

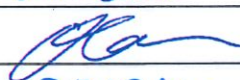


***CENTENNIAL COAL
ANGUS PLACE
ANNUAL REVIEW***

January 2019 to December 2019

March 2020

Table 1. Annual Review Title Block

Name of Operation	Angus Place Colliery
Name of Operator	Centennial Angus Place Pty Ltd
Development Consent/ Project Approval #	PA 06_0021
Name of holder of development consent / project approval	Centennial Angus Place Pty Ltd
Mining Lease #	ML 1326, (part) ML 1424, ML 1699, ML 1720, CCL 704, EL 6293, EL 6856, EL 7415, EL 8188, MLA 498
Name of Holder of Mining Lease	Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd
Water License #	WAL36445; WAL36449; WAL37340; WAL37343; WAL41881
Name of Holder of Water License	Centennial Angus Place Pty Ltd
MOP/RMP Start Date	May 2016
MOP/RMP End Date	April 2023
Annual Review Start Date	1 January 2019
Annual Review End Date	31 December 2019
I, <u>Michael Clark</u>, certify that this audit report is a true and accurate record of the compliance status of Angus Place for the period 2019 and that I am authorised to make this statement on behalf of Angus Place Colliery. 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	<u>Michael Clark</u>
Title of Authorised Reporting Officer	<u>Director</u>
Signature of Authorised Reporting Officer	
Date	<u>27/3/2020</u>

Contents

1. STATEMENT OF COMPLIANCE.....	7
2. INTRODUCTION	8
3. APPROVALS.....	9
3.1. Changes made to Approvals during reporting period	11
3.1.1. Mining Operations Plan (MOP)	11
3.1.2. Environmental Protection Licence (EPL).....	11
3.2. Annual Review Requirements.....	11
4. OPERATIONS SUMMARY	16
4.1. Other Operations	16
4.2. Next Reporting Period	17
5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW	17
6. ENVIRONMENTAL PERFORMANCE	17
6.1. Air Quality.....	19
6.1.1. High Volume Air Sampler	23
6.1.2. Depositional Dust	26
6.1.3. Air Quality Monitoring Data Interpretation	28
6.2. Biodiversity	28
6.2.1. Biodiversity Offsets.....	29
6.2.2. Terrestrial Ecology.....	29
Flora and Fauna.....	29
Flora Monitoring Results	29
Persoonia hindii Monitoring Results	30
Fauna Monitoring 900 Area	31
Fauna Monitoring Results- 900 Area	33
Fauna Monitoring Results- SMP Area	34
Fauna Monitoring Results –SMP Area	35
Fauna Monitoring Results- Angus Place East Area	35
Fauna monitoring results Angus Place East Area.....	36
6.2.3. Aquatic Ecology.....	37
6.3. Greenhouse Gas	41
6.4. Heritage (Aboriginal and non-Aboriginal)	42
6.5. Meteorological Monitoring.....	42
6.6. Noise	45
6.7. Subsidence Monitoring	49
7. WATER MANAGEMENT	49
7.1. Surface Water Monitoring	51
7.1.1. Surface Water Monitoring Results	52

7.1.2. Data interpretation	64
7.2. Water Balance	64
7.3. Groundwater Management	66
8. REHABILITATION	73
8.1. Buildings	73
8.2. Rehabilitation of Disturbed Land	73
8.3. Next Reporting Period	73
9. COMMUNITY	73
9.1. Community Consultation and Engagement	73
9.2. Community Sponsorships	74
9.3. Community Complaints	74
10. INDEPENDENT AUDIT	74
11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD	74
12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD	77

Tables

Table 1. Annual Review Title Block	2
Table 2. Statement of Compliance	7
Table 3. Non-Compliances	7
Table 4. Environmental Management Contact Details	9
Table 5. Approvals held by Angus Place	10
Table 6. Annual Review Requirements	11
Table 7. Production Summary	16
Table 8. Operations Summary	16
Table 9. Actions from previous Annual Review	17
Table 10. Summary of Monitoring Requirement	17
Table 11. Description of Air Quality Monitoring	19
Table 12. Air Quality Environmental Performance	20
Table 13. Total GHG Emissions from Site	41
Table 14. Monthly Rainfall Summary	43
Table 15. Monthly Temperature Summary	44
Table 16. Noise Environmental Performance	45
Table 17. 2019 Attended Noise Monitoring Results	46
Table 18. Noise monitoring at Sharpe Residence (R1) 2015 - 2019	47
Table 19. Noise monitoring at Mason Residence (R2) 2015 - 2019	47
Table 20. Noise monitoring at Lidsdale Village (R3) 2015 – 2019	48
Table 21. Water Take for the water year 2018/2019	50
Table 22. Summary of Surface Water Monitoring Locations	51
Table 23. Average Surface Water Quality 2019	52

Table 24.	LDP001 Water Quality	54
Table 25.	LDP002 Water Quality	55
Table 26.	LDP003 Water Quality	56
Table 27.	2019 LDP001 Discharge Volumes	64
Table 28.	Summary of site water balance results	65
Table 29.	Standpipe Piezometer Bore Details	67
Table 30.	Swamp Piezometer Bore Details	68
Table 31.	Vibrating Wire Piezometer Bore Details	69
Table 32.	Incident/Non-Compliances Summary	74
Table 33.	Summary of Reportable Incidents and Regulatory Actions	77

Figures

Figure 1.	High Volume Air Sampler – 24hr PM ₁₀ Results 2019	23
Figure 2.	High Volume Air Sampler – 24hr TSP Results 2019	23
Figure 3.	High Volume Air Sampler – PM ₁₀ Rolling Annual Average & 24hr Results	24
Figure 4.	High Volume Air Sampler – TSP Rolling Annual Average	24
Figure 5.	High Volume Air Sampler – Historical 24hr TSP Results	25
Figure 6.	High Volume Air Sampler – Historical 24hr PM ₁₀ Results	25
Figure 7.	Dust Depositional Gauge – Rolling Annual Average	26
Figure 8.	Dust Depositional Gauge – 2019 Monthly Results	26
Figure 9.	Dust Depositional Gauge – Historical Rolling Average Results	27
Figure 10.	Dust Depositional Gauge – Historical Monthly Results	27
Figure 11.	900W P. hindii impact vs control sites 2019	31
Figure 12.	900W and 910 longwall monitoring sites	32
Figure 13.	APE survey sites and nearby monitoring sites	36
Figure 14.	Taxa richness in Cocks River samples in 2019	38
Figure 15.	EPT richness in Cocks River samples in 2019	38
Figure 16.	SIGNAL-2 in Cocks River samples in 2019	39
Figure 17.	Taxa richness in Kangaroo Creek samples in 2019	39
Figure 18.	EPT richness in Kangaroo Creek samples in 2019	40
Figure 19.	SIGNAL-2 in Kangaroo Creek samples in 2019	40
Figure 20.	Monthly Rainfall Summary	43
Figure 21.	Monthly Temperature Summary	44
Figure 22.	LDP001 2019 Water Quality Monitoring Results - pH	57
Figure 23.	LDP001 2019 Water Quality Monitoring Results - TSS	57
Figure 24.	LDP001 2019 Water Quality Monitoring Results – Oil and Grease	58
Figure 25.	LDP001 2019 Water Quality Monitoring Results – Conductivity	58
Figure 26.	LDP001 2019 Water Quality Monitoring Results - Turbidity	59

Figure 27.	LDP001 2019 Water Quality Monitoring Results - Fluoride	59
Figure 28.	LDP001 2019 Water Quality Monitoring Results – Aluminium (dissolved)	60
Figure 29.	LDP001 2019 Water Quality Monitoring Results – Arsenic (dissolved)	60
Figure 30.	LDP001 2019 Water Quality Monitoring Results – Boron (dissolved)..	61
Figure 31.	LDP001 2019 Water Quality Monitoring Results – Copper (dissolved)	61
Figure 32.	LDP001 2019 Water Quality Monitoring Results – Iron (dissolved)	62
Figure 33.	LDP001 2019 Water Quality Monitoring Results Manganese (dissolved)	62
Figure 34.	LDP001 2019 Water Quality Monitoring Results – Nickel (dissolved) .	63
Figure 35.	LDP001 2019 Water Quality Monitoring Results – Zinc (dissolved)	63
Figure 36.	Water Management Schematic- Angus Place.....	66

Appendices

1 - Plans

Plan Reference No	Plan Name
1	Regional Locality
2	Site Layout
3	Pit Top
4	Vent Facility
5	Ecological Monitoring
6	Commonwealth Colliery
7	Water Monitoring
8	Air and Noise Monitoring
9	Vale of Clywdd

1. STATEMENT OF COMPLIANCE

Table 2 provides a statement of compliance with the relevant approvals during the reporting period.

Table 2. Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
PA 06_0021	No
Mining Leases (ML424, ML1699, ML1720, CCL 704)	Yes
EPL 467	No
Water Licences (WAL36445; WAL36449; WAL37340; WAL37343; WAL41881)	Yes
SMP Approval 04/1675	Yes
SMP Approval OUT 14/10918	Yes
EPBC Approval 2011/5952	Yes
Mining Operations Plan	Yes
Radiation Management Licence RML29229	Yes

Table 3 provides a list of conditions that were not complied with during the reporting period.

Please note that due to the 2019/2020 Gospers Mountain bushfire, some instruments were damaged affecting monitoring. As these are currently under assessment and repair any non conformances related to these will be reported directly to the responsible Department/s as they are assessed and collectively reported in the 2020 Annual Review.

Table 3. Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Reference # addressed in Annual Review
EPL 467	L2.4	Water quality concentration limits	Non-Compliant	pH measured at 6.2 which was lower than lower limit of 6.5.	Table 32
EPL 467	M2.3	Sampling interval	Non compliant	Unable to sample- dry	Table 32
FPL 467	M2.3	Sampling interval	Non compliant	Hydrosleeve broke removed	Table 32

EPL	M2.3	Sampling interval	Non compliant	Unable to sample- bushfire threat	Table 32
PA 06-0021	Sch 3, Cond 24	Biodiversity monitoring	Non Compliant	Unable to conduct Summer monitoring activities over November/December 2019 due to Bushfire activity.	Section 6.2

Note: Compliance Status Key for Table 3

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: - Potential for serious environmental consequences, but is unlikely to occur; or - Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: - Potential for moderate environmental consequences, but is unlikely to occur; or - Potential for low environmental consequences, but is likely to occur
Administrative	Non-compliant	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

Angus Place Colliery (Angus Place) is an underground coal mining operation located approximately 5 kilometres (km) north of the village of Lidsdale, 8 km northeast of the township of Wallerawang and approximately 15 km northwest of the city of Lithgow in New South Wales (NSW). It is surrounded by Springvale Colliery to the south, Ivanhoe Colliery to the northwest and the Wolgan Valley and Newnes Plateau to the north and east respectively.

Angus Place has been in operation since 1979 and is operated by Centennial Angus Place Pty Ltd which is owned by Centennial Springvale Pty Ltd. Angus Place utilises the longwall retreat method of mining to extract coal from the Lithgow Seam, within Mining Lease (ML) 1424 and Consolidated Coal Lease (CCL) 704.

In response to the prolonged downturn in international coal markets, a decision was made by Centennial Coal to commence 'care and maintenance' at Angus Place following the completion of secondary extraction within Longwall 900W. Angus Place completed secondary extraction of the longwall panel on 15 February 2015 and the mine was placed in 'care and maintenance' on 28 March 2015. To increase the operational efficiency of the neighbouring Springvale Mine (Springvale), two development crews and some mining equipment were redeployed. While on 'care and maintenance', Angus Place will continue to meet safety and environmental regulations and the site will be

appropriately maintained to enable a reopening when the Springvale reserves have been extracted or if market conditions improve.

Angus Place's existing Project Approval (PA) 06_0021 was granted on 13 September 2006 pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act), and provided for extension of the mining area with a production limit of 3.5 million tonnes per annum of coal from the Lithgow seam. Five modifications to PA 06_0021 have since been approved:

Modification 1 – Two additional longwall panels (910 and 900W) and an increase in production to 4 million tonnes per annum.

Modification 2 – Construction and operation of an additional ventilation facility on Newnes Plateau.

Modification 3 – Longwall panel 980 and 900W geometry changes.

Modification 4 – Development continuity

Modification 5 – Operation of Angus Place Water Treatment Plant

The main components of Angus Place's operations are an underground longwall mine and development panels with supporting surface infrastructure situated at the Angus Place pit top area and on the Newnes Plateau.

On 18 November 2013, Centennial Angus Place lodged a State Significant Development Application (SSD 5602) with the NSW Department of Planning and Environment. Assessment of this project is currently ongoing.

This Annual Review relates solely to the reporting period 1 January 2019 to 31 December 2019.

Table 4. Environmental Management Contact Details

Name	Position	Email	Phone
Jacques le Roux	Mine Manager	Jacques.leRoux@Centennialcoal.com.au	(02) 6354 8721
Diana Barnes	Environment and Community Co-ordinator	Diana.Barnes@Centennialcoal.com.au	(02) 6354 8723
Community Information and Complaints Line			(02) 6354 8700

3. APPROVALS

Table 5 includes a list of all of the environmental approvals held by Centennial Angus Place under the EP&A Act, Mining Act, POEO Act, NPW Act, Water Act, Water Management Act, Radiation Act, and any changes made to these approvals during the reporting period.

Table 5. Approvals held by Angus Place

Approval	Changes During the Reporting Period
Development Consent	
PA 06_0021 (MOD 5, 14 th Sep 2018)	Yes (MOD 5, 14 th Sep 2018)
EPBC Approval	
EPBC 2011/5952	No
Mining Operations Plan	
Care and Maintenance Mining Operations Plan (June 2019 to April 2023)	Yes- amendment B
Mining Leases	
CCL 704	No
Part ML 1424	No- Note Shared with Springvale
ML 1699	No
ML 1720	No
Environment Protection Licence	
EPL 467	Yes- Dust monitoring updated along with minor clause updates.
Subsidence Management Plans/Extraction Plans	
SMP Approval 04/1675	No
Extraction Plan Approval 12/15868	No
SMP Approval OUT14/10918	No
Water Licences	
WAL36445	No
WAL36449	No- With Department for Modification
WAL37340	No
WAL37343	No
WAL41881	No
WAL36383	Yes* shared with Springvale- consumed by Springvale mine extractions
Forestry Corporation of NSW Occupation Permits	
Level 3 Occupation Permit	No
Approval Under the NSW Threatened Species Conservation Act 1995	

Approval	Changes During the Reporting Period
Section 95(2) Certificate	No
Radiation Licence	
Radiation Management Licence RML29229	No

3.1. Changes made to Approvals during reporting period

3.1.1. Mining Operations Plan (MOP)

The MOP was updated in 2019 to Modification B to incorporate a new pipeline, pump station and geotechnical boreholes to be installed from the Angus Place pit top to the raw water pipeline in the Springvale Water Treatment Plant.

3.1.2. Environmental Protection Licence (EPL)

On 9 April 2019 the EPA issued a notice of variation of licence 467. Including the following: Updated premise description at A2.1; • Updated discharge/monitoring points at P1; • approved waste to be received at L4; • updated noise limits at L5; • updated dust conditions at O3; • updated monitoring at M2; and • corrects note under M7.

3.2. Annual Review Requirements

The Annual Review has been developed to satisfy the reporting requirements of the approvals listed in Table 6.

Table 6. Annual Review Requirements

Approval	Condition No	Requirement	Where addressed in Annual Review
PA 06_0021	Schedule 5 Condition 4	By the end of March each year, or as otherwise agreed by the Secretary, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary. This review must:	
		(a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;	Section 8 &
		(b) include a comprehensive review of the monitoring results and complaints records of the development over the past calendar year, which includes a comparison of these results against the:	Section 6 , Section 7 Section 9.3

Approval	Condition No	Requirement	Where addressed in Annual Review
		i. relevant statutory requirements, limits or performance measures/criteria; ii. requirements of any plan or program required under this consent; iii. monitoring results of previous years; and iv. relevant predictions in the EIS;	
		(c) identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance;	Section 11
		(d) identify any trends in the monitoring data over the life of the development;	Section 6 & 7
		(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	Section 6 & 7
		(f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	Section 6 & 7
EIS - Statement of Commitments	SOC No. 5.10 Surface water, groundwater, geomorphology and aquatic	To better understand the groundwater linkages, within 12 months of Project Approval, a baseline groundwater monitoring program will be established for the Springvale Coal Services Site. The baseline groundwater monitoring program will include: i. Quarterly monitoring of water levels from a network of monitoring bores following the completion of construction; ii. Six monthly sampling of monitoring bores for field analysis of pH, EC and temperature and laboratory analysis on major ions, pH, EC, TDS, dissolved arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc; and An annual review so that its capacity as an accurate predictive tool can be assessed and maintained.	Section 7
	SOC No. 10.1 Rehabilitation	Within six months of Project Approval a single Rehabilitation Plan will be prepared for the entire PAA in consultation with DRE and DPI and will include the timeframes provided within this EIS, details of the	Section 8

Approval	Condition No	Requirement	Where addressed in Annual Review
		rehabilitation methods, monitoring and reporting framework. Results arising from the implementation of the program will be reported each year in the Annual Review (currently referred to as the AEMR).	
ML 1352 ML 204 ML 1319 CL 394 MPL 314	Condition 3 Mining Operations Plan and Annual Rehabilitation Report	(a) The lease holder must comply with an approved Mining Operations Plan (MOP) in carrying out any significant surface disturbing activities, including mining operations, mining purposes and prospecting. The lease holder must apply to the Minister for approval of a MOP. An approved MOP must be in place prior to commencing any significant surface disturbing activities, including mining operations, mining purposes and prospecting.	Section 8
		(b) The MOP must identify the post mining land use and set out a detailed rehabilitation strategy which: i. identifies areas that will be disturbed; ii. details the staging of specific mining operations, mining purposes and prospecting; iii. identifies how the mine will be managed and rehabilitated to achieve the post mining land use; iv. identifies how mining operations, mining purposes and prospecting will be carried out in order to prevent and or minimise harm to the environment; and v. reflects the conditions of approval under: - the <i>Environmental Planning and Assessment Act 1979</i>; - the <i>Protection of the Environment Operations Act 1997</i>; and vi. - any other approvals relevant to the development including the conditions of this mining lease.	Section 8
ML 1448 ML 564	Condition 3 Annual Environmental Management Report	(1) Within 12 months of the commencement of mining operations and thereafter annually or, at such other times as may be allowed by the Director-General, the lease holder must lodge an Annual Environmental Management	

Approval	Condition No	Requirement	Where addressed in Annual Review
		Report (AEMR) with the Director-General.	
		(2) The AEMR must be prepared in accordance with the Director-General's guidelines current at the time of reporting and contain a review and forecast of performance for the preceding and ensuing twelve months in terms of: a) the accepted Mining Operations Plan; b) development consent requirements and conditions; c) Environment Protection Authority and Department of Land and Water Conservation licences and approvals; d) any other statutory environmental requirements; e) details of any variations to environmental approvals applicable to the lease area; and f) where relevant, progress towards final rehabilitation objectives. (3) After considering an AEMR the Director-General may, by notice in writing, direct the lease holder to undertake operations, remedial actions or supplementary studies in the manner and within the period specified in the notice to ensure the operations on the lease area are conducted in accordance with sound mining and environmental practice. (4) The lease holder shall, as and when directed by the Minister, cooperate with the Director-General to conduct and facilitate review of the AEMR involving other government agencies.	
CCL 733 CL 361	Condition 4 Environment Management Reporting	The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.	
	Condition 5	The AEMR must: (a) report against compliance with the MOP;	Section 1

Approval	Condition No	Requirement	Where addressed in Annual Review
		(b) report on progress in respect of rehabilitation completion criteria;	Section 8
		(c) report on the extent of compliance with regulatory requirements; and	Section 1
		(d) have regard to any relevant guidelines adopted by the Director General;	
	Condition 6	Additional environmental reports may be required on specific surface disturbing operations or environmental incidents from time to time as directed in writing by the Director-General and must be lodged as instructed.	
PA 06_0021	Schedule 3 Section 9	The Water Balance shall: (a) include details of all water extracted, dewatered, transferred, used and/or discharged by the mine; (b) provide for the annual re-calculation of the water balance and its reporting in the Annual Review.	Section 7.2
EPBC Approval		Any annual reporting of the EPBC approval that is completed through the annual review is to be included.	Section 6.2

4. OPERATIONS SUMMARY

Table 7. Production Summary

Material	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock/ Overburden	N/A	N/A	N/A	N/A
ROM Coal	4,000,000	0	0	0
Coarse reject	N/A	N/A	N/A	N/A
Fine reject (Tailings)	N/A	N/A	N/A	N/A
Saleable product	N/A	0	0	0

4.1. Other Operations

Table 8. Operations Summary

Limits	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Comment (if applicable)
Hours of operation	24 hours a day, 7 days a week	24 hours a day, 7 days a week	24 hours a day, 7 days a week	Currently under Care and Maintenance provisions (since 28 March 2015)
Transport (road)	Up to 4 mtpa via Wallerawang Haul Road and Mt Piper Haul Road	Nil	Nil	Currently under Care and Maintenance provisions (since 28 March 2015)
LDP001 Water discharge Volume	10 ML/ Day (EPL 467)	10 ML/ Day (EPL 467)	10 ML/ Day (EPL 467) Until 8 Dec 2019	Reverse Osmosis Plant decommissioned 9.12.2019

Note: Water Extraction under Water Licences is discussed in Section 7.

4.2. Next Reporting Period

All activities within the 2019 reporting period will be undertaken in accordance with the current Mining Operations Plan approved on 25 May 2016 and its amendments.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 9. Actions from previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
ML1424 is currently referenced in both the Springvale and Angus Place AEMRs. It should be clearly identified in the Title Block of both reports that the report covers "(part) ML1424", not the full AEMR requirement for that Mining Lease.	DPE	ML1424 has now been identified as "(part) ML1424" as requested	Title Block
Table 1 - Annual Review Title Block" is to refer to the correct mine site and report type.	DPE	The name of the operation has been corrected to refer to Angus Place	Title Block

6. ENVIRONMENTAL PERFORMANCE

Table 10. Summary of Monitoring Requirement

Monitoring Type	Overview of Monitoring Requirements	Requirement of Approval / Management Plan	Annual Review Section
Air quality	8 x dust gauges (DGs) – Monthly 1 x HVAS Monthly	Western Region Air Quality and Greenhouse Gas Management Plan PA 06_0021 EPL 467	Section 6.1
Biodiversity	Terrestrial and Aquatic Ecology	Western Operations	Section 6.2.2

Monitoring Type	Overview of Monitoring Requirements	Requirement of Approval / Management Plan	Annual Review Section
		Regional Biodiversity Management Plan AP Flora and Fauna Management Plan Persoonia hindii Monitoring Management Research Program	
Heritage	As required	Western Region Historic Heritage Management Plan Western Region Aboriginal Cultural Heritage Management Plan Longwalls 900W and 910 Heritage Management Plan	Section 6.4
Meteorological Monitoring	1 weather station - Continuous	PA 06_0021 EPL 467	Section 6.5
Noise	3 x Attended noise monitoring Quarterly	Western Region Noise Management Plan PA 06_0021 EPL 467	Section 6.6
Rehabilitation	Annual	Mining Operations Plan Longwalls 900W and 910 Rehabilitation Management Plan	Section 8
Water	Discharge Water Volume and Quality – Monthly during discharge Surface water quality – monthly Underground water quality – monthly Groundwater	Angus Place Water Management Plan PA 06_0021 EPL 467	Section 7

Monitoring Type	Overview of Monitoring Requirements	Requirement of Approval / Management Plan	Annual Review Section
	monitoring – Monthly Groundwater monitoring – Bi-monthly		

6.1. Air Quality

During the reporting period, air quality at Angus Place was:

- Compliant with Project Approval 06_0021, Schedule 3, Condition 16.
- Compliant with EPL 467, Condition P1.1
- Managed in accordance with the Western Region Air Quality and Greenhouse Gas Management Plan (WRAQGGMP).
- EPL variation changed the number of depositional dust gauges required to a total of 4 after April 2019 and is reflected in the graphs.

Table 11. Description of Air Quality Monitoring

Monitor Point Reference	Description
DG-1	Depositional dust gauge- Removed April 2019
DG-2	Depositional dust gauge- Removed April 2019
DG-3	Depositional dust gauge
DG-4	Depositional dust gauge- Removed April 2019
DG-5	Depositional dust gauge
DG-6	Depositional dust gauge
DG-7	Depositional dust gauge- Removed April 2019
DG-8	Depositional dust gauge- Removed April 2019
HVAS	High volume air sampler (continuous)

Table 12. Air Quality Environmental Performance

Dust Monitor	Approval criteria	EIS / EA Predictions	Performance during the reporting period	Trend compared to previous years
DG-1	2 g/m ² /month Max Annual Average Increase	Continue to operate under levels in PA 06_0021	NA- Removed	NA- Removed
	4 g/m ² /month Total Annual Average		NA- Removed	NA- Removed
DG-2	2 g/m ² /month Max Annual Average Increase		NA- Removed	NA- Removed
	4 g/m ² /month Total Annual Average		NA- Removed	NA- Removed
DG-3	2 g/m ² /month Max Annual Average Increase		1.5	Steady
	4 g/m ² /month Total Annual Average		1.26	Slight increase
DG-4	2 g/m ² /month Max Annual Average Increase		NA- Removed	NA- Removed
	4 g/m ² /month Total Annual Average		NA- Removed	NA- Removed
DG-5	2 g/m ² /month Max Annual Average Increase		1.12	Slight increase
	4 g/m ² /month Total Annual Average		1.05	Slight increase
DG-6	2 g/m ² /month Max Annual Average Increase		1.17	Slight Increase
	4 g/m ² /month Total Annual Average		1.15	Slight increase
DG-7	2 g/m ² /month Max Annual Average Increase		NA- Removed	NA- Removed
	4 g/m ² /month Total Annual Average		NA- Removed	NA- Removed
DG-8	2 g/m ² /month Max Annual Average Increase		NA- Removed	NA- Removed

Dust Monitor	Approval criteria	EIS / EA Predictions	Performance during the reporting period	Trend compared to previous years
	4 g/m ² /month Total Annual Average		NA- Removed	NA- Removed
HVAS PM10	30 µg/m ³ Annual Average		31.32	Compliant. Although the raw data exceeded the long term average and daily limits on several occasions, this was due to environmental factors out of Centennials control including dust storms and bushfires. Under the approved Western Region Greenhouse Gas and Air Quality Management Plan, data affected by these conditions is allowed to be removed from the total Without affected data average was 7.81.
	50 µg/m ³ 24Hr Average		365- (Max 24 Hr result)	Compliant. Although the raw data exceeded the long term average and daily limits on several occasions, this was due to environmental factors out of Centennials control including dust storms and bushfires. Under the approved Western Region Greenhouse Gas and Air Quality Management Plan, data affected by these conditions is

Dust Monitor	Approval criteria	EIS / EA Predictions	Performance during the reporting period	Trend compared to previous years
				allowed to be removed from the total. Without affected data max 24 hour average result was 50.
HVAS TSP	90 $\mu\text{g}/\text{m}^3$ Annual Average		49.67	Significant increase- however it was due to bushfire activity in the region in November / December. Under the approved Western Region Greenhouse Gas and Air Quality Management Plan, data affected by these conditions is allowed to be removed from the total. Without affected data average was 14.66

Note: $2\text{g}/\text{m}^2/\text{month}$ is measured against the background dust gauge which under the Western Region Air Quality and Greenhouse Gas Management Plan is DG-3. Figure is total, (not minus DG3).

Note: Reporting style for $2\text{g}/\text{m}^2/\text{month}$ differs from 2018, showing totals rather than the total difference.

Note:

6.1.1. High Volume Air Sampler

A high volume air sampler (HVAS) is located on site at Angus Place. The sampler reads particulate matter from the atmosphere in PM₁₀ and TSP forms. The results of raw monitoring including data from days affected by dust storms and bushfires from the HVAS at Angus Place is summarised below.

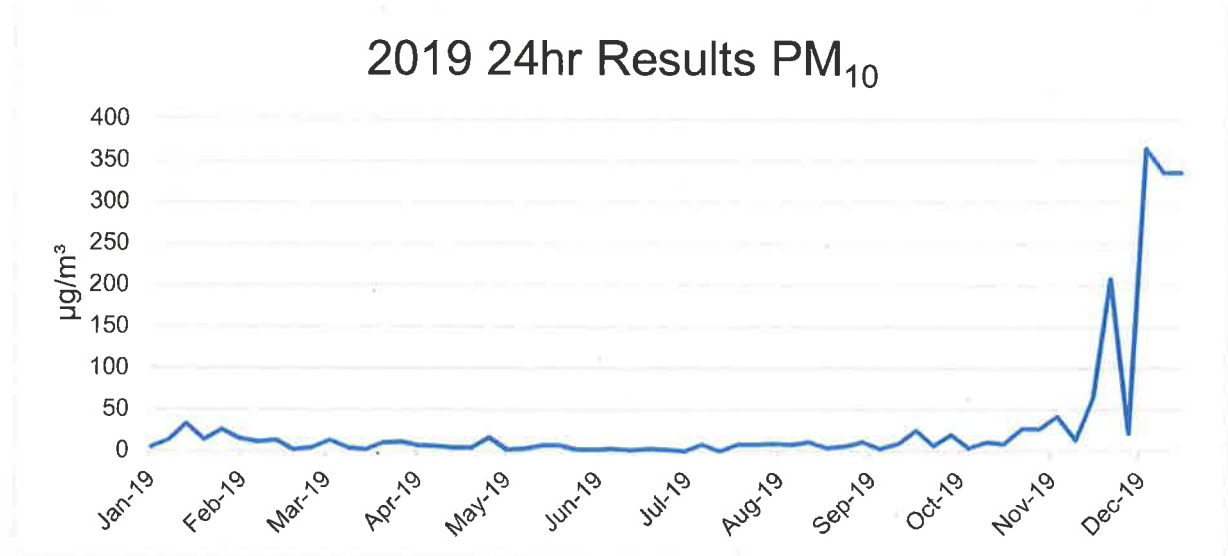


Figure 1. High Volume Air Sampler – 24hr PM₁₀ Results 2019

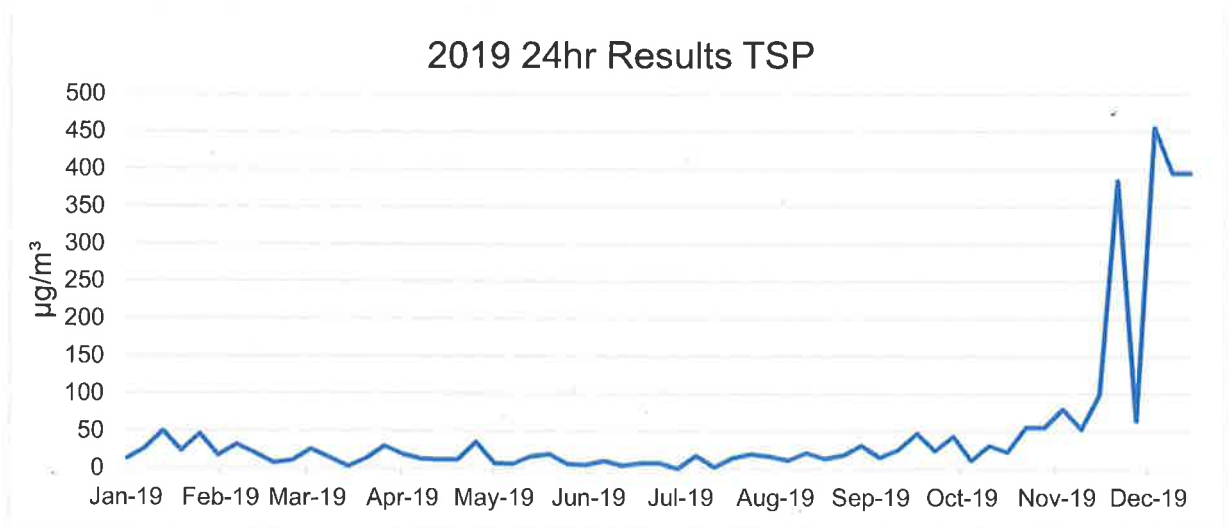


Figure 2. High Volume Air Sampler – 24hr TSP Results 2019

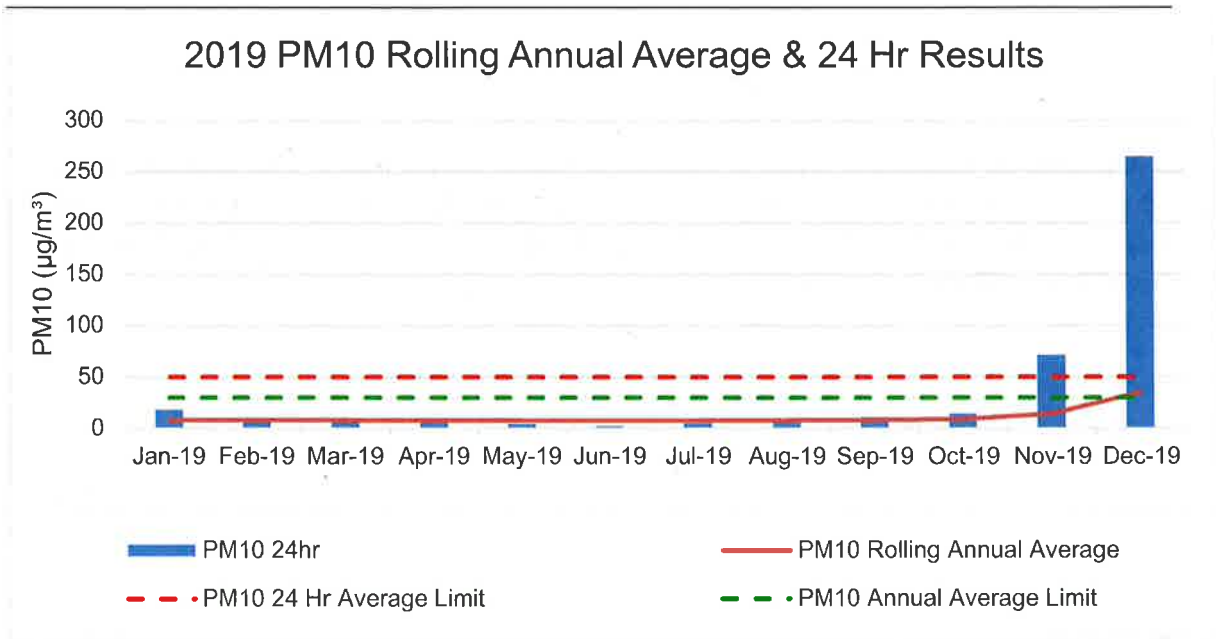


Figure 3. High Volume Air Sampler – PM₁₀ Rolling Annual Average & 24hr Results

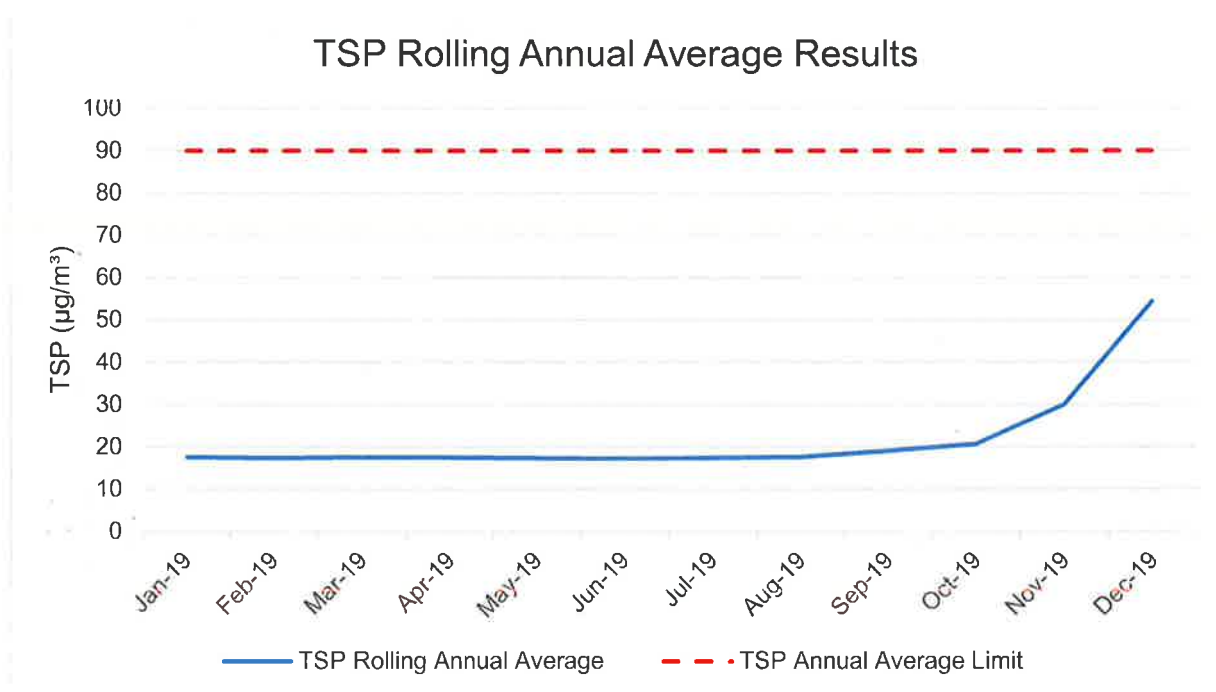


Figure 4. High Volume Air Sampler – TSP Rolling Annual Average

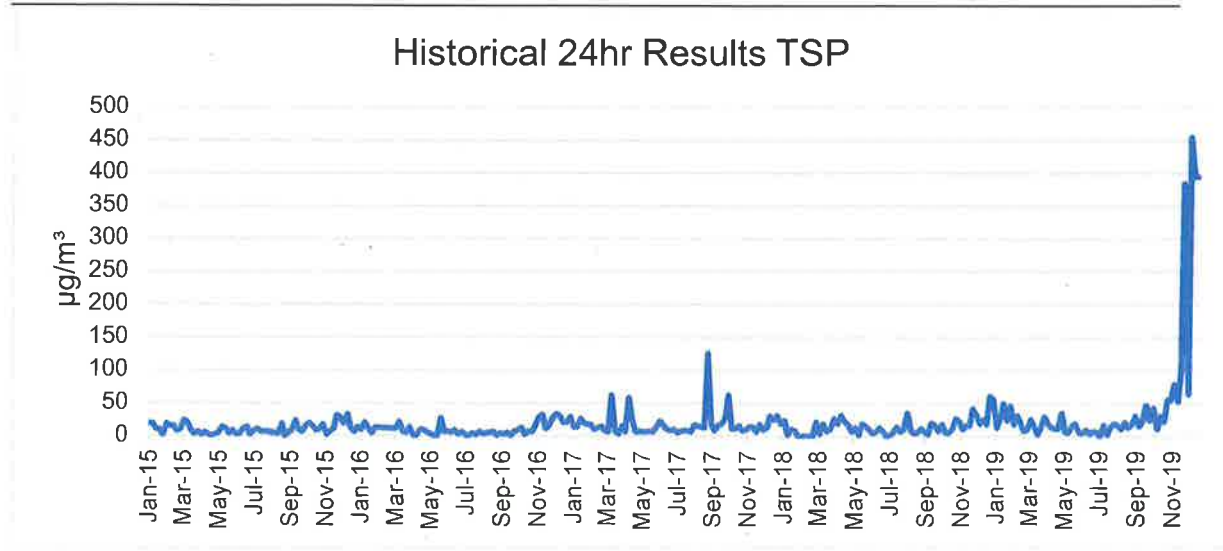


Figure 5. High Volume Air Sampler – Historical 24hr TSP Results

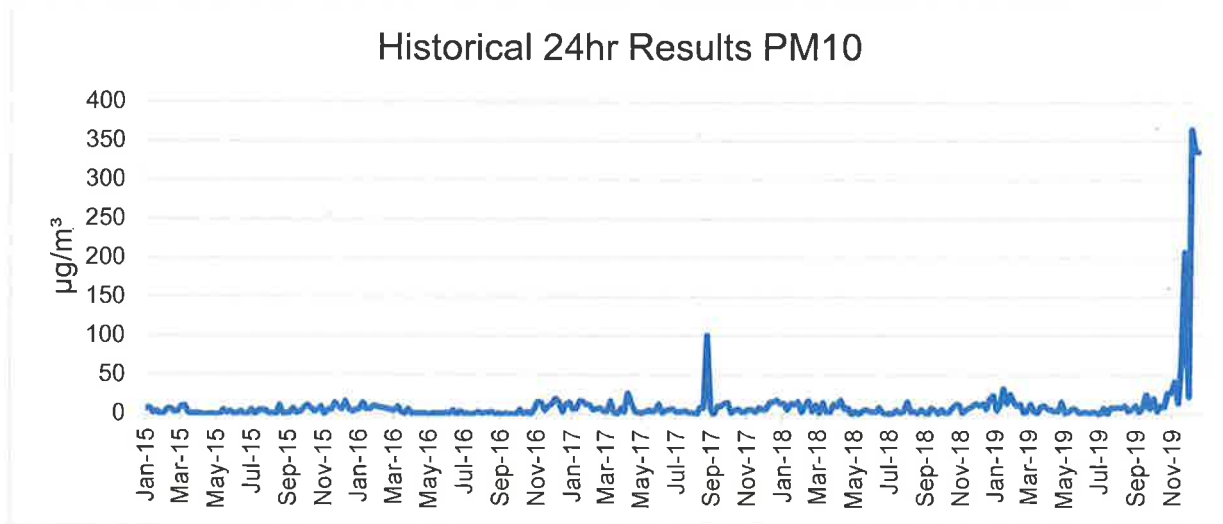


Figure 6. High Volume Air Sampler – Historical 24hr PM10 Results

6.1.2. Depositional Dust

Depositional dust is monitored at eight locations. The deposited dust limit is 4 g/m²/month at any residence on private land averaged annually. Centennial use daily dust forecast reports to determine the frequency of watering unsealed area and to schedule dust suppression activities and operational mitigation.

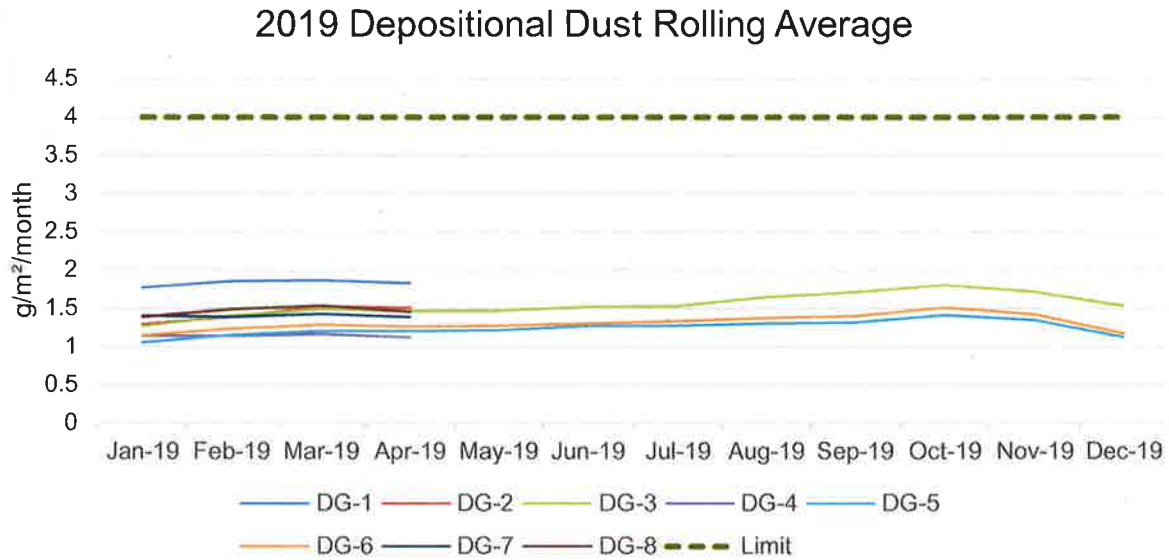


Figure 7. Dust Depositional Gauge – Rolling Annual Average

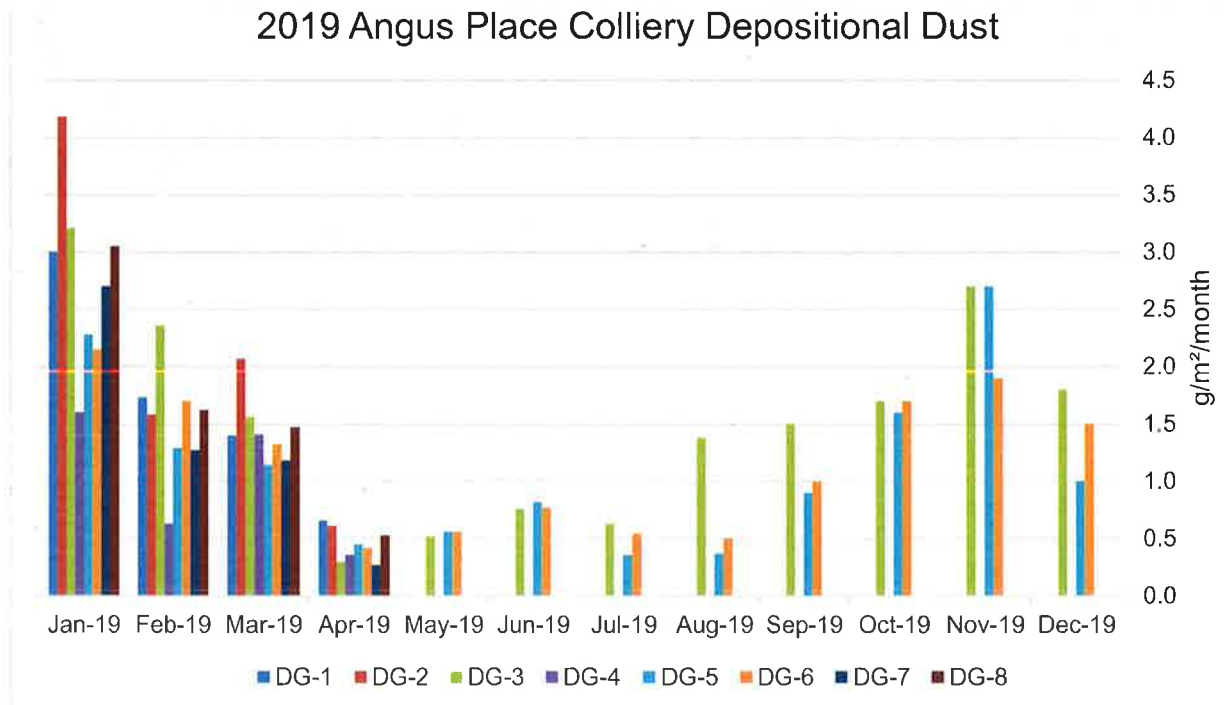


Figure 8. Dust Depositional Gauge – 2019 Monthly Results

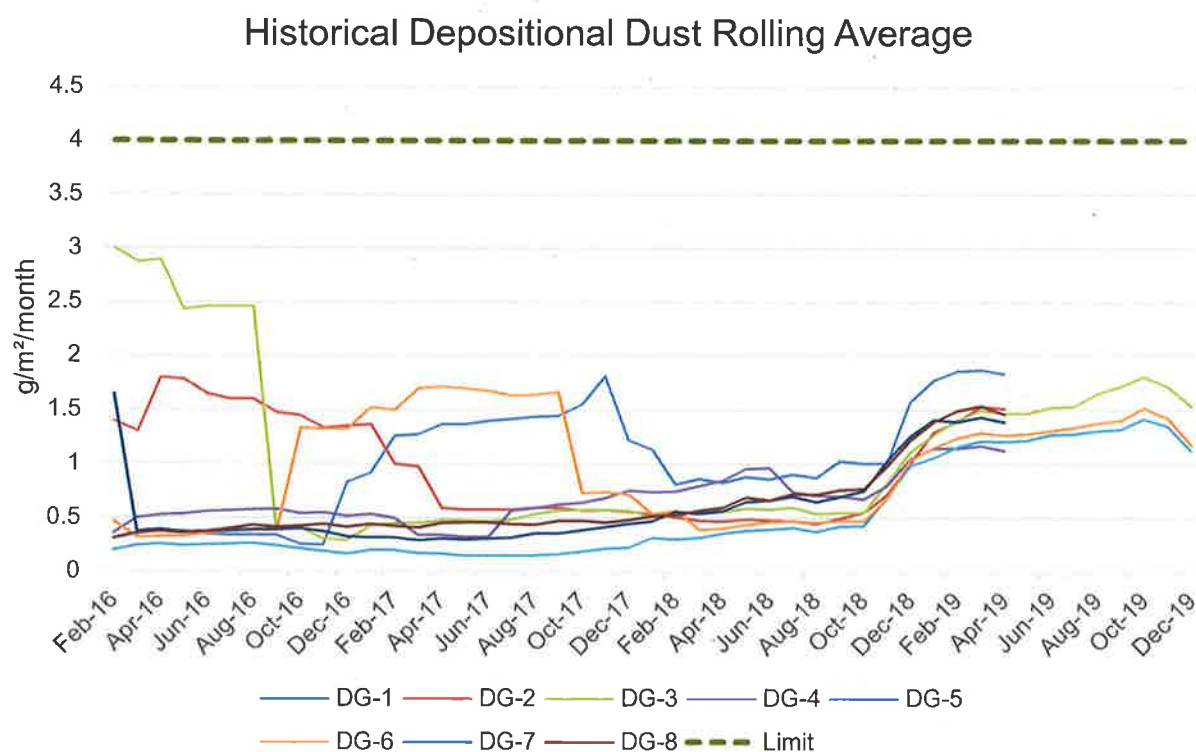


Figure 9. Dust Depositional Gauge – Historical Rolling Average Results

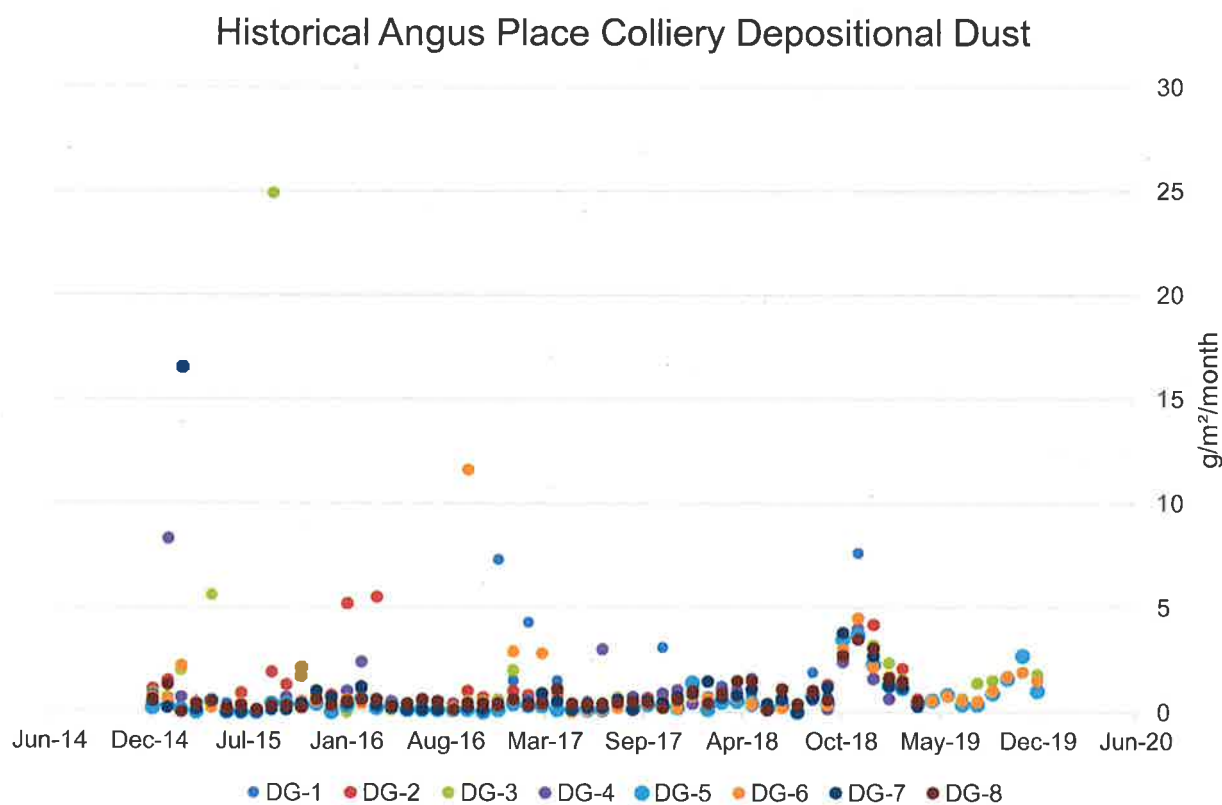


Figure 10. Dust Depositional Gauge – Historical Monthly Results

6.1.3. Air Quality Monitoring Data Interpretation

Air quality at Angus place has remained compliant with all limits in both EPL 467 and PA 06_0021. Although the raw data exceeded the long term average and daily limits on several occasions, this was due to environmental factors out of Centennials control including dust storms and bushfires. Under the approved Western Region Greenhouse Gas and Air Quality Management Plan, data affected by these conditions is allowed to be removed from the total.

Key dust mitigation measures for Angus Place Colliery operations include:

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

Air quality remained consistent throughout most of the reporting period, with elevated results for both depositional dust and HVAS samples in the latter part of 2019. This was due to hot and dry conditions, regional dust storms and bushfire activity between October and December.

No change in trend was observed historically for either HVAS or depositional dust results.

As the site is under Care and Maintenance, dust mitigation and improvement on air quality will continue to be monitored the same way in the next reporting period.

6.2. Biodiversity

During the reporting period, biodiversity (fauna and flora) at Angus Place was:

- Non Compliant with Project Approval 06_0021, Schedule 3, Condition 24. No summer monitoring was able to be undertaken due to significant regional bushfires over the summer period affecting safe access to the monitoring areas.
- Managed in accordance with the Fauna and Flora Management Plan (APFFMP).

Performance against Environmental Assessment

During the reporting period, the following recommendations discussed in the Environmental Impact Statement were complied with:

- Minimal clearing was undertaken.
- Appropriate measures were implemented to minimise erosion and sedimentation impacts upon waterways and associated vegetation. Regular monitoring was undertaken to ensure their functionality and condition.
- Weed monitoring was undertaken and potential weed infestations were appropriately managed to ensure surrounding communities were protected from invasive species.
- Aquatic ecology monitoring was undertaken.

6.2.1. Biodiversity Offsets

On 11 July 2017, Centennial Coal (Centennial) entered into a voluntary undertaking with the DPE. The Voluntary Undertaking enforces commitments made by Centennial in a letter to DPE dated 26 May 2017, to secure the biodiversity offsets by 1 April 2018 for the following development consents:

- Angus Place PA 06_0021;
- Clarence Colliery DA 504-00;
- Springvale Mine SSD_5594;
- Western Coal Services SSD_5579.

The Western Region Biodiversity Offset Strategy V7 was submitted to DPIE for approval in early 2019 and approved by DPIE in April 2019.

The biodiversity offset site Carinya Lot 163 was fenced from cattle access in mid 2018. No cattle have been present on the site since July 2018. Land management activities for pest management of dogs was undertaken in 2019 in conjunction with Local Land Services, National Parks and Wildlife Service and Centennial's tenant on the adjacent agricultural land.

6.2.2. Terrestrial Ecology

Flora and Fauna

Monitoring of flora and fauna is undertaken in accordance with the *Longwalls 900W and 910 Environmental Monitoring Programme* and *Flora and Fauna Management Plan*.

Flora Monitoring Results

Flora monitoring was conducted in summer 2018-19, and in autumn and spring 2019.

Summer 2018-19 surveys showed that the mean native species richness within plots was generally similar between impact plots (21.6 species per plot) and control plots (22 species per plot). The most native species diverse plot was recorded in Narrow swamp (29 species at NS02 and NS03), with the lowest native species richness per plot recorded from Kangaroo Creek (10 species at KC04). Mean species richness of diagnostic swamp species was slightly higher in control swamps than impact swamps, and mean cover scores for diagnostic species at control plots were slightly higher than at impact plots, especially for amphibious species such as *Empodisma minus*, *Gleichenia dicarpa* and *Grevillea acanthifolia*. In addition, the mean plant condition scores for diagnostic swamp species were consistently higher in control plots than those for the same species in impact plots. Weed species were only recorded at impact swamps, and eucalypt seedlings were below 5% cover at all locations.

Autumn 2019 surveys showed that the mean native species richness was generally similar between impact plots (23.78 species per plot) and control plots (24.5 species per plot). The most native species diverse plot was recorded in Tristar swamp (31 species at TS02), with the lowest native species richness per plot recorded from Kangaroo Creek (10 species at KC04). Mean species richness of diagnostic swamp species was higher in control swamps (10.25 species) than impact swamps (5.6 species), and mean cover

scores for diagnostic plants at control plots were slightly higher than at impact plots. Weed species cover and eucalypt seedling cover were higher in impact swamp plots than control swamp plots.

Spring 2018 surveys showed that the mean native species richness was slightly lower in impact plots (20.64 species per plot) and control plots (18 species per plot). The most native species diverse plot was recorded in Narrow swamp (28 species at NS03), with the lowest native species richness per plot recorded from Kangaroo Creek (nine species at KC04). Mean species richness of diagnostic swamp species was higher in control swamps (9.5 species) than impact swamps (5.93 species), and mean cover scores for diagnostic plants at control plots were slightly higher than at impact plots. Bare ground, weed species cover and eucalyptus seedling records were all higher in impact swamp plots.

Persoonia hindii Monitoring Results

Persoonia hindii is listed as Endangered under the *Threatened Species Conservation Act* 1995 (Repealed and replaced by the *Biodiversity Conservation Act 2016* (BC). Condition 24A (e) and (h) of the Development Consent conditions (06_0021) for Mod 2 Vent Shaft Angus Place requires the Company to undertake survey and monitoring in relation to the Endangered *P. hindii*.

Field surveys and monitoring were undertaken in September 2019. Key components of the survey and monitoring are:

- Targeted threatened flora searches to determine the distribution and extent of *P. hindii* recovery at the switch yard (ESA6), substation (ESA7), power supply corridor (ESA1, ESA2 and ESA3) and widened access track (ESA4 and 5);
- Undertake monitoring for the *P. hindii* translocation program; and
- Undertake monitoring for the *P. hindii* disturbance program.

Data from the September 2019 survey indicated that 449 *P. hindii* plants were identified in the areas previously surveyed in 2017 and 2018. This latest data suggests that there has been an overall decline in the number of *P. hindii* individuals in the area since the initial disturbance of 1,290 *P. hindii* in 2011.

In 2019, the overall success rate of all 60 translocated plants has reduced to 14.8%. Although the number of live plants increased from last year's results by one (plant 33 was found alive after 4 years of senescence), two additional planting sites were found dead during this survey (plants 19 and 60).

A comparison of success rates by translocation treatment types suggests that Treatment A (plants translocated with existing soil intact) was the most successful treatment type, providing a success rate of 43.75%, followed by Treatment B (reduced shoots and minimal soil intact) with a 10.53% success rate and; Treatment C (bare rooted) delivering only 5.88% success rate.

Disturbance monitoring revealed that in most instances the number of *P. hindii* individuals present in control plots increased in 2019 compared with 2018 survey data,

with a total of 12 more individuals counted during the 2019 survey. The total number of plants in impact plots decreased by 36 individuals in the year between 2018 and 2019 surveys. No flowering plants were found in either control or impact plots, and fruiting was generally greater in control plots.

In December 2019, the area containing the control and impact plots for *Persoonia Hindii* were affected by bushfire activity that was part of the Gospers Mountain fire.

In addition to this, the trial area under the Australian Coal Associate Program (ACARP) project #C24013 was affected and due to the bushfire, planned inspections were not possible in December 2019, affecting planned watering and installation of irrigation equipment.

Indications are that a number of the translocated plants were affected with up to 35% mortality. These will continue to be closely monitored over the 2020 period.

Continual monitoring in consideration of Condition 24A (e) and (h) of the Development Consent conditions (06_0021) for Mod 2 Vent Shaft Angus Place will provide long-term trend data and assist conservation efforts to understand the life-cycle of *P. hindii*.

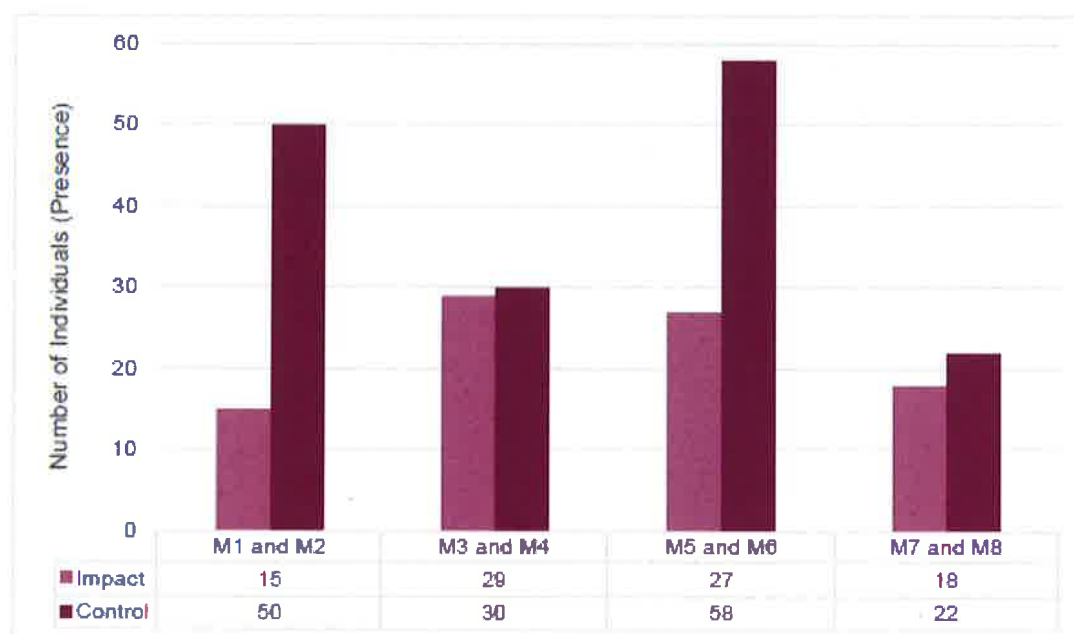


Figure 11. 900W *P. hindii* impact vs control sites 2019

Fauna Monitoring 900 Area

History

To satisfy the Conditions of Approval issued by NSW Department of Planning and Environment for Modification 1 (Mod 1) of PA 06_0021 for the development of Longwalls 900W and 910N baseline flora and fauna monitoring is required. Fauna monitoring in the area of the longwalls is part of an overall strategy to monitor any effects from mine-induced subsidence and surface infrastructure construction and operations on Newnes Plateau.

Five fauna monitoring sites were established in the longwall. These sites consist of three impact sites that sample fauna within land that could be affected by the mining, and two

control sites have been established in similar habitats close to the impact areas. Two of the sites sample swamp habitats. The remaining three sample forest habitat. These sites complement the three sites in Angus Place East (APE) Area, and four sites in Angus Place Subsidence Management Plan (SMP) Area.

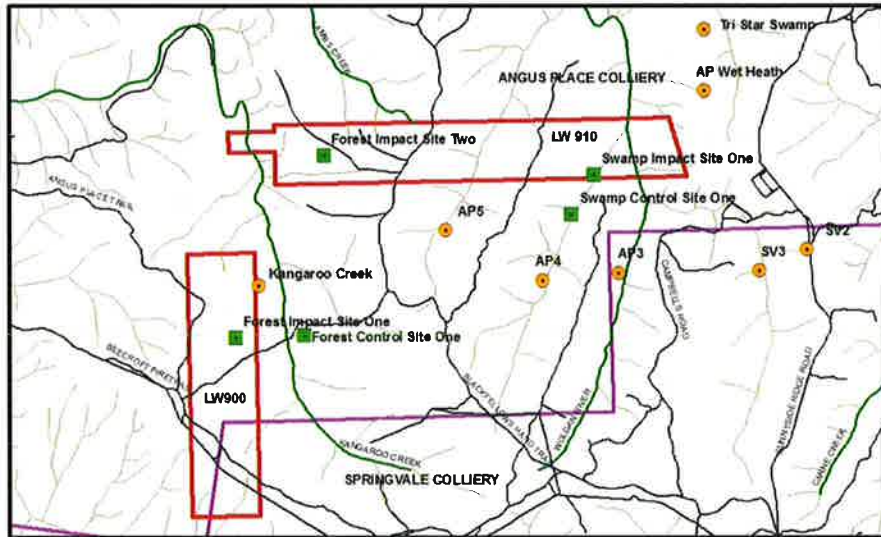


Figure 12. 900W and 910 longwall monitoring sites

Fauna Monitoring Results- 900 Area

Autumn and spring seasonal surveys were undertaken in 2019. Summer 2019-2020 surveys for Angus Place were unable to be undertaken as access to the plateau was denied due to the extreme fire conditions experienced over summer. An assessment of site condition and access will be made prior to autumn 2020 surveys. According to fire mapping it appears all three sites were burnt around the 9th December 2019, but all data used in this report is pre-fire.

The results from the survey of the Angus Place Colliery 900W/910N Area in 2019 show that the fauna assemblage is similar to that recorded from other areas within Angus Place Colliery and Newnes Plateau, with similar species richness values and similar species located. It is expected that the number of new species located each year will level out and the final maximum species richness for the area can be estimated from the value of the asymptote. By 2019, 80 bird, 31 native mammal, 13 reptile and 6 amphibian species have been located within the 900 Area.

The results from the survey of the Angus Place Colliery 900W/910N Area in 2019 show that the assemblages found are typical of that found throughout Newnes Plateau and are similar to that obtained in the remainder of Angus Place Colliery. The timing of the survey was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed, though extreme fire conditions caused the cancellation of summer target surveys. Most diversity parameters have remained stable over time. Reptile and amphibian Simpson's diversity have fluctuated wildly over time, but species richness has also remained relatively stable. Reptile diversities seem to be on the decline in the last two years, but this could be due to the dry survey conditions experienced. Mammal trapping rates are rising from lows seen in 2015, as are the number of threatened species. 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. There is now sufficient data accumulated to provide annual population estimates for all groups of fauna. Surveys from 2020 will likely focus on recovery of faunal communities post fire.

Twelve threatened species were located during the 2019 surveys, as well several bird species dependent upon woodland habitats. Threatened species included Eastern Pygmy-possum, Greater Glider, Yellow-bellied Sheath-tailed Bat, Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat (formerly Eastern Bentwing-bat), White-throated Needletail, Gang-gang Cockatoo, Powerful Owl, Varied Sittella, Scarlet Robin and Flame Robin. Their locations are shown in Figure 5-8. This is an increase in the diversity of threatened species since the surveys began. Woodland-dependent and declining birds have remained relatively stable with a slight decline occurring over the last three years.

At this stage there are no significant differences between the habitat characteristics and fauna assemblages found within the control and treatment sites, indicating no discernible impact from underground mining.

*Fauna Monitoring Results- SMP Area**History*

Long term fauna monitoring sites have been established within the original SMP Application area.

Since 2006, sites comprising the Angus Place SMP Area include:

- 1) AP3 - A swamp in a steep sided gully on the eastern arm of Wolgan River sampling Newnes Plateau Shrub Swamp community. The survey site was beside the watercourse and sampled a dense layer of ferns, shrubs and reeds, as well as some of the fringing Newnes Plateau Woodland. AP3 is on the eastern boundary of the Angus Place SMP Area and the western edge of the Springvale SMP Area. AP3 is about 500m southeast of the start of Longwall 950 which was undermined in 2008, and 250m east of the start of Longwall 960 which was undermined in 2010.
- 2) AP4 - A narrow swamp associated with the central arm of Wolgan River sampling Newnes Plateau Shrub Swamp community. The survey site was beside the watercourse and sampled a dense layer of ferns, shrubs and reeds, as well as some of the fringing Newnes Plateau Woodland. Undermining may not have occurred under AP4 but the site is likely to be within the influence of subsidence.
- 3) AP5 - A Newnes Plateau Clay Swamp located at a vegetation monitoring site on West Wolgan Swamp. The site is surrounded by Newnes Plateau Woodland. The main swamp area contains low shrubs, grasses and forbs with a dense ground cover of dead reeds etc.
- 4) Kangaroo Creek - A narrow swamp formed by Kangaroo Creek. The site is downstream from a road crossing and, although dry within the survey site, it is next to a pool of water that is fed by a spring. The main vegetation is Newnes Plateau Shrub Swamp community comprising a dense layer of ferns, shrubs and reeds, as well as some of the fringing Newnes Plateau Woodland.

Fauna Monitoring Results –SMP Area

The configuration of survey sites established in previous years adequately samples the two major environments within Angus Place SMP Application Area i.e. woodland 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, including new records for the Newnes Plateau region. In addition, there are several sites sampling land in the New Area on Newnes Plateau that have not been undermined and can provide data on control conditions. Data is also available from fauna monitoring surveys for Panels 900W/910N that can be used to provide a relatively large database for all of Angus Place Colliery.

The results from the survey of the Angus Place SMP Area in 2019 show that the assemblages found are typical of that found throughout Newnes Plateau and are similar to that obtained in the remainder of Angus Place Colliery. The timing of the survey was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed, though extreme fire conditions caused the cancellation of summer target surveys. There were few statistical differences found in diversities during autumn and spring, with the overall yearly data presenting a relatively stable picture. Bird, native mammal, reptile and amphibian richness are not too dissimilar to levels they were at prior to undermining of the SMP Area. Overall bird numbers were down for the last two years. Mammal trapping rates are down since the fire impacted the rest of the Plateau (though not this area). Autumn 2019 trapping rates were similar to those seen in 2012, but are still slightly less than expected. The overcast autumn and spring survey conditions resulted in lower reptile richness this year, though Simpson's diversity is within the expected range. 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. There is now sufficient data accumulated to provide annual population estimates for all groups of fauna. Surveys from 2020 will likely focus on recovery of faunal communities post fire.

Seven threatened species were located during 2019, as well several bird species dependent upon woodland habitats. Threatened species included Greater Glider, Yellow-bellied Sheath-tailed Bat (possible call), Eastern False Pipistrelle, Large Bent-winged Bat (formerly Eastern Bentwing-bat), Gang-gang Cockatoo, Scarlet Robin and Flame Robin. Their locations are shown in Figure 5-8. This is an increase in the diversity of threatened species since the surveys began, though a number of these species have been listed since surveys began.

There are now six parameters that can be used to track changes in the biodiversity at Angus Place Colliery and these have been used successfully in this report. The conclusion from the seasonal and yearly analyses is that, at present, there appears to be no evidence of potential impacts from subsidence upon the fauna diversity in the Angus Place Colliery SMP Area.

*Fauna Monitoring Results- Angus Place East Area**History*

Three sites are monitored for the Angus Place East extension area. These are:

- 1) Wet Heath - An area of low heath surrounded by woodland at the top of a water course, north of an old pine plantation. During wet seasons, the area is inundated with water and the habitat could be classed as 'wet heath'.
- 2) Tri Star Swamp - This site sampled an area that contained the arms of three water courses that form swamps with Newnes Plateau Shrub Swamp. The vegetation is very thick within the swamps and water flows along the water courses (tributaries of Wolgan River). The site is surrounded by woodland on steep slopes.
- 3) North Swamp - A swamp formed along a water course near a filled in bore hole dam. The site contains woodland on the slopes surrounding the swamp and dense shrub along the creek line. Water flows along the creek downstream of the site.

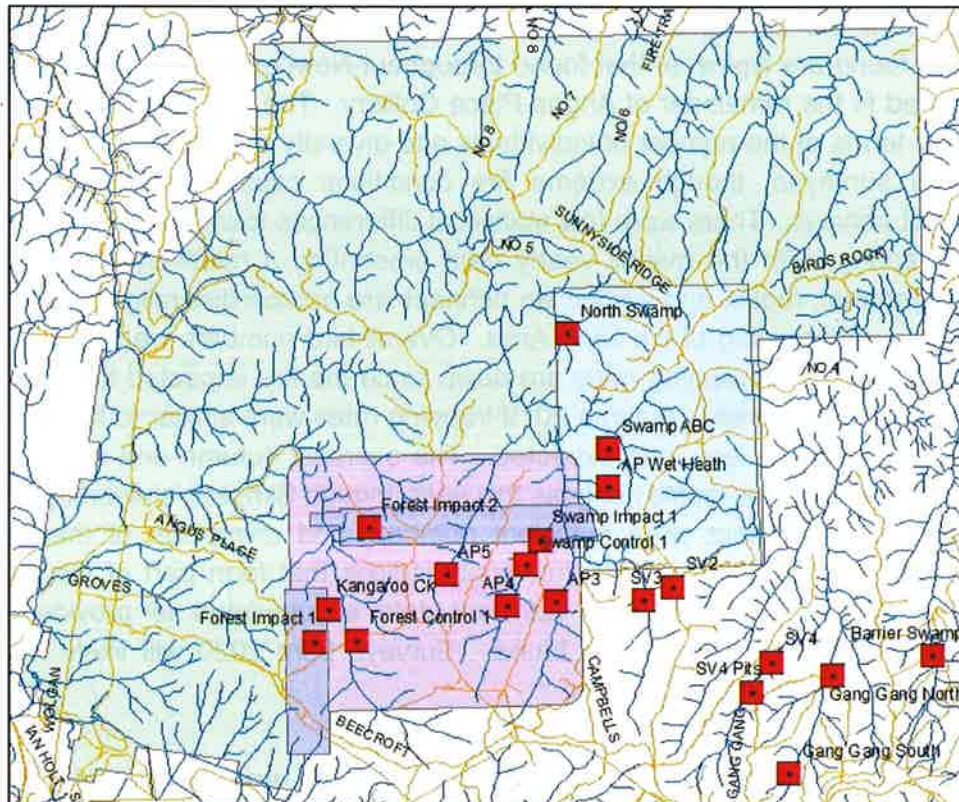


Figure 13. APE survey sites and nearby monitoring sites

Fauna monitoring results Angus Place East Area

The results from the survey of the Angus Place New Area in 2019 show that the assemblages found are typical of that found throughout Newnes Plateau and are similar to that obtained in the remainder of Angus Place Colliery. The timing of the survey was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed, though extreme fire conditions caused the cancellation of summer target surveys. Most diversity parameters have remained stable over the long term, except native non-bat mammal richness which has dropped in the last three years. Woodland dependent and declining bird species have shown the same decline over 2017-2019. Most diversity parameters that have remained within levels of expected variation still declined since 2018. This is not surprising considering the rainfall deficit since January 2017. Mammal trapping rates are good, as are the number of threatened species. 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. There is now sufficient data accumulated to provide annual population estimates for all groups of fauna. Weather conditions during the autumn surveys were ideal (with regard to temperature). Spring conditions were overcast (hampering reptile searches), and summer surveys were cancelled due to extreme fire conditions.

Ten threatened species were located during 2019, as well several bird species dependent upon woodland habitats. Threatened species included Eastern Pygmy-possum, Greater Glider, Greater Broad-nosed Bat (possible), Large-eared Pied Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Gang-gang Cockatoo, Varied Sittella, Scarlet Robin and Flame Robin. This is still an increase in the diversity of threatened species found when surveys began. Woodland-dependant and declining birds have been dropping slowly over time, with 2018 the lowest on record. 2019 bird Simpson's Diversity and mammal species richness (native non-bat) were the lowest since monitoring started.

Surveys from 2020 will likely focus on recovery of faunal communities post fire.

6.2.3. Aquatic Ecology

Aquatic ecology monitoring was conducted in waterways associated with Angus Place in order to determine whether Angus Place operations have influenced the health of aquatic biota in 2019. Macroinvertebrate samples were collected by GHD during autumn 2019 (4/4/19-7/4/19) and spring 2019 (11/11/19, 15/11/19) at the sites indicated in Table 2 1, as part of the integrated Upper Cocks River Catchment (UCRC) Aquatic Ecology Monitoring Program (AEMP). Water and sediment quality were tested in conjunction with macroinvertebrate monitoring.

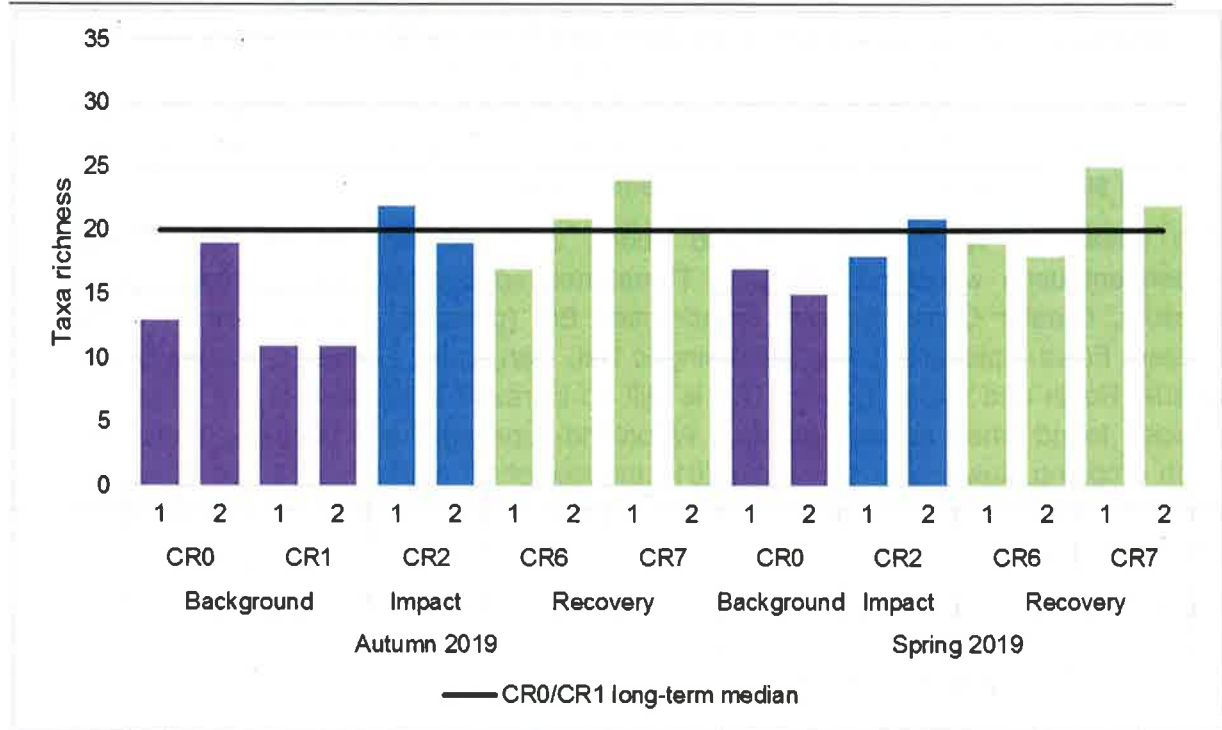


Figure 14. Taxa richness in Cocks River samples in 2019

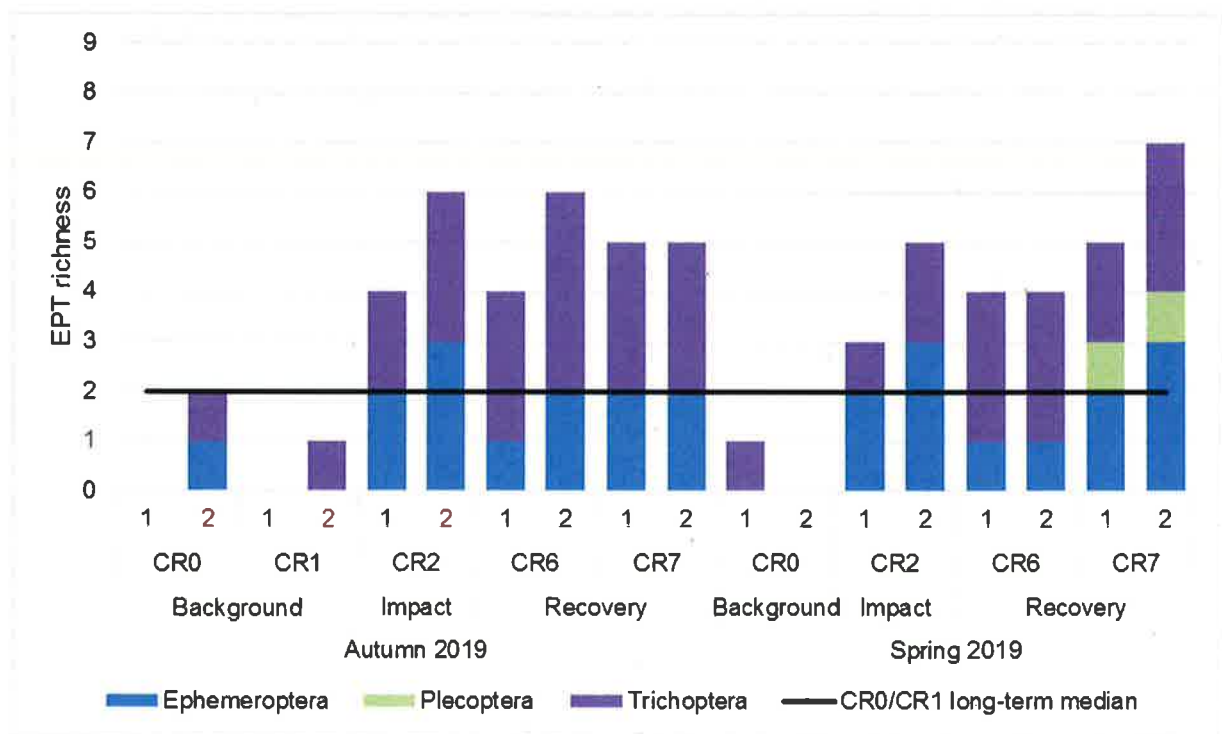


Figure 15. EPT richness in Cocks River samples in 2019

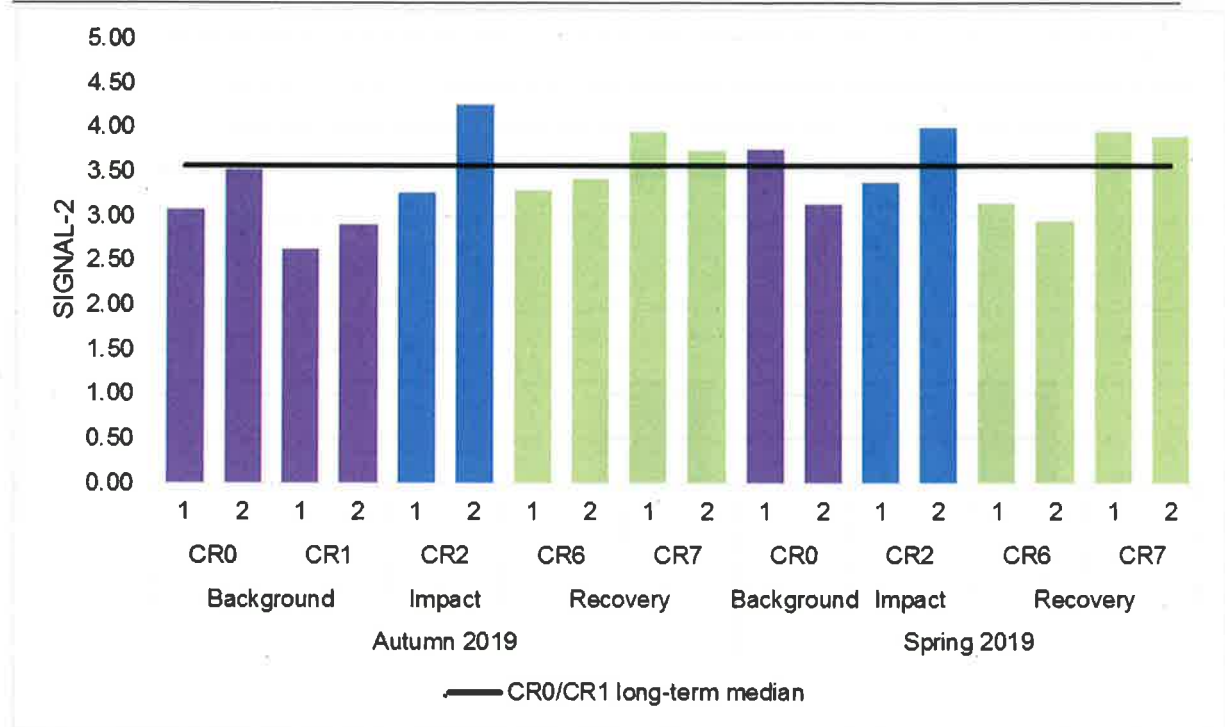


Figure 16. SIGNAL-2 in Cocks River samples in 2019

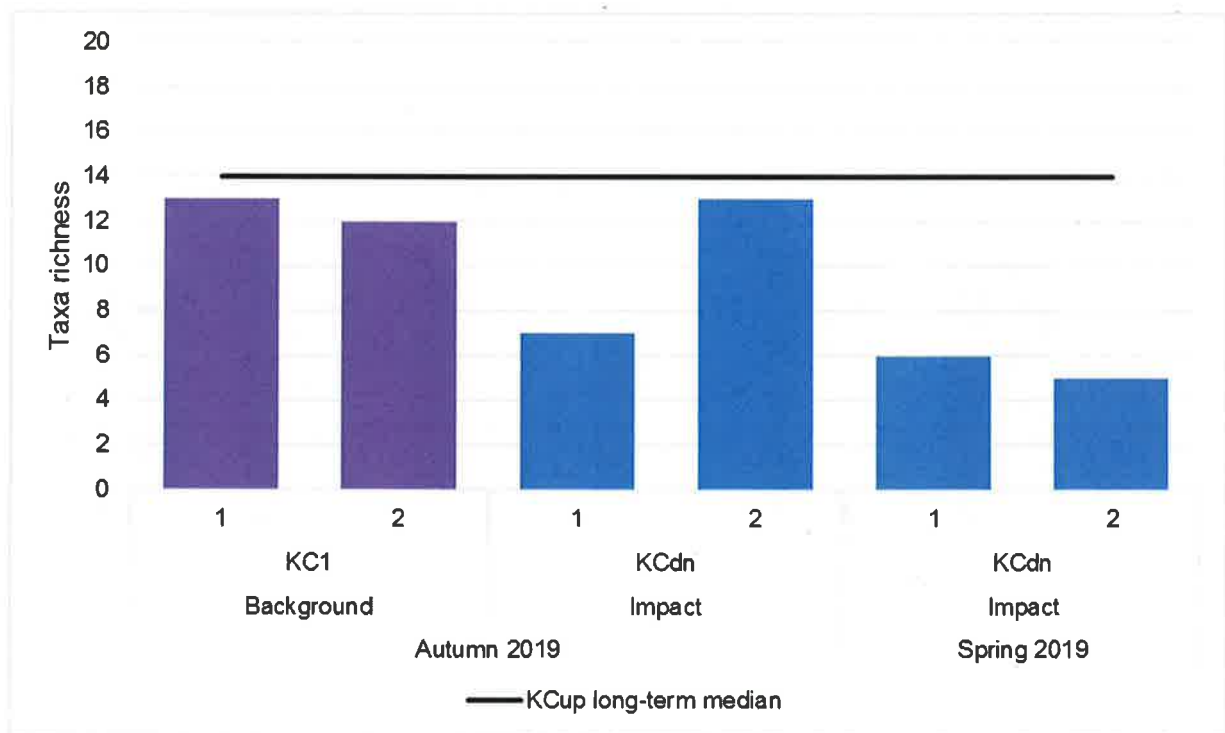


Figure 17. Taxa richness in Kangaroo Creek samples in 2019

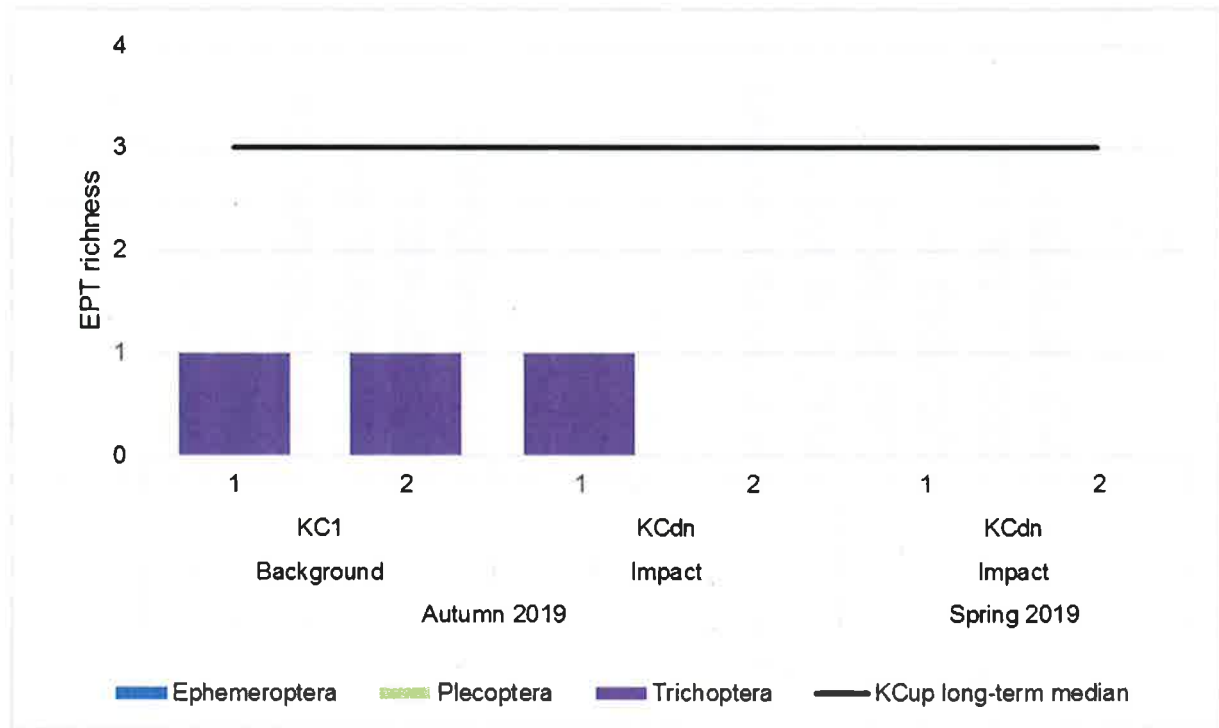


Figure 18. EPT richness in Kangaroo Creek samples in 2019

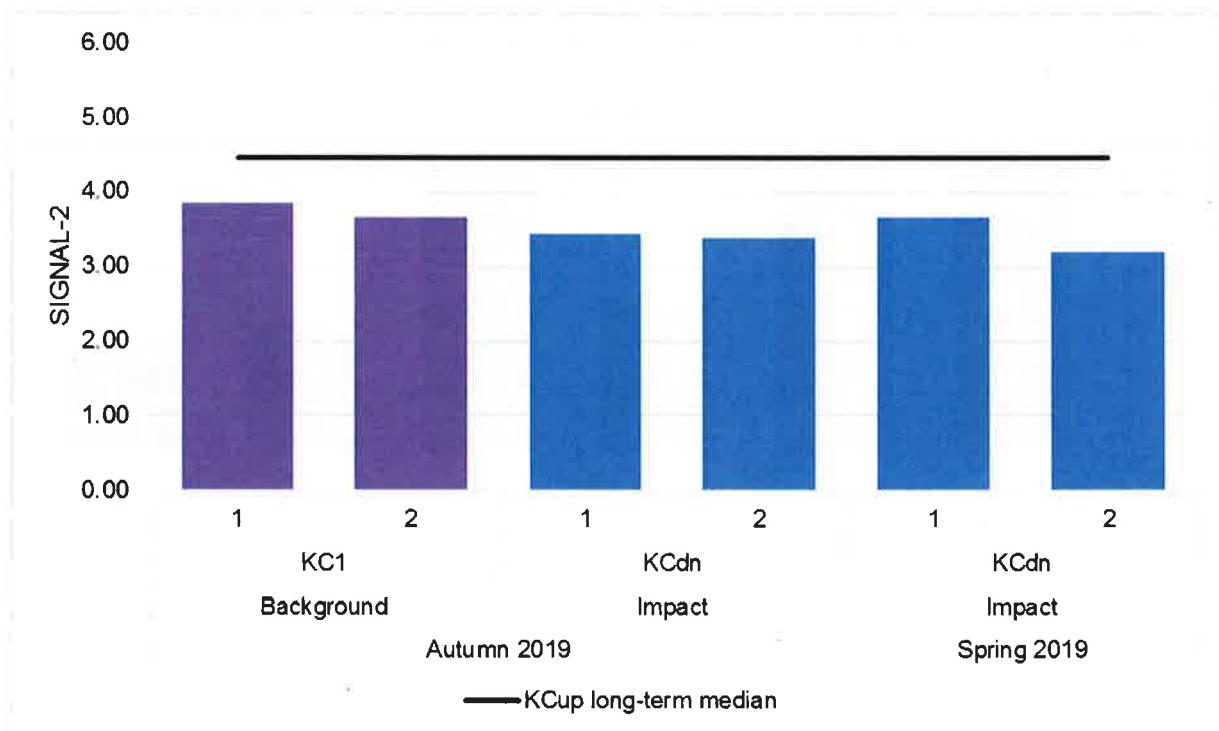


Figure 19. SIGNAL-2 in Kangaroo Creek samples in 2019

Summary of results

Based on recommendations following monitoring in 2018, Kangaroo Creek background site KCup was replaced in 2019 with KC1, located further upstream in Kangaroo Creek. KC1 was selected to avoid the probable influence of LDP1 that were occurring at KCup via shallow groundwater flows. KC1 was dry in spring 2019.

At Kangaroo Creek sites in 2019, taxa richness was generally highest at KC1, though one replicate at KCdn in autumn had the equal highest number of taxa observed between the two sites in 2019. Taxa richness was very low in both KCdn samples from spring. There was a large difference in taxa richness between replicate samples at KCdn in autumn. This is likely due to variability of the instream habitats at the site, with the E1 sample collected in sections of submerged grasses, while the E2 sample contained greater diversity of habitats, with sections of submerged woody habitat and trailing grasses sampled.

EPT richness was low in all samples collected from Kangaroo Creek in 2019. In autumn, one EPT taxon was collected in both replicates at KC1, and in one replicate from KCdn. No EPT taxa were collected in the second replicate at KCdn in autumn, or in either sample collected from KCdn in spring. The lack of EPT taxa at KCdn in 2019 may be associated with the increased discharge rates through LDP1, which reduced the availability of the slow-flowing edge habitat that many EPT taxa prefer.

In autumn, SIGNAL-2 scores were higher at KC1 than at KCdn, while SIGNAL-2 scores at KCdn in spring were more variable between replicates. All SIGNAL-2 results at Kangaroo Creek sites in 2019 were below the long-term KCup median.

Based on the results of 2019 macroinvertebrate monitoring, there was some evidence of impairment of the macroinvertebrate community at KCdn, as demonstrated by reduced richness, EPT richness and SIGNAL-2 results compared to the long-term medians for the background Kangaroo Creek site. This impairment was more likely attributable to the scouring effect of variable and turbulent flows, rather than impacts from water quality (GHD 2020).

In 2019, macroinvertebrate community health in the Coxs River at CR2, downstream of Angus Place LDPs, was improved compared to that of background sites CR0 and CR1. This was evidenced by higher taxa richness, EPT richness and SIGNAL-2 results at CR2 compared to the upstream sites. This indicates that discharges from Angus Place were not having a notable negative impact on macroinvertebrate communities in the Coxs River

6.3. Greenhouse Gas

Table 13 shows total energy consumption at Angus Place in 2016-2019.

Table 13. Total GHG Emissions from Site

Emissions Summary (CO₂-eT)	Total 2016	Total 2017	Total 2018	2019
Electricity	10,577	10,900	9,881	15,700
Diesel	108	129	113	118
Petroleum Based Oils and Greases (PBOG)	6	4	3	1
SF6	2	1	1	1
Fugitives - CH ₄	1,372	1,181	834	1036
Fugitives - CO ₂	5,317	4,206	5,741	4670
Surface Fugitive - Post Mining	0	0	0	0

Emissions Summary (CO ₂ -eT)	Total 2016	Total 2017	Total 2018	2019
TOTAL	17,382	16,421	16,573	21526

Electricity usage increased in 2019 due to the temporary reverse osmosis water treatment plant. This was decommissioned in December 2019.

6.4. Heritage (Aboriginal and non-Aboriginal)

During the reporting period, heritage at Angus Place was:

- Compliant with Project Approval 06_0021, Schedule 3, Condition 3.
- Managed in accordance with the Western Region Aboriginal Cultural Heritage Management Plan (WRACHMP) and the Western Region Historic Heritage Management Plan (WRHHMP).
- Monitored in compliance with the WRACHMP and WRHHMP.

As the heritage monitoring program associated with the Longwalls 900W and 910 Heritage Management Plan is specific to the extraction of Longwall 910 there has been no monitoring required during the reporting period. Longwall 910 is not planned to be extracted until the recommencement of mining.

6.5. Meteorological Monitoring

During the reporting period, meteorological monitoring at Angus Place was:

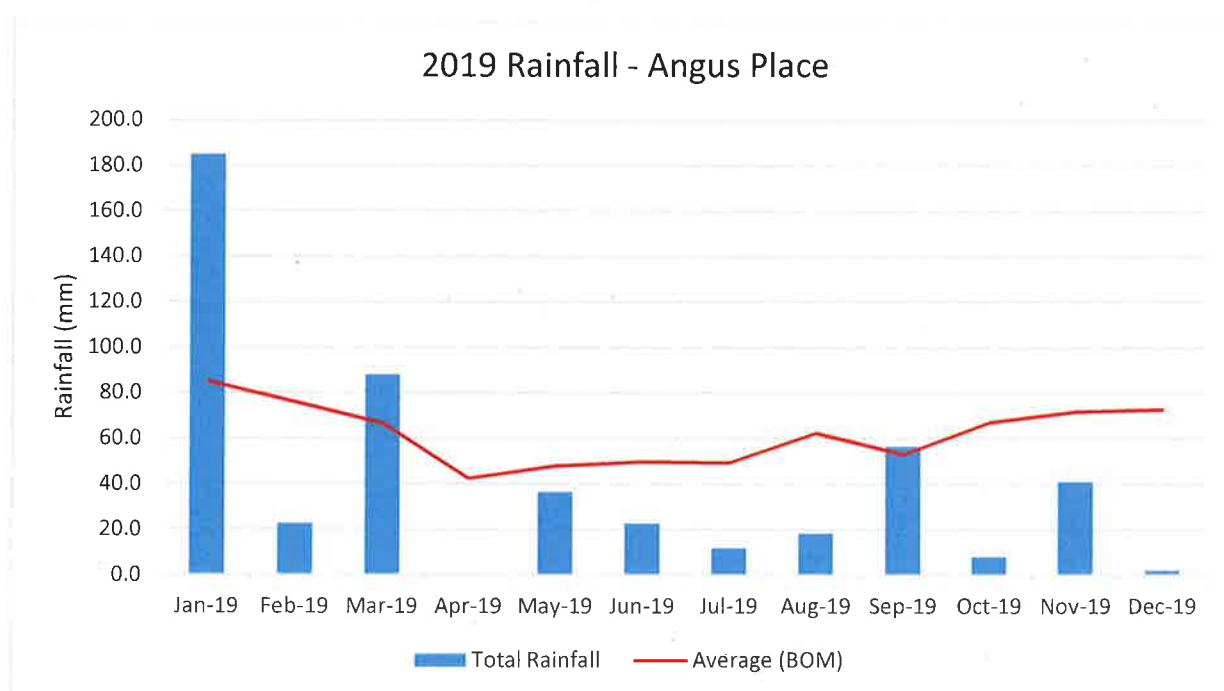
- Compliant with Project Approval 06_0021, Schedule 3, Condition 23.
- Compliant with EPL 467, Condition M4.1.
- Managed in compliance with the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.

Rainfall

The total monthly rainfall at Angus Place for the 2019 reporting period is summarised in Table 14 and Figure 20.

Table 14. Monthly Rainfall Summary

Month	Total Rainfall (mm) ¹	Average (mm) ²
January 2019	185.0	85.1
February 2019	22.6	75.9
March 2019	88.0	66.6
April 2019	0.4	42.4
May 2019	36.4	47.9
June 2019	22.6	49.8
July 2019	11.8	49.3
August 2019	18.2	62.4
September 2019	56.4	53
October 2019	8.0	67.1
November 2019	41.0	71.8
December 2019	2.2	72.8
Total	492.6	744.1

**Figure 20. Monthly Rainfall Summary**¹ Angus Place All Weather Station² BOM station 063132 Lidsdale (Maddox Lane) 1959-2019

Temperature

The minimum and maximum monthly temperature for Angus Place for the 2019 reporting period is summarised in Table 15 and Figure 21.

Table 15. Monthly Temperature Summary³

Month	Min (°C)	Max (°C)
January 2019	11.62	36.54
February 2019	6.2	32.8
March 2019	4.38	31.8
April 2019	-1.8	26.6
May 2019	-3.46	20.4
June 2019	-7.26	18
July 2019	-8.22	17.58
August 2019	-9.6	19
September 2019	-6.4	24.2
October 2019	-3	29.6
November 2019	-0.42	33.58
December 2019	2.18	44.02

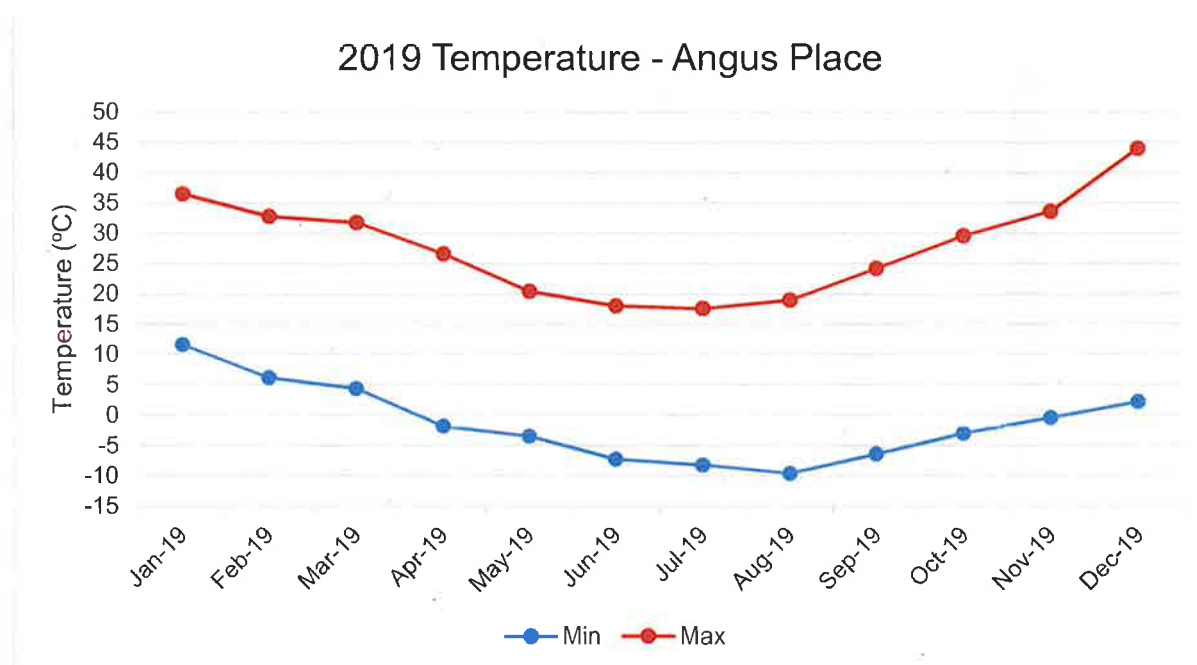


Figure 21. Monthly Temperature Summary

³ Angus Place All Weather Station

6.6. Noise

Angus Place noise monitoring was undertaken quarterly in accordance with the approved Western Region Noise Monitoring Program, as required by Schedule 3, Condition 22 of PA 06_0021.

There were no exceedances of the Project Approval criteria limits or EA predictions for PA 06_0021 Schedule 3 Section 17. Potential operational noise sources from the Pit Top facilities are limited due to the site being in care and maintenance status.

Noise monitoring at the Sharpe Residence (R1) has not recorded an exceedance of the criteria limits from 2015-2019, Noise monitoring results were variable at the Mason (West) Residence from 2015-2019, but all results were below the criteria limits. There have been four audible results recorded at Lidsdale Village (R3) during noise monitoring from 2015-2019.

Noise monitoring results recorded at the Sharpe, Mason (West) and Lidsdale Village residences are presented below in Table 18, Table 19 and Table 20 respectively.

Table 16. Noise Environmental Performance

Location	Existing Noise Compliance Limits Day LAeq (15min)	Existing Noise Compliance Limits Evening LAeq (15min)	Existing Noise Compliance Limits Night LAeq (15min)	Pre project approval range	Monitored range (2019) LAeq (15min)
APNM1 (R1) Sharpe Residence	42	38	36	62-74	IA - <30
APNM2 (R2) Mason (West) Residence	41	37	35	62-74	IA - <25
APNM3 (R3) Lidsdale Village	41	37	35	62-74	IA - 29

IA – Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location

NM – Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified

Table 17. 2019 Attended Noise Monitoring Results

Location	PA Criteria	EA Mod 1 Criteria	Q1	Q2	Q3	Q4
Day (7:00am – 6:00pm)						
APNM1 (R1) Sharpe Residence	42	40	IA	IA	IA	IA
APNM2 (R2) Mason (West) Residence	41	38	IA	<30	IA	IA
APNM3 (R3) Lidsdale Village	44	43	IA	IA	IA	IA
Evening (6:00pm – 10:00pm)						
APNM1 (R1) Sharpe Residence	38	38	IA	IA	<25	<25
APNM2 (R2) Mason (West) Residence	37	37	<30	IA	IA	<25
APNM3 (R3) Lidsdale Village	40	39	IA	IA	<25	<25
Night (10:00pm – 7:00am)						
APNM1 (R1) Sharpe Residence	36	-	<30	IA	<25	<25
APNM2 (R2) Mason (West) Residence	35	-	<30	IA	<25	<25
APNM3 (R3) Lidsdale Village	35	-	IA	IA	<25	<25

Table 18. Noise monitoring at Sharpe Residence (R1) 2015 - 2019

PA Criteria	EA Mod 1 Criteria	2015				2016				2017				2018				2019			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Day (7:00am – 6:00pm)																					
42	40	<30	IA	IA	IA	IA	30	IA	IA	IA	28	IA	IA	IA	IA	IA	IA	IA	IA	IA	AI
Evening (6:00pm – 10:00pm)																					
38	38	<30	<25	<25	IA	<30	IA	IA	IA	<30	23	IA	IA	IA	<25	IA	IA	AI	<25	<25	
Night (10:00pm – 7:00am)																					
36	N/A	<30	IA	<20	IA	<30	IA	IA	IA	IA	IA	IA	IA	<25	29	NM	NM	30	IA	<25	<25

Table 19. Noise monitoring at Mason Residence (R2) 2015 - 2019

PA Criteria	EA Mod 1 Criteria	2015				2016				2017				2018				2019					
		Q1		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Day (7:00am – 6:00pm)																							
41	38	<30	IA	IA	IA	IA	30	IA	IA	IA	IA	<30	IA	IA	IA	IA	IA	IA	IA	<30	IA	IA	IA
Evening (6:00pm – 10:00pm)																							
37	37	<30	<25	<20	IA	IA	<25	IA	IA	IA	IA	20	IA	IA	IA	NM	IA	IA	IA	<30	IA	IA	IA
Night (10:00pm – 7:00am)																							
35	N/A	<30	IA	<20	IA	<30	<25	IA	IA	<25	IA	<25	IA	IA	IA	<25	IA	IA	IA	<30	IA	<25	<25

Table 20. Noise monitoring at Lidsdale Village (R3) 2015 – 2019

PA Criteria	EA Mod 1 Criteria	2015				2016				2017				2018				2019					
		Q1		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
Day (7:00am – 6:00pm)																							
44	43	<30	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA				
Evening (6:00pm – 10:00pm)																							
40	39	<30	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	<25	IA	IA	<25				
Night (10:00pm – 7:00am)																							
35	N/A	<30	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	29	IA	IA	<25				

6.7. Subsidence Monitoring

Subsidence monitoring is no longer required to be monitored due to the time since longwall extraction occurred.

Photo monitoring continues annually to monitor cracking, flows and vegetation condition at Kangaroo Creek, Narrow Swamp, and Wolgan Swamps.

7. WATER MANAGEMENT

During the reporting period, water management at Angus Place was:

- Compliant with Project Approval 06_0021, Schedule 3, Condition 5-13.
- Not compliant with EPL 467. An exceedance of pH below the EPL 467 water quality limits for LDP001 occurred in June 2019.
- Managed in accordance with the Angus Place Water Management Plan (APWMP) completed.

Water access licences 36449 and 36383 permits the Mine to dewater the underground coal measures via a dewatering pump located at Bore 940 (located within the Sydney Basin Richmond Groundwater source). The extraction bore(s) entitles the Mine to extract an annual entitlement of 8481 ML of groundwater for the period.

Water access licences 41881, 36446, and 36445 permit the Mine to dewater the underground coal measures via in-seam pumping system (located with the Sydney Basin Cocks River Groundwater source). The extraction system entitles the Mine to extract an annual entitlement of 7472 ML of groundwater for the period.

This extracted mine water from Angus Place was via a number of ways in 2019 including:

- Discharges via Springvale LDP009 (up until June).
- Transfers to Springvale Water Treatment Plant (sporadically from June to December)
- Discharges via Angus Place LDP001 (up until December).

Table 21 identifies the water take under the water licences. It is important to note that Table 21 reports on the water year which is from 1 July to 30 June, not the calendar year.

Table 21. Water Take for the water year 2018/2019

License #	Water Sharing Plan, source and management zone (as applicable)	Entitlement	Relevant works approval	Extraction volume 2018/2019 Water Year (ML)	Comment
WAL36449	Sydney Basin Richmond Groundwater Source	2523	10WA118750	1452.7	Reduced extractions to compensate for increased extractions from Springvale Mine use of WAL36383
WAL36383*	Sydney Basin Richmond Groundwater Source	5958	10WA118750	0	WAL consumed by Springvale Mine extractions
WAL41881	Sydney Basin Coxs River Groundwater Source	1471	10WA112774**	0	
WAL36446*	Sydney Basin Coxs River Groundwater Source	3300	10WA118748	8.84	
WAL36445	Sydney Basin Coxs River Groundwater Source	2701	10WA118748	2701	

Note: Volume is reported in annual megalitres (ML)

** Shared WAL with Springvale Mine*

*** Pending determination of nominated works approval number on WAL*

7.1. Surface Water Monitoring

There is an established surface water quality monitoring program for Angus Place. The monitoring program includes a network of groundwater monitoring bores, site and surrounds surface water sampling and discharge water sampling.

The monitoring locations are shown on Plan 4 and are summarised in Table 22 below. Monitoring sites as per EPL 467 are in bold.

Table 22. Summary of Surface Water Monitoring Locations

Monitoring Reference	Point	Description / Creek Catchment
LDP001		Licensed discharge point into Kangaroo Creek
LDP002		Licensed discharge point from front carpark
LDP003		Licensed discharge point from Kerosene Vale
Carpark culvert		Dirty water drain prior to entering the Settling Ponds
Entrance Pond		Sediment pond at ventilation facility on Newnes Plateau
Entrance discharge	Pond	Entrance Pond discharge
Bungleboori		Monitored when Entrance Pond is discharging
Coxs River Far U/S		Coxs River located approximately 600 m upstream of confluence with Lambs Creek
Coxs River U/S		Coxs River located approximately 1 km upstream of confluence with Kangaroo Creek
Coxs River D/S		Coxs River located approximately 600 m downstream of confluence with Kangaroo Creek
Lambs Creek		Lambs Creek located approximately 2 km upstream of confluence with Coxs River
Kangaroo Creek U/S (AP)		Kangaroo Creek located approximately 500 m upstream of discharges from LDP001
Kangaroo Creek D/S (AP)		Kangaroo Creek located approximately 200 m downstream of discharges from LDP001
Kangaroo Creek U/S (NP)		Located in the upper reaches of Kangaroo Creek on the Newnes Plateau
Kangaroo Creek D/S (NP)		Kangaroo Creek located on Newnes Plateau approximately 2 km downstream of Kangaroo Creek U/S (NP)
KC/CR confluence		Located at the confluence of the Coxs River and Kangaroo Creek
Wolgan Upstream	River (Spanish)	Located on the Wolgan River upstream of any potential seepage from the 800 District

Steps)	
Wolgan River Downstream (Wolgah Property)	Located on the Wolgan River downstream of any potential seepage from the 800 District
Narrow Swamp U/S	Upper reaches of Narrow Swamp
Narrow Swamp D/S	Lower reaches of Narrow Swamp
Tri Star Swamp	Tri Star Swamp
Twin Gully Swamp	Twin Gully Swamp

7.1.1. Surface Water Monitoring Results

Surface water quality is monitored at 23 locations on a monthly basis. These locations encompass different catchment areas. The water is tested for a range of analytes, however the results for pH, Total Suspended Solids (TSS) and Electrical Conductivity (EC) for points associated with licensed discharge points under EPL 467 are summarised below in Table 23.

Table 23. Average Surface Water Quality 2019

Monitoring Point	pH Average	TSS Average	Electrical Conductivity Average
LDP001	7.2	5.2	572
LDP002	7.5	19	311
LDP003- no samples in 2019	NA	NA	NA
Monitoring Point 16 Wolgan River Upstream (APWRUS)	6	4	43
Monitoring Point 17 Wolgan River Downstream (APWRDS)	6.1	2.5	60
Groundwater Monitoring Point AP1801DP	7.6	97	618
Underground water quality monitoring point	7.4	2	1833

Water quality is monitored monthly during discharge as per the requirements of EPL 467 at Licenced Discharge Points (LDP) LDP001, LDP002 and LDP003 located.

Water quality results for:

- LDP001 are displayed in Table 24 and graphically in Figure 22 to Figure 35.
- LDP002 are displayed in Table 25. LDP002 results are not displayed graphically as the site only discharged on one occasion in 2019.
- LDP003 are displayed in Table 26. LDP003 results are not displayed graphically as the site did not discharge in 2019.

Table 24. LDP001 Water Quality

Pollutant	Unit of Measure	No. of Samples required by licence	No. of Samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL Limit	Exceedance (Yes/No)
Aluminium (dissolved)	mg/L	12	12	<0.01	0.003	0.02	0.45	No
Arsenic (dissolved)	mg/L	12	12	<0.001	0.003	0.002	0.024	No
Boron (dissolved)	mg/L	12	12	<0.05	0.05	0.08	0.37	No
Copper (dissolved)	mg/L	12	12	<0.001	0.001	0.002	0.007	No
Electrical Conductivity	µS/cm	12	12	251	290	327	350 ⁴	No
Fluoride	mg/L	12	12	<0.1	0.22	0.30	1.8	No
Iron (dissolved)	mg/L	12	12	<0.05	<0.05	<0.05	0.4	No
Manganese (dissolved)	mg/L	12	12	0.006	0.009	0.023	1.7	No
Nickel (dissolved)	mg/L	12	12	<0.001	<0.001	0.002	0.047	No
Oil and Grease	mg/L	12	12	<5	<5	<5	10	No

⁴ Electrical conductivity EPL concentration limit for LDP001 introduced following the operation of the Angus Place Water Treatment plant. Prior to this, there was no water quality limit on electrical conductivity concentration for discharges through LDP001.

pH	pH units	12	12	6.2	6.7	7.5	6.5-9.0	Yes
TSS	mg/L	12	12	<5	<5	10	30	No
Turbidity	NTU	12	12	0.4	1.1	2.3	40	No
Zinc (dissolved)	mg/L	12	12	<0.005	0.014	0.034	0.05	No

Table 25. LDP002 Water Quality

Pollutant	Unit of Measure	No. of Samples required by licence	No. of Samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL Limit	Exceedance (Yes/No)
pH	pH units	1	2	7.4	7.8	8.1	6.5-9.0	No
Oil and Grease	mg/L	1	2	<5	<5	<5	10	No
TSS	mg/L	1	2	122	236	349	30	No*

*Note: Condition L2.5 of EPL 467 states that limits specified under Condition L2.4 for the sediment basins identified as EPA licence discharge points 2 and 3 do not apply when the discharge occurs within five days after a rainfall event measured at the premises which exceeds a total of 44 millimetre of rainfall over any consecutive five day period.

Table 26. LDP003 Water Quality

Pollutant	Unit of Measure	No. of Samples required by licence	No. of Samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value	EPL Limit	Exceedance (Yes/No)
pH	pH units	0	0	NA	NA	NA	6.5-8.5	No
TSS	mg/L	0	0	NA	NA	NA	30	No
Turbidity	NTU	0	0	NA	NA	NA	40	No
Oil and Grease	mg/L	0	0	NA	NA	NA	10	No

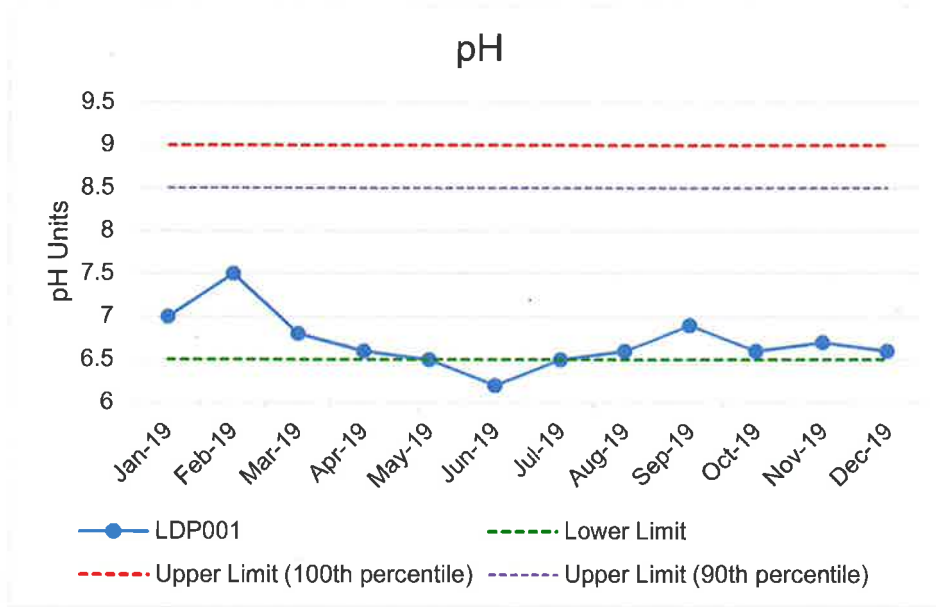


Figure 22. LDP001 2019 Water Quality Monitoring Results - pH

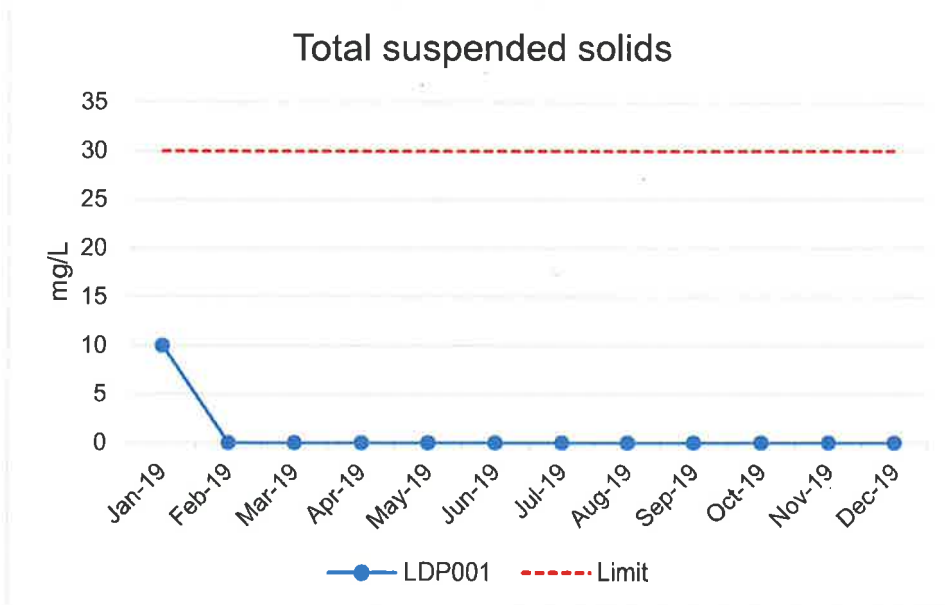


Figure 23. LDP001 2019 Water Quality Monitoring Results - TSS

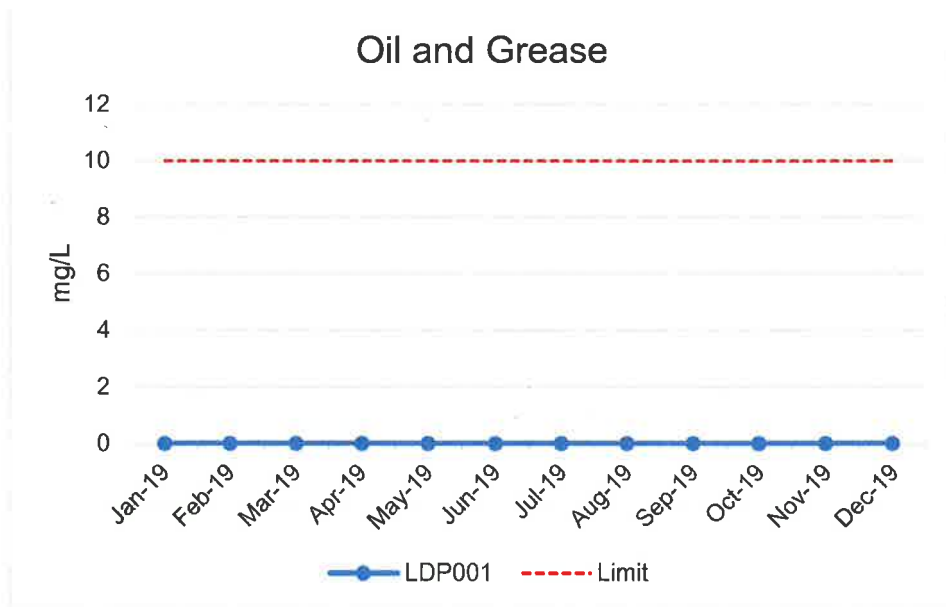


Figure 24. LDP001 2019 Water Quality Monitoring Results – Oil and Grease

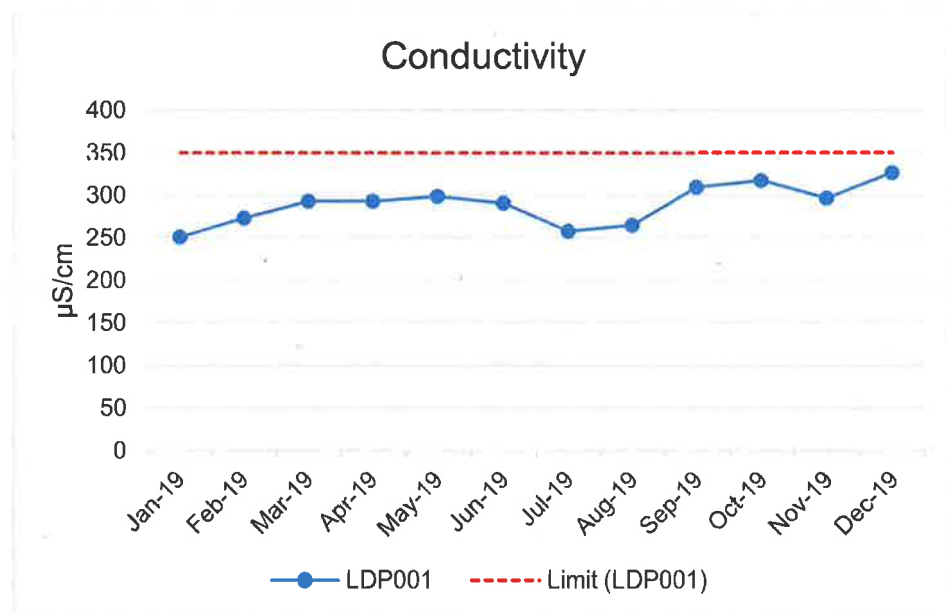


Figure 25. LDP001 2019 Water Quality Monitoring Results – Conductivity

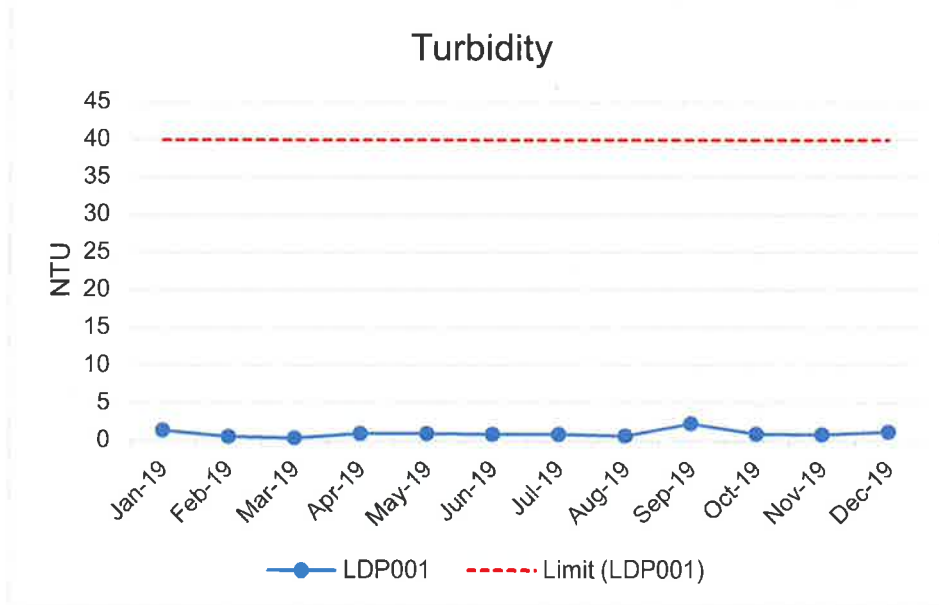


Figure 26. LDP001 2019 Water Quality Monitoring Results - Turbidity

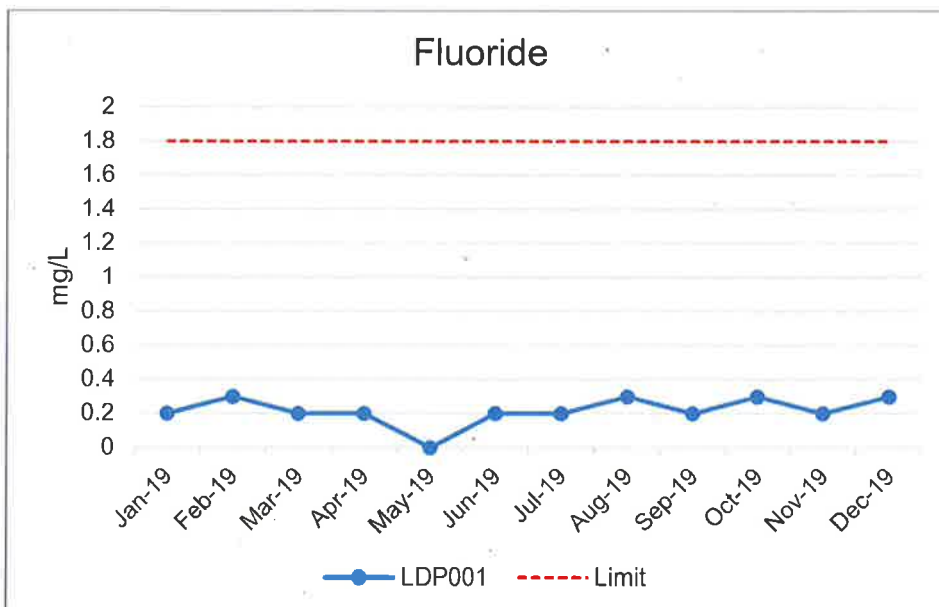


Figure 27. LDP001 2019 Water Quality Monitoring Results - Fluoride

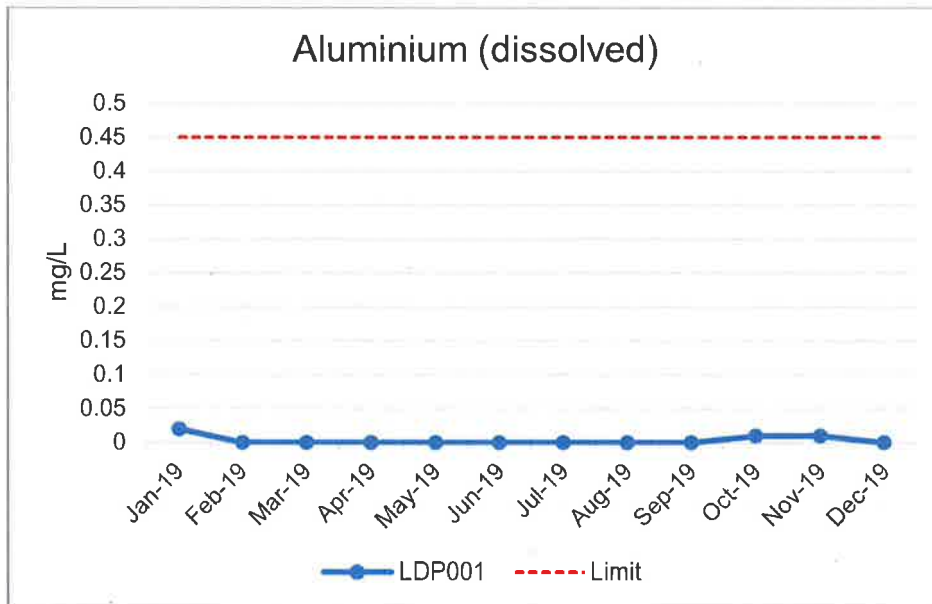


Figure 28. LDP001 2019 Water Quality Monitoring Results – Aluminium (dissolved)

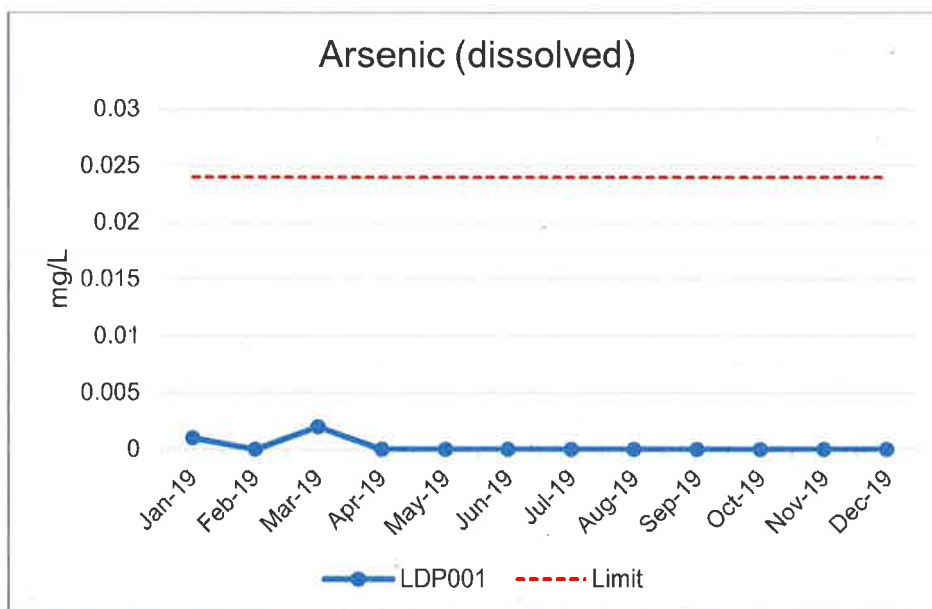


Figure 29. LDP001 2019 Water Quality Monitoring Results – Arsenic (dissolved)

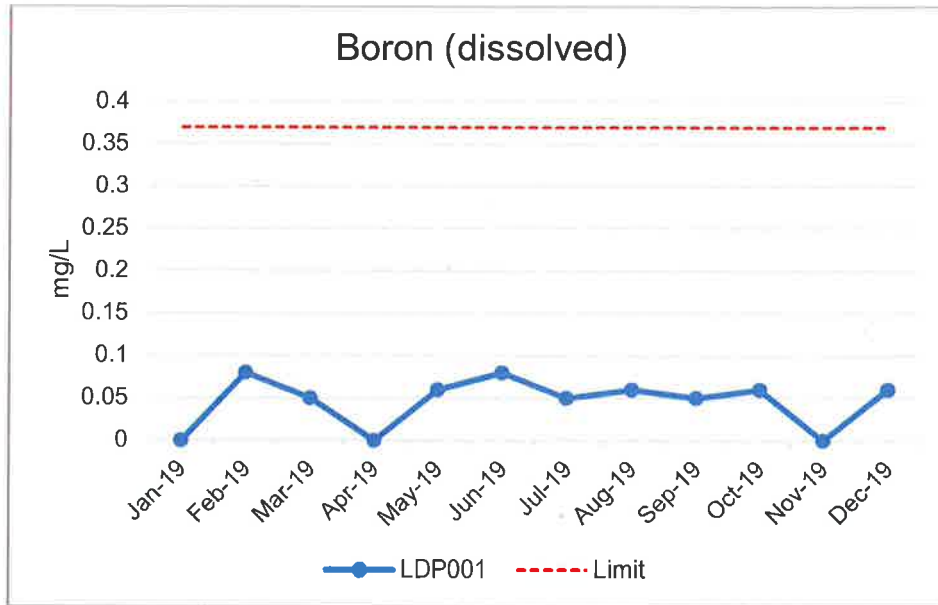


Figure 30. LDP001 2019 Water Quality Monitoring Results – Boron (dissolved)

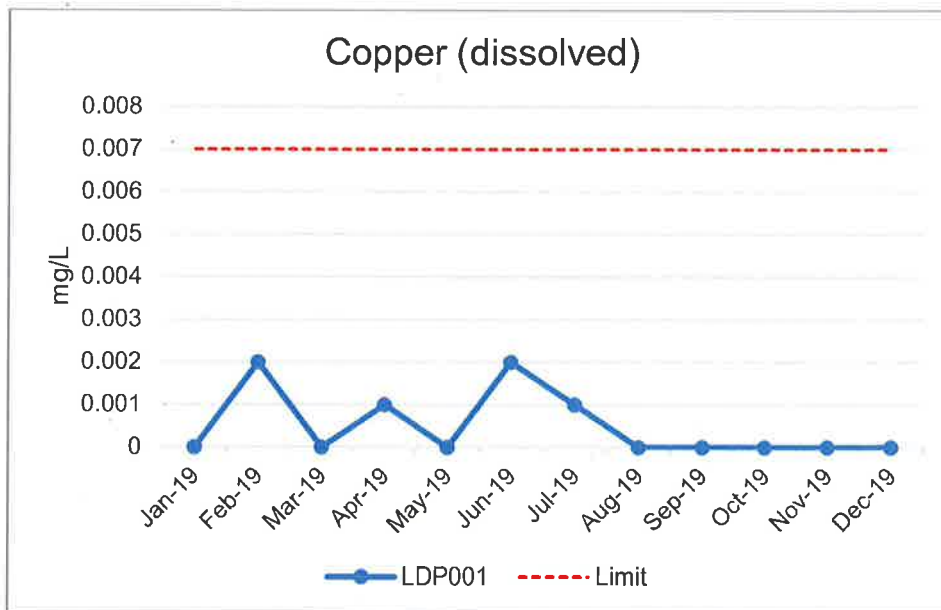


Figure 31. LDP001 2019 Water Quality Monitoring Results – Copper (dissolved)

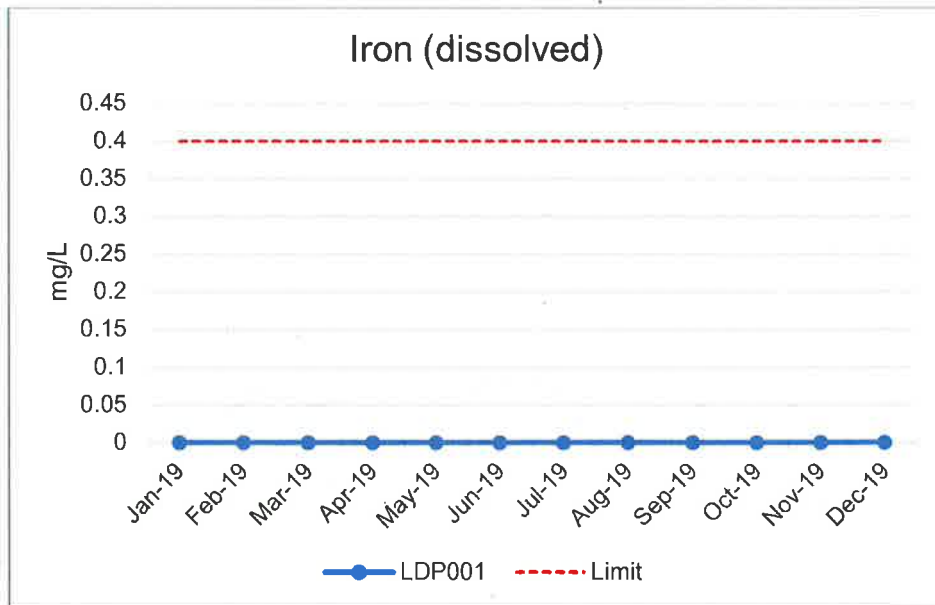


Figure 32. LDP001 2019 Water Quality Monitoring Results – Iron (dissolved)

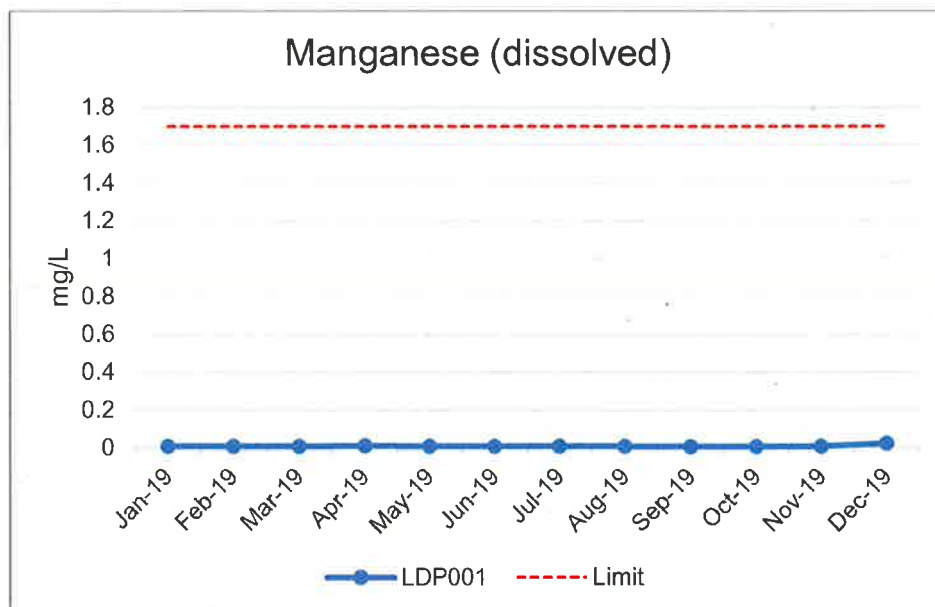


Figure 33. LDP001 2019 Water Quality Monitoring Results Manganese (dissolved)

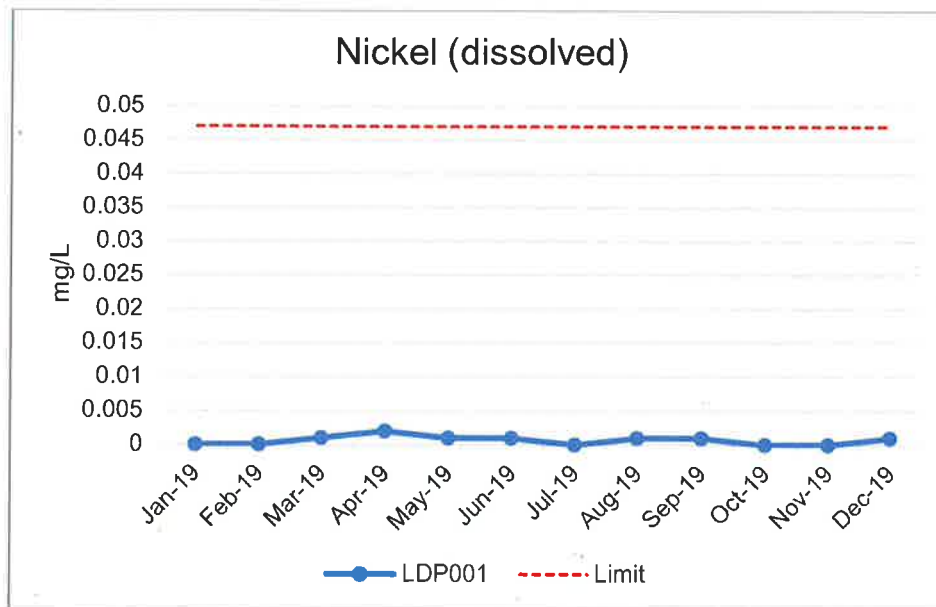


Figure 34. LDP001 2019 Water Quality Monitoring Results – Nickel (dissolved)

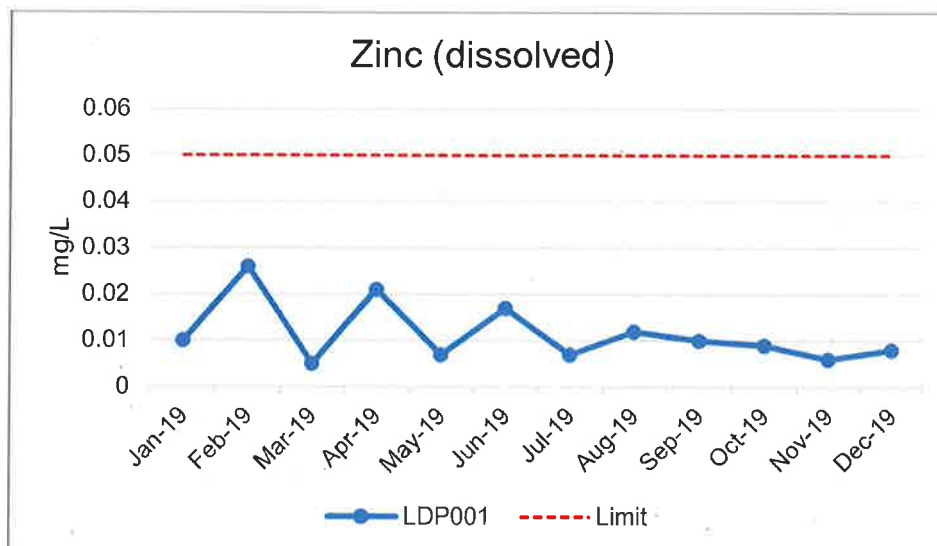


Figure 35. LDP001 2019 Water Quality Monitoring Results – Zinc (dissolved)

Water Volume is required to be monitored daily during discharge at the licenced discharge points in accordance with EPL 467. Table 27 provides the discharge volume results for the Annual Review period.

Table 27. 2019 LDP001 Discharge Volumes

	Frequency	No. of Measurements made	Lowest result (kL)	Mean result (kL)	Highest result (kL)	EPL Limit (kL)
LDP001 ⁵	Daily During Discharge	365	0	5800	9900	10000

7.1.2. Data interpretation

All water quality and water volume at Angus Place was compliant with the exception of one water quality result at LDP001.

This LDP001 exceedance was a pH reading of 6.2 against a lower limit of 6.5. pH measured at 6.2 which was lower than lower limit of 6.5. This was dissimilar to water measured at the RO Plant and deemed to be a potential error in sampling technique.

The sampling procedure reviewed and updated with the sampling contractors.

In December 2019 the Reverse Osmosis was decommissioned.

7.2. Water Balance

A site water balance model for Angus Place Colliery was developed as part of the Angus Place Mine Extension Project (GHD 2013) to quantify transfers within the site under existing and future operational conditions using various rainfall patterns. The site water balance was updated to reflect the current operational conditions as part of the assessments for Modification 5 to development consent PA 06_0021 (GHD 2018b). A schematic of the overall water management system is provided in Figure 37. The site water balance includes the relatively minor volumes of catchment runoff and discharge from LDP003 at KVSA, which were not reported in GHD (2018b) as no changes to KVSA were proposed.

A summary of the average annual inputs and outputs for the Angus Place Colliery water management system are provided in Table 28. Results are based on the predicted average site conditions currently experienced at Angus Place Colliery. Table 28 shows that, on average, water balance modelling predicts that inflows to Angus Place Colliery are almost entirely comprised of groundwater inflows. Groundwater inflows are dewatered predominately to the surface for treatment at the WTP prior to discharge through LDP001 (until start December 2019). During WTP maintenance periods, groundwater is transferred to the SDWTS via the 940 Bore. A relatively small volume of catchment runoff from the pit top is discharged mainly through LDP002.

⁵ EPL 467 Condition L3.1 requires the discharge volume at LDP001 to be no more than 10 ML per day.

Table 28. Summary of site water balance results

Water management element	Annual volume
Inputs	
Direct rainfall onto storages	2.8 ML
Catchment Runoff	41 ML
Groundwater inflows into the underground workings	** estimated cant be equal to outflow as generally there was a lot of storage within 2019 2562 ML
External potable water supply	5.2 ML
Total Inputs	
Outputs	
Evaporation	16.1 ML
Transfer to SDWTS (SWTP and LDP009)	527.12 ML
LDP001 (via in seam pump system)	2117.54 ML
LDP002 (Front gate Sediment Basins)	3.3 ML
LDP003 (KV)	0 ML
LDP005 (Sewage)	0 ML
Total Outputs	
Change in Storage	
Surface water storages	0 ML
Underground water storages	-53.1 ML
Total Change in Storage	
Balance	
Inputs – Outputs – Change in storage	0

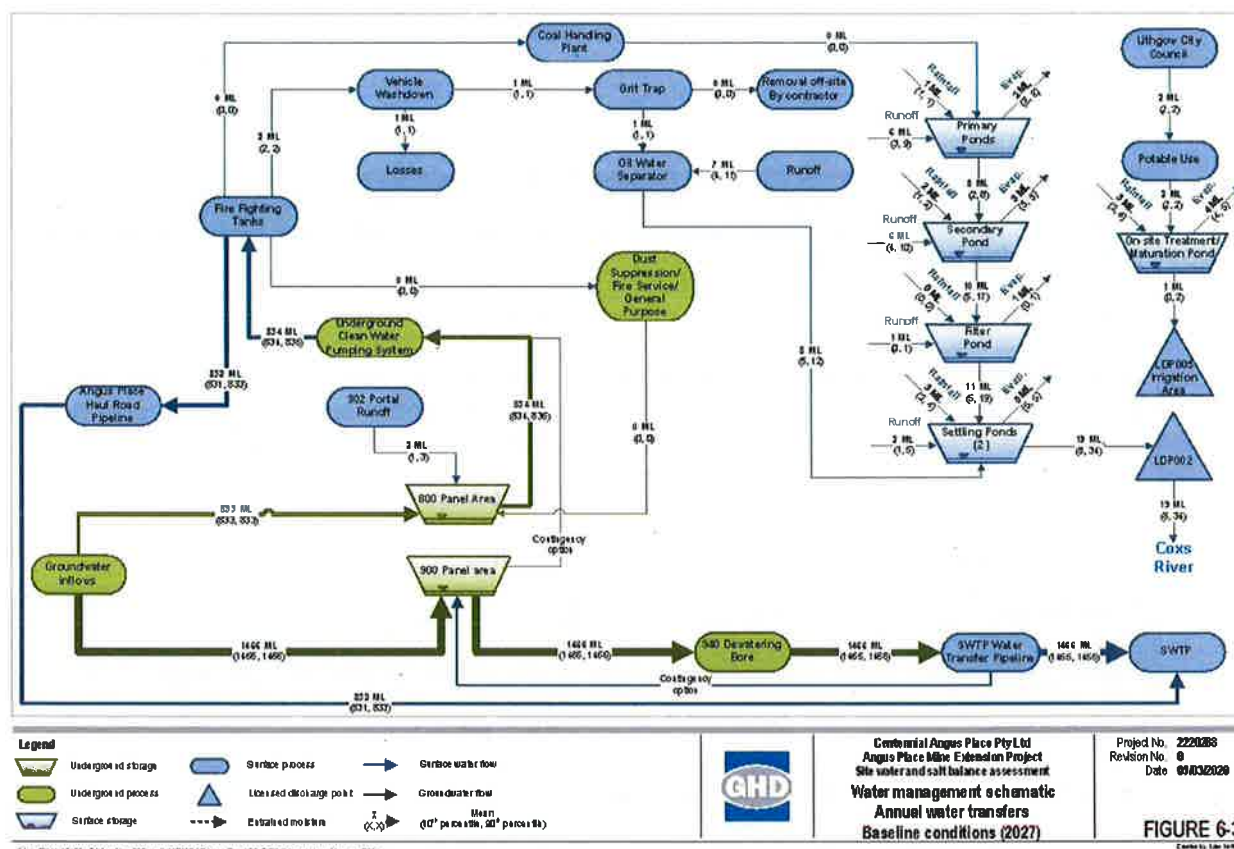


Figure 36. Water Management Schematic- Angus Place

7.3. Groundwater Management

Groundwater is currently monitored in accordance with the *Angus Place Site Water Management Plan*, which has been included to meet Project Approval 06_0021 Schedule 3 Section 3C (h).

As part of the Environmental Management Plan for Angus Place Colliery, an intensive monitoring programme has been implemented on the Newnes Plateau to detect any impacts from mining on the groundwater regime, and in particular the Newnes Plateau Shrub Swamps (NPSS). The greater monitoring programme incorporates NPSS and groundwater monitoring locations above both Angus Place and Springvale collieries, the monitoring locations above Angus Place include the following main aspects:

- Groundwater levels are monitored in seven swamps, with a total of 17 swamp piezometers.
- Surface flow in Narrow Swamp is measured by two monitoring weirs and flow in Kangaroo Creek is monitored by one weir and a pool depth monitor.
- Groundwater levels in the shallow aquifer are measured in 16 standpipe piezometers, which have been installed on the ridges between the swamps.
- Hydrogeological conditions in the cover sequence above the working seam are monitored by multi-level Vibrating Wire Piezometer (VWP) arrays, installed in 12 boreholes in the area to the east and northeast of the extracted workings.
- A basic weather station provides climatic data on the plateau.

Data is recorded at various frequencies as follows:

- At swamp and aquifer piezometers, data is automatically recorded daily.
- Surface water level data in pools and weirs are automatically recorded daily.
- Multilevel VWP's generally record data daily.
- Manually dipped aquifer piezometers are measured at each data collection trip (as a minimum, every two months).
- Barometric data are recorded automatically daily for correction of piezometer data.

Data downloads are undertaken from these installations on a two-monthly basis. At this time, the condition of the instruments is checked, as well as the battery levels and the data quality. The condition and functionality of each piezometer is reviewed once every two months as part of the ongoing maintenance of the monitoring network.

Following the review of the water levels and water quality data, the following salient points have been concluded:

- There are no significant or anomalous changes in any of the swamp piezometers, the regional piezometers or any of the VWP's during the monitoring period.
- There are no significant or anomalous changes in any of the surface water monitoring sites.
- No further investigation of any water levels, outside of routine water level monitoring is considered necessary.
- No trigger exceedances were identified in the context of the site TARP's.

As of the date of the report, Angus Place is currently investigating the potential damage to monitoring assets across the Plateau as a result from the bushfires 2019/20.

Table 29. Standpipe Piezometer Bore Details

Location	Monitoring commenced	Depth (m bgl)	Formation
AP1801DP	November 2018	336.3	Lithgow Seam
AP1PR	July 2010	37.76	Burralow Formation
AP4PR	July 2010	51.57	Burralow Formation
AP5PR	July 2010	93.82	Banks Wall Sandstone
AP8PR	July 2010	90.90	Banks Wall Sandstone
AP9PR	July 2010	82.31	Banks Wall Sandstone
AP10PR	July 2010	39.69	Banks Wall Sandstone
AP1104	February 2012	81.68	Banks Wall Sandstone
AP1105	November 2011	75.85	Banks Wall Sandstone
AP1110	February 2012	70.40	Burralow Formation
AP1102	April 2012	111.41	Banks Wall Sandstone

Location	Monitoring commenced	Depth (m bgl)	Formation
AP1204	July 2012	>100	Banks Wall Sandstone
REN	December 2005	54.98	Burralow Formation
RSE	September 2010	49.55	Burralow Formation
RNW	December 2005	55.50	Burralow Formation

Table 30. Swamp Piezometer Bore Details

Swamp	Location	Monitoring commenced	Depth (m bgl)
Kangaroo Creek Swamp	KC1	May 2005	1.10
	KC2	November 2008	1.56
Tri Star Swamp	TS1	October 2011	3.98
	TS2	October 2011	2.06
	TS3	November 2011	1.77
West Worgan Swamp	WW1	May 2005	1.90
	WW2	May 2005	2.30
	WW3	December 2005	2.40
	WW4	February 2006	2.08
Trail Six Swamp	XS1	October 2011	1.44
Twin Gully Swamp	TG1	October 2011	1.16
	TG2	April 2018	0.85
Narrow Swamp	NS1	May 2005	2.53
	NS2	May 2005	2.60
	NS3	February 2008	2.80
	NS4	April 2008	2.40
East Worgan Swamp	WE1	May 2005	2.51
	WE2	May 2005	1.20

Table 31. Vibrating Wire Piezometer Bore Details

Location	Monitoring commenced	Depth (m bgl)	Aquifer	Formation
AP2PR	February 2010	411	AQ1	Lidsdale/Lithgow coal seams
		381	AQ1	Irondale Coal Seam
		299.5	AQ3	Katoomba Coal Seam
		213	AQ3	Burra-Moko Head Formation
		181	AQ3	Burra-Moko Head Formation
		92	AQ4	Banks Wall Sandstone
AP10PR	May 2010	343	AQ1	Marrangaroo Formation
		327	AQ1	Long Swamp Formation
		300	AQ1	Newnes Formation
		270	Semi-permeable layer	Denman Formation
		248	AQ3	Gap Sandstone
		205	AQ3	Caley Formation
		150	AQ3	Burra-Moko Head Formation
		103	AQ4	Banks Wall Sandstone
AP11PR	May 2010	60	AQ4	Banks Wall Sandstone
		320	AQ3	Gap Sandstone
		295	AQ3	Caley Formation
		263	AQ3	Burra-Moko Head Formation
		223	AQ3	Burra-Moko Head Formation
		167	AQ4	Banks Wall Sandstone
		128	AQ4	Banks Wall Sandstone
		93	AQ4	Banks Wall Sandstone
		72	AQ4	Banks Wall Sandstone
		43	AQ4	Banks Wall Sandstone
AP1101	February 2012	327.5	AQ3	Gap Sandstone
		299.5	AQ3	Katoomba Coal Seam
		248	AQ3	Caley Formation

Location	Monitoring commenced	Depth (m bgl)	Aquifer	Formation
		235.5	AQ3	Burra-Moko Head Formation
		210	AQ3	Burra-Moko Head Formation
		150	AQ4	Banks Wall Sandstone
		92	AQ4	Banks Wall Sandstone
AP1102	January 2012	435.1	AQ1	Lidsdale/Lithgow coal seams
		426.3	AQ1	Lidsdale/Lithgow coal seams
		392	Semi-permeable layer	Denman Formation
		338	Semi-permeable layer	Farmers Creek Formation
		265	AQ3	Caley Formation
		210	AQ3	Burra-Moko Formation
		123	AQ3	Burra-Moko Formation
AP1103	May 2012	341.8	Semi-permeable layer	Denman Formation
		290	AQ3	Caley Formation
		260	AQ3	Caley Formation
		200	AQ3	Burra-Moko Formation
		153	AQ3	Burra-Moko Formation
		105	AQ4	Banks Wall Sandstone
AP1104	September 2012	370.8	AQ1	Lidsdale/Lithgow coal seams
		360	AQ1	Long Swamp Formation
		300	Semi-permeable layer	Denman Formation
		277	AQ2	State Mine Creek Formation
		255.6	AQ3	Katoomba Coal Seam
		240	AQ3	Caley Formation
		170	AQ3	Burra-Moko Head Formation
	February 2012	380.3	AQ1	Lidsdale/Lithgow coal seams
		356.3	AQ1	Long Swamp Formation
AP1106				

Location	Monitoring commenced	Depth (m bgl)	Aquifer	Formation
		335	Semi-permeable layer	Denman Formation
		275	AQ2	State Mine Creek Formation
		251	AQ3	Katoomba Coal Seam
		174	AQ3	Burra-Moko Head Formation
AP1107	December 2011	290	AQ3	Gap Sandstone
		238	AQ3	Caley Formation
		212.5	AQ3	Caley Formation
		210	AQ3	Katoomba Coal Seam
		147.5	AQ3	Burra-Moko Head Formation
		81	AQ4	Banks Wall Sandstone
		54	AQ4	Banks Wall Sandstone
AP1110	September 2012	399.7	AQ1	Long Swamp Formation
		383	AQ1	Newnes Formation
		331.8	AQ3	Gap Sandstone
		304.4	AQ3	Caley Formation
		224	AQ3	Burra-Moko Head Formation
		127	AQ4	Banks Wall Sandstone
AP1204	July 2012	355.3	AQ1	Lidsdale/Lithgow coal seams
		332.2	AQ1	Long Swamp Formation
		316.5	AQ1	Long Swamp Formation
		269	AQ2	State Mine Creek Formation
		198.5	AQ3	Caley Formation
		138.5	AQ3	Burra-Moko Head Formation
		92.5	AQ4	Banks Wall Sandstone
AP1206	September 2012	342	AQ1	Lidsdale Seam
		322	AQ1	Long Swamp Formation
		305	AQ2	Newnes Formation

Location	Monitoring commenced	Depth (m bgl)	Aquifer	Formation
		257.5	AQ2	Gap Sandstone
		244	AQ3	Middle River Coal
		152	AQ3	Burra-Moko Sandstone Head
APXXB1	May 2012	356.5	AQ1	Lithgow Seam
		335	Semi permeable layer	Denman Formation
		275	AQ2	Middle River Coal
		250	AQ3	Katoomba Seam
		179	AQ3	Burra-Moko Sandstone Head
		143	AQ4	Banks Wall Sandstone
APXXB2	January 2012	320	AQ1	Long Swamp Formation
		293	Semi permeable layer	Denman Formation
		243	AQ3	Gap Sandstone
		185	AQ3	Caley Formation
		160.5	AQ3	Burra Moko Head Formation
APXXB3	May 2012	135	AQ4	Banks Wall Sandstone
		69	AQ4	Banks Wall Sandstone
		331.5	AQ1	Long Swamp Formation
		301.5	AQ1	Long Swamp Formation
		285	AQ1	Irondale Seam
		242	AQ2	Middle River Seam
		156.5	AQ3	Burra-Moko Sandstone/Caley Formation Head
		111.5	AQ4	Banks Wall Sandstone
CS1		83.5	AQ4	Banks Wall Sandstone

8. REHABILITATION

8.1. Buildings

No permanent buildings were removed during the 2019 reporting period.

8.2. Rehabilitation of Disturbed Land

Newnes Plateau

No rehabilitation occurred on the Newnes Plateau in 2019.

For details on the *Persoonia Hindii* project please see section 6.2.2

Angus Place Pit Top

An area of 1.5 ha was rehabilitated in the Pit Top area during the 2019 reporting period along the Springvale Water Treatment Plant pipeline corridor.

Commonwealth Colliery

The Commonwealth Colliery area was affected by the Lidsdale Fire which occurred on the 6th of September 2019. Some chitter heatings were found in the post fire assessment and subsequently extinguished. An assessment of the effects on the Commonwealth Colliery rehabilitation will occur in 2020.

8.3. Next Reporting Period

There is 10.6 hectares (ha) of established rehabilitation at Angus Place. These areas include:

- Pit Top areas adjacent to Licenced Discharge Point (LDP) 001 and carpark screening works along Wolgan Road;
- Commonwealth Colliery rehabilitation associated with former mining operations;
- Vale of Clywdd No.2 Colliery rehabilitation associated with former underground mine; and
- Newnes Plateau areas including the Ventilation Facility VSC-AP2 and the services corridor along Sunnyside Ridge Road.

As indicated in the Care and Maintenance Mining Operations Plan (MOP), all of these areas were established prior to the commencement of the 2019 reporting period and maintained as required.

9. COMMUNITY

9.1. Community Consultation and Engagement

In accordance with Schedule 5, Condition 8 of Project Approval 06_0021, a Community Consultative Committee (CCC) has been established to monitor the operations and

provide a forum whereby the community can communicate with the mine operators and be kept up to date with the progress of the mine. The committee is composed of:

- An independent chairperson;
- Four representatives from Centennial Coal, including the Environment and Community Coordinator;
- One representative from Council; and
- At least three representatives from the local community.

In October 2014 the CCC was also expanded to include Springvale Colliery and Western Coal Services. The combined Angus Place, Springvale and Western Coal Services CCC aims to facilitate a single channel of communication regarding current operations in the area. CCC meetings were held in 2019 in May and November.

9.2. Community Sponsorships

No community contributions were made in 2019.

9.3. Community Complaints

No complaints were received in 2019 at Angus Place.

10.INDEPENDENT AUDIT

There was no independent audit undertaken in the 2019 reporting period.

11.INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

Table 32. Incident/Non-Compliances Summary

NC 1	Nature of the incident/non-compliance	EPL Exceedance.	Concentration
	Date of incident/ non-compliance (if known; if not known state not known)	18 June 2019	
	The location of the incident/ non-compliance	LDP001	
	Detail the cause of the incident/non-compliance	pH measured at 6.2 which was lower than lower limit of 6.5. This was dissimilar to water measured at the RO Plant. Possible error in sampling technique.	
	Detail action that has been, or will be, taken to mitigate any adverse effects of the	Sampling procedure reviewed with sampling contractors	

	incident/ non-compliance	
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	RO plant has since been decommissioned.
NC 2	Nature of the incident/non-compliance	Unable to sample
	Date of incident/ non-compliance (if known; if not known state not known)	14 November 2019
	The location of the incident/ non-compliance	Point 17 EPL 467
	Detail the cause of the incident/non-compliance	Sampling point dry- not able to be sampled
	Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	NA
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	NA- Drought conditions were cause of cessation of flow
NC 3	Nature of the incident/non-compliance	Unable to sample
	Date of incident/ non-compliance (if known; if not known state not known)	10 July 2019
	The location of the incident/ non-compliance	Point 18 EPL467
	Detail the cause of the incident/non-compliance	Sample unable to be taken due to removal of hydrasleeve in borehole by a third party
	Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Responsible persons informed they are not to remove any part of bore hole measuring equipment without consent of site.
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	Responsible persons informed they are not to remove any part of bore hole measuring equipment without consent of site.
NC 4	Nature of the incident/non-	Samples not taken

	compliance	
	Date of incident/ non-compliance (if known; if not known state not known)	December 2019
	The location of the incident/ non-compliance	Points 16,17,18 of EPL 467
	Detail the cause of the incident/non-compliance	Bushfire threat at sample location. Area closed for entire month.
	Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	NA
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	NA
NC 5	Nature of the incident/non-compliance	Loss of sample
	Date of incident/ non-compliance (if known; if not known state not known)	17 April 2019
	The location of the incident/ non-compliance	Point 17 of EPL 467
	Detail the cause of the incident/non-compliance	Total alkalinity was unable to be measured due to loss of sample during transit due to lid being secured improperly.
	Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Sampling procedure reviewed with sampling contractors.
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	Sampling procedure reviewed with sampling contractors.
NC 6	Nature of the incident/non-compliance	Unable to conduct biodiversity monitoring over Summer 2019/2020
	Date of incident/ non-compliance (if known; if not known state not known)	Summer 2019/ 2020
	The location of the incident/ non-compliance	Newnes Plateau
	Detail the cause of the	Gospers Mountain bushfire

	incident/non-compliance	affected the entire Newnes plateau. No safe access to plateau
	Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	NA Monitoring resumed as soon as make safe works were completed for Angus Place
	Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	NA Monitoring resumed as soon as make safe works were completed for Angus Place

Table 33. Summary of Reportable Incidents and Regulatory Actions

Compliance Type	Agency(ies)	Number	Response
Incidents	Not relevant		
Caution Notices	Not relevant		
Warning Letters	Not relevant		
Penalty Notices	Not relevant		
Prosecutions	Not relevant		

Note: This table includes actions taken by DPE, DRG, Resources Regulator and the EPA during the reporting period.

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

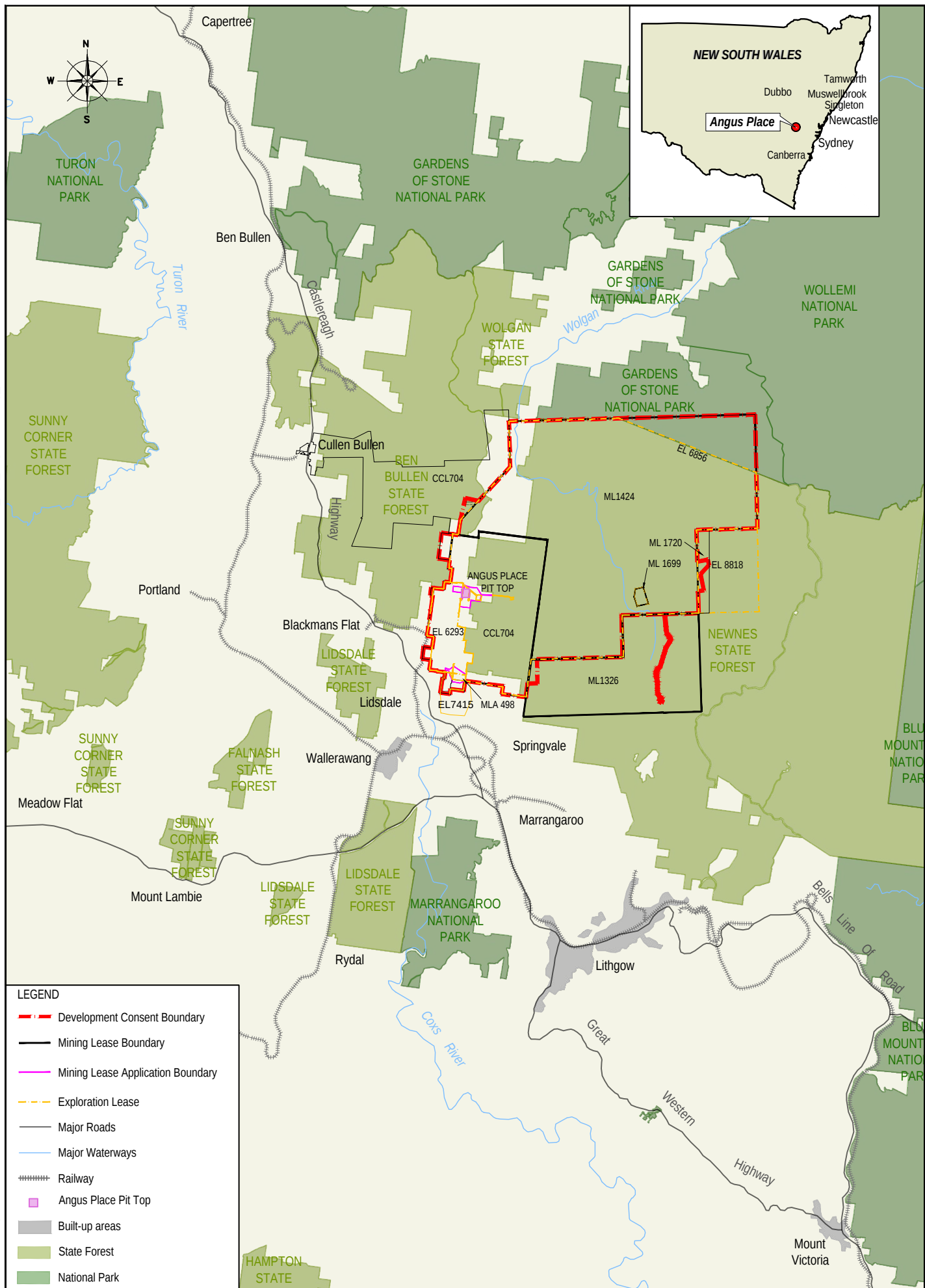
Planned works for 2020 include:

- Pipeline connection to Springvale Water treatment Plant and MOP amendment to reflect changes.
- Feasibility study for Angus Place West.
- Continued baseline monitoring for Angus Place East.
- Assessment and repair of bushfire affected monitoring locations.
- Assessment of bushfire affected rehabilitation areas.

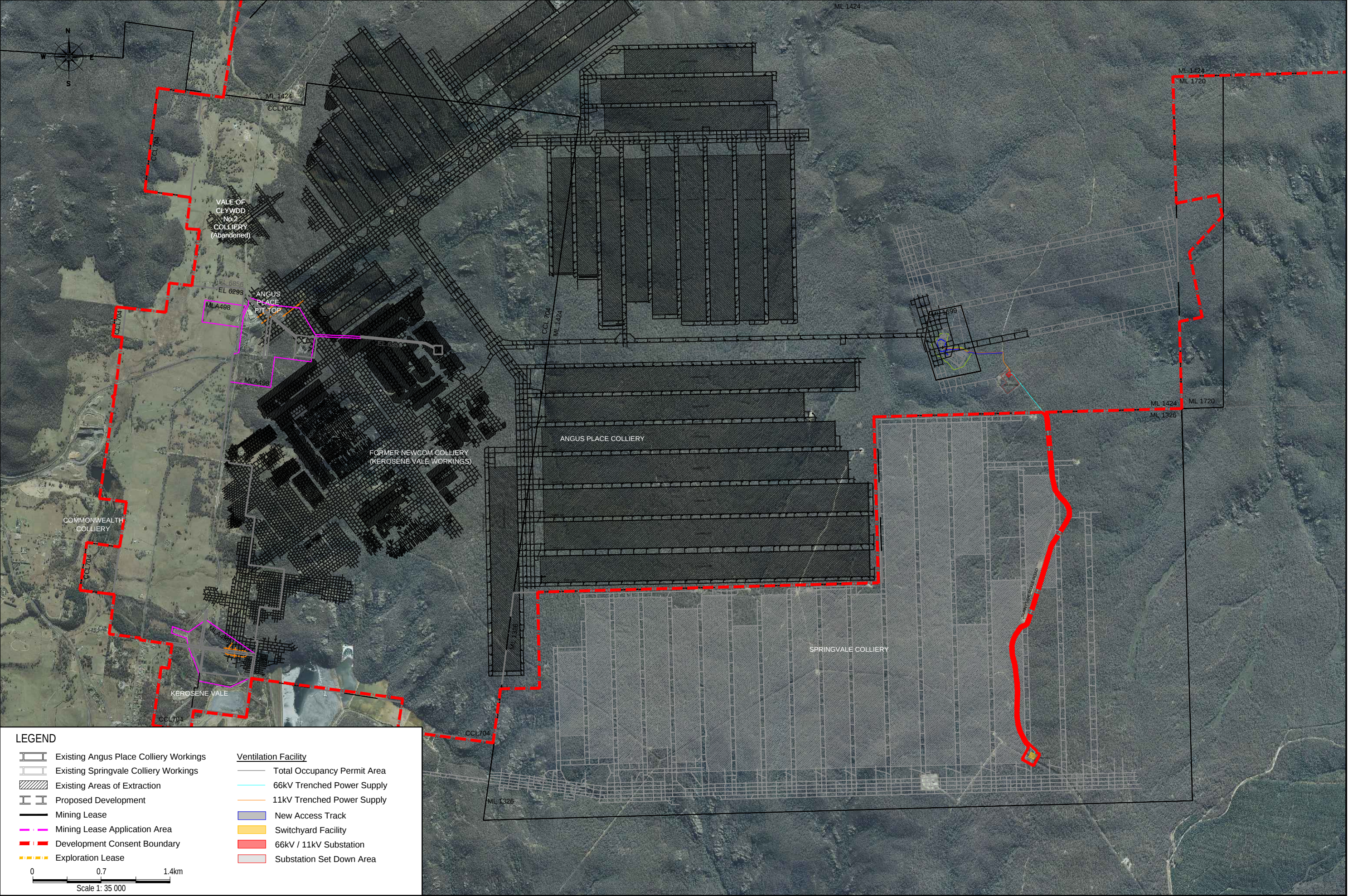


APPENDIX 1

PLANS



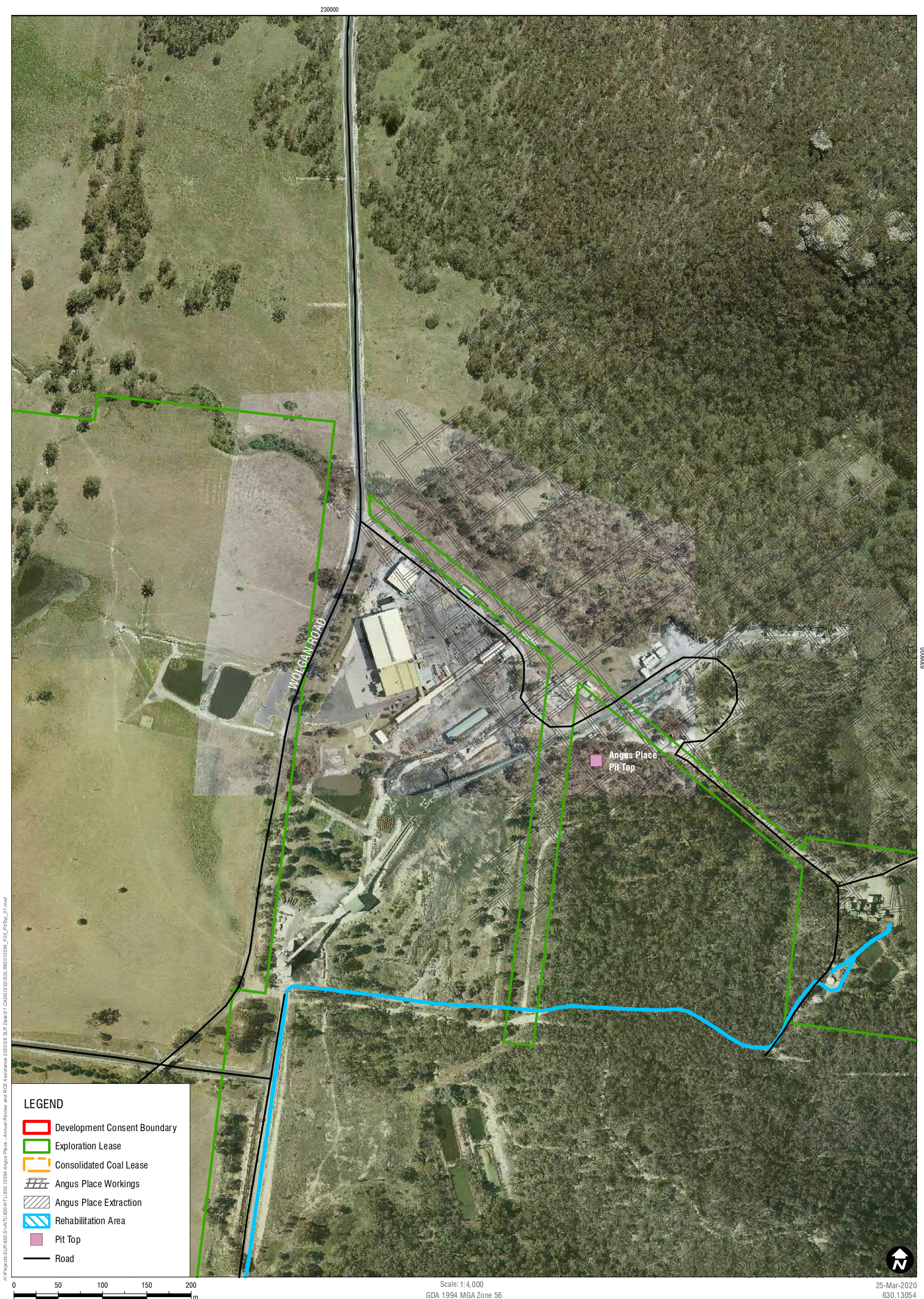
To be printed A4

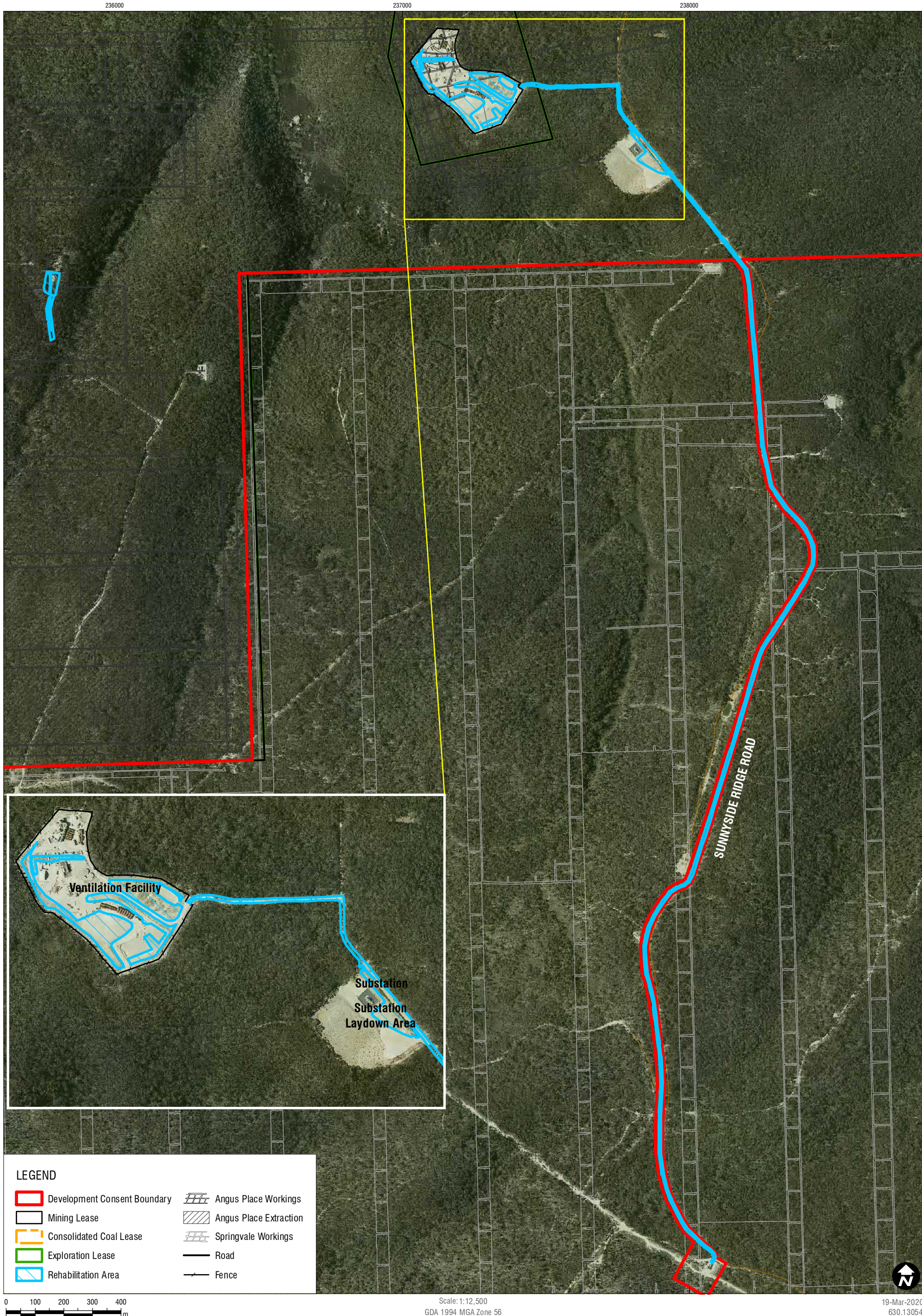


To be printed A3



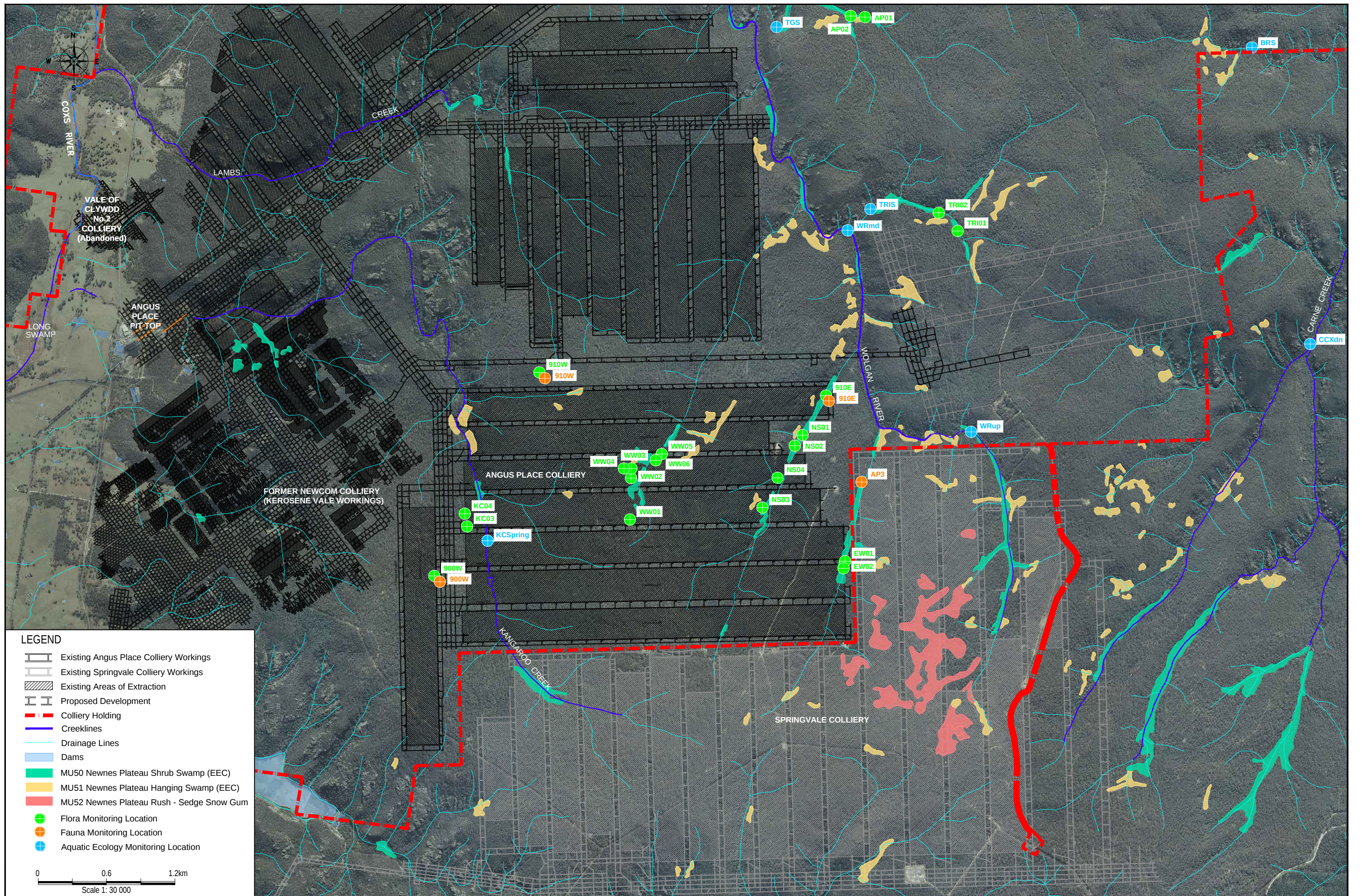
Site Layout
FIGURE 2





Angus Place Rehabilitation:
Newnes Plateau

FIGURE 4



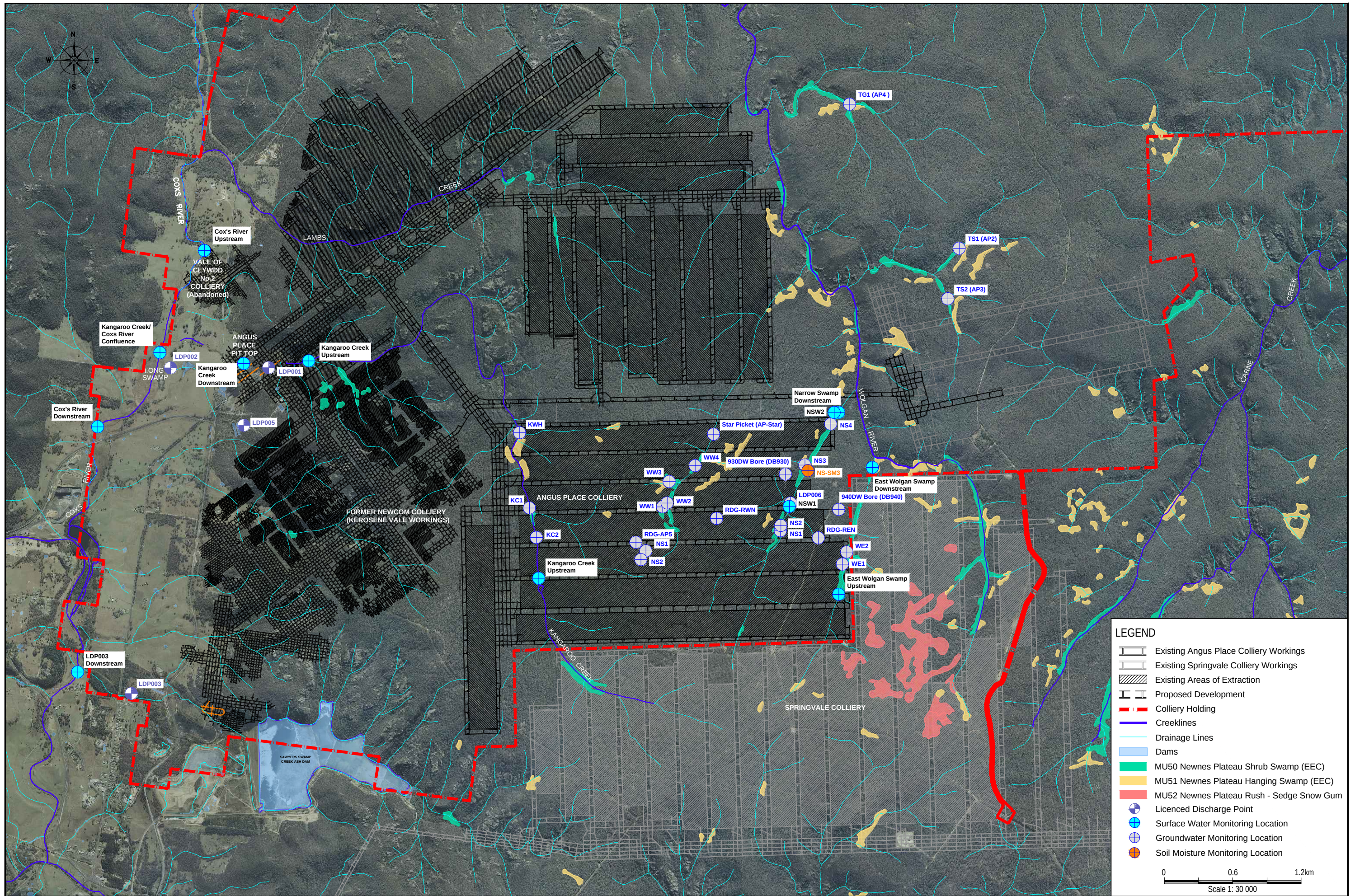
To be printed A3



H:\Projects\SLR\630-SWTL\630-NTL\630.13054_Angus Place - Annual Review and FCE Assistance 2020\6 SLR Data\01 CADGIS\GIS\SLR\63013054_F06_Commonwealth Colliery_01.mxd

LEGEND

- Development Consent Boundary
- Exploration Lease
- Consolidated Coal Lease
- Rehabilitation Areas - Open Cut Boundaries
- Established Rehabilitation
- Road



To be printed A3



To be printed A3



H:\Projects\SLR\630-Sydney\NTL\630-NTL\630-13054-Angus Place - Annual Review and FCE Assistance 2020\6 SLR Data\OT CAD\GIS\GIS\630-13054-F09_Vale of Clywdd_01.mxd

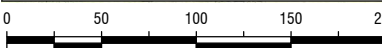
LEGEND

Development Consent Boundary

Exploration Lease

Consolidated Coal Lease

Road



Scale: 1:4,000
GDA 1994 MGA Zone 56

25-Mar-2020
630.13054

ANGUS PLACE COLLIERY

c/o Level 18,

1 Market Street

Sydney NSW 2000

