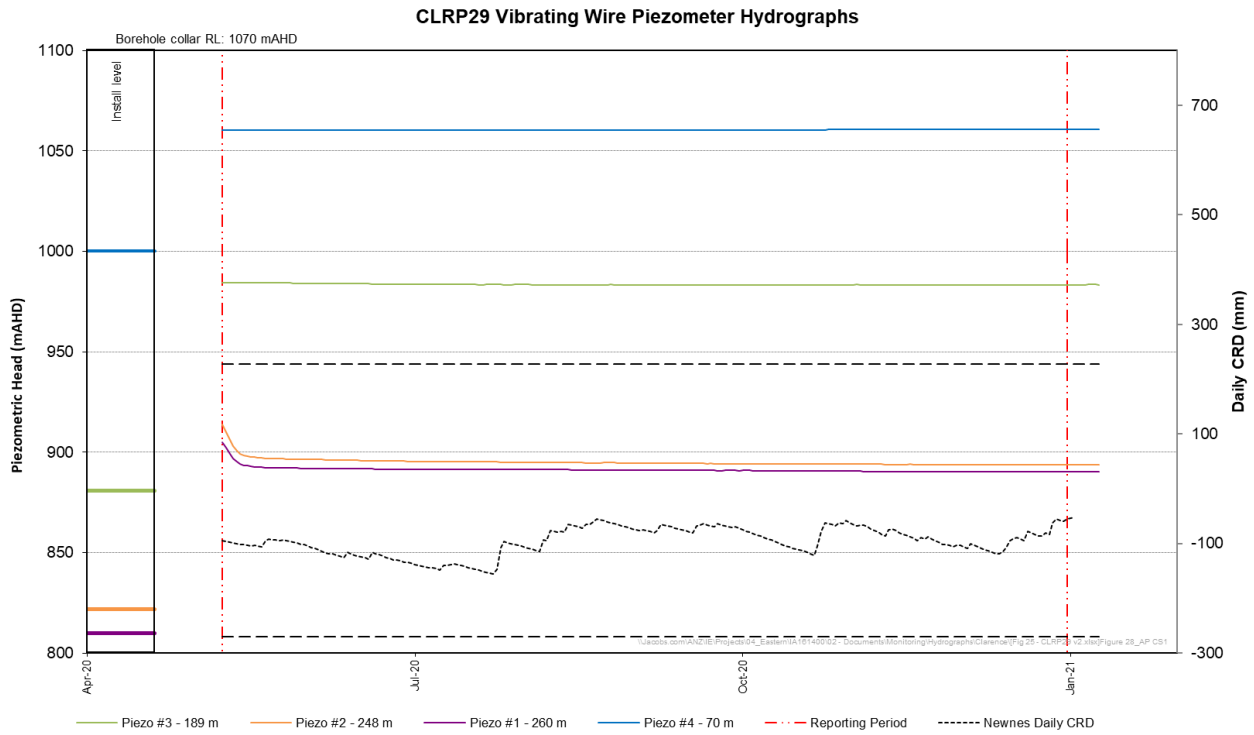

Figure 53. CLRP29 VWP Hydrograph

CLRP33

CLRP33 was installed in May 2020 and is located to the far north of the current mining lease above an unmined area in the pine plantation.

All sensors displayed a short stabilisation period following installation. Sensor #2 appears to be still stabilising with a gradually increasing trend. The remaining sensors display stable trends.

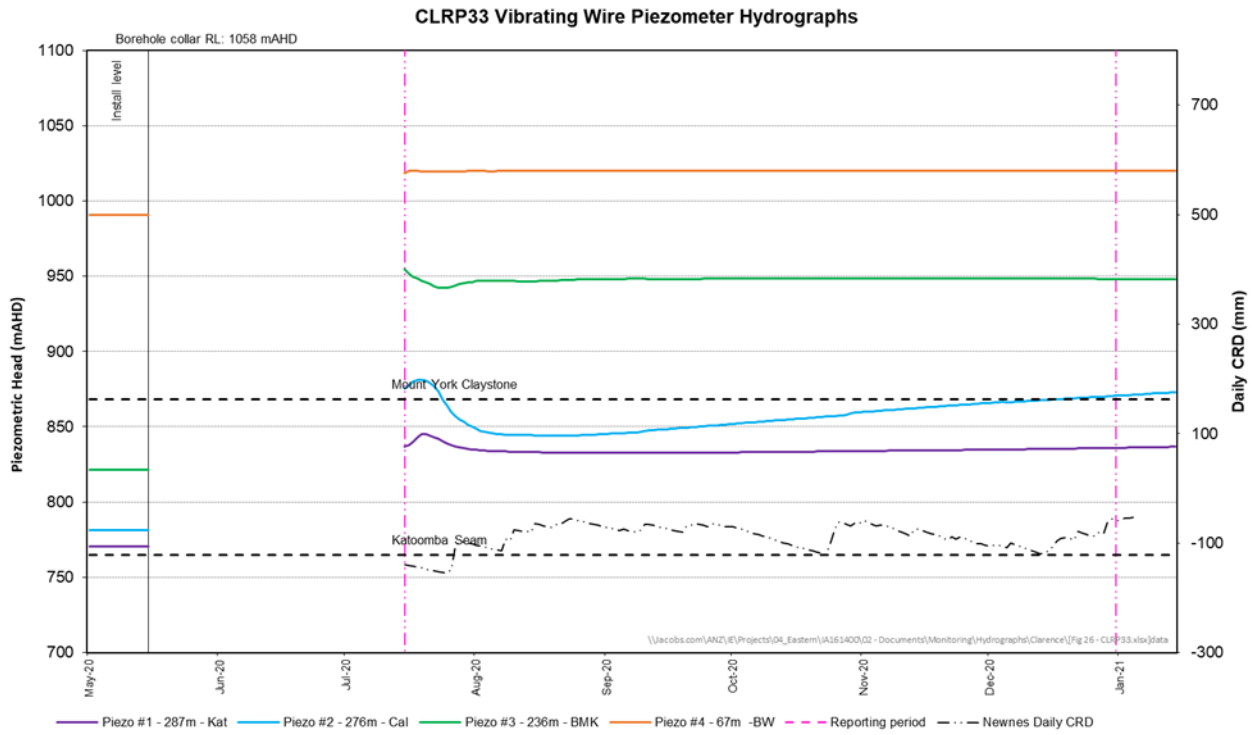

Figure 54 – CLRP33 VWP Hydrograph

CC114

CC114 is located south of the 300 Area, over an unmined area. No mining has occurred near this VWP and there are no indications of mining impacts in the data.

Sensor #1 recorded increasing pressure heads from mid-2019 and at this point in time the cause is unknown and difficult to assess due to the data gaps.

During the reporting period only spot data was available. Sensor #1 recorded a slight increase from the last data point. Sensor #2 recorded stable trends Sensor #3 recorded a small increase in pore pressure. Sensor #4 is unsaturated.

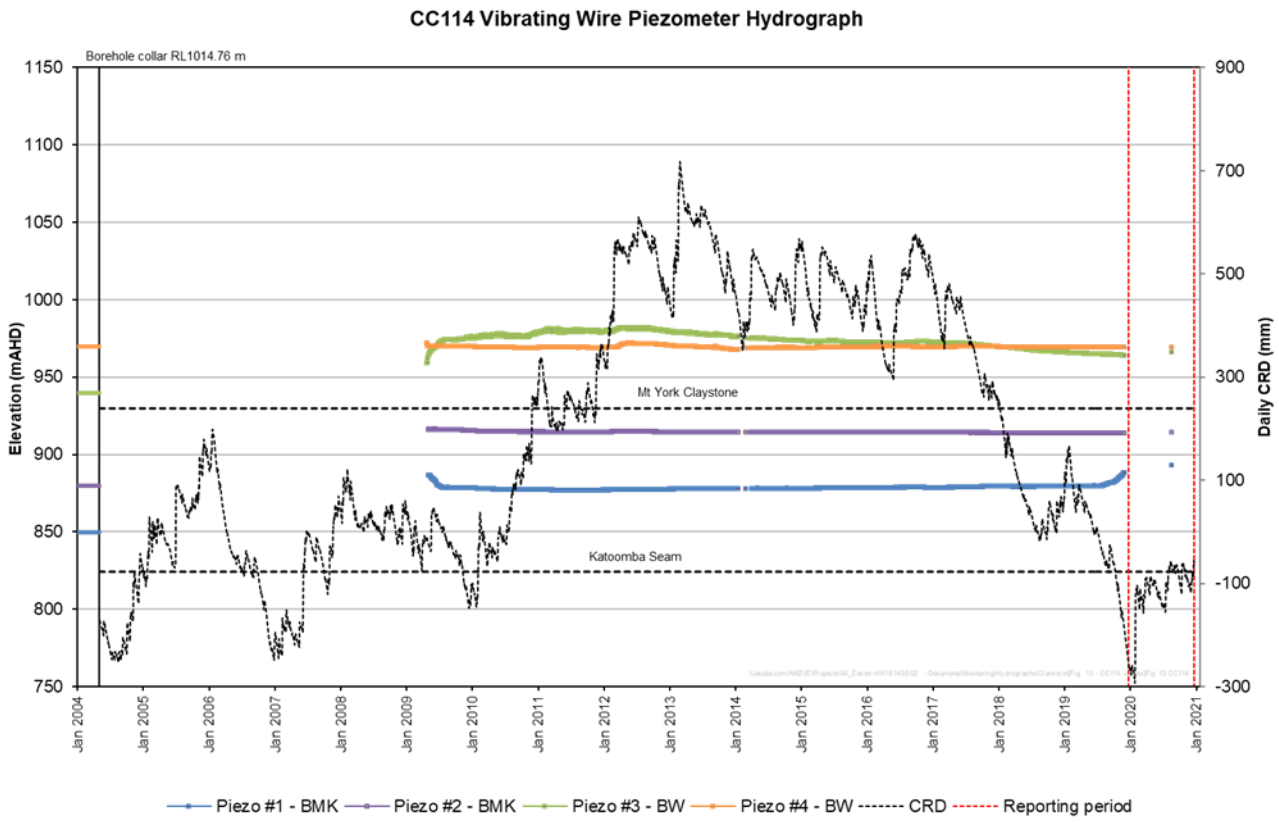

Figure 55. CC114 VWP Hydrograph

CC115

Recent trends have been consistent with historical observations indicating there have been no negative mining impacts on the shallow groundwater aquifer. During the reporting period the closest mining activity occurred approximately 1k south at Panel 822 and 600 m north at Panel 809. There are no observable impacts on water levels.

Sensor #1 located 13m above the Katoomba Seam working horizon is observed to depressurise from the first workings of Panel 812 in June 2013. There is a subsequent partial recovery that extends into present time. The other sensors were also observed to depressurise but a partial recovery was only observed in Sensor #1. In May 2016 the site was directly undermined by pillar extraction and all sensors displayed a small depressurization and subsequent recovery. In December 2016 Sensors #2 and #3 below the Mount York Claystone show another possible decline in response to the extraction. The upper aquifer shows no permanent signs of negative mining impact.

During the reporting period, pore pressures remained relatively stable at all sensors. Sensor #1 shows a continued trend of recovery. Sensor #4 shows a continued slightly declining trend most likely from a subdued reflection of the CRD. Mining to the north and south at Panels 809 and 822 approximately 600 m -1000 m away appeared to have no observable impact on water levels.

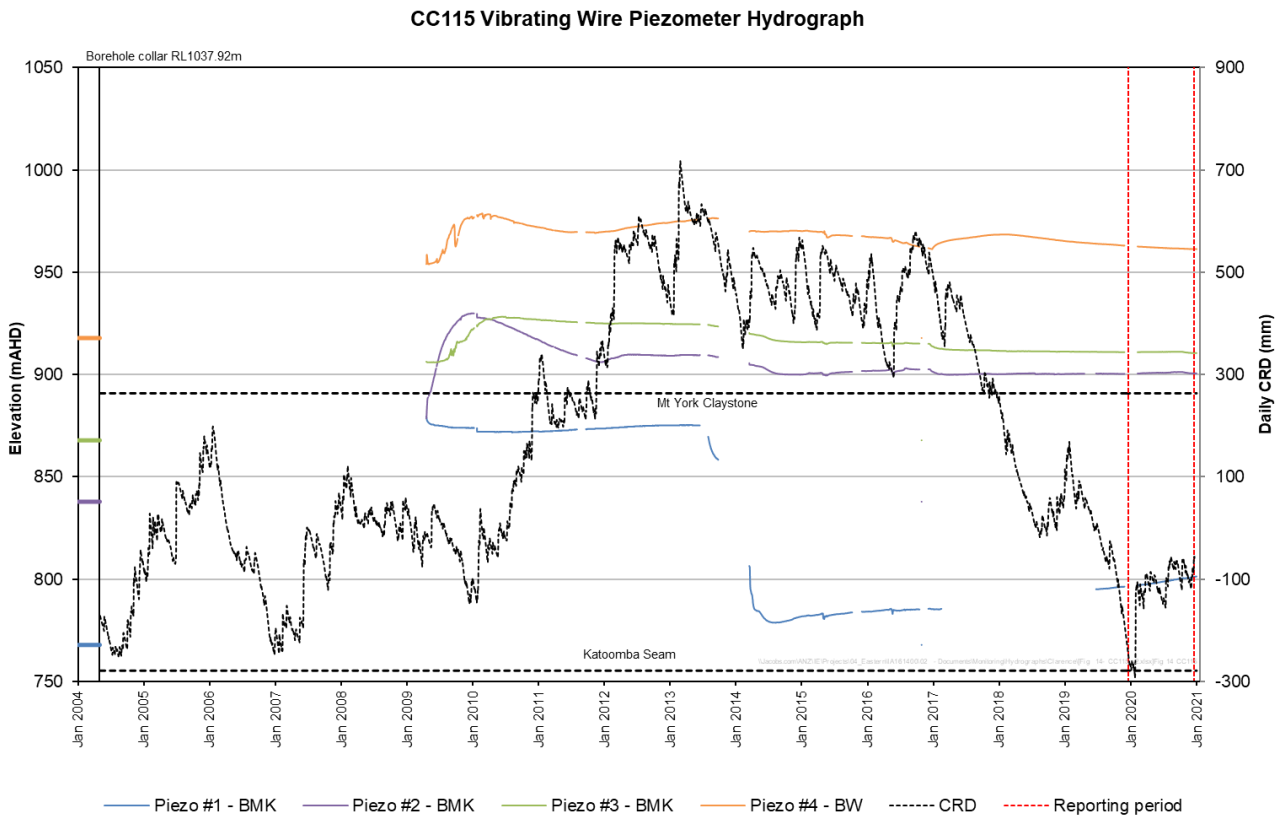

Figure 56. CC115 VWP Hydrograph

13 REHABILITATION

Rehabilitation at Clarence is undertaken in accordance with an approved Mining Operations Plan (MOP) Amendment A. The MOP is consistent with commitments from the 2000 Clarence Environmental Impact Statement and subsequent 2013 Modification 2 Environmental Assessment and the 2013 Modification 3 Environmental Assessment.

As defined in Sections 4.2 and 4.3 of the MOP (2018-2022), the key objective of site rehabilitation at Clarence is to achieve an optimum post-mining land capability suitable for supporting the natural bushland environment which surrounds the site. The entire site will be returned to a natural woodland environment, consistent with bushland surrounding the site which is dominated by 'Sydney Montane Dry Sclerophyll Forest' communities (DEC, 2006). Restoration of all disturbed surface lands will provide a landform largely consistent topographically with the pre-mining and surrounding landscape.

Table 31 shows the rehabilitation status of the site.

Table 31 : Rehabilitation Status

Mine Area Type	Previous Reporting Period 2019	This Reporting Period 2020	Next Reporting Period 2021
A. Total mine footprint[2]	97.6	99.7	99.7
B. Total active disturbance[3]	75.6	77.7	77.7
C. Land being prepared for rehabilitation[4]	0	0	0
D. Land under active rehabilitation[5]	22.0	22.0	22.0
E. Completed rehabilitation[6]	0	0	0

13.1 Buildings & Infrastructure

During the reporting period no buildings were constructed or removed from the Colliery.

[2] **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 (as defined in the DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.
[3] **Total Active Disturbance:** includes all areas requiring rehabilitation
[4] **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 (as defined in DRE MOP/RMP Guidelines)
[5] **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 (as defined under the DRE MOP/RMP Guidelines)
[6] **Completed rehabilitation**: requires formal sign off from DRE that the area has successfully net the rehabilitation land use objectives or completion criteria

13.2 Rehabilitation Trials and Results

During 2019 Clarence Commenced a detailed Rehabilitation Trial Program on REA4 where some rehabilitation has not achieved the standards (Figure 57). The results of the trials will be used to identify suitable methods for the rehabilitation of REA 3. The trial area was monitored throughout 2020 to capture the critical early stages of cover crop development and slope stability.

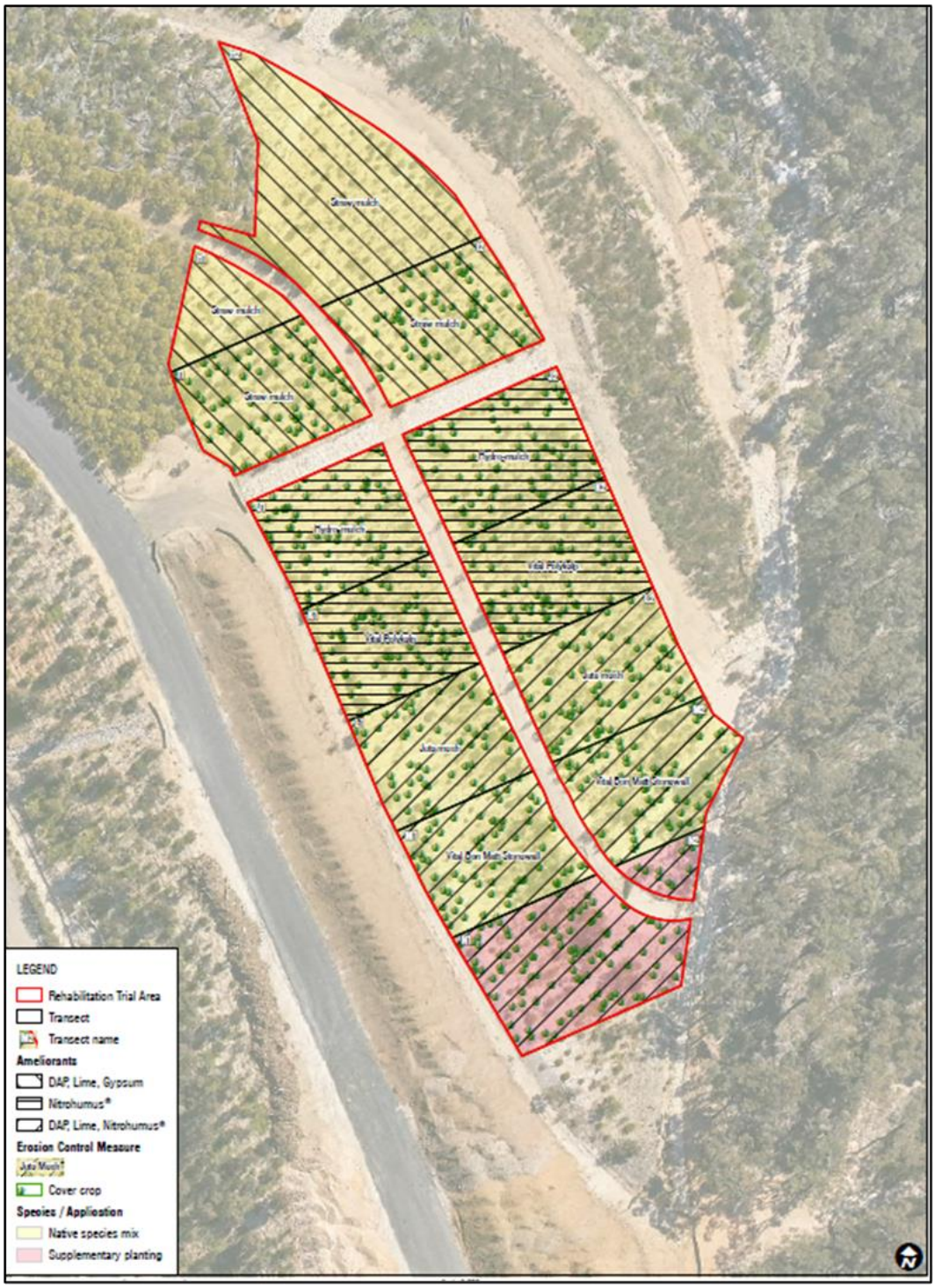

Figure 57. REA IV Rehabilitation Trial Design

Figure 58. REA IV Rehabilitation Trial Area April 2020 showing cover crop growth

2020 REA IV Rehabilitation Trial Results

Monitoring of the trial area was conducted quarterly throughout 2020 and the results are presented below.

Overall Site H (straw mulch without cover crop) performed poorly with lower scores for most EFA variables (landscape organisation index, infiltration index, nutrient cycling, habitat complexity). The groundcover protection and native floristic diversity were also lower than other sites. Without the cover crop protection, the site also experienced a significant amount of erosion with rills present across the bottom portion of the slope. Site H was the only site with considerable erosion, which indicates that the cover crop is essential in controlling erosion during the establishment period.

Site I (straw mulch with cover crop) performed slightly poorer than other sites with lower native flora species diversity and cover, in particular lower diversity and cover of tree species, indicating a poorer germination rate than other sites. No erosion or rills occurred but a small amount of even soil loss was evident through analysis of the profile meters.

Site J (hydro-mulch with cover crop) performed slightly poorer in respect to LFA values, having the lowest stability and nutrient cycling results. However, the groundcover protection and floristic species cover, and diversity were on par with the other sites. No erosion or rills were noted but there was a small amount of soil movement, evident through analysis of the profile meter data.

Site K (vital polykelp with cover crop) had very good performance with the best scores for several LFA attributes (landscape organisation, stability, nutrient cycling). The site also performed very

well in relation to ground cover protection, having the lowest area of bare ground and highest cover of live vegetation. The native species diversity was on par or slightly higher than most sites with the highest diversity of trees out of all sites. The native cover of groundcover and tree species was also the best with shrubs being on par with other sites. There was no erosion or rills noted at site K and soil movement was minimal.

Site L (jute mesh with cover crop) performed well with most LFA scores and groundcover protection and floristic values on par with other sites. Habitat complexity scores were the highest of all sites due to good ground herbage and proximity to the dam at the base of the slope. Native species diversity performed the best at this site, being the highest diversity of natives in the ground and shrub layers. There was no erosion or rills noted and soil movement was minimal.

Site M (vital bon matt stonewall with cover crop) had average performance with almost all LFA scores and groundcover protection and floristic values being on par with other sites. The cover of native plants was on par or slightly lower than other sites and the diversity of weeds was slightly higher than all other sites. There was no erosion or rills noted and only a small amount of soil movement was evident through the analysis of the soil profile meter data.

Site N (no treatment with cover crop) performed slightly poorer than most sites, with average LFA scores and groundcover protection and floristic values. The groundcover protection was poor compared to the other sites, with the second highest score for bare ground and one of the lower scores for live vegetation cover. Native species diversity was on par, or slightly lower than other sites, with a lower diversity of shrubs and no trees. Native species cover was low and there was no tree cover at this site. A small rill was recorded at the middle of the slope where water was channelling beneath the sediment fencing at the top of the road edge. There was some significant soil loss detected by the profile meter at the top of the slope.

Assessment of Rehabilitation Against MOP Completion Criteria

An assessment of the MOP Criteria at the time of the 2020 survey is provided in. As with any newly established rehabilitation, it is not unexpected that the MOP criteria are met in the REA 4 trial area. The MOP criteria will be revisited with each annual monitoring event, and over time it is expected that it will be possible to observe trends in ecosystem function analysis (EFA) and soil erosion results towards MOP criteria.

Table 32. REA IV Trial Rehabilitation Against MOP Criteria

Completion Criteria	Status
Habitat complexity score is >4.0 - ≤6.0.	Not met
Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species.	Not met

Evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.	Not met
Nutrient cycling and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts.	Not met
Continue rehabilitation monitoring until self-sustaining levels are confirmed.	Not met
More than 75% of trees are healthy and growing as indicated by long term rehabilitation monitoring.	Not met
Rehabilitation monitoring confirms woodland rehabilitation areas provide a range of structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer etc.).	Not met
Total woody species richness differs 10 - 20% from analogue sites	Not met
Less than 40% bare ground cover.	Met at sites I-N
The dominant species found within rehabilitation sites are found in analogue sites.	Not met

Conclusions

Results of the surveys suggest that Site K (vital polykelp with cover crop) is currently performing the best, and Site H (straw mulch without cover crop) is performing the worst. As can be expected at year one of a recently rehabilitated area, the EFA data has returned results that are low, and all components are below the values required to meet MOP completion criteria. Notwithstanding this, the trial plots are generally stable and there are currently minimal remediation actions recommended (eg. repair of silt fence). The next annual monitoring survey will be required in November-December 2021.

13.3 Rehabilitation Monitoring

A total of six woodland rehabilitation monitoring sites (including one new site established within recent REA VI rehabilitation) and three analogue sites were assessed during the 2020 monitoring campaign.

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 33 and

Figure 59.

Field surveys were undertaken between 31st November and 2nd of December 2020.

Table 33 : Rehabilitation monitoring program – Monitoring sites

Site Code	Type	Rehabilitation Establishment	Slope (degrees)	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 4a	Rehabilitation	2015	17	244412	6293568
RHB 4b	Rehabilitation	2016	20	244299	6293670
RHB 6a	Rehabilitation (new 2020)	2019	20	244632	6293686
ANA 1 *	Analogue	N/A	3	244632	6293686
ANA 2 *	Analogue	N/A	12	244659	6294391
ANA 3 *	Analogue	N/A	10	244521	6294450

Figure 59. Clarence Colliery Rehabilitation Areas and Monitoring Site Locations

13.3.1 Key Findings

After being already impacted by the 2013 State Mine Bushfire, Clarence was again impacted during the severe 2019-2020 bushfire season which devastated large parts of east-coast Australia. The bushfire swept through parts of the site in December 2019 causing severe impacts to most of the rehabilitated reject emplacement areas (REAs) IV and VI, as well as sections of REAs I and II.

Monitoring methods strictly adhered to those defined in the current MOP (2018-2022) and included a combination of transect-based data collection (six rehabilitation transects and three corresponding analogue sites were monitored) and a walkover inspection of all rehabilitated areas. The data collected allowed for an assessment to be undertaken of current rehabilitation performance and progress against relevant objectives and completion criteria defined in the MOP.

Field surveys were completed between 31st November and 02nd December 2020. Following three years of severe drought between 2016-2019, the conditions eased off during 2020 and the locality received above average rainfall, which alleviated the impacts on vegetation and biophysical systems in the region. This was noted as having positively influenced the rehabilitation condition recorded in 2020, particularly in relation to vegetative ground cover levels and total species diversity in the lower stratum.

Although soil and slope stability were assessed as overall stable at the landform scale, a number of isolated erosion features (principally gullies) have been identified which will require repair – on slope or within water management structures.

Ground cover and landscape function performances remained variable across the site. They were generally satisfactory across REAs I and II, but inconsistent within REA III. More severely impacted by the December 2019, ground cover performance was poor for REAs IV and VI, however was assessed as likely to rapidly improve based on positive signs of vegetation re-establishment.

A total of 70 native ground cover species were recorded across the rehabilitation in 2020 compared to 53 in 2019, highlighting additional native species recruitment and establishment in response to rainfall received in 2020. Average native species richness in the ground layer in the rehabilitation was commensurate with that occurring at the analogue sites (average of 21.8 vs. 21.0 species per site, respectively). Likewise, shrub and tree species diversity at the rehabilitation sites in 2020 compared positively against analogue areas (average of 12.0 vs 11.7 species per site, respectively), with species establishing in the mid and upper storey layers showing high levels of resemblance with local native ecosystems.

Stem densities of canopy trees (i.e. eucalypts) remained generally unsatisfactory and below analogue benchmark range at most locations, whilst other (localised) areas showed excessive

tree densities. Both cases were noted as having the potential to prevent the development of adequate community structure in the long term and may require some level of active management for rehabilitation objectives to be achieved. Tree densities recorded in 2020 decreased at a number of monitoring sites, as a function of declining tree health (possibly related to the 2016-2019 drought) or recent bushfire impacts.

Weed diversity and prevalence remained overall limited in 2020, however a number of problematic and potentially invasive species continue to occur which will require pro-active and ongoing control, including African Lovegrass, Blackberry, Pampas Grass ad St John's Wort. Most occur sporadically across the site, however some infestations of African Lovegrass were noted as establishing in areas of younger rehabilitation at REAs IV and VI.

Consistently with previous years, no evidence of impact from vertebrate animal pests was evident across the site.

13.3.2 Progress Against Completion Criteria

Based on the 2020 rehabilitation monitoring results as presented and discussed in previous sections, Table 34 provides a high-level assessment of current rehabilitation performance against the relevant completion criteria defined in the MOP (2018-2022).

The assessment was undertaken for each REA based on the associated transect-based data and observations made during the walkover inspection.

Compliance was determined as either:

- Compliant – criterion has been successfully achieved.
- Trending – criterion not yet achieved but current performance condition is on a trajectory towards achieving the criterion unassisted (i.e. no active management required); or inconsistent performance within the REA.
- Not Compliant – criterion not achieved and likely to require active management / improvement actions to be achieved.

Table 34. Rehabilitation progress against completion criteria in the MOP (2018-2022)

Completion criteria	Rehabilitation progress	Compliance status 2020				
		REA I	REA II	REA III	REA IV	REA VI
Landform establishment						
Final landform is consistent with surrounding landforms	Rehabilitated REAs and landforms have been constructed as per approved mine plans and generally integrate with surrounding landforms.	Yes	Yes	Yes	Yes	
Slopes are generally less than	Slope angles are adequate and below 14 degrees across most of REA I and REA II. However, steep	Yes	Yes	No	No	No

Completion criteria	Rehabilitation progress	Compliance status 2020				
		REA I	REA II	REA III	REA IV	REA VI
10 degrees and no more than 14 degrees without approval	slope gradients have been established in REAs III and IV and VI which are comprised between 17-22 degrees.					
Erosion control structures installed at intervals commensurate with the slope of the landform and direct water into stable areas or sediment control basins	Contour banks, rock-lined drains and/or diversion drains have been installed at adequate intervals throughout REAs II, III and IV to break linear slopes and slow or re-direct surface water runoff into sediment basins. Particularly, good densities of erosion structures were installed across REA IV were steeper landforms and slope angles have been established. No erosion control structures were installed within REA I, however these were deemed unnecessary as a function of gentler topography and shorter slope lengths. Erosion control structures have not yet been constructed across REA VI however only a small section (one contour) has been rehabilitated to date and rehabilitation works are ongoing.	Yes	Yes	Yes	Yes	Trending
Landforms are stable	• REA I very stable with vegetation well established and no signs of active erosion processes. • REA II mainly stable, but 2 x severe localised gully features identified along the northern boundary requiring repair. • REA III impacted by frequent but low severity erosion processes (sheet + rill) in areas of poorer vegetation establishment. One severe gully incision occurs where the REA meets REA I, exposing rejects. • REA IV impacted by widespread and moderate to severe erosion features on slope and in drainage structures. Recent fire impacts have removed the vegetative layer further exposing the soil surface to erosion processes. • REA VI stable with no erosion features recorded.	Yes	No	No	No	Yes
Growing media development						
Soil analysis undertaken to determine potential constraints to rehabilitation.	No soil monitoring undertaken in 2020. However, soil characterisation and testing results from samples collected at six rehabilitation monitoring sites in 2018 identified no key limitations to the growing media. Soil properties in the rehabilitation were similar to those in analogue areas and generally conducive to the establishment and growth of native vegetation. Soil monitoring to be re-conducted in 2021.	Yes	Yes	Yes	Yes	n/a
Topsoil or alternative dressing media spread at depth of 100-300mm	No soil monitoring undertaken in 2020. The 2018 soil monitoring results indicated that adequate levels of topsoil (consisting of sandy loams or sandy clay loams) were generally present across REAs I, II and IV. However, localised areas with insufficient topsoil and capping depth were observed within REA III. Soil monitoring to be re-conducted in 2021.	Yes	Yes	No	Yes	n/a
Ecosystem establishment and sustainability						
Minimum of 60% protective ground cover, and no bare surfaces >20m^2 or >10m in length down slope	Protective ground cover generally satisfactory across REAs I, II and VI. Ground cover across REA IV has been severely impacted by the December 2019 bushfire, which exposed high levels of bare ground. Ground cover was however showing positive signs of re-establishment at the time of the 2020 monitoring, and is expected to recover. Large continuous bare areas continue to occur throughout REAs III, where vegetation establishment and performance is highly variable.	Yes	Yes	No	Trending	Yes

Completion criteria	Rehabilitation progress	Compliance status 2020				
		REA I	REA II	REA III	REA IV	REA VI
Evidence of nutrient cycling processes (i.e. presence of litter, cryptograms, etc.)	Active in-situ nutrient cycling occurred in all areas of successful vegetation establishment, which was however inconsistent across rehabilitation areas. Based on litter cover and LFA nutrient cycling index scores, nutrient cycling was satisfactory at REAs I, but inconsistent at REAs II and III. The December 2019 fire removed woody vegetation and the litter layer throughout REAs IV and VI, thereby temporarily reducing nutrient cycling.	Yes	Trending	Trending	Trending	Trending
A mixture of native trees, shrubs and grasses is present	Rehabilitation sites generally showed excellent performance in terms of native species assemblages in all vegetation layers, with a range of native endemic ground covers, shrubs and trees recorded at all monitoring sites. Mid and upper storey vegetation was severely impacted by the fire across several locations of REAs I, II, IV and VI, but showed active signs of recovery.	Trending	Trending	Trending	Trending	Trending
Dominant species aligned with those in local native woodland communities	Flora species establishing in the rehabilitation very largely comprised of local native endemic species and generally fully aligned with those recorded at the nearby analogue sites.	Yes	Yes	Yes	Yes	Yes
Total woody species richness within 20% of analogue sites	Total woody species richness in 2020 was within 20% of analogue sites at all monitoring sites in REAs I, II, III, and IV; and comprised between 9-18 species (analogue range 10-14 species). Woody species richness slightly below benchmark at REA VI (7 species), but the rehabilitation remained very young and further species recruitment / germination is expected.	Yes	Yes	Yes	Yes	Trending
>75% of trees are healthy and growing	Tree health was observed at decreased in REAs I and II with apparent dieback in several individuals, possibly linked to the 2016-2019 drought + localised recent fire impacts. Recorded proportion of healthy trees were <60% at the monitoring sites within these REAs. Tree health was assessed as satisfactory at all other locations in 2020.	No	No	Yes	Yes	Yes
Established species survive and/or regenerate after disturbance	REA I, II and III were burnt during the 2013 bushfire, and have since shown good signs of recovery as assessed and reported during subsequent annual monitoring campaigns. Areas burnt in December 2019 (i.e. REA IV, VI and sections of REAs I and II) all started to show positive signs of regeneration during the 2020 monitoring event.	Yes	Yes	Yes	Yes	Yes
Evidence of natural regeneration potential (2nd generation seedlings or reproductive structures on plants)	Active natural regeneration was evidenced across all older rehabilitated areas at REAs I, II and III with second-generation seedlings present. Condition indicator not applicable to REA IV and REA VI given the younger age of the rehabilitation (<5 years).	Yes	Yes	Yes	n/a	n/a
Weed cover <15%	Weed cover remained minimal across REAs II, III and IV (<2% weed cover recorded at the monitoring sites). Weed cover increased at the monitoring site in REA I but remained within criteria at ~10% cover. However, and as reported in the past couple of years, the well-established weed infestation remained the irrigation pipeline. Total weed cover levels recorded at the REA VI monitoring sites slightly exceeded the criterion at ~16% cover. The slope where the transect is	No	Yes	Yes	Yes	No

Completion criteria	Rehabilitation progress	Compliance status 2020				
		REA I	REA II	REA III	REA IV	REA VI
	located also includes localised infestations of African Lovegrass, which are likely to spread further if left unattended. Other problematic species recorded at the site in 2020 included Blackberry (REA VI) and Pampas Grass (REAs II and III). Their occurrence remained sporadic however ongoing vigilance and control will be required.					
Animal pests do not occur in substantial numbers or visibly affect the development of planted species	Animal pests were not an issue at the site. No evidence of impact was recorded.	Yes	Yes	Yes	Yes	Yes
Habitat features or structures suitable for fauna habitat are incorporated	Logs / dead trees have been spread across the surface in all REAs except REA VI (although at excessive densities in REA IV). No other habitat structures observed (e.g. boulders, arboreal nest boxes, etc).	Yes	Yes	Yes	Yes	No
Presence of a range of structural habitats (eucalypts, shrubs, ground cover, developing litter layer)	Good structural complexity and vegetation stratification was generally achieved across REAs I and II. Performance in REA III remained inconsistent with areas containing adequate structural habitat but others being more deprived where vegetation establishment has not been as successful. Recently impacted by fires, structural complexity was poor across REAs IV and VI however signs of active shrubs/trees establishment were recorded.	Yes	Yes	Trending	Trending	Trending
Habitat complexity score >4.0	Habitat complexity scores remained within target benchmark at the monitoring sites within REAs I, II and III, but below target at the fire-impacted REAs IV and VI. Habitat complexity scores excepted to naturally increase with time as vegetation further establishes and communities mature.	Yes	Yes	Trending	Trending	Trending

13.4 Next Reporting Period

2021 will see a MOP amendment to reflect the change that market demand has had on the schedule for fines removal at REA III and subsequently timing of REA III final land formation and complete rehabilitation. Each existing rehabilitation site will continue to be monitored. Results from the REA IV rehabilitation trial area will be used to help decide upon a final REA III rehabilitation treatment. REA IV will now be monitored annually. Continuing from 2020 into early 2021, a pampas grass eradication programme was undertaken. This will continue through 2021 and beyond and be expanded to include other weeds such as blackberry. REA VI will reach capacity in 2021 and pending market conditions (for course coal reject transportation) will be rehabilitated.

14 COMMUNITY

14.1 Community Consultation and Engagement

During the reporting period 3 CCC meetings were held, with a fourth cancelled in April due to COVID-19.

The CCC meetings were held on the following dates:

- 21st Jan 2020;
- 15th July 2020; and
- 12th Nov 2020

Minutes are available on the Centennial Coal Clarence Website (https://data.centennialcoal.com.au/domino/centennialcoal/cc205.nsf/Published.xsp?site=Clarence&type=Community%20Consultative%20Committee&date=All)

14.2 Aboriginal Cultural Heritage

Consultation with Registered Aboriginal Parties was undertaken was undertaken in accordance with the Western Region Cultural Heritage Management Plan, via the Western Region Cultural Heritage Sub-committee. Meeting were held on the following dates:

- 5th May 2020; and
- 28th October 2020

The RAP representatives were consulted on the mine development, exploration activities, results of Archaeological surveys and anticipated timing for post mining archaeological inspections.

14.3 Local Community

The community of the nearby locality of Newnes Junction have been consulted with in relation to the construction of REA V. This consultation has included direct contact with residents to advise of the commencement of the movement of trucks and speed limits along the road. Consultation will be ongoing as the project continues.

14.4 Community Sponsorships

During the reporting period, Clarence (in conjunction with other Centennial sites) supported the following community groups via either in-kind or financial sponsorship (or a combination of both):

- Lithgow Show Society
- Rydal Village Association
- Lithgow High School
- Billy Sinnett - Wings4Kidz Fundraising

- Portland Central School
- Lithgow City Men's Bowling Club
- Blackheath Cricket Club
- Tarana Volunteer Bushfire Brigade
- Wallerawang Public School
- Wallerawang Warriors Junior Rugby League
- Lithgow District Cricket Association
- Kandos High School
- Cooerwull Public School
- Rylstone Public School
- Rydal A H & P Society
- Western Wildfire O/60s Cricket Club

14.5 Community Complaints

There were no community complaints received during the 2020 reporting period.

15 INDEPENDENT AUDIT

The 5 yearly Independent Environmental Audit was conducted from November-December 2020. Based on the finding from this audit, recommendations were given with the aim of addressing the identified non-compliances. Table 35 shows these recommendations with Clarence's response.

Table 35 : Audit Actions and Update

Independent Audit Recommendations	Clarence Response
R1 CLR IEA 2020 **Consult with DPIE/DRG and if, agreed, obtain written approval that the:** • **That the subsidence impact assessment criteria for tilts and strains (as specified in DA 504 Sch 3-1) are not required.** • **That the maximum subsidence impact assessment criteria is 100 mm +/- 25 mm (and not 100 mm as specified in DA 504 Sch 3-1).** • **Whether subsidence impact > 100mm on H Line triggers 'condition red' on the TARP, as this area was mined prior to DA504.**	Clarence will consult with the Regulator regarding written approval.
R2 CLR IEA 2020 **Identify and consolidate quantitative subsidence impact assessment criteria (as specified in DA 504-00 Sch 3 and SMP Approvals), and corresponding baseline data, monitoring (parameter, method and frequency) and reporting requirements, responsibilities, and standardise TARPs; into a management plan document which is reviewed and updated following changes to the development, approvals and/or subsidence monitoring requirements.**	The EIS and Development criteria have been developed to minimise impacts related to subsidence. Subsidence data show subsidence to date has been less than 100mm, with much of the data well below this level, furthermore, strains to date have been generally less than 2mm/m. There has been no surface cracking observed during inspections and monitoring activities Clarence colliery maintains that the data to date show that the surface impacts of subsidence due to the partial extraction operations have been negligible.
R3 CLR IEA 2020 **Identify and consolidate quantitative water resources impact assessment criteria for each of the water resources impacts (as specified in DA504 Sch 3-5 a) to d)); and corresponding baseline data, monitoring and reporting requirements, responsibilities, and TARPs; into a management document which is reviewed and updated following changes to the development, approvals and/or monitoring requirements.**	The EIS and Development criteria have been developed to minimise impacts related to subsidence. Therefore, potential changes in surface flow due to ground level changes caused by mine subsidence would be negligible unless the surface settlements greatly exceed the nominated 100mm criterion for Clarence. Subsidence data show subsidence to date has been typically less than 100mm, with much of the data well below this level, and based on these subsidence levels there would have been no or negligible impact on surface water flows. The above would also apply to potential changes in surface flow due to subsidence-related cracking. This would be negligible unless the surface strains greatly exceed the nominated 2mm/m criterion for Clarence. Strains to date have been generally less than 2mm/m, There has been no surface cracking observed during inspections and monitoring activities. Given the above, there has been no identified cracking-related impact on surface water flows.
R4 CLR IEA 2020 **Align the units in the WMP TARP groundwater**	Revised WMP submitted to DPIE Feb 2021 – All future groundwater report units will align with the TARP units.

level impact assessment criteria (m(AHD)) with units used in the four-monthly groundwater levels (hydrographs) monitoring results (m(bgl).	
R5 CLR IEA 2020 **Conduct an independent investigation into the decline in groundwater level at CLRP5 to understand the basis of the decline; assess if the decline in groundwater level and/or piezo head change at CLRP5 trigger the 2017 WMP groundwater TARP. Pending the outcome of the investigation and assessment against the TARP, implement TARP response and notification actions**	CLRP5 decline appears to be linked to extreme lack of rain observed at the end of 2019 (which Jacobs, our groundwater consultant agrees with). Pre undermining levels at the site were lower than that observed in 2019-2020. The ground water level at this site is now increasing in response to the heightened La Nina rainfalls, although a predicted 9 month lag is expected.
R6 CLR IEA 2020 **Prepare and implement a sediment and erosion control plan to meet each of the requirements of DA504 Sch 3-8 (Erosion and Sediment Control Plan).**	Section 5.7 titled 'Erosion and Sediment Control' of the Centennial Western Region Regional Water Management Plan addresses this consent requirement.
R7 CLR IEA 2020 **Identify and consolidate quantitative surface water impact assessment criteria for each of the surface water impacts (as specified in DA504 Sch 3-9 a) to e)); and corresponding baseline data, monitoring and reporting requirements, responsibilities, and TARPs into a management document which is reviewed and updated following changes to the development, approvals and/or monitoring requirements.**	See Response to R3
R8 CLR 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
R9 CLR IEA 2020 **Assess 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 the regulatory authorities regarding this.
R10 CLR IEA 2020 **Design external lighting to comply with AS4282 (INT) 1995 Control of Obtrusive Effects of Outdoor Lighting and maintain records of compliance.**	Noted
R11 CLR IEA 2020 **Investigate and report annually in the Annual Review on initiatives Clarence is implementing to reduce greenhouse emissions.**	Noted for addition in Annual Review
R12 CLR IEA 2020 **Revise the 2014 long term Reject Management Strategy to reflect status of REAs and future emplacement and rehabilitation considerations. or otherwise confirm with DPIE that this condition can be determined through the MOP process.**	Clarence updated the Rehab Management Strategy in 2017, however, we will review this document and update as necessary.

R13 CLR IEA 2020 **Improve storage and use of dangerous goods and hazardous materials:** • **Assess the suitability of detergents used in the vehicle wash bay and downstream impact on oil and grease removal in the grit basin and WTP. Implement corrective actions if required.** • **Store empty containers that have been used for dangerous goods and hazardous materials within bunded areas.** **Clean up spills in pit top area promptly to minimise load on WTP.**	Noted – however, oil and grease (if any does get to the WTP) is effectively removed in the water treatment process and has never exceeded conditions and rarely been detected in the discharge quality results.
R14 CLR 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.
R15 CLR IEA 2020 **Revise the Clarence Environmental Monitoring Program:** • **Include each of the monitoring requirements in DA504-00 Sch 3 (Specific Environmental Conditions).** • **For each monitoring requirement, identify impact assessment criteria, baseline data, monitoring and reporting requirements, responsibilities, and TARPs.** • **Identify when the Clarence Environmental Monitoring Program is required to be updated.** **Correct Table references.**	Noted.
R16 CLR IEA 2020 **Provide CCC minutes and responses to the CCC's recommendations to DPIE within a month of acceptance of the minutes by the CCC.**	CCC minutes are published to Centennial's website for review by anyone with an internet connection. We will confirm whether the Department will accept this as have met the condition of being provided to them.
R17 CLR 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.
R18 CLR IEA 2020 **Include reporting provisions for all monitoring required under DA504 Sch 3 (Specific Environmental Conditions) in corresponding management plans and programs and make available on the CC website.**	The appropriate management plans will be reviewed and where necessary, provisions for each environmental aspect will be added.
R19 CLR IEA 2020 **Undertake the annual rapid assessment on THPSS community in the summer months.**	This work has been scheduled.
R20 CLR 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**	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.

of Conservation and Land Management, National Parks and Wildlife Service and Department of Mineral Resources (or equivalent agency).	
R21 CLR IEA 2020 **Provide results from the REA III groundwater sampling regime (triggered by the REA III Decommissioning HRA) over the life of the REA III rehabilitation and include an impact assessment of these results against rehabilitation criteria in Annual Reviews. Provide the AR to LCC and Crown Lands.**	Results of any groundwater sampling in REA III will be provided in the Annual Review.
R22 CLR 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.
R23 CLR IEA 2020 **Consult with the Soil Conservation Service (now within DPIE) during topsoil stripping and stockpiling associated with Reject Emplacement Areas and V; or seek approval that this condition is not required for future works.**	Consultation has been achieved through the HRA process – Clarence will investigate whether this condition is still relevant.
R24 CLR IEA 2020 **Consult with the Soil Conservation Service (now within DPIE) prior to construction of runoff diversion and erosion and sediment control works and construct such works to the satisfaction of the Soil Conservation Service; or seek approval that this condition is not required for future works.**	Major construction works are planned under the HRA process in conjunction with the DPIE. We believe this process adequately addresses this condition.
R25 CLR IEA 2020 **Within 6 months of commencement of reject emplacement at REA V, provide a detailed rehabilitation plan for REA V to the Soil Conservation Service (now within DPIE) for approval.**	Covered by the MOP and its amendments.
R26 CLR IEA 2020 **Consult with the Soil Conservation Service (now within DPIE), the Department of Mineral Resources (now DRG) and Council on the progressive rehabilitation of REA IV and when required REA V; and obtain approval that that progressive and final rehabilitation of REA IV and V has been undertaken to the satisfaction of the Soil Conservation Service (now within DPIE), the Department of Mineral Resources (DRG) and Council.**	Centennial does and will work with the DPIE, through the MOP and through site inspections concerning the rehabilitation of REAs IV and V.
R27 CLR IEA 2020	These measurements are conducted by a NATA accredited lab, which in turn conforms with the EPA Approved Methods

Identify the monitoring methods for each of the Pollutants identified in M2.3 in the ALS monthly environmental monitoring reports (.xls), assess if the methodology is in accordance with the EPA Approved Methods, and if required undertake corrective actions.	Publication.
R28 CLR IEA 2020 **Conduct both attended and unattended annual noise monitoring in accordance with EPL 726 M4.1.**	Noise monitoring is conducted annually in accordance with EPL 726 M4.1.
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 main Clarence RCE. Centennial will respond to this appropriately.
R30 CLR IEA 2020 **Provide NPWS with the flora and fauna monitoring program for review and if required, revise the Clarence environmental monitoring program accordingly.**	Clarence will contact the NPWS in relation to this.

16 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

Table 36 : Summary of Reportable Incidents and Regulatory Actions

Compliance Type	Agency	Number	Response
Incidents	N/A	0	N/A
Show Cause Notice	EPA	2	Both Show Cause notices were referring to LDP002 discharge limit exceedances. Clarence undertook a full review of the WTP including management, calibrations, sampling techniques, pH sensor replacements.
Section 240 Notice	DPIE	1	Following a site inspection, the Resources Regulator issue Clarence with a s240 notice, ordering Clarence to conduct a risk assessment on REAIII management and rehabilitation.
Caution Notices	N/A	0	N/A
Warning Letters	N/A	0	N/A
Penalty Notices	N/A	0	N/A
Prosecutions	N/A	0	N/A

Incident/Non-compliance - Summary

Nature of the incident/non-compliance	EPL L2.4- Concentration limit exceedance at LDP002
Date/s of incident/ non-compliance (if known; if not known state not known)	15/01; 19/02; 21/04; 16/06; 21/07; 22/09; 15/12
The location of the incident/ non-compliance (include a figure if appropriate), if known	Discharge Monitoring point identified as LDP002
Detail the cause of the incident/non-compliance	Several exceedances throughout the year – April exceedance due to WTP technician having contracted COVID-19 and a proper handover could not be given. Throughout the year piping and pH sensors were replaced – workorders were placed in the system to ensure maintenance is kept.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	The results are a minor exceedance of the limits and no adverse effects are expected. Water quality and aquatic ecology monitoring continue downstream of the discharge point.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	the water treatment plant was given a full review and an audit took place regarding pH management. The results have since improved and most of the exceedances were considered minor with no material harm caused to the environment.

Incident/Non-compliance No.2 - Summary

Nature of the incident/non-compliance	EPL M2.2 – Dust sample could not be taken due to broken sample bottle
Date/s of incident/ non-compliance (if known; if not known state not known)	9/03/2020; 5/06/2020
The location of the incident/ non-compliance (include a figure if appropriate), if known	Dust Gauge 3 and Dust Gauge 2
Detail the cause of the incident/non-compliance	Thermal shock or high winds caused bottle and/or funnel to break.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Padding place around funnel to prevent knocks from high winds.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	Padding place around funnel to prevent knocks from high winds.

17 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Clarence proposes to undertake the following activities during 2020:

- Continue the removal of reject from REA 3 and re-profiling for rehabilitation;
- Continue Construction of REA V;
- Continue to refine the operation of the water treatment plant; and
- Recommence the 900 North Drilling Program

CENTENNIAL

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