

MANGOOLA OPEN CUT

GLENCORE

Annual Review 2022

1 January to 31 December 2022



Title Block


Name of Operation	Mangoola Open Cut
Name of Operator	Mangoola Coal Operations Pty Ltd
Project Approval	MP 06_0014 (surrendered 21 November 2022)
Development Consent	SSD-8642
Name of holder of Development Consent/ Project Approval	Mangoola Coal Operations Pty Ltd
Mining lease #	ML 1626, ML 1747, ML 1815, ML 1817
Name of holder of mining lease	Mangoola Coal Operations Pty Ltd
Water licence #	Various (refer Section 3.4)
Name of holder of water licence	Mangoola Coal Operations Pty Ltd
MOP Commencement date	29 November 2021
MOP end date	2 July 2022 (superseded by RMP)
Annual Review start date	1 January 2022
Annual Review end date	31 December 2022
<p>I, Sam Palmer, certify that this audit report is a true and accurate record of the compliance status of Mangoola Open Cut for the period 1 January 2022 to 31 December 2022 and that I am authorised to make this statement on behalf of Mangoola Open Cut.</p> <p>Note.</p> <p><i>a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i></p> <p><i>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
Name of authorised reporting officer	Sam Palmer
Title of authorised reporting officer	Environment and Community Manager
Signature of authorised reporting officer	
Date	31 March 2023

Table of Contents

1.	Statement of Compliance	7
2.	Introduction	10
2.1	Mining Operations	10
2.2	Mine Contacts	12
3.	Approvals.....	14
3.1	Project Approval.....	14
3.2	Development Consent	14
3.3	Mining Titles.....	15
3.4	Licences	15
3.4.1	Environment Protection Licence	15
3.4.2	Surface Water Licences	16
3.4.3	Groundwater Licences.....	18
3.4.4	Radiation Licence	19
3.4.5	Sewerage Management System Licence.....	19
3.5	Other Approvals	20
3.5.1	Mining Operations Plan and Rehabilitation Management Plan	20
3.5.2	Compliance with EIS Predictions	20
4.	Operations During the Reporting Period	21
4.1	Mining Operations	21
4.1.1	Overview	21
4.1.2	Exploration	21
4.1.3	Land Preparation	21
4.1.4	Mining	21
4.2	Other Operations	24
4.2.1	Coal Processing.....	24
4.2.2	Coal Transport.....	24
4.2.3	Construction.....	24
4.2.4	Waste Management.....	25
4.3	Next Reporting Period.....	25
4.3.1	Mining	25
4.3.2	Exploration	25
4.3.3	Construction.....	26
4.3.4	Tailings Disposal	26
5.	Actions Required from Previous Annual Review.....	27
6.	Environmental Performance	29
6.1	Meteorology.....	29
6.2	Air Quality	32
6.2.1	Environmental Management	32

6.2.2	Environmental Monitoring Results	36
6.2.2.1	Results from the Reporting Period	36
6.2.2.2	Comparison with Predictions.....	38
6.2.2.3	Long Term Trend Analysis.....	40
6.2.3	Key Performance and/or Management Issues.....	41
6.2.4	Proposed Improvements.....	41
6.3	Noise	41
6.3.1	Environmental Management	41
6.3.2	Environmental Monitoring Results	46
6.3.2.1	Results from the Reporting Period	46
6.3.2.2	Comparison with Predictions.....	53
6.3.2.3	Long Term Trend Analysis.....	53
6.3.3	Key Performance and/or Management Issues.....	54
6.3.4	Proposed Improvements.....	54
6.4	Blasting and Vibration	55
6.4.1	Environmental Management	55
6.4.2	Environmental Monitoring Results	57
6.4.2.1	Results from the Reporting Period	57
6.4.2.2	Comparison with Predictions.....	60
6.4.2.3	Long Term Trend Analysis.....	60
6.4.3	Key Performance and/or Management Issues.....	60
6.4.4	Proposed Improvements.....	61
6.5	Erosion and Sediment Control	61
6.5.1	Environmental Management	61
6.5.2	Environmental Monitoring Results	61
6.5.3	Key Performance and/or Management Issues.....	61
6.5.4	Proposed Improvements.....	63
6.6	Biodiversity.....	63
6.6.1	Environmental Management	63
6.6.1.1	Weather Conditions 2022.....	64
6.6.2	Environmental Monitoring Results	64
6.6.2.1	Floristic Values	64
6.6.2.2	Fauna Values	64
6.6.2.3	Threatened Species.....	65
6.6.2.4	Conservation Agreement Monitoring.....	66
6.6.2.5	Nest Box Monitoring.....	68
6.6.2.6	Threatened Terrestrial Orchid Monitoring	68
6.6.2.7	Groundwater Dependent Ecosystems	69
6.6.2.8	Offset and Infill Tree Planting 2022	70
6.6.3	Key Performance and/or Management Issues.....	72
6.6.4	Proposed Improvements.....	72
6.7	Weed and Pest	73

6.7.1	Environmental Management	73
6.7.1.1	Weed Management Activities	73
6.7.1.2	Feral and Pest Animal Management Activities	73
6.7.2	Key Performance and/or Management Issues.....	74
6.7.3	Proposed Improvements.....	74
6.8	Visual Mitigation	74
6.8.1	Environmental Management	74
6.8.2	Environmental Monitoring Results	74
6.8.3	Key Performance and/or Management Issues.....	75
6.8.4	Proposed Improvements.....	75
6.9	Aboriginal Heritage	75
6.9.1	Environmental Management	75
6.9.2	Environmental Monitoring Results	75
6.9.3	Key Performance and/or Management Issues.....	76
6.9.4	Proposed Improvements.....	76
6.10	European Heritage	76
6.10.1	Environmental Management	76
6.10.2	Environmental Monitoring Results	77
6.10.3	Key Performance and/or Management Issues.....	77
6.10.4	Proposed Improvements.....	77
6.11	Spontaneous Combustion.....	77
6.11.1	Environmental Management	77
6.11.2	Environmental Monitoring Results	77
6.11.3	Key Performance and/or Management Issues.....	77
6.11.4	Proposed Improvements.....	78
6.12	Bushfire	78
6.12.1	Environmental Management	78
6.12.2	Environmental Monitoring Results	78
6.12.3	Key Performance and/or Management Issues.....	78
6.12.4	Proposed Improvements.....	78
6.13	Hydrocarbon Management.....	78
6.13.1	Environmental Management	78
6.13.2	Environmental Monitoring Results	79
6.13.3	Key Performance and/or Management Issues.....	79
6.13.4	Proposed Improvements.....	79
6.14	Public Safety	79
6.14.1	Environmental Management	79
6.14.2	Environmental Monitoring Results	80
6.14.3	Key Performance and/or Management Issues.....	80
6.14.4	Proposed Improvements.....	80
6.15	Greenhouse Gas Energy.....	80
6.15.1	Environmental Management	80

6.15.2	Environmental Monitoring Results	81
6.15.2.1	Results from the Reporting Period	81
6.15.2.2	Comparison with Predictions.....	81
6.15.3	Key Performance and/or Management Issues.....	82
6.15.4	Proposed Improvements.....	82
7.	Water Management	83
7.1	Water Balance.....	83
7.2	Salt Balance	84
7.3	Saline Material, Water Management and Minimisation	84
7.4	Water Take	86
7.4.1	Changes to Licences	87
7.5	Hunter River Salinity Trading Scheme Discharges	88
7.6	Surface Water Monitoring	88
7.6.1	Environmental Management	88
7.6.2	Environmental Monitoring Results	90
7.6.2.1	Results from the Reporting Period	90
7.6.2.2	Comparison with Predictions.....	96
7.6.2.3	Long Term Trend Analysis.....	97
7.6.3	Key Performance and/or Management Issues.....	98
7.6.4	Proposed Improvements.....	98
7.7	Groundwater Management	98
7.7.1	Environmental Management	98
7.7.2	Environmental Monitoring Results	101
7.7.2.1	Results from the Reporting Period	101
7.7.2.2	Comparison with Predictions.....	106
7.7.2.3	Long Term Trend Analysis.....	106
7.7.3	Key Performance and/or Management Issues.....	107
7.7.4	Proposed Improvements.....	108
8.	Rehabilitation.....	109
8.1	Rehabilitation of Disturbed Land	109
8.2	Comparison with RMP Predictions	111
8.3	Removal of Buildings.....	111
8.4	Key Issues Affecting Rehabilitation	112
8.4.1	Post Rehabilitation Land Use	115
8.5	Rehabilitation Trials and Research.....	121
8.6	Actions for the Next Reporting Period	122
9.	Community	123
9.1	Community Engagement.....	123
9.1.1	Face to Face Meetings.....	123
9.1.2	Website	124
9.1.3	Community Newsletters.....	124

9.2	Community Contributions.....	124
9.3	Community Complaints.....	127
9.3.1	2022 Complaints Summary	127
9.3.2	Analysis of Complaints	127
9.3.3	Actions in Response to Complaints.....	129
10.	Independent Environmental Audit	131
11.	Incidents and Non-Compliances.....	132
12.	Activities to be Completed During Next Reporting Period.....	136
12.1	Management Plan Review	136
12.2	2023 Actions.....	138
13.	References	139
Appendix A - Annual Rehabilitation Report and Forward Program and 2022 Disturbance and Rehabilitation Plan		
		140
Appendix B - Long Term Trend Graph: Rainfall		
		143
Appendix C - Long Term Trend Graphs: Air Quality		
		144
Appendix D - Long Term Trend Graphs: Blasting.....		
		148
Appendix E - Long Term Trend Graphs: Surface and Groundwater		
		151
Appendix F - Annual Train Movements 2022		
		161

1. Statement of Compliance

A summary of compliance at Mangoola Open Cut during 2022 is provided in **Table 1-1**.

Table 1-1 Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes/No
Development Consent (MP 06_0014)	No
Development Consent (SSD-8642)	No
Environment Protection Licence (EPL) 12894	No
Mining Lease 1626	Yes
Mining Lease 1747	Yes
Mining Lease 1817	Yes
Mining Lease 1815	Yes
Assessment Lease 9	Yes
Exploration Licence 5552	Yes

A summary of the non-compliances during the reporting period have been summarised in **Table 1-2**. The non-compliances during the 2022 reporting period are discussed further in **Section 11**.

Table 1-2 Non-Compliance During 2022

Relevant Approval	Condition Number	Description Summary	Compliance Status	Comment	Where Addressed
MP 06_0014 & SSD-8642	Sch 3 Cond 31 & B50	Surface Water Monitoring	Non-Compliant	Mangoola failed to collect surface water samples in accordance with the sites approved Surface Water Monitoring Plan.	Section 7.6.3 and Section 11
MP 06_0014	Sch 3 Cond 32	Groundwater monitoring	Non-Compliant	Failure to collect 3 groundwater samples in accordance with the Groundwater monitoring plan in March and May 2022 (GW02 and GW03 and GW16).	Section 7.7.2 and Section 11
EPL 12894	M4.1	Weather Monitoring Requirements	Non-Compliant	Failure to continuously monitor (15 min averaging periods) temperature (10 m) at EPL Monitoring Point 18 on 4 June, 6 June and 24-25 June 2022.	Section 6.1 and Section 11

Relevant Approval	Condition Number	Description Summary	Compliance Status	Comment	Where Addressed
EPL 12894	M9.1	Noise Monitoring Requirements	Non-Compliant	Failure to undertake attended noise monitoring at EPL Monitoring Point 34 during April 2022 monitoring round due to restricted access. Intermediate location, closer to site, used as substitute.	Section 11
EPL 12894	Condition M2.2	PM ₁₀ monitoring must be undertaken continuously	Non-Compliant	Failure to continuously monitor PM ₁₀ at EPL Monitoring Point 19 from 18 March to 1 April and on 6 June and EPL Monitoring Point 20 from 7 to 8 July and 27 November to 1 December due to breakdowns and maintenance.	Section 6.2.3 and Section 11
EPL 12894	E1.1	Exceedance of Hunter River Salinity Trading Scheme (HRSTS) Discharge Volume	Non-Compliant	Exceedance of the daily volume discharge limited allowed under the HRSTS.	Section 7.6.3 and Section 11
SSD-8642	Schedule 2, Condition B46	Surface water discharges must comply with the EPL and POEO Act	Non-Compliant	Sediment laden water was discharged from the MCCO Project construction area into tributaries of Big Flat creek on 7 March. The PIRMP was enacted in accordance with Section 147 of the POEO Act.	Section 7.6.3 and Section 11
MP 06_0014	Schedule 3, Condition 30	Surface water discharges must comply with the EPL			
EPL 12894	Condition L1.1	The licensee must comply with Section 120 of the POEO Act			
SSD-8642	Schedule 2, Condition B46	Surface water discharges must comply with the EPL and POEO Act	Non-Compliant	Sediment laden water discharge from the MCCO Project construction area into tributaries of Big Flat creek on 4 July. The PIRMP was enacted in accordance with Section 147 of the POEO Act.	Section 7.6.3 and Section 11
MP 06_0014	Schedule 3,	Surface water discharges			

Relevant Approval	Condition Number	Description Summary	Compliance Status	Comment	Where Addressed
	Condition 30	must comply with the EPL			
EPL 12894	Condition L1.1	The licensee must comply with Section 120 of the POEO Act			

Table 1-3 Compliance Status Categories

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur.
Low	Non-Compliant	Non-compliance with potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Non-compliance which does not result in any risk of environmental harm

2. Introduction

2.1 Mining Operations

Mangoola Open Cut (Mangoola) is owned and operated by Mangoola Coal Operations Pty Ltd which is a Glencore managed operation. Mangoola is located near Wybong, New South Wales (NSW), approximately 20 kilometres (km) west of Muswellbrook and approximately 10 km north of Denman in the Muswellbrook Local Government Area (LGA). A locality plan is presented in **Figure 2-1**. This Annual Review has been prepared for the 12-month reporting period of 1 January 2022 to 31 December 2022 (herein referred to as the reporting period).

Mangoola was approved as a Major Project under the now repealed Section 75J Part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) in June 2007 (PA 06_0014). PA 06_0014 has since been declared a State Significant Development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017 (PA 06_0014 is now referred to as MP 06_0014). MP 06_0014 approved the construction of an open cut coal mine and associated infrastructure in the Wybong area. The mine, then owned by Centennial Coal and known as the Anvil Hill Project, was approved to extract up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Since April 2014, Mangoola has been approved to extract up to 13.5 Mtpa ROM coal under MP 06_0014. The Site also operates a Coal Handling and Preparation Plant (CHPP) and Train Loading Facility. During the reporting period, mining operations continued in the Main Pit and South Pit areas south of Wybong Road.

On 26 April 2021, the NSW Independent Planning Commission (IPC) approved with conditions, the Development Application for the Mangoola Coal Continued Operations (MCCO) Project under Part 4 of the EP&A Act. The State Significant Development (SSD) 8642 approval provides for the continuation of open cut mining immediately north of the existing mine at Mangoola Coal Operations. This will enable Glencore to extract a further 52 million tonnes of coal through to the end of 2030. During the reporting period, construction continued in the MCCO Project Area north of Wybong Road. The mining phase was triggered on 1 December 2022 with the commencement of vegetation removal associated with mining.

On 21 November 2022, Mangoola surrendered MP 06_0014 in accordance with Schedule 2, Condition A15 of SSD-8642. This Annual Review reports against MP06_0014 and SSD-8642 conditions where they applied during the reporting period.

This Annual Review has been prepared in accordance with:

- Condition D11 of SSD-8642.
- Mining Lease 1626 (ML 1626).
- Mining Lease 1747 (ML 1747).
- Mining Lease 1815 (ML 1815).
- Mining Lease 1817 (ML 1817).
- The NSW Government Annual Review Guideline (October 2015).

Department of Planning and Environment (DPE) 2021 Annual Review feedback.

Copies of and/or a link to this Annual Review will be made available to the DPE, the Department of Regional NSW – Resources Regulator (Resources Regulator), the Biodiversity Conservation Division (BCD), the Natural Resources Access Regulator (NRAR) and the Environment Protection Authority (EPA). As per Condition D11 of SSD-8642 copies of and/or a link to the company website will also be

provided to the Muswellbrook Shire Council and members of the Mangoola Community Consultative Committee (CCC). A copy will also be made available on the Mangoola website in accordance with SSD-8642 for any member of the public to access or be provided at the request of any interested person.

2.2 Mine Contacts

The relevant mine contacts for Mangoola are listed in **Table 2-1**.

Table 2-1 Mine Contacts

Contacts	Details
Operations Manager	Jacob Hundertmark
Environment and Community Manager	Sam Palmer
Mailing Address	PO Box 495 Muswellbrook NSW 2333
Phone Number	(02) 6549 5500
Fax Number	(02) 6549 5655
24 Hour Community Hotline	1800 014 339
Website	www.mangoolamine.com.au
General Enquiries Email	mangoolaenquiries@glencore.com.au

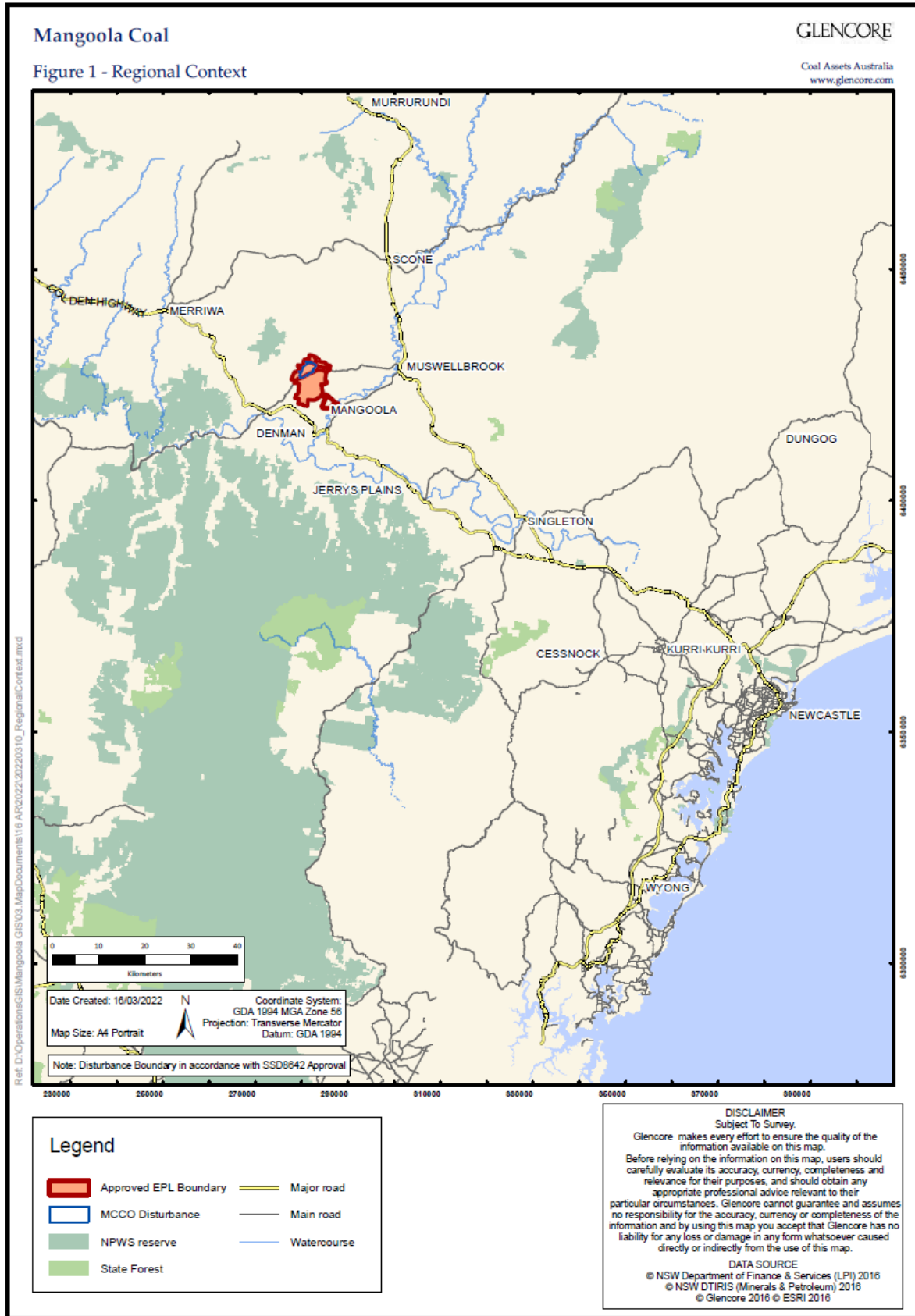


Figure 2-1 Regional Context

3. Approvals

Operations at Mangoola are regulated by a range of leases, licences and approvals, which are summarised in the following sections.

3.1 Project Approval

MP 06_0014 (as modified) allowed for the extraction, processing and transportation of up to 13.5 Mtpa for a period of up to 21 years from the granting of a Mining Lease (ML). Eight modifications to MP 06_0014 have been approved, as detailed in **Table 3-1**. On 21 November 2022, MP 06_0014 was voluntarily surrendered in accordance with condition A15 of Schedule 2 of SSD-8642.

Table 3-1 MP 06_0014 and Modifications

Approval	Title	Date Granted	Expiry
06_0014	Original Approval	7 June 2007	20 November 2029
06_0014 Mod 1	Change to Road Access and Water Supply	22 July 2008	20 November 2029
06_0014 Mod 2	Relocate Water Supply Pipeline	23 June 2009	20 November 2029
06_0014 Mod 3	Relocate Mine Infrastructure Area	4 November 2009	20 November 2029
06_0014 Mod 4	Modify Approved Mine Plan	22 June 2012	20 November 2029
06_0014 Mod 5	Night-time Works	23 February 2010	20 November 2029
06_0014 Mod 6	Extraction Rate Increase	28 April 2014	20 November 2029
06_0014 Mod 7	Removal of Schedule 3, Condition 3 – Traffic Noise Criteria	22 August 2016	20 November 2029
06_0014 Mod 8	Update of Project Layout Plan	14 June 2017	20 November 2029
06_0014	Voluntarily surrendered	-	21 November 2022

3.2 Development Consent

SSD-8642 allows for the continuation of open cut mining immediately north of the existing mine at Mangoola Coal Operations. This will enable Glencore to extract a further 52 million tonnes of coal through to the end of 2030. **Table 3-2** summaries the details of this approval.

Table 3-2 SSD-8642 Summary

Approval	Title	Date Granted	Expiry
SSD-8642	Original Approval	26 April 2021	31 December 2030

3.3 Mining Titles

Mangoola currently holds six active titles as shown in **Table 3-3**.

Table 3-3 Mining Tenements

Title	Date Granted	Expiry
Mining Lease 1626	20 November 2008	20 November 2029
Mining Lease 1747	24 August 2016	5 December 2037
Mining Lease 1815	29 September 2021	29 September 2042
Mining Lease 1817	27 October 2021	27 October 2042
Assessment Lease 9	8 November 2004	7 November 2019 (renewal lodged 1 November 2019)
Exploration Licence 5552	8 May 2006	7 November 2025

3.4 Licences

3.4.1 Environment Protection Licence

Mangoola operates under EPL 12894, with an anniversary date of 7 July. Monitoring results are reported to the EPA as part of the Mangoola EPL Annual Return and monitoring data is available on the Mangoola website.

The environmental reporting and monitoring activities undertaken at Mangoola as required under EPL 12894, are discussed in **Section 6**.

There were three EPL variations in the 2022 reporting period as shown in **Table 3-4**.

Table 3-4 EPL Variations

Date of Variation	Variation Type	Summary
9 February 2022	s58 Licence Variation	Change in monitoring points associated with a discharge to the Hunter River under the HRSTS.
1 March 2022	s58 Licence Variation	Administrative change in relation to the monitoring associated with the HRSTS.
17 August 2022	s58 Licence Variation	Inclusion of a Pollution Reduction Program (PRP) to investigate the adequacy of Water Management Infrastructure.

3.4.2 Surface Water Licences

Mangoola currently holds the following surface water licences, as detailed in **Table 3-5**.

Table 3-5 Surface Water Licences

WAL No.	DPE Water Reference Number	Share Allocation (ML)	Water Source	WAL No.	DPE Water Reference number	Share Allocation (ML)	Water Source
503	20AL200112	159	Hunter Regulated River	6571	20AL201639	111	Hunter Regulated River
644	20AL200456	3	Hunter Regulated River	6572	20AL201640	8	Hunter Regulated River
645	20AL200457	432	Hunter Regulated River	6576	20AL201869	600	Hunter Regulated River
691	20AL200578	50	Hunter Regulated River	6577	20AL201870	8	Hunter Regulated River
692	20AL200579	8	Hunter Regulated River	7291*	20AL202589	63	Wybong Creek
735	20AL200676	72	Hunter Regulated River	7292*	20AL202610	44	Wybong Creek
822	20AL200912	3	Hunter Regulated River	9061	20AL203156	6	Hunter Regulated River
823	20AL200913	310	Hunter Regulated River	9062	20AL203157	18	Hunter Regulated River
824	20AL200915	175	Hunter Regulated River	9343*	20AL203174	25	Wybong Creek
830	20AL200933	306	Hunter Regulated River	9344*	20AL203206	164	Wybong Creek
831	20AL200934	8	Hunter Regulated River	9986	20AL203182	5	Hunter Regulated River
895	20AL201081	8	Hunter Regulated River	9987	20AL203183	82	Hunter Regulated River

WAL No.	DPE Water Reference Number	Share Allocation (ML)	Water Source	WAL No.	DPE Water Reference number	Share Allocation (ML)	Water Source
897	20AL201085	55	Hunter Regulated River	9988	20AL203184	8	Hunter Regulated River
898	20AL201086	8	Hunter Regulated River	11085*	20AL203320	128	Wybong Creek
933	20AL201156	43	Hunter Regulated River	11216	20AL203370	86	Hunter Regulated River
1000	20AL201324	3	Hunter Regulated River	13083	20AL203454	100	Hunter Regulated River
1001	20AL201325	334	Hunter Regulated River	13228	20AL202591	0	Wybong Creek
1057	20AL201469	509	Hunter Regulated River	13229	20AL202592	77	Wybong Creek
1159	20AL201722	159	Hunter Regulated River	18689	20AL209242	15	Muswellb rook
1239	20AL203080	40	Hunter Regulated River	18701	20AL209198	28	Muswellb rook
1349	20AL202949	8	Hunter Regulated River	18712	20AL209241	5	Muswellb rook
1387	20AL202878	40	Hunter Regulated River	20343	20AL204331	48	Wybong Creek
6260*	20AL202522	36	Wybong Creek	37027*	20AL213134	30	Wybong Creek
6261	20AL202524	1	Wybong Creek	37028*	20AL213135	96	Wybong Creek
6262*	20AL202525	8	Wybong Creek	6294*	20AL202631	39	Wybong Creek
6264*	20AL202531	30	Wybong Creek	6296*	20AL202639	86	Wybong Creek
6272*	20AL202554	50	Wybong Creek	6298*	20AL202643	39	Wybong Creek

WAL No.	DPE Water Reference Number	Share Allocation (ML)	Water Source	WAL No.	DPE Water Reference number	Share Allocation (ML)	Water Source
6275	20AL202561	5	Wybong Creek	6300	20AL202647	5	Wybong Creek
6276*	20AL202562	12	Wybong Creek	6304	20CA202655	5	Wybong Creek
6278*	20AL202569	117	Wybong Creek	6305	20CA202656	74	Wybong Creek
6306*	20AL202658	52	Wybong Creek	7495	20AL202699	27	Wybong Creek

*WAL covered under water use approval 20MW065001 (Miscellaneous Works Approval for licence of harvestable rights).

3.4.3 Groundwater Licences

Mangoola currently holds the following groundwater licences shown in **Table 3-6**.

Table 3-6 Groundwater Licences

WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works	WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works
6316	20CA202449	175	Well	-	20BL172827	0	Test bore
6317	20CA202451	19	Well	-	20BL171778	0	Test bore
6322	20CA202463	5	Well	-	20BL171860	0	Test bore
6327	20CA202482	30	Well	-	20BL171861	0	Test bore
18068	20CA208143	5	Bore	-	20BL171862	0	Test bore
18136	20CA208033	596	Bore	-	20BL171864	0	Test bore
18170	20CA207847	219	Well	-	20BL171865	0	Test bore
18214	20CA208151	218	Well	-	20BL171867	0	Test bore
18219	20CA208171	5	Bore	-	20BL172567	0	Test bore
18232	20CA208179	5	Bore	-	20BL172568	0	Test bore
18690	20CA209155	10	Bore/Well	-	20BL172569	0	Test bore
18695	20CA209151	131	Well	-	20BL172570	0	Test bore
18696	20CA209157	53	Well	-	20BL172573	0	Test bore
18701	20CA209199	28	Bore	-	20BL172788	0	Test bore
18718	20CA209147	151	Well/Bore	-	20BL172789	0	Test bore
30247	20CA212344	98	Well	-	20BL172790	0	Test bore
41561	WAL 41561	700	Excavation	-	20BL172806	0	Test bore

WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works	WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works
-	20WA216010	1	Bore	-	20BL172808	0	Test bore
-	20WA207550	0	Bore	-	20BL172809	0	Test bore
-	20WA214821	0	Bore	-	20BL172811	0	Test bore
-	20WA207593	0	Well	-	20BL172812	0	Test bore
-	20WA207594	0	Well	-	20BL172813	0	Test bore
-	20WA209128	0	Bore	-	20BL172814	0	Test bore
-	20WA215330	0	Bore	-	20BL168135	0	Test bore
-	20WA207651	0	Bore	-	20BL168414	0	Test bore
-	20WA215537	0	Bore	-	20BL168696	0	Test bore
-	20WA207655	0	Well	-	20BL168743	0	Test bore
-	20WA207668	0	Well	-	20WA216315	0	Bore
-	20WA209113	0	Bore	-	20WA207700	0	Well
-	20WA212410	0	Bore	-	20WA209139	0	Spear points
-	20WA209136	0	Bore	-	20WA207718	0	Well
-	20WA209112	0	Bore	-	20WA215573	0	Well
-	20WA215016	0	Bore	-	20WA215826	0	Well
-	20WA215082	0	Bore	-	20BL167003	0	Bore
-	20WA215502	0	Bore	-	20CA211849	0	Well
-	20WA207649	0	Bore	-	-	-	-

3.4.4 Radiation Licence

Mangoola holds Radiation Licence 5063445 which expires 28 April 2023. This annual licence was renewed during the reporting period.

3.4.5 Sewerage Management System Licence

Mangoola Coal holds an approval to operate an onsite sewerage management system (licence number WTA5/2010) in accordance with the requirements of the Muswellbrook Shire Council and EPL 12894. The licence expires on 29 July 2026. All monitoring results required under EPL 12894 are published on the Mangoola Coal website.

3.5 Other Approvals

3.5.1 Mining Operations Plan and Rehabilitation Management Plan

The Mangoola Mining Operations Plan (MOP) was superseded on 2 July 2022 by the Rehabilitation Management Plan (RMP), in accordance with the transitional arrangements for the new reporting requirements under the *Mining Act 1992*. The RMP, Annual Rehabilitation Report and Forward Program have been prepared in accordance with B91 of SSD-8642 and the *Mining Act 1992*.

3.5.2 Compliance with EIS Predictions

In accordance with the *Annual Review Guideline* (DPE, 2015), this Annual Review compares the predictions made in the MP 06_0014 Modification 6 Environmental Assessment and SSD-8642 Environmental Impact Statement (EIS) with the environmental monitoring results from the 2022 reporting period where they applied during the reporting period. **Table 3-7** details the location of these prediction comparisons.

Table 3-7 MP 06_0014 Mod 6 and SSD-8642 Comparison Against Predictions

Environmental Aspect	Section Reference
Air Quality	Section 6.2.3
Noise	Section 6.3.3
Blasting and Vibration	Section 6.4.3
Biodiversity	Section 6.6.3
Heritage	Section 6.9.3
Surface Water	Section 7.6.3
Groundwater	Section 7.7.3

4. Operations During the Reporting Period

4.1 Mining Operations

4.1.1 Overview

Open cut mining continued at Mangoola’s Main Pit and South pit located south of Wybong Road during the reporting period. Truck and shovel mining methods are used to handle overburden and coal, following pre-strip and drilling and blasting activities. Product coal is loaded and transported to market via the rail loop connected to the Muswellbrook – Ulan railway. The mine operates 24 hours a day, seven days a week, and currently employs 422 full time equivalent employees (with approval for 450 employees). The general site layout is presented in **Figure 4-1**. Activities undertaken during the reporting period included open cut mining, coal processing and coal transport, which are detailed in the following sections.

4.1.2 Exploration

Throughout the reporting period, three exploration holes were drilled, 24 Limit of Oxidation (LOX) holes were drilled within the MCCO Project area, and two of the groundwater monitoring bores required by the MCCO Project EIS commitments were installed. In July 2022, Mangoola submitted an ESF4 application for the exploration of a further 11 boreholes within Assessment Lease (AL) 9.

4.1.3 Land Preparation

Land clearing is undertaken in accordance with the Mangoola Environmental Management System (EMS). Areas are assessed prior to clearing to minimise potential ecological, water management, sediment and erosion, and cultural heritage impacts in accordance with pre-clearing requirements.

4.1.4 Mining

Open cut mining operations continued during the reporting period, with 7.68 million tonnes (Mt) of ROM coal being extracted. Mining operations during the reporting period continued in the Main Pit and South Pit. Approximately 30.30 million bank cubic metres (BCM) of overburden were moved. The 2022 production summary is presented in **Table 4-1**.

Table 4-1 2022 Production Summary

Material	Approved Limit	2021 Reporting Period (Actual)	2022 Reporting Period (Actual)	2023 Reporting Period (Forecast)
Waste Rock/ Overburden (BCM)	No limit	27,816,881	30,303,401	30,905,184
ROM Coal (t)	13,500,000	8,028,889	7,686,725	9,203,000
Coarse reject (t)	No limit	995,970	1,066,164	2,222,724
Fine reject (Tailings) (t)	No limit	881,949	898,786	

Material	Approved Limit	2021 Reporting Period (Actual)	2022 Reporting Period (Actual)	2023 Reporting Period (Forecast)
Saleable product (t)	No limit	6,441,666	5,718,749	6,981,000

During 2022, an additional four 789 haul trucks were added to the mining fleet and no gravel crushing operations occurred on site during 2022.

4.2 Other Operations

4.2.1 Coal Processing

During the reporting period approximately 5.7 Mt of product coal, 0.89 Mt of tailings and 1.06 Mt of coarse rejects were produced from the CHPP. The CHPP washed or bypassed all coal produced at Mangoola, with Tailings Dam 4 used for fine rejects disposal.

Tailings Dam 4 has sufficient capacity for Life-Of-Mine. No capping was undertaken for Tailings Dam 1 or Tailings Dam 2 during 2022.

4.2.2 Coal Transport

During the reporting period there were 1,286 train movements from the Mangoola rail loader, which transported approximately 5.47 Mt of coal. Each train consists of two movements (one movement into the loop and one movement out of the loop). This equates to an average of 3.52 daily train movements generated by Mangoola, with a maximum of 13 train movements in one day. This is within the 20 train movements per day limit stipulated in Schedule 3, Condition 49 of MP 06_0014 and Condition B93 of SSD-8642. No coal was transported other than by rail during the reporting period.

Annual train movements are included in **Appendix F**.

4.2.3 Construction

Works associated with the MCCO Project have been ongoing since construction commenced with preliminary site establishment works on 6 December 2021, before broader construction activities commenced in early January 2022. Despite the challenges experienced following the significant rainfall received throughout 2022, the construction program progressed well with a number of key Project elements completed throughout the year including:

- Big Flat Creek culverts (3 x 3 m steel culverts capable of conveying a 1:250 year rainfall event);
- Clean Water Diversion Drain 1 (enables clean water to be diverted around the future mining area);
- A number of water management infrastructure items including sedimentation dams, transfer dam and catch drains;
- Visual bunds (VB4 and VB2) and flood protection levee along Wybong Road;
- Relocation of 11 kV transmission lines and Telstra services;
- Vegetation clearing and removal of redundant dwellings; and
- Revisions to the environmental monitoring network as per approved environmental management plans required by SSD-8642.

The Wybong Road project boundary fencing was also installed during 2022.

Works continued throughout 2022 associated with the construction of the Wybong Road overpass to provide a connective haul road from the existing mining operations to the MCCO Project Area. This work included the construction of a temporary diversion of Wybong Road to facilitate the construction of the concrete arch tunnel along with a temporary diversion of Big Flat Creek to enable the installation of the Big Flat Creek culverts. The Big Flat Creek culverts were installed and commissioned for use in November 2022 and the temporary diversion subsequently decommissioned. Topsoil stripping commenced within the MCCO Project Area box cut in 2022.

4.2.4 Waste Management

Waste at Mangoola is managed in accordance with the EMS (incorporating waste reuse and recycling). The EMS has been developed in accordance with the requirements of the *Protection of the Environment Operations Act 1997* (POEO Act).

A licensed waste contractor undertakes the collection, transport and recording of waste material, with as much material as possible being recycled. During the reporting period 1,744 tonnes of waste was disposed of offsite with 1,484 tonnes of that being recycled (85% recycled). This represents an overall increase (by two tonnes) in total waste disposal compared to 2021 (1,746 tonnes).

The major waste streams during the reporting period were waste oil (640 tonnes), scrap steel (257 tonnes), mixed solid waste (228 tonnes) and effluent (430 tonnes).

A summary of waste disposal from 2016 to 2022 is presented in **Figure 4-2**.

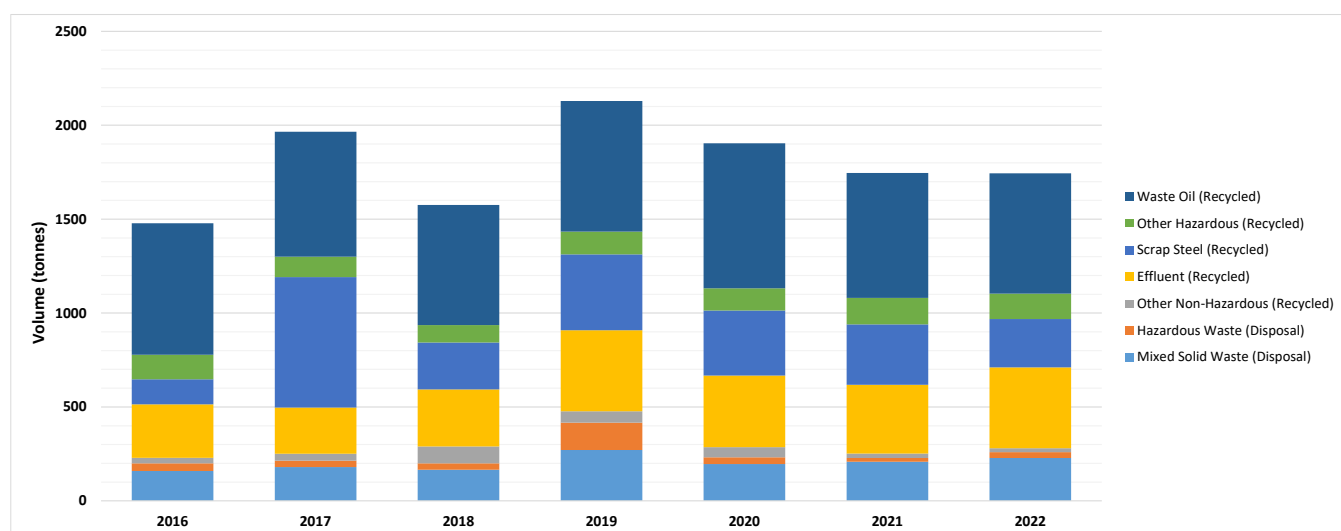


Figure 4-2 2016-2022 Waste Streams Generated

4.3 Next Reporting Period

4.3.1 Mining

During 2023, coal extraction will continue in the Main Pit and South Pit, along with planned commencement of mining in Wybong Pit (to the north of Wybong Road). Forecast production for 2023 is 9.2 Mt of ROM coal and 7.0 Mt of product coal. There are no proposed changes to mining equipment, personnel or mining techniques in 2023. Construction works associated with the MCO project are expected to be complete by end of 2023.

Both the Main and South Pit will continue progressing in line with the mine plan.

4.3.2 Exploration

Approximately 11 boreholes are to be drilled in AL9 and 29 bore holes drilled in ML 1817 for the MCO project. Approximately half of these will be cored with the remainder of the holes open (chip) holes.

4.3.3 Construction

Coal mining activities remain on schedule to occur within the MCCO Project Area in 2023 and the works associated with the Wybong Road overpass are planned to continue into 2023. The MCCO Project construction program remains on track for completion in mid-2023.

4.3.4 Tailings Disposal

During 2023, tailings will be disposed of in Tailings Dam 4, which has sufficient capacity for Life-of-Mine.

5. Actions Required from Previous Annual Review

Mangoola received a letter from DPE on 13 July 2022 stating the Mangoola 2021 Annual Review was found to generally satisfy the requirements of the consents and the Departments *Annual Review Guideline* dated October 2015.

The Resources Regulator advised that the Annual Review had been received and was subject to review to comply with the Mangoola mining authorisations and conditions of the Mining Act. No further correspondence was received.

The follow up actions to the commitments made in the 2021 Annual Review are summarised in **Table 5-1**.

Table 5-1 Actions Required From 2021 Annual Review

Action Required from Previous Annual Review	Due Date	Action Taken by Mangoola	Where Discussed
The noise monitoring network will be reviewed to determine whether continuous noise monitoring units can be relocated to provide better coverage around the mining operations.	Complete	Noise Management Plan (including the continuous noise monitoring units) were updated to align with the SSD-8642 approval.	Section 6.3.4
The monitoring program for terrestrial orchids will be reviewed and updated based on the recommendations from Eastcoast Flora Survey.	Complete	Eastcoast Flora Survey design and undertake the monitoring annually and incorporate their own recommendations each year.	Section 6.6.4
Engagement with Registered Aboriginal Parties (RAPs) regarding funding available to enhance or promote Aboriginal matters will be undertaken in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP).	Ongoing	Included in the presentation in the annual cultural heritage stakeholder meeting held in December 2022. Minutes from meeting and a copy of the presentation was sent out to all RAPs.	Section 6.9.4
Mangoola GIS will be updated to add new artefacts found as part of MCCO Project/other due diligence works.	Complete	Umwelt provided updated master artefact layer for Mangoola GIS reference.	Section 6.9.4
Continued construction of project boundary fencing along Wybong Road.	Completed	Wybong boundary fence installed during 2022	Section 4.2.3
The Energy Savings Action Plan (ESAP) will be reviewed in 2022 (in the event MP 06_0014 has not surrendered).	N/A	MP 06_0014 surrendered. ESAP review not required.	Section 6.15.1

Action Required from Previous Annual Review	Due Date	Action Taken by Mangoola	Where Discussed
Validation and review of Numerical Groundwater Model, including revision of the Groundwater Monitoring Program (GWMP).	December	GWMP has been reviewed as required by SSD-8642. Validation requires the drilling of groundwater bores as per the below action.	Section 7.7.4
Completing installation of additional monitoring bores proposed as part of the MCCO approved EIS.	Started 2022	There are still 5 bores remaining to be installed. Work is underway and is scheduled for completed 30 April 2023.	Section 4.1.2 Section 7.7.4
Completing additional baseline monitoring from existing bores along Big Flat Creek in the area adjacent the eastern flank of the out-of-pit emplacement area for a minimum of 12 months prior to the commencement of mining.	Completed	Additional Baseline monitoring was conducted at bores GW01-D, MN 1006, REG001 and GW07-D monthly (where access permitted) throughout the 12 months prior to the commencement of mining.	Section 7.7.1
Continuation of the rehabilitation research and trials associated with threatened flora species translocations.	Ongoing	Threatened flora species translocation plots continued to be managed and monitored during the reporting period.	Section 6.6.2.3
Enhancement activities associated with species diversity, growth mediums and habitat features.	Ongoing	Infill planting, rehabilitation process including adding gypsum and ripping and addition of rocks, habitat trees and nest boxes.	Section 8.1
Achieving the rehabilitation targets as outlined in the approved MOP.	NA	Rehabilitation is undertaken in accordance with the RMP which replaced the MOP as of 2 July 2022.	Table 8-4
Cool burns in both grassland and woodland areas of approximately ten-year-old rehabilitation.	Complete	In August 2022 Mangoola conducted a cultural burn trial in 11-year-old woodland and 8-year-old grassland rehabilitation. This was assisted by Yarrabin Cultural Consultants.	Section 8.5

6. Environmental Performance

6.1 Meteorology

In accordance with Condition B35 of SSD-8642 and Condition P1.1 of EPL 12894, Mangoola continued to operate at least two meteorological monitoring stations across the site during the reporting period. In preparation for mining within the Wybong Pit a new northern station, known as Weather Station North 1, was installed ahead of decommissioning of the existing northern station in accordance with the 6 December 2021 EPL Variation. These details are summarised in **Table 6-1** and illustrated on **Figure 6-4**. Meteorological data recorded during the reporting period is available on the Mangoola website.

Table 6-1 Summary of Weather Stations in 2022

Weather Station	Commencement Date	Decommission Date	Location Description
Weather Station North (WSN)	Existing	13 December 2022	Located to the north of the site, along Wybong Road.
Weather Station North 1 (WSN1)	20 May 2022	Current	Located to the north of the site, along Wybong PO Road.
Weather Station South (WSS)	Existing	Current	Located to the south of the site, adjacent to the CHPP.

As shown in **Figure 6-1**, total rainfall during 2022 was considered to be ‘very much above average’. WSS recorded 974 mm of rainfall during 2022, slightly higher than the 2021 total of 939 mm. The highest monthly rainfall total was recorded in March (190 mm) while the lowest was recorded in June (15 mm). Long-term rainfall data is presented in **Appendix B**, which shows that rainfall recorded during 2022 was higher than most years since 2010.

As shown in **Figure 6-3**, the daily minimum and maximum 2 metre above surface level temperatures at WSS ranged from 0.0 °C to 35.8°C respectively, with an average daily maximum of 22.5 °C, which is cooler than the 2021 daily average of 23.2 °C. Relative humidity during 2022 ranged from 12.5% to 100%.

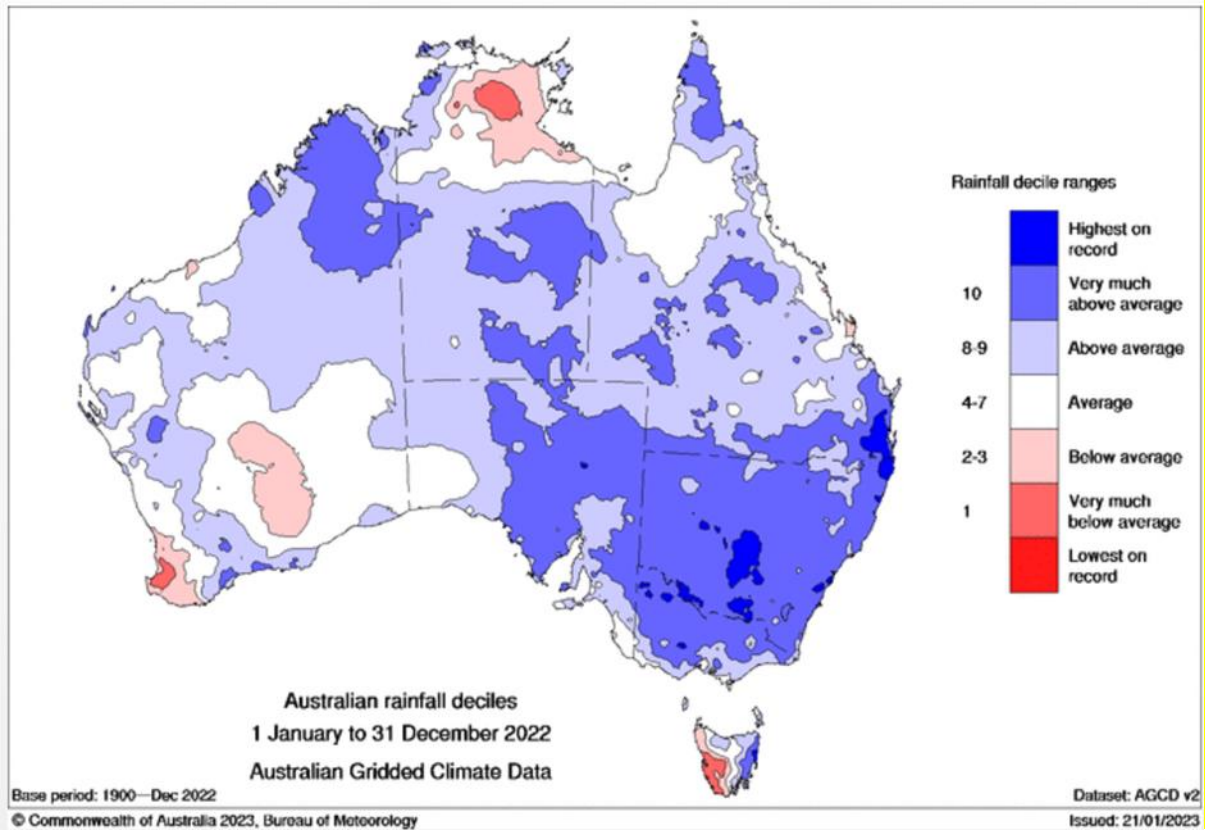


Figure 6-1 12-month Rainfall Deficiency for 2022 (BOM, 2022)

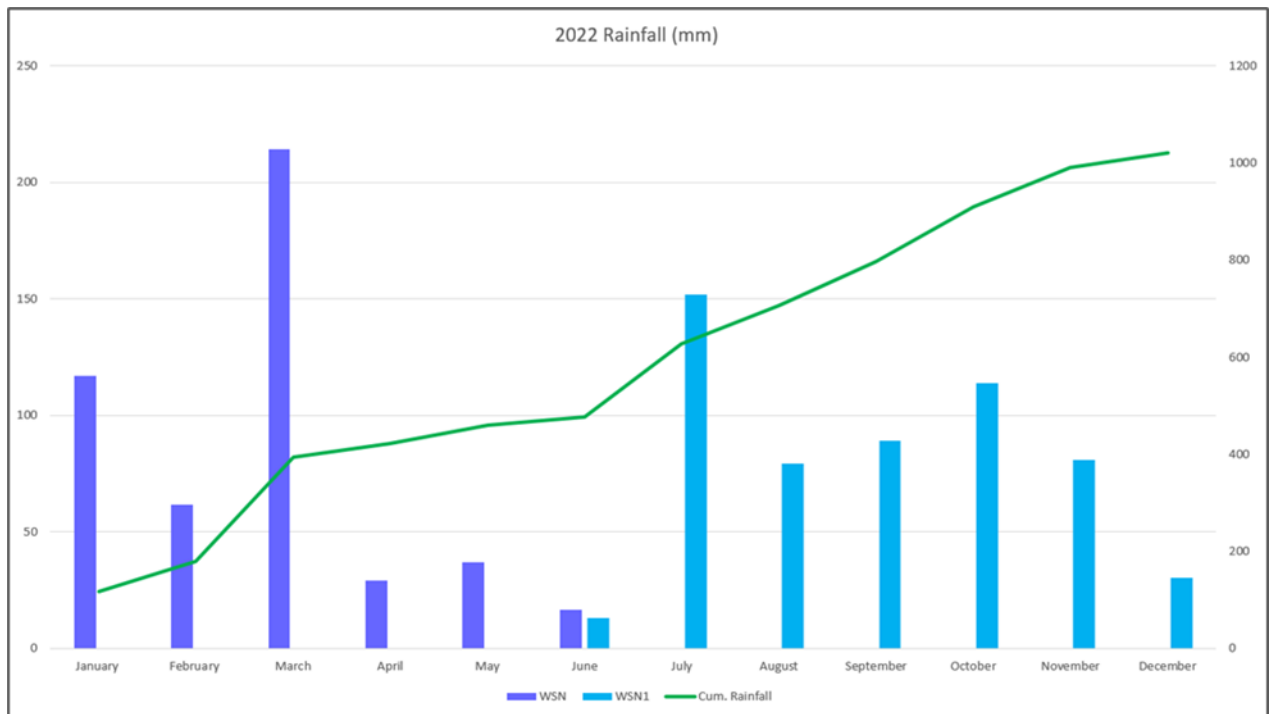


Figure 6-2 WSN/WSN1 2022 Rainfall Data

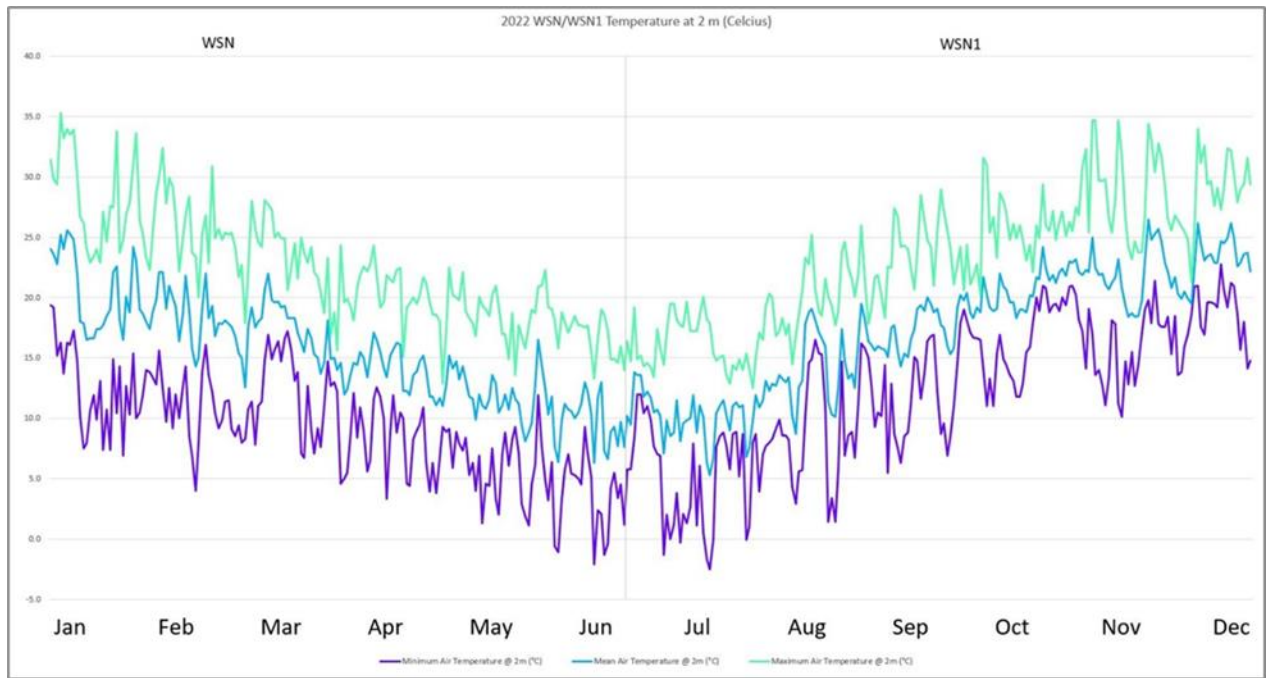


Figure 6-3

WSN/WSN1 2022 2 m Temperature Data

6.2 Air Quality

6.2.1 Environmental Management

Mangoola operated in accordance with the approved Air Quality Management Plan (AQMP) that was reviewed for the construction phase of the MCCO Project. The former Air Quality Management Plan was updated to the Air Quality and Greenhouse Gas Management Plan (AQGGMP) and approved by DPE in 2022, aligning with the new monitoring requirements under SSD-8642. Mangoola commissioned and decommissioned several pieces of air quality monitoring equipment (as shown in **Figure 6-4**) to align with the updated requirements of SSD-8642 and the former approved AQMP. A summary of amendments to the air quality monitoring network made during the reporting period is provided in **Table 6-2**.

Table 6-2 Amendments to Air Quality Monitoring Network made during 2022

Current Site Name	Description of Change	Revised Site Name
WSN	Decommissioned and infrastructure relocated to the west of the mining area north of Wybong Road.	WSN1
D7-DC	Decommissioned and infrastructure relocated.	D9-DC
D05-PM10	Decommissioned and infrastructure relocated to the north of the project boundary to be reflective of the nearest private receivers located on Ridgeland's Road.	D08-PM10
D07-PM10	Decommissioned and infrastructure relocated adjacent to the revised location of WSN1.	D09-PM10
DG09	Removed and replaced with DG25.	DG25
DG04	Removed and replaced with DG23.	DG23
DG20	Removed and replaced with DG24.	DG24
DG15	Removed and replaced with DG26.	DG26
DG19	Removed and replaced with DG27 located adjacent to the relocated position of D08-PM10.	DG27
DG10	Removed and replaced with DG28 located on Hidden Valley Right of Way.	DG28
DG06, DG18, DG03, DG01, DG14, DG13	Depositional dust sites decommissioned.	N/A
D02-DC	PM _{2.5} monitor installed at D02-DC to further enhance the coverage of the PM _{2.5} monitoring capabilities of the network.	No change

The current air quality monitoring program consists of:

- Eleven depositional dust gauges known as DG02, DG07, DG12, DG16-DG18 and DG23-DG28 which are monitored monthly (it is noted that these are not monitoring points in the AQGGMP, but were during the reporting period under the AQMP);
- Five Tapered Element Oscillating Microbalance (TEOM) dust monitors continuously measuring PM₁₀ known as D02-DC to D06-DC (D02-DC, D04-DC and D06-DC measure PM_{2.5} as well as PM₁₀);
- Two PM₁₀ E-Sampler Particulate Monitors continuously measuring PM₁₀ known as D9-DC (formerly known as D7-DC before relocation) and D8-DC (EPL Monitoring Points 19 and 20 respectively);
- Three High Volume Air Sampler (HVAS) dust monitors measuring Total Suspended Particulates (TSP) over one 24-hour period every six days, known as D02-TSP to D04-TSP; and
- Four HVAS dust monitors measuring PM₁₀ over one 24-hour period every six days, known as D01-PM10, D05-PM10 (relocated to D08-PM10 during the reporting period), D06-PM10 and D07-PM10 (relocated to D09-PM10 during the reporting period).

MP 06_0014 stipulated criteria for PM₁₀, TSP and depositional dust. SSD-8642 does not have criteria for depositional dust but includes criteria for PM_{2.5}, as presented in **Table 6-3**.

Table 6-3 SSD-8642 and MP06_0014 Air Quality Criteria that applied during the reporting period

Pollutant	Averaging Period	Criterion ⁴
Long Term Impact Assessment Criteria for Particulate Matter		
TSP	Annual Average	¹ 90 µg/m ³
PM ₁₀	Annual Average	¹ 25 µg/m ³
PM _{2.5}	Annual Average	¹ 8 µg /m ³
Short Term Impact Assessment Criteria for Particulate Matter		
PM ₁₀	24-hour Average	¹ 50 µg/m ³
PM _{2.5}	24-hour Average	¹ 25 µg/m ³
Long Term Impact Assessment Criteria for Deposited Dust As defined in MP 06_0014 and the AQMP for Construction Phase only		
Deposited Dust ³	Annual Average	¹ 4 g/m ² /month (maximum total deposited dust level) ² 2 g/m ² /month (maximum increase in deposited dust level)

¹ – Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

² – Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations sure to all other sources).

³ – Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method. Note the specified criteria only applied until the surrender of MP 06_0014 on 21 November 2022.

⁴ – Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

Mangoola currently implements a Dust Management Trigger Action Response Plan (TARP) developed in line with the Dust Assessment Handbook (NSW EPA, 2019).

Mangoola implements best practice for the management of air quality including the implementation of reasonable and feasible measures to minimise/mitigate offsite odours. Mangoola will continue to implement all controls in the Spontaneous Combustion Management Plan, Blast Fume Management Plan and the AQGGMP.

In addition, Mangoola also implements key operational controls as described in Section 4.2 of the AQGGMP (Section 3.2 of the former AQMP). These controls include, but are not limited to, predictive meteorological forecasting, water carts, chemical dust suppressants, progressive rehabilitation and dust suppression sprays on stockpiles and conveyors.

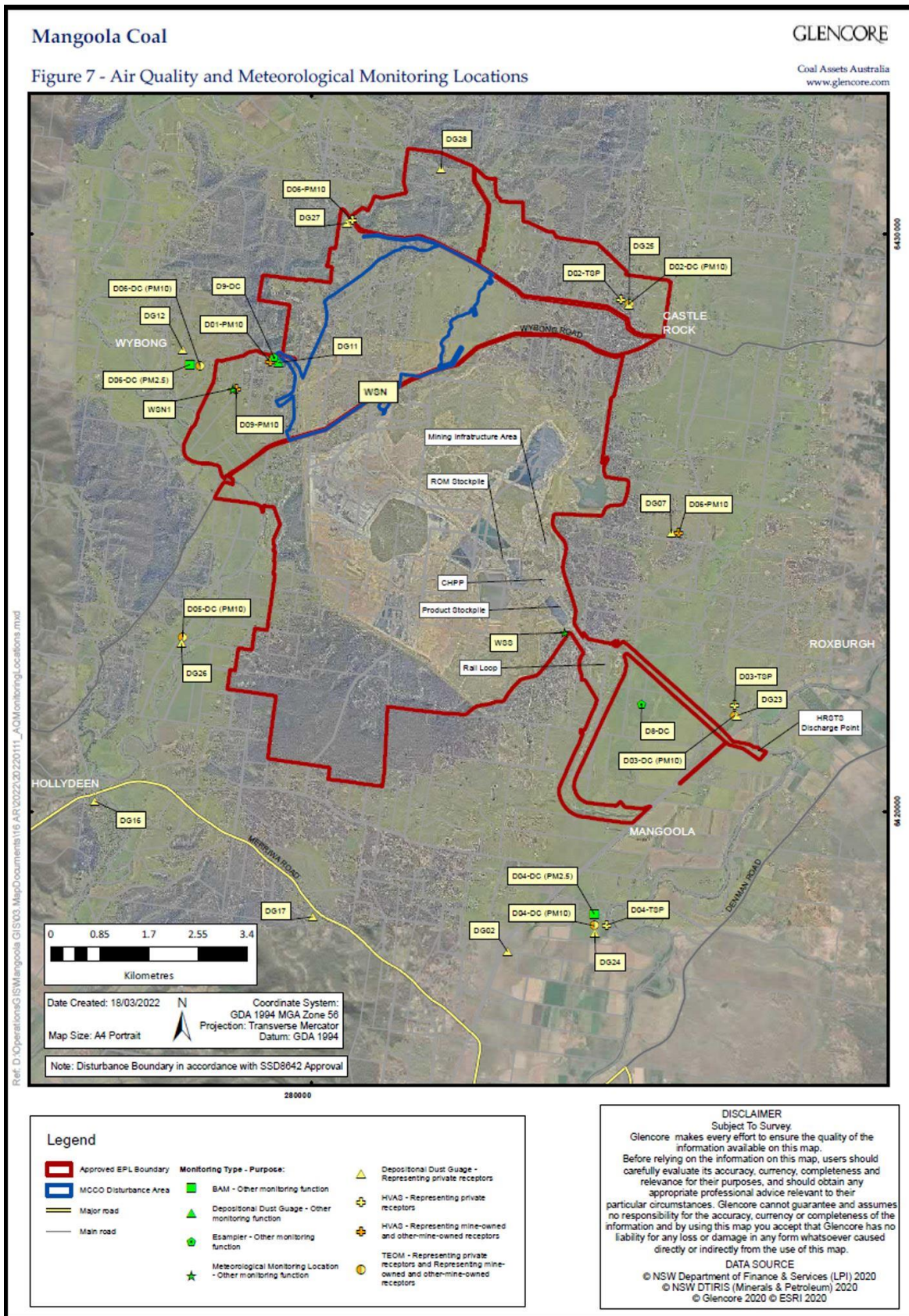


Figure 6-4 Air Quality and Meteorological Locations

6.2.2 Environmental Monitoring Results

6.2.2.1 Results from the Reporting Period

Depositional Dust Gauges

Depositional dust gauge data collected during the reporting period is available on the Mangoola website and is summarised in **Table 6-4**. The data presented is corrected for contamination of samples (i.e. bird droppings or insects) and presents annual average deposition rate of insoluble solids as g/m²/month.

Table 6-4 2022 Depositional Dust Gauge Results (Insoluble Matter)

Gauge	Location Description	No. Of Samples Collected	No. of valid samples	Background level (g/m ² /month)	Annual Average [^] (g/m ² /month)
DG02	Mangoola Rd	12	11 – 1 x contaminated by insect matter	1.0	1.1
DG07	Mangoola Rd	12	12	1.6	1.3
DG12	Wybong Post Office Rd	12	12	1.4	1.0
DG16	Golden Highway	12	12	0.9	0.9
DG17	Golden Highway	12	12	0.7	0.5
DG23	Mangoola Rd	12	12	No data	1.3
DG24	Bells Lane	12	12	No data	0.7
DG25	Ridgelands Rd	12	11 – 1x plastic in sample	No data	1.3
DG26	Wybong Rd	10	10 – first collection March 2022	No data	0.7
DG27	Ridgelands Rd	10	9 – 1x insect matter and bird droppings, first collection March 2022	No data	0.9
DG28	Hidden Valley Row	10	10 – first collection March 2022	No data	0.8

[^] – Depositional Dust Criteria 4g/m²/month Max Annual Average.

During 2022, the annual average dust deposition did not exceed 4 g/m²/month at any monitoring locations. Additionally, the annual average results did not exceed background levels by more than 2 g/m²/month at any monitor.

TEOM (PM₁₀)

TEOM results for PM₁₀ concentrations are available on the Mangoola website and are summarised in **Table 6-5**.

Table 6-5 2022 PM₁₀ 24-hr Average Results

Gauge	Location Description	Minimum (µg/m ³)	Annual Average [#] (µg/m ³)	Maximum 24 hr (µg/m ³) [^]	Mangoola contribution (µg/m ³)
D02-DC	96 Ridgелands Rd	2.7	12.8	34.2	-
D03-DC	830 Mangoola Rd	2.9	13.3	31.2	-
D04-DC	22 Bells Lane	2.2	11.3	30.6	-
D05-DC	2909 Wybong Rd	0.3	7.6	26.3	-
D06-DC	393 Wybong PO Rd	3.3	12.0	31.0	-
D7-DC* (to 5/5/22)	Wybong Rd	0.2	10.4 ^{^^}	49.7	-
D9-DC* (from 6/5/22)	Wybong PO Rd	0.2	10.7 ^{^^}	42.0	-
D8-DC*	CHPP	0.1	8.4	60.3	-

* 'Early warning' unit which represents management monitoring point (not used for compliance purposes as it is not representative of private receptors).

PM₁₀ Annual Average Criterion 30 µg/m³ until the commencement of Development under SSD-8642 occurred on 6 December 2021. Following commencement of Stage 2 – PM₁₀ annual average criterion reduced from 30 µg/m³ to 25 µg/m³ as listed in Table 14. TSP Annual Average Criterion 90 µg/m³.

[^]PM₁₀ 24h Max Criteria 50 µg/m³.

^{^^} Full year of data unavailable due to monitor relocation as per Table 6-2.

There were no exceedances of the 50 µg/m³ 24-hr averaging period criterion or the 25 µg/m³ annual average criterion at any of the applicable monitoring locations throughout the reporting period.

TEOM (PM_{2.5})

TEOM results for PM_{2.5} concentrations are available on the Mangoola website and are summarised in **Table 6-6**.

Table 6-6 2022 PM_{2.5} 24-hr and Annual Average Results

Gauge	Location Description	Minimum (µg/m ³)	Annual Average [#] (µg/m ³)	Maximum (µg/m ³) [^]	Mangoola contribution (µg/m ³)
D02-DC*	96 Ridgелands Rd	1.0	5.3	15.0	-
D04-DC	22 Bells Lane	0.2	3.4	15.3	-
D06-DC	393 Wybong PO Rd	0.8	7.3	20.8	-

PM_{2.5} Annual Average Criterion 8 µg/m³

[^]PM_{2.5} 24h Max Criteria 25 µg/m³.

* Installed 17 May 2022

There were no exceedances of the PM_{2.5} annual average criteria of 8 µg/m³ or the 24-hr maximum criteria of 25 µg/m³ at any of the monitoring locations throughout the reporting period.

High Volume Air Sampler (HVAS) TSP and PM₁₀

HVAS results for TSP and PM₁₀ concentrations are available on the Mangoola website and are summarised in **Table 6-7**.

Table 6-7 2022 PM₁₀ and TSP 24-hr Average Results

Monitoring Point	Minimum (µg/m ³)	Annual Average (µg/m ³)*	Maximum (µg/m ³)**
TSP			
D02-TSP [#]	1.6	28.0	78.8
D03-TSP [#]	2.9	27.2	62.8
D04-TSP [#]	1.7	23.3	53.7
PM₁₀			
D01-PM ₁₀ [^]	0.2	9.2	26.7
D05-PM ₁₀ ^{^#} (to 4/4/22)	7.6	15.3 (16) ^^	20.9
D08-PM ₁₀ ^{^#} (from 10/4/22)	0.0	7.9 (45) ^^	24.8
D06-PM ₁₀ [^]	0.2	10.8	27.4
D07-PM ₁₀ [^] (to 4/4/22)	4.8	14.8 (16) ^^	30.9
D09-PM ₁₀ [^] (from 10/4/22)	0.0	7.4 (45) ^^	30.8

* PM₁₀ Annual Average Criterion 25 µg/m³, TSP Annual Average Criterion 90 µg/m³;

** PM₁₀ 24hr Criterion 50 µg/m³, no specified 24hr Criterion for TSP under PA 06_0014;

[^] Monitor located on Mine Owned Land; and

[#] Representative of private receptors.

^{^^} Full year of data unavailable due to monitor relocation as per Table 6-2.

There were no exceedances of the respective criteria for TSP and PM₁₀ throughout the reporting period.

Odour

In accordance with MP 06_0014, SSD-8642 and EPL 12894, no odour monitoring is required at Mangoola. Odour is not considered an issue at Mangoola and no complaints have been received during the reporting period in relation to odour. No incidents have been reported in relation to odour.

6.2.2.2 Comparison with Predictions

The MP 06_0014 MOD 6 Environmental Assessment (EA) Air Quality Impact Assessment (Todoroski Air Sciences, 2013) predicted dust emissions for the project in years 2, 5, and 10. An Air Quality Impact Assessment (Jacobs, 2019) was also completed as part of the MCCO Project. The assessment predicted dust emissions for 2014, 2022, 2024, 2026 and 2029.

A comparison of 2022 dust data against the relevant MP 06_0014 MOD 6 and MCCO Air Quality Impact Assessments has been made in **Table 6-8**.

Table 6-8 Comparison of 2020 to 2022 Dust Emissions

Dust Monitor	Closest Privately Owned Residence	Year 5 Prediction (MOD 6)	2022 Prediction (SSD-8642)	2020 Annual Average	2021 Annual Average	2022 Annual Average
Depositional Dust (g/m²/month)						
DG02	200	1.7	2.3	2.9	1.1	1.1
DG07	198	2.4	2.4	2.0	1.1	1.3
DG12	134B	1.9	2.7	2.1	1.0	1.0
DG16	265	1.7	2.3	2.0	0.6	0.9
DG17	147	1.7	2.3	2.1	0.6	0.5
DG23	800B	-	-	N/A	N/A	1.3
DG24		-	-	N/A	N/A	0.7
DG25	761	-	-	N/A	N/A	1.3
DG26		-	-	N/A	N/A	0.7
DG27	157	-	-	N/A	N/A	0.9
DG28	66	-	-	N/A	N/A	0.8
TEOM (PM₁₀) Monitoring Sites (µg/m³)						
D02-DC	111	13.0	11.0	12.3	12.8	12.8
D03-DC	125D, E and F	23.0	12.0	17.2	15.4	13.3
D04-DC	184	11.0	11.0	13.6	13.2	11.2
D05-DC	176	9.0	11.0	10.5	9.2	7.6
D06-DC	110	14.0	13.0	14.6	12.3	12.0
TEOM (PM_{2.5}) Monitoring Sites (µg/m³)						
D02-DC	111	-	5.0	-	-	5.3
D04-DC	184	-	5.0	-	-	3.4
D06-DC	110	-	6.0	-	-	7.3
E-Samplers (PM₁₀) (µg/m³)						
D7-DC	130	15.0	20.0	8.7	11.1	9.9
D8-DC	125	23.0	13.0	11.9	8.9	8.4
HVAS (PM₁₀ and TSP) Monitors (µg/m³)						

Dust Monitor	Closest Privately Owned Residence	Year 5 Prediction (MOD 6)	2022 Prediction (SSD-8642)	2020 Annual Average	2021 Annual Average	2022 Annual Average
D02-TSP	111	38.0	50	34.5	27.8	28.0
D03-TSP	125D, E and F	49.0	51	42.1	30.3	27.2
D04-TSP	184	33.0	50	32.9	23.8	23.3
D01-PM ₁₀	110	14.0	-	13.3	10.2	9.2
D05-PM ₁₀	157	10.0	32	11.5	9.0	15.3
D06-PM ₁₀	130	15.0	-	15.6	10.9	10.8
D07-PM ₁₀	190	26.0	-	14.1	9.5	14.8
D08-PM ₁₀ ^{^#} (from 10/4/22)	139/157	-	-	-	-	7.9
D09-PM ₁₀ [^] (from 10/4/22)	130	-	-	-	-	7.4

[^] Full year of data unavailable due to monitor relocation as per Table 6-2.

As shown in **Table 6-8**, the 2022 annual averages for air quality were above the predicted levels in the Year 5 MOD 6 Assessment at two TEOMs (D02-DC & D04-DC); and one HVAS monitor (D05-PM10). Both E-Sampler monitors were below the levels predicted in the Year 5 MOD 6 Assessment.

More detailed comparisons with the 2022 SSD-8642 predictions will be conducted in 2023 following commencement of mining within the Wybong Pit to the north of Wybong Road in the next reporting period.

6.2.2.3 Long Term Trend Analysis

A long-term trend analysis of air quality monitoring results at Mangoola has been undertaken using data from July 2010 to December 2022 to identify any trends in the monitoring data over the life of the project. These graphs are presented in **Appendix C**. Depositional dust monitoring results have been variable since mining operations commenced in 2010, however results generally peaked in 2012 and declined to the lowest results during 2015-2016. Results were generally increasing during 2017-2019 which correlates with low rainfall and the ongoing drought conditions. Increased rainfall in 2020 resulted in lower results than the previous few years (refer **Appendix B**). 2022 saw results slightly higher than those in 2021.

The annual average HVAS TSP data has shown a gradual increase from 2010 to 2014, then declining in 2015, remaining low in 2016 and 2017, before rising again in 2018 and 2019. The results from 2018 and 2019 saw an increase in TSP results due to prolonged period of drought and increased bushfire activity. Due to increased rain in 2020, results decreased to be consistent with results from 2015 to 2017. The 2022 average TSP results decreased further, likely a result of the consistent rain during the period.

The 24hr maximum TEOM data show seasonal peaks in the summer months. The annual average TEOM results have remained consistent with results from 2011 through to 2017 and results have been

generally increasing during 2018-2019 which correlates with low rainfall and the ongoing drought conditions. Increased rain during 2020 decreased results to be consistent with those from 2015 to 2017. Ongoing rain during 2022 saw 24hr maximum TEOM (averages) remain consistent with those in 2021.

6.2.3 Key Performance and/or Management Issues

It is noted that a 24-hr average PM₁₀ concentration of 63.0 µg/m³ was recorded at D02-DC on 26 March 2022. An investigation was undertaken on 29 March 2022, which identified a large number of insects within the TEOM unit which were suspected to have spoiled the sample collected during the 24-hr period on 26 March 2022. The sample was deemed contaminated and has therefore been excluded from the annual average and maximum 24-hr results presented in **Table 6-5**. For reference, the maximum PM₁₀ 24-hr average across the Mangoola air quality monitoring network on 26 March 2022 was 9.3 µg/m³, recorded at D06-DC.

PM₁₀ monitoring is required continuously in accordance with Condition M2.1 of EPL 12894 at Point 19 (D7-DC/D9-DC) and Point 20 (D8-DC). While the continuous emissions monitoring captured >96% data (the minimum is 90% as per EPA website) EPL19 had insufficient valid data from 18/3/22-1/4/22 due to low flow issues. After an initial field service did not rectify issue, the unit was removed for workshop service/part replacements and the battery box refurbished. The monitor also lost data on 6/6/22 due to filter replacement/service. EPL 20 had insufficient data from 7/7/22 to 8/7/22 (low battery charge) and 27/11/22 to 01/12/22 (re-start issues after factory calibrated monitor was reinstalled. A modem cable was also replaced).

Continuous monitoring at other PM₁₀ and PM_{2.5} units was in accordance with the approved AQMP. All units captured more than 96% data and an average of 97.9% overall. Where outages did occur, they were quickly identified and responded to and due to unplanned power outages/interruptions, monitor breakdowns and servicing/calibration.

There were no community complaints received by Mangoola during the reporting period relating to dust, which is consistent with the previous reporting period and decrease from the two community complaints received in 2020. Further detail on the complaints received in 2022 is provided in Section 9.3.

6.2.4 Proposed Improvements

There are no proposed improvements for air quality for 2023.

6.3 Noise

6.3.1 Environmental Management

During the reporting period Mangoola has operated in accordance with the approved Noise Management Plan (NMP) required under SSD-8642, which is available on the Mangoola website. Attended noise monitoring was completed as per the requirements of SSD-8642 and EPL 12894. All noise monitoring undertaken during the reporting period is summarised as follows:

- Attended monthly monitoring occurred during the night period at thirteen locations representative of privately-owned residences and the Anglican Church (NM4, NM8, NM10, NM13–22) and at six locations during the day period to capture potential construction activity associated with the MCCO project (NM4, NM18–22), as per the NMP.
- Continuous unattended noise monitoring was undertaken at five permanent locations (NC02, NC03, NC05, NC06 and NC10). Three mobile units were also utilised and relocated as needed.

This monitoring is used for proactive and reactive management of day-to-day operations at Mangoola Open Cut, not to monitor compliance.

The attended and permanent unattended noise monitoring locations are shown in **Figure 6-5**.

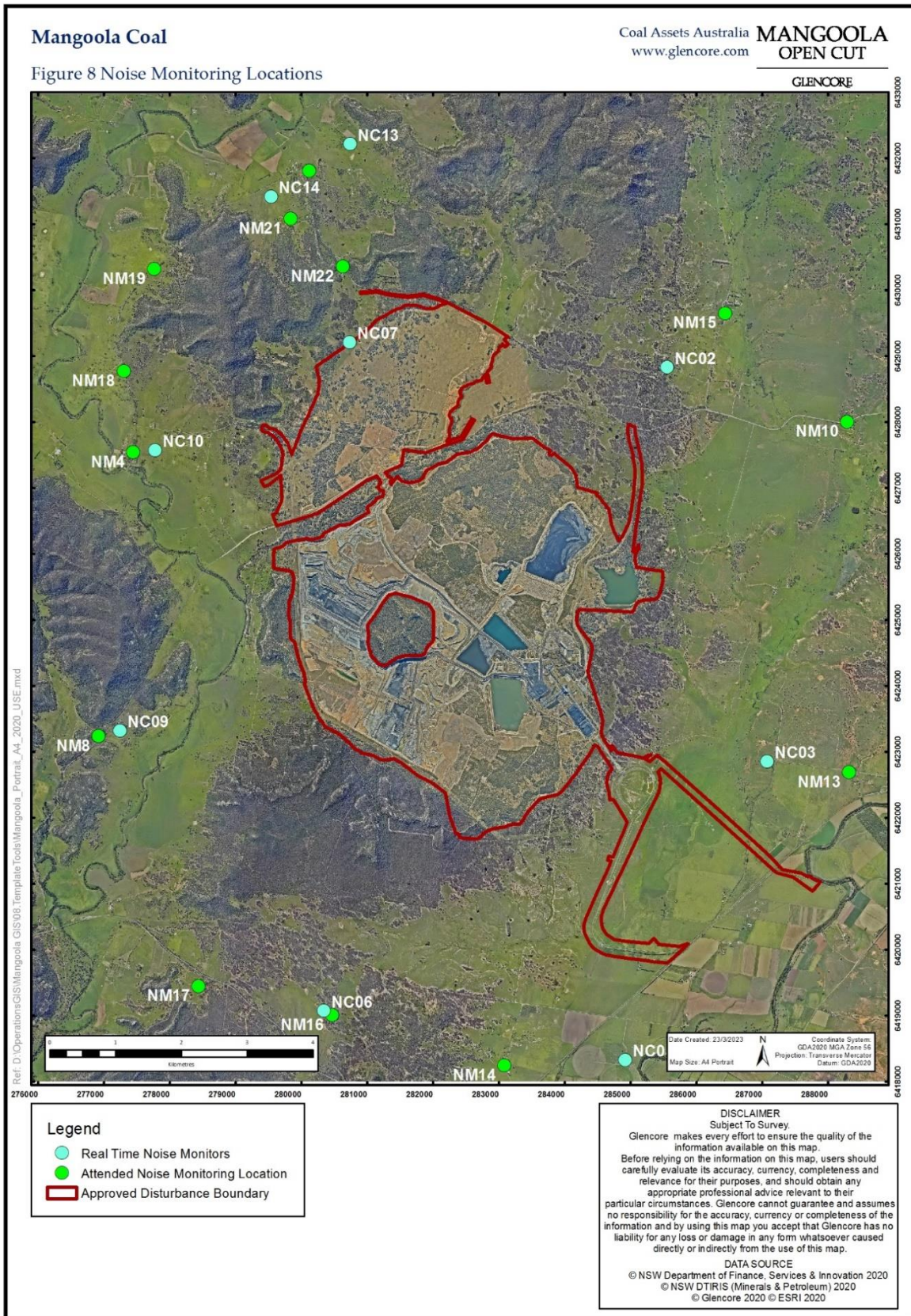


Figure 6-5 Noise Monitoring Locations

Noise Impact Assessment Criteria

Mangoola's noise limits are specified in Table 1, Condition B1 of Schedule 2 of SSD-8642 and Condition L3.2 of the EPL and are reproduced here in **Table 6-9** and **Table 6-10**.

Table 6-9 SSD-8642 – Noise Impact Assessment Criteria

Noise Assessment Location	Day LAeq(15 minute) Years 1 & 2	Day LAeq(15 minute) Year 3 onward	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LA1(1minute)
171, 176, 144	40	40	40	40	52
25, 128, 154, 193, 125A, 182B	40	40	38	38	52
261	42	40	38	38	52
54, 79, 114, 141, 151, 192, 206, 321, 125C, 182A, 241A, 241C, 190, 157	40	40	37	37	52
165, 177, 106B, 104, 166, 178, 251, 253, 260, 112B, 183C, 184A, 147, 112A, 112C, 240, 241B	40	40	36	36	52
134A	44	40	39	39	52
109A-F	43	40	39	39	52
263	42	40	39	39	52
164^	40	40	35	39	52
Other privately-owned residences^	40	40	35	35	52
Wybong Hall and Anglican Church	48	48	48	48	-

^The Applicant has a written agreement in place with the owners of Property ID's 132 and 164 and the Department was notified of this in writing of this.

Table 6-10 EPL 12894 – Noise Impact Assessment Criteria

Attended Noise Monitoring Location	EPL ID Number	Representative Residences	Night LAeq (15 minute)	Night LA1 (1minute)
NM4	23	109A, 109B, 109C, 109D, 109E, 109F	41	54
NM8	26	176	40	52
NM10	27	251	35	551

Attended Noise Monitoring Location	EPL ID Number	Representative Residences	Night LAeq (15 minute)	Night LA1 (1minute)
NM13	29	125A, 125C, 190, 240, 241A, 241B, 241C, 182A, 182B	38	50
NM14	30	184A	37	53
NM15	22	154	34	48
NM16	34	79, 177, 178, 147, 253, 141, 151	37	52
NM17	35	54, 114, 166, 112A, 112B, 112C, 106B	36	51
NM18	36	134A	39	52
NM19	37	165	35	51
NM20	38	206, 260, 261, 263, 321	38	51
NM21	39	144, 128	40	49
NM22	40	157, 171	46	58

The approved NMP adopts 13 attended NM locations for night period operations and six attended NM locations for day period activity (operations and construction) that are representative of residences outlined in SSD-8642 and consistent with those provided in the EPL. Noise criteria only apply in specific meteorological conditions in accordance with EPL 12894. Under SSD-8642, noise criteria increase by 5 dB (compared to the standard noise criteria) when monitoring is undertaken during ‘very noise-enhancing’ conditions (i.e. not ‘standard’ or ‘noise-enhancing’ conditions).

Where several assessment locations are located in one NM catchment, representative noise criteria have been adopted to ensure that the lowest (most stringent) criteria within the NM catchment can be achieved. Additionally, in accordance with the Noise Policy for Industry (NPfI) (EPA, 2017), relevant modifying factor adjustments apply when assessing the characteristics of Mangoola mine noise emissions.

Cumulative Noise Criteria

Cumulative noise criteria were not included in SSD-8642 so, as of December 2021, there is no requirement to monitor or assess cumulative mine noise.

Management and Mitigation Measures

In addition to conducting noise monitoring, Mangoola continues to implement a number of mitigation measures with regard to the management of noise to minimise potential noise impact on nearby receivers, and to comply with the conditions of SSD-8642. Mitigation measures are implemented as per the NMP and include, but are not limited to:

- Consideration of noise impacts during mine planning;
- Controlling mine noise at the source through the use of equipment with appropriate sound attenuation fitted, where practical;
- Maintaining mining equipment in a proper and efficient manner;

- Restricting, where possible, operations on outer dump faces or elevated dumps in sensitive areas during adverse weather conditions;
- Ensuring trucks operating during the night time are restricted to operational areas below the maximum elevation of the overburden emplacement areas; and
- Using real-time noise monitors that incorporate automatic alarms so that proactive control can be implemented.

6.3.2 Environmental Monitoring Results

6.3.2.1 Results from the Reporting Period

EPL 12894 and SSD-8642 Noise Monitoring

During 2022, monthly attended surveys were undertaken at 13 and six representative locations during the night and day periods respectively to measure operational and construction activity noise, in accordance with SSD-8642 and EPL 12894. These locations have been outlined in **Section 6.3.1**.

During 2022, Mangoola was compliant with all noise criteria set out in SSD-8642 and EPL 12894. A summary of results is presented in **Table 6-11** and **Table 6-12**. Where the meteorological conditions did not apply (for EPL 12894) or were 'very noise-enhancing' (for SSD-8642), these cells have been bolded.

All noise monitoring results are available in full on the Mangoola website.

Table 6-11 Attended noise monitoring results and comparison against MCCO predictions ($L_{Aeq,15minute}$ dB)

	NM4	NM8	NM10	NM13	NM14	NM15	NM16	NM17	NM18	NM19	NM20	NM21	NM22	Compliance against criteria	
EA property reference	109A, 109B, 109C, 109D, 109E, 109F	176	251	125A, 125C, 190, 240, 241A, 241B, 241C, 182A, 182B	184A	154	79, 177, 178, 147, 253, 141, 151	54, 114, 166, 112A, 112B, 112C, 106B	134A	165	206, 260, 261, 263, 321	144, 128	157, 171	Yes	
$L_{Aeq,15minute}$ criteria	41	40	35	38	-37	34	37	36	39	35	38	40	46		
$L_{Aeq,15minute}$ Year 1 prediction (Day/Night)	38/39 ¹ , 38/39 ² , 38/39 ³ , 38/39 ⁴ , 38/39 ⁵ , 38/39 ⁶	40	36	38 ⁷ , 37 ⁸ , 37 ⁹ , 36 ¹⁰ , 37 ¹¹ , 36 ¹² , 37 ¹³ , 37 ¹⁴ , 38 ¹⁵	36	38	37 ¹⁶ , 36 ¹⁷ , 36 ¹⁸ , 36 ¹⁹ , 36 ²⁰ , 37 ²¹ , 37 ²²	37 ²³ , 37 ²⁴ , 36 ²⁵ , 36 ²⁶ , 36 ²⁷ , 36 ²⁸ , 36 ²⁹	38/39	33/35	32/34 ³⁰ , 31/34 ³¹ , 36/38 ³² , 35/39 ³³ , 35/37 ³⁴	38/40 ³⁵ , 33/37 ³⁶	31/34 ³⁷ , 34/39 ³⁸		
January (Day/Night)	IA/33	-/31	-/IA	-/IA	-/IA	-/IA	-/IA	-/24	IA/34	IA/26	IA/27	IA/28	IA/<30	Yes	
February (Day/Night)	<20/34	-/28	-/IA	-/23	-/≤21	-/<20	-/29	-/27	IA/27	IA/<20	IA/<20	IA/IA	IA/24	Yes	
March (Day/Night)	IA/27	-/27	-/IA	-/29	-/33	-/IA	-/33	-/35	IA/21	IA/IA	IA/IA	IA/IA	<20/23	Yes	

	NM4	NM8	NM10	NM13	NM14	NM15	NM16	NM17	NM18	NM19	NM20	NM21	NM22	Compliance against criteria
April (Day/Night)	IA/25	-/IA	-/31	-/26	-/IA	-/33	-/IA	-/IA	IA/29	IA/<20	IA/21	IA/IA	IA/27	Yes
May (Day/Night)	23/37	-/35	-/IA	-/IA	-/IA	-/IA	-/IA	-/26	23/32	IA/<20	IA/21	IA/<20	IA/24	Yes
June (Day/Night)	<20/33	-/23	-/26	-/IA	-/IA	-/23	-/IA	-/IA	IA/30	IA/28	IA/28	IA/27	IA/28	Yes
July (Day/Night)	IA/IA	-/IA	-/≤33	-/≤33	-/23	-/≤32	-/<20	-/IA	IA/IA	IA/IA	IA/IA	IA/IA	IA/IA	Yes
August (Day/Night)	20/22	-/<20	-/28	-/29	-/28	-/≤30	-/23	-/<20	IA/<20	IA/27	IA/26	IA/27	IA/35	Yes
September (Day/Night)	IA/36	-/34	-/IA	-/IA	-/IA	-/IA	-/IA	-/27	IA/34	IA/27	IA/22	IA/25	IA/35	Yes
October (Day/Night)	IA/IA	-/IA	-/32	-/28	-/<20	-/<30	-/<20	-/IA	IA/<20	IA/IA	IA/IA	IA/IA	IA/<25	Yes
November (Day/Night)	IA/29	-/29	-/IA	-/IA	-/IA	-/IA	-/IA	-/IA	IA/26	IA/<25	IA/<20	IA/<20	IA/<25	Yes
December (Day/Night)	IA/29	-/33	-/IA	-/IA	-/<20	-/IA	-/22	-/30	IA/28	IA/27	IA/23	IA/IA	IA/<32	Yes

1. EA reference 109A
7. EA reference 125A
13. EA reference 241C
19. EA reference 147
25. EA reference 166
31. EA reference 260
37. EA reference 157

2. EA reference 109B
8. EA reference 125C
14. EA reference 182A
20. EA reference 253
26. EA reference 112A
32. EA reference 261
38. EA reference 171

3. EA reference 109C
9. EA reference 190
15. EA reference 182B
21. EA reference 141
27. EA reference 112B
33. EA reference 263
- IA= Inaudible

4. EA reference 109D
10. EA reference 240
16. EA reference 79
22. EA reference 151
28. EA reference 112C
34. EA reference 321

5. EA reference 109E
11. EA reference 241A
17. EA reference 177
23. EA reference 54
29. EA reference 106B
35. EA reference 144

6. EA reference 109F
12. EA reference 241B
18. EA reference 178
24. EA reference 114
30. EA reference 206
36. EA reference 128

'very noise enhancing' weather conditions at the time of the measurement

Note: Bolded results denote that a positive 5 dB adjustment was applied to the specified noise limit to account for
Note: Bolded in red results denote a measured result that is above the predicted noise level for that location.

Table 6-12 Attended noise monitoring results and comparison against MCCO predictions (L_{Amax} dB)

	NM4	NM8	NM10	NM13	NM14	NM15	NM16	NM17	NM18	NM19	NM20	NM21	NM22	Compliance against criteria
EA property reference	109A, 109B, 109C, 109D, 109E, 109F	176	251	125A, 125C, 190, 240, 241A, 241B, 241C, 182A, 182B	184A	154	79, 177, 178, 147, 253, 141, 151	54, 114, 166, 112A, 112B, 112C, 106B	134A	165	206, 260, 261, 263, 321	144, 128	157, 171	
L_{Amax} criteria	54	51	50	53	48	52	54	51	52	51	51	49	58	
L_{Amax} Year 1 prediction	40 ¹ , 40 ² , 40 ³ , <40 ⁴ , 40 ⁵ , <40 ⁶	41	<40	<40 ⁷ , <40 ⁸ , <40 ⁹ , <40 ¹⁰ , <40 ¹¹ , <40 ¹² , <40 ¹³ , <40 ¹⁴ , <40 ¹⁵	<40	40	<40 ¹⁶ , <40 ¹⁷ , <40 ¹⁸ , <40 ¹⁹ , <40 ²⁰ , <40 ²¹ , <40 ²²	<40 ²³ , <40 ²⁴ , <40 ²⁵ , <40 ²⁶ , <40 ²⁷ , <40 ²⁸ , <40 ²⁹	<40	<40	<40 ³⁰ , <40 ³¹ , 41 ³² , 43 ³³ , 40 ³⁴	44 ³⁵ , 40 ³⁶	<40 ³⁷ , 43 ³⁸	
January	35	33	IA	IA	IA	IA	IA	25	43	30	29	32	<30	Yes
February	42	32	IA	26	23	<20	35	30	34	<20	<20	IA	28	Yes
March	31	31	IA	31	38	IA	38	40	22	IA	IA	IA	26	Yes
April	36	IA	33	31	IA	36	IA	IA	35	<20	27	IA	33	Yes
May	46	40	IA	IA	IA	IA	IA	28	37	<20	22	<20	28	Yes

	NM4	NM8	NM10	NM13	NM14	NM15	NM16	NM17	NM18	NM19	NM20	NM21	NM22	Compliance against criteria
June	50	28	28	IA	IA	27	IA	IA	34	33	30	29	32	Yes
July	IA	IA	≤33	≤36	25	≤45	<20	IA	IA	IA	IA	IA	IA	Yes
August	24	<20	34	34	32	≤30	25	<20	20	22	26	23	32	Yes
September	41	38	IA	IA	IA	IA	IA	30	43	35	25	28	40	Yes
October	IA	IA	34	30	<20	<30	<20	IA	<20	IA	IA	IA	<25	Yes
November	32	36	IA	IA	IA	IA	IA	IA	31	<25	<20	<20	27	Yes
December	32	37	IA	IA	<20	IA	24	32	32	33	26	IA	<32	Yes

- | | | | | | |
|-----------------------|-----------------------|-----------------------|--|-----------------------|-----------------------|
| 1. EA reference 109A | 2. EA reference 109B | 3. EA reference 109C | 4. EA reference 109D | 5. EA reference 109E | 6. EA reference 109F |
| 7. EA reference 125A | 8. EA reference 125C | 9. EA reference 190 | 10. EA reference 240 | 11. EA reference 241A | 12. EA reference 241B |
| 13. EA reference 241C | 14. EA reference 182A | 15. EA reference 182B | 16. EA reference 79 | 17. EA reference 177 | 18. EA reference 178 |
| 19. EA reference 147 | 20. EA reference 253 | 21. EA reference 141 | 22. EA reference 151 | 23. EA reference 54 | 24. EA reference 114 |
| 25. EA reference 166 | 26. EA reference 112A | 27. EA reference 112B | 28. EA reference 112C | 29. EA reference 106B | 30. EA reference 206 |
| 31. EA reference 260 | 32. EA reference 261 | 33. EA reference 263 | 34. EA reference 321 | 35. EA reference 144 | 36. EA reference 128 |
| 37. EA reference 157 | 38. EA reference 171 | IA= Inaudible | For assessment purposes the L_{Amax} and the $L_{A1,1minute}$ are interchangeable. | | |

Note: Bolded results denote that a positive 5 dB adjustment was applied to the specified noise limit to account for 'very noise enhancing' weather conditions at the time of the measurement
 Note: Bolded in red results denote a measured result that is above the predicted noise level for that location.

As shown in **Table 6-11**, the noise levels recorded at Mangoola from January–December 2022 were compared against the Year 1 noise predictions presented in the MCCO Noise Impact Assessment (Global Acoustics, 2019) and relevant SSD-8642 $L_{Aeq,15\text{minute}}$ criteria. One monitoring location (NM22) recorded two results above the Year 1 $L_{Aeq,15\text{minute}}$ prediction, however these levels were well below the relevant criterion. All other results were lower than predicted levels.

Table 6-12 compares the January–December 2022 Mangoola L_{Amax} noise against MCCO Noise Impact Assessment Year 1 predictions and SSD-8642 $L_{A1,1\text{minute}}$ criteria. Three monitoring locations recorded at least one result above the Year 1 L_{Amax} predictions, with one result above the predicted level at NM15, two results above the predicted level at NM18, and four results above the predicted level at NM4. All other measured L_{Amax} were below predicted levels.

Possible reasons for a difference between modelled noise levels and those measured are differences in modelling scenario assumptions compared to actual operations, or specific weather conditions at the time (only a finite set of meteorological conditions can be modelled). The former primarily relates to features such as mine topography and locations of plant and equipment. Importantly, measured Mangoola noise levels did not exceed any $L_{Aeq,15\text{minute}}$ or L_{Amax} noise criterion during 2022.

Figure 6-6 and **Figure 6-7** compare the 2022 noise levels recorded at Mangoola with relevant approval criteria. A graph of the December day period levels has not been included as the site was inaudible at all monitoring locations that month.

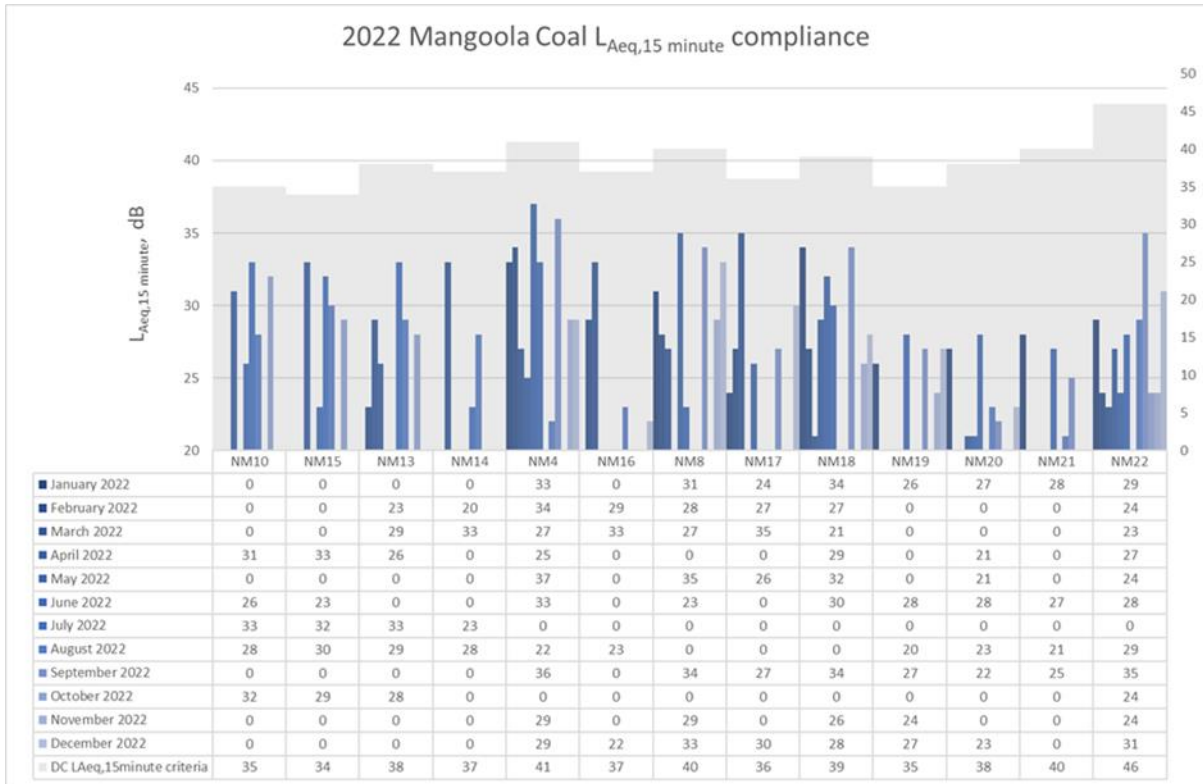


Figure 6-6 Annual Review Attended Noise Monitoring Compliance Results ($L_{Aeq}(15\text{minute})$)

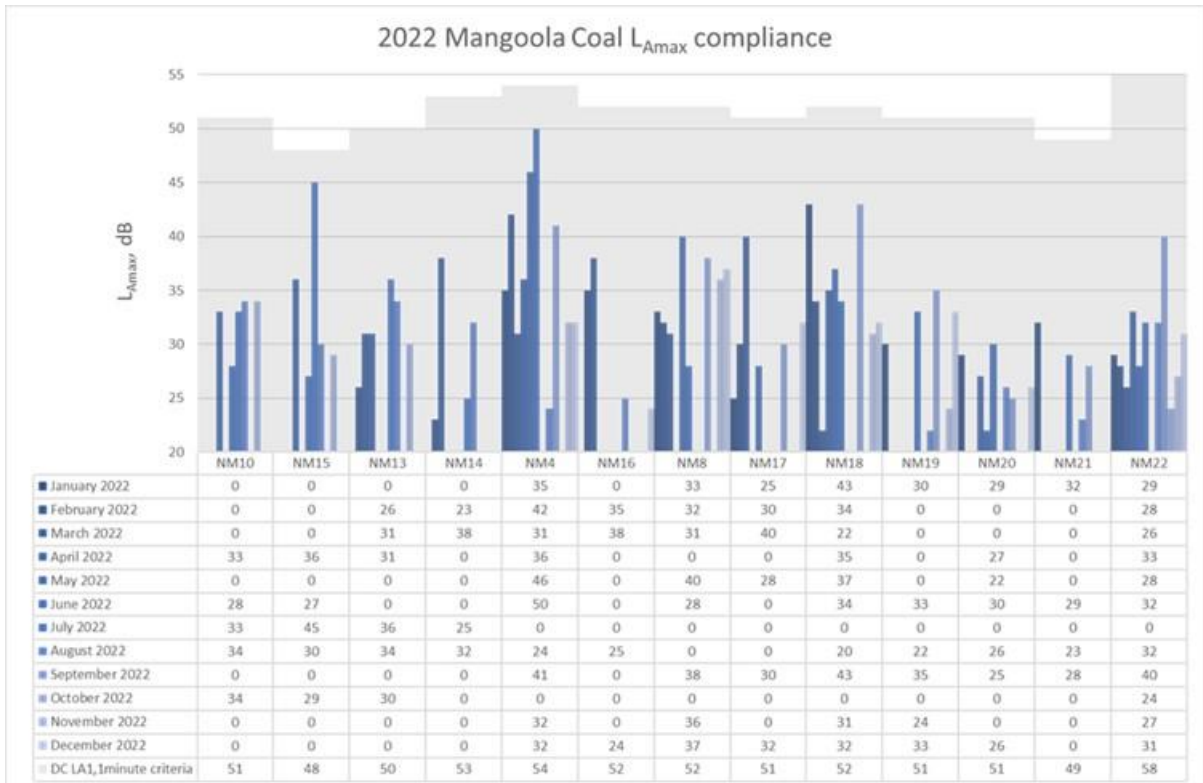


Figure 6-7 Annual Review Attended Noise Monitoring Compliance Results (L_{Amax})

6.3.2.2 Comparison with Predictions

The MCCO Noise Impact Assessment (Global Acoustics, 2019) predicted the 90th percentile LAeq,15minute and LAmax operational noise levels at private receptors in Years 1, 3, 5 and 8. As MCCO was approved in 2021, a comparison of 2022 noise data against the Year 1 predictions has been made in **Table 6-11** and **Table 6-12**.

Any measured level which exceeds that predicted (and meteorological conditions were relevant) has been bolded in red.

6.3.2.3 Long Term Trend Analysis

Exceedances of SSD-8642 and EPL 12984 criteria have decreased over the years. During 2022 there were no occasions when measured Mangoola mine noise levels exceeded SSD-8642 or EPL 12894 criteria. These results represent a continuation of the zero exceedances reported in 2020 and 2021.

6.3.3 Key Performance and/or Management Issues

There are eight properties eligible for acquisition (Property IDs 25, 66, 83, 110, 130, 139, 148 and 205) as per Table 10, Condition C1 of SSD 8642. During 2022, no properties eligible for acquisition have triggered those rights under Condition C1 of SSD 8642. These properties are also eligible for additional mitigation under Condition C2 of SSD 8642. It is noted some have already had mitigation installed and there were no further requests in 2022.

There are 22 properties eligible for additional mitigation (Property IDs 128, 144, 154, 171, 176, 193, 261, 263, 109A, 109B, 109C, 109D, 109E, 109F, 125A, 134A, 182B, 164, 177, 251, 174A and 174B) as per Table 11, Condition C2 of SSD 8642. During 2022, 4 properties (Property ID 144, 174A&B and 263) eligible for additional mitigation triggered those rights. The properties had previous noise mitigation installed. Property 263 sold at auction and new owners have been notified of their rights.

The properties identified in Table 2, Condition B6 of SSD 8642 (Property ID's 246, 249 and 251) have mitigation rights for road traffic noise however it is noted that Property 246 previously had mitigation works completed under MP 06_0014 and 251 also has mitigation rights under Table 11. During 2022, none of these properties triggered those rights.

All private property owners with rights to mitigation or acquisition were notified of the SSD 8642 approval and their rights under this approval within 1 month of the date of consent. A reminder letter was also sent during the reporting period on 26 March 2022.

During 2022, there were no new noise impact agreements and noise impact agreements for Property IDs 164 and 132 were maintained and as such, the SSD 8642 noise criteria relevant to those properties cease to apply.

A total of 32 noise related complaints were received during 2022, which is a decrease from the 58 received during the 2021 reporting period. These were predominately from residences to the north-west of operations. In response to an increase in complaints in this area, weekly attended noise monitoring was once again conducted over the winter period. Monitoring results indicated that site noise was below noise compliance levels. Complaints are further discussed in **Section 9.3**.

6.3.4 Proposed Improvements

In response to any future changes to property ownership around the operation, Mangoola will review the noise monitoring network to determine whether continuous noise monitoring units can be relocated to provide better coverage around the mining operations.

6.4 Blasting and Vibration

6.4.1 Environmental Management

Blasting at Mangoola is undertaken in accordance with the Blast Management Plan (BMP) which was updated in 2022 accounting for SSD-8642 and approved by DPE on 19 October 2022. The Blast Fume Management Procedure is also implemented, which defines practises to reduce the potential for fume generation and therefore reduce the impact of fume on the environment and community.

Prior to blasting and in accordance with the BMP, predictive and current meteorological data is reviewed to ensure that blasting is undertaken in appropriate weather conditions. In particular, wind speed, wind direction and the presence of temperature inversions are analysed prior to initiating blasting activities.

Blast overpressure and vibration was monitored at seven monitoring locations during 2022, known as BM03, BM07, BM08, Anvil Rock, the closest rock formation to the blast, transmission line powerline pylons (where necessary) and the Castle Hill Slab Hut. Blasting within close proximity to the powerline easement is undertaken as per a written agreement between the mining company and the electricity infrastructure owner.

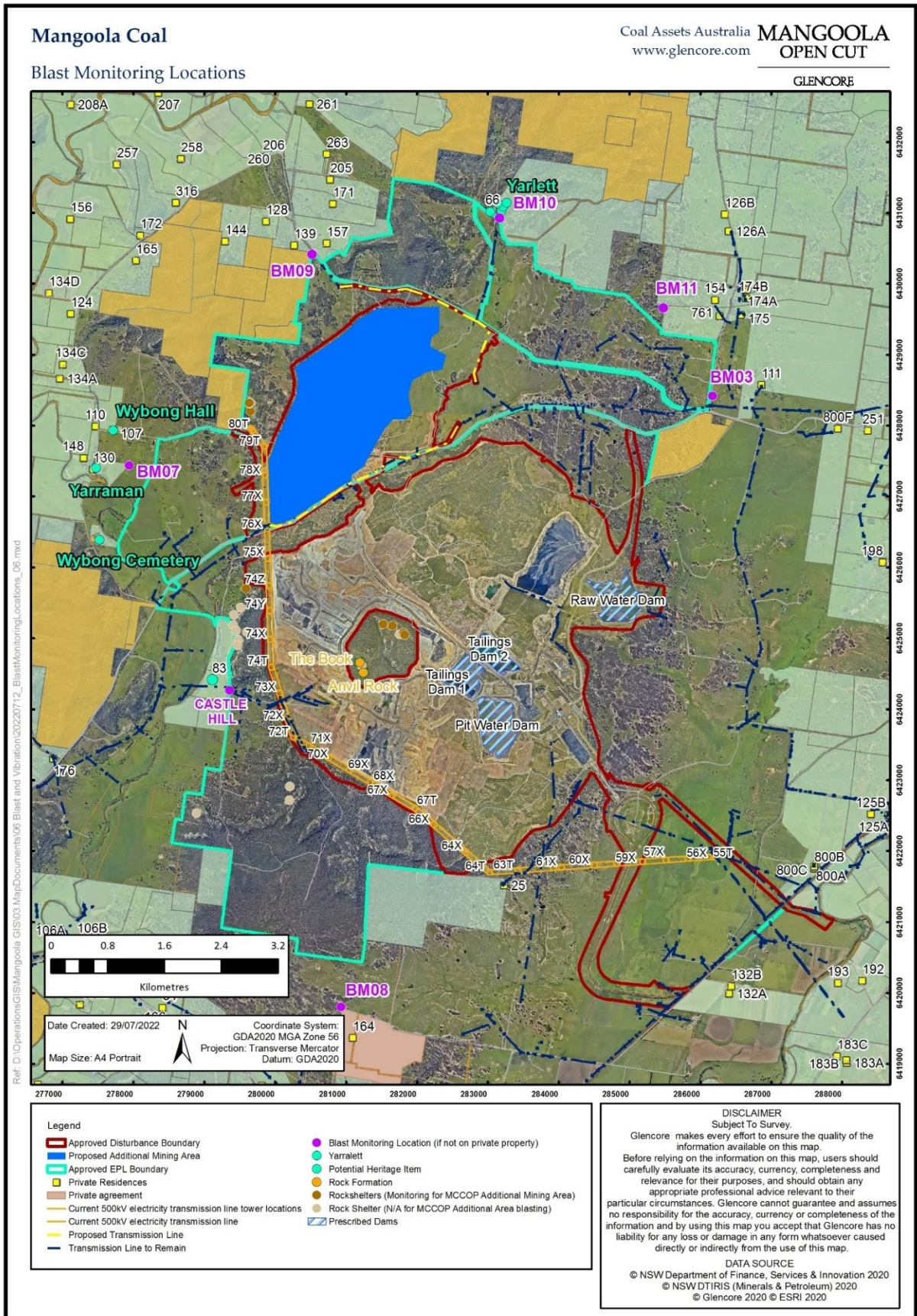


Figure 6-8 Blast Monitoring Locations

6.4.2 Environmental Monitoring Results

6.4.2.1 Results from the Reporting Period

During the reporting period there was an average of 3.2 blast events per week, which is compliant with Schedule 3, Condition 12(b) of MP 06_0014 and Condition B14 of SSD-8642, which allow a maximum of 6 blasts per week, averaged over a calendar year. A total of 167 blast events occurred during the reporting period and no more than 2 blast events per day which is compliant with Schedule 3, Condition 12(a) of MP 06_0014 and Condition B14 of SSD-8642, as shown by **Figure 6-9**.

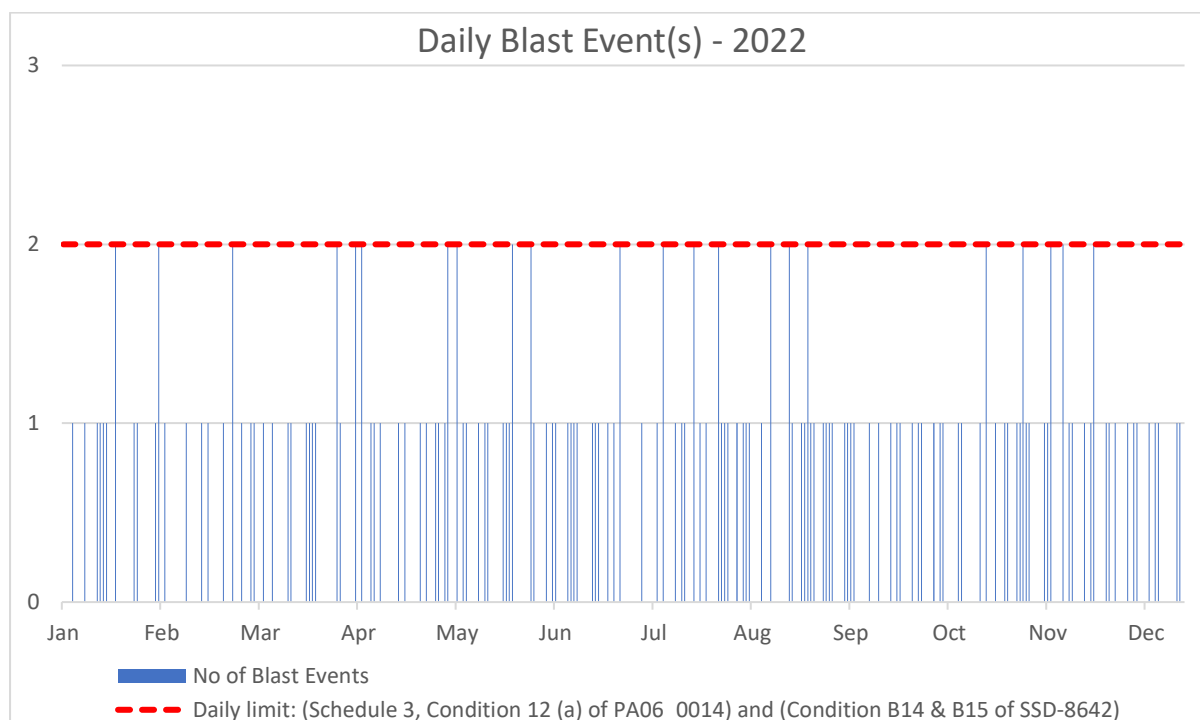


Figure 6-9 Daily Blast Events

Schedule 3, Condition 10 of MP 06_0014, Condition B11 of SSD-8642, as well as Condition L4 of EPL 12894, provide the criteria for allowable air blast overpressure and ground vibration as measured at any privately owned residence. Additional ground vibration limits apply to the electricity transmission pylons in accordance with the agreement with TransGrid as the asset owner.

Table 6-13 summarises the blasting criteria, as defined in MP 06_0014, SSD-8642 and EPL 12894, and other compliance monitoring requirements as defined in the approved BMP and Historic Heritage Management Plan (HHMP) for Mangoola.

Table 6-13 Compliance Monitoring Location Summary and Adopted Criterion

Monitoring Requirement	Monitoring Site (MP or DC / EPL ID)	Airblast Overpressure Limit	Ground Vibration Limit	Comments
MP ¹ : Nearest residence on privately owned land.	Private Property NW (BM07/21)			

Monitoring Requirement	Monitoring Site (MP or DC / EPL ID)	Airblast Overpressure Limit	Ground Vibration Limit	Comments
<p>DC²: Residence on privately owned land.</p> <p>EPL³: At monitoring points 16, 21 and 32.</p>	<p>Church NE (BM03/16)</p> <p>Private Property S (BM08/32)</p>	<p>115 dB (Lin Peak) (allowable exceedance of 5% over 12 months); and</p> <p>120 dB (Lin Peak) absolute limit.</p>	<p>5 mm/s (peak particle velocity (PPV)) (allowable exceedance of 5% over 12 months); and</p> <p>10 mm/s (PPV) absolute limit.</p>	<p>Blast monitoring is conducted at the nearest residence on privately owned land to the blast zone (or representative locations on mine-owned land that is not further than the nearest residence). Locations may change over the life of the mine as properties are acquired and the mining progresses. Criteria applies to the nearest privately owned residence (as per MP 06_0014, SSD-8642 and EPL definition).</p> <p>The EPL requires blast monitoring at monitoring points 16, 21 and 32 as per Condition M7.1. BM03 represents Point 16, BM07 represents Point 21 and BM08 represents Point 32.</p>
<p>MP¹ & DC²: 500 kV Transmission Line</p>	<p>Pylon 64X through to Pylon 75X</p>	<p>N/A (not measured)</p>	<p>⁴60 mm/s for tension towers</p> <p>⁴150mm/s for suspension towers</p>	<p>Monitoring requirements and limits apply as per agreement with the infrastructure owner (TransGrid).</p>
<p>MP¹ & DC²: Rock Formations</p>	<p>Anvil Hill The Book Rockshelter sites</p>	<p>N/A (not measured)</p>	<p><i>Safe blasting limit as determined by specialist analysis under PA.</i></p> <p>50 mm/s under DC.</p>	<p>Representative blast monitoring of Anvil Hill to inform vibration monitoring.</p> <p>The closest rock formation is monitored for every blast if not Anvil Hill.</p>
<p>DC²: Historic Heritage</p>	<p>Castle Hill Slab Hut</p>	<p>N/A (not measured)</p>	<p><i>Safe blasting limit as determined by specialist analysis under DC.</i></p>	<p>Representative blast monitoring for all blasts south of Wybong Road.</p>

¹ A requirement of Mangoola's MP 06_0014 (Schedule 3, Condition 10). Note the specified criteria only applied until the surrender of MP 06_0014 on 21 November 2022

² A requirement of Mangoola's SSD-8642 (Conditions B11, B12 and B71).

³EPL: A requirement of Mangoola's EPL 12894 (condition L4.1, L4.2, L4.3 and L4.4 and M7.1).

⁴As per TransGrid Agreement - Suspension tower limits were increased on 17 September 2020 to 150 mm/s via agreement with TransGrid and DPE.

The above criteria reflects the updated compliance limits which came into force during 2022, to align with the requirements of SSD-8642 through the BMP. The BMP was approved by DPE on 19 October 2022 and the relinquishment of Project Approval (MP 06_0014) occurred on 21 November 2022.

Further information will be reported in the next Annual Review for 2023 associated with the commencement of blasting within the Wybong Pit to the north of Wybong Road. This includes the additional monitoring required where infrastructure features are present such as local roads, 11 kV powerlines and fibre optic cables.

Airblast Overpressure

Airblast overpressure results at all monitoring locations for the reporting period are available on the Mangoola website, with the results recorded at the nearest privately owned residences and sensitive location summarised in **Table 6-14**.

Table 6-14 Airblast Overpressure Summary

Location	Minimum (dBL)	Average (dBL)	Maximum (dBL)	#Blasts between 115 – 120 dBL	% Blasts between 115 – 120 dBL	Exceedances (Y/N)
BM03	72.0	93.0	113.1	0	0.0 %	N
BM07	65.2	99.0	116.9	3	1.5 %	N
BM08	71.1	92.8	113.2	0	0.0 %	N

All monitored blast events were compliant with the airblast over pressure limit of 115 dBL; or within the 5% exceedance allowance of between 115 and 120 dBL.

Ground Vibration

Ground vibration monitoring data for the reporting period is available on the Mangoola website and is summarised in **Table 6-15**.

Table 6-15 Ground Vibration Summary

Location	Minimum (mm/s)	Average (mm/s)	Maximum (mm/s)	Compliance Limit (mm/s)	Exceedances (Y/N)
Residences					
BM03	<0.1	0.1	0.3	5	N
BM07	<0.1	0.1	0.7	5	N
BM08	<0.1	0.1	0.4	5	N
Historic Heritage					
Castle Hill Slab Hut	<0.1	1.0	7.5	20	N
Rock Formations					
Anvil Rock	0.1	4.3	35.9	50	N
Closest Rock Formation (where Anvil Rock is not the closest)	0.1	5.2	30.7	50	N

Location	Minimum (mm/s)	Average (mm/s)	Maximum (mm/s)	Compliance Limit (mm/s)	Exceedances (Y/N)
Infrastructure					
Transmission Line Pylon (tension)	0.1	6.1	48.9	60	N
Transmission Line Pylon (suspension)	0.2	14.5	139.1	150	N

During 2022, there were no exceedances of any compliance limits for ground vibrations.

6.4.2.2 Comparison with Predictions

The MP 06_0014 MOD 6 Environmental Assessment included a Noise and Vibration Assessment (EMM, 2013) which assessed the impacts of blasting. This assessment determined the limiting factors to the blast design with respect to the relevant blast criteria.

EMM (2013) determined that blast overpressure and vibration could be managed to be within MP 06_0014 criteria at all times. During 2022, there were no exceedances of the blast overpressure or ground vibration criteria, and therefore the results were largely consistent with predictions made in the EA (EMM, 2013).

These findings were then reviewed and reassessed by Enviro Strata Consulting (2019) in accordance with ANZECC Guidelines and the relevant Australian and British Standards as part of the EIS for the MCCO Project which formed the basis of the compliance limits imposed under SSD-8642 to achieve the desired performance measures. Similarly, during 2022 there were no exceedances of the blast overpressure or ground vibration criteria, and therefore the results were largely consistent with predictions made in the MCCO EIS (Enviro Strata Consulting, 2019).

6.4.2.3 Long Term Trend Analysis

In accordance with SSD-8642, a long-term trend analysis of blast monitoring results at Mangoola has been undertaken using data from July 2010 to December 2022 (refer **Appendix D**).

Ground vibration monitoring results have remained generally consistent since monitoring commenced, with no increasing trends developing in the data. All blast vibration monitoring results at private residences have been below the SSD-8642 criteria since monitoring commenced. All results have been below the 10 mm/s criteria, and while some results have exceeded the 5 mm/s criteria between 2010 and 2020, these were within the allowable 5% frequency.

Airblast overpressure monitoring results at private residences (BM03, BM07 and BM08) have remained generally constant at all locations since monitoring began.

6.4.3 Key Performance and/or Management Issues

There were no exceedances of the 115 dB or 5 mm/s (and associated 5% exceedance allowance) criteria for private receptors. In addition, the 50 mm/s and 20 mm/s specialist determined safe limit for Anvil Rock (or other closest rock formations) and Castle Hill Slab Huts, respectively, were not exceeded.

Seven complaints were received in relation to blasting during the reporting period, which is an increase from the two complaints received in 2021. All seven complaints were relating to blast vibration/overpressure. Further detail on complaints is provided in **Section 9.3**.

6.4.4 Proposed Improvements

The Blast Management Plan was updated in 2022 to align with the requirements of SSD-8642 prior to commencement of mining within the Wybong Pit to the north of Wybong Road. Improvement opportunities will be reviewed in 2023 as per the review requirements of SSD-8642.

6.5 Erosion and Sediment Control

6.5.1 Environmental Management

Mangoola manages erosion and sediment on site in accordance with the approved Erosion and Sediment Control Plan (ESCP), which is included as Appendix C of the Water Management Plan (WMP). The ESCP was updated in 2022 and a copy is available on the Mangoola website.

Prior to land disturbance for any aspect of the mine, appropriate erosion and sediment controls are designed and constructed according to the ESCP as well as the guidelines *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) (the Blue Book) *Volume One and Volume 2E Mines and Quarries* (DECC 2008).

Site erosion and sediment controls are inspected at least monthly, and within 5 days of a high rainfall event (i.e. greater than 20 mm in 24 hours). Regular maintenance is undertaken as required to replace damaged sediment control structures and maintain other temporary measures. Annual channel stability monitoring is also undertaken at Mangoola to identify any erosion and sedimentation issues on surrounding creeks and drainage lines. The outcomes are reported in the Annual Channel Stability Report in accordance with SSD-8642.

6.5.2 Environmental Monitoring Results

Monitoring of erosion and sediment control structures was completed in accordance with the requirements of the approved ESCP.

The 2022 Annual Channel Stability Report (HLM 2022) saw no observed changes in the ephemeral stream assessments for Big Flat Creek and Sandy Creek which surround Mangoola.

6.5.3 Key Performance and/or Management Issues

There were no issues with erosion and sediment control during the reporting period. The effect of the reduction of sediment previously being contributed into Big Flat Creek from Anvil Creek will be monitored in future assessments. Mangoola will review and implement if required any remedial measures as per the recommendations of the 2022 Annual Channel Stability Report, as provided in

Table 6-16. Remedial actions will be implemented as required following onsite erosion and sediment control inspections completed routinely and following rainfall events.

Table 6-16 2022 Annual Channel Stability Report Recommendations

Recommendation	Mangoola Response
Big Flat Creek: Continue to manage stock access.	This area is in Mangoola grazing land and is only lightly stocked due to the low carrying capacity. The area adjacent to Big Flat Creek was fenced off to exclude stock previously during 2021. Revegetation of adjacent offset areas is undertaken in accordance with the Biodiversity Offset Management Plan and Strategy (BOMPS).
Sandy Creek: Manage stock access along Sandy Creek.	This area is associated within several Mangoola offset areas and grazing land surrounding Sandy Creek. Fencing of offset areas to exclude cattle will continue to be maintained as per the BOMPS. Grazing is restricted due to low carrying capacity. The area will continue to be monitored and further stock reductions undertaken if required.
Sandy Creek: Repair active erosion points.	The area identified has a low stocking rate and any erosion in this grazing land area will continue to be monitored and remediation works undertaken if necessary.
Sandy Creek: Native revegetation and continue to manage weeds.	Weed management works continue to be undertaken regularly across all buffer land and offset areas. These works are prioritised based on weed type and numbers present. Revegetation across offset areas is undertaken in accordance with the BOMPS.

6.5.4 Proposed Improvements

The ESCP was updated in 2022 to align with the requirements of SSD-8642 prior to the commencement of mining in the Wybong Pit. At this stage, no further improvements to the erosion and sediment controls are planned for the 2023 period, however, this will be reviewed as required following the progression of mining activities.

6.6 Biodiversity

6.6.1 Environmental Management

Flora and fauna are managed in accordance with the RMP and BOMPS. The BOMPS was updated in 2021. The updated BOMPS, approved by DPE on 10 August 2022, is available on the Mangoola website.

Clearing activities at Mangoola have been designed to minimise impacts to any threatened flora and fauna species and vegetation communities. Suitably qualified personnel inspect all disturbance areas as part of the Pre-Clearing Procedure to manage approved impacts on threatened species of flora and fauna. Any fauna found during clearing activities are captured (where possible) and relocated by suitably qualified persons.

Two threatened terrestrial orchids and an endangered population of epiphytic orchid are present on lands at Mangoola, being *Diuris tricolor*, *Prasophyllum sp aff petilum* (Wybong) and *Cymbidium canaliculatum*. A Translocation Management Plan is in place to salvage and relocate threatened orchid species affected by the progression of mining activities. The document, titled “Translocation of Threatened Flora Species” was updated and approved during 2021 and is available on the Mangoola website.

6.6.1.1 Weather Conditions 2022

Following increased and sustained rainfall, the intense drought of 2017-2019 eased to recovery conditions in winter of 2020. The Wybong Parish was declared as non-drought in September of 2020. During 2022, rainfall remained consistently high, which was similar to the higher-than-average levels observed in 2020 and 2021.

6.6.2 Environmental Monitoring Results

The following sites were monitored in 2022 as part of the BOMPS monitoring program:

- 10 fauna monitoring sites;
- 14 flora monitoring sites; and
- Two groundwater dependent ecosystem monitoring sites.

6.6.2.1 Floristic Values

The breaking of the drought in 2021 mostly resulted in floristic value improvement, with general increases in vegetation height (particularly in regenerating/revegetation sites) and foliage cover at most sites continuing to be recorded in 2022. This is a good sign of resilience and recovery driven by favourable rainfall patterns. This improvement is particularly evident in the photographic monitoring of most revegetation sites compared to their baselines, where previous grassland areas now have readily observable young trees.

Native groundcover is increasing (in cover and richness); however, exotics are as well. This will be a continued area of focus for management actions in 2023, to prevent exotics from dominating and inhibiting the recovery of native species diversity and abundance.

Floristic results show mostly stable trends in High Threat Weed (HTW) composition, however several sites have identified new HTWs in 2022 that have not previously been observed (including St John's wort (*Hypericum perforatum*), onion weed (*Romulea rosea*) and Noogoora burr (*Xanthium occidentale*)), likely due to favourable weather conditions. Overall weed composition (comprising largely innocuous species) remains quite high at revegetation sites and comparatively low at remnant sites. Coverage by weeds was highest in areas of derived native grassland that had been subject to revegetation (compared to remnant vegetation or rehabilitated vegetation), with weeds favouring small extents of ground disturbance.

Positive improvements have been seen in levels of HTW galenia (*Galenia pubescens*) and African boxthorn (*Lycium ferocissimum*) present, with declines observed in most sites in 2022. Presence of pear species (*Opuntia sp.*) is similarly much lower in 2022 than during baseline. This is due to ongoing targeted management works by Mangoola.

Remnant monitoring sites are considered generally stable and resilient. There is recovery in native species richness at most remnant sites (with the exception of MAN06). It is likely that MAN06 is taking longer than the others to recover due to the allelopathic affects associated with the high levels of slaty gum (*Eucalyptus dawsonii*) leaf litter at this site. Attention to managing exotic species will continue in these communities. The key HTW of concern at remnant sites in 2022 was fireweed (*Senecio madagascariensis*), particularly in treed areas immediately adjacent to grasslands, that are more exposed to edge effects.

6.6.2.2 Fauna Values

Habitat value provided by rehabilitated and revegetated areas continues to increase. Increases in height and foliage cover were recorded as were increases in habitat/niche complexity such as fallen timber, flowering plants and litter cover.

Nest boxes have also been installed in large numbers throughout the remnant areas of offsets over several years. These nest boxes are showing good levels of use by native species.

Fauna diversity in 2022 (including threatened species) in remnant areas was generally consistent with previous monitoring years.

Fauna diversity observed in revegetation areas and regeneration areas in 2022, was lower on average for reptiles, birds and mammals. However, on average was marginally higher for amphibians, this was due to proximity of revegetation/regeneration sites to farm dams compared to remnant areas. Remnant areas also generally had a greater diversity of more niche-specific fauna such as:

- Hollow dependent fauna;
- Small native mammals such as the Antechinus;
- Woodland dependent fauna;
- Frugivorous birds; and
- Honeyeaters.

Remnant areas also contain greater threatened species diversities than revegetation/regeneration areas.

Mollusc numbers are mostly stable, and similar numbers to those previously recorded. Most live specimens were detected under logs, rocks etc, as is typical of these species particularly during dry weather when moisture is captured under structures.

General fauna compositions across remnant sites were consistent with previous monitoring (other than amphibian diversity, which was higher due to an abundant presence of water throughout).

Note: As fauna monitoring survey techniques are slightly different to previous years (removal of remote camera surveys etc. prior to 2016), comparisons between monitoring years prior to this time are only generally informative.

6.6.2.3 Threatened Species

At the time of this report, three threatened fauna species listed as vulnerable under *the Biodiversity Conservation Act 2016* and one migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* had been identified. It is likely that threatened micro-bat species are also present, however these results have yet to be processed. The species recorded in 2022 were:

- Threatened fauna:
 - o Brown treecreeper
 - o Grey-crowned babbler
 - o Speckled warbler
- Migratory fauna:
 - o Rainbow bee-eater.

No targeted threatened flora species work was undertaken as part of this program during 2022 and no new records were identified at any of the monitoring sites. However, known tiger orchids (*Cymbidium canaliculatum*) and weeping myall (*Acacia pendula*) were observed opportunistically while moving between sites and all appeared in a good state of health. Weeping myall (*Acacia pendula*) populations in offsets are flourishing with regenerating shrubs abundant surrounding established plants.

Ecological monitoring locations are shown in **Figure 6-10**.

6.6.2.4 Conservation Agreement Monitoring

In 2022, the biodiversity offset areas were managed under the terms of the Conservation Agreements that are registered with the BCD.

Annual monitoring of the Conservation Areas was undertaken by Umwelt during 2022 (Umwelt, 2023), which included photo monitoring for comparison against baseline photos, quadrat monitoring to compare data to benchmarks and a walk-through assessment of all conservation areas. The following monitoring was undertaken:

Big Flat Creek Conservation Area:

- 11 photo monitoring points; and
- Five quadrat plots.

Western Corridor and Anvil Hill Conservation Area:

- 12 photo monitoring points; and
- Seven quadrat plots.

Southern Offset Conservation Area:

- Eight photo monitoring points; and
- Five quadrat plots.

Eastern Offset Conservation Area:

- Ten photo monitoring points; and
- Seven quadrat plots.

Northern Corridor Conservation Area:

- 12 photo monitoring points; and
- Six quadrat plots.

Due to numerous heavy rainfall events during spring, six photo monitoring points and three quadrat plots could not be accessed in the Western Corridor and Anvil Hill Conservation Area, during the 2022 monitoring. The monitoring data and reports related to the Conservation Agreements have been provided to the Biodiversity Conservation Trust as per conditions of the agreement.

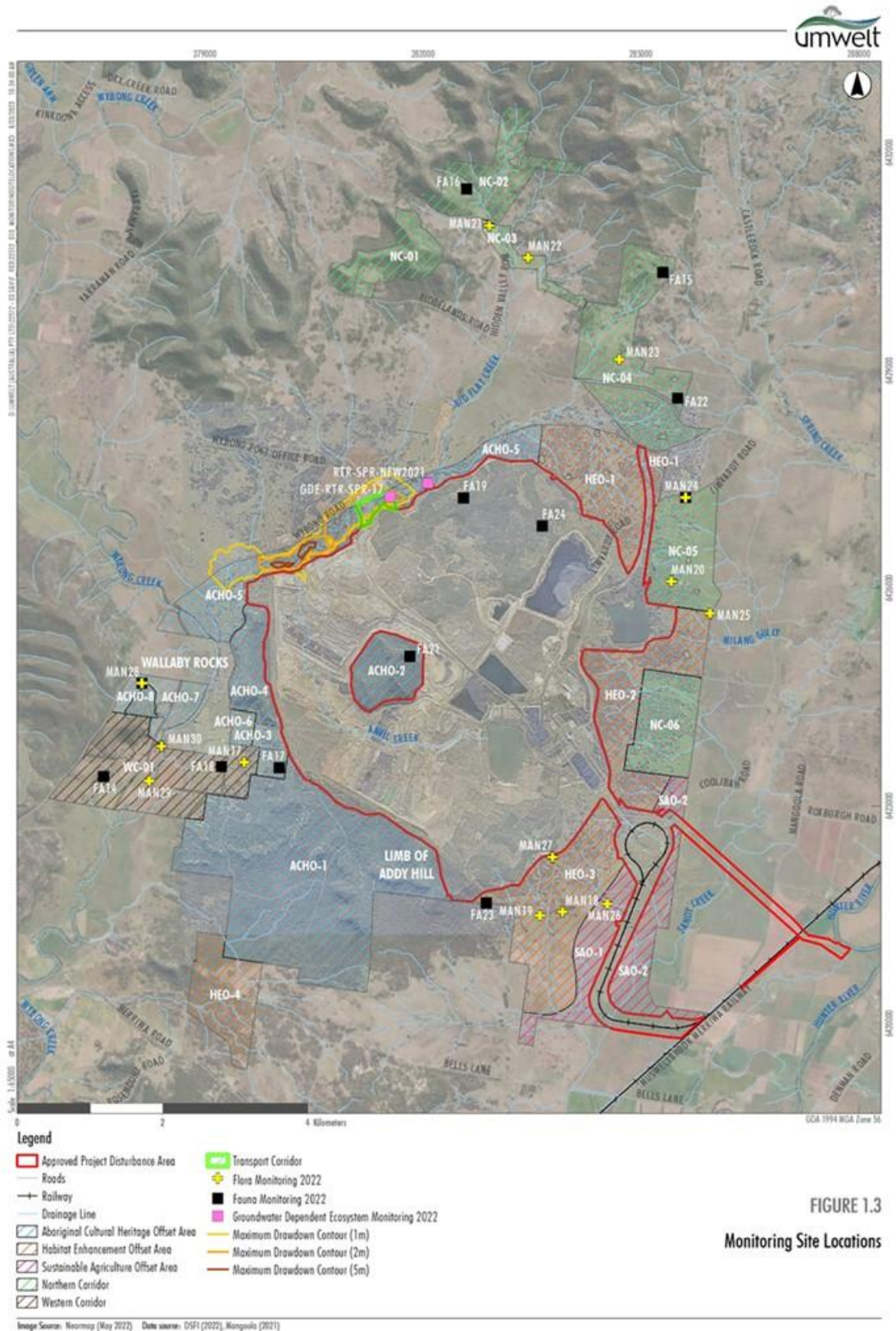


FIGURE 1.3
Monitoring Site Locations

Figure 6-10 Flora, Fauna and GDE Monitoring Locations

6.6.2.5 Nest Box Monitoring

A portion of the nest boxes at Mangoola are monitored every year for the presence of fauna and the condition of each box is also monitored at this time. A total of 593 nest boxes were monitored as part of the program for 2022, and all were monitored for condition and content. This work was completed in January 2023 due to poor weather and accessibility issues.

Results are summarised below:

- 16 of the boxes monitored showed some signs of use, comprising a mixture of eggs, shells and various nesting materials. Note, this is often skewed by installers putting nesting material such as sawdust, leaves or grass in the boxes at the time of installation. This makes it difficult to gauge if fauna brought this material in. In this case, nesting material was counted as a sign of use when it had been clearly shaped or was fresh;
- 69 of the boxes monitored contained an animal at the time of monitoring. These included mammals, marsupials, reptiles, amphibians and birds;
- Breeding was confirmed in a number of boxes, through the presence of young brushtail possums, baby birds or eggs;
- Two threatened squirrel gliders (*Petaurus norfolcensis*) were recorded in a feathertail glider box in the Northern Corridor;
- No boxes were monitored in the rehabilitation this year;
- Nest box occupation is not as high as previous years (12%), however this is possibly a result of the time of year. Monitoring in late summer shows good results for micro-bats in boxes, however is likely to miss key breeding periods for most birds; and
- Pest species usage of boxes continues to be low with only four European honey-bee hives recorded.

6.6.2.6 Threatened Terrestrial Orchid Monitoring

Following three years of drought (2017-2019), improved winter rainfall from 2020 to 2022 has seen elevated orchid presence within most monitoring and control plots. Detected orchids declined slightly in 2022 following an initial three months of above average rainfall (January - March; main orchid dormancy period), and then three months of low rainfall leading into Winter (April - June; leaf emergence and food generation period). Over the course of 12 years, improvements in monitoring methods have dramatically enhanced orchid detection rates with successive monitoring events, although the interplay of this with seasonal rainfall affects final counts. For *Diuris* and *Prasophyllum* combined, detectability for most recipient plots in 2022 was between 1% and 34%, and individually the best result was 71% for *Diuris* in one plot. At the completion of monitoring in 2022, all observed individuals were marked with 90 cm aluminium stakes approximately 5 cm from orchid stem bases, and unique number codes will be applied to each in the coming season. This was done to improve detectability and the tracking of individuals in subsequent years during the transition from annual brush-cutting to irregular biomass reduction burns, where existing tags will be impacted by fire. Newly detected individuals will also be progressively marked in this way.

The new recruitment first confirmed in 2020 for *Diuris* within rehabilitation plots in 2020, continued into 2021 and 2022, but *Prasophyllum* recruitment has not yet been detected. The 29 new *Diuris* individuals (8 in Rehabilitation Plot 4A, 21 in Plot 4B) observed in 2020 increased to 114 (29 in Plot 4A and 85 in Plot 4B) in 2021, irrespective of the biomass reduction burn undertaken in one plot four months prior (May). However, in 2022 no orchids were evident in this burnt plot, and it is possible that the late timing of the 2021 burn had a delayed detrimental impact on emergence in 2022. Future

biomass reduction burns will consequently need to occur only within the dormant growth period (January - March) to ameliorate this impact. Sporadic individuals of *Diuris* within some offset plots observed in recent years may also represent new recruitment; however, it is difficult to know if they were already in those locations prior to the initial translocation event.

Permanently tagged orchids within the four control plots were censused for the seventh time in 2022, and with the changing weather patterns year-to-year is now yielding important emergence and detection data for both species. In 2022, just seven (9.5%) of the 74 (27 *Diuris*, 47 *Prasophyllum*) originally tagged orchids had emerged. An additional two *Diuris* and two *Prasophyllum* newly detected in 2022 were added to the total tagged number, increasing to 41 (35 *Diuris* and 6 *Prasophyllum*) the number of newly emerged orchids that have been added to the 74 tagged at commencement in 2016. This means that over the course of seven years, more than double the number of orchids has emerged from the same four plots as were originally detected in 2016. Since installation, numbered individuals of *Diuris* and *Prasophyllum* declined in detection during the drought years of 2017 to 2019, but from 2020 they have been on an increasing trend. Of 27 *Diuris* followed over seven seasons, only one (3.7%) has been detected every year from 2016 to 2022. For the remainder, one (3.7%) has been recorded over six seasons, seven (26%) over five seasons, five (18.5%) over four, three (11%) over two seasons, and five (18.5%) over one season only. None of the 47 *Prasophyllum* have been detected every year for three or more of the seven seasons, and only one (2.1%) was recorded over four seasons, five (10.6%) over three seasons, 12 (25.5%) over two seasons and 29 (61.7%) in one season only. For both species combined, just 1.4% of all individuals were detected over seven consecutive seasons. Such an outcome is informative for projects where a single season of survey aims to estimate population size in an area, and more importantly where annual monitoring of individuals is required to measure success of translocation or any other management activity. In this case, the monitoring of control plots in tandem with translocation plots over seven seasons suggests caution in the interpretation of translocation 'success' where based on percentage emergence.

Some minor issues relating to the management of translocation recipient and control sites became apparent and action is required to:

- Control outbreak of Coolatai grass near Control Plot #3 (Wybong PO Rd);
- Consider feral pig control in areas around Control Plots #2 and #3;
- Replace gate on Translocation #3, which now has large holes suitable for macropod entry;
- Ensure that if biomass reduction burns (January - March) do not occur in specific plots, then mechanical slashing and removal of grasses in April must occur across all translocation plots; and
- Ensure all ground vegetation is burnt during biomass reduction burns.

6.6.2.7 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystem (GDE) monitoring was undertaken along Big Flat Creek in Swamp Oak Forest to identify if floristic data reflects any substantial negative changes that may have resulted from groundwater depressurisation associated with groundwater inflows. This included site RTR-SPR-17 which is located within the predicted zone of depressurisation and site RTR-SPR-NEW2021 which is located outside of the zone of depressurisation. Site RTR-SPR-NEW2021 was established in 2021 and acts as a reference site against which to compare future changes to RTR-SPR-17 (in event of events such as drought), to guide the likelihood of floristic changes resulting from this, of groundwater depressurisation.

The GDE monitoring site (RTR-SPR-17) experienced extensive dieback between 2017 and 2021 with over-storey and mid-storey cover both reducing by over 50 percent. This dieback was prevalent throughout this area in both the mature and regenerating Swamp Oak (*Casuarina glauca*). Since this

time, the rainfall has been consistently high, as have the general growing conditions experienced in the Wybong area. The canopy foliage is recovering in 2022 and has increased in coverage since 2021 by 15 percent. However, it may take some time before the total canopy coverage returns to its former levels. The site continues to have regeneration present, and saplings are similarly now in a good state of health.

The reference site RTR-SPR-SNEW2021 (outside of the predicted depressurisation zone) is also showing similar levels of improvement since 2021. It should be noted that both swamp oak (*Casuarina glauca*) and river oak (*Casuarina cunninghamiana*) dieback was observed across the Hunter Valley between 2018 and 2021 and was likely to be strongly influenced by the drought conditions.

Groundwater quantitative data is collected at two sites along Big Flat Creek and in proximity to RTR-SPR-17, being MP17-B and MP8-B (in alluvium and weathered conglomerate), these flows move in a south-westerly direction. In 2012, baseline depth to water (DtW) levels for MP17-B and MP8-B were recorded at 2.96 m and 3.35 m, respectively. These levels would have been within the root zones of treed vegetation or at least within a zone where soil capillary action allows groundwater to influence soil moisture and thus be available to surface vegetation.

Ongoing monitoring of these bores identified MP17-B as being dry for numerous years (from late 2017), and as only being identified as in a state of recovery in December 2021 when the depth to water was recorded as recovering to a DtW of 2.52 m. DtW at the time of survey was approximately 2.91 m. In 2022, groundwater monitoring site MP8-B remained empty.

Groundwater depressurisation around RTR-SPR-17 is occurring within the parameters predicted as part of the groundwater modelling of this site. It is probable that the Swamp Oak Riparian Forest vegetation (canopy species) above RTR-SPR-17 and RTR-SPR-2021 is at least partially groundwater dependent. This dependence may be more pronounced during extended periods of drought where surface water availability is reduced or absent.

6.6.2.8 Offset and Infill Tree Planting 2022

Tree planting activities are undertaken in the biodiversity offset areas in accordance with the BOMPS to extend and enhance woodland areas, and create vegetation corridors to link the offset areas and rehabilitation with remnant vegetation to the north and west of Mangoola mine.

As outlined in the BOMPS, an area of 50.4 ha was assessed for planting suitability in 2022. The areas comprised approximately 35.3 ha of Ironbark Woodland Complex in the biodiversity corridor at NC-05 and 15.1 ha of Slaty Box Woodland in the Habitat Enhancement Area at HEO-4 according to the BOMPS. After due diligence, inspections, and preparation of the areas for planting, the approximate areas planted in 2022 were:

- 13 ha of Ironbark Woodland Complex in the biodiversity corridor at NC-05; and
- 10 ha of Slaty Box Woodland in the Habitat Enhancement Area at HEO-4.

The above areas were within the Year 12 (2022) planting areas outlined in the BOMPS and were planted with approximately:

- 10,000 canopy and understory Ironbark Woodland species at NC-05; and
- 7,500 canopy and understory Slaty Box Woodland species at HEO-4.

The trees and shrubs planted were planted after mechanical ground preparation (ripping) and weed spraying to prepare the soil for planting. The areas planted in 2022 are performing well, with high survival rates and species diversity noted during inspections.

A further 11,000 trees and shrubs were infill planted throughout the rehabilitation areas to improve diversity in accordance with recommendations made in the 2021 walkover inspection report. Areas

planted were in North Pit rehabilitation areas SGL06 and IBW06 and South Pit rehabilitation area IBW11. Infill planting was undertaken in August 2022 to coincide with offset planting works.



Photo 6-1 Planting NC-05 Offset Area 2022



Photo 6-2 Infill Planting Throughout the South Pit Rehabilitation Areas 2022

6.6.3 Key Performance and/or Management Issues

During the reporting period there were no reportable incidents, performance or management issues relating to flora and fauna. Management issue recommendations related to biodiversity monitoring are:

- Recommendations from the 2022 BOMPS Monitoring Report (Umwelt, 2023a) include:
 - Continue to undertake ongoing maintenance and monitoring of weed species in line with the identified areas of concern and the 2023 Weed Action Plan;
 - Continue to undertake targeted control works for vertebrate pest mammals;
 - Undertake supplementary or in-fill plantings of canopy and shrub species in specified areas within the offsets; and
 - Modify seeding/ planting ratios as recommended.
- Recommendations for future nest box activities (Umwelt, 2023b) include:
 - Continue to tag new nest box installations with cattle tags and re-tag existing boxes as numbers fade (ongoing);
 - Continue supplementary nest box installation in rehabilitation and regeneration areas as habitat matures and target small nest box designs to encourage use by small birds, microbats, reptiles, frogs, dasyurids and insects; and
 - Maintain nest box diversity to cater for a wide range of species (ongoing).
- Recommendations from the Rehabilitation Monitoring Report (Umwelt, 2023b) include:
 - Ongoing management of weeds and pest species;
 - Erosion control at a small number of sites;
 - Supplementary planting at a small number of sites;
 - Thinning of canopy trees and shrubs at select sites where densities are considered to be impacting the overall vegetation condition; and
 - Undertake review of the target tree stem densities for target vegetation communities and revise targets in the RMP as necessary.

Mangoola will review and implement these recommendations where appropriate as part of the 2023 ecological monitoring program.

6.6.4 Proposed Improvements

After 12 years of monitoring and following two trial burn programs, Eastcoast Flora Survey recommend continuing the transition from brush-cutting to biomass reduction burns but only within a strict burn window (January - March). If conditions are not suitable for burns to occur at that time, then brush-cutting and grass removal in March - April should resume instead. Annual monitoring of selected recipient plots (those in mine rehabilitation, controls, and some *Prasophyllum*-dominated plots in offsets) should continue, in tandem with annual monitoring of control plots to further inform expectations from translocated orchids within recipient plots. Monitoring of translocation plots has been moved to every two years as per previous recommendations from Eastcoast Flora Survey.

6.7 Weed and Pest

6.7.1 Environmental Management

6.7.1.1 Weed Management Activities

During the reporting period, contractors were engaged to undertake weed management works at the mine, within rehabilitation and offset areas. Priority weeds for the Hunter (NSW DPI) were prioritised with environmental weeds treated opportunistically when encountered. A summary of the weed management and control activities undertaken during the reporting period is listed below:

- High and low volume spraying was conducted across all offset areas targeting *Echium plantagineum* (Patterson's Curse), *Eragrostis curvula* (African Love Grass), *Galenia pubescens* (Galenia), *Opuntia sp* (Prickly Pear), *Bryophyllum delagoense* (Mother of Millions), *Hypericum perforatum* (St John's-wort), *Hyparrhenia hirta* (Coolatai Grass), *Glandularia aristigera* (Mayne's Pest) *Rubus sp.* (Blackberry), *Senecio madagascariensis* (Fire Weed), *Sida rhombifolia* (Paddy's Lucerne), *Verbena bonariensis* (Purple Top), *Tagetes minuta* (Stinking Roger) and *Cestrum parvum* (Green Cestrum).
- Primary control areas were along powerlines, tracks, creek lines, rip lines and within revegetation areas.
- Cut-and-paint works with chainsaws and handsaws were conducted throughout site targeting *Lycium ferocissimum* (African Boxthorn).
- Cut-and-paint works with chainsaws and handsaws were conducted around the old farm houses and creek lines within the offsets.
- Widespread high and low volume weed control throughout all mine rehabilitation areas, primarily targeting *Chloris gayana* (Rhodes Grass), *Chloris virgata* (Feathery Rhodes Grass), *Datura stramonium* (Thorn Apple), *Gomphocarpus fruticosus* (Cotton Bush), *Hyparrhenia hirta* (Coolatai Grass), *Tagetes minuta* (Stinking Roger), *Phytolacca octandra* (Ink Weed), *Onopordum acanthium* (Scotch Thistle), *Galenia pubescens* (Galenia), *Heliotrope amplexicaule* (Blue Heliotrope), *Erigeron bonariensis* (Fleabane), *Hypericum perforatum* (St Johns Wort), and *Senecio madagascariensis* (Fire Weed).
- Hand weeding was conducted within the Orchid translocation compounds. Slashing was conducted in and around Orchid monitoring compounds. Biomass was raked and removed from the compounds. Low volume herbicide application was conducted around the edges of some plots targeting *Verbena sp* (Purple Top), *Conyza sp* (Fleabane) and *Galenia pubescens* (Galenia).
- Hand weeding was conducted in the *Pomaderris reperta* planting compounds targeting *Bidens Pilosa* (Farmers Friends), *Chloris virgata* (Feathery Rhodes Grass), *Hyparrhenia hirta* (Coolatai Grass) and *Verbena bonariensis* (Purple Top).
- Slashing and low volume herbicide application was conducted around mining infrastructure areas, dams and monitoring points.

6.7.1.2 Feral and Pest Animal Management Activities

Mangoola completed autumn and spring 1080 baiting programs during 2022 which resulted in 85 fox, 56 wild dog and four pig takes. Mangoola is a member of the Wybong Wild Dog Association and coordinates vertebrate pest control activities with regional neighbours to provide maximum program efficiency.

Additional programs also resulted in 10 fallow deer and 133 feral pigs being culled.

6.7.2 Key Performance and/or Management Issues

No reportable incidents, performance or management issues regarding weeds and feral animal management occurred during the reporting period. Mangoola received a Property Inspection Report from the Upper Hunter Weeds Authority in December 2022 which noted St John's Wort (*Hypericum perforatum*) on the property, however this species was being sprayed at the time the notice was received. No further action is required.

6.7.3 Proposed Improvements

There are no proposed improvements to weed and pest management during 2023.

6.8 Visual Mitigation

6.8.1 Environmental Management

All works occurring onsite are undertaken in a manner which ensures that there is minimal impact on visual amenity in accordance with *AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*. Mangoola is committed to minimising ongoing visual impacts from its operations. To ensure visual impacts are minimised a variety of methods are implemented, including tree screen planting, visual bunds, building placement, light shielding and lighting direction to prevent light spillage.

In 2022, construction of visual controls required for the MCCO Project commenced and are currently scheduled for completion in 2023. The Mangoola Visual Impact Management Plan (VIMP) was approved by the DPE on 28 September 2022.

6.8.2 Environmental Monitoring Results

In August 2022, Mangoola arranged for a consultant to assess compliance against the lighting requirements under SSD-8642 which included a field component held the night of 25 August 2022. There were no identified non-compliances in the management of lighting and visual impacts at Mangoola based on works completed to the time of inspection.

Lighting inspections are undertaken as required by Mining Supervisors to monitor mobile lighting impacts from external viewing points. In 2022, mining moved further to the west behind the Anvil Hill Offset Area. This offered more protection from obtrusive lighting and lessened the requirement for lighting inspections which are not conducted unless there is a greater risk of impact to the community.

Visual tree screening was direct seeded with appropriate local flora species along sections of Yarraman Road during 2018 to reduce visual exposure as the mine progresses to the north-west. As a result of the ongoing drought conditions in 2019, the direct seeding campaign undertaken in 2018 resulted in no germination and 2019 was not re-sown due to ongoing drought. In 2020, the tree screen areas along Yarraman and Wybong Roads were sprayed (where required)/slashed and planted with tube-stock. Additional infill planting in these areas was also undertaken during 2021.

In 2022 three (3) Visual bunds were constructed along Wybong road as required by the sites VIMP. Construction also commenced on a clean water diversion drain along Ridglands Road which includes sections that are built up and will provide additional visual mitigation.

6.8.3 Key Performance and/or Management Issues

There were no performance or management issues regarding visual mitigation or lighting during the reporting period.

There was one lighting complaint received 25 April 2022 (bright clear light observed). This was investigated by the Mining Supervisor including a visit to the receiver locality. Light sources were modified, although the source of concern was not specifically identified. The community member was consulted, and they were satisfied with complaint investigation. A lighting inspection was also completed the following night by the Mining Supervisor.

There was one community enquiry regarding the installation tree screens along Ridglands Road as required by the VIMP and EIS (tabled at the CCC Meeting held 3 May 2022 and 8 November 2022). Installation of the tree screens could not be completed due to construction of the 11 kv powerline and clean water diversion drain through the area. Following the completion of construction activities in the area (expected early 2023) installation of the tree screens will commence.

There were no non-compliances associated with visual amenity or lighting during the reporting period.

6.8.4 Proposed Improvements

There are no proposed improvements to visual impact management during 2023. Construction of visual controls as per the VIMP commitments will continue in 2023. Following construction, these will then be added to the monitoring schedule in accordance with the VIMP.

6.9 Aboriginal Heritage

6.9.1 Environmental Management

The management of activities relating to Aboriginal cultural heritage at Mangoola is undertaken in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP), relevant other guidelines and legislation. The ACHMP was updated in 2021 and a copy is available on the Mangoola website.

A number of Aboriginal archaeological sites are recorded within or adjacent to the Mangoola project area. To assist with the management of Aboriginal cultural heritage, Mangoola maintains spatial information regarding all identified Aboriginal archaeological sites within the operational geographical information system (GIS). The GIS information is utilised to inform the GDP process.

6.9.2 Environmental Monitoring Results

Aboriginal heritage monitoring and inspections undertaken in 2022 have been summarised in **Table 6-17**.

Table 6-17 Aboriginal Heritage Monitoring and Inspections

Monitoring / Inspection	Dates	Attendees	Notes
2022 Offset Tree Planting	29 March 2022	Stephanie Rusden (OzArk - Archaeologist) and a representative from a RAP.	During this inspection, no new Aboriginal sites were recorded. Two previously recorded sites were ground truthed which resulted in the extent of one site being increased. This area was demarcated in field and avoided during tree planting works.
2022 Annual Offset Monitoring	14 – 17 November 2022	Stephanie Rusden (OzArk - Archaeologist), Robyn Ellis (Mangoola Environment and Community Officer) and a representative from a RAP.	Throughout 2022 Mangoola ensured that visitation to rockshelters and other Aboriginal Cultural Heritage Offset Areas (ACHOAs) was kept to a minimum. Visitation to these locations was undertaken to conduct the required monitoring and measurements in line with approved management plans and statutory approvals. A summary of the report outcomes was presented at the annual cultural heritage consultation meeting held on 15 December 2022. Further information is available at the request of RAPs.

6.9.3 Key Performance and/or Management Issues

There were no reportable incidents, performance or management issues relating to Aboriginal heritage during the reporting period however, actions captured in the 2022 Annual Stakeholder Review Meeting have been enacted.

6.9.4 Proposed Improvements

As an outcome of the 2022 annual cultural heritage consultation meeting, Mangoola will provide to the attendees at the 2023 meeting a detailed ‘interactive’ view into the management and scope of work that is completed biannually at the rock shelters. Many RAPs have expressed interest in learning more about the rock shelters and the management controls Mangoola has in place to monitor impacts of blasting at these locations, but due to the steep terrain are unable to attend the rock shelters in person.

Mangoola will continue to work with RAPs regarding the application and processing of funding available to enhance or promote Aboriginal matters as per the process outlined in the ACHMP.

Maintenance of the GIS layers will continue including the addition of any new artefacts and/or sites found as part of due diligence works.

6.10 European Heritage

6.10.1 Environmental Management

European heritage is managed at Mangoola in accordance with the relevant management plan (the Conservation Management Strategy up to 30 September 2022 and the Historic Heritage Management Plan from 30 September 2022).

As required by Condition B71(c) of SSD-8642, the Historic Heritage Management Plan (HHMP) replaced and superseded the Conservation Management Strategy to include the current Approved Project Area for Mangoola which includes the area south of Wybong Road and the MCCO Additional Project Area, north of Wybong Road

A copy of the HHMP is available on the Mangoola website. Specifically, the HHMP identifies known European Heritage sites at Mangoola and any relevant monitoring required to be completed to assess potential impacts (primarily from blasting or clearing activities).

6.10.2 Environmental Monitoring Results

During the reporting period ground vibration monitoring at key heritage sites, such as Anvil Rock, was maintained.

No blast events have exceeded the vibration limit of 20 mm/s at the Castle Hill site in 2022 and results from other blast monitors and structural monitoring undertaken has demonstrated that no damage has occurred to any sites.

6.10.3 Key Performance and/or Management Issues

No reportable incidents regarding European heritage occurred during the reporting period.

Mangoola will continue to undertake ground vibration and physical monitoring in 2023 on Anvil Rock and the Book Rock Formations to inform the adequacy of blasting controls and management of these structures.

6.10.4 Proposed Improvements

There are no proposed improvements in this area in 2023.

6.11 Spontaneous Combustion

6.11.1 Environmental Management

Management of spontaneous combustion is undertaken in accordance with the Mangoola Spontaneous Combustion Principal Hazard Management Plan (SCPHMP). This management plan details the monitoring and control measures implemented by Mangoola to reduce the incidence and impacts of spontaneous combustion, including stockpile inspections, staff training, priority processing of areas that are heating, and track rolling/battering down stockpiles that will be stored for greater than three months.

6.11.2 Environmental Monitoring Results

No significant instances of spontaneous combustion were detected at Mangoola during the reporting period. Implementation of the SCPHMP has been effective in preventing spontaneous combustion on site to date.

6.11.3 Key Performance and/or Management Issues

There were no reportable incidents, performance or management issues involving spontaneous combustion during the reporting period.

6.11.4 Proposed Improvements

There are no proposed improvements in this area in 2023.

6.12 Bushfire

6.12.1 Environmental Management

Potential risks associated with bushfire are managed through the implementation of monitoring and control strategies as documented in the Mangoola Bushfire Management Plan. This management plan was originally developed in consultation with the NSW Rural Fire Service, Muswellbrook Shire Council, and both the Mangoola and Wybong Rural Fire Brigades. A revised Bushfire Management Plan has been drafted and submitted to the DPE and other relevant agencies (including NSW Rural Fire Service) in accordance with the conditions of SSD-8642.

6.12.2 Environmental Monitoring Results

There were no bushfires at Mangoola during 2022.

Mangoola continued to implement the bushfire hazard reduction program which included:

- Building Asset Protection Zone (APZ) maintained at the rear of administration building to Bushfire Management Plan Asset Protection Zone standards (30 m width, 10 cm grass height) (complete);
- Access improvement of site access roads to the south to meet Rural Fire Service (RFS) fire trail standards with 4 m width no obstruction clearance and 4 m height (complete);
- Access maintenance of site access roads to the south (monitor minor washout damage to ensure continued access) (complete);
- Provide a bushfire awareness toolbox talk document prior to total fire ban, severe, extreme or catastrophic fire risk days (to be undertaken when triggered) (contingent on weather conditions); and
- Name and signpost all firefighting access trails identified on the operational map to avoid confusion when liaising with external agencies (complete).

6.12.3 Key Performance and/or Management Issues

There were no performance or management issues relating to bushfires during the reporting period.

6.12.4 Proposed Improvements

The Bushfire Management Plan will be updated in accordance with the requirements of SSD-8642 in consultation with RFS.

6.13 Hydrocarbon Management

6.13.1 Environmental Management

Bulk fuel facilities are managed in accordance with *AS1940-2017 The Storage and Handling of Flammable and Combustible Liquids*. All permanent fuel facilities are fully bunded, with emergency measures in place to manage spills.

All hydrocarbon spills which occur are reported via the sites incident reporting system, and investigations carried out as required. When spills occur, they are managed with one of the spill kits available onsite or treated through oily-water separators.

There is also an active bioremediation area which was constructed within the mining area in 2018 and utilised as required during 2022.

6.13.2 Environmental Monitoring Results

During the reporting period, there were twenty-three hydrocarbon spills which were reported internally. All spills were contained on site within the active mining area and no offsite pollution or environmental harm occurred because of these spills. Consequently, none of these incidents required external reporting to any government agencies.

In response to each spill, the following tasks were generally implemented:

- Source of the spill controlled (pumping/machinery stopped);
- Spill contained and cleaned up with absorbent material;
- Contaminated material taken to bioremediation area, where appropriate;
- Incident reported and investigation commenced where required;
- Machinery repaired, where required; and
- Where required, procedures were updated, and staff and contractors received additional training on adequate management of hydrocarbons or spills.

6.13.3 Key Performance and/or Management Issues

There were no key performance and/or management issues relating to hydrocarbon management in 2022.

6.13.4 Proposed Improvements

There are no proposed improvements in this area in 2023.

6.14 Public Safety

6.14.1 Environmental Management

Mangoola is committed to preventing risks to public safety as a result of operations at the mine. Ongoing reviews of potential public safety issues are undertaken on a regular basis around the mine area and associated public roads.

Day-to-day monitoring of public safety at Mangoola is undertaken through a variety of methods, including:

- All site visitors are directed to the main office and are required to report and logon to an electronic visitors book;
- Implementation of a security system to ensure public and employee safety is maintained in accordance with the relevant requirements under the *Coal Work Health and Safety Act 2011*, *Mining Act 1992* and the mining tenements;
- During hazardous activities such as blasting, sentries are posted throughout the site, and if required, public road, to prevent unauthorised entry into the blasting zone;

- Site boundary fencing surround the perimeter of the site;
- Security patrols;
- Upgrade of local roads in accordance with Conditions B94-B97 of SSD-8642;
- Restrictions of local road use in accordance with Conditions B98-B101 of SSD-8642; and
- Employee and contractor inductions regarding mine safety and environmental management issues prior to commencement of work at the site.

6.14.2 Environmental Monitoring Results

As required by Condition 45 of MP 06_0014, Mangoola was required to contribute funding to the upgrade of the Thomas Mitchell Drive and Denman Road intersection which was to be completed by 31 December 2017.

On 4 May 2016, Mangoola received an extension from the DPE to complete the upgrade works by the end of 2019. During 2019 and 2020, further discussions were held between Mount Arthur Coal (who are completing the upgrade), Muswellbrook Shire Council and DPE regarding the timing of works to be completed. On 16 April 2020, an extension from DPE was granted until 31 December 2022. The upgrade works were completed in December 2022 with Mangoola making the required contributions in accordance with Condition 45 of MP 06_0014.

Wybong PO Road was closed and entry secured in accordance with SSD-8642.

6.14.3 Key Performance and/ or Management Issues

There were no public safety incidents, performance or management issues in 2022.

6.14.4 Proposed Improvements

There are no proposed improvements in this area in 2023.

6.15 Greenhouse Gas Energy

6.15.1 Environmental Management

Energy consumption (electricity, diesel and liquefied petroleum gas) at Mangoola is monitored and reported in accordance with Glencore requirements and the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).

Mangoola operates in accordance with the approved AQGGMP. The AQGGMP has been produced to comply with Condition B31 of SSD-8642. Mangoola continually assesses the viability of initiatives to improve energy efficiency and reduce greenhouse emissions from proposed operations.

The AQGGMP identifies opportunities at Mangoola to reduce greenhouse gas emissions and energy consumption, as well as specifying actions to realise these opportunities.

The three-yearly energy audit was conducted in 2019 as required by the ESAP and energy efficiency improvement opportunities were investigated as a result. As the ESAP is no longer required under SSD-8642, a final independent audit was conducted against the ESAP. Any actions will be addressed accordingly pending approval from DPE.

6.15.2 Environmental Monitoring Results

6.15.2.1 Results from the Reporting Period

Mangoola reports greenhouse gas emissions (GHG) in accordance with NGER legislation. Each financial year Mangoola is required to submit to the federal government the emissions from their NGERs registered facility. Also, because Mangoola emits over 110kt of CO₂e- each year, Mangoola is registered as a Safeguard facility and therefore also had a Safeguard baseline. Emissions above the baseline for that year need to be offset by retiring Australian Carbon credit Units (ACCU). The NGERs reporting year is based on a financial year, not a calendar year such as this Annual Review. To prevent incompatible public reporting, the values in this report also cover a financial year. The following table contains the Scope 1 (direct emissions from the mining activities during the year), and Scope 2 emissions (electricity consumption by the mine during the year). Data relating to electricity consumption, fossil fuel usage and the associated greenhouse gas emissions, during the 2021/2022 reporting period is presented in **Table 6-18**. In 2021/2022, the total emissions produced by Mangoola were 136,954 t CO₂-e which represents a ~1% increase from 2020/2021 (135,015 t CO₂-e).

Table 6-18 Greenhouse Gas Data

Emissions Source	2020/2021 T CO ₂ -e	2021/2022 T CO ₂ -e	Year 2-9 Scope Total T CO ₂ -e – Prediction (MOD 6)
Total Scope 1 Emissions (Direct)	97,971	100,044	136,358 ¹
Total Scope 2 Emissions (Indirect)	37,044	36,910	63,962
TOTAL EMISSIONS (SCOPE 1 & 2)	135,015	136,954	200,320

¹ Scope total made up of diesel use, explosive use and fugitive emissions – MOD 6 greenhouse gas assessment breakdown, current annual broken down more accurately than initial assessment.

6.15.2.2 Comparison with Predictions

The MOD 6 Environmental Assessment included an Air Quality Impact Assessment (Todoroski Air Sciences, 2013) which predicted greenhouse gas emissions for years 1, 2 - 9 and 10 of the Project. As MOD 6 was approved in 2014, 2022 can be considered Year 9 of the modified operations. The Year 2-9 greenhouse gas emissions predictions are presented in **Table 6-18**.

The data shown in **Table 6-18** represents the average annual predicted CO₂-e emissions for Years 2 - 9 of the modified operations. As shown in **Table 6-18**, the total emissions for 2021/2022 were 136,954t CO₂-e. This is 31% less than the 200,320 t CO₂-e predicted in the Environmental Assessment for Years 2-9 (Todoroski Air Sciences, 2013) for Scope 1 (Direct) and 2 (Indirect) emissions.

A Greenhouse Gas and Energy Assessment was prepared by Umwelt (2019) to support the MCCO Project). The MCCO Project is expected to increase annual Scope 1 and Scope 2 emissions by 407,000 t CO₂-e and 51,000 t CO₂-e, respectively (Umwelt, 2019). Whilst construction works associated with MCCO are underway, the results in **Table 6-18** demonstrate that Mangoola are below the forecast emissions.

No reportable incidents regarding greenhouse gas and energy occurred during the reporting period.

6.15.3 Key Performance and/or Management Issues

Greenhouse gas was incorporated into the AQGGMP as required by SSD-8642. The three-yearly energy audit required under the ESAP was carried out in 2022 and required actions will be undertaken once accepted by DPE.

Mangoola is a part of the wider coal assets held by Glencore across Australia. GCAA are themselves a part of the global Glencore mining portfolio. In line with the ambitions of the 1.5°C scenarios set out by the IPCC, Glencore targets a short-term reduction of 15% by 2026 and a medium-term 50% reduction of our total (Scope 1, 2 and 3) emissions by 2035 on 2019 levels. Post 2035, Glencore's ambition is to achieve, with a supportive policy environment, net zero total emissions by 2050.

Glencore incorporates energy costs and our carbon footprint into our annual planning process. Commodity departments, such as GCAA, are required to provide energy and greenhouse gas emissions forecasts for each asset over the forward planning period and provide details of emissions reduction projects.

In the case of Mangoola, this includes involvement with GCAA when considering available greenhouse gas abatement technology and mine planning to optimise efficiency (which usually translates into reduced fuel consumption).

6.15.4 Proposed Improvements

There are no proposed improvements in this area in 2023.

7. Water Management

Mangoola manages water on site in accordance with the approved Mangoola Water Management Plan (WMP) which is available on the Mangoola website. The WMP was reviewed to align with the progress of the MCCO project and was resubmitted and approved in 2022. Mangoola implements the following hierarchy of water supply to meet demand and reduce water take:

1. On-site runoff from within the saline water system is preferentially used for dust suppression and CHPP process water;
2. On-site runoff from within the dirty water system is preferentially used for dust suppression and CHPP process water;
3. Groundwater inflows into the open cut pits is preferentially used for dust suppression and CHPP process water;
4. Clean water incidentally collected from undisturbed areas of the site is preferentially used for dust suppression and CHPP process water in accordance with the Harvestable Rights provisions; and
5. Water extracted from the Hunter River utilising existing water access licences or purchased on the open market.

7.1 Water Balance

Mangoola operates a comprehensive and calibrated site water balance to inform water management at the site. Water held and captured onsite at Mangoola by the water management system during the calendar year reporting period is shown in **Table 7-1**. The Mangoola water balance is generated from a calibrated model, with an error margin of 6.4%.

Table 7-1 2022 Water Balance (Calendar Year)

Aspect	Volume (ML)
INFLOWS	
Rainfall Runoff	5,393
Hunter River Raw Water Supply	1
Groundwater Inflow	99
Spoil Seepage	653
Tailings Bleed Water	802
Total	6,948
OUTFLOWS	
Evaporation	1,067
CHPP Supply	3,255

Aspect	Volume (ML)
Water Cart Usage	447
Wash Bay / Stockpile	9.7
Hunter Release	3,801
Spill	142
Total	8,722
Inflow – Outflow	-1,774
Recorded Stored on Site at Start of Annual Review Period	3,859
Recorded Stored on Site and End of Annual Review Period	3,092
Change in Storage	-767
Error	6.4%

7.2 Salt Balance

As required by Condition B50 (ii) of SSD-8642, a salt Balance was conducted for the 2022 reporting period. Saline material is any material moved on site that has the potential to generate saline water. Salt can be released when saline material is exposed to the surface, via weathering. The salt then has the potential to be transported by water.

Key sources of saline material at Mangoola include:

- Overburden material.
- ROM Coal.
- Product Coal.
- Coal Rejects.

Key sources of saline water at Mangoola include:

- Direct rainfall onto the surface of water storage dams.
- Runoff – where salt on the surface of soils / saline material is dissolved by rainfall and transported in the system through runoff.
- Water imported from the Hunter River.
- Groundwater inflow into the open cut pits.

7.3 Saline Material, Water Management and Minimisation

The measures to manage saline material and minimise the discharge of saline water from site include:

- Store ROM coal and product coal in stockpiles that are contained within the mine Water Management System (WMS).
- Store coal rejects in emplacement dumps which are constructed such that runoff is contained in the mine WMS.
- Separation of different water qualities to reduce the volume saline water.
- Discharge saline water in accordance with the HRSTS once infrastructure is in place.
- Calibrated water balance model to better understand the likely water volumes and qualities to be managed.
- Water use for dust suppressions to reduce the volume of saline water in storages.
- Out of pit storages to reduce the volume of saline water in the pit.

Table 7-2 Salt Sources and Balance

Salt Source	EC (uS/cm)	TDS (mg/L)
Rainfall	54	30
Hardstand Catchment Runoff	4,000	2,235
Pit Catchment Runoff	1,500	838
Tailings Catchment Runoff	5,000	2,793
Active Waste Catchment Runoff	5,000	2,793
Stockpile Catchment Runoff	6,000	3,352
Rehabilitation Catchment Runoff	1,000	559
Natural Catchment Runoff	200	112
Groundwater Inflow	8,000	4,469
Hunter River Imports	500	279
Aspect	Salt (T)	
INFLOWS		
Rainfall Runoff	4,811	
Hunter River Raw Water Supply	0.2	
Groundwater Inflow	3,444	
Spoil Seepage	-	
Tailings Bleed Water	7,419	
OUTFLOWS		
Evaporation	-	

Salt Source	EC (uS/cm)	TDS (mg/L)
CHPP Supply		7,380
Water Cart Usage		1,074 ¹
Wash Bay/Stockpile		-
Hunter Release		7,399
Spill		211
Total		16,064
Inflow-Outflow		-390
Recorded Stored on Site at Start of Annual Review Period		6,548
Recorded Stored on Site at End of Annual Review Period		6,803
Change in storage		255
Error		2%

¹ Combined dust suppression and wash bay / stockpile.

7.4 Water Take

Mangoola currently operates two water extraction pumps within one pump station (20WA211008) to provide additional water for its operations, as required, from the Hunter River in accordance with its water extraction permits. The extraction limit for the Mangoola Hunter River Licences is 2,758 ML. The water allocation for the Hunter River changes throughout the year and the water allocation has been at 100% for General Security during the reporting period.

The total Hunter River water extracted by Mangoola during the 2021-2022 water year was approximately 93 ML which was within the allowable extraction limit. This represents a decrease from the 170 ML extracted from the Hunter River during the previous 2020-2021 water year.

Water taken by the operation during the previous water year (1 July 2021 to 30 June 2022) has been summarised in **Table 7-3**.

Table 7-3 2022 Water Take (Water Year)

Water Licence #	Water Sharing Plan, Source and Management Zone (as applicable)	Entitlement (ML) 100%	Entitlement (ML) 125%	Allocation Used (ML) (Previous Water Year)
Mangoola Licences				
503	Hunter Regulated River (zone 1A)	159	198.75	0
645	Hunter Regulated River (zone 1A)	432	540	0
691	Hunter Regulated River (zone 1A)	50	62.5	0
735	Hunter Regulated River (zone 1A)	72	90	0
823	Hunter Regulated River (zone 1A)	310	387.5	0

Water Licence #	Water Sharing Plan, Source and Management Zone (as applicable)	Entitlement (ML) 100%	Entitlement (ML) 125%	Allocation Used (ML) (Previous Water Year)
824	Hunter Regulated River (zone 1A)	175	218.75	0
830	Hunter Regulated River (zone 1A)	306	382.5	0
897	Hunter Regulated River (zone 1A)	55	68.75	0
933	Hunter Regulated River (zone 1A)	43	53.75	10
1159	Hunter Regulated River (zone 1A)	159	198.75	0
6571	Hunter Regulated River (zone 1A)	111	138.75	0
6576	Hunter Regulated River (zone 1A)	600	750	0
9062	Hunter Regulated River (zone 1A)	18	22.5	0
9987	Hunter Regulated River (zone 1A)	82	102.5	0
11216	Hunter Regulated River (zone 1A)	86	107.5	0
13083	Hunter Regulated River (zone 1A)	100	125	0
Hunter River Licences Sub-Total		2,758	3447.5	10
Colinta Licences				
1001	Hunter Regulated River (zone 1A)	334	417.5	28
1057	Hunter Regulated River (zone 1A)	509	636.25	55
Colinta Licences Sub-Total		843	1035.75	83
Groundwater Inflows				
WAL41561	Excavation Groundwater	700	-	106
6308	Wybong Creek Water Source	96	-	0
6270	Wybong Creek Water Source	30	-	0
11085	Wybong Creek Water Source	128	-	0
Groundwater Licences Sub-Total		954	-	106
TOTAL		4,555	-	199

7.4.1 Changes to Licences

No changes to surface water licences occurred in 2022. The water take under the Harvestable Rights provision is in line with 2019 Harvestable Rights assessment by Engeny and the reducing clean water catchment area of Anvil Creek. This harvestable rights provision was reviewed as part of the MCCO EIS.

7.5 Hunter River Salinity Trading Scheme Discharges

Mangoola undertook numerous Hunter River Salinity Trading Scheme (HRSTS) discharges, in line with Water NSW determinations and EPL conditions, with a total of 3,749.5 ML discharged during the 2022 reporting period.

7.6 Surface Water Monitoring

7.6.1 Environmental Management

Surface water quality continued to be monitored onsite at Mangoola and in the surrounding waterways during the reporting period in accordance with the Surface Water Monitoring Plan. Surface water monitoring locations are shown on **Figure 7-1** and comprise of 16 sites (SW01 – 07 and SW09 – 17) which are sampled monthly for pH, Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS) and flow conditions by observation.

Water monitoring is also undertaken monthly as a requirement of EPL 12894. Monitoring is completed at surface water monitoring points SW16, SW03, SW04 and SW07 representing EPL monitoring point number 7, 8, 9 and 31, respectively.

There is no surface water monitoring criteria limit listed in EPL 12894. Surface water monitoring criteria is described in the approved Surface Water Monitoring Plan.

Note – the Surface Water Monitoring Plan and associated Surface Water and Groundwater Response Plan was updated for the MCCO Project and consolidated into a single Surface Water Management Plan which was approved by DPE in December 2022 in accordance with the MCCO Development Consent (SSD-8642). The new Surface Water Management Plan will be implemented and reported on in 2023.

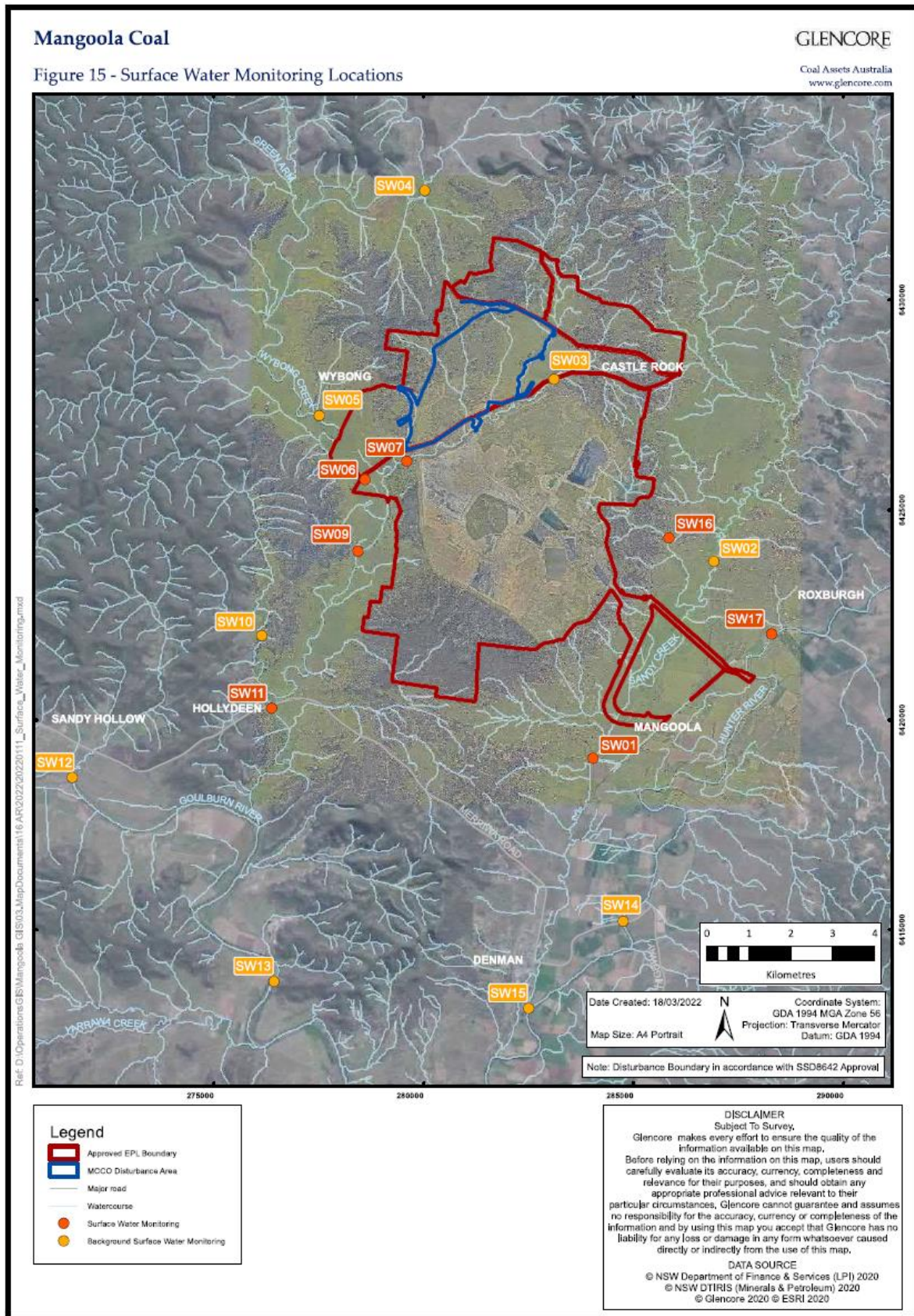


Figure 7-1 Surface Water Monitoring Locations

7.6.2 Environmental Monitoring Results

7.6.2.1 Results from the Reporting Period

The pH and EC monitoring results for the reporting period have been summarised in **Table 7-4**. In accordance with the Surface Water Management Plan (which was updated and approved during 2022) and the Surface Water and Groundwater Response Plan, exceedances of surface water monitoring criteria are not reported to DPE unless three consecutive elevated results are recorded and an incident is deemed to have occurred whereby the results are attributable to mining impacts. Detailed results of surface water quality monitoring collected during the reporting period are available on the Mangoola website.

Table 7-4 Surface Water Monitoring Results – pH and EC

Site	pH Results					EC Results (µS/cm)				No. of Samples and Flow Conditions
	Min	Ave	Max	Lower Criteria*	Upper Criteria*	Min	Ave	Max	Criteria*	
SW01	7.1	7.8	8.2	6.5	9.0 (8.9)	237	1,839	3,030	3,325 (3,757)	12 in Total Flow (12) No Flow (0)
SW02	7.6	8.1	8.4	6.5	8.2 (8.2)	421	1,921	3,260	5,569 (5,654)	12 in Total Flow (12) No Flow (0)
SW03	6.8	7.9	8.7	6.5	8.2 (8.8)	174	5,709	19,700	10,774 (31,805)	12 in Total Flow (5) No Flow (7)
SW04	8.0	8.4	8.7	6.5	8.7 (8.5)	210	794	1,020	1,939 (1,947)	12 in Total Flow (12) No Flow (0)
SW05	8.0	8.3	8.6	6.5	8.5 (8.6)	172	820	1,090	2,049 (2,049)	12 in Total Flow (12) No Flow (0)
SW06	8.0	8.3	8.6	6.5	8.5 (8.5)	202	823	1,110	2,540 (2,422)	12 in Total Flow (12) No Flow (0)
SW07	7.2	7.6	7.9	6.5	8.4 (8.9)	218	1,067	2,070	10,710 (12,780)	12 in Total Flow (12) No Flow (0)
SW09	7.9	8.3	8.6	6.5	8.4 (8.6)	194	837	1,130	3,130 (3,365)	12 in Total Flow (12) No Flow (0)
SW10	6.6	7.1	7.4	5.6 (6.2)	7.1 (7.2)	173	392	516	950 (1,004)	12 in Total Flow (12) No Flow (0)
SW11	7.9	8.3	8.6	6.5	8.4 (8.5)	181	851	1,140	2,400 (2,465)	12 in Total Flow (12) No Flow (0)
SW12	7.7	8.2	8.5	6.5	8.4 (8.6)	290	603	884	1,677 (1,980)	12 in Total Flow (12) No Flow (0)
SW13 [^]	7.9	8.2	8.5	6.5	8.4 (8.6)	263	636	916	1,425 (1,545)	11 in Total Flow (12) No Flow (0)
SW14	7.7	8.1	8.4	6.5	8.2 (8.5)	296	617	920	753 (835)	12 in Total Flow (12) No Flow (0)

Site	pH Results					EC Results ($\mu\text{S}/\text{cm}$)				No. of Samples and Flow Conditions
	Min	Ave	Max	Lower Criteria*	Upper Criteria*	Min	Ave	Max	Criteria*	
SW15	7.5	8.0	8.4	6.5	8.2 (8.3)	253	616	947	802 (878)	12 in Total Flow (12) No Flow (0)
SW16	6.8	7.2	7.6	6.2/6.5	7.8 (8.0)	189	244	370	683 (809)	12 in Total Flow (1) No Flow (11)
SW17	7.7	8.1	8.4	6.5	8.2 (8.3)	269	425	919	761 (796)	12 in Total Flow (12) No Flow (0)

* Criteria with two values denotes criteria for flow or (no flow) monitoring events (taken from January 2020 SWMP). Bold indicates this criterion was applicable at times in 2022.

^ SW13 was inaccessible during monitoring on 31 May due to unsafe access.

Note that shaded sites are monitored to establish background conditions upstream or separate of mining operations and used in the investigation of exceedance of impact assessment criteria at locations directly downstream of mining operations.

Surface water pH levels were slightly alkaline across the site, ranging from 6.6 to 8.8, with an average pH of 8.0 which is the similar to the average 2021 pH of 7.9.

pH results which fell outside the pH level criteria included:

- SW02 during June (8.31) and December (8.27);
- SW03 during September (8.29);
- SW04 during September (8.72);
- SW05 during September (8.62);
- SW06 during September (8.62);
- SW09 during April (8.41), May (8.41), June (8.52), September (8.63) and December (8.46);
- SW10 during June (7.28), August (7.24), September (7.35), October (7.31), November (7.12) and December (7.24);
- SW11 during June (8.49), September (8.63) and December (8.45);
- SW12 during June (8.5) and December (8.52);
- SW13 during December (8.52);
- SW14 during May (8.25), June (8.34) and August (8.22);
- SW15 during June (8.29) and August (8.22); and
- SW17 during June (8.30) and August (8.29).

EC results across the site ranged from 172 $\mu\text{S}/\text{cm}$ to 19,700 $\mu\text{S}/\text{cm}$, with an average of 1,154 $\mu\text{S}/\text{cm}$ which is marginally higher than the 2021 average of 1,076 $\mu\text{S}/\text{cm}$.

EC results which fell outside the EC level criteria included:

- SW14 during January (827 $\mu\text{S}/\text{cm}$), February (798 $\mu\text{S}/\text{cm}$), May (880 $\mu\text{S}/\text{cm}$), June (920 $\mu\text{S}/\text{cm}$) and December (762 $\mu\text{S}/\text{cm}$);
- SW15 during January (825 $\mu\text{S}/\text{cm}$), February (819 $\mu\text{S}/\text{cm}$), May (910 $\mu\text{S}/\text{cm}$) and June (947 $\mu\text{S}/\text{cm}$); and
- SW17 during January (816 $\mu\text{S}/\text{cm}$), May (875 $\mu\text{S}/\text{cm}$), June (919 $\mu\text{S}/\text{cm}$) and July (802 $\mu\text{S}/\text{cm}$).

There were no reportable incidents associated with pH or EC levels during 2022. It should be noted that whilst 3 consecutive month EC exceedances occurred at SW17 from May to July, it was not deemed an incident as SW17 is located on the Hunter River upstream of Mangoola's HRSTS discharge point.

The TDS and TSS monitoring results for the reporting period have been summarised in **Table 7-5**. Detailed results of surface water quality monitoring collected during the reporting period are available on the Mangoola website.

Table 7-5 Surface Water Monitoring Results – TDS and TSS

Site	Total Suspended Solids (mg/L)				Total Dissolved Solids (mg/L)				No. of Samples and Flow Conditions
	Min	Ave	Max	Criteria*	Min	Ave	Max	Criteria*	
SW01	<5	11	28	189.8 (246)	216	1,080	1,670	1,888 (2,128)	12 in Total Flow (12) No Flow (0)
SW02	<5	35	199	291 (89)	294	1,135	1,820	3,119 (3,248)	12 in Total Flow (12) No Flow (0)
SW03	<5	22	58	1,335 (367)	182	3,768	13,100	6,243 (20,410)	12 in Total Flow (6) No Flow (6)
SW04	<5	37	322	496.2 (50)	214	452	554	1,117 (1,147)	12 in Total Flow (12) No Flow (0)
SW05	<5	53	493	629 (50)	216	474	616	1,180 (1,299)	12 in Total Flow (12) No Flow (0)
SW06	<5	52	456	539 (50)	213	481	740	1,470 (1,453)	12 in Total Flow (12) No Flow (0)
SW07	<5	22	137	129 (75)	217	662	1,530	5,775 (7,494)	12 in Total Flow (12) No Flow (0)
SW09	<5	59	488	338 (50)	209	479	625	1,720 (1,917)	12 in Total Flow (12) No Flow (0)
SW10	<5	10	34	43.9 (77)	164	262	456	574 (758)	12 in Total Flow (12) No Flow (0)
SW11	<5	59	528	619 (50)	231	492	626	1,370 (1,463)	12 in Total Flow (12) No Flow (0)
SW12	12	113	477	482 (50)	248	354	467	971 (1,205)	12 in Total Flow (12) No Flow (0)
SW13 [^]	9	266	2,106	922 (50)	264	378	492	839 (924)	12 in Total Flow (11) No Flow (1)
SW14	<5	56	188	183 (50)	230	367	525	455 (514)	12 in Total Flow (12) No Flow (0)

Site	Total Suspended Solids (mg/L)				Total Dissolved Solids (mg/L)				No. of Samples and Flow Conditions
	Min	Ave	Max	Criteria*	Min	Ave	Max	Criteria*	
SW15	8	48	130	139 (50)	208	373	539	454 (527)	12 in Total Flow (12) No Flow (0)
SW16	15	42	100	438 (449)	173	299	466	882 (976)	12 in Total Flow (1) No Flow (11)
SW17	10	66	46	123 (50)	236	386	528	488 (518)	12 in Total Flow (11) No Flow (1)

* Criteria with two values denotes criteria for flow or (no flow) monitoring events (taken from January 2020 SWMP). Bold indicates this criterion was applicable at times in 2022.

^ SW13 was inaccessible during monitoring on 31 May due to unsafe access.

Note that shaded sites are monitored to establish background conditions upstream or separate of mining operations and used in the investigation of exceedance of impact assessment criteria at locations directly downstream of mining operations.

TSS levels during the reporting period ranged from <5 mg/L to 2160 mg/L, with an average of 58 mg/L which was higher than the 2021 average of 41 mg/L.

TSS results which fell outside the TSS level criteria included:

- SW07 during July (137 mg/L);
- SW09 during March (4,88 mg/L);
- SW13 during March (2160 mg/L);
- SW14 during July (188 mg/L); and
- SW17 during March (2,05 mg/L) and July (246 mg/L).

TDS levels during the reporting period ranged from 164 mg/L to 13,100 mg/L, with an average of 717 mg/L which is higher than the 2021 average of 675 mg/L.

TDS results which fell outside the TDS level criteria included:

- SW14 during January (524 mg/L), February (488 mg/L), May (498 mg/L) and June (526 mg/L);
- SW15 during January (539 mg/L), February (506 mg/L), May (493 mg/L) and June (532 mg/L); and
- SW17 during January (528 mg/L), February (490 mg/L), May (504 mg/L) and June (512 mg/L).

There were no reportable incidents associated with TSS or TDS levels during 2022.

Assessment of Surface Water Quality

In accordance with the Surface Water Monitoring Plan, speciation monitoring is undertaken annually at Mangoola surface water monitoring locations in June. There is no speciation monitoring criteria in the Surface Water Monitoring Plan. A summary of the surface water results for 2022 are presented in **Table 7-6**.

Table 7-6 Annual Surface Water Speciation Results

Parameter	SW01	SW02	SW03	SW04	SW05	SW06	SW07	SW09	SW10	SW11	SW12	SW13 *	SW14	SW15	SW16	SW17
Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
pH	8.02	8.31	8.07	8.50	8.50	8.42	7.85	8.52	7.28	8.49	8.50	-	8.34	8.29	7.41	8.30
EC (µS/cm)	3030	3260	15200	1020	1090	1110	2070	1130	488	1140	788	-	920	947	232	919
TSS (mg/L)	10	7	<5	<5	<5	19	5	<5	<5	10	12	-	19	13	63	12
TDS (mg/L)	1670	1820	9960	538	616	740	1530	625	456	608	404	-	526	532	392	512
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	<0.01	<0.01	<0.01
Nitrate (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.71	1.2	1.04	0.08	-	0.99	1.51	0.13	1
TKN (mg/L)	0.4	0.2	0.9	0.2	0.1	0.1	0.4	0.2	0.5	0.4	0.1	-	0.2	0.4	3.2	0.3
Total Nitrogen as N (mg/L)	0.4	0.2	0.9	0.2	0.1	0.1	0.4	0.9	1.7	1.4	0.2	-	1.2	1.9	3.3	1.3
Total Phosphorus as P (mg/L)	0.18	0.1	<0.02	0.19	0.2	0.22	<0.01	0.21	0.01	0.24	0.08	-	0.07	0.07	0.47	0.07
Sulphate (mg/L)	82	100	590	15	15	16	64	17	14	18	27	-	50	52	24	51
Calcium (mg/L)	70	79	176	51	56	56	40	58	6	56	36	-	62	65	5	61
Magnesium (mg/L)	88	97	376	57	60	60	60	62	10	60	40	-	40	42	3	39
Sodium (mg/L)	430	465	2170	78	86	87	277	92	63	92	56	-	63	67	32	60
Potassium (mg/L)	8	4	24	2	2	2	7	2	6	3	3	-	2	2	6	1
Iron (mg/L)	0.2	0.76	0.5	0.2	0.13	0.52	0.77	0.27	2.41	0.86	0.53	-	0.49	0.44	16.7	0.38

Parameter	SW01	SW02	SW03	SW04	SW05	SW06	SW07	SW09	SW10	SW11	SW12	SW13 *	SW14	SW15	SW16	SW17
Arsenic (mg/L)	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	0.011	<0.001
Boron (mg/L)	0.06	0.07	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05
Barium (mg/L)	0.146	0.149	0.379	0.01	0.01	0.011	0.08	0.012	0.051	0.016	0.026	-	0.02	0.021	0.161	0.019
Cadmium (mg/L)	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	-	<0.000 1	<0.000 1	<0.000 1	<0.000 1
Copper (mg/L)	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	-	<0.000 1	<0.000 1	0.005	<0.000 1
Manganese (mg/L)	0.024	0.22	0.285	0.017	0.014	0.041	0.123	0.029	0.574	0.127	0.035	-	0.031	0.031	0.206	0.025
Chloride (mg/L)	757	810	4920	132	155	163	601	179	105	185	94	-	105	114	35	99
Selenium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001
Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	0.014	<0.001
Silver (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001
Zinc (mg/L)	<0.005	0.01	<0.005	0.037	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	0.02	<0.005
Mercury (mg/L)	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	<0.000 1	-	<0.000 1	<0.000 1	<0.000 1	<0.000 1
Fluoride (mg/L)	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	<0.1	0.2	0.1	-	0.2	0.2	0.2	0.2
Bicarbonate (mg/L)	363	406	575	251	327	332	135	290	49	286	198	-	252	262	40	256

* SW13 was inaccessible during speciation monitoring on 31 May due to unsafe access.

Stream Health Monitoring

Biosis (2022) undertook stream health monitoring surveys during autumn and spring in 2022. The stream health monitoring program encompasses seven potential impact sites (monitoring sites) across three major waterways that traverse the Mangoola Open Cut site – Big Flat Creek, Wybong Creek and Sandy Creek. The program also includes five control sites with catchments similar to the monitoring sites to differentiate potential mining impacts from environmentally driven variations due to natural processes.

The control sites are located across two waterways – Cuan Creek and Wybong Creek (upstream of the mine site). The monitoring program assesses macroinvertebrate community structures, water quality and overall catchment-riparian health using NSW AUSRIVAS and Signal2 sampling and analyses, HABSCORE assessments, and physicochemical surface water quality testing.

HABSCORE assessments during 2022 surveys indicated improved stream health conditions when compared with 2021 and 2020, with the results clustering within the marginal and sub-optimal categories. This is likely to be a result of the sustained increase in water availability across the region since 2020. The AUSRIVAS and SIGNAL 2 analyses showed that, while sites have been in poor condition since the commencement of baseline monitoring, the macroinvertebrate assemblages improved over previous years. Year to year fluctuations in these metrics are observed across both monitoring and control sites and therefore likely associated with changes in water availability and environmental conditions, most obviously during the most intense period of the recent drought in 2019.

Stream health criteria have been established for major waterways identified as being potentially subject to impacts associated with mining activities. The assessment of the 2022 monitoring results against these criteria did not trigger the need for any further investigation with the results below the relevant trigger values. Although BFC-US1 recorded scores within Quadrant 4 in autumn, indicating poor stream health and macroinvertebrate community, the site recorded a significant improvement during the spring survey bouncing back into Quadrant 2. Overall, the monitoring and control sites have improved slightly over previous years but are generally still in the same poor condition observed at the commencement of the stream health monitoring project in 2009. As such it is concluded that no impacts to stream health associated with mine operation have occurred in 2022.

7.6.2.2 Comparison with Predictions

The MP 06_0014 MOD 6 Environmental Assessment included a Surface Water Assessment (WRM, 2013) which predicted water usage for the project in years 2, 5, and 10, for a high water demand scenario, and a low water demand scenario.

The high water demand scenario was based on 13.5 Mtpa of ROM coal washed through the CHPP, and the low water demand scenario was based on 8.0 Mtpa of ROM coal washed through the CHPP and 5.5 Mtpa of ROM coal processed as bypass coal (i.e. unwashed).

As MOD 6 was approved in 2014, 2022 constitutes “Year 5” of the modified operations, therefore, the water usage data is compared against the Year 5 high water demand scenario predictions from the MOD 6 Environmental Assessment, as shown in **Table 7-7**.

The predictions against the MCCO project EIS will be shown in the 2023 Annual Review once coal extraction has commenced from Wybong Pit to the north of Wybong Road.

Table 7-7 Comparison of 2022 Water Usage with the 2013 MOD 6 Environmental Assessment

Aspect of Water Management System	2022 Data (ML)	EA Prediction (Year 5) High water demand
CHPP water use	3,246 ML	3,970 ML/annum
Haul Road Dust Suppression	446 ML	480 ML/annum
Pipeline Water (Hunter River)	10 ML	889 ML/annum
Hunter River Salinity Trading Scheme Offsite (HRSTS) Release	3,750 ML	16 ML/annum

As shown **Table 7-7**, all water consumption parameters are within the predictions made in the 2013 Surface Water Assessment. Lawful offsite discharges through the HRSTS exceeded that predicted by the 2013 assessment owing to the high rainfall experienced during the 2022 reporting period, which followed similar conditions in 2020 and 2021, and further upgrades to the sites HRSTS infrastructure since 2013.

7.6.2.3 Long Term Trend Analysis

In accordance with SSD-8642, a long-term trend analysis of surface water monitoring results at Mangoola has been undertaken using data from 2010 to 2022 to identify any trends in the monitoring data over the life of the project. Long term monitoring results for pH, EC, TDS and TSS are presented in **Appendix E**.

The results indicate:

- The pH of surface water monitoring locations has generally remained relatively stable since mining operations commenced in 2010.
- EC has generally remained stable from 2010-22 with the exception of monitoring locations SW01, SW02, SW03, and SW07, which have been periodically elevated. SW02 and SW03 are located upstream of the Mangoola Mining Lease boundary, and therefore the elevated salinity cannot be attributed to operations at Mangoola.
- Similarly, SW07, and SW01, while located within the Mangoola Mining Lease boundary, are downstream of SW03 and SW02 respectively. Monitoring locations SW01, SW02, SW03, and SW07 were dry for most of 2017-19 due to drought conditions. An increase in rain during 2020 to 2022 allowed most sites to be sampled during this period.
- TSS and TDS have also generally remained stable from 2010-22, with a few elevated readings, however no discernible trends have been observed. At the sites with sufficient water for consistent sampling, results have shown an increase in TDS which occurred between 2017 to 2019 due to the drought's impact on flow conditions. This trend declined due to increased rainfall in 2020 to 2021 and has maintained stable through 2022.

7.6.3 Key Performance and/or Management Issues

On 7 March and 4 July, water discharge events occurred where sediment laden water was discharged from the MCCO Project construction area into tributaries of Big Flat creek. On both occasions the PIRMP was enacted in accordance with Section 147 of the POEO Act. A single community complaint was received on 8 March 2022 following the discharge event on 7 March. The complainant observed sediment laden water leaving the MCCO Project Area across Wybong Road. Discharge results show that there was no environmental harm caused based on the chemistry of the water discharged when compared to the receiving environment. This incident was reported to EPA and DPE in accordance with applicable statutory requirements.

In addition, Mangoola failed to collect surface water samples in accordance with the sites approved Surface Water Monitoring Plan. June surface water sampling occurred on 31 May 2022, due to a scheduling error by the sites environmental monitoring contractors. Mangoola identified a non-compliance with Condition 50, Part B of SSD-8642 and reported to DPE. As part of the same sampling event, the access to SW13 was unsafe and therefore no sample was collected.

Mangoola exceeded the daily volume discharge limit under the Hunter River Salinity Trading Scheme. As per EPL 12894, Mangoola Coal is permitted to discharge from Pit Water Dam (EPL Point 41) to the Hunter River (EPL Point 12) via a network of pump stations and pipeline. On Sunday 13 March 2022, a River Register was issued by Water NSW. As per the Mangoola HRSTS Discharge Procedure, notification was made via email that a daily limit of 10.07 ML could be pumped for the block. The block commenced on 14 March 2022 at 8:00:00 AM (AEST). On the morning of 15 March 2022 prior to the block ending at 8:00 am (AEST), discharging ceased when the maximum daily volume limit was exceeded. 10.9 ML was discharged during the permitted window and pumping was immediately ceased when the exceedance was identified. The exceedance was reported to the EPA in the Annual Return as required by EPL 12894.

7.6.4 Proposed Improvements

The Water Management Plan was updated and approved by DPE in December 2022 to meet the requirements of Condition B50 of SSD-8642. Performance against this Water Management Plan will be reported in the 2023 Annual Review.

7.7 Groundwater Management

7.7.1 Environmental Management

Mangoola monitors groundwater quality and levels within and surrounding the site in accordance with the Groundwater Monitoring Plan (GWMP). *Note: The GWMP (dated 2014) was in place for 2021 and forms the basis of this Annual Review.*

Note – the GWMP and associated Groundwater Response Plan was updated for the MCCO Project and consolidated into a single Groundwater Monitoring Plan which was approved by DPE in December 2022 in accordance with the MCCO Development Consent (SSD-8642). The new GWMP will be implemented and reported on in 2023.

Active groundwater monitoring locations are shown on **Figure 7-2** and comprise:

- Six continuous data loggers (VW) to continuously monitor groundwater levels at regular intervals and vibrating wire piezometers;
- 35 standpipe groundwater monitoring bores (GW) sampled bi-monthly for groundwater level, pH and EC;

- Due to the progression of mining and one instance where the landowner has not granted permission to monitor, there are currently 25 groundwater monitoring locations sampled bi-monthly in line with the GWMP defined parameters;
- 15 Monitoring Program (MP) bores sampled quarterly for groundwater level, pH and EC; and
- Five Big Flat Creek (BFC) bores sampled quarterly for groundwater level, pH and EC.

Mangoola also undertakes an annual comprehensive analysis of eight representative boreholes, being GW02 (coal measures), GW04 (coal measures), GW07 (alluvial), GW14 (Fassifern), GW18 (Fassifern), GW33 (deep alluvium), GW34 (Fassifern) and GW46 (alluvial).

Due to the progression of mining, there are currently four groundwater monitoring locations sampled annually (GW02, GW04, GW07-S and GW14).

Groundwater monitoring points GW04 and GW26 represent the EPL monitoring points 10 and 11.

The MCCO EIS included commitments to install additional monitoring sites to assess the impact of the Project on the groundwater regime and receptors. Mangoola has recently finalised the locations of the groundwater monitoring sites in line with approval requirements. Once completed, the GWMP will be updated to include an updated groundwater model validation and review. This will occur during 2023.

Mangoola completed baseline monitoring for bores GW01-D, MN 1006, REG001 and GW07-D on a monthly basis during the reporting period as required 12 months prior to the commencement of mining.

Condition B39 of SSD-8642 requires that prior to commencing construction of the MCCO Project, the owners of the private water supply bores listed in **Table 7-8** may request Mangoola monitor the groundwater level within their bore to determine if there are any impacts from mining activities over time. If monitoring records indicate drawdown of more than 2 m as a result of mining, Mangoola must provide compensatory water in accordance with SSD-8642 conditions B41 to B45.

On 17 May 2021 Mangoola offered monitoring to owners of the bores listed in **Table 7-8** in accordance with the requirements of SSD-8642. Two additional bore-specific monitoring plans were developed and submitted in 2022.

Table 7-8 Private Bore Monitoring

Bore ID*	Receiver ID*	Predicted Groundwater Drawdown (m) [#]	Bore inspected and monitoring plan developed **
Bore 1	R261	0.182	TBC
Bore 2	R157	1.296	Yes, Nov 2021
Bore 3	R130	0.008	Yes, Aug 2021
GW080507	R144	0	Yes, May 2022
GW201589	R144	0.3	Yes, May 2022
GW078502	R83	~7.5	TBC

Notes: * The receiver IDs and bore locations are presented in SSD-8642 Appendix 3.

[#] As outlined in the MCCO Project EIS (Umwelt 2019a) and as updated in the MCCO Project RTS (Umwelt 2019b).

** As per SSD-8642.

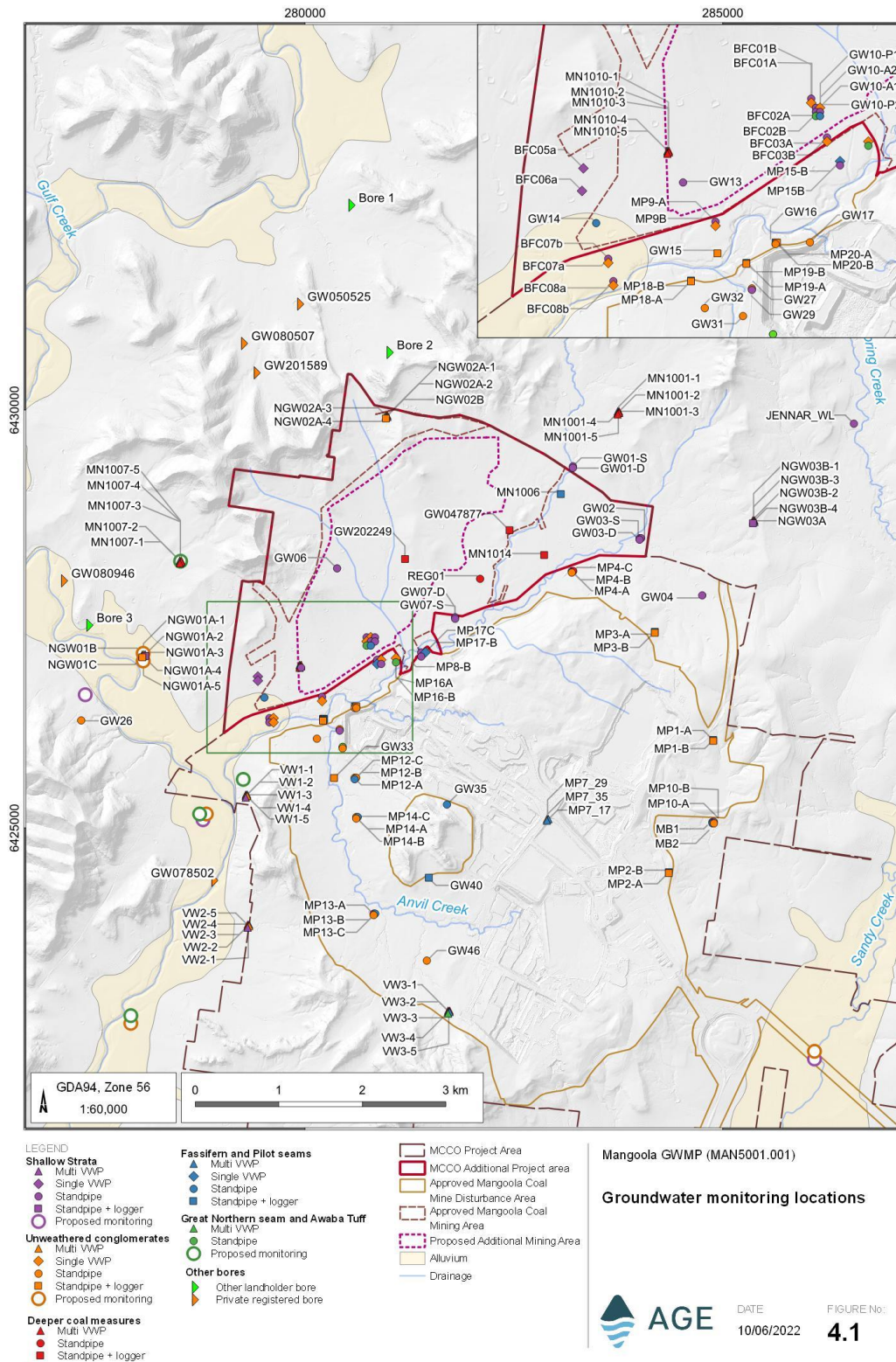


Figure 7-2 Groundwater Monitoring Locations

7.7.2 Environmental Monitoring Results

7.7.2.1 Results from the Reporting Period

The results of the bi-monthly and quarterly groundwater monitoring undertaken during the reporting period are available on the Mangoola website. A summary of the groundwater results for 2022 are presented in **Table 7-9**. Where these results exceed criteria they have been bolded.

In accordance with the Mangoola Groundwater Monitoring Plan when three consecutive monitoring results are outside the adopted impact assessment criteria an investigation will be completed. Consecutive elevated results during 2022 included:

- GW01-D and GW15 exceeded the EC criteria during the January, March, May, July, and September monitoring in 2022;
- GW10-P2 exceeded the EC criteria during March, May, July, September, and November 2022 monitoring rounds;
- GW14 exceeded the EC criteria during the January, March, May, July, and November 2022 monitoring rounds;
- GW01-S exceeded the EC criteria during the January, March, May, July, September, and November 2022 monitoring rounds; and
- GW02 exceeded the EC criteria during the January, July, September and November 2022 monitoring rounds. *Note: due to excessive wet weather and inaccessibility, a sample from this location was not obtained during March and May 2022 however this location was included as part of the investigation process due to previous month's monitoring results being above impact assessment criteria.*

These elevated results for January, March, May, July, September and November were investigated by an independent consultant who determined that the results for bores GW01-D, GW01-S and GW02 were due to background climatic conditions despite the above average rainfall conditions experienced in 2021 and 2022 and were not attributable to Mangoola. Each of these bores are located outside the area impacted by the mine.

Elevated EC concentrations at monitoring bores where mining activities have led to depressurisation (GW10-P2, GW14, GW15 and perhaps GW26) are likely associated with altered flow paths and groundwater mixing. Notably, EC levels began to stabilise and decrease in the second half of 2022 due to above average rainfall and increased groundwater recharge. This indicates that these bores, although affected by Mangoola, are also strongly impacted by climate, just with a more delayed response. (AGE, 2023¹). The elevated results are anticipated to persist while groundwater slowly responds to increased rainfall patterns. Groundwater level and parameter concentration will change, as they already have begun to, from an increase in direct recharge from rainfall conditions. As a result, the outcomes of the investigation found an environmental incident had not occurred and, in accordance with the GWMP, the exceedances were not externally reportable to DPE

Table 7-9 Groundwater Monitoring Results – pH, EC and Groundwater Level

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results (µS/cm)			
	Min	Ave	Max	Min	Ave	Max	Criteria	Min	Ave	Max	Criteria
BFC01A*	10.06	10.85	11.50	6.82	6.94	7.09	6.5-8.5	1,580	9,297.5	13,100	125-2,200
BFC02A*	10.23	11.05	11.69	6.73	6.83	6.92	6.5-8.5	12,040	12,775	13,800	125-2,200
BFC03A*	6.88	8.12	9.85	6.69	7.07	7.31	6.5-8.5	1,453	4,203	11,800	125-2,200
BFC07A*	Dry	Dry	Dry	Dry	Dry	Dry	6.5-8.5	Dry	Dry	Dry	125-2,200
BFC08A*	11.56	(1 result)	11.56	Dry/ Damp	Dry/ Damp	Dry/ Damp	6.5-8.5	Dry/ Damp	Dry/ Damp	Dry/ Damp	125-2,200
GW01-D*	1.40	1.44	1.53	6.77	7.21	7.86	6.5-8.5	1,770	8050	15,500	125-2,200
GW01-S*	1.30	1.36	1.47	6.79	7.04	7.37	6.5-8.5	11,400	13,908	15,800	125-2,200
GW02 ⁺	2.70	3.20	3.64	7.21	7.78	8.61	6.5-9.3	19,700	20,918	21,390	16,039
GW03-D ⁺	3.69	4.22	4.67	6.60	(1 Result)	6.60	6.5-7.5	24,200	(1 Result)	24,200	29,535
GW03-S ⁺	-	-	-	-	-	-	6.5-7.5	-	-	-	29,535
GW04 [^]	11.62	11.84	12.02	7.14	7.22	7.29	6.5-7.3	6,440	7,327	7,760	8,174
GW07-D	1.61	2.45	3.46	7.35	7.58	7.74	6.5-8.5	611	1,412	2,960	18,547
GW07-S	1.48	2.63	3.98	7.61	7.71	7.82	6.5-8.3	1,042	1,113	1,251	20,301
GW10-A2	9.57	10.51	11.27	6.40	6.58	6.74	6.5-7.9	290	345	467	12,864

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results ($\mu\text{S}/\text{cm}$)			
	Min	Ave	Max	Min	Ave	Max	Criteria	Min	Ave	Max	Criteria
GW10-P1	13.02	13.60	14.15	6.91	7.01	7.14	6.5-7.9	7,600	9,536	11,550	15,590
GW10-P2	13.63	14.45	15.26	7.08	7.13	7.18	6.5-8.1	9,420	9,996	10,400	8,034
GW13**	0.64	1.21	2.16	6.82	7.35	7.53	6.5-8.5	112	188	288	125-2,200
GW14	34.32	35.01	35.50	6.79	7.01	7.25	6.5-8.0	4,800	5,505	6,330	5,096
GW15	20.37	20.50	20.58	6.80	6.96	7.10	6.5-7.3	10,600	13,150	14,370	11,483
GW16+	22.14	-	22.14	-	-	-	6.5-7.1	-	-	-	21,584
GW17	3.82	(1 result, broken standpipe)	3.82	6.58	(1 result, broken standpipe)	6.58	6.5-7.4	1,004	(1 result, broken standpipe)	1,004	17,997
GW26*^	17.47	18.11	20.66	7.00	7.10	7.17	6.5-8.5	1,603	1,736	1,958	125-2,200
MP10-A*	15.76	16.10	16.32	7.59	7.69	7.78	6.5-8.5	6,050	6,327	6,460	125-2,200
MP10-B*	8.80	8.90	8.99	10.88	11.15	11.36	6.5-8.5	14,600	14,958	15,500	125-2,200
MP15-B*	12.15	12.40	12.64	7.23	(1 result, mud)	7.23	6.5-8.5	16040	(1 result, mud)	16,040	125-2,200
MP16-B*	9.70	10.97 (2 results, too low to sample)	12.20	7.10	7.11	7.11	6.5-8.5	6,270	9230 (2 results, too low to sample)	12,190	125-2,200
MP17-B*	2.71	3.31	4.88	6.39	6.95	7.41	6.5-8.5	706	920	1,020	125-2,200

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results ($\mu\text{S}/\text{cm}$)			
	Min	Ave	Max	Min	Ave	Max	Criteria	Min	Ave	Max	Criteria
MP1-A*	9.92	10.94	11.51	7.99	8.11	8.17	6.5-8.5	4,700	5,390	5,870	125-2,200
MP1-B*	9.83	10.25	10.88	8.31	8.40	8.50	6.5-8.5	5,630	6,090	6,270	125-2,200
MP2-A*	24.50	34.54	38.08	7.61	7.70	7.78	6.5-8.5	12,100	12,973	13,500	125-2,200
MP2-B*	22.40	22.47	22.53	6.81	6.92	7.01	6.5-8.5	18,300	19,068	19,700	125-2,200
MP3-A*	26.28	27.78	28.40	7.74	7.80	7.92	6.5-8.5	7,200	7,550	7,790	125-2,200
MP3-B*	25.56	25.88	26.64	7.16	7.26	7.42	6.5-8.5	9,820	10,305	10,800	125-2,200
MP4-A*	1.17	1.29	1.42	7.43	7.64	7.81	6.5-8.5	8500	8893	9340	125-2,200
MP4-B*	2.17	2.38	2.57	7.88	7.94	8.01	6.5-8.5	6010	6,383	6,630	125-2,200
MP4-C*	3.46	3.60	3.75	6.67	6.76	6.84	6.5-8.5	22,790	23,298	25,500	125-2,200
MP9-A*	12.55	13.41	14.05	7.07	7.12	7.16	6.5-8.5	620	683	746	125-2,200

Notes: * Locations where insufficient groundwater monitoring data exists for site specific triggers as outlined in the Groundwater Monitoring Plan (GWMP). These are currently being updated in a revision to the GWMP. A subset of these bores where the maximum, minimum and average values are the same only have one data point or two data points with the same value.

^ EPL monitoring points, assessed against ANZECC criteria (if no impact criteria assigned under the GWMP) and investigated as per EPL12984.

+ GW02, GW03 and GW16 were inaccessible due to excessive wet weather during March and May monitoring events. GW03 and GW16 were dry on all other occasions.

Annual Speciation Assessment

There are eight groundwater bores to be sampled for additional analytes on an annual basis: GW02, GW04, GW07-S, GW14, GW33, GW34, and GW46. Four of these bores were not sampled in the 2022 monitoring round as they have been impacted by the progression of mining (mined through). These are GW18, GW33, GW34, and GW46. Bore GW07-S was historically dry however a sample was obtained from this location in 2022 with no parameters exceeding the interim trigger values. A summary of exceedances from the sampled monitoring bores is provided below in **Table 7-10**. It is noted that exceedances of TDS, sodium, and chloride are common to all three bores, and GW02 and GW14 have exceedances of manganese and GW02 has an exceedance of iron. The groundwater results for 2022 are presented in **Table 7-10**.

Table 7-10 Annual Groundwater Speciation Results 2022 (AGE, 2022*)

Parameter	Units	GW02	GW04	GW07-S	GW14	Criteria [#]
TDS	mg/L	16,600	4,230	698	3,530	1,000
Hydroxide	mg/L	<1	<1	<1	<1	N/A
Carbonate	mg/L	<1	<1	<1	<1	N/A
Bicarbonate	mg/L	53	1,500	424	714	N/A
Sulfate	mg/L	<1.00	59	<10.00	3	400
Chloride	mg/L	8,790	1,720	55	1,580	400
Dissolved Calcium	mg/L	230	44	8	94	N/A
Dissolved Magnesium	mg/L	441	15	23	144	N/A
Dissolved Sodium	mg/L	3,820	1,640	187	892	300
Dissolved Potassium	mg/L	51	11	5	24	N/A
Total Phosphorus	mg/L	<0.05	1.63	0.09	1.52	N/A
Dissolved Aluminium	mg/L	<0.01	<0.01	0.01	<0.01	0.2
Dissolved Arsenic	mg/L	<0.001	<0.001	0.002	<0.001	0.005
Dissolved Barium	mg/L	0.109	0.677	0.011	0.438	1
Dissolved Boron	mg/L	<0.05	0.35	0.23	0.11	1
Dissolved Iron	mg/L	25.4	<0.05	<0.05	<0.05	0.3
Dissolved Lithium	mg/L	0.048	0.079	0.002	0.06	N/A
Dissolved Manganese	mg/L	4.3	0.076	0.008	0.343	0.1
Dissolved Rubidium	mg/L	0.044	0.026	0.001	0.041	N/A
Dissolved Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	0.01
Dissolved Silicon	mg/L	<0.05	8.08	11.4	9.89	N/A
Dissolved Strontium	mg/L	17.8	2.89	0.207	2.67	N/A
Dissolved Zinc	mg/L	0.012	<0.005	0.008	<0.005	5

* AGE, 2022. Letter Report: Mangoola Coal Mine Review of Annual Monitoring Bore Exceedance 2022. 21 November 2022

Based on ANZECC (2000) guidelines.

The exceedances were investigated by AGE (2022) who determined that the water quality exceedances are primarily occurring due to inappropriate interim trigger values which are not representative of natural baseline conditions at Mangoola. Where results have been temporarily stable since the start of monitoring, AGE states that it is therefore unlikely that the exceedances will result in environmental harm.

7.7.2.2 Comparison with Predictions

Groundwater modelling for the original Environmental Assessment was undertaken by Mackie Environmental Research (MER) in 2006 (Mackie, 2006). Since then, the progressive three yearly updates to the numerical groundwater model updates were completed by MER in 2010 (Mackie, 2010), 2013 (Mackie, 2013) and AGE in 2016 (AGE, 2016). The numerical groundwater model was further updated and recalibrated in 2018/2019 (AGE, 2019) as part of the EIS for the MCCO Project. The latest three yearly update to the groundwater model was completed by AGE in 2019 (AGE, 2019). The predictions from this model were calibrated with 2018/2019 water level monitoring data to validate the model calibration. The observed monitoring bore water level data was compared to the modelled water level data from the 2019 model predictions. Despite slight divergences between the observed and modelled datasets, the majority of the hydrographs showed similar trends in the 2022 reporting period.

The observed groundwater level trends can be generally categorised into stable or declining groundwater levels. The greatest groundwater level drawdown was measured on the western boundary of the mine, which is consistent with the model simulations and with the mining activities progressing below the groundwater table in this area. The effects of drawdown are most prominent in greater depths, decreasing with distance, both vertically and laterally, from the mining area. Groundwater levels in shallow bores screened within the alluvium of Wybong Creek began declining in 2016, suggesting climate rather than mining influences on groundwater levels in this area.

Engeny (2022 and 2023) completed quarterly reviews of groundwater take associated with groundwater ingress into Main Pit using a spoil seepage model and pit water balance to track compliance with the licence conditions to take under WAL41561 (Converted in 2021 – previously 20BL172598). Engeny concluded that the groundwater inflow volumes estimated by AGE were typically in accordance with the groundwater inflows from quarterly reviews (24.8 ML per quarter). Subsequently, Engeny adopted a groundwater inflow estimate of 99 ML/year for the 2022 period, based on the AGE numerical groundwater model in the water balance report.

7.7.2.3 Long Term Trend Analysis

In accordance with MP 06_0014 and SSD8642 a long-term trend analysis of groundwater monitoring results at Mangoola has been undertaken using data since monitoring commenced to identify any trends in water quality over the life of the project.

Long term groundwater water level, pH and EC results are presented in **Appendix E**. A summary of long-term trends identified for each monitoring dataset is provided below:

- Groundwater levels from monitoring bores generally show fluctuations reflecting climatic conditions and rainfall particularly in the shallow strata. Groundwater levels in deeper Permian strata fluctuate less with rainfall and have recorded declining levels since 2014 when mining of the coal seams progressed below the water table. This has resulted in groundwater

levels declining in the order of 30 m at some sites. The following provide an overview of the general trends observed:

- Where mining resulted in groundwater change: BFC01A, BFC02A, BFC03A, BFC07A, BFC08A, GW14, GW14, GW16, GW26, MP13, MP15B, MP16B, MP18A and MP9A. Some of these sites also depict climate fluctuations with noticeable recovery since 2021 when above average rainfall occurred.
- The majority and remaining standpipe monitoring bores depict water level trends similar to the cumulative rainfall departure (CRD) trend and have a close relationship to climate conditions. Evidently most of these indicate water level recoveries since 2021 when above average rainfall occurred.
- The following salinity (EC) trends were observed:
 - The majority of the GW monitoring bores have relatively stable long term EC with the exception of GW02, GW10-P2, GW14 and GW15. Although these bores indicate a step increase since 2014, they show a decreasing or stable trend over the 2022 period.
 - Several of the BFC and MP bores located northwest of the mine along Big Flat Creek show fluctuations and increasing trends in EC for several years (BFC02A, MP2-A, MP2-B, MP3-A, MP4-C and MP9A) with considerable decreasing trends since the above average rainfall occurrence in 2021.
 - Historic increases in EC usually coincide with below average rainfall over successive years which have led to proportionally more saline water being drawn in from geological formations with inherent higher saline conditions than formations with fresher conditions (AGE, 2022). Consequently, groundwater in bores affected by the mobilisation of more saline groundwater have shown increasing EC levels since 2014. In most cases the increasing trends changed to decreasing trends since the above average rainfall occurred in 2021.
- The pH of groundwater has generally recorded only limited fluctuations with most monitoring sites having no discernible trends. Generally, pH records depicted neutral conditions with no acidic conditions recorded from any boreholes.

7.7.3 Key Performance and/or Management Issues

The Mangoola GWMP establishes groundwater impact criteria and conditions (groundwater level and quality triggers) for site monitoring bores. Water level responses in the monitoring bores are in line with either predicted drawdowns or changes expected due to the below average rainfall-recharge between early 2017 and early 2020. There are no sites where changing water levels are unexpected or deviate significantly from model predictions and require further investigation in accordance with the approved GWMP (2014).

Bi-monthly exceedances were reported by Mangoola for EC at six monitoring bores (GW01-D, GW01-S, GW02, GW10-P2, GW14 and GW15) following 2022 sampling rounds. The annual groundwater chemistry speciation review (AGE, 2022) also identified exceedances in TDS, sodium and chloride, as well as iron in GW02, and manganese in GW02 and GW14.

Where the criteria were exceeded for three consecutive monitoring events, the response protocol was enacted. Following an exceedance, initial steps of the protocol require review of the results and an investigation to determine if an incident has occurred that could cause environmental harm. AGE

was engaged to investigate the exceedances and report on findings. The AGE trigger level exceedance review reports concluded that the EC exceedances posed low potential for material environmental harm, and therefore no incidents were considered to have occurred.

7.7.4 Proposed Improvements

As noted above the three-yearly review of the numerical groundwater model (AGE 2019b) for Mangoola was completed during 2019. The updated model has been calibrated with available groundwater monitoring data. The revised findings on the magnitude and timing of groundwater impacts have been subsequently incorporated into the GWMP in October 2019. The next validation and review of the groundwater model will occur during 2023.

As indicated earlier additional monitoring bores have been proposed as part of the MCCO approved EIS of which, five new bores screened in unweathered conglomerates, four new bores screened in Great Northern Seam and Awaba Tuff, and three bores screened in shallow strata associated with Wybong Creek and Sandy Creek alluvium. The installation of the bores will be completed in H1, 2023 and monitoring results incorporated in the next validation and review of the groundwater model.

In addition, as part of the approved EIS, Mangoola have completed additional baseline monitoring from existing bores along Big Flat Creek in the area adjacent to the eastern flank of the out-of-pit emplacement area for a period of 12 months prior to the commencement of mining.

8. Rehabilitation

Mangoola aims to develop rehabilitation of mined land that returns the site to a condition where the landforms, soils, hydrology, flora and fauna are self-sustaining and compatible with the surrounding land uses. Rehabilitation of the overburden emplacement areas is conducted progressively over the life of mine, as an integral component of mining operations.

8.1 Rehabilitation of Disturbed Land

Rehabilitation at Mangoola was undertaken in accordance with the Rehabilitation Management Plan (RMP), May 2022. A copy of the current RMP is available on the Mangoola website. A total of 873 ha of rehabilitation has been undertaken to date. All rehabilitation areas are classified as being in the Ecosystem and Land Use Establishment Phase. A summary of rehabilitation during 2021 and 2022, and the projected rehabilitation for 2023, is provided in **Table 8-1**.

Table 8-1 Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual) (Ha)	This Reporting Period (Actual) (Ha)	Next Reporting Period (Forecast) (Ha)
A. Total mine footprint¹	2,248	2916	2916
B. Total active disturbance²	1,431	1429	1502
Infrastructure Areas	677	714	837
Active Mining Areas	271	231	269
Waste Emplacements	330	270	182
Tailings Dams	117	117	117
Water Management	N/A	97	97
C. Land being prepared for Rehabilitation³	14	0	0
D. Land under active Rehabilitation⁴	803	873	961
E. Completed rehabilitation⁵	0	0	0

¹ Total mine footprint includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities.

² Total active disturbance includes all areas ultimately requiring rehabilitation except areas listed under C, D or E.

³ Land being prepared for rehabilitation – includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE RMP Guidelines).

⁴ Land under active rehabilitation - includes areas under rehabilitation and being managed to achieve relinquishment.

⁵ Completed rehabilitation – requires formal sign-off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.

Topsoil is being managed to maximise the viability of soil biota. Topsoil management measures on site include varying stripping depths for different soil types, incorporation of mulched vegetation material

into the topsoil resource, limiting topsoil storage stockpiles to a maximum of three metres in height, minimising any compaction of stockpiles, and seeding topsoil stockpiles with a cover crop.

Mangoola has continued with the natural landform design project and will implement this design in all final rehabilitation. The natural landform design has been integrated into the RMP. All rehabilitation undertaken is guided by the completion criteria outlined in the RMP.

A general overview of the 2022 rehabilitation process is presented below:

- After bulk shaping is completed, topsoil is applied at a nominal depth of 100-150 mm in thickness. Direct topsoil placement from recently mulched and stripped areas is prioritised, where possible;
- Gypsum is applied as a soil ameliorant for incorporation into the topsoil;
- Ground timber and stag trees are placed, with the density depending on available resources;
- Frog ponds and aquatic habitat areas are shaped with habitat structures added;
- Topsoiled rehabilitation areas are double pass ripped, across the contour, to a depth ranging from 200 mm (level areas), 400 mm (gradual slopes) to 600 mm (steeper slopes); and
- Rehabilitation areas are seeded by hand. This provides more detail for targeted vegetation communities, such as riparian areas and eco-tonal changes based on soil type and aspect. Seed mixes are comprised of endemic Ironbark woodland complex species sourced from adjoining offset and buffer lands.

In addition to the natural landform created at Mangoola, plant species compositions have been selected based on vegetation types of the surrounding natural landforms, e.g. Forest Gum woodland or Rough-barked Apple woodland in the drainage lines or Ironbark woodland along the ridges and Spotted Gum forest on the ridge tops. An example of seed mixes used at Mangoola is provided in the RMP. During 2022, there was a continued focus on:

- The increase in flora species diversity into the rehabilitation seed mixes;
- The creation of aquatic habitat resources across rehabilitated areas;
- Infill tube-stock planting of recalcitrant or slow growing species to improve rehabilitation structure and complexity; and
- Fauna monitoring using remote cameras and bait lures.

During the reporting period, no rehabilitation areas received sign-off from the Resources Regulator as all rehabilitation criteria have not been met.

Final capping and rehabilitation of Tailings Dam 1 (TD1) is planned to commence in 2023. Further cone penetration testing and shear vane testing for TD1 and TD2 continued during 2022. A High Risk Area (HRA) notification for the capping of TD1 was submitted in December 2020 to the Resources Regulator which was subsequently approved. Due to the unprecedented rainfall experienced during late 2021 and early 2022 TD2 was required to be used as a short term water storage option. This unfortunately prevented the planned 2021 commencement of TD1 capping (due to the seepage from TD2) and the subsequent timing of TD2's capping commencement will need to be reassessed during 2023.

Construction of the capping layer will commence progressively, from the upper beach of TD1 in the north east of the dam. With regards to TD2, the tailings strength will continue to be routinely monitored by use of the shear vane apparatus, until tailings strengths develop to those similar to TD1, when construction of the capping layer commences. Throughout this process any surface water will be kept to a minimum on TD1 and TD2 (once TD2 is emptied of its short term water storage) to maximise the effect of solar desiccation.

The following were undertaken as part of the rehabilitation monitoring program:

- 30 long term monitoring sites (19 existing and 11 newly established);
- 24 initial establishment monitoring sites (comprising 13 existing and 11 new sites); and
- Four fauna monitoring sites.

8.2 Comparison with RMP Predictions

From 1 January to 2 July 2022 Mangoola operated in accordance with the Mangoola Mining Operations Plan: January 2020 – December 2021. On 28 October 2021, an extension was granted to the approved MOP under delegation from the Minister for Regional New South Wales until 2 July 2022. Although the MOP was in effect during the reporting period, no disturbance or rehabilitation predictions were made for 2022 and therefore it is not possible to compare actual rehabilitation and disturbance areas against predictions during 2022. Predictions and mapping of rehabilitation and disturbance areas are included in the Annual Rehabilitation Report and Forward Program, which is attached in **Appendix A**.

The Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 (the Regulation) introduced new standard rehabilitation and reporting conditions on mining leases. The Regulation commenced on 2 July 2021, with a transition period to 2 July 2022. Following the transition period, Mining Operations Plans cease to exist in NSW.

8.3 Removal of Buildings

During 2022, no buildings or other infrastructure were removed or renovated.

8.4 Key Issues Affecting Rehabilitation

During November 2022, a walkthrough rehabilitation inspection audit was completed by a specialist consultant to review and report on the condition of mine rehabilitation and highlight areas where maintenance action is required. Due to the size of the area under rehabilitation, since 2020 the annual walkover inspection has been moved to a biennial schedule, with six rehabilitation blocks totalling 202 ha in the southern rehabilitation area inspected during 2022.

Five occurrences of gully erosion with the potential to impact rehabilitation were observed. These were confined to the more recent rehabilitation (2019 onwards) that generally has less established vegetation cover.

Overall erosion control has been successful. The establishment of vegetation and stabilisation of erosion gullies has been successful in remediating previous erosion issues. The rehabilitation landscape design has been successful in limiting erosion potential across the rehabilitation areas.

No continuous areas of recalcitrant bare ground >400 m² in size were identified in the walkover inspection. Topsoil management including consistent spreading and ripping is evident across the northern rehabilitation area.

Nine exotic and inappropriate native species considered to have potential to adversely impact on the development of target vegetation communities were recorded across the rehabilitation area during the 2022 walkover inspection area. Active weed control works are recommended for these species as described in **Section 6.7**.

Exotic annual and short-lived perennial species were recorded in moderate densities across all areas of the rehabilitation. Most of these were not considered to be problematic as they are generally environmental weeds and do not have a major impact on target vegetation development. Future rehabilitation monitoring should continue to report the abundances of these species and how this relates to seasonal conditions and rehabilitation age. Improving the diversity and density of target vegetation in the ground layer will be valuable in managing the prevalence of these weed species.

Vegetation health was high across the rehabilitation area with good growth rates observed in response to favourable environmental conditions in 2020-2022.

No evidence of spontaneous combustion or associated impacts were observed.

Evidence of two feral animal species was encountered during the walkover inspection: deer and hares. These species have not been observed to be having a significant impact on the rehabilitation at this time. The densities of these species across the Mangoola rehabilitation should be monitored and control measures taken if noticeable increases in population numbers are observed.

A diversity of artificial/salvaged habitat features are present across all areas of the Mangoola rehabilitation. In particular, constructed drainage lines using a mix of stag trees, logs, rocks and chains of ponds are looking promising. Utilisation of these features has been recorded including by mammals, reptiles, amphibians, birds and invertebrates.

While assessment of floristic trends is considered unreliable for rehabilitation under two years of age, all rehabilitation blocks are generally trending towards completion criteria consistent with what could be expected for the age of each rehabilitation block.

Some threats to the rehabilitation as identified in the RMP have been partially triggered, mainly presence of minor erosion and low presence of weeds or species not belonging to the target vegetation communities. With the continuation of current management practices and continued adoption of recommendations, these are unlikely to pose a significant risk to meeting completion criteria for the northern rehabilitation.

Overall, the Mangoola rehabilitation works in the northern rehabilitation to date remains highly successful and are generally progressing towards the completion criteria listed in the RMP. Native diversity across all rehabilitation domains of sufficient age was generally moderate to high. Most areas exhibited appropriate species for the target vegetation community in all layers.

The report concluded by stating that while opportunities to improve remain, Mangoola displays continuous improvements and commitment to best practice and adaptive management within the rehabilitation and remains an industry leader in rehabilitation within the Hunter Valley and Australia wide.

During the reporting period the TARP as contained in the approved RMP was enacted. Triggers and corresponding actions are summarised in **Table 8-2**.

Table 8-2 Summary of RMP TARP Actions Completed in 2022

Aspect/ Category	Key Element	Trigger Condition (Amber / Red)	Response
Landform Stability	Erosion Control	Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Southern rehabilitation area), after November 2021 heavy rainfall event.	Contractors engaged to re-shape erosion rills, install new topsoil and rip lines then re-seed with appropriate native vegetation community seed mix.
		Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Main Pit west rehabilitation area), after November 2021 heavy rainfall event.	Contractors engaged to re-shape erosion rills, install new topsoil and rip lines then re-seed with appropriate native vegetation community seed mix.
		Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Main Pit central rehabilitation area), after November 2021 heavy rainfall event.	Contractors have been engaged to undertake repair works. Work scheduled for completion early 2022.
	Weed Presence	Twelve months following revegetation, >10% but <25% cover of undesirable species present. (Weeds in southern rehabilitation areas). High rainfall year contributing to additional weed growth across site.	Continue the ongoing site weed management program with a focus on the specific areas identified in the annual rehabilitation walkover report to ensure newly identified weed outbreaks are controlled.
		Twelve months following revegetation, >10% but <25% cover of undesirable species present. (Identification of native species inconsistent with the desired vegetation communities in the northern and southern rehabilitation areas). Undesirable species originally seeded in rehabilitation through contaminated seed mix. The supplier has since changed sourcing procedures to ensure that incorrect species are not provided.	Weed management contractor to continue to remove introduced species from the site during weed control activities. This is an ongoing task as some Eucalypts are difficult to identify in the juvenile stage and rely on development indicators over time for positive identification.
Topsoil Availability	Growth medium not acceptable for rehabilitation requirements	Some areas in south pit rehabilitation with no topsoil, low ground cover and litter not yet built up.	Monitor to assess if remedial works are required.
Topsoil Availability	Topsoil quality not sufficient to support required vegetation	Some areas in south pit rehabilitation with no topsoil, low ground cover and litter not yet built up.	Monitor to assess if remedial works are required.
Vegetation	Species composition	Designated grassland areas to be thinned.	Designated grassland areas in the rehabilitation have a variety of shrub and tree species establishing, due to germination from the topsoil seed bank. These areas will be mulched during 2022 and then regrowth sprayed with woody weed herbicide.

8.4.1 Post Rehabilitation Land Use

As outlined in the RMP, the post-rehabilitation land use will be self-sustaining locally occurring vegetation communities, which emulate the pre-mining environment, enhance local and regional ecological linkages and provide for a sustainable final land use option. It has been developed with consideration of the inherently low land capability of the existing land (Class VI) across most of the site. The final void will remain onsite and will be appropriately rehabilitated and fenced to prevent access. Rehabilitation will establish a range of grassland, woodland and forest communities in addition to the offset area which surrounds the site.

Mangoola will establish native woodland and approximately 700 ha of native grassland across the site at closure.

Vegetation communities within the native woodland areas include:

- Forest Redgum Riparian Woodland;
- Ironbark Woodland Complex;
- Paperbark Woodland;
- Sheltered Grey gum Woodland;
- Slaty Box Woodland;
- Spotted Gum Open Forest; and
- Weeping Myall Woodland.

In addition to the above, Mangoola is monitoring rehabilitation against relevant completion criteria. **Table 8-3** and **Table 8-4** provide a summary of progress to date against relevant criteria for the stage of rehabilitation onsite, which has only been undertaken on rehabilitated waste emplacement areas. Further updates against criteria will be provided in future Annual Reviews as relevant criteria are triggered.

Many of the completion criteria listed in the RMP are not yet relevant, as they relate to stages of rehabilitation that have not yet been reached or triggered. The annual ecological monitoring program, rehabilitation walkover inspection and annual bushfire hazard inspection have assessed the relevant criteria, specifically landform stability, floristic diversity, vegetation health, weed presence, structural fauna habitat, management of pest species and bushfire management.

Table 8-3 Comparison of the 2022 Rehabilitation Walkover Inspection Results with RMP Completion Criteria

Performance Indicator	Objective	Completion criteria	Rehabilitation Block Criteria Met Yes/No									
			NP: 2011	NP: 2012	NP: 2013	NP:2014	NP:2015	NP:2016	NP:2017	NP:2018	NP:2019	NP:2020
Development of native ecosystems as per the final land use	Floristic diversity is progressing towards the ecosystems planned in the final land use	Native plant species richness assessed for each growth form	This was not formally assessed as part of the walkover inspection and would be more appropriately assessed under the BAM monitoring programme. All areas appear to be generally trending in the right direction.									
	Strata development is progressing towards the ecosystems planned in the final land use	For Grassland: -0-20% canopy -60-90% Groundcover	Grassland areas are generally consistent with this performance indicator. A number of areas mapped as grassland that were developing a canopy were mulched in 2022.									
		For Woodland: -20-60% canopy -10-60% understorey - 40-80% groundcover	This was not formally assessed as part of the walkover inspection and would be more appropriately assessed under the BAM monitoring programme. All areas appear to be generally trending in the right direction.									
		For Woodland: Minimum total tree/shrub	Densities of trees and shrubs exceed the minimum number across all Woodland rehabilitation areas. This should continue to be monitored as pioneer shrub species senesce.									

Performance Indicator	Objective	Completion criteria	Rehabilitation Block Criteria Met Yes/No												
			NP: 2011	NP: 2012	NP: 2013	NP:2014	NP:2015	NP:2016	NP:2017	NP:2018	NP:2019	NP:2020	NP:2021		
		densities to be 400 stems/ha													
	Weeds are not a major component of the planned ecosystems	Less than 30% weeds	Weeds not a major component of any of these areas and well below 30% cover. Most weeds are spring annuals which will not impact development of the rehabilitation area. Weeds that pose a threat and require management have been listed below. Older rehabilitation has a higher incidence of non-desired species.												
	No signs of ill health and stalling of canopy strata	More than 75% of trees are healthy and growing	Two instances of dieback were recorded in NP: 2014. The impact of this dieback is minimal and does not affect a high enough proportion of the trees to impact on this criteria.												
	The rehabilitation is self-sustainable	For Woodland: Signs of flowering and seeds or second generation seedlings for trees and shrubs	Flowering was observed in canopy species for rehabilitation established up until 2017. Establishment of second-generation canopy species was observed in NP: 2011, NP: 2012 and NP:2013.							Trees too young to flower.					
			All rehabilitation greater than 2 years of age showed signs of prolific seeding for <i>Acacia spp</i> , <i>Daviesia spp.</i> , <i>Dodonaea spp.</i> , <i>Hovea sp.</i> and <i>Senna sp.</i> Some second generation plants found.							Shrubs too young to flower.					
Fauna diversity is progressing towards the ecosystems planned in the final land use	Rehabilitation areas provide a range of structural habitats similar to pre-	Evidence of a range of structural habitats in rehabilitation areas.	All rehabilitation blocks had stag trees, and many areas had logs and ponds. The chain of ponds in 2020-1 was particularly diverse with water holes, logs, rocks, and stags emerging from water holes. Vegetation consistent with wet areas was starting to develop. A diversity of fauna species were observed using the rehabilitation, in particular adjacent to offsets and in older rehabilitation												

Performance Indicator	Objective	Completion criteria	Rehabilitation Block Criteria Met Yes/No											
			NP: 2011	NP: 2012	NP: 2013	NP:2014	NP:2015	NP:2016	NP:2017	NP:2018	NP:2019	NP:2020	NP:2021	
	mining fauna communities.	1-10 boxes or hollows per ha												
	Fauna pest species are managed and controlled (where possible)	Evidence of pest fauna usage of rehabilitation	Very low levels of evidence of deer (visual sightings/footprints) and hares (scat) were found.											

Table 8-4 Comparison of the 2022 Rehabilitation Walkover Inspection Results to Threats to Rehabilitation as Extracted from RMP

Issue/Risk	NP: 2012	NP:2013	NP:2014	NP:2015	NP:2016	NP:2017	NP:2018	NP:2019	NP:2020	NP:2021	
Unsuccessful translocation of threatened orchid species.	Not applicable for these areas. Status = Not Triggered										
Erosion on rehabilitation areas.	Status = Not Triggered							Status = Partially Triggered			
Poor water quality in runoff from rehabilitation areas.	Not formally assessed however none visually identified. Status = Not Triggered										
Failure to meet criteria for each rehabilitation phase.	Status = Not Triggered										
Weed infestation threatening rehabilitation success.	Status = Partially Triggered										
Damage to rehabilitation by feral animals.	No significant damage to the Rehabilitation Area by feral animals was recorded during the 2022 Walkover Inspection. Status = Not Triggered										
Growth medium not acceptable for rehabilitation requirements.	Vegetation acceptable. Status = Not Triggered										
Lack of habitat features in rehabilitation area to attract fauna.	Habitat features present (ponds, stags, logs, boulders etc.). Status = Not Triggered										
Final landform instability resulting in poor water quality, exposed materials such as carbonaceous or	Not Identified Status = Not Triggered										

Issue/Risk	NP: 2012	NP:2013	NP:2014	NP:2015	NP:2016	NP:2017	NP:2018	NP:2019	NP:2020	NP:2021
Potentially Acid Forming Materials.										
Overburden material not suitable for rehabilitation or not sufficient amounts for rehabilitation.	<p>Not identified.</p> <p>Status = Not Triggered</p>									
Topsoil quality not sufficient to support required vegetation.	<p>Vegetation acceptable.</p> <p>Status = Not Triggered</p>									
Lack of local provenance seed for use in rehabilitation.	<p>Local provenance seed collection is undertaken as part of the Mangoola rehabilitation strategy and is constantly reviewed and extended.</p> <p>Status = Not Triggered</p>									
Rehabilitation not completed in accordance with rehabilitation strategy.	<p>Works are being undertaken in line with the rehabilitation strategy.</p> <p>Status = Not Triggered</p>									
Spontaneous combustion of rehabilitation area.	<p>No signs of spontaneous combustion were identified.</p> <p>Status = Not Triggered</p>									

8.5 Rehabilitation Trials and Research

Mangoola is undertaking a long-term orchid translocation trial for the threatened species *Diuris tricolor* and *Prasophyllum petilum*. Orchids were translocated to new areas and the survival rates have been monitored annually since 2010. The results of the 2022 orchid translocation monitoring are presented in **Section 6.2.2.3**.

Invertebrate habitat “bee and bug hotels” were introduced into the rehabilitation during 2019. These structures are being used by invertebrates, but no analysis has been carried out to identify particular species.

Mangoola is partnering with NSW BCD on a large scale translocation project of the critically endangered *Pomaderris reperta*. The aim of the project is to evaluate the effectiveness of propagation and translocation on this species as a means of extending its distribution within the natural range of the species. Two 12 m x 12 m translocation plots have been established within establishing Mangoola rehabilitation, and two identical sized plots located in Mangoola offset land. Ongoing monitoring is showing very favourable results overall and data is being collected regarding the impact of differing ground preparation methods on plant survival rates. Many of the *Pomaderris* flowered during the 2022 season.

Translocation projects including *Cymbidium canaliculatum*, *Xanthorrhoea johnsonii* and *Macrozamia communis* continue to be undertaken throughout the rehabilitation areas.

Mangoola has undertaken and is planning to undertake further trial ecological cool burns in areas of rehabilitation. The purpose of the burns is to evaluate the impact of the burns on the flora assemblages, secondary succession, fire resilience, soil chemistry, weed control and hazard reduction potential. Pre-burn ecological monitoring and soil testing has been undertaken and will be followed up with post-burn monitoring to evaluate the impacts. An image from the cool burn undertaken in the North Pit rehabilitation in August 2022 is provided in **Photo 8-1**.



Photo 8-1 Cool burn within the Northern Rehabilitation Area

8.6 Actions for the Next Reporting Period

Rehabilitation activities proposed for the 2023 reporting period include the continuation of the rehabilitation research and trials for threatened flora species translocation, continued use of seed mix with increased species diversity, mulching and treatment of some rehabilitation areas to achieve the desired grassland vegetation communities, creating additional complexity in aquatic habitat features, and a focus on achieving the rehabilitation targets as outlined in the RMP.

9. Community

9.1 Community Engagement

9.1.1 Face to Face Meetings

Mangoola has developed a comprehensive Stakeholder Engagement Strategy (SES) and Plan to identify and understand stakeholder views and concerns. In 2022, Mangoola also developed the Social Impact Management Plan (SIMP) in accordance with Condition B108 of SSD-8642. Face to face consultation included a focus group meeting held 21 June at Mangoola. Further consultation was undertaken through phone and online surveys (as detailed in Appendix D of the SIMP). The consultation outcomes were considered in the SIMP that was approved by DPE on 27 October 2022.

During the reporting period, an ESF4 application was lodged for an exploration program within AL9. The proposed boreholes and access to them, is on Mangoola owned land. Face to face consultation was completed with the combined Mangoola/MCCO project Community Consultative Committee (CCC). This included updates on application process and wet weather delays. Exploration drilling did not commence in 2022 due to wet ground conditions. Exploration updates were also provided in the community newsletter discussed below. The CCC also received updates regarding the MCCO Project construction and exploration drilling within the MCCO Project additional disturbance area.

There was no exploration activity conducted in EL 5552 during the reporting period. A reduced Annual Community Consultation report was lodged with the Mining, Exploration and Geoscience (MEG) on 25 February 2022 (with the next report due February 2023). As there was no exploration within AL9 in the reporting period, a reduced Annual Community Consultation report was prepared and uploaded to the Mangoola website on 7 December 2022. This is as per advice from MEG that title holders will no longer submit their reports to the Department but publish them to the website or make them available within 14 days of request (advice received November 2022 and is also on the MEG website).

In 2022, there were no acquisitions under the Landholder Liaison Program and Property Acquisition Strategy (LLPPAS) that was developed in accordance with Condition 54 of AL9.

The Mangoola CCC met four times during the reporting period. The January meeting was held at the Denman Memorial Hall (with dial in option) due to COVID social distancing considerations. The May, August and November meetings were held at Mangoola (Boardroom). A tour of the mine, including mine rehabilitation, was held prior to the August meeting. A January tour could not be held (COVID social distancing requirements) so images captured by drone were presented/discussed.

The CCC meetings include an update on mining and exploration operations, MCCO Project update, environmental monitoring (including discussion regarding incidents/elevated results), rehabilitation, land management activities (such as offset works, weed and pest control), community involvement and complaints. Any actions from previous meeting/s are also discussed. During the reporting period, other topics also discussed included the HRSTS participation/authorised releases in 2022, consultation regarding progress of Environmental Management Plans, the development of the Social Impact Management Plan and discussion regarding the Independent Environmental Audit. CCC meeting minutes are provided on the Mangoola website.

In addition to CCC tours, Mangoola normally offers rehabilitation tours through the quarterly Mangoola Community Newsletters as well as liaising directly with school groups, universities and other interested parties to facilitate tours. In response to COVID restrictions, tours were offered pending restrictions. The following tours were held in 2022:

- NSW Minerals Council and Resources Regulator Tour;

- CCC rehabilitation tour (as per above); and
- The Upper Hunting Mining Dialogue 2022 School Mine Tours Program (June).

The “Back to Wybong” community tours of the mine rehabilitation were scheduled in October but the event was cancelled due to adverse weather / localised road flooding.

Tours will again be offered in 2023 through the Community Newsletter and other community interactions.

9.1.2 Website

Mangoola operates a website (www.mangoolamine.com.au) where members of the community can access information about the site, including the latest reports, management plans and environmental monitoring data, including previous Annual Reviews.

An Independent Environmental Audit was completed in 2022. The report found that the site was compliant with its website reporting requirements under SSD-8642 A review against condition D17 (checked 8 July 2022) confirmed the website met the requirements and no further recommendations were made.

9.1.3 Community Newsletters

Mangoola published and distributed two community newsletters reporting on the first and second half of 2022 period (the second which was distributed beginning of 2023 to include a new traineeship advertisement). The newsletters provided information on:

- Operational summary/rehabilitation performance;
- MCCO Project construction updates;
- Exploration and water bore drilling updates;
- Community investment updates;
- Community perception survey outcomes;
- Social Impact Management Plan (Survey link/summary/consultation process), expression of interest (EOI) for Community Enhancement Program working group;
- Registration for blast notifications and EOI for air quality mitigation for those within 4 km or 6 km from active mining;
- Information regarding registration for Glencore (Mangoola) job alerts, apprenticeships, and an Environment & Community Traineeship opportunity in 2023;
- Routine advertising of community response hotline/offer of meeting/mine tours;
- Feedback from the three yearly GCAA Community Perception Survey; and
- Other feature stories of interest.

Copies are available on the Mangoola website.

9.2 Community Contributions

Mangoola is committed to supporting the local community in which it operates. During 2022, we saw the return of some events post-COVID lockdowns. Mangoola was able to support a diverse range of innovative local community activities in 2022, with contributions of approximately \$85,000 made by

Mangoola and additional funding through Glencore Coal Assets Australia. The 2022 recipients of sponsorship/donations during the reporting period are presented below:

- Wybong Public Hall Committee:
 - Annual Insurance;
 - Grounds keeping;
 - Fire Pit/Seating area; and
 - Donation of Sandstone blocks salvaged from Millville Homestead.
- The Upper Hunter Show (Young Women of the Year and Grand Prix Show Jumping. Also in kind support by labour provision for show jump set up);
- Wybong Cemetery:
 - Funding for tree-lined gravel access track; and
 - In kind labour for fence oiling working bee.
- Muswellbrook Chamber of Commerce and Industry:
 - 2022 Business Awards; and
 - The Great Cattle Dog Muster Australia – working dog trials and clinic.
- Upper Hunter Education Fund (funds and tutoring);
- ToyBox – educational/interactive play equipment (joint project with other Glencore mine);
- End of year presentations/awards for Sandy Hollow Public School and Denman Public School; and
- Denman Chamber of Commerce – Denman Late Night Shopping and Christmas Market Event to encourage spend at local businesses as well as community entertainment.

Mangoola also had the pleasure of attending the Merton Living 40th celebrations. Merton Living is an aged care facility/service provider in Denman. Mangoola has partnered with Merton Living on a number of projects over the years and were pleased to celebrate their achievements with them in November.

A key component of the Stakeholder Engagement Strategy, and the newly developed Social Impact Management Plan, is to ensure Mangoola supports the local community. Mangoola implemented the Voluntary Planning Agreement (VPA) formerly required under Schedule 2, Condition 12 of MP 06_0014. On 4 April 2022, a Planning Agreement was signed under Condition A17 of SSD-8642 with Muswellbrook Shire Council. The VPA is designed to provide financial contributions commensurate with the terms set out in SSD-8642. Mangoola is committed to meeting its obligations under the VPA.



Photo 9-1 Mangoola personnel at the Wybong Cemetery Fence staining working bee.



Photo 9-2 Toybox book giving ceremony was attended by Mangoola personnel in 2022. ToyBox support continued in 2022 with a contribution for interactive play equipment.

9.3 Community Complaints

Mangoola manages all complaints in accordance with the Mangoola Complaints Management Procedure, which details the process for receiving and responding to complaints. Complaints are received via a dedicated Community Response Line, in person, facsimile, email, letter or general telephone.

9.3.1 2022 Complaints Summary

A total of 42 community complaints were received by Mangoola during the reporting period. A summary of the time of year and subject of the complaints are provided in **Table 9-1**.

Table 9-1 Summary of Complaints in 2022

Month	Noise	Dust	Lighting	Blasting	Traffic	Other	Total
January	6	-	-	-	-	-	6
February	2	-	-	-	-	-	2
March				2		1	3
April	4	-	1	-	-	-	5
May	-	-	-	-	-	-	-
June	3	-	-	1	-	-	4
July	7	-	-	1	-	-	8
August	1	-	-	1	-	-	2
September	2	-	-	-	-	-	2
October	1	-	-	2	-	-	3
November	5	-	-	-	1	-	6
December	1	-	-	-	-	-	1
Total	32	0	1	7	1	1	42

9.3.2 Analysis of Complaints

Complaint Subject and Quantity

As shown in **Table 9-1** a total of 42 community complaints were received by Mangoola during the reporting period. A summary of the time of year and subject of the complaints are provided above.

The majority of complaints received in the reporting period were in relation to noise (76.2%). This percentage has decreased from 2021 (93.6%) and total noise complaints have reduced from 2021. Further details on management and mitigation measures regarding noise that were implemented during the reporting period are provided in **Section 6.3**. Additional attended noise monitoring was conducted once again from June to September 2022 (cooler period) in the area northwest of the mine which, during the previous year, was where most noise complaints came from.

The 42 complaints received in 2022 represent a 32% decrease from the 62 environmental complaints received in 2021. A review of complaints from 2007 to 2022 found that complaints peaked in 2011 (717 complaints) which represented the first full calendar year of operations.

Complaint Timing

Figure 9-1 shows the time of day that complaints were made during 2022. Analysis of this data shows that noise complaints are generally made in the early morning and late evening, whereas blast related complaints are generally made in the middle of the day.

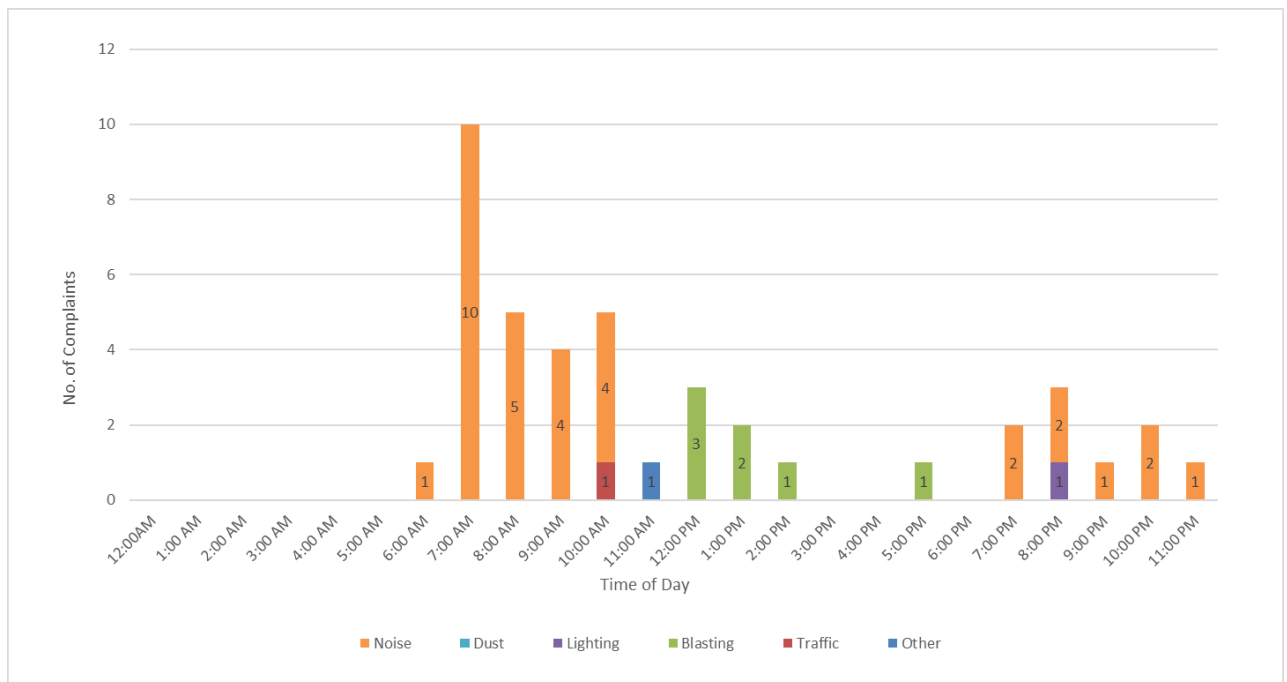


Figure 9-1 2022 Complaints by Time of Day

Complainants

Figure 9-2 shows the number of complaints made by each complainant during 2022. The 42 complaints were made by 17 individuals during 2022 and approximately 52% of all complaints (22) were made by four complainants. These were predominantly in relation to noise.

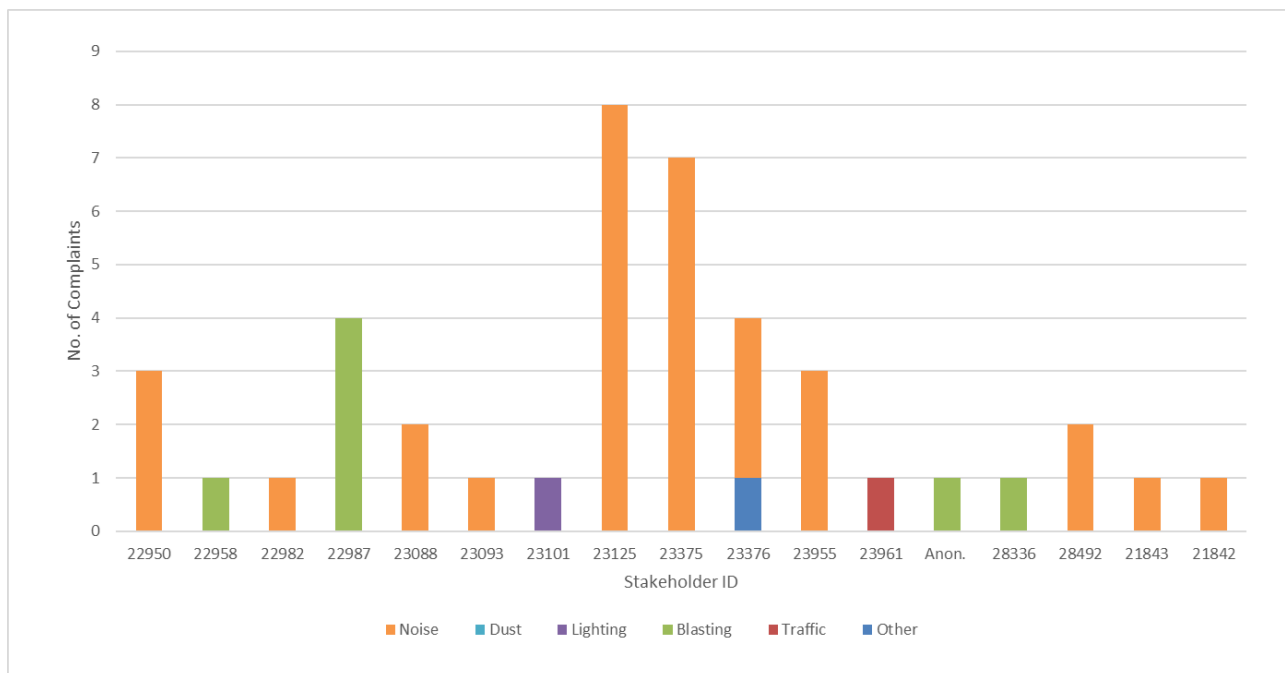


Figure 9-2 2022 Complaints by Complainant

9.3.3 Actions in Response to Complaints

In response to complaints received in 2022, the following responses were undertaken, depending on the nature of the complaint.

Noise

- Following receipt of a noise complaint, the real time noise monitors were reviewed, and noise alarms were reviewed to see if any were received prior to the complaint;
- Operational noise management controls were reviewed by the Mining Supervisor or CHPP Supervisor;
- Where noise alarms were received and the Mining/CHPP Supervisor verified activities from our operation to be the source, the operation was reviewed with changes made as required to reduce noise levels, e.g. parking up equipment; and
- Supplementary weekly attended noise monitoring was undertaken at an additional four locations at a further distance northwest of site as per previous years. This was completed weekly during the winter period, in line with NSW heath restrictions. No non-compliances were measured during this monitoring.

Blast

Depending on the nature of the blast complaint, the following were reviewed:

- Blast monitoring results;
- The blast video;
- Pre-blast assessment to confirm meteorological conditions at time of blasting;
- Air quality monitoring results (not applicable in 2022); and/or
- Other blasting activity in region (where blast time did not correlate with a Mangoola blast); and

- All blast overpressure and ground vibration results confirmed to be within compliance limits and discussed with complainant where relevant.

Dust

- There were no dust complaints received in 2022.

Traffic

- One traffic complaint was received in 2022 which was handled internally.

All other complaints were investigated and handled on a case by cases basis with the aim of mitigating impacts (where required) and responding to community members.

10. Independent Environmental Audit

In accordance with Condition 7, Schedule 5 of MP 06_0014, an Independent Environmental Audit (IEA) is required every three years. In addition, as required by SSD-8642, Condition D13, an independent audit will be conducted within one year of the commencement of development which occurred on 6 December 2021. Mangoola received approval from DPE to combine the year one and three yearly IEAs required in July 2022. The audit period to which this audit applies is inclusive of the period from 2 August 2019 to 22 July 2022 (as requested by DPE).

Submission of the 2019-2022 IEA report was completed on the 6 October 2022 and is currently under assessment by DPE. Once the IEA is has received approval from the DPE it will be published on the Mangoola public website and updates given on the key audit outcomes in subsequent Annual Reviews.

It is anticipated that the next audit will be in 2025 to cover the 3-year period commencing 23 July 2022.

11. Incidents and Non-Compliances

All 2022 incidents, non-compliances and exceedances related to MP 06_0014, EPL 12894, and SSD-8642 (where applicable) and relevant management plans are summarised in **Table 11-1**.

Table 11-1 Incidents, Non-Compliances and Exceedances

Date	Summary	Non-Compliance	Details/Response
07/03/2022	Discharge of Sediment Laden Water	EPL 12894, MP 06_0014, SSD-8642 and WMP	<p>On 7 March, a water discharge event occurred where sediment laden water was discharged from the MCCO Project construction area into tributaries of Big Flat creek. The PIRMP was enacted in accordance with Section 147 of the POEO Act. A single community complaint was received on 8 March 2022 following the discharge event on 7 March. The complainant observed sediment laden water leaving the MCCO Project Area across Wybong Road. Discharge results show that there was no environmental harm caused based on the chemistry of the water discharged when compared to the receiving environment.</p> <p>This incident was reported to EPA and DPE in accordance with applicable statutory requirements.</p>
14/03/2022	Exceedance of HRSTS Discharge Limit	EPL 12894	<p>During a HRSTS discharge event, the daily volume discharge limit was exceeded by 0.8ML. The HRSTS pumping infrastructure was required to operate at low volumes to achieve the prescribed flow rate for the discharge window. This resulted in surges in the flow rate and an exceedance of the daily discharge amount. The predicted time for the pump to reach the daily discharge amount was later than what was actually recorded (due to surging) resulting in the pump running for a short period of time after the daily discharge limit was reached.</p> <p>No adverse effects were identified as a result of the non-compliance. HRSTS pumping ceased immediately once water discharge volume exceedance was known. Alarming has been integrated into Mangoola's Citect system to warn personnel when the discharge amount was approaching the maximum discharge volume and to cease pumping prior to volume being exceeded. This alarming has been integrated into the Mangoola HRSTS Discharge Procedure. Mangoola HRSTS Discharge training to be provided to all CHPP Supervisors following Procedure update. Upgrades to pumping infrastructure have been implemented to improve the ability of site to pump at low volumes while preventing surges in flow rate including additional pumps and valves.</p> <p>This was reported to the EPA via the Annual Return.</p>

Date	Summary	Non-Compliance	Details/Response
20/04/2022	Failure to Undertake Attended Noise Monitoring	EPL 12894 and NMP	<p>Access to EPL Monitoring Point 34 (NM16) was restricted in the April 2022 round of attended noise monitoring. An intermediate location known as NM07 was used as a substitute, which was closer to site. As site noise was inaudible at the intermediate location, it is expected that site noise would have also been inaudible at NM16, given that it is located further from the site and is in a similar acoustic climate. This was reported to the EPA via the Annual Return.</p>
31/05/2022	Failure to Collect Surface Water Samples	SWGWMP	<p>Mangoola failed to collect surface water samples in accordance with the approved Surface Water Monitoring Plan. June surface water sampling occurred on 31 May 2022, due to a scheduling error by the sites environmental monitoring contractors.</p> <p>Mangoola identified a non-compliance with Condition 50, Part B of SSD-8642 and reported in to DPE.</p> <p>Failure to collect sample for SW13 due to unsafe access.</p>
March and May 2021	Failure to collect Groundwater samples	GWMP	<p>Mangoola failed to collect groundwater samples from sites GW02, GW03 and GW16 during the March and May sampling events due to excessive wet weather causing the sample sites to be inaccessible and unsafe. As GW03 and GW16 were dry prior to March and dry again in the July sampling events it was concluded no incident had occurred. As GW02 had previously exceeded the interim assessment criteria, this site was included as part of an investigation undertaken by AGE. This concluded that no environmental incident had occurred as per the SWGWRP and therefore this was not reported to the DPE.</p>
24/06/2022	Failure to Monitor Weather Continuously	EPL 12894	<p>Failure to continuously monitor weather at EPL Monitoring Point 18:</p> <p>Temperature (10 m): 52x 15 min averaging periods.</p> <p>Following a data review, it was identified that there was missed meteorological data for the period. The weather station failed to record temperature @ 10 metres as the sensor had failed. There were no recognisable or adverse effects of the non-compliance and the monitoring contractor attended site to change the sensor.</p> <p>This was reported to the EPA via the Annual Return.</p>

Date	Summary	Non-Compliance	Details/Response
04/07/2022	Discharge of Sediment Laden Water	EPL 12894, MP 06_0014, SSD-8642 and WMP	<p>On 4 July, a water discharge event occurred where sediment laden water was discharged from the MCOO Project construction area into tributaries of Big Flat creek. On both occasions the PIRMP was enacted in accordance with Section 147 of the POEO Act. Discharge results show that there was no environmental harm caused based on the chemistry of the water discharged when compared to the receiving environment.</p> <p>This incident was reported to EPA and DPE in accordance with applicable statutory requirements.</p>
18/3/22-1/4/22, 6/6/22, 7/7/22-8/7/22, 27/11/22-01/12/22	Failure to Monitor PM ₁₀ Continuously	EPL 12894	<p>PM₁₀ monitoring is required continuously in accordance with Condition M2.1 of EPL 12894 at Point 19 (D7-DC/D9-DC) and Point 20 (D8-DC). While the continuous emissions monitoring captured >96% data (the minimum is 90% as per EPA website) EPL19 had insufficient valid data from 18/3/22-1/4/22 due to low flow issues. After an initial field service did not rectify issue, the unit was removed for workshop service/part replacements and the battery box refurbished. The monitor also lost data on 6/6/22 due to filter replacement/service. EPL 20 had insufficient data from 7/7/22 to 8/7/22 (low battery charge) and 27/11/22 to 01/12/22 (re-start issues after factory calibrated monitor was reinstalled. A modem cable was also replaced).</p> <p>This will be reported in the next Annual Return.</p>

12. Activities to be Completed During Next Reporting Period

12.1 Management Plan Review

In accordance with Condition D8 of SSD-8642 the following strategies, plans and programs will be reviewed and/or revised in 2023 as necessary, as listed in **Table 12-1**.

Table 12-1 Revision of Strategies, Plans and Programs

Document	2023 Review	Comment
Aboriginal Cultural Heritage Management Plan	No	No changes required as a result of Annual Review.
Air Quality and Greenhouse Gas Management Plan	No	No changes required as a result of Annual Review.
Biodiversity Offset Management Plan and Strategy	No	No changes required as a result of Annual Review.
Blast Management Plan	No	No changes required as a result of Annual Review.
Blast Fume Management Procedure	No	No changes required as a result of Annual Review.
Closing Public Roads – Mining Procedure	Yes	This procedure will be updated to better align with site requirements in consultation with MSC
Environmental Management Strategy	No	No changes required as a result of Annual Review.
Historic Heritage Management Plan	No	No changes required as a result of Annual Review.
Noise Management Plan	No	No changes required as a result of Annual Review.
Water Management Plan	No	No changes required as a result of Annual Review.
Surface Water Monitoring Plan	No	No changes required as a result of Annual Review.
Groundwater Monitoring Plan	No	No changes required as a result of Annual Review.
Surface and Groundwater Response Plan	No	No changes required as a result of Annual Review.
Erosion and Sediment Control Plan	No	No changes required as a result of Annual Review.
Site Water Balance	Yes	Completed annually.
Annual Rehabilitation Report and Forward Program	Yes	Completed annually.
Rehabilitation Management Plan	No	No changes required as a result of Annual Review.

Document	2023 Review	Comment
Social Impact Management Plan	No	No changes required as a result of Annual Review.
Translocation Management Plan	No	No changes required as a result of Annual Review.
Traffic Management Plan	No	No changes required as a result of Annual Review.
Visual Impact Management Plan	No	No changes required as a result of Annual Review.
AL9 and EL 5552 Groundwater Monitoring and Modelling Plan	No	No changes required as a result of Annual Review.
AL9 Community Consultation Strategy	Yes	This document will be updated due to the proposed 2023 drilling program.

12.2 2023 Actions

Table 12-2 outlines the actions to be implemented during the 2023 reporting period.

Table 12-2 2023 Actions

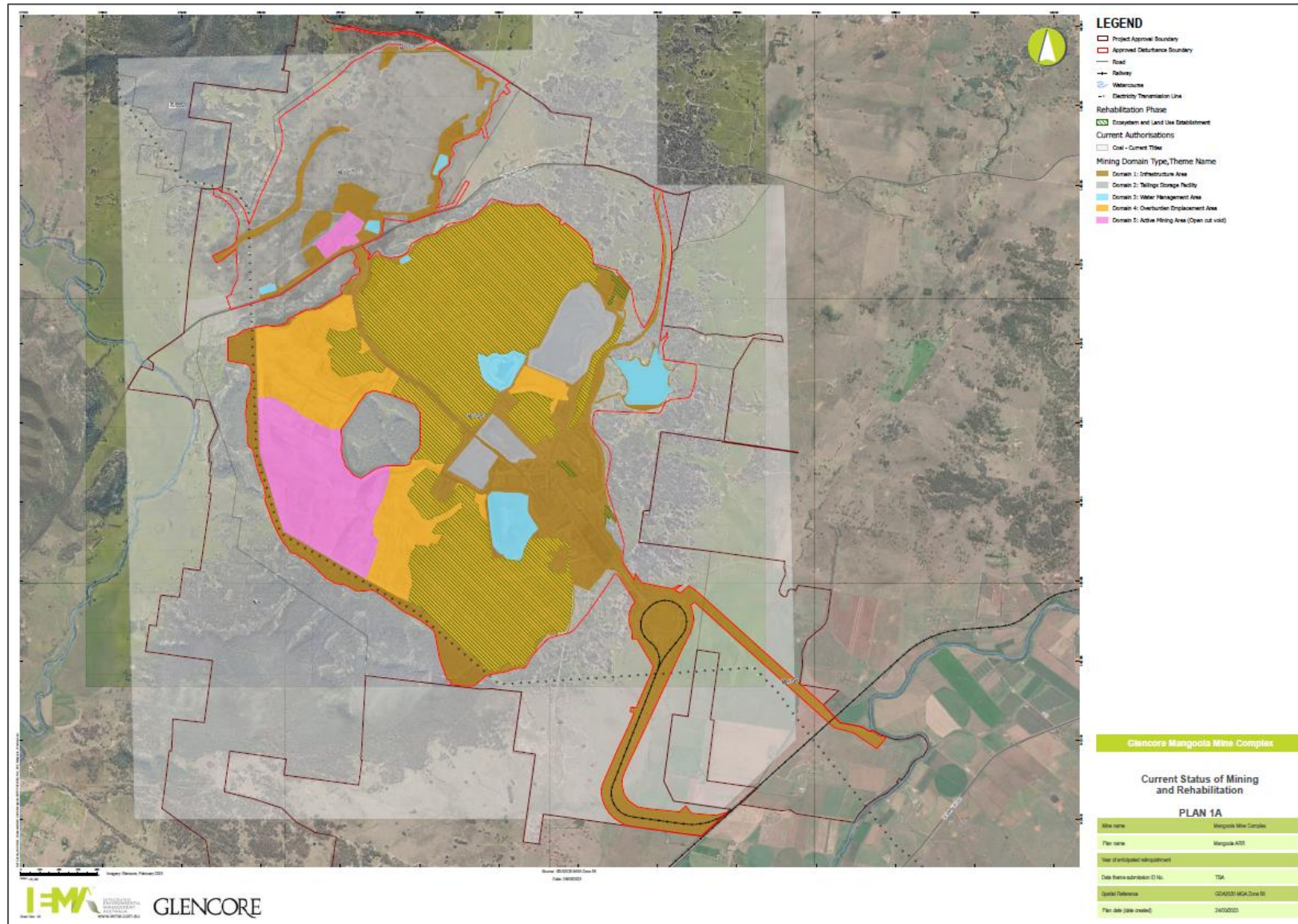
Action	Due Date
Install tree screens along Ridgelands Road as required in the VIMP	June 2023
Validation and review of Numerical Groundwater Model, including revision of the GWMP.	2023
Complete the installation of additional monitoring bores proposed as part of the MCCO approved EIS.	April 2023
Complete 88 hectares of new rehabilitation (target reduced from 100 hectares due to lower-than-expected production in 2021 and 2022)	2023
Conduct post-burn monitoring on areas subject to cool burn in August 2022	2023
Continue pest species management targeting species identified by ecological monitoring reports as a threat to establishment of rehabilitation/revegetation	2023
Continue weed management with particular focus on species and areas noted in ecological monitoring reports and listed species - High Threat Exotic (BAM); Weeds of National Significance and Upper Hunter Region Priority Weeds (DPI)	2023
Conduct annual bushfire APZ inspection and maintain access tracks and vegetation in accordance with recommendations	2023
Conduct annual rehabilitation walkover inspection and undertake erosion repairs on rehabilitation areas identified in the 2022 walkover inspection report and IBW-22 which was noted in the 2022 rehabilitation monitoring report	2023
Begin review of performance criteria for rehabilitation areas, including target tree stem densities, in accordance with the recommendations in the 2022 rehabilitation monitoring report	2023
Undertaken tree thinning at sites noted in the 2022 rehabilitation monitoring report as being high priority for canopy thinning	2023
Align rehabilitation monitoring report to the new PCT classification for Eastern NSW released in 2022 according to the recommendation in the 2022 rehabilitation monitoring report	2023
Review reference sites for native grasslands and, if required, establish new reference sites in accordance with the recommendation in the 2022 rehabilitation monitoring report	2023
Review the recommendations for supplementary planting in the monitoring report and develop an action plan for planting areas where canopy species are incorrect for the target PCT or tree species are not present	2023
Review the recommendation to transition to the new Eastern NSW PCT classification released in 2022, according to the recommendation in the 2022 ecological monitoring report, and determine if this is possible considering the Biodiversity Offset Areas with Conservation Agreements (CA) in place have stipulated PCT's and monitoring methodologies	2023

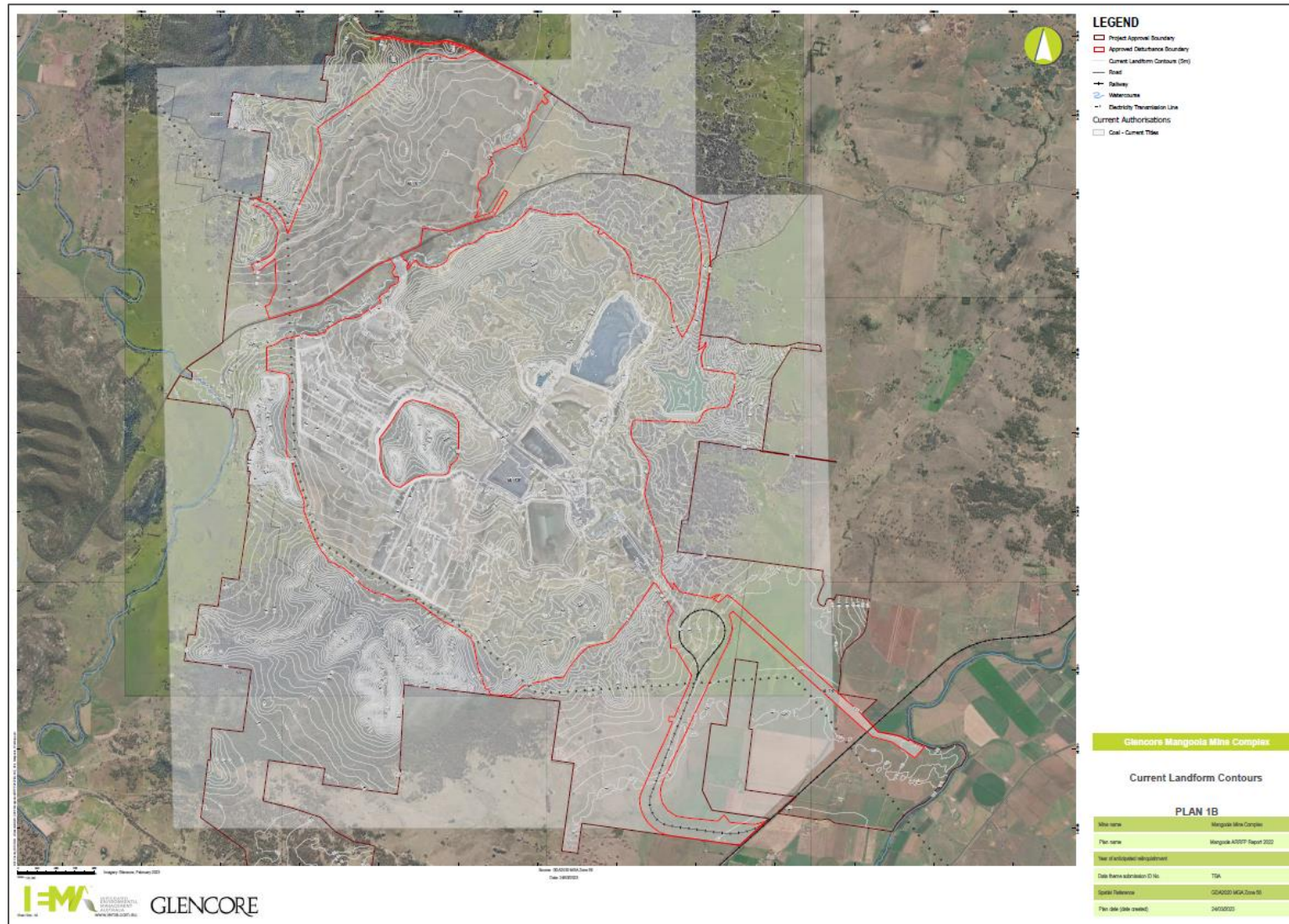
13. References

- AGE, 2023. Mangoola Coal Mine – Review of Electrical Conductivity Trigger Exceedances in Monitoring Bores GW02, GW10-P2, GW14, GW15 and GW26. February 2023
- AGE, 2016. Numerical Model Update Mangoola Mine. December 2016, Ref G1839A.
- AGE, 2019. Mangoola Coal Continued Operations Project Groundwater Impact Assessment. Second draft, 30 January 2019, Ref, G1839F.
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- Mackie Environmental Research, 2006. Centennial Hunter Pty Limited, Anvil Hill Project: Groundwater Management Studies. May 2006
- Mackie Environmental Research, 2010. Long term water levels in the modified Mangoola pit shell, 11 February 2010’.
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- NSW EPA, 2017. Noise Policy for Industry. October 2017.
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- Todoroski Air Sciences, 2013. Air Quality and Greenhouse Gas Assessment. May 2013
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- Umwelt, 2023a. 2022 Ecological Monitoring Report. February 2023.
- Umwelt, 2023b. 2022 Rehabilitation Monitoring Report. February 2023.
- WRM, 2013. Manoola Coal Modification to Project Approval Surface Water Assessment. April 2013.

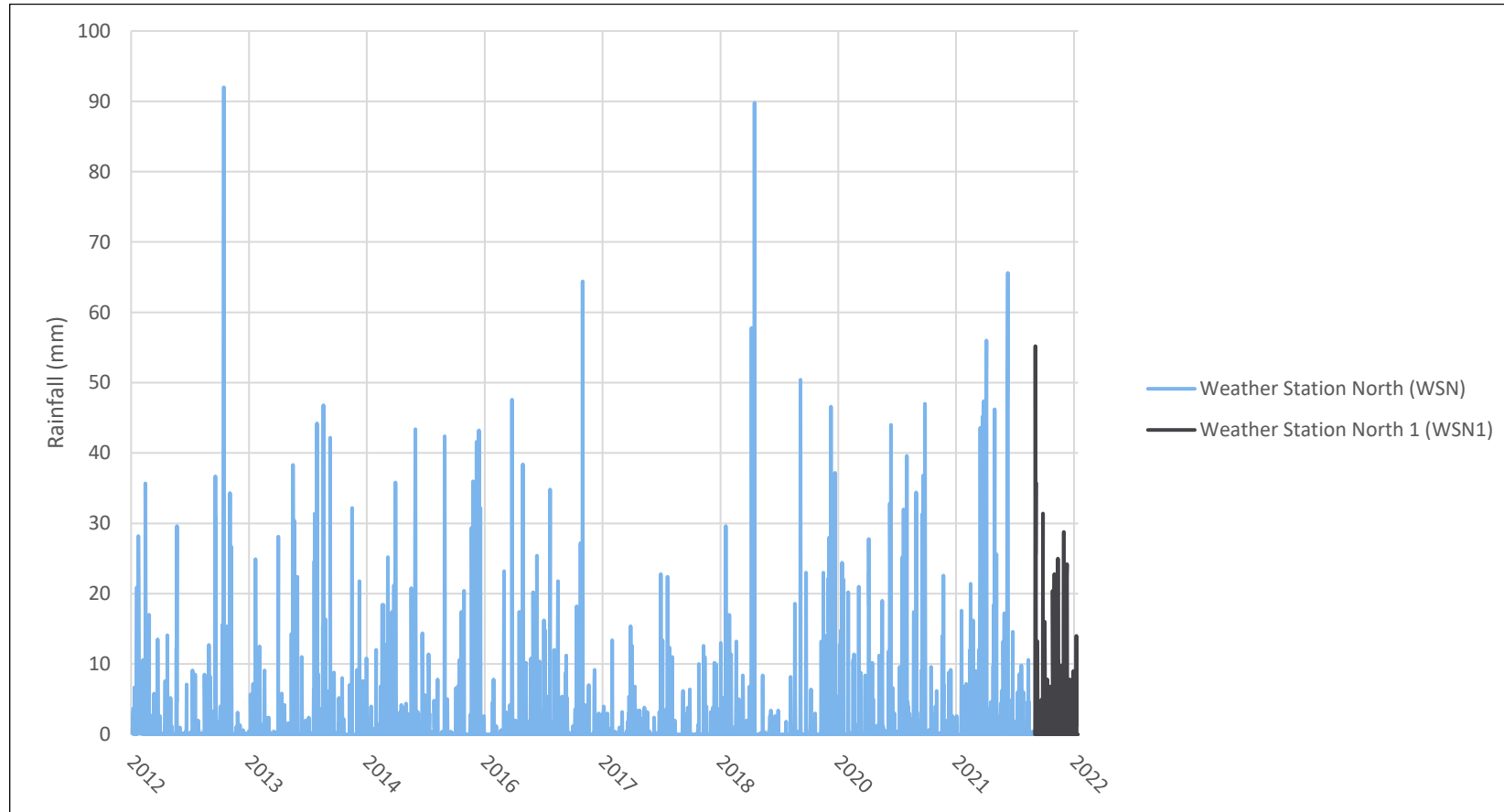
Appendix A - Annual Rehabilitation Report and Forward Program and 2022 Disturbance and Rehabilitation Plan

Note – The Annual Rehabilitation Report and Forward Program will be appended to the Annual Review following submission to the NSW Resources Regulator mine rehabilitation portal. The Annual Rehabilitation Report and Forward Program will also be available on the Mangoola website here: <https://www.glencore.com.au/operations-and-projects/coal/current-operations/mangoola-open-cut/management-plans>



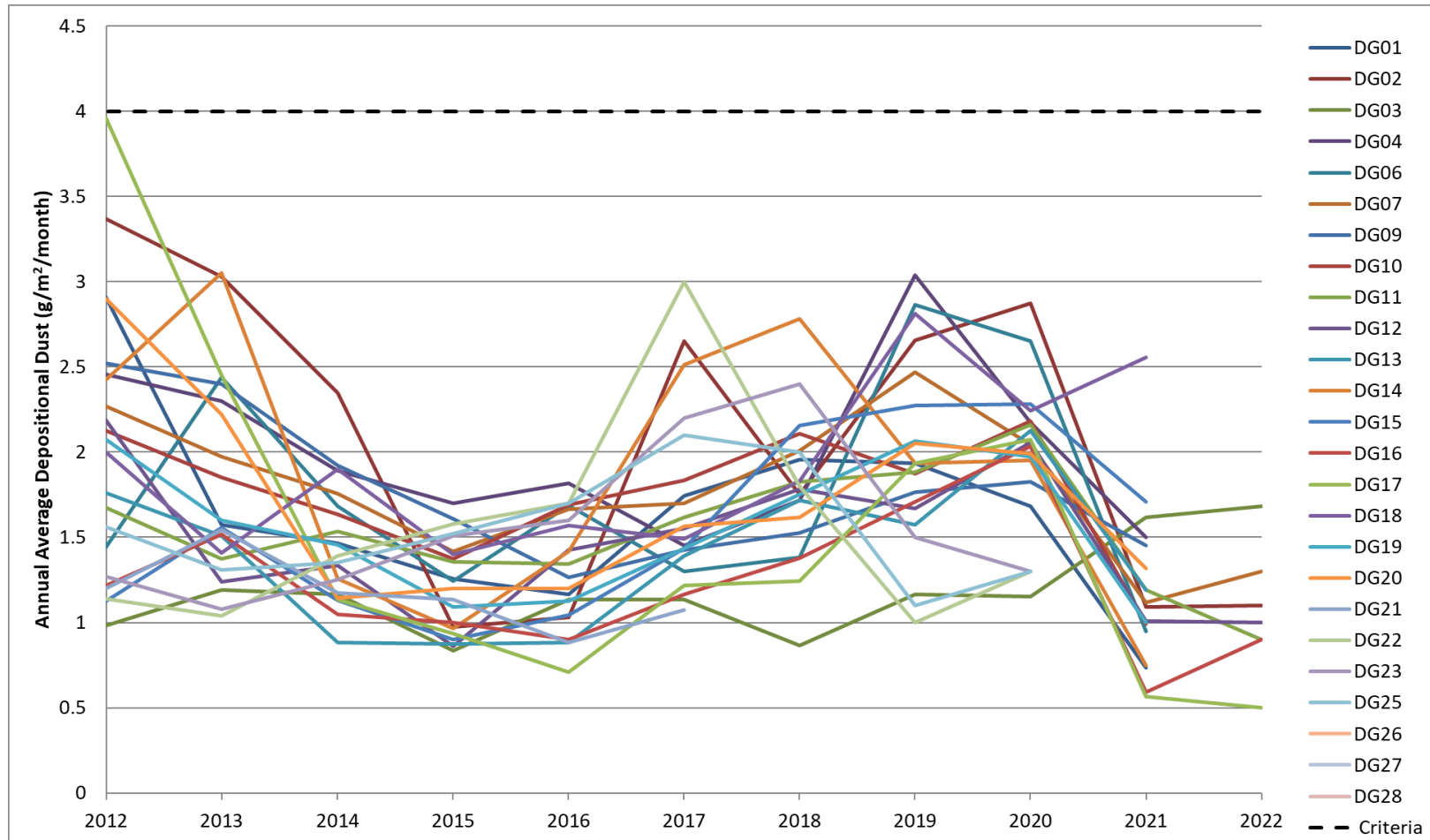


Appendix B - Long Term Trend Graph: Rainfall



Long Term Daily Rainfall Data at WSN/WSN1 – 2010 to 2022

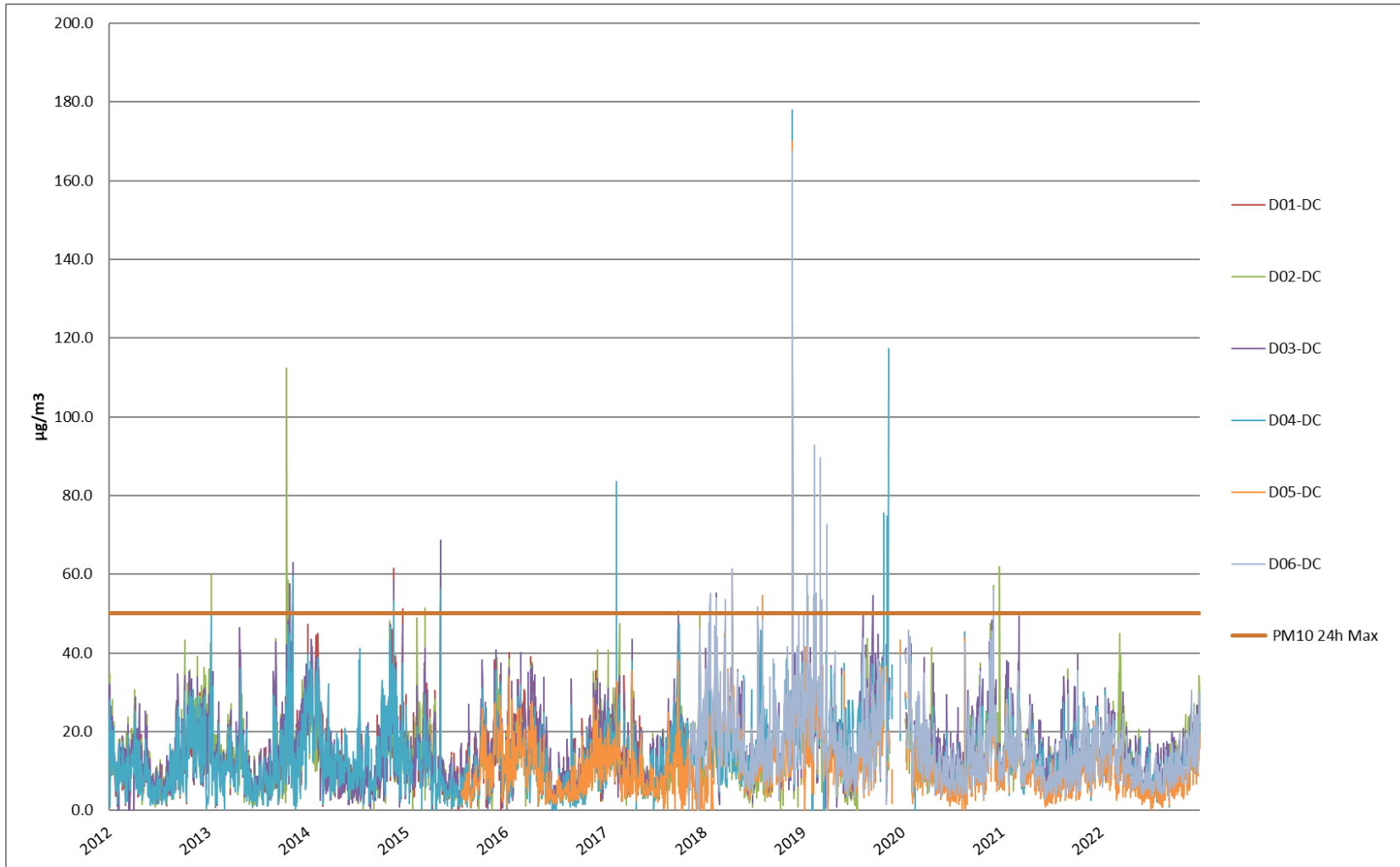
Appendix C - Long Term Trend Graphs: Air Quality



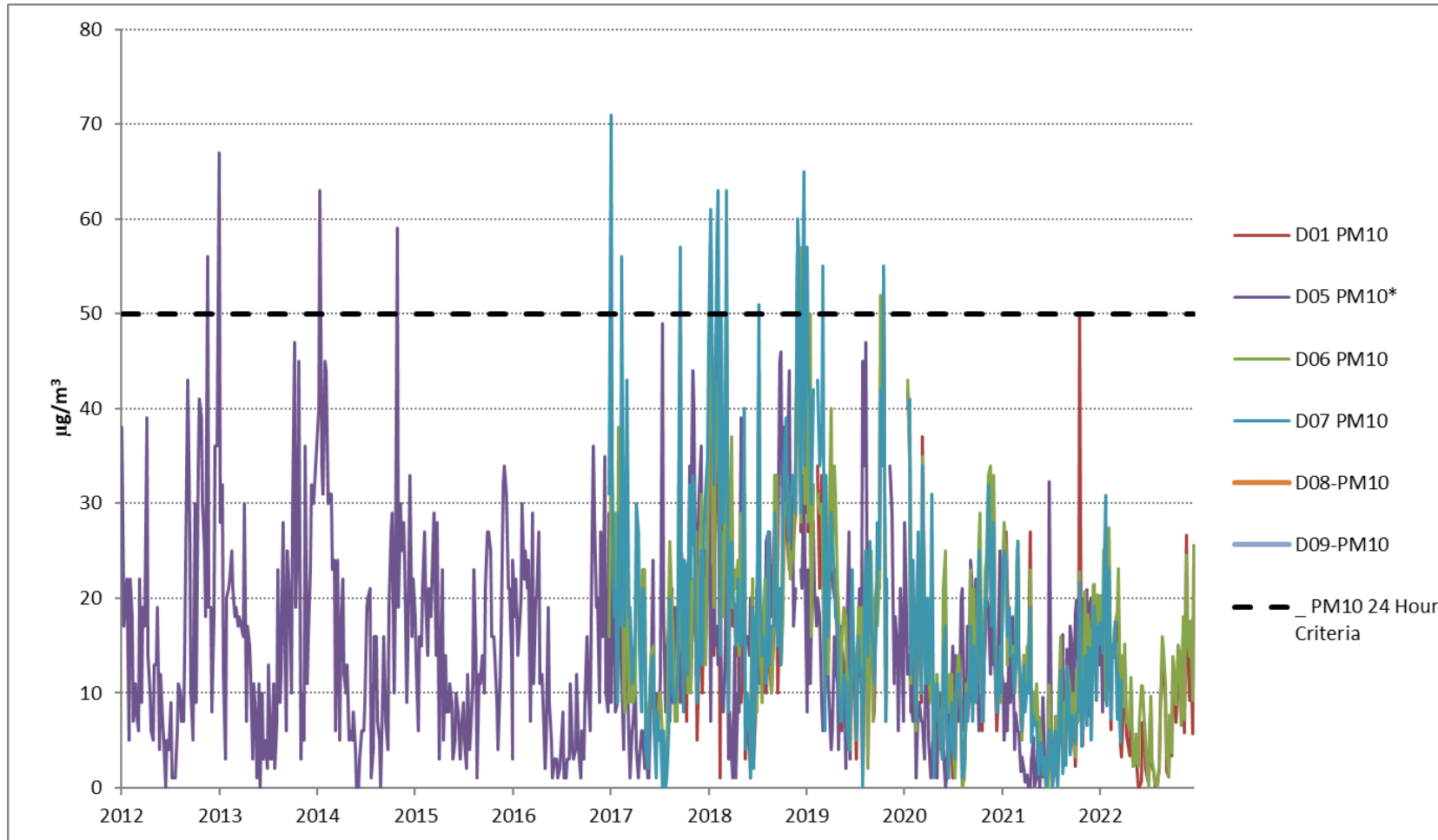
Long Term Annual Average Depositional Dust Monitoring Results – 2012 to 2022



Long Term Annual Average PM10 TEOM Monitoring Results – 2012 to 2022

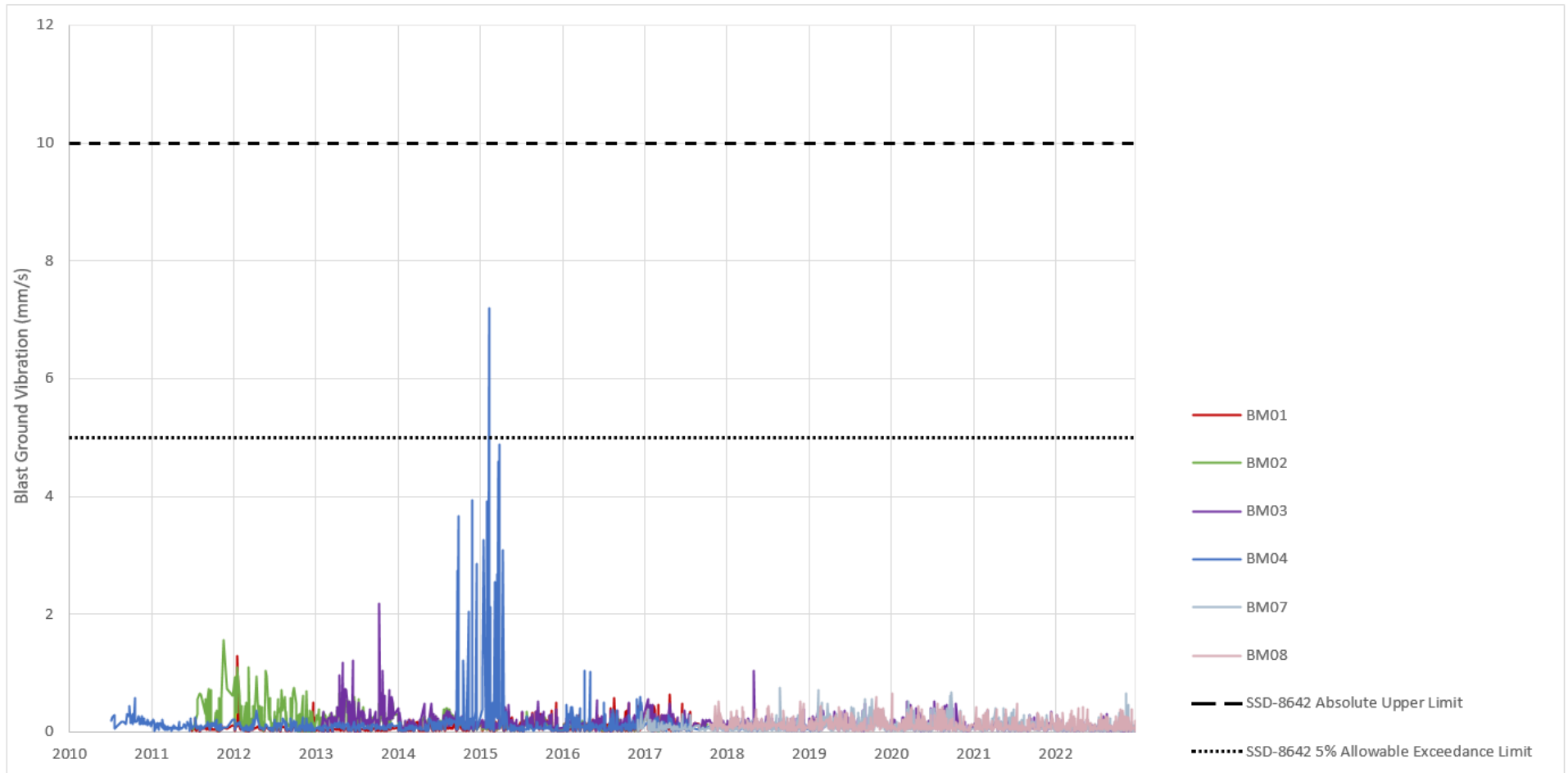


Long Term 24hr PM10 TEOM Monitoring Results – 2012 to 2022

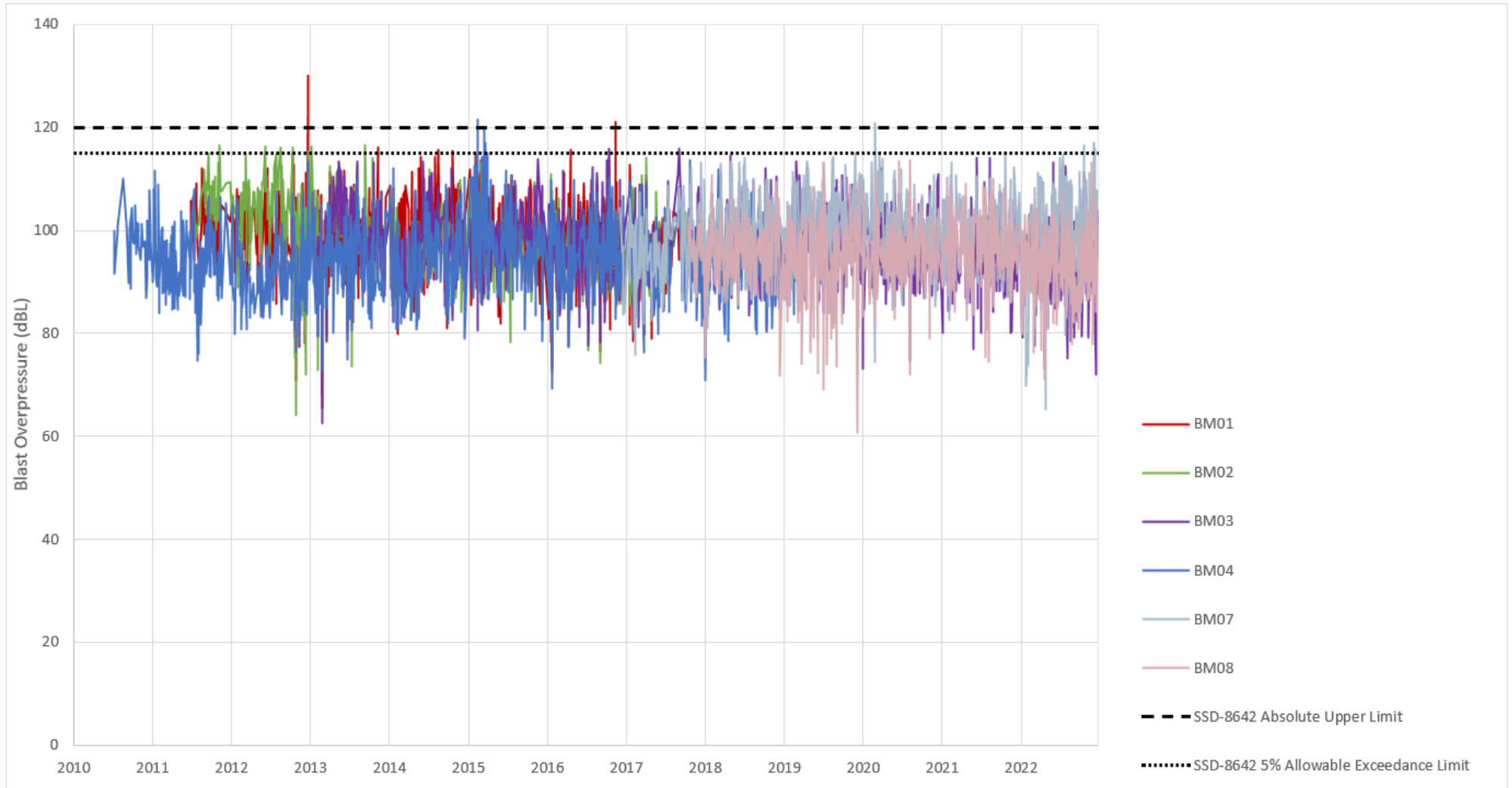


Long Term HVAS Monitoring Results – 2012 to 2022

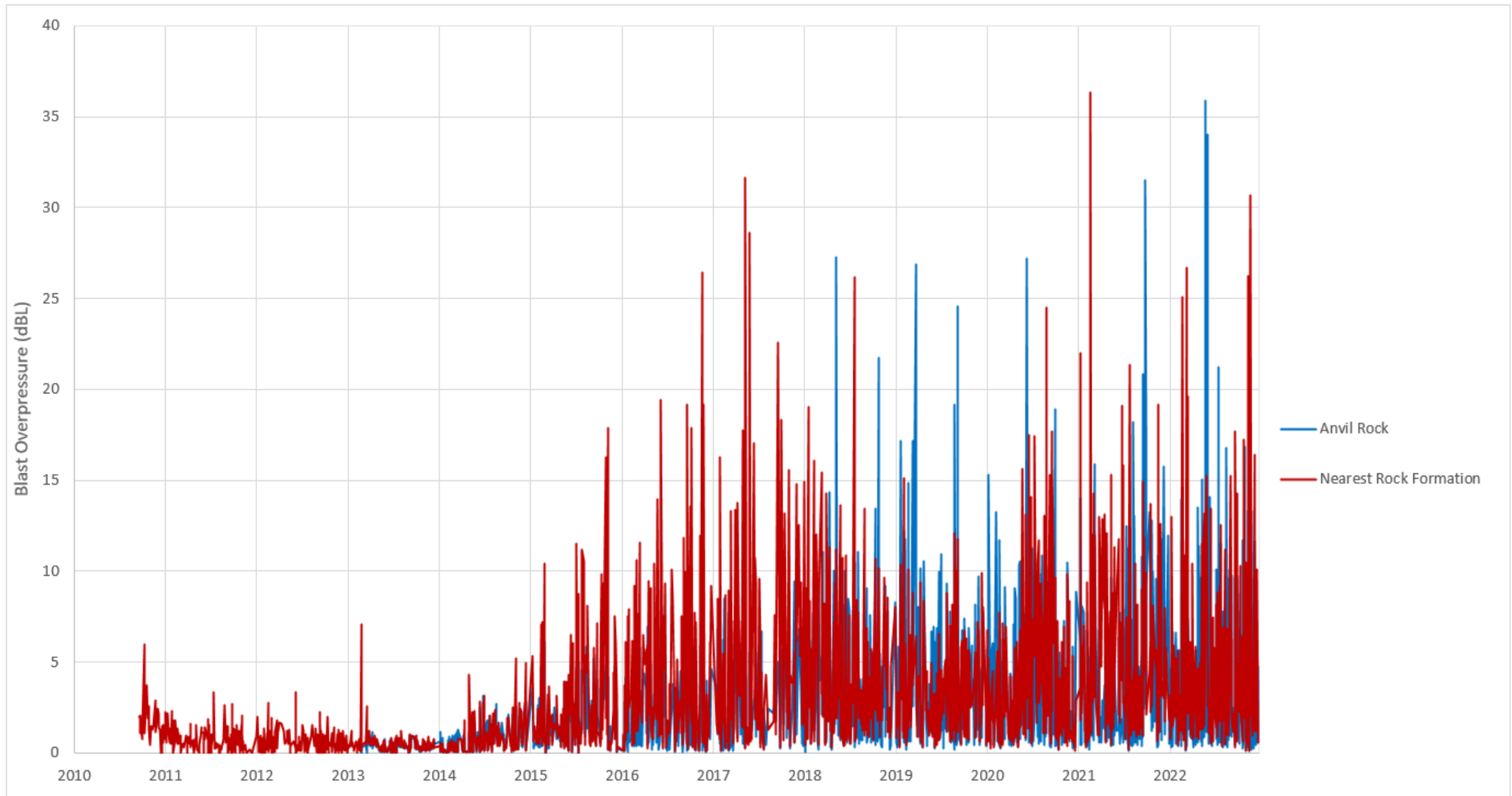
Appendix D - Long Term Trend Graphs: Blasting



Long Term Blast Vibration Monitoring – 2010 to 2022 at BM01 to BM04, BM07 & BM08

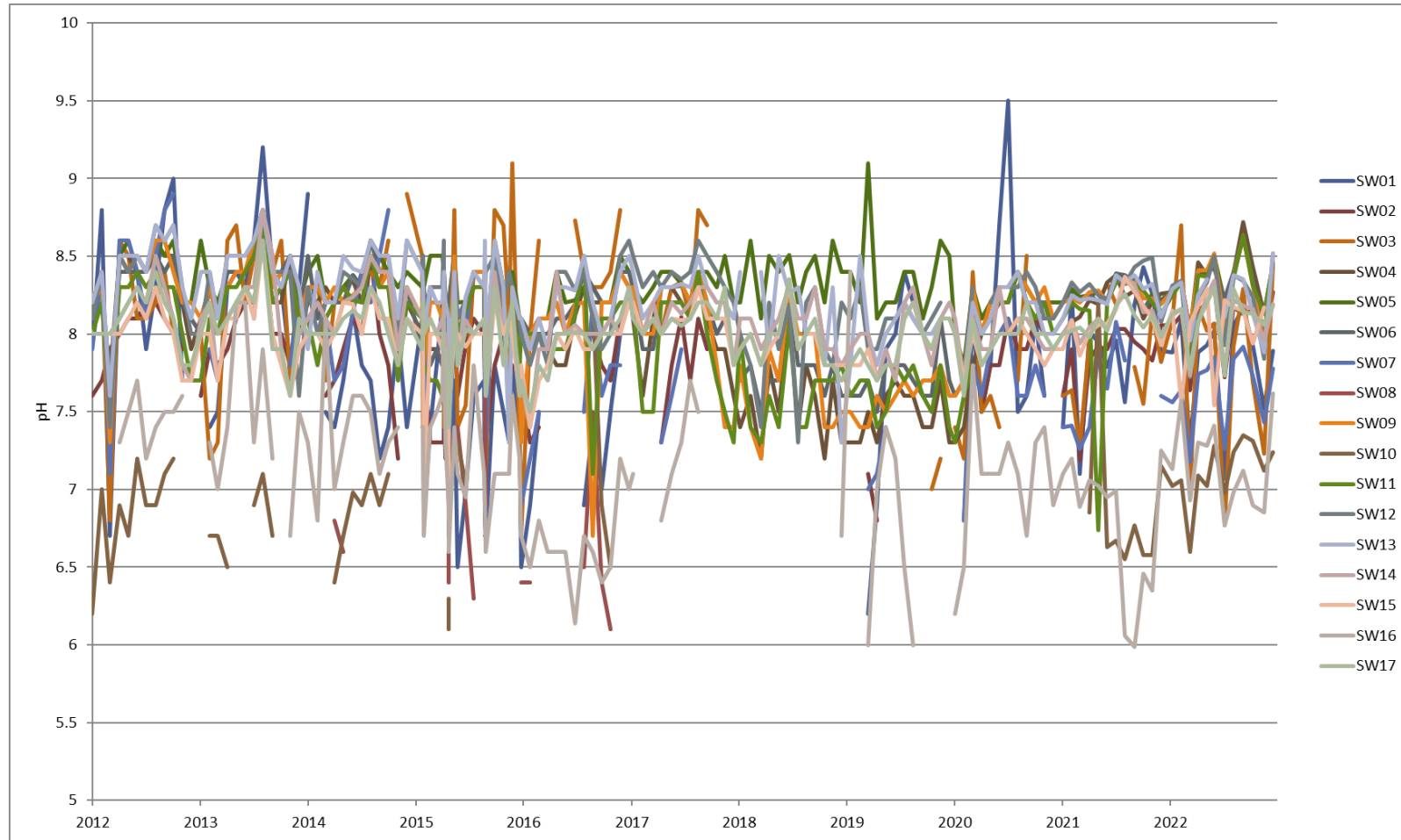


Long Term Blast Overpressure Monitoring – 2010 to 2022 at BM01 to BM04, BM07 & BM08

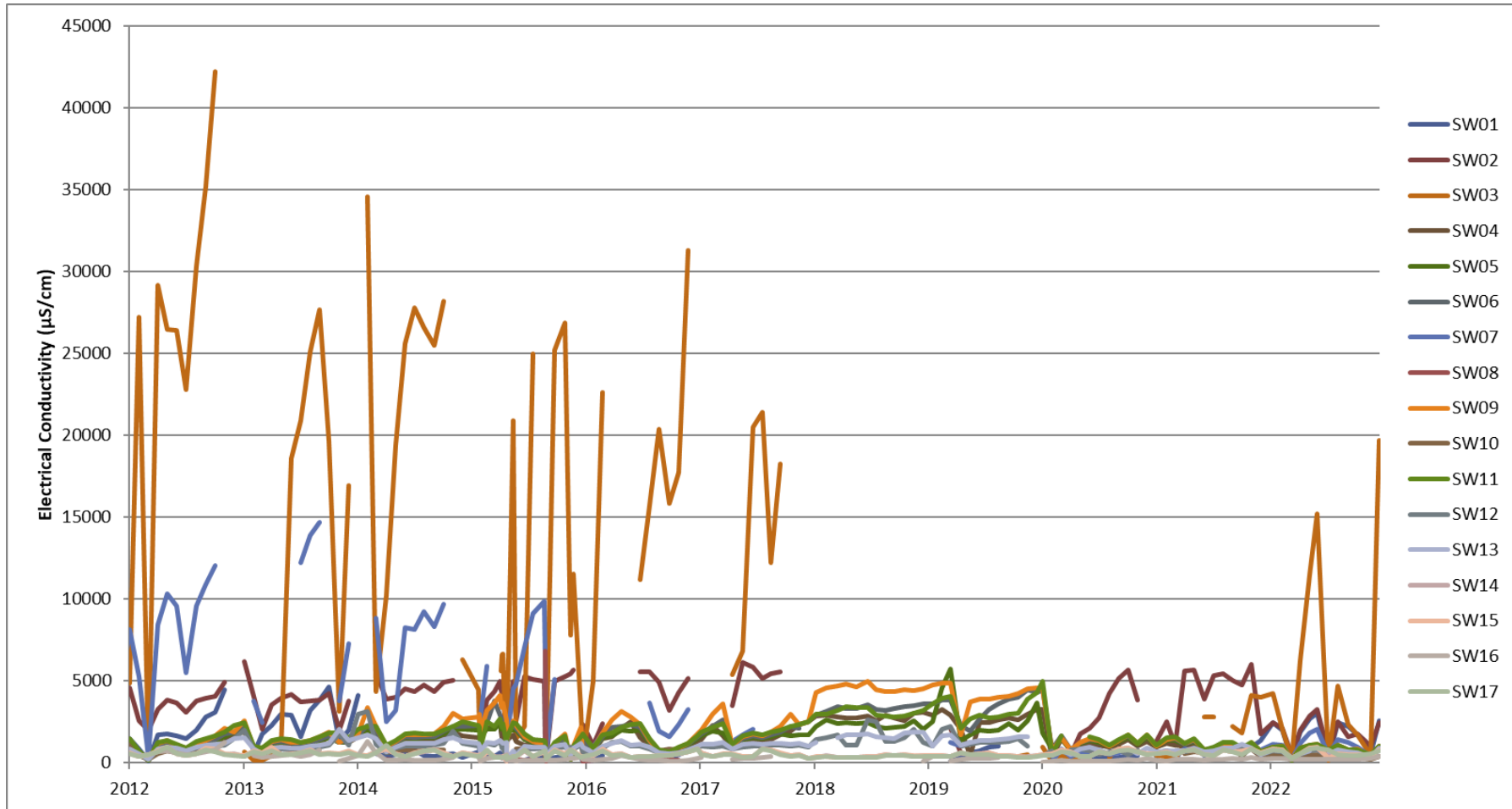


Long Term Blast Vibration Monitoring – 2010 to 2022 at Representative Locations of Anvil Rock and the Nearest Rock Formation

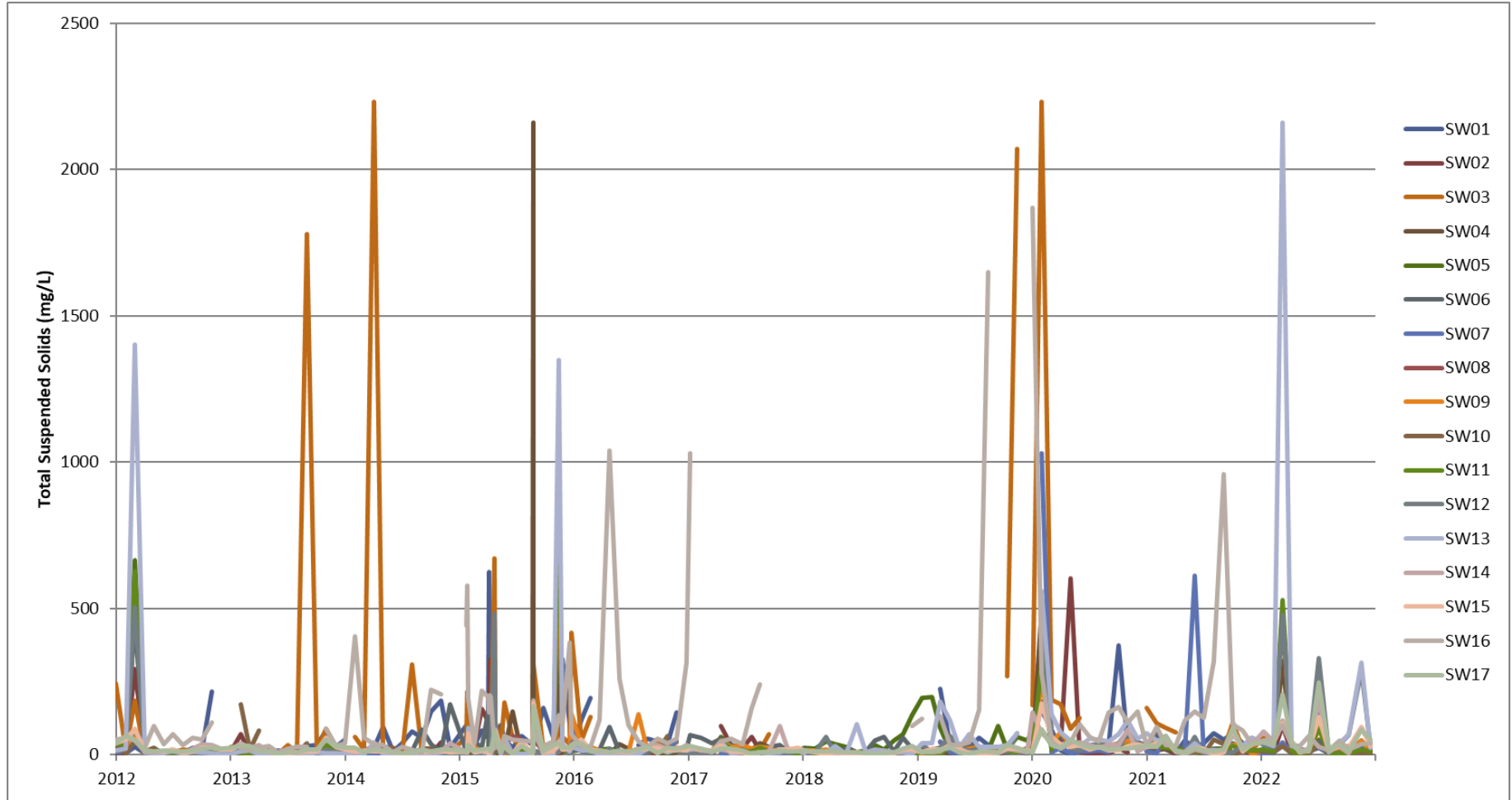
Appendix E - Long Term Trend Graphs: Surface and Groundwater



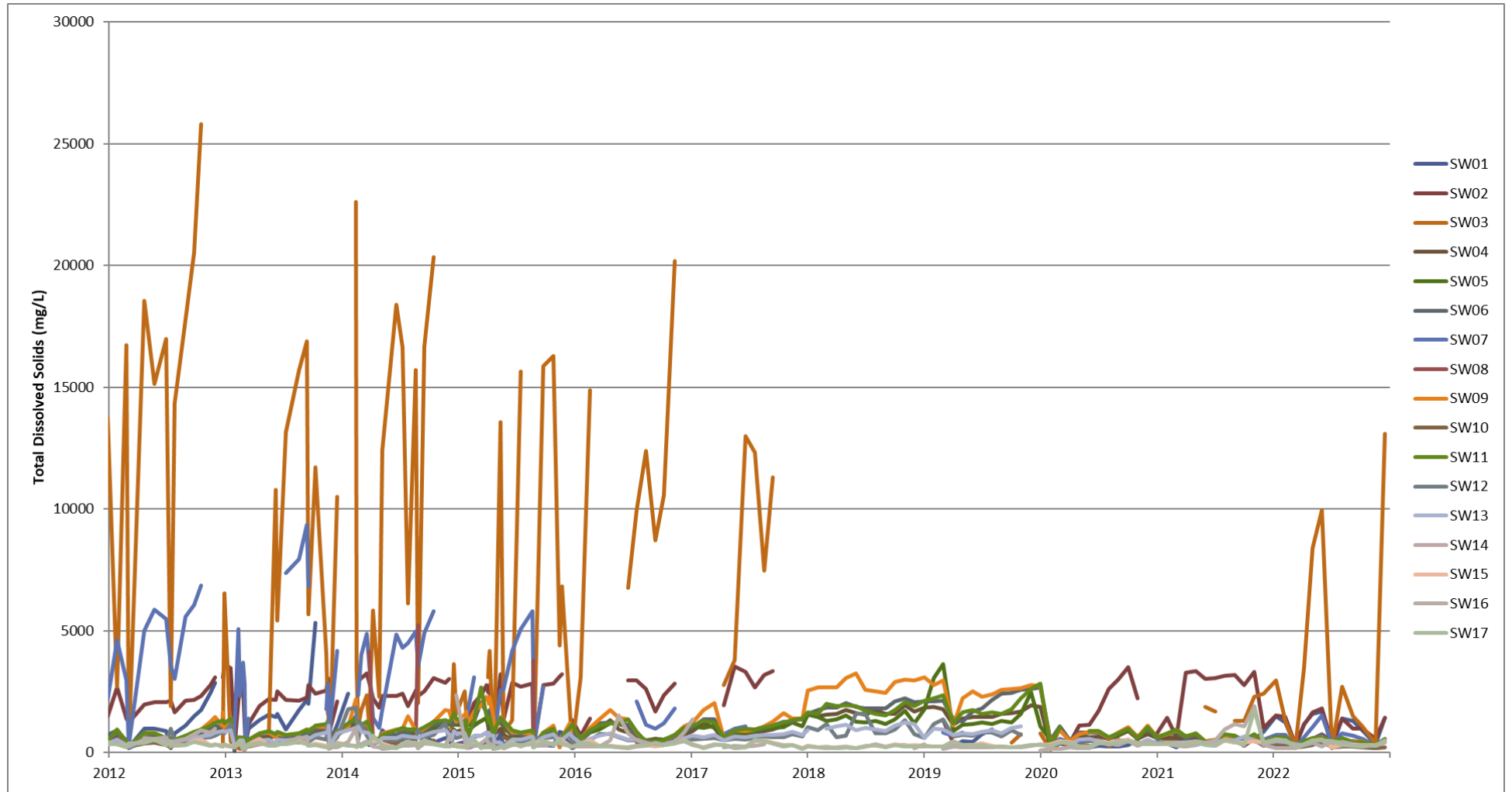
Long Term Surface Water pH Results – 2012 to 2022



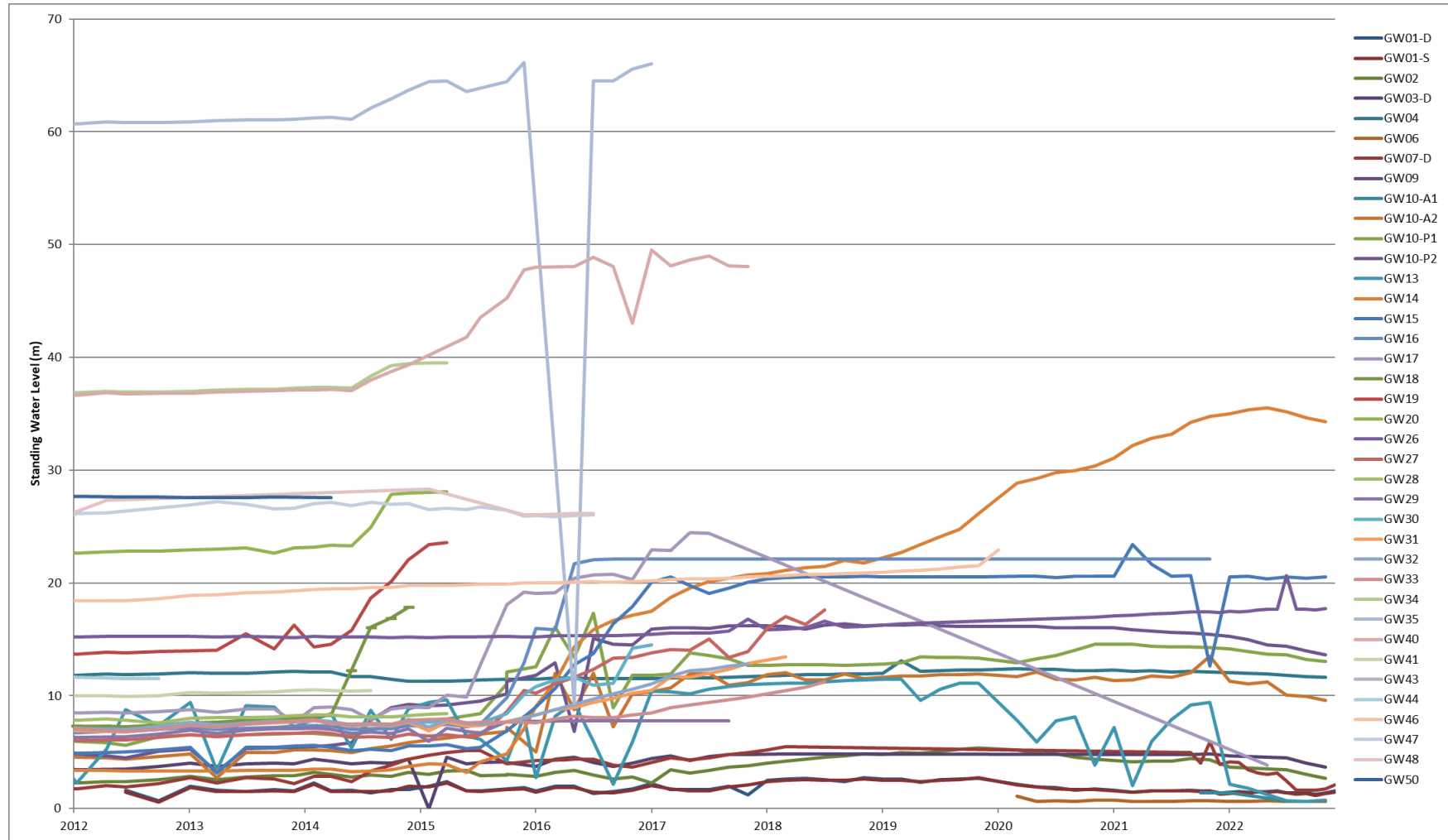
Long Term Surface Water Electrical Conductivity Results – 2012 to 2022



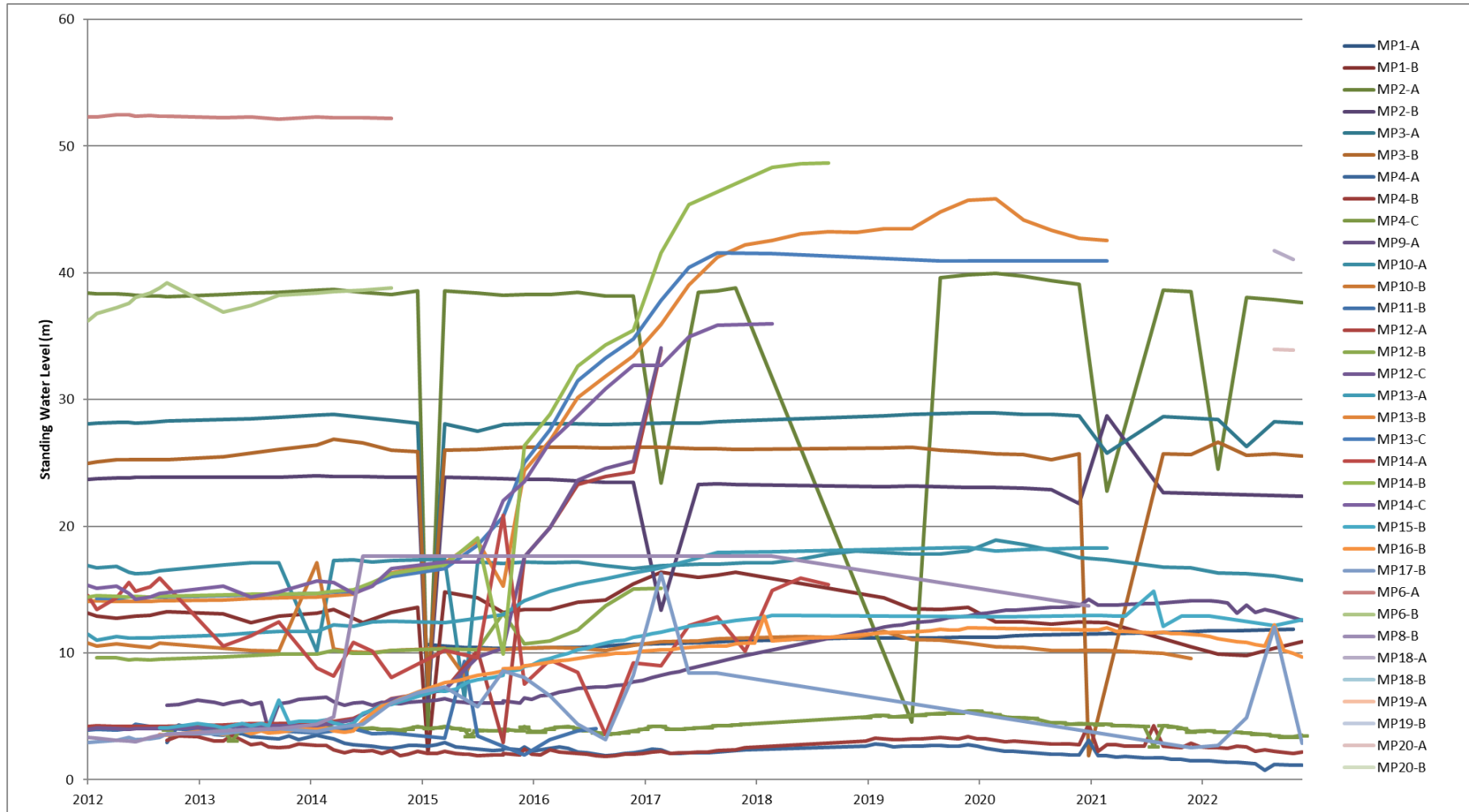
Long Term Surface Water Total Suspended Solids – 2012 to 2022



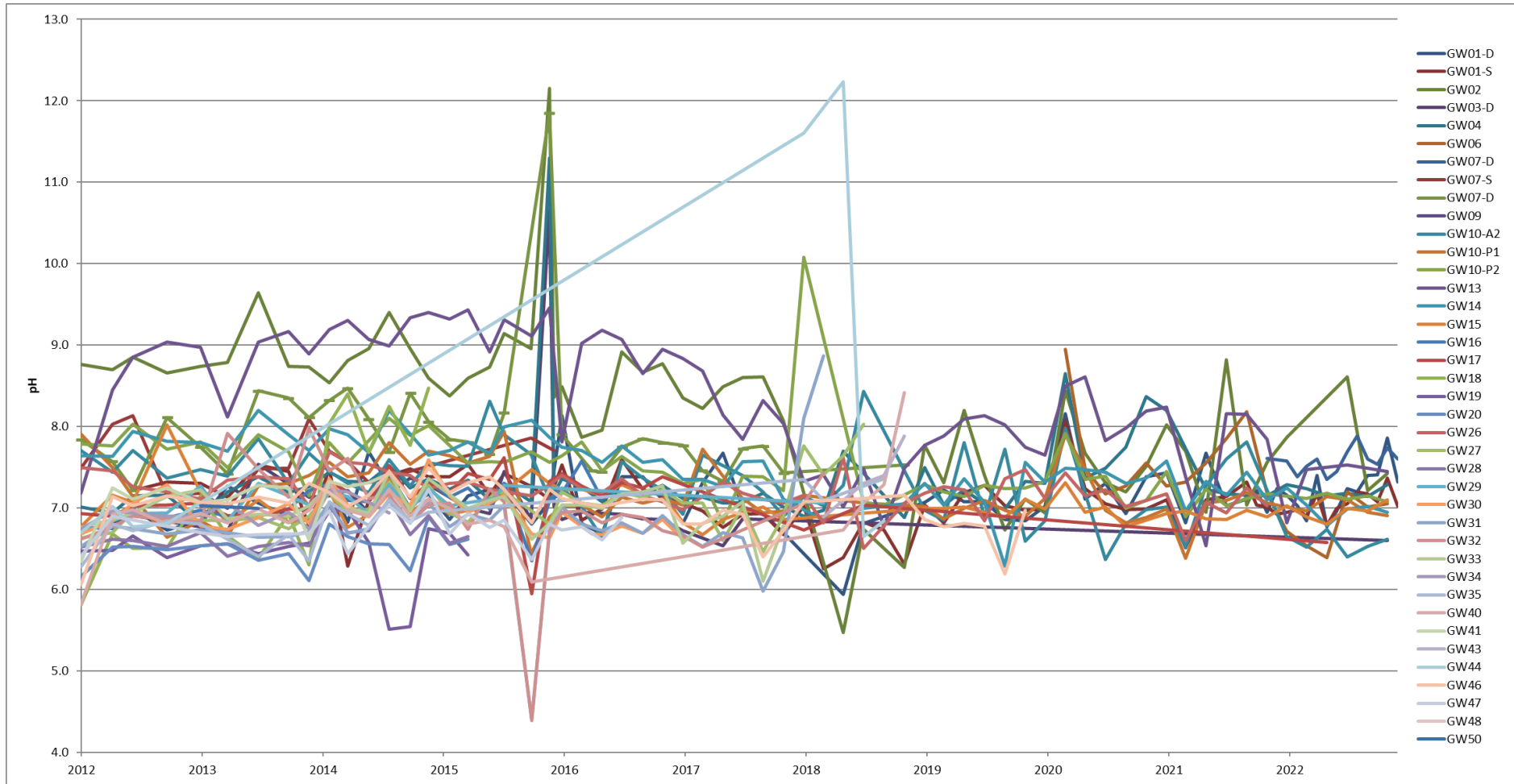
Long Term Surface Water Total Dissolved Solids – 2012 to 2022



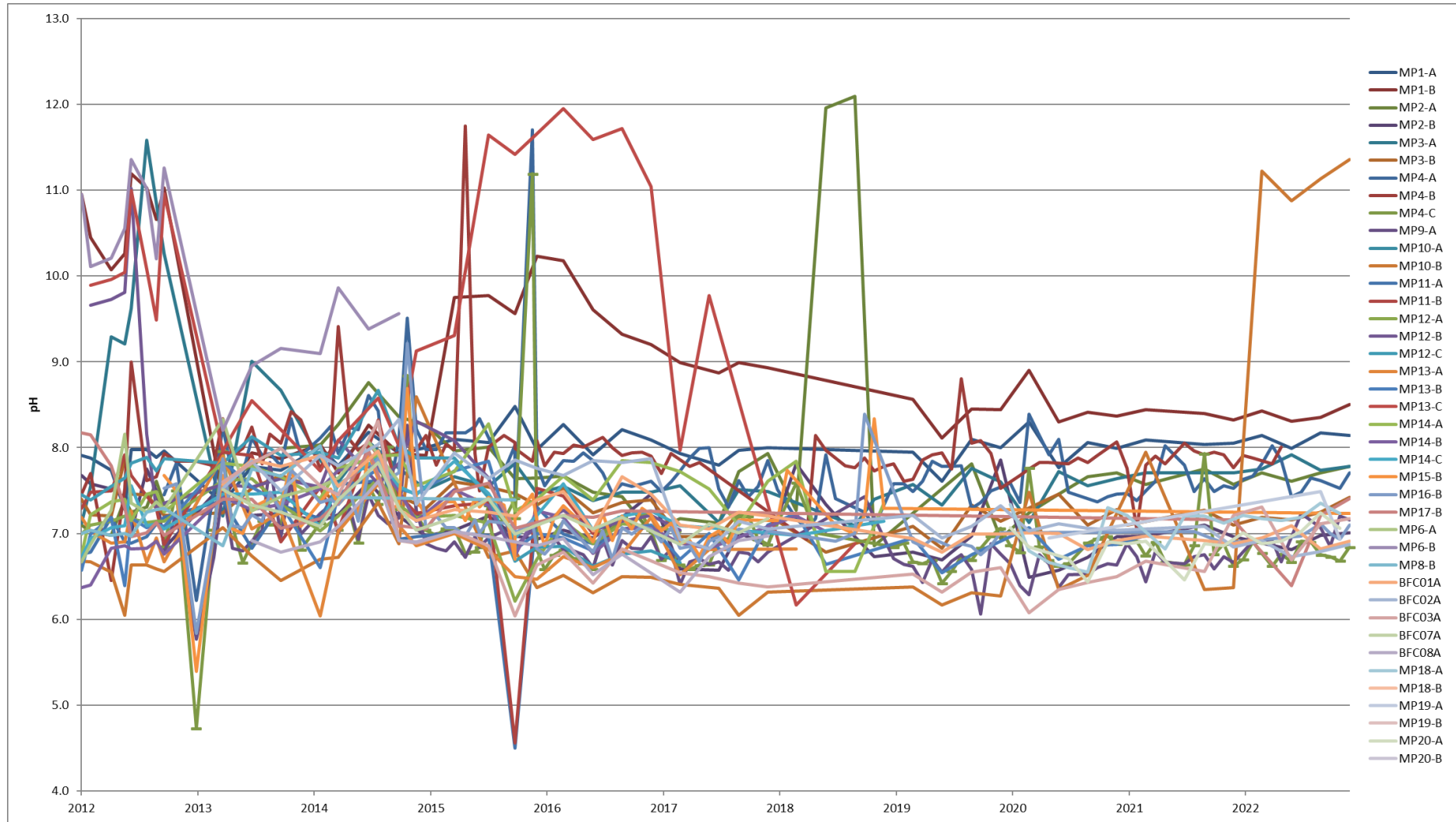
Long Term Groundwater Standing Water Level – 2012 to 2022 (GW-series)



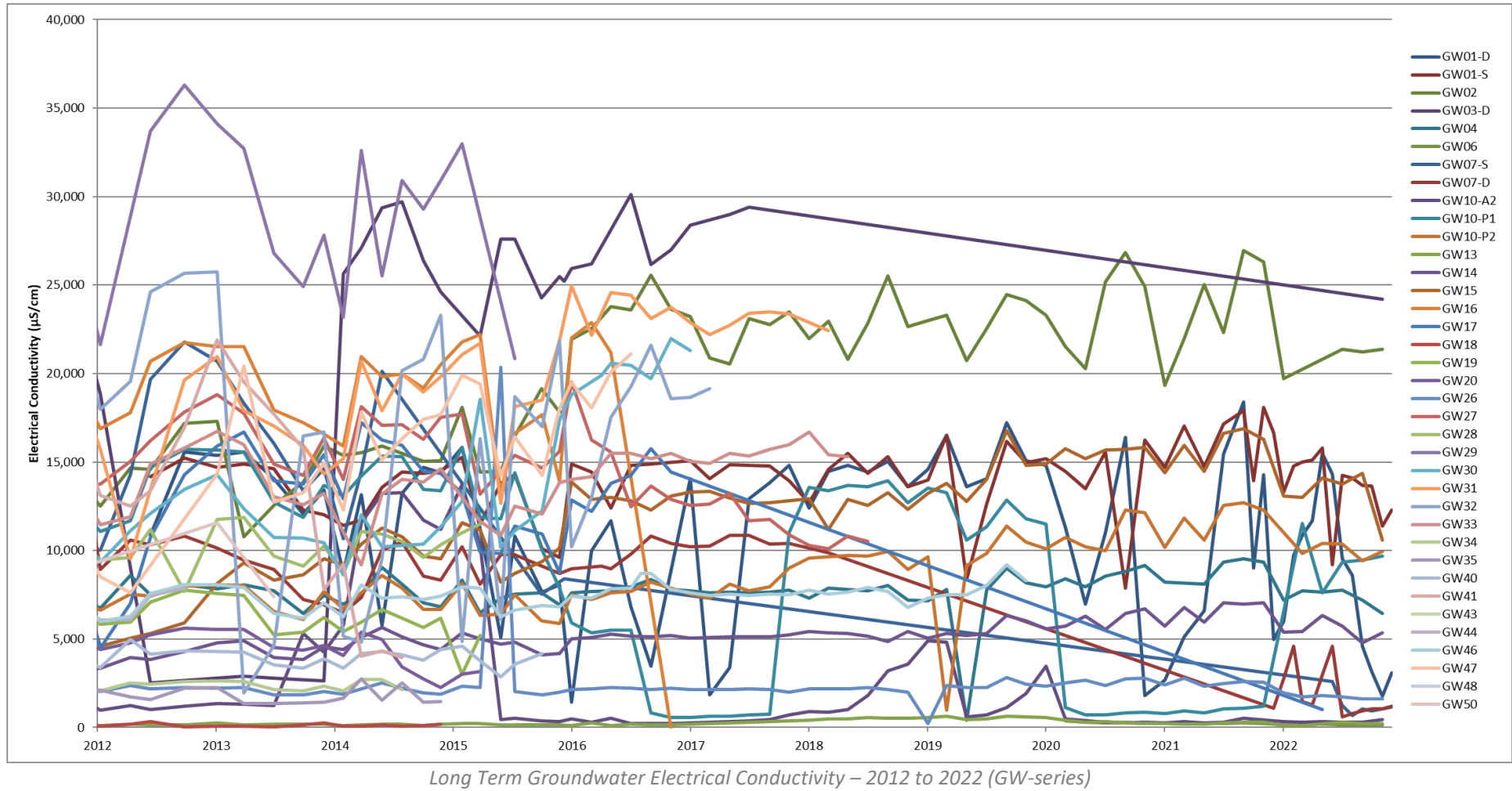
Long Term Groundwater Standing Water Level – 2012 to 2022 (MP and BFC series)

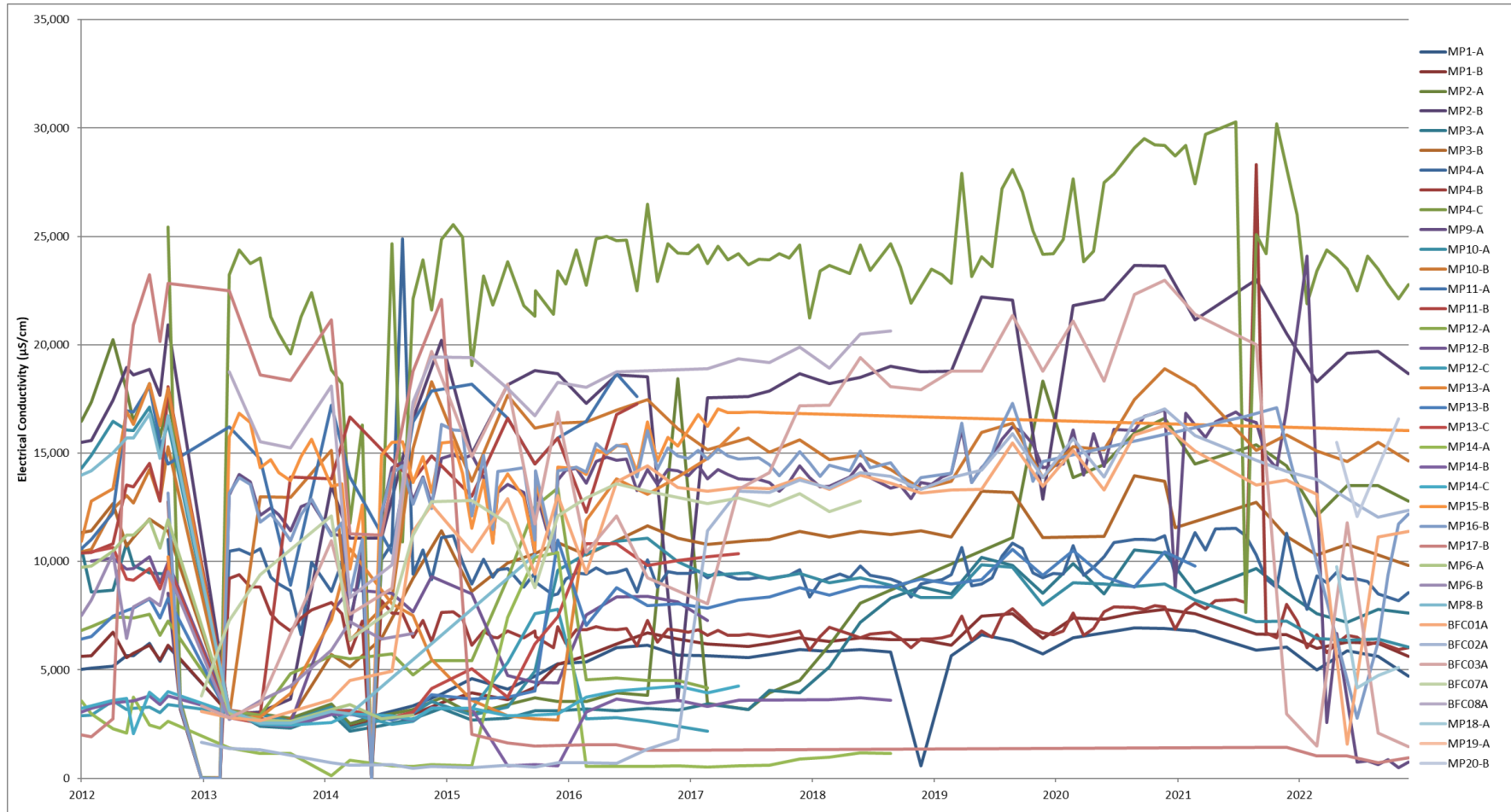


Long Term Groundwater pH – 2012 to 2022 (GW-series)



Long Term Groundwater pH – 2012 to 2022 (MP and BFC series)





Long Term Groundwater Electrical Conductivity – 2012 to 2022 (MP and BFC series)

Appendix F - Annual Train Movements 2022

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
1	01/01/2022 00:12	01/01/2022 02:16	9290
2	01/01/2022 13:41	01/01/2022 16:21	9277
3	04/01/2022 21:24	04/01/2022 23:39	9140
4	05/01/2022 13:50	05/01/2022 15:53	9311
5	05/01/2022 16:16	05/01/2022 18:07	9290
6	06/01/2022 02:31	06/01/2022 05:02	9296
7	06/01/2022 13:15	06/01/2022 15:59	9146
8	07/01/2022 05:10	07/01/2022 08:03	9305
9	08/01/2022 02:09	08/01/2022 06:53	9291
10	08/01/2022 07:12	08/01/2022 09:32	9309
11	09/01/2022 04:11	09/01/2022 06:11	9280
12	11/01/2022 10:48	11/01/2022 13:31	9284
13	11/01/2022 13:59	11/01/2022 15:38	9301
14	12/01/2022 15:51	12/01/2022 18:00	9292
15	12/01/2022 21:49	13/01/2022 00:03	9302
16	13/01/2022 05:00	13/01/2022 08:39	9301
17	14/01/2022 11:53	14/01/2022 13:32	9302
18	14/01/2022 15:00	14/01/2022 17:01	9161
19	16/01/2022 03:35	16/01/2022 05:27	9306

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
01-Jan-22	4	18568
02-Jan-22	0	0
03-Jan-22	0	0
04-Jan-22	2	9140
05-Jan-22	4	18601
06-Jan-22	4	18442
07-Jan-22	2	9305
08-Jan-22	4	18600
09-Jan-22	2	9280
10-Jan-22	0	0
11-Jan-22	4	18585
12-Jan-22	3	9292
13-Jan-22	3	18603
14-Jan-22	4	18463
15-Jan-22	0	0
16-Jan-22	2	9306
17-Jan-22	4	17793
18-Jan-22	4	16960
19-Jan-22	4	18598

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
20	17/01/2022 03:42	17/01/2022 06:10	9308
21	17/01/2022 18:07	17/01/2022 21:11	8485
22	18/01/2022 01:00	18/01/2022 03:07	8479
23	18/01/2022 10:27	18/01/2022 12:40	8481
24	19/01/2022 05:23	19/01/2022 08:02	9311
25	19/01/2022 13:08	19/01/2022 15:45	9286
26	20/01/2022 11:27	20/01/2022 14:09	9132
27	20/01/2022 14:12	20/01/2022 16:17	8405
28	21/01/2022 00:50	21/01/2022 02:47	8510
29	21/01/2022 20:52	21/01/2022 22:48	8491
30	21/01/2022 22:52	22/01/2022 00:55	9268
31	22/01/2022 07:06	22/01/2022 09:32	8486
32	22/01/2022 21:00	22/01/2022 22:53	9294
33	23/01/2022 01:25	23/01/2022 03:24	8491
34	23/01/2022 08:11	23/01/2022 10:53	9234
35	23/01/2022 18:33	23/01/2022 21:04	9152
36	24/01/2022 20:26	24/01/2022 22:18	9266
37	25/01/2022 02:45	25/01/2022 04:40	8484
38	25/01/2022 21:22	25/01/2022 23:20	9296
39	26/01/2022 02:44	26/01/2022 04:49	9228
40	27/01/2022 12:16	27/01/2022 14:26	9111
41	27/01/2022 14:28	27/01/2022 16:55	9271

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
20-Jan-22	4	17536
21-Jan-22	5	17001
22-Jan-22	5	27049
23-Jan-22	6	26878
24-Jan-22	2	9266
25-Jan-22	4	17780
26-Jan-22	2	9228
27-Jan-22	8	36006
28-Jan-22	4	17761
29-Jan-22	7	27031
30-Jan-22	7	37081
31-Jan-22	4	18460
01-Feb-22	4	17706
02-Feb-22	6	27796
03-Feb-22	6	26998
04-Feb-22	2	8500
05-Feb-22	0	0
06-Feb-22	0	0
07-Feb-22	0	0
08-Feb-22	2	9168
09-Feb-22	0	0
10-Feb-22	0	0

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
42	27/01/2022 16:17	27/01/2022 19:57	9151
43	27/01/2022 20:21	27/01/2022 22:14	8472
44	28/01/2022 12:23	28/01/2022 14:21	9263
45	28/01/2022 10:08	28/01/2022 12:12	8498
46	29/01/2022 06:23	29/01/2022 09:04	9285
47	29/01/2022 13:27	29/01/2022 15:24	9270
48	29/01/2022 22:41	30/01/2022 01:28	9273
49	29/01/2022 19:40	29/01/2022 21:48	8475
50	30/01/2022 08:23	30/01/2022 10:59	9302
51	30/01/2022 15:40	30/01/2022 18:09	9268
52	30/01/2022 20:10	30/01/2022 22:06	9238
53	31/01/2022 15:19	31/01/2022 17:22	9304
54	31/01/2022 19:18	31/01/2022 23:34	9156
55	01/02/2022 07:35	01/02/2022 09:39	8477
56	01/02/2022 14:52	01/02/2022 17:20	9229
57	02/02/2022 11:23	02/02/2022 13:19	9209
58	02/02/2022 14:40	02/02/2022 17:13	9277
59	02/02/2022 19:21	02/02/2022 21:48	9310
60	03/02/2022 02:24	03/02/2022 04:34	9295
61	03/02/2022 04:45	03/02/2022 06:59	8484
62	03/02/2022 13:21	03/02/2022 15:45	9219
63	04/02/2022 02:12	04/02/2022 04:27	8500

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
11-Feb-22	2	9126
12-Feb-22	2	9275
13-Feb-22	2	9267
14-Feb-22	2	9147
15-Feb-22	2	9150
16-Feb-22	2	9301
17-Feb-22	4	18445
18-Feb-22	8	36289
19-Feb-22	1	0
20-Feb-22	3	18429
21-Feb-22	1	0
22-Feb-22	5	27076
23-Feb-22	4	16934
24-Feb-22	6	27807
25-Feb-22	4	17759
26-Feb-22	3	9262
27-Feb-22	3	17740
28-Feb-22	3	9243
01-Mar-22	1	8487
02-Mar-22	0	0
03-Mar-22	2	9199
04-Mar-22	5	17793

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
64	08/02/2022 04:11	08/02/2022 05:58	9168
65	11/02/2022 13:10	11/02/2022 15:42	9126
66	12/02/2022 05:00	12/02/2022 08:12	9275
67	13/02/2022 15:16	13/02/2022 17:56	9267
68	14/02/2022 08:19	14/02/2022 10:20	9147
69	15/02/2022 10:38	15/02/2022 13:21	9150
70	16/02/2022 13:53	16/02/2022 16:26	9301
71	17/02/2022 00:43	17/02/2022 02:24	9128
72	17/02/2022 18:20	17/02/2022 23:54	9318
73	18/02/2022 00:27	18/02/2022 04:24	9294
74	18/02/2022 04:27	18/02/2022 06:24	8451
75	18/02/2022 09:01	18/02/2022 10:49	9276
76	18/02/2022 15:40	18/02/2022 17:51	9268
77	19/02/2022 20:37	20/02/2022 00:49	9300
78	20/02/2022 05:50	20/02/2022 08:13	9128
79	21/02/2022 22:28	22/02/2022 00:48	8476
80	22/02/2022 00:58	22/02/2022 03:35	9287
81	22/02/2022 09:21	22/02/2022 11:16	9313
82	23/02/2022 02:12	23/02/2022 04:14	8459
83	23/02/2022 14:23	23/02/2022 16:31	8475
84	24/02/2022 07:36	24/02/2022 09:38	9233
85	24/02/2022 15:01	24/02/2022 17:14	9277

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
05-Mar-22	3	17745
06-Mar-22	3	9227
07-Mar-22	5	26895
08-Mar-22	2	9201
09-Mar-22	3	9267
10-Mar-22	3	17774
11-Mar-22	4	17601
12-Mar-22	2	9301
13-Mar-22	5	18434
14-Mar-22	3	17746
15-Mar-22	8	36312
16-Mar-22	11	46151
17-Mar-22	7	36318
18-Mar-22	2	9240
19-Mar-22	0	0
20-Mar-22	2	9276
21-Mar-22	4	18580
22-Mar-22	6	27774
23-Mar-22	0	0
24-Mar-22	7	27825
25-Mar-22	5	27777
26-Mar-22	9	37155

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
86	24/02/2022 20:01	24/02/2022 21:51	9296
87	25/02/2022 05:55	25/02/2022 08:11	9273
88	25/02/2022 09:24	25/02/2022 11:19	8486
89	26/02/2022 13:15	26/02/2022 15:52	9262
90	26/02/2022 22:26	27/02/2022 00:29	8490
91	27/02/2022 09:57	27/02/2022 12:03	9250
92	28/02/2022 09:03	28/02/2022 11:34	9243
93	28/02/2022 23:51	01/03/2022 01:42	8487
94	03/03/2022 17:51	03/03/2022 19:56	9199
95	04/03/2022 16:51	04/03/2022 20:41	9311
96	04/03/2022 20:52	04/03/2022 22:50	8482
97	04/03/2022 23:32	05/03/2022 01:53	9266
98	05/03/2022 02:31	05/03/2022 04:14	8479
99	06/03/2022 08:06	06/03/2022 10:40	9227
100	06/03/2022 23:47	07/03/2022 01:58	9153
101	07/03/2022 02:15	07/03/2022 04:16	8450
102	07/03/2022 19:51	07/03/2022 22:18	9291
103	08/03/2022 00:00	08/03/2022 03:02	9201
104	09/03/2022 14:34	09/03/2022 17:46	9267
105	09/03/2022 21:05	10/03/2022 00:09	9292
106	10/03/2022 16:52	10/03/2022 18:59	8481
107	11/03/2022 04:56	11/03/2022 07:54	8463

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
27-Mar-22	11	55792
28-Mar-22	4	17788
29-Mar-22	1	0
30-Mar-22	3	17773
31-Mar-22	0	0
01-Apr-22	0	0
02-Apr-22	0	0
03-Apr-22	0	0
04-Apr-22	0	0
05-Apr-22	0	0
06-Apr-22	0	0
07-Apr-22	2	9280
08-Apr-22	5	18498
09-Apr-22	1	9159
10-Apr-22	0	0
11-Apr-22	2	8475
12-Apr-22	2	9245
13-Apr-22	2	8484
14-Apr-22	5	17789
15-Apr-22	5	27083
16-Apr-22	1	0
17-Apr-22	5	26304

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
108	11/03/2022 16:04	11/03/2022 18:15	9139
109	12/03/2022 11:45	12/03/2022 14:01	9301
110	13/03/2022 08:21	13/03/2022 10:15	9320
111	13/03/2022 13:58	13/03/2022 16:51	9113
112	13/03/2022 23:58	14/03/2022 01:51	9282
113	14/03/2022 21:36	14/03/2022 23:49	8464
114	15/03/2022 00:55	15/03/2022 03:48	9274
115	15/03/2022 07:13	15/03/2022 09:46	8482
116	15/03/2022 11:41	15/03/2022 13:57	9285
117	15/03/2022 14:00	15/03/2022 17:36	9270
118	16/03/2022 00:12	16/03/2022 02:03	9305
119	16/03/2022 04:15	16/03/2022 06:18	9173
120	16/03/2022 12:24	16/03/2022 14:20	9270
121	16/03/2022 14:24	16/03/2022 16:37	9103
122	16/03/2022 19:06	16/03/2022 21:31	9301
123	16/03/2022 23:20	17/03/2022 01:03	8492
124	17/03/2022 00:37	17/03/2022 03:13	9316
125	17/03/2022 07:40	17/03/2022 10:02	9236
126	17/03/2022 10:11	17/03/2022 13:04	9275
127	18/03/2022 12:15	18/03/2022 14:43	9240
128	20/03/2022 19:45	20/03/2022 21:34	9276
129	21/03/2022 12:48	21/03/2022 14:31	9287

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
18-Apr-22	4	17660
19-Apr-22	2	8524
20-Apr-22	4	18506
21-Apr-22	2	8502
22-Apr-22	2	9267
23-Apr-22	4	17016
24-Apr-22	2	9259
25-Apr-22	4	18394
26-Apr-22	6	26289
27-Apr-22	0	0
28-Apr-22	2	9260
29-Apr-22	4	17751
30-Apr-22	0	0
01-May-22	2	9257
02-May-22	3	9323
03-May-22	3	18441
04-May-22	2	9316
05-May-22	7	26312
06-May-22	5	27164
07-May-22	3	8515
08-May-22	5	27156
09-May-22	6	27088

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
130	21/03/2022 18:15	21/03/2022 20:39	9294
131	22/03/2022 00:06	22/03/2022 02:16	9252
132	22/03/2022 02:12	22/03/2022 05:13	9259
133	22/03/2022 09:56	22/03/2022 12:19	9263
134	24/03/2022 04:05	24/03/2022 06:07	9311
135	24/03/2022 12:22	24/03/2022 14:57	9260
136	24/03/2022 15:03	24/03/2022 17:37	9254
137	24/03/2022 21:21	25/03/2022 00:48	9264
138	25/03/2022 04:19	25/03/2022 08:09	9284
139	25/03/2022 09:38	25/03/2022 14:02	9230
140	26/03/2022 04:12	26/03/2022 06:08	9264
141	26/03/2022 09:02	26/03/2022 10:48	9304
142	26/03/2022 12:58	26/03/2022 15:33	9280
143	26/03/2022 19:52	26/03/2022 22:05	9306
144	26/03/2022 23:39	27/03/2022 02:28	9325
145	27/03/2022 02:44	27/03/2022 04:40	9302
146	27/03/2022 09:59	27/03/2022 12:46	9273
147	27/03/2022 12:51	27/03/2022 15:34	9297
148	27/03/2022 15:38	27/03/2022 18:14	9306
149	27/03/2022 18:53	27/03/2022 21:28	9289
150	28/03/2022 05:04	28/03/2022 07:25	8494
151	28/03/2022 08:17	28/03/2022 11:57	9293

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
10-May-22	3	9232
11-May-22	5	27813
12-May-22	5	18530
13-May-22	3	18443
14-May-22	11	46171
15-May-22	7	37184
16-May-22	0	0
17-May-22	6	27146
18-May-22	6	26289
19-May-22	2	9145
20-May-22	5	16826
21-May-22	3	17661
22-May-22	4	17864
23-May-22	4	18647
24-May-22	2	9299
25-May-22	0	0
26-May-22	1	0
27-May-22	3	14926
28-May-22	0	0
29-May-22	0	0
30-May-22	1	0
31-May-22	1	9327

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
152	29/03/2022 21:58	30/03/2022 00:18	9281
153	30/03/2022 00:20	30/03/2022 02:30	8492
154	07/04/2022 20:30	07/04/2022 23:02	9280
155	08/04/2022 07:30	08/04/2022 11:03	9326
156	08/04/2022 14:22	08/04/2022 16:20	9172
157	08/04/2022 23:13	09/04/2022 01:16	9159
158	11/04/2022 15:10	11/04/2022 17:02	8475
159	12/04/2022 17:25	12/04/2022 21:10	9245
160	13/04/2022 17:30	13/04/2022 19:29	8484
161	14/04/2022 15:06	14/04/2022 17:01	8488
162	14/04/2022 21:26	14/04/2022 23:45	9301
163	14/04/2022 23:23	15/04/2022 02:40	9300
164	15/04/2022 10:38	15/04/2022 12:58	8485
165	15/04/2022 16:42	15/04/2022 18:48	9298
166	16/04/2022 23:49	17/04/2022 01:57	8499
167	17/04/2022 08:20	17/04/2022 10:19	9306
168	17/04/2022 10:22	17/04/2022 12:42	8499
169	18/04/2022 12:29	18/04/2022 15:14	9158
170	18/04/2022 14:30	18/04/2022 17:31	8502
171	19/04/2022 00:32	19/04/2022 02:30	8524
172	20/04/2022 00:51	20/04/2022 02:39	9260
173	20/04/2022 06:50	20/04/2022 08:55	9245

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
01-Jun-22	3	9192
02-Jun-22	6	17789
03-Jun-22	7	32040
04-Jun-22	4	17815
05-Jun-22	6	21934
06-Jun-22	6	17067
07-Jun-22	8	31815
08-Jun-22	4	17814
09-Jun-22	4	12768
10-Jun-22	4	13562
11-Jun-22	6	27827
12-Jun-22	4	18450
13-Jun-22	2	9127
14-Jun-22	4	12783
15-Jun-22	2	9308
16-Jun-22	8	32147
17-Jun-22	4	8534
18-Jun-22	7	22683
19-Jun-22	3	8525
20-Jun-22	6	17832
21-Jun-22	3	4265
22-Jun-22	7	32194

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
174	21/04/2022 21:27	21/04/2022 23:25	8502
175	22/04/2022 21:08	22/04/2022 23:12	9267
176	23/04/2022 07:26	23/04/2022 09:17	8511
177	23/04/2022 20:53	23/04/2022 22:53	8505
178	24/04/2022 06:46	24/04/2022 09:19	9259
179	25/04/2022 05:02	25/04/2022 07:32	9106
180	25/04/2022 10:15	25/04/2022 13:50	9289
181	26/04/2022 00:32	26/04/2022 02:22	8496
182	26/04/2022 13:26	26/04/2022 15:12	9292
183	26/04/2022 09:32	26/04/2022 11:31	8501
184	28/04/2022 09:22	28/04/2022 11:21	9260
185	29/04/2022 00:26	29/04/2022 03:25	9280
186	29/04/2022 13:29	29/04/2022 15:22	8471
187	01/05/2022 11:23	01/05/2022 14:00	9257
188	02/05/2022 19:37	02/05/2022 21:56	9323
189	02/05/2022 23:39	03/05/2022 02:35	9141
190	03/05/2022 19:42	03/05/2022 21:49	9300
191	04/05/2022 20:18	04/05/2022 22:14	9316
192	05/05/2022 01:25	05/05/2022 03:37	8514
193	05/05/2022 06:20	05/05/2022 09:55	8493
194	05/05/2022 19:34	05/05/2022 22:34	9305
195	05/05/2022 22:43	06/05/2022 00:38	9322

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
23-Jun-22	6	17697
24-Jun-22	4	8523
25-Jun-22	2	4256
26-Jun-22	4	13411
27-Jun-22	7	17620
28-Jun-22	7	32078
29-Jun-22	4	13541
30-Jun-22	4	12745
01-Jul-22	5	12751
02-Jul-22	4	8515
03-Jul-22	10	41098
04-Jul-22	5	17774
05-Jul-22	1	0
06-Jul-22	0	0
07-Jul-22	1	4254
08-Jul-22	2	9245
09-Jul-22	4	17729
10-Jul-22	4	18514
11-Jul-22	4	17753
12-Jul-22	0	0
13-Jul-22	0	0
14-Jul-22	4	17006

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
196	06/05/2022 10:17	06/05/2022 12:07	8517
197	06/05/2022 11:58	06/05/2022 15:27	9325
198	07/05/2022 18:14	07/05/2022 21:12	8515
199	07/05/2022 23:01	08/05/2022 01:46	9301
200	08/05/2022 06:02	08/05/2022 08:55	9338
201	08/05/2022 10:38	08/05/2022 12:45	8517
202	09/05/2022 01:53	09/05/2022 04:31	9292
203	09/05/2022 05:42	09/05/2022 09:19	8496
204	09/05/2022 19:38	09/05/2022 21:40	9300
205	10/05/2022 15:06	10/05/2022 17:14	9232
206	10/05/2022 22:57	11/05/2022 00:51	9297
207	11/05/2022 12:13	11/05/2022 14:19	9258
208	11/05/2022 21:19	11/05/2022 23:16	9258
209	12/05/2022 11:44	12/05/2022 13:52	9277
210	12/05/2022 20:56	12/05/2022 23:00	9253
211	12/05/2022 22:23	13/05/2022 01:33	9170
212	13/05/2022 05:11	13/05/2022 07:23	9273
213	14/05/2022 00:20	14/05/2022 02:25	9216
214	14/05/2022 02:34	14/05/2022 04:20	9332
215	14/05/2022 09:24	14/05/2022 11:18	9270
216	14/05/2022 12:54	14/05/2022 14:55	9208
217	14/05/2022 18:08	14/05/2022 19:56	9145

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
15-Jul-22	3	9243
16-Jul-22	6	17797
17-Jul-22	5	12792
18-Jul-22	2	4264
19-Jul-22	2	9308
20-Jul-22	4	8530
21-Jul-22	2	4267
22-Jul-22	2	4260
23-Jul-22	2	9286
24-Jul-22	2	9122
25-Jul-22	1	0
26-Jul-22	8	32726
27-Jul-22	7	36969
28-Jul-22	7	27630
29-Jul-22	9	45977
30-Jul-22	11	45394
31-Jul-22	4	18644
01-Aug-22	3	17808
02-Aug-22	1	0
03-Aug-22	7	17022
04-Aug-22	2	4264
05-Aug-22	8	31180

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
218	14/05/2022 23:32	15/05/2022 01:13	9298
219	15/05/2022 10:45	15/05/2022 12:35	9296
220	15/05/2022 14:15	15/05/2022 15:59	9292
221	15/05/2022 19:15	15/05/2022 21:30	9298
222	17/05/2022 01:41	17/05/2022 03:45	8515
223	17/05/2022 08:10	17/05/2022 10:58	9319
224	17/05/2022 15:40	17/05/2022 19:08	9311
225	18/05/2022 00:05	18/05/2022 02:09	8504
226	18/05/2022 11:03	18/05/2022 12:57	8481
227	18/05/2022 20:05	18/05/2022 23:25	9304
228	19/05/2022 20:51	19/05/2022 23:33	9145
229	20/05/2022 00:10	20/05/2022 02:15	8317
230	20/05/2022 06:51	20/05/2022 09:23	8509
231	20/05/2022 23:09	21/05/2022 01:06	9152
232	21/05/2022 10:09	21/05/2022 12:33	8508
233	22/05/2022 11:57	22/05/2022 15:57	8512
234	22/05/2022 19:55	22/05/2022 22:39	9353
235	23/05/2022 02:06	23/05/2022 04:50	9352
236	23/05/2022 18:30	23/05/2022 21:45	9295
237	24/05/2022 01:32	24/05/2022 03:14	9299
238	26/05/2022 20:29	27/05/2022 03:06	9304
239	27/05/2022 08:29	27/05/2022 11:55	5622

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
06-Aug-22	6	17020
07-Aug-22	4	12755
08-Aug-22	4	13524
09-Aug-22	8	26319
10-Aug-22	4	12766
11-Aug-22	7	17705
12-Aug-22	3	13513
13-Aug-22	7	17777
14-Aug-22	7	27017
15-Aug-22	2	4253
16-Aug-22	6	22913
17-Aug-22	4	18525
18-Aug-22	4	13531
19-Aug-22	4	18617
20-Aug-22	2	4271
21-Aug-22	3	9118
22-Aug-22	5	22713
23-Aug-22	10	41397
24-Aug-22	5	18641
25-Aug-22	5	27941
26-Aug-22	7	27142
27-Aug-22	6	27936

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
240	30/05/2022 22:25	31/05/2022 02:12	9327
241	01/06/2022 00:29	01/06/2022 03:20	9192
242	01/06/2022 18:40	01/06/2022 20:25	4274
243	02/06/2022 03:59	02/06/2022 06:47	9258
244	02/06/2022 17:44	02/06/2022 19:02	4257
245	02/06/2022 21:19	03/06/2022 00:10	9288
246	03/06/2022 00:15	03/06/2022 02:57	9292
247	03/06/2022 09:10	03/06/2022 10:11	4270
248	03/06/2022 14:57	03/06/2022 18:10	9189
249	04/06/2022 00:21	04/06/2022 03:18	9309
250	04/06/2022 21:42	04/06/2022 23:47	8506
251	05/06/2022 08:39	05/06/2022 11:03	4264
252	05/06/2022 14:08	05/06/2022 16:14	8494
253	05/06/2022 18:36	05/06/2022 21:08	9176
254	06/06/2022 01:30	06/06/2022 02:34	4275
255	06/06/2022 03:20	06/06/2022 05:32	8522
256	06/06/2022 19:00	06/06/2022 20:14	4270
257	07/06/2022 05:53	07/06/2022 09:52	9153
258	07/06/2022 12:32	07/06/2022 14:39	9252
259	07/06/2022 21:04	07/06/2022 23:04	9148
260	07/06/2022 17:04	07/06/2022 17:59	4262
261	08/06/2022 06:04	08/06/2022 09:28	8511

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
28-Aug-22	7	37016
29-Aug-22	0	0
30-Aug-22	3	9315
31-Aug-22	2	9298
01-Sep-22	5	27557
02-Sep-22	1	0
03-Sep-22	4	17762
04-Sep-22	3	18546
05-Sep-22	0	0
06-Sep-22	2	8485
07-Sep-22	0	0
08-Sep-22	1	0
09-Sep-22	5	27809
10-Sep-22	0	0
11-Sep-22	0	0
12-Sep-22	0	0
13-Sep-22	4	18641
14-Sep-22	3	9331
15-Sep-22	1	8490
16-Sep-22	1	0
17-Sep-22	3	17777
18-Sep-22	2	8483

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
262	08/06/2022 15:55	08/06/2022 17:51	9304
263	09/06/2022 02:21	09/06/2022 03:38	4267
264	10/06/2022 12:35	10/06/2022 13:53	4262
265	09/06/2022 19:06	09/06/2022 21:18	8501
266	10/06/2022 13:58	10/06/2022 17:09	9301
267	11/06/2022 03:20	11/06/2022 07:00	9338
268	11/06/2022 07:07	11/06/2022 10:05	9182
269	11/06/2022 17:29	11/06/2022 20:25	9307
270	12/06/2022 04:28	12/06/2022 08:06	9329
271	12/06/2022 08:13	12/06/2022 10:28	9122
272	13/06/2022 19:53	13/06/2022 22:50	9127
273	14/06/2022 18:19	14/06/2022 20:57	8516
274	14/06/2022 22:53	14/06/2022 23:55	4267
275	16/06/2022 03:27	16/06/2022 05:02	4269
276	15/06/2022 20:34	15/06/2022 22:35	9308
277	16/06/2022 00:27	16/06/2022 03:23	9325
278	16/06/2022 08:04	16/06/2022 10:12	9254
279	17/06/2022 00:01	17/06/2022 01:05	4270
280	16/06/2022 18:16	16/06/2022 21:08	9300
281	17/06/2022 18:16	17/06/2022 20:15	4264
282	18/06/2022 10:07	18/06/2022 13:24	9278
283	18/06/2022 08:54	18/06/2022 10:03	4270

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
19-Sep-22	0	0
20-Sep-22	4	17826
21-Sep-22	5	17616
22-Sep-22	9	46421
23-Sep-22	4	17816
24-Sep-22	2	9287
25-Sep-22	5	17629
26-Sep-22	1	9264
27-Sep-22	2	9157
28-Sep-22	2	8510
29-Sep-22	2	8499
30-Sep-22	6	27152
01-Oct-22	8	36482
02-Oct-22	2	9219
03-Oct-22	3	8532
04-Oct-22	4	18601
05-Oct-22	0	0
06-Oct-22	0	0
07-Oct-22	0	0
08-Oct-22	3	18426
09-Oct-22	2	8499
10-Oct-22	0	0

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
284	18/06/2022 13:40	18/06/2022 16:18	9135
285	18/06/2022 23:04	19/06/2022 01:17	4263
286	19/06/2022 15:27	19/06/2022 16:29	4262
287	20/06/2022 03:56	20/06/2022 04:56	4268
288	20/06/2022 10:25	20/06/2022 12:58	9299
289	20/06/2022 18:42	20/06/2022 19:43	4264
290	21/06/2022 18:57	21/06/2022 21:07	4265
291	21/06/2022 22:30	22/06/2022 00:48	9333
292	22/06/2022 10:07	22/06/2022 11:49	4271
293	22/06/2022 11:51	22/06/2022 14:01	9297
294	22/06/2022 18:19	22/06/2022 21:52	9292
295	23/06/2022 00:07	23/06/2022 01:42	4271
296	23/06/2022 08:56	23/06/2022 10:52	9164
297	23/06/2022 15:04	23/06/2022 16:34	4262
298	24/06/2022 04:40	24/06/2022 05:44	4257
299	24/06/2022 22:24	24/06/2022 23:36	4265
300	25/06/2022 12:02	25/06/2022 13:48	4256
301	26/06/2022 01:40	26/06/2022 03:11	4269
302	26/06/2022 12:55	26/06/2022 14:45	9141
303	27/06/2022 07:28	27/06/2022 08:29	4271
304	27/06/2022 16:23	27/06/2022 18:26	9078
305	27/06/2022 23:03	27/06/2022 23:54	4271

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
11-Oct-22	0	0
12-Oct-22	1	0
13-Oct-22	5	26294
14-Oct-22	4	17799
15-Oct-22	5	18635
16-Oct-22	7	36983
17-Oct-22	2	8483
18-Oct-22	2	8491
19-Oct-22	0	0
20-Oct-22	5	18593
21-Oct-22	1	8488
22-Oct-22	2	9253
23-Oct-22	6	27621
24-Oct-22	2	9257
25-Oct-22	0	0
26-Oct-22	1	0
27-Oct-22	3	17803
28-Oct-22	1	0
29-Oct-22	7	36236
30-Oct-22	4	17796
31-Oct-22	0	0
01-Nov-22	4	18512

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
306	27/06/2022 23:58	28/06/2022 02:33	9335
307	28/06/2022 03:46	28/06/2022 05:33	9159
308	28/06/2022 07:37	28/06/2022 10:04	9321
309	28/06/2022 15:25	28/06/2022 16:18	4263
310	29/06/2022 12:35	29/06/2022 15:06	9280
311	29/06/2022 19:26	29/06/2022 20:30	4260
312	30/06/2022 16:55	30/06/2022 18:21	4261
313	30/06/2022 12:45	30/06/2022 15:27	8484
314	01/07/2022 06:34	01/07/2022 08:53	4260
315	01/07/2022 21:13	01/07/2022 23:25	8491
316	01/07/2022 23:33	02/07/2022 01:02	4266
317	02/07/2022 16:30	02/07/2022 17:54	4249
318	02/07/2022 22:14	03/07/2022 00:12	9215
319	03/07/2022 04:35	03/07/2022 07:23	9142
320	03/07/2022 07:26	03/07/2022 10:51	4264
321	03/07/2022 13:41	03/07/2022 16:27	9307
322	03/07/2022 19:15	03/07/2022 22:11	9170
323	03/07/2022 23:13	04/07/2022 02:01	9263
324	04/07/2022 03:50	04/07/2022 05:40	4257
325	04/07/2022 22:05	04/07/2022 23:09	4254
326	05/07/2022 20:24	07/07/2022 14:46	4254
327	08/07/2022 18:06	08/07/2022 22:18	9245

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
02-Nov-22	0	0
03-Nov-22	2	9326
04-Nov-22	2	9246
05-Nov-22	4	17786
06-Nov-22	2	9105
07-Nov-22	2	9228
08-Nov-22	6	26645
09-Nov-22	6	26881
10-Nov-22	4	17622
11-Nov-22	2	8473
12-Nov-22	6	26732
13-Nov-22	6	26305
14-Nov-22	0	0
15-Nov-22	1	0
16-Nov-22	5	27052
17-Nov-22	2	8514
18-Nov-22	4	18572
19-Nov-22	6	27583
20-Nov-22	8	35532
21-Nov-22	4	18342
22-Nov-22	0	0
23-Nov-22	0	0

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
328	09/07/2022 12:40	09/07/2022 15:07	9235
329	09/07/2022 15:59	09/07/2022 18:08	8494
330	10/07/2022 04:17	10/07/2022 09:34	9260
331	10/07/2022 20:05	10/07/2022 22:41	9254
332	11/07/2022 04:52	11/07/2022 07:24	9249
333	11/07/2022 09:39	11/07/2022 11:24	8504
334	14/07/2022 11:01	14/07/2022 13:21	8496
335	14/07/2022 19:30	14/07/2022 23:16	8510
336	15/07/2022 23:56	16/07/2022 00:56	4271
337	15/07/2022 13:37	15/07/2022 15:51	9243
338	16/07/2022 01:45	16/07/2022 04:18	4270
339	16/07/2022 04:20	16/07/2022 08:57	9256
340	17/07/2022 04:45	17/07/2022 06:21	4271
341	16/07/2022 22:18	17/07/2022 04:15	4261
342	17/07/2022 17:40	17/07/2022 18:46	4261
343	18/07/2022 11:04	18/07/2022 20:47	4264
344	19/07/2022 03:00	19/07/2022 05:33	9308
345	20/07/2022 04:07	20/07/2022 04:57	4265
346	20/07/2022 21:40	20/07/2022 23:54	4265
347	21/07/2022 14:10	21/07/2022 19:13	4267
348	22/07/2022 12:25	22/07/2022 13:18	4260
349	23/07/2022 12:59	23/07/2022 15:57	9286

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
24-Nov-22	0	0
25-Nov-22	2	9317
26-Nov-22	4	17009
27-Nov-22	2	9242
28-Nov-22	5	18608
29-Nov-22	1	9250
30-Nov-22	2	9267
01-Dec-22	1	0
02-Dec-22	1	9298
03-Dec-22	6	25528
04-Dec-22	0	0
05-Dec-22	2	8492
06-Dec-22	0	0
07-Dec-22	3	9142
08-Dec-22	3	17799
09-Dec-22	4	17773
10-Dec-22	6	27048
11-Dec-22	8	37127
12-Dec-22	0	0
13-Dec-22	13	55545
14-Dec-22	10	46291
15-Dec-22	5	27658

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
350	24/07/2022 13:20	24/07/2022 16:57	9122
351	25/07/2022 23:14	26/07/2022 01:31	9311
352	26/07/2022 03:21	26/07/2022 05:23	8502
353	26/07/2022 09:44	26/07/2022 11:13	5612
354	26/07/2022 11:48	26/07/2022 15:27	9302
355	26/07/2022 22:10	27/07/2022 01:11	9075
356	27/07/2022 01:22	27/07/2022 03:15	9285
357	27/07/2022 04:30	27/07/2022 08:20	9316
358	27/07/2022 11:58	27/07/2022 14:45	9293
359	28/07/2022 01:39	28/07/2022 04:02	9066
360	28/07/2022 16:04	28/07/2022 18:02	9266
361	28/07/2022 18:57	28/07/2022 21:28	9298
362	29/07/2022 02:03	29/07/2022 04:44	9183
363	28/07/2022 23:50	29/07/2022 02:00	9264
364	29/07/2022 11:48	29/07/2022 13:59	9274
365	29/07/2022 14:04	29/07/2022 16:05	9101
366	29/07/2022 20:18	29/07/2022 22:01	9155
367	30/07/2022 05:39	30/07/2022 08:00	9298
368	30/07/2022 08:50	30/07/2022 13:00	9147
369	30/07/2022 13:07	30/07/2022 15:23	9297
370	30/07/2022 15:26	30/07/2022 18:31	9144
371	30/07/2022 21:08	30/07/2022 23:17	8508

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
16-Dec-22	6	27609
17-Dec-22	6	27703
18-Dec-22	6	26962
19-Dec-22	5	17585
20-Dec-22	7	37041
21-Dec-22	7	27732
22-Dec-22	10	44924
23-Dec-22	6	27138
24-Dec-22	5	26819
25-Dec-22	0	0
26-Dec-22	0	0
27-Dec-22	8	36898
28-Dec-22	10	44744
29-Dec-22	3	9333
30-Dec-22	3	18635
31-Dec-22	0	0

INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
372	30/07/2022 23:46	31/07/2022 02:10	9332
373	31/07/2022 05:07	31/07/2022 07:11	9312
374	31/07/2022 23:59	01/08/2022 01:52	9302
375	01/08/2022 08:55	01/08/2022 11:07	8505
376	03/08/2022 00:59	03/08/2022 02:14	4264
377	03/08/2022 16:00	03/08/2022 17:59	4248
378	02/08/2022 22:05	03/08/2022 00:33	8511
379	03/08/2022 16:24	03/08/2022 17:42	0
380	04/08/2022 05:49	04/08/2022 06:48	4264
381	05/08/2022 08:07	05/08/2022 10:15	9110
382	05/08/2022 10:54	05/08/2022 12:50	8505
383	05/08/2022 13:12	05/08/2022 14:09	4255
384	05/08/2022 17:03	05/08/2022 21:19	9310
385	06/08/2022 06:04	06/08/2022 08:05	4263
386	06/08/2022 08:08	06/08/2022 10:37	8495
387	06/08/2022 20:26	06/08/2022 21:18	4262
388	07/08/2022 16:25	07/08/2022 17:28	4262
389	07/08/2022 10:23	07/08/2022 12:25	8494
390	08/08/2022 10:06	08/08/2022 12:14	4265
391	08/08/2022 08:46	08/08/2022 10:49	9259
392	09/08/2022 01:04	09/08/2022 02:10	4259
393	09/08/2022 06:21	09/08/2022 08:24	9323

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
394	09/08/2022 18:59	09/08/2022 20:19	4261
395	09/08/2022 15:20	09/08/2022 18:40	8475
396	10/08/2022 10:18	10/08/2022 11:27	4260
397	11/08/2022 05:32	11/08/2022 06:32	4267
398	10/08/2022 21:25	10/08/2022 23:38	8506
399	11/08/2022 14:32	11/08/2022 16:42	9173
400	11/08/2022 20:15	11/08/2022 21:54	4265
401	11/08/2022 23:01	12/08/2022 01:07	9252
402	12/08/2022 09:53	12/08/2022 11:08	4261
403	13/08/2022 03:11	13/08/2022 04:10	4252
404	13/08/2022 11:00	13/08/2022 13:00	9271
405	13/08/2022 15:45	13/08/2022 17:13	4254
406	13/08/2022 21:49	14/08/2022 00:08	9262
407	14/08/2022 01:58	14/08/2022 04:18	9239
408	14/08/2022 07:52	14/08/2022 09:12	4259
409	14/08/2022 21:07	14/08/2022 22:16	4257
410	15/08/2022 12:46	15/08/2022 13:49	4253
411	16/08/2022 06:51	16/08/2022 08:40	4277
412	16/08/2022 11:55	16/08/2022 13:59	9311
413	16/08/2022 19:16	16/08/2022 22:02	9326
414	17/08/2022 07:01	17/08/2022 09:30	9240
415	17/08/2022 16:00	17/08/2022 18:02	9285

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
416	18/08/2022 08:50	18/08/2022 10:30	4249
417	18/08/2022 16:46	18/08/2022 18:53	9282
418	19/08/2022 00:25	19/08/2022 02:29	9314
419	19/08/2022 12:58	19/08/2022 15:20	9304
420	20/08/2022 19:02	20/08/2022 20:03	4271
421	21/08/2022 06:58	21/08/2022 09:31	9118
422	21/08/2022 23:22	22/08/2022 02:41	9145
423	22/08/2022 07:38	22/08/2022 08:57	4266
424	22/08/2022 09:19	22/08/2022 11:46	9302
425	23/08/2022 00:46	23/08/2022 01:47	4258
426	23/08/2022 01:59	23/08/2022 06:21	9304
427	23/08/2022 07:41	23/08/2022 10:01	9312
428	23/08/2022 13:44	23/08/2022 17:35	9283
429	23/08/2022 10:08	23/08/2022 12:19	9240
430	24/08/2022 02:04	24/08/2022 04:45	9333
431	24/08/2022 17:48	24/08/2022 21:28	9308
432	24/08/2022 23:35	25/08/2022 01:57	9316
433	25/08/2022 04:30	25/08/2022 07:54	9325
434	25/08/2022 08:30	25/08/2022 11:32	9301
435	26/08/2022 03:16	26/08/2022 05:26	9322
436	26/08/2022 09:20	26/08/2022 11:28	8510
437	26/08/2022 11:35	26/08/2022 13:33	9310

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
438	26/08/2022 23:13	27/08/2022 01:14	9299
439	27/08/2022 06:42	27/08/2022 08:30	9329
440	27/08/2022 12:55	27/08/2022 15:58	9308
441	27/08/2022 23:43	28/08/2022 01:46	9148
442	28/08/2022 05:49	28/08/2022 07:44	9343
443	28/08/2022 13:35	28/08/2022 15:49	9212
444	28/08/2022 17:50	28/08/2022 20:21	9312
445	30/08/2022 06:32	30/08/2022 09:02	9315
446	30/08/2022 23:19	31/08/2022 01:12	9298
447	31/08/2022 23:33	01/09/2022 02:26	9121
448	01/09/2022 12:09	01/09/2022 14:00	9121
449	01/09/2022 14:18	01/09/2022 16:11	9314
450	02/09/2022 22:19	03/09/2022 00:18	8509
451	03/09/2022 03:35	03/09/2022 05:58	9254
452	03/09/2022 23:00	04/09/2022 02:43	9304
453	04/09/2022 12:27	04/09/2022 15:05	9242
454	06/09/2022 15:36	06/09/2022 17:33	8485
455	08/09/2022 23:18	09/09/2022 01:35	9262
456	09/09/2022 02:11	09/09/2022 04:34	9259
457	09/09/2022 08:05	09/09/2022 11:23	9288
458	13/09/2022 01:48	13/09/2022 05:34	9317
459	13/09/2022 15:51	13/09/2022 17:49	9324

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
460	14/09/2022 01:47	14/09/2022 03:52	9331
461	14/09/2022 21:52	15/09/2022 00:58	8490
462	16/09/2022 23:39	17/09/2022 01:47	8525
463	17/09/2022 06:53	17/09/2022 09:17	9252
464	18/09/2022 15:36	18/09/2022 17:41	8483
465	20/09/2022 12:36	20/09/2022 14:30	9315
466	20/09/2022 20:48	20/09/2022 23:13	8511
467	21/09/2022 04:34	21/09/2022 08:49	8515
468	21/09/2022 13:19	21/09/2022 15:49	9101
469	21/09/2022 23:43	22/09/2022 04:55	9309
470	22/09/2022 05:18	22/09/2022 07:42	9335
471	22/09/2022 11:30	22/09/2022 13:41	9324
472	22/09/2022 15:37	22/09/2022 19:06	9143
473	22/09/2022 19:17	22/09/2022 22:17	9310
474	23/09/2022 01:02	23/09/2022 02:47	9323
475	23/09/2022 08:21	23/09/2022 10:28	8493
476	24/09/2022 11:45	24/09/2022 13:39	9287
477	25/09/2022 02:29	25/09/2022 04:21	9105
478	25/09/2022 05:16	25/09/2022 07:27	8524
479	25/09/2022 23:03	26/09/2022 01:27	9264
480	27/09/2022 09:28	27/09/2022 12:29	9157
481	28/09/2022 21:21	28/09/2022 23:24	8510

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
482	29/09/2022 12:48	29/09/2022 14:55	8499
483	30/09/2022 07:16	30/09/2022 11:02	9303
484	30/09/2022 12:08	30/09/2022 14:54	8548
485	30/09/2022 17:22	30/09/2022 21:44	9301
486	01/10/2022 03:57	01/10/2022 05:46	8761
487	01/10/2022 13:35	01/10/2022 15:55	9140
488	01/10/2022 19:20	01/10/2022 21:09	9255
489	01/10/2022 21:39	01/10/2022 23:42	9326
490	02/10/2022 05:54	02/10/2022 09:05	9219
491	03/10/2022 09:29	03/10/2022 11:43	8532
492	03/10/2022 23:25	04/10/2022 05:03	9288
493	04/10/2022 16:28	04/10/2022 19:22	9313
494	04/10/2022 19:30	07/10/2022 23:51	9163
495	08/10/2022 01:03	08/10/2022 03:17	9262
496	09/10/2022 21:21	09/10/2022 23:29	8499
497	12/10/2022 21:41	13/10/2022 01:04	8488
498	13/10/2022 04:30	13/10/2022 07:25	9316
499	13/10/2022 09:07	13/10/2022 11:05	8490
500	14/10/2022 03:12	14/10/2022 05:33	8501
501	14/10/2022 21:04	14/10/2022 23:44	9298
502	15/10/2022 06:59	15/10/2022 09:36	9317
503	15/10/2022 09:38	15/10/2022 13:21	9138

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
504	15/10/2022 19:24	15/10/2022 22:36	9318
505	16/10/2022 00:45	16/10/2022 03:09	9238
506	16/10/2022 12:20	16/10/2022 14:33	9307
507	16/10/2022 20:44	16/10/2022 23:31	9300
508	17/10/2022 08:27	17/10/2022 11:24	8483
509	18/10/2022 13:55	18/10/2022 16:40	8491
510	20/10/2022 04:30	20/10/2022 08:25	9285
511	20/10/2022 19:43	20/10/2022 21:51	9308
512	20/10/2022 23:20	21/10/2022 02:02	8488
513	22/10/2022 01:48	22/10/2022 05:01	9253
514	23/10/2022 12:17	23/10/2022 17:30	9107
515	23/10/2022 17:38	23/10/2022 21:19	9253
516	23/10/2022 21:30	23/10/2022 23:56	9261
517	24/10/2022 02:34	24/10/2022 05:50	9257
518	26/10/2022 20:42	27/10/2022 00:16	8506
519	27/10/2022 19:10	27/10/2022 22:36	9298
520	28/10/2022 21:21	28/10/2022 23:41	8514
521	29/10/2022 03:30	29/10/2022 06:34	9282
522	29/10/2022 13:46	29/10/2022 15:44	9312
523	29/10/2022 19:54	29/10/2022 22:04	9128
524	30/10/2022 04:30	30/10/2022 06:20	9305
525	30/10/2022 11:27	30/10/2022 13:52	8490

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
526	01/11/2022 06:50	01/11/2022 09:28	9220
527	01/11/2022 09:53	01/11/2022 12:20	9292
528	03/11/2022 05:11	03/11/2022 08:07	9326
529	04/11/2022 10:57	04/11/2022 13:43	9246
530	05/11/2022 04:02	05/11/2022 06:51	8491
531	05/11/2022 11:02	05/11/2022 13:06	9295
532	06/11/2022 08:13	06/11/2022 11:16	9105
533	07/11/2022 00:59	07/11/2022 03:01	9228
534	08/11/2022 06:18	08/11/2022 09:40	9094
535	08/11/2022 12:57	08/11/2022 14:52	9050
536	08/11/2022 18:39	08/11/2022 20:51	8501
537	09/11/2022 08:44	09/11/2022 10:50	8495
538	09/11/2022 14:45	09/11/2022 17:13	9084
539	09/11/2022 20:32	09/11/2022 22:24	9302
540	10/11/2022 03:14	10/11/2022 05:15	9141
541	10/11/2022 11:18	10/11/2022 13:36	8481
542	11/11/2022 09:03	11/11/2022 10:56	8473
543	12/11/2022 00:20	12/11/2022 02:34	9107
544	12/11/2022 05:40	12/11/2022 08:16	9146
545	12/11/2022 08:24	12/11/2022 10:50	8479
546	13/11/2022 00:06	13/11/2022 02:02	8504
547	13/11/2022 14:00	13/11/2022 16:15	9307

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
548	13/11/2022 16:06	13/11/2022 18:31	8494
549	15/11/2022 23:37	16/11/2022 02:19	9299
550	16/11/2022 10:59	16/11/2022 13:49	9305
551	16/11/2022 16:14	16/11/2022 18:41	8449
552	17/11/2022 01:00	17/11/2022 03:30	8514
553	18/11/2022 03:20	18/11/2022 05:37	9272
554	18/11/2022 20:36	18/11/2022 22:43	9301
555	19/11/2022 05:12	19/11/2022 06:58	9159
556	19/11/2022 11:35	19/11/2022 13:36	9312
557	19/11/2022 17:42	19/11/2022 21:18	9112
558	20/11/2022 04:59	20/11/2022 07:11	8503
559	20/11/2022 00:46	20/11/2022 02:43	9300
560	20/11/2022 12:21	20/11/2022 14:22	9232
561	20/11/2022 14:47	20/11/2022 16:51	8497
562	21/11/2022 16:30	21/11/2022 18:47	9233
563	21/11/2022 20:38	21/11/2022 22:32	9109
564	25/11/2022 16:38	25/11/2022 19:27	9317
565	26/11/2022 04:42	26/11/2022 06:36	8513
566	26/11/2022 13:04	26/11/2022 15:17	8496
567	27/11/2022 09:15	27/11/2022 11:23	9242
568	28/11/2022 11:42	28/11/2022 14:49	9309
569	28/11/2022 14:56	28/11/2022 17:49	9299

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
570	28/11/2022 22:38	29/11/2022 01:41	9250
571	30/11/2022 01:32	30/11/2022 03:38	9267
572	01/12/2022 22:34	02/12/2022 01:52	9298
573	03/12/2022 02:09	03/12/2022 04:11	8502
574	03/12/2022 08:20	03/12/2022 10:05	8529
575	03/12/2022 13:05	03/12/2022 15:06	8497
576	05/12/2022 07:15	05/12/2022 09:36	8492
577	07/12/2022 20:03	07/12/2022 22:03	9142
578	07/12/2022 23:15	08/12/2022 01:09	9319
579	08/12/2022 11:13	08/12/2022 13:25	8480
580	09/12/2022 11:25	09/12/2022 13:54	9282
581	09/12/2022 18:57	09/12/2022 21:16	8491
582	10/12/2022 08:44	10/12/2022 10:41	8490
583	10/12/2022 13:01	10/12/2022 15:32	9280
584	10/12/2022 19:05	10/12/2022 21:32	9279
585	11/12/2022 03:03	11/12/2022 05:15	9248
586	11/12/2022 09:10	11/12/2022 12:29	9274
587	11/12/2022 16:24	11/12/2022 20:07	9305
588	11/12/2022 20:25	11/12/2022 23:23	9300
589	13/12/2022 01:02	13/12/2022 03:20	9132
590	13/12/2022 03:26	13/12/2022 05:31	9343
591	13/12/2022 05:38	13/12/2022 08:55	9251

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
592	13/12/2022 11:59	13/12/2022 13:57	9285
593	13/12/2022 14:12	13/12/2022 17:01	9241
594	13/12/2022 17:15	13/12/2022 19:26	9293
595	13/12/2022 22:30	14/12/2022 01:17	9114
596	14/12/2022 02:30	14/12/2022 05:01	9319
597	14/12/2022 12:44	14/12/2022 15:06	9308
598	14/12/2022 14:01	14/12/2022 17:16	9238
599	14/12/2022 19:45	14/12/2022 22:00	9312
600	14/12/2022 22:46	15/12/2022 00:43	9310
601	15/12/2022 01:35	15/12/2022 04:15	9248
602	15/12/2022 18:33	15/12/2022 21:31	9100
603	16/12/2022 05:00	16/12/2022 07:59	9141
604	16/12/2022 08:03	16/12/2022 10:11	9258
605	16/12/2022 12:46	16/12/2022 15:15	9210
606	17/12/2022 03:11	17/12/2022 05:09	9106
607	17/12/2022 05:37	17/12/2022 08:06	9306
608	17/12/2022 12:57	17/12/2022 16:26	9291
609	18/12/2022 02:59	18/12/2022 04:57	9322
610	18/12/2022 08:07	18/12/2022 10:00	9136
611	18/12/2022 21:39	18/12/2022 23:47	8504
612	19/12/2022 02:22	19/12/2022 04:22	9111
613	19/12/2022 17:40	19/12/2022 19:50	8474

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
614	19/12/2022 22:38	20/12/2022 01:31	9308
615	20/12/2022 07:50	20/12/2022 10:26	9318
616	20/12/2022 13:09	20/12/2022 15:48	9324
617	20/12/2022 21:38	20/12/2022 23:43	9091
618	21/12/2022 00:59	21/12/2022 03:22	9273
619	21/12/2022 03:29	21/12/2022 06:23	9168
620	21/12/2022 09:15	21/12/2022 11:24	9290
621	21/12/2022 22:36	22/12/2022 00:24	8518
622	22/12/2022 04:34	22/12/2022 06:47	8487
623	22/12/2022 09:21	22/12/2022 11:14	9306
624	22/12/2022 11:51	22/12/2022 13:37	9307
625	22/12/2022 16:55	22/12/2022 18:44	9307
626	22/12/2022 22:27	23/12/2022 00:22	9315
627	23/12/2022 09:31	23/12/2022 11:26	8489
628	23/12/2022 13:03	23/12/2022 16:03	9334
629	23/12/2022 23:20	24/12/2022 01:21	8308
630	24/12/2022 10:57	24/12/2022 13:19	9278
631	24/12/2022 08:05	24/12/2022 10:25	9234
632	27/12/2022 06:09	27/12/2022 09:06	9357
633	27/12/2022 09:36	27/12/2022 11:28	9301
634	27/12/2022 17:34	27/12/2022 20:00	9123
635	27/12/2022 21:53	27/12/2022 23:57	9117

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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INDIVIDUAL TRAIN DETAILS

Train Index	Date and Time to Site	Date and Time From Site	Coal Transported (tonnes)
636	28/12/2022 00:20	28/12/2022 02:08	8507
637	28/12/2022 02:15	28/12/2022 04:49	9312
638	28/12/2022 07:26	28/12/2022 09:31	8520
639	28/12/2022 12:28	28/12/2022 14:27	9105
640	28/12/2022 17:26	28/12/2022 19:43	9300
641	29/12/2022 01:50	29/12/2022 04:51	9333
642	29/12/2022 22:59	30/12/2022 01:24	9313
643	30/12/2022 03:02	30/12/2022 05:10	9321

Bold indicates start of TLO arrival/loading

Italics - only half train loaded for power station

DAILY SUMMARY

Start Date	Total Daily Train Movements (Limit = 20)	Tonnes
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GLENCORE