CENTENNIAL

Centennial Coal
Western Coal Services
ANNUAL REVIEW

March 2022

Annual Review Title Block

Name of Operation	Western Coal Services (WCS)
Name of Operator	Springvale Coal Pty Ltd
Development Consent/ Project Approval #	SSD-5579
Name of holder of Development Consent/ Project Approval	Springvale Coal Pty Ltd
Mining Lease #	ML 204, ML 564, ML 1319, ML 1448, CCL 733, CL 394, CL 361, PLL 133
Name of Holder of Mining Lease	Centennial Springvale Pty Limited and Boulder Mining Pty Ltd
Water License #	Not Applicable
Name of Holder of Water License	Not Applicable
MOP/RMP Start Date	1 January 2020
MOP/RMP End Date	31 December 2024
Annual Review Start Date	1 January 2021
Annual Review End Date	31 December 2021

I, MICHAEL CLARK certify that this audit report is a true and accurate record of the compliance status of Centennial Western Coal Services for the period 1 January to 31 December 2021 and that I am authorised to make this statement on behalf of Springvale Coal Pty Ltd.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion) in an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents –maximum penalty 2 years imprisonment or $22,000,or both).*

Name of Authorised Reporting Officer	MICHAEL CLARK
Title of Authorised Reporting Officer	Director
Signature of Authorised Reporting Officer	M. Clark
Date	28-03-22

Contents

List of Tables

List of Figures

Plans

Plan Reference	Plan Name
1A	Project Locality
1B	Mining Leases
1C	Built Environment
2A	Primary Domains
2B	Secondary Domains
2C	Primary & Secondary Domains
3A	Environmental Monitoring
3B	Rehabilitation Monitoring

Appendices

Appendix No.	Appendix Name
1	Plans
2	Coal Transport Records
3	Noise
4	Air
5	Biodiversity
6	Waste
7	Surface Water
8	Ground Water
9	Rehabilitation
10	Independent Environmental Audit

1 STATEMENT OF COMPLIANCE

Table 1-1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Development Consent SSD-5579	Yes
Environmental Protection Licence 21229	Yes
Mining Lease Number **ML 204, ML564, ML1319, ML 1448, CCL 733, CL 394, CL 361, PLL 133**	Yes
Radiation License	Yes
Statement of Commitments	Yes

During the reporting period no new non-compliances were identified.

Table 1-2: 2021 Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
N/A	N/A	N/A	N/A	N/A	N/A

Note: Compliance Status Key for Table 1-2

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

2 INTRODUCTION

Western Coal Services (WCS) is located to the west of the Blue Mountains in the Lithgow Local Government Area in New South Wales approximately 125 kilometres (km) from Sydney, 15 km north of city of Lithgow, 5 km north-northwest from the township of Wallerawang, and 4 km northwest of the village of Lidsdale.

The WCS includes the operation of infrastructure for the receipt, handling and processing of coal and reject materials from Springvale Mine (SSD-5594), Angus Place Colliery (SSD 06_0021) and other Centennial Coal Company Limited (Centennial) operations; and the transportation of this coal to Mount Piper Power Station (MPPS) (DA80/10060) and Lidsdale Siding (Development Consent 08_0223). WCS also receives and emplaces residual waste from the Springvale Water Treatment Project (SWTP) (SSD-7592). This waste stream is generated by the removal of suspended solid materials from raw mine water treated by SWTP and can be up to 2% solids.

Springvale Coal Services Site (SCSS) is a coal processing and storage facility that forms part of WCS. It is used for run-of-mine (ROM) coal handling and stockpiling, ROM coal beneficiation (washing), emplacement of coal reject material and emplacement of residual waste material from the SWTP. It connects to a network of conveyors which can transfer coal between Springvale Mine, Wallerawang Power Station (now closed), MPPS and Lidsdale Siding. The site is approved to receive and process up to 9.5 million tonnes per annum (Mtpa) of coal from Angus Place Colliery, Springvale Mine and other Centennial operations.

2.1 Scope

This Annual Review (AR) details the compliance and environmental management performance of WCS Site over the Period 1 January 2021 to 31 December 2021. The AR has been prepared in accordance with the *Annual Review Guideline* (DPIE 2015), and satisfies

- Schedule 5, Condition 4 of the Development Consent SSD-5579
- Schedule 3 Condition 42 of the Development Consent SSD-5579
- Reporting requirements of mining tenements

2.2 Mine Contacts

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

Table 2-1: Centennial Site Environmental Contact Details

Name	Position	Phone
Geoff Rapson	Mine Manager	T: (02) 6355 8035
		E: geoff.rapson@centennialcoal.com.au
William Olson	Environment & Community Graduate	T: (02) 6355 9509
		E: william.a.olson@centennialcoal.com.au
Community Contact Number	SCSO Control Room	T: (02) 6355 9500

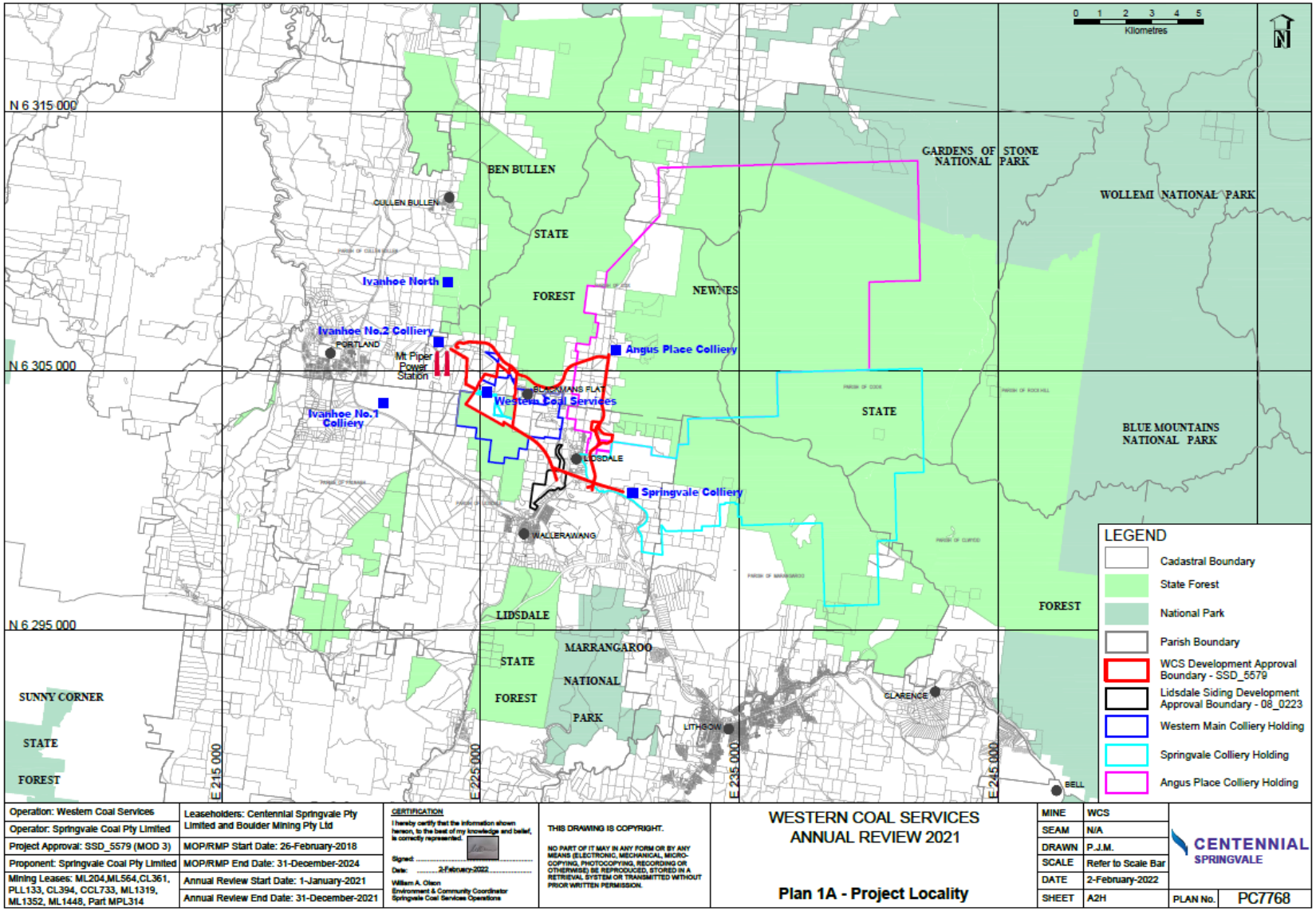


Figure 2-1: Regional Project Locality

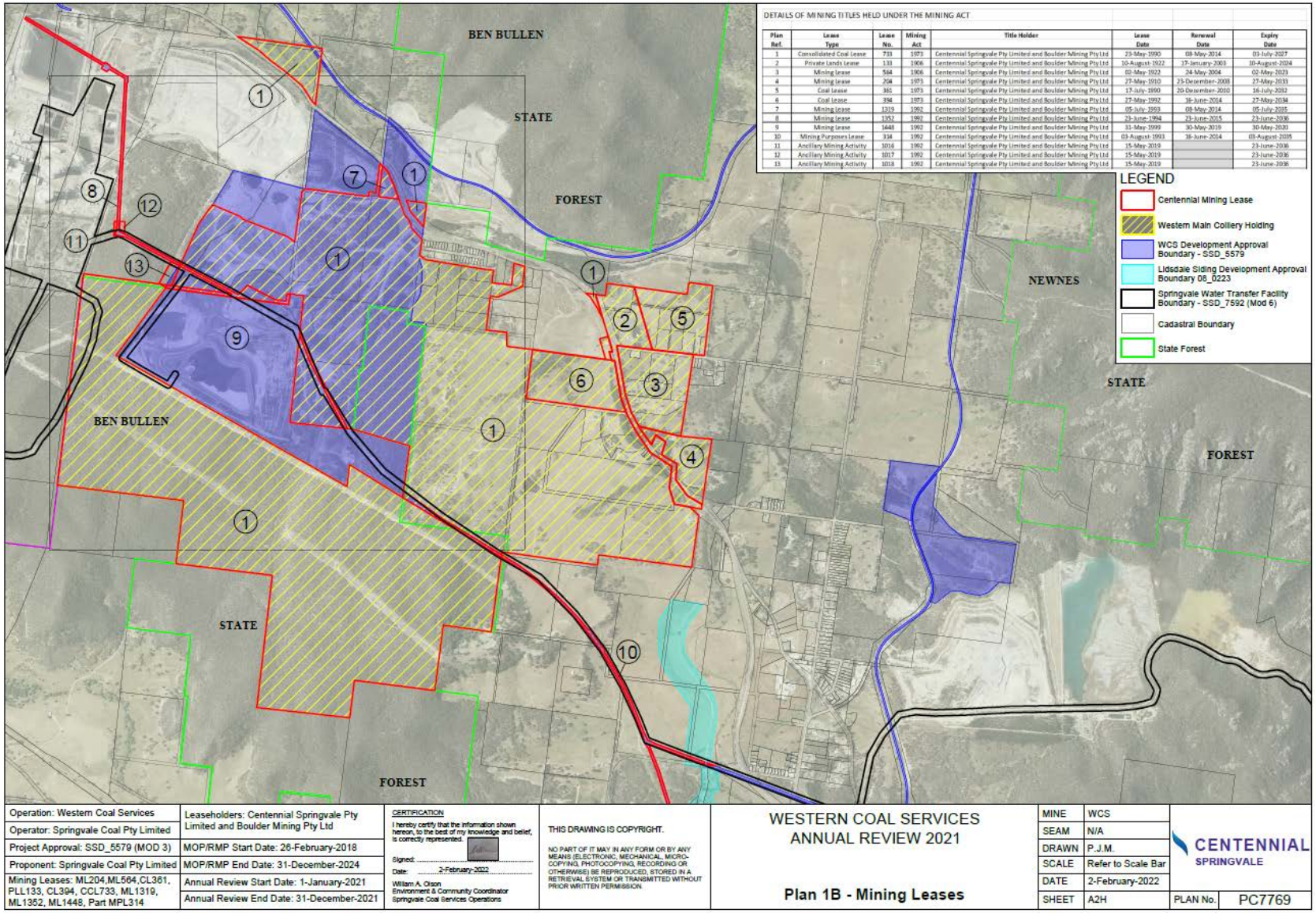


Figure 2-2 Mining Lease

3 APPROVALS

The Western Coal Services Development Consent SSD 5579 was granted in April 2014 and has been modified on 3 occasions.

Modification 1 was approved in June 2017 and included the following scope:

- The receipt of residuals stream from the water treatment plant proposed in the Springvale Water Treatment Plant (WTP) and emplacement within the existing REA at the WCS; and
- Changes to the decommissioning and rehabilitation strategy approved in SSD 5579.

Modification 2 was approved in December 2017 and included the following scope

- Changes to the applicability of noise criteria from noise generated by the operation of the overland coal conveyor, Wallerawang haul road or Mount Piper haul road (no longer applicable to this site); and
- Requirements to prepare and implement a Noise Reduction Study for the overland coal conveyor and SCSS.

Modification 3 was approved in August 2019 and included the following scope

- Enable the transfer of coal from the Lidsdale Rail Siding back to the SCSS using the existing overland conveyor system that operates between the Lidsdale Rail Siding and the SCSS; and
- Increase the volume of coal that can be received at the SCSS from other sources (other than the Springvale Mine and Angus Place Colliery) from 1 million tonnes per annum (Mtpa) to 1.5 Mtpa.

A summary of Project Approvals, Mining Leases, and other Licences relevant to Centennial Site is provided in Table 3-1.

Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at https://www.centennialcoal.com.au/operations/springvale-coal-services/.

Table 3-1: Environmental Approvals held by Centennial WCS.

Approval	Description	Expiry Date	Change to Approval during Reporting Period
Project Approval – NSW Department to Planning, Industry and Environment			
Development Consent SSD-5579	Development Consent approval issued under the EP&A Act	30/06/2039	No
Radiation Plans – NSW Environment Protection Agency			
Radiation Management Licence 5061304	Radiation Management Licence issued under the Radiation Control Act	15/06/2022	No
Environmental Protection Licence – NSW Environment Protection Agency			

Approval	Description	Expiry Date	Change to Approval during Reporting Period
Environment Protection Licence 21229	Environmental Protection Licence issued under the POEO Act	N/A	No
Mining Lease – NSW Department of Regional NSW – Resources Regulator			
ML 204	Mining Lease	27/05/2033	No
ML 1319	Mining Lease	05/07/2035	No
ML 564	Mining Lease	02/05/2023	No
CL 394	Consolidated Coal Lease	27/05/2034	No
CL 361	Consolidated Coal Lease	16/07/2032	No
ML 1352	Mining Lease	23/06/2036	No
ML 1448	Mining Lease	31/05/2020#	No
PLL 133	Private Land Lease	10/08/2024	No
Mining Operation Plan – NSW Department of Regional NSW –Resources Regulator			
Mining Operations Plan	Operation of Western Coal Services	31/12/2024	No

Note # Renewal applications have been lodged and acknowledged for these titles however, no renewal offers have been received at the time of writing of this Annual Review.

During the reporting period Springvale Coal prepared a modification report (MOD 4), to change the existing water management system to facilitate the transfer of water between WCS and other operations, and to improve the quality of water discharged to Wangcol Creek. The modification had not been determined at the end of the reporting period.

3.1 ANNUAL REPORTING

Table 3-2 provides a checklist of reporting requirements and performance conditions addresses within the Annual Review.

Table 3-2: Annual Review Requirements

Approval	Condition No	Requirement	Where addressed in Annual Review
Development Consent SSD-5579	Schedule 5 Condition 4	By the end of March each year, or other timing as may be agreed by the Secretary, the Applicant must review the environmental performance of the development to the satisfaction of the Secretary. This review must:	This Document
		(a) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;	Section 4 Section 12
		(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the: i. relevant statutory requirements, limits or performance measures/criteria; ii. the monitoring results of previous years; the relevant predictions in the EIS;	Section 6.0 to Section 10
		(c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;	Section 1 and 11
		(d) identify any trends in the monitoring data over the life of the development;	Section 6 to 10
		(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	Section 12
		(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.	Section 12
Development Consent SSD-5579	Schedule 3 Condition 42d	Monitor and report on the effectiveness of waste minimisation and management measures in the Annual Review.	Section 6.7.1.1
Environmental Impact Statement – Statement of Commitments	SOC No. 5.11 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 7.2
	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 the Department and will include the timeframes provided within this EIS, details of the rehabilitation methods, monitoring and reporting framework. Results arising from the implementation of	Section 8.0

Approval	Condition No	Requirement	Where addressed in Annual Review
		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	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 6 to 10
		(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 *Environmental Planning and Assessment Act 1979;* - the *Protection of the Environment Operations Act 1997;* and - any other approvals relevant to the development including the conditions of this mining lease.	Section 8.0
		(c) The MOP must be prepared in accordance with the *ESG3: Mining Operations Plan (MOP) Guidelines September 2013* published on the Department's website at www.resources.nsw.gov.au/environment	
		(d) The lease holder may apply to the Minister to amend an approved MOP at any time.	
		(e) It is not a breach of this condition if: i. the operations which, but for this condition 3(e) would be a breach of condition 3{a), were necessary to comply with a lawful order or direction given under the *Environmental Planning and Assessment Act 1979*, the *Protection of the Environment Operations Act 1997*, the *Mine Health and Safety Act 2004/Coal Mine Health and Safety Act 2002* and *Mine Health and Safety Regulation 2007/Coal Mine Health and Safety Regulation 2006* or the *Work Health and Safety Act 2011;* and the Minister had been notified in writing of the terms of the order or direction prior to the operations constituting the breach being carried out.	
		(f) The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must: i. provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP;	Section 12.0

Approval	Condition No	Requirement	Where addressed in Annual Review
		ii. be submitted annually on the grant anniversary date (or at such other times as agreed by the Minister); and be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment	
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 Report (AEMR) with the Director-General.	Section 10.0
		(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 licenses and approvals; (d) any other statutory environmental requirements; (e) details of any variations to environmental approvals applicable to the lease area; and 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.	Section 10.0
	Condition 5	The EMR must: (a) report against compliance with the MOP;	
		(b) report on progress in respect of rehabilitation completion criteria;	
		(c) report on the extent of compliance with regulatory requirements; and	

Approval	Condition No	Requirement	Where addressed in Annual Review
		(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 lime as directed in writing by the Director-General and must be lodged as instructed.	

4 OPERATIONS SUMMARY

Details of coal processing and transportation operations at the WCS site for the reporting period is presented Table 4-1. Previous results and forecasted operations are also summarised within the table.

Table 4-1: Production Summary & Forecast

Material	Approved Limit (SSD-5579)	Previous Reporting Period (2020) (Actual Tonnes)	This Reporting Period (2021) (Actual Tonnes)	Next Reporting Period (2022) (Forecast Tonnes)[1]
Waste Rock / Overburden	N/A	N/A	N/A	N/A
Total receipt of coal	9,500,000	3,963,823	2,555,504	3,033,202
Receipt of ROM coal from Springvale Mine	5,500,000	2,965,382	2,001,231	3,033,202
Receipt of ROM coal from Angus Place	4,000,000	0	0	0
Receipt of coal from sources other than Springvale Mine or Angus Place Colliery	1,500,000	998,441	554,273	0
Receipt of coal from Lidsdale Siding	1,500,000	998,441	554,273	0
Receipt of ROM coal from sources other than Springvale Mine or Angus Place Colliery	1,000,000	0	0	0
Processing of ROM coal	7,000,000	1,056,181	587,840	280,000
Coarse reject	N/A	203,243	232,213	42,000
Fine reject (Tailings)	N/A	203,243	232,213	42,000
Transport Lidsdale Siding (Rail)	6,300,000	0	193,946	0
Transport other parties (Mt Piper)	N/A	3,551,884	0	0

There were no inconsistencies between the approved limit and actual coal processing, transport for the reporting period as defined by Schedule 2 Condition 6, 7, 7, 8 and 8A. Further detail regarding coal transportation and processing is presented in Appendix 2.

[1] As per SCSO budgeted forecast at 31/02/2022- Budgets subject to variation but will be conducted in accordance with approved operations.

4.1 OTHER OPERATIONS

Coal transportation is monitored in accordance with Development Consent SSD-5579, Schedule 3, Condition 39. A summary of operations relevant to WCS is provided in Table 4-2 and Table 4-3 WCS compliance with residual waste limits of consent are discussed in Section 6.7.1.2.

Table 4-2: Operations Summary

Requirement	Approved Limit (SSD-5579)	Previous Reporting Period (2020) (Actual)	This Reporting Period (2021) (Actual)	Comment
Transport (Wallerawang Haul Road) **(SSD-5579)**	Truck movements restricted to the day period only prior to longwall extraction at the Angus Place Colliery. Max. 3 truck operating during the evening period following commencement of longwall extraction at Angus Place Colliery. No truck movements to occur during the night period.	No haulage undertaken	No haulage undertaken	Compliant
Transport (Mt Piper Haul Road) **(SSD-5579)**	Truck movements restricted to the day period only prior to longwall extraction at the Angus Place colliery. Max. 8 trucks operating during the evening period following the commencement of longwall extraction at Angus Place Colliery. Max. 2 trucks operating during the night period. No truck movements to occur in the night period during adverse meteorological conditions.	No haulage undertaken	No haulage undertaken	Compliant
Kerosene Vale Coal Stockpile Operations **(SSD-5579)**	During the day period only.	Stockpile management activities limited to haulage only all undertaken in day period	Stockpile management activities limited to haulage only all undertaken in day period	Compliant

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

Month	Product from Springvale Colliery (6.3 Mtpa limit)	Product to Energy Australia (Mt Piper)	Product from Lidsdale Siding (1.5 Mtpa limit)	Product to Lidsdale Siding
January 2021	127950	250748	48970	0
February 2021	175560	223392	61948	0
March 2021	169550	264266	59841	0
April 2021	145542	233128	92617	0
May 2021	122396	208462	111782	0
June 2021	191449	224990	45752	0
July 2021	201990	163898	1480	48111
August 2021	89063	154915	90969	0
September 2021	162590	201674	15353	0
October 2021	341090	262214	25563	52276
November 2021	210847	80258	0	55698
December 2021	63204	55853	0	37861
Total 2021 CY	**2001231**	**2323798**	**554273**	**193946**

There were no inconsistencies between the approved limit and actual processing or transportation limits for the reporting period. Further detail regarding coal transportation and processing is presented in Appendix 2.

4.2 MINING OPERATIONS

There was no mining activity throughout reporting period.

4.3 EXPLORATION

There was no exploration throughout reporting period.

4.4 LAND DISTURBANCE

There was no land disturbance throughout reporting period.

4.5 CONSTRUCTION

There was no construction or demolition throughout reporting period.

4.6 NEXT REPORTING PERIOD

WCS will continue to receive coal from Springvale and Airly mines. WCS will Wash ROM coal as required for quality control to produce product coal for Energy Australia, and for Export at Lidsdale Siding. The Huon Rehabilitation Project will continue throughout 2022.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 5-1 summarises the outcomes of the 2020 Annual Review, including actions issued by Regulators and actions taken by WCS.

Table 5-1: Actions from Previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Publication to the website within 1 month	DPIE	The 2020 Annual Review was published on the Centennial Website 22/03/2021.	Not Applicable

6 ENVIRONMENTAL PERFORMANCE

WCS implements an Environmental Management Strategy, including management plans, procedures and monitoring programs that provide a framework for managing environment and community risks and impacts. To measure compliance with site approvals and licences, WCS undertakes a comprehensive monitoring program. The environmental monitoring program is shown in Figure 6-1.

This section provides a summary of environmental performance in the reporting period, including:

- Section 6.1 – Meteorological Summary
- Section 6.2 – Noise
- Section 6.3 – Blasting
- Section 6.4 – Air Quality
- Section 6.5 – Biodiversity
- Section 6.6 – Heritage
- Section 6.7- Other Aspects

The environmental performance for water, rehabilitation, and community aspects are reported in Sections 7.0, 8.0, 9.0 and 10.0 respectively.

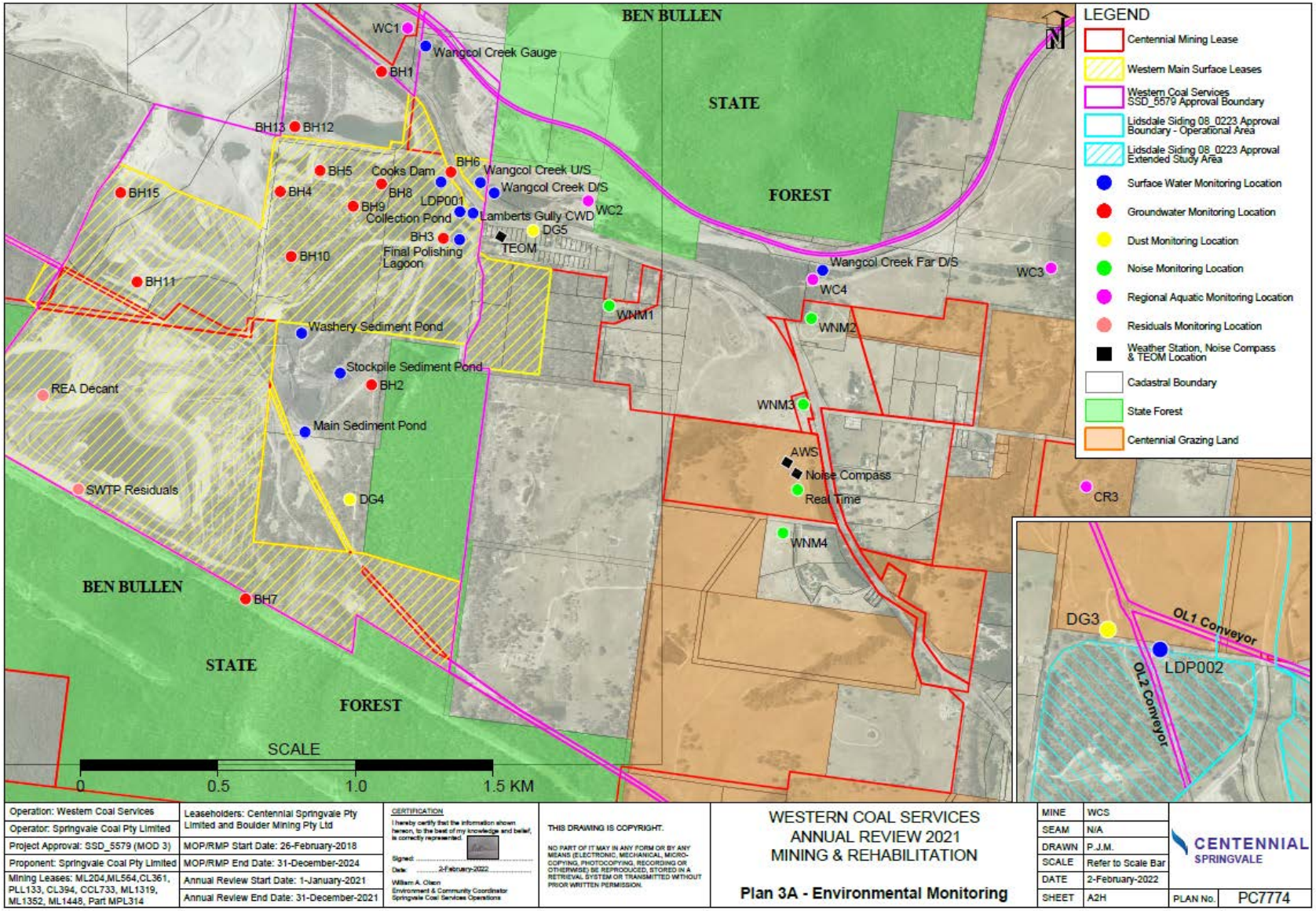


Figure 6-1: Western Coal Services Monitoring Locations

6.1 METEROLOGICAL SUMMARY

6.1.1 Environmental Management

WCS operates a metrological monitoring station in accordance with SSD-5579 Schedule 3 Condition 18 and EPL 21229.

6.1.2 Environmental Performance

A summary of meteorological data collected throughout 2021 is presented in Table 6-1. WCS metrological station a recorded minimum temperature of -6.8°C in July, and a maximum temperature of 31.6°C in January.

On 23 November 2021 the Bureau of Meteorology declared that a La Nina weather pattern has developed in the Pacific Ocean. In November 2021 the highest amount of rainfall was recorded at the site. March 2021 also recorded greater than long term average rainfall. The total rainfall received in 2021 was below the levels recorded in 2020 (923.4mm) however was above the long-term average (748.4mm).

Table 6-1: Annual Meteorological Weather Data

Month	Total Rainfall (mm)	Cumulative Rainfall (mm)	Minimum Temperature (deg C) @ 2m	Maximum Temperature (deg C) @ 2m
Jan-21	104.8	104.8	7.3	31.6
Feb-21	83.4	188.2	8.9	26.7
Mar-21	151.8	340.0	3.4	27.4
Apr-21	5.2	345.2	-2	25.6
May-21	26.6	371.8	-4.4	19
June-21	51	422.8	-3.9	15.6
Jul-21	57.6	480.4	-6.8	16.5
Aug-21	82.6	563.0	-4.4	19
Sep-21	57.6	620.6	-3	20.8
Oct-21	41.4	662.0	0	25.7
Nov-21	168.4	830.4	3.4	22.4
Dec-21	62.2	892.6	5.6	28.5

Monthly rainfall trends have been presented against annual term average in Figure 6-2.

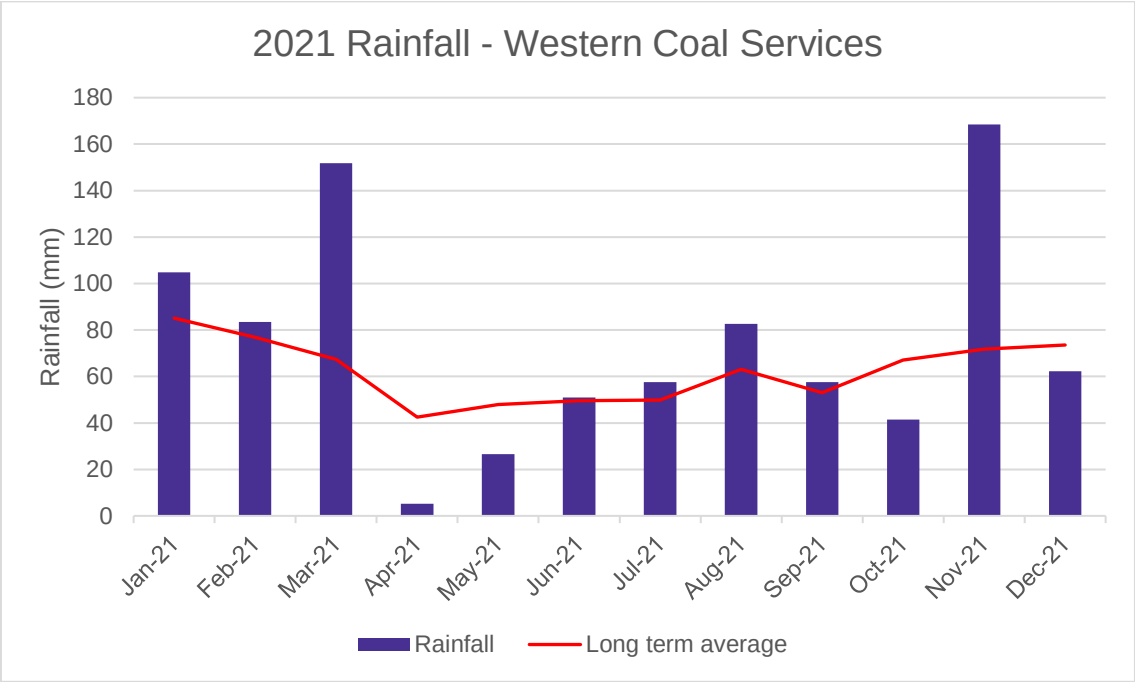


Figure 6-2 2021 Rainfall

Wind speed and direction have been plotted in a wind rose in Figure 6-3. Predominate winds are observed in north west and south west direction.

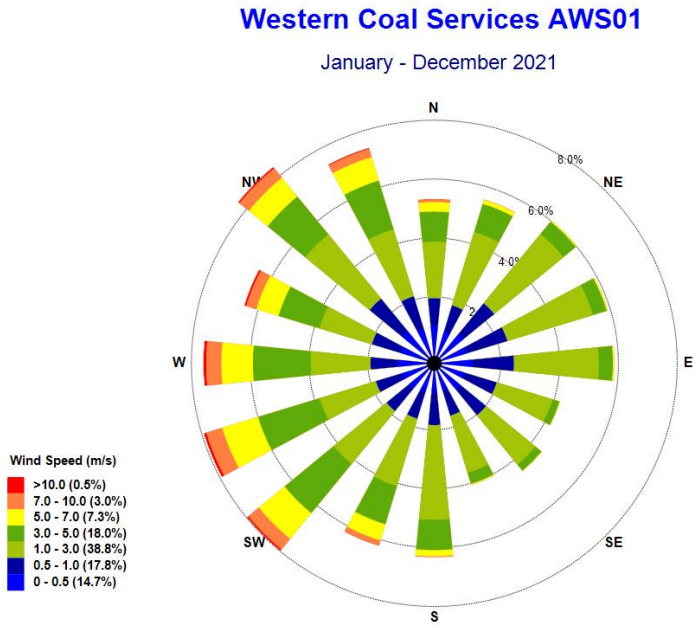


Figure 6-3 2021 Windrose

6.2 NOISE

6.2.1 Environmental Management

WCS manages noise in accordance with the Western Region Noise Management Plan (WRNMP) dated Feb 2021. This plan was approved by DPIE 15 Feb 2021.

The following sources of noise identified in the WRNMP are relevant for WCS operations:

- Operation of mobile equipment – e.g. trucks, loaders
- Coal transporting activities – e.g. overland conveyors
- Washing of ROM coal

Noise mitigation measures for WCS are:

- Maintaining all plant and equipment to manufacturer specifications (ongoing)
- Operate mobile plant in a quiet, efficient manner and regular training of operators (ongoing)
- Installation of frequency modulated reversing alarms or “quakers” on mobile plant to replace reversing alarms (complete)
- Switching off vehicles and plant when not in use (ongoing)
- Low-noise design for transfer chutes on conveyor systems (complete)
- Low-noise idlers fitted to conveyors (complete and ongoing as required to ensure compliance)
- Limiting sound power levels for key noise sources such as conveyor drives and the stockpile dozer (complete)
- Partial enclosures on conveyors (complete)

Additional noise management and mitigation measures are outlined in the WRNMP.

6.2.2 Environmental Performance

Noise Criteria

Schedule 3, Condition 7 of SSD-5579 provides noise criteria for 14 identified locations. EPL 21229 condition L.5.1 specifies noise monitoring limits for 4 locations. Table 6-3 presents the applicable criteria for both the consent and EPL in reference to the monitoring location the attended noise monitoring is undertaken at.

Table 6-2: Western Coal Services Noise Criteria

Monitoring location	EPA identification number	Receiver ID	Day LAeq (15 min) dBA	Evening LAeq (15 min) dBA	Night LAeq (15 min) dBA	Night LA1 (1min) dBA
WNM1	Point 8	B12	40	35	35	47
		B13	41	36	36	50
WNM2	Point 9	B14	41	35	35	55
WNM3	Point 10	B15	36	35	35	45
WNM4	Point 11	B16	35	35	36	45
-	-	B17	42	44	45	45
-	-	W1	37	37	41	45
-	-	W2	35	35	36	45
-	-	L1	42	35	35	45
-	-	L2	40	39	35	45
-	-	WR1	41	38	36	57
-	-	WR2	38	37	35	48
-	-	S3	36	36	39	45
-	-	All other privately owned residences	35	35	35	45

Note 1: Day is defined as the period from 7:00 am to 6:00 pm, evening is defined as the period from 6 pm to 10 pm and night time is defined as 10:00 pm to 7:00 am.
Note 2: The noise criteria in Table 3.1 are to apply under all meteorological conditions except the following:
(a) Average wind speed at microphone height exceeds 5 m/s
(b) Wind speeds greater than 3 m/s measured at 10 m above ground level
(c) Temperature inversion conditions greater than 3°C/100 m
Note 3: The noise criteria in Table 3.1 do not apply to noise generated by the operation of the overland coal conveyor, Mount Piper haul road or the Wallerawang haul road.

Attended Noise Monitoring

In accordance with the long-term monitoring program, monthly attended noise surveys have been undertaken at 4 locations which have been selected to be representative of identified receiver locations in 2021. These locations were shown in Figure 6-1.

Results for Day, Evening and Night are presented in Table 6-3 to Table 6-5.

Table 6-3: Western Coal Services LAeq (15minute) Day

Monitoring location	Day Limit LAeq (15 min)	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	July 2021	Aug 2021	Sept 2021	Oct 2021	Nov 2021	Dec 2021
WNM1	40	ND	ND	ND	ND	30	ND	ND	ND	ND	ND	ND	ND
WNM2	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WNM3	36	ND	ND	ND	<30	ND	ND	ND	ND	ND	ND	ND	ND
WNM4	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33	ND

ND – *Not Discernible. When site only noise is noted as ND, there was no noise from the source of interest audible at the monitoring location*

Table 6-4: Western Coal Services LAeq (15minute) Evening

Monitoring location	Evening Limit LAeq (15 min)	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	July 2021	Aug 2021	Sept 2021	Oct 2021	Nov 2021	Dec 2021
WNM1	35	ND	ND	ND	ND	30	ND	32	34	ND	ND	ND	ND
WNM2	35	ND	ND	ND	ND	ND	29	33	30	ND	ND	ND	ND
WNM3	35	ND	ND	ND	<30	ND	28	ND	ND	ND	ND	ND	ND
WNM4	35	ND	ND	ND	ND	ND	29	ND	ND	ND	ND	ND	ND

ND – *Not Discernible. When site only noise is noted as ND, there was no noise from the source of interest audible at the monitoring location*

Table 6-5: Western Coal Services LAeq (15minute) Night

Monitoring location	Night Limit LAeq (15 min)	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	July 2021	Aug 2021	Sept 2021	Oct 2021	Nov 2021	Dec 2021
WNM1	35	ND	ND	ND	ND	ND	33	31	30	ND	ND	ND	ND
WNM2	35	ND	ND	ND	ND	25	ND	30	30	ND	ND	ND	ND
WNM3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WNM4	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND – *Not Discernible. When site only noise is noted as ND, there was no noise from the source of interest audible at the monitoring location*

Sound Power Levels

In accordance with the WRNMP sound power levels (SPL) monitoring was undertaken in 2021. SP testing was undertaken by Global Acoustics in 2021.

Table 6-6 Annual Sound Power Level Results

Item	2021	
	L_{WA}	L_W
CW01	78	89
CW02	71	76
CW03	89	94
CW04	86	89
CW05	80	85
CW06	79	83
CW07	79	84
CW09	79	85
TT05	105	115
TT07	95	103
OL3 Drive	97	102
CPP	107	127

WCS will continue to monitor potential impact at nearby noise sensitive receivers through the monthly operator-attended noise monitoring program.

Real Time Monitoring

In accordance with Schedule 3, Condition 8 (b), a noise management system is installed at WCS uses a combination of predictive meteorological forecasting and real time noise monitoring data to guide day to day planning of the Western Coal Services operations. As outlined in the WRNMP the system is installed for proactive management purposes only. During the reporting period the system was calibrated and operational.

Further detail for noise monitoring results in the reporting period are presented in Appendix 3.

6.2.3 Comparison against Predictions

Modelled predictions indicate that WCS will comply with the Industrial Noise Policy (INP) Project Specific Criteria. Modelled predictions indicate that there will be likely residual noise impacts above the INP Project Specific Criteria at some receptors in the locality of Blackmans Flat.

6.2.4 Long Terms Analysis

Table 6-7 summarises the number of noise non-compliances at attended monitoring locations since 2017.

Table 6-7: 2017-2021 WCS Attended Noise Monitoring Exceedances

	2017			2018			2019			2020			2021		
Location	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
WNM1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0
WNM2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
WNM3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
WNM4	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
WNM5	0	0	0	0	0	0									
WNM6	3	5	6	0	0	0									
WNM7	4	6	4	0	0	0									
WNM8	0	0	0	0	0	0									
WNM9	0	0	0	0	0	0									
WNM10	0	0	0	0	0	0									
WNM11	0	0	0	0	0	0									

D *= Day period (The period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays).*
E *= Evening period (The period from 6pm to 10pm).*
N *= Night period (The period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays).*

As shown in Table 6-7 there have been no non-compliant measurements since 2018. The WCS attended noise monitoring moved to the long-term monitoring program in 2019 as per the WRNMP which requires only WNM1, WNM2, WNM3, and WNM4 to be monitored.

6.2.5 Implemented / Proposed Improvements

Noise management controls are considered effective based upon compliance with the noise criteria. WCS will continue to implement the WRNMP. WCS will review and revise the WRNMP in accordance with Schedule 5 Condition 5.

6.2.6 Acquisition

There have been no requests received or actions undertaken during the reporting period.

6.3 BLASTING

6.3.1 Environmental Management

There was no blasting carried out at WCS in 2021.

6.4 AIR QUALITY

6.4.1 Environmental Management

WCS manages air quality in accordance with the Western Region Air Quality and Greenhouse Gas Management Plan (WRAQMP) dated April 2021. This plan was approved by DPIE 10 May 2021.

The following identified sources of dust emissions in the WRAQMP are relevant for WCS operations:

- Wind erosion from coal stockpiles;
- Wind erosion from disturbed areas and coal stockpiles;
- Wheel generated dust from vehicle movements;
- Fugitive emissions from coal handling and processing;
- Fugitive emissions during train loading operations;
- Coal transporting activities (i.e. conveyors and trains);

- Operation of mobile equipment.

Key dust mitigation measures for WCS are:
- 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 conditions; and
- Maintaining enclosures on conveyor systems

Additional noise management and mitigation measures are outlined in the WRAQMP.

6.4.2 Environmental Performance

Air Quality Criteria

The criteria for the WCS project is shown in Table 6-8, Table 6-9 and Table 6-10.

Table 6-8: Long term criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Dust	Annual	[2]2 g/m^2/month4	[1]4 g/m^2/month

Table 6-9: Short term criteria for particulate matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM10)	24 hour	[1]50µg/m^3

Table 6-10: Long term criteria for particulate matter

Pollutant	Averaging period	Criterion
Total suspended particulate matter (TSP)	Annual	[1]90µg/m^3
Particulate matter < 10 µm (PM10)	Annual	[1]25µg/m^3

[1]Total impact (ie incremental increase in concentrations due to the development plus background concentrations due to all other sources);
[2] Incremental impact (ie incremental increase in concentrations due to the development on its own)

WCS undertakes air quality monitoring in accordance with the short-term program. The air quality monitoring locations are shown in Figure 6-1.

Dust Deposition

Table 6-11 presents monitoring results obtained during the reporting period.

Table 6-11: 2021 results for deposited dust

Dust Gauge	Min	Mean	Max
WCSDG3	0.46	1.66	3.29
WCSDG4	0.27	0.69	2.39
WCSDG5	0.21	1.37	3.70

The annual averages for deposited dust are within of below the predicted ranges and remain compliant with the limits in the project approval and EPL.

PM10 and TSP

A real time PM_{10} unit monitors air quality levels for compliance purposes. As outlined in the WRAQMP, a ratio of PM10 and TSP is used to estimate TSP contributions.

Table 6-12: 2021 results particulate matter

	Criteria	Maximum (µg/m^3)	Mean (µg/m^3)
PM10 (long term)	25	25.80	9.44
TSP[3]	90	60.00	21.94

[3]calculated TSP concentration estimate (PM10 annual average divided by 0.43)

The annual averages for PM10 are within of below the predicted ranges and remain compliant with the limits in the project approval and EPL.

During the reporting period the Real time monitor operated 100 % of time.

Further detail for air quality monitoring results in the reporting period are presented in Appendix 4.

6.4.3 Comparison against Predictions

As outlined in SSD 5579, dust levels from the Project are predicted to meet relevant air quality criteria for TSP, PM10, PM2.5 and dust deposition.

The dispersion modelling conducted for WCS predicted compliance for all assessed particulate matter air pollutants at all surrounding sensitive receptor locations.

Mod 3 was not predicated to significantly change air quality impacts from those currently generated by the approved operation of the facility.

6.4.4 Long Terms Analysis

The annual average long-term trends are summarised in Table 6-13. Exceedances for particulate matter are summarised in Table 6-14.

Table 6-13: Long term trends for deposited dust

	2017	2018	2019	2020	2021
WCSDG3	1.35	1.63	1.13	1.72	1.66
WCSDG4	0.61	0.98	1.15	1.01	0.69
WCSDG5	0.46	0.73	2.04	1.44	1.37

Table 6-14: Exceedances for particulate matter

	2017	2018	2019	2020	2021
24hr PM10 (short term)	0	0	0[4]	0[4]	0
PM10 (long term)	0	0	0	0	0
TSP	0	0	0	0	0

[4] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, or any other activity agreed by the Secretary as described in the 2019 and 2020 Annual Reviews per Schedule 3 Condition 15

6.4.5 Implemented / Proposed Improvements

Dust emission controls are considered effective based upon compliance with the air quality criteria. WCS will continue to implement the WRAQMP. WCS will review and revise the WRAQMP in accordance with Schedule 5 Condition 5.

6.5 BIODIVERSITY

6.5.1 Environmental Management

WCS manages biodiversity in accordance with the Western Region Biodiversity Management Plan (WRBMP). After receiving feedback from DPIE in October 2021 further consultation is proposed with relevant stakeholders in 2022 with re-submission by 30 April 2022.

6.5.2 Aquatic Ecology

Aquatic ecology monitoring is undertaken in accordance with the requirements of the Upper Coxs River Action and Monitoring dated March 2020. This was approved under Springvale Mine Extension Project (SSD 5594 Schedule 4 Condition 13) on 7 May 2020 by DPIE.

A summary of results as relevant to WCS is presented in Appendix 5.

6.5.3 Biodiversity Offset

The Biodiversity Offset Strategy developed by centennial fulfills the requirements of Schedule 3 Condition 25. The Strategy dated November 2020 was approved by DPIE on 27 January 2021.

To offset the loss of 10.67 ha of vegetation clearing which constitutes the requirement for 695 ecosystem credits the following has been provided as an offset:

- 292 ecosystem credits from HN534 - Moderate/Good Carinya Offset site; and
- 403 ecosystem credits from HN544 – Moderate/Good Carinya Offset site

The conservation agreement for Carinya Lot 163 was finalised in October 2020. Springvale submits Annual Management reports to BCT for the site. Figure 6-4 presents the offset site.

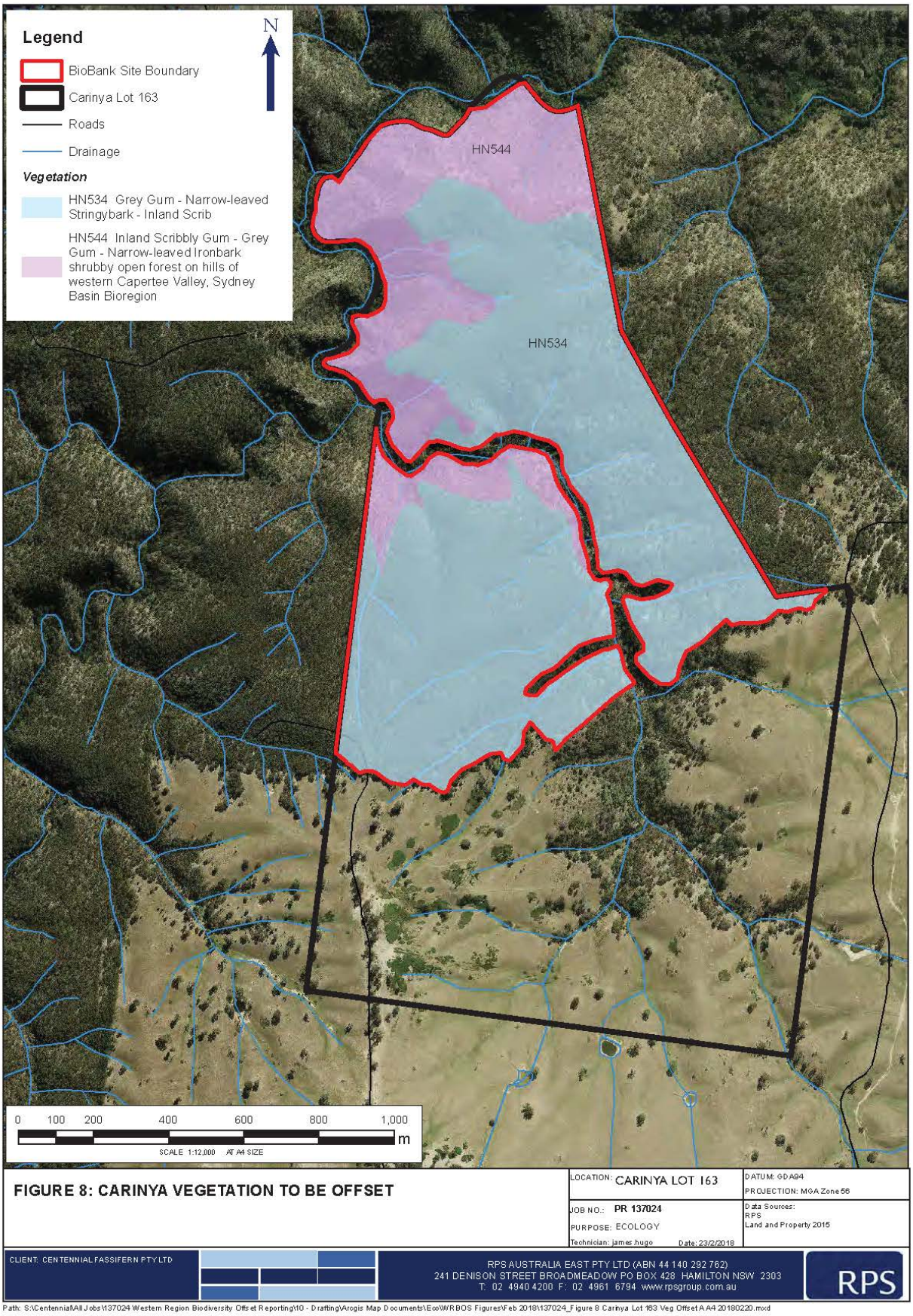


Figure 6-4 Carinya Offset Site Vegetation Units

6.5.4 Comparison against Predictions

The WCS EIS predicted that:

- there are no significant impacts on adjacent aquatic habitats as impacts will be satisfactorily managed and mitigated via construction and operational Environmental Management Plans (EMPs).
- There are no significant impacts on the ecology of the Springvale Coal Services Site, including vegetation communities, threatened flora and fauna or endangered ecological communities that are known or expected to occur.
- There are no significant impacts on threatened species or Endangered Ecological Community (EECs) listed under the NSW Threatened Species Conservation Act 1995 (TSC Act 1995), or Matters National Environmental Significance (MNES) under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).

During the reporting period there were no impacts to biodiversity because of operational activities at WCS.

6.6 HERITAGE

6.6.1 Environmental Management

WCS manages Aboriginal Heritage in accordance with the Western Region Aboriginal Cultural Heritage Management Plan dated September 2021. This plan was approved by DPIE on 14 October 2021.

WCS manages European heritage in accordance with the Historic Heritage Management Plan dated June 2018. This was approved by DPIE on 4 July 2018.

6.6.2 Environmental Performance

No heritage monitoring was triggered at WCS throughout the reporting period because there was no surface disturbance at WCS during the reporting period.

Fencing surrounding aboriginal heritage sites was inspected during the reporting period to ensure that there was no direct or indirect impact on identified Aboriginal sites. There was no damage to the fencing around the sites and no evidence of disturbance in the areas inspected.

6.6.3 Comparison against Predictions

A total of nine known Aboriginal sites (three existing and six new sites) are located on the Springvale Coal Services Site. Of these sites, none are at high risk of impact, one is at low-moderate risk, and eight are at low (remote) risk of impact.

There are no impacts on non-Aboriginal Heritage items predicated.

During the reporting period there was no impact observed to aboriginal or non-aboriginal items.

6.6.4 Implemented / Proposed Improvements

WCS will continue to monitor and implement mitigation and management measures (as triggered) to ensure inadvertent harm to sites can be avoided.
The Western Region Heritage Committee Meetings were held on in May and November 2021.

The land disturbance due diligence process implemented by the site is considered appropriate for the management of heritage items.

6.7 OTHER MATTERS

6.7.1 Bushfire Management

WCS manages Bushfire management in accordance with the SCSO Bushfire Management System.

Fire control equipment was inspected monthly as part of normal operational maintenance.

No fires occurred in the WCS approval boundary area that required Rural Fire Services assistance.

6.7.2 Waste

6.7.1.1 Operational waste

This section provides an overview of waste minimisation and management measures as required under Schedule 3 Condition 42.

There are four main forms of waste generated by the Western Coal Services Project and in particular the Springvale Coal Services Site. These include Coal reject material produced from the washery, recyclable materials, workshop wastes, and domestic wastes.

Coal reject was utilised in the construction of the REA, and for landform completion works for Area 4 in accordance with the WCS MOP.

The following items are collected to minimise waste to landfill

- Waste Oil
- Paper, Cardboard, packaging
- Metals
- Other recyclables (glass plastics)
- Chep Pallets

All general waste is collected by licensed waste contractor for disposed at Licensed land fill site.

In 2021, 1,121 Tonnes was sent offsite for disposal. 271 Tonnes was recycled with yields a 24.2% recycling rate. This compares to a recycling rate of 23.33% in 2020. Figure 6-5 provides a summary of waste generated in 2021 at the WCS site.

Further detail on waste management is presented in Appendix 6.

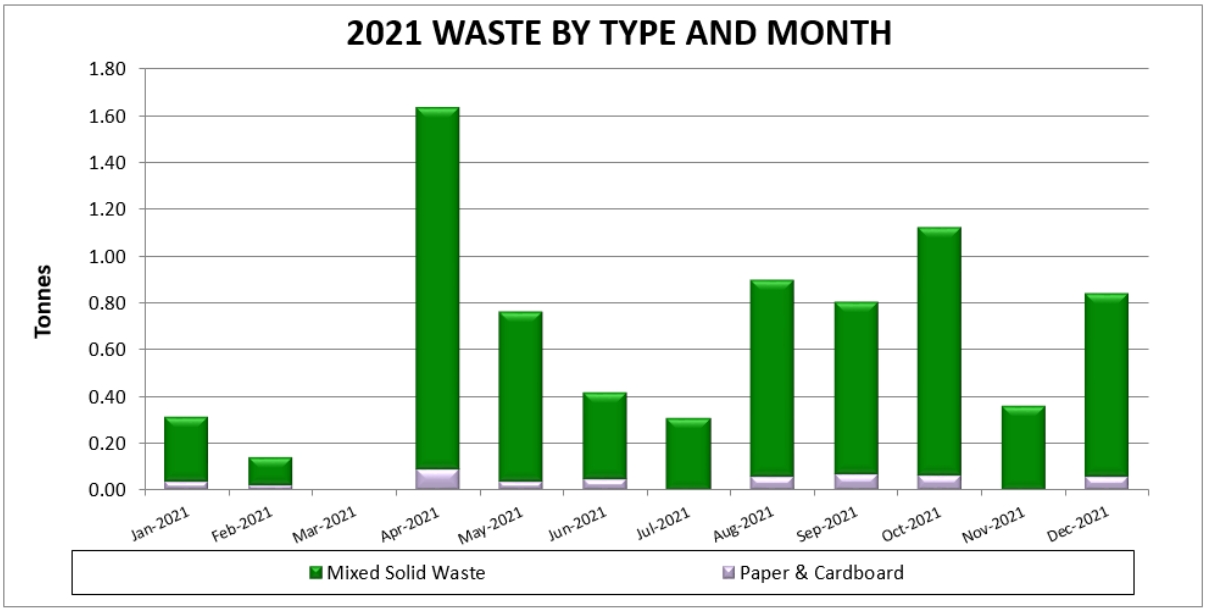


Figure 6-5 2021 Waste Generation

6.7.1.2 Residual Waste

Schedule 2 Condition 8A specifies the limits associated with the transfer of residual waste from the Springvale Water Treatment project. The limits are presented in Table 6-15, alongside the 2021 volumes transferred.

Table 6-15 Residual Transfer Limits and Performance

Performance Criteria	Limit	2021 Results
Annual Average	0.35 Megalitres per Day	0.32 Megalitres per Day
Daily Maximum	0.43 Megalitres per Day	0.43 Megalitres per Day

Results are presented graphically in Figure 6-6.

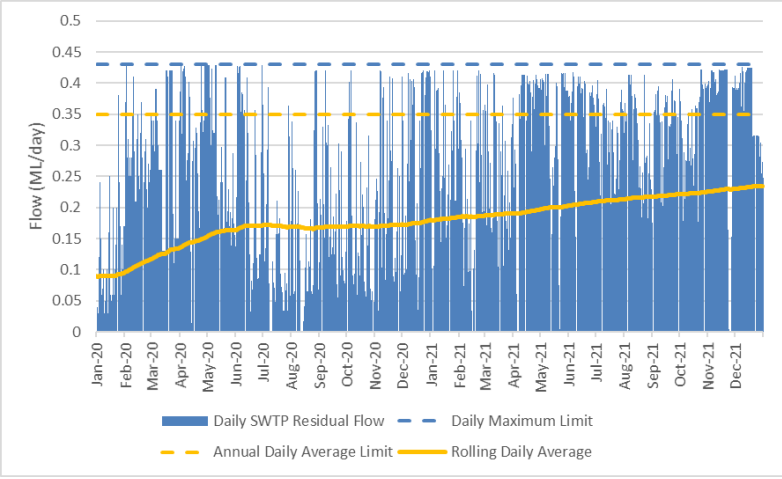


Figure 6-6 2021 Residuals Transferred to WCS 2020-2021

Results obtained during the reporting period demonstrate compliance with limits specified in the consent.

6.7.3 Visual

WCS manages Visual impacts in accordance with the Development Consent SSD-5579, Schedule 3, Condition 40.

- No fixed outdoor lights or mobile lighting rigs shined above the horizontal.
- All external lighting associated with the development complied with Australian Standard AS4282.
- Ensured that the visual appearance of all buildings, structures, facilities or works (including paint colours and specifications) was aimed at blending as far as possible with the surrounding landscape.

During the reporting period no complaints were received in relation to the visual amenity of the site.

7 WATER

7.1 WATER MANAGEMENT

WCS manages both surface water and groundwater in accordance with the Water Management Plan dated August 2014. Versions have also been submitted in 2017 and 2019 however these are not approved by DPIE. This will be followed up with DPIE in 2022.

Key management measures during the operational phase include:

- The use of higher grades of mechanical equipment across the facility to reduce downtime and increase the efficiency of the water management system.
- The management of water discharged from site
- Storage and use of chemicals/ fuel on site in accordance with Technical guidelines
- The use of sprinklers and water carts on coal stockpiles and compacted coal reject –
- The removal of coal spillage on ground
- The removal of invasive species
- Visual, acoustic and water management bunds around maintenance
- Drainage lines maintenance.
- Ponds and Sediment Detention Basins maintenance.

7.1.1 Water Licenses

WCS do not require any licences for the extraction of surface water or groundwater.

7.1.2 Water Balance

A summary of the predicted average annual inputs and outputs for existing and future conditions is provided in Table 7-1.

Table 7-1: WCS Water Balance

	2021 (simulated actual conditions) (ML/year)	2022 (average forecast) (ML/year)
INPUTS		
Catchment runoff onto storages	592	652
Direct rainfall onto storages	134	91
Groundwater recharge	305	299
SWTP residuals	116	128
Flocculant makeup	0	0
ROM coal moisture	42	20
Mount Piper Ash Repository	454	454
TOTAL INPUTS	**1643**	**1644**
OUTPUTS		
Evaporation	160	145
Dust suppression	55	55
Coarse coal reject moisture	11	5
Product coal moisture	28	13
Seepage from DML Dam and Cooks Dam to Wangcol Creek	199	204
Overflow from FPL to Wangcol Creek	267	302
Discharge via LDP001 to Wangcol Creek (SCSS)	852	1053
Discharge via LDP002 to Coxs River (conveyor at Brays Lane)	0	0
TOTAL OUTPUTS	**1572**	**1779**
CHANGE IN STORAGE		
Surface water storages	112	-113
Underground storage	-40	-22
TOTAL CHANGE IN STORAGE	**72**	**-135**
BALANCE	-1	0

The model predications were developed for average and range of water and salt transfers at WCS, particularly the discharge from LDP001 for 2022. The modelling predicts that discharges from LDP001 in 2022 will range from approximately 2 to 4 ML/day, with an EC between approximately 4000 and 6000 µS/cm.

The modelling predicates an upward trend in EC, however that result is highly sensitive to the assumed quantity and quality of potential groundwater seepage from Mount Piper Ash Repository.

Variability in coal washing rates is a major confounding factor in identifying the influence on rainfall and seepage on the shallow groundwater system. Observation during 2021 with minimal coal production is expected to provide additional information of behaviour of the shallow groundwater system.

7.1 SURFACE WATER

7.1.1 Environmental Management

Discharge water quality is monitored monthly during discharge as per the requirements of EPL 21229 and the Western Coal Services Water Management Plan at Licenced Discharge Point (LDP) LDP001, and LDP002. The Location of LDP001, and LDP002 is shown in Figure 6-1.

Further detail on monitoring results obtained during the reporting period are presented in Appendix 7.

7.1.2 Environmental Performance

Discharge Water

Discharge water quality results from LDP001 through the reporting period are summarised in Table 7-2.

Table 7-2: LDP001 Water Quality Summary

Parameter	Unit of Measure	Lowest sample value	Mean of sample	Highest sample value	EPL limit
pH	pH units	6.6	6.91	7.2	6.5-8.5
TSS	mg/L	10	8.5	7	30
EC	µS/cm	1601	3084	3490	-
Oil & Grease	mg/L	<5	<5	<5	10
Turbidity	NTU	4.8	12.87	23	50

* For averaging purposes, when a sample result is reported below the laboratory limit of reporting (LOR), half the LOR value is used for the result where 50% of the total samples are less than the LOR. Otherwise the result is reported as zero.

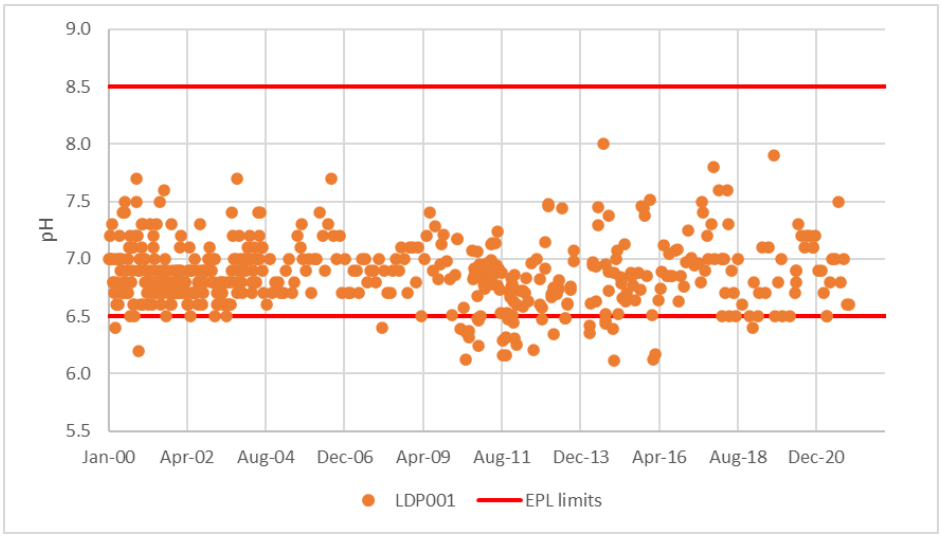


Figure 7-1 pH Trends LDP001

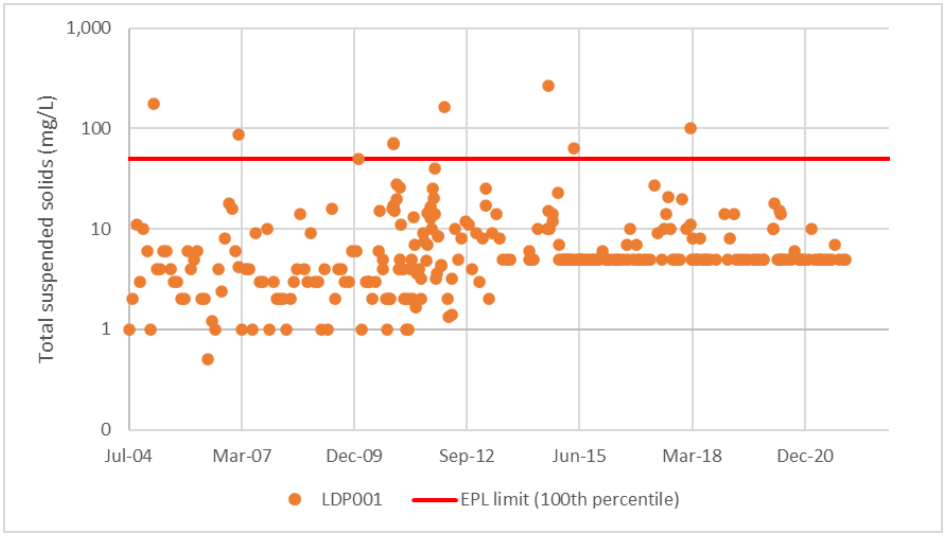


Figure 7-2 TSS Trends LDP001

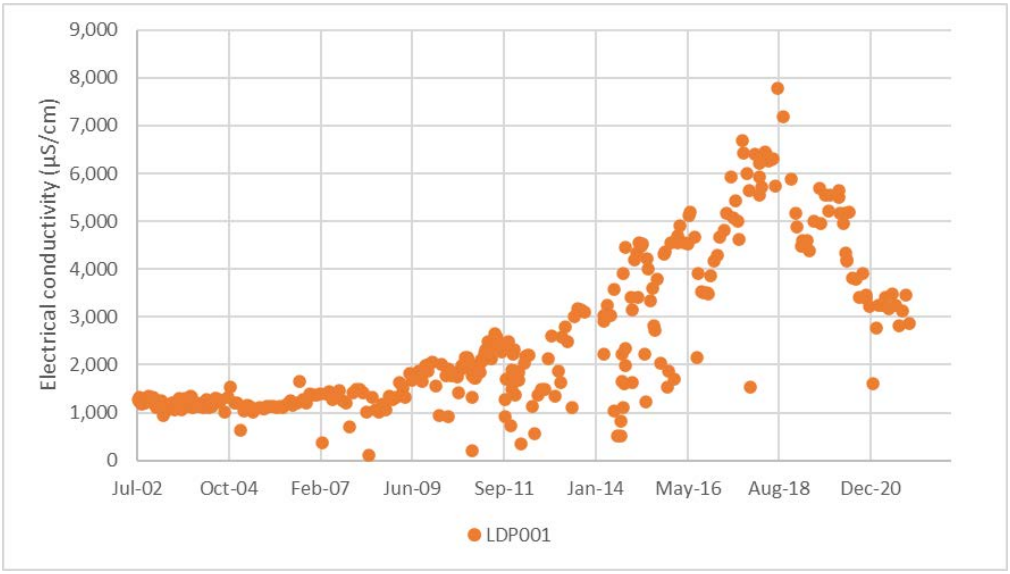


Figure 7-3 EC Trends LDP001

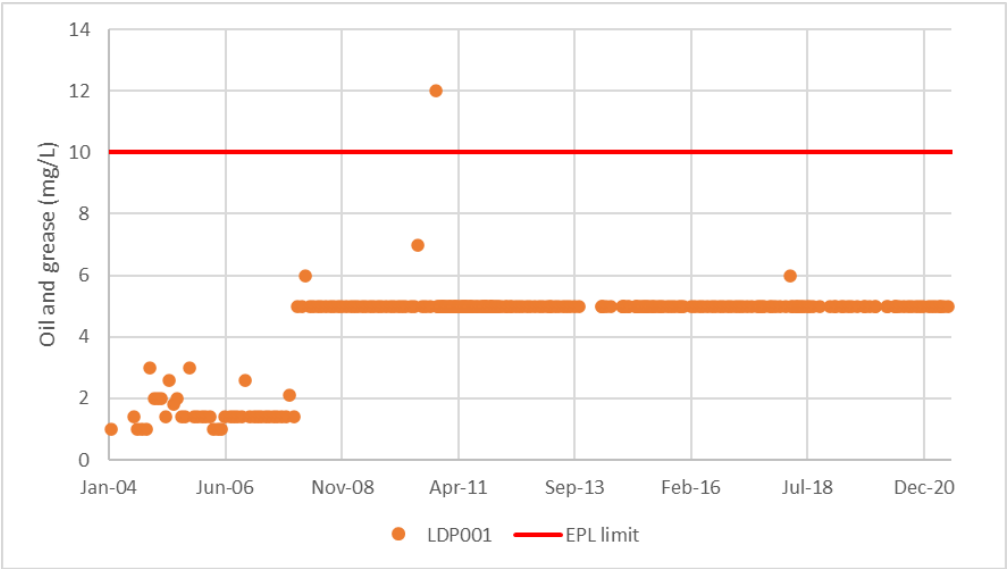


Figure 7-4 TOG trends LDP001

The LDP001 flow summary for the 2021 reporting period is presented in Table 7-3.

Table 7-3: LDP001 2021 Flows

Unit of Measure	Frequency	No. of measurements made	Lowest daily volume	Mean daily volume	Highest daily volume	Total annual volume
Megalitres (ML)	Daily during any discharge	365	0	0.545	4.41	198.895

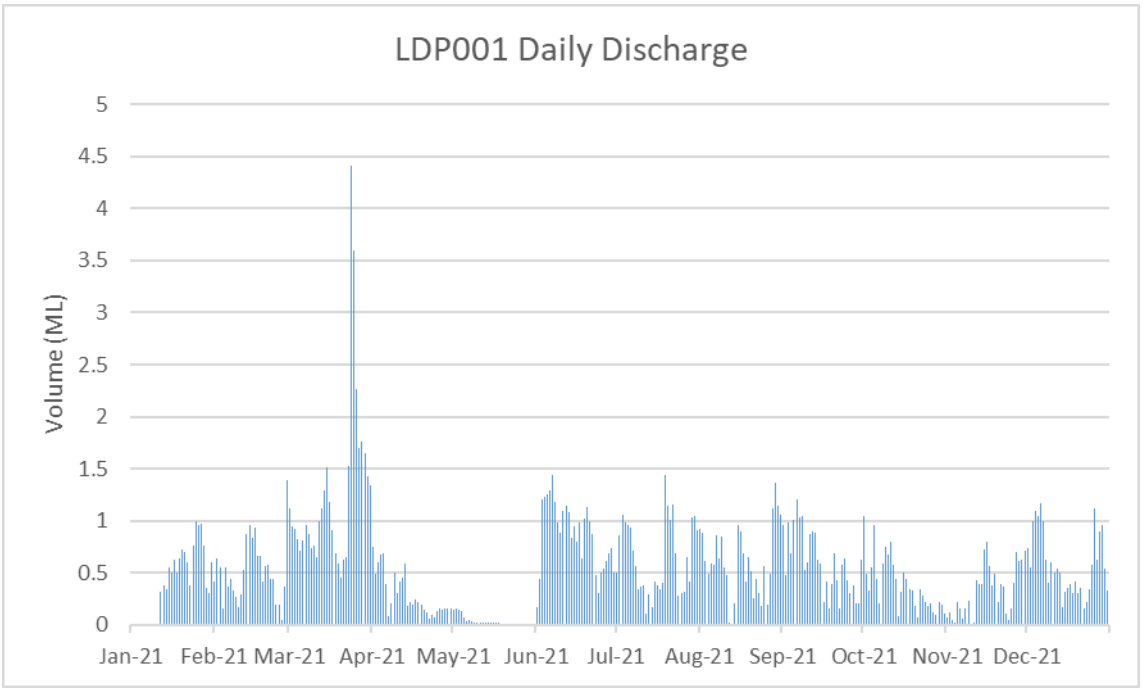


Figure 7-5 LDP001 Flow Summary

During the reporting period monitoring has been undertaken in accordance EPL 21229 and the Western Coal Services Water Management Plan. There was no discharge from LDP002 in 2021.

7.1.3 Wangcol Creek

Surface water monitoring sites on Wangcol Creek are monitored to assess potential impact from site discharges through LDP001. A summary of the water quality data is provided in Table 7-4.

Table 7-4: Wangcol Creek water quality - 2021

Parameter	Units	Wangcol Creek Gauge		Wangcol Creek US		Wangcol Creek DS		Wangcol Creek Far DS	
		#	Median	#	Median	#	Median	#	Median
Physicochemical									
EC	µS/cm	12	551	12	547	12	1479	12	1475
pH	pH units	12	7.5	12	7.4	12	7.5	12	7
TDS	mg/L	12	327	12	388	12	1055	12	1075
TSS	mg/L	12	5	12	5	12	5	12	5
Turbidity	NTU	12	4.2	12	3.9	12	4.3	12	4.2
Nutrients									
Ammonia	mg/L	12	0.01	12	0.01	12	0.01	12	0.01
Nitrate	mg/L	12	0.02	12	0.01	12	0.04	12	0.03
Nitrite	mg/L	12	0.01	12	0.01	12	0.01	12	0.01
Nitrate + nitrite	mg/L	12	0.02	12	0.01	12	0.04	12	0.03
Total Kjeldahl nitrogen	mg/L	12	0.2	12	0.2	12	0.2	12	0.2
Total nitrogen	mg/L	12	0.2	12	0.2	12	0.2	12	0.3
Total Phosphorus	mg/L	12	0.01	12	0.01	12	0.01	12	0.01
Major ions									
Bicarbonate alkalinity	mg/L	12	68	12	67	12	76	12	72
Carbonate alkalinity	mg/L	12	1	12	1	12	1	12	1
Hydroxide alkalinity	mg/L	12	1	12	1	12	1	12	1
Total alkalinity	mg/L	12	68	12	67	12	76	12	72
Calcium	mg/L	12	29	12	34	12	59	12	59
Chloride	mg/L	12	43	12	51	12	102	12	92
Magnesium	mg/L	12	20	12	24	12	47	12	47
Potassium	mg/L	12	5	12	6	12	17	12	16
Sodium	mg/L	12	54	12	66	12	196	12	186
Sulphate	mg/L	12	158	12	193	12	572	12	539
Total hardness	mg/L	12	154	12	183	12	338	12	338
Dissolved metals									

Parameter	Units	Wangcol Creek Gauge		Wangcol Creek US		Wangcol Creek DS		Wangcol Creek Far DS	
		#	Median	#	Median	#	Median	#	Median
Aluminium	mg/L	12	0.01	12	0.01	12	0.01	12	0.04
Boron	mg/L	12	0.07	12	0.09	12	0.40	12	0.39
Cadmium	mg/L	12	0.0001	12	0.0001	12	0.0001	12	0.0001
Iron	mg/L	12	0.09	12	0.05	12	0.05	12	0.05
Manganese	mg/L	12	0.155	12	0.159	12	0.357	12	0.604
Nickel	mg/L	12	0.021	12	0.025	12	0.075	12	0.072
Selenium	mg/L	12	0.01	12	0.01	12	0.01	12	0.01
Zinc	mg/L	12	0.009	12	0.008	12	0.015	12	0.023
Other									
Oil and grease	mg/L	12	5	12	5	12	5	12	5

Graphical representation of results surface water results is presented in Appendix 7.

7.1.4 Comparison against Predictions

The EIS identified that after mitigation measures had been implemented, the Project's impact on water quality would be further improved. The improvements would be progressively implemented and monitored to verify that the anticipated improvements were realised. Section 9.5.3.6 of the EIS shall be referred to for detail on the surface water management and mitigation measures identified as part of the project.

7.1.5 Implemented / Proposed Improvements

A key focus for WCS in 2022 is securing Modification 4. Modification 4 provides resolution of the SCSI Pollution Reduction Program seeking a volume limitation on LDP001 into Wangcol Creek. The project aims to achieve the following objectives

- 99% reduction of discharge volume (616ML/yr down to 5ML/yr)
- 99% reduction in average salt load (1932 tpa to less than 10 tpa)

WCS will follow up with DPIE on the Water Management Plan approval in 2022.

The site will continue to focus on the maintenance of water management structures and soil and erosion controls to ensure ongoing compliance with the performance criteria and EPL limits applicable to WCS.

7.2 GROUNDWATER

7.2.1 Environmental Management

WCS manages groundwater in accordance with the 2014 WCS Water Management Plan as discussed in Section 7.1.

Further detail on monitoring results obtained during the reporting period are presented in Appendix 8.

7.2.2 Environmental Performance

WCS monitoring both groundwater level and quality across a network of boreholes. Groundwater levels trends are summarised in Table 7-5 and groundwater quality trends are presented in Table 7-6.

Table 7-5: WCS groundwater levels trends

Monitoring bore	Groundwater level trigger (m AHD)	2021 Maximum Level (m AHD)	Groundwater level trend
BH01	910	908.9	Level influenced by DML dam. Decreasing level during the first half of 2021, increasing level during the second half of 2021.
BH02	893	890.6	Level has rebounded to pre-2017 levels, likely due to increased rainfall in 2021 Bore was reported as dry for most of 2021 until September.
BH03	905	904.0	Levels vary between 901 m AHD and 904 m AHD in 2021. Levels are potentially influenced by water levels in surrounding surface water storages.
BH04	913	908.4	Level influenced by DML dam. Level has remained relatively constant through 2021. Troughs and spikes are caused by groundwater purging and subsequent recovery respectively.
BH05	928	908.4	Level is highly influenced by DML dam and Lithgow City Council void. Levels vary between 906 m AHD and 908 m AHD in 2021.

Monitoring bore	Groundwater level trigger (m AHD)	2021 Maximum Level (m AHD)	Groundwater level trend
BH06	903	900.7	Level has generally risen through 2021, likely from the influence of above average rainfall during 2021.
BH07	923	911.0	Level has generally risen through 2021, likely from the influence of above average rainfall during 2021.
BH08	915	908.5	Level has generally remained consistent through 2021.
BH09	928	906.9	BH09 was dry until November 2021 and showed groundwater level between 905 and 907 m AHD.
BH10	-	-	BH10 was dry throughout 2021.
BH11	940	911.8	Level has consistently risen through 2021, likely from the influence of above average rainfall during 2021.
BH12	-	-	BH12 was dry throughout 2021.
BH13	914	909.4	Level has consistently risen through 2021, likely from the influence of above average rainfall during 2021.
BH15	947	927.8	BH15 was dry in 2021 with the exception of January.

In 2021, monitoring bores BH10 and BH12 have been consistently dry throughout 2021. A review of groundwater hydrographs indicates a groundwater flow direction from the south west to the north east. No groundwater level trigger events occurred during the reporting period.

Table 7-6: Groundwater quality Median Result Summary – 2021

Parameter	Unit	BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH11	BH13	BH15
Physiochemical													
EC	µS/cm	3440	975	1368	455	24	1910	3855	3780	2850	2021	2840	3520
pH	pH units	5.9	6.8	3.8	6.6	24	6.4	3.8	6.2	6.3	6.7	6.4	6.2
TDS	mg/L	2709	628	1061	267	11	1419	3273	3048	2293	1549	2148	2482
TSS	mg/L	41	20	60	36	11	21	174	52	26.5	46	57	1455
Nutrients													
Nitrate	mg/L	0.07	0.47	0.01	0.33	0.32	0.02	0.10	0.03	0.14	0.40	0.03	0.01
Nitrite	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate + nitrite	mg/L	0.07	0.52	0.02	0.33	0.32	0.02	0.10	0.03	0.14	0.40	0.03	0.01
Total Phosphorus	Mg/L	0.03	0.09	0.03	0.02	0.03	0.03	0.05	0.02	0.02	0.02	0.03	0.25
Major Ions													
Bicarbonate alkalinity	mg/L	123	234	1	185	179	127	7	161	199	274	337	172
Carbonate alkalinity	mg/L	1	1	1	1	1	1	1	1	1	1	1	1
Hydroxide alkalinity	mg/L	1	1	1	1	1	1	1	1	1	1	1	1
Total alkalinity	mg/L	123	234	1	185	179	127	7	161	199	274	337	172
Calcium	mg/L	103	75	55	41	42	97	198	142	122	154	118	162
Chloride	mg/L	270	134	86	13	22	136	144	281	183	70	172	203
Magnesium	mg/L	203	40	62	19	20	67	281	115	101	75	131	83

Potassium	mg/L	12	9	6	10	10	21	7	61	35	22	36	37
Sodium	mg/L	424	45	53	16	17	237	90	594	391	230	409	520
Sulfate	mg/L	1660	95	619	30	27	746	2105	1700	1245	794	1180	1610
Hardness	mg/L	1110	352	395	181	185	520	1650	840	721	689	834	746
Dissolved Metals													
Iron	mg/L	0.65	1.52	69.5	2.43	0.05	5.47	155	3.37	2.94	0.55	5.25	0.07
manganese	mg/L	6.14	0.775	7.15	0.324	0.331	1.90	6.76	4.85	3.01	0.081	4.81	4.40
nickel	mg/L	0.702	0.012	0.301	0.007	0.017	0.107	1.17	0.400	0.265	0.039	0.236	0.291
zinc	mg/L	0.688	0.070	0.931	0.032	0.035	0.050	4.39	0.234	0.156	0.098	0.099	0.209
Total Metals													
Aluminium	mg/L	0.180	0.155	12.5	0.205	0.355	0.355	6.02	0.19	0.185	0.200	0.270	0.270
Boron	mg/L	0.82	0.05	0.05	0.05	0.05	0.05	0.05	1.29	0.68	0.11	0.73	0.73
Cadmium	mg/L	0.0003	0.0001	0.0005	0.0001	0.0001	0.0001	0.0016	0.0002	0.0001	0.0001	0.0001	0.0001
Iron	mg/L	2.26	1.84	73.1	3.64	0.81	0.81	184	4.83	5.18	1.14	7.18	7.18
Manganese	mg/L	6.70	0.841	7.49	0.342	0.338	0.338	7.12	4.99	3.11	0.086	4.94	4.94
Selenium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Zinc	mg/L	0.709	0.088	0.973	0.045	0.055	0.055	4.50	0.245	0.181	0.101	0.132	0.132

Graphical representation of results groundwater results is presented in Appendix 8.

7.2.3 Comparison against Predictions

Section 9.5.4.3 of the EIS presents details in the impacts predicated for the WCS project and shall be referred to for additional detail. Key findings from the water management assessment include:

- Predicted groundwater levels in the shallow aquifer and the Lithgow Seam indicate negligible impact from the Project.
- the Project would not impact on any groundwater users in the area.
- The water quality observed at LDP 006 is impacted by groundwater seepages to DML and Cooks Dams
- Apart from the increase in inflow to dams on the Springvale Coal Services Site over the life of the Project, there will be no other impacts to aquifer systems.
- No sensitive GDEs have been identified within the Springvale Coal Services Site. Any potential ecosystems associated with the Wangcol Creek would not be impacted by the Project both in relation to water quality and quantity.

7.2.4 Implemented / Proposed Improvements

As noted by the predications, an interrelationship between surface and groundwater exists. Modification 4 outlined in Section 7.1.5 will benefit water quality discharging from the site.

8 REHABILITATION

8.1 Environmental Management

WCS manages rehabilitation in accordance with the WCS Mining Operation Plan Amendment A (WCS MOP) dated April 2020. The MOP was approved by Resource Regulator 28 August 2020.

The EIS identified that rehabilitation is to be undertaken following the decommissioning of the Reject Emplacement Area (REA). The REA is currently in operation.

8.2 Rehabilitation and Disturbance Status

Rehabilitation works were undertaken on previously rehabilitated areas in accordance with the MOP and Rehabilitation Improvement Plan (RIP).

Table 8-1: WCS Rehabilitation Status

Year (End of)	Disturbance and rehabilitation at WCS		
	Total disturbance area – Per MOP year (Ha)	Total rehabilitation area – Per MOP year (Ha)	Cumulative rehabilitation areas (Ha)
Start of MOP	185.1	39.2	39.2
2020 (Previous reporting period)	180.5	39.2	39.2
2021 (Current reporting period)	180.5	0	60.2
2022 (Next reporting period)	180.5	0	43.8
End of MOP	180.5	-	43.8

Proposed landform rehabilitation was postponed due to requirements for the prioritisation of handover of areas of Energy Australia land (known as Area 4D). Table 8-1 indicates the status as of 31 December 2021. Centennial are proposing to relinquish 21 ha (Area 4D) to Energy Australia in 2022.

8.3 REHABILITATION MONITORING

8.3.1 Summary

The rehabilitation assessment was undertaken for each rehabilitation area and was based on the average values/results from the monitoring sites located together with the observations made during the walkover inspection. Table 8-2 presents a summary of results against the MOP criteria.

Further detail is presented in Appendix 9

Table 8-2: Rehabilitation progress against completion criteria in the MOP (2018-2024)

Completion criteria	Rehabilitation progress	Compliance status 2021			
		Cooks Dam	Access Road	REA	Lambert's Gully
Landform					
Landform is stable with no evidence of uncontrolled erosion	Satisfactory landform stability has been achieved across all rehabilitation areas, with no recorded evidence of active erosion processes or severe impacts	Yes	Yes	Yes	Yes
Slopes are generally less than 18% and no more than 25%	Except for localised exceptions (particularly along the lower contours of the 2008 Lambert's Gully rehabilitation where higher gradients had to be established to build the landform), established slopes are generally less than 25% across the rehabilitation. Slope as measured at the monitoring sites comprised between 9-25%.	Yes	Yes	Yes	Yes
Growing media					
Soil analysis undertaken to determine potential constraints	Soil sampling and analysis is undertaken on a three-yearly basis as part of the rehabilitation monitoring program. All monitoring sites were sampled in 2021 for soil characterisation. Testing results showed that all key parameters regulating plant establishment and growth were generally within acceptable values, with no key constraints identified that could prevent successful rehabilitation establishment.	Yes	Yes	Yes	Yes
Topsoil or alternative spread at depth of at least 50mm	Areas of older rehabilitation (Cooks Dam and access road) were dressed with adequate amount of topsoil (~100mm). However, topsoil application was minimal and uneven across the REA and Lambert's Gully rehabilitation (<50mm) and the little topsoil used was mixed and diluted in overburden/capping material. Growth medium improvement measures were defined in the RIP for these areas in the form of successive hydro mulching campaigns, but have not yet been implemented.	Yes	Yes	No	No
Ecosystem establishment and sustainability					
Minimum of 70% protective ground cover	Protective ground cover was satisfactory at all locations in 2021, comprised between 83.5-100%. Ground cover largely dominated by litter cover with low to moderate levels of live vegetative cover, but consistent with condition observed at analogue sites.	Yes	Yes	Yes	Yes
No bare areas >200m^2	Vegetation establishment and ground cover protection excellent across the Cooks Dam and access Road rehabilitation areas. Vegetation and ground cover establishment were assessed as slowly improving across the REA and Lambert's Gully rehabilitation, however several continuous bare areas >200m^2 remain. Ground cover improvement measures were defined in the RIP for these areas in the form of successive	Yes	Yes	No	No

Completion criteria	Rehabilitation progress	Compliance status 2021			
		Cooks Dam	Access Road	REA	Lambert's Gully
	hydro-mulching/seeding campaigns, but have not yet been implemented.				
Weed cover <15%	Weed diversity remained moderately high at the Cooks Dam and Access Road rehabilitation monitoring sites, but cumulative weed cover levels remained low and consistently <6% at all locations. Pro-active weed control is nonetheless recommended to minimise the risk of spread of occurring invasive weed species. Negligible weed diversity and weed cover continue to occur across the REA and Lambert's Gully rehabilitation.	Yes	Yes	Yes	Yes
Evidence of nutrient cycling (i.e. presence of litter, cryptograms, etc.)	Active nutrient cycling was evidenced at all monitored locations, including high levels of organic litter cover, abundance of nutrient fixing shrub species (acacias) and presence of cryptograms on the soil surface particularly in older rehabilitation areas.	Yes	Yes	Yes	Yes
Establishing species are consistent with a woodland community	In most rehabilitation areas a range of ground covers, shrubs and canopy eucalypts occur. Although cover levels or vegetation structure are often still developing (as a function of the young ecological age of the rehabilitated communities), the establishing species are generally consistent with local native communities. One exception is for the Cooks Dam rehabilitation where a tree layer is lacking, however improvement works under the RIP have started in this area to establish eucalypts. All planted eucalypt tubestocks consist of local species naturally occurring in the Central Tablelands. Currently, the thick shrub layer generally occurring in the rehabilitation is uncharacteristic of local native communities as observed at the analogue sites, however it is expected that shrub abundance should naturally receded with time as the tree layer further establishes and the canopy closes out.	Trending	Trending	Trending	Trending
>70% of trees are healthy and growing	Despite some residual drought-related impacts noted on some tree individuals; tree health was overall satisfactory with ≥88% of trees assessed as healthy at the monitoring sites. Tree growth also evidenced at many locations (increased girth and/or height), promoted by good rainfall received in the past two years	Yes	Yes	Yes	Yes
Dominant species aligned with those in local native communities	Although the rehabilitated communities do not perfectly align with a specific native community profile, in all vegetation layers the dominant species comprise local native species naturally occurring in the Central Tablelands region.	Yes	Yes	Yes	Yes
Presence of a range of structural habitats (eucalypts, shrubs, ground cover, developing litter layer)	With the exception of the Cooks Dam rehabilitation where the tree layer is not yet established (tree were planted in 2020 but remain at seedling growth stage), a range of structural habitat occurred in most areas including eucalypts, shrubs, ground covers and litter.	Trending	Yes	Yes	Yes
Other habitat features incorporated into rehabilitation areas (large rocks, logs, etc).	Artificial habitat features have not been incorporated throughout the rehabilitation.	No	No	No	No

Further retail on rehabilitation results are presented in Appendix 9.

8.3.2 Implemented / Proposed Improvements

A comprehensive action plan was developed and detailed in the RIP (Koru, 2018) to improve the condition of the rehabilitation across the entire site. No additional issues other than those addressed in the RIP were identified during this 2021 monitoring event, therefore no additional recommendations are suggested. Annual rehabilitation monitoring will continue in 2022.

9 COMMUNITY CONSULTATION

9.1 Environmental Management

WCS consults with the community through forums such as, the Centennial Western Region Community Consultative Committee and community organised events.

Meetings of the Centennial Western Region Community Consultative Committee (CCC) were held

- 17 February 2021
- May 2021 (Presentation distributed only)
- 18 August 2021
- 17 November 2021

Some meetings were conducted using online forums (Microsoft teams to adhere to covid-19 requirements.

Representatives of the appointed community representatives, relevant government organisations and company representatives attended the meetings. A detailed presentation was provided to attendees at each CCC meeting on the operational activities at the site.

Key agenda items discussed in 2021 included:

- Reject Emplacement Management
- Community and Stakeholder Engagement
- Huon site project
- Independent Environmental Audit

9.2 Community Complaints

A complaint register is made publicly available on the Centennial Coal website in accordance with Schedule 5 Condition 11. There have been no community complaints at WCS during the reporting period. Long terms trends in complaints are presented in Table 9-1.

Table 9-1: Record of annual community complaints for 2016 to 2021

Community Complaints						
Year	**Air**	**Water**	**Noise**	**Waste**	**Other**	**Total**
2017	0	0	0	0	0	0
2018	0	1	61	0	0	62
2019	0	0	20	0	0	20
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0

9.2.1 Community Information Line

A community information line was maintained for WCS to receive calls from the local community. The community information line (6355 9500) operates 24 hours a day, 7 days a week.

10 INDEPENDENT ENVIRONMENTAL AUDIT

10.1 Environmental Management

WCS undertakes an Independent Environmental Audit in accordance with Schedule 5, Condition 9 of SSD-5579 every three years from December 2015.

10.2 Environmental Performance

In 2021 the IEA site visit was conducted on the 7-9 December 2021. The audit was not complete at the end of the reporting period and the next WCS Annual Review will provide and update on recommendations from this audit. In accordance with Schedule 5 Condition 9 the next audit will be conducted 2024.

Table 10-1 presents an update on the 2018 auditor's recommendations which was undertaken by MCW Environmental. Ongoing and previously completed actions are presented in Appendix 10.

Table 10-1: Independent Audit Summary

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
Consultation	REC-2018-93	Follow up with Forestry Corporation NSW on the land swap on CCL-733 and required Forestry Permits to ensure these are in place where required.	The land swap agreement is in its final stages with the possibility of Native Title on the Neubeck portion of the swap (Lot 64 DP751636) under assessment. The land portion in question (Part Lot 502 DP825541), which is affected by the southern tip of co-disposal area, does not have any Native Title issues. Parties agreed not to pursue an Occupation Permit for Lot 502 as FCNSW are comfortable with the fact the Land Swap was progressing. As far as the Neubeck block is concerned, we have no reason to apply for an Occupation Permit as we do not have any infrastructure on there.	This is an ongoing process that started in 2012. The decision rests with the Crown Solicitors Office at present.	N/A
Site Observations	REC-2018-20	Investigate surface water and groundwater interactions within the Additional Rehabilitation Area west of the Co-disposal ponds to understand impacts of surface crusting on proposed rehabilitation plans.	The Rehabilitation Improvement Plan integrated as an attachment to WCS MOP Amendment A. Such issues will be identified and investigated once the RIP is implemented.	Commenced. Shared GW study with EA ongoing. LDP001 Pollution Reduction Program considering water management infrastructure within this area for construction in 2021.	N/A
2.17	REC-2018-92	Define and document the process for handover of areas of the WCS site to EA and how rehabilitation liabilities will be considered and managed. Consult with the Resources Regulator regarding this process.	A complex commercial and legal process between parties for land handover and exchanges is ongoing between CEY and EA. Rehabilitation liabilities are assessed and documented via that process.	Ongoing process. The consultation between EnergyAustralia and Centennial has over the last few years been focused on	Centennial is continuing to prepare for handover of WCS site to EA with the Huon Rehabilitation project throughout

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
				information sharing and reporting. Over the period of 2020, the consultation has moved into focusing on specific projects where delivery of solutions is being collaboratively achieved and now not only is information being shared, but assessments are also being completed collaboratively.	the 2021 reporting period
3.24	REC-2018-43	Once the water management works at TT03 are complete, update the Water Management Plan.	WMP will be updated on completion of works. CEY has dedicated approvals team who has established joint workflow process with DPIE for all CEY Management Plan Revision and submissions. WCS is included in this process.	Following completion of TT03 works	N/A
3.44	REC-2018-59	Continue progressive rehabilitation of disturbed areas to meet the condition requirements and realise environmental benefits such as minimising the total area exposed for dust.	Progressive rehabilitation is undertaken at WCS. The condition was noted as not compliant for Kerosene Vale. Kerosene Vale has been removed from the WCS MOP and is now managed under the Angus Place MOP Amendment by Angus Place Operations.	Completed – Transferred to Angus Place	N/A

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

This section refers to non-compliances and incidents reported during the reporting period. In 2021 there were no non-compliance or incidents reported.

12 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 12-1 presents activities that are currently planned for the next reporting period

Table 12-1: Forecast Operations for 2022

Improvement Actions
• Implement WCS IEA Actions • Continue to undertake dam and erosion and sediment control maintenance activities • Continue to work collaborative with relevant stakeholders to pursue modification 4
Management Plan Revisions
• Water Management Plan • Biodiversity Management Plan
Condition Triggers
• Review and Revise Management Plans, Strategies within 3 months of the submission of the WCS 2021 IEA, and the Annual Review (Schedule 5, Condition 5)

It is noted that changes to production activities may trigger changes to planned activities.

13 REFERENCES

ACIRL (2021) January to December 2021 Monitoring Reports

GHD (2021) January to December 2021 Monitoring Reports

GHD (2022) 2021 Annual Review of Surface and Groundwater Results

Global Acoustics (2022) Lidsdale Siding Sound Power Survey 2021

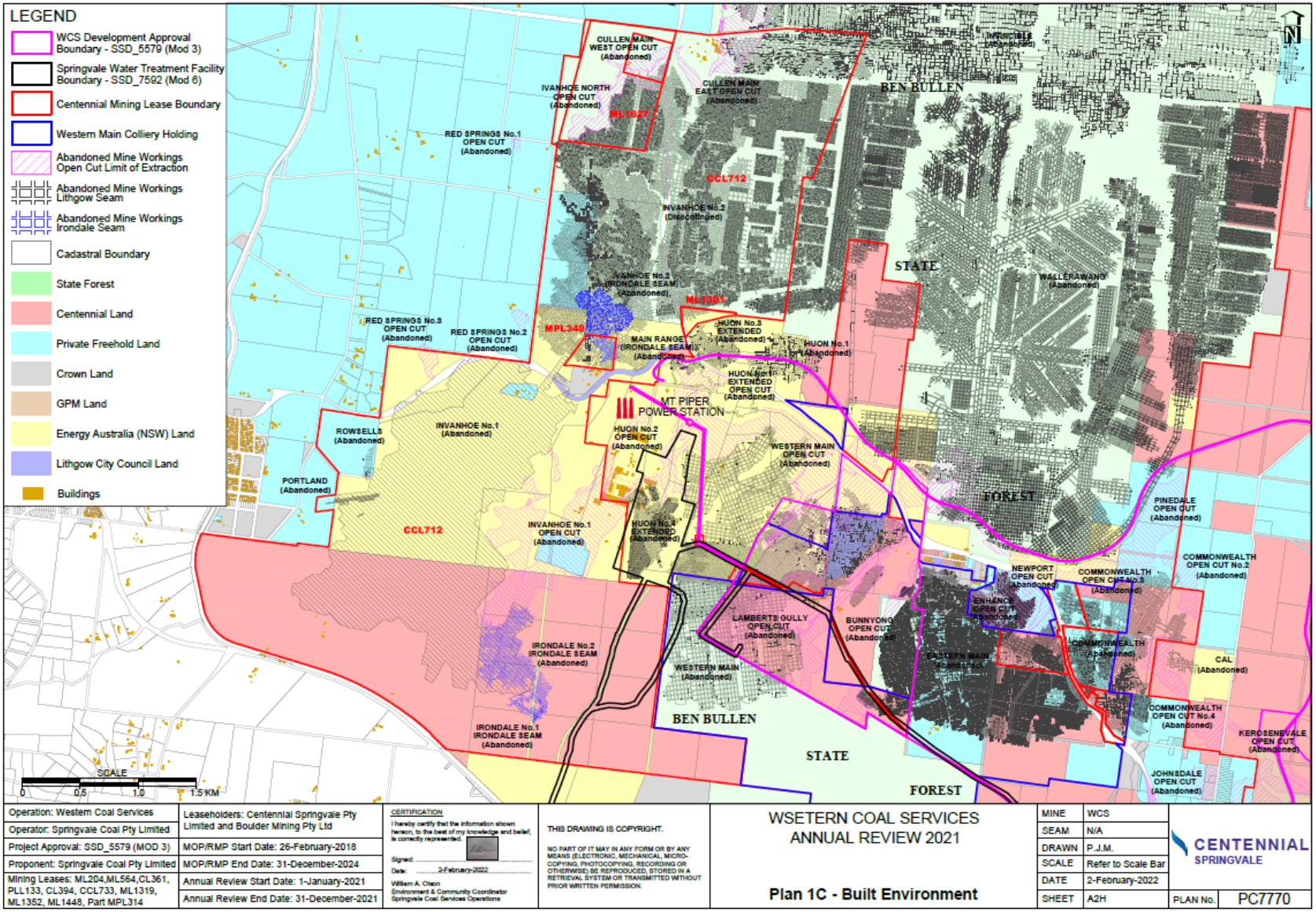
JR Richards (2021) Total Waste Management Report Western Coal Services

Koru Environmental (2021) RIP Progress Inspection and Rehabilitation Monitoring 2021 Western Coal Services

MCW (2019) Western Coal Services Independent Environmental Audit 2018

APPENDICES

Appendix 1:
WCS Plans



Operation: Western Coal Services	Leaseholders: Centennial Springvale Pty Limited and Boulder Mining Pty Ltd	CERTIFICATION: I hereby certify that the information shown hereon, to the best of my knowledge and belief, is correctly represented. Signed: ..... Date: 2-February-2022 William A. Olson Environment & Community Coordinator Springvale Coal Services Operations	THIS DRAWING IS COPYRIGHT. NO PART OF IT MAY IN ANY FORM OR BY ANY MEANS (ELECTRONIC, MECHANICAL, MICRO-COPYING, PHOTOCOPYING, RECORDING OR OTHERWISE) BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED WITHOUT PRIOR WRITTEN PERMISSION.	WSETERN COAL SERVICES ANNUAL REVIEW 2021	MINE: WCS
Operator: Springvale Coal Pty Limited	MOP/RMP Start Date: 26-February-2018				SEAM: N/A
Project Approval: SSD_5579 (MOD 3)	MOP/RMP End Date: 31-December-2024			Plan 1C - Built Environment	DRAWN: P.J.M.
Proponent: Springvale Coal Pty Limited	Annual Review Start Date: 1-January-2021				SCALE: Refer to Scale Bar
Mining Leases: ML204,ML564,CL361, PLL133, CL394, CCL733, ML1319, ML1352, ML1448, Part MPL314	Annual Review End Date: 31-December-2021				DATE: 2-February-2022
					SHEET: A2H

CENTENNIAL SPRINGVALE

PLAN No. PC7770

Figure 1A-1: Built Environment

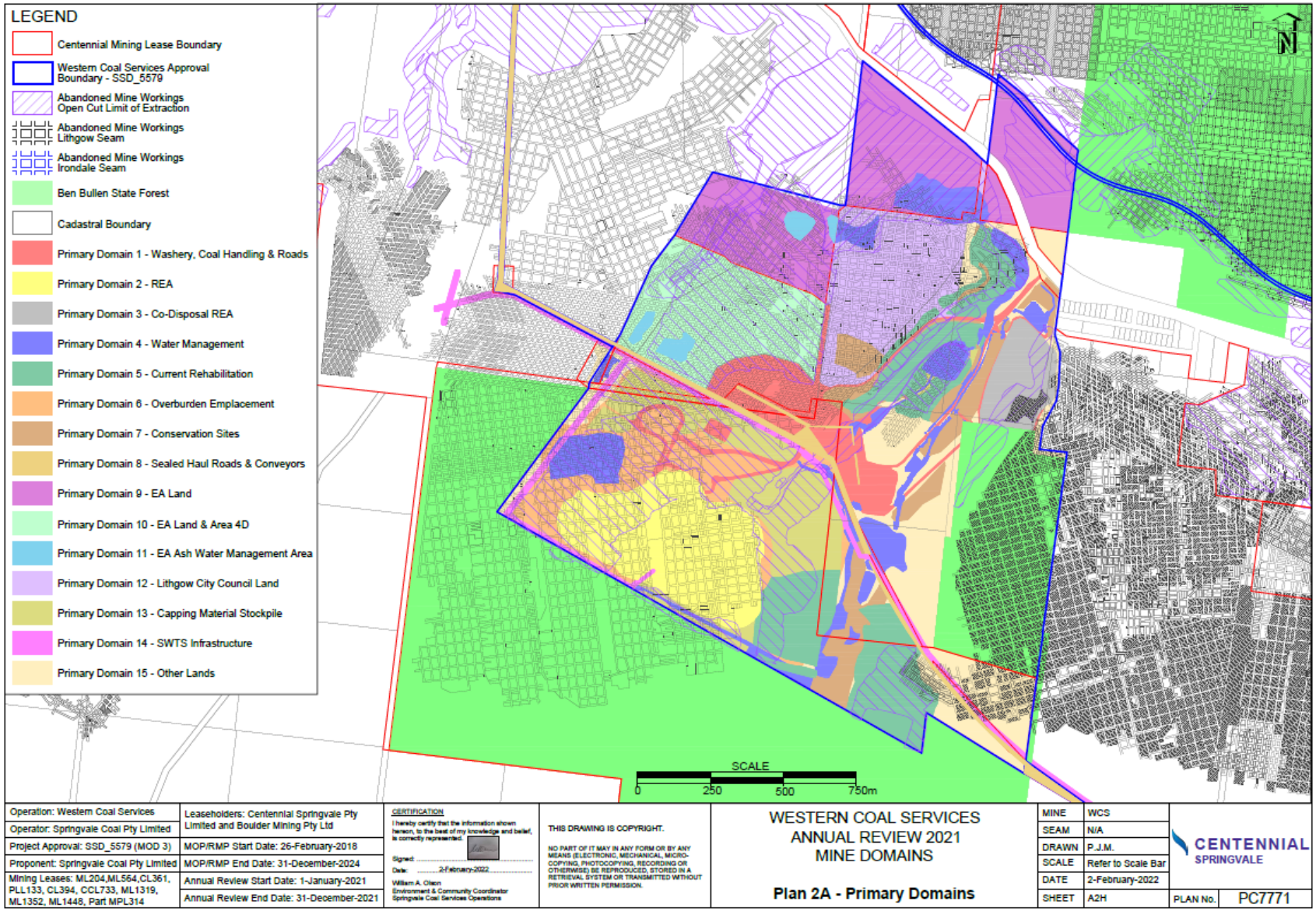


Figure 1A-2: Primary Domains

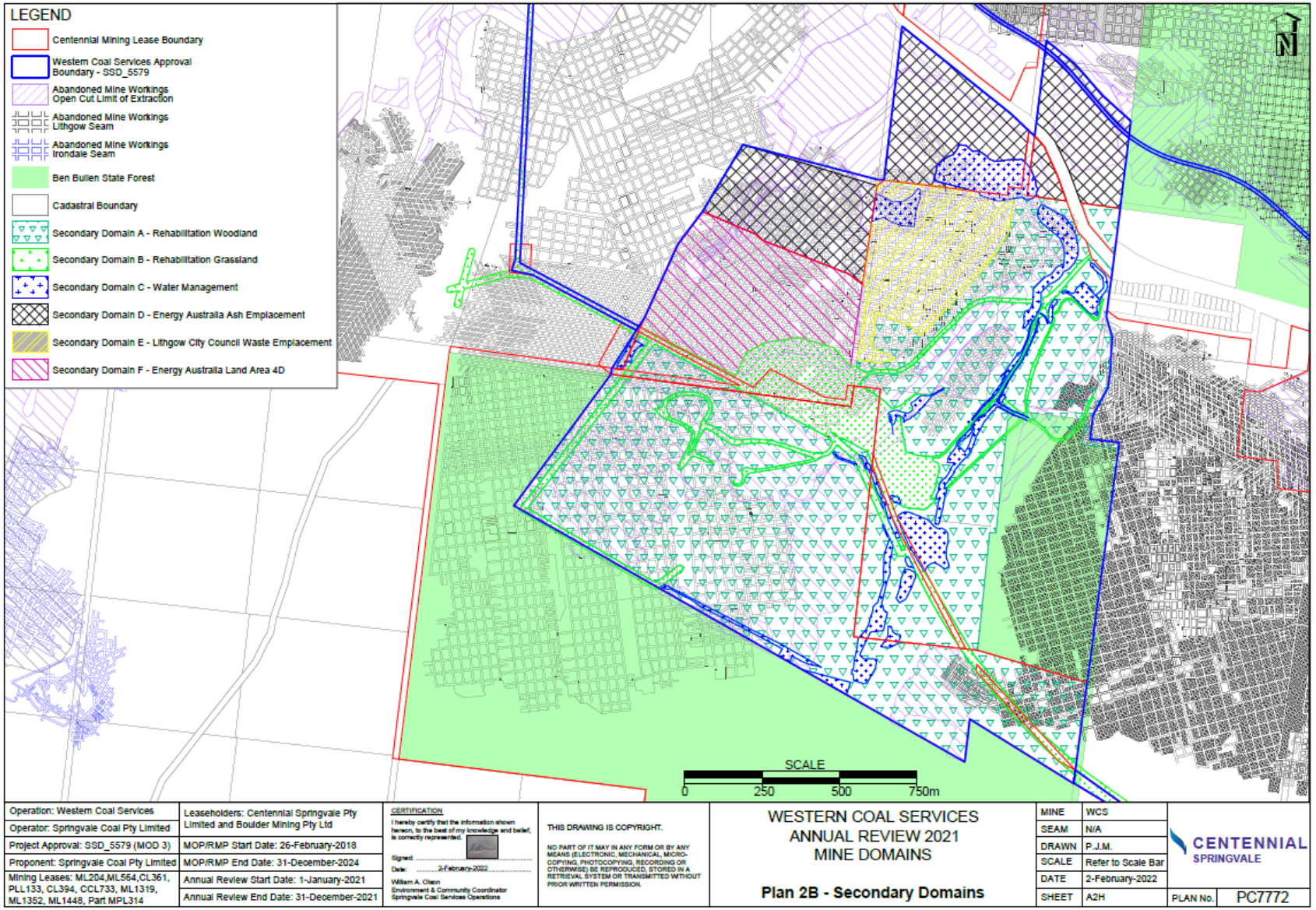


Figure 1A-2: Secondary Domains

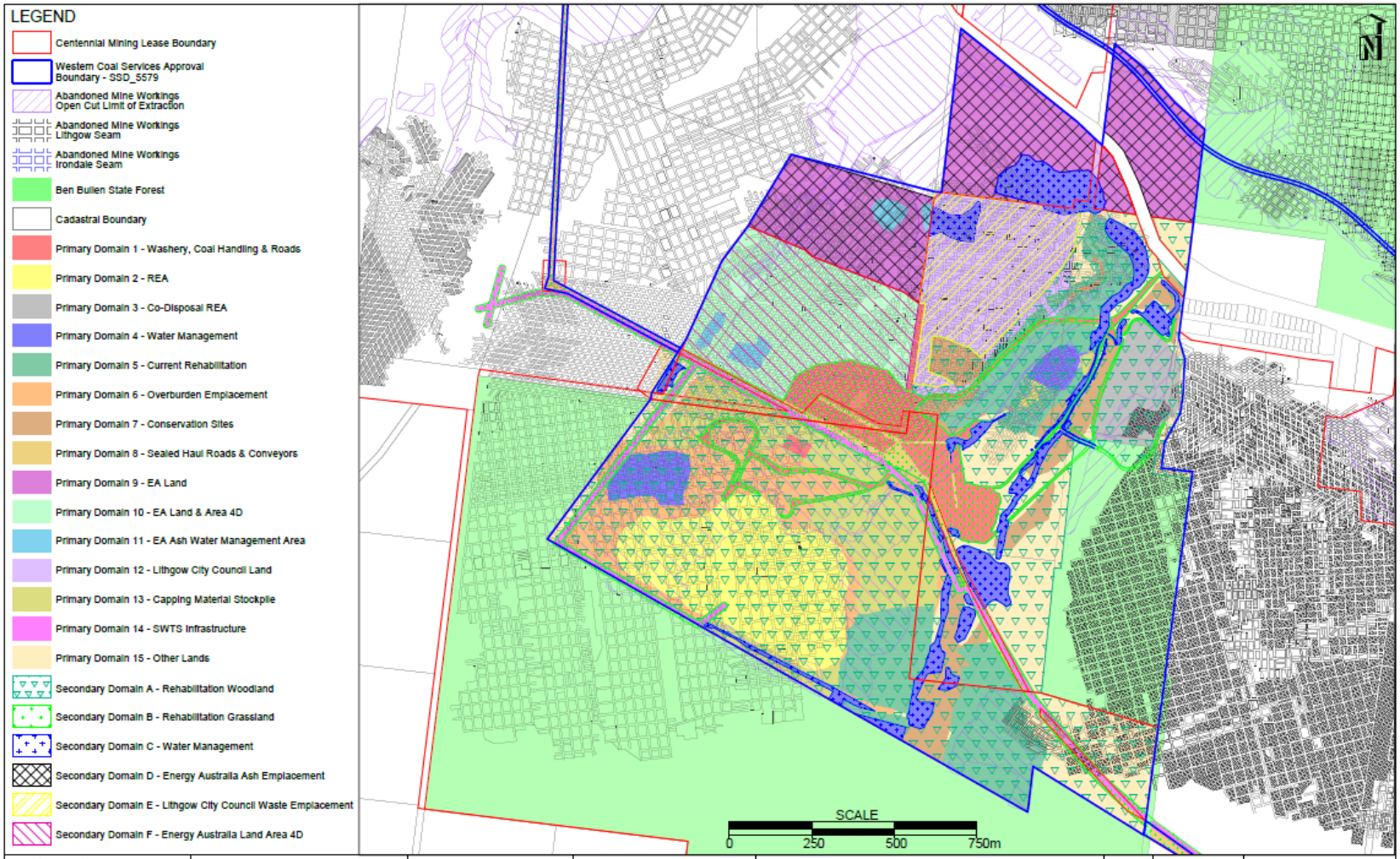


Figure 1A-3: Primary & Secondary Domain

Appendix 2:
Coal Transport Records

Table 2A-1: 2021 Annual Coal Transportation

SCSO Production 2021																		
			Clearance	SPJ & Airly	Airly	CPP in					Airly	Export	CPP out				UG	
	U/G Production	SP01	Overland 1	Mt Piper	Mt Piper	ROM	Stockpile 02	Stockpile 03	Stockpile 04 (Air)	Stockpile 04 (Wash)	Railed	Railed	Product	Yield	Reject	50/50	Avg Ash	Springvale to EA
Jan-21	116967	6131	127950	250748	48970	0	26582	13050	12620	0	45516	0	0		0	0	24.64%	201,779
Feb-21	176648	7219	175560	223392	61948	0	43081	13050	17325	0	66653	0	0		0	0	23.41%	161,445
Mar-21	180164	12833	169550	264266	59841	0	11179	13050	17560	0	61328	0	0		0	0	24.21%	204,425
Apr-21	159937	26347	145542	233128	92617	0	17476	10658	23457	0	98514	0	0		0	0	29.87%	140,511
May-21	131890	35841	122396	208462	111782	8453	45915	3993	10184	0	98508	0	5776	68.3	2677	1338.5	35.39%	96,680
Jun-21	192815	41062	191449	224990	45752	146844	4483	12864	15174	0	50742	0	86572	59.0	60272	30136	34.47%	179,238
Jul-21	170071	2429	201990	163898	1480	56183	-436	0	17038	-1503	3344	48111	34216	60.9	21967	10983.5	27.39%	162,418
Aug-21	89309	2675	89063	154915	90969	0	24819	0	14558	0	88489	0	0		0	0	25.16%	63,946
Sep-21	169468	9553	162590	201674	15353	0	1088	0	13930	0	14725	0	0		0	0	23.35%	186,321
Oct-21	383900	45774	341090	262214	25563	120016	5608	25502	10057	10	29904	52276	81222	67.7	38794	19397	24.73%	236,651
Nov-21	192580	6210	210847	80258	0	176050	7853	16684	10057	10059	0	55698	104635	59.4	71415	35707.5	37.33%	80,258
Dec-21	106089	49095	63204	55853	0	80294	3706	-506	10057	-1202	0	37861	43206	53.8	37088	18544	33.77%	55,853
YTD	**2,069,838**		**2,001,231**	**2,323,798**	**554,273**	**587,840**					**557,723**	**193,946**	**355,627**	**60.5**	**232,213**	**116,107**		**1,769,525**

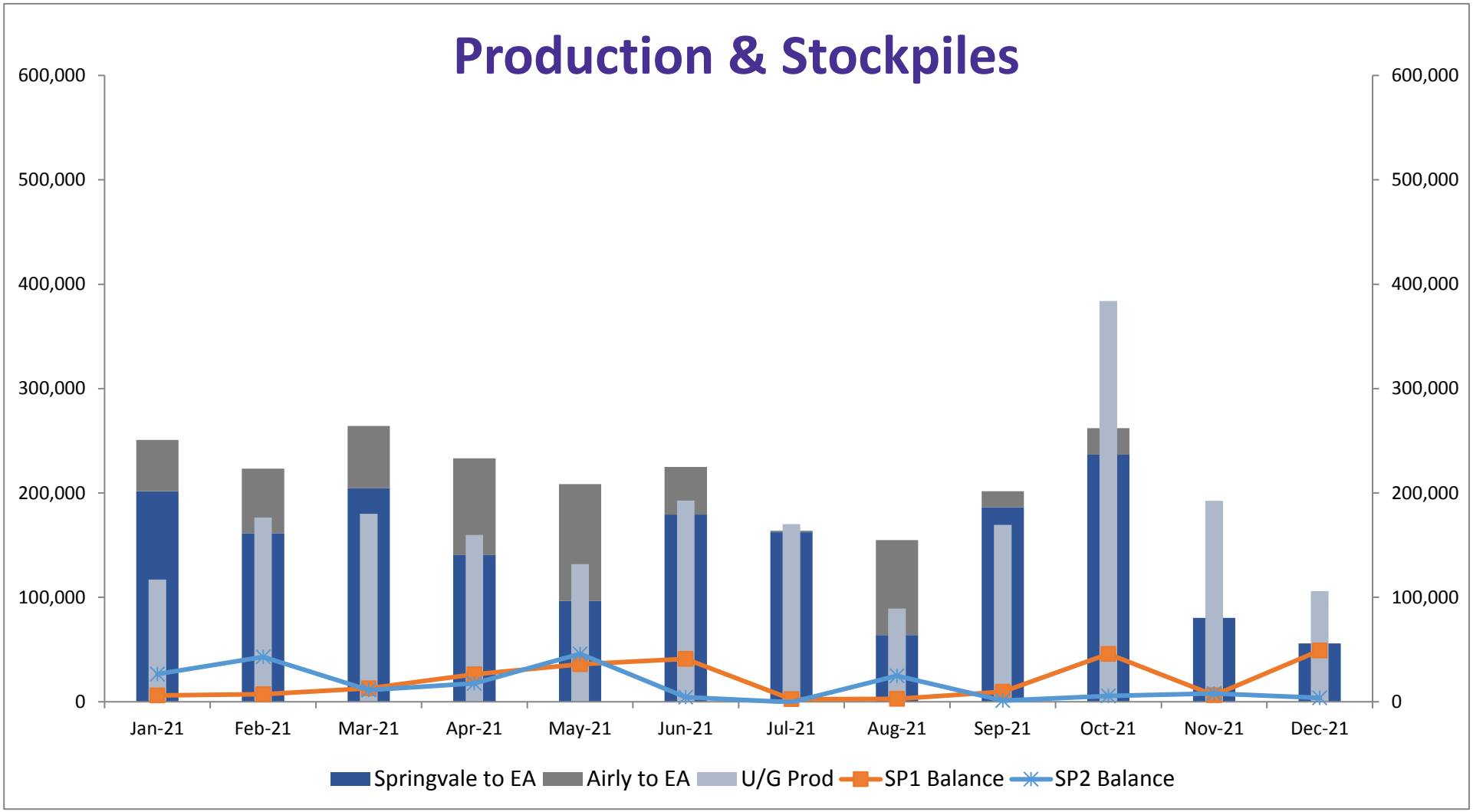


Figure 2A-1: 2021 Production & Stockpile Levels

Appendix 3:

Noise

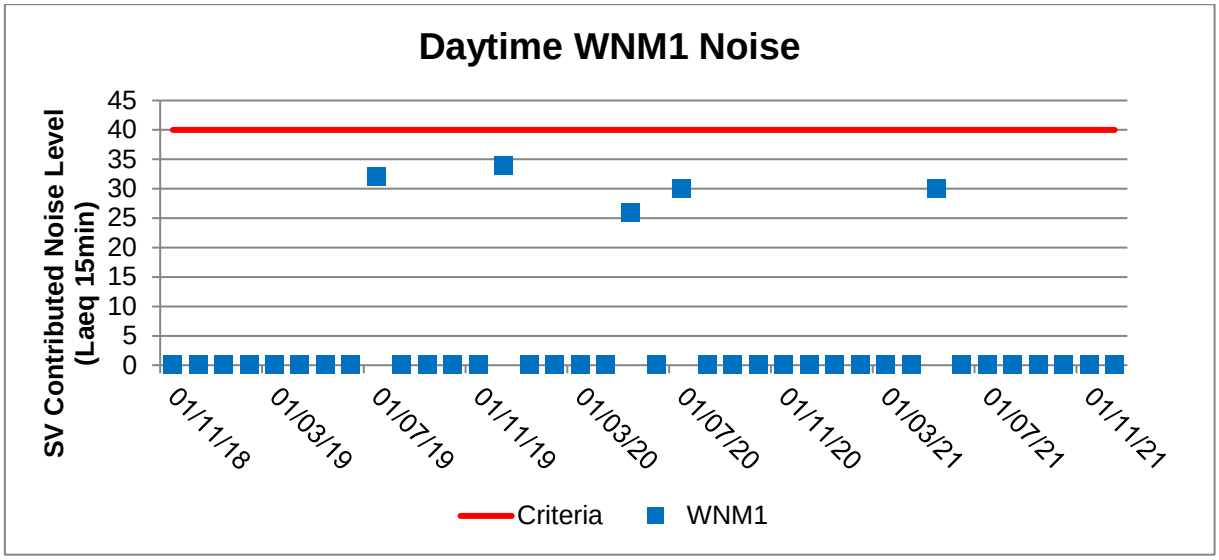


Figure 4A-1: Daytime WNM1 Noise Result (Laeq 15min)

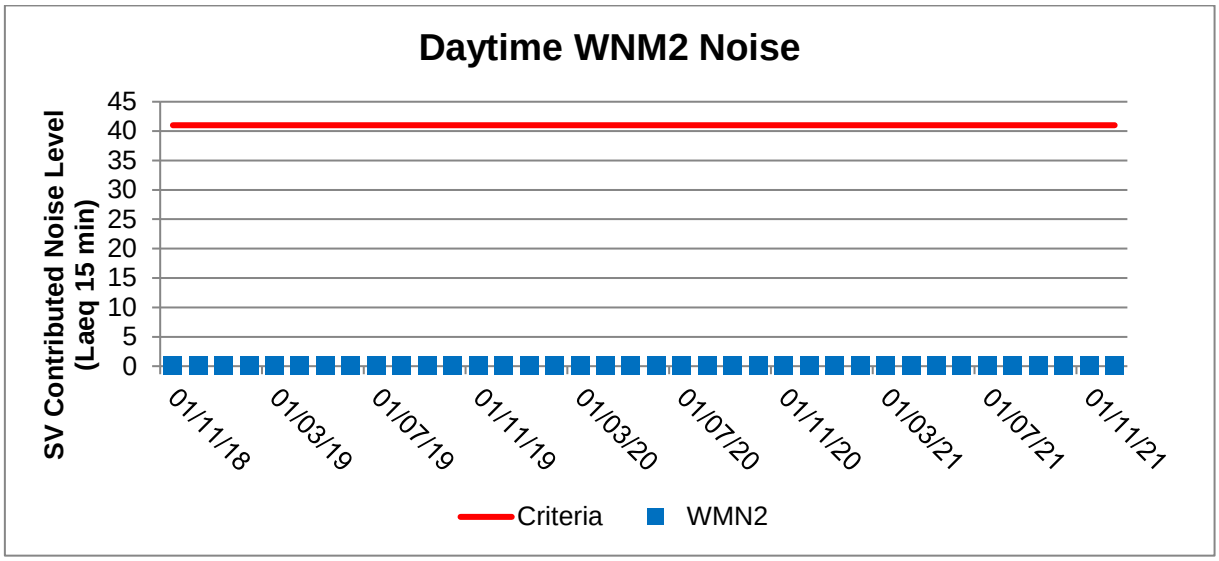


Figure 4A-2: Daytime WNM2 Noise Result (Laeq 15min)

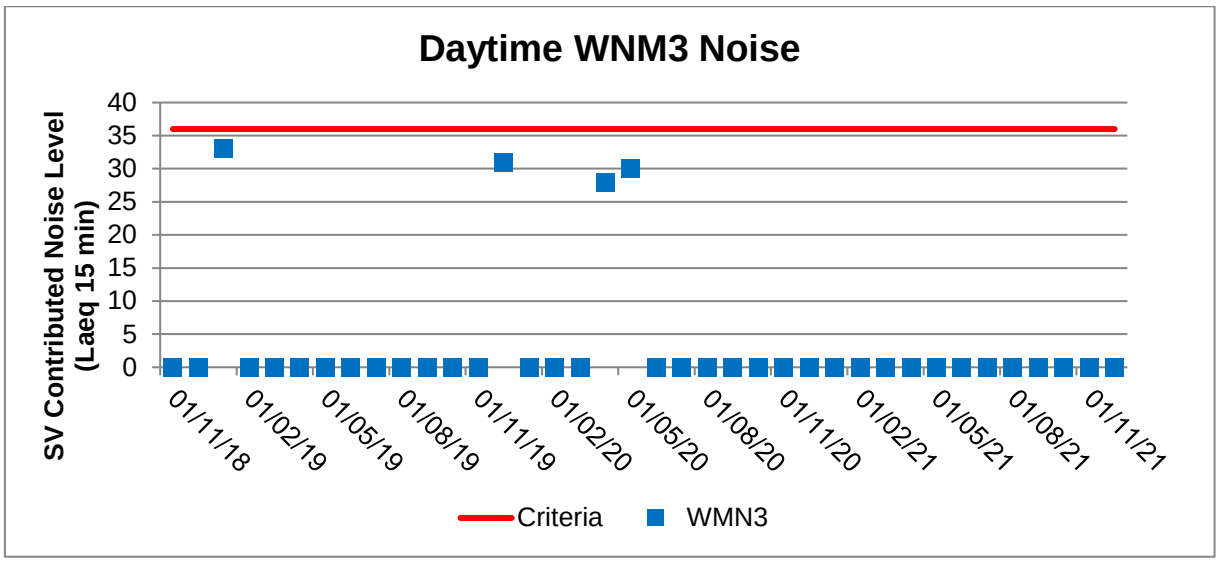


Figure 4A-3: Daytime WNM3 Noise Result (Laeq 15min)

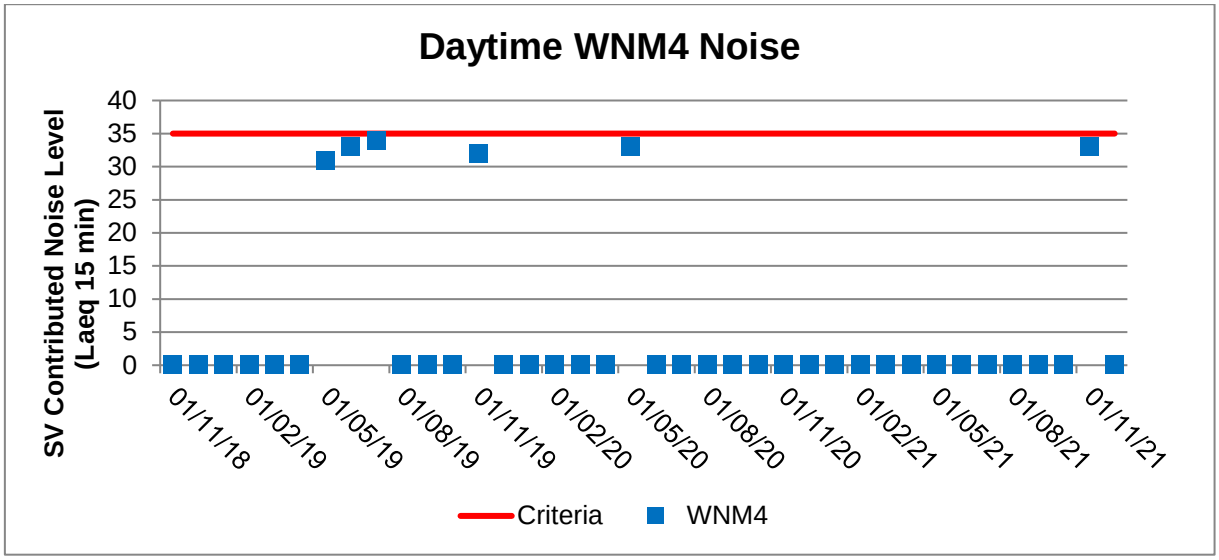


Figure 4A-4: Daytime WNM4 Noise Result (Laeq 15min)

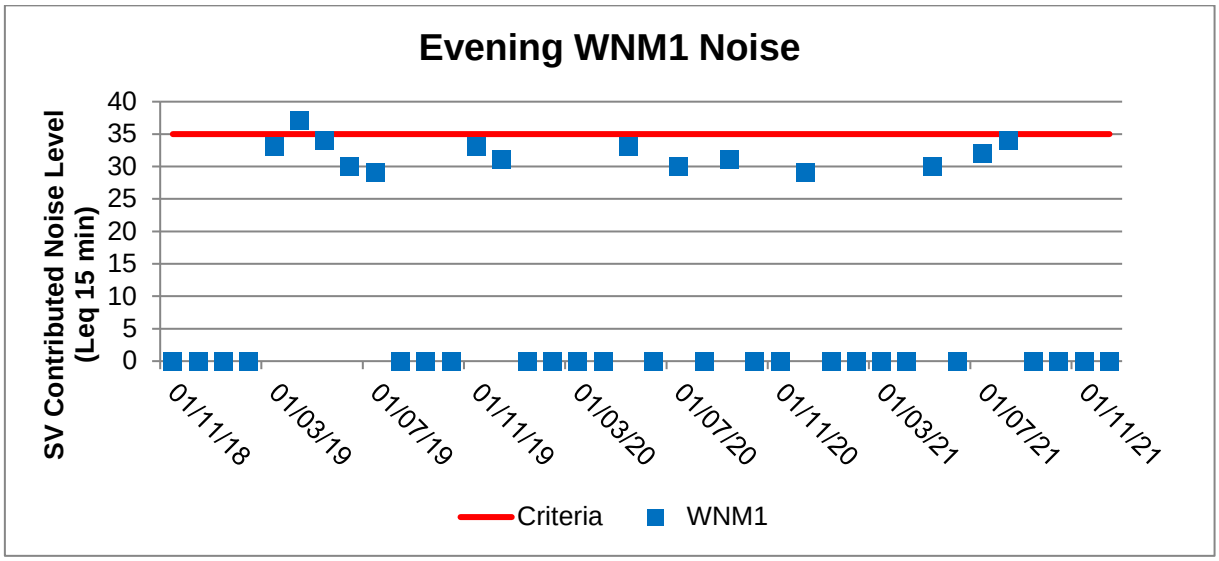


Figure 4A-5: Evening WNM1 Noise Result (Laeq 15min)

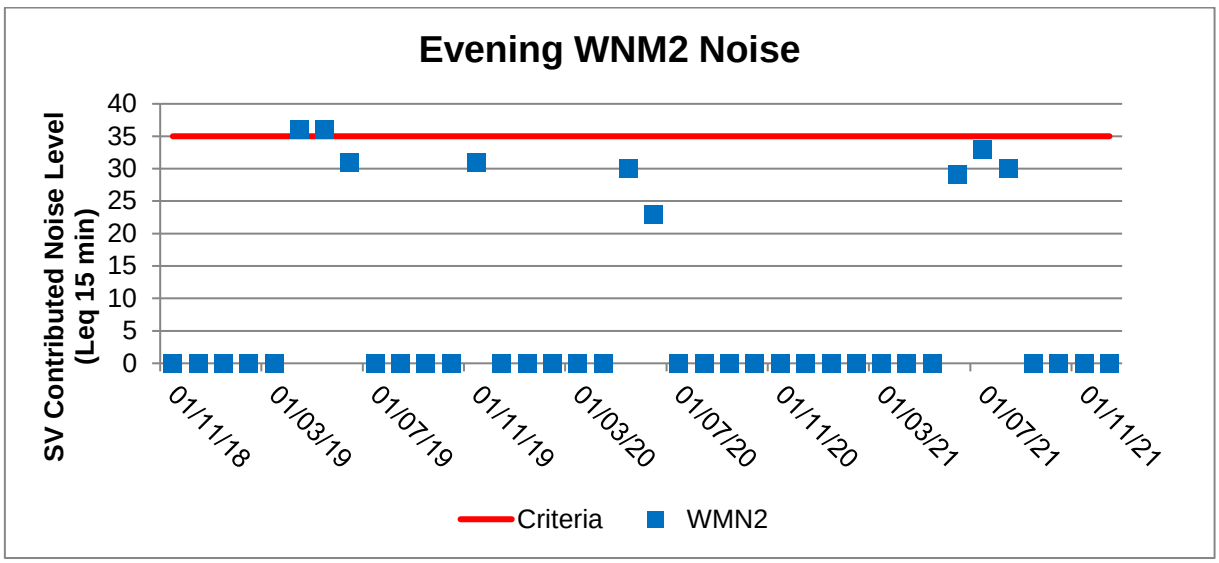


Figure 4A-6: Evening WNM2 Noise Result (Laeq 15min)

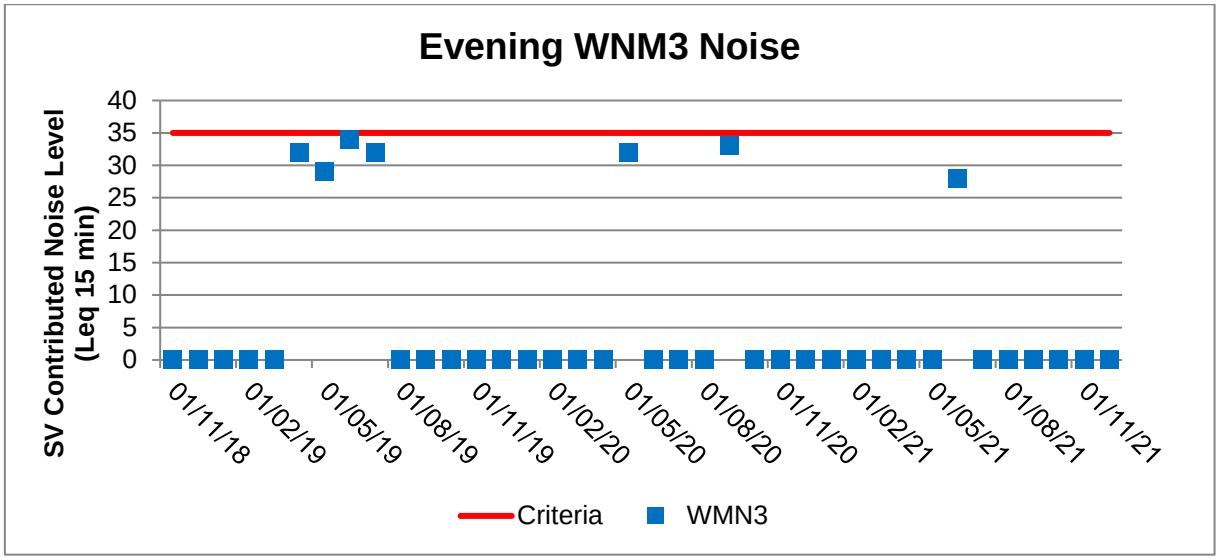


Figure 4A-7: Evening WNM3 Noise Result (Laeq 15min)

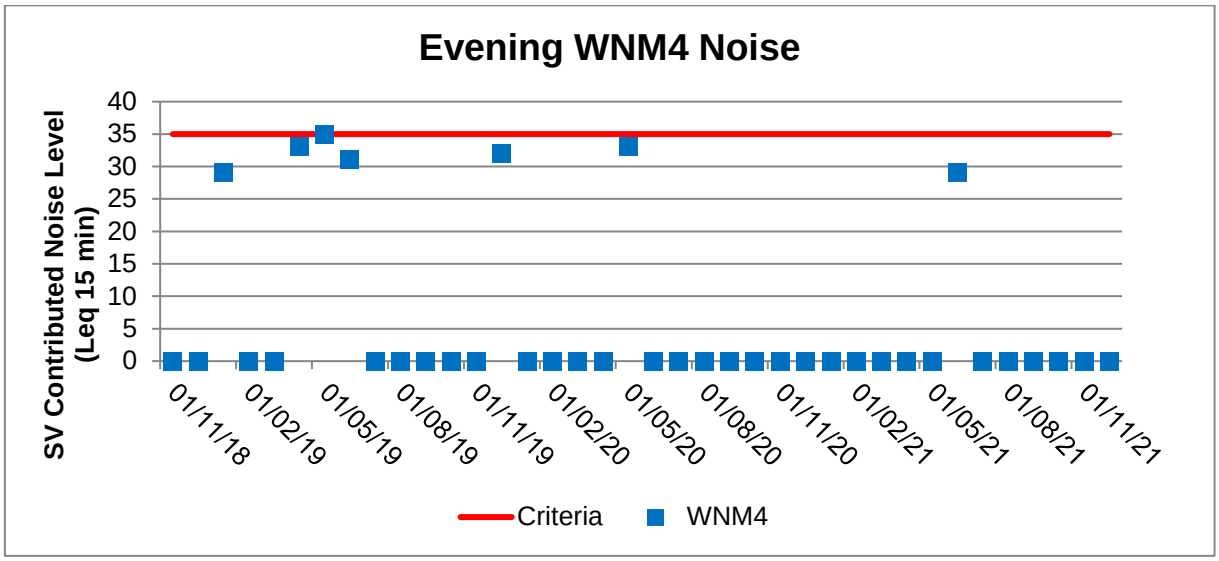


Figure 4A-8: Evening WNM4 Noise Result (Laeq 15min)

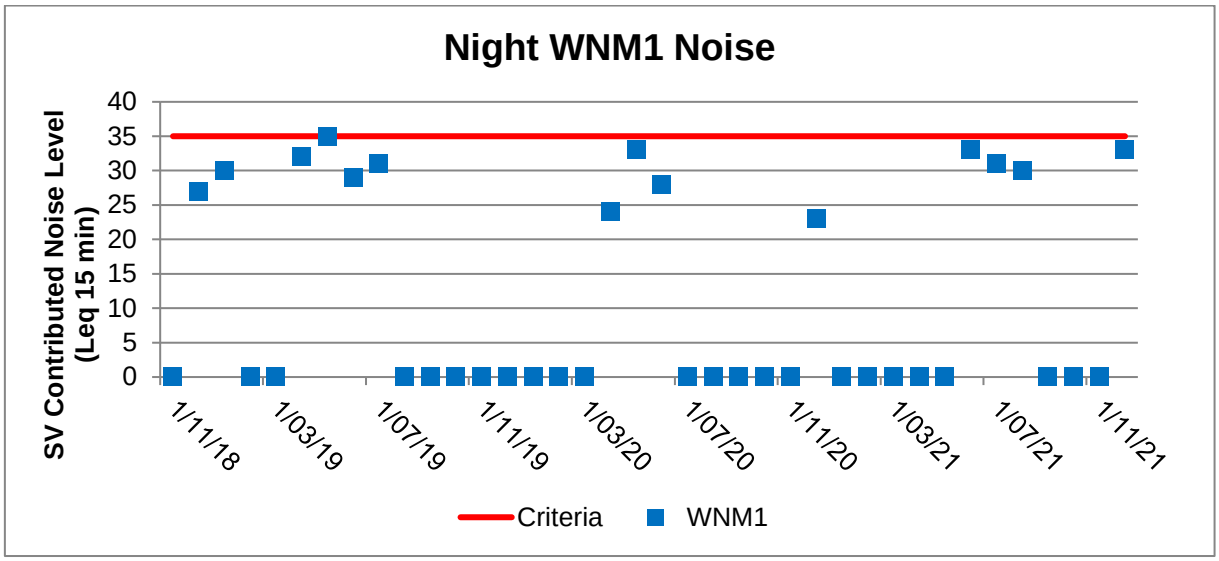


Figure 4A-9: Night WNM1 Noise Result (Laeq 15min)

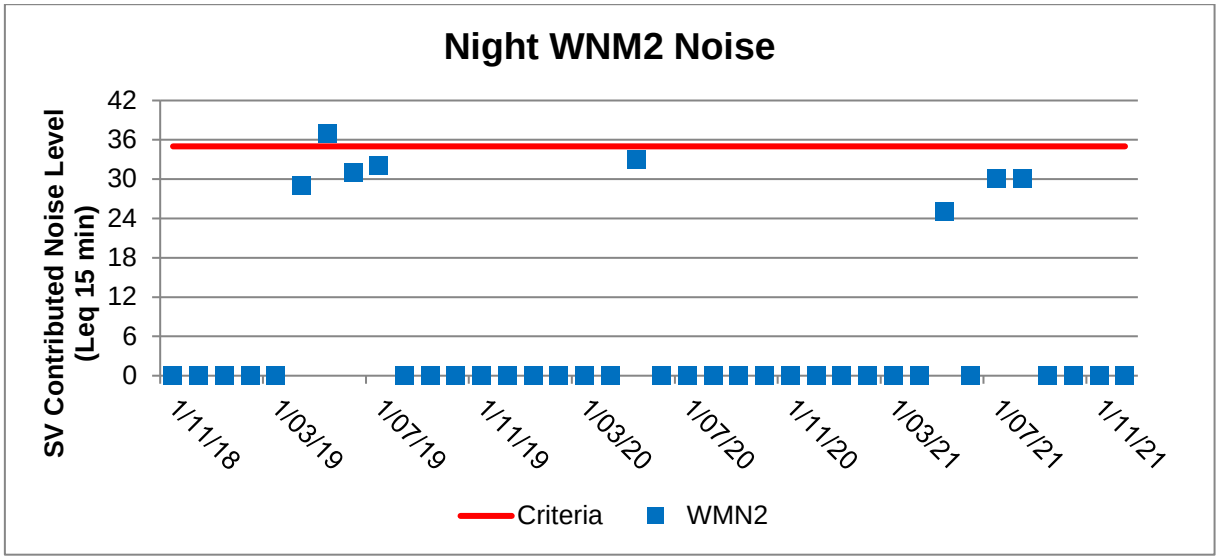


Figure 4A-10: Night WNM2 Noise Result (Laeq 15min)

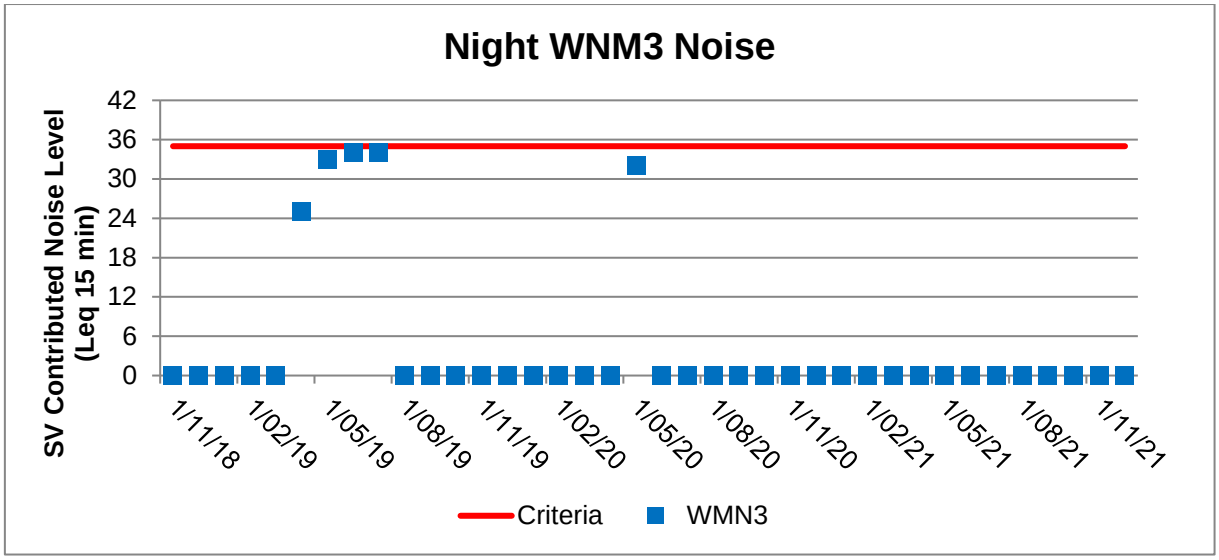


Figure 4A-11: Night WNM3 Noise Result (Laeq 15min)

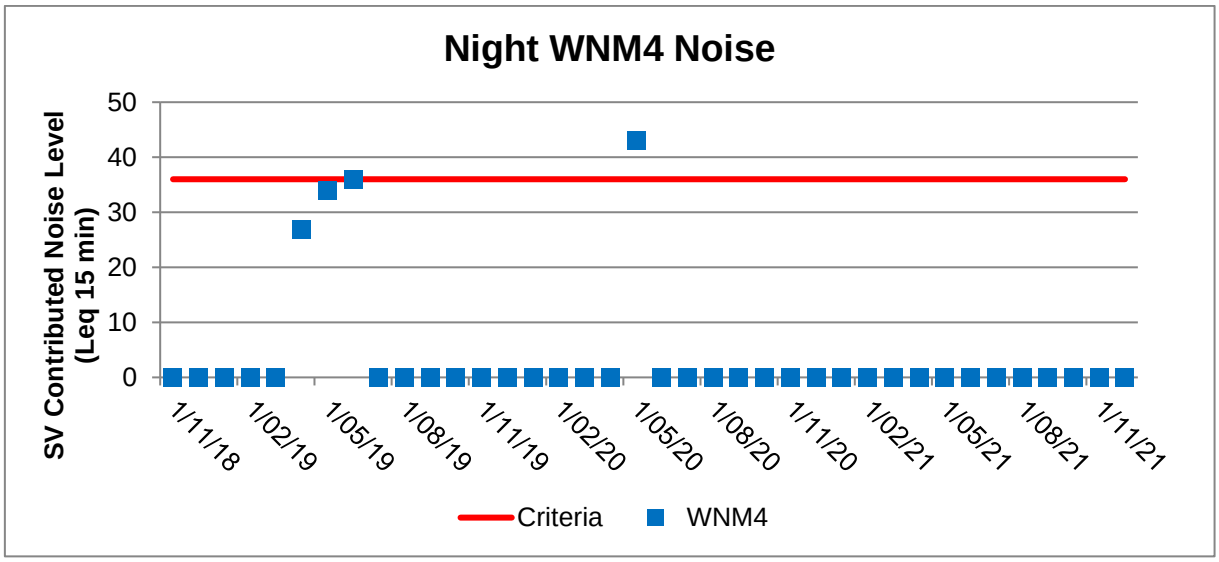


Figure 4A-12: Night WNM4 Noise Result (Laeq 15min)

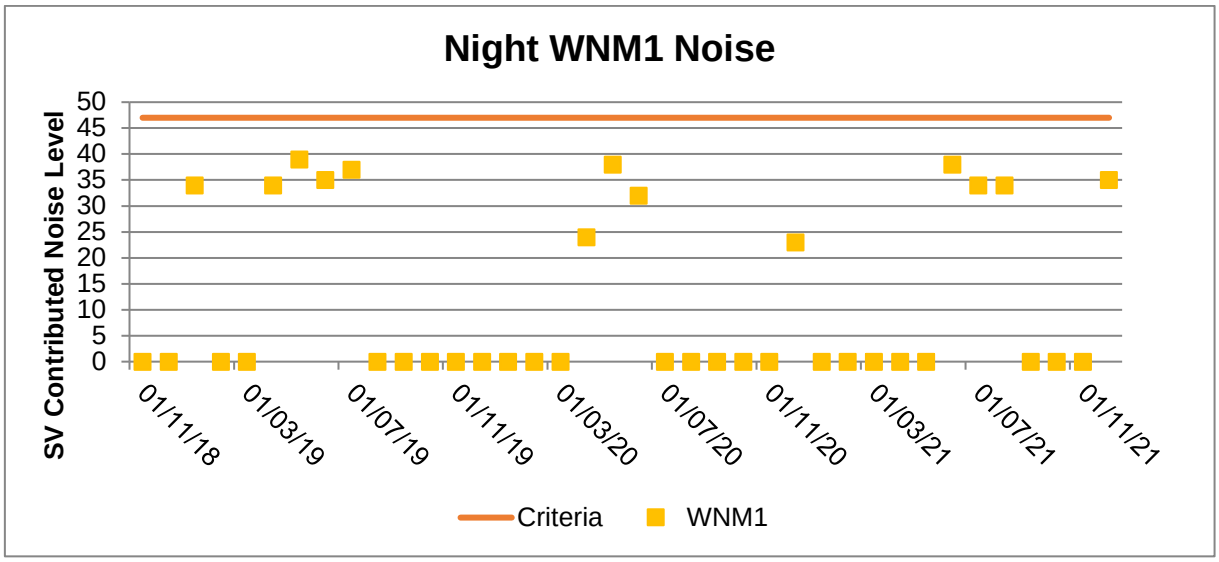


Figure 4A-13: Night WNM1 Noise Result (Laeq 1min)

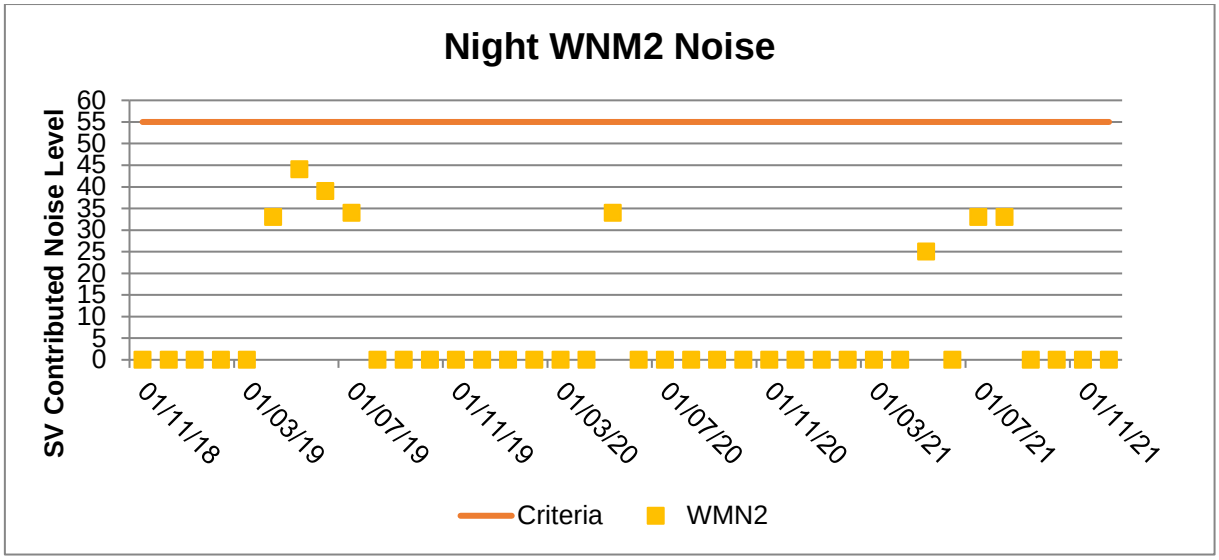


Figure 4A-14: Night WNM2 Noise Result (Laeq 1min)

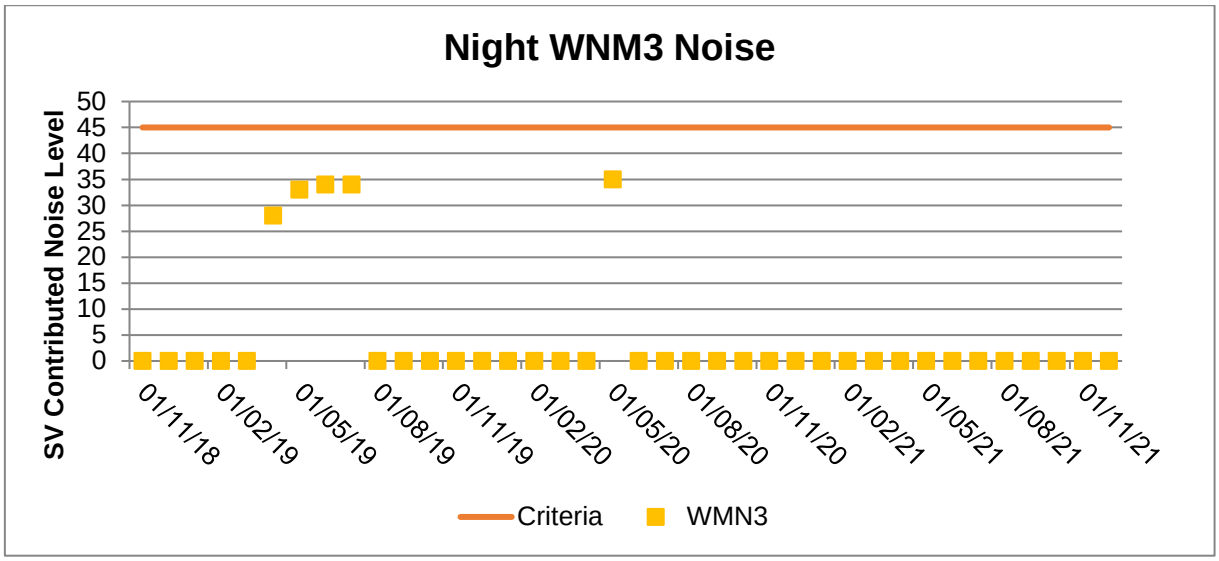


Figure 4A-15: Night WNM3 Noise Result (Laeq 1min)

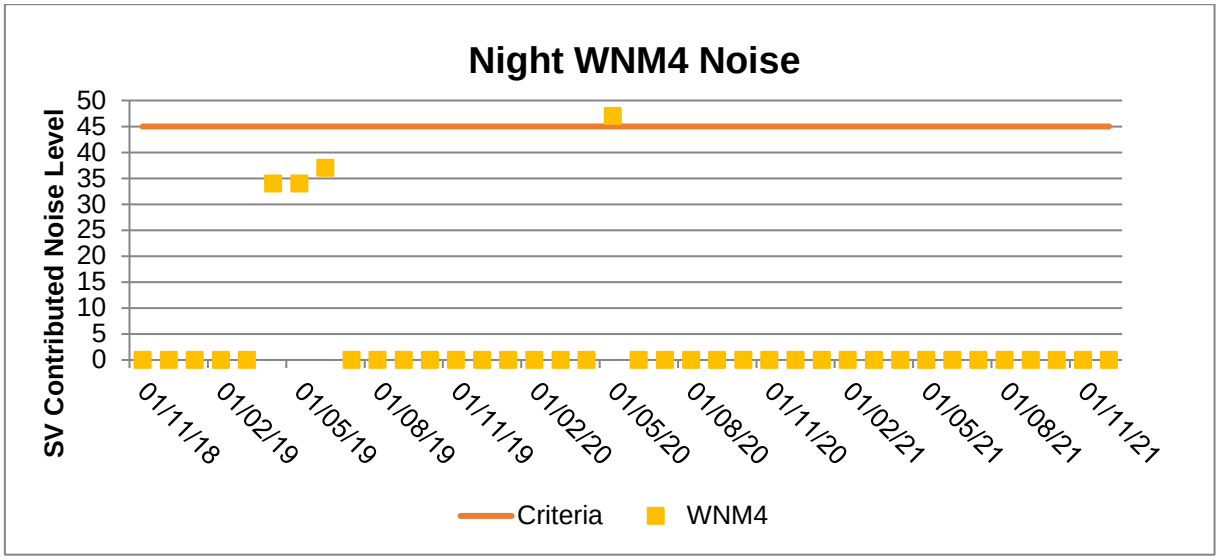


Figure 4A-16: Night WNM4 Noise Result (Laeq 1min)

Table 4A-1: Historical sound pressure level comparison of SCSO (dB)

Zone	Pre LNI		Post LNI		2018		Apr 2019		Dec 19 / Jan 20		Nov 20		Dec 21		Recent change	
	Linear	Awt	Linear	Awt	Linear	Awt	Linear	Awt	Linear	Awt	Linear	Awt	Linear	Awt	Linear	Awt
Zone 1	79	74	71	64	82	74	78	70	79	70	75	67	78	69	3	2
Zone 2	79	75	70	64	81	76	76	69	77	68	71	67	71	66	0	-1
Zone 3	81	78	70	65	76	72	76	72	71	67	73	69	75	71	2	2
Zone 4	82	79	80	72	80	72	81	73	78	69	79	73	76	70	-3	-3
Zone 5	-	-	-	-	84	79	82	78	81	77	82	79	79	75	-3	-4
Zone 6	-	-	-	-	82	73	82	75	79	71	80	74	82	74	2	0
Zone 7	-	-	-	-	84	77	84	78	84	77	80	75	80	75	0	0
Zone 8	-	-	-	-	80	73	83	74	84	72	83	72	-	-	-	-
Zone 9	-	-	-	-	85	79	81	72	82	72	82	74	-	-	-	-

- Linear – Linear sound pressure level
- Awt – A-weighted sound pressure level

Appendix 4:

Air Quality and Greenhouse Gas Monitoring Results

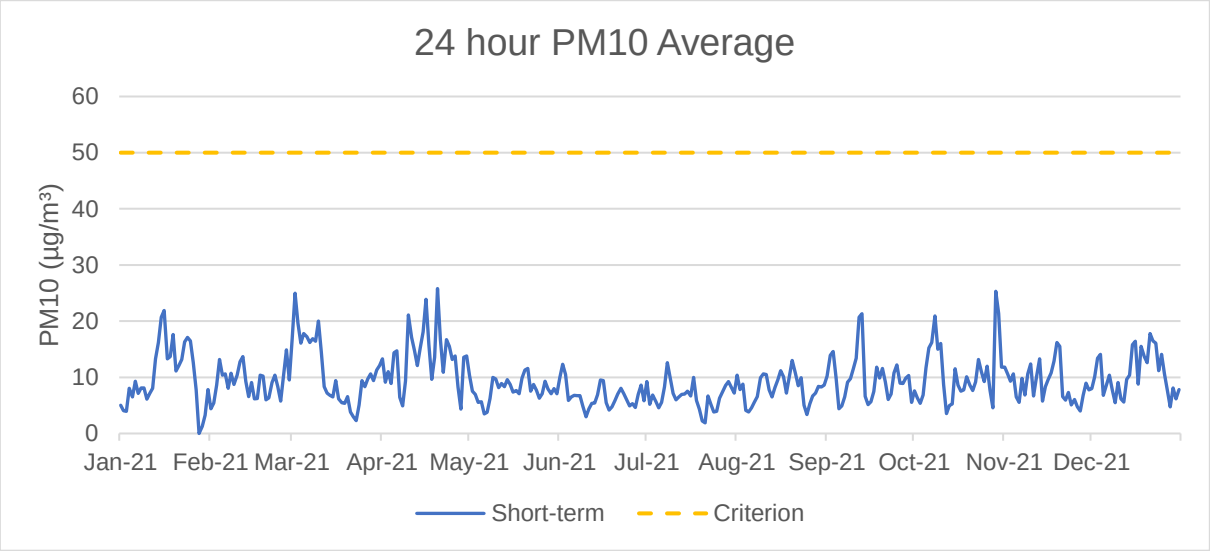


Figure 4A-1: 2021 TEOM 24-hour PM_{10} average

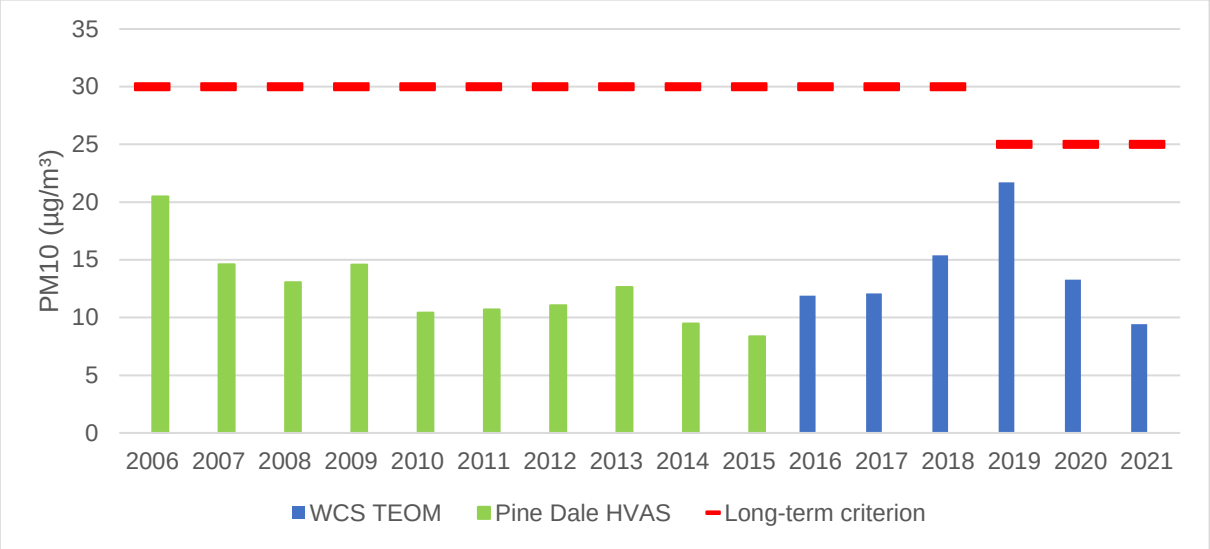


Figure 4A-2: Long-term PM_{10} average (2006–2021)[1]

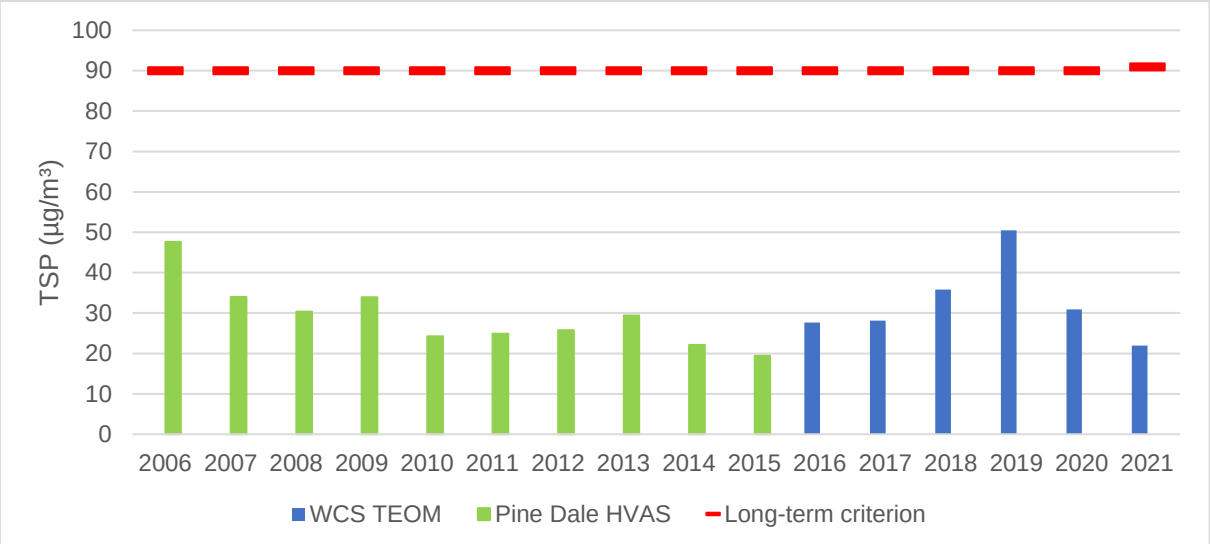


Figure 4A-2: Long-term TSP Mass Concentration (2006-2021)

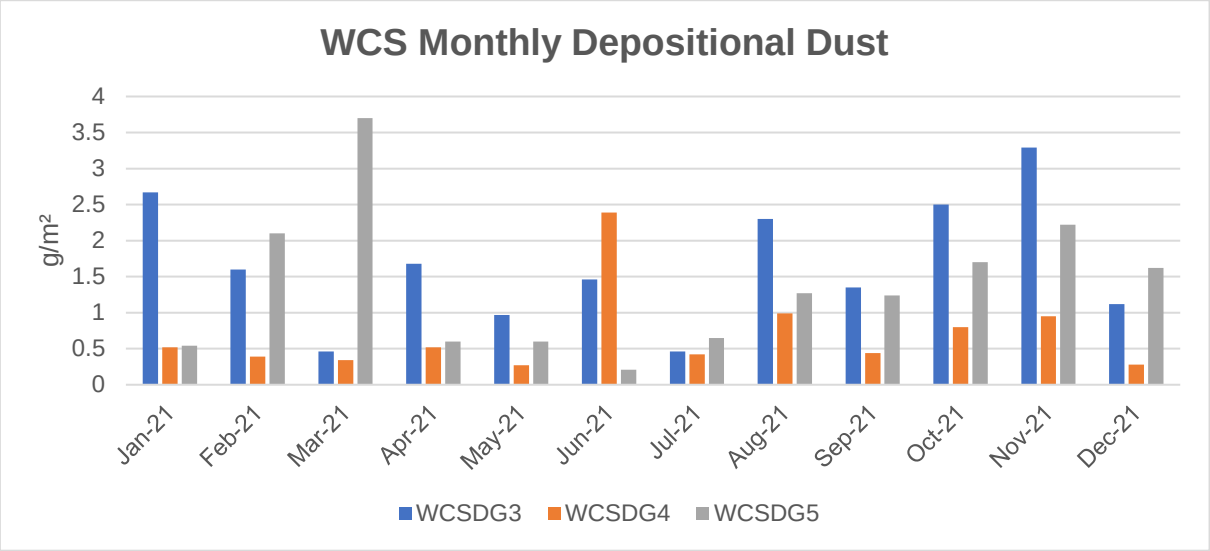


Figure 4A-3: 2021 depositional dust summary

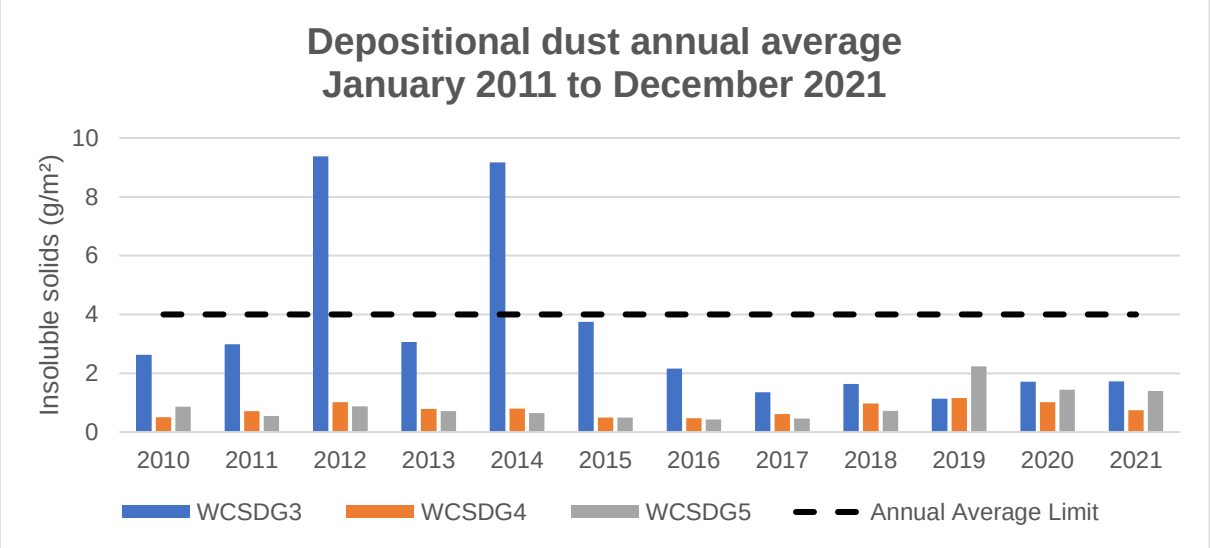


Figure 4A-4: Historical depositional dust summary – January 2010 to December 2021

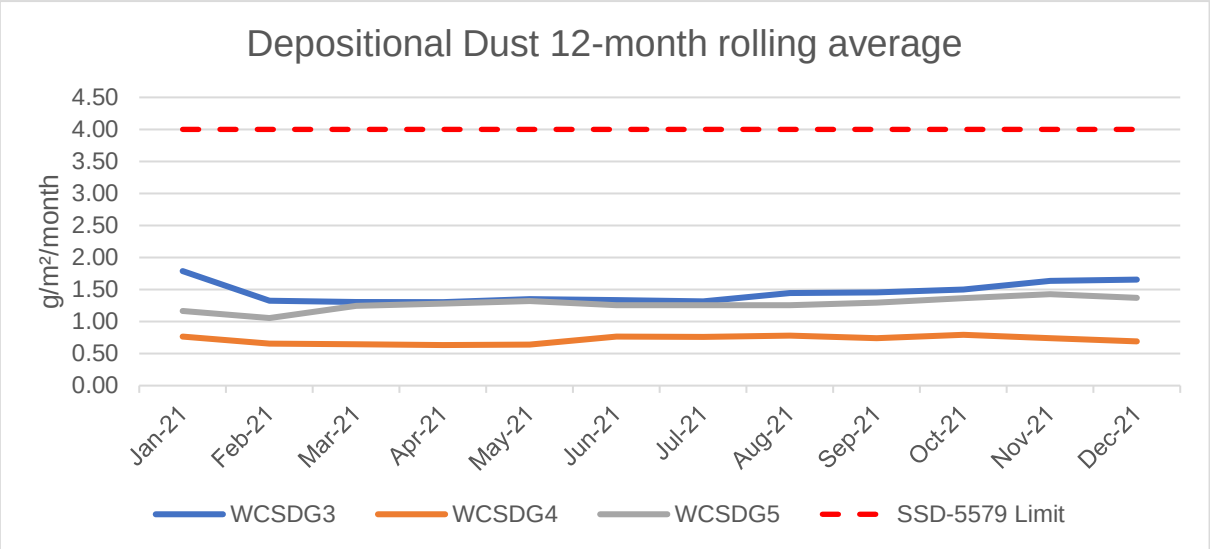


Figure 4A-5: Depositional dust 12-month rolling average

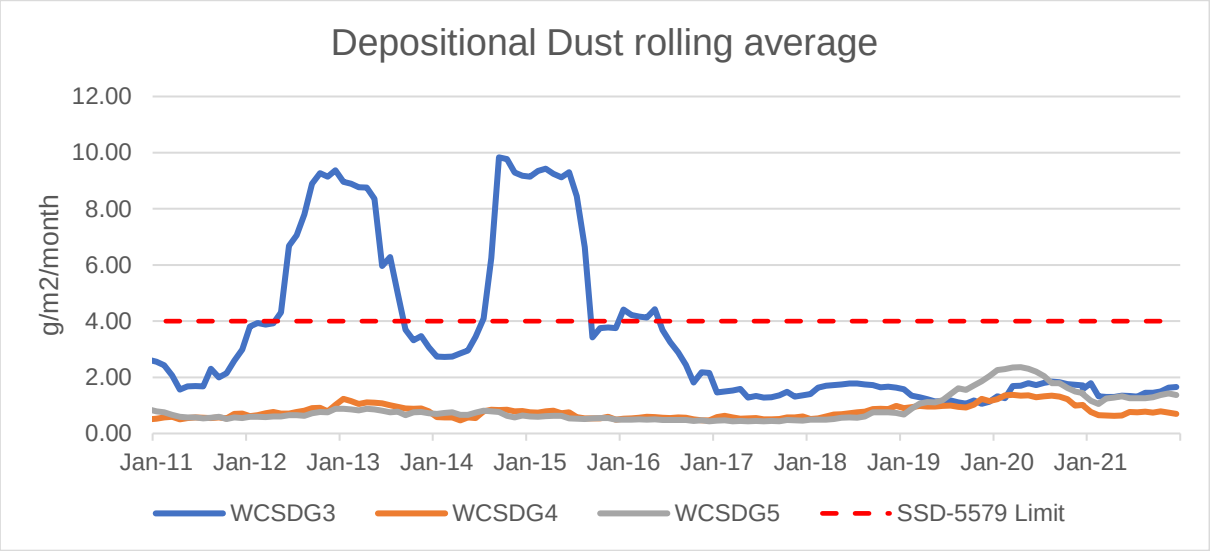


Figure 4A-6: January 2011 to December 2021 depositional dust 12-month rolling average

Appendix 5: Biodiversity

Upper Coxs River Catchment Aquatic Ecology 2021

The Upper Coxs River catchment is a highly modified environment due to historical and current primary production and industrial activities.

In 2017, a coordinated, catchment-wide approach for aquatic ecology monitoring was implemented with the aim of understanding the overall health of the Upper Coxs River catchment (UCRC). The monitoring program, known as the UCRC Aquatic Ecology Monitoring Program (AEMP; GHD 2016), addresses the aquatic ecology monitoring requirements of Centennial operations and the Springvale Upper Coxs River Action and Monitoring Program (UCRAMP; GHD 2017).

The UCRC AEMP allows for identification of impacts (positive and negative) within the catchment due to mine water discharge from Centennial operated licensed discharge points (LDPs) on the ecosystem health of waterways in the UCRC (GHD 2016).

Table 5A- 1: Macroinvertebrate monitoring locations

Site	Easting MGA 56H	Northing MGA 56H	Description	Site Type	Dates sampled
Kangaroo Creek					
KC1	230622	6306096	Located upstream of pit top facilities and LDP1 (decommissioned).	Background	11/05/21, 21/10/21
KCdn	230372	6306103	Located downstream of Angus Place LDP1 (decommissioned) confluence with Kangaroo Creek.	Impact	11/05/21, 22/10/21
Coxs River					
CR0	229753	6309404	~2 km upstream of Kangaroo Creek (LDP1; decommissioned), upstream of LDP2.	Background	06/05/21, 23/10/21
CR1	229828	6307311	Located ~700 m upstream of Kangaroo Creek (LDP1; decommissioned), upstream of LDP2.	Background	12/05/21, 21/10/21
CR2	228767	6305326	Located directly upstream of the Mount Piper Haul Road crossing, downstream of Angus Place LDP1 (decommissioned) and LDP2. Downstream of Kangaroo Creek.	Impact	12/05/21, 21/10/21
CR6	228512	6297751	Coxs River directly downstream of Lake Wallace, on the downstream side of Rocky Waterhole Drive. Downstream of all Centennial LDPs.	Recovery	06/05/21, 22/10/21
CR7	228926	6292637	Located in the Marrangaroo National Park approximately 5 km downstream of the Lake Wallace dam wall.	Recovery	12/05/21, 22/10/21

The following macroinvertebrate metrics were calculated for the purpose of this summary report:

Taxa richness: the number of different families/groups collected in a sample. This metric provides a measure of macroinvertebrate community diversity.

EPT richness: the number of taxa belonging to the Ephemeroptera, Plecoptera and Trichoptera families. These groups of macroinvertebrates have been found to be particularly sensitive to changes in their environment (Karr and Chu 1999) and, therefore, can be used to assess impacts due to chemical and physical changes (Plafkin *et al*. 1989).

SIGNAL-2 Biotic Index: pollution sensitivity of the macroinvertebrates collected in a sample, expressed as an average (Chessman 2003). 1 = greatest pollution tolerance, 10 = greatest pollution sensitivity.

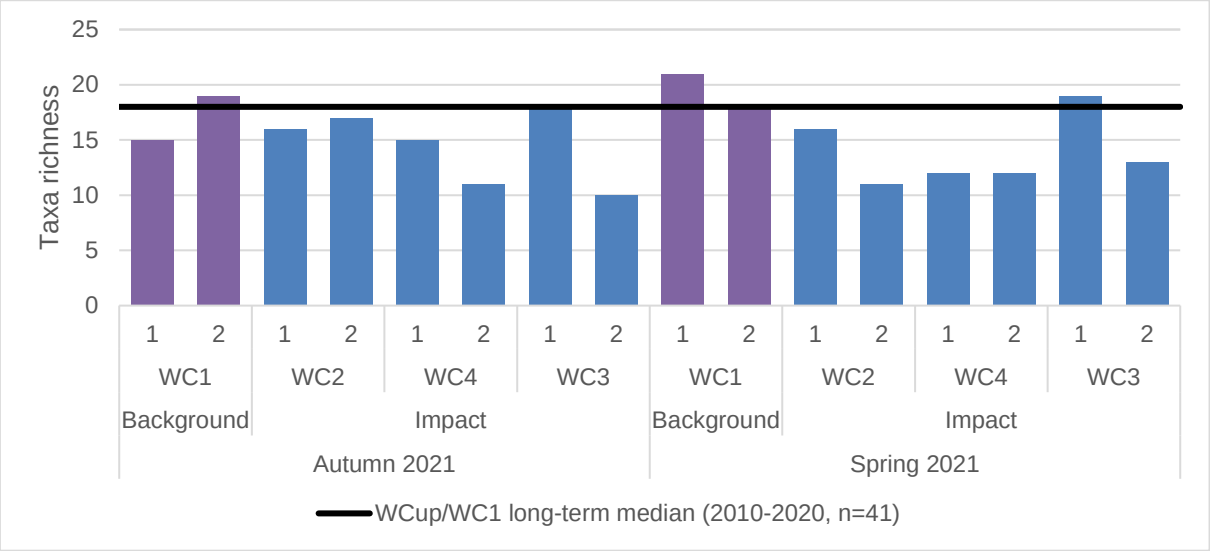


Figure 5A-1 Taxa richness in Wangcol Creek samples in 2021

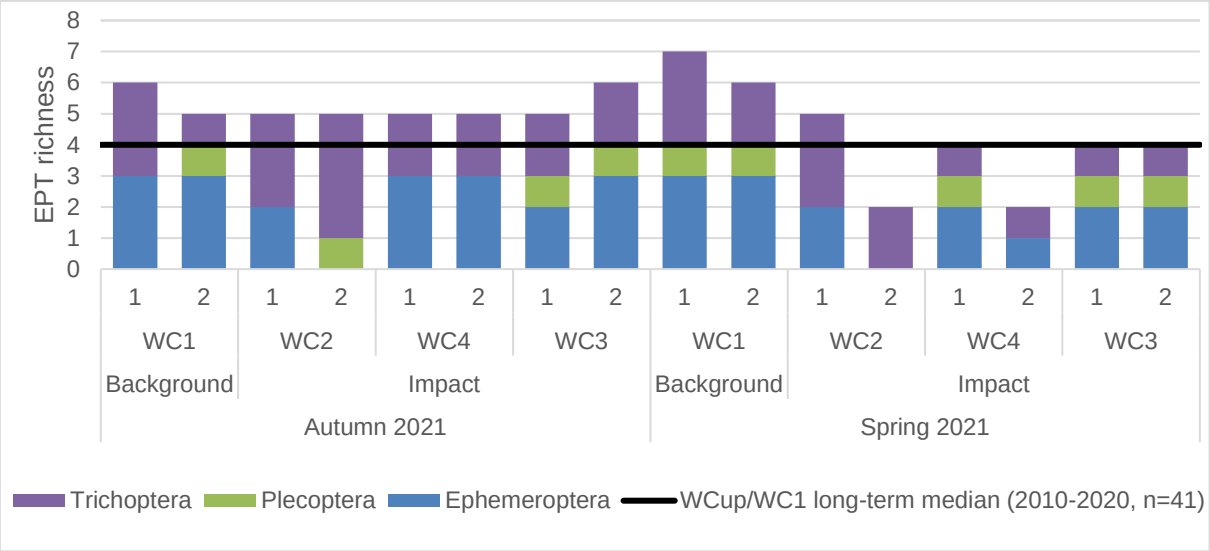


Figure 5A-2 EPT richness in Wangcol Creek samples in 2021

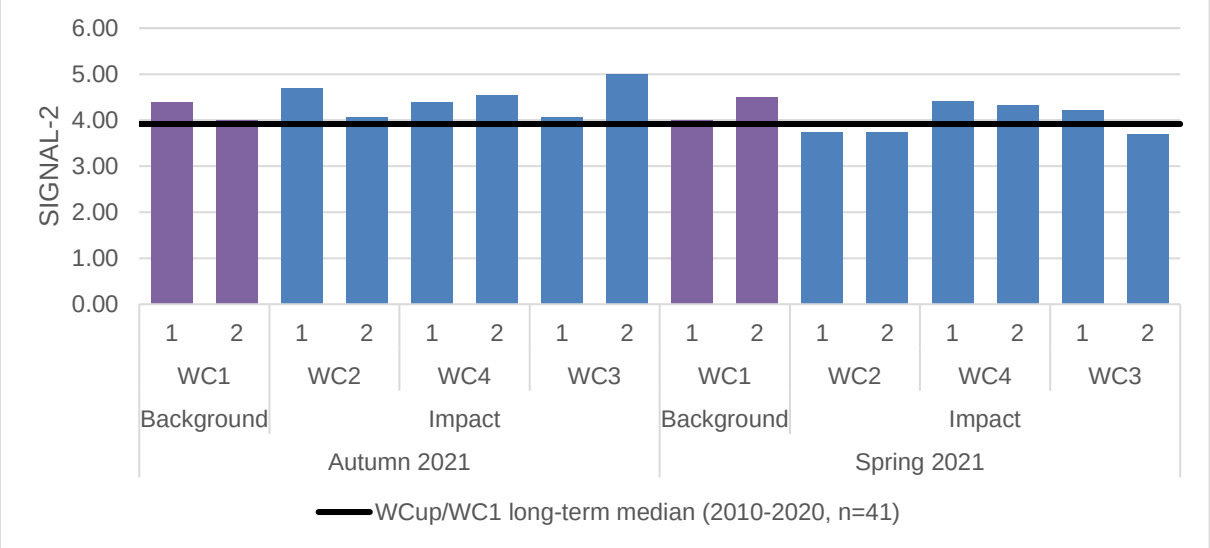


Figure 5A-3 SIGNAL-2 in Wangcol Creek samples in 2021

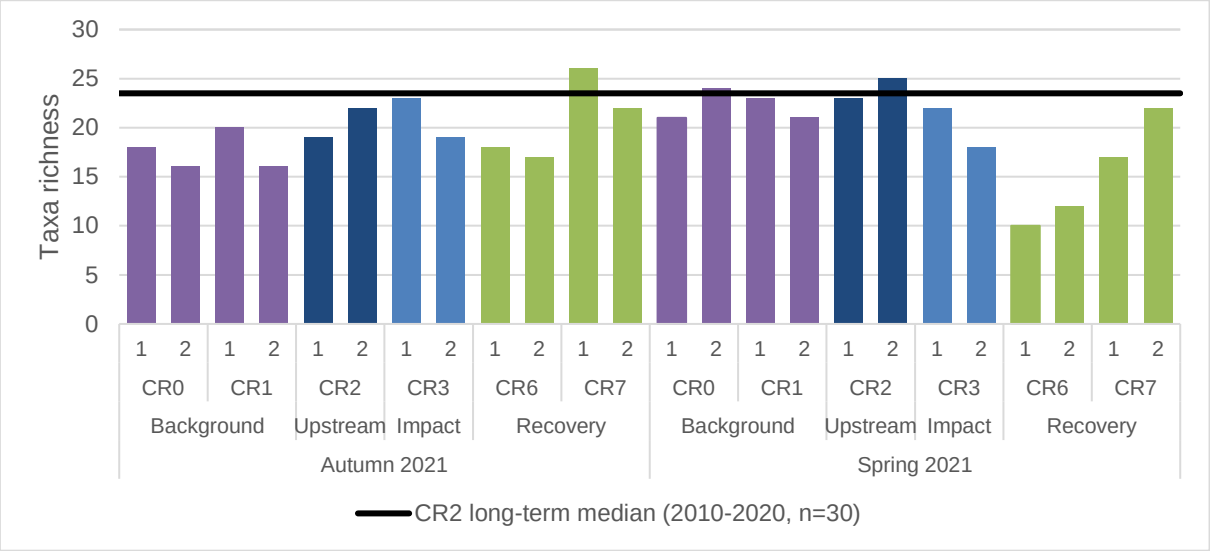


Figure 5A-4 Taxa richness in Coxs River samples associated with Springvale Coal Services in 2021

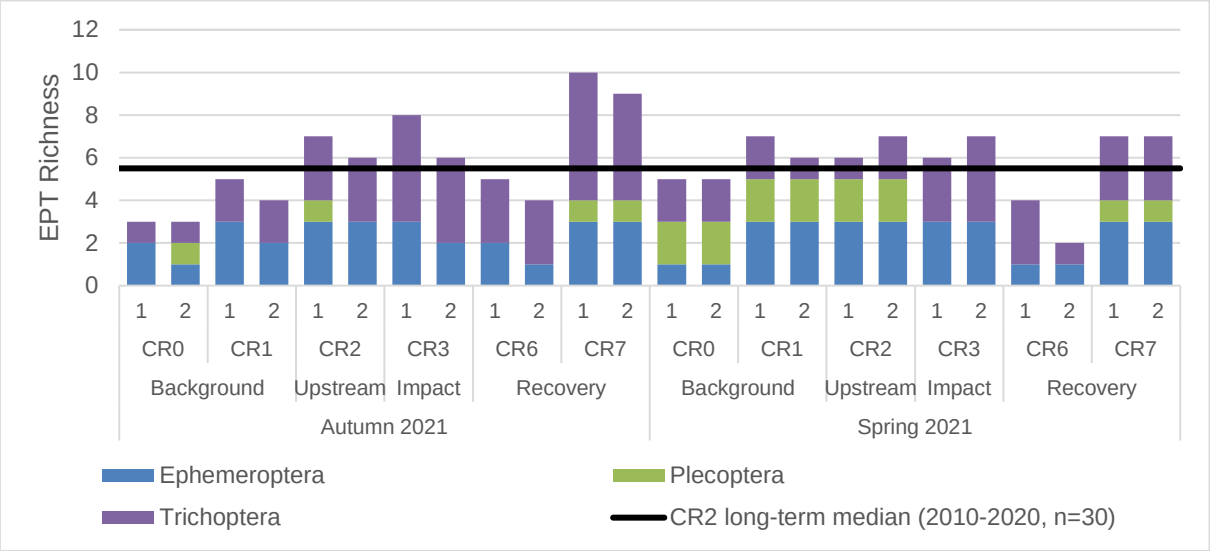


Figure 5A-5 EPT richness in Coxs River samples associated with Springvale Coal Services in 2021

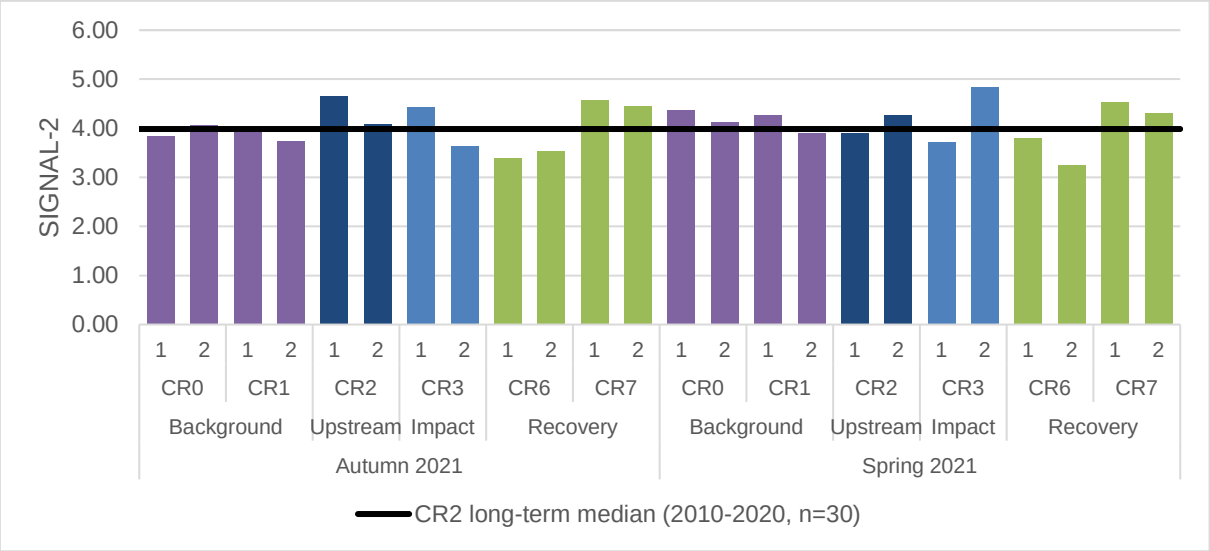


Figure 5A-6 SIGNAL-2 in Coxs River samples associated with Springvale Coal Services in 2021

Appendix 6:

Waste

The monthly waste graphs for WCS for the reporting period are shown in Figure 6-1 – Figure 6-4

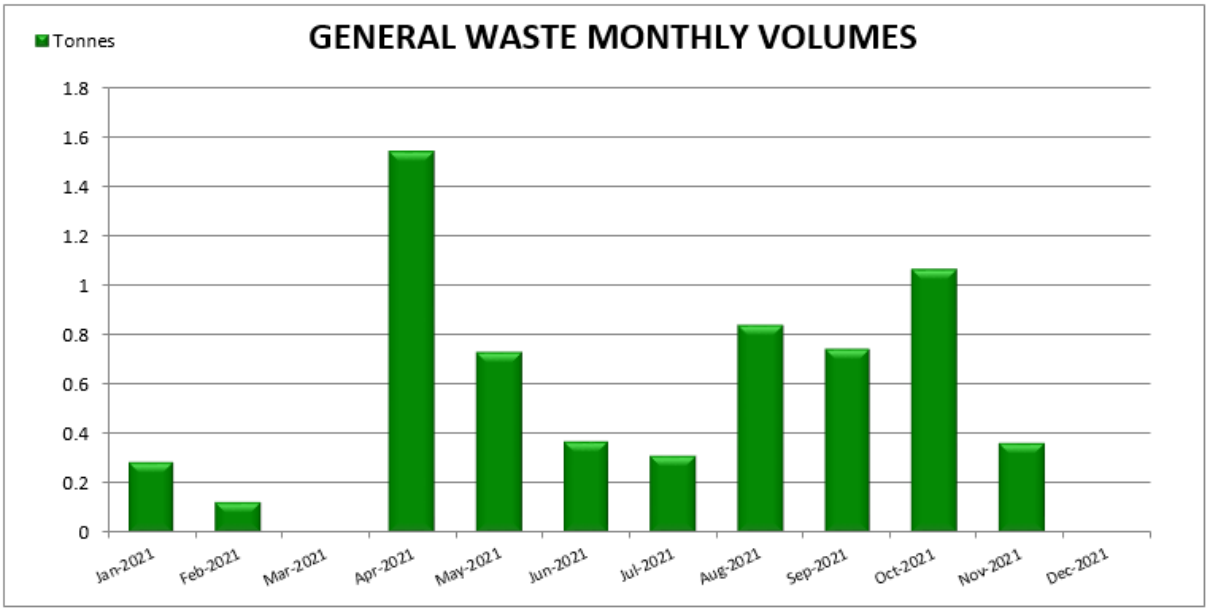


Figure 6A-1: WCS General Waste 2021

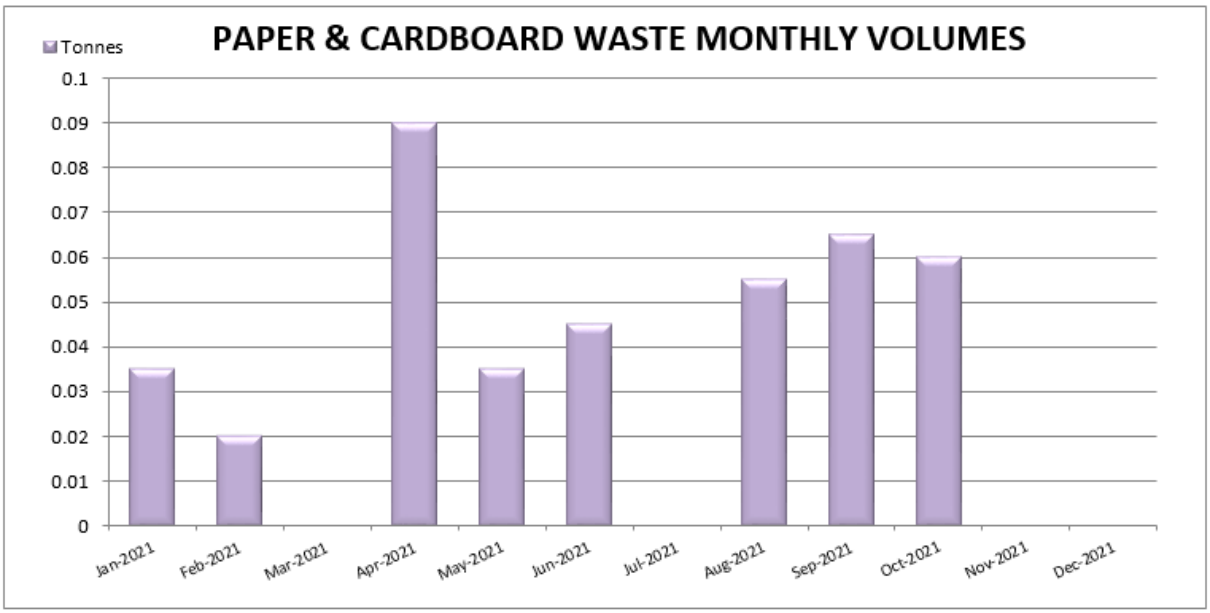


Figure 6A-2: WCS Paper & Cardboard 2021

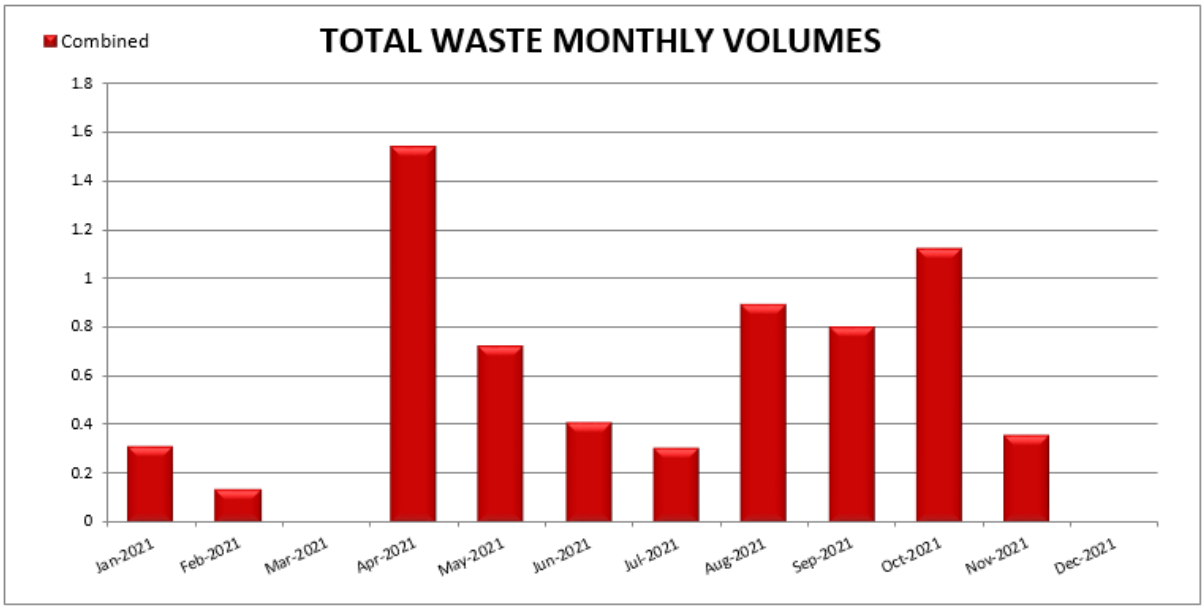


Figure 6A-3: WCS Total Waste Volumes 2021

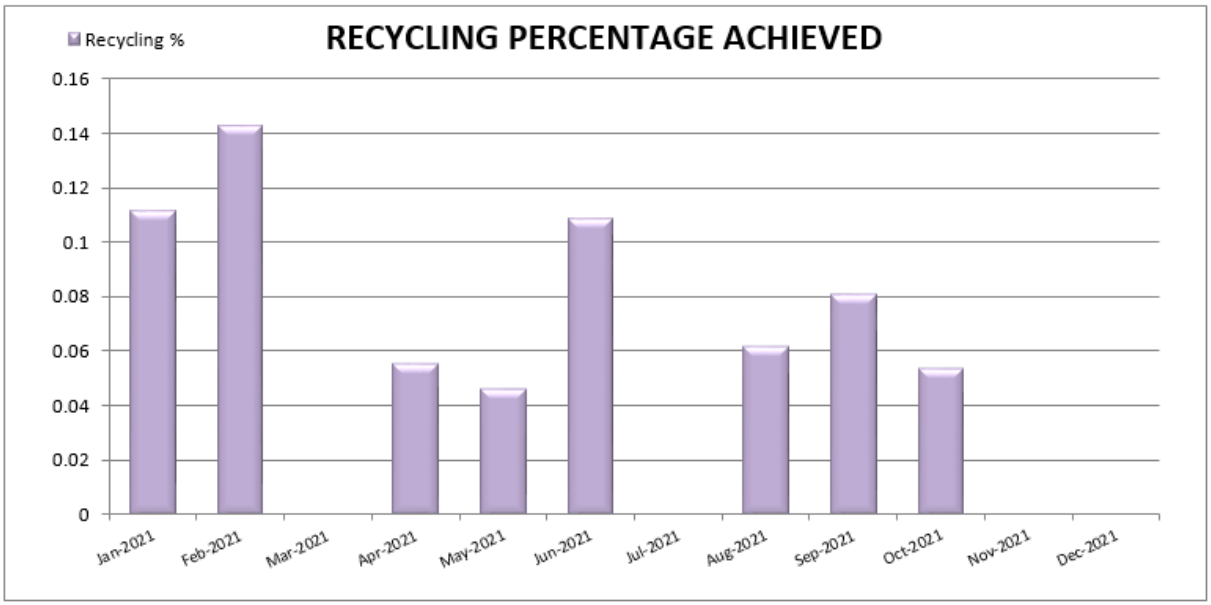


Figure 6A-2: WCS Recycling Percentage 2021

Table 6A-1: 2011-2021 Waste Quantities

	Hazardous Recycled				Non-hazardous Recycled		Hazardous Disposed	Non-hazardous Disposed	Totals		
	Waste oil (kL)	Oily water (kL)	Oil filters (Tonne)	Effluent (kL)	Paper & cardboard (Tonne)	Scrap steel (Tonne)	Oily rags / absorbents (Tonne)	Mixed solid waste (Tonne)	Total waste (Tonne)	Recycled waste (Tonne)	Percent recycled (%)
2011	-	-	-	-	0.73	-	-	2.55	3.28	0.73	22%
2012	1.50	-	-	-	2.90	-	-	6.61	11.01	4.40	40%
2013	-	-	-	-	2.12	-	-	6.85	8.97	2.12	24%
2014	-	-	-	-	1.79	-	-	15.51	17.30	1.79	10%
2015	-	0.62	-	-	2.17	-	-	36.72	39.51	2.79	7%
2016	-	-	-	-	2.12	-	-	20.14	22.26	2.12	10%
2017	1.45	-	-	-	1.96	-	-	12.11	15.51	3.41	22%
2018	1.10	-	-	-	1.96	-	-	18.91	21.96	3.06	14%
2019	0.70	-	-	-	1.72	-	-	5.65	8.07	2.42	30%
2020	1.80	-	-	-	0.90	-	-	8.88	11.58	2.70	23%
2021	-	-	-	-	0.405	-	-	6.345	6.75	0.405	6%

Appendix 7:
Surface Water

LDP Monitoring

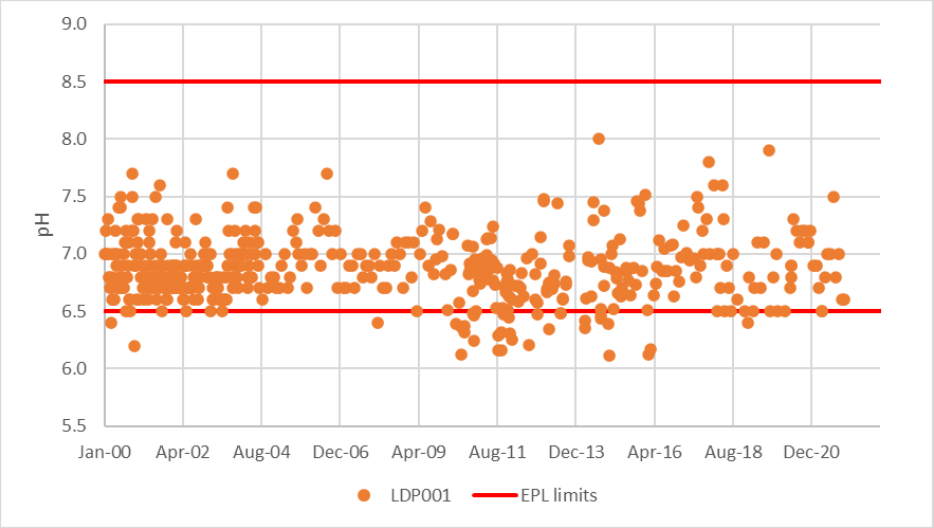


Figure 7A-1 Historical LDP001 pH

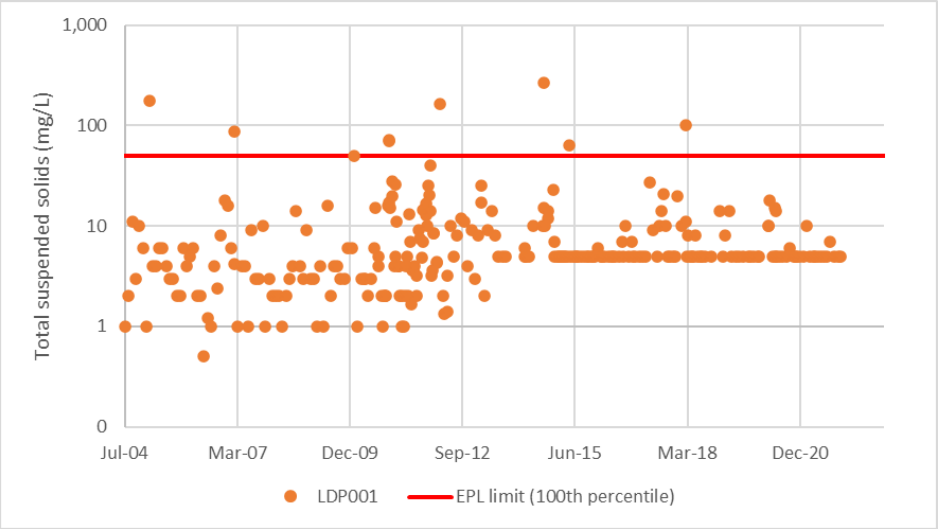


Figure 7A-2 Historical LDP001 Total Suspended Solids

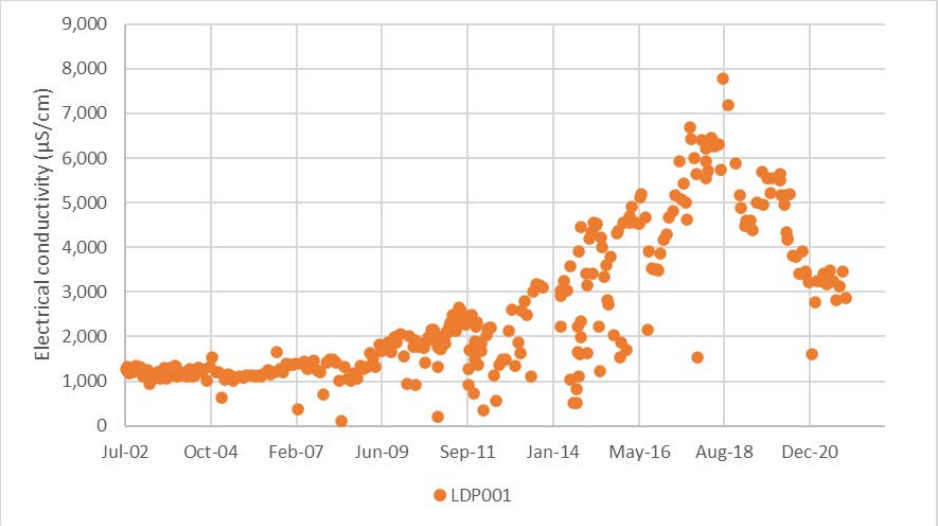


Figure 7A-3 Historical LDP001 Electrical Conductivity

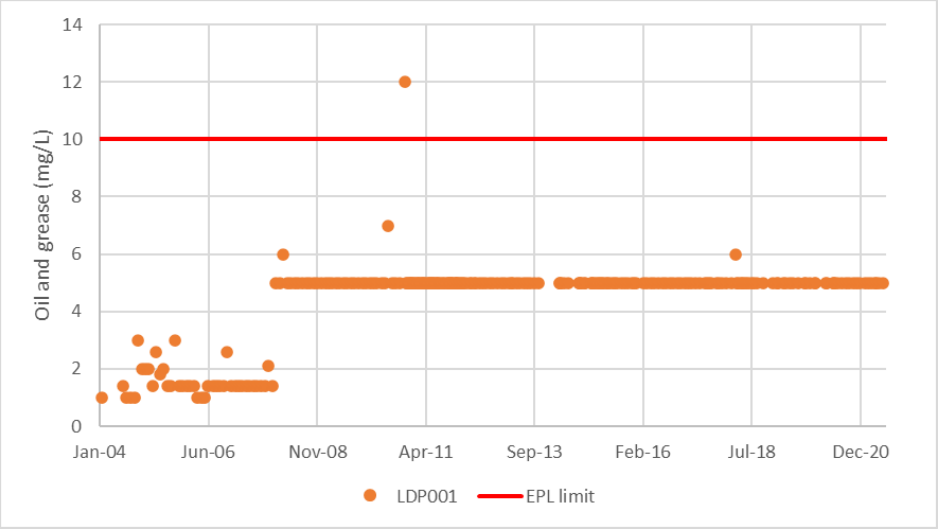


Figure 7A-4 Historical LDP001 Oil and Grease

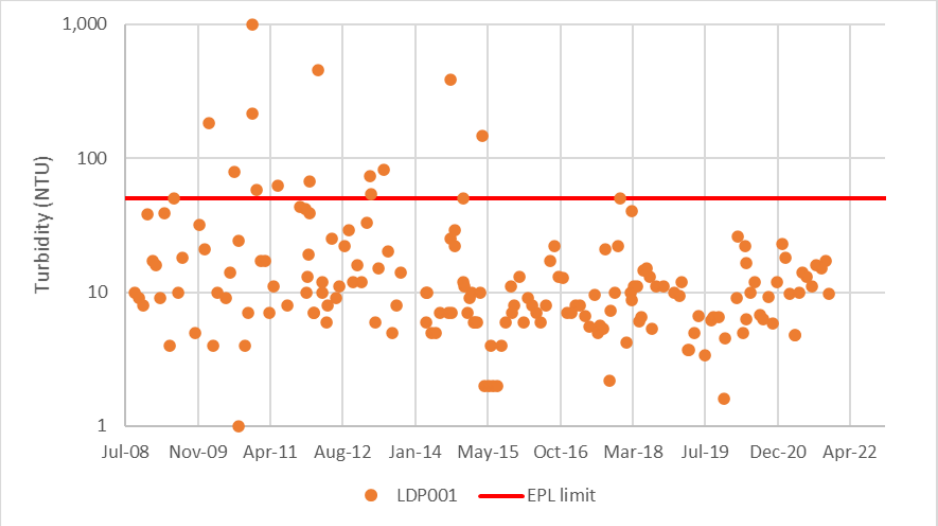


Figure 7A-5 Historical LDP001 Turbidity

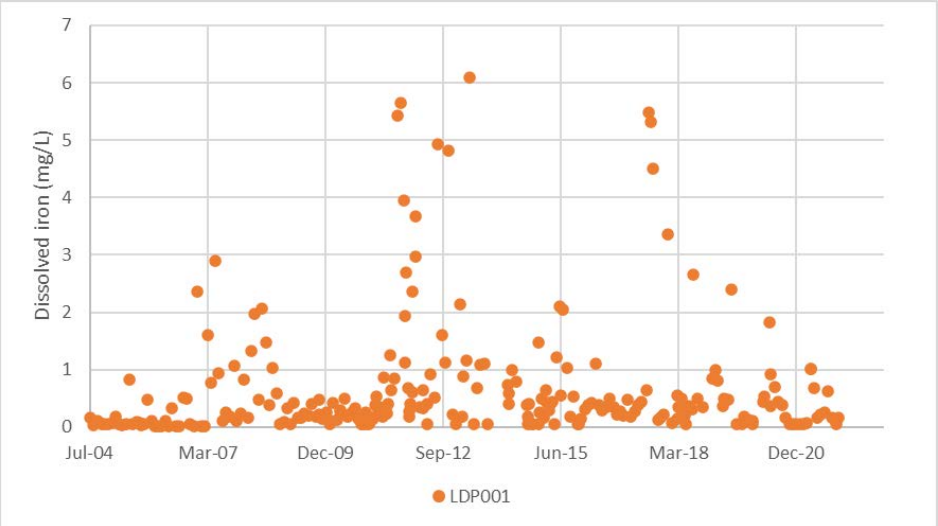


Figure 7A-6 Historical LDP001 Dissolved Iron

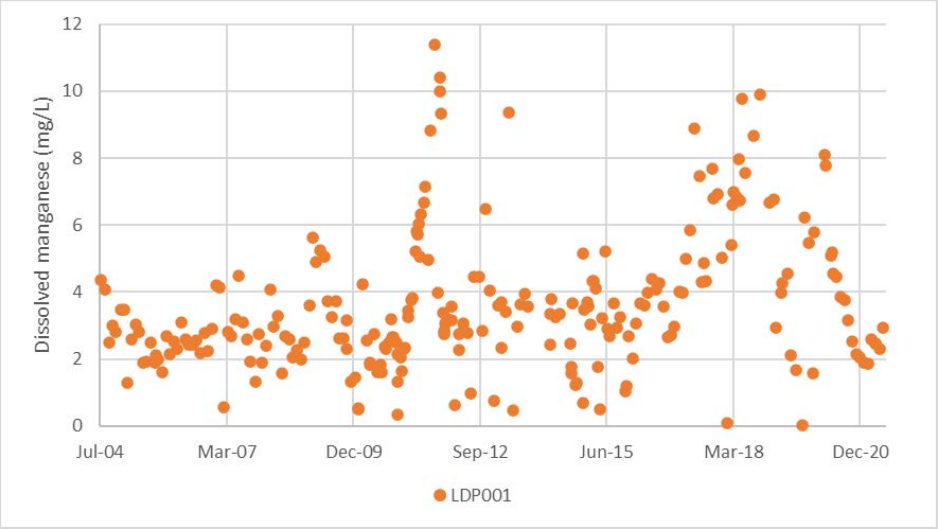


Figure 7A-7 Historical LDP001 Dissolved Manganese

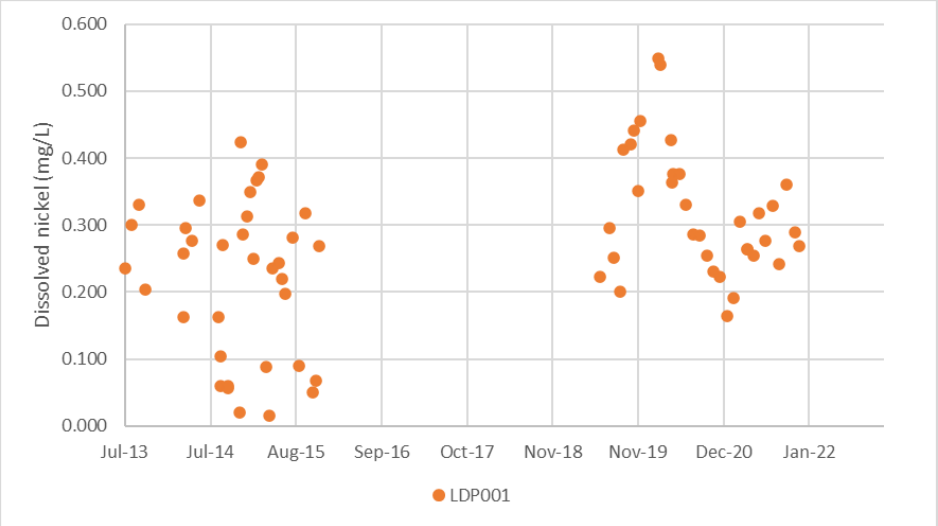


Figure 7A-8 Historical LDP001 Dissolved Nickel

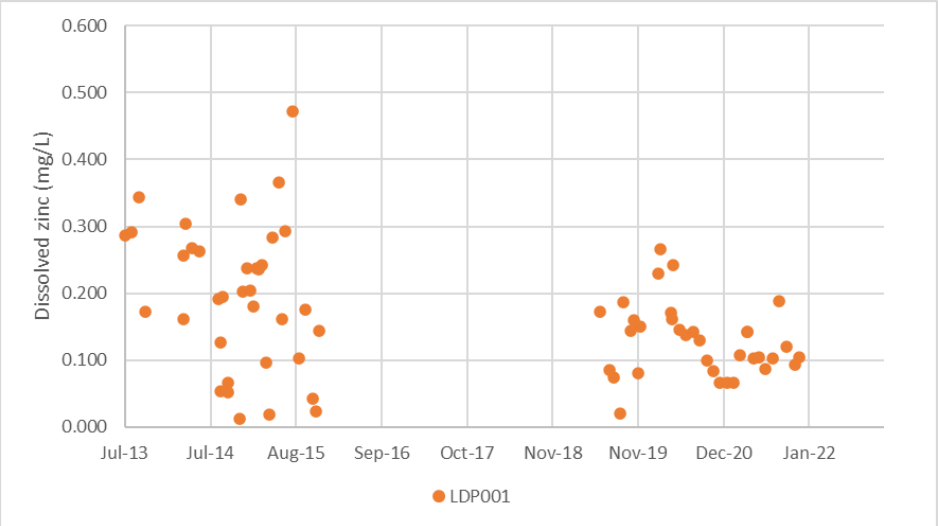


Figure 7A-9 Historical LDP001 Dissolved Zinc

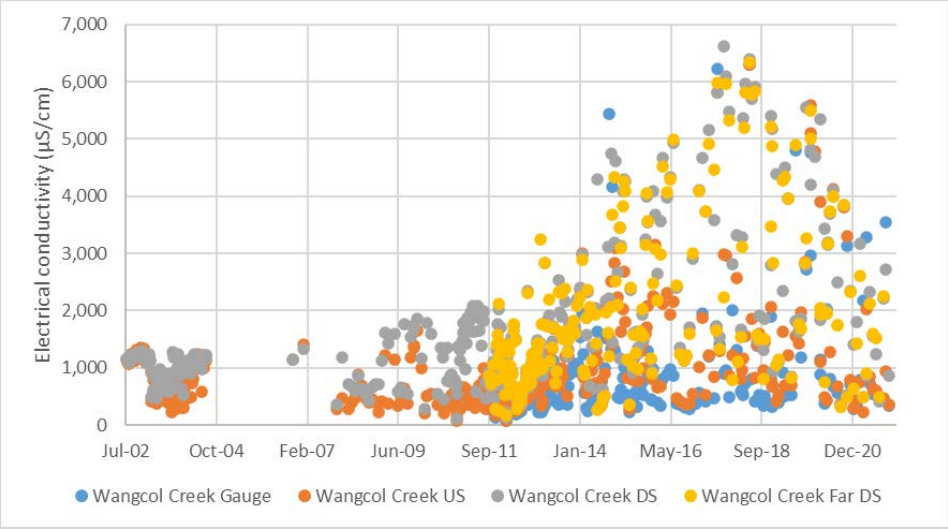


Figure 7A-10 Historical Wangcol Creek EC

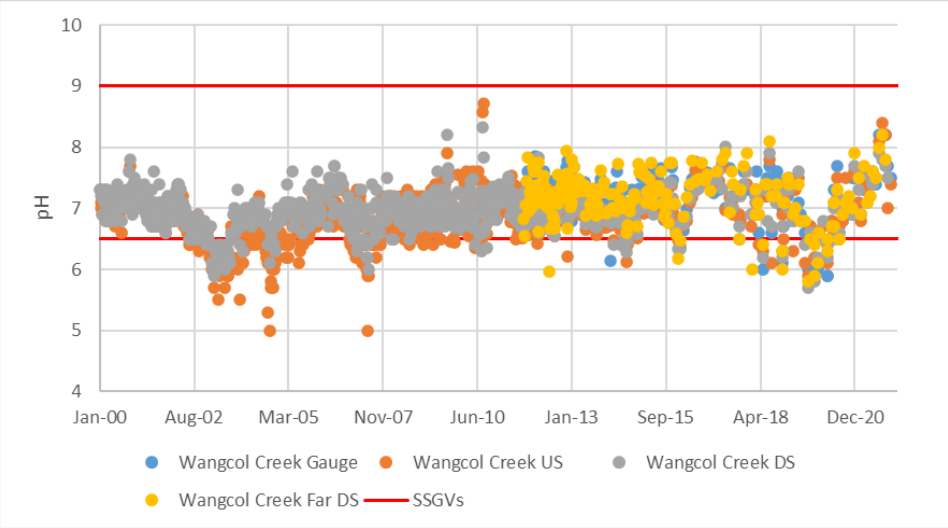


Figure 7A-11 Historical Wangcol Creek pH

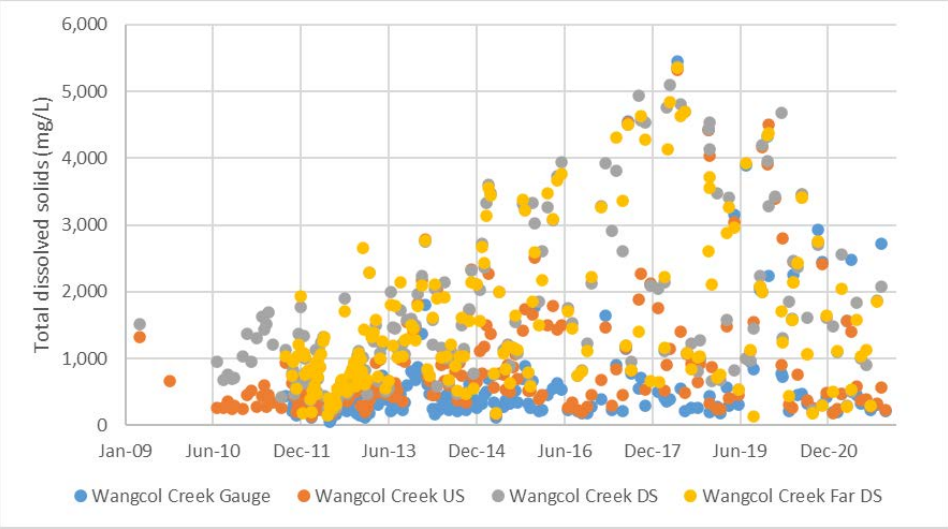


Figure 7A-12 Historical Wangcol Creek TDS

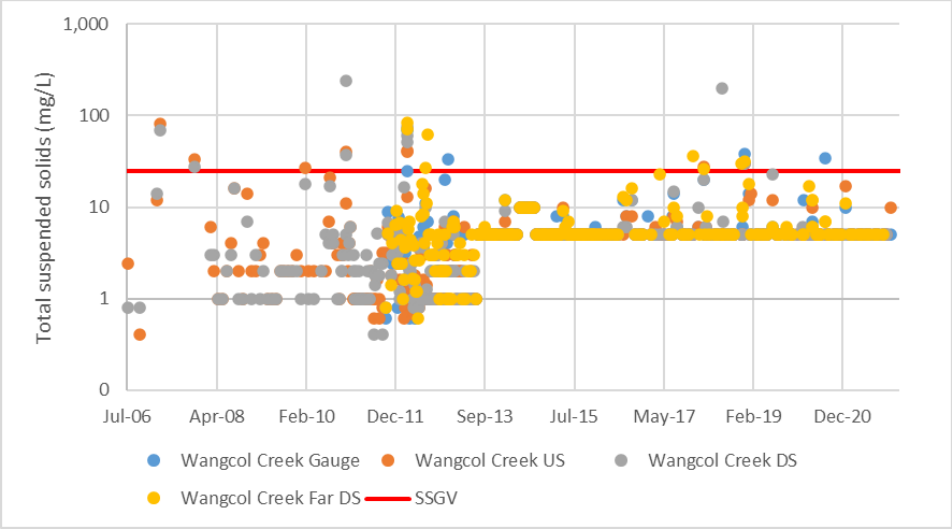


Figure 7A-13 Historical Wangcol Creek TSS

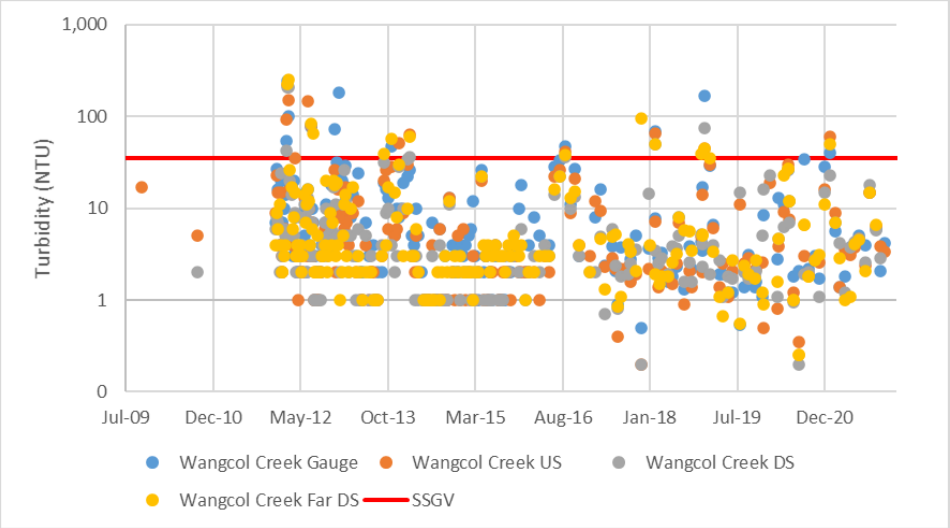


Figure 7A-14 Historical Wangcol Creek Turbidity

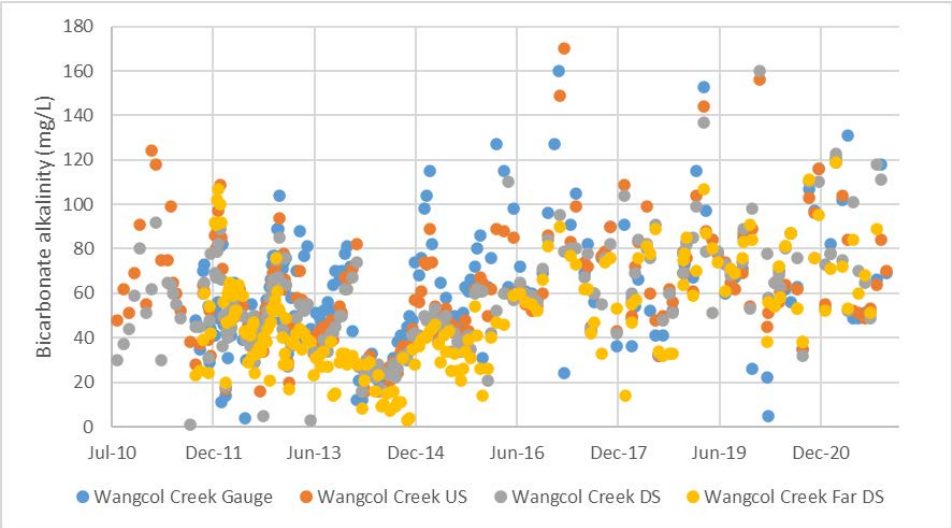


Figure 7A-15 Historical Wangcol Creek HCO Alkalinity

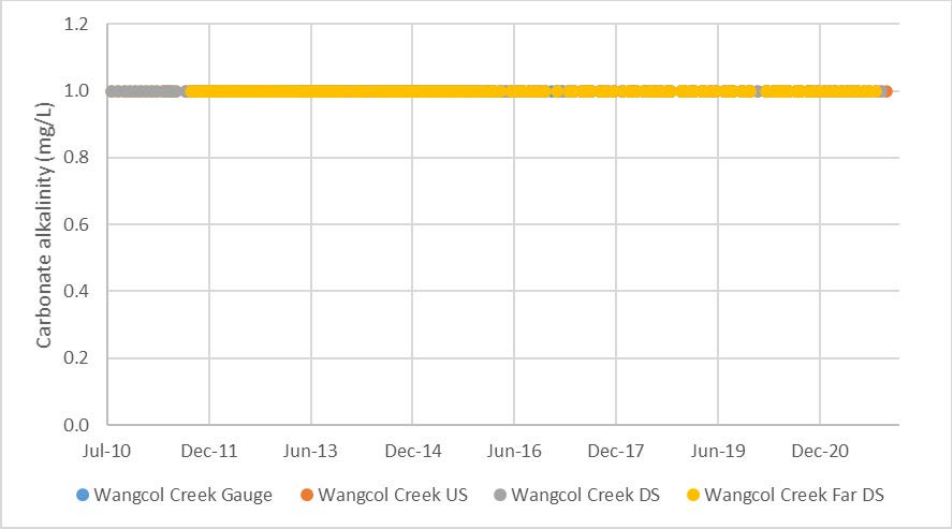


Figure 7A-16 Historical Wangcol Creek CO Alkalinity

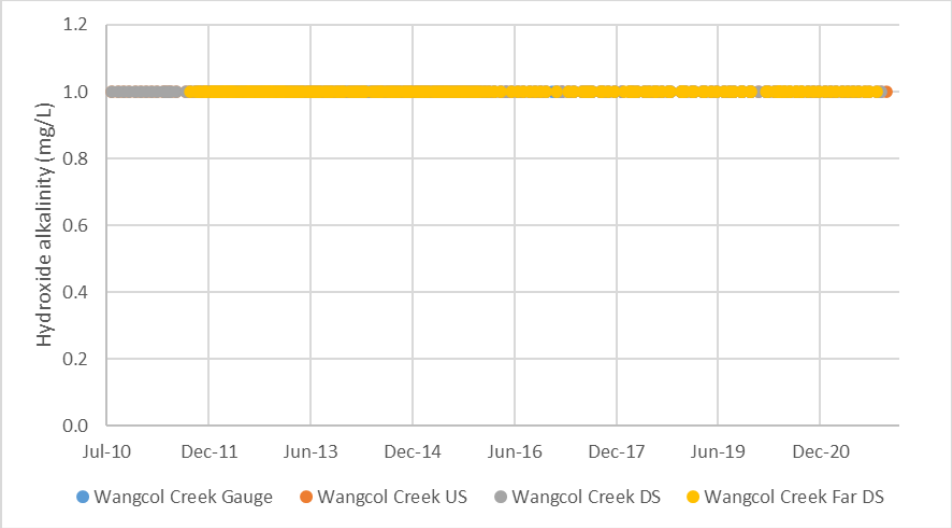


Figure 7A-17 Historical Wangcol Creek OH Alkalinity

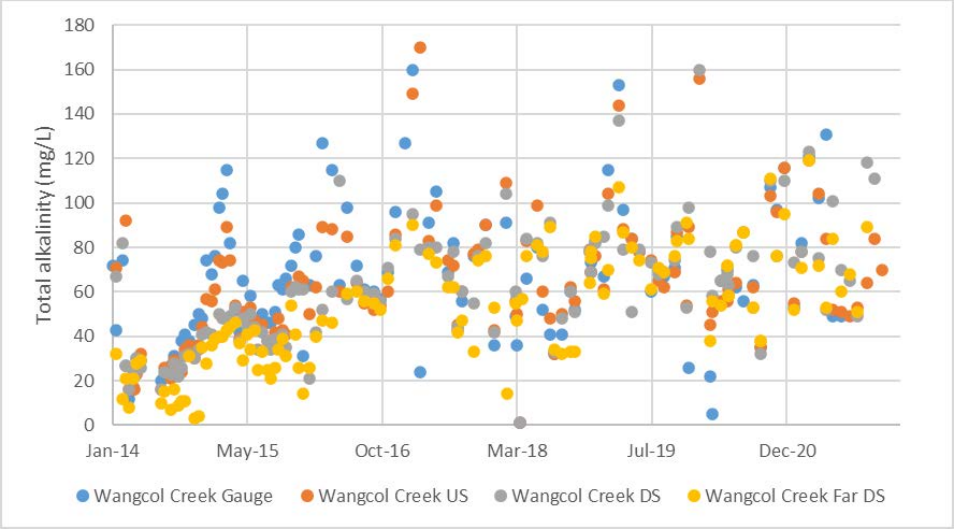


Figure 7A-18 Historical Wangcol Creek Total Alkalinity

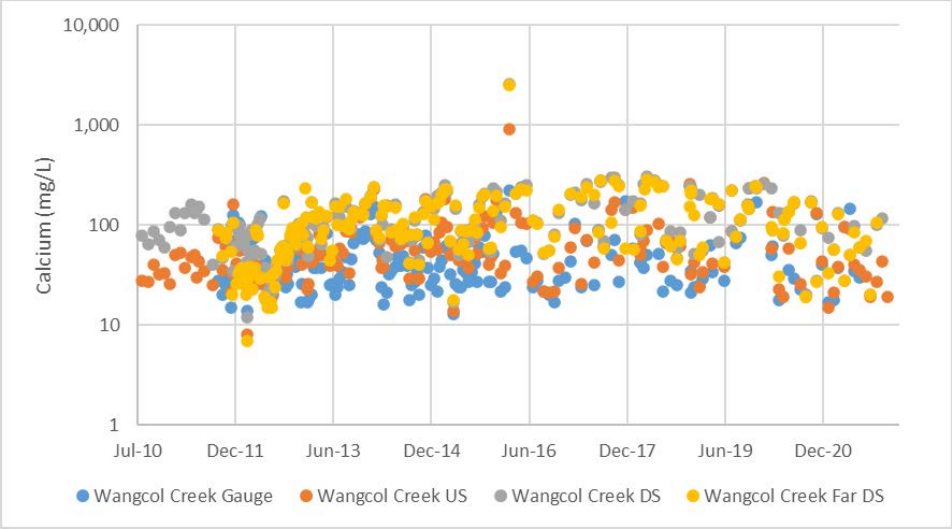


Figure 7A-19 Historical Wangcol Creek Calcium

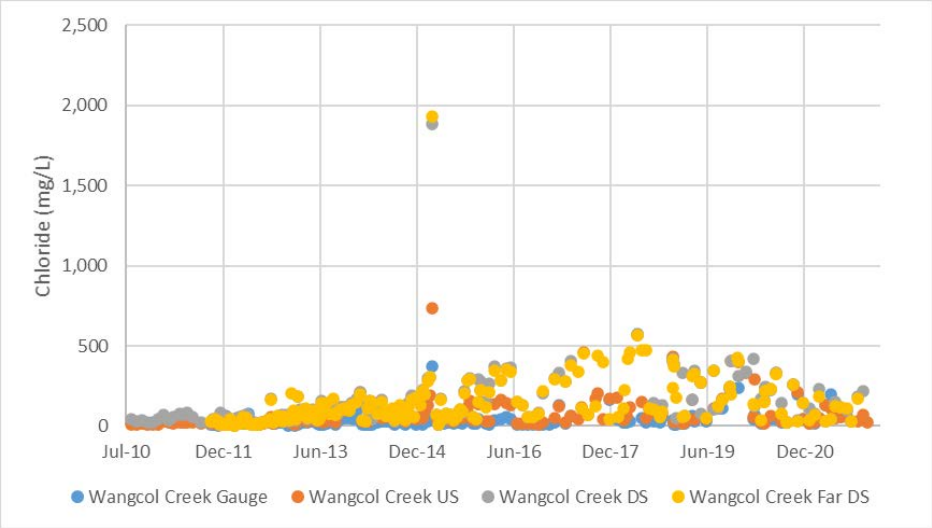


Figure 7A-20 Historical Wangcol Creek Chloride

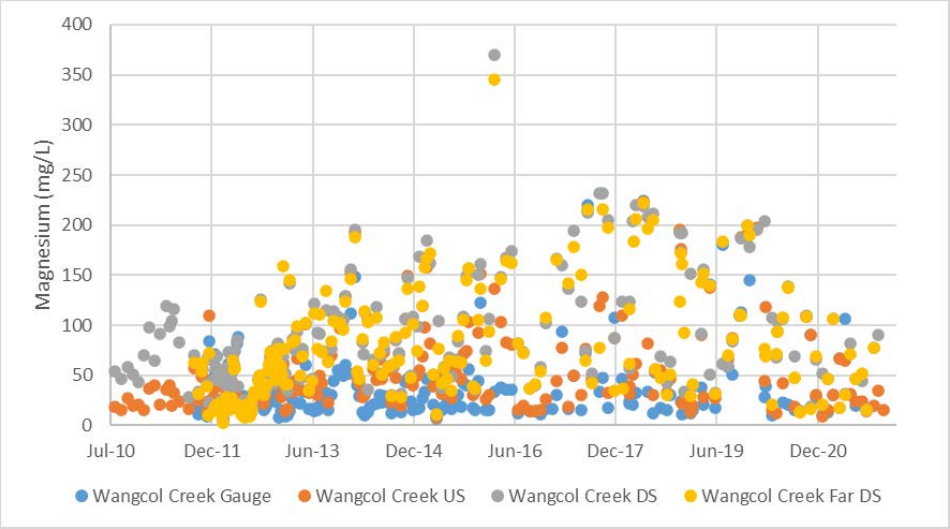


Figure 7A-21 Historical Wangcol Creek Magnesium

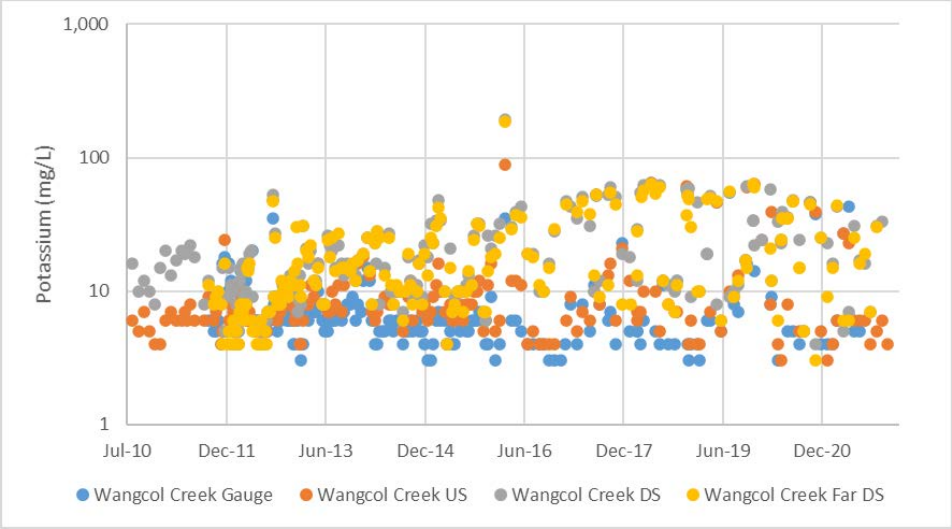


Figure 7A-22 Historical Wangcol Creek Potassium

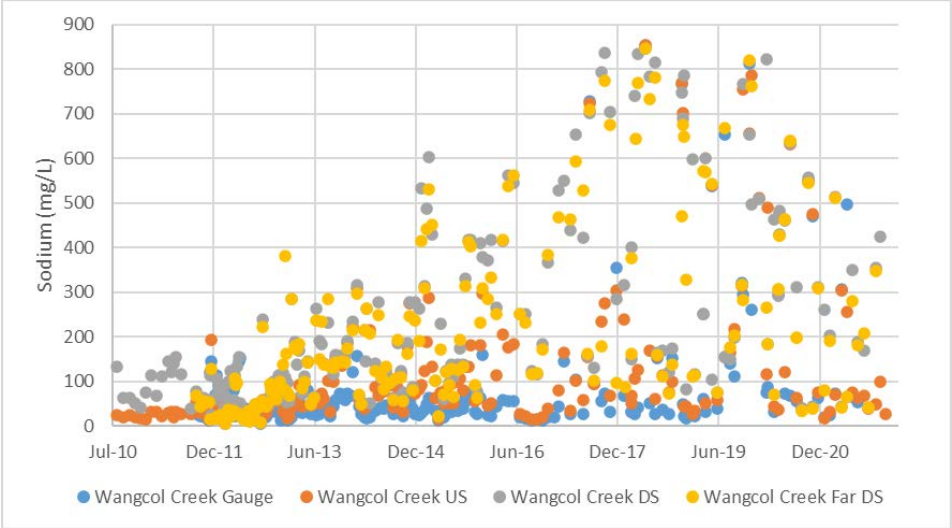


Figure 7A-23 Historical Wangcol Creek Sodium

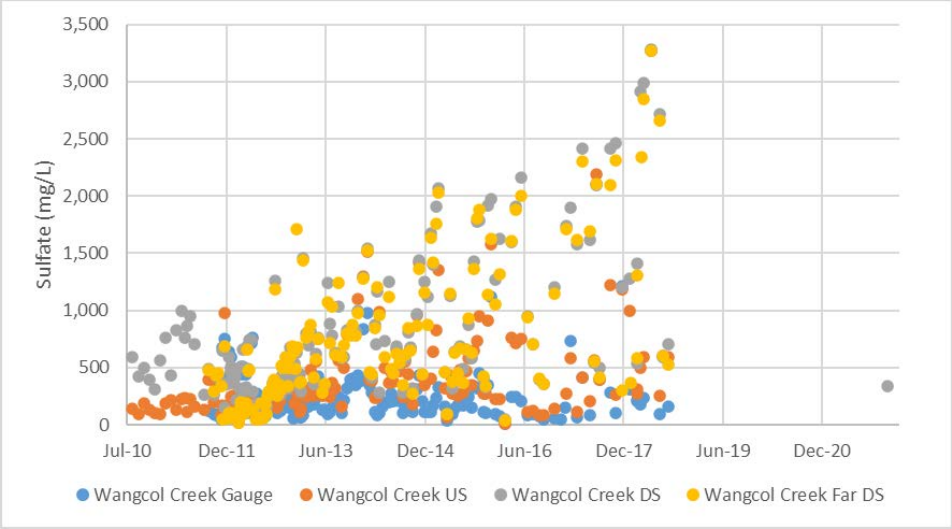


Figure 7A-24 Historical Wangcol Creek Sulfate

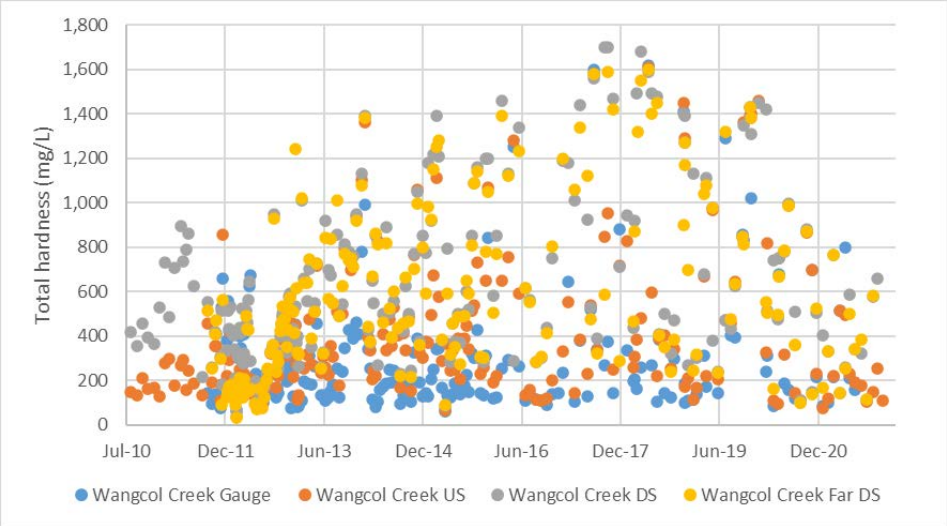


Figure 7A-25 Historical Wangcol Creek Hardness

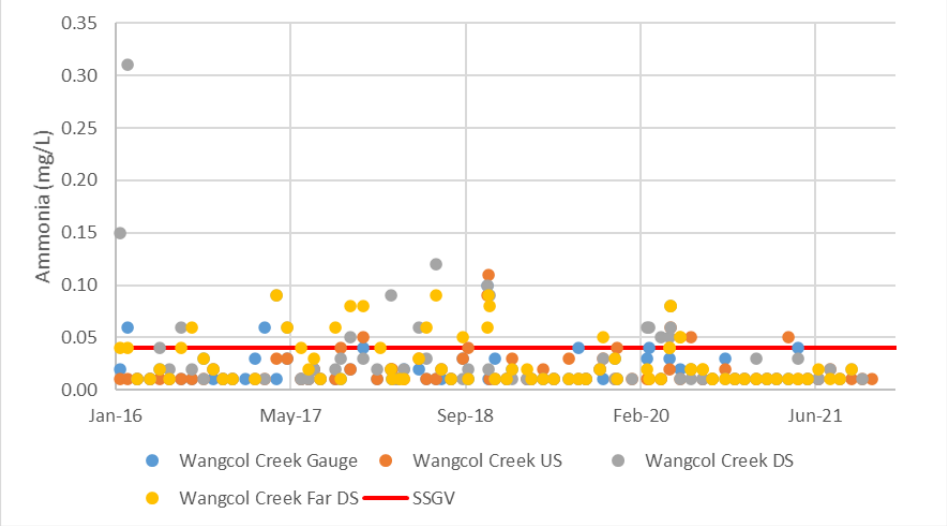


Figure 7A-26 Historical Wangcol Creek Ammonia

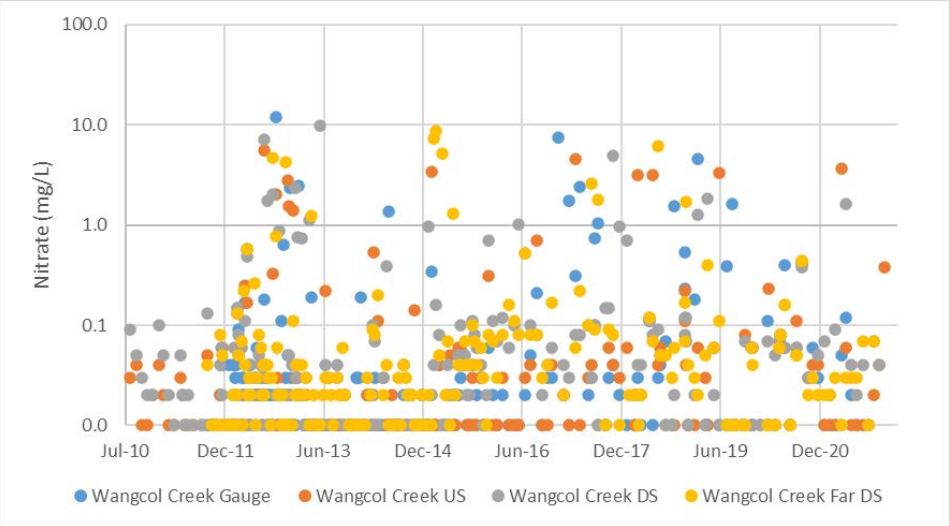


Figure 7A-27 Historical Wangcol Creek Nitrate

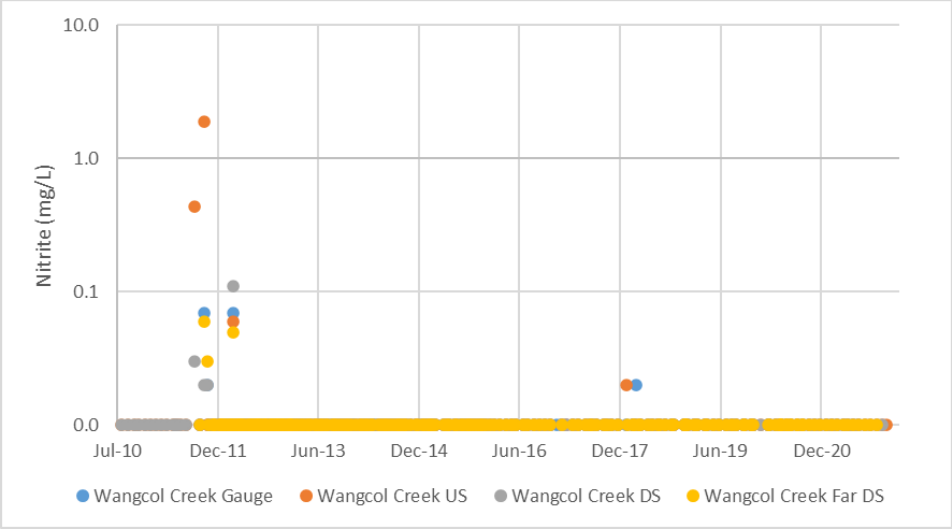


Figure 7A-28 Historical Wangcol Creek Nitrite

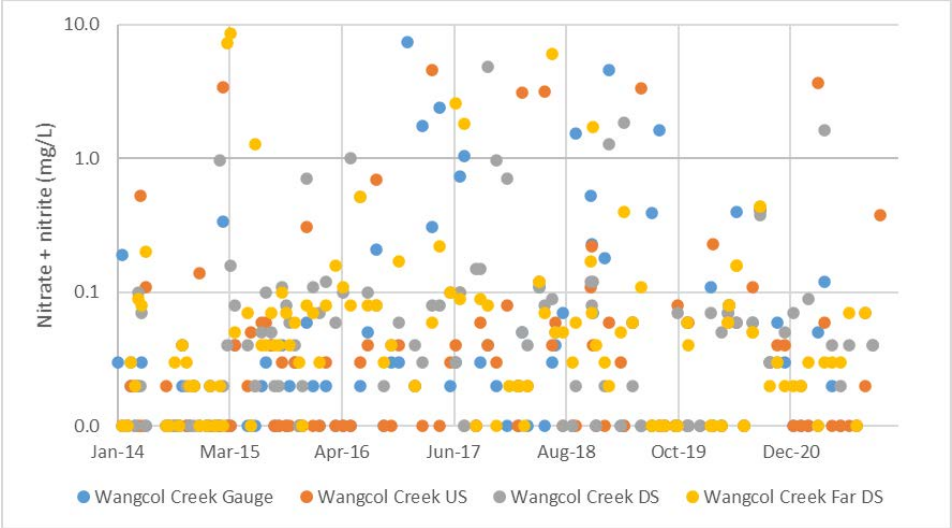


Figure 7A-29 Historical Wangcol Creek Nitrate + Nitrite

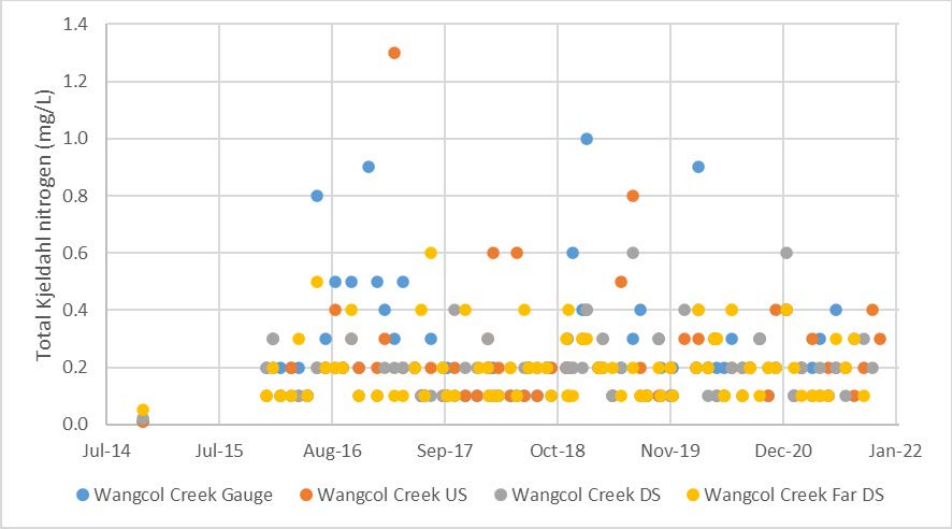


Figure 7A-30 Historical Wangcol Creek TKN

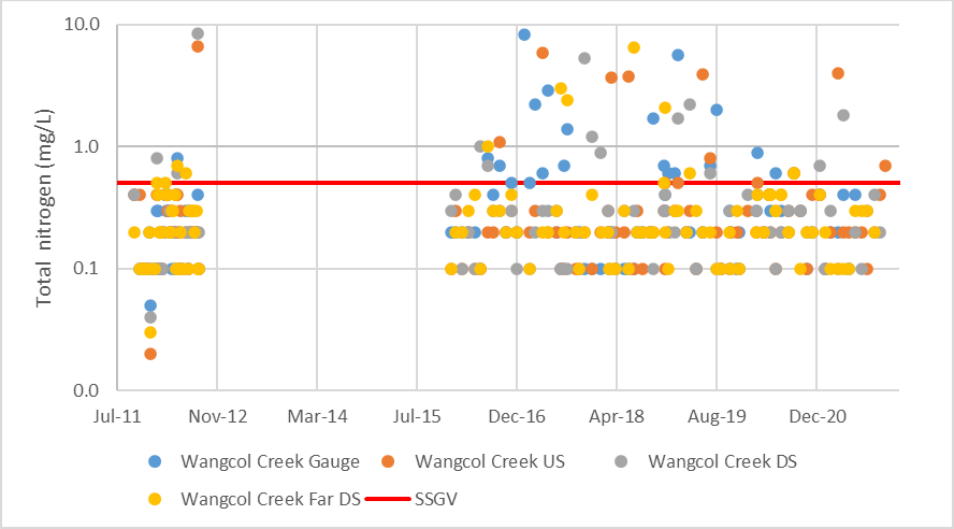


Figure 7A-31 Historical Wangcol Creek Total Nitrogen

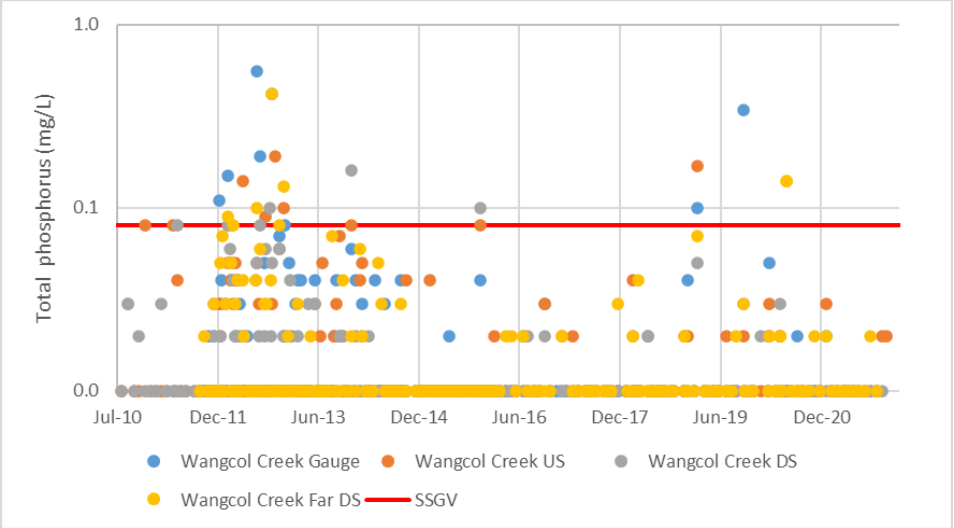


Figure 7A-32 Historical Wangcol Creek Total Phosphorus

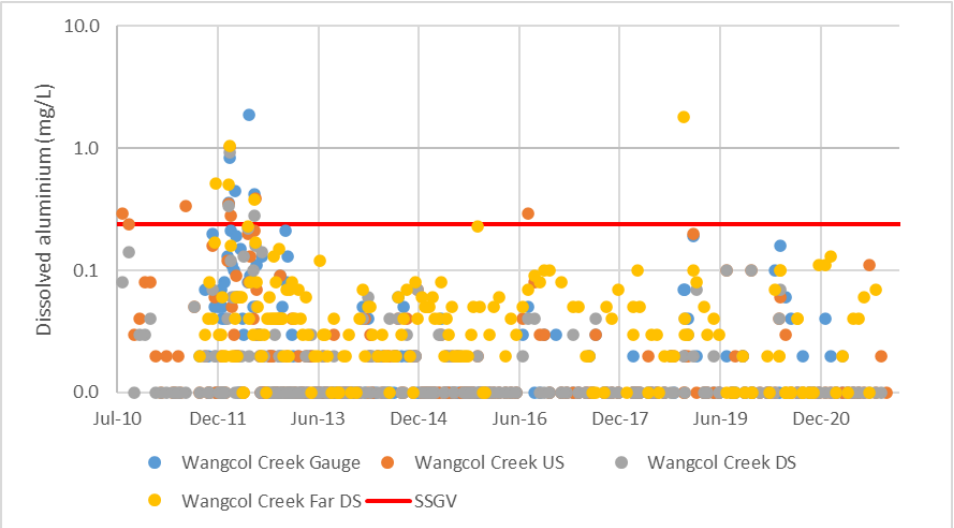


Figure 7A-33 Historical Wangcol Creek Dissolved Aluminium

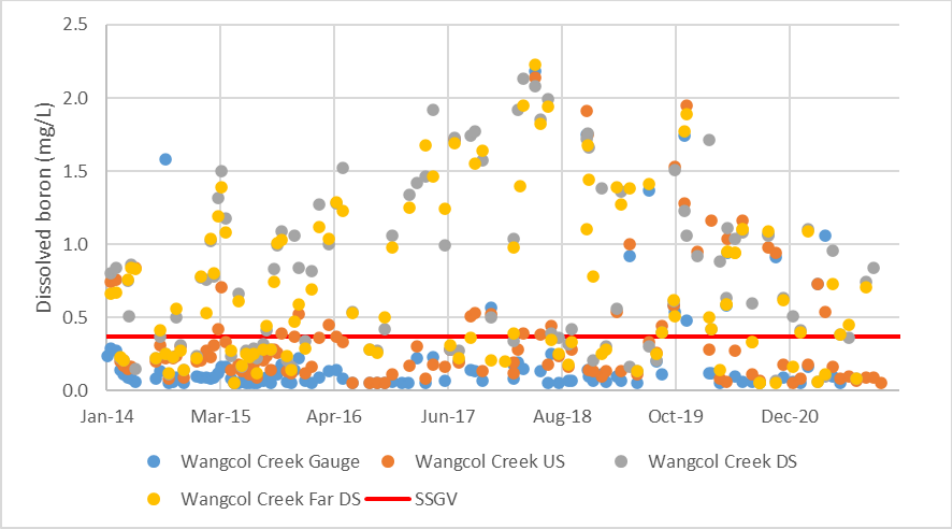


Figure 7A-34 Historical Wangcol Creek Dissolved Boron

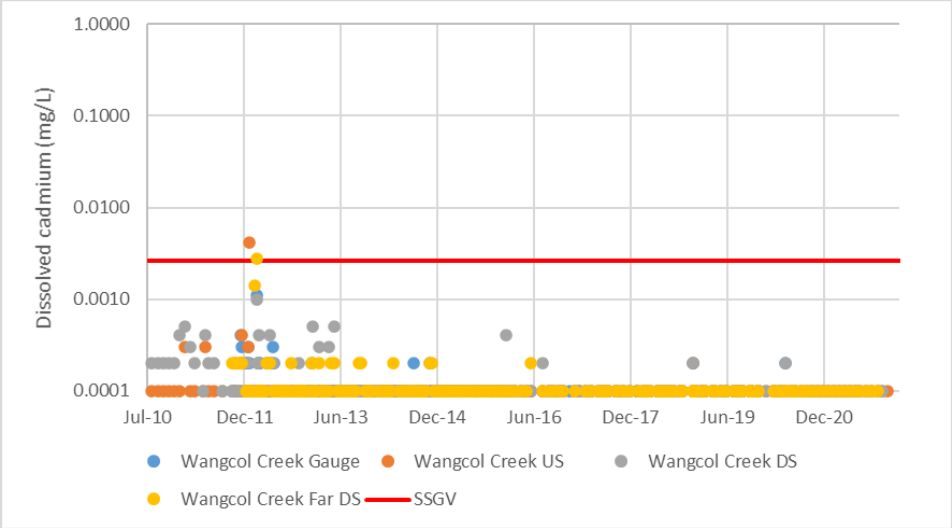


Figure 7A-35 Historical Wangcol Creek Dissolved Cadmium

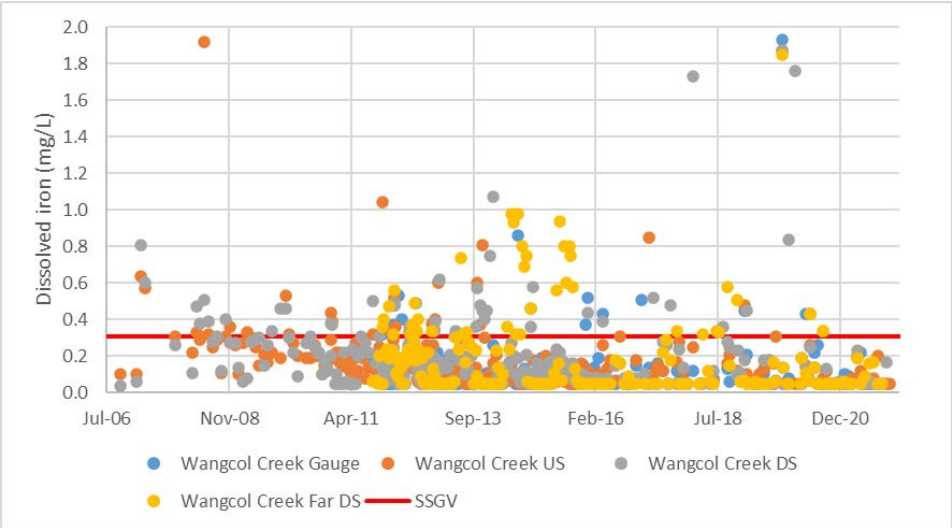


Figure 7A-36 Historical Wangcol Creek Dissolved Iron

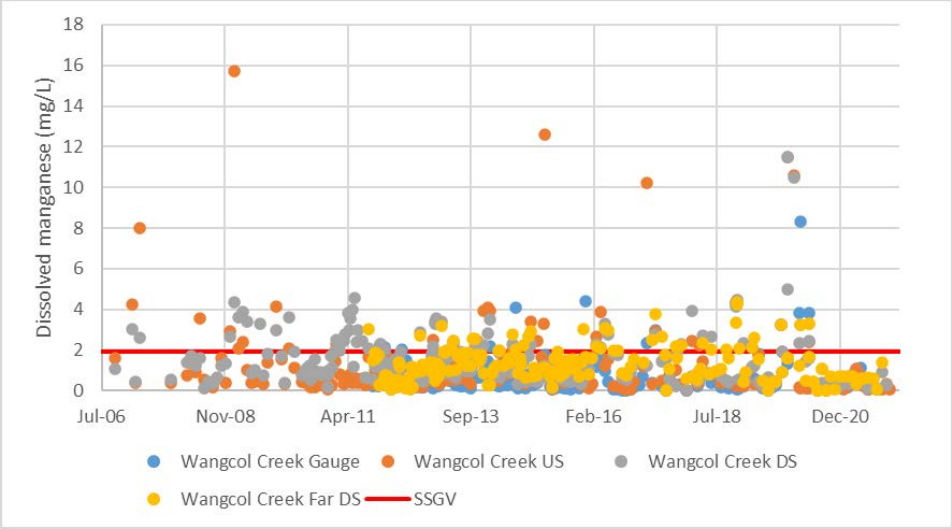


Figure 7A-37 Historical Wangcol Creek Dissolved Manganese

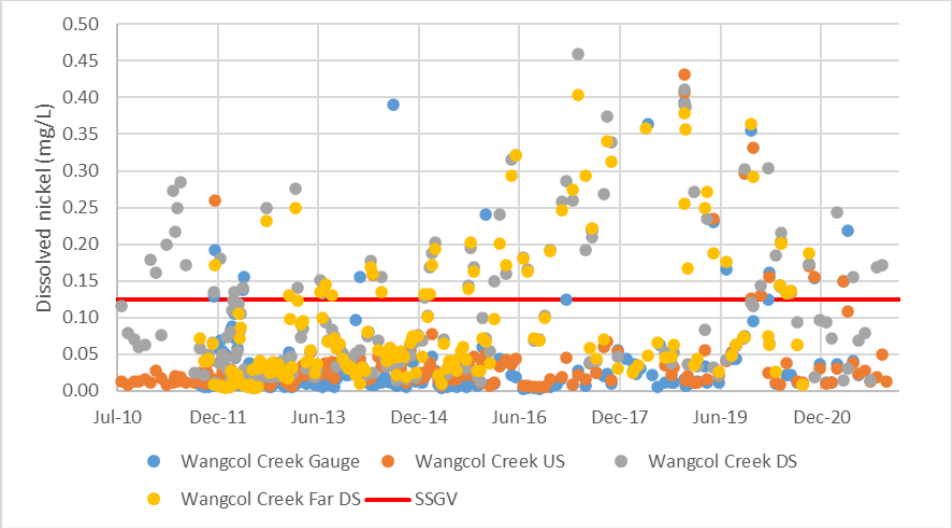


Figure 7A-38 Historical Wangcol Creek Dissolved Nickel

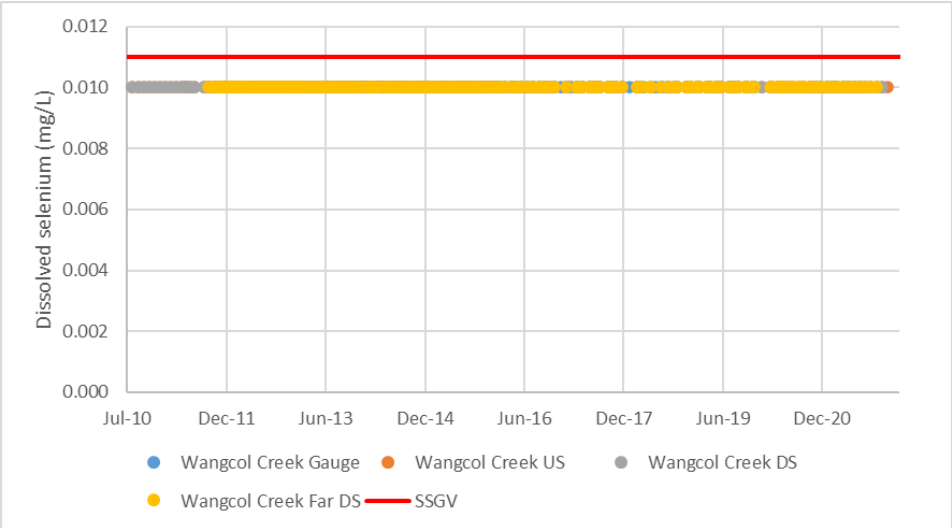


Figure 7A-39 Historical Wangcol Creek Dissolved Selenium

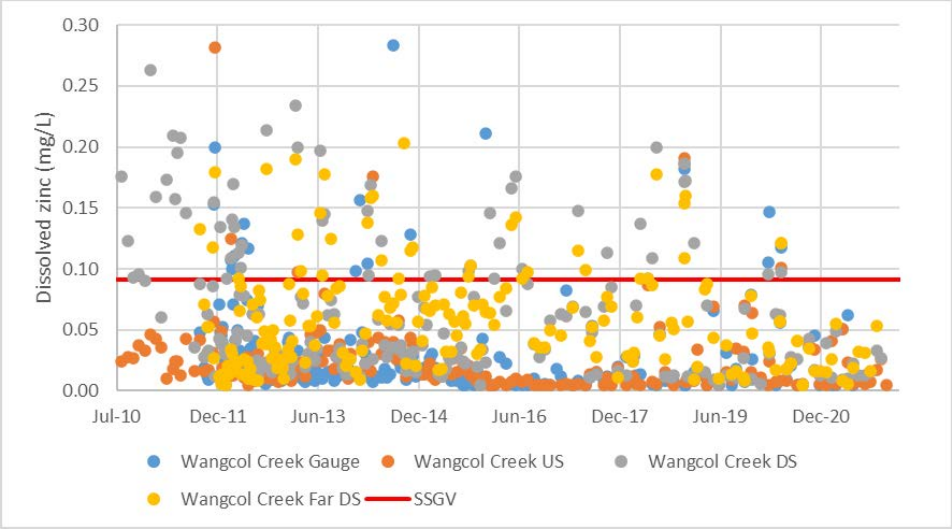


Figure 7A-40 Historical Wangcol Creek Dissolved Zinc

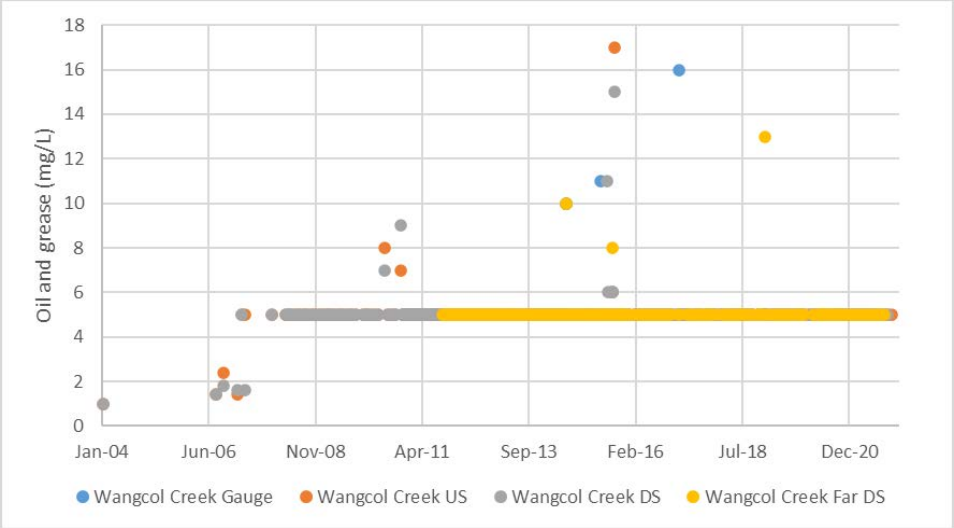


Figure 7A-41 Historical Wangcol Creek Oil and Grease

Table 7A-1 Surface water Trigger Investigations

Parameter	Occurrence (SSGV)	Investigation
Turbidity (NTU)	January, 50 NTU (35 NTU)	Turbidity measured upstream at Wangcol Creek US was also high at a concentration of 60 NTU. Elevated turbidity within Wangcol Creek was likely caused by high rainfall amounts in the five days prior to sampling, equaling 67 mm.
Dissolved Boron (mg/L)	February, 0.4 mg/L (0.37 mg/L)	There was no evidence of elevated dissolved boron upstream of LDP001. LDP001 was discharging at the time of monitoring within Wangcol Creek. The elevated dissolved boron is potentially caused by discharges from WCS through LDP001. 59 mm of rain was recorded in the five days prior to sampling which may not have allowed sufficient residence time for dissolved metals to adsorb to sediment and settle out of Cooks Dam prior to discharge through LDP001.
	March, 1.09 mg/L (0.37 mg/L)	There was no evidence of elevated dissolved boron upstream of LDP001. LDP001 was discharging at the time of monitoring within Wangcol Creek. The elevated dissolved boron is potentially influenced by discharges from WCS through LDP001 and seepages from surroundings operations through historical mine workings.
	June, 0.73 mg/L (0.37 mg/L)	Dissolved boron values did not exceed the trigger value at any upstream location. LDP001 has historically showed dissolved boron concentrations greater than the 0.37 mg/L SSGV and did so in the most recent monitoring event in May 2021 with a result of 1.03 mg/L. This suggests that the cause of the elevated result was potentially influenced by WCS and seepages from surroundings operations through historical mine workings.
	July, 0.38 mg/L (0.37 mg/L)	Dissolved boron values did not exceed the trigger value at any upstream location. LDP001 has concentrations of dissolved boron often greater than 0.37 mg/L SSGV. This suggests that the cause of the elevated result was potentially influenced by WCS and seepages from surroundings operations through historical mine workings.
	August, 0.45 mg/L (0.37 mg/L)	There was no recorded exceedances in upstream locations, however, LDP001 was found to contain 1.22 mg/L of dissolved boron. This suggests that the cause for the exceedance

Parameter	Occurrence (SSGV)	Investigation
		may have come from WCS through LDP001 and/or from surroundings operations through historical mine workings.
	October, 0.71 mg/L (0.37 mg/L)	There were no recorded exceedances in upstream locations and at LDP001. LDP001 has concentrations of dissolved boron often greater than 0.37 mg/L SSGV. This suggests that the cause of the elevated result was potentially influenced by WCS and seepages from surroundings operations through historical mine workings.
	November, 0.7 mg/L (0.37 mg/L)	Upstream at Wangcol Creek Gauge noted an elevated dissolved boron concentration of 1.04 mg/L, as well as LDP001 with 1.07 mg/L recorded. It is inconclusive for the potential cause of this trigger event being from upstream sources or from operational discharges.
Dissolved Nickel (mg/L)	March, 0.227 mg/L (0.125 mg/L)	There was no evidence of elevated dissolved nickel upstream of LDP001. LDP001 was discharging at the time of monitoring within Wangcol Creek. The elevated dissolved nickel is potentially influenced by discharges from WCS through LDP001 with a discharged concentration recorded at 0.305 mg/L.
	June, 0.128 mg/L (0.125 mg/L)	Dissolved nickel concentrations did not exceed the trigger value at any upstream location. LDP001 has historically showed dissolved nickel concentrations greater than the 0.125 mg/L SSGV and did so on the same monitoring event in June 2021 with a result of 0.318 mg/L. This suggests that the cause of the elevated result was potentially influenced by WCS and seepages from surroundings operations through historical mine workings.
	October, 0.19 mg/L (0.125 mg/L)	Dissolved nickel concentrations did not show any exceedance of the trigger value upstream. LDP001 has historically shown dissolved nickel concentrations greater than the 0.125 mg/L SSGV did so in October 2021 with a result of 0.360 mg/L. The cause of the elevated result potentially came from WCS and seepages from surroundings operations through historical mine workings.
	November, 0.153 mg/L (0.125 mg/L)	Dissolved nickel concentrations exceeded the trigger value at Wangcol Creek Gauge with a concentration of 0.196 mg/L. In addition, LDP001 has historically shown dissolved nickel concentrations greater than the 0.125 mg/L SSGV and has once again in November 2021

Parameter	Occurrence (SSGV)	Investigation
		with a concentration of 0.317 mg/L. The cause of the elevated result potentially came from WCS and seepages from surroundings operations through historical mine workings, as well as from upstream.

SWTP Residuals

Monitoring of decant water and residuals from the Springvale Water Treatment Plant (SWTP) commenced following the commissioning of the residuals pipeline in June 2019. With this, SWTP residuals stream to the REA and water decanted from the REA is monitored for water quality on a monthly basis. Residuals water quality results are shown in Figure 7-72 to Figure 7-100 and are assessed against trigger values (where available) established from Cooks Dam, being the assumed final receiving on-site water storage for the REA decant water.

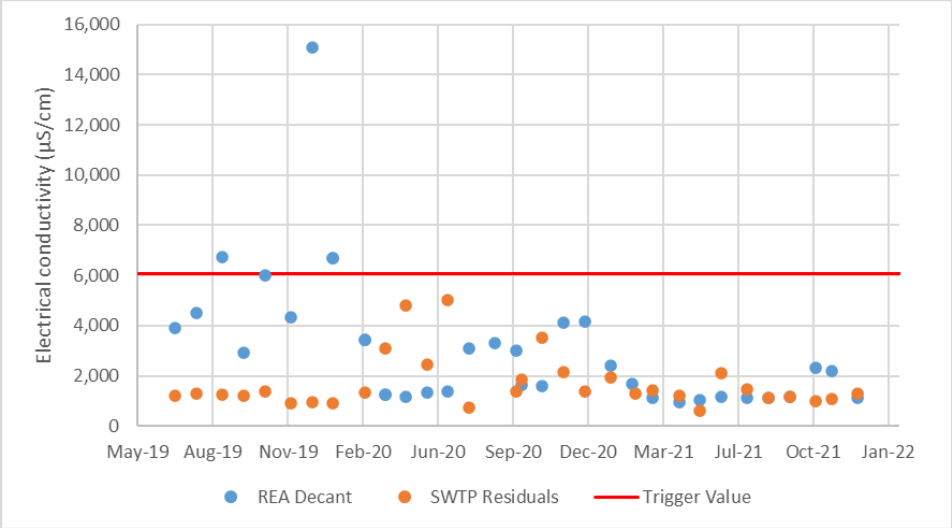


Figure 7A-42 2021 Residuals EC

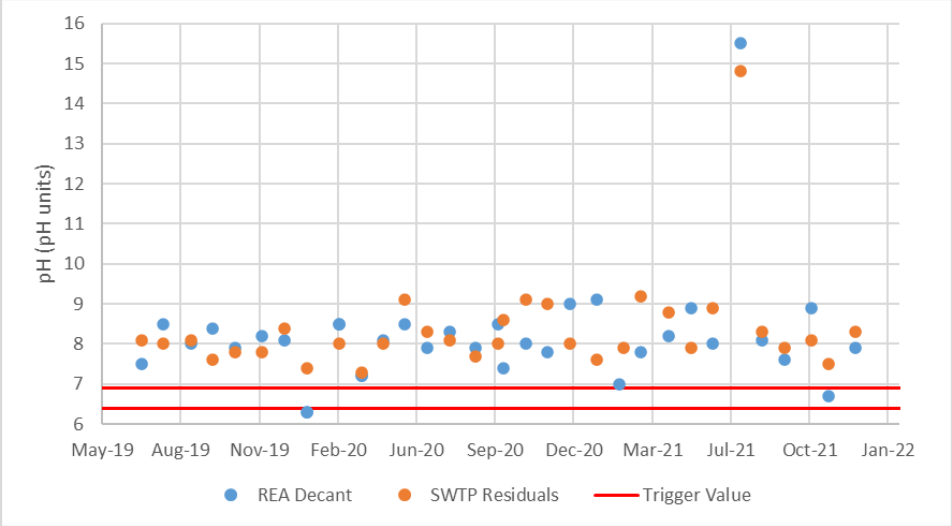


Figure 7A-43 2021 Residuals pH

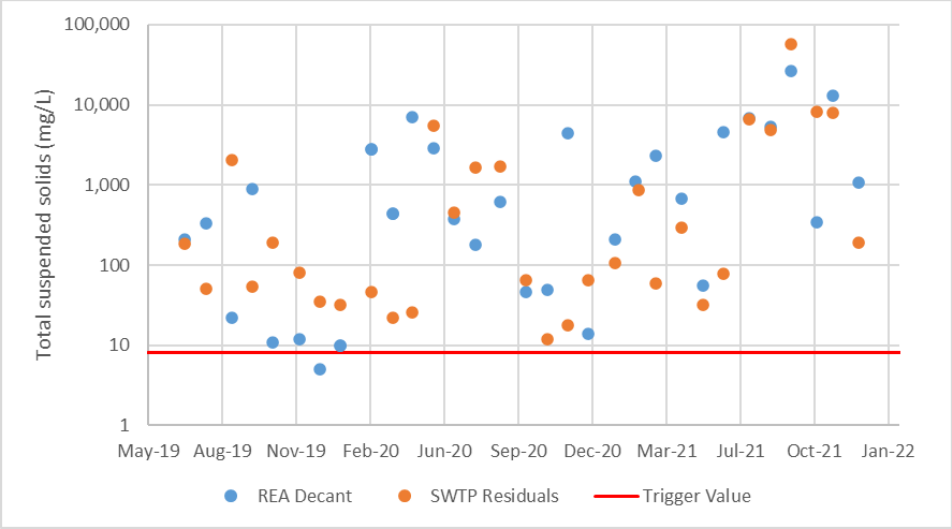


Figure 7A-44 2021 Residuals TSS

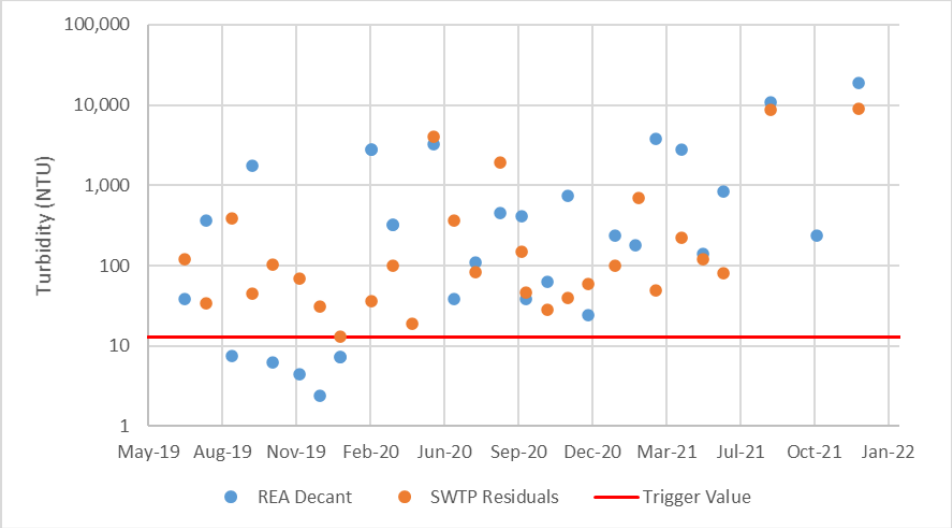


Figure 7A-45 2021 Residuals Turbidity

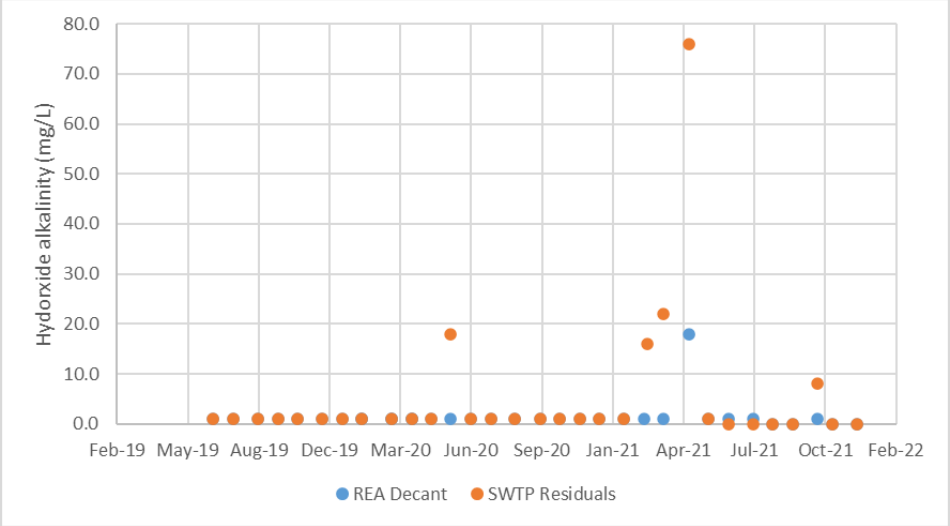


Figure 7A-46 2021 Residuals OH^- Alkalinity

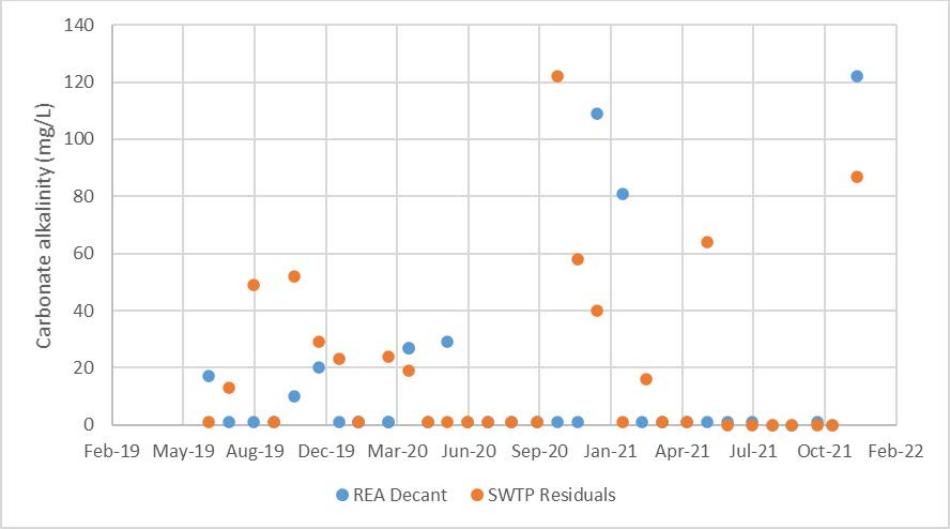


Figure 7A-47 2021 Residuals CO_3^{2-} Alkalinity

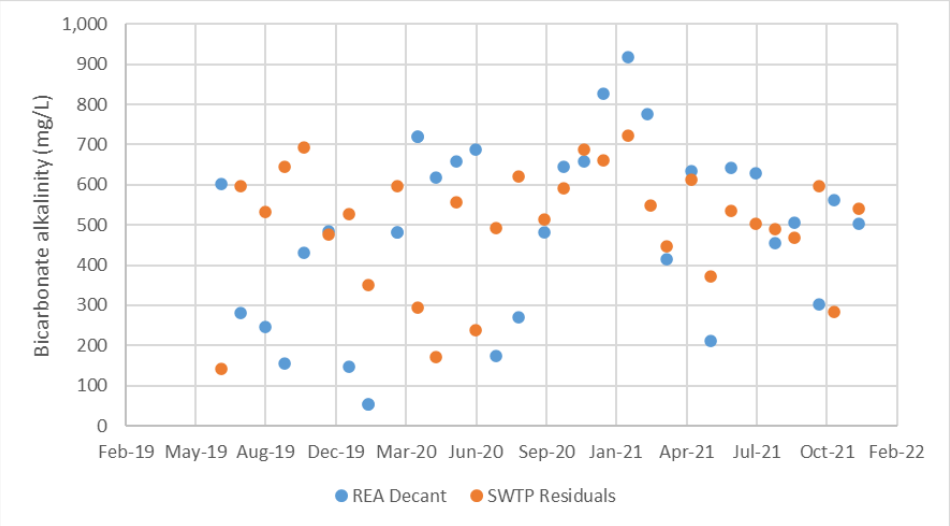


Figure 7A-48 2021 Residuals HCO_3^- Alkalinity

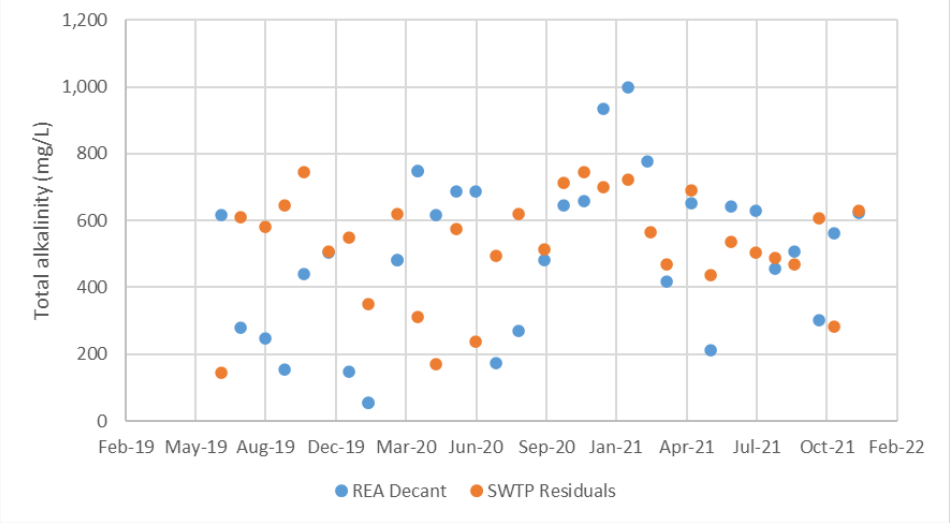


Figure 7A-49 2021 Residuals Total Alkalinity

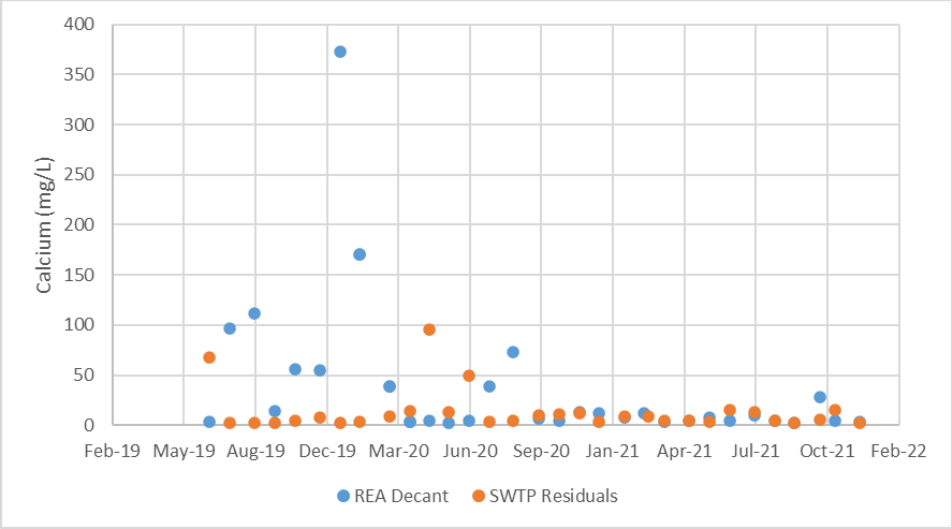


Figure 7A-50 2021 Residuals Calcium

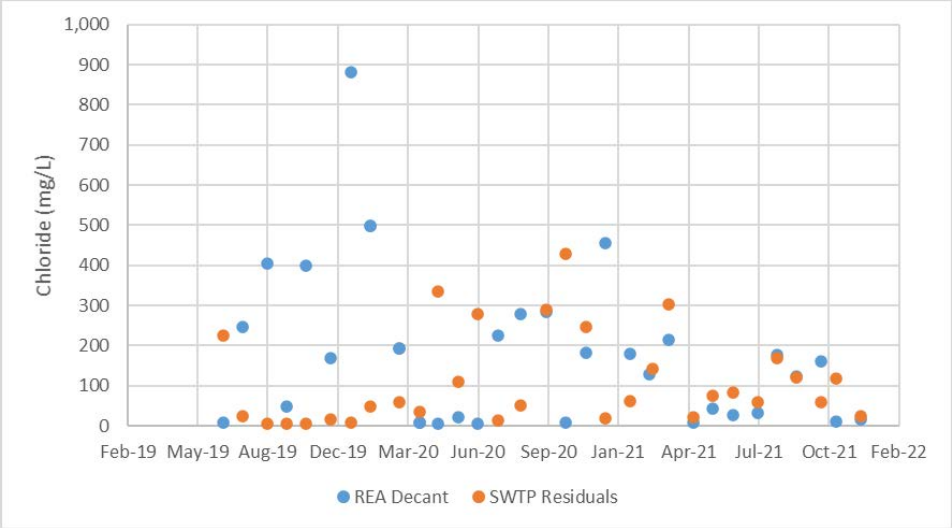


Figure 7A-51 2021 Residuals Chloride

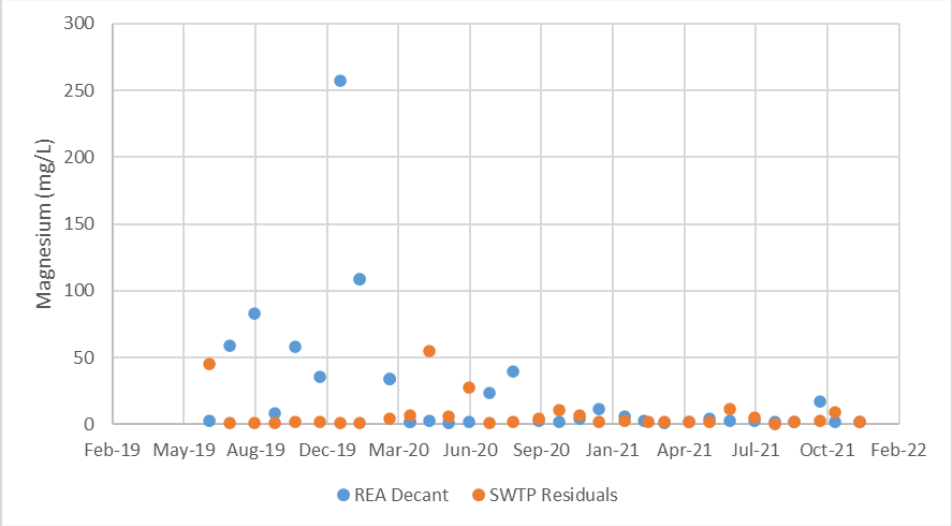


Figure 7A-52 2021 Residuals Magnesium

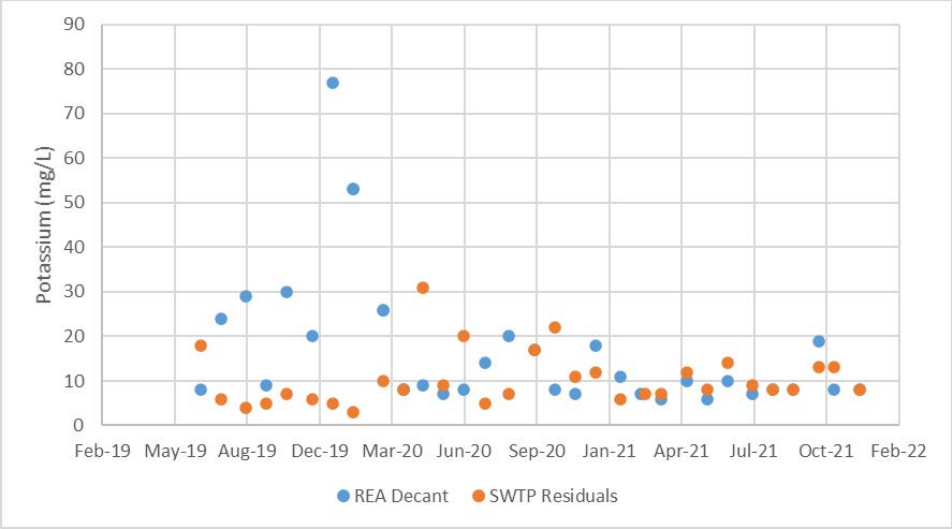


Figure 7A-53 2021 Residuals Potassium

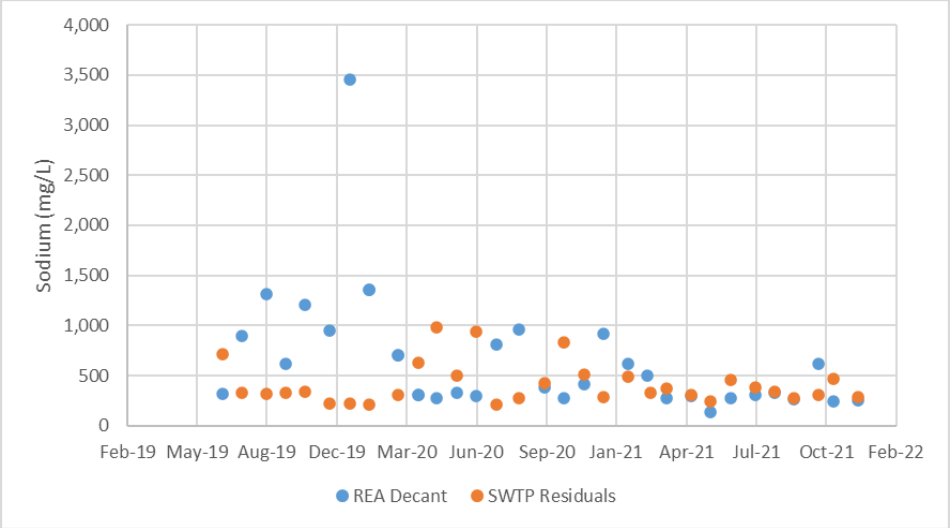


Figure 7A-54 2021 Residuals Sodium

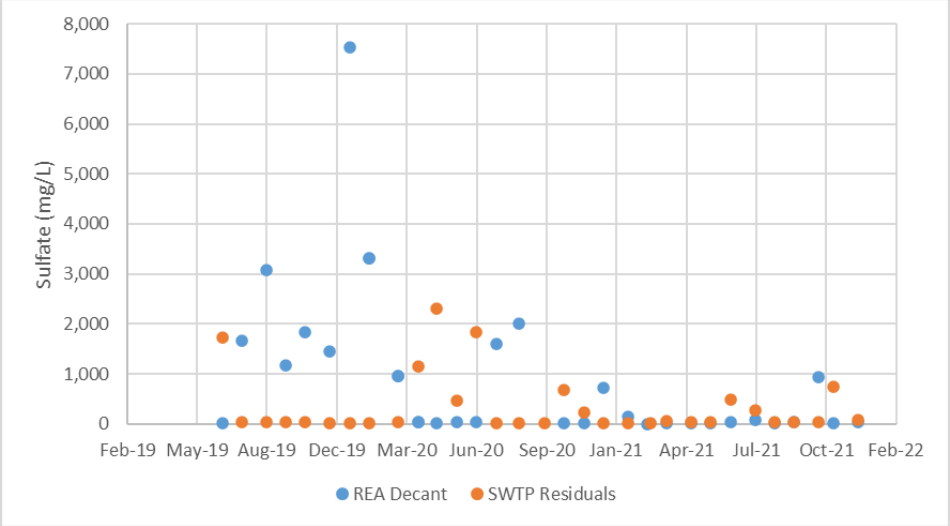


Figure 7A-55 2021 Residuals Sulfate

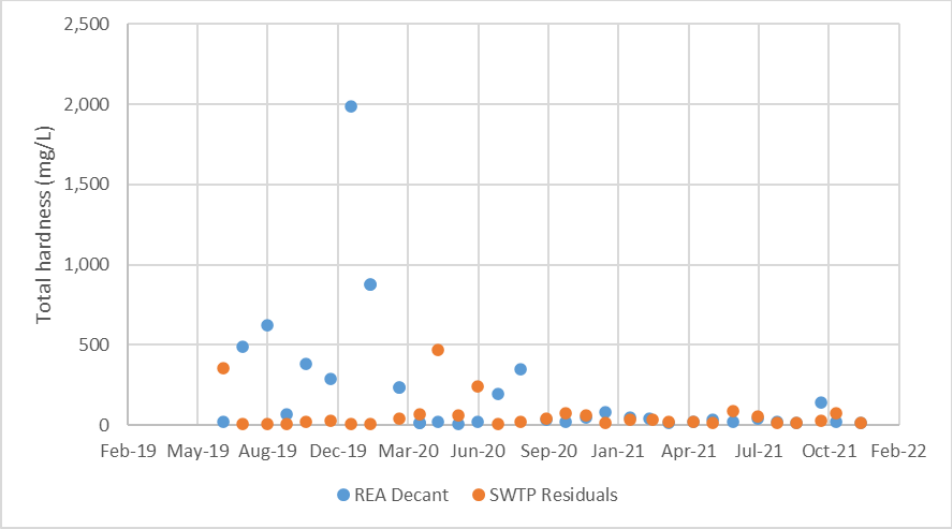


Figure 7A-56 2021 Residuals Total Hardness

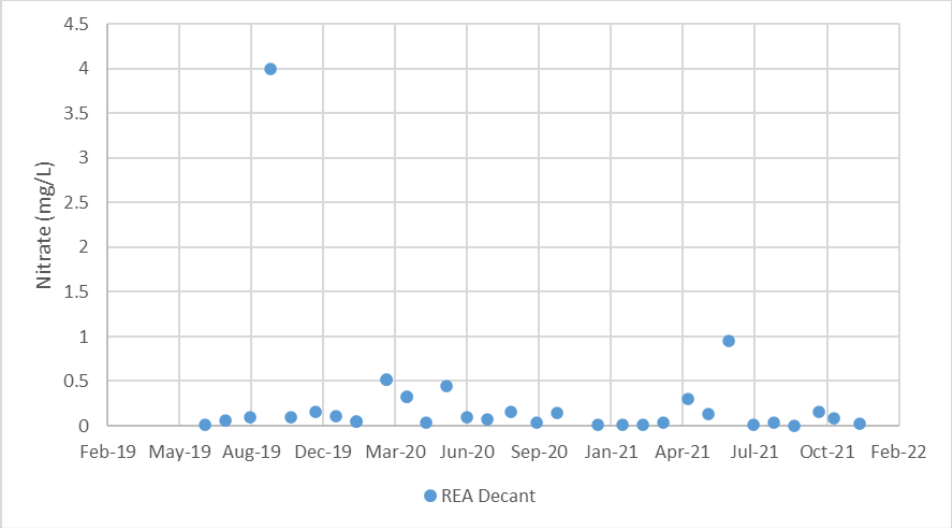


Figure 7A-57 2021 Residuals Nitrate

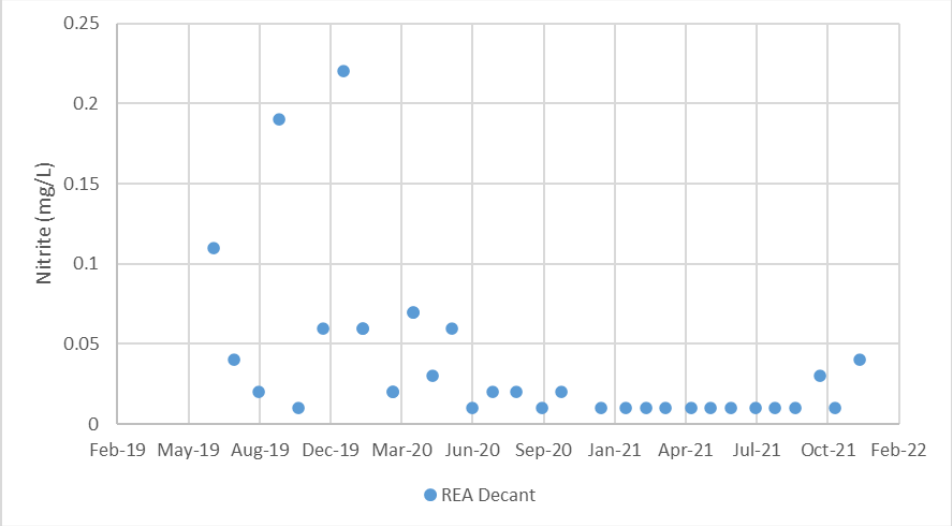


Figure 7A-58 2021 Residuals Nitrite

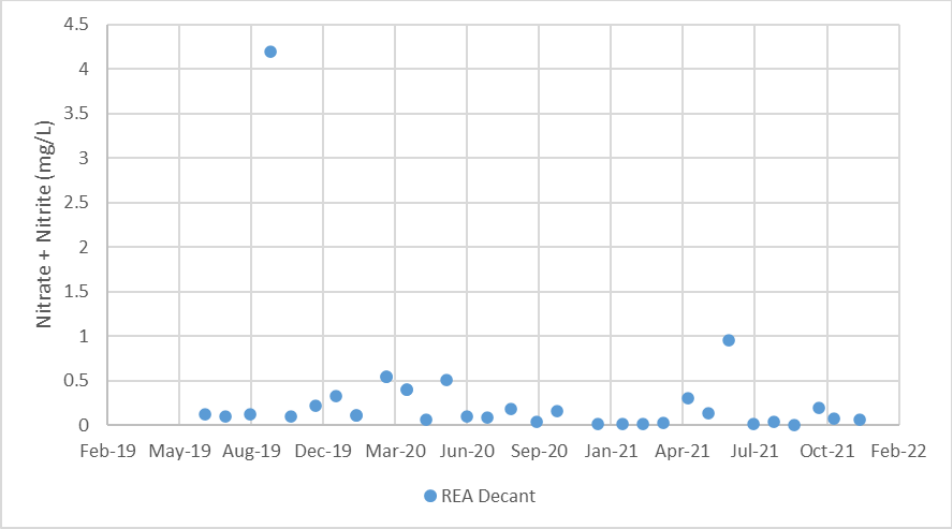


Figure 7A-59 2021 Residuals Nitrate + Nitrite

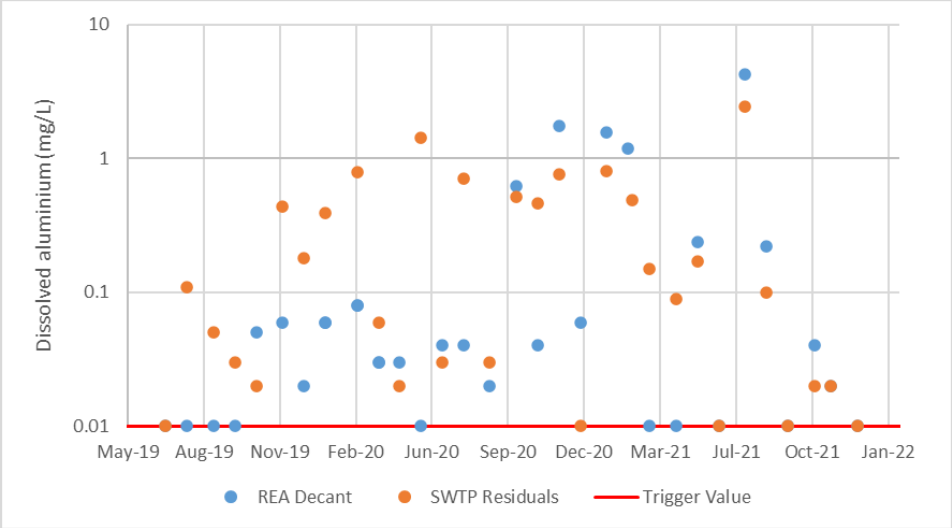


Figure 7A-60 2021 Residuals Dissolved Aluminium

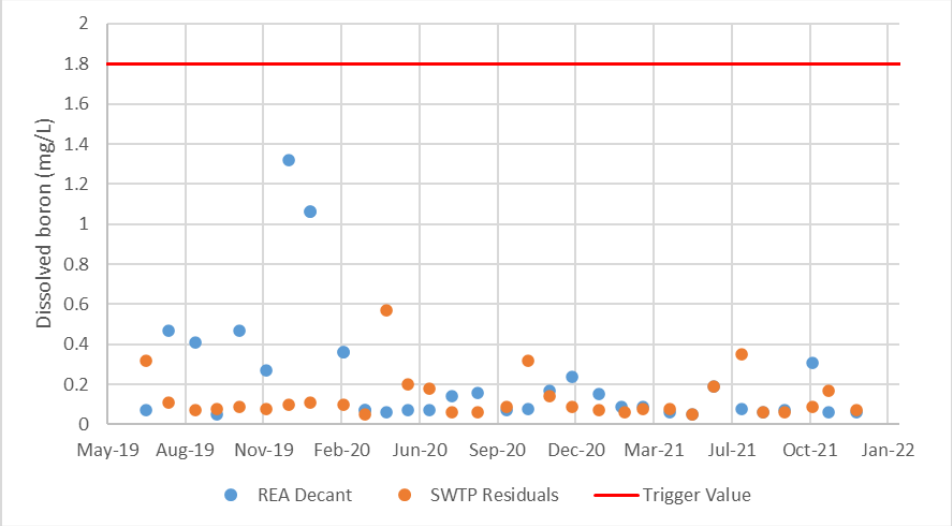


Figure 7A-61 2021 Residuals Dissolved Boron

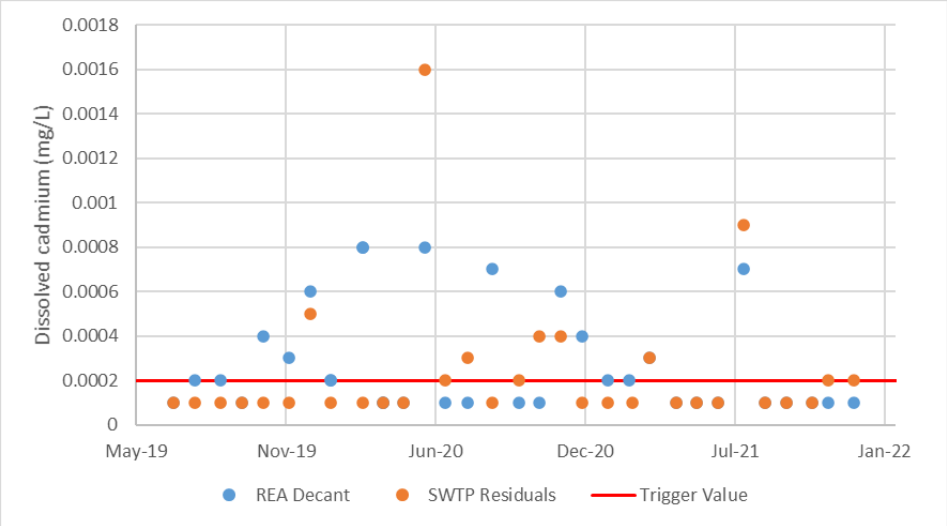


Figure 7A-62 2021 Residuals Dissolved Cadmium

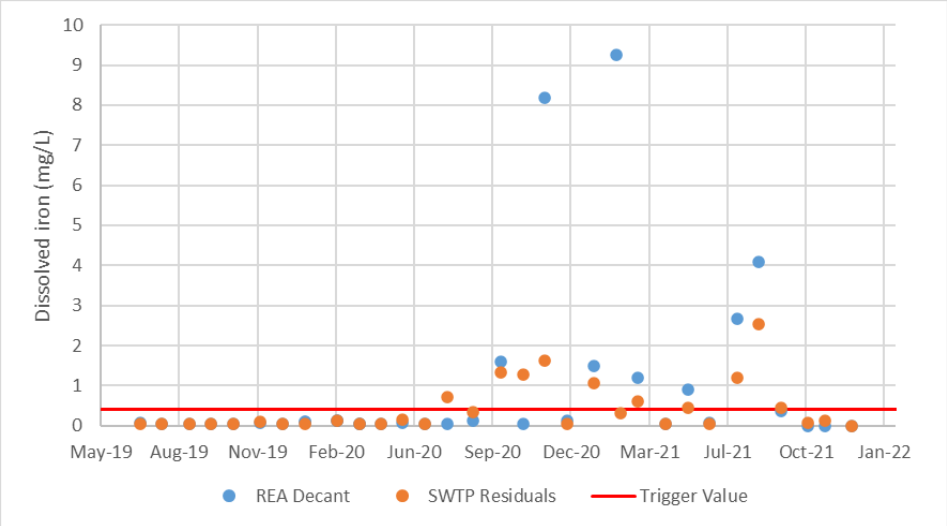


Figure 7A-63 2021 Residuals Dissolved Iron

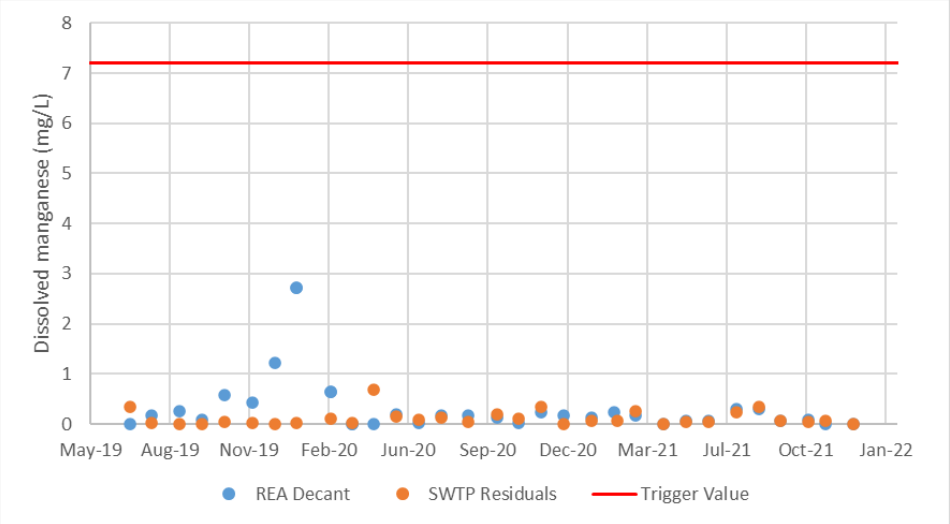


Figure 7A-64 2021 Residuals Dissolved Manganese

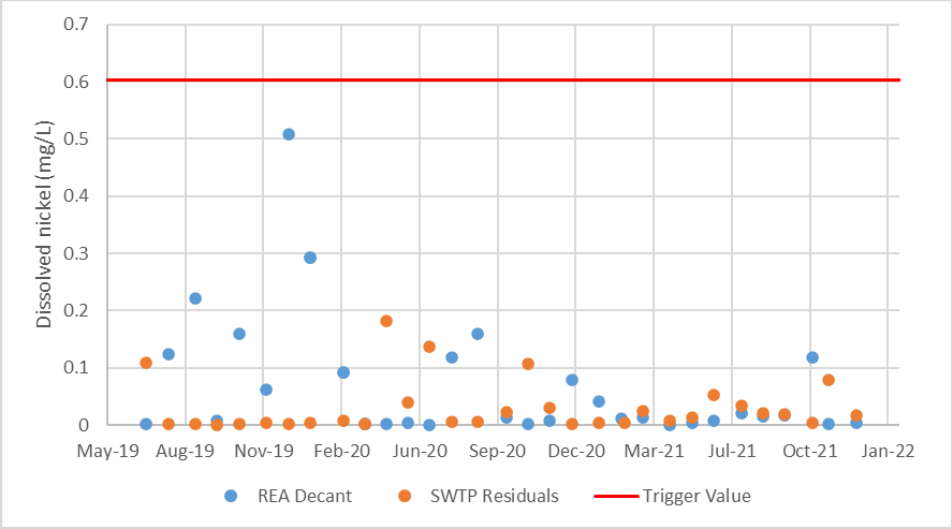


Figure 7A-65 2021 Residuals Dissolved Nickel

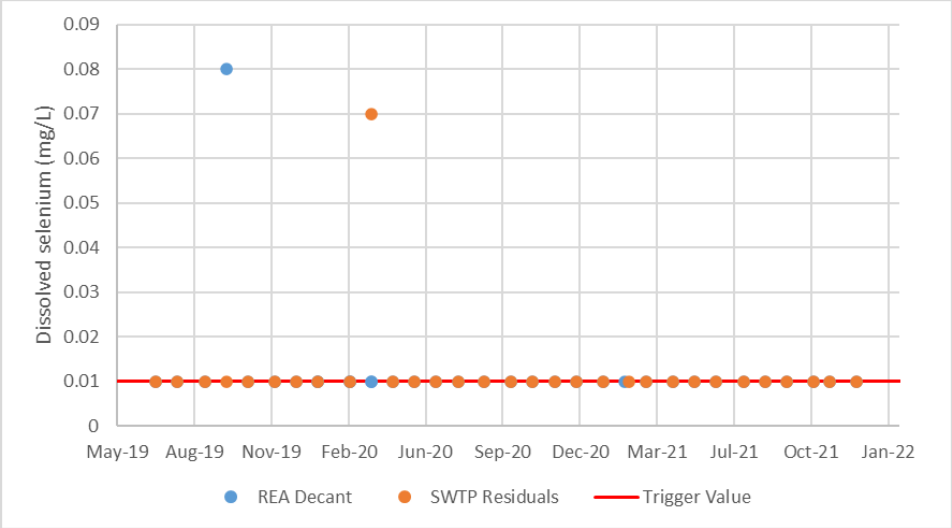


Figure 7A-66 2021 Residuals Dissolved Selenium

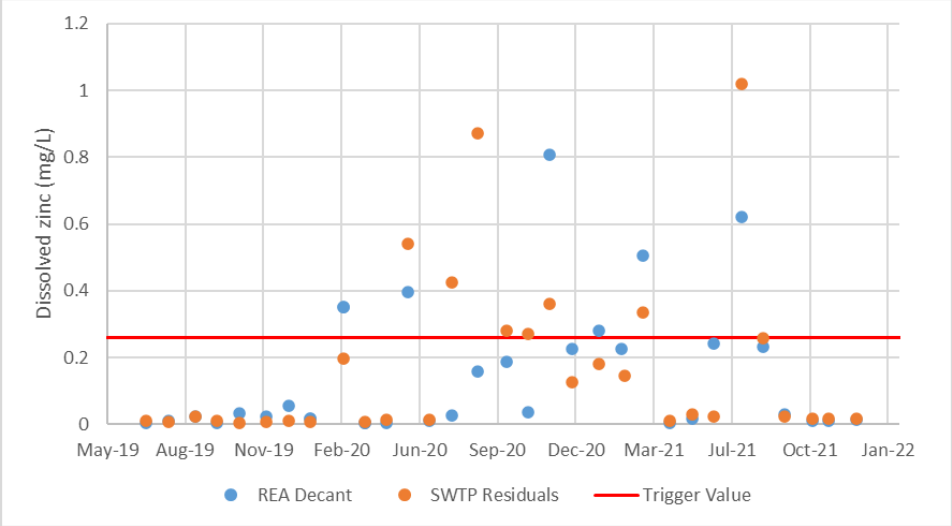


Figure 7A-67 2021 Residuals Dissolved Zinc

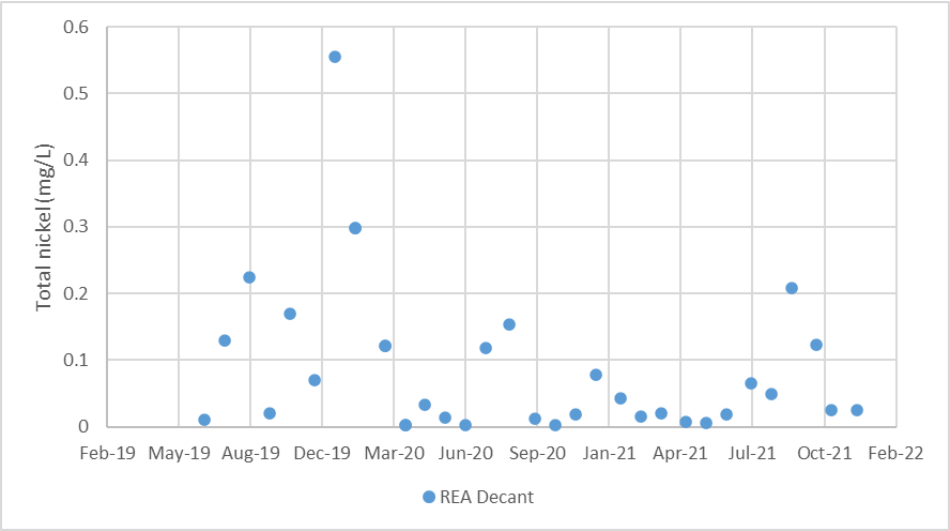


Figure 7A-68 2021 Residuals Total Nickel

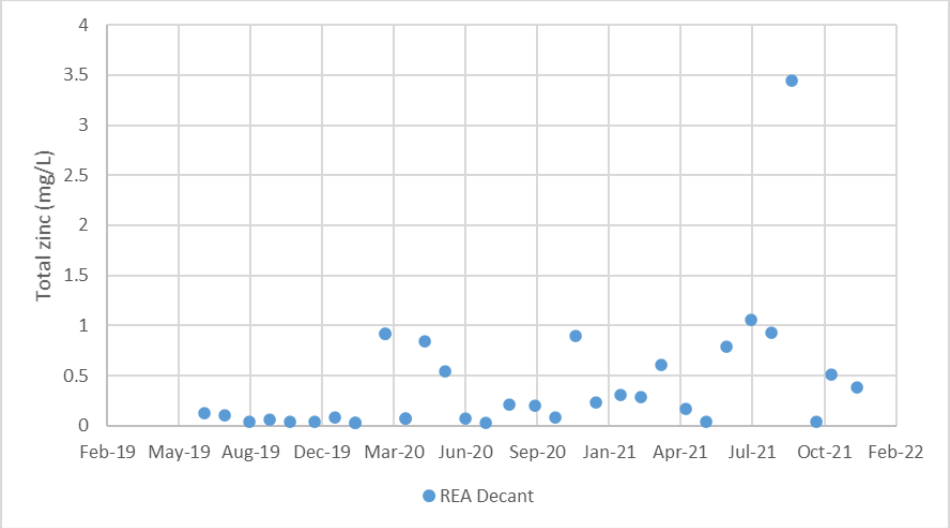


Figure 7A-69 2021 Residuals Total Zinc

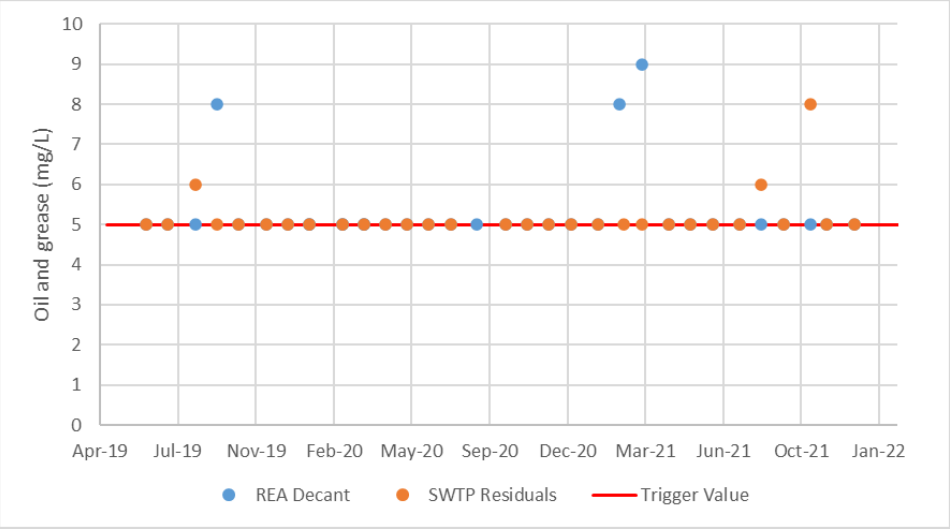


Figure 7A-70 2021 Residuals Oil and Grease

Appendix 8:

Ground Water

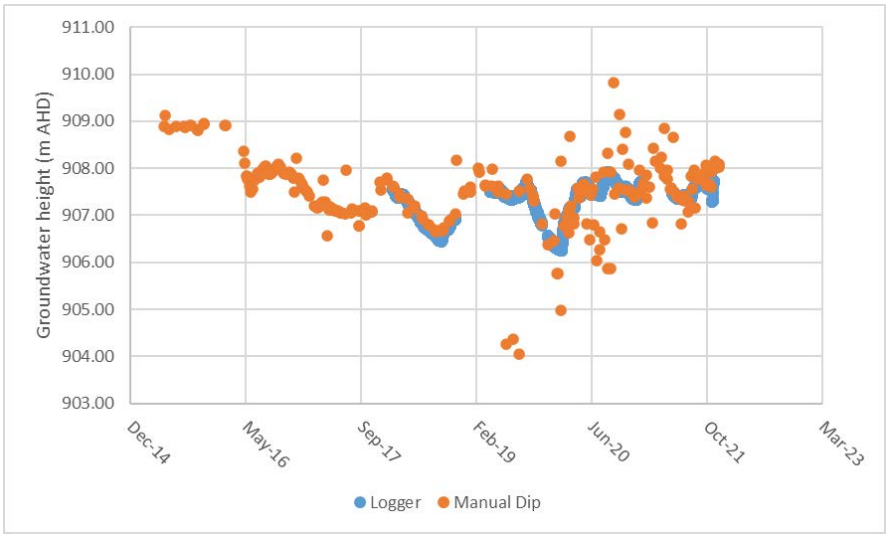


Figure 8A-1 BH01 Groundwater Level

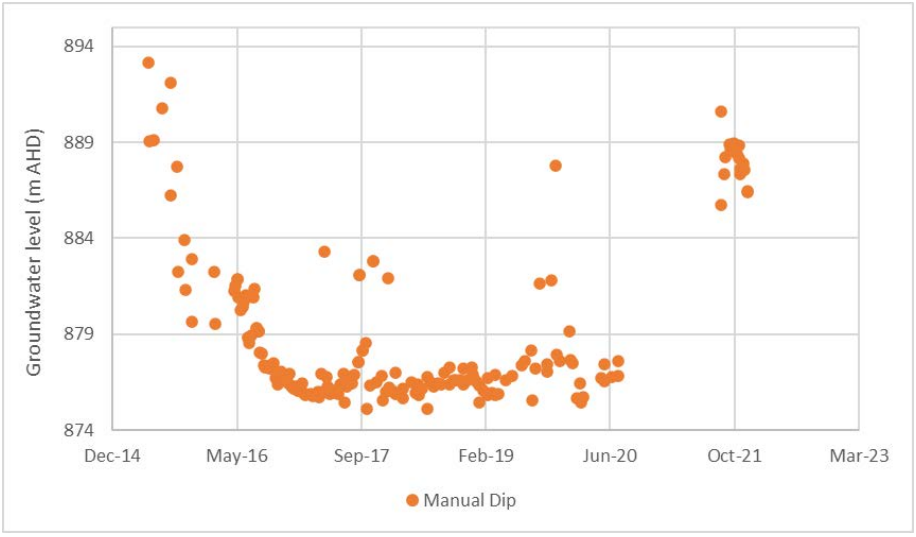


Figure 8A-2 BH02 Groundwater Level

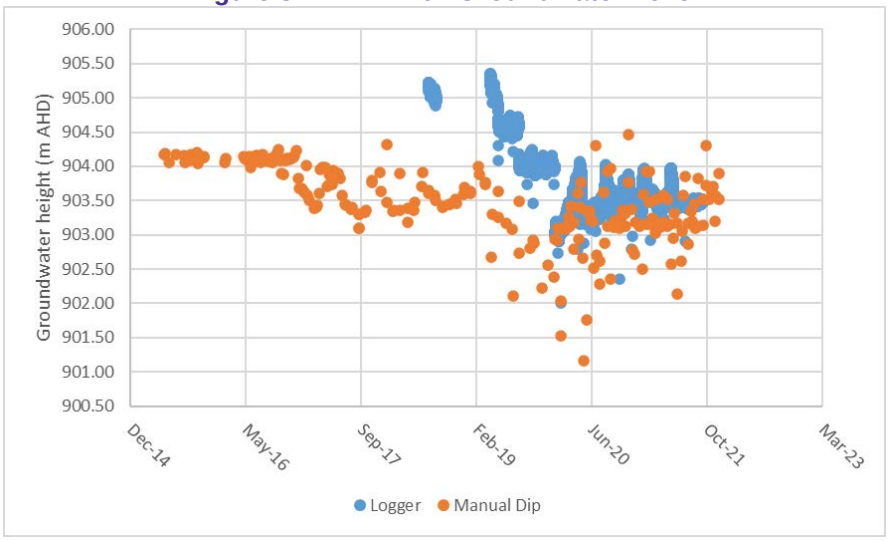


Figure 8A-3 BH03 Groundwater Level

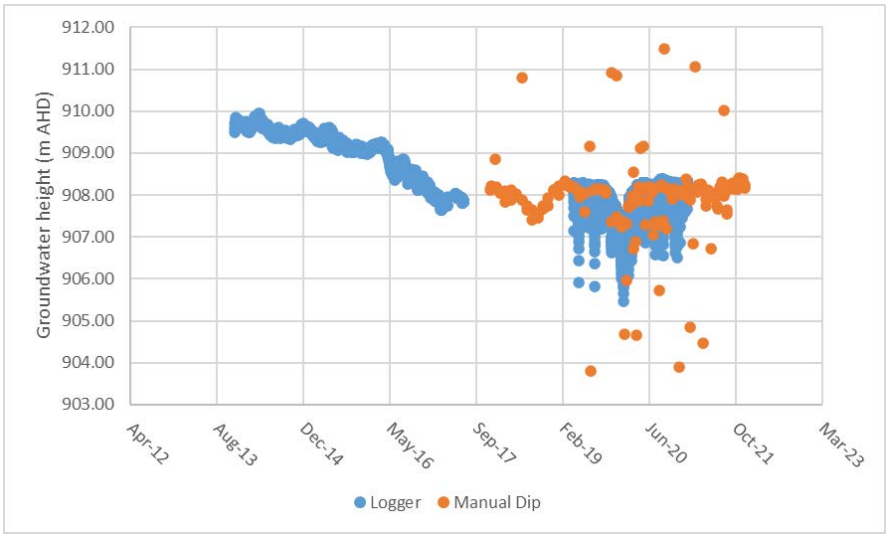


Figure 8A-4 BH04 Groundwater Level

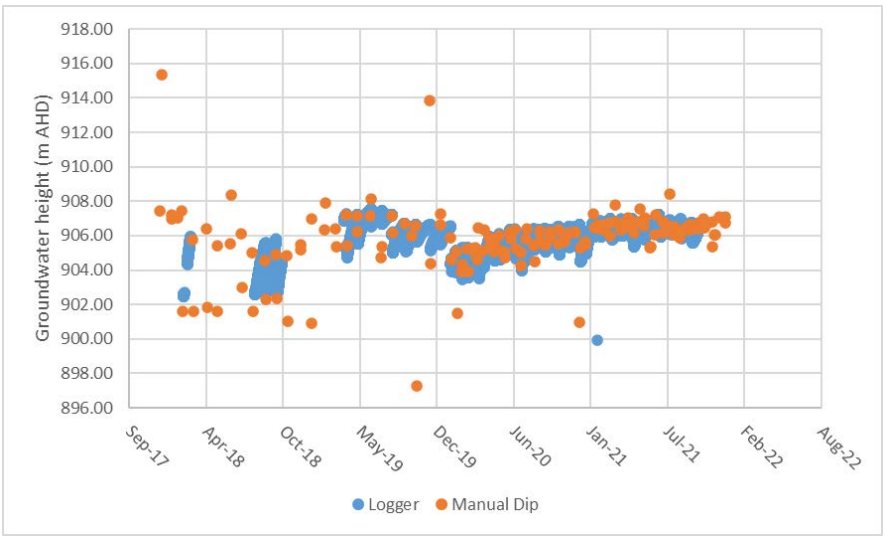


Figure 8A-5 BH05 Groundwater Level

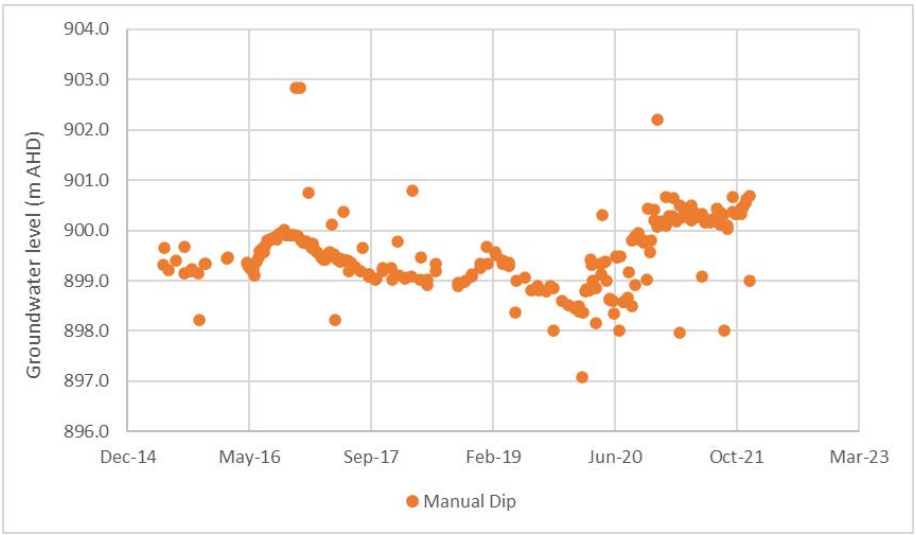


Figure 8A-6 BH06 Groundwater Level

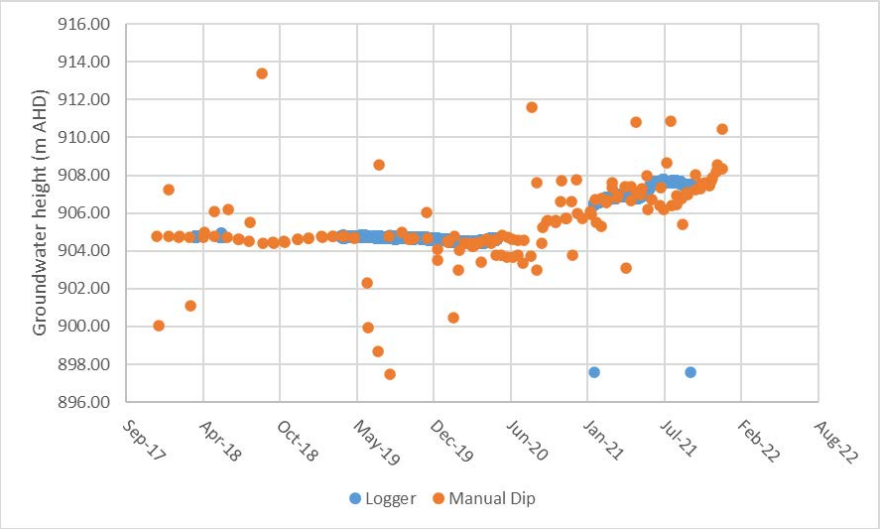


Figure 8A-7 BH07 Groundwater Level

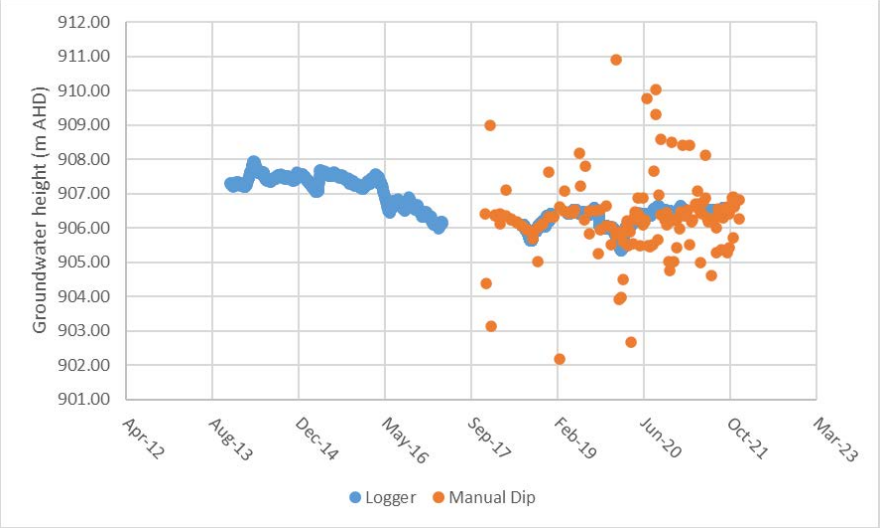


Figure 8A-8 BH08 Groundwater Level

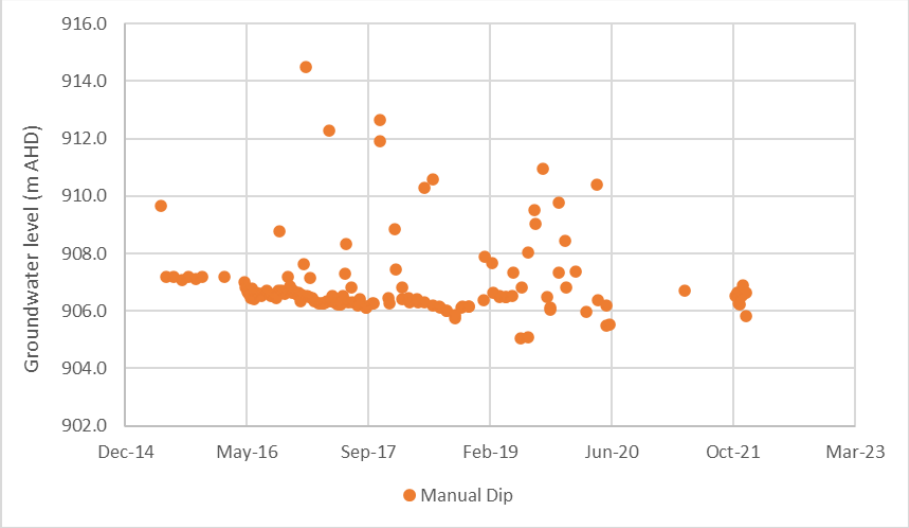


Figure 8A-9 BH09 Groundwater Level

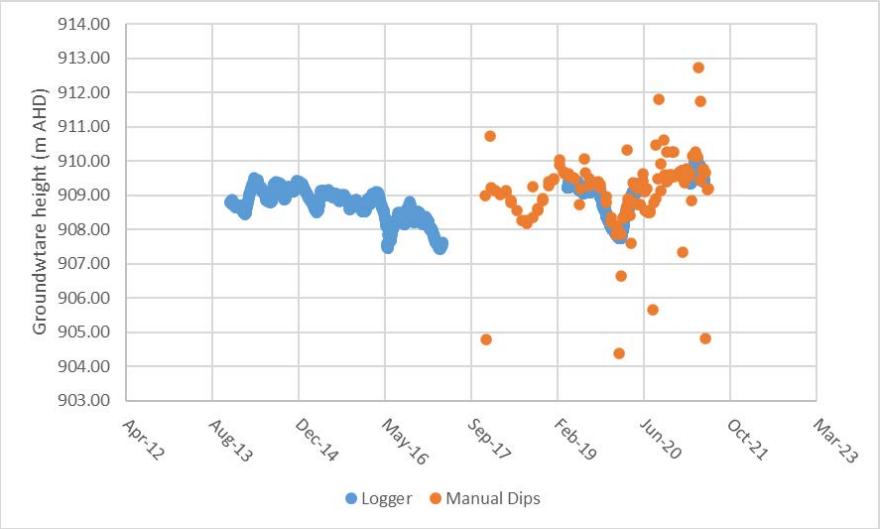


Figure 8A-10 BH11 Groundwater Level

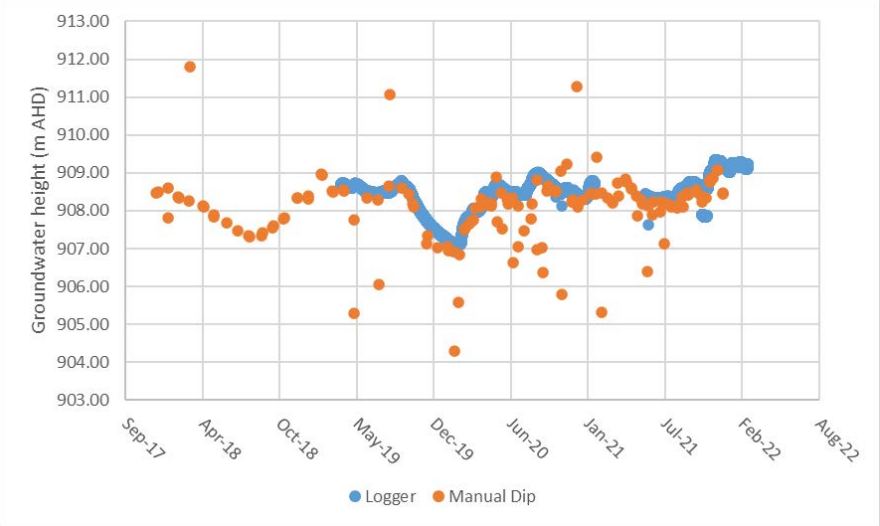


Figure 8A-11 BH13 Groundwater Level

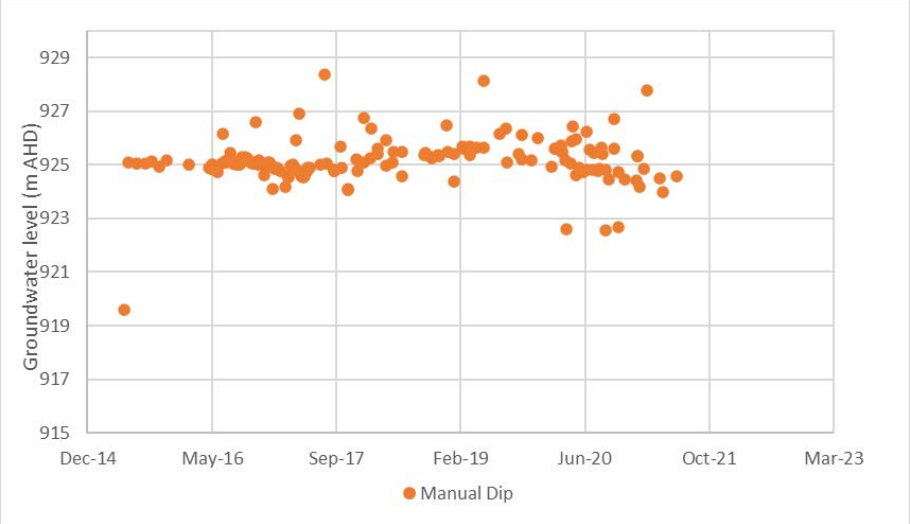


Figure 8A-12 BH15 Groundwater Level

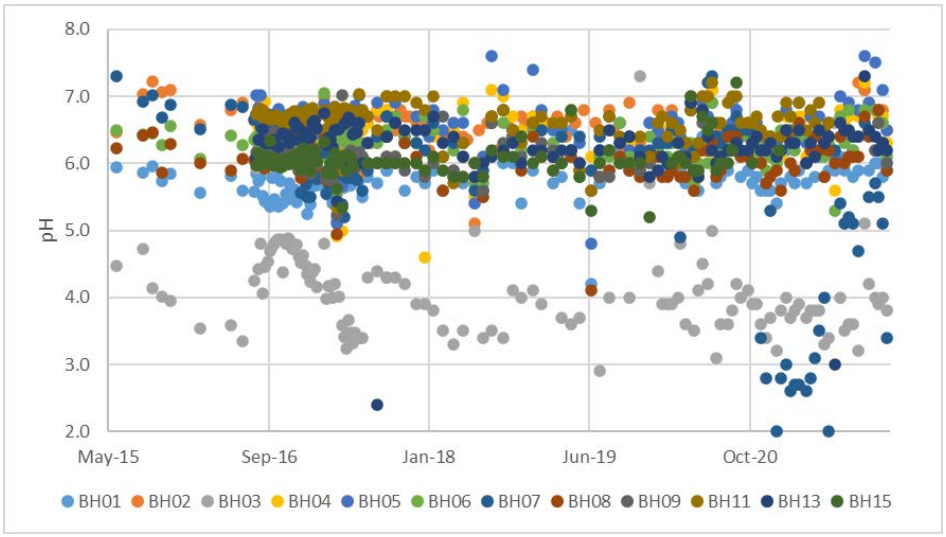


Figure 8A-13 pH 2015 to 2021

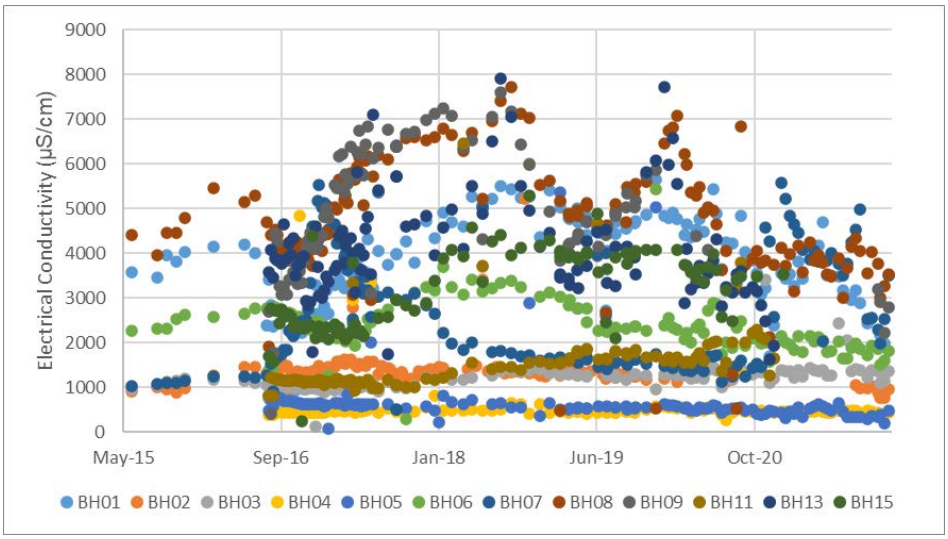


Figure 8A-14 Electrical conductivity 2015 to 2021

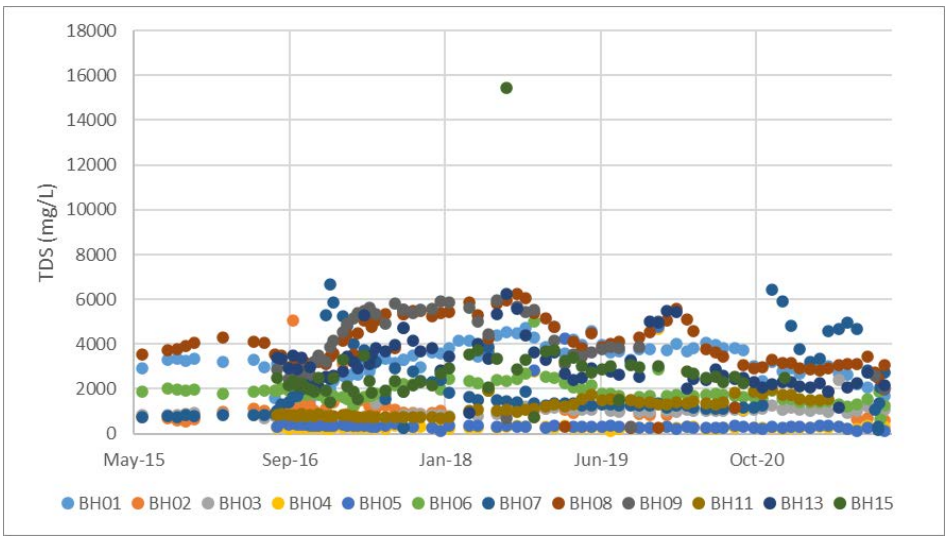


Figure 8A-15 Total dissolved solids 2015 to 2021

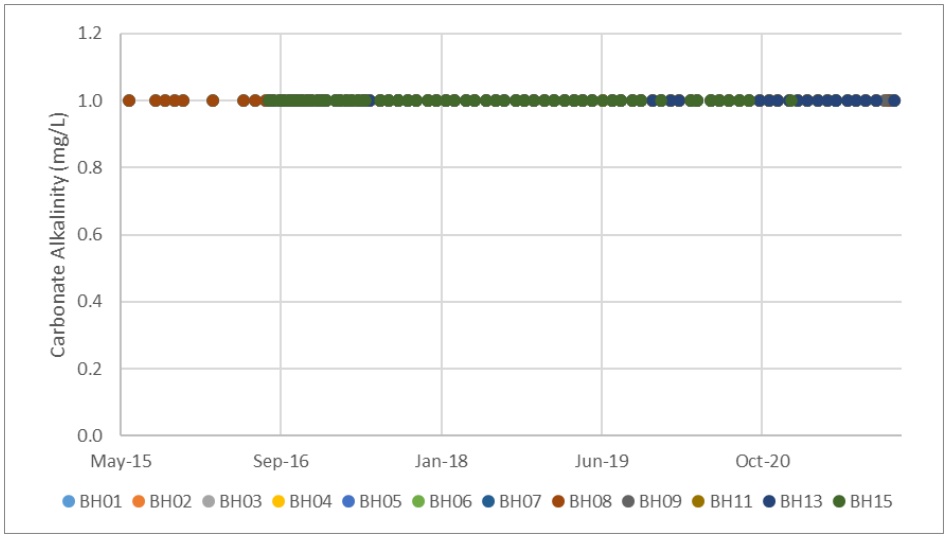


Figure 8A-16 Carbonate alkalinity 2015 to 2021

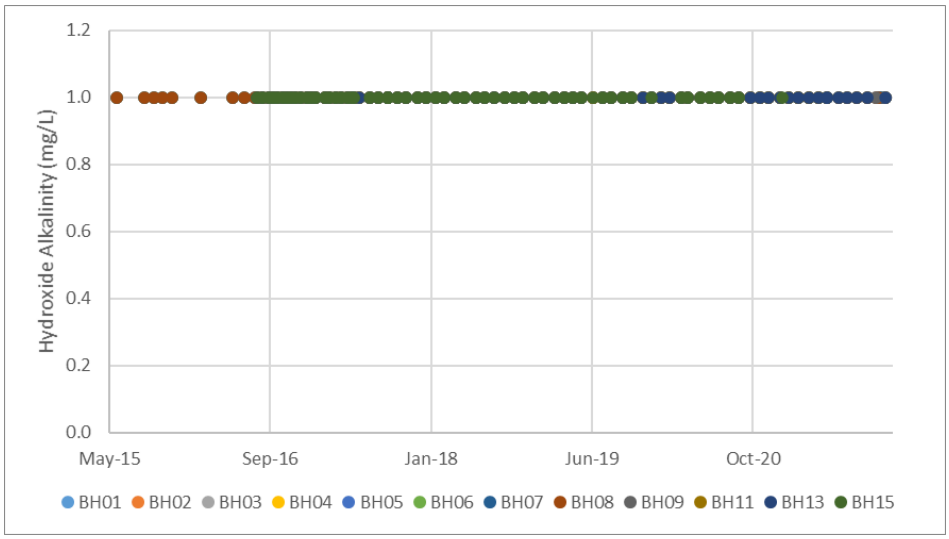


Figure 8A-18 Hydroxide alkalinity 2015 to 2021

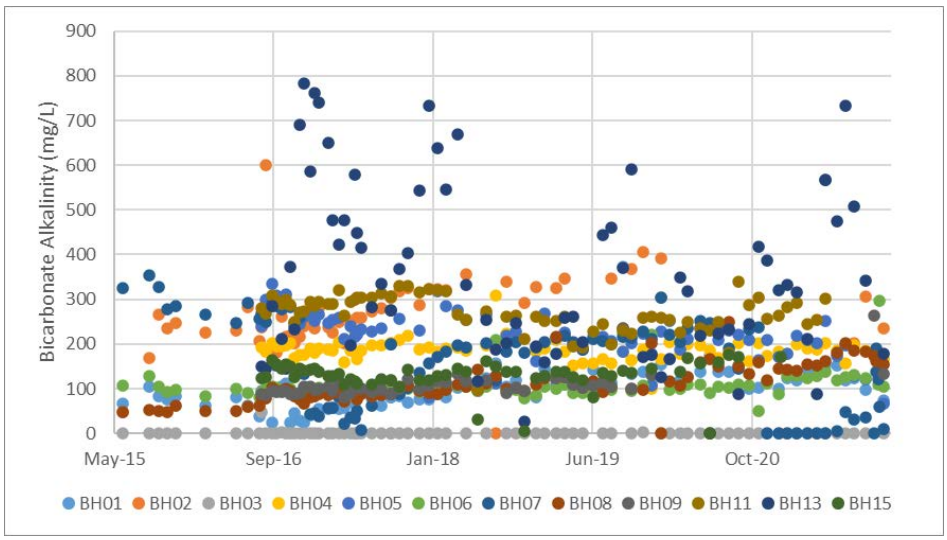


Figure 8A-17 Bicarbonate alkalinity 2015 to 2021

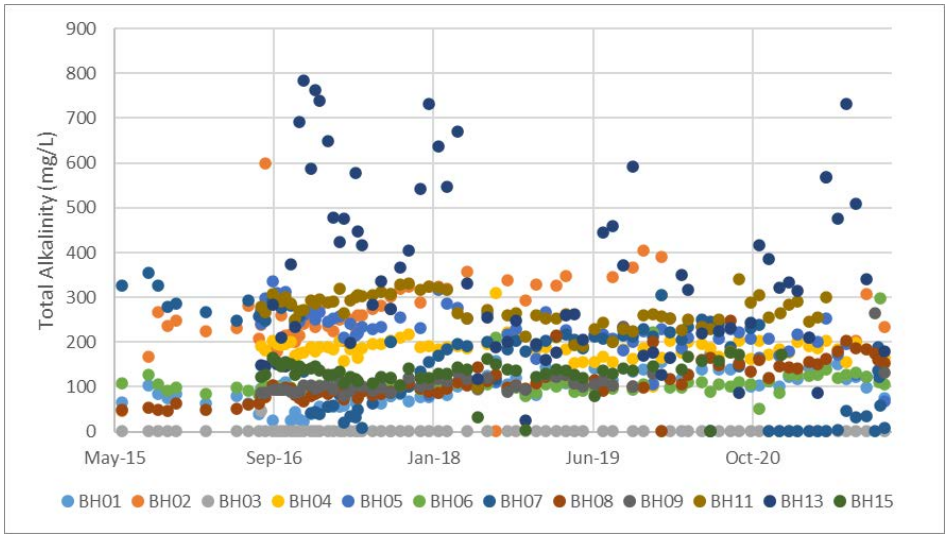


Figure 8A-19 Total alkalinity 2015 to 2021

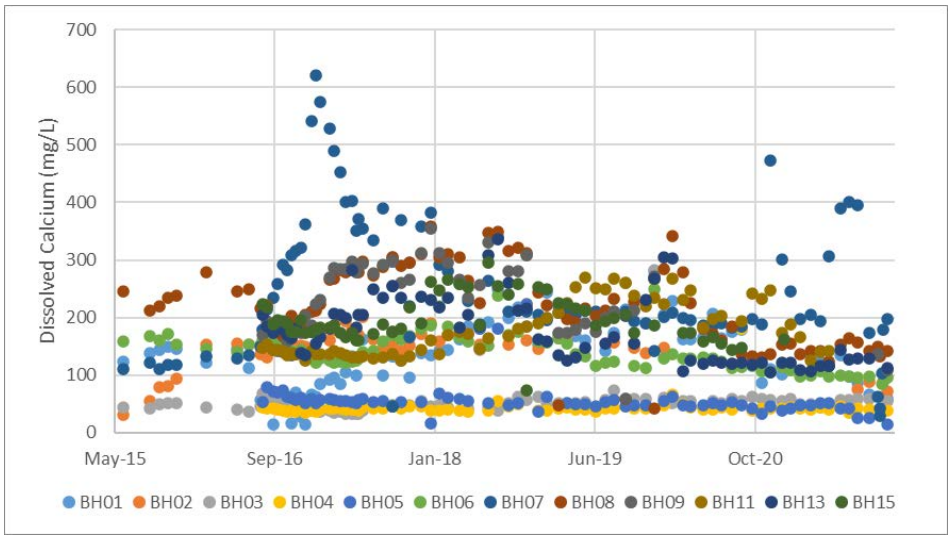


Figure 8A-20 Calcium 2015 to 2021

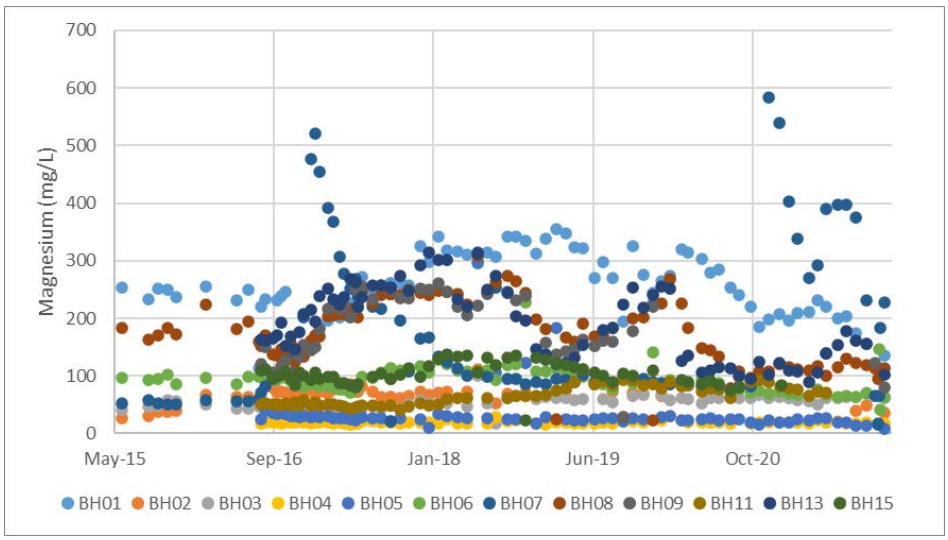


Figure 8A-21 Magnesium 2015 to 2021

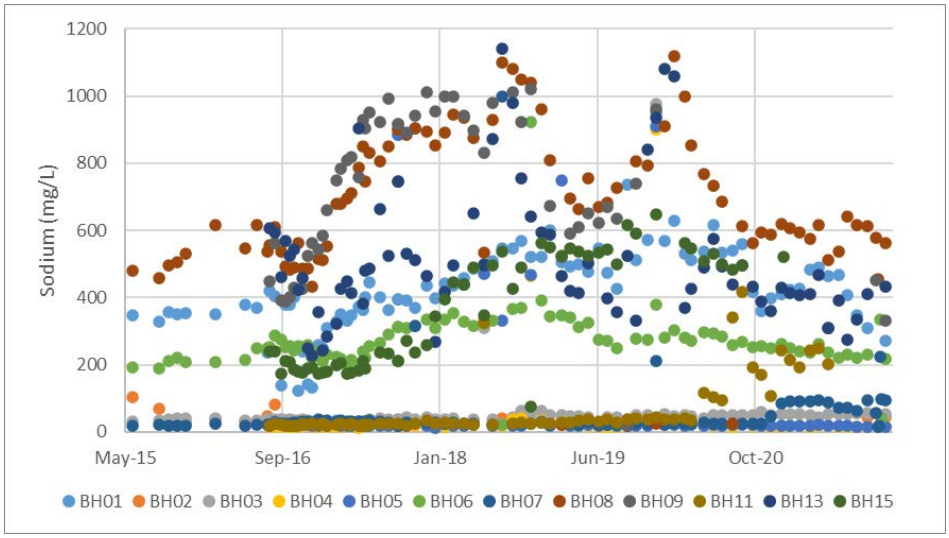


Figure 8A-22 Sodium 2015 to 2021

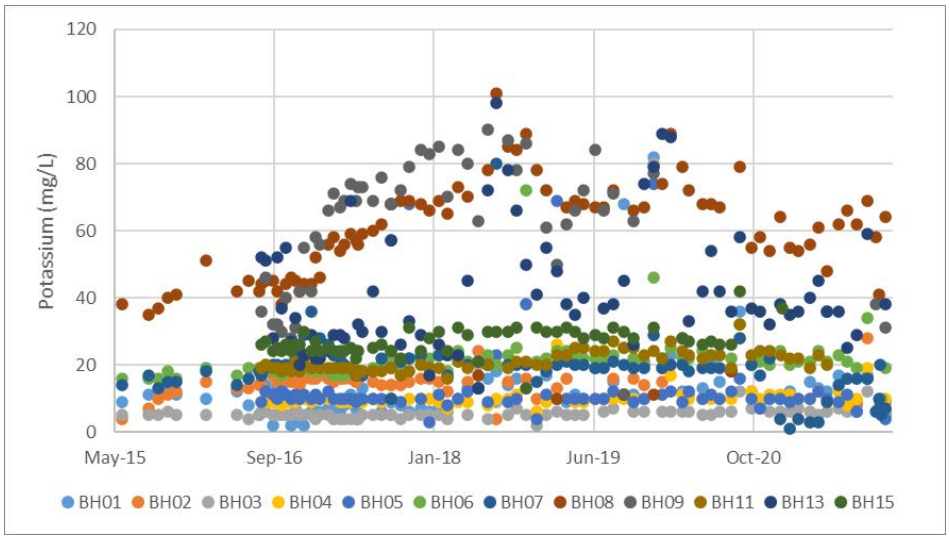


Figure 8A-23 Potassium 2015 to 2021

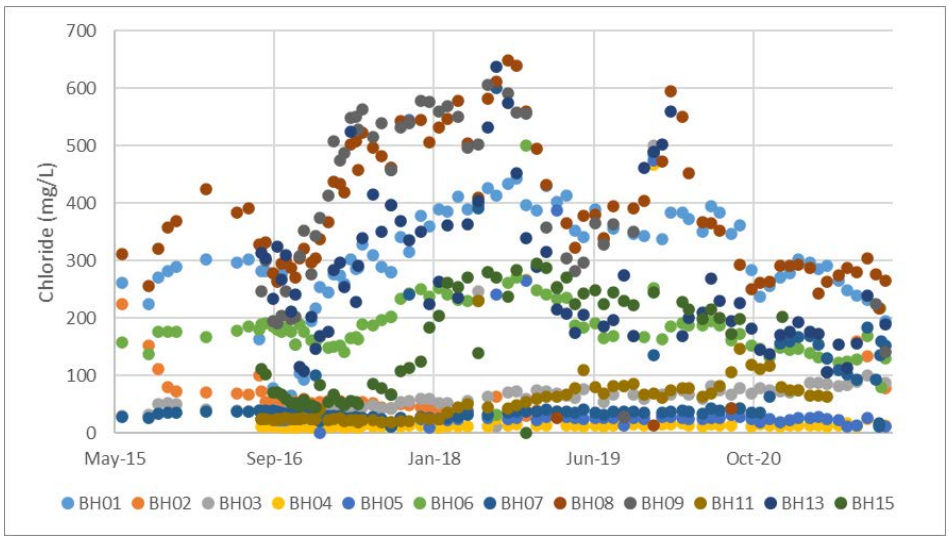


Figure 8A-24 Chloride 2015 to 2021

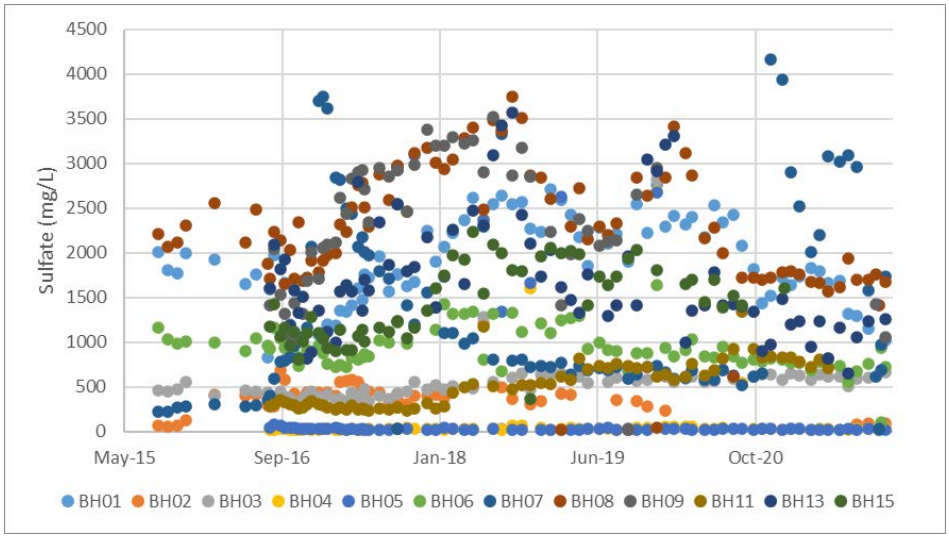


Figure 8A-25 Sulfate 2015 to 2021

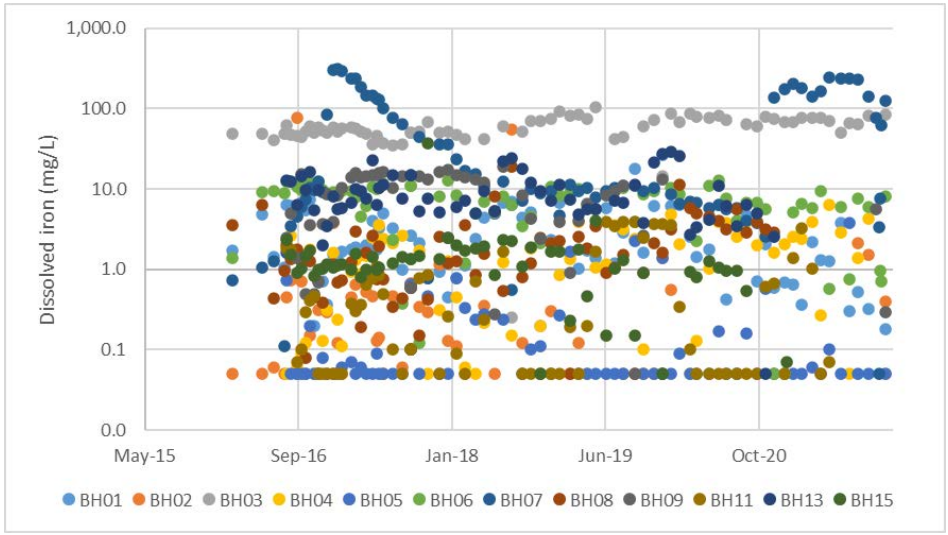


Figure 8A-26 Dissolved iron 2015 to 2021

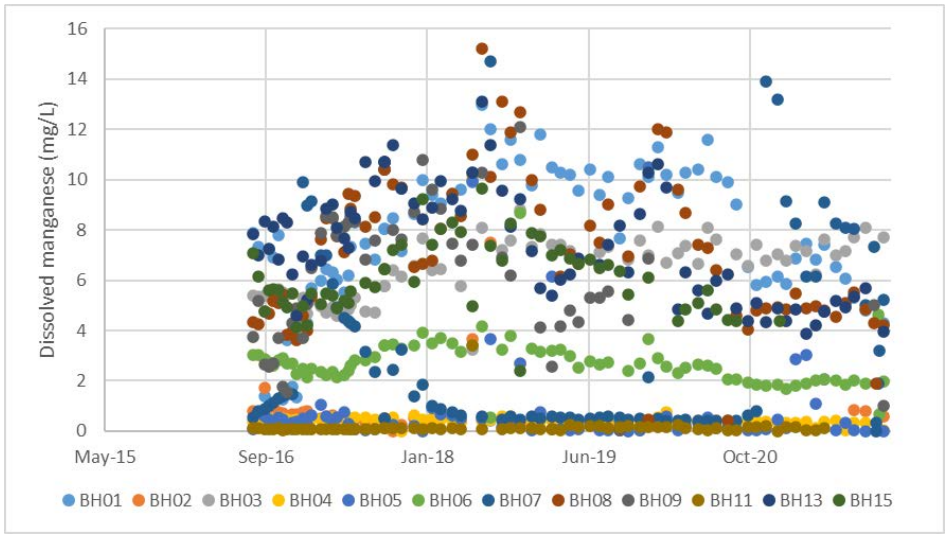


Figure 8A-27 Dissolved manganese 2016 to 2021

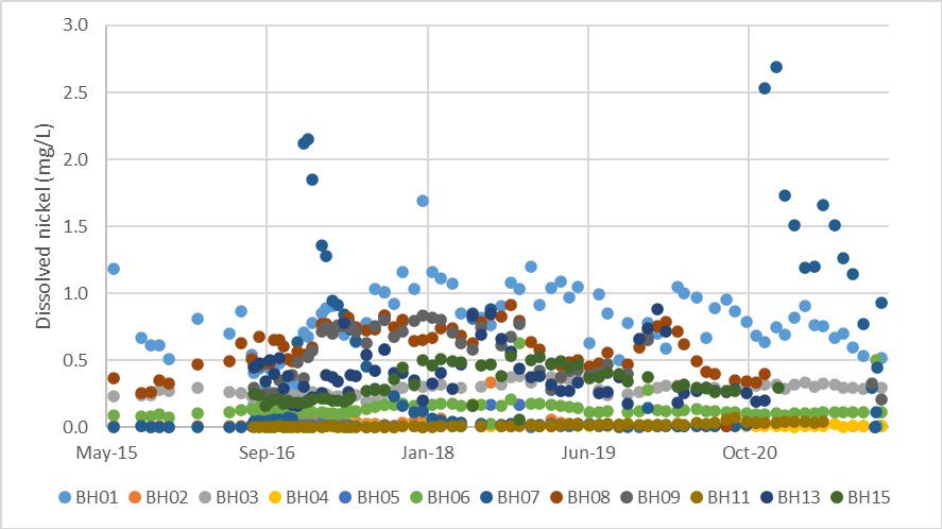


Figure 8A-28 Dissolved nickel 2015 to 2021

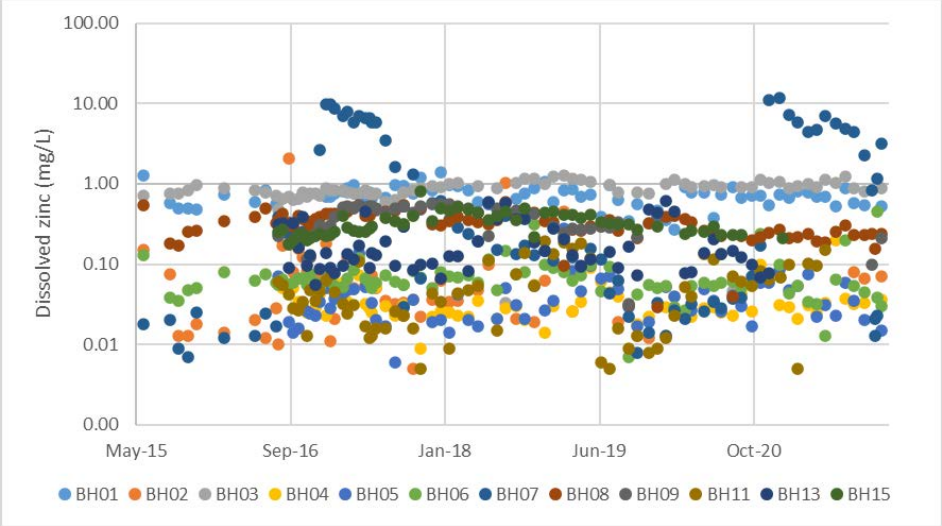


Figure 8A-29 Dissolved zinc 2015 to 2021

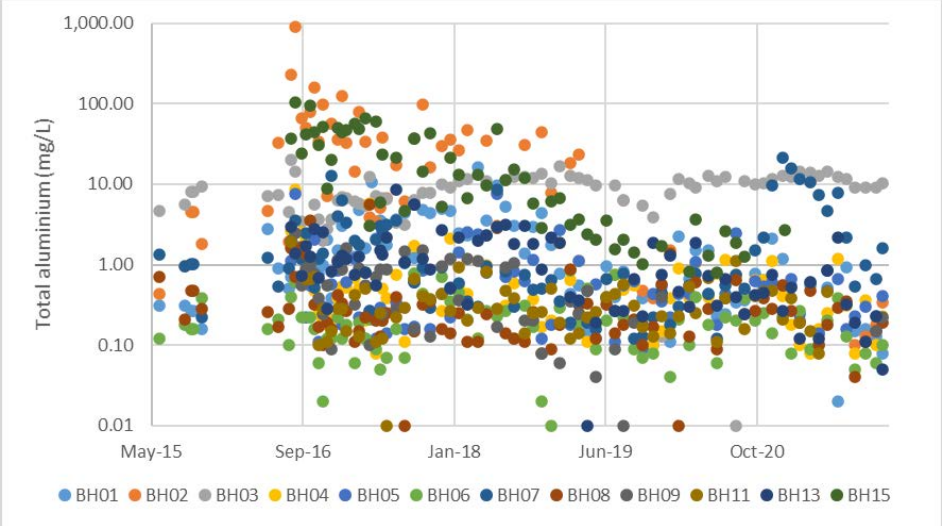


Figure 8A-30 Total aluminium 2015 to 2021

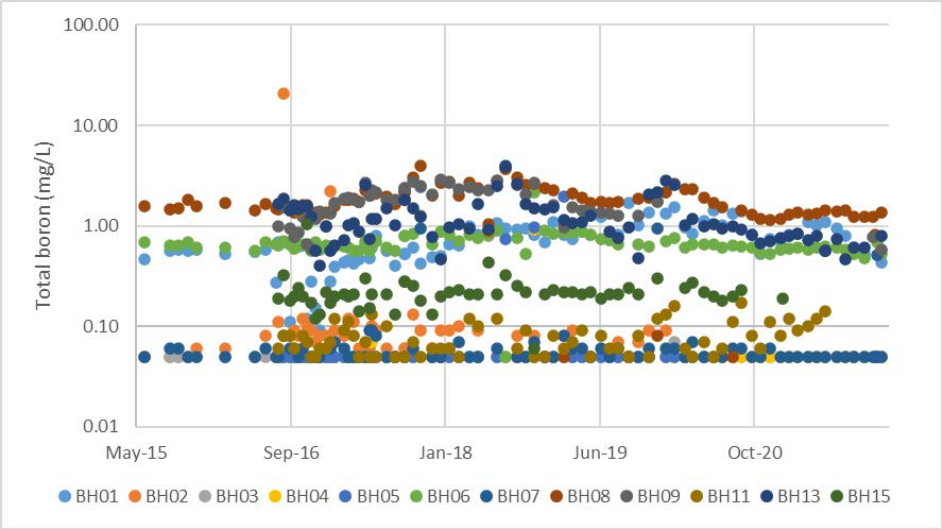


Figure 8A-31 Total boron 2015 to 2021

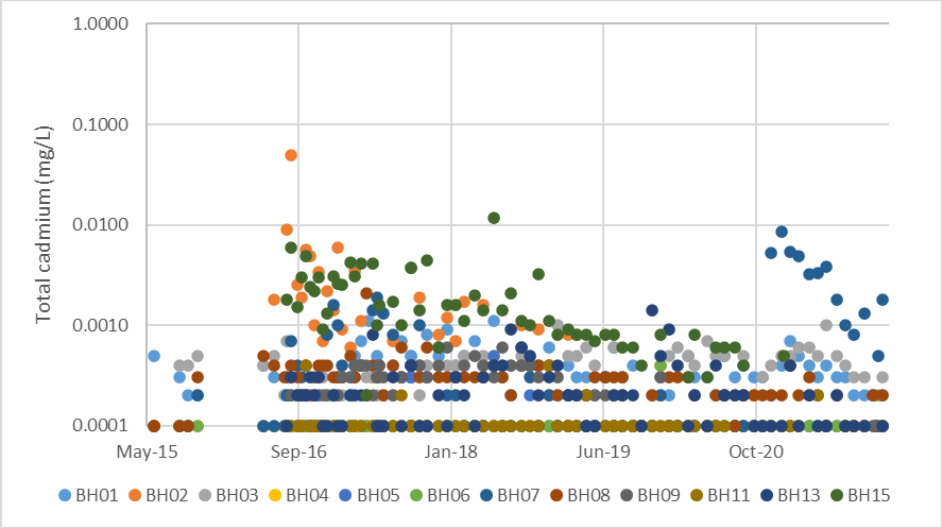


Figure 8A-32 Total cadmium 2015 to 2021

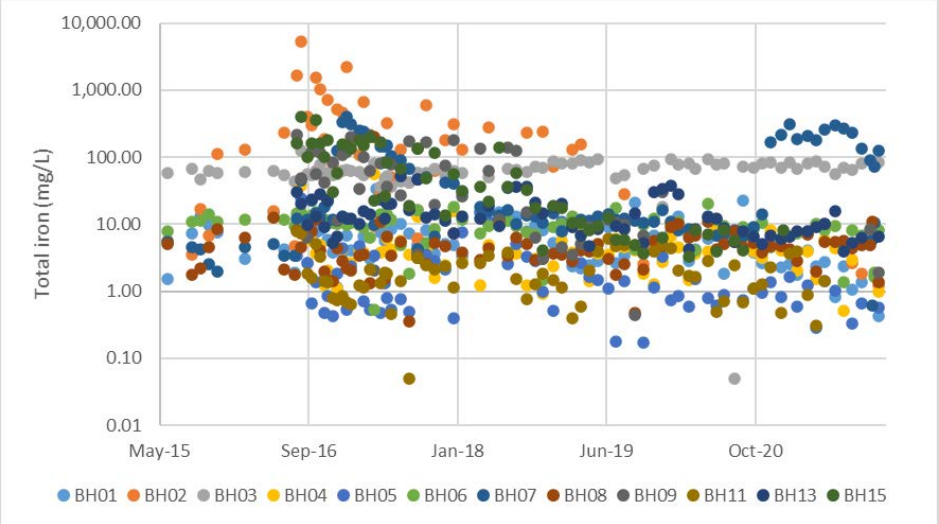


Figure 8A-33 Total iron 2015 to 2021

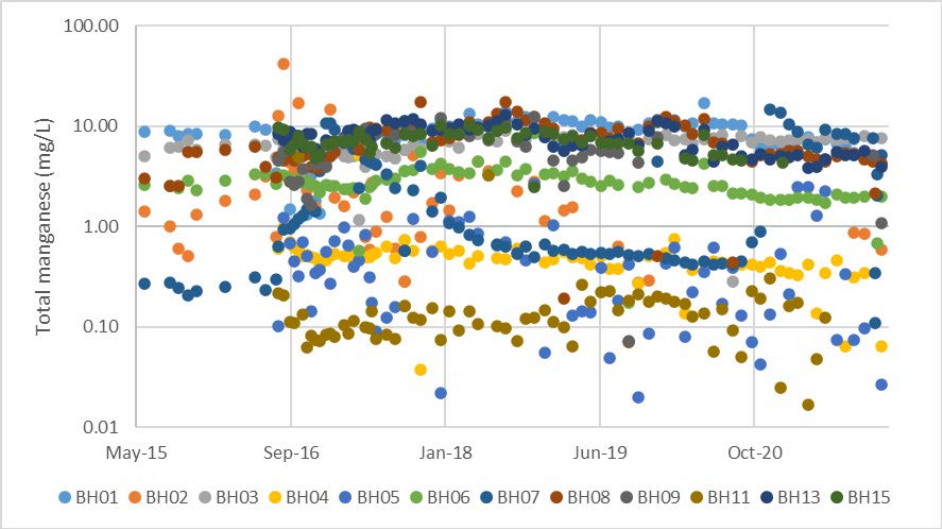


Figure 8A-34 Total manganese 2015 to 2021

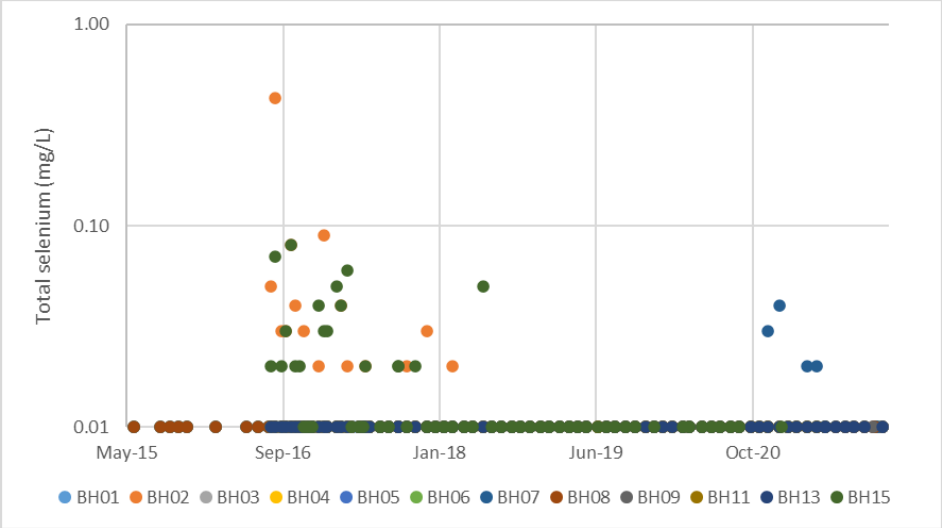


Figure 8A-35 Total selenium 2015 to 2021

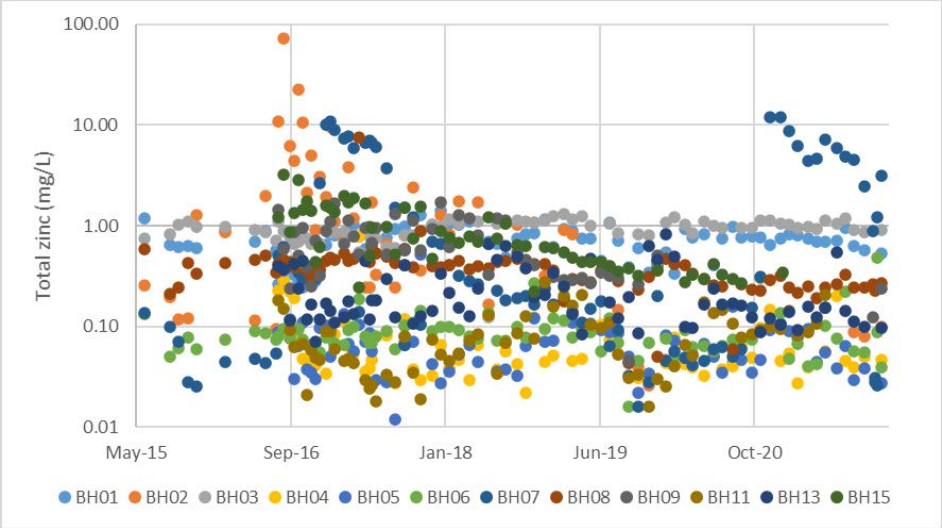


Figure 8A-36 Total zinc 2015 to 2021

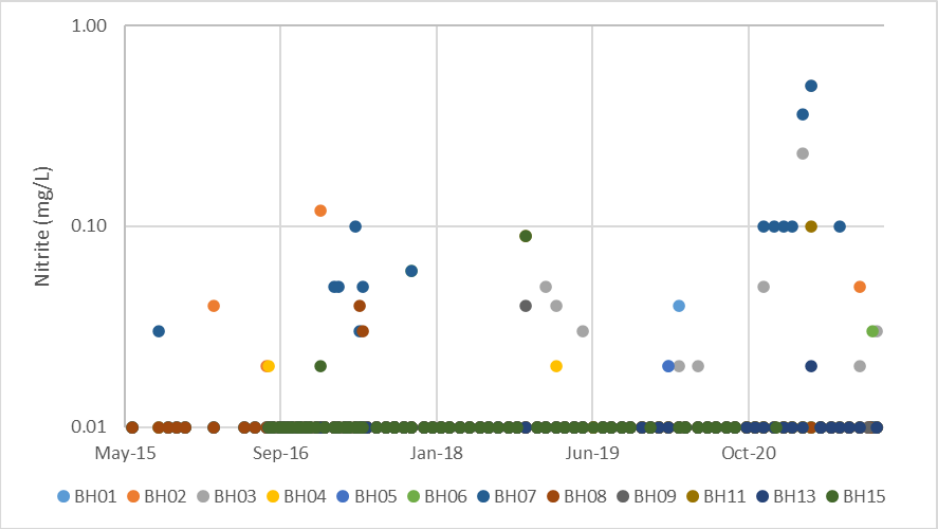


Figure 8A-37 Nitrite 2015 to 2021

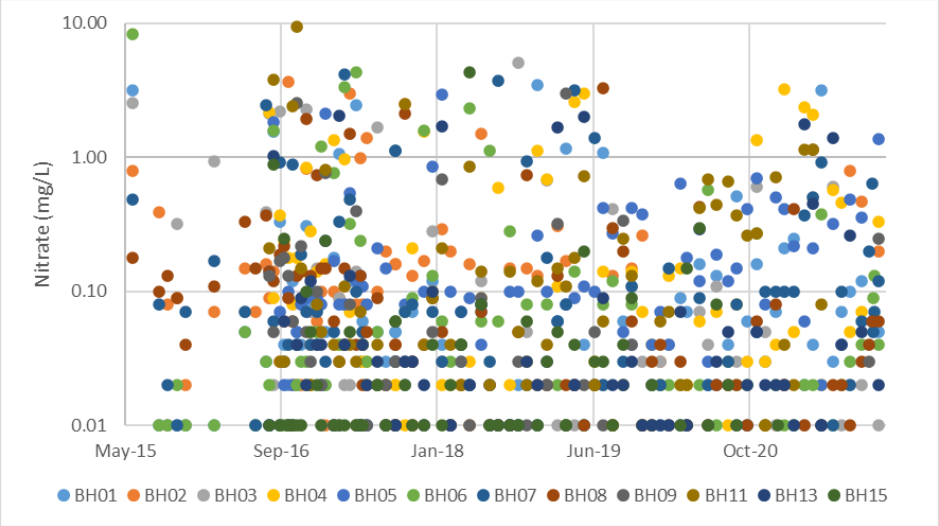


Figure 8A-38 Nitrate 2015 to 2021

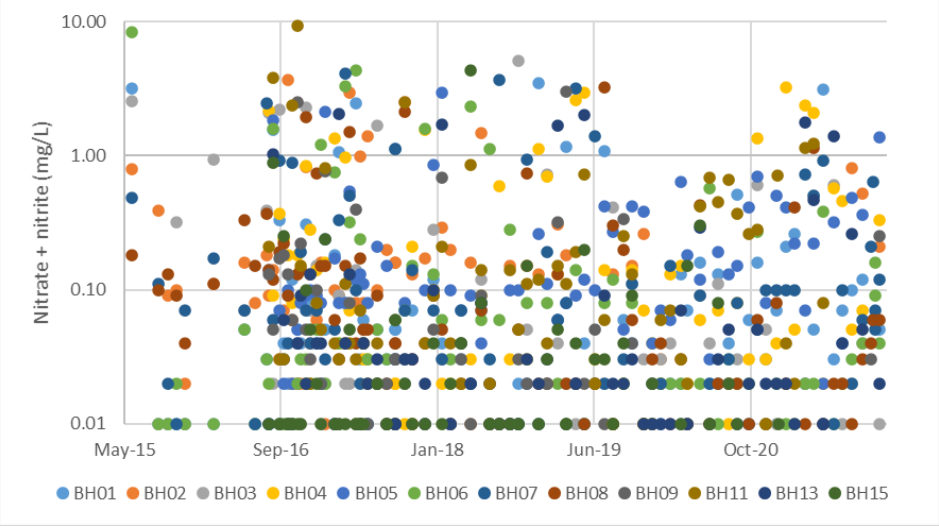


Figure 8A-39 Nitrate + Nitrite 2015 to 2021

Table 8A-1 Groundwater Trigger Investigations

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
BH01	pH	5.5 – 5.9	Feb	6.2	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Apr	6.1	
			May	6.1	
			Jul	6.1	
			Aug	6.1	
			Oct	7.1	
			Nov	6.0	
	Dissolved zinc	0.89 mg/L	Aug	0.893 mg/L	Dissolved zinc at BH01 has only recorded one trigger event in 2021 (August). Therefore further investigation was not required as per the WCSWMP TARPs.
BH02	pH	6.4 - 6.7	Sep	7.2	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Oct	7.1	
			Nov	6.8	
			Dec	6.8	
	Dissolved iron	0.65 mg/L	Sep	2.11 mg/L	BH02 has been reported as dry since January 2020, until the next sampled date in September 2021. It is possible during this time that water existed within BH02 accumulating concentrated dissolved metals. Minimal purging was undertaken for

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Oct	1.52 mg/L	these sample results with samples noted as being 'cloudy'. The concentrations show a decreasing trend through 2021, with the December 2021 result of 0.4 mg/L was less than the SSGV, potentially due to sufficient purging having been performed over multiple monitoring rounds.
			Nov	0.7 mg/L	
BH03	pH	3.6 – 4.8	Jun	3.4	pH at BH03 has only recorded one potentially impactful trigger event in 2021 (June). Therefore further investigation was not required as per the WCSWMP TARPs.
			Jul	6.6	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Oct	5.1	
	EC	1,270 µS/cm	Jan	1,400 µS/cm	Groundwater surrounding BH03 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH03 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. There is no increasing trend throughout 2021 with results circa 1,400 µS/cm.
			Feb	1,366 µS/cm	
			Mar	1,398 µS/cm	
			Apr	1,448 µS/cm	
			May	1,377 µS/cm	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Jun	1,277 µS/cm	
			Jul	3,700 µS/cm	
			Aug	2,060 µS/cm	
			Sep	1,410 µS/cm	
			Oct	1,388 µS/cm	
			Nov	1,355 µS/cm	
			Dec	1,370 µS/cm	
	TSS	89 mg/L	Jan	133 mg/L	As TSS is highly dependent on the sampling method and environmental influences, investigations cannot definitively determine the source of elevated TSS concentrations.
			Jul	154 mg/L	
			Aug	96 mg/L	
	Dissolved iron	61.5 mg/L	Jan	68.7 mg/L	Groundwater surrounding BH03 is under investigation in the joint EA and Centennial groundwater investigation.
			Feb	69.2 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Mar	77.2 mg/L	It is believed that groundwater near BH03 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. There is no increasing trend throughout 2021. The 2021 mean result was 72.0 mg/L.
			Apr	77.0 mg/L	
			May	77.8 mg/L	
			Jun	69.5 mg/L	
			Aug	66.4 mg/L	
			Sep	65.2 mg/L	
			Oct	81.6 mg/L	
			Nov	76.6 mg/L	
			Dec	85.4 mg/L	
	Dissolved nickel	0.31 mg/L	Jan	0.319 mg/L	Groundwater surrounding BH03 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH03 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. There was a steady trend throughout 2021 with a mean result of 0.306 mg/L.
			Mar	0.316 mg/L	
			Apr	0.338 mg/L	
			Jun	0.327 mg/L	
			Jul	0.315 mg/L	
	Dissolved zinc	0.971 mg/L	Jan	1.05 mg/L	Groundwater surrounding BH03 is under investigation in the joint EA and Centennial groundwater investigation.
			Apr	1.00 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Jun	1.12 mg/L	It is believed that groundwater near BH03 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. There was a steady trend throughout 2021 with a mean result of 0.97 mg/L.
			Jul	1.02 mg/L	
			Aug	1.23 mg/L	
BH04	pH	6.3 – 6.7	Jan	6.2	pH at BH04 has only recorded one potentially impactful trigger event in 2021 (Jan). Therefore further investigation was not required as per the WCSWMP TARPs.
			Jul	6.8	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Oct	7.2	
			Nov	6.8	
	EC	516 µS/cm	Mar	520 µS/cm	EC at BH04 did not record two consecutive trigger events for EC in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
			May	518 µS/cm	
	Dissolved iron	2.34 mg/L	Feb	2.55 mg/L	Groundwater surrounding BH04 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH04 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. Results fluctuate greatly at BH04, ranging from <0.05 mg/L to 6.36 mg/L. There was a steady trend in 2021.
			Mar	2.43 mg/L	
			Apr	3.89 mg/L	
			Jun	6.36 mg/L	
			Jul	2.85 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Oct	4.34 mg/L	
			Nov	3.34 mg/L	
	Dissolved nickel	0.012 mg/L	Jul	0.021 mg/L	Dissolved nickel at BH04 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
	Dissolved zinc	0.054 mg/L	Jul	0.198 mg/L	Dissolved zinc at BH04 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
BH05	pH	6.4 – 6.8	Mar	6.9	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Jul	7.0	
			Aug	6.9	
			Oct	7.6	
			Nov	7.5	
			Dec	7.1	
	Dissolved iron	0.32 mg/L	Aug	0.383 mg/L	Dissolved iron at BH05 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
	Dissolved nickel	0.023 mg/L	Jan	0.024 mg/L	Groundwater surrounding BH05 is under investigation in the joint EA and Centennial groundwater investigation.
			Mar	0.033 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Apr	0.043 mg/L	It is believed that groundwater near BH05 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. There was a steady trend throughout 2021 with a mean result of 0.017 mg/L.
			Jun	0.029 mg/L	
	Dissolved zinc	0.069 mg/L	Jan	0.085 mg/L	Dissolved zinc at BH05 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
			Apr	0.074 mg/L	
BH06	pH	6.1 – 6.5	Feb	6.7	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Jul	6.7	
			Aug	6.8	
			Oct	6.8	
			Nov	6.8	
			Dec	6.6	
	Dissolved zinc	0.08 mg/L	Jan	0.099 mg/L	Dissolved zinc at BH06 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
			Aug	0.200 mg/L	
BH07	pH	5.8 – 6.6	Jan	2.8	pH decreased significantly in 2021. BH07 is assumed to be upgradient of site operational activity and is monitored as an unimpacted background location for
			Feb	3.0	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Mar	2.7	WCS. It is however possible that BH07 receives seepage from the REA as assumed groundwater flow for REA seepage is poorly understood.
			Apr	2.8	
			May	3.5	
			Jun	4.0	
			Aug	5.2	
			Sep	5.1	
			Nov	5.7	
			Dec	5.1	
	EC	3,634 µS/cm	Jan	5580 µS/cm	EC increased significantly in 2021. BH07 is assumed to be upgradient of site operational activity and is monitored as an unimpacted background location for WCS. It is however possible that BH07 receives seepage from the REA as assumed groundwater flow for REA seepage is poorly understood.
			Feb	4840 µS/cm	
			Mar	4450 µS/cm	
			Apr	4055 µS/cm	
			May	3820 µS/cm	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Jun	4000 µS/cm	
			Jul	3780 µS/cm	
			Aug	4240 µS/cm	
			Sep	4990 µS/cm	
	TSS	220 mg/L	Jan	385 mg/L	As TSS is highly dependent on the sampling method and environmental influences, investigations cannot definitively determine the source of elevated TSS concentrations.
			Feb	538 mg/L	
			Mar	568 mg/L	
			Apr	820 mg/L	
			May	520 mg/L	
			Jul	1284 mg/L	
			Aug	426 mg/L	
	Dissolved iron	84.2 mg/L	Jan	177 mg/L	Dissolved iron, dissolved nickel, and dissolved zinc increased significantly in 2021. BH07 is assumed to be upgradient of site operational activity and is monitored as an unimpacted background location for WCS. It is however possible that BH07
			Feb	205 mg/L	
			Mar	179 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Apr	144 mg/L	receives seepage from the REA as assumed groundwater flow for REA seepage is poorly understood.
			May	166 mg/L	
			Jun	249 mg/L	
			Jul	236 mg/L	
			Aug	240 mg/L	
			Sep	234 mg/L	
			Oct	140 mg/L	
			Dec	126 mg/L	
	Dissolved nickel	0.647 mg/L	Jan	2.69 mg/L	
			Feb	1.73 mg/L	
			Mar	1.51 mg/L	
			Apr	1.19 mg/L	
			May	1.20 mg/L	
			Jun	1.66 mg/L	
			Jul	1.51 mg/L	
			Aug	1.26 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Sep	1.14 mg/L	
			Oct	0.771 mg/L	
			Dec	0.926 mg/L	
	Dissolved zinc	2.61 mg/L	Jan	11.6 mg/L	
			Feb	7.19 mg/L	
			Mar	5.84 mg/L	
			Apr	4.38 mg/L	
			May	4.72 mg/L	
			Jun	7.00 mg/L	
			Jul	5.72 mg/L	
			Aug	4.93 mg/L	
			Sep	4.40 mg/L	
			Dec	3.13 mg/L	
BH08	pH	5.9 – 6.1	Feb	6.4	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Mar	6.6	
			Apr	6.2	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			May	6.4	
			Jun	6.2	
			Jul	6.4	
			Oct	6.7	
			Nov	6.8	
			Dec	6.3	
	TSS	56 mg/L	Jan	75 mg/L	As TSS is highly dependent on the sampling method and environmental influences, investigations cannot definitively determine the source of elevated TSS concentrations.
			Mar	82 mg/L	
			Jun	57 mg/L	
			Jul	61 mg/L	
	Dissolved iron	2.49 mg/L	Jan	3.08 mg/L	Groundwater surrounding BH08 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH08 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. Results fluctuate greatly at BH08, ranging from 0.29 mg/L to 6.00 mg/L. There was a generally decreasing trend in 2021.
			Feb	2.78 mg/L	
			Mar	2.93 mg/L	
			Apr	3.81 mg/L	
			Jun	6.00 mg/L	
			Jul	3.95 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			Aug	4.25 mg/L	
			Sep	4.10 mg/L	
			Oct	4.29 mg/L	
			Nov	3.37 mg/L	
BH09	pH	5.9 – 6.2	Nov	6.6	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Dec	6.3	
BH11	pH	6.5 – 6.8	Feb	6.9	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Mar	6.9	
			May	6.9	
	EC	1,644 µS/cm	Jan	2190 µS/cm	Groundwater surrounding BH11 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH11 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. Multiple BH11 EC results are elevated greater than the SSGV and saw a decreasing trend in 2021 until the bore was decommissioned.
			Feb	2200 µS/cm	
			Mar	2200 µS/cm	
			Apr	2220 µS/cm	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
			May	2160 µS/cm	
			Jun	1790 µS/cm	
			Jul	1954 µS/cm	
	TSS	76 mg/L	Mar	94 mg/L	As TSS is highly dependent on the sampling method and environmental influences, investigations cannot definitively determine the source of elevated TSS concentrations.
	Dissolved iron	1.68 mg/L	Mar	3.22 mg/L	Dissolved iron at BH11 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
	Dissolved nickel	0.016 mg/L	Jan	0.036 mg/L	Groundwater surrounding BH11 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH11 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. Multiple BH11 dissolved nickel results are elevated greater than the SSGV and saw a steady trend in 2021.
			Feb	0.043 mg/L	
			Mar	0.043 mg/L	
			Apr	0.040 mg/L	
			May	0.035 mg/L	
			Jun	0.038 mg/L	
			Jul	0.033 mg/L	

Monitoring bore	Parameter	SSGV	Month	Trigger event	Investigation
	Dissolved zinc	0.072 mg/L	Feb	0.100 mg/L	Groundwater surrounding BH11 is under investigation in the joint EA and Centennial groundwater investigation. It is believed that groundwater near BH11 is influenced by seepage through historical mine workings. Elevated results are potentially a combination of WCS and MPPS impacts. Multiple BH11 dissolved zinc results are elevated greater than the SSGV and generally saw a steady trend in 2021.
			Apr	0.101 mg/L	
			May	0.096 mg/L	
			Jun	0.149 mg/L	
BH13	pH	6.1 – 6.5	Jul	6.6	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.
			Oct	7.3	
	Dissolved zinc	0.32 mg/L	Jul	0.33 mg/L	Dissolved zinc at BH13 did not record two consecutive trigger events in 2021. Therefore further investigation was not required as per the WCSWMP TARPs.
BH15	pH	5.9 – 6.1	Jan	6.2	The pH result is trending toward the pH circumneutral range and therefore is not considered environmentally harmful.

Appendix 9: Rehabilitation

KORU ENVIRONMENTAL

Centennial Coal

RIP Progress Inspection and Rehabilitation Monitoring 2021

Western Coal Services

RIP Progress Inspection and Rehabilitation Monitoring 2021 – Western Coal Services

Prepared for

Springvale Coal Pty Ltd
P/O Box 198
Wallerawang NSW 2845
ABN 39 052 096 769

Prepared by

Matthieu Catteau - B. Env. Mgmt (Hons 1)
Principal Rehabilitation Scientist / Ecologist

Koru Environmental Pty Ltd
Clarence Town NSW 2321
ABN 18 625 812 348

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Table of Content

List of Figures

List of Tables

List of Graphs

Executive Summary

This report presents the findings of the 2021 rehabilitation monitoring program conducted at Western Coal Services (**WCS**) by Koru Environmental on behalf of Springvale Coal Pty Ltd to satisfy the requirements of the mining operations plan (**MOP**) for the operation.

Rehabilitation Improvement Plan progress update

A Rehabilitation Improvement Plan (**RIP**) was prepared in 2018 (and incorporated in the MOP) detailing management actions and strategies to improve rehabilitation condition across the site, and ensure that rehabilitated communities successfully progress towards a comparable equivalent to local native woodland communities. The plan includes an indicative annual schedule of works to be implemented progressively to improve rehabilitation condition.

Rehabilitation treatment works were implemented at the site during 2020 in accordance with the RIP. These were however limited to the older rehabilitation areas along the site access road and Cooks Dam rehabilitation, and included plantings of eucalypt tubestock to improve community composition and vegetation structure and localised hydro-seeding with a mix of native ground cover species to improve the lower stratum. A total of 582 native eucalypt tubestock were planted in 2020. No additional works were completed under RIP in these areas in 2021.

Although identified for targeted improvements under the RIP, rehabilitation across the reject emplacement area (**REA**) and Lambert's Gully have not yet been treated as of 2021.

Monitoring Results Summary

Monitoring methods strictly adhered to those defined in the current MOP (2018-2024), and included a combination of transect-based data collection (eight rehabilitation transects were monitored) and a walkover inspection of all rehabilitated areas. The data collected allowed for an assessment to be undertaken of current rehabilitation performance and progress against relevant objectives and completion criteria defined in the MOP.

Field surveys were completed between 22nd and 24th November 2021, following nearly two years of above average rainfall received in the locality (which in turn followed three years of severe state drought between 2016-2019). These good growing conditions were noted as having positively influenced the rehabilitation condition recorded in 2021.

All monitored rehabilitation areas were assessed as stable in 2021 with no signs of active erosion processes or issues. Soil sampling and characterisation is undertaken every three years and was implemented in 2021. Testing results showed that all key parameters regulating plant establishment and growth were generally within acceptable values, with no key constraints identified that could prevent successful rehabilitation establishment.

Ground cover protection remained excellent across all monitoring locations in 2021. Levels of live vegetative cover were measured as commensurate with analogue areas, and dominated by native grasses. Average total species richness in the ground layer increased to ~24.3 species per site in 2021, from ~22.0 species per site in 2020 and ~13.3 species per site in 2019, and average native species richness in the rehabilitation continued to be commensurate with levels recorded at the corresponding analogue sites.

Vegetation communities establishing in the rehabilitation generally remained characterised by a moderately dense to dense mid storey of primary colonising species (mainly acacias and Sifton bush), poorly resembling the condition observed in analogue areas (where the mid-storey layer is typically very sparse to absent). However, it is expected that the mid layer should naturally and progressively reduce assuming successful tree and canopy cover establishment over time.

Following tubestock plantings undertaken under the RIP, tree densities in 2021 were consistently within target range across the access road rehabilitation for a satisfactory performance. However, tree densities recorded in the Cooks Dam rehabilitation remained below target range in 2021, due to the RIP works not

yet being completed (plantings are planned to be undertaken in successive sections) and the monitoring sites occurring in areas yet to be treated.

In contrast and consistent with previous years, eucalypt densities remained very high and exceeding target range across most of the REA and Lamberts Gully rehabilitation areas. For these locations the RIP recommended selective tree thinning to reduce competition levels and improve tree growth habit and community structure, however this has not yet been implemented.

Despite some residual drought-related impacts noted in some shrubs and trees, vegetation health and tree growth were overall assessed as satisfactory in 2021. Most areas also showed signs of active natural regeneration, highlighting the potential of the established communities to be able to self-regenerate.

Exotic species diversity remained moderately high at the Cooks Dam and Access Road rehabilitation, but cumulative weed cover levels remained low and consistently <6% at all locations in 2021, and within the defined allowable levels. Pro-active weed control has nonetheless been recommended to minimise the risk of spread of occurring invasive weed species. The REA and Lambert's Gully rehabilitation areas continue to display negligible weed diversity and weed cover in 2021.

Recommendations

The following recommendations have been formulated based on the outcome of the 2021 field inspections and monitoring results:

- Undertake follow control of re-sprouting acacias in areas of RIP tubestock plantings.
- Continue the implementation of the rehabilitation improvement actions defined in the RIP.
- Undertake pro-active and ongoing weed control specifically targeting African Lovegrass, Blackberry, Serrated Tussock and St John's Wart in areas of older rehabilitation to minimise the risk of further spread.

1. Introduction

1.1 Background

Western Coal Services (**WCS**) is located near Blackmans Flat, approximately 15 kilometres (**km**) north of Lithgow in New South Wales (**NSW**). The facility processes coal received from Springvale Coal Mine (located approximately 8 km to the south-east) utilising a screening and sizing plant, an overland conveyor system and a coal preparation plant. WCS operates under development consent SDD 5579 granted in April 2014 under the NSW *Environmental Planning and Assessment Act 1979*, allowing operations to continue until June 2039.

Annual monitoring of rehabilitated areas at WCS commenced in 2010 and has been successively implemented by AECOM (2010-2017) and Koru Environmental (2018-2020). Monitoring is implemented to satisfy the requirements of:

- The current Mining Operations Plan 2018-2024 (**MOP**); and
- Schedule 3 – Condition 45 of SDD 5579.

The rehabilitation monitoring program was fully revised in 2018 to improve the relevance and adequacy of collected datasets and ensure it fully aligned with the objectives and completion criteria defined in the MOP (2018-2024) for WCS rehabilitation. This revision in monitoring methods implied that some of the monitoring data collected during pre-2018 monitoring campaigns cannot be directly compared and analysed against data collected from 2018 onwards. Historic rehabilitation monitoring data remain however relevant and valuable in terms of documenting rehabilitation performance condition over time.

In 2018 and in response to a notice issued by NSW Resources Regulator under Section 240(1)(e) of the *NSW Mining Act 1992*, a 'Rehabilitation Improvement Plan' (**RIP**) document was prepared for WCS (Koru, November 2018) detailing strategies to improve rehabilitation condition across the site and ensure that rehabilitated communities successfully progress towards a comparable equivalent to local native woodland communities. The RIP defined a range of targeted improvement actions to be implemented in stages between 2019-2024 (i.e. over the remaining period of the current MOP).

1.2 Scope

This report presents the findings of the 2021 rehabilitation assessments undertaken at WCS in November 2021 by Koru Environmental Pty Ltd (**Koru**) on behalf of Springvale Coal Pty Limited (**Springvale Coal**) – a Centennial Coal company (**Centennial**). Assessments included:

- Assessment of RIP works progress (visual inspections and discussions with site-based staff);
- Monitoring of eight long-term rehabilitation monitoring transects; and
- A high-level walkover inspection of all rehabilitated areas to record the general condition of the rehabilitation and detect potential maintenance issues.

2. Post-Mined Lands Rehabilitation

2.1 Rehabilitation Planning and Management

As required by Schedule 3 – condition 44 of SDD 5579, Springvale Coal undertakes progressive post-mining rehabilitation of the site, that is as soon as reasonably practicable following disturbance. This is undertaken with the aim to minimise the total exposed area at the site at any given time.

Rehabilitation planning and activities at WCS are undertaken in accordance a MOP approved by NSW Resources Regulator. The current MOP (Jan 2018 – Dec 2024) (Centennial Coal, 2017) also fulfils the function of Rehabilitation Management Plan (**RMP**) for the site, and was prepared to meet the requirements of Schedule 3 – Condition 45 of SDD 5579.

2.2 Post-Mining Land Use Goals

Post-mining land use and landscape goals are outlined in Section 4.2 of the MOP (2018-2024). A number of potential land uses have been defined for WCS (including waste emplacement and industrial uses), however relevant to this rehabilitation monitoring program are those areas proposed to be returned to either native woodland or pasture final land uses post-mining, as follows:

- Woodland will cover most of the site, which is consistent with the surrounding land use and the pre-mining environment. Habitat augmentation activities will be undertaken to enhance the ecological values of the rehabilitated area.
- Grassland rehabilitation will only be used to rehabilitate the haul road batters, a small section of the washery area and any disturbed areas associated with the conveyor at the time of closure.

The final landform will also include permanent water bodies and drainage structures constructed to manage surface water flows and provide water resources for native fauna and stock.

2.3 Rehabilitation Objectives

Rehabilitation objectives for WCS are defined in Schedule 3 – Condition 43 of SDD 5579 and Table 13 (p.45) of the MOP (2018-2024). To achieve these objectives, rehabilitation planning has been undertaken in the MOP and mining 'domains' defined, each of which requiring a different rehabilitation methodology to successfully achieve the intended post-mining land use.

Relevant to this rehabilitation monitoring program are the 'secondary' woodland and grassland rehabilitation domains, i.e. areas of rehabilitation where such land uses have been or are being re-established. Rehabilitation commitments and objectives for these domains are reproduced in **Table 1**.

Table 1 Secondary domains rehabilitation objectives for WCS

Domain	Rehabilitation Objectives
Rehabilitation – Woodland	• All hazardous materials and contaminated materials removed. • Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with the Blue Book. • Class V Land and Soil Capability. • Ecosystem health, structure and composition satisfying completion criteria. • Woodland rehabilitation areas will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for native species. • Woodland rehabilitation will be consistent with the *Cox's Permian Red Stringybark – Brittle Gum Woodland* vegetation community (as per DEC, 2006)
Rehabilitation – Pasture	• Stable batters of haul roads with grassland mix used. • Non-polluting. • Grass seeding completed in conveyor corridor if required.

2.4 Existing Rehabilitation

2.4.1 Completed Rehabilitation

At the time of implementation of the 2021 monitoring campaign, a total of approximately 28.4 hectares (**ha**) of woodland rehabilitation had been completed across WCS, whilst no pasture rehabilitation had been established. Existing woodland rehabilitation at the site comprise:

- Cooks Dam and access road rehabilitation, established in the mid-1990s and covering ~10.4ha;
- Reject Emplacement Area (**REA**) rehabilitation, established in 2006 and covering ~8.5ha; and
- Lambert's Gully rehabilitation, established in 2007/2008 and covering ~9.5ha.

It is noted that an additional ~12.4ha of poorly performing woodland rehabilitation exist at the site. These areas currently remain but were re-classified in 2018 as either 'material stockpile' (for future capping works at the site) or 'water management domain'. These areas have therefore been removed from the woodland rehabilitation domain and from the monitoring program.

2.4.2 Rehabilitation Improvement Plan

All areas of existing woodland rehabilitation were identified in the RIP as requiring at least some level of improvement to progress the rehabilitation towards comparable equivalent to local native woodland communities (as per the main rehabilitation objective defined in the MOP). The following treatments were defined in the RIP:

- Cooks Dam and access road rehabilitation: selective thinning of acacias followed by infill tubestock plantings of endemic eucalypt species, localised improvements of the lower stratum (hand seeding of native sub-shrubs and tubestock plantings of large herbs), and incorporation of ground logs in accessible areas.
- REA and Lambert's Gully rehabilitation: incorporation of ground logs in accessible areas, selective thinning of mid-storey in areas of high plant densities, hydro-mulching of bare areas with a native seed mix (including grasses, forbs, shrubs and trees), and localised improvements of the lower stratum in areas of successfully established canopy layer (hand seeding of native sub-shrubs and tubestock plantings of large herbs).

3. Monitoring Methodology

3.1 Long-term (Transect-based) Monitoring

3.1.1 Monitoring Sites

A total of eight existing woodland rehabilitation monitoring sites were assessed during the 2021 monitoring campaign.

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

The suite of monitoring sites assessed in 2021 is presented in **Table 2**, with their location mapped in **Figure 2**.

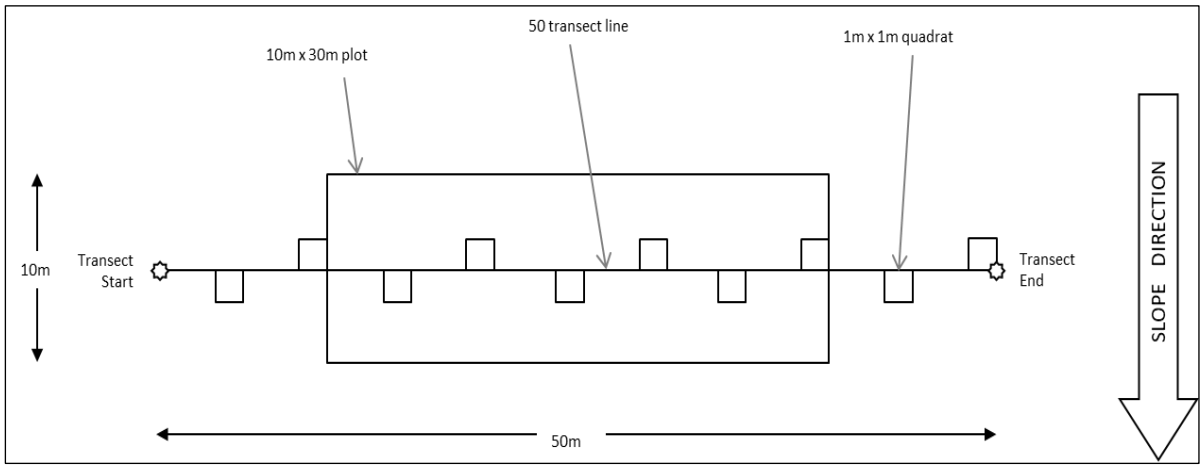


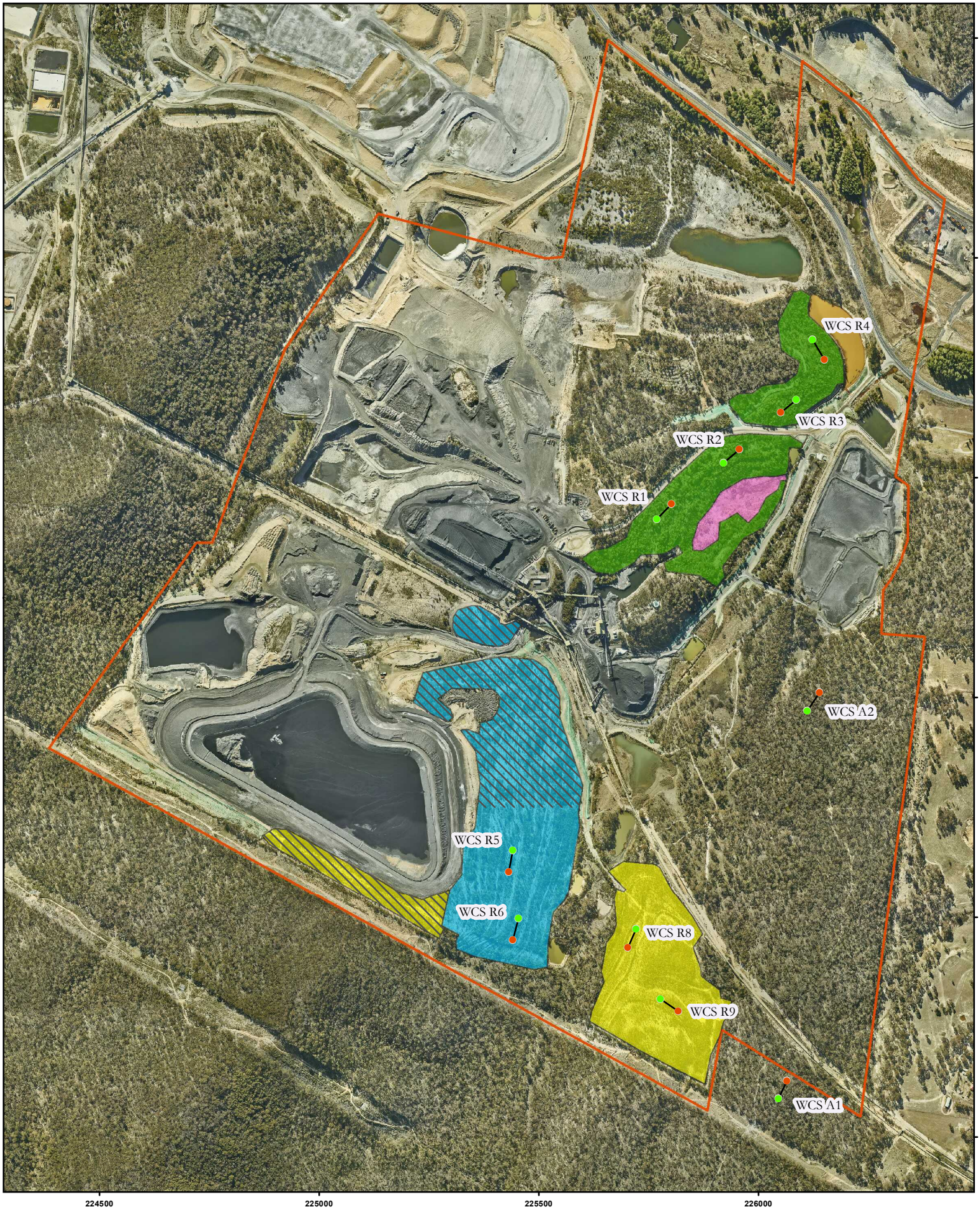
Figure 1 Monitoring site layout

The WCS monitoring program also includes a total of two woodland analogue sites, which are located in nearby areas of undisturbed native vegetation representative of local vegetation type and condition, and commensurate with *Cox's Permian Red Stringybark – Brittle Gum Woodland*. These analogue sites are subject to a 2 to 3 years monitoring frequency (depending on conditions) and were last monitored in 2020 (therefore not re-monitored in 2021).

The analogue sites form a central component of the rehabilitation monitoring program at WCS and are used to derive target benchmarks against which rehabilitation performance can be assessed, particularly with reference to species diversity, species assemblages and vegetation structure.

Table 2 WCS rehabilitation monitoring program – monitoring sites details

Site Code	Type	Rehabilitation Establishment	Slope (%)	Coordinates (GDA94 Zone 56)	
				Easting	Northing
WCS R1	Rehabilitation	Mid-1990s	9	225769	6304206
WCS R2	Rehabilitation	Mid-1990s	14	225920	6304334
WCS R3	Rehabilitation	Mid-1990s	20	226086	6304477
WCS R4	Rehabilitation	Mid-1990s	25	226123	6304614
WCS R5	Rehabilitation	2006	13	225441	6303452
WCS R6	Rehabilitation	2006	15	225454	6303297
WCS R8	Rehabilitation	2007	22	225777	6303114
WCS R9	Rehabilitation	2007	20	225721	6303273
WCS A1	Analogue	n/a	12	226046	6302887
WCS A2	Analogue	n/a	10	226112	6303770



KORU ENVIRONMENTAL

N W E S

0 75 150 300
metres

1:10,950 (when printed at A4)

MAP SIZE:	A4 Portrait	**PROJECT REF:**	P2021-007
DATUM:	GDA 1994	**CREATED BY:**	mcatteau
PROJECTION:	MGA Zone 56	**DATE CREATED:**	01-Feb-2022

LEGEND

- WCS site boundary
- Areas reclassified as material stockpile

Monitoring sites

- 50m transect start
- 50m transect end

Rehabilitation Establishment

- Mid 1990s
- 2007
- 2008
- 2015 (reclassified as 'water management area'

Western Coal Services
Rehabilitation Monitoring 2021

FIGURE 2

Rehabilitation Areas and Monitoring Sites Locations

3.1.2 Field Data Collection

At each of the monitoring sites, the metrics and attributes listed in **Table 3** were assessed and recorded.

Table 3 Monitoring metrics and assessment methods

Metric	Sampling area	Methods
Site attributes	General area surrounding transect	• For each monitoring site the vegetation community type, age of rehabilitation, slope, transect geographical coordinates and transect orientation were recorded.
Photographic monitoring	50m transect line	• Photographs were taken from start the transect with the end of transect in centre background, and from the end of the transect looking in.
Soil monitoring (*every 3 years*)	Centre location along the 50m transect line	• A hand shovel was used to determine the applied thickness of the growing media layer. • A composite soil sample (made up of 5-6 x sub-samples) was collected and sent to a NATA-accredited laboratory for analysis.
Erosion	10m x 50m transect area	• Erosion was assessed in accordance with the guidelines in the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009) for sheet, rill, gully and tunnel erosion. • Where rills and gullies were present, their location, width and depth were recorded along the 50m transect line.
Ground cover protection and floristics	1m x 1m quadrats	• The percentage cover live vegetation (projected), organic litter, rocks >200mm and bare ground were visually estimated. • All ground cover species (grasses, forbs, sub-shrubs and shrubs <0.5m) were identified (where possible) and recorded, and assigned a percentage cover score.
Vegetation community composition and structure	10m x 30m plot	• All trees and shrub species were identified and recorded. • A count was undertaken of all tree stems (long-lived canopy tree species only i.e. eucalypts) to determine the overall stem density. • Tree stems were categorised in DBH classes (diameter at breast height) as follows: <5cm, 5-9cm, 10-20cm, 20-30cm, 30-50cm, >50cm. • The height range of both the mid-storey (shrubs and small trees) and over-storey (eucalypts) vegetation layers was estimated and recorded.
	At 10 points along 50m transect	• At every 5 metres, the foliage percent cover (FPC) of both over and mid-storey vegetation (i.e. trees and shrubs) directly overhead were estimated to the nearest 5%, using for reference the estimation charts provided in the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009).
Community health and resilience	10m x 30m plot	• The condition of each recorded tree (long lived eucalypts only) was assessed as healthy, sick or dead. • The number of tree species with second generation seedlings (i.e. <5cm DBH) and the number of species bearing reproductive material (i.e. flowers/fruits) was recorded. Regeneration status for the site was assessed as follows: - Active: second generation seedlings present. - Potential: no seedlings but reproductive material present. - Nil: no seedlings or reproductive material present.
Habitat complexity	10m x 50m plot	• The presence and abundance of ground logs/woody debris, large rocks or other artificial habitat features was quantified and recorded. • The number of hollow-bearing stems in live trees was counted and recorded.

3.2 Walkover Inspections

The walkover inspection is intended as a complement to the long-term (transect-based) monitoring, and consists of a high-level assessment of all rehabilitated lands across the site with the objective to identify any potential issues / deficiencies requiring maintenance treatments. While covering the rehabilitated areas on foot (ensuring optimum geographical coverage within the available time allocation), opportunistic sightings and assessments are made identifying the following factors where relevant:

- Stability of slopes and landforms – including presence and severity of active erosion areas (e.g. rill, gully and tunnel erosion);
- Function and condition of existing erosion and sediment control structures and landform features, including water management structures (e.g. drains), water ponding areas, etc. (where applicable);
- Visual assessment of ground protection and vegetation cover, vegetation health and growth rates;
- Areas of significant weed incursion;
- Evidence of presence/impact of vertebrate pests; and
- Any other disturbance factors or features, such as presence of mine waste, track disturbance, damaged fences etc.; and

GPS points (±3m accuracy) and geo-referenced photographs were taken of all observations made during the assessment. By collecting geo-located photos, areas can be re-visited in the future and photo-monitoring continued to demonstrate the evolution of the site condition over time.

The walkover inspection in 2021 was also targeted to capture and assess the progress of the rehabilitation improvement works defined in the RIP.

3.3 Works Implementation

3.3.1 Monitoring Dates

Field data collection took place between 22nd and 24th November 2021, and was conducted by Matthieu Catteau (Principal Rehabilitation Scientist) from Koru.

Monitoring activities were supervised by William Olson of Centennial Coal.

3.3.2 Weather Conditions

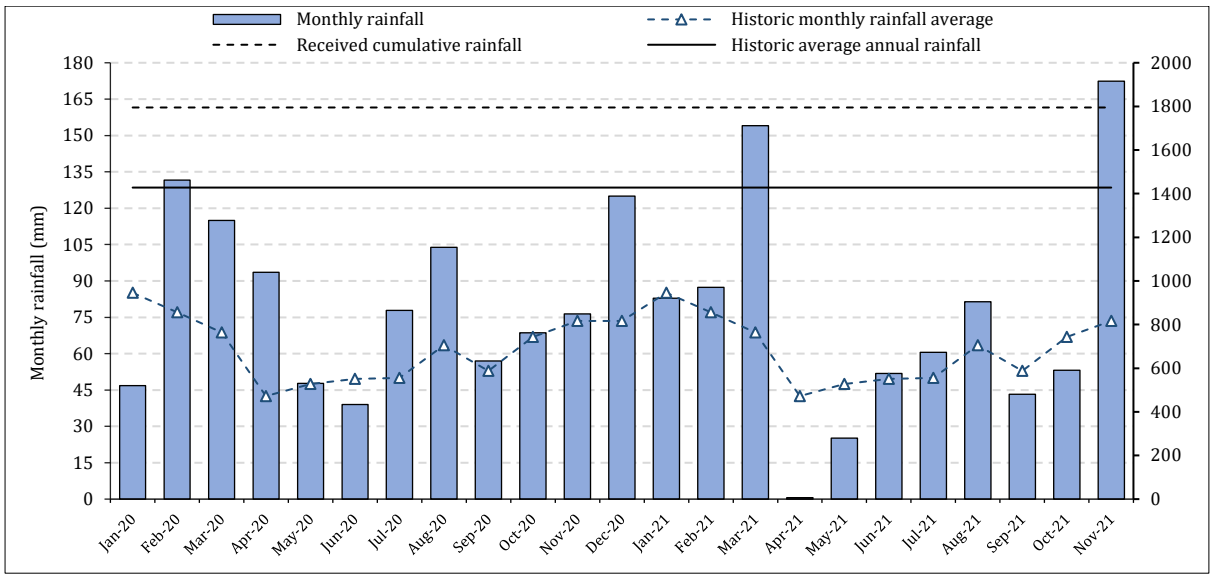
For illustration purposes, weather data for the 23 months leading to the 2021 monitoring event (i.e. since January 2020) have been presented graphically in **Graph 1** (rainfall) and **Graph 2** (temperature), together with historical data ranges included for comparison purposes (rainfall data from Lidsdale Maddox Lane BoM Station No. 063132; temperature data from Marrangaroo Defence BoM Station No. 063308).

Following the severe three-year state drought which impacted the region between 2016 and 2019 and placed a significant amount of stress on local vegetation and biophysical systems (including rehabilitated lands), conditions significantly eased off starting early 2020 and good rainfall was received (and generally sustained) throughout 2020 and 2021.

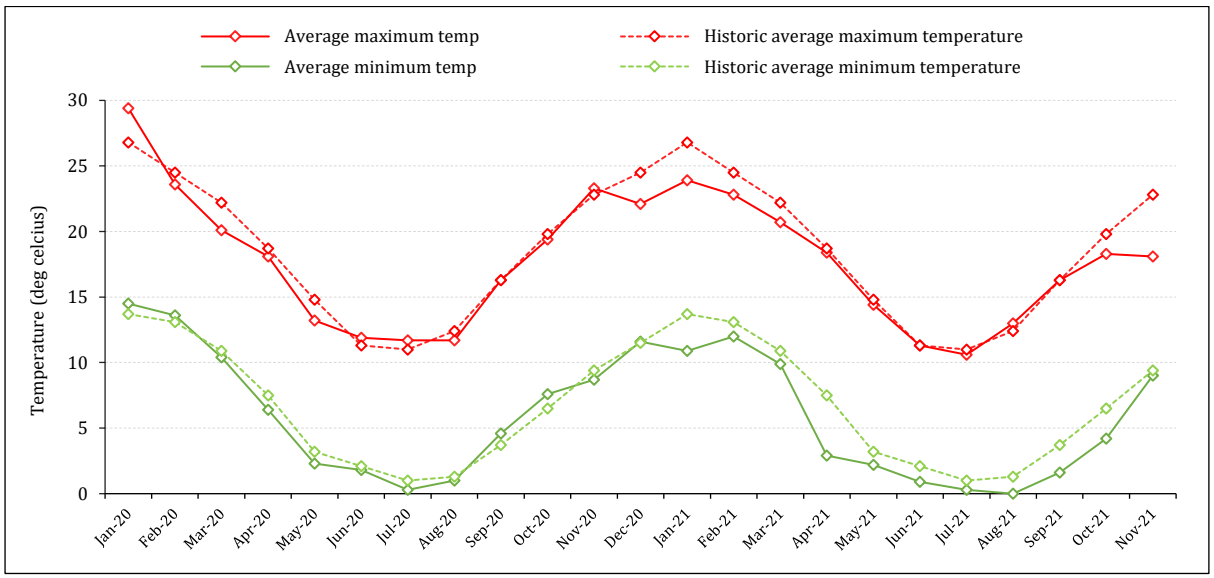
As illustrated in **Graph 1**, cumulative rainfall received in the past two years exceeded historical average by ~25% for the equivalent time period (1,795 mm received vs. 1,428 mm average). The months of April 2020, March 2021 and November 2021 were particularly wet and experienced rainfall more than double their historical monthly average

As presented in this report, the sustained good conditions of the past 2 years generally positively impacted rehabilitation condition in terms of species establishment and diversity.

Finally, temperature data records (**Graph 2**) showed that mean temperatures were generally within historical averages with the exception of a relatively cool summer and early autumn 2021. This followed two particularly hot years in 2018 and 2019 (i.e. at the peak of the drought) where average seasonal maximum temperatures were usually above historical averages (further compounding the lack of rainfall).



Graph 1 Local rainfall data (Jan 20 – Nov 21)



Graph 2 Local temperature data (Jan 20 – Nov 21)

3.4 Data Analysis and Interpretation

Field collected data were analysed with the view to provide an accurate assessment of current rehabilitation performance against the rehabilitation completion criteria defined in the MOP (2018-2024).

For reference, criteria defined for the 'rehabilitation – woodland' domain have been reproduced in **Table 4**, which also indicates the associated monitoring component / metrics metric used to undertake compliance assessment. (Note that for legibility purposes some criteria have been reworded or grouped where relevant).

Table 4 MOP completion criteria for woodland rehabilitation

Completion criteria	Monitoring metric
Landform	
Landform is stable with no evidence of slumping or uncontrolled erosion	Erosion assessments Walkover inspection
Slopes are generally less than 18% and no more than 25%	Site attributes Walkover inspection
Growing media	
Soil analysis is undertaken to determine potential constraints to rehabilitation	Soil monitoring
Topsoil or alternative dressing media spread at depth of at least 50mm	Soil monitoring
Ecosystem establishment / sustainability	
Minimum of 70% protective ground cover	Ground cover protection
No bare areas >200m^2	Walkover inspection
Weed cover <15%	Floristics monitoring Walkover inspection
Evidence of nutrient cycling (i.e. presence of litter, cryptograms, etc.)	Ground cover protection
Establishing species are consistent with a woodland community	Vegetation composition
>70% of trees are healthy and growing	Vegetation health
Dominant species aligned with those in local native communities	Vegetation composition
Presence of a range of structural habitats (eucalypts, shrubs, ground cover, developing litter layer)	Vegetation structure Habitat complexity
Other habitat features incorporated into rehabilitation areas (large rocks, logs, etc).	Habitat complexity

4. RIP Progress

4.1 Cooks Dam and Access Road Rehabilitation

Initial area preparation works including localised thinning/mulching of mature senescing acacias was undertaken during quarter 3 2019. A total of 13 locations were prepared to receive tubestock planting, ranging from approximately 20m x 20m to 20m x 30m in size. However, due to inadequate conditions at the time (i.e. particularly the drought), plantings were postponed until 2020.

Tubestock plantings of eucalypts commenced in November 2020, with a total of 582 eucalypt seedlings planted across the Cooks Dam and access road rehabilitation by the end of 2020. Details of planting locations and types (including maps) were provided in the 2020 rehabilitation monitoring report (Koru, 2021).

Species selected for plantings were limited by the availability of eucalypt tubestock in local nurseries (Neil Thompson, pers. communication), and included a total of five species comprising *Eucalyptus dalrympleana* (Mountain gum), *E. dives* (Broad-leaved peppermint), *E. pauciflora* (Snow gum), *E. rubida* (Candle gum) and *E. viminalis* (Ribbon gum). All these species are consistent with those suggested in the RIP and consist of local native species found in the surrounding *Tablelands Dry Sclerophyll Forests* native vegetation communities.

As specified in the RIP, all tubestock were mulched and protected by tree guards, and water crystals and fertiliser pellets were used during the planting process (Neil Thompson, pers. communication). An initial watering program was implemented in the weeks following planting to maximise the likelihood of seedlings survival.

All areas planted with tubestock were also hydro-seeded with a mix of native ground cover species in Spring 2020 (Neil Thompson, pers. communication).

All Cooks Dam and Access Road rehabilitation areas were re-inspected during the 2021 site works, and it appeared that no additional works under the RIP were carried on during 2021 (or any implemented works were not documented and could not be evidenced). The following observations were made on the condition of the previously treated areas:

- Satisfactory tubestock survival has generally been achieved (estimated at ~70-80% survival rate), and survived seedlings appeared healthy (see Photo 1).
- Variable growth rates were observed between the planting locations, but some areas achieved excellent seedling growth 12 months following planting (Photo 2),
- Some planted areas were noted with tree guards damaged or missing (Photo 3) – possibly knocked down by macropods.
- Several infestations of Serrated Tussock (*Nassella trichotoma*) have established particularly along the access tracks created for the works (**Photo 4**), with no clear evidence of control being implemented. The spread of the species was likely promoted by inadequate vehicle hygiene protocols during works implementation.
- In several locations rapid resprouting / recolonisation of acacias has taken place in response the mulching disturbance (Photo 5). If left to re-establish, these may outcompete the young eucalypt seedlings for access to water, soil and light resources – and it is recommended that localised follow-up control of re-sprouting acacias be implemented in the planted areas.

Finally and as noted in last year's report, not all areas flagged for canopy improvements (as identified in the RIP) have been treated. However, this was intentional and intended to: 1) minimise the rehabilitation areas re-disturbed at any one time, and 2) allow for monitoring and determining the outcomes and efficacy of the revegetation technique before treating additional areas.

4.2 REA and Lambert's Gully Rehabilitation

In discordance with the RIP, none of the improvement / treatment works defined for the REA and Lambert's Gully rehabilitation areas have been implemented to date.

This is mainly justified by these areas being flagged for potential re-disturbance under the latest mine planning and REA design. This rehabilitation will continue to be monitored under the annual rehabilitation monitoring program, but investment in treatment works postponed until it is confirmed which areas (if any) will be retained.

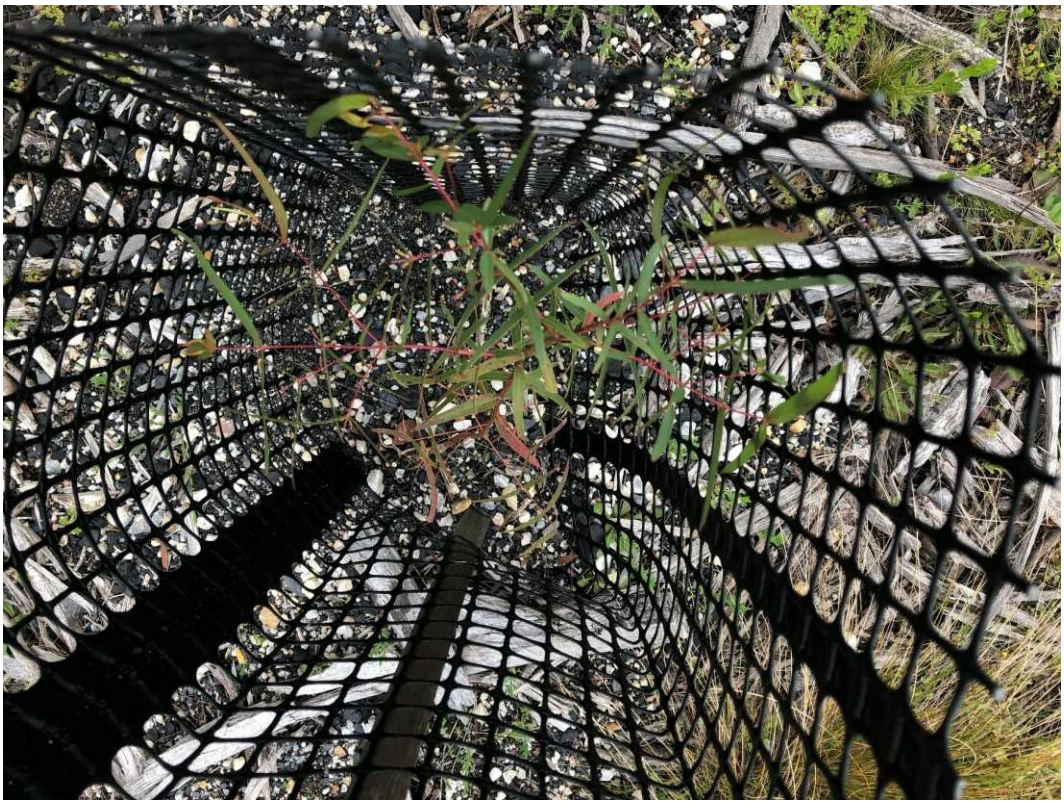


Photo 1 Healthy *Eucalyptus viminalis* tubestock

Photo 2 Tubestocks displaying excellent growth 12 months following planting

Photo 3 Missing or lost tree guard around tubestocks

Photo 4 Established Serrated Tussock infestation along access track

Photo 5 Example of acacias recolonising previously mulched area

5. Long-term Monitoring

Notes: in the following section, monitoring results showed in blue font indicate an acceptable rehabilitation performance for the specific metric/attribute (i.e. meeting completion criteria and/or commensurate to analogue benchmarks (within 30%)); whilst red font indicates otherwise.

5.1 Photographic Monitoring

Photographs taken from the permanent photo points are provided **Table 5** which show the condition of the monitoring sites at the time of the 2021 monitoring event. These are provided to assist with the interpretation and conceptualisation of the monitoring results detailed in the following sections. For reference and comparison, analogue sites photographs (as last taken in 2021) have also been included.

Long-term photographic monitoring results are provided in **Appendix B**.

Table 5 Photographic monitoring results (2021)

Site (date)	View from start of transect (0m)	View from end of transect (50m)
WCS R1 (22/11/21)		
WCS R2 (23/11/21)		

WCS R3 (24/11/21)		
WCS R4 (24/11/21)		
WCS R5 (23/11/21)		
WCS R6 (23/11/21)		

WCS R8 (23/11/21)		
WCS R9 (23/11/21)		
WCS A1 (10/11/20)		
WCS A2 (09/11/20)		

5.2 Soils and Erosion

5.2.1 Erosion

The 2021 erosion monitoring results as assessed at the monitoring sites are summarised in **Table 6**. Consistently with previous years, soil and slope stability were excellent at all monitoring sites and no active erosion processes recorded. As reported in previous years, a small residual erosion channel (<30cm deep) occurred as intersecting the transect line at WCS R5, however the channel has fully stabilised and starting to fill with alluvium, therefore no erosion score was awarded.

No severe and active erosion processes or features were recorded (e.g. tunnel or gully erosion) that could compromise landform integrity and land capability objectives.

Table 6 Erosion monitoring results (2021)

Erosion type	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9
Wind erosion	0	0	0	0	0	0	0	0
Sheet erosion	0	0	0	0	0	0	0	0
Rill erosion	0	0	0	0	0	0	0	0
Gully erosion	0	0	0	0	0	0	0	0
Tunnel erosion	0	0	0	0	0	0	0	0
Total score	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Erosion status	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable

5.2.2 Soil Performance

This section provides a summary of results for key soil performance indicators, i.e. those most likely to limit or restrict vegetation establishment and growth or to promote erosion.

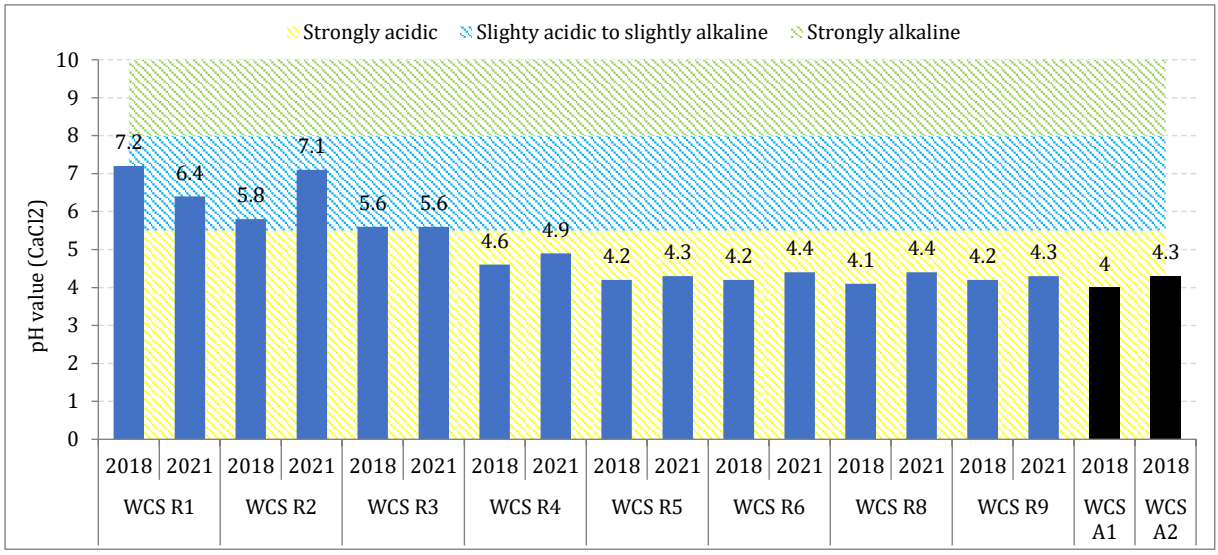
Detailed laboratory soil analyses results are included in **Appendix B** for further reference.

5.2.2.1 Soil acidity

Soil pH($CaCl_2$) showed some seasonal fluctuations particularly at the monitoring sites located in the Access Road rehabilitation (WCS R1 and WCS R2), but generally remained within comparable range from the 2018 levels (**Graph 3**).

With the exception of WCS R2 which returned a neutral soil pH, soils across the rehabilitation were acidic to strongly acidic, with pH ($CaCl_2$) levels comprised between 4.3 and 6.4. Such acidity levels are however considered adequate as comparable to pH levels recorded in natural soil profiles at the analogue sites.

All sites returned pH readings within acceptable range for the establishment and growth of native species, for an overall acceptable performance.

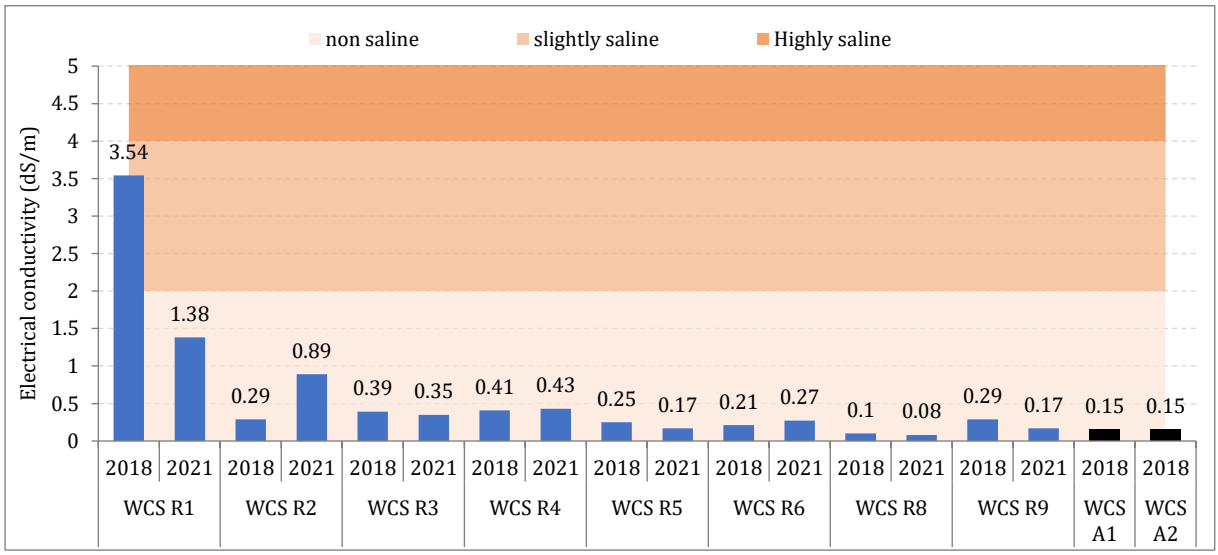


Graph 3 Soil acidity levels (pH $CaCl_2$) (2018-2021)

5.2.2.2 Soil salinity

Electrical conductivity (**EC**) results are presented in **Graph 4**, noting that the EC values reported in the laboratory report (**Appendix B**) were converted to account for soil types (as per Hazelton & Murphy, 2007).

The soil at WCS R1 which returned as slightly saline in 2018 showed a distinct decrease in EC levels, and all EC readings in 2021 were consistently within levels classified as non-saline (i.e. <2.0 dS/m) and generally comparable to levels observed at the analogue sites. These results indicate that soil salinity is unlikely to negatively affect plant establishment and growth at the site, or become an issue in the rehabilitation.



Graph 4 Soil salinity levels (2018-2021)

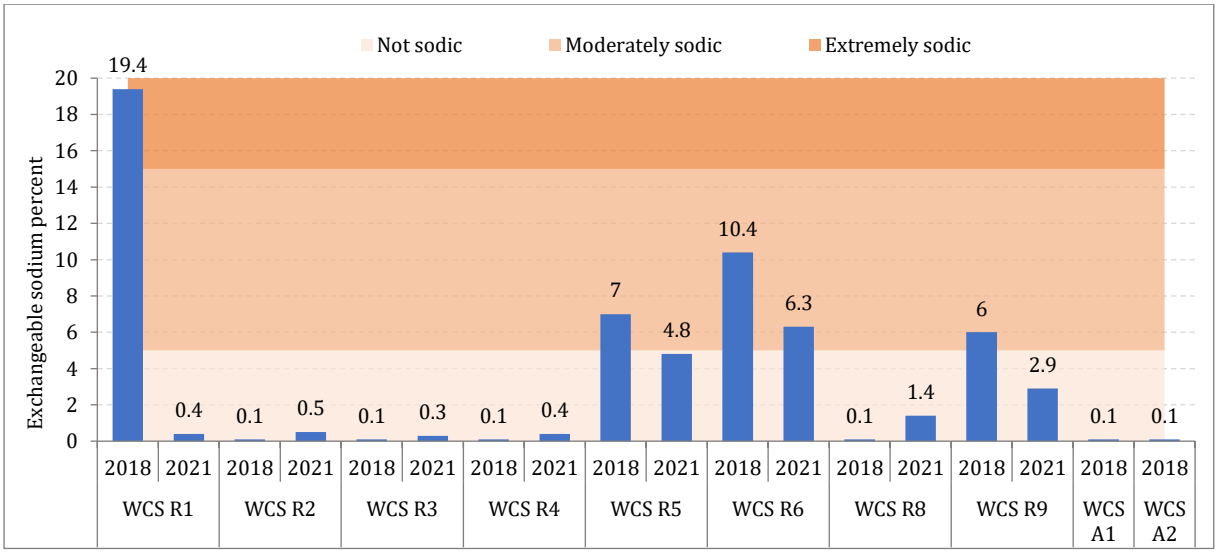
5.2.2.3 Soil sodicity

Consistently with the results obtained during the last round of sampling in 2018, soil sodicity levels (i.e. as expressed by exchangeable sodium percent **ESP**) remained variable across the rehabilitation areas and between the monitoring sites (**Graph 5**).

- ESP levels only showed minor seasonal variations at WCS R2, WCS R3, WCS R4 and WCS R8, which all remained non-sodic.
- WCS R1 experienced a significant drop in ESP from being extremely sodic in 2018 (19.4%) to very low sodicity in 2021 (0.4%).
- WCS R5, WCS R6 and WCS R9 all showed a moderate decrease in ESP readings. WCS R5 and WCS R9 went from being moderately sodic in 2018 to non-sodic (or only slightly sodic) levels in 2021. However, and despite a ~40% decrease in ESP, WCS remained moderately sodic in 2021 (6.3%).

These results indicate that soil sodicity levels may be a factor affecting vegetative performance across the REA rehabilitation (WCS R5 and WCS R5). High sodicity levels are generally associated with poor soil structure which can restrict root growth, and a propensity for surface crusting. This is potentially impacting on new species recruitment or establishment of ground cover vegetation at these locations.

Sodic soils can also be dispersive. However, soil and slope erosion did not appear to be an issue at the site with all rehabilitation areas being observed as generally stable and with no severe and active erosion processes. The locally sodic soils are therefore likely to slake, but unlikely to disperse.



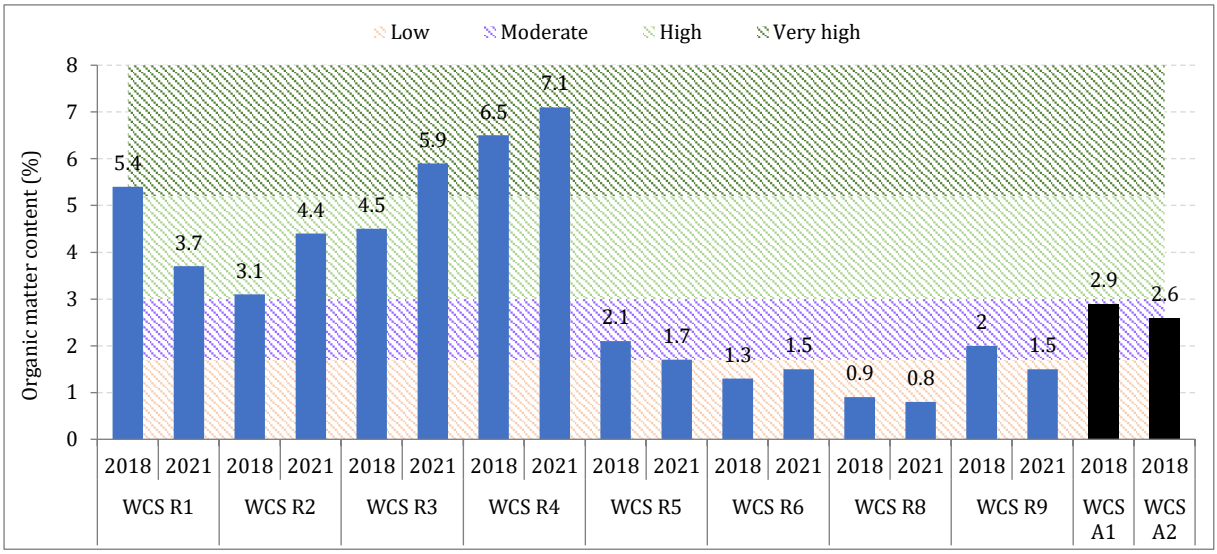
Graph 5 Soil sodicity levels (2018-2021)

5.2.2.4 Soil organic matter

Testing results for organic matter content are presented in **Graph 6**. The levels of organic matter in soils are a key indicator of soil structure stability, water holding capacity and overall soil fertility (through the storage of nutrients and food source for soil microbes).

The 2021 analyses results indicated that:

- Organic matter levels in older rehabilitation areas (WCS R1, WCS R2, WCS R3 and WCS R4) showed some variation from 2018 but remained consistently high to very high, reflecting the better-established nature of the vegetation and soil profiles in these areas (high levels of nutrient rich litter has been returned to the soil over time). Organic matter levels in these areas greatly exceed levels recorded at the analogue sites.
- Organic matter levels remained generally low across the REA and Lambert's Gully rehabilitation areas and below analogue sites levels, reflecting the younger age of the rehabilitation and lack of topsoil in these areas compared to the Cooks Dam and Access Road rehabilitation. Organic matter should however gradually keep increasing over time has communities further establish and litter is returned and accumulates on the ground.

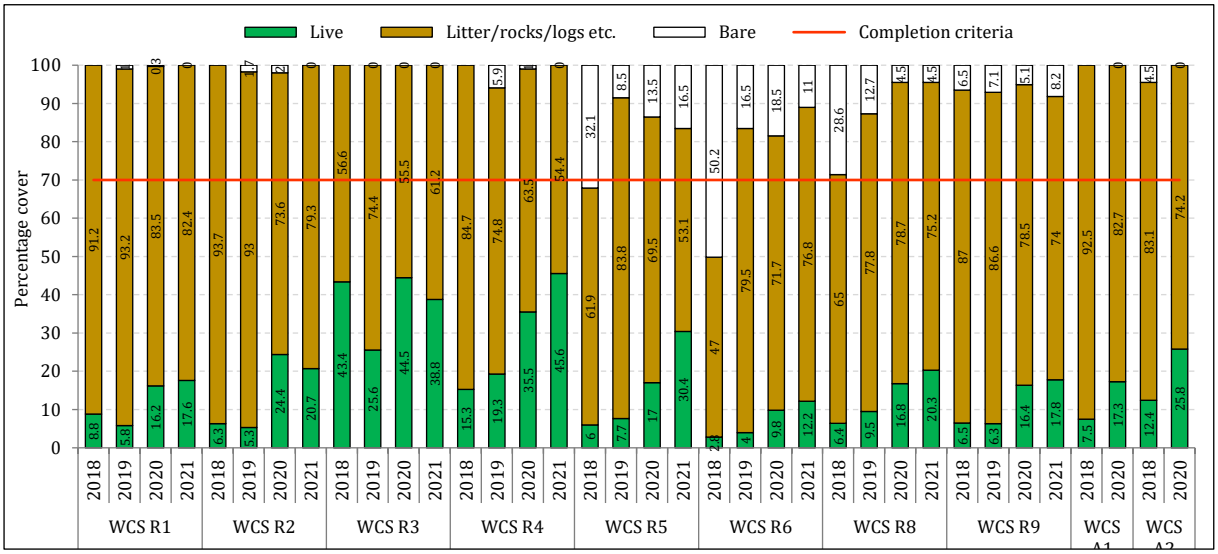


Graph 6 Soil organic matter content (2018-2021)

5.3 Ground Cover Protection

Trends in ground cover protection since 2018 are depicted in **Graph 7**, which shows that the 2021 results were generally consistent with those recorded last year. The 70% ground cover benchmark remained met at all locations for an overall satisfactory performance.

Influenced by the ongoing good conditions, live ground cover vegetation remained comparable to last year and ranged from 12.2% to 45.6% for an average of ~22.6% (compared to ~22.6% average live cover in 2020). Ground cover distribution (i.e. the relative proportions of live vs. litter cover) at the rehabilitation sites remained very similar to the analogue sites, where the live ground cover averaged ~21.5% when last assessed in 2020.



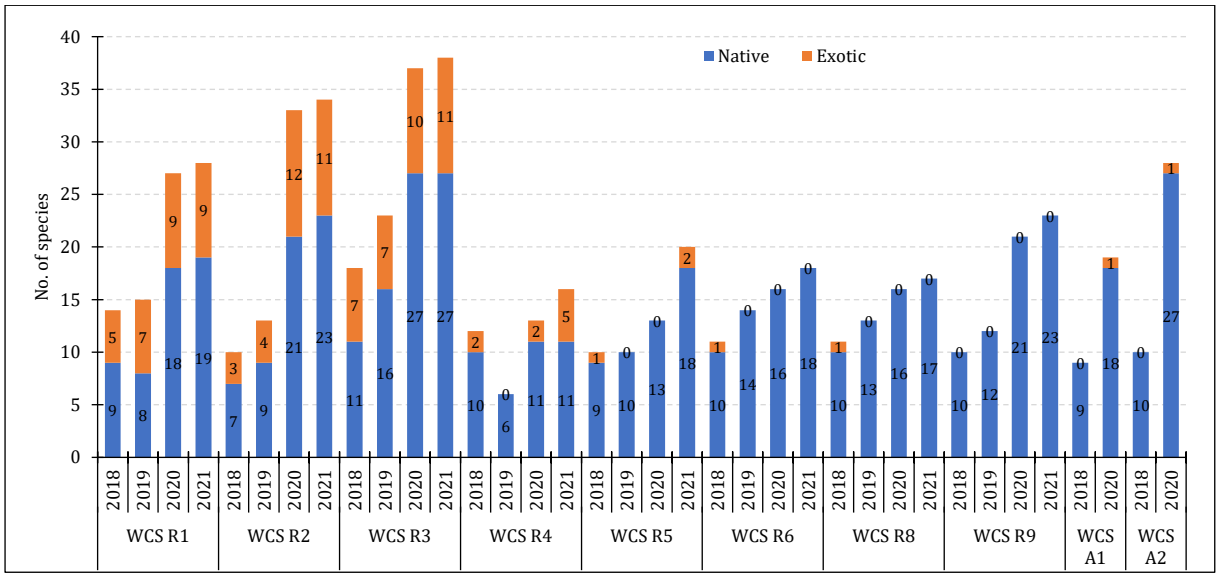
Graph 7 Ground cover protection monitoring results (2018-2021)

5.4 Floristics

The following sub-sections provide an overview of the floristic composition recorded at the monitoring sites. Detailed floristics monitoring results are included in **Appendix C** for further reference.

5.4.1 Ground Layer

Graph 8 demonstrates the annual variations and dynamics in ground cover species assemblages and abundance patterns.



Graph 8 Ground cover species diversity (2018-2021)

Total species richness increased slightly at all monitor sites in 2021, reflecting the ongoing good conditions of the past two years. Recorded total richness ranged between 16-38 species with an average of ~24.3 species per site, compared to an average of ~22.0 species per site (range 13-37 species) in 2020. These levels remained well above the biodiversity levels recorded during the peak of the drought in 2019 (range 6-23 species; average ~13.3 species per site).

Consistent with previous years, the ground layer in the older Cooks Dam and Access Road rehabilitation areas remained more diverse than in the REA and Lambert's Gully rehabilitation (average ~29.0 species/site vs. ~19.5 species/site, respectively.

Positively, average native species richness in the rehabilitation also slightly increased from ~17.9 species/site in 2020 to ~19.5 species/site in 2021, highlighting additional recruitment of native species. This continued to compare well with the native diversity recorded at the analogue sites in 2020 (~22.5 species/site), for an overall good vegetative performance in the ground layer.

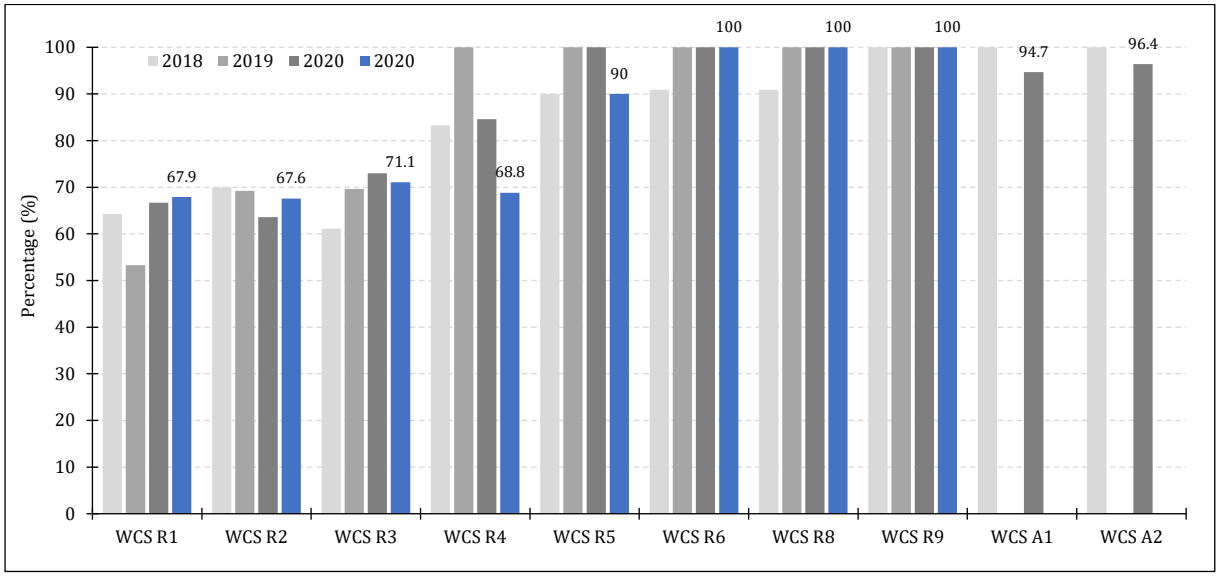
A total of 58 native ground covers were recorded across the rehabilitation in 2021 (comprising 13 grasses, 30 forbs, three twiners, one sedge, one fern and ten low shrubs), which was similar to the native ground biodiversity recorded in 2020 (also 58 species).

As presented in **Graph 9**, the proportion of native species varied very little from last year highlighting good stability in the established rehabilitated communities. Native species represented between 67.6% and 100.0% of the total species richness in the ground layer in 2021 (average of 85.0% for all sites), which compared positively to the average of ~95.5% native species proportion at the analogue sites.

Interestingly and as noted last year, the diversity of exotic species was distinctively lower REA and Lambert's Gully rehabilitation sites (97.5% average native ground cover, including three of four sites

recording no exotic species), whilst the older rehabilitation areas of Cooks Dam and the Access Road showed a lower proportion of natives (67.6-71.1%).

Consistent with previous years, local native grasses dominated the ground layer, particularly *Austrostipa rudis subpsp. nervosa* (Veined Speargrass), *Poa Sieberiana* (Snow Grass), and a range of *Rytidosperma spp.* (Wallaby Grasses). Commonly recorded forb species included *Gonocarpus tetragynus* (Common Raspwort), *Hypericum gramineum* (Small St John's Wart), *Oxalis spp*. (Wood Sorrels), *Stylidium graminifolium* (Grass Trigger-plant) or *Veronica calycina* (Hairy Speedwell); whilst the native sub-shrubs *Cassinia arcuata* (Sifton Bush) and *Dillwynia phylicoides* (Small-leaf Parrot-pea) were also common.



Graph 9 Proportion of native species in the ground layer (2018-2021)

5.4.2 Mid and Canopy Layers

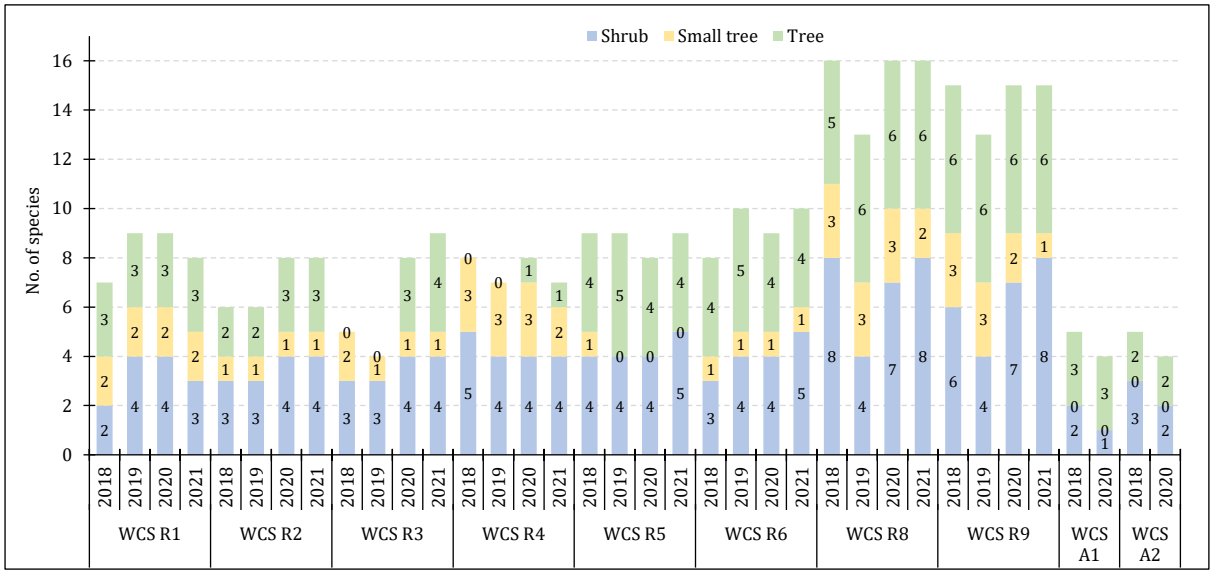
Graph 10 presents the mid and upper storey species diversity monitoring results (i.e. excluding sub-shrubs and woody priority weed species).

Not surprisingly considering the well-established stage of all rehabilitation areas (i.e all areas are at least 14 years old), minimal annual variations occur in shrub and tree diversity, and the 2021 results were generally consistent with the 2020 results (with some minor differences explained by dieback of shorter-lived shrubs species and others by revised species identifications).

Shrub and tree species diversity at the rehabilitation sites in 2021 was comprised between 7-16 species, with the Cooks Dam and Access Road rehabilitation (average ~8.0 species per site) typically less diverse tan the REA and Lambert's Gully areas (average ~12.5 species per site). In both cases, this however remained much higher than the shrub and tree diversity observed at the analogue sites (4 species recorded at both sites), reflecting the abundance of primary colonising and nutrient fixing species (particularly acacias) used in the revegetation program.

In total, 27 mid and upper storey species were recorded across the rehabilitation sites in 2021 (same as last year), comprising 13 shrubs, three small trees (large acacia trees) and eleven trees (eucalypts).

Overall and as reported in previous years, the mid-storey layer occurring in the rehabilitation generally does not resemble local native communities due to the abundance of acacias, but the latter are expected to recede over time assuming successful establishment and closing of a canopy layer. However, all eucalypt tree species establishing in the rehabilitation are local native species which naturally occur across the Central Tablelands, for a satisfactory performance in terms of tree layer composition.



Graph 10 Mid and upper storey species diversity (2018-2021)

5.5 Vegetation Structure and Function

5.5.1 Tree Stem Densities

Total eucalypt densities recorded at the analogue sites in 2020 ranged between approximately 935-2,000 stems/ha. However, these densities were highly influenced by the number of small regenerating seedlings which have germinated possibly in response to the 2020 rainfall (particularly at WCS A1). These seedlings are unlikely to develop as mature trees and are more an indication of a healthy and self-sustaining community (i.e. one with a high potential for self-regeneration following disturbance). Therefore, an acceptable and realistic benchmark range for the rehabilitation was defined by only considering established trees with diameter at breast height (**DBH**) >5cm (i.e. range 400-630 stems/ha), then applying the 'allowable' ±30% variance from the analogue range. The derived tree stem density benchmark range was comprised between 280-820 stems/ha.

However, and because the rehabilitation areas all remain at a relatively early stage of succession on ecological timescales (i.e. young vegetation communities compared to undisturbed native communities), tree stem counts at the rehabilitation monitoring sites included seedlings <5cm DBH (this also ensured that recently planted eucalypt tubestock were included in the stem count).

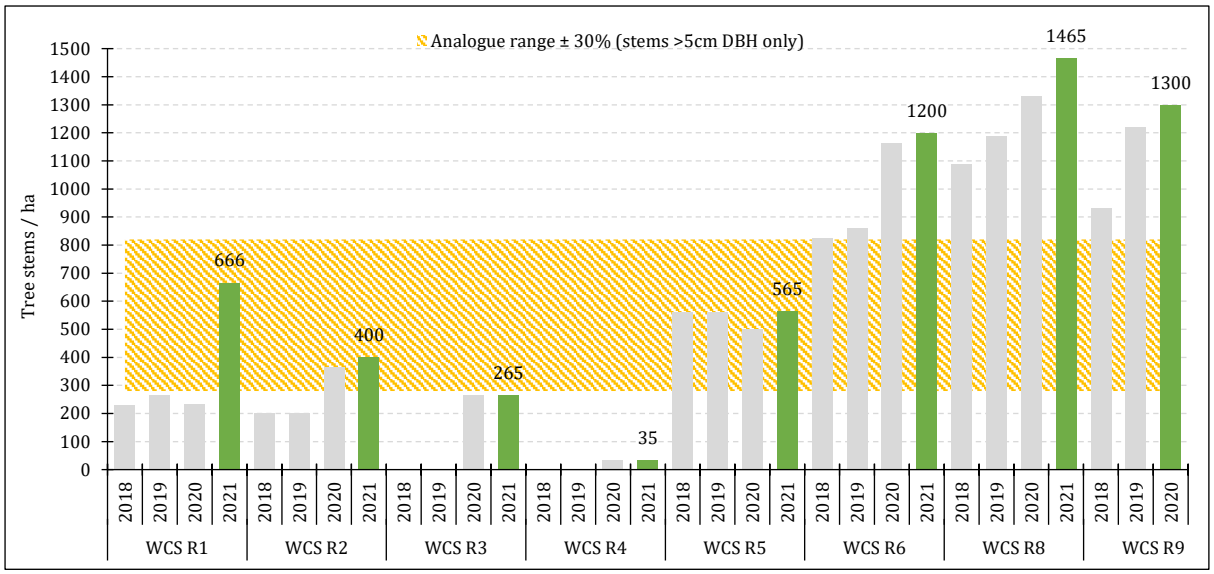
Using this approach, **Graph 11** shows that tree stem densities recorded in 2021 were within benchmark range at three of the eight rehabilitation monitoring sites (WCS R1, WCS R2 and WCS R5).

The increase in stem densities at WCS R1 was explained by additional tubestock being planted under the RIP between the 2020 and 2021 monitoring event (plantings were not fully completed at the time of the 2020 monitoring). Following the successful implementation of the RIP, both sites located in the Access Road rehabilitation (WCS R1 and WCS R2) now display satisfactory tree densities.

Tree densities remained below benchmark for both sites located in the Cooks Dam rehabilitation (WCS R3 and WCS R4). This is due to the RIP works not yet being completed and the monitoring sites occurring in areas yet to be treated. This should therefore increase in the coming years as RIP works are continued.

In contrast and consistent with previous years, eucalypt densities remained very high and exceeding target range at WCS R6, WCS R8 and WCS R9 (1,200-1,465 stems/ha). The slight increase recorded at these locations in 2021 was due to additional young (second generation) seedlings establishing and include in the tree count. For these locations the RIP recommended selective tree thinning to reduce

competition levels and improve tree growth habit and community structure. However, and mentioned in **Section 4.2**, this has not yet been implemented.



Graph 11 Tree (eucalypts) stem densities (2018-2021)

5.5.2 Community Structure

The 2021 monitoring results for key vegetation structure metrics are presented in **Table 7**. Rehabilitation performance for these parameters is assessed against the analogue sites range ±30%.

Foliage projective cover (**FPC**) in both the mid and canopy storey increased at most monitoring sites in 2021, highlighting continued shrub/tree foliage growth in response to the ongoing favourable conditions since early 2020.

The mid-storey across the rehabilitation remained moderately dense to dense (FPC range 14.0-44.0%, average ~26.9%) and compared poorly against the condition recorded at the analogue sites where the shrub layer is very sparse (FPC range 1.2-2.5%, average ~1.9%).

Canopy FPC increased and was within benchmark range at WCS R1 and WCS R2 in 2021, but remained below range at all other monitoring sites. At WCS R3 and WCS R4, the poor canopy scores (≤5.0% FPC) were due to the lack of trees and will likely take a long time to improve until tubestock eucalypts are planted and mature. Despite very high tree densities, canopy foliage score at WCS R8 remained very low and unchanged at ~2.0%. This is due to most trees at this location showing stunted and limited growth, and/or tree located within the sampling plot not directly intersecting the transect line. Finally, and despite remaining below target range, WCS R5, WCS R6 and WCS R9 all recorded an increase in canopy FPC score attributable to additional tree growth achieved at these locations.

Stem size class assessments indicated that additional tree growth occurred at most locations across the REA and Lambert's Gully rehabilitation since last year, highlighting continued growth in response to the good 2020/2021 rains. Community structure is slowly improving at these locations, with an increasing number of trees being recorded in the 10-14cm and 15-19cm DBH classes, which is encouraging as no RIP improvement works have yet been undertaken. If implemented, the RIP works should further speed up community structure development.

Minimum additional tree growth was recorded in the access road rehabilitation (WCS R1 and WCS R2). Established trees in these areas (except for the new tubestocks) were planted in the mid-90s and have achieved excellent growth, with mature individuals occurring in the larger DBH classes.

Overall, vegetation structure in the rehabilitation remains unlike the analogue sites where greater densities of large trees occur (**Table 7**). However, and as noted in previous reports, tree stem size is

recorded principally to allow an assessment of tree growth over time in the rehabilitation, and cannot be readily compared to analogue sites results having regards to the ecological timeframes required to achieve significant vegetation growth. It can be assumed that if satisfactory tree densities and tree health are maintained in the rehabilitation, and ongoing tree growth can be demonstrated, then community structure and complexity should naturally develop and improve over time.

Table 7 Vegetation structure monitoring results (2021)

Metric	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9	WCS A1	WCS A2
Vegetation layers height range (m)										
Mid-storey layer	1-6	1-7	1-4	1-5	1-3	1-4	1-5	1-5	1-3	0.5-1.5
Canopy layer	10-17	12-16	5-8*	6-9*	5-10	6-10	6-10	6-11	10-18	9-15
Foliage projective cover (%)										
Mid-storey layer	24.0	14.0	23.0	19.5	27.5	26.0	44.0	37.0	1.2	2.5
Trend 2020-21#	↑	↑	↑	→	↑	→	↑	↑	n/a	n/a
Canopy layer	26.0	29.0	1.0	5.0	20.5	15.0	2.0	11.5	33.0	31.0
Trend 2020-21#	↑	↑	→	→	↑	↑	→	↑	n/a	n/a
Eucalypt stem densities recorded in 10m x 30m plot per DBH class										
<5cm DBH	14	7	7	1	5	25	29	28	48	9
5-9cm DBH	2	2	0	0	4	6	10	7	3	4
10-14cm DBH	0	0	1	0	4	1	3	6	1	1
15-19cm DBH	0	0	0	0	3	4	2	1	1	4
20-29cm DBH	1	0	0	0	1	0	0	0	2	4
30-49cm DBH	3	2	0	0	0	0	0	0	4	3
>50cm DBH	0	1	0	0	0	0	0	0	1	3

* Canopy layer at WCS R3 and WCS R4 provided by large acacia trees, not eucalypts.
# Value change ≤2.0% in FPC scores defined as a stable trend.

5.5.3 Habitat Complexity

The 2021 monitoring results for habitat value metrics have been summarised in **Table 8**. Rehabilitation performance for these parameters is assessed against the analogue sites range ±30%.

Table 8 Habitat complexity monitoring results (2021)

Metric	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9	WCS A1	WCS A2
Total native species richness	27	29	36	16	26	27	31	37	22	31
Litter cover (%)	82.4	79.3	61.2	54.4	53.1	76.8	75.2	74.0	78.5	74.2
Shrub layer present	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Tree layer present	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Cumulative length of log (m)	0	4	0	0	0	2	0	0	30	20
No. hollow stems	0	0	0	0	0	0	0	0	4	8

Consistent with last year, total native species richness was satisfactory at all sites in 2021, indicating that the rehabilitation provides levels of diversity, food and foraging resources commensurate with local native ecosystems. Additionally, the satisfactory litter layer also provides habitat and resources particularly for invertebrates.

The tree layer present at most locations and the (usually thick) shrub layer across the rehabilitation provide potential shelter and refuge resources for local native fauna to utilise or move across the landscape.

Overall, the habitat value provided by the rehabilitation remains however limited compared to analogue areas as a function of a less developed community structure, and the absence of key ecological features such as logs, hollows, rocks, boulders, etc. However, this is a direct reflection of the young ecological age of the rehabilitated communities, and these habitat values only develop naturally over long ecological timeframes (100s years) if not artificially incorporated.

Some habitat improvement measures were included in the RIP to assist in habitat construction and improve vegetation structure and current habitat value of the rehabilitation, but none have been implemented to date.

5.5.4 Ecosystem Health and Resilience

Table 9 highlights the results of the 2021 vegetation health, reproduction and regeneration assessments, which were all generally consistent with last year's observations.

Table 9 Ecosystem health and resilience monitoring results (2021)

Metric	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9	WCS A1	WCS A2
Percent healthy trees	90.0	100.0	100.0	100.0	88.2	88.9	88.6	88.1	83.3	96.6
% shrubs and trees with reproductive structures	36.4	50.0	30.0	37.5	50.0	66.7	53.3	66.7	75.0	75.0
No. trees with seedlings	1	1	0	0	2	2	2	2	3	2
Regeneration status	Active	Active	Nil	Nil	Active	Active	Active	Active	Active	Active

Tree health assessed in 2021 at the monitoring sites was overall satisfactory and consistently met the MOP completion criteria of >70% healthy trees. Some dieback and evidence of water stress was however noted in few individuals in the broader areas, which were likely impacts from the 2016-2019 drought.

In total, between 30.0-66.7% of all shrub and tree species at the rehabilitation sites were recorded with evidence of reproductive structures (flowers, fruits) at the time of monitoring, highlighting the potential for the established communities to be able to self-regenerate and self-sustain.

Finally, active natural regeneration (i.e. presence of second-generation eucalypt seedlings) was recorded at all sites where eucalypts were present (i.e. all sites except across the Cooks Dam rehabilitation), including in younger REA and Lamberts Gully rehabilitation areas.

5.6 Weeds

A summary of weeds prevalence recorded in 2021 is presented in **Table 10,** including an indication of abundance trend from levels recorded in 2021 (a stable trend was defined for value changes ≤2%).

Consistently with last year, minimal to no weed cover was recorded at the monitoring sites in the REA or Lambert's Gully rehabilitation, for an excellent performance. Weed cover levels in the Cooks Dam and Access Road rehabilitation remained generally stable and low, and consistently <5.3% - i.e. well below the 15% MOP completion criteria.

Consistently with previous years, a total of four invasive and potentially problematic weed species were recorded in the Cooks Dam and Access Road rehabilitation in 2021, including *Eragrostis curvula* (African Lovegrass), *Hypericum perforatum* (St John's Wort), *Nassella trichotoma* (Serrated Tussock) and *Rubus fruiticosus* (Blackberry). Ongoing control of these species will be required to prevent their spread. Details on these species and suggested control mechanisms are provided in **Table 11**.

Table 10 Weeds diversity and prevalence (2021)

Metric	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9	WCS A1	WCS A2
Number of non-invasive exotics	9	8	9	4	2	0	0	0	1	1
Non-invasive exotics total cover (%)	2.3	2.8	4.9	0.3	0.2	0.0	0.0	0.0	0.1	0.1
Number of invasive weeds(1)	1	3	3	2	0	0	0	0	0	0
Invasive weeds total cover (%)	0.1	1.2	0.4	0.4	0	0	0	0	0	0
Total weed cover (%)	2.4	4.0	5.3	0.7	0.2	0.0	0.0	0.0	0.1	0.1
Trend 2019-20	→	→	↓	→	→	→	→	→	→	→

(1) Invasive weeds have been defined to include species listed as: priority weeds within the Central Tablelands local land services region (NSW WeedWise), Weeds of National Significance (WoNS), and/or High Threat Exotics (HTE) listed under NSW biodiversity legislation.

Table 11 Recorded invasive weed species at WCS and recommended control mechanisms

Species	Description	Control Mechanisms
African Lovegrass (HTE)	Hardy and drought-tolerant perennial grass establishing in clumps and with the potential to quickly colonise disturbed areas.	• Spray plants with a suitable registered herbicide in spring to summer, targeting new seedlings as much as possible before they are allowed to mature. Successive herbicide treatment may be required on mature plants.
Blackberry (HTE, Priority weed, WoNS)	Prickly scrambling shrub forming dense thickets and potentially spreading quickly. Dense thickets reduce native habitat for fauna and flora, represent a fire hazard and can harbour vermin. The plant is classified as a weed of national significance.	• Physical control is usually unsuccessful because the entire root system must be removed. • Spray the plants with suitable registered herbicide when plants are healthy and actively growing. Successive treatments will likely be required for well-established plants.
Serrated Tussock (HTE, Priority weed, WoNS)	Small tussock grass producing very large amount of seeds and with the potential to take over new areas very rapidly, including native vegetation where it can displace other natives. The plant is classified as a weed of national significance.	• Small isolated patches should be physically removed with a mattock, ensuring that the pulled plants and soil attached to roots are bagged and dispose of correctly. • Alternatively, spray the plants with a registered herbicide before seed production.
St John's Wort (HTE, Priority weed)	Herb or small shrub with bright yellow flowers, potentially poisonous to herbivore species.	• Spot spray with registered herbicide when the plants are actively growing, in early flower and before seed set (late spring/early summer). • Successive spraying treatment will likely be required to suppress the species. • Hand-weeding is not an effective way to control St John's wort as the entire root system must be removed to stop new plants from growing.

5.7 Animal Pests

Consistently with previous years, the presence of four species of animal pests was evidenced during the monitoring, including rabbits, goats, foxes and wild dogs.

- Rabbits in particular appeared abundant across the site and more particularly in younger rehabilitation areas, where they may have a detrimental impact on ground cover vegetation establishment and growth. Grazing impacts were evident in these areas (further compounded by macropods), although given the sparsity of ground vegetation these impacts were difficult to quantify.
- Impacts from goats on vegetation could not be clearly evidenced during the monitoring, however impacts can potentially become severe if population levels of the species increase.
- Foxes and wild dogs, although undesirable, are unlikely to influence rehabilitation establishment, though they may predate on local native fauna recolonising the rehabilitated areas. From this perspective the installation of supplementary habitat features throughout the rehabilitation (e.g. with logs, rocks, etc.) would provide additional refuge to ground dwelling native fauna and help mitigate predatory impacts.

Overall, given the likely low local population of feral goats and the absence of evident impacts to the rehabilitation, control of the species is considered unnecessary at present. However, rabbits are abundant and represent a more realistic threat to rehabilitation success. Rabbits are a declared noxious animal in NSW, and landholders are obliged to control rabbit populations on their land. A targeted control program should therefore be considered at the site, which should be developed and implemented in consultation with the Lithgow Local Land Services.

5.8 Recommendations

A comprehensive action plan was developed and detailed in the RIP (Koru, 2018) to improve the condition of the rehabilitation across the entire site. No additional issues other than those addressed in the RIP were identified during this 2021 monitoring event, therefore no additional recommendations are suggested.

6. Walkover Inspection

Findings and observations made during the 2021 walkover inspection are summarised in the dot point below. Note that comprehensive inspections of all rehabilitation across WCS were implemented in 2018 and 2019, and included additional findings which can be referred to in relevant reports (Koru 2018, 2019, 2020).

- **Erosion** – All inspected areas were assessed as stable with no evidence of active erosion processes or impacts recorded.
- **Drainage** – No drainage issues recorded in 2021. All inspected areas appeared free draining with no evidence of ponding, slumping or waterlogging.
- **Vegetation establishment** – vegetation establishment across the REA and Lambert's Gully rehabilitation generally remained consistent with the condition reported in the RIP, and is slowly improving in terms of tree growth and ground cover establishment. Vegetation establishment across the older Cooks Dam and access road rehabilitation areas remained satisfactory, and RIP improvement works have started to further improve community structure and composition in these areas.
- **Vegetation health** – Vegetation health condition was overall satisfactory throughout. However, tree dieback was observed as impacting some individuals across the REA and Lambert's Gully rehabilitation (see **Photo 5**), which may be linked to water and heat stress during the 2016-2019 drought. Tree health and continued growth will need to be closely monitored in these areas in the future.
- **Weeds** – the prevalence of invasive species across the Access Road and Cooks Dam rehabilitation was overall assessed as increased during 2021, including African Lovegrass (**Photo 6**), Blackberry (**Photo 7**), Serrated Tussock (**Photo 8**) and St John's Wart (**Photo 9**). Increased targeted effort is recommended to control these species.
- **Predation and herbivory** – Although their impact is difficult to quantify, rabbits' populations remain high across the site, and a targeted control program may need to be investigated.

Photo 6 Example of drought-impacted tree in Lambert's Gully rehabilitation

Photo 7 African Lovegrass patch in older access road/Cooks Dam rehabilitation

Photo 8 Blackberry establishing in older access road/Cooks Dam rehabilitation

Photo 9 Serrated Tussock in area of recently established tubestocks in access road/Cooks Dam rehabilitation

Photo 10 St John's Wart in older access road/Cooks Dam rehabilitation

7. Progress Against Completion Criteria

Based on the 2021 rehabilitation monitoring results as presented and discussed in previous sections, a high-level assessment of rehabilitation progress against the relevant completion criteria defined in the MOP (2018-2024) is presented in **Table 12**.

The assessment was undertaken for each rehabilitation area, and was based on the average values/results from the monitoring sites located together with the observations made during the walkover inspection.

Table 12 Rehabilitation progress against completion criteria in the MOP (2018-2024)

Completion criteria	Rehabilitation progress	Compliance status 2021			
		Cooks Dam	Access Road	REA	Lambert's Gully
Landform					
Landform is stable with no evidence of uncontrolled erosion	Satisfactory landform stability has been achieved across all rehabilitation areas, with no recorded evidence of active erosion processes or severe impacts	Yes	Yes	Yes	Yes
Slopes are generally less than 18% and no more than 25%	Except for localised exceptions (particularly along the lower contours of the 2008 Lambert's Gully rehabilitation where higher gradients had to be established to build the landform), established slopes are generally less than 25% across the rehabilitation. Slope as measured at the monitoring sites comprised between 9-25%.	Yes	Yes	Yes	Yes
Growing media					
Soil analysis undertaken to determine potential constraints	Soil sampling and analysis is undertaken on a three-yearly basis as part of the rehabilitation monitoring program. All monitoring sites were sampled in 2021 for soil characterisation. Testing results showed that all key parameters regulating plant establishment and growth were generally within acceptable values, with no key constraints identified that could prevent successful rehabilitation establishment.	Yes	Yes	Yes	Yes
Topsoil or alternative spread at depth of at least 50mm	Areas of older rehabilitation (Cooks Dam and access road) were dressed with adequate amount of topsoil (~100mm). However, topsoil application was minimal and uneven across the REA and Lambert's Gully rehabilitation (<50mm) and the little topsoil used was mixed and diluted in overburden/capping material. Growth medium improvement measures were defined in the RIP for these areas in the form of successive hydro mulching campaigns, but have not yet been implemented.	Yes	Yes	No	No
Ecosystem establishment and sustainability					
Minimum of 70% protective ground cover	Protective ground cover was satisfactory at all locations in 2021, comprised between 83.5-100%. Ground cover largely dominated by litter cover with low to moderate levels of live vegetative cover, but consistent with condition observed at analogue sites.	Yes	Yes	Yes	Yes
No bare areas >200m^2	Vegetation establishment and ground cover protection excellent across the Cooks Dam and access Road rehabilitation areas. Vegetation and ground cover establishment were assessed as slowly improving across the REA and Lambert's Gully rehabilitation, however several continuous bare areas >200m^2 remain. Ground cover improvement measures were defined in the RIP for these areas in the form of successive hydro-mulching/seeding campaigns, but have not yet been implemented.	Yes	Yes	No	No

Completion criteria	Rehabilitation progress	Compliance status 2021			
		Cooks Dam	Access Road	REA	Lambert's Gully
Weed cover <15%	Weed diversity remained moderately high at the Cooks Dam and Access Road rehabilitation monitoring sites, but cumulative weed cover levels remained low and consistently <6% at all locations. Pro-active weed control is nonetheless recommended to minimise the risk of spread of occurring invasive weed species. Negligible weed diversity and weed cover continue to occur across the REA and Lambert's Gully rehabilitation.	Yes	Yes	Yes	Yes
Evidence of nutrient cycling (i.e. presence of litter, cryptograms, etc.)	Active nutrient cycling was evidenced at all monitored locations, including high levels of organic litter cover, abundance of nutrient fixing shrub species (acacias) and presence of cryptograms on the soil surface particularly in older rehabilitation areas.	Yes	Yes	Yes	Yes
Establishing species are consistent with a woodland community	In most rehabilitation areas a range of ground covers, shrubs and canopy eucalypts occur. Although cover levels or vegetation structure are often still developing (as a function of the young ecological age of the rehabilitated communities), the establishing species are generally consistent with local native communities. One exception is for the Cooks Dam rehabilitation where a tree layer is lacking, however improvement works under the RIP have started in this area to establish eucalypts. All planted eucalypt tubestocks consist of local species naturally occurring in the Central Tablelands. Currently, the thick shrub layer generally occurring in the rehabilitation is uncharacteristic of local native communities as observed at the analogue sites, however it is expected that shrub abundance should naturally receded with time as the tree layer further establishes and the canopy closes out.	Trending	Trending	Trending	Trending
>70% of trees are healthy and growing	Despite some residual drought-related impacts noted on some tree individuals; tree health was overall satisfactory with ≥88% of trees assessed as healthy at the monitoring sites. Tree growth also evidenced at many locations (increased girth and/or height), promoted by good rainfall received in the past two years	Yes	Yes	Yes	Yes
Dominant species aligned with those in local native communities	Although the rehabilitated communities do not perfectly align with a specific native community profile, in all vegetation layers the dominant species comprise local native species naturally occurring in the Central Tablelands region.	Yes	Yes	Yes	Yes
Presence of a range of structural habitats (eucalypts, shrubs, ground cover, developing litter layer)	With the exception of the Cooks Dam rehabilitation where the tree layer is not yet established (tree were planted in 2020 but remain at seedling growth stage), a range of structural habitat occurred in most areas including eucalypts, shrubs, ground covers and litter.	Trending	Yes	Yes	Yes
Other habitat features incorporated into rehabilitation areas (large rocks, logs, etc).	Artificial habitat features have not been incorporated throughout the rehabilitation.	No	No	No	No

8. References

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APPENDIX A

LONG-TERM PHOTOGRAPHIC MONITORING RECORD

WCS R1 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R2 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R3 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

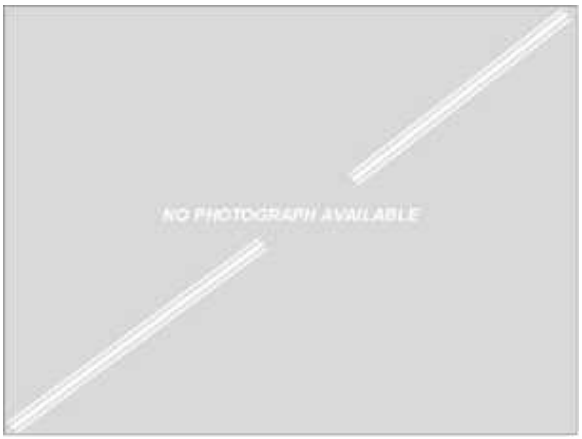
WCS R4 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R5 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R6 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R8 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS R9 (2018-2021)

	View from start of transect	View from end of transect
2018		
2019		
2020		
2021		

WCS A1 (2018-2020)

	View from start of transect	View from end of transect
2018		
2020		

WCS A2 (2018-2020)

	View from start of transect	View from end of transect
2018		
2020		

APPENDIX B

LABORATORY SOIL TESTING REPORT 2021

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2143082**	Page	: 1 of 6
Client	: **SPRINGVALE COAL PTY. LTD.**	Laboratory	: Environmental Division Sydney
Contact	: Mr Matthieu Catteau	Contact	: Customer Services ES
Address	: PO Box 189 WALLERAWANG NSW 2845	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: P2021-007: REHAB MONITORING 2021	Date Samples Received	: 26-Nov-2021 14:27
Order number	: ----	Date Analysis Commenced	: 29-Nov-2021
C-O-C number	: ----	Issue Date	: 09-Dec-2021 17:28
Sampler	: Matthieu Catteau		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5
			Sampling date / time	22-Nov-2021 00:00	23-Nov-2021 00:00	24-Nov-2021 00:00	24-Nov-2021 00:00	23-Nov-2021 00:00
Compound	CAS Number	LOR	Unit	ES2143082-001	ES2143082-002	ES2143082-003	ES2143082-004	ES2143082-005
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	6.4	7.1	5.6	4.9	4.3
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.3	6.9	6.0	5.4	5.5
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	60	64	25	31	12
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.5	14.1	21.7	18.7	14.2
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	8.5	8.7	7.5	8.4	1.3
Exchangeable Magnesium	----	0.1	meq/100g	1.9	2.2	2.0	2.6	1.0
Exchangeable Potassium	----	0.1	meq/100g	0.4	0.5	0.6	0.6	0.3
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	0.1
Cation Exchange Capacity	----	0.1	meq/100g	10.9	11.5	10.2	11.7	2.9
Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Exchangeable Sodium Percent	----	0.1	%	0.4	0.5	0.3	0.4	4.8
Calcium/Magnesium Ratio	----	0.1	-	4.5	4.0	3.8	3.2	1.3
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	100	mg/kg	415	475	642	755	315
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	<10	<10	<10	<10
ED092: DTPA Extractable Metals								
ø Copper	7440-50-8	1.00	mg/kg	<1.00	1.38	1.49	1.45	<1.00
ø Iron	7439-89-6	1.00	mg/kg	20.9	33.1	70.5	92.3	64.0
ø Manganese	7439-96-5	1.00	mg/kg	5.51	6.75	56.1	36.2	35.8
ø Zinc	7440-66-6	1.00	mg/kg	2.88	5.70	6.11	8.04	1.06
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	<20	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	2.1	1.7	3.8	5.7	0.1
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	2.2	1.7	3.8	5.7	0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5
			Sampling date / time	22-Nov-2021 00:00	23-Nov-2021 00:00	24-Nov-2021 00:00	24-Nov-2021 00:00	23-Nov-2021 00:00
Compound	CAS Number	LOR	Unit	ES2143082-001	ES2143082-002	ES2143082-003	ES2143082-004	ES2143082-005
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	1470	1480	1760	4450	780
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	1470	1480	1760	4460	780
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	113	142	160	177	121
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	5	<5	<5
EP004: Organic Matter								
Organic Matter	----	0.5	%	3.7	4.4	5.9	7.1	1.7
Total Organic Carbon	----	0.5	%	2.2	2.6	3.4	4.1	1.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	WCS R6	WCS R8	WCS R9	----	----
			Sampling date / time	23-Nov-2021 00:00	23-Nov-2021 00:00	23-Nov-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2143082-006	ES2143082-007	ES2143082-008	--------	--------
				Result	Result	Result	----	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**4.4**	**4.3**	**4.3**	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.2**	**5.4**	**5.2**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**19**	**8**	**18**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**10.0**	**13.4**	**13.8**	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**0.6**	**0.6**	**0.8**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**0.6**	**1.5**	**1.2**	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.3**	**0.3**	**0.4**	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.1**	<0.1	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**1.7**	**2.4**	**2.5**	----	----
Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	<0.1	----	----
Exchangeable Sodium Percent	----	0.1	%	**6.3**	**1.4**	**2.9**	----	----
Calcium/Magnesium Ratio	----	0.1	-	**1.0**	**0.4**	**0.7**	----	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	100	mg/kg	**325**	**310**	**350**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	<10	**10**	----	----
ED092: DTPA Extractable Metals								
ø Copper	7440-50-8	1.00	mg/kg	<1.00	<1.00	**1.22**	----	----
ø Iron	7439-89-6	1.00	mg/kg	**88.2**	**1.36**	**48.5**	----	----
ø Manganese	7439-96-5	1.00	mg/kg	**18.4**	<1.00	**15.1**	----	----
ø Zinc	7440-66-6	1.00	mg/kg	**1.06**	<1.00	**1.90**	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	<20	<20	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	**0.1**	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	**0.2**	**0.2**	**0.3**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	**0.2**	**0.2**	**0.4**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	WCS R6	WCS R8	WCS R9	----	----
			Sampling date / time	23-Nov-2021 00:00	23-Nov-2021 00:00	23-Nov-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2143082-006	ES2143082-007	ES2143082-008	--------	--------
				Result	Result	Result	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	**520**	**590**	**320**	**----**	**----**
EK062: Total Nitrogen as N (TKN + NOx)								
^ **Total Nitrogen as N**	----	20	mg/kg	**520**	**590**	**320**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	**103**	**70**	**88**	**----**	**----**
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	**----**	**----**
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.5**	**0.8**	**1.5**	**----**	**----**
Total Organic Carbon	----	0.5	%	**0.8**	<0.5	**0.9**	**----**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EK080: Bicarbonate Extractable Phosphorus (Colwell)

(SOIL) ED021: Bicarbonate Extractable Potassium (Colwell)

(SOIL) ED092: DTPA Extractable Metals

APPENDIX C

FLORISTICS MONITORING RESULTS 2021

Key:

- Numeric values indicate the species was recorded and measured during the ground cover assessments, the value representing the average FPC for the species.
- 'x' indicates the species was recorded in the sampling area during the mid and upper storey assessments.

Species	Common name	Type	Life from	WCS R1	WCS R2	WCS R3	WCS R4	WCS R5	WCS R6	WCS R8	WCS R9
Acacia baileyana	Cootamundra Wattle	Small tree	Exotic			x	x				
Acacia buxifolia subsp. buxifolia	Box-leaf Wattle	Shrub	Native							x	
Acacia dealbata	Silver Wattle	Small tree	Native	x	x	x	x		x	x	
Acacia deanii	Green Wattle	Shrub	Native					x	x		
Acacia decurrens	Black Wattle	Small tree	Native	x			x			x	x
Acacia rubida	Red-stemmed Wattle	Shrub	Native	x	x	x	x	x	x	x	x
Acacia filicifolia	Fern Wattle	Shrub	Native							x	x
Acaena novae-zelandiae	Bidgee-widgee	Forb	Native		0.1	0.4					
Allocasuarina gymnanthera	Mallee She-oak	Shrub	Native							x	x
Anthosachne scabra	Common Wheatgrass	Grass	Native		0.1	0.5					
Aristida jerichoensis	Jericho Wiregrass	Grass	Native	0.2		0.5				0.1	0.6
Austrostipa rudis subsp. nervosa	Veined Speargrass	Grass	Native		1	0.5	22.8	17	0.8	0.1	
Bossiaea buxifolia	Matted bossiaea	Sub-shrub	Native			0.1		x			0.1
Brachyloma daphnoides	Daphne Heath	Shrub	Native								x
Callistemum ?linearis	Narrow-leaved Bottlebrush	Shrub	Native							x	x
Cassinia aculeata	Dogwood	Shrub	Native				x				
Cassinia arcuata	Sifton Bush	Shrub	Native	1.9	1.6	1.5	1.8	6.6	2	0.2	0.8
Cassinia spp.		Shrub	Native			x					
Centaurium erythraea	Common Centaury	Forb	Exotic	0.4	0.2	0.5		0.1			
Cheilanthes sieberi subsp. sieberi	Poison Rock Fern	Fern	Native	0.1							
Cirsium vulgare	Spear Thistle	Forb	Exotic		0.3	0.1					
Conyza spp.	Fleabane	Forb	Exotic	0.1	0.3		0.1				
Cynoglossum australe	Australian Hound's-tongue	Forb	Native		0.1						
Dactylis glomerata	Cocksfoot	Grass	Exotic	0.2	0.2	0.9	0.1				
Dichelachne inaequiglumis	Plumegrass	Grass	Native					0.2	0.1	0.1	
Dichondra repens	Kidney Weed	Forb	Native			0.1		0.1			
Dillwynia phylicoides	Small-leaf Parrot-pea	Shrub	Native	x	0.1	x	0.2	0.2	0.7	0.2	0.7
Eragrostis curvula	African Lovegrass	Grass	Priority weed			0.1					
Eucalyptus aggregata	Black Gum	Tree	Native	x	x						
Eucalyptus dives	Broad-leaved Peppermint	Tree	Native			x	x			x	
Eucalyptus macrorhyncha	Red Stringybark	Tree	Native					x	x	x	x
Eucalyptus mannifera	Brittle Gum	Tree	Native	x						x	x

Eucalyptus pauciflora	Snow Gum	Tree	Native			x		x	x	x	x
Eucalyptus punctata	Grey Gum	Tree	Native					x			
Eucalyptus racemosa	Narrow-leaved Scribbly Gum	Tree	Native					x	x	x	x
Eucalyptus rubida	Candlebark	Tree	Native	x	x	x					x
Eucalyptus stellulata	Black Sally	Tree	Native						x		
Eucalyptus viminalis	Ribbon Gum	Tree	Native		x	x				x	x
Euchiton japonicus	Creeping Cudweed	Forb	Native			0.2					
Euchiton sphaericus	Star Cudweed	Forb	Native	0.1	0.1						
Gamochaeta americana	Cudweed	Forb	Exotic	0.2							
Geranium solanderi	Native Geranium	Forb	Native		0.1	0.3					
Glycine microphylla	Small-leaf Glycine	Forb	Native				0.1				
Glycine tabacina	Variable Glycine	Vine	Native		0.1		0.1				
Gompholobium huegelii	Paele Wedge Pea	Sub-shrub	Native	0.8					x		x
Gonocarpus tetragynus	Common Raspwort	Forb	Native		0.3	0.1		0.6	0.3	0.3	0.4
Goodenia bellidifolia	Daisy Goodenia	Forb	Native						0.1		
Goodenia hederacea	Forest Goodenia	Forb	Native								0.6
Haloragis heterophylla	Rough Raspwort	Forb	Native		0.2						
Hardenbergia violacea	Purple Coral Pea	Vine	Native					0.1			0.1
Hibbertia obtusifolia	Hoary guinea flower	Sub-shrub	Native			x					0.1
Hovea heterophylla	Common Hovea	Forb	Native			0.1					
Hydrocotyle laxiflora	Stinking Pennywort	Forb	Native		0.1	0.1					
Hypericum gramineum	Small St. John's Wort	Forb	Native	0.1				0.1	0.1		0.1
Hypericum perforatum	St John's-wort	Forb	Priority weed		0.1	0.1	0.1				
Hypochaeris glabra	Smooth Catsear	Forb	Exotic	0.8							
Hypochaeris radicata	Catsear	Forb	Exotic		0.6	2.8		0.1			
Laxmannia gracilis	Slender Wire Lily	Forb	Native							0.1	
Leptospermum polygalifolium	Tantoon	Shrub	Native					x	x	12	x
Linum trigynum	French flax	Forb	Exotic	0.1							
Lissanthe strigosa	Peach Heath	Shrub	Native		x						
Lomandra confertifolia	Mat-rush	Forb	Native			0.1				0.1	
Lomandra glauca	Pale Mat-rush	Forb	Native			0.1		0.6			
Lomandra filiformis	Wattle Mat-rush	Forb	Native			0.1					
Lysimachia arvensis	Scarlet Pimpernel	Forb	Exotic	0.1	0.1	0.3	0.1				
Microlaena stipoides var. stipoides	Weeping Grass	Grass	Native	0.1	1.3	2.1	0.4	2.2	2.4	1	0.6
Mirbelia platylobioides	Large-flowered Mirbelia	Vine	Native						0.2		0.2
Monotoca scoparia	Prickly Broom Heath	Shrub	Native								0.2
Nassella trichotoma	Serrated Tussock	Grass	Priority weed		1						
Opercularia diphylla	A Stinkweed	Forb	Native							0.1	0.1
Oxalis perennans	Grassland Wood-sorrel	Forb	Native	0.2	0.1	0.1					
Oxalis exilis	Shady Wood-sorrel	Forb	Native	0.7	1.1	1.5	0.8	0.2			0.1
Patersonia sericea	Purple Flag	Forb	Native						0.3		4.5

Plantago lanceolata	Ribwort Plantain	Forb	Exotic			0.1					
Platysace ericoides	Heath Platysace	Sub-shrub	Native	5.2							
Poa labillardierei var. labillardierei	Tussock Grass	Grass	Native			0.3					
Poa sieberiana	Snow Grass	Grass	Native		1	0.4	0.2	0.1	0.8	0.5	5
Poranthera microphylla	Small Poranthera	Forb	Native						0.1	0.1	1.4
Pultenaea subspicata	Low Bush-pea	Sub-shrub	Native	x	0.1			0.2	0.4	x	0.5
Rubus fruiticosus	Blackberry	Shrub	Priority weed	0.1	0.1	0.3	0.3				
Rubus rosifolius	Native Raspberry	Sub-shrub	Native			0.1					
Rytidosperma longifolium	Long-leaved Wallaby Grass	Grass	Native	3			1.1			0.2	
Rytidosperma monticola	Small-flowered Wallaby Grass	Grass	Native	1.5	2			1.3	1.9	2.5	
Rytidosperma pallidum	Redanther Wallaby Grass	Grass	Native	0.5		0.5		0.3			1
Rytidosperma racemosum	Clustered Wallaby Grass	Grass	Native		6.4	21	17		0.7		
Rytidosperma spp.	A Wallaby Grass	Grass	Native			1.7					
Schoenus apogon	Common Bog-rush	Sedge	Native	0.1	0.1	0.4		0.1	0.4	1.7	0.1
Senecio diaschides	Erect Groundsel	Forb	Native		0.3	0.2			0.1		
Senecio quadridentatus	Cotton Fireweed	Forb	Native	0.1	0.1						
Sonchus asper	Prickly Sowthistle	Forb	Exotic			0.1					
Sonchus oleraceus	Common Sowthistle	Forb	Exotic		0.1						
Stylidium graminifolium	Grass Trigger-plant	Forb	Native						0.8	1	0.4
Themeda triandra	Kangaroo Grass	Grass	Native	0.2				0.2			0.1
Trifolium dubium	Yellow Suckling Clover	Forb	Exotic			0.1					
Trifolium glomeratum	Clustered Clover	Forb	Exotic	0.2							
Veronica calycina	Hairy Speedwell	Forb	Native	0.2	0.3	0.4	0.4	0.1			
Vittadinia muelleri	Narrow-leaf New Holland Daisy	Forb	Native	0.1							
Vulpia bromoides	Squirrel Tail Fescue	Grass	Exotic	0.2	1						
Wahlenbergia gracilis	Sprawling Bluebell	Forb	Native								0.1
Wahlenbergia stricta subsp. stricta	Tall Bluebell	Forb	Native	0.1							

KORU ENVIRONMENTAL

END OF REPORT

Appendix 10:
2018 Independent Audit

Management Plan Recommendation
Compliant
Not Verified
Non-compliant

Table 9A-1 Independent Environmental Audit Recommendations 2018

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
Management Plans					
Consultation	REC-2018-93	Follow up with Forestry Corporation NSW on the land swap on CCL-733 and required Forestry Permits to ensure these are in place where required.	The land swap agreement is in its final stages with the possibility of Native Title on the Neubeck portion of the swap (Lot 64 DP751636) under assessment. The land portion in question (Part Lot 502 DP825541), which is affected by the southern tip of co-disposal area, does not have any Native Title issues. Parties agreed not to pursue an Occupation Permit for Lot 502 as FCNSW are comfortable with the fact the Land Swap was progressing. As far as the Neubeck block is concerned, we have no reason to apply for an Occupation Permit as we do not have any infrastructure on there.	This is an ongoing process that started in 2012. The decision rests with the Crown Solicitors Office at present.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
EMS	REC-2018-01	Update the Environmental Management Strategy to include figures that show all current environmental monitoring locations (e.g. TEOM and dust gauges).	The approved EMS figures now show all environmental monitoring locations.	Completed	N/A
EMS	REC-2018-02	Update the Environmental Management Strategy to include current environmental management plans approved for the site.	The approved EMS includes all environmental management plans associated with SCSO	Completed	N/A
EMS	REC-2018-03	Update the Environmental Management Strategy with copies of the current EPLs for 3607 and 467.	EPL 467 is now wholly managed by Centennial Angus Place Colliery, therefore a copy is not included in the approved EMS.	Completed	N/A
EMS	REC-2018-04	Update the Environmental Management Strategy - Appendix 4 – to replace the 2012 version of the Centennial Environment and Community Policy with the current policy as available on the Centennial website.	The approved EMS includes the current Centennial Environment and Community Policy.	Completed	N/A
Management Plans	REC-2018-05	Ensure all management plans include document control that identifies the revision number, when the plans had been updated and a summary of what was changed or reason for the update.	All management plan reviews now include document control.	Completed	N/A
Management Plans	REC-2018-06	Investigate the management plan review timeframes for the Western Region plans as outlined in the different project approvals for all the relevant sites. Identify	CEY has dedicated approvals team who has established joint workflow process with DPE for all CEY Management Plan Revision and	Completed – Ongoing Annual process	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		efficiencies and develop a plan for meeting timeframes within all project approvals.	submissions. WCS is included in this process.		
Noise MP	REC-2018-07	Consider including the same monitoring locations in the monthly monitoring program as the 6 monthly Noise Reduction Study monitoring program required by Condition 8A, Schedule 3.	Monitoring points have been reviewed and reconciled in approved 2018 WRNMP.	Completed	N/A
Air quality MP	REC-2018-91	Review and consider whether the current number of dust gauges monitored provides an adequate understanding of the dust risk profile at the site.	Dust gauge monitoring network was reviewed for adequacy during 2015 by GHD in the *Centennial Western Region Environmental Monitoring Rationalisation, Review and Recommendations (GHD 2015).* Operations at WCS have not changed significantly during this time in relation to the creation of dust. Mitigation measures have been managed on site as per the WRAQGGMP.	Completed	N/A
Heritage MP	REC-2018-08	Update the WRACHMP to include the new site BF JN 1 identified during the RPS due diligence survey in May 2017.	WRACHMP updated to include site reference 45-1-2795.	Completed	N/A
PIRMP	REC-2018-09	Update the Plans / Figures appended to the PIRMP to clearly and legibly show the location of potential pollutants on the premises. Ensure the cross referencing of Figures correlates with those included in the PIRMP.	The approved PIRMP figures show the location of potential pollutants on site when cross referenced with Tables in Section 5.	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
PIRMP	REC-2018-10	Update the PIRMP to reflect roles and responsibilities.	Roles and responsibilities for SCSO staff have been tabulated in the approved PIRMP.	Completed	N/A
PIRMP	REC-2018-11	Upload the 2018 PIRMP to the Springvale Coal Services website.	The approved PIRMP is published.	Completed	N/A
PIRMP	REC-2018-12	Ensure the PIRMP lists all EPLs relevant to the site.	EPL 5129 and EPL 21229 have been listed in the approved PIRMP.	Completed	N/A
PIRMP	REC-2018-13	Ensure a pollution risk assessment is attached to the PIRMP that addresses the requirement of Condition 98C(1)(c).	A risk assessment is included in the appendices for both LS and WCS. The risk assessment was produced in collaboration with GHD in 2017 and revised in 2019 and reviewed for currency in 2020.	Completed	N/A
Site Observations	REC-2018-14	Carry out maintenance of coal spillage under conveyors and review (and address if required) the adequacy of erosion and sediment controls on steep sections along the conveyor.	Inspection and Maintenance of Coal Transport System is undertaken in a systematic manner across WCS to identify and address spillage. Inspection and Maintenance of ESC structures at WCS undertaken in a systematic manner across the operations.	Completed - Ongoing operational requirement	N/A
Site Observations	REC-2018-15	Undertake maintenance along conveyor OL1 to remove coal fines on rollers and spillage under the conveyor.	Inspection and Maintenance of Coal Transport System s undertaken in a systematic manner across WCS to identify and address spillage. Inspection and Maintenance of ESC structures at WCS undertaken in a systematic manner across the operations.	Completed - Ongoing operational requirement	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
Site Observations	REC-2018-16	Inspect and maintain sediment controls at Kerosene Vale Stockpile Site, including desilting drainage structures.	Inspection and Maintenance of ESC structures at WCS undertaken in a systematic manner across the operations. A targeted maintenance project was undertaken in December 2018 for Kerosene Vale Stockpile Site and LDP003 to remove sediment build up, improve controls for drainage and water management. Kerosene Vale Stockpile Site is managed under the Angus Place MOP by the Angus Place Operation.	Completed - Ongoing operational requirement	N/A
Site Observations	REC-2018-17	Restrict access to the derelict buildings and mine entries at Kerosene Vale.	Access to Kerosene Vale is via locked gates with signage in place restricting access. Mine entries have been locked / barricaded. Kerosene Vale Stockpile Site is managed under the Angus Place MOP by the Angus Place Operation	Completed	N/A
Site Observations	REC-2018-18	Remove materials from within the drip line of trees at Kerosene Vale.	A targeted maintenance project was undertaken in December 2018 for Kerosene Vale Stockpile Site and LDP003 to remove sediment build up, improve controls for drainage and water management. Kerosene Vale Stockpile Site is managed under the Angus Place MOP by the Angus Place Operation	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
Site Observations	REC-2018-19	Implement measures outlined in the Rehabilitation Improvement Plan (November 2018).	The Rehabilitation Improvement Plan (RIP) integrated as an attachment to WCS MOP Amendment A. Measures from the RIP will be implemented once approved by DPIE.	Completed – ongoing for the term of the RIP	N/A
Site Observations	REC-2018-20	Investigate surface water and groundwater interactions within the Additional Rehabilitation Area west of the Co-disposal ponds to understand impacts of surface crusting on proposed rehabilitation plans.	The Rehabilitation Improvement Plan integrated as an attachment to WCS MOP Amendment A. Such issues will be identified and investigated once the RIP is implemented.	Commenced. Shared GW study with EA ongoing. LDP001 Pollution Reduction Program considering water management infrastructure within this area for construction in 2021.	N/A
Complaints Management	REC-2018-21	Develop a single complaints record form that meets the requirements of the development consent and EPL and include in the Environmental Management Strategy and PIRMP.	An SCSO Complaint Record Form has been included in both the approved EMS and PIRMP versions that meets the requirements of EPL 21229 and EPL 5129	Completed	N/A
Incident management	REC-2018-22	Ensure environmental incidents meeting the definition of EPL 3607 condition R2 are notified to the EPA in writing within 7 days of the incident occurring.	All incidents are reported within required timeframes (1 x non- occurrence recorded in audit period)	Completed - Ongoing operational requirement	N/A
Incident management	REC-2018-23	Ensure reporting of incidents is completed within the timeframes outlined in Condition 7, Schedule 5.	All incidents are reported within required timeframe. (1 x non- occurrence recorded in audit period)	Completed - Ongoing operational requirement	N/A
Incident management	REC-2018-24	Review and update the categorisation of incidents in ECD with respect to incidents that have been issued with Penalty Notices.	All environmental incidents are categorised and recorded in ECD in accordance with CEY process	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
N/A Incident management	REC-2018-25	Ensure all 2018 incidents are recorded in ECD database including TEOM wheel theft (27 June 2018) and ruptured diesel tank (20 April 2018).	All environmental incidents are categorised and recorded in ECD in accordance with CEY process. Property damage incidents are not recorded in ECD and are recorded in PULSE.	Completed	N/A
EPLs, Section 4.3.1	REC-2018-25	Confirm if a modification to SSD-5579 is required for the transfer of commitments relating to Kerosene Vale to Angus Place (upon approval of the proposed revisions to the Mining Operations Plans).	Kerosene Vale Stockpile will be included in the Angus Place MOP in accordance with Consolidated Colliery leases associated with Angus Place. No modification is required. Kerosene Vale Stockpile Site is managed under the Angus Place MOP by the Angus Place Operation.	Completed	N/A
Development Consent SSD-5579					
2.4	REC-2018-26	Ensure the response to recommendations for all future IEAs submitted to DPE includes a timeframe for implementation of recommendations.	Noted – timeframes provided (this document)	Completed	N/A
2.6	REC-2018-94	Ensure all material received at the site, is appropriately classified as ROM coal and does not contain other materials.	Noted	Completed - Ongoing operational requirement	N/A
2.6	REC-2018-95	Continue to review and then implement options for re-use (including removal) of coal stored at Kerosene Vale. Avoid or	Internal Review Completed. Kerosene Vale Stockpile will be included in the Angus Place MOP in accordance with Consolidated	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		minimise the volume of coal received at Kerosene Vale until appropriate approvals are in place for its processing or disposal.	Colliery leases associated with Angus Place. Kerosene Vale Stockpile Site is managed under the Angus Place MOP by the Angus Place Operation.		
2.14	REC-2018-27	Review the adequacy of the frequency of conveyor and transfer station sump maintenance.	Inspection and Maintenance of Coal Transport System is undertaken in a systematic manner across WCS to identify and address spillage. Existing process is subject to Continuous Improvement assessments. IEA outcomes included in process.	Completed – ongoing operational requirement	N/A
2.17	REC-2018-28	Consider including in any future project approval modifications an adjustment of the project boundary to areas under full control of WCS.	Noted for future MODs.	Completed	N/A
2.17	REC-2018-92	Define and document the process for handover of areas of the WCS site to EA and how rehabilitation liabilities will be considered and managed. Consult with the Resources Regulator regarding this process.	A complex commercial and legal process between parties for land handover and exchanges is ongoing between CEY and EA. Rehabilitation liabilities are assessed and documented via that process.	Ongoing process. The consultation between EnergyAustralia and Centennial has over the last few years been focused on information sharing and reporting. Over the period of 2020, the consultation has moved into focusing on specific projects where delivery of solutions is being collaboratively achieved and now not only is information being shared, but assessments are also being completed collaboratively.	Centennial is continuing to prepare for handover of WCS site to EA with the Huon Rehabilitation project throughout the 2021 reporting period

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
3.3	REC-2018-29	Remove the Construction Environmental Management Plan from the website.	Website published documents are periodically reviewed for relativity. Web page publishing review will be undertaken in conjunction with the 2018 IEA & Annual Review processes Management Plan review. CEMP revoked from web.	Completed	N/A
3.8	REC-2018-30	Continue unattended noise monitoring at Blackmans Flat to investigate the noise complaints received between June and October 2018.	A range of noise monitoring and assessment was undertaken to investigate noise complaints at Blackmans Flat. Unattended monitoring continues.	Completed – ongoing operational requirement	N/A
3.8	REC-2018-31	Ensure coordination of noise management on site with the noise management of other approved developments and/or projects on or in the vicinity of the site to minimise cumulative noise impacts.	WCS Noise is Managed via an approved regional CEY Western Region Noise Management Plan (WRNMP). The WRNMP does not coordinate CEY noise management activities with other approved non-CEY development programs to minimise cumulative impacts. Shared noise mitigation has been tabled in CEY-EA working group / interface meetings.	Completed	N/A
3.13	REC-2018-32	Report progressive long-term PM_{10} and TSP results in monthly environmental monitoring data reports.	Identified reporting has commenced and formally implemented from Jan 2019	Completed – ongoing operational requirement	N/A
3.22	REC-2018-33	Clarify with the EPA any remediation actions required from the Phase 2 contamination	Contact with the EPA will be sought to clarify remediation actions required	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		assessment to address SSD 5579 Schedule 3, Condition 22.			
3.23	REC-2018-34	Update the Water Management Plan to include a TARP for Lamberts Gully Creek in accordance with ANZECC 2000 and Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures (DECC 2006), or its latest version.	WMP updated to include TARP for Lamberts Gully in line with ANZECC guidelines	Completed	N/A
3.23	REC-2018-35	Revise the existing site inspection to verify compliance with Managing Urban Storm water: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries, or its latest version.	EMS under review following 2018 IEA and Annual Review Changes will be implemented	Completed	N/A
3.23	REC-2018-87	Assess the performance of the maintenance and/or improvements to baseline channel stability.	WMP assesses the performance of baseline channel stability Further consideration will be undertaken in the 2018 IEA & Annual Review processes Management Plan review	Completed	N/A
3.23	REC-2018-88	Periodically assess compliance against the performance measures in Table 10 of Condition 23, Schedule 3. Consider engaging an independent water quality expert to conduct this assessment.	Periodic assessment is conducted. All water management design, installation and maintenance is carried out by competent persons. Consideration for engagement of an independent water quality expert to conduct assessment will undertake as part of WMP review process.	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
3.24	REC-2018-36	Consult DPE regarding timing for approval of the Water Management Plans.	CEY has dedicated approvals team General Manager who has established joint workflow process with DPIE for all CEY Management Plan Revision and submissions. WCS is included in this process. Comment is too general. DPIE are consulted with each SSD-5579 modification triggered review. DPIE (and other regulatory groups) provide consultation comments which are addressed and returned to DPIE for pending approval. This process can be lengthy.	Completed - Ongoing Annual process	N/A
3.24	REC-2018-37	In the next revision of the Water Management Plan, ensure the management measures (i.e. actions and timeframes for implementation) are more integrated into the WMP.	WMP updated to ensure management measures are integrated into WMP. WMP management measures are continually implemented with each review. Timeframes for implementation of actions is not possible due to lengthy consultation and approval processes.	Completed	N/A
3.24	REC-2018-38	Ensure the Water Management Plan is prepared by persons whose appointment has been approved by the Secretary.	The WMP was prepared by Dr Stuart Gray who DPE endorsed as suitably experienced and qualified on a letter dated 20 December 2016.	Completed	N/A
3.24	REC-2018-39	Include the reporting procedures for the results of the monitoring program for the Surface Water Management Plan within the WCS Water Management Plan, rather than deferring to the broader Western Region Water Management Plan.	The surface water monitoring program is included in the WCS Water Management Plan	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
3.24	REC-2018-40	Review the requirement for additional operational controls to minimise coal spillage along conveyors, in consideration of projected coal qualities.	Inspection and Maintenance of Coal Transport Systems undertaken in a systematic manner across WCS to identify and address spillage. Existing process is subject to Continuous Improvement assessments. IEA outcomes included in process.	Completed – ongoing operational requirement	N/A
3.24	REC-2018-41	Monitoring data indicated that BH14 was not sampled, as outlined in the Water Management Plan. It is recommended that the WMP be updated to reflect the monitoring locations sampled.	BH14 has been removed from the groundwater monitoring program	Completed	N/A
3.24	REC-2018-42	Complete implementation of the TT03 Action Plan in accordance with the Voluntary Undertaking with DPE, as a priority.	A works action plan is in place with quarterly updates provided to DPIE. Works will commence once all regulatory approvals are completed (mining lease application, MOP amendment)	Completed – ongoing operational requirement	N/A
3.24	REC-2018-43	Once the water management works at TT03 are complete, update the Water Management Plan.	WMP will be updated on completion of works. CEY has dedicated approvals team who has established joint workflow process with DPIE for all CEY Management Plan Revision and submissions. WCS is included in this process.	Following completion of TT03 works	N/A
3.25	REC-2018-44	Develop a Biodiversity Offset Management Plan (as proposed in the Biodiversity Management Plan) to ensure compliance with	The Western Region Biodiversity Offset Strategy (WRBOS) was approved by the NSW Department of	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		the BOS requirements of Condition 29, Schedule 3.	Planning, Industry and Environment (DPIE) on 17 November 2020.		
3.26	REC-2018-45	Monitor fauna habitat values and rehabilitation to establish and enhance locally endemic native vegetation species within the Lamberts Gully Creek catchment areas as part of Annual Rehabilitation Monitoring program.	Monitoring is conducted as per the WCS Rehabilitation Improvement Plan (Nov 2018), Monitoring is conducted annually which considers fauna habitat values and rehabilitation to establish and enhance locally endemic native vegetation species within the Lamberts Gully Creek catchment areas.	Completed – Ongoing annual monitoring	N/A
3.28	REC-2018-46	Ensure the Biodiversity Offset Strategy and Additional Rehabilitation Initiatives Areas, in combination, provide suitable habitat for threatened species recorded on the SCSS. This may include reviewing current rehabilitation strategies and/or revising monitoring programs to include fauna.	The offsets which are being provided for the WCS credit liability are located at Carinya Lot 163. The credits being utilised at Carinya Lot 163 consist of 695 formation level credits which is made up of 403 Credits of HN534 and 292 Credits of HN544. Both HN 534 and HN544 are listed on the OEH BioNET website as providing habitat for almost all the above listed threatened species, with the exception of the Brown Treecreeper. Furthermore, field validation surveys over the Carinya site recorded four of the seven species including the Brown Treecreeper. Therefore, the Carinya Lot 163 offset site provides suitable habitat for all of the listed threatened species which were recorded on the SCSS.	Completed	N/A
3.29	REC-2018-89	Consult DPE regarding timing for approval of the Biodiversity Management Plan.	WCS (SSD-5579 Schedule 3 Condition 29) Biodiversity Management Plan (BMP) requires the development of a Biodiversity Management Plan for the site by	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
			December 2016. Centennial submitted the Western Region Biodiversity Management Plan to DPE in December 2016, and an update in April 2017 for approval. Centennial revised the Western Region Biodiversity Management Plan in accordance with its operational Annual Reviews in 2019. The WCS BMP was incorporated into the WRBOS in 2020. The WRBOS was approved by DPIE on 17 November 2020.		
3.29	REC-2018-47	Ensure the Biodiversity Management Plan is sufficient to achieve biodiversity objectives for the undisturbed and rehabilitated areas given the Rehabilitation and Closure Management Plan has been superseded by the 2018 MOP.	This recommendation was incorporated into the WRBOS.	Completed	N/A
3.29	REC-2018-48	Review and if required revise the WRBMP to ensure it includes the requirements of Condition 29, Schedule 3 relating to the Biodiversity Offset Strategy that are proposed to be deferred to the Biodiversity Offset Management Plans (once approved).	The BMP was incorporated into the WRBOS.	Completed	N/A
3.29	REC-2018-49	Review the management areas mapped in the WRBMP (e.g. operational areas) to ensure they align with the areas outlined in the MOP.	MOP management areas aligned with management areas in the WRBOS.	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
3.29	REC-2018-50	Improve erosion and sediment controls where minor encroachment of sediment runoff has occurred within rehabilitation areas within the approved project boundary.	Erosion and sediment controls will be implemented in impacted rehabilitation areas	Completed - Ongoing operational requirement	N/A
3.32	REC-2018-51	Ensure inspections of sites outside of the disturbance footprint are undertaken with Registered Aboriginal Parties every 2 years.	Inspections will be undertaken every two years	Completed - Ongoing operational requirement. The last inspections were completed in December 2020.	N/A
3.36	REC-2018-52	Complete a Dilapidation Report for the Haul Roads and undertake recommended maintenance to ensure compliance with Schedule 3, Condition 36 to 38 should any haulage operations commence.	Noted. Dilapidation report will be implemented if haul road usage commences.	Completed – Ongoing operational requirement	N/A
3.39	REC-2018-53	Record and report the time of each truck movement of coal to and from the site.	All coal must be transported via the SCSO overland conveyor. Movement of coal via truck movements will not be undertaken unless approved by regulatory parties. Records will be kept and are provided in WCS Annual Reviews.	Completed	N/A
3.41	REC-2018-54	Update the Bushfire Management System SCSO-MS 009 document to include the map of fire extinguishers as noted in the table of contents.	Completed.	Completed	N/A
3.42	REC-2018-55	Ensure the Annual Review reports on the on the effectiveness of waste minimisation and	The 2018 WCS Annual Review included detailed breakdown of waste disposal.	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		management measures in the Annual Review including a detailed breakdown of waste disposal. Annual Reviews should compare total waste and % recycled year to year (going forward).			
3.43	REC-2018-56	On lands on which other approved developments exist or are proposed, the final land use is to be determined in consultation with, and the agreement of the landowner. Confirm if agreements are in place with landowners for projects such as EA Ash Emplacement and LCC waste management facility. If no agreements are in place, confirm responsibilities for rehabilitating the site to the standards required for "Remainder of the SCSS' in Table 11 of Condition 43, Schedule 3.	Noted.	Completed – Ongoing operational requirement	N/A
3.43	REC-2018-57	Review consistency of the Rehabilitation Strategy outlined in the EIS (and shown conceptually in Appendix 7 of SSD 5579) and the rehabilitation plan outlined in the 2018/2024 MOP. Consult with DPE regarding compliance with Condition 43, Schedule 7 if any inconsistencies.	The WCS MOP Amendment A includes primary and secondary rehabilitation domains. Although naming convention of domains has changed, the areas remain consistent with the EIS in terms of rehabilitation objectives.	Completed	N/A
3.44	REC-2018-58	Assess progressive rehabilitation requirements at Kerosene Vale and update the MOP to include the requirement of Condition 44,	Kerosene Vale has been removed from the WCS MOP and is now managed under the Angus Place	Completed	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		Schedule 3 and implement measures.	MOP Amendment by Angus Place Operations.		
3.44	REC-2018-59	Continue progressive rehabilitation of disturbed areas to meet the condition requirements and realise environmental benefits such as minimising the total area exposed for dust.	Progressive rehabilitation is undertaken at WCS. The condition was noted as not compliant for Kerosene Vale. Kerosene Vale has been removed from the WCS MOP and is now managed under the Angus Place MOP Amendment by Angus Place Operations.	Completed – Transferred to Angus Place	N/A
3.45	REC-2018-60	Review and revise the MOP to incorporate the requirements of the BMP, detailing how rehabilitation of the site will be integrated with the BMP and include any aspects of the 2014 Rehabilitation and Closure Plan not already included (as requested by DPE).	The requirements of the WRBOS are included in the MOP.	Completed	N/A
3.45	REC-2018-61	Incorporate the requirements of the Rehabilitation Improvement Plan (November 2018) into the next revision of the MOP.	The RIP has been included as an appendix to WCS MOP Amendment A.	Completed	N/A
4.3	REC-2018-62	Ensure landholder notifications are undertaken for any future exceedances of noise and air quality criteria in accordance with PA condition 4.2.	Future exceedances will be notified to surrounding landholders.	Completed - Ongoing operational requirement.	N/A
4.5	REC-2018-63	Ensure records of offers for acquisition are based on current valuations and include details regarding costs and compensation	Noted.	Completed - Ongoing operational requirement.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		inclusions in accordance with SSD 5579 Schedule 4, Condition 5.			
5.1	REC-2018-65	Conduct and maintain records of environmental and community awareness training specific to WCS and its environmental management plans, particularly for staff with roles and responsibilities within those plans.	Management plan summary documents or informative sessions are provided to all SCSO management staff which includes their environmental responsibilities in relation each plan.	Completed - Ongoing operational requirement.	N/A
5.1	REC-2018-66	Document annual reviews of objectives and targets as outlined in the Environmental Management Strategy.	Noted. The EMS is reviewed at least annually, where objectives and targets set out in relevant site management plans are reviewed and actioned upon.	Completed - Ongoing operational requirement.	N/A
5.4	REC-2018-67	Ensure all future Annual Reviews meet the requirements of Schedule 5, Condition 4 to the satisfaction of the Secretary. This includes items requested by DPE on 4 June 2018: *-. Include a plan showing the offset areas;* *- Provide trends for all monitoring data and discuss these trends over the life of the development; and* *- Provide a data comparison for all monitoring data between years".*	The 2018 WCS Annual Review included items requested by DPE on 4 June 2018.	Completed - ongoing annually	N/A
5.4	REC-2018-68	Follow up on DPE approval of the revised 2015 Annual Review submitted on 18 July 2016.	Nil actions identified.	Completed.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
5.4	REC-2018-69	Upload the revised version of the 2015 Annual Review to the website.	Noted	Completed	N/A
5.5	REC-2018-70	Maintain a record of review of management plans against SSD 5579 Condition 5, Schedule 5, including the details of revisions made and timing of submission to DPE.	Register maintained by CEY Corporate.	Completed - Ongoing operational requirement.	N/A
5.6	REC-2018-71	Consult with recognised environmental groups regarding participation in the CCC.	CCC meetings are advertised in media and environmental groups are invited to participate.	Completed - Ongoing operational requirement.	N/A
5.6	REC-2018-72	Consider exploring community engagement activities in addition to the Community Consultative Committee in the Wallerawang District.	Noted	Completed - Ongoing operational requirement.	N/A
5.10	REC-2018-73	Ensure the 2018 Audit Report and response to recommendations is provided to DPE within the timeframe required by Schedule 5, Conditions 9 and 10, or as otherwise agreed with DPE.	The 2018 WCS IEA report and the initial responses to recommendations were provided to DPE within the 3-month timeframe.	Completed	N/A
Environmental Protection Licence 3607					
L2.1	REC-2018-74	Ensure all analytes required to be sampled by EPL 3607 Condition L2.4 and M2.4 are tested and reported in the Centennial Coal Environmental Monitoring Data Reports.	A corrections log was provided in the WCS Environmental monitoring report to address this recommendation. Subsequent monitoring data reports contain all EPL 3607 required monitoring data	Completed - Ongoing operational requirement.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
L2.2	REC-2018-75	Continue to implement the LDP006 Works Plan, providing periodic updates to the EPA.	An LDP001 (Formerly LDP006) options assessment was submitted to EPA on 18 December 2019. Continual consultation and future works will be ongoing.	Completed - Ongoing operational requirement.	N/A
L2.6	REC-2018-76	Ensure the EPA is advised within 3 working days of the completion of sampling and testing where TSS meets the EPL criteria outlined in L2.6.	The EPA will be notified of TSS exceedances within 3 days even if the elevated result is considered compliant under condition L2.5.	Completed - Ongoing operational requirement.	N/A
O1.1	REC-2018-77	Develop and implement a staff environmental training program that ensures roles and responsibilities outlined in environmental management plans are communicated and understood.	Each management plan review is now communicated with relevant staff on their roles and responsibilities for the plan. A separate document lists each person's roles and responsibilities and is signed off accordingly.	Completed - Ongoing operational requirement.	N/A
O6.1	REC-2018-90	Maintain records to demonstrate that basins at LDP006 (including Cooks Dam) are maintained at the design storage capacity within 5 days following rainfall.	The WCS WMP includes a controlled pump-out discharge process from Cooks Dam following a rainfall event. As Cooks Dam is recharged by groundwater, this process is problematic to manage as Cook Dams levels are dependent on CHPP operation for water use.	Completed - Ongoing operational requirement.	N/A
M2.4	REC-2018-78	Report turbidity results in NTU (not mg/L) in the Centennial Coal Environmental Monitoring Data Reports.	Item corrected in Springvale Coal Services monthly monitoring data reports.	Completed	N/A
M7.1	REC-2018-79	Ensure the volume of discharge at LDP007 is recorded and reported	LDP007 discharge requires an estimate volume to be published. This estimate will be communicated in	Completed - Ongoing operational requirement.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		in the Centennial Environmental Monitoring Data Reports.	future instances of LDP007 discharge.		
R2.2	REC-2018-22	Ensure environmental incidents meeting the definition of EPL 3607 condition R2 are notified to the EPA in writing within 7 days of the incident occurring.	Future environmental incidents will be reported in writing to the EPA within 7 days of occurrence	Completed - Ongoing operational requirement.	N/A
O5.5	REC-2018-80	Undertake maintenance to desilt sediment basins at LDP003 at Kerosene Vale by end 2018 to ensure the basins design storage capacity is maintained.	Works program undertaken in 2018. LDP003 maintenance is undertaken by Angus Place Operations as managed in the Angus Place MOP and Water Management Plans.	Completed - Q4 2018	N/A
Statement of Commitments					
PO SoC 3.1	REC-2018-64	Consult with relevant agencies regarding the ongoing planned use of the Co-disposal ponds and ensure appropriate approvals are gained for the relevant activities planned.	Noted. HRA process concurrent. The planned use for the Blackmans Flat Co-Disposal (BFCD) is to cap and rehabilitate the northern cells and redesign the southern cells to emplace fine coal reject for potential future resale. NSW Dams Safety has been contacted, seeking advice to whether the BFCD needs to be a Declared Dam under the Dams Safety Regulation. Consultation requests were sent to other relevant agencies including: • Industry Health and Safety Representative • Resources Regulator	Ongoing operational requirement.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
PO SoC 5.3	REC-2018-81	Consult DPE regarding the proposed timeframes for implementation of water diversion works at Huon Gully with respect to the commitment of the EIS SoC 5.3.	Ongoing consultation program in place.	Completed – commitment timeframe met	N/A
PO SoC 5.11	REC-2018-82	Implement an annual review of groundwater monitoring program in accordance with SoC 5.11.	Completed annually with the annual WCS water management plan revision and the 2018 WCS Annual Review.	Completed	N/A
Consolidated Coal Lease – CCL 733					
CCL-733-04	REC-2018-83	Ensure the next revision of the MOP includes current surveyed rehabilitation and disturbance area volumes are provided in the next revision of the MOP.	Rehabilitation areas are detailed in the WCS MOP Amendment A.	Completed	N/A
CCL-733-04	REC-2018-84	Ensure all relevant Mining Leases are included in the Title Block of AEMRs.	Relevant Mining Leases are included in each WCS annual review.	Completed – Ongoing requirement	N/A
CCL-733-28	REC-2018-85	Ensure the deed of security bond deposit for the bond calculation assessed by DPE on 10 April 2018 has been paid.	Confirmed bond deposit in place	Completed - Q4 2018.	N/A
CCL-733-32	REC-2018-86	It is recommended that site review the requirements of *the Sydney Water Catchment Management Act 1998* and ensure that all conditions of the Act as relevant to operations at WCS are being complied with.	Noted	Completed – Ongoing operational requirement.	N/A

Condition Number	REC #	Improvement Opportunity Recommendation	Response / Addressed	Timing	2021 AR Update
		Refer to other recommendations regarding water management as relevant.			

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