Tahmoor Coal Pty Ltd

2022 ANNUAL REVIEW AND ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

March 2023

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Document Control

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REVIEW DATE:	31/03/2023
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REVIEW:	Zina Ainsworth – Environment and Community Manager April Hudson - Approval Specialist Nick Le Baut – Projects Manager – Environmental Projects
VERSION NUMBER:	**1.0**
COMMENTS:	**Final**

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1 Title Block

Table 1.1 Title Block

Name of operation	Tahmoor Coal – SIMEC Mining
Name of operator	Tahmoor Coal Pty Ltd
Development consent / project approval #	DA 1975, DA 1979, DC 57/93, DC 67/98, DA 190/85, DA 162/76, SSD8445, EPBC 2017/8084
Name of holder of development consent / project approval	Tahmoor Coal Pty Ltd
Mining lease #	Tahmoor Coal Holdings - ML1376, ML1308, ML1539, ML1642 & CCL716 Bargo Coal Holdings - CCL747
Name of holder of mining lease	Tahmoor Coal Pty Ltd Bargo Collieries Pty Ltd
Water licence #	WAL36442, , WAL 25777, WAL43572
Name of holder of water licence	Tahmoor Coal Pty Ltd
Annual Review start date	01/01/2022
Annual Review end date	31/12/2022
I, Zina Ainsworth, certify that this audit report is a true and accurate record of the compliance status of Tahmoor Coal Mine for the period 1 January 2022 and 31 December 2022 and that I am authorised to make this statement on behalf of Tahmoor Coal Pty Ltd. *Note.* *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.* *b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).*	
Name of authorised reporting officer	**Zina Ainsworth**
Title of authorised reporting officer	**Environment and Community Manager**
Signature of authorised reporting officer	Zina Ainsworth
Date	*31/03/23*

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2 Statement of Compliance

Table 2.1 outlines the statement of compliance with the relevant conditions for the reporting period.

Table 2.2 provides a statement of compliance for Tahmoor Coal for 2022.

Table 2.1 Statement of Compliance (2022)

Were all the conditions of the relevant approvals complied with?	Compliance
ML1376	Yes
ML1308	Yes
ML1539	Yes
ML1642	Yes
CCL716	Yes
CCL747	Yes
EPL 1389	Yes
WAL36442	Yes
WAL43572	Yes
DA 1975	Yes
DA 1979	Yes
DA 190/85	Yes
DA 57/93	Yes
DA 67/98	Yes
SSD 8445	Yes
EPBC 2017/8084	Yes

Table 2.2 Non-Compliance Summary (2022)

Relevant Approval	Condition #	Condition Description	Compliance statement	Section addressed in Annual Review
		No non-compliances reported for the Reporting period		

3 Independent Audits

3.1 2020 Tri-ennial Independent Audit

A Tri-ennial Independent Environmental Audit was conducted by SLR in September 2020 during the 2021 AEMR reporting period. The audit recommendations and actions undertaken in this reporting period are outlined and updated in **Table 3.1** below and have all been completed to date with some actions ongoing as required and the construction of the Final Water Treatment Plant outstanding (to be completed by December 2023). The next independent audit is due to be conducted in May 2023.

Table 3.1 Actions from 2020 Independent Environmental Audit completed in this reporting period.

Ref	Description	Risk	Tahmoor Coal Comment/Action	Timing
Non-Compliance Recommendations				
DA 57/93				
41	NC REC 8 – Topsoil/rehabilitation Complete cover crop seeding of topsoil stockpile areas.	Non – Compliant (Low Risk)	Tahmoor Coal has relocated a section of the topsoil stockpile. This section was noted during the audit as requiring reseeding due to lack of sufficient ground cover.	**Seeding completed September 2022**
41	NC REC 9 – Topsoil/rehabilitation Reduce topsoil stockpile height to <3m and ensure stockpiles resulting from future disturbance be a maximum of be 3m high and be seeded with a temporary vegetation cover.	Non – Compliant (Low Risk)	Topsoil stockpiles were reduced to less than 3m between July and September 2021.	**Seeding completed September 2022**
EPL 1389				
A3	NC REC 11 – Water Treatment Plant Continue investigations to commission the water treatment plant in consultation with the EPA.	Non – Compliant (Low Risk)	Tahmoor Coal is required, under EPL1389 (2/12/2020) Special Condition E1, to install and test the Pilot Plant by 31/12/2021, and commission the Final Plant prior to commencement of secondary coal extraction in the Tahmoor South area (currently scheduled for September 2022).	Pilot plant: **COMPLETED December 2021** EPL variation and SSD8445 Modification 1 for the WTP to be commissioned by December 2023.

Improvement Recommendations				
DA 57/93 C46	Improvement REC 1 – Reporting Include reference to the requirements of Condition 46 of DA 57/93 into future iterations of the MOP and include a table to show where these conditions have been addressed.	NA	The MOP was replaced by the new Rehabilitation reforms commenced on the 2nd July 2022.	The MOP was replaced by the new Rehabilitation reforms commenced on the 2nd July 2022.
NA	Improvement REC 10 – ML 1376 Undertake further consultation with RR regarding status of mining lease application and obtain confirmation of expected date of approval.	NA	Tahmoor Coal has consulted with RR regarding status of mining lease.	Ongoing Renewal is part of the NSW Government Ageing Dealings Project and they have advised they aim to renew before June 2023.
NA	Improvement REC 12 – Reporting Include table showing actual daily results in discharge volumes against the approved volumes in Annual Review (as a table) as per the Annual Return (ie min, max and average). Reporting of volume should be in the same units as the limit (KL) rather than ML. Also recommended to update discharge figure in the Annual Reviews to show the discharge limit of 15500 KL/day.	NA	Tahmoor Coal will include comparison results and discharge figures in Annual Reviews.	2020 Annual Review: **COMPLETED March 2021** 2021 Annual Review: **COMPLETED March 2022- see Section 17.2** **COMPLETED March 2023- see Section 17.2**

3.2 2022 Independent Environmental Audit(construction phase)

An Independent Environmental Audit was completed during October 2022 by IEMA (Integrated Environmental Management Australia Pty Ltd) in reference to Schedule 2 Condition E16.The following table contains the recommendations and actions completed following the audit.

		IEMA Comments/Recommendations	Status	Tahmoor Coal Comments/Actions	Timing
		IEMA Recommendations with Comments from Tahmoor Coal			
NC#		**SSD-8445**			
NC1	**A2**	**TERMS OF CONSENT** Based on the findings of this audit, the development has generally been carried out in accordance with the requirements of this condition with the exception of the identified non-compliances below.	**Non-compliant (Administrative)**	Noted.	As per below
NC2	**B48**	**WASTE** It is recommended that Tahmoor Coal: Explain the situation in relation to Condition B48 (c) to the Planning Secretary and the EPA and seek a direction that any references in the Development Consent to complying with an applicable EPL will be deemed to include permission to conduct an activity if an EPL is not required for such activity.	**Non-compliant**	Tahmoor Coal will consult with the DPE (Planning Secretary) and EPA to seek further direction relating to any references in the Development Consent to complying with an applicable EPL will be deemed to include permission to conduct an activity if an EPL is not required for such activity. Tahmoor Coal have sought clarification with both the DPE and EPA and no further action is required.	12/12/2022 - Completed
NC3	**E15**	**INDEPENDENT ENVIRONMENTAL AUDIT** This audit has been undertaken in accordance with the requirements of the IA PAR (2020). It was understood by the auditor that the audit was required to be undertaken by 16 August 2022. The audit was scheduled and undertaken on 10 August 2022 which was understood to be within the required period.	**Non-Compliant (Administrative)**	Tahmoor Coal acknowledge the ‘low risk’ administrative non-compliance due to the audit being inadvertently undertaken 2 days over the required 12 weeks post commencement of construction period. Tahmoor Coal will ensure that all	N/A

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		During the preparation of the audit report it was identified that the required 12 week period following commencement of construction on 16 May 2022 ended on 8 August 2022, thus the site inspection was undertaken 2 days outside of the 12 week period. Tahmoor Coal has advised that they interpreted the wording of "12 weeks" as "3 months". This is considered to be a minor and administrative non-compliance. The audit report is required to be submitted within 2 months of the site inspection and will be submitted with a response to recommendations prior to 10 October 2022. No further recommendations.		commitments/requirements regarding Consent Conditions including Independent Audits will be conducted/completed within the specified timelines.	
REC 1		**OPERATION OF PLANT AND EQUIPMENT** Ensure that contractors maintain appropriate records during future activities.	**Recommendation**	Tahmoor Coal will ensure that contractors will keep and maintain appropriate administrative records.	Ongoing
REC 2		**WASTE** Liaise with the EPA to confirm Tahmoor Coal's interpretation of the requirements of condition B49 as it relates to import of road upgrade materials to the Site.	**Recommendation**	Tahmoor Coal will liaise with the EPA to seek confirmation of the requirements of condition B49, specifically in relation the use of materials for onsite road upgrades and maintenance. Tahmoor have engaged with the EPA and no further action is required.	12/12/2022 – Completed
REC 3		**TRANSPORT** Seek clarification from DPE on the definition of laden trucks.	**Recommendation**	Tahmoor Coal will seek clarification from DPE on the definition of laden trucks. DPE clarified the definition of 'laden trucks' (9/11/2022) and Tahmoor Coal has amended relevant management plans.	12/12/2022 - Completed

				The Definition description shall be updated in the next consent modification.	
REC 4		**ACCESS TO INFORMATION** Remove the link to the Department's Major Projects website for the EIS and provide the EIS itself on the Tahmoor Coal website. Remove hyperlink to former Tahmoor South website and ensure any relevant information on that website is transferred to the new website. Consider implementing a recurring trigger in the site's compliance management system to ensure the website content is kept up to date.	**Recommendation**	Tahmoor Coal is in the process of consolidating the Tahmoor South and Tahmoor Coal websites. An internal review will be undertaken of the website and remove all identified links listed in the Audit Report. An internal monthly prompt within Tahmoor's compliance tracking software has been implemented to ensure the website is up to date. New consolidated website launched (5/12/2022)	12/12/2022 - Completed

4 Introduction

4.1 Background

Tahmoor Coal Mine (Tahmoor Mine) is an underground coal mine located approximately 80 kilometres (km) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (NSW). Tahmoor Mine is approved to extract up to 4 million tonnes of Run of Mine (ROM) coal per annum from the Bulli Coal Seam. Tahmoor Mine produces a primary hard coking coal product and a secondary higher ash coking coal product that are used predominantly for coke manufacture for steel production. Product coal is transported via rail to Port Kembla and Newcastle for Australian domestic customers and export customers.

Tahmoor Mine has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since the mine commenced in 1979 using bord and pillar mining methods, and via longwall mining methods since 1987. Tahmoor Coal is a wholly owned entity within the SIMEC Mining Division of the GFG Alliance group.

Tahmoor Coal has previously mined 37 longwalls to the north and west of the Tahmoor Mine's current pit-top location. Tahmoor Coal is currently mining the Longwall South 1A (LW S1A) in the Tahmoor South Domain area located to the north of the Bargo township. This mining is in accordance with Development Consents and Extraction Plan Approval.

In April 2021, Tahmoor Coal received Development Application Approval (SSD 8445) for the extraction of up to 4 Mtpa of ROM coal, with a total of up to around 33 Mt of ROM coal proposed to be extracted over a 10-year period. Tahmoor Coal also received conditions of approval (EPBC 2017/8084) under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) in October 2021.

The Tahmoor South Domain is located south of the Bargo River and east of Remembrance Driveway and north-east of the township of Bargo. Longwall mining will be used to extract coal from the Bulli coal seam within the bounds of Consolidated Coal Lease (CCL) 716 and CCL 747. Twelve longwalls are proposed in this domain which are divided into a series of six northern (A series) and six southern (B series) longwalls. An Extraction Plan for the A series, Longwalls' South 1A to South 6A (LW S1A-S6A) was approved on 20 September 2022 and the first longwall of Series A is currently being mined.

The Department of Planning and Environment (DPE) and the Department of Regional NSW – Resources Regulator (Resources Regulator) approved that the Annual Review prepared under Condition 45 of Development Consent DA 67/98 can also fulfil the requirement of the Annual Environmental Management Report (AEMR). This was to reduce duplication of reported information to both Government authorities. In addition, Mining Lease 1376 was varied on the 17th October 2022 and excludes the need to include a Rehabilitation Report as part of the Annual Review report. However Tahmoor Coal has recently been approved to include the new Rehabilitation Report (in the new Rehabilitation reforms format) with next years AEMR. This will allow the reporting period for the Rehabilitation Report to be aligned with the AEMR.

This Annual Review or Annual Environmental Management Report (AEMR) is for the reporting period of 1 January 2022 to 31 December 2022.

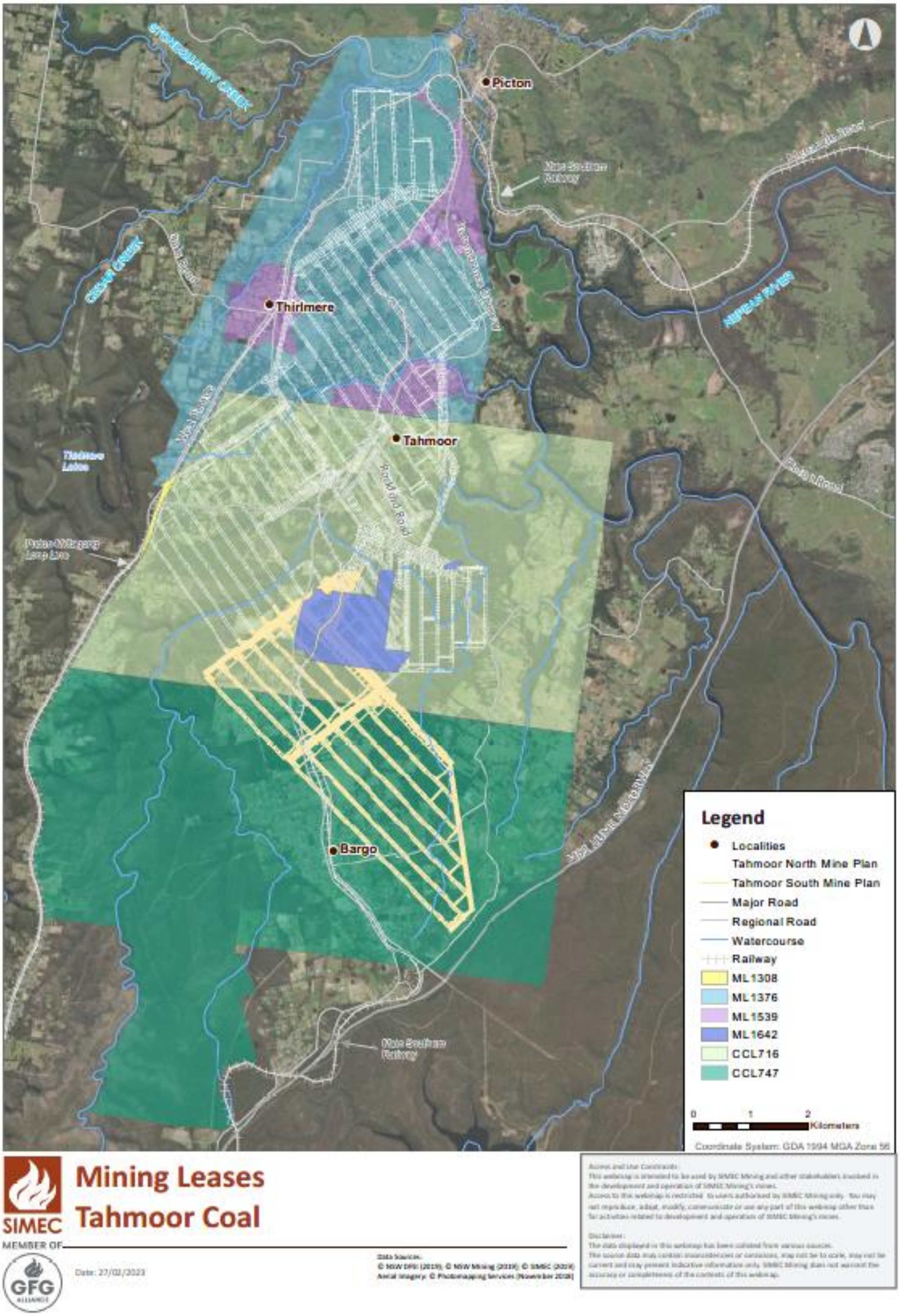
A plan of Tahmoor Mine showing the regional context, development consent boundary and mining lease boundaries is shown in **Figure 1**.

Contact information for Tahmoor Coal senior management and environment and community staff are listed in **Table 4.1** below.

Table 4.1 Tahmoor Coal Contacts

Name	Position held	Contact details
Tahmoor Coal Management		
Peter Vale	Executive General Manager Coal Operations	(02) 4640 0100
Clint Mason	Head of Tahmoor Coal Operations	(02) 46400150
Environment and Community Management Team		
Zina Ainsworth	Environment & Community Manager	(02) 4640 0100
Ross Barber	Project Manager Subsidence	(02) 4640 0028
April Hudson	Approvals Specialist	(02) 4640 0022
Nick Le Baut	Environment Projects Manager	(02) 4640 0090
Thomas O'Brien	Environment Specialist	(02) 4640 0018
Natalie Brumby	Environmental Officer	(02) 4640 0048
Amanda Bateman	Community Liason Specialist	(02) 4640 0025
Amanda Fitzgerald	Environment & Community Officer	(02) 4640 0079

Figure 1 Mining Area and Tenure



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5 Approvals

Tahmoor Coals' development consents, mining tenures and environmental licences are outlined in **Table 5.1** below.

Table 5.1 Consents and Licences

Consent Number	Consent Description	Date Granted	Expiry Date
Development Consents			
DA 1975	Underground Mine	26/03/1975	No expiry
DA 162/76	Bargo Consent	21/04/1976	This Consent was surrended on the 05/10/2022
DA 1979	Coal Preparation Plant Stockpiles and Refuse Emplacement Area	23/08/1979	No expiry
DA 1979 (Mod 1)	Modification for road haulage of trial coal shipments	16/09/1985	No expiry
DA 190/85	Surface Works for Gas Extraction	16/12/1985	No expiry
DA 1979 (Mod 2)	Modification for Upgrades for Longwall Mining	05/11/1986	No expiry
DA 1979 (Mod 3)	Modification for Road haulage in Wollondilly Shire and when rail unavailable	1988	No expiry
DA 1979 (Mod 4)	Modification for Road haulage to Corrimal and Coal Cliff Coke Works	13/12/1994	No expiry
DA 57/93	Tahmoor North Project	07/09/1994	No expiry
DA 57/93 (Mod 1)	Modification for heritage approval condition	07/06/2007	No expiry
DA 67/98	Tahmoor North Extension Project	25/02/1999	16/06/2024
DA 67/98 (Mod 1)	Modification for additional areas to be subsided	26/11/2006	As above
DA 67/98 (Mod 2)	Modification for Redbank Tunnel Subsidence Management	08/04/2012	As above
DA 67/98 (Mod 3)	Modification for Redbank Tunnel Rail Deviation – Subdivision of Land	25/11/2012	As above
DA 67/98 (Mod 4)	Modification for subsidence are update	15/10/2018	As above
DA 67/98 (Mod 5)	Modification for subsidence are update	03/11/2020	As above
SSD 8445	Tahmoor South Project	23/04/2021	31/12/2033 (or 10 years from commencement of second workings, ie 19 October 2032)
SSD 8445 (MOD 1)	Extension of time to commission WTP	19/07/2022	As above
EPBC 2017/8084	Conditions of approval under the *Environment Protection and Biodiversity Conservation Act 1999*	01/10/2021	01/09/2061

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Mining Tenure – Mining Leases & Exploration Authorisations			
Consolidated Coal Lease 716	Tahmoor Mining Lease – Renewal documentation submitted and being assessed	15/06/1990	13/03/2021 (approval pending)
Mining Lease 1376	Tahmoor North Mining Lease Renewal documentation submitted and being assessed – refer to comments in Table 3.1 (improvement REC 10)	28/08/1995	28/08/2016 (approval pending)
Mining Lease 1308	Mining Lease to west of CCL716	02/03/2014	02/03/2035
Mining Lease 1539	Tahmoor North Extension Mining Lease	16/06/2003	16/06/2024
Mining Lease 1642	Pit Top and REA surface Mining Lease	27/08/2010	27/08/2031
Consolidated Coal Lease 747	Bargo Mining Leases	23/05/1990	06/11/2025
Environmental Licences			
EPL 1389	Environmental Protection Licence– Licence variation 23rd August 2022.	17/10/2000	No expiry
WAL36442	Water Access Licence	06/12/2013	No expiry
WAL25777	Water Access Licence	27/10/2014	No expiry
WAL43572	Water Access Licence	10/05/2021	No expiry
WAL43656	Water Access Licence	1/8/2022	No expiry
WAL44608	Water Access Licence	8/2/2023	No expiry
SWC828767	Water Access Licence (Lease)	19/8/2022	1/7/2023
SWC828752	Water Access Licence (Lease)	19/8/2022	1/7/2023

6 Operations Summary

6.1 Mining Operations

Mining activities during the reporting period have been conducted in accordance with the Rehabilitation Management Plan and Extraction Plan approvals. The new Resources Regulator Rehabilitation Reforms *Rehabilitation Management Plan* have replaced the Mining Operations Plan (MOP) from the 2nd of July 2022.

Extraction of Longwall West 4 (LW W4) commenced on the 16th May 2022 and was completed on 17th August 2022 which completed mining in the Western Domain area (refer to **Figure 2**). Mining in the Tahmoor South domain commenced with the start of extraction for LW S1A on the 18th October 2022 and is currently progressively mining (see **Figure 3** for longwall location). An Extraction Plan for Longwalls South 1A to South 6A was approved on the 20th September 2022.

No seismic or exploration activity has occurred during the reporting period.

Table 6.1 outlines a summary of operational performance at Tahmoor Mine.

Table 6.1 Operational Performance

Material	Approved Limit (Specify Source)	Previous Reporting Period (2021) (Actual)	This Reporting Period (2022) (Actual)	Next Reporting Period (2023) (Forecast)
ROM Feed Tonnes	3,000,000 until secondary extraction of Tahmoor South then 4,000,000 (SSD 8445)	2,747,965	2,324,202	2,826,112
Reject Tonnes	-	903,622	853,000	1,085,846
Fine Reject (Tailings) Tonnes	-	117,470	110,891	-
Waste rock/Overburden /OversizeTonnes	Maximun of 200,000 tonnes of material transported to and from site each year (SSD 8445)	-	2,256	-
Saleable Product Tonnes	3,500,000 (EPL 1389)	1 929,343	1,554,298	1,771,151

6.2 Next Reporting Period

Table 6.2 outlines the completed longwall sequencing for the Western Domain, part of the Tahmoor North Mining Domain. All longwall mining has now been completed in the Tahmoor North mining Domain and active mining is currently focused in the Tahmoor South Mining Domain.

Table 6.3 outlines the proposed longwall sequencing for the continuation of mining in the Tahmoor South Domain. Secondary workings have commenced for the first longwall (LW S1A) and once completed, extraction of the next longwall (LW S2A) will commence.

Appendix 10 outlines the planned longwall layout and planned longwall progress plot for the Tahmoor South longwalls.

Table 6.2 Western Domain Longwall Sequencing - Completed

Longwall Block	Start Dates	Completion Dates
Western Domain – Longwall West 1	15/11/2019 (Actual)	06/11/2020 (Actual)
Western Domain – Longwall West 2	05/12/2020 (Actual)	17/06/2021 (Actual)
Western Domain – Longwall West 3	14/08/2021 (Actual)	21/03/2022 (Actual)
Western Domain – Longwall West 4	16/05/2022 (Actual)	17/08/2022 (Actual)

Table 6.3 Tahmoor South Longwall Sequencing – Current Mining Domain

Longwall Block	Proposed Start	Proposed Completion (subject to change)
Tahmoor South – Longwall S1A	19/10/2022 (Actual)	14/05/2023
Tahmoor South – Longwall S2A	23/07/2023	02/03/2024
Tahmoor South – Longwall S3A	01/04/2024	25/10/2024
Tahmoor South – Longwall S4A	25/11/2024	27/06/2025
Tahmoor South – Longwall S5A	08/07/2025	01/02/2026
Tahmoor South – Longwall S6A	04/03/2026	09/10/2026

Figure 2 Western Domain Longwalls West 1 - West 4 - Complete

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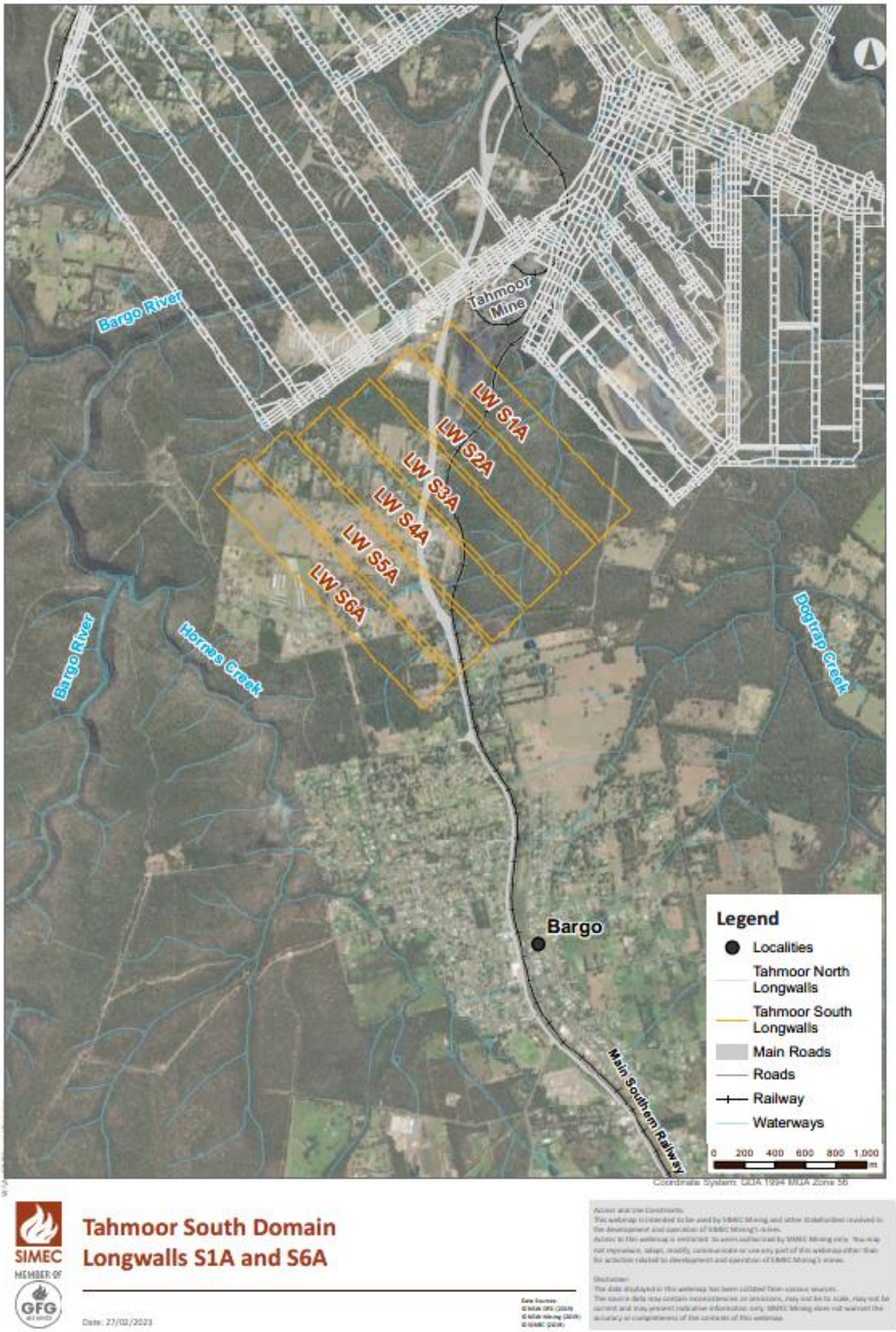
Figure 3 Tahmoor South Domain Longwalls - Current



7 Actions Required from Previous 2021 Annual Review

As required under Schedule 2 Condition 52 of Development Consent DA 67/98 and Schedule 2 Condition E23 of the Development Consent SSD 8445, a copy of the 2021 Annual Review is available on the Tahmoor Coal Website Annual Environmental Management Reports - Tahmoor Colliery.

In accordance with Schedule 2 Condition 46 of the Development Consent DA 67/98 and Schedule 2 Condition E7 of Consent SSD8445, the related Management Plans were reviewed and updated within three months following the submission of the AEMR.

No further actions were required from stakeholders for the 2021 Annual Review.

8 Environmental Performance

Environmental performance and implemented and/or proposed management activities at Tahmoor MIne is outlined in **Table 8.1** below. Further details regarding environmental performance is given in **Sections 9 to 24**.

Table 8.1 Environmental Performance

Aspect	Approval Criteria/EIS Prediction	Performance during the Reporting Period	Trend/key management implications	Implemented / proposed management actions
Noise	Maximum L10 reading of 45 dBA within 3 m of a residence Maximum L10 reading of 37 dBA at the REA	Monitoring results all within approved criteria	Noise levels compliant	Continue regular monitoring of noise levels
Blasting	Tahmoor Coal does not conduct surface blasting activities			
Air quality	Maximum deposited dust annual average of 4 $g/m^2/month$ (DA67-98 MOD3)	Monitoring results all within approved criteria	Air quality levels within approved criteria	Continue regular monitoring of air quality levels
	Maximum total suspended particulate (TSP) matter annual average of 90 $\mu g/m^3$ (DA67-98 MOD3)	Monitoring results all within approved criteria	Air quality levels within approved criteria	Continue regular monitoring of air quality levels
	Maximum particulate matter (PM10) annual average of 30 $\mu g/m^3$ (DA67-98 MOD3)	Monitoring results all within approved criteria	Air quality levels within approved criteria	Continue regular monitoring of air quality levels
	Maximum particulate matter (PM10) 24-hour	Monitoring results all within approved criteria	Air quality levels within	Continue regular monitoring of air quality levels

Aspect	Approval Criteria/EIS Prediction	Performance during the Reporting Period	Trend/key management implications	Implemented / proposed management actions
	average of 50 µg/m^3 (DA67-98 MOD3)		approved criteria	
	Maximum increase in deposited dust level over an annual period of 2 g/m^2/month (DA67-98 MOD3)	Monitoring results all within approved criteria	Air quality levels within approved criteria	Continue regular monitoring of air quality levels
Biodiversity	-	Monitoring results all within approved criteria	N/A	Continue current management and monitoring activities
Heritage	Aboriginal cultural heritage site at Redbank Creek	Monitoring results all within approved criteria	Heritage compliant	Continue current management and monitoring activities
Heritage	Stonequarry Rockbar	Monitoring results all within approved criteria	Heritage compliant	Continue current management and monitoring activities. Refer to **Section 15** for further details
Water Quality	EPL 1389 Conditions	Monitoring results all within approved criteria	Water quality compliant with EPL	Construction of Water Treatment Plant to be completed December 2023. E3 Aquatic Health monitoring program continuing. E4 Investigation into Sediment Contamination in Teatree Hollow completed. Continue current management and monitoring activities.
Subsidence	Subsidence Management Plan and Extraction Plan approvals	Cracking on sandstone culverts at 88.400 km and 88.980 km (DPE notified 21/09/2021) resulted in an exceedance of subsidence performance indicator for 'other Aboriginal and heritage sites', which was defined as 'negligible subsidence impacts or environmental consequences'. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.*	Subsidence monitoring results generally within predictions	Continue current management and monitoring activities. Complete remediation works for Redbank and Myrtle Creek. Tahmoor Coal has committed to complete remediation to sandstone culverts at 88.400km and 88.980km by 30 June 2023.

9 Operational Noise

9.1 Environmental Management

Tahmoor Mine is approved to operate 365 days a year, 24 hours a day.

Tahmoor Mine and its associated facilities currently operate in accordance with noise criteria provided by the 1994 Development Consents. However, this criteria will be superseded by the noise criteria conditions provided with in the SSD 8445 following two (2) years from commencement of development works for Tahmoor South (ie.16 May 2024).

Current noise conditions are listed in Conditions 73 and 74 (DA 57/93 Tahmoor North development consent) as follows:

> *Condition 73: The noise level emanating from Tahmoor Mine and any associated facilities, including the Washery, stock pile area and rail loading facility, shall not exceed an L10 level of 45 dBA when measured within 3 m of any residence.*
>
> *Condition 74: The noise emanating from operations at the refuse emplacement site shall not exceed an L10 of 37 dBA or background +5 dBA whichever is the greater when measured within 3 m of any residence.*

The DA 57-93 consent conditions reference a distance of three (3) metres (m) from any residence that was constructed or approved prior to 1994.

Tahmoor Coal operates a real-time noise monitoring system which includes a Trigger Action Response Plan (TARP) and alarm system, linked back to the mine's 24-hour control room.

Attended due diligence monitoring and assessment is conducted quarterly during the reporting period as part of ongoing noise compliance.

9.2 Environmental Performance

Tahmoor Mine's real-time noise monitoring data and due diligence assessments continued to demonstrate compliance with the sites' development consent noise criteria, with all monitoring results satisfying the noise assessment goals for the mine pit-top, No.2 ventilation shaft and REA operational areas. **Appendix 1** outlines the positions of the noise monitoring locations and **Appendix 2** contains a summary of noise monitoring completed from 2014 to 2022.

Tahmoor Coal received four (4) noise complaints in 2022 as listed below. Further information regarding the complaints and actions taken is given in **Section 22 Community**.

- One (1) complaint received in relation to noise & vibration;
- One (1) complaint received in relation to siren noise;
- One (1) complaint received in relation to dozer movements; and
- One (1) noise complaint received in relation to a mine alarm.

9.3 Further Improvements

Tahmoor Coal will continue to operate and monitor the sites real-time noise monitoring network and alarm system, which includes a monitor at the mine pit-top facility (SX48) and one at a residence along Olive Lane (SX47) (refer to **Figure 3**). The site also hosts an additional portable noise monitor which is utilised at times to investigate off site noise issues, SX25. This noise monitor is situated to the north of the stockpile area and is kept active and used as an additional onsite noise monitor. This system has proved effective in managing compliance with development consent noise criteria to date.

As part of the Tahmoor South consent, significant noise mitigation works are being investigated as to the most effective avenues to mitigate noise emissions from site. Works being investigated and implemented include Coal Handling Preparation Plant (CHPP) noise reduction progressing in two stages:

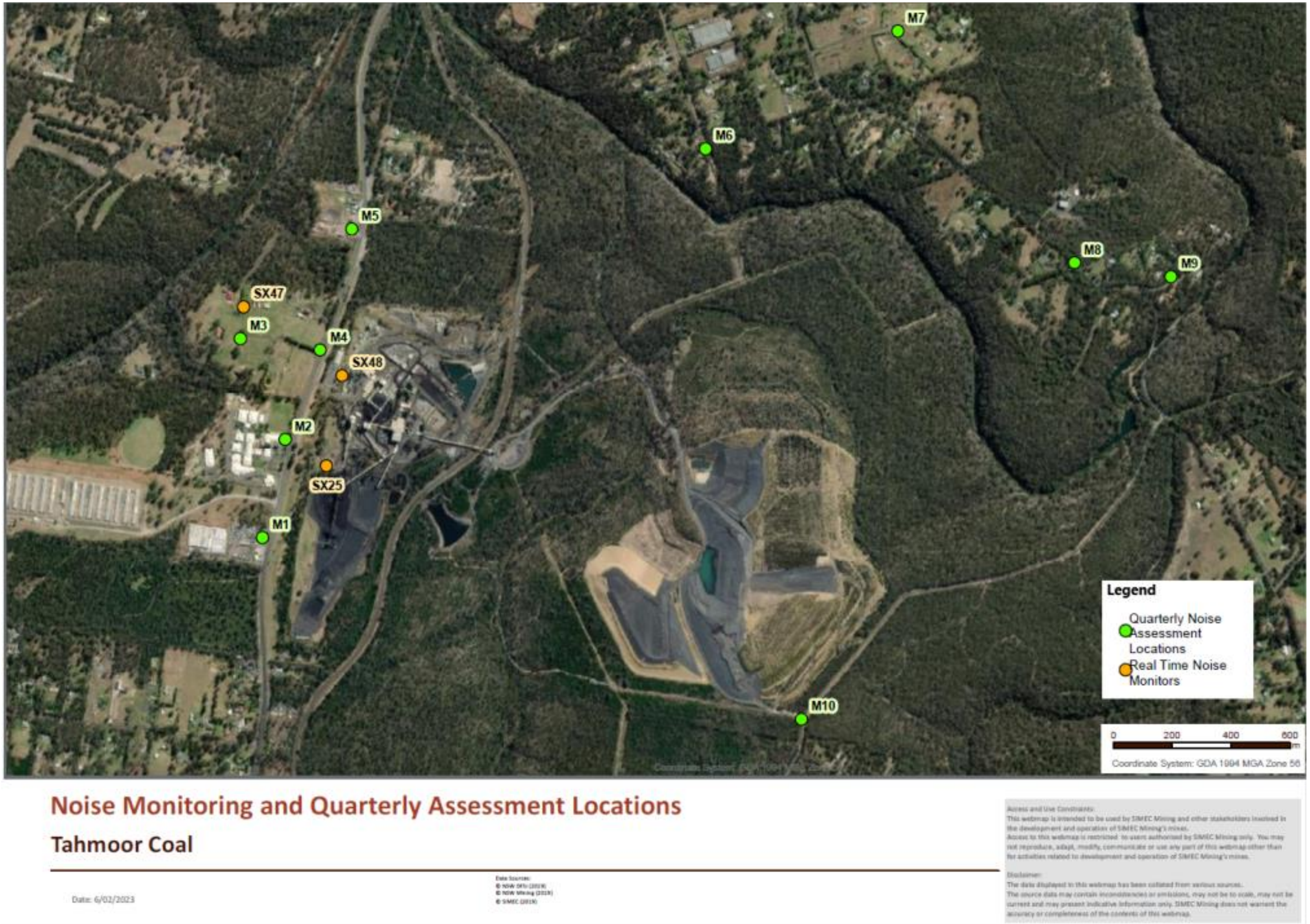
1. Installation of noise dampening cladding (works to be completed during the next reporting period)

2. Closure of openings on the external CHPP walls (works to be completed during the next reporting period)

Noise mitigation works will be implemented in a staged approach over the next reporting period in order to comply with Condition B2 (SSD 8445).

Tahmoor Coal will continue to operate and monitor the sites noise levels in accordance with the approved Tahmoor South Noise Management Plan (TAH-HSEC-00372) which has been prepared to address the requirements of Condition B7 of the SSD8445 development consent for Tahmoor South. It provides a framework for Tahmoor Coal personnel to ensure that compliance is achieved with relevant internal and external regulatory requirements related to noise management at Tahmoor MIne. The plan ensures that noise impacts on the community are minimised and managed efficiently and effectively within a structured framework.

Figure 3 Locations of Noise Monitors and Noise Assessment Locations



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10 Air Quality

10.1 Environmental Management

Tahmoor Coal manages air quality in accordance with the Air Quality and Greenhouse Gas Management Plan approved by DPE - V 2.0, dated 14th March 2022 (*TAH-HSEC-00379– Tahmoor South Air Quality & Greenhouse Gas Management Plan).*

A comprehensive system of controls is detailed for managing particulate matter on-site, including dust suppression sprays on the coal stockpiles (automatically triggered by pre-defined meteorological conditions), and visual triggers for operators and site personnel. Water carts are used at the REA and Pit-top hardstand areas to reduce wheel generated dust from mobile equipment. Unsealed access ways are controlled through the daily and additional on-call deployment of water carts to control dust. An organic dust suppressant 'Dustloc' is mixed into the water carts for additional effectiveness.

The site also utilises a chemical dust suppressant 'PetroTac' on highly trafficked areas to prevent wheel generated dust from mobile equipment. This suppressant is applied monthly to hardstand areas by a third party contractor, however can be applied more frequently if needed.

10.2 Environmental Performance – Dust

10.2.1 Depositional Dust

The annual average depositional dust monitoring results for the reporting period, expressed as insoluble solids (g/m^2/month), are compared against those from previous reporting periods and reviewed monthly. Monitoring results indicate that all recorded dust levels are monitored in accordance with Tahmoor Coal's Environmental Protection Licence (EPL) and within the annual average of 4 g/m^2/month as allowed by consent SSD 8445. Depositional dust results during the reporting period are outlined in **Table 10.1** and **Figure 4** and have remained relatively low compared to results of the last reporting period. There were two (2) occurances of samples being contaminated by Insects, Polysaccharide Slime and/or Vegetation for Site 2 and one (1) occurance for Site 9 during 2022. Air quality monitoring site locations are shown in **Appendix 3**.

Table 10.1 Depositional Dust Gauge Data

Month /Site	1	2	3	4	7	8	9	10	11	12
Jan-22	0.7	0.7	1.9	1.5	1.2	1.2	0.5	3.6	1.9	2.1
Feb-22	0.5	0.8	1.6	1.1	1.3	1.3	2.8	1.6	0.9	2
Mar-22	0.1	1.6	0.6	0.8	0.4	0.7	6.6*	1.2	0.4	0.6
Apr-22	0.6	3.2	0.9	0.3	0.2	0.4	1.0	3.6	0.3	0.4
May-22	0.4	2.8	0.6	0.6	0.2	0.8	1.5	2.6	0.5	2.9
Jun-22	0.4	2.0	0.4	0.5	0.2	0.6	1.1	1.4	0.4	1.0

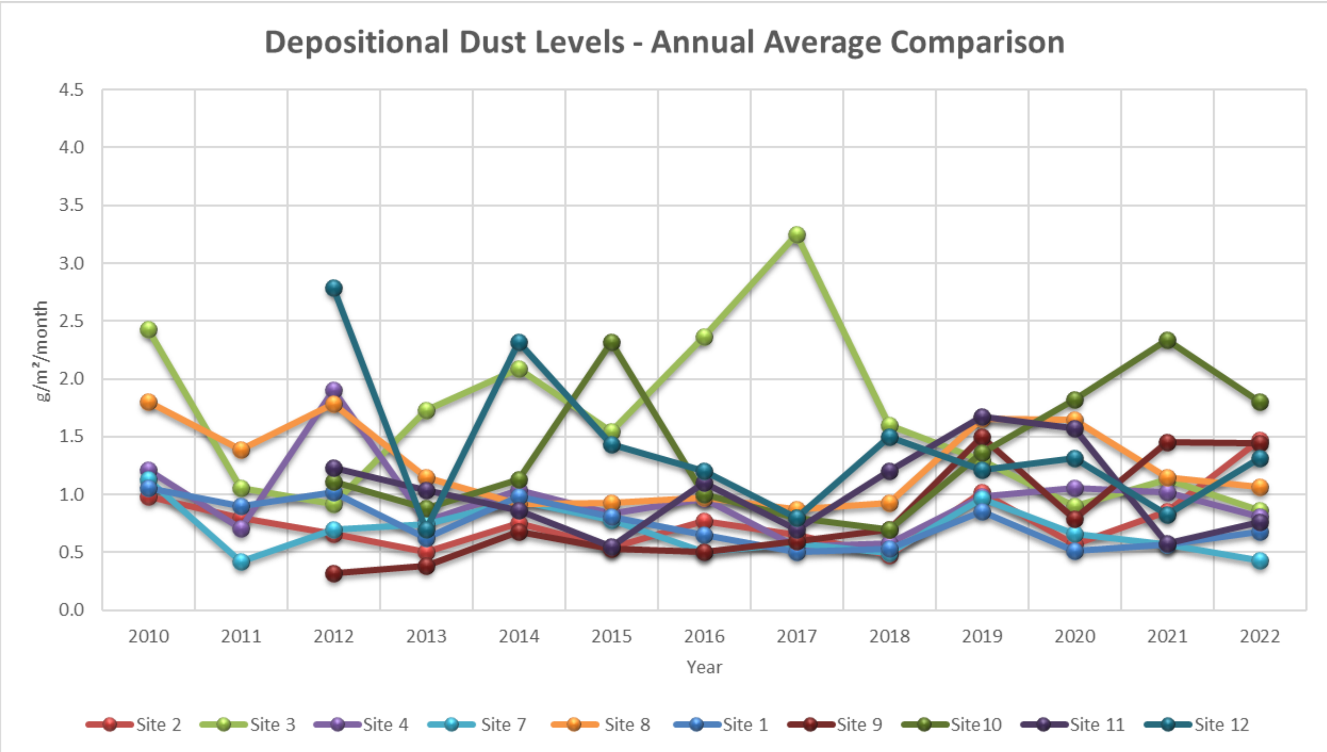
Jul-22	1.1	6.1*	1.0	1.6	0.8	1.3	3.7	0.8	1.8	0.8
Aug-22	0.8	0.7	0.5	0.2	0.1	2.8	1.4	0.1	0.2	0.7
Sep-22	0.4	8.9*	0.6	0.3	0.1	1.0	0.9	1.0	0.8	1.1
Oct-22	1.6	1.7	0.6	0.9	0.1	0.8	0.8	2.1	1.1	2.5
Nov-22	0.5	0.4	0.5	0.8	0.3	0.6	0.4	1.9	0.3	1.2
Dec-22	1.0	0.8	1.2	1.1	0.3	1.3	1.8	1.7	0.5	0.5
Avg	**0.6**	**0.9**	**1.1**	**1.0**	**0.6**	**1.2**	**1.5**	**2.7**	**0.6**	**0.8**

Notes:

* Dust Gauge contaminated with Insects, Polysaccharide Slime and/or Vegetation.

Figure 4 illustrates all sites are below limits set by Tahmoor Coal's EPL 1389 and SSD 8445. In general, all Depositional Dust monitoring site levels fluctuated on average between 0.4 to 1.8g/m^2/month with an annual average of 1.06 g/m^2/month for 2022.

Figure 4 Depositional Dust Monitoring Annual Average Comparison



10.2.2 Continuous and Hi Vol Dust Monitoring

Figure 5 and **Figure 6** demonstrate the results of the particulate matter (PM_{10}) monitoring at Charlies Point Road and quarterly High Volume (Hi Vol) dust monitoring at Olive Lane and Hodgson Grove in Tahmoor. PM_{10} particles have a diameter of 10 micrometers or smaller and are found in dust and smoke as a common air pollutant. These monitoring sites have been established since August 2013, with a continuous TEOM (Tapered Element Oscillating Microbalance) dust monitor located at the Charlies Point Road residence.

In **Figure 5,** the historical high recorded in Q1 2019 was attributed to a localised dust event at Hodgson Grove (87.9 µg/m³) that is not thought to be related to mining operations. During 2022, Hi vol results have remained low and well below our 24 hour maximum average level of 50 µg/m³ and lower than last reporting period.

In **Figure 6**, bushfires and hazard reduction burns impacted on the air quality significantly during November and December 2019 causing a steep increase in the PM_{10} annual average. However, during 2020 levels considerably declined and returned to baseline levels during 2021. During 2022, PM_{10} results from our continuous TEOM dust monitor at Charlies Point Road have remained below development conditions (SSD 8445) maximum annual average of 25 µg/m³.

Figure 5 Air Quality Monitoring Results for PM10 from 24hr High Volume dust monitors located at Olive Lane and Hodgson Grove.

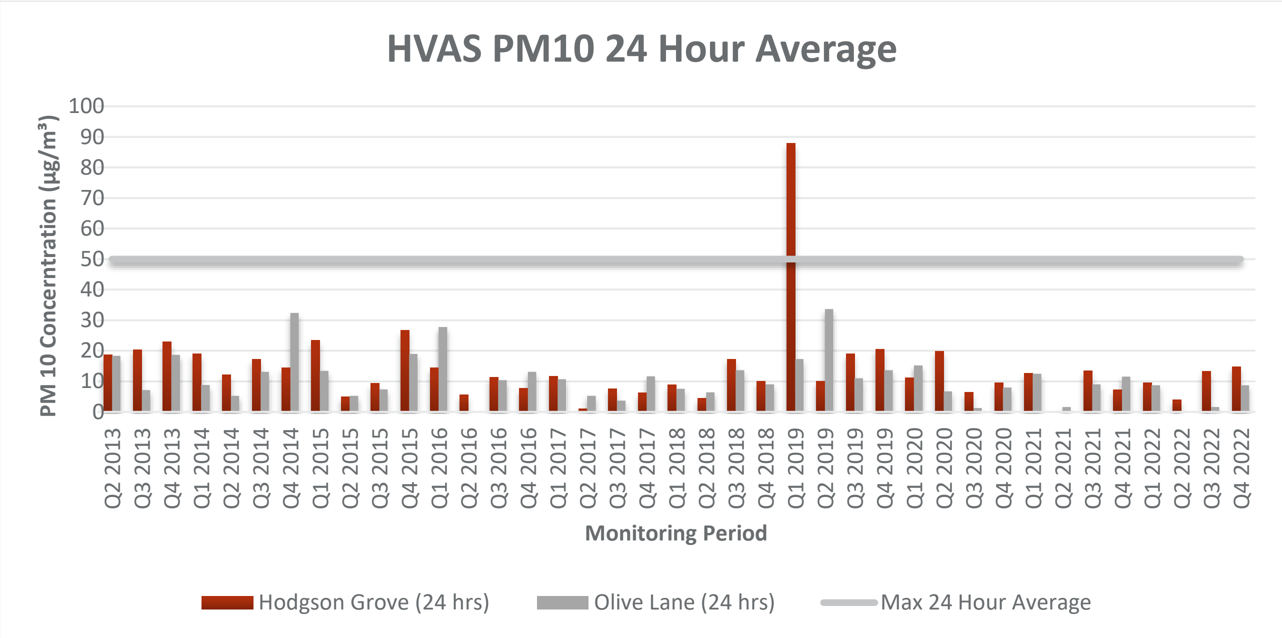
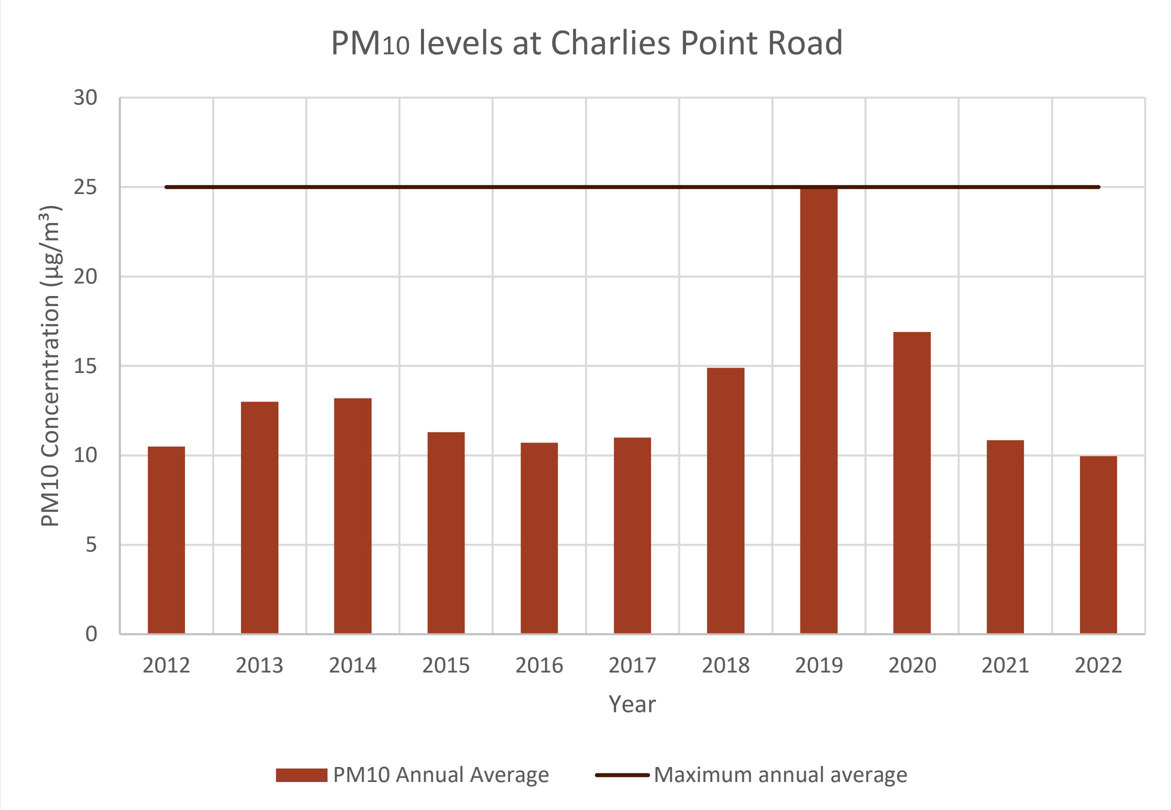


Figure 6 Continuous PM10 annual average results from our Charlies Point Road dust monitor.



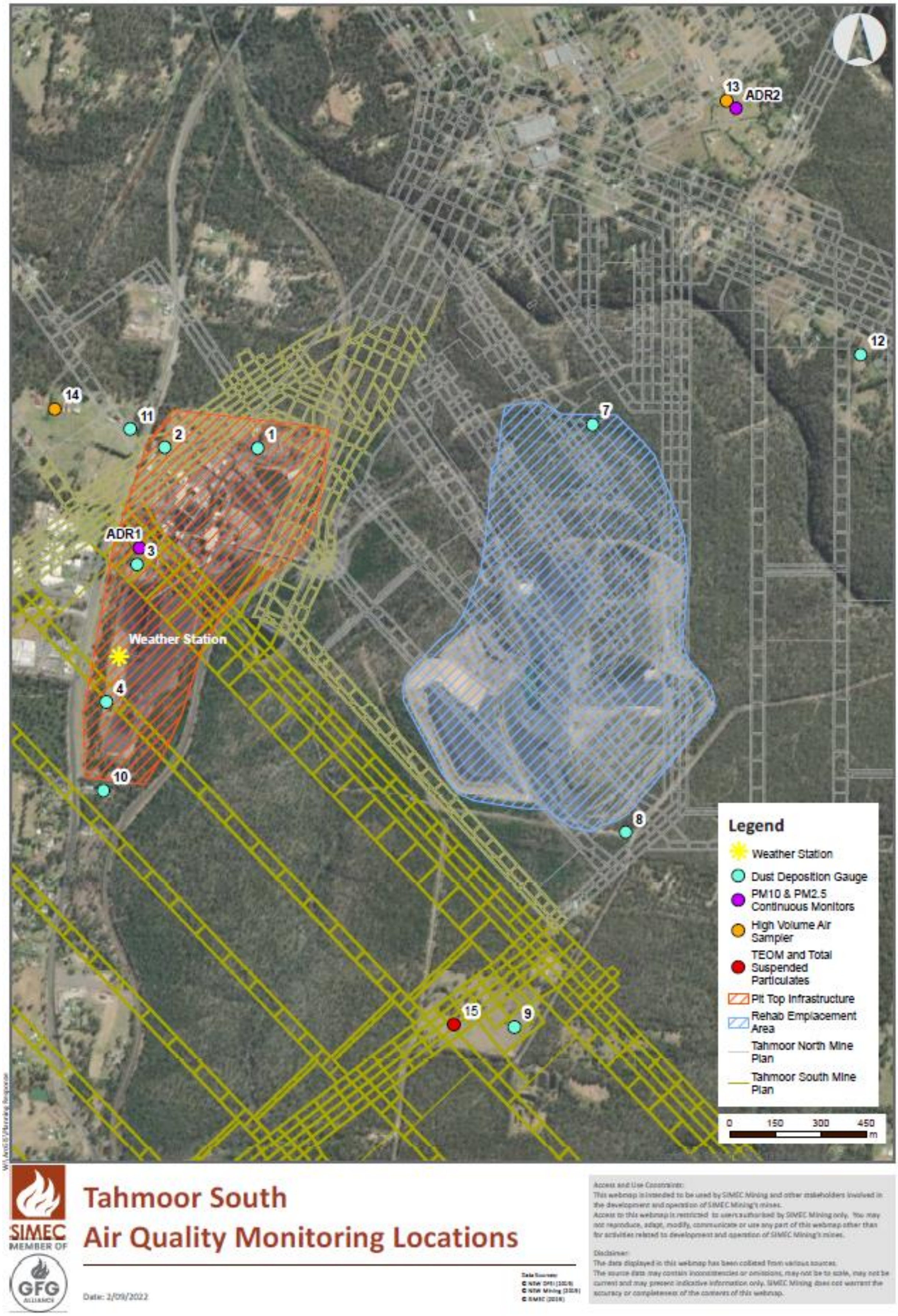
10.2.3 Total Suspended Particulate

Total suspended particulate (TSP) refers to the totality of small solid matter released, documented and/or otherwise observed in the atmosphere. TSP is sampled every 6 days by a third party contractor and sent to a laboratory for analysis. The below data in **Table 10.2** was captured for the reporting period and recorded an average annual concentration of **10.49**, this has decreased from the previous reporting period's average of 16.5 µg/m^3 for 2021 (and within the 90 µg/m^3 average as stated in Condition 37, DA 67/98).

Table 10.2 Total Suspended Particulates recorded for 2022.

2021	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Jan	12.9	13.7	13.9	8.6	22.5	
Feb	12.9	15.8	20.4	21.8	7.6	
Mar	9.3	10.1	10	21.2	5.1	
Apr	14.9	6.7	11	7.8	5.1	
May	13.1	6.1	9.2	0.2	3.8	
June	9.2	2.9	7	8.4	5.3	
July	1.2	5.2	8.3	3	2.8	
Aug	13.6	9.3	2.9	4.5	3.5	
Sept	13.7	11.4	8.1	9.1	8.7	
Oct	7.9	10.6	14.7	13.4	7.5	16.5
Nov	13.5	13	9.8	14.9	22.6	
Dec	15.6	26.6	8.6	14.6	8.3	

Figure 7 Air Quality monitoring locations



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10.3 Environmental Performance – Greenhouse Gas Emissions

Greenhouse gas emissions (GHG) are recorded every six (6) months and reported every twelve (12) months in the National Greenhouse and Energy Reporting (NGERS) scheme as a requirement under the National Greenhouse and Energy Reporting Act 2007 (NGER Act). NGER provides information about GHG emissions, energy production and energy consumption.

Carbon Dioxide Emmisions (CO2-e) for the Financial Year 2022 and previous years are shown in **Table 10.3** below, as well as further explanation of the data.

Table 10.3 Annual Greenhouse Gas Emissions for Financial Year

Year	Scope 1 (Mt CO2-e)	Scope 2 (Mt CO2-e)	Total Scope 1+2 (Mt CO2-e)	Explanation for results
FY16	1.643	0.085	1.727	Finished Longwall LW29 and commenced LW 30. A 78 day changeout between longwalls occurred versus a budget of 28 days. The cause of delays included 12 days lost due to surface dam subsidence risk management.
FY17	1.625	0.085	1.710	-
FY18	1.396	0.082	1.478	Decrease in emissions with use of more accurate gas composition (SICK Analyser) on Shaft 2 (VAM) emissions. In Dec 17 there was a Pit bottom roof fall which delayed mining for 12 days.
FY19	1.260	0.083	1.343	Decrease in Greenhouse emissions driven by plant outage for 10 weeks at Tahmoor due to Number 3 shaft safety incident (shaft winder), however 4 weeks of this period was a Longwall changeover, so the additional impact was 6 weeks. The Net Energy Consumed increased in main due to a higher ratio of CH4 to CO2 in mine gas flaring at Tahmoor due to longwall gas geology.
FY20	1.239	0.088	1.326	In H1 FY20 – Reduction in normal VAM emissions Sept-Nov 19 due to a longwall non-production period, due to extended LW changeout (discontinuity). Ramp up of longwall production within the new, more highly CH4 rich Domain has been significantly slower than forecast. Dec19- Bushfire site power outage.
FY21	1.124	0.079	1.222	Approx. 110,000 t CO2-e Scope 1 reduction due to decreases in VAM emissions primarily driven by • Increase in gas drainage plant capacity and post-drainage capture efficiency (PDCE) with waste gas sent to EDL and flares. • 2 x LW non-production periods in Nov 20 and Jun 21 relating to LW changeout. • Partial extraction in a virgin LW environment (ie. 1st LW in new domain i.e. Western Domain)
FY22	0.964	0.091	1.055	Main data variances identified when compared to the previous corresponding period are a reduction in normal free-vented emissions.These reductions are believed to be contributed to by: 1. Significant reduction in CH4 VAM (15-20%). Equivalent CO2 VAM. CH4 VAM reduced 16.4% from FY21 (the methane component of VAM was 873,040 tCO_2e in FY21 and 729,570 tCO_2e in FY22) 2. In general, trend towards increases in carbon dioxide fugitive emissions when compared to FY21 (note – emissions of carbon dioxide, not carbon dioxide equivalent emissions): • CO2 vented increased 192.4% from FY21 (303 tonnes in FY21 to 886 tonnes in FY22)

				• CO2 sent to EDL increased 114.2% from FY21 (6,131 tonnes in FY21 to 13,135 tonnes in FY22) • CO2 sent to flare increased 65.8% from FY21 (10,126 tonnes in FY21 to 16,786 tonnes in FY22) 3. Composition of methane and carbon dioxide as expected due to the above variation has shifted: • CO2: total mass in total mass of gas generated from the mine during the year before capture and storage (measured per NGERs requirement) has increased 10.6% from FY21 (140,262 tCO_2e in FY21, 155,088 tCO_2e in FY22) • CH4: total mass in total mass of gas generated from the mine during the year before capture and storage (measured per NGERs requirement) has decreased 11.59% from FY21 (1,623,825 tCO_2e in FY21, 1,435,567 tCO_2e in FY22) 4. VAM reductions due to reduced LW SGE and improved post-drainage capture efficiency (PDCE). 5. 2 x extended LW non-production periods in Jul-Aug 21 and Mar-Apr 22 relating to Longwall relocation. Combined non-production timeframe marginally exceeds that of previous period.

10.3.1 Tahmoor South Project specific reporting

In accordance with Condition B19 (d) of the consent SSD 8445, the below **Table 10.4 and 10.5** demonstrates the reporting of annual and 3-year rolling GHG emissions for the Tahmoor South Project.

Table 10.4 Calculated Scope 1 and 2 GHG Emissions

Project Year	Scope 1 GHGE (t CO2-e) (flaring and power generation occurring)	Scope 2 GHGE (t CO2-e)	Total Scope 1+ Scope 2 GHGE (t CO2-e)	Comments
1 (2021)	97,571	9,106	106,678	-
2 (2022)	112,111	11,138	123,249	H2 FY22 Data only (Jan-June 2022) H1 FY23 data will be published in NGER for FY23.
Total	209,683	20,244	229,928	

Table 10.5 Predicted Scope 1 and 2 GHG Emissions (APPENDIX 9 from SSD 8445 consent)

Project Year	Scope 1 GHGE (t CO2-e) (flaring and power generation occurring)	Scope 2 GHGE (t CO2-e)	Total Scope 1+ Scope 2 GHGE (t CO2-e)
1 (2021)	230,041	14,764	244,805
2 (2022)	1,003,246	64,389	1,067,635
3 (2023)	1,636,849	105,054	1,741,903
4 (2024)	2,054,557	131,863	2,186,420
5 (2025)	1,843,089	118,291	1,961,380
6 (2026)	2,065,327	132,555	2,197,882
7 (2027)	2,070,977	132,917	2,203,894
8 (2028)	2,301,721	147,727	2,449,448
9 (2029)	1,859,357	119,335	1,978,692
10 (2030)	2,016,949	129,450	2,146,399
11 (2031)	1,761,824	113,076	1,874,900
12 (2032)	466,314	29,928	496,242
Total	19,310,249	1,239,350	20,549,599
Annual Average	1,609,187	103,279	1,712,466

10.4 Further Improvements

Tahmoor Coal will continue to operate and monitor the sites dust and air quality levels in accordance with the approved Tahmoor South Air Quality and Greenhouse Gas Management Plan (TAH-HSEC-00379) as approved by the DPIE, last update dated 19th October 2022 version 3.0.

Improvements completed during the reporting period include the introduction to site of two (2) photometers to analyse particulate matter for 2.5µm and 10µm in real-time equipped with alarms triggered by the approved Air Quality Trigger Action Response Plan for Tahmoor Coal.

An additional telemetry upgrade to the existing TEOM (Tapered Element Oscillating Microbalance) monitor was completed during the reporting period to allow 24/7 remote access to real-time monitoring for PM10 data and was equipped with additional SMS alarm level alerts.

Tahmoor Coal will continue to implement control strategies identified in Tahmoor MIne's Air Quality and Greenhouse Gas Management Plan (TAH-HSEC-00379) and continue to identify areas for improvement over the next reporting period

11 Erosion and Sediment Control

11.1 Environmental Management

Tahmoor Coal has recently developed a new Water Management Plan (TAH-HSEC-00369) and site Erosion & Sediment Control Plan (TAH-HSEC-00374), prepared generally in accordance with the requirements of *Managing Urban Stormwater* (OEH, 2008), including *Volume 2E Mines and Quarries* (2008) (also known as 'the Blue Book') and have both been approved by the DPE in accordance with the Tahmoor South Consent (SSD 8445) conditions.

A number of drive-in sumps are positioned around Pit top to capture and hold sediment laden water. Settling dams are also utilised to capture and settle sediments prior to discharge via Tahmoor Coal's Licence Discharge Point 1 (LDP1).

The unsealed equipment storage area between dams M1, M2, M3 and M4 is treated regularly with a dust suppressant to seal the roadways and reduce wind blown dust activity. The sealing agent is also useful in reducing sediment mobilisation during stormwater runoff.

Continued use of flocculent in surface water dams enables a reduction in turbidity and an increased settling of mobilised particles during rain events. Flocculent levels are adjusted depending on Turbidity readings from the real-time Turbidity monitor situated on Dam M3.

11.2 Environmental Performance

Dust and water sampling are carried out monthly by third party licenced contractors while continuous water and dust gauge downloads are accessed remotely via telemetry by the environmental team onsite. Results obtained during the reporting period reflect Tahmoor Coal has operated within maximum levels as required by Environmental Protection Licence 1389 (EPL 1389) and that the current dust suppression activities are sufficient in continued dust control for site.

A section of drainage scoured out by heavy rainfall earlier in the calendar year located north of the future Water Treatment Plant, was remediated mid-year and no further issues have been noted during the monthly site environmental inspections.

11.3Further Improvements

Tahmoor Coal will continue to implement control strategies identified in Tahmoor Coal's Water Management Plan (TAH-HSEC-00369) and the site's Erosion & Sediment Control Plan (TAH-HSEC-00374) which incorporate site-wide erosion and sediment controls and their effective implementation.

12 Waste Management

12.1 Environmental Management

Tahmoor MIne's waste management system currently operates in accordance with the developed Waste Management Plan (TAH-HCEC-00106). This plan aids in ensuring waste streams generated at Tahmoor Mine are minimised and managed effectively and that all waste is collected, disposed of and tracked in accordance with regulatory requirements and in a way that does not compromise the health or safety of our personnel or impact the environment. This Waste Management Plan applies to all waste generated or stored at Tahmoor Coal and is part of the Tahmoor Coal's Environmental Management System (EMS).

In accordance with Consent SSD 8445 condition B48(e), Tahmoor Coal monitors and reports annually on the effectiveness of the waste minimisation and management measures undertaken onsite and included in this section.

According to the Waste Classification Guidelines Part 1: Classifying Waste (EPA 2014), waste is classified using six classes:

a) Special waste;

b) Liquid waste;

c) Hazardous waste;

d) Restricted solid waste;

e) General solid waste (putrescible); and

f) General solid waste (non-putrescible).

These classes are documented with their corresponding waste stream in Appendix A of the Waste Management Plan available on the Tahmoor Coal website (Plans - Tahmoor Colliery).

Tahmoor Coal recognises the importance of segregating the six groups of waste so they can be treated separately. Various bins are placed across the site to assist with waste segregation, refer to **Figure 9** for their locations at Tahmoor Mine. Waste produced on site is placed in the appropriate bin and if no bin fits the description of that waste, it is placed in a bunded area and covered in case of a rainfall event.

All wastes that have the potential to cause environmental harm (e.g. hazardous waste) are placed in secure areas on site. Adequate containment (bunding) is provided to minimise the potential for spillage or leaching which could affect surface water quality or cause soil contamination. Bunded areas are constructed and operated generally in accordance with the EPA's Technical Guideline "Bunding and Spill Management" and Australian Standard (1940-2004) "The Storage and Handling of Flammable and Combustible Liquids". Particular waste streams, such as waste oil, are also managed to provide that they are safe from likely ignition sources to minimise the risk of fire. All bins and waste storage areas are clearly identified, designed to meet the storage requirements, and maintained to contain any spillages.

12.2 Environmental Performance

During the reporting period waste generated on site has been managed in accordance with Tahmoor Mine's Waste Management Plan with the **Table 12.1** below quantifying the waste generated during 2022.

Table 12.1 Main waste streams

Waste Stream	2021	2022	2023
General waste (tonnes)	1104.9	1226.4	-
Paper and Cardboard (tonnes)	19.5	14.7	-
Comingled Recyclables (tonnes)	-	0.06	-
Oil Filters (units)	1507	742	-
Oil Drums empty 20L (units)	4578	4628	-
Diesel Particulate Filters (tonnes)	60.1	55.8	-

12.2.1 On site Sewage Management

Tahmoor Coal operates a *Smith & Loveless* Sewage Treatment Plant (STP) onsite and utilises two (2) maturation treatment ponds to treat it's effluent waters. During the reporting period, in accordance with consent SSD 8445 condition B50, the STP was upgraded to a larger capacity and the superseded unit decommissioned (refer to **Figure 8**). The new STP was commissiond before secomdary extraction commenced for Tahmoor South. Water Quality samples taken before and after commissioning have shown an improvement for a range of analytes including E.coli, Total Nitrogen and Ammonia as showing noted improvements with a vast improvement in water clarity and color.

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Figure 8 Upgraded Sewage Treatment Plant

12.2.2 Coal Washery rejects (CWR)

During the reporting period, Tahmoor Coal's CWR obtained certified compliance with the EPA Coal Washery Rejects Order and Exemption 2014. The use of CWR is controlled by the NSW State Government Environmental Planning Authority (EPA), under the Protection of the Environment Operations (Waste) Regulation 2014.

This has provided Tahmoor Coal the unique opportunity to utilise it's CWR for potential offsite purposes including but not limited to General construction fill Construction of public facilities such as playing fields, tennis courts, golf courses and general landscaping, road construction, usually as embankment fill, subgrade or for unsealed road surfacing. Further uses include topdressing, haul roads, drainage blankets, capping (e.g. tailings dams prior to application of topsoil layer), retaining wall backfill, cattle tracks and earthwall dams.

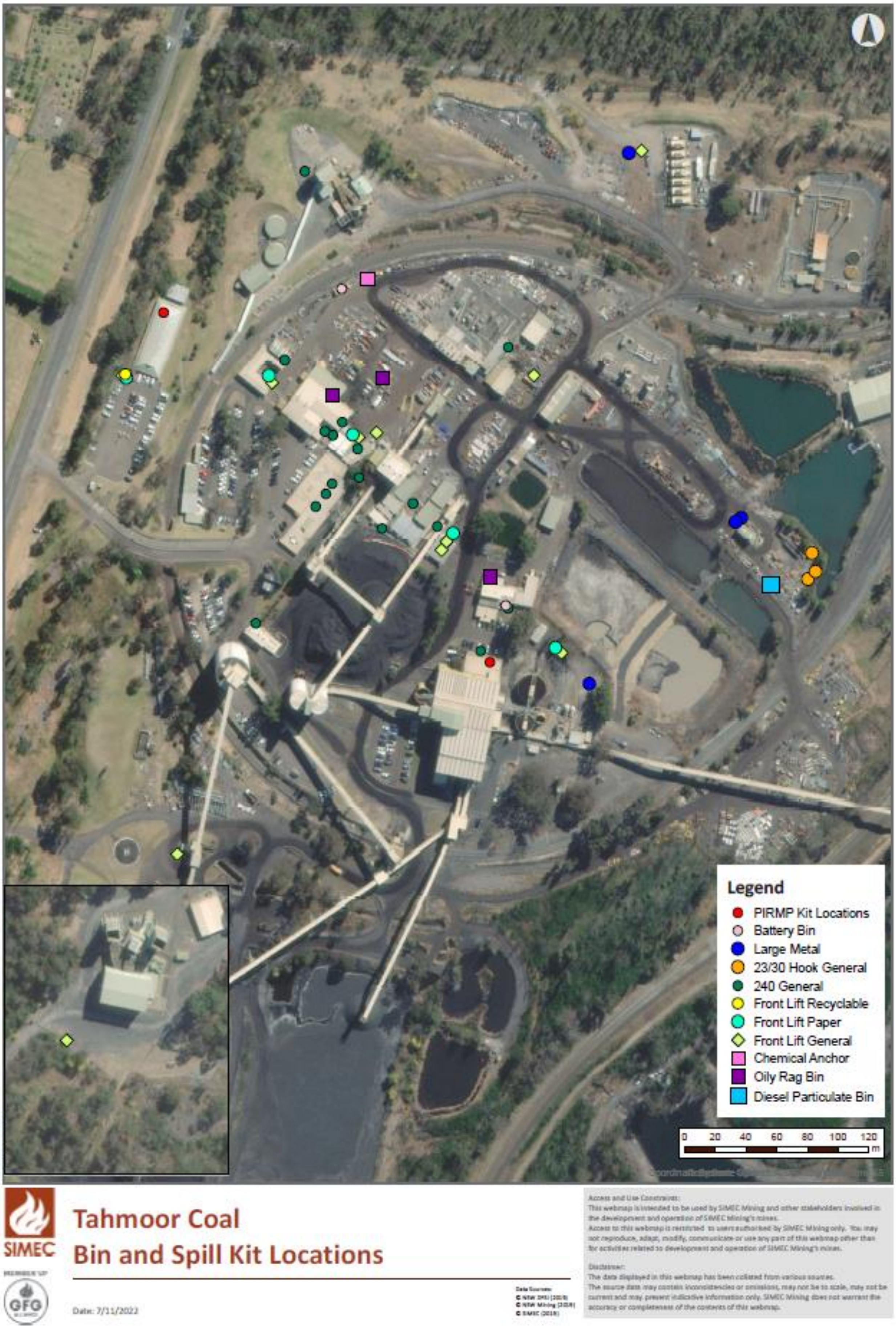
Due to the relatively consistent nature of the coal seam and surrounding geology; and the coal washing process (i.e. crusher and sieve sizing), the CWR material characteristics are consistent over time. Using CWR significantly reduces construction costs compared with conventional quarried materials and is also eligible for Carbon Credits and Offsets.

Any offsite use of Tahmoor Coal's CWR will be reported in the AEMR in accordance with Consent SSD 8445 condition B61.

12.3Further Improvements

Tahmoor Coal will continue to implement control strategies identified in Tahmoor Mine's Waste Management Plan (TAH-HSEC-00106) and continue to identify areas for improvement over the next reporting period.

Figure 9 Bin and Spill Kit Locations



13 Contaminated Land

13.1 Environmental Management

A Stage 1 Preliminary Contamination Investigation was completed by GHD in 2017 and actions from the findings have been closed out, including removal of former underground storage tanks (USTs) and remediation works around the waste oil tanks and diesel above ground storage tanks (ASTs).

Groundwater monitoring around the UST area is ongoing as part of the quarterly water quality sampling and monitoring program for pit top groundwater.

13.2 Environmental Performance

A Hazardous Building Material audit and inspection was undertaken by GHD in 2018.

The audit focused on:

- Asbestos containing materials (ACM);
- Lead based paint systems;
- Lead Dust;
- Synthetic Mineral Fibre (SMF);
- Polychlorinated Biphenyls (PCBs) in light fittings; and
- Ozone depleting substances (ODS).

The Hazardous Materials Audit identified several actions that were completed during 2019 and one outstanding action as outlined in **Table 13.1** below.

Table 13.1 Hazardous Building Material Audit Actions

Action	Proposed Completion Date
Remove vinyl floor tiles from 5 offices and replace with new tiles	Complete
Labelling of all asbestos	Complete
Seal or encapsulate the eaves of BU001 which were found to contain asbestos	Works delayed – to be addressed in the future.
Remove dust on upper surface of ceiling panels in muster area	Complete
Remove dust in Washery HV switch room SR 105 and SR106- low level lead contamination	Complete
Remove dust from No3 Switch room SR103 – high lead on top of st169	Complete

There were no reportable incidents related to contaminated land during the reporting period.

13.3 Further Improvements

Tahmoor Coal will continue to monitor potential areas of contaminated lands across the site and have one (1) action to complete from the 2018 Hazardous Building Materials Audit (refer to **Table 12.1**).

14 Biodiversity

14.1 Environmental Management

Tahmoor Coal undertakes ecological assessments and due diligence vegetation assessments prior to undertaking activities likely to require vegetation clearing as documented in our approved Biodiversity Management Plan (TAH-HSEC-00378). Several threatened plant species have previously been identified on the surface mining lease areas, including *Grevillea parviflora* and *Persoonia bargoensis,* which have been identified at the REA, near the No.2 Shaft area, and along Charlies Point Road. *Grevillea parviflora* is listed as vulnerable on both the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). *Persoonia bargoensis* is listed as endangered under the Biodiversity Conservation Act and vulnerable under the EPBC Act.

Terrestrial, Amphibian and Aquatic ecology studies have been conducted on a regular basis for Tahmoor North, Western and Tahmoor South Mining Domains. This includes periodic monitoring for changes in environment, diversity and abundance with in these ecological communities.

Aquatic ecology (macroinvertebrates) studies are conducted along Myrtle Creek and Redbank Creek in the Tahmoor North Domain to monitor impacts to stream health from subsidence and in response to post-mining creek remediation works currently being conducted.

Baseline terrestrial and aquatic ecology studies have previously been conducted within waterway catchments in the Western Domain in Stonequarry Creek, Matthews Creek and Cedar Creek since before the extraction of Longwall West 1 (LW W1). Visual inspections have been conducted monthly during periods of active subsidence of these creek systems for any impacts to pool level, drainage behaviour and flow. Terrestrial and aquatic monitoring of these waterway catchments will continue to be monitored and assessed for a year following the completion of mining in the Western Domain during 2023.

Terrestrial and aquatic monitoring is currently conducted in the Tahmoor South Domain as a requirement of the Biodiversity Management Plan (BMP) for the LW S1A-S6A Extraction Plan. The BMP identifies the monoitoring and management measures for aquatic and terrestrial biodiversity that are required to be implemented to demonstrate that the relevant performance measures are achieved for various sites in Teatree Hollow Creek, Bargo River, Dogtrap Creek and Hornes Creek. The BMP focuses on aquatic and terrestrial biodiversity, with particular focus on threatened species, populations and their habitats, and Endangered Ecological Communities (EECs) and water dependent ecosystems.

Baseline monitoring results of pre-mining conditions have been completed over a 3 year period previous to LW S1A commencement for Tahmoor South Longwalls, which has focused on riparian vegetation, watercourses, and amphibian monitoring, as these areas were previously determined to be more susceptible to impacts from subsidence.

14.2 **Environmental Performance**

14.2.1 **Tahmoor North Domain**

Aquatic ecology (macroinvertebrates) studies have been conducted along Myrtle Creek and Redbank Creek to monitor impacts to stream health from subsidence and in response to post-mining creek remediation works currently being conducted.

Mining related subsidence in Myrtle and Redbank Creek had resulted in reduced pool holding capacity. Water flow in affected pools was diverted through the subsurface via cracks and fissures in the bedrock, this resulted in a reduced pool holding capacity in impacted pools.

Remediation of Myrtle Creek and Redbank Creek is currently underway in accordance with the approved Corrective Action Management Plan by the Resources Regulator and in consultation with a variety of stakeholders. The remediation process consists of drilling a series of boreholes and injecting an expanding hydrophobic polyurethane grout material. This creates a “curtain wall” or subsurface dam wall across the creek bed to a depth where the fracture network has been detected, which seals the fractures and helps redirecting the stream flow back to the surface. This remediation technique is also used in combination with a grid pattern grouting process that acts as a liner to improve the water retention capability of the pool. The grout material has also been used successfully for creek rehabilitation in Sydney Catchment Authority areas as it has minimal ecotoxicological effects and has proven to be highly effective in remediating subsurface fractures. To assess the remediation effectiveness, aquatic ecology monitoring is undertaken biannually in Autumn and Spring with specific reference to the recovery of stream health in pools that have been rehabilitated.

Monitoring was conducted using standard Australian River Assessment System (AUSRIVAS) method, including aquatic habitat assessment, quantitative macroinvertebrate survey and physiochemical water quality results in autumn and spring 2019 before remediation commenced, and during autumn and spring 2020, 2021 and 2022. Un-impacted sites unaffected by subsidence are also monitored for aquatic health in the creek systems.

Aquatic Ecology Monitoring

Redbank Creek

Autumn monitoring results for Redbank Creek show an improvement in water quality and an overall improvement in rehabilitated sites compared to previous surveys with Pool R11 scoring in Band A (excellent recovery) and pools RB6, RB19 and RR30 scoring a Band B (good recovery). In comparison an unimpacted site further downstream, RR33, scored in a Band C (moderate recovery). During Spring, Pools RB19 and RR26 scored in a Band B (good recovery) while Pools RB6, RR11, RR30 and unimpacted site RR33 scored in a Band C (moderate recovery). Sensitive aquatic species (Leptophlebiidae) were also observed at all rehabilitated sites during Autumn and Spring surveys.

These monitoring results show that moderate to excellent levels of recovery were recorded at remediated sites during the reporting period. There has also been an overall increase in stream health since spring 2021, which is likely related to increased flow in the waterway, increased pool holding capacity and improved water quality. These studies have offered promising results to date from Tahmoor Coal's creek remediation works and the re-establishment of aquatic life in remediated pools post-mining impacts.

Myrtle Creek

Autumn and Spring monitoring for Myrtle Creek reflected an overall generally consistant water quality result across monitoring sites, this correlated to elevated water levels and flows recorded. During the Autumn survey, AUSRIVAS results recorded Band B and C for all monitoring pools with Pools 18 and 20 recording Band B and Pools 10,11 and 30 recording a Band C. In comparison in Spring, Pools 10 and 18 recorded a Band B and Pools 11, 14, 20 and 30 (non-impacted site) recorded a Band C. Pool 12a, recently remediated for the Spring survey scored a Band D.

The sensitive aquatic families observed in the Autumn survey included Leptophlebiidae (mayfly) in Pools 10, 18 and 20 and Leptoceridae (caddis fly) at Pools 11, 18 and 20. During the Spring survey, Leptophlebiidae (mayfly) was observed in all pools except Pool 12a and Leptoceridae (caddis fly) was observed in all pools except Pool 12a and 30.

During Autumn 2022, Pools 10, 11 and 18 were monitored for the first time. The stream health results at these sites were low but are considered nominal for low flowing edge habitats in Myrtle Creek as observed in unimpacted sites (Pool 30), pre-mining surveys and other similar waterways in the area. Pool 20 showed lower stream health results in the first post remediation assessment (spring 2021) when compared to the other monitoring sites. A substantial increase in all stream health indices has occurred at Pool 20, including the detection of sensitive taxa.

During Spring 2022, Pool 10 and Pool 18 showed good levels of recovery, Pool 11, Pool 14 and Pool 20 moderate levels of recovery and Pool 12a low or limited recovery. Unimpacted site (Pool 30) scored in Band C indicating that most sites were comparable to a pool generally considered to be unimpacted by subsidence.

It has been recommended that biannual monitoring of remediated pools be completed to determine if remediated habitat is sustained in the long term, for up to two years after work has been completed. In line with this recommendation, biannual monitoring will occur for Pool 10, 11, 18, 20 and 30, as well as any additional locations that are planned to be remediated in the near future.

14.2.2 Western Domain

Aquatic Ecology and Terrestrial monitoring has been conducted biannually on 11 occasions across control and *impact* monitoring sites in Stonequarry Creek, Matthews Creek and Cedar Creek (November 2017, April 2018, November 2018, May 2019, October 2019, March 2020, September 2020, April 2021, September 2021, March 2022 and September 2022)(refer to **Figures 10 and 11**). These occasions included baseline data since before mining commenced in the area, during active mining in the area, and post-mining monitoring with the latest Spring 2022 monitoring.

Aquatic Ecology Monitoring

Aquatic Ecology Monitoring is conducted using The Australian River Assessment System (AUSRIVAS), Riparian Channel and Environment (RCE) inventory, AUSRIVAS macroinvertebrate sampling, quantitative benthic macroinvertebrate monitoring program and Water quality sampling. All sites had similar riparian and channel condition to pre-mining sampling, with AUSRIVAS OE50 scores generally comparable to pre-mining stream surveys (refer to **Figure 11**).

SIGNAL2 scores were low but were comparable to pre-mining scores and indicated more moderate levels of pollution or environmental stress in autumn 2022 than in recent surveys.

The autumn and spring 2022 results showed continued habitat availability since the previous surveys, with elevated rainfall and flows occurring in autumn and spring 2022. Water quality was good across all sites in 2022 with minor exceedances of turbidity at a limited number of sites associated with the elevated flows. AUSRIVAS OE50 scores and associated bands were observed to increase during the year and likely reflect differing site or habitat responses to the elevated flows which are supported by the identification of previously unobserved taxa inhabiting the waterways that prefer flowing water environments. However, these results were higher than or comparable to pre-mining stream surveys. SIGNAL2 scores for the sites were maintained or increased during 2022, reflecting the increased water availability during the year.

While the quantitative macroinvertebrate analysis identified some spatial and temporal differences were present during 2022 to the previous surveys, the overall results indicate intrinsic variability in macroinvertebrate assemblages across the sites and time periods. This is not indicative of any change in macroinvertebrate assemblages that would indicate an impact.
No triggers for surface water monitoring or visual subsidence monitoring were observed over the latest monitoring period, indicating that there was no potential subsidence related influence on stream health. The assemblage data also shows that there have been no obvious trends in macroinvertebrate communities, density or family richness that may indicate a potential impact.

As such aquatic biodiversity has remained within Level 1 according to the relevant TARPs for the monitoring period. It is recommended that the current monitoring program continues in accordance with the Longwall West 3 to West 4 (LW W3-W4) Biodiversity Management Plan.

Terrestrial Monitoring

Riparian Vegetation Monitoring

A Before, After, Control, Impact (BACI) monitoring program was designed to identify ecological change within the Study Area as a result of mine subsidence by permitting comparisons between control and *impact* areas before and after subsidence. The monitoring was required for three years prior to the commencement of mining and continued throughout active mining. Mining in the Western Domain was completed in August 2022, with the Spring 2022 monitoring considered the commencement of post-mining monitoring for the study area (refer to **Figure 10**).

Nine sites (including four *impact* sites and five control sites) were monitored. Riparian vegetation monitoring involved floristic surveys within established vegetation monitoring plots at each site. Amphibian monitoring included spotlighting, call provocation, listening for diagnostic amphibian calls and tadpole surveys along established transects and were targeted at two threatened amphibian species: the Giant Burrowing Frog (*Heleioporus australiacus)* and the Red-crowned Toadlet (*Pseudophryne australis).*

River-flat Eucalypt Forest, which is listed as an Endangered Ecological Community under the Biodiversity Conservation Act, was recorded at 2 control sites along Stonequarry Creek.

For Autumn 2022, *impact* sites in the study area had a slightly higher mean flora species richness than control sites, this was the opposite for Spring 2022 monitoring which recorded a slightly lower mean flora species richness than control sites. This was a similar trend for the control sites, with Autumn results showing a higher percentage of vegetation cover than impact sites and Spring results showing a lower vegetation cover. This is likely due to persistent rainfall patterns, stream morphology, human disturbance and altered flow regimes (e.g. flood events) increasing weed dominance at control sites. Some sites appeared to be more influenced by seasonal changes and flooding events than sites further up the catchment which tended to be protected in deep gullies and canyons.

Exotic vegetation cover had increased at control sites compared to impact sites with native cover which reduced at both control and impact sites, indicating they were affected in a similar way in response to severe flooding. The reduction in native cover observed at both impact and control sites indicated there were no detectable subsidence related impacts on riparian vegetation.

Based on stream morphology, persistent rainfall during the La Niña climatic period, and other associated factors, some sites appeared to be more influenced by seasonal changes and flooding events (e.g. destabilisation of the embankments, loss of riparian vegetation and large accumulation of flood debris) than other sites located further up the catchment in more protected deep gullies and canyons.

Continuation of monitoring is recommended to observe the recovery of vegetation cover with time, at impact and control sites post-natural disaster event(s) which have been experienced during the recent La Niña climatic conditions.

No thresholds in the Trigger Action Response Plan from the LW W3-W4 Biodiversity Management Plan have been triggered, and therefore, no remedial management actions are required.

Amphibian Monitoring

Amphibian detection rates were variable between Before and After monitoring for most sites. In Autumn 2022, the most widespread and abundant amphibian species was the Common Eastern Froglet (*Crinia signifera),* which was detected at all but one of the sites. During the Autumn 2022 monitoring, the Stony Creek Frog (*Litoria lesueuri)* was detected at two of the nine sites. However, during Spring 2022, the Striped Marsh Frog (*Limnodynastes peronii)* and Stony Creek Frog (*Litoria lesueuri)* were both detected at five of the nine monitoring sites. The greatest number of amphibians detected at one particular site was 35 Common Eastern Froglet individuals in Autumn, and 38 Stony Creek Frog individuals in Spring. Two amphibian species were detected in Autumn which increased to seven detected amphibian species in the Spring monitoring. These results represent an otherwise normal assemblage of common species that may be expected to be present in the Study Area under the current climatic conditions.

Amphibian detection rates fluctuated between monitoring events for most sites, likely due to the highly variable weather and climatic conditions experienced across all monitoring sites.

No thresholds in the Trigger Action Response Plan from the LW W3-W4 Biodiversity Management Plan have been triggered, and therefore, no remedial management actions are required.

Visual Creek Inspections

Creek visual inspections conducted over the reporting period have reported no observed impacts to pool level, drainage behaviour or overland connected flow.

Figure 10. LW W1-W4 Terrestrial Ecology Monitoring Locations

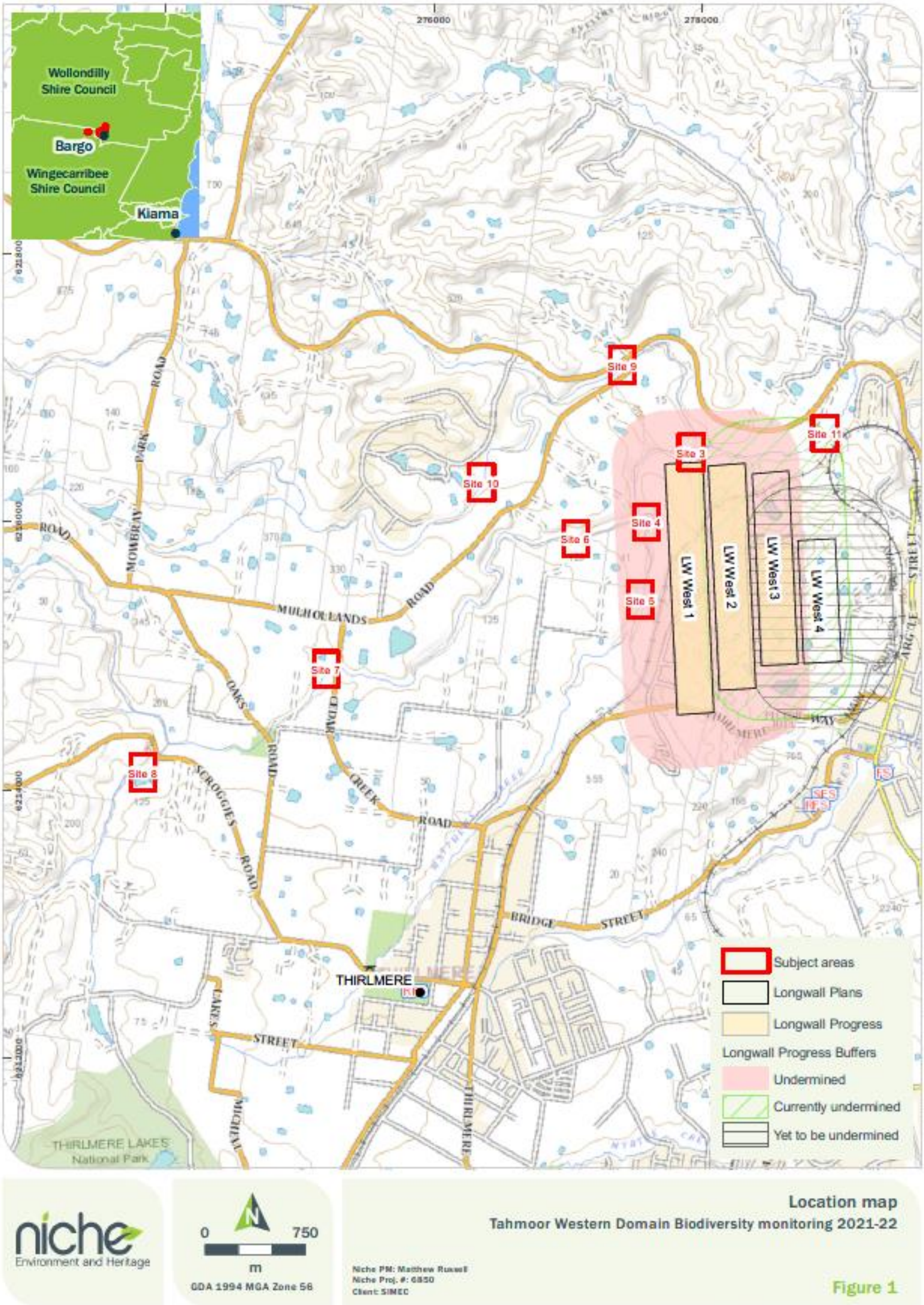
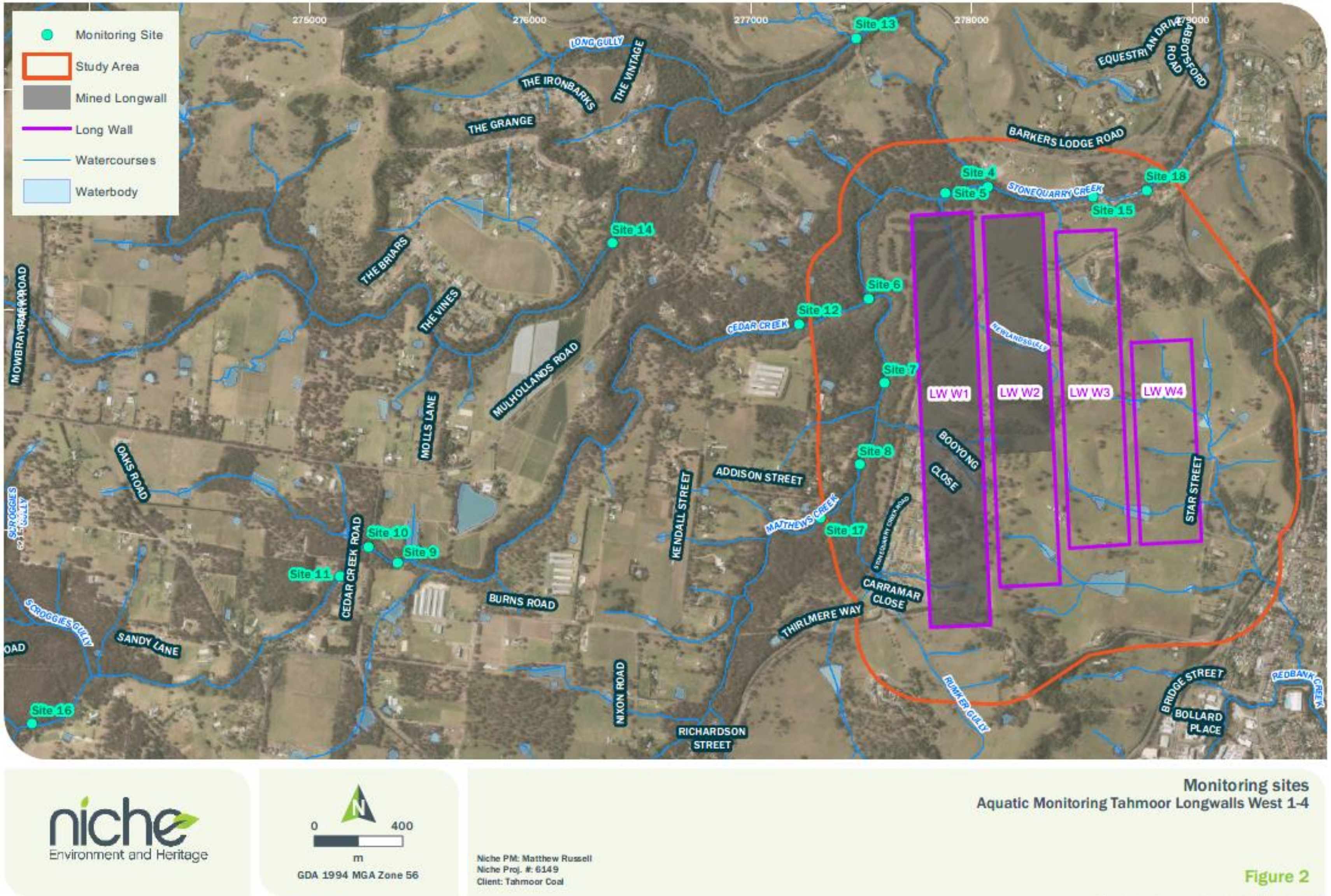


Figure 11. LW W1-W4 Aquiatic Ecology Monitoring Locations



14.2.3 Tahmoor South Domain

The LW S1A-S6A Biodiversity Management Plan was prepared to manage the potential environmental consequences of LW S1A-S6A extraction on aquatic and terrestrial flora and fauna in accordance with Condition C8 of SSD 8445. Baseline aquatic and terrestrial monitoring commenced in Spring 2019 and is conducted during Spring and Autumn in various sites in Teatree Hollow Creek, Bargo River, Dogtrap Creek and Hornes Creek. These creek systems have been selected as being representative of the waterways present in the study area and are required as part of the monitoring requirements of the Biodiversity Management Plan for the LWS1A-S6A Extraction Plan.

Aquatic Ecology Monitoring

Monitoring was conducted at sites using standard (Australian River Assessment System (AUSRIVAS)) methods and quantitative benthic macroinvertebrate surveys. The monitoring program included Aquatic habitat assessment, Macroinvertebrate survey and Physiochemical water quality sampling. Monitoring results for Autumn and Spring showed there was a slight improvement in water quality (in comparison to Spring 2021 results), stream health scores, and a significant difference observed in macroinvertebrate assemblages in autumn 2022. These changes are likely attributed to increased flows over the period, leading to increased habitat availability. The variation in water quality and stream health are expected responses to changing environmental conditions, particularly in intermittent waterways that experience extreme fluctuations in aquatic habitat availability and quality. For locations of monitoring sites refer to **Figure 13**.

Terrestrial Monitoring

Six monitoring sites were established for both riparian and amphibian Sites, including three future impact and three control sites.

Riparian Vegetation Monitoring

Six monitoring sites were established for both threatened flora and Threatened Ecological Community (TEC) sites (12 monitoring sites in total), including the monitoring of three impact and three control sites (refer to **Figure 12**). TEC monitoring included establishing vegetation monitoring plots within each site for repeat survey. Threatened flora monitoring involved establishing 10 x 10 metre (m) monitoring plots in locations with known occurrence of threatened flora species, for repeated survey across monitoring seasons.

According to the Fire Extent Severity Mapping (FESM) mapping (DPE 2022), all riparian sites were burnt in the 2019/2020 bushfires and were within a ‘Moderate’ to ‘Extreme’ severity burnt class, where all stratum layers were severely burnt to canopy height. Many species and communities will take years to recover, particularly those not adapted to fire or impacted by prolonged drought or other threatening processes.

Threatened Ecological Communities (TEH) monitoring focused on Shale Sandstone Transition Forest in the Sydney Basin Bioregion (listed as Critically Endangered under the *Biodiversity Conservation Act 2016*) which is in moderate to high condition within the monitoring plots.

TEC monitoring for Spring 2022 indicated that TEC remnants within the Tahmoor South Study Area were in moderate to high condition across control and impact Sites. The current dataset has indicated that the TEC control and impact Sites are sufficiently similar to be suitable for long-term monitoring.

Dominant species in terms of percent cover since Spring 2020 monitoring include, Pteridium esculentum, Acacia decurrens, A. mearnsii, Desmodium rhytidophyllum, Banksia spinulosa and B. serrata. Most dominant exotic species included Desmodium intortum, Lonicera japonica, and Cyperus eragrostis. Across all sampling seasons, native species richness appears to be decreasing at riparian control sites, while native cover at future *impact* sites is relatively stable.

During the Spring 2020, 2021 and 2022 riparian monitoring, the average floristic cover at the *impact* sites was much higher compared with the control sites in both native and exotic species, whereas native vegetation cover across impact and control sites during Autumn 2021 and Autumn 2022, appears to be similar. This suggests that seasonality is currently very influential on the degree of vegetation cover across *impact* and control monitoring sites.

Climatic influences were observed at sites that had been impacted by bushfires (2019/2020 bushfires), moderate to severe flooding (March and July 2022), human disturbance, particularly weeds and altered flow regimes as a result of elevated rainfall conditions. Monitoring to date has indicated that the control and *impact* sites are sufficiently similar (riparian vegetation and TEC [type and condition class]), to be suitable for long-term monitoring.

Threatened Flora Monitoring

Threatened flora monitoring for Tahmoor South was established in September 2022, and the baseline number of threatened individuals at each site was recorded within a fixed 10 x 10 m plot (prior to the commencement of mining) at each monitoring site. A subsequent round of monitoring was undertaken in November 2022 (after the commencement of mining), and therefore the Spring 2022 round of threatened flora monitoring is represented by both baseline and post-mining monitoring surveys. The six monitoring plots were designed to monitor a subset of Pomaderris brunnea, Persoonia bargoensis and Grevillea parviflora subsp.parviflora. Monitoring to date has indicated that the control and impact sites are sufficiently similar (species and abundance) to be suitable for long-term monitoring.

Amphibian Monitoring

Frog detection rates were variable between Spring and Autumn monitoring events. Frog species were less abundant during Autumn monitoring. The two species driving this difference were the Common Eastern Froglet, Striped Marsh Frog and the Stoney Creek Frog. During the reporting period there were consecutive months of substantially above average monthly rainfall, including notable flooding events in March and July 2022. For locations of monitoring sites refer to **Figure 12**.

Two frog species were detected across the Autumn monitoring event and three in Spring, which represents a reduced level of species detection that was observed across both control and *impact* monitoring sites in comparison to previous baseline surveys. This may be attributable to the recent flooding events in March and July 2022, which altered microhabitats within the streams. Amphibian species diversity (e.g., tree frogs) are likely to increase with time after flooding and as flow conditions return to more nominal levels and habitats are restored.

Monitoring will need to focus primarily on the changes in hydrological regimes overtime, rate of recovery (i.e. identify whether mining impacts are influencing this), and ensure the recording of any anomalous changes in the existing environment (particularly those that cannot be attributed to post-fire) incontrol and future impact Sites.

There were no reportable incidents related to ecological impacts for Tahmoor South monitoring during the reporting period.

Visual Creek Inspections

Creek visual inspections conducted over the reporting period have reported no observed impacts to pool level, drainage behaviour or overland connected flow.

Figure 12. LW S1A-S6A Riparian Vegetarian and Amphibian Montoring Locations

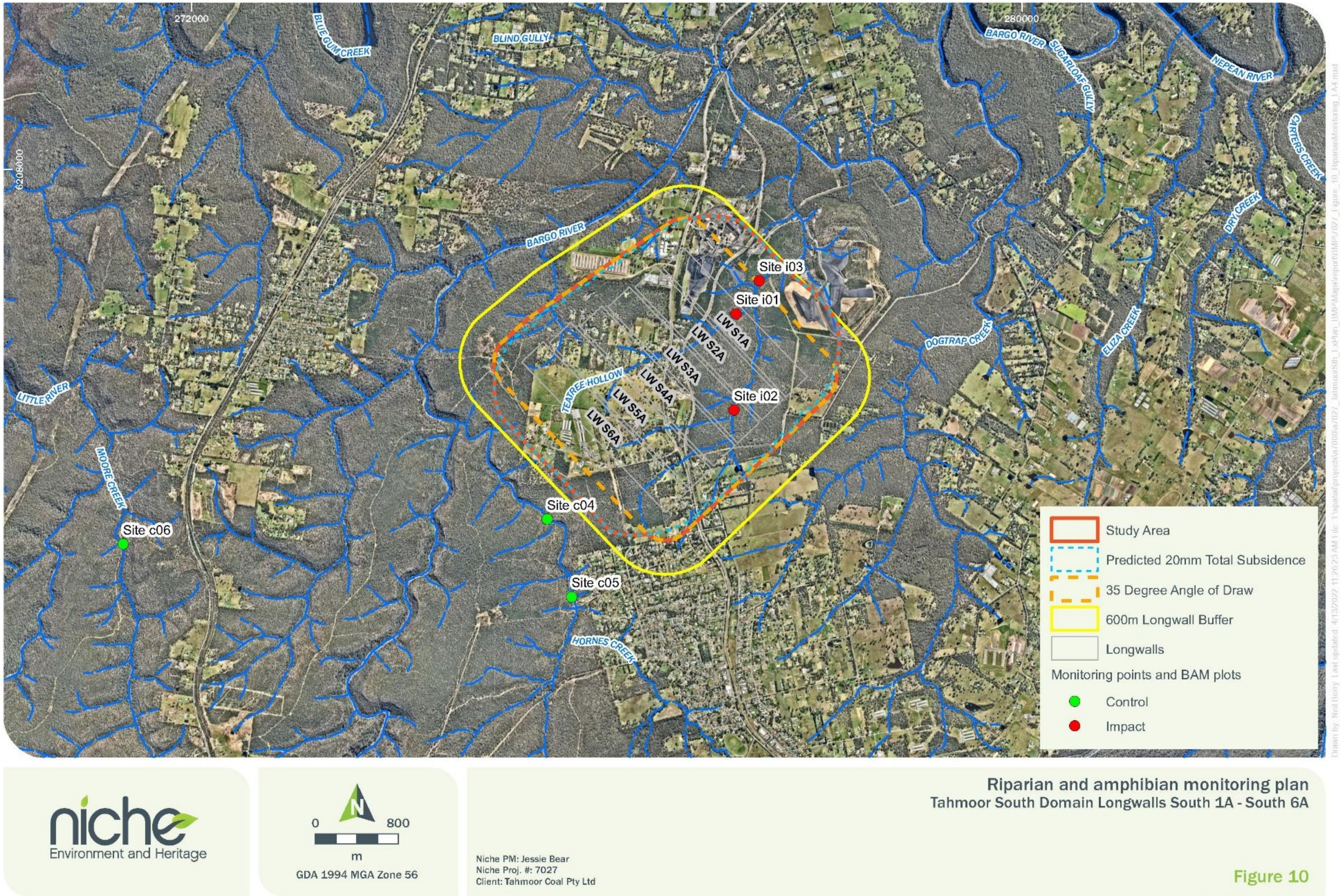
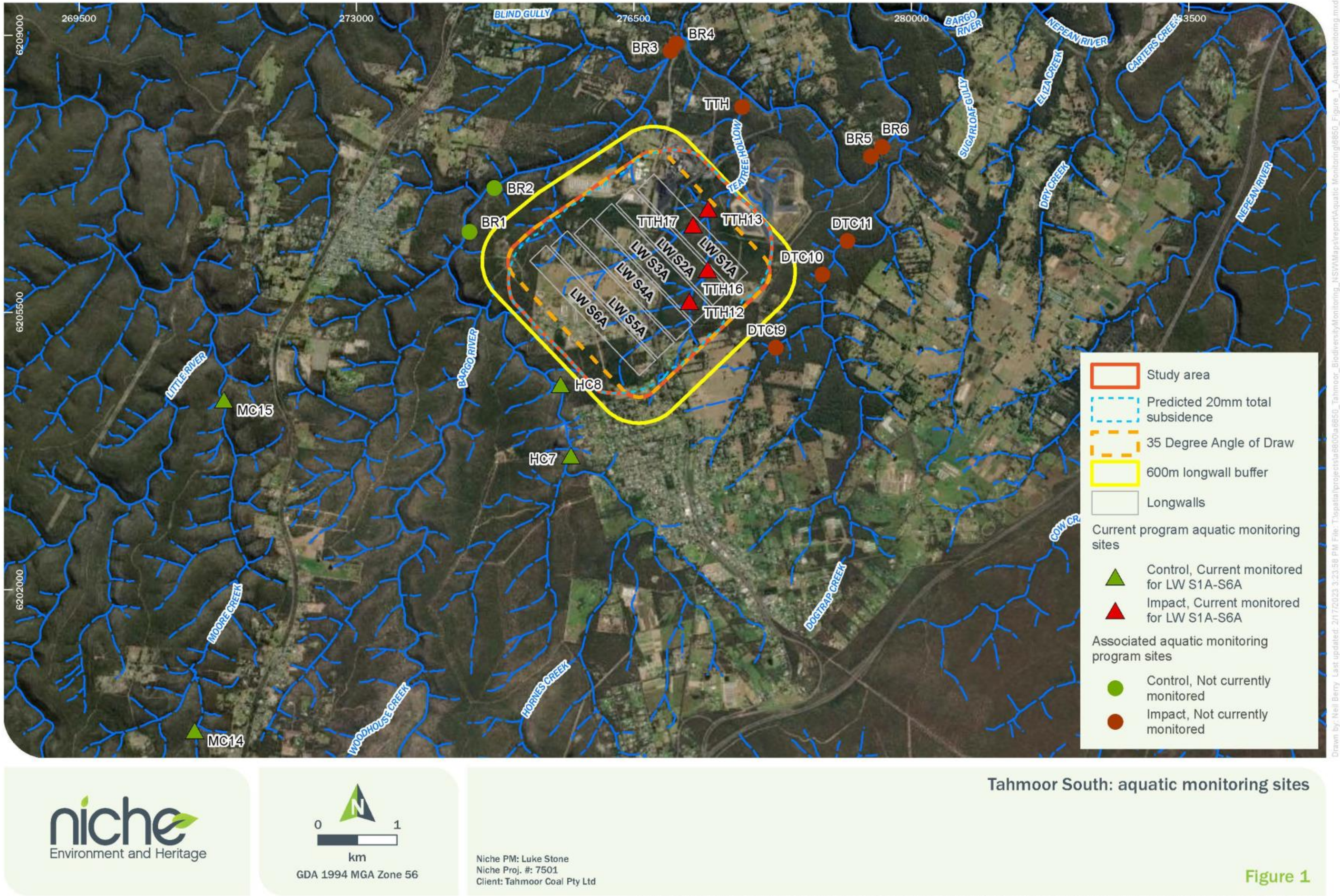


Figure 13. LW S1A-S6A Aquatic Ecology Monitoring Locations



14.2.4 **Additional Ecological Assessments**

An ecological assessment was conducted during February 2022 for the Eastern Batter section of the Reject Emplacement Area (REA) for further emplacement of refuse material. The area had previously undergone unsuccessful rehabilitation regimes and was sparsley vegetated and in poor condition with no large trees, several weed species present and mostly bare soil. This due diligence assessment aimed to identify key habitat features including any hollow-bearing trees, hollow-bearing stags, hollow logs trees with nests or dreys and threatened flora and fauna, and Threatened Ecological Communities (TEC's) listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The site had limited regrowth of mostly midstory and understory species which comprised both native and exotic vegetation. The regrowth was most prominent in the south-eastern area of the site, supporting a greater number of midstory trees. The midstory however was limited and was dominated by native Acacia species including *Acacia decurrens* and *Acacia longifolia.* Other shrubs present included *Acacia terminalis, Acacia maidenii, Acacia falcata* and *Dodonaea viscosa.* The ground cover was dominated by native grass *Cynodon dactylon,* with significant presence of exotic grasses including *Setaria gracilis, Setaria italica* and herbs *Bidens Pilosa, Centaurium erythraea, Conyza bonariensis* and *Verbena bonariensis.* Other common weeds included *Hypochaeris radicata, Asphodelus fistulosus, Sida rhombifolia* and *Plantago lanceolata.* Native understory plants *Lomandra longifolia, Hardenbergia violacea, Glycine tabacina* and *Dichondra repens* were common but occurred in low numbers.

There was limited habitat for arboreal fauna recorded at the site. There were no hollow bearing tree or stags within the site or BAM plots. The BAM plots also showed there was limited leaf letter on the soil, with the soil predominantly bare. The main habitat feature present on the site included timber logs that could provide refuge for some reptiles or small mammals, however there were no hollow logs observed and no fauna were observed on site at time of the survey. No threatened species or TECs were observed during the survey.

14.3 **Further Improvements**

Ecological survey assessments will continue to be undertaken as required to manage compliance and assess potential impact across all Tahmoor Coal's mining domains and inline with the relevant Biodiversity Management Plan.

15 Aboriginal Cultural Heritage

15.1 Environmental Management

Prior to the extraction of each longwall, a search is completed to confirm if new Aboriginal cultural or historical heritage sites have been identified. An Extraction Plan for LW W3-W4 was approved by DPE in 2021 with the accompanying Heritage Management Plan identified 8 Aboriginal sites in the study area, comprising one axe grinding groove site, six open artefact sites and one modified tree (shown in **Figure 14**). Aboriginal sites associated with LW W3–W4 are managed through the provisions of the Tahmoor Mine Extraction Plan LW W3-W4 Aboriginal Heritage Technical Report (AHTR) (EMM 2021), which informs the LW W3–W4 Heritage Management Plan.

The AHTR provides a subsidence monitoring program for Aboriginal sites within the LW W3–W4 project area (**Figure 7**). The project area is defined by calculating a 35-degree angle of draw from the extents of LW W3–W4, and the predicted limit of vertical subsidence (20 mm subsidence contour) that may result from their extraction. The AHTR includes a Trigger Action Response Plan (TARP) which provides a description of performance indicators to be implemented to ensure compliance with negligible subsidence impacts or environmental consequences to sites of Aboriginal heritage.

A site-specific management plan was developed for the Stonequarry Creek rockbar to address management performance measures for *Stonequarry Creek 1* (AHIMS #52-2-2068), also the site of grinding grooves located on the rockbar of Pool SR17 (hereafter referred to as the 'rockbar'). The Stonequarry Creek Rockbar Management Plan (SCRMP), provides management provisions additional to the overarching AHTR. Management and monitoring in accordance with the SCRMP is conducted by the Stonequarry Creek Rockbar Technical Committee.

For the Tahmoor South mining area as part of the SSD approval, an Extraction Plan for LW S1A and S6A was developed and approved by DPE in 2022 with the accompanying Heritage Management Plan (HMP) identifying 3 Aboriginal sites recorded in the A-series study area, comprising 2 artefact sites with 1-2 artefacts and a rockshelter with art and artefacts (Teatree Hollow 2013.1 (#52-2-4471). This HMP has been developed to provide direction on the management of Aboriginal cultural materials that may interact with the proposed development activities.

One of the requirements as part of the HMP was the proactive investigation of a documented rockshelter, Teatree Hollow 2013.1 (AHIMS #52-2-4471), situated on the eastern bank of Teatree Hollow Creek. While the site was considered of very low risk of being adversely affected by the under-mining of the locale, discussions with Heritage NSW and the registered Aboriginal parties sought to obtain some archaeological information from the site prior to the development activities should harm and/or destruction ultimately result. An archival recording of the site was undertaken as one aspect of these proactive works. In addition, the implementation of an archaeological excavation program was also proposed and completed during the reporting period.

15.2 Environmental Performance

During this reporting period, the LW W3-W4 Heritage Management Plan and the LW W3-W4 Stonequarry Creek Rockbar Management Plan has been implemented to monitor subsidence impacts for the following Aboriginal heritage items:

- Grinding grooves:
    - Monthly review of GNSS unit movements by MSEC;
    - Weekly or monthly monitoring of the SR17 Rockbar in accordance with the Stonequarry Creek Rockbar Management Plan; and
    - LW W3 and LW W4 End of panel review of Aboriginal heritage items by an EMM Archaeologist and RAP representatives (EMM, 2022a; EMM, 2022b).
- Scarred Tree:
    - LW W3 and LW W4 end of panel review of Aboriginal heritage items by an EMM Archaeologist and RAP representatives (EMM, 2022a; EMM, 2022b).

The grinding groove site (AHIMS #52-2-2068) has been monitored during the extraction of LW W3-W4 by Global Navigation Satelite System (GNSS) units and monthly ground surveys of the rock bar during the period of active subsidence for the longwall. GNSS units are fixed survey stations that continuously measure their absolute horizontal and vertical positions in real time and provide an early warning system for the TARP to be activated. The rockbar has also been monitored during creek surveys and regular visual inspections.

Fracturing in the rockbar that was first identified on 28 October 2021 (and the relevant stakeholders including RAPs notified), has not impacted the grinding grooves which are located approximately 35 m to the west and on the other side of a vehicle crossing to the fracturing. There has been no visually perceptible cracking through the groove features and therefore no impact to the values of primary significance, the grooves themselves. Geotechnical investigations of the rockbar indicate that the fractured area has different geological characteristics to the grinding groove site which made it more susceptible to fracturing. The fractured area is characterised by 'drummy' laminations (like layers of plaster on a wall) which more easily fracture when subject to compressive strains. In contrast, the geological character of the grinding groove site is solid and is not composed of weaker laminated sandstone layers. These features of the grinding groove site, teamed with far more intensive monitoring, indicates that it is not at increased risk of subsidence impacts.

An end of panel monitoring inspection following the completion of extraction from LW W3 and LW W4 was carried out by an EMM archaeologist and a RAP representative on 26 April 2022 and 23 August 2022 respectively. The findings of these inspections were reported in an end of panel reports for each Longwall. The focus of the fieldwork was to conduct archaeological monitoring of Aboriginal sites associated with the underground coal mining of LW W3 and LW W4 after completion of each panel extraction in the Tahmoor Mine Western Domain. The locations of Aboriginal heritage items within the Study Area of LW W3-W4 are illustrated in **Figure 15**.

In accordance with the subsidence monitoring program, the inspection related to one grinding groove site and one modified tree. The six open artefact sites did not require monitoring.

The grinding groove site (AHIMS #52-2-2068) has been monitored during LW W3 and W4 extraction through the GNSS units and various other monitoring strategies as outlined in the Stonequarry Creek Rockbar Management Plan. Two triggers to the Stonequarry Creek Rockbar TARPs were noted during the reporting period as discussed in Section 3.2.8 of the Western

Domain Six Monthly Subsidence Impact Report 7 (**Appendix 10**). The Subsidence Technical Committee confirmed that fracturing was identified approximately 40 m downstream of the nearest grinding grove site on the north-eastern side of the access track. No evidence of fracturing was evident at any of the grinding groove sites.

During the reporting period hairline cracking at the rockbar was identified on the 20th May 2022. The hairline crack extends along natural joints and was located on the north-eastern corner of the rockbar on the opposite side away from the grinding grooves. Geotechnical assessment confirmed that this type of cracking is consistent with natural erosion processes as evidenced by the numerous other joints that define the rock features in this area. The crack is not related to the underground mining of LW W4 or to the other compressional fracturing that was identified previously. Overall there has been no visually perceptible cracking through the groove features during underground mining of LW W3–W4 and therefore no impact to the values of primary significance, the grooves themselves.

During the end of panel inspection, no subsidence related impacts were observed to any of the Aboriginal sites inspected, and as such no additional management strategies are required.

For the Tahmoor South Domain, there are 3 registered Aboriginal sites recorded in the A-series study area (refer to **Figure 15** for location sites), comprising 2 artefact sites with 1-2 artefacts and a rockshelter with art and artefacts (Teatree Hollow 2013.1 (#52-2-4471). All 3 sites were assessed by Niche as having low archaeological significance. For further information refer to the Heritage Management Plan for the Extraction Plan LW S1A-S6A. Feedback from RAPs as part of the consultation process for this HMP has been that they consider this site to be of higher cultural significance rather than the low significance rating attributed to it in the Aboriginal Cultural Heritage Assessment (Niche, 2020).

No subsidence related impacts have been observed to any of the Aboriginal sites inspected as part of the monitoring program. This is considered 'Normal Condition' in the Tahmoor South TARP, and as such no additional management strategies are required. The Tahmoor South TARPs were updated with a different structure than the Western Domain (WD) TARPs, with Level 1 now meaning that there is an impact as opposed to Normal Conditions which was the case in the WD TARPs.

15.3 Further Improvements

Aboriginal cultural due diligence assessments will continue to be undertaken by qualified Aboriginal cultural consultants.

Aboriginal cultural assessment processes will identify items of significance and propose mitigation measures to ensure compliance with statutory requirements and relevant Extraction and Management Plans. Additionally, Tahmoor Coal aims to maintain valued working relationships with local Registered Aboriginal Parties (RAPS) before and during mining activities.

This information has been retracted - For more information contact Tahmoor Coal

16 Historical Heritage

16.1 Environmental Management

Historical heritage sites associated with LW W3–W4 are managed through the provisions of the Tahmoor Mine Extraction Plan Longwall West 3–West 4 Historical Heritage Technical Report (HHTR) (EMM 2019), which informs the LW W3–W4 Heritage Management Plan. The HHTR requires that historical brick and sandstone culverts within the Study Area (**Figure 15**) be subject to monitoring at the completion of each longwall.

The HHTR provides a subsidence monitoring program for historical heritage sites within the LW W3–W4 project area (**Figure 16 and Figure 17**). The project area is defined by calculating a 35-degree angle of draw from the extents of LW W3 – W4, and the predicted limit of vertical subsidence (20 mm subsidence contour) that may result from their extraction. The HHTR includes a Trigger Action Response Plan (TARP) which provides a description of performance indicators to be implemented to ensure compliance with negligible subsidence impacts or environmental consequences to sites of historical heritage.

A Heritage Management Plan (HMP) for Tahmoor South LW S1A-S6A has been developed which identifes the monitoring and management measures for historical heritage items within the Extraction Plan Study Area that are required to be implemented to demonstrate that the relevant performance measures are achieved. The HMP focused on Aboriginal and historical heritage items listed on heritage databases, and Aboriginal and historical heritage items identified in the Study Area during site investigations.

16.2 Environmental Performance

Western Domain - Culvert Performance

There are six culverts on the Picton Mittagong Loop Line (Loop Line) and two culverts on the Main Southern Railway (MSR) within the project area which require subsidence monitoring.

During the reporting reporting period, there was one (1) exceedance of environmental performance measures or indicators, as adopted from DA 67/98 Modification 5 or the LW W1-W2 Extraction Plan Approval conditions. Cracking on sandstone culverts at 88.400 km and 88.980 km resulted in an exceedance of subsidence performance indicator for 'other Aboriginal and heritage sites', which was defined as 'negligible subsidence impacts or environmental consequences'. Tahmoor Coal notified DPE and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A site visit with DPE was completed on 12 April 2022. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.* Tahmoor Coal has committed to complete remediation by 30 June 2023. Refer to **Figure 18** for site locations.

Culvert 88.400 has experienced the greatest impacts of the Loop Line culverts within the Study Area. An 8 mm wide crack in the vertical mortar joint and cracked sandstone capping on the downside abutment (eastern side of culvert), as well as a 7 mm wide crack in a mortar joint around the arch stones at the upside (western side of culvert) as well as minor spalling of sandstone on the arch stones were observed during extraction of LW W2 in 2021. These impacts are a result of the lime grout becoming so strong over time that the weaker sandstone blocks sheer just below the grout bedding plain when under strain. It was noted that both the upside and downside cracks observed increased slightly between LW W2 and LW W3 (approx. 3-4mm) in width and have remained stable after the period of active subsidence during LW W4. No new impacts to culvert 88.400 were observed during monitoring throughout the extraction of LW W3.

During the current reporting period, it was confirmed that no new impacts to the portal faces of the culverts have been observed during the monitoring throughout the extraction of both LW W3 and LW W4, and the LW W3 and LW W4 end of panel heritage inspection confirmed that no additional cracking, worsening of existing cracks or spalling had occurred.

A full inspection of the Picton-Mittagong Loop Line culverts was able to be completed during the LW W4 end of panel inspection as reinforced concrete pipe (RCP) sleeves from the barrel of the culverts had been removed. This inspection noted that several cracks had formed since the commencement of mining in the Western Domain in the barrel of the sandstone culvert at 88.400 km. These cracks were not noted in the pre-mining inspection report by Robinson Rail in July 2019.

Cracking on the portal ends of the sandstone culverts at 88.980 km and 88.400 km and the barrel of the culvert at 88.400 km results in a Level 3 TARP trigger due to confirmed mining-related impacts. As mining in the Western Domain has been completed, repairs can now be undertaken on the arch stones on the eastern and western sides of the culvert as well as any additional cracks identified in the culvert barrel that have formed during mining. These repairs will be completed in accordance with the Transport for NSW Heritage Structures Repair Standard.

Tahmoor Coal was advised that the prescribed repair specifications within the report provided by JMA structural engineer regarding repairs to the Culverts 88.400 and 88.980, were not within the skill set of a Heritage Stonemason. The specification advises detailed grout injection along the cracks and other associated repair methods consistent with cracks within masonry structures. The grout injection company will arrange a repointing subcontractor to complete the mortar joints repairs post grout injection task. Currently, Tahmoor Coal is engaging an experienced grout injection company to complete the repair work. An extension of the completion date to the 30 June 2023 has been accepted by DPE by Tahmoor Coal due to the required pivoting in the repairer skills.

The four other Loop Line culverts and two MSR culverts in the LW W3– W4 Study Area are considered to be level 1 in the TARP, and as such no additional management strategies are required.

No other impacts to historical heritage were observed during this reporting period.

Victoria Bridge Performance

Very gradual and minor closure was observed to develop across Stonequarry Creek at Victoria Bridge, which is located approximately 1000 metres from LW W3. The timing of the closure coincided with the final stages of mining LW W3, a period of heavy rainfall and completion of abutment strengthening works by TfNSW. Visual inspections did not identify any impacts associated with mine subsidence however the gap between the deck and the eastern abutment was observed to almost close during the mining of LW W3. The buffer board was replaced on 7 June 2022 and the gap reinstated. A gap of 35 mm was measured between the structural cross beam and abutment on 10 June. The gap has gradually reduced over time to 19 mm. Rates of change showed a reduction throughout the remainder of and after LW W4 mining completion. TfNSW has agreed to continue surveys on a monthly period, unless adverse changes are observed.

Automated, continuous monitoring of GNSS units and laser distance meters will continue to monitor continuously and results will be reported once a month.

Tahmoor South Mining Domain

Within the Study Area there are no items listed on the CHL or NHL. One heritage item, Wirrimbirra Sanctuary (now known as the Australian Wildlife Sanctuary) is of State heritage significance and is listed on the SHR for its historical heritage values, research potential, rarity and associative values (Refer to **Figure 7**). Wirrimbirra Sanctuary is also listed on the National Trust register and the Wollondilly Local Environment Plan (WLEP) (2011). A site-specific management plan for the Sanctuary is being developed as a stand-alone document. The *Australian Wildlife Sanctuary Management Plan* includes a Statement of Heritage Impact (EMM, 2020) that was prepared in consultation with the National Trust and NSW Heritage Council. Including Wirrimbirra Sanctuary and Bargo Cemetery, these are the two registered items of local heritage significance (WLEP 2011) within the Study Area and there are three additional items of local heritage significance that are outside the Study Area but may be subject to far field movement, they are Picton Weir, Bargo Railway Bridge North (known as the Wellers Road Overbridge) and Bargo Railway Viaduct. Bargo Railway Bridge North is also listed on the CRN S170 Register.

Two unregistered heritage sites were identified by Niche (2020): the Great Southern Road in Bargo (c.1820) and Tahmoor Colliery (c.1972) (also known as the Tahmoor Mine Site). Approximately 550 m of the Great Southern Road at its northern end are located within the Study Area. The road has had many subsequent upgrades and parts of the original road are no longer in use. Tahmoor Colliery was identified in the *Macarthur Heritage Study* (1986) as item #509 but is not listed on any of the heritage registers.

During the reporting period, no impacts to historical heritage items were reported in relation to LW S1A mining. Monitoring and management measures are detailed within the Extraction Plans and assessment of monitoring results reviewed in the two (2) Six Monthly Reports: Western Domain Six Monthly Report 7 and Tahmoor South Six Monthly Report 1 (**Appendix 10** and **Appendix 11** respectively).

16.3 Further Improvements

Historical Heritage due diligence assessments will continue to be undertaken by qualified historic heritage consultants. Historical Heritage assessment processes will identify items of significance and propose mitigation measures to ensure compliance with statutory requirements and relevant Extraction and Management Plans.

Figure 16 Registered historical heritage sites in the LW W3-W4 Study Area and surrounds

Figure 17 Unregistered Historical heritage items within the Study Area for LW W3-W4.

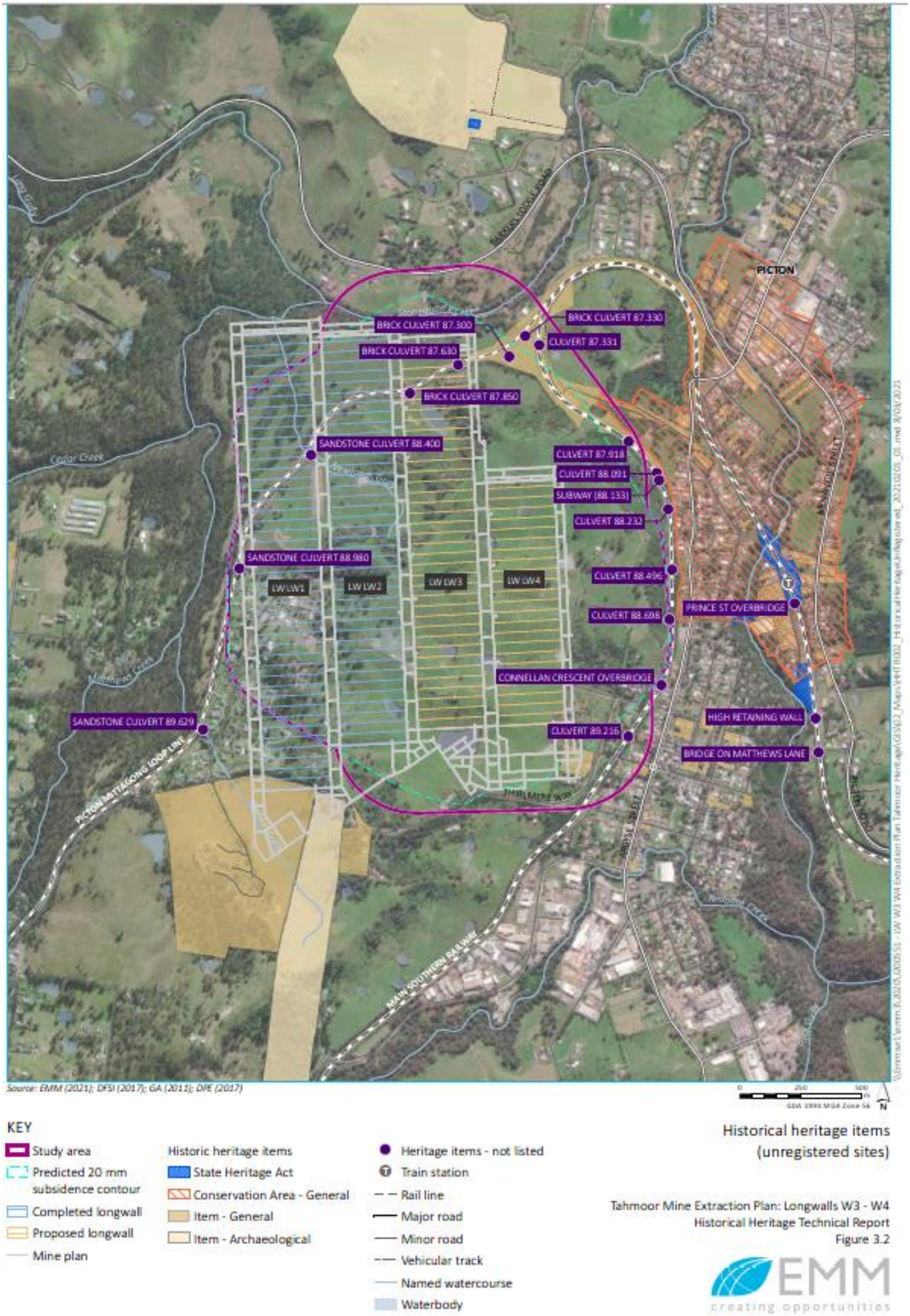


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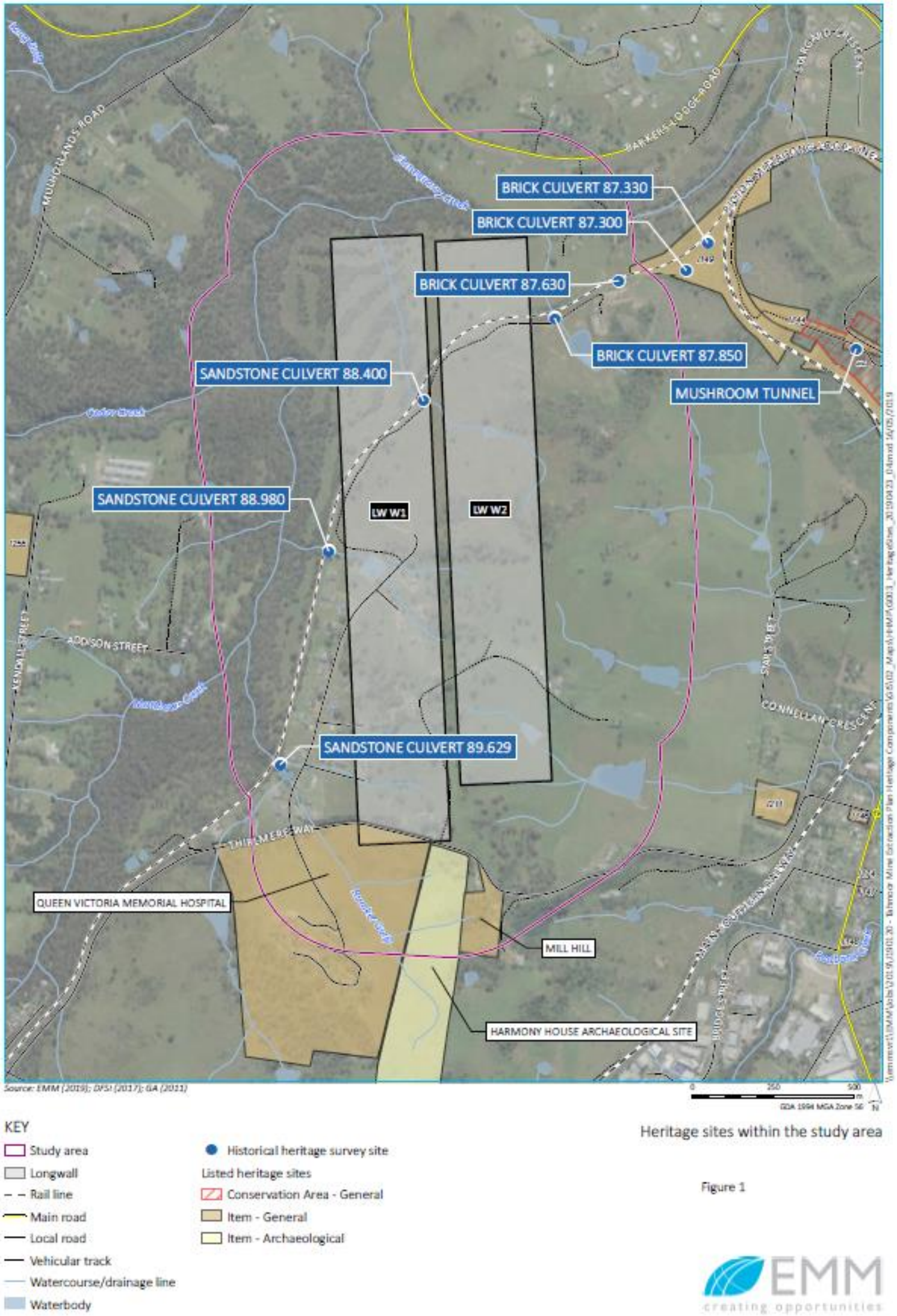
Figure 18 Locations of Sandstone culvets to be remediated at 88.400km and at 88.980km.



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17 Mine Subsidence

17.1 Environmental Management

17.1.1 Western Domain

During the reporting period, the LW W3-W4 Subsidence Monitoring Program have been implemented to monitor subsidence impacts within the Study Area. The Subsidence Monitoring Program includes eighteen (18) Global Navigation Satellite System (GNSS) units measuring absolute horizontal and vertical positions in real time installed directly above and adjacent to LW W3-W4.

The LW S1A-S6A Subsidence Monitoring Program was implemented with the commencement of LW S1A longwall secondary extraction on the 18th October 2022 to monitor subsidence impacts within the Study Area. The Subsidence Monitoring Program includes twenty (20) Global Navigation Satellite System (GNSS) units measuring absolute horizontal and vertical positions in real time installed directly above and adjacent to LW S1A-S6A. By the end of this reporting period (31 December 2022), 536.5m of LW S1A had been extracted.

Tahmoor Coal commenced extraction of LW W3 on the 13th September 2021 and was completed on 21 March 2022, LW W4 commenced extraction on the 16 May 2022 and completed on the 17 August 2022 and LW S1A commence extraction on the 18th October 2022 and is currently active. All subsidence related impacts are managed in accordance with the LW W3-W4 Extraction Plan approval and the Tahmoor South LW S1A-S6A Extraction Plan approval.

A weekly review of the subsidence survey results during the reporting period has been completed by Tahmoor Coal and MSEC.

17.1.2 Tahmoor South Domain

During the reporting period, the LW S1A-S6A Subsidence Monitoring Program has been implemented to monitor subsidence impacts within the Study Area. The Subsidence Monitoring Program includes twenty (20) Global Navigation Satellite System (GNSS) units measuring absolute horizontal and vertical positions in real time installed directly above and adjacent to LW S1A-S6A.

A weekly review of the subsidence survey results was completed by Tahmoor Coal and MSEC during the extraction period. Extraction of LW S1A commenced on 18 October 2022 and 536.5 m of LW S1A had been extracted by 31 December 2022.

17.1.3 Environmental Performance Measures

During the reporting period for the Western Domain, there was one (1) exceedance of environmental performance measures or indicators, as adopted from DA 67/98 Modification 5 or the LW W1-W2 Extraction Plan Approval conditions. As detailed in **Section 16.2**, cracking on sandstone culverts at 88.400 km and 88.980 km resulted in an exceedance of subsidence performance indicator for ‘other Aboriginal and heritage sites’, which was defined as ‘negligible subsidence impacts or environmental consequences’. Tahmoor Coal notified DPE and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A site visit with DPE was completed on 12 April 2022. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.* Tahmoor Coal has committed to complete remediation by 30 June 2023.

During the reporting period for the Tahmoor South Domain, there were no exceedances of environmental performance measures or indicators, as adopted from Condition C1 and Condition C5 of SSD 8445.

17.2 Environmental Performance

A detailed review of subsidence monitoring data and impacts is provided in the Tahmoor Coal Six Monthly Subsidence Impact Reports. These reports fulfil the reporting requirement of the Extraction Plans approved for LW W3-W4 and LW S1A-S6A, and cover the period from 1st January 2022 – 31st December 2022. These requirements are outlined in Section 6.1 of the LW W3-W4 Extraction Plan and Section 7.1 of the LW S1A-S6A Extraction Plan, which are derived from Section 6 of the DPIE *Draft Guidelines for the Preparation of Extraction Plans V5* (DPE, 2015). These reports provide the Secretary of DPE with a summary of subsidence and environmental monitoring results, subsidence impacts and management actions undertaken during the reporting period. The following Reports are found in the Appendix to this AEMR:

Appendix 10 – Western Domain Six Monthly Subsidence Impact Report 7; and

Appendix 11 – Tahmoor South Six Monthly Subsidence Impact Report 1.

17.2.1 Surface Water

In accordance with monitoring requirements of the LW W3-W4 Water Management Plan and the Tahmoor South LW S1A-S6A Water Management Plan, Trigger Action Response Plans (TARPs) have been developed to class degrees of impact based on monitoring data and are reviewed monthly to track progression. Flow, pool level, surface water quality and Visual Creek Inpection monitoring for natural drainage behaviour are monitored and reviewed in accordance with the relevant Water Management Plan. Refer to **Figure 19** for surface water monitoring sites for Western Domain and **Figure 20** for Tahmoor South monitoring sites.

During the reporting period, monitoring sites on Matthews Creek, Stonequarry Creek, and Cedar Creek water levels remained above minimum baseline levels and/or consistent with baseline conditions.

Tahmoor Coal has been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE on 25 June 2021. These reports include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

During the reporting period the following TARP levels were triggered with further details given below and in the Tahmoor Coal Six Monthly Subsidence Impact Reports (**Appendix 10** and **Appendix 11** respectfully):

- Western Domain:
  - Pool Water Level TARP – Level 3 triggered due to pool water level reduction in Cedar Creek (pool CR14) between 9 and 20 December 2022. During the periods of water level decline the water level remained above the previously recorded minimum and did not decline atypically. This TARP was resolved on 31 December 2022 and no

further actions other than ongoing monitoring are required. Tahmoor Coal is reporting on pool water level on a 3-monthly basis to DPE;
    - Natural Drainage Behaviour TARP – Level 3 triggered due to laminar fracturing at SR17 Rockbar from November 2021 onwards and fracturing occurring at Rockbar SR20 from August 2022 onwards. A Level 3 TARP trigger was associated for both locations as the rockbar fracturing was formed during mining (was not present during baseline inspections), and there was no reduction in pool water level, drainage or overland connected flow (taking into account climatic conditions and observations during the baseline monitoring period). No further actions other than ongoing monitoring are required;
    - Surface Water Quality TARP – Level 2 triggered due to elevated dissolved aluminium at various pools during January to July 2022 and variable pH levels at monitoring site SD in August and Sept 2022. These elevated concentrations were attributed to prevailing climatic conditions, and no further actions other than ongoing monitoring are required; and
    - Stonequarry Creek Rockbar TARP – Blue Triggers for extension of High Resolution Closure Lines and measured strains across the SR17 Rockbar, and a Yellow Trigger for fractures on the SR17 Rockbar. These triggers have been investigated, and no impacts were noted at the Aboriginal heritage items located on the SR17 Rockbar. Monitoring of the rockbar has now finished as mining in the Western Domain has been completed.
- Tahmoor South
    - Surface Water Level TARP (WMP3) – Level 1 triggered at monitoring site TT9 due to decline in recorded water level by greater than 10 cm below the recorded baseline minimum level for the period 27 to 30 December 2022. This trigger was considered to be related to the prevailing climatic conditions and likely unrelated to mining influences. Water level monitoring will continue in accordance with the LW S1A-S6A Water Management Plan.

Actions completed for Pool Water Level TARP Trigger:

The following actions have been completed in light of the Level 3 TARP trigger during this reporting period:

- Continue monitoring as per monitoring program - monthly monitoring is ongoing according to the monitoring program;

- Continue monthly review of data – quarterly result analysis and reporting in accordance with the post-mining monitoring program;

- Review relevant surface water level, groundwater level and streamflow data to assess comparative trends – completed as part of this report (refer to Appendix B), which suggested that gaining conditions (groundwater contribution to the surface water system) were occurring during this time period in the vicinity of monitoring site CB (pool CR14);

- Convene Tahmoor Coal Environmental Response Group to review response – completed and included a discussion of this TARP trigger;

- Response as defined by Environmental Response Group – there were no actions regarding this TARP trigger; and

- Consider increasing inspection and review of data frequency to fortnightly for sites where Level 3 has been reached – considered as part of the Surface Water Review (Appendix B). Given the decline in water level at monitoring site CB has occurred intermittently since late 2020 and there has been negligible indication of an associated impact to downstream monitoring sites, increased frequency of monitoring is not deemed to be required. The water level records for this site will continue to be monitored in accordance with the LW W3-W4 Water Management Plan.

Tahmoor Coal has been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE on 25 June 2021. These reports include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

Actions completed for Surface Water Quality and Natural Drainage Behaviour TARP triggers:

The following actions have been completed in light of the TARP triggers during this reporting period:

- Continue monitoring as per monitoring program - monthly monitoring is ongoing according to the monitoring program, however the frequency of some monitoring going forward will be quarterly during the post-mining monitoring phase;

- Continue monthly review of data including analysis of water quality trend along creek (upstream to downstream) to identify spatial changes – completed on a monthly basis during the reporting period. Reporting will now be completed on a quarterly basis during the post-mining stage;

- Convened the Tahmoor Coal Environmental Response Group to review response for Surface Water Quality TARP trigger and undertook further investigation for SR17;

- Response as defined by Environmental Response Group – there were no actions regarding these TARP triggers; and

- Considered increasing inspection and review of data frequency to fortnightly for sites where Level 3 had been reached - an increase in the frequency of visual inspections and review of data in relation to pool physical features, natural drainage behaviour and pool water level is not considered to be required at this stage. However monthly visual inspections has continued into the post-mining period, which is an increase in the monitoring frequency for this stage compared to that which has been described in the WMP.

Monitoring of flow and visual inspection of pools will continue under the existing monitoring program.

During the reporting period, there were no exceedances of environmental performance measures or indicators for surface water, as adopted from DA 67/98 Modification 5 or the LW W3-W4 and LWS1A-S6A Extraction Plan Approval conditions.

Actions completed for Surface Water Quality TARP triggers:

The following actions have been completed in response to the Level 2 TARP triggers during this reporting period:

- Continue monitoring as per monitoring program - monthly monitoring is ongoing according to the monitoring program;

- Continue monthly review of data including analysis of water quality trend along creek (upstream to downstream) to identify spatial changes – completed on a monthly basis during the reporting period. Reporting will now be completed on a quarterly basis during the post-mining stage;

- Convene Tahmoor Coal Environmental Response Group to review response – completed following the reporting of this data, including discussions of these TARP triggers; and

- Response as defined by Environmental Response Group – there were no actions regarding this TARP trigger.

Actions completed for Stonequarry Creek Rockbar TARP trigger:

Following the Blue Trigger for the extension of High Resolution Closure Lines across the SR17 Rockbar on 11 October 2021, the Stonequarry Creek Rockbar Technical Committee met and reviewed the results, considered the Key Assessment Criteria and determined that the current survey, visual inspections, monitoring and management measures remained suitable. The results were then reviewed on a twice weekly basis. Regular updates were also provided to DPE on the status of the rockbar throughout mining, including the outcomes of the Technical Committee meetings.

In accordance with the Stonequarry Creek Rockbar Management Plan, mining of LW W3 was temporarily suspended on 28 October 2021 following initial identification of surficial fracturing of the rockbar at pool SR17. Subsequently, the Subsidence Technical Committee convened to review the required actions and responses in accordance with the Stonequarry Creek Rockbar Management Plan TARP. The Subsidence Technical Committee confirmed that the fracturing was identified approximately 40m downstream of the nearest grinding grove site on the north-eastern side of the access track. No evidence of fracturing was evident at any of the grinding groove sites.

Additional monitoring, inspection and reporting was implemented following the first Blue Trigger for the extension of High Resolution Closure Lines across the SR17 Rockbar, and the Yellow Trigger for observation of fractures in the rockbar.

Geotechnical reviews of the rockbar identified that:

- The fractures occurred in thinly bedded, laminated sandstone and were considered a response to mining related differential compression in combination with the presence of existing delamination in the rockbar surface formed by natural weathering processes;

- There was no evidence of new cracking outside the existing fractured area;

- The extension of the fractured area was associated with a veneer of sandstone sitting on top of competent sandstone;

- The fracturing was considered consistent with subsidence monitoring results and was effectively an extension of the original fracture site; and

- The fracturing provided a release for mining induced stress and was confined to the sheeted sandstone above the competent sandstone. In addition, no evidence of fracturing was evident at any of the grinding groove sites.

The Technical Committee reviewed the latest observations on 26 September 2022. Monitoring results indicate that little to no measurable change has been observed at the rockbar where the fracturing has occurred. The water level in the small man-made pond is also holding water and has returned to normal level.

Actions completed for Surface Water Level TARP Trigger (Tahmoor South):

Table 17.1 outlines the actions and responses that are required to be completed in accordance with a Level 1 TARP trigger for pool water level (TARP WMP3), as well as how these actions and responses have been addressed.

Table 17.1 Actions and Responses for Level 1 TARP Trigger for Pool Water Level Reduction

Action / Response	Tahmoor Coal response
Actions	
Continue monitoring and review of data as per monitoring program	Monthly monitoring and review of data is ongoing according to the monitoring program.
Review water level trends along watercourse (upstream to downstream) to identify spatial changes with consideration to climatic conditions	Completed in the Surface Water Review report. This assessment noted that similar very slight declines were recorded at monitoring sites TT3-QLa, TT2-QLa, TT7-QLa, and TT12-QLa. However, the decline in water level at these monitoring sites did not exceed 10 cm below the associated recorded baseline minimum level. It was noted that the baseline monitoring period for TT7-QLa and TT3-QLa commenced in early 2020, whereas the baseline monitoring period for TT9-QLa commenced in August 2022. Based on the available monitoring data, it is considered that the hydrological characteristics of TT9-QLa are similar to that of TT&-QLa. As such, there is potential that the water level at monitoring site TT9-Qla declined to a similar level historically to that which was recorded in late December 2022.
Review streamflow data recorded at TT-F1 and conduct streamflow reduction assessment;	Completed in the Surface Water Review report. Challenges in the construction of the v-notch weir on Teatree Hollow (TT-F1) were encountered such that further construction works were required in late 2022 to early 2023. Therefore, as the streamflow monitoring data for TT-F1 was influenced by the weir construction works for the duration of the review period and was not reflective of natural conditions, a streamflow reduction assessment has not been undertaken.
Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, groundwater level monitoring results) necessary to inform assessment.	Completed in the Surface Water Review report. A review of subsidence monitoring results indicated that, as mining of LW S1A had only progressed 630 metres (approximately 400 m to the east of TT9-QLa), it was considered unlikely that pool TT9 had been impacted by mining of LW S1A. A visual inspection of pool TT9 conducted on 17 January 2023 did not identify any environmental consequences from mining,

Action / Response	Tahmoor Coal response
	such as evidence of fractures, impacts to pool water level, overland connected flows, iron staining or gas release. A review of groundwater monitoring data from the closes groundwater monitoring site P56 indicated that a notable decline in groundwater level was recorded in the Hawkesbury Sandstone (equating to approximately 3.4 m decline since the start of LW S1A mining). This indicates that there is potential that a decline in baseline contribution to Teatree Hollow occurred from October to December 2022, which may have had a minor contribution to the overall recorded decline in water level at TT9-QLa.
Responses	
Report trigger exceedance to DPE and key stakeholders	Trigger exceedance notification provided to DPE on 28 February 2023, and the Tahmoor Colliery Community Consultative Committee on 2 March 2023.
Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report.

From the completion of actions and responses (as discussed in **Table 3-2**), it is concluded that the water level decline at monitoring site TT9-QLa for the period 27 to 30 December 2022 is considered to be related to the prevailing climatic conditions and likely unrelated to mining influences. Therefore, this TARP trigger is not considered to be an environmental consequence of mining, and the results remain within predictions in accordance with the LW S1A-S6A Water Management Plan.

Water level data recorded at monitoring site TT9-QLa will continue to be recorded and reviewed in accordance with the LW S1A-S6A Water Management Plan. If additional monitoring data indicates continued decline in water level at monitoring site TT9-QLa, further assessment and actions will be taken in accordance with the LW S1A-S6A Water Management Plan.

The current monitoring program will continue in accordance with the LW S1A-S6A Water Management Plan. The next update will be provided as part of the next Six Monthly Subsidence Impact Assessment report, to be provided to DPE by 30 September 2023.

Figure 19 LW W3-W4 Surface Water Monitoring Locations

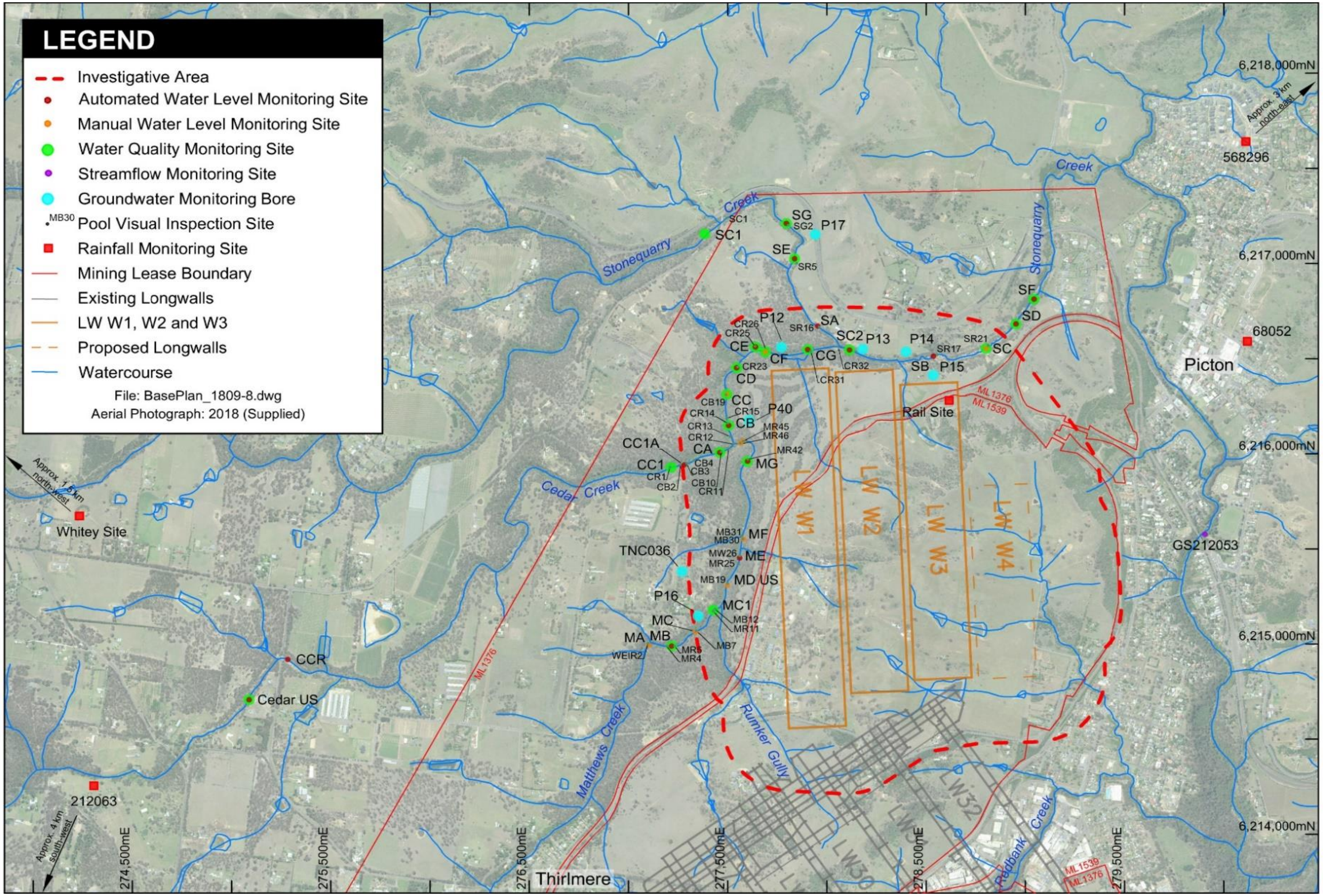

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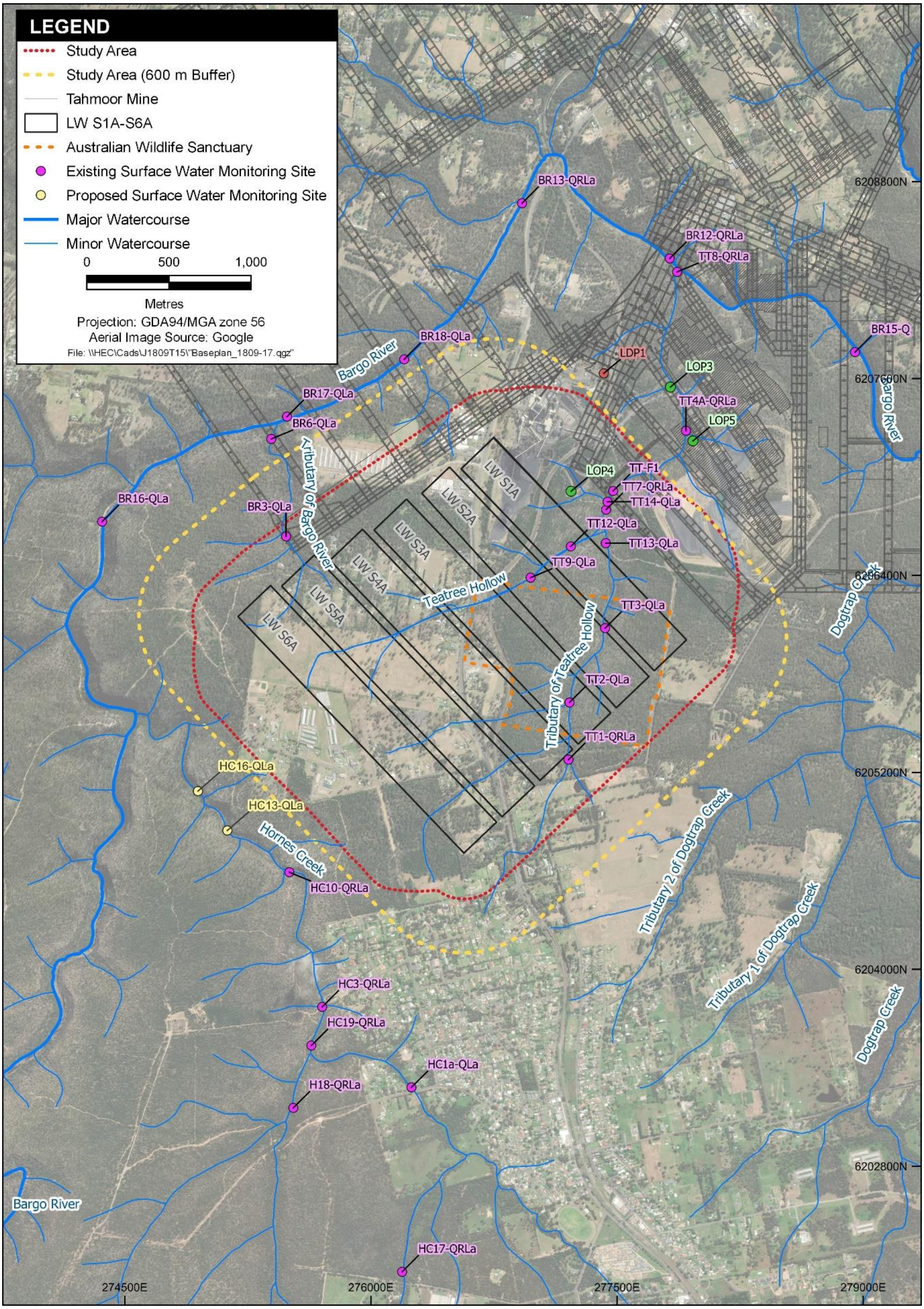
Figure 20 LW S1A-S6A Surface Water Monitoring Sites Specific to LW S1A-S6A



17.2.2 Groundwater

During the reporting period (1st January 2022 - 31st December 2022), the following TARP levels were triggered with further details explained in the Western Domain Six Monthly Subsidence Impact Report 7 and Tahmoor South Six Monthly Subsidence Impact Report 1 (**Appendix 10**, **Appendix 11** respectfully). Locations of boreholes monitored are shown in **Figure 21**.

- Western Domain:
  - Groundwater Quality TARP – Groundwater Quality TARP – Levels 2 and 3 and potential Level 4 were triggered due to water quality results during the reporting period. Potential Level 4 triggers were identified for pH at P12B, and strontium at P15A, and EC and Barium at GW115860. All potential Level 4 triggers were resolved during this reporting period. A Level 3 TARP trigger was noted for elevated zinc concentration at P16C. Groundwater monitoring will continue under the existing monitoring program, and no actions are required;
  - Groundwater Bore Level TARP – Levels 2 and 3 triggered during the reporting period, however a trend in groundwater recovery was evident. Groundwater bore level will continue to be monitored in accordance with the LW W3-W4 Water Management Plan, and Tahmoor Coal will continue to provide 3-monthly reports to DPE for surface water and groundwater;
  - Shallow Groundwater Pressures TARP – Levels 2, 3 and 4 triggered during the reporting period, however a trend in groundwater recovery was evident. Groundwater bore level will continue to be monitored in accordance with the LW W3-W4 Water Management Plan, and Tahmoor Coal will continue to provide 3-monthly reports to DPE for surface water and groundwater;
  - Deep Groundwater Pressures TARP – Level 2 triggered during the reporting period. Groundwater monitoring will continue under the existing monitoring program;
- Tahmoor South:
  - Multiple triggers of groundwater TARPs WMP9, WMP10, WMP11 and WMP13 during the reporting period. Upon review of these TARP triggers, it was apparent that a revision of the TARPs in question was required as some parameters were too sensitive, resulting in triggers from typical short term fluctuations in parameters rather than trends indicating potential environmental consequences from longwall extraction. Following the revision of the TARPs, a re-assessment of the groundwater data against the TARPs noted that there were no residual TARP triggers for this reporting period. The LW S1A-S6A Water Management Plan and associated documents will be updated to reflect the revised groundwater TARPs, and submitted to DPE via the Planning Portal.

Actions completed for Western Domain Grondwater Bore Level TARP triggers:

On 30 December 2020, Level 4 TARP triggers for the reduced water level elevations at P12C, P16B, P16C and TNC036 were notified to DPE and NRAR. This reduction was attributed to mining induced depressurisation of deeper groundwater aquifer, however this also correlated to a reduction in rainfall recharge events.

In light of the Level 4 TARP triggers, Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE on 25 June 2021. This Six Monthly Subsidence Impact Report includes this 3-monthly monitoring reporting. These reporting requirements include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

The following actions have been completed in light of the Level 2 and Level 3 TARP triggers during this reporting period:

- Continue monitoring program - monthly monitoring is ongoing according to the monitoring program;
- Ongoing review of water level data and consideration of mining and external stresses – monthly result analysis and reporting was completed during the mining period. Result analysis and report will be completed on a quarterly basis as monitoring has entered the post-mining stage;
- Review relevant surface water level, groundwater level and streamflow data to assess comparative trends – completed as part of 3-monthly Monitoring Reporting for surface water and groundwater. The next monitoring report will be provided to DPE in June 2023;
- Compare against base case and deterministic model scenarios – completed as part of the groundwater reports (Appendix D);
- Convene Tahmoor Coal Environmental Response Group to review response – completed on a monthly basis, including the discussion of any groundwater level TARP triggers; and
- Response as defined by Environmental Response Group – there were no actions regarding this TARP trigger.

It is noted that a drain to divert surface run-off was installed in early November 2022 at P16B and P16C along with re-sealing the monitoring bores so that that no surface water run-off flows into the bore.

Actions Completed for Western Domain Shallow Groundwater Pressures TARP triggers:

On 30 December 2020, Level 4 TARP triggers for the reduced water level elevations at P13C, P16B, P16C and TNC036 were notified to DPE and NRAR. This reduction was attributed to mining induced depressurisation of deeper groundwater aquifer, however this also correlated to a reduction in rainfall recharge events. The Level 4 TARP triggers observed during this reporting period are a continuation of the trend as previously notified.

In light of the Level 4 TARP triggers, Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE on 25 June 2021. This report incorporates the 3-monthly monitoring reporting requirement, including a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater (Refer to Section 2.2; Appendix B; Appendix D), and any recommendations in relation to ongoing monitoring or corrective actions (Section 2.3.5).

The following actions have been completed in light of the Level 2, 3 and 4 TARP triggers during this reporting period:

- Continue monitoring program - monthly monitoring is ongoing according to the monitoring program;
- Ongoing review of water level data and consideration of mining and external stresses – monthly result analysis and reporting was completed during mining. Result analysis and report will be completed on a quarterly basis as monitoring has entered the post-mining stage;
- Compare against base case and deterministic model scenarios – completed as part of the Groundwater Report (Appendix D);
- Convene Tahmoor Coal Environmental Response Group to review response – completed on a monthly basis, including the discussion of any groundwater level TARP triggers; and
- Response as defined by Environmental Response Group – there were no actions regarding this TARP trigger.

Actions Completed for Western Domain Deep Groundwater Pressures TARP triggers:

The following actions have been completed in light of the Level 2 TARP triggers during this reporting period:

- Continue monitoring program - monthly monitoring is ongoing according to the monitoring program;
- Ongoing review of water level data – monthly result analysis and reporting was completed during mining. Result analysis and report will be completed on a quarterly basis as monitoring has entered the post-mining stage;
- Convene Tahmoor Coal Environmental Response Group to review response – completed on a monthly basis, including the discussion of any groundwater level TARP triggers; and
- Response as defined by Environmental Response Group – there were no actions regarding this TARP trigger.

Actions Completed for Western Domain Groundwater Quality TARP Triggers:

As discussed in the groundwater reports in Appendix D, the following actions were completed in response to the potential Level 4 TARP triggers for this reporting period:

- Continue monitoring as per monitoring program - monthly groundwater monitoring is ongoing according to the monitoring program;
- Continue monthly review of data and consideration of mining and external stresses (in groundwater monthly report) – completed monthly during mining. Result analysis and reporting will be completed on a quarterly basis as monitoring has entered the post-mining stage. Analysis of the potential Level 4 TARP triggers is complete, and these trigger levels have been resolved in this reporting period; and

- Convene Tahmoor Coal Environmental Response Group to review response - completed following the reporting of this data, which included the discussion of these TARP triggers.

Investigations into these potential Level 4 TARP triggers were completed to the cause of these triggers (i.e. has or has not been attributed to mining-related impacts). A summary of the investigations is provided below.

pH at P12B

The higher pH at this bore was likely due to an issue with the integrity of the bore, with recent high surface runoff flushing cement/grout into the bore. Investigations by SLR in January 2022 found that the reason for the increase in pH at P12B is unclear and could potentially be related to compromised bore integrity, however an increasing trend was also observed at GW072402. At this time, a mining-related effect is plausible, however the consequences of this effect (if it is mining-related) are considered minor.

The TARP trigger level was reduced to a TARP Level 1 in June 2022 as the source of the pH increase was determined not to be related to mining but to grout contamination. Since July 2022, pH has reduced to within the baseline limit.

Strontium at P15A

SLR investigated the recent Sr exceedances at P15A in January 2022 with no clear mining-impact identified. The following presents a summary of the findings:

- Since the start of monitoring at site P15A-D, the Sr concentrations are above the ranges reported at unaffected sites and above the pre-mining Sr concentrations at P14A-P14D except for P15D within pre-mining Sr concentrations at P14;

- No exceedances in Sr concentrations were identified at surface water monitoring sites along Stonequarry Creek, with all surface water monitoring sites across the Western Domain within TARP Level 1 for water quality during the reporting period;

- From the U.S Environmental Protection Agency, Sr concentrations in drinking water are assessed relative to the health-based screening level benchmark of 4 mg/L. Values greater than 4 mg/L are considered high, between 2 mg/L and less than 4 mg/L are considerate moderate and less than 2.0 mg/L are considered low. At P15A, Sr concentrations are considered moderate (less than 4.0 mg/L);

- Since monitoring started at P15A, the higher Sr concentrations observed at P15A compared to other sites (i.e. P14, GW105228 and GW115860) and compared to the deeper piezometers (i.e. P15B-D) suggest a localised Sr source in groundwater at piezometer P15A;

- The range of strontium in natural soils is highly variable, from 50 mg/kg to 1000 mg/kg. P15A is located within the mapped alluvium and may be screened within alluvial soil with a higher Sr concentration compared to the deeper lithology of weathered and fresh Hawkesbury Sandstone. No bore logs are available to review and verify the lithology at this location; and

- The Sr concentrations at nearby registered bores GW105228 and GW115860 are considered low (less than 2 mg/L) suggesting no risk of human-health concerns and that the increase in Sr concentrations at P15A is possibly localised.

The trigger level at P15A for Sr was revised to 4 mg/L in June 2022, as the trigger was assessed to be too conservative for this site.

The concentration of strontium were reported as a TARP Level 2 from June 2022. Strontium concentrations at site P15B and P15C have started to increase above the trigger level in July 2022 however the overall increase to September 2022 is within the range of 0.2 mg/L, considerably less than previously observed at P15A.

Barium at GW115860

SLR investigated the potential TARP Level 4 for Ba at GW115860 (refer to Appendix D). The following summarises the findings:

- Ba concentration at GW105228 (110 m from GW115860) are stable within 0.20-0.25 mg/L since monitoring started;

- The short record of Ba concentrations at site P15A-D shows fluctuation within the range of 0.08 to 0.21 mg/L, generally lower than at GW105228; and

- No exceedances or increasing trends in Ba concentrations were identified at sites P14A-D and P15A-C (only 180 m and 65 m from LW W3) between October 2021 and January 2022 (SLR, 2021a, 2022a) except at P15D (TARP Level 2) in February 2022 slightly increasing at the trigger level.

A mining-related effect on Ba at GW115860 was assessed to be unlikely but could not be excluded at the time of the investigation. A revision to the Ba trigger level was undertaken as it appeared that the trigger level was conservative and could not be based on pre-mining data. The revised trigger level for Ba at bore GW115860 is 0.51 mg/L and remains conservative (i.e. lower than) with respect to the relevant guideline values considered.

EC at GW115860

SLR investigated the trigger exceedances at GW115860 for EC (refer to Appendix D). The following summarises the findings:

- The reason for the increased EC at GW115860 is unclear, although it is consistent with the trend observed at nearby bore GW105228. Therefore, this trigger is a ‘potential’ Level 4 TARP trigger, and it has not been confirmed that the cause is mining;

- No drawdown was observed during the extraction of LW LW3 at GW115860, and hence drawdown does seem to be the cause of the change in EC;

- The increase in EC at GW115860 (to 1,246 µS/cm) does not change the beneficial use classification of the groundwater extracted at this site, and therefore the currently observed effects are considered to be immaterial. Indeed, salinity (TDS) at GW115860 remains within the desirable palatability of less than 600 mg/L (class A1 category). Groundwater quality at GW115860 remains suitable for all beneficial uses, including the current purpose; and

- Given the low salinity of groundwater at GW115860, and the small incremental change in that salinity in relation to the beneficial use classifications it is recommended to continue observing this bore over the next monitoring period (April 2022) to see if EC decreases, otherwise to revise the trigger. The most reliable method to revise the trigger would be to adopt the EC trigger from GW105228 for use at GW115860 as it has been derived from a longer record period.

EC concentrations naturally lowered in February 2022, resulting in a return to Level 1.

Actions Completed for Tahmoor South Groundwater TARP Triggers:

During the reporting period, a number of TARP triggers occurred in accordance with the following groundwater TARPs:

- TARP WMP9 Shallow Groundwater Pressure (VWP Sensors < 200 m Depth): Potential Level 2 for TBC032 HBSS recorded at 131m in December 2022;
- TARP WMP10 Groundwater Level / Pressure Deep VWPs (> 200 m Depth excluding Bulli Coal Seam): Level 1 triggered since October 2022 for TBC09 (BGSS – 322m), TBC09 (BGSS-343m), TBC018 (BGSS-282m), TBC018 (BGSS-366m), TBC18 (BUSM-404m), TBC20 (WBCS-397m), TBC20 (BGSS-375m), TBC26 (BUSM-432m), TBC32 (BGSS-237m), TBC32 (BGSS-294m); since November 2022 for TBC09 (WWCO-391m), TBC09 (WO-397m), TBC18 (W0-432m), TBC020 (211m), TBC32 (BGSS-200m), TBC39 (BGSS-299m); December 2022 for TBC020 (293m);
- TARP WMP11 Groundwater Quality (Open Standpipes and Private Bores): Level 1 triggered for P53B (pH upper), GW112473 (EC and pH lower), P52 (EC), P53A (EC) for November; P55A (EC) for November and December; numerous exceedances of heavy metals (Fe, MN, Cu, Pb, Zn, Ni, Al, As, Li, Ba, Sr) at P51B, P52, P53A-C, P55A-C, P56B-C, GW062068, GW104008, GW104323, GW104659, GW105395, GW109257 and GW112473 in November and December 2022; and
- TARP WMP13 Groundwater Bores Monitoring for Thirlmere Lakes: Level 1 triggered due to Level 1 triggers of TARP WMP11 for "early warning" bores P51B (Al, As), GW062068 (Fe, Cu, Zn, Ni), and GW104659 (Mn, Al, Li, Ba) recorded in November and December 2022.

Regarding the TARP WMP9 trigger, the decline in observed groundwater levels below the TARP Level 2 at TBC032-HBSS 131m could be related to climate or mining of LW S1A. However the wording in the current TARP has no timeframe associated with the change in groundwater levels.

Regarding the TARP WMP11 triggers (and consequently the WMP13 triggers), the TARP Level 1 triggers for groundwater quality were not likely to be mining related but rather due to climate related events. All triggers for pH, EC and metal concentrations were short term exceedances (less than three months) that were likely due to natural fluctuation in groundwater conditions following above average rainfall in October and November 2022. The trigger level was calculated using a short baseline period which could have resulted in a conservative trigger level.

Regarding the TARP WMP10 triggers, it was noted that secondary extraction of the new mining domain commenced on 18 October 2022 and the Level 1 TARP trigger triggered shortly thereafter. Therefore Level 1 triggers in October 2022 appear to be very conservative. In addition, the TARPs did not allow for any level of variation below the modelled drawdown.

Groundwater TARP triggers for October to December 2022 were notified to DPE via the Planning Portal on 28 February 2022.

Upon review of the TARP triggers, it was identified that these TARP were not representative of incurred variations to the system that required further analysis as per the objectives of the TARPs. This was primarily due to the temporal scales in many of the TARP trigger descriptions being either incorrect, insufficient or lacking. Without an appropriate temporal scale, isolated fluctuations and seasonal variations were resulting in triggers to the TARPs, which was unrepresentative of trends that would indicate potential environmental consequences from longwall extraction.

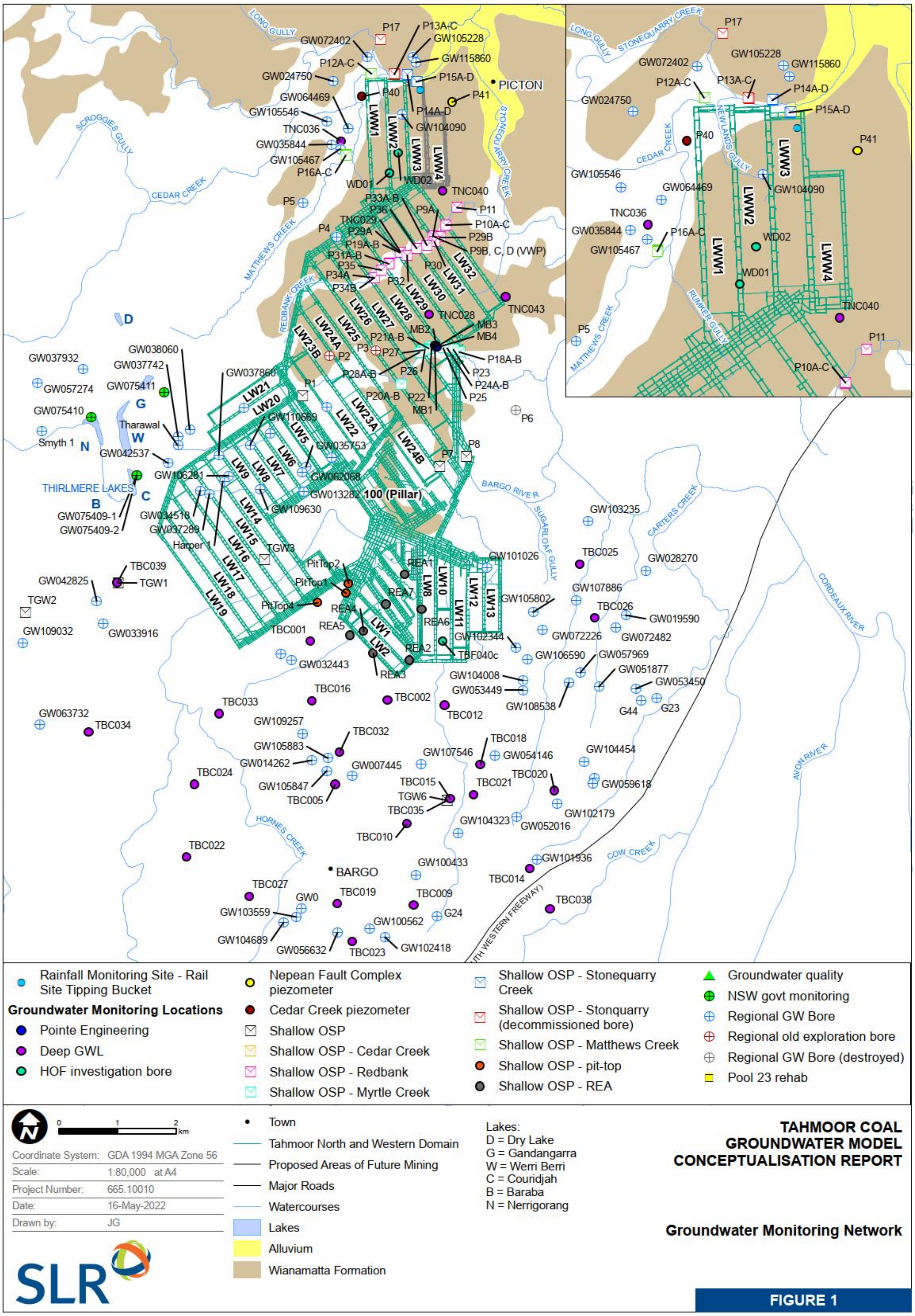
Further, where modelled drawdown was relied upon to define trigger levels, insufficient allowance was given for the known and accepted level of accuracy with modelled drawdowns (i.e. an exceedance of 20 cm beyond modelled drawdown would trigger a Level 1, although this can be considered within the bounds of the model results and not representative of trends of exceedance of model outputs).

The TARPs in question were therefore revised. A marked-up version of the original TARPs showing changes is provided in Appendix F of the Groundwater Report (Appendix C of **Appendix 11**), and the reasoning behind each TARP change is provided in Table 3-3 of the Tahmoor South Six Monthly Subsidence Impact Report (**Appendix 11**).

Following the revision of the TARPs, a re-assessment of the data against the TARPs was completed and there were no residual TARP triggers for this reporting period.

The LW S1A-S6A Water Management Plan and associated documents will be updated and submitted to DPE via the Planning Portal to reflect the changes made to the groundwater TARPs (following the submission of the Annual Review and the Six Monthly Subsidence Impact Report).

Figure 21 Groundwater Monitoring Borehole network



17.2.3 **Natural Drainage Behaviour**

For the Western Domain, Visual and photographic surveys for subsidence impacts on creeks have been completed monthly for all monitoring pools on Stonequarry Creek, Cedar Creek and Matthews Creek within the active subsidence zone of LW W3 and LW W4. The purpose of these surveys is to note whether change has occurred to pool level, drainage or overland flow, and to assist in determining if any change can be attributed to mining impacts. Surveys are carried out to identify rock bar and/or stream base cracking, gas release, or increased iron precipitation.

A summary of creek observations for the reporting period is provided below:

- Pool water level and overland connective flow was influenced by a major rainfall event that occurred from late February to early March 2022, as well as during May and July 2022. These rainfall events resulted in catchment base-flow recharge;
- Surficial fracturing of the controlling rockbar at Pool SR17 and a rockbar at Pool SR20 have been noted;
- There were no other surface fracturing or cracking noted in the waterways during the reporting period;
- No reduction in pool flow or connective overland flow was observed in the waterways during the reporting period;
- Some minor iron hydroxide precipitation was observed in Stonequarry Creek, Cedar Creek and Matthews Creek during the reporting period, however these levels did not exceed pre-Longwall West 1 baseline levels; and
- No gas release was noted in the waterways during the reporting period.

The surficial fracturing of the controlling rockbar at Pool SR17 was first noted following the visual inspection on 17 November 2021. The fractures occurred in thinly bedded, laminated sandstone and were likely in response to mining related differential compression in combination with the presence of existing delamination in the rockbar surface formed by natural weathering processes.

The surficial fracturing of a rockbar at Pool SR20 was noted following the inspection on 18 August 2022. Two fractures were noted and it was confirmed that one crack was the development of an existing (pre-mining) joint / discontinuity, while the other was first observed during mining of LW W4. During the latest inspection on 15 November 2022, it was noted that both cracks appear to be getting wider. The new crack was noted to have an increase in maximum width from 6 mm (noted on 27 October 2022) to 21 mm (noted on 15 November 2022). The development of the existing joint / discontinuity was also noted to have increased in maximum width from 7 mm (noted ton 27 October 2022) to 14 mm (noted on 15 November 2022). Further information is discussed in the Western Domain Six Monthly Subsidence Impact Report 7 (**Appendix 10**).

For the Tahmoor South Domain, visual and photographic surveys for subsidence impacts on creeks have been completed monthly for monitoring pools, reaches, geomorphology and channel stability in Teatree Hollow and Teatree Hollow tributary within the active subsidence zone of LW S1A, with the exception of headwater sites completed on an annual basis. The purpose of these surveys is to note whether change has occurred to pool level, drainage, overland flow,channel stability, erosion and/or sedimentation, and to assist in determining if any change can be attributed to mining impacts. Surveys are carried out to identify any visual changes in knickpoint development, channel morphology, rock bar and/or stream base cracking, changes in overland connected flow, gas release, turbidity or increased iron precipitation. Creek monitoring locations for physical features and natural behaviour are illustrated on **Figure 22** and locations for channel stability, sedimentation and erosion are illustrated on **Figure 23**.

During this reporting period, there were no observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity, as compared with baseline conditions.

Figure 22 LW S1A-LWS6A Pool Visual Inspection Sites

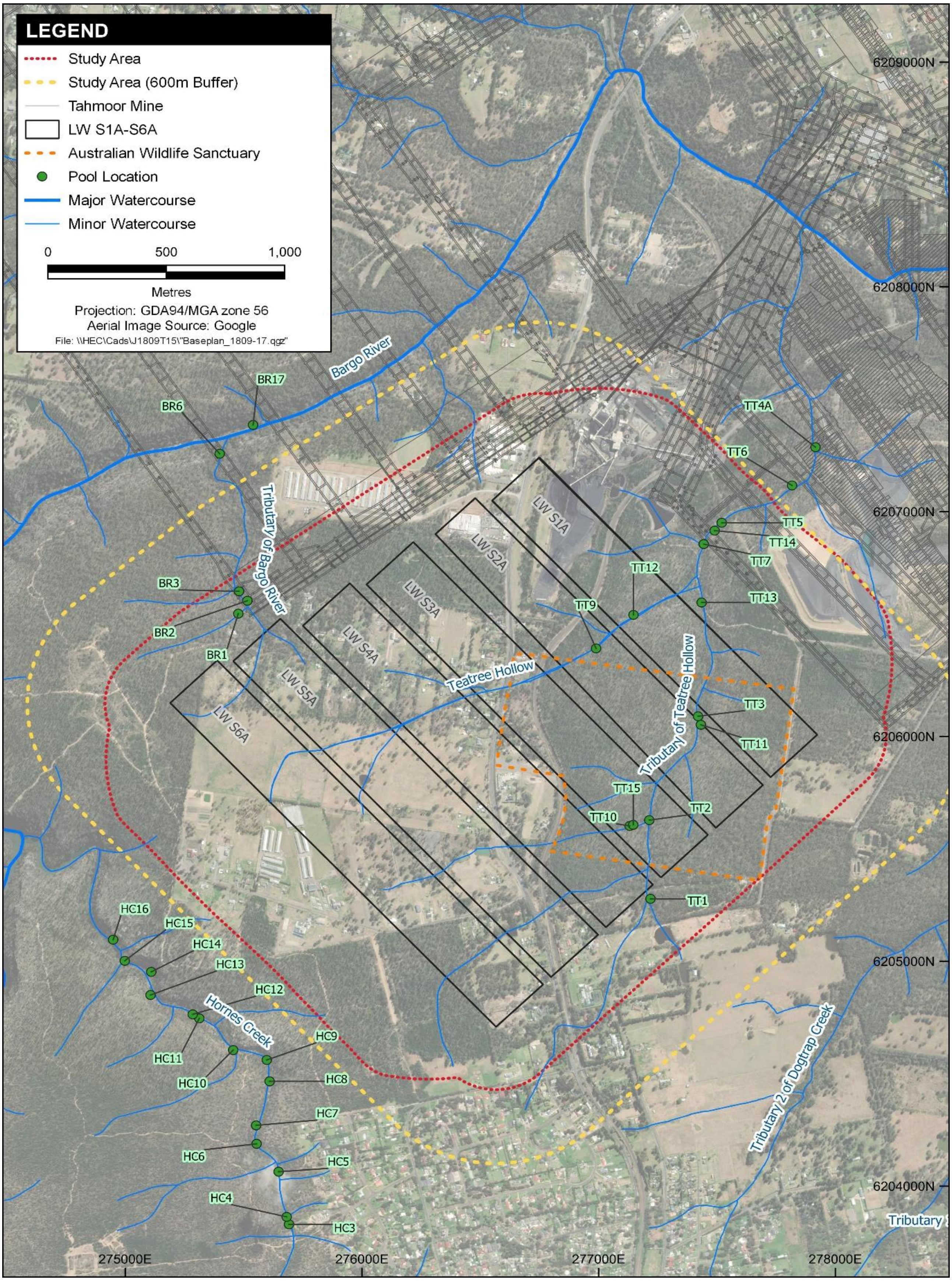


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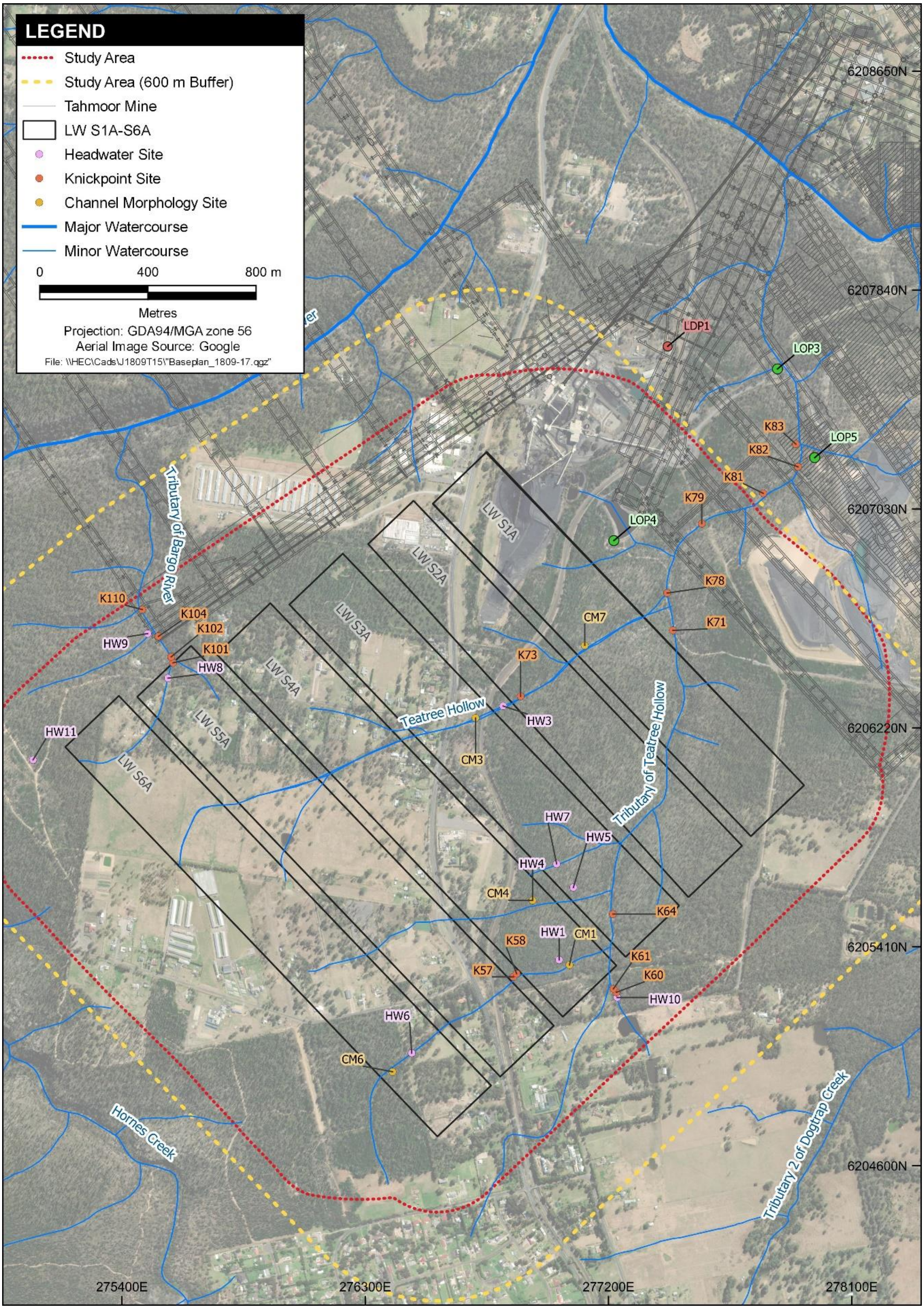
Figure 23 LW S1A-S6A Morphology and Channel Stability Monitoring Sites



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17.2.4 **Flooding**

Following the completion of mining in the Western Domain, a post-mining flood study was completed to assess the potential impacts of subsidence on flooding in Matthews Creek, Cedar Creek and Stonequarry Creek. This assessment was completed to fulfil the requirements of Condition 7 of DA 67/98, which requires that mining does not result in the subsidence of any habitable floors to below the 1 in 100 year flood level (1% annual exceedance probability [AEP] flood level).

The report (WRM, 2022) concluded that flooding is confined to the Matthews Creek system (which includes Matthews Creek, Cedar Creek and Stonequarry Creek), and subsidence has not resulted in any habitable floor areas to fall below the 1 in 100 year flood level.

17.2.5 **Historical Heritage**

During the reporting period, as reported in the Western Domain Six Monthly Subsidence Impact Report 7 and Tahmoor South Six Monthly Subsidence Impact Report 1, (1st January 2022 – 31st December 2022), the following TARP trigger occurred for Historical Heritage. Further details are explained in the Six Monthly Subsidence Impact Reports (**Appendix 10** and **Appendix 11** respectively).

- Historical Heritage TARP – Level 3 Trigger for impacts to sandstone culverts at 88.400 km and 88.980 km. These impacts included cracking and minor spalling on the portal sides and cracking in the barrel of the culvert at 88.400 km. This Level 3 TARP trigger is a continuation of the TARP notification to DPE on 21 September 2021. Tahmoor Coal is undertaking remediation now that the full effects of LW W3-W4 have been complete.

This TARP trigger was the one (1) exceedance of environmental performance measures or indicators, as adopted from DA 67/98 Modification 5 or the LW W1-W2 Extraction Plan Approval conditions. Cracking on sandstone culverts at 88.400 km and 88.980 km resulted in an exceedance of subsidence performance indicator for 'other Aboriginal and heritage sites', which was defined as 'negligible subsidence impacts or environmental consequences'. Tahmoor Coal notified DPE and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A site visit with DPE was completed on 12 April 2022. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.* Tahmoor Coal has committed to complete remediation by 30 June 2023.

No other impacts to historical heritage were observed during this reporting period.

Actions completed

As per the Historical Heritage TARP, the following actions have been completed:

- Continue monitoring program as per monitoring program - monitoring according to the monitoring program has now finished with the completion of LW W4;
- Convene Tahmoor Coal Environmental Response Group to review response – completed on a monthly basis. This TARP trigger was discussed shortly after the identification of the trigger on 14 September 2021. Discussion of the cracking in the barrel of culvert 88.400 km is scheduled for December 2022;

- Co-ordinate a site inspection with a structural engineer and qualified archaeologist or heritage architect – completed as part of the LW W2 End of Panel inspection, as well as during the LW W3 End of Panel inspection and LW W4 End of Panel inspection;
- Investigate exceedance of subsidence prediction – completed as part of the LW W2 End of Panel Historical Heritage Report;
- Review mine design / predictions against mine criteria - completed as part of the LW W2 End of Panel Historical Heritage Report;
- Review monitoring program and modify if necessary - completed as part of the LW W2 End of Panel Historical Heritage Report, with no modifications were deemed required;
- Notify DPE and Heritage NSW within one week of awareness of the event – Tahmoor Coal notified DPE and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A site visit was undertaken with DPE representatives on 12 April 2022 and a warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the Environmental Planning and Assessment Act 1979. Cracking in the barrel of culvert 88.400 km is likely to be part of the same subsidence impact event that caused the identified cracking on the portal face. Therefore, as the cracking in the barrel is not likely to indicate a new subsidence impact event, no further notification is deemed required; and
- Investigate and implement any additional management measures as required in consultation with Heritage NSW and DPE – rehabilitation of the two culverts will be completed following the full effects of LW W4 in accordance with the Transport for NSW (TfNSW) Structures Repair Standard TMC302. A works program for the rehabilitation of the two culverts was submitted to DPE on 10 May 2022, as well as a report on the proposed rehabilitation methodology. Tahmoor Coal also provided the rehabilitation methodology to the Heritage Division of TfNSW on 19 May 2022 (please refer to **Section 15.2** for more information).

17.2.6 **Built Features**

The LW W3-W4 Built Features Management Plan and associated sub-plans were prepared to manage the potential environmental consequences of LW W3-W4 extraction on built features in accordance with Condition 13H(vii)(b) of DA 67/98.

During this reporting period, the LW W3-W4 Subsidence Monitoring Program have been implemented to monitor subsidence impacts on infrastructure owned by Endeavour Energy (electrical infrastructure), Sydney Water (potable water infrastructure and sewer infrastructure), Bradcorp (sewer infrastructure), Jemena (gas infrastructure), Wollondilly Shire Council (roads, bridges and culverts), Telstra (telecommunications infrastructure), NBN (telecommunications infrastructure), ARTC (rail infrastructure), Transport Heritage NSW (rail infrastructure), Weatherboard House (historical building) and private property owners.

A number of impacts to local roads and built structures occurred during the reporting period as a result of subsidence from LW W3 extraction. These impacts are focused within the Stonequarry Estate and along Thirlmere Way and can be summarised as:

- Stonequarry Creek Road - impacts to kerb drain (January 2022) and a property (March 2022);
- Connellan Crescent - impacts to road surface (March 2022);
- Carramar Close - impacts to road surface (March 2022);
- Booyong Close - impacts to a property (March 2022); and
- Thirlmere Way - impacts to road surface (March 2022).

The impacts to the road surfaces was noted to be largely attributed to the large rain event from the end of February to early March 2022. Where possible, Tahmoor Coal has repaired damages to roads and built structures in consultation with SA NSW where appropriate.

A number of impacts to local roads and built structures occurred during the reporting period, however these impacts were related to heavy rainfall and heavy traffic as opposed to subsidence from LW W4 extraction.

During the reporting period there have been one (1) 'Blue Trigger' according to the Picton-Mittagong Loop Line TARP and the Main Southern Railway TARP as follows:

- Main Southern Railway TARP – Blue Triggers at Ballast Top Subways (88.133 km and 86.838 km) and Picton Tunnel, which were attributed to impacts from rainfall rather than mining impacts. As these triggers have been resolved, ongoing monitoring is required.

Further details of impacts to Rail Infrastructure from LW W3 and LW W4 are found in the Western Domain Six Monthly Subsidence Impact Report 7 and Tahmoor South Six Monthly Subsidence Impact Report 1 (1st January 2022 – 31st December 2022), **Appendix 10** and **Appendix 11**.

No other subsidence impacts to built features or the Main Southern Railway were observed during this reporting period.

17.2.7 Public Safety

The LW W3-W4 Public Safety Management Plan were prepared to manage the potential consequences as a result of LW W3-W4 extraction on public safety within the Study Area in accordance with Condition 13H(vii)(g) of DA 67/98.

Management requirements for public safety are covered in the Built Features Management Plan and the Land Management Plan. Monitoring of cliffs, rock outcrops and steep slopes and other landscape features has been conducted for the reporting period in accordance with the LW W3-W4 Land Management Plan. In addition, monitoring of infrastructure items has also been conducted for the reporting period in accordance with the LW W3-W4 Built Features Management. For further information refer to the Tahmoor Coal Six Monthly Subsidence Impact Reports (**Appendix 10 and 11** respectively).

No subsidence impacts were identified during the reporting period that were considered to pose a risk to public safety.

17.3 Subsidence Event Notifications

There were no subsidence incidents and/or ongoing management reporting notifications for LW W3, LW W4 and LW S1A during 2022.

Notifications of subsidence events to Government agencies is required in accordance with LW W3-W4 Extraction Plan and Tahmoor South LW S1A-S6A Extraction Plan, and TARPs under the relevant Infrastructure and Environmental Management Plans. There were no subsidence event notifications during the reporting period, however a TARP notification for December 2022 was notified to the Department on the 28th February 2023 as detailed in **Section 17.2.1**.

17.4Subsidence Monitoring

Subsidence monitoring has been completed during the reporting period in accordance with the approved Tahmoor Coal LW W3-W4 Extraction plan and Tahmoor South S1A-S6A Extraction Plan, specifically as summarised in the LW W3-W4 and S1A-S6A Subsidence Monitoring Programs. On completion of a Longwall, the active subsidence zone is resurveyed, and comparative analysis of predicted and actual subsidence forecasts are reported in the 6 monthly Subsidence Reports.

LW W1-W4 Six Monthly Subsidence Impact Report 7 **(Appendix 10)** combines Reports 5 and 6 reporting on the calender year 2022, demonstrates observed subsidence along the centreline of LW W1-W4 was less than predicted, with the maximum observed vertical subsidence of 897mm recorded along the LW W1-W4 crossline survey and a maximum of 200 mm of vertical subsidence relating to the extraction of LW S1A was recorded at the GNSS unit Site S01 for Tahmoor South.

Regarding the Tahmoor South Domain, during the reporting period, a maximum of 200 mm of vertical subsidence relating to the extraction of LW S1A was recorded at the GNSS unit Site S01.Subsidence is currently developing within the predictions, with magnitude of subsidence similar to observed above previously extracted Longwall 22. In comparison, observed subsidence above previously extracted first panel Longwall West 1 was substantially less than prediction.

Notable environmental monitoring observations during the reporting period are discussed in **Section 16.2** for Surface water, Groundwater, Historical Heritage, Built Features and Public Safety; and **Section 14** Aboriginal Cultural and **Section 15** Historical Heritage.

17.5 Further Improvements

Tahmoor Coal commited to the installation of a pre-mining and post-mining height of fracture (HoF) hole as stated in accordance with the LW W1–W2 and LW W3-W4 Water Management Plan located over LW W2 and associated headings. The pre-mining HoF hole has been completed before the commencement of LW W1 mining and the post-mining HoF hole will be installed once subsidence impacts from LW W3-W4 are finalised.

In accordance with the Tahmoor South LW S1A-S6A Water Management Plan, a pre-mining HoF hole was completed for LW S1A and a post mining HoF hole is yet to be complete following ceasation of subsidence. Another pre-mining and post-mining HoF hole will be installed and is located above LW S4A for the Tahmoor South Domain A-series. Further pre and post mining HoF holes are planned for the B-series upon approval of the Extraction plan.

18 Natural Landscape Features

18.1 Environmental Management

The LW W3-W4 Land Management Plan and LW S1A-S6A Land Management Plan were prepared to manage the potential environmental consequences of LW W3-W4 and LW S1A-S6A extraction on cliffs, natural steep slopes, dams, agricultural land, and land in general in accordance with Condition 13H(vii)(e) of DA 67/98 and Condition C8 of SSD 8445 for Tahmoor South. Refer to **Figures 24**, **25** and **26** for locations of Tahmoor South inspection sites for natural landscape features.

18.2 Environmental Performance

During this reporting period, LW W3-W4 and S1A-S6A Land Management Plans have been implemented to monitor the following landscape features:

- Cliffs and rock outcrops – 3-monthly visual inspections and reporting by geotechnical engineers from Douglas Partners. As there are no cliffs or rock outcrops within the LW W3-W4 Study Area**,** no monitoring of these features has been completed during the extraction of LW W3; for Tahmoor South, a visual inspection at the completion of mining by a geotechnical engineer will be undertaken for Cliff BC1 after LW S6A, Cliff BC2 after LW S3A, S4A, S5A and S6A. No visual inspections have been required during this reporting period required according to the LW S1A-S6A Land Management Plan.

- Steep slopes, and dams – monthly visual inspections and reporting by geotechnical engineers from Douglas Partners. During the reporting period for Western Domain, structures located on Stonequarry Creek Road, Booyong Close, Attunga Close, Carramar Close, Thirlmere Way, Star Street and Connellan Crescent were inspected. There were no signs of distress or changes in the areas inspected that could be attributed to mine subsidence; for Tahmoor South, visual and photographic surveys of natural steep slopes were completed monthly for features within the LW S1A active subsidence zone. No visual observations or cracks, localised ground bulging, buckling or shearing was observed at natural steep slopes during the reporting period.

- Stonequarry Sewage Treatment Plan retention basin (Dam FD7) – weekly visual inspections and reporting by Newcastle Geotechnical. There were no signs of distress or changes in the areas inspected that could be attributed to mine subsidence;

- Dams in active subsidence zone – weekly and monthly visual inspections and reporting by Building Inspection Services. During the reporting period for Western Domain, the dams monitored were considered to be within the normal ranges as defined in the TARP for dams; for Tahmoor South visual and photographic surveys for subsidence impacts on dams were completed on a weekly and monthly basis of dams within the LW S1A active subsidence zone. A visual inspection of FD-1 on 9 December 2022 found no issues, however the water level has dropped since the previous inspection due to drier weather conditions. No significant changes were observed on 30 December 2022. The small dam is holding a small volume of water following recent rainfall.

- Agricultural land – monthly visual inspections and reporting by Building Inspection Service. During the reporting period, it was noted that seasonal changes had affected vegetation growth, however there were no observable changes to agricultural land in comparison to pre-mining baseline data.

18.3 Further Improvements

Natural heritage surveys will continue to be undertaken as per operational needs and approval requirements to manage compliance and impacts. Cliffs, natural steep slopes, dams, agricultural land, and land in general will continue to be monitored in accordance with Condition 13H(vii)(e) of DA 67/98, Condition C8 of SSD 8445 for Tahmoor South and LW W3-W4 and LW S1A-S6A Land Management Plans.

Figure 24 Cliffs and natural slopes within the LW S1A-S6AStudy Area

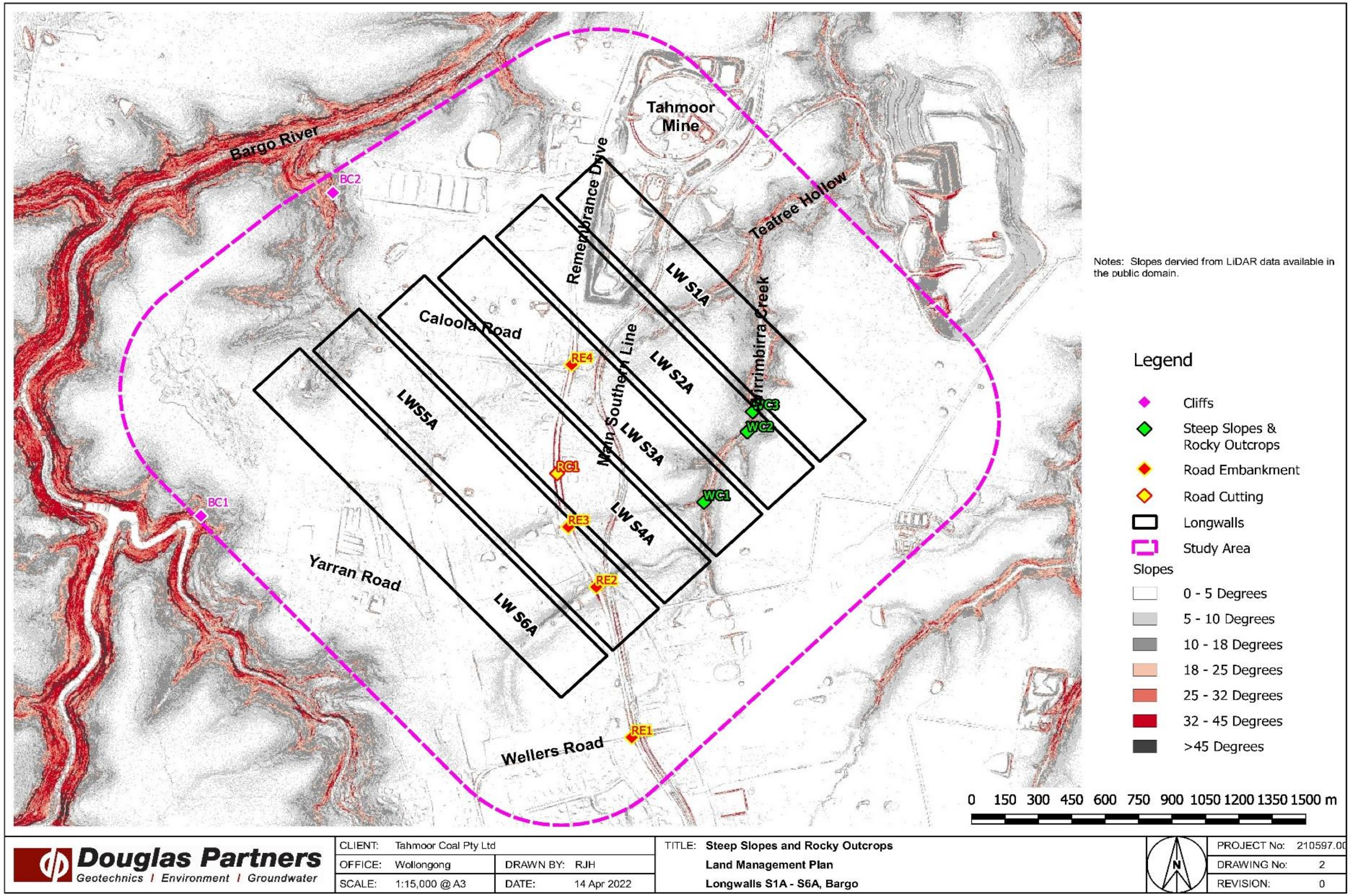

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Figure 25 Dams within the LW S1A-S6A Study Area

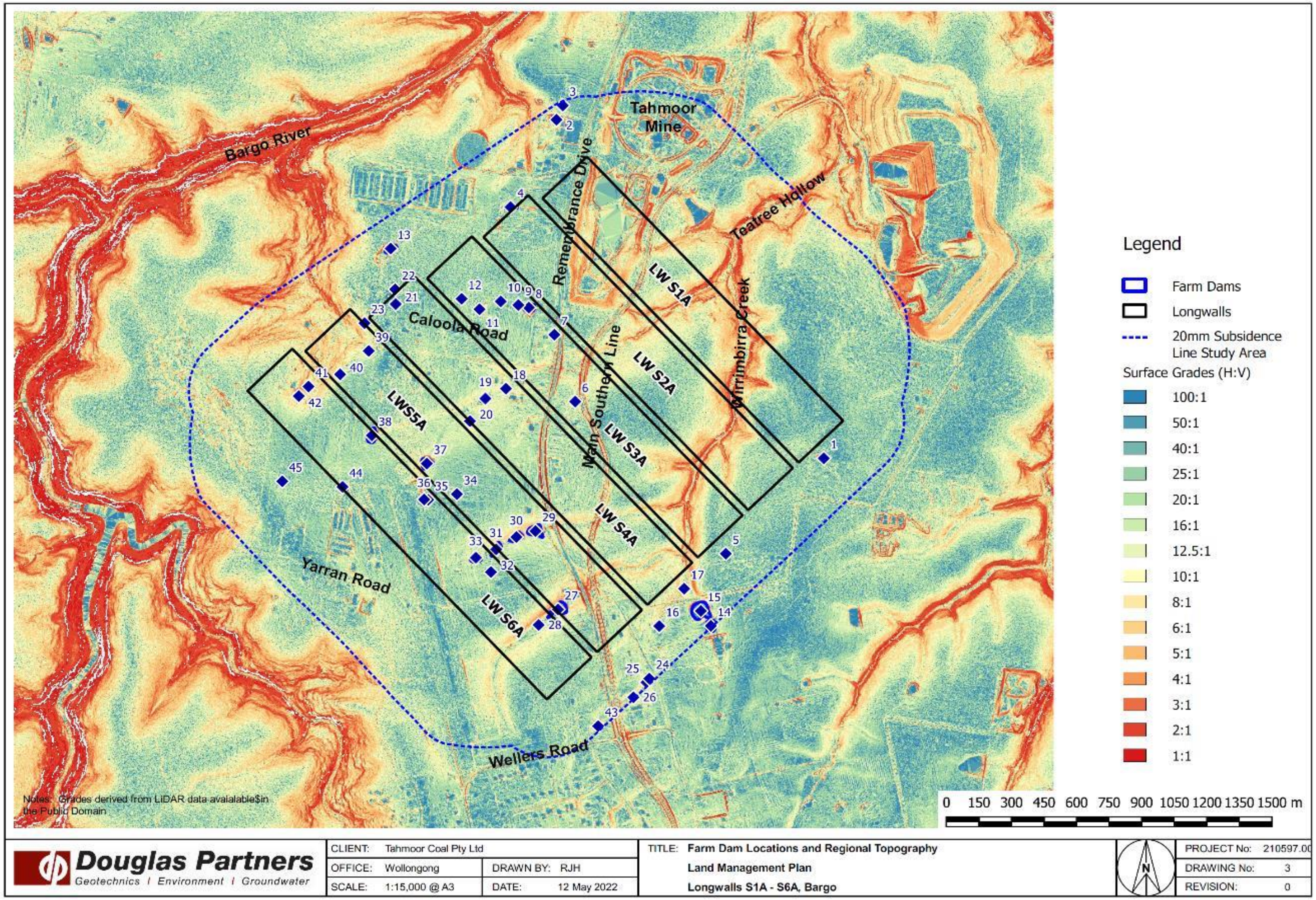

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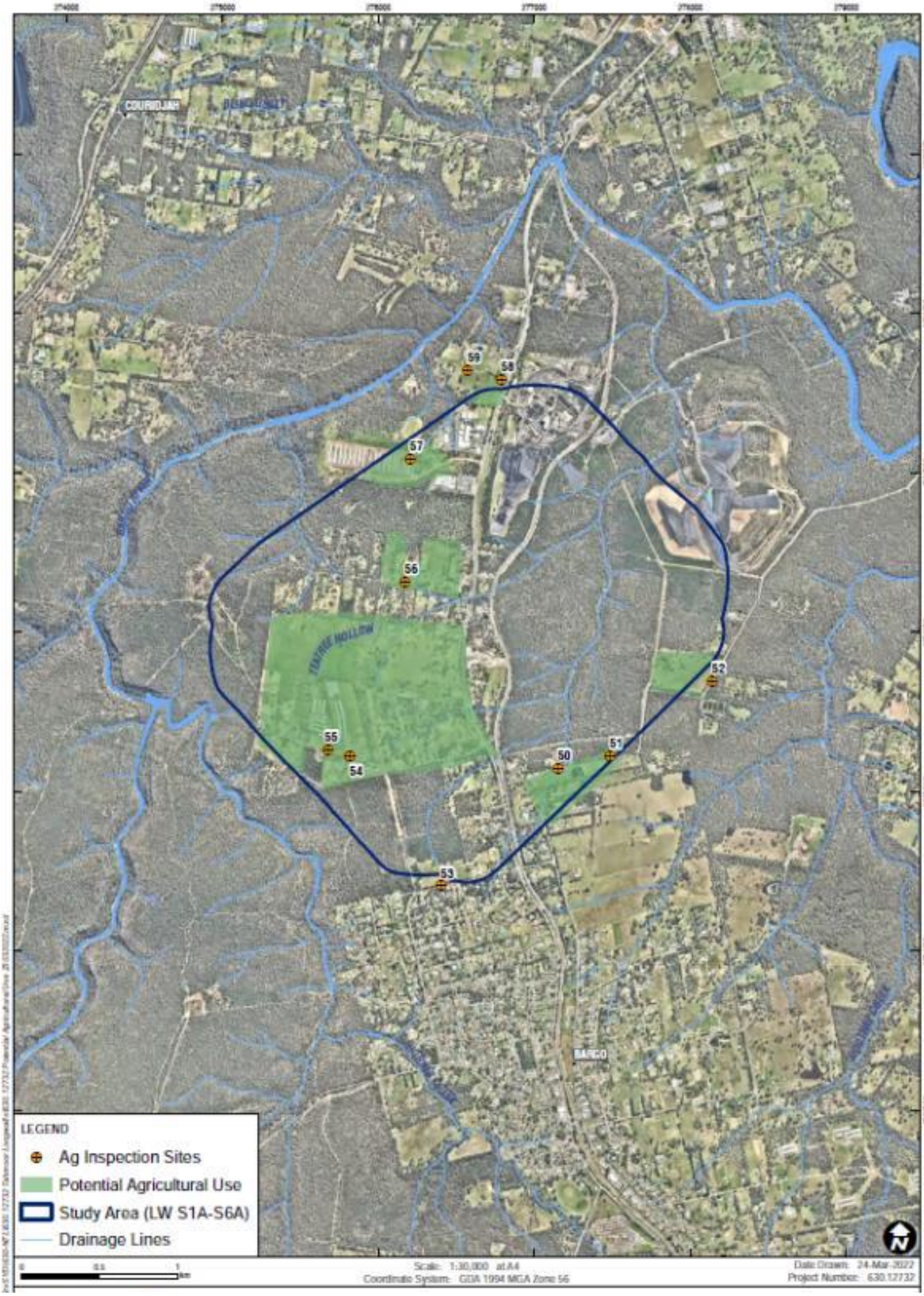
Figure 26 Agricultural land and inspection sites within the LW S1A-S6A Study Area



19 Water Management

19.1 Groundwater

19.1.1 Environmental Management

Longwalls have been extracted within the Tahmoor North and Western Domains at a depth of approximately 450m in the Bulli Seam, with current longwall extraction within the Tahmoor South Domain at a depth of approximately 385m in the Bulli Coal Seam. During the reporting period, water from sedimentary layers above the mine workings seeped into the mine at a rate of approximately 3.65 ML/day. This water is pumped to the surface and directed to a series of mine pit-top treatment dams before being discharged through Licenced Discharge Point 1 (LDP1). Water quality and flow is monitored under the conditions of Tahmoor Coal's Environmental Protection Licence (EPL) 1389 and Water Licence 36442.

A schematic of the Tahmoor Mine water management system and water quality infrastructure is outlined within **Appendix 6**. This schematic details main water sources and their flow paths across the mine site and eventual discharge via LDP1.

Groundwater piezometer boreholes located at Tahmoor Mine pit-top and REA are monitored quarterly for water quality and continual water level loggers downloaded by a third party contractor (for piezometer locations refer to **Figure 27).**

Figures 28 to 33 illustrate changes in level data, pH and EC results during the reporting period. It is noted that PT4 (pit top piezometer 4) is greatly influenced by storm water and has recorded increases during rainfall events as shown in **Figure 28**. PT 1 levels show a slight increase during 2021 and 2022 with PT 2 showing a gradual decrease during 2022 however within baseline limits. REA piezometer levels have recorded a gradual increase across many of the sites during 2022 (see **Figure 29**).

Results for pH across pit-top and REA piezometers displayed a slight increase during Q1 and Q2 water samples with results either stablising or decreasing towards the end of 2022. EC results have varied through-out the year as displayed in **Figures 32** and **33**, remaining with-in baseline levels. For further information refer to **Appendix 7** for pit-top and REA piezometer data.

A plan showing the location of all monitoring bores in the Tahmoor North, Tahmoor South and Western Domain mining areas are shown in **Figure 21** and reported in the Tahmoor Coal Six Monthly Subsidence Impact Reports (**Appendix 10** and **Appendix 11**, respectively).

Table 19.1 provides a summary of groundwater outflow from 2015 to 2022 and is illustrated in **Figure 34**.

There were no reportable incidents related to groundwater pollution during the reporting period.

Figure 27 Locations of Piezometers at Pit top and the REA

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Figure 28 Piezometer groundwater levels for Pit Top

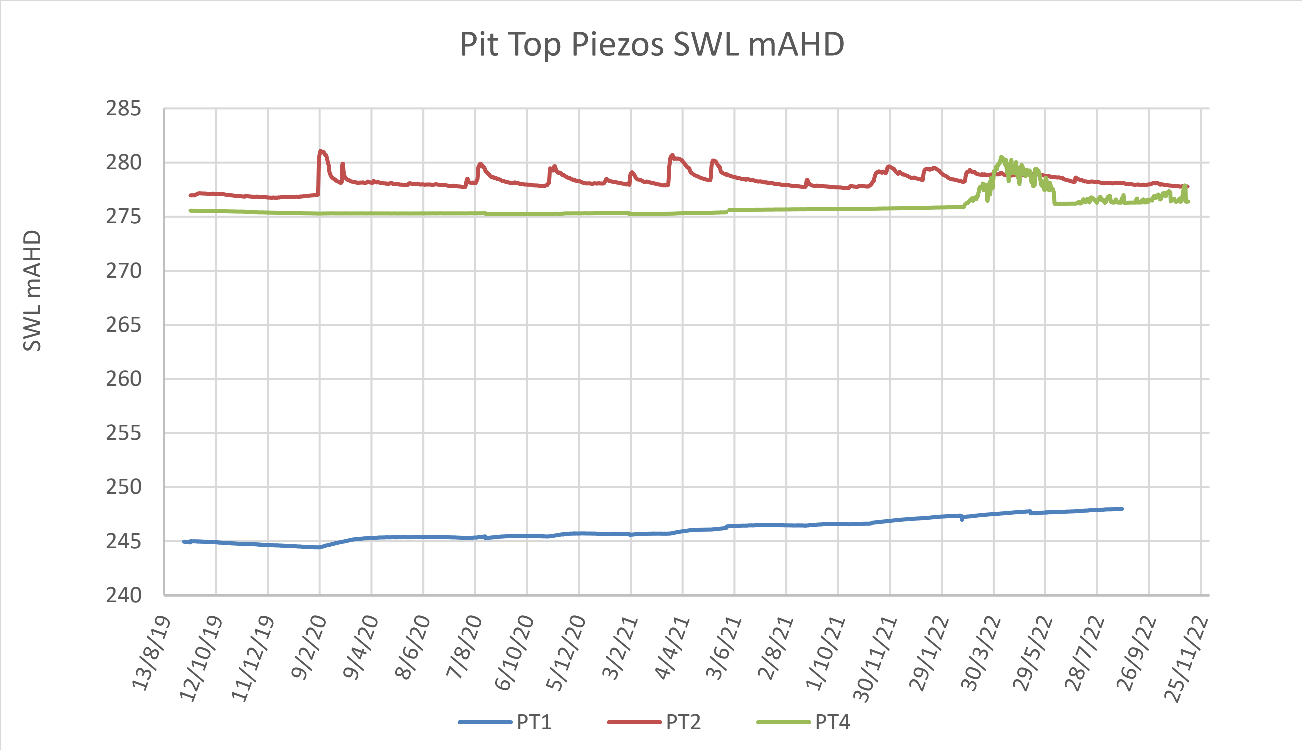


Figure 29 Piezometer groundwater levels for REA

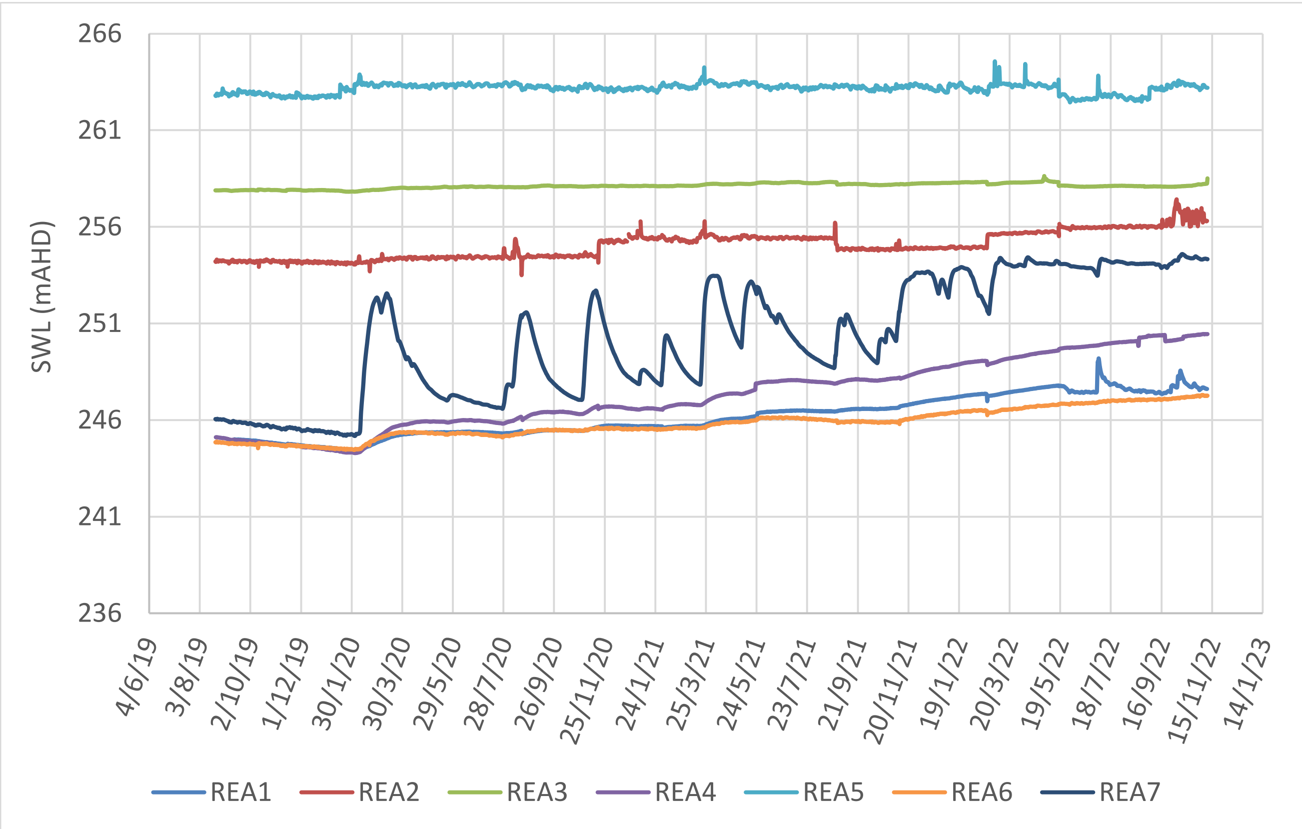


Figure 30 Groundwater pit-top Piezometers – pH

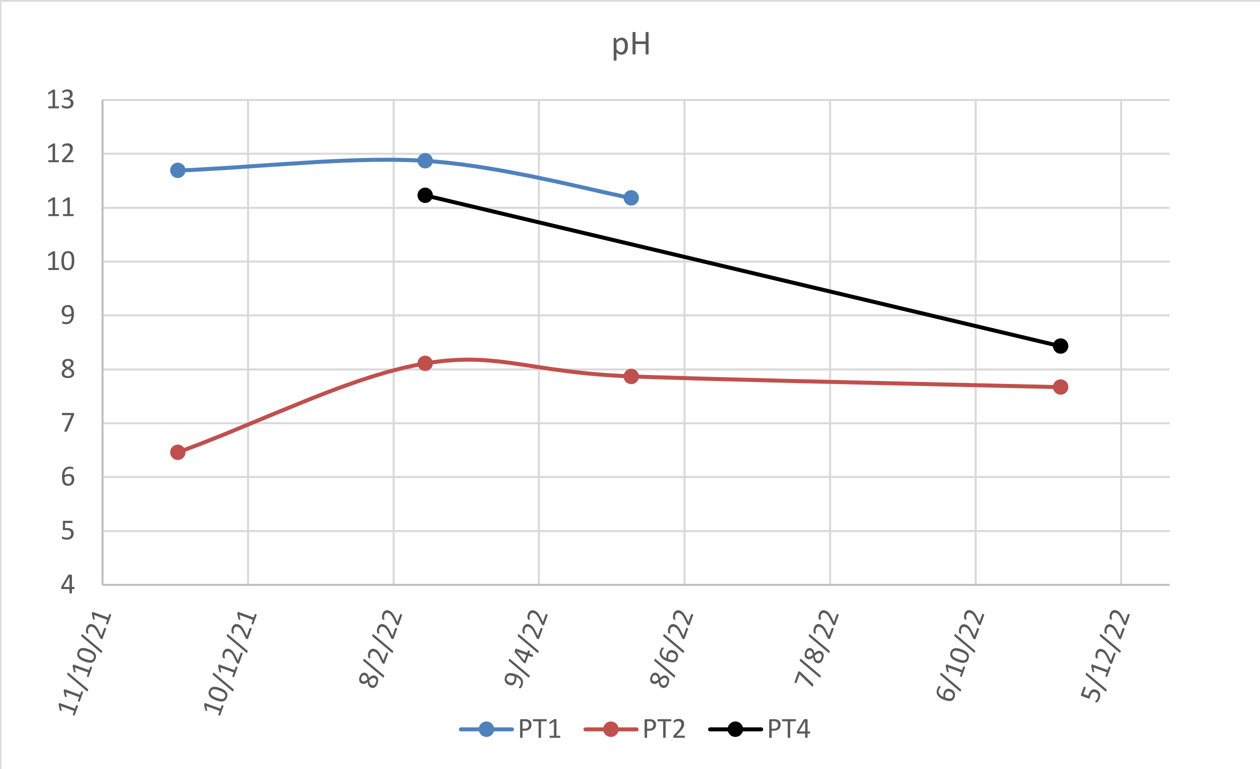


Figure 31 Groundwater REA Piezometers – pH

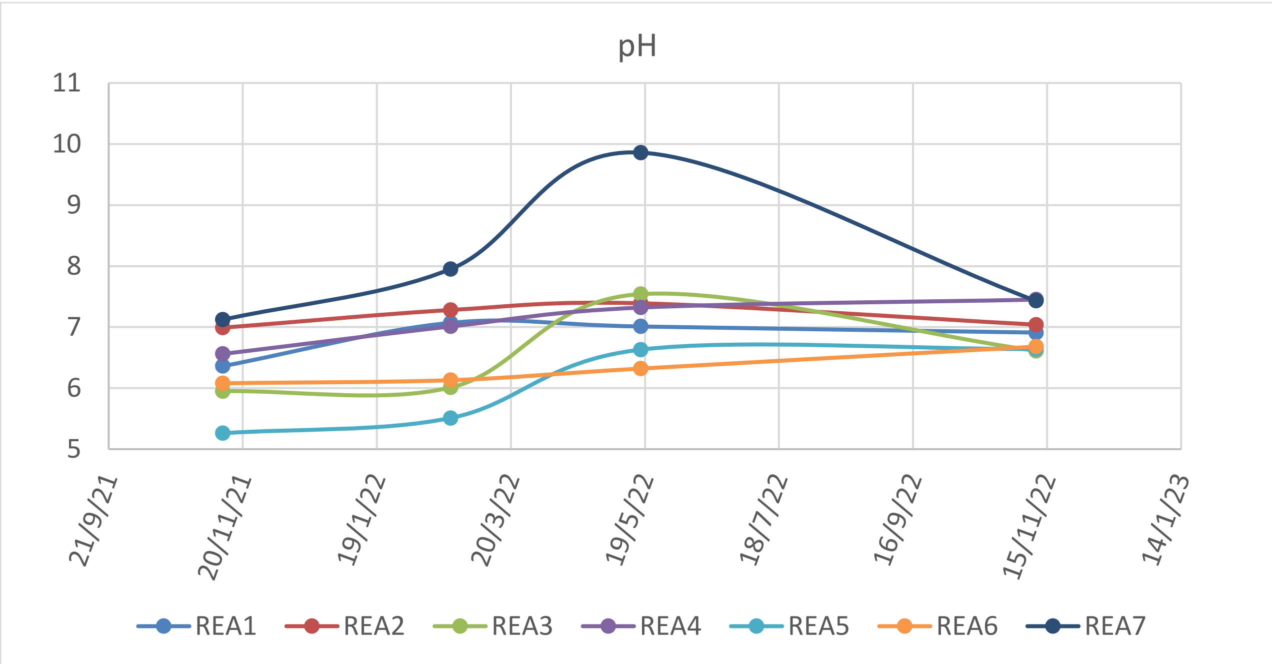


Figure 32 Groundwater pit-top Piezometers – EC

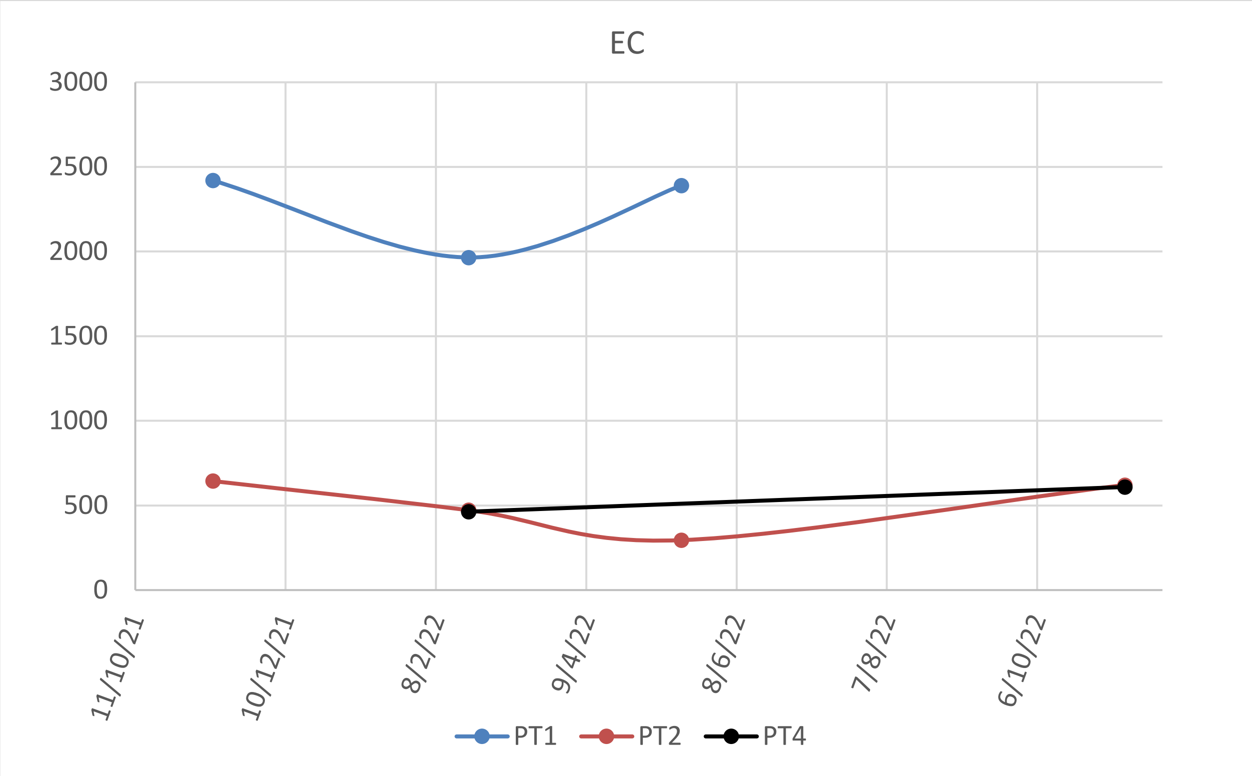


Figure 33 Groundwater REA Piezometers – EC

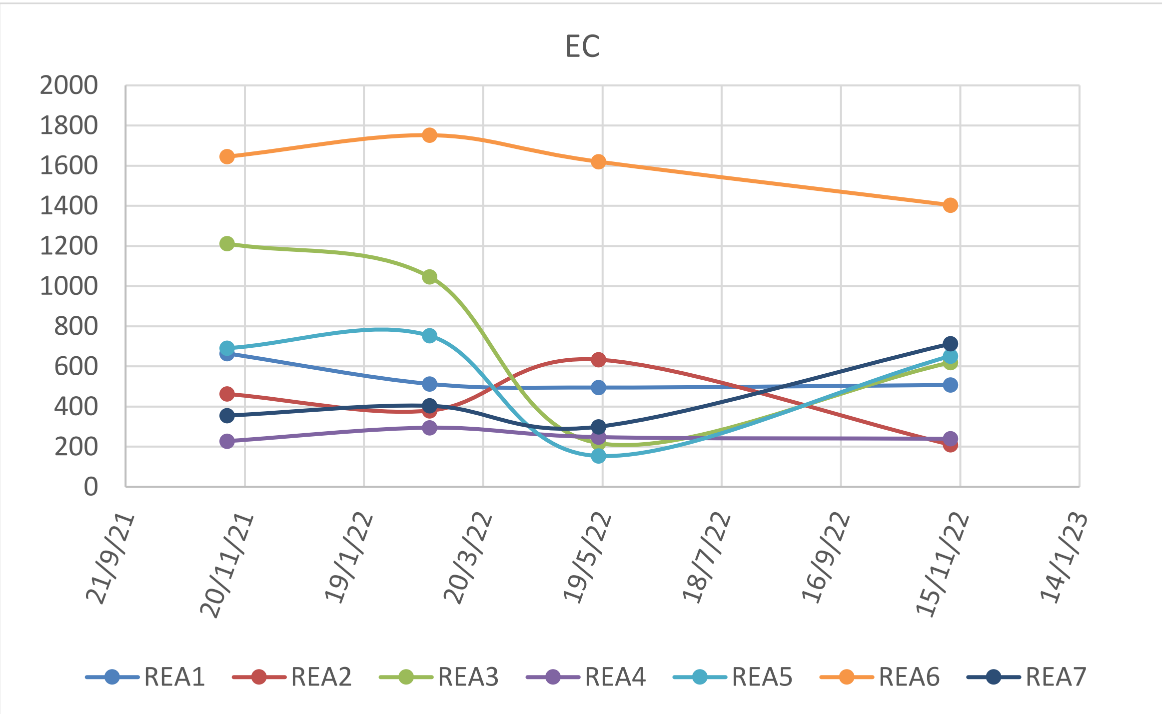
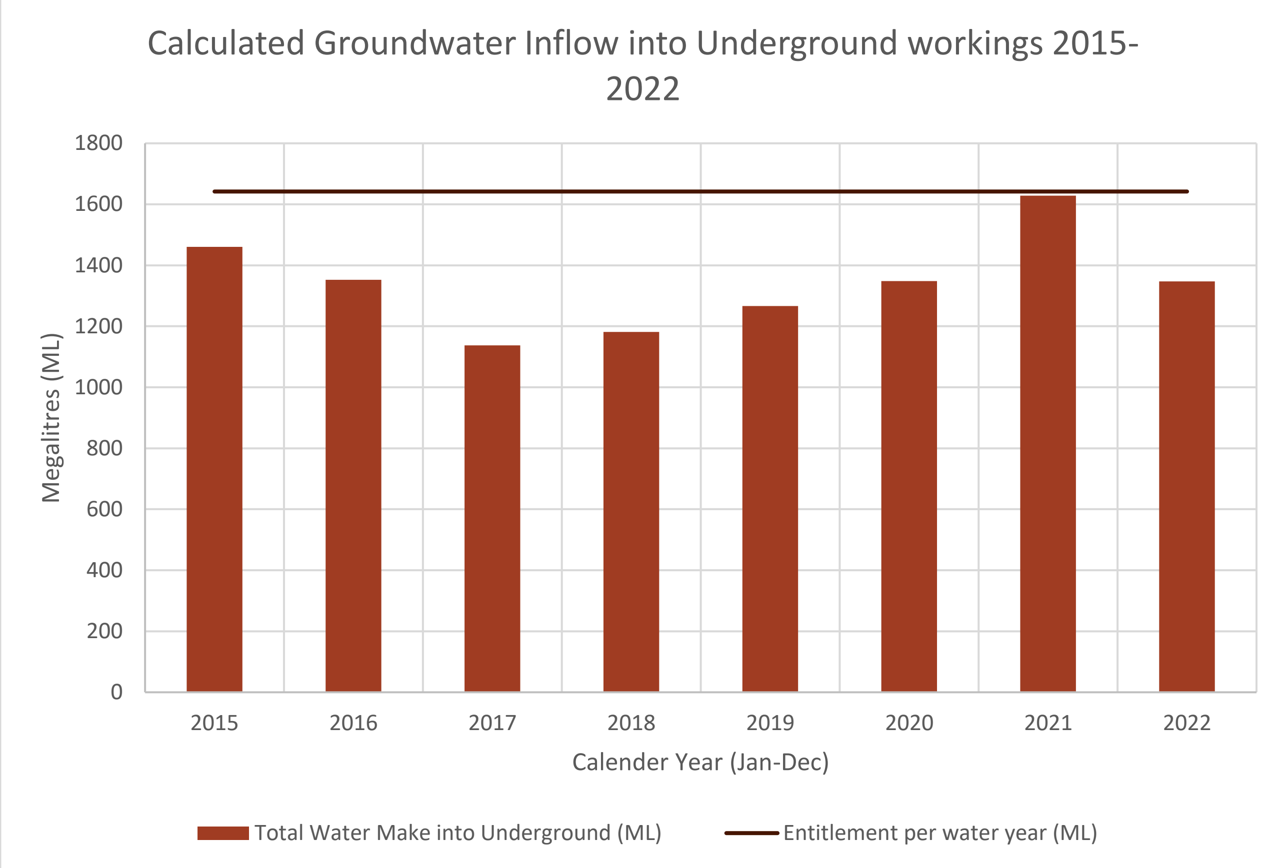


Table 19.1 Summary of Groundwater Outflow

Date	Water Licence #	Water Sharing plan/source and management zone (as applicable)	Entitlement per water year (ML)	Total Water Make into Underground (ML) *includes vent air and entrained ROM	Total out from Underground (ML)	Total Water sent to Underground (ML)
Jan-Dec 2015	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1460*	1600	411
Jan-Dec 2016	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1353*	1524	424
Jan-Dec 2017	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1137*	1514	428
Jan-Dec 2018	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1182*	1360	420
Jan-Dec 2019	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1266*	1469	460
Jan-Dec 2020	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1348*	1619	547
Jan-Dec 2021	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1628*	1873	525
Jan-Dec 2022	36442	Greater Metropolitan Region Groundwater Sources / Sydney Basin Nepean Groundwater Source	1642	1347*	1498	438

Please note the following: 'Total Water to Underground' (includes water sent from Tahmoor Coal's Recycle Water Treatment Plant tanks and Sydney Water to underground workings) and 'Total water Make into Underground' (includes vented moisture and water entrained in extracted ROM material)

Figure 34 Calculated Groundwater Inflow Annual Volume (Calender Year).



Please note Tahmoor Coal have remained within groundwater extraction limits for the water year as per the licence WAL36442 for 2022 (as shown in **Table 19.1** above) and the FY22.

19.1.2 **Water Access Licences Environmental Performance**

During the reporting period the below water take has been calculated in accordance with condition B24 of consent SSD 8445.

Table 19.2 Water Access Licence calculated take

WAL Number	Management Zone	Entitlement	Estimate Take			
			FY20	FY21	FY22	Jul 22-Dec 22
43572	Stonequarry Creek	25ML	0ML	4ML	13ML	6ML
25755		24ML (lease)				

Estimated take were within entitlement of Water Access Licences during the reporting period.

19.1.3 **Further Improvements**

Tahmoor Coal will continue to implement the Groundwater Management Plan, and ongoing monitoring and reporting will occur in accordance with the conditions in the water licence. Investigations into improved water recycling for site is currently being undertaken in conjunction with the contruction of the Water Treatment Plant.

19.2 **Surface Water**

19.2.1 **Environmental Management – Water Quality**

Tahmoor Coal is licensed to discharge water from one (1) licenced discharge location and overflow from three (3) Licenced Overflow Points (LOPs) during periods of wet weather (as per EPL 1389) which refers to more than 10 mm of rainfall within a 24 hour period at the premisis. The location of the Licensed Discharge Point 1 and LOPs are described in **Table 19.2** and shown in **Appendix 4.**

Table 19.3 Licensed Discharge and Overflow Points Locations

Point	Location
LDP 1	Discharge from Dam M4
LOP 3	Overflow from the REA Dam S9
LOP 4	Overflow from REA Dam S4
LOP 5	Overflow from REA Dam S8

19.2.2 **Environmental Performance – Water Quality**

Water discharged from LDP1 and overflow points is monitored monthly via a grab sample and is conducted and analysed by an independent laboratory.

Tahmoor Coal's EPL 1389 states maximum discharge limits for analytes discharged via LDP1. These results are provided in **Table 19.3** for the reporting period. The water quality trend for LDP1 is outlined in **Figures 36** to **Figure 47** and shows relatively consistent results from monthly data in the last 5 years of monitoring since January 2018. There have been no non-compliances or exceedances of limits set by Tahmoor Coals EPL during the reporting period.

During 2020, the installation of a real-time turbidity monitor was completed and has continued to form an integral part of the water management system on site. The additional use of flocculent mixed into the discharge dam series (M1-M4) via a dosing pump allows controlled dosing depending on the turbidity readings received from the real-time monitor.

Tahmoor Coal was issued with an updated EPL in August 2022 which updated the commissioning date of Water Treatment Plant to be commsioned by 31 December 2023. Modification 1 of SSD8445 was issued in July 2022 with the same updated date for commissioning. The new Water Treatment Plant will improve water quality for mine discharge waters and is on schedule to be completed in December 2023.

Table 19.4 LDP1 Discharge Water Quality

	pH	Electrical Conductivity	Total Suspended Solids (TSS)	Turbidity	Enterococci	Total Nitrogen	Aluminium	Arsenic	Barium	Copper	Nickel	Zinc
	pH Unit	µS/cm	mg/L	NTU	CFU/100ml	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
100th Percentile Concentration Limits	6.5-9	2,600	30	150	1700	8	110	200	6440	5	200	300
Jan-2022	8.5	1900	15	9.2	410	2.2	10	39	1920	<1	24	92
Feb-2022	8.5	2030	28	54.3	330	3.1	20	80	2230	1	44	138
Mar-2022	8.6	1680	6	2.9	23	1.6	50	74	1850	1	34	101
Apr-2022	8.5	1680	11	4.2	6	1.6	20	58	2160	<1	28	62
May-2022	8.5	1510	16	20.5	310	2	<10	30	1320	2	28	60
Jun-2022	8.8	2150	10	19.1	10	2.3	20	80	3080	2	49	134
Jul-2022	8.6	1690	10	7.7	37	1.9	40	25	2450	<1	28	36
Aug-2022	8.6	1820	24.8	47	2	2.5	20	20	2250	<1	36	105
Sep-2022	8.4	1890	<5	1.1	51	2.7	30	19	3340	<1	43	54
Oct-2022	8.4	898	23	43.5	46	2.4	30	2	1160	<1	7	13
Nov-2022	8.3	1480	<5	5	50	2	20	12	2160	<1	19	62
Dec-2022	8.7	1350	15	5.5	130	1.8	30	11	2410	<1	25	72

Figure 35 Monthly Compliance Monitoring of pH at LDP1 for the previous 5 years.

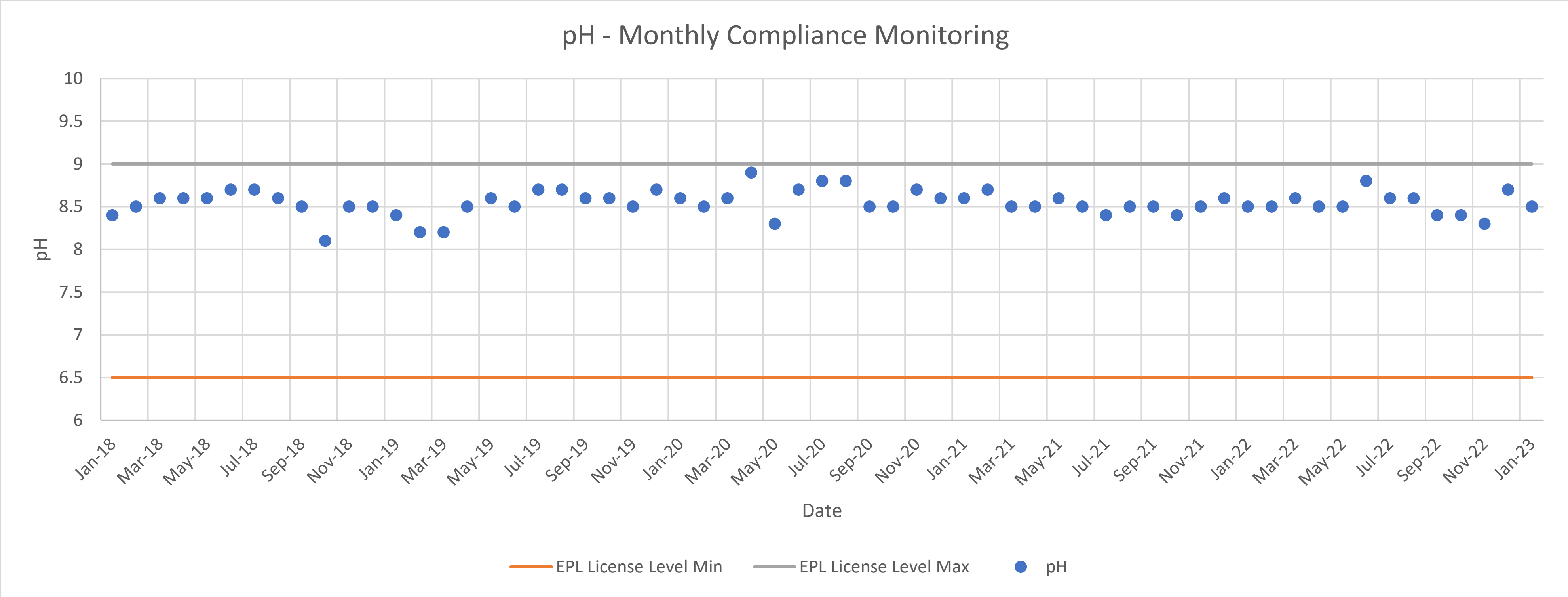


Figure 36 Monthly Compliance Monitoring of EC at LDP1 for the previous 5 years.

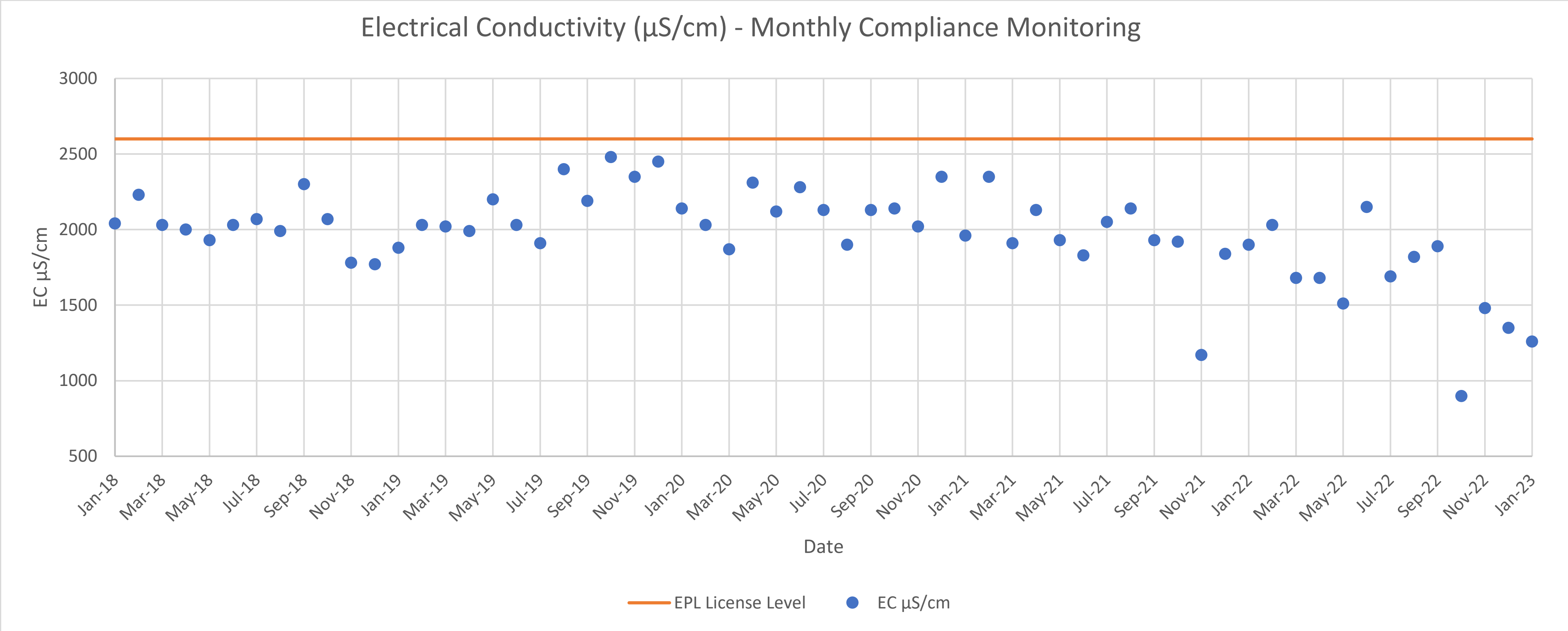


Figure 37 Monthly Compliance Monitoring of Turbidity at LDP1 for the previous 5 years.

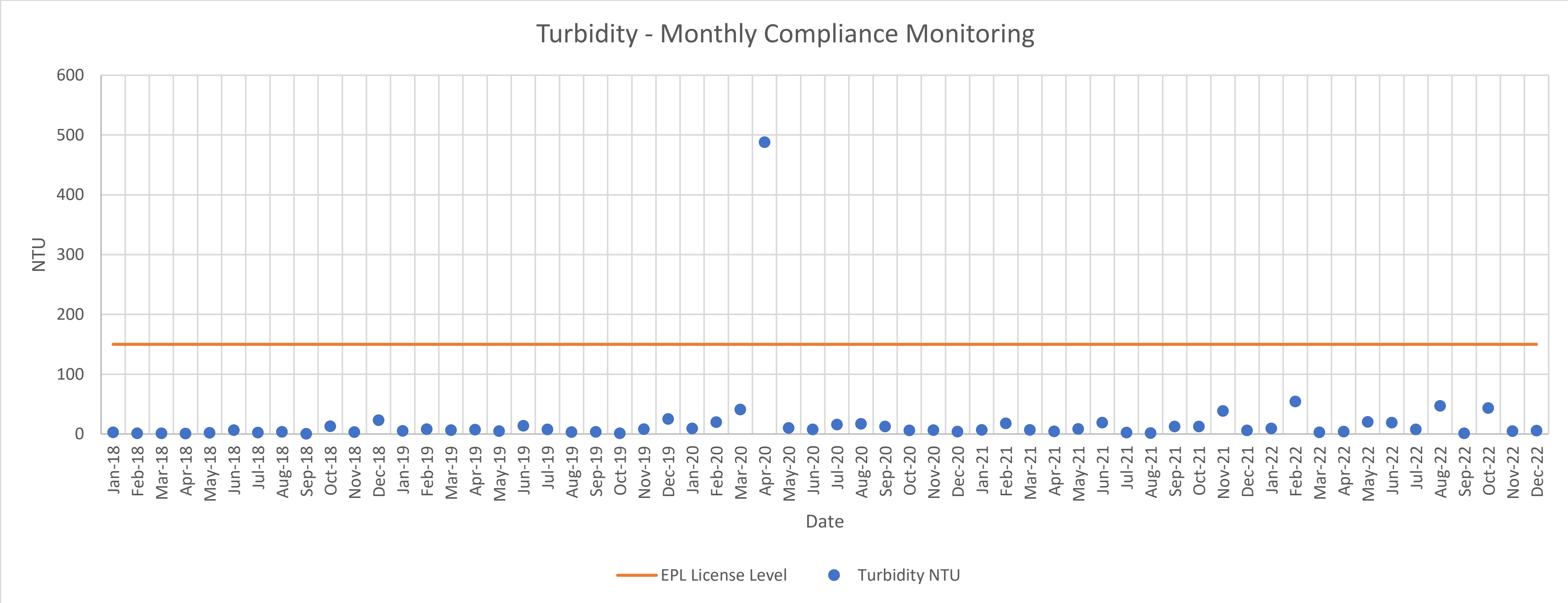


Figure 38 Monthly Compliance Monitoring of Total Suspended Solids at LDP1 for the previous 5 years.

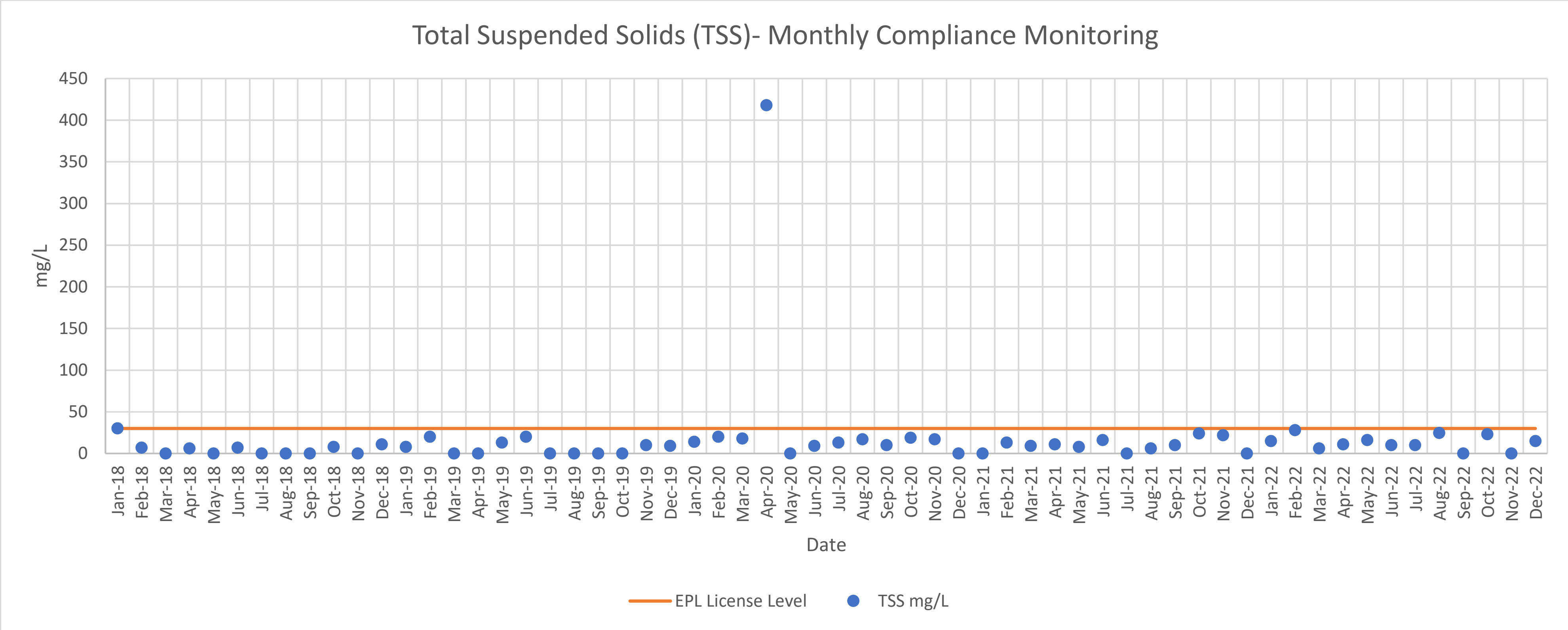
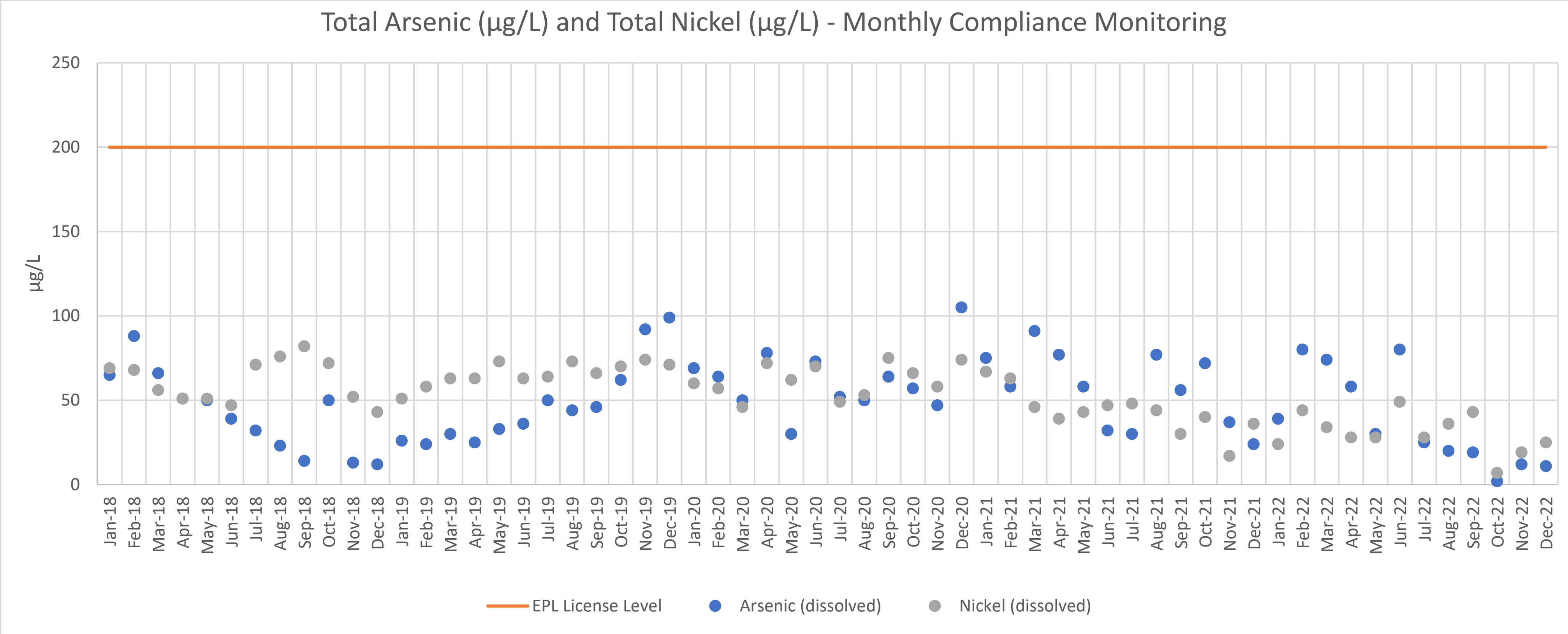
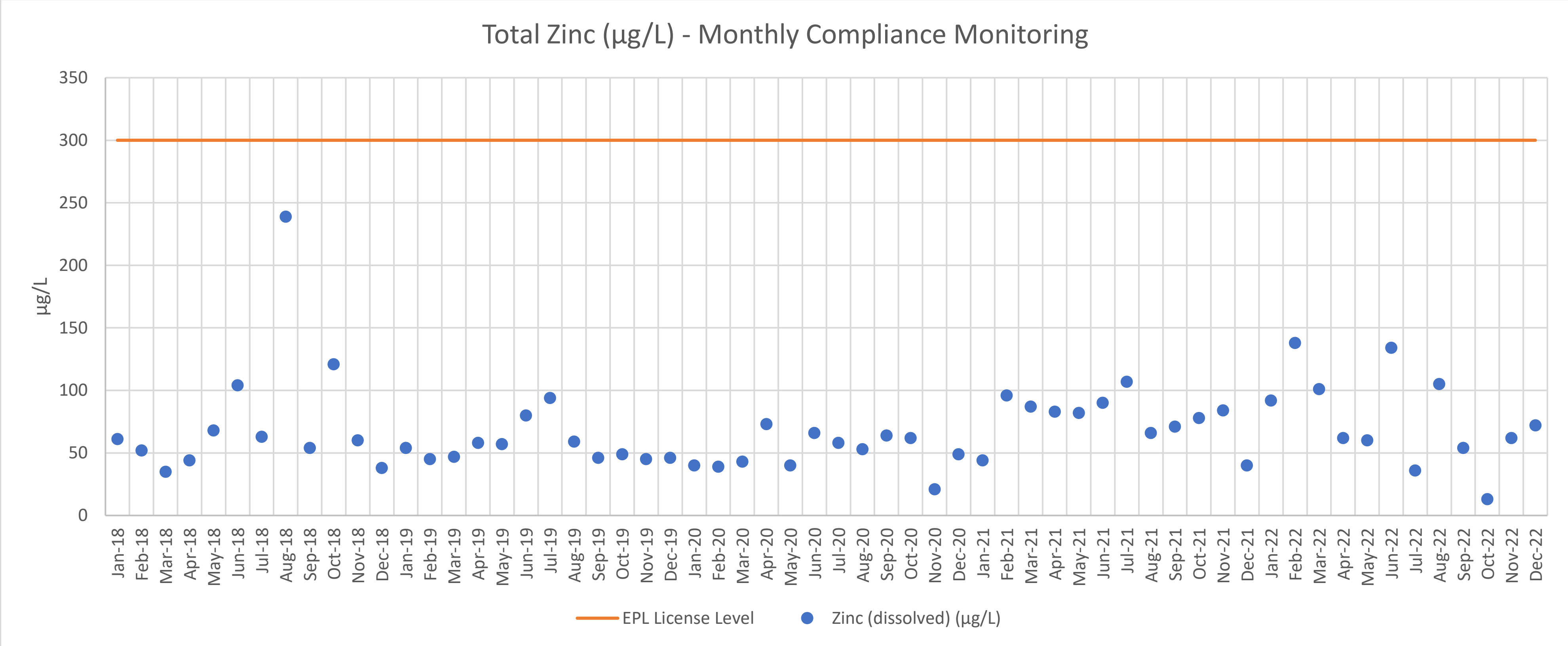


Figure 39 Monthly Compliance Monitoring of Arsenic and Nickel at LDP1 for the previous 5 years.



SIMEC

Figure 40 Monthly Compliance Monitoring of Zinc at LDP1 for the previous 5 years.



SIMEC

Figure 41. Monthly Compliance Monitoring of Dissolved Aluminium at LDP1 from Jan 2022-Dec 2022.

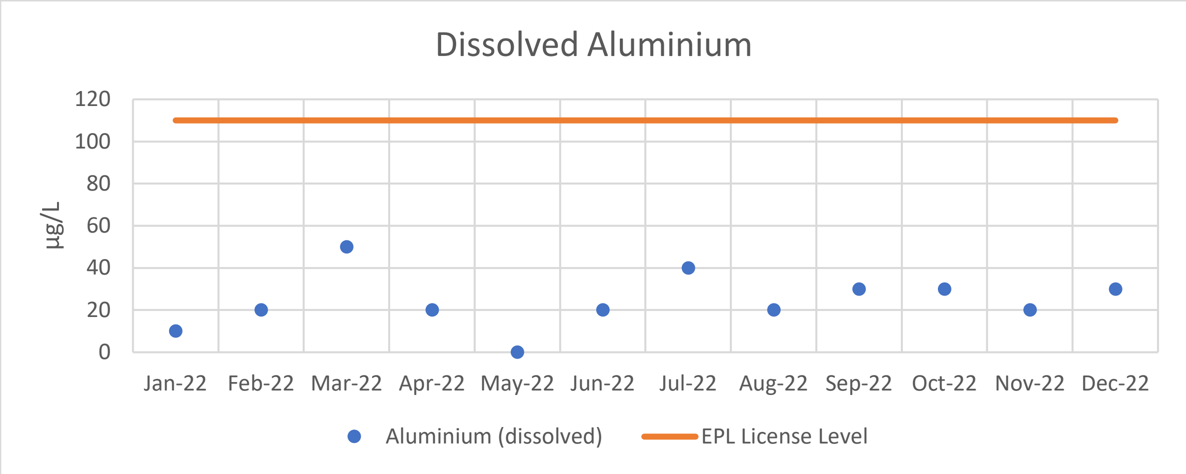


Figure 42 Monthly Compliance Monitoring of Dissolved Zinc at LDP1 from Jan 2022 to Dec 2022.

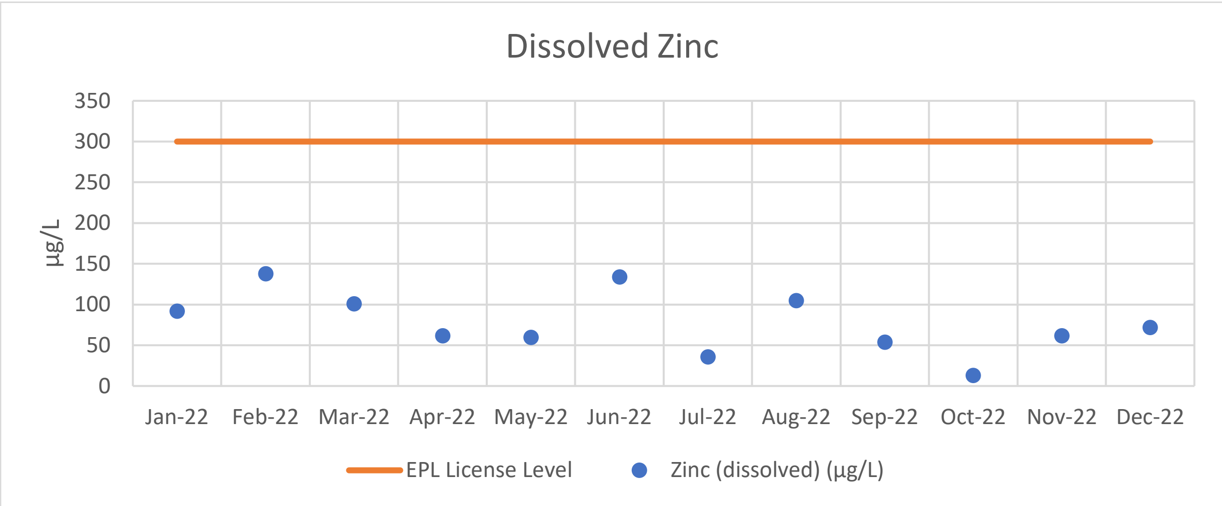


Figure 43 Monthly Compliance Monitoring of Copper at LDP1 from Jan 2022-Dec 2022.

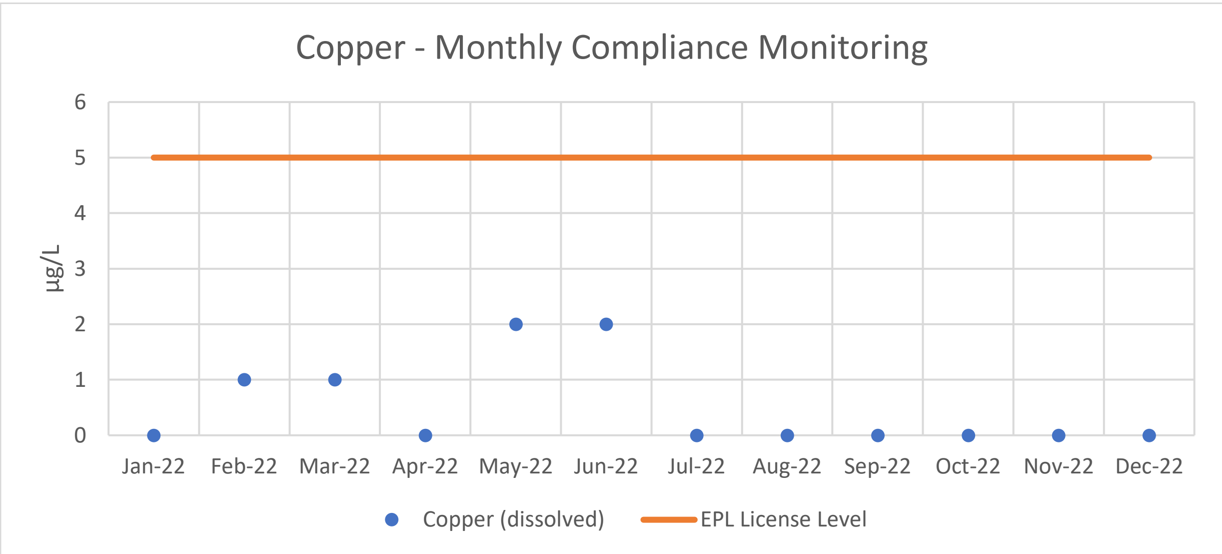


Figure 44 Monthly Compliance Monitoring of Barium at LDP1 from Jan 2022-Dec 2022.

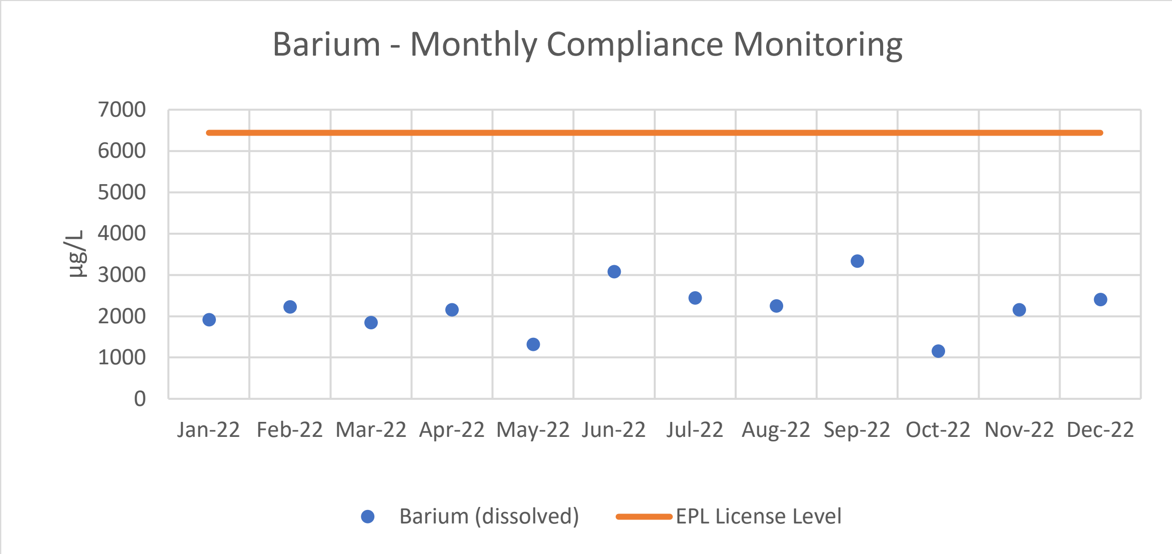


Figure 45 Monthly Compliance Monitoring of Nitrogen at LDP1 from Jan 2022-Dec 2022.

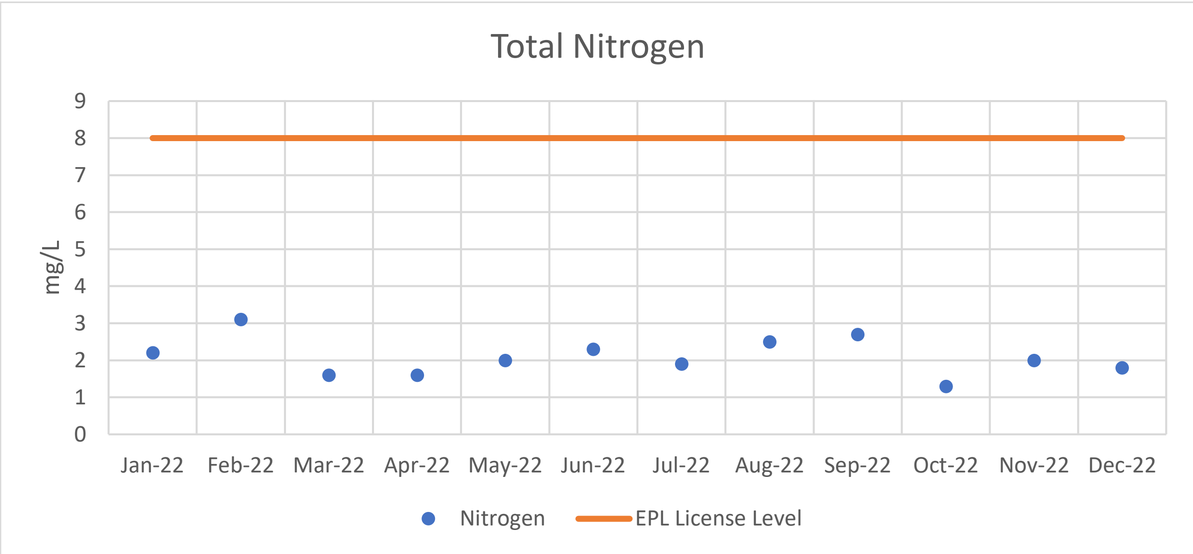
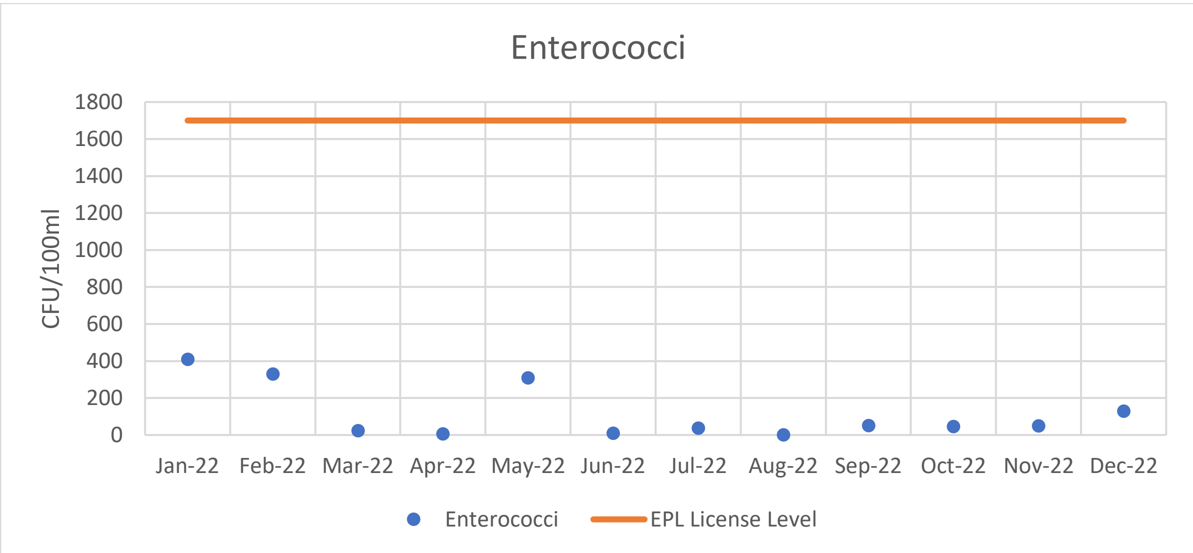


Figure 46 Monthly Compliance Monitoring of Enterococci at LDP1 from Jan 2022-Dec 2022.



19.2.3 **Environmental Management – Water Discharge**

Tahmoor Coal is licensed to discharge water from one (1) licenced discharge location and overflow from three (3) LOPs during periods of wet weather (as per EPL 1389) which refers to more than 10 mm of rainfall within a 24 hour period at the premisis. The location of the LDP1 and LOPs are described in **Table 19.2** and shown in **Appendix 4.**

On average Tahmoor Mine discharged 7795 kL/day with a total of 2 845 522 kL or approximately 2845 ML discharged during the reporting period. This is shown in **Table 19-5, Figure 48** and **Figure 49.** The peaks shown in **Figure 49** in 2022 was as a result of high rainfall events through-out the reporting year. This is in accordance as per Tahmoor Coal's EPL 1389 (more than 10 mm rainfall in 24 hrs, recorded from Tahmoor Coal's pit-top weather station). Daily rainfall data from Tahmoor Coal's weather station located at the stockpile area is illustrated in **Figure 50.**

Figure 47 Volume (ML) of Discharge from LDP1 for the past 7 years.

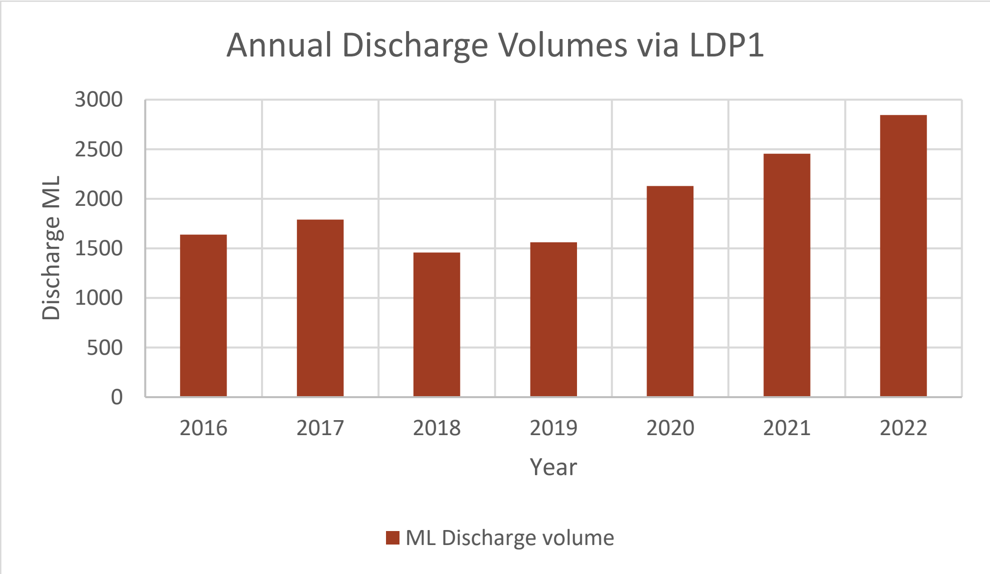
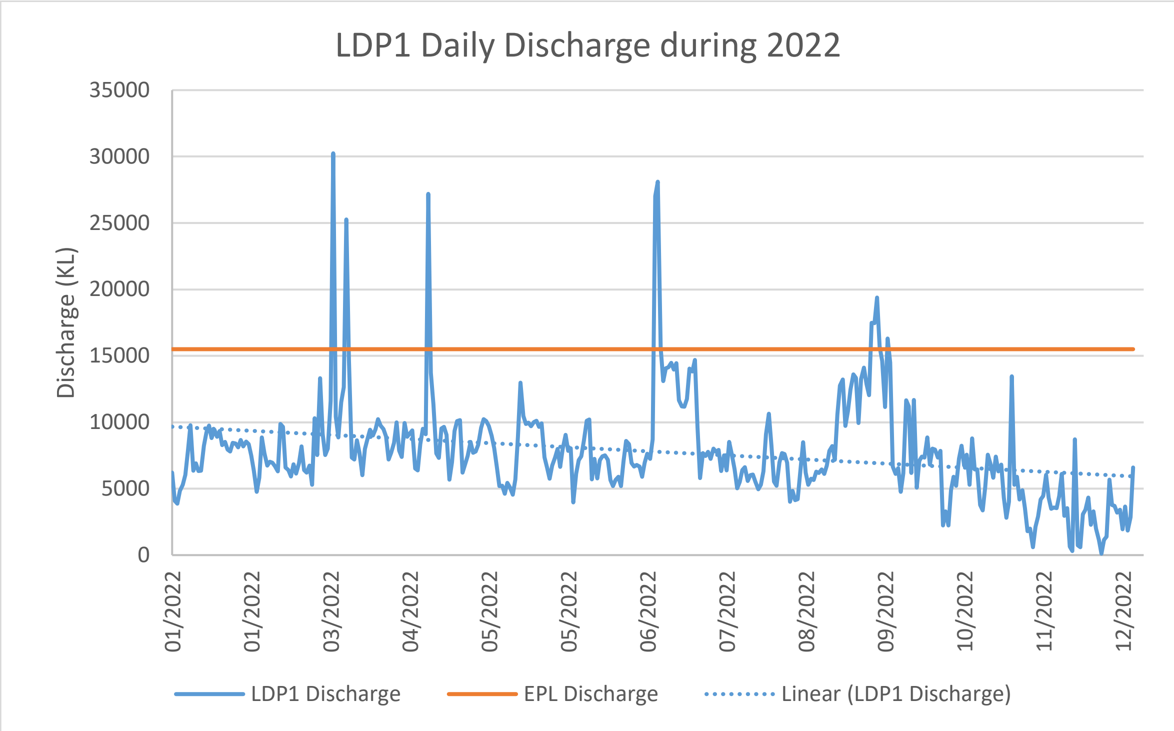


Figure 48 Daily Discharge (kL) via LDP1



*The spikes across the calendar year is attributed to high rainfall events (refer to **Figure 48** below **Table 18.4** for further details). This is in accordance with Tahmoor Coal's EPL 1389 which allows daily discharge over the prescribed limit when more than 10mm of rainfall is recorded in 24hours.

Figure 49 Daily Rainfall from Stockpile weather station

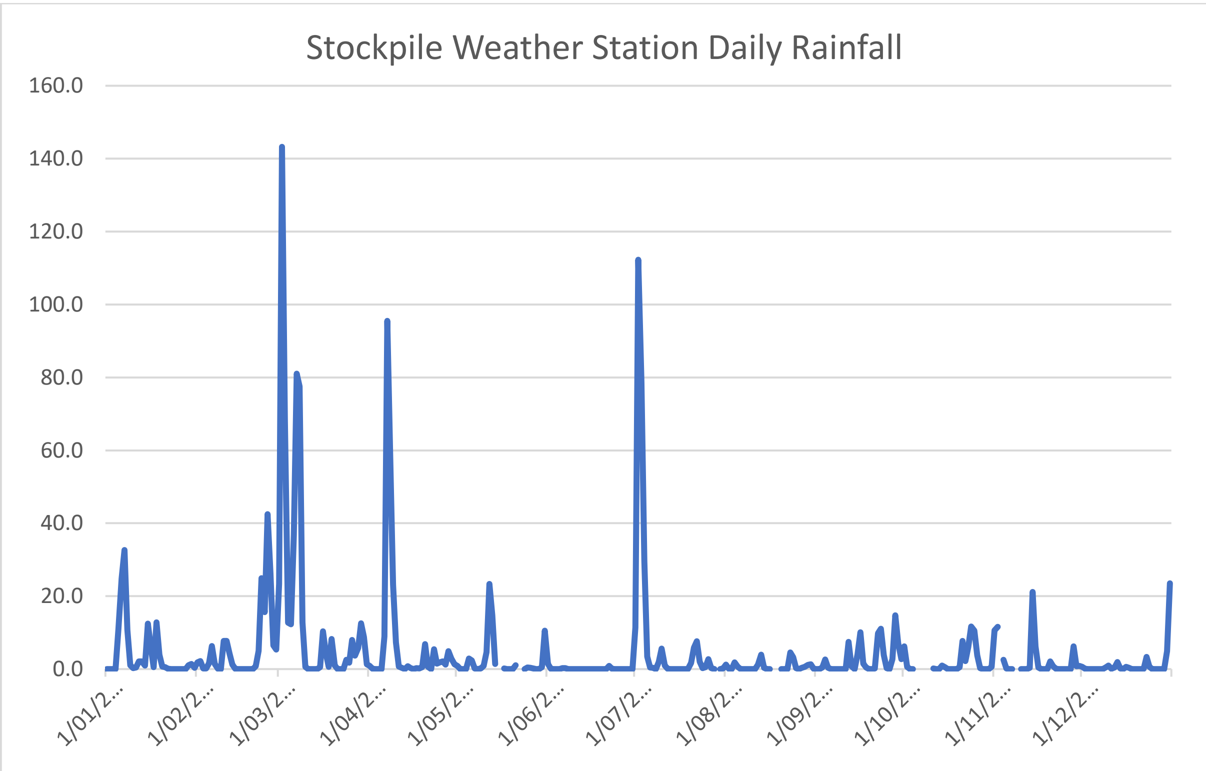


Table 19.5 Daily Discharge (KL) via Licence Discharge Point 1 (LDP1).

Day	Jan (kL)	Feb (kL)	Mar (kL)	Apr (kL)	May (kL)	Jun (kL)	Jul (kL)	Aug (kL)	Sep (kL)	Oct (kL)	Nov (kL)	Dec (kL)	EPL Daily Discharge Limit (kL)
1	6221	6347	8029	9141	9737	8039	7252	7618	5647	6665	6460	3536	15500
2	4102	4758	11596	9381	8983	3963	8716	6458	6279	6108	3771	4445	15500
3	3866	5822	30246	6516	8040	6146	27022	5032	6181	6547	3362	6107	15500
4	4827	8851	10430	6384	6658	7151	28116	5505	6452	4765	5155	2969	15500
5	5297	7689	8848	8366	5196	7446	15616	6413	6107	6164	7558	3536	15500
6	6047	6730	11503	9503	5217	8603	13094	6615	6737	11655	6819	636	15500
7	7832	7024	12642	9110	4628	10124	14072	5587	7857	11201	5829	311	15500
8	9771	6958	25259	27200	5431	10216	14145	6021	8221	6177	7408	8710	15500
9	6353	6684	14786	13729	5100	5712	14474	6071	7185	11690	6318	737	15500
10	6913	6308	7335	11358	4546	7241	13965	5507	10580	5089	6819	603	15500
11	6326	9860	7202	7648	5708	5781	14459	4963	12761	7112	4320	3080	15500
12	6366	9652	8642	7320	8883	7147	11655	5290	13219	7408	2806	3420	15500
13	8245	6605	7715	9534	12974	7437	11201	6299	9720	7333	4012	4320	15500
14	9241	6396	6008	9659	10476	7519	11177	9095	10840	8870	13470	2284	15500
15	9752	5915	7997	9064	9862	7172	11743	10652	12472	6819	5287	3305	15500
16	8817	6827	8749	5687	9963	5654	14035	8263	13598	8010	5898	1988	15500
17	9430	6138	9428	6992	9700	5209	13819	5542	13339	7936	4196	1148	15500
18	8913	6903	9013	9352	10016	5654	14689	5229	9948	7333	4893	110	15500
19	9348	8182	9461	10088	10106	5888	9666	6987	13255	7860	3536	1148	15500
20	8281	6414	10229	10169	9648	5191	5798	7671	14120	2234	1799	1397	15500
21	8534	6209	9745	6213	9923	7069	7691	7602	12871	3305	1988	5692	15500
22	7954	6745	9490	6845	7361	8603	7470	6958	12040	2234	603	3771	15500
23	7806	5287	8929	7461	6607	8343	7776	4016	17486	4893	2134	3712	15500
24	8439	10300	7209	8530	5741	6935	7254	4838	17461	5898	2914	3192	15500
25	8414	7547	7714	7715	6743	6660	8006	4149	19380	5221	4196	3420	15500
26	8117	13308	8451	7800	7345	6796	7767	4203	15709	7259	4445	1940	15500
27	8667	9127	10002	8303	7984	6664	7928	6490	14612	8240	6037	3653	15500
28	8197	7533	7882	9577	6655	5886	6338	8508	11152	6747	4320	1846	15500
29	8549		7383	10223	8012	6955	7516	6207	16309	7558	3478	2860	15500
30	8362		9933	10083	9064	7640	6384	5290	14492	5287	3594	6603	15500
31	7498		8896		7838		8524	5747		8790		5692	15500
MIN	3866	4758	6008	5687	4546	3963	5798	4016	5647	2234	603	110	110
MAX	9771	13308	30246	27200	12974	10216	28116	10652	19380	11690	13470	8710	30246
AVERAGE	7629	7361	10347	9298	7876	6961	11528	6285	11534	6852	4781	3102	7796

Highlighted cells indicate exceedance due to high rainfall events with more than 10mm of rainfall received from our stockpile weather station on site. This is in accordance with Tahmoor Coal's EPL 1389 which allows daily discharge over the prescribed limit when more than 10mm of rainfall is recorded in 24hours at the premisis.

19.2.4 Potable Water Supply

Sydney potable water is utilised across Tahmoor Coal with applications in amendities across pit-top facilities and sent underground for Longwall applications. Emphasis is placed on utilising recycled water and seeking to reduce Sydney Water potable water use on site where possible. The average monthly potable water usage was 37ML/month for the reporting period (2022), a reduction from 43 ML/month recorded for the previous reporting period (2021).

19.2.5 Recycled Water Treatment Plant

Tahmoor Coal recycles mine water from the sealed longwall goafs to the south of the No.3 Shaft for reuse in the mine operations underground and various surface facilities. **Table 19-6** demonstrates an increase in the use of Sydney potable water for site due to issues with the operation of the Recycled Water Treatment Plant (RWTP) since 2021. This has caused a gradual decrease in the amount of water recycled for site during this reporting period however further investigations are underway for re-use of waters from the new Water Treatmennt Plant to be constructed during the next reporting period.

Table 19.6 Recycled and Potable Water Use

Water usage	2015	2016	2017	2018	2019	2020	2021	2022
Potable Water usage (kL)	437 440	402 840	259 668	133 389	414 115	396 435	525 301	449 600
Recycled Water usage (kL)	261 870	308 290	200 755	388 449	291 372	186 584	65 259*	48*
ROM tonnes	2 632 695	2 721 284	2 107 326	2 110 328	2 388 854	2 354 901	2 747 965	2,324,202
Potable Water Intensity (L/ROM tonne)	166	148	123	63	173	168	191	193

*Reduction in Recycled water usage for the reporting period is attributed to issues with the operation of the Recycled Water Treatment Plant.

19.2.6 Water Storage Volumes

Data regarding stored water volume in site dams is provided within **Appendix 5.**

Tahmoor Coal does not participate in any salinity trading scheme, and therefore does not report controlled discharge water in this section.

Water used or contaminated by mining activities is discharged at the approved licence discharge or overflow point. Each discharge is sampled and tested monthly and as required by a third party contractor in accordance with the EPL 1389 conditions and EPA *Approved methods for sampling and analysis of water pollutants in NSW*.

Mine water and storm water is captured onsite and settled through the utilisation of a network of dams across site and is then discharged into Teatree Hollow Creek which flows into the Bargo River. Water samples from the Bargo River are also taken monthly; upstream, downstream and at the confluence of Teatree Hollow Creek.

The layout of Tahmoor Coal's water management system is outlined in **Appendix 4** and **Appendix 6**.

19.2.7 Further Improvements

Tahmoor Coal has demonstrated a significant reduction in historical non-compliances with EPL water conditions, with the performance improvement attributed to the implementation of water management Pollution Reduction Programs (PRPs) at Tahmoor Coal from 2011 to present.

Tahmoor Coal will further improve Water Quality of its discharge waters through the construction and commisioning of a new Water Treatment Plant using Reverse Osmosis technology during the next reporting period. The implementation of a pilot plant trial operated for 8 weeks and was successfully completed in December 2021, ensuring that Reverse Osmosis technology is fit for purpose.

20 Rehabilitation

The Tahmoor South Project was approved in April 2021, extending mining activities until 10 years from the commencement of second workings (ie 19 October 2032). The area for future reject emplacement will occupy the current approval extent, increasing the allowable height of the Reject Emplacement Area (REA) to 320RL. This will involve the stripping of top rehabilitated sections to emplace reject material higher, which will then be capped with topsoil and re-rehabilitated as per Tahmoor Coals' Rehabilitation Management Plan and Rehabilitation Strategy approved by the department.

A summary of Tahmoor Coals' rehabilitation is provided within **Table 20-1** and **Figure 53 and 54**. Approximately four and a half (4.5) hectares of land in the western section of the REA was capped with top soil, contour poughed and rehabilitated with seed mix containing both a cover crop for stability and native seed mix from Tahmoor Coal's native seed list. During the reporting period further emplacement was completed on the eastern batter and has been capped with topsoil. Rock armoured drainage lines will be completed during the next reporting period with contour ploughing and rehabilitation seeding to be completed soon after.

Table 20.1 Rehabilitation Summary

Mine Area Type	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	2021	**2022**	**2023**
A. Total mine footprint (ha)	142.5	142.5	142.5
B. Total active disturbance (ha)	78.5	74	72.2
C. Land being prepared for rehabilitation (ha)	0	4.5	1.8
D. Land under active rehabilitation (ha)	0	4.5	4.5 + 1.8 (6.3)
E. Completed Rehabilitation (ha)	0	**4.5**	**1.8**

Annual rehabilitation monitoring was conducted by Ecological Australia during November 2022. Bushfires affected the area including stages 6 and 9 and adjoining bushland containing the permanent reference sites and plots during late 2019. During the annual walkover in late 2020, evidence of epicormic growth across all affected sites were noted and regrowth of grasses and forbs as groundcover had began to regenerate. Further growth and regeneration of vegetation continued in 2021 and into 2022 through-out the rehabilitation areas. During the reporting period, some areas have been noted to contain minor weed species due to the favourable climatic conditions. Regular weed maintenance activities will be undertaken this reporting period to maintain control over these identified areas.

The reference sites and permanent monitoring plots which were burnt by the green wattle bushfire during the end of 2019, showed good signs of recovery with epicormic growth evident of canopy species, high levels of seedings and saplings of canopy species noted, and a high level of species cover and diversity of grasses and forbs. There is also evident of nutrient recycling with termite mounds, ants and scats noted in those burnt plots. Litter cover had significantly improved in these plots with grass, leaf litter and twigs recorded in all plots.

During 2022, the region has recieved above average rainfall attributed from the current La Nina conditions. The non-burnt plots in the REA showed slight decrease overall, however the continued high rainfall received has improved the cover of understorey species such as grasses, sedges and forbs across the REA. There has also been a general increase in the number of seedlings and saplings of second-generation *Eucalyptus* species, and *Allocasuarina littoralis* across the REA. Some plots also recorded a higher percentage of weed cover which is expected considering the high rainfall coverage over the past 12 months.

Additional characteristics and changes that were noted include:

- Adequate growth of the diameter at breast height (DBH) in all canopy species including juveniles and seedlings;
- Consistent senescence of *Acacia* spp*;*
- Increase of weed cover over the last 12 months in stages 10 and 12A of the REA, in particular the cover of *Eragrostis curvula* (African Love Grass).
- Signs of a rabbit population observed, and
- Herbivory of planted grasses in grass trials reducing reproductive potential of grass species.

Overall, native vegetation cover has improved over the past 12 months, with a general increase in native understorey cover across the REA.

20.1 Environmental Performance

20.1.1 Rehabilitation Performance

A Rehabilitation Improvement Plan in association with a TARP, included a classification status of each assessed area forming the basis for the TARP for each stage showed in **Table 20-2** and **Table 20-3**. This is used in the Annual Rehabilitation walkover to categorise the successfulness of the rehabilitation in **Appendix 9**. Over the reporting period, all stages have maintained their status rating from 2021 results (see **Figure 51 and 52** for location of stages).

Table 20.2 TARP Classification

Annual Rehabilitation Status	Description	Action
VC	Generally, exceeds the good practice standards and regulatory requirements by a significant margin.	No further action. Continue to maintenance activities as scheduled.
C	Generally good practice standards and regulatory requirements subject to normal variance.	No further action. Continue to maintenance activities as scheduled.
NC1	Not complying with some regulatory requirements and improvement needed to meet required good practice standards. Required works minor in nature and generally within budgeted site program.	Undertake minor works to improve rehabilitation to minimum standard prior to next annual inspection.

NC2	Not complying with significant risk to this inspection item, urgent corrective action needed. Requirements generally substantial in nature and beyond a budgeted site program.	Undertake major works required to improve rehabilitation to minimum standard prior to next annual inspection.

Table 20.3 TARP Rehabilitation Performance

Area	Status Rating	Comments/Opportunity for improvement
Stage 1-2	C	Minor gully erosion to be improved, continued weed control.
Stage 3-5	C	Continued weed control. Opportunity for planting with understorey species in limited areas
Stage 7	NC1	Continued weed control for priority and environmental weeds
Stage 8	C	Continued weed control for priority and environmental weeds
Stage 6 & 9	C	Continued weed control for priority and environmental weeds
Stage 10	C	Continued weed control
Stage 12	C	Opportunity for brush mulching to increase species diversity in understorey species
Stages 14-16	C	Continued weed control for priority and environmental weeds

Figure 50. Rehabilitation stages

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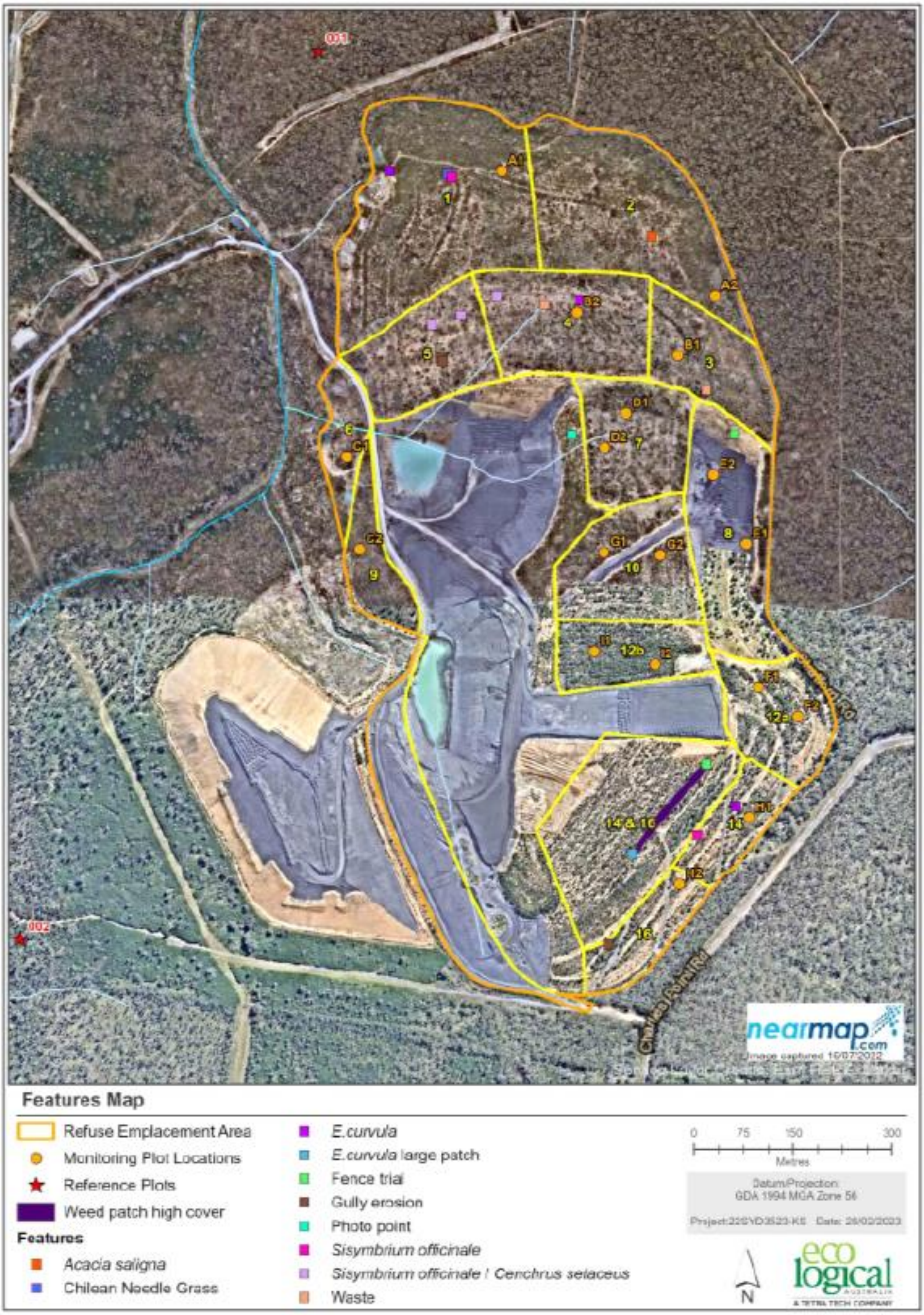
Figure 51 . Features noted during the Annual Rehabilitation Walkover during 2022



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20.1.2 Rehabilitation and Emplacement Areas

There have been no further extensions in 2022, however future plans will see vegetation clearance on the top-most sections of the REA to allow for further vertical emplacement, this will negate the need for future disturbance outside the already approved REA profile.

Tahmoor Coal is currently continuing to emplace refuse with in the current approved boundary of the REA as part of normal operations. The emplacement areas utilised during the reporting period were confined to the western lobe and adjoining valley section, an area located east of Dam S7 and the eastern batter which has been re-shaped and capped with topsoil (refer to Figure 34). Future emplacement of refuse material will be confined to the western lobs and adjoining valley section and the area located east of Dam S7 (Refer to **Figure 53**).

Rehabilitation planned for the next reporting period will take place on the recently topsoil capped eastern batter section (refer to **Figure 54**). This section will be capped with topsoil and re-rehabilitated as per Tahmoor Coals' Rehabilitation Management Plan and Rehabilitation Strategy approved by the department.

Tahmoor Coal is continuing to sample upstream and downstream of the Bargo River, as well as the EPA Licenced Discharge Point at the mine and overflow points of dams located at the REA.

Figure 52 Reject Emplacement Areas and completed Rehabilitation works during 2022.

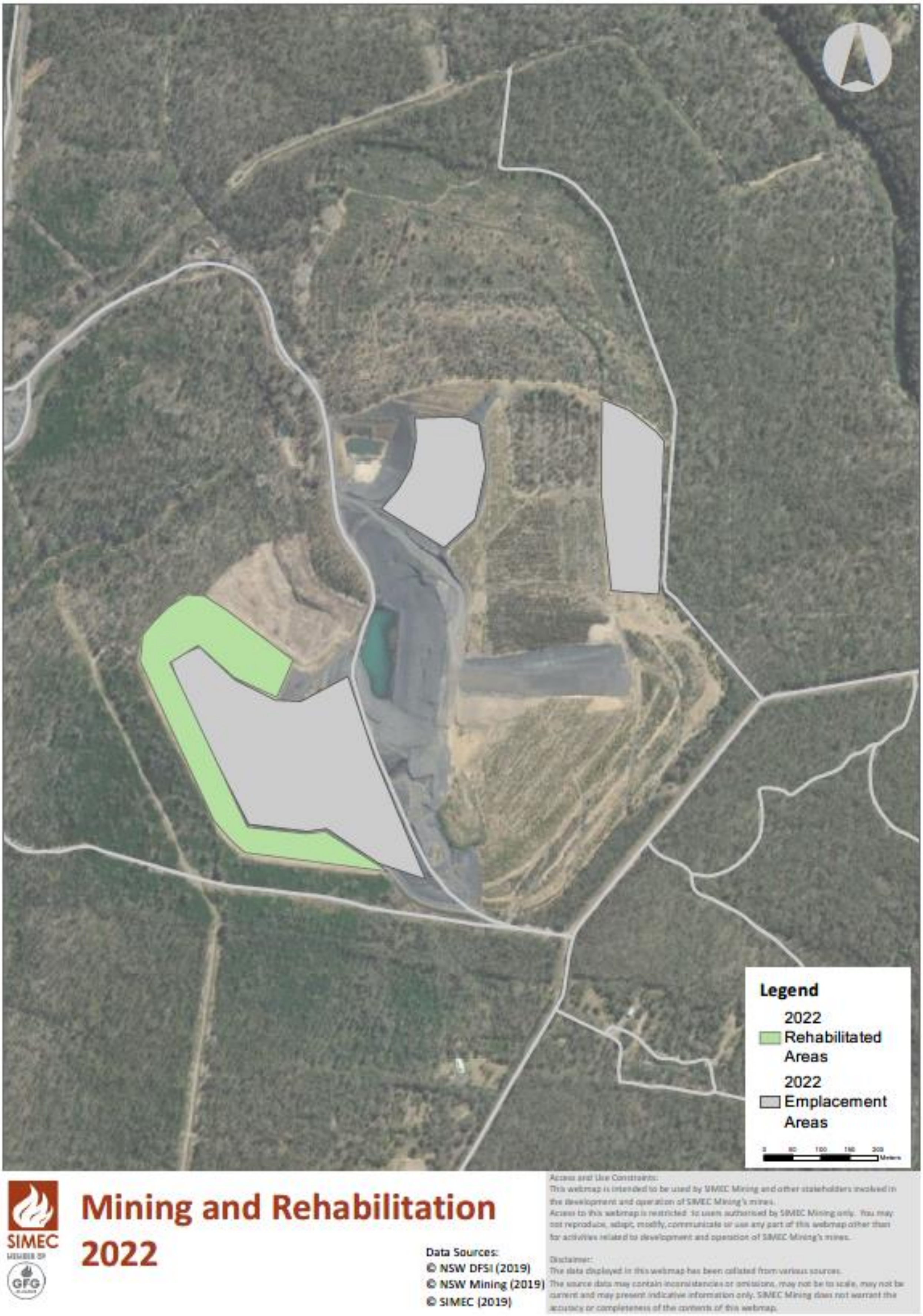
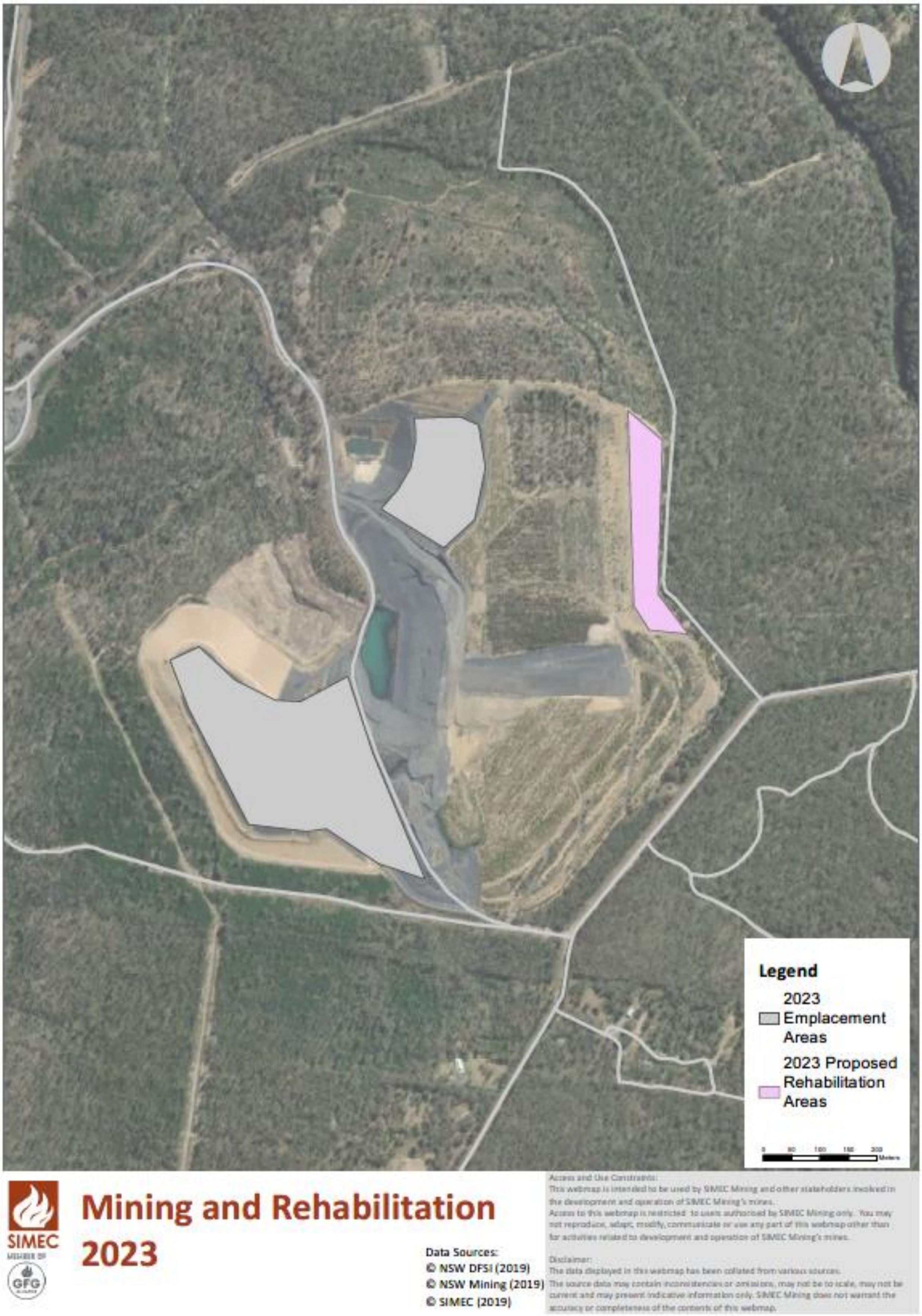


Figure 53. Reject Emplacement Areas and proposed Rehabilitation works for 2023.



20.2 Actions for the Next Reporting Period

Rehabilitation works on the eastern batter of the REA will be commenced with contor ploughing and rehabilitation seeding to be completed during spring 2023. Rehabilitation targets for the next reporting period (1st January 2023 – 31st December 2023) are outlined in **Table 20.4** below.

Table 20.4 Rehabilitation Targets

Category	Targets for 2023 (ha)				
	Q1	Q2	Q3	Q4	Total (Target)
Disturbed	0	0	0	0	0
Levelled/Re-contoured	1.8	0	0	0	1.8
Rehabilitation Seeding	0	0	1.8	0	1.8
Established	0	0	0	0	0

A summary of maintenance activities completed and proposed for all rehabilitated land is outlined within **Table 20.5 below**.

Table 20.5 Rehabilitation Maintenance Activities

Nature of Treatment	Area (Ha) this Reporting period	Area (Ha) next reporting period	Comments, Control Strategies, Treatment Detail
Additional erosion control (drains re-contouring, rock protection)	<1	<1	Routine improvements and maintenance to existing stormwater drainage system and erosion/sediment controls on disturbed areas and around dams.
Re-covering (detail – further topsoil, subsoil sealing, etc)	0	0	Exterior batter of eastern section covered with top soil after additional emplacement completed and to be seeded with a prescribed grass mix during 2023.
Soil treatment (detail – fertiliser, lime, gypsum, etc)	4	1.8	Fertiliser applied to the exterior batters of the western section in 2022.
Treatment management (detail – grazing, cropping, slashing, weeding etc)	0	0	No actions completed in 2022.
Adversely affected by weeds (detail, type and treatment)	<1	<1	Weed spraying continues on a monthly regime, with some weed establishment noted in the Annual Rehabilitation Walkover in Nov 2022 and to be controlled during 2023 maintenance activities.
Re-seeding/planting (detail – species density, season, etc)	0.5	0	Pature mix seeded on topsoil stock piles in 2022.
Feral animal control (detail – additional fencing, trapping, baiting, etc)	80	80	Continued baiting of rabbits for next reporting period.

20.3 **Mine Closure**

20.3.1 **Post mining Land use**

There are several post mining land use options that may be applicable for the Tahmoor Mine site including residential land use, industrial land use or a return to native bushland.

The likely final land use option for most of Tahmoor Coal's closure domains will be a return to native bushland (refer to **Figure 55**). However, the final land use options will be confirmed in the detailed closure planning process, which involves undertaking a final land use analysis required 5 years prior to to the cessation of mining activities at Tahmoor Mine.

A detailed closure plan was developed as part of the Environmental Impact Statement for the Tahmoor South Project, as the Rehabilitation and Mine Closure Strategy (SLR,2020).

20.3.2 **Rehabilitation Indicators**

The REA key rehabilitation indicators include the following:

- Maximum height of RL320 (SSD 8445);
- Maximum slope on final landform external batters will be 1:4 (generally will be 1:8);
- External batters should have gently sloping contour drains, reporting to water storage dams;
- Topsoil placement depth >300 mm;
- All final landform slopes to be contour ploughed prior to seeding or planting;
- Target <10% weed infestation within monitoring transects;
- Target evidence of second-generation flora germination in monitoring transects (monitored annually); and
- Rehabilitation monitoring transects contain flora species and structural characteristics like the desired vegetation communities at the analogue/reference sites (monitored annually).

Soils located at Tahmoor Coal have been identified as part of the Lucas Heights Soil Landscape and occurring adjacent to the Gymea Soil Landscape. Soil limitations of the landscape include stoniness, hard setting surfaces and low soil fertility. Erosion on the landscape is generally low. Where possible, deeper soil horizons are reserved for subsoil and capping material, while the top soil horizons with the highest organic content is reserved for rehabilitation and direct seeding/planting applications.

A combination of sterile cover crops and grasses for initial stability while native shrub and tree seed mixes establish are used at the REA to achieve the rehabilitation objective outcome of surrounding native bushland in the area. A species list has been developed and refined based on Tahmoor Coal's development consents and the results of the annual rehabilitation monitoring (which identifies which species have performed more successful than others during each year).

Hollow bearing trees and timber logs from clearing activities at the REA are salvaged and stockpiled for use throughout rehabilitation areas. Logs and hollows are spread throughout rehabilitation areas where accessible, to provide structure and encourage habitation colonisation by native fauna.

All mine closure domains including active domains still in operational use, are described in the Tahmoor Mine Conceptual Mine Closure Plan (TAH-HSEC-00121), the Rehabilitation Management Plan (TAH-HSEC-00402) and Rehabilitation Strategy (TAH-HSEC-00401). were assessed to establish an annual record of the status of each domain, including photographic monitoring to show progress and changes year to year included in the annual rehabilitation walkover (**Appendix 9**).

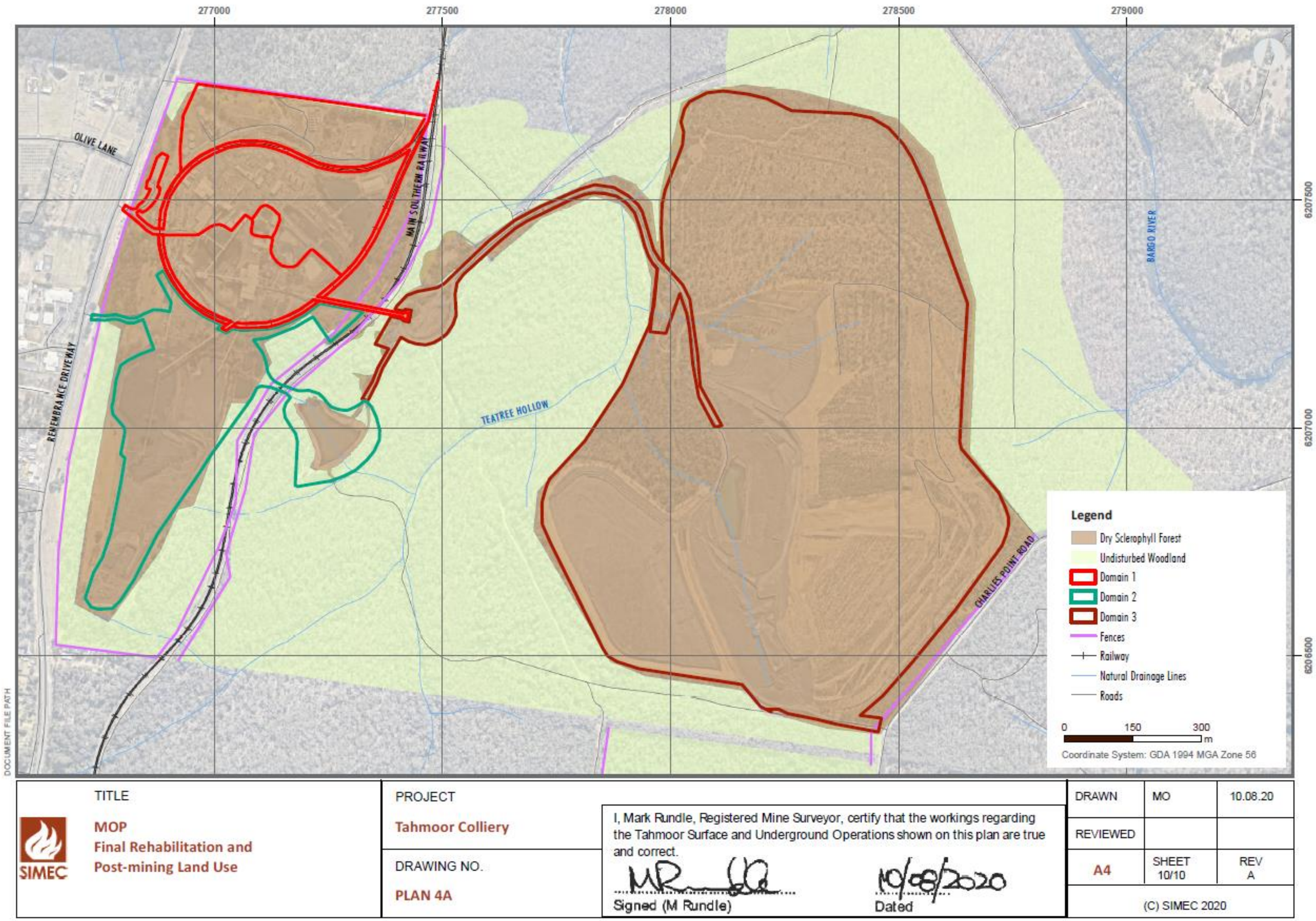
Regular surveying is conducted in active landform areas to monitor maximum slope to conform to final landform designs.

Tahmoor Coal has five (5) identified primary closure domains based on operational function and geography (ie. 1, 2, 3, 4 and 5)(refer to **Appendix 8** for locations). Most of these domains are connected or within close proximity of one another, and will therefore share similar final landforms and rehabilitation objectives. A schedule of these domains, with the rehabilitation status comparing last reporting period to this reporting period, is provided in **Table 20-6** and shown in **Appendix 9.**

Table 20.6. Tahmoor Coal Closure Domains

Domain	Description	Rehabilitation Status	
		2021	**2022**
1	Tahmoor Mine Main Pit Top Area	-	-
1A	CHPP	Active Area	Active Area
1B	Rail Loading Facility	Active Area	Active Area
1C	Main Workshop and Administration Area	Active Area	Active Area
1D	No.3 Shaft and Gas Drainage Plant	Active Area	Active Area
1E	Sewage/Water Treatment Plant	Active Area	Active Area
2	Product Stockpile Area	Active Area	Active Area
3	Refuse Emplacement Area	Active Area, Ecosystem Est., and Ecosystem Dev.	Active Area, Ecosystem Est., and Ecosystem Dev.
4	No.1 Ventilation Shaft	Active Area	Active Area
5	No.2 Ventilation Shaft	Active Area	Active Area
6	Off Title Subsidence Area	Active Area	Active Area

Figure 54 Final rehabilitation and post-mining land use.



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21 Weeds

21.1 Environmental Management

A Weed Management Procedure (TAH-HSEC-00107) has been developed as part of the site Environmental Management System. The purpose of this plan is to outline management strategies and controls for noxious and environmental weeds, so that weed infestations are controlled and kept at an acceptable level on all lands owned or managed by the mine. A summary of weed species targeted during the reporting period, and control methods used, is provided in **Table 21-1.**

Table 21.1 Weed Target Species

Target Weed Species	Date of Control	Treatment Method
African Lovegrass (Eragrostis curvula)	All seasons	Herbicide (Glyphosate)
Hedge Mustard (Sisymbrium orientale)	All seasons	Herbicide (Glyphosate Dicamba)
Whiskey Grass (Andropogon virginicus)	All seasons	Herbicide (Glyphosate)
Serrated Tussock (Nassella trichotoma)	All seasons	Herbicide (Glyphosate)
Fireweed (Senecio riensis madagasca)	Winter or as detected	Hand Weeding & Herbicide (Glysophate) Late Autumn
Swan Plant (Gomphocarpus fruticosus)	All seasons	Hand Weeding
Western Australian Golden Wattle (Acacia saligna)	All seasons	Cut stump removal and herbicide application
Couch (Cynodon dactylon)	All seasons	Herbicide (Glyphosate)
Fountain Grass (Cenchrus setaceus)	All seasons	Herbicide (Glyphosate)
Catsear (Hypochaeris radicata)	All seasons	Herbicide (Glyphosate)
Narrow-leafed Cotton Bush (Gomphocarpus fruticosus)	All seasons	Herbicide (Glyphosate Dicamba)
Flaxleaf Fleabane (Conyza bonariensis)	All seasons	Herbicide (Glyphosate resistant)
Scarlet Pimpernel (Anagallis arvensis)	All seasons	Herbicide (Glyphosate Dicamba)
Veined Verbena (Verbena rigida)	All seasons	Herbicide (Glyphosate Dicamba)
Paspalum (Paspalum dilatatum)	All seasons	Herbicide (Glyphosate)
Red-flowered Mallow (Modiola caroliniana)	All seasons	Hand weeding & Herbicide (Glyphosate)
Pampas Grass	All seasons	Herbicide (Glyphosate)
Plantain (Plantago)	All seasons	Herbicide (Glyphosate)

21.2 Environmental Performance

Weed management of all land owned or managed by Tahmoor Coal has continued through the reporting period. Monthly Environmental inspections across Pit-top, REA, Shaft site 1, Shaft site 2 and the Bargo shaft site continually monitor weed prevalence across these sites and target area's of concern to be controlled within the next month by Tahmoor Coal's Grounds maintenance contractors.

During the Reporting period, a noxious weed inspection was carried out by council across site. Two weeds of concern were identified on pit-top, these being a localised community of Serrated Tussock on the bank to the east of the gas plant and localised clumps of Pampas Grass contained within a section of a drainage way. These weeds were quickly controlled with the implementation of the correct herbicide application within 2 weeks following the inspection. With no re-emergence of Serrated tussock on site, the monthly environmental inspections have noted a clump of Pampas grass starting to re-emerge in the same area as the parent plants. Continued weed maintenance and control will be implemented in this area over the next reporting period.

Continuation of the current weed control program and control of *Whiskey Grass, African Lovegrass, Hedge Mustard, Acacia saligna* and seedling *Leptospermum laevigatum* has been recommended and is monitored monthly by Tahmoor Coal's Grounds Maintenance Contractor.

During the reporting period there was an increased prevalence in the quantity of weed species germinating on site due to the wetter than average conditions, in particular African lovegrass. This was managed and maintained monthly by Tahmoor Coal's Grounds Maintenance Contractor and the monthly environmental inpections.

There were no reportable incidents related to weed management during the reporting period.

21.3 **Further Improvements**

Tahmoor Coal will continue weed management monitoring and maintenance activities within associated leased and owned land, across pit-top and rehabilitation areas at the REA, inparticular problem weeds identified in the Annual Rehabilitation walkover which have began to establish within pockets of the REA due to the favourable climatic conditions during the reporting period.

22 Bushfire Management

22.1 Environmental Management

During 2020, Tahmoor Coal reviewed and updated the Bushfire Management Plan (BMP) in consultation with the Wollondilly Rural Fire Service (RFS) to include an updated hazard reduction burn schedule as a response to the Green Wattle Bushfire of November 2019 to January 2020 (refer to **Figure 56**). The BMP provides significant detail on the location of all Tahmoor Coal land holdings with detailed maps showing Asset Protection Zones (APZ), Land Management Zones (LMZ) and Strategic Fire Zones (SFZ), gate/track/road access for all locations, and a detailed schedule of hazard reduction activities required for each location. For further information the Bushfire Management Plan can be viewed on the Tahmoor coal's website https://www.tahmoorcolliery.com.au/environment/plans/.

22.2 Environmental Performance

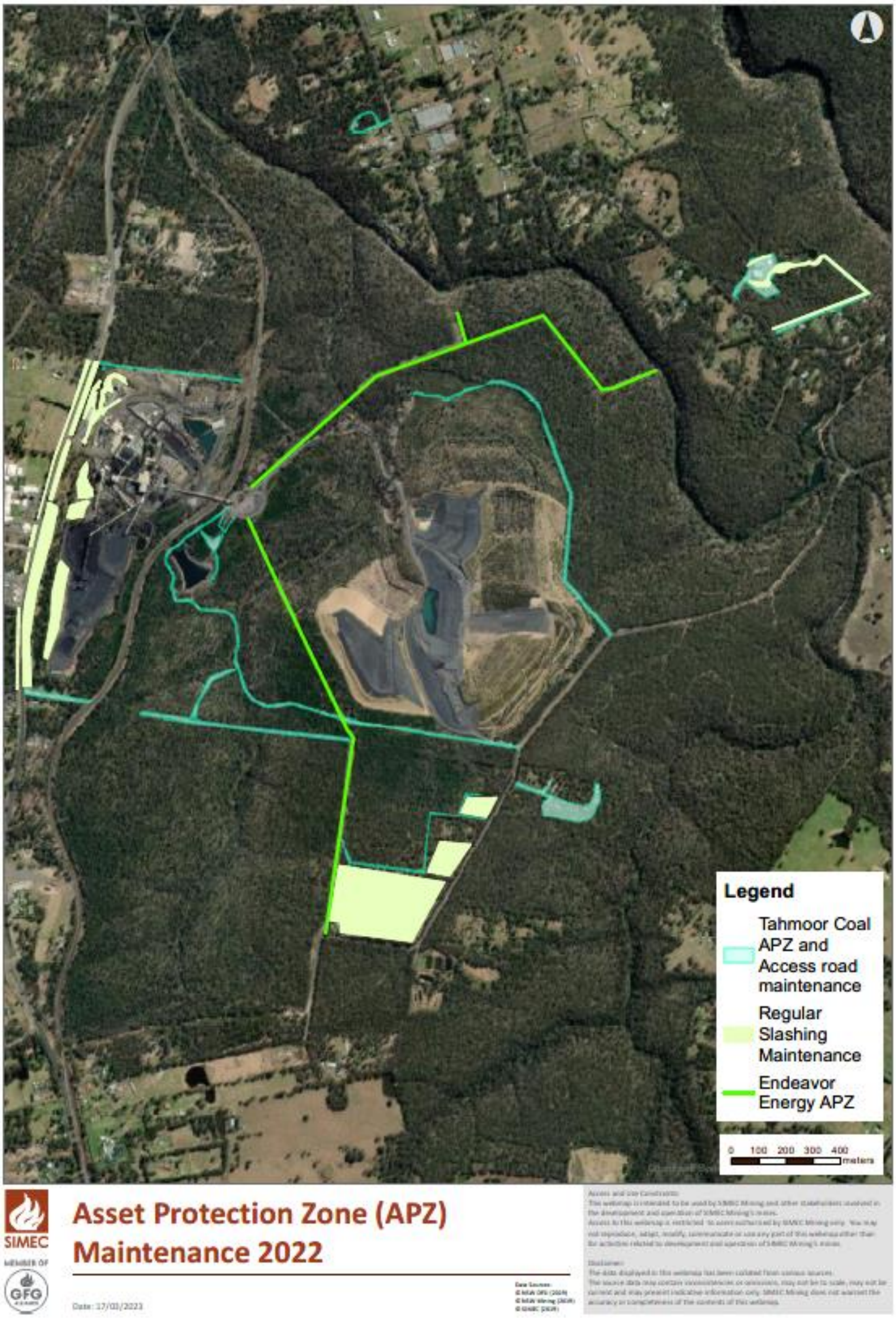
During 2022, Tahmoor Coal undertook Annual Asset Protection Zone maintenance during spring keeping light vehicle access roads maintained and perimeters around pit top, REA fire trails, Shaft site 1, Shaft site 2 and Tahmoor Coal owned neighbouring properties on Charlies Point Road south of the REA maintained (refer to **Figure 56**). An additional asset protection zone was implemented along the southern boundary of the REA.

No hazard reduction burns were completed during the reporting period and no wild fires were reported in the region.

22.3 Further Improvements

Tahmoor Coal will continue to implement hazard control strategies outlined in the current Bushfire Management Plan and in consultation with the Wollondilly/Wingecaribee Bush Fire Managment Commitee.

Figure 55 Annual Asset Protection Zone (APZ) and Fire trail maintenance for Tahmoor Coal during 2022



23 Traffic Management

Traffic is managed in accordance with the approved Traffic Management Plan (TAH-HSEC-00370) and in accordance with consent SSD 8445 conditions B61, B62, B67, A10, A11, A13, A15.

During the reporting period truck and train times and tonnes have been recorded and reported in **Appendix 11** and **Appendix 12** in accordance with condition B61 of SSD 8445.

Tahmoor Coal operations have been in accordance with condition A11(c) and A13 of consent SSD8445 during the reporting period (refer to **Appendix 11** and **Appendix 12**).

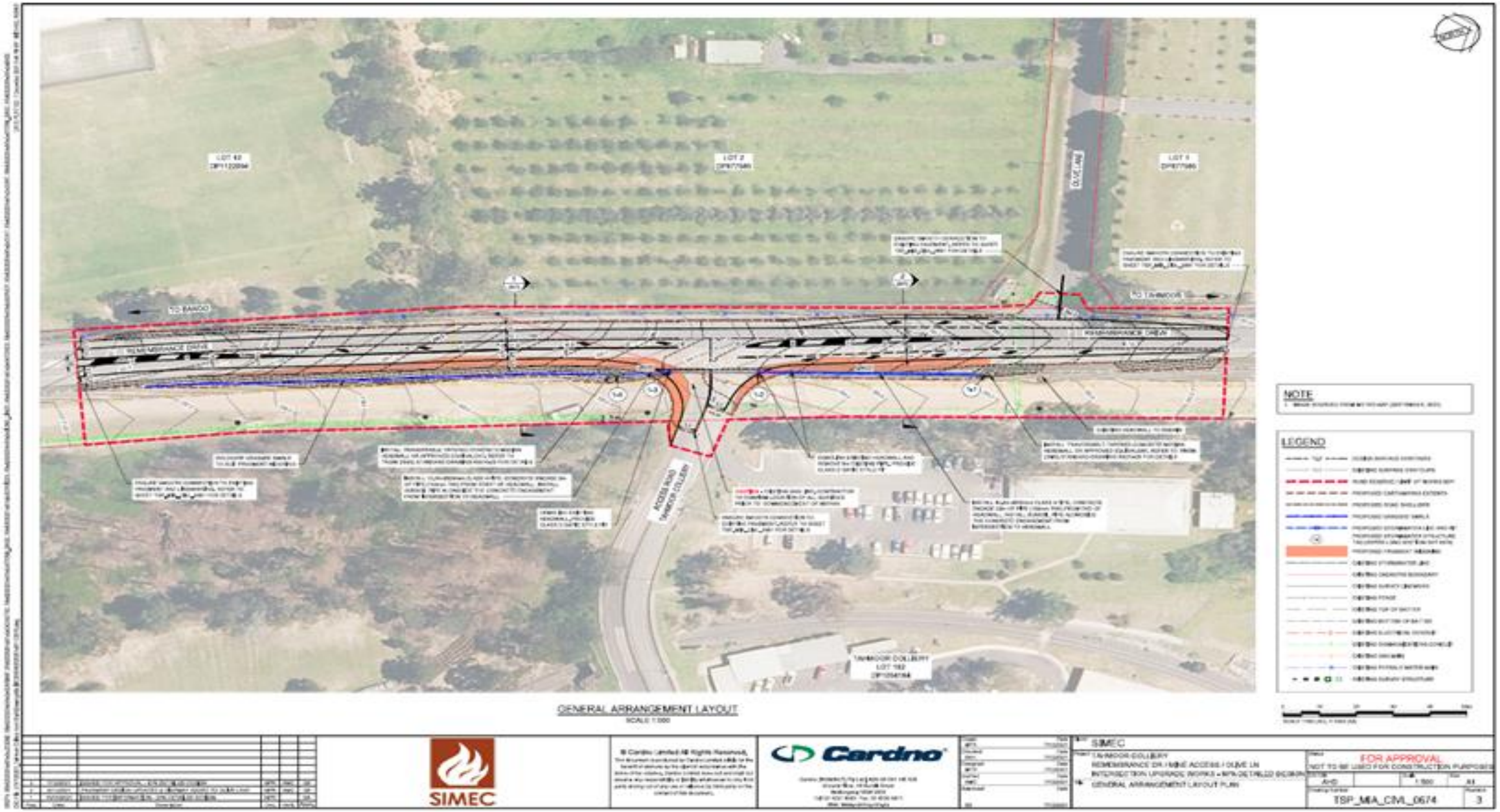
In accordance with actions agreed to in the Traffic Management Plan, traffic counting was undertaken during school days between 2-4pm on a Tuesday and the next day 7:30-9:30am on the Wednesday to understand road usage by Tahmoor Coal related vehicles compared with public road users for Remembrance Driveway. The results are displayed in the below **Table 23.1**.

Table 23.1 Mine related vehicles vs public vehicles counted on Remembrance Driveway

	Tuesday 2pm-4pm	Wednesday 7:30-9:30am
Mine traffic (entering and exiting site)	232	127
Remembrance Drive traffic (northbound and south bound)	1680	1786
% of Mine related vehicles vs public road users	13.81 %	7.11 %

During the reporting period, construction works were undertaken to upgrade Tahmoor Coals' access intersection of Remembrance Driveway, the main mine entry road and Olive Lane (refer to **Figure 57**), as required under Consent Condition B66 and in consultation with Wollondilly Council. A specific Construction Environmental Management Plan (CEMP) (TAH-HSEC-00376) was completed for construction works, which included specific traffic management measures, outlining any changes to mine site access. The road upgrade works included all road furniture and safety requirements required to meet relevant road standards, to the satisfaction of the appropriate roads authorities

Figure 56 Construction layout of Intersection upgrade



24 Community

24.1 Community Engagement Activities

Tahmoor Coal recognises that genuine partnerships with stakeholders and local communities are an essential part of community engagement.

Tahmoor Coal has established a good working relationship with the local community throughout its operations and seeks to continue this as new projects are established. There is a focus on providing timely and accurate information regarding its performance to its varied stakeholders.

The method of consultation used varies depending on the scale of project, stakeholder type and preferred method of communication.

The following consultation methods are commonly used to communicate and engage with stakeholders:

- Newsletters – distributed by email, website, post and printed posters displayed in various locations;
- Resident Information Packs – Distributed to residents in current and future proposed mining areas and website;
- Face to face consultation meetings, eg. Local landholders, schools, businesses and community groups;
- Website (https://www.tahmoorcolliery.com.au/) containing a variety of information and reports;
- 24-hour complaints line – phone number displayed on newsletter, website and distributed as required, eg. Face to face meetings;
- Tahmoor Coal Community Consultative Committee (TCCCC) Meetings – four (4) quarterly meetings held in 2022 (3 March, 2 June, 1 September and 1 December);
- Community Information Sessions – as required at various locations (open to all members of the public) – Community Drop-In Session for Tahmoor South Domain held on 28 July 2022;
- Six Monthly Subsidence Impact Reports – distributed to TCCCC and available on Tahmoor Coal website.

24.2 Community Contributions

Tahmoor Coal contributes to the social and economic development of sustainable communities associated with its operations and ensures the rights of communities in which it operates are respected and supported. This is achieved by:

- Identifying the communities and stakeholders associated with our operations and actively engaging with them as early as possible and throughout the life cycle of the operations to establish relationships based on mutual benefit and active participation;
- Respecting the cultural, customs, interests and rights of communities, including indigenous peoples and vulnerable or disadvantaged groups;

- Working with governments, local authorities, community representatives, inter-governmental and non-governmental organisations and other interested parties to develop and support projects that benefit the communities associated with our operations; and
- Contributing an indicative amount of $100,000 each year to fund initiatives that benefit the communities associated with our operations, particularly those located in remote areas or in regions with a lower level of social and economic development and infrastructure.

24.3 Community Investment Program

In 2022 some of the major sponsorships and donations included support for:

- Australian Wildlife Sanctuary: Tahmoor Coal sponsored and provided a grant of $17,700 for the installation of a woodlands pond. The Woodlands is a predator proof fenced sanctuary for non-releasable, resuce and unwanted zoo animals. It is home to birds, wombats, quokkas, wallabies, kangaroos, geese and black swans. The pond is utilised by all animals residing in the area and includes a seating area for visitors to appreciate the water birds and other animals.
- Wollondilly Shire Council Beach Bus: The Wollondilly Beach Bus is a free service travelling to the Illawarra Beaches daily during January. The program primarily targets the 8000 young people in the LGA. Wollondilly is significantly transport disadvantaged and has a lack of free or affordable entertainment options for young people. The service enables young people to meet with or develop new friendships while undertaking a recreational activity that promotes healthy lifestyle and fitness. Ultimately, it connects the community throughout summer, providing them with an opportunity to socialise, exercise and unwind. Tahmoor Coal provides the financial support to allow two buses to run at no cost to participants during January 2022 with over 492 people using the beach bus.
- Wollondilly Heritage Centre and Museum: Dedicated volunteers have developed an award winning centre of excellence in the collection and display of significant items that tell the story of settlement in the Wollondilly region. Included in the collection are extensive photographic records, family history and local history, specialised collections such as Burragorang, Yerranderie, coal mining and Indigenous history of the Gundungurra people. Tahmoor Coal provided a grant of $16,000 to upgrade the outdoor community BBQ area at the heritage centre which includes a wheelchair accessible large deck to be utilised by school excursion groups, local residents and visitors of the centre.
- Bargo – Two Hundred Years in the Making: Local Bargo resident, author, historian and community leader, Marjo Hallowell wrote a history book on Bargo, released in November 2022 for the bicentenary of the First Land Grants in Bargo. Tahmoor Coal sponsored and provided a grant for the printing of the book encompassing over 30 years worth of newspaper collections and local information with the support of The Picton and District Historical Society.

In accordance with the Tahmoor Coal Community Development Plan and Community Investment Program, all community investment activities, whether financial or in-kind support, should target the following group-wide focus areas:

- Community development;
- Education;
- Health; and
- Environment.

An overview of the Tahmoor Coal community contributions during 2022 are outlined in **Table 24-1**.

Table 24.1 Community Contributions in 2022

Category	Contributions in 2022
Community Development	$27,250
Health	$19,983
Environment	$21,787
Education, Art & Culture	$17,500
Total	**$86,520**

24.4 Community Complaints

A total of twelve (12) community complaints were received for the reporting period. As outlined in **Figure 58** and **Table 24-2**, there has been a significant reduction in community complaints since 2012. The complaints received related to the following categories:

- Noise and vibration (4)
- Road drainage (3)
- Disposal of debris (2)
- Miscellaneous (3)

Figure 57 Community Complaint Statistics

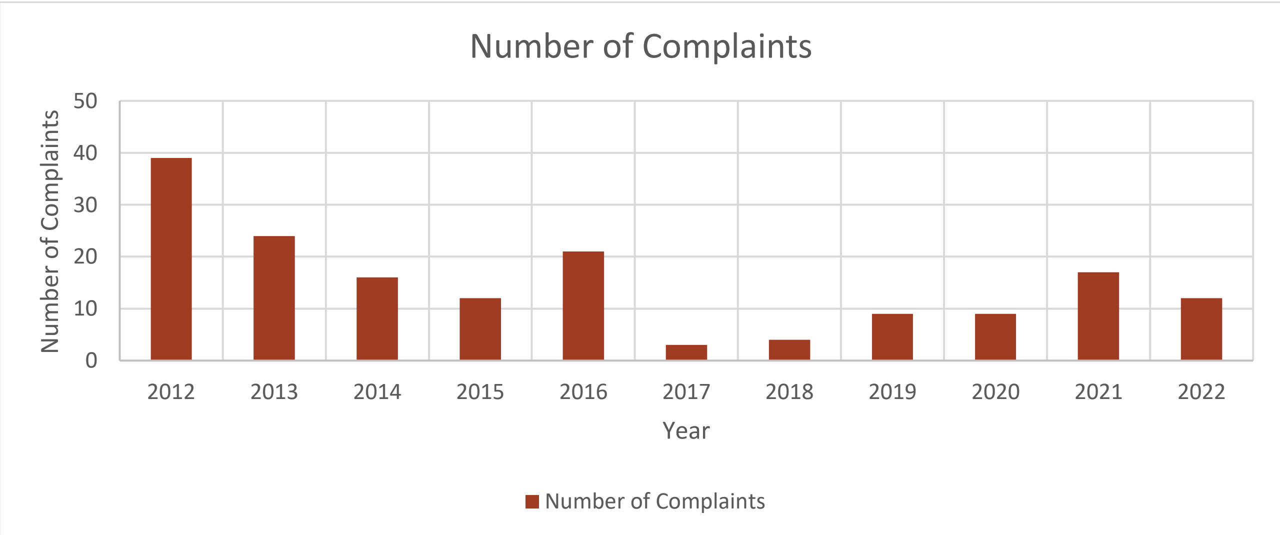


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Table 24.2 Complaint Details

Date	Type	Complaint Details
04/03/2022	Road drainage	Road drainage issue on council strip near coal mine owned property caused by heavy rain fall. Matter referred to Wollondilly Shire Council to address road drainage concerns.
14/03/2022	Road drainage	Road drainage issue on council strip near coal mine owned property caused by heavy rain fall. Matter referred to Wollondilly Shire Council to address road drainage concerns.
18/03/2022	Road drainage	Road drainage issue on council strip near coal mine owned property caused by heavy rain fall. Matter referred to Wollondilly Shire Council to address road drainage concerns.
15/07/2022	Noise/Vibrations	Complaint received regarding noise and vibrations from resident's windows. Preliminary investigation found no issues from mine pit top and that it could be vibrations from trains on the Main Southern Railway line. Asked resident to keep a noise/vibration log. Investigation closed out with no log received.
01/08/2022	Noise	Council received a siren noise complaint from a local resident. Mine site replaced collision warning siren with a lower dB output and response provided to council.
02/08/2022	Off site / Miscellaneous	Tahmoor Coal security company conducting U-turns on resident's nature strip causing tyre tracks. Direction issued to security company to cease driving on residential property nature strips.
02/08/2022	Noise	Complaint received regarding coal mine dozer noise causing local resident disruption at night. Update provided on pit top noise mitigation works. Asked resident to keep a noise log and offered an independent investigation by a noise consultant.
11/08/2022	Off site / Miscellaneous	Complaint received regarding unfavbourable behaviour by a Tahmoor Coal consultant at a resident's property. Contacted the consultancy company to report the unfavourable behaviour. Apology provided to resident. Resident confirmed the consultant's behaviour improved the following visit.
18/08/2022	Disposal of debris	Complaint received regarding the disposal of a small quantity of concrete on a neighbouring residential property by a Tahmoor Coal contractor. Investigated immediately and confirmed this was the case. Contractors' services are no longer engaged by Tahmoor Coal. Apology provided to resident and offer extended to attend site and clean up concrete debris.
10/10/2022	Noise	Complaint received regarding a mine site alarm causing disruption to local resident. Investigated immediately and reduced the volume of the pit top winder siren located to the north of pit top. Response issued to complainant accordingly.
17/10/2022	Disposal of debris	Complaint received regarding discarded vegetation under rail overpass at Picton Viaduct. Investigated immediately and arranged a contractor to clear the vegetation. Response provided to complainant who confirmed their satisfaction with the clearing works.
31/10/2022	Off site / Miscellaneous	Complaint received regarding a creek remediation compound with chemicals set up at an assumed Aborginial heritage site. Investigated immediately and confirmed the creek remediation compound was not located at an Aboriginal heritage site. The bunded area was constructed in accordance with the approved control plans. No impact was caused by the creek remediation activities to the rock overhang. Arranged a contractor to demobilise the site to alleviate any concerns.

25 Incidents, Notifications and Non-Compliances

Tahmoor Coal had no (0) non-compliances during the reporting period

A summary of all environmental incidents and notifications which occurred during the reporting period for 2022, is outlined within **Table 25-1** below.

In total there were four (4) incidents with four (4) related to spill management onsite.

Table 25.1 2022 Incidents, notifications and non-compliances

Date	Classification (if required)	Type	Location	Details	Action/s taken
30/03/2022	Cat 0	Spill Management	Pit top - bathhouses	Bodywash spill behind bath houses	Yard team contained spill immediately and cleaned up appropriately. Pumps have been replaced with gravity feed to reduce pressure and potential for repeat of incident.
04/05/2022	Cat 0	Spill Management	Underground	Diesel spill delivery line failure	Spill contained in UG sump. Precautionary controls were installed in the surface dam network. Additional Work order checks for fuel lines implemented.
13/08/2022	Cat 0	Spill Management	Pit top - bathhouses	Bodywash spill in bath houses	Yard team contained spill immediately and cleaned up appropriately. Faulty nozzle replaced.
26/09/2022	Cat 0	Spill Management	Pit top – bath houses	Bodywash spill in bath houses	Spill contained on site and cleaned up appropriately. All bath house nozzles checked and nozzles replaced with auto shut offs

26 Activities to be Completed during the Next Reporting Period (1st January 2023 – 31st December 2023)

The following activities are aimed to improve the environment and/or community performance of Tahmoor Coal and are planned to be completed during the next reporting period:

- Progress Myrtle Creek and Redbank Creek CMAP;
- Complete installation of Main Water Treatment Plant for processing discharge water;
- Continue Aquatic Health Monitoring Program for the Bargo River as directed in EPL 1389;
- Ecological Toxicity monitoring to commence Spring 2023 before commissioning of the Water treatment plant;
- Post-mining HoF hole for Western Domain;
- Continued community engagement for Tahmoor South mining;
- Staged Noise mitigation implementation for site;
- Undertake post-mining monitoring for LW W4 extraction; and
- Undertake studies required to support Extraction Plan for LW S1B-S6B, with installation of additional surface water and groundwater monitoring sites to obtain baseline monitoring data.

27 Related Documents

Related Documents directly related to or references from this document are provided below in **Table 27-1**.

Table 27.1 Related Documents

Document Title	Document Number
Tahmoor South Air Quality and Greenhouse Gas Management Plan	TAH-HSEC-00379
Tahmoor South Water Management Plan	TAH-HSEC-00369
Tahmoor South Noise Management Plan	TAH-HSEC-00372
Biodiversity Management Plan	TAH-HSEC-00378
Bushfire Management Plan	TAH-HSEC-00377
Rehabilitation Management Plan	TAH-HSEC-00402
Rehabilitation Strategy	TAH-HSEC-00401
Longwall West 3 and West 4 (LW W3-W4) Extraction Plan	TAH-HSEC-00326
Longwall S1A-S6A Extraction Plan	TAH-HSEC-00360
Heritage Management Plan for Extraction Plan LW S1A-S6A	TAH-HSEC-00364
Aboriginal Cultural Heritage Assessment: Amended Tahmoor South Project (Niche, 2020)	
WRM (2022), Matthews Creek Post-mining Flood Study, LW W1-W4, 15 December 2022, document 1072-08-B1.	
Conceptual Closure Plan	TAH-HSEC-00121

28 Abbreviations

Abbreviations used in this document are provided below in **Table 28-1**.

Table 28.1 Abbreviations

Abbreviation	Definition
ACM	Asbestos containing materials
AEMR	Annual Environmental Management Report
APZ	Asset Protection Zones
ASTs	Above ground storage tanks
AUSRIVAS	Australian River Assessment System
BC Act	*Biodiversity Conservation Act 2016*
BMP	Bushfire Management Plan
CCL	Consolidated Coal Lease
CHPP	Coal Handling Preparation Plant
CMAP	Corrective Management Action Plan
DA	Development Application
DPIE	Department of Planning, Industry and Environment
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental Protection Licence
ERG	Tahmoor Coal Environmental Response Group
GHG	Greenhouse gas
GIS	Global Information System
HHRT	Historical Heritage Technical Report
IPC	Independent Planning Commission
km	Kilometre
KL	Kilolitres
LDP1	Licenced Discharge Point 1
LMZ	Land Management Zones
LOP	Licenced Overflow Point
LW	Longwall
LW W1	Longwall West 1
LW W1-W2	Longwall West 1 and Longwall West 2
LW W2	Longwall West 2
LW W3	Longwall West 3
LW W3-W4	Longwall West 3 and Longwall West 4
LW W4	Longwall West 4

Abbreviation	Definition
LW S1A	Longwall South 1A
LW S6A	Longwall South 6A
m	Metres
ML	Mining Lease
MOP	Mining Operation Plan
NGERS	National Greenhouse and Energy Reporting
NSW	New South Wales
ODS	Ozone depleting substances
OSP	Open Stand Pipe
PCBs	Polycholorinated Biphenyls
PIRMP	Pollution Incident Response Management Plan
PM10	Particulate Matter smaller than 10 micrometres
PRP	Pollution Reduction Program
QA	Quality assurance
RAPs	Registered Aboriginal Parties
REA	Reject Emplacement Area
RFS	Rural Fire Service
RWTP	Recycled Water Treatment Plant
Resources Regulator	Department of Regional NSW – Resources Regulator
ROM	Run of Mine
SFZ	Strategic Fire Zones
SLR	SLR Consulting Australia Pty Ltd
SMF	Syntheci Mineral Fibre
TSS	Total Suspended Solids
Tahmoor Coal	Tahmoor Coal Pty Ltd
Tahmoor Mine	Tahmoor Coal Mine
TARP	Trigger Action Response Plan
TCCCC	Tahmoor Coal Community Conultative Committee
USTs	Underground storage tanks
VWP	Vibrating Wire Piezometer
WELP	Wollondilly Local Environment Plan
WMP	Water Management Plan
WWTP	Waste Water Treatment Plant

29 Appendices

Table 29.1 Appendix Details

Appendix Number	Details
Appendix 1	Noise Monitoring Locations
Appendix 2	Quarterly Noise Monitoring Assessment Results
Appendix 3	Air Quality Monitoring Points
Appendix 4	Licence Discharge and Overflow Points
Appendix 5	Dam Water Volumes
Appendix 6	Surface Water Management Schematic
Appendix 7	Pit-top and REA Groundwater Monitoring data
Appendix 8	Closure Domains
Appendix 9	Tahmoor Annual Rehabilitation monitoring 2022
Appendix 10	Western Domain Six Monthly Subsidence Report 7
Appendix 11	Tahmoor South Six Monthly Subsidence Report 1
Appendix 12	2022 Train Timetable
Appendix 13	2022 Truck Timetable
Appendix 14	Tahmoor South Longwall schedule
Appendix 15	Groundwater Monitoring results for Jan-Dec 2022 (excerpt from Groundwater 6-month review)

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APPENDIX 1

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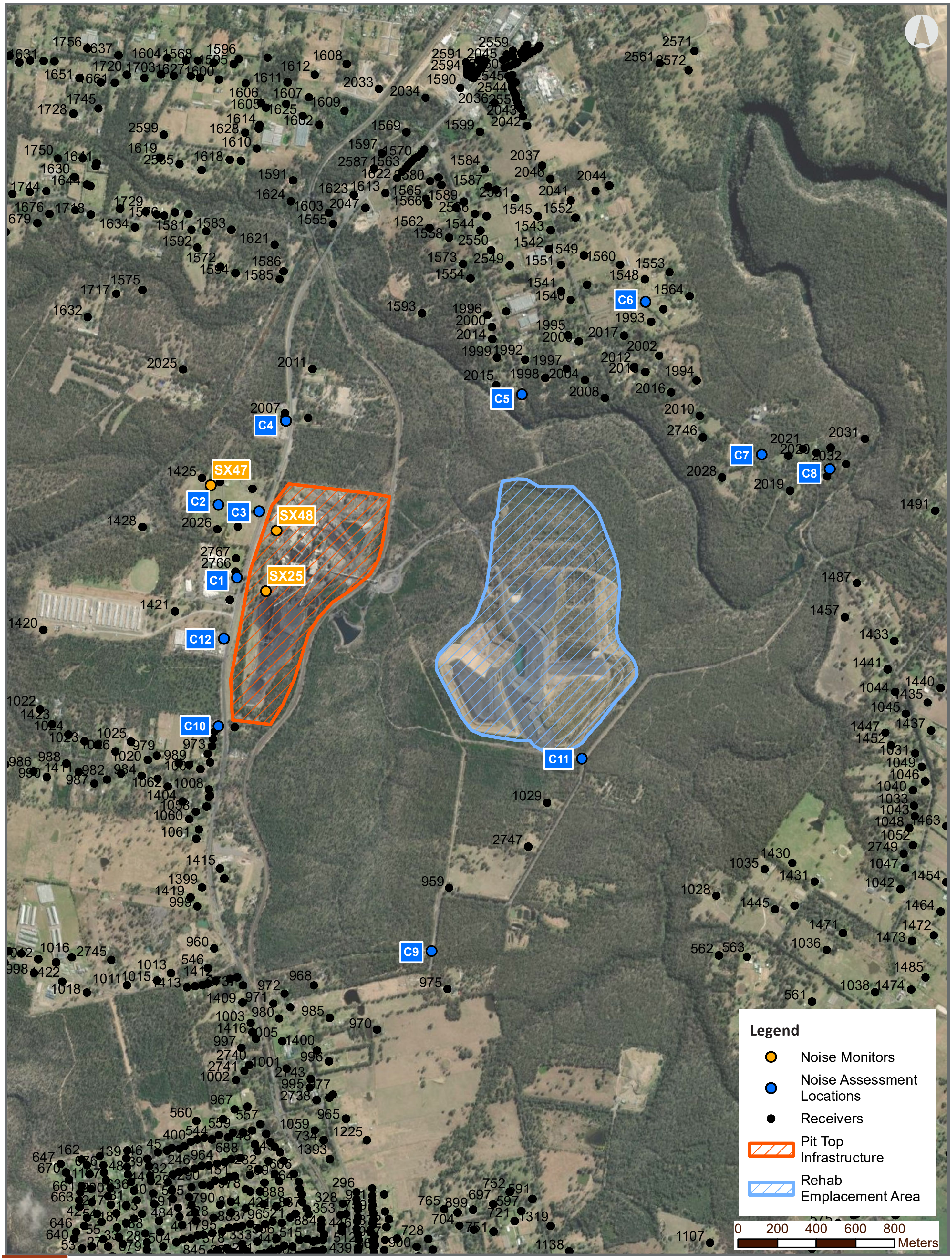

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Tahmoor South
Noise Monitoring Locations

Date: 11/01/2023

Data Sources:
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APPENDIX 2

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Year	Site	EIS Site Name	Assessment Goal L10	Estimated contribution Q1 (L10)	Estimated contribution Q2 (L10)	Estimated contribution Q3 (L10)	Estimated contribution Q4 (L10)	Description	Residential Property
2014				<45/6	<48	<48	<48		
2015				<52	<50	<46	54/5		
2016				<50	<50	<55	<45		
2017				53/4	50/1	54/5	53/4		
2018	M1	C12		48/9	50/1	<45	<45	Remembrance Driveway (Service Station)	No
2019				<49	<52	<56	<45		
2020				<48	<46	<46	<44		
2021				<47	<56	<47	<58***		
2022				<50***	<50***	<50**	<50**		
2014				46/7	47	<60	47		
2015				<53	<54	<47	55/6		
2016				<50	<50	<50	<46		
2017				53/4	55/7	56/7	53/3		
2018	M2	C1		48/9	50/1	<45	<46	Remembrance Driveway (School Entrance Road)	No
2019				<53	<56	<56	<48		
2020				<48	<46	<48	<45		
2021				<49	<56	<48	<60***		
2022				<52***	<53***	<50***	<50***		
2014				<44	<47	<45	<42		
2015				<48**	<47	<42	44/5		
2016				44/5	<40	<45	<45*		
2017				<45**	<47**	<47	<45*		
2018	M3	C2	45	<47***	<47**	<44	<47***	Olive Lane (End of Cul-de-sac)	Yes
2019				<46***	<47***	<42**	<44		
2020				<46***	<44**	<46**	<45**		
2021				<45**	<45**	<45**	<51***		
2022				<47***	<50***	<45***	<44***		
2014				<45	<49	<47	<45		
2015				<48	<53	<47	47/8		
2016				<45	<40	<45	<46		
2017				<48	<50	<50	<50		
2018	M4	C3		<45	<50	<50	<48	Olive Lane/Remembrance Driveway Intersection	No
2019				<50	<46	<46	<50		
2020				<48	<47	<47	<46		
2021				<50	<52	<50	<60***		
2022				<52***	<55***	<50***	<50***		
2014				<40	<40	<47	<40		
2015				<40	<46	<42	<42		
2016				<40	<40	<45	<45*		
2017				<45**	<45**	<45	<40		
2018	M5	C4	45	<35	<35	<45	<40	Remembrance Driveway (Service Station)	Yes
2019				<43**	<45**	<40**	<40		
2020				<44**	<45**	<35	<40		
2021				<45**	<45**	<42**	<48***		
2022				<45**	<45**	<44**	<40**		
2014				<35 (<35)	<43 (<35)	<38 (<35)	<30		
2015				<30	40/1 (-)	40/1 (-)	39/40 (-)		
2016				<35 (<35)	<50	<55	<45		
2017				<40** (<35)	<40** (<35)	<40 (<35)	<40 (<35)		
2018	M6	C5	45 (37)	<35	<37	<40	<40**	Stratford Road	Yes
2019				<35**	<37**	<39**	<39		
2020				<35	<39	<35	<40		
2021				<44**(<35)	<42(<35)	<40 (<35)	<42** (<35)		
2022				<40**(<35)	<43**(<35)	<44***	<40 (<35)		
2014				<35	<35	<35	<30		
2015				<30	35/6(-)	<35	<30 (-)		
2016				<30 (-)	<30 (-)	<30 (-)	<35*(-)		
2017				<35**(<35)	<35**(<35)	<35**(<35)	<35**(<35)		
2018	M7	C6	45 (37)	<35	<35	<35	<35	Hodgson Grove (End of Cul-de-sac)	Yes
2019				<35	<35	<35	<35		
2020				<35	<35	<35	<35		
2021				<35(<35)	<35 (<35)	<35 (<35)	<42** (<35)		
2022				<40(<35)	<40(<35)	<40**	<40 (<35)		
2014				<35	<35	<35	<32		
2015				<33	32/3(-)	<34	<35 (-)		
2016				<33 (-)	<30 (-)	<30 (-)	<40* (<35)		
2017				<35**(<35)	<35**(<35)	<37**(<35)	<37**(<35)		
2018	M8	C7	45 (37)	<35	<35	<35	<40	Rockford Road	Yes
2019				<35	<35	<35	<35		
2020				<35	<35	<35	<37**		
2021				<37 (<35)	<35 (<35)	<35 (<35)	<42 (<35)		
2022				<40**(<35)	<40**(<35)	<40**	<42** (<35)		
2014				<35	<35	<35	<30		
2015				<30	<30 (-)	<30 (-)	<30 (-)		
2016				<30 (-)	<30 (-)	<30 (-)	<35* (<35)		
2017				<35* (<35)	<35* (<35)	<35* (<35)	<35* (<35)		
2018	M9	C8	45 (37)	<35	<35	<35	<35	Kammer Place (End of Cul-de-sac)	Yes
2019				<35	<35	<35	<35		
2020				<35	<35	<35	<35		
2021				<35 (<35)	<35 (<35)	<35 (<35)	<35 (<35)		
2022				<40**(<35)	<40 (<35)	<40**(<35)	<40 (<35)		
2014				<35 (<35)	<36 (<35)	<32 (<35)	<30		
2015				<30	<30	<6	<35		
2016				<30	<35	<35	<35		
2017				<45	<45	<35	<35		
2018	M10	C11		<35	<35	<35	<35	Charlies Point Road	No
2019				<35	<35	<35	<35		
2020				<35	<35	<30	<30		
2021				<35	<35	<35	<35		
2022				<35	<35	<35	<45***		

NOTES: # Ambient noise controlled by insects (2-5kHz)
* Includes DECC INP +2dB(A) allowance (INP Section 11.1.3)
** Includes +2dB correction for low frequency noise (NPfI Table C.1)
*** Includes +5dB correction for low frequency noise (NPfI Table C.1)
() Noise Assessment Goal for REA

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APPENDIX 3

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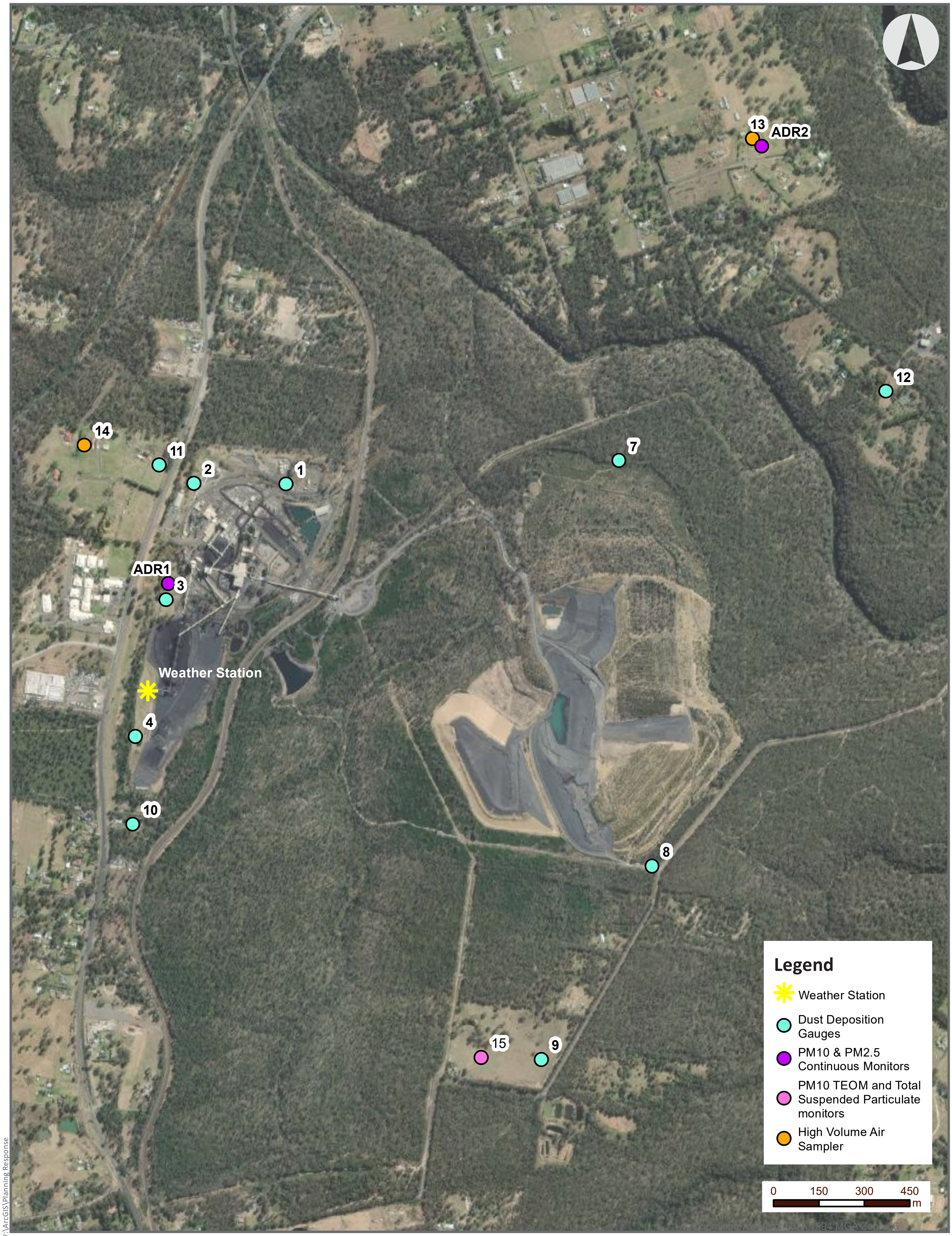

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Tahmoor South
Air Quality Monitoring Locations

Date: 13/01/2023

Data Sources:
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APPENDIX 4

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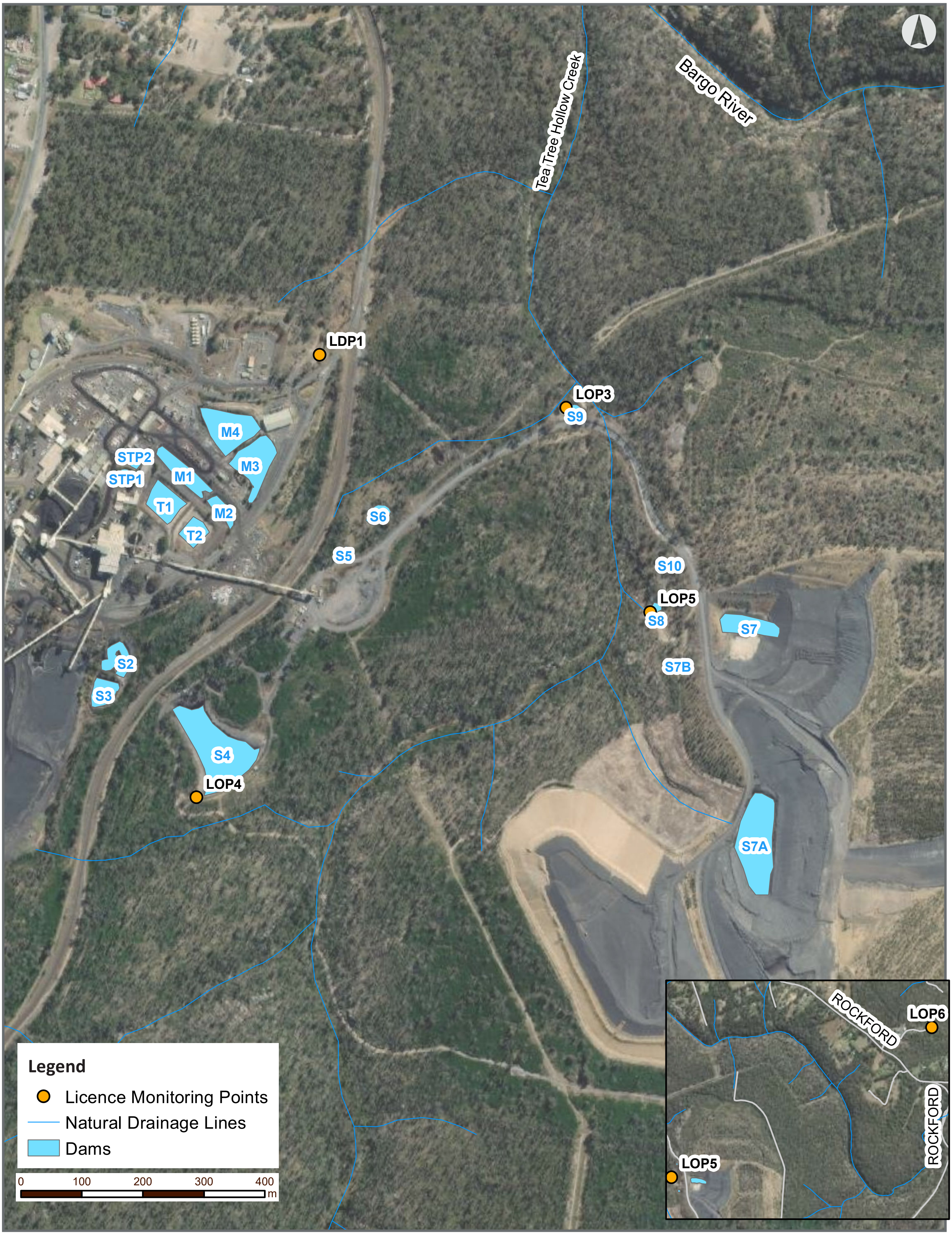

DOCUMENT FILE PATH

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Tahmoor Coal
EPL Discharge and Overflow points

Date: 13/01/2023

Data Sources:
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Coordinate System: GDA 1994 MGA Zone 56

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APPENDIX 5

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Estimated Water Volume				
Water Storage Name	**Beginning 2022**	**End 2022**	**Capacity**	**Comments**
M1	1.8ML	1.8ML	1.8ML	M series Dams act together to treat mine water pumped from Underground and stormwater which is then discharged via Licenced Discharge Point One (LDP1).
M2	0.5ML	0.5ML	0.5ML	
M3	9.0ML	9.0ML	9.0ML	
M4	8.0ML	8.0ML	8.0ML	
M5	1.5ML	1.0ML	3.0ML	First settling Dam for No.2 Shaft Site area (stormwater).
M6	4ML	2ML	4.5ML	Second settling Dam for No.2 Shaft Site area (stormwater).
S1	0ML	0ML	14.5ML	The coking coal stockpile acts as a retention basin during major storms (refered to as S1). Discharges to S2 Dam. Stockpile Dams S2 and S3 are kept full and are used to supply water used for Dust suppression. Discharges via overflow to S4 Dam.
S2/S3	8.3ML	8.3ML	8.3ML	
S4	1.8ML	10ML	36.9ML	The Dam is designed to act as a retention basin with a controlled outlet. Discharges via Licenced Overflow Point 4 (LOP4).
S5	0.3ML	0.2ML	0.5ML	This Sediment Dam is designed to act as a retention basin and discharges to S6.
S6	1ML	0.75ML	1.5ML	This Sediment Dam is designed to act as a retention basin with a controlled outlet.
S7	2ML	1ML	41.5ML	This is the main catchment for runoff from the REA. The dam is a retention basin during peak rainfall events. All water is pumped to S9 then onto S4.
S7a	10ML	8ML	12.0ML	These Dams are designed to act as retention basins with a controlled outlet to S7 Dam.
S7b	0.8ML	0.5ML	1.0ML	
S8	2ML	2.5ML	4.5ML	Dam retains overflow from S7b. Pumps to Dam S9. Overflow discharge via LOP5.
S9	0.2ML	0.15ML	0.4ML	Silt trap only for sealed Haul road. Wet werll pumps to Dam S4. Overflow discharges via LOP3.
STP1	590KL	590KL	590KL	Treated effluent overflows to M1 Dam.
STP2	590KL	590KL	590KL	
Tank No.1	250KL	250KL	250KL	Underground potable water supply
Tank No.2	250KL	250KL	250KL	Underground potable water supply

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APPENDIX 6

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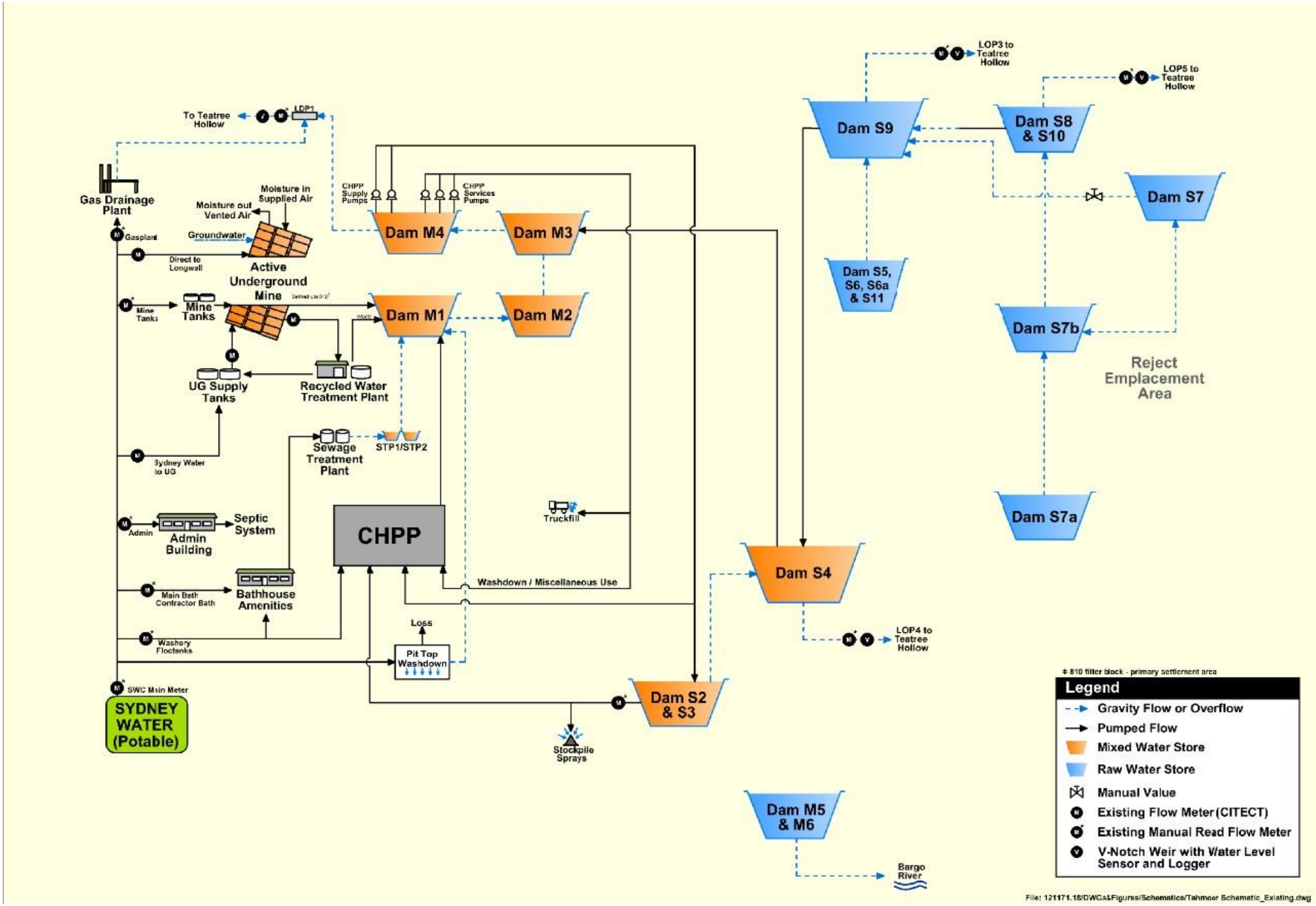

LOP3 to Teatree Hollow
LOP5 to Teatree Hollow
To Teatree Hollow
LDP1
Dam S9
Dam S8 & S10
Dam S7
Dam S5, S6, S6a & S11
Dam S7b
Dam S7a
Reject Emplacement Area
Gas Drainage Plant
Gasplant
Moisture in Supplied Air
Moisture out Vented Air
Groundwater
Direct to Longwall
Active Underground Mine
Mine Tanks
CHPP Supply Pumps
CHPP Services Pumps
Dam M4
Dam M3
Dam M1
Dam M2
UG Supply Tanks
Recycled Water Treatment Plant
Sewage Treatment Plant
STP1/STP2
Sydney Water to UG
Admin
Admin Building
Septic System
CHPP
Truckfill
Washdown / Miscellaneous Use
Dam S4
Main Bath Contractor Bath
Bathhouse Amenities
Washery Floctanks
Loss
Pit Top Washdown
LOP4 to Teatree Hollow
SWC Main Meter
SYDNEY WATER (Potable)
Dam S2 & S3
Stockpile Sprays
Dam M5 & M6
Bargo River
‡ 810 filter block - primary settlement area
Legend
Gravity Flow or Overflow
Pumped Flow
Mixed Water Store
Raw Water Store
Manual Value
Existing Flow Meter (CITECT)
Existing Manual Read Flow Meter
V-Notch Weir with Water Level Sensor and Logger
File: 121171.18/DWGs&Figures/Schematics/Tahmoor Schematic_Existing.dwg

APPENDIX 7

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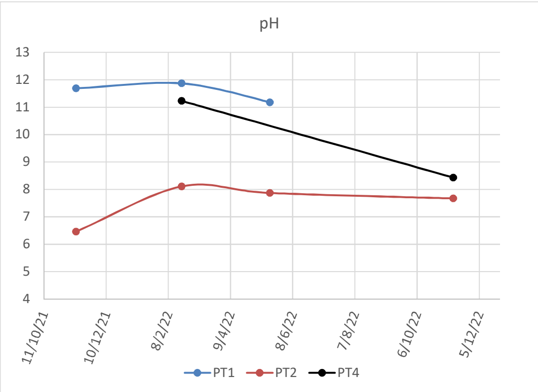
pH	PT1	PT2	PT4
5/9/19	5.88	5.68	5.69
14/11/19	9.5	5.9	4.46
20/2/20	10	6.9	5.38
18/8/20	10.81	6.15	5.8
17/11/20	10.79	7.87	6.15
1/2/21	11.21	6.26	8.93
24/5/21	10.98	6.05	5.8
27/8/21	11.14	6.38	
11/11/21	11.69	6.46	
21/2/22	11.87	8.11	11.23
17/5/22	11.18	7.87	
10/11/22		7.67	8.43
Min	5.88	5.68	4.46
Max	11.87	8.11	11.23
Median	10.98	6.42	5.8

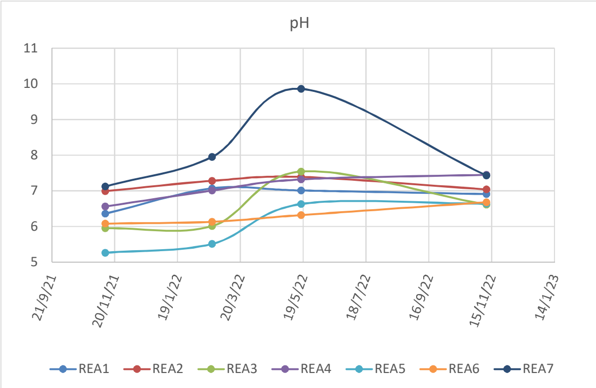
EC	PT1	PT2	PT4
5/9/19	1542	758	3290
14/11/19	1490	632	3190
20/2/20	1605	977	3000
18/8/20	1560	257	1250
17/11/20	1176	633	240
1/2/21	1395	572	298
24/5/21	1855	765	312
27/8/21	1921	356	
11/11/21	2420	644	
21/2/22	1965	472	463
17/5/22	2390	295	
10/11/22		621	609
Min	1176	257	240
Max	2420	977	3290
Median	1605	626.5	609

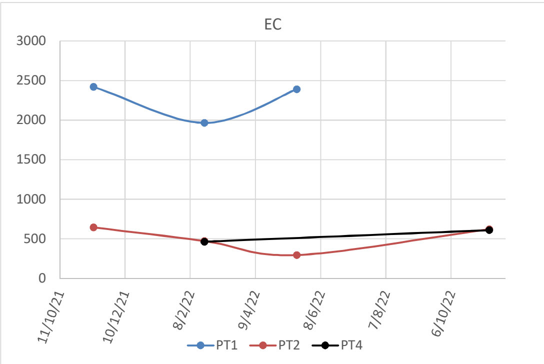
pH	REA1	REA2	REA3	REA4	REA5	REA6	REA7
9/8/19	7.49	7.7	5.04	5.86	7.88	7.89	6.65
11/10/19	6.25	5.55	5.48	5.72	5.89	6.22	6.59
14/11/19	5.91	5.62	5.4	5.87	5.33	5.9	5.99
20/2/20	5.94	5.99	5.44	5.84	6.1	5.88	6.54
18/8/20	5.19	5.58	5.16	5.2	5.4	5.38	6.21
17/11/20	6.24	6.6	6.66	6.12	6.72	6.13	6.77
1/2/21	5.99	6.32	5.61	5.54	5.41	6.03	6.28
24/5/21	5.58	6.6	5.66	5.31	5.1	5.41	6.06
27/8/21	6.2	6.7	6.11	5.95	5.12	5.93	6.89
11/11/21	6.36	6.99	5.95	6.56	5.26	6.08	7.12
21/2/22	7.07	7.28	6.01	7.01	5.51	6.13	7.95
17/5/22	7.01	7.39	7.54	7.32	6.63	6.32	9.86
10/11/22	6.91	7.04	6.61	7.45	6.64	6.68	7.43
Min	5.19	5.55	5.04	5.2	5.1	5.38	5.99
Max	7.49	7.7	7.54	7.45	7.88	7.89	9.86
Median	6.2	6.6	5.61	5.86	5.41	6.03	6.59

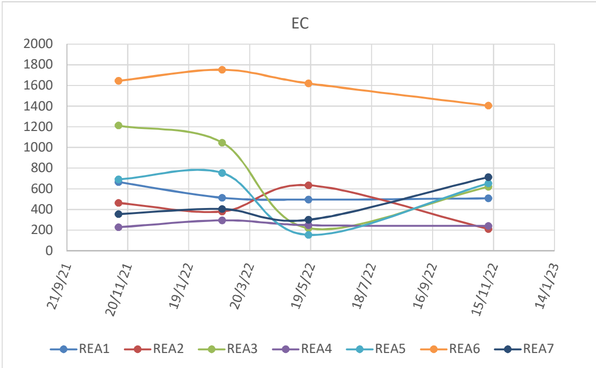
EC	REA1	REA2	REA3	REA4	REA5	REA6	REA7
9/8/19	477	2940	1030	958	750	1780	1084
11/10/19	583	4200	1000	747	608	1450	672
14/11/19	519	3400	1270	930	634	1377	787
20/2/20	563	1992	976	936	309	1358	744
18/8/20	570	623	1050	1024	380	1218	653
17/11/20	515	262	956	790	323	1215	568
1/2/21	502	333	1055	754	490	1193	632
24/5/21	430	423	323	145	606	1426	309
27/8/21	509	386	489	222	489	1146	312
11/11/21	665	463	1212	228	691	1645	355
21/2/22	513	380	1046	295	753	1752	404
17/5/22	495	634	218	248	154	1620	300
10/11/22	507.6	210.6	620	240	652	1404	713
Min	430	210.6	218	145	154	1146	300
Max	665	4200	1270	1024	753	1780	1084
Median	515	463	1030	754	606	1377	632

wellhead flooded - no access









		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		TDS	Na	Ca	K	Mg	Cl	F	HCO3	SO4	TP	TN	Fe T	Fe	Mn T	Mn	Cu	Pb	Zn	Cd	Ni	Al	As	Sr	Li	Ba	Se	DOC
REA3	**16/07/19**	595	125	48	5.8	31	285	0.11	125	19	0.37	1.4	8.6	3.7	2.5	2.2	<0.001	<0.001	0.46		0.04	0.01	<0.01	0.10	0.017	0.17		2
REA4	**16/07/19**	480	115	22	15	20	235	0.15	63	28	0.28	1.8	19	12	2.4	2.3	<0.001	<0.001	0.50		0.03	<0.01	<0.01	0.089	0.022	0.16		2
REA5	**16/07/19**	390	84	28	4.6	18	190	0.13	65	17	0.26	1.0	20	6.5	2.1	2.1	<0.001	<0.001	0.66		0.03	0.03	<0.01	0.056	0.010	0.12		<1
REA6	**16/07/19**	1220	340	62	4.9	27	445	0.20	280	170	0.50	0.7	43	11	2.5	2.3	<0.001	<0.001	0.28		0.04	0.01	<0.01	0.29	0.026	0.10		9
REA7	**16/07/19**	680	215	21	16	15	50	0.19	635	26	0.07	0.9	6.5	5.5	0.22	0.17	<0.001	<0.001	0.20		0.04	0.01	<0.01	0.24	0.28	0.73		4
REA2	**09/08/19**	1740	445	67	8.9	91	995	0.18	92	58	0.08	0.5	27	20	3.2	3.0	<0.001	<0.001	0.68		0.06	<0.01	<0.01	0.19	0.039	0.13		1
REA1	**12/09/19**	260	78	3.2	2.5	8.2	81	0.14	130	2	<0.01	0.6	9.5	8.6	0.71	0.66	<0.001	<0.001	0.18		0.04	<0.01	<0.01	0.013	0.084	0.062		
REA1	**10/10/19**	250	73	4.1	2.1	8.2	79	0.14	135	2	0.06	0.7	16	16	0.95	0.90	<0.001	<0.001	0.017		0.05	0.04	<0.01	0.021	0.11	0.083		4
REA2	**10/10/19**	1690	430	62	8.8	86	960	0.18	92	64	0.06	0.7	41	38	3.4	3.4	<0.001	<0.001	0.16		0.06	0.03	<0.01	0.23	0.048	0.17		2
REA3	**10/10/19**	550	115	24	4.7	29	305	<0.1	37	15	0.13	0.9	40	39	2.8	2.8	<0.001	<0.001	0.19		0.03	0.05	<0.01	0.081	0.017	0.26		<1
REA4	**10/10/19**	495	110	31	10	20	230	0.12	72	42	0.06	2.5	21	21	2.5	2.5	<0.001	<0.001	0.072		0.02	0.05	<0.01	0.066	0.018	0.13		10
REA5	**10/10/19**	370	81	24	3.2	17	185	<0.1	61	14	0.09	0.5	17	15	2.3	2.3	<0.001	<0.001	0.77		0.03	0.02	<0.01	0.084	0.014	0.19		2
REA6	**10/10/19**	1120	285	65	5.2	26	385	0.25	315	120	0.16	1.7	65	33	3.3	3.0	<0.001	<0.001	0.035		<0.01	0.01	<0.01	0.27	0.025	0.10		5
REA7	**10/10/19**	465	150	20	13	12	43	0.21	410	33	0.08	1.1	3.0	1.6	0.50	0.50	<0.001	<0.001	0.016		0.02	<0.01	<0.01	0.11	0.21	0.35		3
REA1	**14/11/19**	265	84	3.5	1.3	6.4	87	0.21	125	6	0.08	0.7	15	15	1.0	0.91	<0.001	<0.001	0.021		0.06	0.03	<0.01	0.018	0.14	0.079		2
REA2	**14/11/19**	1770	450	60	10	82	985	0.22	120	61	0.17	1.9	52	49	3.5	3.3	<0.001	<0.001	0.20		0.05	0.02	<0.01	0.29	0.072	0.18		3
REA3	**14/11/19**	500	120	7.2	3.2	30	300	<0.1	5	13	0.15	1.1	39	38	2.8	2.8	<0.001	<0.001	0.23		0.03	0.04	<0.01	0.067	0.020	0.27		<1
REA4	**14/11/19**	510	115	27	8.4	21	245	0.13	85	27	0.15	3.6	21	18	2.6	2.4	<0.001	<0.001	0.078		0.01	0.03	<0.01	0.090	0.034	0.067		16
REA5	**14/11/19**	355	86	8.5	2.2	14	195	0.11	8	11	0.11	0.6	33	32	2.3	2.3	<0.001	<0.001	1.8		0.06	0.03	<0.01	0.10	0.013	0.16		1
REA6	**14/11/19**	970	260	58	4.1	23	380	0.27	225	110	0.40	1.0	42	31	2.7	2.4	<0.001	<0.001	0.019		<0.01	0.04	<0.01	0.26	0.037	0.088		6
REA7	**14/11/19**	470	140	18	10	11	45	0.20	385	39	0.09	1.1	3.4	1.2	0.48	0.44	<0.001	<0.001	0.027		0.02	0.03	<0.01	0.15	0.23	0.28		6
REA1	**20/02/20**	275	82	5.6	2.5	6.7	88	0.23	125	8	0.04	0.3	11	9.2	0.72	0.71	<0.001	<0.001	0.036		0.06	0.04	<0.01	0.027	0.11	0.077	<0.01	2
REA2	**20/02/20**	1220	275	77	14	51	550	0.21	225	105	0.13	1.8	18	14	2.2	1.8	<0.001	<0.001	0.090		0.02	0.03	<0.01	0.53	0.029	0.13	<0.01	13
REA3	**20/02/20**	485	125	8.4	5.3	26	285	0.11	4	15	0.10	0.5	23	18	2.3	2.3	<0.001	<0.001	0.26		0.03	0.05	<0.01	0.063	0.015	0.19	<0.01	1
REA4	**20/02/20**	490	115	22	8.5	19	235	0.12	85	19	0.06	1.7	20	18	2.3	2.2	<0.001	<0.001	0.095		0.01	0.03	<0.01	0.082	0.019	0.082	<0.01	9
REA5	**20/02/20**	150	24	12	4.1	6.9	49	<0.1	37	24	0.12	1.9	3.4	2.7	0.35	0.35	<0.001	<0.001	0.13		0.01	0.04	<0.01	0.057	0.011	0.048	<0.01	8
REA6	**20/02/20**	820	220	42	5.2	20	345	0.24	160	84	0.28	0.7	31	27	2.1	2.0	<0.001	<0.001	0.087		0.04	0.02	<0.01	0.30	0.020	0.10	<0.01	7
REA7	**20/02/20**	425	125	15	11	10	43	0.21	340	35	0.09	0.8	0.80	0.76	0.23	0.21	<0.001	<0.001	0.023		0.01	0.03	<0.01	0.12	0.19	0.11	<0.01	5
REA1	**17/11/20**	245	88	5.1	1.8	6.7	83	0.16	120	11	0.10	0.6	19	13	0.85	0.74	<0.001	<0.001	0.056		0.05	0.04	<0.01	0.021	0.10	0.081	<0.01	2
REA2	**17/11/20**	380	43	64	20	9.0	43	0.14	225	77	0.10	0.9	3.6	2.6	0.10	0.10	<0.001	<0.001	0.049		<0.01	0.04	<0.01	0.44	0.003	0.026	<0.01	19
REA3	**17/11/20**	485	110	10	3.3	29	280	<0.1	<1	16	0.07	0.4	39	34	2.6	2.2	<0.001	<0.001	0.10		0.03	0.02	<0.01	0.051	0.010	0.23	<0.01	<1
REA4	**17/11/20**	500	115	31	7.2	23	240	0.11	105	13	0.10	1.6	18	16	2.4	2.1	<0.001	<0.001	0.047		<0.01	0.01	<0.01	0.11	0.023	0.067	<0.01	3
REA5	**17/11/20**	195	43	12	4.1	10	95	<0.1	23	24	0.08	0.9	4.0	3.7	0.28	0.25	<0.001	<0.001	0.94		0.02	<0.01	<0.01	0.064	0.004	0.073	<0.01	2
REA6	**17/11/20**	790	235	36	4.2	25	355	0.26	140	70	0.41	1.2	60	27	2.3	2.0	<0.001	<0.001	0.066		0.04	0.02	<0.01	0.29	0.019	0.13	<0.01	4
REA7	**17/11/20**	395	130	13	10	9.4	43	0.17	315	30	0.08	0.7	4.9	1.5	0.31	0.29	<0.001	<0.001	0.059		0.01	0.02	<0.01	0.085	0.14	0.085	<0.01	3
REA1	**20/2/21**	250	79	3.4	1.2	6.4	82	0.20	115	10	0.04	0.5	12	12	0.90	0.85	<0.001	<0.001	0.024		0.05	0.01	<0.01	0.019	0.10	0.085	<0.01	2
REA2	**20/2/21**	315	31	63	14	7.2	36	0.13	215	48	0.12	1.2	3.1	1.6	0.07	0.06	<0.001	<0.001	0.026		<0.01	0.05	<0.01	0.41	0.004	0.054	<0.01	19
REA3	**20/2/21**	470	110	10	2.5	29	280	<0.1	<1	19	0.11	0.4	33	30	2.9	2.3	<0.001	<0.001	0.14		0.03	0.04	<0.01	0.053	0.011	0.22	<0.01	1
REA4	**20/2/21**	440	105	20	6.1	19	235	<0.1	43	14	<0.01	0.3	30	23	2.5	2.2	<0.001	<0.001	0.036		<0.01	0.02	<0.01	0.18	0.015	0.18	<0.01	2
REA5	**20/2/21**	295	76	7.9	2.9	15	165	0.11	7	23	0.06	0.4	15	13	1.9	1.7	<0.001	<0.001	1.1		0.03	0.03	<0.01	0.060	0.007	0.11	<0.01	2
REA6	**20/2/21**	815	225	32	3.5	24	390	0.30	140	66	0.33	1.0	53	24	2.4	2.2	<0.001	<0.001	0.047		0.04	0.02	<0.01	0.28	0.021	0.12	<0.01	3
REA7	**20/2/21**	390	125	13	10	8.8	39	0.21	320	29	0.04	0.4	1.4	1.2	0.15	0.11	<0.001	<0.001	0.050		0.01	0.02	<0.01	0.081	0.16	0.14	<0.01	4
REA1	**24/5/21**	0	88	5.1	1.9	7.7	88	0.16	120	11	0.03	0.3	13	11	0.88	0.82	<0.001	<0.001	0.030	<0.0002	0.05	0.02	<0.01	0.018	0.10	0.082	<0.01	2
REA2	**24/5/21**	250	19	58	8.3	5.5	20	0.10	180	39	0.08	1.0	2.3	1.4	0.06	0.06	0.004	0.002	0.11	<0.0002	<0.01	0.05	<0.01	0.26	0.006	0.037	<0.01	15
REA3	**24/5/21**	175	27	26	6.2	3.1	17	<0.1	135	16	0.14	1.4	12	4.2	0.22	0.15	0.006	0.003	0.93	<0.0002	0.01	0.04	<0.01	0.12	0.014	0.035	<0.01	5
REA4	**24/5/21**	76	13	10	3.4	1.9	11	<0.1	41	13	0.06	0.5	2.2	0.28	0.03	0.03	0.002	0.002	0.24	<0.0002	<0.01	0.05	<0.01	0.069	0.008	0.031	<0.01	4
REA5	**24/5/21**	285	90	4.1	2.2	11	160	0.11	8	21	0.05	0.2	26	25	2.0	1.6	0.003	0.004	0.82	<0.0002	0.02	0.03	<0.01	0.045	0.007	0.11	<0.01	1
REA6	**24/5/21**	770	240	24	4.5	26	370	0.26	100	62	0.31	1.2	39	28	1.9	1.9	0.001	<0.001	0.16	<0.0002	0.05	0.03	<0.01	0.29	0.018	0.10	<0.01	3
REA7	**24/5/21**	165	47	3.6	16	2.4	15	<0.1	105	25	0.05	0.2	1.6	0.72	0.09	0.07	<0.001	<0.001	0.057	<0.0002	<0.01	0.05	<0.01	0.043	0.015	0.025	<0.01	2
REA1	**27/8/21**	265	84	5.8	2.2	7.2	88	0.17	125	11	0.25	1.4	22	12	0.93	0.85	0.002	<0.001	0.053	<0.0002	0.06	<0.01	<0.01	0.10	0.074	0.016	<0.01	<1
REA2	**27/8/21**	235	18	55	10	4.5	20	0.13	180	33	0.19	2.0	10	4.6	0.24	0.23	0.002	<0.001	0.049	<0.0002	<0.01	0.05	<0.01	0.004	0.037	0.26	<0.01	14
REA3	**27/8/21**	320	67	32	8.2	12	145	<0.1	82	18	0.09	0.6	17	9.3	1.4	1.1	<0.001	<0.001	0.48	<0.0002	0.02	0.02	<0.01	0.012	0.10	0.11	<0.01	<1
REA4	**27/8/21**	82	13	12	4.8	2.0	11	<0.1	55	12	<0.01	0.8	1.8	0.61	0.15	0.15	0.001	<0.001	0.21	<0.0002	<0.01	0.02	<0.01	0.005	0.047	0.081	<0.01	3
REA5	**27/8/21**	325	71	19	3.9	12	175	<0.1	8	19	0.04	0.3	20	17	2.3	2.1	0.002	0.001	1.1	<0.0002	0.03	0.04	<0.01	0.008	0.13	0.026	<0.01	<1
REA6	**27/8/21**	780	225	22	4.2	24	375	0.27	97	54	0.14	0.3	36	30	2.3	2.2	<0.001	<0.001	0.062	<0.0002	0.04	0.01	<0.01	0.021	0.082	0.37	<0.01	<1
REA7	**27/8/21**	160	37	5.5	21	1.7	17	<0.1	110	21	0.04	0.6	2.0	1.2	0.11	0.10	<0.001	<0.001	0.019	<0.0002	<0.01	0.03	<0.01	0.018	0.031	0.047	<0.01	1
REA1	**11/11/21**	275	81	7.9	3.5	6.4	91	0.15	125	11	0.09	0.5	12	12	0.84	0.79	<0.001	<0.001	0.019	<0.0002	0.05	0.01	<0.01	0.10	0.079	0.015	<0.01	<1
REA2	**11/11/21**	230	17	55	11	4.6	19	0.10	195	24	0.04	0.7	1.9	1.6	0.08	0.07	<0.001	<0.001	0.030	<0.0002	<0.01	0.04	<0.01	0.002	0.037	0.26	<0.01	14
REA3	**11/11/21**	475	110	20	5.4	25	280	<0.1	2	19	0.08	0.2	26	19	2.4	2.3	<0.001	<0.001	0.17	<0.0002	0.03	0.03	<0.01	0.008	0.21	0.076	<0.01	<1
REA4	**11/11/21**	91	15	11	5.9	3.1	12	<0.1	59	13	0.03	0.5	3.9	3.5	0.19	0.17	<0.001	<0.001	0.061	<0.0002	<0.01	0.03	<0.01	0.003	0.050	0.091	<0.01	3
REA5	**11/11/21**	315	81	12	2.8	14	180	<0.1	5	15	0.03	0.4	5.2	4.6	2.2	2.2	0.003	<0.001	0.89	<0.0002	0.04	0.01	<0.01	0.010	0.13	0.027	<0.01	<1
REA6	**11/11/21**	715	210	19	3.5	22	345	0.22	91	51	0.13	0.3	27	23	2.2	2.1	<0.001	<0.001	0.047	<0.0002	0.03	0.02	<0.01	0.017	0.081	0.33	<0.01	<1
REA7	**11/11/21**	170	40	5.1	26	1.8	19	<0.1	120	19	0.06	0.6	2.2	1.7	0.16	0.13	<0.001	<0.001	0.032	<0.0002	<0.01	<0.01	<0.01	0.018	0.078	0.064	<0.01	<1
REA1	**11/11/21**	275	81	7.9	3.5	6.4	91	0.15	125	11	0.09	0.5	12	12	0.84	0.79	<0.001	<0.001	0.019	<0.0002	0.05	0.01	<0.01	0.10	0.079	0.015	<0.01	<1
REA2	**11/11/21**	230	17	55	11	4.6	19	0.10	195	24	0.04	0.7	1.9	1.6	0.08	0.07	<0.001	<0.001	0.030	<0.0002	<0.01	0.04	<0.01	0.002	0.037	0.26	<0.01	14
REA3	**11/11/21**	475	110	20	5.4	25	280	<0.1	2	19	0.08	0.2	26	19	2.4	2.3	<0.001	<0.001	0.17	<0.0002	0.03	0.03	<0.01	0.008	0.21	0.076	<0.01	<1
REA4	**11/11/21**	91	15	11	5.9	3.1	12	<0.1	59	13	0.03	0.5	3.9	3.5	0.19	0.17	<0.001	<0.001	0.061	<0.0002	<0.01	0.03	<0.01	0.003	0.050	0.091	<0.01	3
REA5	**11/11/21**	315	81	12	2.8	14	180	<0.1	5	15	0.03	0.4	5.2	4.6	2.2	2.2	0.003	<0.001	0.89	<0.0002	0.04	0.01	<0.01	0.010	0.13	0.027	<0.01	<1
REA6	**11/11/21**	715	210	19	3.5	22	345	0.22	91	51	0.13	0.3	27	23	2.2	2.1	<0.001	<0.001	0.047	<0.0002	0.03	0.02	<0.01	0.017	0.081	0.33	<0.01	<1
REA7	**11/11/21**	170	40	5.1	26	1.8	19	<0.1	120	19	0.06	0.6	2.2	1.7	0.16	0.13	<0.001	<0.001	0.032	<0.0002	<0.01	<0.01	<0.01	0.018	0.078	0.064	<0.01	<1

REA1	**21/02/2022**	260	83	8.2	2.1	7.1	85	0.16	120	11	<0.01	0.7	15	11	0.72	0.67	<0.001	<0.001	0.016	<0.0002	0.06	0.04	<0.01	0.1	0.091	0.036	<0.01	1
REA2	**21/02/2022**	235	17	55	12	4.9	19	0.11	200	18	<0.01	0.7	1.2	1	0.05	0.03	<0.001	<0.001	0.047	<0.0002	<0.01	0.05	<0.01	0.007	0.05	0.26	<0.01	14
REA3	**21/02/2022**	460	115	14	6.1	28	265	<0.1	11	16	0.15	0.5	2	1.9	2.3	2	<0.001	<0.001	0.12	<0.0002	0.03	0.03	<0.01	0.012	0.22	0.066	<0.01	<1
REA4	**21/02/2022**	145	25	19	5.3	2.7	12	<0.1	115	14	0.11	0.9	2.5	1	0.25	0.2	<0.001	<0.001	0.056	<0.0002	<0.01	0.02	<0.01	0.024	0.059	0.077	<0.01	4
REA5	**21/02/2022**	320	80	16	2.7	14	180	<0.1	6	16	0.09	0.8	1.5	0.76	2.1	1.9	<0.001	<0.001	0.95	<0.0002	0.02	0.04	<0.01	0.01	0.16	0.17	<0.01	<1
REA6	**21/02/2022**	765	245	20	4.1	23	375	0.25	100	50	0.05	0.6	20	15	2.2	2	<0.001	<0.001	0.081	<0.0002	0.03	0.04	<0.01	0.021	0.1	0.35	<0.01	1
REA7	**21/02/2022**	230	53	6.4	35	1.5	19	0.11	170	23	0.02	1.1	0.86	0.77	0.08	0.07	<0.001	<0.001	0.007	<0.0002	<0.01	0.05	<0.01	0.032	0.049	0.073	<0.01	2

REA1	**10/11/2022**	330.2	73	2	1	6.2	77	0.2	120	9	0.08	0.2	25	16	0.94	0.78	<0.001	<0.001	0.004	_	0.045	<0.001	<0.001	0.016	0.13	0.088	<0.001	7
REA2	**10/11/2022**	136.5	13	49	5.5	4	8	0.1	160	6	0.1	1.4	3.5	0.19	0.33	0.011	0.003	<0.001	0.007	_	0.001	0.03	<0.001	0.18	0.001	0.036	<0.001	16
REA3	**10/11/2022**	403	8.4	24	4	3	85	<0.1	36	7	0.08	0.5	11	0.07	1.2	0.09	0.004	<0.001	0.082	_	0.001	0.06	<0.001	0.082	0.001	0.027	<0.001	7
REA4	**10/11/2022**	156	8.8	31	11	1	5	<0.1	110	4	<0.05	0.3	2.4	0.03	0.051	<.001	0.003	<0.001	0.085		0.005	0.02	<0.001	0.14	0.008	0.018	<0.001	6
REA5	**10/11/2022**	422.5	38	5.4	3	8.6	100	0.1	15	9	0.1	0.2	30	2.3	1.3	0.41	0.003	<0.001	2.1	_	0.013	0.05	<0.001	0.021	0.005	0.065	<0.001	5
REA6	**10/11/2022**	910	190	18	4	18	300	0.3	130	38	0.2	0.1	38	25	2.2	1.9	<0.001	<0.001	0.012	_	0.012	0.02	<0.001	0.28	0.03	0.1	<0.001	9
REA7	**10/11/2022**	461.5	72	6	27	5	29	0.2	230	29	<0.05	0.1	2.6	2.7	0.13	0.15	<0.001	<0.001	0.002	_	0.007	0.02	0.001	0.043	0.12	0.11	<0.001	3

		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site	**Date**	**TDS**	**Na**	**Ca**	**K**	**Mg**	**Cl**	**F**	**HCO3**	**SO4**	**TP**	**TN**	**Fe T**	**Fe**	**Mn T**	**Mn**	**Cu**	**Pb**	**Zn**	**Cd**	**Ni**	**Al**	**As**	**Sr**	**Li**	**Ba**	**Se**	**DOC**
PIT TOP 1	**5/09/2019**	970	300	14	86	14	260	0.23	495	51	0.18	2.2	4.6	0.14	0.36	0.33	0.003	<0.001	0.052	_	0.03	0.04	<0.01	0.10	0.15	0.047	_	7
PIT TOP 2	**5/09/2019**	520	72	83	12	33	30	0.14	560	6	0.12	1.0	8.1	2.5	0.23	0.18	0.001	<0.001	0.012	_	<0.01	<0.01	<0.01	0.82	0.021	1.2	_	6
PIT TOP 4	**5/09/2019**	1750	570	40	7.3	69	1060	0.40	62	36	0.19	1.5	3.4	0.56	4.3	4.2	0.004	<0.001	1.2	_	0.07	0.05	<0.01	0.11	0.025	0.17	_	3
PIT TOP1	**14/11/19**	800	265	8.2	66	7.5	230	0.25	165	37	0.08	1.8	1.0	0.95	0.05	0.03	0.001	<0.001	0.006	_	0.03	0.05	<0.01	0.14	0.22	0.023	140	11
PIT TOP2	**14/11/19**	425	76	43	9.5	21	34	0.11	385	20	5.5	6.0	110	8.5	0.46	0.14	<0.001	<0.001	0.008	_	<0.01	0.03	<0.01	0.60	0.013	0.74	_	4
PIT TOP4	**14/11/19**	1710	530	29	5.7	70	1020	0.51	<1	42	0.11	1.7	5.4	1.8	4.4	4.3	0.005	0.003	0.56	_	0.07	0.11	<0.01	0.14	0.046	0.17	_	4
PIT TOP 1	**20/02/20**	680	245	1.6	64	1.4	200	0.22	10	32	3.7	2.4	1.5	1.4	0.06	0.04	<0.001	<0.001	0.016	_	0.03	0.05	<0.01	0.11	0.21	0.016	<0.01	9
PIT TOP 2	**20/02/20**	560	43	105	18	36	34	0.13	570	21	0.05	4.0	1.2	0.55	0.08	0.05	<0.001	<0.001	0.085	_	<0.01	0.01	<0.01	1.1	0.12	0.95	<0.01	5
PIT TOP 4	**20/02/20**	1700	500	23	11	72	1020	0.45	<1	47	0.05	0.9	1.7	1.3	3.8	3.8	0.009	0.011	0.62		0.09	1.3	<0.01	0.18	0.037	0.19	<0.01	3
PIT TOP 1	**17/11/20**	620	260	0.8	59	0.9	185	0.21	<1	29	0.10	1.3	4.7	0.52	0.06	0.05	<0.001	<0.001	0.032	_	0.02	0.28	<0.01	0.12	0.14	0.012	<0.01	12
PIT TOP 2	**17/11/20**	370	43	64	13	20	19	<0.1	365	20	0.08	0.7	10	3.2	0.13	0.13	<0.001	<0.001	0.017	_	<0.01	0.03	<0.01	0.74	0.025	1.3	<0.01	3
PIT TOP 4	**17/11/20**	155	26	19	7.3	6.1	11	<0.1	115	23	0.12	1.4	1.6	1.3	0.09	0.08	<0.001	<0.001	0.34		<0.01	0.05	<0.01	0.17	0.013	0.11	<0.01	11
PIT TOP 1	**20/2/21**	630	250	0.5	59	0.6	195	0.23	<1	28	0.05	1.4	190	16	0.10	0.08	<0.001	<0.001	0.030	_	0.02	0.31	<0.01	0.12	0.14	0.015	<0.01	13
PIT TOP 2	**20/2/21**	360	38	66	14	21	15	<0.1	385	17	0.03	0.7	5.1	3.8	0.14	0.11	<0.001	<0.001	0.015	_	<0.01	0.05	<0.01	0.74	0.027	1.3	<0.01	4
PIT TOP 4	**20/2/21**	140	27	12	6.8	4.5	17	0.11	98	16	0.15	3.0	3.1	1.2	0.06	0.04	<0.001	<0.001	0.10		<0.01	0.03	<0.01	0.47	0.034	0.068	<0.01	15
PIT TOP 1	**24/5/21**	620	245	0.7	63	0.5	190	0.22	<1	29	0.05	1.2	2.2	0.47	0.03	0.02	<0.001	<0.001	0.017	<0.0002	0.02	0.32	<0.01	0.12	0.13	0.016	<0.01	14
PIT TOP 2	**24/5/21**	580	61	98	15	39	20	<0.1	635	15	0.07	0.5	7.0	5.3	0.12	0.10	<0.001	<0.001	0.010	<0.0002	<0.01	0.03	<0.01	0.98	0.059	1.3	<0.01	3
PIT TOP 4	**24/5/21**	185	39	19	13	5.7	18	0.11	155	14	0.07	1.4	1.7	0.72	0.05	0.05	<0.001	<0.001	0.062	<0.0002	<0.01	0.05	<0.01	0.36	0.019	0.092	<0.01	15
PIT TOP 1	**27/8/21**	605	260	0.8	56	0.4	190	0.19	<1	27	0.17	2.3	8.1	1.7	0.12	0.09	<0.001	<0.001	0.025	<0.0002	0.02	0.36	<0.01	0.13	0.010	0.10	<0.01	16
PIT TOP 2	**27/8/21**	225	24	39	9.6	10	17	<0.1	200	12	0.03	0.6	12	5.3	0.13	0.09	<0.001	<0.001	0.016	<0.0002	<0.01	0.02	<0.01	0.015	0.66	0.36	<0.01	1
PIT TOP 2	**11/11/21**	260	32	44	10	11	15	<0.1	260	7	0.03	0.6	0.66	0.49	0.07	0.06	<0.001	<0.001	0.022	<0.0002	<0.01	0.02	<0.01	0.012	0.82	0.45	<0.01	3
PIT TOP 4	**11/11/21**	600	260	0.6	52	0.5	185	0.18	<1	25	0.07	2.8	1.5	1.4	0.26	0.23	<0.001	<0.001	0.006	<0.0002	<0.01	0.05	<0.01	0.12	0.032	0.12	<0.01	15
PIT TOP 1	**21/02/2022**	595	255	0.5	58	0.2	190	0.18	<1	27	0.2	1.9	0.62	0.43	0.13	0.1	<0.001	<0.001	0.016	<0.0002	0.02	0.47	<0.01	0.12	0.017	0.11	<0.01	13
PIT TOP 2	**21/02/2022**	210	23	36	11	9.3	10	<0.1	205	8	0.24	0.7	2	1.2	0.02	0.01	<0.001	<0.001	0.017	<0.0002	<0.01	0.04	<0.01	0.033	0.69	0.37	<0.01	2
PIT TOP 4	**21/02/2022**	155	44	3.6	42	0.5	10	<0.1	<1	16	0.01	2.7	1.5	0.35	0.02	0.02	<0.001	<0.001	0.01	<0.0002	<0.01	1.1	<0.01	0.069	0.085	0.59	<0.01	13
PIT TOP 1	**10/11/2022**																											
PIT TOP 2	**10/11/2022**	403	60	93	13	34	12	<0.1	460	14	<0.05	0.4	16	6.9	0.19	0.13	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	0.93	0.09	1.1	<0.001	4.00
PIT TOP 4	**10/11/2022**	396.5	42	32	4	28	8	0.2	270	31	1.8	1.8	9.2	0.98	2.1	0.64	<0.001	<0.001	0.01	-	<0.001	<0.001	<0.001	0.22	<0.001	0.07	<0.001	29

Not tested

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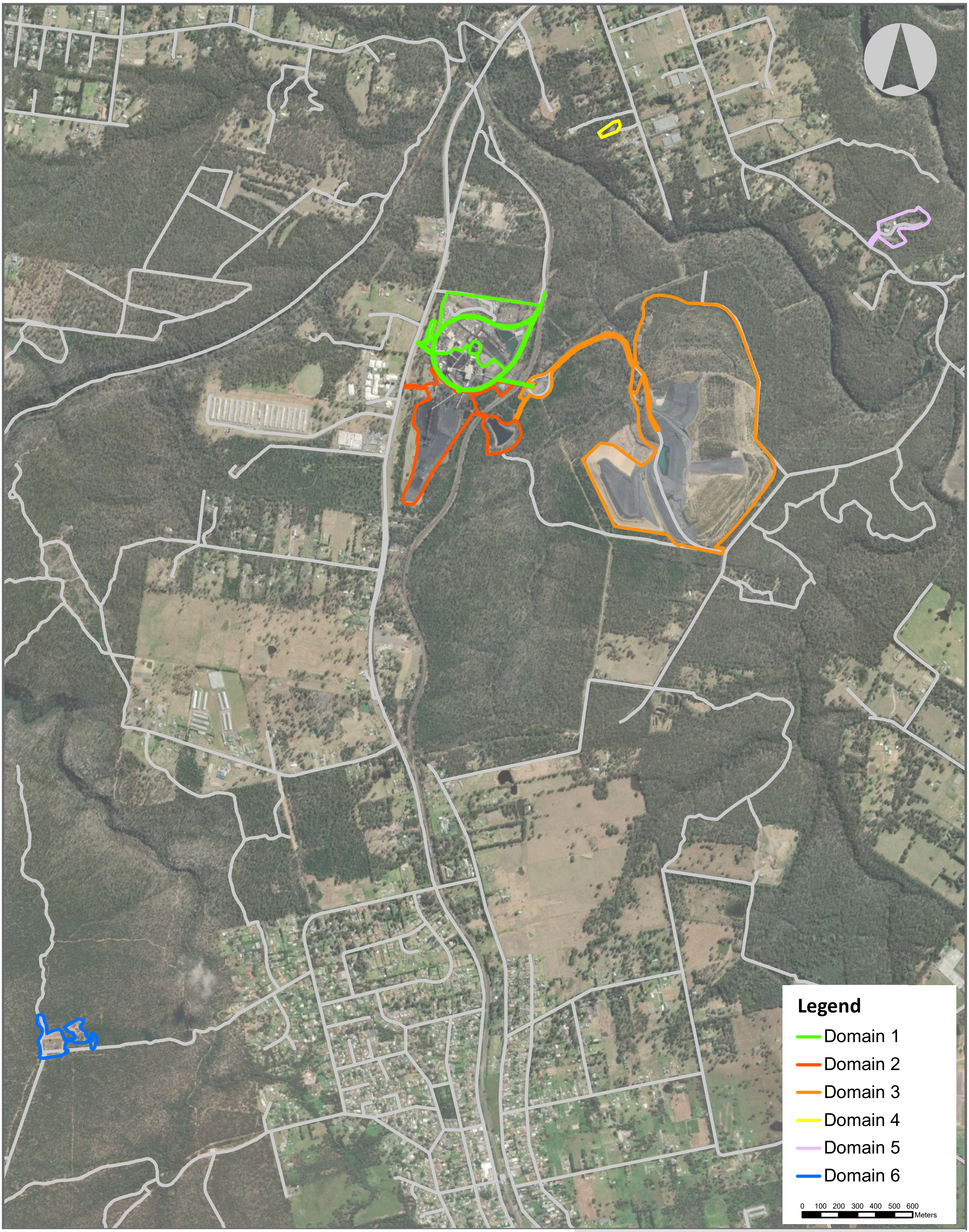
APPENDIX 8

simecgfg.com



Closure Domains

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APPENDIX 9

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Tahmoor Coal Pty Ltd. Rehabilitation Monitoring 2022

Tahmoor Coal Pty Ltd.

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DOCUMENT TRACKING

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Template 2.8.1

Contents

List of Tables

Abbreviations

Abbreviation	Description
ELA	Eco Logical Australia Pty Ltd
OGM	Organic Growth Medium
REA	Refuse Emplacement Area

1. Introduction

In 2022, rehabilitation monitoring was carried out by Eco Logical Australia Pty Ltd (ELA) in accordance with the Tahmoor Coal's Rehabilitation Management Plan - TAH-HSEC-402 and Rehabilitation Strategy TAH-HSEC-401 and Rehabilitation Monitoring procedure which require both:

- an annual walkover inspection of all areas within the Refuse Emplacement Area (REA) where rehabilitation activities have been completed including newly established revegetation
- monitoring of permanent monitoring sites within each mine closure Domain. Within the REA (closure Domain 3) permanent plots have been established in each development stage to assess revegetation progress.

These guidelines state:

"The objective of this monitoring is to evaluate progress of rehabilitation towards fulfilling long term land use objectives, such as the development towards a self-sustaining ecosystem."

Rehabilitation of vegetation within the REA has been carried out since 1993 as each stage of the refuse emplacement was constructed. The permanent monitoring sites program began in 2010 with the establishment of two permanent plots within each existing section of the REA and two reference site plots within relatively undisturbed native vegetation nearby. As each Stage of the REA was completed permanent plots have been established following revegetation. In addition, further plots were established in areas greater than four hectares to address the recommendations for native vegetation monitoring provided in the Rehabilitation Strategy. In future, in accordance with monitoring guidelines, additional permanent plots will be installed as each area of revegetation within the REA reaches an age of 5 years from planting.

Monitoring of permanent sites in the rehabilitation areas provides information regarding changes in both vegetation growth, senescence, colonisation, and species diversity. In addition, indication of the success of the rehabilitation is gained through comparison of both vegetation structure and species composition with the reference sites monitored in nearby bushland. Methods for measuring these values include detailed species counts and cover within 2 m x 2 m nested quadrats and species diversity, canopy cover, growth rates, reproductive potential, and progress within a 20 m x 10 m plot. Photographic monitoring of plots is also implemented.

The walkover inspection records details across each stage and includes information on the following factors:

- evidence of soil profile development and visual assessment of surface materials
- evidence of erosion and stability, and function of erosion and sediment control structures
- growth rates and evidence of plant mortality or dieback
- species diversity including identification of target species
- presence of over-storey, mid-storey and understorey species
- evidence of reproductive potential
- evidence of biological nutrient cycling
- occurrence of potholing or slumping and evidence of spontaneous combustion

- evidence of contamination or other limitations to vegetative establishment.

Native grass species have been trialled in areas where the existing vegetation within established revegetation areas was sparse. These grass planting trials were monitored to review the survival and growth of planted species.

More detailed presentation of the monitoring results is included in the appendices:

- **Appendix A - Monitoring 2021 – Mine Closure Domains 1 – 5 Permanent Sites** and
- **Appendix B - Monitoring 2021 - Annual Walkover – Refuse Emplacement Area and No. 2 Shaft Power Corridor.**

These appendices include collated details of the recorded monitoring results, the collected field data sheets, and monitoring photographs.

2. Results

2.1 Monitoring results prior to 2022

Revegetation across the REA was highly variable with some sections approximately 20 years old and others newly established with seeding carried out 24 months prior to monitoring. The native species included in the revegetation mix also varies, in both diversity and structural representation, between those areas revegetated prior to 2006 and those revegetated more recently.

Characteristics of sections revegetated prior to 2006 include:

- canopy species including *Eucalyptus* species, *Angophora* species and *Allocasuarina littoralis* providing cover ranging from good to limited, heights up to 10 m and exhibiting good growth. Second generation *Allocasuarina littoralis* were common near mature plants, with other canopy species second generation plants beginning to appear.
- smaller tree species including *Acacia decurrens and Acacia binervia* were also regenerating with second generation individuals present
- a midstorey that varied from dense stands of *Kunzea ambigua* (Tick Bush) or the non-local species *Leptospermum laevigatum* (Coast Teatree) to scattered *Acacia* species interspersed with other less abundant native species.
- highly effective weed control actions reduced weed cover where extensive stands of the weed *Andropogon virginicus* (Whiskey Grass) and smaller populations of *Eragrostis curvula* (African Lovegrass) were present and excluded all other species. Weed cover was generally low with weed control providing good on-going results.
- increasing colonisation by native grasses with cover increasing annually in most areas, including where exotic grasses have been controlled.
- vegetation was dominated by *Acacia* species, many of which are senescent or in some sections mixed native vegetation that is not representative of the local native plant communities. Senescent Acacias becoming less common.
- good species diversity including target species; however, many species had a low abundance.
- all species exhibited signs of good reproduction potential including the threatened species, *Persoonia bargoensis* and *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea).

Characteristics of sections revegetated in 2007 (Stage 8):

- originally planted with pasture species as a stabiliser, and was still dominated by exotic grasses in 2016
- trial of reseeding using the soil amelioration product OGM proved not suitable for the REA
- very limited cover by native species, both target and non-target
- scattered patches of native grasses with good cover prior to 2017.

Characteristics of sections revegetated post 2010 are:

- generally good germination rates on level areas with species from all strata represented
- germination more variable on slopes but still adequate
- growth rates moderate to very good

- limited weed populations.

2.2 Monitoring results in 2022

Erosion control structures which were implemented in 2019 remain in good condition and no major erosion was recorded along the slopes of the REA. An area in Stage 1 where seepage affected vegetation growth was rehabilitated with the ripping of the soil surface and mulching in 2018. This area continues to be in a good condition with no seepage evident in 2022. Nearby the seepage area, minor erosion has been recorded, this should continue to be monitored and minor works required to rectify the erosion if required.

Monitoring of grass trials was undertaken, the grass trials have previously shown that with adequate fencing, herbivory is somewhat controlled and have shown good growth rates of grasses. In 2022 grass trial monitoring was undertaken. Most of the fencing around the trials as been damaged, likely by macropods. Regardless, native grass diversity and cover were recorded as well as midstorey shrubs and come regenerating canopy species such as *Allocasuarina littoralis* and eucalypt species. This was particular evident within Stages 1, 2 and 3 which are likely to be naturally recruiting from the maturing plantings across those Stages.

The reference plots and permanent monitoring plots which were burnt by fire in 2019 showed good signs of recovery with epicormic growth evident of canopy species, high levels of seedings and saplings of canopy species noted, and a high level of species cover and diversity of grasses and forbs. There is also evident of nutrient recycling with termite mounds, ants and scats noted in those burnt plots. Litter cover had significantly improved in these plots with grass, leaf litter and twigs recorded in all plots.

Over the past 12 months there has been above average rainfall attributed to the current La Nina event. It is advised that all erosion control measures, and gully erosion are carefully monitored to prevent significant erosion developing.

The non-burnt plots in the REA showed slight decrease overall. However, most plots recorded an increased percentage of understorey cover which was attributed to the higher cover of non-grass species including midstorey species and recruitment of canopy species. It is likely that above average rainfall over the year had a positive impact on understorey species cover and across the REA.

Superficially, the result of the species diversity shows that species diversity across the REA has declined, however, this is due to the Reference plots being previously burnt and therefore the species diversity within the reference plots generally does not match the monitoring plots. Prior to the Reference sites being burnt, there were many target species recorded in the permanent monitoring plots. It is expected that as the Reference plots continue to regenerate, the results of species diversity of the reference plots against the monitoring plots will better align.

Some plots also recorded a higher percentage cover of weed cover which is expected considering the high rainfall coverage over the past 12 months.

Additional characteristics and changes that were noted include:

- adequate growth of the diameter at breast height (DBH) in all canopy species including juveniles and seedlings

- consistent senescence of *Acacia* spp.
- increase of weed cover over the last 12 months in stage 10 and 12A of the REA, in particular the cover of *Eragrostis curvula* (African Love Grass), increased weed management is required in this area.
- signs of a rabbit population observed
- herbivory of planted grasses in grass trials reducing reproductive potential of grass species.

Table 1 provides further details of the monitoring results from 2022 in comparison with results from earlier years and recommendations.

Table 1: Key monitoring results

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
Soil profile development	Highly variable and developing in the older stages of rehabilitation around leaf and grass litter, fallen timber, native grass clumps, and newer revegetation in rip lines. <u>2020</u> Development recorded in rip lines and areas with high leaf litter. Cover with grass litter low due to drought conditions	Soil profile continues to develop across all areas of the REA and litter cover has generally improved or remained consistent across all monitoring plots.	Nil.
Evidence of erosion	Isolated areas of minor gully erosion, rill and sheet wash have been recorded. Remediation works carried out at several locations. Additional drains installed to direct stormwater and addressing erosion in new rehabilitation area. Stormwater drains in some sections were rock lined to provide better erosion control. <u>2020</u> Limited, minor gully erosion present across the REA.	Limited, some erosion noted past the seepage area to the north of Stage 1 which should be monitored.	Repair areas of minor gully erosion with minor works (i.e., filling with rocks, branches, logs etc.) Monitor minor and major gully erosion.
Native plant species diversity	Species diversity has increased since monitoring began, with an increase in groundcover species seen in areas of weed control within the early revegetation areas. Native herbs and forbs are more abundant in areas where native grasses are colonising. The midstorey is dominated by *Acacia* spp., but also includes *Dodonaea* spp., *Persoonia* spp., *Kunzea ambigua and Cassinia* sp. Groundcover species diversity is good with herbs, sedges, lilies, and grasses all represented; however, many species have low abundance.	<u>Previously burnt vegetation</u> Continued evidence of epicormic growth in canopy species. Regeneration of Acacia spp. is high and many seedlings and saplings of *Eucalyptus* spp. and *Allocasuarina littoralis* noted within and around plots. Grass and forb cover in the understorey is regenerating and generally includes good species diversity and cover and includes target species. Leaf and twig litter significantly increased.	Maintain weed control program with attention to avoiding off-target damage

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
	<u>2020</u> <u>Burnt vegetation</u> Reference sites and stages 6 and 9 results were consumed by fire in 2019. These areas show evidence of epicormic growth in canopy species. Midstorey species consumed by fire and have not begun to regenerate yet. Grass and forb cover in the understorey is regenerating and generally includes good species diversity and cover and include target species. Leaf and twig litter slowly accumulating. <u>Non-burnt vegetation</u> Native species diversity remains consistent overall allowing for a dry season and a decrease in species diversity in undisturbed bushland. *Acacia* diversity reduced with senescence in some shrub species. Senescence of *Hakea* species also noted across stages 1 and 2. The number of target species (i.e., those consistent with reference sites and nearby native vegetation) within each monitoring plot remains adequate to good despite earlier drought conditions. Species diversity in canopy species adequate on average in most REA stages, however some sections have more limited diversity. Midstorey species diversity more limited. Forb species diversity limited.	<u>Non-burnt vegetation</u> Most plots recorded increased percentage of understorey cover including shrubs and non-grasses Native grass cover tended to decline overall Good diversity of species noted across the REA. Expected that target species in non-burnt plots will better align with the Reference sites as they continue to regenerate	

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
Native plant cover (overstorey, midstorey, groundcover)	Native cover is highly variable within all strata across the REA and, with some small areas devoid of vegetation. Canopy cover varies from good to very low, with much of the revegetation too young to provide a meaningful measurement. Sub-shrub cover is more limited with a number of species failing to reach maturity. Groundcover varies within the established revegetation areas from 100% to 0%. Colonisation by grasses and groundcover species is patchy but improving slowly. <u>2020</u> Native plant cover remains variable across the REA, with groundcover varying greatly and some areas devoid of groundcover species. Otherwise, native plant cover is increasing at a slow rate. Colonisation by groundcover species including grasses and sedges delayed by earlier drought conditions In more recent revegetation areas, native cover is consistent with high numbers of juvenile canopy species. <u>2021</u> Native plant cover has generally increased across the REA with most plots recording increase in cover of understorey stratum. Areas which have the least groundcover are within I1 and I2. Continue to monitor native plant cover in these plots and consider infilling with native grass tubestock.	Notable recruitment in midstorey stratum, as permanent plots continue to progress. Overstorey species second generation recruitment evident and consistent across the REA. Previously noted that plots I1 and I2 (Stage 12b) lacked groundcover species; result from 2022 monitoring recorded increase in understorey live cover and increase in total number of native species.	Continue to monitor groundcover diversity of Stage 12b.

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
Native plant growth rates and regeneration	Canopy species growth is adequate and is consistent with the growth rates determined in the undisturbed nearby native vegetation. Second generation canopy species are prevalent in the earlier revegetation areas. Many *Acacia parramattensis* are senescent or have died and fallen. Some species (particularly sub shrubs) failing to thrive to maturity, possibly due to selective herbivory by rabbits. Native grasses are regenerating and spreading in some sections strongly. <u>2020</u> For those monitoring plots burnt in the 2019 bushfires the following characteristics were noted: • all strata consumed by fire • canopy species showing epicormic growth • midstorey is absent, *Allocasuarina* and *Acacia* species did not survive hot fire • groundcover has recolonised following fire, generally low cover however, some monitoring plots have higher diversity of species post fire. • leaf litter and woody material largely consumed by fire, reduced cover of grass, twig litter is available. Growth rates are variable in newly established revegetation areas. Growth rates are generally better in those areas with low slope, indicating that moisture availability is limiting growth on steeper sections.	The growth rate in canopy species remains consistent and small increases recorded in all plots across the REA.	Nil.

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
	The growth rate in canopy species remains consistent. Senescent *Acacia* midstorey species are present across the REA. Growth rates, other than that of sub-shrubs, are adequate but variable. Second generation recruitment in this stratum is greatest in *Acacia* species, with recruitment in other species increasing slowly. Native grasses have increased in some monitoring plots despite drought conditions. <u>2021</u> The growth rate in canopy species remains consistent and small increases recorded in all plots across the REA.		
Threatened flora	Two threatened species have been observed within the rehabilitation areas, *Grevillea parviflora* subsp. *parviflora* and *Persoonia bargoensis* <u>2020</u> The population of *Grevillea parviflora* subsp. *parviflora* within Stage 6 has significantly decreased as a result of fire in late 2019. One individual seeding was found within this area during 2020 monitoring. The population of *Persoonia bargoensis* is increasing within areas of early revegetation. It is unknown if the plants previous recorded within the No 2 shaft 11kV power line were lost to fire in late 2019. <u>2021</u> Stable populations of *Grevillea parviflora* subsp. *parviflora* and *Persoonia bargoensis.*	Stable populations of *Grevillea parviflora* subsp. *parviflora* and *Persoonia bargoensis* in Stages 6 and 9. *Persoonia bargoensis* also recorded in some permanent monitoring plots in Stages 3, 4, & 5 and Stage 10 where it has not been recorded previously.	Continue to monitor threatened species populations. Weed control in the vicinity of these species to be carried out by hand.

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
Weed occurrences and cover	Weed densities were highly variable across the REA. Heavy infestations of *Andropogon virginicus* (Whiskey Grass) and smaller populations of *Eragrostis curvula* (African Lovegrass), *Sisymbrium officinale* (Hedge Mustard) and *Nassella trichotoma* (Serrated Tussock) were observed within the early rehabilitated areas in the north of the REA prior to 2010. Weed control programs were instigated with strong results. *Andropogon virginicus* and *Eragrostis curvula* continued to be present in isolated patches within the REA. *Cenchrus setaceus* (Fountain Grass) colonised the slopes of Stage 5 in 2017. <u>2020</u> Weed cover is generally low across the REA, however there is increased cover by *Eragrostis curvula* in several stages - the upper benches of Stages 14 and 16 and Stage 12, and the western section of stage 10. Patches of this weed are increasing across the REA. *Cenchrus setaceus* (Fountain Grass) continues to spread on the slopes of Stage 5. The population of *Sisymbrium officinale* has increased over the last 12 months. The small population of *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush) has increased over the last 12 months. <u>2021</u> The population of *Gomphocarpus fruticosus* was significantly lower than previous year.	*Gomphocarpus fruticosus* not recorded across REA *Cenchrus setaceus* not recorded across REA Populations of *Sisymbrium officinale* and *Eragrostis curvula* continue to spread across Stage 5 and parts of Stage 1. Large area of *Eragrostis curvula* present on top of upper benches of Stages 14 and 16 and Stage 12	Increase weed monitoring and weed control program overall, targeting key areas of weed infestations. Take care to avoid off-target damage during weed control works is to be considered. *Eragrostis curvula - control* mature plants year-round, with extra effort in spring before flowering look for flushes of seedlings after rain when temperatures are over 10°C (most seeds germinate in autumn and spring) and target the seedlings before they are six weeks old (DPI, 2023)

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
	Populations of *Sisymbrium officinale* and *Cenchrus setaceus* continue to spread across Stage 5 and parts of Stage 1. Large area of *Eragrostis curvula* present on top of upper benches of Stages 14 and 16 and Stage 12		
Non-local native species	Non-local native species are common within those sections of the REA which were revegetated prior to 2000 and are uncommon elsewhere. *Leptospermum laevigatum* is the most abundant non-local native species and is colonising strongly outside the original area of planting. *Acacia saligna* (Western Australian golden wattle) was recorded as both mature trees and juveniles. This species was controlled across the REA prior to November 2016. Most other species within this category are present in limited numbers and populations are not increasing. <u>2020</u> *Leptospermum laevigatum* remains abundant within the oldest revegetation area with scattered individuals beyond stages 1 and 2. These species have not been included in more recent seedings for revegetation within the REA. Limited *Acacia saligna* seedlings were located across the REA. <u>2021</u> *Leptospermum laevigatum* remains abundant. Acacia saligna is limited.	*Leptospermum laevigatum* remains abundant. *Acacia saligna* is limited.	Control the spread of *Leptospermum laevigatum* by controlling seedlings outside stages 1 and 2. Maintain monitoring for *Acacia saligna* and control opportunistically during weed control activities.
Feral fauna	Evidence of significant rabbit population. Herbivory by this species was considered to be impacting on the	Rabbits noted during field surveys	Rabbit monitoring to continue and control programme in conjunction

Key Characteristics	Summary - Results from Permanent Plot surveys 2010 – 2017 and Walkover surveys 2008 - 2012	Results from survey 2022	Recommendations
	success of revegetation by the selective removal of some species. Rabbit population controlled in 2017. 2020 A small rabbit population remains. 2021 A small rabbit population remains.		with neighbouring properties if required. Consultation with Local Land Services advisable.

References

Eco Logical Australia 2022. Tahmoor Coal Pty Ltd. Rehabilitation Monitoring 2021. Prepared for Tahmoor Coal Pty Ltd.

Department of Primary Industries. 2023. NSW Weed Wise. African Lovegrass (Eragrostis curvula) profile. Available from: https://weeds.dpi.nsw.gov.au (Accessed 13 February 2023).

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MEMBER OF GFG ALLIANCE

APPENDIX 10

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APPENDIX 11

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APPENDIX 12

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Date	Arrival	Departure	Total Tonnes railed
Sun-02-01-22	20:47	23:30	3364
Sun-02-01-22	23:39	1:40	3282
Mon-03-01-22	8:24	10:40	3381
Mon-03-01-22	11:20	14:00	3393
Mon-03-01-22	21:21	23:30	3340
Tue-04-01-22	8:24	10:40	3344
Tue-04-01-22	11:14	13:54	3331
Tue-04-01-22	23:52	1:35	3292
Wed-05-01-22	8:29	10:40	3345
Wed-05-01-22	11:08	14:10	3275
Wed-05-01-22	21:21	23:30	3276
Thu-06-01-22	8:24	10:40	3393
Thu-06-01-22	11:20	14:00	3371
Thu-06-01-22	21:21	23:30	3324
Thu-06-01-22	23:47	1:40	3318
Fri-07-01-22	8:17	10:40	3357
Fri-07-01-22	11:43	14:10	3568
Sun-09-01-22	19:58	20:35	3702
Sun-09-01-22	23:45	1:35	3499
Mon-10-01-22	8:24	10:40	3547
Mon-10-01-22	11:01	14:10	3308
Mon-10-01-22	21:21	23:30	3453
Mon-10-01-22	23:52	1:40	3362
Tue-11-01-22	8:24	10:40	3375
Tue-11-01-22	21:21	23:30	3408
Tue-11-01-22	23:47	1:40	3358
Wed-12-01-22	8:24	10:40	2720
Wed-12-01-22	11:20	14:00	3329
Wed-12-01-22	21:21	23:30	2482
Thu-13-01-22	8:24	10:40	3220
Thu-13-01-22	11:05	14:10	3400
Thu-13-01-22	21:21	23:30	3407
Thu-13-01-22	23:47	1:40	3381
Fri-14-01-22	8:24	10:40	3340
Fri-14-01-22	11:20	14:00	3337
Sun-16-01-22	20:47	23:30	3337
Sun-16-01-22	23:47	1:40	2400
Mon-17-01-22	8:24	10:40	2508
Mon-17-01-22	11:14	13:54	3288
Mon-17-01-22	21:26	23:29	3322
Mon-17-01-22	23:52	1:39	3346
Tue-18-01-22	8:29	10:40	3335
Tue-18-01-22	11:14	13:54	3332
Tue-18-01-22	21:28	23:29	3358
Tue-18-01-22	23:52	1:40	3305
Wed-19-01-22	8:24	10:40	3215
Wed-19-01-22	11:04	14:10	3244
Wed-19-01-22	21:21	23:30	3273
Wed-19-01-22	23:52	1:40	3319
Thu-20-01-22	8:24	10:40	3265
Thu-20-01-22	11:20	14:00	3257
Thu-20-01-22	21:26	23:30	3343
Thu-20-01-22	23:47	1:40	3321
Fri-21-01-22	8:29	10:40	3344
Fri-21-01-22	11:20	14:00	3343
Mon-24-01-22	11:04	14:10	3263
Mon-24-01-22	21:21	23:30	3309
Mon-24-01-22	23:47	1:40	3051
Tue-25-01-22	11:04	14:10	3214
Tue-25-01-22	21:26	23:29	3333
Tue-25-01-22	23:52	1:39	3344
Wed-26-01-22	8:29	10:40	3324
Wed-26-01-22	11:33	14:10	3164
Wed-26-01-22	21:11	23:30	3337
Wed-26-01-22	23:52	1:40	3348
Thu-27-01-22	8:26	10:40	3276
Thu-27-01-22	11:39	14:00	3246
Thu-27-01-22	21:26	23:29	3373
Thu-27-01-22	23:52	1:39	3342
Fri-28-01-22	8:29	10:40	3194
Fri-28-01-22	11:14	13:54	3223
Mon-31-01-22	21:26	23:20	3340
Mon-31-01-22	23:52	1:30	3353
Tue-01-02-22	8:29	10:40	3279
Tue-01-02-22	11:14	13:54	3198
Tue-01-02-22	21:26	23:25	3326
Tue-01-02-22	23:52	1:35	3352
Wed-02-02-22	8:29	10:40	3367

Date	Arrival	Departure	Total Tonnes railed
Mon-20-06-22	7:12	9:20	3378
Mon-20-06-22	12:46	15:33	3303
Mon-20-06-22	22:07	23:45	3477
Tue-21-06-22	12:38	15:04	3262
Tue-21-06-22	15:16	17:45	3365
Wed-22-06-22	6:33	9:21	3433
Wed-22-06-22	20:12	22:35	3433
Thu-23-06-22	13:59	17:00	3207
Fri-24-06-22	5:49	10:55	3442
Fri-24-06-22	22:45	1:10	3418
Sat-25-06-22	14:05	17:09	3376
Sun-26-06-22	5:49	8:55	3220
Sun-26-06-22	13:05	15:30	3327
Sun-26-06-22	19:31	22:40	3458
Mon-27-06-22	14:04	16:55	3438
Tue-28-06-22	5:51	8:15	3354
Tue-28-06-22	20:54	23:33	3403
Wed-29-06-22	13:21	15:04	3281
Wed-29-06-22	15:15	17:31	3390
Thu-30-06-22	6:25	9:20	3251
Thu-30-06-22	20:26	22:20	3396
Fri-01-07-22	15:41	17:35	3387
Wed-06-07-22	12:59	16:55	3200
Wed-06-07-22	20:18	22:33	3375
Thu-07-07-22	14:17	16:55	3214
Fri-08-07-22	7:18	9:20	3404
Fri-08-07-22	20:17	22:20	3486
Sat-09-07-22	14:05	17:08	3428
Sun-10-07-22	6:17	8:30	3393
Sun-10-07-22	20:08	22:20	3442
Mon-11-07-22	14:05	16:32	3228
Tue-12-07-22	5:51	8:19	3417
Tue-12-07-22	20:28	22:32	3421
Wed-13-07-22	12:10	14:56	3354
Wed-13-07-22	15:10	17:40	3233
Thu-14-07-22	6:32	8:20	3412
Thu-14-07-22	19:58	22:25	3477
Fri-15-07-22	14:09	16:35	3375
Sat-16-07-22	5:48	8:30	3149
Sat-16-07-22	20:28	22:25	3377
Sun-17-07-22	15:16	17:30	3292
Mon-18-07-22	6:17	8:30	3281
Mon-18-07-22	20:17	22:30	3300
Tue-19-07-22	14:17	16:30	3337
Wed-20-07-22	6:03	8:41	3408
Wed-20-07-22	20:32	22:35	3470
Thu-21-07-22	13:56	17:00	3196
Fri-22-07-22	5:51	8:30	3386
Sat-23-07-22	12:36	15:06	3306
Sat-23-07-22	15:38	17:15	3443
Sun-24-07-22	5:50	8:30	3410
Sun-24-07-22	12:24	15:05	3254
Sun-24-07-22	20:07	22:30	3444
Mon-25-07-22	14:46	17:40	3343
Tue-26-07-22	5:50	9:15	3329
Tue-26-07-22	19:58	23:10	3271
Wed-27-07-22	11:40	14:10	3260
Wed-27-07-22	15:37	17:40	3395
Thu-28-07-22	7:59	10:11	3399
Thu-28-07-22	20:01	21:45	3438
Fri-29-07-22	13:22	17:30	3406
Sat-30-07-22	6:17	8:30	3382
Sat-30-07-22	20:17	22:30	3366
Sun-31-07-22	11:40	14:10	3250
Sun-31-07-22	13:47	16:00	3403
Mon-01-08-22	6:17	8:30	3369
Mon-01-08-22	20:21	23:10	3446
Tue-02-08-22	15:15	17:40	3269
Wed-03-08-22	5:52	9:20	3372
Wed-03-08-22	22:59	0:45	3352
Thu-04-08-22	14:47	16:55	3224
Fri-05-08-22	7:15	9:20	3352
Fri-05-08-22	20:19	22:30	3348
Sat-06-08-22	14:12	17:10	3366
Sun-07-08-22	5:42	8:20	3376
Sun-07-08-22	11:40	14:10	3231
Sun-07-08-22	20:12	22:25	3365
Mon-08-08-22	14:14	16:55	3235

Wed-02-02-22	11:40	14:00	3351
Wed-02-02-22	21:11	23:20	3466
Wed-02-02-22	23:52	1:35	3355
Thu-03-02-22	8:26	10:40	3270
Thu-03-02-22	11:39	14:00	3447
Thu-03-02-22	21:26	23:25	3311
Thu-03-02-22	23:52	1:35	3466
Fri-04-02-22	8:29	10:40	3374
Fri-04-02-22	11:14	13:54	3331
Sun-06-02-22	11:32	15:00	3433
Sun-06-02-22	20:52	23:25	3402
Sun-06-02-22	23:47	1:35	3438
Mon-07-02-22	8:29	10:40	3305
Mon-07-02-22	11:22	13:54	3233
Mon-07-02-22	21:26	23:25	3373
Mon-07-02-22	23:52	1:35	3357
Tue-08-02-22	8:29	10:40	3292
Tue-08-02-22	11:14	14:00	3258
Tue-08-02-22	21:26	23:30	3261
Tue-08-02-22	23:52	1:40	3273
Wed-09-02-22	8:29	10:40	3326
Wed-09-02-22	21:11	23:25	3367
Wed-09-02-22	23:52	1:35	3345
Thu-10-02-22	8:24	10:40	3233
Thu-10-02-22	11:20	14:00	3174
Thu-10-02-22	21:26	23:25	3327
Fri-11-02-22	8:29	10:40	3390
Fri-11-02-22	11:14	13:54	3344
Sun-13-02-22	9:21	14:10	3141
Sun-13-02-22	20:52	23:25	3360
Sun-13-02-22	23:44	1:35	3344
Mon-14-02-22	8:29	10:40	3301
Mon-14-02-22	11:20	14:00	3246
Mon-14-02-22	21:26	23:25	3360
Tue-15-02-22	8:29	10:40	3420
Tue-15-02-22	11:15	13:55	3369
Tue-15-02-22	23:52	1:35	3393
Wed-16-02-22	8:29	10:40	3174
Wed-16-02-22	11:03	14:10	3164
Wed-16-02-22	21:11	13:55	3505
Thu-17-02-22	8:26	10:40	3372
Thu-17-02-22	21:26	23:25	3278
Fri-18-02-22	8:29	10:40	3265
Fri-18-02-22	11:15	13:55	3268
Mon-21-02-22	6:43	10:33	3217
Mon-21-02-22	11:17	13:54	3175
Mon-21-02-22	21:26	23:25	3332
Tue-22-02-22	8:29	10:40	3403
Tue-22-02-22	21:26	23:25	3439
Wed-23-02-22	8:29	10:40	3463
Wed-23-02-22	11:02	14:10	3479
Thu-24-02-22	8:26	10:40	3460
Fri-25-02-22	8:29	10:40	3271
Sun-27-02-22	20:52	23:30	3459
Mon-28-02-22	6:12	10:40	3422
Mon-28-02-22	11:20	14:00	3384
Mon-28-02-22	21:26	23:25	3291
Tue-01-03-22	8:29	10:40	3345
Tue-01-03-22	21:26	23:25	3426
Wed-02-03-22	8:29	16:30	3468
Sat-05-03-22	8:26	11:15	3346
Sat-05-03-22	20:52	23:10	3375
Sun-06-03-22	11:36	14:10	3278
Sun-06-03-22	20:52	23:25	3448
Wed-16-03-22	13:41	15:30	3215
Thu-17-03-22	8:28	9:35	3222
Thu-17-03-22	12:08	15:05	3361
Fri-18-03-22	7:08	9:30	3135
Fri-18-03-22	22:00	23:59	3260
Sat-19-03-22	7:30	9:30	3219
Sat-19-03-22	22:00	23:59	3278
Sun-20-03-22	12:30	14:30	3315
Sun-20-03-22	21:30	23:15	3249
Tue-22-03-22	12:16	15:30	3188
Wed-23-03-22	13:22	16:01	3280
Thu-24-03-22	21:36	23:33	3505
Thu-24-03-22	12:13	15:10	3323
Fri-25-03-22	15:38	17:35	3245
Sat-26-03-22	4:17	6:14	3355
Sun-27-03-22	20:03	22:03	3236
Mon-28-03-22	14:23	16:23	3427
Tue-29-03-22	6:17	9:15	3419

Tue-09-08-22	5:49	9:20	3326
Tue-09-08-22	20:29	22:23	3405
Wed-10-08-22	12:43	15:15	3212
Wed-10-08-22	15:44	18:46	3167
Thu-11-08-22	6:21	9:20	3401
Thu-11-08-22	20:26	22:47	3354
Fri-12-08-22	14:12	16:55	3404
Mon-15-08-22	6:00	10:55	3293
Mon-15-08-22	23:23	1:10	3336
Tue-16-08-22	15:08	17:25	3352
Wed-17-08-22	12:43	15:15	3304
Wed-17-08-22	20:17	22:43	3239
Thu-18-08-22	14:02	16:20	3295
Fri-19-08-22	6:19	9:16	3252
Fri-19-08-22	21:38	23:55	3236
Sat-20-08-22	14:03	16:52	3216
Sun-21-08-22	5:38	8:50	3186
Sun-21-08-22	12:43	15:15	3155
Sun-21-08-22	19:23	21:46	3192
Fri-26-08-22	14:18	16:35	3208
Sun-28-08-22	15:12	17:20	3275
Mon-29-08-22	12:43	15:15	3275
Thu-01-09-22	6:19	8:50	3074
Fri-02-09-22	0:11	7:10	3147
Mon-05-09-22	12:09	14:50	3178
Mon-05-09-22	15:40	17:40	3160
Tue-06-09-22	11:12	17:40	3304
Wed-07-09-22	12:52	15:15	3240
Wed-07-09-22	16:21	18:45	3285
Thu-08-09-22	15:07	18:10	3175
Mon-12-09-22	15:21	18:45	3222
Tue-13-09-22	15:20	17:30	3045
Wed-14-09-22	12:53	15:15	3336
Wed-14-09-22	16:21	21:40	3240
Thu-15-09-22	16:19	18:41	3215
Fri-16-09-22	14:48	17:34	3285
Sat-17-09-22	14:28	17:50	3220
Sun-18-09-22	15:26	17:50	3249
Mon-19-09-22	15:26	17:50	3255
Tue-20-09-22	15:05	17:32	3206
Wed-21-09-22	11:40	15:10	3252
Wed-21-09-22	16:21	18:42	3282
Thu-22-09-22	18:09	20:22	3375
Fri-23-09-22	16:37	20:57	3422
Sat-24-09-22	6:24	9:05	3361
Sun-25-09-22	12:35	15:05	3384
Sun-25-09-22	15:25	17:00	3387
Mon-26-09-22	14:31	17:00	3327
Tue-27-09-22	15:09	17:00	3392
Wed-28-09-22	12:52	15:10	3269
Tue-04-10-22	5:50	9:20	3454
Wed-05-10-22	8:29	10:40	3415
Wed-05-10-22	11:32	14:10	3409
Fri-07-10-22	8:29	10:40	3512
Sun-09-10-22	11:34	14:10	3440
Mon-10-10-22	8:24	10:40	3510
Mon-10-10-22	21:26	23:30	3426
Tue-11-10-22	9:30	12:00	2045
Wed-12-10-22	8:29	10:40	3339
Wed-12-10-22	11:36	14:10	3326
Sat-15-10-22	20:52	23:30	3396
Sun-16-10-22	8:26	11:20	3165
Tue-18-10-22	8:24	10:40	3254
Wed-19-10-22	8:29	10:40	2988
Wed-19-10-22	11:02	14:10	3323
Fri-21-10-22	8:29	10:40	3470
Fri-21-10-22	21:11	23:20	3440
Sat-22-10-22	20:47	23:30	3510
Sun-23-10-22	8:00	11:20	3419
Sun-23-10-22	20:47	23:30	3421
Mon-24-10-22	13:24	16:55	3441
Tue-25-10-22	15:11	17:00	3408
Wed-26-10-22	11:01	14:10	3292
Wed-26-10-22	15:10	16:50	3393
Thu-27-10-22	15:12	17:30	3367
Sun-30-10-22	11:51	14:10	3256
Mon-31-10-22	17:31	21:40	3242
Tue-01-11-22	12:52	17:00	3300
Wed-02-11-22	7:18	9:20	3220
Wed-02-11-22	11:07	14:10	3300
Thu-03-11-22	4:22	8:00	3450
Fri-04-11-22	4:15	16:50	3370

Wed-30-03-22	7:08	9:15	3421
Thu-31-03-22	7:08	9:15	3283
Thu-31-03-22	12:52	16:00	3273
Fri-01-04-22	7:00	9:00	3187
Sun-03-04-22	11:30	14:10	3196
Mon-04-04-22	7:00	9:00	3163
Mon-04-04-22	11:30	14:10	3120
Mon-25-04-22	15:01	17:00	3229
Tue-26-04-22	7:15	9:15	3194
Tue-26-04-22	22:14	0:35	3226
Wed-27-04-22	11:30	14:30	3250
Wed-27-04-22	15:45	17:35	3220
Thu-28-04-22	6:20	8:46	3212
Thu-28-04-22	21:39	23:35	3311
Fri-29-04-22	15:14	16:55	3195
Sat-30-04-22	5:42	8:10	3323
Sat-30-04-22	20:36	22:50	3325
Sun-01-05-22	10:19	11:54	3072
Sun-01-05-22	13:46	15:50	3317
Sun-01-05-22	23:28	1:35	3241
Mon-02-05-22	17:08	18:45	3147
Tue-03-05-22	7:13	9:00	3187
Tue-03-05-22	22:08	23:25	3194
Wed-04-05-22	12:56	15:20	3262
Thu-05-05-22	20:58	22:43	3344
Mon-09-05-22	7:00	9:00	3225
Mon-09-05-22	21:00	23:00	3295
Tue-10-05-22	21:00	23:00	3185
Wed-11-05-22	8:44	11:13	3170
Wed-11-05-22	16:57	19:23	3393
Thu-12-05-22	15:05	17:30	3291
Mon-16-05-22	4:55	8:50	3420
Mon-16-05-22	21:44	23:25	3372
Tue-17-05-22	13:48	16:50	3340
Wed-18-05-22	7:23	9:15	3245
Wed-18-05-22	13:04	17:31	3410
Wed-18-05-22	21:24	22:45	3357
Thu-19-05-22	14:12	16:55	3325
Fri-20-05-22	7:08	9:00	3226
Mon-23-05-22	7:00	9:00	3353
Mon-23-05-22	21:40	23:25	3434
Wed-25-05-22	7:40	9:15	3290
Wed-25-05-22	12:47	15:10	3415
Wed-25-05-22	21:39	23:30	3362
Thu-26-05-22	15:08	17:25	3361
Fri-27-05-22	7:08	9:15	3203
Sat-28-05-22	10:36	12:36	3393
Sat-28-05-22	13:53	16:52	3428
Sat-28-05-22	22:55	0:45	3349
Sun-29-05-22	11:30	13:30	3291
Sun-29-05-22	14:00	17:00	3149
Mon-30-05-22	8:05	10:30	3267
Mon-30-05-22	21:40	0:30	3417
Wed-01-06-22	12:50	15:20	3460
Fri-03-06-22	7:00	9:00	3438
Fri-03-06-22	21:00	23:00	3455
Sat-04-06-22	9:43	12:00	3431
Sun-05-06-22	2:34	4:00	3366
Sun-05-06-22	15:06	16:56	3455
Mon-06-06-22	4:45	6:41	3354
Mon-06-06-22	21:41	23:30	3404
Tue-07-06-22	12:44	14:12	3340
Wed-08-06-22	5:51	9:20	3334
Wed-08-06-22	12:25	15:05	3475
Wed-08-06-22	21:37	23:55	3705
Thu-09-06-22	14:03	16:30	3327
Fri-10-06-22	6:17	9:15	3386
Fri-10-06-22	22:12	0:40	3363
Sat-11-06-22	13:42	15:55	3383
Sun-12-06-22	5:47	8:00	3380
Mon-13-06-22	6:17	9:15	3140
Tue-14-06-22	6:19	9:40	3387
Tue-14-06-22	21:41	23:25	3368
Wed-15-06-22	13:22	15:04	3251
Wed-15-06-22	15:16	17:25	3190
Thu-16-06-22	6:21	9:20	3316
Thu-16-06-22	21:40	23:45	3378
Fri-17-06-22	13:24	16:57	3494
Sat-18-06-22	5:46	7:59	3514
Sat-18-06-22	19:33	21:55	3481
Sun-19-06-22	13:47	16:00	3404

Sat-05-11-22	9:05	16:50	3288
Sun-06-11-22	11:40	14:10	3291
Sun-06-11-22	14:22	17:00	3500
Mon-07-11-22	14:03	17:00	3295
Tue-08-11-22	11:21	17:00	3229
Wed-09-11-22	11:39	14:10	3107
Wed-09-11-22	14:32	17:40	3085
Thu-10-11-22	13:21	17:35	3305
Thu-10-11-22	21:26	23:25	3266
Mon-14-11-22	6:34	10:40	3310
Mon-14-11-22	21:26	23:25	3331
Tue-15-11-22	8:29	10:40	3206
Tue-15-11-22	11:14	13:54	3230
Tue-15-11-22	21:26	23:25	3390
Tue-15-11-22	23:52	1:30	3382
Wed-16-11-22	8:29	10:40	3379
Wed-16-11-22	11:13	14:10	3283
Wed-16-11-22	21:11	23:20	3363
Wed-16-11-22	23:52	1:35	3322
Thu-17-11-22	8:26	10:40	3303
Thu-17-11-22	11:39	14:00	3303
Thu-17-11-22	21:26	23:25	3294
Sun-20-11-22	8:00	11:20	3358
Mon-21-11-22	8:29	10:40	3300
Mon-21-11-22	21:26	23:25	3272
Tue-22-11-22	8:29	10:40	3178
Tue-22-11-22	21:26	23:25	3296
Wed-23-11-22	8:29	10:40	3347
Wed-23-11-22	21:11	23:20	3350
Sat-26-11-22	20:52	23:25	3283
Sun-27-11-22	8:26	11:15	3428
Sun-27-11-22	20:52	23:25	3328
Thu-01-12-22	8:26	10:40	3228
Thu-01-12-22	11:34	14:10	3198
Thu-01-12-22	23:52	1:39	3337
Fri-02-12-22	11:14	13:54	3353
Sat-03-12-22	3:45	6:30	3322
Sat-03-12-22	21:33	1:10	3350
Sun-04-12-22	13:28	16:00	3215
Wed-07-12-22	8:29	10:40	3173
Wed-07-12-22	11:08	14:10	3306
Wed-07-12-22	21:11	23:20	3330
Thu-08-12-22	8:26	10:40	3118
Sat-10-12-22	8:19	11:15	3196
Sat-10-12-22	20:52	23:25	3350
Sun-11-12-22	8:26	11:15	3212
Sun-11-12-22	11:35	14:10	3318
Sun-11-12-22	20:52	23:25	3274
Mon-12-12-22	8:29	10:40	3279
Mon-12-12-22	21:23	23:25	3333
Tue-13-12-22	8:29	10:40	3378
Tue-13-12-22	21:26	23:25	3343
Wed-14-12-22	8:29	10:40	3192
Wed-14-12-22	12:13	15:33	3271
Wed-14-12-22	21:11	23:20	3389
Thu-15-12-22	8:26	10:40	3309
Thu-15-12-22	21:26	23:29	3274
Fri-16-12-22	8:29	10:40	3390
Fri-16-12-22	11:14	13:54	3365
Sat-17-12-22	8:19	11:12	3351
Sat-17-12-22	11:33	12:23	3343
Sat-17-12-22	20:52	23:29	3221
Sun-18-12-22	8:26	11:15	3287
Sun-18-12-22	11:20	14:00	3294
Sun-18-12-22	20:52	23:25	3387
Mon-19-12-22	8:29	10:40	3338
Mon-19-12-22	21:26	23:25	3458
Tue-20-12-22	8:29	10:40	3342
Tue-20-12-22	11:14	13:54	3216
Tue-20-12-22	21:26	23:25	3343
Wed-21-12-22	8:29	10:40	3171
Wed-21-12-22	11:08	14:10	3312
Wed-21-12-22	21:11	23:20	3372
Thu-22-12-22	8:26	10:40	3357
Thu-22-12-22	21:26	23:25	3384
Fri-23-12-22	8:29	10:40	3362
Fri-23-12-22	21:11	23:20	3429
Sat-24-12-22	8:26	11:15	3345
Tue-27-12-22	11:10	14:00	3320
Tue-27-12-22	18:57	23:25	3451
Wed-28-12-22	8:29	10:40	3427
Wed-28-12-22	11:08	14:00	2994

Wed-28-12-22	21:11	23:20	3312
Thu-29-12-22	11:45	14:07	3330
Thu-29-12-22	21:26	23:25	3490

SIMEC

MEMBER OF GFG ALLIANCE

APPENDIX 13

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Stone Bin Data
Tonnes Trucked to the Reject Emplacement Area
Truck immediately returns after delivery to REA

Date	Time	Tonnes trucked
3/01/2022	10:06:00 AM	6
4/01/2022	9:00:00 AM	8
4/01/2022	12:08:00 PM	8
4/01/2022	3:20:00 PM	6
5/01/2022	7:53:00 AM	8
7/01/2022	8:17:00 AM	5
7/01/2022	12:02:00 PM	10
7/01/2022	1:59:00 PM	3
8/01/2022	7:33:00 AM	8
8/01/2022	2:08:00 PM	9
10/01/2022	7:30:00 AM	8
10/01/2022	8:23:00 AM	9
10/01/2022	1:28:00 PM	10
11/01/2022	2:35:00 PM	9
12/01/2022	8:58:00 AM	7
12/01/2022	12:52:00 PM	6
12/01/2022	3:30:00 PM	4
13/01/2022	1:48:00 PM	8
13/01/2022	2:55:00 PM	4
13/01/2022	7:30:00 AM	5
13/01/2022	2:56:00 PM	4
17/01/2022	7:04:00 AM	7
17/01/2022	11:15:00 AM	9
18/01/2022	2:48:00 PM	8
19/01/2022	8:08:00 AM	9
21/01/2022	8:06:00 AM	6
21/01/2022	10:32:00 AM	6
21/01/2022	1:52:00 PM	3
22/01/2022	8:02:00 AM	8
22/01/2022	2:18:00 PM	7
22/01/2022	2:56:00 PM	6
22/01/2022	3:25:00 PM	3
24/01/2022	7:26:00 AM	8
24/01/2022	11:49:00 AM	8
24/01/2022	3:18:00 PM	6
25/01/2022	10:14:00 AM	10
25/01/2022	2:41:00 PM	3
26/01/2022	11:05:00 AM	6
26/01/2022	11:38:00 AM	4
28/01/2022	7:08:00 AM	10
29/01/2022	7:05:00 AM	8
29/01/2022	12:14:00 PM	8
1/02/2022	11:02:00 AM	6
1/02/2022	2:16:00 PM	7
2/02/2022	9:34:00 AM	7
2/02/2022	1:49:00 PM	9
4/02/2022	12:54:00 PM	9
5/02/2022	1:53:00 PM	4
10/02/2022	1:44:00 PM	10
11/02/2022	7:36:00 AM	9
12/02/2022	7:34:00 AM	8
12/02/2022	2:16:00 PM	7
14/02/2022	7:28:00 AM	9
14/02/2022	10:39:00 AM	6

Date	Time	Tonnes trucked
2/07/2022	10:06:00 AM	6
4/07/2022	9:00:00 AM	8
4/07/2022	12:08:00 PM	8
4/07/2022	3:20:00 PM	6
5/07/2022	7:53:00 AM	8
6/07/2022	3:03:00 PM	10
7/07/2022	8:17:00 AM	5
7/07/2022	12:02:00 PM	10
7/07/2022	1:59:00 PM	3
8/07/2022	7:33:00 AM	8
8/07/2022	2:08:00 PM	9
9/07/2022	10:52:00 AM	6
9/07/2022	3:16:00 PM	8
11/07/2022	8:23:00 AM	9
11/07/2022	1:28:00 PM	10
11/07/2022	2:35:00 PM	9
12/07/2022	8:58:00 AM	7
12/07/2022	12:52:00 PM	6
12/07/2022	3:30:00 PM	4
15/07/2022	1:48:00 PM	8
15/07/2022	2:55:00 PM	4
16/07/2022	2:56:00 PM	4
18/07/2022	8:08:00 AM	9
19/07/2022	11:15:00 AM	9
20/07/2022	2:48:00 PM	8
21/07/2022	8:06:00 AM	6
21/07/2022	10:32:00 AM	6
21/07/2022	1:52:00 PM	3
22/07/2022	8:02:00 AM	8
22/07/2022	2:18:00 PM	7
22/07/2022	3:25:00 PM	3
23/07/2022	7:26:00 AM	8
23/07/2022	11:49:00 AM	8
23/07/2022	1:46:00 PM	8
23/07/2022	3:18:00 PM	6
25/07/2022	7:09:00 AM	7
25/07/2022	10:14:00 AM	10
25/07/2022	1:26:00 PM	9
25/07/2022	2:41:00 PM	3
26/07/2022	11:05:00 AM	6
26/07/2022	11:38:00 AM	4
28/07/2022	7:08:00 AM	10
29/07/2022	7:35:00 AM	10
29/07/2022	12:14:00 PM	8
30/07/2022	1:34:00 PM	10
1/08/2022	11:02:00 AM	6
1/08/2022	2:16:00 PM	7
2/08/2022	7:06:00 AM	9
2/08/2022	9:34:00 AM	7
2/08/2022	1:49:00 PM	9
3/08/2022	1:37:00 PM	10
3/08/2022	5:09:00 PM	8
4/08/2022	12:54:00 PM	9
5/08/2022	1:53:00 PM	4

15/02/2022	8:36:00 AM	8
15/02/2022	3:27:00 PM	8
16/02/2022	7:38:00 AM	9
17/02/2022	1:59:00 PM	8
17/02/2022	2:29:00 PM	4
1/03/2022	9:24:00 AM	5
4/03/2022	5:09:00 PM	5
12/03/2022	7:47:00 AM	6
21/03/2022	7:05:00 AM	5
22/03/2022	1:28:00 PM	6
24/03/2022	3:04:00 PM	9
25/03/2022	8:46:00 AM	7
5/04/2022	2:57:00 PM	4
6/04/2022	7:17:00 AM	8
12/04/2022	7:04:00 AM	10
15/04/2022	1:11:00 PM	8
19/04/2022	7:32:00 AM	6
20/04/2022	9:22:00 AM	7
28/04/2022	2:28:00 PM	5
29/04/2022	9:46:00 AM	10
30/04/2022	1:52:00 PM	10
30/04/2022	4:18:00 PM	5
2/05/2022	10:06:00 AM	6
3/05/2022	9:00:00 AM	8
3/05/2022	12:08:00 PM	8
3/05/2022	3:20:00 PM	6
4/05/2022	7:53:00 AM	8
6/05/2022	3:03:00 PM	10
7/05/2022	8:17:00 AM	5
7/05/2022	12:02:00 PM	10
7/05/2022	1:59:00 PM	3
10/05/2022	7:10:00 AM	8
10/05/2022	8:23:00 AM	9
10/05/2022	1:28:00 PM	10
11/05/2022	2:35:00 PM	9
12/05/2022	8:58:00 AM	7
12/05/2022	12:52:00 PM	6
12/05/2022	3:30:00 PM	4
13/05/2022	1:48:00 PM	8
14/05/2022	2:55:00 PM	4
16/05/2022	7:06:00 AM	5
16/05/2022	2:56:00 PM	4
17/05/2022	7:01:00 AM	7
17/05/2022	11:15:00 AM	9
17/05/2022	2:48:00 PM	8
18/05/2022	8:08:00 AM	9
21/05/2022	8:06:00 AM	6
21/05/2022	10:32:00 AM	6
21/05/2022	1:52:00 PM	3
23/05/2022	7:14:00 AM	7
23/05/2022	11:57:00 AM	6
24/05/2022	7:26:00 AM	8
24/05/2022	11:49:00 AM	8
24/05/2022	1:46:00 PM	8
24/05/2022	3:18:00 PM	6
25/05/2022	10:14:00 AM	10
25/05/2022	1:26:00 PM	9
25/05/2022	2:41:00 PM	3
26/05/2022	11:05:00 AM	6

11/08/2022	1:44:00 PM	10
12/08/2022	7:36:00 AM	8
13/08/2023	7:34:00 AM	8
13/08/2023	9:01:00 AM	8
13/08/2023	2:16:00 PM	7
15/08/2023	6:31:00 AM	8
15/08/2023	8:36:00 AM	8
15/08/2023	3:27:00 PM	8
16/08/2023	6:38:00 AM	9
16/08/2023	1:59:00 PM	8
16/08/2023	2:29:00 PM	4
31/08/2022	9:24:00 AM	5
5/09/2022	5:09:00 PM	5
12/09/2022	7:47:00 AM	6
21/10/2022	7:03:00 AM	5
22/10/2022	1:28:00 PM	6
22/10/2022	3:04:00 PM	9
24/10/2022	7:28:00 AM	10
24/10/2022	8:46:00 AM	7
24/10/2022	2:57:00 PM	4
26/10/2022	7:17:00 AM	8
27/10/2022	7:34:00 AM	10
27/10/2022	1:11:00 PM	8
28/10/2022	7:32:00 AM	6
28/10/2022	9:22:00 AM	7
28/10/2022	2:28:00 PM	5
29/10/2022	9:46:00 AM	10
29/10/2022	1:52:00 PM	10
29/10/2022	4:18:00 PM	5
2/11/2022	10:06:00 AM	6
3/11/2022	9:00:00 AM	8
3/11/2022	12:08:00 PM	8
3/11/2022	3:20:00 PM	6
4/11/2022	7:53:00 AM	8
5/11/2022	3:03:00 PM	10
7/11/2022	8:17:00 AM	5
7/11/2022	12:02:00 PM	10
7/11/2022	1:59:00 PM	3
8/11/2022	7:33:00 AM	8
8/11/2022	2:08:00 PM	9
9/11/2022	7:08:00 AM	7
9/11/2022	10:15:00 AM	10
9/11/2022	10:52:00 AM	6
9/11/2022	3:16:00 PM	8
10/11/2022	7:05:00 AM	8
10/11/2022	8:23:00 AM	9
10/11/2022	1:28:00 PM	10
11/11/2022	2:35:00 PM	9
12/11/2022	8:58:00 AM	7
12/11/2022	12:52:00 PM	6
12/11/2022	3:30:00 PM	4
15/11/2022	1:48:00 PM	8
15/11/2022	2:55:00 PM	4
16/11/2022	7:30:00 AM	5
16/11/2022	2:56:00 PM	4
17/11/2022	7:04:00 AM	7
17/11/2022	11:15:00 AM	9
17/11/2022	2:48:00 PM	8
18/11/2022	8:08:00 AM	9

28/05/2022	7:08:00 AM	10
31/05/2022	12:14:00 PM	8
31/05/2022	1:34:00 PM	10
1/06/2022	11:02:00 AM	6
1/06/2022	2:32:00 PM	10
2/06/2022	9:34:00 AM	7
2/06/2022	1:49:00 PM	9
3/06/2022	1:37:00 PM	10
3/06/2022	5:09:00 PM	8
4/06/2022	12:54:00 PM	9
4/06/2022	1:53:00 PM	4
11/06/2022	1:44:00 PM	10
13/06/2022	7:36:00 AM	9
13/06/2022	9:01:00 AM	8
13/06/2022	2:16:00 PM	7
14/06/2022	10:39:00 AM	6
15/06/2022	8:36:00 AM	8
15/06/2022	3:27:00 PM	8
16/06/2022	7:18:00 AM	9
16/06/2022	1:59:00 PM	8
16/06/2022	2:29:00 PM	4
20/06/2022	7:11:00 AM	6
21/06/2022	7:36:00 AM	10
21/06/2022	3:48:00 PM	4
22/06/2022	3:38:00 PM	6
23/06/2022	7:37:00 AM	8
23/06/2022	4:11:00 PM	7
28/06/2022	7:13:00 AM	6
30/06/2022	7:08:00 AM	7
30/06/2022	1:52:00 PM	3

21/11/2022	8:06:00 AM	6
21/11/2022	10:32:00 AM	6
21/11/2022	1:52:00 PM	3
22/11/2022	8:02:00 AM	8
22/11/2022	2:18:00 PM	7
22/11/2022	2:56:00 PM	6
22/11/2022	3:25:00 PM	3
23/11/2022	7:14:00 AM	7
23/11/2022	11:57:00 AM	6
24/11/2022	7:26:00 AM	8
24/11/2022	11:49:00 AM	8
24/11/2022	1:46:00 PM	8
24/11/2022	2:24:00 PM	8
24/11/2022	3:18:00 PM	6
25/11/2022	7:02:00 AM	9
25/11/2022	7:09:00 AM	7
25/11/2022	10:14:00 AM	10
25/11/2022	1:26:00 PM	9
25/11/2022	2:41:00 PM	3
26/11/2022	11:05:00 AM	6
26/11/2022	11:38:00 AM	4
28/11/2022	7:08:00 AM	10
29/11/2022	7:05:00 AM	8
29/11/2022	12:14:00 PM	8
30/11/2022	1:34:00 PM	10
1/12/2022	11:02:00 AM	6
1/12/2022	2:16:00 PM	7
1/12/2022	5:46:00 PM	6
2/12/2022	7:06:00 AM	9
2/12/2022	9:34:00 AM	7
2/12/2022	1:49:00 PM	9
3/12/2022	1:37:00 PM	10
3/12/2022	5:09:00 PM	8
5/12/2022	12:54:00 PM	9
5/12/2022	1:53:00 PM	4
10/12/2022	1:44:00 PM	10
12/12/2022	7:36:00 AM	10
12/12/2022	12:02:00 PM	10
13/12/2023	7:04:00 AM	8
13/12/2023	9:01:00 AM	8
13/12/2023	2:16:00 PM	7
14/12/2023	7:28:00 AM	9
14/12/2023	10:39:00 AM	6
15/12/2023	7:31:00 AM	8
15/12/2023	8:36:00 AM	8
15/12/2023	3:27:00 PM	8
16/12/2023	7:08:00 AM	9
16/12/2023	1:59:00 PM	8
16/12/2023	2:29:00 PM	4
20/12/2023	7:11:00 AM	6
21/12/2023	7:36:00 AM	10
21/12/2023	3:48:00 PM	4
22/12/2023	7:05:00 AM	5
22/12/2023	3:38:00 PM	6
23/12/2023	7:37:00 AM	8
23/12/2023	4:11:00 PM	7
28/12/2023	7:07:00 AM	6
30/12/2023	7:04:00 AM	7
30/12/2023	1:52:00 PM	3

APPENDIX 14

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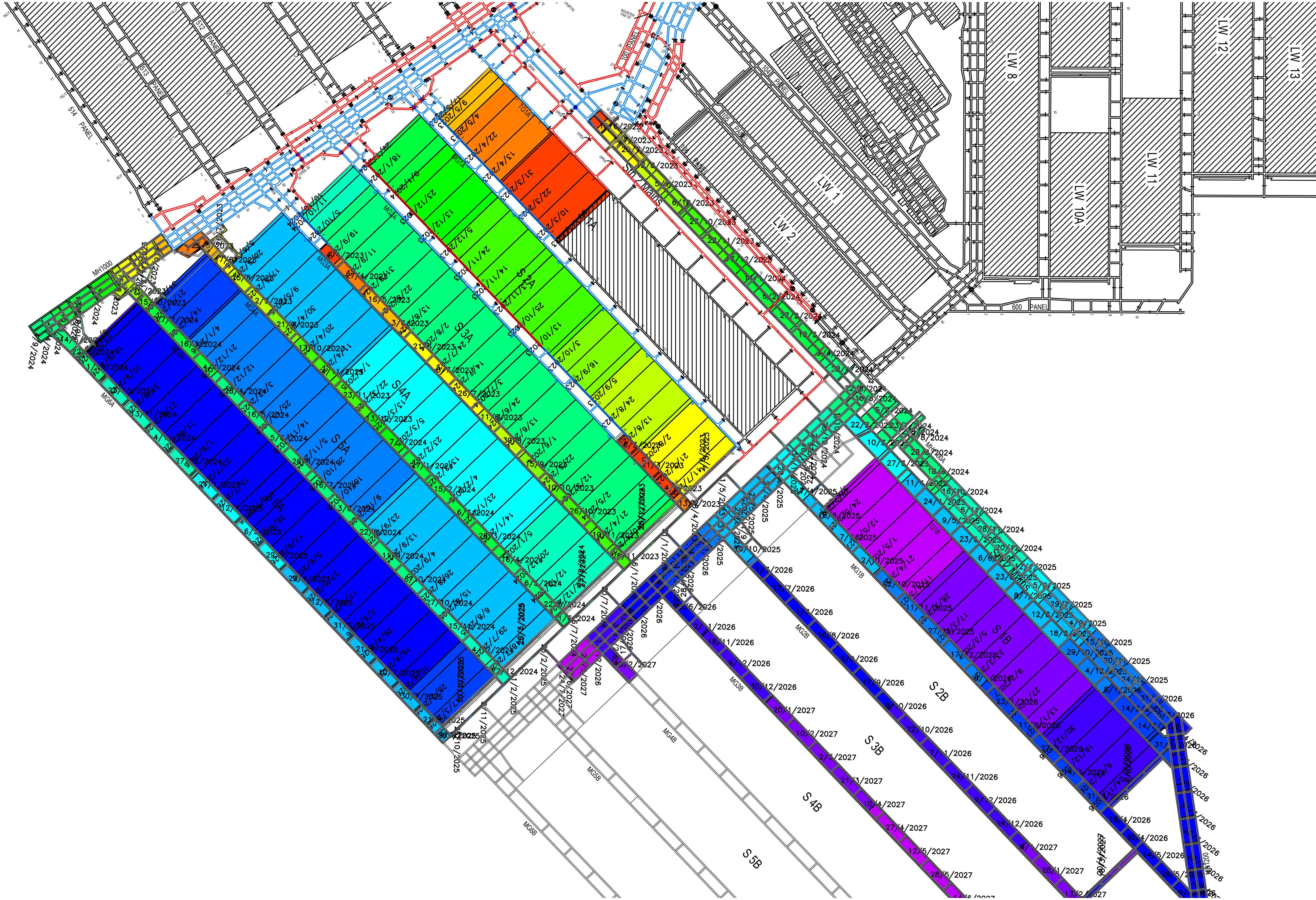

LW 8
LW 12
LW 13
LW 11
LW 10A
LW 1
LW 2
600 PANEL
S 2A
S 3A
S 4A
S 5A
S 6A
S 1B
S 2B
S 3B
S 4B
S 5B
MG1B
MG2B
MG3B
MG4B
MG5B
MG6B
MG6A
MH1000

APPENDIX 15

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4.2 Trigger Criteria

TARPs have been developed based on the groundwater management program outlined in the Groundwater Technical Report LW W3-W4 (SLR, 2021) and the WMP (Tahmoor Coal, 2021), and describe necessary responses for exceedances in groundwater quality and groundwater level triggers at open standpipe 'P' bores, as well as exceedance of groundwater pressure triggers developed for VWPs. The approved trigger criteria for shallow and deep groundwater levels are summarised and presented in Table 5. Appendix B1 details the latest approved impact assessment trigger criteria from the LW W3-W4 Extraction Plan presented in the WMP (Tahmoor Coal, 2021) and the appropriate action plan to be enacted should a trigger exceedance occur during mining of LW W1-W2 and LW W3-W4. Figure 13 to Figure 17 present groundwater hydrographs at each site with the associated groundwater level triggers.

Prior to the approval of LW W3 in September 2021, groundwater levels and quality observations were assessed against the TARPs developed for and outlined in the Groundwater Technical Report LW W1-W2 (HS/SLR, 2019). From September 2021, as stated above, groundwater levels and quality observation across the Western Domain are now assessed against latest approved impact assessment trigger criteria (Tahmoor Coal, 2021). The following sections present the groundwater exceedances identified and highlight the change in TARPs that occurred from September 2021.

Further details regarding the development of the TARPs are provided in SLR (2021).

Table 5 Groundwater TARP Level Criteria for Open Standpipes, Shallow VWPs and Deep VWPs (Tahmoor Coal, 2021).

Significance Level	Criteria		
	Open standpipes	Shallow VWPs (<200m bgl)	Deep VWPS (>200m bgl)
Level 1	Groundwater level remains consistent within baseline variability and/or pre-mining trends, with reductions in groundwater level less than two metres and does not trigger Level 2 to Level 4 Significance Levels (refer to Appendix C).	No observable mining induced change at VWP intakes located at or above (i.e. shallower than) 200 m depth.	Observed data does not exceed predicted (modelled) impacts (excluding those monitoring the Bulli Coal Seam).
Level 2	Greater than 2 m water level reduction following the commencement of extraction at LW W1 (and LW W2, W3, W4) (refer to Appendix C for TARP Significance Level 2). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Greater than 5 m water level reduction in VWP intakes located at or above (i.e. shallower than) 200 m depth following the commencement of extraction at LW W1 (and LW W2, W3 and W4) (refer to Appendix C for TARP Significance Level 2). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) is within 30 m of predicted (modelled) drawdown.
Level 3	Water level declines below the water level of TARP Significance Level 3 (refer Appendix C, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Water level declines below the water level of TARP Significance Level 3 (refer Appendix C, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 6 months or more.
Level 4	Water level reduction greater than the maximum modelled drawdown (refer to Appendix C for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Water level reduction greater than the maximum modelled drawdown (refer to Appendix C for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 12 months or more.

4.3 Trigger Exceedances

Table 6 presents the occurrence of trigger level exceedances in groundwater levels since the start of mining at Western Domain as per the trigger values (HS/SLR, 2019; SLR, 2021) and the TARP trigger criteria presented in Table 5 and Appendix B1.

Table 6 Groundwater Level Trigger Exceedances over January 2021 – March 2022 for the Shallow Open Standpipes, Shallow and Deep VWPs.

Bore	Groundwater Level prior to LW W1 (m AHD)	Trigger Level Exceedances															Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W3 (10-SEP-21) (m AHD)	Drawdown since Nov 21 as of March 2022 (m)
		Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22			
Shallow OSP		TARP (HS/SLR, 2019)								TARP (Tahmoor Coal, 2021)									
P12A	170.1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	0.5	170.5	-
P12B	170.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	0.8	170.7	-
P12C	176.3	L4	L4	L4	L4	L4	L4	L4	L4	L3	L3	L3	L3	L3	L3	L3	11.0	172.1	2.1
P13A	167.2	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	#	#	#	#	0.7	167.5	#
P13B	166.4	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	#	#	#	#	1.5	166.5	#
P13C	169.8	L4	L4	L4	L4	L4	L4	L2	L1	L2	#	#	#	#	#	#	5.0	168.3	#
P14A	168.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	-	170.3	-
P14B	166.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	1.4	166.4	-
P14C	166.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	1.7	166.2	-
P14D	164.8	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	1.8	164.8	-
P15A	164.7^	L1	L1	L1	L1	L1	*	L1	L1	L1	L1	L1	L1	L1	L1	L1	-	165.7	-
P15B	165.2^	L1	L1	L1	L1	L1	*	L1	L1	L1	L1	L1	L1	L1	L1	L1	-	165.6	-
P15C	164.9^	L1	L1	L1	L1	L1	*	L1	L1	L1	L1	L1	L1	L1	L1	L1	-	165.6	-
P15D	165.4^	#	#	#	#	#	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	164.4	-
P16A	211.3	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	1.1	210.7	-
P16B	206.4	L4	L4	L4	L4	L4	L4	L4	L4	L2	L2	L2	L2	L2	L2	L2	5.7	203.9	2.4

Bore	Groundwater Level prior to LW W1 (m AHD)	Trigger Level Exceedances															Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W3 (10-SEP-21) (m AHD)	Drawdown since Nov 21 as of March 2022 (m)
		Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22			
P16C	199.6	L4	L4	L4	L4	L4	L4	L4	L4	L3	L3	L3	L3	L3	L3	L3	13.8	191.4	8.3
P17	171.3	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	#	#	#	#	0.2	171.5	#
		Shallow VWPs (<200m)																	
TNC036 - HBSS-65	209.5	L4	L4	L4	L4	L4	L4	L2	L1	L1	L1	L1	L1	L1	L1	L1	6.7	207.3	0.9
TNC036 - HBSS-97	196.3	L4	L4	L4	L4	L4	L4	L4	L4	L4	L4	L4	L4	L4	L4	L3	24.0	179.5	14.2
TNC036 - BGSS-169	197.5	L4	L4	L4	L4	L4	L4	L4	L4	L2	L2	L2	L2	L2	L2	L2	47.6	161.5	34
TNC040 - WNFM-27	208.3	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1	L1	L1	L1	L1	-	210.3	-
TNC040 - HBSS-65	187.1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1	L1	L1	L1	L1	-	187.5	-
TNC043 - HBSS-65	158.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	0.3	158.2	-
TNC043 - HBSS-111.5	155.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	1.8	153.9	0.9

Bore	Groundwater Level prior to LW W1 (m AHD)	Trigger Level Exceedances															Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W3 (10-SEP-21) (m AHD)	Drawdown since Nov 21 as of March 2022 (m)
		Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22			
		Deep VWPs (>200m)																	
TNC036 - BGSS-214	176.5	L3	L3	L3	L3	L3	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	81.4	103.4	85.5
TNC036 - BGSS-412.5	96.8	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	49.7	33.5	73.5

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

LX: maximum trigger level exceedances recorded (including P13 and P17 decommissioned in October 2021) *"-": no observed drawdown* *^ baseline groundwater level at P15 (A,B,C,D) is the groundwater level recorded in June 2021.* *#: not applicable*

"" not assessed due to disruption in groundwater levels during drilling and packer testing at P15D (see (SLR, 2021c) section 2.3)*

Table 7 Groundwater Level Trigger Exceedances over the Reporting Period (January 2021 – January 2022) for Private Bores

Bore	Baseline Maximum Ground water Depth (m bgl)	Baseline Groundwater Yield (L/s)	Trigger Level Exceedances													Groundwater Depths as of January 2022 (m bgl)	Ground water Yield as of January 2022 (L/s)
			Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	July 2021	Aug 2021	Sep 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022		
Private Bores																	
GW104090	39.0	#	L1	L1	L1	L1	#	#	#	L1	L1	L1	L1	L1	#	# (49.2^)	#
GW105467	32.0	0.5	L1	L1	L1	L1	L1	L1	L2	#	#	*	*	*	*	#	#
GW105228	23.0	1.8	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	22.4	2.0-2.1
GW072402	11.76	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	11.5	#
GW115860	5.0	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	12.6	2.0
GW105546	31.9	1.6	L1	L1	L1	L1	#	#	*	#	#	*	*	*	*	#	#

LX: maximum trigger level exceedances recorded *#: not applicable* ** no site access* *"-"standing water level not available (access is not available inside the bore)*

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

4.4 Discussion of Groundwater Level Exceedances

This section discusses any exceedances observed over the reporting period from November 2021 to March 2022. TARP level exceedances were observed in bores as follows:

- TARP Level 4 at the shallow VWP sensors at TNC036 (HBSS-97m) from October 2021 to February 2022, with a reduction in TARP to Level 3 in March 2022;
- TARP Level 3 at the shallow open standpipes P12C and P16C during the reporting period;
- TARP Level 2 at the shallow open standpipe P16B during the reporting period;
- TARP Level 2 at the shallow VWP sensors at TNC036 (BGSS-169m) during the reporting period; and
- TARP Level 2 at the two deep VWP sensors at TNC036 (BGSS-214m and BGSS-412.5m) during the reporting period.

All other groundwater monitoring sites remained within TARP Level 1 across the six-monthly reporting period.

In terms of yield and groundwater level at the private bores, the following observations are noted over the reporting period (to January 2022):

- GW105228: There was no significant change in groundwater yield at GW105228 that could impede groundwater use in January 2022. In January 2022, groundwater yield was recorded between 2.0-2.1 L/sec compared to 1.82 L/sec during the baseline period (GeoTerra, 2019). As of January 2022, groundwater levels are observed within baseline level. TARP Level 1 applies.
- GW115860: There was no significant change in groundwater yield at GW115860 that could impede groundwater use in January 2022. In January 2022, groundwater yield at this location is recorded between 2.0-2.05 L/sec compared to 2.3 L/sec during the baseline period. As of January 2022, groundwater levels are observed within baseline level. TARP Level 1 applies.
- GW105467: In January 2021 the bore yield at GW105467 has declined from 0.67 L/s to 0.38 L/s in July 2021. A TARP Level 2 was applied at GW105467 as the lowest groundwater yield during the baseline period was 0.47 L/s in March 2019 and during the severe NSW drought. This bore is not actively used for groundwater extraction and no site access was possible in October 2021 and January 2022. Further monitoring is planned at this location.
- There was no site access at GW105546 throughout the reporting period, hence the assessment of trigger assessment exceedances at this location was not possible.

4.4.1 Shallow Open Standpipes

4.4.1.1 P12C

During the reporting period, groundwater levels at P12C have increased to a maximum of 174.2 mAHD in March 2022 and are 2.1 m below baseline levels (Table 6). Groundwater levels at P12C have increased by 2.8 m in March 2022 and are approximately 3.1 m above groundwater level observed in the upper piezometer P12A and P12B (Figure A-1). A TARP Level 3 still applies at P12C as the recovered groundwater levels as of March 2022 are below the trigger level 3.

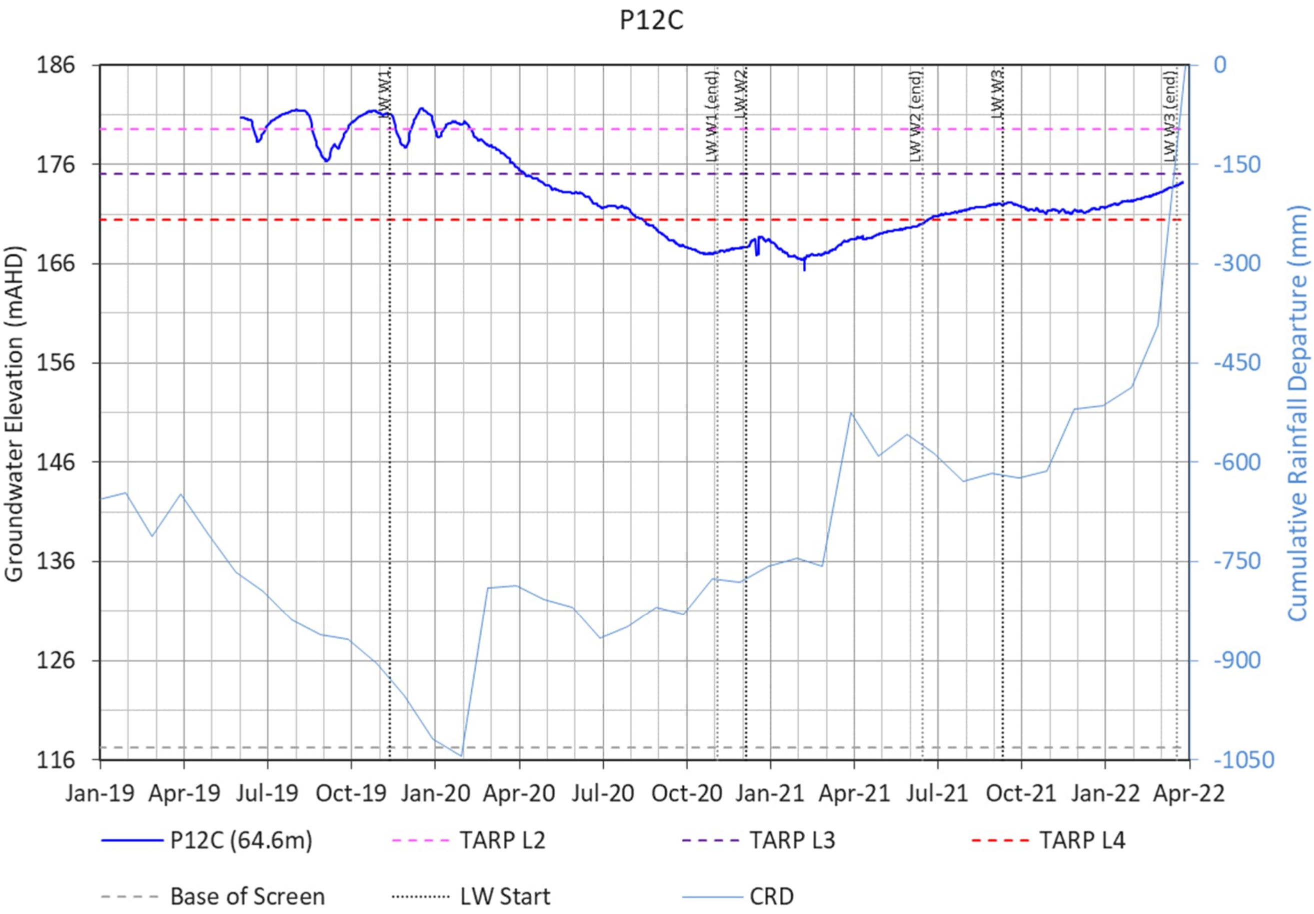


Figure 13 Groundwater Level Exceedance at P12C

4.4.1.2 P16B and P16C

Both P16B and P16C have shown a TARP Level 4 exceedance from December 2020 to August 2021 and reduced respectively to Level 2 and Level 3 from September 2021. During the reporting period a TARP Level 2 and Level 3 still apply at P16B and P16C respectively.

At P16B, groundwater levels were observed at 202.8 mAHD in mid-January 2022, below the trigger TARP Level 2 (205.9 mAHD) following a decline of approximately 1.8m (Figure 14). SLR investigated the nature of the sharp decline (SLR, 2022a). The recent decline in groundwater levels could be due to a delayed mining effect from LW W2 and active mining at LW W3. The sudden decline in groundwater levels at P16B could potentially be due to the sudden movement of strata from mining. Similar sudden declines were observed at P15 located adjacent to the northern end of LW W3 after the commencement of that panel (Appendix A, Figure A-3).

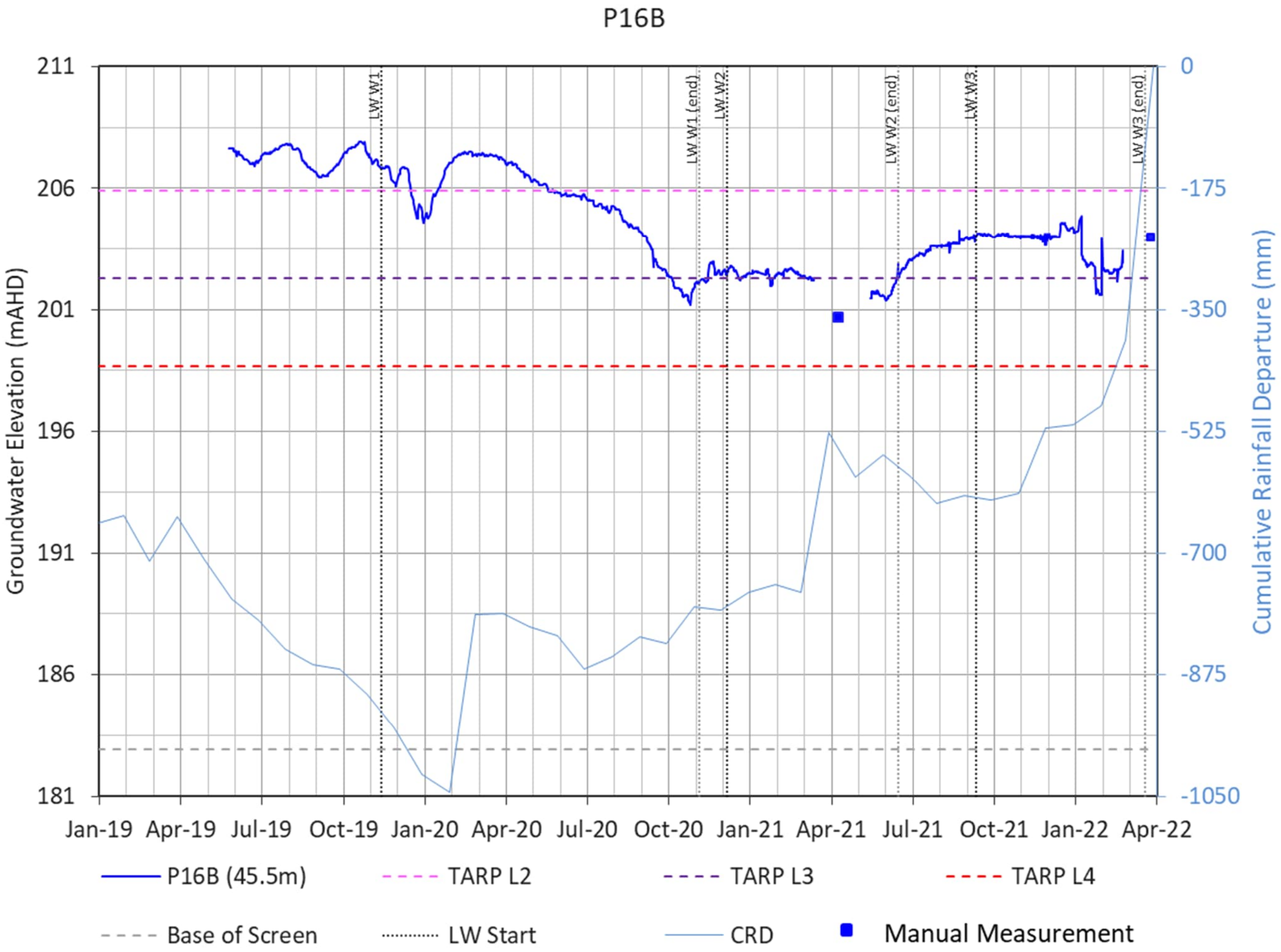


Figure 14 Groundwater Level Exceedance at P16B

During the second half of January 2022, water levels at P16B declined by 1.4 m, dropping below the TARP Level 3 for a short-period of time between 25th- 31st January 2022 before rising back to approximately 203.4 mAHD from March 2022. As of March 2022, groundwater levels at P16B are within a TARP Level 2 (Figure 14).

During the reporting period, recovery in groundwater at P16C has reduced with water levels at 191.7 mAHD and 7.6 m below baseline levels (Table 6 and Figure 15).

Groundwater levels at P16C gradually declined by approximately 0.4 m throughout the reporting period to 190.2 mAHD and are observed at 191.3 mAHD in March 2022. As of March 2022, groundwater levels remain below the trigger TARP Level 3 (193.9 mAHD), hence a TARP Level 3 still applies (Figure 15).

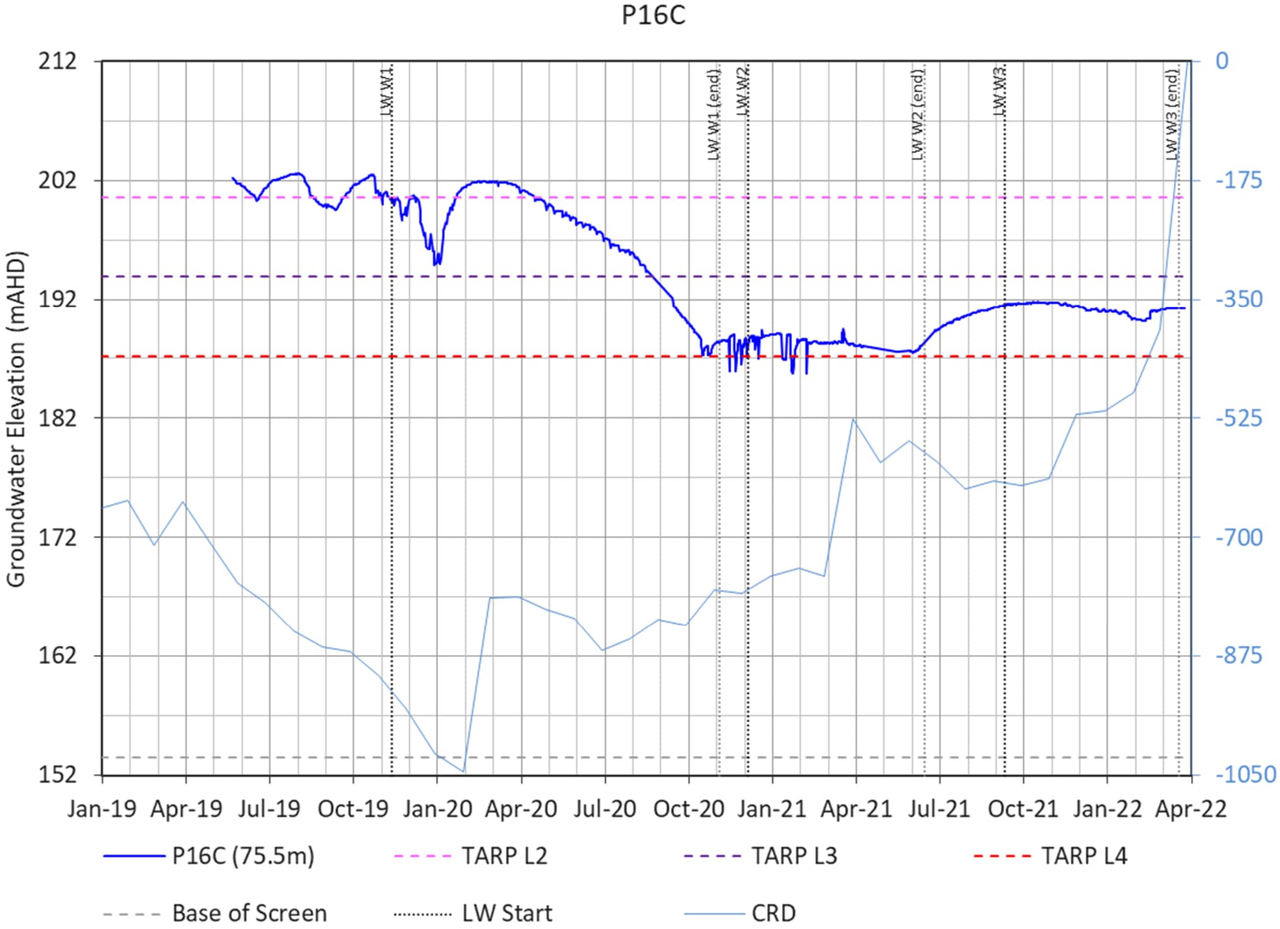


Figure 15 Groundwater Level Exceedance at P16C

4.4.2 Shallow VWPs – TNC036

Groundwater trends at monitoring sites equipped with shallow VWPs (less than 200m depth) were within the TARP Level 1 except at TNC036 (HBSS-65m, HBSS-97m and BGSS-169m) triggering the TARP Level 3 throughout 2020 and TARP Level 4 from December 2020 to April 2021 (Table 6).

The triggering of TARP Level 3 at TNC036 was attributed to mining induced depressurisation of deeper aquifer throughout the passage of LW W1 and exacerbated by a reduction in rainfall recharge events in late 2020.

Following the completion of LW W1 in November 2020, groundwater levels started to stabilise in all shallow TNC036 sensors and in WD01-HBSS-190m. In November 2020, a TARP Level 4 was attributed to TNC036 (HBSS-65m, HBSS-97m and BGSS-169m) due to a greater than 5 m depressurisation over a period of six months. Above LW W1 and following the completion of that longwall, groundwater levels in WD01-190m started to recover.

At TNC036, the progression of mining at LW W2 induced a minor drawdown in HBSS-65m and HBSS-169m while water levels at HBSS-97m are stable. Between December 2020 and June 2021, water levels in HBSS-65m recorded a reduction greater than 5m due to the passage of both LW W1 and LW W2, being within the Level 4 TARP criteria. Groundwater levels started to recover in June 2021 and by the end of July 2021, water levels in HBSS-65m increased above the TARP level 2 (i.e. 4.2 m below baseline level) and since August 2021 a TARP Level 1 applies (Table 6).

At HBSS-97m groundwater levels are observed between 180.7 and 179.6 mAHD between November 2021 and February 2022. Over this period groundwater levels seem to have stabilised with fluctuations up to 1 m. This follows a period of recovery since June 2021 (Figure 16). In February 2022, groundwater levels declined marginally below the trigger TARP Level 4 (180 mAHD) for short periods of time (five days in February 2022). As of March 2022, groundwater levels increased above the trigger TARP Level 4, hence a TARP Level 3 applies.

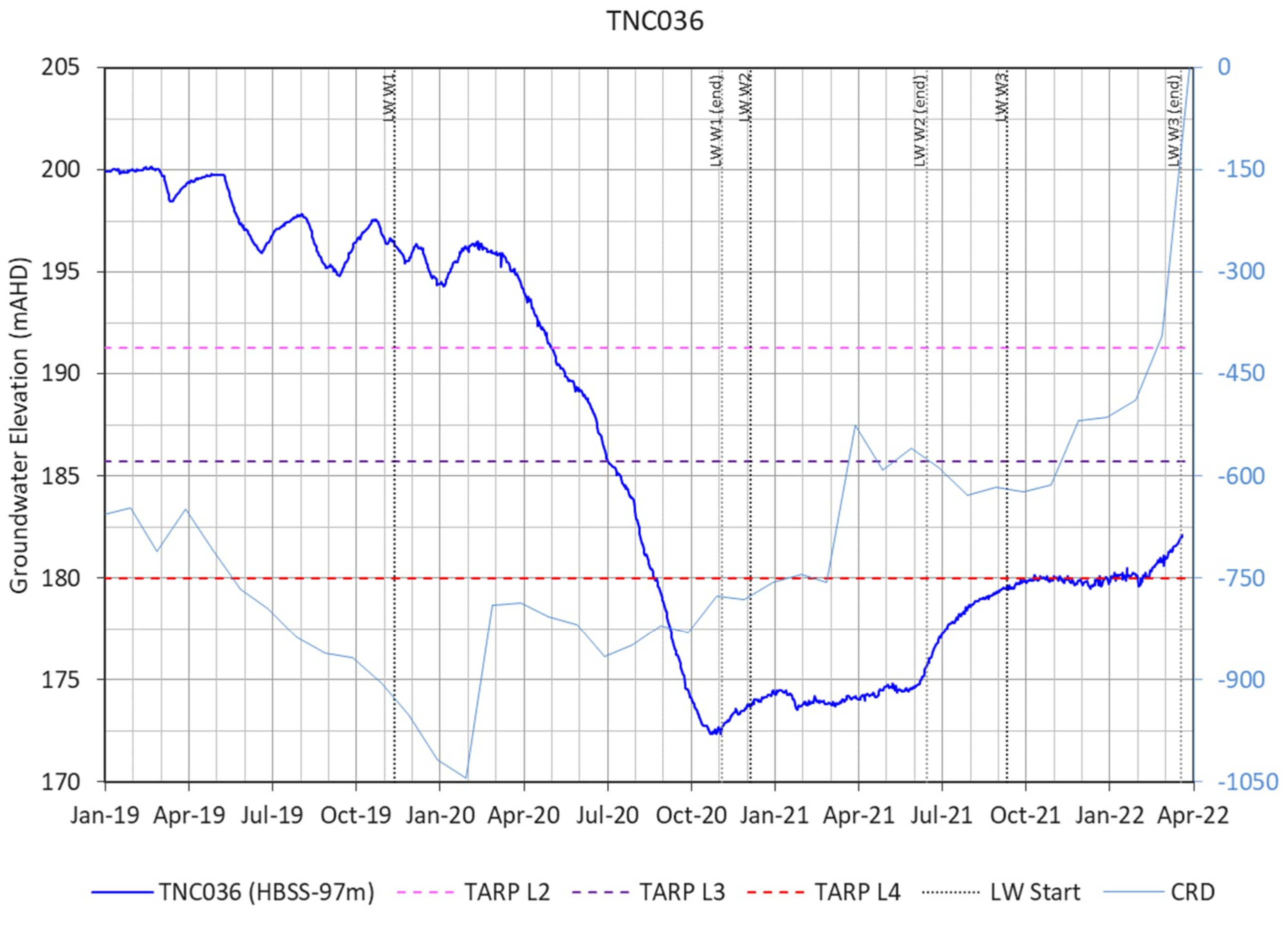


Figure 16 Groundwater Level Exceedance at TNC036-HBSS-97m

In HBSS-169m, the reduction to a TARP Level 2 occurred in September 2021 while groundwater levels continued to recover within the revised TARP Level 2. Groundwater levels are observed between 161.5 and 163.5 mAHD and increase by approximately 2 m during the reporting period (Figure 17). The groundwater trend at TNC36-169m in March 2022 remains consistent with the observations made in the six-monthly review (SLR, 2021a) and previous monthly reporting (SLR, 2022b). As of March 2022, groundwater levels remain below the trigger for TARP Level 2 (192.5 mAHD), hence a TARP Level 2 still applies.

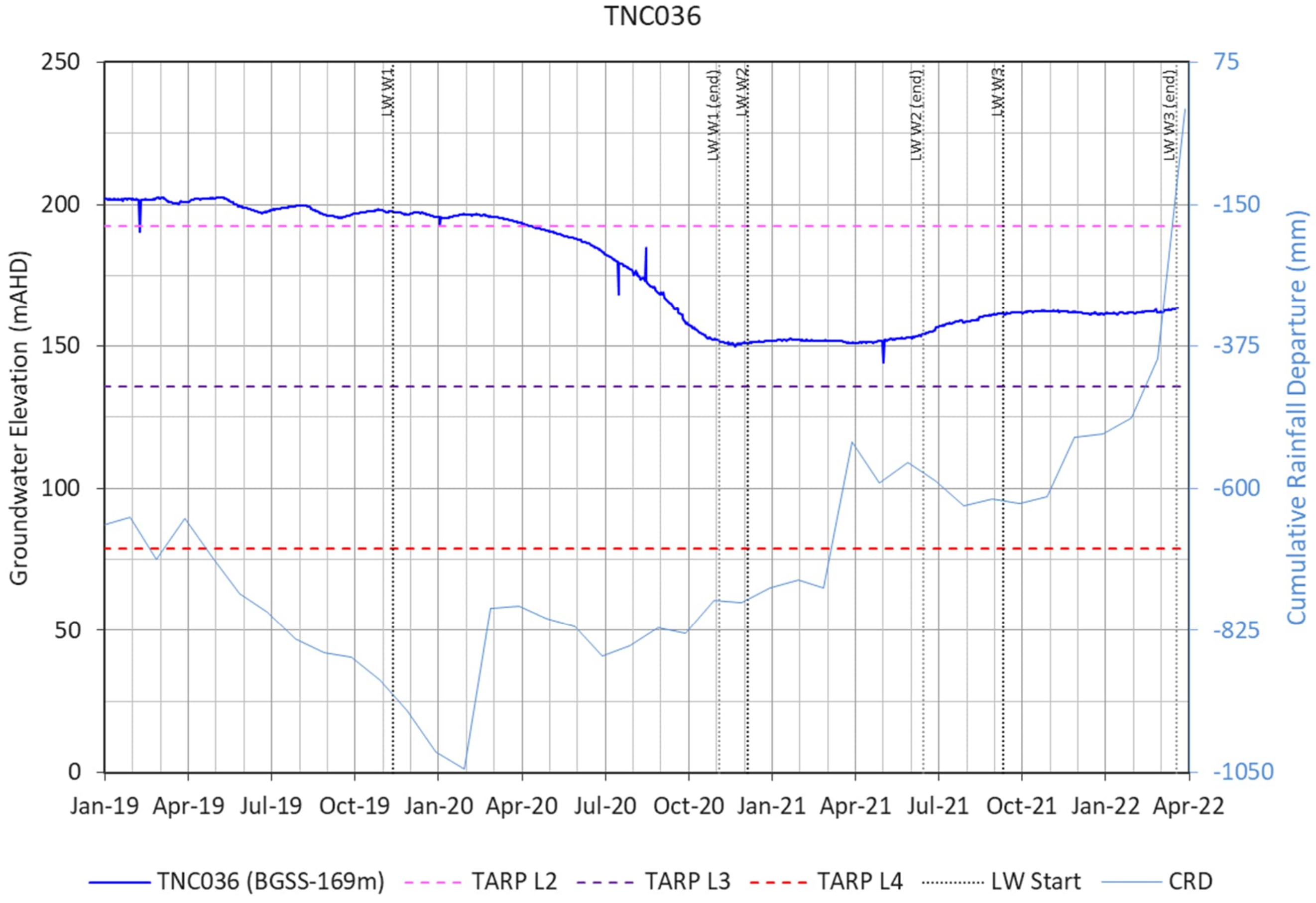


Figure 17 Groundwater Level Exceedance at TNC036-BGSS-169m

4.4.3 Deep VWPs – TNC036

Figure 18 and Figure 19 present the modelled (blueline) and observed (orange marker) drawdown at TNC036 sensors (BGSS-214m, BGSS-412.5m) since the start of LW LW1 extraction. The blue dashed line represents a threshold established as per the TARP for deep VWP sensors which is the modelled drawdown plus 30 m (Table 5).

Figure 18 shows that the observed drawdown at TNC036-BGSS-214m exceeds the modelled drawdown from March 2020 and the 30 m predicted drawdown between September 2020 and April 2021. Since May 2021, a TARP Level 2 applies with observed water levels within the predicted drawdown (+30m) (Table 5).

Figure 19 shows that the observed drawdown at TNC036-BGSS-412.5m exceeds the modelled drawdown from August 2020 but remains within the predicted drawdown (+30m) as of March 2022. A Level 2 TARP criteria applies at TNC036-BGSS-412.5m over the reporting period (Table 5).

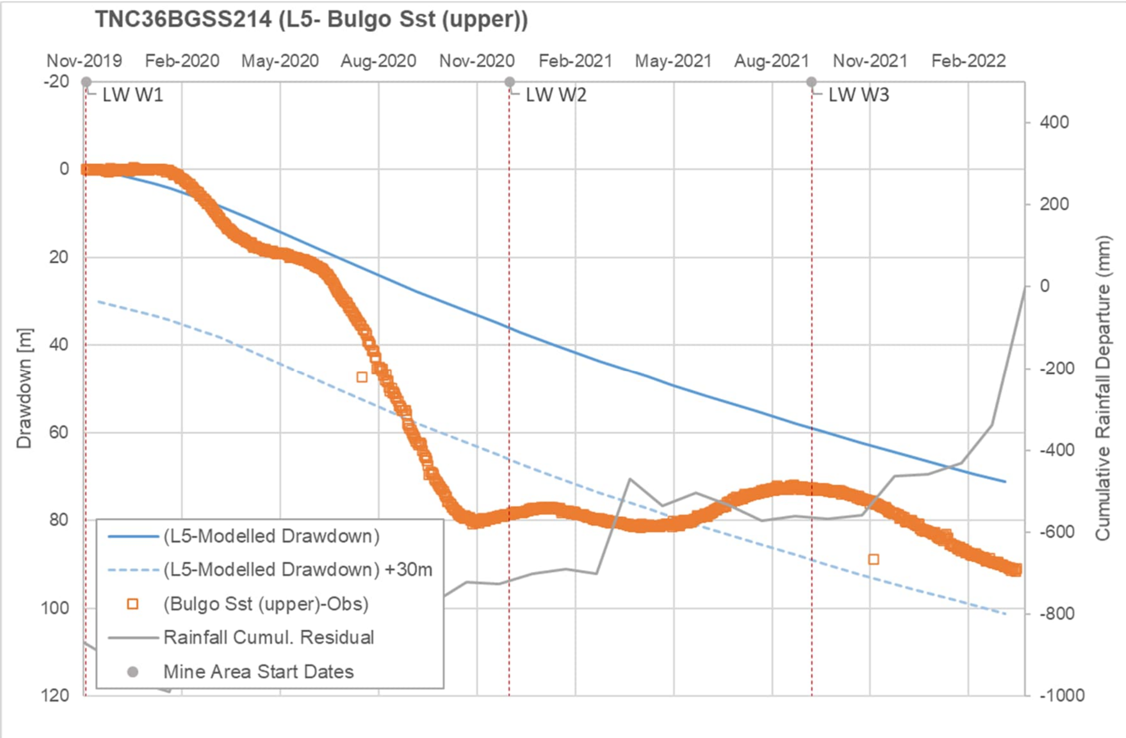


Figure 18 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-214m) with the +30m Threshold Modelled Drawdown

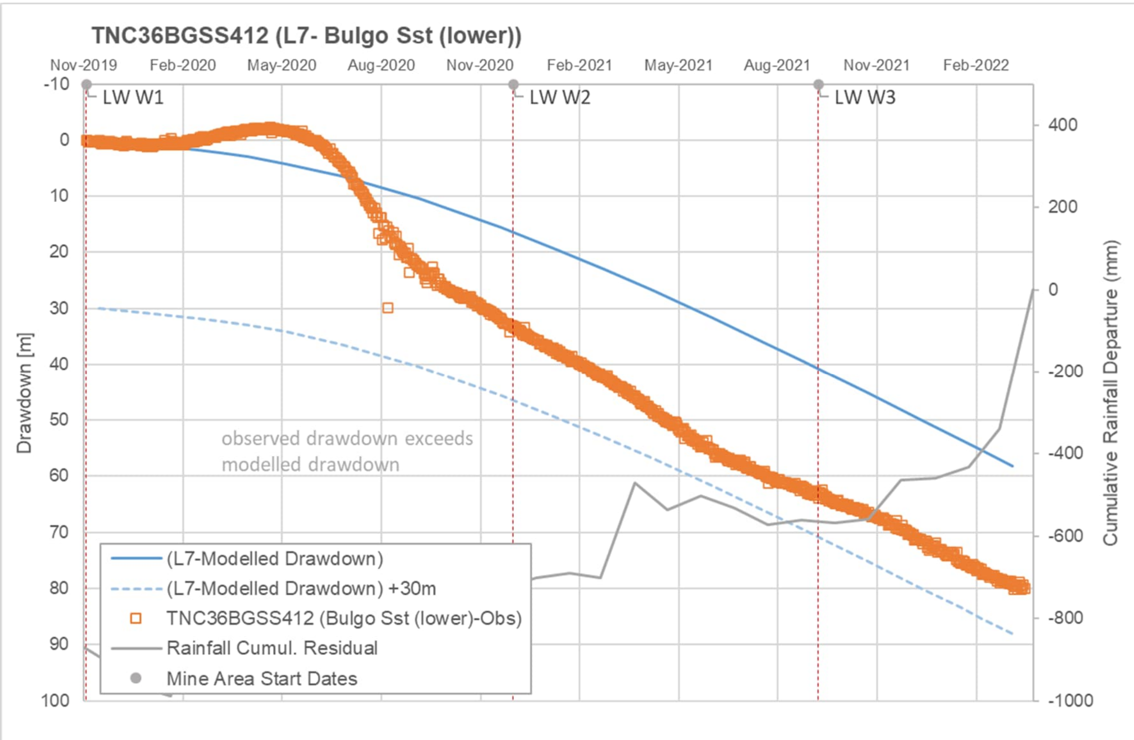


Figure 19 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-412.5m) with the +30m Threshold Modelled Drawdown

5 Groundwater Quality Trigger Review

5.1 Trigger Criteria

The approved trigger criteria for groundwater quality are summarised in Table 8. Appendix B2 details the water quality impact assessment trigger criteria from the LW W3-W4 Extraction Plan (Tahmoor Coal, 2021) and the appropriate action plan to be enacted should a trigger exceedance in groundwater quality occur during mining of LW W1-W2.

The groundwater triggers for water quality parameters are detailed in the Groundwater Technical Report (SLR, 2021) and reproduced in Table 9 below. These values were set for each bore. The water quality triggers were assigned as follows:

- pH - each bore was assigned a lower and upper pH trigger level based on the minimum and maximum pH value recorded in the available dataset minus/plus a pH unit;
- electrical conductivity (EC) - this trigger was established for each bore as the maximum observed EC during the pre-mining baseline and early mining period, plus ten percent of this maximum value; and
- for metals, either:
    - when the maximum metal concentration was recorded during the mining period, the trigger was set at the 95th percentile of the full historical data record (pre-mining and mining period); or
    - when the maximum metal concentration was recorded during the baseline period, the trigger level was defined as the maximum concentration plus ten percent of that value.

Further details on the methodology to develop the proposed groundwater quality trigger levels are provided in the Section 6.2.2 of the Groundwater Technical Report LWW3-W4 (SLR, 2021).

Table 8 Groundwater Quality TARP Criteria for Open Standpipes and Private Bores (Tahmoor Coal, 2021)

Significance Level	Criteria
	Open Standpipes
Level 1	No observable change in salinity, pH or metals outside of the baseline variability*.
Level 2	Short term increase (< 3 months) in salinity and/or metals, or change in pH outside of baseline variability*. The effect does not persist after a significant rainfall recharge event. AND/OR A similar trend or response has been noted at other monitored bores or private groundwater bores.
Level 3	Short term increase (< 3 months) in salinity and/or metals or change in pH outside of baseline variability*. The effect persists after a significant rainfall recharge event. AND/OR the change in water quality is determined not to be controlled by climatic or anthropogenic factors.
Level 4	Medium to long term increase in salinity and / or metals or a change in pH outside of baseline variability* with the effect persisting for greater than 3 months or after a significant rainfall recharge event. AND The reduction in water quality is determined not to be controlled by climatic or anthropogenic factors.

*the baseline variability was estimated using available data and refers to the proposed trigger levels (refer the section 6.2.2 and Table 6.2 of Groundwater Technical Report (SLR,2021)

Table 9 Triggers for Groundwater Quality TARPs

Bore	Trigger Level			Trigger Level Concentrations (mg/L) for Metals											
	EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
P12A	942	5.4	8.1	26.4	1.7	0.0110	0.0044	75.90	0.011	0.06	0.011	0.06	0.3	0.1	0.011
P12B	729	5.0	8.2	15.2	1.3	0.0044	0.0076	50.6	0.011	0.04	0.011	0.04	0.4	0.2	0.011
P12C	528	5.9	9.2	23.1	0.8	0.0034	0.0011	0.90	0.011	0.04	0.011	0.1	0.2	0.1	0.011
P13A	1232	5.2	9.4	69.3	1.5	0.0036	0.0014	0.91	0.011	0.04	0.011	0.03	0.4	0.3	0.011
P13B	1269	5.4	9.6	16.6	1.2	0.0020	0.0011	0.22	0.011	0.06	0.011	0.04	0.2	0.3	0.011
P13C	376	6.3	10.2	46.2	1.4	0.0011	0.0011	0.1	0.011	0.1	0.011	0.02	0.1	0.3	0.011
P14A	396	4.1	9.1	15.4	2.0	0.0022	0.0011	0.21	0.011	0.05	0.011	0.01	0.1	0.1	0.011
P14B	915	4.6	8.8	46.2	0.9	0.0022	0.0011	0.22	0.011	0.04	0.011	0.07	0.1	0.2	0.011
P14C	1881	5.3	9.4	19.8	1.5	0.0011	0.0011	0.04	0.011	0.1	0.011	0.11	0.2	0.4	0.011
P14D	1198	5.5	9.6	11.0	1.9	0.0011	0.0011	0.04	0.011	0.04	0.011	0.35	0.1	0.2	0.011
P15A	4620	4.63	8.22	5.7	1.0	0.0011	0.0011	0.28	0.0011	0.055	0.011	0.13	2.9	2.3	0.011
P15B	3575	4.11	12.1	4.8	0.9	0.0011	0.0011	0.09	0.0011	0.055	0.011	0.14	1.3	1.2	0.011
P15C	2090	5.04	8.66	6.2	0.5	0.0011	0.0011	0.19	0.0011	0.033	0.011	0.20	0.5	0.5	0.011
P15D	1430	5.48	7.72	3.5	0.9	0.0011	0.0011	0.13	0.0011	0.055	0.011	0.19	0.2	0.4	0.011
P16A	1539	4.9	7.8	116.0	3.9	0.0011	0.0011	0.1	0.011	0.04	0.011	0.06	0.3	0.5	0.011
P16B	1180	5.9	9.6	41.8	1.8	0.0011	0.0011	0.03	0.011	0.05	0.011	0.04	0.2	0.1	0.011
P16C	1212	6.2	9.5	46.6	1.6	0.0011	0.0011	0.02	0.011	0.05	0.011	0.1	0.1	0.1	0.011
P17	2019	4.8	8.3	10.6	0.6	0.0011	0.0011	0.2	0.011	0.04	0.011	0.11	0.2	0.7	0.011
GW105546	448	3.5	7.2	37.4	1.6	0.0011	0.0011	0.1	0.011	0.03	0.011	0.011	0.05	0.04	0.011
GW105467	1041	3.7	6.8	77.0	3.9	0.094	0.0019	0.2	0.039	0.04	0.011	0.072	0.1	0.04	0.011

Bore	Trigger Level			Trigger Level Concentrations (mg/L) for Metals											
	EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
GW105228	1793	4.6	7.1	31.4	2.7	0.0011	0.0011	0.2	0.0181	0.04	0.011	0.026	0.23	0.15	0.011
GW072402	8151	4.7	7.5	63.8	0.9	0.0019	0.0011	0.2	0.011	0.03	0.011	0.157	0.3	0.5	0.011
GW115860*	948.2	4.9	7.25	16.5	0.9	0.0011	0.0011	0.02	0.011	0.022	0.011	0.253	0.51	0.3	0.011
GW104090	3861	5.3	7.5	50.6	1.4	0.0011	0.0011	0.05	0.022	0.033	0.011	1.650	0.1	1.2	0.011

‘*” Revised trigger level for Ba at bore GW115860 following the groundwater trigger investigation presented in SLR (2022a)

5.2 Discussion of Groundwater Quality Exceedances

The following section details the groundwater quality compliance at Tahmoor Coal in relation to the groundwater quality triggers. Table 10 presents the occurrence of trigger level exceedances in groundwater quality (EC, pH and metals) over the reporting period as per the proposed trigger values (Table 9) and the TARP trigger criteria found respectively in Appendix B.

A brief analysis of the EC, pH and metal concentrations in relation to climate and mining activity during the reporting period is presented in Sections 5.2.1 to 5.2.3 alongside trigger exceedances. Time series plots with the approved trigger values (EC, pH, metals) with exceedances only are shown in Appendix D, Figures D1-D25.

Table 10 Trigger Exceedances for pH, EC and Metal Concentrations over the Reporting Period (November 2021 – March 2022)

Bore	Month	Trigger Level Exceedance														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
Shallow OSP																
P12A	Nov															
	Dec															
	Jan															
	Feb						L2	L2								
	Mar															
P12B	Nov															
	Dec			L2							L2					
	Jan			L2												
	Feb			L2												
	Mar			*L4									L2			
P12C	Nov										L2					
	Dec															
	Jan															
	Feb															
	Mar															
P14A	Nov						L2						L2		L2	
	Dec															
	Jan															
	Feb												L2			
	Mar															
P14B	Nov															
	Dec										L2					

Bore	Month	Trigger Level Exceedance														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Jan										L2					
	Feb															
	Mar															
P14C	Nov										L2					
	Dec															
	Jan															
	Feb										L2					
	Mar															
P14D	Nov															
	Dec															
	Jan															
	Feb															
	Mar															
P15A	Nov														L2	
	Dec														L2	
	Jan														*L4	
	Feb	L2													*L4	
	Mar	L2													*L4	
P15B	Nov														L2	
	Dec	L2														
	Jan															
	Feb														L2	
	Mar	L2														
P15C	Nov					L2									L2	
	Dec															
	Jan															
	Feb										L2				L2	
	Mar					L2									L2	
P15D	Nov															
	Dec															
	Jan															
	Feb				L2									L2		
	Mar															
P16A	Nov													L2		

Bore	Month	Trigger Level Exceedance														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Dec															
	Jan															
	Feb															
	Mar															
P16B	Nov														L2	
	Dec				L2										L2	
	Jan															
	Feb														L2	
	Mar				L2											
P16C	Nov															
	Dec			L2												
	Jan															
	Feb															
	Mar															
Private Bores																
GW104090	Jan													L2	L2	
GW105467	Jan															
GW105228	Jan													L2		
GW072402	Jan													L2		
GW115860	Jan	*L4												*L4 ^		
GW105546	Jan															

TARP Level 1 TARP Level 2 TARP Level 3 Potential TARP Level 4 no site access

site decommissioned (P13 and P17)

LX: maximum trigger level exceedances recorded

"*" remains a potential Level 4 TARP trigger

"^" A potential TARP Level 4 was identified at GW115860 for Ba. Following the groundwater trigger investigation (SLR,2022a), a revision of the trigger levels was recommended with a reduction to a TARP Level 1 (see Section 5.2.3.8)

5.2.1 Electrical Conductivity (EC)

Prior to this reporting period, there had been no trigger exceedances for EC at any of the standpipes (P12-P14, P16, and P17). Private bores GW104090 and GW115860 showed a TARP Level 2 EC trigger exceedance in the July monitoring round, with GW115860 also showing an exceedance in October 2021.

During this reporting period, three monitoring sites have triggered EC trigger levels within this six-monthly monitoring period:

- P15A;

- P15B; and
- GW115860.

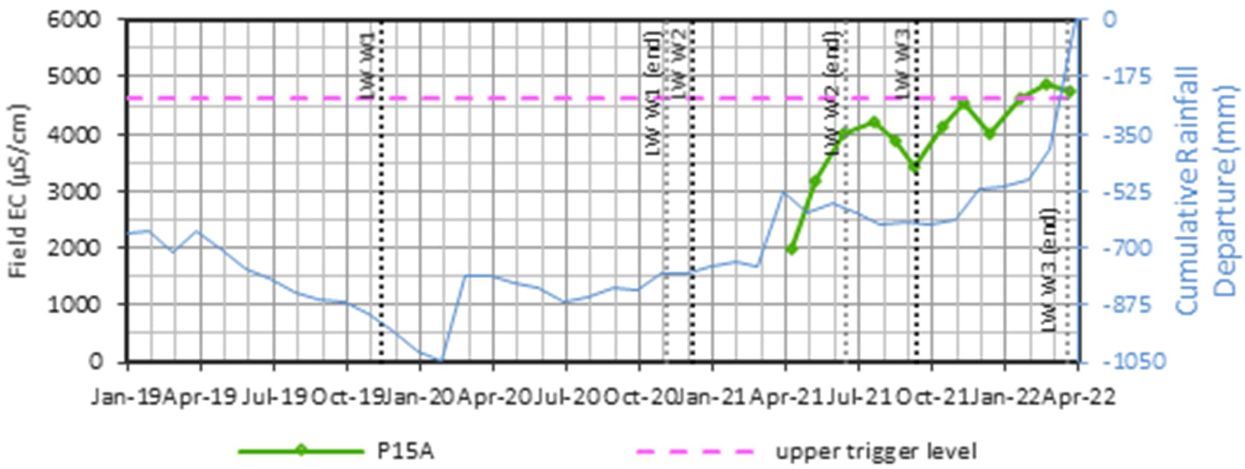
All others EC measurements from the Tahmoor standpipes and private bores are within the Level 1 TARP.

5.2.1.1 P15A

EC in P15A shows fluctuating behaviour since monitoring started in April 2021. The salinity at P15A has been increasing from 4,010 in December 2021 to 4,860 µS/cm in February 2022 before reducing to 4,760 µS/cm in March 2022. Since February 2022, EC has been marginally above the TARP Level 2 of 4,620 µS/cm (Figure 20).

5.2.1.2 P15B

EC in P15B also shows fluctuating behaviour. At P15B, EC triggered a TARP Level 2 of 3,575 µS/cm in December 2021 before returning within TARP Level 1 in January 2022. In February 2022, EC increased to 4270 µS/cm and reduced slightly to 4,210 µS/cm in March 2022 triggering the TARP Level 2 since February 2022 (Figure 20).



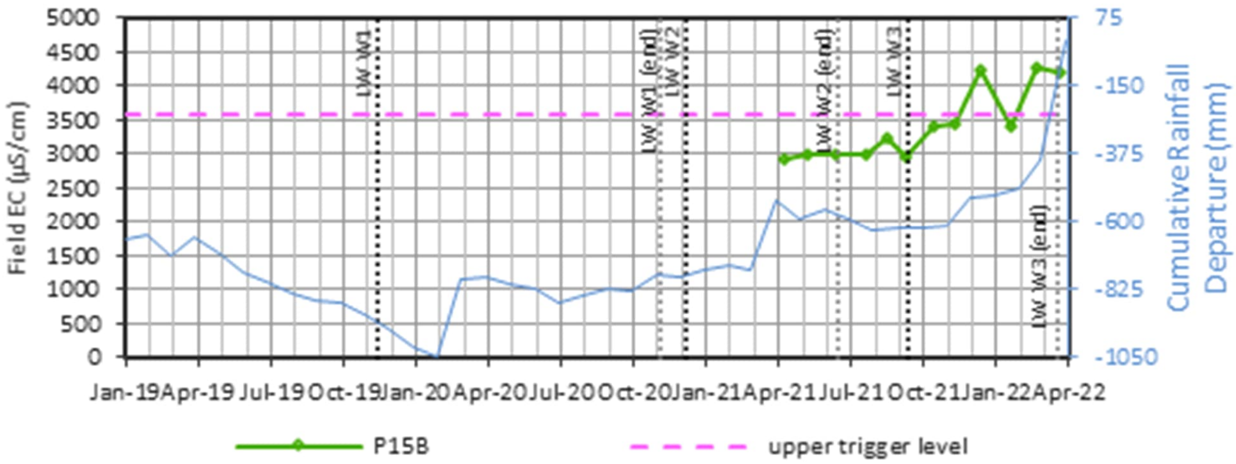


Figure 20 EC Exceedances at P15A and P15B

5.2.1.3 GW115860

The salinity at GW115860 has been steadily increasing from 621 µS/cm in January 2021 to 1,246 µS/cm in March 2022. Final EC in January 2022 at this bore exceeds the trigger level of 948.2 µS/cm for three consecutive recordings (greater than 6 months), resulting in a potential TARP Level 4 (Figure 21). Private bore GW115860 is used for domestic purposes. SLR (2022a) investigated the trigger exceedances at GW115860 for EC. The following summarises the findings presented in SLR (2022a):

- The reason for the increased EC at GW115860 is unclear, although it is consistent with the trend observed at nearby bore GW105228. Therefore, this trigger is only 'potential' Level 4 TARP trigger, and it has not been confirmed that the cause is mining.
- No drawdown was observed during the extraction of LW LW3 at GW115860, and hence drawdown does seem to be the cause of the change in EC;
- The increase in EC at GW115860 (to 1,246 µS/cm) does not change the beneficial use classification of the groundwater extracted at this site, and therefore the currently observed effects are considered to be immaterial. Indeed, salinity (TDS) at GW115860 remains within the desirable palatability of less than 600 mg/L (class A1 category – DPIE, 2012). Groundwater quality at GW115860 remains suitable for all beneficial uses, including the current purpose.
- Given the low salinity of groundwater at GW115860, and the small incremental change in that salinity in relation to the beneficial use classifications it is recommended to continue observing this bore over the next monitoring period (April 2022) to see if EC decreases, otherwise to revise the trigger. The most reliable method to revise the trigger would be to adopt the EC trigger from GW105228 for use at GW115860 as it has been derived from a longer record period.

Further details regarding the investigation of EC exceedances at GW115860 is presented in SLR (2022a).

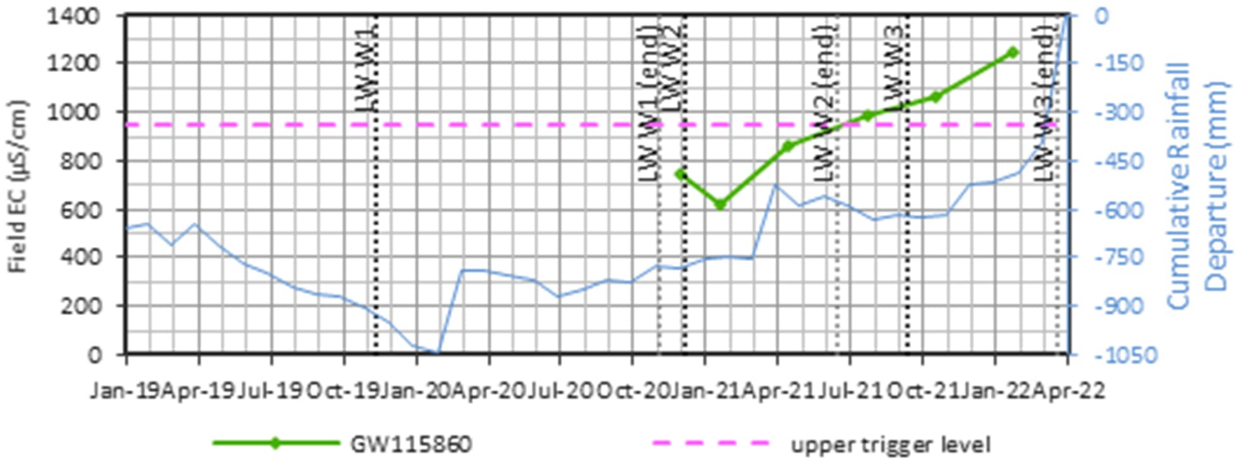


Figure 21 EC Exceedances at GW115860

5.2.2 pH Exceedances

Two monitoring sites have triggered pH trigger levels within this six-monthly monitoring period:

- P12B - triggered the upper pH threshold; and
- P16C - triggered the upper pH threshold.

5.2.2.1 P12B

P12B triggered the upper trigger level for pH between December 2021 and March 2022 with a pH of 10.65 in March 2022 (trigger level = 8.16) (Figure 22). A potential TARP Level 4 was identified in March 2022 as four consecutive recordings (greater than three months) were recorded during a period of above average rainfalls.

SLR (2022a) investigated the recent rise in pH at P12B in January 2022. The following summarises the findings:

- A rising trend in pH was previously observed at P12A, P12B and P12C around December 2020 to April 2021. It has been previously reported by SLR (2021a), that this could be due to compromised integrity of the monitoring bores combined with high rainfall causing cement to become mobilised into the groundwater.
- No anomalous variations in groundwater level were identified in P12A, P12B and P12C, that could be indication of a compromised bore integrity (SLR, 2022a and Figure A-1).
- The reason for the increase in pH at P12B causing the trigger exceedance is unclear and could potentially be related to compromised bore integrity, however an increasing trend was also observed at GW072402.
- GW072402 has experienced a pH increase from 5.9 to 6.8 between January 2021 and January 2022, however the bore had a pH of 6.5 in December 2019 just after mining began. The pH at GW072402 remains at near-neutral values (close to 7), while the pH at P12B is higher, above 10, where a value of 9.5 is often considered the maximum for some beneficial uses (Department of Environment and Heritage Protection, May 2014).

At this time, a mining-related effect is plausible, however the consequences of this effect (if it is mining-related) are considered minor.

In addition, in March 2022, pH at nearby bores P12A and P12C is within a TARP Level 1 at 6.9 and 8.61 respectively, both relatively neutral, and well below the pH seen at P12B (Figure 22). It is recommended that pH at P12B remains a potential TARP Level 4.

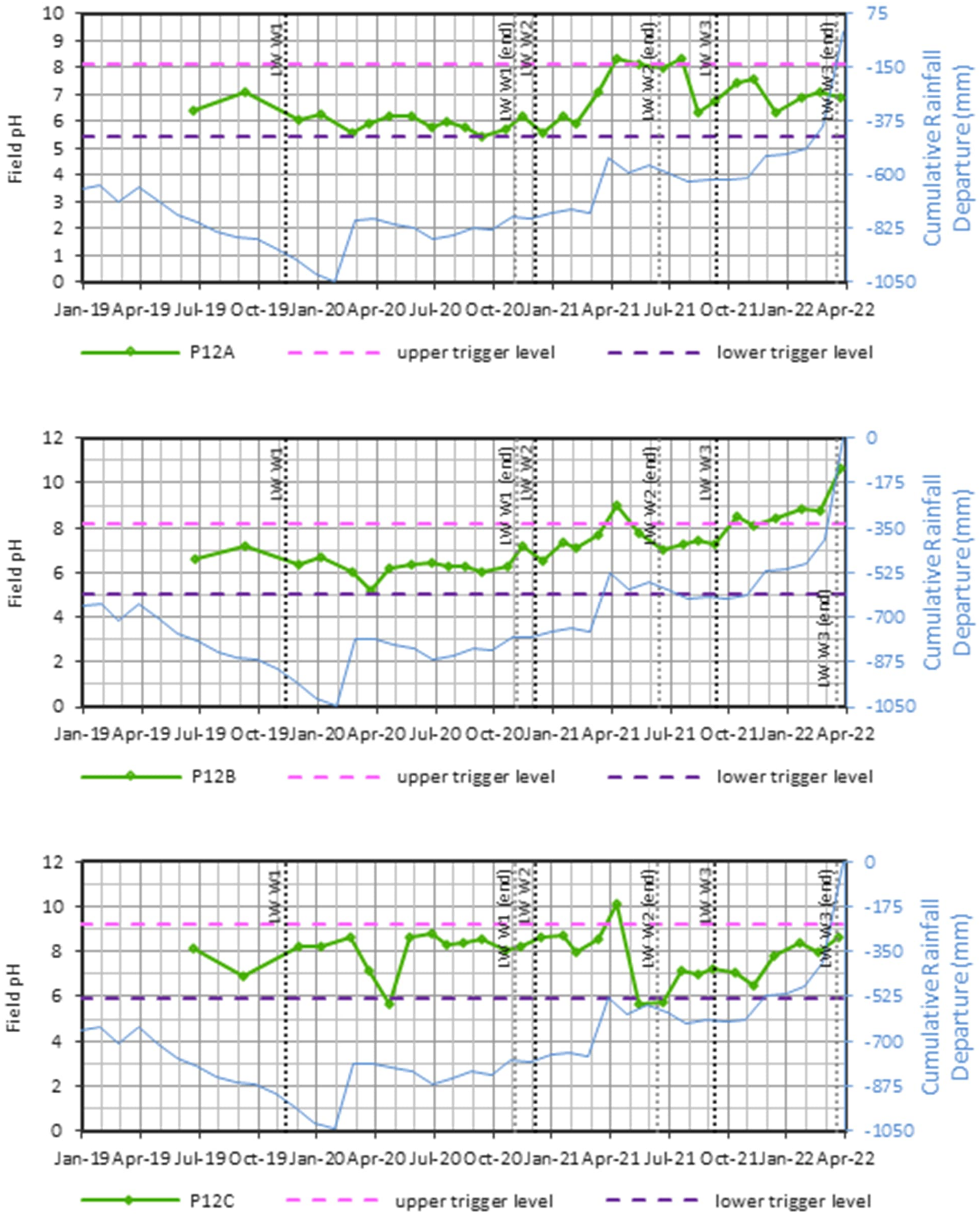


Figure 22 pH at P12A and P12C and pH Exceedances at P12B

5.2.2.2 P16C

pH at P16C exceeded the TARP Level 2 trigger of 9.49 in December 2021. pH increased from 9.36 to 9.5 in December 2021. Between January 2022 and March 2022, pH at P16C shows a fluctuating behaviour ranging from 7.15 to 9.22. As of March 2022, pH at P16C is within a TARP Level 1.

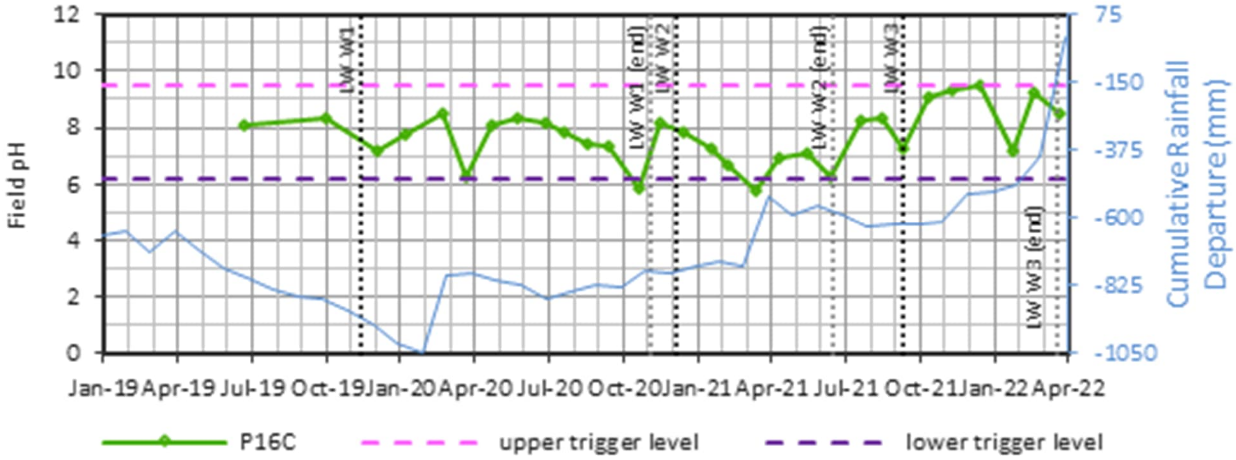


Figure 23 pH Exceedances at P16C

5.2.3 Metals

The following metal triggers were exceeded over the five-monthly monitoring period from November 2021 to March 2022 in the respective bores (Appendix D, Figure D-1 to Figure D-25):

- Iron (Fe) - P15D (February), and P16B (December and March)
- Manganese (Mn) – P15C (March)
- Copper (Cu) – P12A (February), P14A (November)
- Lead (Pb) – P12A (February)
- Aluminium (Al) – P12B (December), P12C (November), P14B (December and January), P14C (November and February), P15C (February)
- Lithium (Li) – P12B (March), P14A (November and February)
- Barium (Ba) – P15D (February), P16A (November), GW104090, GW105228, GW072402, GW115860 (all in January);
- Strontium – P14A (November), P15A (all months), P15B (November and March), P15C (November, February and March), P16B (November, December and February), GW104090 (January).

Over the reporting period, there were no exceedances in the lower pH and in dissolved zinc (Zn), nickel (Ni), arsenic (As) and selenium (Se).

5.2.3.1 P12A, B and C

- A TARP Level 2 for dissolved copper (Cu) and lead (Pb) was triggered at P12A in February Cu concentrations increased from 0.001 mg/Lto 0.011 mg/L in February (i.e. at the trigger level) reducing to 0.005 mg/L in March (Appendix D, Figure D-1). Pb concentrations increased from 0.002 mg/l to 0.005 mg/L in February above the trigger level of 0.0044 mg/L and reducing to 0.003 mg/L in March (Appendix D, Figure D-2).
- A TARP Level 2 for dissolved aluminium (Al) and lithium (Li) was triggered in December and March respectively at P12B. Dissolved (Al) increased from 0.01 mg/L to 0.04 mg/L in December. This aluminium concentration remained close to the trigger level (0.038 mg/L) (Appendix D, Figure D-3). It is noted that aluminium concentrations in all standpipes across the site show fluctuations in the range of 0.01 to 0.06 mg/L, and these are considered representative of the natural groundwater system. Thus, the trigger level for P12B may be too conservative considering the background levels, and therefore occasional exceedances of the trigger limit are expected to occur. Dissolved (Li) increased from 0.027 mg/L to 0.065 mg/L in March marginally above the trigger level of 0.042mg/L (Appendix D, Figure D-4).
- A TARP Level 2 for dissolved aluminium (Al) was triggered in November at P12C. Dissolved (Al) increased from 0.01 mg/L to 0.05 mg/L in November (Appendix D, Figure D-5). Like P12B, this aluminium concentration remained close to the trigger level (0.04 mg/L) and is considered representative of the natural groundwater system.

5.2.3.2 P14A

A TARP Level 2 for dissolved copper (Cu) and strontium (Sr) was triggered in November at P14A. Cu concentration increased to 0.003 mg/L in November, above the trigger level of 0.022 mg/L (Appendix D, Figure D-6). Sr concentration increased to 0.069 mg/L in November, above the trigger level of 0.06 mg/L (Appendix D, Figure D-7).

A TARP Level 2 for dissolved lithium (Li) was triggered in November and February at P14A. Concentrations increased to 0.011 mg/L and 0.09 mg/L marginally above the trigger level of 0.066 mg/L (Appendix D, Figure D-8). As of March, lithium concentration reduced to 0.05 mg/L. As of March 2022, Li concentrations are within TARP Level 1.

5.2.3.3 P14B, C

Short-term increases in dissolved Al triggered the TARP Level 2 throughout the reporting period. A TARP Level 2 was triggered in December and January at P14B for dissolved Al with concentrations rising to 0.05 mg/L (trigger level of 0.044 mg/l) (Appendix D, Figure D-9). A TARP Level 2 was recorded at P14C in November and February with concentration observed rising to the trigger level of 0.05 mg/L (Appendix D, Figure D-10). As mentioned above, aluminium concentrations show natural fluctuations in the range of 0.01 to 0.06 mg/L and these exceedances are not considered a cause for concern.

5.2.3.4 P15A

Strontium levels at P15A have continually exceeded the trigger of 2.31 mg/L from September 2021 to March 2022 monitoring rounds resulting in a potential TARP Level 4 exceedance in January 2022 (Appendix D, Figure D-11). Strontium concentrations have decreased from 3.7 mg/L in January 2022 to 3.1 mg/L in March 2022. SLR (2022a) investigated the recent Sr exceedances at P15A in January 2022 with no clear mining-impact identified.

In March 2022, Sr concentrations at nearby bores P15B and P15C resulted in a minor decrease (-0.2 mg/L at P15B) and was stable at P15C at 0.47 mg/L and observed within a TARP Level 1 at bores P15D, P14A-D. As presented in SLR (2022a), the stable and minor increase in Sr concentrations observed at nearby bores suggest that the exceedance in Sr concentrations in March 2022 at P15A remains a potential TARP Level 4.

Further details regarding the strontium investigation are presented in SLR (2022a). The following presents a summary of the findings:

- Since the start of monitoring at site P15A-D, the Sr concentrations are above the ranges reported at the unaffected sites in Morrison *et al*. (2019) and above the pre-mining Sr concentrations at P14A-P14D except for P15D within pre-mining Sr concentrations at P14.
- No exceedances in Sr concentrations were identified at surface water monitoring sites along Stonequarry Creek, with all surface water monitoring sites across the Western Domain within TARP Level 1 for water quality in January 2022 (HEC, 2022b) and during the reporting period (HEC, 2022a).
- From the U.S Environmental Protection Agency, Sr concentrations in drinking water are assessed relative to the health-based screening level benchmark of 4 mg/L (Musgrove, 2021). Values greater than 4 mg/L are considered high, between 2 mg/L and less than 4 mg/L are considerate moderate and less than 2.0 mg/L are considered low. At P15A, Sr concentrations are considered moderate (less than 4.0 mg/L).
- Since monitoring started at P15A, the higher Sr concentrations observed at P15A compared to other sites (i.e. P14, GW105228 and GW115860) and compared to the deeper piezometers (i.e. P15B-D) suggest a localised Sr source in groundwater at piezometer P15A.
- The range of strontium in natural soils is highly variable, from 50 mg/kg to 1000 mg/kg (USEPA, 1983). P15A is located within the mapped alluvium (Figure 1) and may be screened within alluvial soil with a higher Sr concentration compared to the deeper lithology of weathered and fresh Hawkesbury Sandstone. No bore logs are available to review and verify the lithology at this location.

- The Sr concentrations at nearby registered bores GW105228 and GW115860 are considered low (less than 2 mg/L) (Musgrove, 2021) suggesting no risk of human-health concerns and that the increase in Sr concentrations at P15A is possibly localised.

It is recommended to continue monitoring Sr concentration at site P15A-D, P14A-D and at the two nearby registered bores (GW105228 and GW115860).

5.2.3.5 P15B, C and D

At P15B, strontium levels exceeded the trigger of 1.21 mg/L in November (1.3 mg/L) and February (1.4mg/L) triggering the TARP Level 2. As of March 2022, strontium levels reduced to 1.2 mg/L (Appendix D, Figure D-12).

At P15C, strontium levels exceeded the trigger of 0.45 mg/L in November (concentration rising at the trigger level), in February and March (0.47 mg/L) triggering the TARP Level 2 (Appendix D, Figure D-13). Short-term increases in dissolved Al and Mn were also recorded at P15C triggering a TARP Level 2. Al levels increased from 0.01 mg/l in January to 0.04 mg/L in February, being stable in March above the trigger level of 0.03 mg/L (Appendix D, Figure D-14). As mentioned above, aluminium concentrations show natural fluctuations in the range of 0.01 to 0.06 mg/L and these exceedances are not considered a cause for concern. Mn levels were recorded marginally above the trigger level of 0.54 mg/L in November (0.55 mg/L) and in March (0.58 mg/L) (Appendix D, Figure D-15). As of March 2022, Mn levels at P15C appear lower than in the upper Hawkesbury Sandstone recorded at 0.82 mg/L (P15A) and 0.59 mg/L (P15B) and within a TARP Level 1.

A TARP Level 2 for dissolved iron (Fe) and barium (Ba) was triggered in February at P15D. Fe levels increased from 2.3 mg/L in January to 4.8 mg/L in February and as of March reduced to 2.2 mg/L (TARP Level 1) (Appendix D, Figure D-16). Ba levels increased from 0.15mg/L in December to 0.21 mg/L in February and as of March reduced below the trigger level of 0.21 mg/L to 0.17mg/L (Appendix D, Figure D-17).

5.2.3.6 P16A

A TARP Level 2 for barium (Ba) was triggered in November at P16A. Ba levels increased to 8.5 mg/L in November and reduced to 0.1 mg/L for the rest of the reporting period (Appendix D, Figure D-18). This single trigger is likely an outlier and could be attributed to a lab error measurement. Ba levels at P16A have been observed at 0.1 mg/L since monitoring started.

5.2.3.7 P16B

A TARP Level 2 for Sr was triggered in November and December at P16B and returned to TARP Level 1 in January. In February, Sr levels increased to 0.15 mg/L above the trigger level of 0.13 mg/L triggering the TARP Level 2 (Appendix D, Figure D-9). As of March, Sr reduced to 0.08 mg/L within a TARP Level 1. A TARP Level 2 for Fe was triggered in December at P16B which follows a period of decline in levels observed since July 2021. In January and February, Fe levels reduced within TARP Level 1 (i.e. 9.1mg/L) but as of March Fe levels increased to 86 mg/L (Appendix D, Figure D-20). Iron staining was previously reported at this location likely attributed to the installed steel casing.

5.2.3.8 Private Bores

At GW104090 a short-term increase for Sr and Ba triggered a TARP Level 2 in January. Sr levels have continually been increasing since April 2021 from 0.27 mg/L to 1.7 mg/L in January 2022 (trigger level is at 1.2 mg/L) (Appendix D, Figure D-21). Ba levels increased from 0.08 mg/L in October 2021 to 0.44 mg/L (Appendix D, Figure D-22).

At GW105228, Ba concentrations exceeded the trigger of 0.228 mg/L in January resulting in a TARP Level 2. Concentrations increased marginally from 0.23 mg/L in October 2021 to 0.24 mg/L in January 2022 (Appendix D, Figure D-23).

At GW072402 Ba concentrations in January 2022 were reported at 0.28 mg/L, which is marginally above the trigger value of 0.2785 mg/L, resulting in a TARP Level 2 (Appendix D, Figure D-24).

GW115860 is located 400 m north of LW W3. Barium concentrations at GW115860 exceeded the trigger of 0.33 mg/L for the third consecutive time in the January 2022 (i.e. a period of more than six months), resulting in a potential TARP Level 4 exceedance (Appendix D, Figure D-25). Concentrations increased from 0.36 mg/L in October 2021 to 0.39 mg/L in January 2022. The first reported concentration of Ba in January 2021 at GW115860 was 0.3 mg/L with the lowest concentration reported in April 2021 (0.032 mg/L).

SLR (2022a) investigated the potential TARP Level 4 for Ba at GW115860. The following summarises the findings:

- Ba concentration at GW105228 (110 m from GW115860) are stable within 0.20-0.25 mg/L since monitoring started.
- The short record of Ba concentrations at site P15A-D shows fluctuation within the range of 0.08 to 0.21 mg/L, generally lower than at GW105228.
- No exceedances or increasing trends in Ba concentrations were identified at sites P14A-D and P15A-C (only 180 m and 65 m from LW W3) between October 2021 and January 2022 (SLR, 2021a, 2022a) except at P15D (TARP Level 2) in February 2022 slightly increasing at the trigger level.

A mining-related effect on Ba at GW115860 was assessed to be unlikely but could not be excluded at the time of the investigation. A revision to the Ba trigger level was undertaken (SLR, 2022a) as it appeared that the trigger level was conservative and could not be based on pre-mining data.

The revised trigger level for Ba at bore GW115860 is 0.51 mg/L (SLR, 2022a) (Appendix D, Figure D-27).

The revised trigger level was calculated using the maximum Ba concentration recorded at GW115860 (i.e. 0.39 mg/L in January 2022) plus 30% (i.e. 30% being the percentage increase from 0.3 mg/L in January 2021 to 0.39 mg/L January 2022).

Published guideline values for Barium are:

- 1 mg/L for recreational purposes (ANZECC, 2000 / ANZG, 2018).
- There is no guideline value for Ba for freshwater ecosystems (ANZECC, 2000 / ANZG, 2018).
- 2 mg/L for health (i.e. drinking water) (NHMRC, 2011);

The revised trigger level for Ba at GW115860 remains conservative (i.e. lower than) with respect to the guideline values stated above. Further monitoring at GW115860 will be undertaken in April 2022 to confirm trends.

4.2 Trigger Criteria

TARPs have been developed based on the groundwater management program outlined in the Groundwater Technical Report LW W3-W4 (SLR, 2021) and the WMP (Tahmoor Coal, 2021), and describe necessary responses for exceedances in groundwater quality and groundwater level triggers at open standpipe ‘P’ bores, as well as exceedance of groundwater pressure triggers developed for VWPs. The approved trigger criteria for shallow and deep groundwater levels are summarised and presented in **Table 7. Appendix B1** details the latest approved impact assessment trigger criteria from the LW W3-W4 Extraction Plan presented in the WMP (Tahmoor Coal, 2021) and the appropriate action plan to be enacted should a trigger exceedance occur during mining of LW W1-W2 and LW W3-W4. **Appendix B (Figure B-1 to B-27)** present groundwater hydrographs at each site with the associated groundwater level triggers.

Prior to the approval of LW W3 in September 2021, groundwater levels and quality observations were assessed against the TARPs developed for and outlined in the Groundwater Technical Report LW W1-W2 (HS/SLR, 2019). From September 2021, as stated above, groundwater levels and quality observation across the Western Domain are now assessed against latest approved impact assessment trigger criteria (Tahmoor Coal, 2021). The following sections present the groundwater exceedances identified during the reporting period.

Further details regarding the development of the TARPs are provided in SLR (2021).

Table 7 Groundwater TARP Level Criteria for Open Standpipes, Shallow VWPs and Deep VWPs (Tahmoor Coal, 2021).

Significance Level	Criteria		
	Open standpipes	Shallow VWPs (<200m bgl)	Deep VWPS (>200m bgl)
Level 1	Groundwater level remains consistent within baseline variability and/or pre-mining trends, with reductions in groundwater level less than two metres and does not trigger Level 2 to Level 4 Significance Levels (refer to Appendix C).	No observable mining induced change at VWP intakes located at or above (i.e. shallower than) 200 m depth.	Observed data does not exceed predicted (modelled) impacts (excluding those monitoring the Bulli Coal Seam).
Level 2	Greater than 2 m water level reduction following the commencement of extraction at LW W1 (and LW W2, W3, W4) (refer to Appendix C for TARP Significance Level 2). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Greater than 5 m water level reduction in VWP intakes located at or above (i.e. shallower than) 200 m depth following the commencement of extraction at LW W1 (and LW W2, W3 and W4) (refer to Appendix C for TARP Significance Level 2). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) is within 30 m of predicted (modelled) drawdown.
Level 3	Water level declines below the water level of TARP Significance Level 3 (refer Appendix C, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Water level declines below the water level of TARP Significance Level 3 (refer Appendix C, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 6 months or more.
Level 4	Water level reduction greater than the maximum modelled drawdown (refer to Appendix C for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	Water level reduction greater than the maximum modelled drawdown (refer to Appendix C for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND The reduction in water level is determined not to be controlled by climatic or anthropogenic factors.	Calculated or observed drawdown (based on 2009-2015 baseline data and excluding VWPs within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 12 months or more.

4.3 Trigger Exceedances

Table 8 presents the occurrence of trigger level exceedances in groundwater levels since the start of mining at Western Domain as per the trigger values (HS/SLR, 2019; SLR, 2021) and the TARP trigger criteria presented in **Table 7** and **Appendix Table B1**.

Table 8 Groundwater Level Trigger Exceedances over September 2021 – September 2022 for the Shallow Open Standpipes, Shallow and Deep VWPs.

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances													Future Review Period						Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	**Apr 22**	**May 22**	**Jun 22**	**Jul 22**	**Aug 22**	**Sep 22**	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
Shallow OSP		TARP (Tahmoor Coal, 2021)																					
P12A	170.1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							0.5	170.7	-
P12B	170.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							0.8	171.3	-
P12C	176.3	L3	L3	L3	L3	L3	L3	L3	L3	L2	L2	L2	L2	L2							11.0	175.6	4.3
P14A	168.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							0.2	171.5	-
P14B	166.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1	L1	L1							1.4	168.4	-
P14C	166.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							1.7	168.5	-
P14D	164.8	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	L1	L1							1.8	167.4	
P15A	164.7^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							-	169.2	-
P15B	165.2^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							-	168.8	-
P15C	164.9^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1							-	168.8	-
P15D	165.4^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	L1							#	169.1	-
P16A	211.3	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1							1.1	210.7	0.9
P16B	206.4	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	#	#	#							5.7	205	1.3 [Jun 22]
P16C	199.6	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3							13.8	191.7	3.3

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances													Future Review Period						Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	**Apr 22**	**May 22**	**Jun 22**	**Jul 22**	**Aug 22**	**Sep 22**	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
Shallow VWPs (<200m)		TARP (Tahmoor Coal, 2021)																					
P41A	194	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1							-	190	0.1
P41B	172.9	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1							-	173	-
P41C	161.0	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1							-	161.7	-
P41D	160.0	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1							-	164.4	-
TNC036 - HBSS-65	209.5	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#							6.7	209.8	-
TNC036 - HBSS-97	196.3	L4	L4	L4	L4	L4	L4	L3	L3	L3	L3	L2	L2	#							24.0	185.5	8.7 [Aug 22]
TNC036 - BGSS-169	197.5	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	#							47.6	164.5	35.2 [Aug 22]
TNC040-WNFM-27	208.3	L1	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#							-	209.6	- [Aug 22]
TNC040 - HBSS-65	187.1	L1	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#							-	189	- [Aug 22]

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances													Future Review Period						Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	**Apr 22**	**May 22**	**Jun 22**	**Jul 22**	**Aug 22**	**Sep 22**	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
TNC043 - HBSS-65	158.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	NA	NA	NA									- [Jun 22]
TNC043 - HBSS-111.5	155.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	NA	NA	NA									0.9 [Jun 22]
Deep VWPs (>200m)	TARP (Tahmoor Coal, 2021)																						
TNC036 - BGSS-214	176.5	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	#							81.4	82.9	96.5 [Aug 22]
TNC036 - BGSS-412.5	96.8	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	#							49.7	13.9	13.9 [Aug 22]

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

LX: maximum trigger level exceedances recorded "-": no observed drawdown "#": groundwater levels not available

^ baseline groundwater level at P15 (A,B,C,D) is the groundwater level recorded in June 2021.

"" not assessed due to disruption in groundwater levels during drilling and packer testing at P15D.*

Table 9 Groundwater Level Trigger Exceedances over the Reporting Period (January 2021 – Sep 2022) for Private Bores

Bore	Baseline Maximum Ground water Depth (m bgl)	Baseline Groundwater Yield (L/s)	Trigger Level Exceedances									Groundwater Depths as of July 2022 (m bgl)	Ground water Yield as of July 2022 (L/s)
			Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22		
Private Bores													
GW104090	39.0	#	^	^	^	^	^	^	~	^		42.6	#
GW105467	32.0	0.5	*	*	*	*	*	*	*	*	*	#	#
GW105228	23.0	1.8	L1	L1	L1	L1	L1	L1	L1	x	x	10.6	1.1 to 2.5
GW072402	11.76	#	L1	L1	L1	L1	L1	L1	~	blocked	blocked	#	#
GW115860	#	#	L1	L1	L1	L1	L1	L1	L1	x	x	10.6	2.5
GW105546	31.9	1.6	*	*	*	*	*	*	*	*	*	#	#

LX: maximum trigger level exceedances recorded *#: not applicable* ** no site access* *"-"standing water level not available (access is not available inside the bore)*
m bgl – metres below ground level *^Bore blocked at 48.3 m bgl* *~sampling did not occur in July 2022, reported in Sept 22.* *"x": to be assessed in next review period (Oct 22)*

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

4.4 Discussion of Groundwater Level Exceedances

This section discusses any exceedances observed over the reporting period from April 2022 to September 2022. Hydrographs for monitoring locations with approved groundwater level triggers are presented in **Appendix C (Figures C1-C27)**.

TARP level exceedances were observed in bores as follows:

- TARP Level 3 at the shallow open standpipes P16C during the reporting period;
- TARP Level 3 at the shallow VWP sensors at TNC036 (HBSS-97m) from March 2022 to June 2022, with a reduction in TARP to Level 2 in July 2022;
- TARP Level 3 at the shallow open standpipes P12C in April 2022, with a reduction in TARP to Level 2 in May 2022;
- TARP Level 2 at the shallow open standpipe P16B during the reporting period;
- TARP Level 2 at the shallow VWP sensors at TNC036 (BGSS-169m) during the reporting period; and
- TARP Level 2 at the two deep VWP sensors at TNC036 (BGSS-214m and BGSS-412.5m) during the reporting period.

All other groundwater monitoring sites remained within TARP Level 1 across the six-monthly reporting period.

In terms of yield and groundwater level at the private bores, the following observations are noted over the reporting period (to July/September 2022):

- <u>GW105228</u>: There was no significant change in groundwater yield at GW105228 that could impede groundwater use during the reporting period. In July 2022, groundwater yield was recorded between 1.1-2.5 L/sec compared to 1.82 L/sec during the baseline period (GeoTerra, 2019). As of July 2022, groundwater levels were observed within baseline level**. TARP Level 1 applies**.
- <u>GW115860</u>: There was no significant change in groundwater yield at GW115860 that could impede groundwater use. In July, groundwater yield at this location is recorded at 2.5 L/sec compared to 2.3 L/sec during the baseline period. As of July 2022, groundwater levels were observed within baseline level**. TARP Level 1 applies**.
- <u>GW105467</u>: This bore is not actively used for groundwater extraction and no site access was possible during the reporting period. Further monitoring is planned at this location, if site access allows it.
- <u>GW105546</u>: There was no site access at GW105546 throughout the reporting period, hence the assessment of trigger assessment exceedances at this location was not possible.
- <u>GW072402:</u> No mining effect on groundwater levels is identified at this location at least until May 2022 (i.e. latest available records). The bore is suspected to be blocked at a depth of approximately 3 m. Further investigation is required to be completed to identify the cause of blockage and unblock the bore.

4.4.1 Shallow Open Standpipes

4.4.1.1 P12C

Groundwater levels are stable at 176.7 mAHD in September 2022 following a period of recovery. Groundwater levels have increased above the trigger TARP Level 3 (175 mAHD) in May 2022 which reduced the TARP to Level 2 (179.5 mAHD). Groundwater levels are 2.8m below the TARP Level 2 hence a TARP Level 2 applies (**Appendix C, Figure C-3**).

4.4.1.2 P16B and P16C

Since July 2022 no groundwater levels are recorded for P16B due to blockage of the bore. Groundwater levels were at approximately 205 mAHD in July 2022 and a TARP Level 2 was applied at P16B (**Appendix C, Figure C-13**). The groundwater monitoring bore P16B has been unblocked in October 2022 with groundwater data expected in the next review period.

In September 2022, groundwater levels at P16C were observed below the trigger TARP Level 3 (193.9 mAHD) (**Appendix C, Figure C-14**). There seem to be discrepancies between groundwater levels (mAHD) from the data logger and the manual measurements since June 2022, showing differences in the range of 3 m **(Appendix C, Figure C-14)**. While the groundwater levels from the data logger are used in the groundwater level TARP assessment, it is recommended to record several (i.e. 2-3) records of the depth to water at P16C using a water level meter to make sure the correct standing water level is recorded. Additionally, it is recommended to record the data logger installation depth and use this record in the calculations to convert pressure into a groundwater head (mAHD).

A drain to divert surface run-off has been developed in early November 2022 at P16B and P16C along with re-sealing the monitoring bores. These should ensure that no surface water run-off flows into the bore.

4.4.2 Shallow VWPs – TNC036

4.4.2.1 TNC036 - HBSS-97m

Groundwater levels gradually recovered above the TARP Level 3 threshold in July 2022 and therefore moved to TARP Level 2. A TARP Level 2 applies in August 2022 as groundwater levels were observed at 187.2 mAHD still below the threshold for TARP Level 2 (191.3 mAHD). (**Appendix C, Figure C-16)**

4.4.2.2 TNC036-169m

Groundwater levels were observed at 174.2 mAHD in late August 2022 (**Appendix C, Figure C-17**). The latest measurement taken on the 31st August 2022 indicated a decline of 12m in groundwater levels to 162.2mAHD. Further monitoring is required to confirm this sudden change against the general trend. As of August 2022, groundwater levels remain below the trigger TARP Level 2 (192.5 mAHD), hence a TARP Level 2 still applies.

4.4.3 Deep VWPs – TNC036

Figure 10 and **Figure 11** present the modelled (blueline) and observed (orange marker) drawdown at TNC036 sensors (BGSS-214m, BGSS-412.5m) since the start of LW LW1 extraction. The blue dashed line represents a threshold established as per the TARP for deep VWP sensors which is the modelled drawdown plus 30 m (**Table 7**).

The groundwater level observed at TNC036-BGSS-214m and TNC036-BGSS-412.5m exceeds the modelled drawdown from mid-2020 but remains within the 30 m predicted drawdown as of August 2022 (**Figure 10** and **Figure 11**). A Level 2 TARP criteria (exceeds modelled drawdown but less than 30 m exceedance) still applies at TNC036-BGSS-214m and TNC036-BGSS-412.5m over the reporting period (**Table 8**).

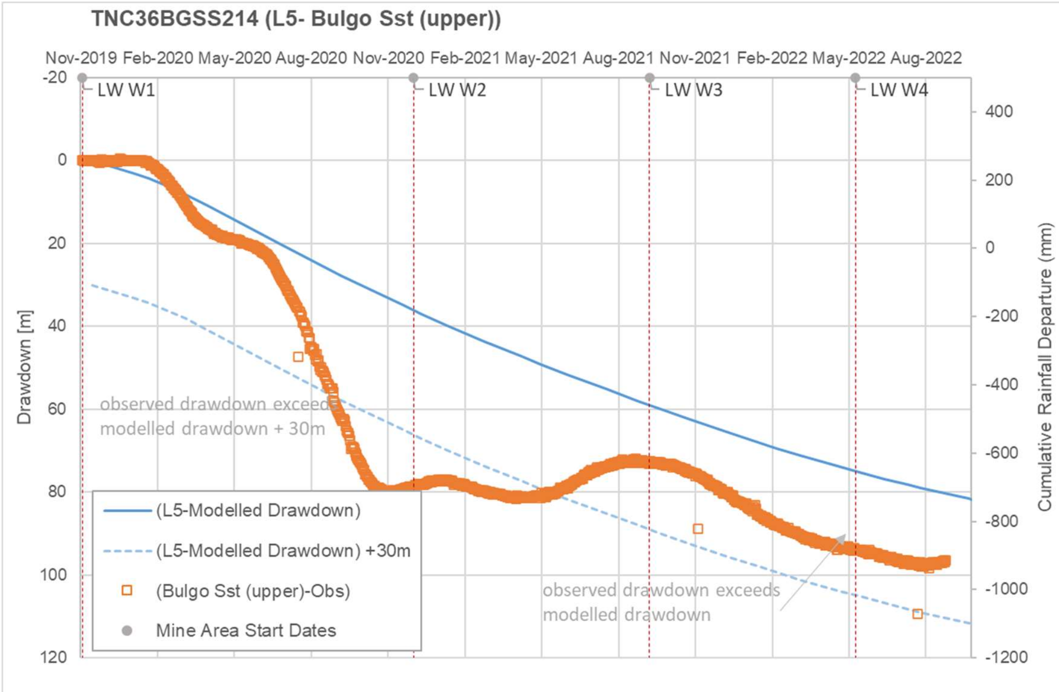


Figure 10 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-214m) with the +30m Threshold Modelled Drawdown

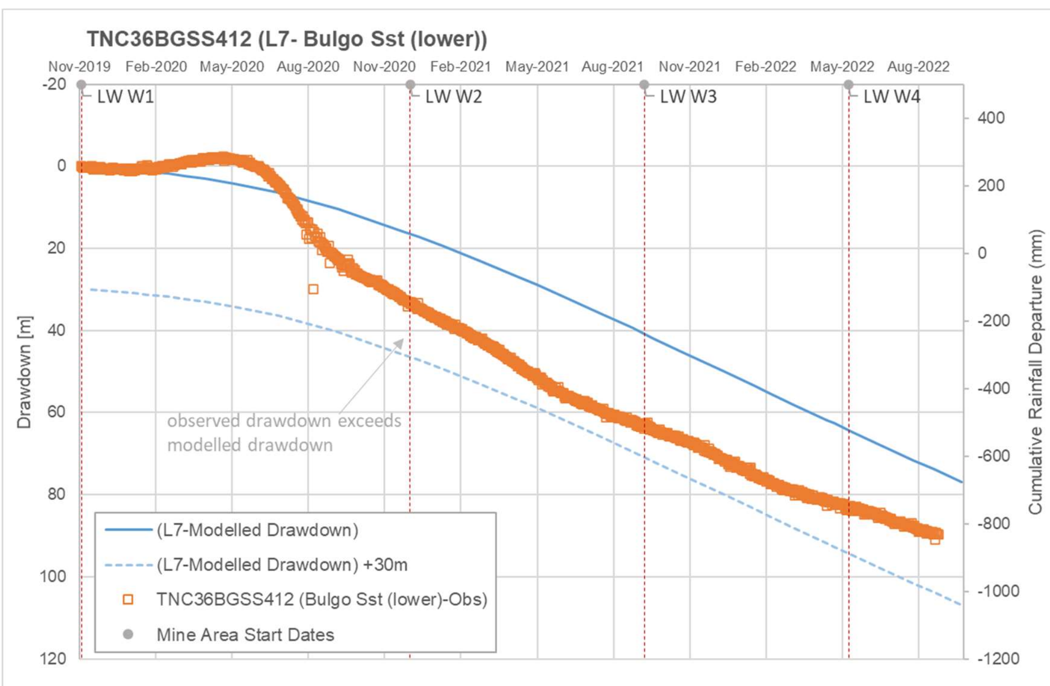


Figure 11 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-412.5m) with the +30m Threshold Modelled Drawdown

5 Groundwater Quality Trigger Review

5.1 Trigger Criteria

The approved trigger criteria for groundwater quality are summarised in **Table 10. Appendix B2** details the water quality impact assessment trigger criteria from the LW W3-W4 Extraction Plan (Tahmoor Coal, 2021) and the appropriate action plan to be enacted should a trigger exceedance in groundwater quality occur during mining of LW W3-W4.

The groundwater triggers for water quality parameters are detailed in the Groundwater Technical Report (SLR, 2021) and reproduced in **Table 11** below. These values were set for each bore. The water quality triggers were assigned as follows:

- pH - each bore was assigned a lower and upper pH trigger level based on the minimum and maximum pH value recorded in the available dataset minus/plus a pH unit;
- electrical conductivity (EC) - this trigger was established for each bore as the maximum observed EC during the pre-mining baseline and early mining period, plus ten percent of this maximum value; and
- for metals, either:
    - when the maximum metal concentration was recorded during the mining period, the trigger was set at the 95^{th} percentile of the full historical data record (pre-mining and mining period); or
    - when the maximum metal concentration was recorded during the baseline period, the trigger level was defined as the maximum concentration plus ten percent of that value.

Further details on the methodology to develop the proposed groundwater quality trigger levels are provided in the Section 6.2.2 of the Groundwater Technical Report LWW3-W4 (SLR, 2021).

Table 10 Groundwater Quality TARP Criteria for Open Standpipes and Private Bores (Tahmoor Coal, 2021)

Significance Level	Criteria
	Open Standpipes
Level 1	No observable change in salinity, pH or metals outside of the baseline variability*.
Level 2	Short term increase (< 3 months) in salinity and/or metals, or change in pH outside of baseline variability*. The effect does not persist after a significant rainfall recharge event. AND/OR A similar trend or response has been noted at other monitored bores or private groundwater bores.
Level 3	Short term increase (< 3 months) in salinity and/or metals or change in pH outside of baseline variability*. The effect persists after a significant rainfall recharge event. AND/OR the change in water quality is determined not to be controlled by climatic or anthropogenic factors.
Level 4	Medium to long term increase in salinity and / or metals or a change in pH outside of baseline variability* with the effect persisting for greater than 3 months or after a significant rainfall recharge event. AND The reduction in water quality is determined not to be controlled by climatic or anthropogenic factors.

*the baseline variability was estimated using available data and refers to the proposed trigger levels (refer the section 6.2.2 and Table 6.2 of Groundwater Technical Report (SLR,2021)

Table 11 Triggers for Groundwater Quality TARPs

Bore	Trigger Level			Trigger Level Concentrations (mg/L) for Metals											
	EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
P12A	942	5.4	8.1	26.4	1.7	0.0110	0.0044	75.90	0.011	0.06	0.011	0.06	0.3	0.1	0.011
P12B	729	5.0	8.2	15.2	1.3	0.0044	0.0076	50.6	0.011	0.04	0.011	0.04	0.4	0.2	0.011
P12C	528	5.9	9.2	23.1	0.8	0.0034	0.0011	0.90	0.011	0.04	0.011	0.1	0.2	0.1	0.011
P13A	1232	5.2	9.4	69.3	1.5	0.0036	0.0014	0.91	0.011	0.04	0.011	0.03	0.4	0.3	0.011
P13B	1269	5.4	9.6	16.6	1.2	0.0020	0.0011	0.22	0.011	0.06	0.011	0.04	0.2	0.3	0.011
P13C	376	6.3	10.2	46.2	1.4	0.0011	0.0011	0.1	0.011	0.1	0.011	0.02	0.1	0.3	0.011
P14A	396	4.1	9.1	15.4	2.0	0.0022	0.0011	0.21	0.011	0.05	0.011	0.01	0.1	0.1	0.011
P14B	915	4.6	8.8	46.2	0.9	0.0022	0.0011	0.22	0.011	0.04	0.011	0.07	0.1	0.2	0.011
P14C	1881	5.3	9.4	19.8	1.5	0.0011	0.0011	0.04	0.011	0.1	0.011	0.11	0.2	0.4	0.011
P14D	1198	5.5	9.6	11.0	1.9	0.0011	0.0011	0.04	0.011	0.04	0.011	0.35	0.1	0.2	0.011
P15A*	4620	4.63	8.22	5.7	1.0	0.0011	0.0011	0.28	0.0011	0.055	0.011	0.13	2.9	**4.0**	0.011
P15B	3575	4.11	12.1	4.8	0.9	0.0011	0.0011	0.09	0.0011	0.055	0.011	0.14	1.3	1.2	0.011
P15C	2090	5.04	8.66	6.2	0.5	0.0011	0.0011	0.19	0.0011	0.033	0.011	0.20	0.5	0.5	0.011
P15D	1430	5.48	7.72	3.5	0.9	0.0011	0.0011	0.13	0.0011	0.055	0.011	0.19	0.2	0.4	0.011
P16A	1539	4.9	7.8	116.0	3.9	0.0011	0.0011	0.1	0.011	0.04	0.011	0.06	0.3	0.5	0.011
P16B	1180	5.9	9.6	41.8	1.8	0.0011	0.0011	0.03	0.011	0.05	0.011	0.04	0.2	0.1	0.011
P16C	1212	6.2	9.5	46.6	1.6	0.0011	0.0011	0.02	0.011	0.05	0.011	0.1	0.1	0.1	0.011
P17	2019	4.8	8.3	10.6	0.6	0.0011	0.0011	0.2	0.011	0.04	0.011	0.11	0.2	0.7	0.011
GW105546	448	3.5	7.2	37.4	1.6	0.0011	0.0011	0.1	0.011	0.03	0.011	0.011	0.05	0.04	0.011
GW105467	1041	3.7	6.8	77.0	3.9	0.094	0.0019	0.2	0.039	0.04	0.011	0.072	0.1	0.04	0.011

Bore	Trigger Level			Trigger Level Concentrations (mg/L) for Metals											
	EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
GW105228	1793	4.6	7.1	31.4	2.7	0.0011	0.0011	0.2	0.0181	0.04	0.011	0.026	0.23	0.15	0.011
GW072402	8151	4.7	7.5	63.8	0.9	0.0019	0.0011	0.2	0.011	0.03	0.011	0.157	0.3	0.5	0.011
GW115860*	948.2	4.9	7.25	16.5	0.9	0.0011	0.0011	0.02	0.011	0.022	0.011	0.253	0.51	0.3	0.011
GW104090	3861	5.3	7.5	50.6	1.4	0.0011	0.0011	0.05	0.022	0.033	0.011	1.650	0.1	1.2	0.011

'*' Revised trigger level for Ba at bore GW115860 following the groundwater trigger investigation presented in SLR (2022a) and revised trigger level for SR at bore P15A following the groundwater investigation in SLR (2022b)

5.2 Summary of Groundwater Quality Exceedances

The following section details the groundwater quality compliance at Tahmoor Coal in relation to the groundwater quality triggers. **Table 12** presents the occurrence of trigger level exceedances in groundwater quality (EC, pH and metals) over the reporting period as per the proposed trigger values (**Table 11**) and the TARP trigger criteria found respectively in **Appendix B.**

A brief analysis of the EC, pH and metal concentrations in relation to climate and mining activity during the reporting period is presented in **Sections 5.2.1** to **5.2.3** alongside trigger exceedances. Time series plots with the approved trigger values (EC, pH, metals) with exceedances only are shown in **Appendix D, Figures D1-D44.**

Table 12 Trigger Exceedances for pH, EC and Metal Concentrations over the Reporting Period (April 2022 – September 2022)

Bore	Month	Trigger Level Exceedance														
		EC	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
Shallow OSP																
P12A	Apr															
	May															
	Jun															
	Jul							L2			L2					
	Aug							L2			L2					
	Sep							L2			L2					
P12B	Apr			*L4							L2					
	May			*L4												
	Jun															
	Jul				L2											
	Aug				L2											
	Sep				L2											
P12C	Apr															
	May															
	Jun				L2	L2										
	Jul				L2	L2										
	Aug				L2	L2										
	Sep				L2	L2										
P14A	Apr															
	May								L2							
	Jun										L2					
	Jul															

Bore	Month	Trigger Level Exceedance														
		EC	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Aug						L2									
	Sep						L2									
P14B	Apr															
	May															
	Jun															
	Jul															
	Aug															
	Sep												L2	L2	L2	
P14C	Apr															
	May								L2							
	Jun															
	Jul															
	Aug						L2									
	Sep															
P14D	Apr															
	May								L2							
	Jun															
	Jul															
	Aug				L2		L2									
	Sep						L2									
P15A	Apr	L2													*L4	
	May	L2													*L4	
	Jun					L2							L2		L2	
	Jul					L2							L2		L2	
	Aug												L2		L2	
	Sep	L2											L2		L2	
P15B	Apr	L2							L2						L2	
	May	L2							L2							
	Jun	L2													L2	
	Jul														L2	
	Aug														L2	
	Sep	L2					L2									
P15C	Apr															
	May				L2											

Bore	Month	Trigger Level Exceedance														
		EC	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Jun	L2			L2										L2	
	Jul														L2	
	Aug											L2			L2	
	Sep	L2									L2				L2	
P15D	Apr				L2											
	May				L2											
	Jun	L2			L2	L2										
	Jul				L2											
	Aug				L2											
	Sep				L2											
P16A	Apr															
	May								L2							
	Jun			L2												
	Jul															
	Aug						L2									
	Sep															
P16B	Apr															
	May								L2				L2			
	Jun															
	Jul															
	Aug															
	Sep															
P16C	Apr															
	May								L2							
	Jun								L2		L2					
	Jul						L2		L2							
	Aug						L2		L2							
	Sep						L2		L2		L2					
Private Bores																
GW104090	Apr															
	Jul															
GW105467	Apr															
	Jul															
GW105228	Apr															

Bore	Month	Trigger Level Exceedance														
		EC	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Jul												L2			
GW072402	Apr															
	Jul															
GW115860	Apr	L2														
	Jul	L2													L2	
GW105546	Apr															
	Jul															

TARP Level 1 TARP Level 2 TARP Level 3 Potential TARP Level 4 no site access

LX: maximum trigger level exceedances recorded

"*" remains a potential Level 4 TARP trigger

5.2.1 Electrical Conductivity (EC) and pH

During this reporting period, EC and pH recorded at the following groundwater monitoring bores were observed above the TARP Level 2 trigger level:

- EC at P15A, B, C and D – TARP Level 2 (**Appendix D, Figure D1-D4**);
- EC at GW115860 – TARP Level 2 (**Appendix D, Figure D5**);
- pH at P12B – potential TARP Level 4 reducing to TARP Level 1 June 2022 (**Appendix D, Figure D6**); and
- pH at P16A (**Appendix D, Figure D7**) – TARP Level 2.

The increase in EC and pH at the groundwater monitoring bores presented above is not a result of a mining effect in the Western Domain (SLR, 2022d). As of September 2022, there were no groundwater quality trigger exceedances for EC and pH.

All others EC and pH measurements from the Tahmoor Coal standpipes and private bores were observed within the Level 1 TARP.

5.2.2 Metals

During this reporting period, metal concentrations for all groundwater monitoring bores, and three private bores were observed above the trigger level as presented in **Table 12** and **Appendix D, Figure D8-D43**. The increases in metal concentrations observed across the Western Domain bores are short-term increases (less than three months) and likely due to natural fluctuations in groundwater quality rather than a mining related effect (SLR, 2022). Further discussion on increases in metal concentrations at specific locations is presented in **Section 5.2.3.**

5.2.3 Discussion of Groundwater Quality Exceedances

Table 13 presents a discussion of trigger exceedances at each groundwater monitoring and private bores observed during the reporting period. Metal concentrations measurements above the trigger level for a single month are listed as TARP Level 2 in **Table 12** and briefly mentioned in **Table 13** although not discussed in details below as natural fluctuations in groundwater quality is likely the reason for the short-term (1 month) increase.

Table 13 Groundwater Quality Trigger Exceedances - Discussion

Site	Discussion
P12A	TARP Level 2 metals for lead (**Figure D22**) and aluminium (**Figure D30**) from July to September 2022. The increase in metal concentrations (Pb and Al) in July 2022 is likely due to wet conditions (i.e. flooding) rather than mining. A decreasing trend was observed since August 2022 for both metals justifying the TARP Level 2. Additional monitoring required to confirm trends.
P12B	Potential TARP Level 4 pH upper exceedance observed in May 2022 but is reduced to a TARP Level 1 in June 2022. The higher pH at bore P12B is likely due to an issue with the integrity of the bore, with the recent flooding flushing cement/grout in the bore (**Figure D6**). The potential TARP Level 4 put in place since April 2022 at P12B reduces to a TARP Level 1 in June 2022 as the source of the pH increase is not related to mining but to grout contamination. The consequences of this effect (unlikely to be mining-related) were assessed as minor in the latest six-monthly review (SLR, 2022). Since July 2022 pH at P12B reduced within baseline level and was observed within a TARP Level 1. The pH at nearby monitoring bores P12A and P12C remain within a TARP Level 1 during the reporting period. A greater volume of water was purged from bore P12B in the May round of monitoring to remove groundwater potentially contaminated with grout before sampling. Additional purging will be conducted in the next review period prior sampling. TARP Level 2 metals (iron) observed between July and September 2022 (**Figure D8**). This exceedance for dissolved metal concentration is a short-term increase (three months) and likely due to above average rainfalls and bore construction material. In fact, the increase in iron is likely due to iron staining on the steel casing rather than mining related effect. Further monitoring is required to confirm Fe trends.
P12C	TARP Level 2 metals (iron and manganese) exceedance observed since June 2022 (**Figure D9-D13**). A decreasing trend in manganese was observed from August 2022 hence a TARP Level 2. The increase in dissolved iron is likely caused by the dissolution of iron present on the steel casing rather than mining related effect. Additional monitoring required to confirm trends.
P14A	Single measurement in zinc concentration observed above the trigger level in May 2022 **(Figure D23**). Single measurement in aluminium concentration observed above the trigger level in June 2022. **(Figure D32**) Two consecutive measurements in copper concentration observed above the trigger levels in August and September 2022 (**Figure D16**). These higher dissolved metals concentrations are short-term increases (less than three months) and no mining effect is identified.
P14B	Single measurement in lithium, barium, strontium concentrations observed above the trigger levels in September 2022 (**Figure D37, D40**). These higher dissolved metal concentrations are short-term increases (less than three months) and no mining effect is identified.

Site	Discussion
P14C	Single measurement in zinc and copper concentrations observed above the trigger levels in May 2022 and August 2022 respectively (**Figure D24, D17**). These exceedances for dissolved metals concentrations are short-term increases (less than three months) and no mining effect is identified.
P14D	Single measurement in zinc and iron concentrations observed above the trigger levels in May 2022 and August 2022 respectively (**Figure D25, D10**). Two consecutive measurements in copper concentrations observed above the trigger level in August and September 2022 (**Figure D18**). These higher dissolved metals concentrations are short-term increases (less than three months) and no mining effect is identified.
P15A	Potential TARP Level 4 metals (strontium) exceedance observed in April and May 2022, but it is reduced to a TARP Level 2 in June 2022. Concentration of strontium increased by approximately 9 mg/L over the reporting period to 11.7 mg/L in June 2022 but has decreased and is stable at 8.1 mg/L since July 2022. At P15D, strontium concentration has fluctuated between 0.1 and 0.3 mg/L, which suggests that the deeper strata have not been impacted by the strontium observed in the shallow groundwater (P15A). The high strontium concentration at P15A remain localised and unlikely to be a mining related impact though mining was not excluded as a potential cause as discussed in SLR (2022c). Six months following the potential TARP Level 4 for strontium at P15A, no significant increases were observed at adjacent site P14 and deeper bores at site P15 (concentration of strontium increased by approximately 0.2 mg/L at P15B and P15C in the previous reporting period). Hence the trigger level at P15A for Sr was revised to 4 mg/L in June 2022 (Figure D-20), as the trigger was assessed to be too conservative for this site (SLR 2022c). The concentration of strontium was reported as a TARP Level 2 from June 2022. Strontium concentrations at site P15B and P15C have started to increase above the trigger level in July 2022 however the overall increase to September 2022 is within the range of 0.2 mg/L, considerably less than previously observed at P15A. Strontium concentration at P14 sites and nearby private bores should be closely monitored in the next review period. TARP Level 2 metals (lithium) exceedances observed since June 2022 (more than 3 months) however a decline in lithium concentration was observed in September 2022 hence a TARP Level 2 applies (**Figure D38**). Two consecutive measurements in manganese concentration observed above the trigger levels in June and July 2022 (**Figure D4**). Reduction to a TARP Level 1 for EC due to a decrease in EC in July 2022 following rainfall events (**Figure D1**). As of September 2022, TARP Level 2 applies following an increase in EC to 5,250 µS/cm.
P15B	TARP Level 2 EC reduces to a TARP Level 1 in July 2022 following a steady decline which could be associated to rainfall recharge (**Figure D2**). As of September 2022, EC increased above the trigger level hence a TARP Level 2 applies. Mining effect is unlikely. Two consecutive measurements in zinc concentration observed above the trigger levels in April and May 2022 (**Figure D26**). These higher dissolved metal concentrations are short-term increase (less than three months) and no mining effect is identified. TARP Level 2 metals (strontium) exceedance observed in April and between June and August 2022 (**Figure D42**). As of September 2022, strontium concentrations decreased below 0.1 mg/L within a TARP Level 1. It is recommended to continue closely monitoring strontium concentrations, with respect to TARP Level 2 in place for strontium for site P15A.

Site	Discussion
P15C	TARP Level 2 EC exceedance observed in June 2022 (**Figure D3**). EC at P15C decreased in May 2022 before sharply increasing to a maximum of 3,595 µS/cm in June 2022. A decline in EC was observed between July and August 2022 (TARP L1) before increasing to 2,400 µS/cm in September 2022 (TARP L2). Two consecutive measurements in iron concentration observed above the trigger levels in May and June 2022 (**Figure D11**). These are a short-term increase (less than three months) and no mining effect is identified. Single measurement in aluminium and arsenic concentrations observed above the trigger levels in September 2022 and August 2022 respectively. TARP Level 2 metals (strontium) exceedance observed between June and September although a declining trend was observed from August 2022 (**Figure D43**). Over the reporting period the overall increase in strontium concentration at P15C is approximately 0.35 mg/L compared to 9 mg/L at P15A in June 2022. It is recommended to continue closely monitoring strontium concentrations, with respect to a TARP Level 2 in place for strontium for site P15A.
P15D	Single measurement in EC observed above the trigger levels in June 2022 resulting in a TARP Level 2 (**Figure D4**). Large fluctuations in iron concentrations were observed and above the trigger level for most of the reporting period (**Figure D12**). Maximum iron concentration peaked at 27mg/L in June 2022, declined in August and increased slightly in September 2022 to 17 mg/L. Recent increase in iron may be due to iron precipitation within the bore. Insufficient baseline data is available to assess potential mining influences. Continued monitoring is recommended to assess if concentration stabilise post-mining. Single measurement in manganese concentrations observed above the trigger levels in June 2022 (**Figure D15**). This is a short-term increase (less than three months) and no mining effect is identified.
P16A	Single measurement in pH observed above the trigger levels in June 2022 (Figure D7). Single measurement in copper and zinc concentrations observed above the trigger levels in August and May 2022 (**Figure D20**). These exceedances for pH and dissolved metal concentration are short-term increases (less than three months) and no mining effect is identified.
P16B	Single measurement in zinc and lithium concentrations observed above the trigger levels in May 2022. These exceedances for dissolved metals concentrations are short-term increases (less than three months) and no mining effect is identified.
P16C	TARP Level 2 metals (zinc) exceedance observed from May to September 2022 (**Figure D29**). The source of the recent increase in zinc concentration is unknown but likely due to surface runoff flowing into the bore however a mining effect is not excluded. Purging of the bore to remove the potential surface water run-off has been recommended. Additional monitoring will be conducted to confirm trends. Zinc concentrations at the nearby shallow piezometers P16A is within a TARP Level 1. Three consecutive measurements in copper concentrations observed from June 2022 (**Figure D21**). Recent decline in copper concentration observed in September 2022 hence TARP Level 2 applies. Single measurements in aluminium concentrations observed above the trigger levels in June and September 2022 (**Figure D34**). Except for the exceedances in zinc which required further monitoring, exceedances at P16C for other dissolved metals concentrations are a short-term increase (less than three months) and no mining effect is identified.

Site	Discussion
GW105228	Recent increases in lithium concentrations above the trigger level was observed since April 2022. Further monitoring is required to confirmed trends however the lack of baseline data is likely to make the trigger level too conservative (**Figure D36**).
GW115860	EC observed above the trigger level since July 2021. Given the low salinity of groundwater at GW115860, and the small incremental change in that salinity in relation to the beneficial use classifications (SLR, 2022) a TARP Level 2 remains. In addition, EC has declined since April 2022 to 1,029 µS/cm (trigger level set at 948.2 µS/cm) (**Figure D5**). No mining effect identified. Single measurement in strontium concentration observed marginally above the trigger levels in September 2022 (**Figure D39**). Further monitoring to be conducted in the area in relation to the higher strontium concentration observed in P15A.

6 Predicted and Observed Groundwater Depressurisation

The following section provides a summary of comparison between the modelled and observed groundwater levels using the groundwater model SLR (2021) results (i.e. referred in this report as the "groundwater model") presented in the Groundwater Technical Report: Extraction Plan for LW W3-W4 (SLR, 2021) and latest available observed groundwater data (up to March 2022).

6.1 Summary

The drawdowns observed during LW W1, LW W2 and LW W3 show a clear relationship with depth below surface (or height above the mined seam), with drawdowns greatest at depth, and being 8-15 m in the lower or mid-Hawkesbury Sandstone, and less in the shallower horizons (typically 0.5-1 m). The same trend was observed for the subsequent recovery post LW W1 and LW2, with greatest recovery in the deep piezometers (6 m) and being 1-3.5 m in the lower or mid-Hawkesbury Sandstone. As of September 2022, groundwater recovery is complete in the shallower horizons except at some site (P16A) where a potential partial recovery was observed (approximately 0.5-0.8 m below baseline).

The hydrographs for P12, P14, P15, P16, and TNC036 monitoring sites were reviewed in light of the TARP exceedances (**Section 4.3**) at these monitoring sites (**Figure 12** to **Figure 16**). The modelled water level for the piezometer A at each site is shown. The key findings over the reporting period are:

- Piezometers at P12 and P16 are spaced, in a vertical sense, at a smaller interval than the model layers, so that it is not possible nor practical for the model to simulate or replicate water levels at all piezometers. Also, temporal discretisation does not allow all short-term variability, especially to rainfall events, to be simulated.
- The groundwater model does not simulate groundwater abstraction at private bores because the extractions are not metered by WaterNSW nor are there estimated extraction rates available.
- The historical period of the model ends in November 2020, which means that all predictions after December 2020 are based on average rainfall. Hence, the model does not capture the response to the rainfall recharge observed in 2021 and more recently in July 2022 (i.e. flood events).
- To the north-west area of the Western Domain, the groundwater levels in upper (P12A) and mid (P12B) Hawkesbury Sandstone aquifers continue to be well replicated by the model (within +/- 1-2m of observed). In the deeper start at P12C, the recovery in groundwater level (model layer 2) continues to be a good approximation of the recovery in P12C (i.e. same was true for the drawdown in 2020). The timing of recovery is well replicated, while its magnitude is slightly underestimated by the model (within 3 m of observed) over the reporting period. No mining effect due to LW W4 is simulated at P12C (model layer 2) which is also reflected in the observed groundwater levels.
- North to the Western Domain, it was previously reported that the modelled drawdown was slightly overestimated at sites P14 and P15 (during LW W2 and early parts of LW W3). From April 2022, in all piezometers at site P14, modelled groundwater levels in model layers 1 and 2 are within 1m of the observed groundwater levels.

- During 2022, the modelled drawdown at P15 is overestimated by approximately 3-4m in model layer 2 however modelled groundwater levels in model layer 1 are within 1m of observed. The modelled groundwater levels in model layers 1 and 2 remain a good approximation of observed groundwater levels for all piezometers at site P15. We note that piezometers P15A, B, C and D all sit within the same model layer 2. The presence of multiple piezometers within a single layer makes it challenging (if not impossible) to replicate or match all observations. Similar observations apply to site P14 in terms of model layering and model performance.
- At P16B and P16C, sitting within the model in Layer 1 and Layer 2 respectively, the model replicates the stabilisation of water level throughout the reporting period. Modelled groundwater levels in model layer 2 replicates well the observed groundwater levels in P16C within +/-2m. Further monitoring data is required at P16B to compare to modelled estimates however it is within 3m of observed groundwater levels at the start of the reporting period which is acceptable as the modelled trends is generally well matched.
- At TNC036 (Figure 16) there is a small underestimation in the model to replicate the observed recovery during 2022 but modelled groundwater levels are within 5-10 m observed as of August 2022 (i.e. similar as modelled prior to LW W1). The HBSS-65m and HBSS-97 m piezometers are assigned the same model layer, which makes difficult to match the difference in groundwater head between the two shallow piezometers, but previously the model gives a reasonable estimate in the rate and magnitude of drawdown at this location.
- The observed stabilisation and recovery in water levels in BGSS-169 m are well replicated by the model, being within 1 m of observed prior the start of LW W4. This suggests that the height and mode of subsidence fracturing in this area is well represented in the model. The modelled underestimates the groundwater recovery in the upper model layers due to the July rainfall recharge not being captured in the model. This explains why the modelled groundwater levels diverge from observed groundwater levels from July 2021 in TNC36-169m. The model performance at this site remains acceptable.

2.3 Groundwater Monitoring Network Status Update

All groundwater level monitoring bores and vibrating wire piezometers (VWPs) in the vicinity of the Western Domain, and their available completion details, are listed in Table 3 below.

Updates on the status of the groundwater monitoring network and operations from 1 October 2022 to 31 December 2022 are as follows:

- No groundwater levels were available at P16B in October 2022 and at GW72402 during the reporting period due to blockage of the bores.
- No groundwater levels nor groundwater quality sampling was undertaken in October 2022 at GW105546 and GW105467.
- Manual measurements of groundwater levels were taken at private bores GW115860 and GW105228 in October 2022.

Table 3 Groundwater Monitoring Network

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
Shallow Groundwater Levels (monitoring bores/standpipe piezometers)					
P12A	Tahmoor Coal	277771	6216561	14.6 - 19.6	EX
P12B	Tahmoor Coal	277776	6216560	31.6 - 34.6	EX
P12C	Tahmoor Coal	277781	6216559	61.6 - 64.6	EX
P13A	Tahmoor Coal	278180	6216550	19.5 - 22.5	D
P13B	Tahmoor Coal	278175	6216554	33.5 - 37.5	D
P13C	Tahmoor Coal	278170	6216558	64.5 - 67.5	D
P14A	Tahmoor Coal	278398	6216536	4.5 - 6.0	EX
P14B	Tahmoor Coal	278393	6216534	13.6 - 16.6	EX
P14C	Tahmoor Coal	278397	6216542	28.6 - 31.6	EX
P14D	Tahmoor Coal	278391	6216540	58.6 - 61.6	EX
P15A	Tahmoor Coal	278550	6216426	16.1-17.6	EX
P15B	Tahmoor Coal	278545	6216423	18.6-20.1	EX
P15C	Tahmoor Coal	278556	6216427	30.5-32.0	EX
P15D	Tahmoor Coal	278561	6216431	66 (bore depth)	EX
P16A	Tahmoor Coal	277351	6215147	24.5 - 27.5	EX
P16B	Tahmoor Coal	277350	6215140	42.5 - 45.5	EX
P16C	Tahmoor Coal	277347	6215135	72.5 - 75.5	EX
P17	Tahmoor Coal	277941	6217153	19.6 - 22.6	D
GW072402	Private	277708	6216852	8.2 - 72.0	EX
GW105228	Private	278490	6216858	23.0 - 63.0	EX
GW105467	Private	277253	6215247	73.0 - 79.0	EX
GW105546	Private	277018	6215732	48.0 - 56.0	EX

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
GW115860	Private	278543	6216760	20, 48 and 55	EX
Shallow Groundwater Pressures (VWPs < 200 mBGL)					
P40(A-D)	Tahmoor Coal	277620.6	6216160.1	HBSS-39	EX
				HBSS-44	EX
				HBSS-49	EX
				HBSS-85	EX
P41(A-F)	Tahmoor Coal	279167	6216068	WMFM-53 (vertical)	EX
				HBSS-71 (vertical)	EX
				HBSS-88 (vertical)	EX
				HBSS-106 (vertical)	EX
				HBSS-123 (vertical)	EX
				140 (vertical)	EX
TNC036	Tahmoor Coal	277269	6215382	HBSS-65	EX
				HBSS-97	EX
				BGSS-169	EX
TNC040	Tahmoor Coal	279004	6214521	WMFM-27	EX
				HBSS-65	EX
				HBSS-111	F
TNC043	Tahmoor Coal	280077	6212671	HBSS-65	L
				HBSS-111.5	L
WD01	Tahmoor Coal	278099	6214828	HBSS-70	EX
				HBSS-90	EX
				HBSS-190	F
WD02	Tahmoor Coal	278246	6215178	Drilling in Feb 23	TBC
Deep Groundwater Pressures (VWPs > 200 mBGL)					
TNC036	Tahmoor Coal	277269	6215382	BGSS-214	EX
				BGSS-298.5	F
				BGSS-412.5	EX
				BUSM-463.5	F
TNC040	Tahmoor Coal	279004	6214521	HBSS-225	F
				BHCS-252	F
				BGSS-352	F
				SCSS-482	F
				BUCO-501.9	F
TNC043	Tahmoor Coal	280077	6212671	HBSS-213	D

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
				BGSS-240	D
				BGSS-332.6	D
				BGSS-405.2	D
				BUCO-476.3	D
WD01	Tahmoor Coal	278099	6214828	210-HBSS	EX
				230-Newport Fm	F
				300-BGSS	F
				330-BGSS	F
				350-BGSS	F
WD02	Tahmoor Coal	278246	6215178	Drilling in Feb 23	TBC

1 Coordinates in metres (GDA 1994 MGA Zone 56).

WMFM – Wianamatta Group
BGSS – Bulgo Sandstone
HBSS – Hawkesbury Sandstone
SCSS – Scarborough Sandstone
BHCS – Bald Hill Claystone
BUCO – Bulli Coal Seam
VWP – vibrating wire piezometer
EX – Existing
P – Proposed monitoring bore
L – Loss of logger (stolen), manual readings still taken.
"-" - Not drilled yet
mBGL – metres below ground level
F - Failed
D – Decommissioned

3 Groundwater Level Trends

During the reporting period, groundwater level trends were observed across the shallow open standpipes (P12, P14-P16), shallow vibrating wire piezometers (P40, P41 and TNC036/40) and the deep vibrating wire piezometers (TNC036). The cause and effect of key groundwater trends observed at these sites, over the reporting period, are briefly discussed in this section.

Groundwater level trends which represented TARP Level exceedances are discussed in Section 4.

Hydrographs for groundwater levels at P12, P14, P15, P16, P40, P41, TNC036, TNC40, P9, P11 and private bores are presented in Appendix A.

Some of the key groundwater trends over the reporting period include:

- Site P12: groundwater levels at P12A and P12B remained relatively stable at 170.4 mAHD and 171 mAHD respectively during the review period (Appendix A, Figure A-1). At P12C, the observed trend of previous months continued with groundwater levels increasing by approximately 1.5 m over the reporting period to 178.4 mAHD in December 2022. As of December 2022, groundwater levels at sites P12 are within baseline level (P12A), 0.5m above baseline level (P12B) and have mostly recovered in P12C as groundwater levels are observed within baseline level. The recovery period at P12C follows a maximum groundwater depressurisation of 11m in February 2021 caused by mining of LW W1-W2.

- Site P14: groundwater levels at P14A decreased by approximately 1.1 m over the reporting period, to 169.9 mAHD in December 2022, which is likely attributable to lower rainfall recharge in November and December 2022 (Figure A-2). As of December 2022, groundwater levels at P14A are observed 1.2m above baseline levels. Overall, groundwater levels fluctuated within 0.5 m, and were observed above the creek bed elevation at P14B, P14C and P14D which suggest strengthening of baseflow conditions along Stonequarry Creek over the reporting period (Figure A-2).
- Site P15: overall, groundwater levels fluctuated within 0.5-1 m over the reporting period, and decreased in late November 2022, at P15A, P15B, P15C and P15D, which aligned with observed CRD trends (Figure A-3). Similar to the observations for the P14 sites, groundwater levels at P15 sites (P15A, B, C and D) remained above the creek bed elevation favouring baseflow conditions along Stonequarry Creek.
- Site P16: groundwater levels at P16A were consistently observed at approximately 210.5 mAHD over the reporting period (Figure A-4). As observed in previous years, there are no responses observed in groundwater levels to rainfall at P16A during the reporting period with groundwater levels being approximately 1m below baseline level. A localised long-term impact on groundwater levels is to be considered at P16A. At P16B, the available groundwater levels in November and December 2022 indicated that groundwater conditions have remained stable with groundwater levels observed at a similar elevation as in May 2022 prior the commencement of LW W4 (Figure A-4). At P16C, groundwater levels stabilised at approximately 197.4 mAHD following successive periods of recovery in 2021-2022. Groundwater levels in the mid and lower Hawkesbury Sandstone aquifers (P16B and P16C respectively) are observed approximately 1.5m and 3m below baseline levels. Additional groundwater monitoring data will inform whether post mining conditions (i.e., following valley closure) will allow groundwater to completely recover at sites P16.
- Site P40: groundwater levels at P40A and P40B fluctuated by 0.5m during the review period (Figure A-5). To note at P40B a groundwater decline of approximately 1.2m in late November 2022 likely due to lower rainfalls. A similar groundwater decline was observed in June 2022 likely associated with drier condition this month. At P40C observed groundwater levels were remain stable at 178.7 mAHD. In the lower Hawkesbury Sandstone aquifer at P40D, groundwater levels continued to increase and for the first time in November 2022 increased above the Cedar Creek bed elevation. The increase in groundwater levels at P40D between October and December 2022 was observed at a lower rate than previously measured in early and mid-2022. During the review period, groundwater levels at P40A, B, C and D remained above the surveyed creek bed elevation at Cedar Creek which favour baseflow condition (i.e. gaining condition) in the vicinity of surface monitoring site CB.
- Site P41: Groundwater levels at P41A were observed at almost the same elevation as the VWP (189.2 mAHD) which suggests near unsaturated condition at this elevation. In P41B, water levels are stable at 173.2 mAHD throughout the reporting period at the same VWP elevation which also suggest unsaturated condition. At P41C, a gradual increase in groundwater levels was observed since October 2022 and from early November 2022 started to stabilise at 163.3mAHD. The P41C piezometer is located at a similar elevation to the surveyed elevation of Stonequarry Creek (SC surface water monitoring site) with groundwater levels at approximately 1m above the Stonequarry Creek bed elevation (labelled “SC base elevation” on Figure A-6). As presented in SLR (2022), review and analysis of groundwater level exceedances at site P41 is focused on VWPs P41A, P41B, P41C and P41D (i.e. the primary assessment sites). Groundwater levels at P41D, P41E and P41F are likely influenced by faulty sensors but will continue to be reviewed in future reports. P41E and P41F are not considered in the groundwater level trigger assessment and P41D has been removed from the TARP as groundwater trends continue to appear erroneous (SLR, 2022).

- TNC36: Groundwater levels in HBSS-65m and HBSS-97m increased by 1.1m and 2m during the reporting period (Figure A-7). In the Bulgo Sandstone aquifer, groundwater levels in the sensor BGSS-169m recorded an increase in groundwater levels of 8.5m and are observed at 181.8 mAHD in December 2022. Groundwater levels in the lower Bulgo Sandstone aquifer started to recover in late September 2022 and have shown a significant recovery during the review period of approximately 9m to 93.2 mAHD. In the deepest piezometer BGSS-463m, a groundwater levels continued to decrease with an observed groundwater depressurisation of 5.5m during the reporting period.
- TNC40: The two remaining sensors at TNC040 WHFM-27m and HBSS-65m recorded an increase in groundwater level of 0.3m and 0.7m respectively during the review period (Figure A-8). No delayed groundwater depressurisation due to mining of LW W4 is identified at TNC040.
- Private Bores: Groundwater levels in the private bores (i.e. where available) generally responded to rainfall events in the range of 0.5m at GW104090 between October and December 2022 (Figure A-10). To the north of the LW W3-W4 and as of October 2022 groundwater levels in GW115860 and GW105228 were observed at a stable elevation compared to water levels in April and July 2022 (Figure A-11). To note that the manual measurement taken in July 2022 (171.4 mAHD) at GW105228 is likely a measurement error. For the private bores, no effects on groundwater levels due to post-mining operations at LW W4 during the review period is identified. Additional groundwater monitoring data is required at GW72402 to confirm groundwater trends post LW W4.
- P9 and P11 (Tahmoor North Domain): The latest groundwater available for P9A, P9B and P11 are dated 30 November 2022. Groundwater levels at P9A and P9B remained stable over the reporting period fluctuating by 0.5m following rainfall events (Figure A-12). Groundwater levels at P9A-24m were observed above the creek bed elevation during the reporting period which suggests strengthening of gaining conditions along Redbank Creek in the vicinity of P9. At P9B, following a possible groundwater depressurisation in early 2021 during mining of LW W1-W2, groundwater levels have shown an increasing trend since late 2021. However as of November 2022, groundwater levels at P9-40m remain approximately 3m below baseline level. Hence since early 2021, a downward vertical head gradient between P9A and P9B (i.e. groundwater head separation of 3m) is established which suggests a possible medium-long term impact at P9B due to historic mining (i.e. LW 32) and LW W1-W2. Further monitoring data is required at P9A-B to assess post-mining groundwater conditions. Groundwater levels in P11 (i.e. located 700 m south-east of LW W4) have also remained stable with groundwater levels being close to surface (1m below ground level) which explain the subdued response to rainfall 2021-22 compared to March 2020 (Figure A-13). No delayed mining effect on groundwater levels due to mining of LW W4 is observed at P9A-B and P11 during the review period.

4 Groundwater Level Trigger Review

4.1 Summary of Groundwater Level Exceedances

Approved Trigger Action Response Plan (TARP) levels are defined for each site (Tahmoor Coal, 2021) and presented in Appendix B. Groundwater hydrographs for each monitoring site where the groundwater trigger level is plotted is also presented in Appendix B (Figure B1-B28).

An assessment of groundwater levels at each of the monitored bore and VWP locations against the TARP trigger levels has been undertaken. During the reporting period, the following exceedances were observed:

- TARP Level 2
    - Shallow bores: P16B across the whole reporting period. Bore P12C during the review period likely to be reduced to a TARP level 1 in the next review period.
    - A reduction form TARP Level 3 to Level 2 at P16C in October 2022 onwards.

- Shallow VWPs: TNC036 (HBSS-97m) and TNC036 (BGSS-169m) across the whole reporting period.
- Deep VWPs: TNC036 (BGSS-214m) until November 2022, then reduced to a TARP Level 1 in December 2022. TNC036 (BGSS-412.5m) across the whole reporting period.

No TARP Level 3 and 4 for groundwater levels are identified during the review period.

All other groundwater monitoring sites remained within TARP Level 1 across the quarterly reporting period. A summary of the groundwater level trigger exceedances during the reporting period, in comparison to previous months, at the monitored bores are presented in Table 4 and Table 5 (note private bores were only scheduled for sampling in October 2022).

Hydrographs for groundwater levels with approved groundwater trigger levels at P12, P14, P15, P16, P40, P41, GW72402, GW104090, GW115860, GW105228, TNC036, TNC040 are presented in Appendix B.

Table 4 Groundwater Level Trigger Exceedances - Shallow-Open Standpipes (Shallow OSP), Shallow and Deep Vibrating Wire Piezometers (VWPs)

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances																			Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
Shallow OSP		TARP (Tahmoor Coal, 2021)																					
P12A	170.1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				0.5	170.7	-
P12B	170.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				0.8	171.3	-
P12C	176.3	L3	L3	L3	L3	L3	L3	L3	L3	L2	L2	L2	L2	L2	L2	L2	L2				11.0	175.6	-
P14A	168.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				0.2	171.5	-
P14B	166.7	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1	L1	L1	L1	L1	L1				1.4	168.4	-
P14C	166.6	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				1.7	168.5	-
P14D	164.8	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	L1	L1	L1	L1	L1				1.8	167.4	
P15A	164.7^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				-	169.2	-
P15B	165.2^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				-	168.8	-
P15C	164.9^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	L1	L1	L1	L1				-	168.8	-
P15D	165.4^	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	#	#	L1	L1	L1	L1				#	169.1	-
P16A	211.3	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				1.1	210.7	0.7
P16B	206.4	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	#	#	#	L2	L2				5.7	205	0.7
P16C	199.6	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L3	L2	L2	L2				13.8	191.7	2.2

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances																			Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
Shallow VWPs (<200m)		TARP (Tahmoor Coal, 2021)																					
P41A	194	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1	L1	L1	L1				-	190	-
P41B	172.9	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1	L1	L1	L1				-	173	-
P41C	161.0	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1	L1	L1	L1				-	161.7	-
P41D	160.0	#	#	#	#	#	#	#	#	L1	L1	L1	L1	L1	L1	L1	L1				-	164.4	-
TNC036 - HBSS-65	209.5	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				6.7	209.8	-
TNC036 - HBSS-97	196.3	L4	L4	L4	L4	L4	L4	L3	L3	L3	L3	L2	L2	L2	L2	L2	L2				24.0	185.5	5.0
TNC036 - BGSS-169	197.5	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2				47.6	164.5	15.7
TNC040-WNFM-27	208.3	L1	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				-	209.6	-
TNC040 - HBSS-65	187.1	L1	#	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1				-	189	-
Deep VWPs (>200m)		TARP (Tahmoor Coal, 2021)																					

Bore	Groundwater Level prior to LW W1 (m AHD) (pre-mining)	Trigger Level Exceedances																			Maximum drawdown Nov 2020 - Aug 2021	GWL Prior to LW W4 (15-MAY-22) (m AHD)	Drawdown as of Sep 2022 compared to pre-mining GWL (m)
		Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23			
TNC036 - BGSS-214	176.5	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L1				81.4	82.9	83.4
TNC036 - BGSS-412.5	96.8	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2				49.7	13.9	94

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

LX: maximum trigger level exceedances recorded *"-": no observed drawdown* *"#": groundwater levels not available*

^ baseline groundwater level at P15 (A,B,C,D) is the groundwater level recorded in June 2021.

"" not assessed due to disruption in groundwater levels during drilling and packer testing at P15D.*

Table 5 Groundwater Level Trigger Exceedances - Private Bores

Bore	Baseline Maximum Ground water Depth (m bgl)	Baseline Groundwater Yield (L/s)	Trigger Level Exceedances						Future Reviews			Groundwater Depths as of Dec 2022 (m bgl)	Ground water Yield as of Dec 2022 (L/s)
			Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23		
GW104090	39.0	#	blocked	L1	L1	L1	L1	L1				20.32	#
GW105467	32.0	0.5	*	*	*	*	*	*				#	#
GW105228	23.0	1.8	L1	L1	L1	L1	L1	L1				10.6	#
GW072402	11.76	#	blocked	blocked	blocked	blocked	blocked	blocked				#	#
GW115860	#	#	L1	L1	L1	L1	L1	L1				10.6	#
GW105546	31.9	1.6	*	*	*	*	*	*				#	#

LX: maximum trigger level exceedances recorded *#: not applicable* ** no site access* *"-"standing water level not available (access is not available inside the bore)*
m bgl – metres below ground level

TARP Level 1 TARP Level 2 TARP Level 3 TARP Level 4

4.2 Discussion of Groundwater Level Exceedances

During the reporting period, groundwater level triggers were exceeded at P12, P16 and TNC036. Analysis of the observed exceedances, and a high-level outline of the potential influencing factors for the exceedances, are briefly discussed in Table 6.

Table 6 Groundwater Level Trigger Exceedances – Discussion

Site	Discussion
P12C	TARP Level 2 exceedance was observed from October to December 2022. Groundwater level increased at 178.4 mAHD, just 1m below the TARP Level 2. TARP Level 1 is likely to apply at P12C in the next review period.
P16B	TARP Level 2 exceedance was observed from October to December 2022. Groundwater levels are observed at 205.6 mAHD in December 2022, 0.3m below the TARP Level 2. TARP Level 2 could remain in the short to medium term as a long-term groundwater impact is likely at P16.
P16C	TARP Level reduced from Level 3 to Level 2 exceedance in October 2022. Groundwater levels are observed at 197.4 mAHD in December 2022, 3.2m below the TARP Level 2. TARP Level 2 could remain in the short to medium term as a long-term groundwater impact is likely at P16.
TNC036 (BGSS - 97m)	TARP Level 2 exceedance was observed from October to December 2022. Groundwater level increased to the TARP Level 2 end of December 2022. It is likely that TNC036-HBSS 97m TARP Level will reduce to a TARP Level 1 in the next review period.
TNC036 (BGSS - 169m)	TARP Level 2 exceedance was observed from October to December 2022. Groundwater levels are observed at 181.6 mAHD in December 2022 and increased by approximately 8.5 m during the reporting period. As of December 2022, groundwater levels remain below the trigger TARP Level 2 (192.5 mAHD), hence a TARP Level 2 still applies.
TNC036 (BGSS - 214m)	A reduction from TARP Level 2 exceedance to TARP Level 1 was observed during the review period. The groundwater level observed at TNC036-BGSS-214m exceeds the modelled drawdown from mid-2020 but remains within the 30 m predicted drawdown in October and November 2022 (Figure 4). As of December 2022, the observed drawdown does not exceed the modelled drawdown resulting in a TARP Level 1.
TNC036 (BGSS – 412.5m)	TARP Level 2 exceedance was observed during the review period. The groundwater level observed at TNC036-BGSS-412.5m exceeds the modelled drawdown from mid-2020 but remains within the 30 m predicted drawdown as of December 2022 (Figure 5). A Level 2 TARP criteria (exceeds modelled drawdown but less than 30 m exceedance) still applies at TNC036-BGSS-412.5m over the reporting period.

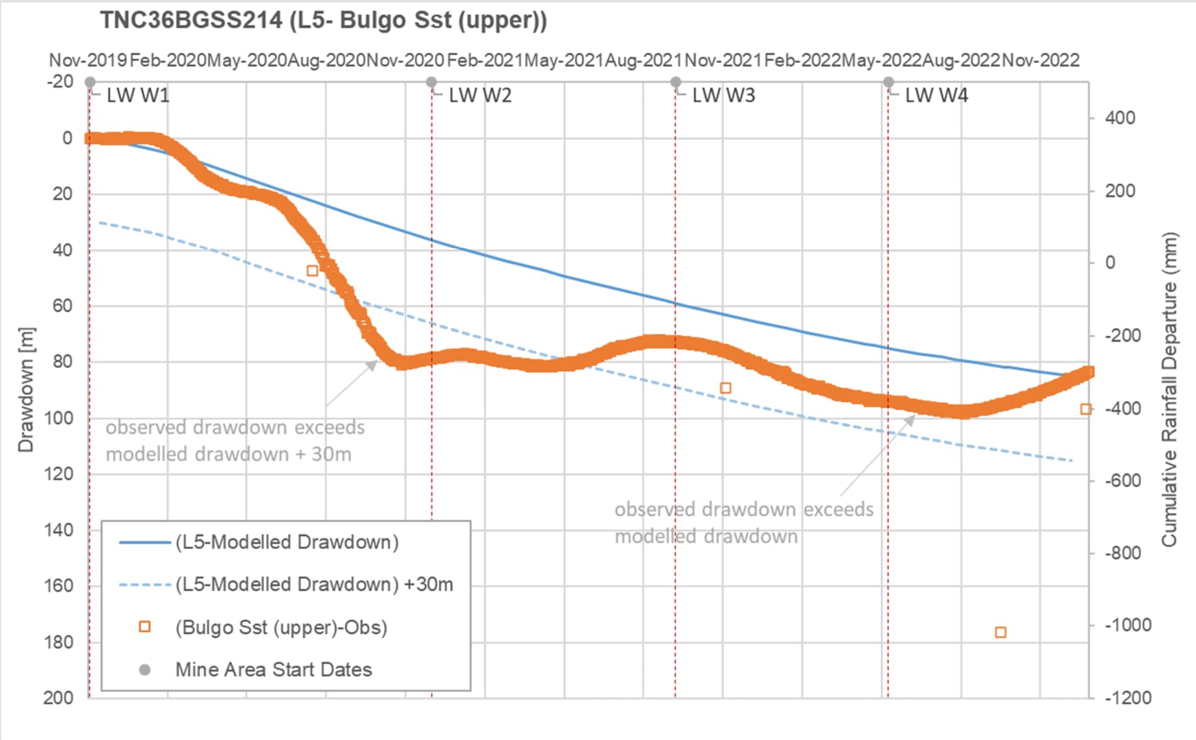


Figure 4 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-214m) with the +30m Threshold Modelled Drawdown

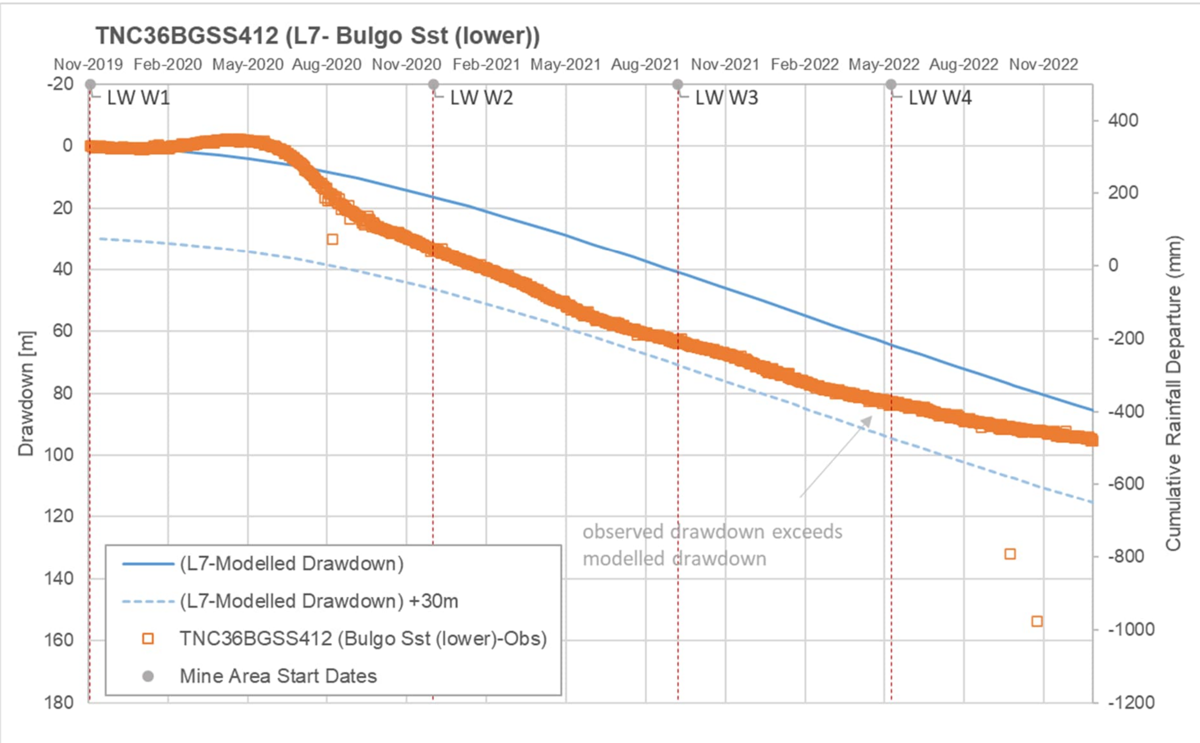


Figure 5 Comparison of Modelled and Observed Drawdown at TNC036 (BGSS-412.5m) with the +30m Threshold Modelled Drawdown

5 Groundwater Quality Trigger Review

5.1 Summary of Groundwater Quality Exceedances

Approved Trigger Action Response Plan (TARP) levels are defined for each site (Tahmoor Coal, 2021) and presented in Appendix B (Table B1-B2). Graphs for pH, electrical conductivity (EC) and metals exceedances are presented in Appendix C and Appendix D.

An assessment of groundwater quality at each of the monitored bore locations against the TARP trigger levels has been undertaken. During the reporting period, the following exceedances and reduction in TARP Level were observed:

- TARP Level 3
  - Metals – zinc (Zn): bore P16C. Dissolved zinc concentrations have fluctuated above the trigger level (0.021 mg/L) since May 2022 but declined following rainfall events (i.e July and October 2022). In October 2022, dissolved zinc concentrations decreased to 0.034 mg/L (marginally above the trigger level). As of December 2022, zinc concentrations increased to 0.12 mg/L, where a TARP Level 3 applies (Appendix D, Figure D12).
- TARP Level 2 (EC, pH and metals)
  - EC: bore P15A and P15B in October and November 2022. P16B in November 2022.
  - pH upper: bore P16A, GW115860, GW105228, GW104090 in October 2022.
  - pH lower: bore P16A in December 2022.
  - Fe (P12C), Mn (P12C, P15D), Cu (P14A, P14C, P14D, P15D, P16A, P16B, P16C), Zn (P16C), Al (P12A, P14D, P16C), As (P15C), Sr (P15A, P15B, P15C, P16B, P16C, GW104090)

All other groundwater monitoring sites remained within TARP Level 1 across the quarterly reporting period.

A summary of the groundwater quality (electrical conductivity, pH, and metals) trigger exceedances during the reporting period at the monitored bores are presented in Table 7.

Groundwater quality parameters are sampled every three months as per the Water Management Plan and TARPs (Tahmoor Coal, 2021), and as such private bores were last sampled in October 2022 and the exceedances from that sampling event are presented in Table 7.

Table 7 Trigger Exceedances for pH, EC, and Metal Concentrations

Bore	Month	Trigger Level Exceedance														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
Shallow OSP																
P12A	Oct										L2					
	Nov															
	Dec															
P12B	Oct															
	Nov															
	Dec															
P12C	Oct					L2										
	Nov				L2	L2										
	Dec				L2	L2										
P14A	Oct						L2									
	Nov						L2									
	Dec															
P14B	Oct															
	Nov															
	Dec															
P14C	Oct						L2									
	Nov															
	Dec						L2									
P14D	Oct															
	Nov						L2				L2					
	Dec															
P15A	Oct	L2											L1^		L2	
	Nov	L2											L1^		L2	
	Dec												L1^		L2	
P15B	Oct	L2													L2	
	Nov	L2													L2	
	Dec	*													L2	
P15C	Oct														L2	
	Nov											L2			L2	
	Dec														L2	
P15D	Oct				L1^											
	Nov				L1^	L2										
	Dec				L1^		L2									
P16A	Oct			L2			L2									

Bore	Month	Trigger Level Exceedance														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
	Nov															
	Dec		L2													
P16B	Oct															
	Nov						L2								L2	
	Dec	*					L2								L2	
P16C	Oct						L2		L2						L2	
	Nov								L2							
	Dec						L2		L3		L2					
GW104090	Oct			L2*											L2	
GW105467	Oct	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105228	Oct			L2*									L1^			
GW072402	Oct															
GW115860	Oct			L2*												
GW105546	Oct	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

TARP Level 1 TARP Level 2 TARP Level 3 Potential TARP Level 4

LX: maximum trigger level exceedances recorded *possible measurement error in EC and pH calibration #: no data available

^: TARP Level 1 following revision of the trigger level

5.2 Discussion of Groundwater Quality Exceedances

During the reporting period, groundwater quality triggers were exceeded at sites P12, P14, P15, P16, and GW105228 and overall, the:

- EC levels are observed within a TARP Level 2 at site P15A and P15B over the reporting period;
- pH levels are observed within a TARP Level 2 at site P16A, GW115860, GW105228 and GW104090; and
- Metals concentrations are observed within a potential TARP Level 3 at site P16C and within a TARP Level 2 at sites P12, P14, P15, P16 and GW104090. All metals observations within a TARP Level 2 are likely short-term increases (less than three months), otherwise specified in Table 8 and are not identified as a mining related effect.

Assessment of the observed exceedances, short-term increases (less than three months) and a high-level outline of the potential influencing factors for the exceedances, are briefly discussed in Table 8.

Table 8 Groundwater Quality Trigger Exceedances – Discussion

Site	Discussion
P12A	Short-term increase in aluminium observed in October 2022 (TARP Level 2) (Figure D13)
P12C	TARP Level 2 metals (iron and manganese) (Figure D1 and Figure D3). Dissolved iron concentrations have shown significant fluctuations in the past six-months with a peak observed in September 2022 to 76 mg/L followed by a sharp decline to 18 mg/L (below the trigger level) in October 2022 (Figure 6). However dissolved iron concentrations fluctuated between 64 and 38 mg/L and above the trigger level in November and December 2022. Dissolved iron concentrations remained below the trigger level at P12A and P12B being recorded at 5.2 mg/L and 14 mg/L respectively which show that dissolved iron concentrations in the shallow Hawkesbury Sandstone aquifer remain within baseline level (Figure 6). The increase in dissolved iron at P12C is suggested to be localised and likely the result of iron being mobilised during the groundwater recovery observed over the past six months. Iron staining may have formed along the steel casing during the period of groundwater depressurisation and is likely mobilised as groundwater levels increased in the bore. It is recommended to purge the bore for a longer period in the next monitoring round to confirm trends in dissolved iron concentrations. The increase of dissolved manganese concentrations above the trigger level during the reporting period (i.e. peak at 1.3. mg/L in October 2022) could also be linked to the staining of the casing. As shown on Figure 6 and Figure 7, dissolved iron and manganese concentrations appear to be correlated. Also, dissolved manganese concentrations at P12A and P12B were recorded between 1 and 1.5 mg/L and are observed within similar level as P12C during the reporting period. This suggests that natural fluctuation in groundwater quality could be associated with the increasing trend at sites P12. As for dissolved iron concentration trigger level, prior to undertake a revision to the dissolved iron trigger level, it is recommended to purge the bore for a longer period in the next monitoring round to confirm trends in dissolved manganese concentrations.
P14A, P14C, P14D, P16A, P16B, P16C, P15D	Figure D5 to Figure D11 —TARP Level 2 metals (copper) – short-term fluctuations in dissolved copper concentrations above the trigger level likely to be the result of above average rainfall in 2022.
P14D	Short-term increase in aluminium observed in November 2022 (TARP Level 2) (Figure D14)

Site	Discussion
P15A	Groundwater EC was observed marginally above the trigger level in October and November 2022 before declining below the trigger level in December at 4,000 uS/cm. (Figure C1). TARP Level 2 metals (strontium) – dissolved strontium concentrations continue to decrease over the reporting period to 5.7 mg/L following a peak to 11.7 mg/L in June 2022 (Figure D18). TARP Level 2 metals (lithium) (Figure D23) – dissolved lithium concentrations have fluctuated marginally above the trigger level (0.13 mg/L) since June 2022 between 0.17-0.21 mg/L. Since June 2022 minor increases in lithium concentrations in the range of 0.05 mg/L are observed in the mid Hawkesbury Sandstone (P15B and P15C) and at less than 0.05mg/L in the lower Hawkesbury Sandstone (P15D) (Figure 10) and within TARP Level 1. Also, lithium concentrations at the nearby private bores are observed at less than 0.05 mg/L. The nearby groundwater monitoring sites P14A, B, C and D record lithium concentrations of less than 0.025 mg/L and are observed within a TARP Level 1 (Figure 11). This suggests that the slight increase in lithium concentrations above the trigger level at P15A is localised and not driven by upwelling of groundwater with higher lithium concentration (i.e. unlikely to be mining related). Since no significant increases in lithium concentration is observed at nearby bores P14, P15B, C, D and private bores, the trigger level was revised to 0.25 mg/L in line with the private bores GW115860. Further monitoring for lithium concentrations should continue at P15A and nearby groundwater monitoring bores and private bores.
P15B	Groundwater EC was observed marginally above the trigger level (3,575 uS/cm) in October and November 2022 at 3,741 uS/cm (Figure C2). The groundwater EC data point for December 2022 was removed the datasets as the record appears erroneous (i.e. greater than 6,500uS/cm) while TDS is recorded at 233.5 mg/L. The TDS value suggests that the groundwater EC would be close to 348.5 uS/cm (i.e. EC approximately equals to TDS / 0.67). TARP Level 2 metals (strontium) exceedance observed across the reporting period (Figure D19). Strontium concentrations peaked to 1.5 mg/L in October 2022 and have declined to 1.3 mg/L in December 2022, marginally above the trigger level of 1.21 mg/L (Figure D19). It is recommended to continue closely monitoring strontium concentrations at P15B although the fluctuations in lithium concentrations slightly above the trigger level are likely due to floods events in 2022.
P15C	TARP Level 2 metals (strontium) exceedance observed across the reporting period (Figure D20). Strontium concentrations peaked to 0.74 mg/L in July 2022 and have gradually declined to 0.52 mg/L in December 2022, marginally above the trigger level of 0.45 mg/L. Fluctuations in strontium concentrations just above the trigger level is likely the result of flood events in 2022 and the local geology mobilising a slightly higher source of lithium following rainfall events than at P14 or nearby private bores (within TARP Level 1). The strontium concentrations observed at P15B and P15C remain well below the US health-based screening level benchmark of 4 mg/L.

Site	Discussion
P15D	TARP Level 2 metals (iron) (Figure D2). While dissolved iron concentrations increased above the trigger level since April 2022, concentrations have moderately fluctuated (i.e. from less than 30 mg/L in June 2022 to less than 10 mg/L in August 2022) (Figure D2). The range in dissolved iron concentrations observed at P15D is not significantly different and is even lower than iron concentrations observed at other monitoring sites (P14A) or private bores (GW105228) observed within TARP Level 1. In addition, no exceedance in dissolved iron is observed at GW115860 (i.e. closest private bore to P15D) during the reporting period. No significant increases in dissolved iron concentrations are observed in the shallow and mid Hawkesbury aquifer (P15A, B and C) which suggest that the increase at P15D is localised and likely natural. The trigger level for dissolved iron concentrations at P15D is too conservative as the trigger level was calculated using data points taken during July-September 2021, period associated with rainfalls and decline in dissolved iron concentrations at most groundwater monitoring sites (Figure 8). It is recommended to revise the trigger level for dissolved iron at P15D to 25 mg/L, just below the peak value of 28 mg/L in June 2022. Following the revised trigger level dissolved iron concentrations at P15D are observed within a TARP Level 1 during the review period. TARP Level 2 metals (manganese) in November 2022 and marginally above the trigger level and observed within TARP Level 1 in December 2022 (Figure D4).
P16A	pH at P16A has fluctuated significantly as it triggered the upper pH level in October 2022 and lower pH level in December 2022 (Figure C4). pH at P16A has previously shown large fluctuations. Additional monitoring data is required to confirm pH trends. TARP Level 2 applies in October and December 2022.
P16B	Short-term increase in strontium observed in November and December 2022 (TARP Level 2) (Figure D16).
P16C	TARP Level 3 metals (zinc) (Figure D12). Dissolved zinc concentrations have fluctuated above the trigger level (0.021 mg/L) since May 2022 but declined following rainfall events (i.e July and October 2022). In October 2022, dissolved zinc concentrations decreased to 0.034 mg/L (marginally above the trigger level). As of December 2022, zinc concentrations increased to 0.12 mg/L, where a TARP Level 3 applies. For comparisons, P16A and P16B have shown natural fluctuations in zinc concentrations (i.e in the range of 0.1 mg/L) following rainfall events however no increases are observed during the reporting period. This suggest that the increase in zinc in the lower Hawkesbury Sandstone (P16C) is localised (Figure D12). Since early 2022, the sustained increase in groundwater levels seen at P16C could locally mobilised a naturally occurring source of zinc (i.e in the range of 0.10-0.15 mg/L). Also, the mild steel casing at P16C could contribute to a higher zinc concentration. Higher zinc concentrations at P16C could be related to a post mining impact however natural fluctuations in groundwater quality and major flood events in 2022 are likely the reason for higher zinc concentrations. As of December 2022, it is recommended to apply a TARP Level 3 at P16C for dissolved zinc concentrations. A TARP Level 4 should be considered in the next review period if further increase in zinc at P16C is observed and if zinc concentrations increase above the trigger level at P16A and P16B. Short-term increase in aluminium observed in December 2022 (TARP Level 2) (Figure D15) Short-term increase in strontium observed in November and December 2022 (TARP Level 2) – (Figure D17).

Site	Discussion
GW115860, GW105228, GW104090	pH at these private bores increased significantly in October 2022 compared to the last pH reading in July 2022 (i.e. pH increased up to 5 pH units) (Figure C5 to C7). Since monitoring of pH started at these bores, pH did not fluctuate significantly only within 1 pH unit and did not exceed the upper or lower pH trigger level. The recorded pH in October 2022 is likely a measurement error. pH in January 2023 (i.e. reported in the next review period) is observed within baseline level.
GW104090	TARP Level 2 metals (strontium) (Figure D21) – following a peak in strontium concentration to 1.7 mg/L in January 2022 and above the trigger level of 1.2 mg/L, strontium concentrations have continued to decline to 1.1 mg/L in October 2022 hence a TARP Level 2 remains. Further monitoring is required to confirm post-mining trend in strontium concentrations although minimal baseline data exist at this site.
GW105228	TARP Level 2 metals (lithium) (Figure D22) – since April 2022 lithium concentrations have gradually increased above the trigger level (0.026mg/L) from 0.024 mg/L in April 2022 to 0.037 mg/L in October 2022. A couple of data points have been used to develop the lithium trigger level at GW105228, which make the trigger level too conservative. For comparison, the trigger level at GW115860 was set at 0.25 mg/L. Lithium concentrations at GW115860 and GW105228, located a couple of hundreds of meters apart, show similar lithium concentrations (Figure 10). It is considered appropriate to revise the trigger level at GW105228 in line with GW115860 to 0.25 mg/L. Using the revised trigger level of 0.25 mg/L at GW105228, a TARP Level 1 applies.

7 Trigger Level Review

A review of the monitoring data compared to the trigger levels has been conducted to identify if any triggers have occurred that would enact the TARP.

Given the identified sensitivities with the current TARPs, the following sections report both triggers against the original and the modified TARPs. In light of the proposed amendments, there are no TARPs triggered over the reporting period, October through December 2022.

7.1 WMP8 - Shallow OSPs and Private Bores (WMP8)

There are no proposed changes to WMP8, and all bores were within normal conditions for the reporting period (Table 5).

Table 5 TARP Level Review – WMP8

Bore	Groundwater Level prior to LW S1A (m AHD)	TARP Level Triggers			Maximum drawdown since LW S1A start (m)	Drawdown as of December 2022 compared to pre-mining GWL (m)
		Oct-22	Nov-22	Dec-22		
Shallow standpipes						
P51A	298.1				-	-
P51B	299.2				-	-
P52A	249.6				-	-
P53A	257.2				2.8	2.8
P53B	257.2				-	-
P53C	255.9				-	-
P54A	DRY	DRY	DRY	DRY	NA	NA
P54B	DRY	DRY	DRY	DRY	NA	NA
P55A	273				2	2
P55B	268.7				0.7	0.7
P55C	262.7				4.7	4.7
P56A	291				-	-
P56B	280.5				0.8	0.8
P56C	259.6				3.4	3.4
REA4	250.3				0.3	0.3
Private Bores						
GW062068	276.3				-	-
GW104008	235.2				-	-
GW104323	259.1			*	-	-
GW104659	252.4				-	-
GW105395	324				-	-
GW109257	282.7				-	-
GW112473	296				-	-

Normal Condition TARP Level 1 TARP Level 2 TARP Level 3

7.2 WMP9 - Shallow VWPs (sensors <200 metres)

The TARP WMP9 required amendment, and consequently, presented in Table 6 are the triggered TARP levels for both the original and updated TARPS, represented on the lower left and upper right quadrants respectively.

It is noted, that groundwater pressures at TBC032 HBSS 131m declined by approximately 6 metres through November and December 2022 which as per the original WMP would trigger Level 2. However, this only occurred temporarily and has since observed some recovery in the pressure. This validates the requirement for a temporal scale on the TARP levels. Under the revised TARPs, this is not yet triggering a response.

Table 6 TARP Level Review – WMP9 (original (lower left) and updated (upper right))

Bore	Groundwater Level prior to LW S1A (m AHD) [TARP Groundwater Reference Level]	TARP Level Triggers			Maximum drawdown since LW S1A start (m)	Drawdown as of December 2022 compared to pre-mining GWL (m)
		Oct-22	Nov-22	Dec-22		
Shallow VWPs (<200 mbgl)						
TBC09HBSS-30m	326.6 [287.6]				0.3	0.3
TBC09HBSS-75m	325.1 [309.4]				-	-
TBC09BHCS-182m	308.3 [293]				0.1	0.1
TBC09 BGSS-192m	292.7 [290.4]				-	-
TBC018 WWFM/HBSS-70m	250.5 [250.5]				0.7	0.7
TBC018 WWFM/HBSS-117m	253.6 [251.9]				0.6	0.6
TBC018 - HBSS (lower) -164m	249.9 [250.7]				0.7	0.7
TBC018 BHCS -179m	248.4 [248.5]				0.6	0.6
TBC018 BGSS -198m	244.4 [244.7]				0.7	0.7
TBC024 HBSS-117m	322.4 [287.6]				-	-
TBC024 HBSS-139m	256.0 [287.0]	#	#	#	-	-
TBC024 BHCSS-168m	300.7 [289.5]				-	-
TBC024 BGSS-185m	308.6 [289.3]				-	-
TBC027 HBSS-95m	321.8 [320.1]				1.3	1.3
TBC027 HBSS-132m	313.6 [312.8]				2.6	2.6
TBC027 HBSS-169m	312.9 [312.2]				2.5	2.5
TBC027 BHCS-181m	309.9 [310.7]				2.1	2.1
TBC027 BGSS-198m	308 [310.3]				0.3	0.3
TBC032 HBSS-95m	262.6 [262.3]				4.3	4.3
TBC032 - HBSS-131m	255.6 [255.0]				6.6	6.6
TBC032 - HBSS-168m	280.7 [266.9]				2.1	2
TBC032 - BHCS-181m	243.8 [242.8]				5.8	5.8
TBC032 - BGSS-200m	245.1 [243.8]				5.5	5.5
TBC034 HBSS-65m	372.4 [371.8]				-	-
TBC034 HBSS-113m	507.2 [368.0]	~	~	~	-	-
TBC034 HBSS-161m	358.0 [358.4]				-	-
TBC034 BHCS-176m	233.3 [354.9]	~	~	~	-	-
TBC034 BGSS-196m	360.9 [358.3]				-	-
TBC039 HBSS-65m	313.6 [313.5]				-	-

Normal Condition TARP Level 1 TARP Level 2 TARP Level 3

7.3 WMP10 - Deep VWPs (sensors > 200 metres)

WMP10 resulted in numerous Level 1 TARPs triggered based on the original wording, as noted in the bottom left quadrants of Table 7. However, as presented in Column 6, the maximum drawdowns since commencement of LW S1A are overall very small. Consequently, the updated TARP now allows for these small fluctuations that do not warrant TARP triggers. Based on the updated TARP, there are currently no TARP levels triggered over the reporting period (see top right quadrants of columns C, D and E of Table 7).

Table 7 TARP Level Review – WMP10 (original (lower left) and updated (upper right))

Bore	Groundwater Level prior to LW S1A (m AHD) [TARP Groundwater Reference Level]	TARP Level Triggers			Maximum drawdown since LW S1A start (m)	Drawdown as of December 2022 compared to pre-mining GWL (m)
		Oct-22	Nov-22	Dec-22		
Deep VWPs (greater than 200 mbgl)						
TBC09 BGSS-332m	236				0.3	0.3
TBC09 BGSS-343m	270.1				1	1
TBC09 SBSS-357m	202.6				0.8	0.8
TBC09 BUSM-381m	^	^	^	^	NA	NA
TBC09 WWCO-391m	243.6				1.1	1.1
TBC09 WWCO-397m	221.1				-	-
TBC18 BGSS-282m	238.6				0.76	0.76
TBC18 BGSS-366m	217.1				0.5	0.5
TBC18 WBCS-377m	~				~	~
TBC18 BUSM-404m	218.5				0.4	0.4
TBC18 WO-432m	215.1				0.5	0.5
TBC20 BGSS (mid)-211m	243.3				4.8	4.8
TBC20 BGSS (mid)-293m	239.3				0.4	0.4
TBC20 BGSS (mid)-375m	246.4				0.7	0.3
TBC20 WBCS-397m	^	^	^	^	0.8	0.3
TBC20 BGSS (upper)-411m	216.2				-	-
TBC20 WO-434m	220				-	-
TBC20 WO-439m	~	~	~	~	~	~
TBC26 BGSS (mid)-211m	203.2				-	-
TBC26 BGSS (mid)-278m	198.9				0.1	0.1
TBC26 BGSS (mid)-344m	204.1				0.2	0.2
TBC26 WBCS-409m	220.2				0.2	0.2
TBC26 BUSM-432m	114.5				4.8	4.8
TBC26 ECSL-440m	199				0.1	0.1
TBC26 ECSL-460m	221.1				-	-
TBC32 BGSS-200m	245				5.4	5.4
TBC32 BGSS-237m	234.7				0.4	0.4
TBC32 BGSS-294m	232.8				0.7	0.7
TBC39 BGSS-243m	214.2				-	-
TBC39 BGSS-299m	231.8				1.2	1.2
TBC39 SBSS-354m	250.1				0.2	0.2
TBC39 BUSM-375m	259.6				0.4	0.4
TBC39 WWCO-402m	266.3				0.3	0.3

Normal Condition TARP Level 1 TARP Level 2 TARP Level 3

"": no data available*

7.4 WMP11 – Groundwater Quality

Review of the groundwater quality against the revised trigger levels for the TARPS was only undertaken for November and December 2022, noting that at the time of monitoring in October 2022, extraction was yet to commence.

The groundwater quality triggers were developed based on a relatively short baseline period, and consequently, are unlikely to have captured the full range of natural variation. The original wording of the TARP as per the Water Management Plan does not have any temporal allowance, therefore not allowing for a trend to develop to indicate potential impact via mining. This approach does not allow for atypical measurements to be considered with adjacent data prior to triggering a TARP. For example, an erroneous data point or a response to an extreme climatic event may result in one point breaching a trigger level which will resolve the following month.

Table 8 presents the TARP Levels triggers for the OSPs and Private Bores, for the original TARPs in the lower left quadrant, and revised TARPs in the upper right quadrant. Based on the revisions to the TARPs, there are no triggers identified across the reporting period.

Table 8 TARP Level Review – WMP 11 ((original (lower left) and updated (upper right))

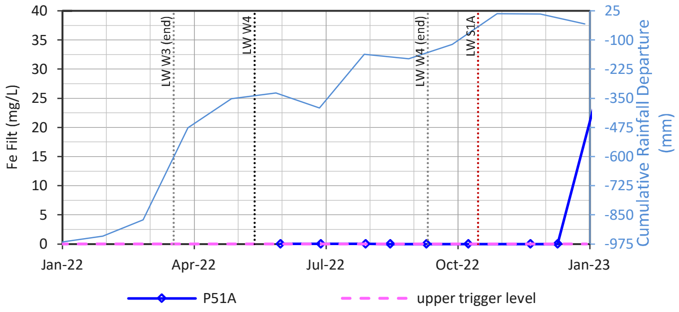
Bore	Month	TARP Level Exceeded														
		EC (µS/cm)	pH lower	pH upper	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
Shallow OSP																
P51A	Nov															
	Dec															
P51B	Nov															
	Dec															
P52	Nov															
	Dec															
P53A	Nov															
	Dec															
P53B	Nov															
	Dec															
P53C	Nov															
	Dec															
P54A	Nov		*	*												
	Dec		*	*												
P54B	Nov															
	Dec		*	*												
P55A	Nov															
	Dec		*	*												
P55B	Nov															
	Dec															
P55C	Nov															
	Dec															
P56A	Nov															
	Dec															
P56B	Nov															
	Dec															
P56C	Nov															
	Dec															
GW062068	Nov															
	Dec															
GW104008	Nov															
	Dec															
GW104323	Nov															
	Dec															
GW104659	Nov															
	Dec															
GW105395	Nov															
	Dec															
GW109257	Nov															
	Dec															
GW112473	Nov															
	Dec															

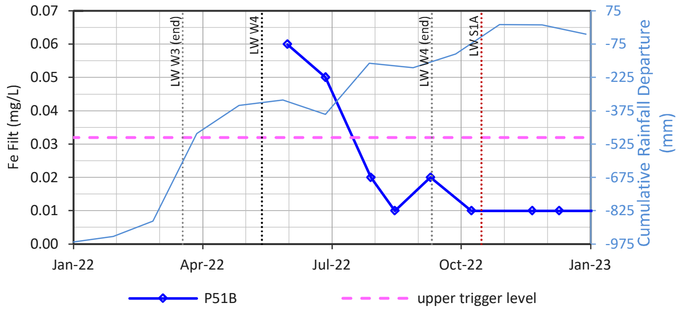
Normal Condition TARP Level 1 TARP Level 2 TARP Level 3

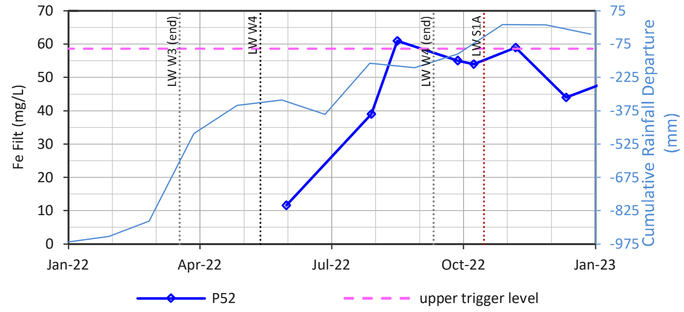
"": no data available*

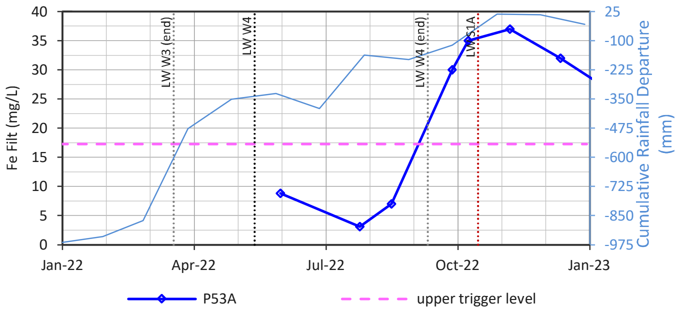
Appendix D:

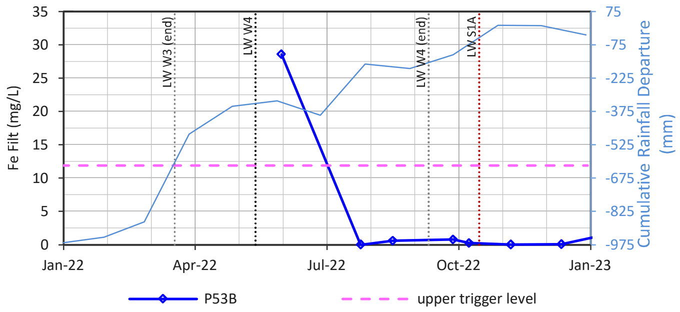
Groundwater Quality Time-series plots for Shallow OSPs and Private Bores

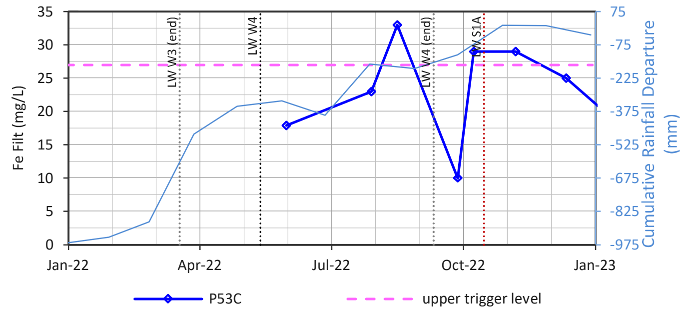

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P51A
upper trigger level

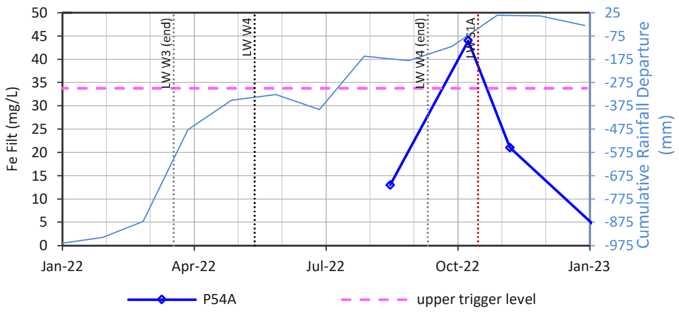

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P51B
upper trigger level

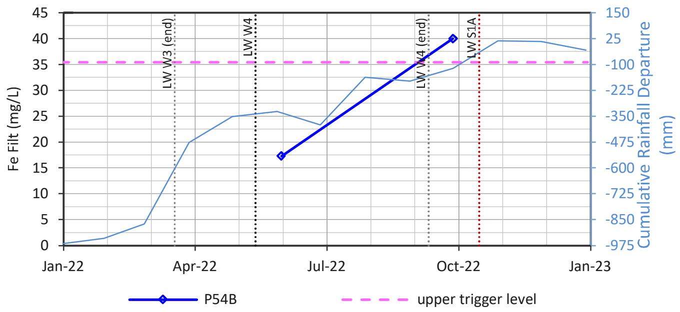

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P52
upper trigger level

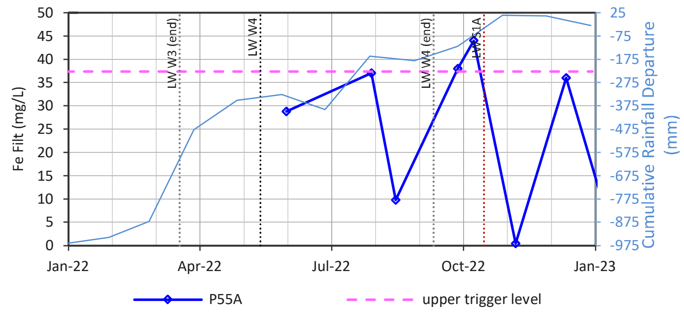

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53A
upper trigger level

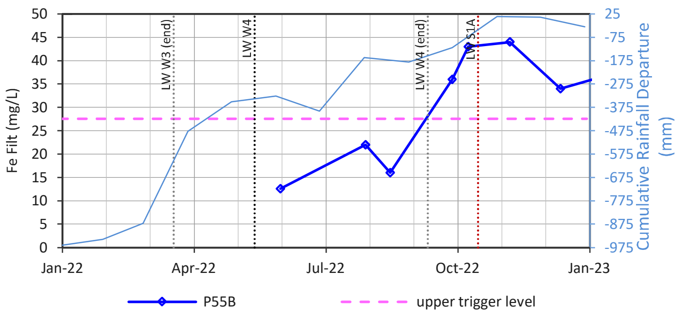

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53B
upper trigger level

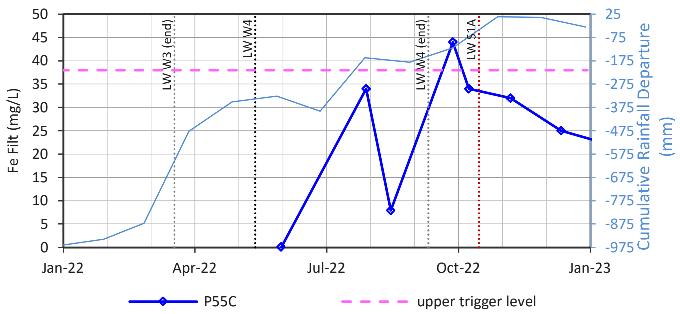

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53C
upper trigger level

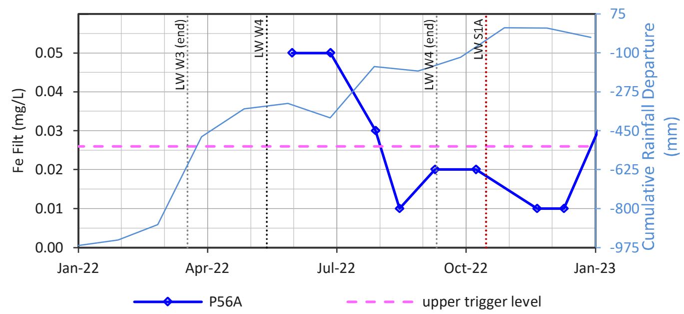

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54A
upper trigger level

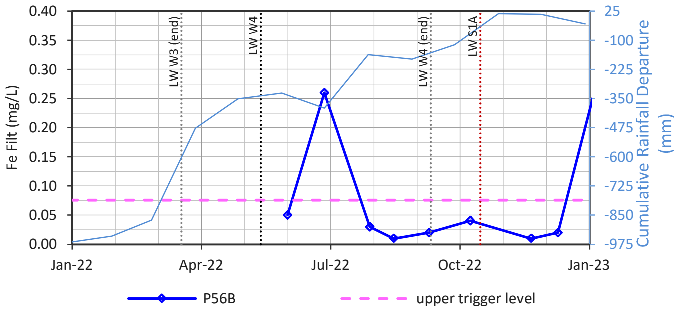

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54B
upper trigger level

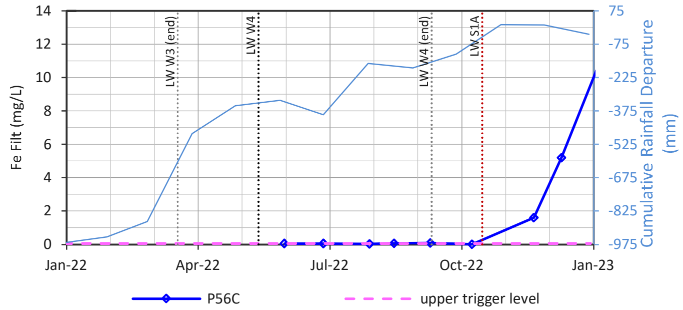

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55A
upper trigger level

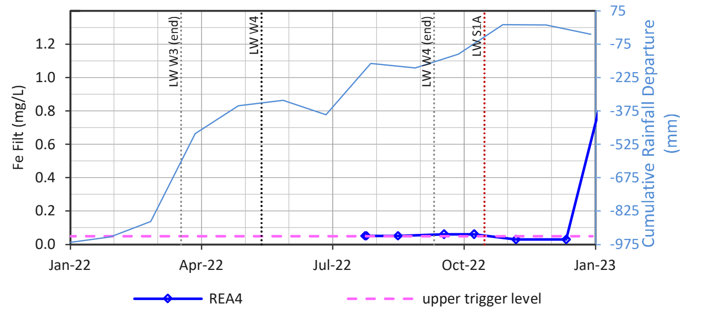

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55B
upper trigger level

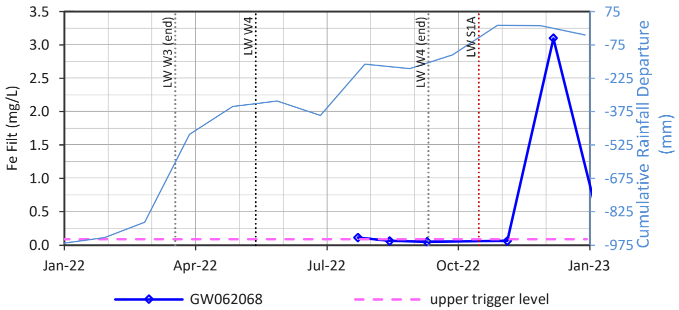

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55C
upper trigger level

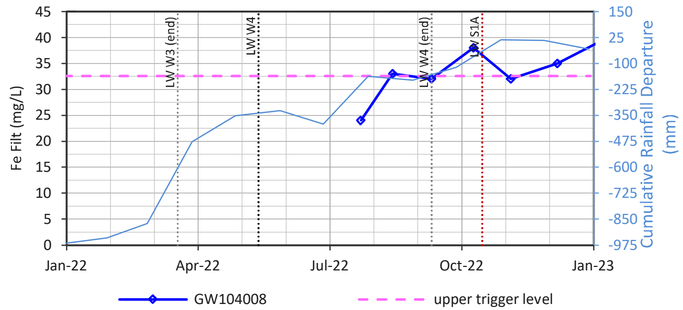

Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56A
upper trigger level

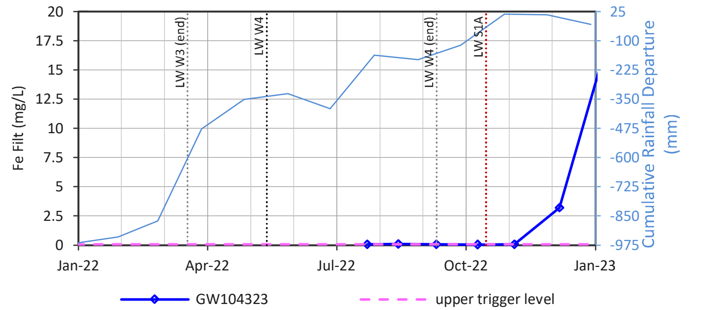


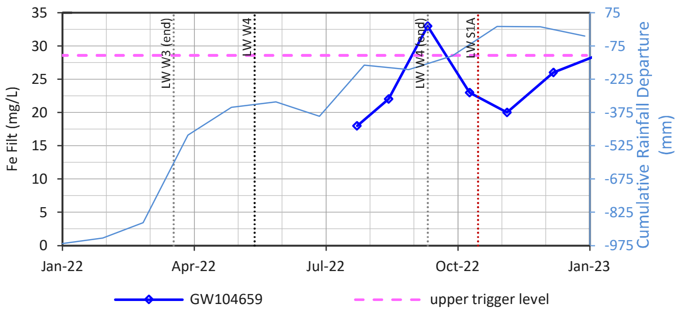


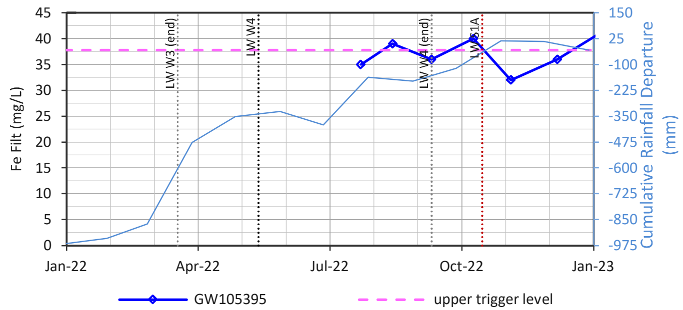


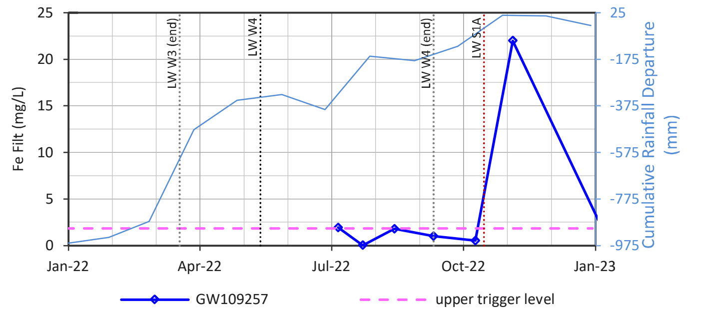


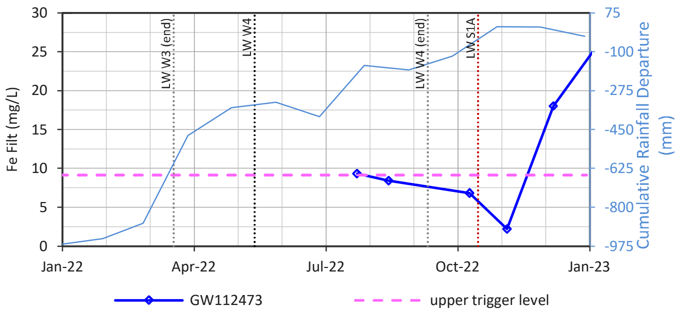




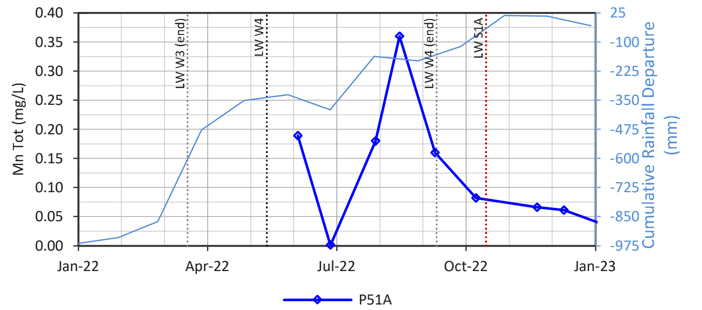


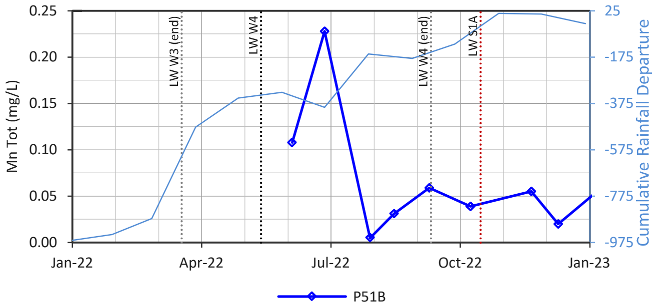


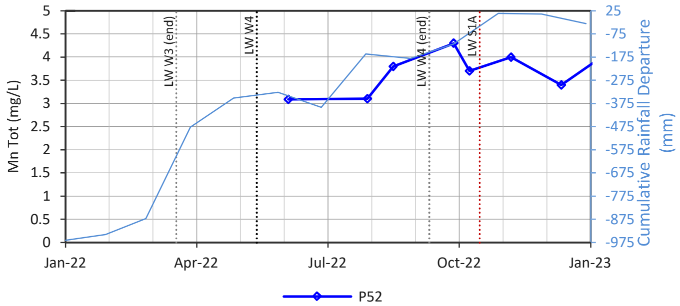




No Data Available for Fe Filt (mg/L)




Mn Tot (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P51B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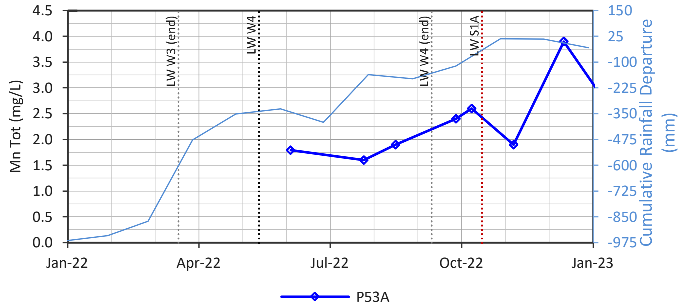
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P52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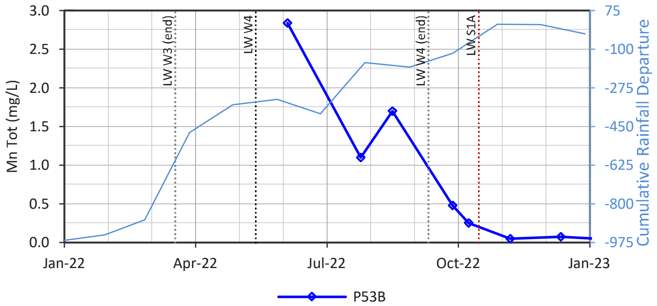
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53A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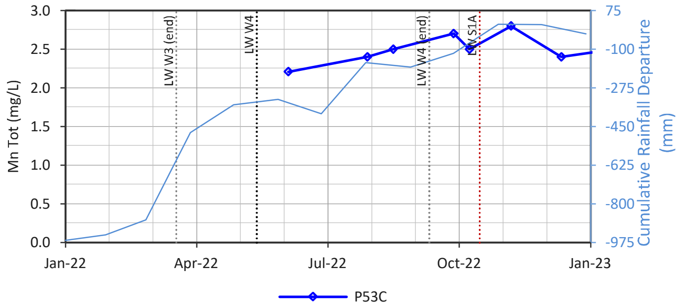
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53B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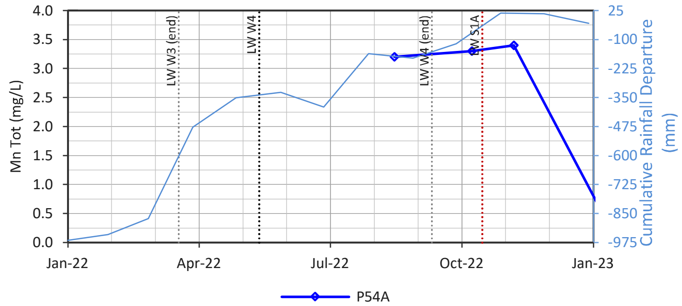
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53C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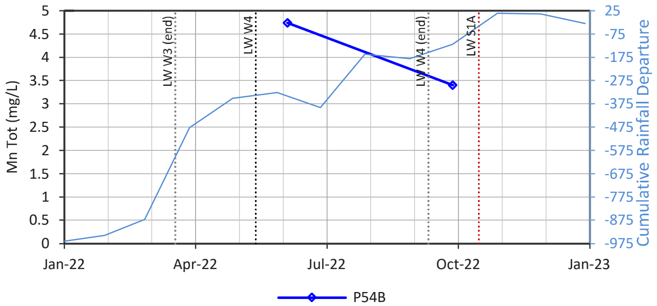
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54A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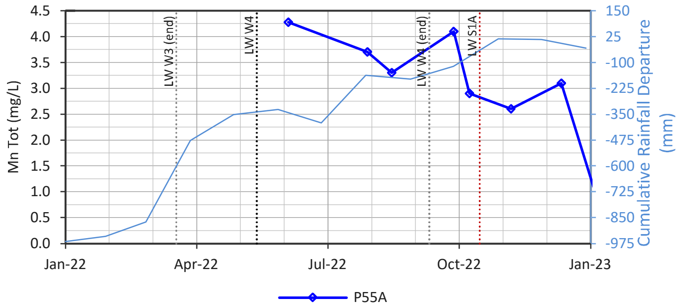
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54B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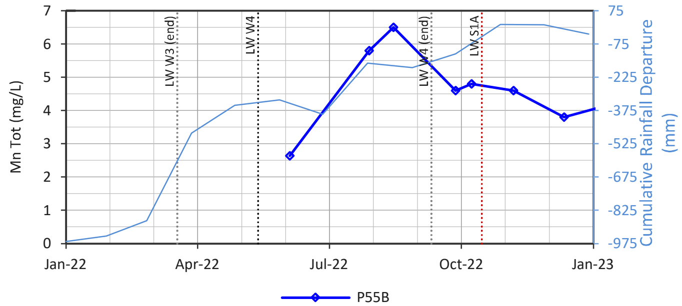
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55A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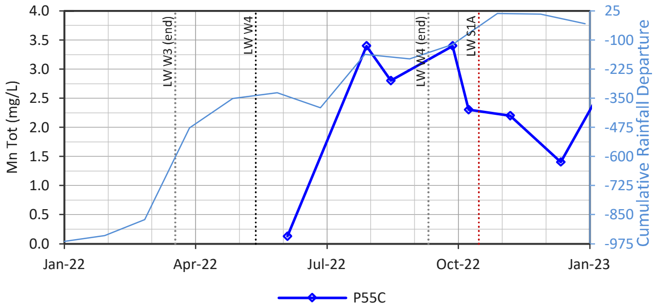
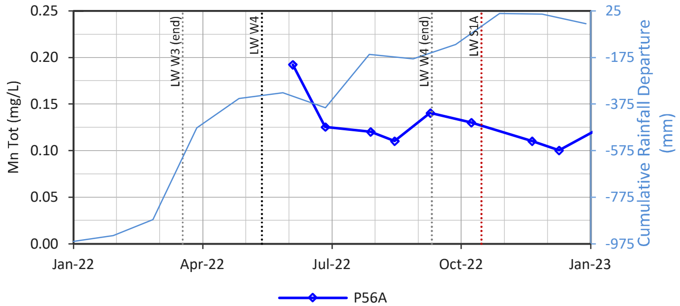
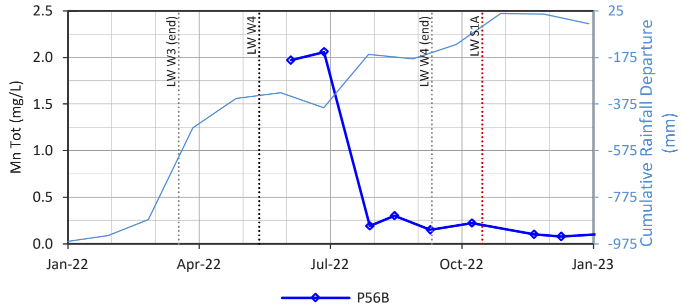
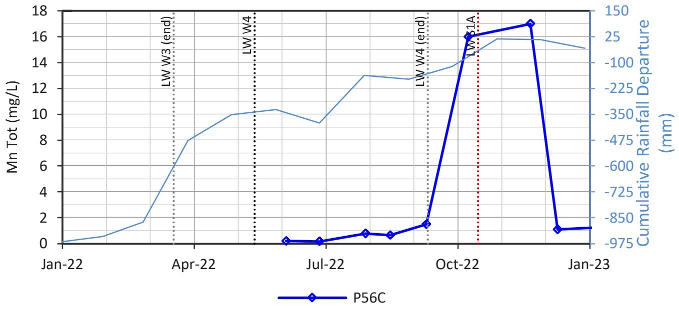
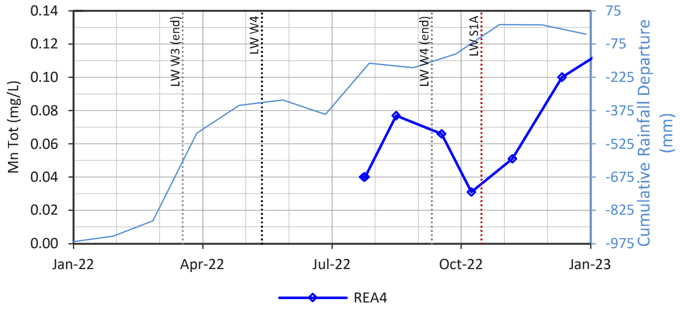
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55B

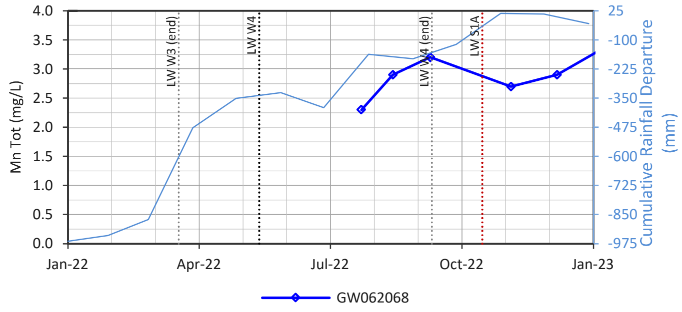

Mn Tot (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55C

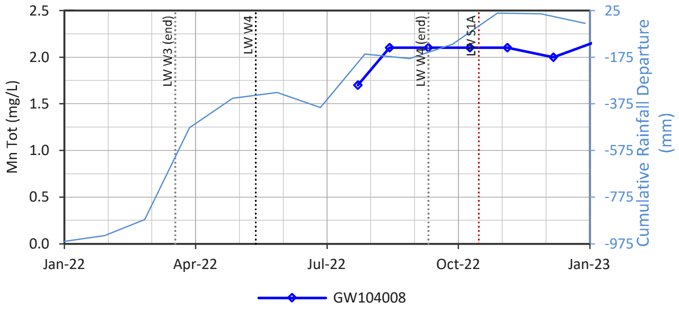

Mn Tot (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56A

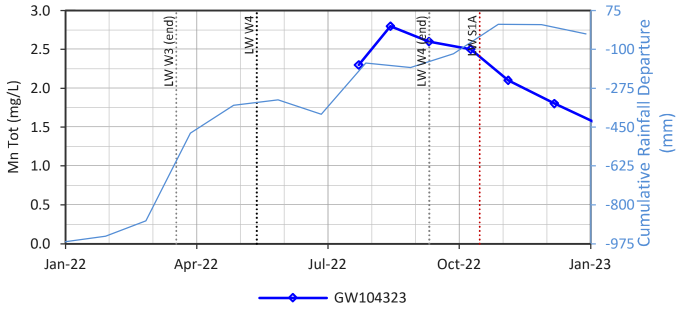

Mn Tot (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56B

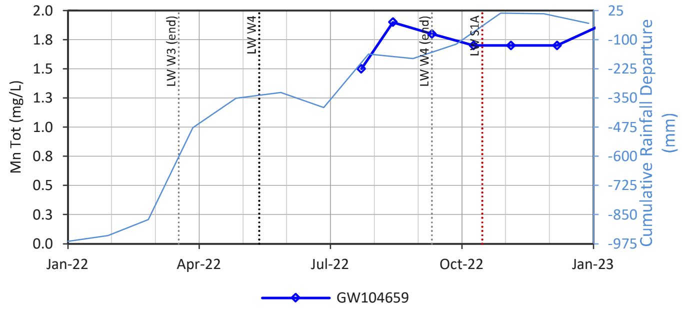


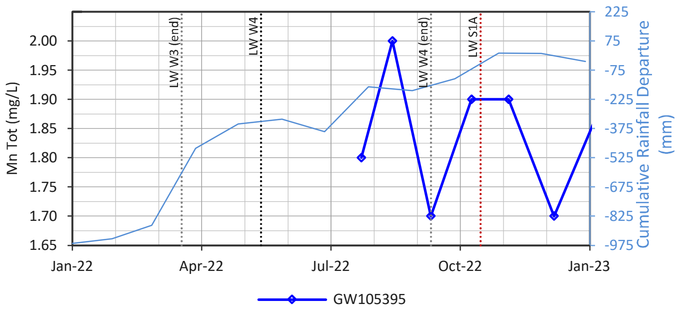


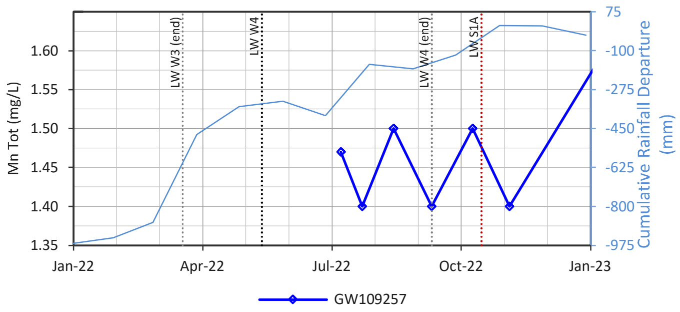


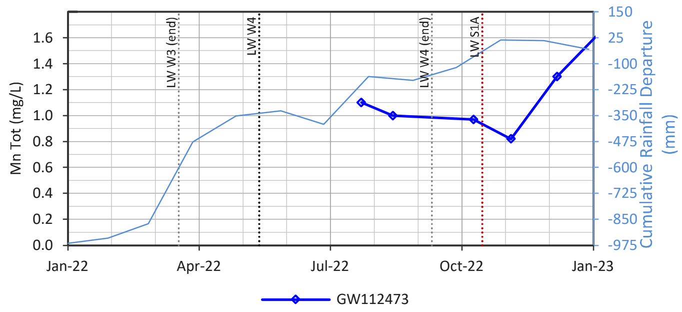




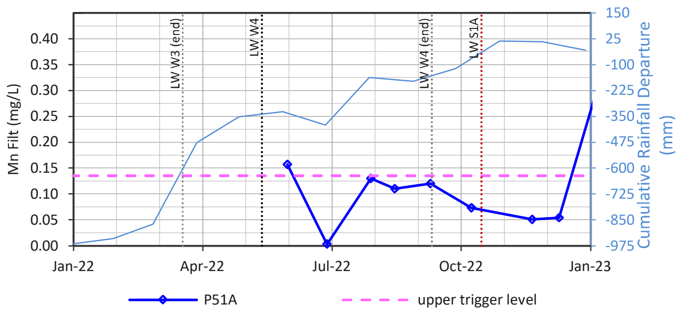


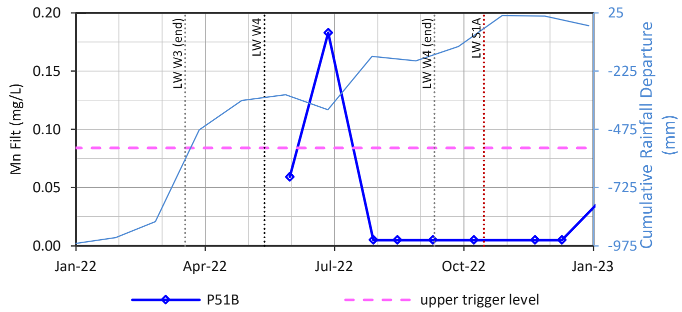


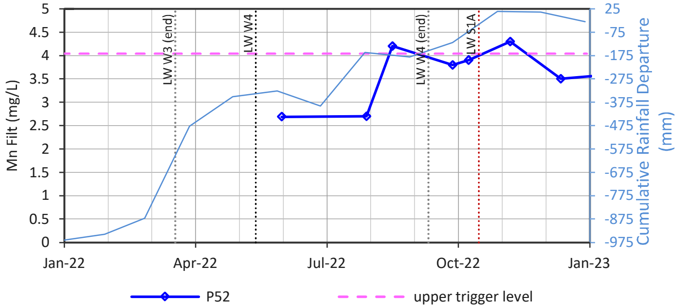


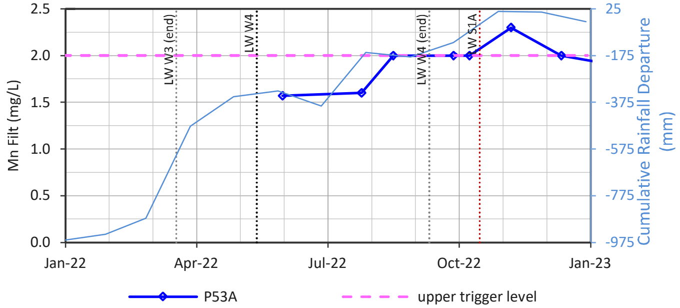


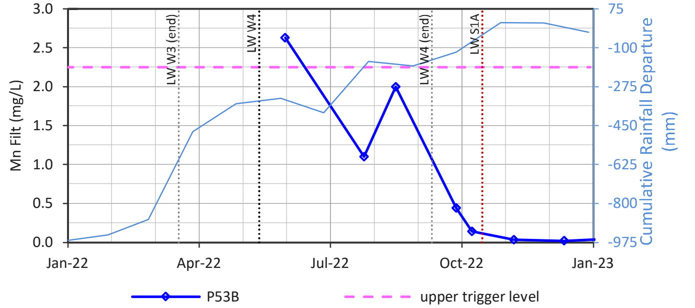
No Data Available for Mn Tot (mg/L)

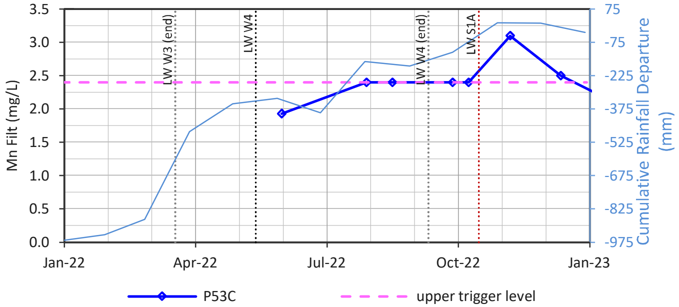


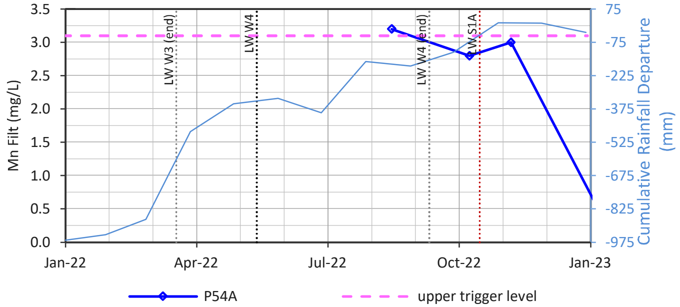


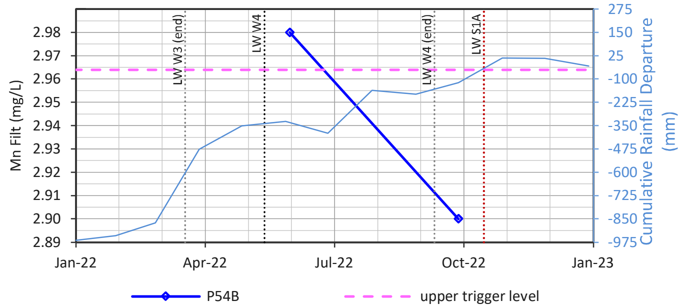

P52
upper trigger level

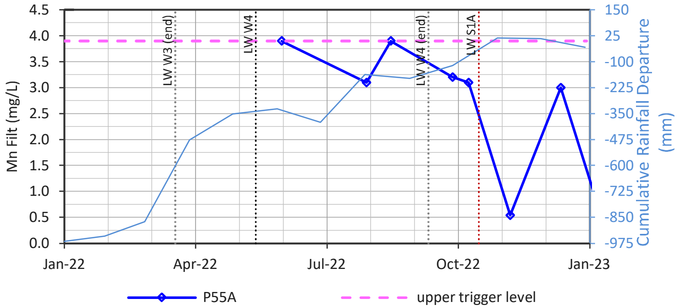

P53A
upper trigger level

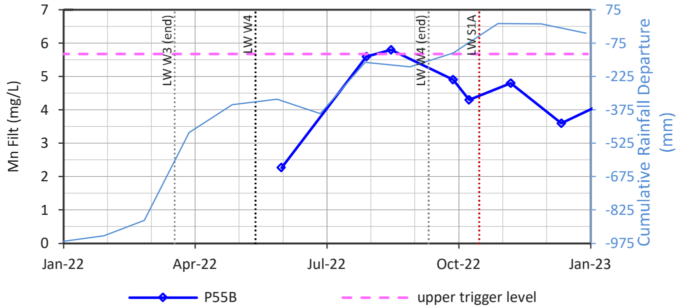

P53B
upper trigger level

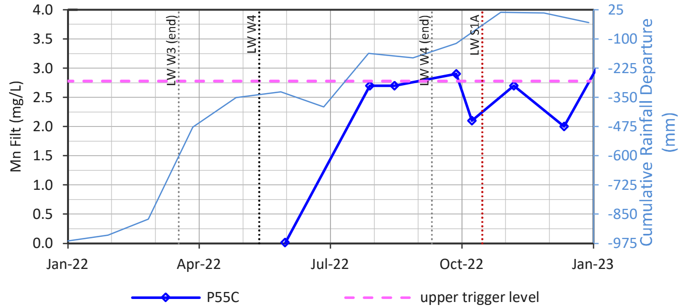

P53C
upper trigger level

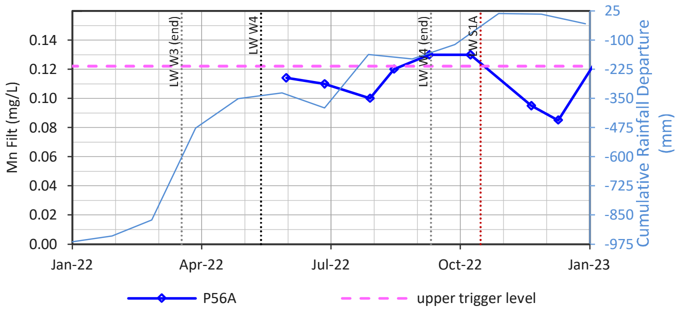

P54A
upper trigger level

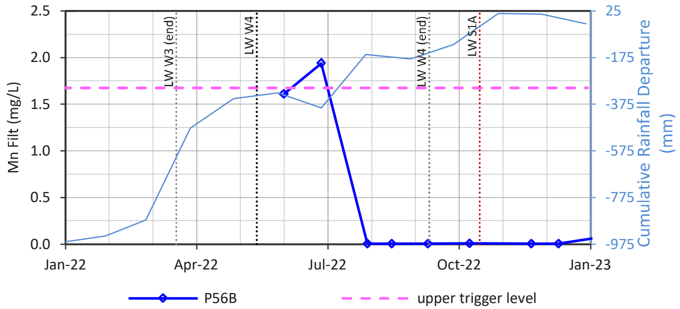

P54B
upper trigger level

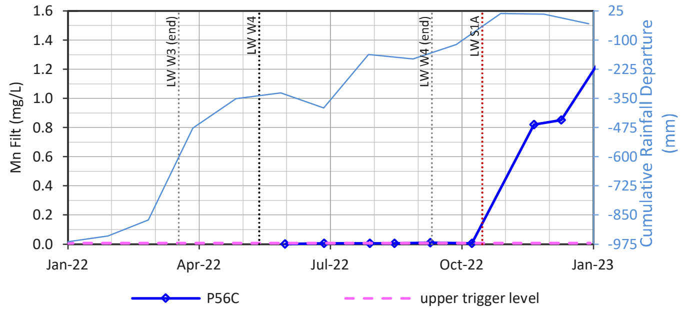

P55A
upper trigger level

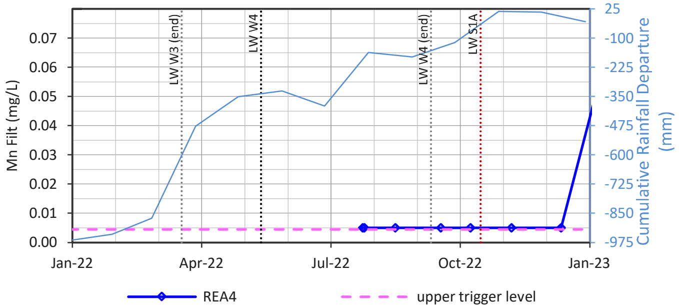

P55B
upper trigger level

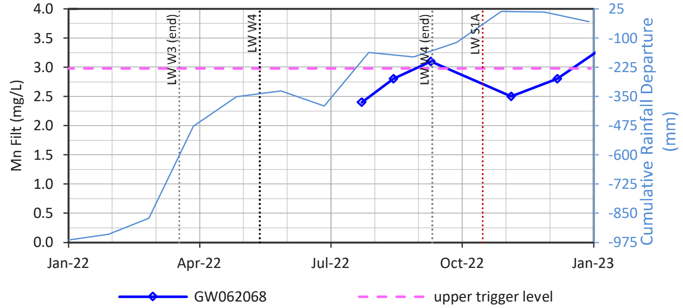

P55C
upper trigger level

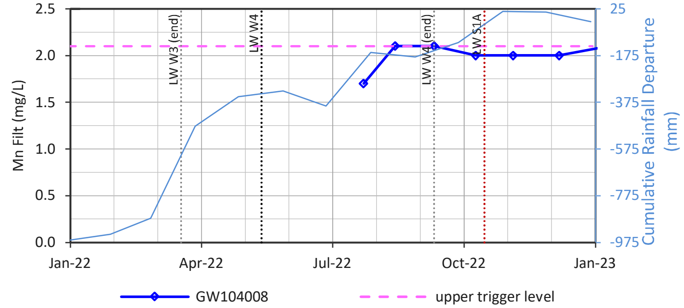

P56A
upper trigger level

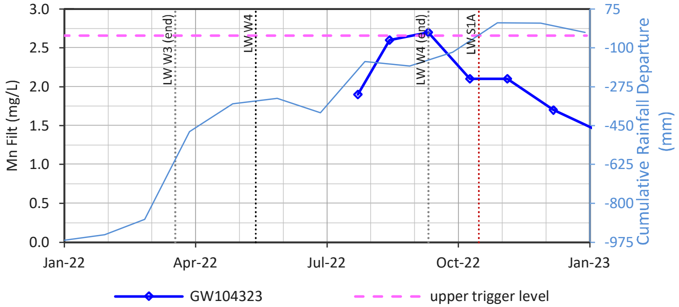

P56B
upper trigger level

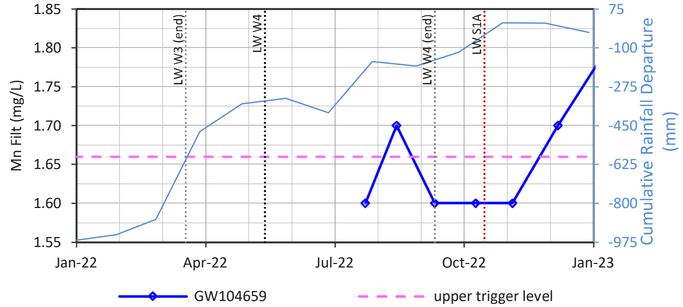

P56C
upper trigger level

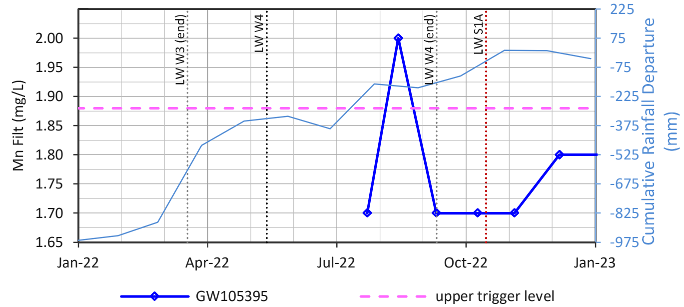


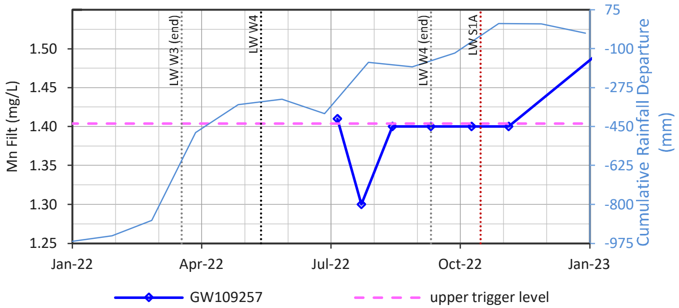


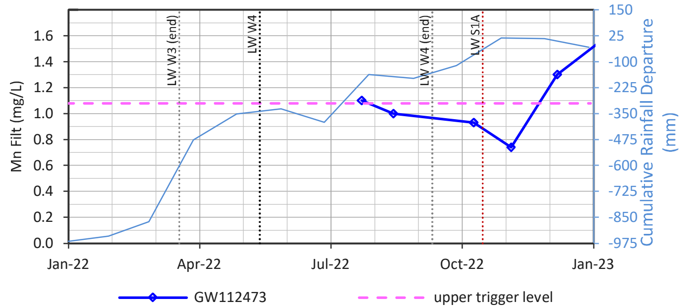




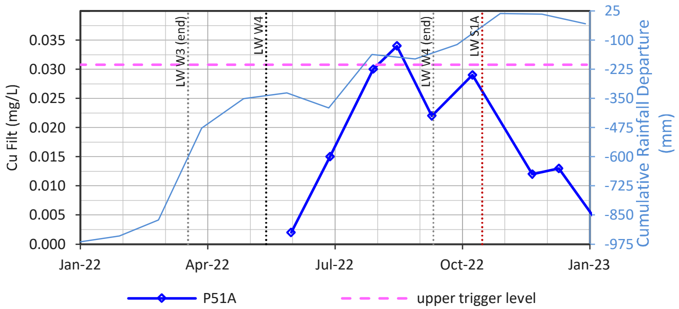


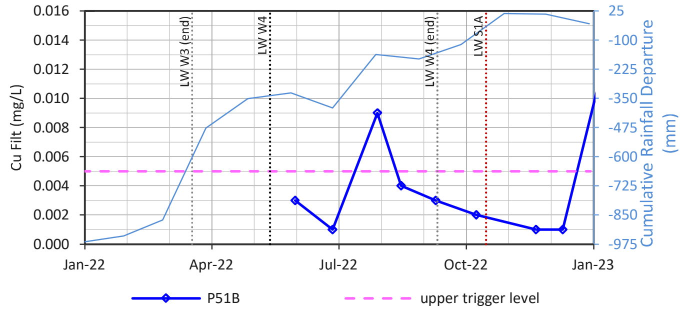


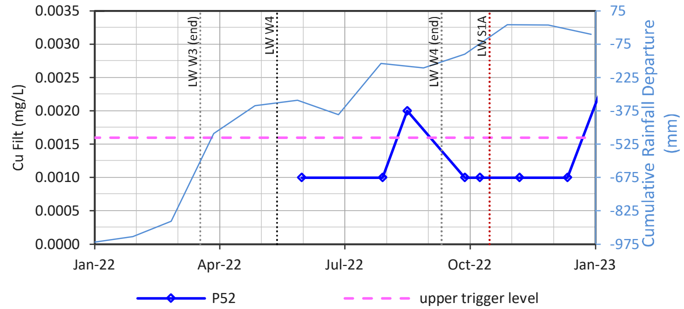


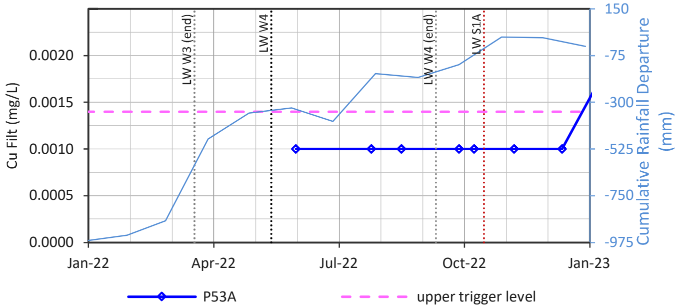


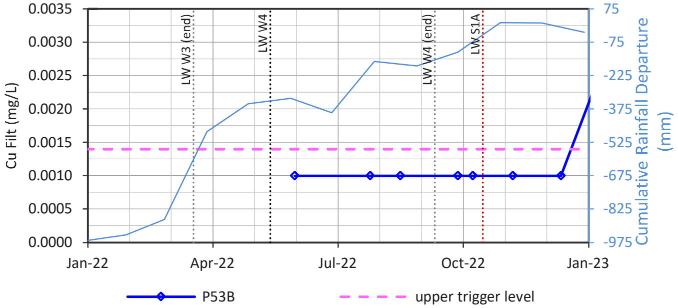
No Data Available for Mn Filt (mg/L)

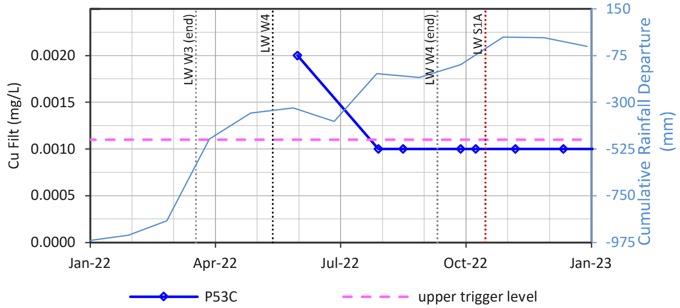


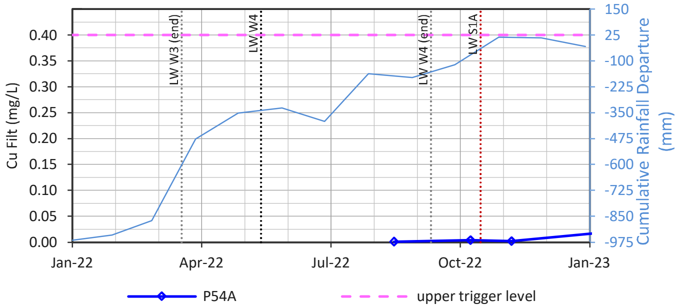


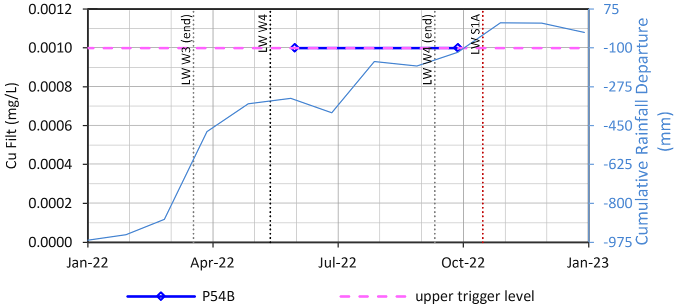


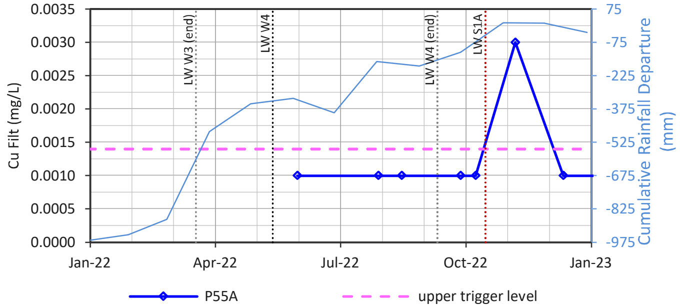

P53A
upper trigger level

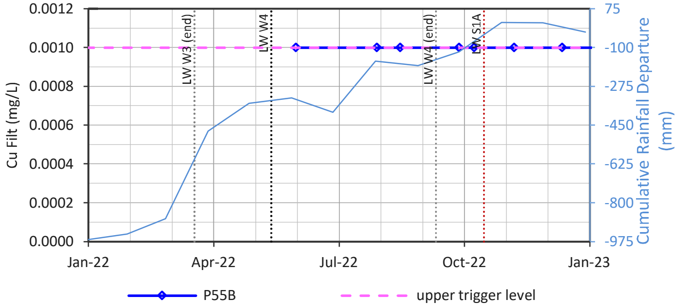

P53B
upper trigger level

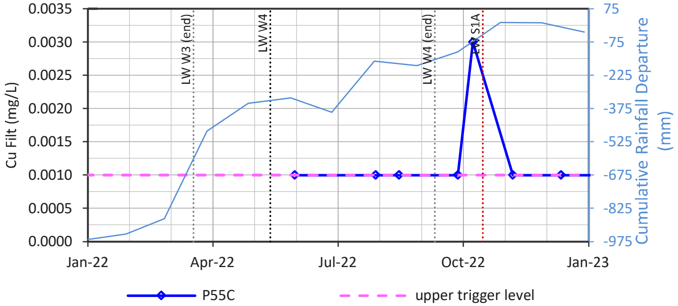

P53C
upper trigger level

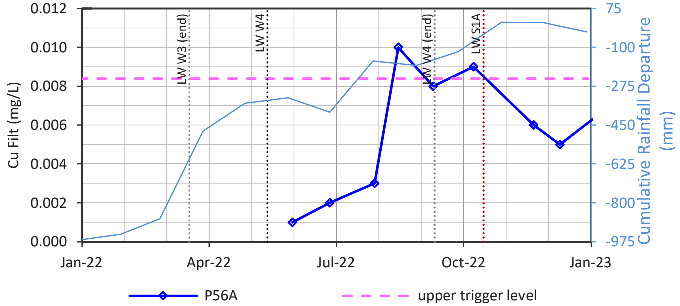

P54A
upper trigger level

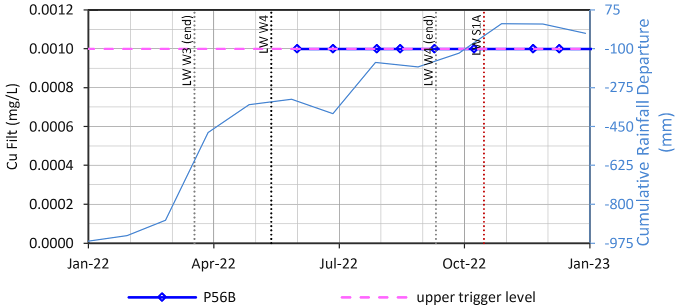

P54B
upper trigger level

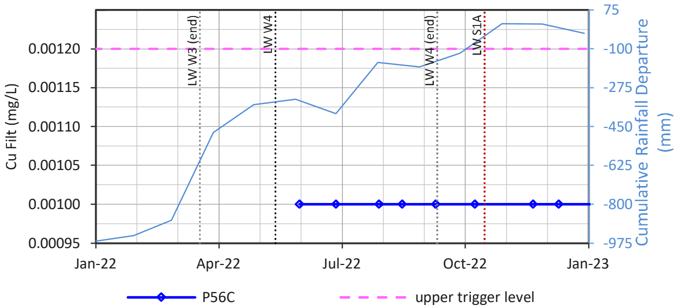

P55A
upper trigger level

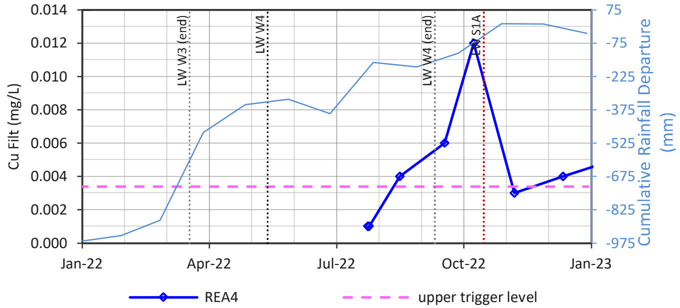

P55B
upper trigger level

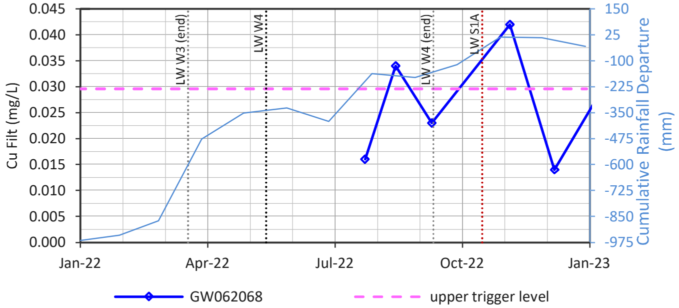

P55C
upper trigger level

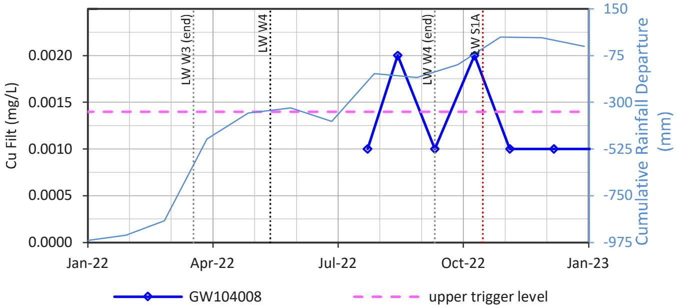

P56A
upper trigger level

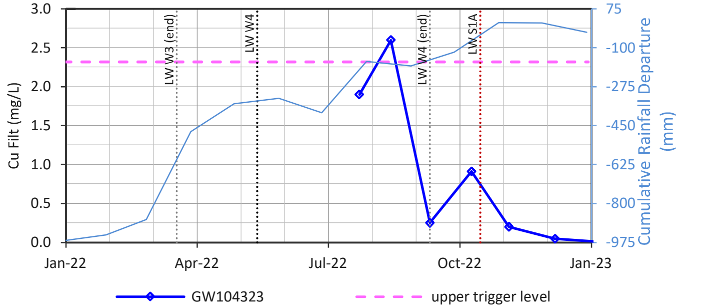

P56B
upper trigger level

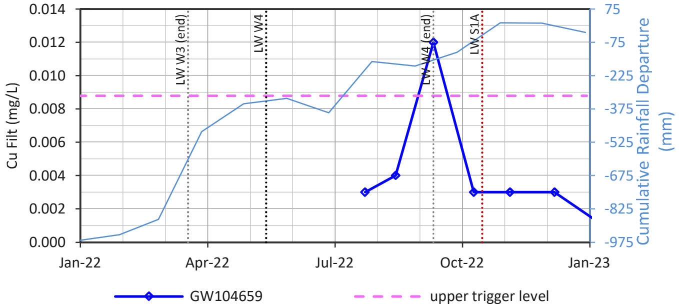

P56C
upper trigger level

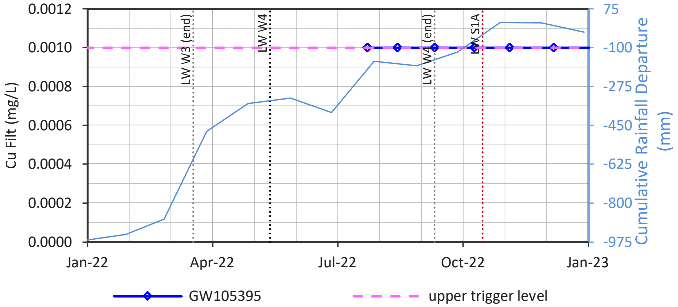

REA4
upper trigger level

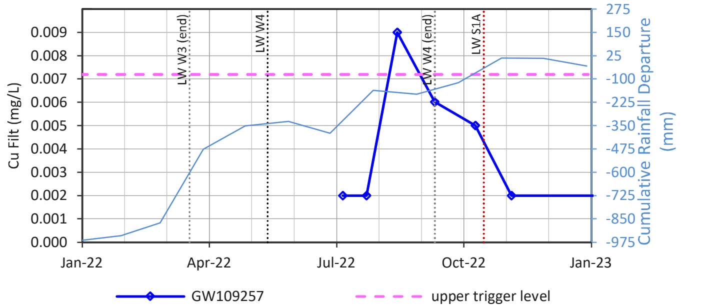


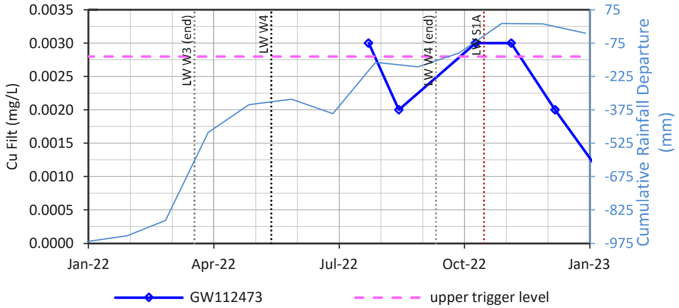




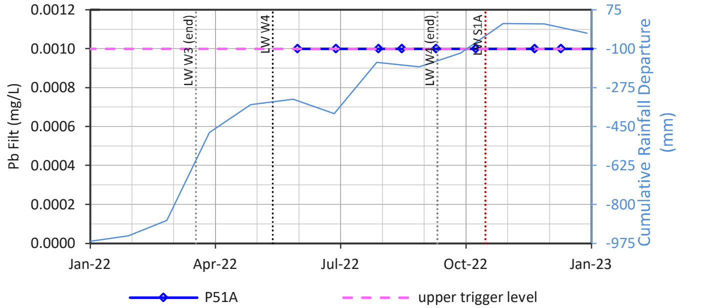


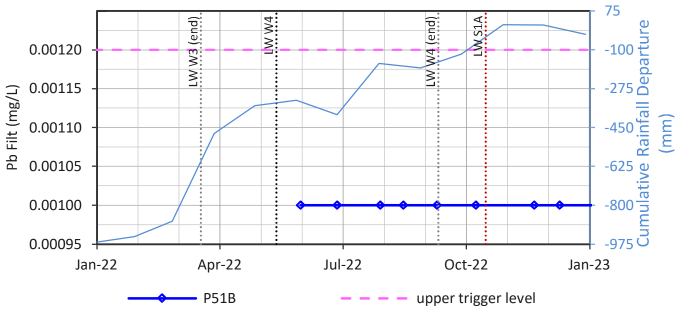


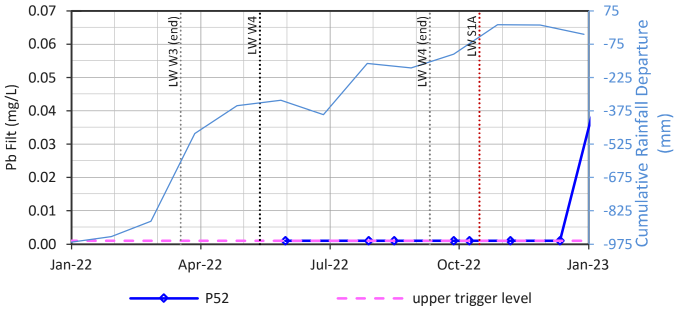


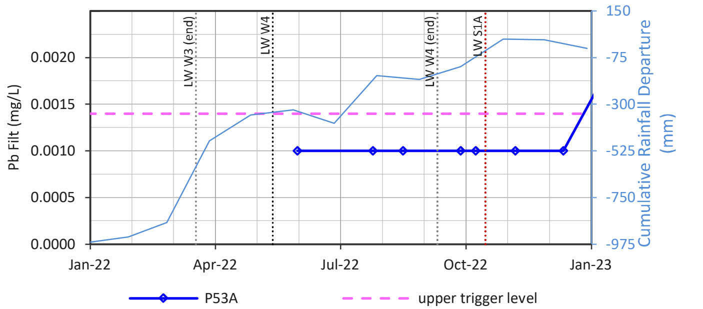


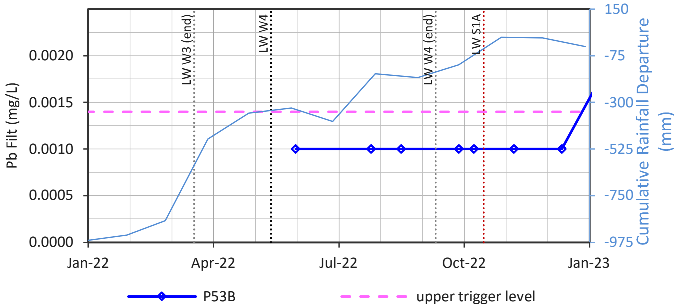
No Data Available for Cu Filt (mg/L)

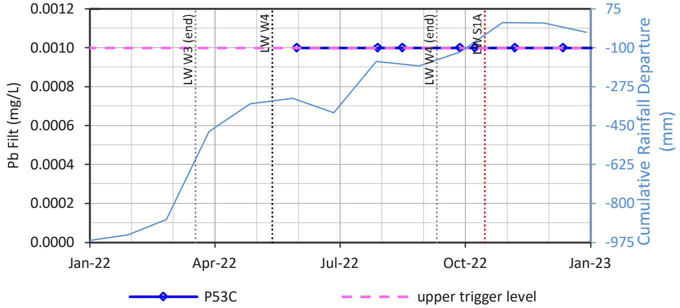


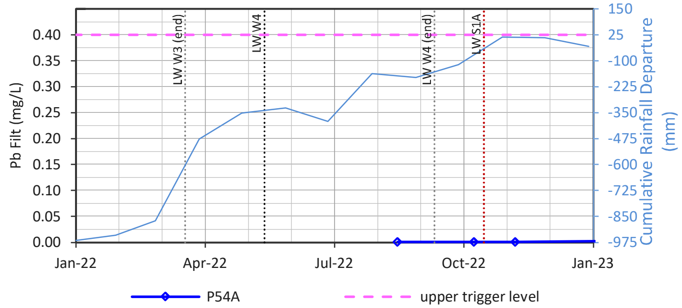


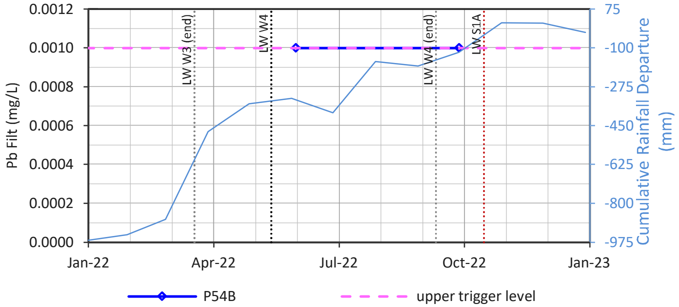


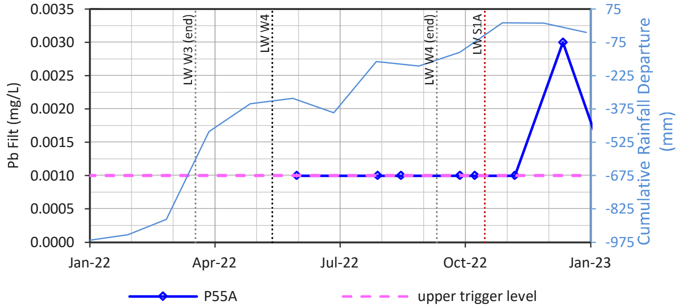


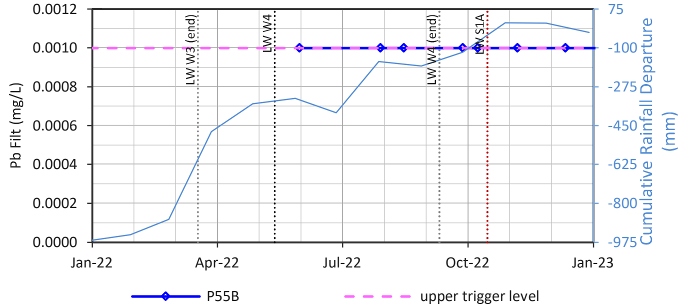

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53B
upper trigger level

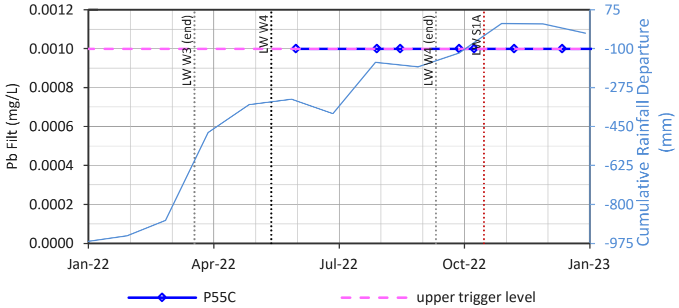

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P53C
upper trigger level

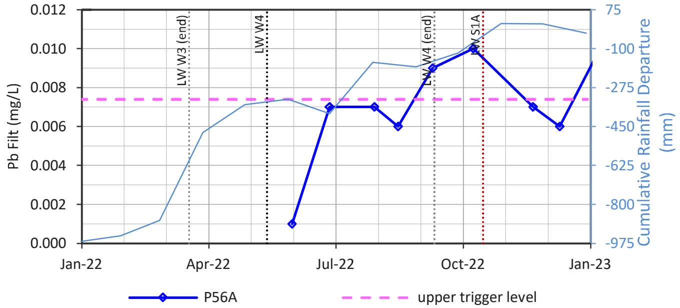

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54A
upper trigger level

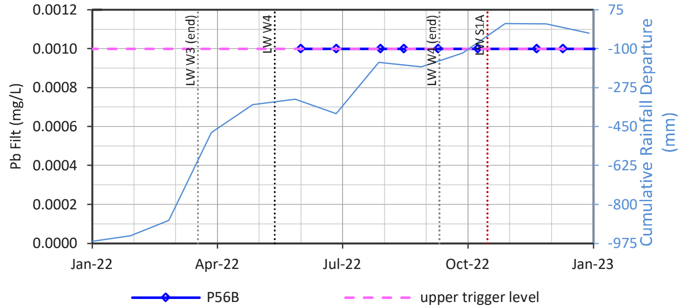

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54B
upper trigger level

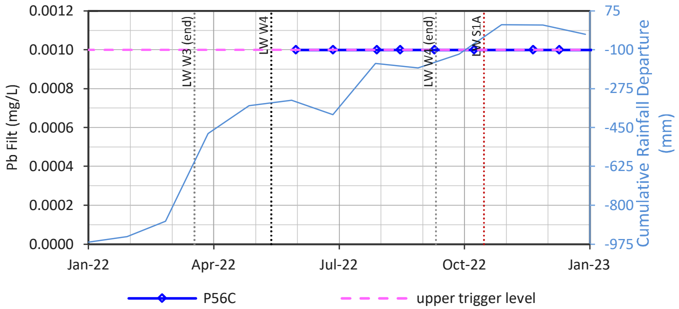

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55A
upper trigger level

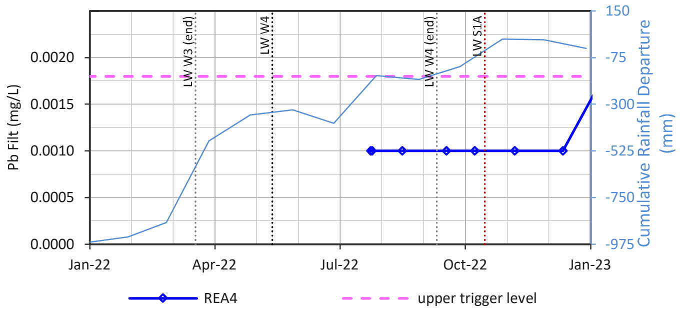

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55B
upper trigger level

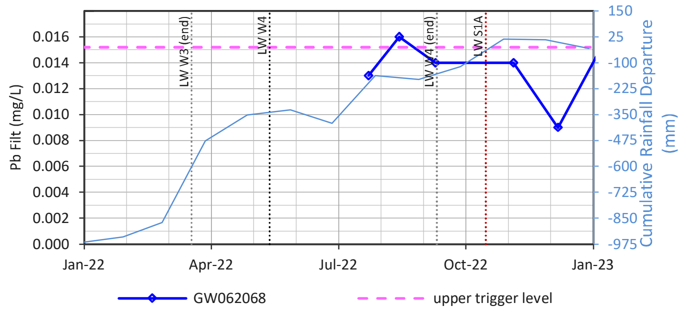

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55C
upper trigger level

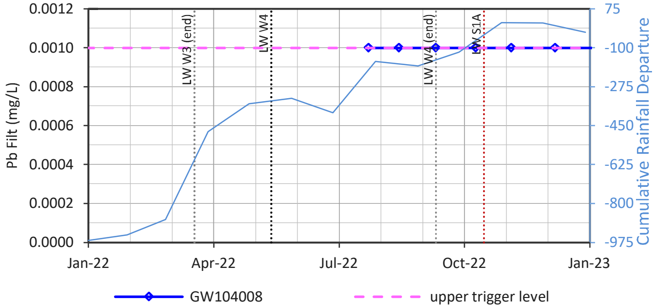

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56A
upper trigger level

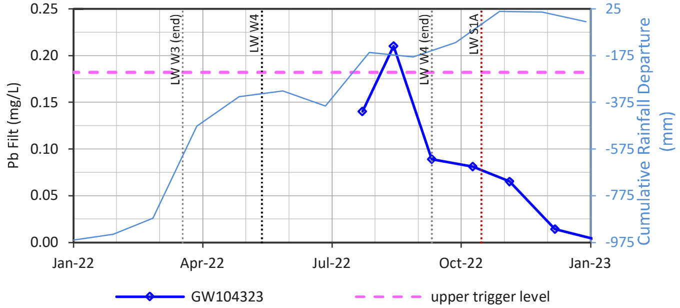

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56B
upper trigger level

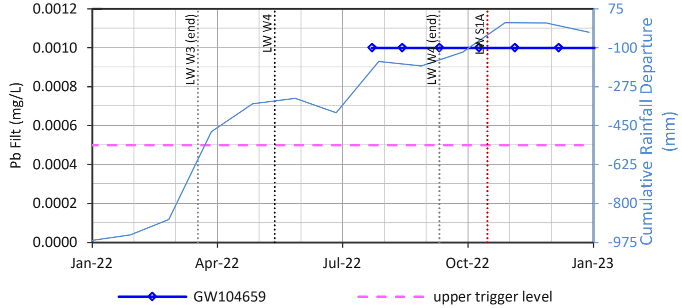

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56C
upper trigger level

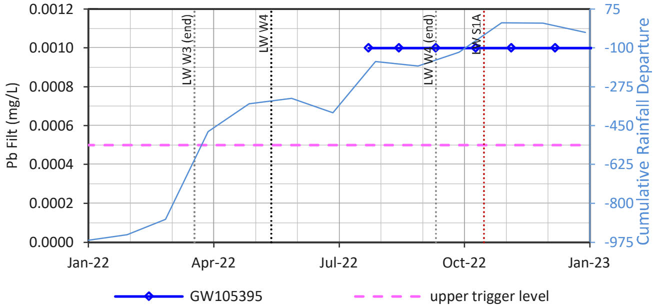

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
REA4
upper trigger level

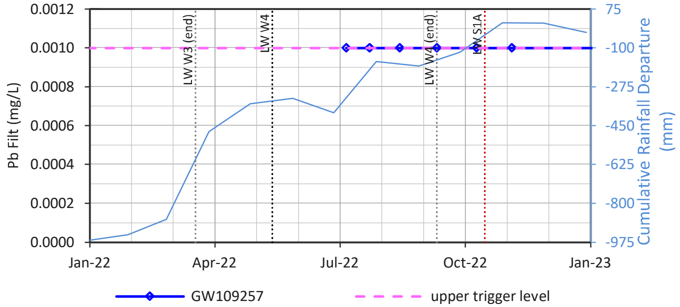

Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW062068
upper trigger level

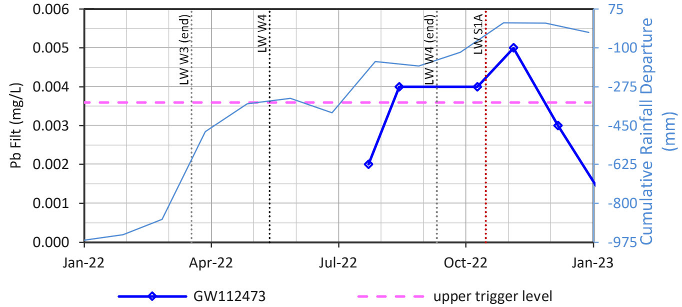




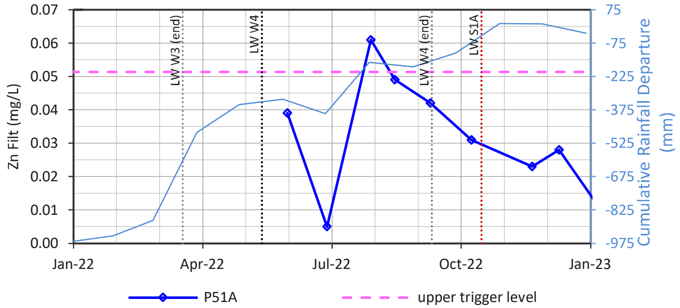


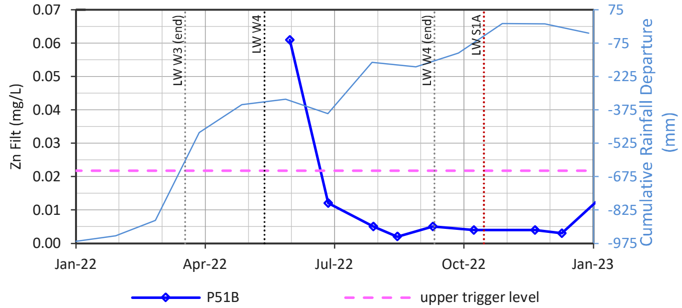


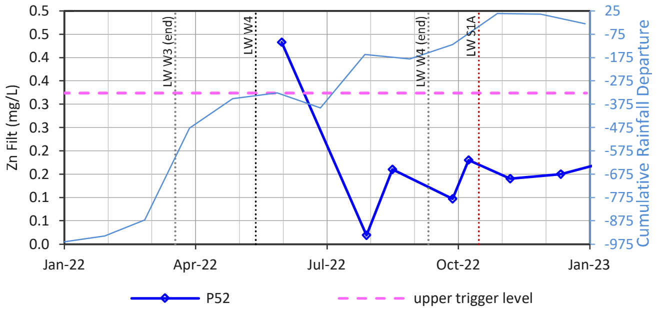


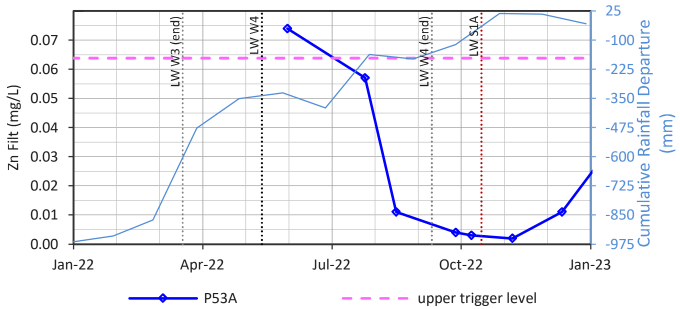


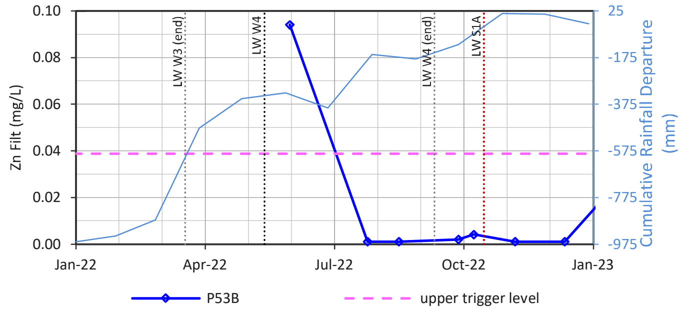
No Data Available for Pb Filt (mg/L)

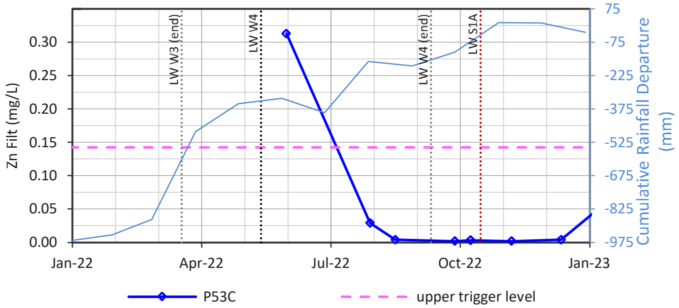


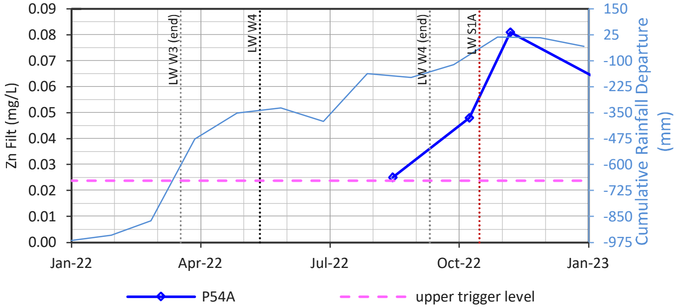


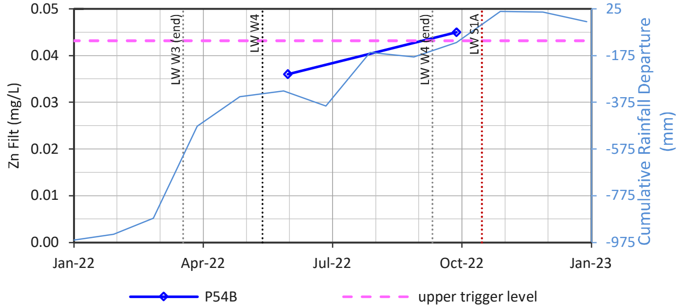


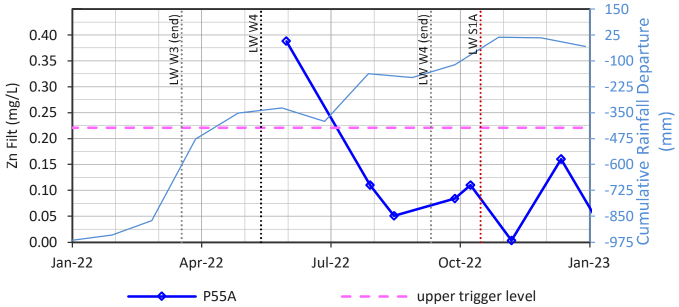


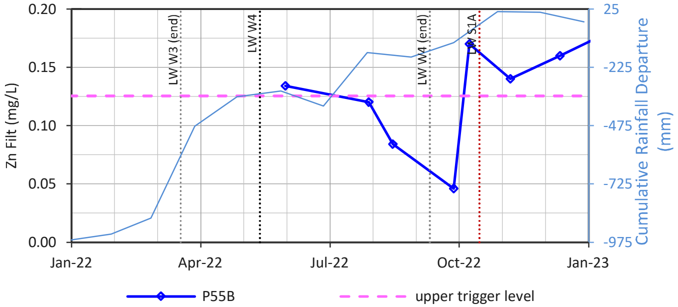


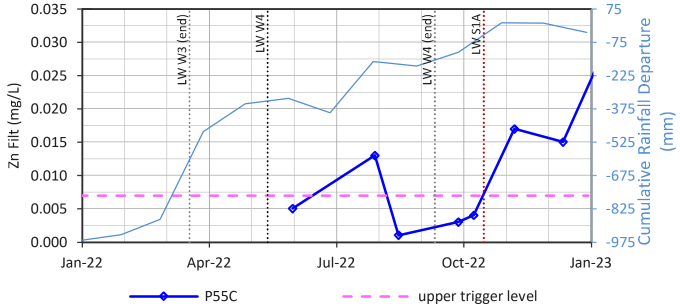

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53C
upper trigger level

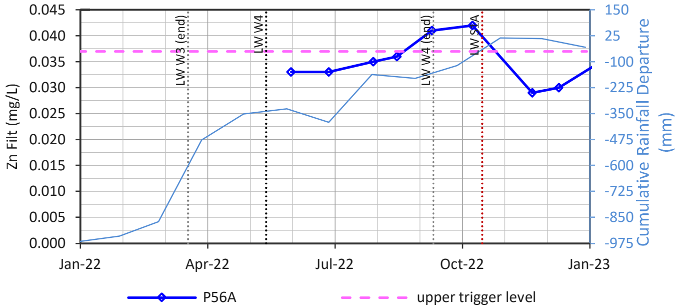

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54A
upper trigger level

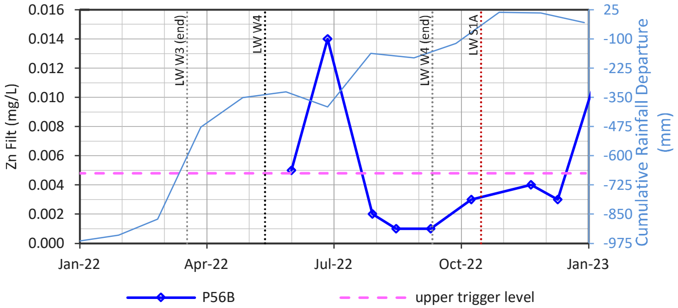

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54B
upper trigger level

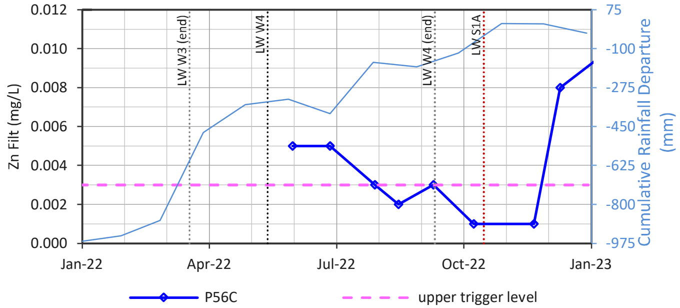

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55A
upper trigger level

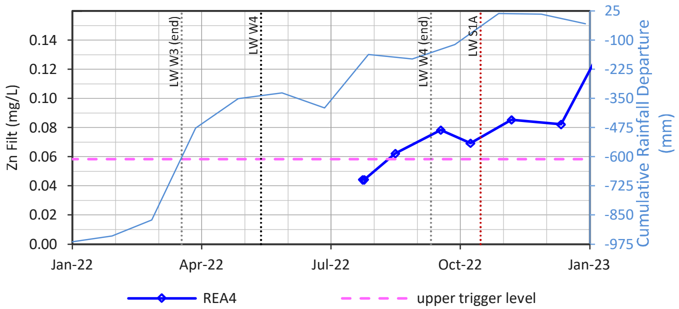

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55B
upper trigger level

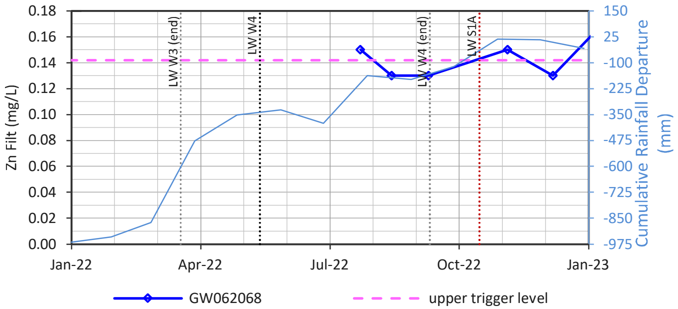

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C
upper trigger level

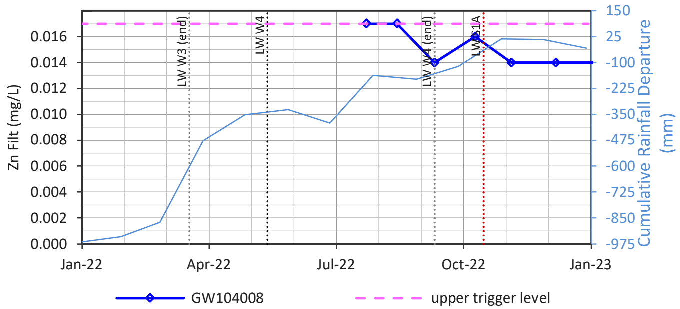

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A
upper trigger level

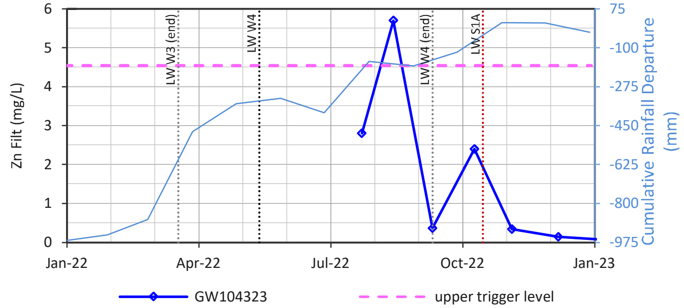

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56B
upper trigger level

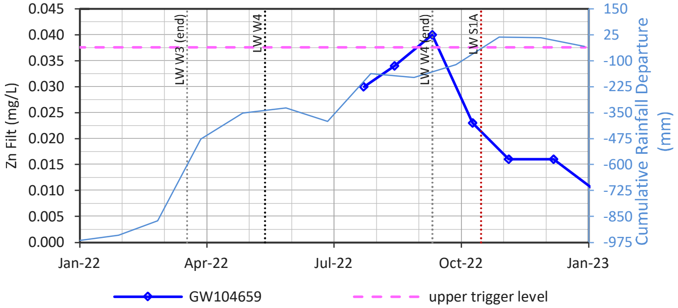

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56C
upper trigger level

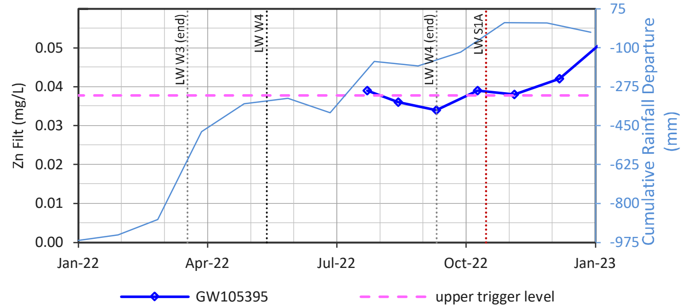

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
REA4
upper trigger level

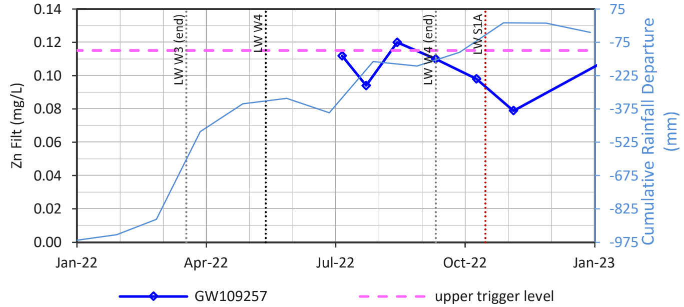

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW062068
upper trigger level

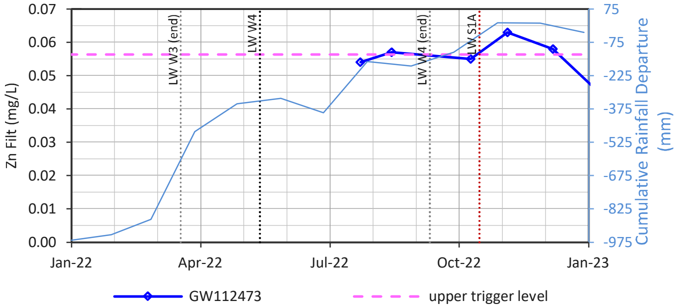

Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104008
upper trigger level



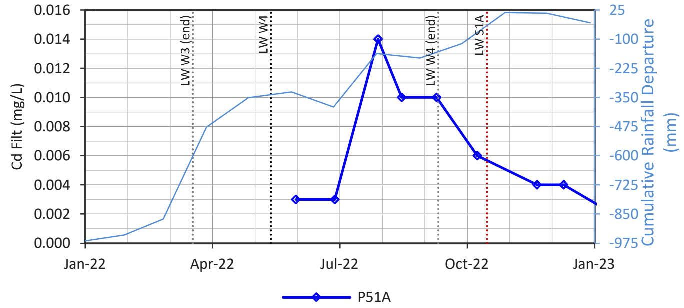


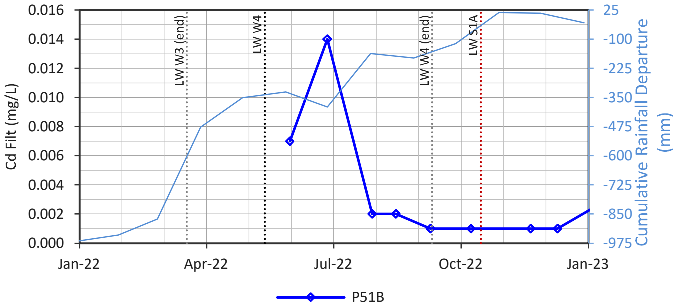


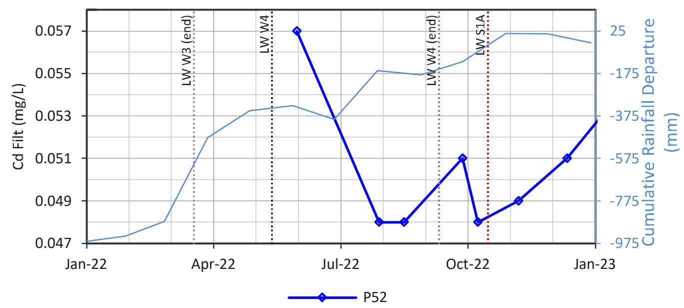


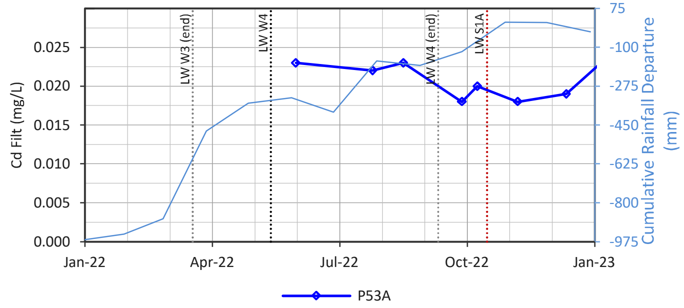


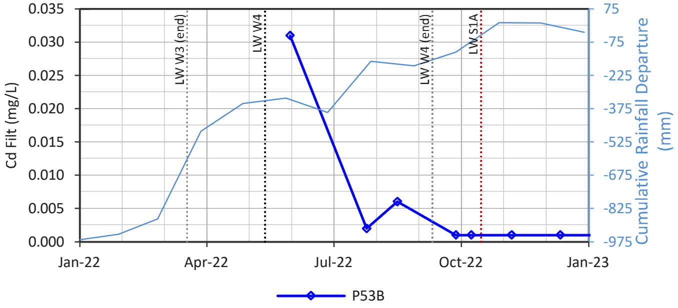
No Data Available for Zn Filt (mg/L)

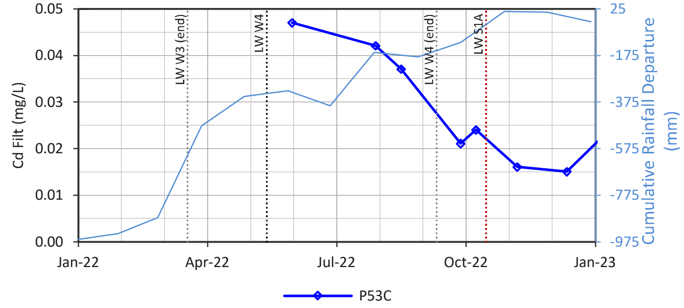


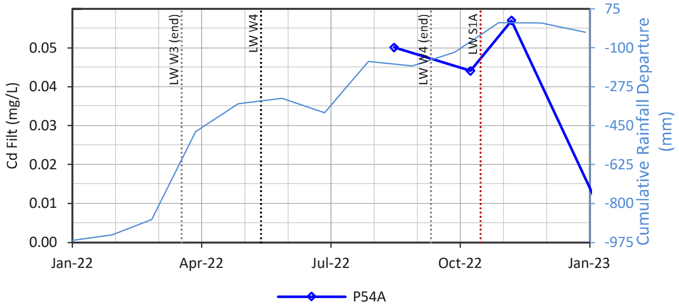


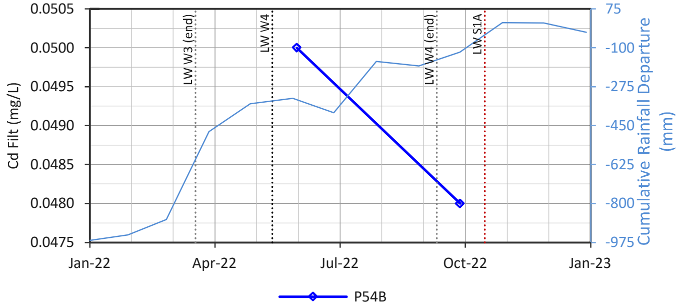


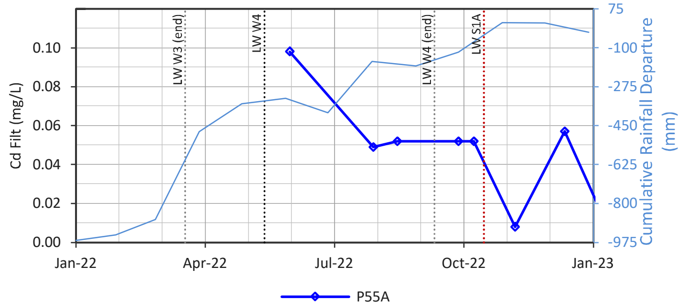


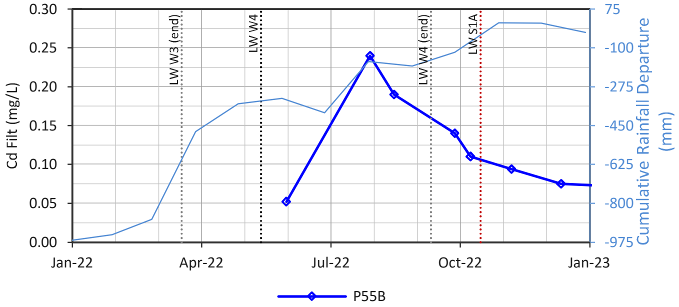


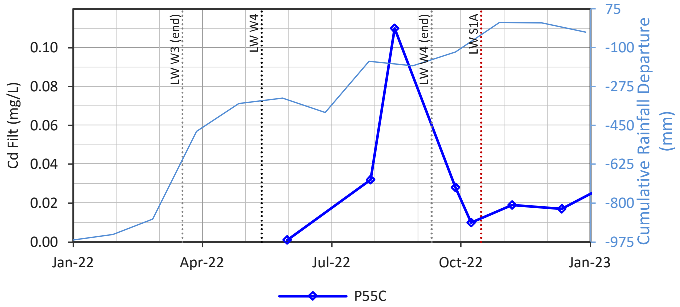


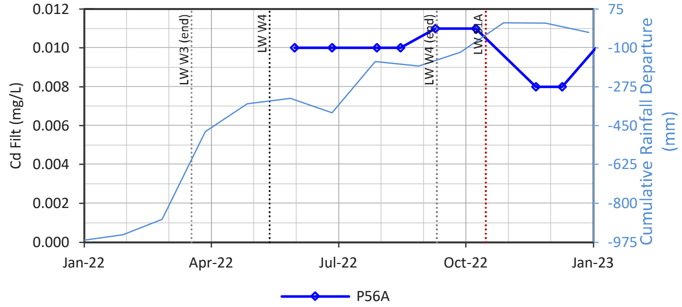

Cd Filt (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54A

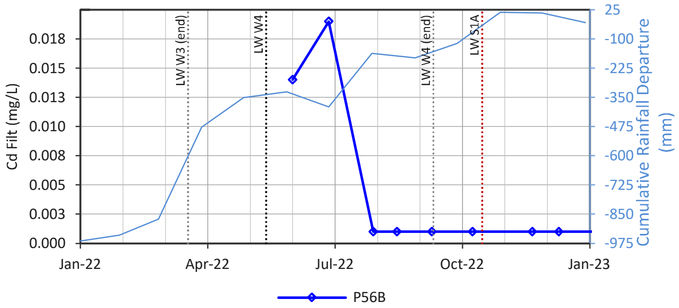

Cd Filt (mg/L)
0.0505
0.0500
0.0495
0.0490
0.0485
0.0480
0.0475
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54B

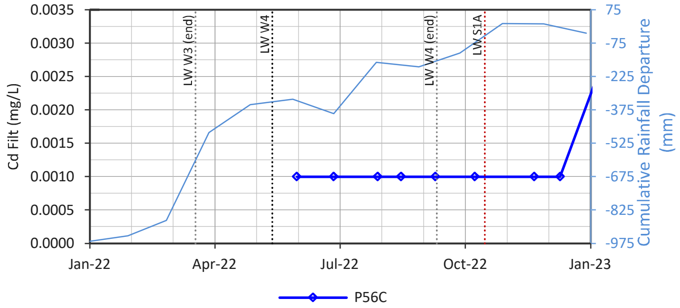

Cd Filt (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55A

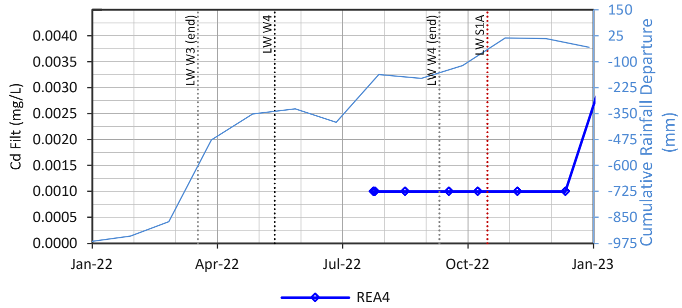

Cd Filt (mg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55B

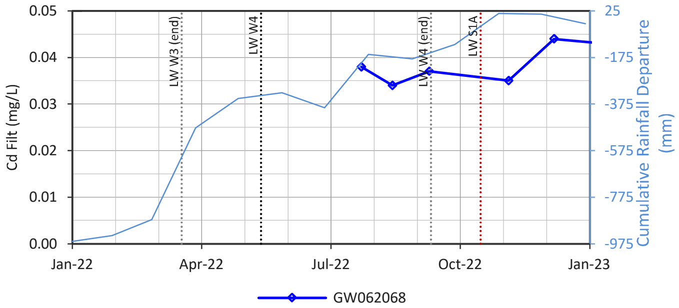

Cd Filt (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C

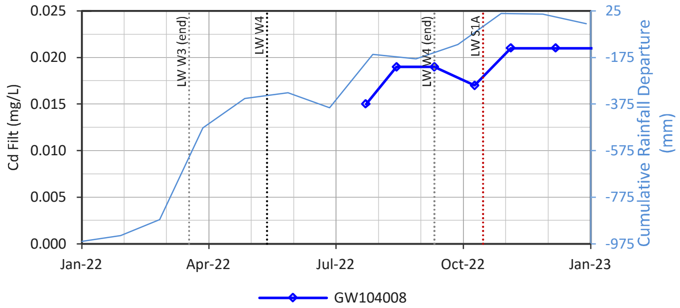

Cd Filt (mg/L)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A

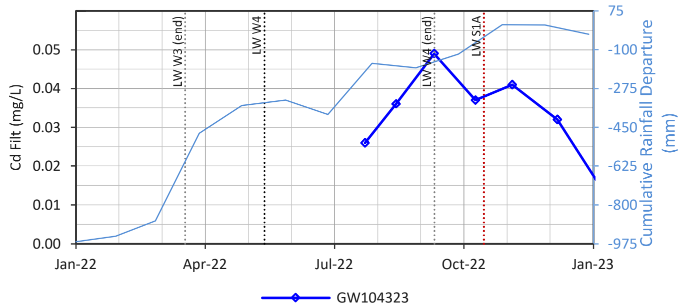

Cd Filt (mg/L)
0.018
0.015
0.013
0.010
0.008
0.005
0.003
0.000
Cumulative Rainfall Departure (mm)
25
-100
-225
-350
-475
-600
-725
-850
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56B

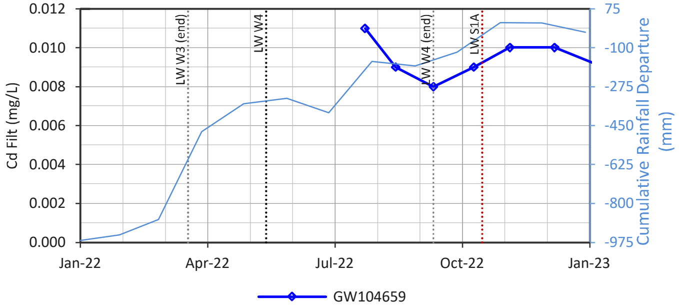

Cd Filt (mg/L)
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Cumulative Rainfall Departure (mm)
75
-75
-225
-375
-525
-675
-825
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56C

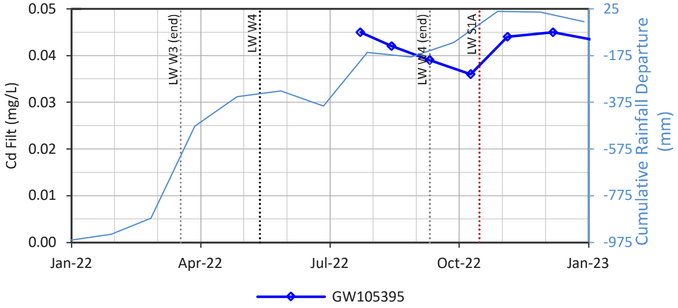

Cd Filt (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Cumulative Rainfall Departure (mm)
150
25
-100
-225
-350
-475
-600
-725
-850
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
REA4

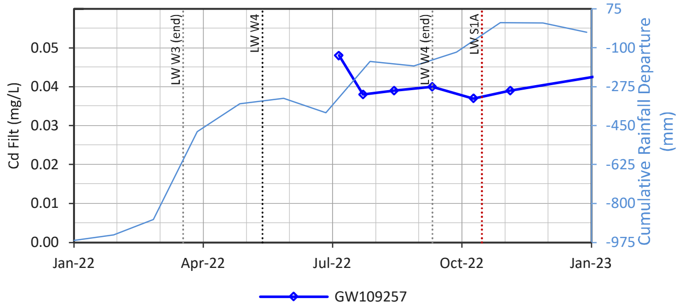

Cd Filt (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
Cumulative Rainfall Departure (mm)
25
-175
-375
-575
-775
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW062068

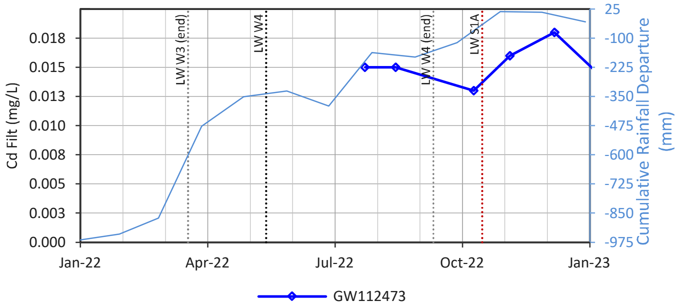

Cd Filt (mg/L)
0.025
0.020
0.015
0.010
0.005
0.000
Cumulative Rainfall Departure (mm)
25
-175
-375
-575
-775
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104008


Cd Filt (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
Cumulative Rainfall Departure (mm)
75
-100
-275
-450
-625
-800
-975
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104323

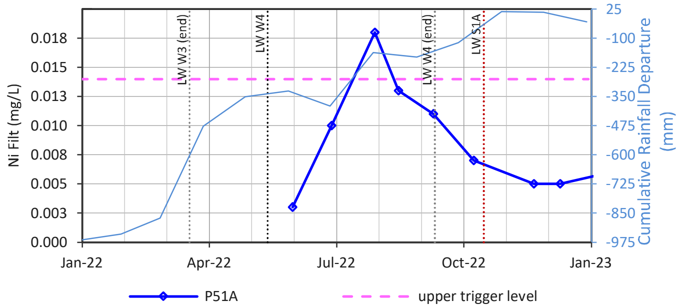


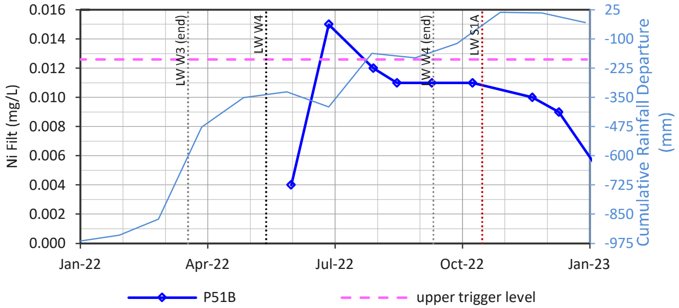


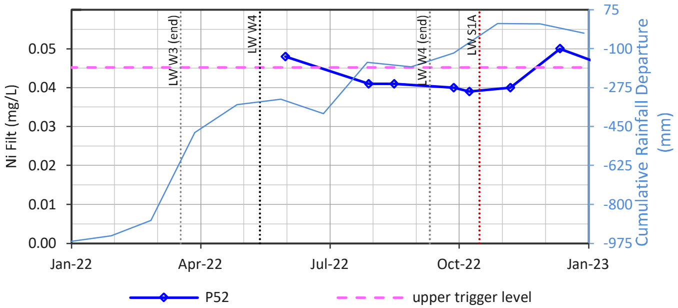


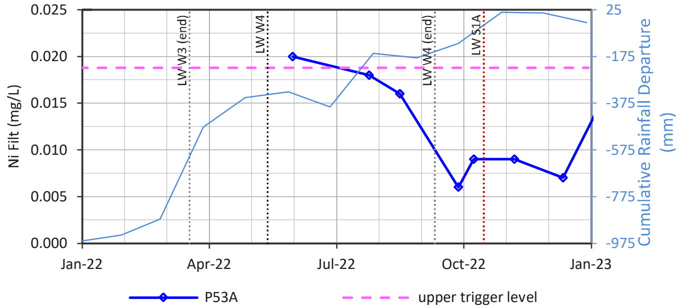


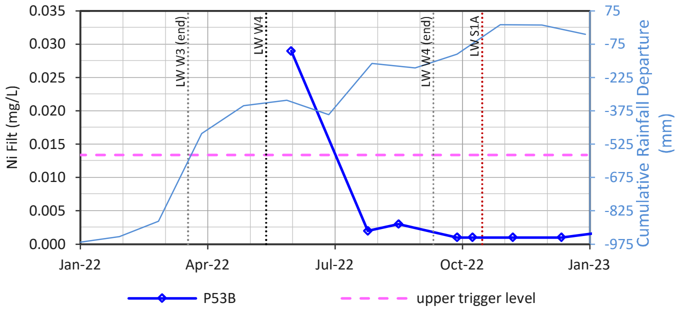
No Data Available for Cd Filt (mg/L)

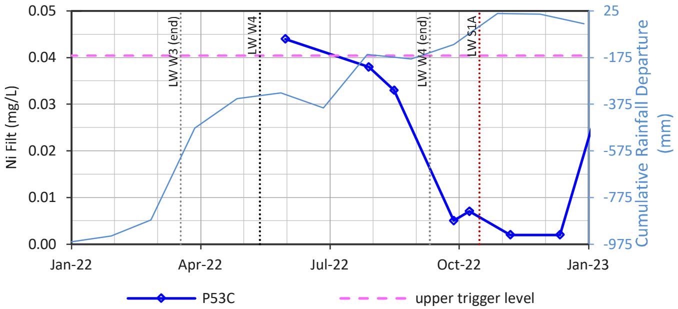


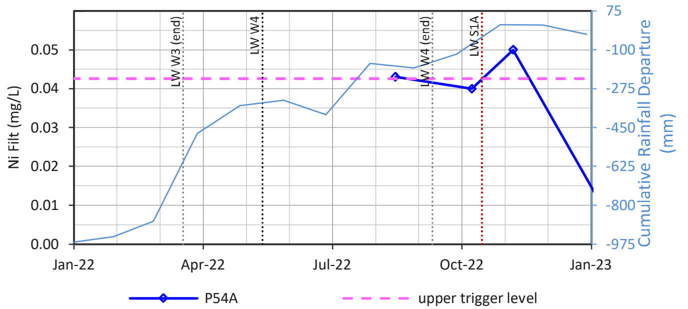


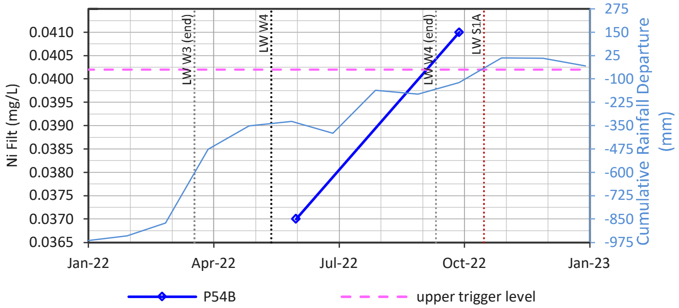


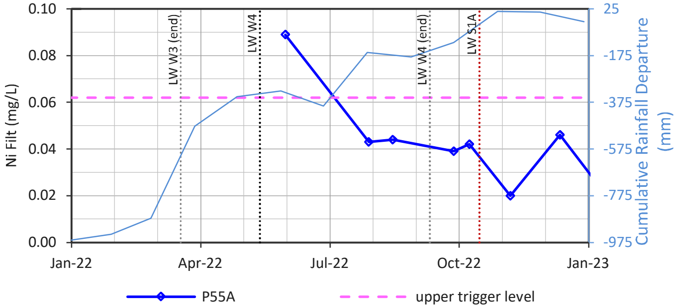


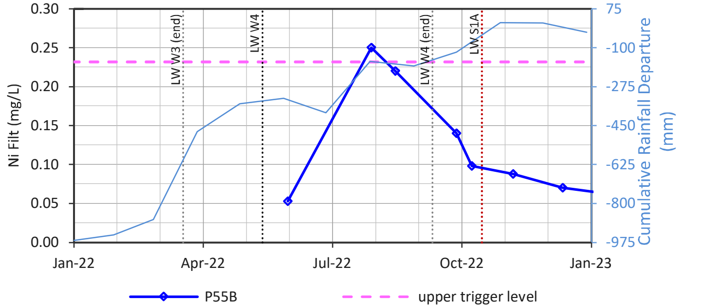


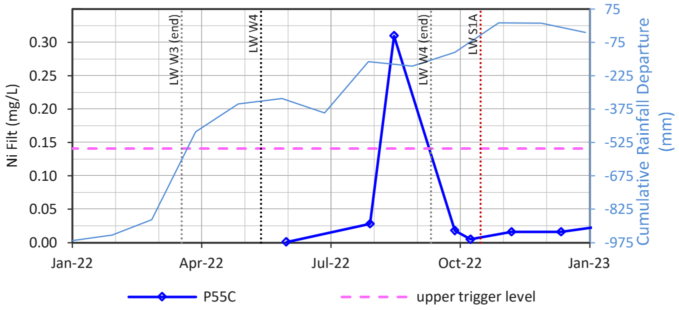


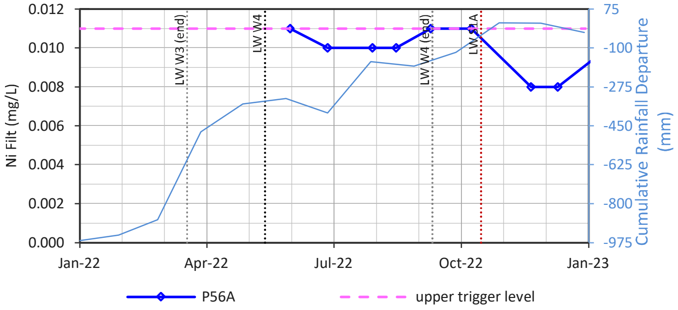


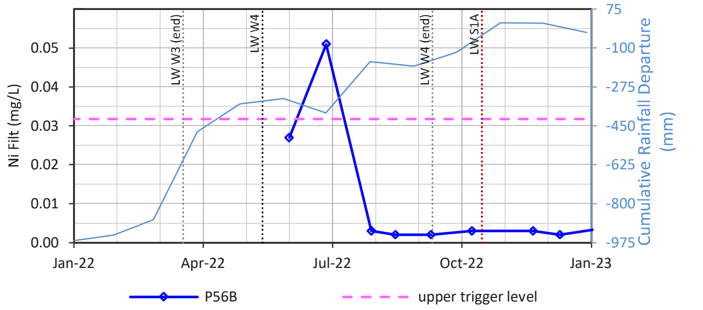

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P54B
upper trigger level

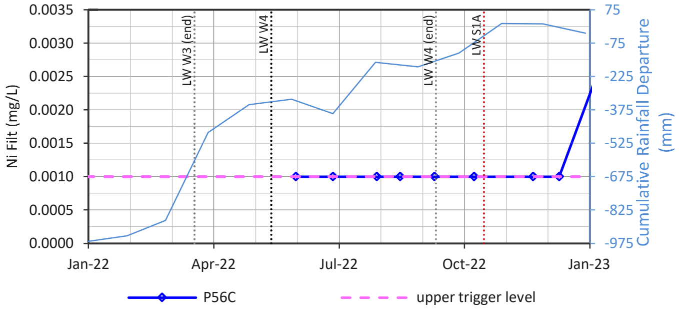

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55A
upper trigger level

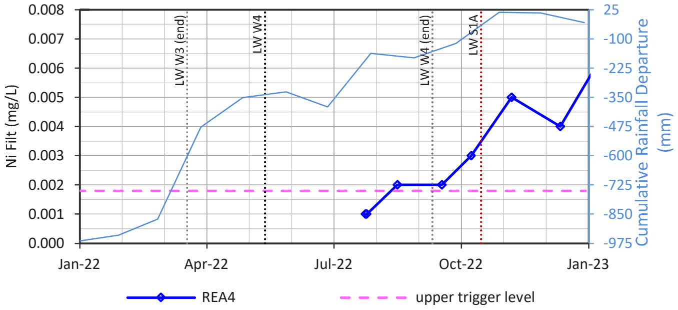

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55B
upper trigger level

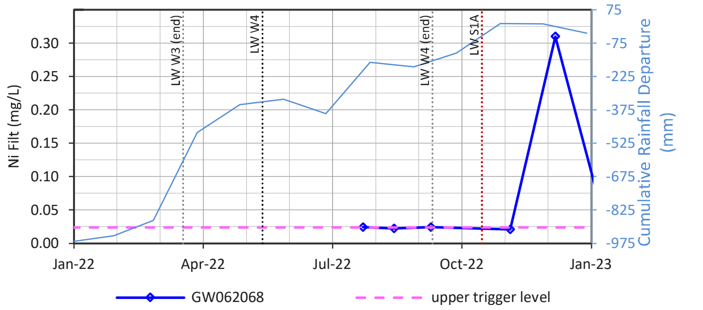

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55C
upper trigger level

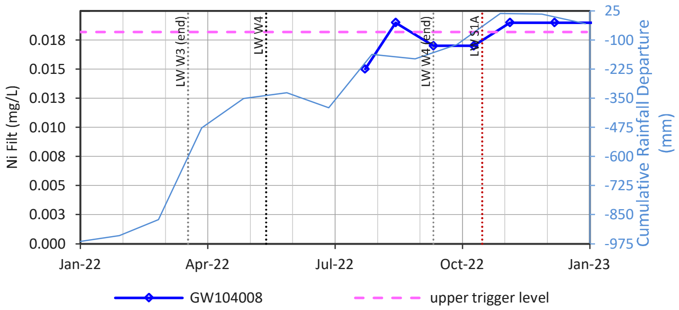

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56A
upper trigger level

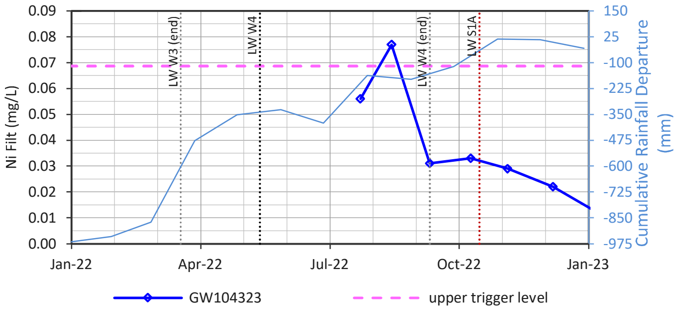

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56B
upper trigger level

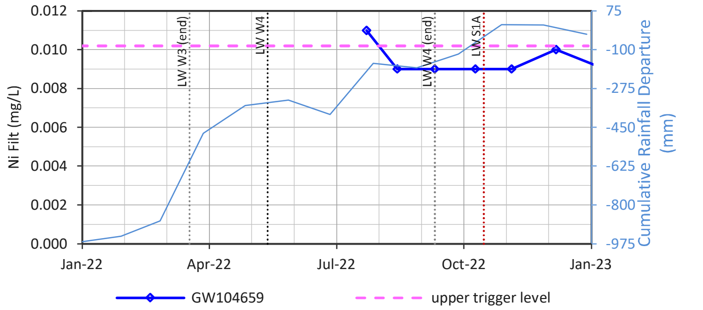

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56C
upper trigger level

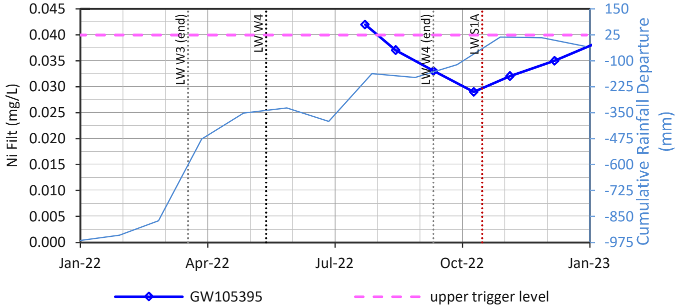

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
REA4
upper trigger level

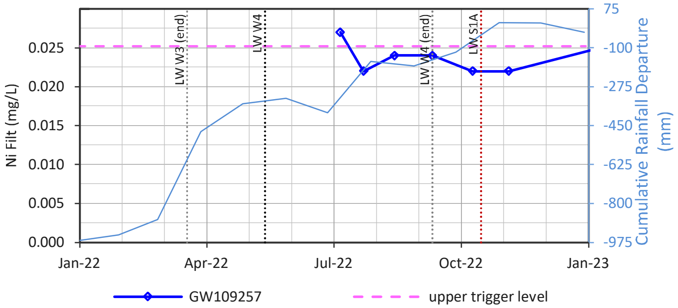

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW062068
upper trigger level

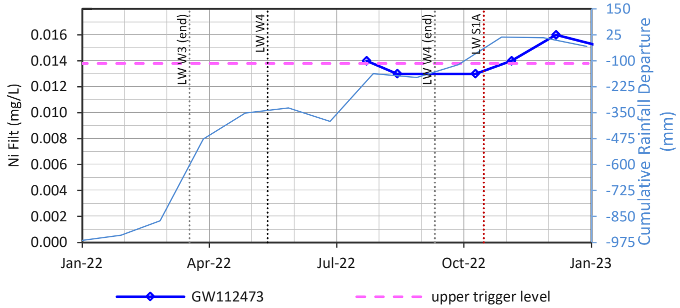

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104008
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104323
upper trigger level

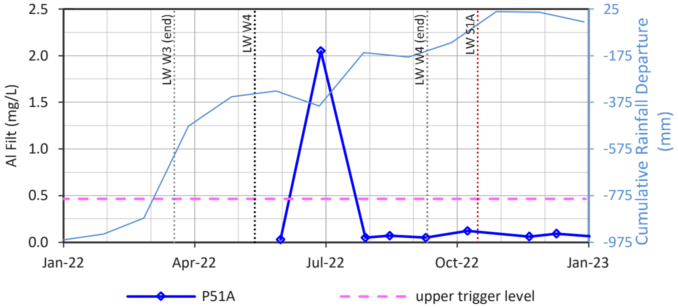

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104659
upper trigger level

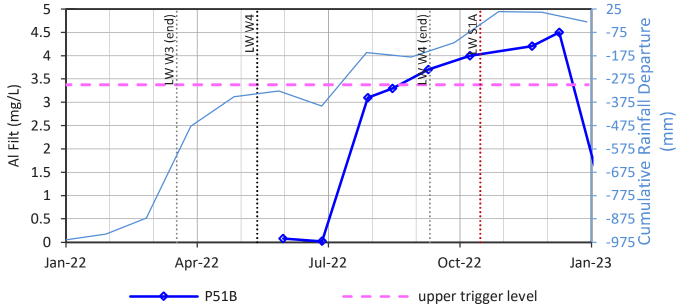


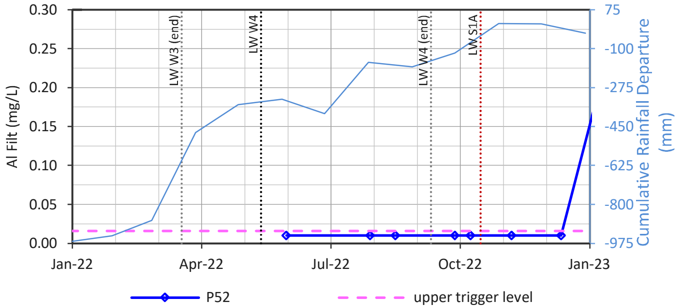


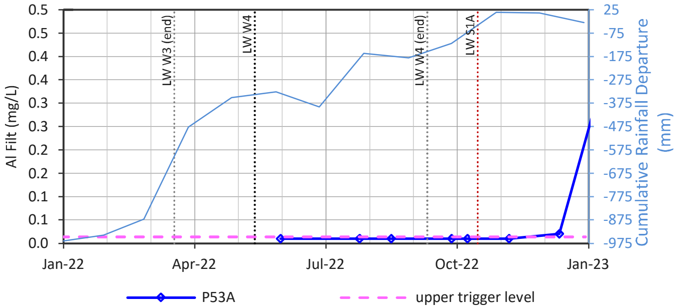


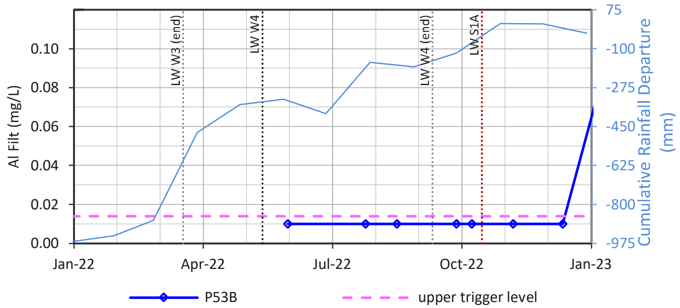
No Data Available for Ni Filt (mg/L)

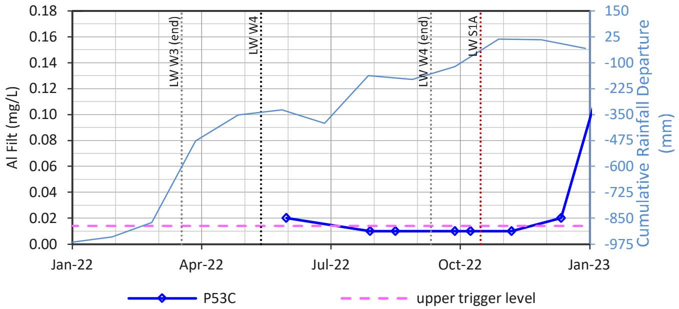


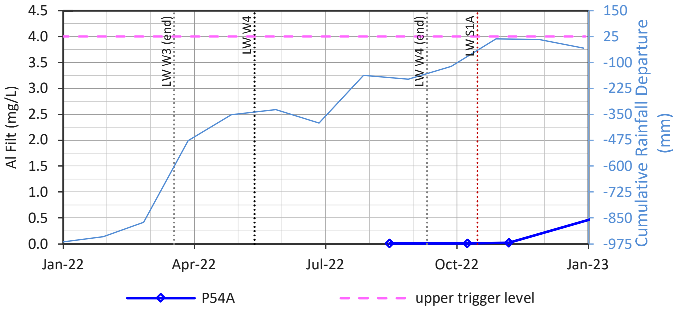


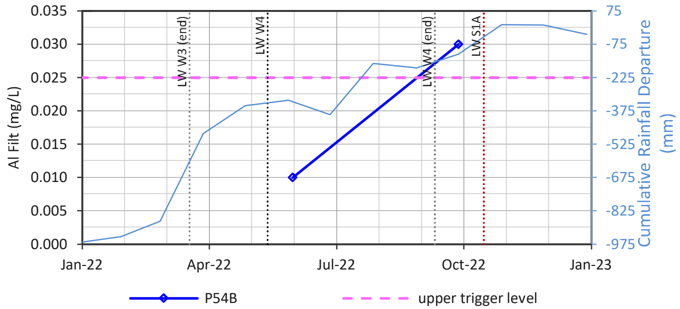


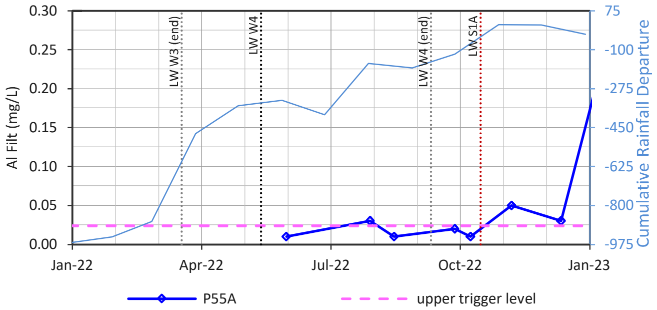


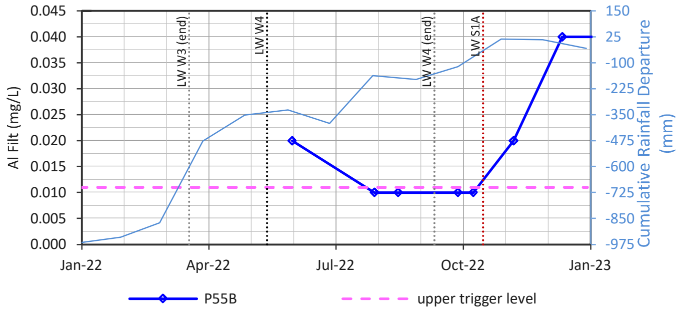


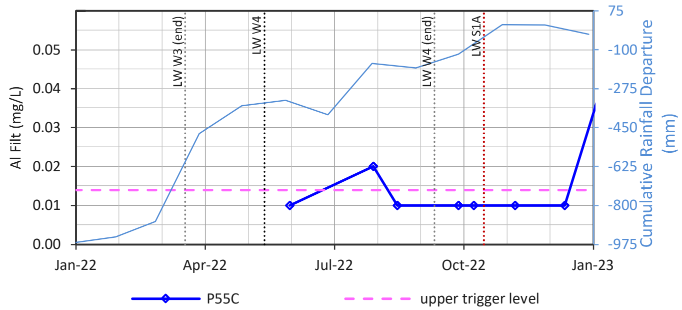


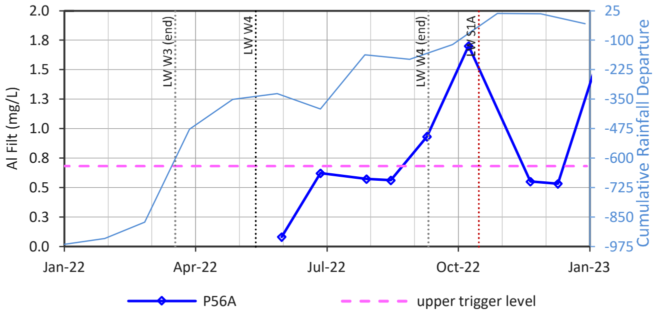


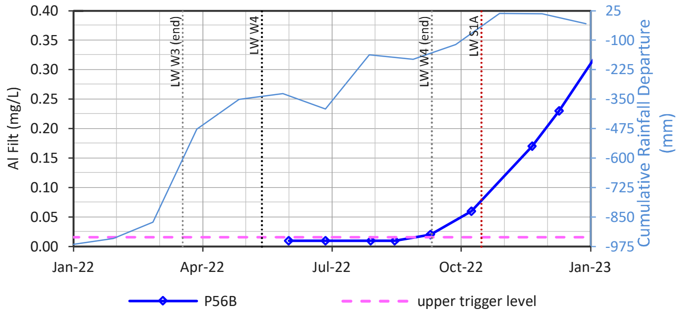


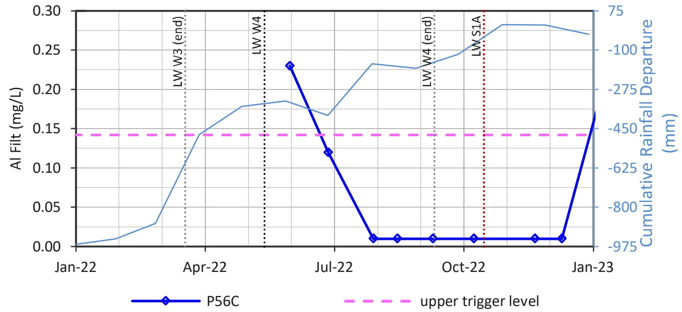

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55A
upper trigger level

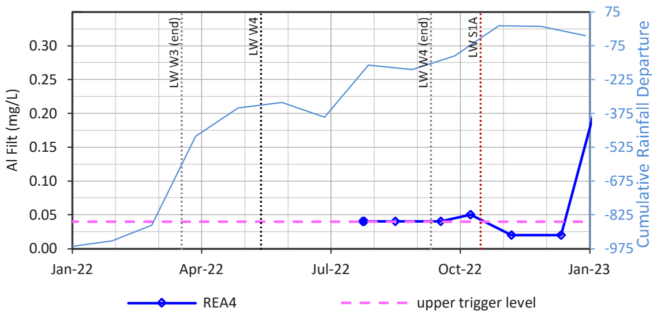

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55B
upper trigger level

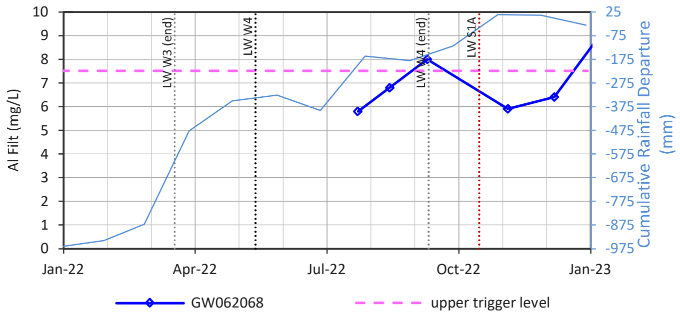

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P55C
upper trigger level

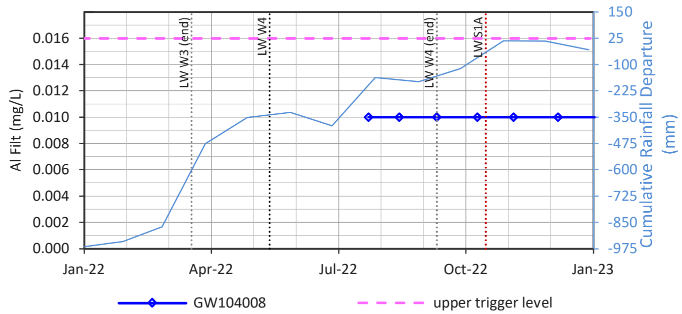

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56A
upper trigger level

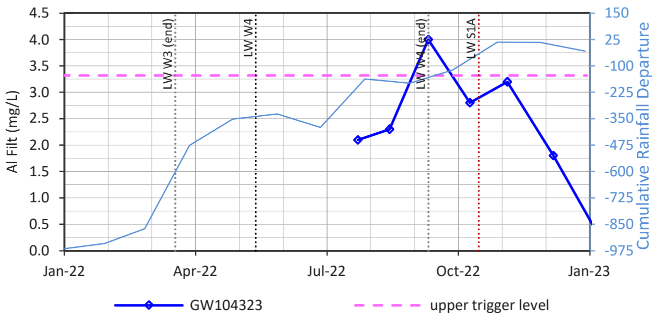

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56B
upper trigger level

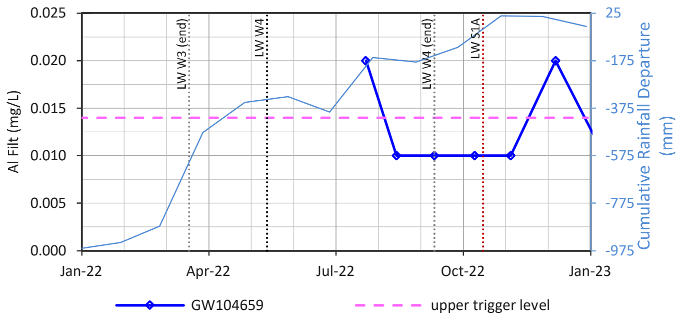

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
P56C
upper trigger level

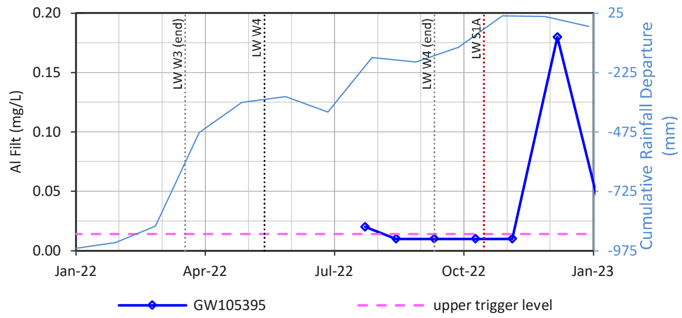

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
REA4
upper trigger level

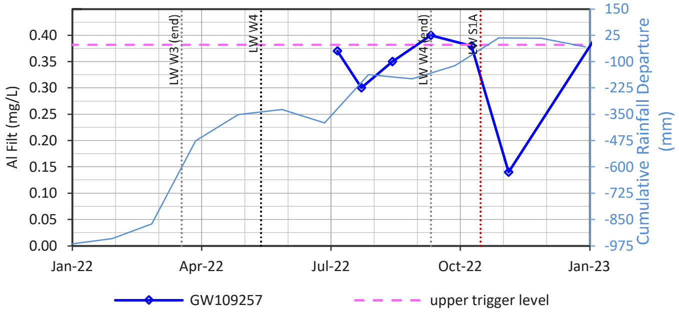

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW062068
upper trigger level

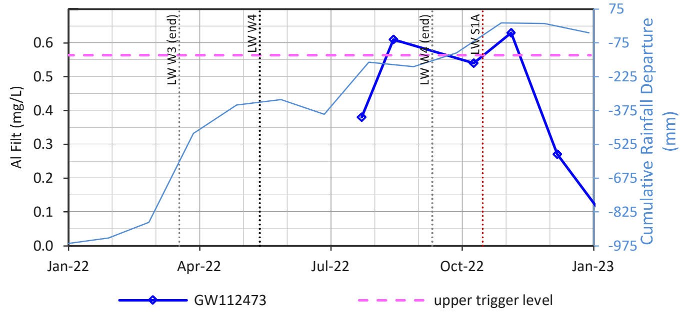

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104008
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104323
upper trigger level

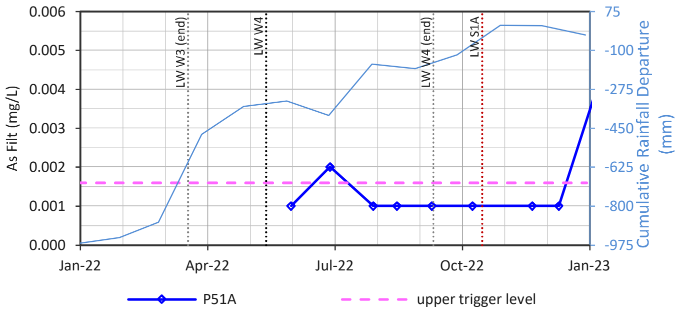

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW104659
upper trigger level

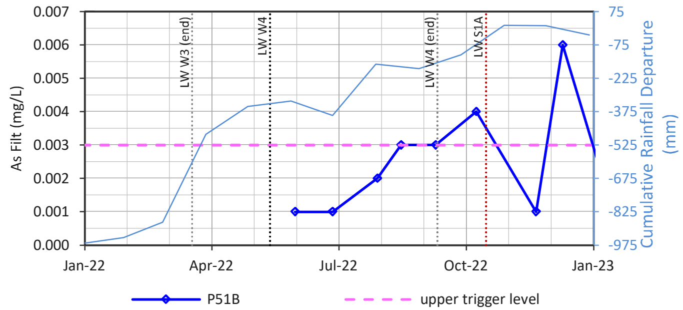

Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
GW105395
upper trigger level

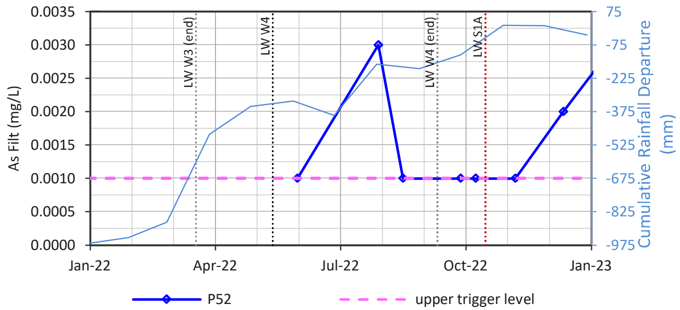


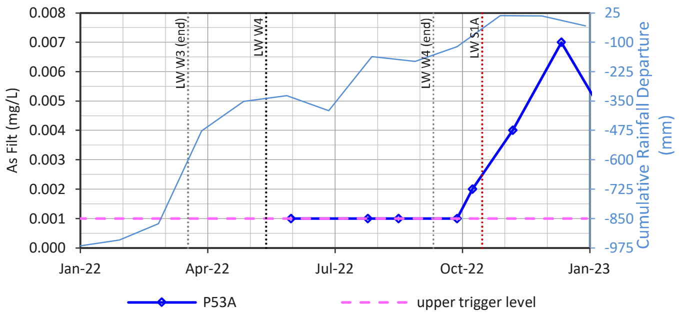


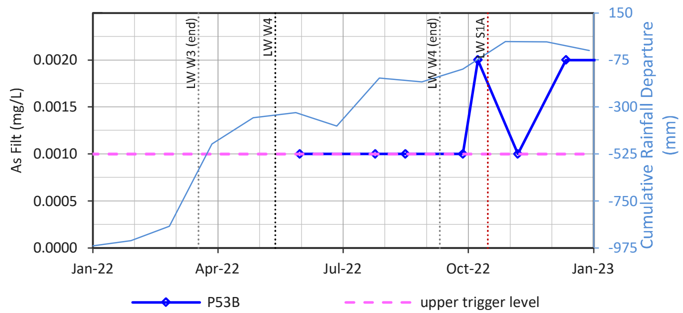
No Data Available for Al Filt (mg/L)

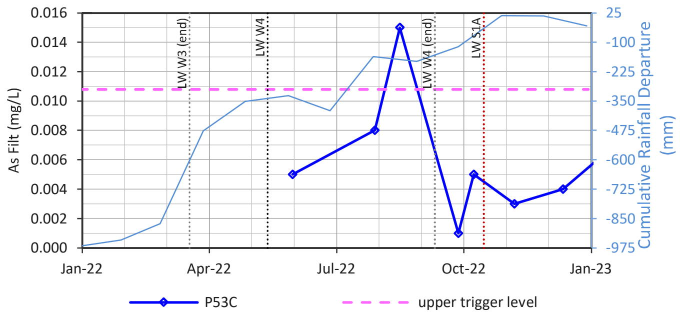


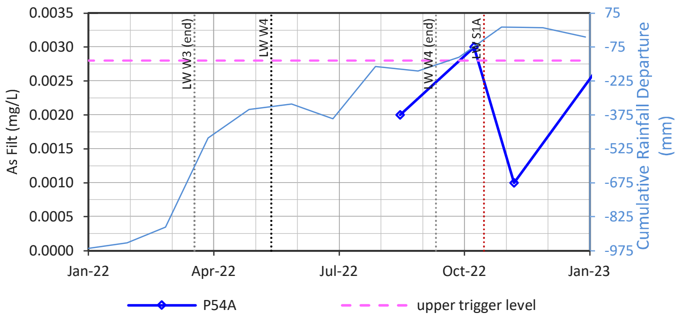


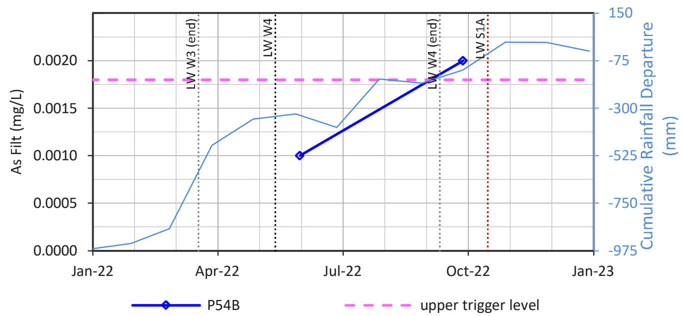


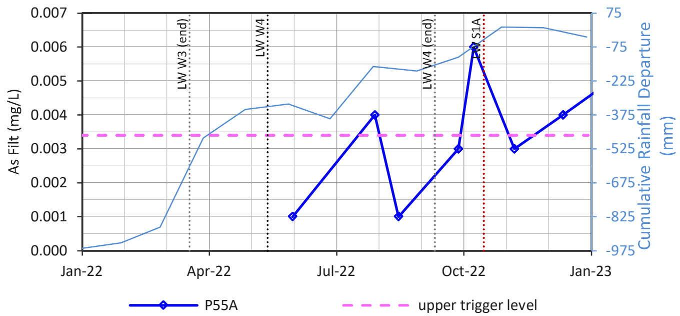


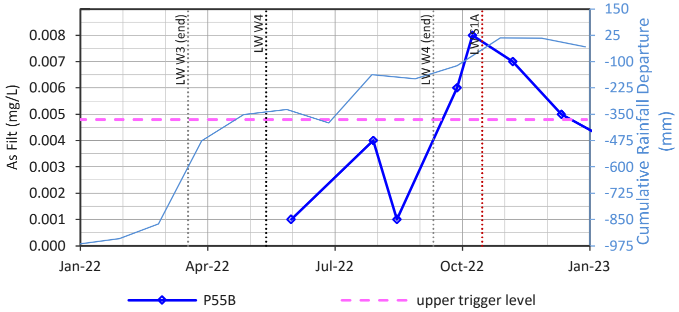


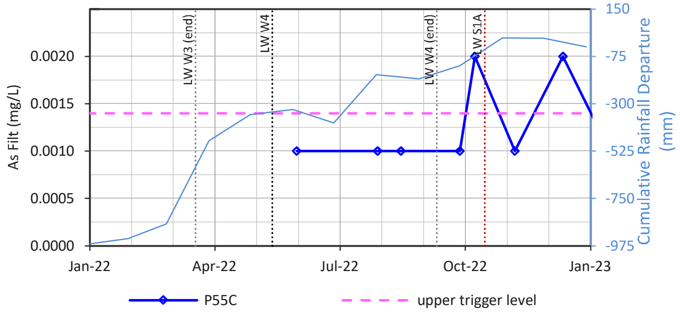


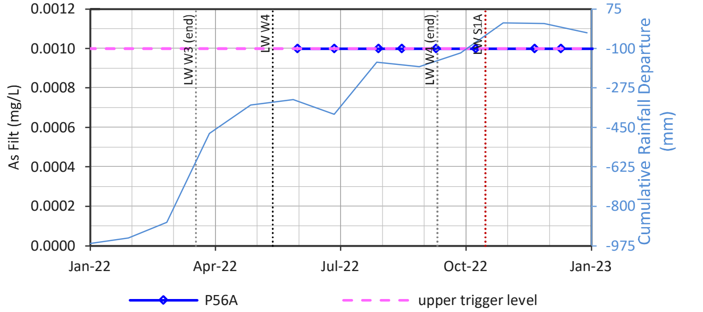


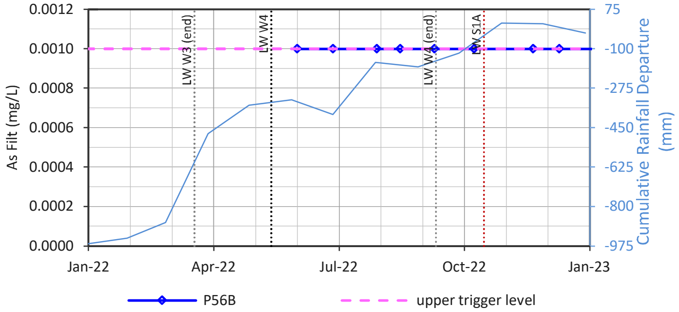


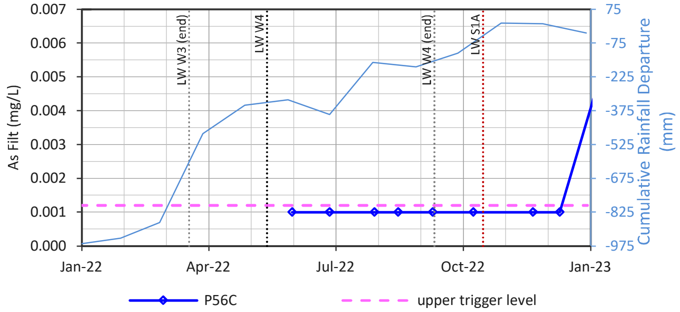


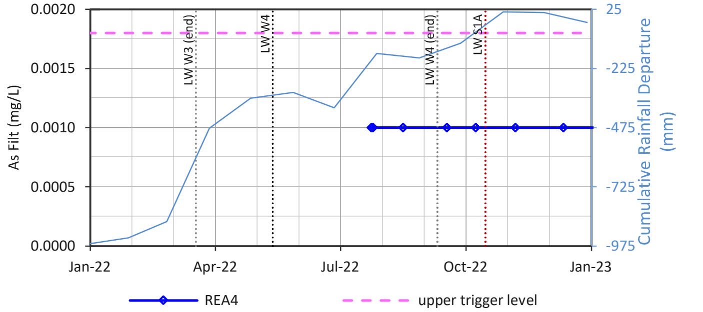

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55B
upper trigger level

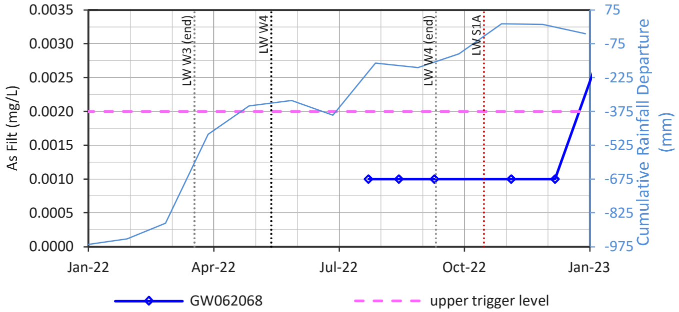

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C
upper trigger level

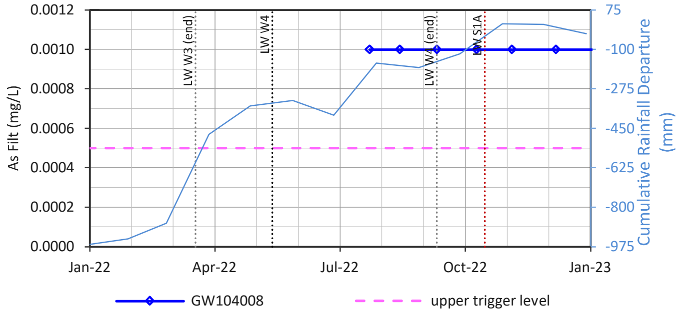

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A
upper trigger level

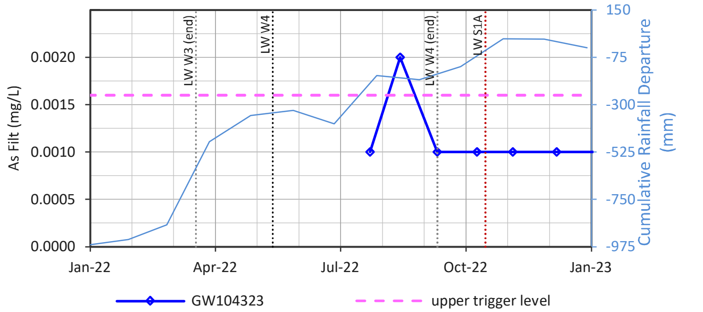

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56B
upper trigger level

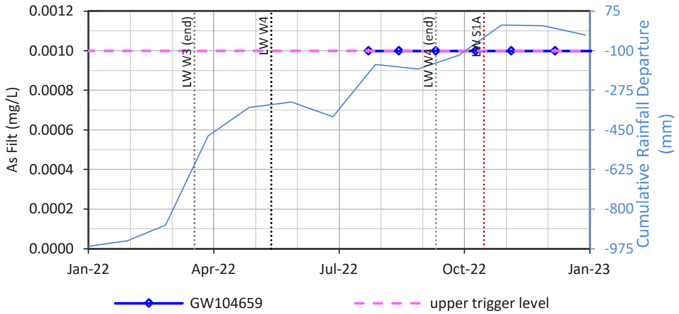

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56C
upper trigger level

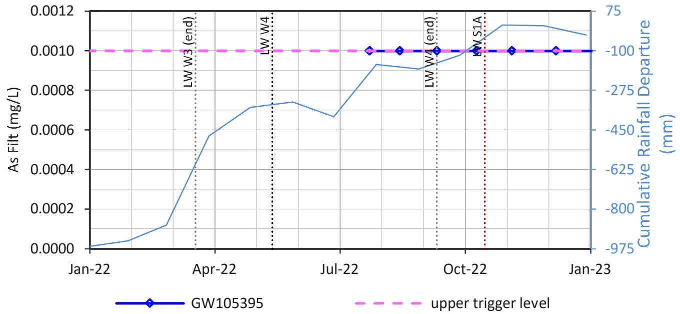

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
REA4
upper trigger level

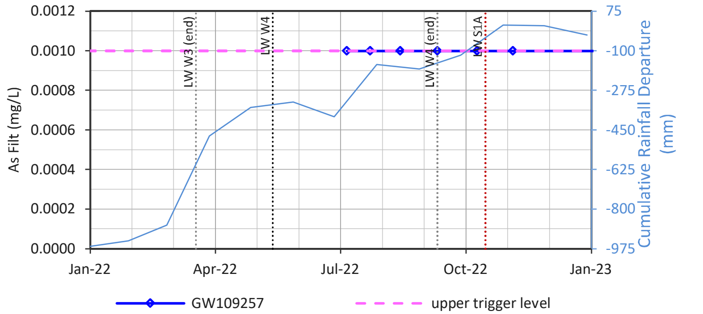

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW062068
upper trigger level

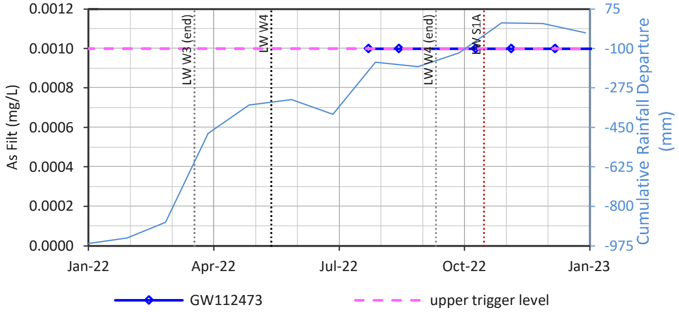

As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104008
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104323
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104659
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW105395
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW109257
upper trigger level



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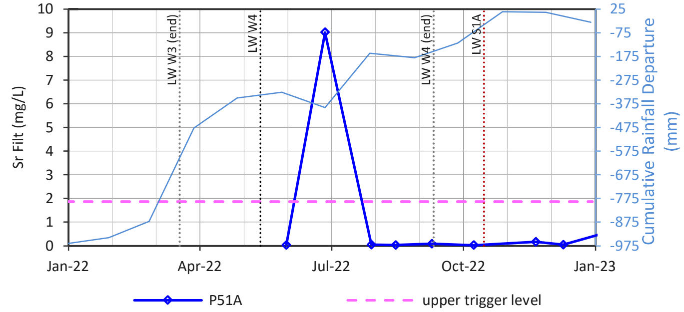
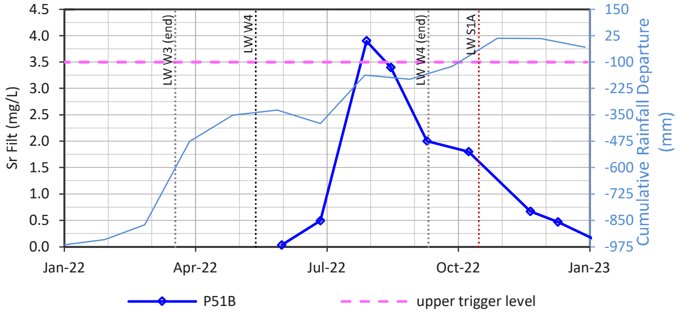
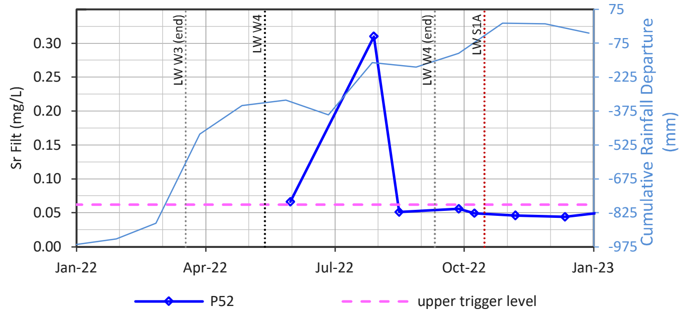
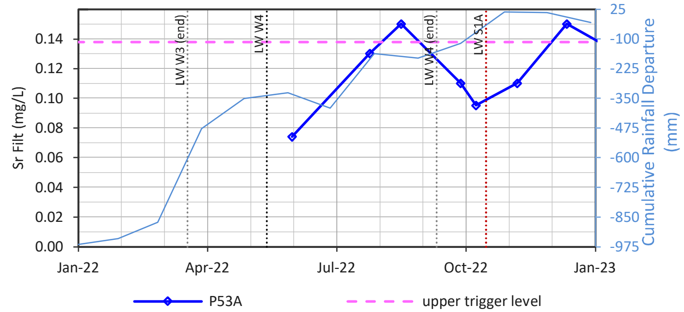
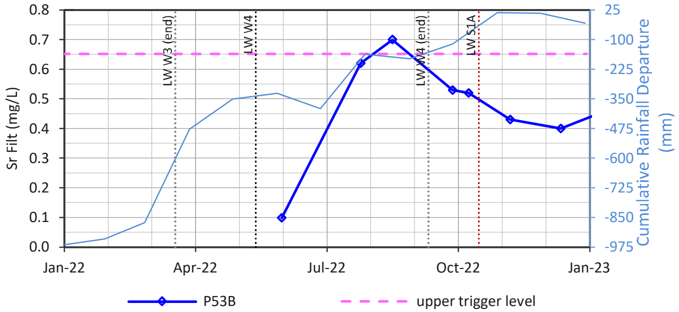
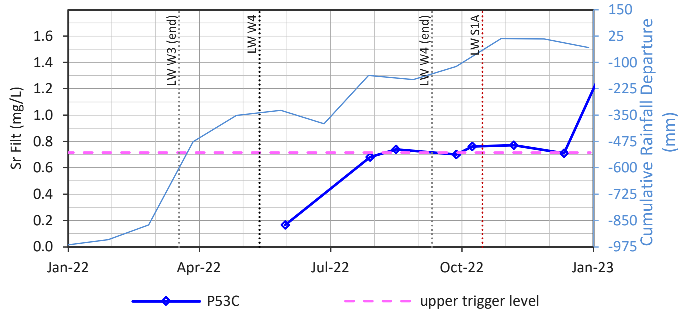


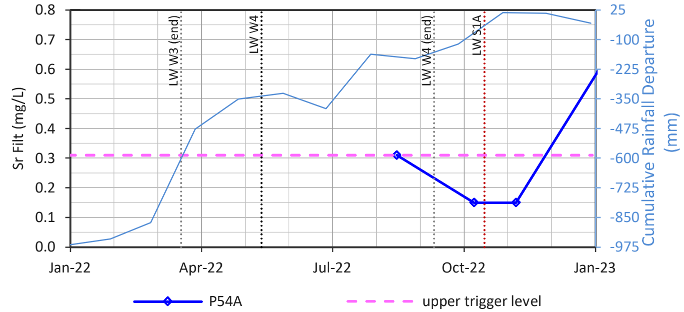


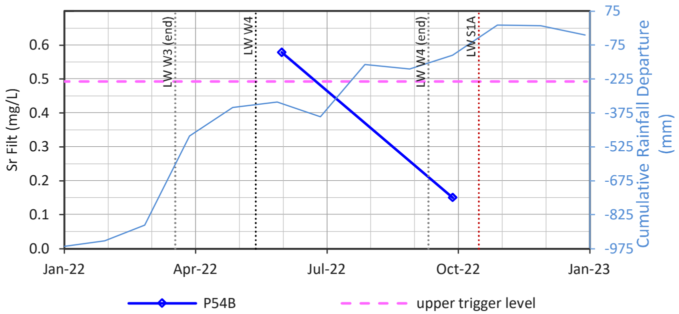


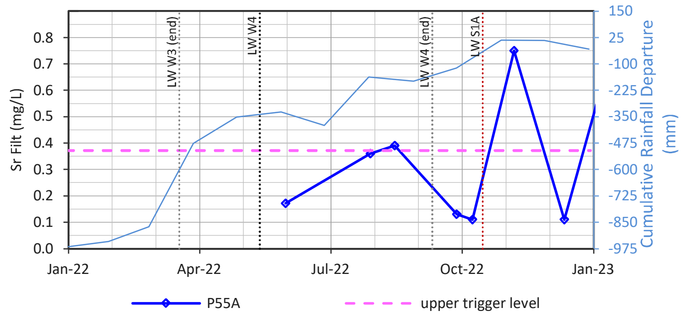


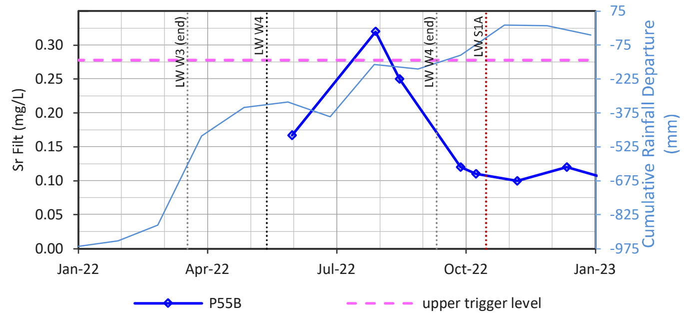


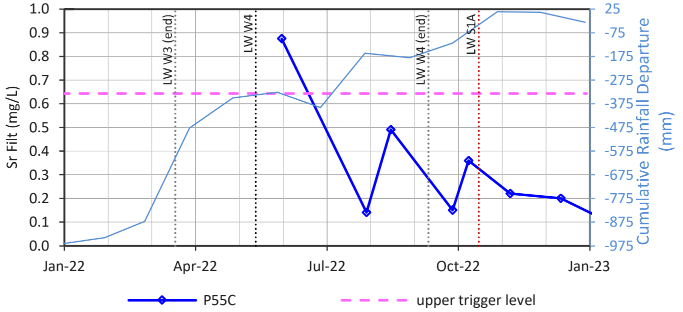


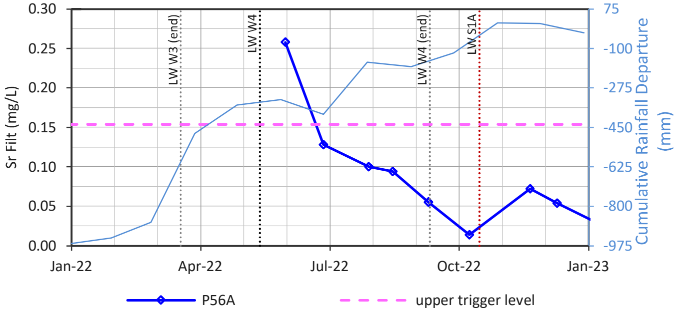


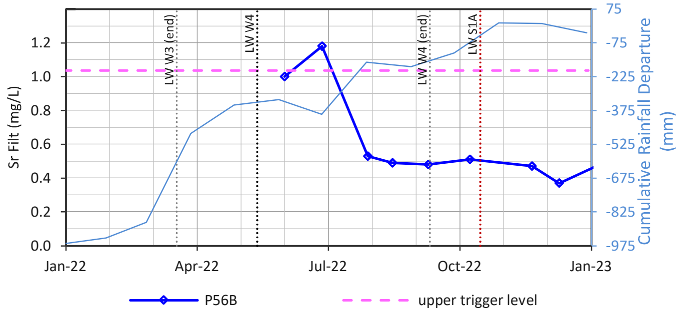


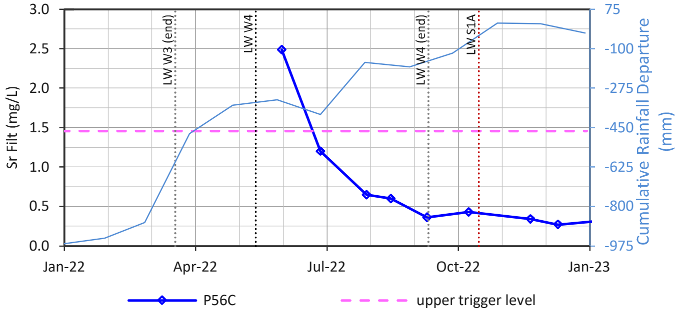


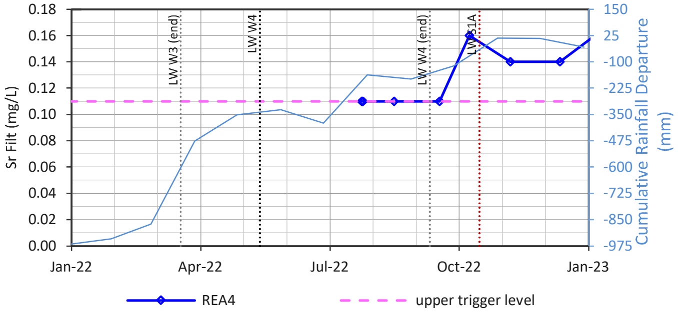


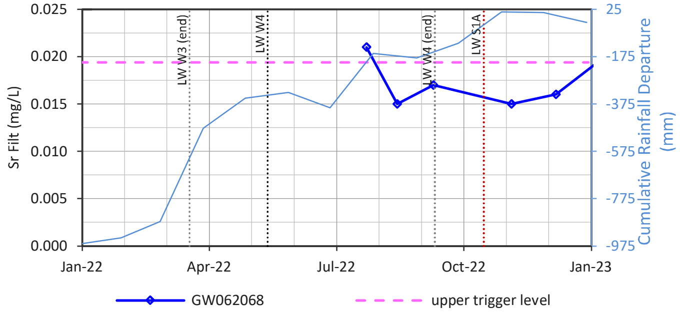

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C
upper trigger level

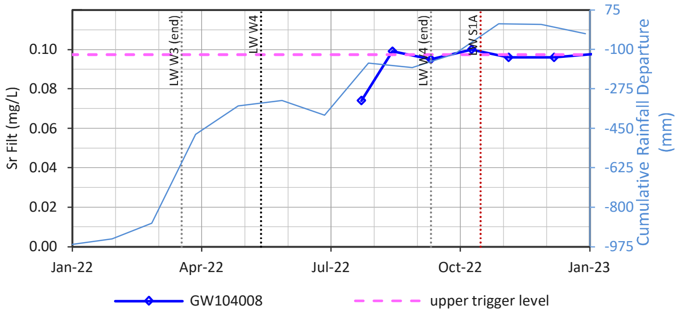

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A
upper trigger level

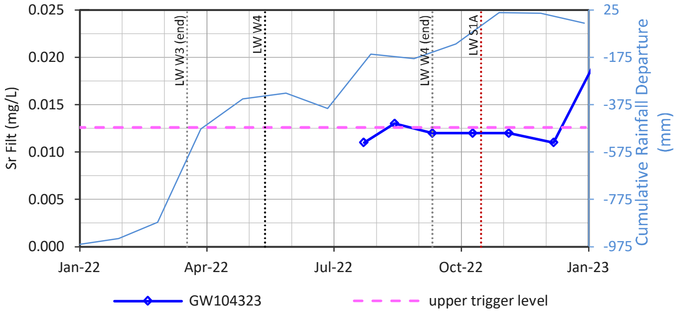

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56B
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56C
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
REA4
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW062068
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104008
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
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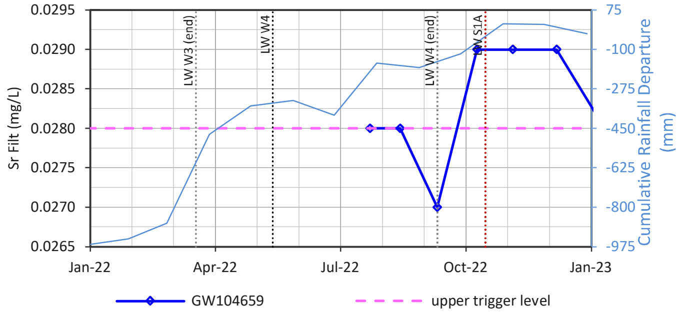
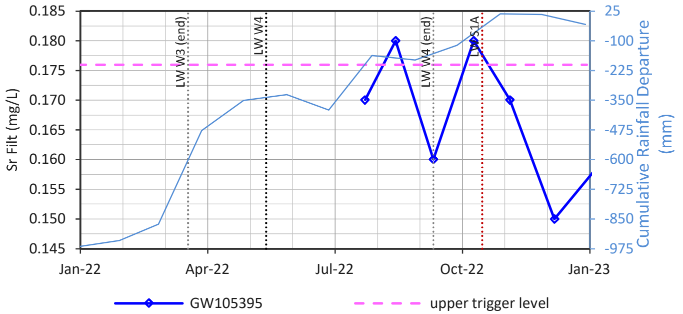
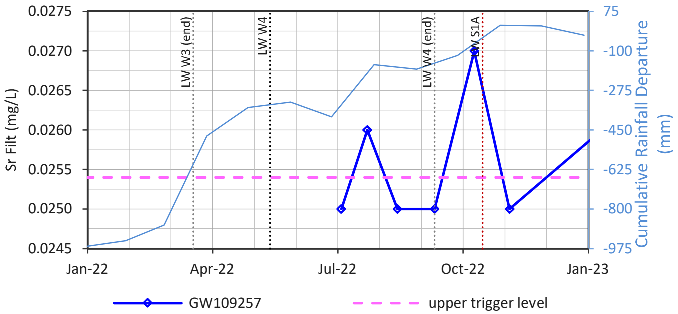
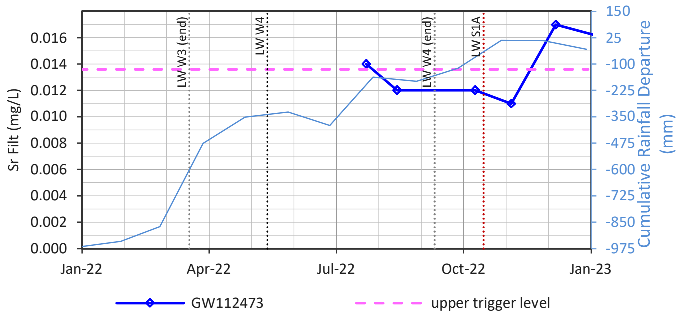
Jan-23
GW104323
upper trigger level

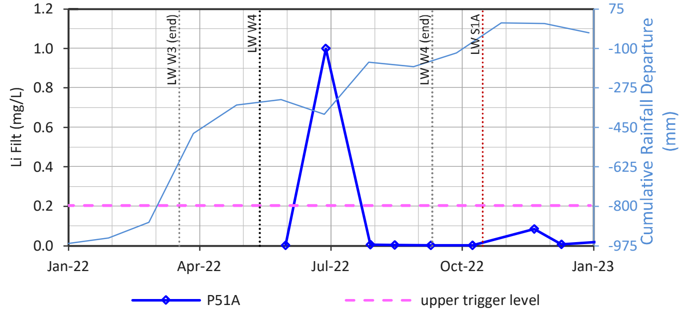

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW104659
upper trigger level

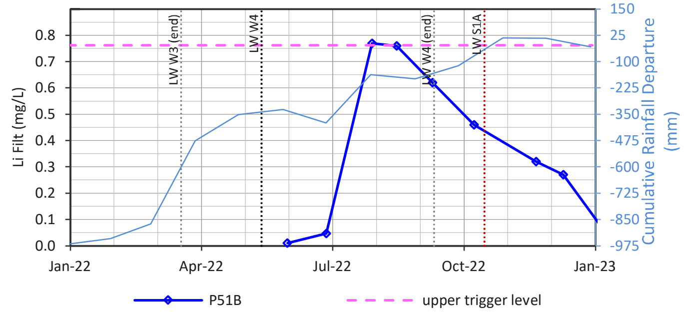

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW105395
upper trigger level

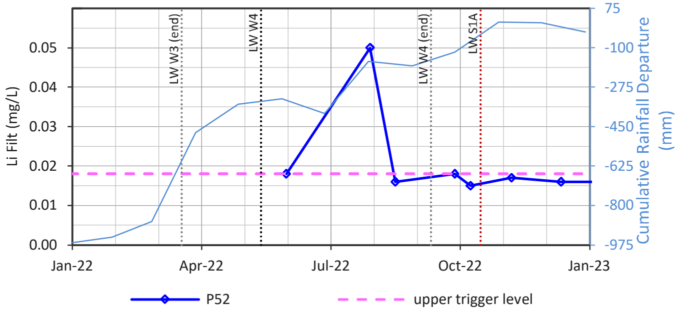

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW109257
upper trigger level

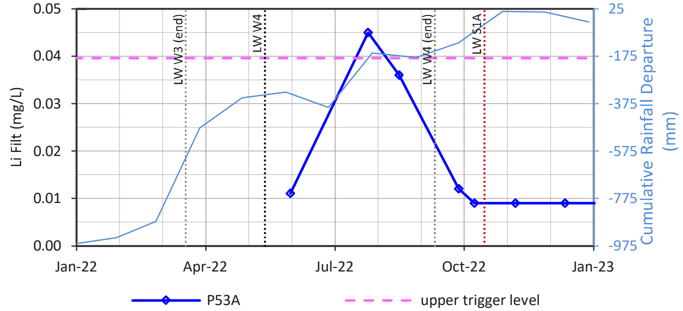

Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
GW112473
upper trigger level

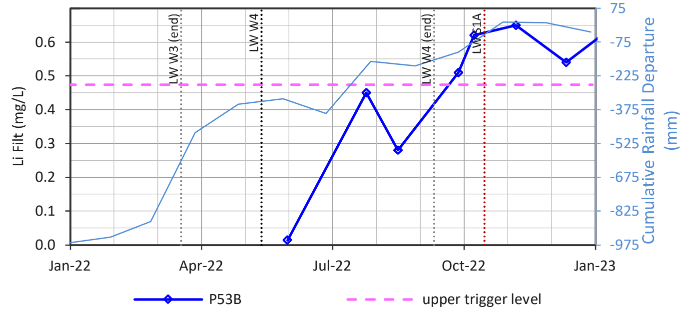
No Data Available for Sr Filt (mg/L)

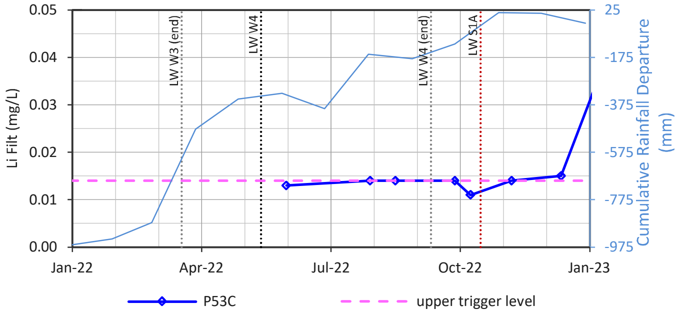


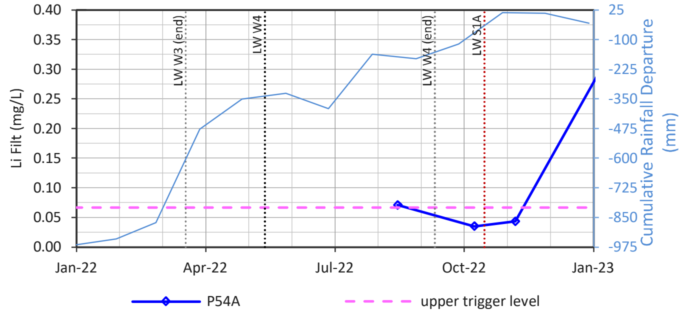


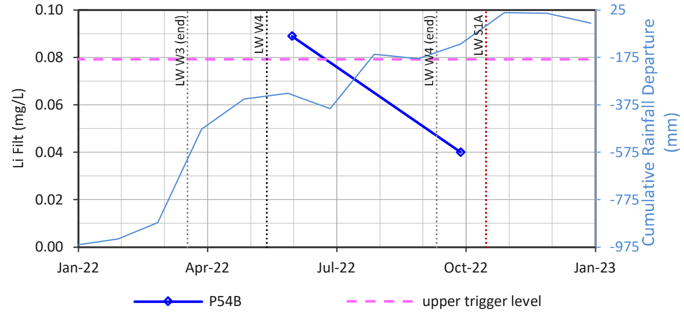


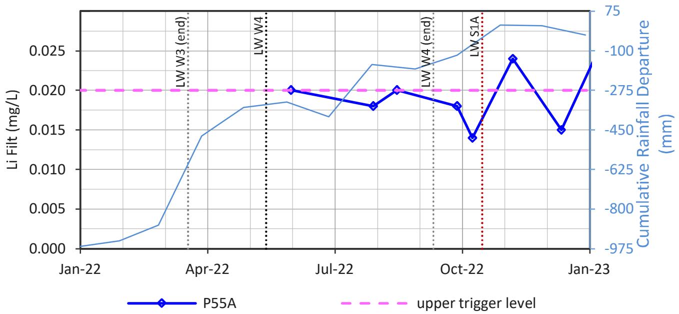


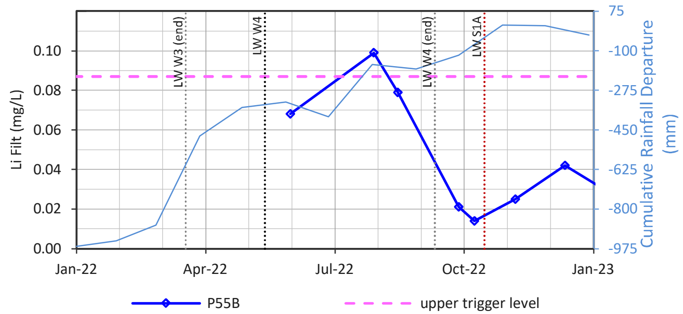


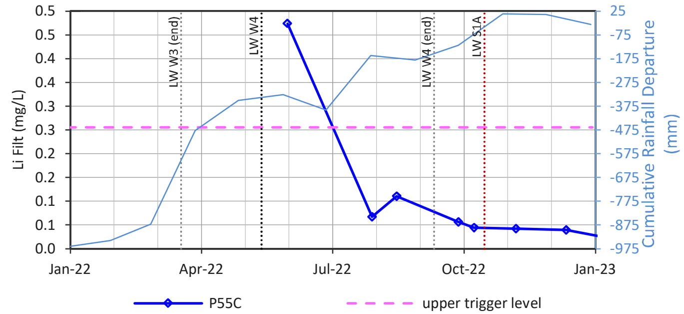


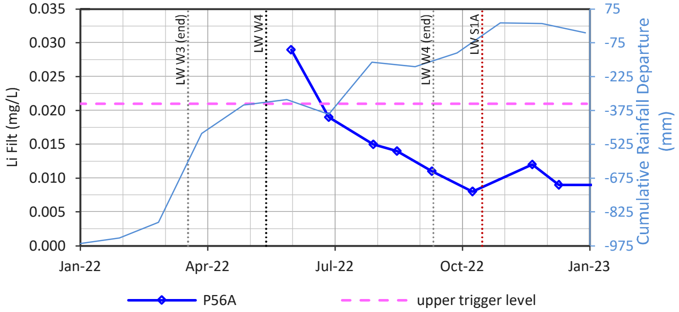


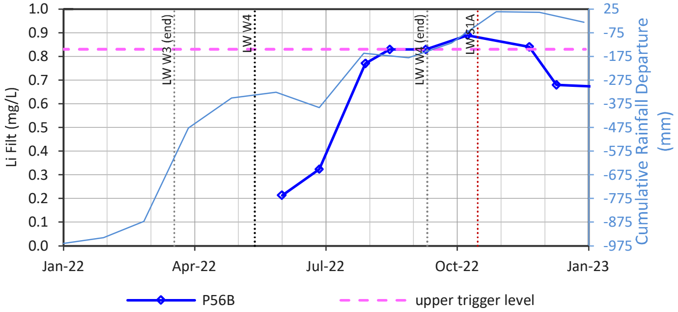


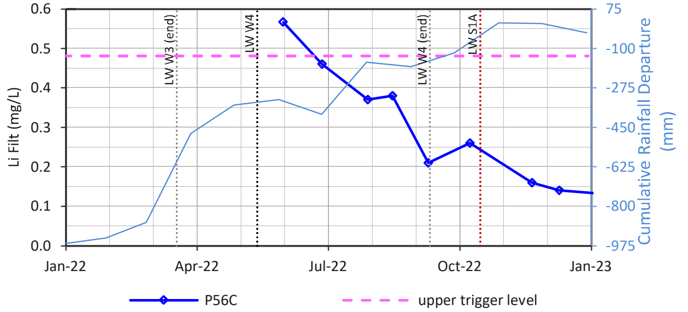


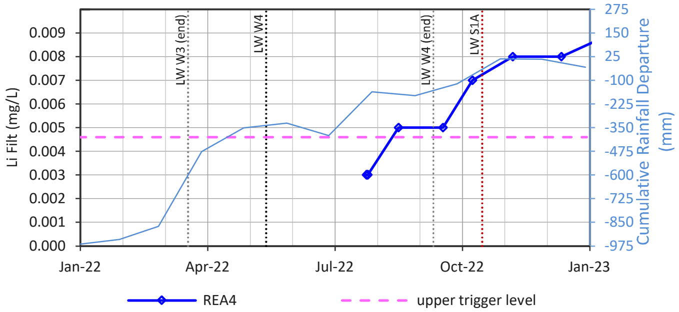


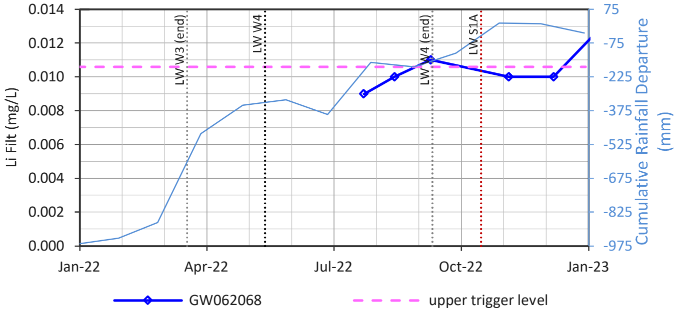


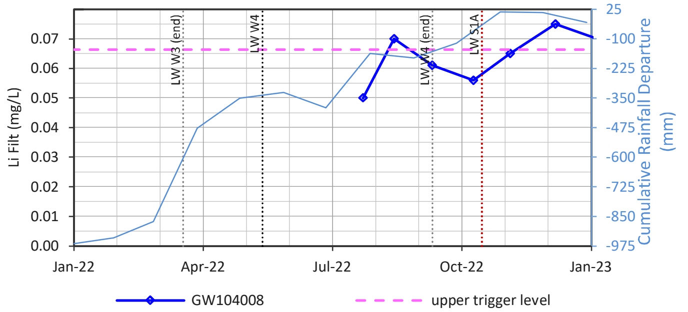


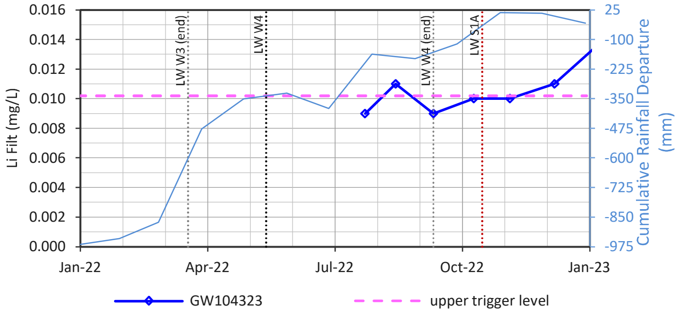


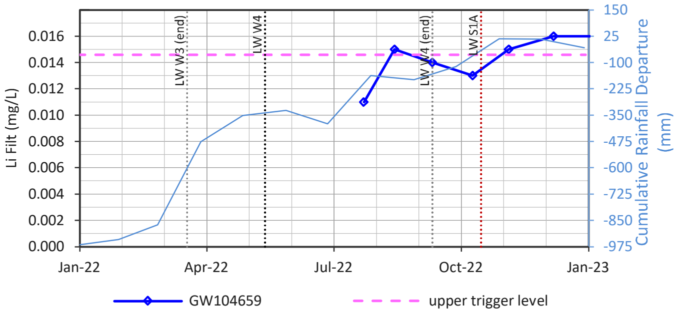


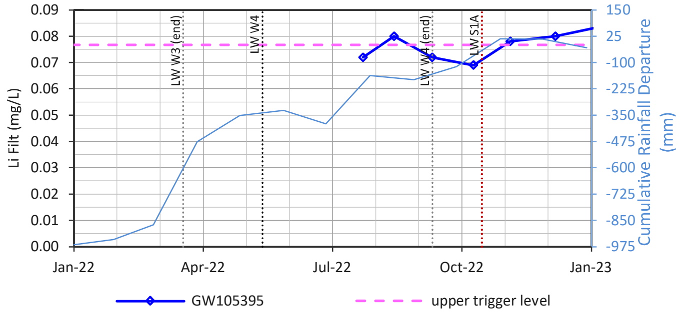


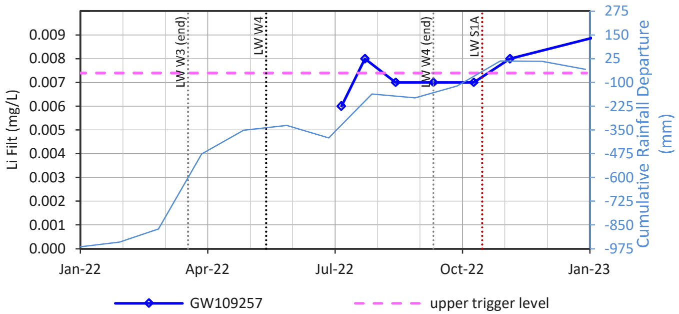


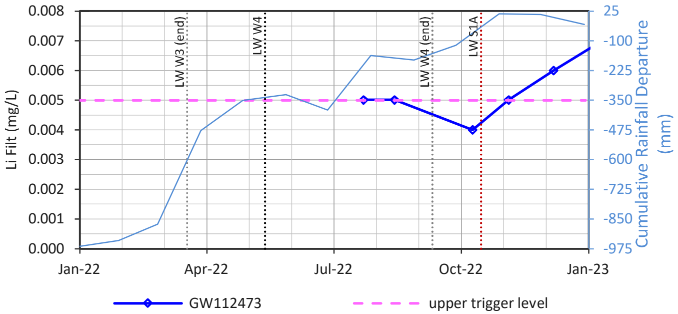




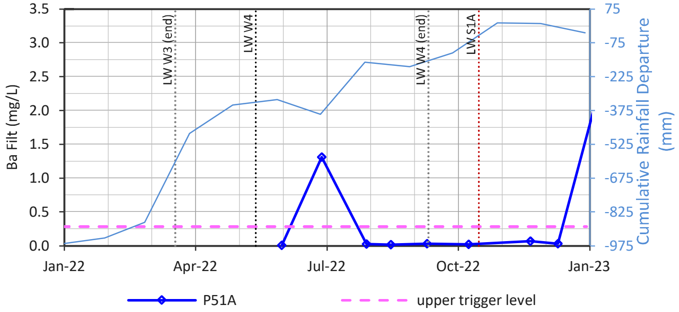


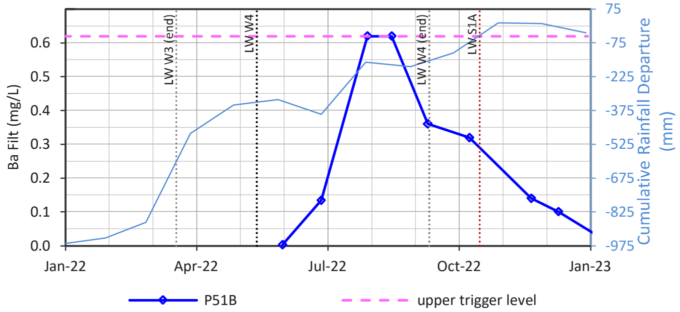


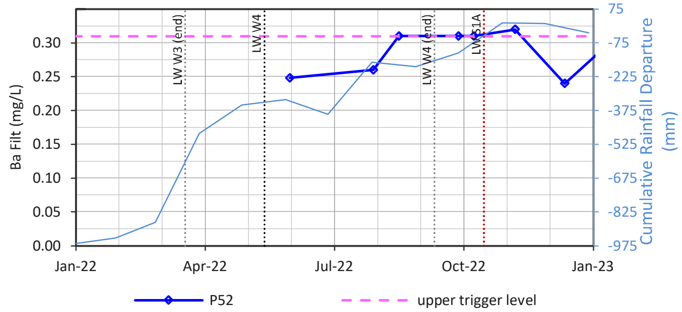


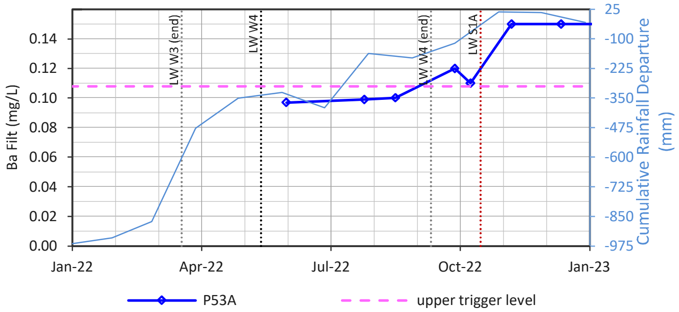


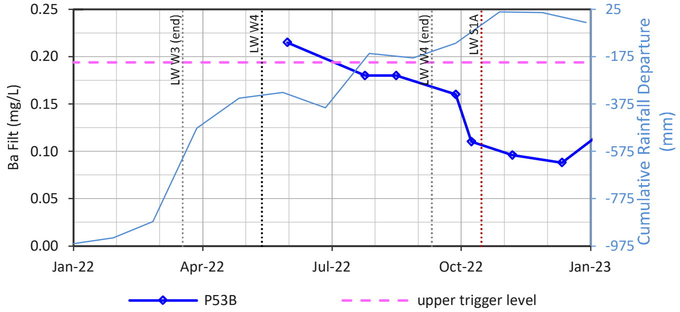
No Data Available for Li Filt (mg/L)

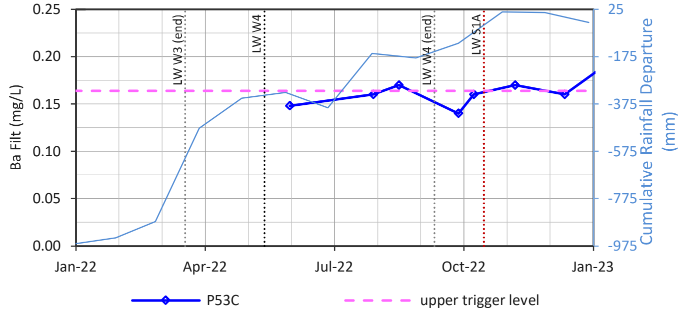

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P51A
upper trigger level

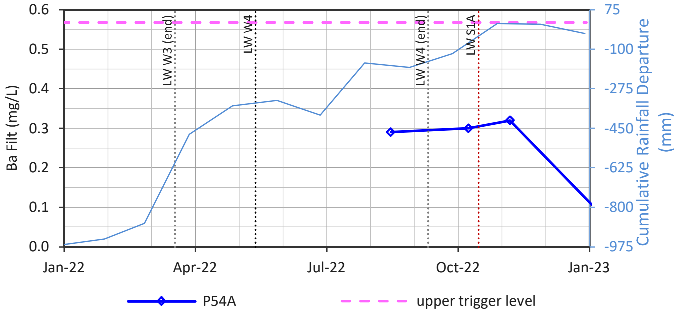

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P51B
upper trigger level

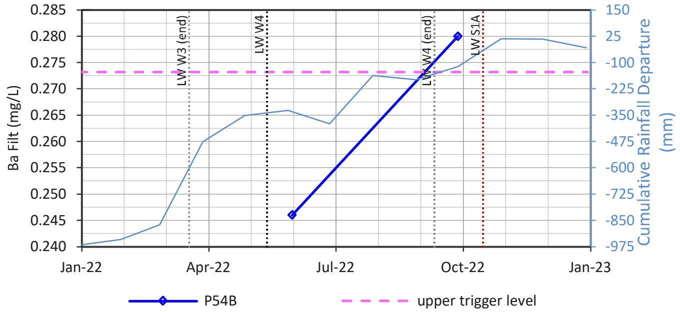

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P52
upper trigger level

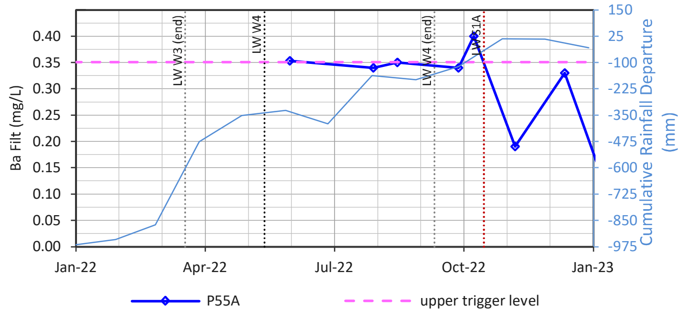

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53A
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53B
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53C
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54A
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54B
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
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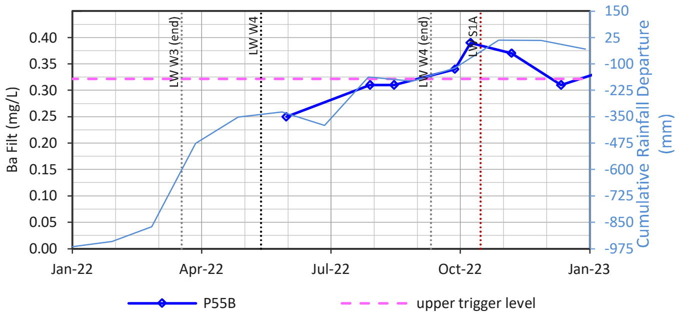
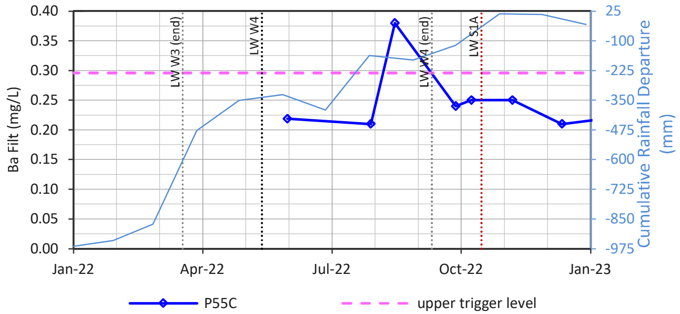
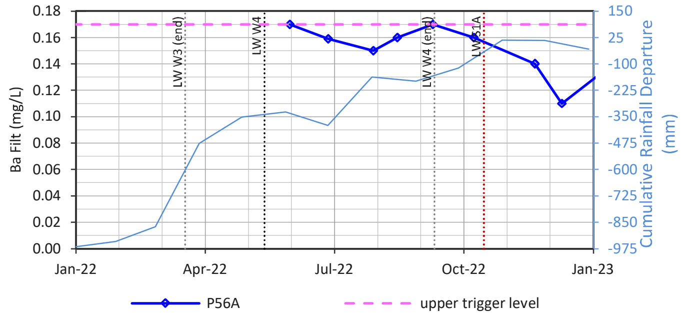
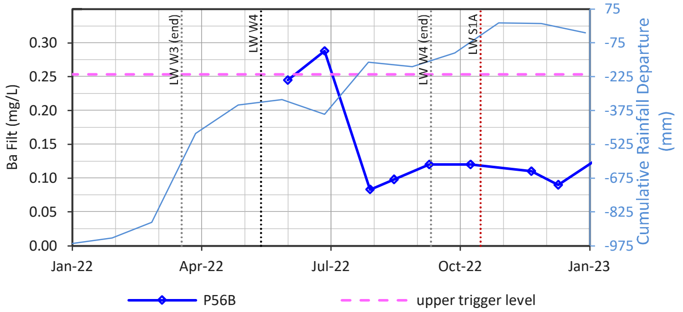
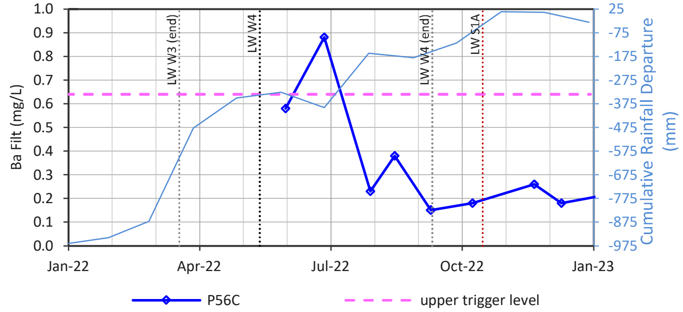
Jan-23
P55A
upper trigger level

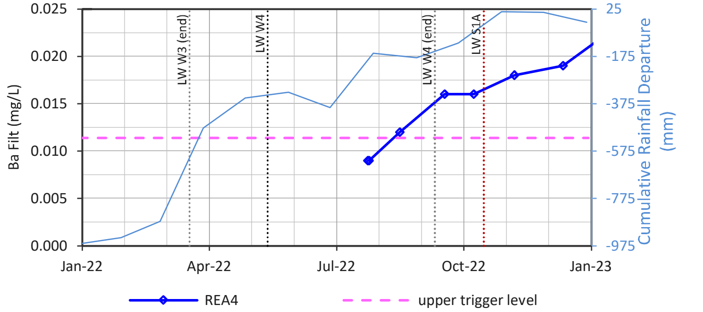

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55B
upper trigger level

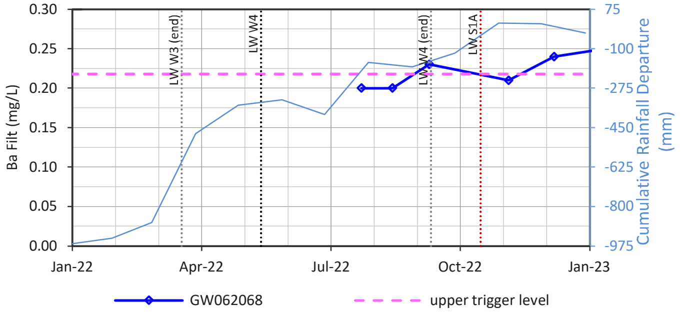

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C
upper trigger level

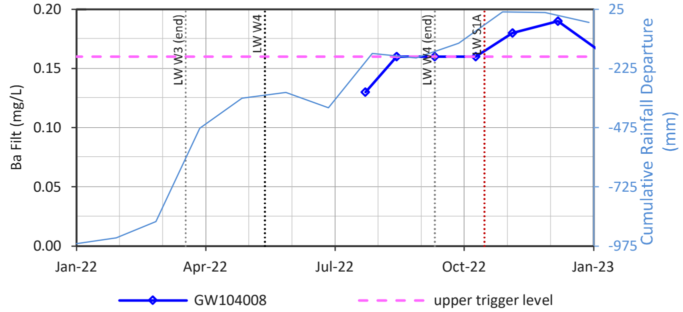

Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A
upper trigger level

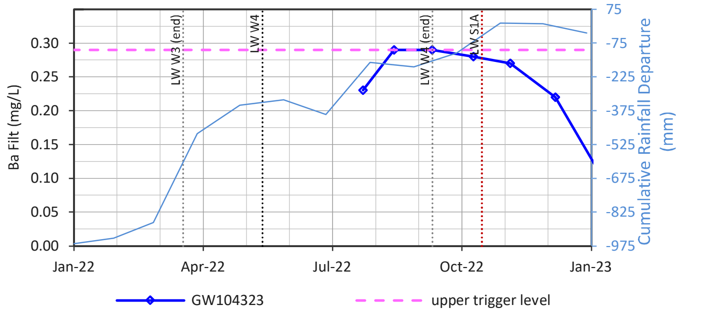


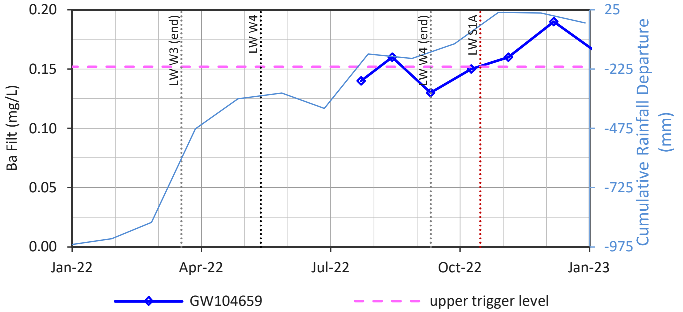


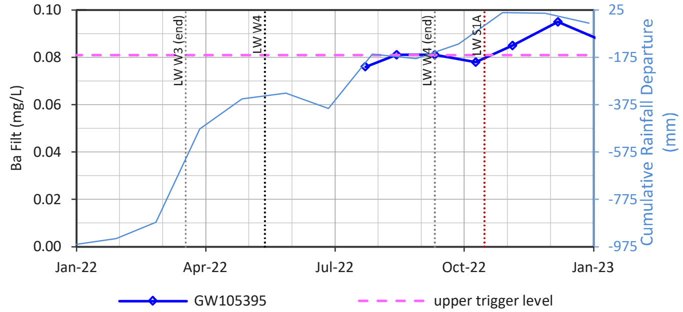


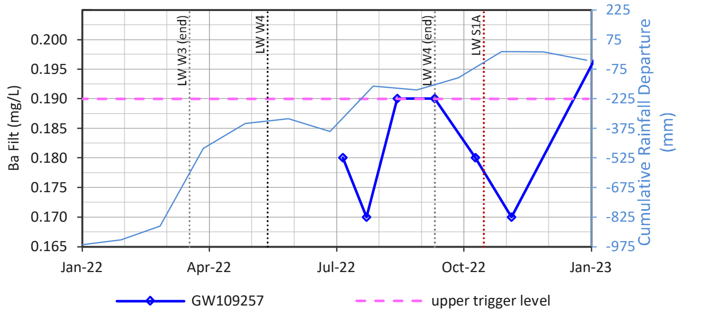


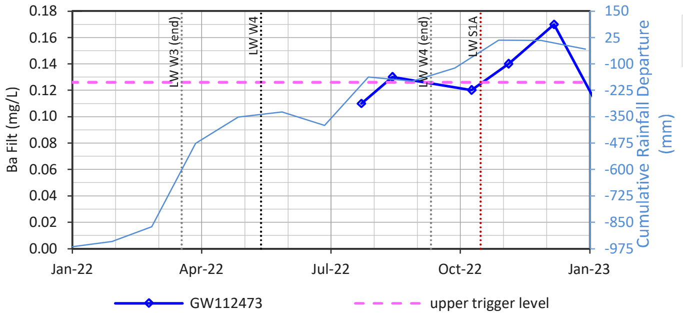




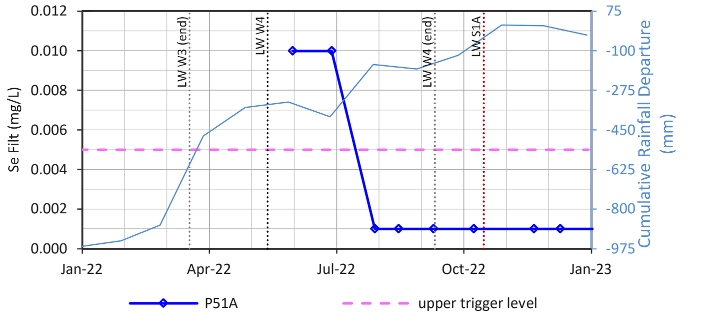


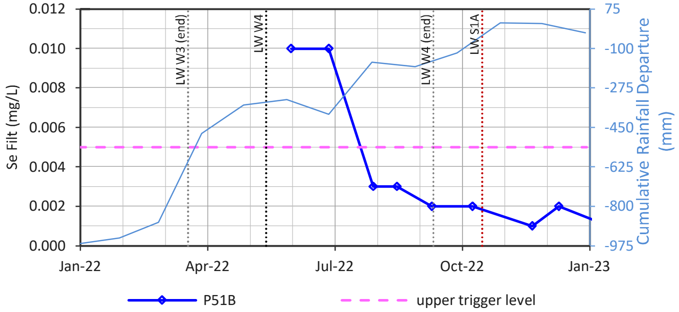


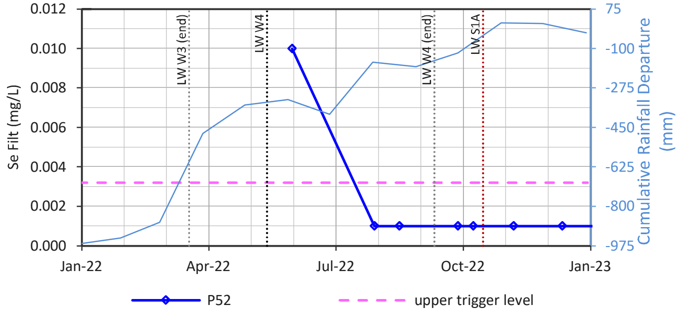




No Data Available for Ba Filt (mg/L)




0.012
0.010
0.008
0.006
0.004
0.002
0.000
Se Filt (mg/L)
75
-100
-275
-450
-625
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P51B
upper trigger level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Se Filt (mg/L)
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-100
-275
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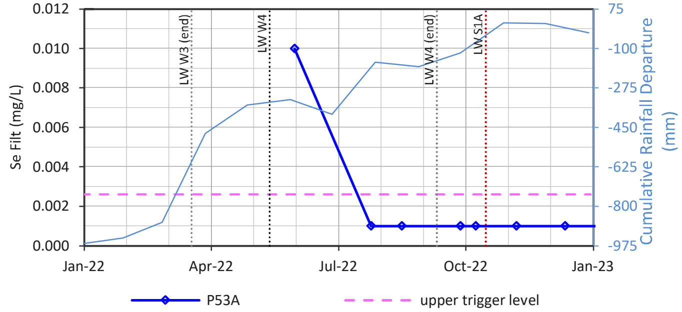
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P52
upper trigger level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Se Filt (mg/L)
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-100
-275
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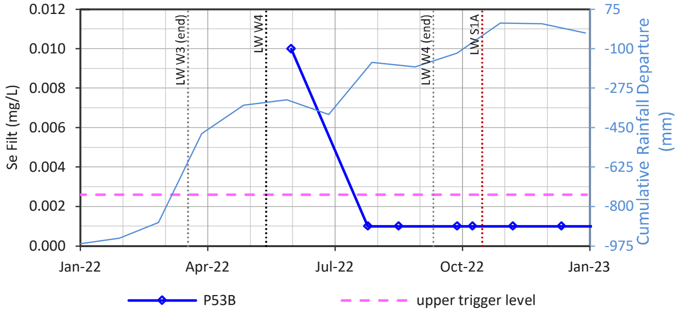
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53A
upper trigger level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Se Filt (mg/L)
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Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
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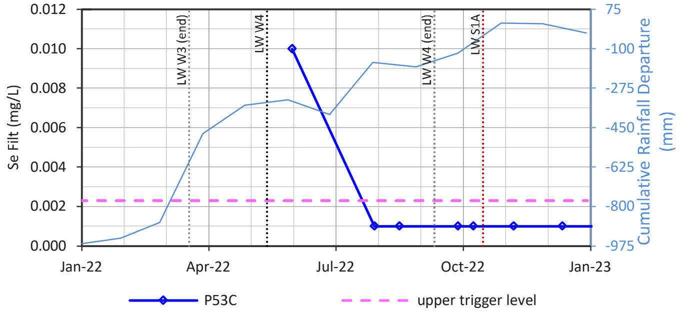
Jan-23
P53B
upper trigger level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Se Filt (mg/L)
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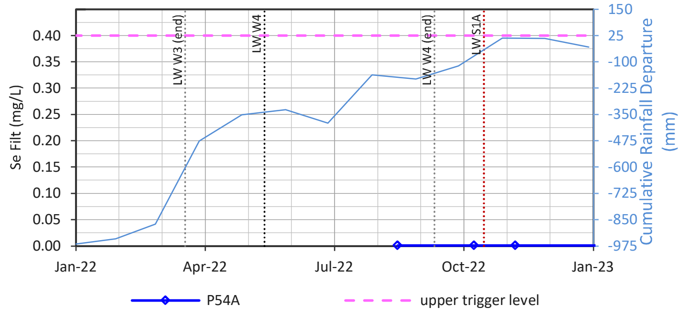
-100
-275
-450
-625
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P53C
upper trigger level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Se Filt (mg/L)
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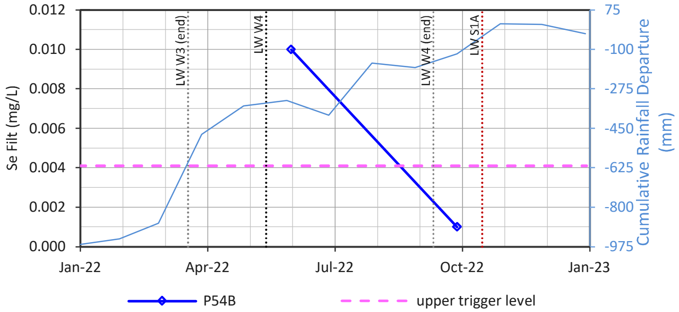
25
-100
-225
-350
-475
-600
-725
-850
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54A
upper trigger level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Se Filt (mg/L)
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-100
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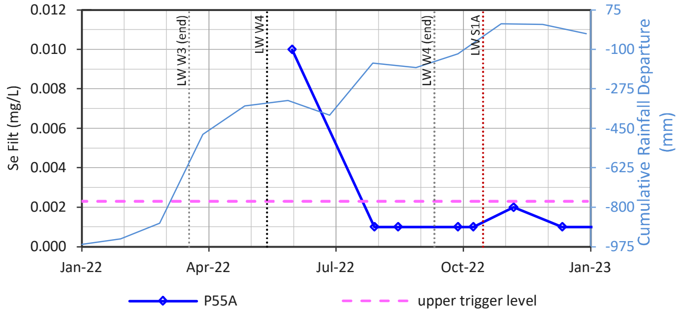
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P54B
upper trigger level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Se Filt (mg/L)
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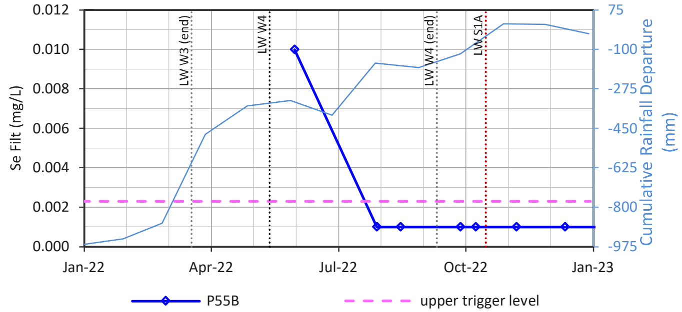
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55A
upper trigger level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Se Filt (mg/L)
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-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
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LW S1A
Jan-22
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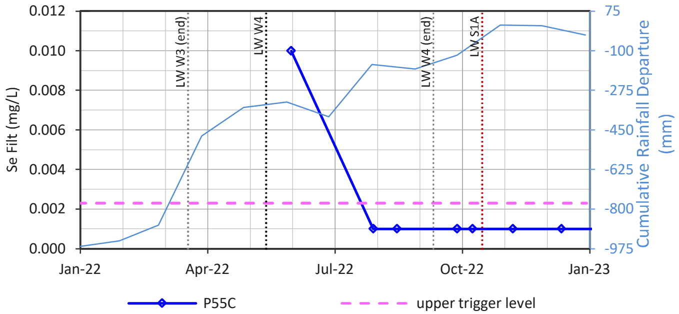
Jan-23
P55B
upper trigger level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Se Filt (mg/L)
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-100
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-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
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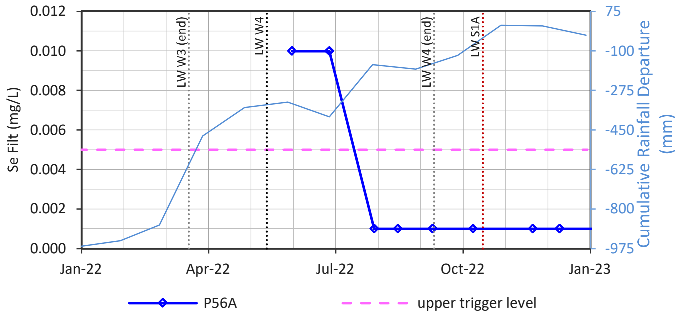
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P55C
upper trigger level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Se Filt (mg/L)
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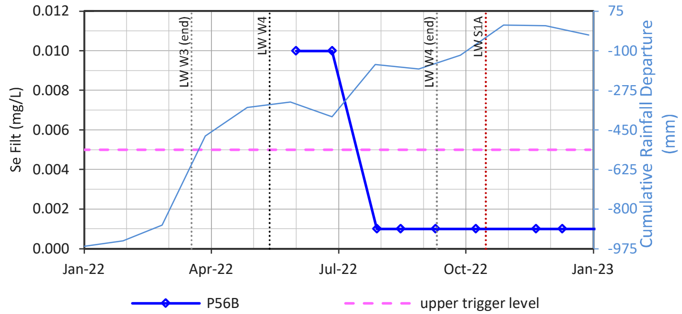
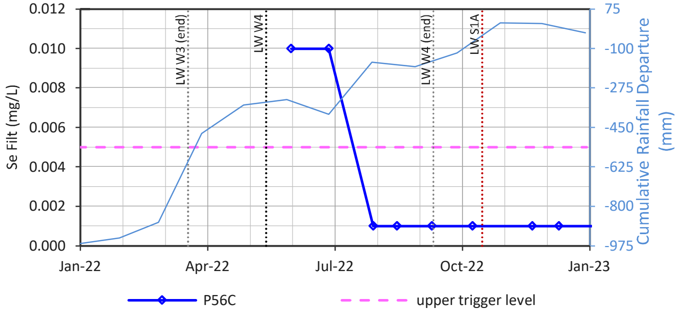
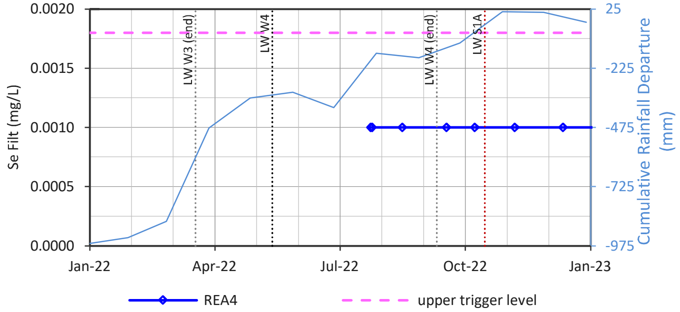
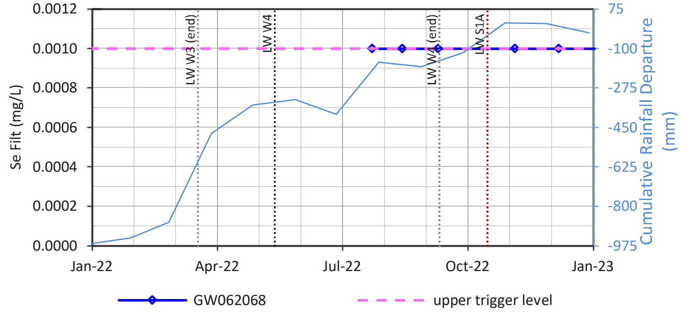
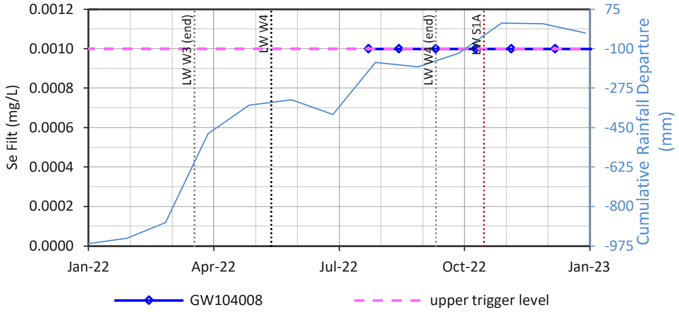
-100
-275
-450
-625
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56A
upper trigger level

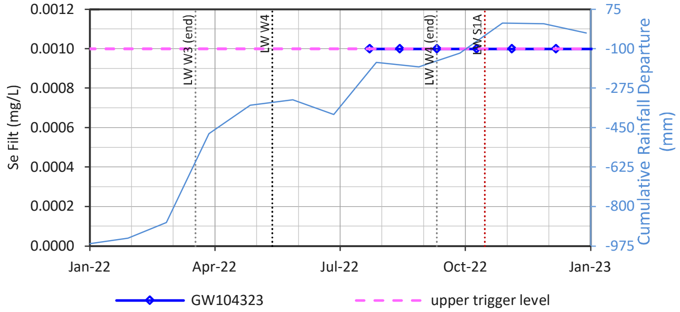

0.012
0.010
0.008
0.006
0.004
0.002
0.000
Se Filt (mg/L)
75
-100
-275
-450
-625
-800
-975
Cumulative Rainfall Departure (mm)
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
P56B
upper trigger level

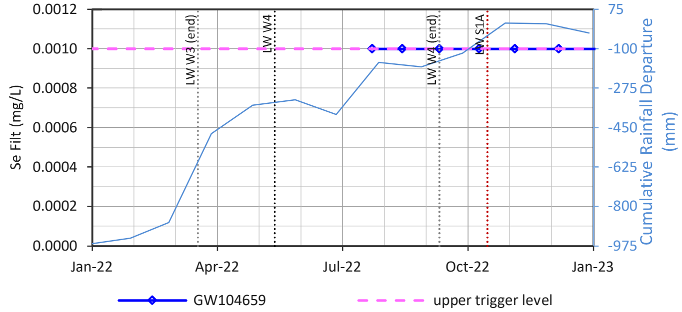


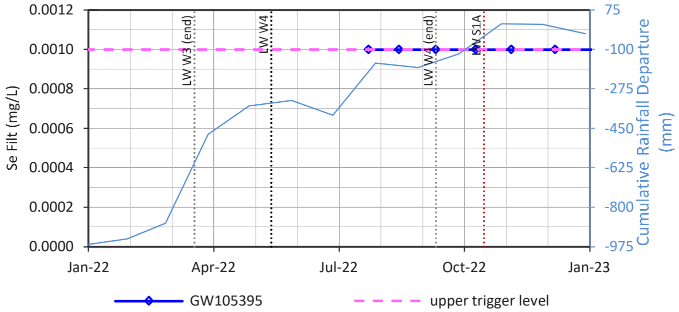


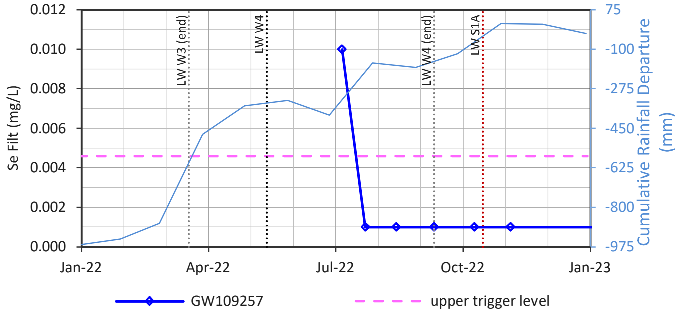


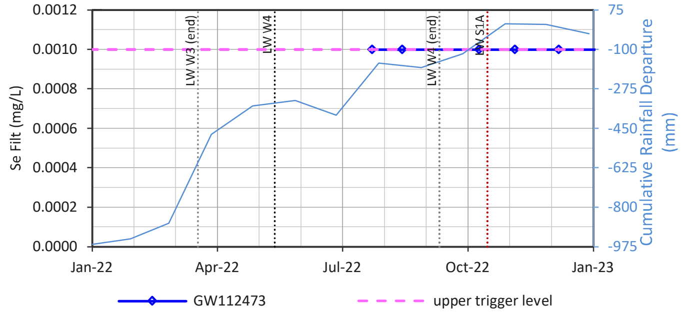












No Data Available for Se Filt (mg/L)