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Tahmoor Coal Pty Ltd

SIX MONTHLY SUBSIDENCE IMPACT REPORT

Tahmoor South Domain Longwalls South 1A – South 6A

1 January 2024 – 30 June 2024

Report 4 – October 2024

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Document Control

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Executive Summary

This report is the fourth six-monthly report to be submitted since the commencement of extraction in the Tahmoor South Domain, in accordance with the requirements of the Longwall South 1A to South 6A (LW S1A-S6A) Extraction Plan.

Extraction of coal from Longwall South 1A (LW S1A) commenced on 18 October 2022 and was completed on 4 July 2023. The extraction of Longwalls South 2A (LW S2A) commenced on 2 August 2023 and was completed on 6 April 2024. Extraction of Longwall South 3A (LW S3A) commenced on 8 May 2024, and as of 27 June 2024 had progressed a distance of 402 metres from its starting position.

The reporting period of this report is from 1 January 2024 to 30 June 2024 and includes observations noted during the extraction of LW S2A and LW S3A.

During the reporting period, a maximum of 965 mm of vertical subsidence relating to the extraction of LW S2A was recorded at the V-Line.

During the reporting period, fourteen (14) TARPs for environmental and built features were triggered as summarised:

- Surface Water Level TARP (WMP3) – Reduction in pool water level at various sites resulted in Level 1, 2 and 3 triggers during this reporting period. This included Level 3 TARP triggers at monitoring sites TT2, TT3, TT7, TT9, TT12 and TT13. Observations of water level decline at these monitoring sites were confirmed to be associated with direct or indirect mining impacts, in addition to influence from prevailing climatic conditions. A WCAMP will be prepared and implemented (if required) following the cessation of subsidence movements associated with Tahmoor South mining;
- Physical Features and Natural Behaviour TARP (WMP5) – Reduction in pool water level and the development of new or existing fractures resulted in Level 1 and 3 TARP triggers during this reporting period. This included Level 3 TARP triggers at monitoring sites TT2, TT3, TT11 and TT12. Changes to physical features and natural behaviour of these pools and reaches were confirmed to be associated with direct or indirect mining impacts, in addition to influence from prevailing climatic conditions. WCAMP will be prepared and implemented (if required) following the cessation of subsidence movements associated with Tahmoor South mining;
- Channel Stability, Sedimentation and Erosion (WMP7) – Erosion at knickpoint sites resulted in Level 1 and 2 triggers during this reporting period. This included a Level 2 TARP trigger at knickpoint site K64 due to a combination of high rainfall / flow event and mining-induced subsidence. At this time, Corrective Management Actions have not been considered to be reasonable or feasible;
- Groundwater Level TARP for Shallow Groundwater Level (Open Standpipes and Private Bores; WMP8) – Reduction in bore water level was noted at various sites during this reporting period, resulting in Level 1, 2 and 3 TARP triggers, with a Level 3 TARP trigger observed at P55B. This includes a reduction at P51B, P53 nested sites, P55B, P55C, P56C, private bore GW104659 and private bore GW109257. Groundwater level decline at P53 and P55 is likely due to ongoing mining effect. However, at the remaining locations, it cannot definitely be attributed to extraction activities. No further actions other than ongoing monitoring is required;
- Groundwater Level TARP for Shallow Groundwater Pressure (VWPs; WMP9) – Reduction in pressure was noted at various sensor depths at TBC032 during the reporting period. This resulted in Level 1 and 3 TARP triggers, with a Level 3 TARP trigger observed at sensor depth 131m. The groundwater decline is likely a regional groundwater drawdown in response to mining activity. No further actions other than ongoing monitoring is required;

- Groundwater – Surface Water Interaction TARP (WMP12) – A review of groundwater – surface water interaction between P53 and P55 nested bores and associated surface water monitoring site TT13-QLa and TT1-QLa, respectively, was completed. Reduction in bore water level was noted at various sites during this reporting period, resulting in Level 1, 2 and 3 TARP triggers, with a Level 3 TARP trigger observed at P55B. The review did not find any apparent relationship between the groundwater and surface water responses to extraction, and consequently no further actions other than ongoing monitoring is required;
- Aquatic Habitat and Macroinvertebrate Indicators (BMP1) – Level 2 triggered at aquatic ecology monitoring sites TTH16 and TTHt7 due to reduced aquatic pool habitats (dry pools) compared to baseline observations for three consecutive sampling occasions. These monitoring sites correlate to surface water monitoring sites where reduction of water levels is related to both mining-induced impacts in combination with prevailing dry weather conditions. No further actions other than ongoing monitoring is required;
- Historical Heritage TARP (HMP2) – Level 1 triggered for detectable environmental consequences observed at Tahmoor Mine Site. A review of the cracks by a qualified archaeologist noted that they were minor and, if required, could be repaired in a manner that preserves the heritage value of the mine. No further actions other than ongoing monitoring is required;
- Main Southern Rail TARP – Blue trigger due a measured extension across the crest between Pegs B99360 and C99360, which has been attributed to heavy vehicle movement along the crest. This trigger was resolved by the Rail Management Group. No further actions other than ongoing monitoring is required;
- Wollondilly Shire Council TARP – Non-conventional subsidence movements occurred resulting compression humps on Remembrance Drive. Meetings with all infrastructure owners are ongoing during the reporting period, and actions from these meetings are currently being implemented;
- Wollondilly Anglican College TARP – Non-conventional subsidence movements occurred resulting in impacts to gates, pavements, brick walls and stairs at the site. Repairs at the site have been completed and these triggers were resolved at the end of the LW S2A monitoring period (and no new triggers have been observed during the extraction of LW S3A). No further actions other than ongoing monitoring is required;
- Tahmoor Mine Site TARP – Blue trigger due to ground shortening on the rail loop and cracking in the 6C Tunnel, as a result of mining. An inspection by a structural engineer of the 6C Tunnel noted no immediate concerns. Ongoing monitoring is required;
- Australian Wildlife Sanctuary TARP – Level 4 trigger relating to pool water level reduction and fracturing in Wirrimbirra Creek. This trigger is largely managed by the Water Management Plan TARPs. A WCAMP will be prepared (if required) and implemented following the cessation of subsidence movements associated with Tahmoor South mining; and
- 3030 Remembrance Drive TARP – Non-conventional subsidence movements occurred along Remembrance Driveway potentially resulting in misalignment of several internal doors and tilting of one vehicle hoist at the Prestige Care Restorations Workshop. Proposed actions have not been able to be completed due to refusal of entry to the workshop by the owners.

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

1 Table of Contents

2 List of Figures

3 List of Tables

1 Introduction

1.1 Background

Tahmoor Coal Pty Ltd (Tahmoor Coal) owns and operates the Tahmoor Mine, an existing underground coal mine located approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW) (refer to **Figure 1-1**). The mine has previously extracted longwalls to the north and west of the surface facilities and has been operating continuously since 1979 when coal was first mined using bord and pillar mining methods, followed by longwall mining methods since 1987.

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. Extracted coal is processed on site at the coal handling and preparation plant (CHPP) and coal clearance facilities prior to transportation via rail to Port Kembla and Newcastle for Australian domestic and export customers.

In April 2021, Tahmoor Coal received Development Application Approval (SSD 8445) from NSW Department of Planning and Environment (DPE) (now the NSW Department of Planning, Housing and Infrastructure (DPHI)) for the Tahmoor South Domain using existing surface infrastructure and extension of underground longwall mining to the south of existing workings. The approval allows 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.

In addition to the SSD 8445 approval 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 the township of Bargo. Longwall mining would 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 granted approval on 20 September 2022. The Study Area for this extraction plan is provided in **Figure 1-2**.

The progress of extract from Tahmoor South longwalls is as follows:

- Longwall South 1A (LW S1A): Commenced 18 October 2022, completed on 4 July 2023;
- Longwall South 2A (LW S2A): Commenced 2 August 2023, completed on 6 April 2024; and
- Longwall South 3A (LW S3A): Commenced 8 May 2024, 425.5 m extracted as of 30 June 2024.

1.2 Purpose

1.2.1 Six-Monthly Subsidence Impact Report Requirements

The purpose of this report is to address the requirements for six-monthly reporting on impacts and environmental monitoring results associated with the extraction of LW S1A-S6A. These requirements are outlined in Section 7.1.1 of the LW S1A-S6A Extraction Plan, which are derived from the Section 6 of the DPE *Draft Guidelines for the Preparation of Extraction Plans V5* (DPE, 2015). It is noted that an updated version of the Guidelines was published in October 2022.

This report provides a summary of subsidence and environment monitoring results, subsidence impacts and management actions undertaken during the reporting period. The reporting period for this report is defined in **Section 1.3**.

Reporting requirements are listed in **Table 1-1** below, together with the cross-reference where the requirements are addressed in this report.

Table 1-1 Six Monthly Subsidence Impact Report Requirements

Requirement No.	Requirement Description	Section Addressed
Reporting Requirements as per Section 7.1.1 of the LW S1A-S6A Extraction Plan		
1	A comprehensive summary of all impacts, including a revised characterisation according to the relevant TARP(s);	Section 3
2	Any proposed actions resulting from triggers being met in the TARP, or other actions;	Section 3
3	An assessment of compliance with all relevant performance measures and indicators; and	Section 4
4	A comprehensive summary of all quantitative and qualitative environmental monitoring results, including landscape monitoring, water quality data, water flow and level data, piezometer readings.	Section 3

This report will be distributed to the stakeholders listed in **Section 5.4**.

1.2.2 Annual Review Requirements

An Annual Review for Tahmoor Mine operations during the previous calendar year is required in accordance with Condition E13 (SSD 8445) and is submitted by 31 March annually to DPHI and other stakeholders, as well as upload to the Tahmoor Coal Website. This Six-Monthly Subsidence Impact Report will assist with the completion of the 2024 Annual Review and will be included as an appendix to the Annual Review.

The Annual Review will address compliance with Condition 22 of the EPBC Act (EPBC 2017/8084) approval, which requires the submission of an Annual Compliance Report to DPHI by 31 March of each year.

1.3 Scope

1.3.1 Reporting Period

This report is the fourth six-monthly report to be submitted since the commencement of extraction of LW S1A, in accordance with the requirements of the LW S1A-S6A Extraction Plan. The reporting period of this report is from 1 January 2024 to 30 June 2024, and covers subsidence impacts observed during the extraction of LW S2A and LW S3A.

Table 1-2 summarises the monitoring and reporting completed during the reporting period, as well as the timeframe of data reviewed for each monitoring component.

1.3.2 LW S1A-S6A Study Area

The Extraction Plan Study Area for LW S1A-S6A is defined as the surface area that is likely to be affected by the extraction of LW S1A-S6A from the Bulli Coal Seam. This Study Area has been calculated by combining the areas bound by the following limits:

- The predicted limit of vertical subsidence, taken as the 20 millimetre (mm) subsidence contour resulting from the extraction of LW S1A-S6A; and
- A 35^{o} angle of draw line from the limit of proposed extraction for LW S1A-S6A.

The Study Area is illustrated in **Figure 1-2**.

1.3.3 LW S1A-S6A Extraction Plan Context

The LW S1A-S6A Extraction Plan is part of the Tahmoor Coal Environmental Management Structure, as illustrated in **Figure 1-3**.

As part of the LW S1A-S6A Extraction Plan, a set of management plans was prepared to manage particular environment or built features with the LW S1A-S6A Study Area, which consisted of the following:

- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Built Features Management Plan, with a number of sub-plans to manage potential environmental consequences to infrastructure and specific building structures as a result of secondary extraction; and
- Public Safety Management Plan.

The overall framework for subsidence monitoring and management of impacts of the LW S1A-S6A Extraction Plan is provided in the relevant Subsidence Monitoring Programs. Monitoring of environmental and built features has been completed by Tahmoor Coal in accordance with management plans listed above.

It is noted that the management requirements for public safety are covered in the Built Features Management Plan and the Land Management Plan.

Table 1-2 Monitoring and Reports Reviewed for this Reporting Period

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Section Discussed	Reference
Subsidence Monitoring Program	Subsidence	General subsidence	• SMEC • Building Inspection Service	• Mine Subsidence Engineering Consultants (MSEC)	• Weekly reports during mining	Section 3.1	Appendix A (referenced reports only)
Water Management Plan	Surface Water	Streamflow Pool water level Stream water quality	• ALS • SMEC	• ATC Williams	• Report for 1 January 2024 to 30 June 2024	Sections 3.2.1, 3.2.4	Appendix B
		Physical features and natural behaviour of pools and reaches Morphology and channel stability	• ENRS	• ENRS	• Monthly and fortnightly reports during mining	Sections 3.2.2, 3.2.3	Available on request
	Groundwater	Groundwater quality Groundwater bore level at open standpipes and private bores Shallow groundwater pressures Deep groundwater pressures	• CES	• SLR	• Report for 1 January 2024 to 30 June 2024	Section 3.3	Appendix C
		Groundwater level and quality at Thirlmere Lakes	• NSW Government				
		Groundwater Inflow	• Tahmoor Coal				

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Section Discussed	Reference
Land Management Plan	Landscape	Cliffs Natural steep slopes Farm dams	• Douglas Partners	• Douglas Partners	• Geotechnical reports during mining (monthly)	Sections 3.4.1, 3.4.2, 3.4.3	Available on request
		Farm Dams	• Building Inspection Service (BIS)	• BIS	• Weekly dam inspection and reports for dams with active subsidence	Section 3.4.3	Available on request
	Agricultural Land	Agricultural Land	• SMEC • BIS	• MSEC	• Weekly inspections along local roads – completed as part of roads survey	Section 3.4.4	Appendix A (referenced report only)
			• SLR	• SLR	• Visual inspections at the completion of LW S2A (April 2024)	Section 3.4.4	Available on request
Biodiversity Management Plan	Aquatic Ecology	Macroinvertebrates	• Niche	• Niche	• Aquatic Ecology Monitoring Report for Autumn 2024 (October 2024)	Section 3.5.1	Appendix D
	Terrestrial Ecology	Amphibians Riparian vegetation Threatened flora and fauna Threatened Ecological Communities	• Niche	• Niche	• Terrestrial Ecology Monitoring Report for Autumn 2024 (March, April and May 2024)	Section 3.5.2	Available on request
Heritage Management Plan	Aboriginal heritage	Teatree Hollow 2013.1	• SMEC	• MSEC	• Weekly reports during mining	Section 3.6.1	Appendix A (referenced report only)
			• BIS • Douglas Partners	• BIS • Douglas Partners	• Monthly inspection and reporting (alternate fortnights) during period of active subsidence for LW S1A, S2A, S3A and S4A	Section 3.6.1	Available on request
			• EMM	• EMM	• Visual inspection at the completion of LW S2A (April 2024)	Section 3.6.1	Available on request

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Section Discussed	Reference
Heritage Management Plan	Historical heritage	Great Southern Road (partial)	• SMEC • BIS	• MSEC	• Weekly reports during mining – not required during this reporting period	Sections 3.6.2, 3.7.2	Not required
		Picton Weir	• SMEC • BIS	• MSEC	• Weekly reports during mining – not required during this reporting period	Sections 3.6.2, 3.7.13	Not required
		Bargo Cemetery	• SMEC • BIS	• MSEC	• Weekly reports during mining – not required during this reporting period	Sections 3.6.2, 3.7.9	Not required
			• EMM	• EMM	• Visual inspections at the completion of LW S6A – not required during this reporting period	Not required	Not required
		Wirrimbirra Sanctuary (Australian Wildlife Sanctuary)	• SMEC	• MSEC	• AWS Subsidence Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.12	Appendix I (referenced only)
			• EMM	• EMM	• Visual inspections at the completion of LW S5A – not required during this reporting period	Not required	Not required
		Tahmoor Colliery (Tahmoor Mine Site)	• SMEC • BIS	• MSEC	• Tahmoor Mine Site Status Reports (weekly during active subsidence)	Sections 2.6.2, 2.7.11	Appendix H (referenced only)
			• Tahmoor Coal	• Tahmoor Coal • EMM	• Tahmoor Mine Site Photo Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.11	Not required
		Bargo Railway Bridge North (Wellers Road Overbridge)	• SMEC • Southern rail Services • Bloor Rail • Newcastle Geotech	• MSEC	• MSR Weekly Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.11	Appendix F (referenced report only)
			• EMM	• EMM	• Visual inspections at the completion of LW S6A – not required during this reporting period	Not required	Not required

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Section Discussed	Reference
Heritage Management Plan	Historical heritage	Bargo Railway Viaduct	• SMEC • Southern rail Services • Bloor Rail • Newcastle Geotech	• MSEC	• MSR Weekly Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.1	Appendix F (referenced report only)
			• EMM	• EMM	• Visual inspections at the completion of LW S6A – not required during this reporting period	Not required	Not required
Built Features Management Plan	Built Features	Local roads, bridges and culverts	• SMEC • BIS • Comms Network Solutions	• MSEC	• Weekly reports during mining	Section 3.7.2	Appendix A (referenced report only)
		Potable Water Infrastructure				Section 3.7.3	
		Sewerage Infrastructure				Section 3.7.4	
		Gas Infrastructure				Section 3.7.5	
		Electricity Infrastructure				Section 3.7.6	
		Telecommunications Infrastructure				Section 3.7.7	
		Residential structures				Section 3.7.8	
		Structures for public amenity, commercial, industrial and agricultural purposes				Section 3.7 (various)	
		Picton Weir				Section 3.7.13	

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Section Discussed	Reference
Built Features Management Plan	Built Features	Main Southern Railway (MSR)	• SMEC • Southern rail Services • Bloor Rail • Newcastle Geotech	• MSEC	• MSR Weekly Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.1	Appendix F (referenced report only)
		Wollondilly Anglican College (WAC)	• SMEC	• MSEC	• Wollondilly Anglican College Status Report (weekly during active subsidence)	Section 3.7.10	Appendix G (referenced reports only)
		Tahmoor Mine Site	• SMEC • BIS	• MSEC	• Tahmoor Mine Site Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.11	Appendix H (referenced reports only)
			• Douglas Partners	• Douglas Partners	• Tahmoor Mine Ponds and Embankment Reports (monthly during active subsidence)	Section 3.7.11	Available on request
			• Tahmoor Coal	• Tahmoor Coal	• Mine Site Photo Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.11	Available on request
		Australian Wildlife Sanctuary (AWS)	• SMEC	• MSEC	• AWS Subsidence Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.12	Appendix I (referenced reports only)
		Bargo Petroleum	• SMEC	• MSEC	• Petrol Station Status Report (weekly during active subsidence)	Section 3.7.14	Appendix J (referenced reports only)
		Tahmoor Garden Centre	• SMEC	• MSEC	• Tahmoor Garden Centre Status Report (weekly during active subsidence)	Section 3.7.16	Available on request

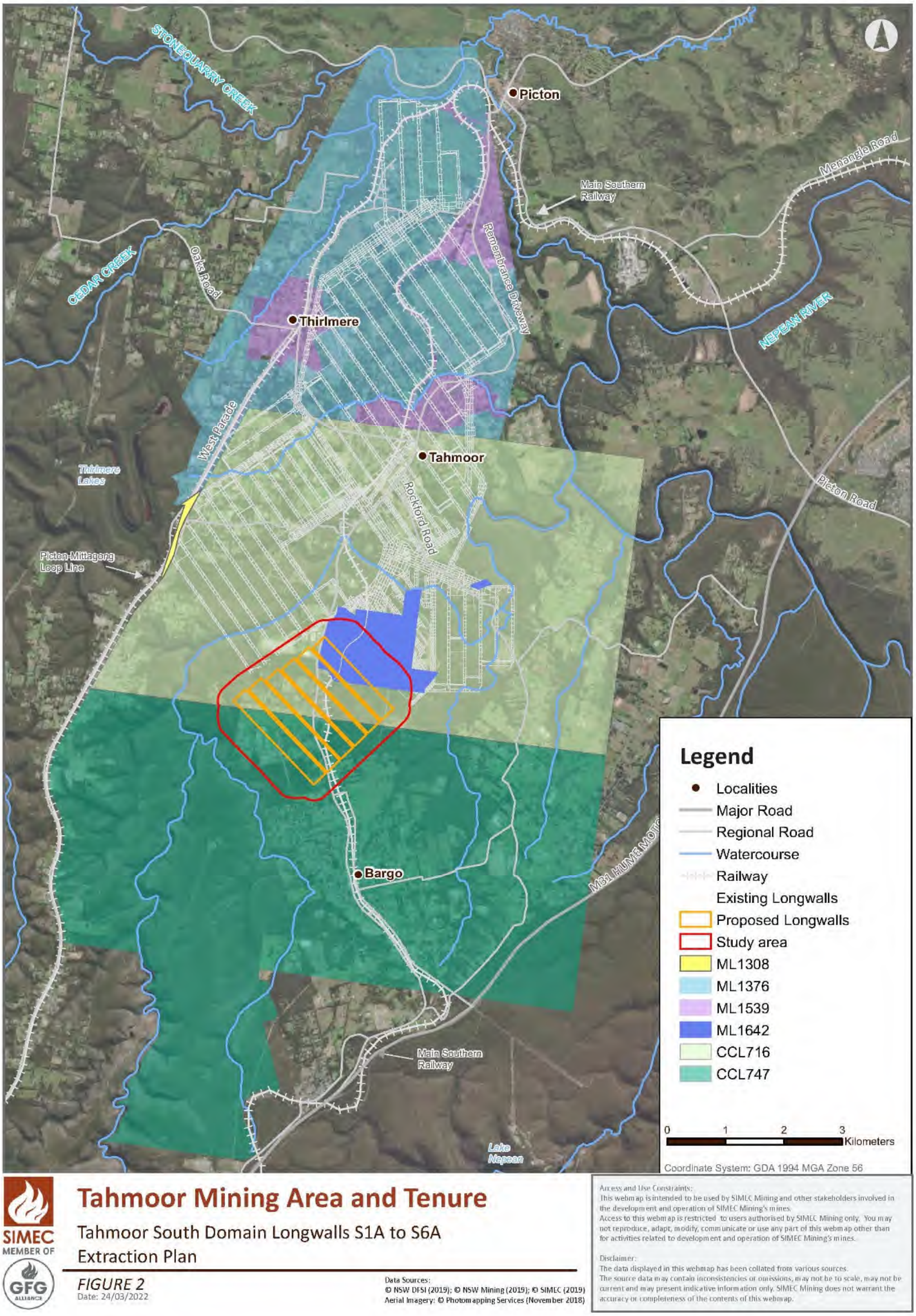

Figure 1-1 Tahmoor Mine Area and Tenure (source: LW S1A-S6A Extraction Plan)

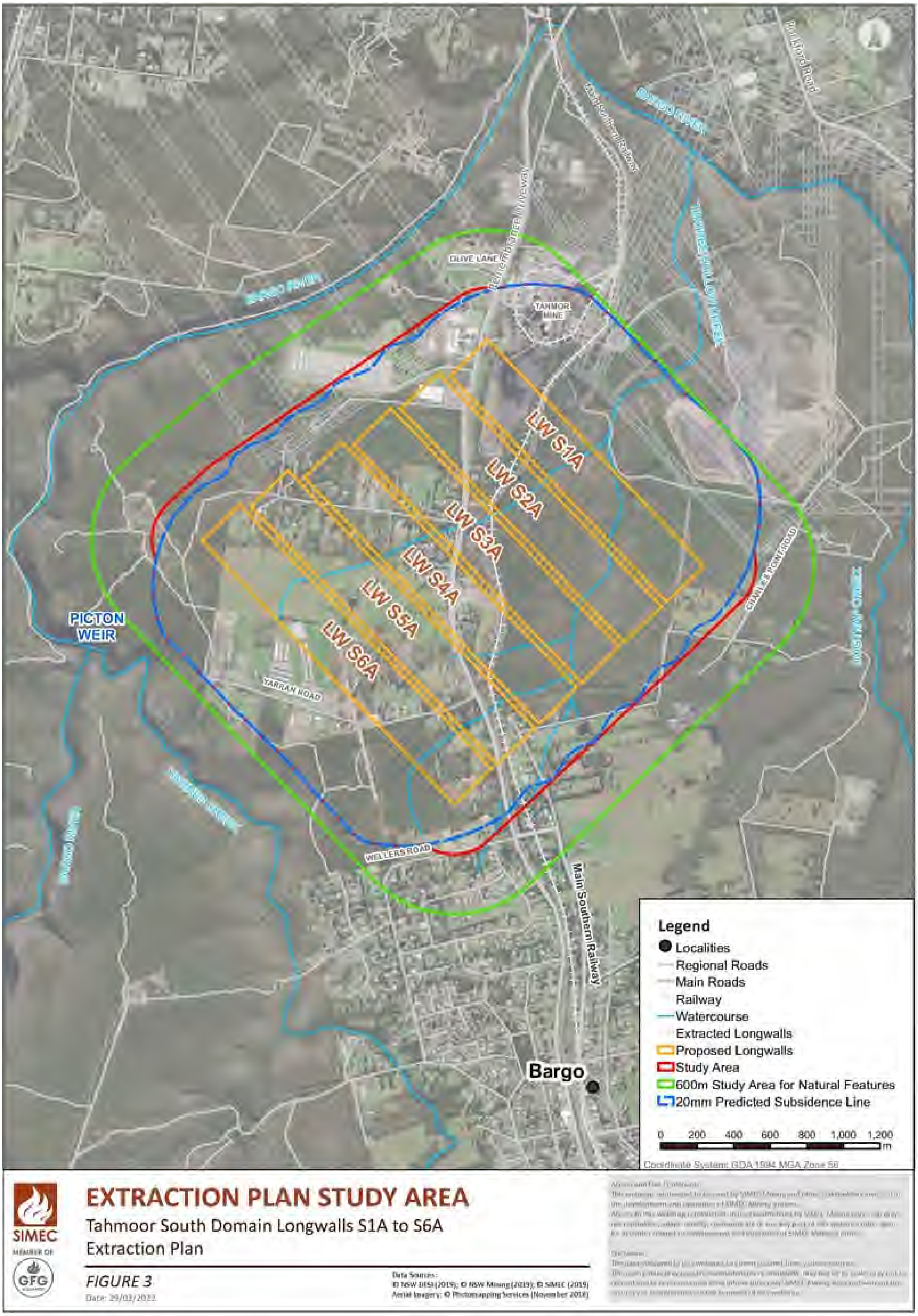

Figure 1-2 LW S1A-S6A Extraction Plan Study Area (source: LW S1A-S6A Extraction Plan)

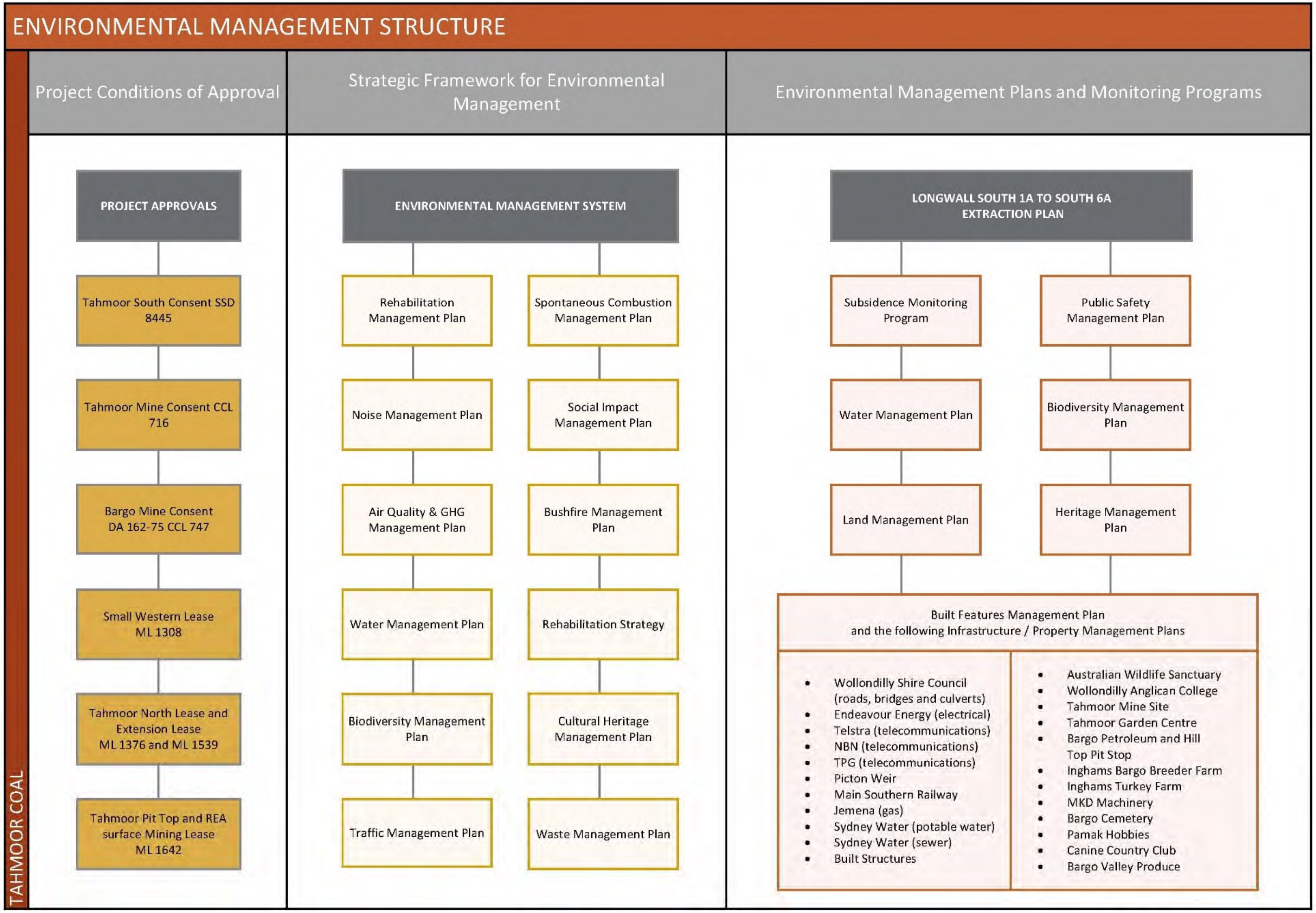

Figure 1-3 Overview of Environmental Management Structure for Tahmoor Coal (source: LW S1A-S6A Extraction Plan)

2 Overview of TARP Triggers

2.1 Summary of TARP Triggers

Table 2-1 provides a summary of monitoring results for TARPS. A full list of TARPs for environmental features that are applicable is provided in Appendix B of the LW S1A-S6A Extraction Plan.

A comprehensive discussion of TARP triggers and a summary of actions and responses for each trigger, as well as the progress and success of any remediation actions, is provided in **Section 3.**

Table 2-1 Summary of TARP Triggers for January to June 2024

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
Water Management Plan	WMP1	Stream Water Quality for all Watercourses within the Subsidence Area	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.
	WMP2	Stream Water Quality for other Watercourses (Bargo River and Hornes Creek)	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.
	WMP3	Pool Water Level for all Watercourses within the Subsidence Area	LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT3 (5 to 17 January; 21 January to 5 February), TT12 (14, 20 and 31 January), TT13 (21 January to 6 February).	LEVEL 1 TRIGGERED[1] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT2 (2 to 5 February), TT9 (1 to 5 February). LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT3 (21 January to 5 February; 9, 17, 23 February), TT12 (1 to 5, 8 to 17, 27 to 29 February), TT13 (21 January to 6 February; 15 to 17 February). LEVEL 3 TRIGGERED[3] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT3 (26 February to 4 April).	LEVEL 1 TRIGGERED[1] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (30 March to 4 April). LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT2 (10 March to 4 April), TT9 (11 to 16, 27 March to 4 April), TT12 (5 March to 5 April). LEVEL 3 TRIGGERED[3] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT3 (26 February to 4 April), TT12 (1 March to 4 April).	LEVEL 1 TRIGGERED[1] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (30 March to 4 April, and 10-18 April). LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT2 (10 March to 4 April), TT3 (17 April to 5 May), TT9 (27 March to 4 April), TT12 (25 to 29 April), TT13 (5 March to 5 April). LEVEL 3 TRIGGERED[3] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT3 (26 February to 4 April), TT12 (1 March to 4 April).	LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT3 (17 April to 5 May; 29 May to 5 June), TT12 (1 to 3 May 2024), TT13 (1 to 5 May 2024).	LEVEL 2 TRIGGERED[2] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT3 (29 May to 5 June; 29 to 30 June 2024).
	WMP4	Pool Water Level for other Watercourses (Bargo River and Hornes Creek)	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).	The recorded water level did not decline below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level).
	WMP5	Physical Features and Natural Behaviour of Watercourses within the Subsidence Area	LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, TT12.	LEVEL 1 TRIGGERED[4] Visually observed anomalous change observed for one month at monitoring site TT13. LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, TT12.	LEVEL 2 TRIGGERED[5] Visually observed anomalous change observed for two consecutive months at monitoring site TT13. LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, TT12.	LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3.	LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, TT12.	LEVEL 3 TRIGGERED[6] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, TT12.
	WMP6	Physical Features and Natural Behaviour of Pools for other Watercourses (Bargo River and Hornes Creek)	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.	No observed impacts to pool water level, overland connected flow, iron staining, gas release or turbidity – as compared with baseline conditions.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
	WMP7	**Channel Stability, Sedimentation and Erosion**	No further development of soft knickpoints or increased erosion of headwater streams.	No further development of soft knickpoints or increased erosion of headwater streams.	No further development of soft knickpoints or increased erosion of headwater streams.	No further development of soft knickpoints or increased erosion of headwater streams.	LEVEL 1 TRIGGERED[7] Visually observed minor increase in knickpoint development noted at knickpoints K57 and K64.	LEVEL 1 TRIGGERED[7] Visually observed minor increase in knickpoint development noted at knickpoint K57.
								LEVEL 2 TRIGGERED[8] Visually observed moderate increased in knickpoint development noted at knickpoint K64.
	WMP8	**Shallow Groundwater Level (Open Standpipes and Private Bores)**	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, P55B, GW104659.	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, GW104659, GW109257.	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, GW104659, GW109257.	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, GW104659, GW109257.	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P53A, P53B, GW104659, GW109257.	LEVEL 1 TRIGGERED[9] Greater than 2 m water level reduction for a period of 6 months at P53A, P53B, GW104659, GW109257.
			LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55C and P56C.	LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55B, P55C and P56C.	LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55B, P55C and P56C.	LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55B, P55C and P56C.	LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55C and P56C.	LEVEL 2 TRIGGERED[10] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P53C, P55C and P56C.
							LEVEL 3 TRIGGERED[11] Water level reduction below the maximum modelled drawdown for a period of 6 months at P55B.	LEVEL 3 TRIGGERED[11] Water level reduction below the maximum modelled drawdown for a period of 6 months at P55B.
	WMP9	**Shallow Groundwater Pressure (VWP Sensors < 200 m Depth) – original TARP**	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).	LEVEL 1 TRIGGERED[12] Greater than 5 m water level reduction in VWP intakes for a period of greater than six months at TBC032 (BHCS-181m) and TBC032 (BGSS-200m).
						LEVEL 1 TRIGGERED[13] Water level reduction greater than the maximum modelled drawdown for a period of greater than six months and the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors for TBC032 (HBSS-131m).	LEVEL 1 TRIGGERED[13] Water level reduction greater than the maximum modelled drawdown for a period of greater than six months and the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors for TBC032 (HBSS-131m).	LEVEL 1 TRIGGERED[13] Water level reduction greater than the maximum modelled drawdown for a period of greater than six months and the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors for TBC032 (HBSS-131m).
	WMP10	**Groundwater Level / Pressure Deep VWPs (> 200 m Depth excluding Monitoring the Bulli Coal Seam)**	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.	No observed exceedance of modelled impacts to predicted drawdown by greater than 30 metres, or exceedance of the modelled predicted drawdown by greater than 30 metres occurred for less than three consecutive months.
	WMP11	**Groundwater Quality (Open Standpipes and Private Bores)**	No observed changes in salinity, pH or metals outside of the baseline variability.	No observed changes in salinity, pH or metals outside of the baseline variability.	No observed changes in salinity, pH or metals outside of the baseline variability.	No observed changes in salinity, pH or metals outside of the baseline variability.	No observed changes in salinity, pH or metals outside of the baseline variability.	No observed changes in salinity, pH or metals outside of the baseline variability.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
	WMP12	Groundwater – Surface Water Interaction	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B, P55B.	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B.	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B.	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B.	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B.	LEVEL 1 TRIGGERED[14] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) at P53A, P53B, P55A.
			LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55C.	LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55B, P55C.	LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55B, P55C.	LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55B, P55C.	LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55C.	LEVEL 2 TRIGGERED[15] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) at P53C, P55C.
							LEVEL 3 TRIGGERED[16] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 3 (in TARP WMP8) at P55B.	LEVEL 3 TRIGGERED[16] Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 3 (in TARP WMP8) at P55B.
	WMP13	Groundwater Bores Monitoring for Thirlmere Lakes	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.
Land Management Plan	LMP1	Cliffs	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	LMP2	Natural Steep Slope (excluding Constructed Steep Slopes associated with Roads, Railway and the Tahmoor Mine Site)	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.	No observations of surface cracking, or localised ground bulging, buckling or shearing as a result of mining.
	LMP3	Farm Dams	No observations of cracks developing within dam embankments as a result of mining.	No observations of cracks developing within dam embankments as a result of mining.	No observations of cracks developing within dam embankments as a result of mining.	No observations of cracks developing within dam embankments as a result of mining.	No observations of cracks developing within dam embankments as a result of mining.	No observations of cracks developing within dam embankments as a result of mining.
	LMP4	Agricultural Land	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	No observations of impact to agricultural production or use of land, mining-induced changes to slope on ponding / flooding or increase in soil / tunnel erosion.	NA – No monitoring required.	NA – No monitoring required.
Biodiversity Management Plan	BMP1	Aquatic Habitat and Macroinvertebrate Indicators (Stream Health)	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.	LEVEL 2 TRIGGERED[18] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for three consecutive sampling occasions.
	BMP2	Amphibian Populations	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	Amphibian populations are stable and habitat parameters are predominantly within a reasonable range of baseline data.	Amphibian populations are stable and habitat parameters are predominantly within a reasonable range of baseline data.	NA – No monitoring required.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
	BMP3	Riparian Vegetation	NA – No monitoring required.	NA – No monitoring required.	Riparian vegetation parameters are predominantly within a reasonable range of baselines data, and monitoring indicates native vegetation cover is within a reasonable range of baseline data.	Riparian vegetation parameters are predominantly within a reasonable range of baselines data, and monitoring indicates native vegetation cover is within a reasonable range of baseline data.	Riparian vegetation parameters are predominantly within a reasonable range of baselines data, and monitoring indicates native vegetation cover is within a reasonable range of baseline data.	NA – No monitoring required.
	BMP4	Threatened Species, Threatened Populations and Endangered Ecological Communities	NA – No monitoring required.	NA – No monitoring required.	TEC parameters are within a reasonable range of average baseline data and targeted threatened flora species numbers are stable.	TEC parameters are within a reasonable range of average baseline data and targeted threatened flora species numbers are stable.	TEC parameters are within a reasonable range of average baseline data and targeted threatened flora species numbers are stable.	NA – No monitoring required.
Heritage Management Plan	HMP1	Aboriginal Cultural Heritage Sites – Teatree Hollow 2013.1	No detectable environmental consequences observed.	No detectable environmental consequences observed.	No detectable environmental consequences observed.	No detectable environmental consequences observed.	No detectable environmental consequences observed.	No detectable environmental consequences observed.
	HMP2	Historical Heritage Items - Wirrimbirra Sanctuary (Australian Wildlife Sanctuary) - Bargo Cemetery - Bargo Railway Bridge North (Wellers Road Overbridge) - Picton Wier - Tahmoor Colliery (Tahmoor Mine Site) - Bargo Railway Viaduct - Great Southern Road (partial)	LEVEL 1 TRIGGERED[19] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel).	LEVEL 1 TRIGGERED[19] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel and shortening on rail loop).	LEVEL 1 TRIGGERED[19] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel and shortening on rail loop).	LEVEL 1 TRIGGERED[19] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel and shortening on rail loop).	LEVEL 1 TRIGGERED[19] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel and shortening on rail loop).	NA – No monitoring required.
Built Features Management Plan	1. Main Southern Railway Management Plan	Main Southern Railway Infrastructure	No mining impacts observed.	No mining impacts observed.	BLUE TRIGGER Measured extension across the crest at 99.338 km.	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.
	2. Wellers Road Overbridge Management Plan	Wellers Road Overbridge	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.
	3. Wollondilly Shire Council Management Plan	Public roads, bridges and culverts	Non-conventional subsidence movements measured at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47.	Non-conventional subsidence movements measured at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain measured between Pegs R54 and R55, accompanied by a small bump in the observed subsidence profile at Peg R54.	Non-conventional subsidence movements measured at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain measured between Pegs R54 and R55, accompanied by a small bump in the observed subsidence profile at Peg R54.	Non-conventional subsidence movements measured at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain measured between Pegs R54 and R55, accompanied by a small bump in the observed subsidence profile at Peg R54. A very minor bump observed near Peg R61 on 22 April 2024.	NA – No monitoring required.	NA – No monitoring required.
	4. Sydney Water Potable Water Management Plan	Potable Water Infrastructure	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
	5. Sydney Water Sewer Management Plan	Sewerage Infrastructure	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	6. Jemena Management Plan	Gas Infrastructure	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	7. Endeavour Energy Management Plan	Electricity Infrastructure	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	8. Telstra Management Plan	Telecommunications	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	9. NBN Management Plan	Telecommunications	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	10. TPG Management Plan	Telecommunications	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.	NA – No monitoring required.	NA – No monitoring required.
	11. Built Structures Management Plan	Public amenities, private structures and farm dams	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.
	12. Bargo Cemetery Management Plan	Bargo Cemetery (Heritage Site)	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.
	13. Wollondilly Anglican College Management Plan	Wollondilly Anglican College	Non-conventional subsidence movements resulting in impacts to gates, pavements, brick walls and stairs at the site.	Non-conventional subsidence movements resulting in impacts to gates, pavements, brick walls and stairs at the site.	Non-conventional subsidence movements resulting in impacts to gates, pavements, brick walls and stairs at the site.	Non-conventional subsidence movements resulting in impacts to gates, pavements, brick walls and stairs at the site.	Non-conventional subsidence movements resulting in impacts to gates, pavements, brick walls and stairs at the site.	NA – No monitoring required.
	14. Tahmoor Mine Site Management Plan	Tahmoor Mine Site	BLUE TRIGGER Cracks observed in 6C Tunnel.	BLUE TRIGGER Cracks observed in 6C Tunnel and ground shortening between BL600 and BL700 in the rail loop.	BLUE TRIGGER Cracks observed in 6C Tunnel.	BLUE TRIGGER Cracks observed in 6C Tunnel.	BLUE TRIGGER Cracks observed in 6C Tunnel.	NA – No monitoring required.
	15. Australian Wildlife Sanctuary Management Plan	Australian Wildlife Sanctuary	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[20] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.
	16. Picton Weir Management Plan	Picton Weir	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This structure is located outside the active subsidence zone of LW S2A and LW S3A.
	17. 3030 Remembrance Drive Management Plan	Bargo Petroleum and Hill Top Pit Stop	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	Non-conventional subsidence movements resulting in misalignment of several internal doors and tilting of one vehicle hoist at the site.	NA – No monitoring required.	NA – No monitoring required.
	18. Inghams Bargo Chicken Breeder Production Complex Management Plan	Inghams Bargo Breeder Farm	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.
	19. Inghams Bargo Turkey Farm Management Plan	Inghams Bargo Turkey Farm	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024
	20. Tahmoor Garden Centre Management Plan	**Tahmoor Garden Centre**	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	21. MKD Machinery Management Plan	**MKD Machinery**	No mining impacts observed.	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	No mining impacts observed.
	22. Bargo Valley Produce Management Plan	**Bargo Valley Produce**	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.
	23. Canine Country Club Management Plan	**Canine Country Club**	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.
	24. Pamak Hobbies Management Plan	**Pamak Hobbies**	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.	NA – This property is located outside the active subsidence zone of LW S2A and LW S3A.

Notes:

NR – Monitoring not required this month.

NA – Monitoring data not available as monitoring not completed this month or reporting not yet available.

[1] TARP WMP3 Level 1 Trigger (LW S1A-S6A Water Management Plan): The recorded water level has declined by greater than 10 centimetres (cm) below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level) and the same has not occurred at the at the reference site(s).

[2] TARP WMP3 Level 2 Trigger (LW S1A-S6A Water Management Plan): The recorded water level has declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) and the same has not occurred at the reference site(s).

[3] TARP WMP3 Level 3 Trigger (LW S1A-S6A Water Management Plan): The recorded water level has declined atypically below the recorded baseline minimum level for greater than one month (as a consecutive period) and the same has not occurred at the reference site(s).

[4] TARP WMP5 Level 1 Trigger (LW S1A-S6A Water Management Plan): Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs in one month and the same has not occurred at the reference site(s) AND/OR Visual observation of fracturing.

[5] TARP WMP5 Level 2 Trigger (LW S1A-S6A Water Management Plan): Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs for two consecutive months and the same has not occurred at the reference site(s).

[6] TARP WMP5 Level 3 Trigger (LW S1A-S6A Water Management Plan): Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs for three consecutive months and the same has not occurred at the reference site(s) AND The change in behaviour has been investigated and confirmed to be related to mining effects.

[7] TARP WMP7 Level 1 Trigger (LW S1A-S6A Water Management Plan): Visually observed minor increase in knickpoint development and/or minor erosion and sedimentation at headwater streams.

[8] TARP WMP7 Level 2 Trigger (LW S1A-S6A Water Management Plan): Visually observed moderate increase in knickpoint development and/or moderate or greater increase in erosion and sedimentation of headwater streams.

[9] TARP WMP8 Level 1 Trigger (LW S1A-S6A Water Management Plan): Greater than 2 m water level reduction for a period of 6 months following the commencement of extraction.

[10] TARP WMP8 Level 2 Trigger (LW S1A-S6A Water Management Plan): Water level declines below the average between the 'maximum modelled drawdown' (Level 3 trigger) and the '2 m drawdown' (Level 1 trigger) for a period of greater than 6 months following the commencement of extraction AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[11] TARP WMP8 Level 3 Trigger (LW S1A-S6A Water Management Plan): Water level reduction greater than the maximum modelled drawdown for a period of greater than 6 months following the commencement of extraction AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[12] TARP WMP9 Level 1 Trigger (LW S1A-S6A Water Management Plan): Greater than 5 m water level reduction in VWP intakes following the commencement of extraction for a period of greater than six months.

[13] TARP WMP9 Level 3 Trigger (LW S1A-S6A Water Management Plan): Water level reduction greater than the maximum modelled drawdown following the commencement of extraction for a period of greater than six months AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[15] TARP WMP12 Level 1 Trigger (LW S1A-S6A Water Management Plan): Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) following the commencement of extraction.

[16] TARP WMP12 Level 2 Trigger (LW S1A-S6A Water Management Plan): Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 2 (in TARP WMP8) following the commencement of extraction AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factor.

[17] TARP WMP12 Level 3 Trigger (LW S1A-S6A Water Management Plan): Inferred groundwater levels at surface water monitoring site decline below Level 3 (in TARP WMP8) following the commencement of extraction AND The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[18] TARP BMP1 Level 2 (LW S1A-S6A Biodiversity Management Plan): Visual monitoring indicates reduction in aquatic pool habitat compared to baseline observations at aquatic ecology monitoring sites for three consecutive sampling occasions. OR AUSRIVAS score of Band D recorded for three consecutive sampling occasions at one or more aquatic ecology monitoring site(s).

[19] TARP HMP2 Level 1 (LW S1A-S6A Heritage Management Plan): Historical heritage site monitoring indicates potential detectable environmental consequences, but with negligible impacts to the heritage value of the heritage site(s).

[20] TARP Level (Australian Wildlife Sanctuary Management Plan): Visually observed reduction in pool water level, drainage or overland connected flow AND The above change has not occurred at one of the upstream pools (beyond mining effects).

3 Summary of Environmental Monitoring Results

3.1 Subsidence Monitoring

During the reporting period, the LW S1A-S6A Subsidence Monitoring Program have been implemented to monitor subsidence impacts within the Study Area. The details of the Subsidence Monitoring Program are illustrated in **Figure 3-1**.

The Subsidence Monitoring Program includes twenty-eight (28) Global Navigation Satellite System (GNSS) units measuring absolute horizontal and vertical positions in real time installed directly above and adjacent to LW S1A-S6A. These include four (4) units above the commencing end and along the centreline of LW S2A, being Sites S05, S06, S26 and S27. In addition, two (2) units are also located above the commencing end of LW S3A, being Sites S09 and S10.

Extraction of LW S2A commenced on 2 August 2023 and was completed on 6 April 2024. Extraction of LW S3A commenced on 8 May 2024, and as of 27 June 2024 had progressed a distance of 402 metres from its starting position. This reporting period includes observations noted during the extraction of LW S2A and LW S3A.

Table 3-1 summarises the maximum observed ground movements within the active subsidence zone at the start and end of this reporting period. During the reporting period, a maximum of 965 mm of vertical subsidence relating to the extraction of LW S2A was recorded at the V-Line.

Table 3-1 Subsidence Monitoring Observations for LW S2A and LW S3A to end of this Reporting Period (source: MSEC1368 Report 37 and MSEC1430 Report 5, Appendix A)

	MSEC1368 LW S2A Subsidence Monitoring Report 37		MSEC1430 LW S2A Subsidence Monitoring Report 5	
Monitoring Period	1 January 2024 to 10 May 2024		8 May 2024 to 30 June 2024	
Progress of extraction	LW S2A extraction completed.		LW S3A commenced on 8 May 2924 402 metres on 27 June 2024	
Observed Ground Movement Parameters	**Maximum Observed Total**	**Location**	**Maximum Observed Total**	**Location**
Subsidence (mm)	965	V-Line	908	GNSS S06 &GNSS S26
Tilt (mm/m)	9.0	Main Southern Railway	9.0	Main Southern Railway
Hogging Curvature (km^{-1})	0.19	Remembrance Drive	0.20	Remembrance Drive
Sagging Curvature (km^{-1})	-0.21	Remembrance Drive	-0.21	Remembrance Drive
Tensile Strain (mm/m)	1.2	V-Line	0.5	Main Southern Railway
Compressive Strain (mm/m)	-3.4	Remembrance Drive	-3.3	Remembrance Drive

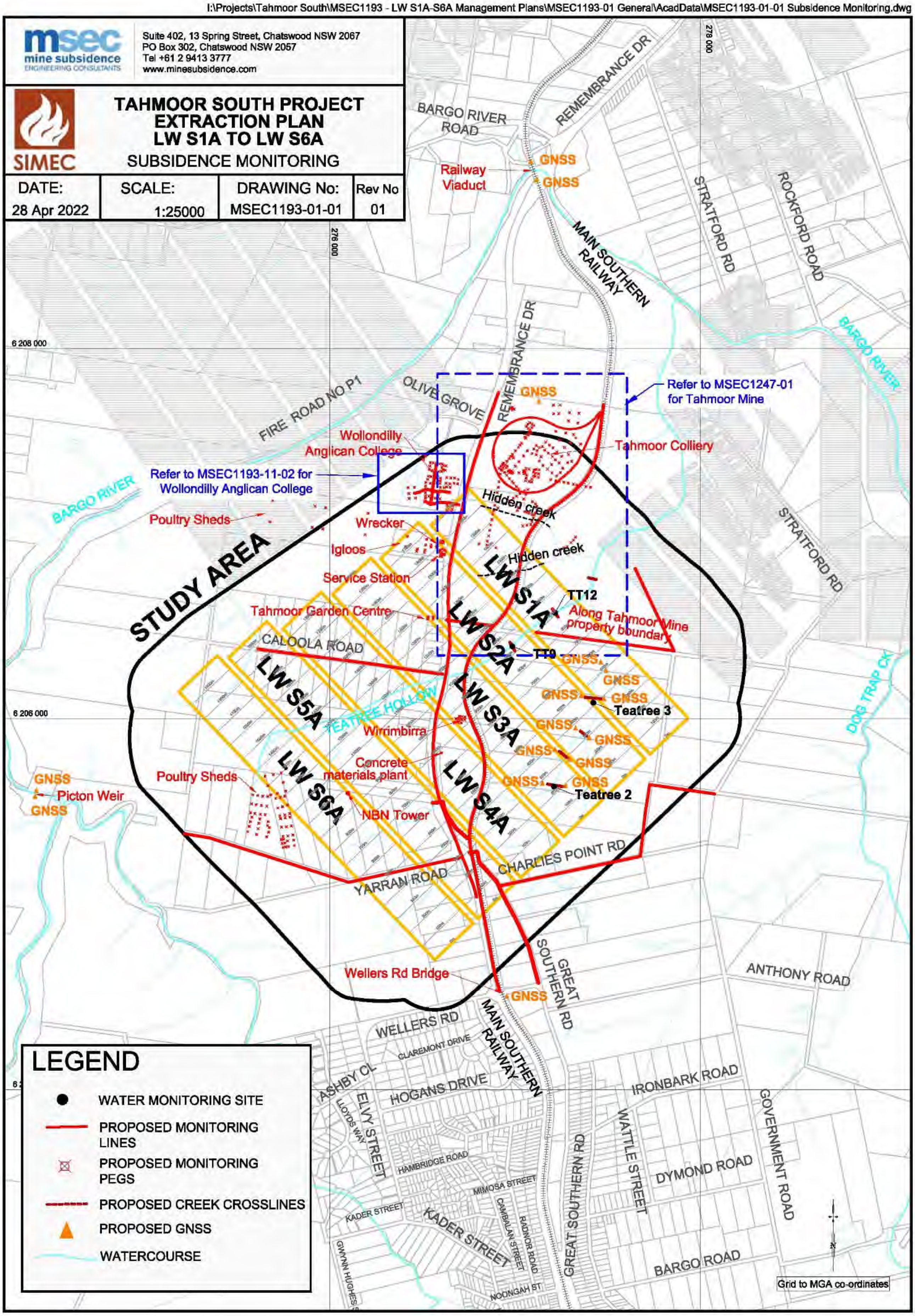

Figure 3-1 LW S1A-S6A Subsidence Monitoring Program (source: LW S1A-S6A Subsidence Monitoring Program)

3.1.1 Ground Survey Results

A summary of all surveys and inspections completed during the reporting period is provided in MSEC1368 LW S2A Subsidence Monitoring Report 37 and MSEC1430 LW S3A Subsidence Monitoring Report 5 (refer **Appendix A**). A weekly review of the subsidence survey results was completed by Tahmoor Coal and MSEC during the extraction period. A comparison between assessed and observed impacts to surface features is summarised in Table 1 of the MSEC1430 Subsidence Monitoring Report 5 (refer to **Appendix A**).

Survey results associated with built features are discussed in **Section 3.7**.

3.1.2 Tahmoor Mine Boundary Survey Line (V-Line)

The latest survey along the V-Line was conducted on 2 May 2024 during active subsidence from LW S2A. Rates of change have reduced to low levels.

3.1.3 GNSS Unit Results

The development of subsidence above LW S2A and LW S3A is illustrated in **Figure 3-2** and **Figure 3-3**, respectively.

Since the commencement of LW S2A, mining-induced movements showed development at the GNSS units, with maximum measured incremental subsidence of 896 mm at Site S26. Subsidence is increasing at Site S27 above LW S2A, but at a reduced magnitude at the equivalent stages of mining compared to GNSS S26. Rate of change are reducing at both sites. Subsidence observations above LW S2A are greater than observed above LW S1A because it is the second panel in the longwall series (MSEC1368 Subsidence Monitoring Report 37 (**Appendix A**)).

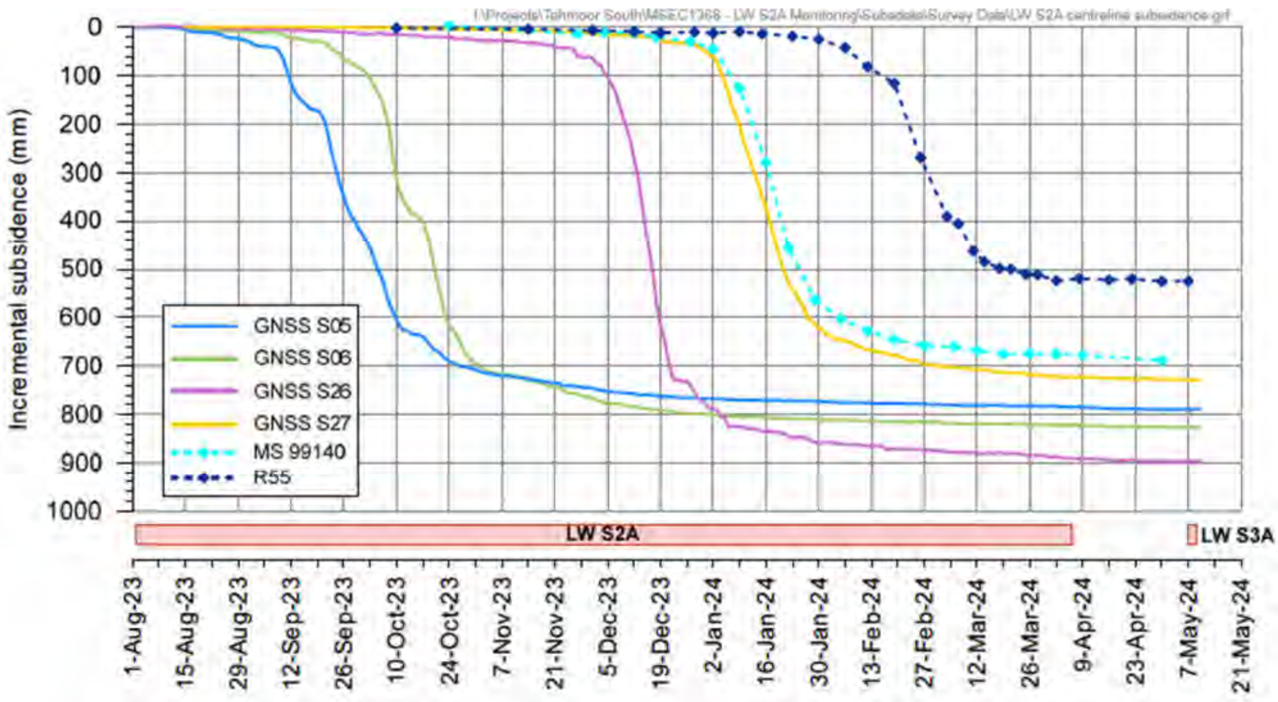

*Figure 3-2 Development of observed subsidence above LW S2A (source: MSEC1368 Subsidence Monitoring Report 37, **Appendix A**)*

Since the commencement of LW S3A, mining-induced movements have developed at the GNSS units, with maximum measured incremental subsidence of 533 mm at Site S10 above LW S3A. Rates of change continue at previously observed maximum rates. It was predicted that subsidence above LW S3A would be greater than observed above LW S2A because it is the third panel in the longwall series (MSEC1430 Subsidence Monitoring Report 5 (**Appendix A**)).

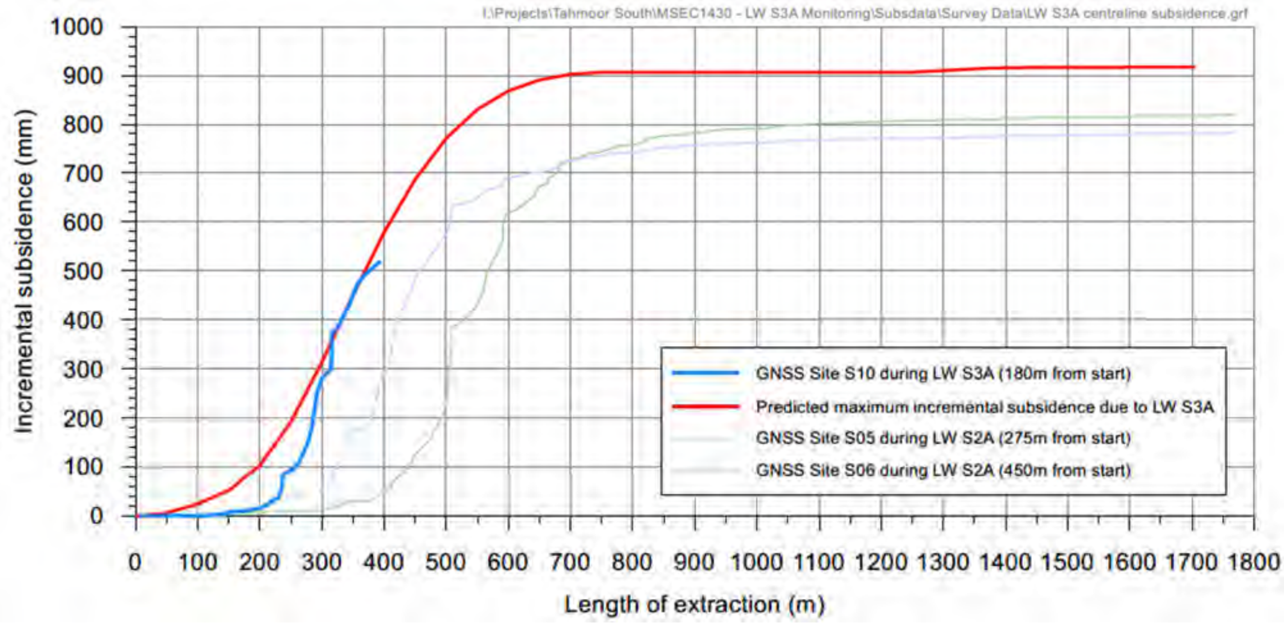

Figure 3-3 Development of observed subsidence above LW S3A (source: MSEC1430 Subsidence Monitoring Report 5, ***Appendix A****)*

During the extraction of LW S2A, changes in horizontal distances between paired GNSS units that are stationed close together on opposite sides of Teatree Hollow and Teatree Hollow Tributary (also known as 'Wirrimbirra Creek') are illustrated in **Figure 3-4**. The following trends have been observed since the commencement of LW S2A:

- Closure has developed across the Tributary to Teatree Hollow (Wirrimbirra Creek), particularly between Sites S07 and S08 directly above LW S2A;
- Closure has reduced between Sites S05 and S06, as previously observed between Sites S01 and S02 during the mining of LW S1A;
- Closure has reduced between Sites S03 and S04; and
- Closure has developed across Teatree Hollow between Sites S26 and S27 directly above LW S2A, and is now reducing.

During the extraction of LW S3A, changes in horizontal distances between paired GNSS units that are stationed close together on opposite sides of Teatree Hollow and Teatree Hollow Tributary (also known as 'Wirrimbirra Creek') are illustrated in **Figure 3-5**. Closure is currently developing across Wirrimbirra Creek between Sites S09 and S10 directly above LW S3A.

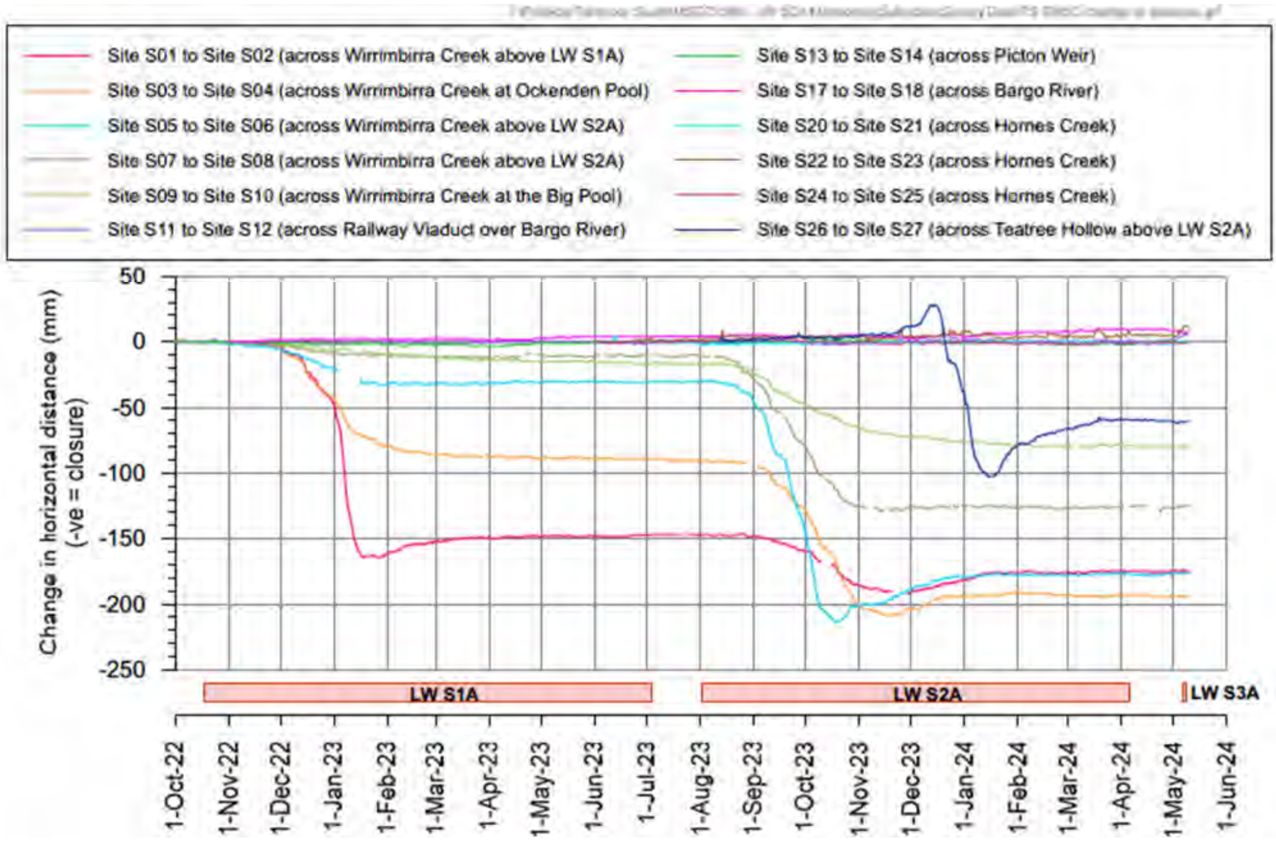

*Figure 3-4 Observed changes in horizontal distances between GNSS units during LW S2A extraction (source: MSEC1368 Subsidence Monitoring Report 37, **Appendix A**)*

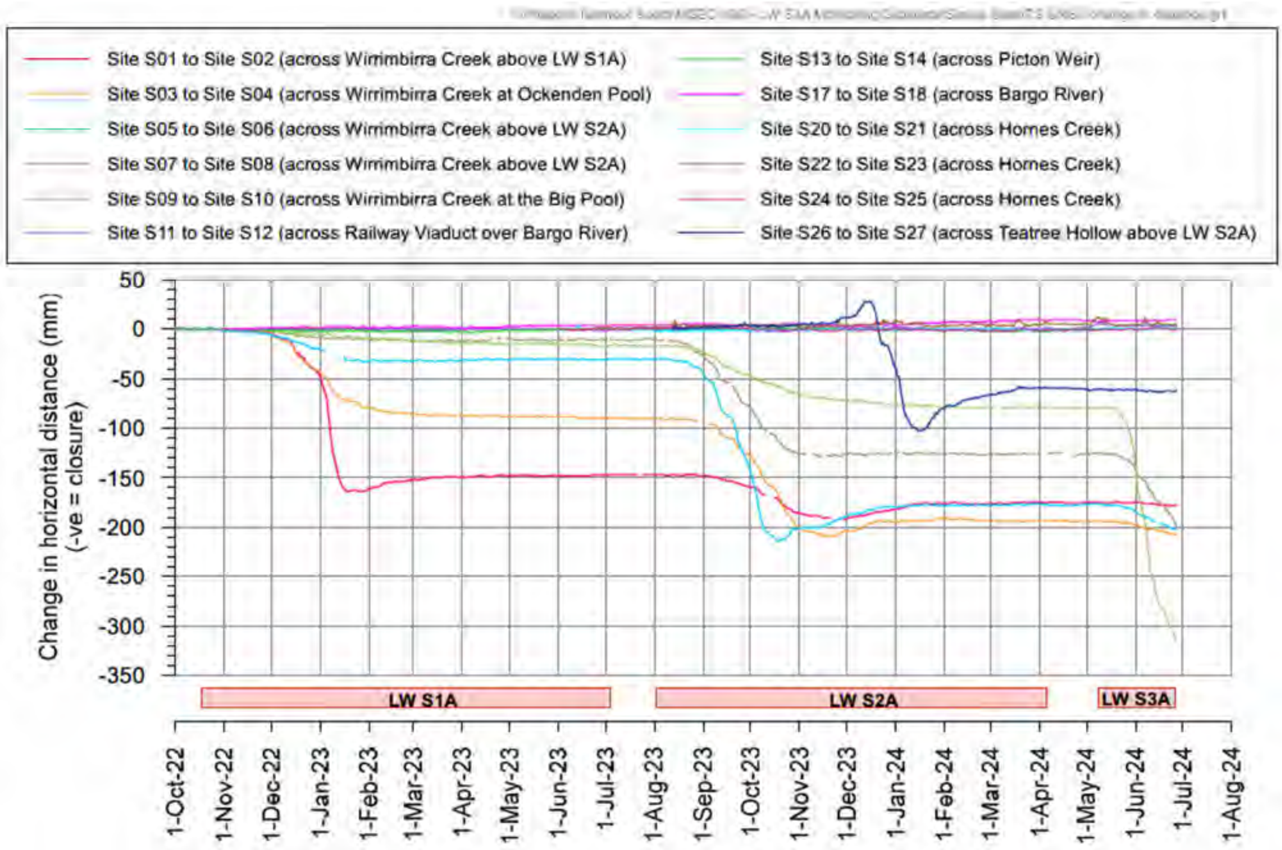

*Figure 3-5 Observed changes in horizontal distances between GNSS units during LW S3A extraction (source: MSEC1430 Subsidence Monitoring Report 5, **Appendix A**).*

3.2 Surface Water Monitoring

The LW S1A-S6A Water Management Plan was prepared to manage the potential environmental consequences of LW S1A-S6A extraction on surface water in accordance with Condition C8 of SSD 8445.

During this reporting period, the LW S1A-S6A Water Management Plan has been implemented to monitor surface water:

- Flow, pool water level and surface water quality monitored for Teatree Hollow, Teatree Hollow tributary ('Wirrimbirra Creek'), Bargo River, and Bargo River Tributary – monthly monitoring data reviewed by ATC Williams on a monthly basis, as well as a fortnightly basis for impacted sites (refer to **Appendix B**); and
- Creek monitoring for physical features and natural behaviour of pools, as well as channel stability, sedimentation and erosion – visual inspections and reporting by ENRS on a monthly basis (reports available on request, summarised in **Appendix B**).

The following sections summarise the observations made during the reporting period for each surface water category. Performance against all Surface Water Management Plan TARPs for the reporting period are summarised in **Table 2-1**, and actions and responses completed relating to any TARP triggers are discussed in the following sections.

3.2.1 Stream Water Quality

3.2.1.1 Overview of Monitoring Results

Surface water quality data has been recorded at the following sites (refer to **Figure 3-6**):

- Teatree Hollow:
  - o Reference site: TT1-QLa;
  - o Potential impact sites: TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa;
- Bargo River:
  - o Reference site: BR16-QLa; and
  - o Potential impact sites: BR12-QLa, BR13-QLa, BR17-QLa, BR18-QLa.

Water quality data consisted of constituents which are considered to be primary indicators of mining. These constituents include pH, electrical conductivity (EC), and specific dissolved metals (aluminium, copper, iron, manganese, nickel and zinc).

Charts illustrating water quality results for monitored pools in Teatree Hollow and Bargo River are presented in Appendix C of the Surface Water Monitoring Report (refer to **Appendix B**).

The water quality characteristics of monitoring sites following commencement of mining LW S2A and LW S3A have been largely consistent with baseline conditions and / or consistent with reference site conditions. During the reporting period, the following sites recorded elevated results of specific constituents:

- All sites:
  - o High concentrations of dissolved aluminium were recorded at all sites in May 2024;
- BR16-QLa:
  - o High concentration of dissolved copper in February 2024;
- TT1-QLa:
  - o Elevated concentration of dissolved iron in May 2024.

3.2.1.2 TARP WMP1 – Stream Water Quality for all Watercourses within the Subsidence Area

During this reporting period, there have been no triggers under this TARP.

3.2.1.3 TARP WMP2 – Stream Water Quality for other Watercourses (Bargo River and Hornes Creek)

During this reporting period, there have been no triggers under this TARP.

3.2.2 Pool Water Level

3.2.2.1 Overview of Monitoring Results

Surface water level data has been recorded at the pool monitoring sites on Teatree Hollow, Teatree Hollow Tributary (also known as Wirrimbirra Creek), Bargo River, and Bargo River Tributary as shown in **Figure 3-6**. Continuous surface water level data and manual monthly water level measurements have been recorded at seven monitoring sites on Teatree Hollow (and tributary) and six monitoring sites on Bargo River (and tributary).

Streamflow recorded from TT-F1 in Teatree Hollow indicate that streamflow is intermittent, with extended periods of no flow recorded prior to the commencement of mining of LW S1A. During the review period, flow occurred intermittently in response to rainfall. The rate of streamflow decline recorded during the review period is consistent with historical declines, including period prior to the commencement of mining of LW S1A.

During the reporting period, the following monitoring sites on Teatree Hollow and Bargo River (and their tributaries) observed a reduction below baseline minimum levels:

- Monitoring site TT1 – water level declined below the cease to flow level for short periods in early-March, consistent with below average rainfall conditions;
- Monitoring site TT2 – water level was recorded below the trigger level for a brief period in February 2024 and from mid-March to early April 2024;
- Monitoring site TT3 – during low rainfall periods, the water level declined to below the sensor level or the pool was dry;
- Monitoring site TT7 – water level declined below the trigger level for a brief period from late March to early April 2024;
- Monitoring site TT9 – water level declined below the trigger level for brief periods in February, March and April 2024;
- Monitoring site TT12 – water level was recorded below the sensor level or the pool was dry from January to early April 2024, except during rainfall events; and
- Monitoring site TT13 – water level was below the trigger level for periods of January, February, March, April and May 2024.

Cumulative rainfall indicates that during January and early April 2024, near average rainfall conditions were recorded. From middle April to June 2024, an increasing trend in rainfall was recorded. These rainfall patterns correlated to a rise in pool water level following the high rainfall events from early April 2024 onwards, which was largely sustained for the remainder of the review period.

Charts illustrating monitored pool water level hydrographs for pools on Teatree Hollow and Bargo River (and their tributaries) are presented in the Surface Water Monitoring Report (refer to **Appendix B**).

3.2.2.2 TARP WMP3 - Pool Water Level for all Watercourses within the Subsidence Area

Background

During the reporting period, a number of TARP triggers for pool water level occurred as summarised below:

- Monitoring site TT2: Level 1 TARP triggered in February 2024, and Level 2 TARP triggered from March to April 2024;

- Monitoring site TT3: Level 2 TARP triggered in various periods in January to June 2024, and Level 3 TARP triggered between February and April 2024;
- Monitoring site TT7: Level 1 TARP triggered from March to April 2024;
- Monitoring site TT9: Level 1 TARP triggered in February 2024, and Level 2 TARP triggered from March to April 2024;
- Monitoring site TT12: Level 2 TARP triggered in various periods from January to May 2024, and Level 3 TARP triggered from March to April 2024; and
- Monitoring site TT13: Level 2 TARP triggered in various periods from January to May 2024.

Further discussion of these triggers, including confirmation of direct and indirect mining impacts, is provided in **Section 3.2.3.1,** as well as the Surface Water Report (refer **Appendix B**) for this reporting period. In summary from **Section 3.2.3.1**, it is considered that the water level decline recorded at these monitoring sites during the review period is related to mining effects in combination with the prevailing climatic conditions.

Actions and Responses Completed

Table 3-3 outlines the actions and responses that are required to be completed in accordance with Level 1, 2 and 3 TARP triggers for pool water level (TARP WMP3), as well as how these actions and responses have been addressed.

Table 3-2 Actions and Responses for Level 1, 2 and 3 TARP Triggers for Pool Water Level Reduction (TARP WMP3)

Action / Responses from TARP WMP3	Tahmoor Coal response
Actions	
Level 1, 2 and 3 trigger Continue monitoring and review of data as per monitoring program.	Monthly (or more frequent) monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 trigger Review water level trends along watercourse (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer Section 6 of **Appendix B**).
Level 1, 2 and 3 trigger Review streamflow data recorded at TT-F1 and conduct streamflow reduction assessment.	Streamflow data recorded at TT-F1 was reviewed and streamflow reduction assessment conducted (refer Section 5.3 and Section 6.2 of **Appendix B**). The streamflow assessment indicated that streamflow trends recorded at monitoring site TT-F1 in Teatree Hollow have been consistent with rainfall trends for the duration of the review period. It is also considered that the rate of streamflow decline recorded during the review period is consistent with historical declines, including periods prior to the commencement of mining of LW S1A.
Level 1, 2 and 3 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, groundwater level monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer **Appendix B**).
Level 2 and 3 trigger Consider increasing monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows:	Causation (combination of mining effects and prevailing climatic conditions) was identified for the Level 2 and 3 triggers equated for TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa and TT13-QLa. For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency occurs on a fortnightly basis as real-time

Action / Responses from TARP WMP3	Tahmoor Coal response
• Fortnightly, for sites within the active subsidence zone. • Monthly, out of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g. singular, anthropogenic, non-mining related change or confirmed as a mining-related impact that resulted in a water level change).	telemetry data is available for these sites. The monitoring frequency was not increased for TT7-QLa, TT9-QLa, TT12-QLa andTT13-QLa as causation has been confidently identified.
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water level trends along creek (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer Section 6 of **Appendix B**).
Level 2 and 3 trigger Review Water Management Plan and modify if necessary.	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 3 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at sites where Level 3 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	Causation was identified for the Level 3 triggers equated for TT3-QLa and TT12-QLa (related to subsidence induced fracturing and the prevailing climate, refer Section 7.3.2 of **Appendix B**). As such, the monitoring frequency was not increased.
Level 3 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing), other catchment changes, effect unrelated to mining or the prevailing climate.	A detailed investigation was undertaken to assess if the change in behaviour at is related to mining effects (refer Section 6 of **Appendix B**). Direct and indirect impacts from mining have been confirmed at the pools in question, as summarised in **Table 3-4**.
Responses	
Level 1, 2 and 3 trigger Report trigger exceedance to DPHI and key stakeholders	Trigger exceedance during the reporting period were notified to DPHI on 19 June 2024 (triggers for the January to March 2024 period). Notification to NRAR was required as part of the conditions of the Enforceable Undertaking (in force from 24 July 2023). Tahmoor Colliery Community Consultative Committee was advised of water level triggers on 6 June 2024 and 5 September 2024. Future meetings will include further notification of additional TARP triggers.
Level 1, 2 and 3 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report.
Level 2 and 3 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.

Action / Responses from TARP WMP3	Tahmoor Coal response
Level 3 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Offer site visit with DPHI and other key stakeholders. • Develop Watercourse Corrective Action Management Plan (WCAMP) in consultation with the Resources Regulator, DPHI and other key stakeholders (in accordance with C12 of SSD 8445). The stream remediation measures in the WCAMP could include grout curtain and grout pattern injection. • Implement approved WCAMP, subject to land access.	A site visit was offered to DPIE and NRAR in relation to Level 3 TARP triggers of TARPs WMP3 and WMP5. This offer was extended via letter dated 10 November 2023. A site visit was also offered to National Trust and Australian Wildlife Sanctuary and took place on 22 November 2023. In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared (if required) for watercourses damaged by subsidence impacts in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented (if required) at the cessation of subsidence movements associated with Tahmoor South mining.

Proposed Actions and Responses

From the review of actions and responses (as discussed in **Table 3-3**), the following remain outstanding:

- Preparation of a WCAMP (if required) to address damage to watercourses will be prepared and implemented following the cessation of subsidence movements associated with Tahmoor South mining.

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 DPHI by 31 March 2025.

3.2.2.3 TARP WMP4 – Pool Water Level for other Watercourses (Bargo River and Hornes Creek)

During this reporting period, there have been no triggers under this TARP.

3.2.3 Physical Features and Natural Behaviour

3.2.3.1 Overview of Monitoring Results

Visual and photographic surveys for subsidence impacts on creeks have been completed monthly for monitoring pools and reaches in Teatree Hollow and Teatree Hollow tributary within the active subsidence zone of LW S2A and LW S3A.

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, 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 3-7**.

During this reporting period, there were numerous observed occurrences of impacts to pool water level, overland connected flow and observations of iron staining, turbidity and fracturing. These observations are summarised below:

- Pool TT1 (reference site):
  - Water level decline was observed in late March, with trickle flow over the hydraulic control;
  - Moderate turbidity was noted during the review period;
- Pool TT2:

- Water level was visually lower than baseline conditions in February and March 2024;
  - A fractured boulder (first observed in July 2023) was noted to have been washed away in April 2024;
  - A new fracture of approximately 6 m in length was observed upstream of the pool in June 2024;
  - Turbidity was reported as moderate between January and April. In May and June, turbidity was noted as high;
- Pool TT3:
  - The pool was observed as dry from January to March, with no connective surface flow observations from TT2 to TT3;
  - High turbidity was noted in May and June 2024;
- Pool TT7:
  - A decline in water level was observed in March 2024;
  - Iron staining at the upstream reach of the pool was noted in January 2024;
  - Moderate turbidity was observed during the review period;
- Pool TT9:
  - A decline in water level was observed in February and March 2024;
  - Moderate turbidity was observed in January to March 2024;
- Pool TT10:
  - Minor turbidity was observed for most of the review period, increasing to moderate in May and June 2024;
- Pool TT11:
  - The pool was observed as dry from January to March 2024;
  - High turbidity was noted in May and June 2024;
- Pool TT12:
  - A decline in water level was observed in January with no flow over the hydraulic control. The pool was observed as dry in mid-February, with isolated puddles noted in late February, and again dry in March 2024;
  - Iron staining was observed, consistent with that observed in the previous reporting period;
  - Moderate to high turbidity was observed in May and June 2024;
- Pool TT13:
  - A decline in water level was observed in January to March 2024, with no flow over the hydraulic control;
  - Moderate turbidity was observed during the reporting period;
- Pool TT15:
  - Moderate turbidity was noted during the reporting period.

It was noted that following above average rainfall from early April onwards, the water level at all pools rose and were noted to be higher than baseline conditions in May 2024 onwards.

Figure 3-8 demonstrates the location of flow re-emergence, fracturing, ponded water, iron staining and overland flow observed at the end of the reporting period (June 2024).

A summary of mining related impacts to pools and stream reaches as a result of mining of LW S2A and LW S3A is provided in **Table 3-4** below. It is noted that the LW S2A and LW S3A mining related impacts to the watercourse features listed in the **Table 3-4** are consistent with that predicted in the Tahmoor South Project Environmental Impact Statement, and no greater impact than that predicted in the EIS has occurred to watercourses within the Subsidence Area.

*Table 3-3 Summary of mining related impacts to watercourse features (source: ATC Williams, 2024; **Appendix B**)*

Watercourse Feature	Impact Feature	Impact Type
Pool TT2	• Pool water level • Physical (fractures)	Direct mining impact
Pool TT3	• Pool water level	Indirect mining impact
Pool TT7	• Pool water level	Indirect mining impact
Pool TT9	• Pool water level	Indirect mining impact
Pool TT11	• Pool water level	Indirect mining impact
Pool TT12	• Pool water level • Physical (fractures) • Iron staining	Direct mining impact
Pool TT13	• Pool water level	Indirect mining impact
Knickpoint K64	• Physical (erosion)	Direct mining impact

Direct and indirect mining impacts, in the form of surface fracturing and associated flow diversion, have occurred at several locations in Teatree Hollow and Teatree Hollow tributary, upstream of monitoring site TT-F1. During the review period, the reduction in surface flow recorded at TT-F1 was generally consistent with natural (climatic) variability. As such, there is no indication of material environmental harm to Teatree Hollow or other watercourses caused by mining activities (**Appendix B**).

Pools TT2, TT10 and TT15

At pool TT2 (Big Pool), an increase in closure by approximately 320 mm was recorded from late May to the end of June 2024. In June 2024, a new fracture of approximately 6 m long was observed approximately 12 m upstream of pool TT2 (**Appendix B**).

The water level decline, particularly between March and April recorded at pool TT2, is considered atypical and inconsistent with historical conditions. In addition, fracturing has been recorded at and upstream of pool TT2, indicating that mining related effects have occurred in the direct vicinity of pool TT2. As such, it is considered that the water level decline recorded at pool TT2 during the review period is related to mining effects in combination with the prevailing climatic conditions (**Appendix B**).

At pools TT10 and TT15, which are located on a minor tributary which discharges to Teatree Hollow tributary immediately upstream of pool TT2, no fractures have been observed. In January, connective flow upstream of pool TT10 was noted to cease. However, water levels at pools TT10 and TT15 were reported as consistent at pools TT10 and TT15 during the reporting period (**Appendix B**).

Pools TT3 and TT11

Pool TT3 and pool TT11 were reported as dry during the visual inspections conducted from January to March 2024. The water level rose from April to June in response to rainfall. As the likelihood of groundwater-surface water connectivity in the vicinity of these pools is considered low, the decline in water level recorded at pool TT3 is unlikely related to a decline in baseflow contributions. The decline in water level at pool TT3 is considered atypical and inconsistent with historical conditions. A diversion of surface flow via upstream mining-related fractures is considered to be related to the observed water level decline (**Appendix B**).

Closure development generally stabilised in the vicinity of pool TT3 from January to late May 2024. From late May to end of June 2024, a further 10 mm (approximately) of closure was recorded. No new fracturing or development of historical fractures (located upstream of pools TT3 and TT11) were recorded at pools TT3 and TT11 during the review period (**Appendix B**).

Pool TT7

Water level recorded at pool TT7 during the review period was generally consistent with climatic conditions and fluctuated in response to rainfall trend. A decline in water level at pool TT7 from late March to early April 2024 was predominately related to the prevailing climatic conditions. However, mine induced fracturing located upstream of pool TT7 has likely resulted in a change in surface flow behaviour in the vicinity of pool TT7 (**Appendix B**).

Pool TT9

Water level at pool TT9 fluctuated in response to rainfall conditions during the review period. On 14 March 2024, the pool was visually observed as dry. Following rainfall events from early April 2024, the water level rose for the remainder of the review period (**Appendix B**).

The water level data recorded at pool TT9 during the review period indicates a change in water level behaviour and an increase in the rate of water level recession in comparison to historical conditions. Accordingly, it is considered that the decline in water level recorded at pool TT9 during the review period is related to the prevailing climatic conditions in addition to mining effects (**Appendix B**).

Pool TT12

From January to early April 2024, the water level was recorded below the sensor level or the pool was dry, except for very brief periods during rainfall events. Following above average rainfall from early April 2024, the water level rose and remained above the sensor level for the remainder of the review period (**Appendix B**).

Mining-related fracturing has previously occurred upstream and downstream of pool TT12. During the review period, no new fractures or further development of existing fractures was reported. Notwithstanding, the decline in water level recorded during the review period is considered atypical and related to mining induced fracturing (previously recorded) in combination with the prevailing climatic conditions (**Appendix B**).

Pool TT13

The water level at pool TT13 declined intermittently for periods from January to June 2024 in response to below average rainfall. However, these declines in water level are considered atypical in comparison to baseline conditions. Groundwater-surface water connectivity in the vicinity of pool TT13 is considered to be low and the decline in water level is unlikely to be related to a decline in baseflow contribution. The declines in water level are considered related to the cessation of surface water flow in Teatree Hollow tributary due to mining induced fracturing upstream of pool TT11 in combination with the prevailing climatic conditions (**Appendix B**).

3.2.3.2 TARP WMP5 – Physical Features and Natural Behaviour of Watercourses within the Subsidence Area

Background

During the reporting period, a number of TARP triggers for physical features and natural behaviour of watercourses occurred as summarised below:

- Pool TT2: Level 3 triggered for the entire reporting period;
- Pool TT3: Level 3 triggered for the entire reporting period;
- Pool TT11: Level 3 triggered in January, February, March, May and June of the reporting period;
- Pool TT12: Level 3 triggered in January, February, March, May and June of the reporting period; and
- Pool TT13: Level 1 triggered in February 2024, and Level 2 triggered in March 2024.

Further discussion of these triggers, including confirmation of direct and indirect mining impacts, is provided in **Section 3.2.3.1**, as well as the Surface Water Report (refer **Appendix B**) for this reporting period.

Actions and Responses Completed

Table 3-5 outlines the actions and responses that are required to be completed in accordance with Level 1, 2 and 3 TARP triggers for physical features and natural behaviour (TARP WMP5), as well as how these actions and responses have been addressed.

Table 3-4 Actions and Responses for Level 1, 2 and 3 TARP Triggers for Physical Features and Natural Behaviour of Watercourses (TARP WMP5)

Action / Responses from TARP WMP5	Tahmoor Coal response
Actions	
Level 1, 2 and 3 trigger Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 trigger Assess visual change along watercourse (upstream to downstream) to observe any spatial changes with consideration to climatic conditions.	Visual changes along watercourse were reviewed with consideration to climatic conditions (refer Section 6 of **Appendix B**).
Level 1, 2 and 3 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water monitoring results, groundwater monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer to **Appendix B**).
Level 2 and 3 trigger Consider increasing monitoring and review of data frequency to fortnightly at sites where Level 1 has been reached and at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g., surface fracturing of weathered bedrock that does not affect water holding capacity of rockbar control or pool base or confirmed as a mining-related impact)	Monitoring and review of data frequency was not increased at pools TT2, TT3, TT11, TT12 and TT13.
Level 2 and 3 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing other catchment changes, effect unrelated to mining or the prevailing climate).	A detailed investigation was undertaken to assess if the change in behaviour at is related to mining effects (refer Section 6 of **Appendix B**). Direct and indirect impacts from mining have been confirmed at the pools in question, as summarised in **Table 3-4**.
Level 2 and 3 trigger Review Water management Plan and modify if necessary.	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.

Action / Responses from TARP WMP5	Tahmoor Coal response
Level 2 and 3 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	Monitoring and review of data frequency was not increased at pools TT2, TT3, TT11, TT12 and TT13 as mining impacts were confirmed.
Responses	
Level 1, 2 and 3 trigger Report trigger exceedance to DPHI and key stakeholders	Trigger exceedance during the reporting period were notified to DPHI on 19 June 2024 (triggers for the January to March 2024 period). Notification to NRAR was required as part of the conditions of the Enforceable Undertaking (in force from 24 July 2023). Tahmoor Colliery Community Consultative Committee was advised of water level triggers on 6 June 2024 and 5 September 2024. Future meetings will include further notification of additional TARP triggers.
Level 1, 2 and 3 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report.
Level 2 and 3 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 3 trigger Offer site visit with DPHI and other key stakeholders.	A site visit was offered to DPIE and NRAR in relation to Level 3 TARP triggers of TARPs WMP3 and WMP5. This offer was extended via letter dated 10 November 2023. A site visit was also offered to National Trust and Australian Wildlife Sanctuary, and took place on 22 November 2023.
Level 3 trigger Develop Watercourse Corrective Action Management Plan (WCAMP) in consultation with the Resources Regulator, DPHI and other key stakeholders (in accordance with C12 of SSD 8445). The stream remediation measures in the WCAMP could include grout curtain and grout pattern injection.	In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared (if required) for watercourses damaged by subsidence impacts in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented (if required) at the cessation of subsidence movements associated with Tahmoor South mining.
Level 3 trigger Implement approved WCAMP, subject to land access.	Refer to response above.

Proposed Actions and Responses

From the review of actions and responses (as discussed in **Table 3-5**), the following actions and responses remain outstanding:

- Preparation of a WCAMP (if required) to address damage to watercourses will be prepared and implemented following the cessation of subsidence movements associated with Tahmoor South mining.

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 DPHI by 31 March 2025.

3.2.3.3 TARP WMP6 – Physical Features and Natural Behaviour of Pools for Other Watercourses (Bargo River and Hornes Creek)

During this reporting period, there have been no triggers under this TARP.

3.2.4 Channel Stability, Sedimentation and Erosion

3.2.4.1 Overview of Monitoring Results

Visual and photographic surveys for subsidence impacts on creeks have been completed monthly for morphology and channel stability monitoring site in Teatree Hollow and Teatree Hollow tributary within the active subsidence zone of LW S1A, with the exception of headwater sites which are completed on an annual basis.

The purpose of these surveys is to note whether change has occurred to channel stability, erosion and 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 and channel morphology. In addition, annual visual inspections are conducted at headwater sites to characterise erosion and sedimentation.

Creek monitoring locations for channel stability, sedimentation and erosion are illustrated on **Figure 3-9**.

Visual inspections observations recorded during active mining have been compared to the baseline visual inspection records from September 2022 (headwater sites) and October 2022 (channel morphology sites and knickpoints).

During the reporting period, knickpoint site K57 was observed to develop minor erosion in May and June 2024 in comparison to baseline conditions. This erosion was considered to be related to elevated water flow following high rainfall in April 2024 (refer **Appendix B**).

At knickpoint site K64, minor erosion development was observed in May 2024 with progression to moderate erosion in June 2024, in comparison to baseline conditions. During the same period, some bank slipping and slumping was also noted. High rainfall / flow events occurred during this period, in addition to direct impacts from undermining of knickpoint site K64. Undermining at pool TT2, located downstream of K64, was reported to result in incremental subsidence of 533 mm during this reporting period. Changes at this site are considered to be associated with high rainfall / flow events in combination with mining-induced subsidence (refer **Appendix B**).

3.2.4.2 TARP WMP7 – Channel Stability, Sedimentation and Erosion

Background

During the reporting period, a number of TARP triggers channel stability, sedimentation and erosion occurred, as summarised below:

- Knickpoint Site K57: Level 1 TARP triggered in May 2024; and
- Knickpoint Site K64: Level 1 TARP triggered in May 2024, and Level 2 TARP triggered in June 2024.

Further discussion of these triggers, including confirmation of direct and indirect mining impacts, is provided in **Section 3.2.4.1**, as well as the Surface Water Report (refer **Appendix B**) for this reporting period.

Actions and Responses Completed

Table 3-5 outlines the actions and responses that are required to be completed in accordance with Level 1 and 2 TARP triggers for channel stability, sedimentation and erosion (TARP WMP7), as well as how these actions and responses have been addressed.

Table 3-5 Actions and Responses for Level 1 and 2 TARP Triggers for Channel Stability, Sedimentation and Erosion (TARP WMP7)

Action / Responses from TARP WMP7	Tahmoor Coal Response
Actions	
Level 1 and 2 trigger Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1 and 2 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, biodiversity monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer to **Appendix B**).
Level 1 and 2 trigger Consider increasing monitoring and review of data frequency at sites where Level 1 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g. singular, anthropogenic, non-mining related change or confirmed as a mining-related impact that resulted in increased erosion).	Monitoring and review of data frequency has not been increased in frequency as the causation of the erosion at the knickpoint sites K57 and K64 was considered to be understood (elevated water flow for K57, and a combination of elevated water flow and subsidence impacts for K64).
Level 1 and 2 trigger Consider and decide on reasonable and feasible options for remediation as relevant (e.g. enhanced vegetation establishment, rock armouring).	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	Monitoring and review of data frequency has not been increased in frequency as the causation of the erosion at the knickpoint site K64 is understood to be partially due to mining. Monitoring as per the monitoring program and after large rainfall events will continue at K64 to assess if remediation actions are required.
Level 2 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. subsidence induced, other catchment changes, effects unrelated to mining or the prevailing climate).	A detailed investigation was undertaken to assess if the change in behaviour at K64 is related to mining effects (refer Section 6 of **Appendix B**). Direct impacts from mining were confirmed for K64.
Level 2 trigger Obtain specialist advice on further CMAs.	Advice was obtained by specialists, as detailed in Section 6.3 and 9 of **Appendix B**.

Action / Responses from TARP WMP7	Tahmoor Coal Response
Level 2 trigger Review CMAs in light of findings from further investigations and consider additional remediation options.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger Review Water Management Plan and modify if necessary.	There are no proposed changes to the Water Management Plan in light of the Level 2 TARP trigger at K64.
Responses	
Level 1 and 2 trigger Report trigger exceedance to DPHI and key stakeholders	Completed as part of this report.
Level 1 and 2 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	Completed as part of this report.
Level 1 and 2 trigger Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for approval (e.g. enhanced vegetation establishment, rock armouring).	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 1 and 2 trigger Implement CMAs, subject to land access.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 1 and 2 trigger Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	There are no proposed changes to the Water Management Plan in light of the Level 2 TARP trigger at K64.
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Offer site visit with DPHI and other key stakeholders.	A site visit to knickpoint site K64 will be offered to DPHI and other key stakeholders in relation to subsidence impacts in the vicinity of K64.
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Provide findings of CMA review to DPHI and key stakeholders for consultation.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts:	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.

Action / Responses from TARP WMP7	Tahmoor Coal Response
• Implement additional CMAs, subject to land access.	

Proposed Actions and Responses

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 DPHI by 31 March 2025.

3.2.5 Recommendations and Actions for Surface Water

3.2.5.1 Current Surface Water Monitoring Recommendations

Based on the assessment outcomes discussed in the Surface Water Review for January to June 2024 (**Appendix B**), ATC Williams recommended that ongoing review of surface monitoring data is continued to be undertaken 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 DPHI by 31 March 2025.

It was also recommended that knickpoint site K64 continue to be monitored to assess whether remedial work is necessary. This ongoing monitoring will be undertaken in accordance with the existing LW S1A-S6A Water Management Plan and visual inspections following large rainfall events during the extraction of LW S4A and LW S5A to assist in confirming the extent and longevity of impacts. The requirement for remediation works at K64 would subsequently be assessed at this time.

In accordance with C12 of SSD 8445 and as detailed in the LW S1A-S6A Water Management Plan, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining.

3.2.5.2 Previous Surface Water Monitoring Recommendations

The recommendation made in the previous Six Monthly Subsidence Impact Report (July to December 2023, submitted in March 2024) for surface water, along with an update on the progress of this recommendation, is provided below:

- *Ongoing review of surface monitoring data is continued to be undertaken in accordance with the LW S1A-S6A Water Management Plan* – Since mining commencement in October 2022, review of surface monitoring data has been undertaken in accordance with the WMP; and
- *Removal of the potential impact site CM3 from the monitoring program due to works associated with the railway corridor resulting in non-mining anthropogenic changes to the natural features of the channel at this location* – The site has been removed from the monitoring program.

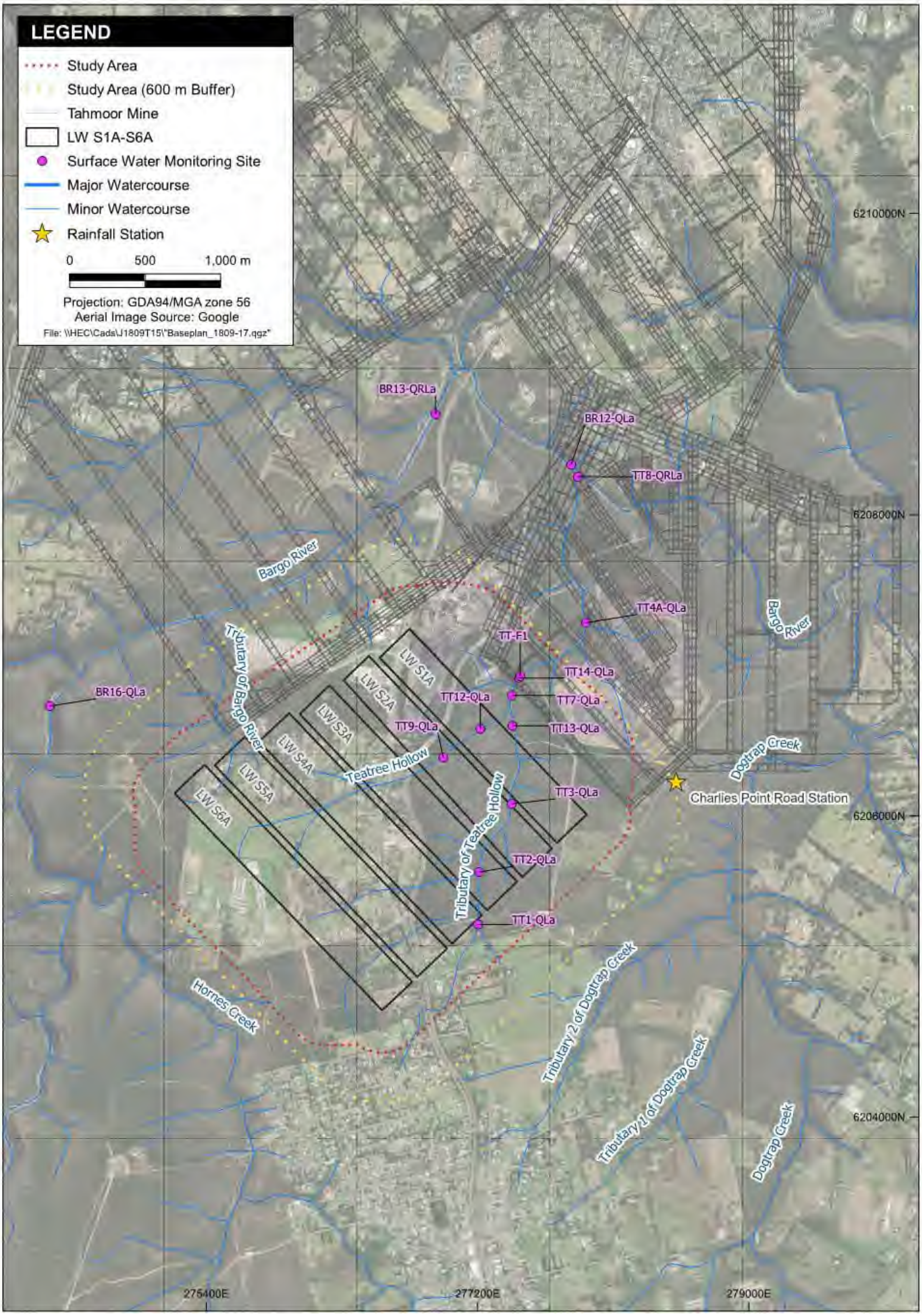

Figure 3-6 LW S1A-S6A Surface Water Monitoring Sites Specific to LW S1A-S6A (source: ATC Williams, 2024; ***Appendix B****)*

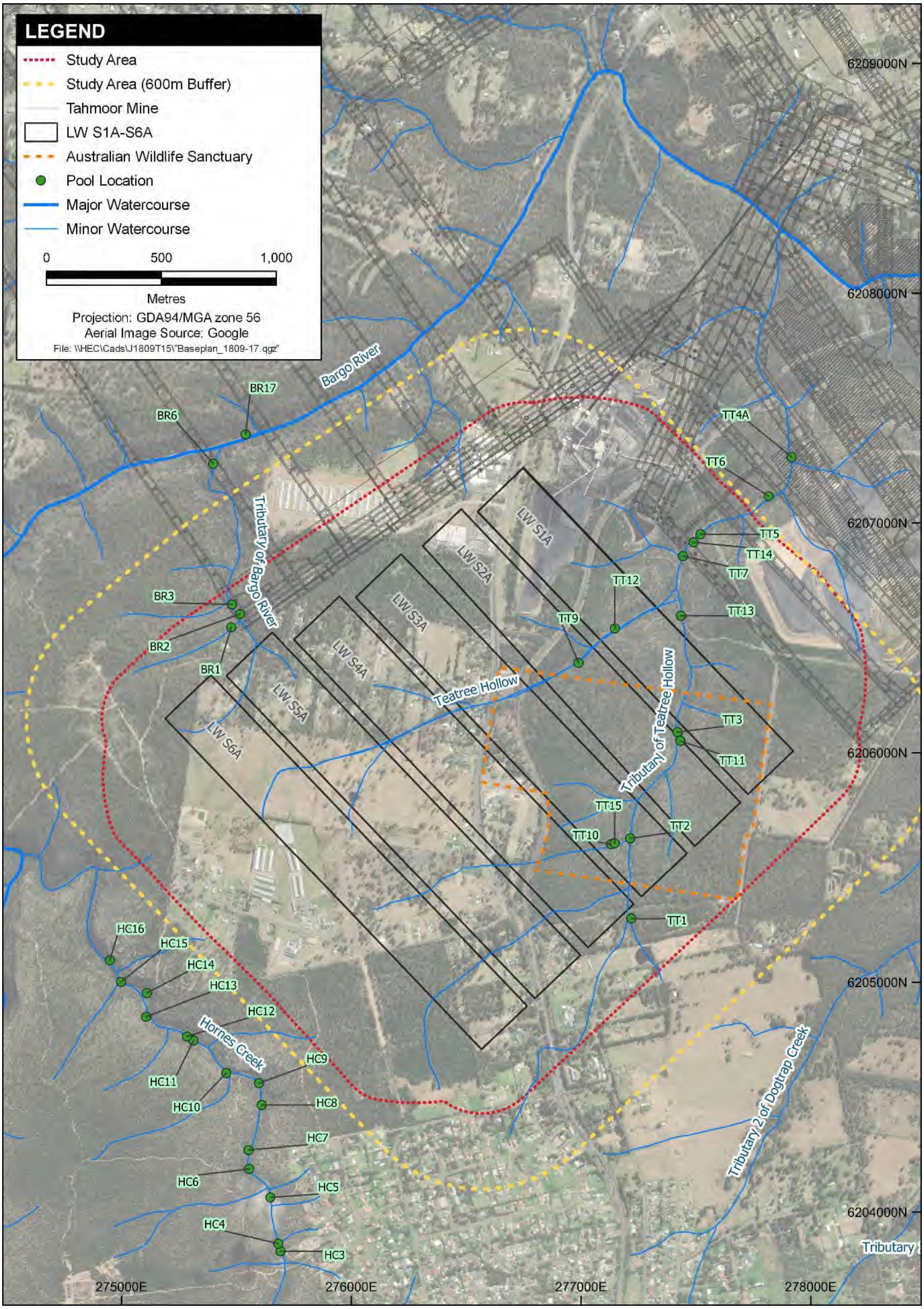

Figure 3-7 LW S1A-S6A Pool Visual Inspection Sites (source: LW S1A-S6A Water Management Plan)

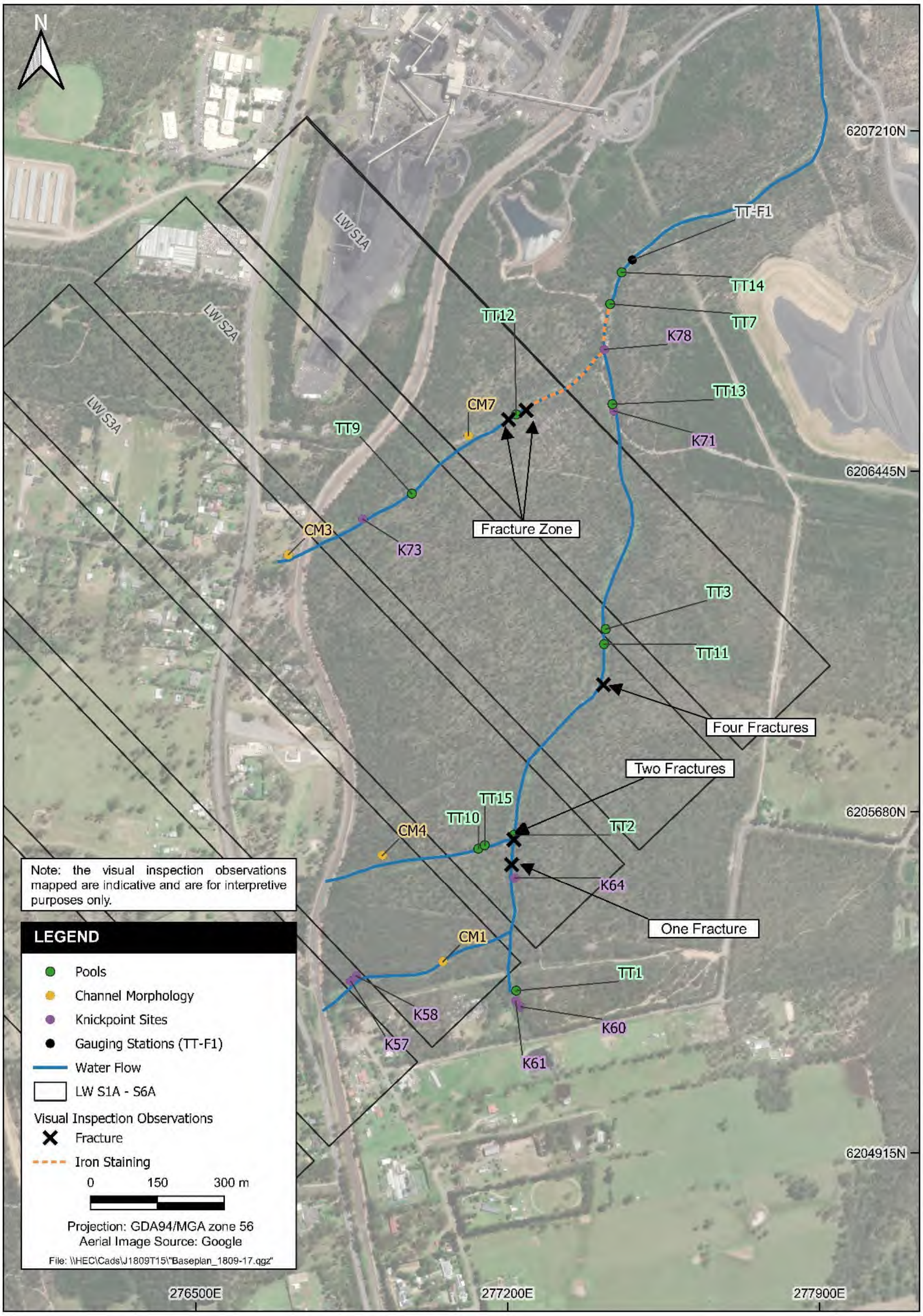

*Figure 3-8 Visual depiction of surface water characteristics and physical effects in June 2024 (source: **Appendix B**)*

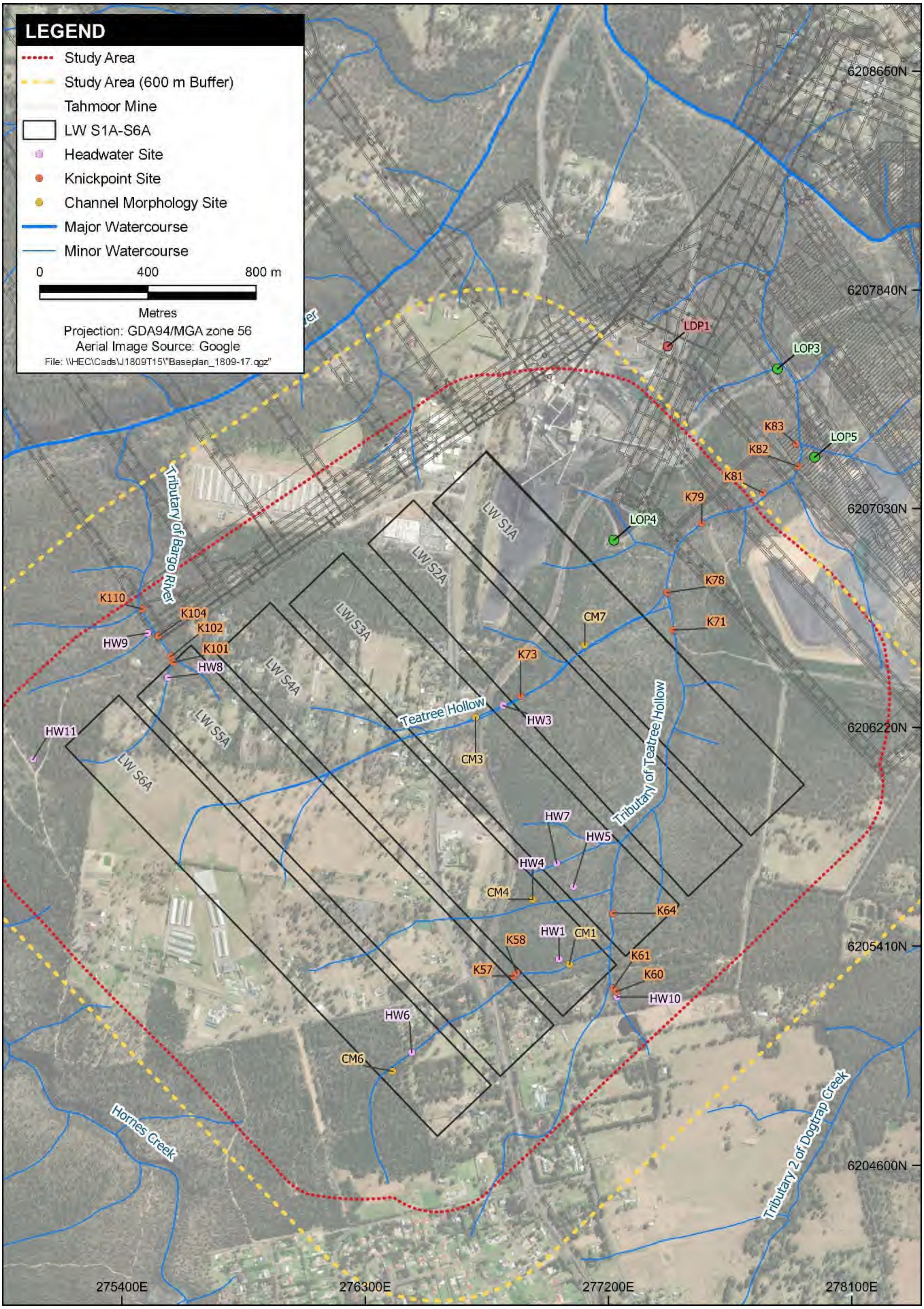

Figure 3-9 LW S1A-S6A Morphology and Channel Stability Monitoring Sites (source: LW S1A-S6A Water Management Plan)

3.3 Groundwater Monitoring

The LW S1A-S6A Water Management Plan was prepared to manage the potential environmental consequences of LW S1A-S6A extraction on groundwater in accordance with Condition C8 of SSD 8445.

During this reporting period, the LW S1A-S6A Water Management Plan has been implemented to monitor groundwater:

- Shallow groundwater levels, quality and pressures, and deep groundwater levels / pressures – monthly monitoring data reviewed by SLR on a monthly basis (SLR, 2024; refer to **Appendix C**); and
- Mine water intake – data for this reporting period reviewed and reported by SLR (SLR, 2024; refer to **Appendix C**).

The following sections summarise the observations made during the reporting period for each groundwater category. Performance against all Groundwater Management Plan TARPs for the reporting period are summarised in **Table 2-1**, and actions and responses completed relating to any TARP triggers are discussed in the following sections.

3.3.1 Groundwater Bore Levels

3.3.1.1 Overview of Monitoring Results

The Tahmoor South Monitoring Network comprises both open standpipes (OSP) and Vibrating Wire Piezometers (VWPs). The standpipe piezometers can be used for monitoring water levels manually or with an automated datalogger, as well as for collection of water samples for groundwater quality monitoring purposes. The VWPs are grouted and therefore can only be used for monitoring groundwater pressures, but do allow for multiple instruments to be installed at different depths within a single borehole. The locations of groundwater monitoring bores is provided in **Figure 3-10**.

Further detail on groundwater level results, including graphs showing progressive groundwater levels, are provided in the SLR Groundwater Monitoring Report (refer to SLR, 2024; **Appendix C**).

Shallow OSPs bores

Groundwater depressurisation has been observed in a series of shallow monitoring bores, primarily notable at P53 and P55 (SLR, 2024).

At P51B, the decline of water level was noted to potentially be in response to extraction, however further investigation is required. The bore was indicated to be responsive to climatic changes as it returned to normal water level after the large rainfall events from April 2024 onwards. In addition, the bore is located at the end of LW S5A, and is unlikely to be directly impacted by mining at this point in time (SLR, 2024).

At the P53 nested bores, which are located to the north of LW S1A, all three groundwater levels displayed similar temporal trends. A decline in water level was observed to occur around April to May 2024, with relatively stable groundwater levels observed since. Given the locality of the three bores to LW S1A and the consistent reduction in water level in all three bores, it is likely that the drawdown is due to extraction activities. Subsidence and groundwater level profiles over time show similar trends, with a short period of relatively rapid decline following by stabilisation. There is potential some recovery has started to occur at these bores (SLR, 2024).

At the P55 nested bores, which are located mid-way along LW S3A, all three bores are showing a decline in groundwater levels. In comparison with the GNSS units in vicinity of the bores, groundwater response to extraction appears to be more regional, occurring over time as the regional groundwater levels drawdown. However, the consistent decline over time in groundwater level at these bores is likely resultant from mining extraction activities (SLR, 2024).

At P56C, water level decline has been observed, however this trend is not consistent across the associated nested bores. In particular, P56A is showing stable water levels. Some minor decline has been observed in P56B but also periods of significant increase. P56C has shown periods of decline, with intermittent periods of stabilisation and minor recovery. Given the groundwater trends are not consistent across all nested piezometers and show notable fluctuations that do not appear to appear to align with longwall progression, the declining water levels in P56C are not considered to be attributable to mining operations at this point in time (SLR, 2024).

P52 and REA4 are showing some consistent decline in water level since approximately November 2022, however both are showing signs of stabilisation. Where depressurisation has been observed, a period of relative stability of reduced groundwater level has occurred (SLR, 2024).

Groundwater monitoring is undertaken within nearby vicinity of surface watering at multiple locations to assist with the review of groundwater – surface water interaction. Although P55 and P53 have depressurisation noted, the lack of connectivity between the systems indicates that the groundwater conditions are unlikely to have a causal effect on surface water conditions. Surface water losses are likely due to surface fracturing and drainage rather than baseflow losses (SLR, 2024).

Private bores

Fluctuations in groundwater levels across the suite of private bores monitored are observed, however there is no identifiable trend and no indication of impact from mining extraction activities (SLR, 2024).

Shallow VWPs (sensors <200 metres)

Shallow VWPs are showing variation in responses since commencement of extraction. TBC009 (HBSS – 30m) experienced a period of small steady decline since November 2022, however it is now showing some increase in water levels. The deeper sensors remained relatively stable, also recently showing some increase in water levels. TBC018 also showed minor reduction in water level over time in the three shallowest sensors (70m, 117m, 164m, 179 m) although followed by a period of stabilisation and some increase. Water levels in the deepest sensor at 198 m have shown relatively consistent very minor decline (SLR, 2024).

TBC027 is showing fluctuation in groundwater level across all depth sensors, although there is no apparent depressurisation occurring. TBC034 remains stable and TBC039 has observed an increase in water level (SLR, 2024).

TBC032 is the closest VWP to current extraction activities and is showing depressurisation in all sensors. The declines observed in TBC032 are relatively consistent across all sensors and show similar trends to the shallower OSPs, with periods of more rapid decline followed by some stabilisation. However, overall, there is an observed trend of declining groundwater levels in all sensors. Minimal subsidence (< 15 mm) has been observed close to the location of TBC032. The groundwater decline is likely a regional groundwater drawdown in response to mining activity (SLR, 2024).

Deep VWPs (sensors >200 metres)

The deep VWPs overall are showing some depressurisation over the reporting period but this is not consistent spatially or across depth profiles at individual sites. Sensors that are showing drawdown / depressurisation recovery are summarised below (SLR, 2024):

- TBC009: Drawdowns of 15m at 357m, 4m at 391m, 4m at 343m, and 1m at 332m. Recovery at sensor depth 357m has been observed to baseline conditions during this reporting period;
- TBC018: Drawdown to a maximum of 3.5 m since November 2022;

- TBC020: Drawdowns of 8.5m at 211m, 3.5m at 411m, and very minor drawdowns at 293m and 375m. Recovery at sensor depth 211m of 4.5 m has been observed, and some recent recovery has been observed at 293m and 375m;

- TBC026: Drawdowns of 4m at 344m, and very minor drawdown at 211m and 278m; and

- TBC032: Drawdowns of 20m at 220m, 10m at 237m, and 10m at 294m.

3.3.1.2 TARP WMP8 – Shallow Groundwater Level (Open Standpipes and Private Bores)

Background

During the reporting period, a number of groundwater TARP triggers occurred as summarised below:

- Monitoring bore P51B: Level 1 TARP triggered in January to April 2024;
- Monitoring bore P53A: Level 1 TARP triggered from the entire monitoring period;
- Monitoring bore P53B: Level 1 TARP triggered from the entire monitoring period;
- Monitoring bore P53C: Level 2 TARP triggered for the entire monitoring period;
- Monitoring bore P55B: Level 1 TARP triggered in January 2024, Level 2 TARP triggered in February to April, and Level 3 TARP triggered in May and June 2024;
- Monitoring bore P55C: Level 2 TARP trigger for the entire monitoring period;
- Monitoring bore P56C: Level 2 TARP trigger for the entire monitoring period;
- Private bore GW104659: Level 1 TARP triggered from the entire monitoring period; and
- Private bore GW109257: Level 1 TARP triggered in February to June 2024.

The spatial distribution of these triggers is illustrated in **Figure 3-11**. Further discussion of these triggers is provided in the Groundwater Monitoring Report (refer **Appendix C**).

Actions and Responses Completed

Table 3-7 outlines the actions and responses that are required to be completed in accordance with Level 1, 2 and 3 TARP triggers for shallow groundwater level reduction (TARP WMP8), as well as how these actions and responses have been addressed.

Table 3-6 Actions and Responses for Level 1, 2 and 3 TARP Triggers for Groundwater Level Reduction (TARP WMP8)

Action / Response from TARP WMP8	Tahmoor Coal response
Actions	
Level 1, 2 and 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline is provided in **Section 3.3.1.3** and Section 4.0 of **Appendix C.** Groundwater level decline at P53, P55 and GW104659 could be due to ongoing mining effect. However, at the remaining locations, it cannot definitely be attributed to extraction activities.
Level 1, 2 and 3 TARP Undertake investigation to determine if the decline will impact the long-term viability of the affected water supply works.	Current drawdown associated with exceedances is localised. Consequently, there is no indication that extensive regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 1, 2 and 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists necessary to inform assessment (refer Section 4 of **Appendix C**).
Level 1, 2 and 3 TARP If the changes have been confirmed to be related to mining effects: For Open Standpipe Monitoring Bores: • For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP. For Private Bores: • Initiate negotiations with impacts landowners as soon as practicable. Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores, etc – as per Section 6.2.1.4 of the Water Management Plan).	Regarding open standpipe monitoring bores, it is noted that WMP12 has been initiated for P53 and P55 nested bores. WMP13 (Thirlmere Lakes) has not been enacted). Regarding private bores, no private bore decline has been definitively attributed to mining. No landholder has reported impacts requiring ameliorative actions at this point in time.
Level 2 and 3 TARP Consider increasing monitoring and review of data at sites where Level 2 has been reached, subject to land access. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact).	Review indicates the cause of the triggers is known and no cause for additional monitoring and data review is required. The current frequency of water level monitoring is sufficient for impact assessments (i.e. 15 minute readings capture minor water level fluctuations, with monthly review allowing enough temporal scale for causation analysis).

Action / Response from TARP WMP8	Tahmoor Coal response
Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed.	
Level 2 and 3 TARP Compare against base case and deterministic model scenarios.	TARP trigger levels accommodate the base case and deterministic model scenarios. With each model update, these levels will continue to be reviewed and revised as necessary.
Level 2 and 3 TARP Review Water Management Plan and modify if necessary.	Update of the WMP completed in June 2024. No update required at this point, which will be reviewed upon submission of the next 6-monthly/annual report.
Level 2 and 3 TARP For Private Bores: • Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	Not applicate as no Level 2 TARP triggers have occurred for private bores.
Level 3 TARP Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, subject to land access.	Cause of Level 3 trigger is known, and no increase in monitoring frequency is necessary.
Level 3 TARP Undertake a detailed investigation to assess the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, effect unrelated to mining or the prevailing climate).	Detailed investigation, including comparison to local monitored subsidence data and climate data, has been completed in **Appendix C**.
Responses	
Level 1, 2 and 3 TARP Report trigger exceedance to DPHI and key stakeholders.	Notification of this exceedance to DPHI is completed as part of this report.
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	Completed as part of this report, and to be incorporated into forthcoming Six Monthly Subsidence Impact Report and Annual Review.
Level 1, 2 and 3 TARP If the changes have been confirmed to be related to mining effects: For Private Bores: • Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). • Implement CMAs, subject to land access (finalise negotiations and implement the agreed “make-good” arrangements).	No private bore decline has been attributed to mining. No landholder has reported impacts requiring ameliorative actions at this point in time.

Action / Response from TARP WMP8	Tahmoor Coal response
• Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	
Level 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes have been identified via this reporting.
Level 2 and 3 TARP For Private Bores: Provide findings of CMA review to DPHI and key stakeholders for consultation.	No CMA required at this point.
Level 2 and 3 TARP For Private Bores: Implement additional CMAs, subject to land access.	No CMA required at this point.
Level 3 TARP For Private Bores: • Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders. • Implement Rehabilitation Management Plan, subject to land access.	No level 3 triggers for private bores.

Proposed Actions and Responses

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 DPHI by 31 March 2025.

3.3.1.3 TARP WMP9 – Shallow Groundwater Pressure (VWP Sensors < 200 m depth)

Background

During the reporting period, a number of groundwater TARP triggers occurred in shallow VWP sensors, as summarised below:

- TBC032 (BHCS-181m): Level 1 TARP triggered for the entire monitoring period;
- TBC032 (BGSS-200m): Level 1 TARP triggered for the entire monitoring period; and
- TBC032 (HBSS-131m): Level 3 TARP triggered for April to June 2024.

The spatial distribution of these triggers is illustrated in **Figure 3-11**. Further discussion of these triggers is provided in the Groundwater Monitoring Report (refer **Appendix C**).

Actions and Responses Completed

Table 3-7 outlines the actions and responses that are required to be completed in accordance with Level 1 and 3 TARP triggers for shallow groundwater pressure (TARP WMP9), as well as how these actions and responses have been addressed.

Table 3-7 Actions and Responses for Level 1 and 3 TARP Triggers for Shallow Groundwater Pressure (TARP WMP9)

Action / Response from TARP WMP9	Tahmoor Coal response
Actions	
Level 1, 2 and 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.

Action / Response from TARP WMP9	Tahmoor Coal response
Level 1, 2 and 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline TBC032 is provided in **Section 3.3.1** and Section 4.0 of **Appendix C**. The cause appears to be mining related.
Level 1, 2 and 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g., subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists necessary to inform assessment (refer to Section 4.0 of **Appendix C**).
Level 3 TARP (action as per Level 2 TARP) Review deeper VWP data at monitored sites. Determine whether additional review of data is required.	Current drawdown associated with exceedances is localised. Consequently, there is no indication that regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 3 TARP (action as per Level 2 TARP) Determine if review of additional existing VWP sites is required.	Review of all VWP sites included in this reporting. Only TBC032 reporting TARP triggers.
Level 3 TARP (action as per Level 2 TARP) Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed.	Cause of TARP trigger known, no cause for increase of monitoring frequency.
Level 3 TARP (action as per Level 2 TARP) Compare against base case and deterministic model scenarios.	TARP trigger levels accommodate the base case and deterministic model scenarios. With each model update, these levels will continue to be reviewed and revised as necessary.
Level 3 TARP (action as per Level 2 TARP) Review Water Management Plan and modify if necessary.	Update of the WMP completed in June 2024. No update required at this point, which will be reviewed upon submission of the next 6-monthly/annual report.
Level 3 TARP Increase frequency of data review for sites where Level 3 has been reached and the cause is unknown.	Cause of Level 3 Trigger identified and discussed in **Section 3.3.1** and Section 4.0 of **Appendix C**.
Level 3 TARP Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Commence/complete as soon as practicable.	Detailed investigation, including comparison to local monitored subsidence data and climate data, has been completed (refer to **Appendix C**).
Level 3 TARP Undertake investigative to review model results in conjunction with field data.	Review of updated model results compared to field data will be undertaken with next iteration of the Groundwater Management Plan.
Responses	

Action / Response from TARP WMP9	Tahmoor Coal response
Level 1, 2 and 3 TARP Report trigger exceedance to DPHI and key stakeholders.	Notification of exceedances to DPHI is completed as part of this report.
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report, and to be incorporated into forthcoming Six Monthly Subsidence Impact Report and Annual Review.
Level 1, 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review.

Proposed Actions and Responses

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 DPHI by 31 March 2025.

3.3.1.4 TARP WMP10 – Groundwater Level / Pressure Deep VWPs (>200 m depth excluding monitoring the Bulli Coal Seam)

During this reporting period, there have been no triggers under this TARP.

3.3.2 Groundwater Quality

3.3.2.1 Overview of Monitoring Results

Groundwater quality has been monitored monthly in the OSPs (monitoring network and private bores) since the commencement of extraction. The Tahmoor South Groundwater Monitoring Network, and the locations of groundwater monitoring bores is provided in **Figure 3-10**.

Further detail on groundwater quality results, including graphs showing progressive groundwater quality results, are provided in the Groundwater Monitoring Report (refer to **Appendix C**). Further detail and discussion of TARP triggers for groundwater level are also discussed in the sections below.

Electrical conductivity and pH

The pH and EC across all bores show some level of fluctuation with no apparent trends across the full record (SLR, 2024).

Metal concentrations

Metals across all bores have shown fluctuation over the reporting period and cannot be attributable to mining with sporadic spatial and depth profile distribution (SLR, 2024).

3.3.2.2 TARP WMP11 – Groundwater Quality (Open Standpipes and Private Bores)

During this reporting period, there have been no triggers under this TARP.

3.3.3 Groundwater and Surface Water Interaction

3.3.3.1 Overview of Monitoring Results for Groundwater – Surface Water Connectivity

Groundwater monitoring is undertaken within nearby vicinity of surface watering at multiple locations to assist with the review of groundwater – surface water interaction. Namely to assist with defining if surface flow changes identified are attributable to baseflow loss due to groundwater depressurisation resultant from mining activities. Further detail of the groundwater – surface water interaction review is provided in the Surface Water Monitoring Report (**Appendix B**) and Groundwater Monitoring Report (**Appendix C**).

WMP12 pertains specifically to the monitoring of potential impacts on groundwater – surface water interactions. Assessment under this TARP is initiated if a TARP WMP8 trigger is confirmed to be related to mining effects.

3.3.3.2 TARP WMP12 – Groundwater – Surface Water Interaction

Background

Numerous triggers of TARP WMP8 occurred during this reporting period. It is enacted when one of the TARP bores (those associated with surface water monitoring units) has triggered TARP WMP8. The bores for which TARP WMP12 has been enacted include:

- P53 nested bores – associated with surface water site TT13-Qla; and
- P55 nested bores – associated with surface water site TT1-QLa.

As discussed in **Section 3.3.1.2**, the following bores triggered a TARP level for TARP WMP8:

- Monitoring bore P53A: Level 1 TARP triggered for the entire monitoring period;
- Monitoring bore P53B: Level 1 TARP triggered for the entire monitoring period;
- Monitoring bore P53C: Level 2 TARP triggered for the entire monitoring period;
- Monitoring bore P55A: Level 1 TARP triggered in June 2024;
- Monitoring bore P55B: Level 1 TARP triggered in January 2024, Level 2 TARP triggered in February to April, and Level 3 TARP triggered in May and June 2024; and
- Monitoring bore P55C: Level 2 TARP triggered for the entire monitoring period.

It is noted that the associated surface water monitoring sites do not have any active exceedances (TARP triggers) at the conclusion of the reporting period. Therefore, there is no apparent relationship between the groundwater and surface water responses to extraction, and consequently no further analysis has been undertaken.

Further discussion of this review is provided in the Groundwater Monitoring Report (SLR, 2024; refer **Appendix C**).

Actions and Responses Completed

Table 3-8 outlines the actions and responses that are required to be completed in accordance with Level 1, 2 and 3 TARP triggers for groundwater – surface water interaction (TARP WMP12), as well as how these actions and responses have been addressed.

Table 3-8 Actions and Responses for Level 1, 2 and 3 TARP Triggers for Groundwater – Surface Water Interactions (TARP WMP12)

Action / Response from TARP WMP12	Tahmoor Coal response
Actions	
Level 1, 2 and 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline at P53 nested bores is provided in the section above and Section 4 of **Appendix C.** TARP WMP12 has been initiated for P53 and P55 nested bores due to the assessment that groundwater level decline could be due to ongoing mining effect. There are no surface water triggers at the associated sites. Detailed investigation into the site-specific groundwater surface water relationship indicated there is unlikely to be a direct

Action / Response from TARP WMP12	Tahmoor Coal response
	relationship between groundwater drawdown and surface water changes. It was determined that it is unlikely that mining activities are influencing groundwater – surface water interactions during the reporting period.
Level 1, 2 and 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists necessary to inform assessment, and discussed with the Environmental Response Group (refer Section 4.2 of **Appendix C**).
Level 2 and 3 TARP Increase frequency of data review to fortnightly at sites where Level 2 has been reached, subject to land access. Reasons for not increasing frequency could include solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change).	Update of network to install loggers in all P53 and P55 bores has been completed, with monthly review of the data occurring. The current frequency of water level monitoring is sufficient for impact assessments (i.e. 15-minute readings capture minor water level fluctuations, with monthly reporting allowing enough temporal scale for causation analysis).
Level 2 and 3 TARP Compare against base case and deterministic model scenarios.	Completed as part of trigger level review.
Level 2 and 3 TARP Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.	Review of spatial trends of water level was undertaken as part of this report.
Level 2 and 3 TARP Review surface water data to assess for surface water level decline at relevant site.	Review of surface water data in conjunction with groundwater data at the relevant site was undertaken as part of this report. No triggers were observed at relative surface water sites.
Level 2 and 3 TARP Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	CMAs are not required at this point (no correlation between groundwater impacts and the surface water site noted at this point).
Level 2 and 3 TARP Review Water Management Plan and modify if necessary.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes have been identified via this reporting.
Level 3 TARP Increase frequency of data review for sites where Level 3 has been reached and cause is unknown, subject to land access.	Data frequency review is sufficient, given no triggers at relative surface water sites and cause of groundwater decline is known.
Level 3 TARP Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Report to be commenced and completed as soon as practicable.	Investigation undertaken as part of this reporting, and previous detailed analysis of groundwater – surface water interaction. No further investigation required at this point.
Responses	
Level 1, 2 and 3 TARP	Notification of this exceedance to DPHI is completed as part of this report.

Action / Response from TARP WMP12	Tahmoor Coal response
Report trigger exceedance to DPHI and key stakeholders.	
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	Completed as part of this report.
Level 1, 2 and 3 TARP If the changes have been confirmed to be related to mining effects: • Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). • Implement CMAs, subject to land access. • Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	It was determined that it is unlikely that extraction is currently impacting groundwater – surface water interactions. Therefore, these responses have not been enacted at this time.
Level 2 and 3 TARP Provide findings of CMA review to DPHI and key stakeholders for consultation.	CMA not required at this point.
Level 2 and 3 TARP Implement additional CMAs, subject to land access.	CMA not required at this point.
Level 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan, including reporting on relationship of observations to baseline and deterministic model scenarios, as necessary.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes have been identified via this reporting.
Level 3 TARP Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders.	Not required at this point.
Level 3 TARP Implement Rehabilitation Management Plan, subject to land access.	Not required at this point.

Proposed Actions

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 DPHI by 31 March 2025.

3.3.3.3 TARP WMP13 – Groundwater Bores Monitoring for Thirlmere Lakes

During this reporting period, there have been no triggers under this TARP.

3.3.4 Mine Water Intake

Tahmoor Coal has a Groundwater Licence (WAL 36442) to extract 1642 ML/year of groundwater make from underground.

The inferred water make is calculated from the difference between total mine inflows and total mine outflows. This calculation is assisted by input from flow meters installed on fresh water supply lines that pump water into the mine (mine inflow from Sydney Water supply to underground workings), and flow meters on three pipelines that extract water from underground (mine outflow). In addition, mine inflow and outflow also includes a measurement of water that enters and exits the mine through other means such as moisture in air vented in and out of the mine (water in vented air), and moisture in coal extracted from the mine.

Water make calculations provide an indication of the groundwater pumped out of the total Tahmoor Mine underground workings.

SLR completed an analysis of water make for Tahmoor Mine recorded between 1 January 2009 to 30 June 2024 (SLR, 2024; **Appendix C**). During this period, observed inflows to Tahmoor Mine have been ranging between 2 to 7 ML/d. In October 2022, the Western Domain blocks were sealed. Since this time, the average groundwater inflow from Tahmoor underground workings is reported as 2.3 ML/d.

The reporting period for this report falls within the water year calendar 2023-24. As of 30 June 2024, the cumulative groundwater make for the water year 2023-24 is 1,310 ML, which remained below the groundwater entitlement of 1,642 ML per annum (i.e. water year) (refer **Figure 3-12**).

3.3.5 Recommendations and Actions

3.3.5.1 Current Groundwater Monitoring Recommendations

As discussed in the Groundwater Review for January to June 2024 (SLR, 2024; **Appendix C**), the following groundwater recommendations were made for this reporting period by SLR:

- Continue the monitoring program, and the reporting of groundwater level and quality data in routine six monthly groundwater monitoring reporting; and
- Once groundwater level data becomes available at the Thirlmere Lakes bores, assess groundwater levels against WMP13 to confirm that no groundwater level exceedances occurred following the commencement of LW S1A.

Progress of these recommendations will be provided in the next Six Monthly Subsidence Impact Assessment for the Tahmoor South Domain.

3.3.5.2 Previous Groundwater Monitoring Recommendations

Table 3-9 provides the recommendations as made in the previous Six Monthly Subsidence Impact Report (January to June 2023) for groundwater, along with an update on the progress of these recommendations.

Table 3-9 Groundwater recommendations from the previous Six Monthly Subsidence Impact Report and Current Progress

Item	Previous Recommendation	Progress of Recommendation
1	Adopt the revised groundwater quality trigger levels provided in Appendix C (of the July-Dec 2023 six-monthly report) in the WMP11.	Completed: Trigger level revision has been undertaken and incorporated into this 6-monthly report. Triggers also updated in updated WMP submitted June 2023.
2	Remove monitoring site GW062068 from the groundwater monitoring program due to infrastructure issues that render the bore unsuitable for ongoing monitoring;	Completed: Bore has been removed from the ongoing monitoring program.
3	Establish the historical groundwater level for VWPs TBC09 (BUSM-381m), TBC018 (WBCS-377m). TBC020 (WBCS-397m) and TBC020 (WO-439m) so that drawdown at these locations can be calculated.	Completed: VWP review undertaken. Ongoing review of data will be completed, and sensors apparently damaged to be removed from the reporting requirements.

Item	Previous Recommendation	Progress of Recommendation
4	Review the configuration of all VWPs in the monitoring network as it appears there are potential issues of channels duplicating data (particularly at Site TBC024) and misalignment between the understanding of installed/labelled sensor depth and the sensor depth as per the data download.	Completed: VWP review undertaken. Ongoing review of data will be completed, and sensors apparently damaged to be removed from the reporting requirements.
5	Following a review of the VWP configuration, consider removing VWPs TBC024 (BHCS-168m), TBC032 (in particular, HBSS-95m) and TBC034 (BHCS-176m) from the monitoring regime as data appears to be erroneous due to faulty loggers.	Completed: VWP review undertaken. Ongoing review of data will be completed, and sensors apparently damaged to be removed from the reporting requirements.
6	Continue the monitoring program, and the reporting of groundwater level and quality data in monthly groundwater monitoring reporting.	Completed: reporting of groundwater level and quality data completed and presented at monthly Environmental Response Group (ERG) meetings
7	Once groundwater level data become available at the Thirlmere Lakes bores, assess groundwater levels against WMP13 to confirm that no groundwater level exceedances occurred following the commencement of LW S1A.	Ongoing: data yet to become available.

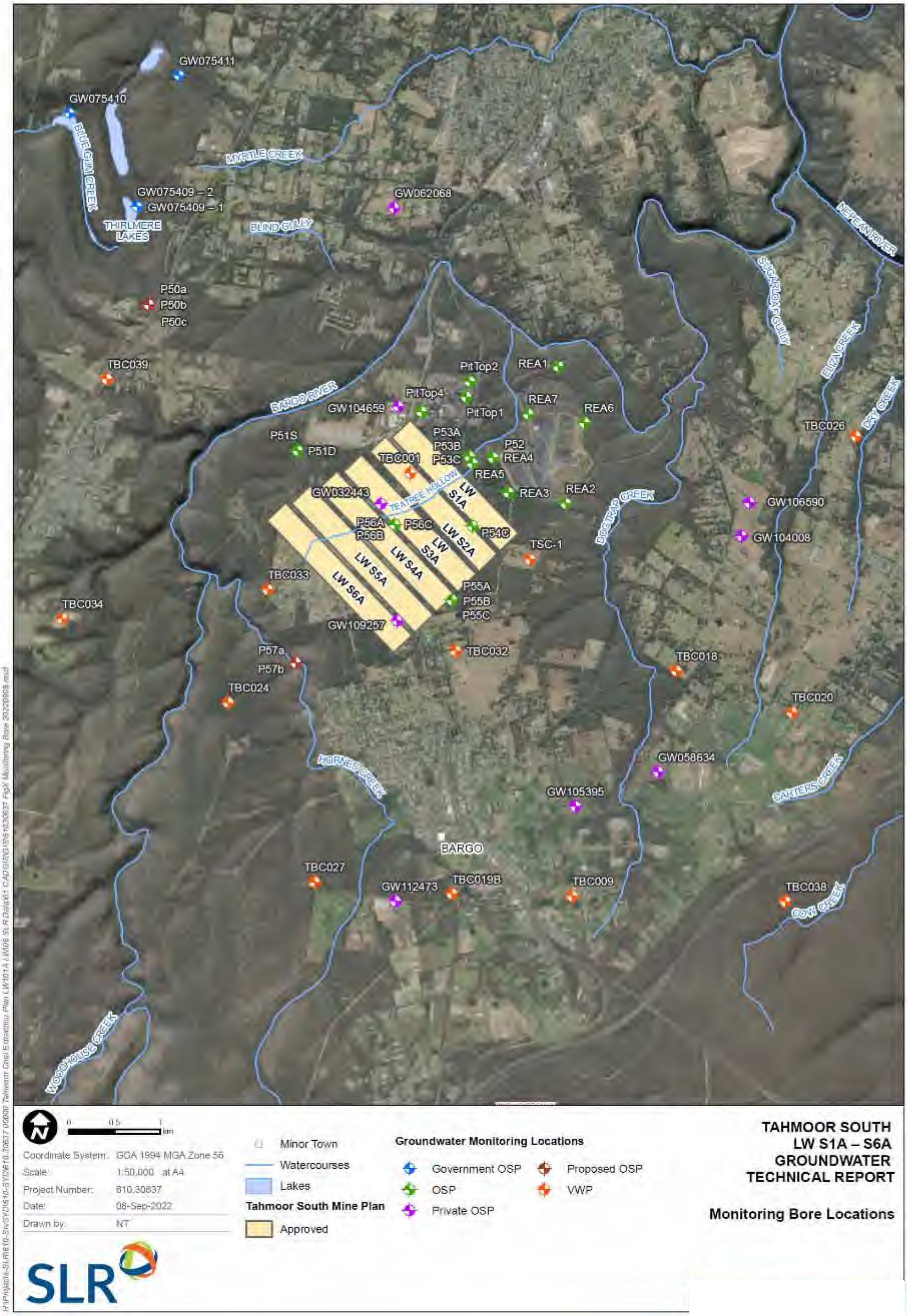

Figure 3-10 LW S1A-S6A Groundwater Monitoring Site (source: LW S1A-S6A Water Management Plan)

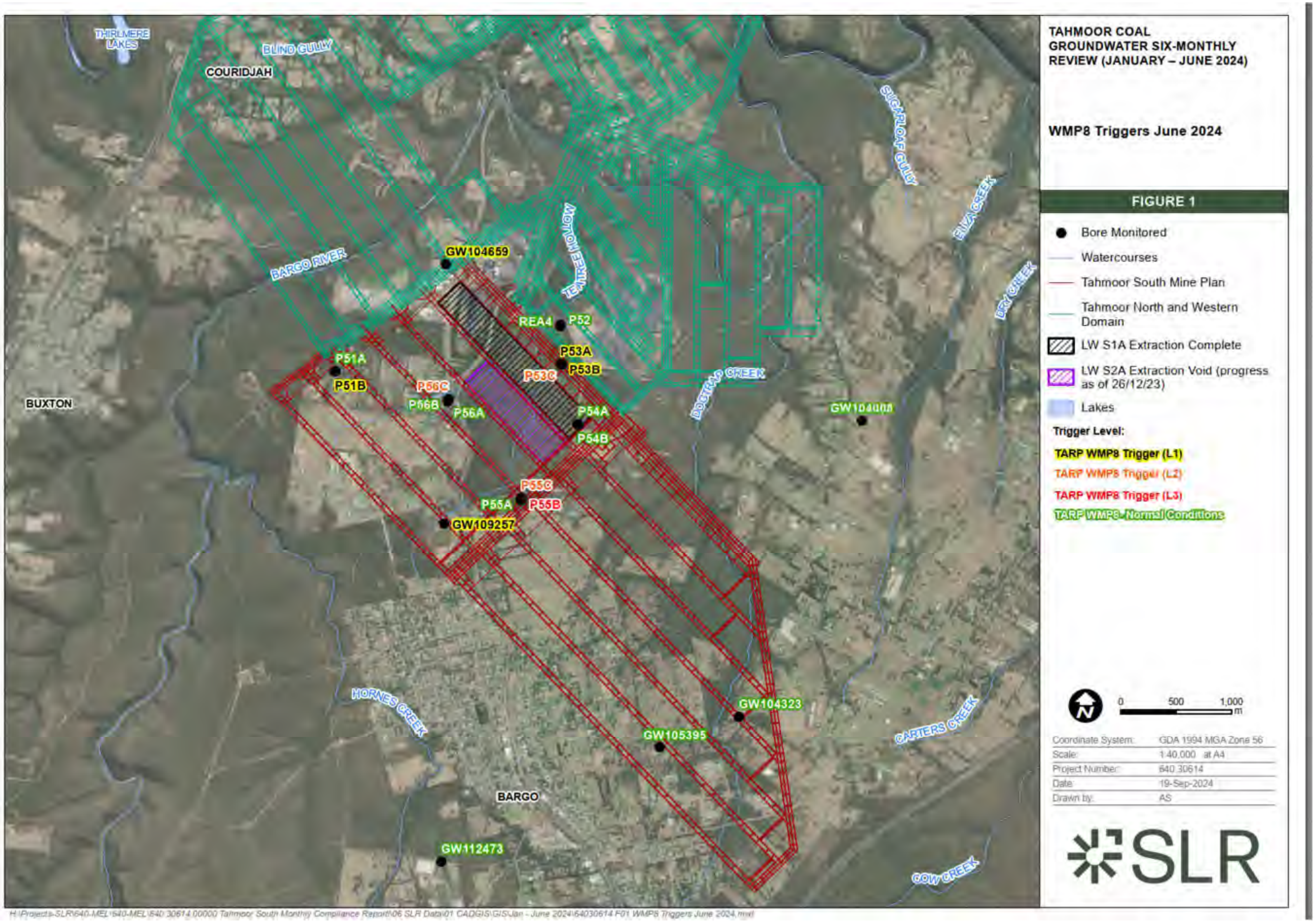

*Figure 3-11 Groundwater TARP triggers (source SLR, 2024; **Appendix C**).*

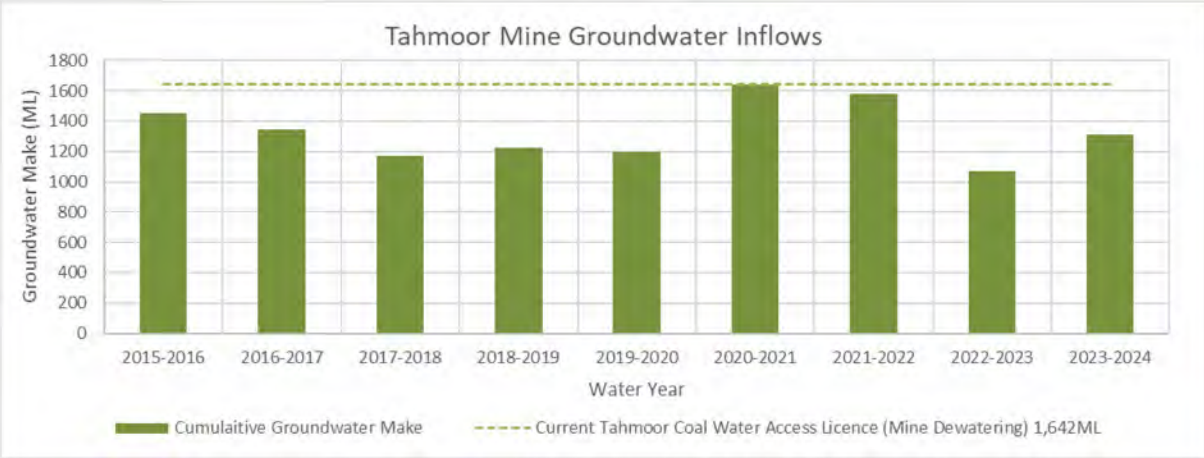

*Figure 3-12 Groundwater Make per Water Year (financial year) from 2015/16 to 2023/24 (source SLR 2024; **Appendix C**).*

3.4 Land Monitoring

The LW S1A-S6A Land Management Plan was prepared to manage the potential environmental consequences of LW S1A-S6A extraction on cliffs, natural steep slopes, farm dams, agricultural land in accordance with Condition C8 of SSD 8445.

During this reporting period, the LW S1A-S6A Land Management Plan has been implemented to monitor the following landscape features:

- Cliffs – visual inspection at the completion of mining by a geotechnical engineer (Cliff BC1 after LW S6A, Cliff BC2 after LW S3A, S4A, S5A and S6A). A baseline inspection of Cliff BC2 was completed during the reporting period, however no further visual inspections have been required during this reporting period;
- Natural steep slopes – monthly visual inspection during active subsidence period by a geotechnical engineer. This monitoring and reporting is completed by Douglas Partners (available on request);
- Farm dams – dam embankment integrity and water level observation every week during active subsidence, and every month the active subsidence period by a geotechnical consultant. This monitoring is completed by Building Inspection Services on a weekly basis, and Douglas Partners on a monthly basis, and reported in their reports (available on request); and
- Agricultural land – weekly inspections along local roads and farm dams, and visual inspection at the completion of each longwall for land within the predicted limit of subsidence for each longwall. This monitoring is covered by the farm dams inspections discussed above and built features monitoring discussed in **Section 3.7.2**. An inspection of agricultural land was completed in April 2024 following the completion of LW S2A (report available on request).

The following sections summarise the observations made during the reporting period for each land category. Performance against all Land Management Plan TARPs for the reporting period are summarised in **Table 2-1**, and actions and responses completed relating to any TARP triggers are discussed in the following sections.

3.4.1 Cliffs

3.4.1.1 Overview of Monitoring Results

The locations of cliffs (BC1 and BC2) within the LW S1A-S6A Study Area are illustrated in **Figure 3-13**.

During the reporting period, the baseline visual inspection of cliff BC2 was completed in accordance with the land monitoring program as specified in the LW S1A-S6A Land Management Plan. No active mine monitoring was required during the reporting period, as the cliff has not yet been located in the active subsidence zone.

3.4.1.2 TARP LMP1 – Cliffs

During this reporting period, there have been no triggers under this TARP.

3.4.2 Natural Steep Slopes

3.4.2.1 Overview of Monitoring Results

The locations of natural steep slopes within the LW S1A-S6A Study Area are illustrated in **Figure 3-14**.

During the reporting period, visual and photographic surveys of natural steep slopes were completed monthly for features within the LW S2A and LW S3A active subsidence zone. With the exception of steep slope WC1, no visual observations or cracks, localised ground bulging, buckling or shearing was observed at natural steep slopes.

In October 2023, it was noted that movement (i.e. opening) of approximately 10 mm occurred between two sandstone boulders / blocks (i.e. not bedrock) near the 'Big Pool' in Wirrimbirra Creek at the steep slope WC1. From a geotechnical viewpoint, the current movement/cracking at the location is not considered to be detrimental to the stability of the rocky outcrop or the water carrying capacity of the creek. No additional movement is discernible between the two boulders / blocks since this initial observation. No TARPs have been triggered in relation to this movement.

3.4.2.2 TARP LMP2 – Natural Steep Slopes

During this reporting period, there have been no triggers under this TARP.

3.4.3 Farm Dams

3.4.3.1 Overview of Monitoring Results

The location of dams within the LW S1A-S6A Study Area are illustrated in **Figure 3-14**.

During the reporting period, visual and photographic surveys for subsidence impacts on dams were completed on a weekly and monthly basis of dams within the LW S2A and LW S3A active subsidence zone.

Visual inspections of dams located in the active subsidence zone did not identify any mining-related impacts during the reporting period.

Visual inspections of dams from January to March 2024 observed relatively stable water level, with the exception of FD8 which was noted to have a slightly lower water level than other nearby dams in February 2024. It was unclear if the lower water level in FD8 was due to mine subsidence or to a permeable floor in the pondage area. Tahmoor Coal installed a monitoring marker near the exiting water level as a point of reference for future monitoring observations.

Following a large storm event in early April 2024, dams were noted to have increased in water level. Many dams also exhibited water pooling at the toe of embankments and downstream of the embankment, water in spillways, and at FD7 there were observations of the development of erosion rills as a result of the high flow event.

3.4.3.2 TARP LMP3 – Farm Dams

During this reporting period, there have been no triggers under this TARP.

3.4.4 Agricultural Land

3.4.4.1 Overview of Monitoring Results

Agricultural land identified within the LW S1A-S6A Study Area are illustrated on **Figure 3-15**.

Inspections points were set up prior to the commencement of LW S1A mining to provide vantage of agricultural land within the LW S1A-S6A Study Area. The purpose of the surveys is to note whether change has occurred to agricultural land, and to assist in determining if any change can be attributed to mining impacts. Surveys noted the presence of erosion, condition of boundary and internal fencing components, paddock gate condition, out-building condition, paddock dam condition, presence of any surface slumping or cracking, and the presence of vegetation dieback.

During the reporting period, visual and photographic surveys of agricultural land have been completed as part of inspections for local roads, which are discussed in **Section 3.7.2**.

A post-longwall visual inspection was completed on 10 April 2024 following the completion of LW S2A extraction. The report noted that ground surface features observed during the post-mining agricultural land monitoring were considered typical for the age, location, type of construction and climatic conditions present at the time of the inspection. There were no identified assets or land that were associated with potential hazards as a result of LW S2A extraction.

3.4.4.2 TARP LMP4 – Agricultural Land

During this reporting period, there have been no triggers under this TARP.

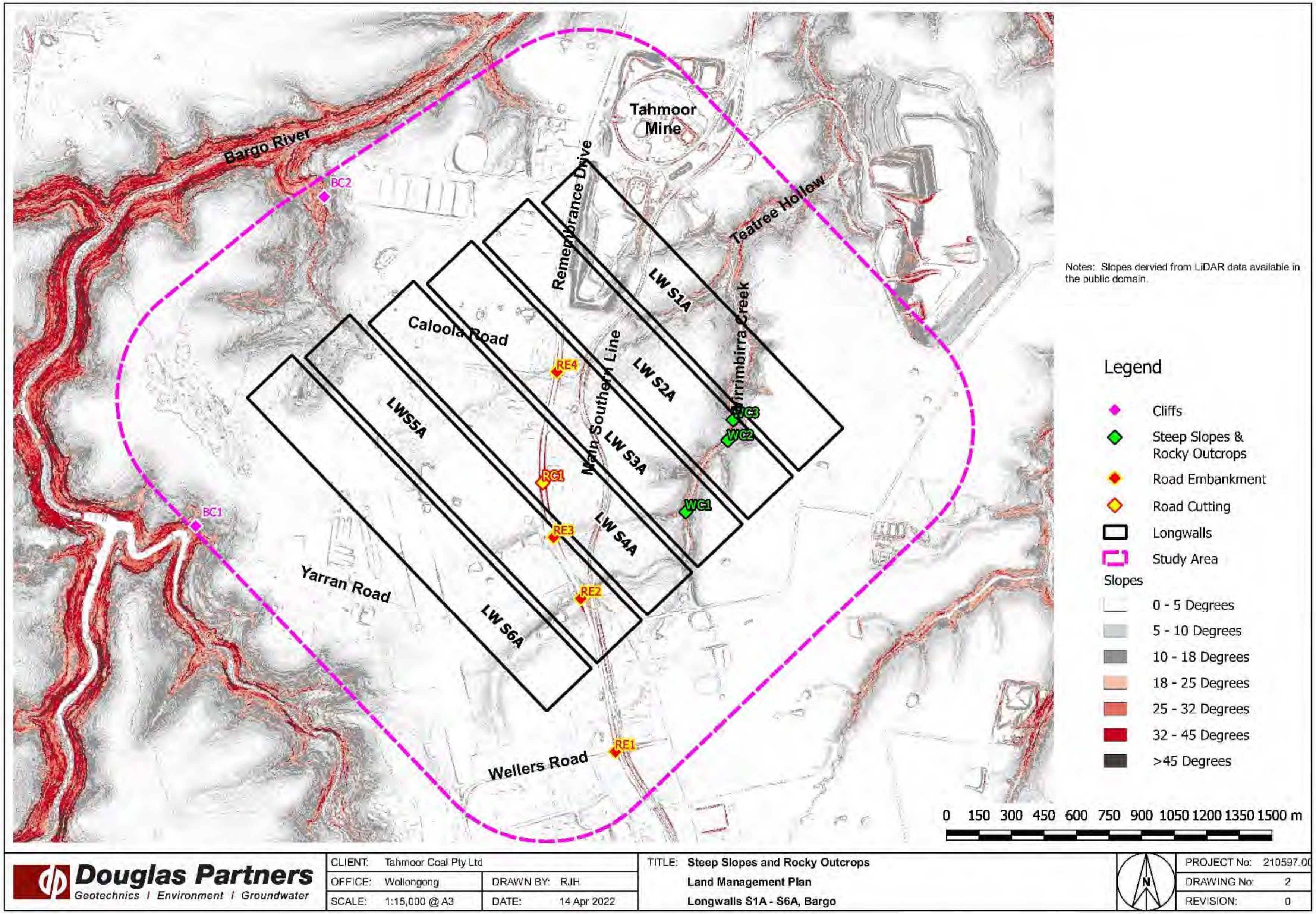

Figure 3-13 Cliffs and natural steep slopes within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)

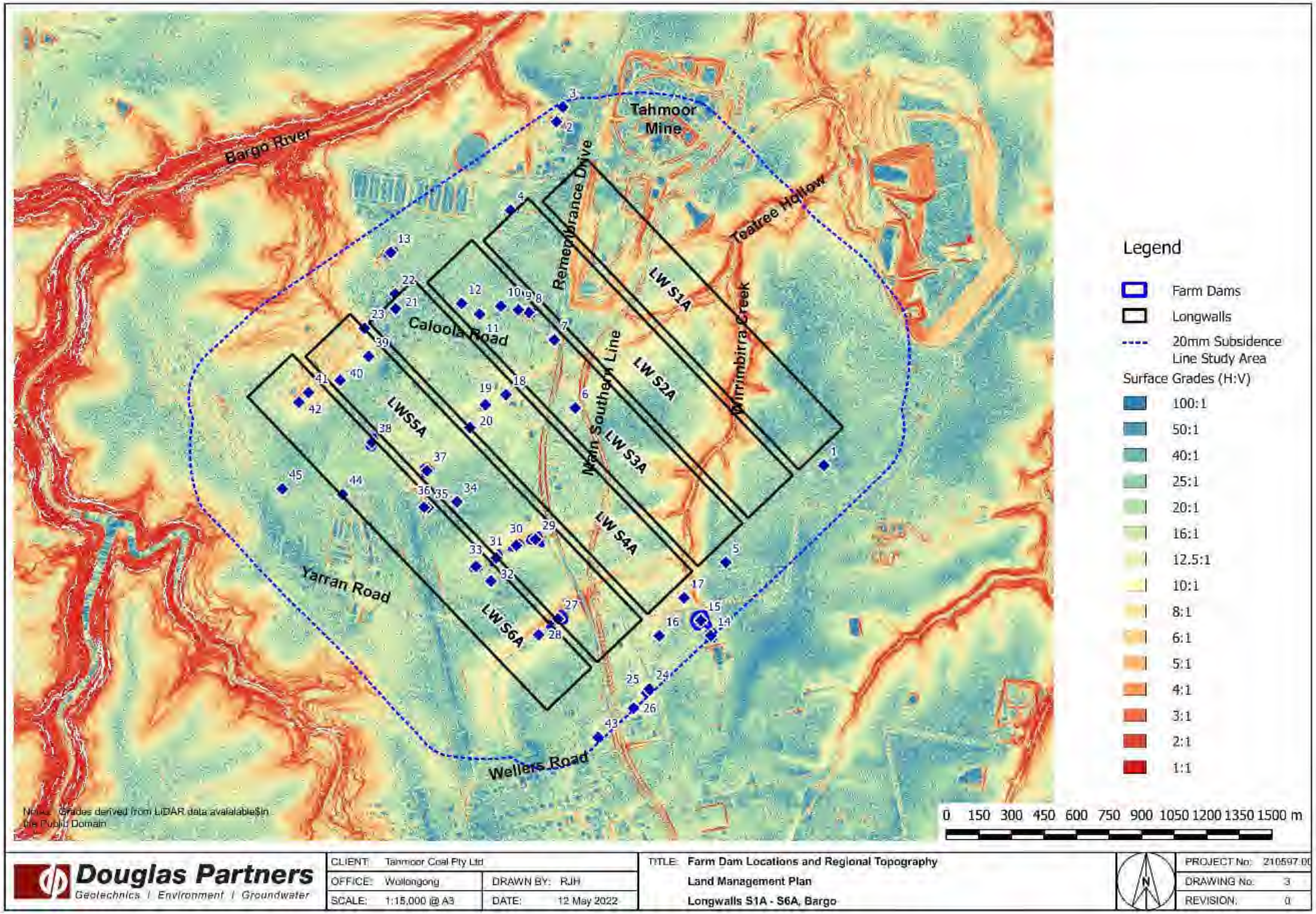

Figure 3-14 *Dams within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)*

Figure 3-15 Agricultural land and inspection sites within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)

3.5 Biodiversity Monitoring

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.

During the reporting period, the LW S1A-S6A Biodiversity Management Plan has been implemented to monitor ecology in the Study Area, as outlined below:

- Aquatic ecology – Bi-annual (Spring and Autumn) monitoring. During this reporting period, monitoring was completed during Spring 2023 by Niche Environment and Heritage (Niche, 2024a) (**Appendix D**); and
- Terrestrial ecology – Bi-annual (Spring and Autumn) monitoring. During this reporting period, monitoring was completed during Spring 2023 by Niche Environment and Heritage (Niche, 2024b).

The following sections summarise the observations made during the reporting period for aquatic and terrestrial ecology. Performance against all Biodiversity Management Plan TARPs (BMP1-4) for the reporting period are summarised in **Table 2-1**, and actions and responses completed relating to any TARP triggers are discussed in the following sections.

3.5.1 Aquatic Ecology

The aquatic ecology monitoring program for LW S1A-S6A has been designed to monitor subsidence-induced impacts on aquatic ecology. The following survey methods have been completed during baseline and during mining monitoring sampling:

- Aquatic habitat assessment of geomorphology, channel diversity, bank stability, riparian vegetation and adjacent land use, water quality, macrophytes and local impacts and land use practices in accordance with the Australian River Assessment System (AUSRIVAS);
- Macroinvertebrate survey:
    - AUSRIVAS macroinvertebrate sampling; and
    - Quantitative benthic macroinvertebrate monitoring program.

The aquatic ecology monitoring program is primarily focused on macroinvertebrate monitoring regimes including AUSRIVAS and quantitative using Before After Control Impact (BACI) design.

3.5.1.1 Overview of Monitoring Results

Aquatic monitoring for autumn 2024 was conducted by Niche Environment and Heritage between 26 March and 5 April 2024. A total of thirteen locations were sampled within Teatree Hollow, Hornes Creek and Moore Creek. These sites comprised eight impact sites (TTHt9, TTH12, TTH13, TTH13 (d/s), TTH16, TTH17, TTHt17 (d/s), BRt6) and five control sites (HC6, HC7, HC8, MC14, MC15). The locations of monitoring sites are illustrated in **Figure 3-16**.

Control sites HC6 and impact sites BRt6 and TTHt9 were added to the program in the spring 2023 round of monitoring in order to assess potential impacts to these sections of a waterway associated with potential future longwall panels.

The following results were observed for this monitoring period (Niche, 2024a):

- Autumn 2024 surveys were preceded by above average seasonal rainfall, although much of this rainfall occurred in one rain event. Observed habitat conditions at the impact sites represented a continuation of low flow conditions, observed during recent monitoring. This was reflected in the observations of low flows, limited organic debris and low flow levels across the monitoring sites;
- Impact sites TTH16, TTHt9, TTHt17, TTHt17 (d/s) and BRt6 were dry during the autumn 2024 surveys, with TTH12 and TTH13 (d/s) holding water. All control sites were holding water;

- Dry conditions at site TTH13 have not spanned consecutive monitoring surveys but do indicate an ongoing pattern of harsh environmental conditions at this pool since autumn 2023. Further monitoring will be required to establish whether additional time will result in macroinvertebrate assemblage recovery at this site;
- The additional AUSRIVAS sample collected at site TTH13 (d/s) indicate that mining induced changes upstream at TTH13 do not appear to have translated into acute impacts to macroinvertebrate assemblages downstream.
- Site TTH12 recorded quantitative monitoring data that did not identify any significant differences between the autumn 2024 survey data and that of previous surveys that indicate a decline in ecosystem health associated with mining induced change.

3.5.1.2 TARP BMP1 – Aquatic Habitat and Macroinvertebrate Indicators (Stream Health)

Background

During this reporting period, all impact monitoring sites (with the exception of Sites TTH16 and TTHt17) align with a 'Normal Condition' in accordance with the BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP in autumn 2024.

A level 2 TARP trigger exceedance (TARP BMP1) was reported for sites TTH16 and TTHt17 in autumn 2024 in relating to a reduction in aquatic pool habitat being observed over three consecutive sampling occasions. It should be noted that the Surface Water Report (**Appendix B**) concluded that the reduction of water levels at TTH16 (surface water monitoring site TT3) and TTHt17 (surface water monitoring site TT12) was related to both mining-induced impacts in combination with prevailing dry weather conditions.

Therefore, the decline in water level at TTH16 and TTHt17 is considered to be related to mining effects and also prevailing climatic conditions.

Further discussion of these triggers is provided in the Aquatic Monitoring Report for autumn 2024 (Niche, 2024a; **Appendix D**).

Actions and Responses Completed

Table 3-10 outlines the actions and responses that are required to be completed in accordance with a Level 2 TARP trigger for aquatic habitat and macroinvertebrate indicators (stream health) (TARP BMP1), as well as how these actions and responses have been addressed.

Table 3-10 Actions and Responses for Level 2 TARP Trigger for Aquatic Habitat and Macroinvertebrate Indicators (stream health) (TARP BMP1)

Action / Responses from TARP BMP1	Tahmoor Coal response
Actions	
Level 1 and 2 TARP Continue monitoring and review of data as per monitoring program.	Bi-annual seasonal monitoring (spring and autumn) and review of data is ongoing according to the monitoring program.
Level 1 and 2 TARP Undertake an investigation of BACI quantitative macroinvertebrate data to assess Level 1 observations and determine if mining related or the response to environmental conditions (e.g. drought) within the catchment.	Not applicable to TTH16 and TTHt17 as no samples could be collected.
Level 1 and 2 TARP Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water monitoring results, groundwater monitoring results).	It is noted that surface water level data concluded that the reduction of water levels at TTH16 (surface water monitoring site TT3) and TTHt17 (surface water monitoring site TT12) were related to both mining-induced impacts in combination with prevailing dry weather conditions.
Level 1 and 2 TARP Consider and decide on reasonable and feasible options for remediation, where relevant (e.g. limestone cobble for pH management).	No corrective management actions are proposed as there are no actions that can currently be completed to correct water level decline. In accordance with C12 of SSD 8445 and as detailed in the Water Management Plan, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared (if required) for watercourses damaged by subsidence impacts in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented (if required) at the cessation of subsidence movements associated with Tahmoor South mining.
Level 1 and 2 TARP Following investigation, any declines detected that are not attributable to mining impacts (e.g. are a result of environmental conditions or stochastic events) are to be considered 'normal condition' and are continued to be included in the ongoing development of the ecological monitoring dataset.	Not relevant to trigger at TTH16 and TTHt17.
Level 2 TARP Consider increasing monitoring and review of data frequency where Level 2 has been reached and at other relevant sites, subject to land access.	Monitoring is completed bi-annually in line with AUSRIVAS monitoring protocols and collection of baseline data. As mining induced change has so far manifested in pool-drying, rather than water quality decline, there is limited value in increasing biological sampling frequency.
Level 2 TARP Consider the inclusion of additional sites within impact area.	Additional AUSRIVAS sites downstream of areas of mining induced change observed, TTH13 (d/s) and TTH17 (d/s), have been included in the program since autumn 2023

Action / Responses from TARP BMP1	Tahmoor Coal response
	when impacts were first observed. These additional sites have been established as part of an adaptive monitoring approach to provide an indication of potential impacts downstream of areas of observed mining induced change. Due to the intermittent nature of the Teatree Hollow stream network and prevailing dry conditions, there is limited scope to include additional monitoring sites. Data from related program sites may be called upon as relevant, to assist in the interpretation of impacts. This has not been completed to date as the potential impacts to data have so far been primarily via pool drying/reduced flows rather than declining water quality.
Level 2 TARP Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	No corrective management actions are proposed as there are no actions that can currently be completed to correct water level decline. In accordance with C12 of SSD 8445 and as detailed in the Water Management Plan, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared (if required) for watercourses damaged by subsidence impacts in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented (if required) at the cessation of subsidence movements associated with Tahmoor South mining.
Level 2 TARP Review Biodiversity Management Plan and modify if necessary.	No further updates are required in line with the above outcomes.
Responses	
Level 1 and 2 TARP Report trigger exceedance to DPHI and key stakeholders.	Completed as part of this report.
Level 1 and 2 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	Completed as part of this report.
Level 1 and 2 TARP Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. limestone cobbles for pH management).	No CMAs are proposed.
Level 1 and 2 TARP Implement CMAs, subject to land access.	No CMAs are proposed.
Level 1 and 2 TARP Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	No CMAs are proposed.
Level 1 and 2 TARP Continue monitoring to determine if a Level 2 TARP trigger will occur.	Bi-annual seasonal monitoring (spring and autumn) and review of data is ongoing according to the monitoring program.
Level 2 TARP	No CMAs are proposed.

Action / Responses from TARP BMP1	Tahmoor Coal response
Provide findings of CMA review to DPHI and key stakeholders for consultation.	
Level 2 TARP Implement additional CMAs, subject to land access.	No CMAs are proposed.
Level 2 TARP Advise DPHI and key stakeholders of any required amendments to Biodiversity Management Plan.	No further updates are required in line with the above outcomes.
Level 2 TARP Continue monitoring to determine if a Level 3 TARP trigger will occur.	Continue monitoring and review of data as per existing monitoring program.

Proposed Actions and Responses

The current monitoring program will continue in accordance with the LW S1A-S6A Biodiversity Management Plan. The next update will be provided as part of the next Six Monthly Subsidence Impact Assessment report, to be provided to DPHI by 31 March 2025.

3.5.2 Terrestrial Ecology

The terrestrial ecology monitoring program for LW S1A-S6A has been designed to monitor subsidence-induced impacts on terrestrial ecology including riparian vegetation and amphibian monitoring.

The terrestrial ecology monitoring program uses a Before After Control Impact (BACI) design to identify ecological change within the Study Area as a result of mine subsidence by permitting comparisons of population trends between control and impact areas, before and after the impact. The following survey methods have been completed during baseline and during mining monitoring sampling:

- Floristic surveys within established vegetation monitoring plots for riparian vegetation, Threatened Ecological Communities (TEC), and threatened flora species;
- Amphibian monitoring along established transects:
    - Spotlighting;
    - Call provocation;
    - Listening for diagnostic frog calls; and
    - Tadpole identification.

3.5.2.1 Overview of Monitoring Results - Amphibian Monitoring

Amphibian monitoring for autumn 2024 was conducted by Niche Environment and Heritage between 9 April and 16 May 2024. A total of nine locations were sampled for amphibians, including four impact sites (i01, i02, i03 and i09) and five control sites (c04, c05, c06, c07 and c08). The locations of monitoring sites are illustrated in **Figure 3-17**.

Amphibian monitoring targeted two threatened frog species – the Giant Burrowing Frog (*Heleioporus australiacus*) and the Red-crowned Toadlet (*Pseudophryne australis*).

The following results were observed for this monitoring period (Niche, 2024b):

- There was a significant effect of Control-Impact on frog detections for all data (frog numbers are significantly higher at Control Sites when compared to Impact Sites), but no significant Before-After and BACI interaction effects. There was a significant BACI interaction for frog communities for Autumn 2024 data. Meaning, frog numbers at control and impact Sites are shifting in different ways before and after mining. Impact site frog abundance is significantly lower than control Sites, however, there is an overall increase in frog numbers at impact Sites, whereas frog numbers at control Sites are relatively stable.

- At the time of Autumn 2024 monitoring, there was a significant rainfall event preceding surveys which sustained moderate to high flow at all watercourses.
- Frog detection rates were variable across Autumn monitoring events. The species driving this variation was the Common Eastern Froglet (*Crinia signifera*).
- A total of six frog species were detected across the Autumn 2024 monitoring event, with two species detected across Impact Sites and six species across Control Sites. This represents an increased level of species detection observed across both Control and Impact monitoring Sites in comparison to the Autumn 2023 surveys.
- The targeted threatened frog species has not been detected within the Study Area during the monitoring program. While the Study Area contains superficially suitable habitat, it is possible that these species would no longer be able to survive in the area due to number of factors such as:
    - Past disturbance events (e.g. black summer bushfires, and significant flooding events)
    - Increased urban encroachment resulting in habitat removal, altered hydrological flows, water quality and nutrient loads.
    - Potential predation pressures from two introduced predators: Eastern Gambusia (*Gambusia holbrooki*) and the Yabby (*Cherax destructor*), both of which were detected at all Sites.

3.5.2.2 TARP BMP2 – Amphibian Populations

During this reporting period, there have been no triggers under this TARP.

3.5.2.3 Overview of Monitoring Results - Riparian Vegetation

Riparian monitoring for autumn 2024 was conducted by Niche Environment and Heritage between 24 March and 16 May 2024. A total of nine locations were sampled for riparian vegetation, including four impact sites (i01, i02, i03 and i09) and five control sites (c04, c05, c06, c07 and c08). The locations of monitoring sites are illustrated in **Figure 3-17**.

The following results were observed for this monitoring period for riparian vegetation (Niche, 2024b):

- During Autumn 2023 monitoring, vegetation cover and floristics at Impact Site 3 were impacted by the partial removal of native vegetation for the extension of the toe wall, and installation of a weir on Teatree Hollow Creek. As a result, the spring 2023 round of monitoring included the establishment of two additional riparian Control Sites on Hornes Creek and a Bargo River Tributary, and an additional Impact Site along Teatree Hollow Creek. The Vegetation Integrity (VI) scores recorded in Autumn 2024 for these newly established plots ranged between 60.1 to 74.
- There was a significant effect of Control-Impact and Before-After for vegetation cover across Spring sampling events, but no significant BACI interaction. The VI scores have increased between autumn sampling seasons across all Sites, which indicates an overall improvement in vegetation condition across Impact and Control Sites.
- Dominant species in terms of percent cover for Autumn 2024 riparian plots include *Pteridium esculentum* (particularly dominant at Control Site 7), *Eucalyptus piperita*, *Cynodon dactylon* (particularly at Impact Site 2), *Acacia terminalis* (particularly dominant at Control Site 7), *Acacia longifolia* and *Schoenus melanostachys* Most dominant exotic species included *Senna pendula, Cyperus congestus* and *Setaria verticillata.*
- Across all sampling seasons, native species richness at riparian Control Sites has decreased overall since monitoring commenced in Spring 2020. However, it appears to be increasing slightly over the last three monitoring seasons, trending towards baseline native species richness. Native species richness at Impact Sites has remained relatively stable throughout monitoring and there was a substantial increase in Spring 2023 and Autumn 2024.

- Overall, the average native vegetation was considerably higher at Impact Sites than Control Sites before mining started whereas the native vegetation cover has become more similar in the last two years after mining with Control Sites predicted to continue to increase in future years.
- The Vegetation Integrity (VI) of the six original riparian plots (1-6), across sampling seasons ranged between 21.6 (Control Site 4, Autumn 2023) and 83.7 (Control Site 5, Spring 2023) in VI score (low to high condition) (Table 3-4). The three new riparian plots that were established in Spring 2023 (Site 7-9) has VI scores ranging from 60.1 to 75.6 (moderate to high condition). The VI scores for Autumn 2024 ranged between 28.2 (Impact Site 3) to 74 (Impact Site 9). The fluctuation in VI scores is attributed to seasonality, reduced structural condition, and shifts in exotic species, which is likely due to stochastic events observed in previous seasons.

3.5.2.4 TARP BMP3 – Riparian Vegetation

During this reporting period, there have been no triggers under this TARP.

3.5.2.5 Overview of Monitoring Results – Threatened Species, Threatened Populations and Endangered Ecological Communities

Threatened Flora Species

Monitoring of threatened flora species for autumn 2024 was conducted by Niche Environment and Heritage between 24 March and 16 May 2024. Threatened flora species were monitored at six plot sites in areas with known threatened flora records, including three impact sites (TF4, TF5 and TF6) and three control sites (TF1, TF2 and TF3). The locations of monitoring sites are illustrated in **Figure 3-17**.

The threatened flora monitoring 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. The threatened flora monitoring was established in September 2022 (prior to the commencement of mining). Four rounds of monitoring have occurred after the commencement of mining (Spring 2022, Autumn 2023, Spring 2023 and Autumn 2024).

The six plots were designed to monitor a subset of individuals of the following species, Brown Pomaderris (*Pomaderris brunnea*), Bargo Geebung (*Persoonia bargoensis*), and small-flowered Grevillea (*Grevillea parviflora* subsp. *parviflora*).

During autumn 2024 monitoring, the highest number of individuals was identified at the impact Sites TF3 and TF6, followed by impact Sites TF1 and TF5. Overall, the number of threatened flora individuals across impact and control Sites is considered stable, with minor fluxes in the number of individuals across sampling seasons.

Monitoring to date has indicated that the control and impact Sites are sufficiently similar (species and abundance) to be suitable for long-term monitoring.

Threatened Ecological Communities

Monitoring of TEC vegetation for spring 2023 was conducted by Niche Environment and Heritage on various nights between 24 March and 16 May 2024. TEC vegetation surveys were conducted at six plot sites including three impact sites (TEC4, TEC5 and TEC6) and three control sites (TEC1, TEC2 and TEC3). The locations of monitoring sites are illustrated in **Figure 3-15**.

TEC 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 autumn 2024 indicated that TEC remnants within the Tahmoor South Study Area were in moderate to high condition across control and impact Sites. There is variance in the scores, which may be due to seasonality and the sites recovering from the flooding event in 2022 at different rates.

3.5.2.6 TARP BMP4 – Threatened Species, Threatened Populations and Endangered Ecological Communities

During this reporting period, there have been no triggers under this TARP.

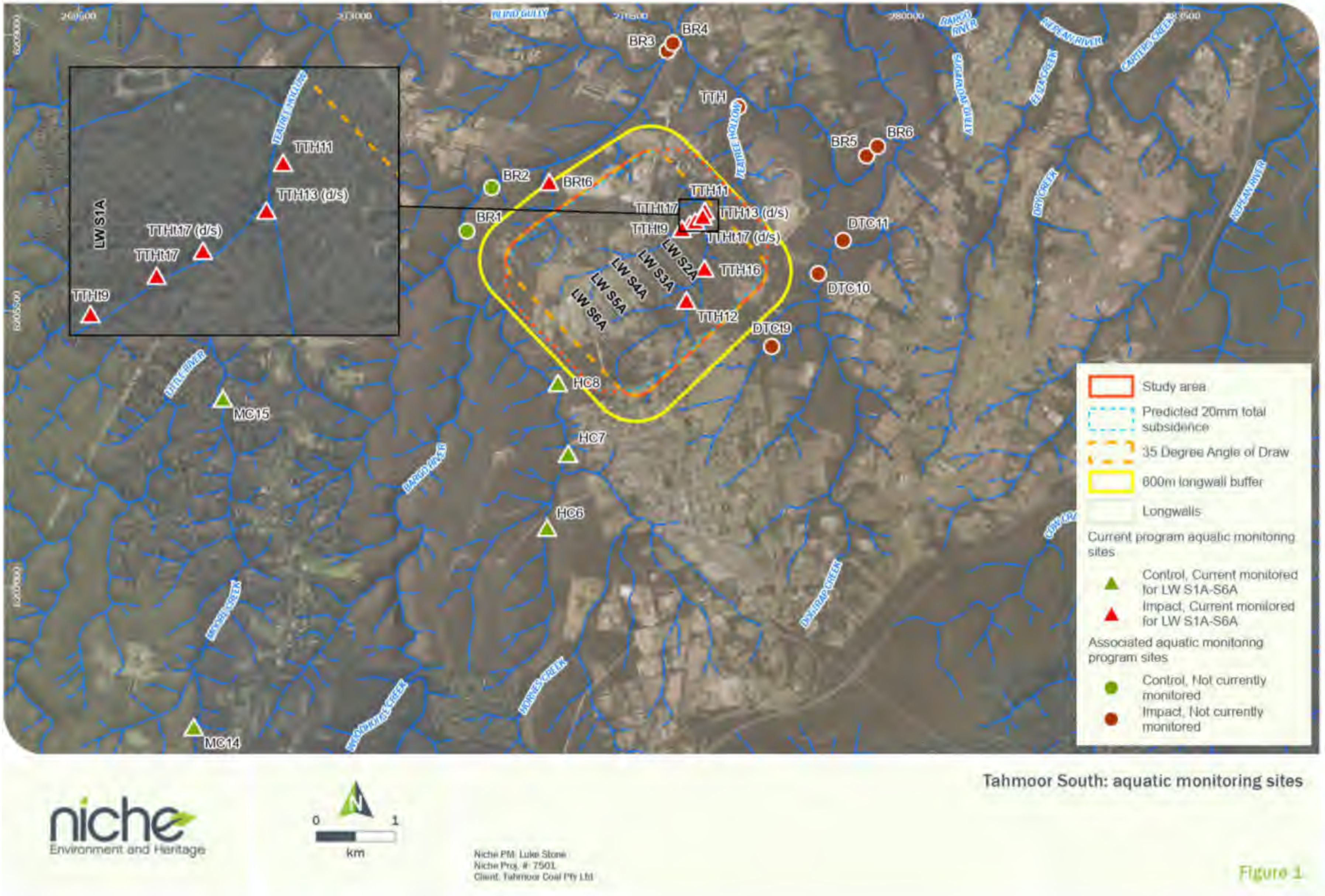

Figure 3-16 *LW S1A-S6A Aquatic Ecology Monitoring Locations (source: Niche, 2024a)*

This information has been retracted

- For more information contact Tahmoor Coal

3.6 Heritage Monitoring

The LW S1A-S6A Heritage Management Plan was prepared to manage the potential environmental consequences of LW S1A-S6A extraction on Aboriginal heritage and historical heritage sites and values in accordance with Condition C8 of SSD 8445.

The following sections summarise the observations made during the reporting period for Aboriginal and historical heritage items. Performance against all Heritage Management Plan TARPs (HMP1 and HMP2) for the reporting period are summarised in **Table 2-1**, and actions and responses completed relating to any TARP triggers are discussed in the following sections**.**

3.6.1 Aboriginal Heritage

3.6.1.1 Overview of Monitoring Results

During this reporting period, the LW S1A-S6A Heritage Management Plan has been implemented to monitor subsidence impacts on the rockshelter Teatree Hollow 2013.1 (AHIMS 52-2-4471) (refer **Figure 3-18**). The Aboriginal heritage monitoring of this rockshelter requires the following monitoring during and post-mining:

- Fortnightly visual inspection of the rockshelter (monitoring overall rockshelter stability) during periods of active subsidence for LW S1A, S2A, S3A and S4A, to be completed from a safe distance. This monitoring is completed by Building Inspection Services and Douglas Partners on an alternative monthly schedule, and reported in their monthly reports (available on request);
- Monitoring of GNSS units / survey lines in proximity to the rockshelter, reviewed on a monthly basis during periods of active subsidence for LW S1A, S2A, S3A and S4A. This monitoring is summarised in the weekly MSEC Subsidence Reports (refer to **Appendix A** for referenced report); and
- Visual inspection by archaeologist with RAPs at the completion of LW S1A, S2A, S3A and S4A. An end of panel inspection for LW S2A was completed on 12 April 2024 (available on request).

It is noted that the artefact scatter Remembrance Drive 2013.1 (AHIMS 52-2-3968) and isolated find TC14-2-19 (AHIMS 48-2-0275) were also assessed in the LW S1A-S6A Heritage Management Plan, however no pre-mining, during mining or post-mining monitoring is required for these sites.

During the reporting period, gradual developing movements have been measured by GNSS units S03 and S04 located on either side of Wirrimbirra Creek (in vicinity of the rockshelter site) (**Appendix A**).

The LW S2A end of panel inspection completed on 12 April 2024 did not identify any observable impacts such as cracks, exfoliation, or collapse, as a result of subsidence or other activities. Further, the floor of the rockshelter showed no evidence of recent rockfall or other moved material that may suggest collapse or movement has occurred.

The small area of abrasion on the rear wall at the southern end of the site that was identified during the 2023 site inspection had not changed and did not appear to exhibit any further signs of fresh abrasion. These changes were confirmed likely to be the result of animal activity or changing climatic conditions. There is no evidence that this relates to mining activities, nor does it require any form of remediation.

Teatree Hollow Creek adjacent to the rockshelter was full at the time of the inspection.

3.6.1.2 TARP HMP1 – Aboriginal Cultural Heritage Sites

During this reporting period, there have been no triggers under this TARP.

3.6.2 Historical Heritage

During this reporting period, the LW S1A-S6A Heritage Management Plan was implemented to monitor subsidence impacts for the following historical heritage items (refer **Figure 3-19**):

- Wirrimbirra Sanctuary (Australian Wildlife Sanctuary):
  - Various monitoring as per the Australian Wildlife Sanctuary Management Plan - This monitoring is summarised into Weekly Subsidence Status Reports by MSEC (refer **Appendix A** and **Appendix I** for referenced report);
  - Visual inspection by a heritage consultant at the completion of LW S5A - No visual inspections have been required during this reporting period;
- Bargo Railway Bridge North (Wellers Road Overbridge) and Bargo Railway Viaduct:
  - Various monitoring as per the Main Southern Railway Management Plan and the Wellers Road Overbridge Management Plan (latter to be prepared) - This monitoring is summarised into Weekly Subsidence Status Reports by MSEC (refer **Appendix A** and **Appendix F** for referenced reports);
  - Visual inspection by a heritage consultant at the completion of LW S6A - No visual inspections have been required during this reporting period;
- Bargo Cemetery:
  - Various monitoring as per the Bargo Cemetery Management Plan - This monitoring will be summarised into Weekly Subsidence Status Reports by MSEC and is not yet required;
  - Visual inspection by a heritage consultant at the completion of LW S6A - No visual inspections have been required during this reporting period;
- Picton Weir:
  - Various monitoring as per the Picton Weir Management Plan - This monitoring will be summarised into a Weekly Subsidence Status Report by MSEC and is not yet required;
- Tahmoor Colliery (Tahmoor Mine Site):
  - Various monitoring as per the Tahmoor Mine Site Management Plan - This monitoring is summarised into Weekly Subsidence Status Reports by MSEC (refer **Appendix A** and **Appendix H** for referenced report) and Mine Site Photo Reports by Tahmoor Coal;
- Great Southern Road (partial):
  - Various monitoring as per the Main Southern Railway Management Plan - This monitoring is summarised in weekly MSEC Subsidence Reports (refer to **Appendix A** for referenced report).

3.6.2.1 Overview of Monitoring Results

During the reporting period, no observations of impacts to heritage structures were made at the Australian Wildlife Sanctuary (Refer **Section 2.7.12**), Wellers Road Overbridge and Bargo Railway Viaduct (refer **Section 2.7.1**), Bargo Cemetery (refer **Section 2.7.9**), Picton Weir (refer **Section 2.7.13**) or the Great Southern Road (refer **Section 2.7.2**).

The following changes were observed at the Tahmoor Mine Site during the reporting period (refer to **Appendix H** for further information):

- Minor new cracking observed in the eastern and southern walls of the 6C tunnel from 22 January 2024 onwards at location of cracking identified during LW S1A. The eastern wall crack measured to be approximately 3 m long. The most significant cracks on the western wall adjacent to the ventilation shaft are approximately 1.2 mm wide; and
- Minor growth in ground shortening between BL600 and BL700 to 14 mm in the rail loop long bay length survey.

Impacts to Tahmoor Mine Site infrastructure were noted to be *possible* in the LW S1A-S6A Heritage Management Plan. Changes observed at the 6C Tunnel are a continuation of those observed during the previous reporting period, for which a review was completed by a heritage consultant (refer to **Appendix E)**. The hairline cracks were perceived to be minor and, if required, could be repaired in a manner that preserves the heritage value of the mine. Therefore, it is unlikely that the performance measures identified in the LW S1A-S6A Heritage Management Plan will be exceeded.

During the reporting period, the Tahmoor Mine Site remained safe and serviceable. Further discussion of these observations is provided in **Section 3.7.11**.

3.6.2.2 TARP HMP2 – Historical Heritage Items

Background

During the reporting period, a Level 1 TARP trigger of the TARP HMP2 (historical heritage items) occurred due to the following detectable environmental consequences at the Tahmoor Mine Site (or Tahmoor Colliery):

- Minor new cracking observed in the eastern and southern walls of the 6C tunnel from 22 January 2024 onwards at location of cracking identified during LW S1A. The eastern wall crack measured to be approximately 3 m long. The most significant cracks on the western wall adjacent to the ventilation shaft are approximately 1.2 mm wide; and
- Minor growth in ground shortening between BL600 and BL700 to 14 mm in the rail loop long bay length survey.

These triggers remained at the end of the LW S2A monitoring period (3 May 2024), and no new triggers have been observed during the extraction of LW S3A.

Actions and Responses Completed

Table 3-11 outlines the actions and responses that are required to be completed in accordance with a Level 1 TARP trigger for change to historical heritage items (TARP HMP2), as well as how these actions and responses have been addressed.

Table 3-11 Actions and Responses for Level 1 TARP Trigger for Change to Historical Heritage Item (TARP HMP2)

Action / Response from TARP HMP2	Tahmoor Coal response
Actions	
Continue monitoring and review of data as per monitoring program.	Monitoring is ongoing in accordance with the LW S1A-S6A Tahmoor Mine Site Management Plan and the LW S1A-S6A Heritage Management Plan.
Co-ordinate a site inspection with a structural engineer.	A structural engineer inspected the cracks in the 6C Tunnel on 30 May 2023 and reported no immediate concerns as the structure remains safe and serviceable. Cracking observed in this reporting period is in the same area and is similar to that observed in the previous reporting period. Tahmoor Coal restressed the rail loop track at the completion of LW S2A.
Consult with a qualified archaeologist or heritage architect to determine whether impacts to heritage sites have occurred.	A review of cracks in the 6C Tunnel was completed by a qualified archaeologist (refer **Appendix E**). Hairline cracks in the concrete within the 6C Tunnel were considered to be minor and, if required, could be repaired in a manner that preserves the heritage value of the mine. In addition, the Tahmoor Mine Site is a working site and minor

Action / Response from TARP HMP2	Tahmoor Coal response
	impacts such as hairline cracks are unlikely to affect its heritage values. It is noted that changes at the rail loop did not result in any visual changes and were therefore not considered by the archaeologist as a potential historical heritage impact.
Consider increasing monitoring and review of data frequency for sites subject to a Level 1 trigger event, subject to land access.	The 6C Tunnel and rail loop at the Tahmoor Mine Site are considered to be adequately monitored in accordance with the LW S1A-S6A Tahmoor Mine Site. The current frequency of monitoring at the 6C Tunnel and rail loop is weekly during active subsidence.
Detailed photographic recording of any damage to be documented.	Photographic evidence of any damage to the 6C Tunnel was completed on a weekly basis as part of the weekly Mine Conveyor Photo Reports.
Erect warning signs and restrict access to areas where necessary.	The Tahmoor Mine Site remained safe and serviceable during the reporting period, and no warning signs or restricted access to the areas in question were deemed necessary.
Responses	
Report trigger exceedance to DPHI and Heritage NSW.	Notification of this exceedance to DPHI is completed as part of this report. As discussed in the historical heritage review (refer **Appendix E**), as the heritage values of the item have not been impacted, there is no requirement to report this trigger to Heritage NSW.
Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report.

Proposed Actions

The current monitoring program will continue in accordance with the LW S1A-S6A Tahmoor Mine Site Management Plan.

The review of the 6C Tunnel by a qualified archaeologist (refer **Appendix E**) recommended the following actions:

- The site should continue to be monitored and the data reviewed as per the Tahmoor Mine Site Management Plan;
- At the conclusion of mining of LW S1A-S6A, the cracks within Tunnel 6C should be assessed by a suitably qualified heritage advisor to determine whether remediation is required;
- If it is determined that remediation of the tunnel is required and/or the impact cannot be repaired at the conclusion of mining of LW S1A-S6A to a level that preserves the heritage values of the site, the TARP requires that the trigger exceedance be report to DPHI (already completed) and Heritage NSW; and
- The TARP requires that trigger exceedance and investigation outcomes be included in the Six Monthly Subsidence Impact Report (this document) and Annual Review.

SIMEC

This information has been retracted

- For more information contact Tahmoor Coal

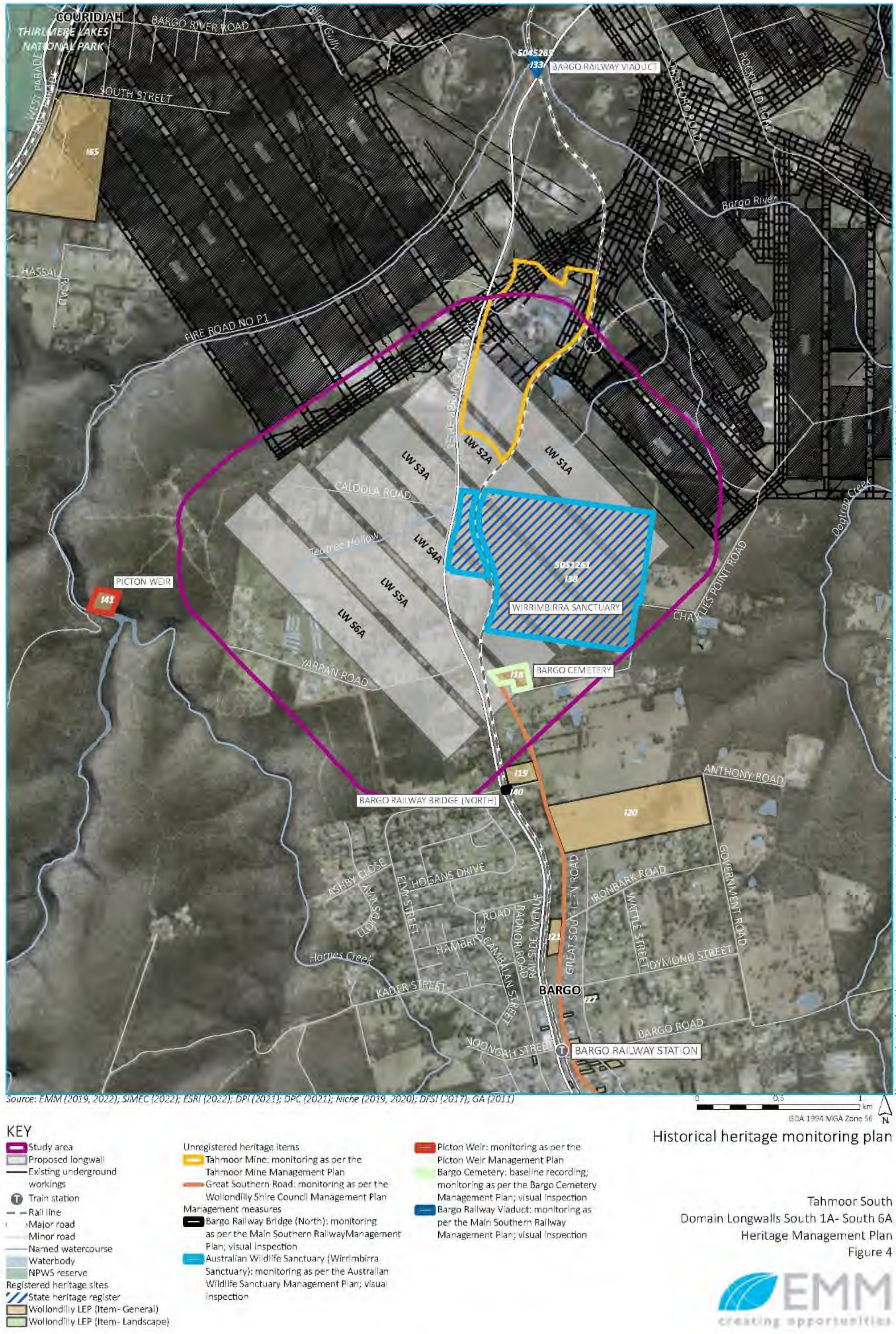

Figure 3-19 Historical Heritage Sites in the LW S1A-S6A Study Area and Surrounds (Source LW S1A-S6A Heritage Management Plan)

3.7 Built Features Monitoring

The LW S1A-S6A Built Features Management Plan and associated sub-plans were prepared to manage the potential environmental consequences of LW S1A-S6A extraction on built features in accordance with Condition C8 of SSD 8445.

During this reporting period, the LW S1A-S6A Subsidence Monitoring Program was implemented to monitor subsidence impacts on infrastructure owned by Wollondilly Shire Council (roads, bridges and culverts), ARTC (rail infrastructure), Sydney Water (potable water infrastructure and sewer infrastructure), Endeavour Energy (electrical infrastructure), Jemena (gas infrastructure), Telstra (telecommunications infrastructure), NBN (telecommunications infrastructure), TPG (telecommunications infrastructure) and private property owners. The details of the Subsidence Monitoring Program are illustrated in **Figure 3-1**.

A weekly review of the subsidence survey results during the reporting period has been completed by MSEC during mining of LW S2A and LW S3A (referred document provided in **Appendix A**). In addition, weekly reports by MSEC are prepared for specific built features including the Main Southern Railway, Tahmoor Mine Site, 3030 Remembrance Driveway (Petrol Station), MKD Machinery, Tahmoor Garden Centre, Wollondilly Anglican College, and Australian Wildlife Sanctuary.

The following sections summarise the observations made during the reporting period for built features, as well as actions and responses completed relating to any TARP triggers. Performance against all built features TARPs for the reporting period are summarised in **Table 2-1**.

3.7.1 Main Southern Railway

3.7.1.1 Overview of Monitoring Results

Weekly surveys have been conducted on the Main Southern Railway when located in the LW S2A and LW S3A active subsidence zones. Weekly Subsidence Status Reports have been prepared for the Main Southern Railway during active subsidence, which summarise monitoring and inspection results for the railway track, early warning monitoring, embankment and culvert at 98.445 km, embankment and culvert at 98.739 km, embankment and culvert at 99.035 km, embankment and culvert at 99.338 km, cuttings, coal conveyor at 98.160 km, Bargo River Railway Viaduct at 96.256 km, Remembrance Drive Bridge over Bargo River at 96.385 km, Bago River Road Overbridge at 96.049 km, and Wellers Road Overbridge at 101.162 km.

During the reporting period, there were minor changes observed during the absolute 3D survey of the embankment and culvert at 99.338 km on 6 March 2024. This minor change consisted of minor closure on the Up side and minor extension across the crest at this location (refer to LW S2A Report 19 in **Appendix F**).

The Main Southern Railway was maintained in a safe and serviceable conditions during mining of LW S2A and LW S3A.

3.7.1.2 Main Southern Railway TARP

Background

As discussed in the Main Southern Railway Report 19 for LW S2A (refer to **Appendix F**), on 6 March 2024 a measured extension of 29 mm across the crest between Pegs B99360 and C99360 for the second consecutive week was observed. This resulted in the exceedance of the Level 1 trigger (blue trigger) of 25 mm. The cause of this change was attributed to heavy vehicle movement along the crest, as was previously observed in July and August 2023. No issues of concern were observed from visual inspections.

Actions and Responses Completed

During the current reporting period, the blue trigger for measured extension at 99.338 km was resolved by the RMG, who reviewed the monitoring results on 8 March 2024 and agreed to increase the Level 1 rigger for measured extension of the crest from 99.340 km to 99.400 km from 25 mm to 50 mm.

Proposed Actions

Continuous monitoring is ongoing for the Main Southern Railway in accordance with the Main Southern Railway Management Plan.

3.7.2 Local Roads and Bridges

3.7.2.1 Overview of Monitoring Results

Monthly and weekly surveys have been conducted on local roads and bridges during LW S2A and LW S3A in accordance with the Wollondilly Shire Council Management Plan, Jemena Management Plan, Sydney Water Potable Water Management Plan, Sydney Water Sewer Management Plan, Telstra Management Plan, NBN Management Plan and TPG Management Plan. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

Remembrance Drive

On 22 May 2023, non-conventional subsidence movements were initially measured at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47 (refer to **Figure 3-20**). A focused visual inspection was conducted on 31 May 2023, which identified a small compression bump in the southbound lane of Remembrance Drive between Pegs R47 and R48 (refer to **Figure 3-21**).

Rates of change in compressive ground strain have reduced following the completion of LW S2A, though a minor trend of increasing compressive strain continues (refer to MSEC1368 LW S2A Subsidence Monitoring Report 37 in **Appendix A**). Observations as part of LW S3A mining had not yet commenced during this reporting period.

On 26 February 2024 (during the mining of LW S2A), increase compressive strain was observed between Pegs R54 and R55, accompanied by a small bump in the observed subsidence profile at Peg R54. This bump extended across the southbound land and into the northbound lane, however did not represent a safety hazard on the road. No significant changes were observed during a visual inspection on 30 April 2024.

On 22 April 2024, a very minor bump was observed in the northbound land of Remembrance Drive near Peg R61 (refer to **Figure 3-22**). No significant changes were observed during a visual inspection on 30 April 2024.

The identified bumps intersect a number of utility services, including Jemena's gas main, Sydney Water's potable water main and sewer main, and optical fibre and copper telecommunication cables.

Other Roads

Monthly ground surveys have been conducted along Charlies Point Road during LW S2A and LW S3A mining, with very minor changes observed. Visual inspections have not identified any issues.

Surveys of Arina Road Bridge and Rockford Road Bridge on 11 April 2024 measured very minor changes.

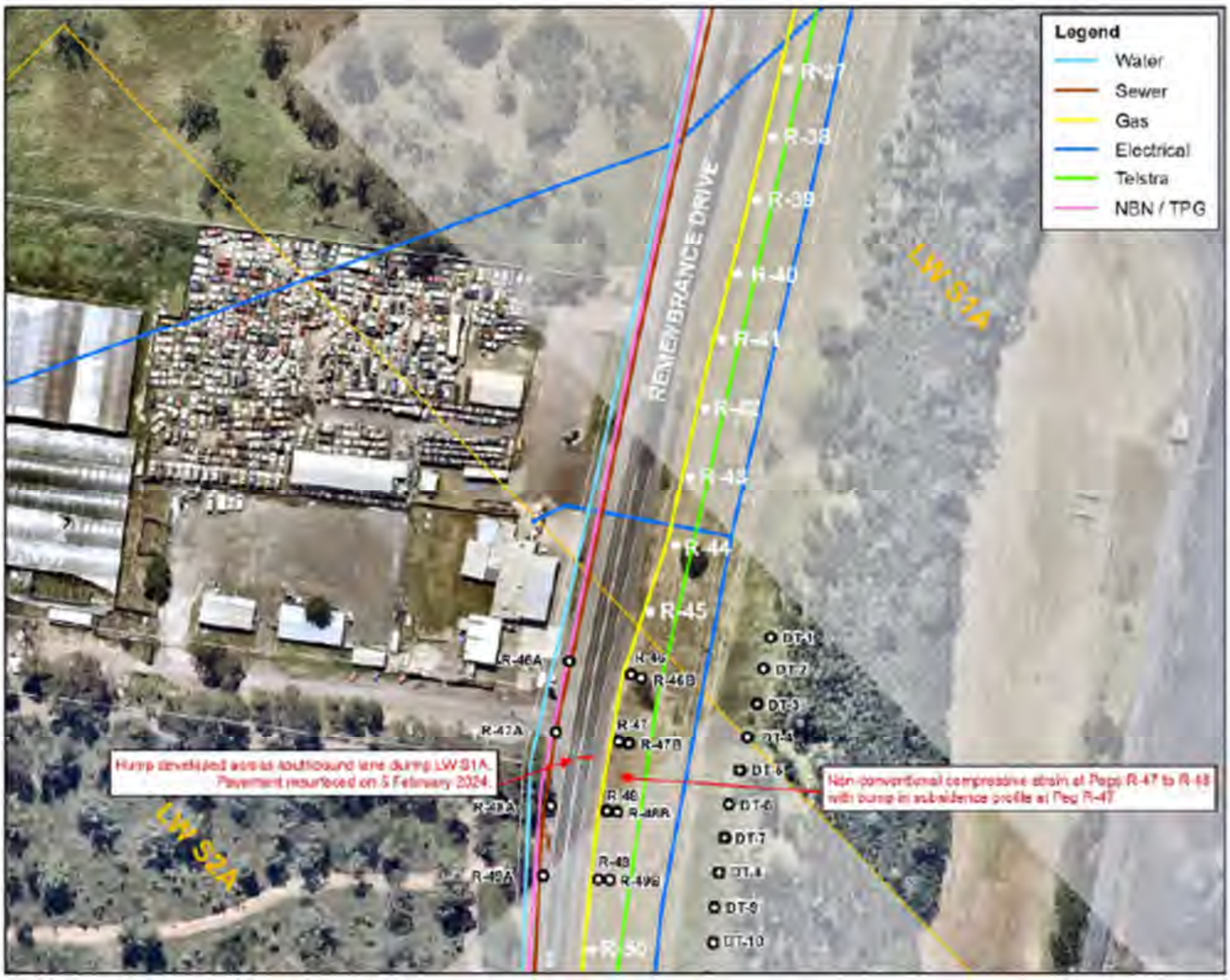

Figure 3-20 Location of non-conventional compressive strain, bump and hump in southbound lane of Remembrance Drive near Peg R46 (Source: MSEC1368 Report 37, Appendix A)

Figure 3-21 Small bump observed in southbound land of Remembrance Drive near Peg R46 on 31 May 2023 (Source: MSEC1368 Report 37, Appendix A)

Figure 3-22 Very minor bump observed in northbound land of Remembrance Drive near Peg R61 on 22 April 2024 (Source: MSEC1368 Report 37, Appendix A)

3.7.2.2 Wollondilly Shire Council TARP

Background

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. In addition, compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. These observations exceeded trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication owners Telstra, TPG and NBN.

Actions and Responses Completed

In accordance with the Wollondilly Shire Council Management Plan, Tahmoor Coal completed the following actions:

- Notification to Wollondilly Shire Council on 31 May 2023;
- Representatives from Tahmoor Coal, Wolldondilly Shire Council and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:
  - Pavement of Remembrance Drive was resurfaced on 5 February 2024 and again on 8 April 2024;
  - The speed limit was reduced to 60 km/hour for the Southbound direction due to the presence of the traffic barriers and was extended to cover the newly forming bump north of Pegs R54 and R55. The speed limit remains at 80 km/hour for the Northbound direction. This barrier was removed and normal speed restrictions reinstated in May 2024;
  - Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June 2023);
  - Frequency of surveys was weekly during LW S2A active subsidence;
  - Frequency of focussed visual inspections was weekly during LW S2A active subsidence;
  - Tahmoor Coal to continue to keep Council informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via monitoring reports and via weekly teleconferences;
  - Tahmoor Coal to arrange for contractor on standby to repair the road at short notice, when required by Council;
  - Council to install warning signs and temporary speed restriction signs, when required; and
  - Notify and inform Council staff about the impact site, in the event of enquiries from the travelling public.

Proposed Actions

The current monitoring program will continue in accordance with the Wollondilly Shire Council Management Plan discussed in the sections above.

3.7.3 Potable Water Infrastructure

3.7.3.1 Overview of Monitoring Results

Monthly and weekly surveys have been conducted on local roads and bridges during LW S2A and LW S3A in accordance with the Wollondilly Shire Council Management Plan, Jemena Management Plan, Sydney Water Potable Water Management Plan, Sydney Water Sewer Management Plan, Telstra Management Plan, NBN Management Plan and TPG Management Plan. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were initially measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024.

No impacts to Sydney Water potable water infrastructure were observed during the LW S2A monitoring period. Observations as part of LW S3A mining had not yet commenced during this reporting period.

3.7.3.2 Sydney Water Potable Water TARP

Background

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. In addition, compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. These observations exceeded trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication owners Telstra, TPG and NBN.

Actions and Responses Completed

In accordance with the Sydney Water Potable Water Management Plan and Sydney Water Sewer Management Plan, Tahmoor Coal completed the following actions:

- Notification to Sydney Water on 31 May 2023;
- Representatives from Tahmoor Coal, Sydney Water, Sweeting Consulting and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:
    - Tahmoor Coal and Sydney Water installed four expansion joints (Gibault joints) near the site prior to the influence of LW S2A. The joints were installed on 11 September 2023, with joint displacement sensors installed;
    - Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June 2023);
    - Frequency of surveys was weekly during LW S2A active subsidence;
    - Frequency of focussed visual inspections was weekly during LW S2A active subsidence;
    - Sydney Water confirmed that valves have been marked out on site, as planned. Values to the north of the site have been audited to ensure that they are in working condition. A valve audit was completed for valves located to the south of the site on 15 June 2024;
    - Sydney Water confirmed that reservoirs in the network are currently operating at 87% to 93% full, as planned;
    - Sydney Water confirmed that this section of the water main has no history of previous leaks;
    - Sydney Water has procedures in place to repair a water leak between Pegs R53 and R55, if required;
    - Tahmoor Coal to continue to keep Sydney Water informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via monitoring reports and by weekly teleconferences; and
    - Sydney Water remains on standby to conduct repairs if required.

Displacement sensors were installed on all four Gibault joints of the 100 mm water main on Caloola Road. Closure has been observed to gradually develop on the northern Gibault joint at the northern connection to the existing water main. The northern-most Gibault joint reached the limit of its capacity on 25 February

2024, and closure has been taken up by the next joint. Closure has gradually developed on the southern Gibault joint at the northern connection, with rates of change reduced to low levels. The displacement sensors across the other two joints are currently recording very minor changes.

The northern displacement sensor across the southern joint was replaced in late February 2024. The observed changes are compared with changes in horizontal distance between Pegs R76C and R78C, which are located on either side of the joints. Measured changes are within survey tolerances, and a very small trend of closure observed on the joint sensors is gradually reversing.

Proposed Actions

The current monitoring program will continue in accordance with the various Management Plans discussed in the sections above.

3.7.4 Sewer Infrastructure

3.7.4.1 Overview of Monitoring Results

Monthly and weekly surveys have been conducted on local roads and bridges during LW S2A and LW S3A in accordance with the Wollondilly Shire Council Management Plan, Jemena Management Plan, Sydney Water Potable Water Management Plan, Sydney Water Sewer Management Plan, Telstra Management Plan, NBN Management Plan and TPG Management Plan. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were initially measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024.

No impacts to Sydney Water sewer infrastructure were observed during the LW S2A monitoring period. Observations as part of LW S3A mining had not yet commenced during this reporting period.

3.7.4.2 Sydney Water Sewer TARP

Background

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. In addition, compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. These observations exceeded trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication owners Telstra, TPG and NBN.

Actions and Responses Completed

In accordance with the Sydney Water Potable Water Management Plan and Sydney Water Sewer Management Plan, Tahmoor Coal completed the following actions:

- Notification to Sydney Water on 31 May 2023;
- Representatives from Tahmoor Coal, Sydney Water, Sweeting Consulting and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 2 June 2024.
- It was agreed that local excavation of pipework or repairs are not required at this stage. The following additional management measures were agreed:
    - Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June 2023);

- Frequency of surveys was weekly during LW S2A active subsidence;
- Frequency of focussed visual inspections was weekly during LW S2A active subsidence;
- Sydney Water confirmed that there were no signs of impact on the sewer system from automated monitoring results from sensors located upstream and downstream of the site;
- Tahmoor Coal to continue to keep Sydney Water informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via monitoring reports and by weekly teleconferences; and
- Sydney Water remains on standby to conduct repairs if required.

Proposed Actions

The current monitoring program will continue in accordance with the various Management Plans discussed in the sections above.

3.7.5 Gas Infrastructure

3.7.5.1 Overview of Monitoring Results

Monthly and weekly surveys have been conducted on local roads and bridges during LW S2A and LW S3A in accordance with the Wollondilly Shire Council Management Plan, Jemena Management Plan, Sydney Water Potable Water Management Plan, Sydney Water Sewer Management Plan, Telstra Management Plan, NBN Management Plan and TPG Management Plan. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were initially measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. It is noted that no odours were detected during visual inspections.

No impacts to Jemena gas infrastructure were observed during the LW S2A monitoring period. Observations as part of LW S3A mining had not yet commenced during this reporting period.

3.7.5.2 Jemena TARP

Background

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. In addition, compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. These observations exceeded trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication owners Telstra, TPG and NBN.

Actions and Responses Completed

In accordance with the Jemena Management Plan, Tahmoor Coal completed the following actions:

- Notification to Jemena on 31 May;
- Representatives from Tahmoor Coal, Jemena, Worley Consulting and MSEC met on multiple occasions to review the latest observations and decide whether any addition management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:
  - Following engineering analysis or observed ground movements, Tahmoor Coal and Jemena excavated and exposed the pipeline prior to the influence of LW S2A, in order to decouple the pipeline from the ground. The excavation of the trench was successfully completed on

18 December 2023. Excavation and decoupling of the pipe to relieve stress between Pegs R53 and R55 was completed on 11 March 2024. The pipeline has bowed in response to the compressive ground strain and thermal loads, as expected. The trench was backfilled on 7 May 2024 and the traffic barriers have been removed following recent wet weather;

  - Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June 2023);
  - Frequency of surveys, including a survey of the pipe alignment, was weekly during LW S2A active subsidence;
  - Frequency of focussed visual inspections was weekly during LW S2A active subsidence;
  - Weekly gas detection surveys along affected section of Remembrance Drive by Tahmoor Coal;
  - As per recommendation from Worley Consulting, a trigger of 1.2 mm/m additional compressive strain has been implemented. Upon exceeding the trigger, Tahmoor Coal and Jemena will meet to discuss management actions, which include re-exposing the gas pipes. Based on the latest absolute 3D survey on 7 May 2024, the triggers are set to 4.6 mm/m between Pegs R47 and R48, and 3.2 mm/m between Pegs R54 and R55;
  - Tahmoor Coal to continue to keep Jemena informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via monitoring reports and by weekly teleconferences; and
  - Jemena remains on standby to conduct repairs if required.

Proposed Actions

The current monitoring program will continue in accordance with the Jemena Management Plan discussed in the sections above.

3.7.6 Electrical Infrastructure

3.7.6.1 Overview of Monitoring Results

Ground surveys of critical power poles are conducted when Endeavour Energy electrical poles are within the active subsidence zone. The latest survey was on 20 February 2024. Observations during LW S2A extraction were reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report). Observations as part of LW S3A mining had not yet commenced during this reporting period.

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were initially measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. The observations do not adversely affect Endeavour Energy infrastructure at this stage.

No impacts to Endeavour Energy electrical infrastructure were observed during the reporting period.

3.7.6.2 Endeavour Energy TARP

During this reporting period, there have been no triggers under this TARP.

3.7.7 Telecommunications Infrastructure

3.7.7.1 Overview of Monitoring Results

Monthly and weekly surveys have been conducted on local roads and bridges during LW S2A and LW S3A in accordance with the Wollondilly Shire Council Management Plan, Jemena Management Plan, Sydney Water Potable Water Management Plan, Sydney Water Sewer Management Plan, Telstra Management Plan, NBN

Management Plan and TPG Management Plan. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were initially measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. Compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024.

On 27 December, a minor loss was detected by ODTR at the location of the bump and high compressive strain on Remembrance Drive. The cable was retested on 29 December 2023 and 1 January 2024, which found minor changes since 27 December 2023. An increase in loss was observed on 4 and 8 January 2023. The cause of the loss could be related to the gas pipe trench excavation or heavy construction vehicles travelling over the cable, or saturation of soils from recent rainfall events. Latest testing on 17 April 2024 showed no indication of losses above LW S2A.

Observations as part of LW S3A mining had not yet commenced during this reporting period.

3.7.7.2 Telstra, TPG and NBN TARPs

Background

As discussed in **Section 2.7.2.1**, non-conventional subsidence movements were measured on 22 May 2023 at Pegs R46 to R48 on Remembrance Drive, accompanied by a bump in the observed subsidence profile at Peg R47. In addition, compressive strain was observed between Pegs R54 and R55 on 26 February 2024, accompanied by a small bump at Peg R54. A very minor bump was also observed near Peg R61 on 22 April 2024. These observations exceeded trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication owners Telstra, TPG and NBN.

Actions and Responses Completed

In accordance with the Telstra, TPG and NBN Management Plans, Tahmoor Coal completed the following actions:

- Notification to Telstra, TPG and NBN on 31 May.
- Representatives from Tahmoor Coal, Telstra, CNS and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. It is noted that the Telstra cable is the most vulnerable as it is direct-buried, while the NBN and TPG cables are in 100 mm diameter conduit;
- Telstra excavated and exposed the buried cables on 16 January 2024. Testing by Telstra indicated that the transmission fibres in the cable have relaxed following the protection works but the spare test fibre that is used by CNS to conduce OTDR testing experienced a break on 18 January, approximately 5 metres north of the original loss location;
- OTDR testing by CNS of the Telstra cable south of the impact site found no ongoing losses detected between Pegs R47 and R48. A small transmission loss, though less than trigger levels, was detected by Telstra automated monitoring near Pegs R54 and R55 with no change. An OTDR test at 1625 nm by CNS on 8 April 2024 detected no loss at this location;
- Telstra will continue to monitor the condition of the transmission fibres in the cable, with no ongoing losses detected;
- Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June 2023);
- Frequency of surveys was weekly during LW S2A active subsidence;
- Frequency of focussed visual inspections was weekly during LW S2A active subsidence;

- Based on the result of the OTDR monitoring, it is currently not planned to excavate and relieve cable stress between Pegs R53 and R55;
- Tahmoor Coal to continue to keep Telstra, NBN and TPG informed on the status of ground movements, visual inspections and OTDR;
- Tahmoor Coal to continue to keep Telstra informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via monitoring reports and via weekly teleconferences; and
- Comms Network Solutions remains on standby to locally excavate and expose the buried cables if required.

Proposed Actions

The current monitoring program will continue in accordance with the various Management Plans discussed in the sections above.

3.7.8 Built Structures (General)

3.7.8.1 Overview of Monitoring Results

Monthly and weekly surveys are conducted at farm structures (farm buildings, sheds, tanks, fences) and residential structures (houses, swimming pools, associated residential structures, fences, pavement) during active subsidence as required.

During the reporting period and the mining of LW S2A and LW S3A, no impacts were observed at farm structures or residential structures.

A summary of observations of farm dams is provided in **Section 3.4.3**.

3.7.8.2 Built Structures TARP

During this reporting period, there have been no triggers under this TARP.

3.7.9 Bargo Cemetery

3.7.9.1 Overview of Monitoring Results

During the reporting period and the mining of LW S2A and LW S3A, no impacts have been observed at this location. This location is located directly above LW S5A and was outside the active subsidence zone of LW S2A and LW S3A.

3.7.9.2 Bargo Cemetery TARP

During this reporting period, there have been no triggers under this TARP.

3.7.10 Wollondilly Anglican College

3.7.10.1 Overview of Monitoring Results

Weekly Subsidence Status Reports have been prepared for the Wollondilly Anglican College, which summarise monitoring and inspection results for the Remembrance Driveway, monitoring lines between College buildings, structures, fence lines, dams, and sensitive equipment.

During the reporting period and the mining of LW S2A and LW S3A, the following observations were made (refer to WAC Reports No. 02 and 14 for LW S2A, **Appendix G)**:

- A gate to side of Clifford Warne Auditorium was noted to have jammed in February and March 2024, having already been repaired as a result of similar impacts observed during LW S1A mining;
- A gate on the opposite side of the Clifford Warne Auditorium was also noted to have slightly pulled apart;

- Impacts to pavement and brick walls between the Shoulder to Shoulder Shelter and Canteen were observed. A depression in the walkway pavement outside the Assembly Awning on the canteen side was also observed;
- Cracking in the brick retaining structures at a set of stairs and an observed dip in the pavement leading to the stairs were noted;
- Ground cracking was observed along the southern wall of Clifford Warne Auditorium;
- The Johnson Building was reported to develop cracking, however this was noted not to be associated with mining impacts;
- The garden access gate at Quarmby Cottage was noted to have jammed; and
- A gate at the northeastern corner of White Cottage was noted to be self-closing intermittently.

3.7.10.2 Wollondilly Anglican College TARP

Background

As discussed in **Section 2.7.10.1**, non-conventional subsidence result in impacts to gates, pavement, brick walls and stairs at Wollondilly Anglican College during mining of LW S2A. These observations exceeded the trigger level in the Wollondilly Anglican College Management Plan.

Actions and Responses Completed

In accordance with the Wollondilly Anglican College Management Plan, Tahmoor Coal completed the following actions (refer to **Appendix G**):

- The gate to the side of Clifford Warne Auditorium was removed, resized and reinstalled on 5 February 2024, and repaired again on 21 March 2024. The gate on the opposite side of Clifford Warne Auditorium was repaired on 28 February 2024. The gate on the north-eastern corner of White Cottage was repaired;
- A TARP Trigger Notification was provided to Wollondilly Anglican College, Resources Regulator and Subsidence Advisory NSW on 13 February 2024;
- A structural inspection of the depression and cracking near the set of stairs was completed on 15 February 2024 and noted that impacts were cosmetic in nature. A temporary barrier at the steps was installed to ensure no further access. Tahmoor Coal's Structure Review Committee (SRG) attended and observed the location for the damage and potential mechanism from mining impact; and
- Tahmoor Coal completed concrete pavement and brickwork repairs and the installation of expansion joints on 26 April 2024.

These triggers were resolved at the end of the LW S2A monitoring period (3 May 2024), and no new triggers have been observed during the extraction of LW S3A.

Proposed Actions

The current monitoring program will continue in accordance with the Wollondilly Anglican College Management Plan.

3.7.11 Tahmoor Mine Site

3.7.11.1 Overview of Monitoring Results

Monthly and weekly surveys were conducted at the Tahmoor Mine Site during LW S2A and LW S3A in accordance with the Tahmoor Mine Site Management Plan. Weekly Subsidence Status Reports have been prepared for the Tahmoor Mine site during active subsidence, which summarise monitoring and inspection results for general mine site monitoring, the stockpile area (including conveyor 5C and reclaim tunnel conveyor 6C), overhead conveyors, drift, winder, rail loop, mine site structures, overhead crane and monorails, shaft No. 3, dams, embankments and site services, and the reject emplacement area. In addition, Weekly Photo Reports are also prepared by Tahmoor Coal of infrastructure).

The latest survey was conducted on 3 March 2024 at the end of LW S2A monitoring period, and the rates of change have reduced to very low levels.

During the reporting period, the following changes were observed (refer to the Mine Site Reports No. 03, 09 and 18 for LW S2A, **Appendix H**):

- Minor new cracking observed in the eastern and southern walls of the 6C tunnel from 22 January 2024 onwards at location of cracking identified during LW S1A. The eastern wall crack measured to be approximately 3 m long. The most significant cracks on the western wall adjacent to the ventilation shaft are approximately 1.2 mm wide; and
- Minor growth in ground shortening between BL600 and BL700 to 14 mm in the rail loop long bay length survey.

The mine site remained safe and serviceable during LW S2A and LW S3A extraction. A structural engineer inspected the cracks in the 6C Tunnel on 25 March 2024 and reported no immediate concerns.

3.7.11.2 Tahmoor Mine Site TARP

Background

As discussed in the above section (**Section 3.7.11.1**), the following blue triggers occurred during the reporting period (refer to **Appendix H**):

- 22 January 2024 – Cracks observed in 6C Tunnel; and
- 26 February 2024 – Ground shortening between BL600 and BL700 in the rail loop.

These triggers remained at the end of the LW S2A monitoring period (3 May 2024), and no new triggers have been observed during the extraction of LW S3A.

Actions and Responses Completed

Tahmoor Coal restressed the rail loop track at the completion of LW S2A.

Proposed Actions

The current monitoring program will continue in accordance with the Main Southern Railway Management Plan. Tahmoor Coal proposes to continue monitoring the 6C Tunnel and associated cracking.

3.7.12 Australian Wildlife Sanctuary

3.7.12.1 Overview of Monitoring Results

Weekly Subsidence Status Reports have been prepared for the Australian Wildlife Sanctuary during active subsidence, which summarises monitoring and inspection results from relevant GNSS units, ground survey (Tahmoor Mine Boundary line (V line)), survey and visual inspections of Main Southern Railway, local streets, structures; and natural features observations.

During the reporting period and the mining of LW S2A and LW S3A, no impacts to built structures have been observed at this property.

During the reporting period, changes were observed in Wirrimbirra Creek (a tributary of Teatree Hollow) with regards to water level, flow and fracturing within the waterways (refer to **Appendix A** and AWS Report No. 06 for LW S2A in **Appendix I**). These changes are summarised below:

- Surface flow were noted to decrease in Wirrimbirra Creek:

- On 8 February 2023, surface water flows were first observed to stop 120 m upstream of monitoring site TT3 (above the centreline of LW S2A). A surface crack was observed in the bedrock downstream of this location.
    - On 10 April 2024, flows in the creek had increased due to heavy rainfall on 6 April 2024.
    - An inspection on 12 June 2024 observed surface water continuing along the full length of the Wirrimbirra Creek (Tributary to Teatree Hollow).
- Low water levels were observed at Pool TT2, and were assessed to be atypical in comparison with what would be considered 'normal' conditions. This atypical water level was considered likely to be due to mining-induced reduction in groundwater baseflow into the pool;
- Fractures within a surface boulder upstream of Pool TT2 were noted to increase in size from September 2023 onwards. The fracture was not visible in the boulder to the same scale and extent as observed prior to or after the mining of LW S1A.
    - On 9 November 2023, a geotechnical inspection of the fracture site confirmed that the boulder was once connected to the host rock on both sides of the stream, however became dislocated due to natural weather and erosion of the underlying strata prior to mining. The boulder remained in contact with the host rock, however mining-induced closure has resulted in almost immediate fracturing.
    - During the reporting period, the fracture did not have any effect on surface flows into Pool TT2.
    - On 8 April 2024, an inspection of the boulder found that the detached sandstone block had been displaced following the heavy rainfall event on 6 April 2024.
- An additional fracture upstream of Pool TT2 was observed at the end of the reporting period.

These changes in water level and physical features of the pools are noted to be related to observations discussed in **Section 3.2.3.1**.

No impacts were observed to the rockshelter located on the Australian Wildlife Sanctuary property (refer to **Section 3.6.1** for more details of this observation).

3.7.12.2 Australian Wildlife Sanctuary TARP

Background

The combination of observed increase in fracturing and pool water level reduction, as discussed in the above section (**Section 3.7.12.1**), resulted in a Level 4 TARP trigger in accordance with the Australian Wildlife Sanctuary TARP (refer to **Appendix I**). This trigger was noted from the full reporting period.

Actions and Responses Completed

Table 3-12 outlines the actions and responses that are required to be completed in accordance with a Level 4 TARP trigger in accordance with the Australian Wildlife Sanctuary Management Plan, as well as how these actions and responses have been addressed.

Table 3-12 Actions and Responses for a Level 4 TARP Trigger (Australian Wildlife Sanctuary Management Plan TARP)

Action / Response from TARP	Tahmoor Coal response
Actions	
Tahmoor Coal to consider whether any additional management measures are required, including: - Investigation to assess if the observed change is related to mining effects, other catchment changes or the prevailing climate.	Detailed assessment of the observed water level changes and fracturing in Wirrimbirra Creek have been completed (refer **Appendix B**) and a summary is provided in **Section 3.2** of this report. Changes to water level were noted to be related to both mining-induced changes as well as prevailing weather

Action / Response from TARP	Tahmoor Coal response
	conditions. Fracturing was confirmed to be directly related to mining.
Tahmoor Coal to consider whether any additional management measures are required, including: - Increase monitoring and reporting procedures.	As the cause of the changes have been confirmed to be associated with mining impact (as stated in the relevant TARPs in the Water Management Plan), increase in the frequency of monitoring and reporting is not deemed necessary.
Tahmoor Coal to consider whether any additional management measures are required, including: - If it is concluded that the impact is due to mining, implement a corrective management action plan (CMAP) in consultation with Australian Wildlife Sanctuary.	As required under the LW S1A-S6A Water Management Plan, Tahmoor Coal will develop a Waterways Corrective Action Management Plan (WCAMP) in consultation with AWS as required. The WCAMP is noted to be equivalent to a CMAP. The preparation of this WCAMP (if required) will likely commence following the cessation of subsidence movements associated with Tahmoor South mining.
Notify AWS of trigger exceedance and any management decisions undertaken.	AWS were notified of this trigger on 24 October 2023. A site inspection with National Trust and AWS staff to Pools TT2 and TT3 was conducted on 22 November 2023.

In addition, due to the reduction in water in the Wirrimbirra Creek, temporary water supply for wildlife was installed on 25 July 2023 and continued to be maintained during the reporting period.

Proposed Actions

The current monitoring program will continue in accordance with the Australian Wildlife Sanctuary Management Plan.

3.7.13 Picton Weir

3.7.13.1 Overview of Monitoring Results

This built feature is located outside the active subsidence zone of LW S2A and LW S3A.

3.7.13.2 Picton Weir TARP

During this reporting period, there have been no triggers under this TARP.

3.7.14 Bargo Petroleum (3030 Remembrance Drive)

3.7.14.1 Overview of Monitoring Results

Weekly Subsidence Status Reports have been prepared for the Bargo Petroleum (3030 Remembrance Drive) during active subsidence, which summarise monitoring and inspection results from survey and visual inspections on Remembrance Driveway and structures, fuel balance monitoring and pressure testing of fuel tanks and fuel lines, hydrocarbon testing and visual inspections of groundwater, and alignment survey of vehicle hoists.

During the reporting period and the mining of LW S2A and LW S3A, the following observations were made (refer to 3030 Remembrance Drive Report No. 12 and 13 for LW S2A, **Appendix J)**:

- On 16 April 2024, a vehicle hoist was measured to be out of alignment and was tagged “out of use”; and
- On 22 April 2024, several internal doors were observed to be misaligned and close to jamming.

3.7.14.2 3030 Remembrance Drive TARP

Background

The impacts to doors (misalignment) and the vehicle hoist, as discussed in the above section (**Section 3.7.14.1**), resulted in an exceedance of the trigger level in the 3030 Remembrance Driveway Management Plan.

Actions and Responses Completed

In accordance with the 3030 Remembrance Driveway Management Plan, Tahmoor Coal completed the following actions (refer to **Appendix J**):

- A structural inspection of the vehicle hoist was completed on 16 April 2024. Tahmoor Coal immediately advised the tenant that the 3T vehicle hoist could not be used due to the tilt observed. On the same day, Tahmoor Coal demarcated the 3T vehicle hoist and attached an 'Out of Service' tag to cease use;
- Tahmoor Coal arranged a slab survey on 18 April 2024 which confirmed the observed strain between Pegs 10 and 14;
- Tahmoor Coal scheduled hoist specialist to conduct an inspection on 22 April 2024 to provide a remediation scope. The recommendations were to complete core holes to determine concrete thickness and integrity; and
- A TARP Trigger Notification was provided to the landowners, Bargo Petroleum (Lessee), Prestige Car Restoration (Sub-Lessee), Resources Regulator and Subsidence Advisory NSW on 23 April 2024.

No new triggers have been observed during the extraction of LW S3A.

Proposed Actions

The following actions were proposed for completion:

- Complete core hole investigation to determine concrete integrity (subject to agreement);
- Review of core sampling by Structural Engineer to provide input into footing design;
- Install replacement hoist (subject to agreement).

These actions have not been able to be completed due to refusal of entry to the Prestige Care Restorations Workshop by the owners of the property for Tahmoor Coal personnel and contractors.

Where access is possible, the current monitoring program will continue in accordance with the 3030 Remembrance Driveway Management Plan.

3.7.15 Inghams Farms

3.7.15.1 Overview of Monitoring Results

During the reporting period, there were no triggers under the Inghams Bargo Chicken Breeder Production Complex Management Plan and no impacts were observed at this property.

3.7.15.2 Inghams Farms TARPs

During this reporting period, there have been no TARP triggers under this TARP.

3.7.16 Tahmoor Garden Centre

3.7.16.1 Overview of Monitoring Results

Weekly Subsidence Status Reports have been prepared for the Tahmoor Garden Centre during active subsidence of LW S2A, which summarise monitoring and inspection results from the Remembrance Drive, structures, and outdoor storage racks.

During the reporting period and the mining of LW S2A and LW S3A, no impacts have been observed at this property.

3.7.16.2 Tahmoor Garden Centre TARP

During this reporting period, there have been no triggers under this TARP.

3.7.17 MKD Machinery

3.7.17.1 Overview of Monitoring Results

Weekly Subsidence Status Reports have been prepared for the MKD Machinery property during active subsidence of LW S2A, which summarises monitoring and inspection results from Remembrance Driveway, Main Southern Railway, structures, silo hopper tower, and visual inspections of the concrete plant, external pavement, fences and gates, and the pool.

During the reporting period and the mining of LW S2A, no impacts to built features have been observed at this property.

3.7.17.2 MKD Machinery TARP

During this reporting period, there have been no triggers under this TARP.

3.7.18 Bargo Valley Produce

3.7.18.1 Overview of Monitoring Results

This property is located outside the active subsidence zones of LW S2A and LW S3A.

3.7.18.2 Bargo Valley Produce TARP

During this reporting period, there have been no triggers under this TARP.

3.7.19 Canine Country Club

3.7.19.1 Overview of Monitoring Results

This property is located outside the active subsidence zones of LW S2A and LW S3A.

3.7.19.2 Canine Country Club TARP

During this reporting period, there have been no triggers under this TARP.

3.7.20 Pamak Hobbies

3.7.20.1 Overview of Monitoring Results

This property is located outside the active subsidence zones of LW S2A and LW S3A.

3.7.20.2 Pamak Hobbies TARP

During this reporting period, there have been no triggers under this TARP.

3.8 Public Safety Monitoring

The LW S1A-S6A Public Safety Management Plan was prepared to manage the potential consequences as a result of LW S1A-S6A extraction on public safety within the Study Area in accordance with Condition C8 of SSD 8445.

As noted in **Section 1.3.3** of this report, management requirements for public safety are covered in the Built Features Management Plan and the Land Management Plan. Monitoring of cliffs, natural steep slopes and other landscape features has been conducted for the reporting period in accordance with the LW S1A-S6A Land Management Plan (refer to **Section 3.4** for a summary of monitoring results). In addition, monitoring of built features has been conducted for the reporting period in accordance with the LW S1A-S6A Built Features Management Plan (refer to **Section 3.7** for a summary of monitoring results).

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

4 Assessment of Environmental Performance

4.1 Environmental Performance Measures and Indicators

The following development consents include subsidence impact performance measures as conditions for the extraction of LW S1A-S6A:

- SSD 8445:
    - Performance Measures – Natural and heritage features: Condition C1 (Table 7); and
    - Performance Measures – Built Features: Condition C5 (Table 8).

The subsidence impact performance measures were adopted as part of the LW S1A-S6A Extraction Plan and associated management plans. To assist in defining the performance measures, each measure has been assigned subsidence performance indicator(s) and addressed in relevant TARPs.

These performance measures and indicators are provided in **Table 4-1**, as well as an assessment of performance in accordance with the TARPs (as discussed previously in **Table 2-1** and **Section 3**).

Table 4-1 Assessment of Environmental Performance

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Water Resources				
All watercourses within the Subsidence Area	• No greater subsidence impact or environmental consequences to water quality, water flows (including baseflow) or stream health (including riparian vegetation), than predicted in the EIS.	Exceedance of the impact assessment criteria, as defined in the relevant Level 1 to Level 3 trigger, where a Level 3 trigger denotes progression towards a potential exceedance of the performance measure.	TARP WMP1, WMP3 and WMP5.	**No**
Other watercourses	• Negligible environmental consequences including beyond those predicted in the EIS, including: - Negligible diversion of flows or changes in the natural drainage behaviour of pools; - Negligible decline in baseline channel stability; - Negligible gas releases and iron staining; and - Negligible increase in water turbidity.	The performance measure will be considered to be exceeded if a Level 3 TARP is triggered in relation to water level decline and/or water quality changes and the investigation outcomes indicate a mining related impact based on monitoring data for sites in Hornes Creek and the Bargo River. Performance indicators in relation to channel stability are not proposed as soft knickpoints have not been mapped in Hornes Creek or the Bargo River.	TARP WMP2, WMP4 and WMP6.	**No**
GDEs including Thirlmere Lakes	• Negligible impacts including: - Negligible change in groundwater levels; and - Negligible change in groundwater quality.	The performance measure will be considered to be exceeded if a Level 3 TARP is triggered and the investigation outcomes indicate a mining related impact based on monitoring data for the Thirlmere Lakes.	TARP WMP13.	**No**

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Land				
Any cliff located directly above longwalls	• Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 5% of the total face area of the cliff within any longwall mining domain)	This performance measure is not relevant to this Extraction Plan, as there are no cliffs located directly above LW S1A-S6A.	None, not applicable to LW S1A-S6A.	Not applicable.
Any cliff within Subsidence Area beyond the extent of longwalls	• Negligible environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 0.5% of the total face area of such cliffs within Subsidence Area)	This performance measure will be considered to be triggered if more than 0.5% of the total face area of the cliffs within the 600 m Environmental Features Study Area is impacted by mining (i.e. by occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing).	TARP LMP1.	**No**
All land within the Subsidence Area	• No greater subsidence impacts or environmental consequences than predicted in the EIS	This performance measure will be considered to be triggered if mining results in mine subsidence-induced slope instability, which would be a greater subsidence impact or consequence than predicted in the EIS.	TARP LMP2.	**No**
All land outside the Subsidence Area	• Negligible subsidence impacts or environmental consequences	This performance measure is not relevant to this Extraction Plan, as there are no steep slopes identified within the 600 m Environmental Features Study Area, other than the three steep slopes located within the Subsidence Area and already assessment in accordance with the ‘All land within the Subsidence Area’ performance measure.	None, not applicable to LW S1A-S6A.	Not applicable.

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Biodiversity				
Threatened species, threatened populations, or endangered ecological communities	• No greater subsidence impacts or environmental consequences than predicted in the EIS. • Negligible impacts on threatened species, populations or communities due to remediation of subsidence cracking.	This performance measure will be triggered if subsidence impacts cannot be remediated in a manner that restores habitat of threatened species, threatened populations, or endangered ecological communities.	TARP BMP4.	**No**
GDEs including Thirlmere Lakes	• Negligible impacts including: - Negligible change in groundwater levels; and - Negligible change in groundwater quality	The performance measure will be considered to be exceeded if the groundwater levels or groundwater quality decline below Level 3 (in the relevant groundwater TARP triggers for water level and water quality – TARP WMP8 or WMP11) following the commencement of extraction, and the investigation outcomes indicate a mining related impact based on monitoring data for riparian vegetation.	TARP BMP3.	**No**

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Heritage sites				
Aboriginal cultural heritage sites listed in Appendix 4	• No greater subsidence impacts or loss of heritage values than predicted in the EIS.	**TC14-2-19** (Isolated find): No performance indicators are currently established as impacts are predicted to be negligible.	None, not applicable to LW S1A-S6A.	Not applicable.
		Remembrance Drive 2013.1 (open camp site): No performance indicators are currently established as impacts are predicted to be negligible.	None, not applicable to LW S1A-S6A.	Not applicable.
		Teatree Hollow 2013.1 (rockshelter with art and deposit): This performance indicator will be considered to be triggered if more than 10% of rockshelters (i.e. more than two) in the Tahmoor South Domain (including A and B series longwalls) are impacted by: • Subsidence monitoring identifies obvious perceptible change, e.g. rockfall, cracking, or toppling within rockshelters; and • These subsidence impacts result in impacts to the heritage values of the site, e.g. cracking or spalling of the art work panels or, elsewhere in the shelter, cracking or spalling greater than naturally caused examples in the rockshelter. This performance measure cannot be exceeded during the extraction of the A series longwalls, even if the above-mentioned performance indicators are fully triggered for Teatree Hollow 2013.1. Such impacts would not exceed the 10% threshold of impacts to the 19 total rockshelters in the longwalls A and B Study Area.	TARP HMP1.	**No**

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Heritage sites				
Historical heritage sites listed in Appendix 4	• No greater subsidence impacts or loss of heritage values than predicted in the EIS.	This performance indicator will be considered to be triggered if subsidence impacts cannot be repaired in a manner that preserves the heritage value of the historical heritage items. This performance indicator is applicable to the following historical heritage items: • Wirrimbirra Sanctuary (Australian Wildlife Sanctuary); • Bargo Cemetery; • Bargo Railway Bridge North (Wellers Road Overbridge); • Picton Weir; • Tahmoor Colliery (Tahmoor Mine Site); • Great Southern Road (partial); and • Bargo Railway Viaduct.	TARP HMP2.	**No**
Mine workings				
First workings	• To remain long term stable and non-subsiding.	None allocated.	None – ongoing assessment in accordance with mine design.	**No**
Second workings	• To be carried out only within the approved mine plan, in accordance with an approved Extraction Plan.	None allocated.	None – ongoing assessment in accordance with LW S1A-S6A Extraction Plan mine plan.	**No**

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Public Infrastructure				
Key public infrastructure: • Main Southern Railway • Remembrance Drive • M31 Motorway • Moomba to Sydney Gas Pipeline • Gorodok Ethane Pipeline • Bargo Waste Management Centre	• Always safe and serviceable • Damage that does not affect safety or serviceability must be fully repairable, and must be fully investigated and repaired at the cost of the Applicant	None allocated.	Addressed in TARPs contained in the Main Southern Railway Management Plan and Wollondilly Shire Council Management Plan. It is noted that the Bargo Waste Management Centre, M31 Motorway, Moomba to Sydney Gas Pipeline, and the Gorodok Ethane Pipelines are not located within the Study Area of this Extraction Plan.	**No**
• All other public infrastructure including roads, culverts, bridges, viaducts, water supply pipelines, sewerage mains, gas pipelines, electrical and telecommunication infrastructure and survey control marks.	• Always safe • Serviceability should be maintained wherever practicable • Loss of serviceability must be fully compensated • Damage must be fully repairable, and must be fully investigated and repaired or else replaced or fully compensated at the cost of the Applicant	None allocated.	Addressed in TARPs contained in Subsidence Management Plans for various built features.	**No**

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Relevant TARP	Subsidence Performance Measure Exceeded?
Other Built Features				
• Public amenities including schools, churches and community centres • Industrial, commercial and business premises • Bargo Cemetery • Wirrimbirra Sanctuary • Privately-owned residences • Other privately-owned built features and improvements, including petrol stations, sheds, garages, farm dams, tanks, swimming pools, tennis courts, roads, tracks and fences	• Always safe • Serviceability should be maintained wherever practicable • Loss of serviceability must be fully compensated • Damage must be fully repairable, and must be fully investigated and repaired or else replaced or fully compensated at the cost of the Applicant.	**Farm dams**: This performance measure will be considered to be triggered if mining results in damage to a farm dam such that the dam is not safe and serviceable and/or any damages cannot be fully repairable and/or compensated.	TARP LMP3.	**No**
		All other features: None allocated.	Addressed in TARPs contained in Subsidence Management Plans for various built features.	**No**
Public Safety				
• Public safety	• Negligible additional risk	This performance measure will be considered to be triggered if subsidence monitoring identifies a mining induced hazard to the public that cannot be controlled or managed.	Assessed indirectly through TARP LMP1, LMP2, LMP3. Addressed in TARPs contained in Subsidence Management Plans for various built features.	**No**

5 Document Information

5.1 References

ATC Williams (2024), Tahmoor South Domain, Surface Water Review 1 January to 30 June 2024, prepared for Tahmoor Coal, August 2024.

Department of Planning and Environment (DPE) (2015), Draft Guidelines for the Preparation of Extraction Plans V5.

Niche (2024a), Tahmoor South, Aquatic Monitoring Report Autumn 2024, prepared for Tahmoor Coal, October 2024.

Niche (2024b), Tahmoor Mine South, Terrestrial Ecology Monitoring Report: Autumn riparian vegetation and amphibian baseline monitoring 2024, prepared for Tahmoor Coal, 25 June 2024.

SLR (2024), Six-Monthly Groundwater Monitoring: January to June 2024, Tahmoor South Domain, prepared for Tahmoor Coal, September 2024.

Tahmoor Coal Documents:

- Extraction Plan LW S1A-S6A Extraction Plan Main Document, TAH-HSEC-00360
- Extraction Plan LW S1A-S6A Water Management Plan, TAH-HSEC-00361
- Extraction Plan LW S1A-S6A Land Management Plan, TAH-HSEC-00362
- Extraction Plan LW S1A-S6A Biodiversity Management Plan, TAH-HSEC-00363
- Extraction Plan LW S1A-S6A Heritage Management Plan, TAH-HSEC-00364
- Extraction Plan LW S1A-S6A Built Features Management Plan, TAH-HSEC-00366
- Extraction Plan LW S1A-S6A Public Safety Management Plan, TAH-HSEC-00365
- Extraction Plan LW S1A-S6A Subsidence Monitoring Program, TAH-HSEC-00367

5.2 Glossary of Terms

Terms references to this document are provided below in **Table 5-1**.

Table 5-1 Glossary of Terms

Term	Definition
Active Subsidence Zone	The active subsidence zone for each longwall is defined by the area bounded by the predicted 20 mm subsidence contour for the active longwall and a distance of 150 m in front of the active longwall face and 450 m behind the active longwall face or following 500 m of longwall extraction.
Angle of draw	The angle of inclination from the vertical of the line connecting the goaf edge of the workings and the limit of subsidence (which is usually taken as 20 mm of subsidence).
Built features	Includes any building or work erected or constructed on land, including dwellings and infrastructure such as a formed road, street, path, walk, or driveway; any pipeline, water sewer, telephone, gas or other infrastructure service main.
Cliff	A continuous rock face, including overhangs, having a minimum length of 20 metres, a minimum height of 10 metres and a minimum slope of 2 to 1 (>63.4°).

Term	Definition
Closure	The reduction in the horizontal distance between the valley sides. The magnitude of closure, which is typically expressed in the units of mm, is the greatest reduction in distance between any two points on the opposing valley sides. It should be noted that the observed closure movement across a valley is the total movement resulting from various mechanisms, including conventional mining induced movements, valley closure movements, far-field effects, downhill movements and other possible strata mechanisms.
Curvature	Second derivative of subsidence, or the rate of change of tilt, and is calculated as the change in tilt between two adjacent sections of the tilt profile divided by the average length of those sections. Curvature is usually expressed as the inverse of the Radius of Curvature with the units of 1/km (km-1), but the value of curvature can be inverted, if required, to obtain the radius of curvature, which is usually in km. Curvature can be either hogging (i.e. convex) or sagging (e.g. concave).
Longwall	A system of mining coal in which the seam is extracted on a broad front or long face using a coal shearer and the roof is supported by hydraulic roof supports.
Reporting period	1 July 2023 to 31 December 2023.
Run of mine (ROM)	Raw coal production. The unprocessed mined coal that is conveyed to the CPP. ROM may consist of coal and rock.
Steep slope	An area of land having a gradient between 1 in 3 (33% or 18.3°) and 2 in 1 (200% or 63.4°).
Strain	The change in the horizontal distance between two points divided by the original horizontal distance between the points, i.e. strain is the relative differential displacement of the ground along or across a subsidence monitoring line. Strain is dimensionless and can be expressed as a decimal, a percentage or in parts per notation. Tensile Strains are measured where the distance between two points or survey pegs increases and Compressive Strains where the distance between two points decreases. Whilst mining induced strains are measured along monitoring lines, ground shearing can occur both vertically, and horizontally across the directions of the monitoring lines.
Study Area	Study Area as defined in the LW S1A-S6A Extraction Plan.
Subsidence	The vertical movement of a point on the surface of the ground as it settles above an extracted panel, but 'subsidence of the ground' in some references can include both a vertical and horizontal movement component. The vertical component of subsidence is measured by determining the change in surface level of a peg that is fixed in the ground before mining commenced and this vertical subsidence is usually expressed in units of mm. Sometimes the horizontal component of a peg's movement is not measured, but in these cases, the horizontal distances between a particular peg and the adjacent pegs are measured.
Subsidence impacts	The physical changes or damage to the fabric or structure of the ground, its surface and environmental features, or built structures that are caused by the subsidence effects. These impacts considerations can include tensile and shear cracking of the rock mass, localised buckling of strata, bed separation, rock falls, collapse of overhangs, failure of pillars, failure of pillar floors, dilation, slumping and also include subsidence depressions or troughs.

Term	Definition
Subsidence consequences	The knock-on results of subsidence impacts, i.e. any change in the amenity or function of a natural feature or built structure that arises from subsidence impacts. Consequence considerations include public safety, loss of flows, reduction in water quality, damage to artwork, flooding, draining of aquifers, the environment, community, land use, loss of profits, surface improvements and infrastructure. Consequences related to environmental features are referred to as environmental consequences.
Tilt	The change in the slope of the ground as a result of differential subsidence and is calculated as the change in subsidence between two points divided by the horizontal distance between those points. Tilt is, therefore, the first derivative of the subsidence profile. Tilt is usually expressed in units of mm/m. A tilt of 1 mm/m is equivalent to a change in grade of 0.1 %, or 1 in 1000.

5.3 Abbreviations

Abbreviations used in this document are provided below in **Table 5-2**.

Table 5-2 Abbreviations

Abbreviation	Definition
AHIMS	Aboriginal Heritage Information System
ARTC	Australian Rail Track Corporation
AUSRIVAS	The Australian River Assessment System
BACI	Before After Control Impact design
BGSS	Bargo Sandstone
BIS	Building Inspection Service
CTF	Cease to flow
DPE	NSW Department of Planning and Environment (formerly DPIE, now DPHI)
DPIE	NSW Department of Planning, Industry and Environment (now DPHI, formerly DPIE and DPE)
DPHI	NSW Department of Planning, Housing and Infrastructure (formerly DPE, now DPHI)
EC	Electrical conductivity
EPA	NSW Environment Protection Authority
EPT	Ephemeroptera Plecoptera Trichoptera scores
GFG	GFG Alliance
GNSS	Global Navigation Satellite System units
HBSS	Hawkesbury Sandstone
Km	Kilometres
LW S1A	Longwall South 1A
LW S2A	Longwall South 2A
LW S3A	Longwall South 3A
LW S4A	Longwall South 4A
LW S5A	Longwall South 5A
LW S6A	Longwall South 6A
LW S1A-S6A	Longwall South 1A to South 6A

Abbreviation	Definition
m	metres
mbgl	Metres below ground level
mg/L	Milligrams per litre
ML	Mining Lease
mm	millimetre
MSEC	Mine Subsidence Engineering Consultants
MSR	Main Southern Railway
NRAR	NSW Industry – Land & Water – Natural Resources Access Regulator – East
NSW	New South Wales
OE	Observed expected score
OSP	Open Standpipe Piezometers
pH	pH units
SSGVs	Site Specific Guideline Values
Tahmoor Coal	Tahmoor Coal Pty Ltd
Tahmoor Mine	Tahmoor Coal Mine
TARP	Trigger Action Response Plan
TDS	Total dissolved solids
TfNSW	Transport for NSW
VMP	Vibrating Wire Piezometer

5.4 Document Distribution

This report and associated documents have been distributed according to **Table 5-3**.

Table 5-3 Distribution List for Six Monthly Subsidence Impact Report

Agency	Contact Person	Position	Electronic Copy
DPHI	(Planning Portal)	(Planning Portal)	(https://www.planningportal.nsw.gov.au/major-projects)
	Jessie Evans	Director – Resource Assessments	Jessie.evans@dpie.nsw.gov.au
	Gabrielle Allan	Team Leader	Gabrielle.Allan@dpie.nsw.gov.au
NSW Resources – Resources Regulator	(General email)	(General email)	subsidence.monitoring@planning.nsw.gov.au nswresourcesregulator@service-now.com
	Ray Ramage	Mine Safety Officer - Subsidence	ray.ramage@planning.nsw.gov.au
	Greg Kininmonth	Manager Environmental Operations (Southern)	greg.kininmonth@planning.nsw.gov.au
NSW Resources (formerly Mining Exploration and Geoscience)	(General email)	(General email)	resource.operations@planning.nsw.gov.au

Agency	Contact Person	Position	Electronic Copy
Wollondilly Shire Council	(General email)	(General email)	council@wollondilly.nsw.gov.au
	David Henry	Acting Team Leader Environmental Services	david.henry@wollondilly.nsw.gov.au
Subsidence Advisory NSW	(General email)	(General email)	subsidencetechnical@customerservice.nsw.gov.au
NRAR	(General email)	(General email)	nrar.servicedesk@dpie.nsw.gov.au eucoordination@nrar.nsw.gov.au
EPA	(General email)	(General email)	epa.illawarra@epa.nsw.gov.au
	Andrew Couldridge	Senior Operations Officer - Metropolitan Illawarra	andrew.couldridge@epa.nsw.gov.au
Commonwealth Department of Climate Change, Energy, the Environment and Water	(General email)	(General email)	epbcmonitoring@dcceew.gov.au
TCCCC Committee Members	Documents sent to TCCCC Committee Members at private email addresses.		

Appendix A – Subsidence Monitoring Reports

SIMEC

Six Monthly Subsidence Monitoring Report for Tahmoor South LW S2A
1 January 2024 to 10 May 2024

Summary	
Monitoring period	24 May 2024 to 10 May 2024
Length of extraction of LW S2A	LW completed extraction on 6 April 2024. LW S3A commenced extraction on 8 May 2024.
Distance travelled by longwall since previous report	
Distance to completion of LW S2A	

Summary of observed ground movements

Subsidence Parameter		Maximum observed during LW S2A	Location
Subsidence (mm)	Inc Total	895 965	GNSS S26 V-Line
Tilt (mm/m)	Inc Total	8.7 9.0	Main Southern Railway Main Southern Railway
Hogging Curvature (km^{-1})	Inc Total	0.14 0.19	Remembrance Drive Remembrance Drive
Sagging Curvature (km^{-1})	Inc Total	-0.21 -0.21	Remembrance Drive Remembrance Drive
Tensile Strain (mm/m)	Inc Total	1.1 1.2	V-Line V-Line
Compressive Strain (mm/m)	Inc Total	-1.9 -3.4	Remembrance Drive Remembrance Drive
Subsidence since previous survey (mm)		4	GNSS Site 22 since 2 May

This monitoring report provides the results of the latest ground surveys during the mining of LW S2A, in accordance with the requirements of subsidence management plans.

Longwall face position

LW S2A commenced on 2 August 2023 and completed extraction on 6 April 2024. The mine layout and the monitoring peg positions are shown in Drawing No. MSEC1368-01. LW S3A commenced extraction on 8 May 2024.

Monitoring results

Ground monitoring is being undertaken within the active subsidence zone of LW S2A. Maximum incremental subsidence parameters within the current extent of monitoring are summarised in Table 1.

Table 1 Summary of maximum observed subsidence parameters

Monitoring Line		Maximum observed subs (mm)	Maximum observed tilt (mm/m)	Maximum observed hogging curvature (km^{-1})	Maximum observed sagging curvature (km^{-1})	Maximum observed tensile strain (mm/m)	Maximum observed comp. strain (mm/m)
V-Line	Inc Total	758 965	4.7 6.9	0.07 0.07	-0.10 -0.15	1.1 1.2	-1.0 -2.2
Remembrance Drive	Inc Total	525 561	4.3 4.5	0.14 0.19	-0.21 -0.21	0.4 0.3	-1.9 -3.4
Main Southern Railway	Inc Total	756 814	8.7 9.0	0.14 0.15	-0.20 -0.19	0.4 0.5	-1.6 -2.6
Charlies Point Road	Inc Total	37 57	0.6 0.5	0.04 0.03	-0.04 -0.05	0.2 0.2	-0.2 -0.3
Caloola Road	Inc Total	27 58	0.1 0.2	0.01 0.01	-0.01 -0.01	0.1 0.2	-0.2 -0.2

Ground survey results

Ground monitoring is being undertaken within the active subsidence zone of LW S2A. Monitoring results are shown graphically at the back of this report.

The spatial distribution of incremental subsidence is shown in Drawing No. MSEC1368-02. Changes in subsidence since the previous survey are shown in Drawing No. MSEC1368-03.

Tahmoor Mine Boundary Survey Line (V Line)

The latest survey along the V-Line was conducted on 2 May. Rates of change have reduced to low levels. Surveys have ceased as the survey line is beyond the active subsidence zone.

Main Southern Railway

This latest survey was conducted on 30 April with minor changes observed.

GNSS monitoring

Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure their absolute horizontal and vertical positions in real time. There are 28 units located directly above and adjacent to LW S1A to S6A. These include four units above the commencing end and along the centreline of LW S2A, being Sites S05, S06, S26 and S27.

The measured position of each GNSS unit varies depending on atmospheric conditions and the array of satellites that are present in the sky at each time, and the vegetation cover surrounding each unit. Measured variations in height are typically greater than the variations for eastings and northings.

The results from the GNSS units are shown in Fig. S01 to Fig. S27 and Fig. TM. Mining-induced movements have developed at the GNSS units, with maximum measured incremental subsidence of 896 mm at Site S26 since the commencement of LW S2A. Subsidence is increasing at Site S27 above LW S2A, but at a reduced magnitude at the equivalent stages of mining compared to GNSS S26. Rates of change are reducing at both sites.

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Observed development of subsidence above LW S2A over time is shown in Figure A.

It was predicted that subsidence above LW S2A would be greater than observed above LW S1A because it is the second panel in the longwall series.

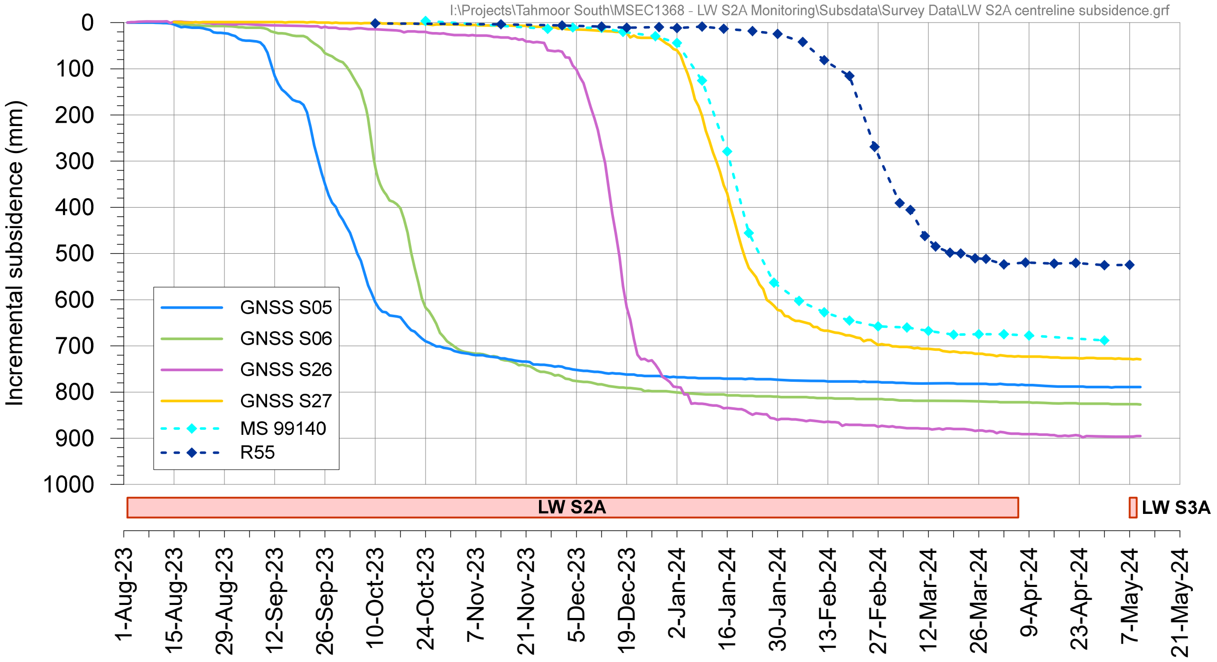

Figure A Observed development of incremental subsidence above LW S2A over time

Changes in horizontal distances can be calculated between GNSS units that are stationed close together and results are shown in Figure B. Closure has developed across the Tributary to Teatree Hollow (Wirrimbirra Creek), particularly between Sites 07 and 08 directly above LW S2A. Closure has reduced between Sites 05 and 06, as previously observed between Sites S01 and S02 during the mining of LW S1A. Closure has also reduced between Sites 03 and 04. Closure has developed across Teatree Hollow between Sites S26 and S27 directly above LW S2A and is now reducing.

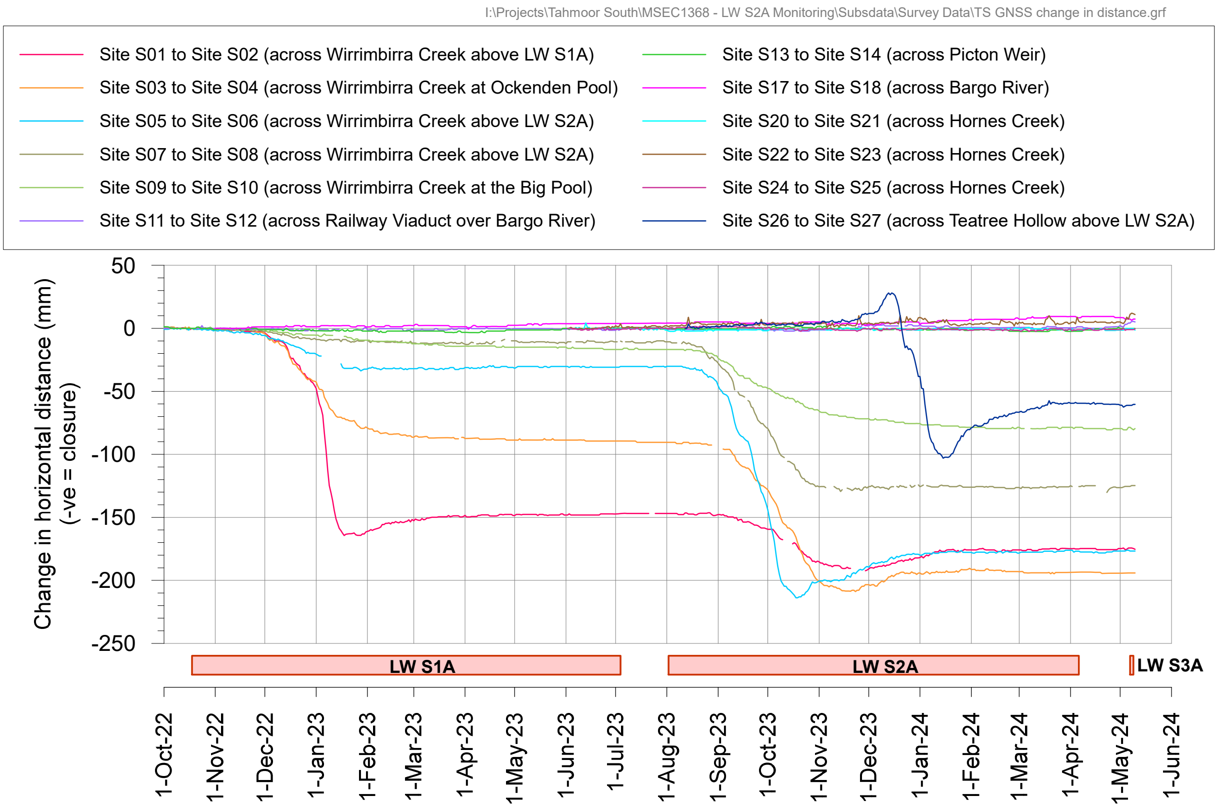

Figure B Observed changes in horizontal distances between GNSS units

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Remembrance Drive

Non-conventional subsidence movements are observed at Pegs R46 to R48. Increased compressive strain is observed between Pegs R47 and R48, accompanied by a bump in the observed subsidence profile at Peg R47. The non-conventional subsidence movements were first identified on 22 May 2023 during the mining of LW S1A and are continuing to develop during the mining of LW S2A. The longwall face has mined directly beneath the site.

The observed development of compressive strain is shown in Figure C. Rates of change are reducing.

Increased compressive strain is observed between Pegs R54 and R55, accompanied by a small bump in the observed subsidence profile at Peg R54, as shown in Figure C. Rates of change are reducing

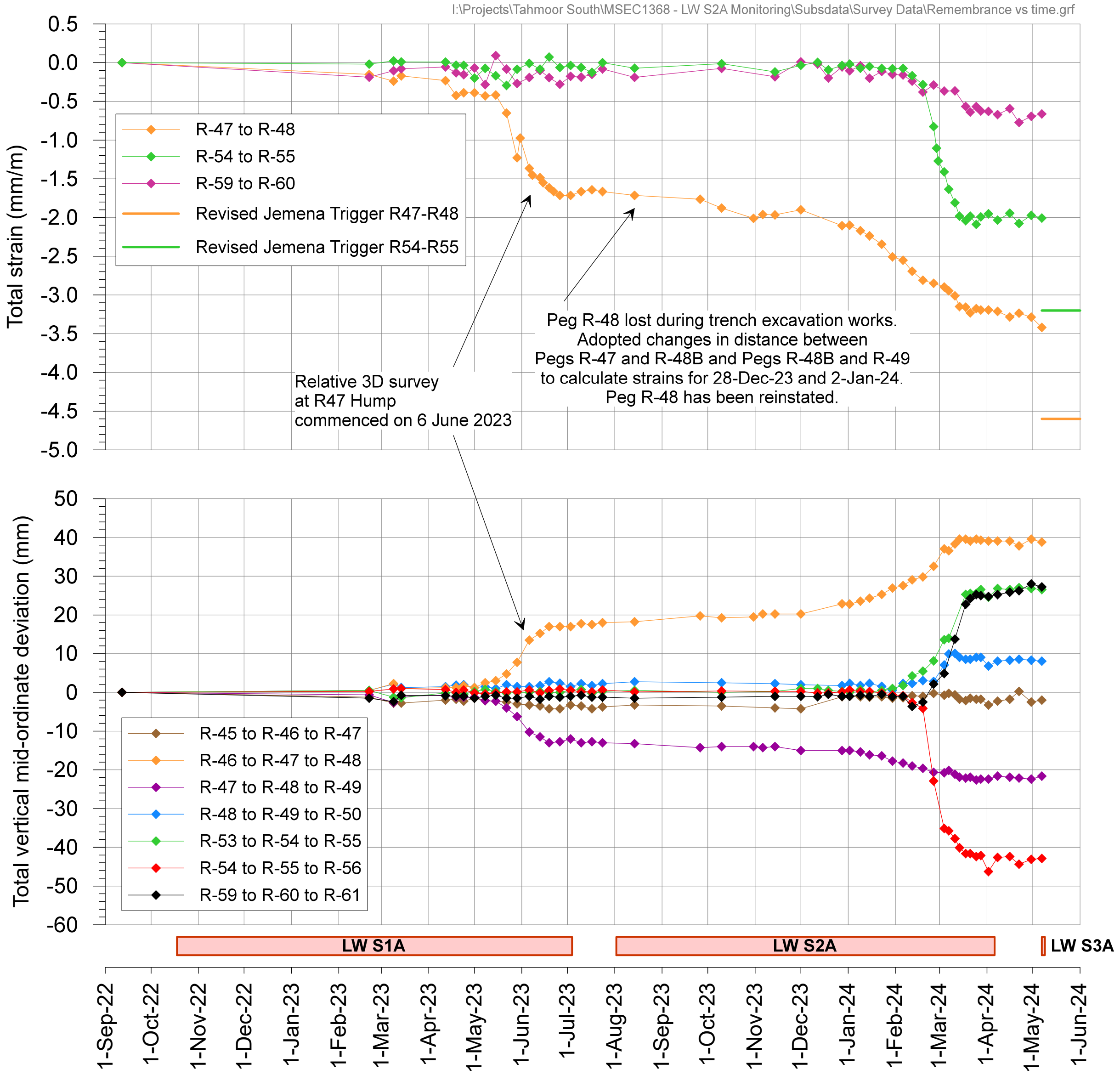

Figure C **Observed development of ground strain and changes in vertical alignment at selected pegs along Remembrance Drive**

Observed incremental strains between Pegs R47 and R48 due to the mining of LW S2A are plotted in Figure D. Rates of change in compressive ground strain have reduced as expected following the completion of LW S2A, though a minor trend of increasing compressive strain continues.

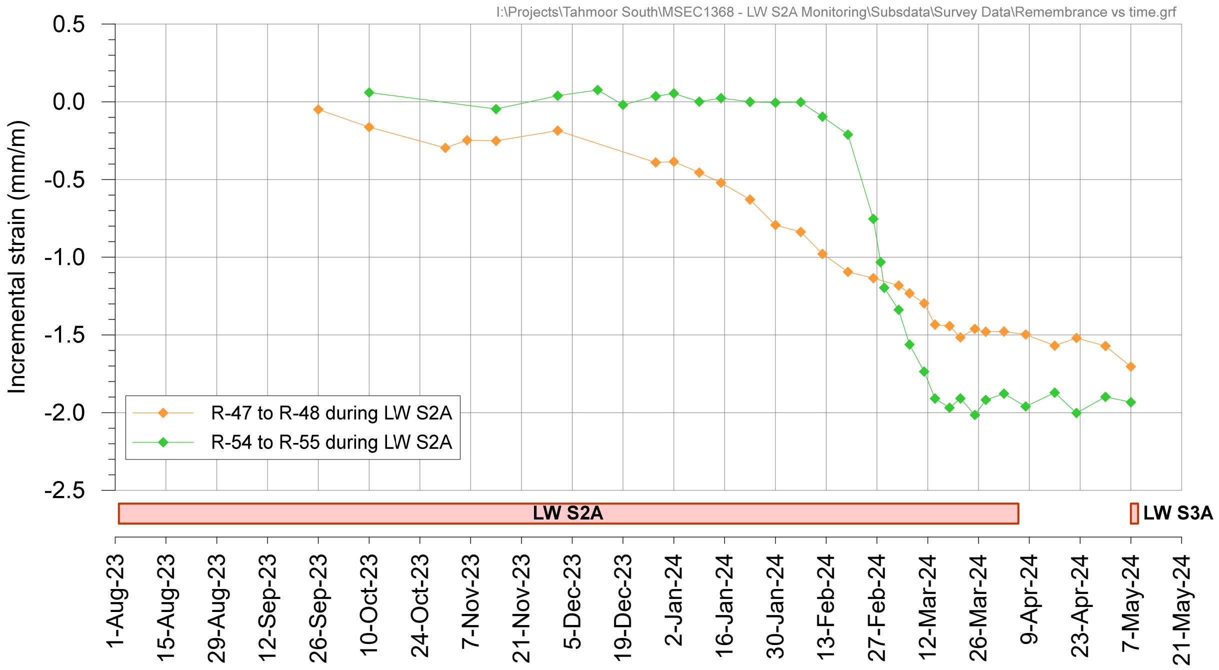

Figure D Observed development of ground strain between Pegs R47 and R48 and between Pegs R54 and R55 over time

In light of the survey results and observations of minor impacts on the pavement, Tahmoor Coal notified potentially affected stakeholders. The gas main pipeline was decoupled from the ground on 11 March. Tahmoor Coal remains on standby with respect to repairing the road pavement and reducing stresses on the direct buried Telstra cable, if required.

Survey pegs were installed along the northbound side of Remembrance Drive across from Pegs R53 to R55. The first re-survey measured an increase in compressive opposite Pegs R52 and R53, indicating that the zone of compressive strain is oriented at a skew to the road but potentially aligned with the longitudinal axis of the longwall.

A focussed visual inspection between Pegs R47 and R48 was conducted on 31 May, which identified a small compression bump in the southbound lane of Remembrance Drive between Pegs R47 and R48. A photograph of the bump on 31 May is shown in Figure E. A map showing the location and orientation of the bump relative to nearby building structures and utility services is shown in Figure F. It can be seen that the bump is located to the side of LW S1A and above future LW S2A. It is oriented at an angle to the pavement and does not intersect with the Bargo Petroleum petrol station or any other structures. The bump intersects with a number of utility services, including Jemena's gas main, Sydney Water's potable water main and sewer main, and optical fibre and copper telecommunication cables.

Photograph courtesy Building Inspection Services

Figure E Small bump observed in southbound lane of Remembrance Drive near Peg R46 on 31 May 2023

In light of the survey results on 22 May, which were confirmed by survey results on 29 May and identification of a bump in the road pavement on 31 May, the location is considered to be experiencing non-conventional subsidence movements. The observation exceeds trigger levels in the Management Plans for Wollondilly Shire Council, Jemena, Sydney Water (potable and sewer) and telecommunication powners Telstra, TPG and NBN. Tahmoor Coal has notified and met with the infrastructure owners as required under the Management Plans. Summaries of decisions made in the meetings are discussed later in this report.

The road was resurfaced on the evening of 5 February, as shown in Figure G, and resurfaced again on 8 April, as shown in Figure H. No significant changes were observed on 30 April, as shown in Figure I.

A small bump was identified in the road pavement approximately 6 metres south of Peg R53 on 26 February 2024. Visual inspections have been conducted daily since the bump was observed. The bump has gradually increased in size but is yet to represent a safety hazard on the road. Tahmoor Coal has informed potentially affected stakeholders, including Wollondilly Shire Council, Jemena, Telstra and Sydney Water. The road was resurfaced on 8 April.

No significant changes were observed during a visual inspection on 30 April.

A very minor bump was observed in the northbound lane of Remembrance Drive to the south of the previously observed bumps near Peg R61. A photograph is shown in Figure J. The site has been identified previously and is near Peg R61 where some changes in lateral alignment have been identified from 3D ground surveys.

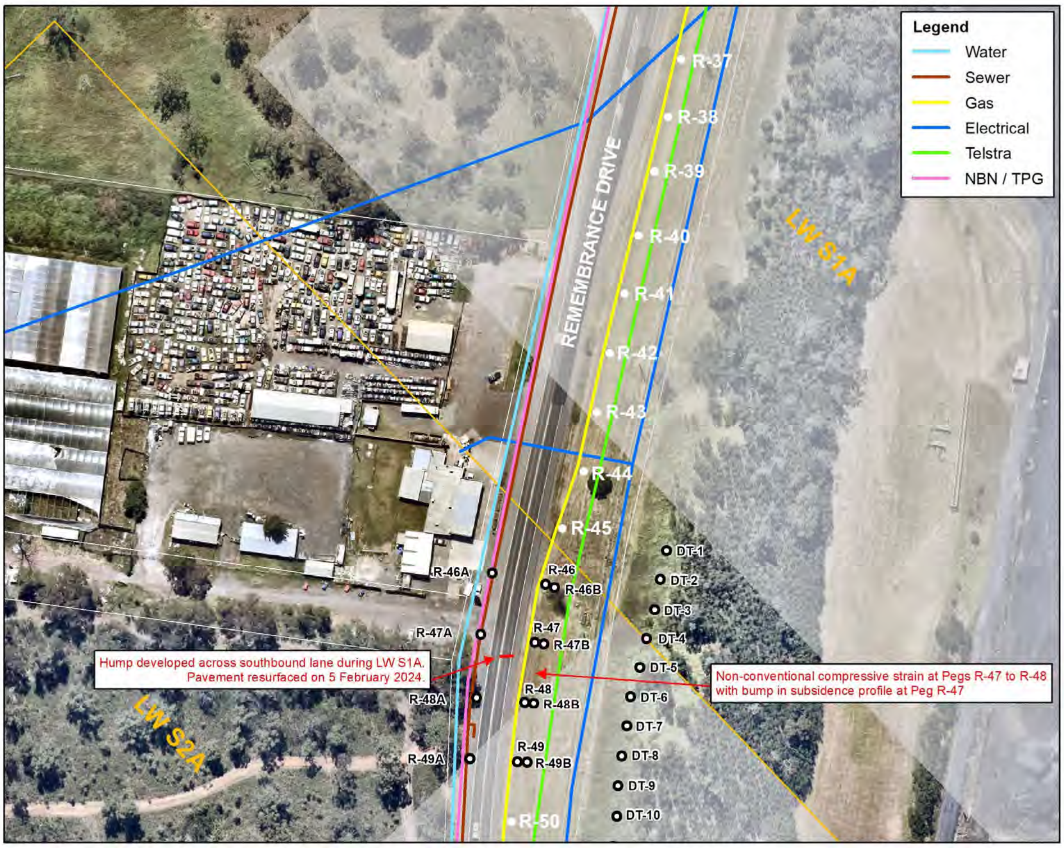

Figure F Location of small bump observed in southbound lane of Remembrance Drive near Peg R46 on 2 June 2023

Figure G Resurfacing of bump near Peg R47 on 5 February 2024

Figure H Resurfaced pavement at location of bump near Peg R47 on 9 April 2024

Figure I Remembrance Drive on 30 April 2024

Figure J Remembrance Drive pavement near Peg R61 on 22 April 2024

Natural Features

In addition to the GNSS units, survey marks have been installed at four locations across the Tributary to Teatree Hollow (Wirrimbirra Creek), and at four locations across Teatree Hollow, as shown in Drawing No. MSEC1368-01.

An end of LW S2A survey was conducted on 30 April along ground survey lines that were installed across the Tributary to Teatree Hollow, and a summary is shown in Figure K. The results correlate reasonably well with the observations from GNSS units, taking into account the shorter lengths of the survey lines, which are based within the floor of the creek valley, compared to the distances between the GNSS units, which are mounted at the tops of the valleys.

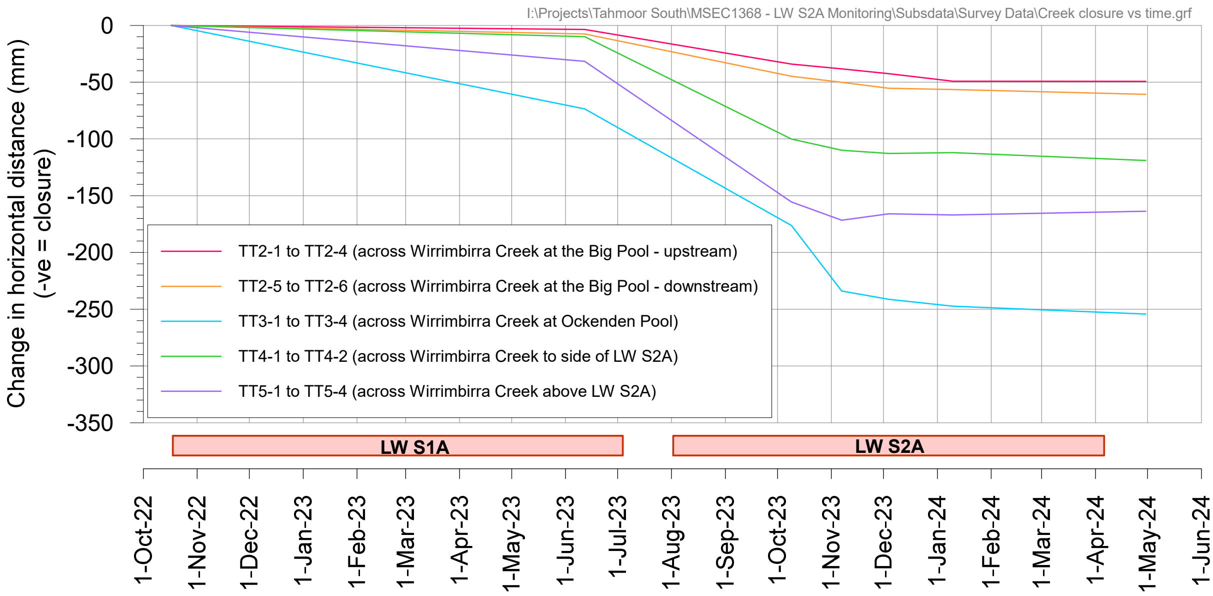

Figure K Observed development of closure across Tributary to Teatree Hollow from ground surveys

Tributary to Teatree Hollow (Wirrimbirra Creek)

Impacts were first detected in the Tributary to Teatree Hollow (Wirrimbirra Creek) on 8 February 2023. Surface water flows were first observed to stop approximately 120 metres upstream of monitoring site TT3, above the centreline of future LW S2A. A surface crack was observed in the bedrock downstream of this location. On 10 April, flows in the creek had increased since the previous inspection on 27 March following a heavy rainfall event on 6 April.

Surface water was observed to be flowing along the full length of the Tributary to Teatree Hollow.

Additional impacts have been observed at TT2 since October 2023. A fracture within a surface boulder upstream of Pool TT2 has been observed to increase in size during the mining of LW S2A. The boulder is wedged between two larger rocks on either side of the creek. Investigations have found that the fracture was present in July 2023, after the mining of LW S1A and prior to the commencement of LW S2A. The fracture contained some debris and some ageing of the exposed rock inside the fracture at this time. While pre-mining photographs and videos identified pre-existing fractures elsewhere within the boulder field upstream of Pool TT2, the fracture was not visible prior to the mining of LW S1A to the scale and extent as observed in July and September. The images, however, were not focussed directly on the boulder in question and could not definitively confirm whether there were any pre-existing hairline or slight fractures in it.

A geotechnical inspection was conducted by Douglas Partners on 9 November 2023. The fractured boulder has been assessed to be a detached sandstone block, which was previously part of the rock strata on either side of the valley prior to mining. The host rock had been naturally eroded and undercut by the weaker underlying strata, resulting in dislocation and fracturing along naturally formed joints at the fracture site. Pre-mining photographs show surface water was flowing underneath the site. While dislocated from the host rock on either side of the valley, the detached sandstone block remained in contact on both sides, such that mining-induced valley closure almost immediately resulted in fracturing. New fractures are developing at the detached sandstone block and within the adjoining rock strata at the contact points due to ongoing closure. The fracture site is situated above Pool TT2 and has no effect on surface water levels in Pool TT2. An inspection on 8 April has found that the detached sandstone block has been displaced following the recent heavy rainfall event on 6 April. Future inspections will focus on the host rock where the detached sandstone block had been location.

A local 3D ground survey was conducted on 9 October 2023 along the TT2 line that is located upstream of Pool TT2 and very close to the fracture in the boulder. The results are shown in Figure L. It can be seen that very little tilt or strain had developed after the mining of LW S1A but valley closure strains and upsidence have developed since the completion of LW S1A. The fracture in the boulder is located between Pegs TT2-2 and TT2-3. The latest survey on 30 April measured no change in compressive strain.

While this section of the Tributary to Teatree Hollow has been previously observed to be dry during periods of dry weather, the observations indicate that the changes may be mining-induced.

A visual inspection of the rock shelter on 2 June 2023 found no water in the pool at TT3, and the pool has remained dry since 26 June 2023. A visual inspection on 8 April found no changes to the rock shelter. The stream was flowing on 8 April following a heavy rainfall event on 6 April.

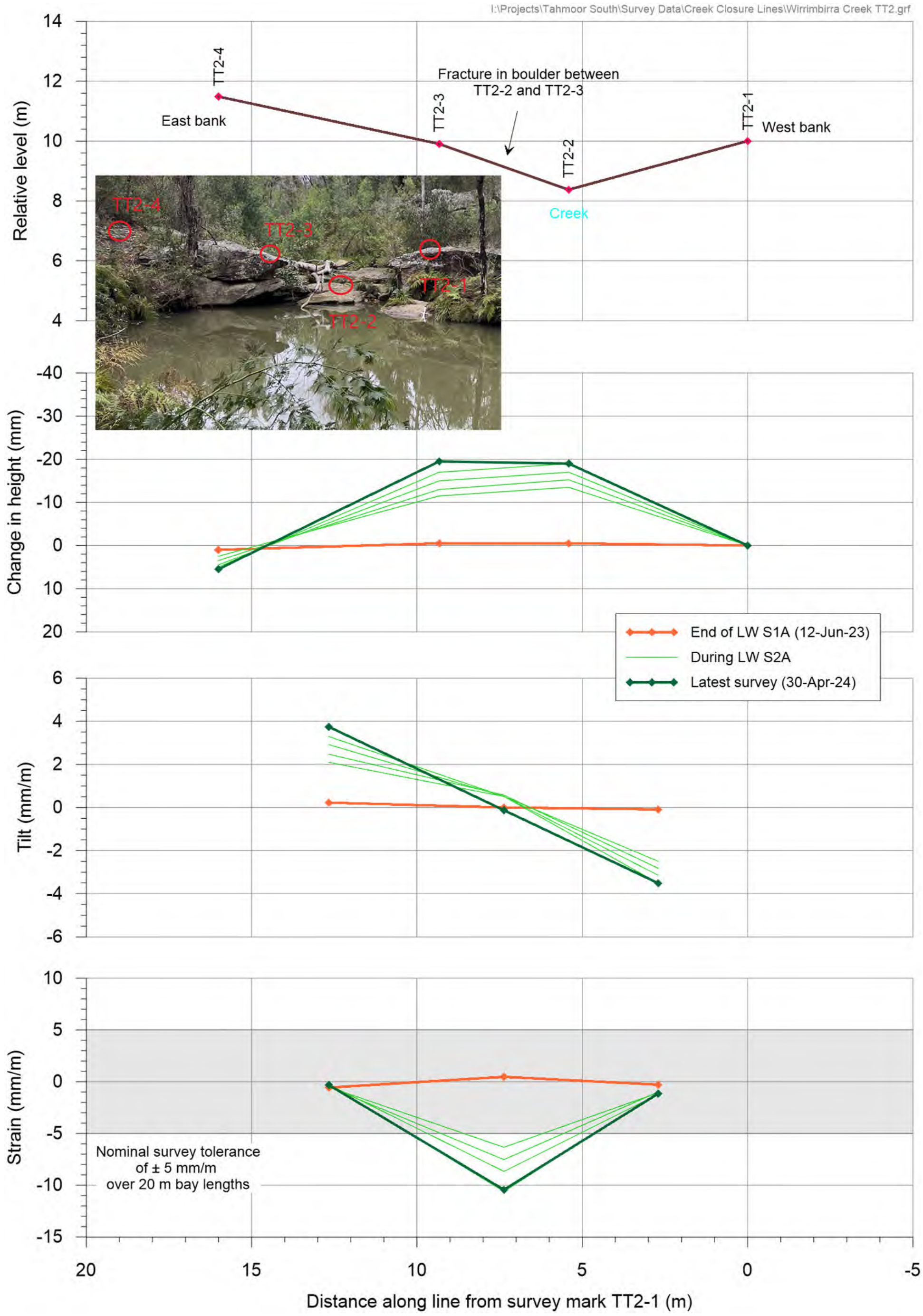

Figure L Observed subsidence, tilt and strain along TT2 line, upstream of Pool TT2

Teatree Hollow

Surveys were conducted across Teatree Hollow between 23 February and 12 June during LW S1A, with very little closure observed at TT6, TT9 and TT12 (6 mm or less).

The first survey for LW S2A was conducted across Teatree Hollow on 30 August 2023, with subsequent surveys on 9 October, 7 November, 4 December, 10 January and 30 April. Very little closure is observed at TT6 and TT12 (3 mm or less). GNSS units S26 and S27 have been installed across Teatree Hollow directly above LW S2A to measure valley closure. Approximately 100 mm closure has been measured by the GNSS units.

Impacts were first observed along Teatree Hollow directly above LW S1A on 1 March 2023. Surface water flows have been observed to stop near the upstream edge of LW S1A and reappear with iron staining present above the downstream edge of LW S1A. On 10 April, flows in the creek had increased since the previous inspection on 27 March following a heavy rainfall event on 6 April. Surface water was observed to be flowing along the full length of Teatree Hollow.

Structures

Weekly surveys and inspections at the Australian Wildlife Sanctuary and MKD Machinery have ceased as the properties are beyond the active subsidence zone.

Weekly surveys and inspections have been conducted at Tahmoor Garden Centre with no issues observed. As extraction of LW S2A has effectively finished, surveys will cease in accordance with the Management Plan.

Weekly surveys and inspections have been conducted at Bargo Petroleum. New cracking in floor tiles has been observed, and extension of a pre-existing crack above an internal door frame. Several internal doors are close to jamming and require adjustment and one vehicle hoist has been damaged and is not operational.

Weekly surveys and inspections have been conducted at Wollondilly Anglican College. A jammed gate has been resized and reinstalled. The gate had jammed again and was repaired on 21 March. A gate on the opposite side of the same building has slightly pulled apart.

A short flight of stairs has been cordoned off due to the development of a trip hazard at a drainage grate and Tahmoor Coal is arranging repair as soon as possible. A structural inspection was conducted on 15 February. Whilst the damage was considered to be cosmetic in nature, it was recommended that trip hazards be repaired, with some isolated joints installed to enable future differential movement to occur. Crack gauges were installed at 7 locations to monitor changes. Tahmoor Coal commenced temporary repairs on 2 March. Concrete pavement and brickwork repairs and installation of expansion joints has been completed.

New cracking has been reported in the Johnson Building, which has been investigated and is unlikely to be mining related.

Ground cracking has been observed along the southern wall of Clifford Warne Auditorium and possible widening of gap in garden retaining wall near site of existing damage at Shoulder to Shoulder Shelter. Garden access gate at Quarmby Cottage has jammed.

A gate at the northeastern corner of White Cottage is self-closing intermittently. The gate has been repaired.

Local Roads

A focussed detailed inspection on 31 May identified a bump in the southbound lane of Remembrance Drive where non-conventional subsidence movements have been observed between Pegs R46 and R48. A visual inspection on 9 June found that the bump had extended slightly across towards the Northbound lane since the inspection on 31 May. Minor changes were observed on 20 and 23 June. A faint bump is visible on the edge line of the northbound lane south of Peg R46. Small changes were observed on 26 December. The southbound pavement outside of the fog line has deteriorated. The bump appeared to be slightly longer and more visible on 29 January and some continued growth and extension of the bump was observed on 30 January before the pavement was resurfaced on 5 February. The bump had re-emerged through the patched pavement on 15 March. The bump appeared to have increased on 26 March. The pavement was resurfaced on 8 April.

A new small bump is observed along southbound fog line of Remembrance Drive just north of location of compressive strain between Pegs R54 and R55. The bump extends across the southbound lane and into the northbound lane. The bump does not present a vehicle hazard. The pavement was resurfaced on 8 April.

MSEC notified Wollondilly Shire Council on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Wollondilly Shire Council and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:

- The pavement was resurfaced on 5 February and 8 April;
- The speed limit is currently at 60 km/hour for the Southbound direction due to the presence of the traffic barriers and was extended to cover the newly forming bump north of Pegs R54 and R55. The speed limit remains at 80 km/hour for the Northbound direction. It is planned to remove the barriers and return to normal speed restriction in the next week;
- Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June);
- Frequency of surveys is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Frequency of focussed visual inspections is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Tahmoor Coal to continue to keep Council informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via this monitoring report and via weekly teleconferences;
- Tahmoor Coal to arrange for contractor on standby to repair the road at short notice, when required by Council;
- Council to install warning signs and temporary speed restriction signs, when required; and
- Notify and inform Council staff about the impact site, in the event of enquiries from the travelling public.

Surveys of Arina Road Bridge and Rockford Road Bridge on 11 April measured very minor changes.

Visual inspections of Arina Road Bridge and Rockford Road Bridge on 18 December found no issues.

Gas Infrastructure

Minor subsidence movements and ground strains are developing along Remembrance Drive. Non-conventional subsidence movements are observed at Pegs R46 to R48 on Remembrance Drive.

It is noted that no odours have been detected during visual inspections. Gas detection surveys were completed this week, with no issues observed.

A new small bump is observed along southbound fog line of Remembrance Drive just north of location of compressive strain between Pegs R54 and R55. The bump extends across the southbound lane and into the northbound lane. The compressive strain exceeded the trigger levels of 2 mm/m on 18 March. The gas pipe had already been exposed. The road was resurfaced on 8 April.

MSEC notified Jemena on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Jemena, Worley Consulting and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:

- Following engineering analyses of observed ground movements, Tahmoor Coal and Jemena excavated and exposed the pipeline prior to the influence of LW S2A, in order to decouple the pipeline from the ground. The excavation of the trench was successfully completed on 18 December 2023. The pipeline has bowed in response to the compressive ground strain and thermal loads, as expected. The trench was backfilled on 7 May and it is planned to remove the traffic barriers have been removed following the recent wet weather;
- Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June);
- Frequency of surveys, including a survey of the pipe alignment, is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed. Worley Consulting advise that based on the measured ground survey and pipeline alignment surveys, calculated peak stresses in the pipeline are below trigger levels;
- Frequency of focussed visual inspections is currently weekly but is planned to cease after one month has passed since the completion of LW S2A as no ongoing adverse changes are observed;
- Weekly gas detection surveys are ongoing along the affected section of Remembrance Drive by Tahmoor Coal. No gas was detected during LW S2A;
- Excavation and decoupling of the pipe to relieve stress between Pegs R53 and R55 was completed on 11 March. The trench was backfilled on 7 May and it is planned to remove the traffic barriers have been removed following the recent wet weather;
- Worley Consulting recommends that a trigger of 1.2 mm/m additional compressive strain after the trenches have been backfilled at both impact sites. Upon exceeding the trigger, Tahmoor Coal and Jemena will meet to discuss management actions, which include re-exposing the gas pipes. Based

on the latest absolute 3D survey on 7 May, the triggers are set to 4.6 mm/m between Pegs R47 and R48, and 3.2 mm/m between Pegs R54 and R55 and are shown in Figure C and Fig. 6.
- Tahmoor Coal to continue to keep Jemena informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via this monitoring report and via weekly teleconferences; and
- Jemena remains on standby to conduct repairs if required.

Electrical Infrastructure

Subsidence and ground strains are developing along Remembrance Drive. Non-conventional subsidence movements are observed at Pegs R46 to R48 and potentially Pegs R53 and R55 on Remembrance Drive. The observations do not adversely affect Endeavour Energy infrastructure at this stage.

Ground surveys of critical power poles are conducted when poles are within the active subsidence zone. The latest survey was on 20 February.

Telecommunications Infrastructure

Minor subsidence movements and ground strains are developing along the optical fibre cables on Remembrance Drive, the southern end of the mine and the Main Southern Railway. Until 27 December 2023, visual inspections and OTDR testing had not detected impacts, including where a bump is observed in the pavement on Remembrance Drive.

Non-conventional subsidence movements are observed at Pegs R46 to R48 on Remembrance Drive. Comms Network Solutions notified Telstra, TPG and NBN on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Telstra, CNS and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. It is noted that the Telstra cable is the most vulnerable as it is direct-buried, while the NBN and TPG cables are in 100 mm diameter conduit.

A new small bump is observed along southbound fog line of Remembrance Drive just north of location of compressive strain between Pegs R54 and R55. A very small bump was also identified near Peg R61 on 11 March.

The following additional management measures are being conducted:

- Telstra excavated and exposed the buried cables on 16 January 2024. Testing by Telstra indicates that the transmission fibres in the cable have relaxed following the protection works but the spare test fibre that is used by CNS to conduct OTDR testing experienced a break on 18 January, approximately 5 metres north of the original loss location;
- OTDR testing by CNS of the Telstra cable south of the impact site found no ongoing losses detected between Pegs R47 and R48. A small transmission loss, though less than trigger levels, was detected by Telstra automated monitoring near Pegs R54 and R55 with no change this week. An OTDR test at 1625nm by CNS on 8 April detected no loss at this location;
- Telstra will continue to monitor the condition of the transmission fibres in the cable, with no ongoing losses detected;
- Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June);
- Frequency of surveys is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Frequency of focussed visual inspections is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Based on the results of the OTDR monitoring, it is currently not planned to excavate and relieve cable stress between Pegs R53 and R55.
- Comms Network Solutions to continue to keep Telstra, NBN and TPG informed on the status of ground movements, visual inspections and OTDR; and
- Tahmoor Coal to continue to keep Telstra informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via this monitoring report and via weekly teleconferences; and
- Comms Network Solutions remains on standby to locally excavate and expose the buried cables if required.

On 27 December 2023, a minor loss was detected by OTDR at the location of the bump and high compressive strain on Remembrance Drive. The cable was re-tested on 29 December and 1 January 2024, which found minor changes since 27 December. Telstra advised on 29 December that a minor increase in loss could be detected from their automated monitoring systems.

The cause of the loss could be related to the gas pipe trench excavation or heavy construction vehicles travelling over the cable, or saturation of soils from recent rainfall events.

Increases in loss were observed on 4, 8 and 11 January. Decreases in loss were observed on 15 January.

Planned cable protection works were conducted on 16 and 17 January by excavating and exposing the cable. Testing by Telstra indicates that the transmission fibres in the cable have relaxed following the protection works but the spare test fibre experienced a break on 18 January, approximately 5 metres north of the original loss location. Telstra will continue to monitor and CNS will continue to test the spare test fibre. Latest testing on 17 April shows no indication of losses above LW S2A.

Potable Water Infrastructure

Minor subsidence movements and ground strains are developing along Remembrance Drive. Non-conventional subsidence movements are observed at Pegs R46 to R48 on Remembrance Drive.

A new small bump was observed along southbound fog line of Remembrance Drive just north of location of compressive strain between Pegs R54 and R55. The bump extends across the southbound lane and into the northbound lane. The pavement was resurfaced on 8 April.

MSEC notified Sydney Water on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Sydney Water, Sweeting Consulting and MSEC have met on multiple occasions to review the latest observations and decide whether any additional management measures are required. The latest review was conducted on 7 May 2024. The following agreed additional management measures are in place:

- Tahmoor Coal and Sydney Water installed two expansion joints (Gibault joints) near the site prior to the influence of LW S2A. The joints were installed on 11 September, with joint displacement sensors installed;
- Additional survey pegs were installed on the northbound side of Remembrance Drive to measure changes along both sides of the pavement in local 3D (pegs installed 5 June);
- Frequency of surveys is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Frequency of focussed visual inspections is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Sydney Water confirmed that valves have been marked out on site, as planned. Valves to the north of the site have been audited to ensure that they are in working condition. A valve audit was completed for valves located to the south of the site on 15 June;
- Sydney Water confirmed that reservoirs in the network are currently operating at 87% to 93% full, as planned;
- Sydney Water confirmed that this section of the water main has no history of previous leaks;
- Sydney Water has procedures in place to repair a water leak between Pegs R53 and R55, if required
- Tahmoor Coal to continue to keep Sydney Water informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via this monitoring report and via weekly teleconferences; and
- Sydney Water remains on standby to conduct repairs if required.

Displacement sensors were installed on all four Gibault joints. Closure has been observed to gradually develop on the northern Gibault joint at the northern connection to the existing water main, as shown in Figure M. As anticipated, the northern-most Gibault joint reached the limit of its capacity on 25 February, and closure has been taken up by the next joint. Closure has gradually developed on the southern Gibault joint at the northern connection, with rates of change reduced to low levels. The displacement sensors across the other two joints are currently recording very minor changes.

The observed changes are compared with changes in horizontal distance between Pegs R47A and R48A, which are located on either side of the joints. It can be seen from Figure M that the joint displacement is now less than measured between the survey pegs, though there is currently good correlation between the survey methods on weekly changes.

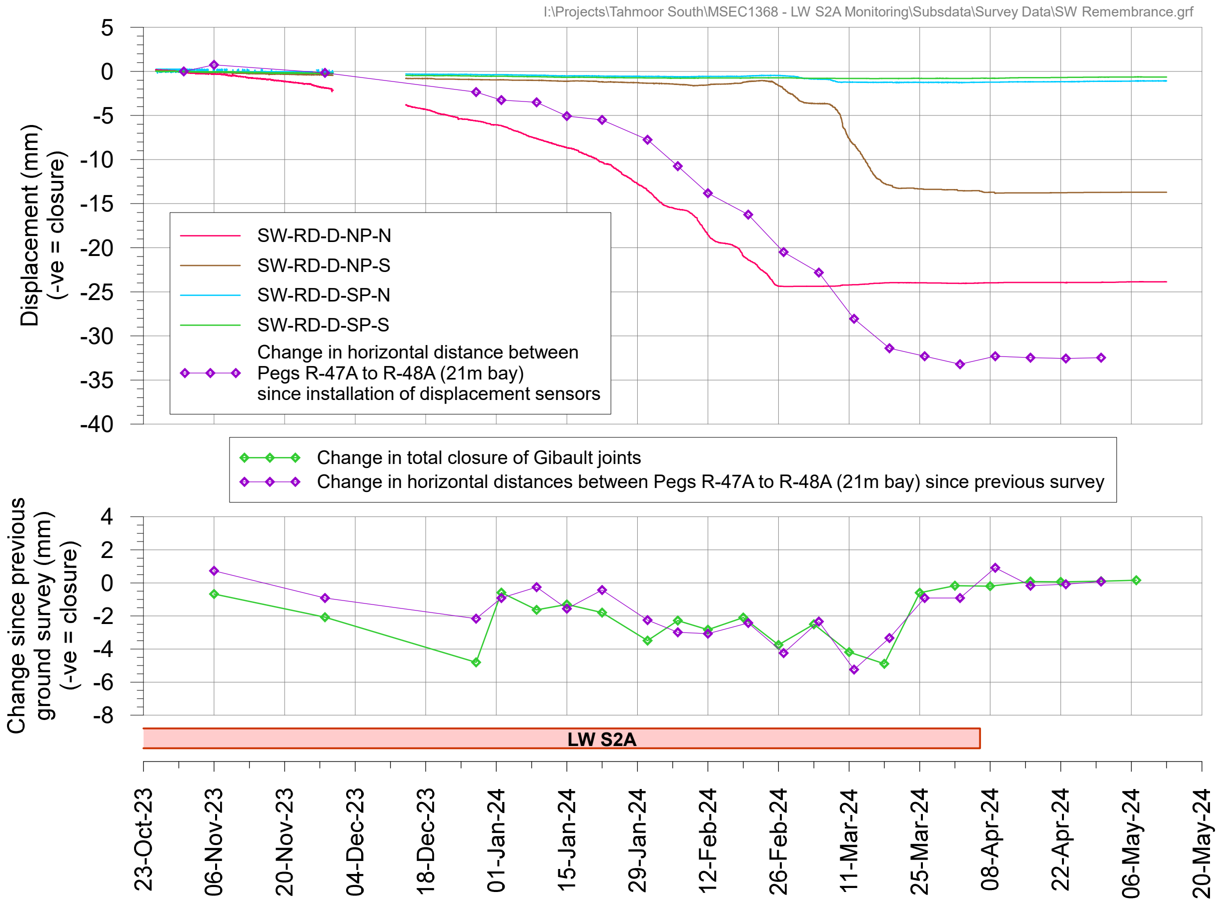

Figure M **Observed change in distance across Gibault joints at Remembrance Drive between Pegs R47A and R48A on Sydney Water potable water main**

Displacement sensors were also installed on the four Gibault joints of the 100 mm water main on Caloola Road. Minor changes have been observed, as shown in Figure N. The northern displacement sensor across the southern joint has been replaced in late February 2024. The observed changes are compared with changes in horizontal distance between Pegs R76C and R78C, which are located on either side of the joints. It can be seen from Figure N that the measured changes are within survey tolerances. A very small trend of closure observed on the joint sensors is gradually reversing.

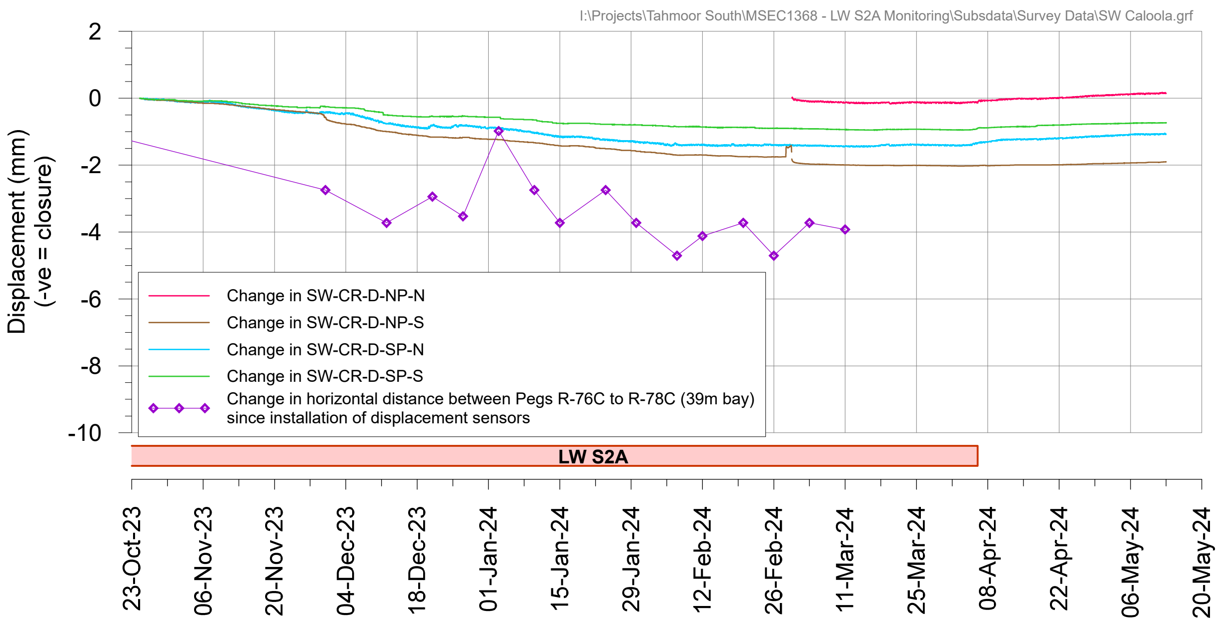

Figure N **Observed change in distance across Gibault joints at Caloola Road on Sydney Water potable water main**

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Sewer Infrastructure

Minor subsidence movements and ground strains are developing along Remembrance Drive.
Non-conventional subsidence movements are observed at Pegs R46 to R48 on Remembrance Drive.

MSEC notified Sydney Water on behalf of Tahmoor Coal on 31 May. Tahmoor Coal met with Sydney Water via teleconference on 2 June to review the latest observations and decide whether any additional management measures are required.

It was agreed that local excavation of pipework or repairs are not required at this stage. The following additional management measures were agreed:

- Install additional survey pegs on the northbound side of Remembrance Drive and measure changes along both sides of the pavement in local 3D (pegs installed 5 June);
- Frequency of surveys is weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Frequency of visual inspections is currently weekly but will now cease. One month has passed since the completion of LW S2A and no ongoing adverse changes are observed;
- Sydney Water confirmed that there are no signs of impact on the sewerage system from automated monitoring results from sensors located upstream and downstream of the site;
- Tahmoor Coal to continue to keep Sydney Water informed on the status of ground movements and visual inspections, and on the status of potential impacts at the petrol station and utility services via this monitoring report and by direct communication if required; and
- Sydney Water remains on standby to conduct repairs if required.

Dams

Weekly visual inspections, and monthly geotechnical inspections have been undertaken when dams are within the active subsidence zone.

No significant changes were observed at FD-7 on 25 March. Small reduction in water level at Dam FD-8 on 27 March. No significant changes were observed at Dam FD-9 on 27 March. No significant changes were observed at Dams FD-18 and FD-19 on 26 March.

No issues observed during inspection of dams on 16 April. Inspections have ceased for LW S2A.

Archaeological Sites

Gradually developing movements have been measured by GNSS units S03 and S04 located on either side of Wirrimbirra Creek, with no impacts observed. The most recent visual inspection at rock shelter site 52-2-4471 on 18 December 2023 found that the creek bed was dry.

Summary

LW S2A commenced extraction on 2 August 2023 and completed extraction on 6 April 2024. Minor subsidence is continuing to develop above the finishing end of the longwall panel but observed rates of change are reducing.

Focussed monitoring has been conducted where non- conventional subsidence movements are observed at Pegs R46 to R48 on Remembrance Drive. Tahmoor Coal has notified and met with infrastructure owners to analyse the latest monitoring information and consider whether any additional management measures are required.

Surveys and inspections will re-commence during the extraction of LW S3A, which commenced extraction on 8 May.

A summary of observations and comparisons of observed and predicted impacts for LW S2A is provided in the Six Monthly Report for LW S3A in Report No. MSEC1430-R05.

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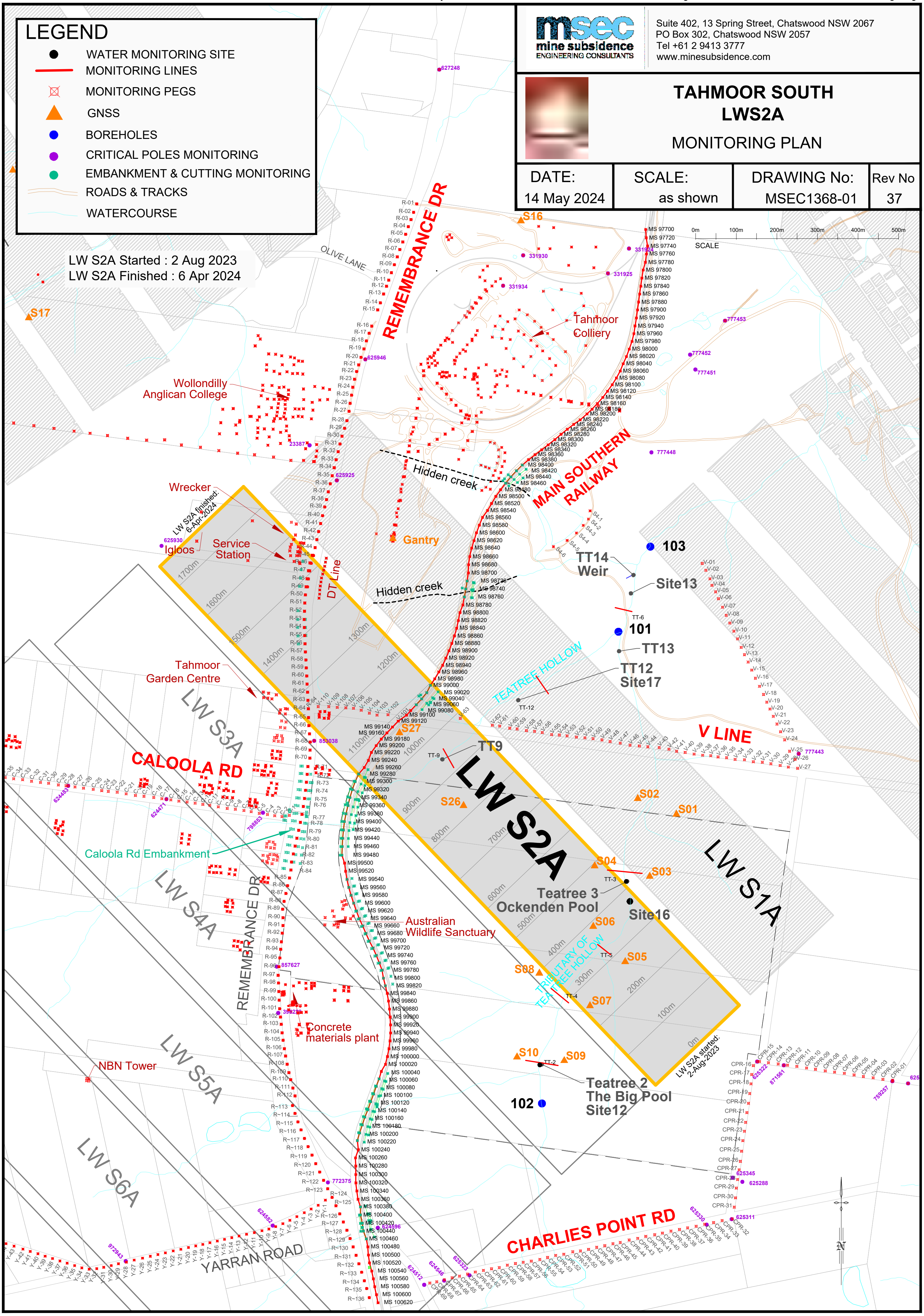
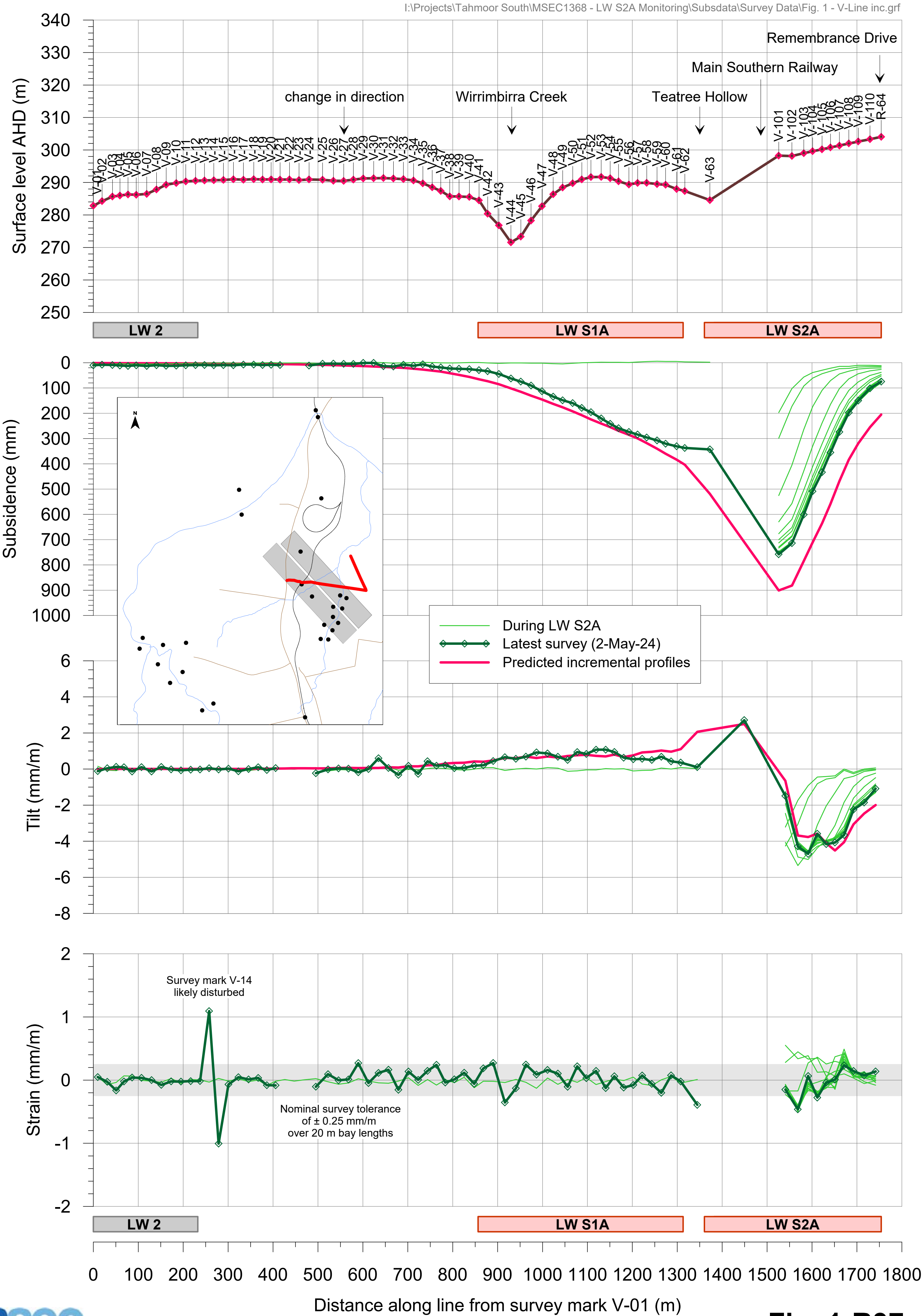


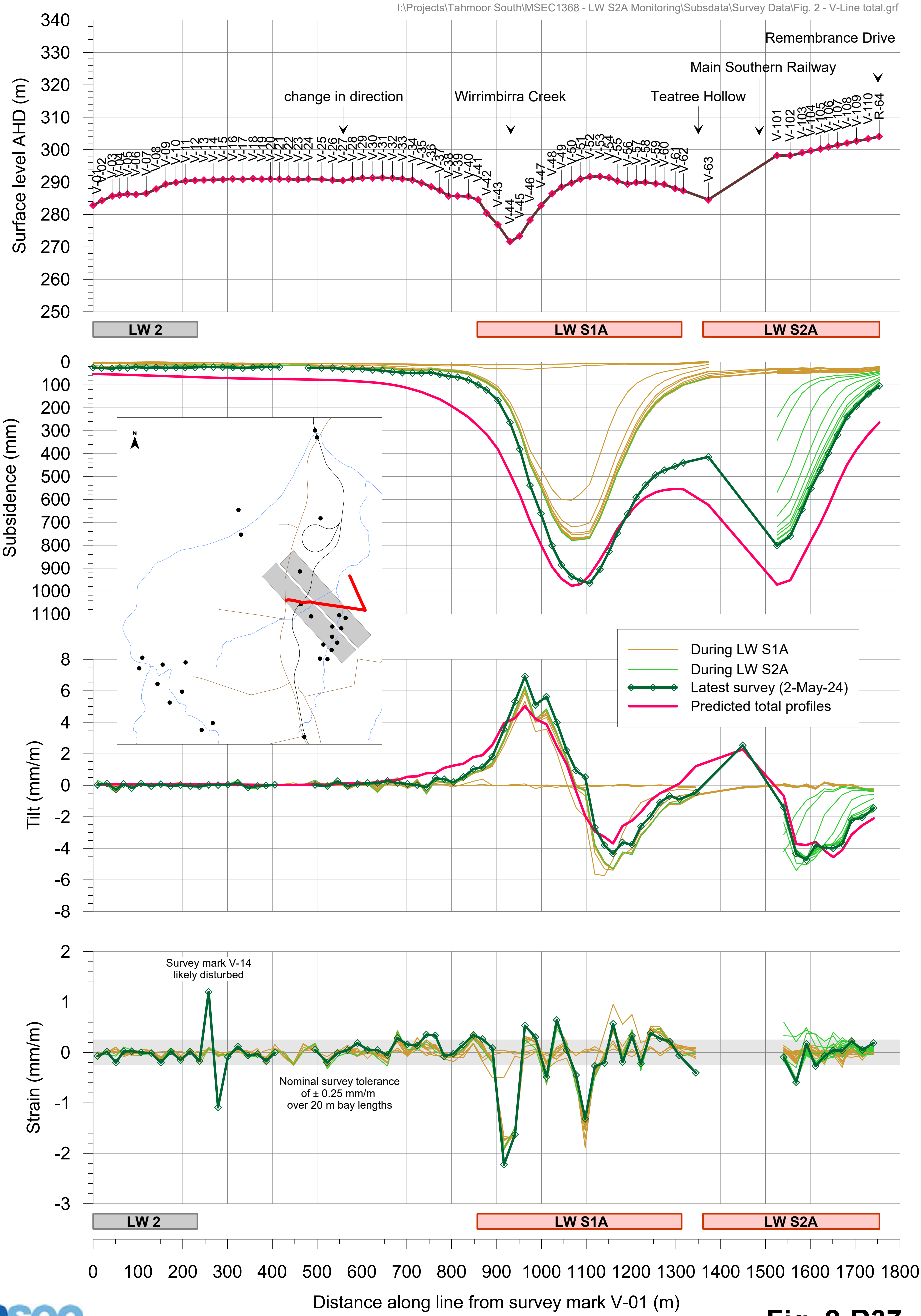
Tahmoor South LW S2A
Incremental subsidence profiles along V-Line



msec

Fig. 1-R37

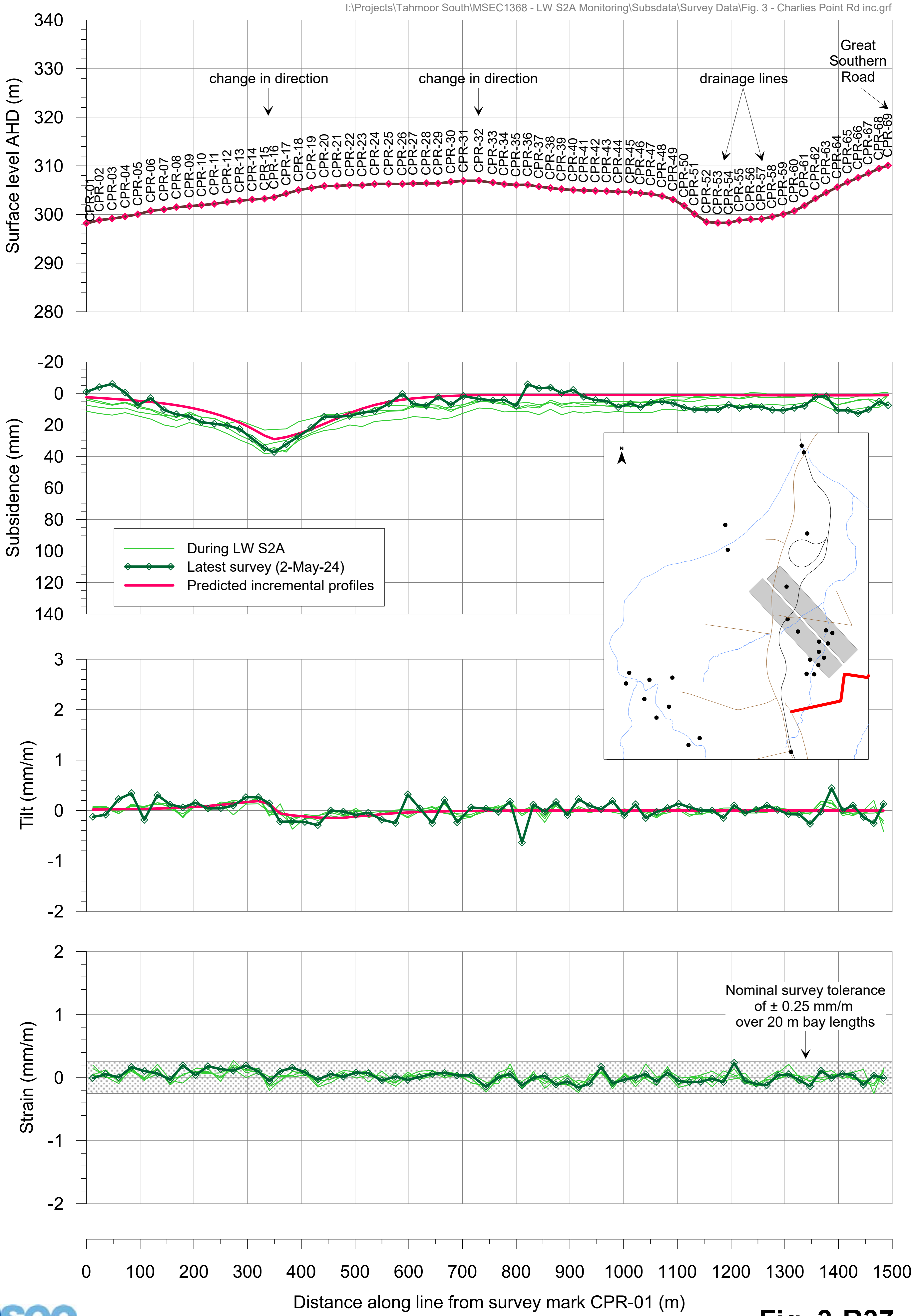
Tahmoor South LW S2A
Total subsidence profiles along V-Line



msec

Fig. 2-R37

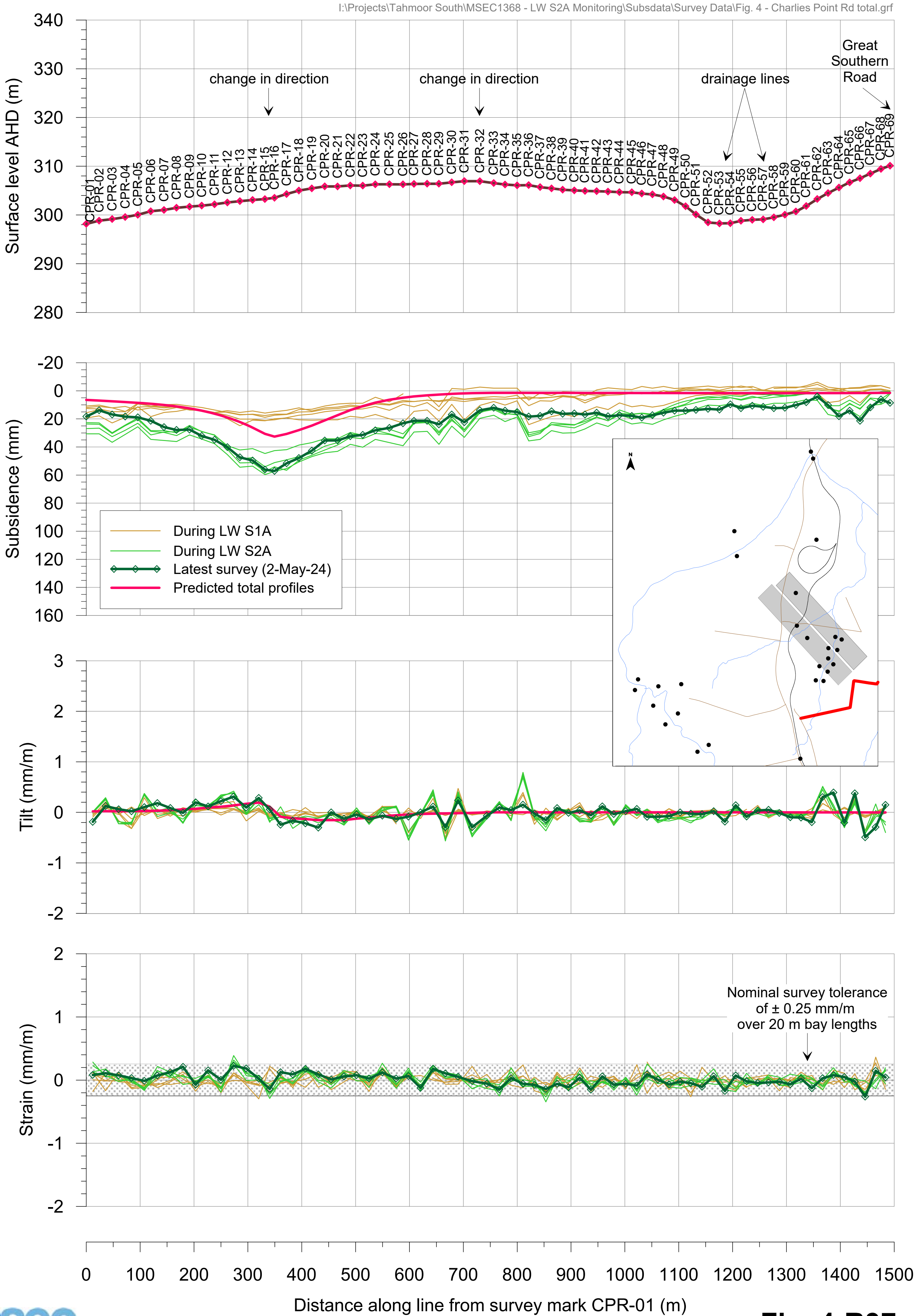
Tahmoor South LW S2A
Incremental subsidence profiles along Charlies Point Road



msec

Fig. 3-R37

Tahmoor South LW S2A
Total subsidence profiles along Charlies Point Road



msec

Fig. 4-R37

Tahmoor South LW S2A
Incremental subsidence profiles along Remembrance Drive

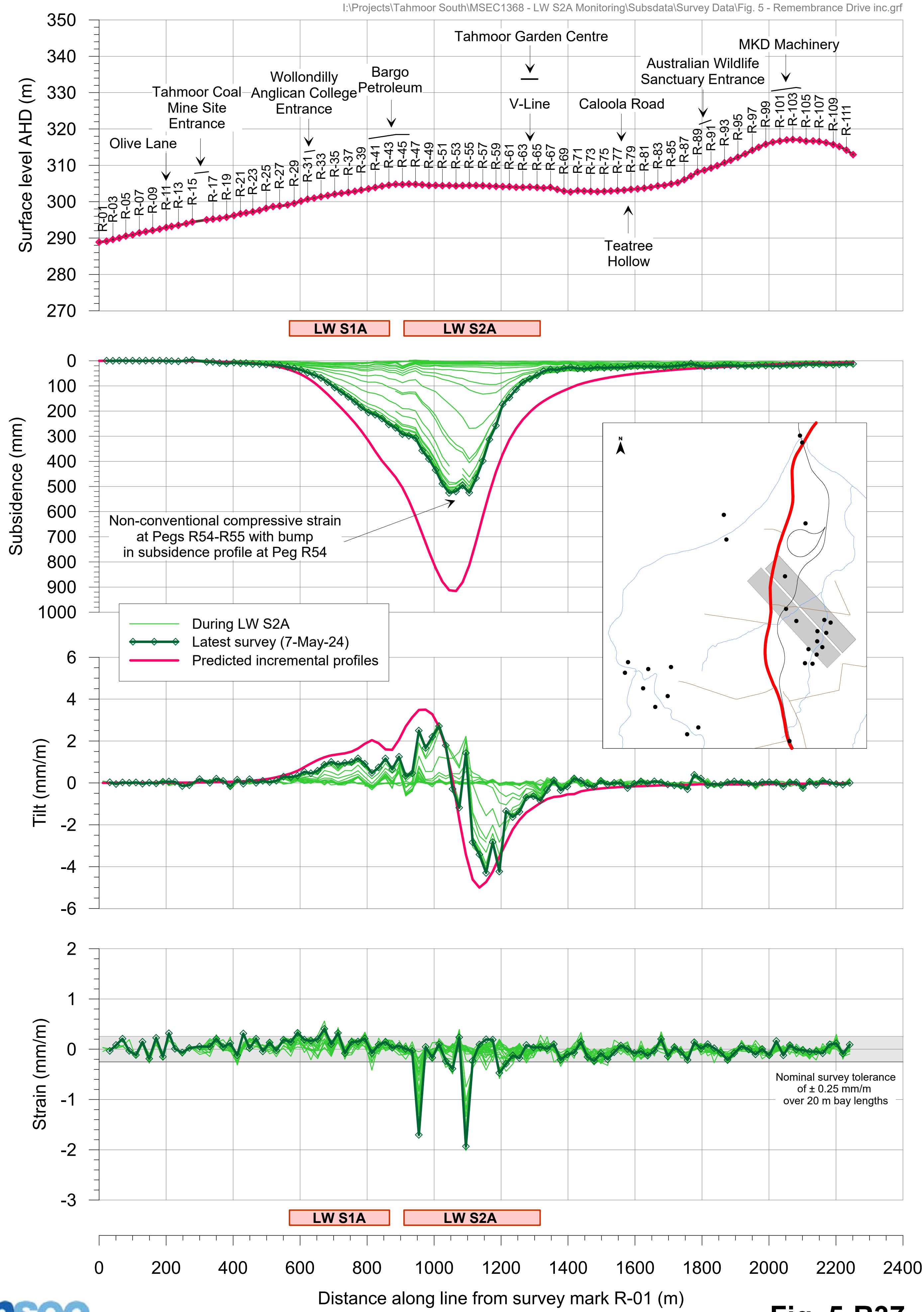


Fig. 5-R37

Tahmoor South LW S2A
Total subsidence profiles along Remembrance Drive

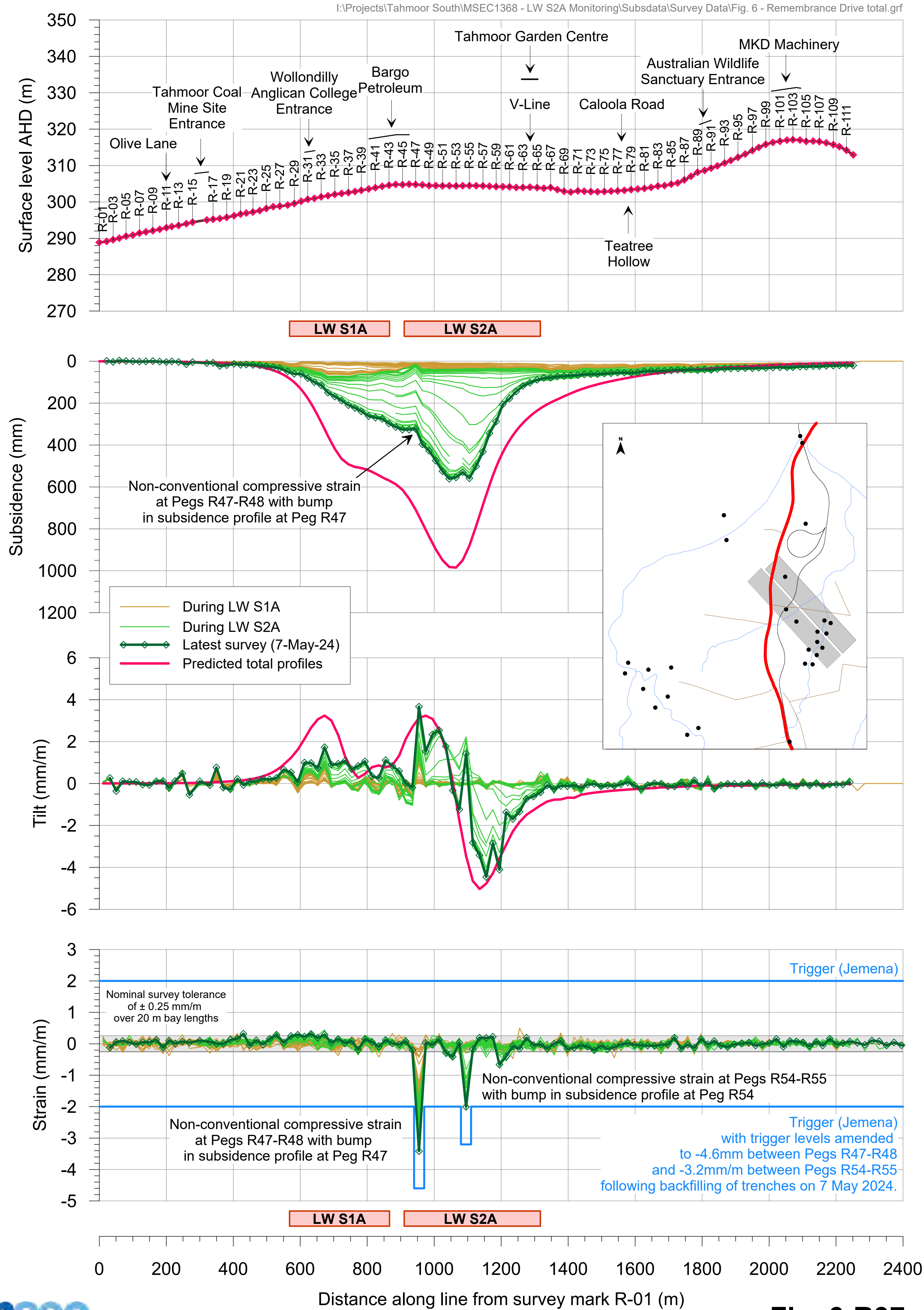


Fig. 6-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S01 above LW S1A

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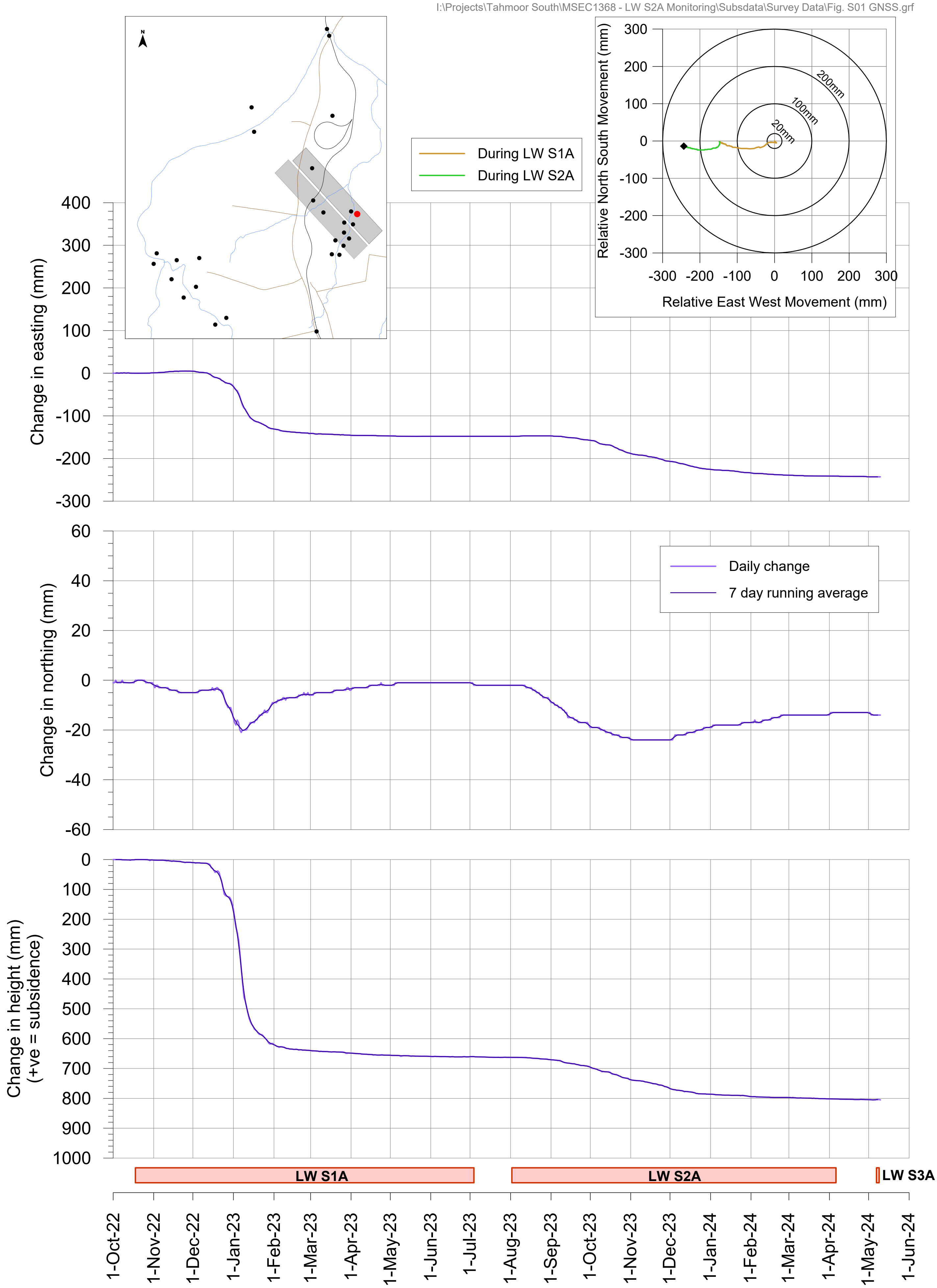


msec

Fig. S01-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S02 above LW S1A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S02 GNSS.grf

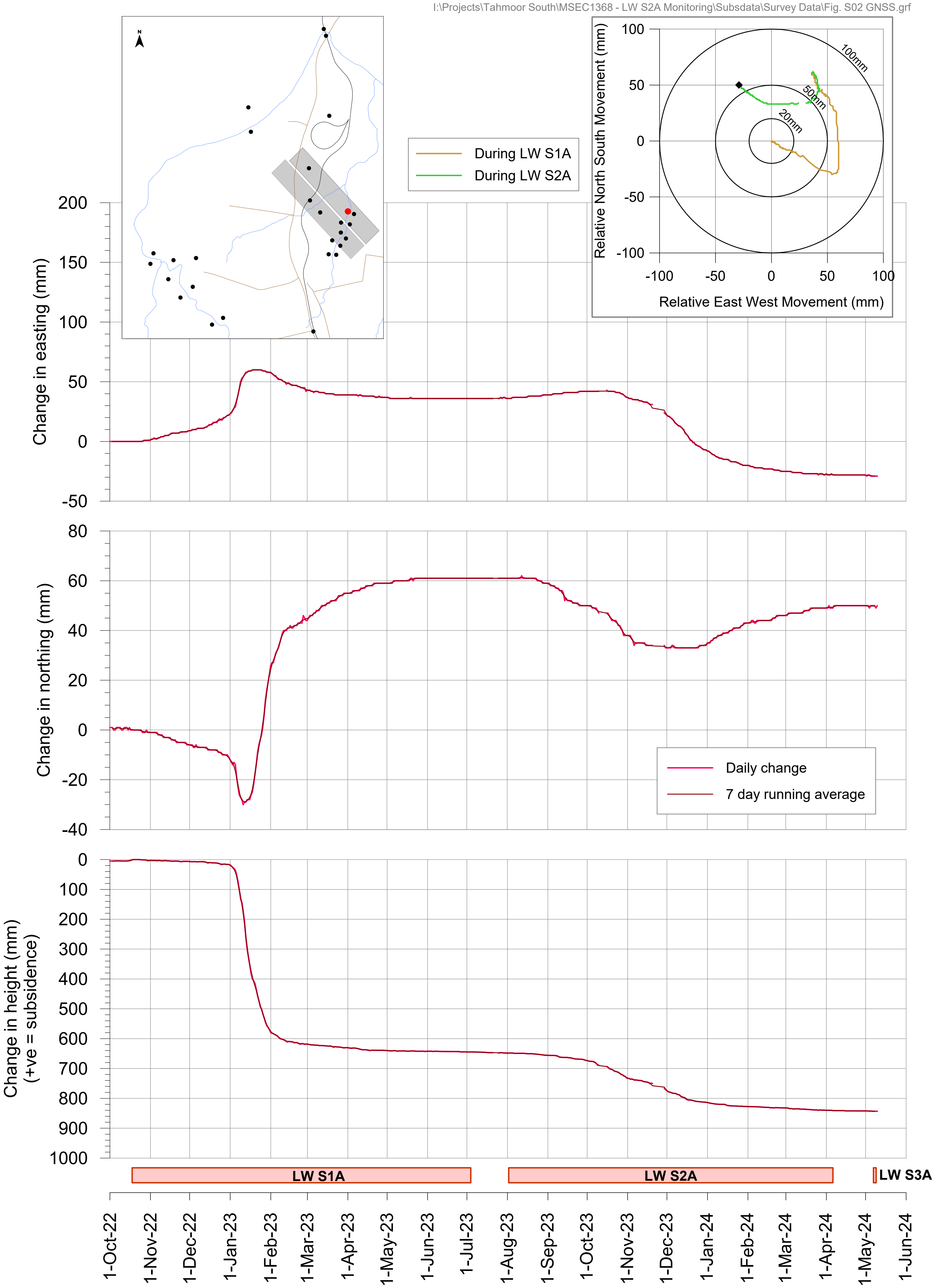
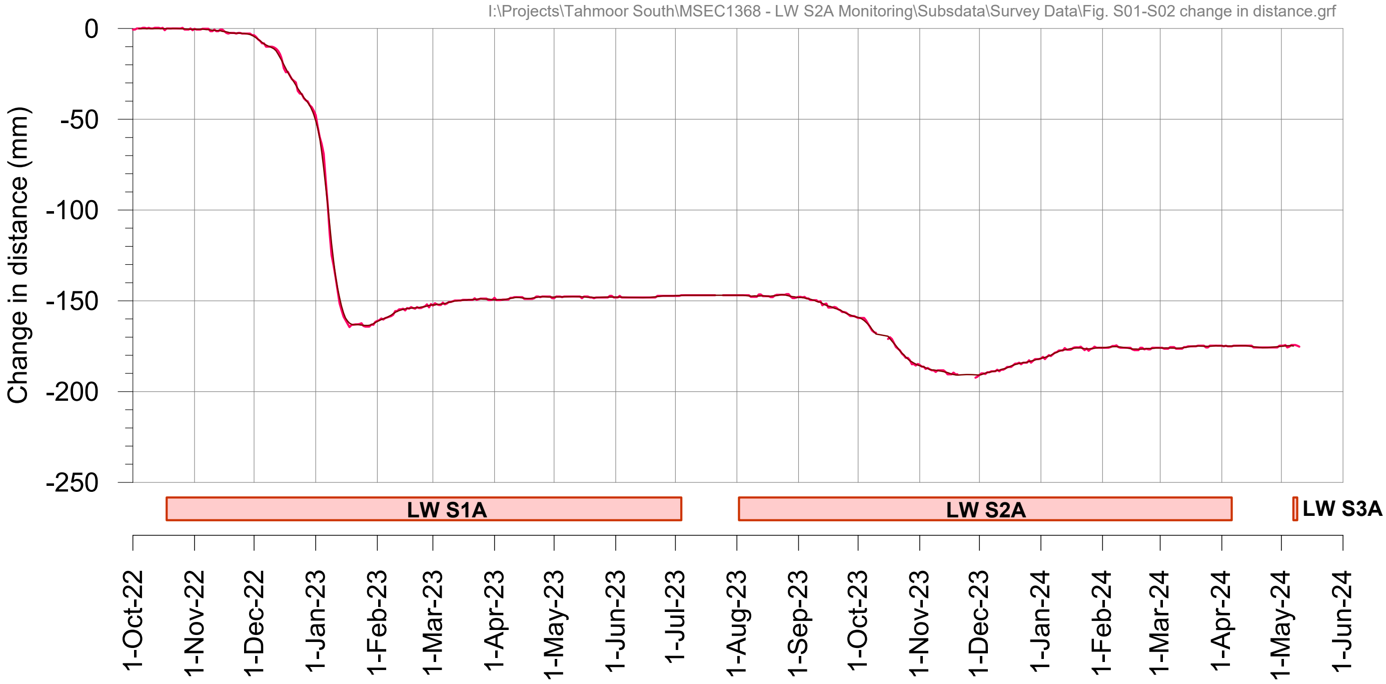
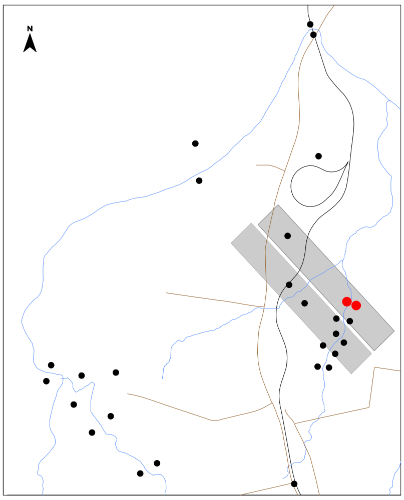


Fig. S02-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Wirrimbirra Creek
Sites S01 and S02 above LW S1A



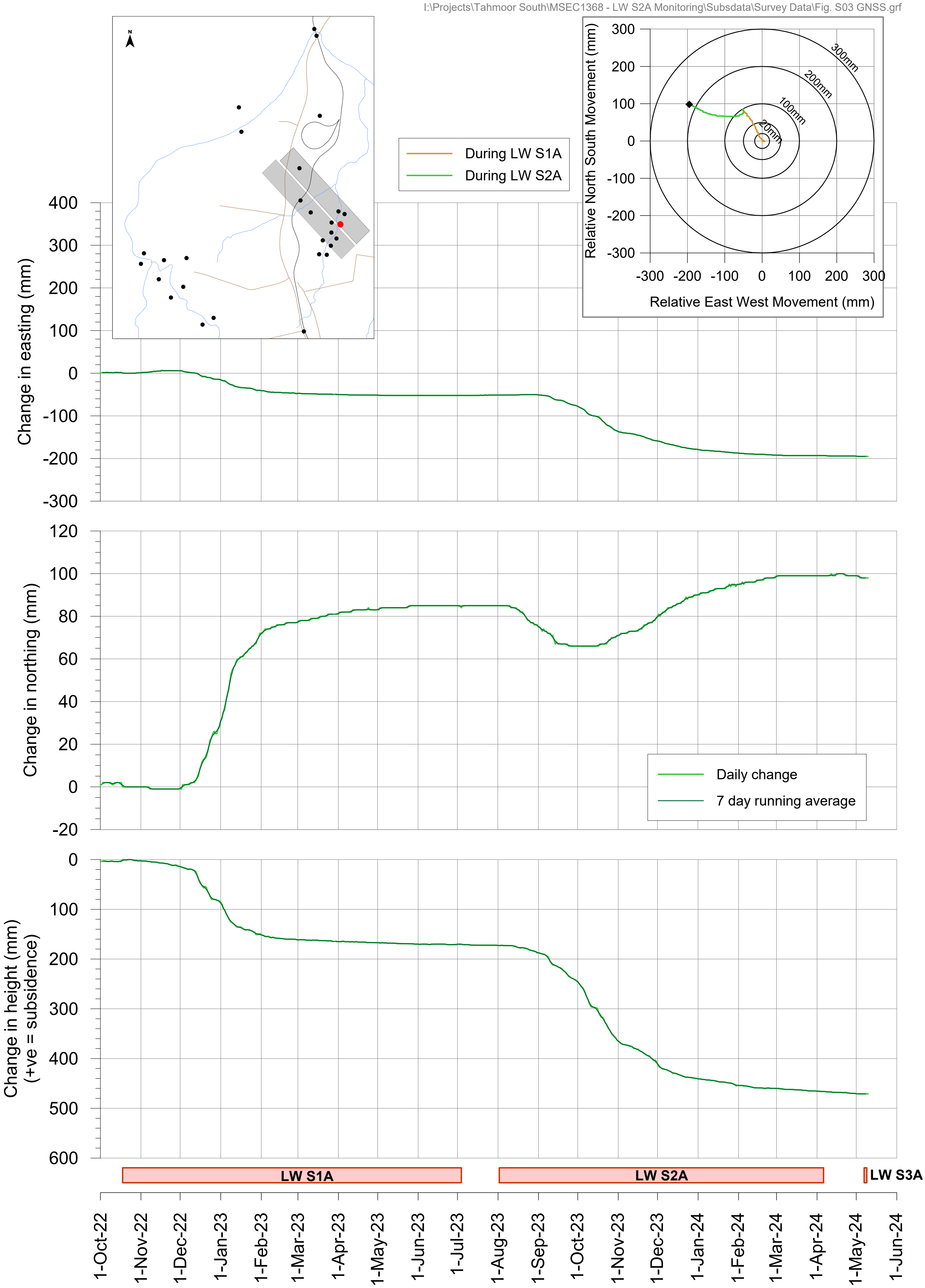


msec

Fig. S01-S02-R37

Tahmoor South LW S2A - GNSS Monitoring

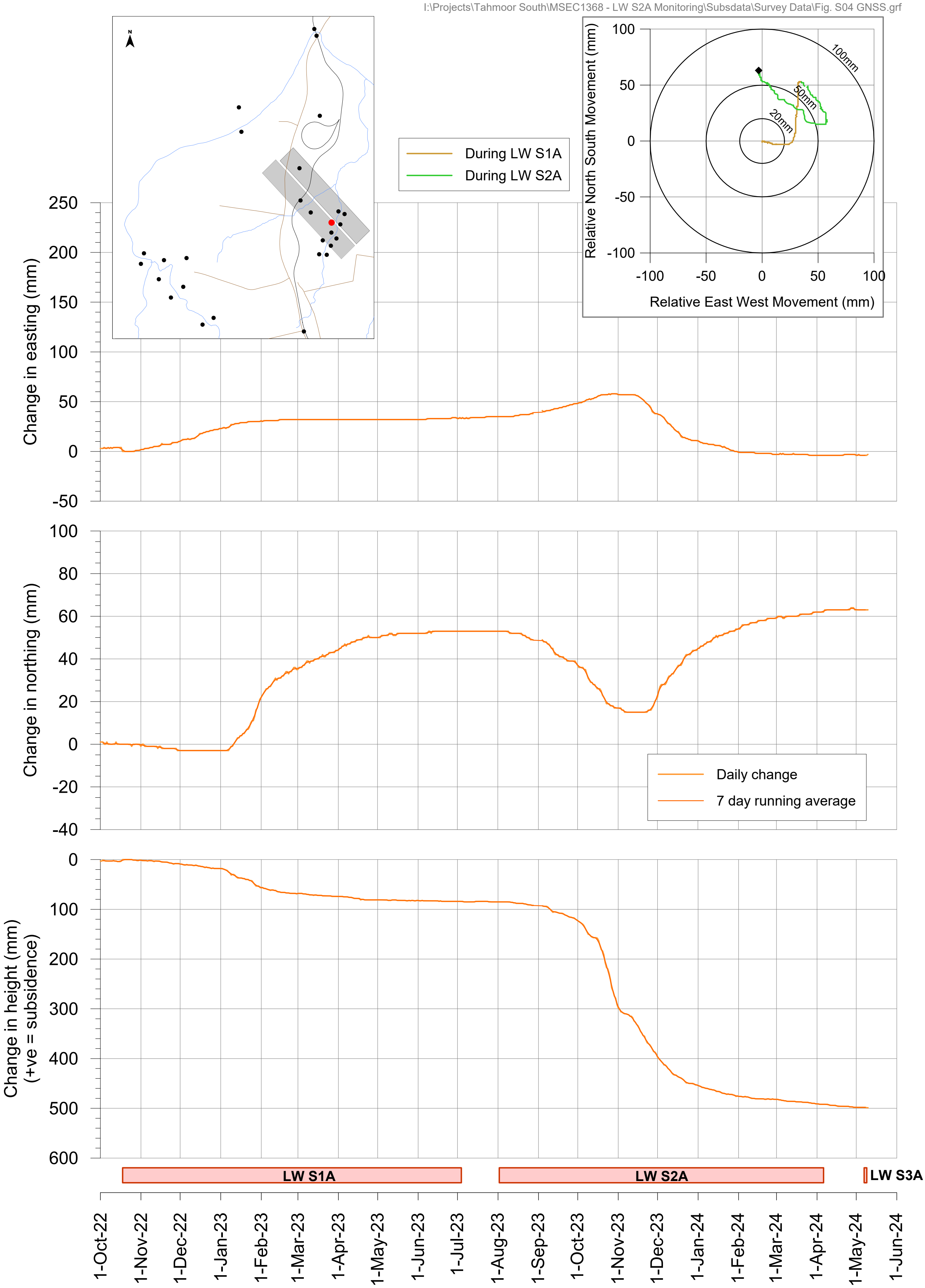
Site S03 above LW S1A at Teatree 3



msec

Fig. S03-R37

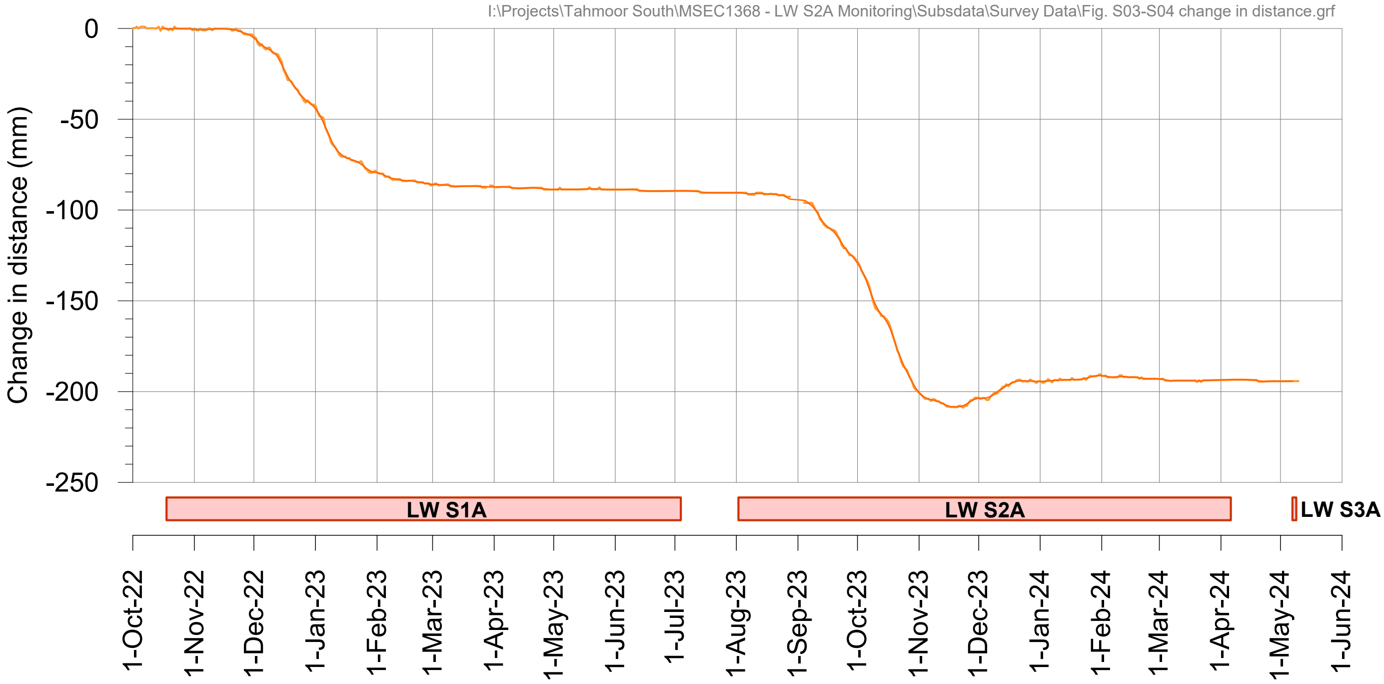
Tahmoor South LW S2A - GNSS Monitoring
Site S04 above LW S2A at Teatree 3

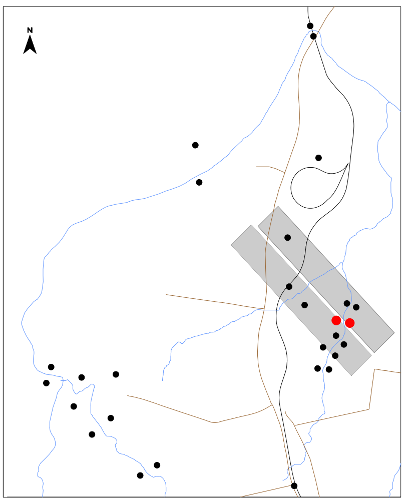


msec

Fig. S04-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Wirrimbirra Creek at Teatree 3
Site S03 above LW S1A and Site S04 above LW S2A

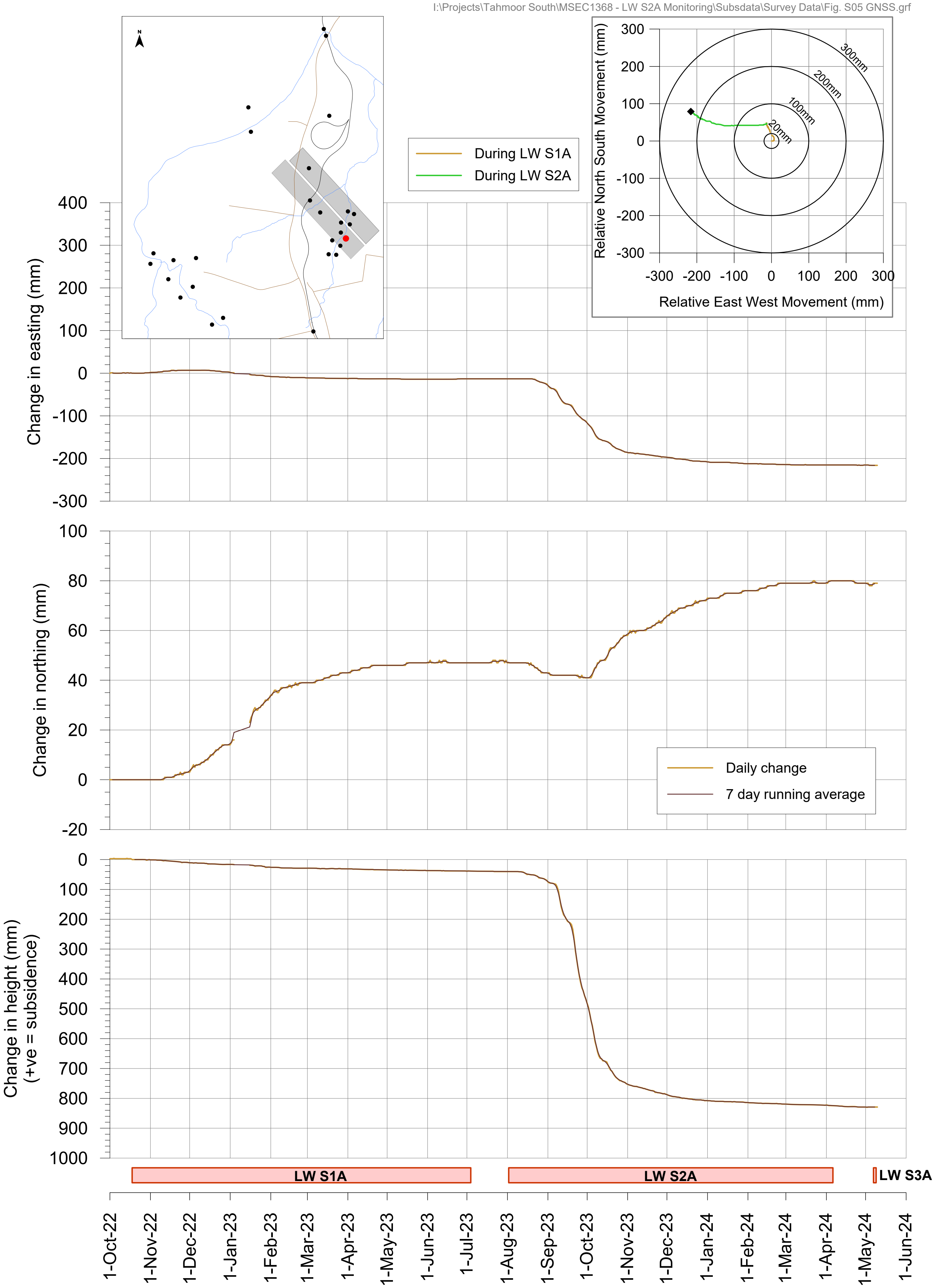




msec

Fig. S03-S04-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S05 above LW S2A



msec

Fig. S05-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S06 above LW S2A

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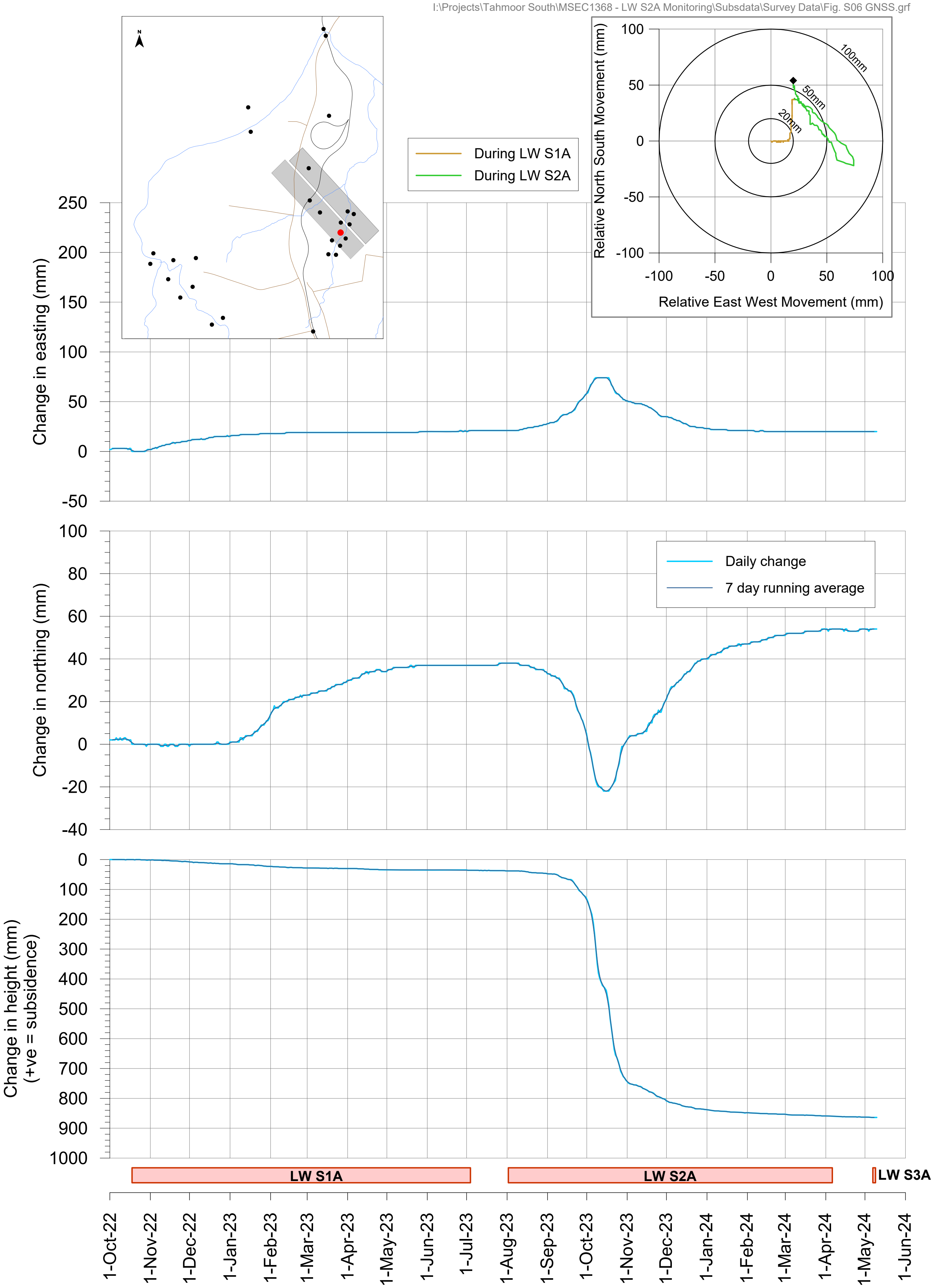
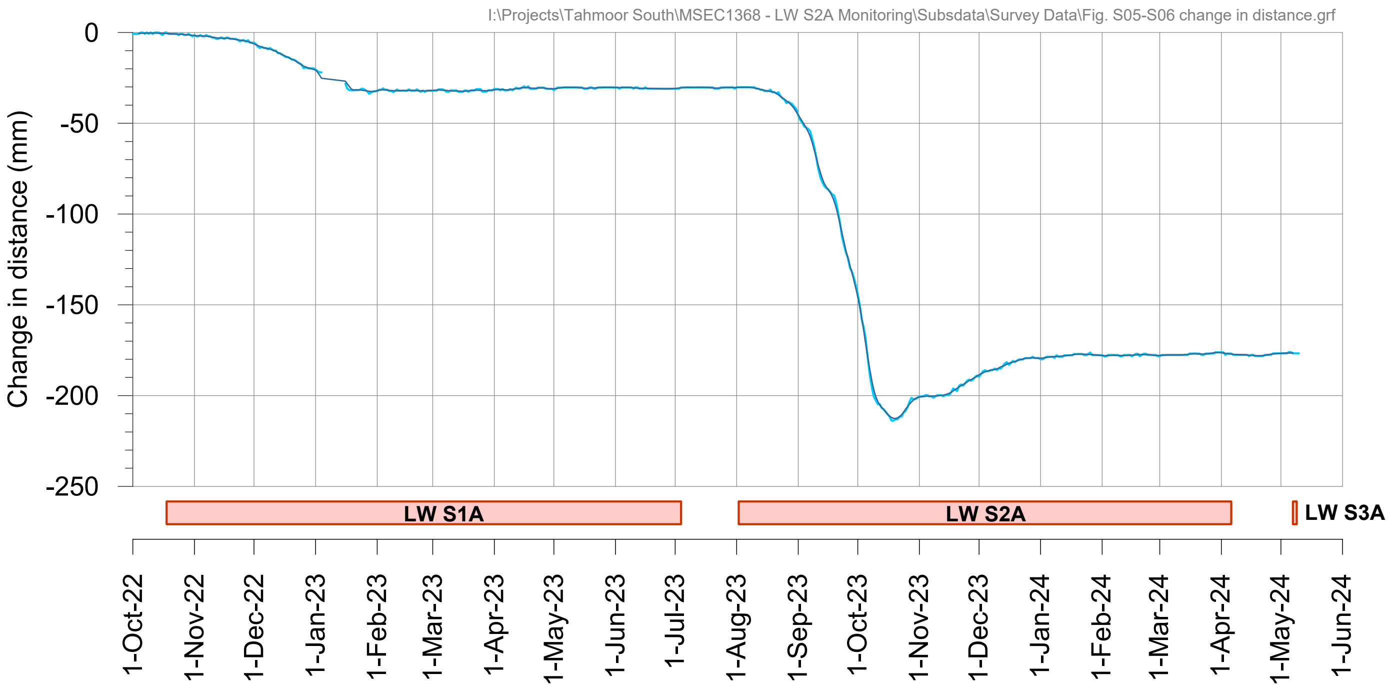
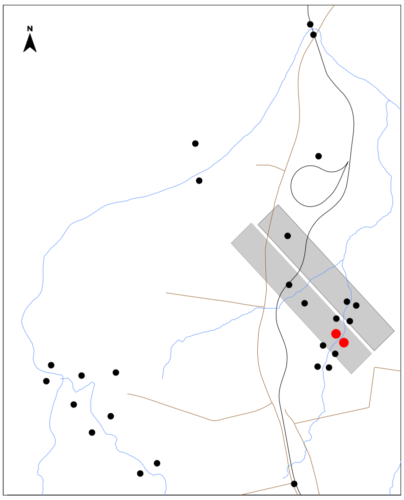


msec

Fig. S06-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Wirrimbirra Creek
Sites S05 and S06 above LW S2A





msec

Fig. S05-S06-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S07 above LW S2A

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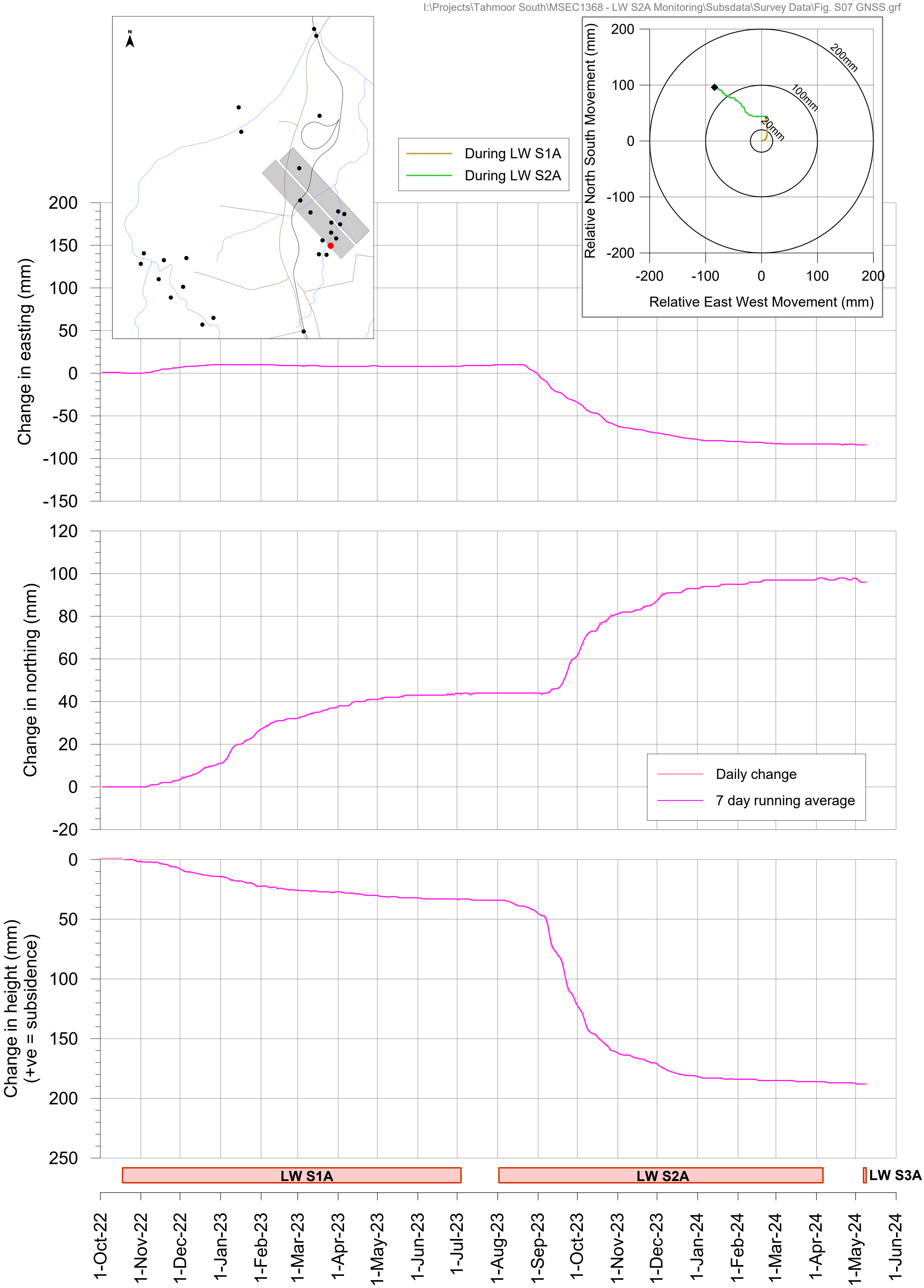


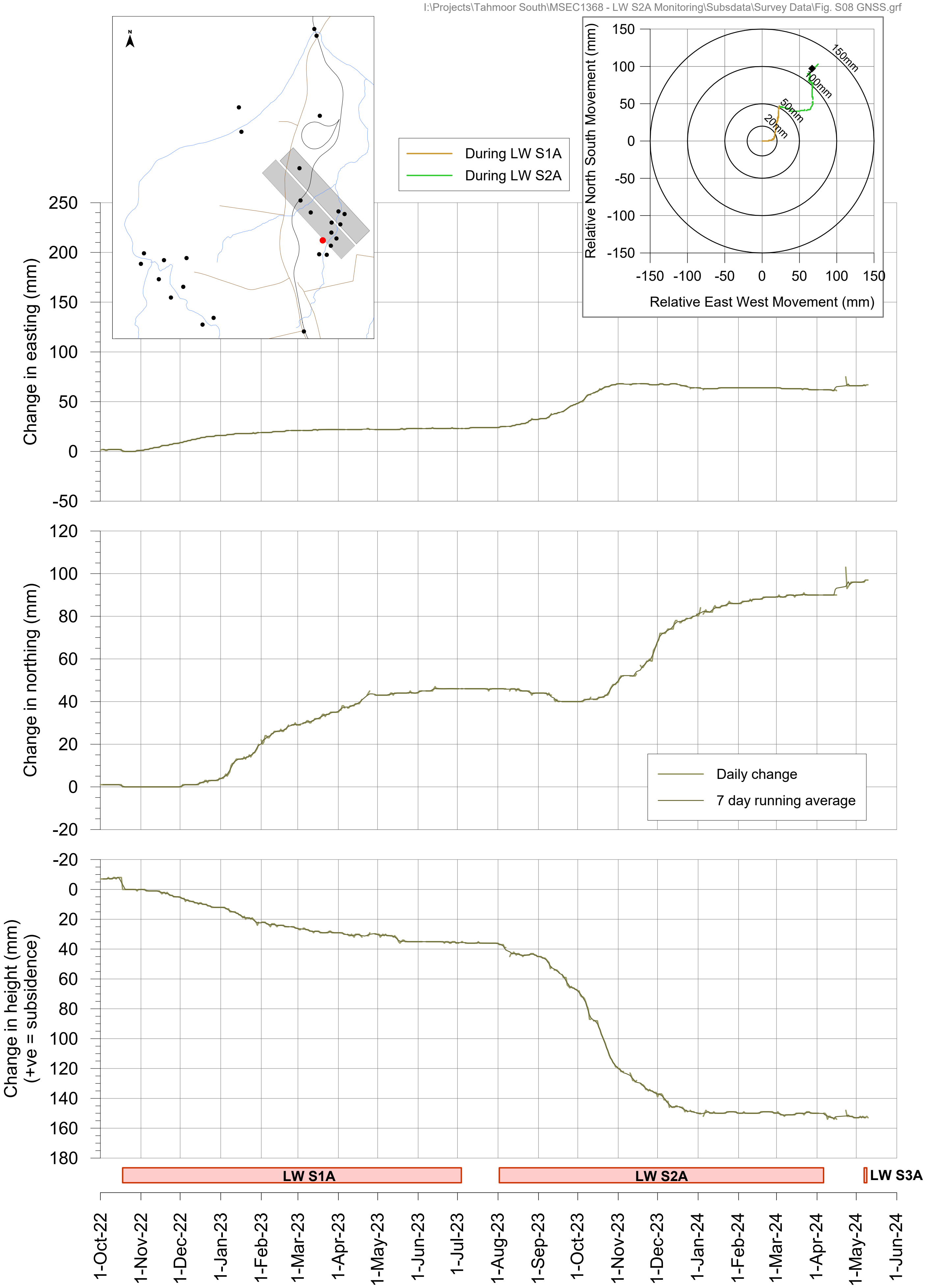
msec

Fig. S07-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S08 between LW S2A and LW S3A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S08 GNSS.grf



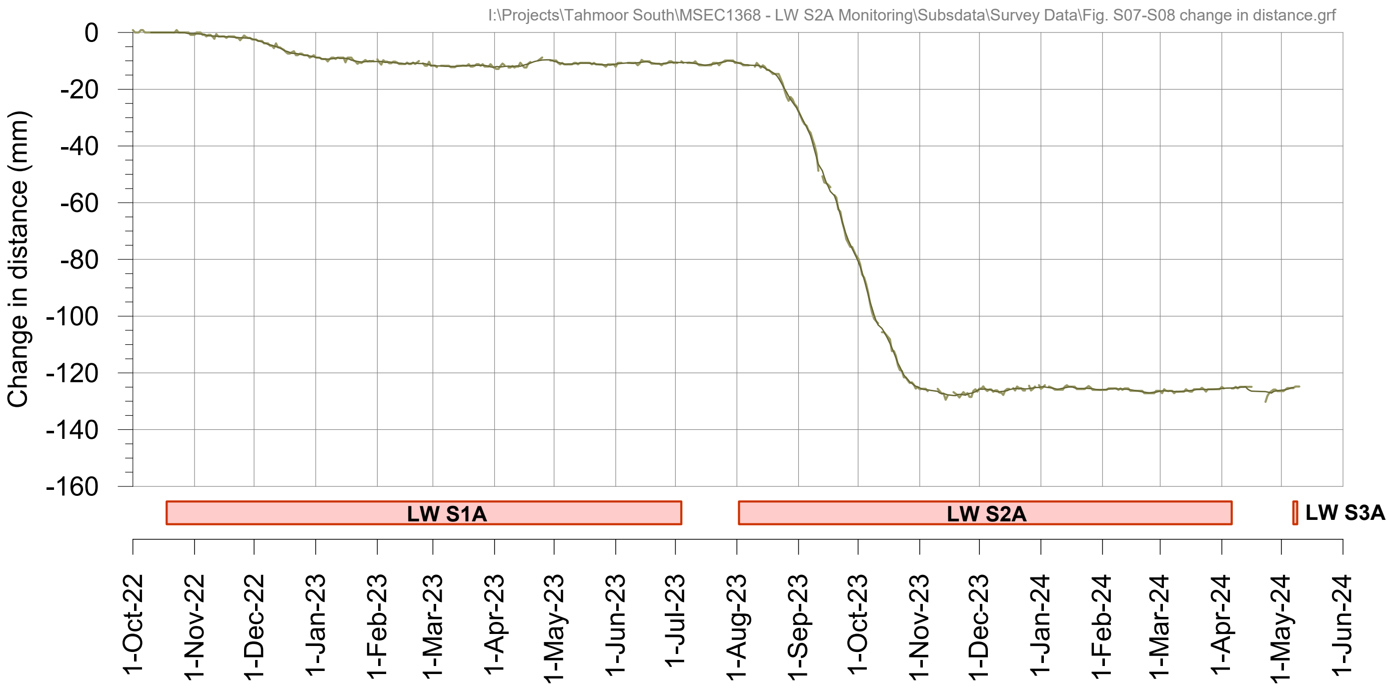
msec

Fig. S08-R37

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Wirrimbirra Creek

Site S07 above LW S2A and Site S08 between LW S2A and LW S3A



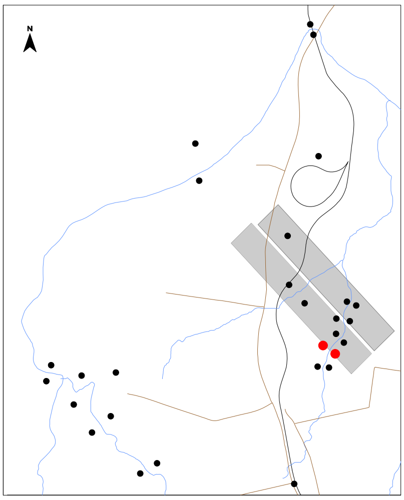


Fig. S07-S08-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S09 above LW S3A at Teatree 2

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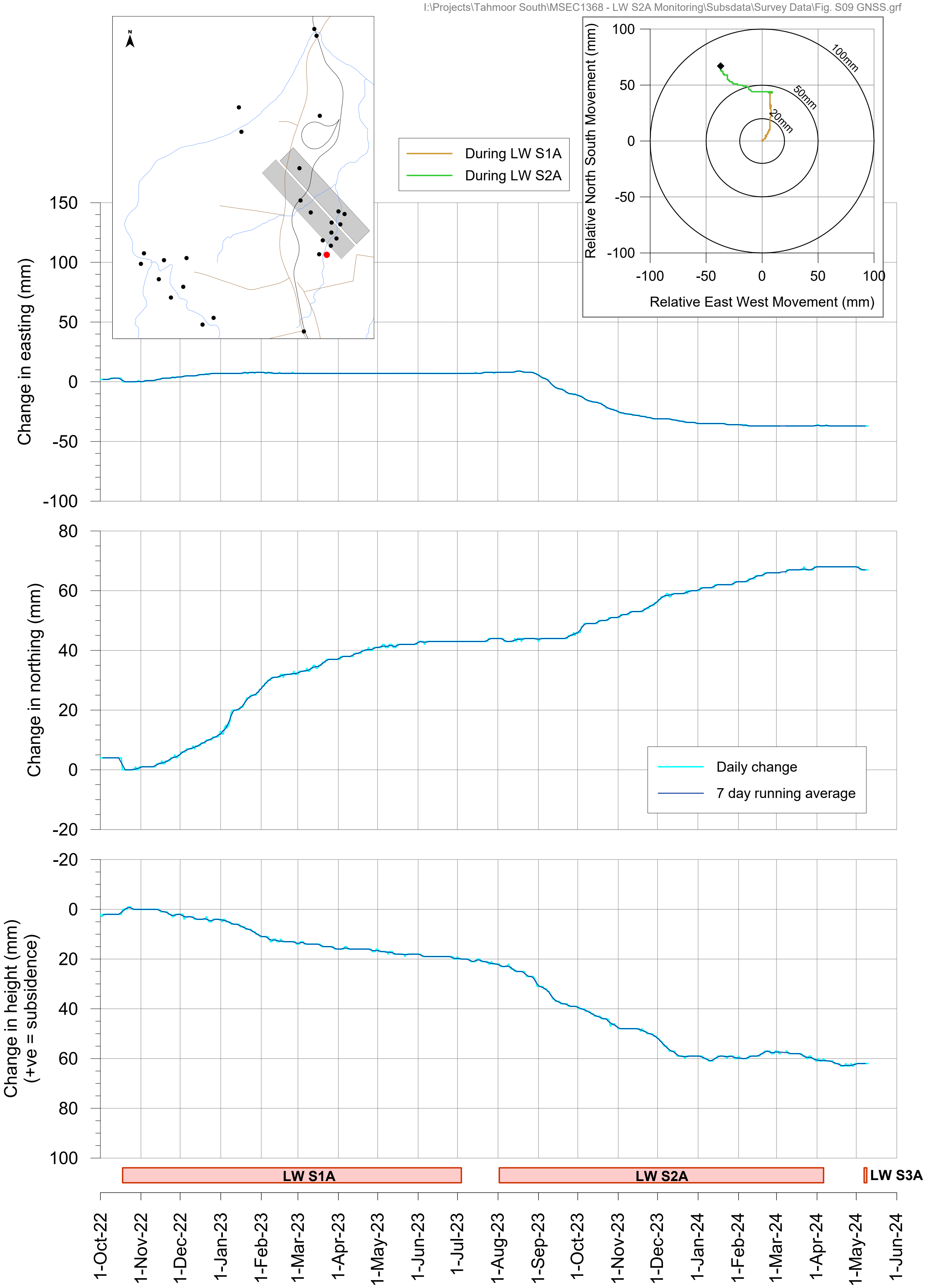
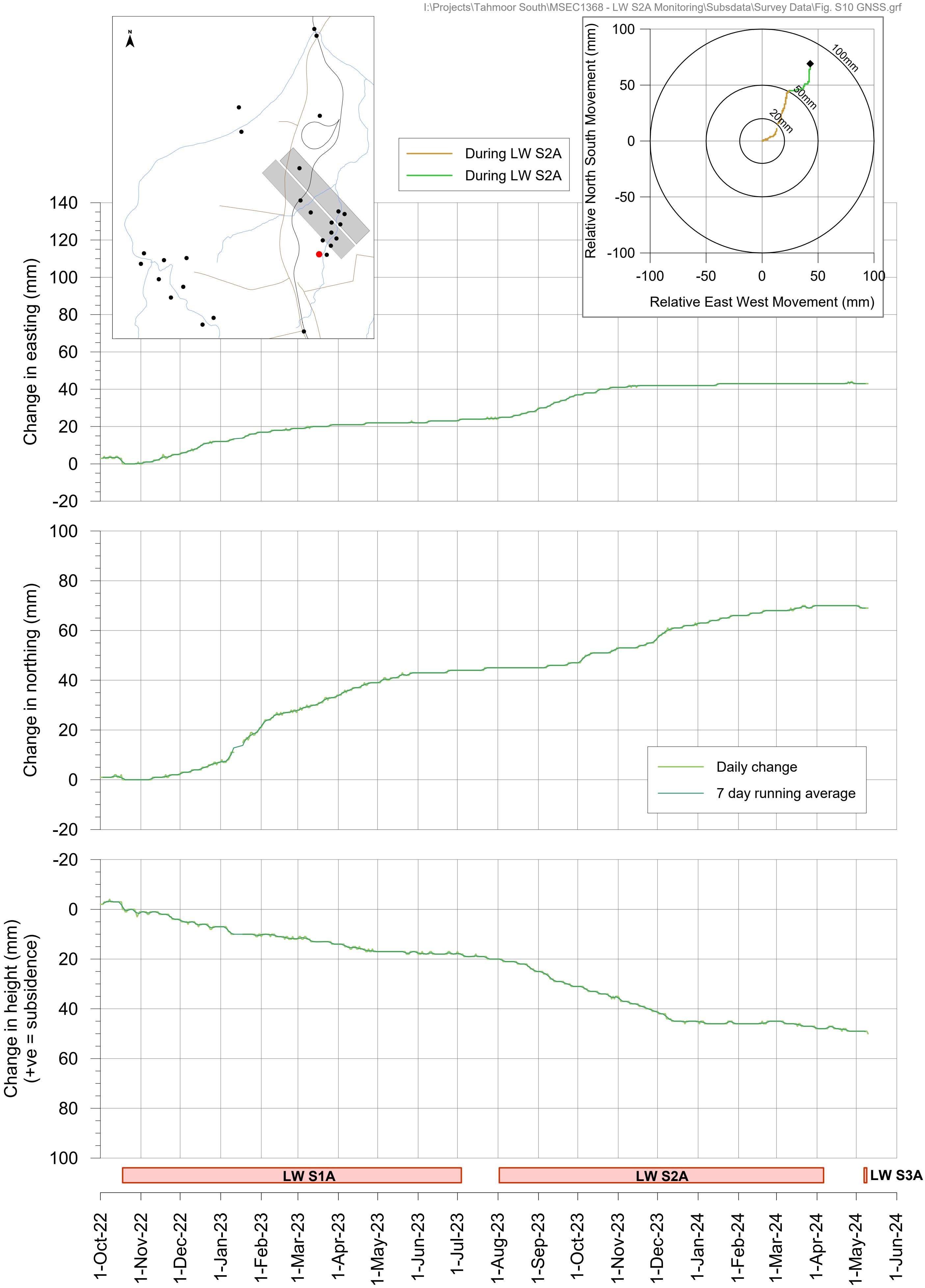


Fig. S09-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S10 above LW S3A at Teatree 2

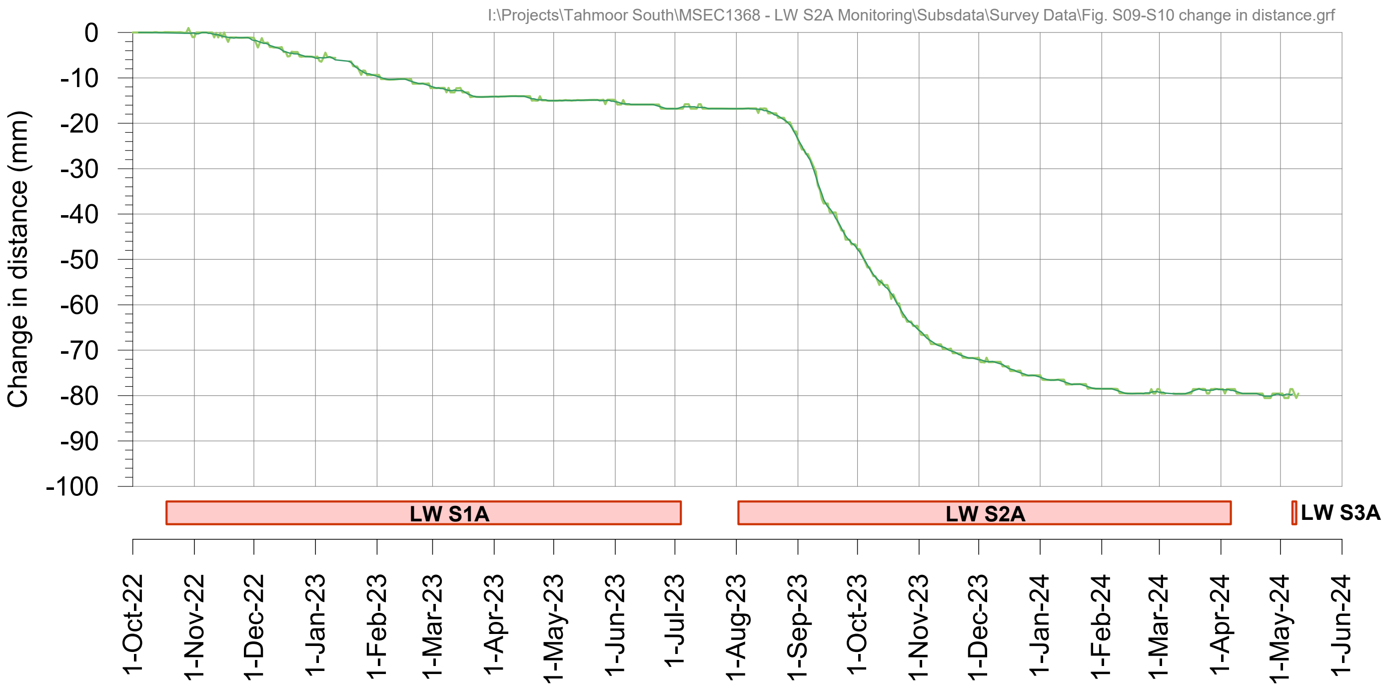


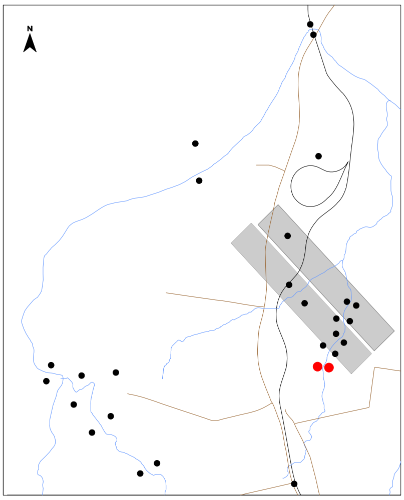
msec

Fig. S10-R37

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Wirrimbirra Creek at Teatree 2
Sites S09 and S10 above LW S3A



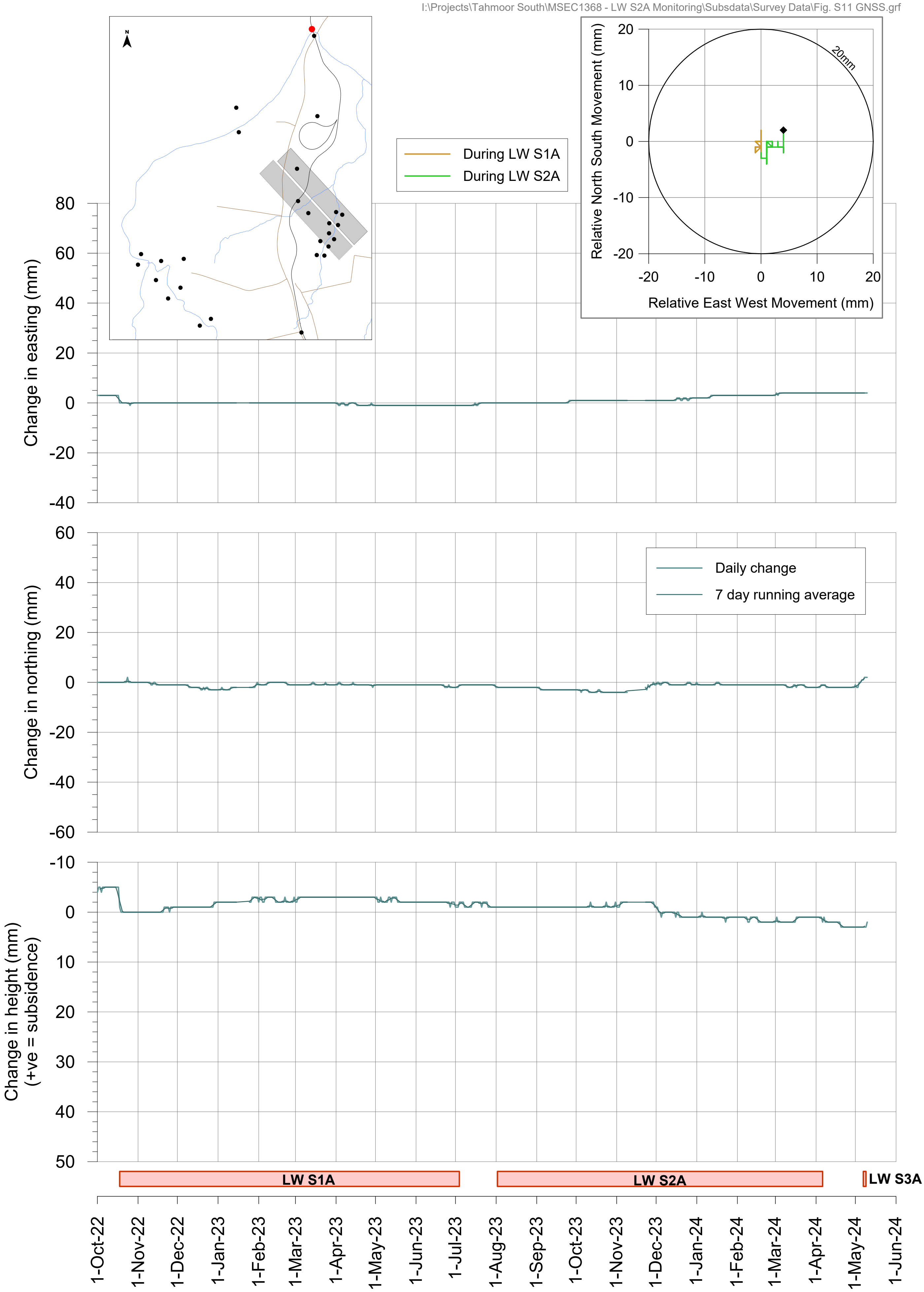


msec

Fig. S09-S10-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S11 at northern end of railway viaduct over Bargo River

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S11 GNSS.grf



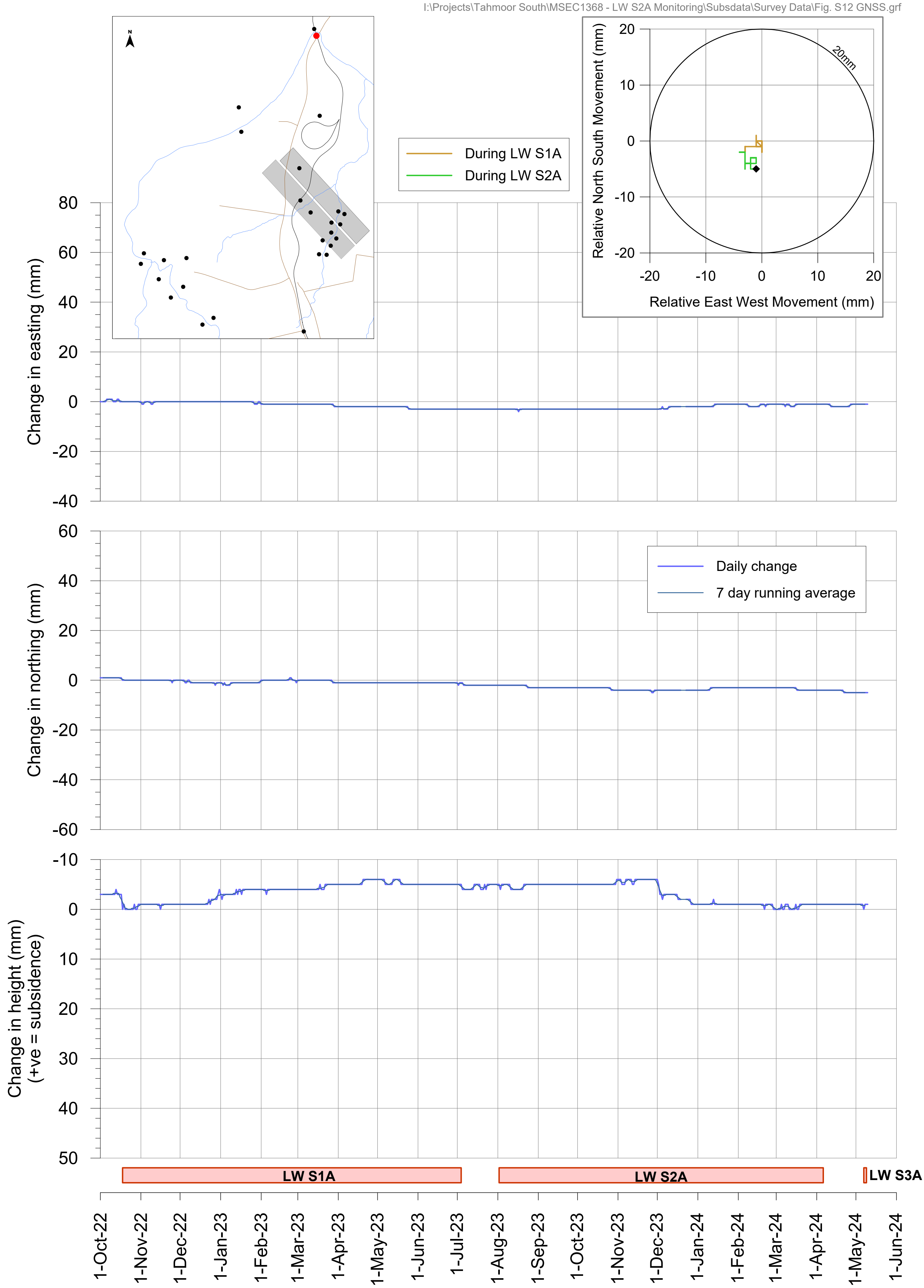
msec

Fig. S11-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S12 at southern end of railway viaduct over Bargo River

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S12 GNSS.grf

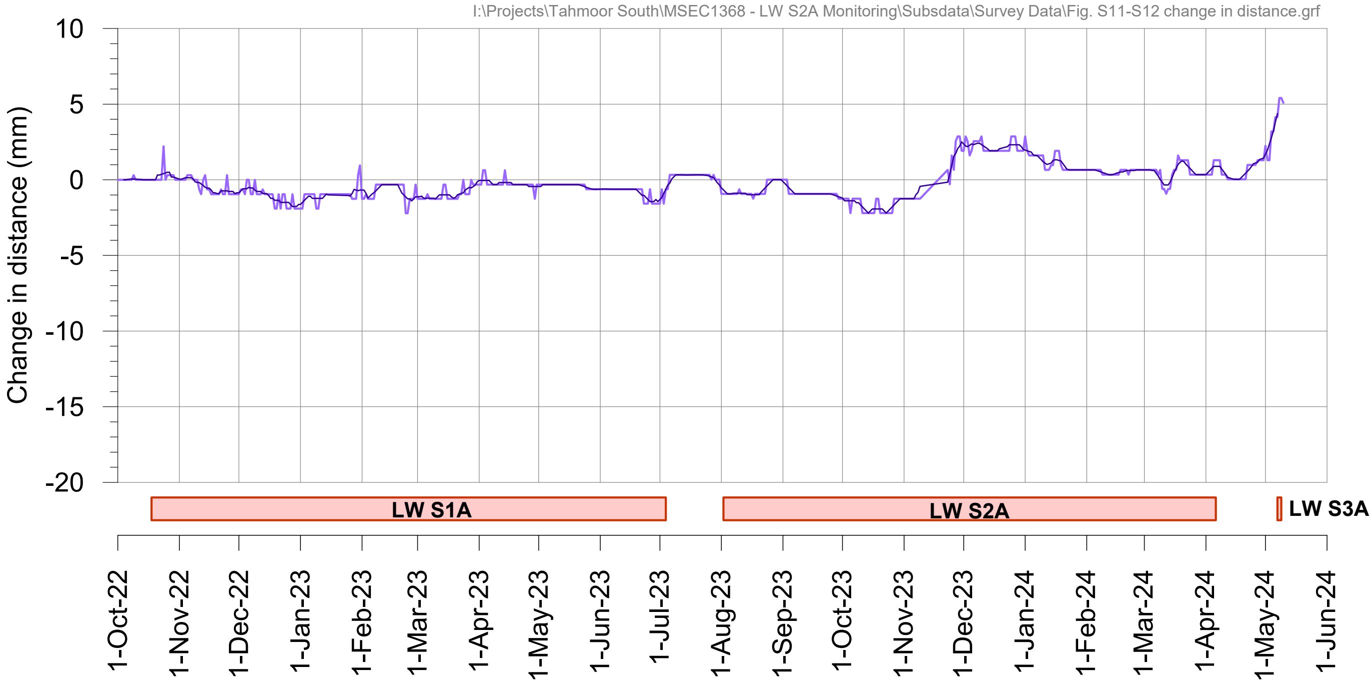


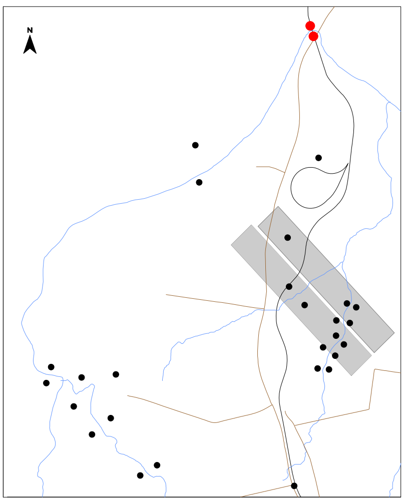
msec

Fig. S12-R37

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Railway Viaduct over Bargo River
Sites S11 and S12





msec

Fig. S11-S12-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S13 on northern side of Picton Weir

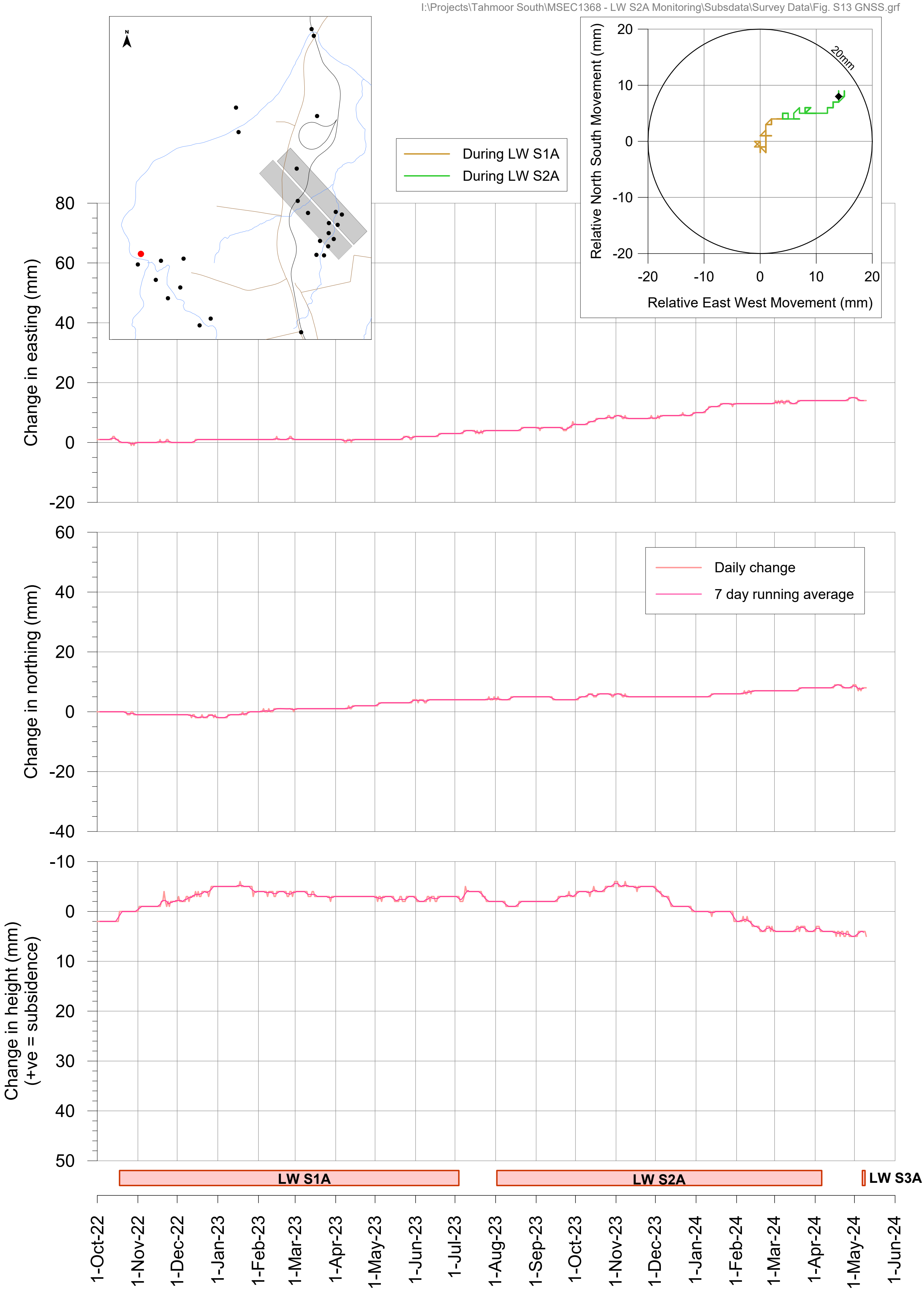
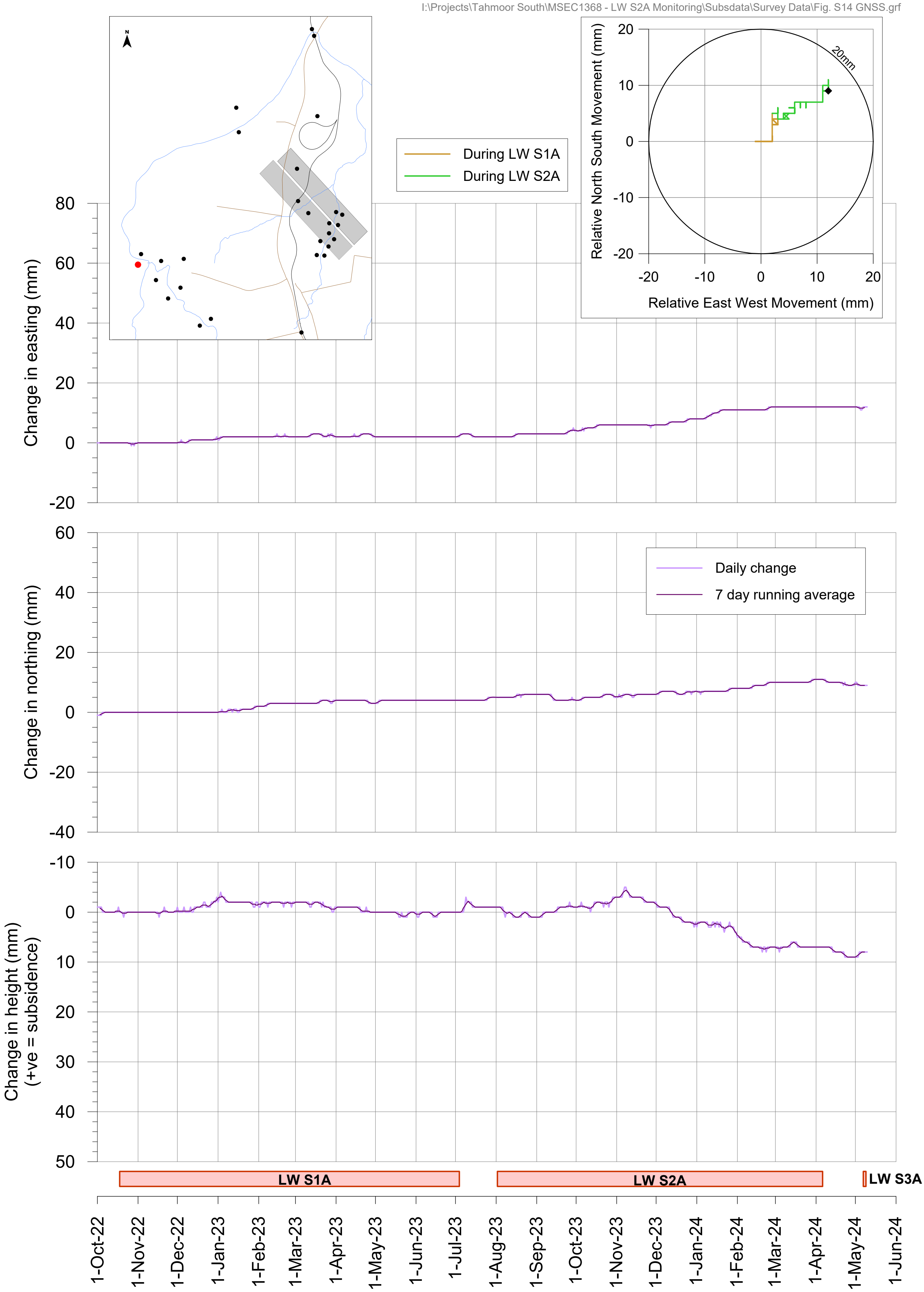


Fig. S13-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S14 on southern side of Picton Weir

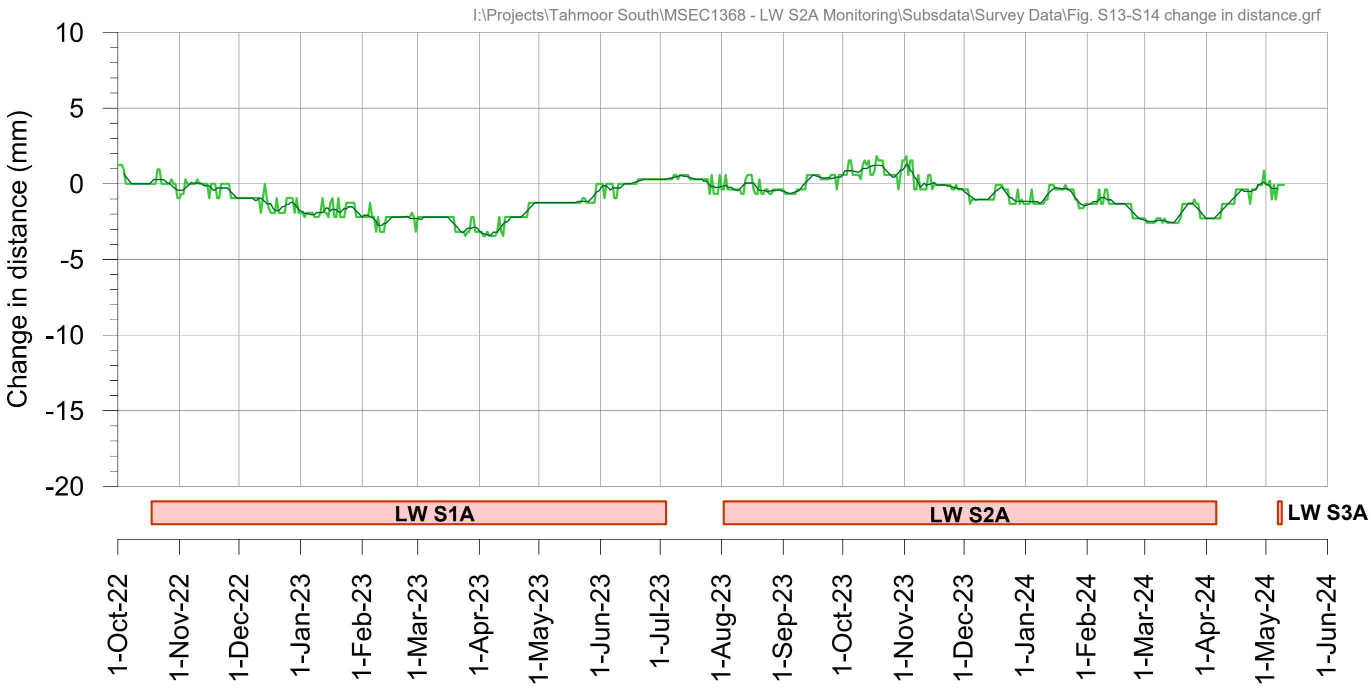


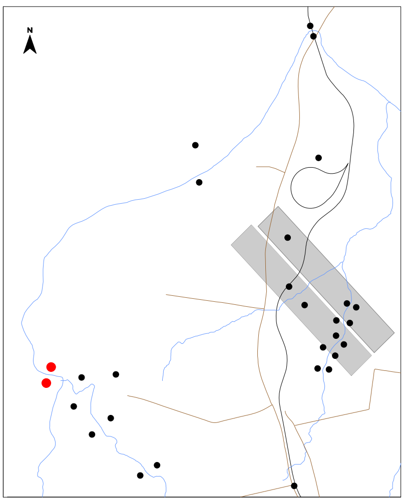
msec

Fig. S14-R37

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Picton Weir
Sites S13 and S14



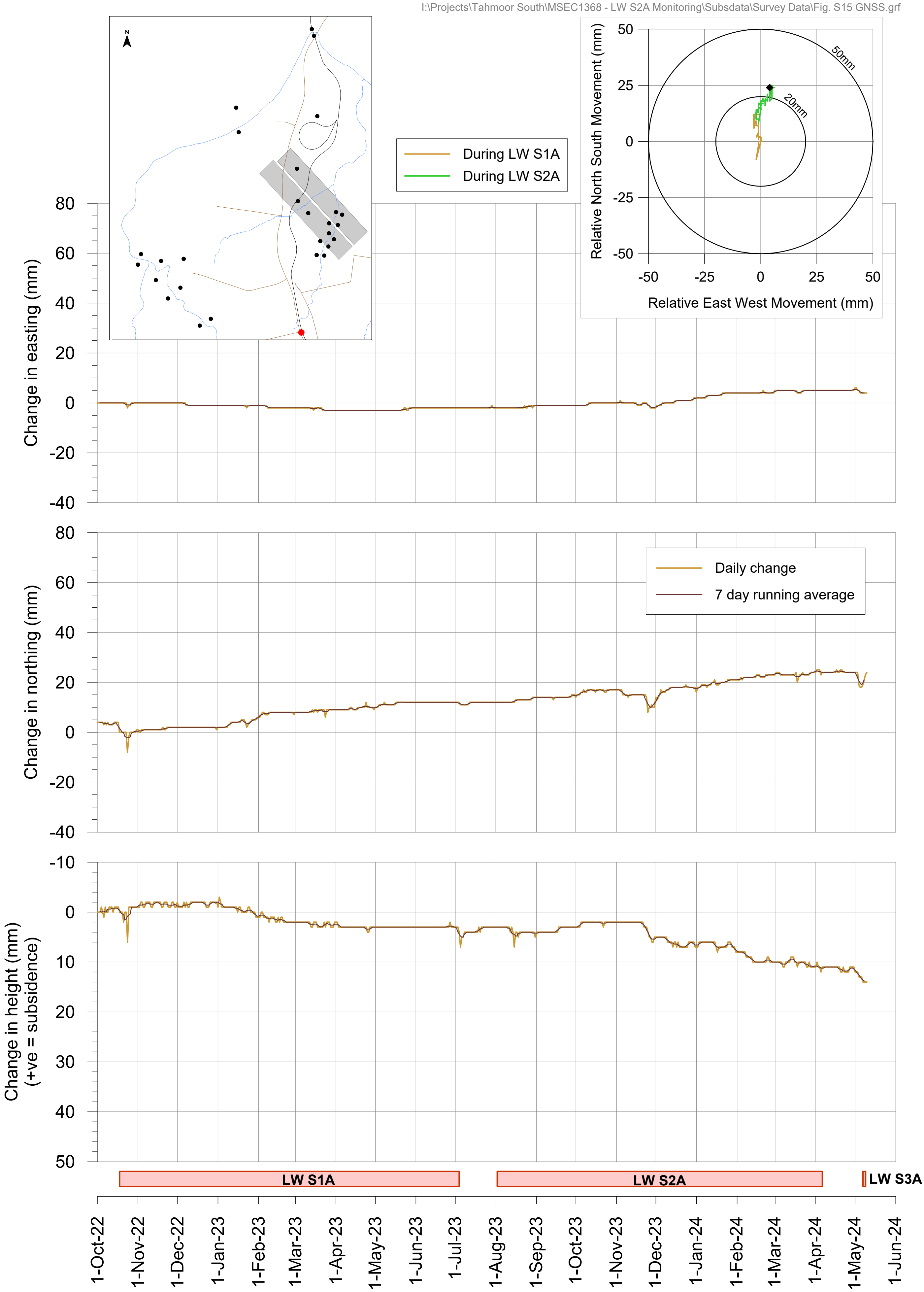


msec

Fig. S13-S14-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S15 at Wellers Road Overbridge

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S15 GNSS.grf



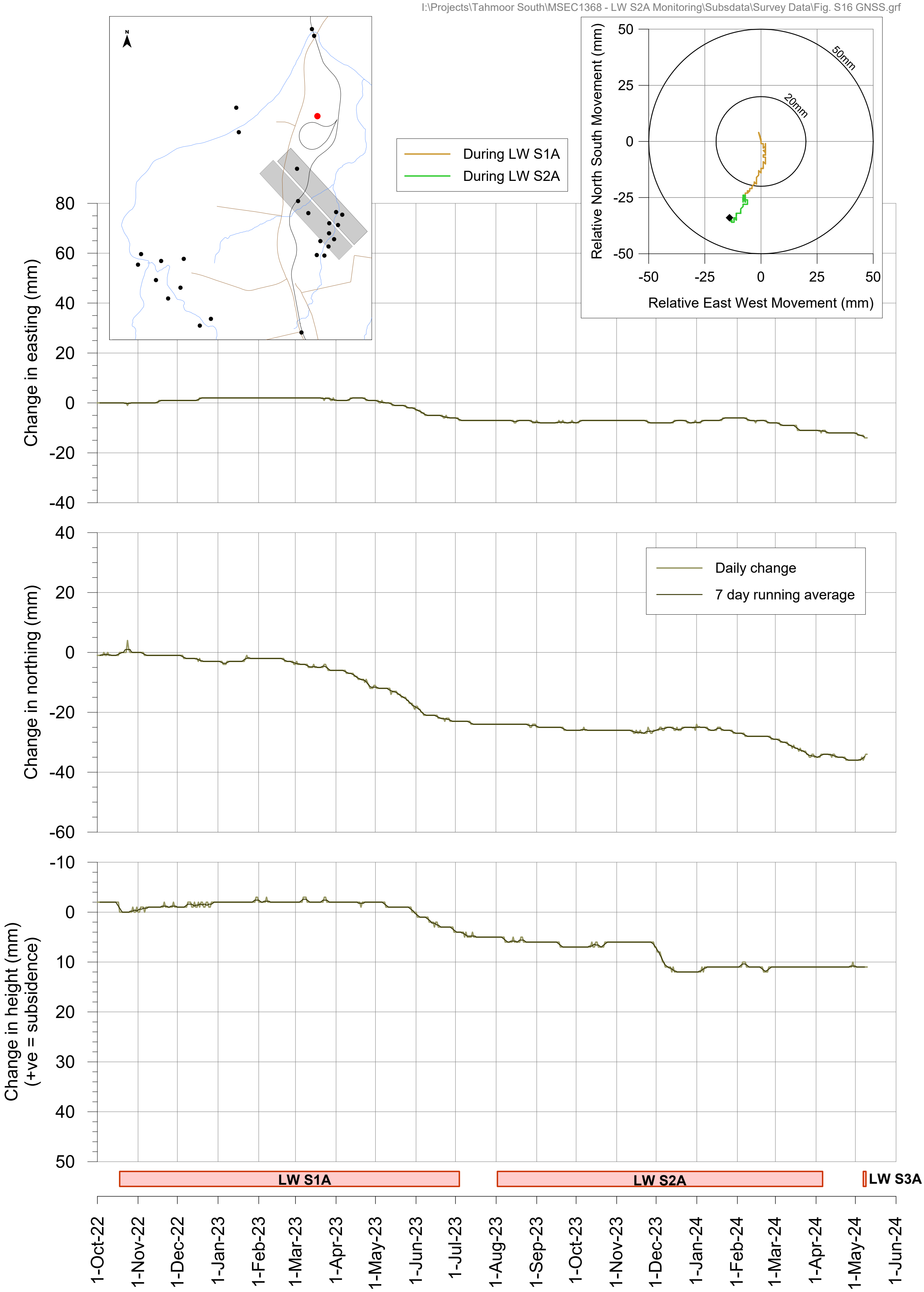
msec

Fig. S15-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S16 at Tahmoor Mine site

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S16 GNSS.grf



msec

Fig. S16-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S17 on east bank of Bargo River

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S17 GNSS.grf

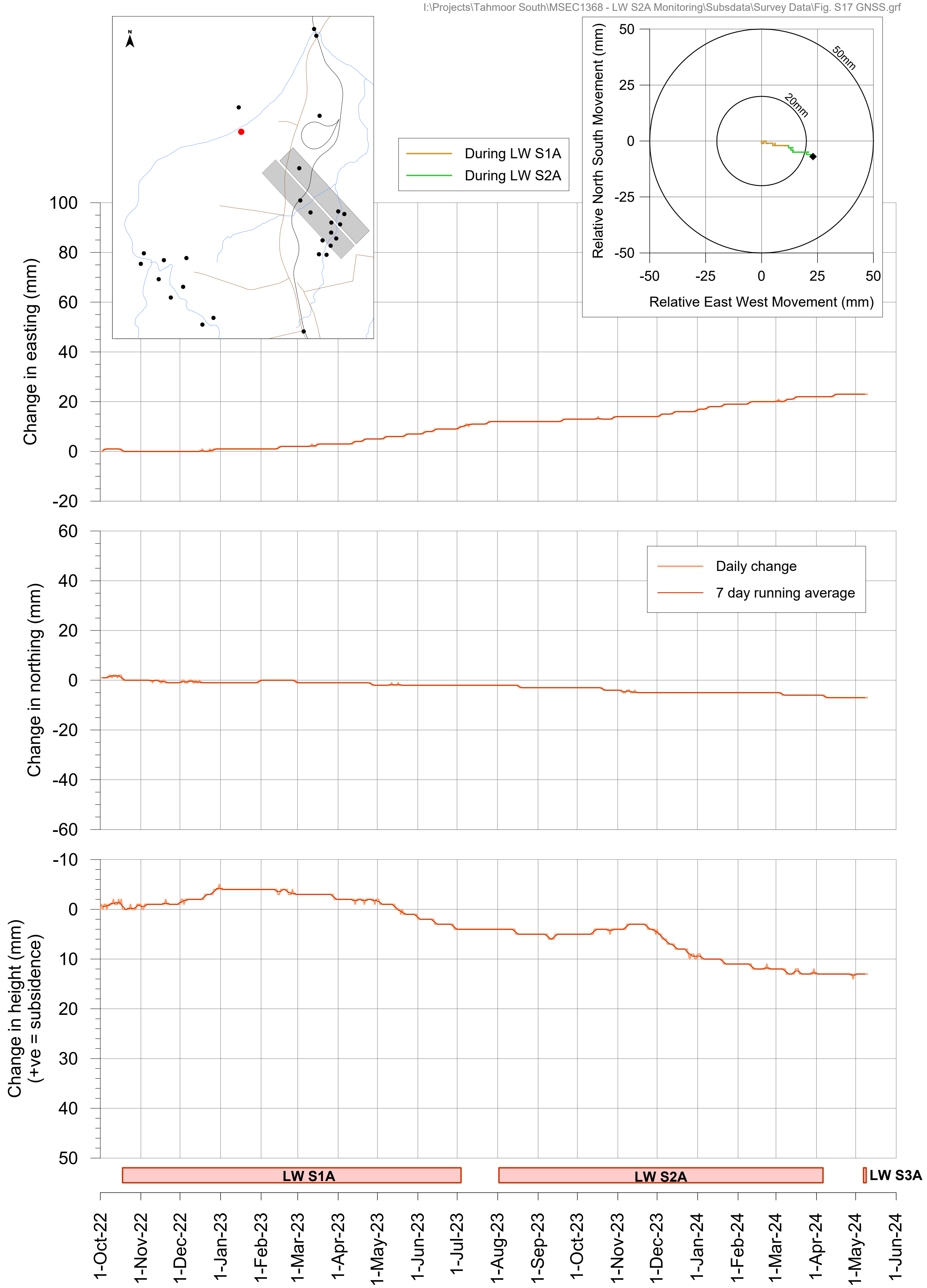
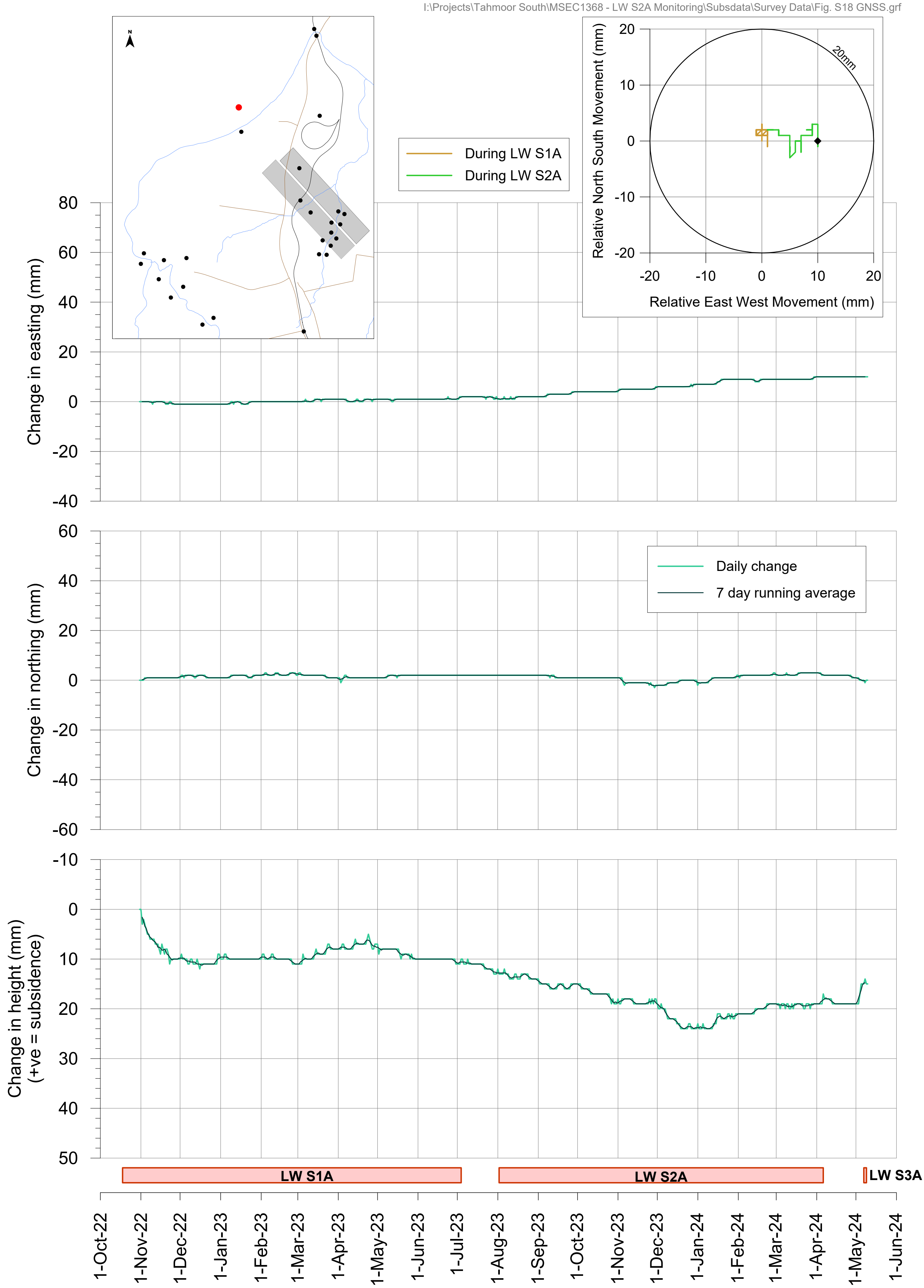


Fig. S17-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S18 on west bank of Bargo River

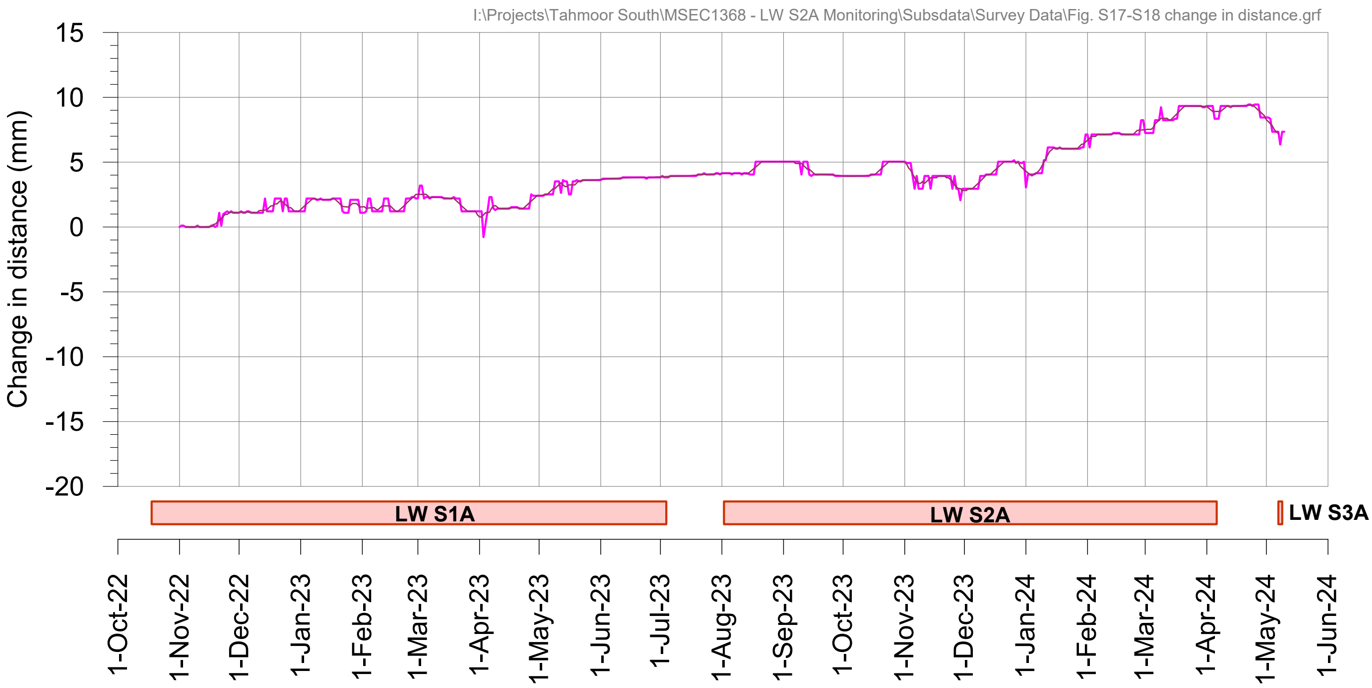
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S18 GNSS.grf

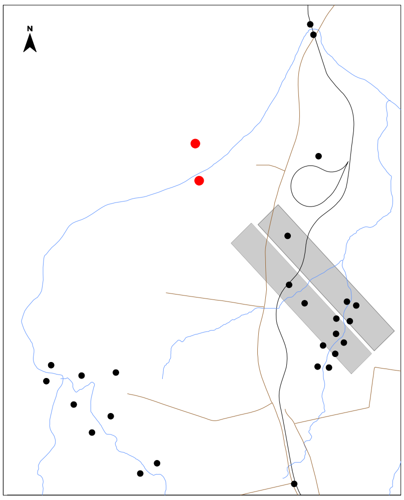


msec

Fig. S18-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Bargo River
Sites S17 and S18





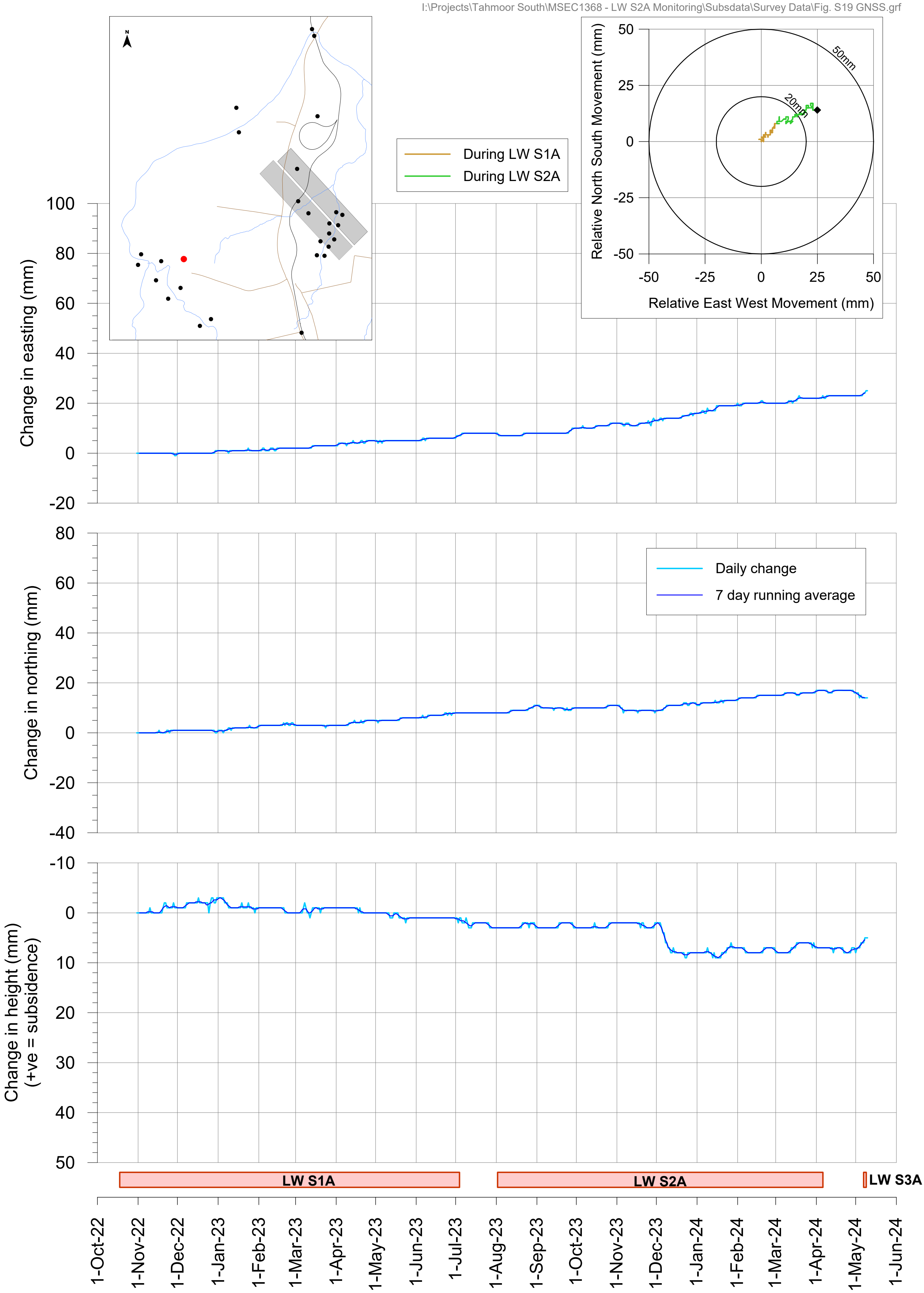
msec

Fig. S17-S18-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S19 near Hornes Creek

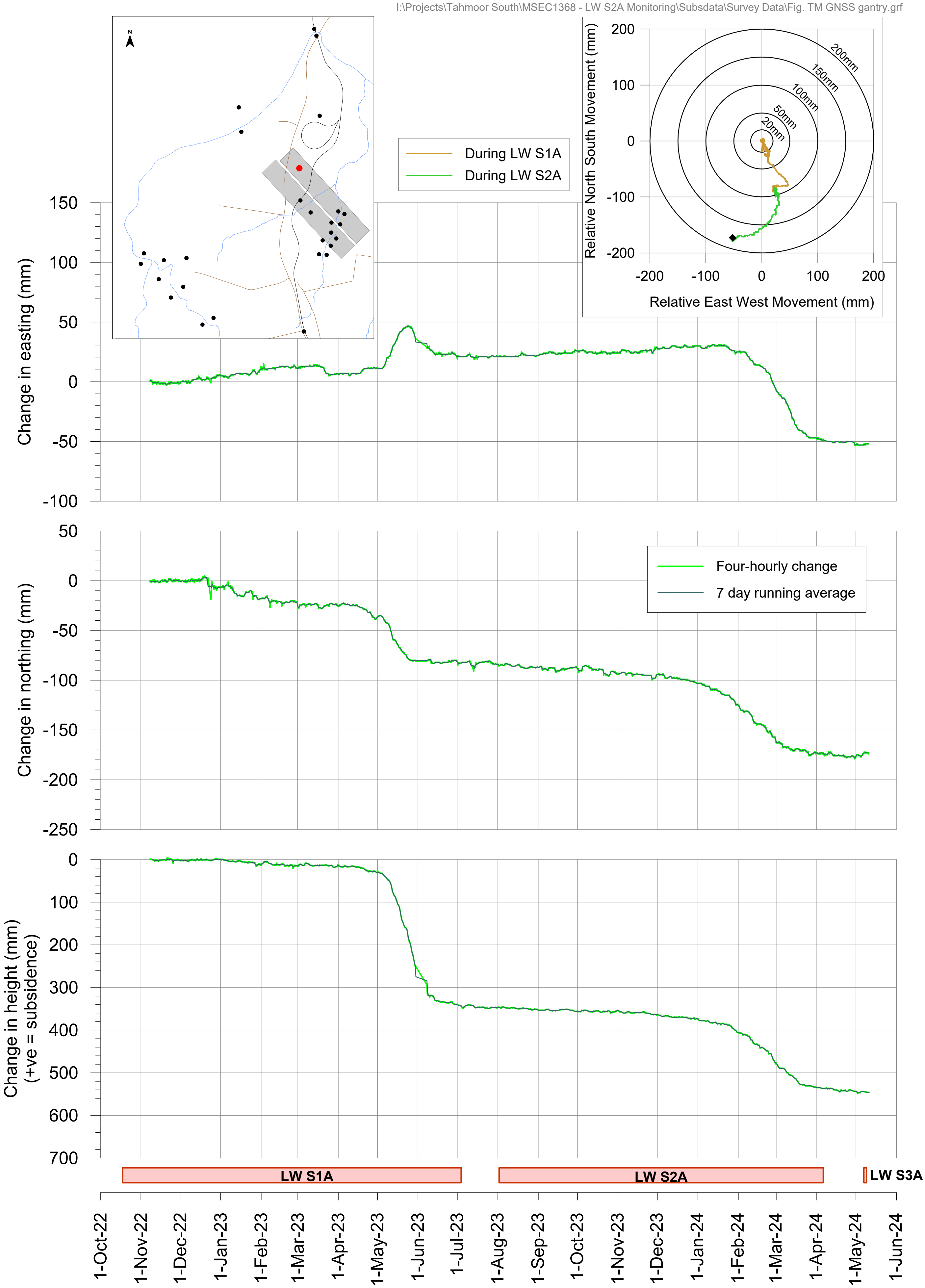
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S19 GNSS.grf



msec

Fig. S19-R37

Tahmoor South LW S2A - GNSS Monitoring
Gantry at Tahmoor Mine site



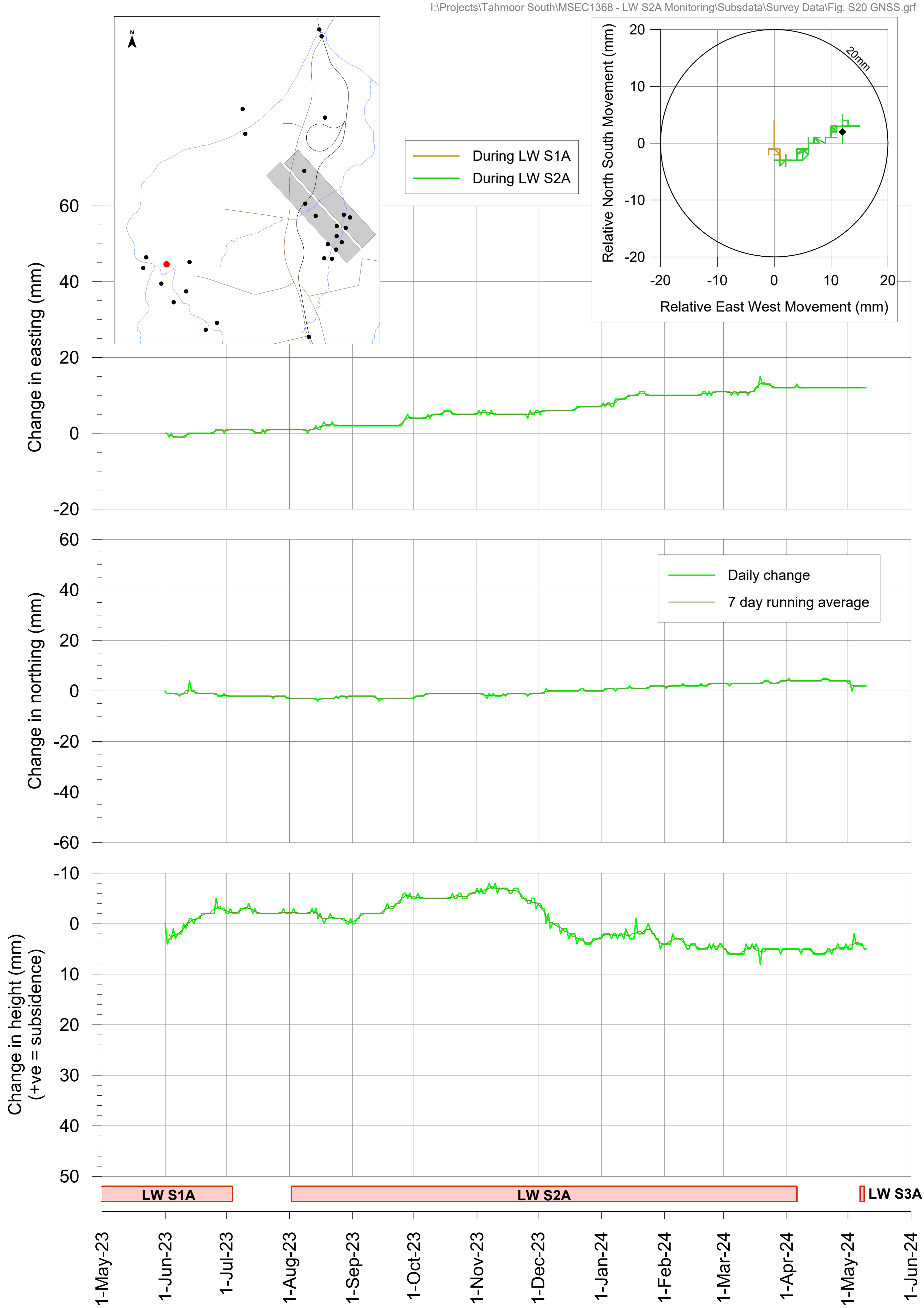
msec

Fig. TM-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S20 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S20 GNSS.grf



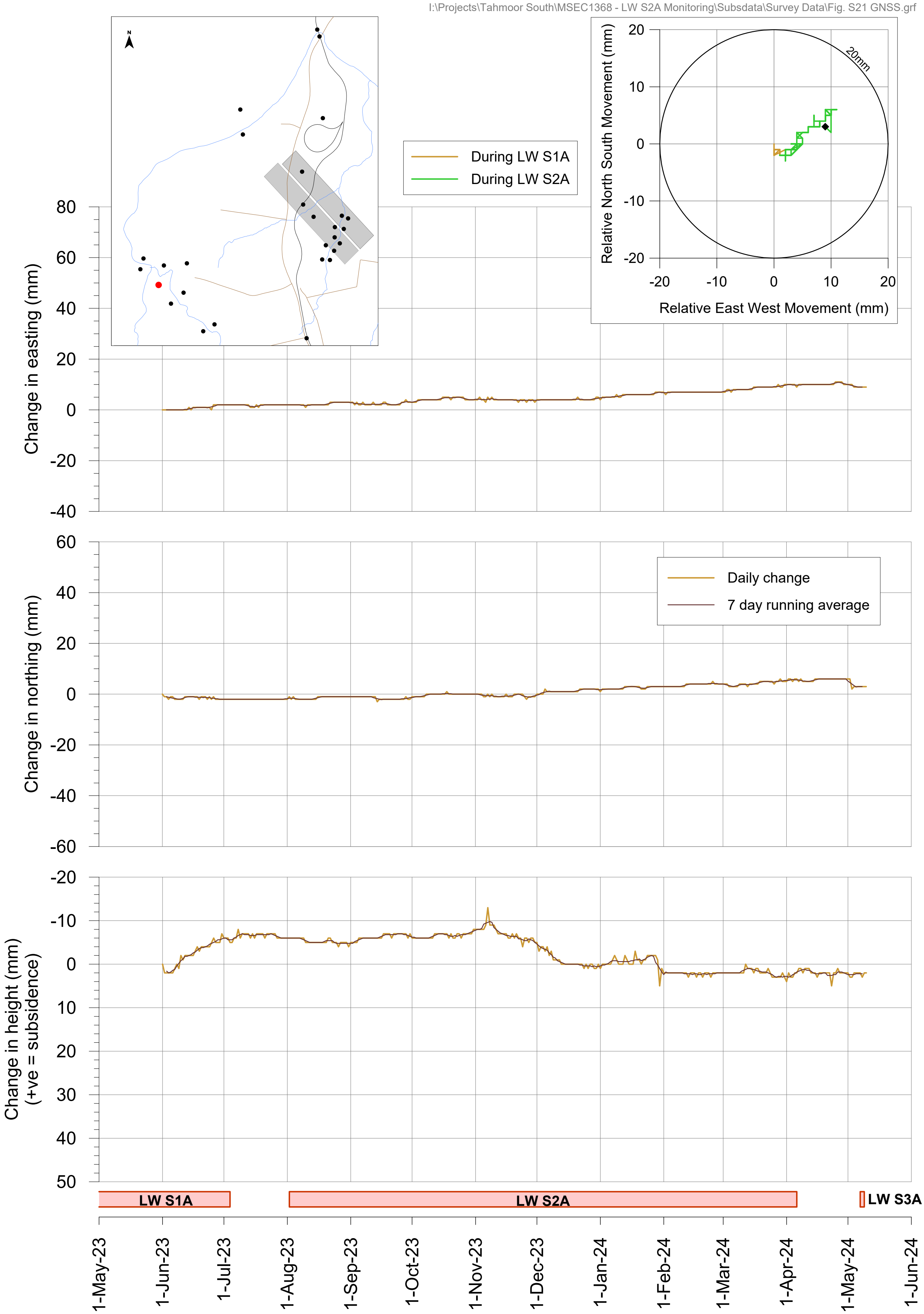
msec

Fig. S20-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S21 on southern side of Hornes Creek

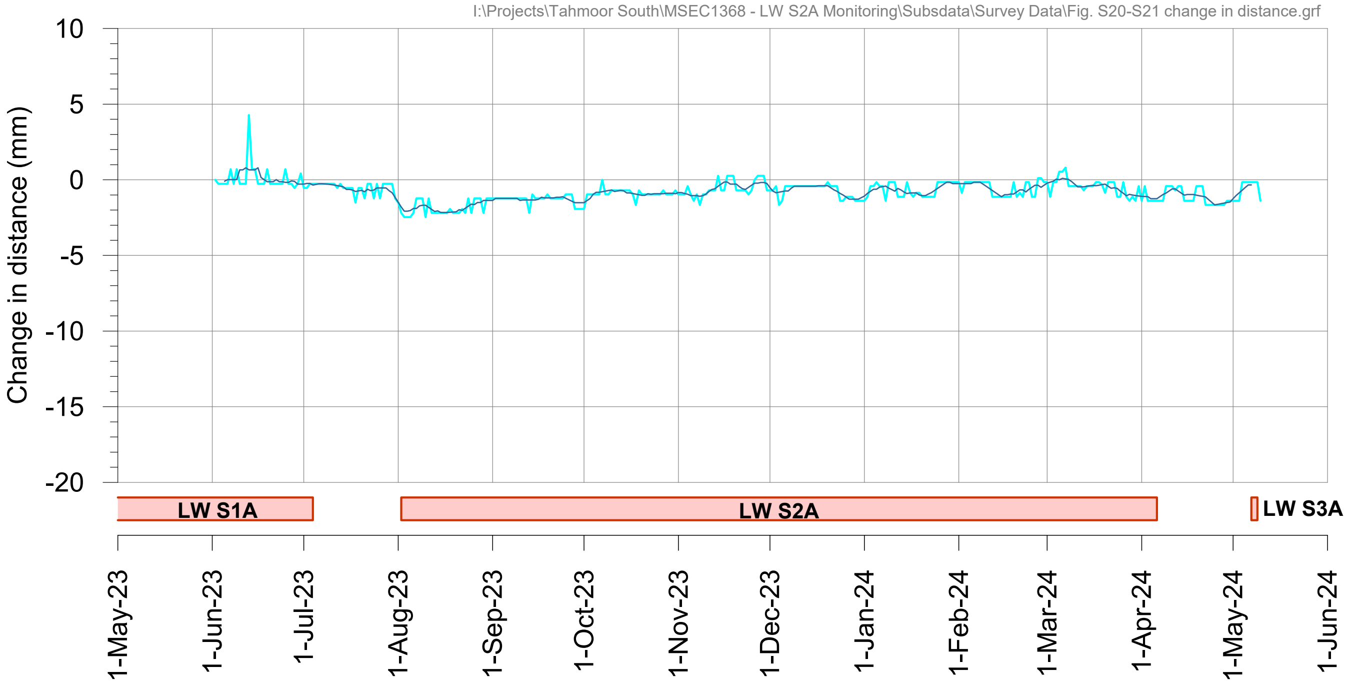
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S21 GNSS.grf

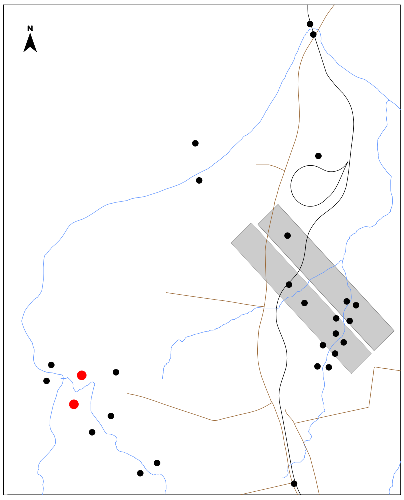


msec

Fig. S21-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S20 and S21



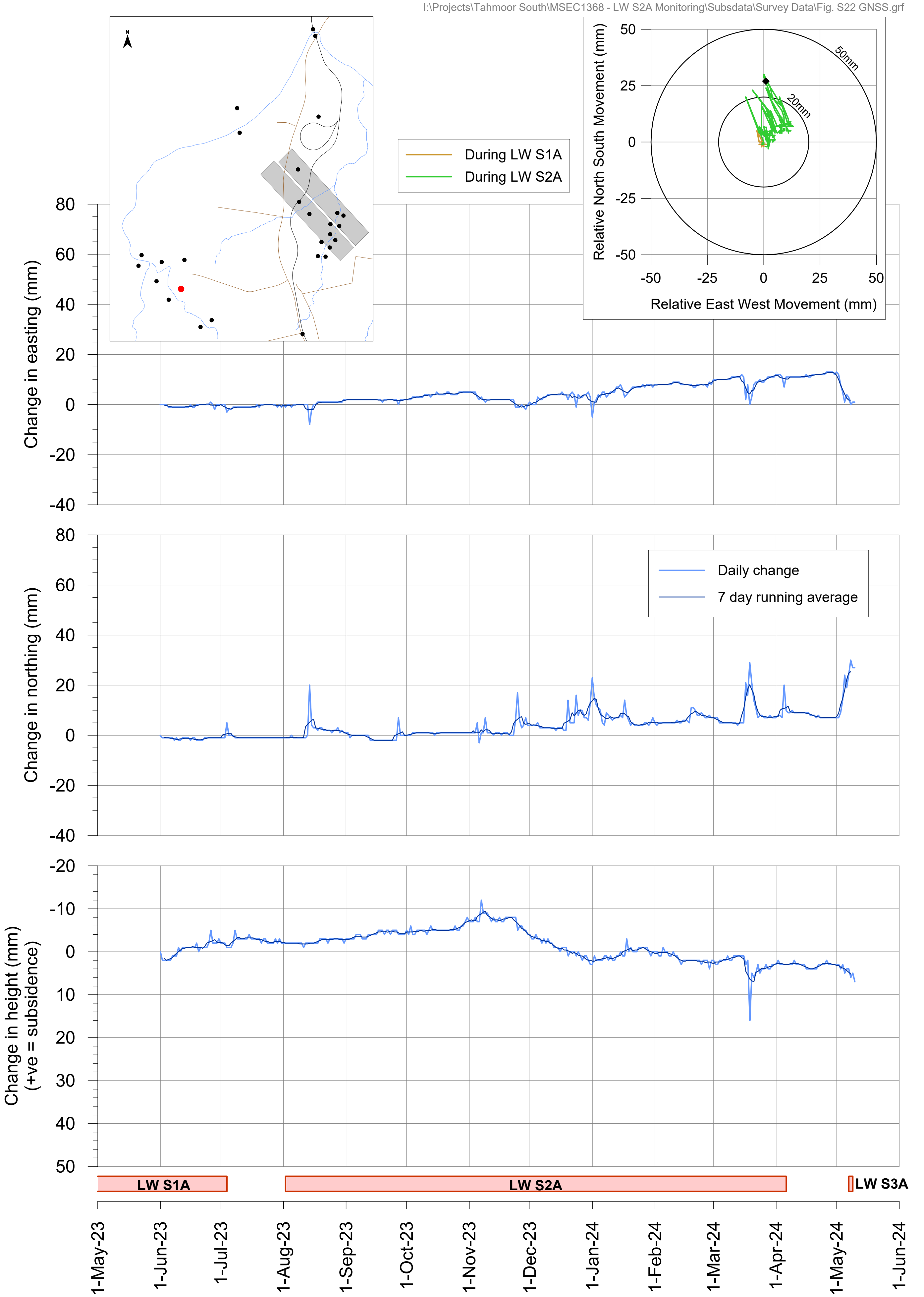


msec

Fig. S20-S21-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S22 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S22 GNSS.grf



msec

Fig. S22-R37

Tahmoor South LW S2A - GNSS Monitoring

Site S23 on southern side of Hornes Creek

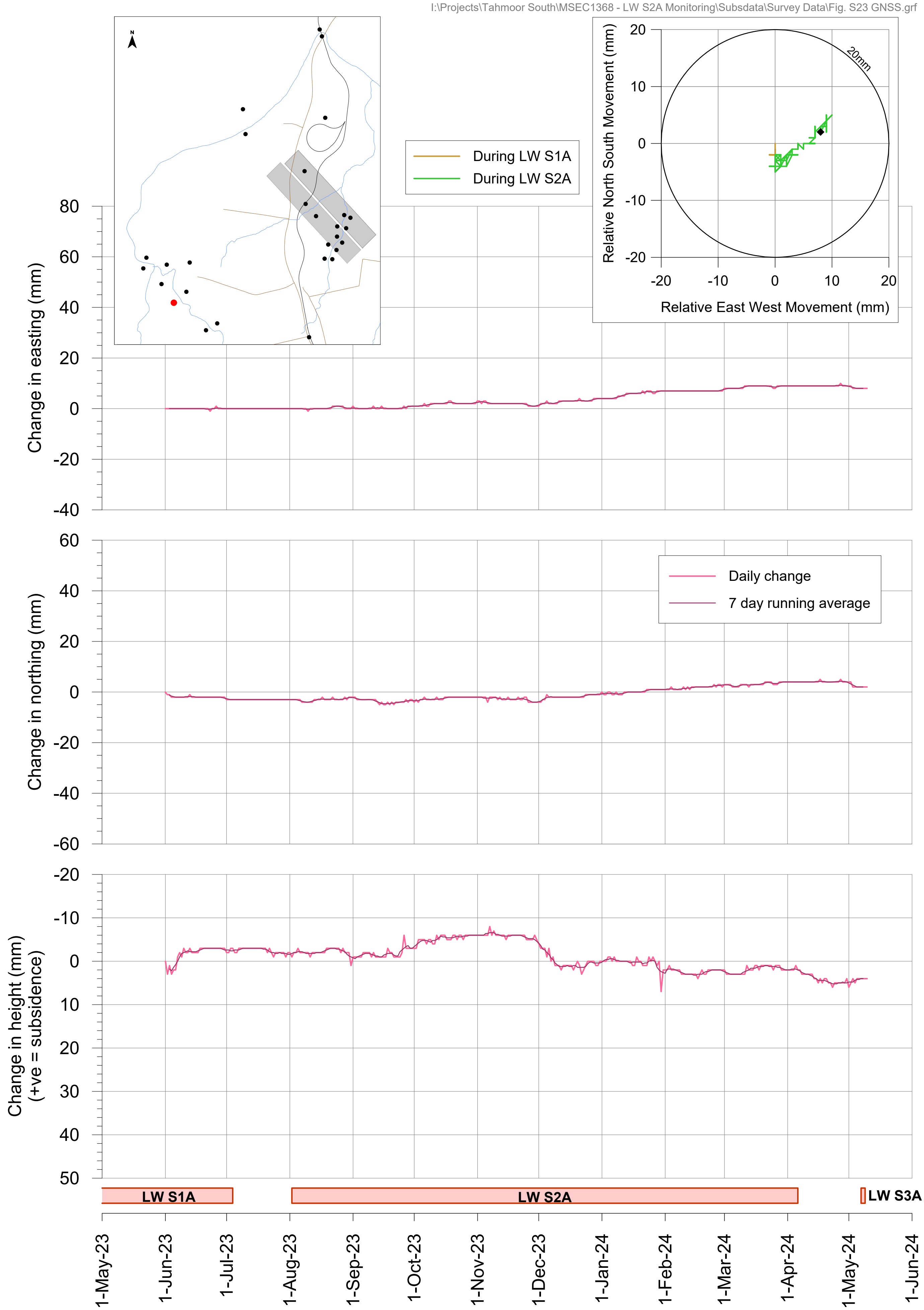
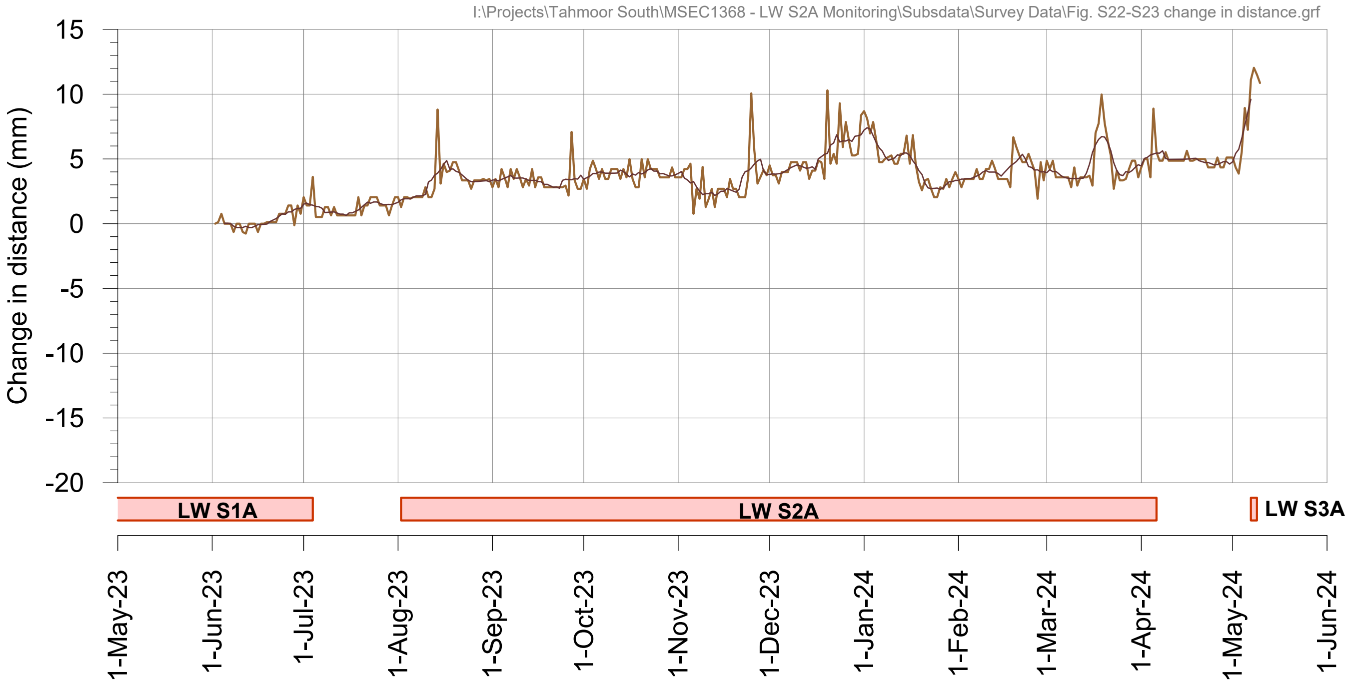
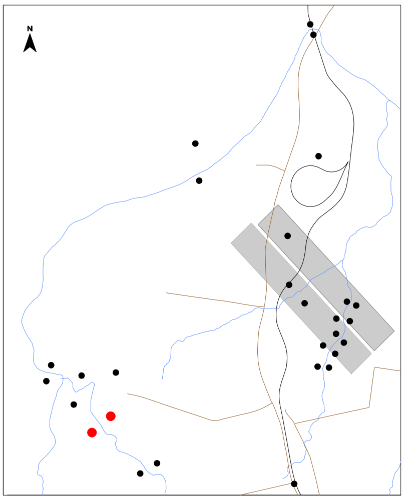


Fig. S23-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S22 and S23



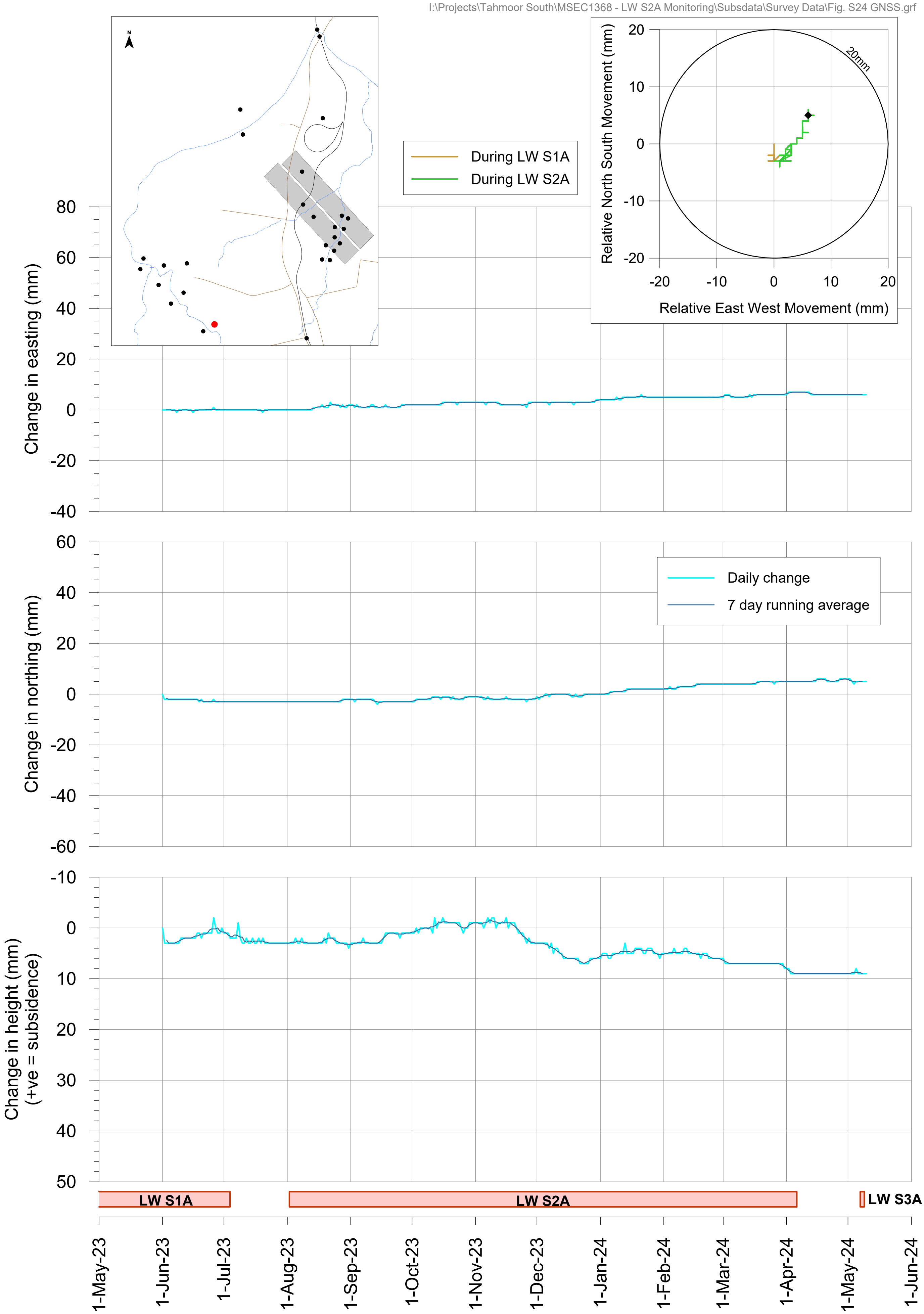


msec

Fig. S22-S23-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S24 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S24 GNSS.grf

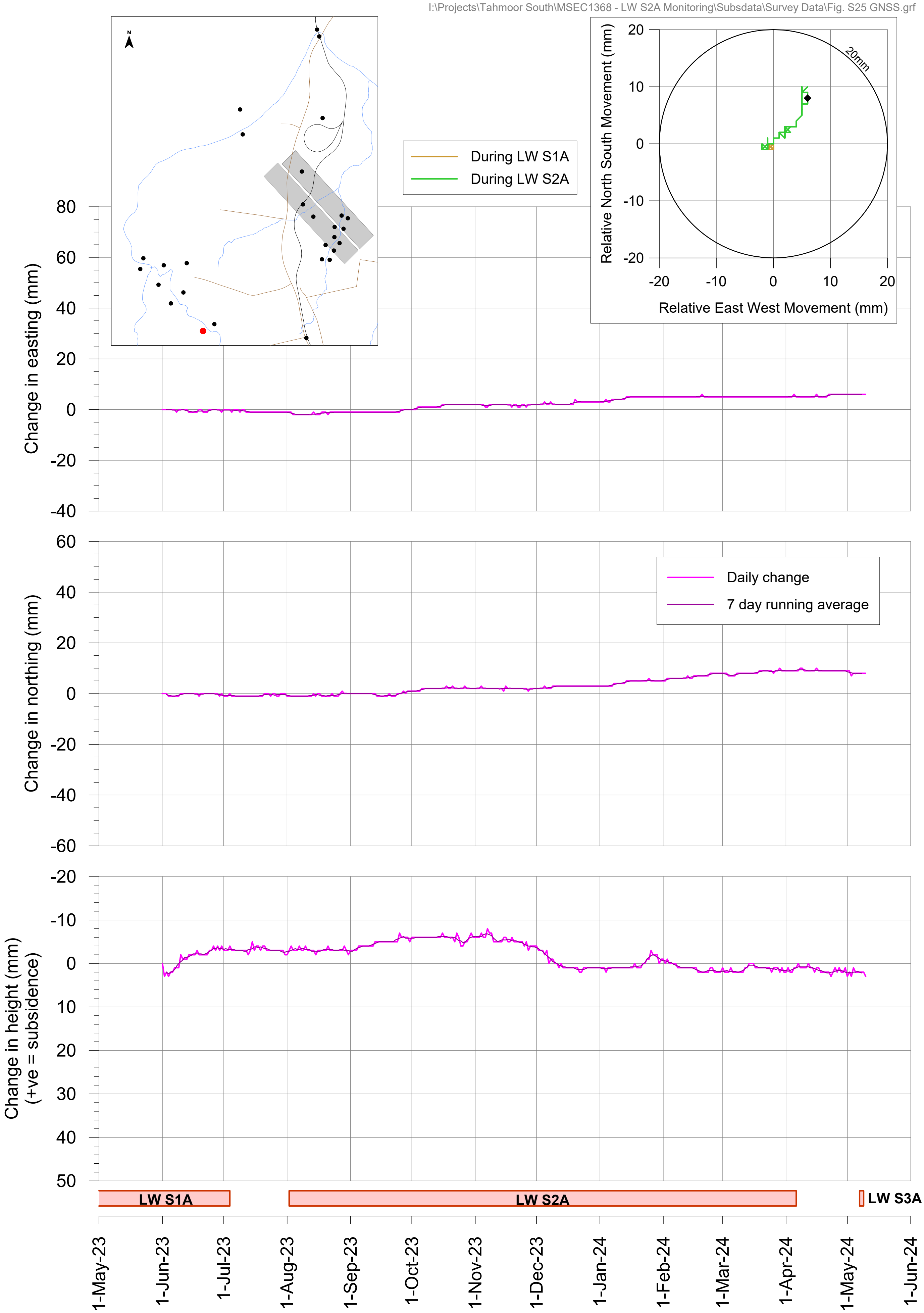


msec

Fig. S24-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S25 on southern side of Hornes Creek

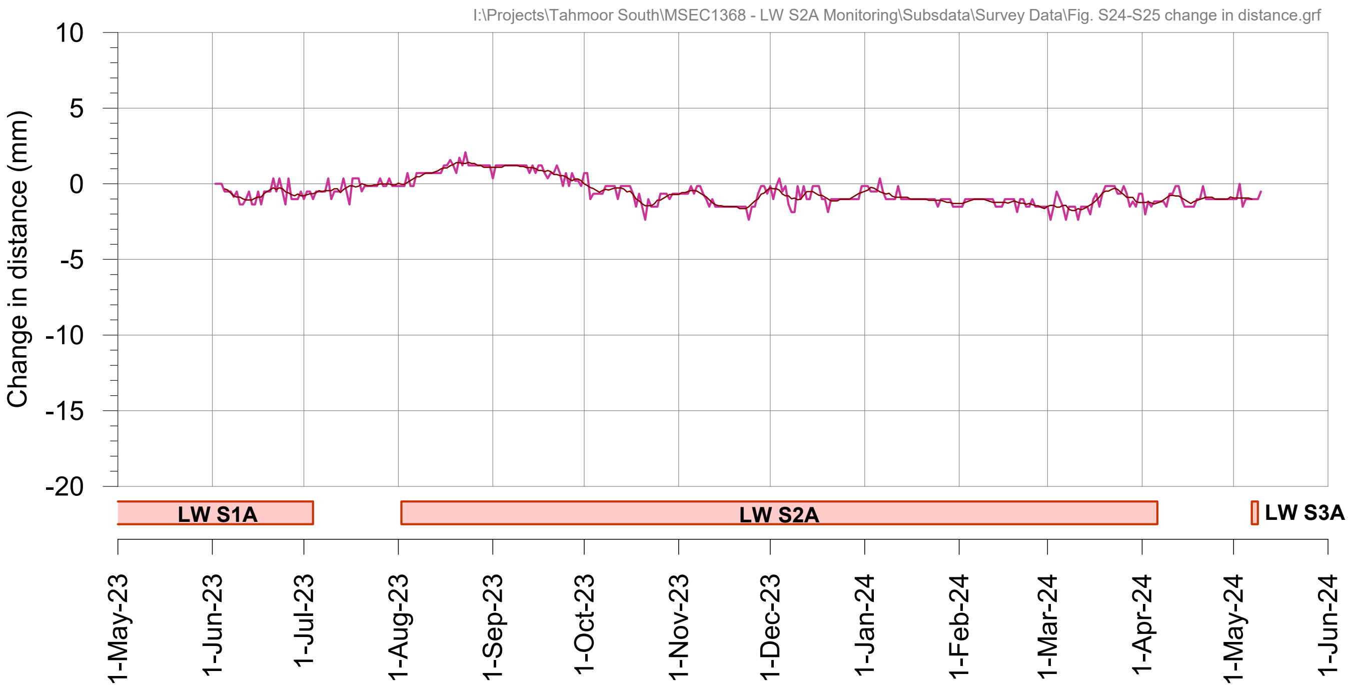
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S25 GNSS.grf



msec

Fig. S25-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S24 and S25



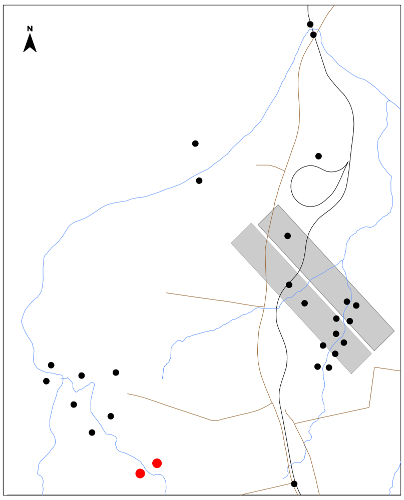


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Fig. S24-S25-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S26 above LW S2A

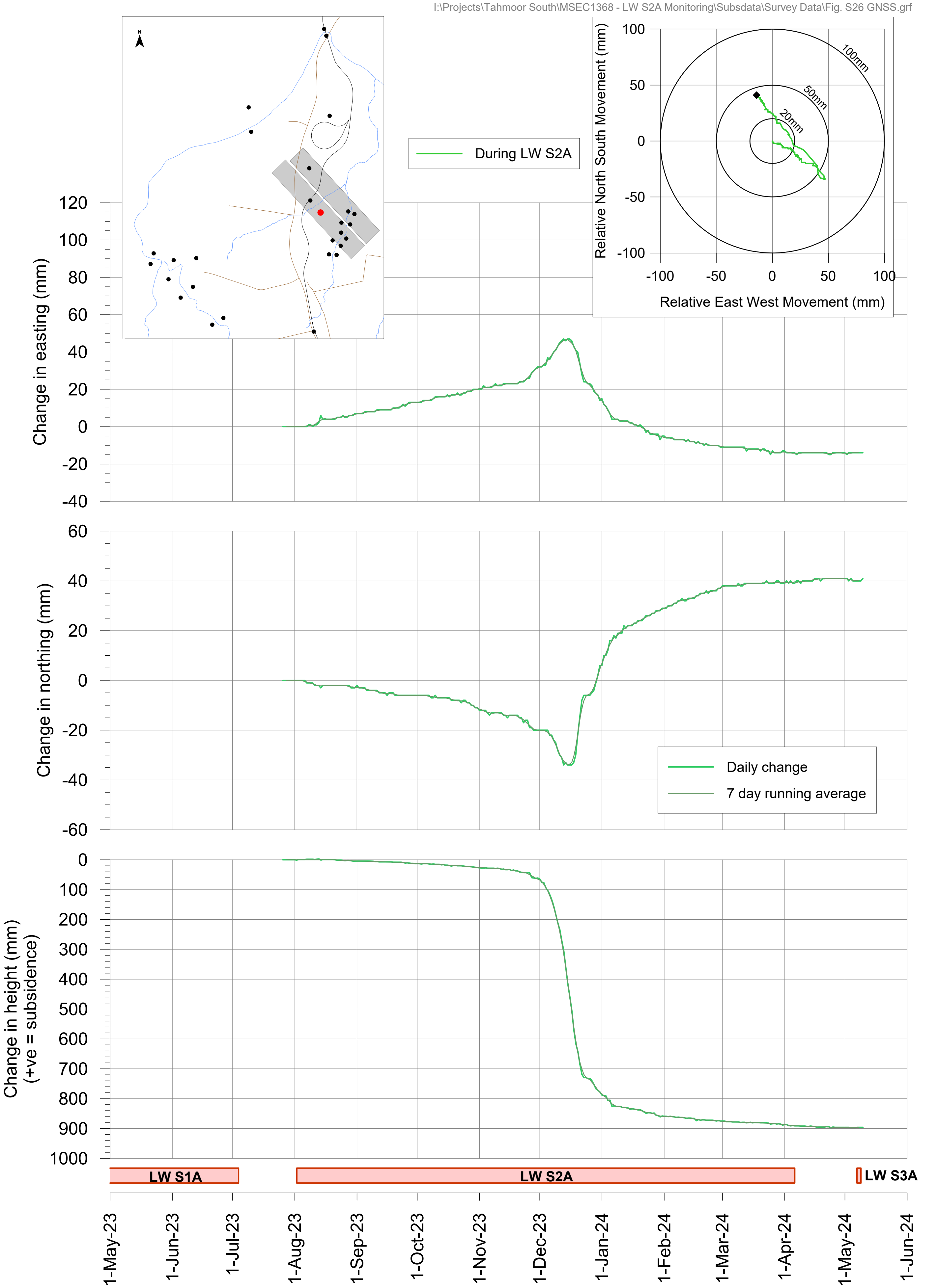

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Fig. S26-R37

Tahmoor South LW S2A - GNSS Monitoring
Site S27 on railway embankment above LW S2A

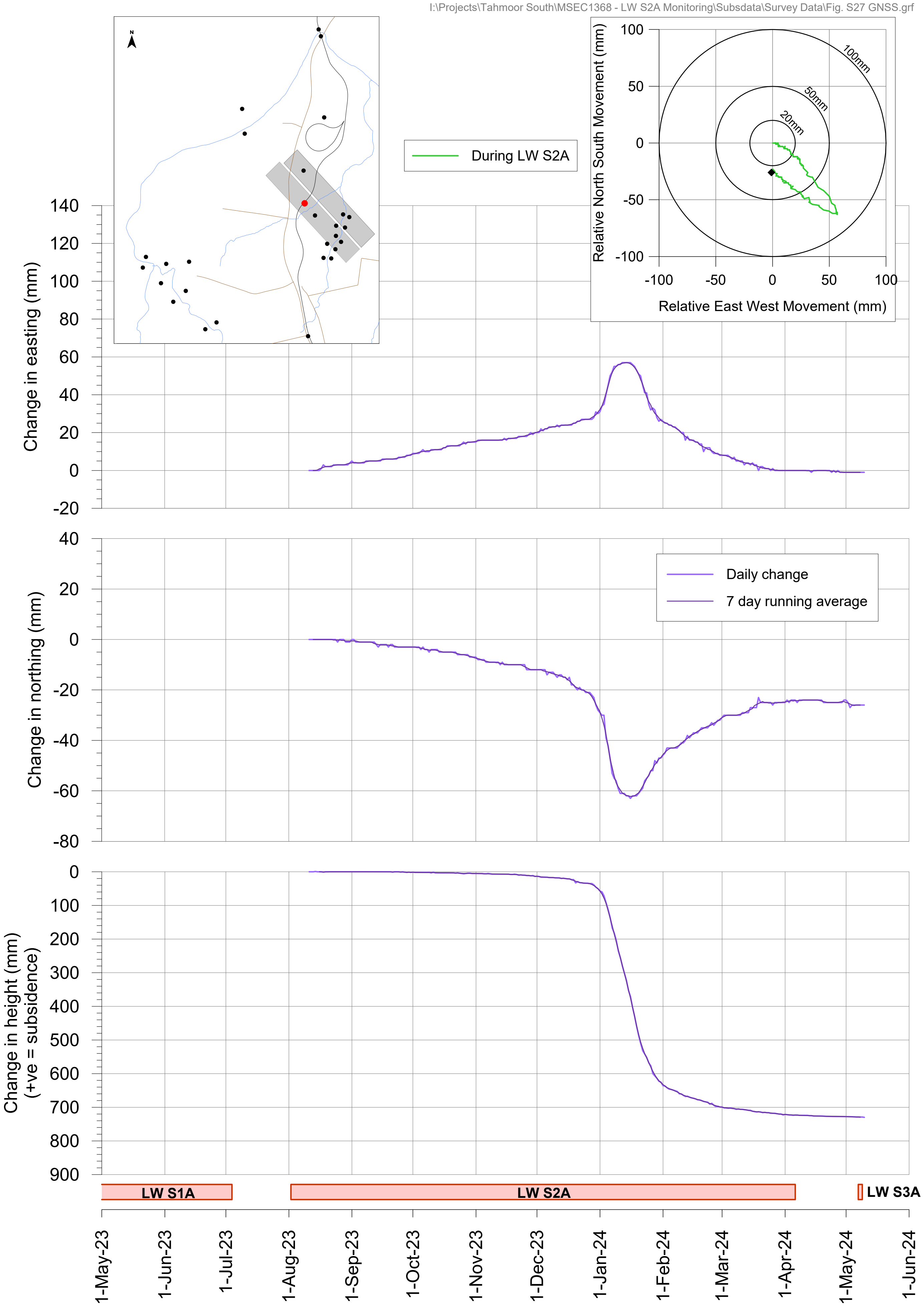

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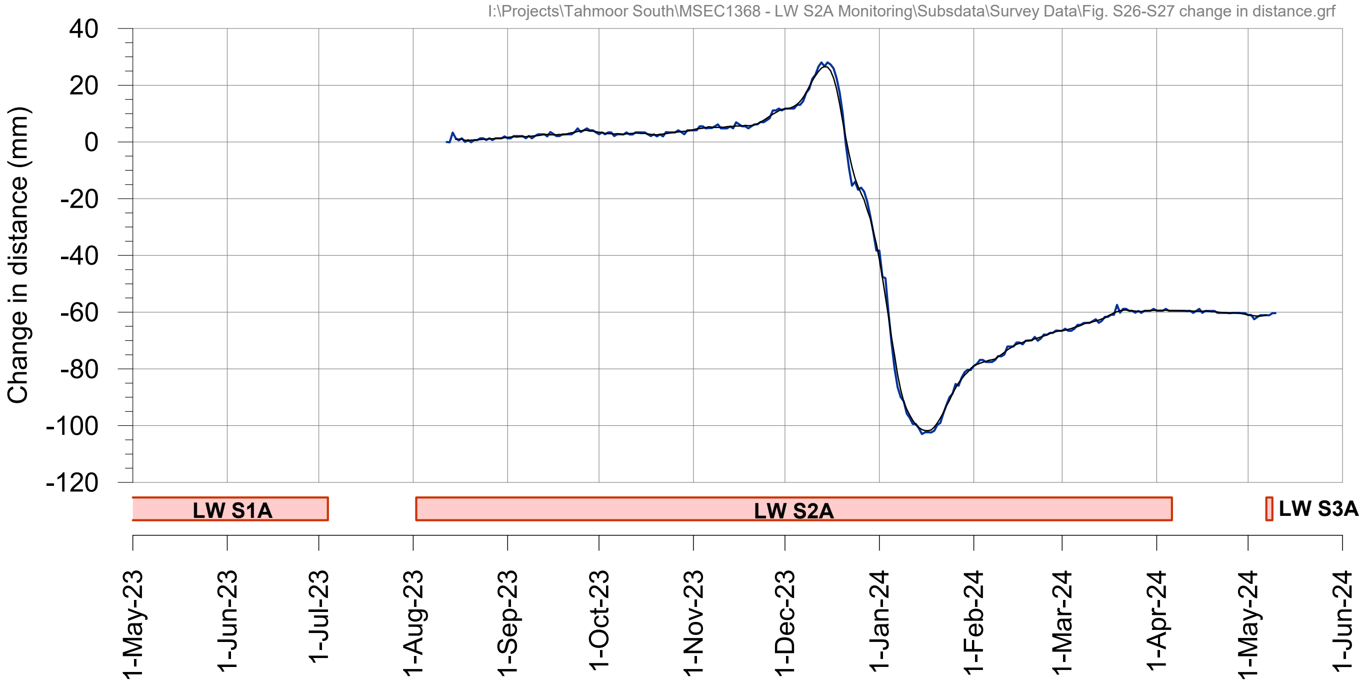
Fig. S27-R37

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Teatree Hollow above LW S2A
Sites S26 and S27



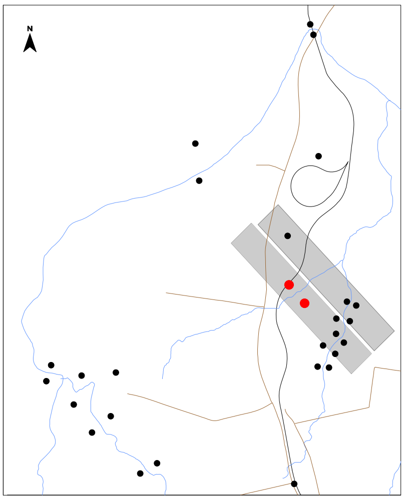


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Fig. S26-S27-R37

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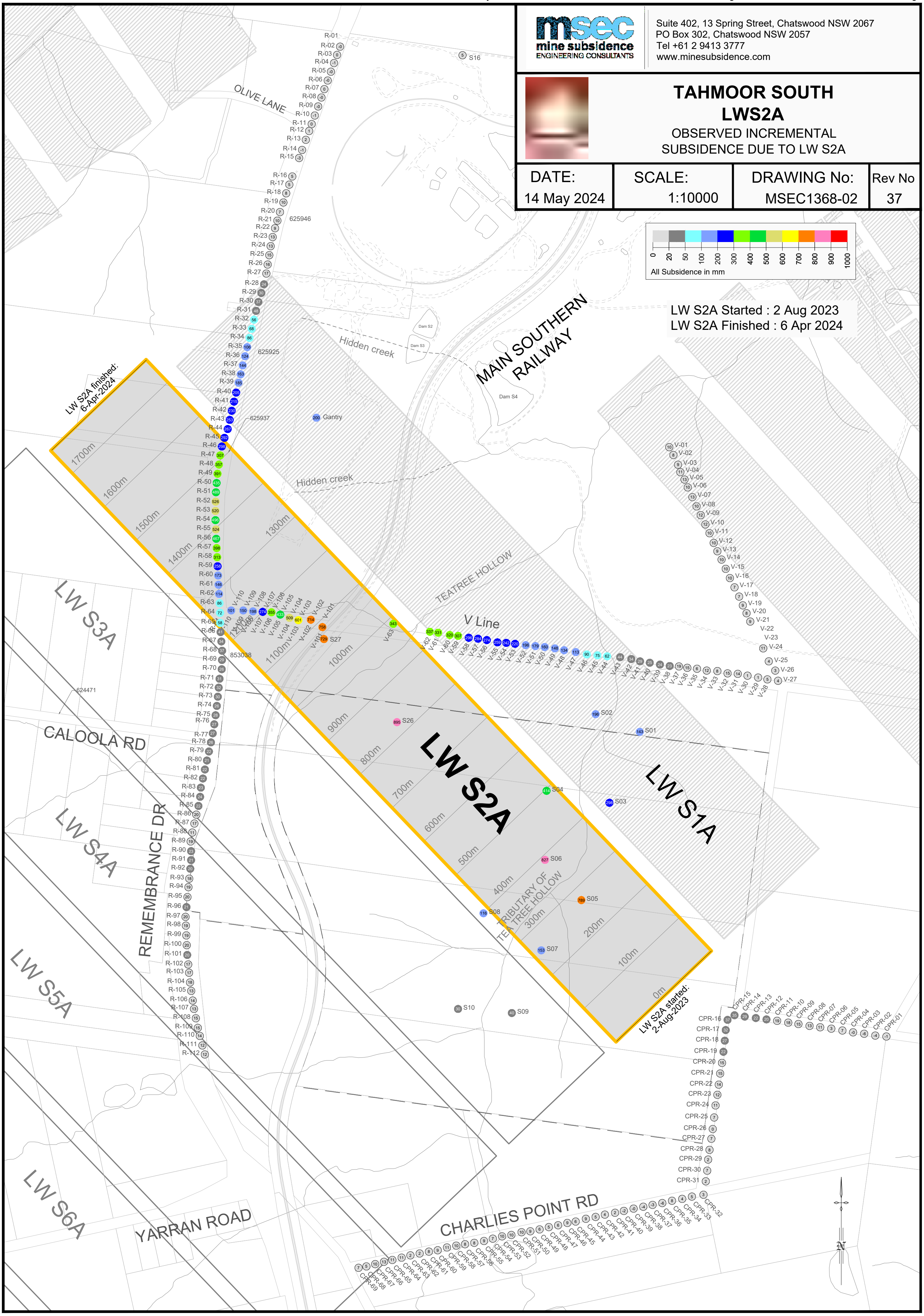

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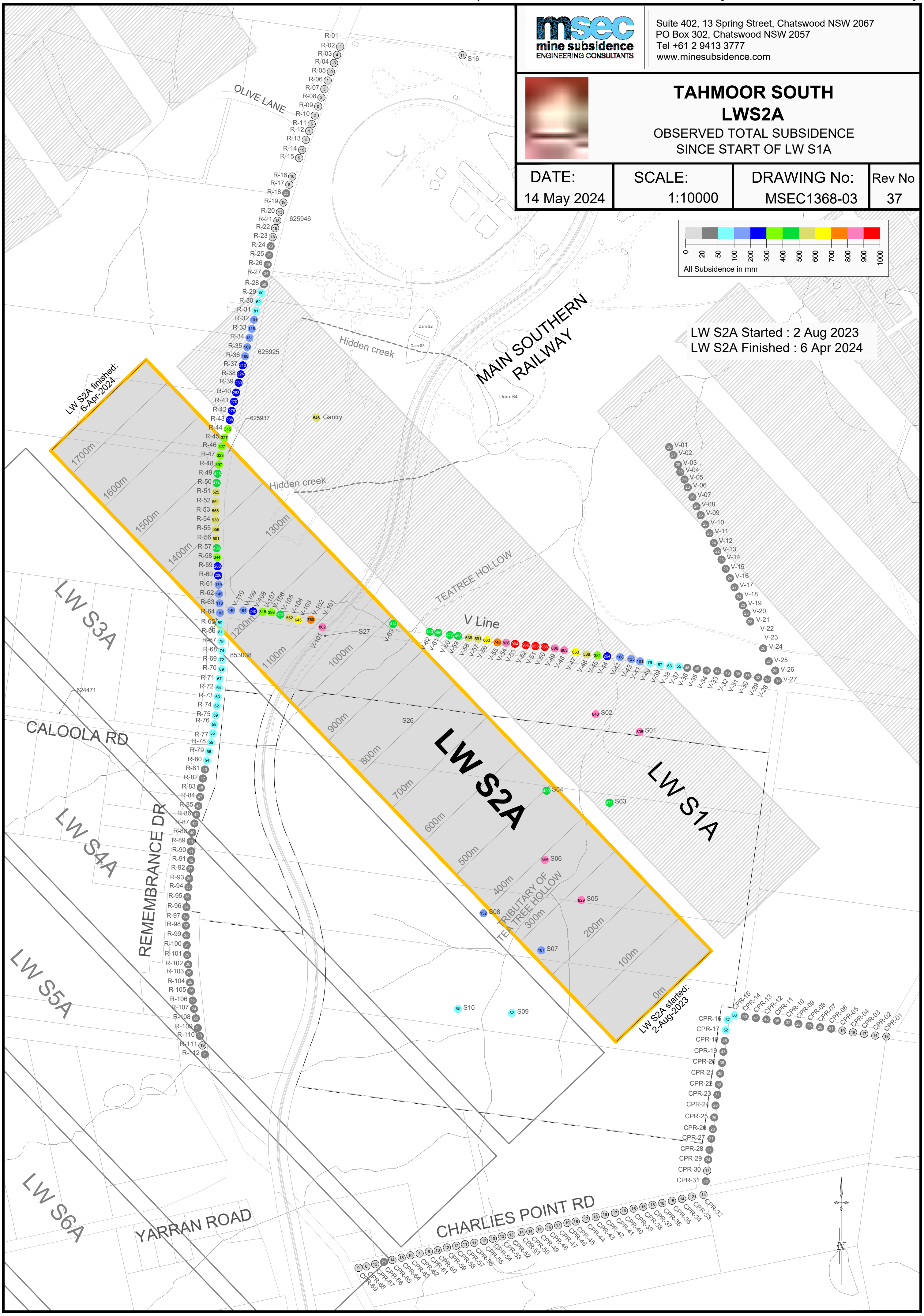

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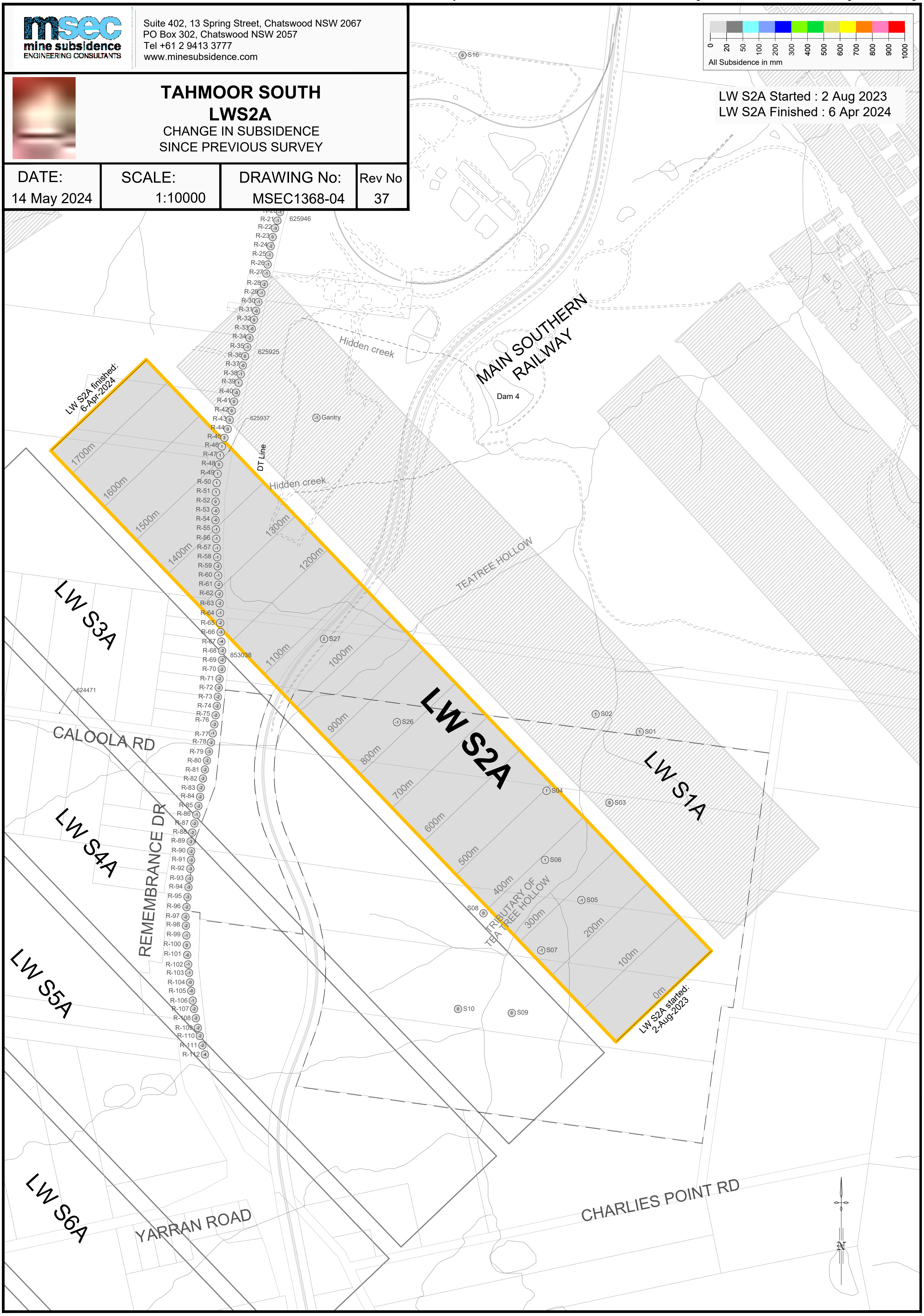
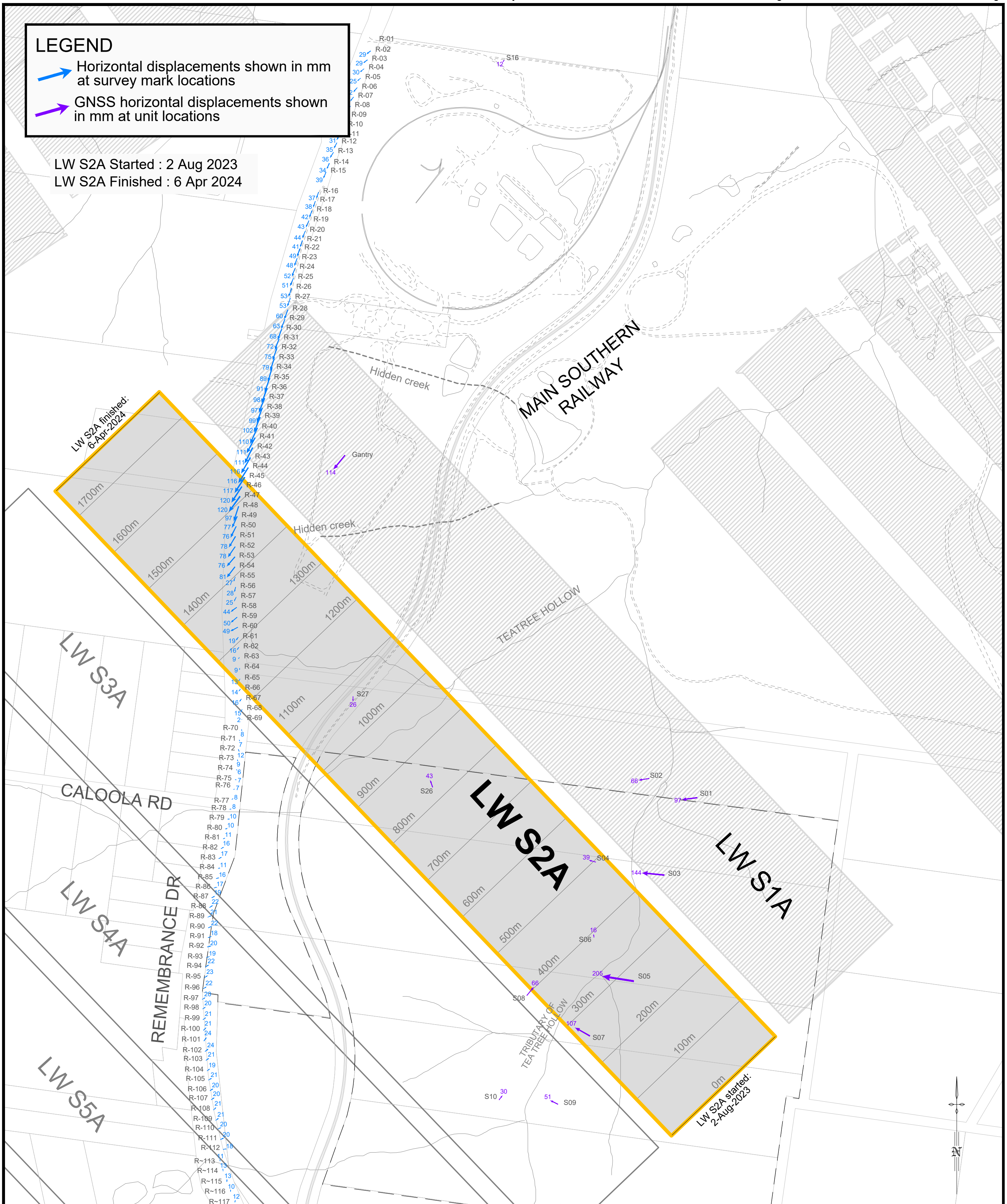
TAHMOOR SOUTH
LWS2A
CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
14 May 2024	1:10000	MSEC1368-04	37





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TAHMOOR SOUTH
LWS2A
OBSERVED INCREMENTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S2A

DATE:	SCALE:	DRAWING No:	Rev No
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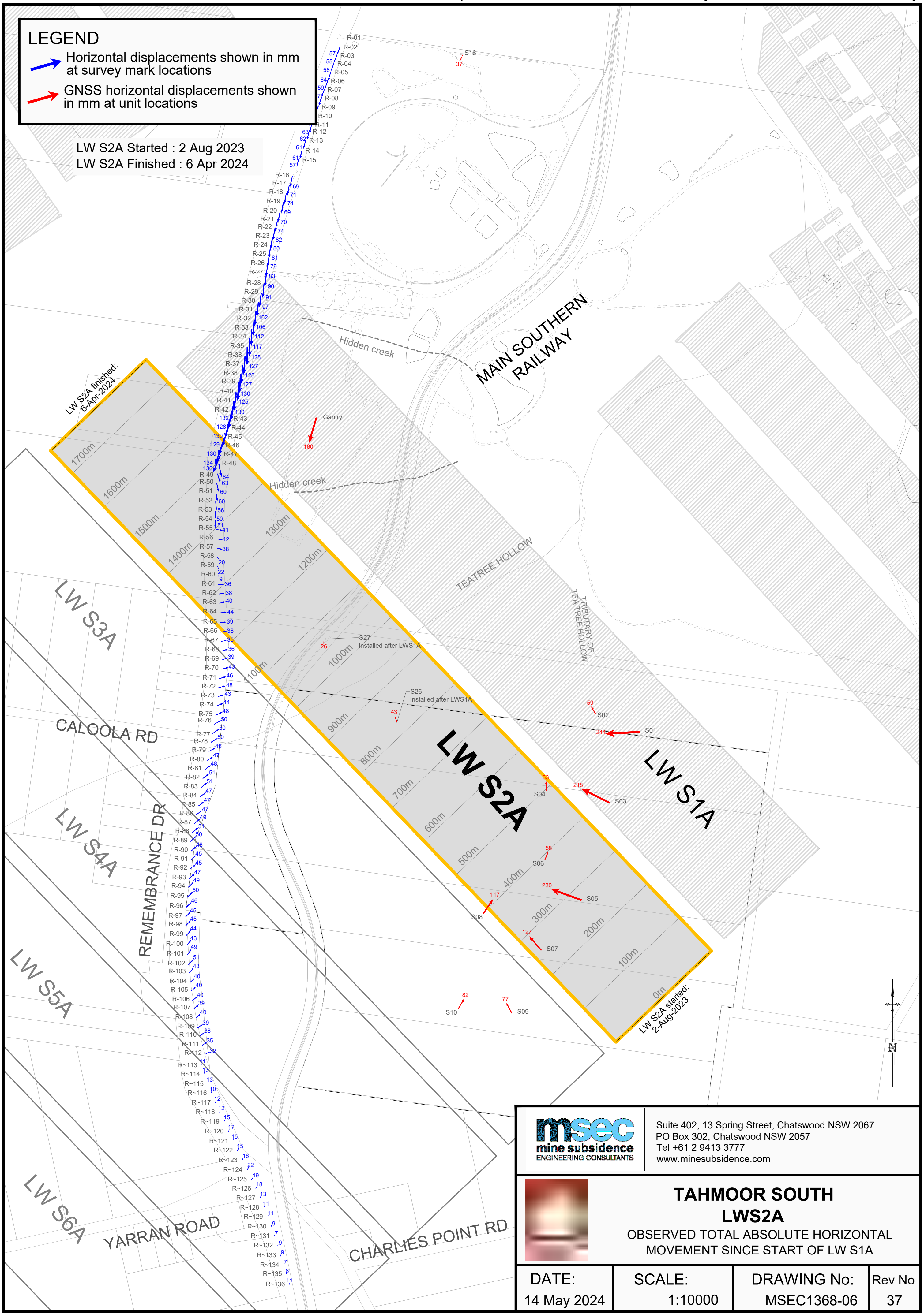

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TAHMOOR SOUTH
LWS2A
OBSERVED TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
14 May 2024	1:10000	MSEC1368-06	37

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TAHMOOR SOUTH
LWS2A

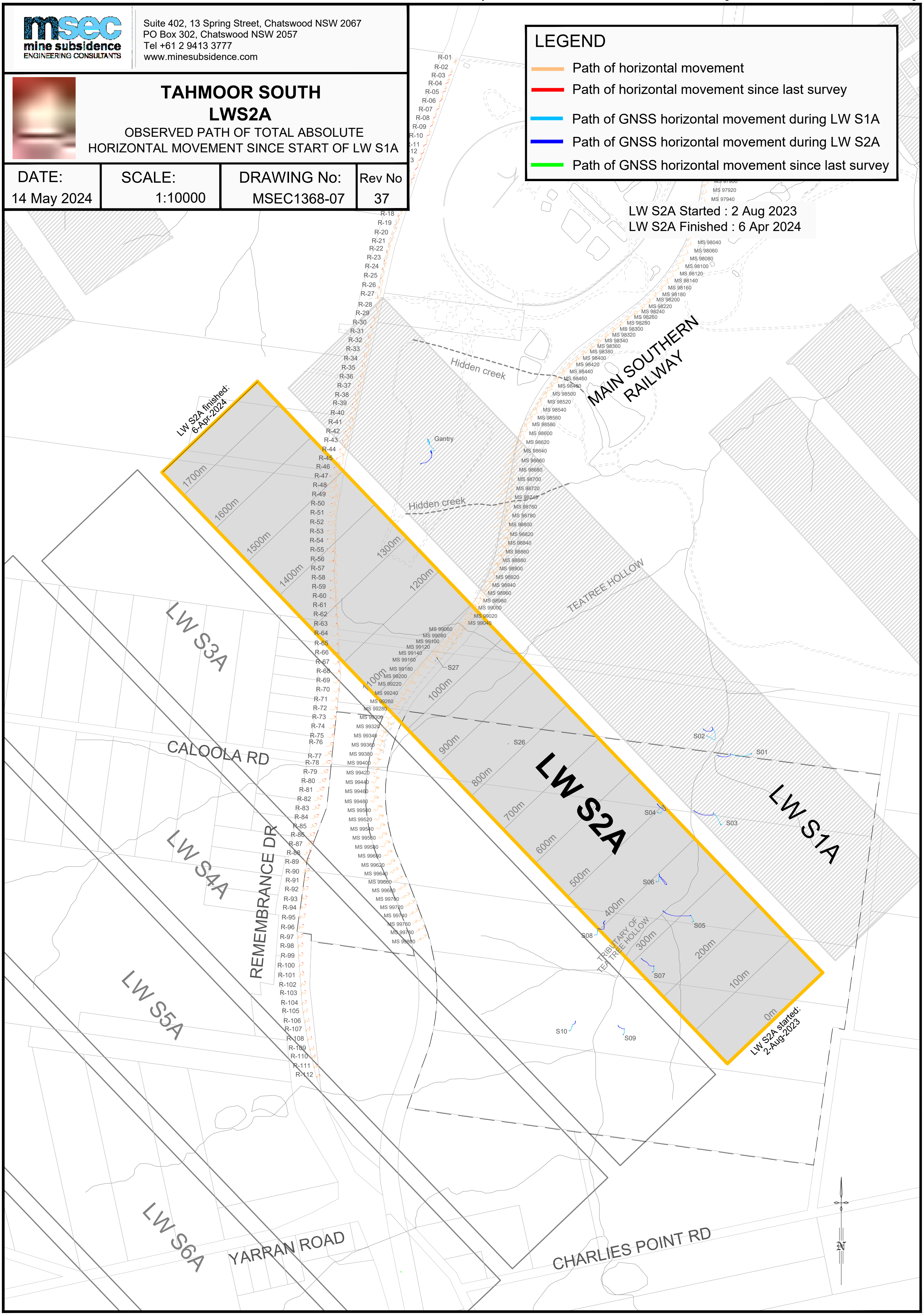
OBSERVED PATH OF TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
14 May 2024	1:10000	MSEC1368-07	37

LEGEND

- Path of horizontal movement
- Path of horizontal movement since last survey
- Path of GNSS horizontal movement during LW S1A
- Path of GNSS horizontal movement during LW S2A
- Path of GNSS horizontal movement since last survey

LW S2A Started : 2 Aug 2023
LW S2A Finished : 6 Apr 2024



Six Monthly Subsidence Monitoring Report for Tahmoor South LW S3A
8 May 2024 to 30 June 2024

Summary	
Monitoring period	22 June to 28 June 2024
Length of extraction of LW S3A	402 metres on 27 June LW commenced extraction on 8 May2024
Distance travelled by longwall since previous report	72 metres in the last week (since 19 June 2024)
Distance to completion of LW S3A	1302 metres

Summary of observed ground movements

Subsidence Parameter		Maximum observed during LW S3A	Location
Subsidence (mm)	Inc Total	533 908	GNSS S10 GNSS S06 & GNSS S26
Tilt (mm/m)	Inc Total	0.2 9.0	Charlies Point Rd Main Southern Railway
Hogging Curvature (km^{-1})	Inc Total	0.02 0.20	Charlies Point Rd Remembrance Drive
Sagging Curvature (km^{-1})	Inc Total	0.02 -0.21	Charlies Point Rd Remembrance Drive
Tensile Strain (mm/m)	Inc Total	0.2 0.5	Charlies Point Rd Main Southern Railway
Compressive Strain (mm/m)	Inc Total	0.2 -3.3	Charlies Point Rd - Remembrance Drive
Subsidence since previous survey (mm)		121 mm	GNSS S10 since 20 June

This monitoring report provides the results of the latest ground surveys during the mining of LW S3A, in accordance with the requirements of subsidence management plans.

Longwall face position

LW S3A commenced on 8 May 2024 and at the time of this report had progressed a distance of 402 metres from its start position. The mine layout and the monitoring peg positions are shown in Drawing No. MSEC1430-01.

Monitoring results

Ground monitoring is being undertaken within the active subsidence zone of LW S3A. Monthly surveys have commenced.

Ground survey results

Ground monitoring is being undertaken within the active subsidence zone of LW S3A. Monitoring results are shown graphically at the back of this report.

The spatial distribution of incremental subsidence is shown in Drawing No. MSEC1430-02. Changes in subsidence since the previous survey are shown in Drawing No. MSEC1430-03.

Main Southern Railway

Monthly surveys have commenced, with small changes observed on 3 June. Visual inspections have not identified any issues at this stage. Weekly surveys commence this week.

GNSS monitoring

Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure their absolute horizontal and vertical positions in real time. There are 28 units located directly above and adjacent to LW S1A to S6A. These include two units above the commencing end of LW S3A, being Sites S09 and S10.

The measured position of each GNSS unit varies depending on atmospheric conditions and the array of satellites that are present in the sky at each time, and the vegetation cover surrounding each unit. Measured variations in height are typically greater than the variations for eastings and northings.

The results from the GNSS units are shown in Fig. S01 to Fig. S27 and Fig. TM. Mining-induced movements have developed at the GNSS units, with maximum measured incremental subsidence of 533 mm at Site S10 above LW S3A. Rates of change continue at previously observed maximum rates.

Observed development of subsidence above LW S3A relative to the length of extraction is shown in Figure A. It was predicted that subsidence above LW S3A would be greater than observed above LW S2A because it is the third panel in the longwall series.

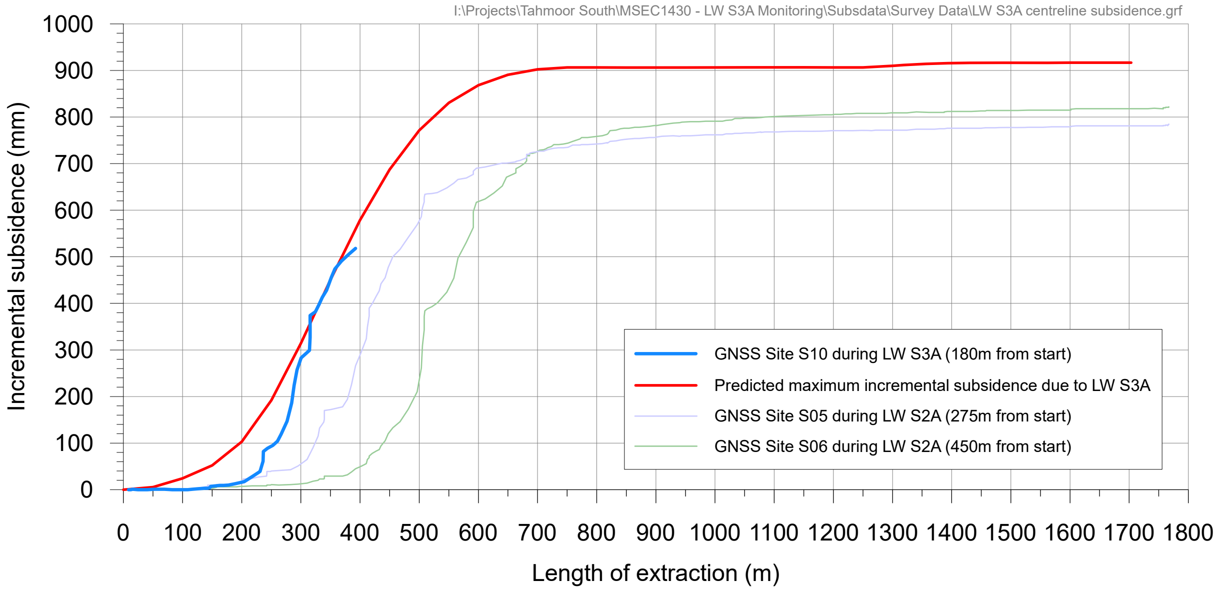


Figure A Observed development of incremental subsidence above LW S3A

Changes in horizontal distances can be calculated between GNSS units that are stationed close together and results are shown in Figure B. Closure has developed across the Tributary to Teatree Hollow (Wirrimbirra Creek). Closure is currently developing across Wirrimbirra Creek between Sites S09 and S10 directly above LW S3A. Rates of change were slightly reduced this week.

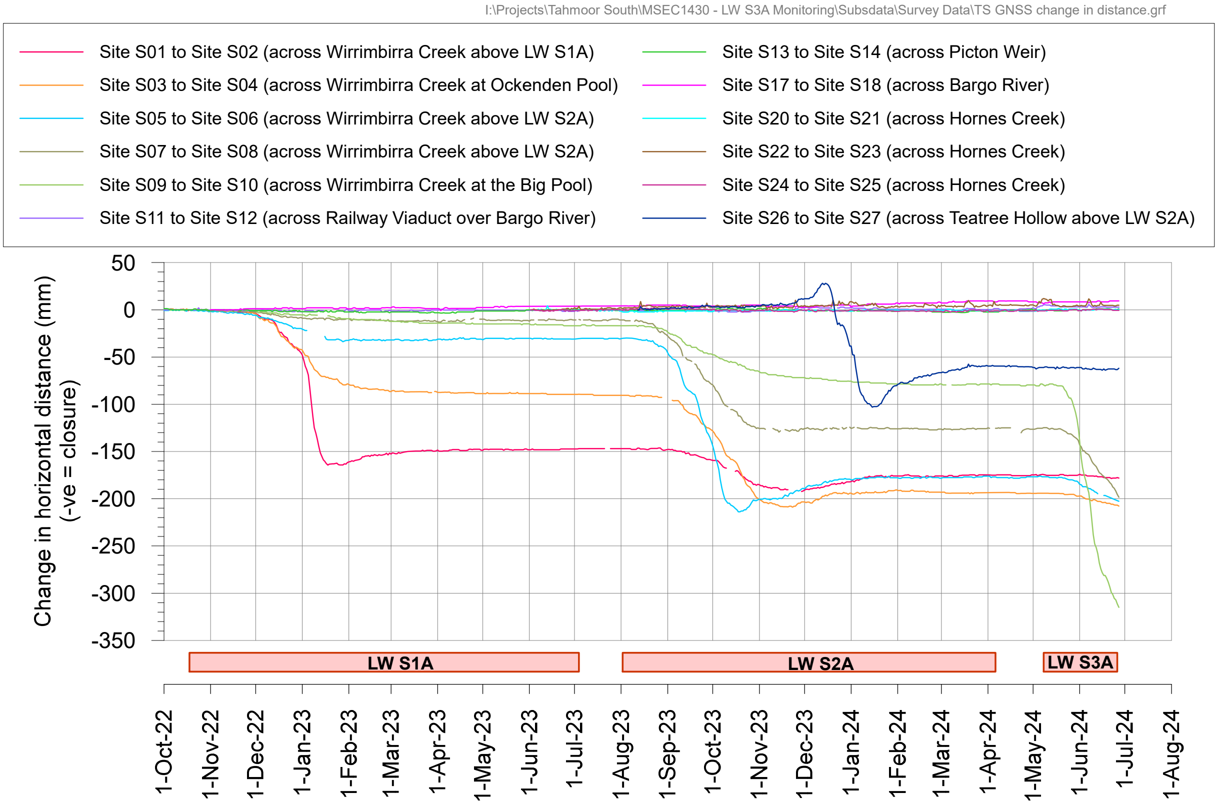


Figure B Observed changes in horizontal distances between GNSS units

Charlies Point Road

Monthly surveys have commenced, with small changes observed on 3 June. Visual inspections have not identified any issues at this stage.

Remembrance Drive

Weekly surveys will commence when the length of extraction exceeds 500 metres.

Natural Features

In addition to the GNSS units, survey marks have been installed at four locations across the Tributary to Teatree Hollow (Wirrimbirra Creek), and at four locations across Teatree Hollow, as shown in Drawing No. MSEC1430-01.

An end of LW S2A survey was conducted on 30 April along ground survey lines that were installed across the Tributary to Teatree Hollow, and a summary is shown in Figure C. The results correlate reasonably well with the observations from GNSS units, taking into account the shorter lengths of the survey lines, which are based within the floor of the creek valley, compared to the distances between the GNSS units, which are mounted at the tops of the valleys.

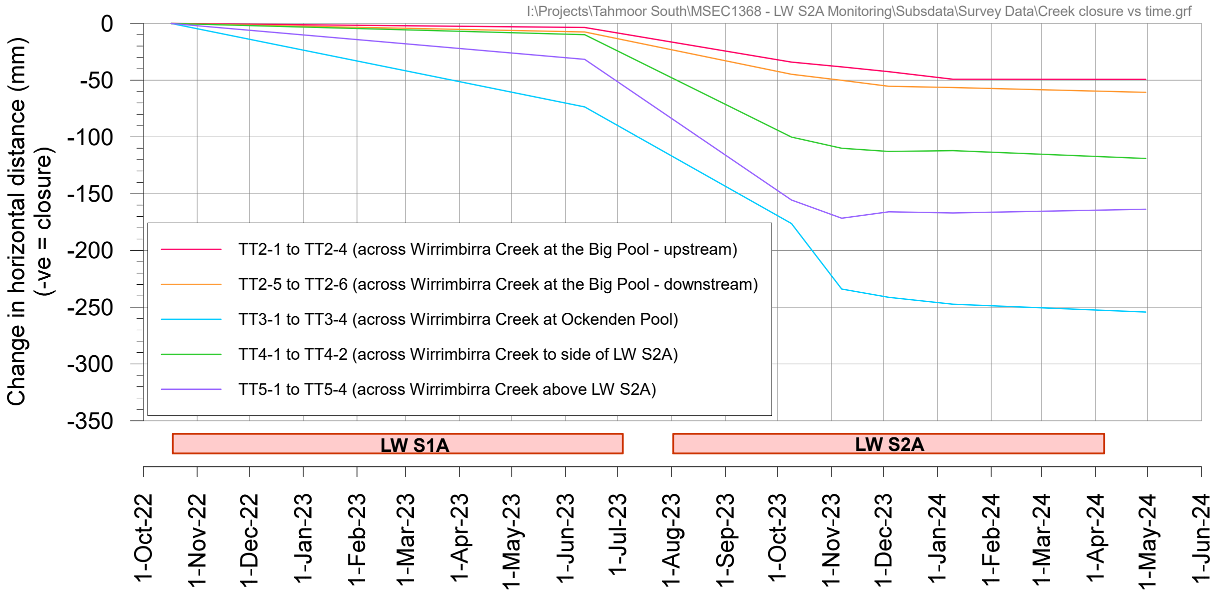


Figure C Observed development of closure across Tributary to Teatree Hollow from ground surveys

Tributary to Teatree Hollow (Wirrimbirra Creek)

Impacts were first detected in the Tributary to Teatree Hollow (Wirrimbirra Creek) on 8 February 2023. Surface water flows were first observed to stop approximately 120 metres upstream of monitoring site TT3, above the centreline of future LW S3A. A surface crack was observed in the bedrock downstream of this location. On 12 June, flows in the creek continued to flow along the full length of the Tributary to Teatree Hollow since the previous inspection on 15 May following a series of rainfall events. A new fracture approximately 6 metres long was observed upstream of Pool TT2.

Additional impacts have been observed at TT2 since October 2023. A fracture within a surface boulder upstream of Pool TT2 has been observed to increase in size during the mining of LW S3A. The boulder is wedged between two larger rocks on either side of the creek. Investigations have found that the fracture was present in July 2023, after the mining of LW S1A and prior to the commencement of LW S3A. The fracture contained some debris and some ageing of the exposed rock inside the fracture at this time. While pre-mining photographs and videos identified pre-existing fractures elsewhere within the boulder field upstream of Pool TT2, the fracture was not visible prior to the mining of LW S1A to the scale and extent as observed in July and September. The images, however, were not focussed directly on the boulder in question and could not definitively confirm whether there were any pre-existing hairline or slight fractures in it.

A geotechnical inspection was conducted by Douglas Partners on 9 November 2023. The fractured boulder has been assessed to be a detached sandstone block, which was previously part of the rock strata on either side of the valley prior to mining. The host rock had been naturally eroded and undercut by the weaker underlying strata, resulting in dislocation and fracturing along naturally formed joints at the fracture site. Pre-mining photographs show surface water was flowing underneath the site. While dislocated from the host rock on either side of the valley, the detached sandstone block remained in contact on both sides, such that mining-induced valley closure almost immediately resulted in fracturing. New fractures are developing at the detached sandstone block and within the adjoining rock strata at the contact points due to ongoing closure. The fracture site is situated above Pool TT2 and has no effect on surface water levels in Pool TT2.

A local 3D ground survey was conducted on 9 October 2023 along the TT2 line that is located upstream of Pool TT2 and very close to the fracture in the boulder. The results are shown in Figure D. It can be seen that very little tilt or strain had developed after the mining of LW S1A but valley closure strains and upsidence have developed since the completion of LW S1A. The fracture in the boulder is located between Pegs TT2-2 and TT2-3. The latest survey on 30 April measured no change in compressive strain.

While this section of the Tributary to Teatree Hollow has been previously observed to be dry during periods of dry weather, the observations indicate that the changes may be mining-induced.

A visual inspection of the rock shelter on 2 June 2023 found no water in the pool at TT3, and the pool has remained dry since 26 June 2023. A visual inspection on 18 December found no changes.

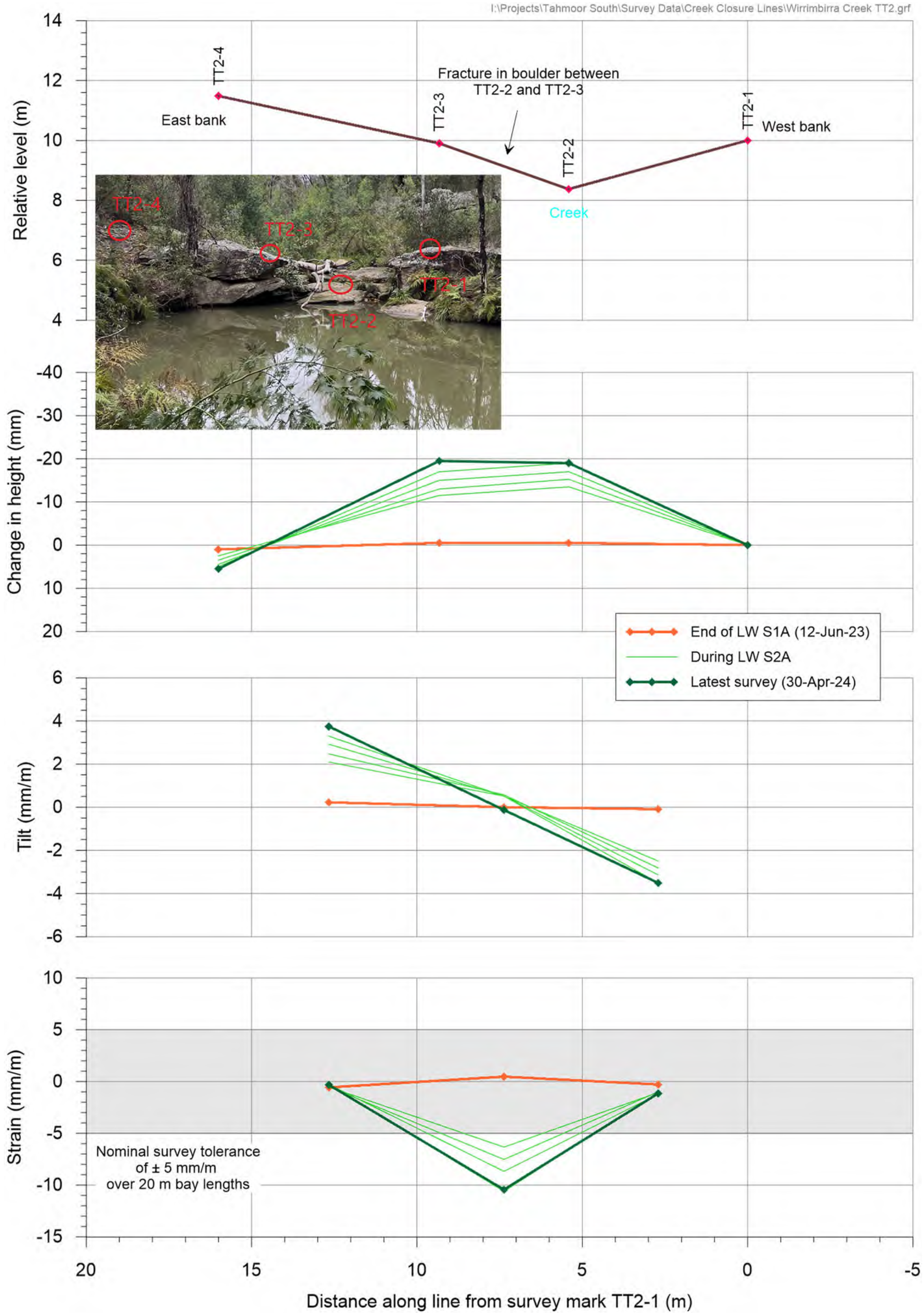


Figure D Observed subsidence, tilt and strain along TT2 line, upstream of Pool TT2

Teatree Hollow

Surveys were conducted across Teatree Hollow between 23 February 2023 and 12 June 2023 during LW S1A, with very little closure observed at TT6, TT9 and TT12 (6 mm or less).

The first survey for LW S2A was conducted across Teatree Hollow on 30 August 2023, with subsequent surveys on 9 October 2023, 7 November 2023, 4 December 2023, 10 January 2024and 30 April 2024. Very little closure is observed at TT6 and TT12 (3 mm or less). GNSS units S26 and S27 have been installed across Teatree Hollow directly above LW S2A to measure valley closure. Approximately 100 mm closure has been measured by the GNSS units.

Impacts were first observed along Teatree Hollow directly above LW S1A on 1 March 2023. Surface water flows have been observed to stop near the upstream edge of LW S1A and reappear with iron staining present above the downstream edge of LW S1A. On 12 June, flows in the creek continued to flow along the full length of Teatree Hollow since the previous inspection on 15 May following a series of rainfall events.

Structures

Weekly surveys will commence at MKD Machinery when the length of extraction exceeds 450 metres.

Weekly surveys will commence at the Australian Wildlife Sanctuary when the length of extraction exceeds 550 metres.

Local Roads

Weekly visual inspections have commenced within the active subsidence zone. Visual inspections along Charlies Point Road have not identified any issues.

Gas Infrastructure

Weekly surveys along Remembrance Drive will commence when the length of extraction exceeds 500 metres.

Electrical Infrastructure

Weekly surveys along Remembrance Drive will commence when the length of extraction exceeds 500 metres.

Ground surveys of critical power poles are conducted when poles are within the active subsidence zone.

Telecommunications Infrastructure

Weekly surveys along Remembrance Drive will commence when the length of extraction exceeds 500 metres.

Potable Water Infrastructure

Weekly surveys along Remembrance Drive will commence when the length of extraction exceeds 500 metres.

Sewer Infrastructure

Weekly surveys along Remembrance Drive will commence when the length of extraction exceeds 500 metres.

Dams

Weekly visual inspections, and monthly geotechnical inspections have been undertaken when dams are within the active subsidence zone. No issues were observed at Dam FD-5 during a geotechnical inspection on 7 June and a visual inspection on 24 June.

Archaeological Sites

Gradually developing movements have been measured by GNSS units S03 and S04 located on either side of Wirrimbirra Creek, with no impacts observed. The most recent visual inspection at rock shelter site 52-2-4471 was on 19 June 2024. No significant changes were observed.

Summary

LW S3A commenced extraction on 8 May 2024. Subsidence is increasing above the commencing end of the longwall panel.

Summary of surveys and inspections completed during LW S2A and LW S3A

Surveys and inspections have been conducted to meet the requirements of the LW S1A-S6A Extraction Plan. A timeline showing when each type of survey and inspection was conducted during LW S2A and the first 400 m of extraction of LW S3A shown in Figure E.

Figure E Surveys and inspections during LW S2A and LW S3A

A summary of surveys and inspections is provided in Table 1.

Table 1 Surveys and inspections conducted during LW S2A and LW S3A

Inspection / Survey	Responsibility	Number of Inspections / Surveys
Ground Monitoring Surveys		
GNSS	GNSS Monitoring	334
Local road surveys	SMEC	127
Local road inspections	BIS	100
Local road bridge surveys	SMEC	15
Local road bridge inspections	BIS	21
Sub-Total		**597**
Natural Features		
Teatree Hollow, Wirrimbirra Creek and Bargo River Survey Lines	SMEC	7
Teatree Hollow and Wirrimbirra Creek Visual inspections	Brienan Environment & Safety ENRS	22
Surface water manual monitoring	ATC Williams	6
Groundwater manual monitoring	SLR	5
Cliffs and steep slopes geotechnical inspections	Douglas Partners	11
Sub-Total		**51**
Main Southern Railway		
Ground Surveys	Southern Rail Surveys	31
Track Geometry Surveys	BloorRail	24
Track Inspections	BloorRail	173
Main Southern Railway structure surveys	Southern Rail Surveys	13
Main Southern Railway structure visual inspections	Southern Rail Surveys	10
Embankments and cutting surveys	Southern Rail Surveys	103
Embankments and cuttings geotechnical inspections	Newcastle Geotech	22
Sub-Total		**376**
Utilities		
Endeavour Energy Power Pole Surveys and Inspections	SMEC & BIS	50
Telecommunications Monitoring and Inspections	CNS & BIS	45
Gas Detection Surveys	BIS	8
Sub-Total		**103**
Mine Site		
Rail Loop Surveys	Southern Rail Surveys	15
Conveyor and Tunnel Surveys	SMEC	62
Structure Surveys	SMEC	-
Dam Surveys	SMEC	28
Visual inspections	Tahmoor Coal & BIS	139
Sub-Total		**244**
Public Amenities		
Public Amenity Ground Surveys	SMEC	17
Public Amenity Visual inspections	BIS	50
Sub-Total		**67**
Commercial and Business		
Commercial Ground Surveys	SMEC	25
Commercial Visual inspections	BIS	43
Sub-Total		**68**
Residential		
Pre-mining Front of House inspections (LW W S1A-S6A)	JMA Solutions	-
Pre-mining Structural Hazard Identification inspection and PMI (LW W S1A-S6A)	JMA Solutions	-
Private property ground surveys	SMEC	20
Private property pool inspections	BIS	16
Private property dam inspections	BIS	94
Sub-Total		**130**
Total		**1636**

A comparison between assessed and observed impacts to surface features is summarised in Table 2. The assessed and observed impacts to surface features compare reasonably well with predictions.

Table 2 Summary of predicted and observed impacts during LW S2A-S3A

Surface Feature	Predicted Impacts	Observed Impacts
Natural Features		
Teatree Hollow and Wirrimbirra Creek	Likely fracturing in creek bed. Likely surface flow diversion Likely reduction in water quality during times of low flow. Likely gas emissions.	Fracturing, surface flow diversion and reduction in water quality observed in Tributary to Teatree Hollow and Teatree Hollow. No gas emissions observed.
Aquifers or known groundwater resources	Temporary lowering of piezometric surface by up to 4m. Groundwater levels should recover with no permanent post mining reduction in water levels in bores. Potential impacts to privately owned groundwater bores. Please refer Water Management Plan.	Groundwater levels fallen in response to mining. Please refer report summarising 6 months of results by SLR.
Steep slopes and cliffs	Potential soil slippage and cracking to slopes. Large scale slope failures or cliff instabilities unlikely.	No impacts observed during LW S2A and LW S3A.
Natural vegetation	No impacts anticipated.	No impacts observed during LW S2A and LW S3A.
Public Utilities		
Main Southern Railway	Impacts expected at isolated locations. Railway bridges and Viaduct very unlikely to experience adverse impacts. Railway will remain safe and serviceable with a management plan in place.	No impacts to track geometry observed during LW S2A and LW S3A. No adverse impacts observed on bridges and Viaduct. Railway maintained in safe and serviceable condition during mining.
Tahmoor Mine Rail Loop	Very minor impacts possible at isolated locations. Railway will remain safe and serviceable with a management plan in place.	Railway maintained in safe and serviceable condition during mining. No adverse impacts observed.
Roads and Bridges (all types)	Cracking and buckling may occur in isolated locations. Road bridges very unlikely to experience adverse impacts. Local roads will remain safe and serviceable with a management plan in place.	Small bump observed in southbound lane of Remembrance Drive at location of compressive strain near Peg R47. Small bump observed across southbound lane of Remembrance Drive at location of compressive strain near Peg R54. Faint bump visible on the edge line of the northbound lane near Peg R61. Pavement resurfaced. Pavement maintained in safe and serviceable condition during mining. No impacts observed to bridges.
Potable water pipelines	Impacts and minor leakages possible at isolated locations, particularly at creek crossings. Potable water pipelines will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Sewer pipelines	Impacts possible at isolated locations, particularly at creek crossings. Sewer pipelines will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Gas pipelines	Impacts possible at isolated locations, particularly at creek crossings. Gas pipelines will remain safe and serviceable with a management plan in place.	Gas pipeline temporarily exposed at two locations during LW S2A. Trenches have been backfilled. No impacts observed during LW S2A and LW S3A.

Surface Feature	Predicted Impacts	Observed Impacts
Electricity infrastructure	Some adjustments of power poles, catenaries or aerial powerline connections may be required. Electricity infrastructure will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Telecommunication infrastructure	Impacts possible at isolated locations, particularly at creek crossings. Telecommunications cables will remain safe and serviceable with a management plan in place.	Minor losses detected in optic fibre cable near location of compressive strain on Remembrance Drive. Cable protection works undertaken.
Public Amenities		
Wollondilly Anglican College	Damage may occur in isolated locations but will remain safe and serviceable with a management plan in place.	Gates jammed and not closing. Cosmetic impacts to pavements and brick walls. Repairs undertaken. Minor ground cracking. College maintained in safe and serviceable condition during mining.
Australian Wildlife Sanctuary	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Bargo Cemetery	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A. Cemetery is located directly above LW S5A.
Commercial and Business Establishments		
Tahmoor Garden Centre	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Bargo Petroleum	Damage may occur but will remain safe and serviceable with a management plan in place.	Cracking in internal floor tiles and plasterboard lining. Misaligned internal doors. 3000kg vehicle hoist measured as out of alignment Business maintained in safe and serviceable condition during mining.
Poultry sheds	Damage may occur in isolated locations but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Tahmoor Mine Site	Damage may occur but will remain safe and serviceable with a management plan in place.	Minor cracking in roof and wall joints in 6C tunnel. Minor cracking in connection joints of raw coal bins. Mine site maintained in safe and serviceable condition during mining.
Farmland and Facilities		
Farm buildings, sheds, tanks	Negligible to slight impacts predicted for all farm buildings and sheds with management plan in place.	No impacts observed during LW S2A and LW S3A.
Fences	Potential for impacts to fences and gates.	No impacts reported to fences on farm properties during LW S2A and LW S3A.
Farm dams	Potential adverse effects on dam walls and storage capacity.	No impacts observed during LW S2A and LW S3A.
Wells or bores	Potential impact to groundwater bores, particularly bores located directly above LWs.	No impacts observed during LW S2A and LW S3A.

Surface Feature	Predicted Impacts	Observed Impacts
Areas of Archaeological Significance	Rock shelter site may experience adverse impacts. Open Camp site and Isolated Find site unlikely to experience adverse impacts.	No impacts observed during LW S2A and LW S3A.
Areas of Heritage Significance	Picton Weir extremely unlikely to experience adverse impacts. The Weir will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A. Picton Weir is located west of LW S6A.
Permanent Survey Control Marks	Ground movement predicted at identified survey marks.	Ground movement occurred.
Residential Establishments		
Houses	Damage may occur to houses but they will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Swimming pools	Damage may occur to pools but they will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
Associated structures such as workshops, garages, on-site wastewater systems, water or gas tanks or tennis courts	Potential impact to pipes connected to inground septic tanks. Damage may occur to structures but they will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.
External residential pavements and fences	Damage may occur but they will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A and LW S3A.

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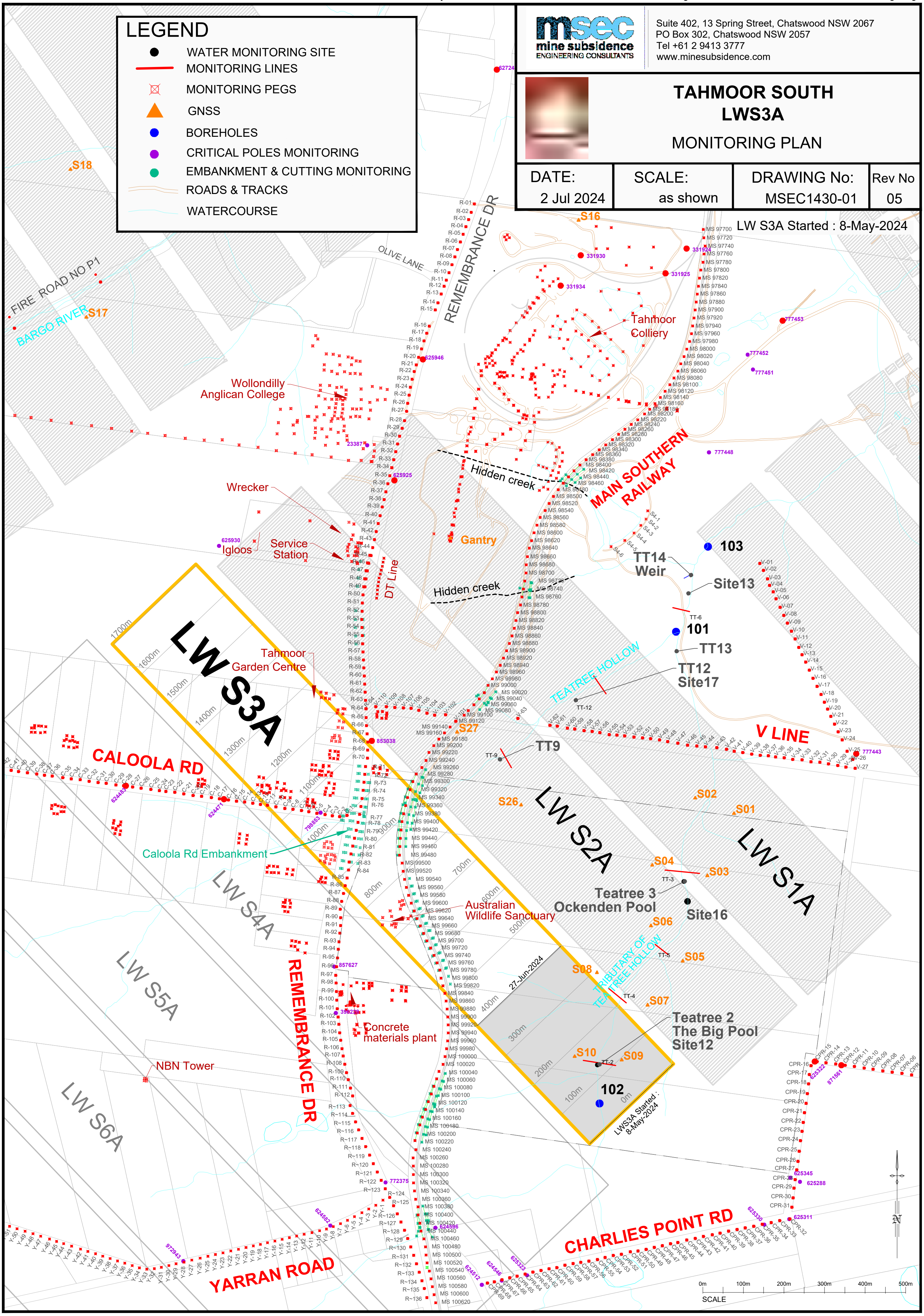

Tahmoor South LW S3A - GNSS Monitoring
Site S01 above LW S1A

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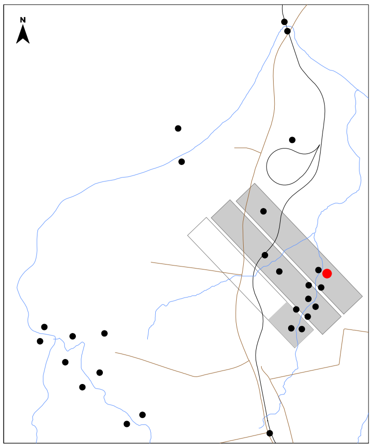
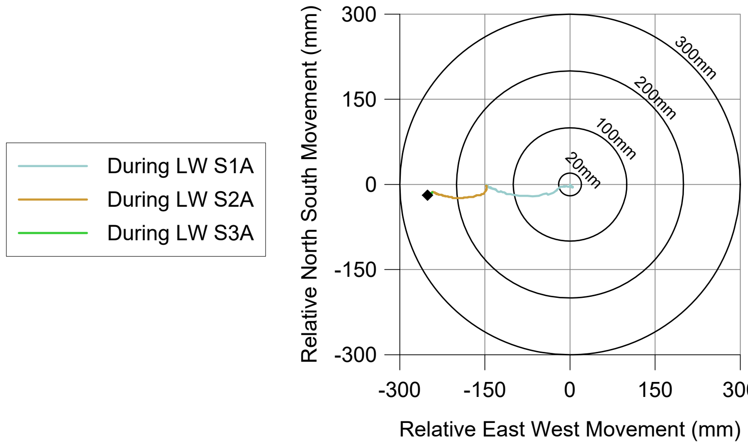
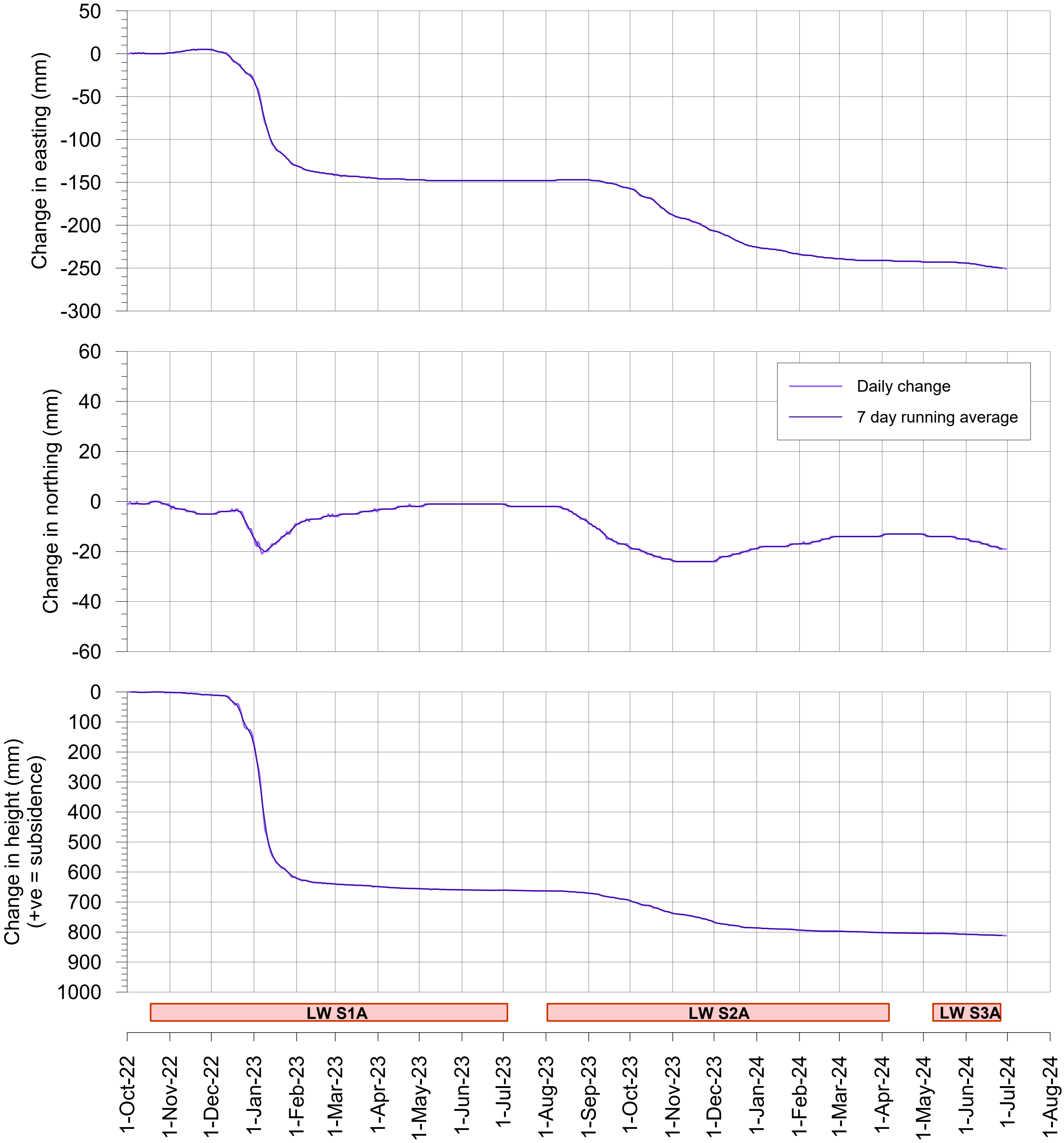




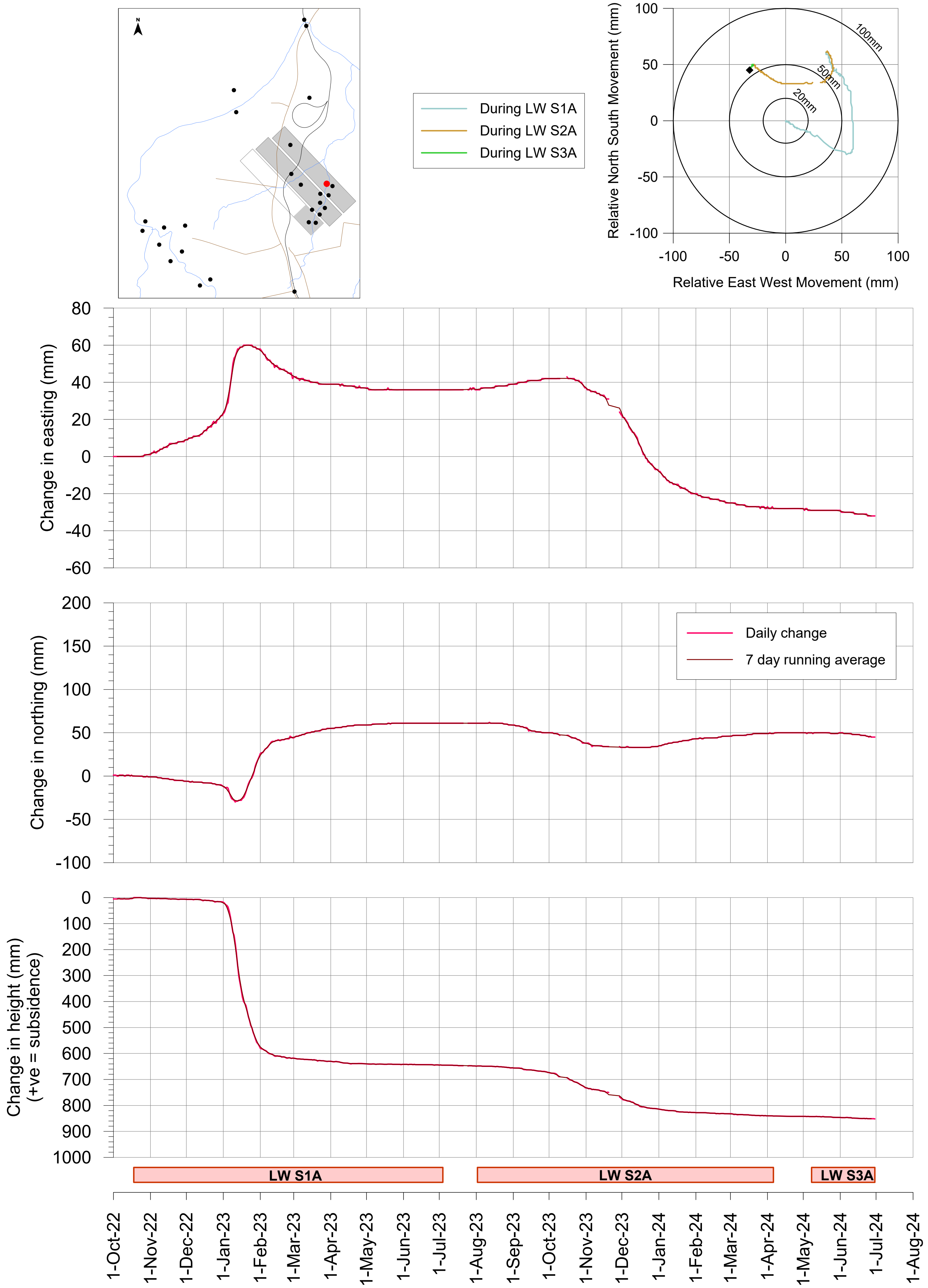


msec

Fig. S01-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S02 above LW S1A

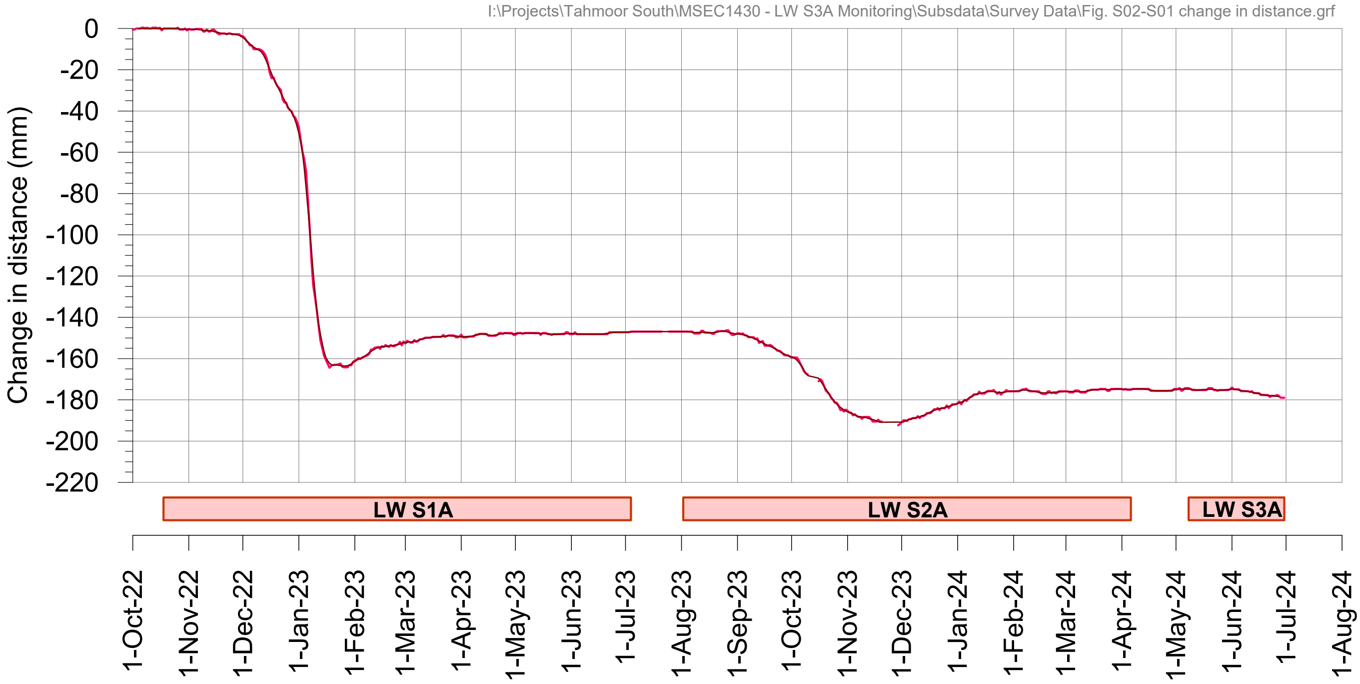
I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S02 GNSS.grf



msec

Fig. S02-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Wirrimbirra Creek
Sites S01 and S02 above LW S1A



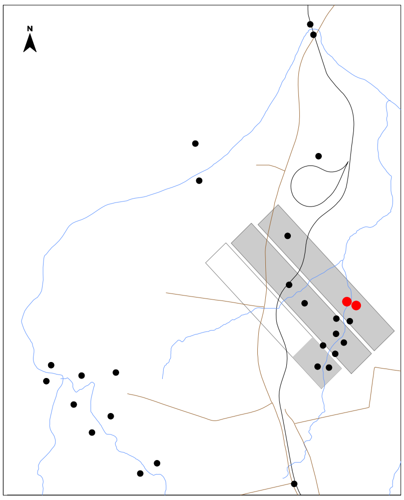
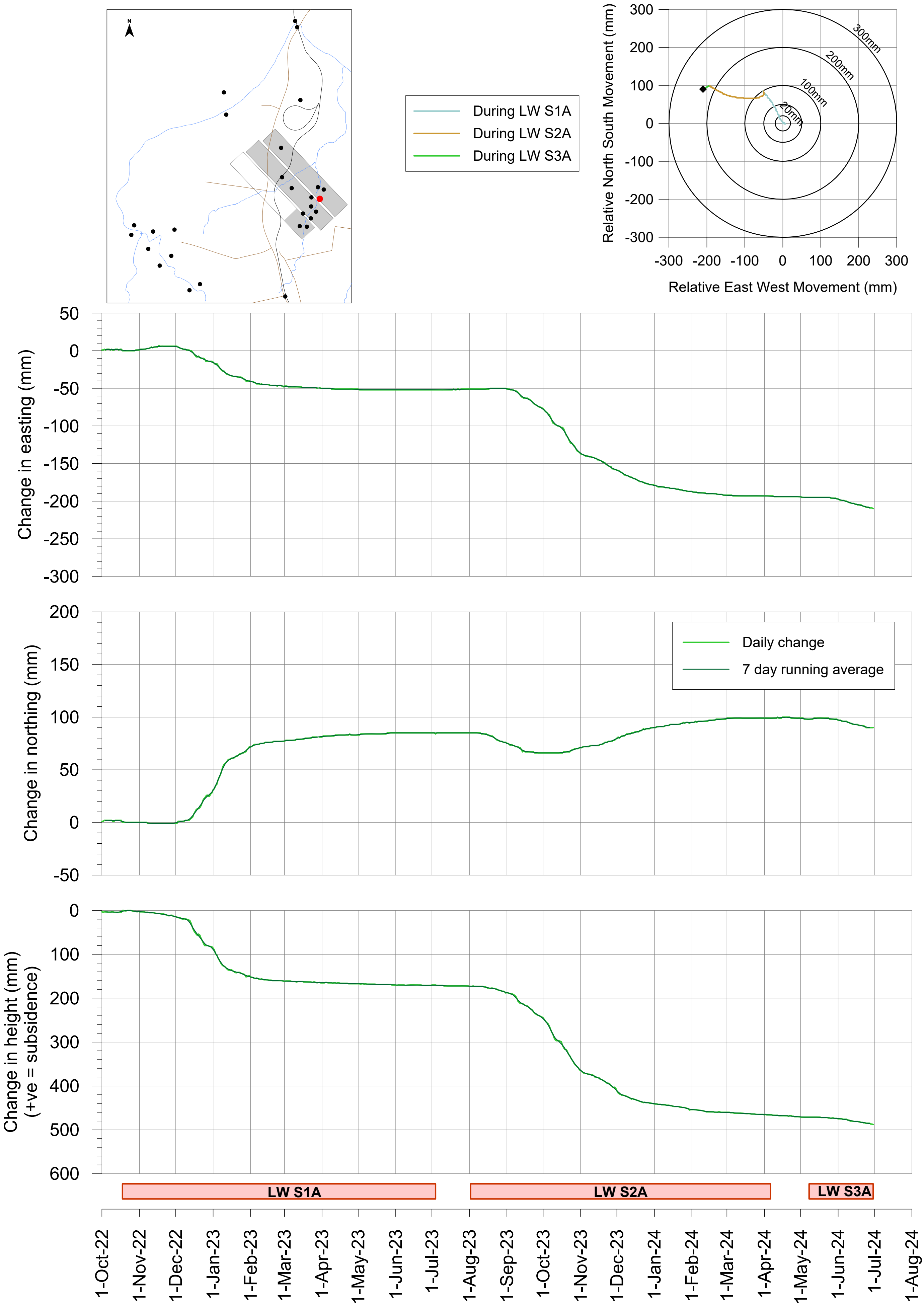


Fig. S01-S02-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S03 above LW S1A at Teatree 3

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S03 GNSS.grf

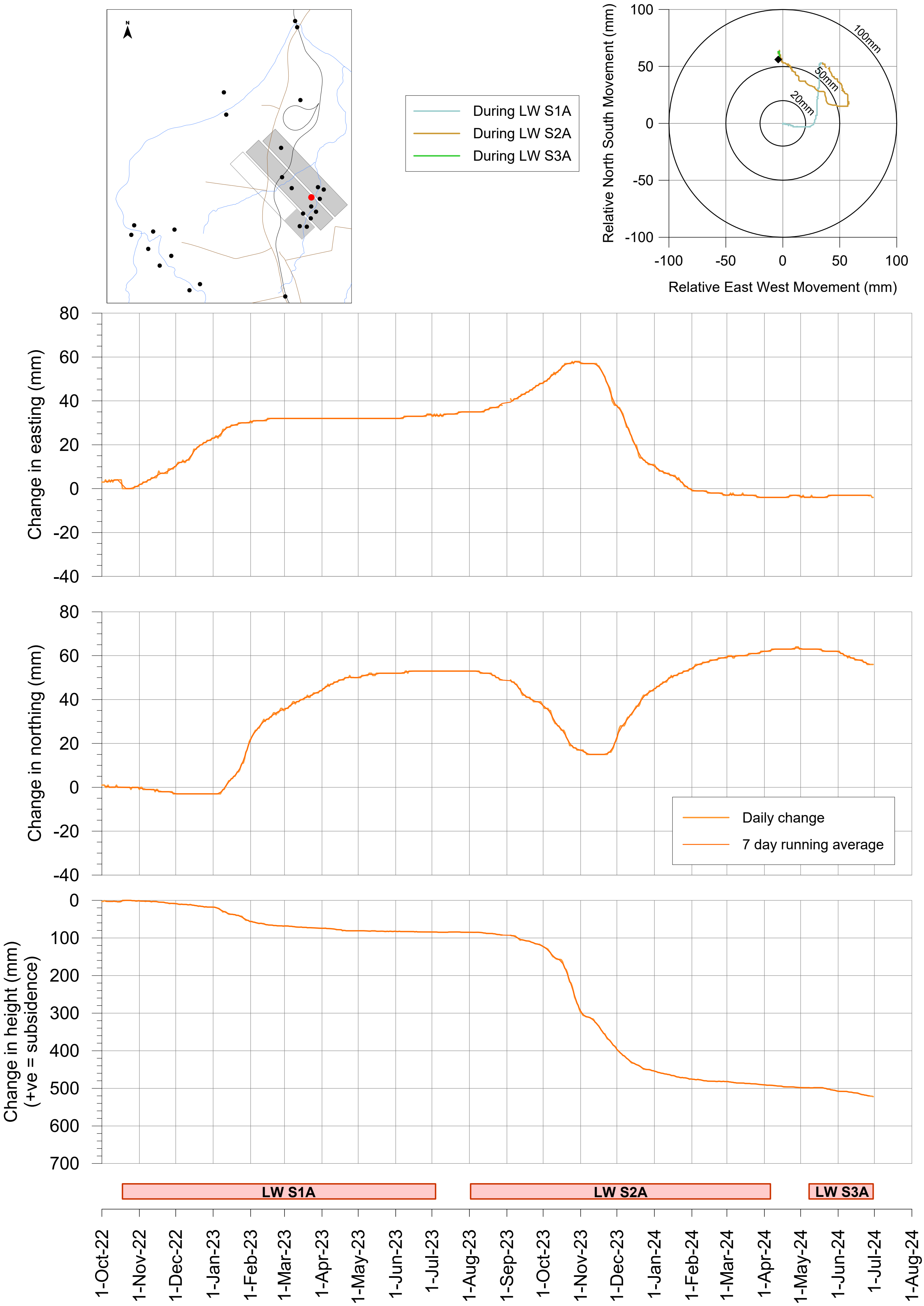


msec

Fig. S03-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S04 above LW S2A at Teatree 3

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S04 GNSS.grf

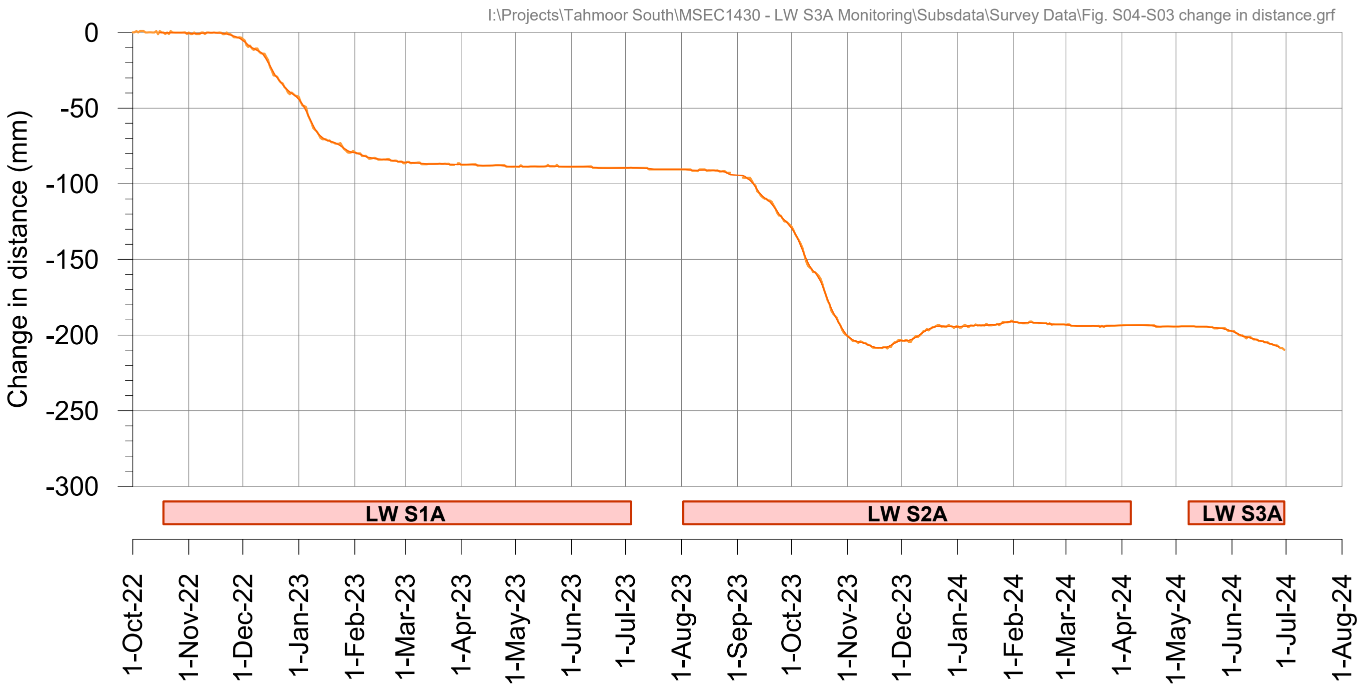


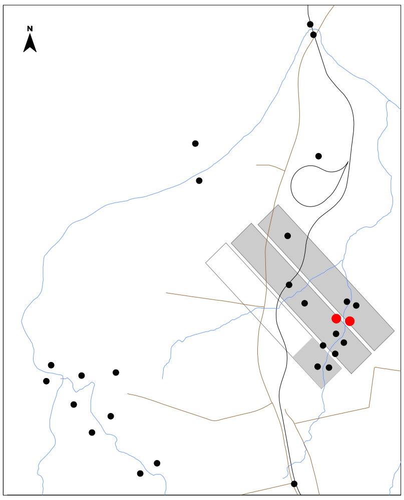
msec

Fig. S04-R05

Tahmoor South LW S3A - GNSS Monitoring

Change in distance across Wirrimbirra Creek at Teatree 3
Site S03 above LW S1A and Site S04 above LW S2A



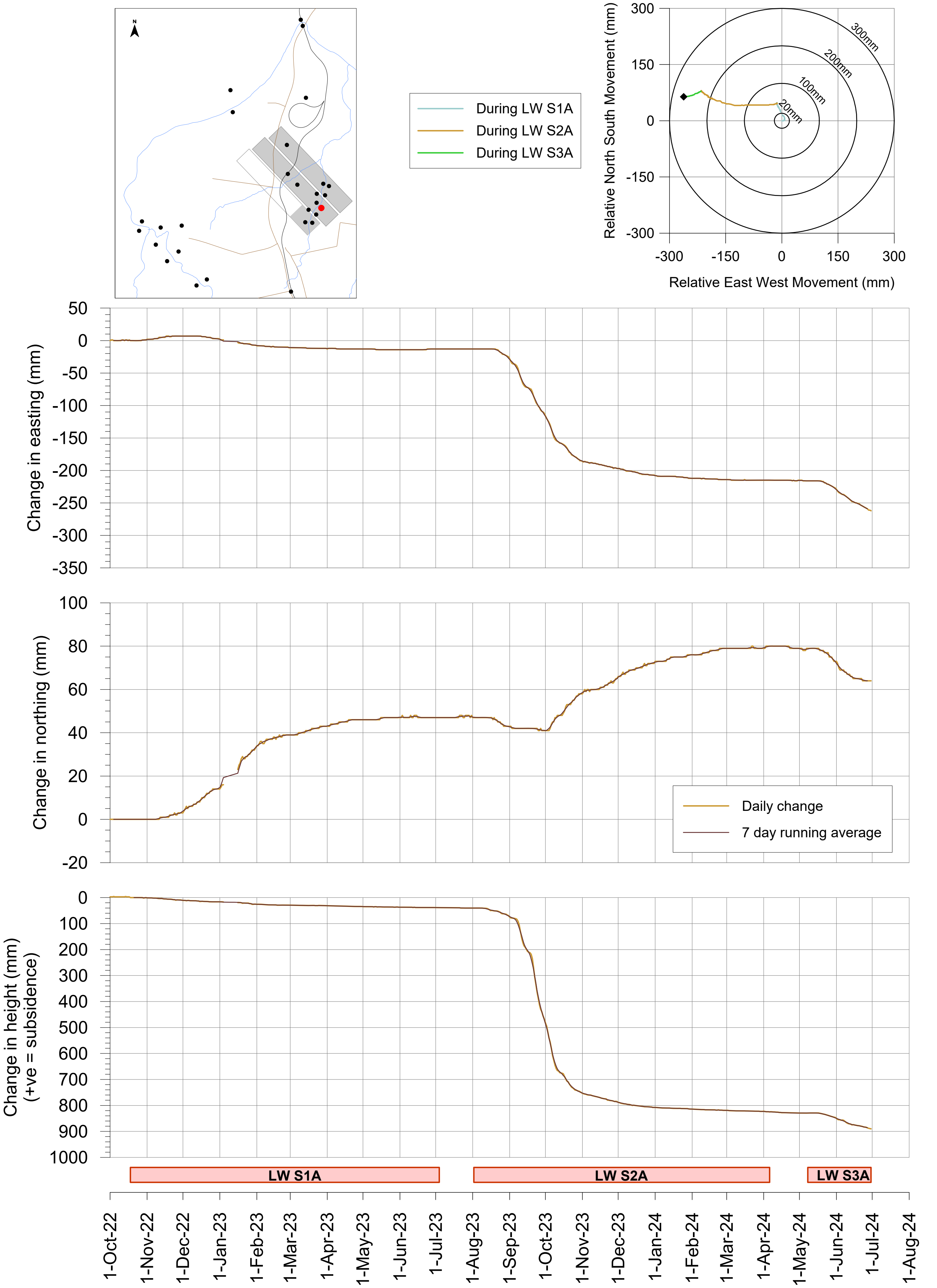


msec

Fig. S03-S04-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S05 above LW S2A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S05 GNSS.grf

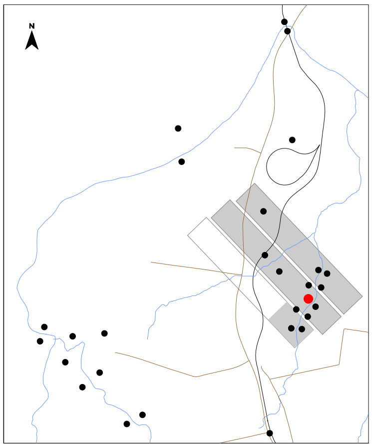


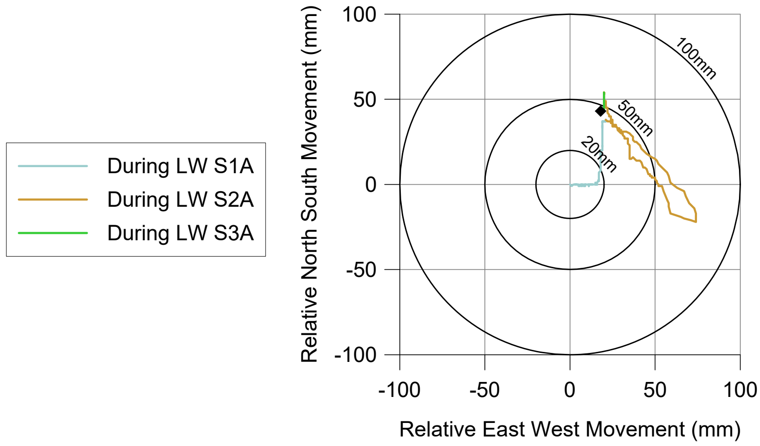
msec

Fig. S05-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S06 above LW S2A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S06 GNSS.grf





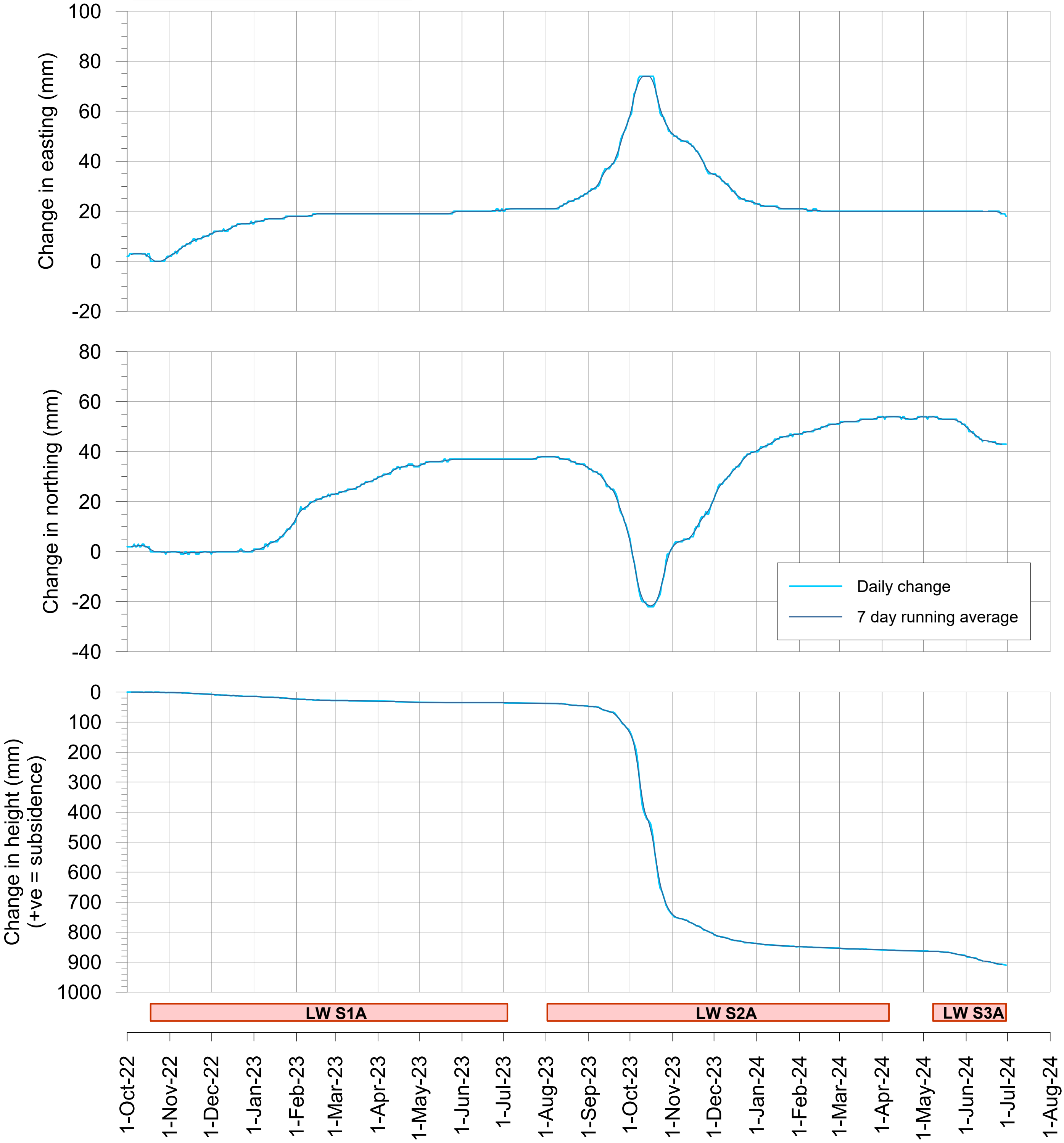
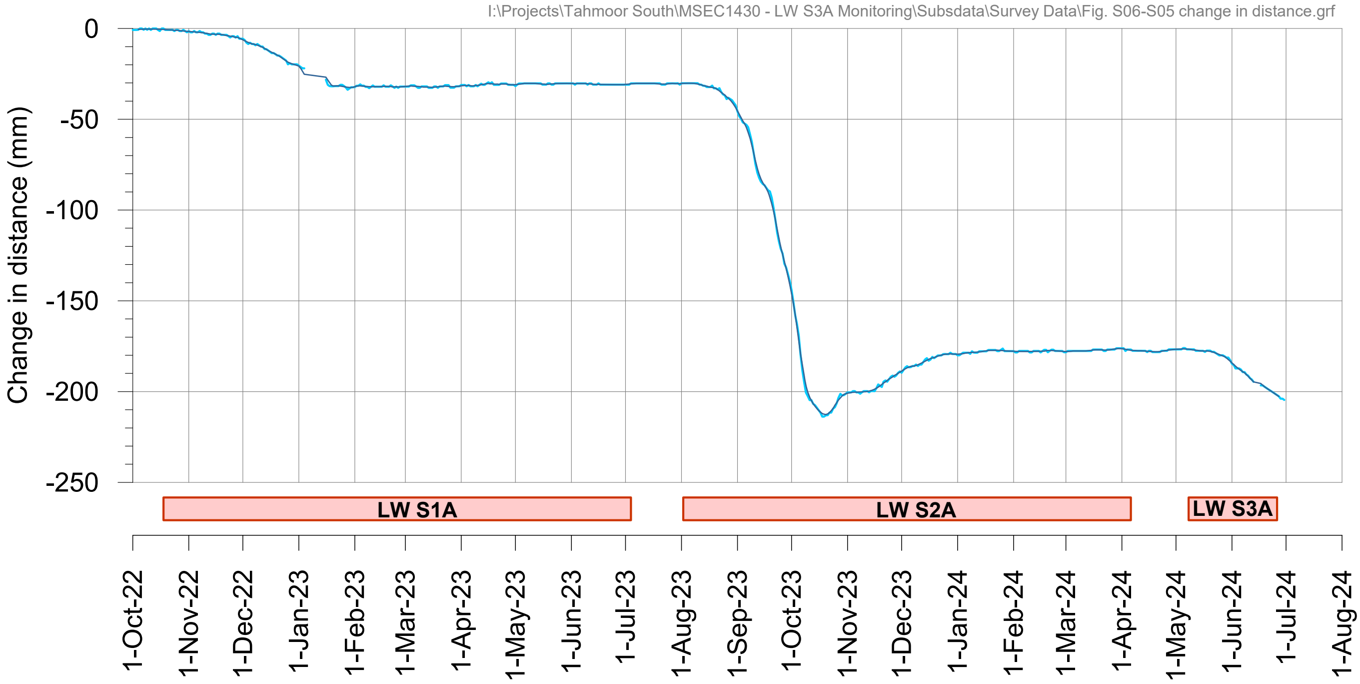
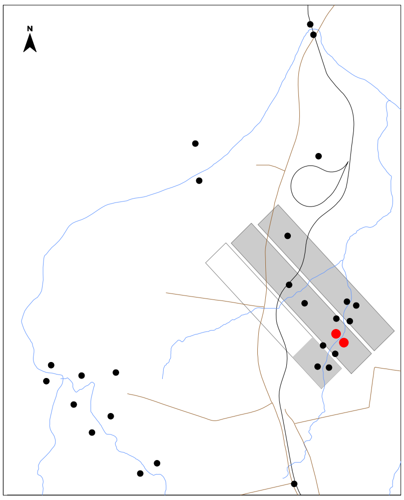


Fig. S06-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Wirrimbirra Creek
Sites S05 and S06 above LW S2A





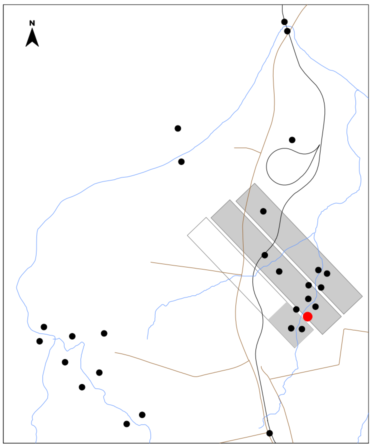
msec

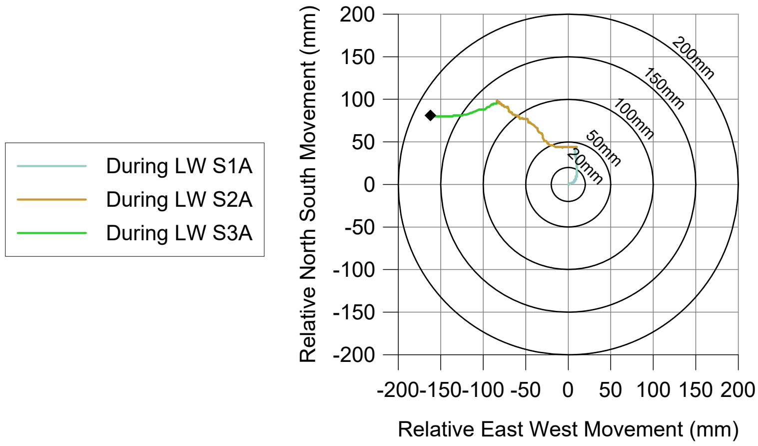
Fig. S05-S06-R05

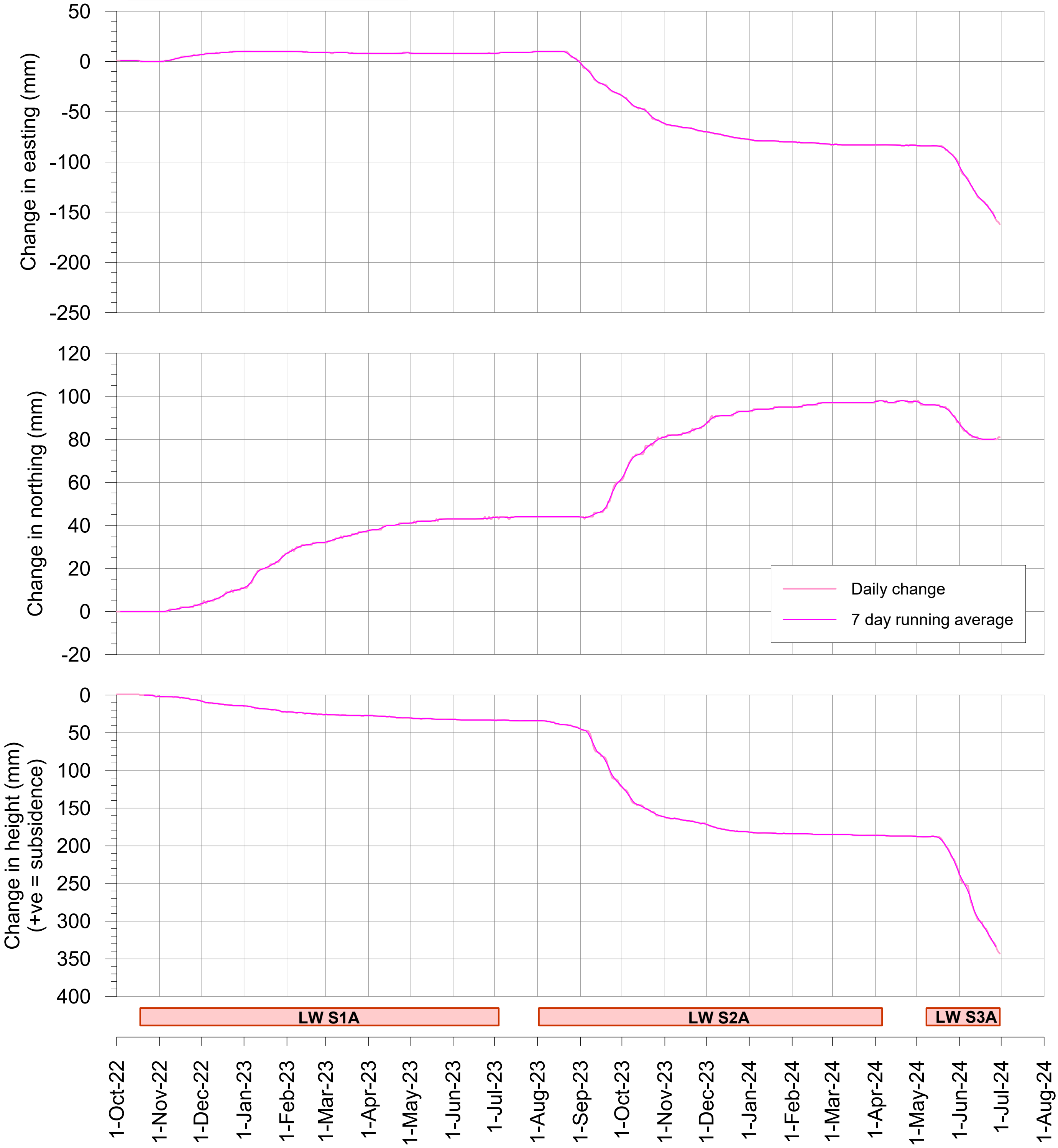
Tahmoor South LW S3A - GNSS Monitoring

Site S07 above LW S2A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S07 GNSS.grf







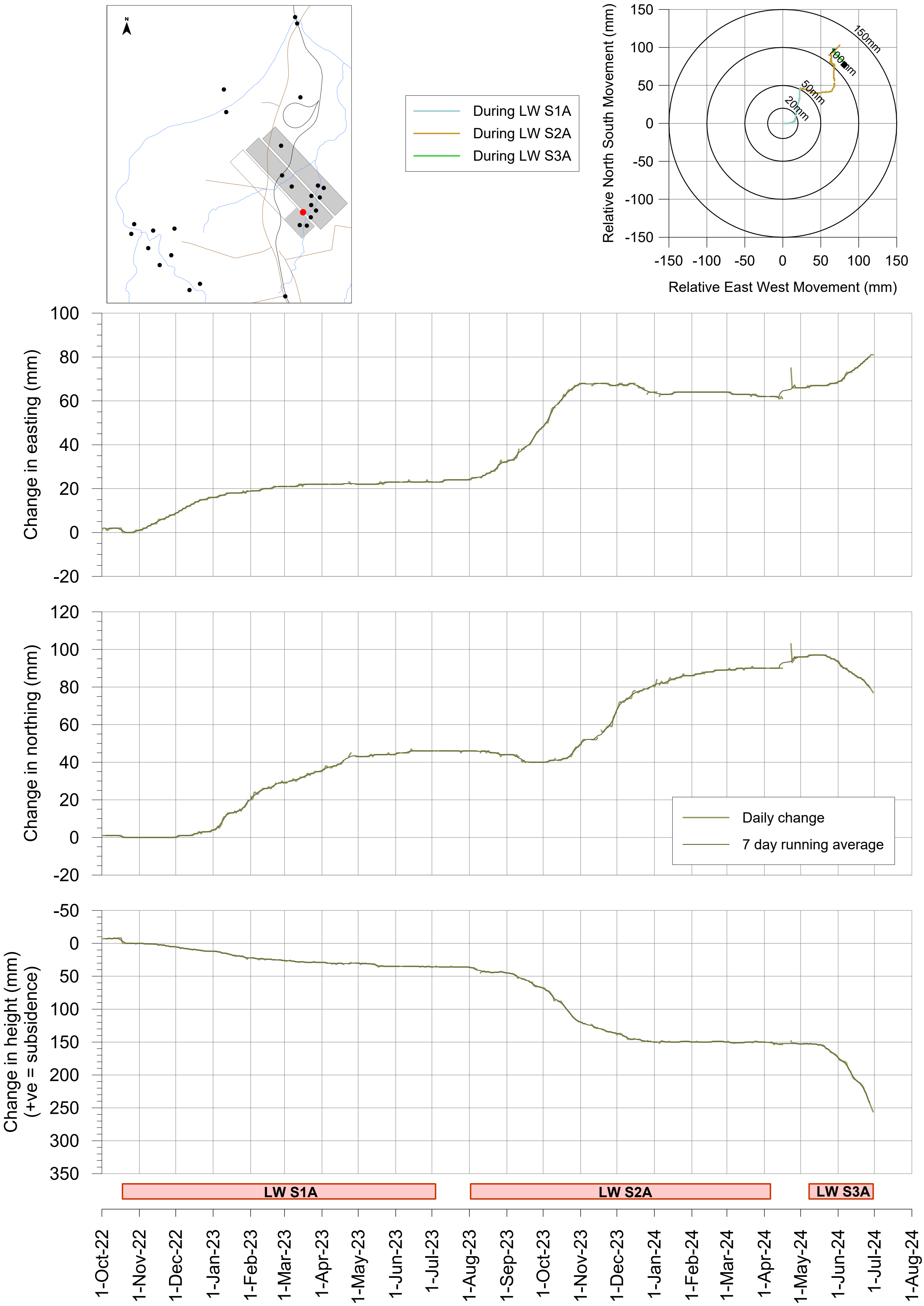
msec

Fig. S07-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S08 between LW S2A and LW S3A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S08 GNSS.grf



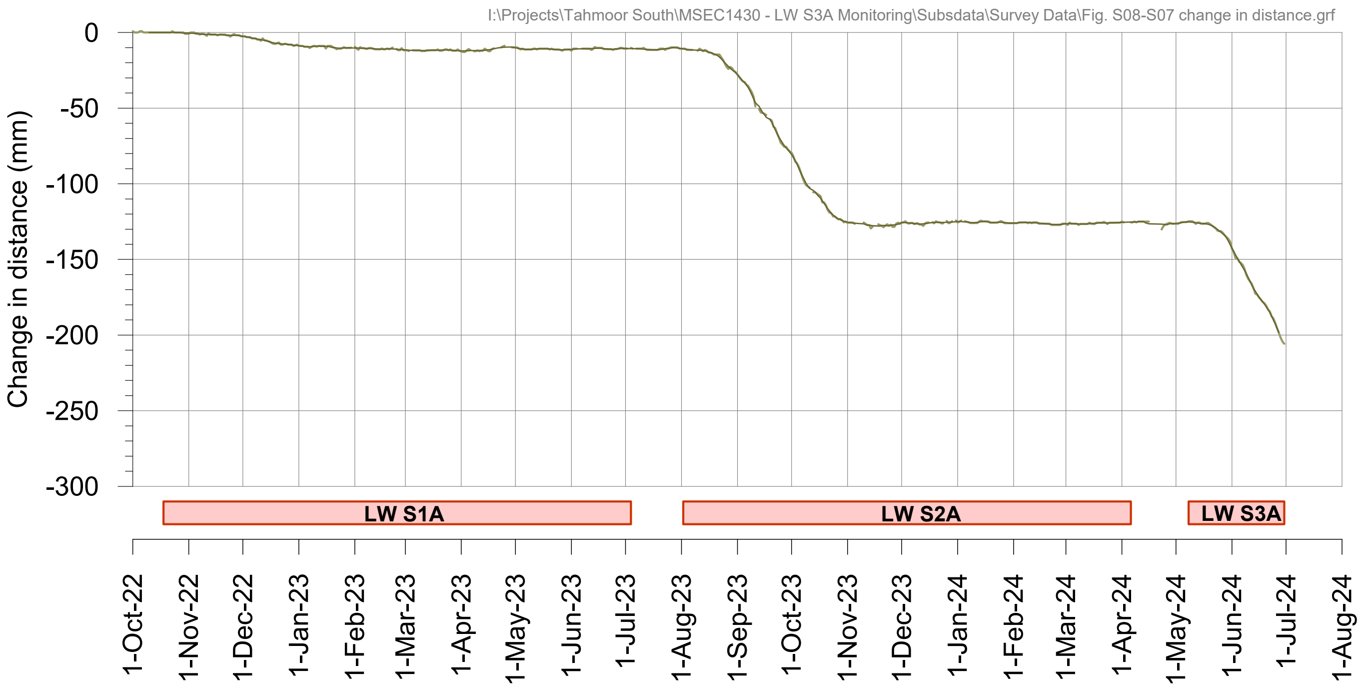
msec

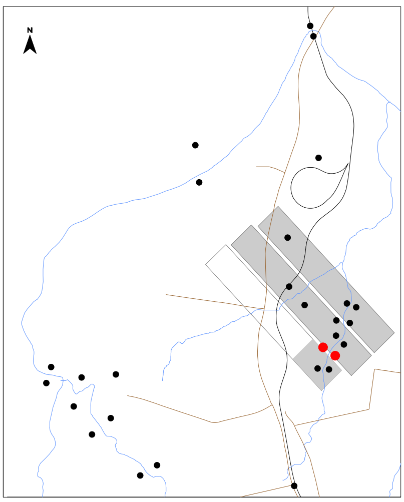
Fig. S08-R05

Tahmoor South LW S3A - GNSS Monitoring

Change in distance across Wirrimbirra Creek

Site S07 above LW S2A and Site S08 between LW S2A and LW S3A



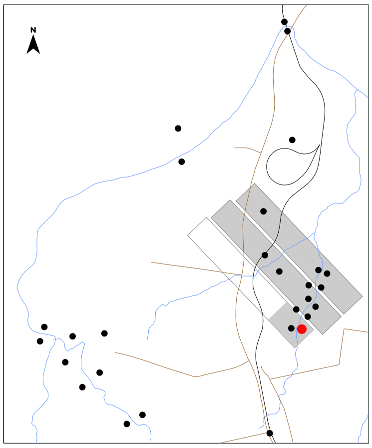


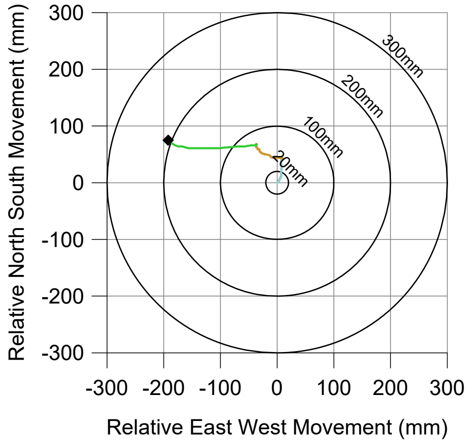
msec

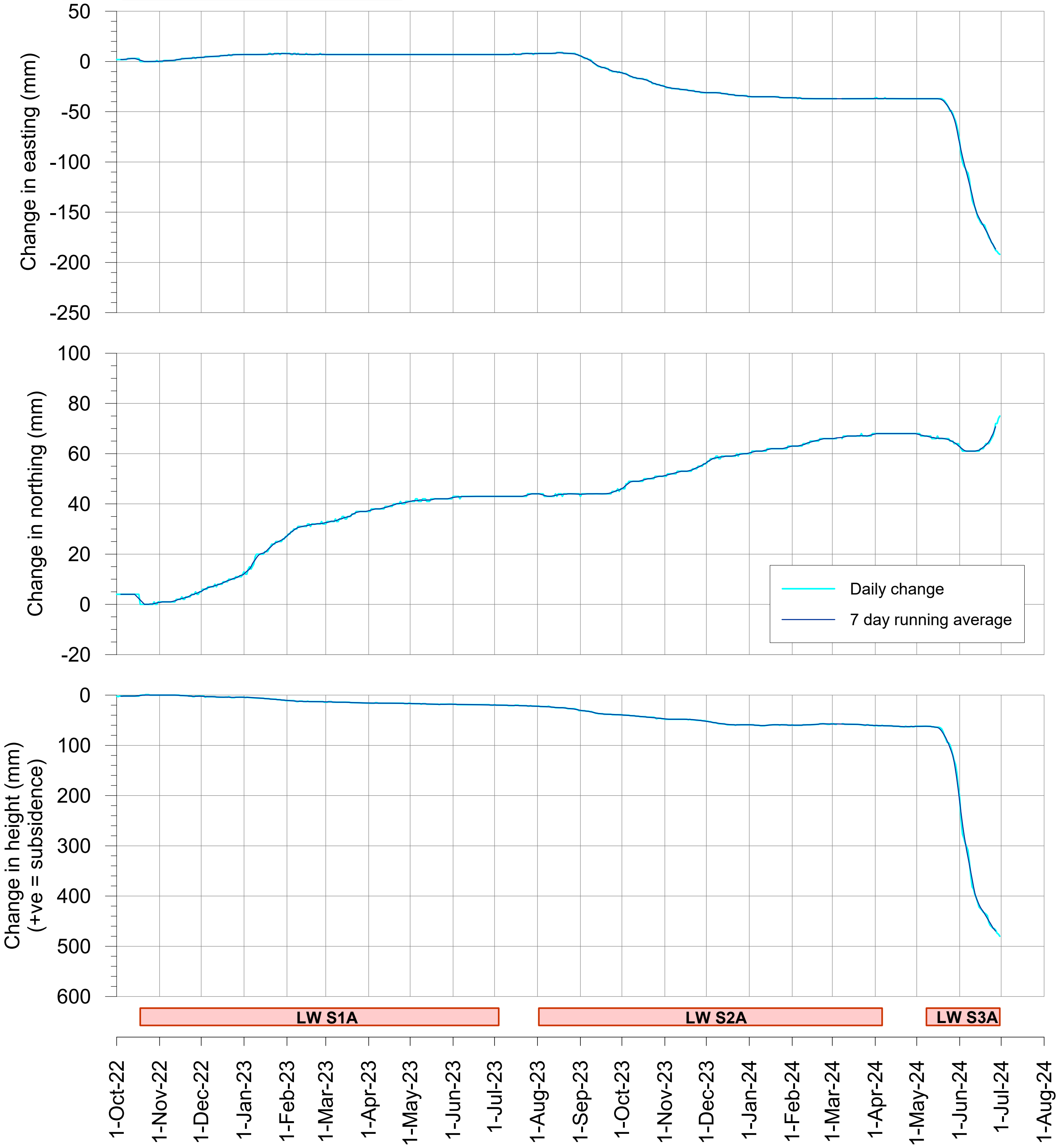
Fig. S07-S08-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S09 above LW S3A at Teatree 2

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S09 GNSS.grf







msec

Fig. S09-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S10 above LW S3A at Teatree 2

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S10 GNSS.grf

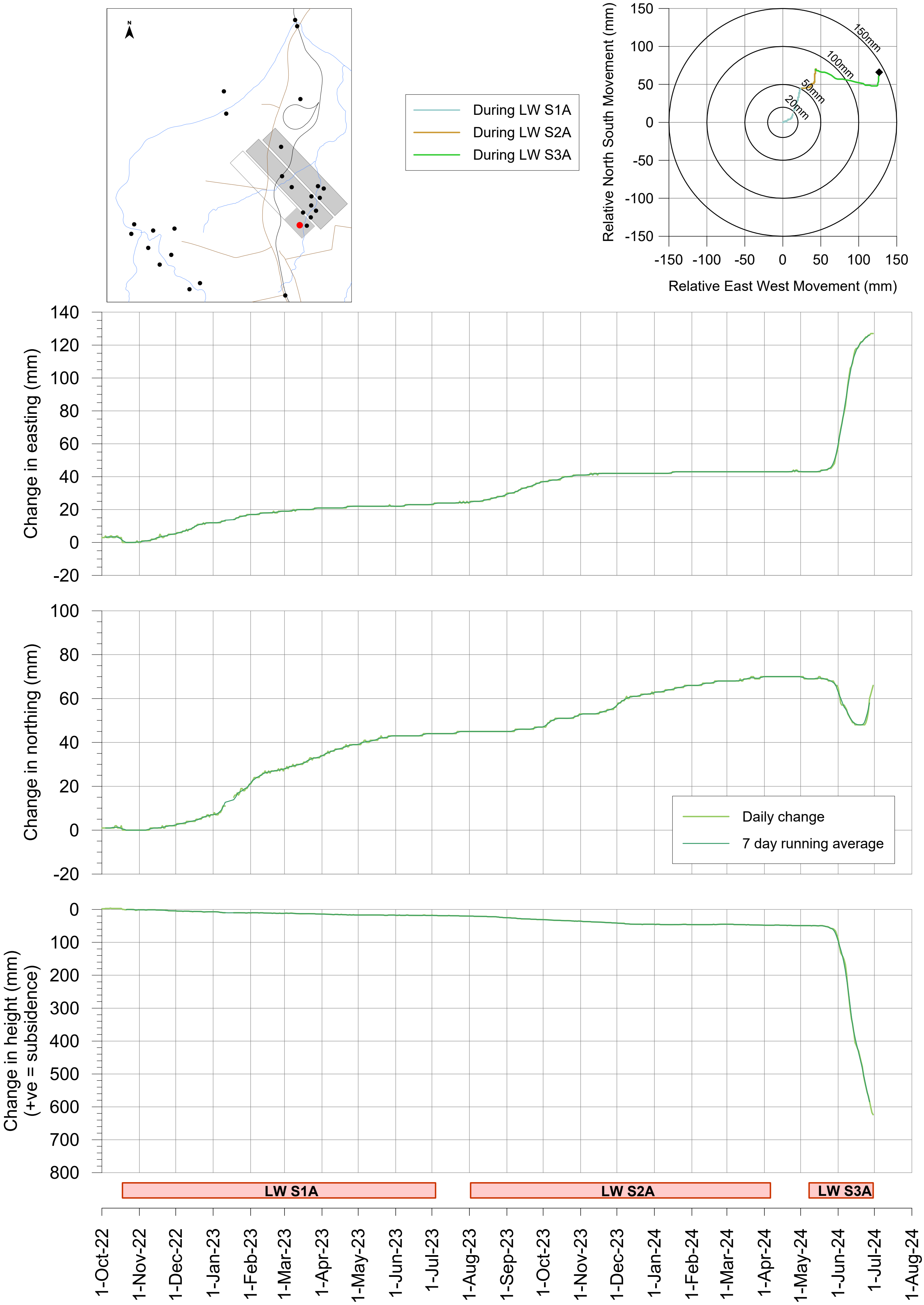
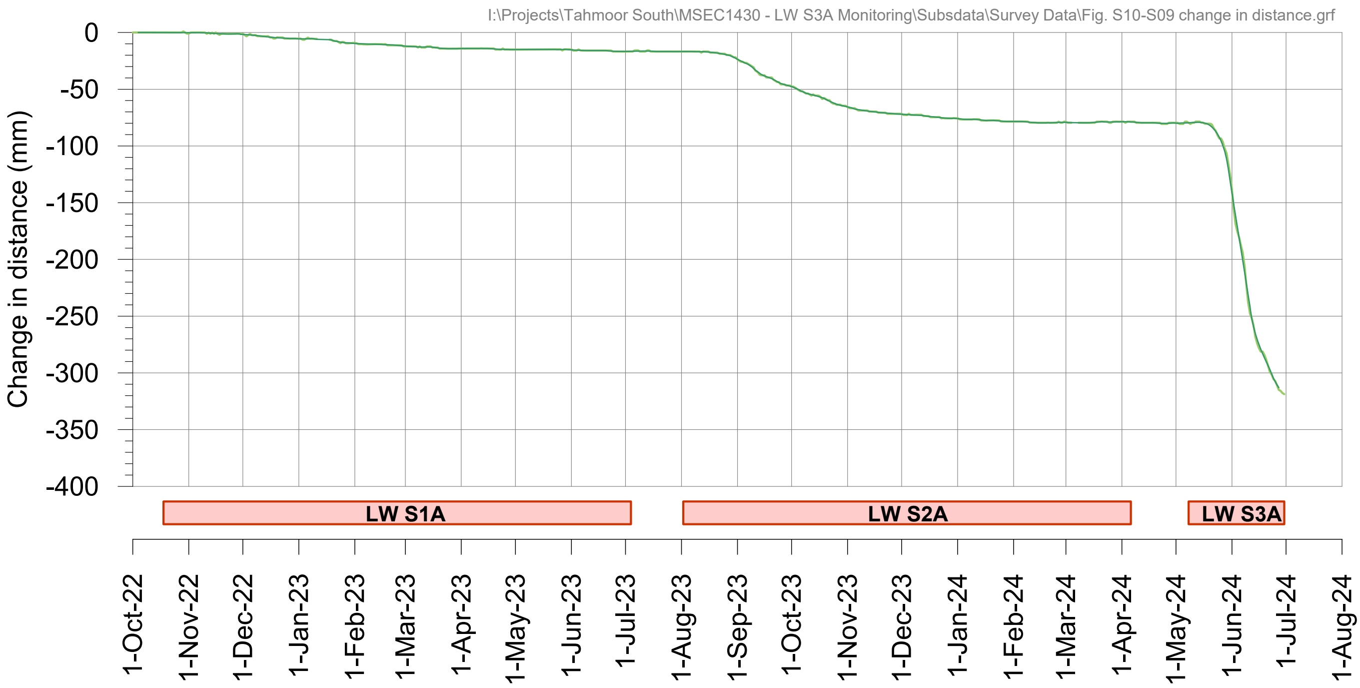
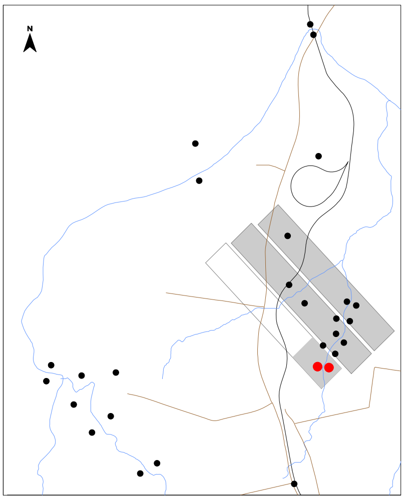


Fig. S10-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Wirrimbirra Creek at Teatree 2
Sites S09 and S10 above LW S3A



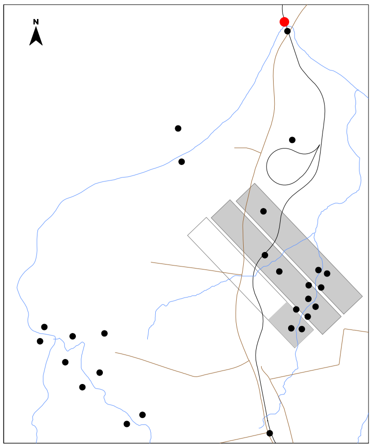


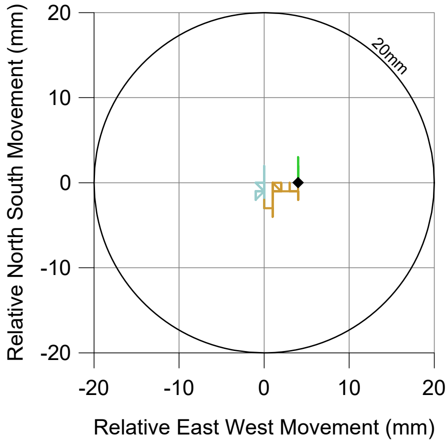
msec

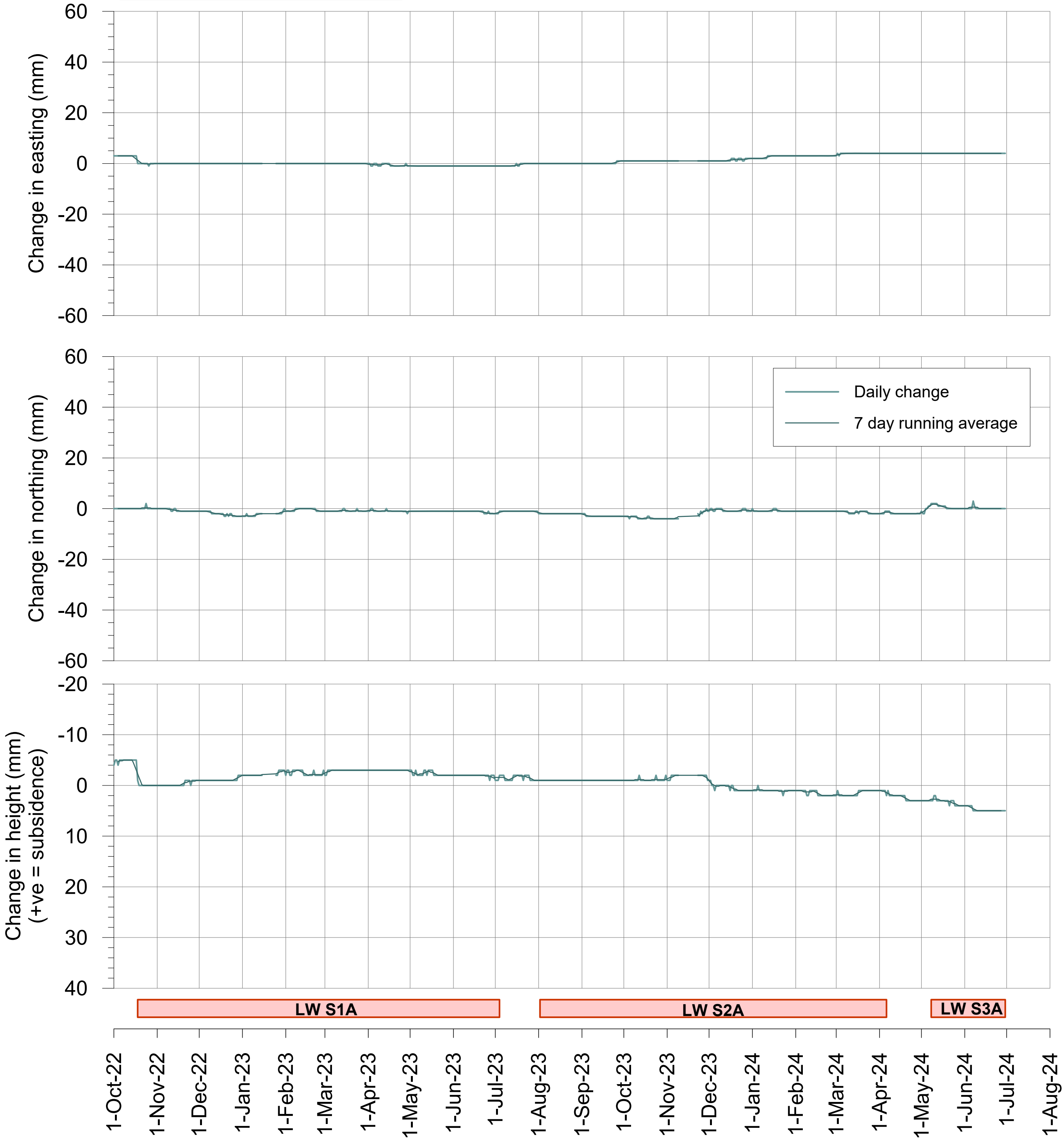
Fig. S09-S10-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S11 at northern end of railway viaduct over Bargo River

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S11 GNSS.grf







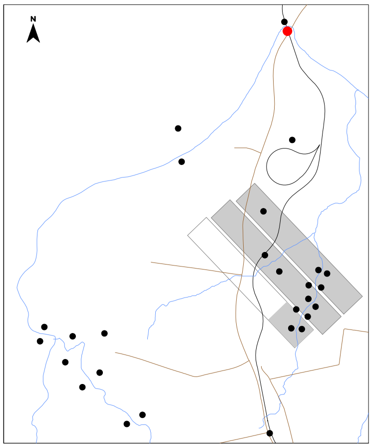
msec

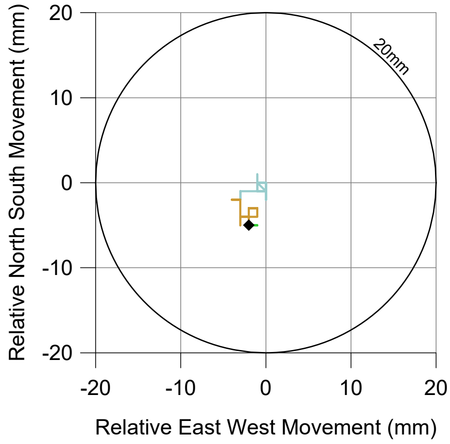
Fig. S11-R05

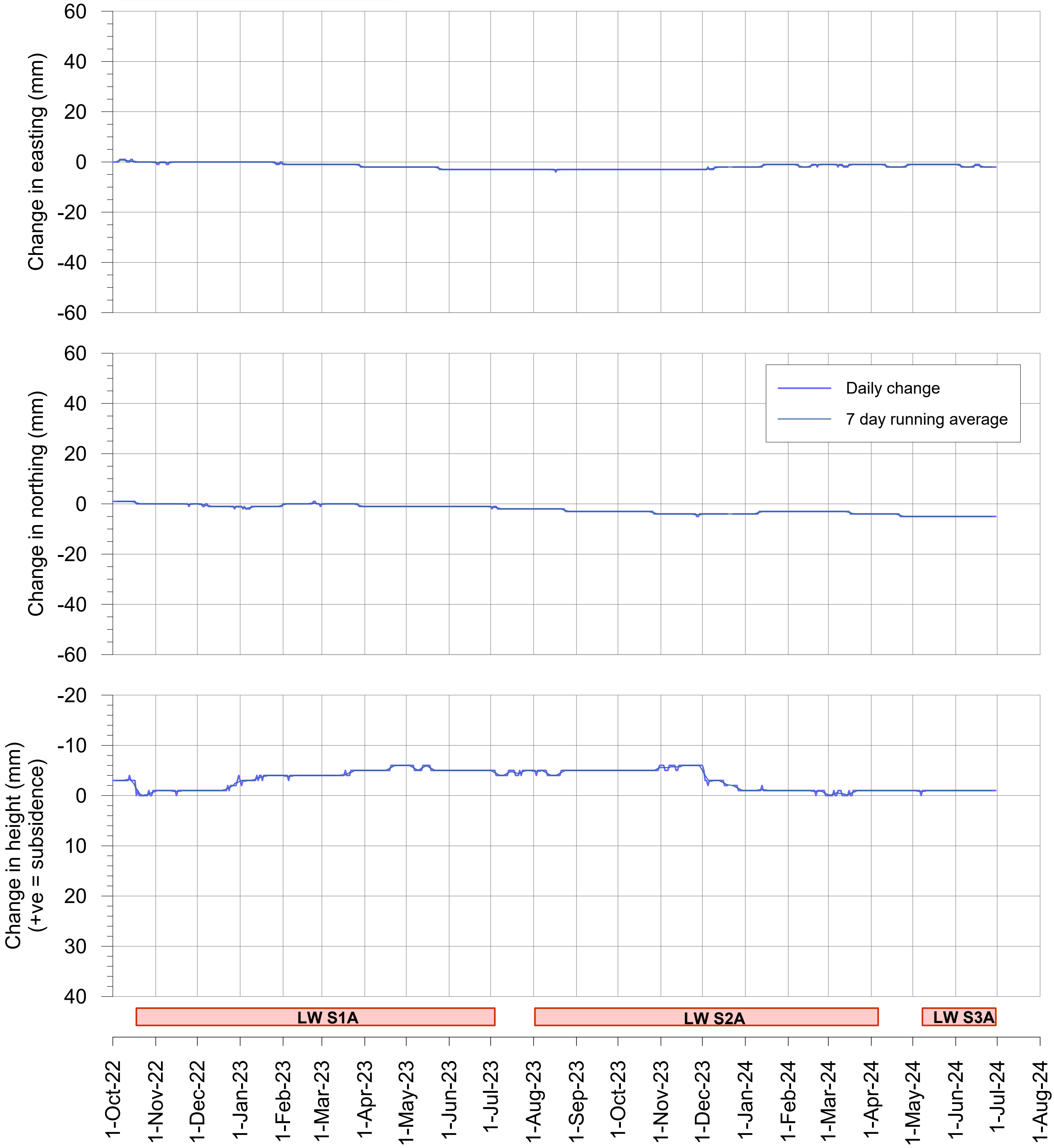
Tahmoor South LW S3A - GNSS Monitoring

Site S12 at southern end of railway viaduct over Bargo River

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S12 GNSS.grf





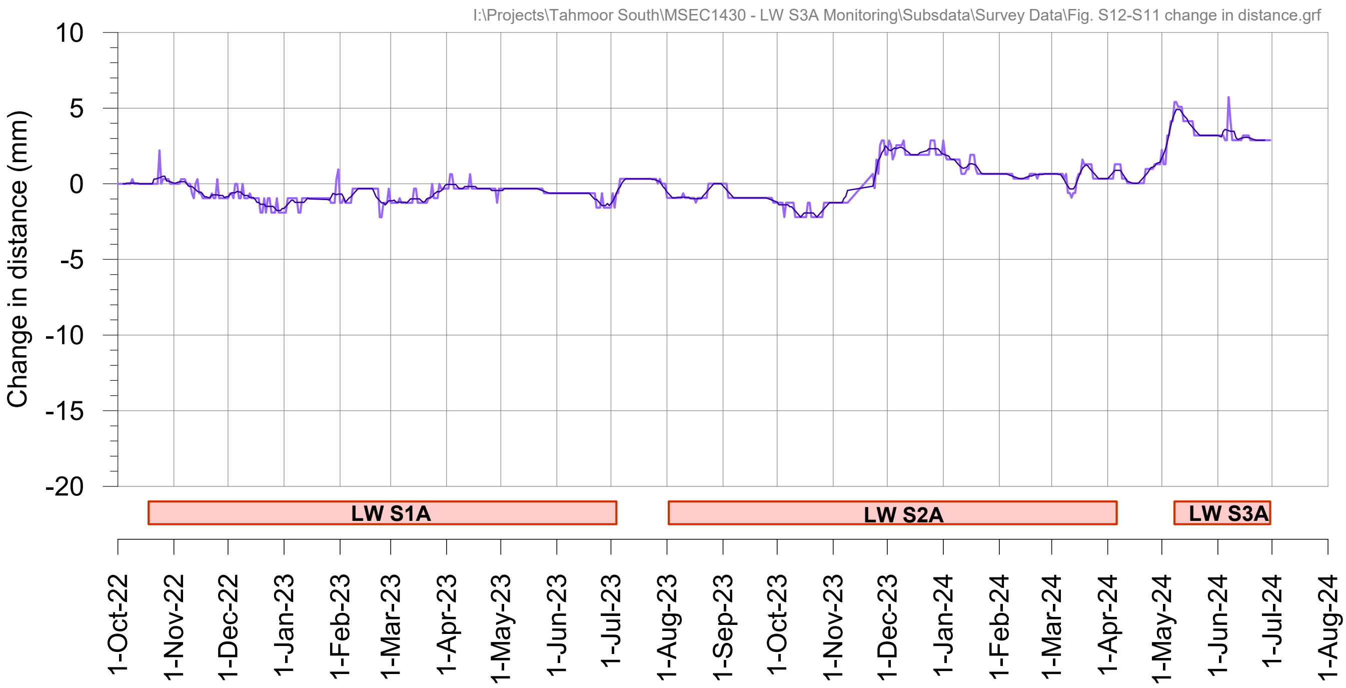


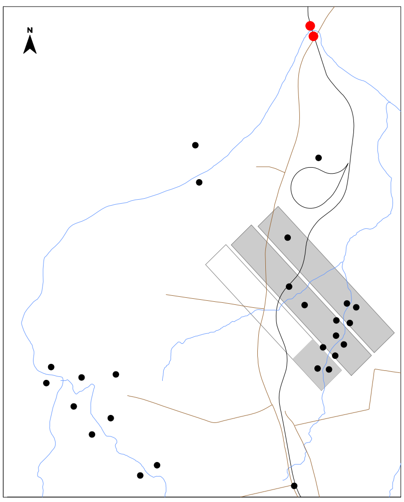
msec

Fig. S12-R05

Tahmoor South LW S3A - GNSS Monitoring

Change in distance across Railway Viaduct over Bargo River
Sites S11 and S12





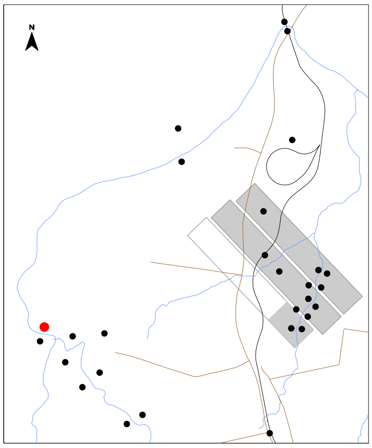
msec

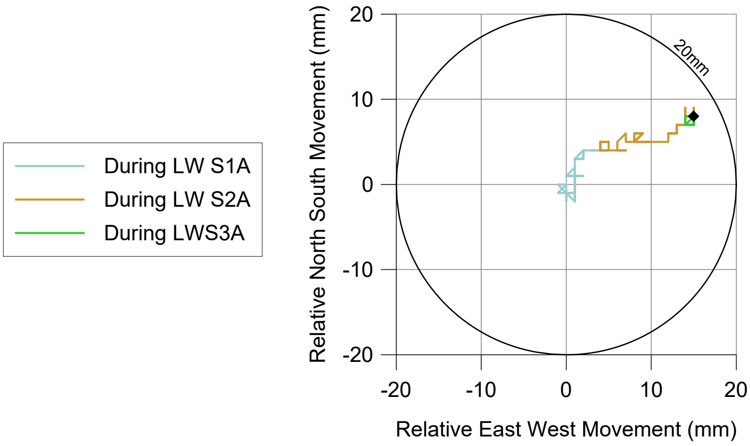
Fig. S11-S12-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S13 on northern side of Picton Weir

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S13 GNSS.grf





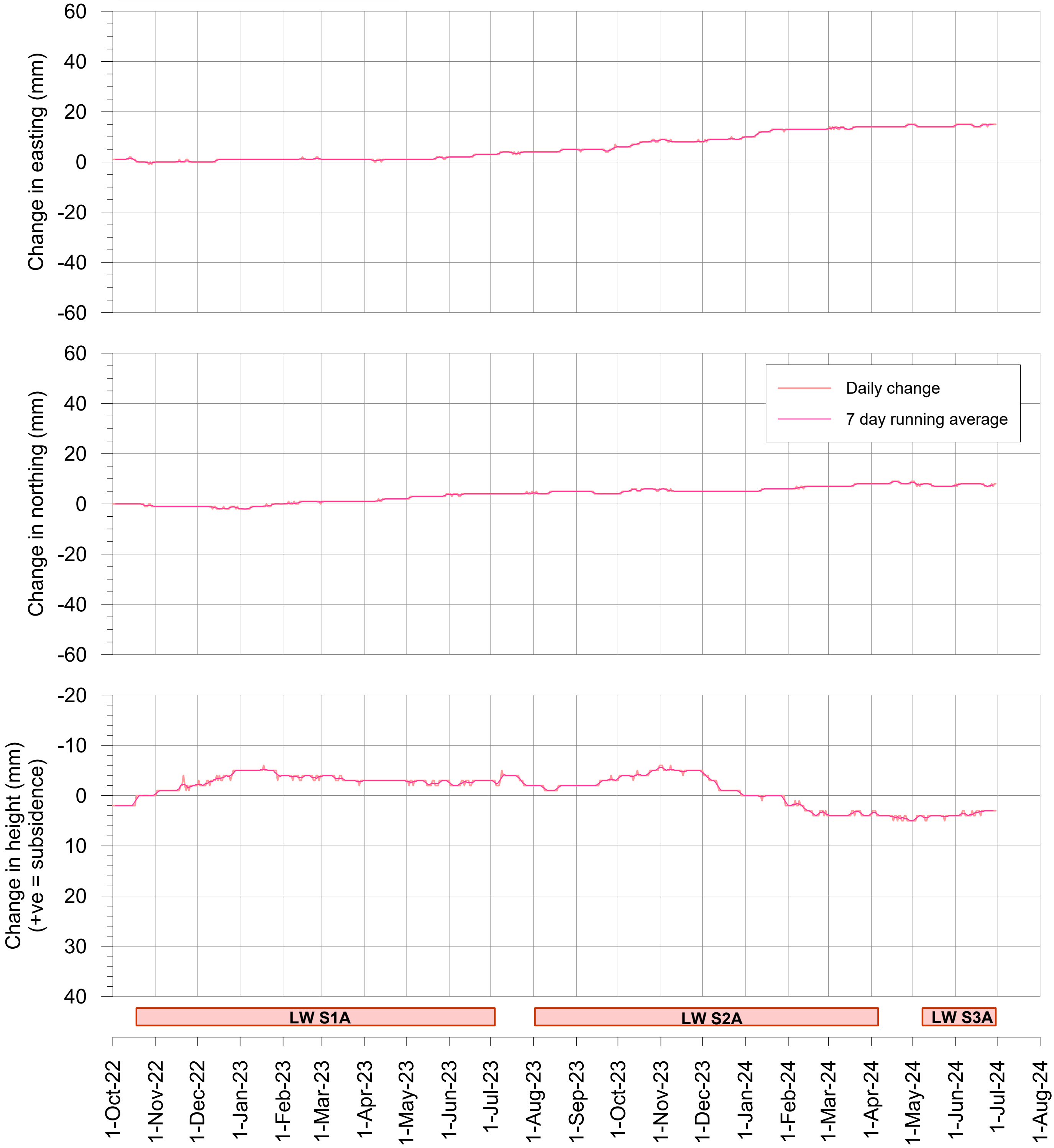
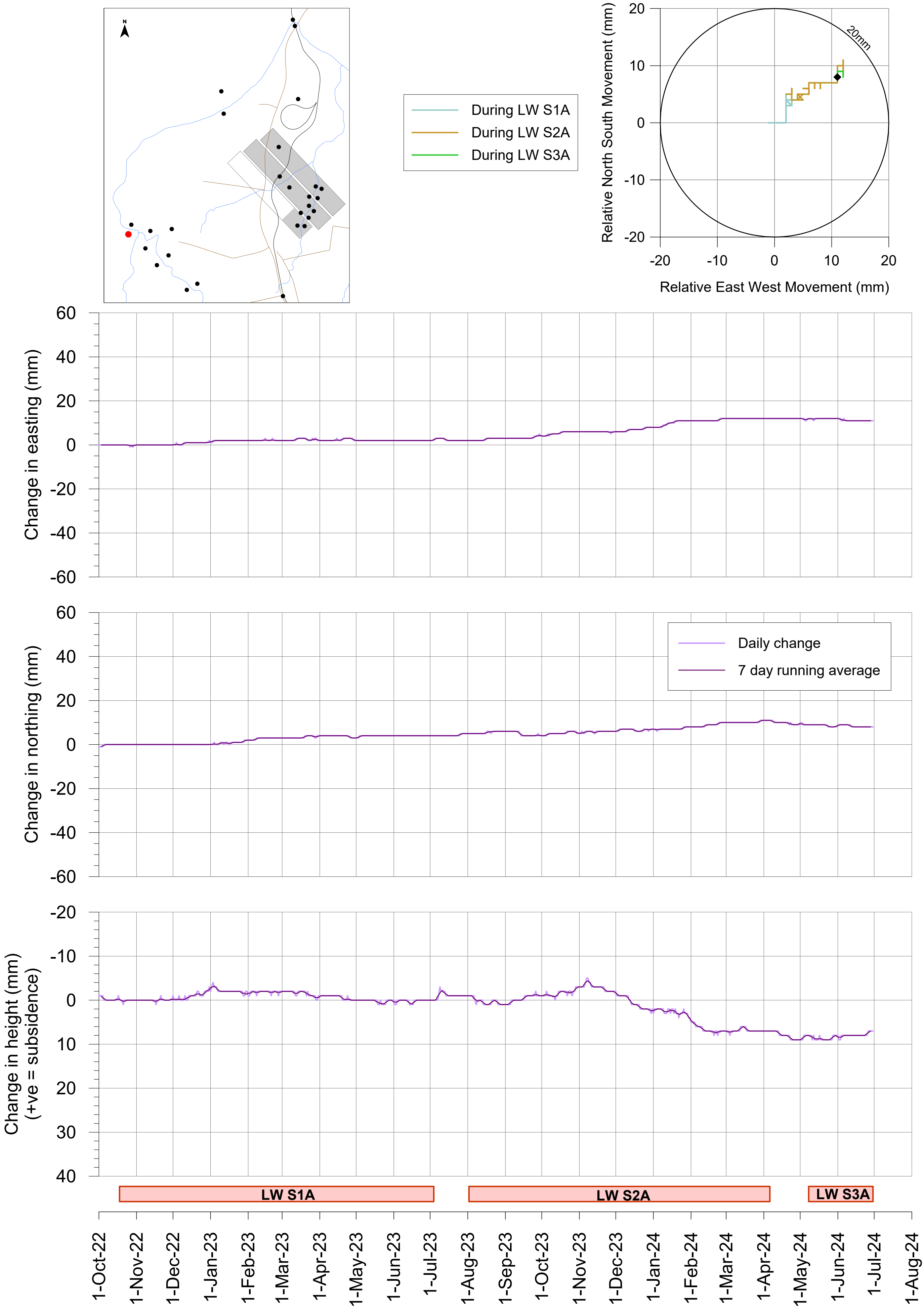


Fig. S13-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S14 on southern side of Picton Weir

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S14 GNSS.grf

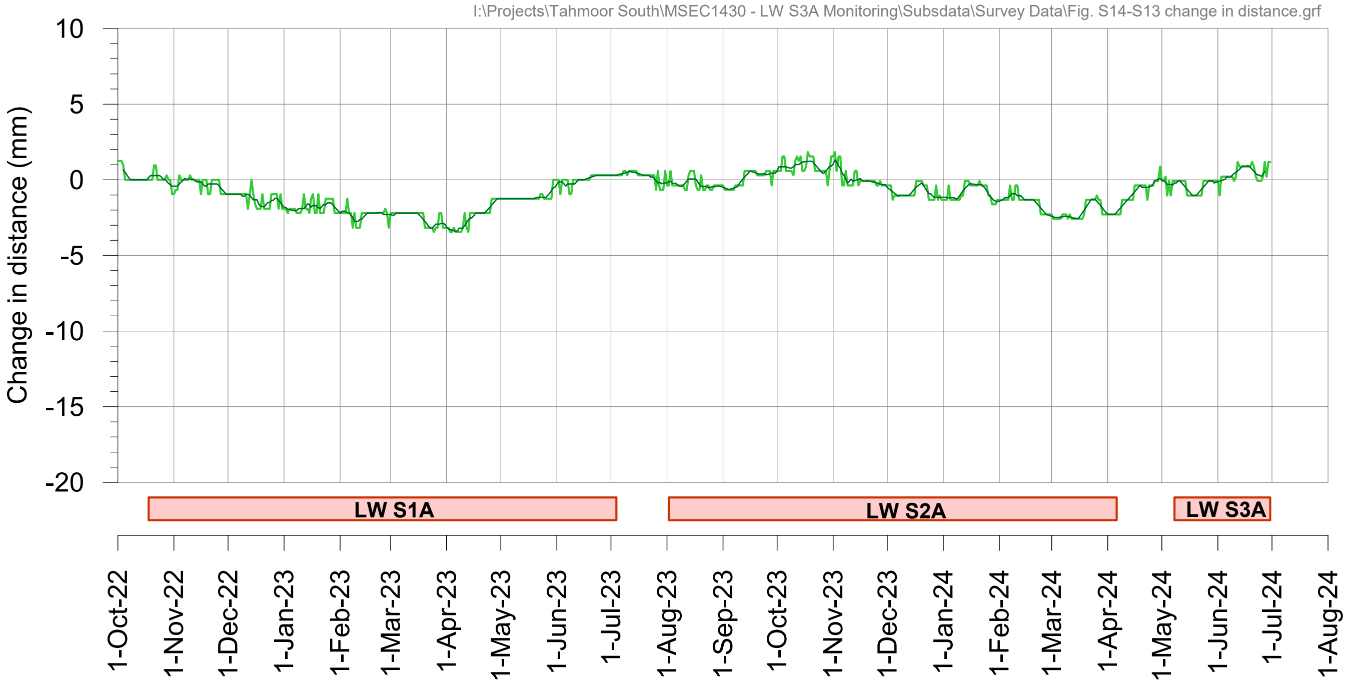


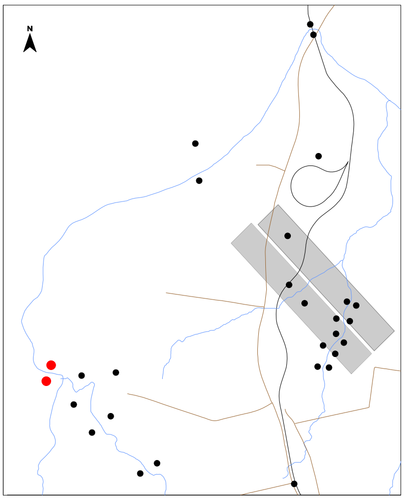
msec

Fig. S14-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Picton Weir
Sites S13 and S14

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S14-S13 change in distance.grf



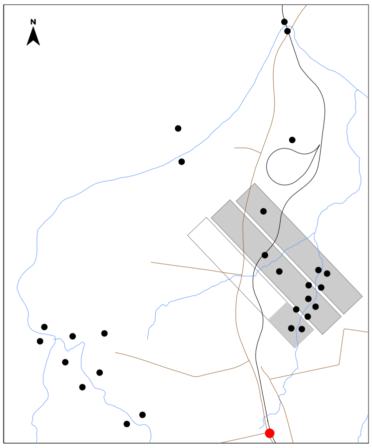


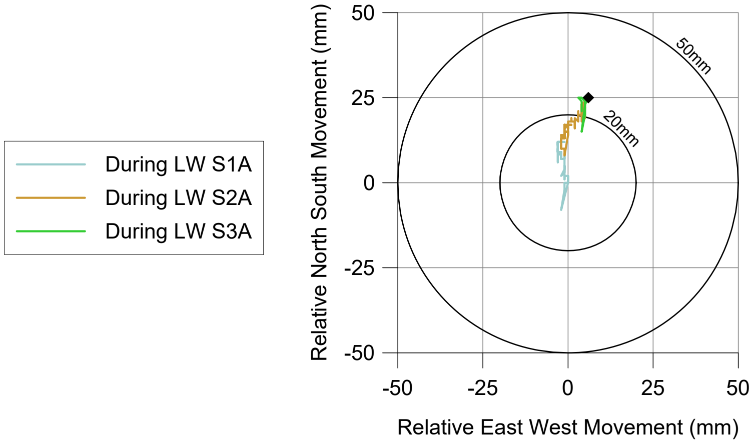
msec

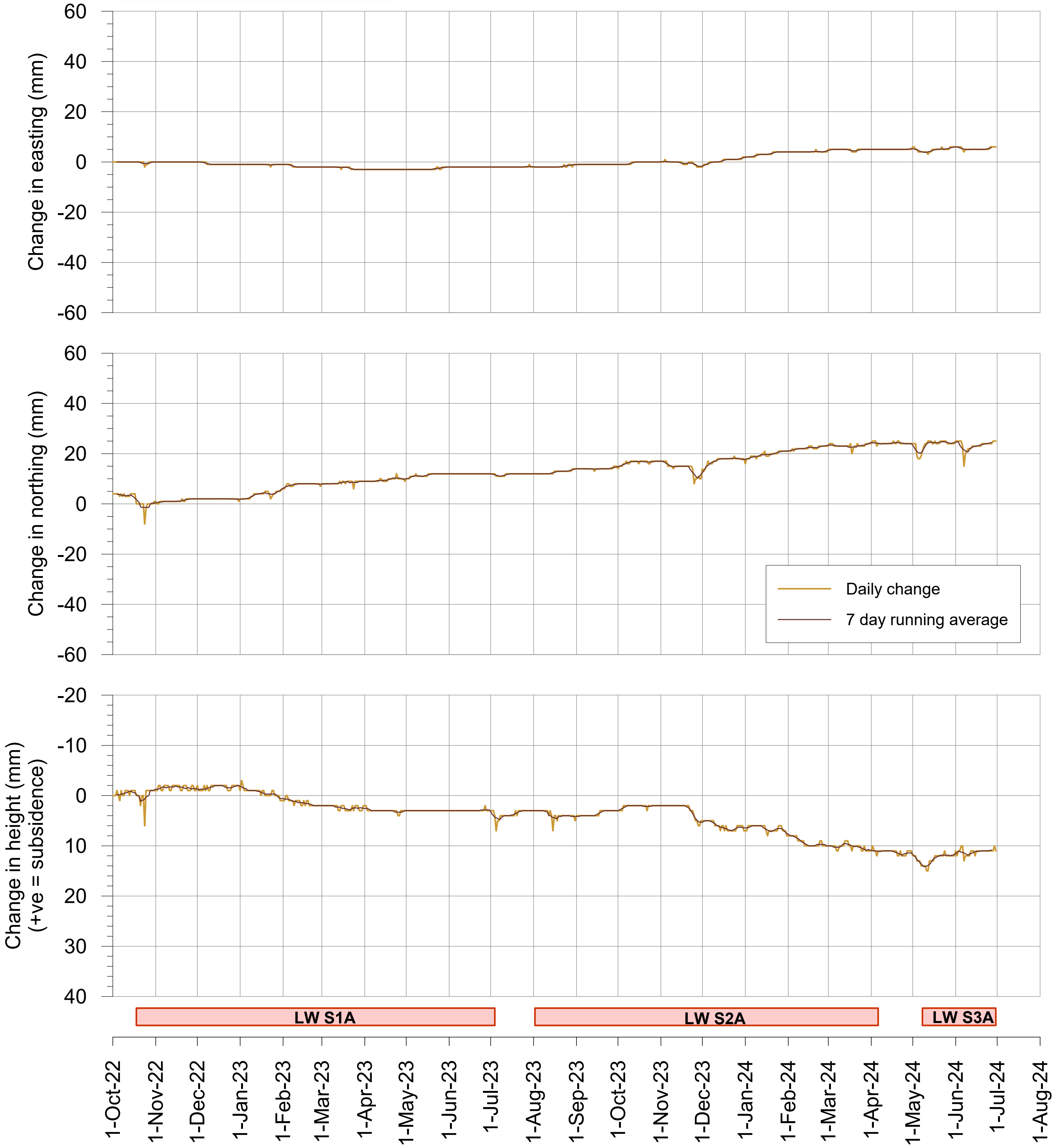
Fig. S13-S14-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S15 at Wellers Road Overbridge

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S15 GNSS.grf







msec

Fig. S15-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S16 at Tahmoor Mine site

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S16 GNSS.grf

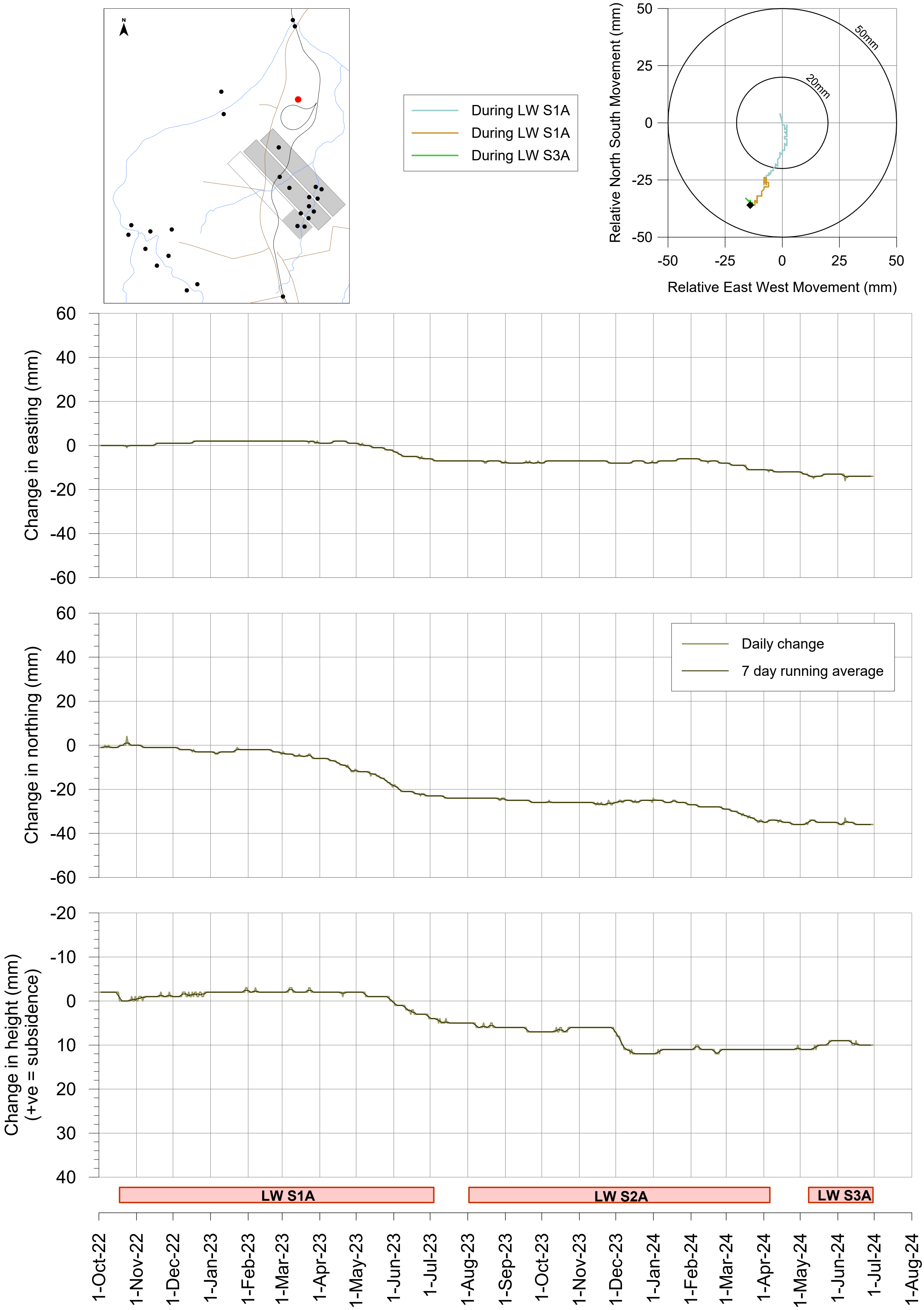
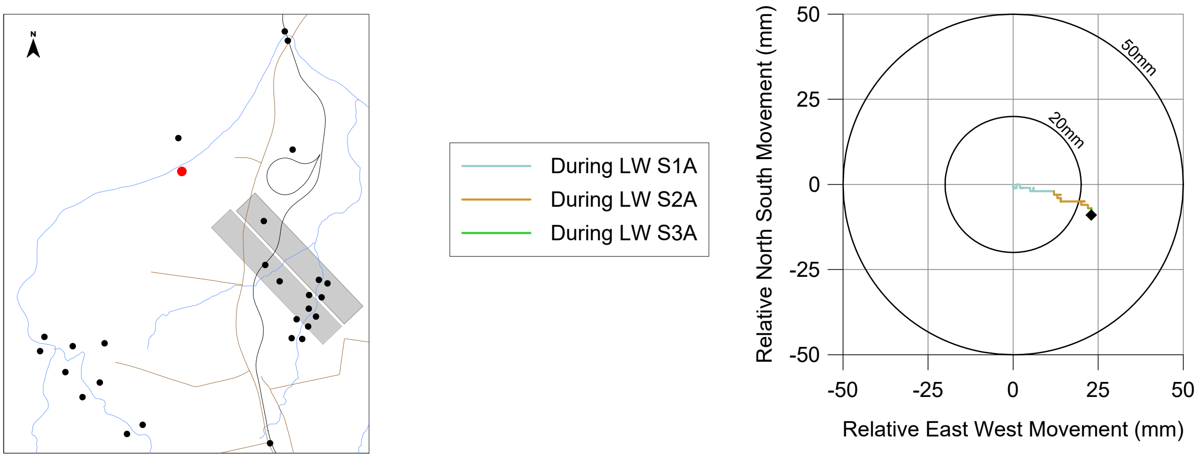


Fig. S16-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S17 on east bank of Bargo River

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S17 GNSS.grf



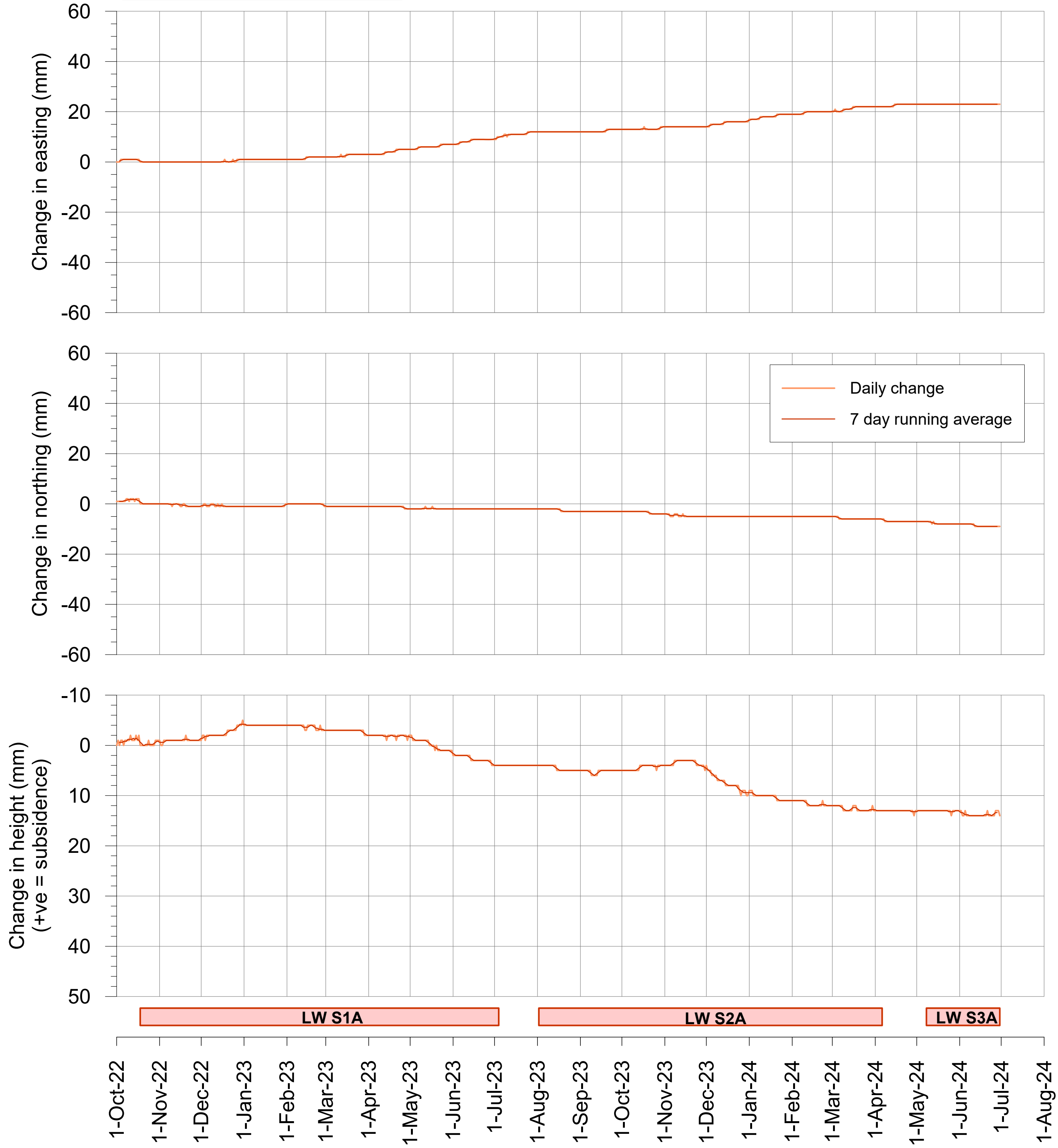
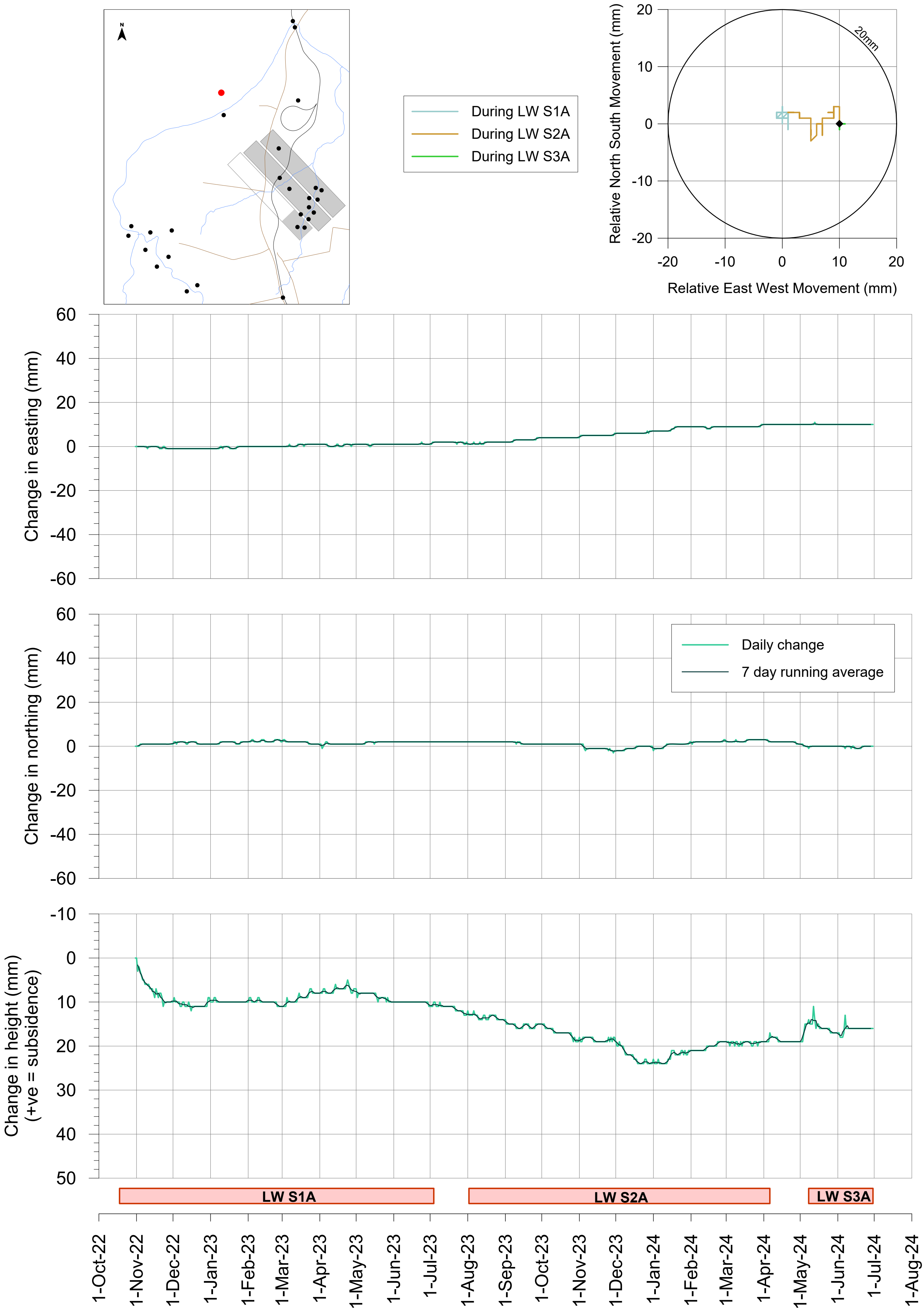


Fig. S17-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S18 on west bank of Bargo River

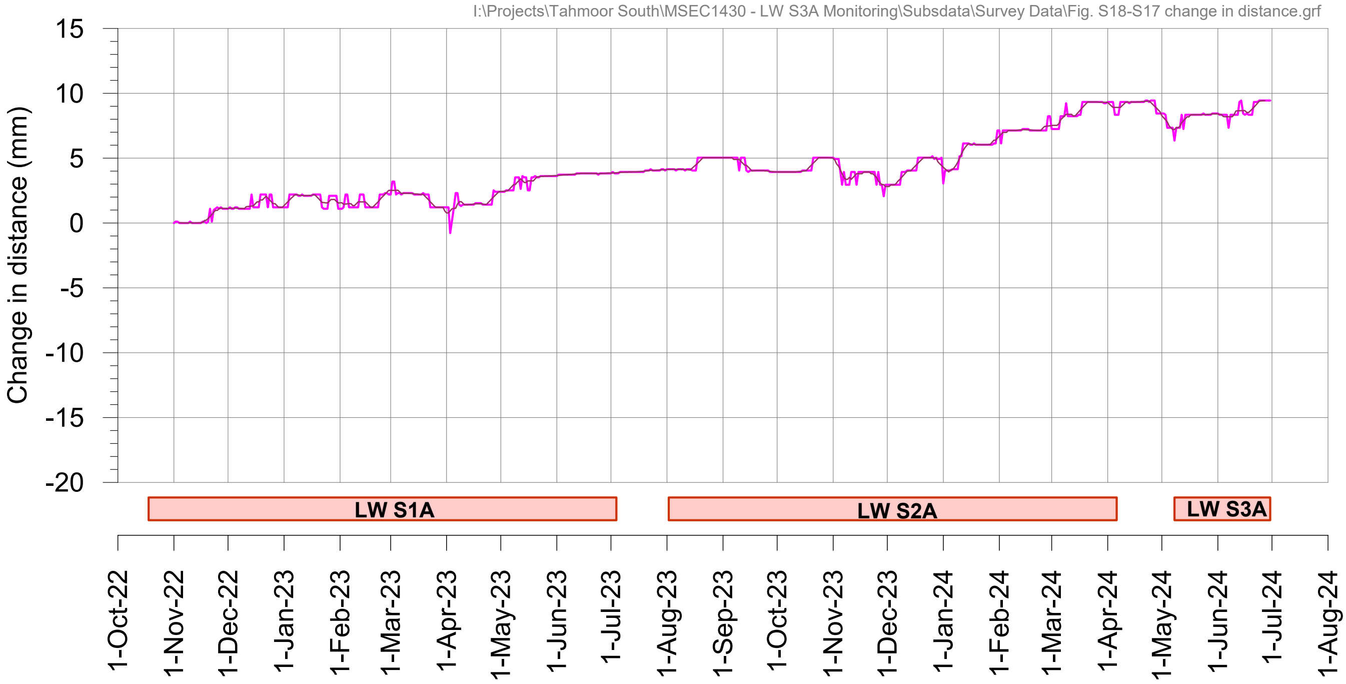
I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S18 GNSS.grf

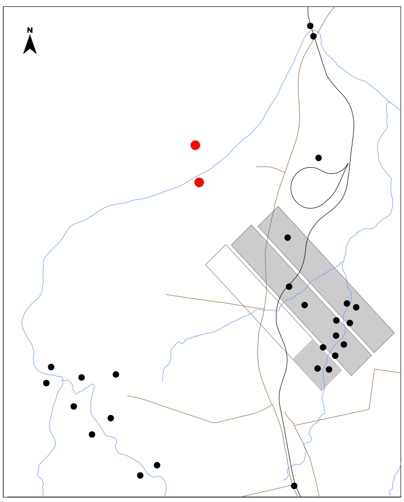


msec

Fig. S18-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Bargo River
Sites S17 and S18





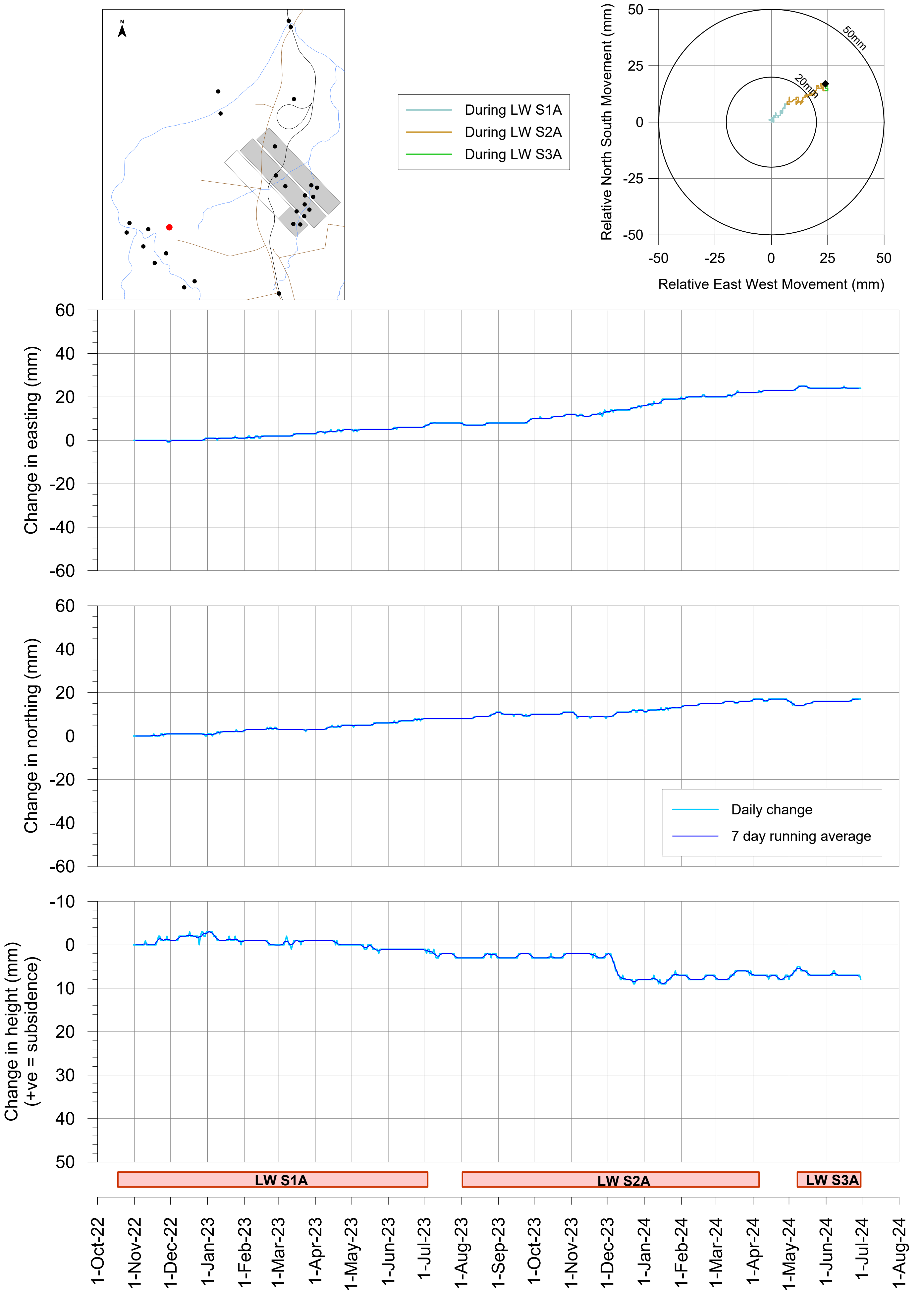
msec

Fig. S17-S18-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S19 near Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S19 GNSS.grf



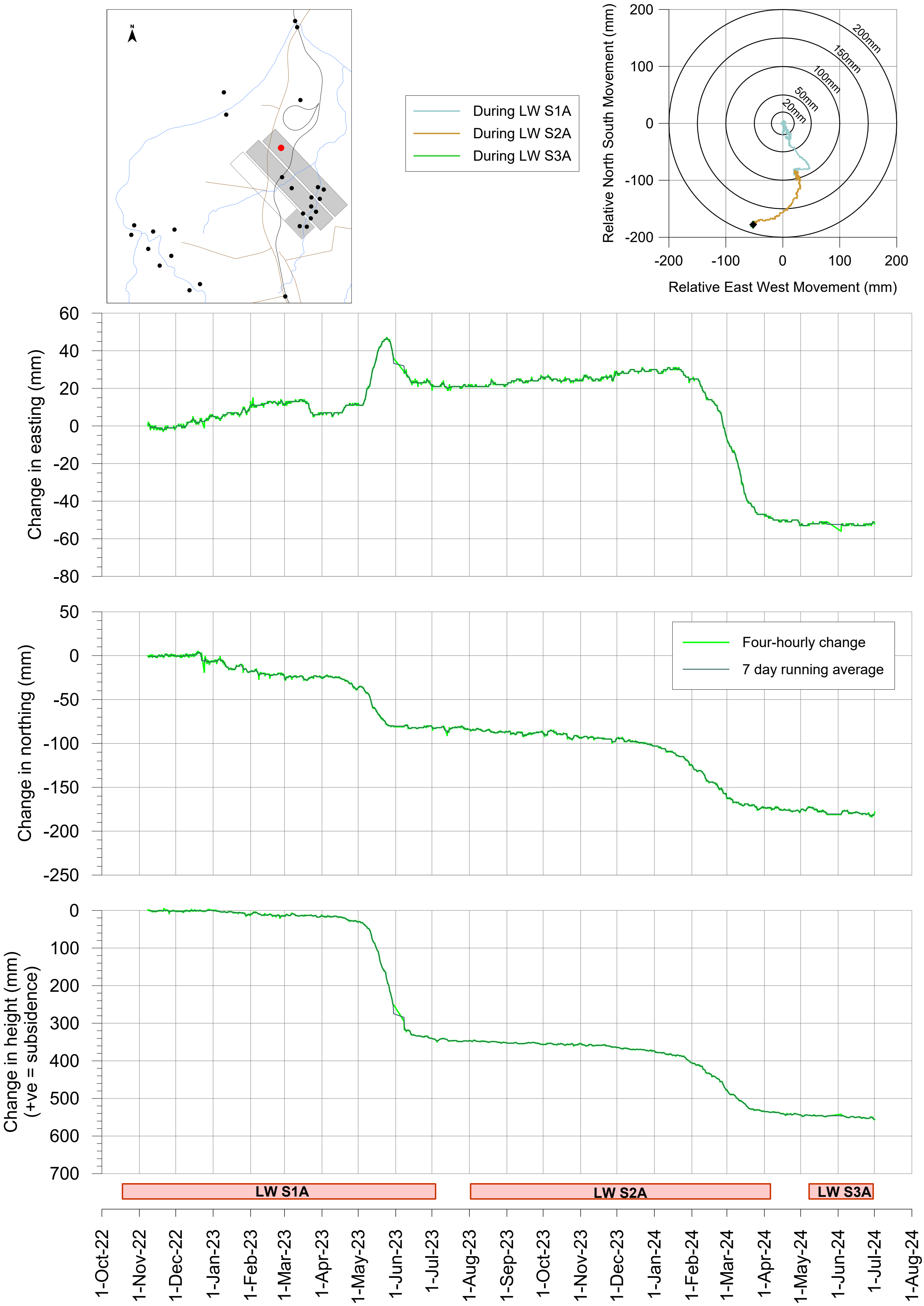
msec

Fig. S19-R05

Tahmoor South LW S3A - GNSS Monitoring

Gantry at Tahmoor Mine site

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. TM GNSS gantry.grf

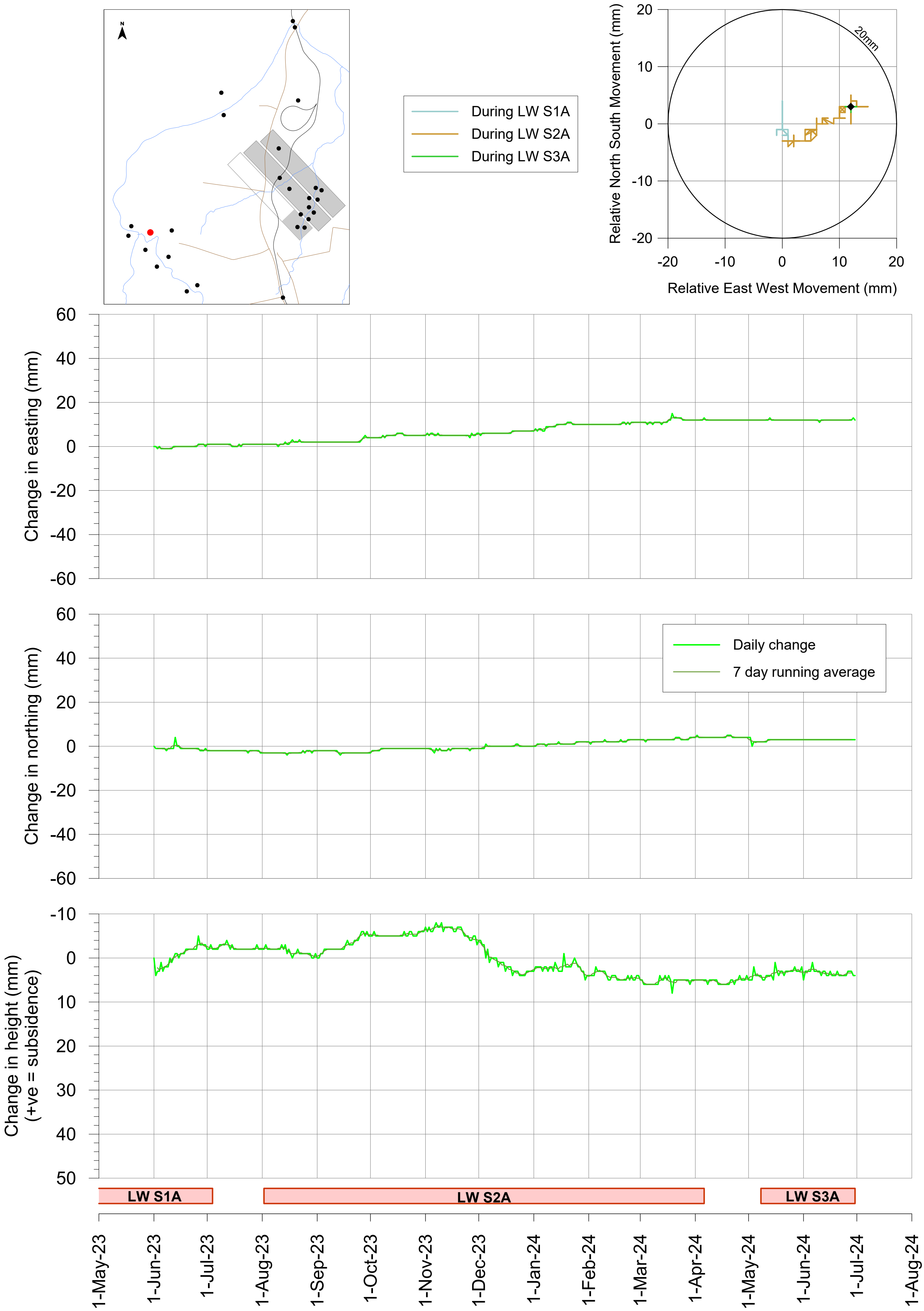


msec

Fig. TM-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S20 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S20 GNSS.grf

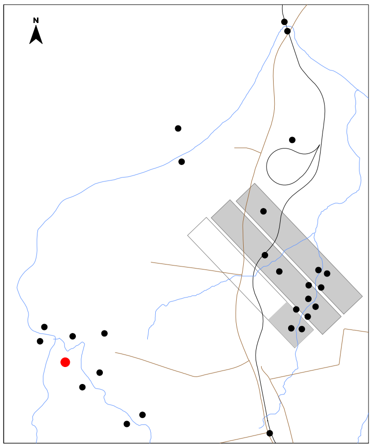


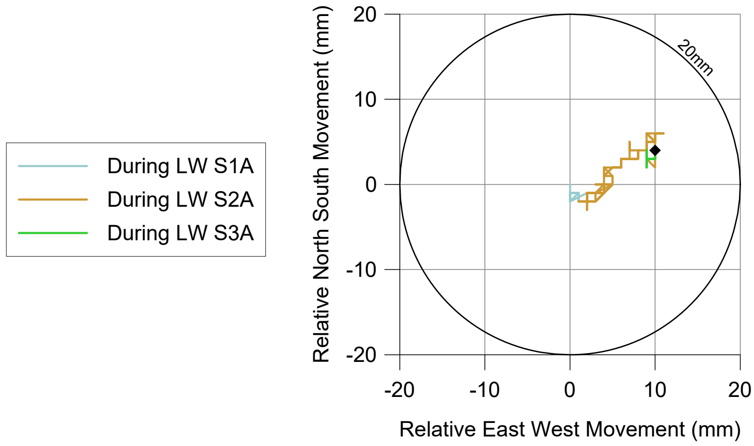
msec

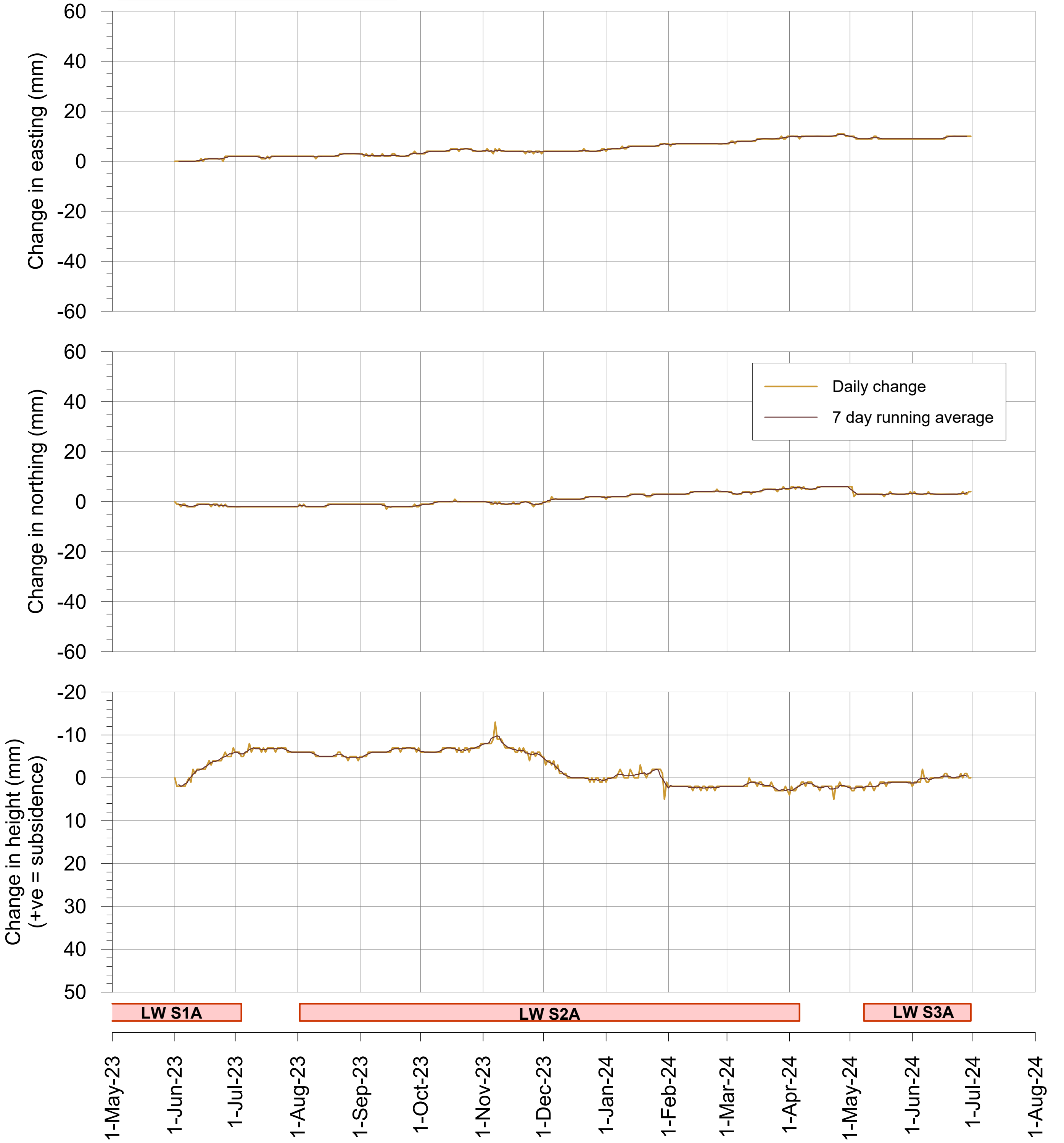
Fig. S20-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S21 on southern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S21 GNSS.grf



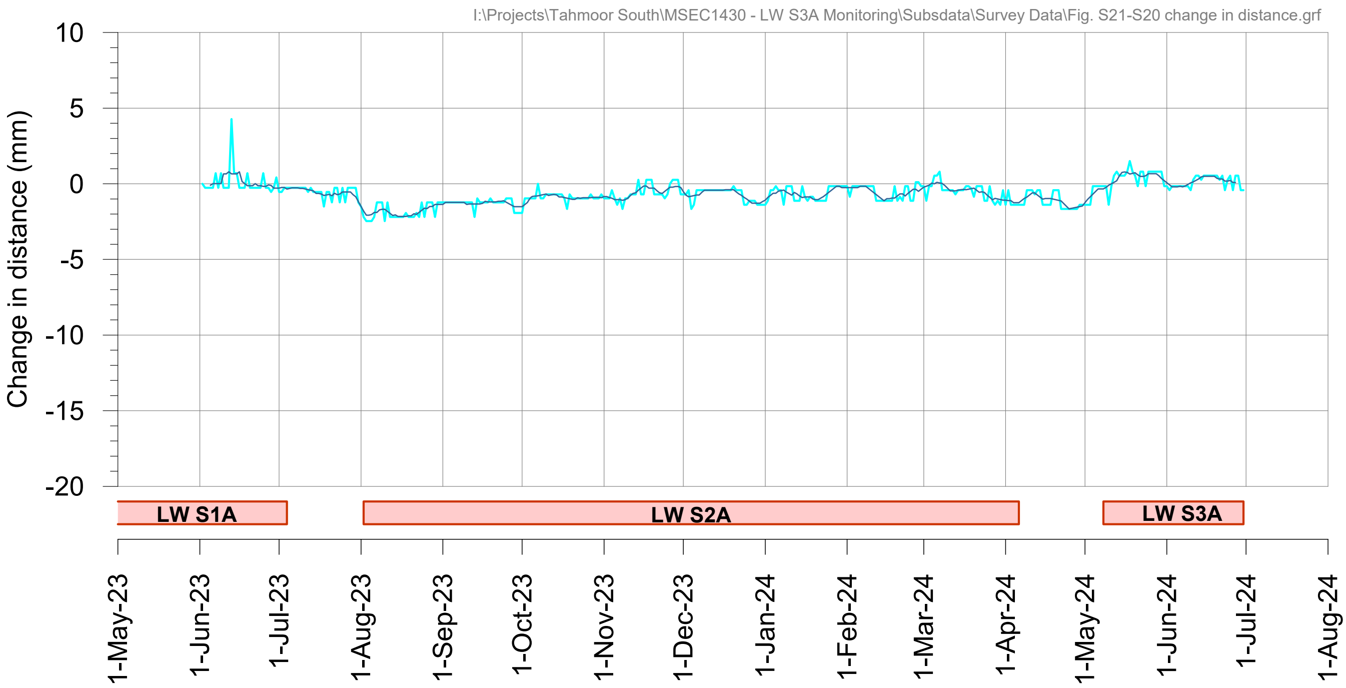




msec

Fig. S21-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S20 and S21



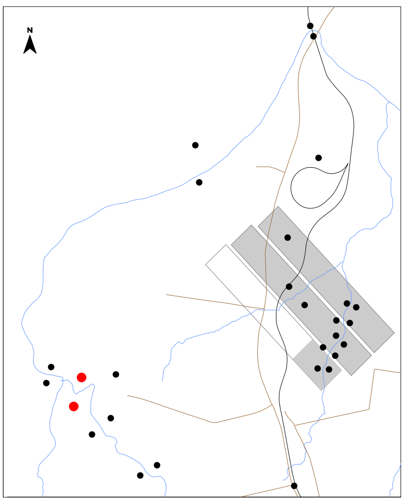


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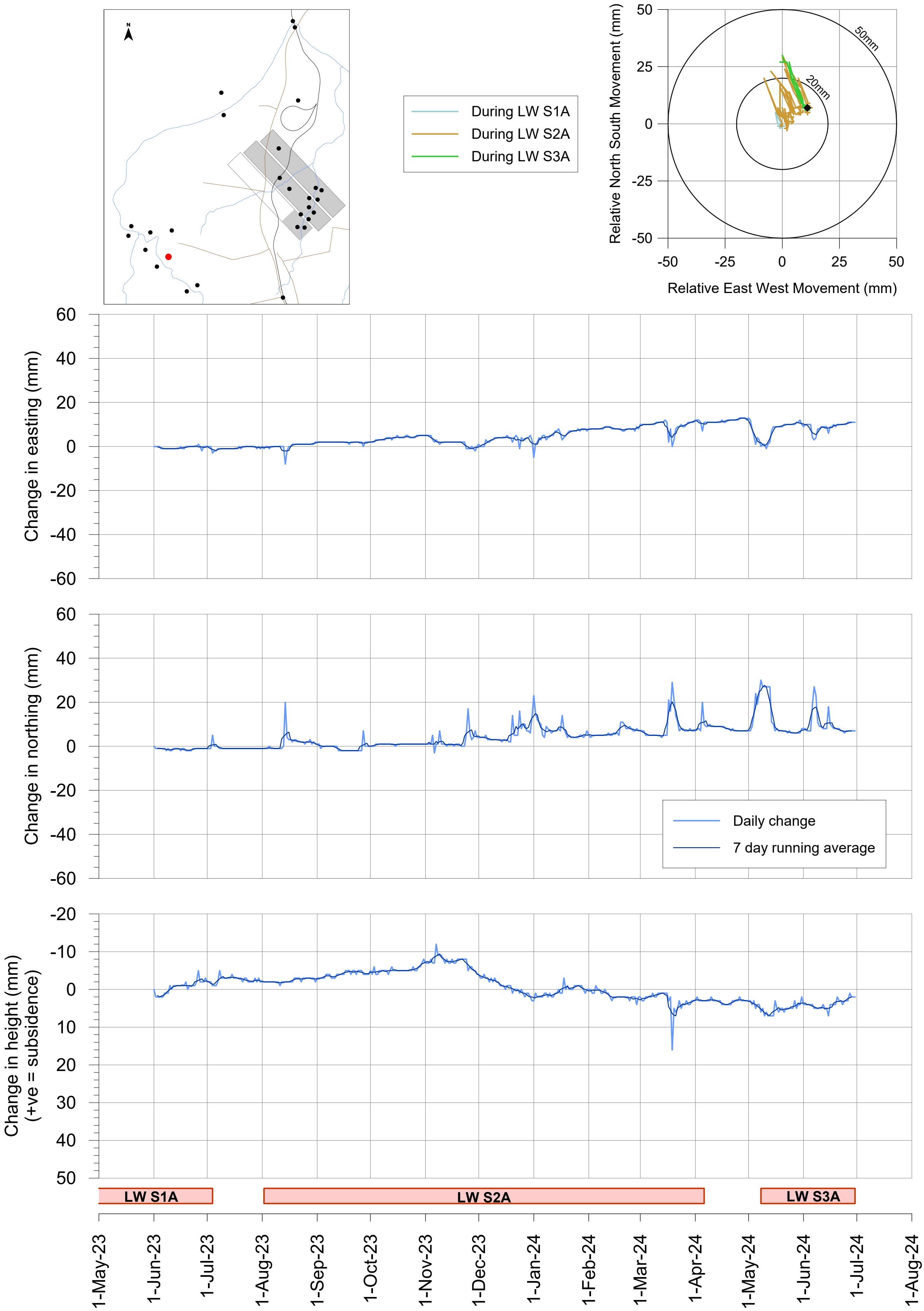
Fig. S20-S21-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S22 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S22 GNSS.grf



msec

Fig. S22-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S23 on southern side of Hornes Creek

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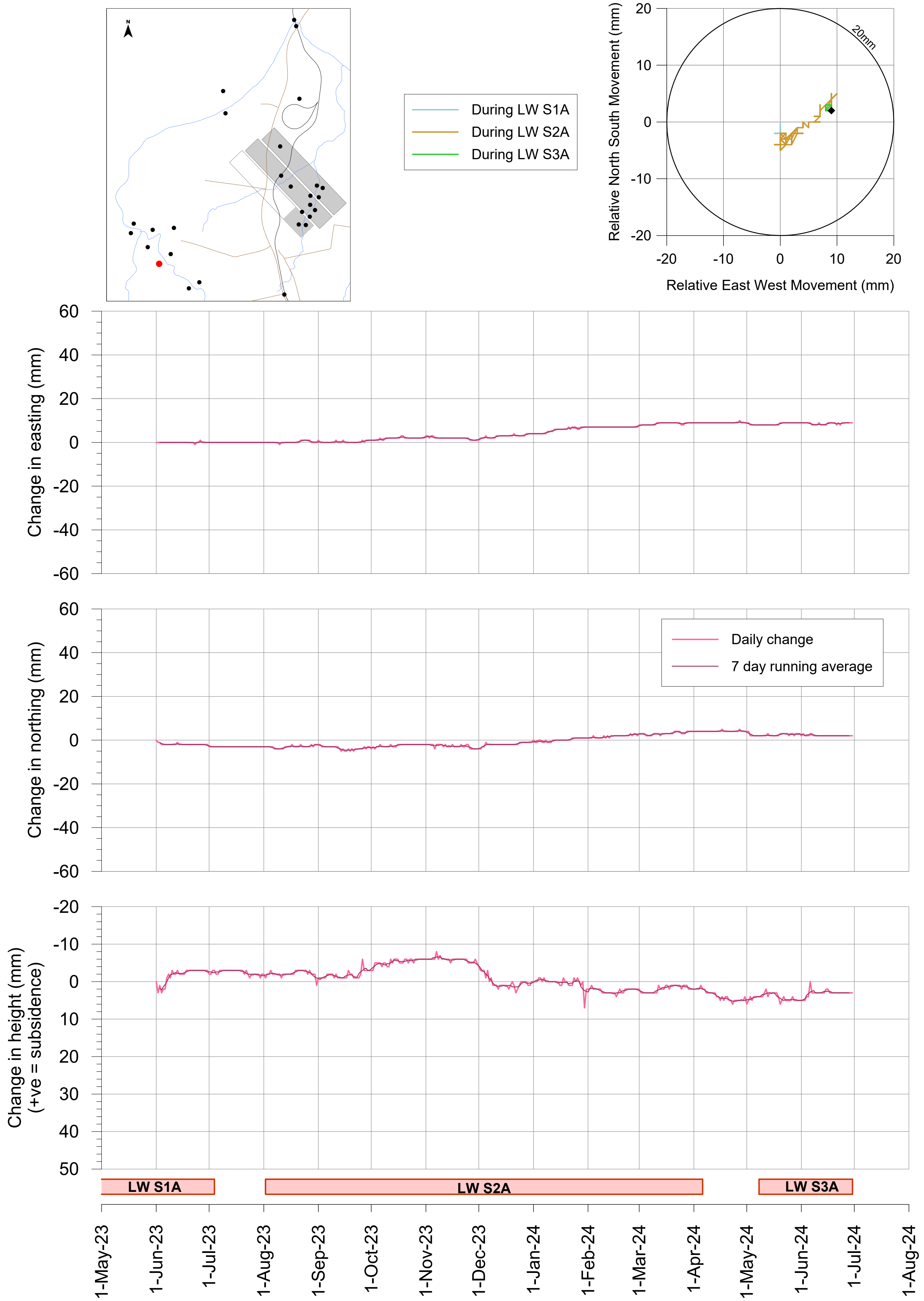
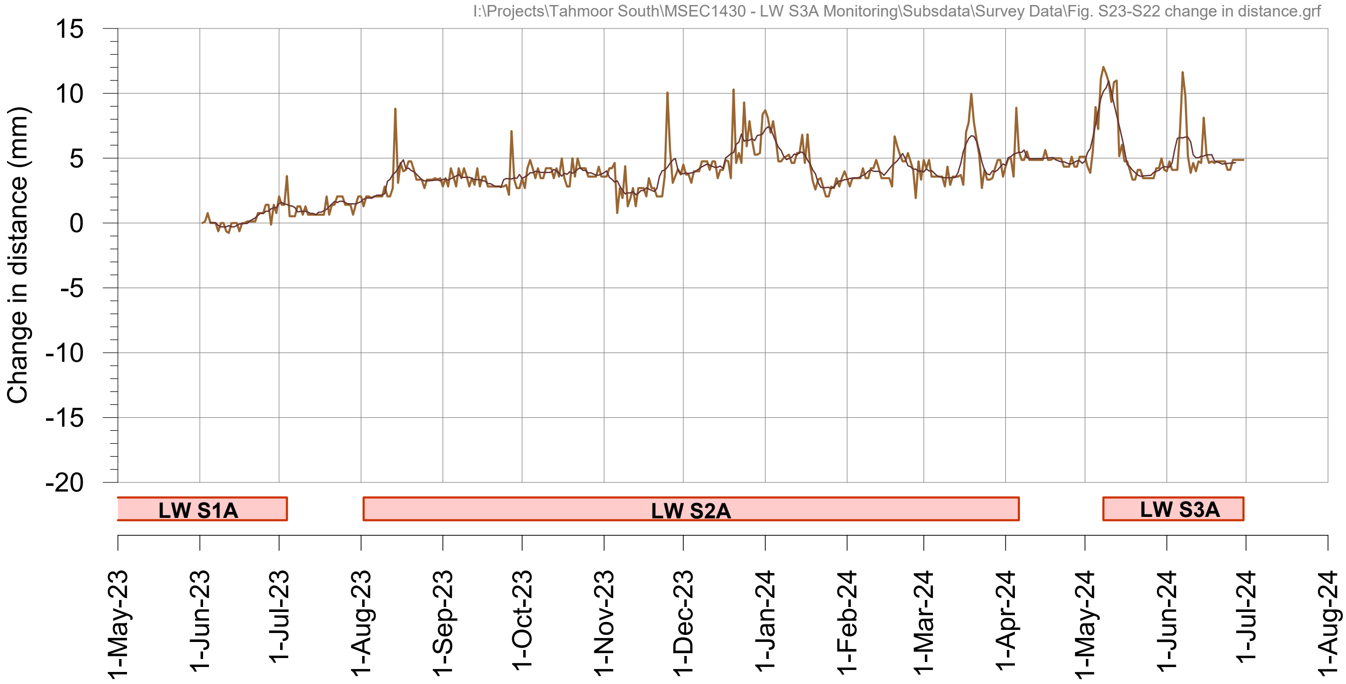
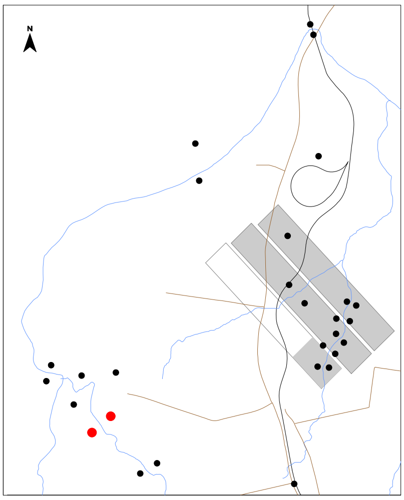


Fig. S23-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S22 and S23





msec

Fig. S22-S23-R05

Tahmoor South LW S3A - GNSS Monitoring

Site S24 on northern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S24 GNSS.grf

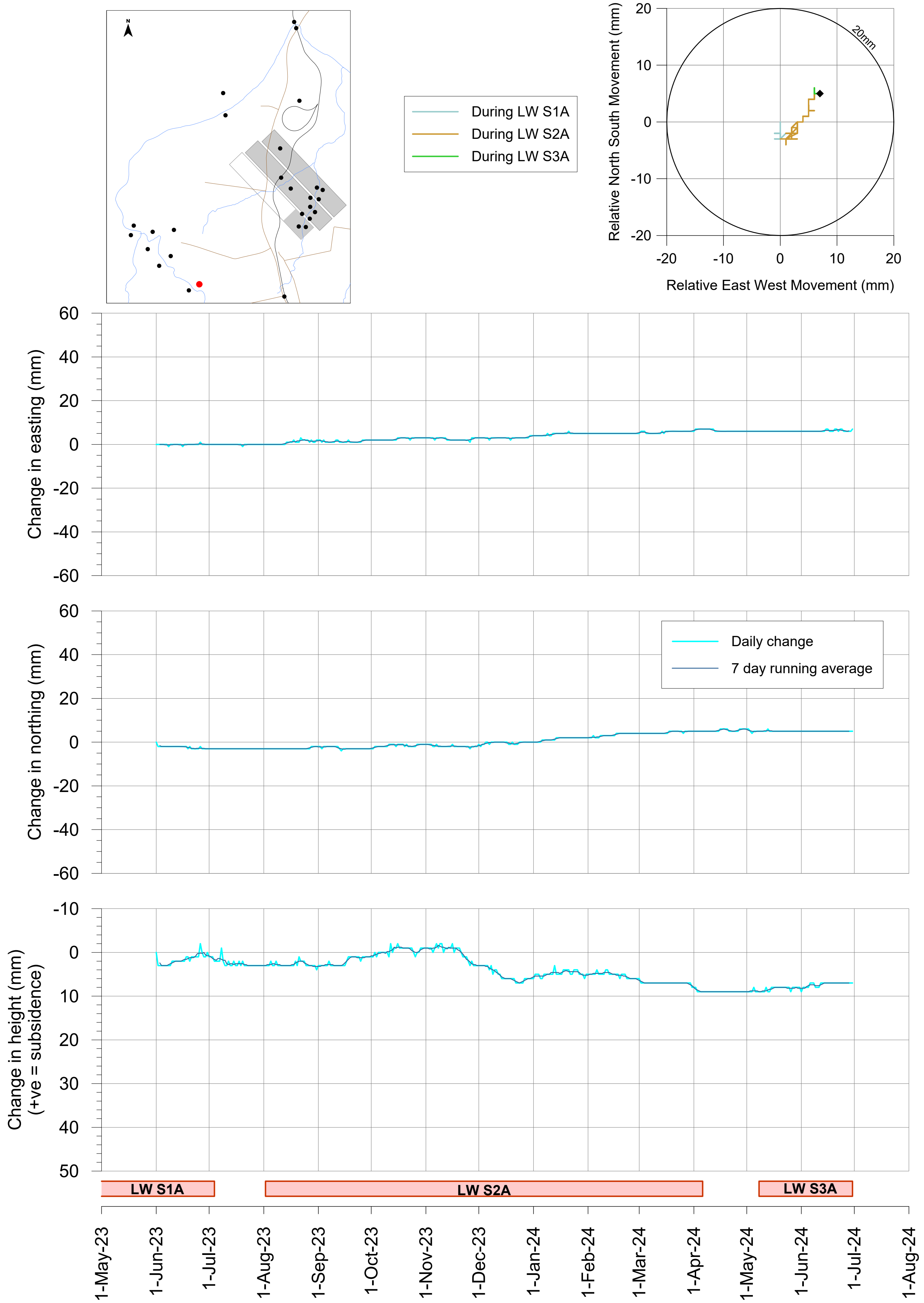


Fig. S24-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S25 on southern side of Hornes Creek

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S25 GNSS.grf

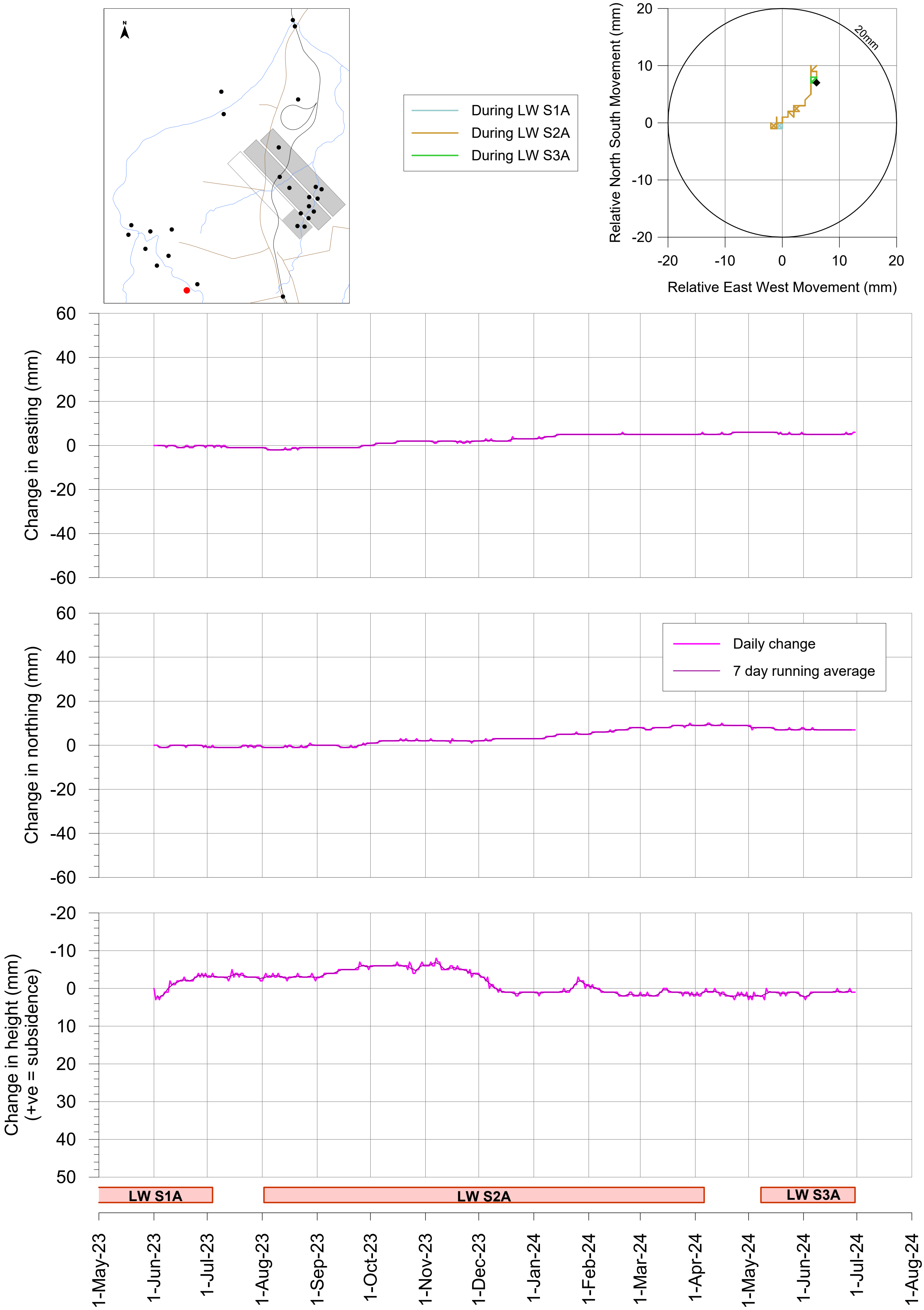
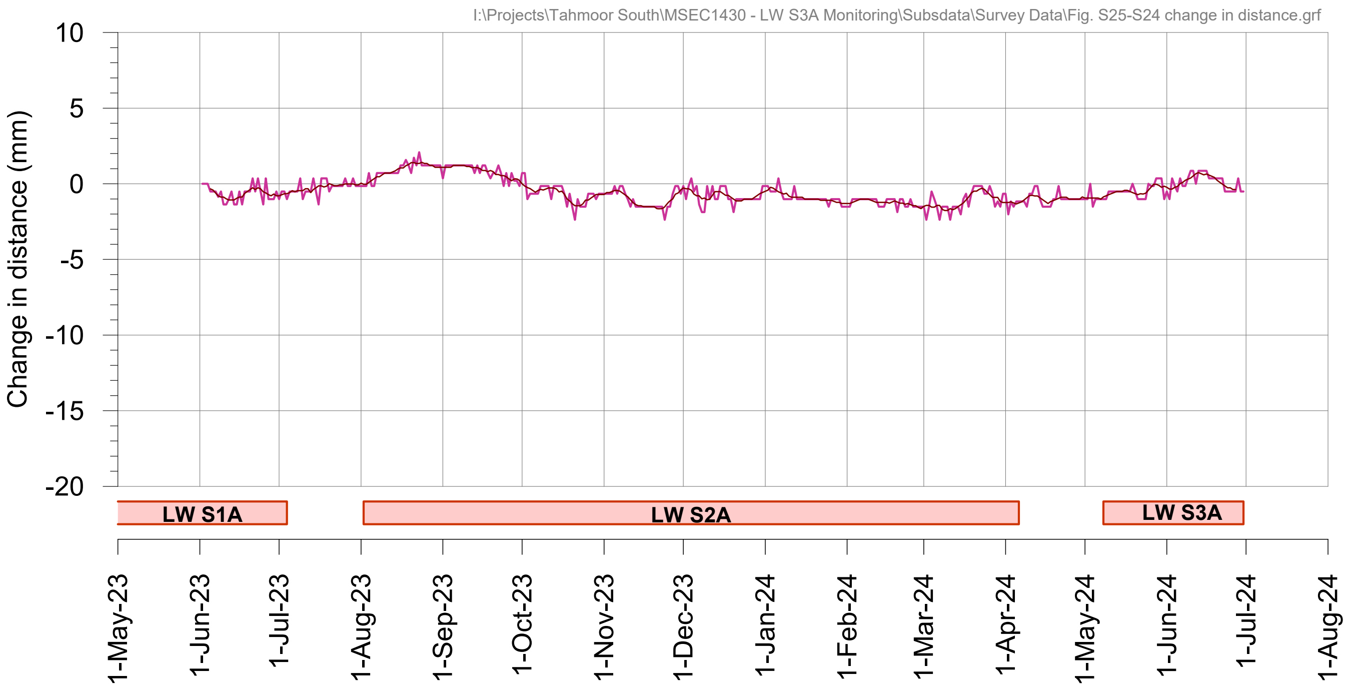
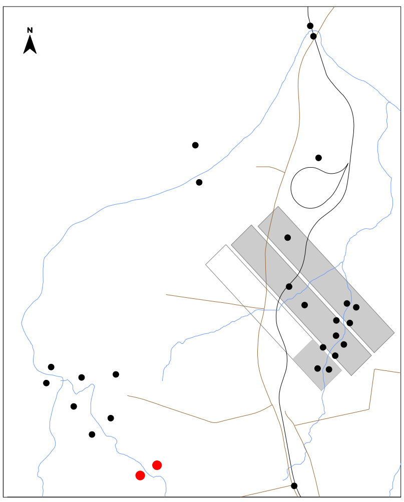


Fig. S25-R05

Tahmoor South LW S3A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S24 and S25



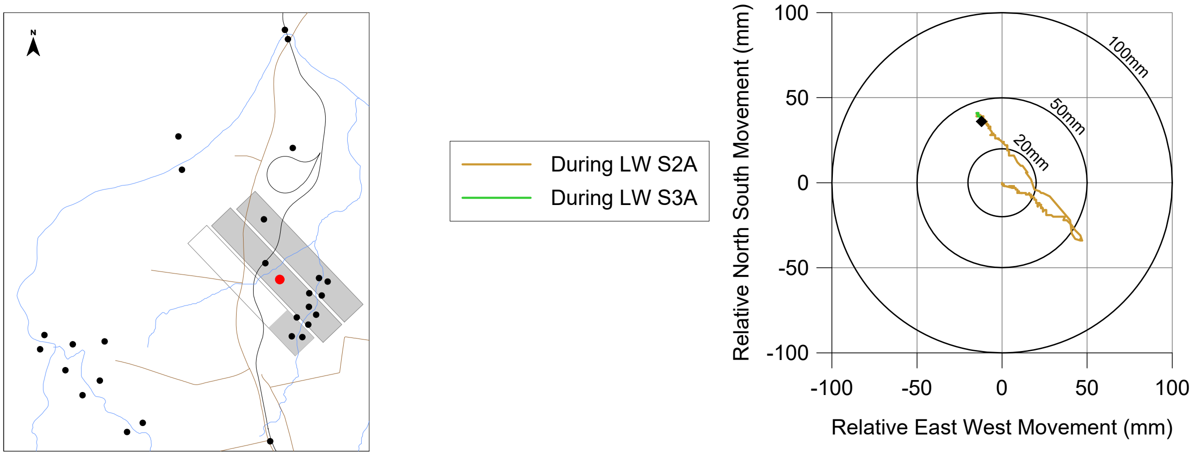


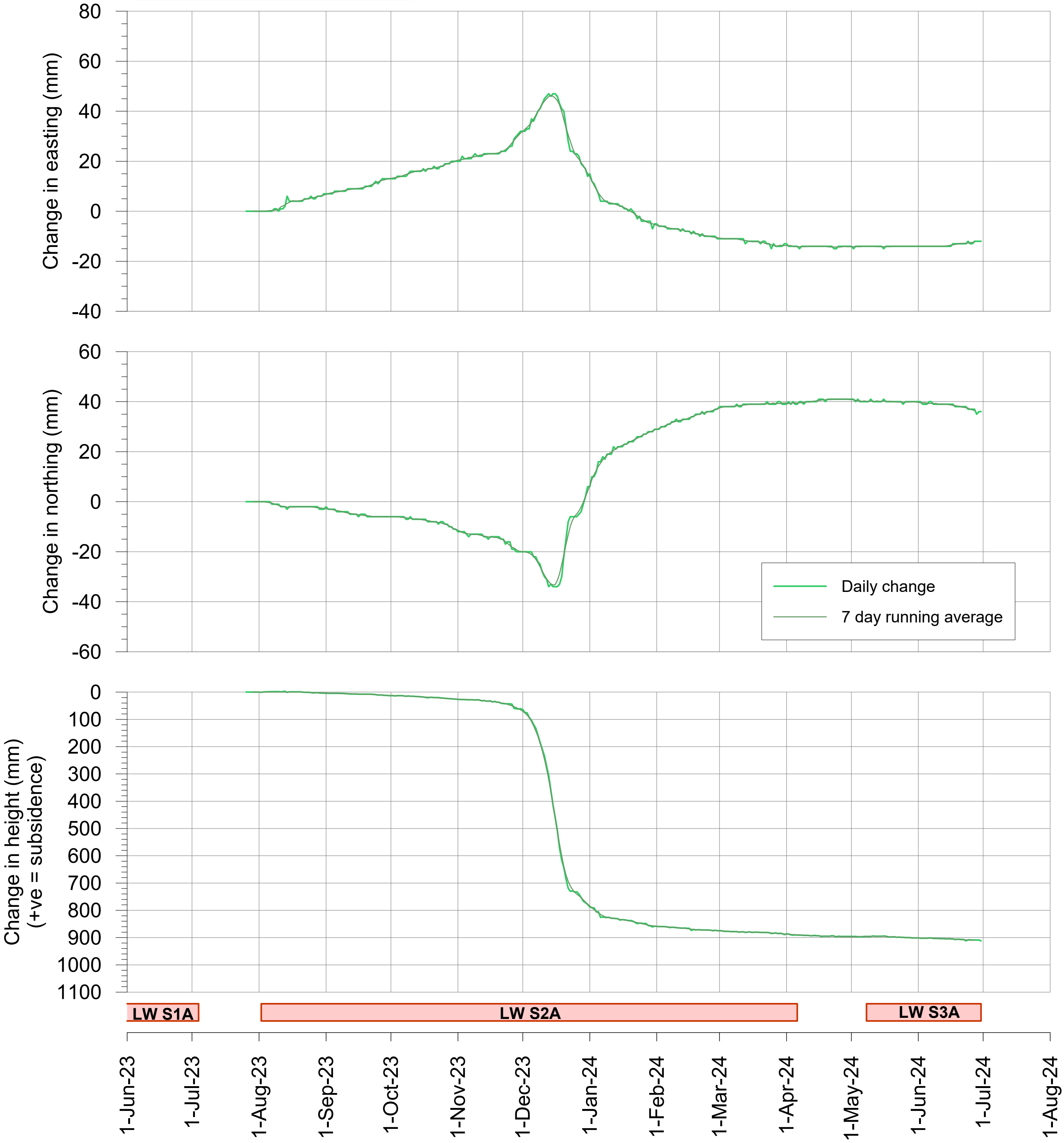
msec

Fig. S24-S25-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S26 above LW S2A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S26 GNSS.grf



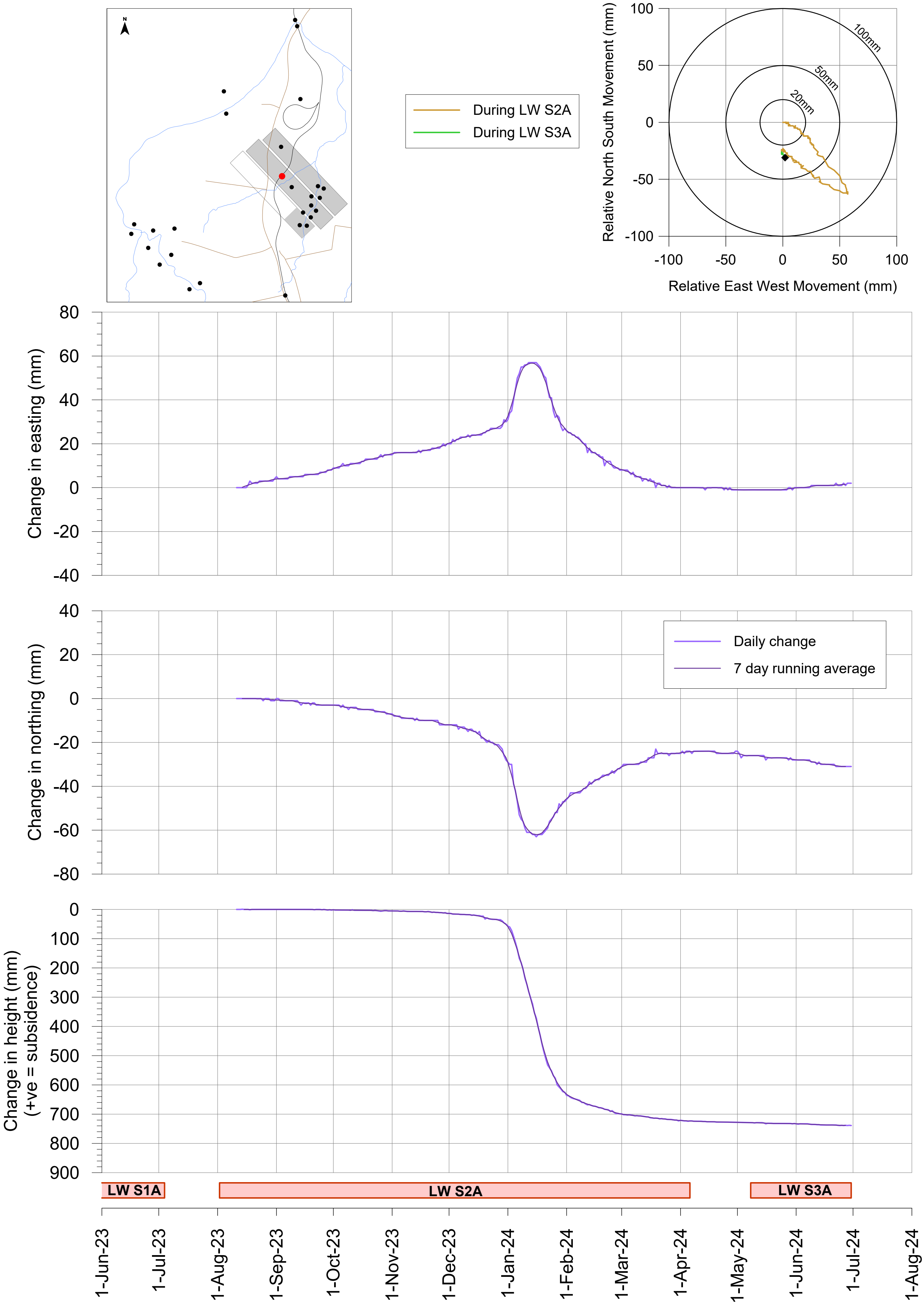


msec

Fig. S26-R05

Tahmoor South LW S3A - GNSS Monitoring
Site S27 on railway embankment above LW S2A

I:\Projects\Tahmoor South\MSEC1430 - LW S3A Monitoring\Subsdata\Survey Data\Fig. S27 GNSS.grf



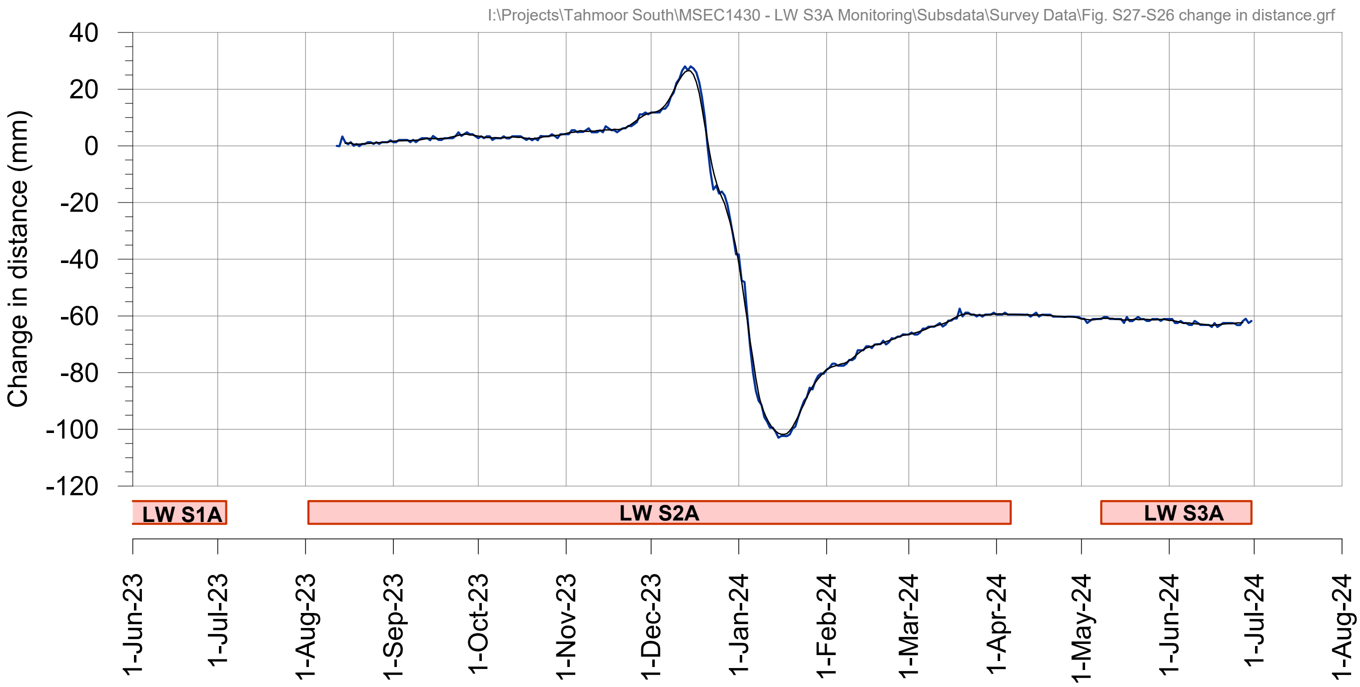
msec

Fig. S27-R05

Tahmoor South LW S3A - GNSS Monitoring

Change in distance across Teatree Hollow above LW S2A

Sites S26 and S27



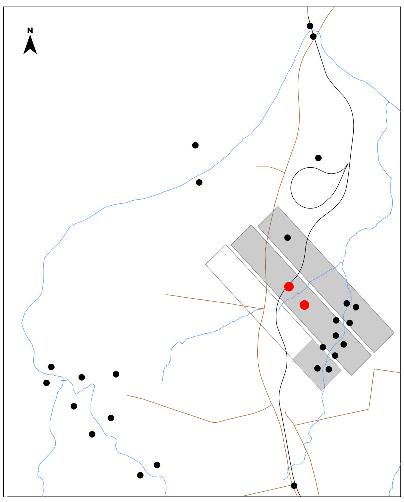


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Fig. S26-S27-R05

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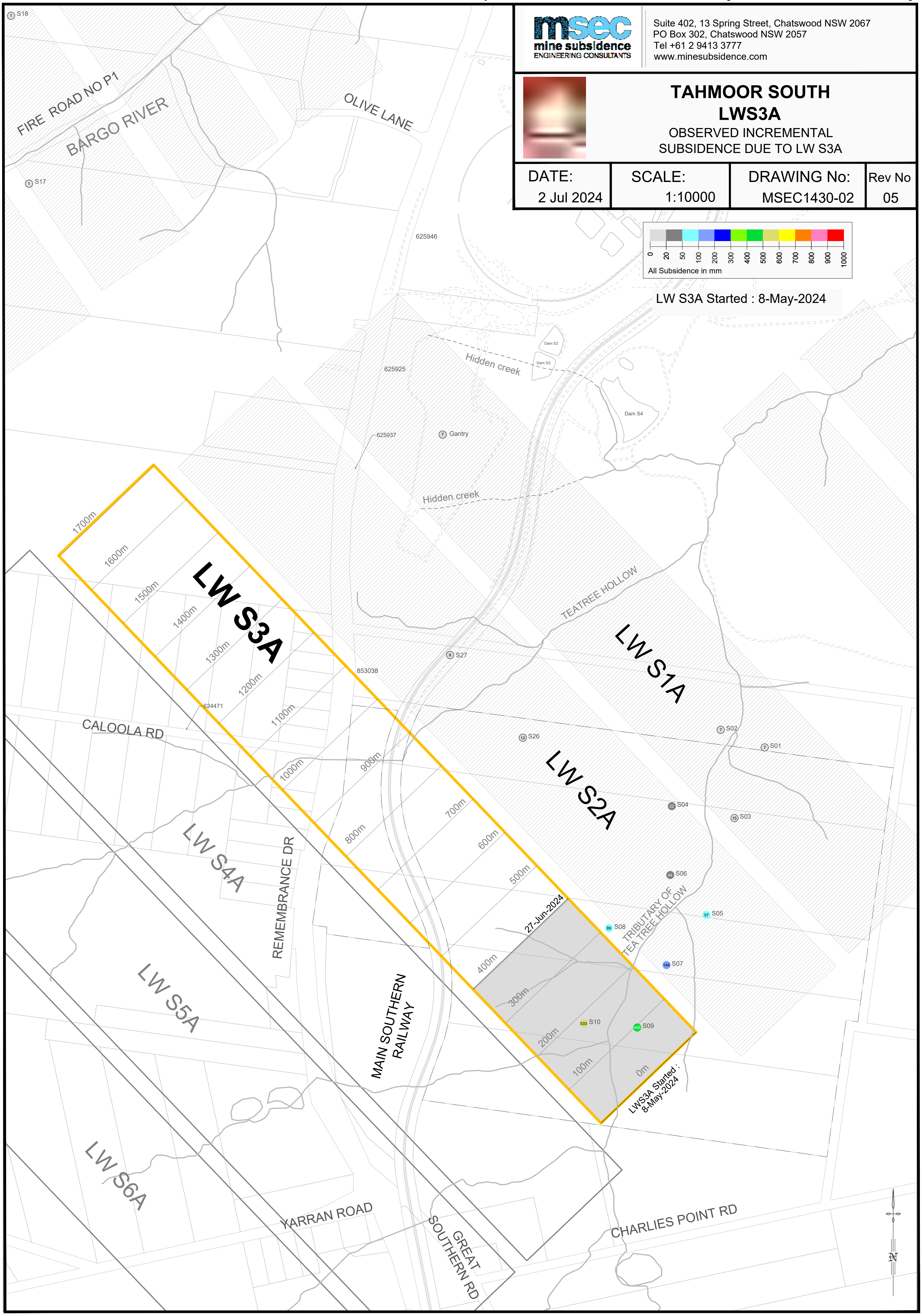
TAHMOOR SOUTH LWS3A

OBSERVED INCREMENTAL SUBSIDENCE DUE TO LW S3A

DATE:	SCALE:	DRAWING No:	Rev No
2 Jul 2024	1:10000	MSEC1430-02	05



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TAHMOOR SOUTH LWS3A

OBSERVED TOTAL SUBSIDENCE SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
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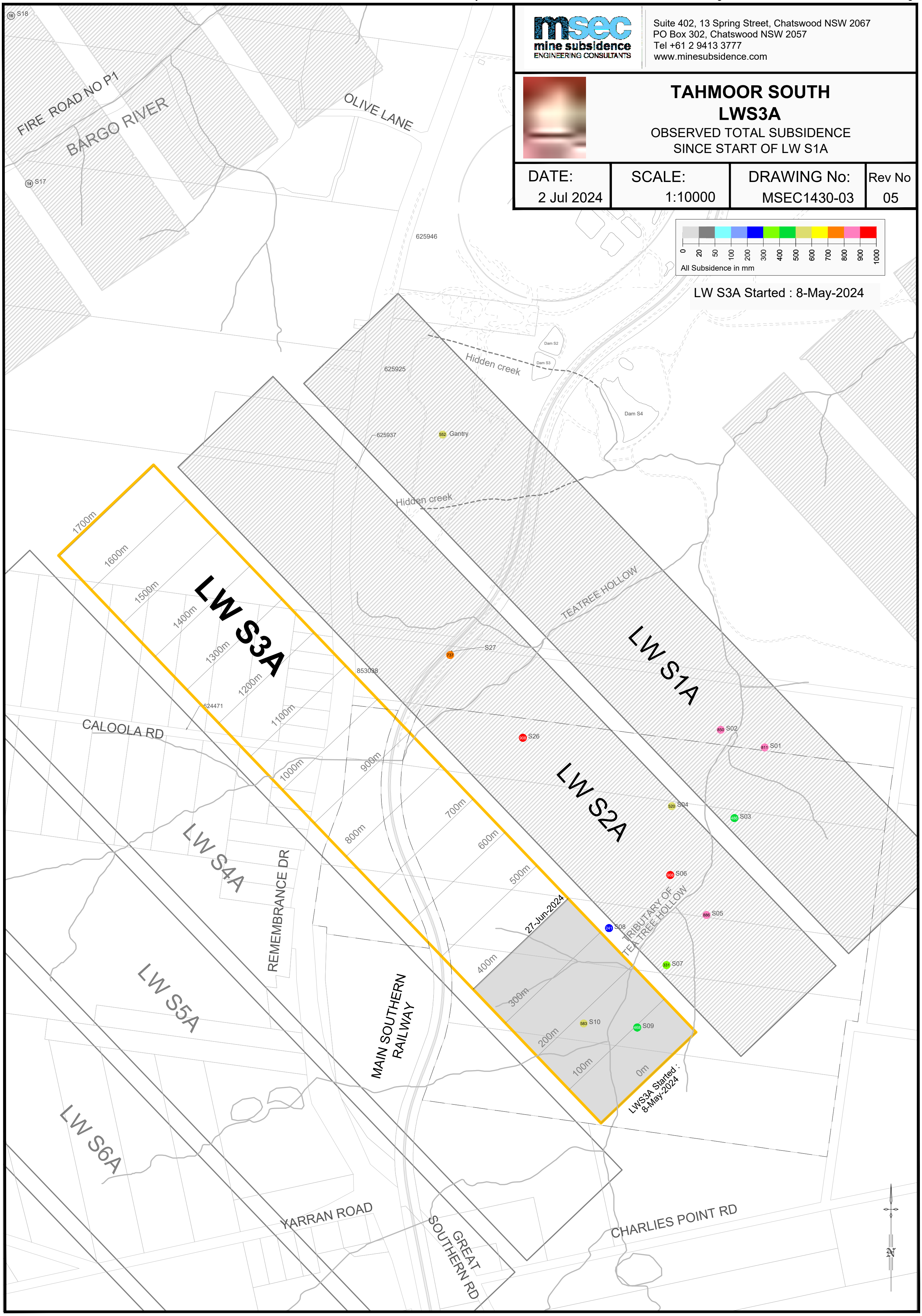

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TAHMOOR SOUTH
LWS3A
CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
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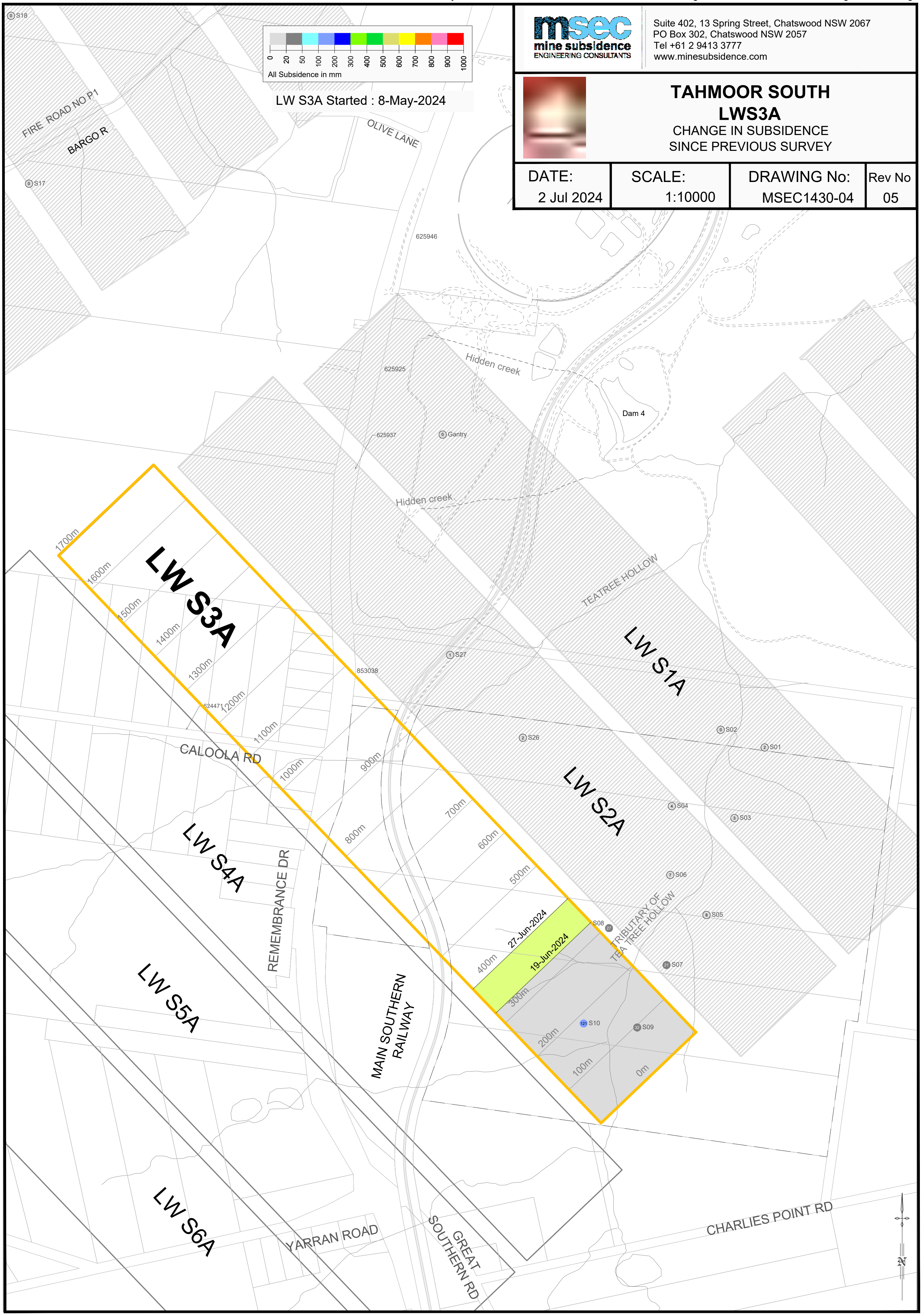

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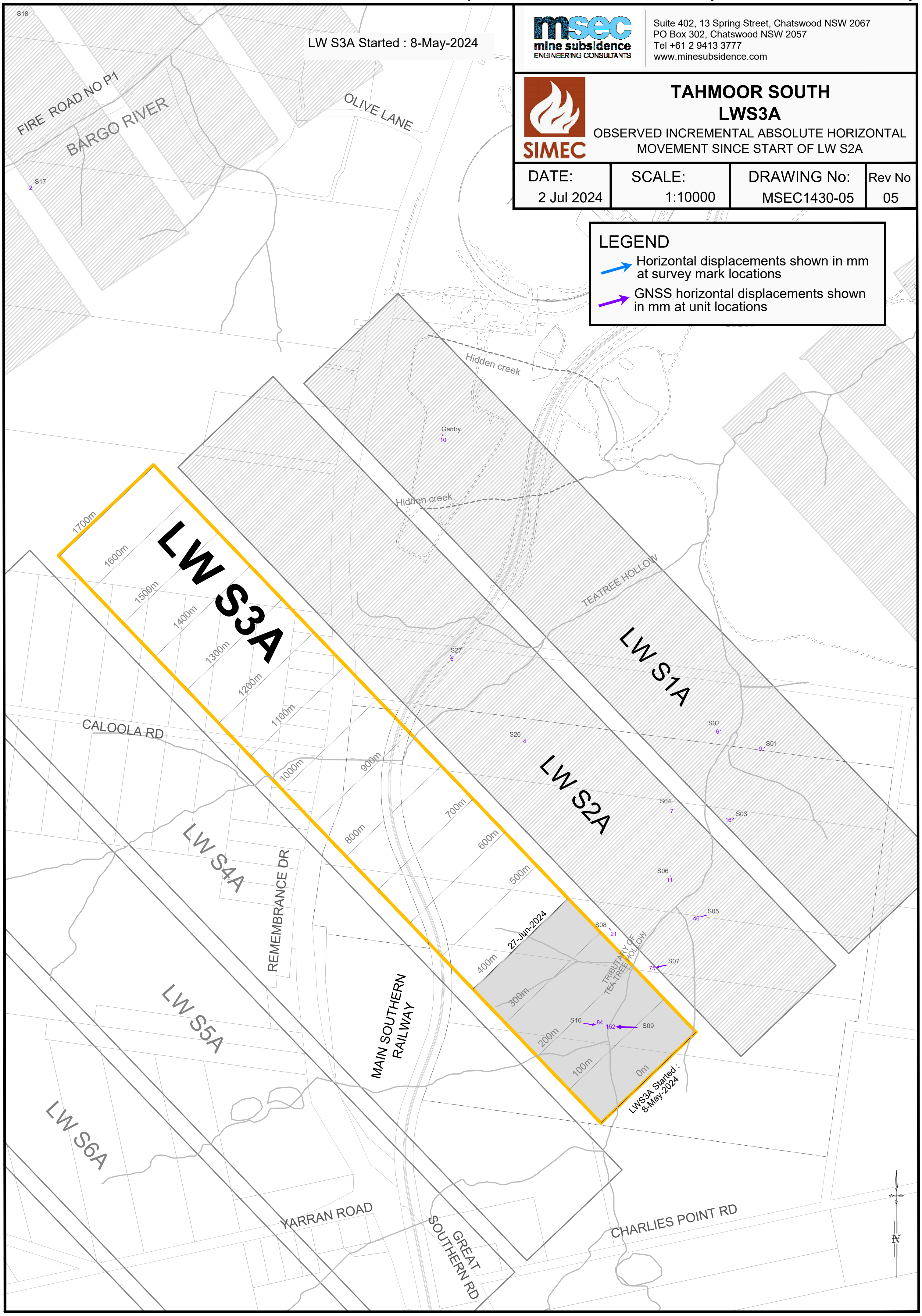

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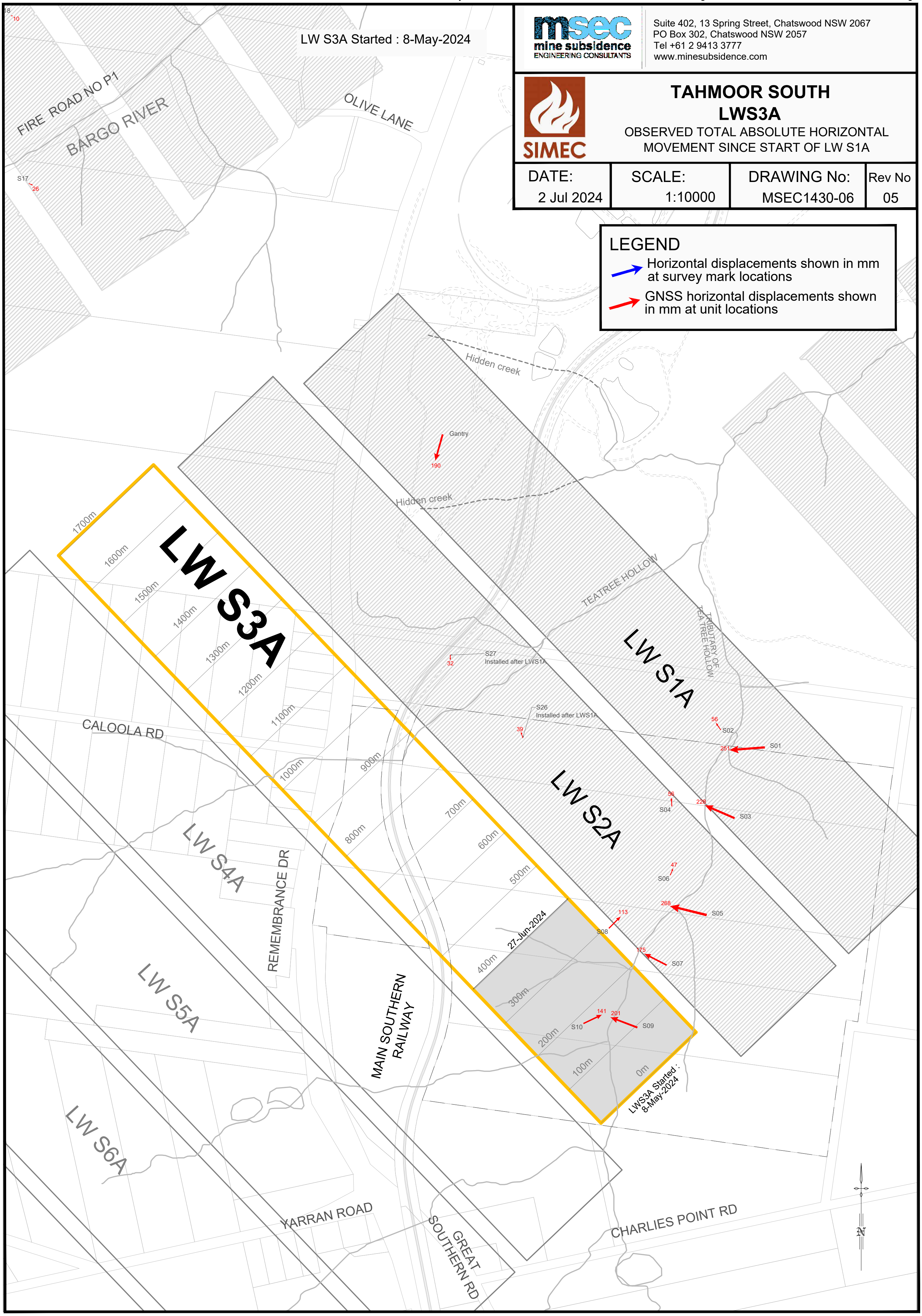
TAHMOOR SOUTH
LWS3A

OBSERVED TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
2 Jul 2024	1:10000	MSEC1430-06	05

LEGEND
Horizontal displacements shown in mm at survey mark locations
GNSS horizontal displacements shown in mm at unit locations



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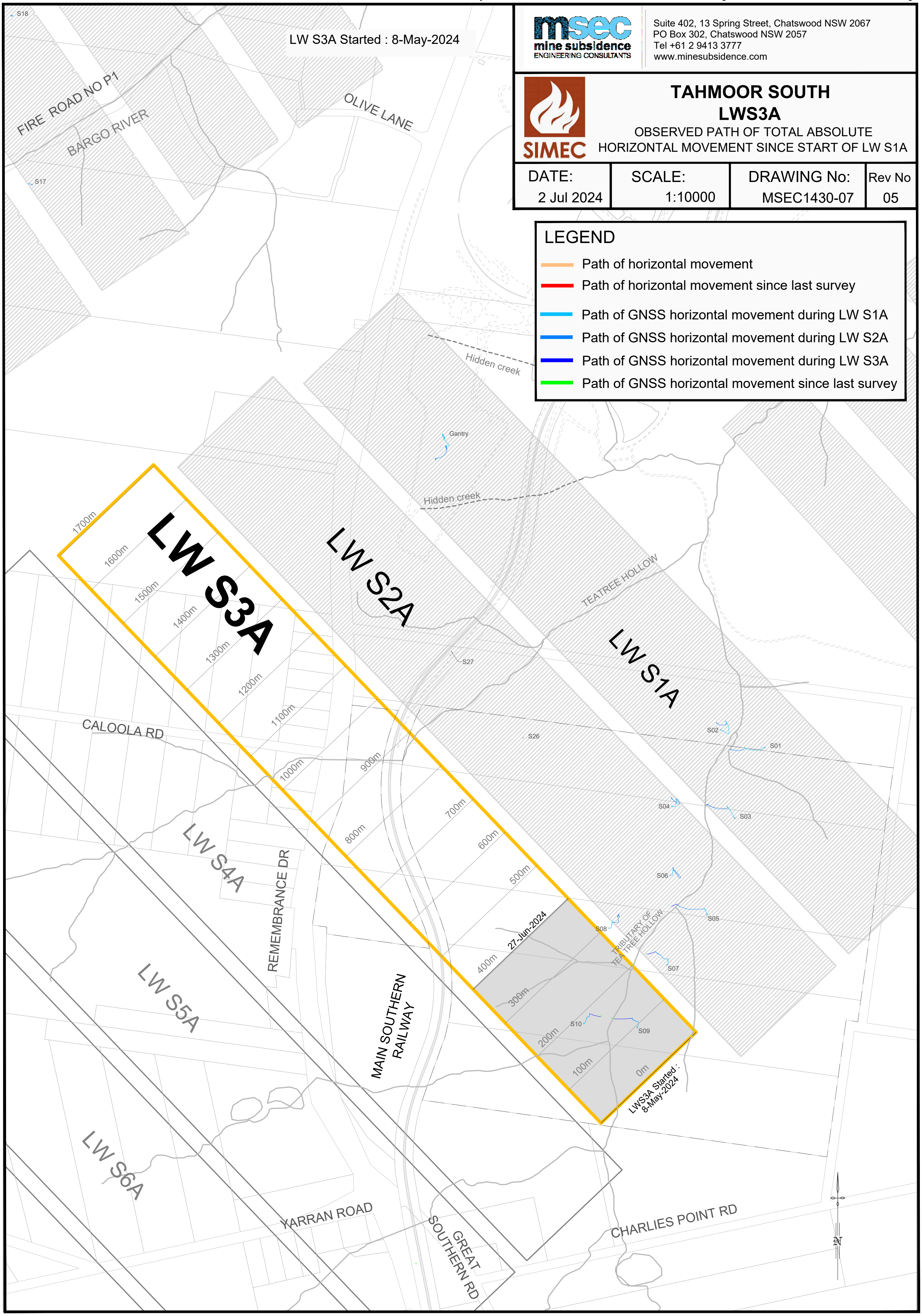
TAHMOOR SOUTH
LWS3A
OBSERVED PATH OF TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
2 Jul 2024	1:10000	MSEC1430-07	05

LEGEND
- Path of horizontal movement
- Path of horizontal movement since last survey
- Path of GNSS horizontal movement during LW S1A
- Path of GNSS horizontal movement during LW S2A
- Path of GNSS horizontal movement during LW S3A
- Path of GNSS horizontal movement since last survey



Appendix B – Surface Water Monitoring Report

ATC WILLIAMS

REPORT

TAHMOOR COAL PTY LTD
ABN: 97076663968

Tahmoor South Domain

Surface Water Review
1 January to 30 June 2024

121171-26R003-rev0
AUGUST 2024

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Document Control

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Document Title:	Surface Water Review 1 January to 30 June 2024
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Document Number:	121171-26R003-rev0

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B	Draft	18 September 2024	Pamella Grangeiro	Makaela McGrath
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TAILINGS.WATER.WASTE.

CONTENTS

APPENDICES

TAILINGS.WATER.WASTE.

TABLES

DIAGRAMS

MAPS

TAILINGS.WATER.WASTE.

1 INTRODUCTION

1.1 Background

Tahmoor Coal engaged ATC Williams Pty Ltd (ATCW) to undertake a review and analysis of surface water monitoring data recorded at sites within and adjacent to Tahmoor South for the period of 1 January to 30 June 2024. The groundwater and subsidence review were undertaken by independent specialists, with relevant details summarised in this report.

Tahmoor Coal Pty Ltd (Tahmoor Coal) owns and operates Tahmoor Mine, an underground coking coal mine. The mine surface operations are located south of Tahmoor NSW (within the Greater Sydney Basin) approximately 80 km southwest of Sydney. Tahmoor Mine is located within the Wollondilly Shire Council (WSC) Local Government Area (LGA). Underground workings extend north under the town of Tahmoor and Picton, with two ventilation shafts being located on the outskirts of Tahmoor.

The Tahmoor South Domain (Tahmoor South) is located south of the Bargo River and east of Remembrance Driveway and the township of Bargo. Mining of the six Longwalls (LW) S1A-S6A within Tahmoor South was approved on 23 April 2021 in accordance with Approval SSD 8445. The location of LW S1A-S6A and the associated Study Area are illustrated in **MAP 1**, with mining commencement and completion dates as follows:

- LW S1A commenced on 18 October 2022, completed on 4 July 2023
- LW S2A commenced on the 2 August 2023, completed on 6 April 2024
- LW S3A commenced on 8 May 2024, currently in progress

Tahmoor Coal are required to implement a monitoring program that includes groundwater, surface water and subsidence in accordance with the *Tahmoor Water Management Plan - Tahmoor South Domain – Longwalls South S1A-S6A* (WMP).

As a component of the monitoring program, Tahmoor Coal has developed a comprehensive rainfall, surface water and groundwater monitoring network within and adjacent to Tahmoor South. The surface water monitoring network comprises water level, streamflow and water quality monitoring sites in addition to visual inspection sites. The locations of the relevant monitoring sites are shown in **MAP 4** to **MAP 6**.

1.2 Scope and Report Purpose

In accordance with the WMP, a Trigger Action Response Plan (TARP) is required to be implemented, including an assessment of surface water monitoring data. The purpose of this report is to present:

- Review and interpretation of monitoring data for the period of 1 January to 30 June 2024 - referred to as the review period herein.
- Assessment against the performance measures and performance indicators for surface water.
- Recommendations in relation to ongoing monitoring and/or corrective actions.

This report predominantly presents and interprets surface water monitoring data recorded in the vicinity of LW S1A-S6A.

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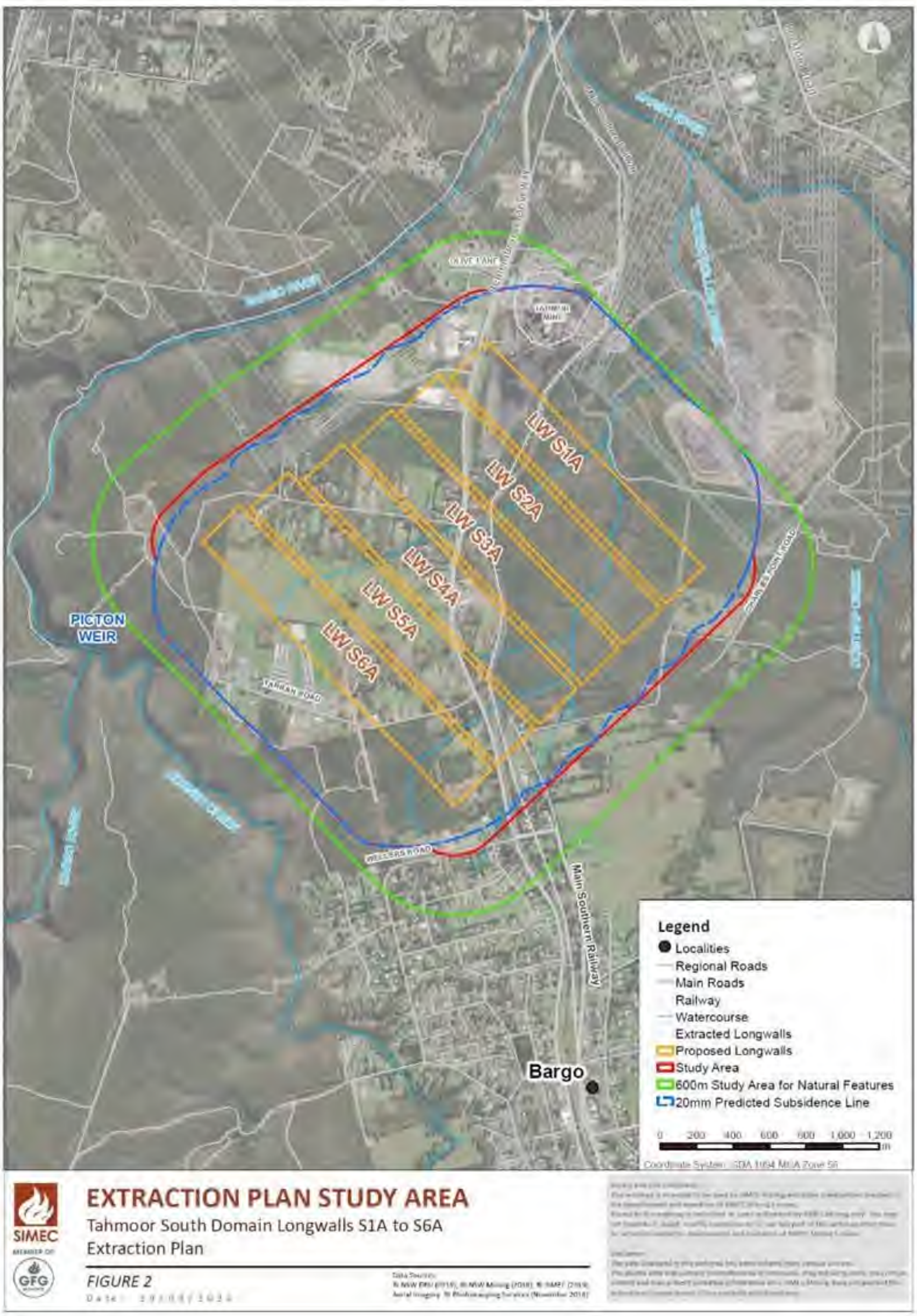
MAP 1: TAHMOOR SOUTH MINING AREA



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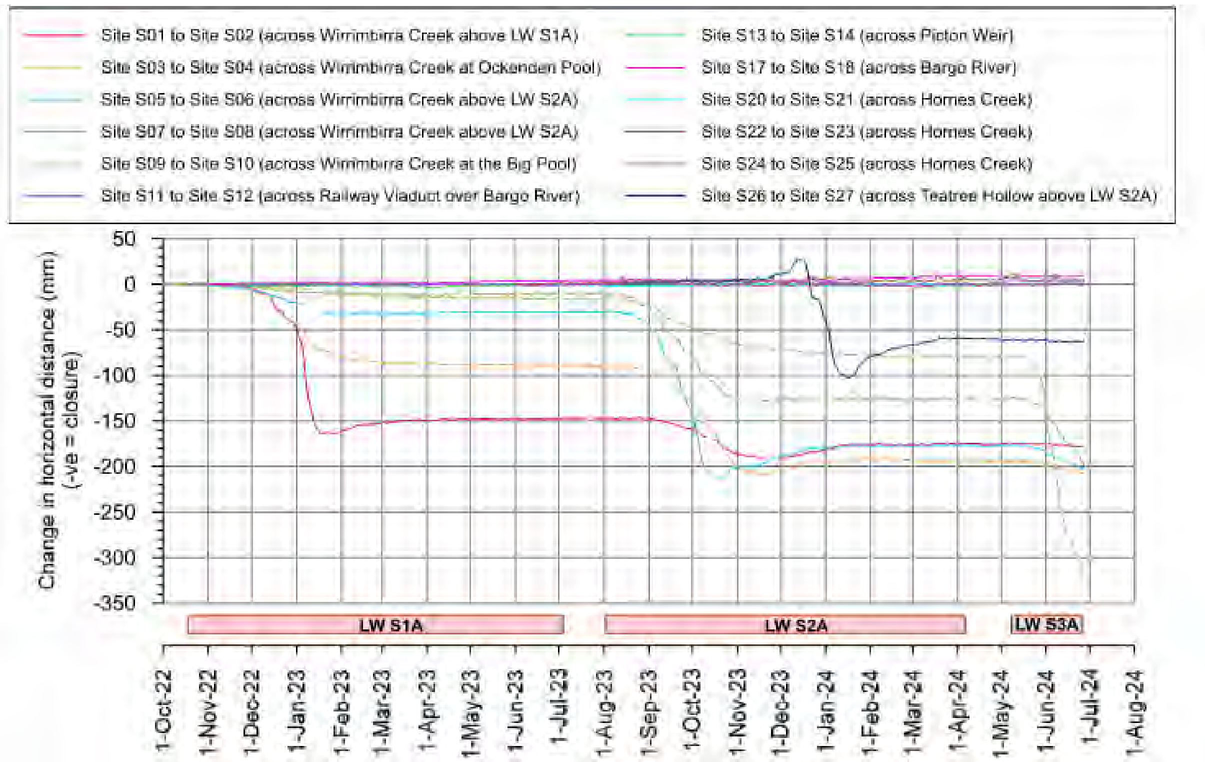
2 SUMMARY OF MONITORED SUBSIDENCE MOVEMENTS

Tahmoor Coal has installed ground survey marks above and adjacent to LW S1A – S6A, with monitoring of subsidence movements undertaken at key locations within and adjacent to Tahmoor South (refer **MAP 2**). The subsidence monitoring is detailed in the six monthly subsidence monitoring reports prepared by Mine Subsidence Engineering Consultants (MSEC) **[10][11]** and summarised below. Changes in horizontal distances calculated between GNSS[1] units located at key locations associated with Tahmoor South are presented in **DIAGRAM 1** extracted from MSEC, 2024 **[11]**.

DIAGRAM 1: OBSERVED CHANGES IN HORIZONTAL DISTANCES BETWEEN GNSS UNITS (SOURCE: MSEC, 2024)



Subsidence monitoring of surface water features indicates the following:

- The rate of change of closure recorded between sites S01 to S02 (across Teatree Hollow - above LW S1A) was slight during the review period.
- The rate of change of closure recoded between sites S05 to S06 (across Wirrimbirra Creek above LW S2A) was negligible from January to mid-May 2024. Following commencement of mining of LW S3A, a further 20 mm of closure developed with approximately 200 mm of closure recorded in total between sites S05 to S06 as at end of June 2024.
- Approximately 40 mm of reduction in closure between sites S26 and S27 (across Teatree Hollow) was recorded from January to mid-March 2024, with the rate of closure change negligible from mid-March to end of June 2024.
- Closure development generally stabilised between sites S03 and S04 (Ockenden Pool TT3) from January to late May 2024. From late May to end of June 2024, a further 10 mm (approximately) of closure was recorded.
- Approximately 320 mm of closure developed between sites S09 and S10 (Big Pool (TT2) directly above LW S3A – across Teatree Hollow) between late May to end of June 2024.

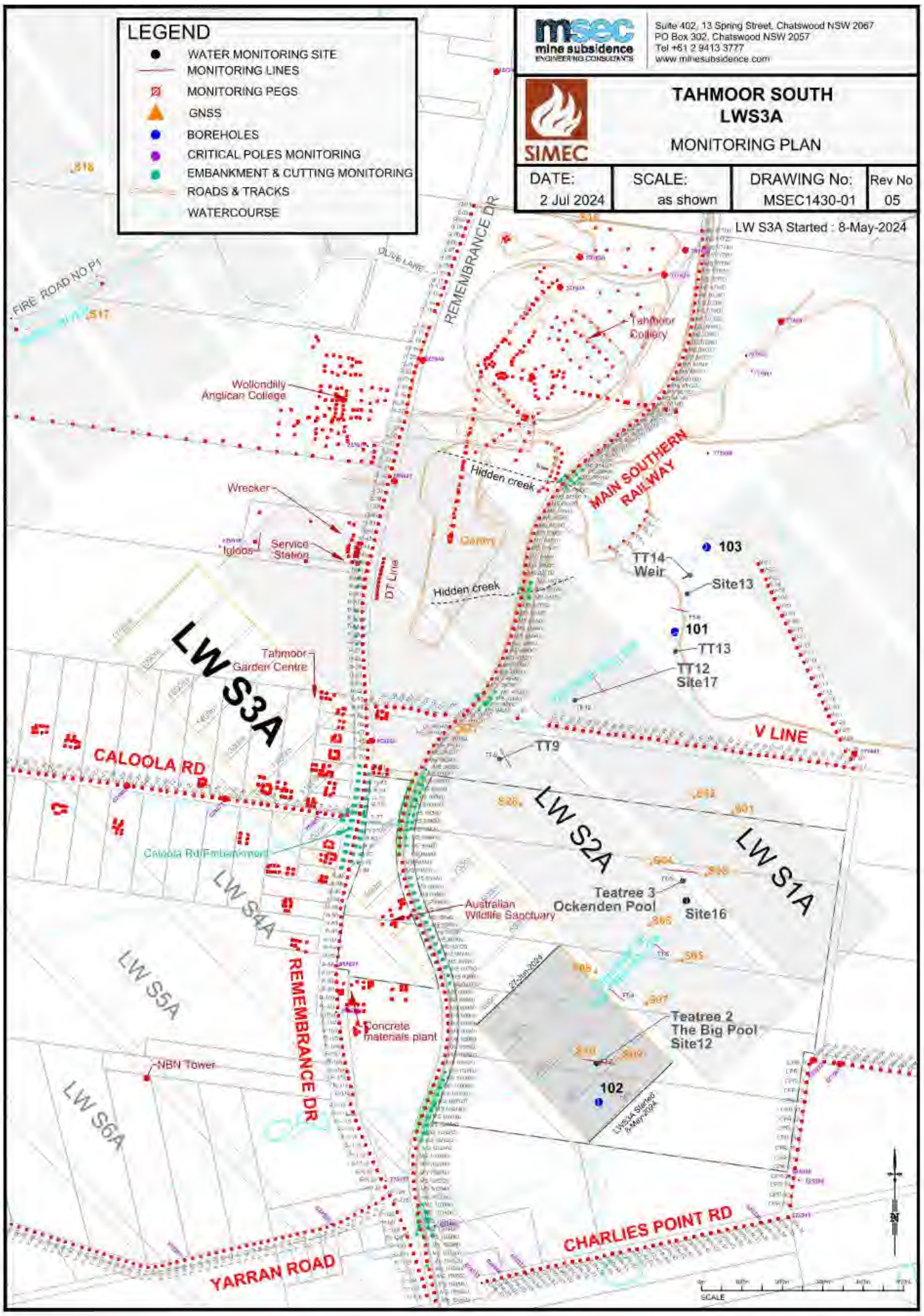
---

[1] Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure absolute horizontal and vertical positions at a location in real time.

TAILINGS.WATER.WASTE.

- Approximately 70 mm of closure developed between site S07 and S08 (across Wirrimbirra Creek above LW S2A) in June 2024.
- Negligible change in horizontal distance has been recorded at sites across the Bargo River and Hornes Creek.

MAP 2: GNSS MONITORING LOCATIONS – TAHMOOR SOUTH (MSEC 2024)



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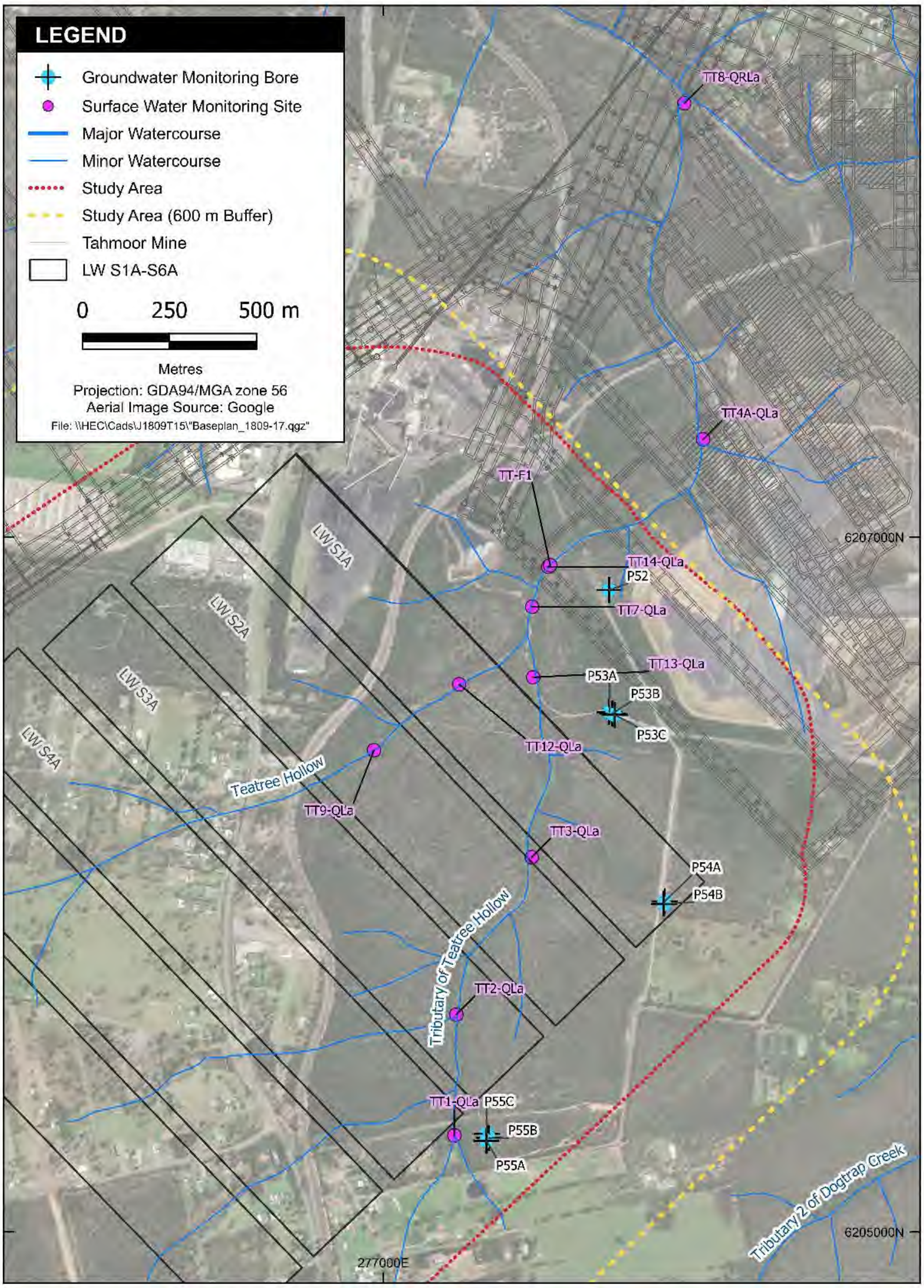
3 SUMMARY OF GROUNDWATER LEVEL TRENDS

Groundwater levels were reviewed to assess the potential for baseflow contribution (groundwater discharge to the surface water system) and surface water-groundwater interaction within the Study Area. A summary of groundwater level trends recorded during the review period of 1 January to 30 June 2024 for groundwater monitoring bores is provided below. The monitoring bores considered for this review are situated near the surface water monitoring sites as illustrated in **MAP 3**.

The monitoring bores referenced are shallow open standpipe bores where 'C' denotes the lowest elevation sensor and 'A' denotes the highest elevation sensor in the open standpipe. Detailed discussion of groundwater monitoring data recorded within and adjacent to the Study Area is presented in SLR, 2024 **[9]**.

- **Monitoring Bore P55A-C**: located approximately 100 m to the east of monitoring site TT1-QLa in Teatree Hollow tributary.
  - During the review period the maximum groundwater level recorded at P55A was approximately 272 m AHD, around 20 m below the bed elevation of Teatree Hollow tributary at TT1-QLa.
  - No trigger exceedances were reported for P55A during the review period.
  - At P55B, a TARP level 3 exceedance for groundwater level was reported in May and June 2024, due to recorded reduction in groundwater level greater than the maximum modelled drawdown.
  - At P55C, a TARP level 2 exceedance for groundwater level was reported from January to June. However, groundwater level decline is not determinedly related to extraction as reported by SLR, 2024 **[9].**
  - The baseflow contribution was likely to be negligible in the vicinity of TT1-QLa, based on the groundwater levels recorded during the review period.
- **Monitoring Bore P54A-B**: located approximately 400 m to the south-east of monitoring site TT3-QLa in Teatree Hollow tributary.
  - Since February 2023, the P54A-B has been recorded as dry.
- **Monitoring Bore P53A-C**: located approximately 250 m to the south-east of monitoring site TT13-QLa in Teatree Hollow tributary.
  - During the review period the maximum groundwater level recorded at P53A was approximately 253 m AHD, around 14 m below the bed elevation of Teatree Hollow tributary at TT13-QLa.
  - At P53A and P53B, a TARP level 1 exceedance for groundwater level was reported from January to June.
  - The baseflow contribution was likely to be negligible in the vicinity of TT13-QLa, based on the groundwater levels recorded during the review period.
- **Monitoring Bore P52:** located approximately 230 m and 190 m to the east of monitoring sites TT7-QLa and TT14-QLa in Teatree Hollow, respectively.
  - No trigger exceedances were reported for P52 during the review period.
  - For the duration of the monitoring period, a declining trend in groundwater levels has been recorded at P52. The groundwater level increased approximately 0.6 m in June 2024, with a maximum level of approximately 247.5 m AHD recorded during the review period.
  - The maximum groundwater level was approximately 14 m below the bed elevation of Teatree Hollow at TT7-QLa.
  - The baseflow contribution was likely to be negligible in the vicinity of TT7-QLa, based on the groundwater levels recorded during the review period.

MAP 3: GROUNDWATER MONITORING BORES PROXIMAL TO TEATREE HOLLOW



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4 SURFACE WATER MONITORING PROGRAM

Tahmoor Coal has implemented an extensive surface water monitoring program in the vicinity of LW S1A-S6A, as detailed in the WMP. The LW S1A-S6A surface water monitoring program includes the following:

- water level
- streamflow
- water quality
- visual inspection

The surface water monitoring program seeks to ensure compliance with regulatory requirements and to enable identification of potential mining related impacts to:

- pool and watercourse physical features and natural behaviour
- surface water level and streamflow
- surface water quality

The monitoring program developed a baseline dataset for a range of surface water features, and it is used to assess operational and post-mining impacts through the monitoring of reference sites (control) and potential impact sites (impact).

The monitoring sites are characterised as follows:

Baseline Site:	Surface water monitoring site that has been monitored for water level and quality prior to the commencement of mining in the South Domain. Baseline surface water monitoring data was used to derive water quality Site Specific Guideline Values (SSGVs) and water level trigger values.
Reference Site:	Surface water monitoring site located upstream of the subsidence impact zone and considered unlikely to be affected by mining activity. These sites are utilised as benchmarks for observations from potential impact sites.
Potential Impact Site:	Surface water monitoring site located within the potential subsidence impact zone (as defined based on mining induced subsidence predictions), from which a potential effect on surface water level or quality from the site activity may be detected.

4.1 Monitoring Program Summary

Surface water monitoring sites are located on key watercourses within and adjacent to LW S1A - S6A, and includes Teatree Hollow, Teatree Hollow tributary, Bargo River, Bargo River tributary and Hornes Creek. The locations of the monitoring sites relevant to the Study Area are shown in **MAP 4** to **MAP 6,** the surface water monitoring program for LWS1A-S6A is summarised in **Appendix A**.

The monitoring site nomenclature is associated with the watercourse and pool number (i.e., TT9 is pool 9 on Teatree Hollow), and the type of monitoring to be implemented as follows:

- water quality: Q
- automated (continuous) water level monitoring: La
- streamflow: F
- channel morphology: CM
- knickpoint: K
- headwater reaches: HW

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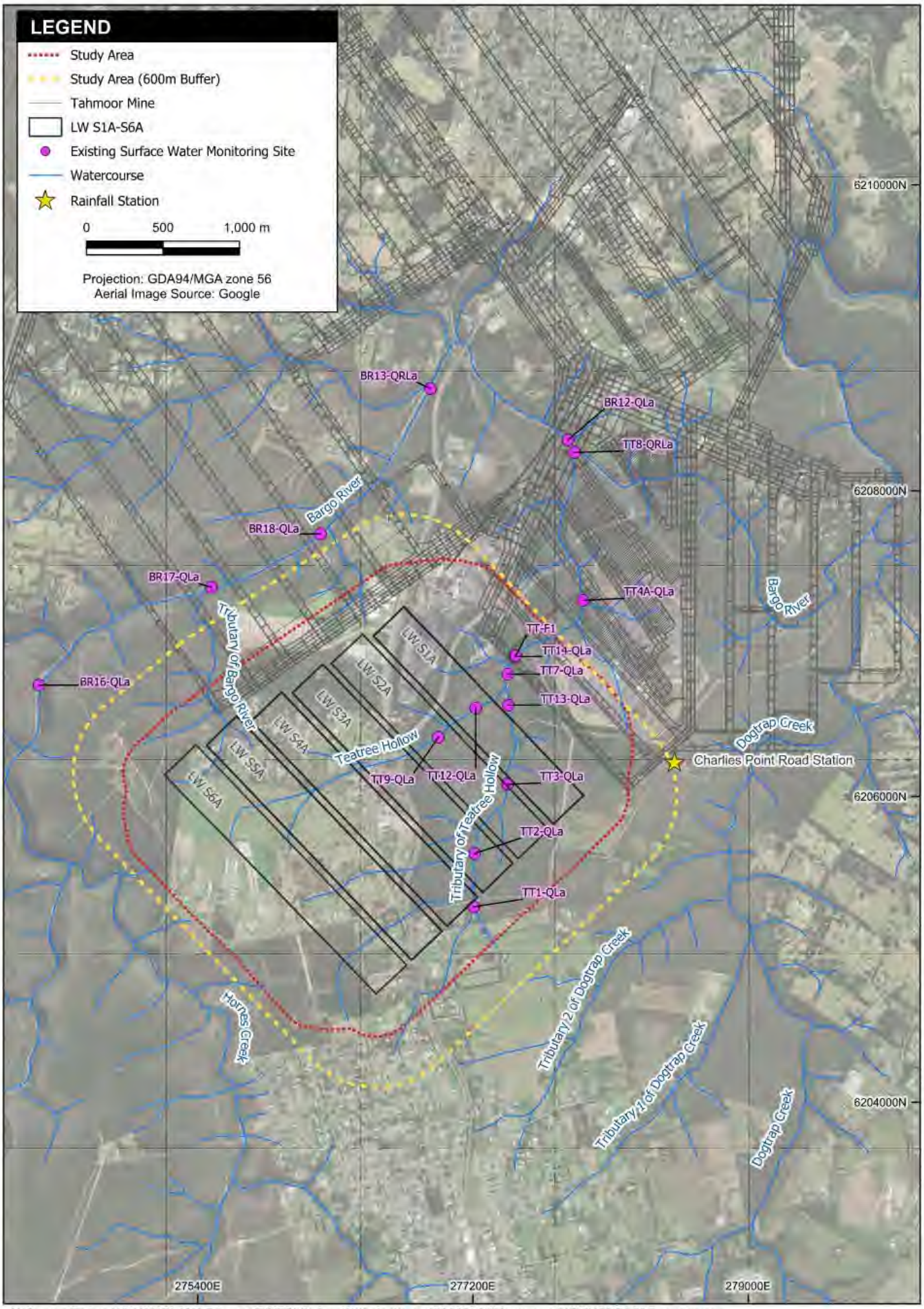
MAP 4: RELEVANT RAINFALL STATIONS, SURFACE WATER MONITORING SITES AND GROUNDWATER MONITORING BORES SPECIFIC TO LWS1A-S6A



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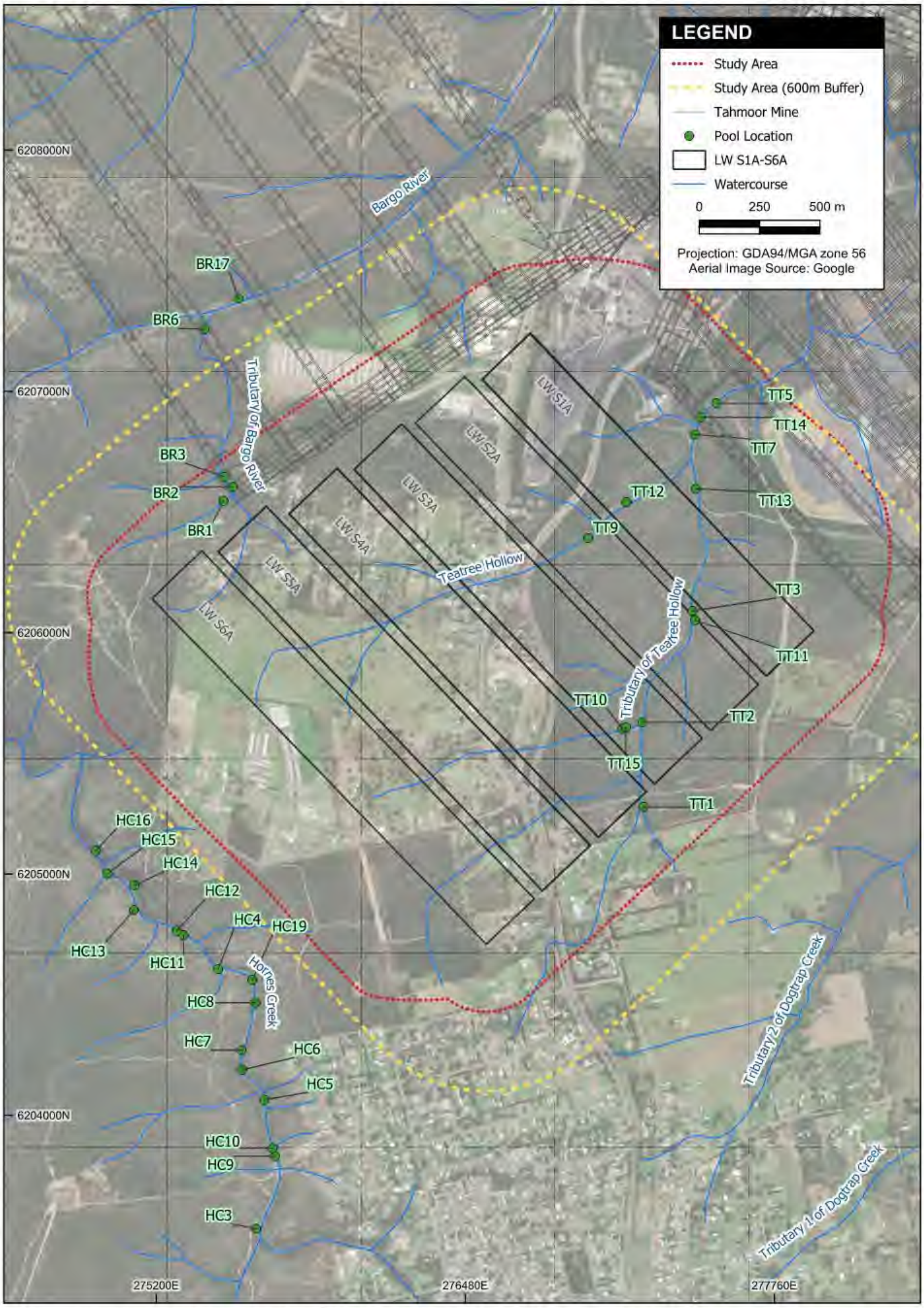
MAP 5: POOL VISUAL INSPECTION SITES SPECIFIC TO LWS1A-S6A



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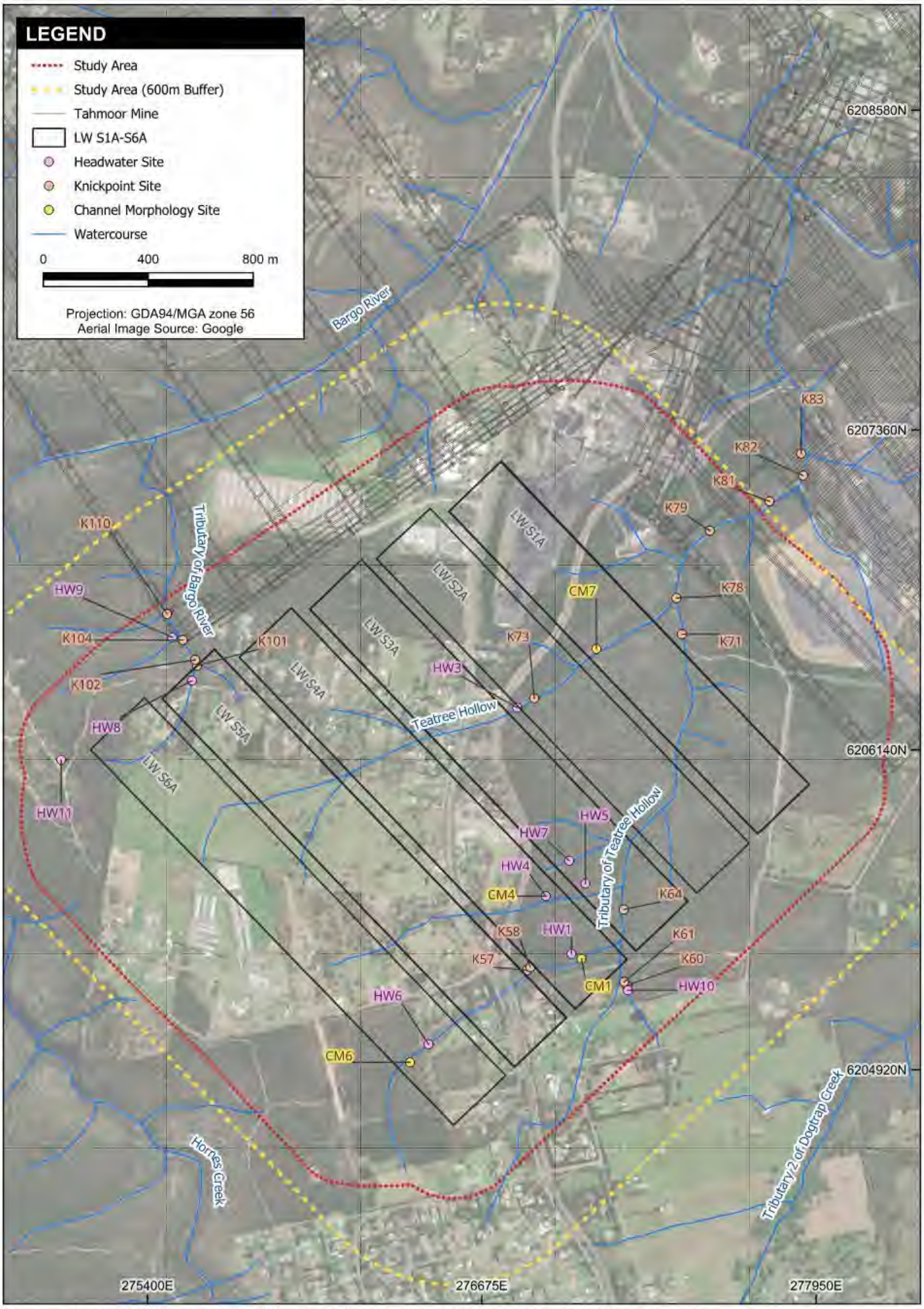
MAP 6: MORPHOLOGY AND CHANNEL STABILITY MONITORING SITES SPECIFIC TO LWS1A-S6A



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4.2 Monitoring Constraints

Monitoring constraints during the review period are summarised in **TABLE 1**.

TABLE 1: MONITORING CONSTRAINTS

Sites	Type of data missing	Month	Reason	Status
BR16-QLa, BR17-QLa, BR18-QLa	Water levels	Mid-January to early April	Automated water level data was lost due to logger issues.	Previous loggers replaced with submersible datalogger (TD-divers).
BR12-QLa	Water quality	April	Site inaccessible for monitoring.	Site accessible from May.
TT1-QLa, TT2-QLa, TT3-QLa	Water quality	June	Not visited	Visual inspections to recommence in July.

5 SURFACE WATER MONITORING DATA REVIEW

A summary of the monitoring data for the period review from 1 January to 30 June 2024 is presented in the following sections. Monitoring sites on Hornes Creek and Bargo River tributary (refer **MAP 4**), are located outside of the subsidence zone associated with mining of LW S1A, LW S2A and LW S3A. As such, review of the monitoring data for these sites has been excluded from the assessment for the current review period.

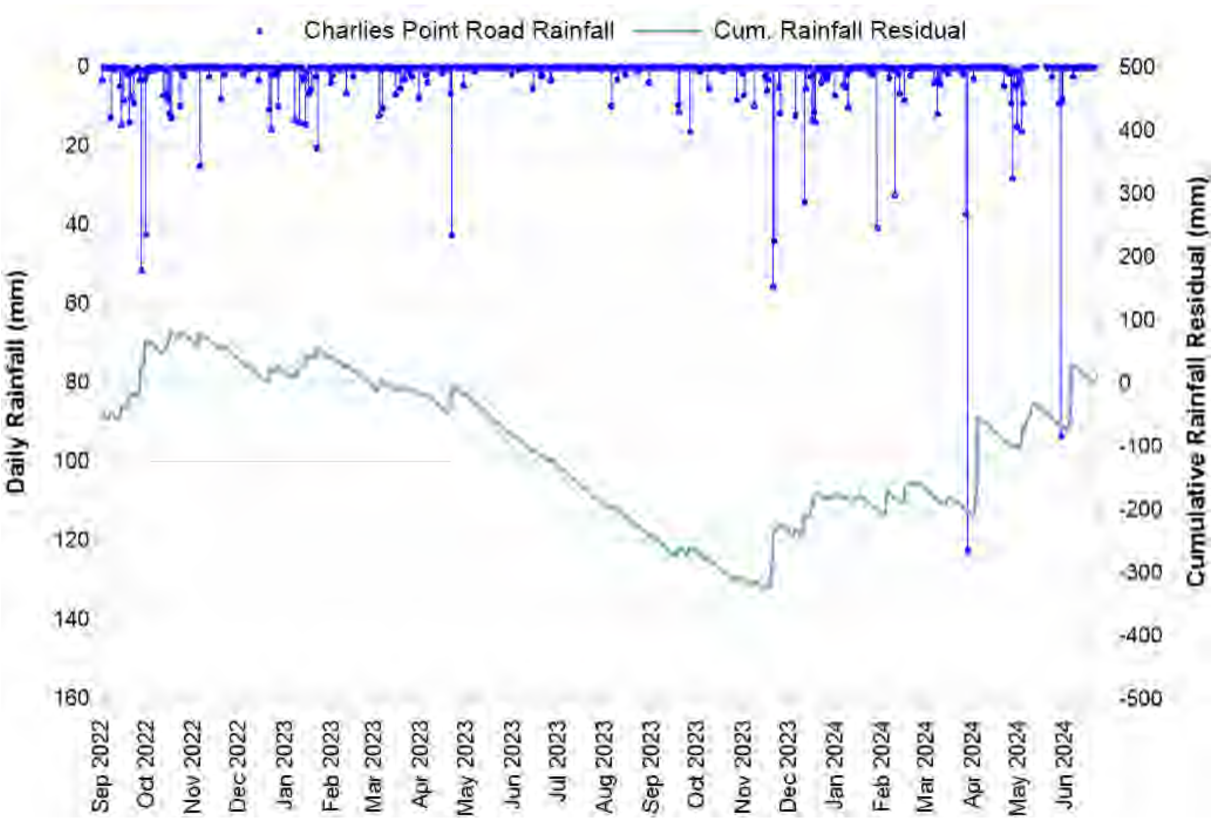
The assessment of monitoring data against the TARP trigger levels defined in the WMP is provided in **Section 6**.

5.1 Rainfall Trends

DIAGRAM 2 presents daily rainfall data recorded at the Tahmoor Coal rainfall station (refer **MAP 4**), referred to as “Charlies Point Road”. Rainfall data from 8 September 2022 to 30 June 2024 is displayed with the cumulative rainfall residual (CRR)[2], to illustrate climatic trends over a long-term period. The CRR was calculated from SILO Point Data for the period of 1 January 2000 to 30 June 2024, and Charlies Point Road data for the period of 8 September 2022 to 30 June 2024. The SILO Point Data was obtained for a location near Tahmoor South.

The cumulative rainfall residual depicted in **DIAGRAM 2** indicates that during January and early April, near average rainfall conditions were recorded. From middle April to June an increasing trend was recorded.

DIAGRAM 2: DAILY RAINFALL AND CUMULATIVE RAINFALL RESIDUAL



[2] The cumulative rainfall residual is calculated as the cumulative deviation from the average daily rainfall, where positive (upward) slope in the plot indicates periods of above average rainfall and negative (downward) slope indicates periods of below average rainfall.

5.2 Surface Water Level Data

Automated water level data for the full period of record is presented as a series of graphs in **Appendix B**. Note that the cease to flow (CTF) level shown on the automated water level plots refers to the point at which surface water ceases to flow over the pool control (i.e., the lowest point on a rockbar, boulder field or other feature that contains water within the pool / controls surface flow from the pool). If surface flow over the pool control ceases, there may still be leakage from the pool occurring around, through or under the pool control and reporting downstream.

TABLE 2 presents a summary of the review period water level trends. Note that the water level data recorded at monitoring site TT14-QLa is not summarised in **TABLE 2,** rather the water level data is converted to streamflow using a rating relationship derived for the low flow gauging weir at TT-F1 (refer **MAP 4** for location). Streamflow records for TT-F1, derived based on TT14-QLa water level data, are presented in **Section 5.3**.

TABLE 2: SUMMARY OF WATER LEVEL TRENDS - 1 JANUARY TO 30 JUNE 2024

Monitoring Site	Classification	Summary of Water Level Trends	Appendix B - Graph Reference
Teatree Hollow Catchment			
TT1-QLa	Reference Site	The water level trends were consistent with climatic conditions for the duration of the review period. The water level was recorded below the CTF for short periods in early-March, consistent with below average rainfall conditions. The water level rose considerably in early April and early June in response to high rainfall events.	B1.1
TT2-QLa	Potential Impact Site	The water level rose and fell periodically in response to rainfall conditions. The water level declined below the trigger level for a brief period in February 2024 and from mid-March to early April.	B1.2
TT3-QLa	Potential Impact Site	The water level was recorded above the CTF level for brief periods during and following rainfall events. During low rainfall periods, the water level declined below the sensor level or the pool was dry.	B1.3
TT7-QLa	Potential Impact Site	The water level remained above the CTF level and the baseline minimum for most of the review period. The water level was recorded below the trigger level for a brief period from late March to early April.	B1.4
TT9-QLa	Potential Impact Site	The water level was recorded below the trigger level for brief periods in February, March and April 2024. In response to high rainfall event in April, the water level rose and remained above the baseline minimum until the end of the review period.	B1.5
TT12-QLa	Potential Impact Site	From January to early April 2024, except during rainfall events, the water level was recorded below the sensor level or the pool was dry. From early April to June 2024, the water level was recorded predominately above the baseline minimum.	B1.6

Monitoring Site	Classification	Summary of Water Level Trends	Appendix B - Graph Reference
TT13-QLa	Potential Impact Site	Except during rainfall events, the water level was recorded below the baseline minimum during the review period. The water level declined below the trigger level for periods of January, February, March, April and May 2024.	B1.7
Bargo River			
BR16-QLa	Reference Site	The water level trends were consistent with climatic conditions for the duration of the review period. Note that no data was available from mid-January to early March (refer **Section 4.2**). However, manual measurements recorded during this period indicated that the water level was above the baseline minimum.	B2.1
BR12-QLa	Potential Impact Site	The water level remained above the baseline minimum for the duration of the review period.	B2.2
BR13-QRLa	Potential Impact Site	The water level remained above the baseline minimum for the duration of the review period.	B2.3
BR17-QLa	Potential Impact Site	The water level remained above the baseline minimum for the duration of the review period. Note that no data was available from mid-January to early March (refer **Section 4.2**). However, manual measurements recorded during this period indicated that the water level was above the baseline minimum.	B2.4
BR18-QLa	Potential Impact Site	The water level remained above the baseline minimum for the duration of the review period. Note that no data was available from mid-January to early March (refer **Section 4.2**). However, manual measurements recorded during this period indicated that the water level was above the baseline minimum.	B2.5

5.3 Streamflow Data

The TT-F1 streamflow and rainfall data from SILO Point Data and Charlies Point Road for the period of record is presented in **DIAGRAM 3**. The cumulative rainfall (CRR) and cumulative streamflow residual (CSR) for the period of record is presented in **DIAGRAM 4.**

The streamflow records presented in **DIAGRAM 3** indicate that streamflow at TT-F1 in Teatree Hollow is intermittent, with extended periods of no flow recorded prior to the commencement of mining of LW S1A. During the review period, flow occurred intermittently in response to rainfall.

The comparison of the cumulative rainfall (CRR) and streamflow residual (CSR) presented in **DIAGRAM 4** indicates that streamflow trends have been consistent with rainfall trends for the duration of the review period. It is also considered that the rate of streamflow decline recorded during the review period is consistent with historical declines, including periods prior to the commencement of mining of LW S1A.

DIAGRAM 3: TEATREE HOLLOW (TT-F1) STREAMFLOW AND RAINFALL

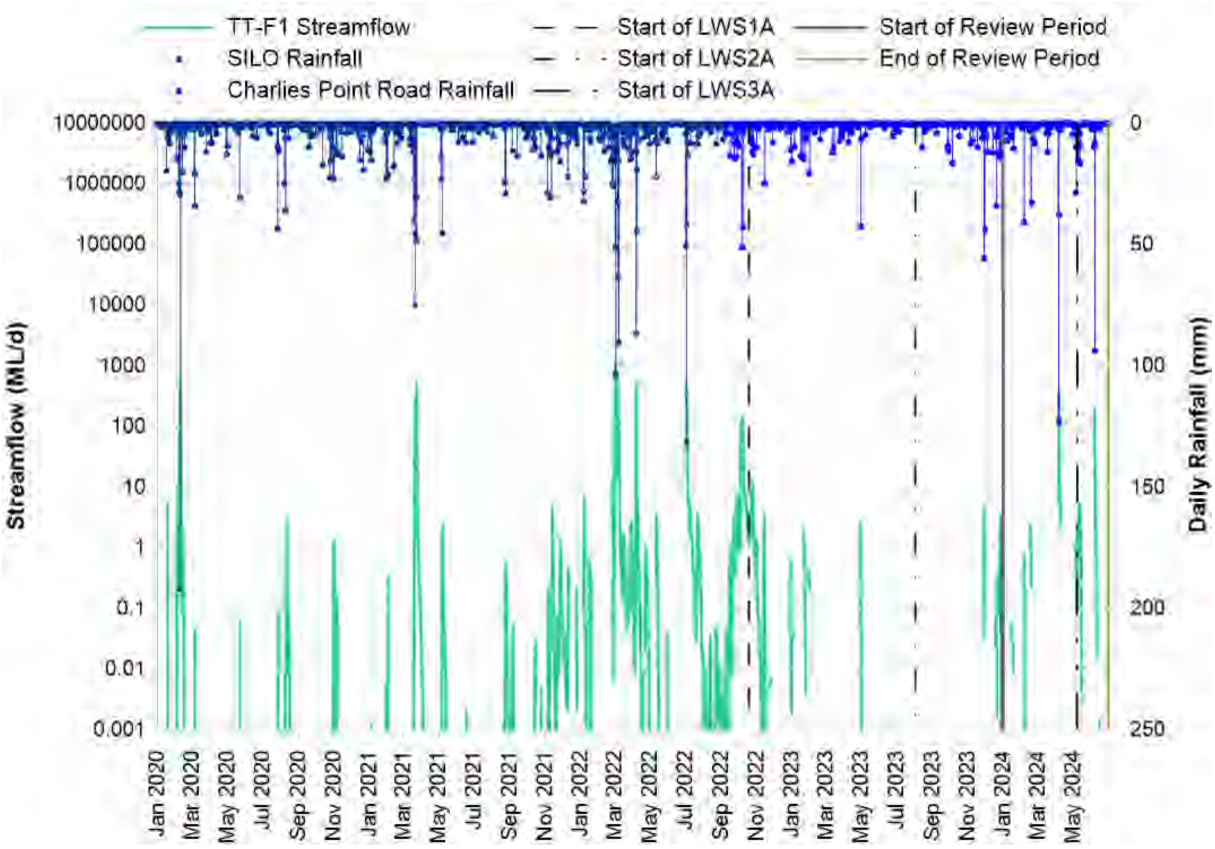
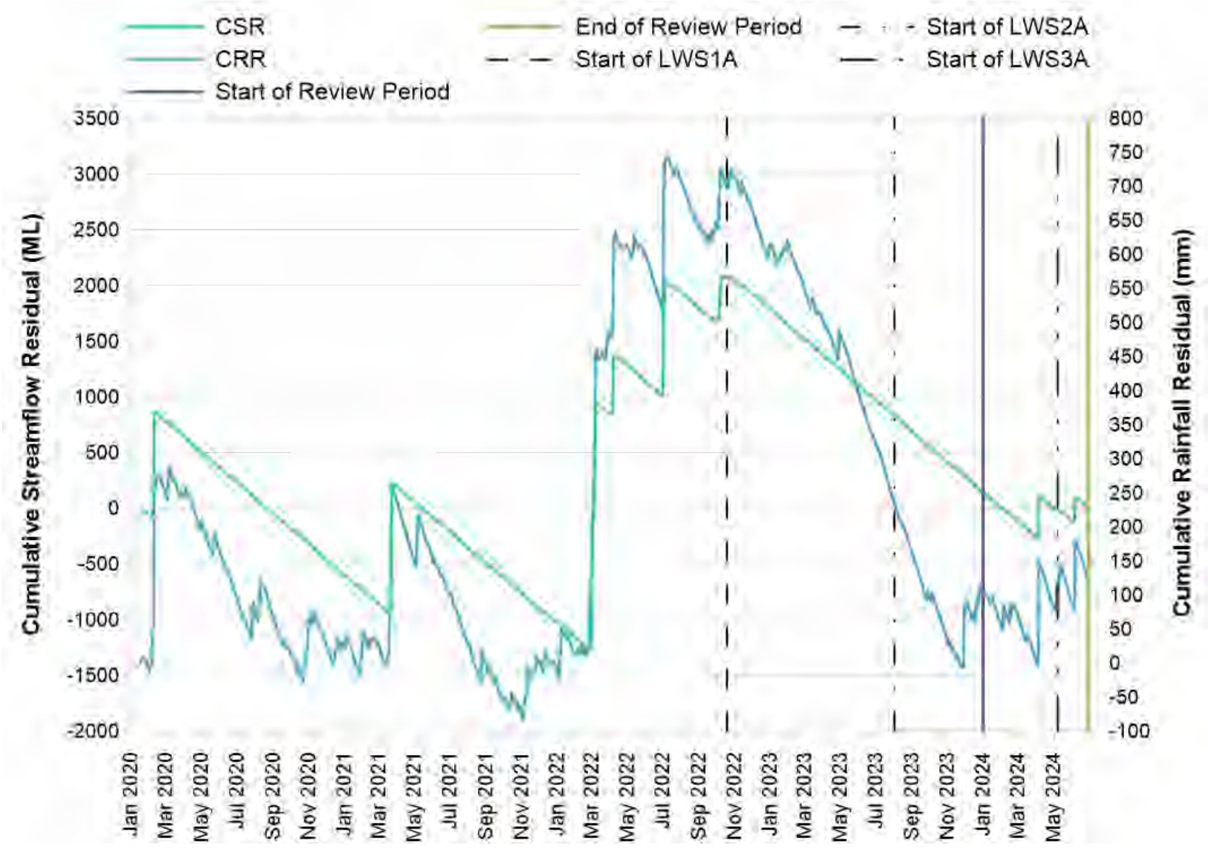


DIAGRAM 4: TEATREE HOLLOW (TT-F1) STREAMFLOW AND RAINFALL



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5.4 Surface Water Quality

The water quality recorded during the period of 1 January to 30 June 2024 is summarised in **TABLE 3**, and it is graphically presented in **Appendix C.**

The following constituents have been adopted for the assessment as they are considered to be primary indicators of a potential mining related effect (refer WMP).

- pH
- electrical conductivity (EC)
- specific dissolved metals: aluminium, copper, iron, manganese, nickel and zinc

TABLE 3: SUMMARY OF KEY WATER QUALITY CONSTITUENTS – 1 JANUARY TO 30 JUNE 2024

Constituent	Summary of Water Quality	
	Teatree Hollow Catchment TT1-QLa (reference site) TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa (potential impact sites)	**Bargo River** BR16-QLa (reference site) BR12-QLa, BR13-QRLa, BR17-QLa, BR18-QLa (potential impact sites)
Field pH	• Slightly acidic to slightly alkaline pH recorded at all monitoring sites. • The pH values recorded during the review period were within the range of baseline values for all sites.	• Slightly acidic to slightly alkaline pH was recorded at all monitoring sites. • The pH recorded during the review period was within the range of baseline values for all sites.
Field Electrical Conductivity (EC)	• Field EC values recorded during the review period were within the range of baseline values for all sites.	• Field EC values were within the range of baseline values for the duration of the review period. • A decrease in EC values was recorded in June in comparison to the remainder of the review period, except at site BR13-QRLa.
Dissolved Aluminium	• Dissolved aluminium concentrations were variable at all sites during the review period, including reference site TT1-QLa. • Historically high concentrations of dissolved aluminium were recorded at all sites in May.	• The concentrations of dissolved aluminium were slightly elevated from April to June in comparison to January to March 2024. • Notwithstanding, the dissolved aluminium concentrations were within the range of baseline concentrations.
Dissolved Copper	• Dissolved copper concentrations were within the range of baseline conditions at all sites during the review period.	• Dissolved copper concentrations were equal to or less than the limit of reporting for the duration of the review period, except at reference site BR16-QLa. • A historically high concentration was recorded at reference site BR16-QLa in February (0.002 mg/L).

Constituent	Summary of Water Quality	
	Teatree Hollow Catchment TT1-QLa (reference site) TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa (potential impact sites)	**Bargo River** BR16-QLa (reference site) BR12-QLa, BR13-QRLa, BR17-QLa, BR18-QLa (potential impact sites)
Dissolved Iron	• Dissolved iron concentrations were within the range of baseline concentrations at most sites, except reference site TT1-QLa. A historically elevated dissolved iron concentration was recorded at TT1-QLa in May (1.14 mg/L).	• Slightly elevated concentrations of dissolved iron (generally above 0.6 mg/L) were recorded from January to March, however, were declined to less than 0.4 mg/L from April to June 2024. • The dissolved iron concentrations were within the range of baseline concentrations for the duration of the review period.
Dissolved Manganese	• Dissolved manganese concentrations recorded during the review period were within the range of baseline concentrations at all sites.	• Dissolved manganese concentrations recorded at all sites were within the range of baseline values.
Dissolved Nickel	• Dissolved nickel concentrations recorded during the review period were within the range of baseline concentrations at all sites.	• Dissolved nickel concentrations were within the range of baseline concentrations for the duration of the review period at all sites.
Dissolved Zinc	• Dissolved zinc concentrations were within the range of baseline concentrations at all sites.	• Dissolved zinc concentrations were within the range of baseline concentrations for the duration of the review period at all sites.

5.5 Pool Physical Features and Natural Behaviour

Inspections of the natural behaviour and physical features of pools is undertaken as per frequency below:

- **Fortnightly**: for sites within the active subsidence zone.
- **Monthly**: for sites outside of the active subsidence period.

The inspections are undertaken to record visual observations of:

- **Natural behaviour**: pool water level and surface flow in the downstream reach.
- **Physical features**: iron staining, gas release, turbidity and fracturing.

The visual inspection observations recorded during active mining have been compared to the baseline visual inspection recorded between July and October 2022, prior to the commencement of mining of LW S1A.

A summary of key visual observations recorded during the review period is presented in **TABLE 4**.

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TABLE 4: SUMMARY OF POOL VISUAL INSPECTION RECORDS – 1 JANUARY TO 30 JUNE 2024

Pool	Classification	Inspection Date	Summary of Visual Inspection Records
TT1	Reference Site	January to June 2024	• In late March, the water level was visually lower than baseline levels, with trickle flow over the hydraulic control. • Following a period of high rainfall, the water level rose and was observed higher than baseline levels in May and June. • The observed pool physical features were consistent with baseline conditions during the review period, with no new fractures, iron staining, or gas release observed. • Moderate turbidity was noted during the review period.
TT2	Potential Impact Site	January to June 2024	• The water level was generally consistent with baseline conditions, except in February and March. During these months, the water level was reported visually lower than baseline conditions. Following a period of high rainfall, the water level rose and was observed higher than baseline levels in May and June. • The water flow was consistent with the reference site for most of the period, except in March. In January and February, trickle flow over hydraulic control was recorded, consistent with reference site TT1. Flow over the hydraulic control was also recorded from April to June. In March, no flow was recorded, inconsistent with reference site conditions. • In April, the fractured boulder (first observed in July 2023) was noted to have been washed way. • A new fracture of approximately 6 m was observed upstream of the pool during the June inspection. • No iron staining or gas discharge were noted during the review period. • Turbidity was reported as moderate between January to April. In May and June, turbidity was noted as high.
TT3	Potential Impact Site	January to June 2024	• The pool was observed as dry during the inspection events from January to March, with no connective surface flow observed from TT2 to TT3. • Following a period of high rainfall, the water level rose and was observed higher than baseline levels in May and June. • No mining related fractures were observed. • No iron staining or gas release were noted. • High turbidity was noted in May and June inspections.

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Pool	Classification	Inspection Date	Summary of Visual Inspection Records
TT7	Potential Impact Site	January to March 2024	• The water level was generally consistent with baseline conditions except in March when a water level decline was noted, corresponding to a period of low rainfall. • No new fractures or gas release were observed during the review period. • Iron staining at the upstream reach of the pool was noted in January. • Moderate turbidity was observed during the review period.
TT9	Potential Impact Site	January to March 2024	• In comparison to baseline conditions, a decline in water level was observed in February and March corresponding to a period of low rainfall. • No new fractures were observed, and no development of historical fractures was noted. • No iron staining or gas discharge was noted. • Moderate turbidity was observed in January, February and March.
TT10	Potential Impact Site	January, May and June 2024	• The water level observed was consistent with baseline conditions in January. From February to April, no inspection results were available for the site. • Following a period of high rainfall, in May and June the water level was observed higher than baseline conditions. • No gas discharge, iron staining or fracturing were noted during the review period. • Minor turbidity was observed for most of the review period, increasing to moderate in May and June.
TT11	Potential Impact Site	January to March, May and June 2024	• The pool was observed as dry in January, February and March. • Following a period of high rainfall, the water level rose and was noted higher than baseline conditions in May and June. • No gas discharge or iron staining was observed. • No new fractures were observed and no development of the historical fractures was noted. • High turbidity was noted in May and June.
TT12	Potential Impact Site	January to March, May and June 2024	• In comparison to baseline conditions, a decline in water level was observed in January with no flow over the hydraulic control present. • The pool was observed as dry in mid-February, with isolated puddles noted in late February. In March, pool TT12 was observed as dry again. • Following a period of high rainfall, the water level rose and was noted higher than baseline conditions in May and June. • No development of historical fractures was noted. • Iron staining was observed downstream of the pool. • No gas discharge was observed. • Moderate to high turbidity noted in May and June.

Pool	Classification	Inspection Date	Summary of Visual Inspection Records
TT13	Potential Impact Site	January to March 2024	• In comparison to baseline conditions, a decline in water level was observed in January, February and March, with no flow over the hydraulic control (water was pooled). • No changes to fractures, inferred to be natural, were noted. • No iron staining or gas release observed. • Moderate turbidity noted during the review period.
TT15	Potential Impact Site	January, February, May and June 2024	• The water level was consistent with baseline conditions for most of the review period. • Following a period of high rainfall, the water level was visually higher than baseline conditions in May and June. • No gas discharge or iron staining was observed. • Moderate turbidity was noted during the review period. • No fractures were observed.

5.6 Channel Morphology and Knickpoint and Headwater Sites

Inspections of the physical features and natural behaviour of channel morphology and knickpoint sites are undertaken on a minimum monthly basis to record visual observations of the following:

- ponded / flowing water (where relevant)
- iron staining, gas release and turbidity (where relevant)
- fracturing or shearing (where relevant)
- knickpoint development
- erosion and sedimentation.

In addition, annual visual inspections are conducted in October at headwater sites to characterise erosion and sedimentation.

The visual inspection observations recorded during active mining have been compared to the baseline visual inspection recorded in September 2022 (headwater sites) and October 2022 (channel morphology sites and knickpoints), prior to the commencement of mining of LW S1A.

A summary of the observations recorded during the review period is presented in **TABLE 5**.

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TABLE 5: SUMMARY OF VISUAL INSPECTION RECORDS FOR CHANNEL MORPHOLOGY, KNICKPOINT AND HEADWATER SITES – 1 JANUARY TO 30 JUNE 2024

Pool	Classification	Inspection Date	Summary of Visual Inspection Records
CM1	Potential Impact Site	May and June	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions during the visual inspections
CM4	Potential Impact Site	May and June	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions during the visual inspections.
CM7	Potential Impact Site	January, February and March	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions during the visual inspections. • No changes to previously observed fracturing noted during the inspection period. • Iron staining was observed, consistent with baseline conditions. • No gas discharge was observed and turbidity was considered consistent with baseline conditions. • Ponded water was observed at CM7 although surface flow was not present in January and most of February. In late February and March, intermittent water flow was observed.
K57	Potential Impact Site	May and June	• Minor erosion development was observed in May and June in comparison to baseline conditions. • The minor erosion was considered to be related to elevated water flow following high rainfall.
K58, K60 and K61	Potential Impact Site	May and June	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions during the visual inspections.
K64	Potential Impact Site	May and June	• Minor erosion development was observed in May in comparison to baseline conditions. • Erosion development was observed to have increased to moderate in June. During the same period, some bank slipping and slumping was also noted.
K71, K73 and K78	Potential Impact Sites	January, February and March	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions during the visual inspections.

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6 SURFACE WATER TRIGGER EXCEEDANCE ASSESSMENT

The surface water trigger levels exceeding ‘Normal Condition’ during the period of 1 January to 30 June 2024 are summarised in **TABLE 6**.

In summary, triggers exceedances have been recorded at the following sites:

- **Surface water level**: TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa and TT13-QLa.
- **Physical features and natural pool behaviour**: TT2, TT3, TT11, TT12, TT13, K57 and K64.
- **Surface water quality**: no exceedances recorded during the review period.

A visual depiction of the Teatree Hollow and Teatree Hollow tributary surface water conditions and physical effects is presented in **MAP 7**. The information presented in **MAP 7** was predominately collated from the visual inspection records (ENRS, 2024a-f) and represents conditions observed in June 2024.

TABLE 6: SURFACE WATER TARP SIGNIFICANCE LEVELS AND ACTIONS – 1 JANUARY TO 30 JUNE 2024

<table>
<tr><th>Date</th><th>Location(s)</th><th>Comment</th><th>TARP Significance</th><th>Actions</th></tr>
<tr><td colspan="5">Surface Water Level (TARP WMP3)</td></tr>
<tr><td>2 to 5 February 2024</td><td>TT2-QLa</td><td rowspan="3">The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level (for more than one 24-hour period for automated pool water level) and the same did not occur at the reference site(s).</td><td rowspan="3">Level 1</td><td rowspan="3">• Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer Section 6.1).
• Streamflow data recorded at TT-F1 was reviewed and streamflow reduction assessment conducted (refer Section 5.3 and Section 6.1).
• Relevant information was obtained from key specialists necessary to inform assessment (refer Section 6.1).</td></tr>
<tr><td>1 to 5 February 2024</td><td>TT9-QLa</td></tr>
<tr><td>30 March to 4 April;
10 to 18 April 2024</td><td>TT7-QLa</td></tr>
<tr><td>10 March to 4 April 2024</td><td>TT2-QLa</td><td rowspan="4">The recorded water level has declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) and the same has not occurred at the reference site(s).</td><td rowspan="4">Level 2</td><td rowspan="4">• Actions as per Level 1.
• Detailed investigation undertaken to identify cause of atypical water level decline (refer Section 6.1).</td></tr>
<tr><td>5 January to 17 January; 21 January to 5 February; 9 to 17, 23 February; 17 April to 5 May, 29 May to 5 June, 29 to 30 June 2024</td><td>TT3-QLa</td></tr>
<tr><td>11 to 16, 27 March to 4 April</td><td>TT9-QLa</td></tr>
<tr><td>14, 20 to 31 January; 1 to 5, 8 to 17, 27 to 29 February; 25 to 29 April; 1 to 3 May 2024</td><td>TT12-QLa</td></tr>
</table>

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Date	Location(s)	Comment	TARP Significance	Actions
21 January to 6 February, 15 to 17 February; 5 March to 5 April; 1 to 5 May 2024	TT13-QLa			
26 February to 4 April 2024	TT3-QLa	The recorded water level has declined atypically for greater than one month (as a consecutive period) and the same has not occurred at the reference site(s).	Level 3	• Actions as per Level 2. • Detailed investigation undertaken to identify cause of atypical water level decline (refer **Section 6.1**).
1 March to 4 April 2024	TT12-QLa			

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Date	Location(s)	Comment	TARP Significance	Actions
Physical Features and Natural Pool Behaviour (TARP WMP5)				
February 2024	TT13	Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs in one month and the same has not occurred at the reference site(s) AND/OR visual observation of fracturing	Level 1	• Visual changes along watercourse were reviewed with consideration to climatic conditions (refer **Section 6.1**). • Monitoring and review of data frequency increased to fortnightly. • Relevant information was obtained from key specialists necessary to inform assessment (refer **Section 6.1**).
March 2024	TT13	Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs for two consecutive months and the same has not occurred at the reference site(s).	Level 2	• Actions as per Level 1. • Detailed investigation undertaken to assess if the change in behaviour is related to mining effects (refer **Section 6.1**).
January - June 2024	TT2, TT3	Visually observed anomalous change in water level, overland connected flow, iron staining, gas release or turbidity - as compared with baseline conditions - occurs for three consecutive months and the same has not occurred at the reference site(s) AND the change in behaviour has been investigated and confirmed to be related to mining effects.	Level 3	• Actions as per Level 2.
January – March, May, and June 2024	TT11, TT12			

Date	Location(s)	Comment	TARP Significance	Actions
Channel Stability, Sedimentation and Erosion (TARP WMP7)				
May 2024	K57, K64	Visually observed minor increase in knickpoint development and/or minor erosion and sedimentation of headwater streams.	Level 1	• Relevant information was obtained from key specialists necessary to inform assessment (refer **Section 6.3**). • Monitoring and review of data frequency increase considered (refer **Section 7.3**). • Reasonable and feasible options for remediation were considered where relevant (refer **Section 7.3**).
June 2024	K57			
June 2024	K64	Visually observed moderate increase in knickpoint development and/or moderate or greater increase in erosion and sedimentation of headwater streams.	Level 2	• Actions as stated in Level 1. • Detailed investigation undertaken to assess if the change in behaviour is related to mining effects (refer **Section 6.3**). • Advise was obtained by specialists as detailed in **Section 6.3.**

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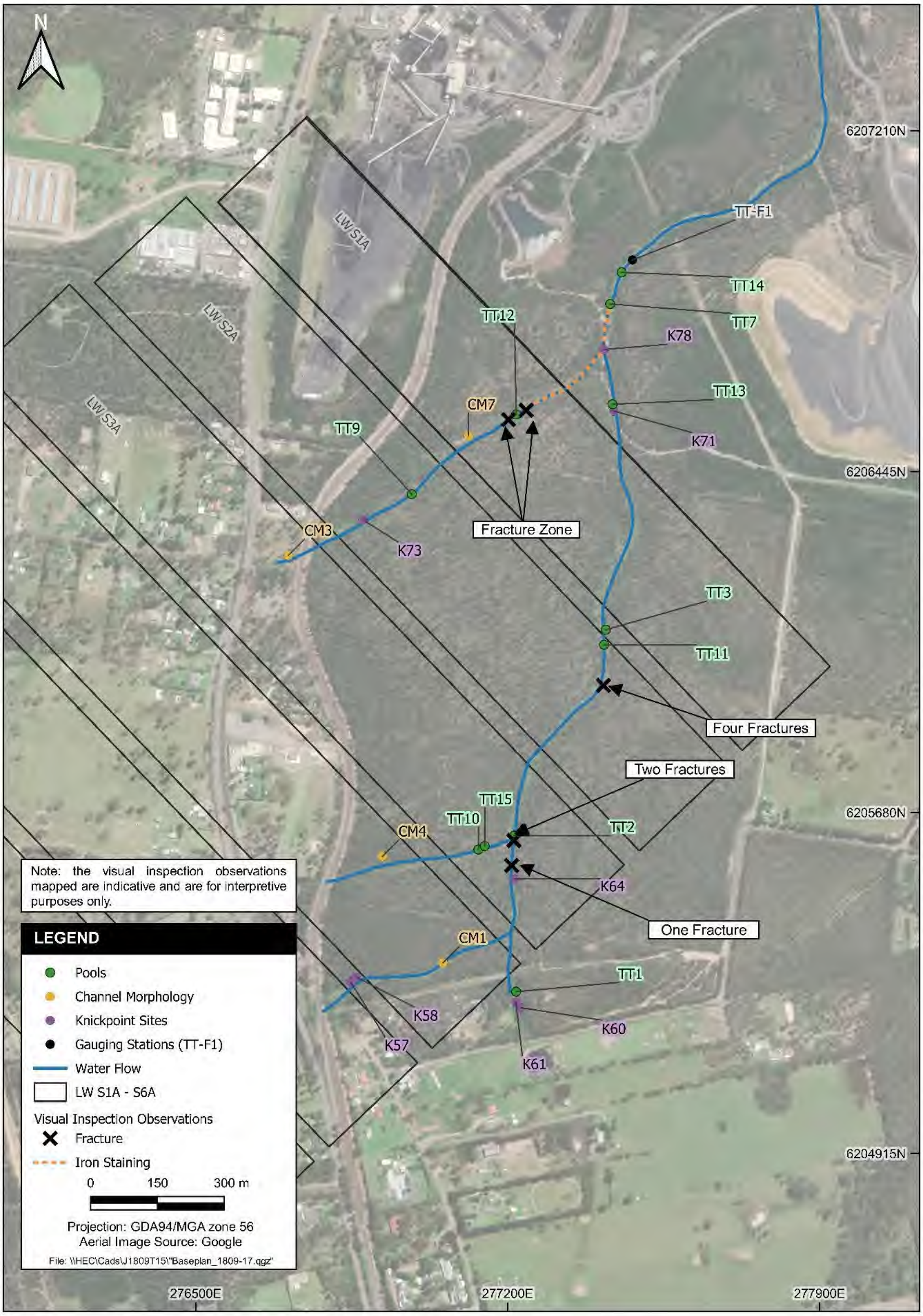
MAP 7: VISUAL DEPICTION OF SURFACE WATER CHARACTERISTICS AND PHYSICAL EFFECTS (JUNE 2024)



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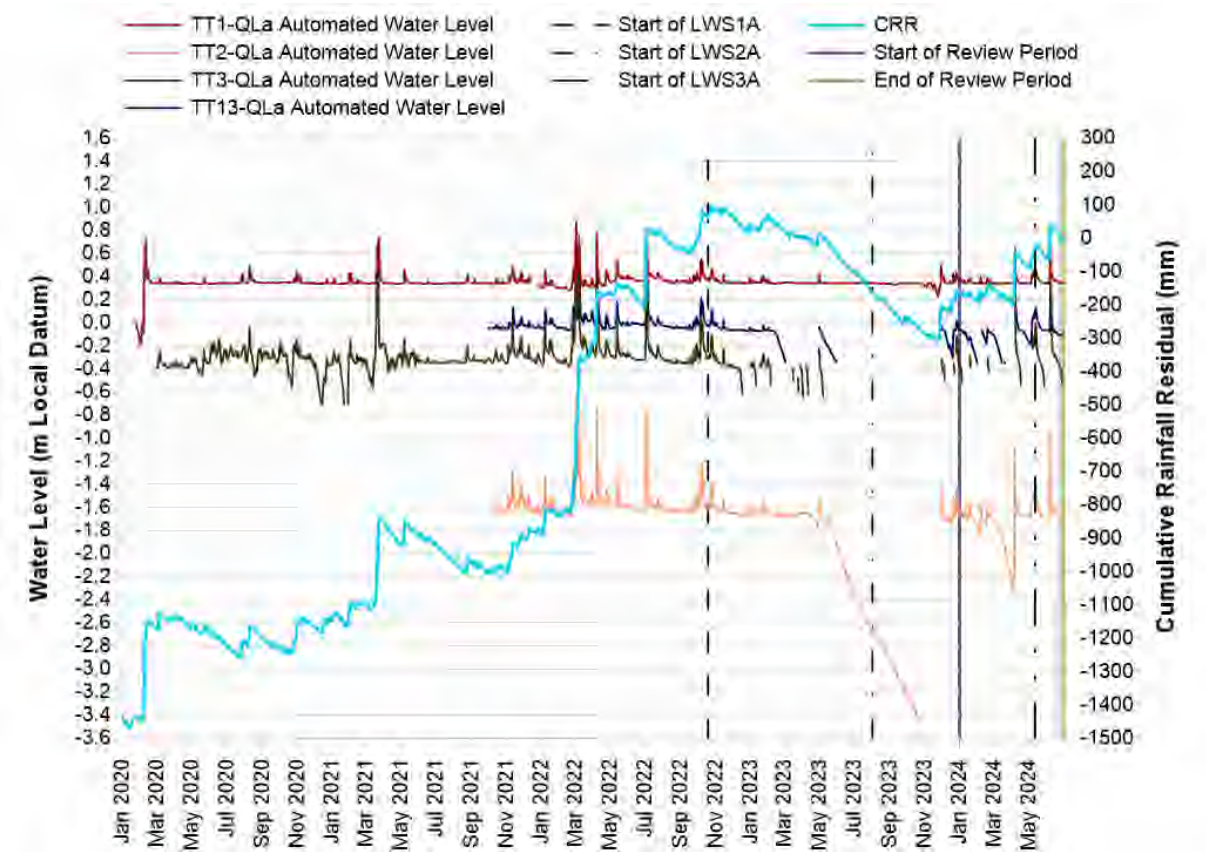
6.1 Water Level Assessment

6.1.1 Teatree Hollow Tributary

DIAGRAM 5 presents a comparison of the water level data recorded at monitoring sites on Teatree Hollow tributary for the full period of record. The cumulative rainfall residual (CRR) is also presented, and it was calculated for the period 1 January 2000 to 30 June 2024 to illustrate long-term trends in rainfall.

Note that the water levels have been converted to metres local datum to facilitate the comparative assessment.

DIAGRAM 5: TEATREE HOLLOW TRIBUTARY WATER LEVEL COMPARISON



Reference Site TT1-QLa – Pool TT1

As illustrated in **DIAGRAM 5**, the water level trends recorded at pool TT1 (reference site TT1-QLa) were consistent with climatic conditions during the review period.

It is noted that pool TT1 is located upstream of the zone of active subsidence. The groundwater levels recorded at P55A-C for the period of record, indicated that baseflow contribution is likely to be negligible in the vicinity of TT1-QLa (refer **Section 3**).

Monitoring Site TT2-QLa – Pools TT2, TT10 and TT15

A Level 3 trigger was initially reported at pool TT2 (monitoring site TT2-QLa) in August 2023. During the current review period, the water level at pool TT2 rose in response to rainfall events, however, declined atypically below the trigger level from 10 March to 4 April (Level 2 trigger).

It is noted that 320 mm of closure developed at pool TT2 (Big Pool) from late May to end of June 2024 (refer **Section 2**). In June, a new fracture of approximately 6 m long was observed approximately 12 m upstream of pool TT2.

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Fracturing has not been observed at pool TT10 or pool TT15, located on a minor tributary which discharges to Teatree Hollow tributary immediately upstream of pool TT2. In January, connective flow was reported to cease upstream of CM4, located upstream of pool TT10, with water levels reported as consistent with baseline conditions at pools TT10 and TT15 during the visual inspection periods (refer **TABLE 4**).

There is insufficient groundwater monitoring data to assess surface water-groundwater connectivity in the vicinity of pool TT2 (refer **Section 3**). As such, a decline in baseflow contribution to pool TT2 during the review period can be neither confirmed nor discounted.

The water level decline, particularly between March and April recorded at pool TT2, is considered atypical and inconsistent with historical conditions. In addition, fracturing has been recorded at and upstream of pool TT2, indicating that mining related effects have occurred in the direct vicinity of pool TT2.

As such, it is considered that the water level decline recorded at pool TT2 during the review period is related to mining effects in combination with the prevailing climatic conditions.

Monitoring Site TT3-QLa – Pools TT3 and TT11

Pool TT3 and pool TT11 were reported as dry during the visual inspections conducted from January to March 2024, with no connective surface flow observed from approximately 15 m downstream of TT1 and pooled water recorded at pool TT2. The water level rose from April to June in response to rainfall. Note that no visual inspection was recorded at TT11 in April 2024.

It is noted that the water level at pool TT3 has been recorded below the sensor level since mid-December 2022, except for brief intervals during or following rainfall (refer **DIAGRAM 5**). As illustrated in **Map 7**, fracturing has occurred upstream of pool TT3 and pool TT11.

Closure development generally stabilised between sites S03 and S04 (Ockenden Pool TT3) from January to late May 2024. From late May to end of June 2024, a further 10 mm (approximately) of closure was recorded (refer **Section 2**). No new fracturing or development of historical fractures were recorded at pools TT3 and TT11 during the review period.

As indicated by SLR the likelihood of groundwater-surface water connectivity in the vicinity of pool TT11 and pool TT3 is considered low (refer **Section 3**). As such, the decline in water level recorded at pool TT3 is unlikely related to a decline in baseflow contribution.

The water level decline recorded at pool TT3 is considered atypical and inconsistent with historical conditions. It is considered that the atypical decline in water level recorded at pool TT3 is related to the diversion of surface flow via upstream mining-related fractures.

Monitoring Site TT13-QLa – Pool TT13

The water level at pool TT13 declined intermittently below the trigger level for periods from January to June 2024, with a maximum Level 2 trigger recorded. The water level declines occurred during periods of below average rainfall, however, are considered atypical in comparison to baseline conditions.

As indicated by SLR, the likelihood of groundwater-surface water connectivity in the vicinity of pool TT13 is considered low (refer **Section 3**). As such, the decline in water level recorded at pool TT3 is unlikely related to a decline in baseflow contribution.

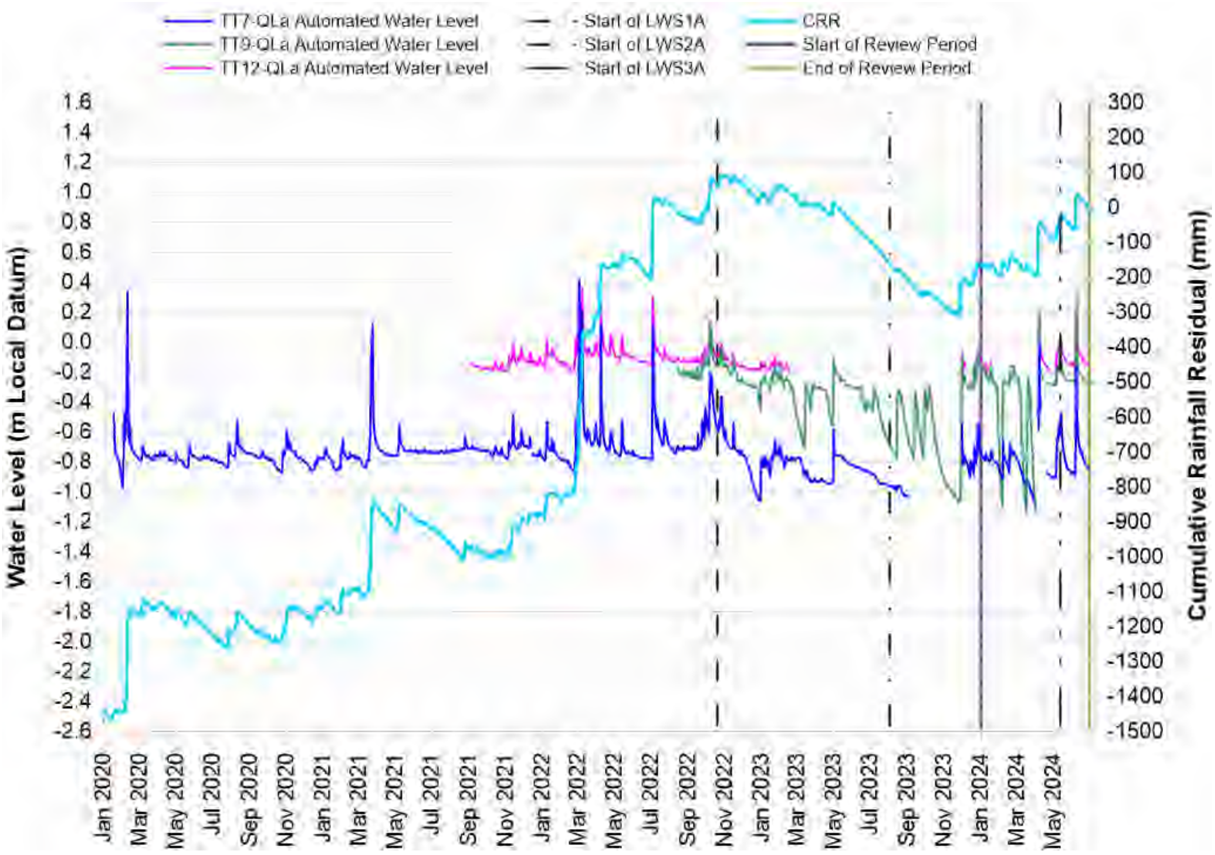
The declines in water level recorded during the review period are considered related to the cessation of surface water flow in Teatree Hollow tributary due to mining induced fracturing upstream of pool TT11 in combination with the prevailing climatic conditions.

6.1.2 Teatree Hollow

DIAGRAM 6 presents a comparison of the water level recorded at monitoring sites on Teatree Hollow for the period of record. The CRR is also presented (calculated for the period 1 January 2000 to 30 June 2024).

Note that the water levels have been converted to metres local datum to facilitate the comparative assessment.

DIAGRAM 6: TEATREE HOLLOW WATER LEVEL COMPARISON



Monitoring Site TT7-QLa – Pool TT7

As illustrated in **DIAGRAM 6**, the water level recorded at pool TT7 during the review period was generally consistent with climatic conditions, fluctuating in response to rainfall trends. From late March to early April 2024, a decline in water level was recorded equating to a Level 1 trigger.

It is considered that the decline in water level recorded at pool TT7 from 30 March to 4 April 2024 was predominately related to the prevailing climatic conditions. However, mine induced fracturing has occurred at locations in Teatree Hollow and Teatree Hollow tributary upstream of pool TT7. As such, it is considered that upstream fracturing has likely resulted in a change in surface flow reporting to pool TT7.

It is noted that the groundwater levels recorded at monitoring bore P52 indicated that baseflow contribution was likely negligible in the vicinity of TT7-QLa as stated in **Section 3.**

Monitoring Site TT9-QLa – Pool TT9

The water level at pool TT9 (monitoring site TT9-QLa) fluctuated in response to rainfall conditions during the review period. The water level was recorded below the trigger level in parts of February, March and April 2024 (maximum Level 2 trigger). On 14 March, the pool was visually observed as dry. Following rainfall events from early April 2024, the water level rose and remained above the trigger level for the remainder of the review period.

It is noted that only two months of baseline data are available for this site prior to the commencement of mining of LW S1A (refer **DIAGRAM 6**). As such, there is potential that the water level at monitoring site TT9-QLa declined to similar levels historically. Notwithstanding, it is considered that the water level declines recorded during the review period were atypical, with an increased rate of water level recession evident in comparison to historical conditions.

It is noted that there is insufficient groundwater monitoring data to assess surface water-groundwater connectivity in the vicinity of pool TT9. As such, a decline in baseflow contribution to pool TT9 during the review period can be neither confirmed nor discounted. Additionally, mining related fractures have not been observed at pool TT9 to date.

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Notwithstanding, the water level data recorded at pool TT9 during the review period indicates a change in water level behaviour and an increase in the rate of water level recession in comparison to historical conditions. Accordingly, it is considered that the decline in water level recorded at pool TT9 during the review period is related to the prevailing climatic conditions in addition to mining effects.

Monitoring Site TT12-QLa – Pool TT12

From January to early April 2024, the water level was recorded below the sensor level or the pool was dry, except for very brief periods during rainfall events. During this period, a maximum Level 3 trigger was recorded. Following above average rainfall from early April 2024, the water level rose and remained predominantly above the trigger level to the end of the review period.

Mining-related fracturing has previously occurred upstream and downstream of pool TT12. During the review period, no new fractures or further development of existing fractures was reported. Notwithstanding, the decline in water level recorded during the review period is considered atypical and considered related to mining induced fracturing (previously recorded) in combination with the prevailing climatic conditions.

6.2 Streamflow Assessment

Despite mining related impacts recorded at locations in Teatree Hollow and Teatree Hollow tributary, the streamflow data presented in **Section 5.3** indicates that streamflow trends recorded at monitoring site TT-F1 have been consistent with rainfall trends during January and June 2024. The rate of streamflow decline recorded during the review period is considered consistent with that recorded prior to the commencement of mining of LW S1A and consistent with climatic conditions during the review period.

Notwithstanding, a streamflow reduction assessment has been conducted for the period from commencement of mining of LW S1A (October 2022) to end June 2024 to estimate the volume of surface water reduction attributable to mining effects. In accordance with the SSD 8445, the surface water reduction volumes will be presented in the Annual Review and compared to the Water Access Licence (WAL) volumes held by Tahmoor Coal for the Maldon Weir Management Zone of the Upper Nepean and Upstream Warragamba Water Source (regulated by the *Water Sharing Plan for Greater Metropolitan Region Unregulated River Water Sources)*.

6.3 Channel Morphology and Knickpoint Assessment

During May and June 2024, erosion development and a moderate increase in bank slipping and slumping were recorded at knifepoint K64. High rainfall/flow events occurred during this period, in addition to direct undermining of K64. MSEC, 2024 **[11]** reported incremental subsidence of 533 mm at pool TT2 located downstream of K64 during May and June. Accordingly, the erosion development and bank slipping and slumping is considered to be associated with high rainfall/flow events in combination with mining-induced subsidence.

7 REVIEW OF SURFACE WATER PERFORMANCE

7.1 Subsidence Impact Performance Measures

The monitoring results, in conjunction with the TARPs, are used to assess the impacts of mining in Tahmoor South against the subsidence impact performance measures specified in **TABLE 7**, as replicated from the WMP.

TABLE 7: SUBSIDENCE PERFORMANCE MEASURES AND PERFORMANCE INDICATORS FOR SURFACE WATER

Feature	Subsidence Performance Measures	Subsidence Performance Indicators
All watercourses within the Subsidence Area	No greater subsidence impact or environmental consequences to water quality, water flows (including baseflow) or stream health (including riparian vegetation), than predicted in the EIS.	Exceedance of the impact assessment criteria, as defined in the relevant Level 1 to Level 3 trigger, where a Level 3 trigger denotes progression towards a potential exceedance of the performance measure.
Other watercourses	Negligible environmental consequences including beyond those predicted in the EIS, including: • negligible diversion of flows or changes in the natural drainage behaviour of pools; • negligible decline in baseline channel stability; • negligible gas releases and iron staining; and • negligible increase in water turbidity.	The performance measure will be considered to be exceeded if a Level 3 TARP is triggered in relation to water level decline and/or water quality changes and the investigation outcomes indicate a mining related impact based on monitoring data for sites in Hornes Creek and the Bargo River.

7.2 Assessment of Performance

TABLE 8 summarises the features considered to be directly or indirectly impacted by mining of LW S1A to LW S3A (to date).

TABLE 8: SUMMARY OF MINING RELATED IMPACTS

Watercourse Feature	Impact Feature	Impact Type
TT2	• Pool water level • Physical (fractures)	Direct
TT3	• Pool water level	Indirect
TT7	• Pool water level	Indirect
TT9	• Pool water level	Indirect
TT11	• Physical (fractures)	Indirect
TT12	• Pool water level • Physical (fractures) • Iron staining	Direct
TT13	• Pool water level	Indirect
K64 (upstream of TT2)	• Physical (erosion)	Direct

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Where Teatree Hollow and Teatree Hollow tributary are directly mined beneath, subsidence effects are expected to be of sufficient magnitude to result in the buckling of underlying strata and associated surface fracturing at some locations, as detailed in the *Tahmoor South Project Environmental Impact Statement* (SIMEC, 2019) **[8]**.

At these locations, it is likely that water would be diverted from the watercourse into the underlying dilated strata, and the diverted flow would be conveyed via the dilated strata, remerging further downstream in the watercourse as surface flow. As such, the localised reduction in pool water level and streamflow associated with fracturing in the vicinity of LW S1-S6A can occur. However, the net reduction in streamflow conveyed from Teatree Hollow to the Bargo River is expected to be negligible.

Additionally, isolated, episodic pulses in salinity and dissolved metals are expected to occur at Teatree Hollow due to subsidence induced changes in surface water runoff, underflow and baseflow discharging to these surface water systems.

Accordingly, it is considered that:

- The LW S1A to LW S3A mining related impacts to the watercourse features listed in **TABLE 8** are consistent with that predicted in the EIS.
- No greater impact than that predicted in the EIS has occurred to watercourses within the subsidence area.
- No impacts have occurred to other watercourses.
- No exceedance of the performance measures has occurred.
- No material environmental harm has occurred as a result of mining.

7.3 Impact Response

Direct and indirect mining impacts, in the form of surface fracturing and associated flow diversion, have occurred at several locations in Teatree Hollow and Teatree Hollow tributary, upstream of monitoring site TT-F1. During the review period, the reduction in surface flow recorded at TT-F1 was generally consistent with natural (climatic) variability (refer **Section 5.3**). As such, there is no indication of material environmental harm to Teatree Hollow or other watercourses caused by mining activities. Nonetheless, surface water monitoring and data review will continue to be undertaken in accordance with the WMP.

In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining.

Given that impacts at K64 are considered to be associated with high rainfall/flow events combined with mining-induced subsidence (i.e. direct mining impact was confirmed) an increased monitoring frequency is not required (in accordance with the WMP). Tahmoor Coal will continue to undertake visual inspections of K64 in accordance with WMP and following large rainfall events during the extraction of LW S4A and LW S5A to assess the extent and longevity of impacts. The requirement for remediation works at K64 would subsequently be assessed at this time.

A summary of the Tahmoor Coal responses to the action and responses as detailed in the TARPs in the WMP (Tahmoor Coal, 2023) has been prepared in collaboration with Tahmoor Coal and is presented in **Appendix C**.

8 GUIDELINE VALUES FOR BARGO RIVER MONITORING SITES

Subsidence monitoring data indicates negligible subsidence-related movement at monitoring sites across the Bargo River to date (refer **Section 2**). Additionally, impacts to water quality or water level have not been recorded at monitoring sites on the Bargo River.

Site specific guideline values (SSGVs) were not previously derived for monitoring sites BR16-QLa, BR17-QLa or BR18-QLa on the Bargo River due to an insufficient number of samples. Sufficient samples have now been collected to enable derivation of SSGVs for these sites. SSGVs have been derived or proposed consistent with the approach detailed in the WMP. Revised SSGVs are also proposed for monitoring sites BR12-QLa and BR13-QLa; updated to include contemporary monitoring data. It is noted that BR16-QLa is a reference site and, as such, SSGVs have been derived for this site for comparative purposes only.

The proposed SSGVs for monitoring sites on the Bargo River are listed in **TABLE 9**. The revised SSGVs would be documented in future in a revised version of the WMP.

TABLE 9: PROPOSED BARGO RIVER SSGVS

Parameter	BR12-QLa	BR13-QRLa	BR16-QLa	BR17-QLa	BR18-QLa
No. of Values	57	59	22	22	22
pH (pH units)	6.5 - 8	6.5 – 8	6.5 - 7.5	6.5 - 7.5	6.3 - 7.5
EC (µS/cm)	350	350	350	350	350
Dissolved Al (mg/L) – pH >6.5	0.060	0.070	0.070	0.060	0.080
Dissolved Cu (mg/L)	0.0014	0.0014	0.0014	0.0014	0.0014
Dissolved Fe (mg/L)	0.58	0.68	0.7	0.7	1.6
Dissolved Mn (mg/L)	1.9	1.9	1.9	1.9	1.9
Dissolved Ni (mg/L)	0.011	0.011	0.011	0.011	0.011
Dissolved Zn (mg/L)	0.008	0.008	0.008	0.008	0.008

9 SUMMARY AND RECOMMENDATIONS

9.1 Trigger Level Summary

Review and assessment of surface water monitoring data recorded prior to and during the review period of 1 January to 30 June 2024 has indicated the following.

Surface Water Level:

- A maximum Level 3 trigger exceedance was recoded at monitoring site TT3-QLa due to mining related fracturing in the vicinity of pool TT11 and pool TT3 in combination with climatic conditions.
- A maximum Level 2 trigger exceedance was recorded at monitoring site TT2-QLa due to mining related fracturing immediately upstream of pool TT2 in combination with climatic conditions.
- A maximum Level 2 trigger exceedance was recorded at monitoring site TT7-QLa and TT13-QLa as a result of upstream mining-related fracturing in combination with climatic conditions.
- A maximum Level 2 trigger exceedance was recorded at monitoring site TT9-QLa due to mining-related effects in combination with climatic conditions.
- A maximum Level 2 trigger exceedance was recorded at monitoring site TT12-QLa due to mining-related effects in combination with climatic conditions.
- The monitoring sites on the Bargo River were 'normal condition' for the duration of the review period.

Physical Features and Natural Behaviour of Pools:

- A maximum Level 3 trigger exceedance was recorded at pools TT3, TT11 and TT12 due to visually anomalous changes in water level.
- A maximum Level 3 trigger exceedance was recorded at pool TT2 due to visually anomalous changes in water level and the observation of a new mining-related fracture upstream of pool TT2 (June 2024).
- A maximum Level 2 trigger exceedance was recorded at pool TT13 due to visually anomalous changes in water level.

Channel Morphology and Knickpoint assessment

- A maximum Level 1 trigger exceedance was recorded at knickpoint K57 due to erosion development related to high rainfall.
- A maximum Level 2 trigger exceedance was recorded at knickpoint K64 due to erosion development, related to high rainfall and mining-induced subsidence, was recorded at knickpoint K64.

Based on the monitoring data for the period of 1 January to 30 June 2024, mining related impacts to the watercourse features are considered consistent with that detailed in the EIS.

9.2 Monitoring Recommendations

Based on the assessment outcomes contained herein, it is recommended that ongoing review of monitoring data is continued to be undertaken in accordance with the WMP. It is also recommended that knickpoint site K64 continue to be monitored in accordance with with the monitoring program and following large rainfall events to assess whether remedial work is necessary.

Recommendations from the previous review period (1 July to 31 December 2023, ATCW 2023) **[13]** and the subsequent status/actions are summarised in **TABLE 10**.

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TABLE 10: STATUS OF PREVIOUS SURFACE WATER MONITORING PROGRAM RECOMMENDATIONS

Item	Previous Recommendation	Progress of Recommendation
1	Ongoing review of surface monitoring data is continued to be undertaken in accordance with the WMP.	Since mining commencement in October 2022, review of surface monitoring data has been undertaken in accordance with the WMP.
2	Removal of the potential impact site CM3 from the monitoring program due to works associated with the railway corridor resulting in non-mining anthropogenic changes to the natural features of the channel at this location.	The site has been removed from the monitoring program.

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REFERENCES

[1] ENRS (2024a). January 2024 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd.

[2] ENRS (2024b). February 2024 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd.

[3] ENRS (2024c). March 2014 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd.

[4] ENRS (2024d). April 2024 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd.

[5] ENRS (2024e). May 2024 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd.

[6] ENRS (2024f). June 2024 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, December.

[7] ATC Williams Pty Ltd (2023) Tahmoor South Domain, Surface Water Review 18 October to 31 December 2022. Prepared on behalf of Tahmoor Coal Pty Ltd. March 2022. Doc ref: 121171-16R004-rev0.

[8] SIMEC (2019) Tahmoor South Project Environmental Impact Statement, Volumes 1 and 7, dated January 2019.

[9] SLR (2024). “Tahmoor South Groundwater Levels, January 2023 to July 2024”. Prepared by SLR Consulting Australia Pty Ltd (SLR) on behalf of Tahmoor Coal, August 2024.

[10] MSEC (2024). Six Monthly Subsidence Monitoring Report for Tahmoor South LW S2A. 1 January 2024 to 10 May 2024.

[11] MSEC (2024). Six Monthly Subsidence Monitoring Report for Tahmoor South LW S3A. 8 May 2024 to 30 June 2024.

[12] Tahmoor Coal (2023). Tahmoor South Domain – Longwalls South S1A-S6A Water Management Plan, January.

[13] ATCW (2023). Tahmoor South Domain – Surface Water Review 1 July to 31 December 2023. March 2024.

[14] ANZECC & ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

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APPENDICES

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APPENDIX A – SUMMARY OF SURFACE WATER MONITORING PROGRAM

Feature	Locations	Monitoring		
		Prior to Mining	During Mining	Post Mining
Streamflow	Streamflow gauging stations: • TT-F1 • DT-F1	Continuous record. Data downloaded prior to the commencement of secondary extraction in relevant catchment.	Continuous record. Data downloaded and reviewed monthly.	Continuous record, data downloaded and reviewed quarterly for 12 months following the completion of relevant mining activities. This period may be extended as per decision by the Environmental Response Group*.
Surface Water Quality	TT1-QLa, TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa, HC1-QLa, HC2-QLa, HC3-QLa, HC9-QLa, HC4-QRLa, HC13-QLa, HC15-QLa, HC17-QLa, BR6-QLa, BR13-QRLa, BR12-QLa, BR16-QLa, BR17-QLa, BR18-QLa, DT4-QLa, DT3-QLa	Monthly sampling prior to secondary extraction or other relevant mining activity.	Monthly sampling and analysis or as required by a specified action relevant to a trigger level.	Monthly sampling and analysis for a minimum of 12 months following the completion of LW S6A or as required in accordance with a Watercourse Corrective Action Management Plan.
		Parameters: Field analysis: pH, EC and DO, temperature and ORP. Laboratory analysis for: pH, EC, total dissolved solids, total suspended solids, turbidity, major cations†, sulphate, alkalinity, chloride, dissolved metals‡, total metals≠, total kjeldahl nitrogen, total nitrogen, total phosphorus, total cations and total anions.		

Feature	Locations	Monitoring		
		Prior to Mining	During Mining	Post Mining
Automated pool water level	Existing sites: TT1-QLa, TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa, HC1-QLa, HC2-QLa, HC3-QLa, HC9-QLa, HC4-QRLa, HC13-QLa, HC15-QLa, HC17-QLa, BR6-QLa, BR13-QRLa, BR12-QLa, BR16-QLa, BR17-QLa, BR18-QLa, DT4-QLa, DT3-QLa	Continuous record and monthly manual measurements. Data downloaded prior to the commencement of secondary extraction of the relevant longwall.	Continuous record and monthly manual measurements. Data downloaded and reviewed monthly.	Continuous record and monthly manual measurements for a minimum of 12 months following the completion of LW S6A or as required in accordance with a Watercourse Corrective Action Management Plan.
Physical features and natural behaviour of pools and reaches	Teatree Hollow, Teatree Hollow tributary and the Bargo River tributary pools and reaches	One observation prior to mining using fixed location photo points.	Observations every month during the active subsidence period (after 200 m of secondary extraction of relevant longwall) for sites within the active subsidence zone using fixed location photo points.	Quarterly observations over 12 months for pools that are no longer within the active subsidence zone or as required in accordance with a Watercourse Corrective Action Management Plan.
Morphology and channel stability	Headwater and knickpoint sites in Teatree Hollow, Teatree Hollow tributary and the Bargo River tributary	One observation prior to mining using fixed location photo points. One catchment survey of 10 headwater sites	Observations of knickpoint formation every month during the active subsidence period for sites within the active subsidence zone using fixed location photo points. Annual catchment survey of 10 headwater sites.	One observation of knickpoint formation at sites that are no longer within the active subsidence zone using fixed location photo points. One catchment survey of 10 headwater sites. Post-mining geomorphology survey following completion of mining LW S6A.

APPENDIX B – WATER LEVEL PLOTS

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APPENDIX B1 – TEATREE HOLLOW WATER LEVEL PLOTS

DIAGRAM B1.1: MONITORING SITE TT1-QLA WATER LEVEL RECORDS

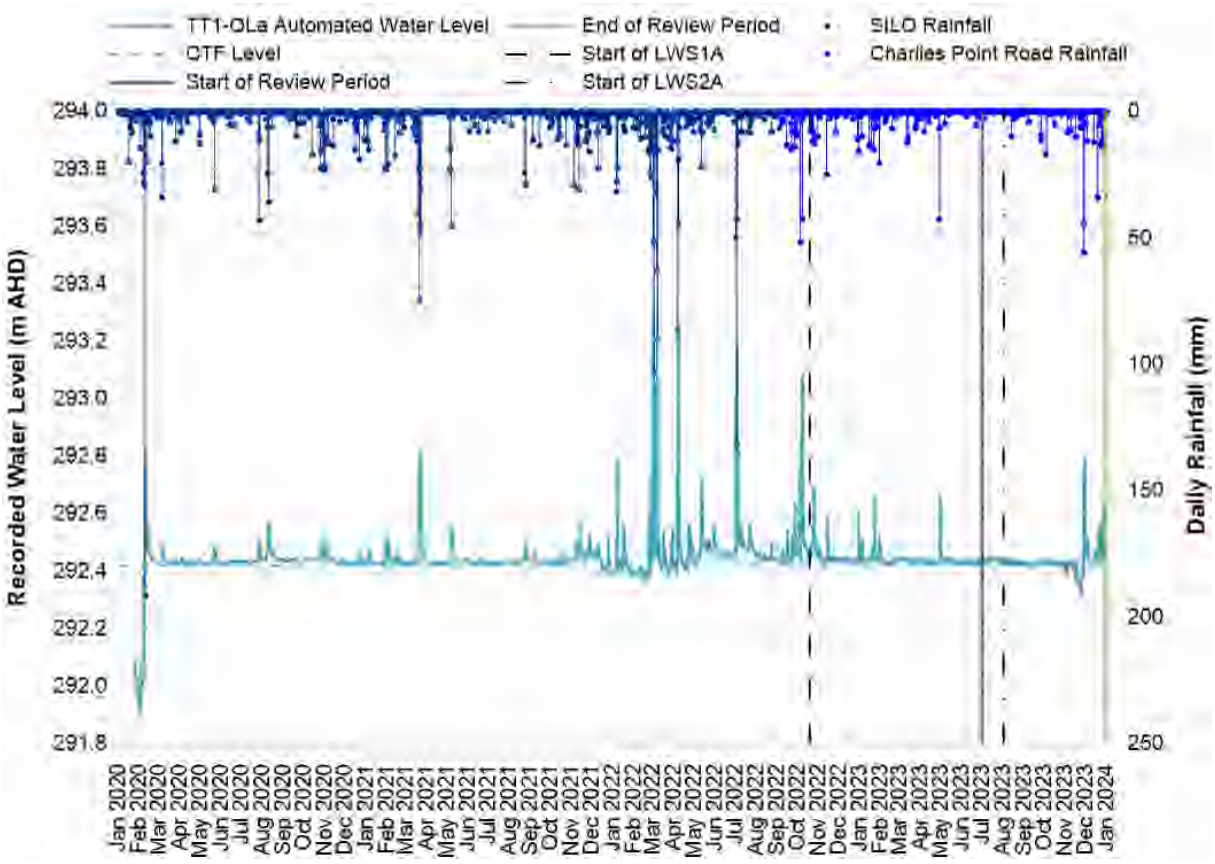


DIAGRAM B1.2: MONITORING SITE TT2-QLA WATER LEVEL RECORDS

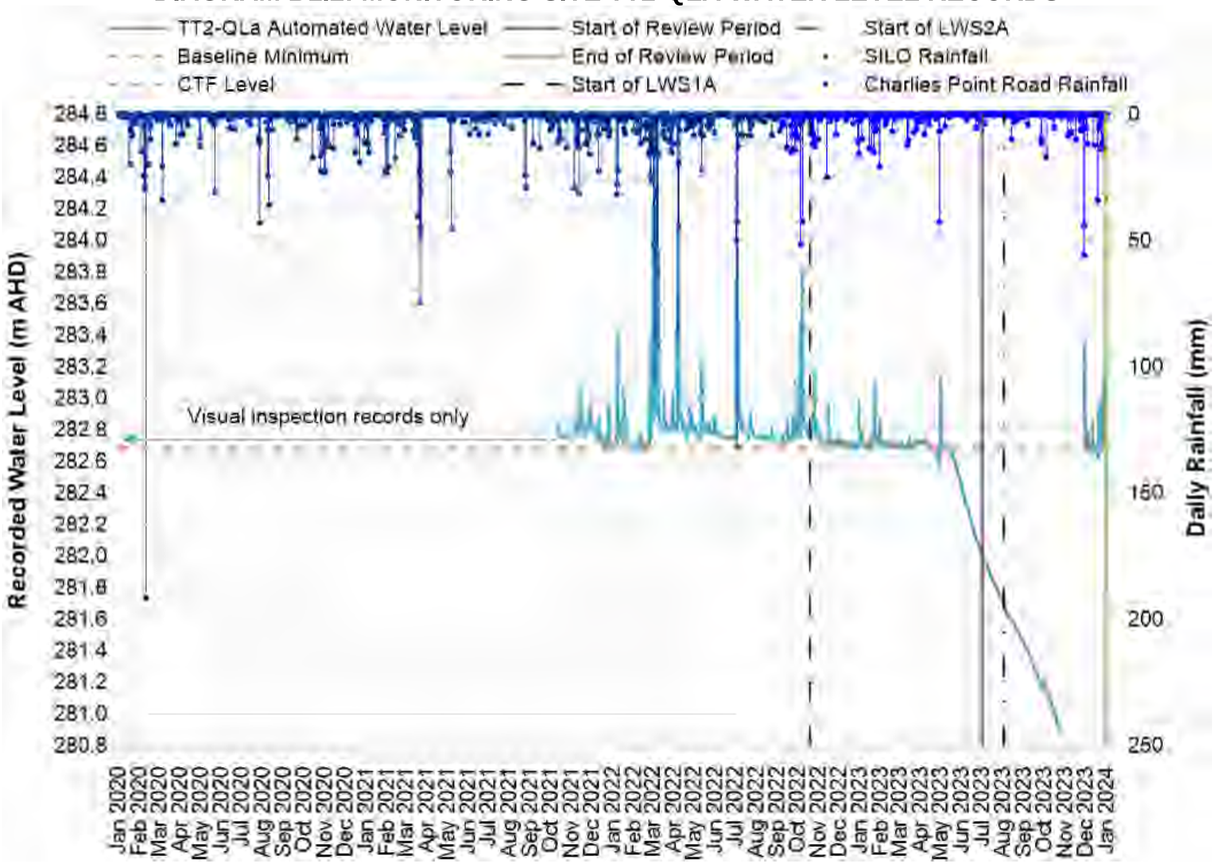


DIAGRAM B1.3: MONITORING SITE TT3-QLA WATER LEVEL RECORDS

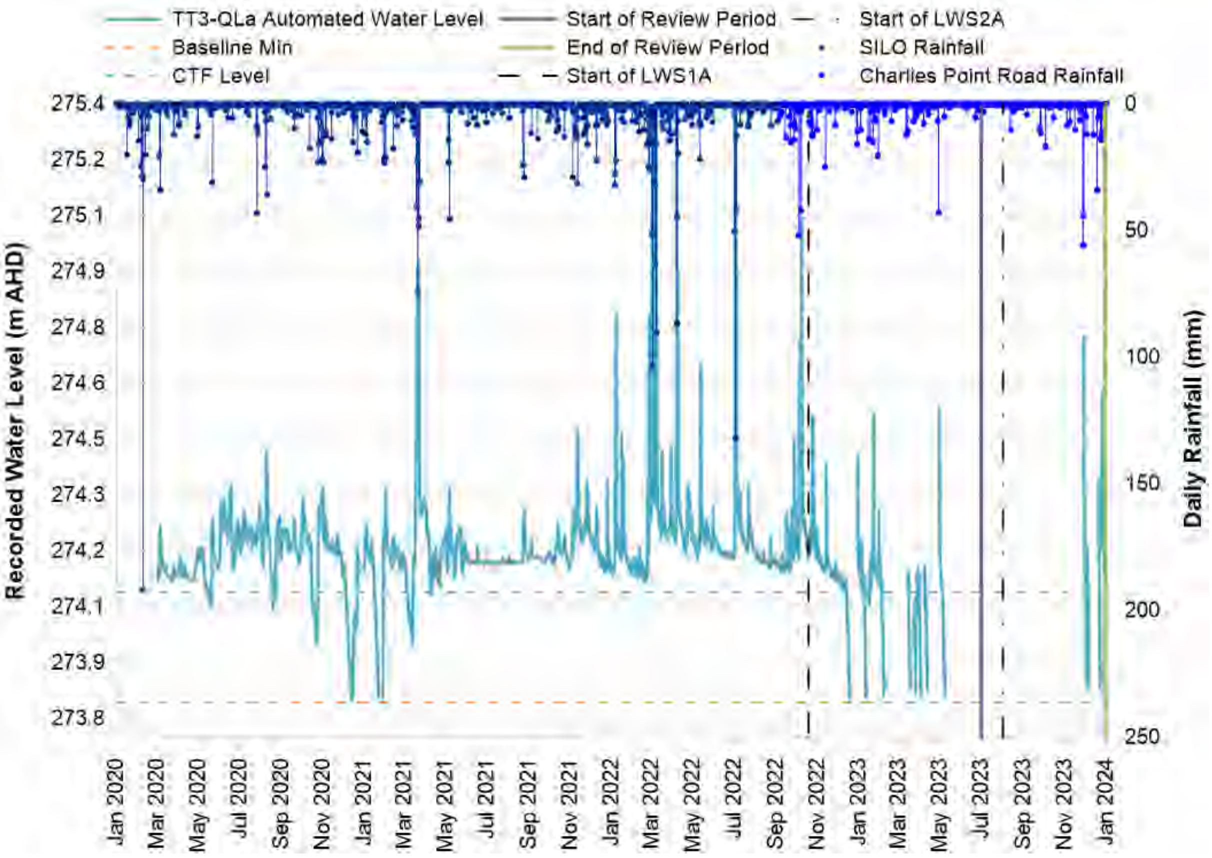


DIAGRAM B1.4: MONITORING SITE TT7-QLA WATER LEVEL RECORDS

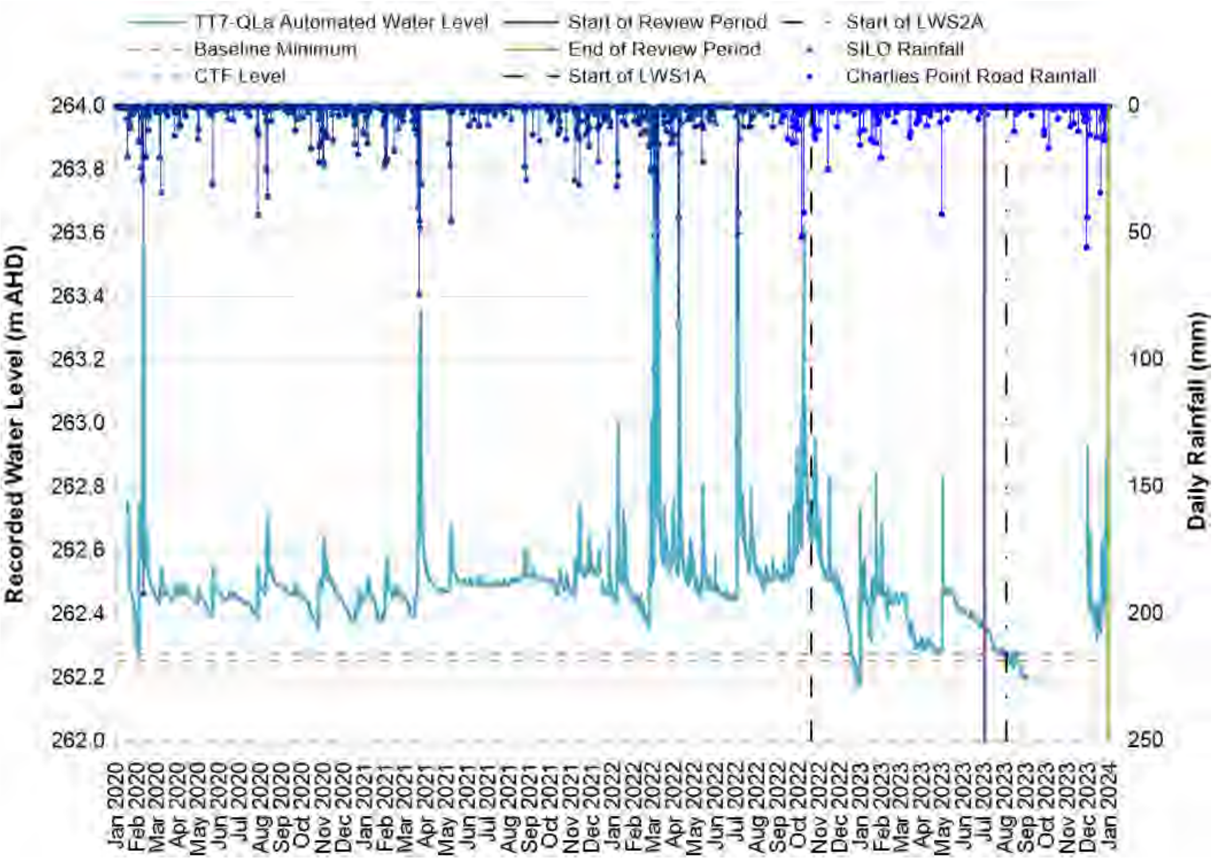


DIAGRAM B1.5: MONITORING SITE TT9-QLA WATER LEVEL RECORDS

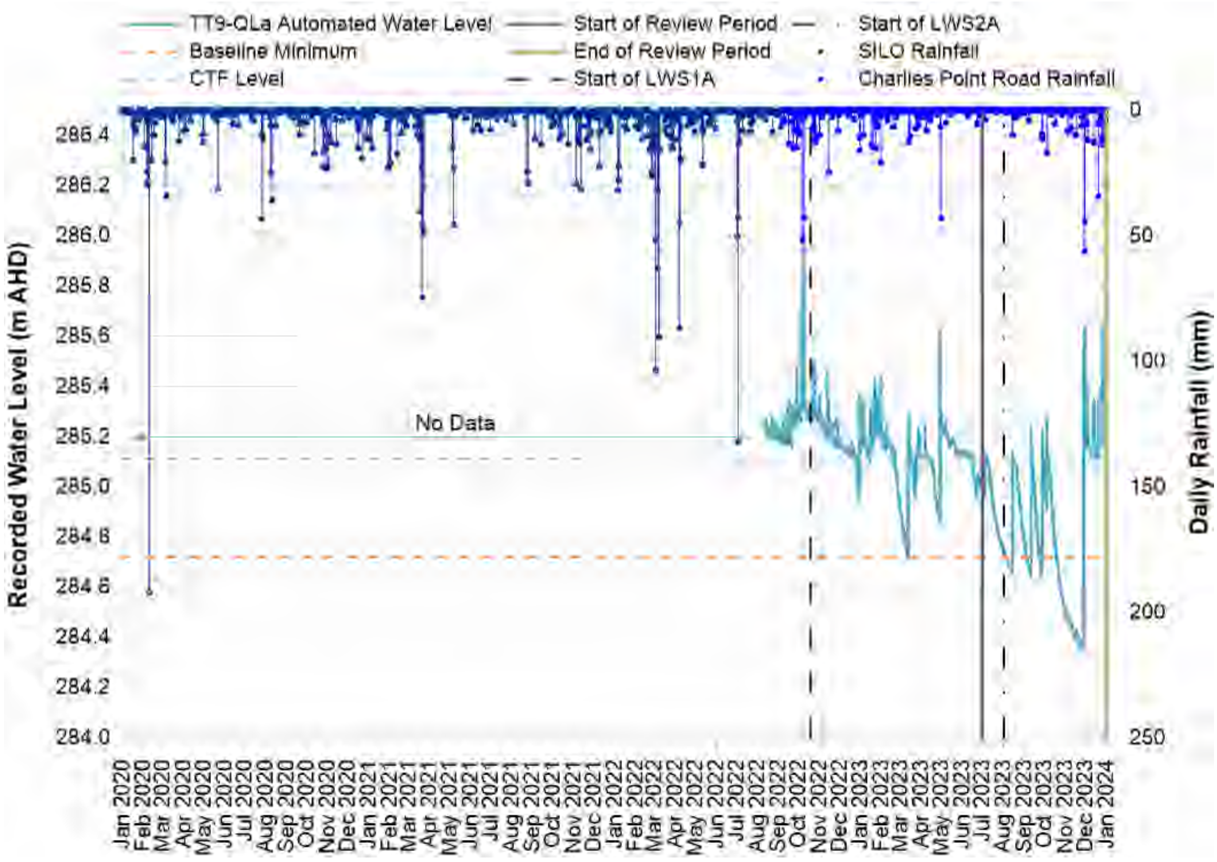


DIAGRAM B1.6: MONITORING SITE TT12-QLA WATER LEVEL RECORDS

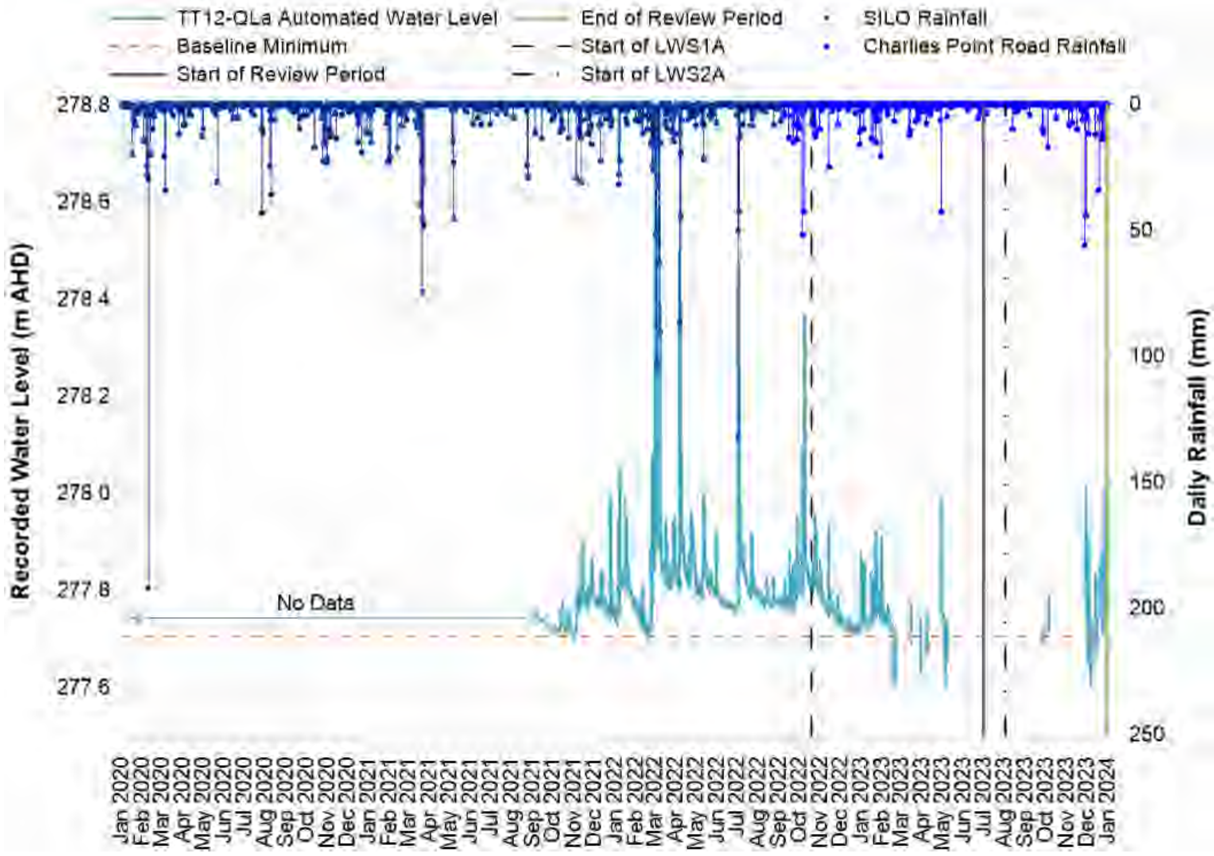
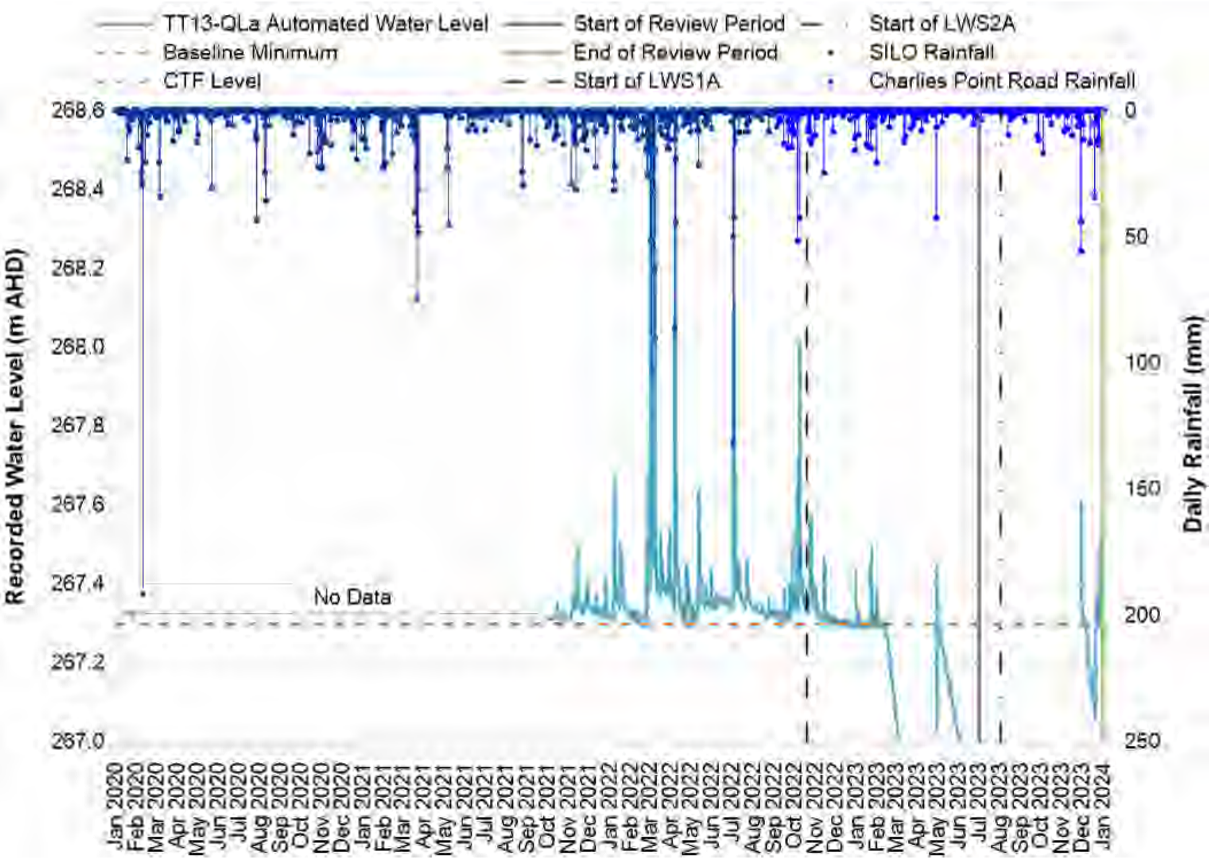


DIAGRAM B1.7: MONITORING SITE TT13-QLA WATER LEVEL RECORDS



APPENDIX B2 – BARGO RIVER WATER LEVEL PLOTS

DIAGRAM B2.1: MONITORING SITE BR12-QLA WATER LEVEL RECORDS

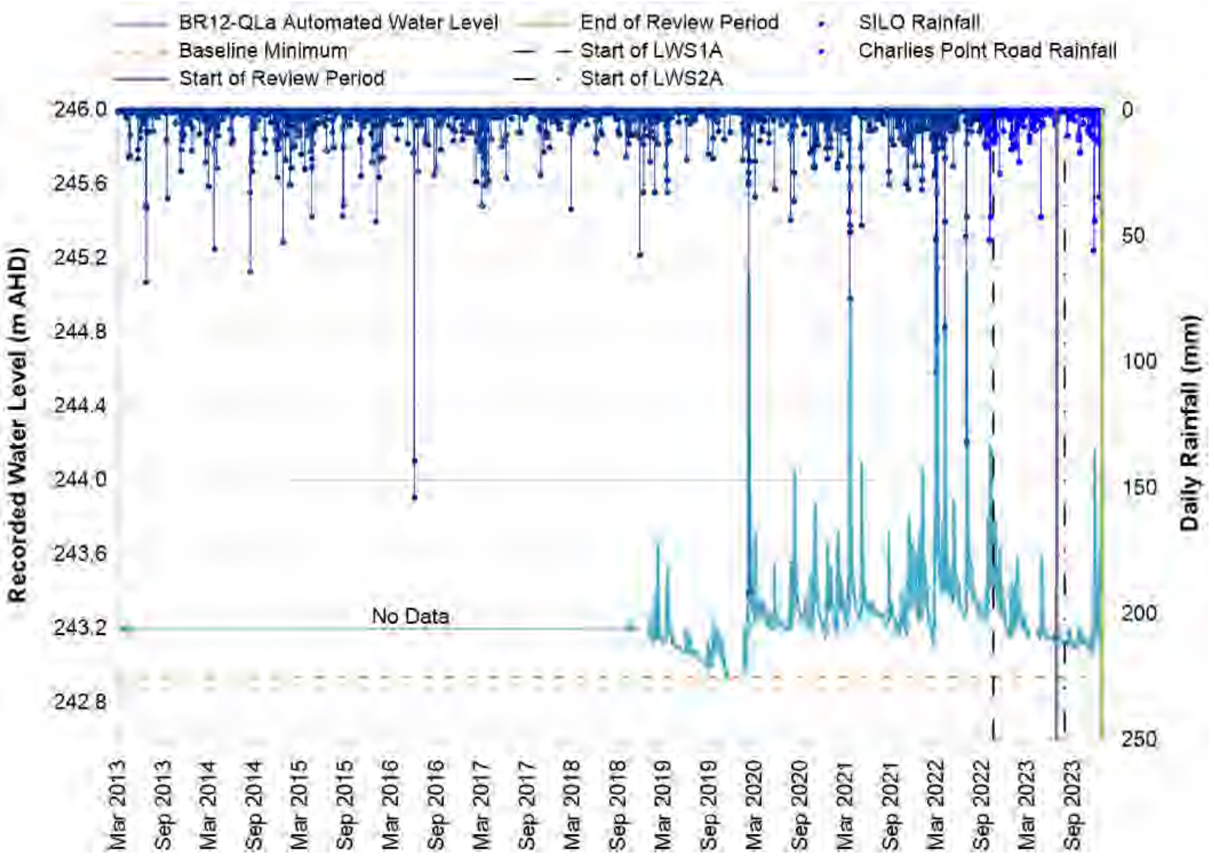


DIAGRAM B2.2: MONITORING SITE BR13-QLA WATER LEVEL RECORDS

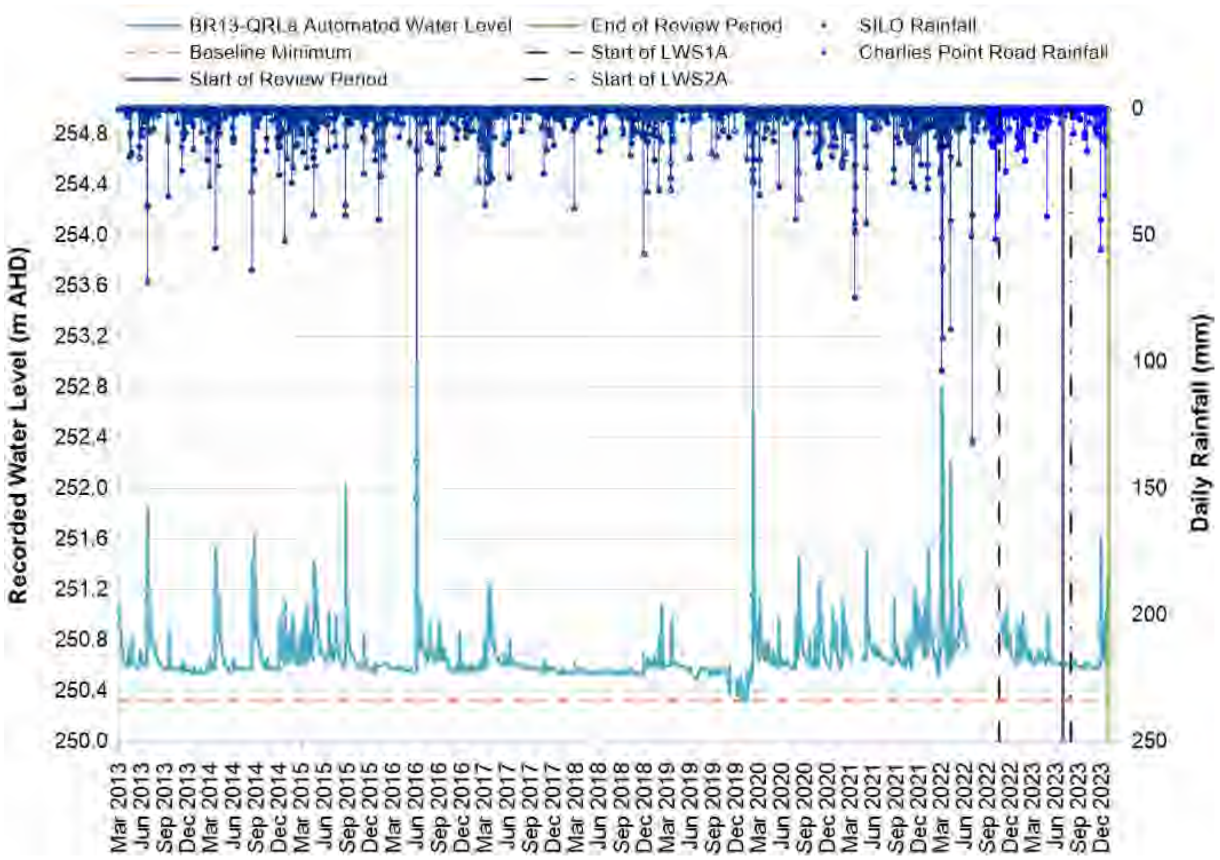


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DIAGRAM B2.3: MONITORING SITE BR16-QLA WATER LEVEL RECORDS

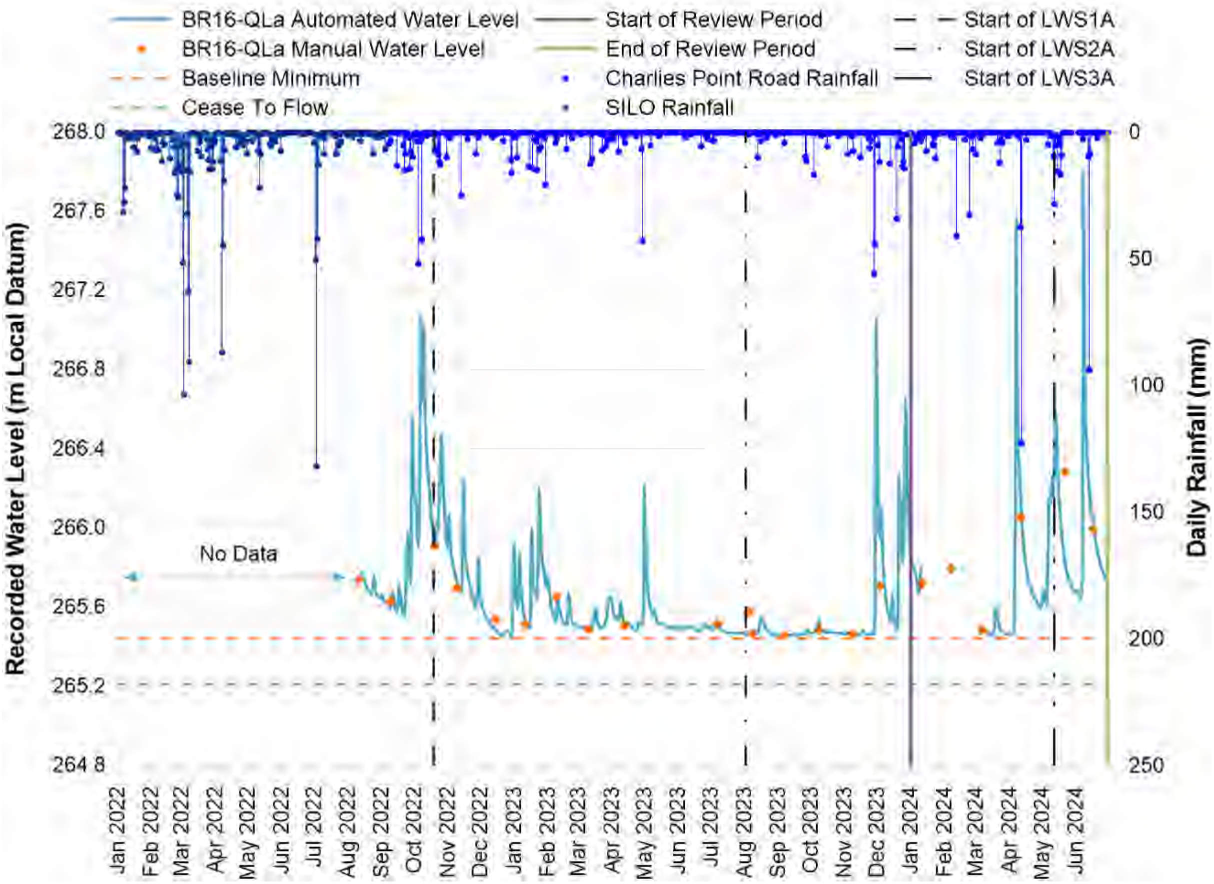


DIAGRAM B2.4: MONITORING SITE BR17-QLA WATER LEVEL RECORDS

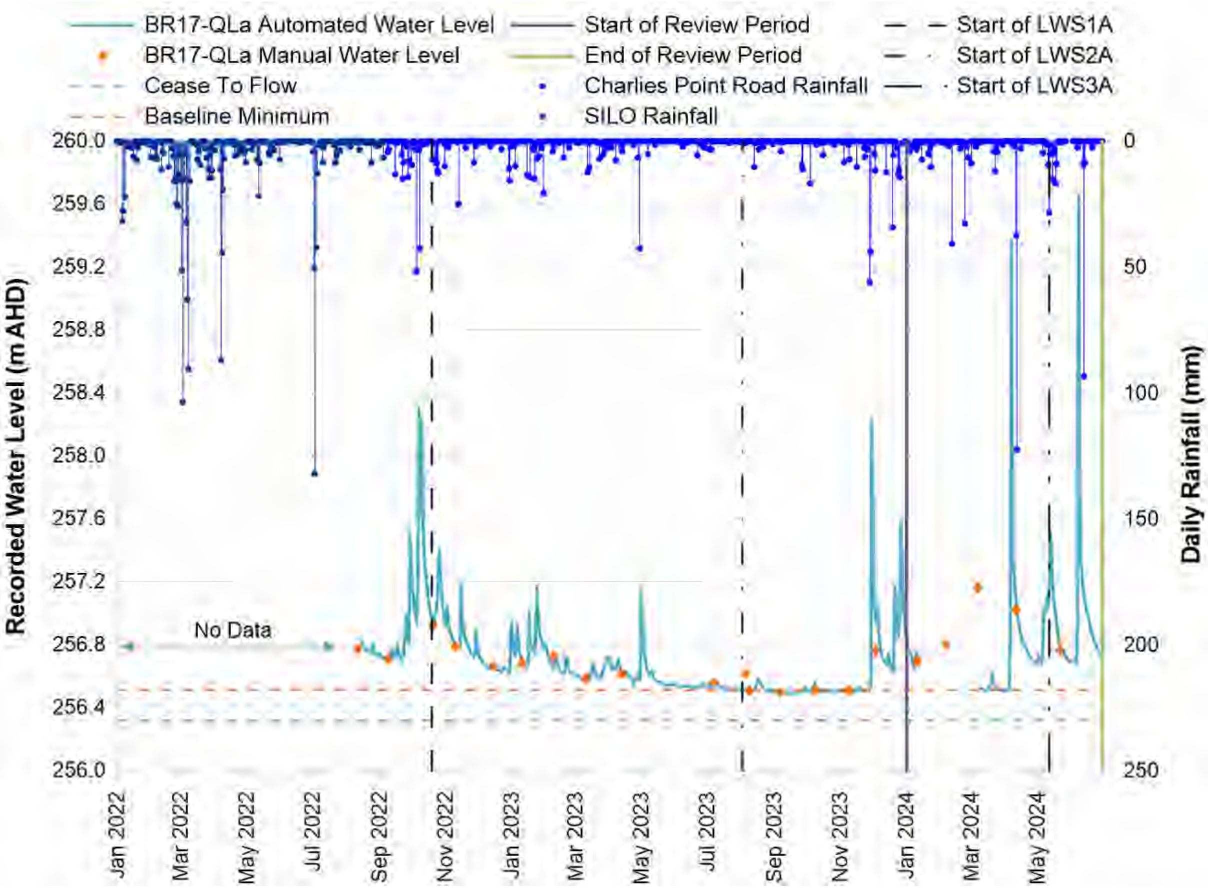
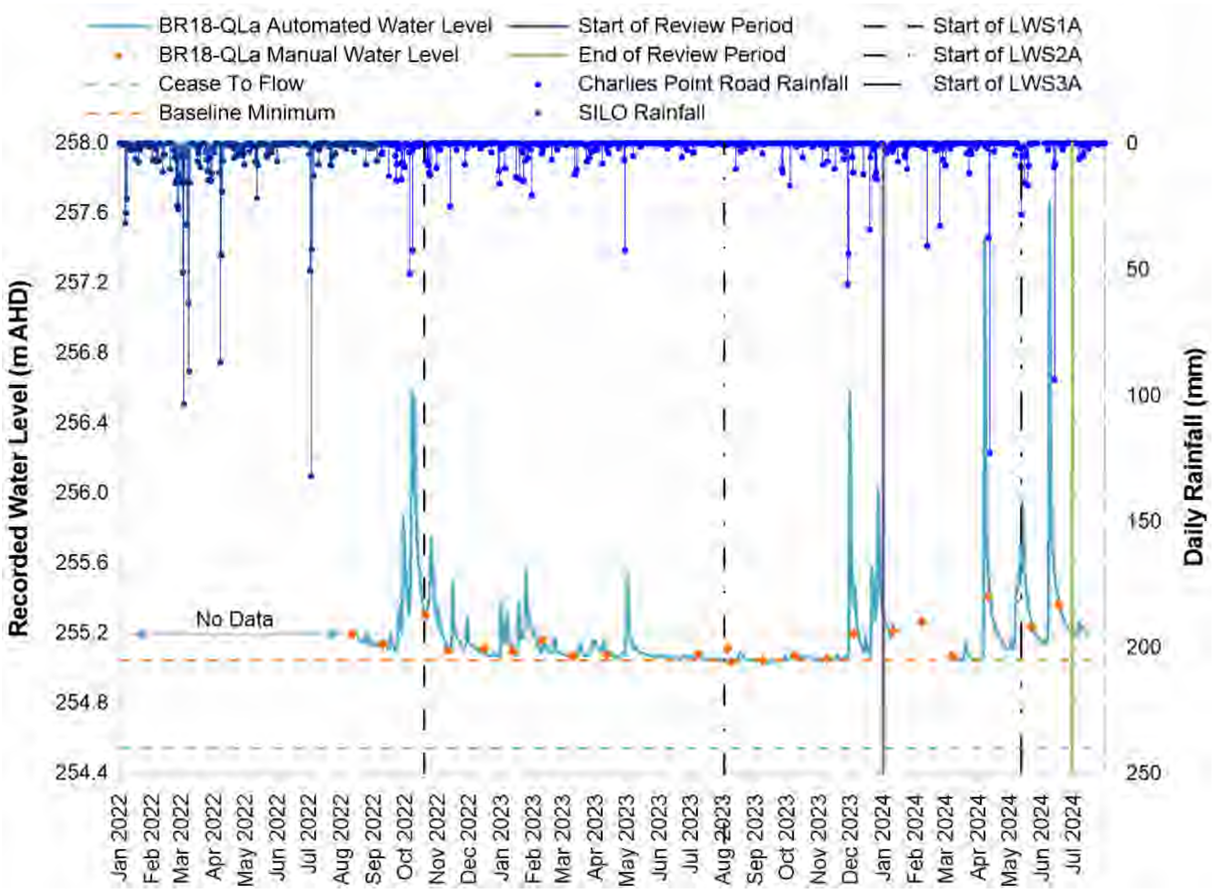


DIAGRAM B2.5: MONITORING SITE BR18-QLA WATER LEVEL RECORDS



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APPENDIX C – WATER QUALITY PLOTS [3]

[3] When the recorded value was below the limit of reporting, the value has been plotted at the limit of reporting in the following plots.

APPENDIX C1 – TEATREE HOLLOW WATER QUALITY PLOTS

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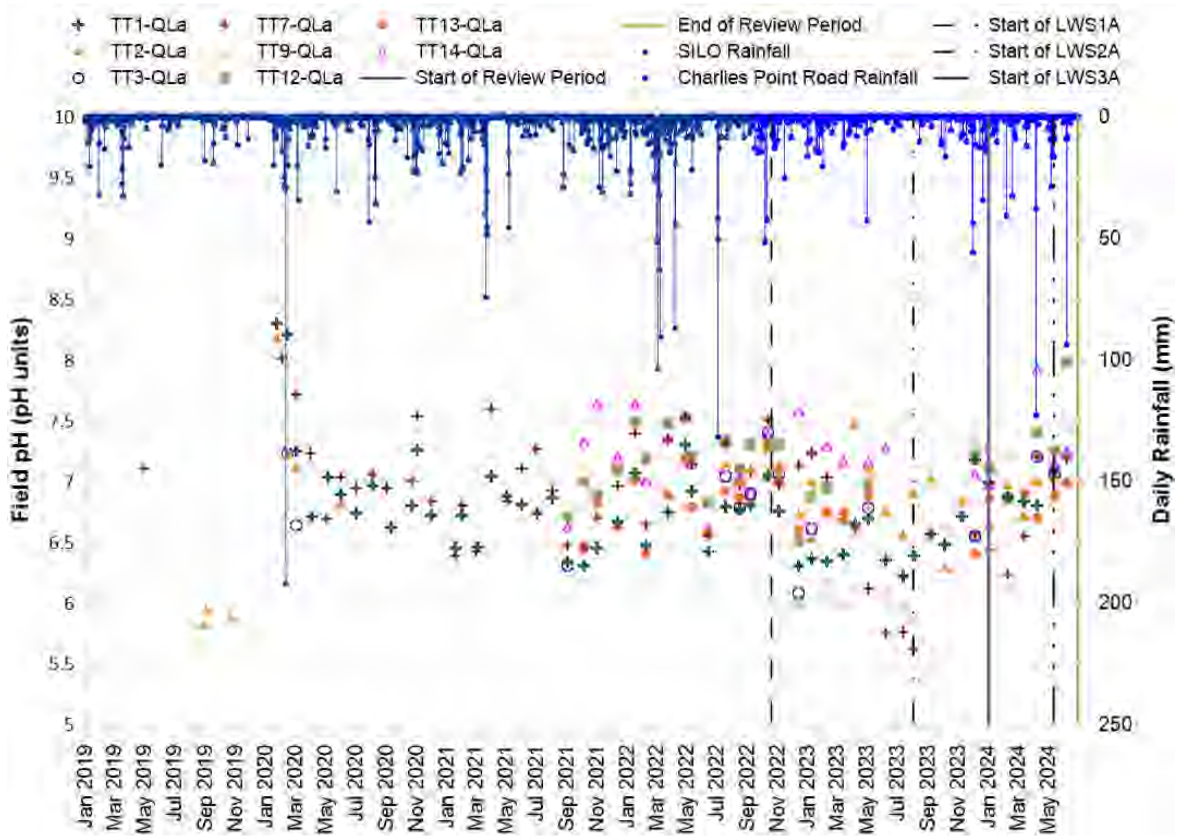
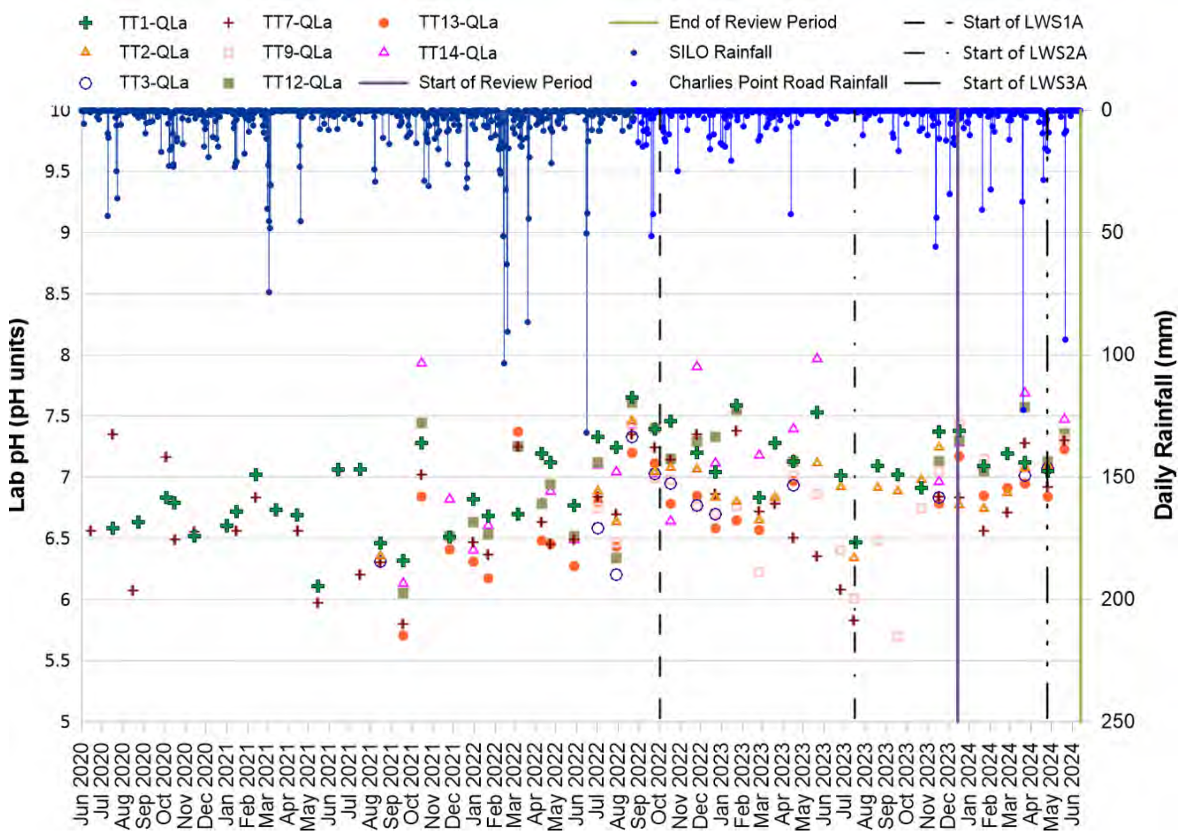
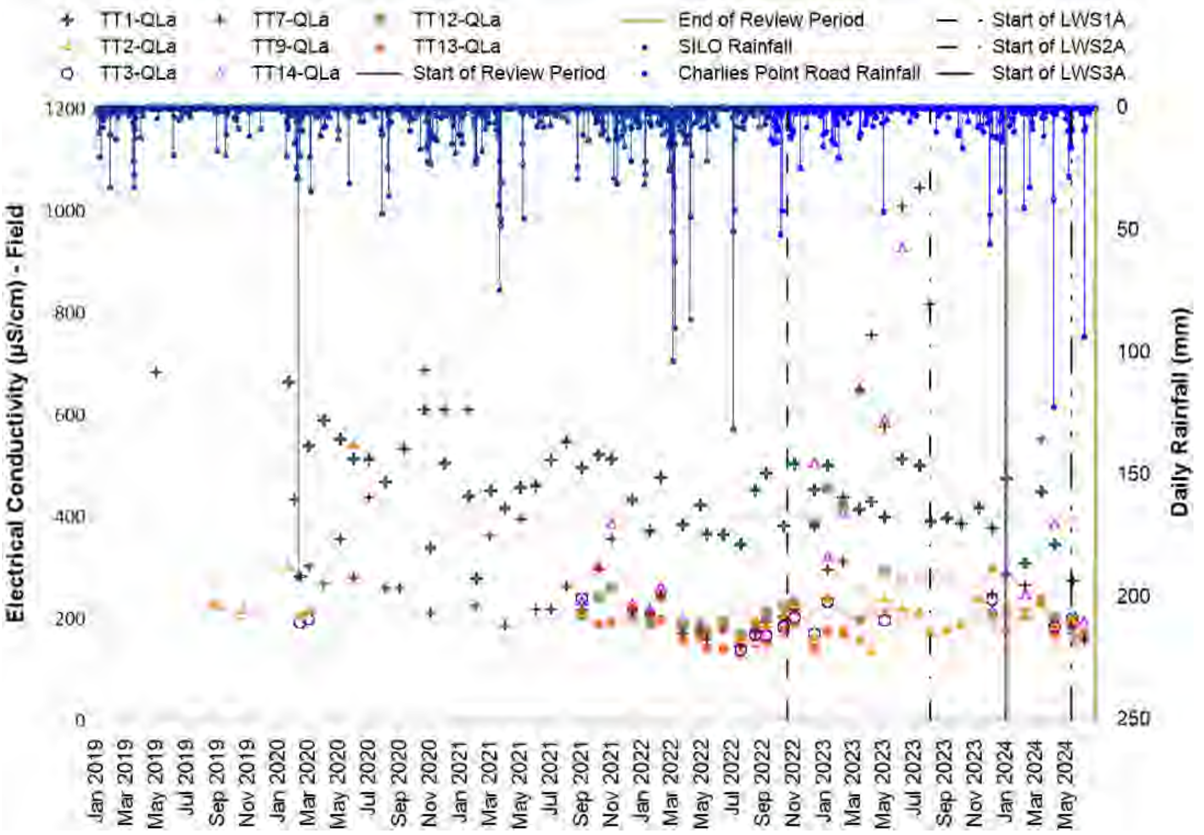
DIAGRAM C1.1: FIELD AND LABORATORY PH RECORDS

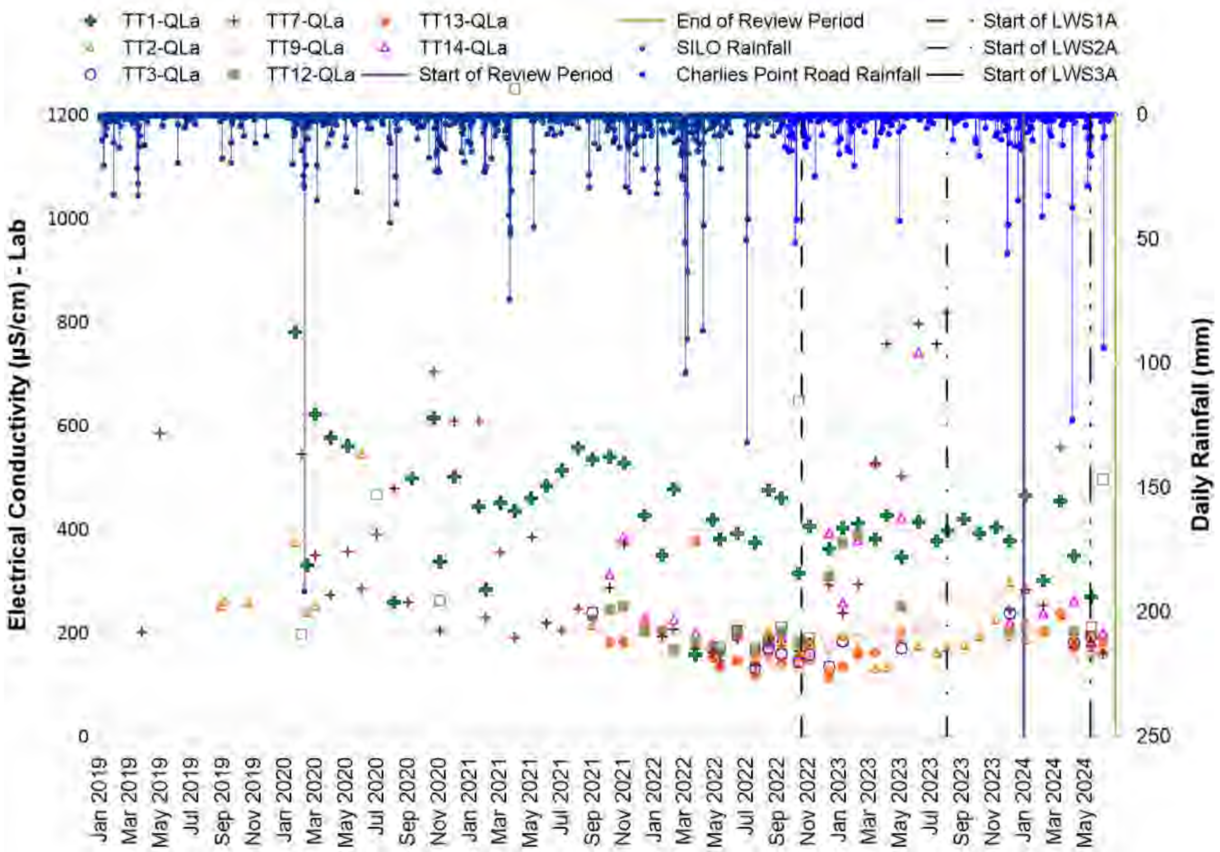




TAILINGS.WATER.WASTE.

DIAGRAM C1.2: FIELD AND LABORATORY ELECTRICAL CONDUCTIVITY RECORDS





TAILINGS.WATER.WASTE.

DIAGRAM C1.3: DISSOLVED ALUMINIUM RECORDS

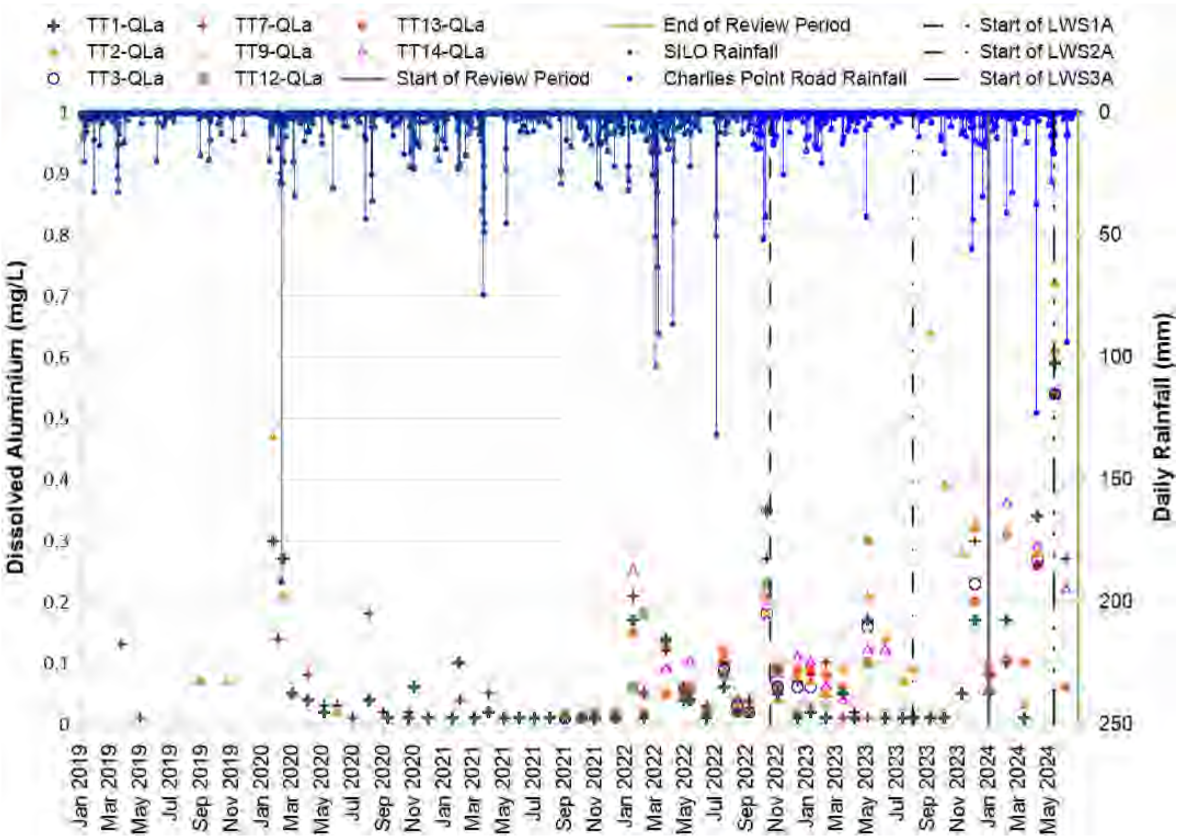
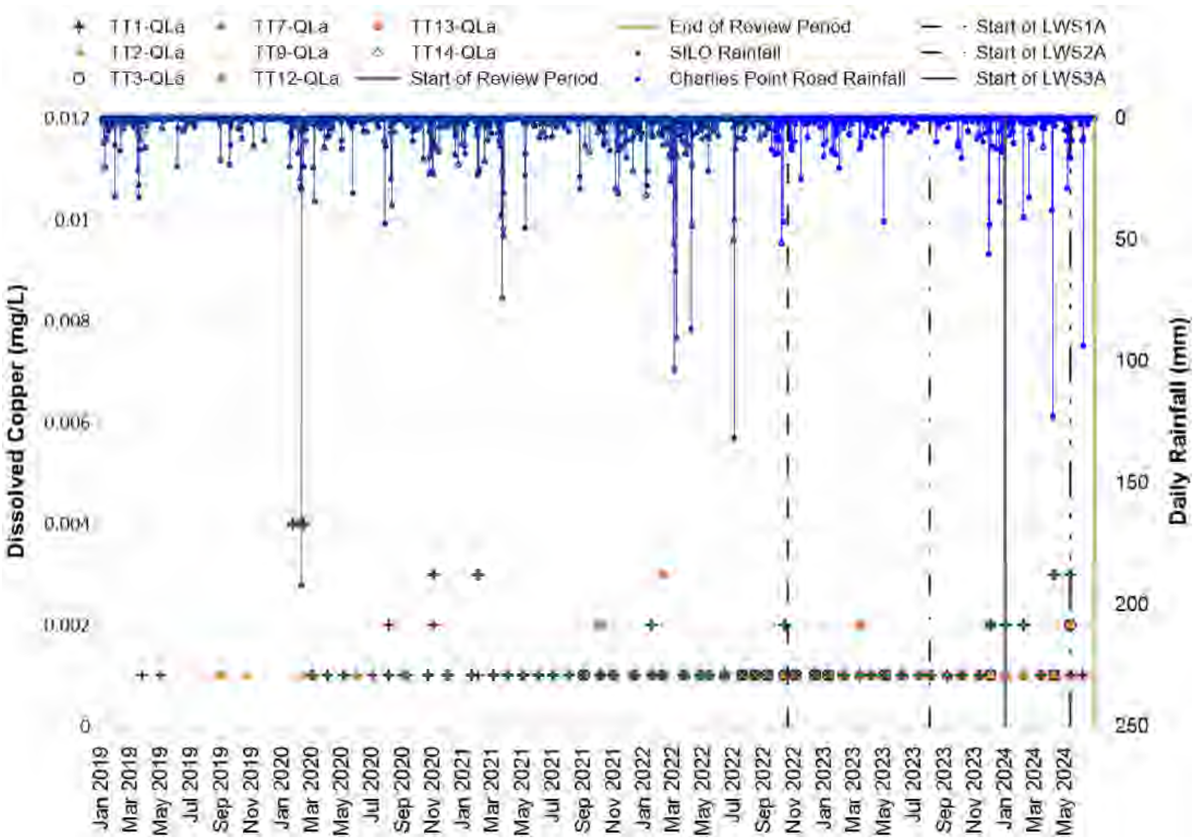


DIAGRAM C1.4: DISSOLVED COPPER RECORDS



TAILINGS.WATER.WASTE.

DIAGRAM C1.5: DISSOLVED IRON RECORDS

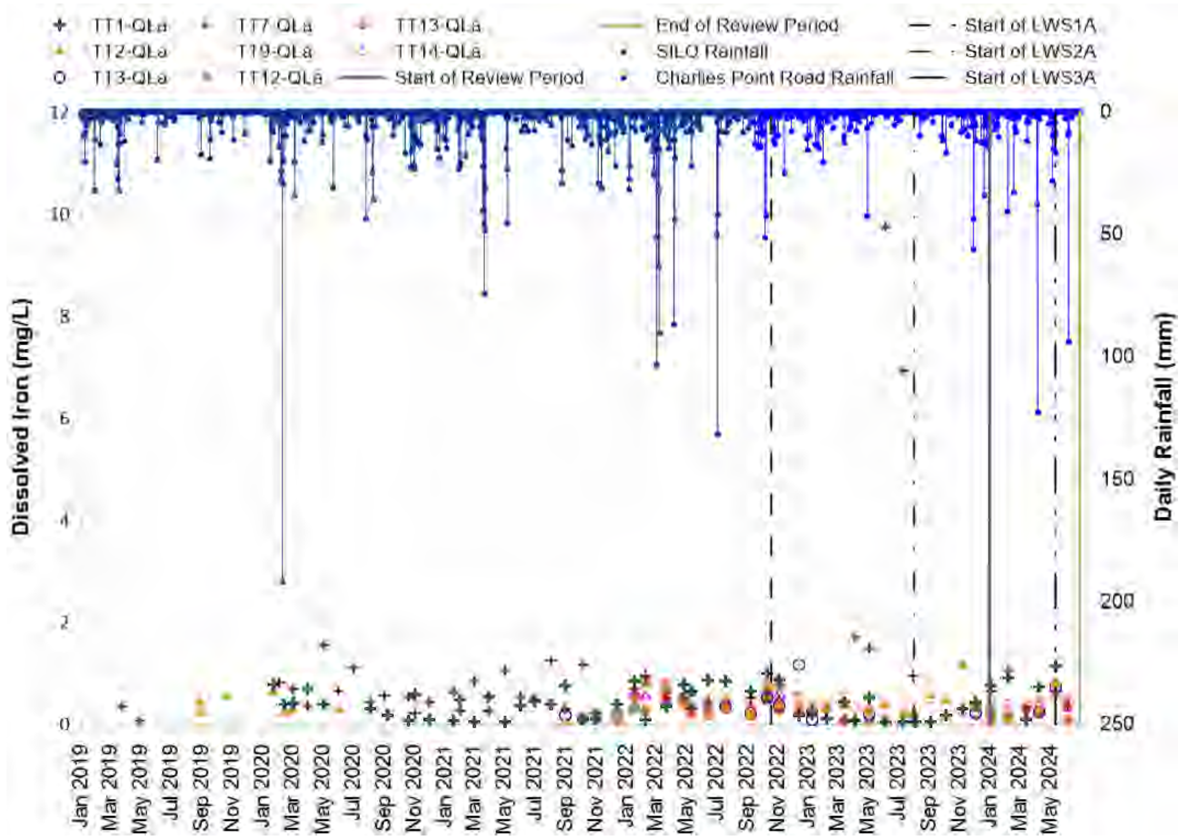


DIAGRAM C1.6: DISSOLVED MANGANESE RECORDS

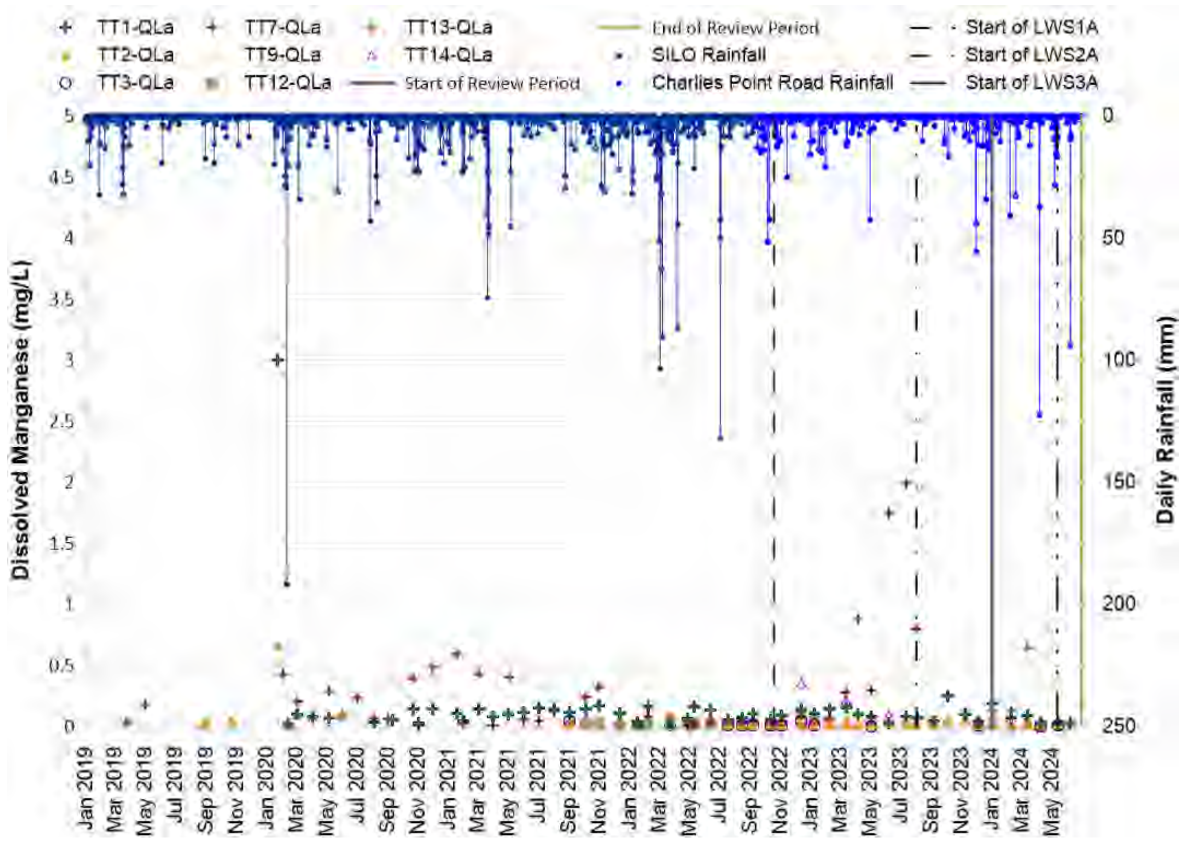


DIAGRAM C1.7: DISSOLVED NICKEL RECORDS

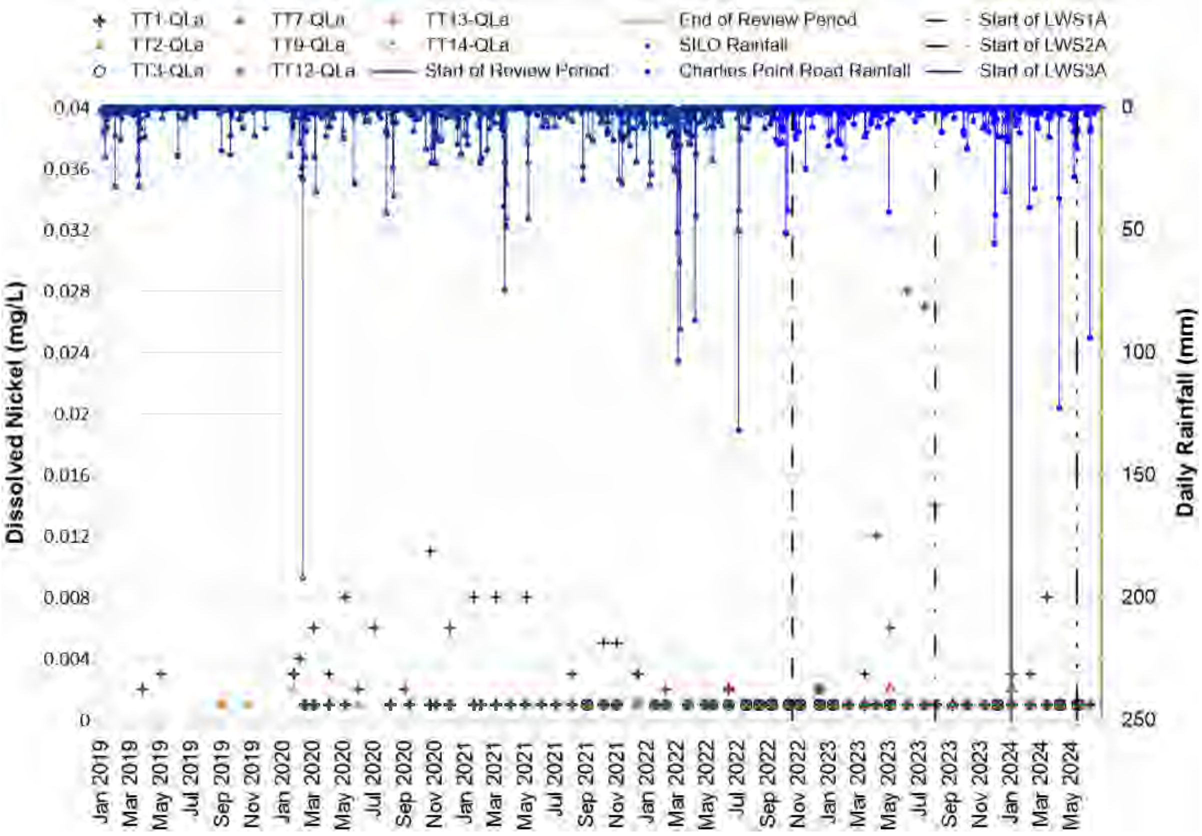
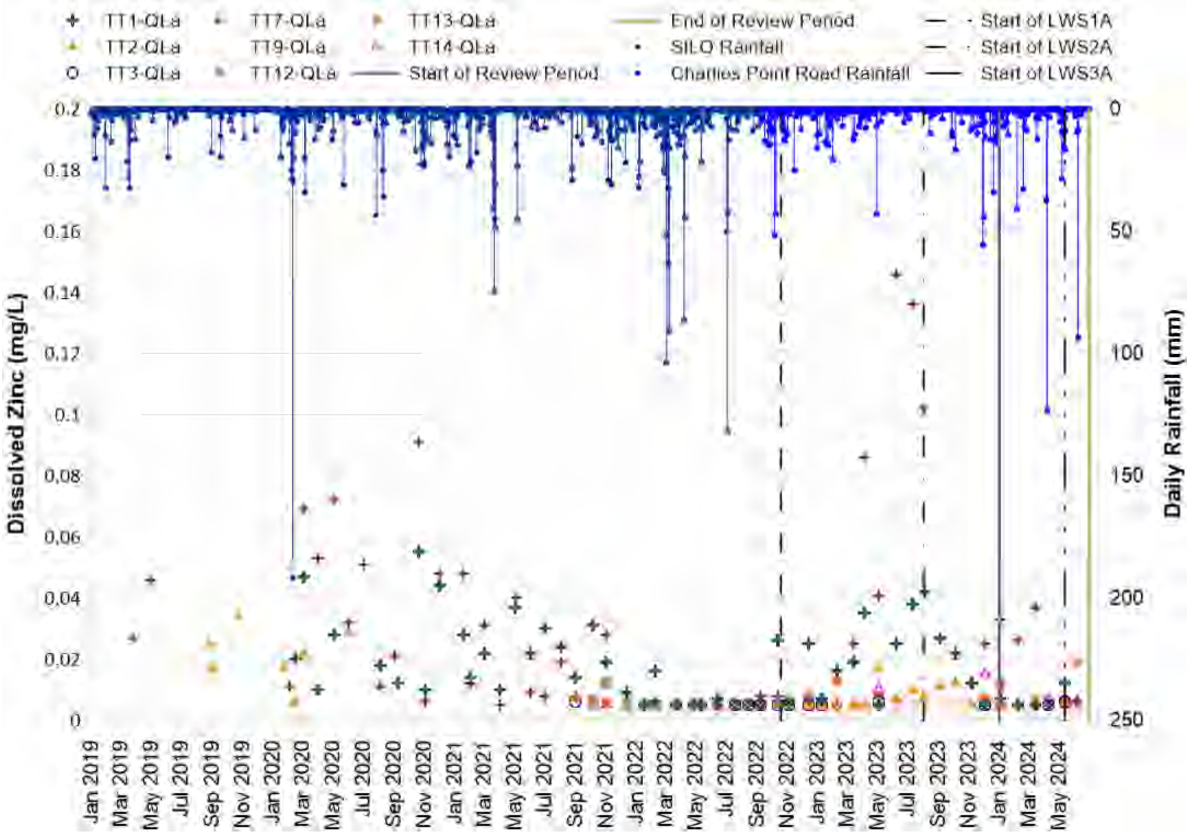


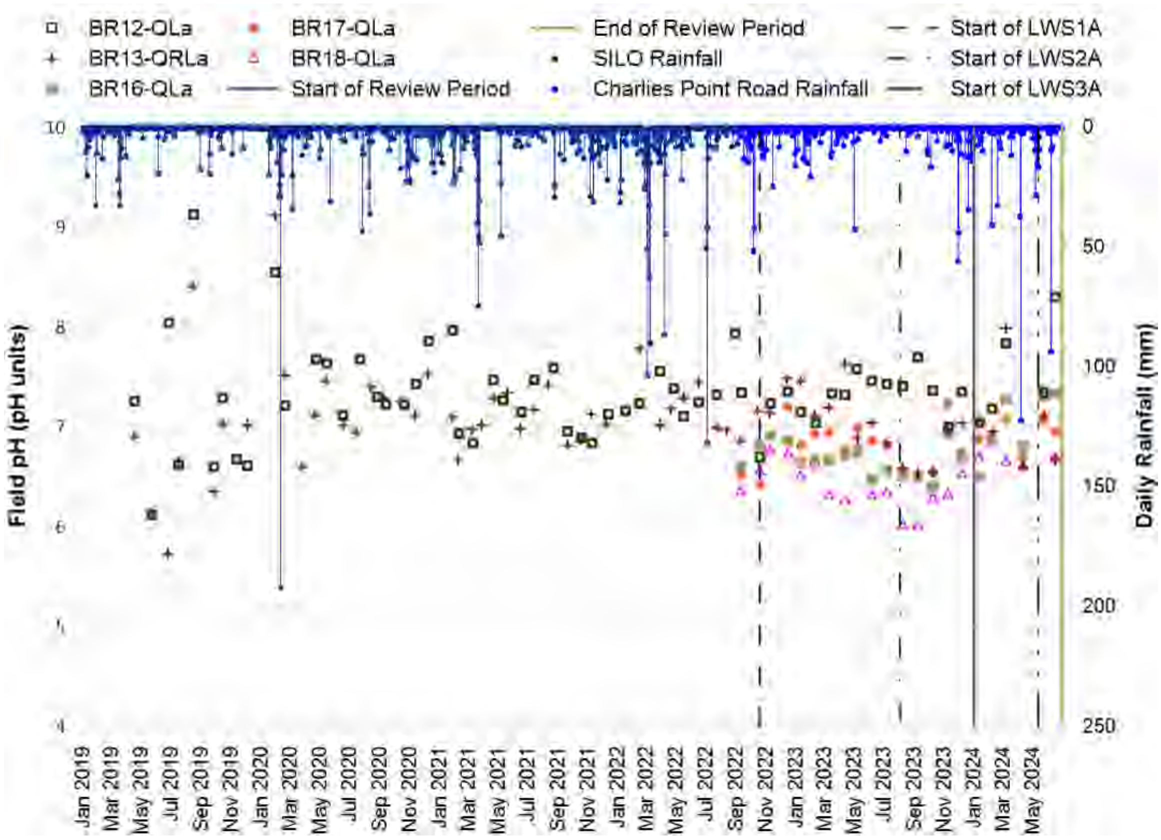
DIAGRAM C1.8: DISSOLVED ZINC RECORDS



APPENDIX C2 – BARGO RIVER WATER QUALITY PLOTS

TAILINGS.WATER.WASTE.

DIAGRAM C2.1: FIELD AND LABORATORY PH RECORDS



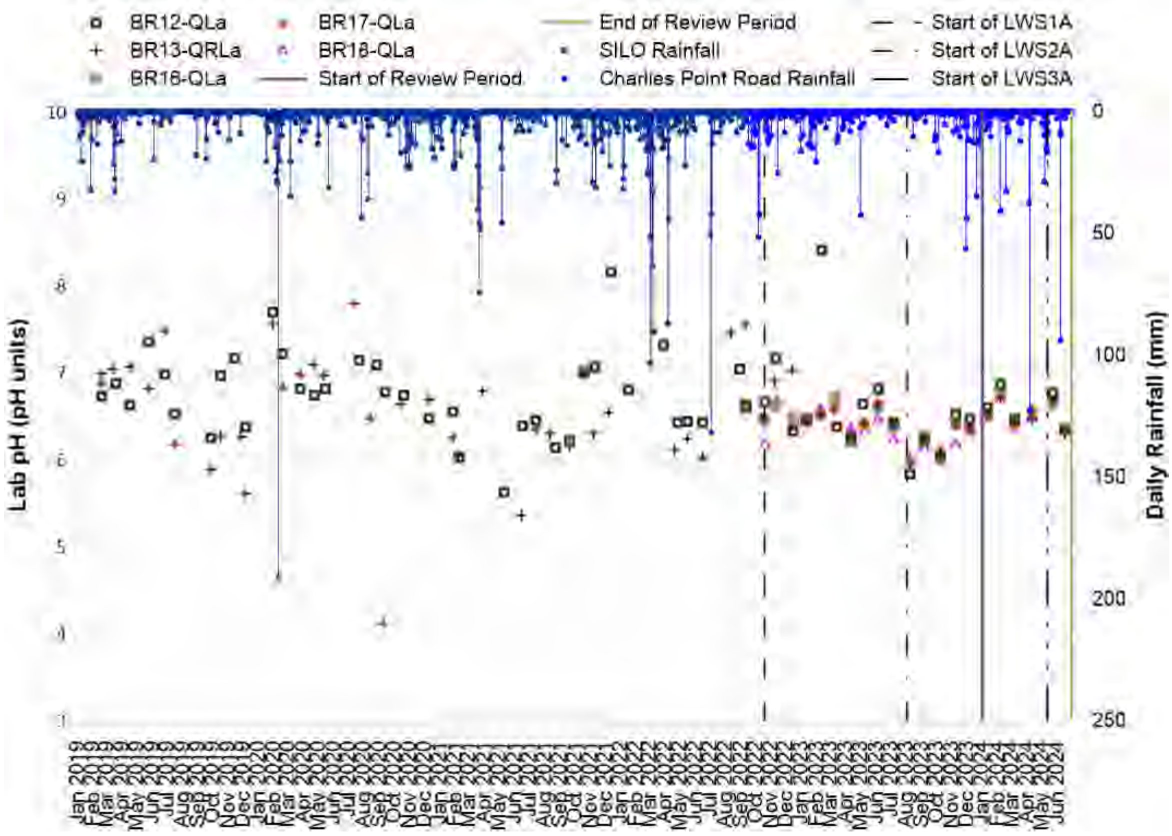
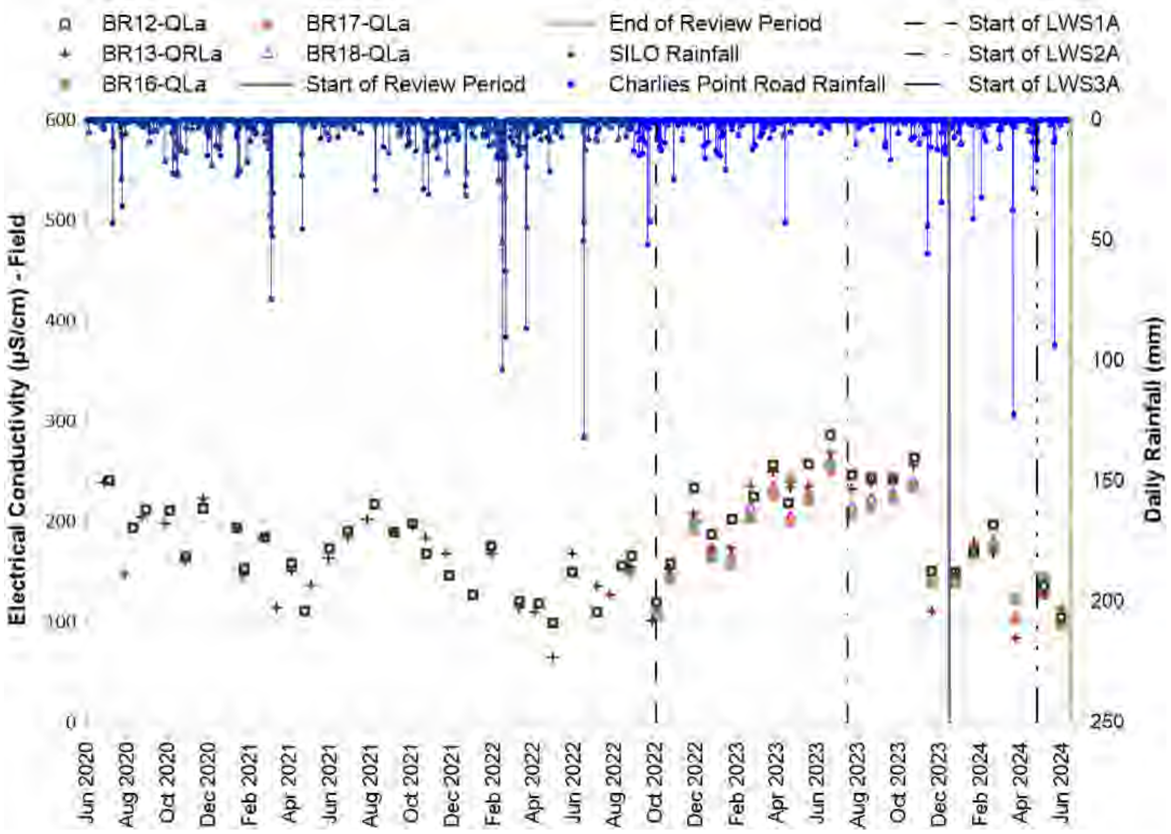


DIAGRAM C2.2: FIELD AND LABORATORY ELECTRICAL CONDUCTIVITY RECORDS



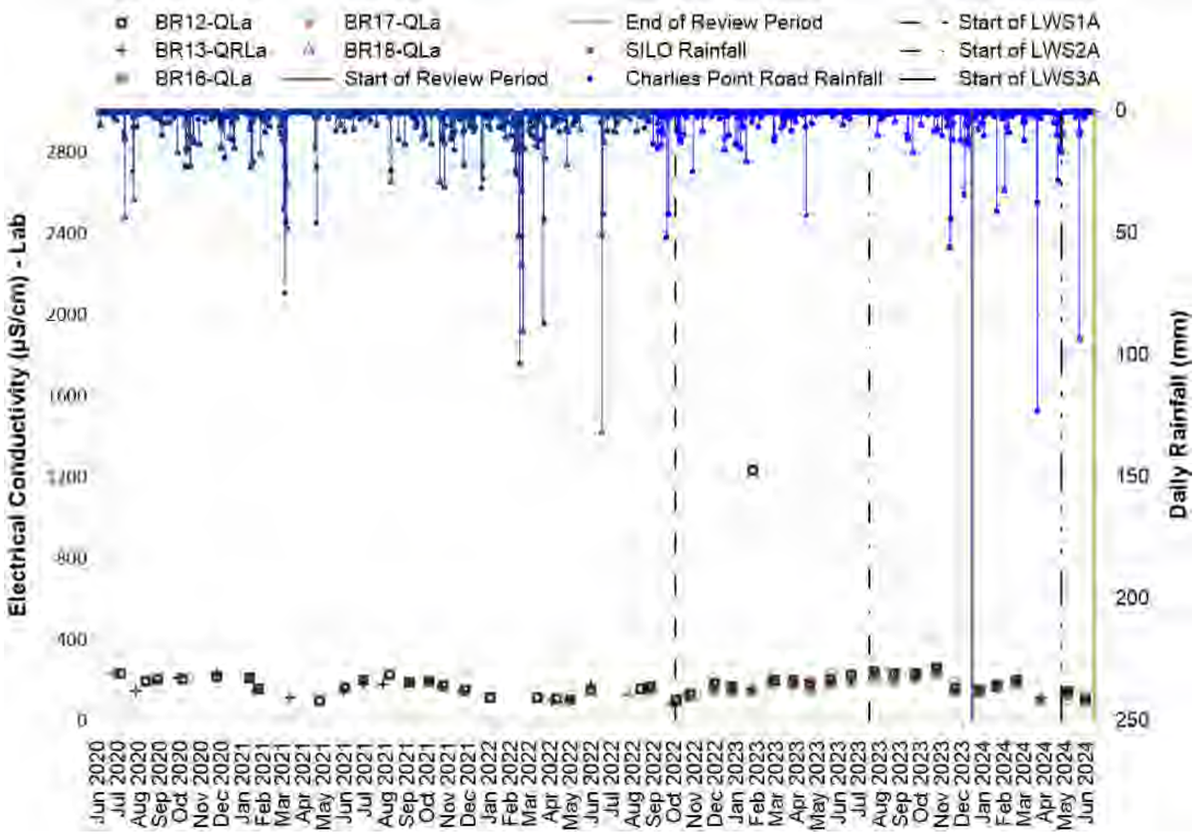


DIAGRAM C2.3: DISSOLVED ALUMINIUM RECORDS

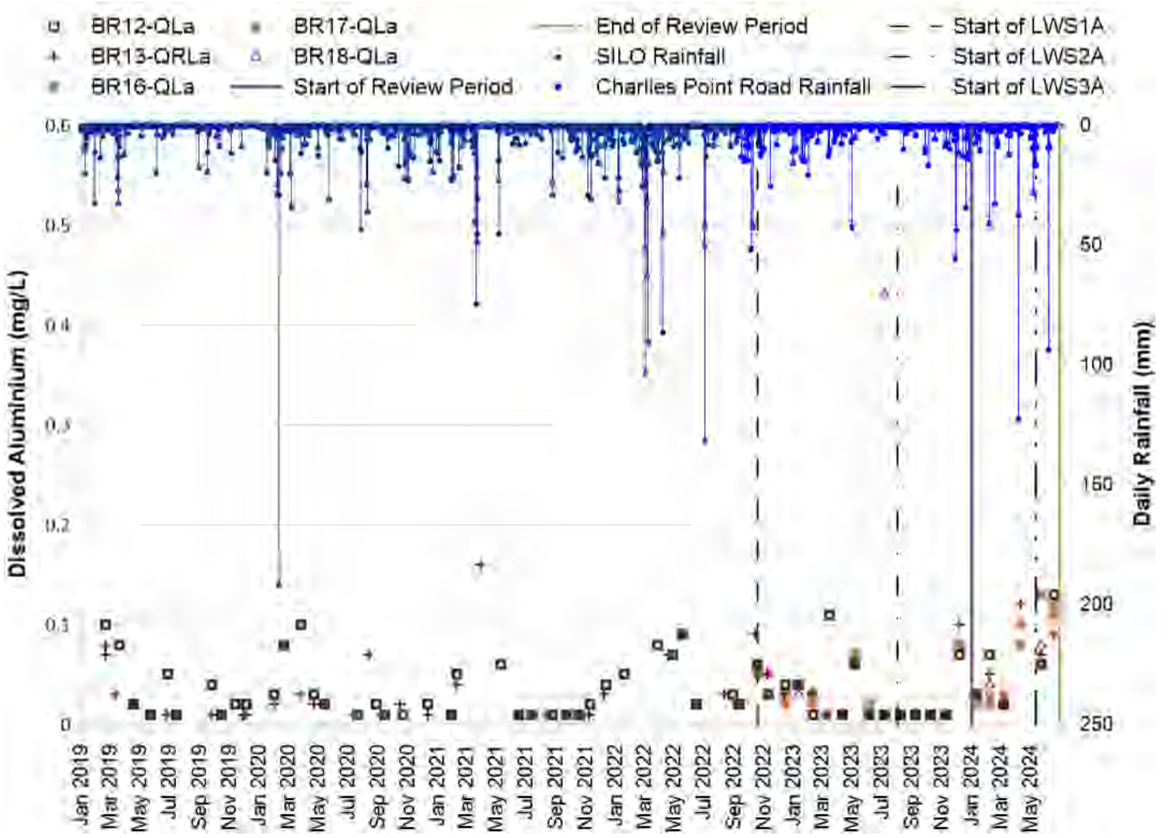


DIAGRAM C2.4: DISSOLVED COPPER RECORDS

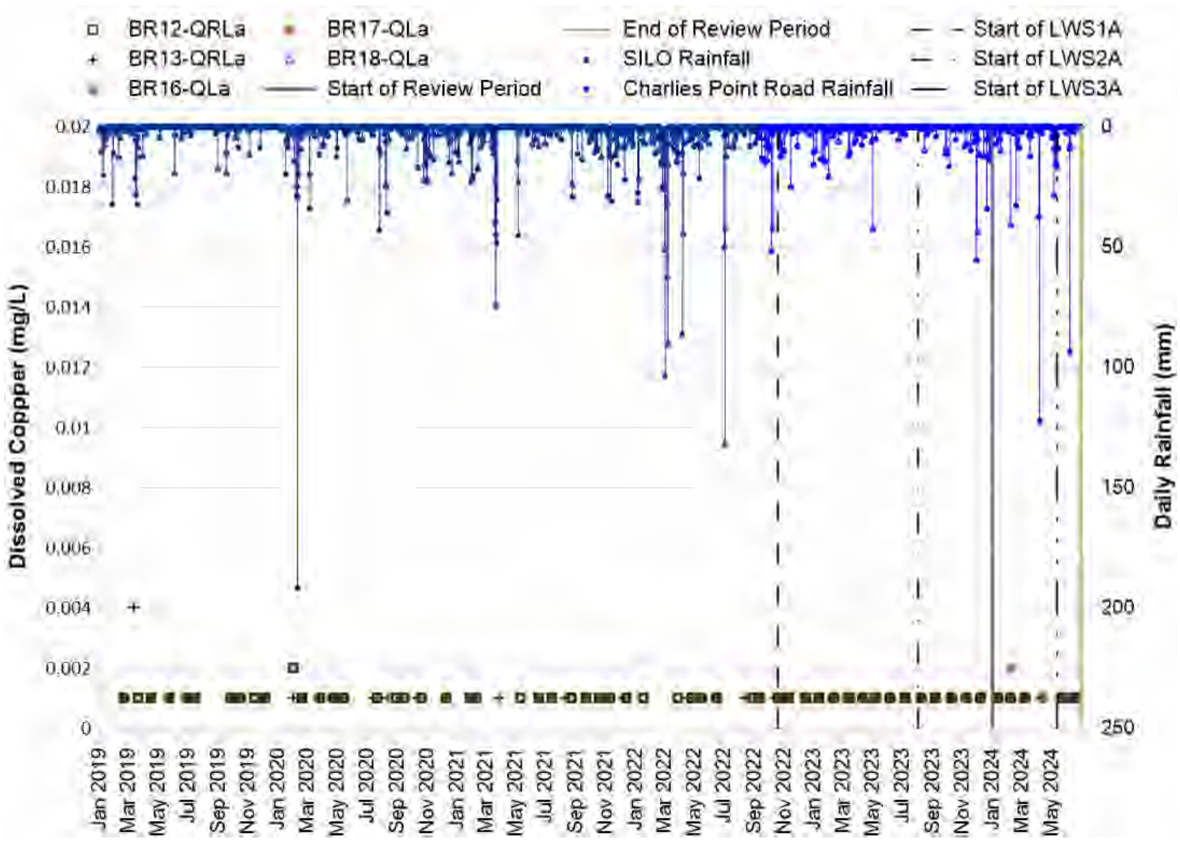


DIAGRAM C2.5: DISSOLVED IRON RECORDS

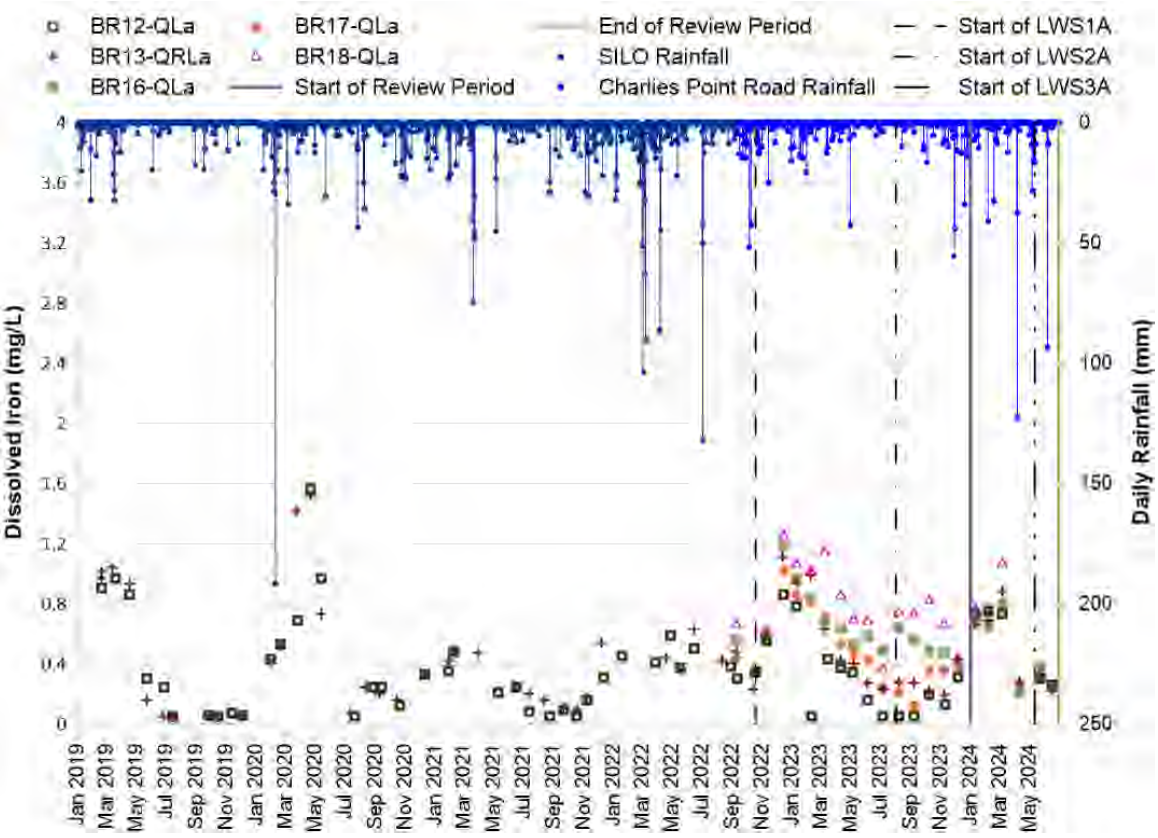
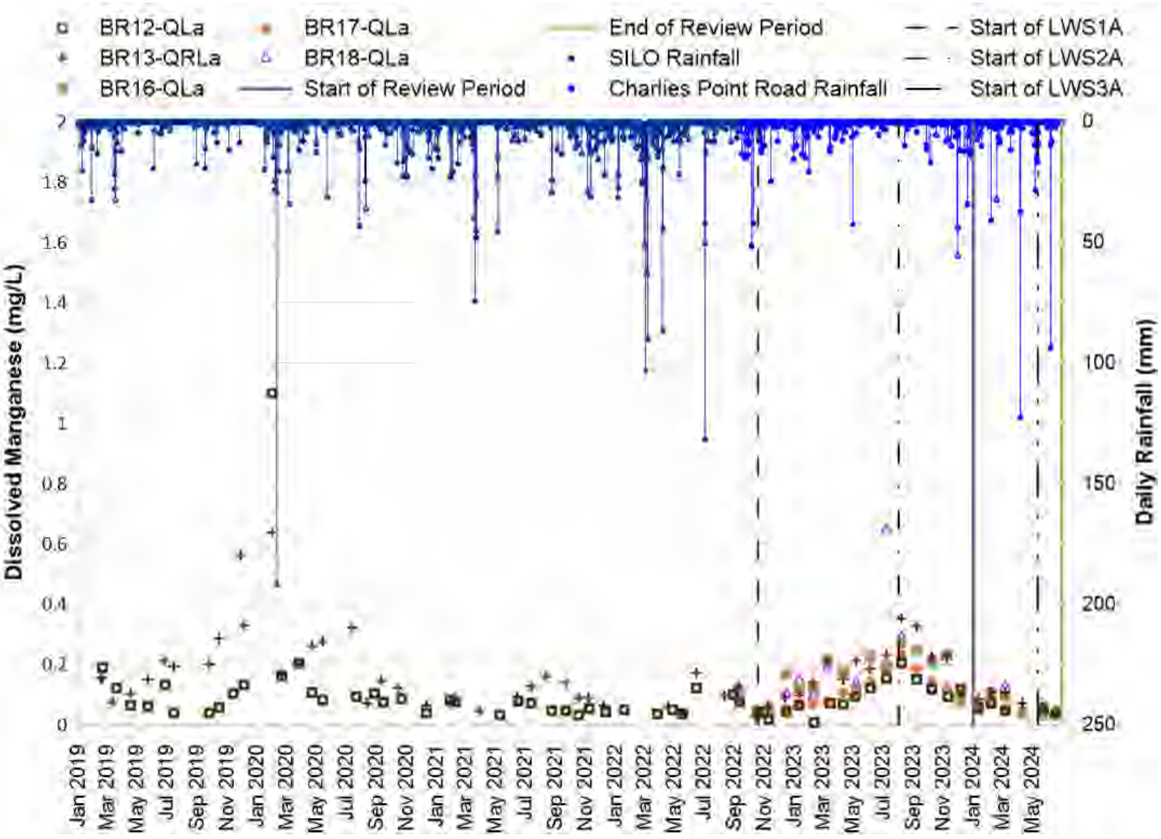


DIAGRAM C2.6: DISSOLVED MANGANESE RECORDS



TAILINGS.WATER.WASTE.

DIAGRAM C2.7: DISSOLVED NICKEL RECORDS

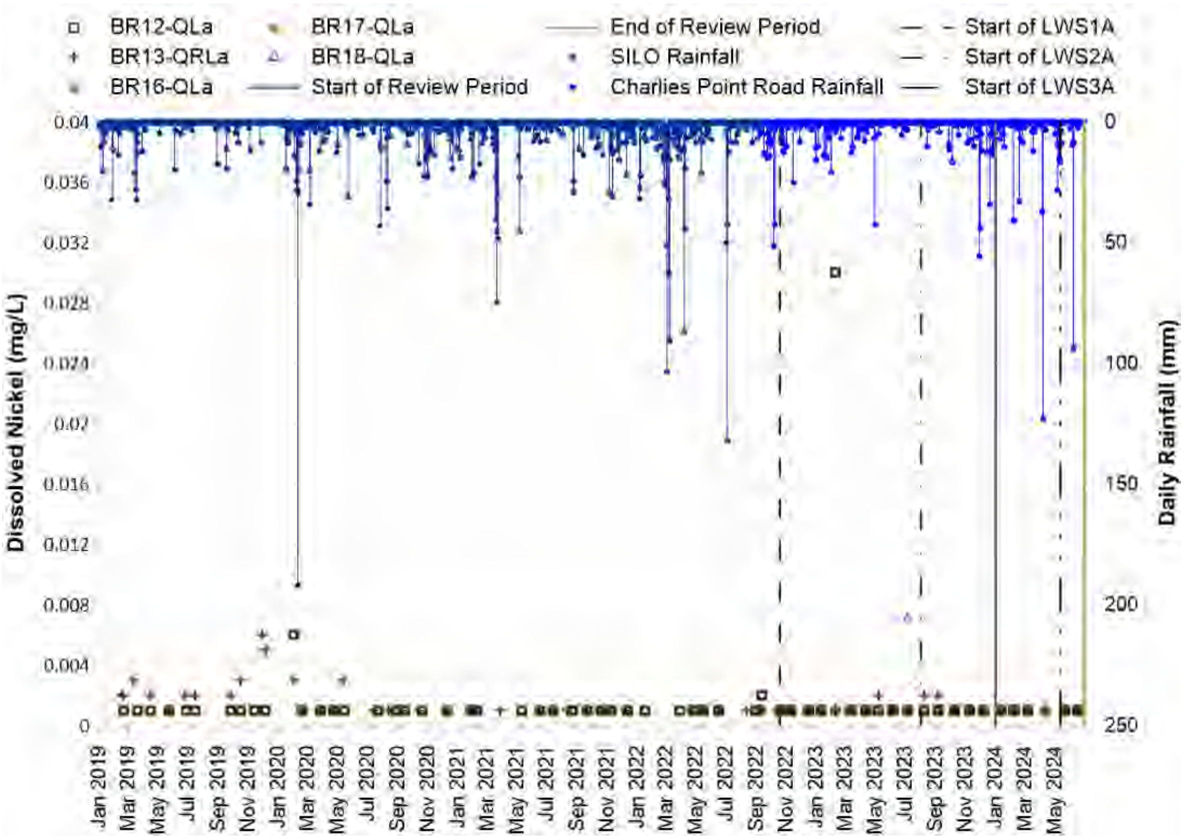
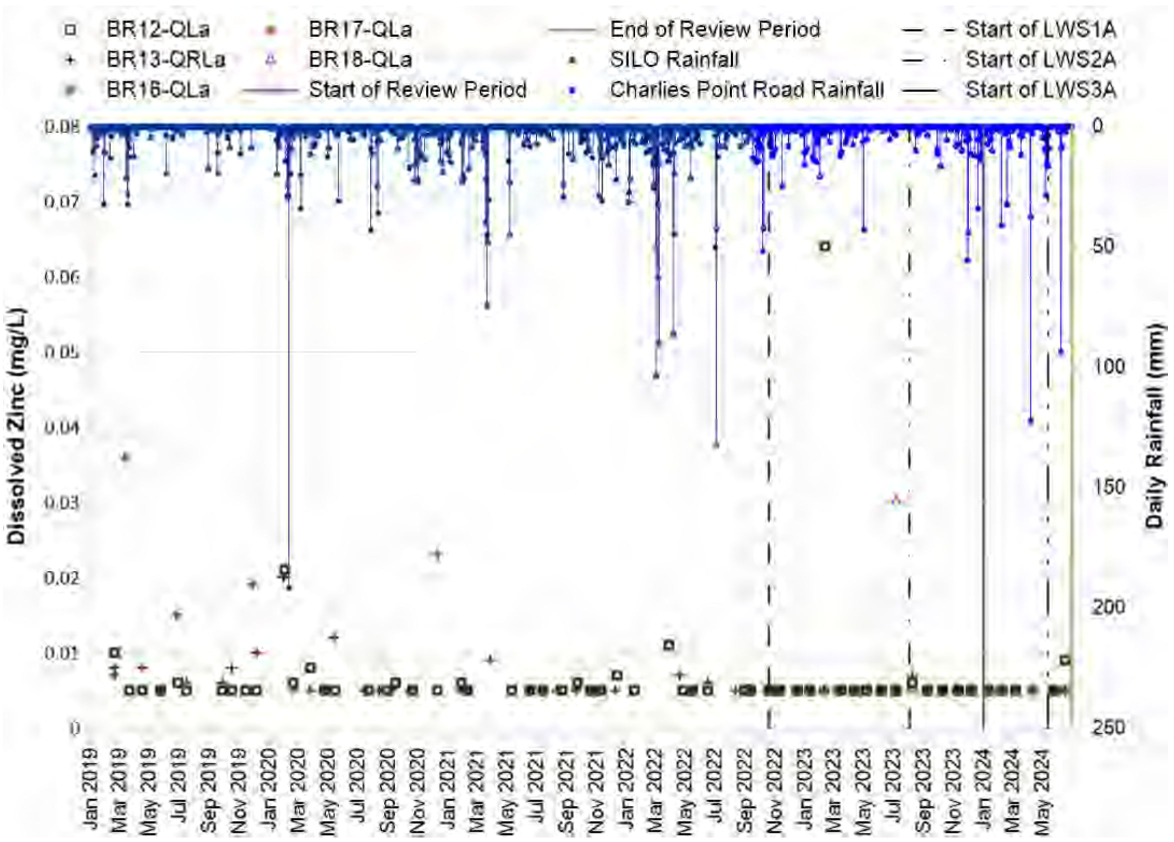


DIAGRAM C2.8: DISSOLVED ZINC RECORDS



APPENDIX D – TAHMOOR COAL RESPONSES TO TARP ACTION AND RESPONSE REQUIREMENTS

TAILINGS.WATER.WASTE.

APPENDIX D1.1 – STREAM WATER QUALITY FOR ALL WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP1 RESPONSES

Response from TARP WMP1	Tahmoor Coal Response
Level 1, 2 and 3 trigger Report trigger exceedance to DPE and key stakeholders.	Trigger exceedances during the reporting period were notified to DPE (now DPHI) on 23 February 2024. Notification to NRAR was required as part of the conditions of the Enforceable Undertaking (in force from 24 July 2023). Tahmoor Colliery Community Consultative Committee was advised of water quality triggers on 7 March 2024. Future meetings will include further notification of additional TARP triggers.
Level 1, 2 and 3 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of the Annual Review.
Level 1, 2 and 3 trigger Provide DPE and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. limestone cobbles for increasing pH level).	CMAs are not considered reasonable or feasible.
Level 1, 2 and 3 trigger Implement CMAs, subject to land access.	CMAs were not considered reasonable or feasible.
Level 1, 2 and 3 trigger Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	CMAs were not considered reasonable or feasible.
Level 2 and 3 trigger Advise DPE and key stakeholders of any required amendments to Water Management Plan	Proposed amendments to the LW S1A-S6A Water Management Plan were submitted to DPE (now DPHI) on 5 July 2023. Tahmoor Coal and DPHI are in currently in consultation regarding the changes to the WMP. Following the submission of the Annual Review, another round of review and (if required) update will be completed for the LW S1A-S6A Water Management Plan, and any amendments submitted to DPHI for approval.
Level 2 and 3 trigger Provide findings of CMA review to DPE and key stakeholders for consultation.	CMAs were not considered reasonable or feasible.
Level 2 and 3 trigger Implement additional CMAs, subject to land access.	CMAs were not considered reasonable or feasible.
Level 3 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Offer site visit with DPE and other key stakeholders.	A site visit was offered to DPIE and NRAR in relation to Level 3 TARP triggers of TARPs WMP1, WMP3 and WMP5. This offer was extended via letter dated 10 November 2023. A site visit was also offered to National Trust and Australian Wildlife Sanctuary and took place on 22 November 2023.

Response from TARP WMP1	Tahmoor Coal Response
• Develop Watercourse Corrective Action Management Plan (WCAMP) in consultation with the Resources Regulator, DPE and other key stakeholders (in accordance with C12 of SSD 8445). The stream remediation measures in the WCAMP could include grout curtain and grout pattern injection. • Implement approved WCAMP, subject to land access.	In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining.

TAILINGS.WATER.WASTE.

APPENDIX D2.1 – WATER LEVEL FOR ALL WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP3 ACTIONS

Action from TARP WMP3	Tahmoor Coal Response
Level 1, 2 and 3 trigger Continue monitoring and review of data as per monitoring program.	Monthly (or more frequent) monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 trigger Review water level trends along watercourse (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer **Section 6.1**).
Level 1, 2 and 3 trigger Review streamflow data recorded at TT-F1 and conduct streamflow reduction assessment.	Streamflow data recorded at TT-F1 was reviewed and streamflow reduction assessment conducted (refer **Section 5.3** and **Section 6.2**). The streamflow assessment indicated that trends have been consistent with rainfall trends for the duration of the review period. It is also considered that the rate of streamflow decline recorded during the review period is consistent with historical declines, including periods prior to the commencement of mining of LW S1A.
Level 1, 2 and 3 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, groundwater level monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (contained herein).
Level 2 and 3 trigger Consider increasing monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, out of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g. singular, anthropogenic, non-mining related change or confirmed as a mining-related impact that resulted in a water level change).	Causation was identified for the Level 2 and 3 triggers equated for TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa and TT13-QLa, refer **Section 6.1**). For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency occurs on a fortnightly basis as real-time telemetry data is available for these sites. The monitoring frequency was not increased for TT7-QLa, TT9-QLa, TT12-QLa and TT13-QLa as causation has been confidently identified.
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water level trends along creek (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer **Section 6.1**).

TAILINGS.WATER.WASTE.

Action from TARP WMP3	Tahmoor Coal Response
Level 2 and 3 trigger Review Water Management Plan and modify if necessary.	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 3 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at sites where Level 3 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	Causation was identified for the Level 3 triggers equated for TT3-QLa and TT12-QLa (related to subsidence induced fracturing and the prevailing climate, refer **Section 6.1**). As such, the monitoring frequency was not increased.
Level 3 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing), other catchment changes, effect unrelated to mining or the prevailing climate.	A detailed investigation was undertaken to assess if the change in behaviour was related to mining effects (refer **Section 6**). Direct and indirect impacts from mining have been confirmed at the related pools, as summarised in **Section 7.1.**

APPENDIX D2.2 – WATER LEVEL FOR ALL WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP3 RESPONSES

Response from TARP WMP3	Tahmoor Coal Response
Level 1, 2 and 3 trigger Report trigger exceedance to DPHI and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) on 19 June 2024 (triggers for the January to March 2024 period). Notification to NRAR was required as part of the conditions of the Enforceable Undertaking (in force from 24 July 2023). Tahmoor Colliery Community Consultative Committee was advised of water level triggers on 6 June 2024 and 5 September 2024. Future meetings will include further notification of additional TARP triggers.
Level 1, 2 and 3 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of the Annual Review.
Level 2 and 3 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 3 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Offer site visit with DPHI and other key stakeholders. • Develop Watercourse Corrective Action Management Plan (WCAMP) in consultation with the Resources Regulator, DPHI and other key stakeholders (in accordance with C12 of SSD 8445). The stream remediation measures in the WCAMP could include grout curtain and grout pattern injection. • Implement approved WCAMP, subject to land access.	A site visit was offered to DPIE and NRAR in relation to Level 3 TARP triggers of TARPs WMP3 and WMP5. This offer was extended via letter dated 10 November 2023. A site visit was also offered to National Trust and Australian Wildlife Sanctuary and took place on 22 November 2023. In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining.

APPENDIX D3.1 – PHYSICAL FEATURES AND NATURAL BEHAVIOUR OF WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP5 ACTIONS

Action from TARP WMP5	Tahmoor Coal Response
Level 1, 2 and 3 trigger Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 trigger Assess visual change along watercourse (upstream to downstream) to observe any spatial changes with consideration to climatic conditions.	Visual changes along watercourse were reviewed with consideration to climatic conditions (refer **Section 6.3**).
Level 1, 2 and 3 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water monitoring results, groundwater monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (contained herein).
Level 2 and 3 trigger Consider increasing monitoring and review of data frequency to fortnightly at sites where Level 1 has been reached and at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g., surface fracturing of weathered bedrock that does not affect water holding capacity of rockbar control or pool base or confirmed as a mining-related impact)	Monitoring and review of data frequency was not increased at pools TT2, TT3, TT11, TT12 and TT13.
Level 2 and 3 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing other catchment changes, effect unrelated to mining or the prevailing climate).	A detailed investigation was undertaken to assess if the change in behaviour at is related to mining effects (refer **Section 6**). Direct and indirect impacts from mining have been confirmed at the pools in question, as detailed in **Section 7.1.**
Level 2 and 3 trigger Review Water management Plan and modify if necessary.	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 2 and 3 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at	Monitoring and review of data frequency was not increased at pools TT2, TT3, TT11, TT12 and TT13 as mining impacts were confirmed.

TAILINGS.WATER.WASTE.

sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	

TAILINGS.WATER.WASTE.

APPENDIX D3.2 – PHYSICAL FEATURES AND NATURAL BEHAVIOUR OF WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP5 RESPONSES

Response from TARP WMP5	Tahmoor Coal Response
Level 1, 2 and 3 trigger Report trigger exceedance to DPHI and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) on 19 June 2024 (triggers for the January to March 2024 period). Notification to NRAR was required as part of the conditions of the Enforceable Undertaking (in force from 24 July 2023). Tahmoor Colliery Community Consultative Committee was advised of water level triggers on 6 June 2024 and 5 September 2024. Future meetings will include further notification of additional TARP triggers.
Level 1, 2 and 3 T trigger ARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of the Annual Review.
Level 2 and 3 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan	The LW S1A-S6A Water Management Plan was reviewed and proposed amendments were approved by DPHI on 14/8/2024. No further modifications to the Water Management Plan are currently planned.
Level 3 trigger Offer site visit with DPHI and other key stakeholders.	A site visit was offered to DPIE and NRAR in relation to Level 3 TARP triggers of TARPs WMP1, WMP3 and WMP5. This offer was extended via letter dated 10 November 2023. A site visit was also offered to National Trust and Australian Wildlife Sanctuary and took place on 22 November 2023.
Level 3 trigger Develop Watercourse Corrective Action Management Plan (WCAMP) in consultation with the Resources Regulator, DPHI and other key stakeholders (in accordance with C12 of SSD 8445). The stream remediation measures in the WCAMP could include grout curtain and grout pattern injection.	In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining.
Level 3 trigger Implement approved WCAMP, subject to land access.	Refer to response above.

APPENDIX D4.1 – CHANNEL STABILITY, SEDIMENTATION AND EROSION: WMP7 ACTIONS

Action from TARP WMP7	Tahmoor Coal Response
Level 1 and 2 trigger Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1 and 2 trigger Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, biodiversity monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer to **Appendix B**).
Level 1 and 2 trigger Consider increasing monitoring and review of data frequency at sites where Level 1 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g. singular, anthropogenic, non-mining related change or confirmed as a mining-related impact that resulted in increased erosion).	Monitoring and review of data frequency has not been increased in frequency as the causation of the erosion at the knickpoint sites K57 and K64 was considered to be understood (elevated water flow for K57, and a combination of elevated water flow and subsidence impacts for K64).
Level 1 and 2 trigger Consider and decide on reasonable and feasible options for remediation as relevant (e.g. enhanced vegetation establishment, rock armouring).	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger If mining related impact unconfirmed, increase monitoring and review of data frequency at sites where Level 2 has been reached or at other relevant sites, subject to land access, as follows: • Fortnightly, for sites within the active subsidence zone. • Monthly, outside of the active subsidence period.	Monitoring and review of data frequency has not been increased in frequency as the causation of the erosion at the knickpoint site K64 is understood to be partially due to mining. Monitoring as per the monitoring program and after large rainfall events will continue at K64 to assess if remediation actions are required.
Level 2 trigger Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. subsidence induced, other catchment changes, effects unrelated to mining or the prevailing climate).	A detailed investigation was undertaken to assess if the change in behaviour at K64 is related to mining effects (refer Section 6 of **Appendix B**). Direct impacts from mining were confirmed for K64.

Action from TARP WMP7	Tahmoor Coal Response
Level 2 trigger Obtain specialist advice on further CMAs.	Advice was obtained by specialists as detailed in **Section 6.3** and **9**
Level 2 trigger Review CMAs in light of findings from further investigations and consider additional remediation options.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger Review Water Management Plan and modify if necessary.	There are no proposed changes to the Water Management Plan in light of the Level 2 TARP trigger at K64.

APPENDIX D4.2 – CHANNEL STABILITY, SEDIMENTATION AND EROSION: WMP7 RESPONSES

Response from TARP WMP7	Tahmoor Coal Response
Level 1 and 2 trigger Report trigger exceedance to DPHI and key stakeholders	Completed as part of this report.
Level 1 and 2 trigger Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	Completed as part of this report.
Level 1 and 2 trigger Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for approval (e.g. enhanced vegetation establishment, rock armouring).	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 1 and 2 trigger Implement CMAs, subject to land access.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 1 and 2 trigger Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.
Level 2 trigger Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	There are no proposed changes to the Water Management Plan in light of the Level 2 TARP trigger at K64.
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Offer site visit with DPHI and other key stakeholders.	Tahmoor Coal will offer site visit to DPHI and other related stakeholders in relation to subsidence impacts (in relation to TARP triggers for other water TARPs) in the vicinity of K64.
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Provide findings of CMA review to DPHI and key stakeholders for consultation.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.

TAILINGS.WATER.WASTE.

Response from TARP WMP7	Tahmoor Coal Response
Level 2 trigger If it is concluded from the detailed investigation that watercourses have been damaged by subsidence impacts: • Implement additional CMAs, subject to land access.	CMAs are not considered reasonable or feasible until the extent and longevity of the impacts are confirmed. Monitoring will continue at K64 to assess if remediation actions are required.

Appendix C – Groundwater Monitoring Report

Six-Monthly Groundwater Report: January – June 2024

Tahmoor South Domain

Tahmoor Coal Pty Ltd

2975 Remembrance Driveway, Bargo NSW 2574

Prepared by:

SLR Consulting Australia

SLR Project No.: 640.30614.00001

25 September 2024

Revision: 2.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
2.0	28 August 2024	J Xie / S Hulbert	S Hulbert	KJ Wallis
2.0	19 September 2024	J Xie / S Hulbert	S Hulbert	S Hulbert

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Tahmoor Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Table of Contents

Tables in Text

Figures in Text

Appendices

Acronyms and Abbreviations

Al	Aluminium
As	Arsenic
BHCS	Bald Hill Claystone
Ba	Barium
BGSS	Bulgo Sandstone
BUCO	Bulli Coal Seam
CCL	Consolidated Coal Lease
Cu	Copper
EC	Electrical Conductivity
Filt	Filtered
HBSS	Hawkesbury Sandstone
Fe	Iron
Pb	Lead
Li	Lithium
LW	Longwall
Mn	Manganese
ML	Mining Lease
Ni	Nickel
pH	Potential of Hydrogen
Se	Selenium
SSD	State Significant Development
Sr	Strontium
TDS	Total Dissolved Solids
TARP	Trigger Action Response Plan
VWP	Vibrating Wire Piezometer
WWCO	Wongawilli Coal Seam
WBCS	Wombarra Claystone
WMP	Water Management Plan
WWFM	Wianamatta Form
Zn	Zinc

1.0 Introduction

1.1 Background

SLR Consulting Australia Pty Ltd (SLR) was engaged by Tahmoor Coal Pty Ltd (Tahmoor Coal) to undertake a review of groundwater data, which has been collected by Consulting Earth Scientists Pty Ltd (CES), for the Tahmoor South Domain (Tahmoor South) of the Tahmoor Coal Mine (Tahmoor Mine) between 1st January 2024 and 30th June 2024.

Tahmoor Mine, located approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW), is an underground mine extracting from the Bulli Coal Seam via longwall mining.

Mining at Tahmoor South commenced on 18 October 2022. The Tahmoor South mining area is within Consolidated Coal Lease (CCL) 716 and CCL 747. Tahmoor South comprises 12 longwalls which includes the ‘A series’ panel of six longwalls and the ‘B series’ panel of six longwalls. Tahmoor Coal is currently mining the Tahmoor South A series panel of longwalls, which includes longwall (LW) South 1A to South 6A (S1A – S6A). LW S1A – S6A are orientated north-west to south-east. Extraction of LW S1A and S2A are complete, with extraction currently underway at LW S3A.

1.2 Trigger Action Response Plan

In accordance with Condition E5 (f) of the Development Consent (SDD 8445) (the Consent), in the event that performance measures (in the form of pre-defined triggers) are considered to have been exceeded or are likely to be exceeded, a response will be undertaken in accordance with the Trigger Action Response Plans (TARPs) (SLR, 2022).

TARPs for Tahmoor South were established in the Tahmoor South Water Management Plan (WMP) (Tahmoor Coal, 2022) to manage and protect surface water and groundwater within the vicinity of Tahmoor South.

Six TARPs (WMP8 – WMP13) address various components of the groundwater system, and these are presented in **Appendix A**. Tahmoor South groundwater monitoring sites are captured in the following TARPs:

- WMP8 Shallow Groundwater Level (Open Standpipes and Private Bores);
- WMP9 Shallow Groundwater Pressure (Vibrating Wire Piezometer (VWP) Sensors <200 m Depth);
- WMP10 Groundwater Pressure Deep (VWP Sensor >200 m Depth, excluding monitoring the Bulli Coal Seam);
- WMP11 Groundwater Quality (Open Standpipes and Private Bores);
- WMP12 Groundwater-Surface Water Interaction; and
- WMP13 Groundwater Monitoring Bores for Thirlmere Lakes.

Each TARP has four levels of triggers which range from “Normal Conditions”, where the environment is behaving or performing within normal or expected levels, to “Level 1” (L1), “Level 2” (L2) and “Level 3” (L3), where with an increase in level there is an escalating risk to the environment via deviation from baseline or expected conditions (SLR, 2022).

Groundwater level triggers and groundwater quality triggers are discussed in **Appendix A** and presented in **Appendix B**.

1.3 Trigger Action Response Plan Amendments

The Water Management Plan (WMP), in accordance with Condition E7 (b-e) of the Consent, will be reviewed within three months of the submission of an Annual Review under Condition E13. Amendments were proposed to the original TARPs and detailed in the 2023 Six-Monthly Review documentation (SLR, 2024). Accordingly, the WMP was updated to reflect these changes and submitted to the Department of Climate Change, Energy, Environment and Water (DCCEEW) in June 2024. This six-monthly reporting is reflective of the updated WMP.

1.4 Report Objective

This report assesses the Tahmoor South groundwater monitoring data against the triggers of TARP WMP8 – WMP13 for the reporting period from 1st January 2024 through 30th June 2024 (inclusive).

This report includes:

- A summary of TARP triggers during the reporting period,
- A full summary of trigger level exceedances over time including the identification of breaches of triggers that remain within normal condition in this reporting period (**Appendix C**),
- An outline of potential factors influencing TARP triggers during the reporting period, and
- Recommendations of relevant actions and responses to be undertaken, in alignment with the TARPs.

The information in this six-monthly report will inform be built upon in the overarching 2024 Annual Review.

2.0 Monitoring Period Summary

2.1 Mine Operation

Mining is currently underway at Tahmoor South, with the following progression;

- LW S1A – commenced 18th October 2022, concluded on Tuesday 4th July 2023,
- LW S2A – commenced 2nd August 2023, concluded on 6th April 2024, and
- LW S3A – commenced 8th May 2024, extraction underway.

The extraction void progression of 425.5 metres (m) as of the 30th June 2024 (conclusion of this reporting period), is approximately 25% of the 1,704 m modified void length. **Figure 1** presents the extraction void progress and the Tahmoor South groundwater monitoring network.

2.2 Monitoring Network Status

The Tahmoor South groundwater monitoring network is shown on **Figure 1.**

An update on the status of the groundwater monitoring network, and associated data availability, during the reporting period includes:

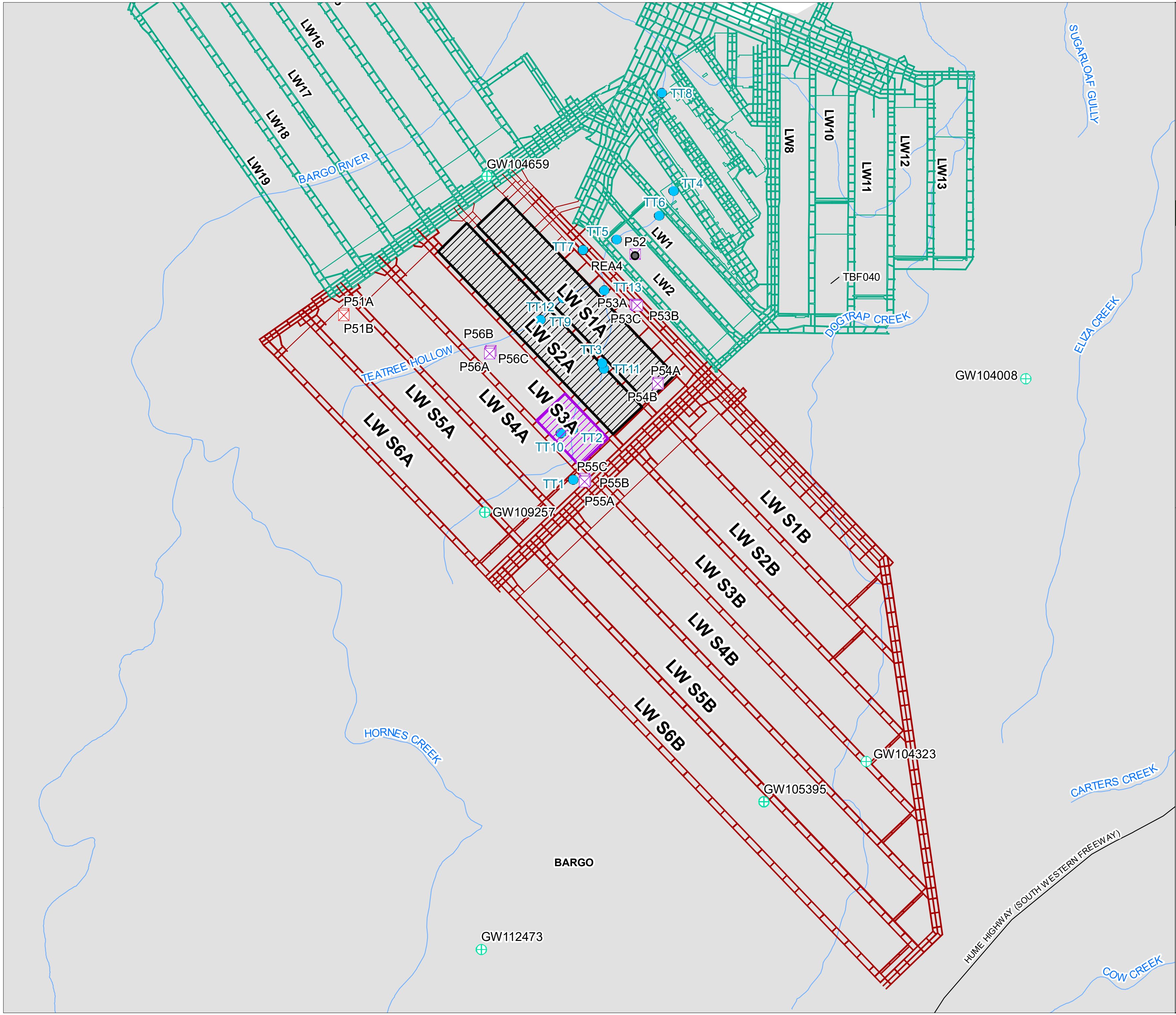
- P54: groundwater quality and water level logger data were not provided as the bore was observed as being dry since February 2023.
- TBC026 (ECSL-460m): data appeared erroneous in August 2023 and was omitted from the analysis.
- GW105395: Monitoring ceased in March 2024. This bore has been removed from the monitoring program due to damage resulting in it being inoperable and no longer fit-for-purpose.
- P53C: no logger data available post April 2024.
- P55A & P55B: no logger data available.

The groundwater monitoring network is shown alongside the subsidence monitoring network on **Figure 2**. Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure their absolute horizontal and vertical positions in real time. There are 28 GNSS units located directly above and adjacent to LW S1A to S6A.

2.3 General Site Matters

General site matters or matters pertinent to other technical disciplines as noted at June Environmental Response Group (ERG) meeting, include:

- Overall, the subsidence curve is no longer approaching the predicted maximum subsidence, and will be less than predicted.
- Surface water levels showed an increased water level in April and May in response to the high rainfall observed.
- No exceedances in surface water quality triggers were observed. Some elevated metal concentrations, however present across reference sites also.
- New fracture noted between K64 and TT2, approximately six m long.
- Geotechnical investigations reporting normal conditions observed for cliffs and steep slopes, dams, and road embankments.



TAHMOOR COAL GROUNDWATER MONTHLY REVIEW (JUN 2024)

Tahmoor South Monitoring Network

FIGURE 1

- LW S3A Extraction Void (progress as of 30/06/2024)
- LW S1A and LW S2A Extraction Complete
- Tahmoor South Mine Plan
- Tahmoor North and Western Domain
- Major Roads
- Watercourses
- Hawkesbury Sandstone

Groundwater Monitoring Locations

- Shallow OSP - Bargo Trib
- Shallow OSP - TeaTree Ck
- Shallow OSP - REA
- Regional groundwater bore (part of TARP)

Surface Water Monitoring Location

- Surface Water Pool Location

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:35,000 at A4
Project Number:	640.30614
Date:	30-Aug-2024
Drawn by:	AS

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TAHMOOR COAL
GROUNDWATER MONTHLY REVIEW
(JUN 2024)

Groundwater Monitoring Network

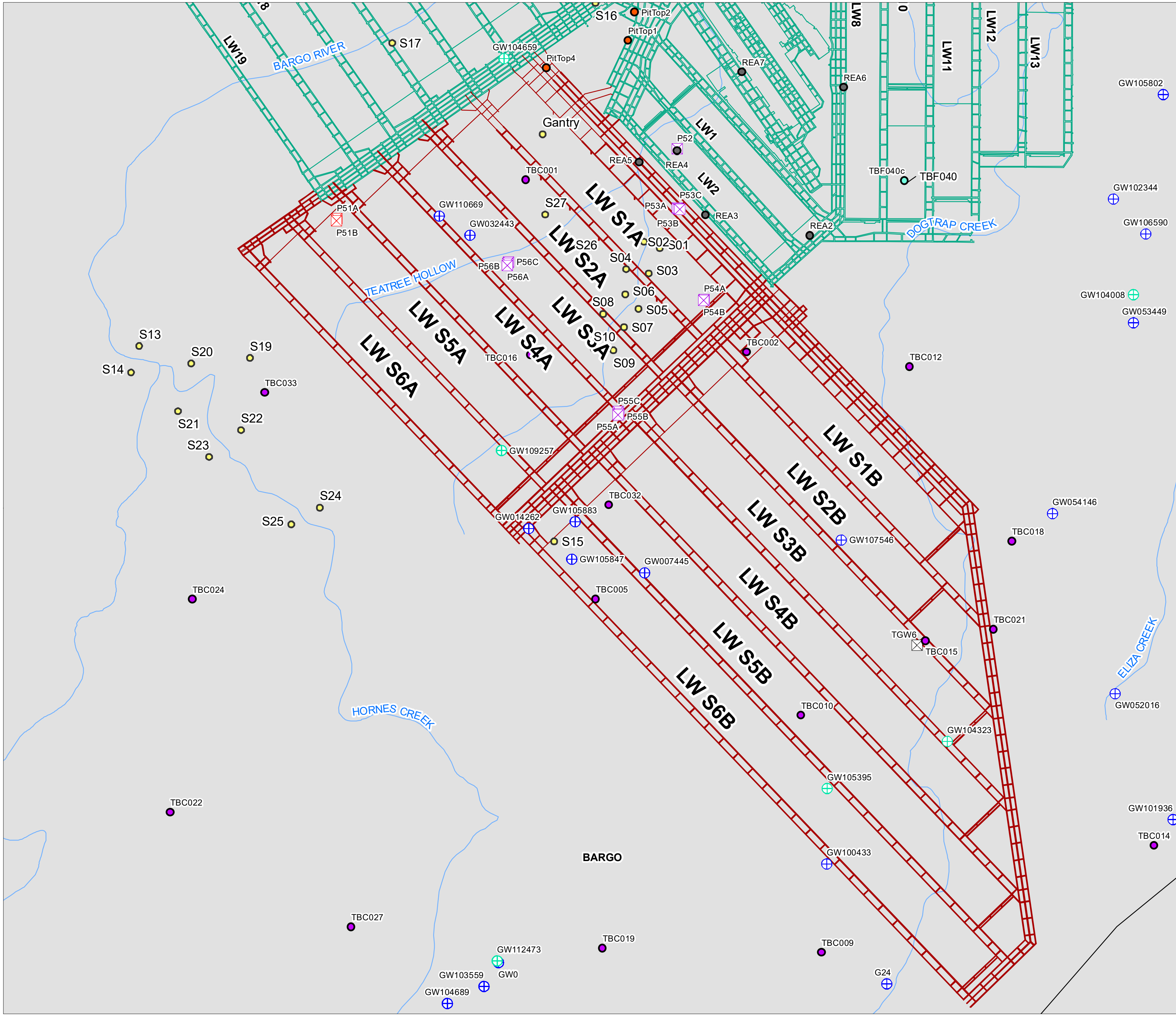


FIGURE 2

- Tahmoor South Mine Plan
- Tahmoor North and Western Domain
- Major Roads
- Watercourses
- Hawkesbury Sandstone
- Subsidence Montioring (GNSS Unit)

Groundwater Monitoring Locations

- Deep GWL
- HOF investigation bore
- Shallow OSP
- Shallow OSP - Bargo Trib
- Shallow OSP - TeaTree Ck
- Shallow OSP - Pit-top
- Shallow OSP - REA
- Regional groundwater bore
- Regional groundwater bore (part of TARP)

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:30,000 at A4
Project Number:	640.30614
Date:	30-Aug-2024
Drawn by:	AS

2.4 Climatic Conditions

Rainfall over the past 12 months, in comparison to the long-term average (i.e., January 1900 – present) is shown in **Table 1**. The SILO climate record for the location 0.05° x 0.05° tile centred on a location within proximity of Tahmoor Mine (latitude: -34.25, longitude: 150.60) has been used for this assessment to understand long-term rainfall trends (Queensland Government, 2023).

Within the six-month reporting period, February and March showed notably below average rainfall, whilst April, May and June received significantly higher than average rainfall.

Table 1: Monthly Rainfall vs Long-Term Average Rainfall

SILO (-34.25, 150.60)	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Long-term average rainfall (mm)	38.9	47	43.6	63.6	81.2	67.9	84.4	112.9	97.7	71.8	54.6	64.5
July 2024 - June 2024 monthly rainfall (mm)	8.8	32.7	15	30	149.4	154.5	75.9	69.1	34.8	202.8	105.7	136

Long-term monthly average rainfall, potential evaporation and estimated actual evapotranspiration is presented in **Figure 3.** The evaporation and evapotranspiration are, on average, higher than rainfall between July and January.

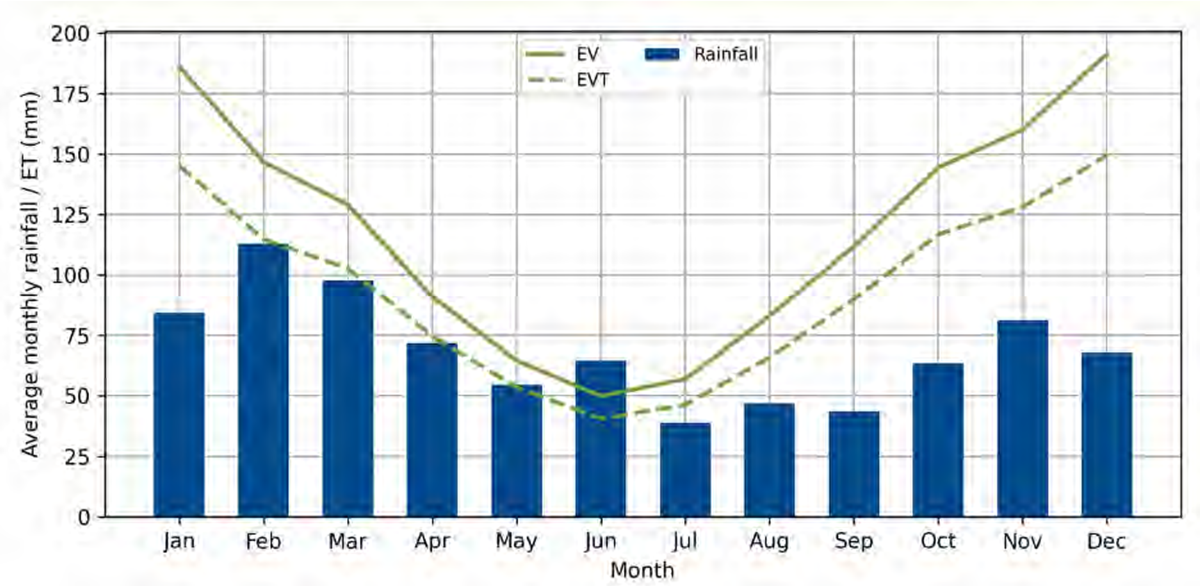


Figure 3: Long-term Average Monthly Rainfall, Evaporation and Evapotranspiration

The historical record of monthly rainfall and the calculated trend in rainfall, using the cumulative residual departure from mean method, is presented in **Figure 4** where a positive gradient indicates above average rainfall, whilst a declining trend represents below average. During the reporting period, there have been below average rainfall conditions.

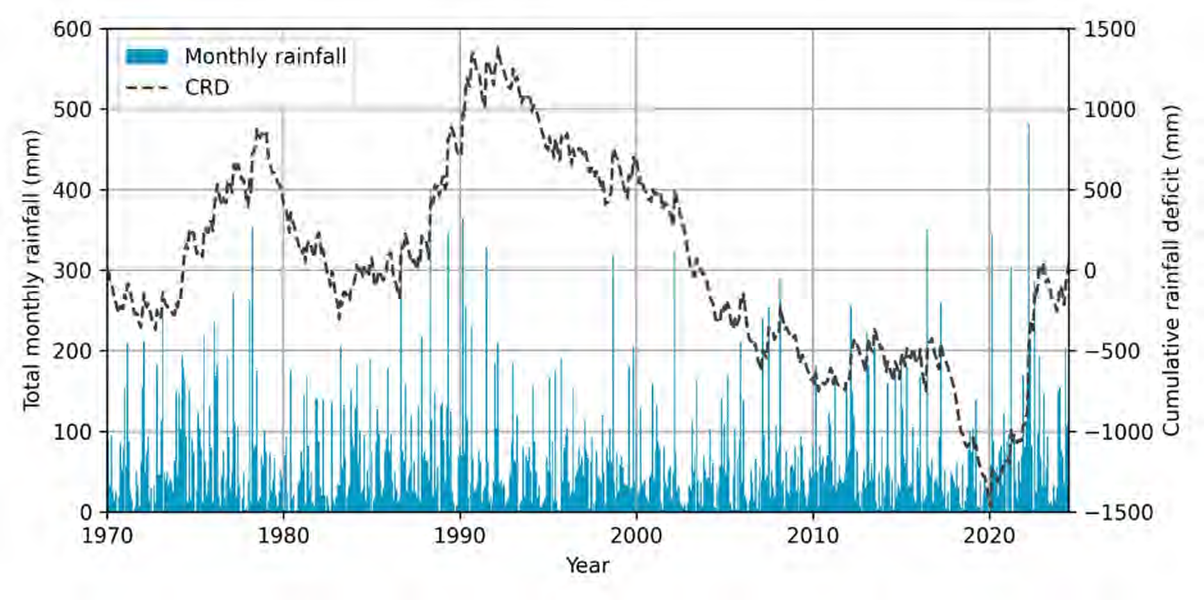


Figure 4: Cumulative Residual Departure and Total Monthly Rainfall

2.5 Summary of Groundwater Conditions

The following sub-sections provide a brief summary of the subsequent discussion. Please see detailed discussion in Section **3.0** and Section **4.0**.

2.5.1 Shallow Open Standpipe (OSP) Bores

Groundwater depressurisation has been identified in a series of shallow monitoring bores, primarily notable at P53 and P55.

Decline is also observed at P56C, although it is not consistent across the nested bores (depth profile of the Hawkesbury Sandstone), with P56A showing stable water levels.

P52 and REA4 are showing some consistent decline in water levels since approximately November 2022, however both are showing signs of stabilisation and did not trigger TARP WMP8 in the reporting period.

Quite consistently, where depressurisation has been observed, a period of relative stability at this reduced groundwater level has occurred. Ongoing monitoring will inform if further depressurisation occurs or whether recovery commences as the longwall progresses further from currently impacted sites (as observed at P52/REA4).

No groundwater quality triggers are active at the conclusion of the reporting period. There is no apparent trends occurring between groundwater level and groundwater quality.

2.5.2 Groundwater – Surface Water Connectivity

Groundwater monitoring is undertaken within nearby vicinity of surface watering at multiple locations to assist with the review of groundwater – surface water interaction. Namely to assist with defining if surface flow changes identified are attributable to baseflow loss due to groundwater depressurisation resultant from mining activities.

Previous investigations indicate significant disparity between the base of the surface water features and the baseline groundwater level (i.e. no direct interaction (baseflow) observed).

Although P55 and P53 have TARP triggers and depressurisation noted, the lack of connectivity between the systems indicates that the groundwater conditions are unlikely to have a causal effect on surface water conditions. Surface water losses are likely due to surface fracturing and drainage rather than baseflow losses.

2.5.3 Private Bores

Fluctuations in groundwater levels across the suite of private bores monitored are observed, however this is no identifiable trend and no indication of impact from mining extraction activities.

2.5.4 Shallow VWPs (<200 metres)

Shallow VWPs are showing variation in responses since commencement of extraction. TBC009 (HBSS – 30m) experienced a period of small steady decline since November 2022, however is now showing some increase in water levels. The deeper sensors remained relatively stable, also recently showing some increase in water levels. TBC018 also showed minor reduction in water level over time in the three shallowest sensors (70m, 117m, 164m, 179 m) although followed by a period of stabilisation and some increase. Water levels in the deepest sensor at 198 m have shown relatively consistent very minor decline. TBC027 is showing fluctuation in groundwater level across all depth sensors, although there is no apparent depressurisation occurring.

TBC032 is the closest VWP to current extraction activities and is showing depressurisation in all sensors.

TBC034 remains stable and TBC039 has observed an increase in water level.

2.5.5 Deep VWPs (>200 metres)

The deep VWPs overall are showing some depressurisation over the reporting period but this is not consistent spatially or across depth profiles at individual sites.

TBC009 shows maximum depressurisation of 15 m between December 2022 and December 2023 at sensor depth 357 m, however recovery was observed to baseline conditions during this reporting period. Approximately 4 m of drawdown was observed in the sensor below (391 m) although this has shown some fluctuation. The sensor at 343 m shows a maximum of approximately 4 m decline also with similar fluctuation trends as the 391 metre sensor. The shallowest sensor at 332 m, shows relatively steady decline of maximum 1 metre occurring since November 2022.

TBC018 has observed steady drawdown to a maximum of 3.5 m since November 2022, with less drawdown followed by stabilisation in the deeper sensors.

TBC020 has shown fluctuation across all sensors, the lowest three sensors have observed no overall drawdown. The shallowest sensor (211m) observed total drawdown to a maximum of approximately 8.5 m between June 2023 and December 2023 however a 4.5 m recovery was observed subsequently. Minor drawdowns and some recent recovery is observed in the sensors at 293m and 375m. The sensor at 411 m, had decline in water level of approximately 3.5 m since December 2023. The deepest sensor at 434 m is stable.

TBC026 has shown minor overall drawdown (< 1 m) occurring in the shallowest sensors, 211 m and 278 m. The sensor at 344 m shows the most drawdown at 4 m, noting some fluctuation across the observed record. The deepest sensors, at 409 m, 432 m and 440 m show no apparent decline, with the sensor at 440 m presenting an increase above baseline conditions.

TBC032 is the closest VWP to current extraction activities and has observed relatively steady drawdown over time, with the shallowest sensor showing the highest drawdown, which decreases with depth (220m sensor – 20 m drawdown, 237m sensor – 10 m drawdown, 294 metre sensor – 10 m drawdown).

TBC039 is not showing any clear response to mining with water levels stable, increasing above baseline conditions or some drawdown and stabilisation.

2.5.6 Salinity (as electrical conductivity) and pH

The pH and EC across all bores show some level of fluctuation with no apparent trends across the full record.

2.5.7 Metals

Metals across all bores have shown fluctuation over the reporting period and cannot be attributable to mining with sporadic spatial and depth profile distribution.

3.0 TARP Assessment

3.1 TARP Trigger Assessment

A review of the temporal data against pre-defined trigger levels has been completed for the reporting period. The full summary, showing all trigger level breaches and exceedances, is provided in **Appendix C**. Groundwater level/potentiometric surface hydrographs are provided in **Appendix D**, with temporal groundwater quality plots provided in **Appendix E**.

The TARPs enacted, including WMP8, WMP 9 an WMP12, during the reporting period are summarised in **Table 2, Table 3** and **Table 4**.

No groundwater quality TARP triggers, WMP10, were enacted during the reporting period. The presentation of the monthly groundwater quality breaches (i.e. individual breached of trigger levels that were not consistent with a TARP trigger) are provided in **Appendix C.**

The bores associated with WMP11, pertaining to Thirlmere Lakes, were not triggered during the reporting period.

Table 2 WMP8 TARP Triggers

TARP Significance	Sites	Months Active	Comment
Level 1	P51B	Jan, Feb, March, April	Greater than 2 metre water level reduction for a period of greater than 6 months following the commencement of extraction.
	P53A	Jan, Feb, March, April, May, **June**	
	P53B	Jan, Feb, March, April, May, **June**	
	GW104659	Jan, Feb, March, April, May, **June**	
	GW109257	Feb, March, Apr, May, **June**	
	P55B	Jan	
Level 2	P53C	Jan, Feb, March, April, May, **June**	Water level declines below Trigger Level 2 for a period of greater than 6 months P56C not determinedly found to be due to extraction. Monitoring to continue.
	P55C	Jan, Feb, March, April, May, **June**	
	P56C	Jan, Feb, March, April, May, **June**	
	P55B	Feb, March, April	
Level 3	P55B	May, **June**	Water level reduction greater than the maximum modelled drawdown for a period of greater than 6 months following the commencement of extraction.

Note. Bold text to show TARPs active as conclusion of reporting period (June)

Table 3 WMP9 TARP Triggers

TARP Significance	Sites	Months Active	Comment
Level 1	TBC032 (BHCS-181m)	Jan, Feb, March, April, May, **June**	Greater than 2 metre water level reduction for a period of greater than 6 months following the commencement of extraction.
	TBC032 (BGSS-200m)	Jan, Feb, March, April, May, **June**	

TARP Significance	Sites	Months Active	Comment
Level 3	TBC032 (HBSS – 131 m)	April, May, **June**	Water level reduction greater than maximum modelled drawdown following commencement of extraction for a period of greater than six months.

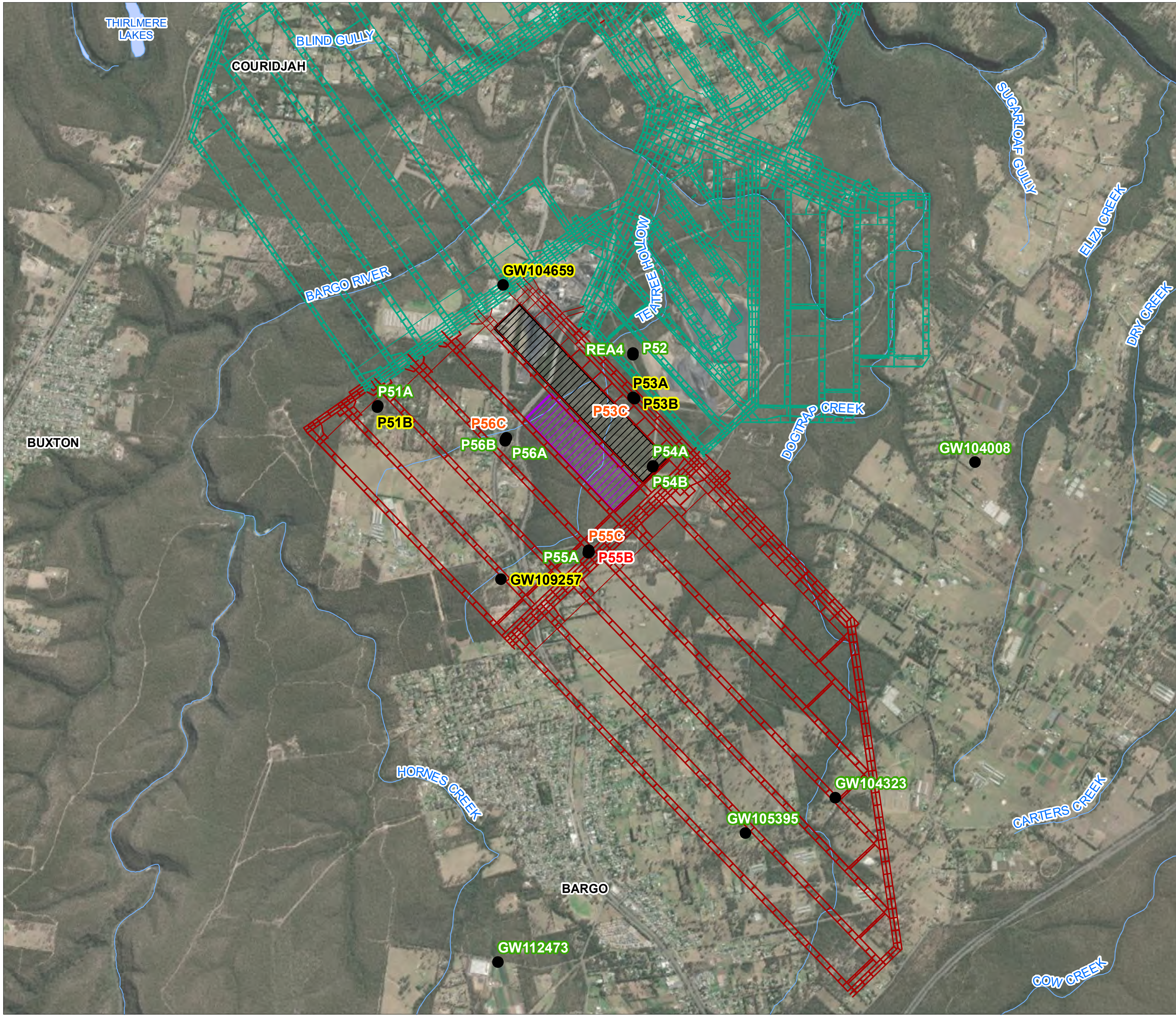
Note. Bold text to show TARPs active as conclusion of reporting period (June)

Table 4 WMP12 TARP Triggers

TARP Significance	Sites	Months Active	Comment
Level 1	P53A	Jan, Feb, March, April, May, **June**	Greater than 2 metre water level reduction for a period of greater than 6 months following the commencement of extraction.
	P53B	Jan, Feb, March, April, May, **June**	
	P55A	**June**	
	P55B	Jan	
Level 2	P53C	Jan, Feb, March, April, May, **June**	Water level declines below Trigger Level 2 for a period of greater than 6 months
	P55C	Jan, Feb, March, April, May, **June**	
	P55B	Feb, March, April	
Level 3	P55B	May, **June**	Water level decline below Trigger Level 3 for a period of greater than 6 months.

Note. Bold text to show TARPs active as conclusion of reporting period (June)

The triggers are presented spatially on **Figure 5**.



TAHMOOR COAL
GROUNDWATER SIX-MONTHLY REVIEW (JANUARY – JUNE 2024)

WMP8 Triggers June 2024

FIGURE 5

- Bore Monitored
- Watercourses
- Tahmoor South Mine Plan
- Tahmoor North and Western Domain
- LW S1A Extraction Complete
- LW S2A Extraction Void (progress as of 26/12/23)
- Lakes

Trigger Level:

- TARP WMP8 Trigger (L1)
- TARP WMP8 Trigger (L2)
- TARP WMP8 Trigger (L3)
- TARP WMP8- Normal Conditions

0 500 1,000 m

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	640.30614
Date:	19-Sep-2024
Drawn by:	AS

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4.0 Potential Influence Discussion

4.1 TARP WMP8

TARP WMP8 pertains to shallow water levels. Both environmental (i.e. climatic conditions influencing recharge) and anthropogenic (i.e. irrigation pumping or mining extractive activities) can influence the groundwater level or shallow potentiometric surfaces. A review of the sites for which TARP WMP8 has been enacted is provided below. Where one or more bores have triggered, and the bore/s are part of a nested site, the site is discussed collectively for additional context.

4.1.1 P51

Two OSPs are nested at Site P51, as follows;

- P51A – normal conditions,
- P51B – Level 1 TARP in Jan, Feb, March and April before brief return to normal conditions.

P51B decline to level 1 TARP (stable or possible recovery) for some of the reporting period. This is potentially a response to extraction but not determinate. There was notably low rainfall in January and February, prior to above average rainfall for the remainder of the reporting period. The observed trends may indicate a response to climatic conditions. Further, P51 is located at the end of LW S5A, and is unlikely to be directly impacted by mining at this point in time. It is recommended to continue to monitor, and not to enact WMP12 for this site (as not confirmed attributable to mining and no impact in shallow bore).

4.1.2 P53

Three OSPs are nested at site P53, as follows;

- P53A – Level 1 TARP (see **Figure 6**)
  - o At P53A, the groundwater elevation was lower than TARP Level 1 trigger in all monitoring rounds since May 2023 with groundwater elevation declining approximately 3 m between May and June 2023. Over the reporting period, between January and June 2024, the groundwater elevation has remaining relatively stable slightly below the Level 2 trigger level before showing some minor recovery back to Level 1.
- P53B – Level 1 TARP (see **Figure 7**)
  - o At P53B, the groundwater elevation was lower than TARP Level 1 trigger in all monitoring rounds since April 2023 with groundwater elevation declining approximately 3 m between April and May 2023. Over the reporting period, between January and June 2024, the groundwater elevation has shown some fluctuation, finishing at a higher level in June than observed in January.
- P53C – Level 2 TARP (see **Figure 8**)
  - o At P53C, the groundwater elevation was lower than the TARP Level 2 trigger level in all monitoring rounds since August 2023. Over the reporting period, the groundwater level has fluctuated by approximately 2 m with groundwater potentially beginning to show some recovery.

P53 is located to the north of LW S1A, approximately a third of the way along the panel. All three groundwater levels displayed similar temporal trends, with a decline occurring around

April – May 2023, with relatively stable groundwater levels observed since. There is potentially some recovery starting to occur, however further data is required to confirm this.

Given locality to the longwall and the consistent response in all three bores it is likely that the drawdown is due to extraction activities.

The notable decline observed in April/May 2023 does not correlate directly with the extraction progression, with LW S1A nearing completion at this time (i.e. not mining adjacent to the bores at this time). **Figure 9** presents the hydrographs accompanied by the closest subsidence monitoring points (GNSS units), which overlie LW S1A (see **Figure 3**). The subsidence typically shows direct correlation to when extraction occurs directly beneath. The subsidence and groundwater level profiles over time show similar trends, with a short period of relatively rapid decline followed by stabilisation. Although the subsidence profile appears more responsive to longwall extraction activities directly. The groundwater drawdown appears to be more regional and potentially delayed response.

Figure 6 P53A Hydrograph

Figure 7 P53B Hydrograph

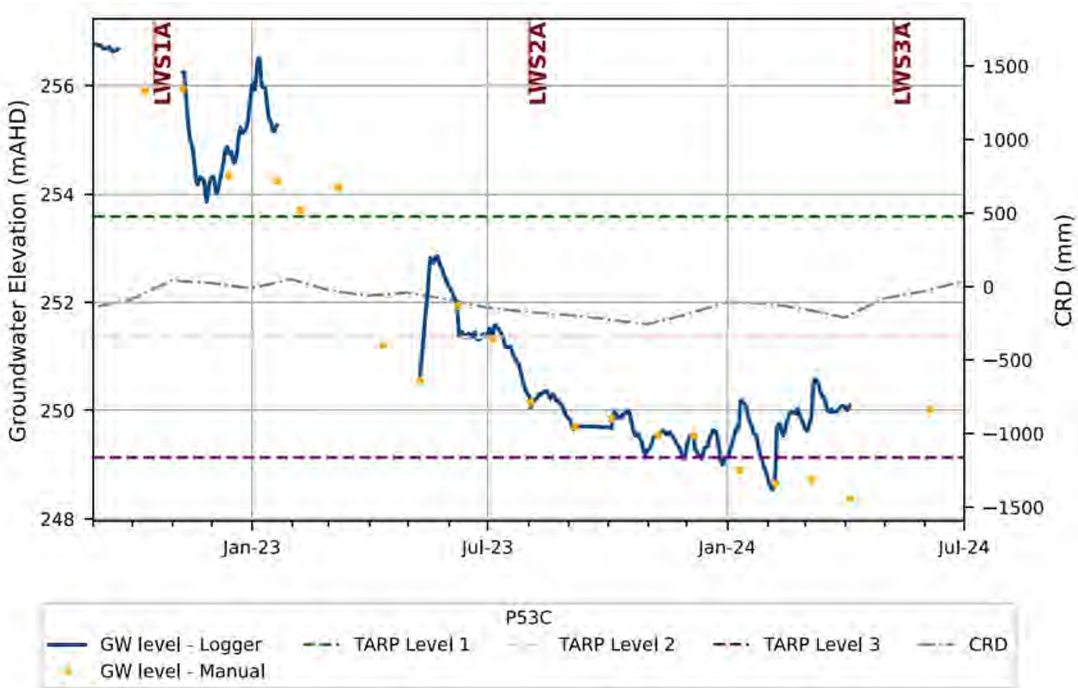


Figure 8 P53C Hydrograph

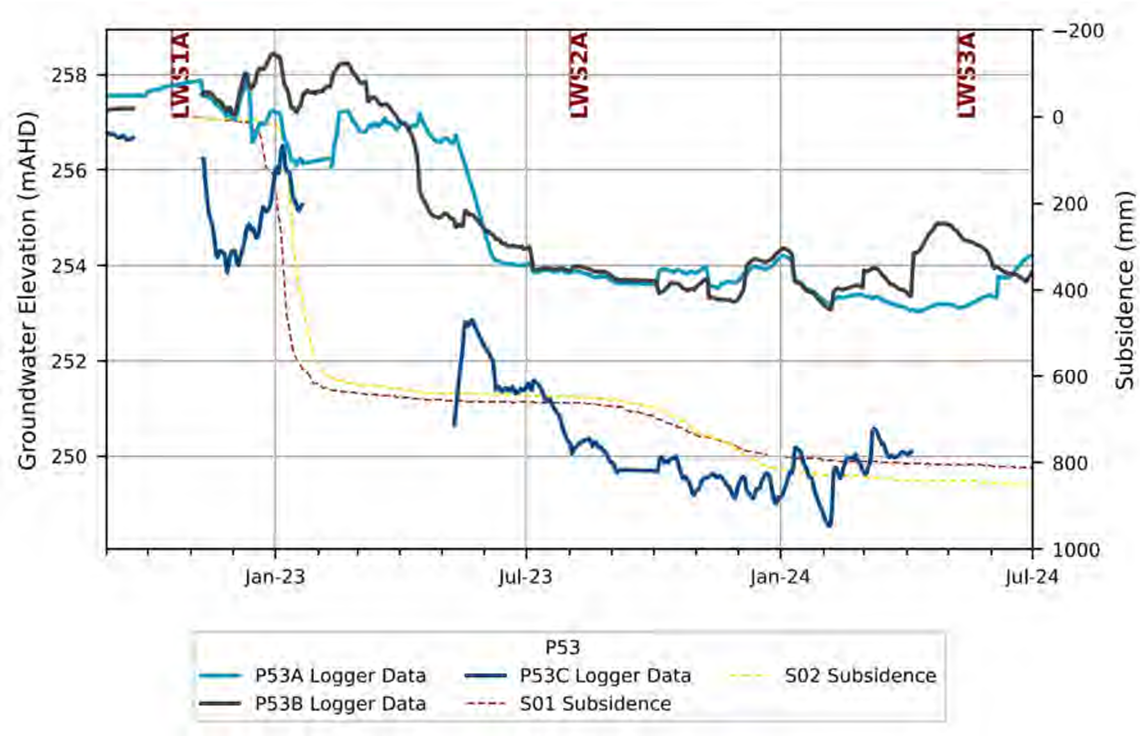


Figure 9 P53 Site Hydrographs and closest subsidence monitoring points

4.1.3 P55

There are three OSPs nested at Site P55, including:

- P55A – Level 1 TARP (**Figure 10**)
  - o Groundwater levels at P55A have shown relatively consistent decline over time, noting some fluctuations, with all monitoring points since December 2023 below the Level 1 TARP trigger. An overall decline of approximately 2.5 m has been observed since mid-2022.
- P55B – Level 3 TARP (**Figure 11**)
  - o Groundwater elevation at P55B has shown relatively consistent decline over time, noting some fluctuations, with all monitoring points since December 2023 below the Level 3 TARP trigger.
- P55C – Level 2 TARP (**Figure 12**)
  - o Groundwater elevation at P55C has more apparent fluctuation than the two shallower bores, although the overall trend is a decline in water levels.

P55 is located mid-way along LW S3A, and is showing a decline in groundwater levels in all three bores. The groundwater level decline is of the lowest magnitude in the shallowest bore, and the greatest magnitude in the mid-depth bore.

Review of groundwater levels in P55C (the only bore with logger data) against the closest GSSN units is provided in **Figure 13**. The GSSN units clearly show direct response to undermining, showing subsidence when the longwall passes beneath the unit. The groundwater response appears more regional, occurring over time as the regional groundwater levels drawdown. This consistent decline over time is likely resultant from mining extraction activities.

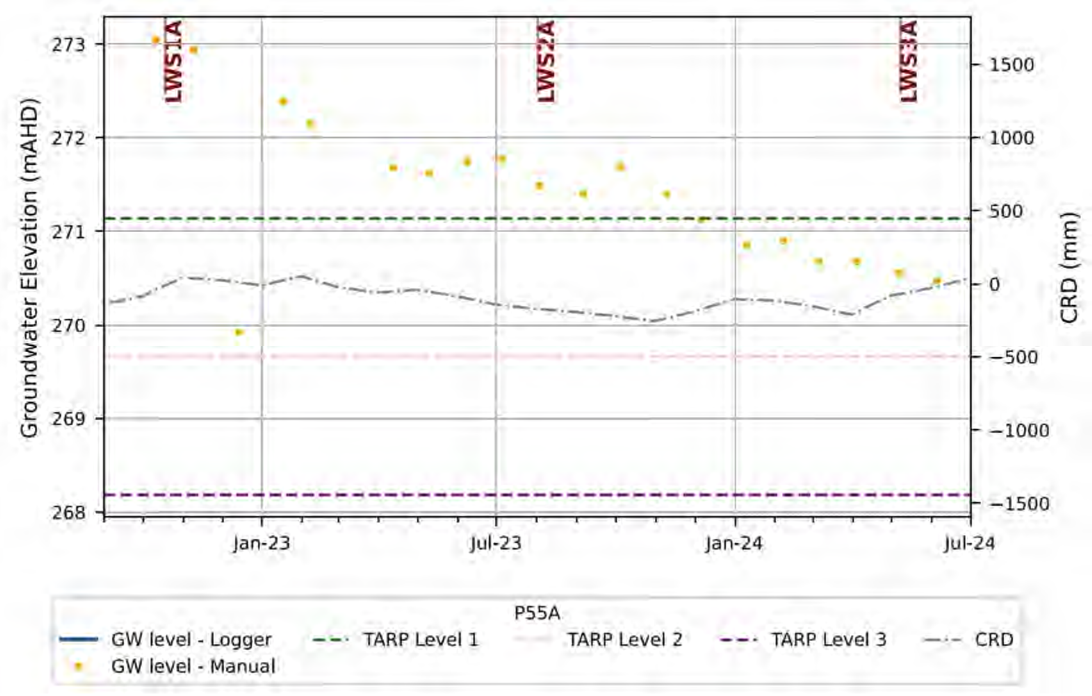


Figure 10 P55A Hydrograph

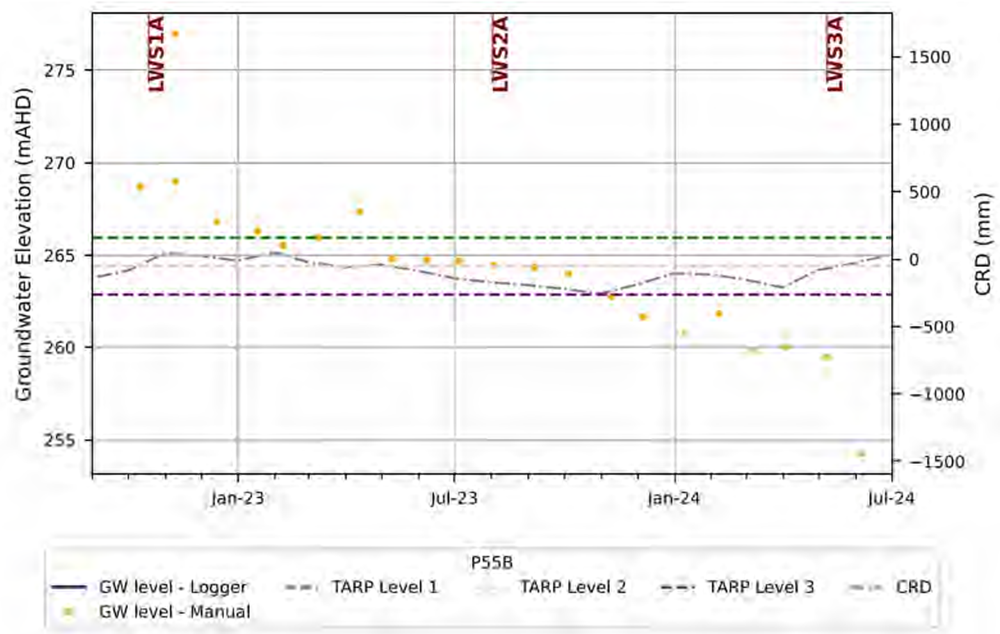


Figure 11 P55B Hydrograph

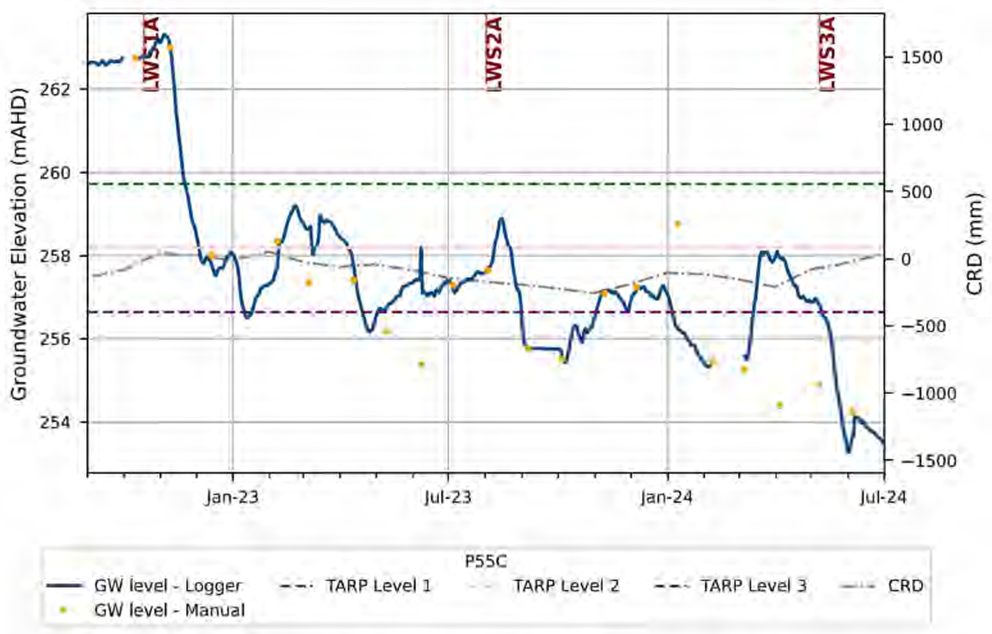


Figure 12 P55C Hydrograph

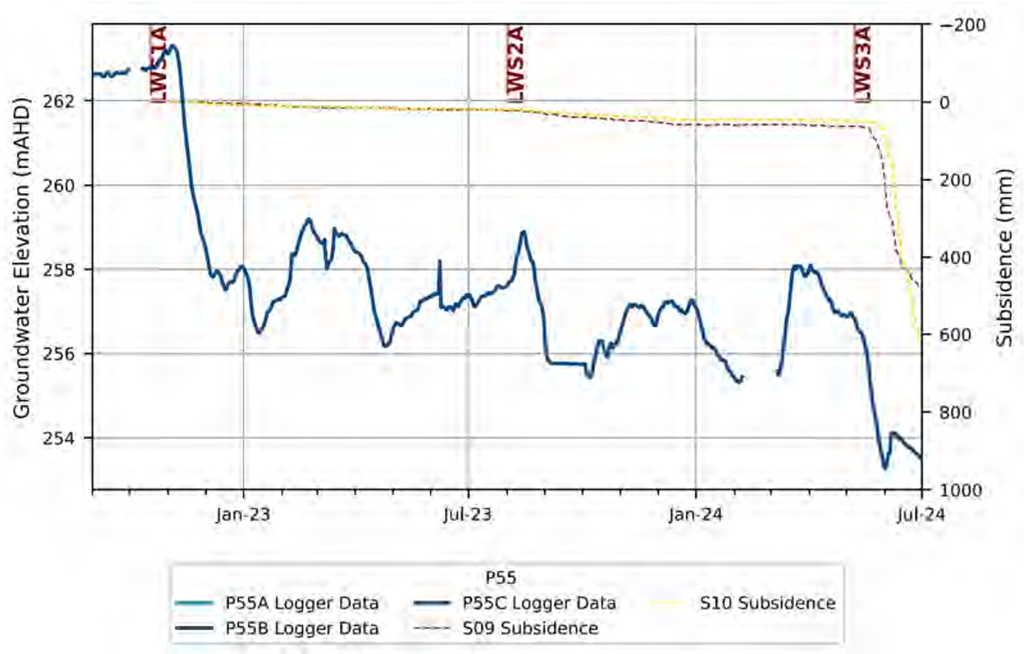


Figure 13 P55 Hydrograph and closest GNSS subsidence data

4.1.4 P56

Three OSPs are nested at Site P56, as follows;

- P56A – normal conditions,
- P56B – normal conditions
- P56C – Level 2 TARP in January through June 2024 (see **Figure 14**).
    - o Groundwater levels at P56C have shown periods of decline, with intermittent periods of stabilisation and minor recovery, although the overall trend is of decline. March through June (4 months) saw water levels drop below the Level 3 trigger, although a trend of recovering water levels may be apparent. Ongoing monitoring required to ascertain trends.

P56A has no indication of decline in water levels, maintaining stable at baseline conditions. P56B has some minor decline but also periods of significant increase (above baseline conditions). Given the groundwater trends are not consistent across all nested piezometers and show notable fluctuations that do not appear to align with longwall progression, the declining water levels in P56C are not deterministically attributable to mining operations at this point in time.

Figure 14 P56C Hydrograph

4.1.5 GW104659

Bore GW104659 is located to the north of the end of LW S1A. Groundwater levels were relatively stable until July 2023 when a decrease below the TARP Level 2 trigger was observed, after which another period of relative stability (noting fluctuations) occurred (**Figure 15**). A drop below the TARP Level 3 trigger occurred in April and May of 2024 prior to a return to the previous stable level in June 2024.

The fluctuations observed in the bore appear to correlate to the CRD (rainfall fluctuations), however there appears to be an overarching trend of groundwater decline.

During the initial private bore survey, this bore was reported to be utilised regularly to replenish the adjacent dam. In order to ascertain if drawdown is due to use or mining the pumping schedule would need to be reviewed. There has been no reported issue with bore operation from the bore owner, and groundwater quality indicated no variation over time that aligns with extraction activities. Consequently, the declining groundwater levels are not definitively attributed to mining activity.

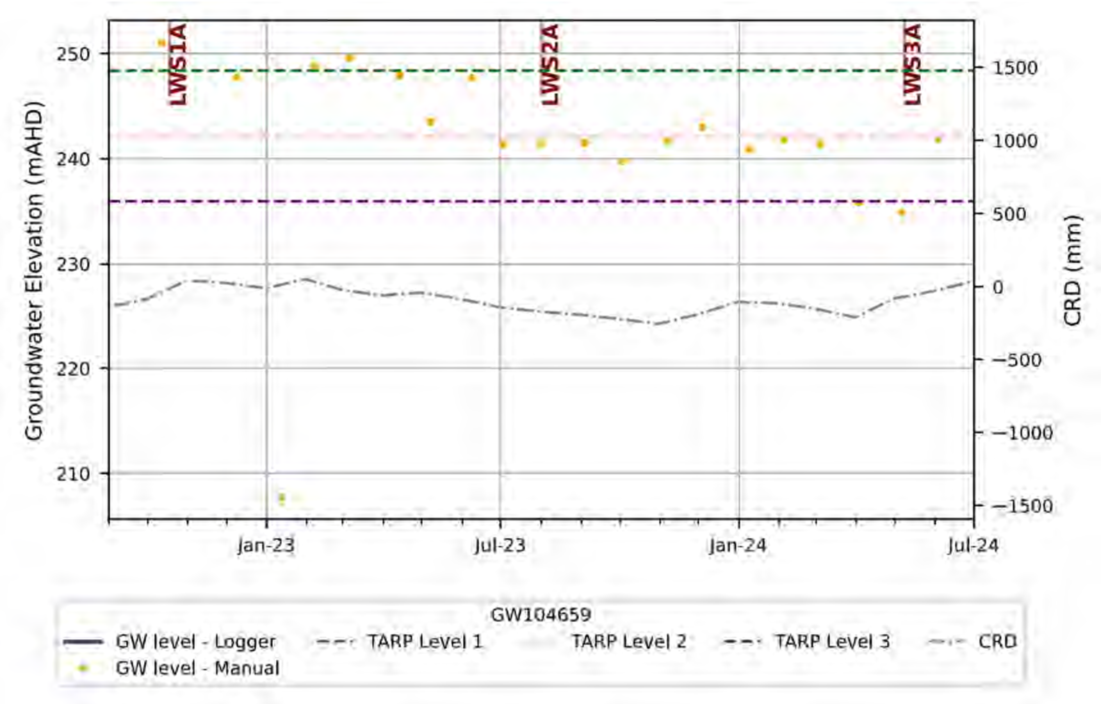


Figure 15 GW104659 Hydrograph

4.1.6 GW109257

Bore GW109257 is located near the start of LW S6A, to the south of current extraction areas. All monitoring points since July 2023 are below the Level 1 TARP trigger (**Figure 16**). The groundwater levels are quite reflective of the CRD. Given the spatial disparity from the current extraction and the reflection of rainfall conditions, this TARP trigger is not definitively attributed to mining activity. Ongoing monitoring and review is recommended.

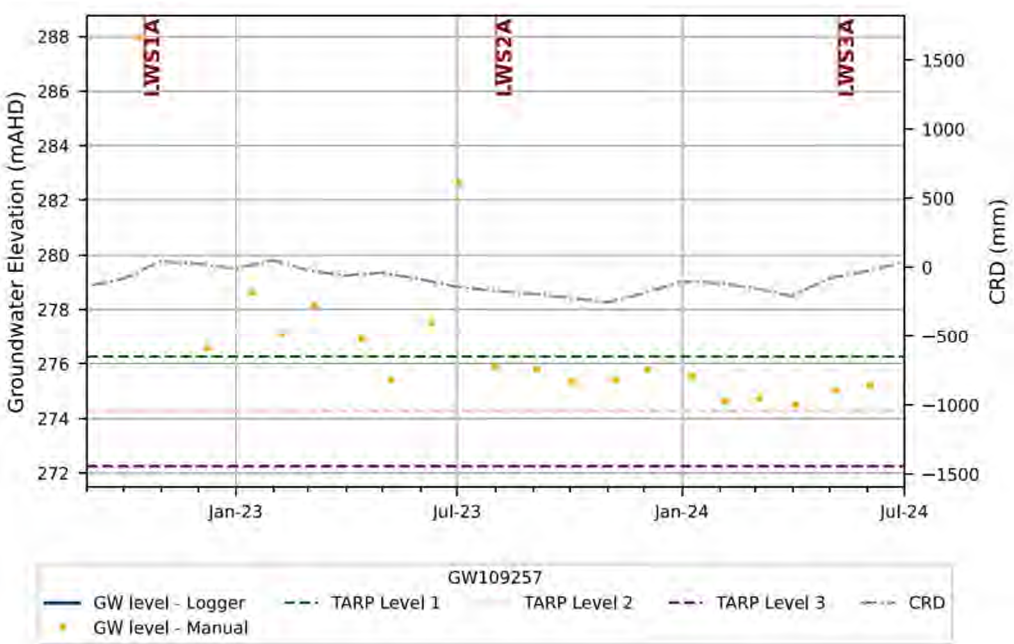


Figure 16 GW109257 Hydrograph

4.2 TARP WMP9

TARP WMP9 pertains to shallow VWP (< 200 metres). Both environmental (i.e. climatic conditions influencing recharge) and anthropogenic (i.e. irrigation pumping or mining extractive activities) can influence the groundwater level or shallow potentiometric surfaces. A review of the sites for which TARP WMP9 has been enacted is provided below.

4.2.1 TBC032

TBC032 is located to the south of the current extraction area, at the northern-most end of LW S5B. There are active sensors at the following depths;

- HBSS – 131 metres: TARP Level 3
- HBSS – 168 metres: normal conditions
- BHCS – 181 metres: TARP Level 1
- BGSS – 200 metres: TARP Level 1

The declines observed in TBC032 are relatively consistent across all sensors and show similar trends to the shallower OSPs, with periods of more rapid decline followed by some stabilisation. However, overall, there is an observed trend of declining groundwater levels in all sensors. **Figure 17** presents the TBC032 hydrographs, with the closest GNSS unit subsidence data. Minimal subsidence (< 15 mm) has been observed here. The groundwater decline is likely a regional groundwater drawdown in response to mining activity.

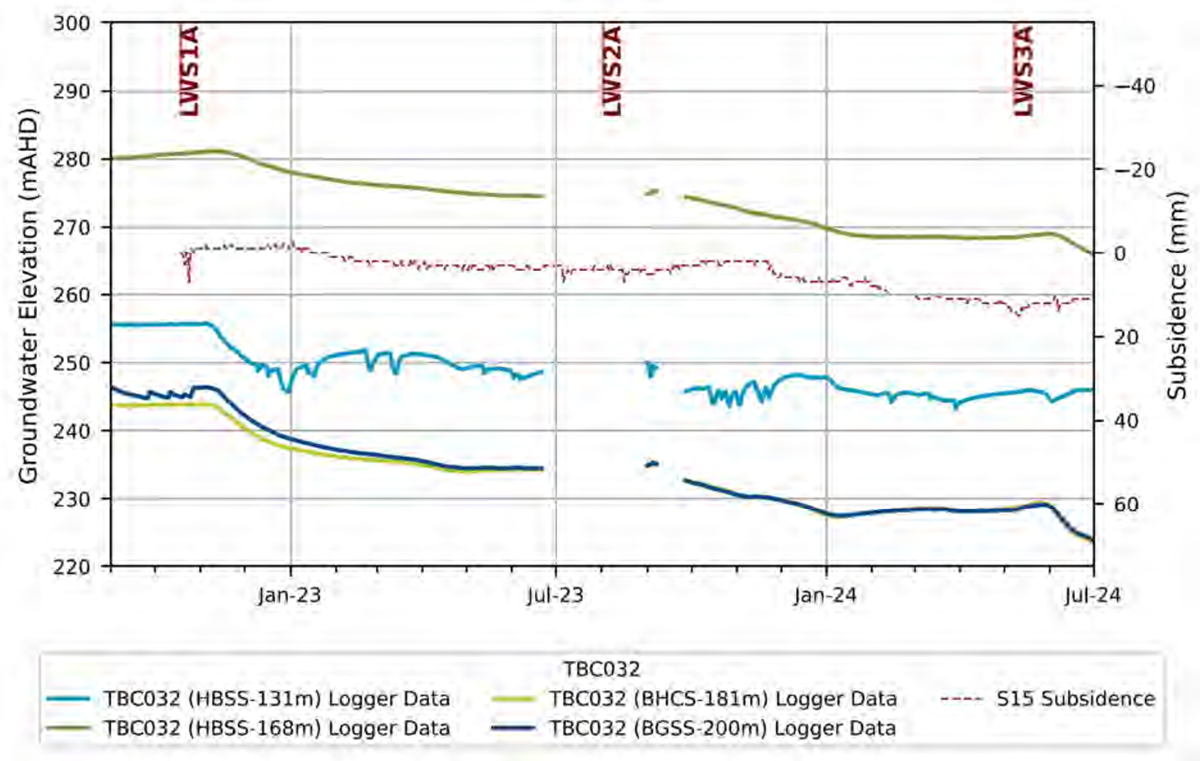


Figure 17 TBC032 Hydrograph with closest GNSS unit subsidence

4.3 TARP WMP12

TARP WMP12 pertains to groundwater – surface water interaction. It is enacted where one of the TARP bores (those associated with surface water monitoring units) has triggered TARP WMP8. The bores for which TARP WMP12 has been enacted include:

- P53a, P53b, P53c - associated with surface water site-TT13-Qla
- P55a, P55b, P55c - associated with surface water site TT1-QLa

However, the associated surface water monitoring sites do not have any active exceedances, TARP triggers, at the conclusion of the reporting period.

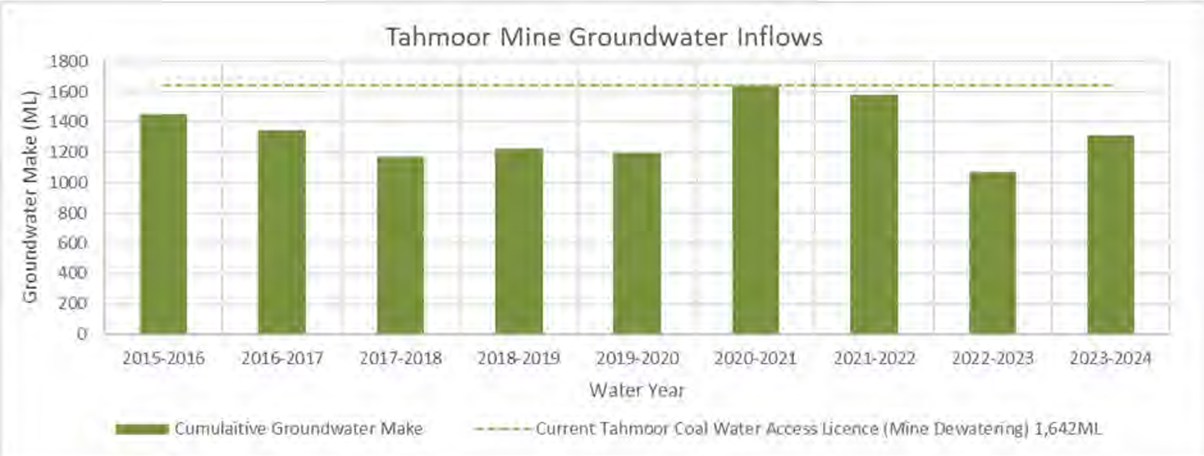
There is no apparent relationship between the groundwater and surface water responses to extraction, and consequently no further analysis has been undertaken.

5.0 Mine Inflows

Since 2009, observed inflows to Tahmoor Mine have ranged from approximately 2 to 7 ML/d. In October 2022, the Western Domain blocks were sealed. Since this time, the average groundwater inflow from Tahmoor underground workings is reported as 2.3 ML/d.

The cumulative groundwater inflows, as calculated from the mine water balance and pump-out records is presented in **Figure 18**.The reporting period concludes simultaneously with the end of the 2023-24 water year. The total water take for the 2023-34 water year was 1,310 ML, which remains below the groundwater entitlement of 1,642 ML/y (**Figure 18**).

Figure 18: Tahmoor Mine Groundwater Inflows



6.0 Action and Response

The following tables (**Table 5**, **Table 6**, and **Table 7**) summarise the Actions and Responses in line with each relevant TARP that has been triggered (refer **Appendix A** for full TARPs).

Table 5: Actions and Responses for TARP Triggers for WMP8

Action / Response from TARP WMP8	Tahmoor Coal response
Actions	
Level 1, 2 and, 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and, 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline is provided in **Section 4.0**. Groundwater level decline at P53, P55 and GW104659 could be due to ongoing mining effect. However, at the remaining locations, it cannot definitely be attributed to extraction activities.
Level 1, 2 and, 3 TARP Undertake investigation to determine if the decline will impact the long-term viability of the affected water supply works.	Current drawdown associated with exceedances is localised. Consequently, there is no indication that extensive regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 1, 2 and, 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g., subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists (notably subsidence and surface water) necessary to inform assessment (refer **Section 4.0**).
Level 1 and 2 TARP If the changes have been confirmed to be related to mining effects: For Open Standpipe Monitoring Bores: • For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP. For Private Bores: • Initiate negotiations with impacts landowners as soon as practicable. Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores, etc – as per Section 6.2.1.4 of the Water Management Plan).	For Open Standpipe Monitoring Bores: • It is noted that WMP12 has been initiated for P53 and P55 nested bores. WMP13 (Thirlmere Lakes) has not been enacted) For Private Bores: • No private bore decline has been definitively attributed to mining. No landholder has reported impacts requiring ameliorative actions at this point in time.
Level 2 and 3 TARP Consider increasing monitoring and review of data at sites where Level 2 has been reached, subject to land access. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed.	Review indicates the cause of the triggers is known and no cause for additional monitoring and data review is required. The current frequency of water level monitoring is sufficient for impact assessments (i.e. 15 minute readings capture minor water level fluctuations, with monthly review allowing enough temporal scale for causation analysis).
Level 2 and 3 TARP Compare against base case and deterministic model scenarios.	TARP trigger levels accommodate the base case and deterministic model scenarios. With each model update, these levels will continue to be reviewed and revised as necessary.

Action / Response from TARP WMP8	Tahmoor Coal response
Level 2 and 3 TARP Review Water Management Plan and modify if necessary.	Update of the WMP completed in June 2024. No update required at this point, which will be reviewed upon submission of the next 6-monthly/annual report.
Level 2 and 3 TARP For Private Bores: • Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	Not applicable as no Level 2 or 3TARP triggers have occurred for private bores.
Level 3 TARP Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, subject to land access.	Cause of Level 3 trigger is known, and no increase in monitoring frequency is necessary.
Level 3 TARP Undertake a detailed investigation to assess the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, effect unrelated to mining or the prevailing climate).	Detailed investigation, including comparison to local monitored subsidence data and climate data, has been completed. See Section **4.0**.
Responses	
Level 1, 2 and 3 TARP Report trigger exceedance to DPHI and key stakeholders.	Notification of exceedances to DPHI is completed as part of this report.
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report, and to be incorporated into forthcoming Six Monthly Subsidence Impact Report and Annual Review.
Level 1, 2 and 3 TARP If the changes have been confirmed to be related to mining effects: For Private Bores: • Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). • Implement CMAs, subject to land access (finalise negotiations and implement the agreed “make-good” arrangements). • Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	No private bore decline has been definitively attributed to mining. No landholder has reported impacts requiring ameliorative actions at this point in time.
Level 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes identified via this reporting.
Level 2 and 3 TARP For Private Bores: Provide findings of CMA review to DPHI and key stakeholders for consultation.	No CMA required at this point.
Level 2 and 3 TARP	No CMA required at this point.

Action / Response from TARP WMP8	Tahmoor Coal response
For Private Bores: Implement additional CMAs, subject to land access.	
Level 3 TARP For Private Bores: - Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders. - Implement Rehabilitation Management Plan, subject to land access.	No level 3 triggers for private bores.

Table 6: Actions and Responses for TARP Triggers for WMP9

Action / Response from TARP WMP8	Tahmoor Coal response
Actions	
Level 1, 2 and 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline TBC032 is provided in **Section4.0.** Appears to be mining related.
Level 1, 2 and 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g., subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists necessary to inform assessment (refer **Section4.0**).
Level 3 TARP Actions as per Level 2: Review deeper VWP data at monitored sites. Determine whether additional review of data is required.	Current drawdown associated with exceedances is localised. Consequently, there is no indication that regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 3 TARP Actions as per Level 2: Determine if review of additional existing VWP sites is required.	Review of all VWP sites included in this reporting. Only TBC032 reporting TARP triggers.
Level 3 TARP Actions as per Level 2: Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites. - Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed.	Cause of TARP trigger known, no cause for increase of monitoring frequency.
Level 3 TARP Actions as per Level 2: Compare against base case and deterministic model scenarios.	TARP trigger levels accommodate the base case and deterministic model scenarios. With each model update, these levels will continue to be reviewed and revised as necessary.
Level 3 TARP Actions as per Level 2: Review Water Management Plan and modify if necessary.	Update of the WMP completed in June 2024. No update required at this point, which will be reviewed upon submission of the next 6-monthly/annual report.
Level 3 TARP Increase frequency of data review for sites where Level 3 has been reached and the cause is unknown.	Cause of Level 3 Trigger identified and discussed in Section **4.0**.
Level 3 TARP Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has	Detailed investigation, including comparison to local monitored subsidence data and climate data, has been completed. See Section **4.0**.

Action / Response from TARP WMP8	Tahmoor Coal response
been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Commence/complete as soon as practicable	
Level 3 TARP Undertake investigative to review model results in conjunction with field data	Review of updated model results compared to field data will be undertaken with next iteration of the Groundwater Management Plan.
Responses	
Level 1, 2 and 3 TARP Report trigger exceedance to DPHI and key stakeholders.	Notification of exceedances to DPHI is completed as part of this report.
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report, and to be incorporated into forthcoming Six Monthly Subsidence Impact Report and Annual Review.
Level 1, 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review.

Table 7: Actions and Responses for TARP Triggers for WMP12

Action / Response from TARP WMP12	Tahmoor Coal response
Actions	
Level 1,2 and 3 TARP Continue monitoring and review of data as per monitoring program.	Monthly monitoring and review of data is ongoing according to the monitoring program.
Level 1, 2 and 3 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to review if the trigger at WMP8 is indicative of groundwater – surface water interaction changes (WMP12) has been completed. TARP WMP12 has been initiated for P53 and P55 due to TARP triggers (WMP8) and the assessment that groundwater level decline could be due to ongoing mining effect. There are no surface water triggers at the associated sites. Detailed investigation into the site-specific groundwater surface water relationship indicated there is unlikely to be a direct relationship between groundwater drawdown and surface water changes. It was determined that it is unlikely that mining activities are influencing groundwater – surface water interactions during the reporting period.
Level 1, 2 and 3 TARP Discuss findings and obtain other relevant information from key specialists (e.g., subsidence monitoring results, surface water level results).	Relevant information was obtained from key specialists necessary to inform assessment, and discussed at Environmental Response Group (ERG).
Level 2 and 3 TARP Increase frequency of data review to fortnightly at sites where Level 2 has been reached, subject to land access. Reasons for not increasing frequency could include solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change).	Update of network to install loggers in all P53 and P55 bores has been completed, with monthly review of the data occurring. The current frequency of water level monitoring is sufficient for impact assessments (i.e. 15 minute readings capture minor water level fluctuations, with monthly reporting allowing enough temporal scale for causation analysis).
Level 2 and 3 TARP Compare against base case and deterministic model scenarios.	Completed as part of trigger level review.
Level 2 and 3 TARP Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.	Review of spatial trends of water level was undertaken as part of this report.
Level 2 and 3 TARP Review surface water data to assess for surface water level decline at relevant site.	Review of surface water data in conjunction with groundwater data at the relevant site was undertaken as part of this report. No triggers at relative surface water sites.

Action / Response from TARP WMP12	Tahmoor Coal response
Level 2 and 3 TARP Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	CMAs are not required at this point (no correlation between groundwater impacts and the surface water site noted at this point).
Level 2 and 3 TARP Review Water Management Plan and modify if necessary.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes have been identified via this reporting.
Level 3 TARP Increase frequency of data review for sites where Level 3 has been reached and cause is unknown, subject to land access.	Data frequency review sufficient, given no triggers at relative surface water sites and cause of groundwater decline is known.
Level 3 TARP Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Report to be commenced and completed as soon as practicable.	Investigation undertaken as part of this reporting, and previous detailed analysis of groundwater – surface water interaction. No further investigation required at this point.
Responses	
Level 1, 2 and 3 TARP Report trigger exceedance to DPHI and key stakeholders.	Notification of this exceedance to DPHI is completed as part of this report.
Level 1, 2 and 3 TARP Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review	Completed as part of this report.
Level 1, 2 and 3 TARP If the changes have been confirmed to be related to mining effects: For Private Bores: • Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g., provision of access to an alternative source of water as detailed in Section 6.2.1.4 of the Water Management Plan). • Implement CMAs, subject to land access. • Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	It was determined that it is unlikely that extraction is currently impacting groundwater – surface water interactions. Therefore, these responses have not been enacted at this time.
Level 2 and 3 TARP Provide findings of CMA review to DPHI and key stakeholders for consultation.	CMA not required at this point.
Level 2 and 3 TARP Implement additional CMAs, subject to land access.	CMA not required at this point.
Level 2 and 3 TARP Advise DPHI and key stakeholders of any required amendments to Water Management Plan, including reporting on relationship of observations to baseline and deterministic model scenarios, as necessary.	Changes to the WMP will be made in accordance with the regulatory guidelines, provided as track changes to the Department for review. No required changes have been identified via this reporting.
not required at this point.	Not required at this point.
Level 3 TARP Implement Rehabilitation Management Plan, subject to land access.	Not required at this point.

7.0 Recommendations

Based on the TARP assessment and discussion of potential influences driving the observed triggers in the reporting period, of the following recommendations are made:

- Continue the monitoring program, and the reporting of groundwater level and quality data in routine six-monthly groundwater monitoring reporting.
- Once groundwater level data become available at the Thirlmere Lakes bores, assess groundwater levels against WMP13 to confirm that no groundwater level exceedances occurred following the commencement of LW S1A.

Table 8 provides a summary of the status of the recommendations made in the previous 6-monthly report (June through December 2023).

Table 8: Update on Recommendation in Previous 6-Monthly Reporting.

Item	Previous Recommendation	Progress of Recommendation
1	Adopt the revised trigger levels provided in Appendix C (of the July-Dec 2023 six-monthly report) in the WMP11.	Complete: Trigger level revision has been undertaken and incorporated into this 6-monthly report. Triggers also updated in updated WMP submitted June 2023.
2	Remove monitoring site GW062068 from the groundwater monitoring program due to infrastructure issues that render the bore unsuitable for ongoing monitoring.	Complete: Bore has been removed from the ongoing monitoring program.
3	Complete a review of the VWP network	Complete: VWP review undertaken. Ongoing review of data will be completed and sensors apparently damaged to be removed from the reporting requirements.
6	Continue the monitoring program, and the reporting of groundwater level and quality data in the monthly groundwater monitoring reporting.	Complete: reporting of groundwater level and quality data completed and presented at monthly Environmental Response Group (ERG) meetings
7	Once groundwater level data become available at the Thirlmere Lakes bores, assess groundwater levels against WMP13 to confirm that no groundwater level exceedances occurred following the commencement of LW S1A.	Ongoing: data yet to become available.

8.0 References

SLR, 2023. *Tahmoor South Groundwater Reporting October – December 2022*. SLR Report: 640.30614.00000-R01-v2.0.

SLR, 2022. *Extraction Plan Groundwater Technical Report*. Prepared for Tahmoor Coal, October 2022. SLR Report: 610.30637.00000-R01

SLR, 2024, Six-Monthly Groundwater Monitoring: July – December 2023, Tahmoor South Domain, March 2024, SLR Report: 640.30614.00000-R012

Queensland Government, 2023. SILO Long Paddock. Available at https://www.longpaddock.qld.gov.au/

Tahmoor Coal Pty Ltd, 2022. *Water Management Plan – Tahmoor South Domain – Longwalls South 1A-South 6A*. May 18,2022. Report: TAH-HSEC-00361

Appendix A Tahmoor South TARPS

Six-Monthly Groundwater Report: January – June 2024

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00001

25 September 2024

Trigger Action Response Plan – WMP8 Shallow Groundwater Levels (Open standpipes and private bores)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in groundwater level from 'normal' or baseline conditions and the actions to be implemented in response to each level deviation. This TARP supports TARP WMP13, where groundwater levels as they pertain to groundwater dependent ecosystems (GDEs) (Thirlmere Lakes) are covered. **Assessment Criteria** Bore specific trigger values based on baselines data for each reporting level.	**Locations** **Open standpipes** Existing sites: P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P54c, P55a, P55b, P55c, P56a, P56b, P56c P50a, P50b, P50c, P57a, P57b, P57c **Private bores** GW109257, GW104008, GW112473, GW104659, GW104323 All monitoring locations are shown in Figure 23 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** Monthly manual measurements of water level. **During Mining** Monthly manual measurements of water level. **Post-mining** Quarterly manual measurements of water level for 12 months following the completion of LW S6A, or as required in accordance with a Rehabilitation Management Plan.	**Normal Condition**		
		• Groundwater level remains consistent with baseline variability and pre-mining trends with reductions in groundwater level less than two meters.	• Continue monitoring and review of data as per monitoring program.	• No response required.
		Level 1		
		• Greater than 2 m water level reduction[1] for a period of greater than 6 months following the commencement of extraction.	For Private Bores and Open Standpipe Monitoring Bores • *Actions as required for Normal Condition.* • Undertake an investigation to assess cause and determine if mining related. • Undertake investigation to demonstrate if the decline will impact the long-term viability of the affected water supply works. • Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results). The investigation will be commenced/completed as efficiently as practicable. If the changes have been confirmed to be related to mining effects: For Private Bores: • Initiate negotiations with impacts landowners as soon as practicable. Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores, etc - as per Section 6.2.1.4 of the Water Management Plan. " For Open Standpipe Monitoring Bores • For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.	For Private Bores and Open Standpipe Monitoring Bores • Report trigger exceedance to DPHI and key stakeholders. • Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review. If the changes have been confirmed to be related to mining effects: For Private Bores: • Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan). • Implement CMAs, subject to land access (finalise negotiations and implement the agreed "make-good" arrangements) • Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.
		Level 2		
		• Water level declines below the average between the 'maximum modelled drawdown' (Level 3 trigger) and the '2 m drawdown' (Level 1 trigger)[1] for a period of greater than 6 months following the commencement of extraction. AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	For Private Bores and Open Standpipe Monitoring Bores • *Actions as stated in Level 1.* • Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access. Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed. • Compare against base case and deterministic model scenarios[2]. • Review Water Management Plan and modify if necessary. For Private Bores: • Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	For Private Bores and Open Standpipe Monitoring Bores • *Responses as stated in Level 1.* • Advise DPHI and key stakeholders of any required amendments to Water Management Plan. For Private Bores: • Provide findings of CMA review to DPHI and key stakeholders for consultation. • Implement additional CMAs, subject to land access.
		Level 3		
		• Water level reduction greater than the maximum modelled drawdown[1] for a period of greater than 6 months following the commencement of extraction. AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	For Private Bores and Open Standpipe Monitoring Bores • *Actions as stated in Level 2.* • Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, subject to land access. • Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has	For Private Bores and Open Standpipe Monitoring Bores • *Responses as stated in Level 2.* For Private Bores: • Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders. • Implement Rehabilitation Management Plan, subject to land access.

			been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate).	

Notes:
[1] Level 1, 2 and 3 triggers for water level reduction is provided in Table 6-3 in Appendix E of the Water Management Plan.
[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.
[3] Trigger levels to be developed for P50 and P57 bores when suitable baseline data available

Trigger Action Response Plan – WMP9 Shallow Groundwater Pressures (VWP sensors < 200 m)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management		
		Trigger	**Action**	**Response**
Performance Measure Feature No performance measure relevant. **TARP Objective** This TARP defines levels of deviation in groundwater level from 'normal' or baseline conditions and the actions to be implemented in response to each level deviation. **Assessment Criteria** Bore specific trigger values based on baselines data for each reporting level.	**Locations** TBC032, TBC033, TBC009, TBC018, TBC0039 Monitoring of all VWP < 200 m depth intakes. Reference Sites:TBC027, TBC034, TBC038 All monitoring locations are shown in Figure 23 of the Water Management Plan. **Monitoring Frequency** **Pre-mining** VWPs sensors take pressure readings hourly. The system is now telemetered so data is streamed continuously and can be accessed at any point in time. **During Mining** VWPs sensors take pressure readings hourly. The system is now telemetered so data is streamed continuously and can be accessed at any point in time. **Post-mining** Monitoring of data (streamed continuously) for 12 months following the completion of LW S6A.	**Normal Condition**		
		• No observable mining induced change at VWP intakes. • Greater than 5 m water level reduction in VWP intakes[1] following the commencement of extraction for a period of less than six months	• Continue monitoring and review of data as per monitoring program.	• No response required.
		Level 1		
		• Greater than 5 m water level reduction in VWP intakes[1] following the commencement of extraction for a period of greater than six months	• *Actions as required for Normal Condition.* • Undertake an investigation to assess cause and determine if mining related, commence/complete as soon as practicable. • Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).	• Report trigger exceedance to DPHI and key stakeholders. • Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.
		Level 2		
		• Water level declines below the calculated Level 2 trigger – being the average of Level 1 (the '5 m drawdown'[1]) and Level 3 (the 'maximum modelled drawdown') – following the commencement of extraction for a period of greater than six months. AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• *Actions as stated in Level 1.* • Review deeper VWP data at monitored sites. Determine whether additional review of data is required. • Determine if review of additional existing VWP sites is required. • Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites. • Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed.Compare against base case and deterministic model scenarios[2]. • Review Water Management Plan and modify if necessary.	• *Responses as stated in Level 1.* • Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
		Level 3		
		• Water level reduction greater than the maximum modelled drawdown[1] following the commencement of extraction for a period of greater than six months. AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• *Actions as stated in Level 2.* • Increase frequency of data review for sites where Level 3 has been reached and the cause is unknown. • Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Commence/complete as soon as practicable • Undertake investigative to review model results in conjunction with field data.	• *Responses as stated in Level 2.*

Notes:
[1] Level 1, 2 and 3 triggers for water level reduction is provided in Table 6-4 in Appendix E of the Water Management Plan).
[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.

Trigger Action Response Plan – WMP10 Groundwater level/pressure Deep VWPs (> 200 m)

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8">Performance Measure Feature
No performance measure relevant.

TARP Objective
This TARP defines levels of deviation in groundwater level from ‘normal’ or baseline conditions and the actions to be implemented in response to each level deviation.

Assessment Criteria
Bore specific trigger values based on modelled data for each reporting level.
Model layers utilised to define predicted drawdown for each VWP logger provided in Table below.</td><td rowspan="8">Locations
TBC009, TBC0018, TBC020, TBC026, TBC032, TBC033, TBC039

Reference sites: TBC027, TBC034, TBC038

Monitoring of all VWP > 200 m depth intakes excluding those monitoring the Bulli Coal Seam.

All monitoring locations are shown in Figure 23 of the Water Management Plan.

Monitoring Frequency
Pre-mining
VWPs sensors take pressure readings hourly. The system is now telemetered so data is streamed continuously and can be accessed at any point in time.

During Mining
VWPs sensors take pressure readings hourly. The system is now telemetered so data is streamed continuously and can be accessed at any point in time.

Post-mining
Monitoring of data (streamed continuously) for 12 months following the completion of LW S6A.</td><td colspan="3">Normal Condition</td></tr>
<tr><td>• Observed data does not exceed modelled impacts predicted drawdown by greater than 30 metres[1].
• Observed drawdown exceeds the modelled predicted drawdown[1], by greater than 30 metres for of less than three consecutive months</td><td>• Continue monitoring and review of data as per monitoring program.</td><td>• No response required.</td></tr>
<tr><td colspan="3">Level 1</td></tr>
<tr><td>• Observed drawdown exceeds the modelled predicted drawdown[1], by greater than 30 metres for greater than three consecutive months.</td><td>• Actions as required for Normal Condition.
• Undertake an investigation to assess cause and determine if mining related, to be commenced/completed as soon as practicable.
• Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).</td><td>• Report trigger exceedance to DPHI and key stakeholders.
• Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• Observed drawdown is exceeds modelled predicted drawdown[1], by more than 30 metres greater than 6 consecutive months.</td><td>• Actions as stated in Level 1.
• Consider increasing frequency of data review at sites where Level 2 has been reached or at other relevant sites.
• Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observed. Consider reviewing data in conjunction with VWP data from additional existing VWP sites.
• Compare against base case and deterministic model scenarios[2].
• Review Water Management Plan and modify if necessary.</td><td>• Responses as stated in Level 1.
• Inclusion of more regional VWPs into data review to determine likely extent and depth of depressurisation.
• Advise DPHI and key stakeholders of any required amendments to Water Management Plan.</td></tr>
<tr><td colspan="3">Level 3</td></tr>
<tr><td>• Observed drawdown exceeds modelled predicted drawdown[1] by 30 m, for 12 consecutive months or more.</td><td>• Actions as stated in Level 2.
• Increase review of data frequency for sites where Level 3 has been reached if the cause is unknown.
• Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). To be commenced/completed as soon as practicable.
• Review base case and deterministic model scenarios[2] in conjunction with water pressure data and report findings.</td><td>• Responses as stated in Level 2.</td></tr>
<tr><td colspan="5">Notes:
[1] Predicted drawdown refers to the drawdown as generated by the groundwater model and varies over time as extraction progresses. Observed drawdown will be plotted on a monthly basis against the predicted drawdown to determine if a trigger has occurred. Therefore, as the predicted drawdown will be constantly changing according to extraction progression, it is not possible to set a specific trigger limit.
[2] “Deterministic” model scenario refers to the predictive scenario modelling utilised to determine the trigger level.</td></tr>
</table>

Sensor	Model Layer	Model Geology
TBC09_322	8	BUSS Mid
TBC09_343	8	BUSS Mid
TBC09_357	12	SBSS Lower
TBC09_381	10	SPCS
TBC09_391	15	Bulli Seam
TBC09_397	17	Wongawilli

Sensor	Model Layer	Model Geology
TBC26_344	8	BUSS Mid
TBC26_409	13	WBCS
TBC26_432	15	Bulli Seam
TBC26_440	16	Eckersley
TBC26_460	16	Eckersley
TBC32_200	8	BUSS Mid

TBC18_282	8	BUSS Mid		TBC32_237	8	BUSS Mid
TBC18_366	8	BUSS Mid		TBC32_257	8	BUSS Mid
TBC18_377	13	WBCS		TBC32_294	8	BUSS Mid
TBC18_404	15	Bulli Seam		TBC32_314	8	BUSS Mid
TBC18_426	17	Wongawilli		TBC33_247	8	BUSS Mid
TBC18_432	17	Wongawilli		TBC33_306	8	BUSS Mid
TBC20_211	8	BUSS Mid		TBC33_363	11	SBSS Upper
TBC20_293	8	BUSS Mid		TBC33_384	16	Eckersley
TBC20_375	8	BUSS Mid		TBC33_408	16	Eckersley
TBC20_397	13	WBCS		TBC39_243	8	BUSS Mid
TBC20_411	7	BUSS Upper		TBC39_299	8	BUSS Mid
TBC20_434	17	Wongawilli		TBC39_354	11	SBSS Upper
TBC20_439	4	HBSS Mid		TBC39_375	16	Eckersley
TBC26_211	8	BUSS Mid		TBC39_402	16	Eckersley
TBC26_278	8	BUSS Mid				

Trigger Action Response Plan – WMP11 Groundwater Quality (open standpipes and private bores)

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8"><u>Performance Measure Feature</u>
No performance measure relevant.

<u>TARP Objective</u>
This TARP defines levels of deviation in groundwater level from ‘normal’ or baseline conditions and the actions to be implemented in response to each level deviation.
This TARP supports TARP WMP13, where groundwater quality as it pertains to groundwater dependent ecosystems (GDEs) (Thirlmere Lakes) is covered.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level.</td><td rowspan="8"><u>Locations</u>
Open standpipes
Existing sites:
P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P55a, P55b, P55c, P56a, P56b, P56c
P50a, P50b, P50c, P57a, P57b. P57c[2]

Private bores
GW109257, GW104008, GW112473, GW104659, GW104323

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency</u>
Pre-mining
Monthly water quality sampling.

During Mining
Monthly water quality sampling

Post-mining
Quarterly water quality sampling.

Water Quality sample parameters:
<table><tr><th>Field Parameters</th></tr><tr><td>PH
EC
TDS
DO</td></tr><tr><th>Laboratory Analysis</th></tr><tr><td>Total alkalinity as CaCO3, HCO3, CO3, DOC
Dissolved Major Cations (Ca, K, Na, Mg, F, Cl, SO4)
Dissolved Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Nitrogen
Total Phosphorus
Ionic Balance (Total Anions and Total Cations)</td></tr></table></td><td colspan="3">Normal Condition</td></tr>
<tr><td>• No observable changes in salinity, pH or metals outside of the baseline variability.</td><td>• Continue monitoring and review of data as per monitoring program.</td><td>• No response required.</td></tr>
<tr><td colspan="3">Level 1</td></tr>
<tr><td>• Observed salinity and/or metals or pH outside of defined trigger levels[1] for 3 consecutive months or more. The effect does not persist after a significant rainfall recharge event.
AND
• A similar trend or response is noted at other monitored bores or private groundwater bores.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Actions as required for Normal Condition.
• Undertake an investigation to assess cause and determine if mining related.
• Undertake investigation to demonstrate if the change in quality will impact the long-term viability of the affected water supply works.
• Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).
If the changes have been confirmed to be related to mining effects:
For Private Bores:
• Initiate negotiations with impacted landholders as soon as practicable. Consider all reasonable and feasible options for remediation as relevant. This could include potential for implementation of make-good provisions as per Section 6.2.1.4 of the Water Management Plan for affected private bore owners (e.g. provision of access to an alternative source of water).
For Open Standpipe Monitoring Bores
• For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Report trigger exceedance to DPHI and key stakeholders.
• Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.
If the changes have been confirmed to be related to mining effects:
For Private Bores:
• Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. provision of access to an alternative source of water as detailed in Section 6.2.1.4 of the Water Management Plan).
• Implement CMAs, subject to land access.
• Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• Observed salinity and/or metals or pH outside of defined trigger levels[1], for 3 consecutive months or more. The effect persists after a significant rainfall recharge event.
AND
• The change in water quality is determined not to be controlled by climatic or external anthropogenic factors.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Actions as stated in Level 1.
• Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access and feasibility.
• Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact). Increased monitoring could be beneficial where commensurate responses in paired surface water monitoring locations have been observedReview Water Management Plan and modify if necessary.
For Private Bores:
• Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Responses as stated in Level 1.
• Advise DPHI and key stakeholders of any required amendments to Water Management Plan.
For Private Bores:
• Provide findings of CMA review to DPHI and key stakeholders for consultation.
• Implement additional CMAs, subject to land access.</td></tr>
<tr><td colspan="3">Level 3</td></tr>
<tr><td>• Observed salinity and/or metals or pH outside of defined trigger levels[1], for greater than 6 consecutive months.
AND
• The change in water quality is determined not to be controlled by climatic or external anthropogenic factors.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Actions as stated in Level 2.
• Increase monitoring and review of data frequency for sites where Level 3 has been reached, and cause is unknown, subject to land access and feasibility.
• Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate).
• Undertake investigative report to demonstrate if the water quality change will impact the long-term viability of any affected water supply works.</td><td>Private Bores and Open Standpipe Monitoring Bores
• Responses as stated in Level 2.
For Private Bores:
If ascertained impact is due to mining activities and has potential to impact long-term viability of supply for private groundwater bores:
• Develop a Rehabilitation Management Plan in consultation with DPHI and landowner.
• Implement Rehabilitation Management Plan, subject to land access.</td></tr>
<tr><td colspan="5">Notes:
[1] Defined trigger levels for groundwater quality are listed in Table 6-5 of Appendix E of the Water Management Plan.
[2] Trigger levels to be defined for P50 and P57 bores when adequate baseline data becomes available.</td></tr>
</table>

Trigger Action Response Plan – WMP12 Groundwater – surface water Interaction

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8"><u>Performance Measure Feature</u>
No performance measure relevant.

<u>TARP Objective</u>
This TARP defines levels of deviation in surface water - groundwater interactions from ‘normal’ conditions and the actions to be implemented in response to each level deviation.
The instigation of this TARP will be dictated by triggers exceedances in pertinent groundwater or surface water sites requiring further investigation of groundwater – surface water interactions.

Where groundwater – surface water connectivity indicates in a gaining stream, there is potential for groundwater supporting riparian vegetation. Consequently, Riparian vegetation in these situations could be a Groundwater Dependent Ecosystem (GDE), and the pertinent Performance Measure applicable:
Negligible impacts including:
• Negligible change in groundwater levels; and
• Negligible change in groundwater quality.

Riparian GDEs are addressed through the Riparian Vegetation TARP (BMP3). Consultation through the ERG will link this TARP (WMP12) to BMP3 via actions in BMP3 to consider groundwater – surface water relationships when pertinent.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level. For this TARP, the aligned groundwater and surface water sites would be considered collectively to interpret potential changes/impacts to groundwater – surface water interaction.</td>
<td rowspan="8"><u>Locations</u>
Open standpipes
P51a, P51b, P52, REA4, P53a, P53b, P53c
P54a, P54b, P54c, P55a, P55b, P55c

The aligned surface water and groundwater sites are as follows:
• P51a, P51b with surface water site BR2-Qla
• P52, REA4 with surface water site-TT14-QLa
• P53a, P53b, P53c with surface water site-TT14-Qla
• P54a, P54b, P54c with surface water site TT3-QLa
• P55a, P55b, P55c with surface water site TT1-QRLa

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency</u>
Pre-mining
Monthly manual measurements of water level and water quality.

During Mining
Monthly manual measurements of water level and water quality.

Post-mining
Quarterly manual measurements of water level for 12 months following the completion of LW S6A, or as required in accordance with a Rehabilitation Management Plan.</td>
<td colspan="3">Normal Condition</td></tr>
<tr><td>• Observed (or inferred where not immediately neighbouring a surface water site) groundwater and surface water interaction remains consistent with baseline variability and/pre-mining trends, and decrease in groundwater inflow not persisting after significant rainfall recharge events.</td><td>• Continue monitoring and review of data as per monitoring program.</td><td>• No response required.</td></tr>
<tr><td colspan="3">Level 1</td></tr>
<tr><td>• Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at surface water monitoring site decline below Level 1 (in TARP WMP8) following the commencement of extraction.</td><td>• Actions as required for Normal Condition.
• Undertake an investigation to assess cause and determine if mining related.
• Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).</td><td>• Report trigger exceedance to DPHI and key stakeholders.
• Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.
If the changes have been confirmed to be related to mining effects:
• Provide DPHI and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan).
• Implement CMAs, subject to land access.
• Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• Observed (or inferred where not immediately neighbouring a surface water site) groundwater levels at aligned surface water monitoring site decline below Level 2 (in TARP WMP8) following the commencement of extraction.
AND
• The reduction in water level is determined not to be controlled by climatic or external anthropogenic factor.</td><td>• Actions as stated in Level 1.
• Consider increasing frequency of monitoring and review of data at sites where Level 2 has been reached or at other relevant sites, subject to land access and feasibility.
• Reasons for not increasing monitoring frequency could include confident identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change, or confirmed as a mining-related impact.
• Compare against base case and deterministic model scenarios[1].
• Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.
• Review surface water data to assess for surface water level decline at relevant site.
• Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.
• Review Water Management Plan and modify if necessary.</td><td>• Responses as stated in Level 1.
• Provide findings of CMA review to DPHI and key stakeholders for consultation.
• Implement additional CMAs, subject to land access.
• Advise DPHI and key stakeholders of any required amendments to Water Management Plan, including reporting on relationship of observations to baseline and deterministic model scenarios, as necessary.</td></tr>
<tr><td colspan="3">Level 3</td></tr>
<tr><td>• Inferred groundwater levels at surface water monitoring site decline below Level 3 (in TARP WMP8) following the commencement of extraction.
AND
• The reduction in water level is determined not to be controlled by climatic or external anthropogenic factor.</td><td>• Actions as stated in Level 2.
• Increase frequency of data review for sites where Level 3 has been reached, and cause is unknown, subject to land access.
• Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g. whether there has been subsidence induced fracturing, other catchment changes, effect unrelated to mining or the prevailing climate). Report to be commenced and completed as soon as practicable.</td><td>• Responses as stated in Level 2.
• Develop a Rehabilitation Management Plan in consultation with DPHI and key stakeholders.
• Implement Rehabilitation Management Plan, subject to land access.</td></tr>
<tr><td colspan="5">Notes:
[1] “Deterministic” model scenario refers to the predictive scenario modelling utilised to determine the trigger level.</td></tr>
</table>

Trigger Action Response Plan – WMP13 Groundwater Bore Monitoring for Thirlmere Lakes

<table>
<tr><th rowspan="2">Performance Measure and Indicator, TARP Objective and Assessment Criteria</th><th rowspan="2">Monitoring Program</th><th colspan="3">Management</th></tr>
<tr><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td rowspan="8"><u>Performance Measure Feature</u>
GDEs including Thirlmere Lakes[1].

<u>Performance Measure</u>
Negligible impacts including:
• Negligible change in groundwater levels; and
• Negligible change in groundwater quality.

<u>Performance Indicator</u>
The performance measure will be considered to be exceeded if the groundwater levels or groundwater quality decline below Level 3 (in the relevant groundwater TARP triggers for water level and water quality – TARP WMP8 or WMP11) following the commencement of extraction, and the investigation outcomes indicate a mining related impact based on monitoring data for the Thirlmere Lakes.

<u>TARP Objective</u>
This TARP defines levels of deviation at Thirlmere Lakes from 'normal' conditions and the actions to be implemented in response to each level deviation.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level.</td>
<td rowspan="8"><u>Locations</u>
"Early warning" bores
Existing sites:
GW062068, GW104659, TBC039 (sensor at 65 metres in Hawkesbury Sandstone (HBSS))
Proposed sites:
P50a, P50b, P50c

Thirlmere Lakes bores (not trigger bores)
Existing sites:
GW075409–1, GW075409–2, GW075410, GW075411 (paired with gauging station 212066)

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency (for "early warning" bores)</u>
Pre-mining
Monthly manual measurements of water level and water quality.

During Mining
Monthly manual measurements of water level and water quality.

Post-mining
Quarterly manual measurements of water level for 12 months following the completion of LW S6A, or as required in accordance with a Rehabilitation Management Plan.

Water Quality sample parameters:
Field Parameters
PH
EC
TDS
DO
Laboratory Analysis
Total alkalinity as CaCO3, HCO3, CO3, DOC
Dissolved Major Cations (Ca, K, Na, Mg, F, Cl, SO4)
Dissolved Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Metals (Al, As, Ba, Co, Cu, Pb, Li, Mn, Ni, Se, Sr, Zn, Fe)
Total Nitrogen
Total Phosphorus
Ionic Balance (Total Anions and Total Cations)</td>
<td colspan="3">Normal Condition</td></tr>
<tr><td>• Groundwater levels and quality remain consistent with baseline variability and/pre-mining trends, and changes in groundwater levels/quality not persisting after significant rainfall recharge events.</td><td>• Continue monitoring and review of data as per monitoring program.</td><td>• No response required.</td></tr>
<tr><td colspan="3">Level 1</td></tr>
<tr><td>• Level 1 trigger of TARP WMP8 for a minimum of two "early warning" bores.
OR
• Level 1 trigger of TARP WMP11 for a minimum of two "early warning" bores.</td><td>• Actions as required for Normal Condition.
• Undertake an investigation to assess cause and determine if mining related.
• Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water level results).
If the changes have been confirmed to be related to mining effects:
• Consider all reasonable and feasible options for remediation as relevant (e.g. extending the depth of the bore, establishment of additional bores). This could include potential for implementation of make-good provisions as per Section 6.2.1.4 of the Water Management Plan for affected private bore owners.
• For monitoring sites relevant to Thirlmere Lakes or associated with surface water monitoring sites, initiate groundwater – surface water interaction TARP.</td><td>• Report trigger exceedance to DPE and key stakeholders.
• Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.
If the changes have been confirmed to be related to mining effects:
• Provide DPE and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. extending the depth of the bore, establishment of additional bores, compensation to affected landowners as detailed in Section 6.2.1.4 of the Water Management Plan).
• Implement CMAs, subject to land access.
• Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• Level 2 trigger of TARP WMP8 for a minimum of three bores "early warning" bores
OR
• Level 2 trigger of TARP WMP11 for a minimum of three bores ("early warning" bores and Thirlmere Lakes bores).</td><td>• Actions as stated in Level 1.
If the changes have been confirmed to be related to mining effects:
• Consider increasing monitoring and review of data at sites where Level 2 has been reached, subject to land access. Reasons for not increasing monitoring frequency could include solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change).
Review Thirlmere Lakes monitoring bore data
• Compare against base case and deterministic model scenarios[2].
• Review manual water level measurements for additional monitoring sites to identify potential spatial trends in water level decline.
• Review surface water data to assess for surface water level decline at relevant site.
• Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.
• Review Water Management Plan and modify if necessary.
• Undertake an investigation to determine if an exceedance of the performance measure is likely. To be commenced/completed as soon as practicable.</td><td>• Responses as stated in Level 1.
• Provide findings of CMA review to DPE and key stakeholders for consultation.
• Implement additional CMAs, subject to land access.
• Advise DPE and key stakeholders of any required amendments to Water Management Plan.
• If relevant, notify DAWE of any predictions of an exceedance of a performance measure within two business days.</td></tr>
<tr><td colspan="3">Exceeds Performance Measure</td></tr>
<tr><td>• Level 3 trigger of TARPs WMP8 for a minimum of four bores "early warning" bores)
OR
• Level 3 trigger of TARPs WMP11 for a minimum of four bores ("early warning" bores and Thirlmere Lakes bores).
AND
• Review of Thirlmere Lakes bores indicated potential impacts resulting from extraction</td><td>• Actions as stated in Level 2.
If the changes have been confirmed to be related to mining effects:
• Increase monitoring and review of data frequency for sites where Level 3 has been reached, subject to land access.
• Investigate reasons for the performance measure exceedance. To be commenced/completed as soon as practicable.
• Review predictions of subsidence impacts and environmental consequences associated with further longwall extraction based on the outcomes of the investigation.
• Consider modifying mine plan.</td><td>• Responses as stated in Level 2.
• Submit a report to DPE (in accordance with Condition E4 of SSD 8445) within 14 days of the exceedance occurring (or other timeframe agreed by DPE) describing remediation options and any preferred remediation measures or other course of action.
• Implement any reasonable remediation measures as directed by DPE, subject to land access.
• Notify DAWE of any detection or predictions of an exceedance of a performance measure within two business days.
• Submit an Impact Response Plan to DAWE (in accordance with Condition 11 of the DAWE Consent for the Tahmoor South Project).</td></tr>
</table>

				• Update numerical groundwater model and re-run predictive scenarios to determine the likely extent and depth of depressurisation in the vicinity of Thirlmere Lakes, and to determine whether any additional management actions are required such as modifying the mine plan

Notes:
[1] It is noted that the only Groundwater Dependent Ecosystem (GDE) pertinent to the Tahmoor South Project is that of Thirlmere Lakes[2] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.

Appendix B Tahmoor South TARP Trigger Levels

Six-Monthly Groundwater Report: January – June 2024

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00001

25 September 2024

B.1 WMP8, WMP9, WMP10, WMP13 Groundwater Level

Table B-1 Summary of Groundwater Level Triggers

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
P51A	Shallow Open Standpipe	298.3	296.3	292.4	288.5
P51B	Shallow Open Standpipe	299.5	297.5	293.6	289.7
P52	Shallow Open Standpipe	248.7	246.7	244.6	242.5
P53A	Shallow Open Standpipe	257.8	255.8	253.7	251.6
P53B	Shallow Open Standpipe	257.8	255.8	253.7	251.6
P53C	Shallow Open Standpipe	255.6	253.6	251.4	249.1
P54A	Shallow Open Standpipe	262.7	260.7	259.0	257.4
P54B	Shallow Open Standpipe	261.9	259.9	258.2	256.6
P55A	Shallow Open Standpipe	273.1	271.1	269.7	268.2
P55B	Shallow Open Standpipe	268.0	266.0	264.4	262.9
P55C	Shallow Open Standpipe	261.7	259.7	258.2	256.6
P56A	Shallow Open Standpipe	290.2	288.2	284.8	281.4
P56B	Shallow Open Standpipe	280.9	278.9	275.5	272.1
P56C	Shallow Open Standpipe	259.4	257.4	254.1	250.7
REA4	Shallow Open Standpipe	250.3	248.3	246.2	244.1
GW062068	Private Bore	276.0	274.0	270.5	267.1
GW104008	Private Bore	236.7	234.7	234.0	233.2
GW104323	Private Bore	258.9	256.9	256.8	256.8
GW104659	Private Bore	251.8	249.8	243.6	237.4

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
GW105395	Private Bore	324.1	322.1	Modelled drawdown is equal to 2 m	Modelled drawdown is equal to 2 m
GW109257	Private Bore	282.9	280.9	278.9	276.9
GW112473	Private Bore	319.1	317.1	Modelled drawdown is equal to 1 m	Modelled drawdown is equal to 1 m
TNC036 (HBSS-65m)	Shallow VWP	-	204.5	-	-
TNC036 (HBSS-97m)	Shallow VWP	-	191.3	185.7	180.0
TNC036 (BGSS-169m)	Shallow VWP	-	192.5	135.7	79.0
TNC040 (WMFM-27m)	Shallow VWP	-	203.3	198.2	193.1
TNC040 (HBSS-65m)	Shallow VWP	-	182.1	175.8	169.5
TNC043 (HBSS-65m)	Shallow VWP	-	153.7	152.50	151.3
TNC043 (HBSS-111.5m)	Shallow VWP	-	150.6	148.50	146.5
TBC09 (HBSS-30m)	Shallow VWP	287.6	321.8	321.6	321.5
TBC09 (HBSS-75m)	Shallow VWP	309.4	304.4	304.2	304.1
TBC09 (BHCS-182m)	Shallow VWP	293.0	288.0	287.4	286.8
TBC09 (BGSS-192m)	Shallow VWP	290.4	285.4	285.2	285.0
TBC018 (WWFM/HBSS-70m)	Shallow VWP	250.5	245.5	245.2	244.8
TBC018 (WWFM/HBSS-117m)	Shallow VWP	251.9	246.9	246.6	246.2
TBC018 (HBSS lower-164m)	Shallow VWP	250.7	245.7	245.4	245.1
TBC018 (BHCS-179m)	Shallow VWP	248.5	243.5	243.1	242.8
TBC018 (BGSS-198m)	Shallow VWP	244.7	239.7	237.8	236.0

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
TBC024 (HBSS-117m)	Shallow VWP	287.6	282.6	-	-
TBC024 (HBSS-139m)	Shallow VWP	287.0	282.0	281.5	281.0
TBC024 (BHCS-168m)	Shallow VWP	289.5	284.5	283.6	282.8
TBC024 (BGSS-185m)	Shallow VWP	289.3	284.3	282.3	280.3
TBC027 (HBSS-95m)	Shallow VWP	320.1	315.1	-	-
TBC027 (HBSS-132m)	Shallow VWP	312.8	307.8	307.6	307.3
TBC027 (HBSS-169m)	Shallow VWP	312.2	307.2	307	306.8
TBC027 (BHCS-181m)	Shallow VWP	310.7	305.7	305.5	305.3
TBC027 (BGSS-198m)	Shallow VWP	310.3	305.3	305.1	304.9
TBC032 (HBSS-95m)	Shallow VWP	262.3	257.3	256.7	256.2
TBC032 (HBSS-131m)	Shallow VWP	255.0	250	249.3	248.6
TBC032 (HBSS-168m)	Shallow VWP	266.9	261.9	261.1	260.4
TBC032 (BHCS-181m)	Shallow VWP	242.8	237.8	228.7	219.5
TBC032 (BGSS-200m)	Shallow VWP	243.8	238.8	208.7	178.7
TBC034 (HBSS-65m)	Shallow VWP	371.8	366.8	-	-
TBC034 (HBSS-113m)	Shallow VWP	368.0	363.0	362.7	362.3
TBC034 (HBSS-161m)	Shallow VWP	358.4	353.4	353.1	352.8
TBC034 (BHCS-176m)	Shallow VWP	354.9	349.9	349.4	348.9
TBC034 (BGSS-196m)	Shallow VWP	358.3	353.3	352.1	350.9
TBC039 (HBSS-65m)	Shallow VWP	313.5	308.7	-	-
TBC09 (BGSS-332m)	Deep VWP	-	N/A	N/A	N/A
TBC09 (BGSS-343m)	Deep VWP	-	N/A	N/A	N/A

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
TBC09 (SBSS-357m)	Deep VWP	-	N/A	N/A	N/A
TBC09 (BUSM-381m)	Deep VWP	-	N/A	N/A	N/A
TBC09 (WWCO-391m)	Deep VWP	-	N/A	N/A	N/A
TBC09 (WWCO-397m)	Deep VWP	-	N/A	N/A	N/A
TBC018 (BGSS-282m)	Deep VWP	-	N/A	N/A	N/A
TBC018 (BGSS-366m)	Deep VWP	-	N/A	N/A	N/A
TBC018 (WBCS-377m)	Deep VWP	-	N/A	N/A	N/A
TBC018 (BUSM-404m)	Deep VWP	-	N/A	N/A	N/A
TBC018 (WO-432m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (BGSS-211m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (BGSS-293m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (BGSS-375m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (WBCS-397m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (BGSS-411m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (WO-434m)	Deep VWP	-	N/A	N/A	N/A
TBC020 (WO-439m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (BGSS-211m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (BGSS-278m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (BGSS-344m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (WBCS-409m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (BUSM-432m)	Deep VWP	-	N/A	N/A	N/A
TBC026 (ECSL-440m)	Deep VWP	-	N/A	N/A	N/A

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
TBC026 (ECSL-460m)	Deep VWP	-	N/A	N/A	N/A
TBC032 (BGSS-200m)	Deep VWP	-	N/A	N/A	N/A
TBC032 (BGSS-237m)	Deep VWP	-	N/A	N/A	N/A
TBC032 (BGSS-294m)	Deep VWP	-	N/A	N/A	N/A
TBC039 (BGSS-243m)	Deep VWP	-	N/A	N/A	N/A
TBC039 (BGSS-299m)	Deep VWP	-	N/A	N/A	N/A
TBC039 (SBSS-354m)	Deep VWP	-	N/A	N/A	N/A
TBC039 (BUSM-375m)	Deep VWP	-	N/A	N/A	N/A
TBC039 (WWCO-402m)	Deep VWP	-	N/A	N/A	N/A

“-“ not defined

“N/A” not applicable; a specific trigger limit is not set as predicted drawdown constantly changes with extraction progression.

B.2 WMP11 Groundwater Quality

Table B-2 Summary of Groundwater Quality Triggers

Bore	pH Upper	pH Lower	EC	Fe Filt (mg/L)	Mn Filt (mg/L)	Cu Filt (mg/L)	Pb Filt (mg/L)	Zn Filt (mg/L)	Ni Filt (mg/L)	Al Filt (mg/L)	As Filt (mg/L)	Sr Filt (mg/L)	Li Filt (mg/L)	Ba Filt (mg/L)	Se Filt (mg/L)
GW109257	10.18	4.01	927	0.465	0.001	0.21	0.008	14.65	0.009	1.55	0.027	0.001	0.003	0.028	0.13
GW104008	7.15	4.5	1983	0.016	0.001	0.186	0.003	38.2	0.073	2.21	0.02	0.001	0.001	0.099	0.017
GW112473	7.08	3.32	574	0.621	0.001	0.157	0.003	24.75	0.007	1.71	0.016	0.005	0.001	0.017	0.063
GW104659	7.08	4.12	685	0.02	0.001	0.177	0.008	31.2	0.017	1.8	0.011	0.001	0.001	0.03	0.037
GW062068	2.59	6.1	2070	2.98	0.024	0.0194	0.218	7.52	0.001	0.002	0.0106	0.0296	0.142	0.0152	0.09
GW105395	8.24	4.5	4635	0.1	0.001	0.098	0.001	40.5	0.084	2	0.041	0.001	0.001	0.18	0.05
GW104323	6.95	2.63	1541	3.8	0.002	0.295	2.25	17	0.014	2.7	0.067	0.175	0.001	0.021	4.25
P51A	12.66	5.18	299	0.912	0.001	0.502	0.031	0.027	0.405	0.139	0.015	0.001	0.005	3.261	0.053
P51B	13.79	7.82	3971	4.57	0.017	1.418	0.007	13.135	0.764	0.255	0.013	0.003	0.005	3.575	0.039
P52	8.82	4.47	1450	0.221	0.004	0.315	0.004	61	0.018	4.245	0.049	0.104	0.003	0.064	0.316
P53A	8.94	5.07	896	0.298	0.008	0.16	0.002	38.2	0.04	2.24	0.019	0.003	0.003	0.22	0.064
P53B	12.87	5.56	1848	0.08	0.002	0.194	0.006	12.64	0.654	2.372	0.015	0.001	0.003	0.688	0.053
P53C	11.54	5.08	1879	0.172	0.011	0.246	0.002	30.6	0.049	2.74	0.042	0.001	0.002	1.64	0.239
P54A	9.61	5	1951	4.75	0.003	0.289	0.475	37.7	0.07	3.175	0.043	0.475	0.475	0.31	0.025
P54B	8.63	5.18	2182	0.029	0.003	0.317	0.004	43.4	0.082	2.997	0.049	0.001	0.004	0.515	0.076
P55A	12.33	4.26	1822	0.138	0.006	0.372	0.002	40.4	0.026	3.9	0.066	0.002	0.003	0.762	0.311
P55B	9.04	4.68	1699	0.136	0.01	0.39	0.007	49.8	0.087	5.68	0.232	0.049	0.002	0.278	0.254
P55C	11.07	3.92	2663	0.668	0.002	0.302	0.522	55	0.256	3.38	0.146	0.023	0.002	0.644	0.468
P56A	10.21	3.4	1560	1.77	0.001	0.17	0.009	0.04	0.023	0.134	0.012	0.01	0.005	0.174	0.041

Bore	pH Upper	pH Lower	EC	Fe Filt (mg/L)	Mn Filt (mg/L)	Cu Filt (mg/L)	Pb Filt (mg/L)	Zn Filt (mg/L)	Ni Filt (mg/L)	Al Filt (mg/L)	As Filt (mg/L)	Sr Filt (mg/L)	Li Filt (mg/L)	Ba Filt (mg/L)	Se Filt (mg/L)
P56B	13.22	6.06	1526	0.276	0.004	0.26	0.002	0.295	0.858	1.726	0.035	0.001	0.005	1.063	0.014
P56C	13.19	5.27	3520	0.237	0.007	0.685	0.001	17.2	0.497	1.635	0.003	0.001	0.005	1.652	0.012
REA4	10.41	5.31	1126	0.29	0.001	0.032	0.009	1.04	0.01	0.084	0.007	0.002	0.001	0.175	0.135

B.3 WMP12 Groundwater-Surface Water Interaction

Refer to **Table 1** for the relevant bores, as per **Appendix A**.

Appendix C Trigger Level Breach and Exceedance Discussion

Six-Monthly Groundwater Report: January – June 2024

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00001

25 September 2024

C.1 Trigger Breach Discussion

Trigger Breaches & Exceedances As detailed in **Section 3.0 (main body)**, the groundwater level triggers and groundwater quality triggers are discussed in **Appendix A** and presented in **Appendix B**.

Two classes of data assessment are reported:

- **Breach**: a trigger breach is noted when an observed data point is outside of the defined trigger level. Breaches are reported to provide site context and inform where exceedances may occur in the future.

  An example of a breach for groundwater levels as detailed in WMP8, is where a groundwater level is reported with greater than 2 m water level reduction for a particular month for a period less than 6 consecutive months.

  An example for groundwater quality is where the measured concentration exceeds the defined trigger level but for a period of less than 3 consecutive months.

- **Exceedance**: An exceedance occurs when the TARP level has been exceeded.

  Using the same example above, an **exceedance** would be when the groundwater level is reported with greater than 2 m water level reduction for a particular month for a period of 6 months or more consecutively.

Pertaining to water quality, the criteria for a TARP Level 1 in WMP11 detailed below (Tahmoor Coal, 2022) where both criteria must be met for an exceedance, and a trigger breach occurs where only one criterion is met, or criteria are only partially met:

- **Criteria 1**: Observed salinity and/or metal or pH outside of defined trigger levels for 3 consecutive months or more. The effect does not persist after a significant rainfall recharge event.

  AND

- **Criteria 2**: A similar trend or response is noted at other monitored bores or private bores.

C.1.1 Water Levels (TARP WMP8, WMP9, WMP10, WMP12, WMP13)

Table C-2 provides a summary of all Groundwater Level/Pressure trigger level breaches and exceedances over the reporting period.

Table C-1: Groundwater Level Trigger Summary (TARP WMP8, WMP9, WMP10, WMP12, WMP13) January to June 2024

Bore	Type	TARP WMP	Dec 2023	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024
P51A	SOP	8, 12							
P51B	SOP	8, 12	L1	L1	L1	L1	L1		B1
P52	SOP	8, 12	B1		B1	B1	B1		
P53A	SOP	8, 12	L1	L1	L1, B2	L1, B2	L1, B2	L1, B2	L1, B2
P53B	SOP	8, 12	L1, B2	L1	L1, B2	L1	L1, B1	L1	L1
P53C	SOP	8, 12	L2	L2	L2, B3	L2	L2	L2	L2
P54A	SOP	8, 12	^						
P54B	SOP	8, 12	^						
P54C	SOP	8, 12	^						
P55A	SOP	8, 12		B1	B1	B1	B1	B1	B1
P55B	SOP	8, 12	L1, B3	L1, B3	L2, B3	L2, B3	L2, B3	L3	L3
P55C	SOP	8, 12	L2	L2, B3	L2, B3	L2, B3	L2	L2	L2, B3
P56A	SOP	8							
P56B	SOP	8				B1	B1	B1	B1
P56C	SOP	8	L2	L2	L2	L2	L2	L2, B3	L2, B3
REA4	SOP	8, 12	B1	L1	L1	L1	L1		
GW104008	Private Bore	8							
GW104323	Private Bore	8		B3	B1		B3	B3	B3
GW104659	Private Bore	8, 13	L1	L1, B2	L1, B2	L1, B2	L1, B3	L1, B3	L1, B2
GW105395	Private Bore	8			#ND	#ND	#ND	#ND	#ND
GW109257	Private Bore	8	B1	B1	L1	L1	L1	L1	L1
GW112473	Private Bore	8	B1	B1		B1			
TBC09 (HBSS-30m)	Shallow VWP	9							
TBC09 (HBSS-75m)	Shallow VWP	9							
TBC09 (BHCS-182m)	Shallow VWP	9							

Bore	Type	TARP WMP	Dec 2023	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024
TBC09 (BGSS-192m)	Shallow VWP	9							
TBC018 (WWFM/HBSS-70m)	Shallow VWP	9							
TBC018 (WWFM/HBSS-117m)	Shallow VWP	9							
TBC018 (HBSS lower-164m)	Shallow VWP	9							
TBC018 (BHCS-179m)	Shallow VWP	9							
TBC018 (BGSS-198m)	Shallow VWP	9							
TBC024 (HBSS-117m)	Shallow VWP	9							
TBC024 (HBSS-139m)	Shallow VWP	9	*	*	*	*	*	*	*
TBC024 (BHCS-168m)	Shallow VWP	9	B3*	*	*	*	*	*	*
TBC024 (BGSS-185m)	Shallow VWP	9	B3*	B3*	B3*	B3*			
TBC027 (HBSS-95m)	Shallow VWP	9						B1	B1
TBC027 (HBSS-132m)	Shallow VWP	9							
TBC027 (HBSS-169m)	Shallow VWP	9							
TBC027 (BHCS-181m)	Shallow VWP	9							
TBC027 (BGSS-198m)	Shallow VWP	9							
TBC032 (HBSS-95m)	Shallow VWP	9		*	*	*	*	*	*
TBC032 (HBSS-131m)	Shallow VWP	9	B3*	B3	B3	B3	L3	L3	L3
TBC032 (HBSS-168m)	Shallow VWP	9							
TBC032 (BHCS-181m)	Shallow VWP	9	B2*	L1, B2	L1, B2	L1, B2	L1, B2	L1	L1, B2
TBC032 (BGSS-200m)	Shallow VWP	9	B1	L1	L1	L1	L1	L1	L1
TBC034 (HBSS-65m)	Shallow VWP	9							
TBC034 (HBSS-113m)	Shallow VWP	9							
TBC034 (HBSS-161m)	Shallow VWP	9							
TBC034 (BHCS-176m)	Shallow VWP	9	B3*	B3*	B3*	B3*	B3*	B3*	B3*
TBC034 (BGSS-196m)	Shallow VWP	9							

Bore	Type	TARP WMP	Dec 2023	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024
TBC039 (HBSS-65m)	Shallow VWP	9, 13						B1*	B1*
TBC09 (BGSS-332m)	Deep VWP	10							
TBC09 (BGSS-343m)	Deep VWP	10							
TBC09 (SBSS-357m)	Deep VWP	10							
TBC09 (BUSM-381m)	Deep VWP	10							
TBC09 (WWCO-391m)	Deep VWP	10							
TBC09 (WWCO-397m)	Deep VWP	10							
TBC018 (BGSS-282m)	Deep VWP	10							
TBC018 (BGSS-366m)	Deep VWP	10							
TBC018 (WBCS-377m)	Deep VWP	10	~NC						
TBC018 (BUSM-404m)	Deep VWP	10							
TBC018 (WWCO-432m)	Deep VWP	10	#ND	#ND	#ND	#ND	#ND	#ND	#ND
TBC020 (BGSS-211m)	Deep VWP	10							
TBC020 (BGSS-293m)	Deep VWP	10							
TBC020 (BGSS-375m)	Deep VWP	10							
TBC020 (WBCS-397m)	Deep VWP	10	~NC						
TBC020 (BGSS-411m)	Deep VWP	10							
TBC020 (WO-434m)	Deep VWP	10							
TBC020 (WO-439m)	Deep VWP	10	~NC						
TBC026 (BGSS-211m)	Deep VWP	10							
TBC026 (BGSS-278m)	Deep VWP	10							
TBC026 (BGSS-344m)	Deep VWP	10							
TBC026 (WBCS-409m)	Deep VWP	10							
TBC026 (BUSM-432m)	Deep VWP	10							
TBC026 (ECSL-440m)	Deep VWP	10							
TBC026 (ECSL-460m)	Deep VWP	10							
TBC032 (BGSS-200m)	Deep VWP	10							

Bore	Type	TARP WMP	Dec 2023	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024
TBC032 (BGSS-237m)	Deep VWP	10							
TBC032 (BGSS-294m)	Deep VWP	10							
TBC039 (BGSS-243m)	Deep VWP	10							
TBC039 (BGSS-299m)	Deep VWP	10							
TBC039 (SBSS-354m)	Deep VWP	10							
TBC039 (BUSM-375m)	Deep VWP	10							
TBC039 (WWCO-402m)	Deep VWP	10							

^ Bore was observed as dry during the reporting period.
* Data appears erroneous therefore not considered to be an exceedance.
~ Not calculated (NC) as the historical groundwater level, upon which the drawdown calculation is based upon, is not available.
# No data (ND) available for the reporting period.
Note: green shading indicates a trigger was breached and/or an exceedance occurred

C.1.2 Water Quality

A summary of groundwater quality trigger breaches and exceedances in this reporting period is presented in the Sections below where the performance of each bore against each trigger is:

- Within normal conditions (indicated by a blank cell);
- Indicated as “B”, meaning that the trigger was breached in the current reporting period but is not yet considered an exceedance; or
- Indicated as “L” and shaded in green, meaning that trigger was breached in the current reporting period for the third time or more and complies with Criteria 1 and 2 of TARP Level 1 in WMP11.

C.1.3 TARP WMP11 and WMP13

Table C-2: Groundwater Quality Trigger Summary (TARP WMP11 and WMP13) – January to June 2024

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW104008	11	Jan-24															
GW104008	11	Feb-24					B1										
GW104008	11	Mar-24					B1				B1			B1			
GW104008	11	Apr-24															
GW104008	11	May-24								B1	B1			B1			
GW104008	11	June-24					B1				B1			B1			
GW104323	11	Jan-24															
GW104323	11, 13	Feb-24					B1					B1					
GW104323	11	Mar-24					B1					B1	B1				
GW104323	11	Apr-24										B1	B1				
GW104323	11	May-24															
GW104323	11	June-24												B1			
GW104659	11, 13	Jan-24															
GW104659	11	Feb-24					B1										
GW104659	11, 13	Mar-24															
GW104659	11, 13	Apr-24															
GW104659	11, 13	May-24															
GW104659	11, 13	June-24															
GW105395	11	Jan-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105395	11, 13	Feb-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105395	11	Mar-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105395	11	Apr-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105395	11	May-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW105395	11	June-24	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW109257	11	Jan-24															
GW109257	11	Feb-24					B1										
GW109257	11	Mar-24					B1				B1					B1	

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW109257	11	Apr-24					L1										
GW109257	11	May-24				B1	L1		L1			B1		B1		B1	
GW109257	11	June-24					L1							B1			
GW112473	11	Jan-24			B1					B1							
GW112473	11	Feb-24				B1	B1										
GW112473	11	Mar-24			B1					B1		B1					
GW112473	11	Apr-24					B1				B1			B1		B1	
GW112473	11	May-24												B1	B1		
GW112473	11	June-24					**B1**							L1			
P51A	11	Jan-24		B1													
P51A	11	Feb-24		L1													
P51A	11	Mar-24		L1													
P51A	11	Apr-24		L1													
P51A	11	May-24			B1	B1	B1			B1	B1						
P51A	11	June-24															
P51B	11	Jan-24															
P51B	11	Feb-24															
P51B	11	Mar-24															
P51B	11	Apr-24															
P51B	11	May-24					B1	B1		B1	B1						
P51B	11	June-24															
P52	11	Jan-24								L1					B1		
P52	11	Feb-24								L1					L1		
P52	11	Mar-24								L1					L1		
P52	11	Apr-24															
P52	11	May-24															
P52	11	June-24									B1						
P53A	11	Jan-24															
P53A	11	Feb-24															
P53A	11	Mar-24															
P53A	11	Apr-24															
P53A	11	May-24															
P53A	11	June-24			B1				B1	B1	B1						
P53B	11	Jan-24				L1										L1	
P53B	11	Feb-24				L1										L1	
P53B	11	Mar-24															
P53B	11	Apr-24				B1										B1	
P53B	11	May-24															
P53B	11	June-24		B1					B1	B1	B1			B1		B1	
P53C	11	Jan-24															
P53C	11	Feb-24												B1			

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P53C	11	Mar-24												B1			
P53C	11	Apr-24												L1			
P53C	11	May-24												L1			B1
P53C	11	June-24						B1						L1			
P54A	11	Jan-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Feb-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Mar-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Apr-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	May-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	June-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Jan-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Feb-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Mar-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Apr-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	May-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	June-24	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P55A	11	Jan-24			B2					B1							
P55A	11	Feb-24			L1							B1					
P55A	11	Mar-24			L1					B1							
P55A	11	Apr-24			L1										B1		
P55A	11	May-24			L2												
P55A	11	June-24							B1		B1						
P55B	11	Jan-24								B2						B1	
P55B	11	Feb-24														B1	
P55B	11	Mar-24				B1										L1	
P55B	11	Apr-24			B1	B1											
P55B	11	May-24															B1
P55B	11	June-24							B1		B1						
P55C	11	Jan-24					L1										
P55C	11	Feb-24					L1										
P55C	11	Mar-24					L1										
P55C	11	Apr-24					L2										
P55C	11	May-24					L2										
P55C	11	June-24							B1		B1						
P56A	11	Jan-24															
P56A	11	Feb-24															
P56A	11	Mar-24															
P56A	11	Apr-24															
P56A	11	May-24				B1											
P56A	11	June-24									B1						
P56B	11	Jan-24															

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P56B	11	Feb-24															
P56B	11	Mar-24															
P56B	11	Apr-24											B1				
P56B	11	May-24			B1												
P56B	11	June-24															
P56C	11	Jan-24								B1							
P56C	11	Feb-24															
P56C	11	Mar-24															
P56C	11	Apr-24						B1									
P56C	11	May-24															
P56C	11	June-24							B1	B1	B1						
REA4	11	Jan-24												B1	**B1**	**L1**	
REA4	11	Feb-24													B1	**L1**	
REA4	11	Mar-24												B1		**L1**	
REA4	11	Apr-24						B1		B1					**B1**	L1	
REA4	11	May-24				B1	**B1**								B1	L1	
REA4	11	June-24							B1		**B1**					L2	

No data (ND) available for the reporting period.
^ Bore was observed as dry during the reporting period.
Green shading indicates that the bore and analyte comply with Criteria 1 of TARP Level 1 in WMP11.
Bolded text indicates that the bore and analyte comply with Criteria 1 and 2 of TARP Level 1 in WMP11.

C.1.4 Trigger Level Breach and Exceedance Summary

The following tables provide a summary of the Trigger Level breaches and Exceedances.

Table C-3: Active June 2024 Trigger Exceedances – WMP8, WMP12

Exceedance Site	Trigger Parameter	TARP Level	TARP
P53A	Groundwater level	1	WMP8, WMP12
P53B	Groundwater level	1	WMP8, WMP12
P53C	Groundwater level	2	WMP8, WMP12
P55B	Groundwater level	3	WMP8, WMP12
P55C	Groundwater level	2	WMP8, WMP12
P56C	Groundwater level	2	WMP8
GW104659	Groundwater level	1	WMP8
GW109257	Groundwater level	1	WMP8,

Table C-4: Active June 2024 Trigger Breaches and Exceedances – WMP 11

Exceedance Site	Breach Parameter (Criterion 1 met)	Exceedance Parameter (Criteria 1 and 2 met)	Exceedance Level
P53C	Sr		1
REA4	Ba		1

Exceedance Site	Breach Parameter (Criterion 1 met)	Exceedance Parameter (Criteria 1 and 2 met)	Exceedance Level
GW109257	Mn		1
GW112473	Sr		1

Note: for water quality exceedances those **bolded** are the only parameters that fulfil both criteria 1 and 2 of the TARP.

Appendix D Hydrographs – Groundwater Levels

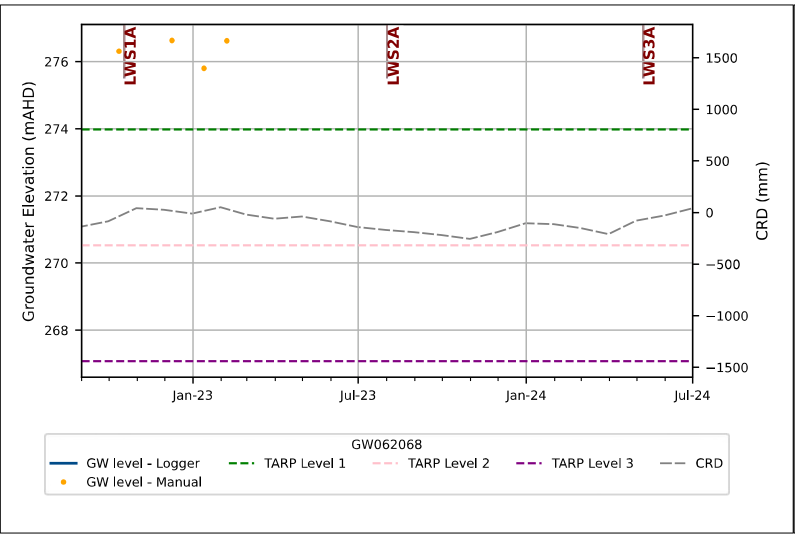
Six-Monthly Groundwater Report: January – June 2024

Tahmoor South Domain

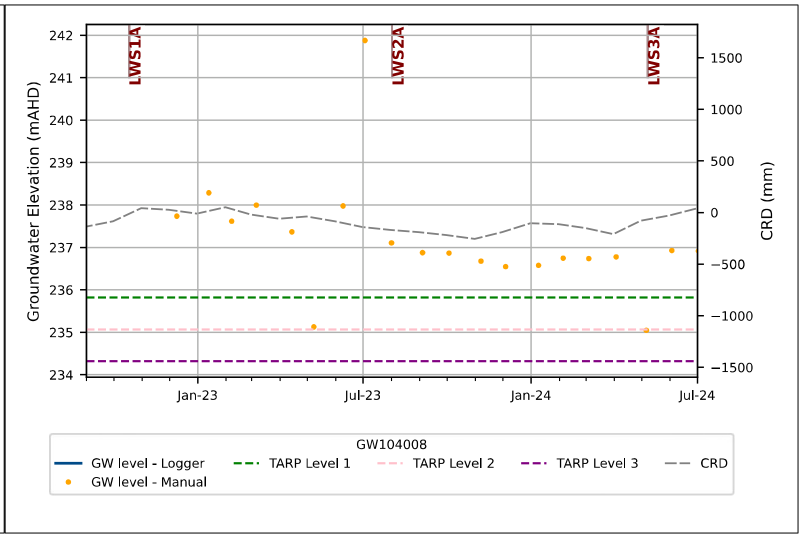
Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00001

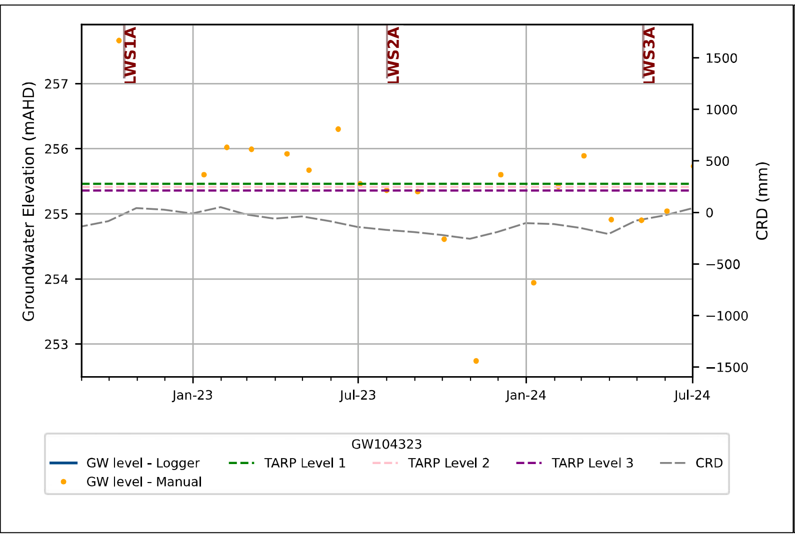
25 September 2024



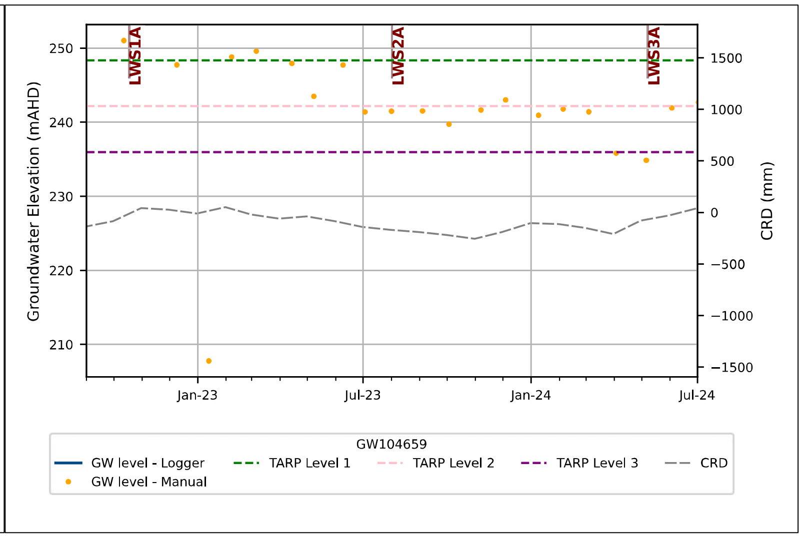
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual



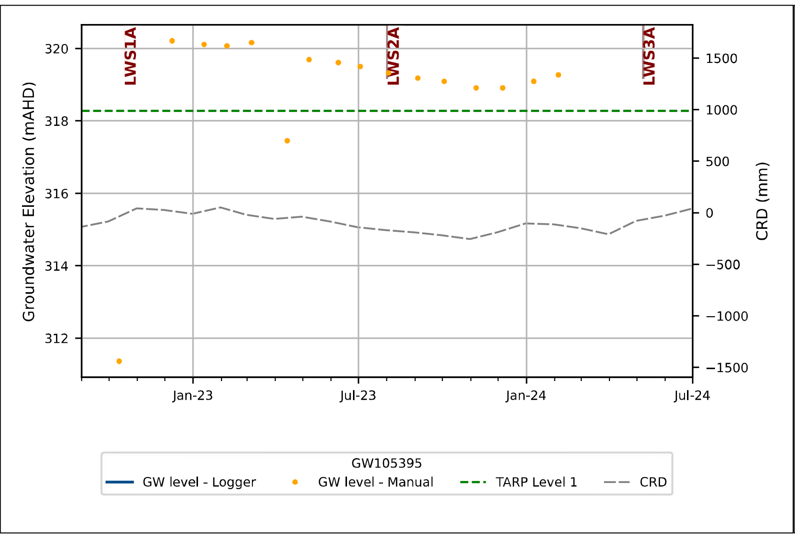
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual



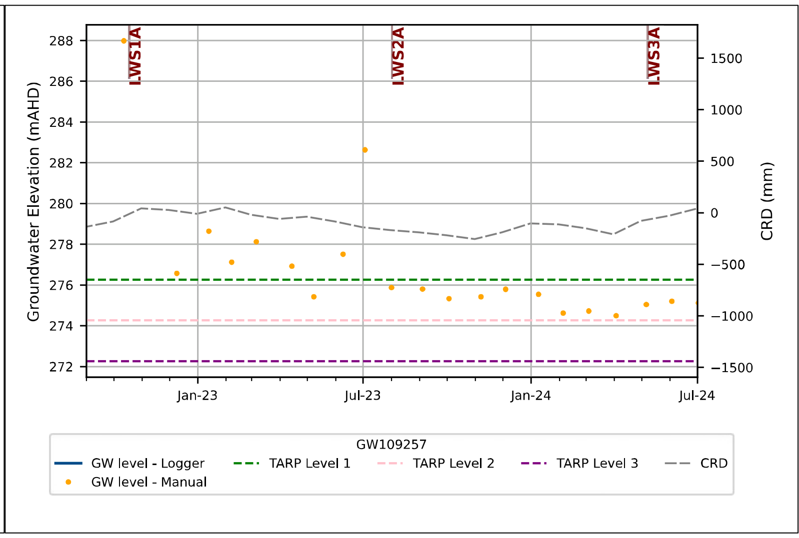
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual



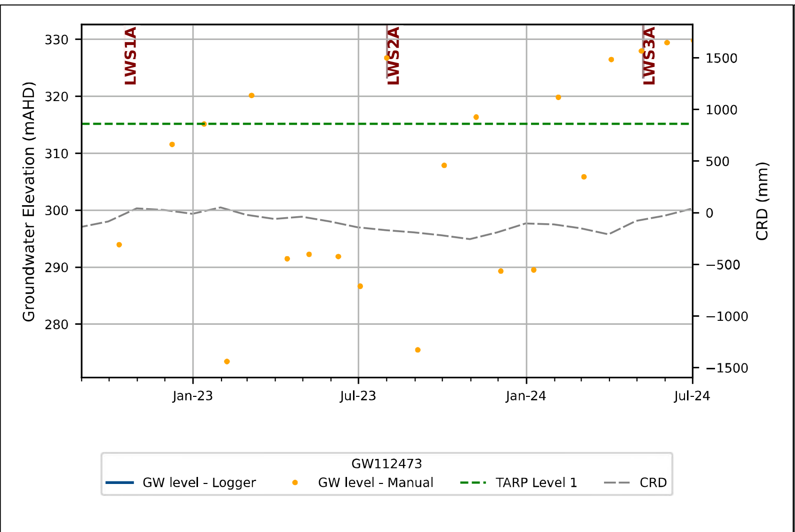
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual

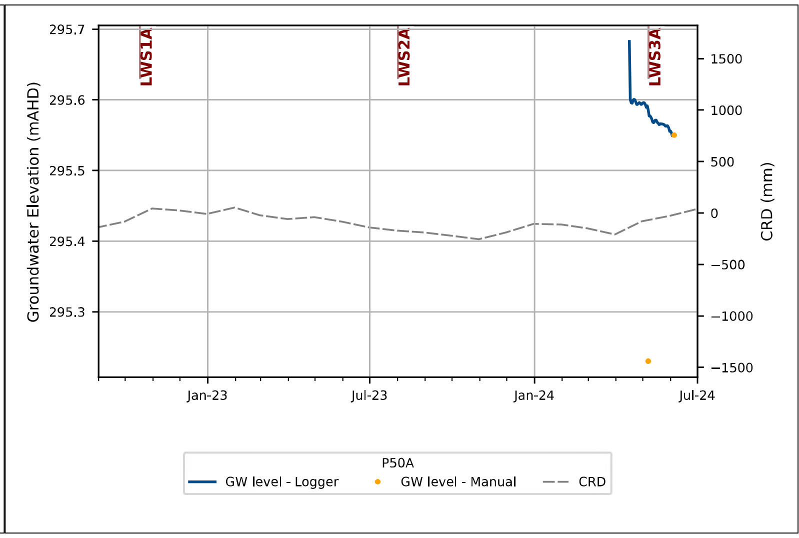


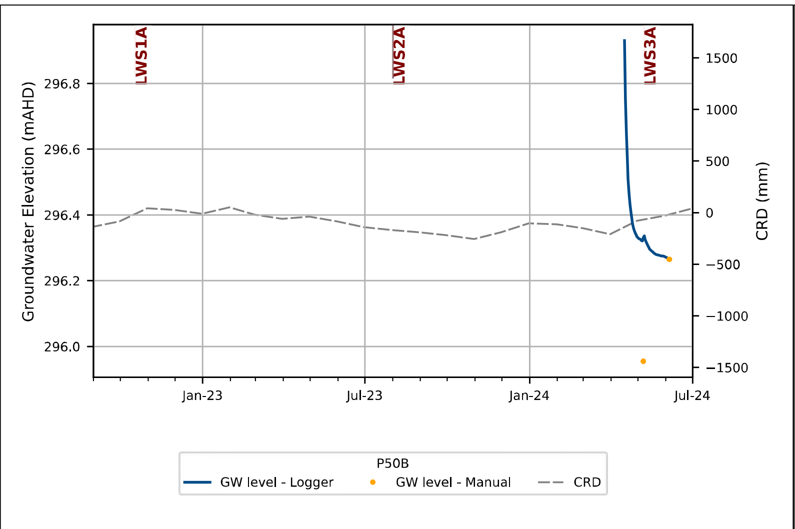
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
GW level - Logger
GW level - Manual
TARP Level 1
CRD

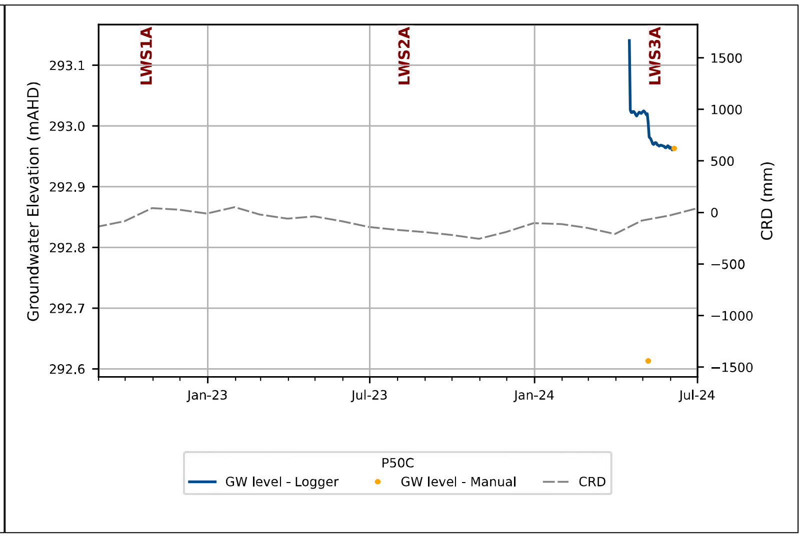


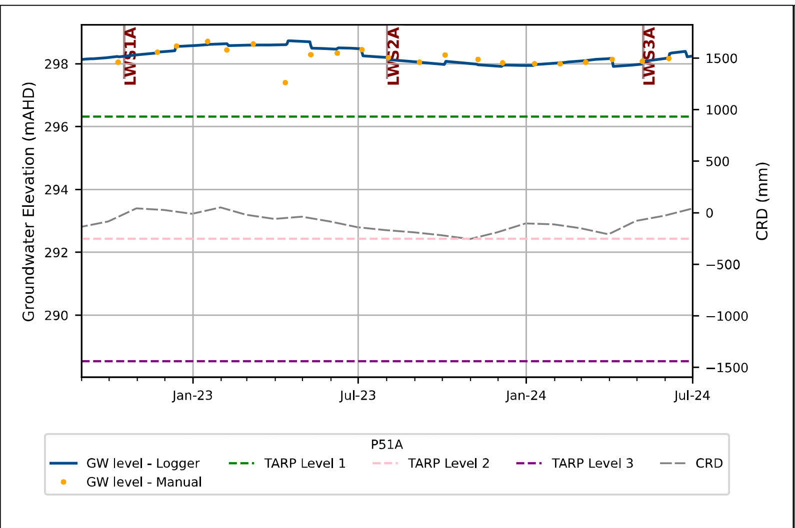
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual

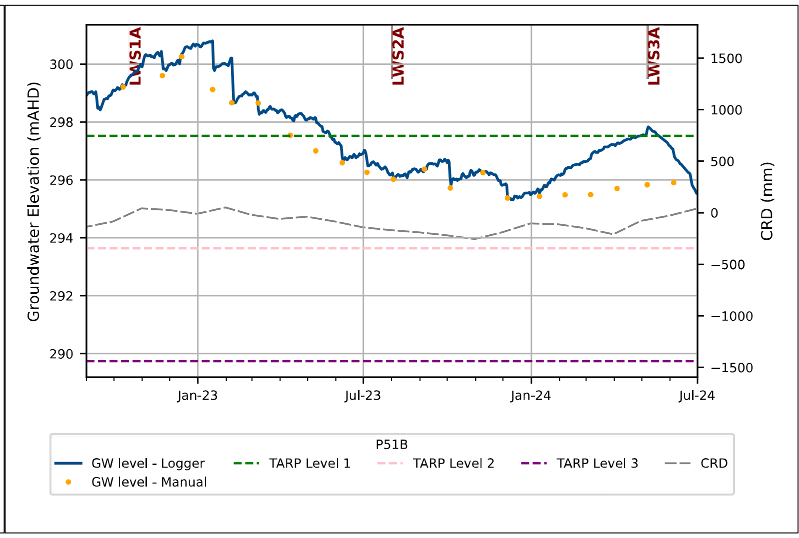

GW112473
GW level - Logger
GW level - Manual
TARP Level 1
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

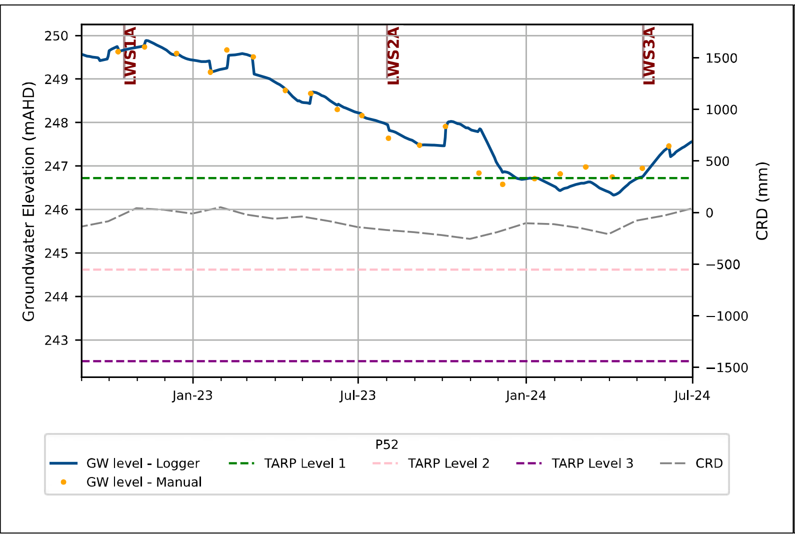

P50A
GW level - Logger
GW level - Manual
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

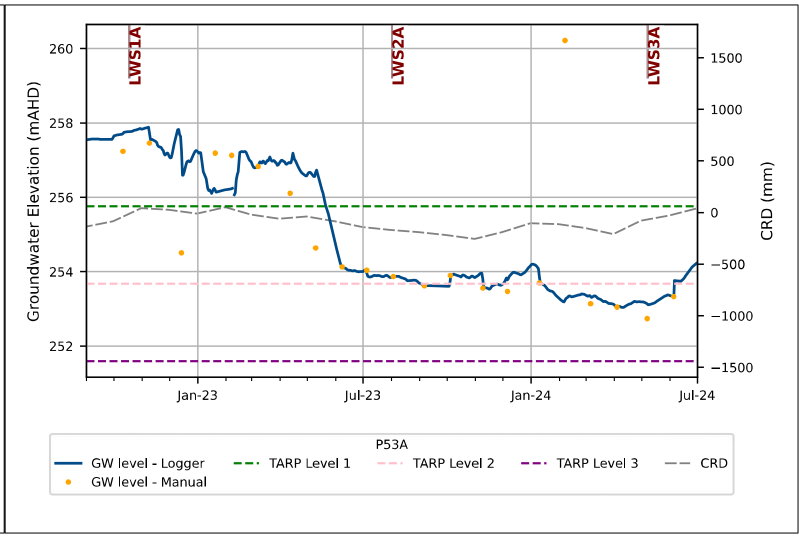

P50B
GW level - Logger
GW level - Manual
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

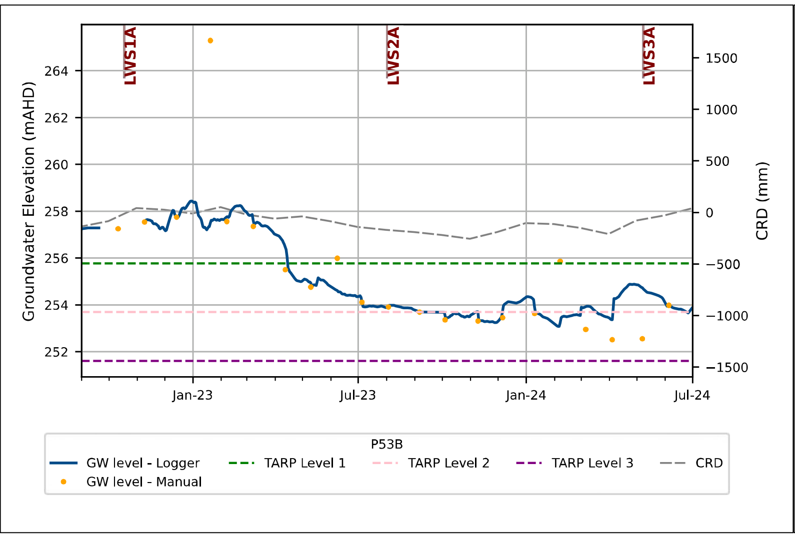

P50C
GW level - Logger
GW level - Manual
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

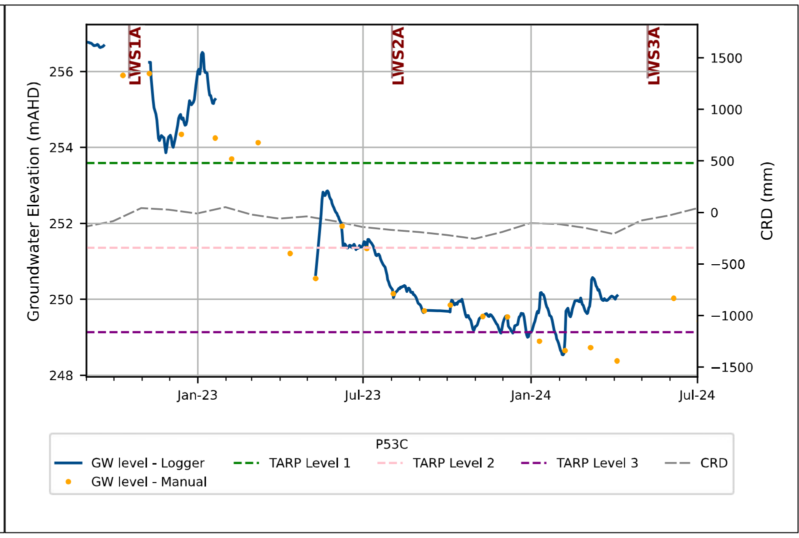

P51A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

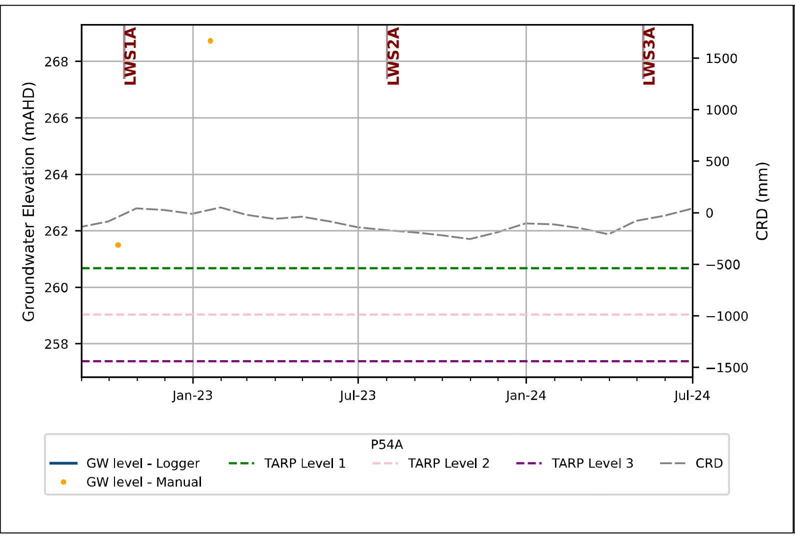

P51B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A

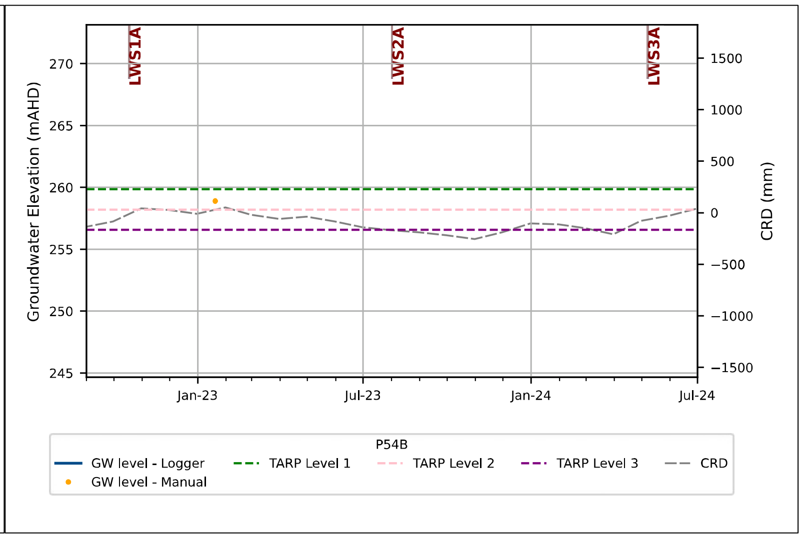

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
250
249
248
247
246
245
244
243
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P52
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

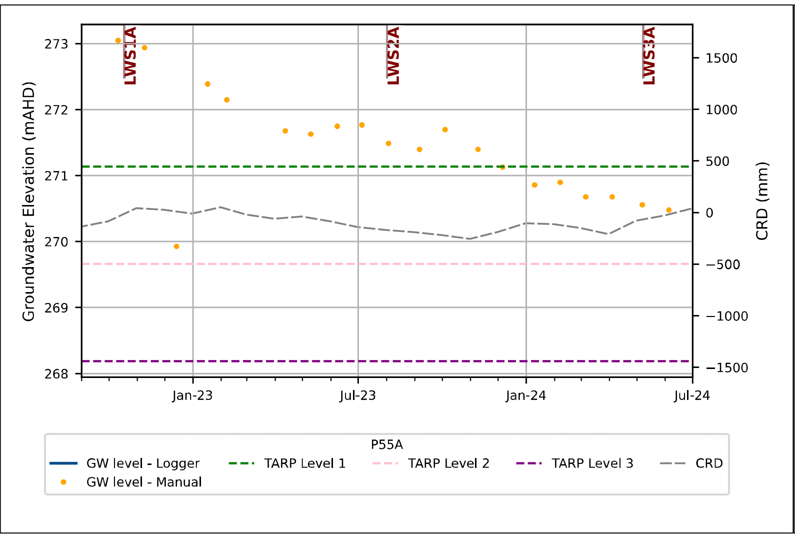

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
260
258
256
254
252
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

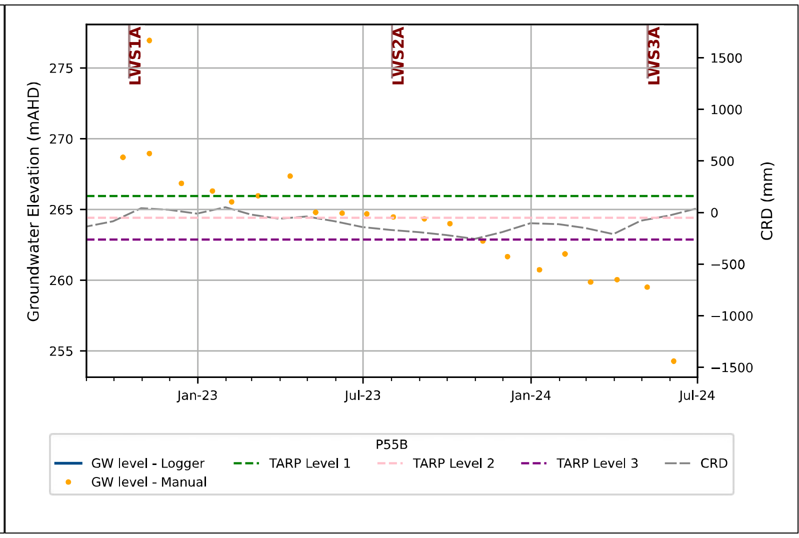

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
264
262
260
258
256
254
252
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

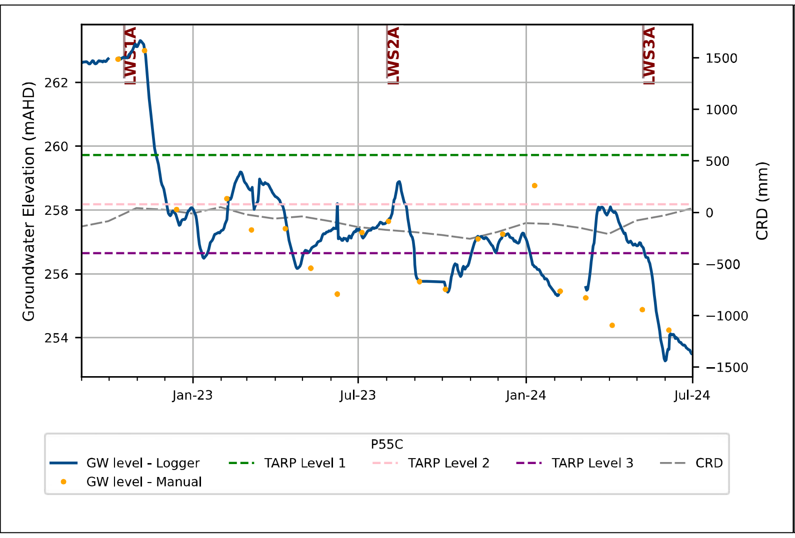

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
256
254
252
250
248
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

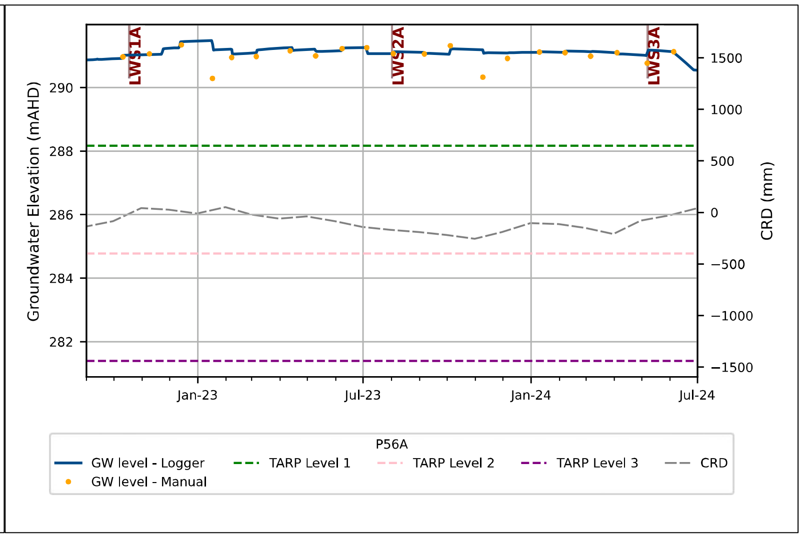

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
268
266
264
262
260
258
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P54A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

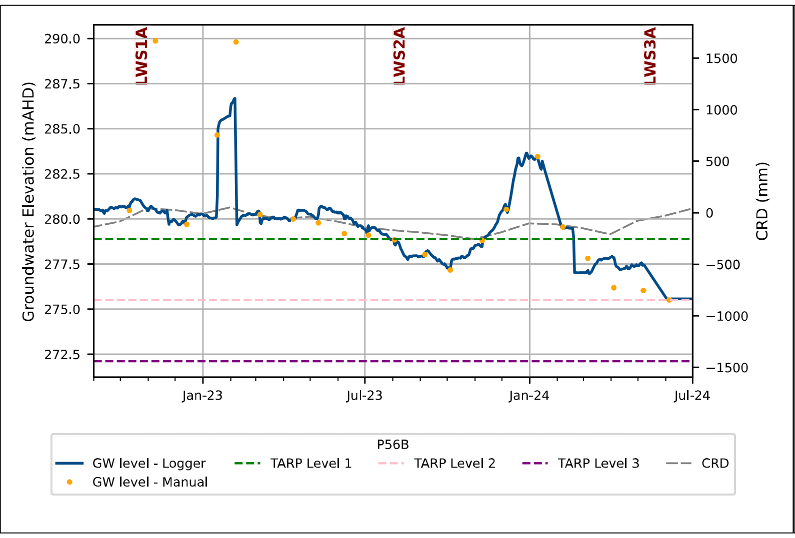

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
270
265
260
255
250
245
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P54B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

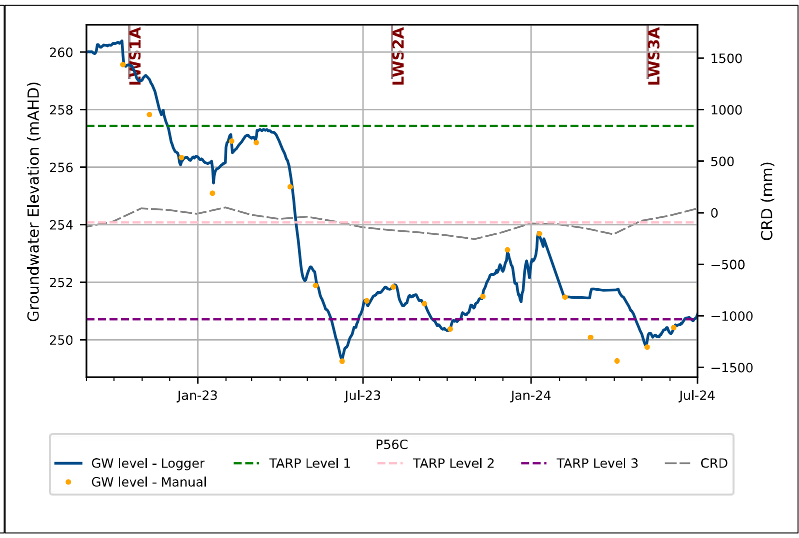

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
273
272
271
270
269
268
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

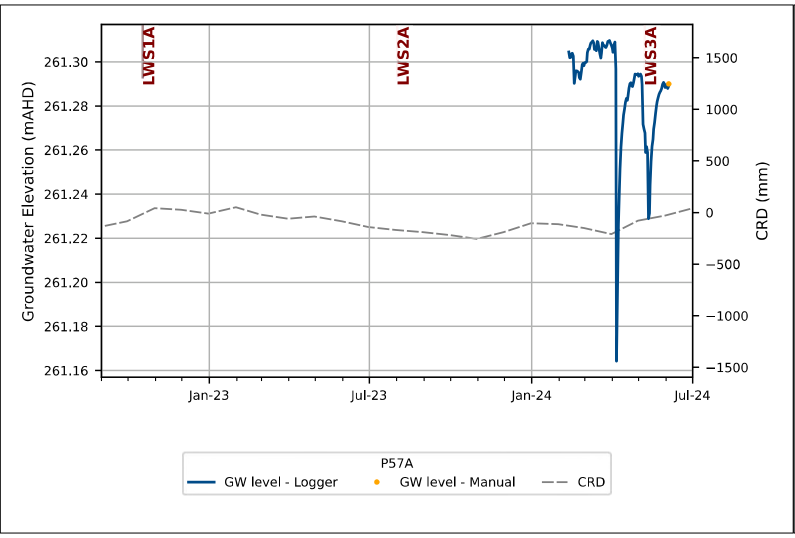

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
275
270
265
260
255
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
262
260
258
256
254
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

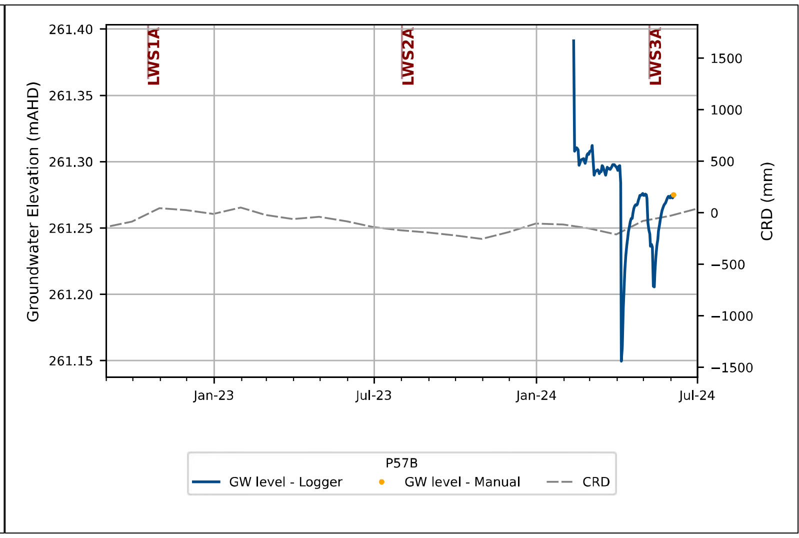

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
290
288
286
284
282
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P56A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
290.0
287.5
285.0
282.5
280.0
277.5
275.0
272.5
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P56B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD

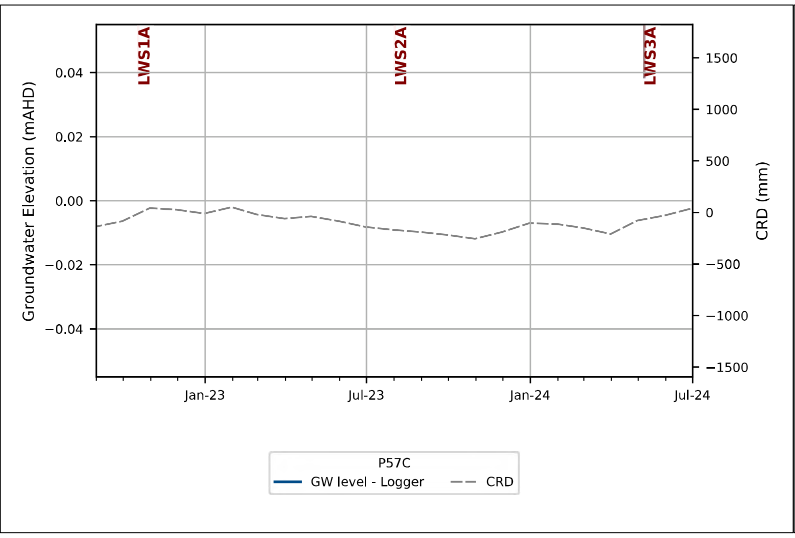

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
260
258
256
254
252
250
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P56C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD



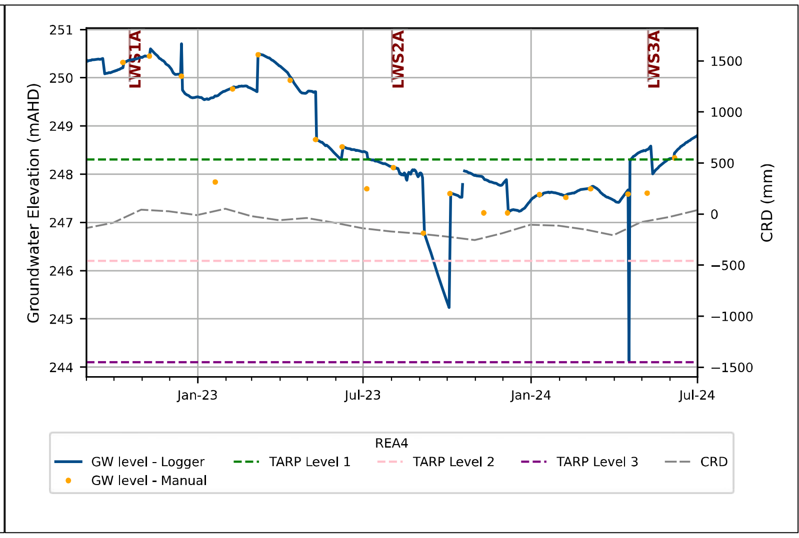
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
P57A
GW level - Logger
GW level - Manual
CRD



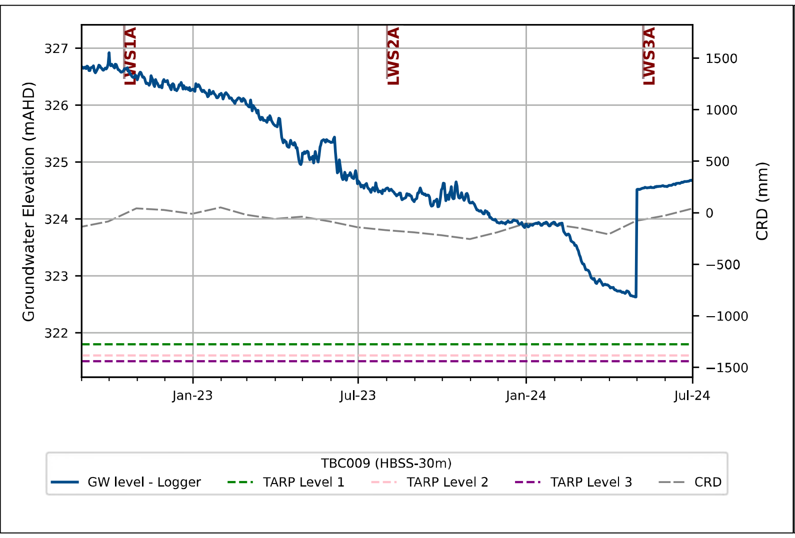
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
P57B
GW level - Logger
GW level - Manual
CRD



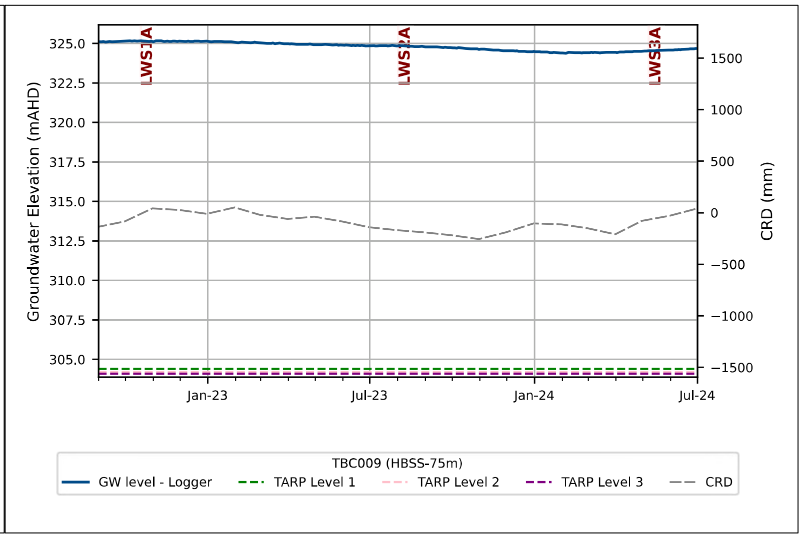
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
P57C
GW level - Logger
CRD



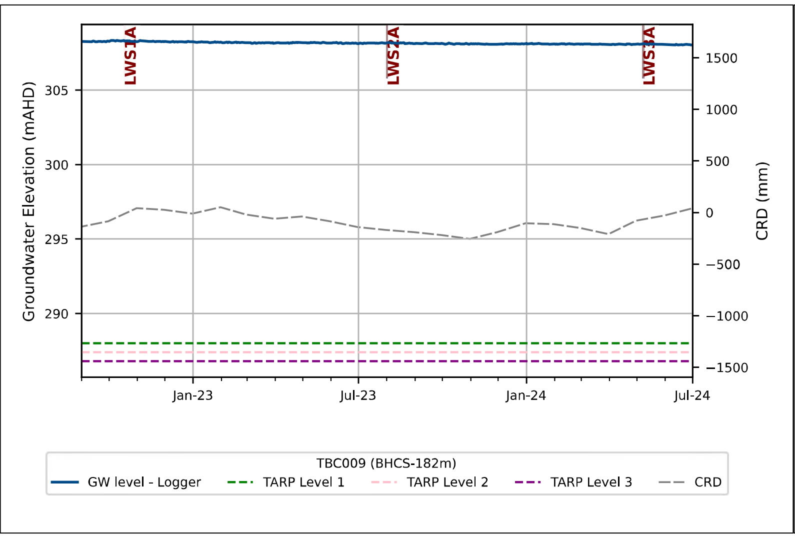
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
REA4
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
GW level - Manual

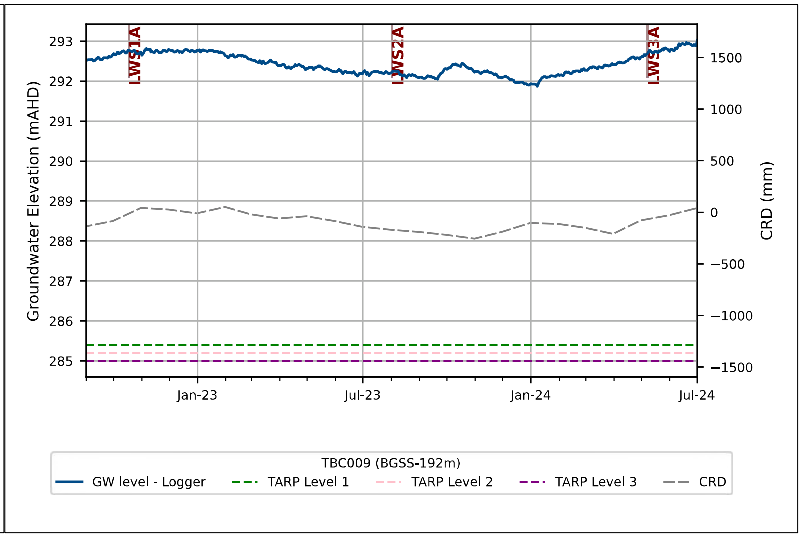


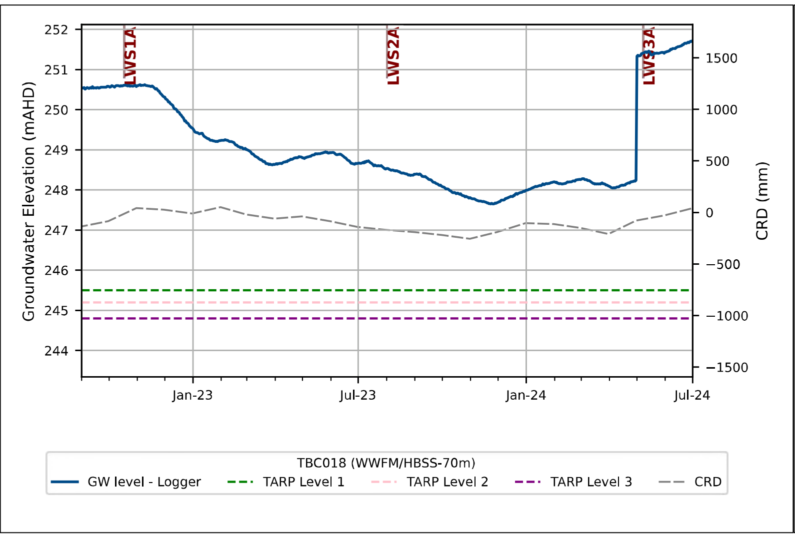
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
TBC009 (HBSS-30m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

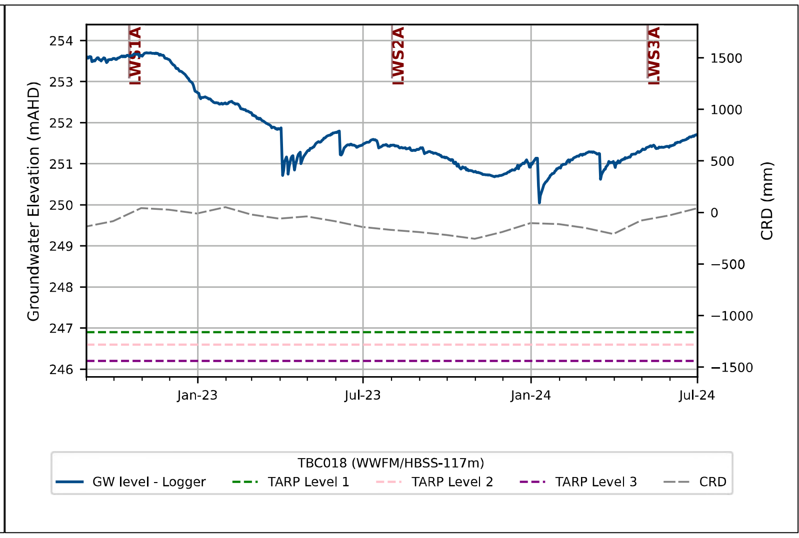


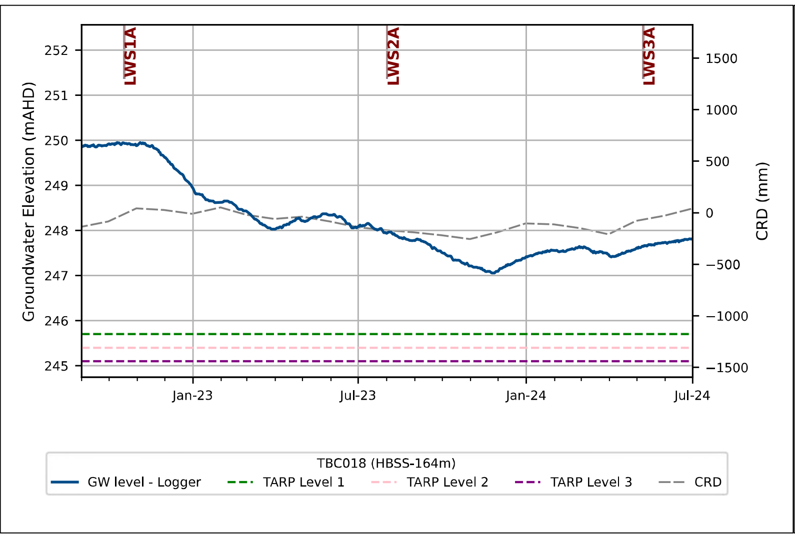
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
TBC009 (HBSS-75m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

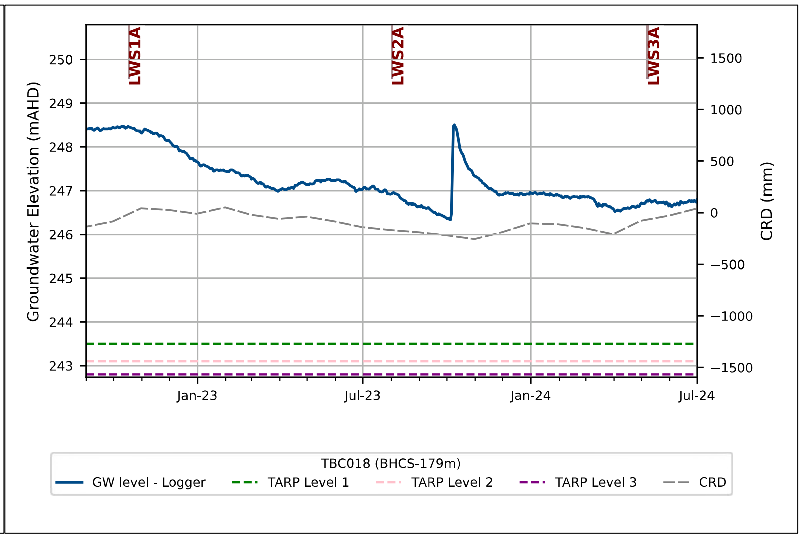

Groundwater Elevation (mAHD)
305
300
295
290
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (BHCS-182m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

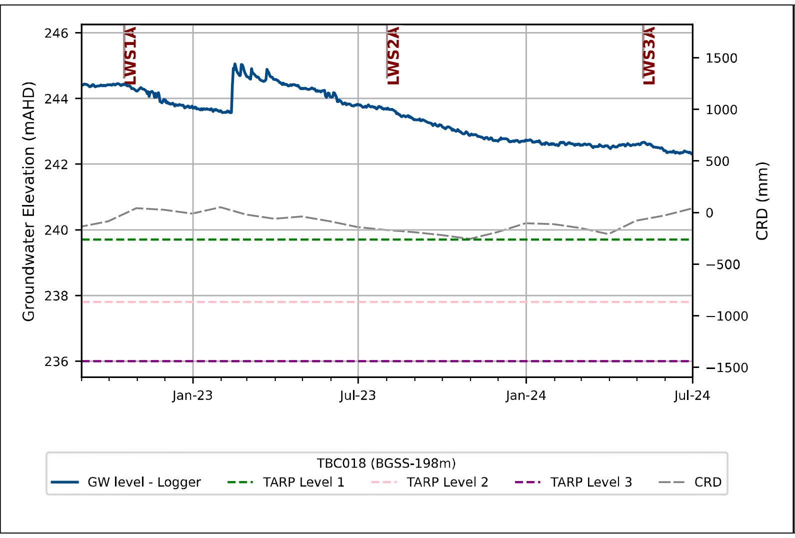

Groundwater Elevation (mAHD)
293
292
291
290
289
288
287
286
285
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (BGSS-192m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

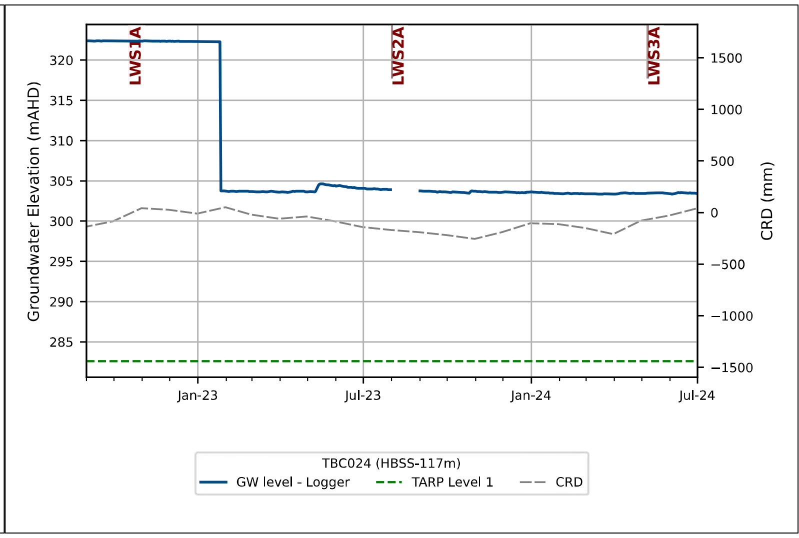

Groundwater Elevation (mAHD)
252
251
250
249
248
247
246
245
244
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (WWFM/HBSS-70m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

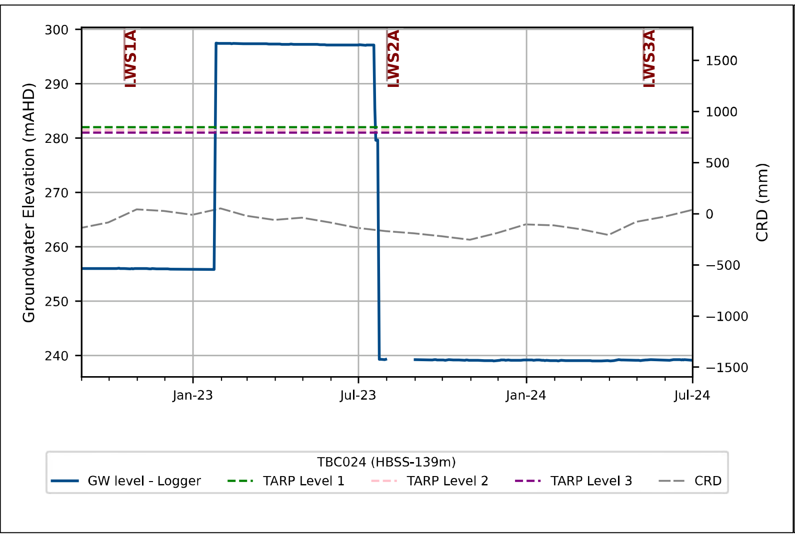

Groundwater Elevation (mAHD)
254
253
252
251
250
249
248
247
246
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (WWFM/HBSS-117m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

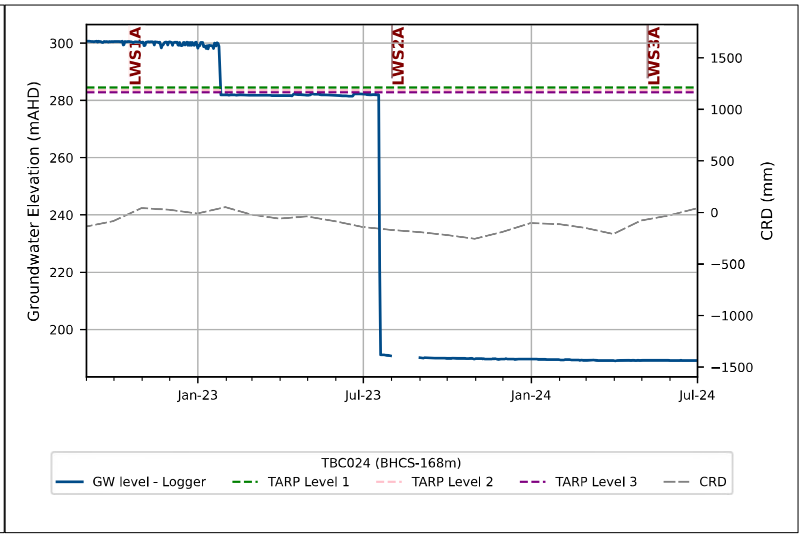

Groundwater Elevation (mAHD)
252
251
250
249
248
247
246
245
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (HBSS-164m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

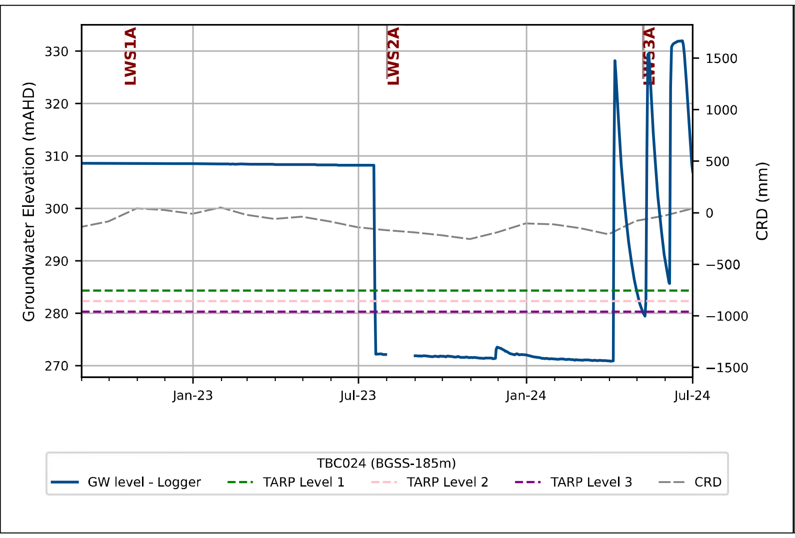

Groundwater Elevation (mAHD)
250
249
248
247
246
245
244
243
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (BHCS-179m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

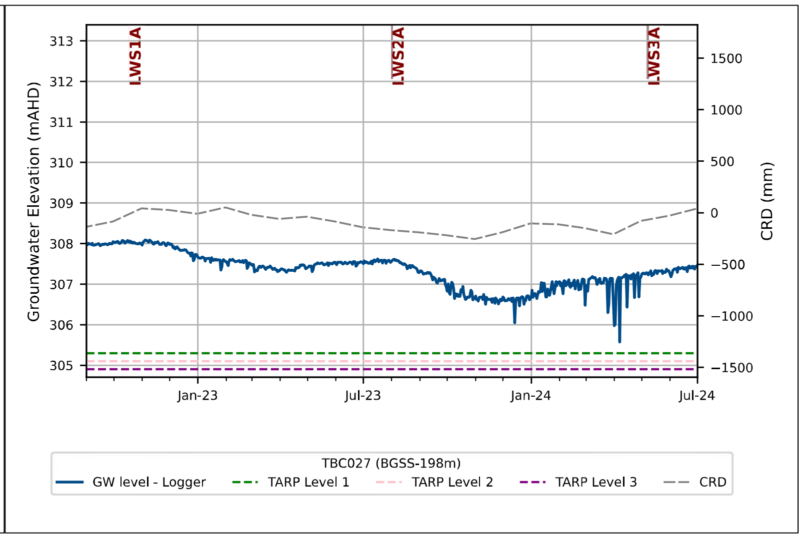

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
246
244
242
240
238
236
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (BGSS-198m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

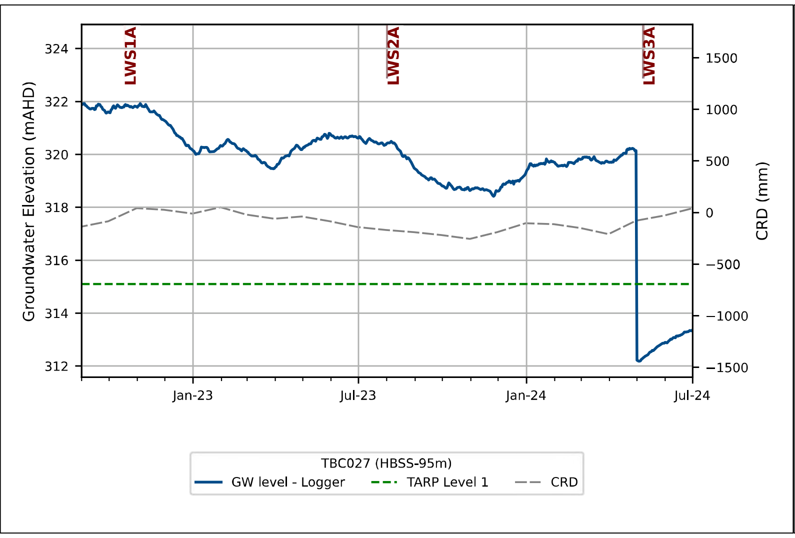

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
320
315
310
305
300
295
290
285
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC024 (HBSS-117m)
GW level - Logger
TARP Level 1
CRD

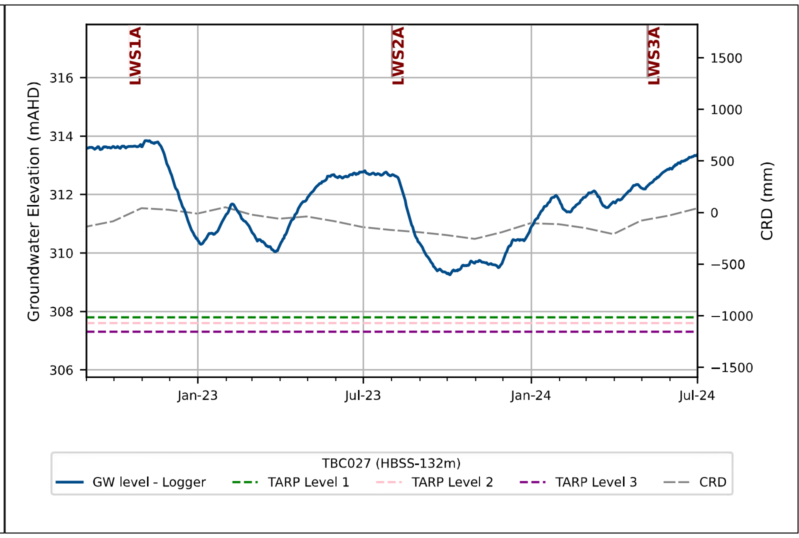

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
300
290
280
270
260
250
240
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC024 (HBSS-139m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

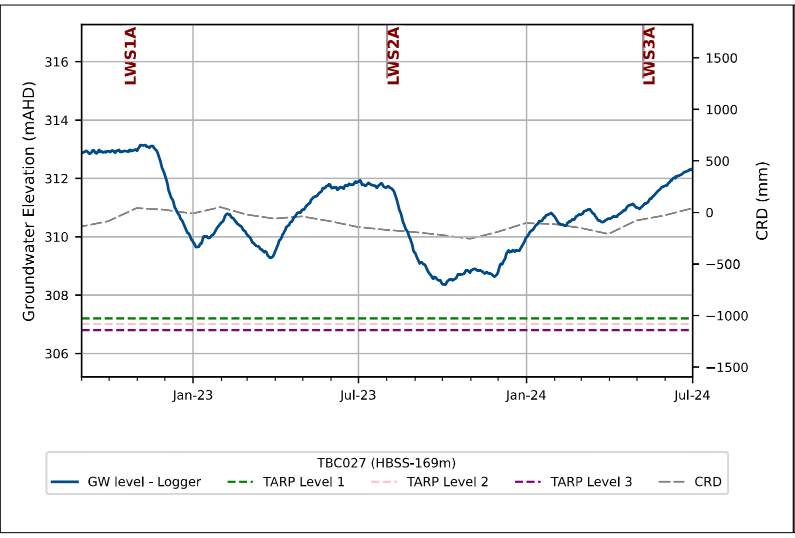

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
300
280
260
240
220
200
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC024 (BHCS-168m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

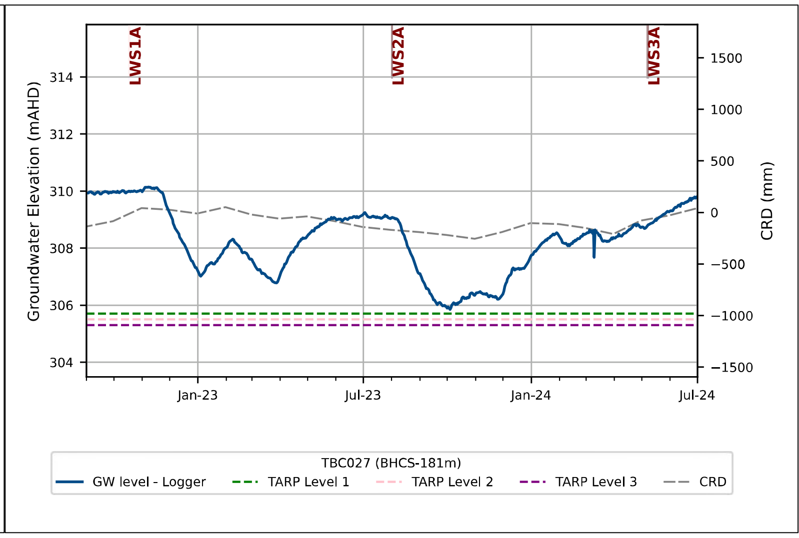

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
330
320
310
300
290
280
270
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC024 (BGSS-185m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

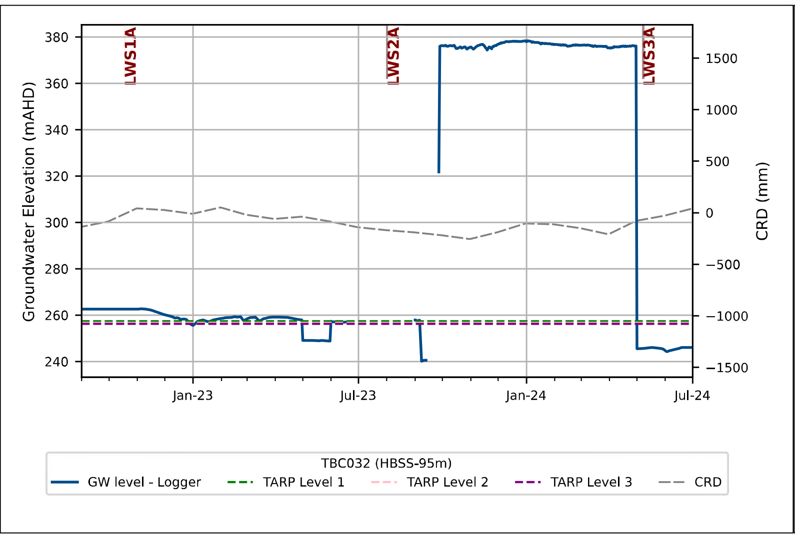

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
313
312
311
310
309
308
307
306
305
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC027 (BGSS-198m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

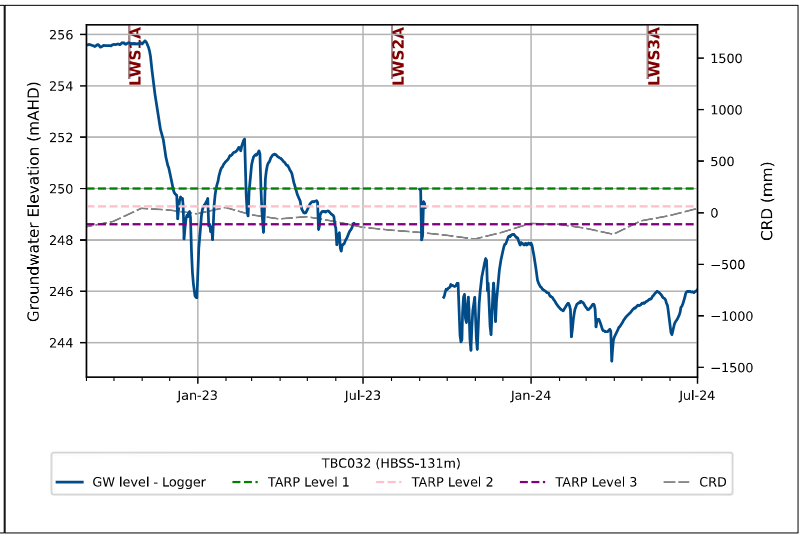

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC027 (HBSS-95m)
GW level - Logger
TARP Level 1
CRD

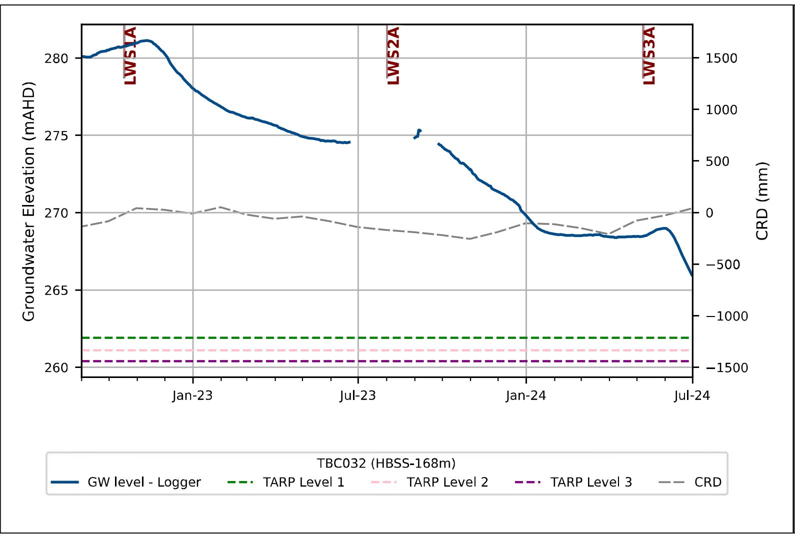

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC027 (HBSS-132m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

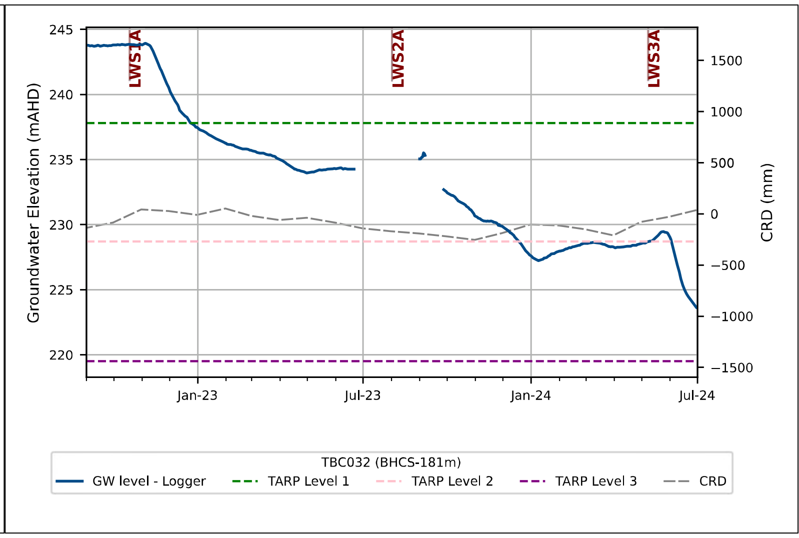

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC027 (HBSS-169m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

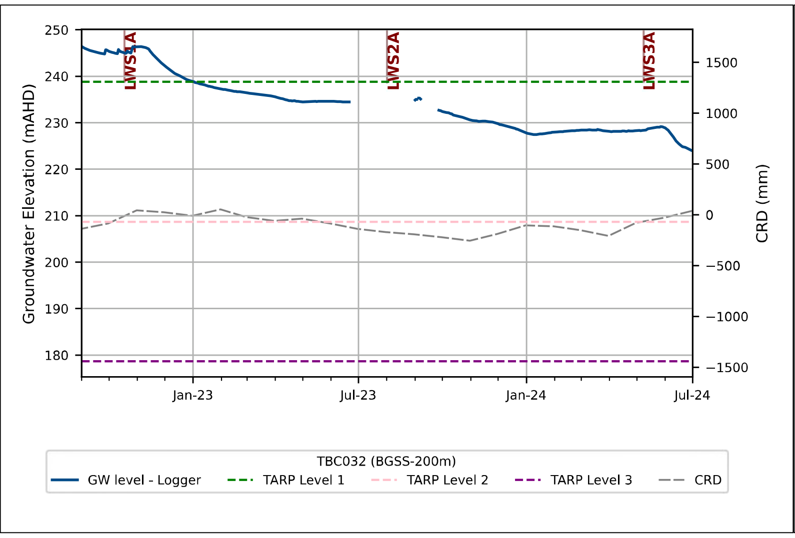

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC027 (BHCS-181m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

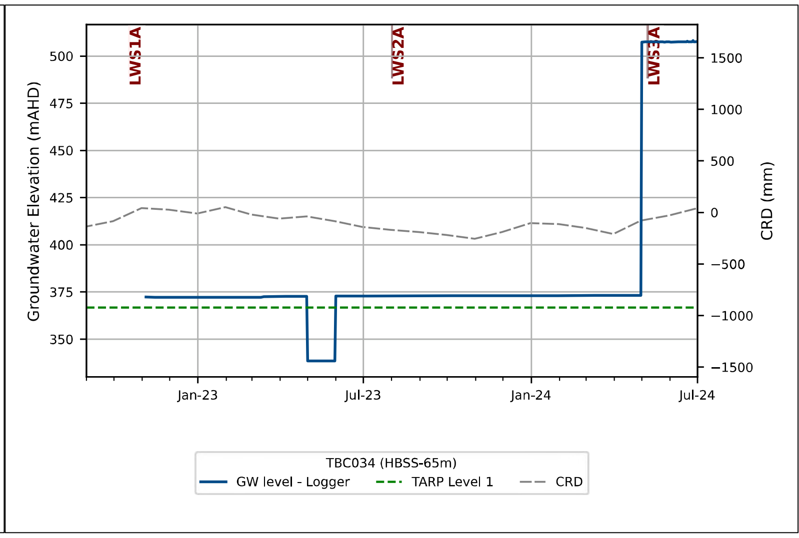

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (HBSS-95m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

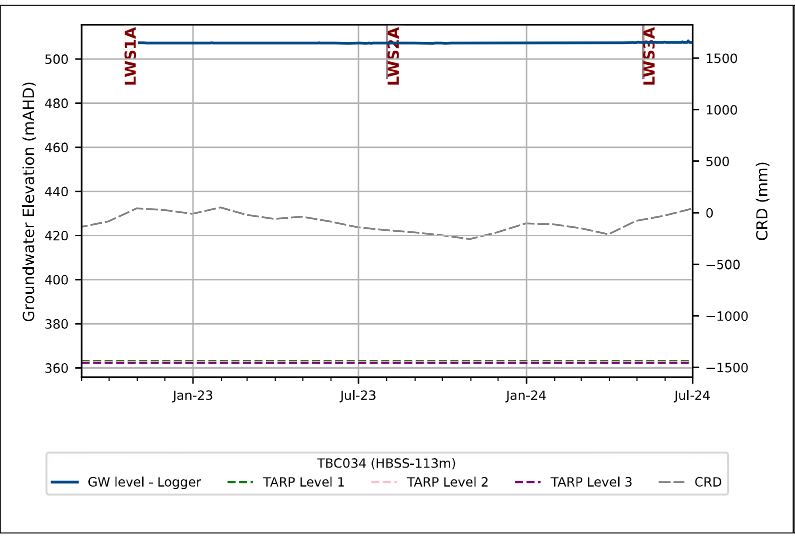

LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (HBSS-131m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

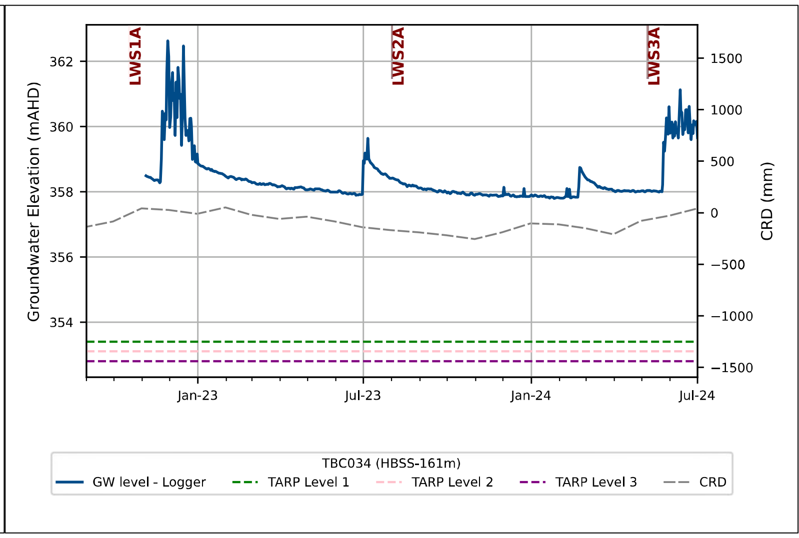

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
280
275
270
265
260
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (HBSS-168m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

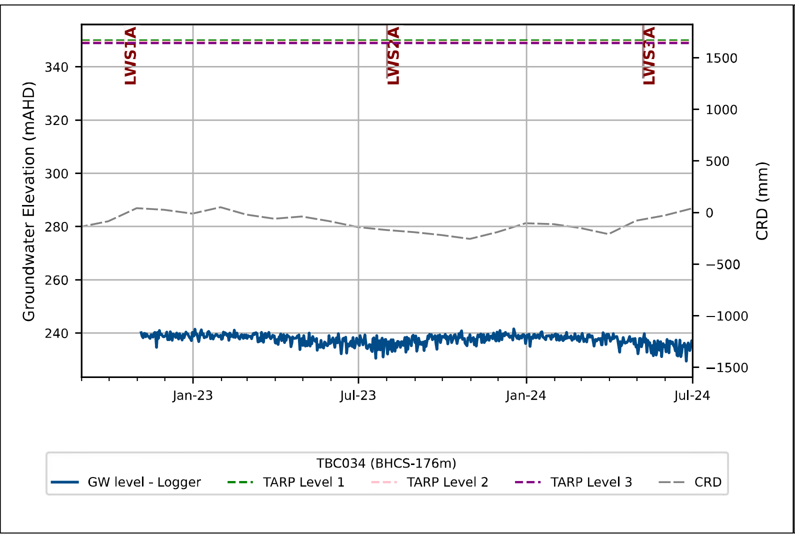

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
245
240
235
230
225
220
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (BHCS-181m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
250
240
230
220
210
200
190
180
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (BGSS-200m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

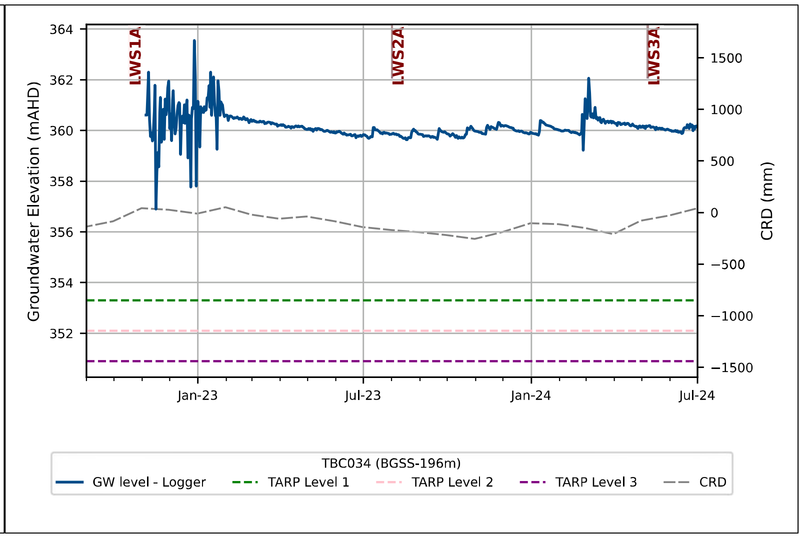

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
500
475
450
425
400
375
350
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC034 (HBSS-65m)
GW level - Logger
TARP Level 1
CRD


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
500
480
460
440
420
400
380
360
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC034 (HBSS-113m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

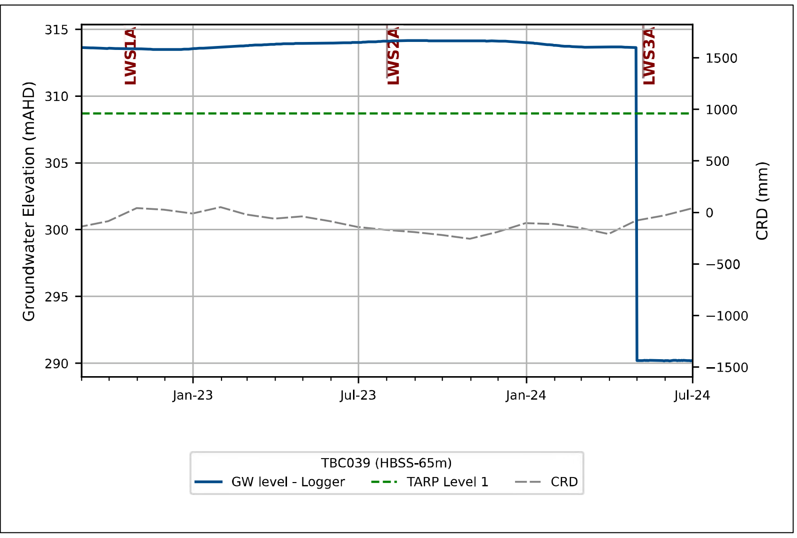

Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
LWS3A
362
360
358
356
354
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
TBC034 (HBSS-161m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD



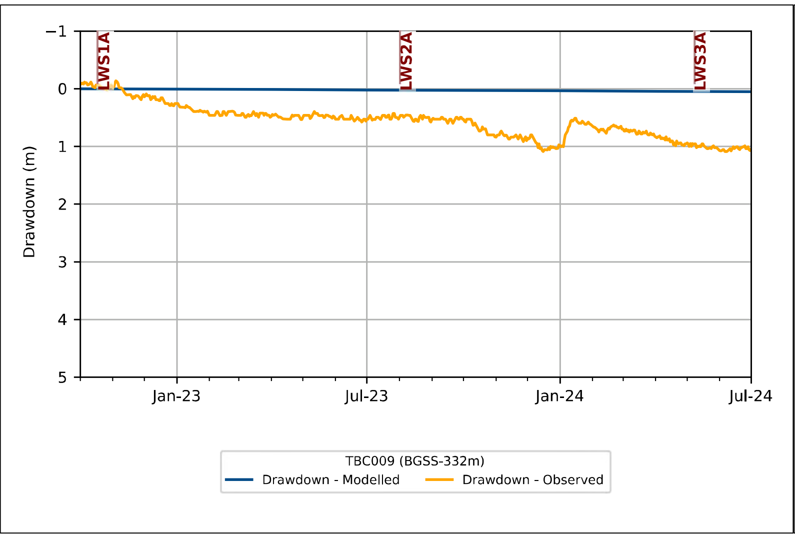
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC034 (BHCS-176m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

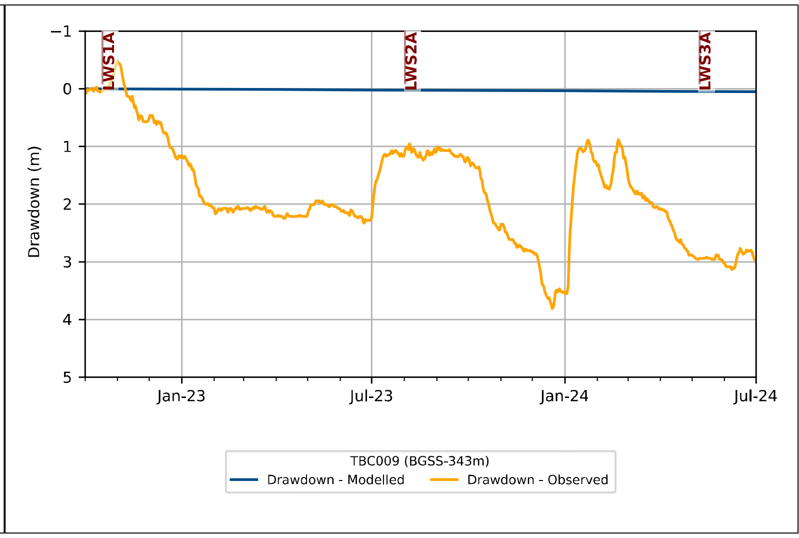


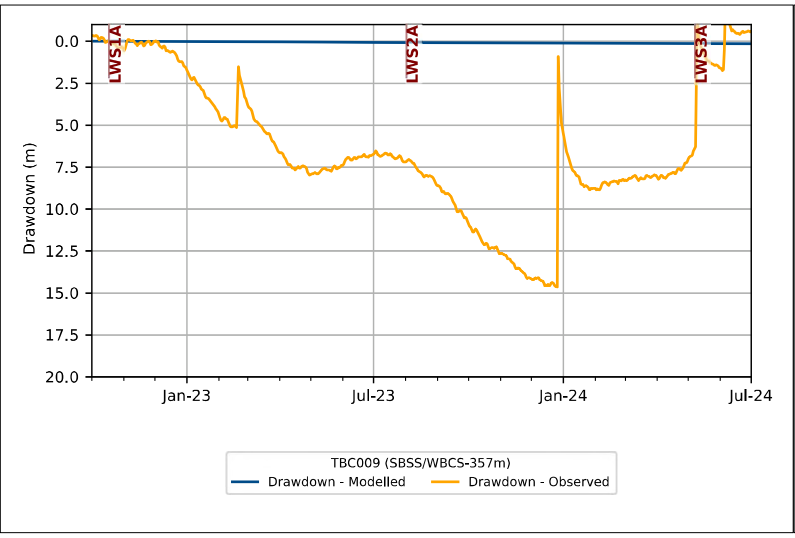
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC034 (BGSS-196m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD

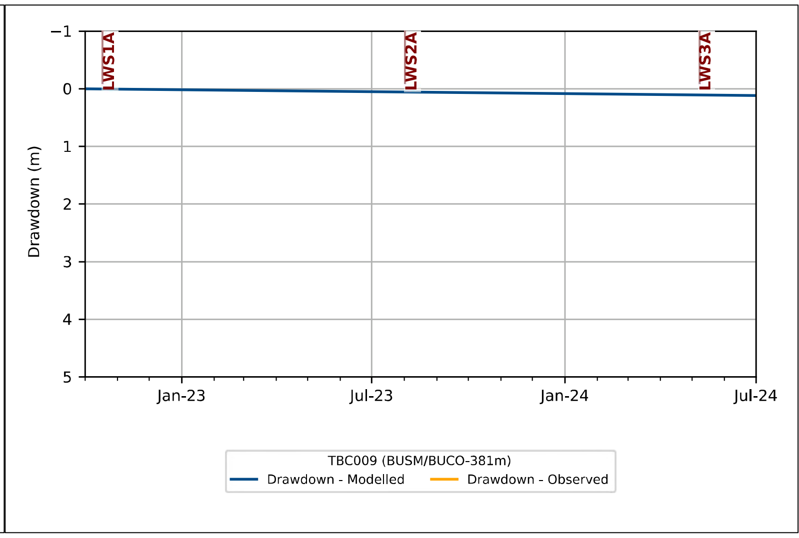


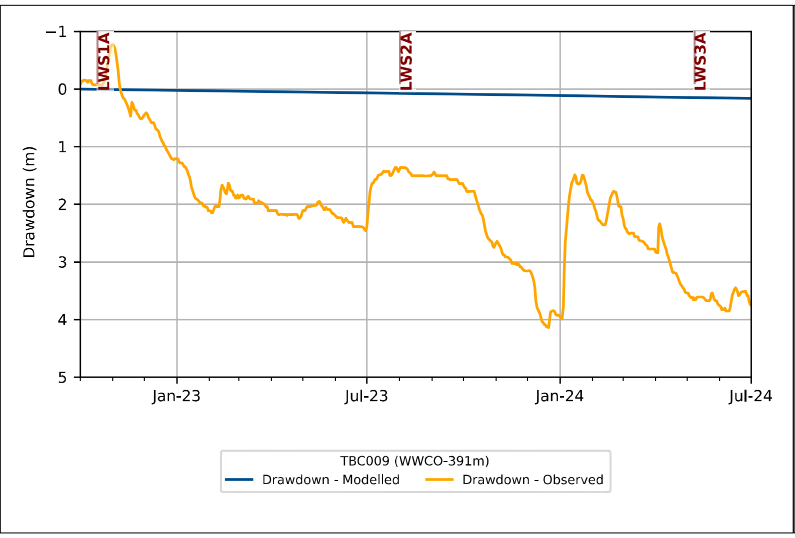
LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (HBSS-65m)
GW level - Logger
TARP Level 1
CRD

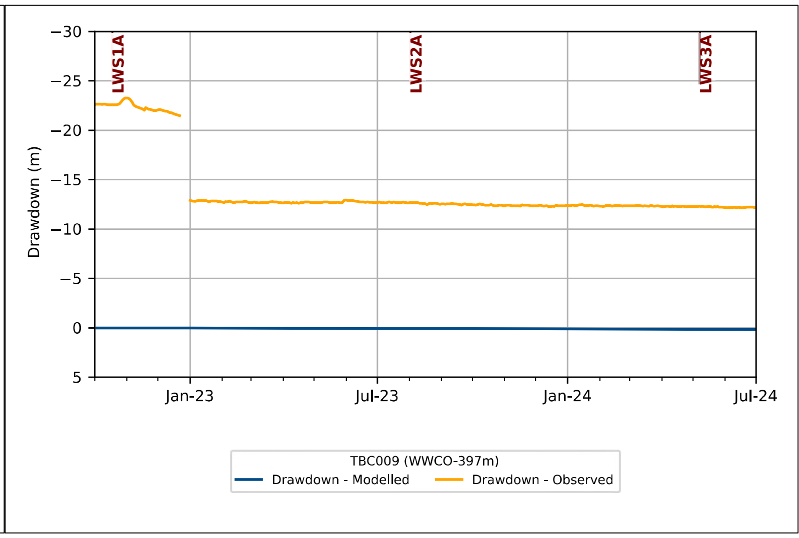

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (BGSS-332m)
Drawdown - Modelled
Drawdown - Observed

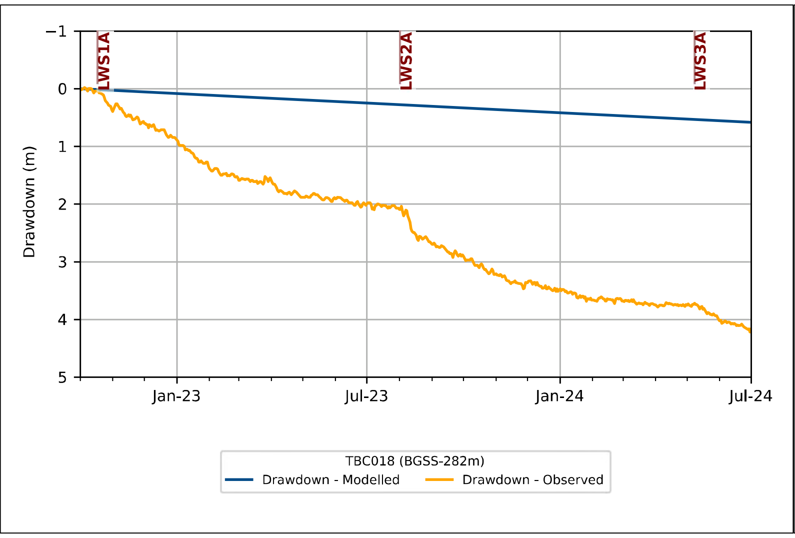

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (BGSS-343m)
Drawdown - Modelled
Drawdown - Observed

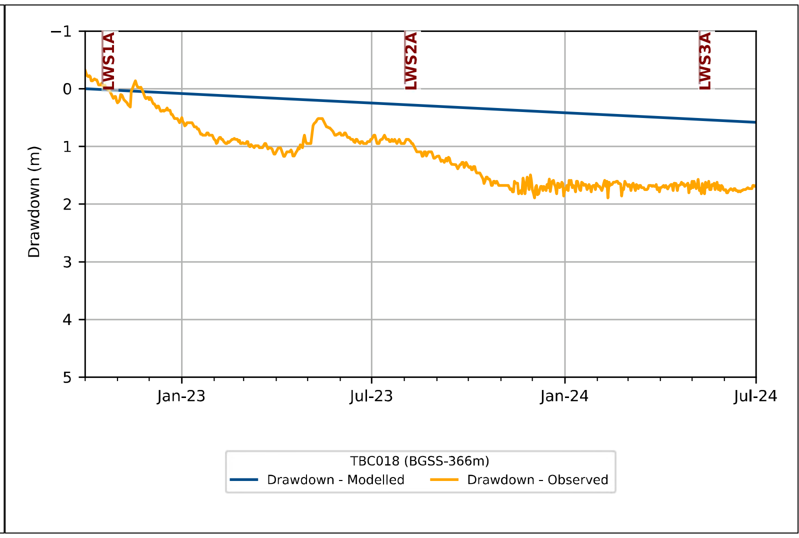

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (SBSS/WBCS-357m)
Drawdown - Modelled
Drawdown - Observed

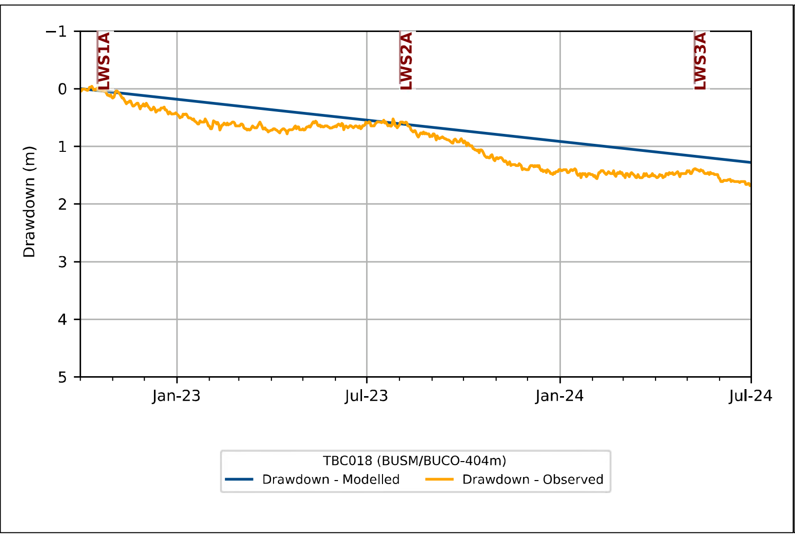

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (BUSM/BUCO-381m)
Drawdown - Modelled
Drawdown - Observed

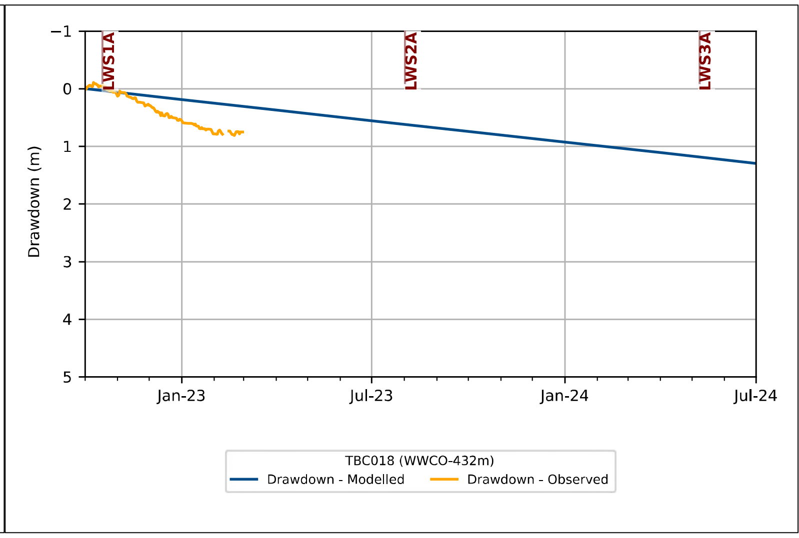

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (WWCO-391m)
Drawdown - Modelled
Drawdown - Observed

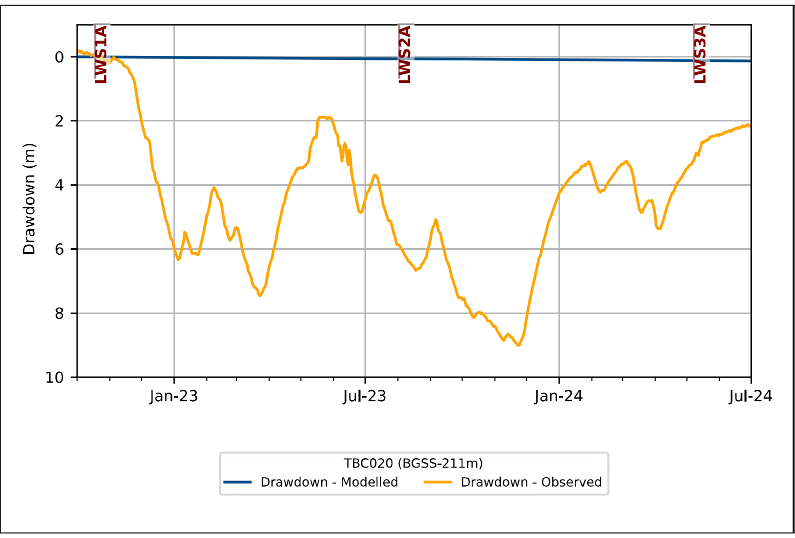

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC009 (WWCO-397m)
Drawdown - Modelled
Drawdown - Observed

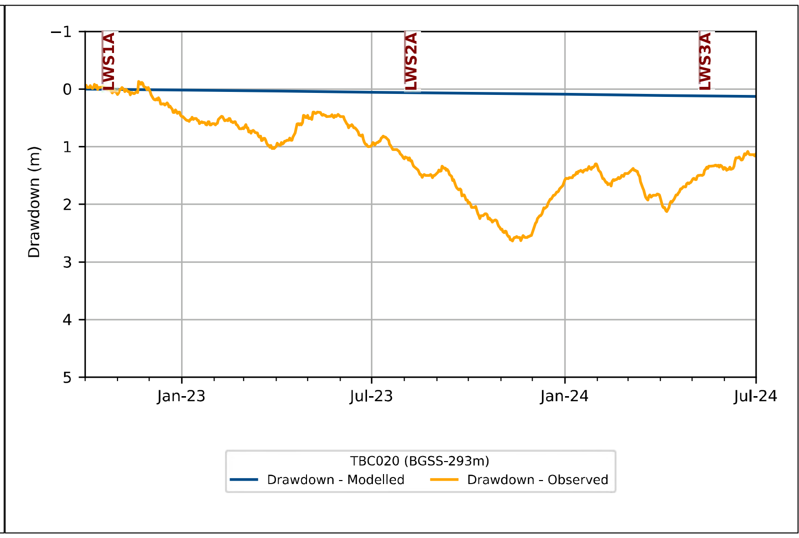

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (BGSS-282m)
Drawdown - Modelled
Drawdown - Observed

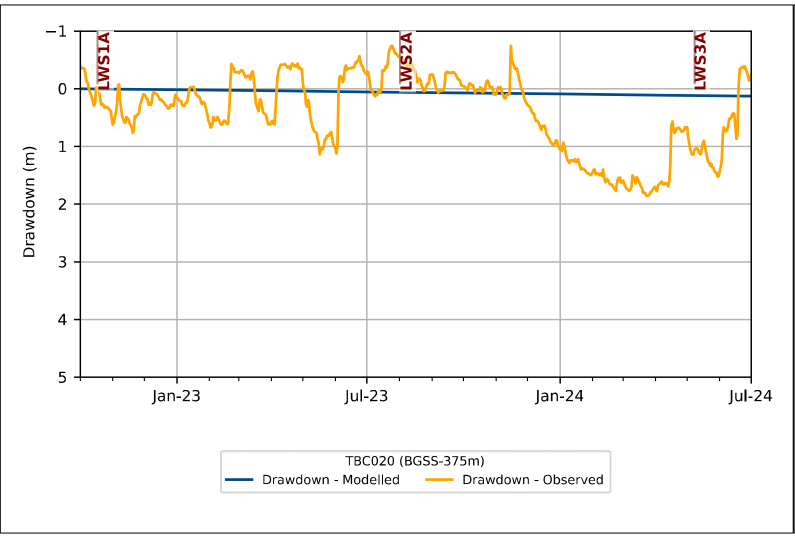

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (BGSS-366m)
Drawdown - Modelled
Drawdown - Observed

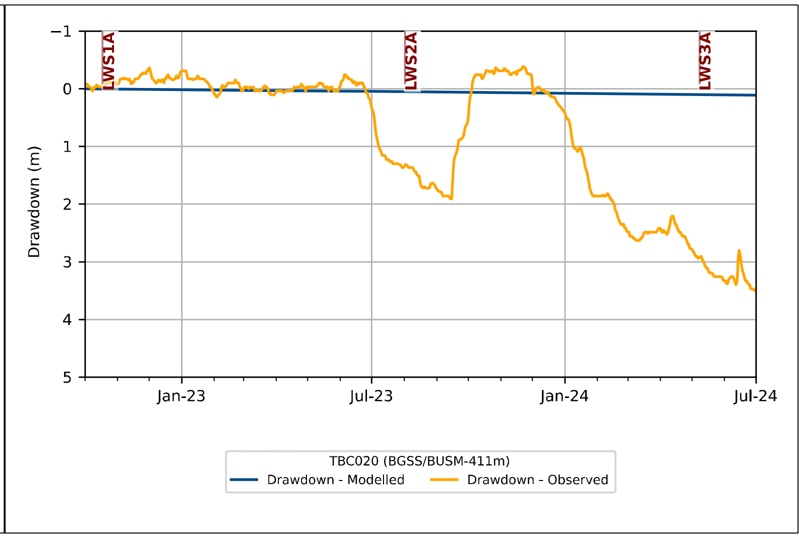

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (BUSM/BUCO-404m)
Drawdown - Modelled
Drawdown - Observed

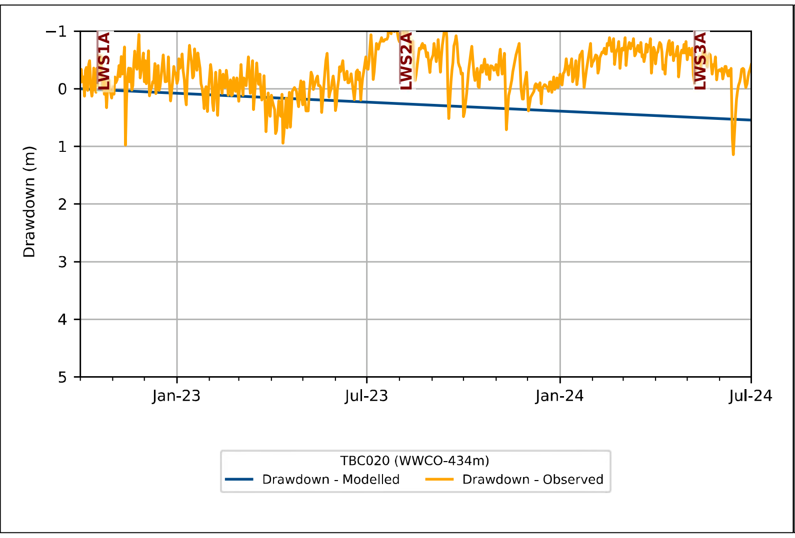

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (WWCO-432m)
Drawdown - Modelled
Drawdown - Observed

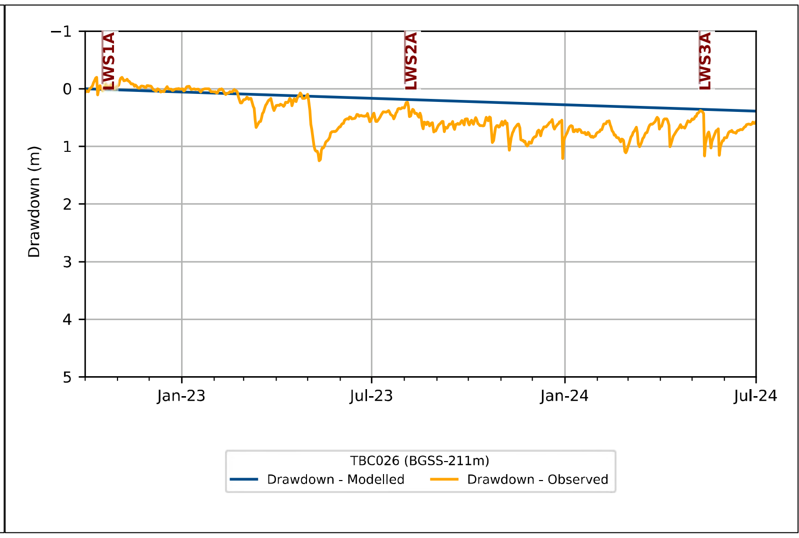

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (BGSS-211m)
Drawdown - Modelled
Drawdown - Observed

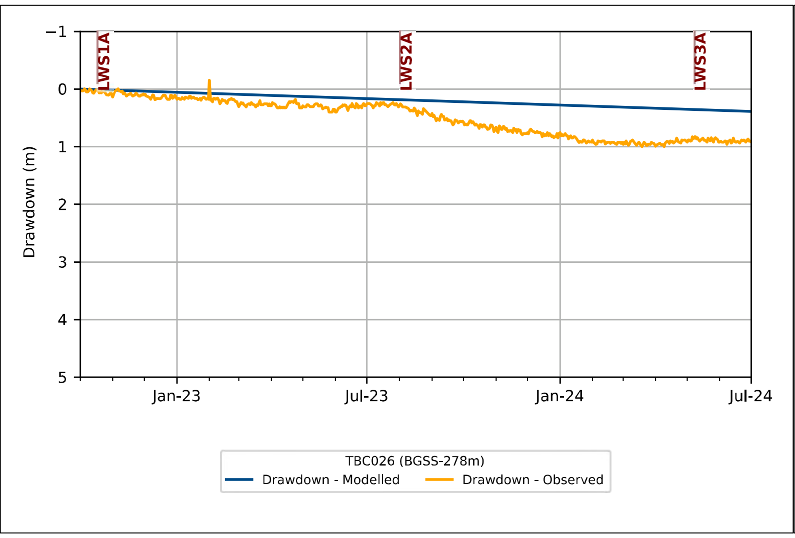

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (BGSS-293m)
Drawdown - Modelled
Drawdown - Observed

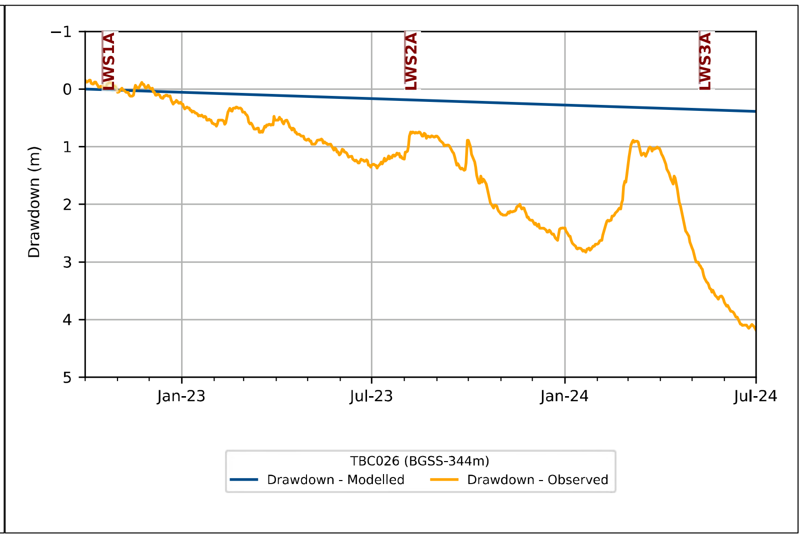

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (BGSS-375m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (BGSS/BUSM-411m)
Drawdown - Modelled
Drawdown - Observed

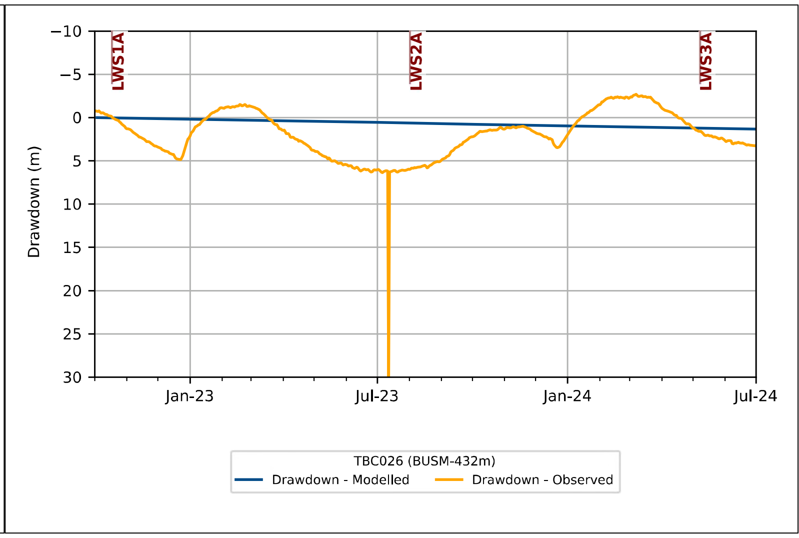

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (WWCO-434m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (BGSS-211m)
Drawdown - Modelled
Drawdown - Observed

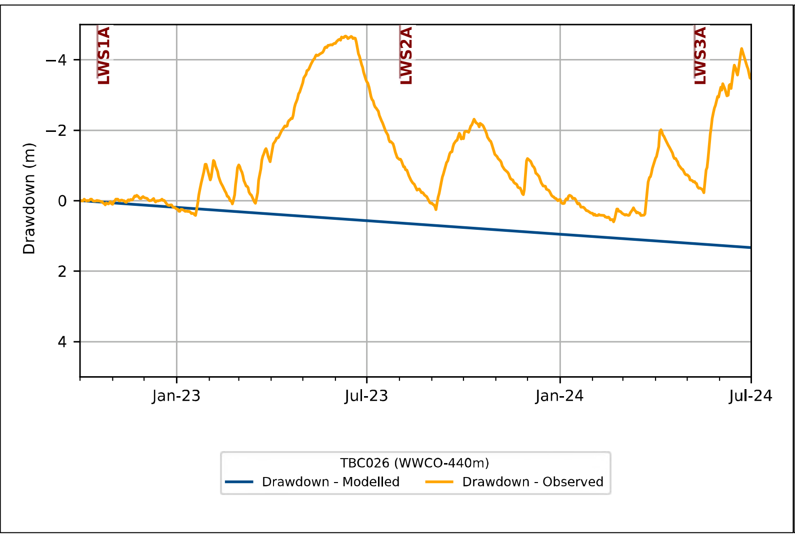

LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (BGSS-278m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (BGSS-344m)
Drawdown - Modelled
Drawdown - Observed

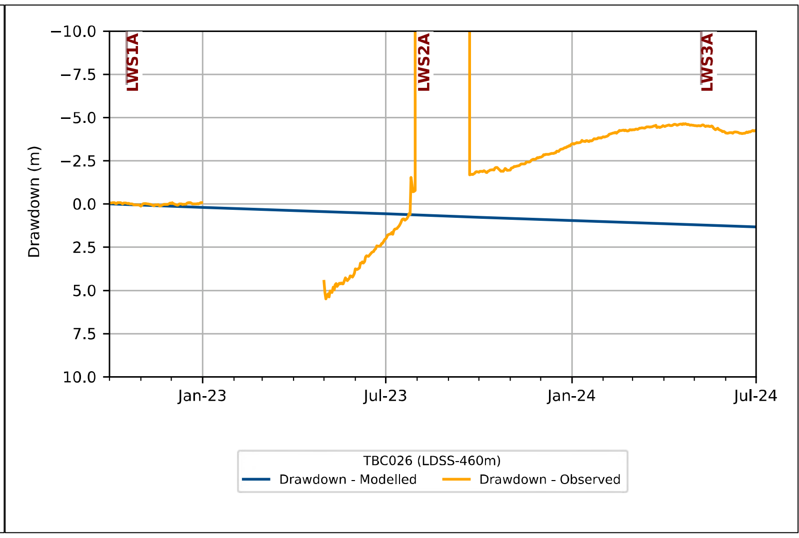
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (WBCS-409m)
Drawdown - Modelled
Drawdown - Observed



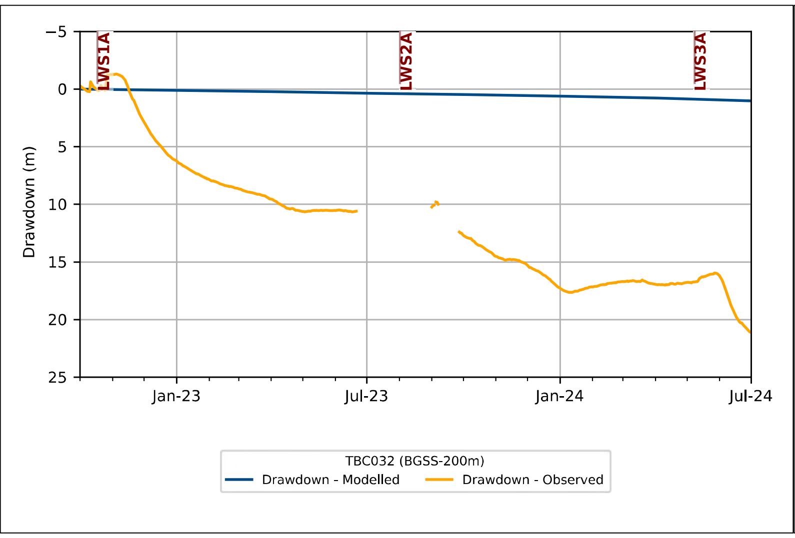
Drawdown (m)
−10
−5
0
5
10
15
20
25
30
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (BUSM-432m)
Drawdown - Modelled
Drawdown - Observed



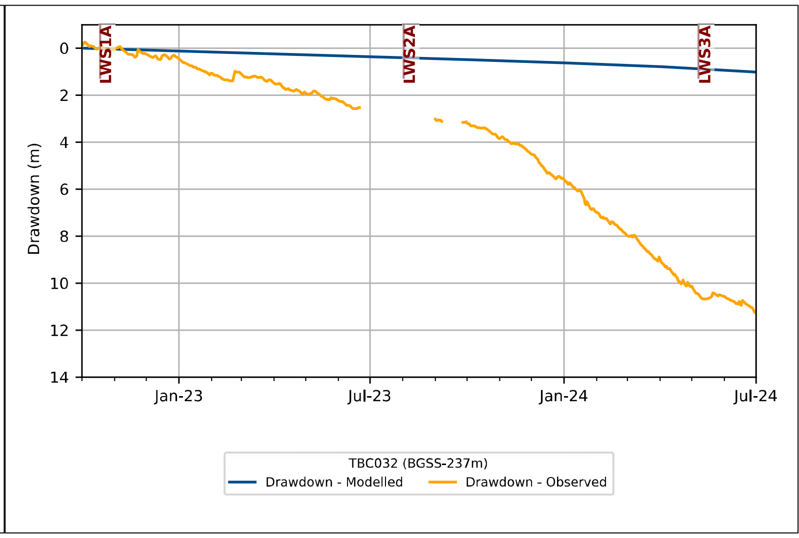
Drawdown (m)
−4
−2
0
2
4
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (WWCO-440m)
Drawdown - Modelled
Drawdown - Observed



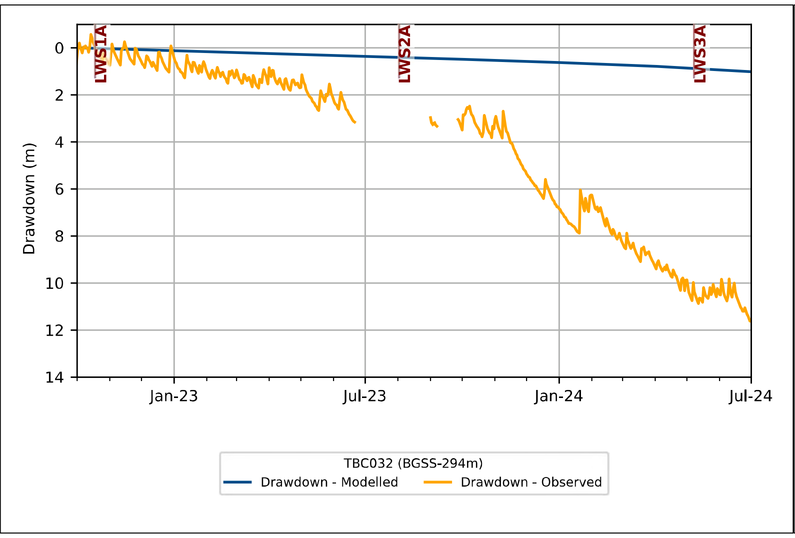
Drawdown (m)
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC026 (LDSS-460m)
Drawdown - Modelled
Drawdown - Observed



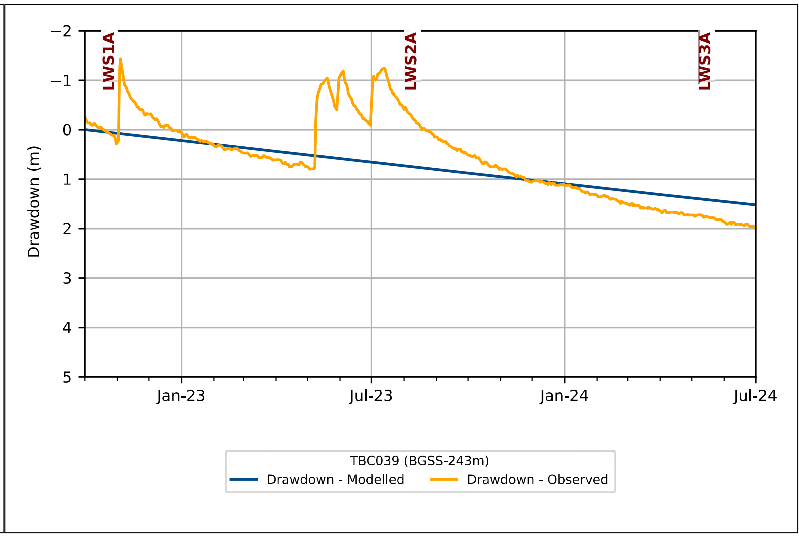
Drawdown (m)
−5
0
5
10
15
20
25
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (BGSS-200m)
Drawdown - Modelled
Drawdown - Observed



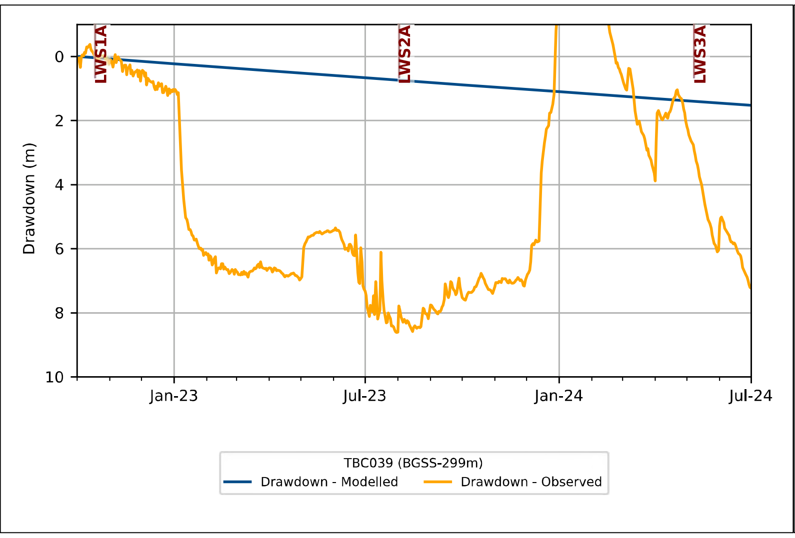
Drawdown (m)
0
2
4
6
8
10
12
14
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (BGSS-237m)
Drawdown - Modelled
Drawdown - Observed



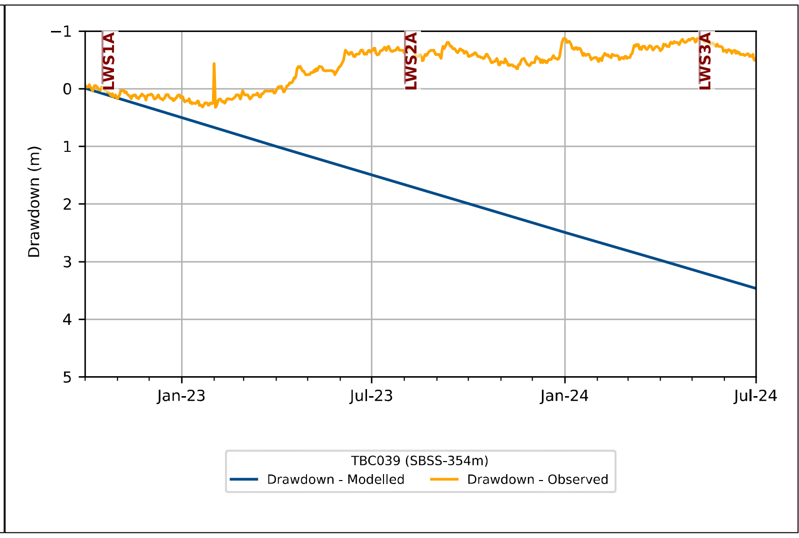
Drawdown (m)
LWS1A
LWS2A
LWS3A
0
2
4
6
8
10
12
14
Jan-23
Jul-23
Jan-24
Jul-24
TBC032 (BGSS-294m)
Drawdown - Modelled
Drawdown - Observed



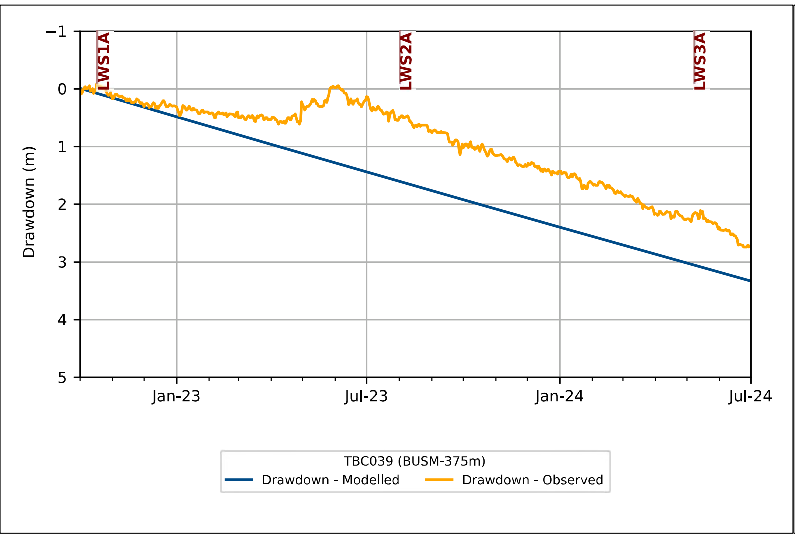
Drawdown (m)
LWS1A
LWS2A
LWS3A
−2
−1
0
1
2
3
4
5
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (BGSS-243m)
Drawdown - Modelled
Drawdown - Observed



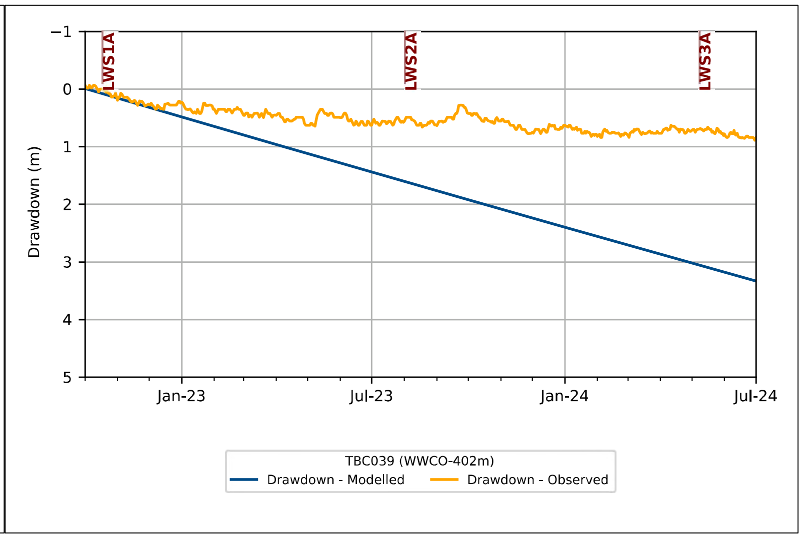
Drawdown (m)
LWS1A
LWS2A
LWS3A
0
2
4
6
8
10
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (BGSS-299m)
Drawdown - Modelled
Drawdown - Observed



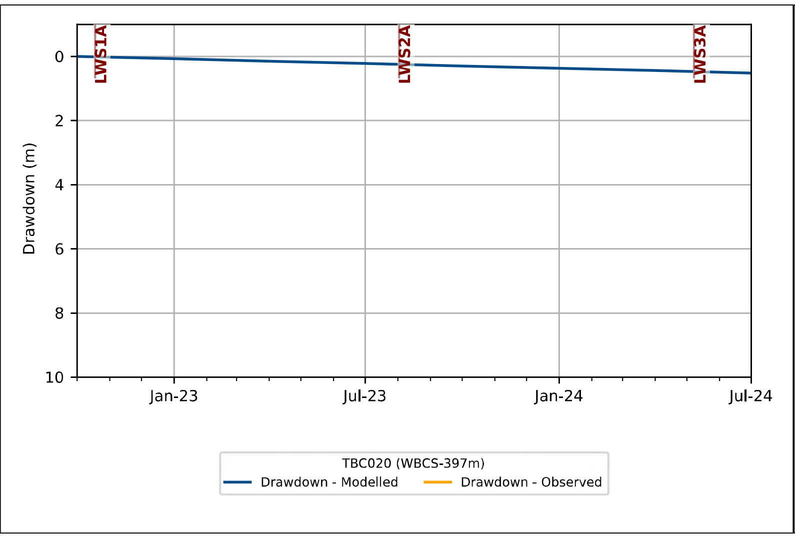
Drawdown (m)
LWS1A
LWS2A
LWS3A
−1
0
1
2
3
4
5
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (SBSS-354m)
Drawdown - Modelled
Drawdown - Observed

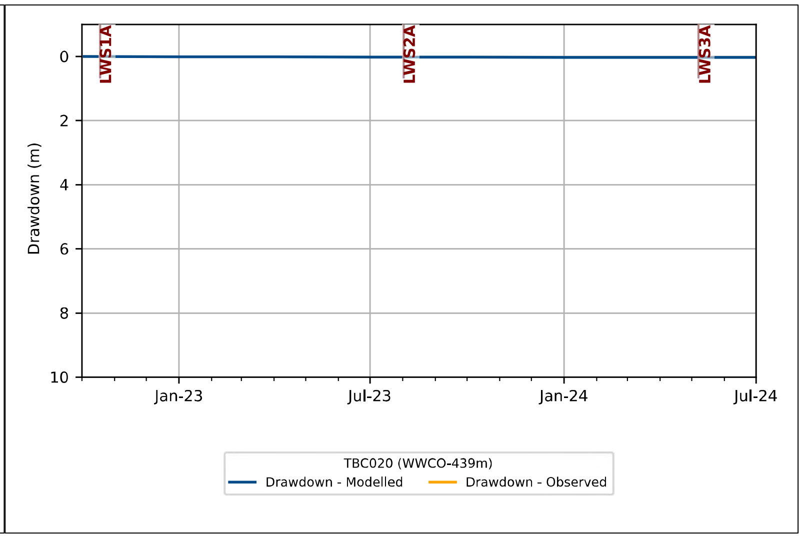


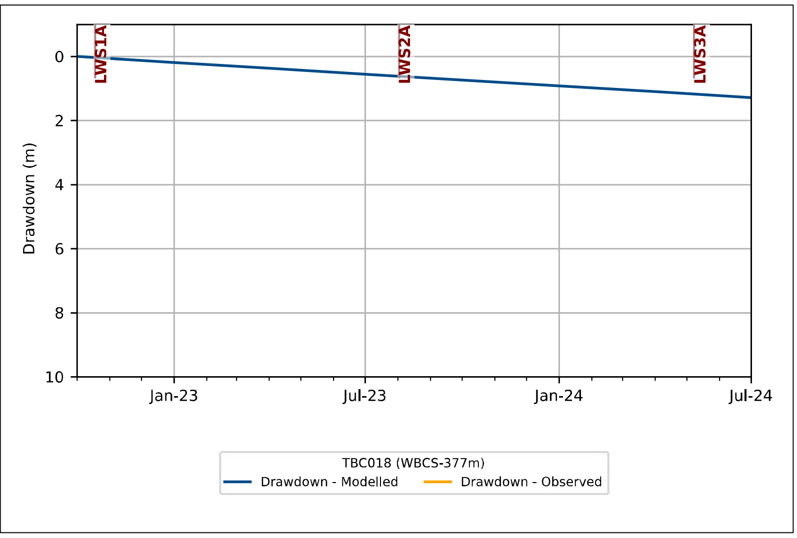
Drawdown (m)
LWS1A
LWS2A
LWS3A
−1
0
1
2
3
4
5
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (BUSM-375m)
Drawdown - Modelled
Drawdown - Observed



Drawdown (m)
LWS1A
LWS2A
LWS3A
−1
0
1
2
3
4
5
Jan-23
Jul-23
Jan-24
Jul-24
TBC039 (WWCO-402m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
0
2
4
6
8
10
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (WBCS-397m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
0
2
4
6
8
10
Jan-23
Jul-23
Jan-24
Jul-24
TBC020 (WWCO-439m)
Drawdown - Modelled
Drawdown - Observed


LWS1A
LWS2A
LWS3A
Drawdown (m)
0
2
4
6
8
10
Jan-23
Jul-23
Jan-24
Jul-24
TBC018 (WBCS-377m)
Drawdown - Modelled
Drawdown - Observed

Appendix E Temporal Groundwater Quality Plots

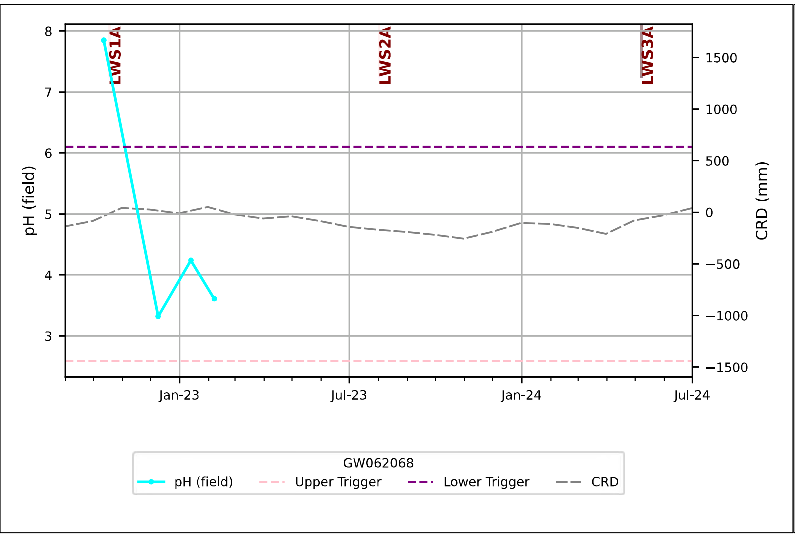
Six-Monthly Groundwater Report: January – June 2024

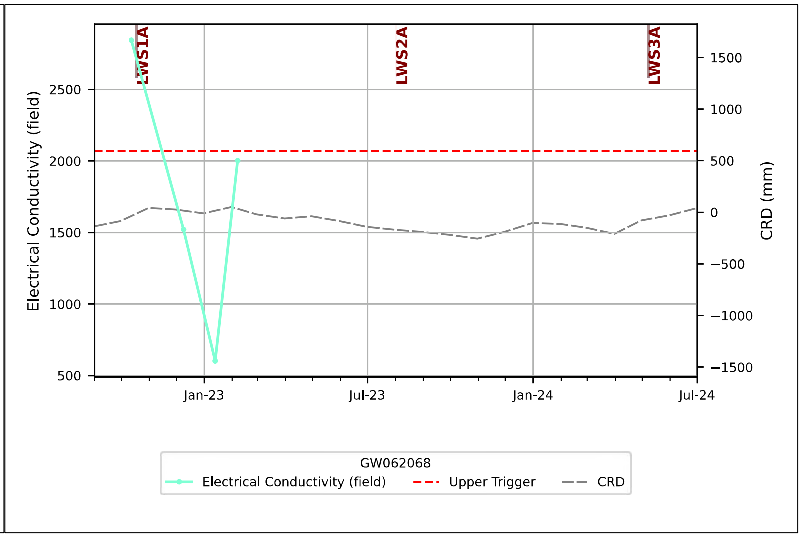
Tahmoor South Domain

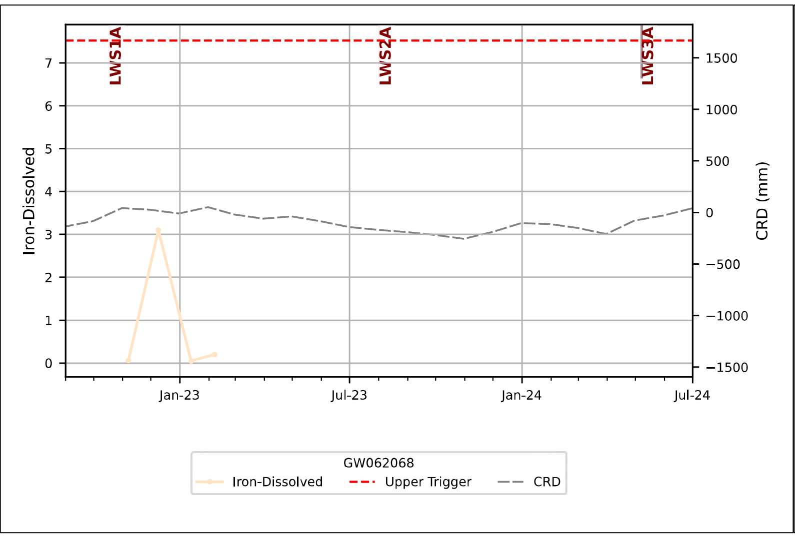
Tahmoor Coal Pty Ltd

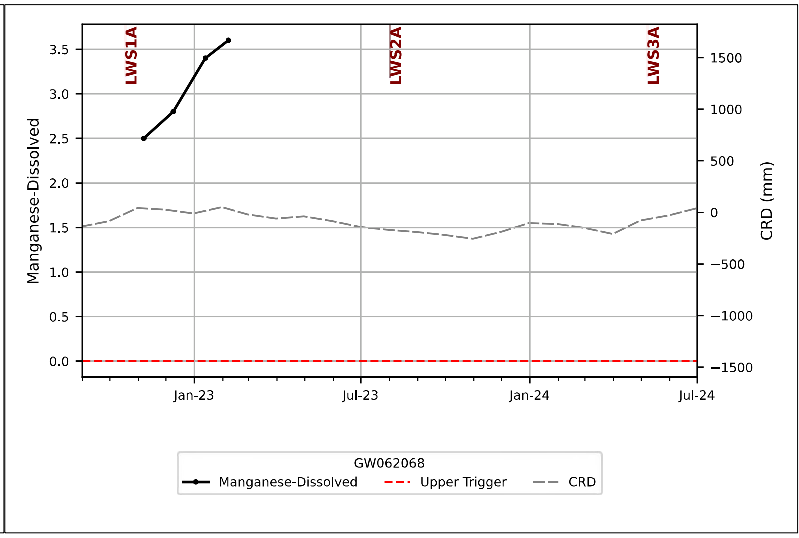
SLR Project No.: 640.30614.00001

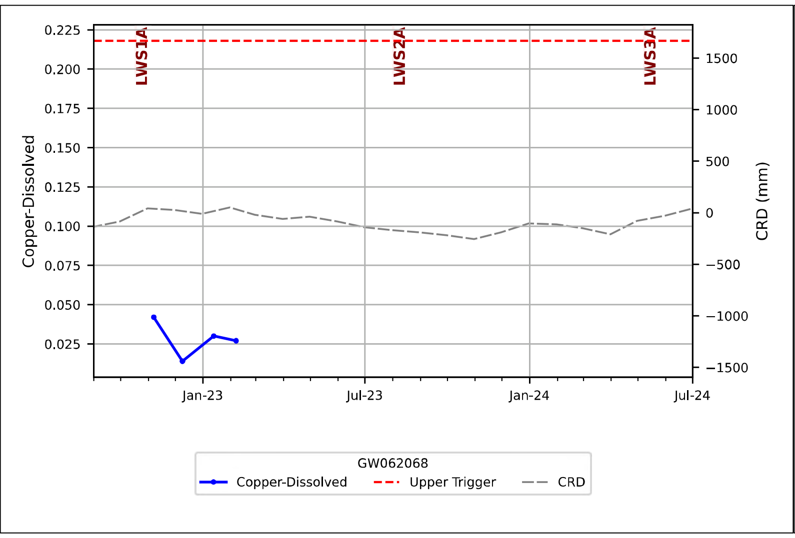
25 September 2024

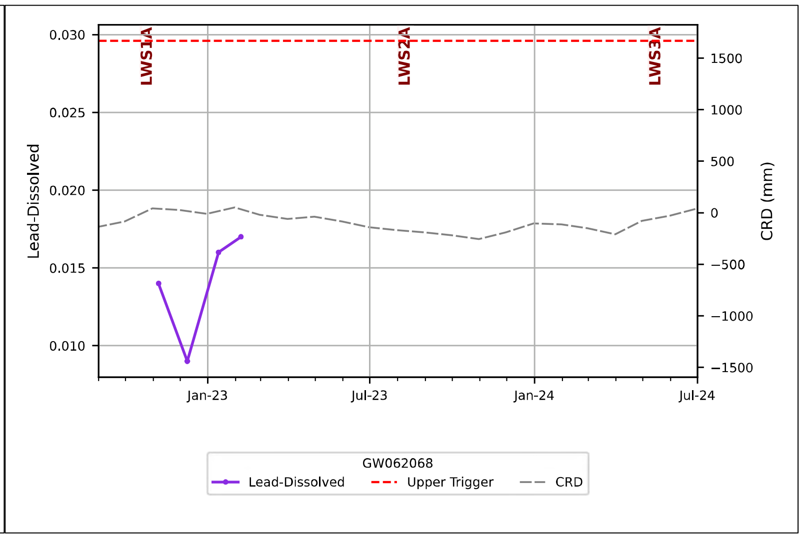

LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
pH (field)
Upper Trigger
Lower Trigger
CRD

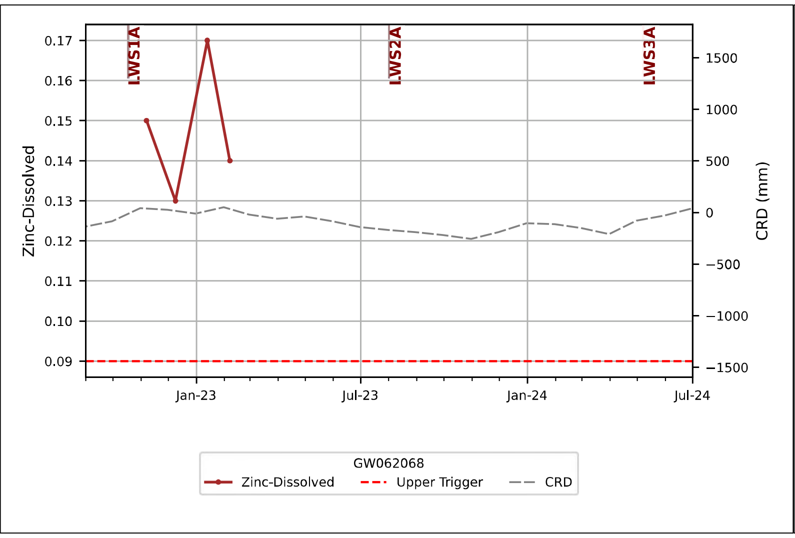

LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Electrical Conductivity (field)
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Iron-Dissolved
Upper Trigger
CRD

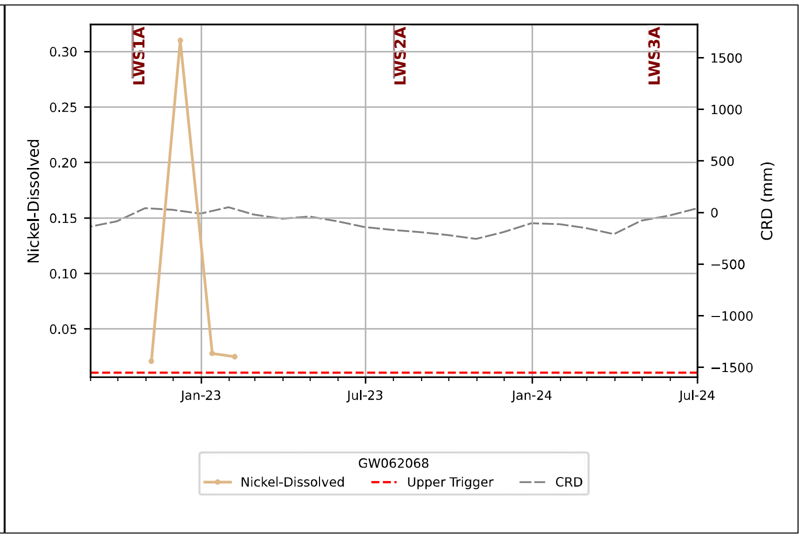

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Manganese-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Copper-Dissolved
Upper Trigger
CRD

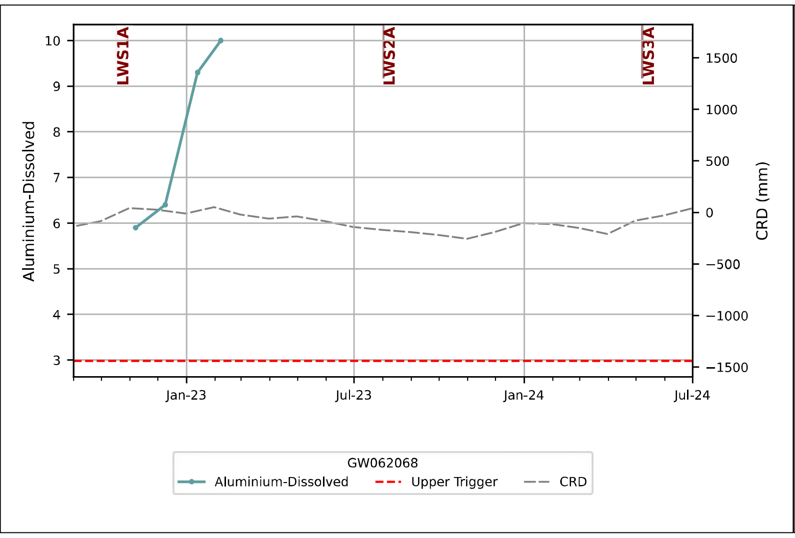

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Lead-Dissolved
Upper Trigger
CRD



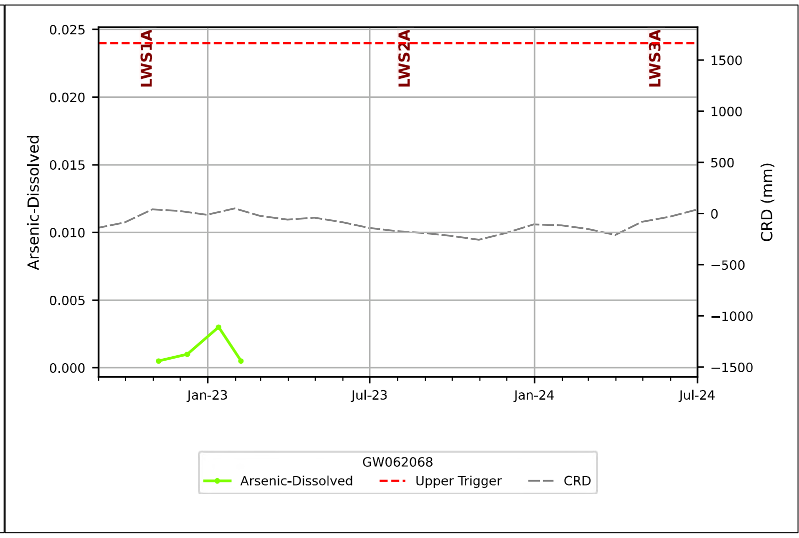
LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Zinc-Dissolved
Upper Trigger
CRD



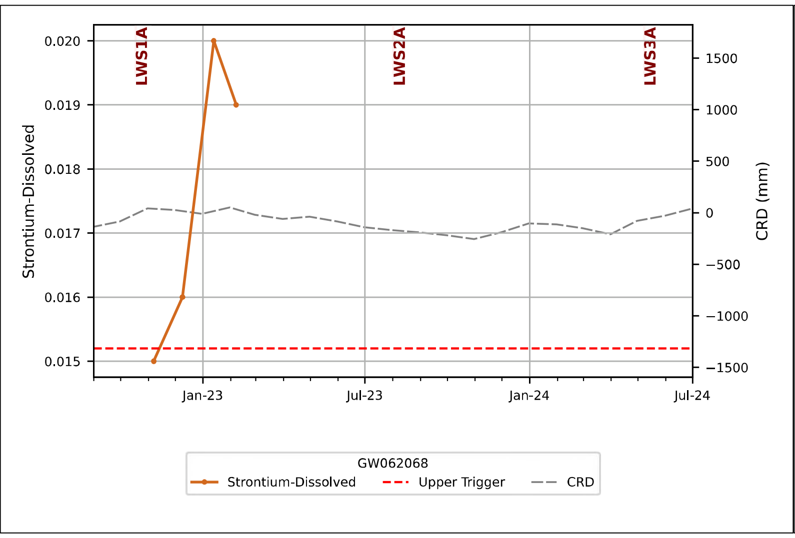
LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Nickel-Dissolved
Upper Trigger
CRD



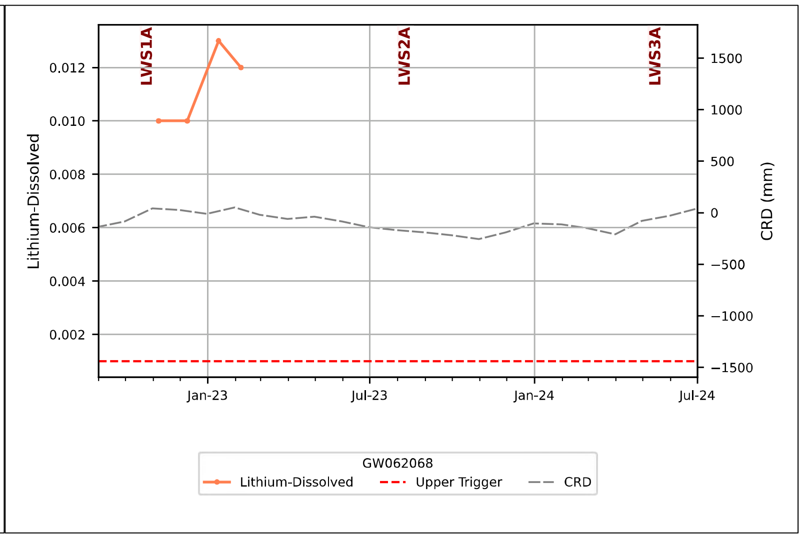
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Aluminium-Dissolved
Upper Trigger
CRD



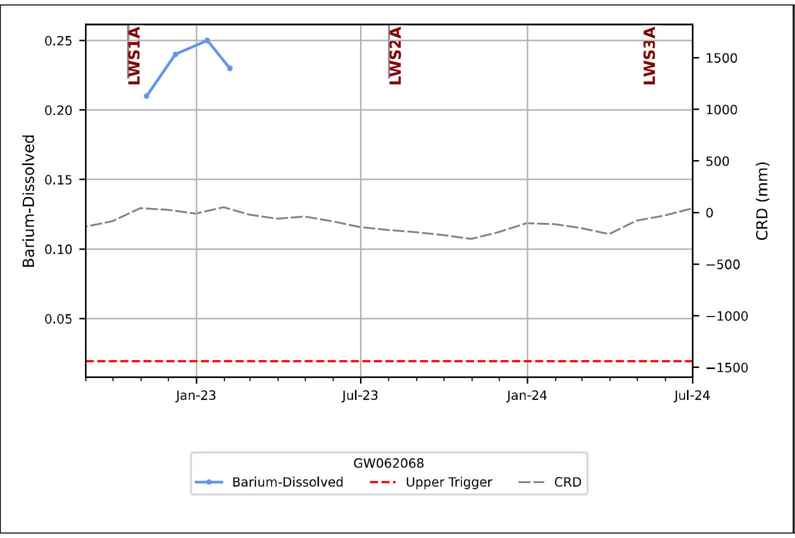
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Arsenic-Dissolved
Upper Trigger
CRD

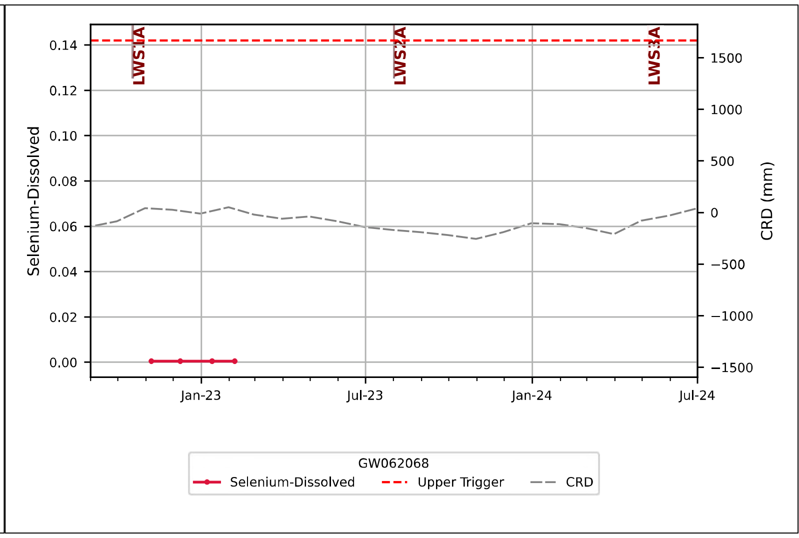


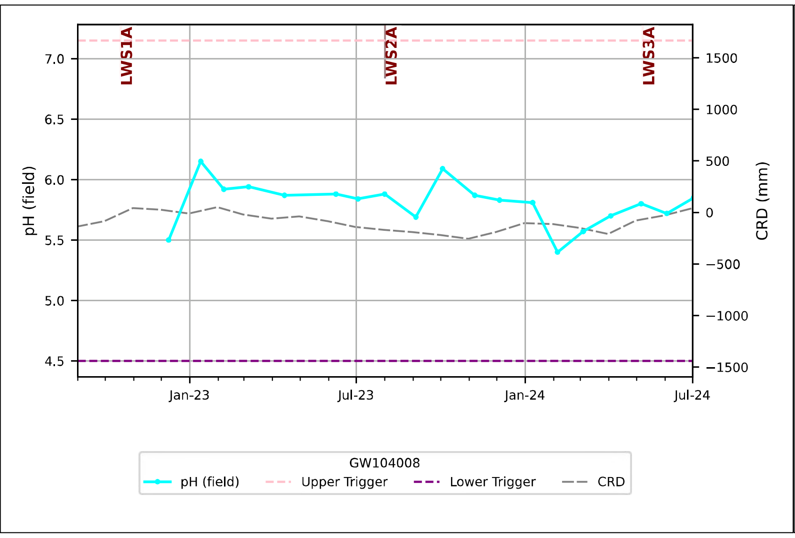
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Strontium-Dissolved
Upper Trigger
CRD

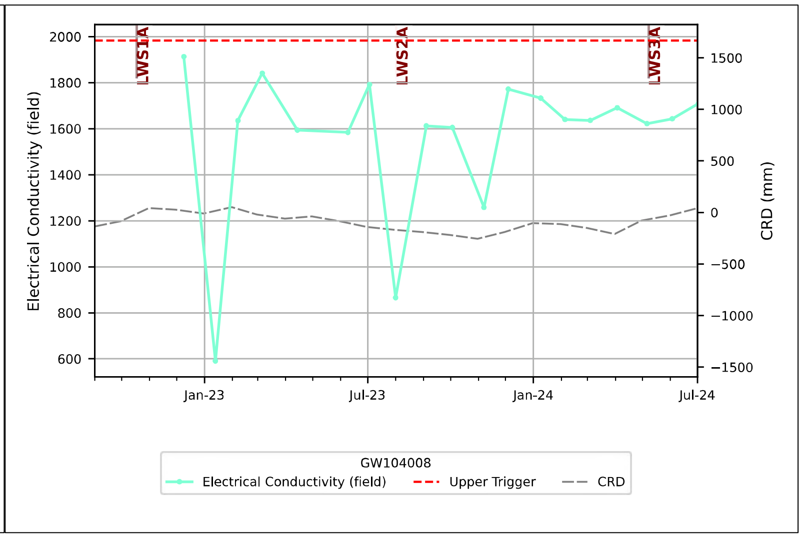


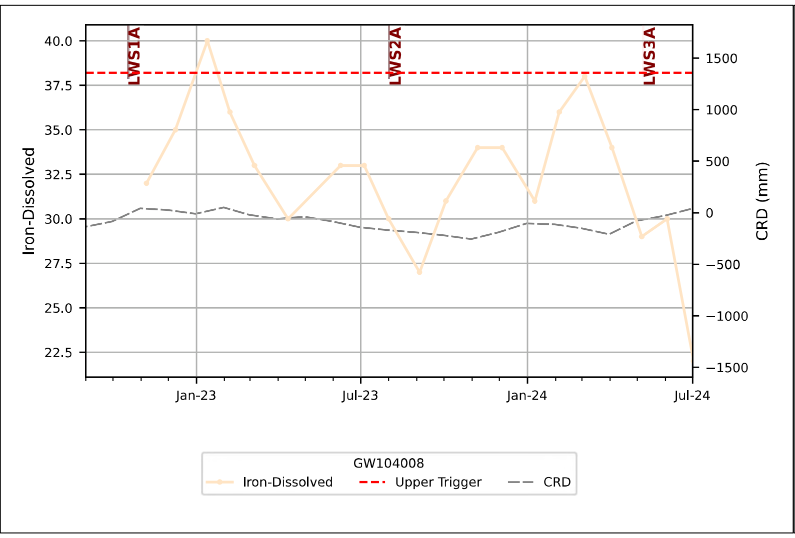
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Lithium-Dissolved
Upper Trigger
CRD

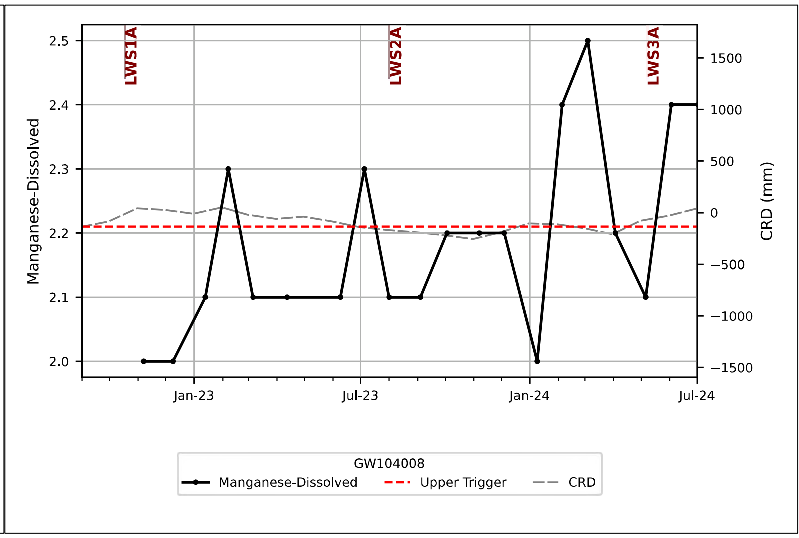

Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Barium-Dissolved
Upper Trigger
CRD

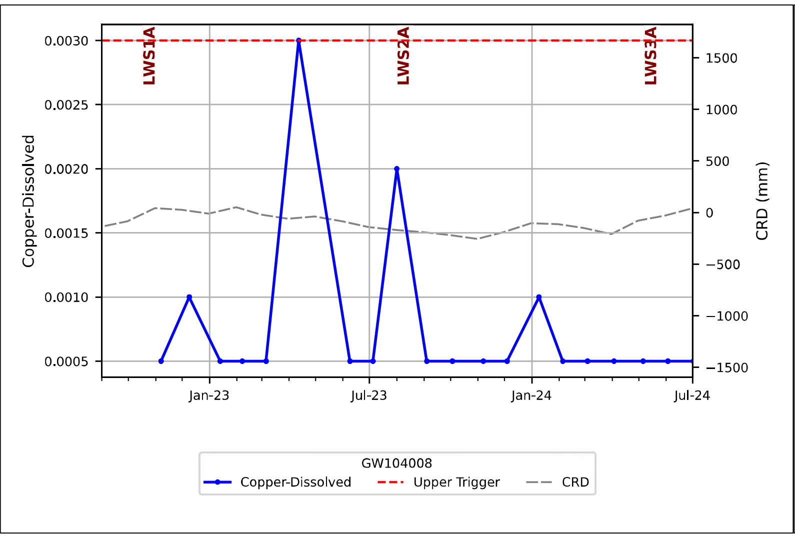

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW062068
Selenium-Dissolved
Upper Trigger
CRD


pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
pH (field)
Upper Trigger
Lower Trigger
CRD

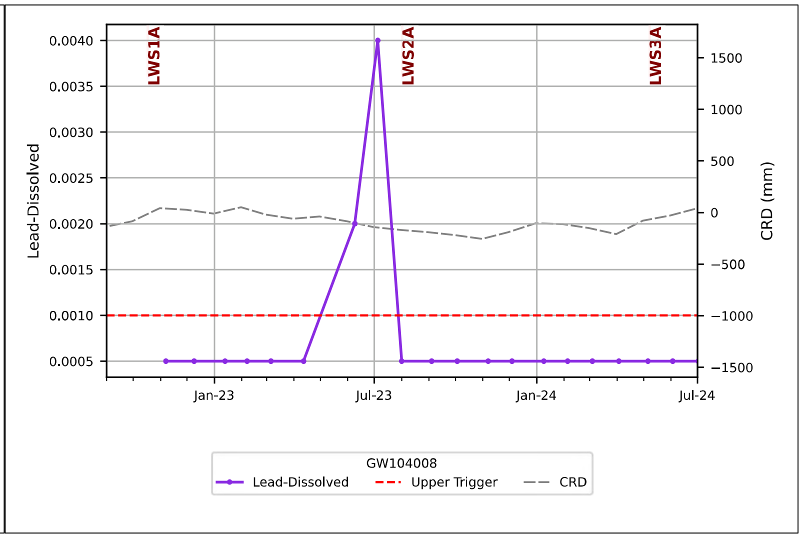

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Electrical Conductivity (field)
Upper Trigger
CRD


Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Iron-Dissolved
Upper Trigger
CRD

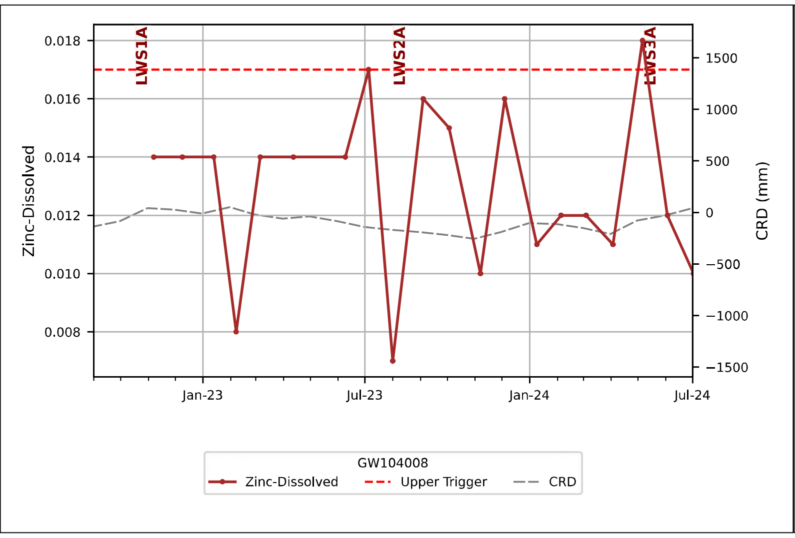

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Manganese-Dissolved
Upper Trigger
CRD



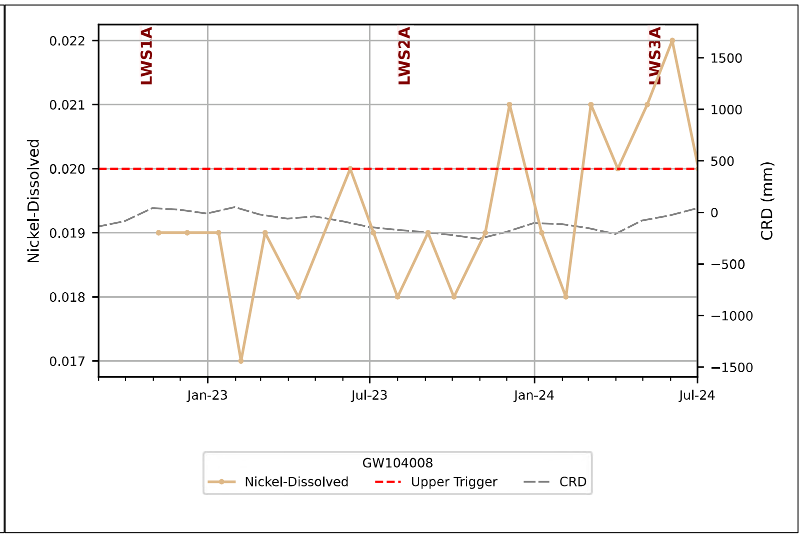
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Copper-Dissolved
Upper Trigger
CRD



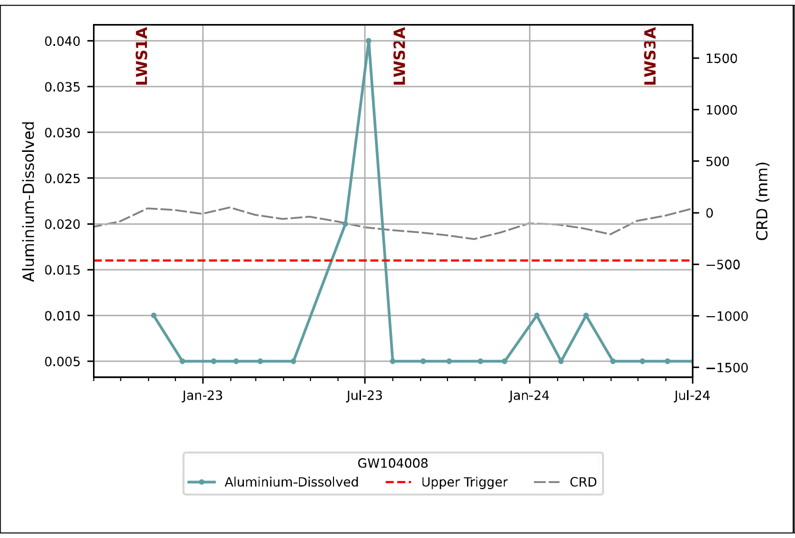
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Lead-Dissolved
Upper Trigger
CRD



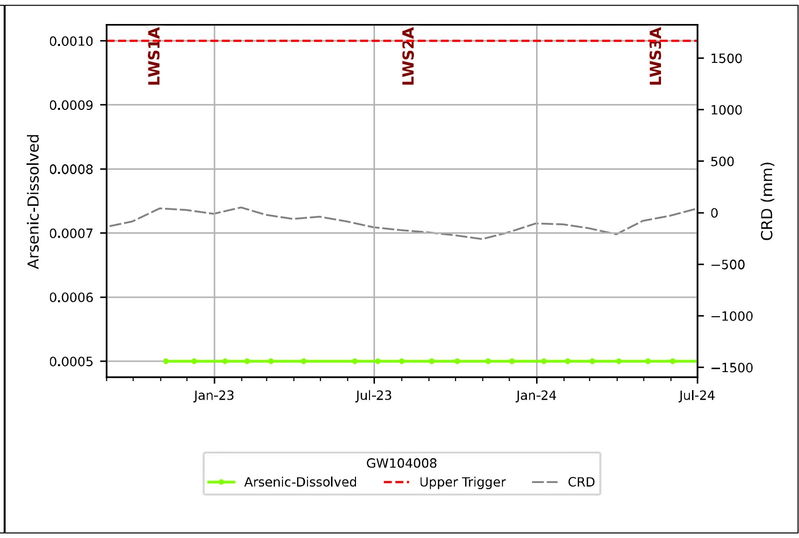
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Zinc-Dissolved
Upper Trigger
CRD



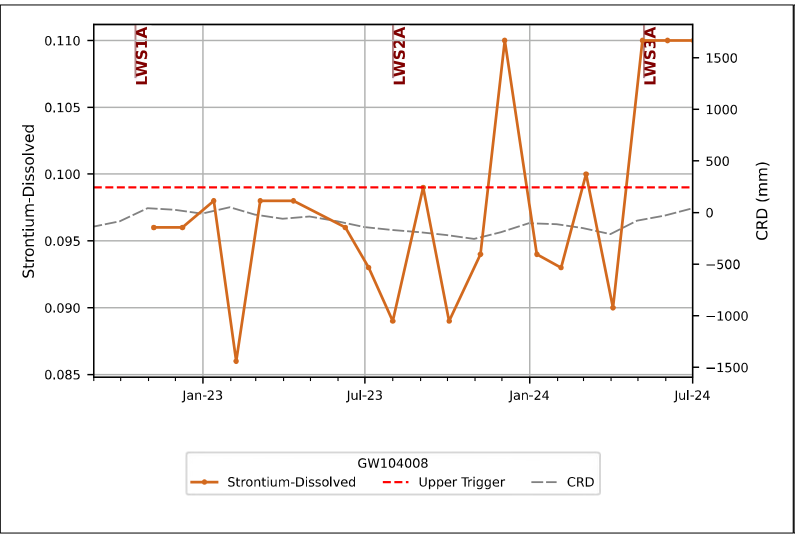
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Nickel-Dissolved
Upper Trigger
CRD



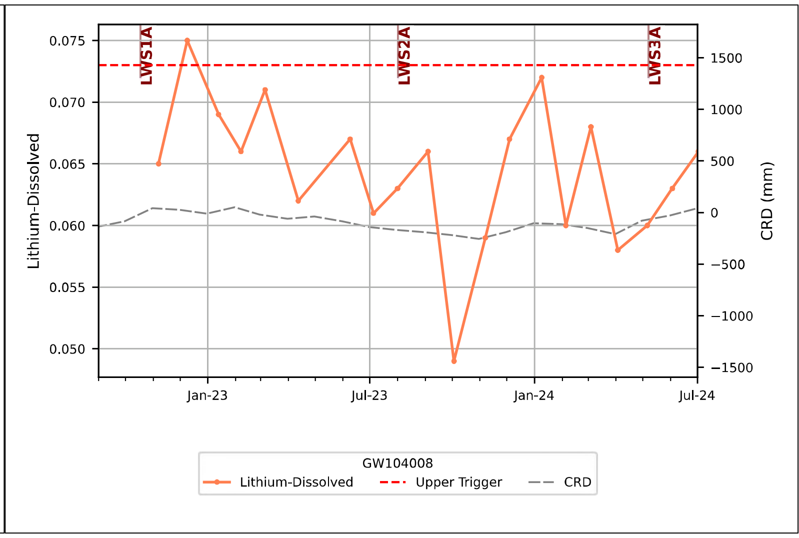
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Aluminium-Dissolved
Upper Trigger
CRD



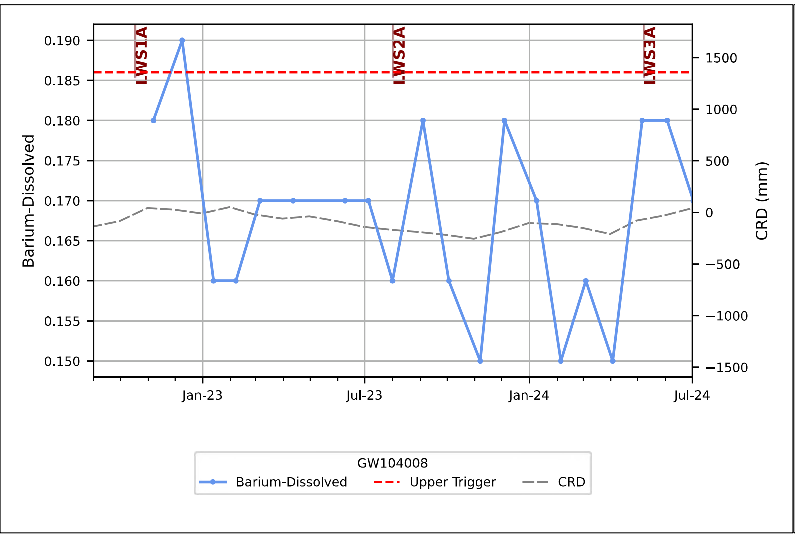
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Arsenic-Dissolved
Upper Trigger
CRD



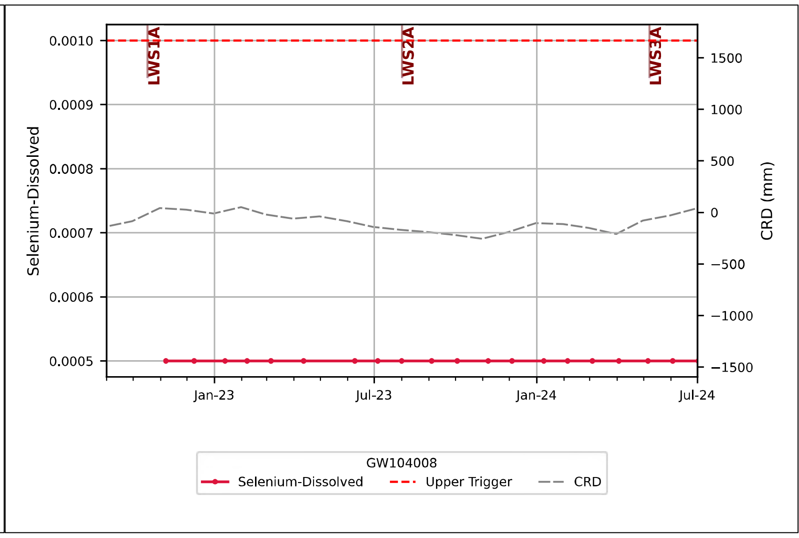
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Strontium-Dissolved
Upper Trigger
CRD



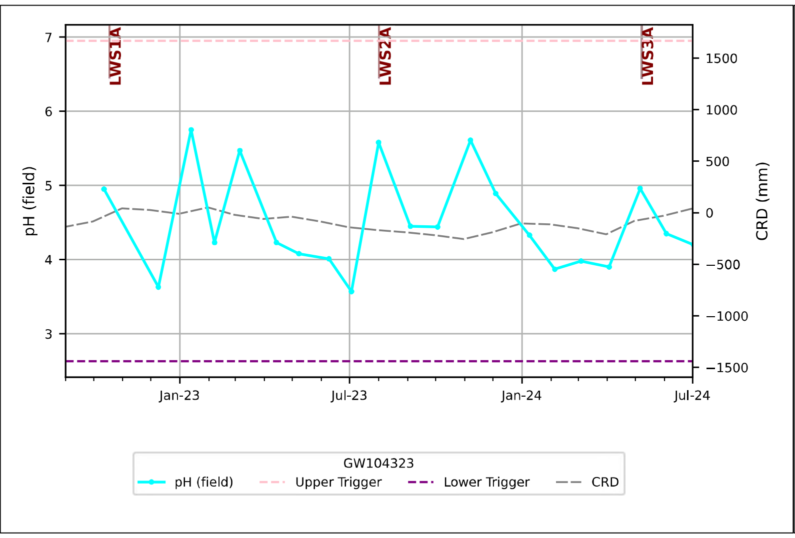
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Lithium-Dissolved
Upper Trigger
CRD



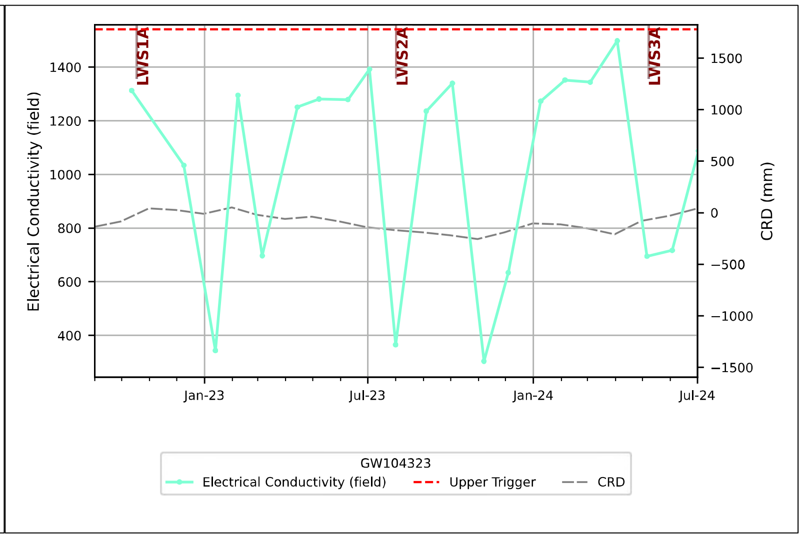
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Barium-Dissolved
Upper Trigger
CRD



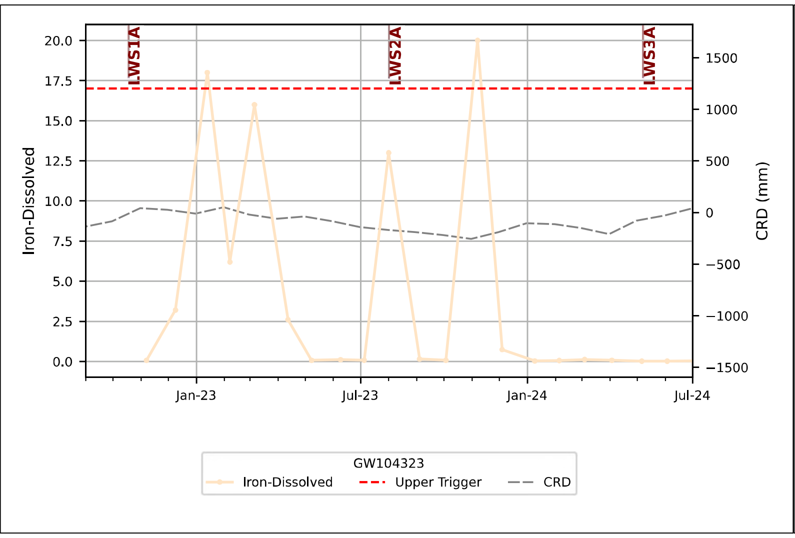
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104008
Selenium-Dissolved
Upper Trigger
CRD



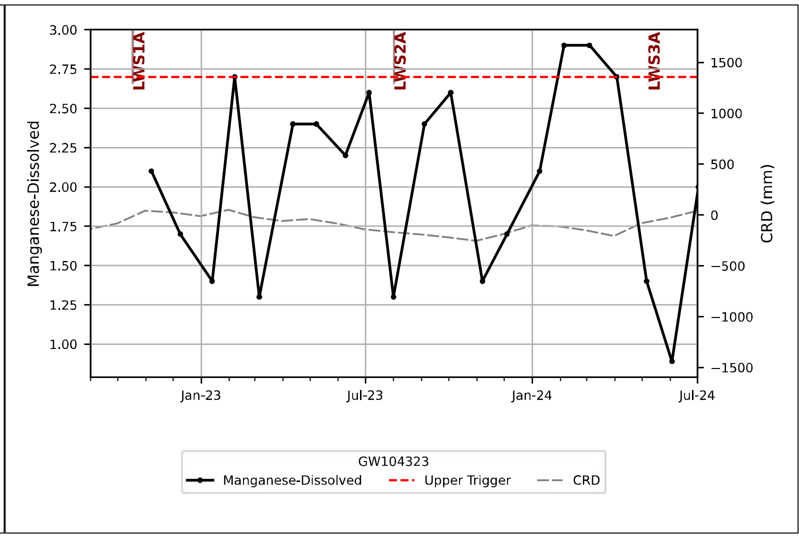
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
pH (field)
Upper Trigger
Lower Trigger
CRD



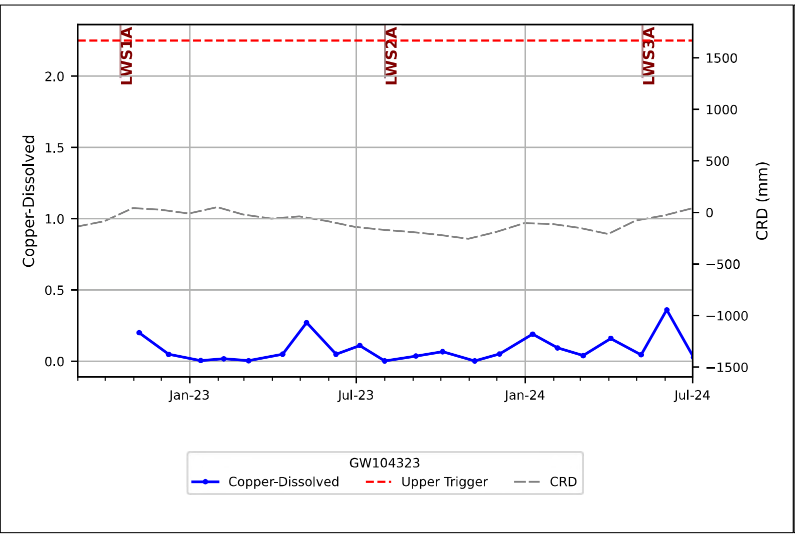
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Electrical Conductivity (field)
Upper Trigger
CRD



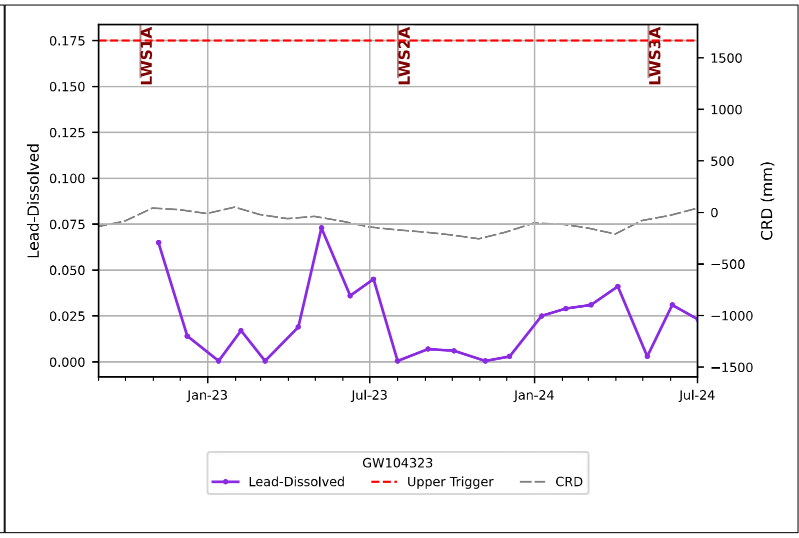
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Iron-Dissolved
Upper Trigger
CRD



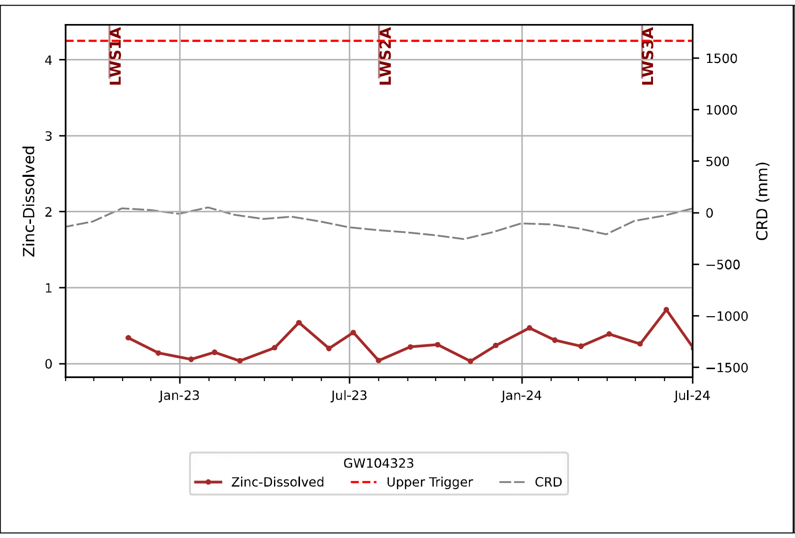
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Manganese-Dissolved
Upper Trigger
CRD



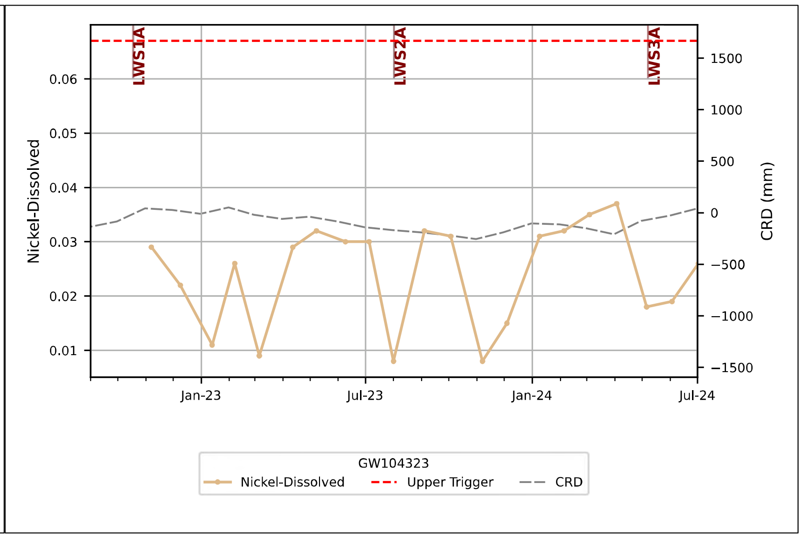
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Copper-Dissolved
Upper Trigger
CRD



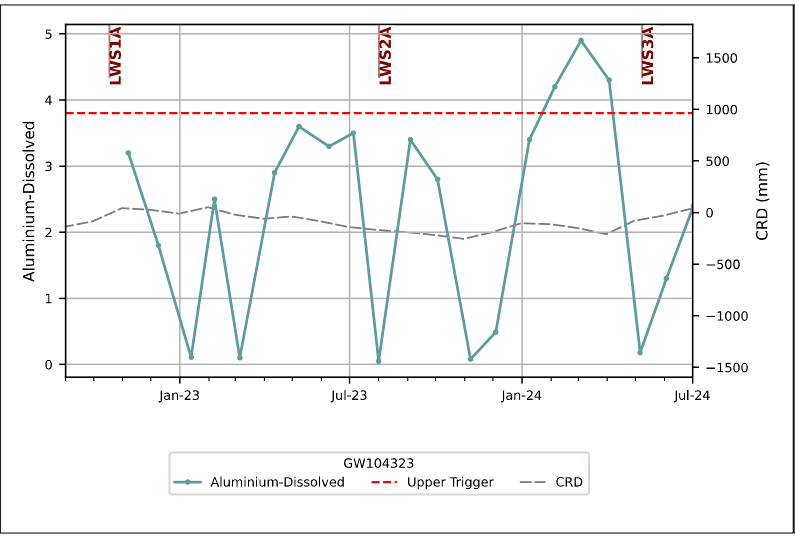
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Lead-Dissolved
Upper Trigger
CRD



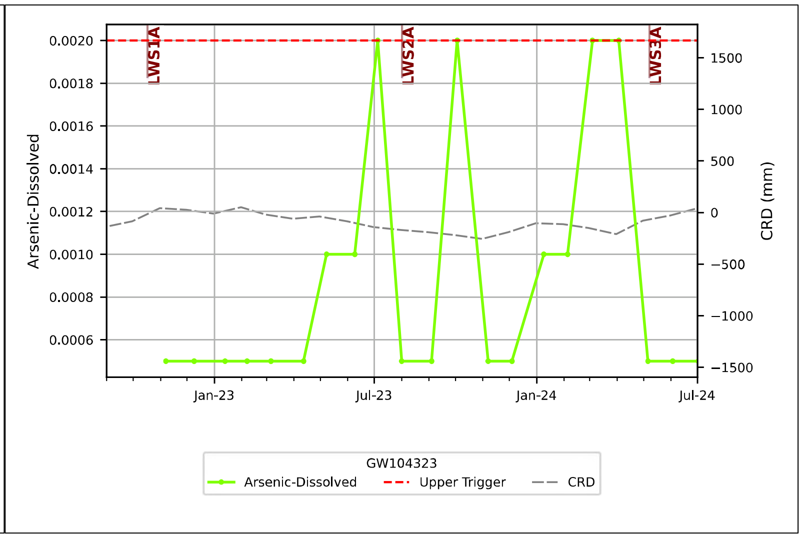
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Zinc-Dissolved
Upper Trigger
CRD



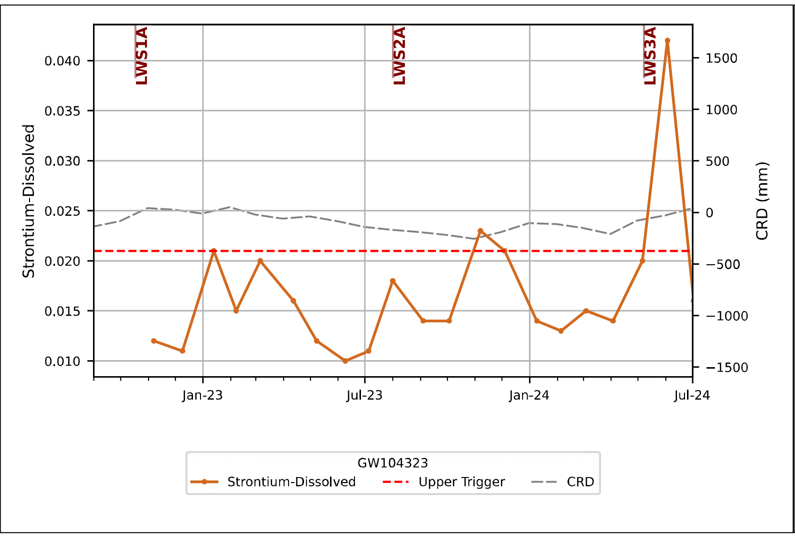
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104323
Nickel-Dissolved
Upper Trigger
CRD



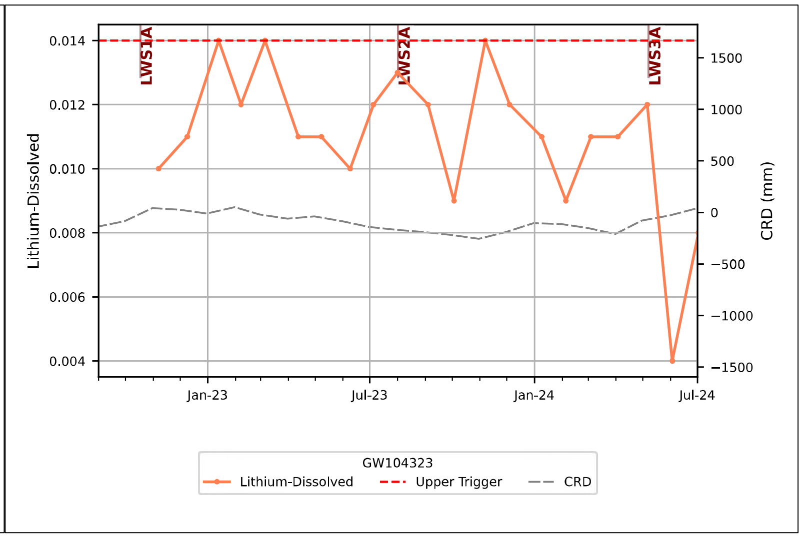
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
GW104323
Aluminium-Dissolved
Upper Trigger
CRD



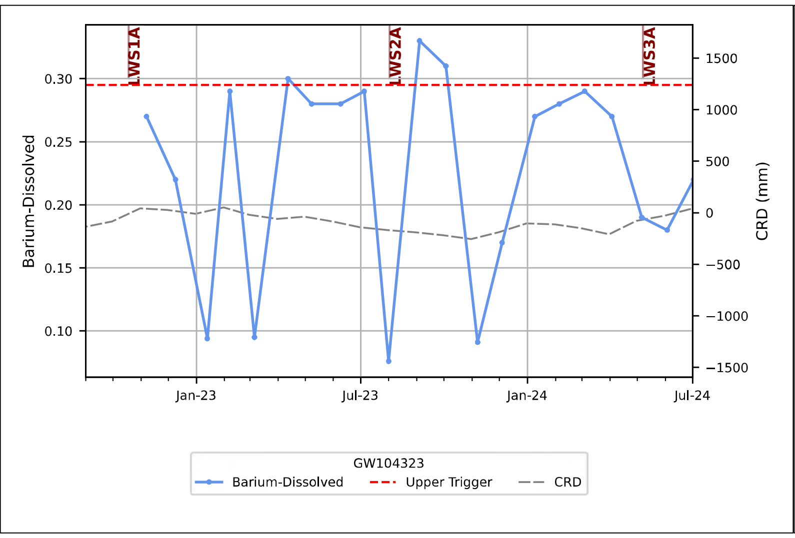
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
GW104323
Arsenic-Dissolved
Upper Trigger
CRD



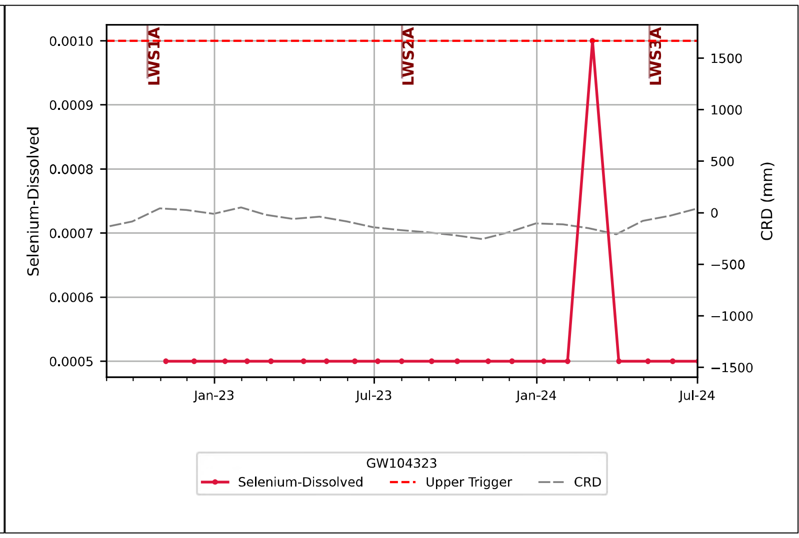
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
GW104323
Strontium-Dissolved
Upper Trigger
CRD



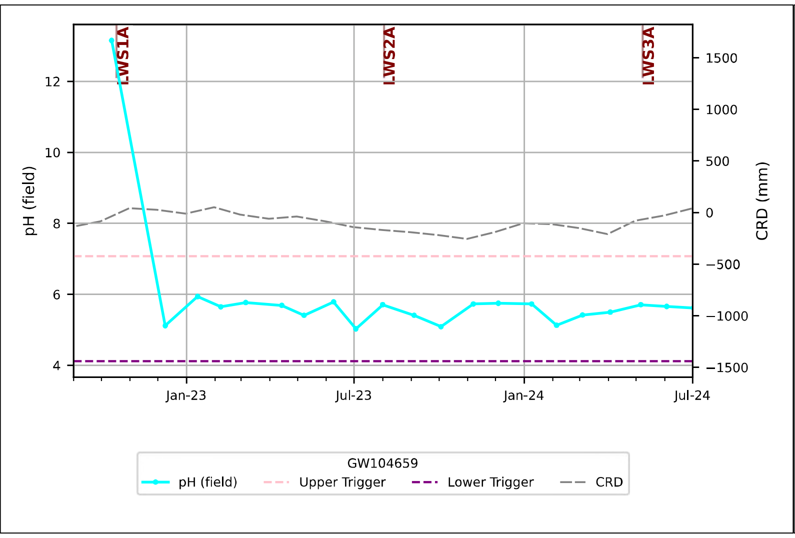
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
GW104323
Lithium-Dissolved
Upper Trigger
CRD



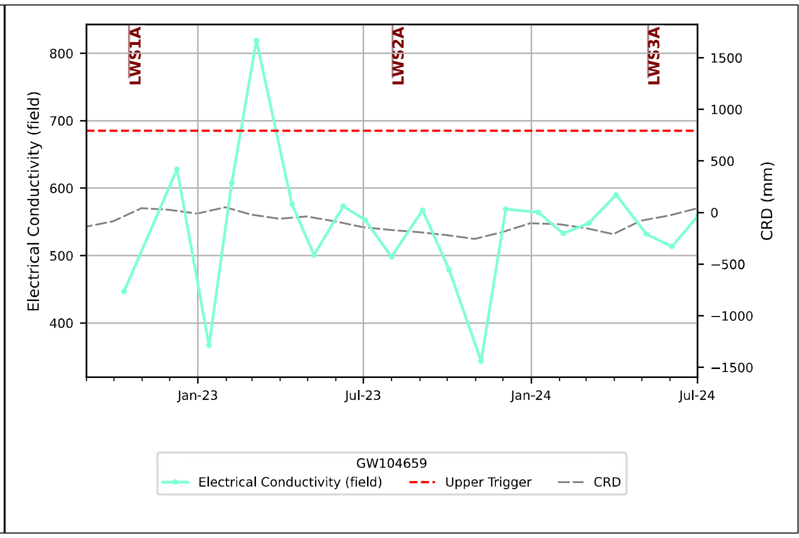
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
GW104323
Barium-Dissolved
Upper Trigger
CRD



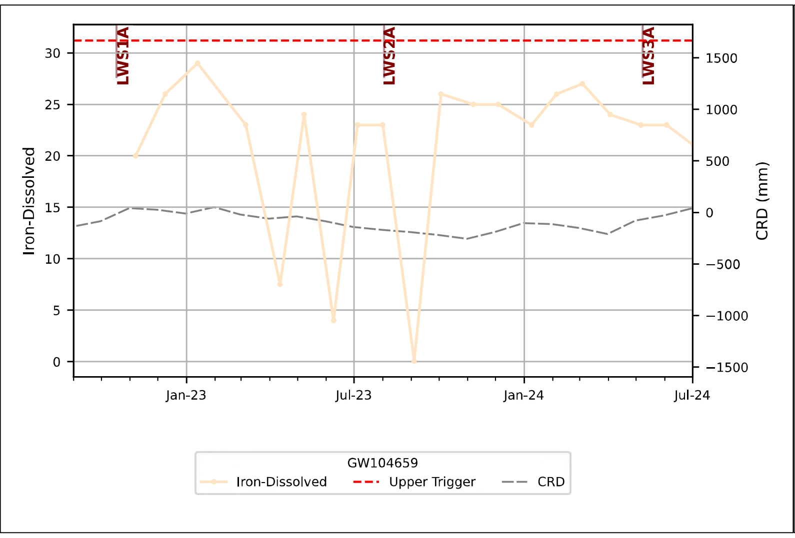
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
GW104323
Selenium-Dissolved
Upper Trigger
CRD



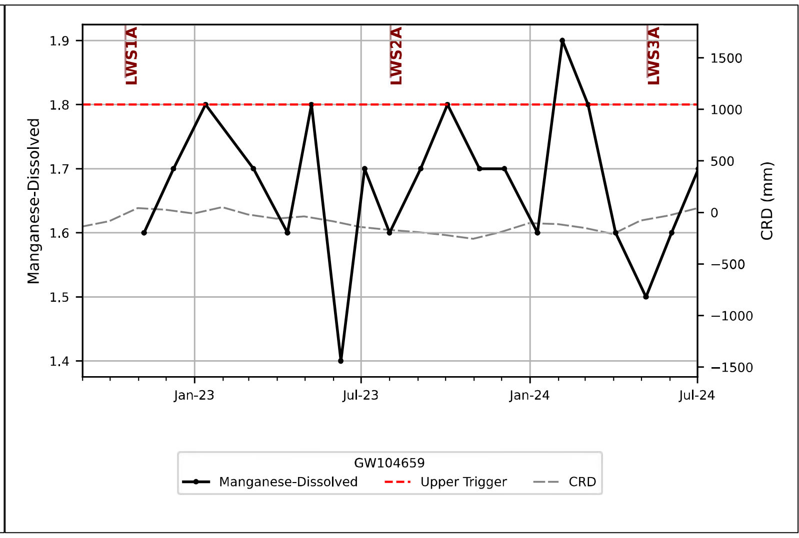
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
4
6
8
10
12
1500
1000
500
0
−500
−1000
−1500
GW104659
pH (field)
Upper Trigger
Lower Trigger
CRD



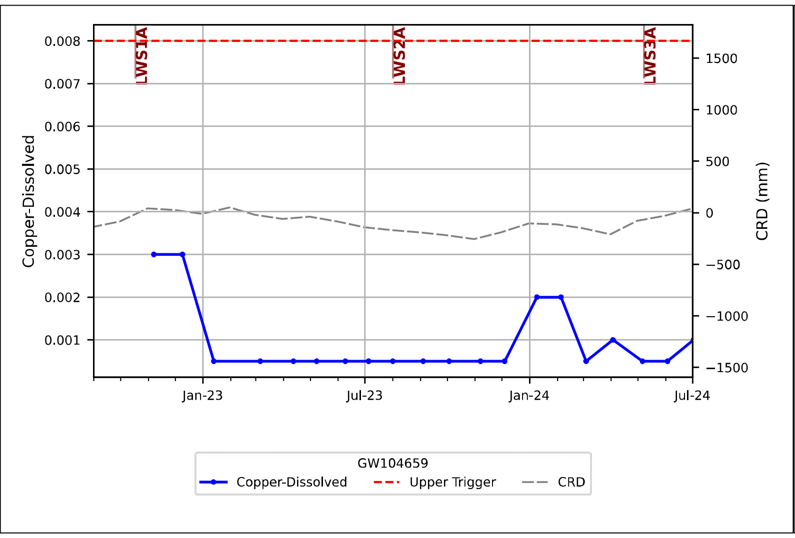
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
400
500
600
700
800
1500
1000
500
0
−500
−1000
−1500
GW104659
Electrical Conductivity (field)
Upper Trigger
CRD



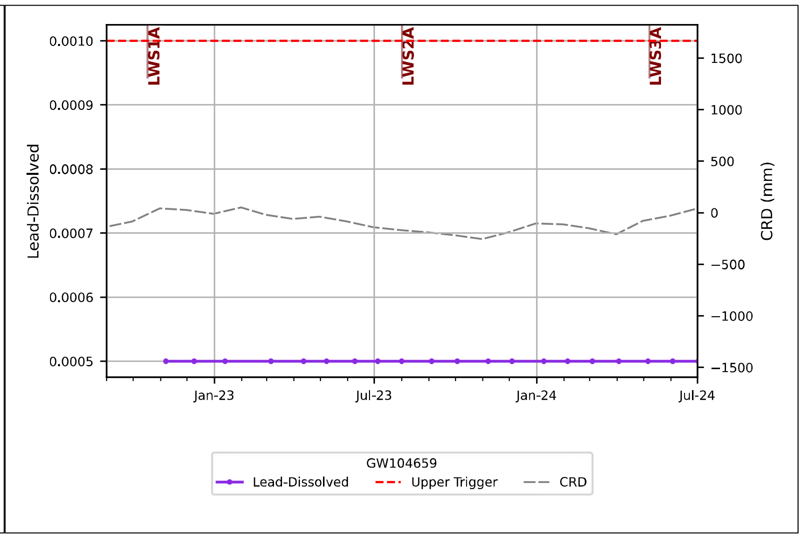
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
0
5
10
15
20
25
30
1500
1000
500
0
−500
−1000
−1500
GW104659
Iron-Dissolved
Upper Trigger
CRD



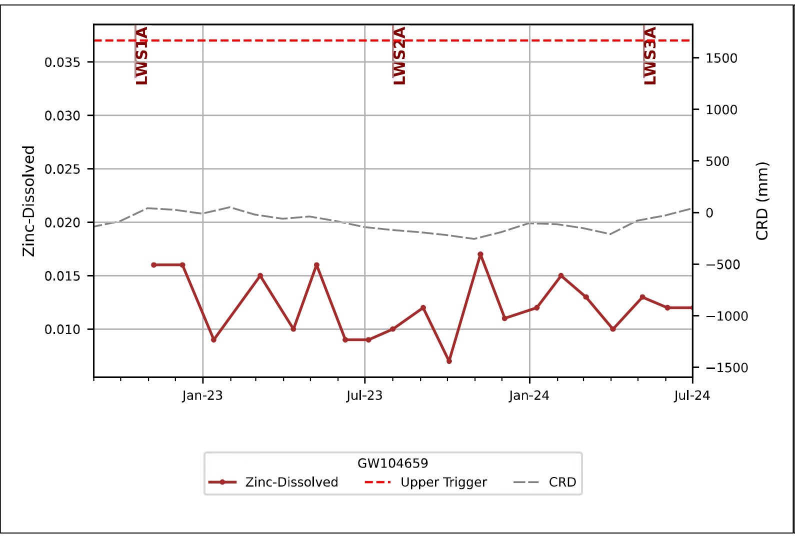
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
1.4
1.5
1.6
1.7
1.8
1.9
1500
1000
500
0
−500
−1000
−1500
GW104659
Manganese-Dissolved
Upper Trigger
CRD



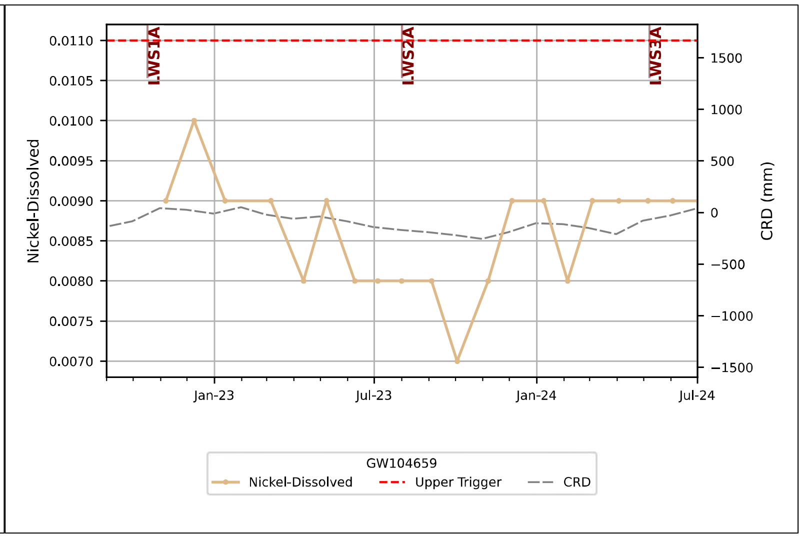
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
1500
1000
500
0
−500
−1000
−1500
GW104659
Copper-Dissolved
Upper Trigger
CRD



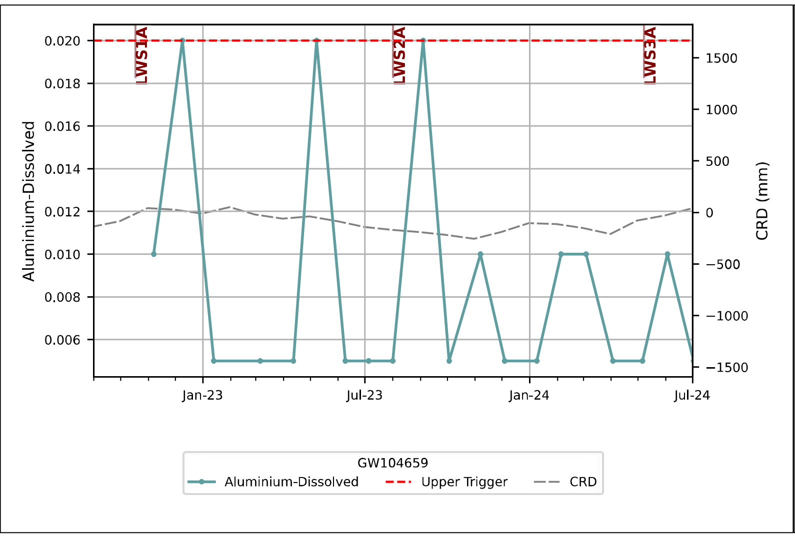
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
0.0005
0.0006
0.0007
0.0008
0.0009
0.0010
1500
1000
500
0
−500
−1000
−1500
GW104659
Lead-Dissolved
Upper Trigger
CRD



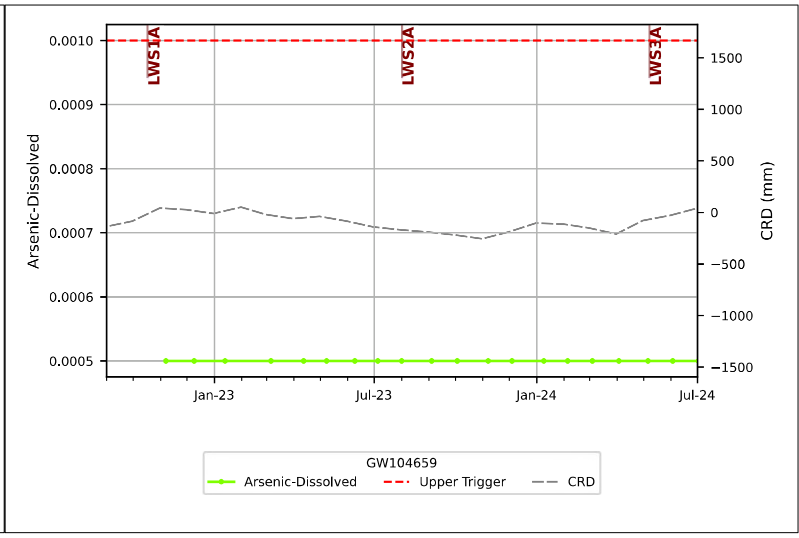
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Zinc-Dissolved
Upper Trigger
CRD



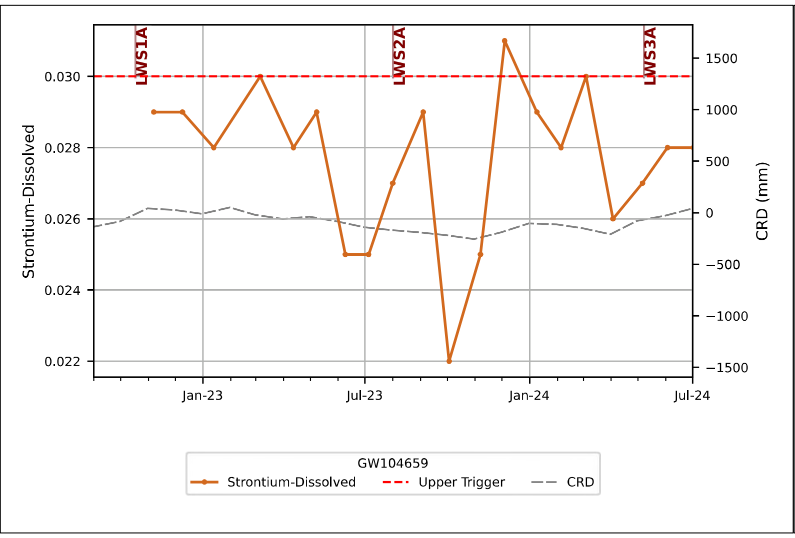
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Nickel-Dissolved
Upper Trigger
CRD



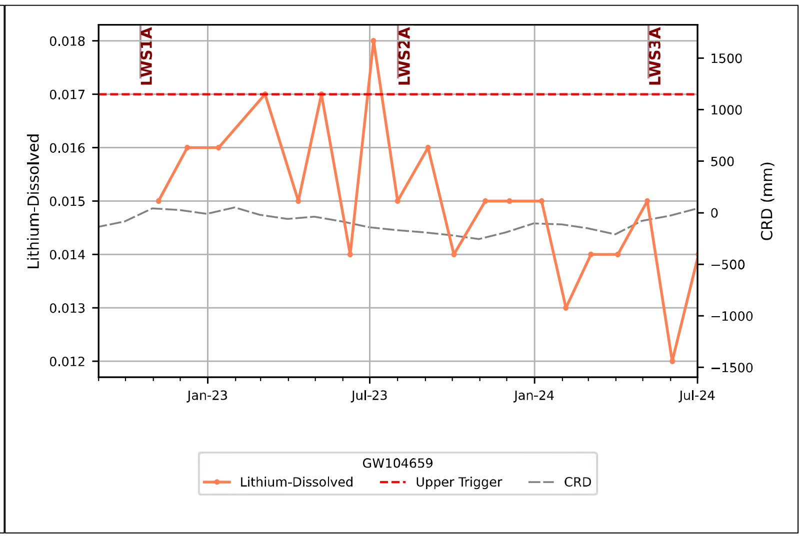
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Aluminium-Dissolved
Upper Trigger
CRD



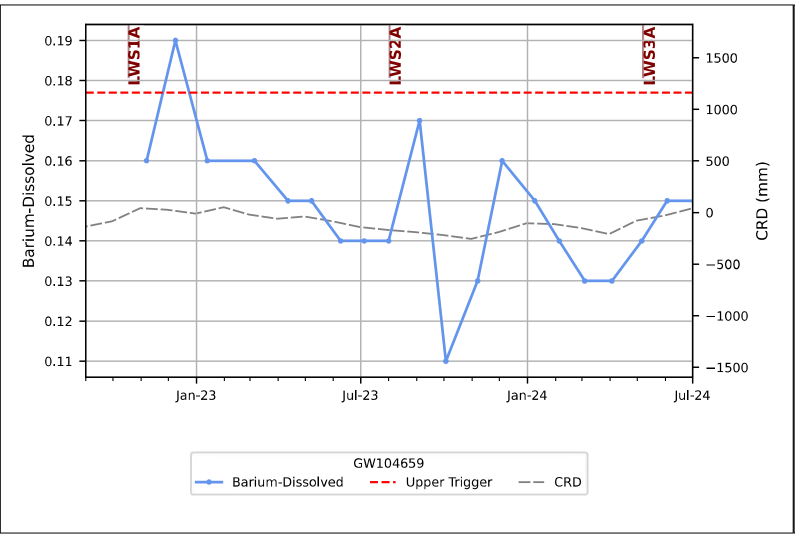
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Arsenic-Dissolved
Upper Trigger
CRD

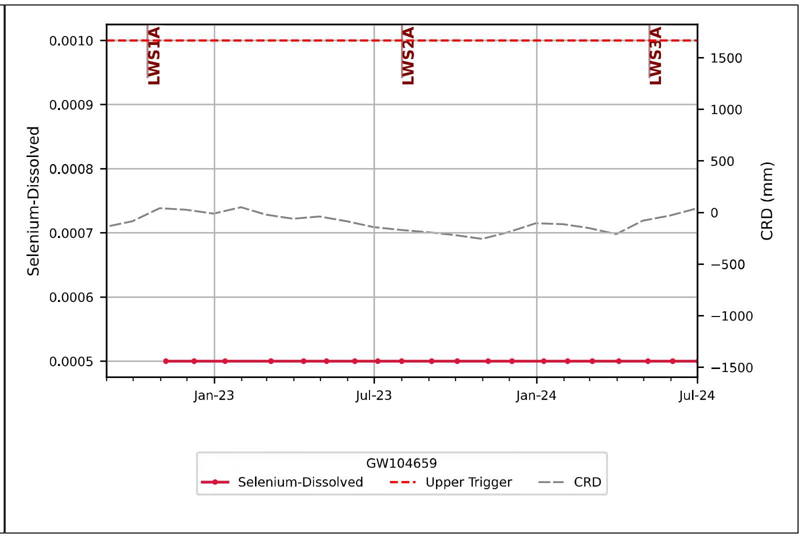


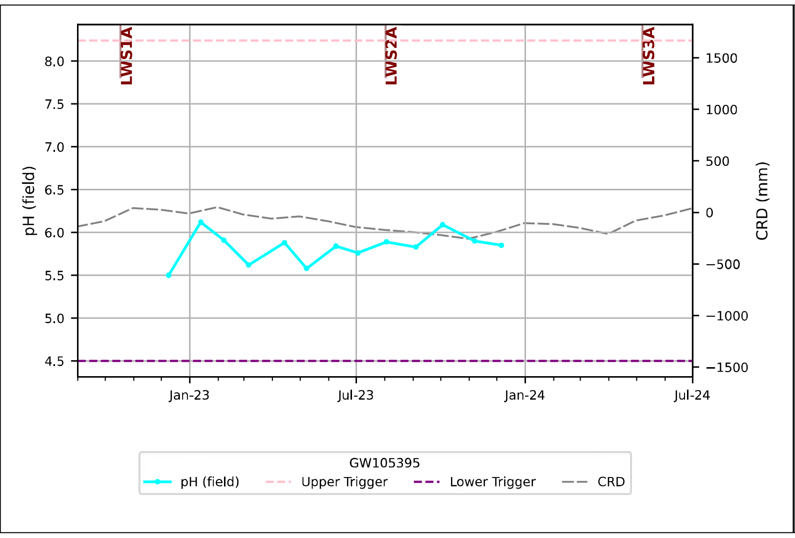
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Strontium-Dissolved
Upper Trigger
CRD

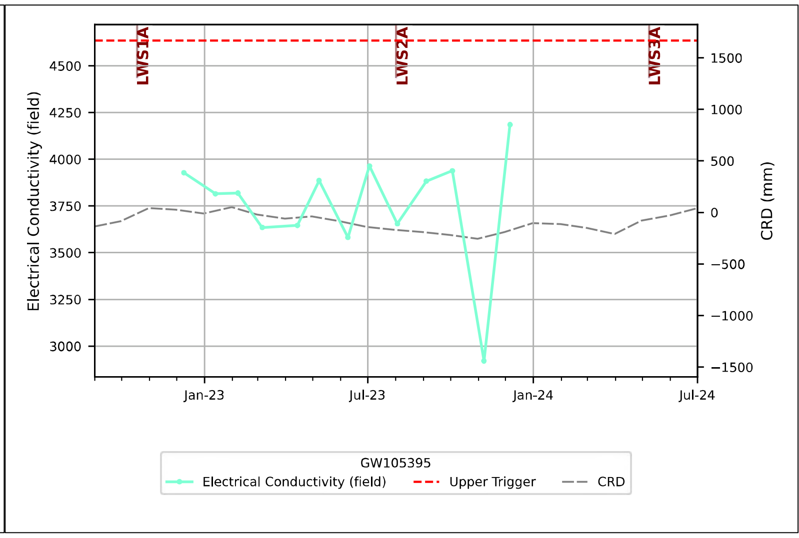


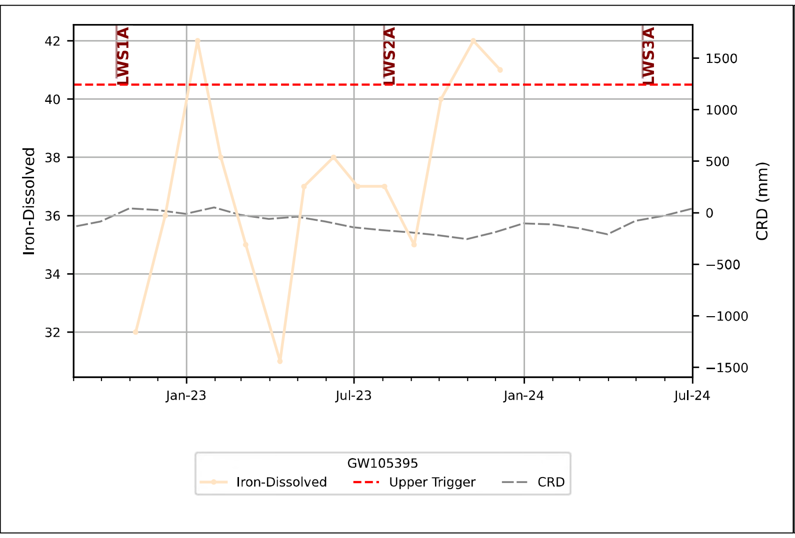
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Lithium-Dissolved
Upper Trigger
CRD

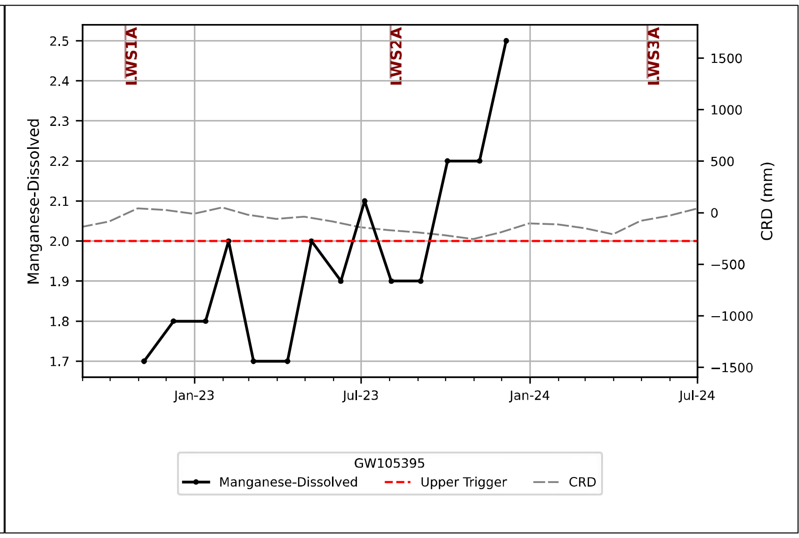

Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Barium-Dissolved
Upper Trigger
CRD

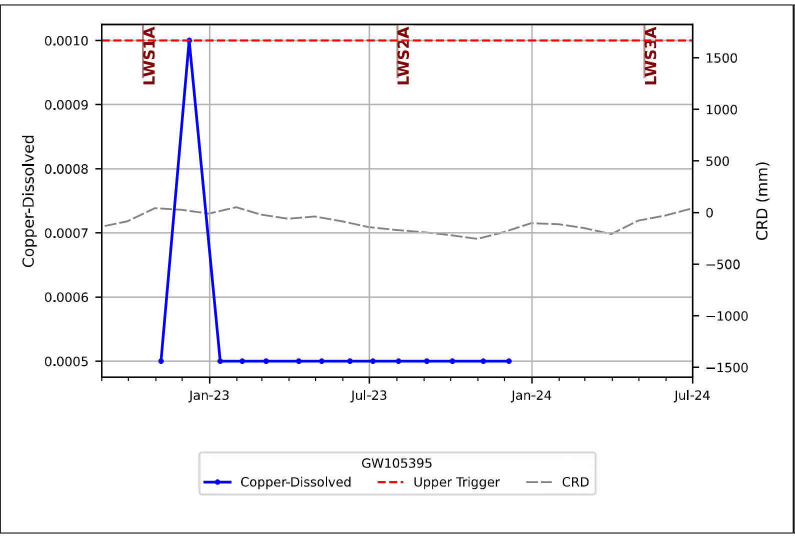

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW104659
Selenium-Dissolved
Upper Trigger
CRD


pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
pH (field)
Upper Trigger
Lower Trigger
CRD

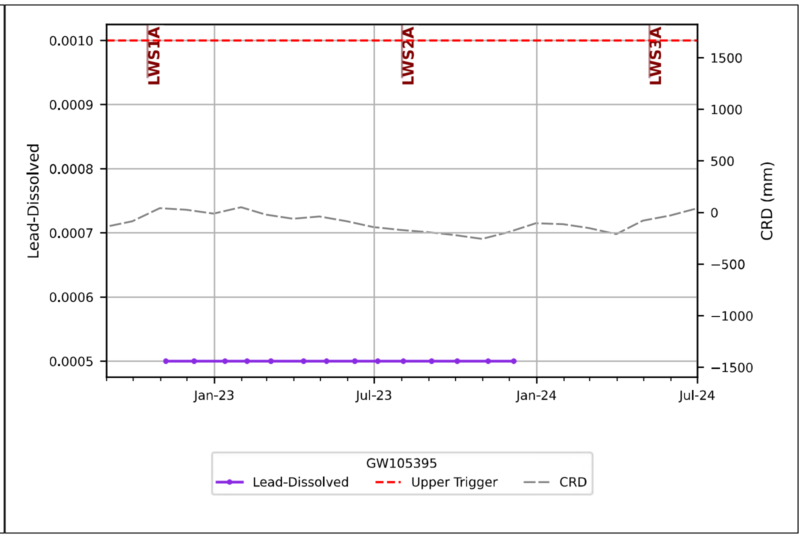

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Electrical Conductivity (field)
Upper Trigger
CRD


Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Iron-Dissolved
Upper Trigger
CRD

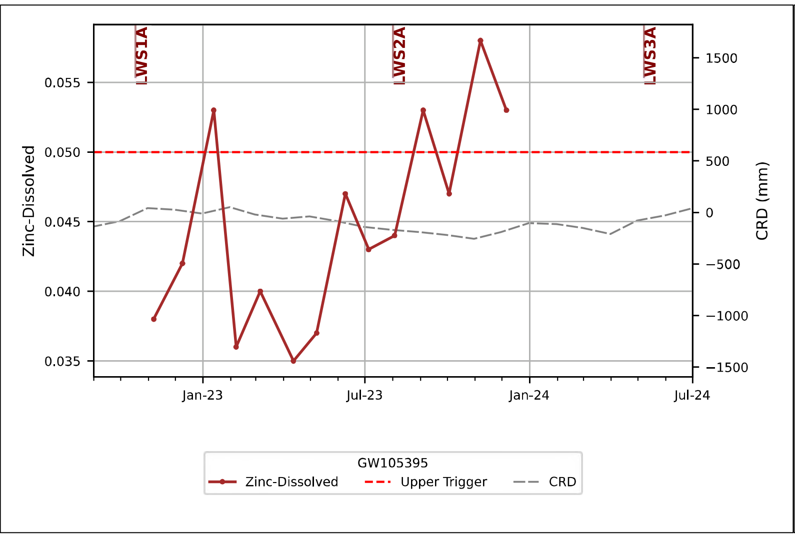

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Manganese-Dissolved
Upper Trigger
CRD



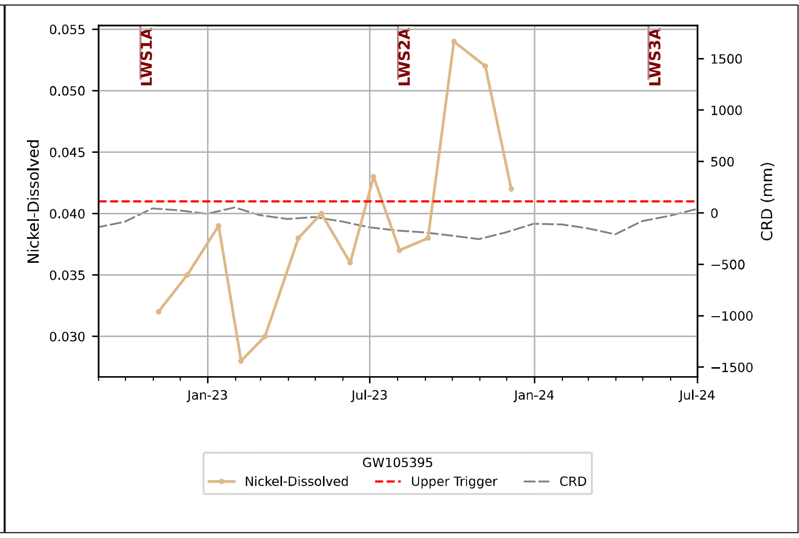
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Copper-Dissolved
Upper Trigger
CRD



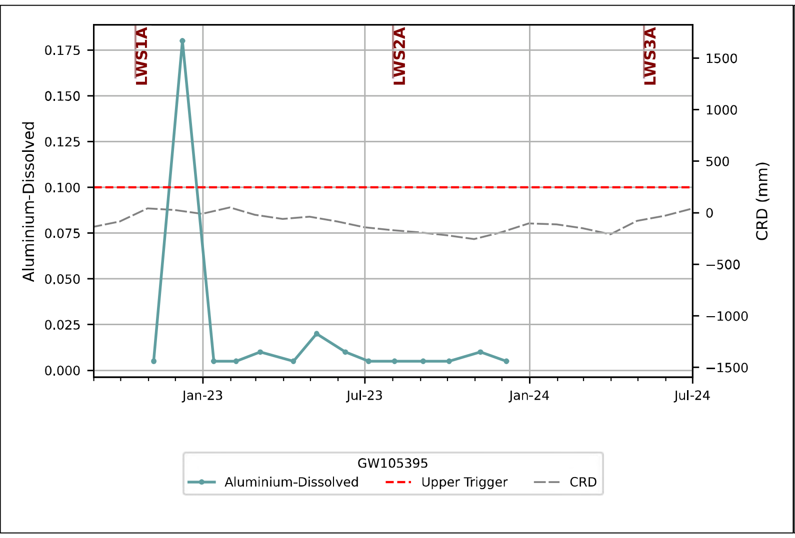
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Lead-Dissolved
Upper Trigger
CRD



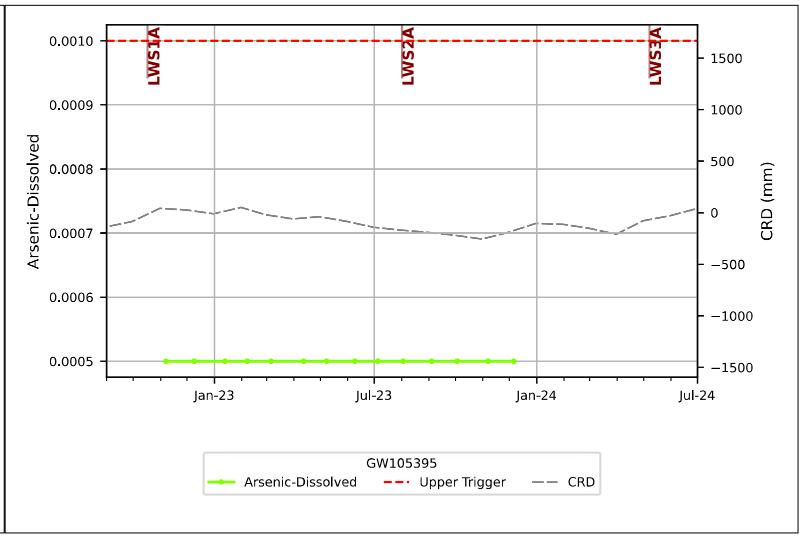
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Zinc-Dissolved
Upper Trigger
CRD



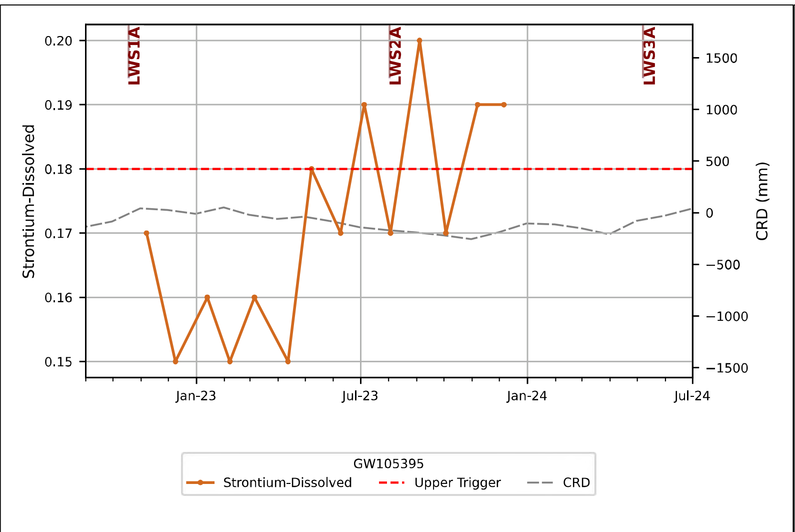
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Nickel-Dissolved
Upper Trigger
CRD

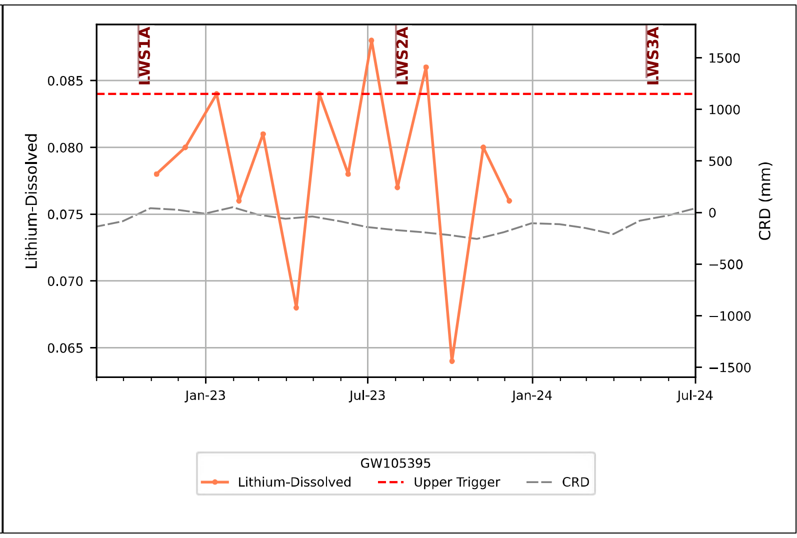


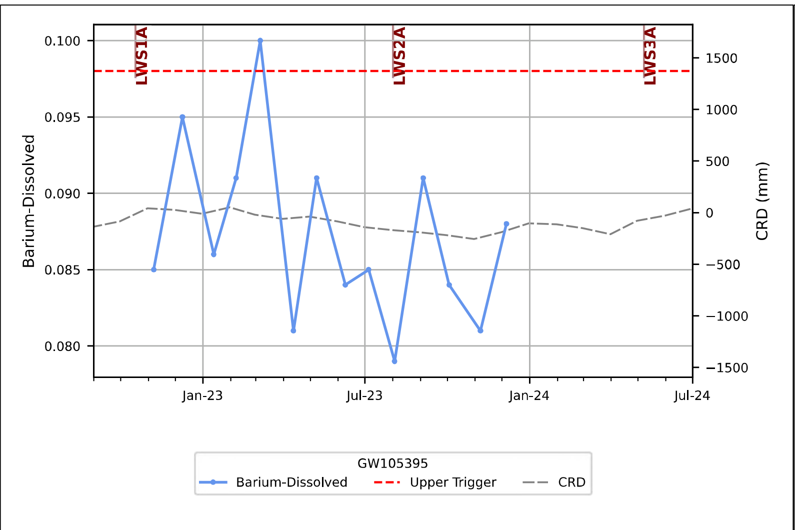
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Aluminium-Dissolved
Upper Trigger
CRD

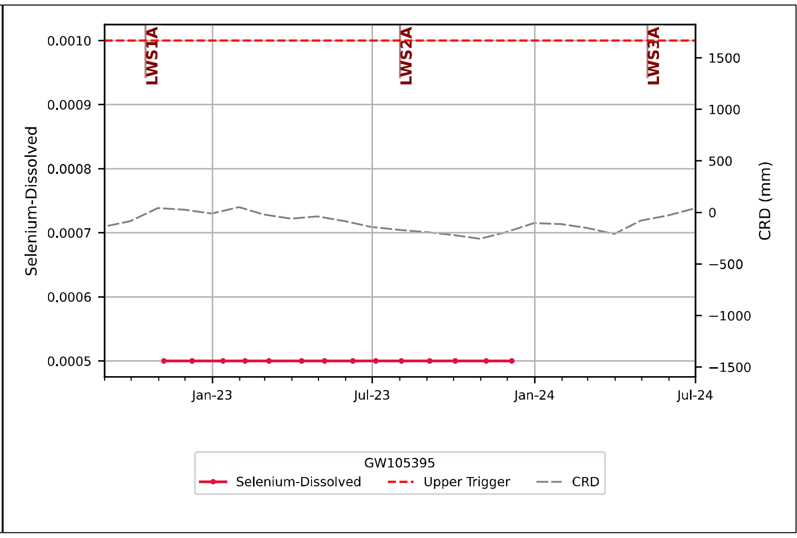


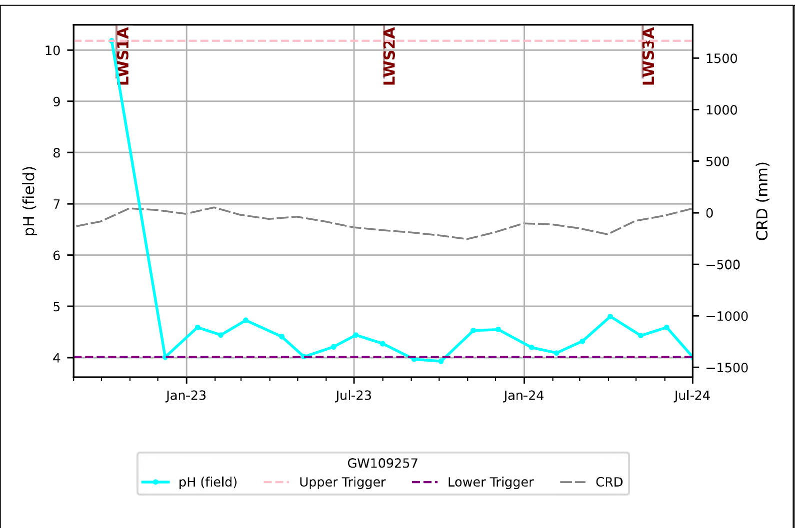
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Arsenic-Dissolved
Upper Trigger
CRD

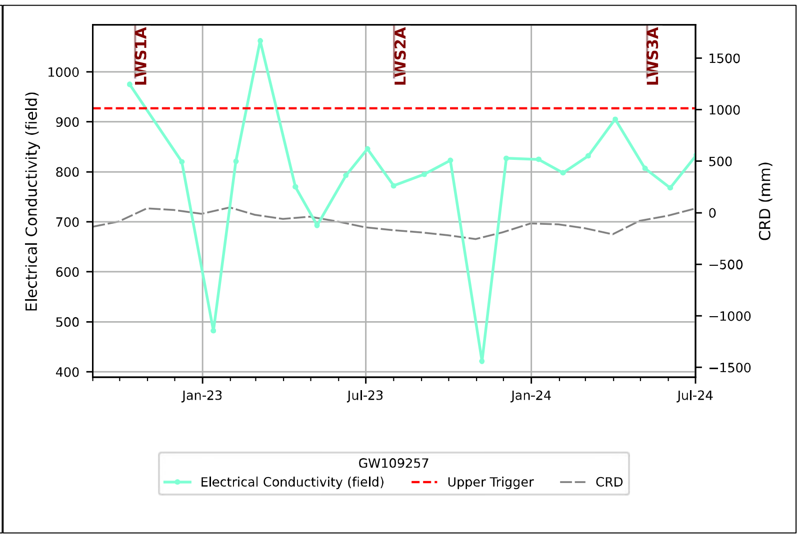

LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Strontium-Dissolved
Upper Trigger
CRD

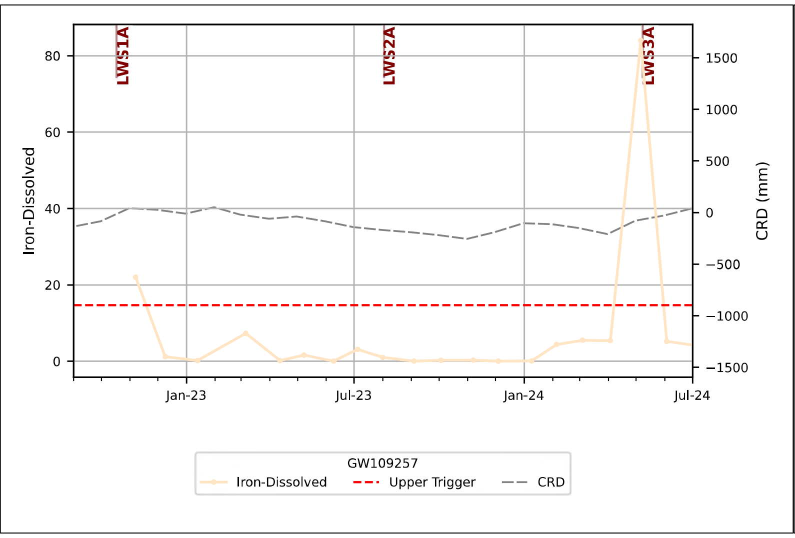

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Lithium-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Barium-Dissolved
Upper Trigger
CRD

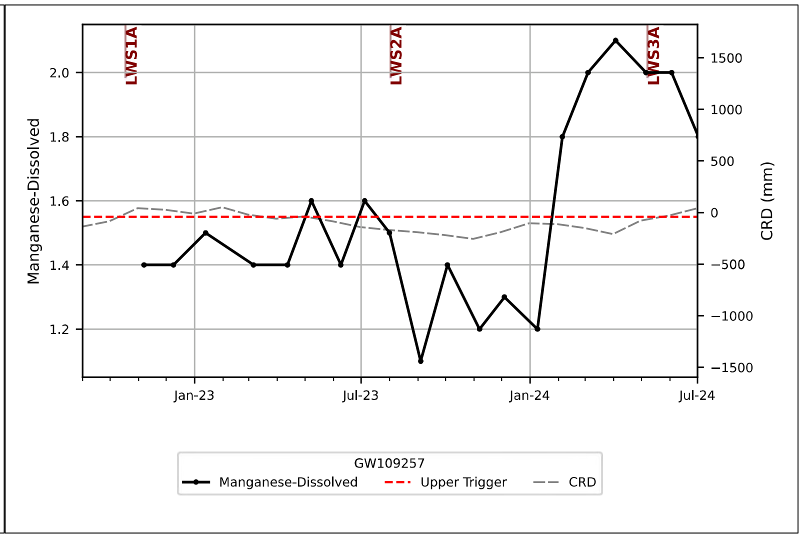

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW105395
Selenium-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
pH (field)
Upper Trigger
Lower Trigger
CRD

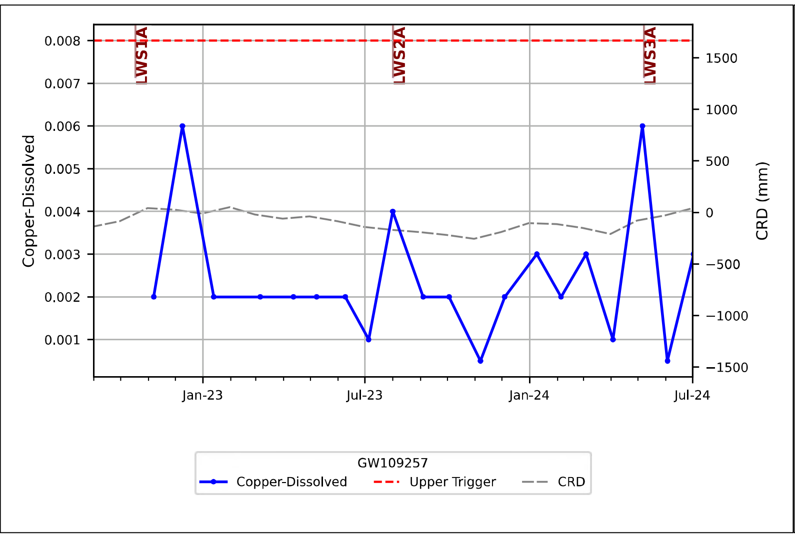

LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Electrical Conductivity (field)
Upper Trigger
CRD



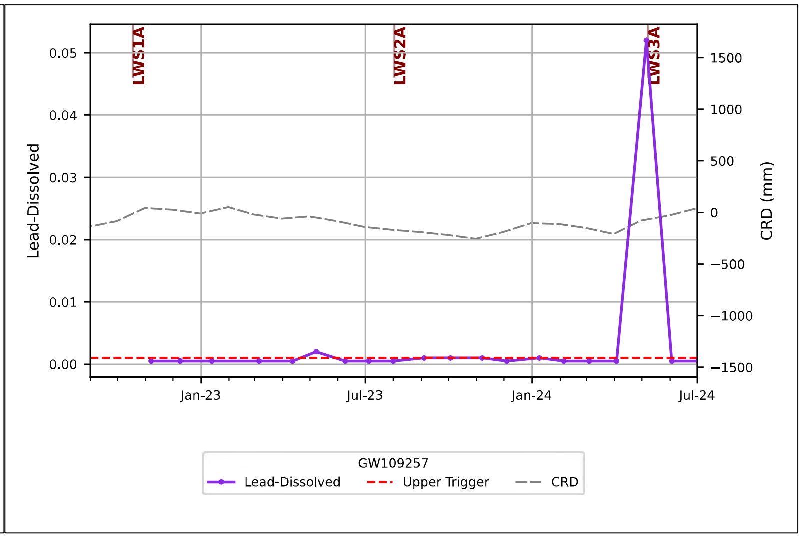
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Iron-Dissolved
Upper Trigger
CRD



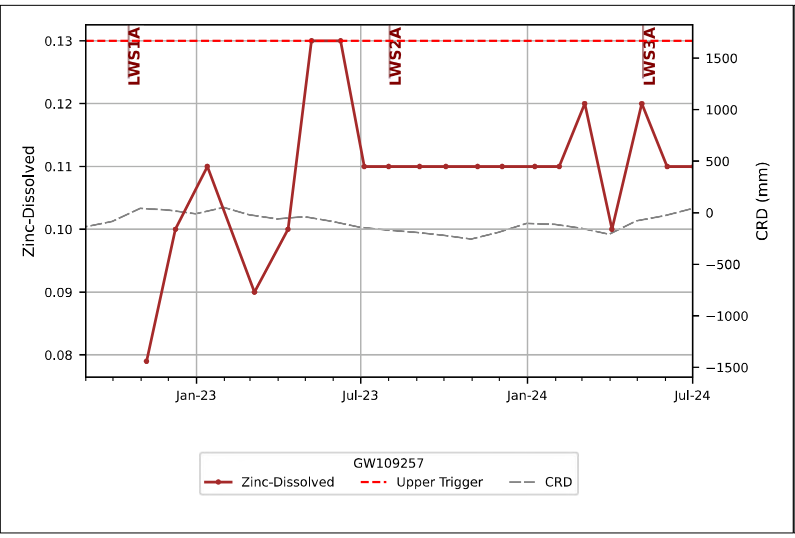
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Manganese-Dissolved
Upper Trigger
CRD



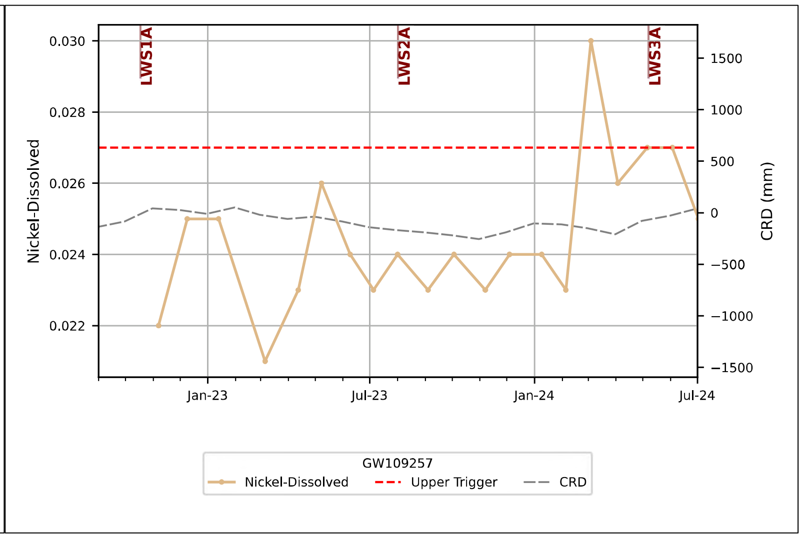
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Copper-Dissolved
Upper Trigger
CRD



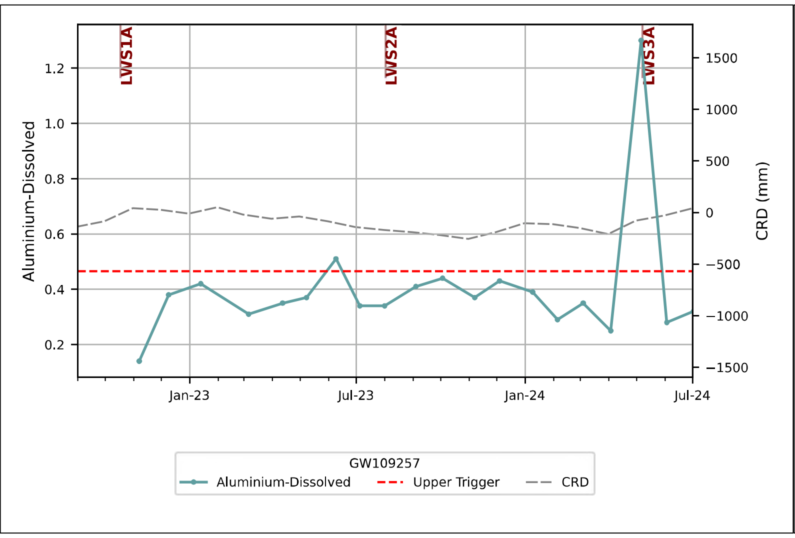
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Lead-Dissolved
Upper Trigger
CRD

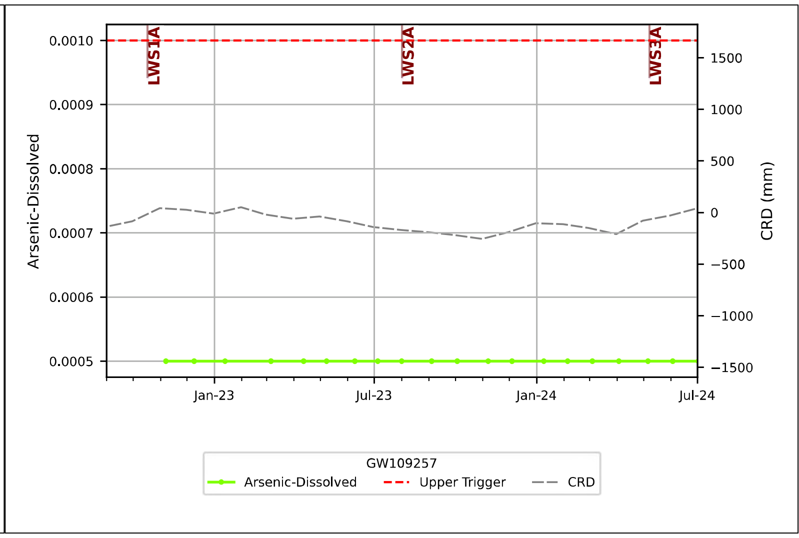


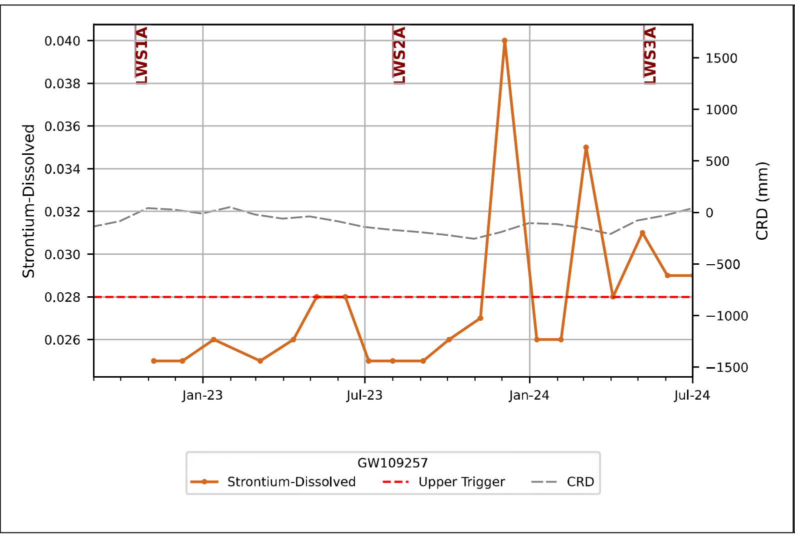
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Zinc-Dissolved
Upper Trigger
CRD

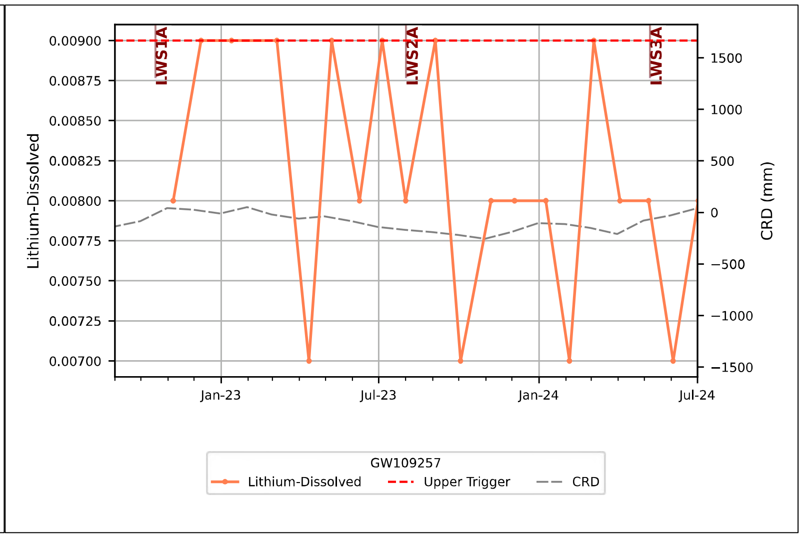


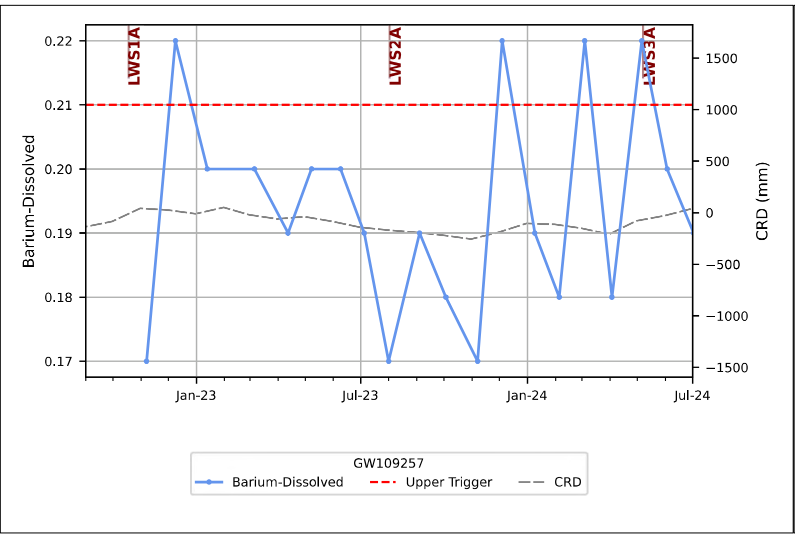
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Nickel-Dissolved
Upper Trigger
CRD

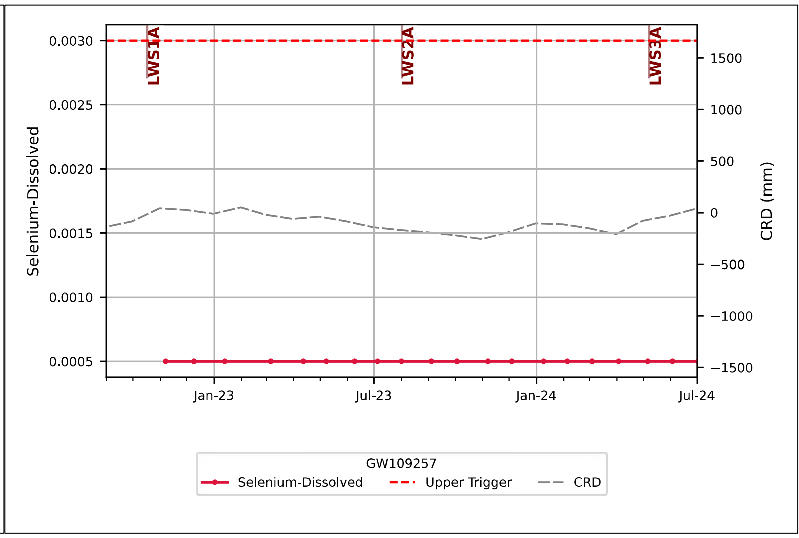

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
1.2
1.0
0.8
0.6
0.4
0.2
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Aluminium-Dissolved
Upper Trigger
CRD

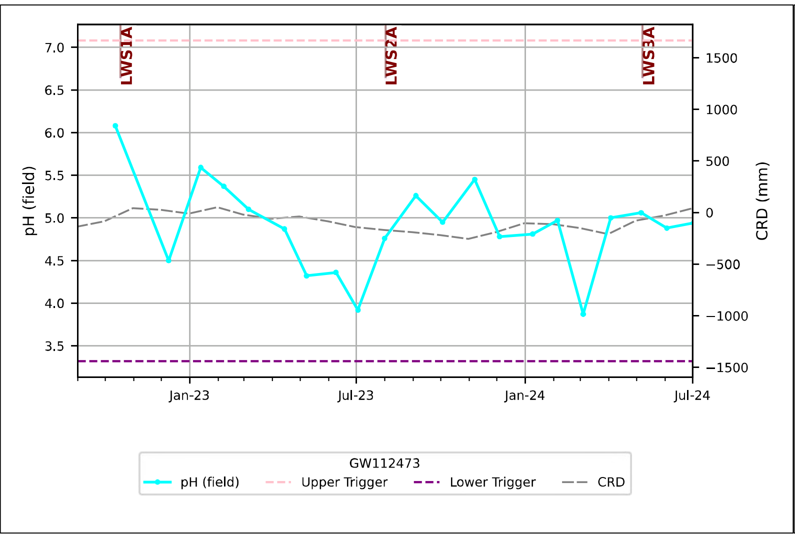

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Arsenic-Dissolved
Upper Trigger
CRD

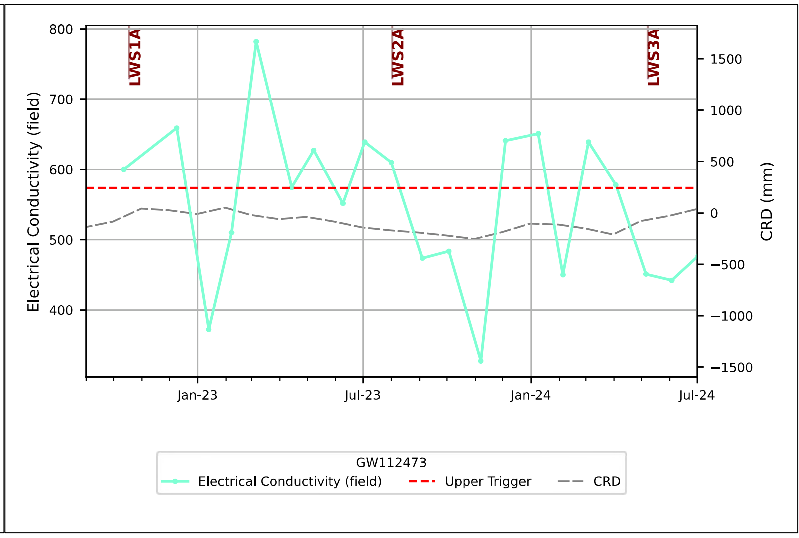

LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
0.040
0.038
0.036
0.034
0.032
0.030
0.028
0.026
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Strontium-Dissolved
Upper Trigger
CRD

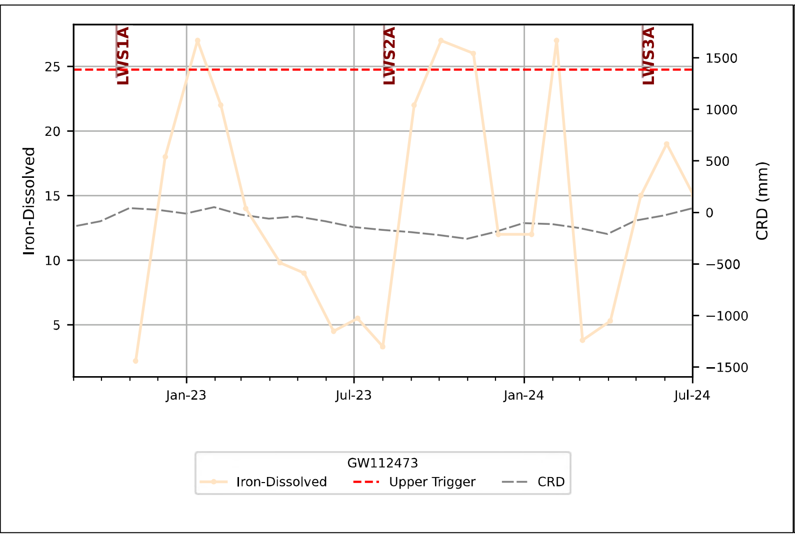

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
0.00900
0.00875
0.00850
0.00825
0.00800
0.00775
0.00750
0.00725
0.00700
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Lithium-Dissolved
Upper Trigger
CRD

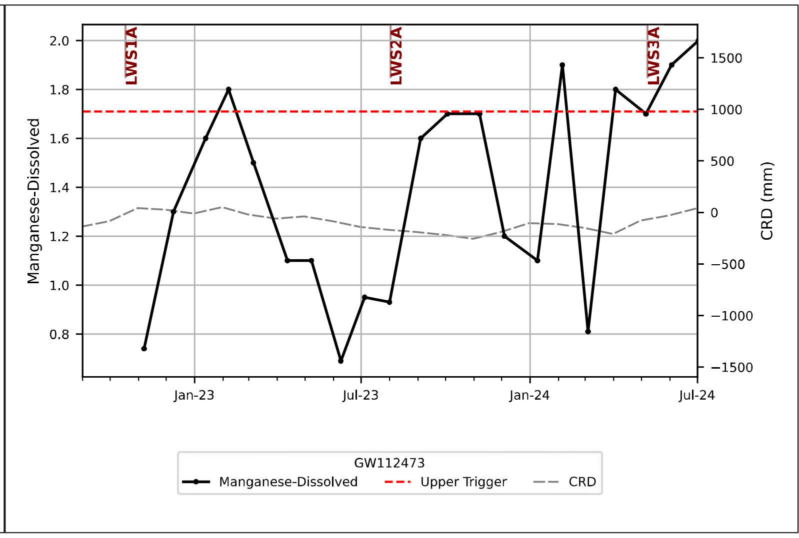

LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
0.22
0.21
0.20
0.19
0.18
0.17
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Barium-Dissolved
Upper Trigger
CRD

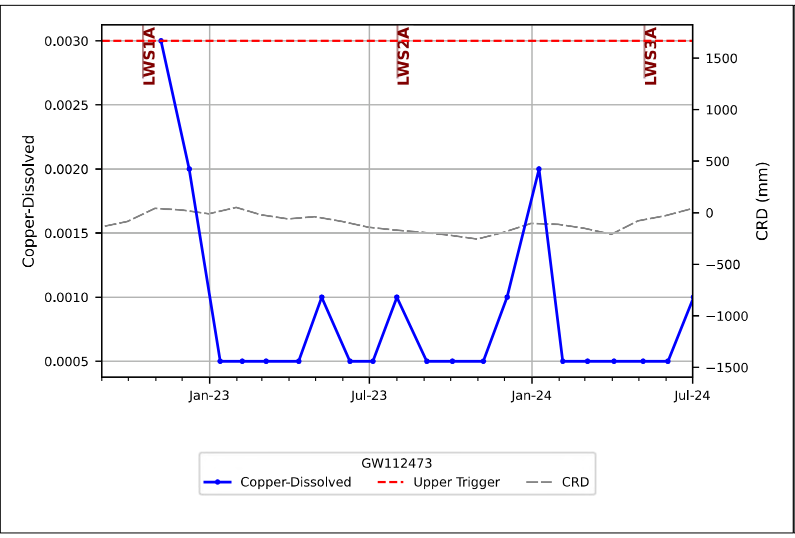

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
GW109257
Selenium-Dissolved
Upper Trigger
CRD

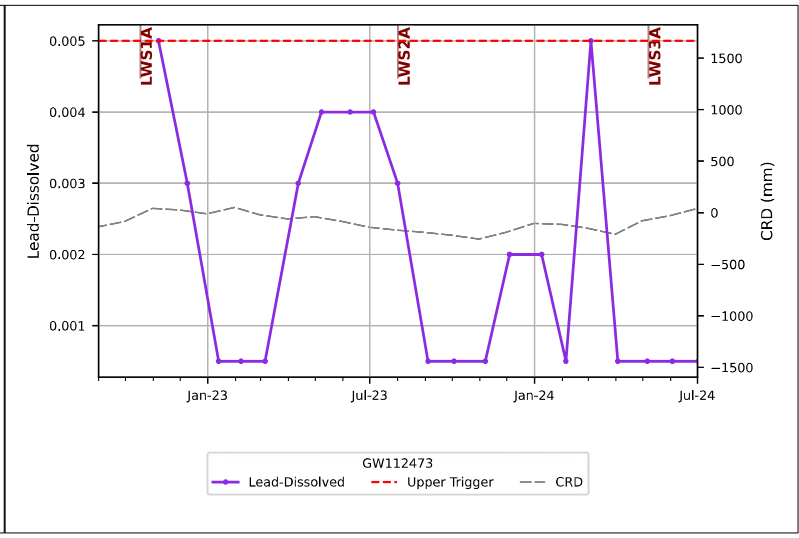

pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
pH (field)
Upper Trigger
Lower Trigger
CRD

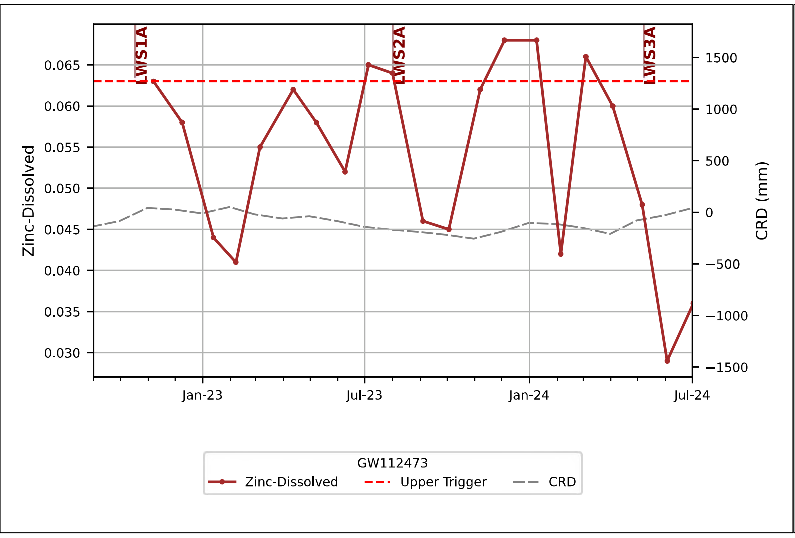

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Electrical Conductivity (field)
Upper Trigger
CRD

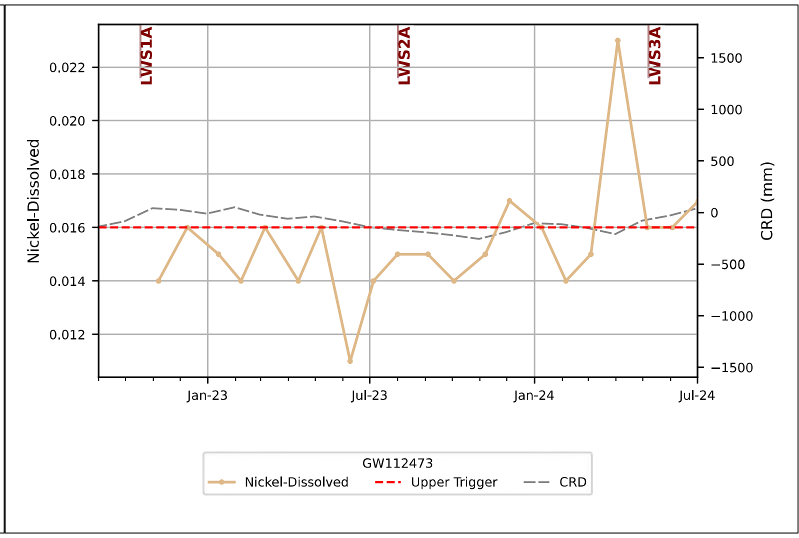

Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Iron-Dissolved
Upper Trigger
CRD

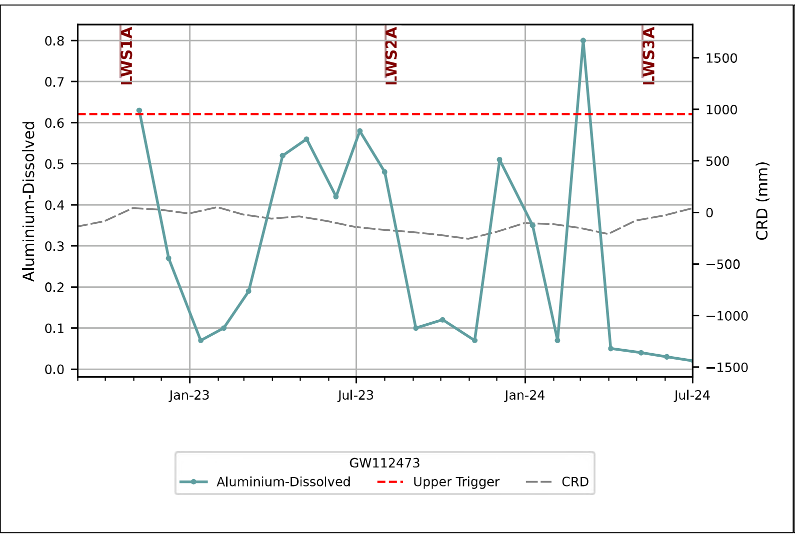

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Manganese-Dissolved
Upper Trigger
CRD

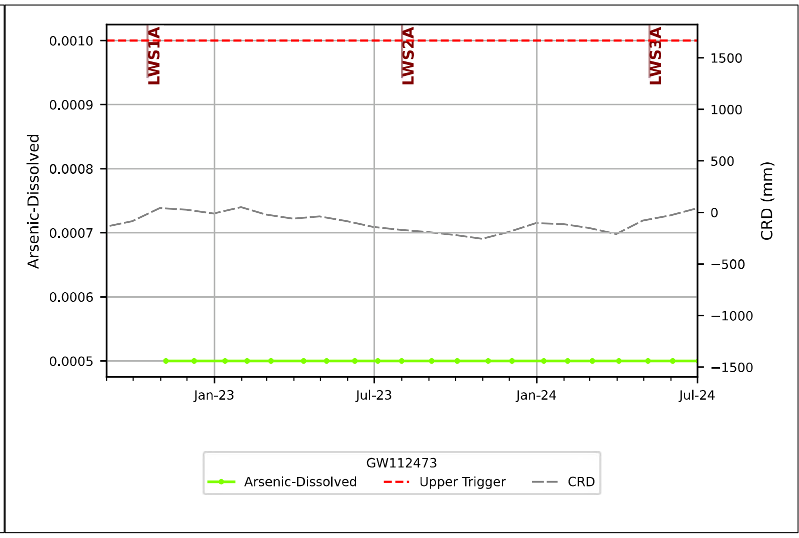

Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Copper-Dissolved
Upper Trigger
CRD

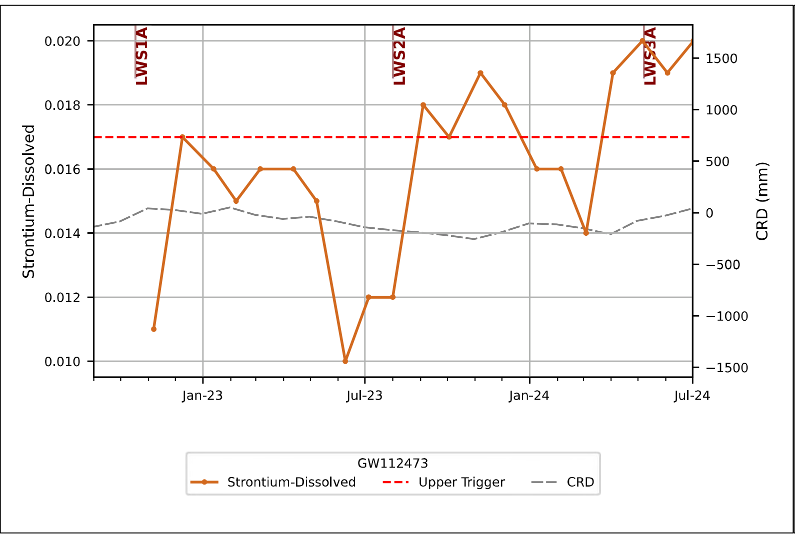

Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Lead-Dissolved
Upper Trigger
CRD

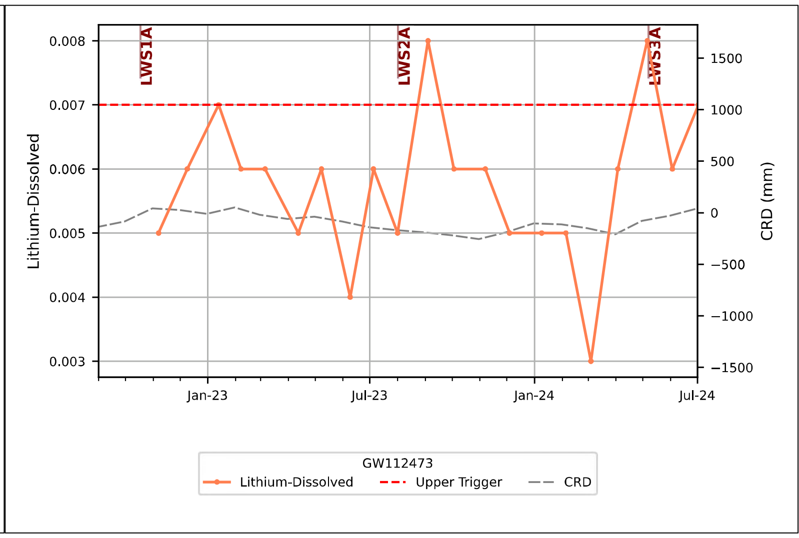

Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Zinc-Dissolved
Upper Trigger
CRD

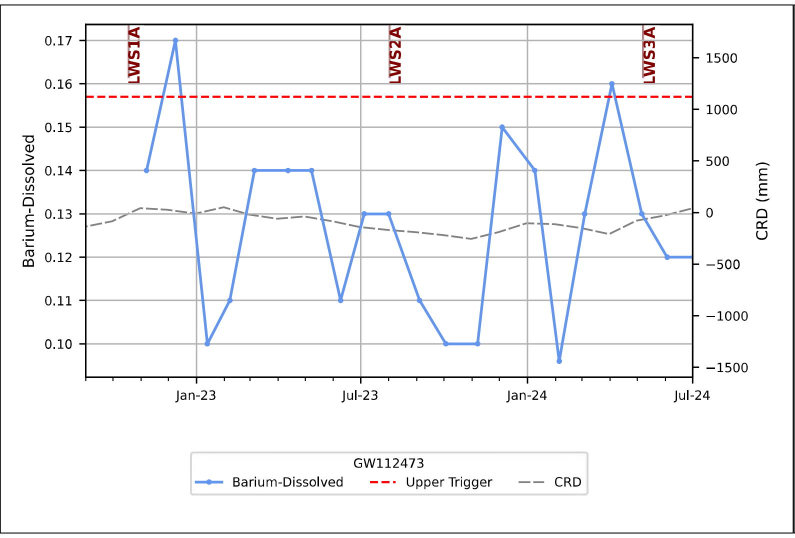

Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Nickel-Dissolved
Upper Trigger
CRD


Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Aluminium-Dissolved
Upper Trigger
CRD

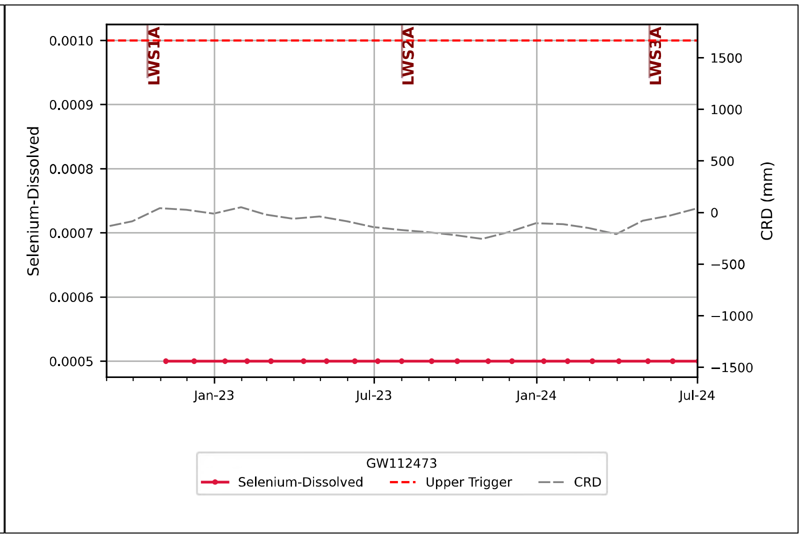

Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Arsenic-Dissolved
Upper Trigger
CRD


Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Strontium-Dissolved
Upper Trigger
CRD

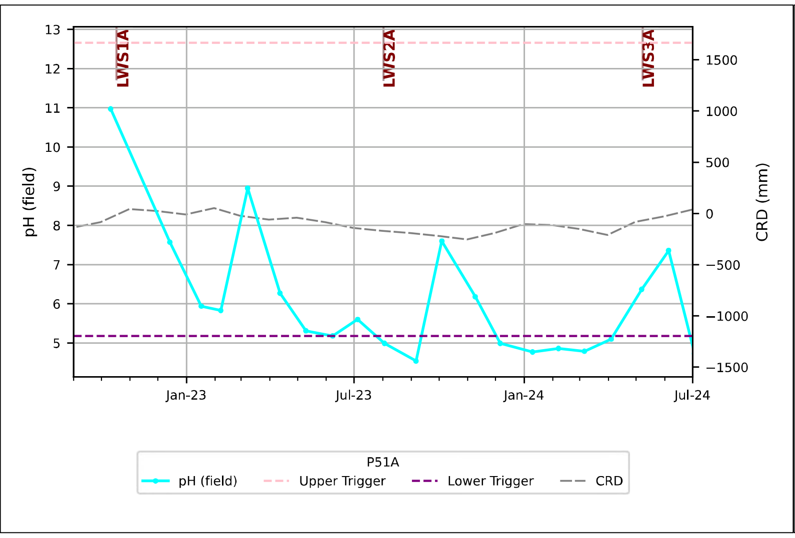

Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Lithium-Dissolved
Upper Trigger
CRD



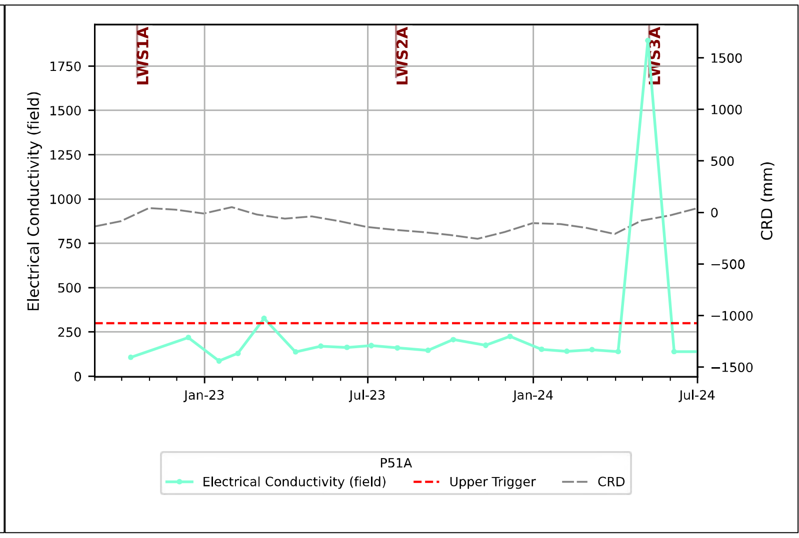
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Barium-Dissolved
Upper Trigger
CRD



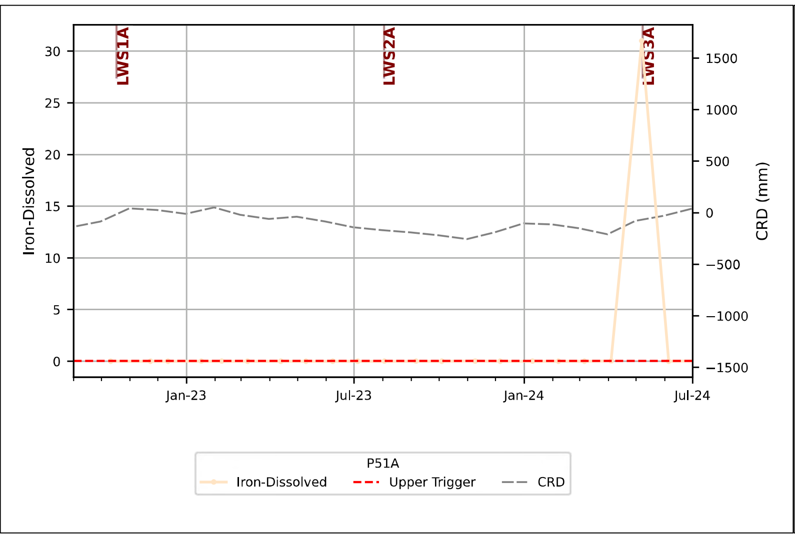
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
GW112473
Selenium-Dissolved
Upper Trigger
CRD



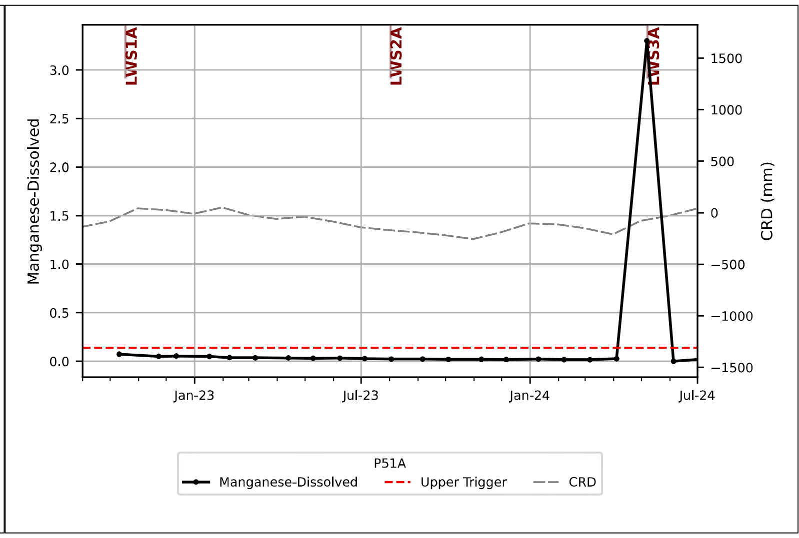
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
pH (field)
Upper Trigger
Lower Trigger
CRD



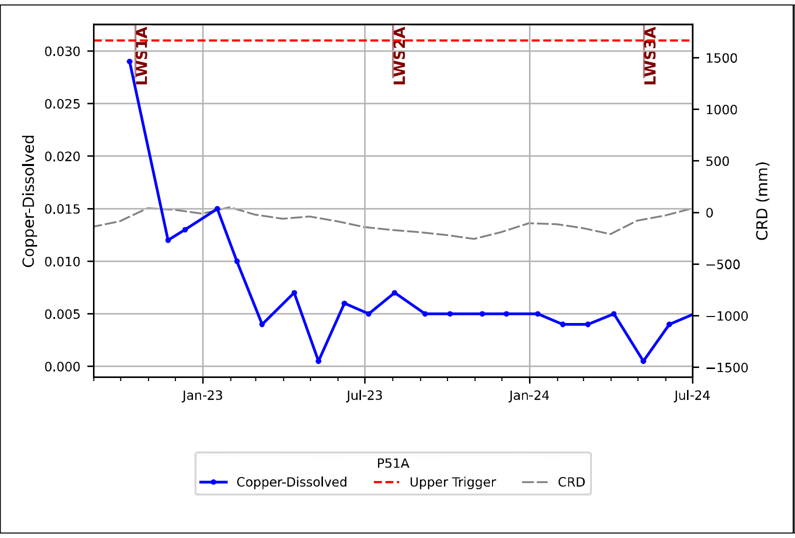
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Electrical Conductivity (field)
Upper Trigger
CRD

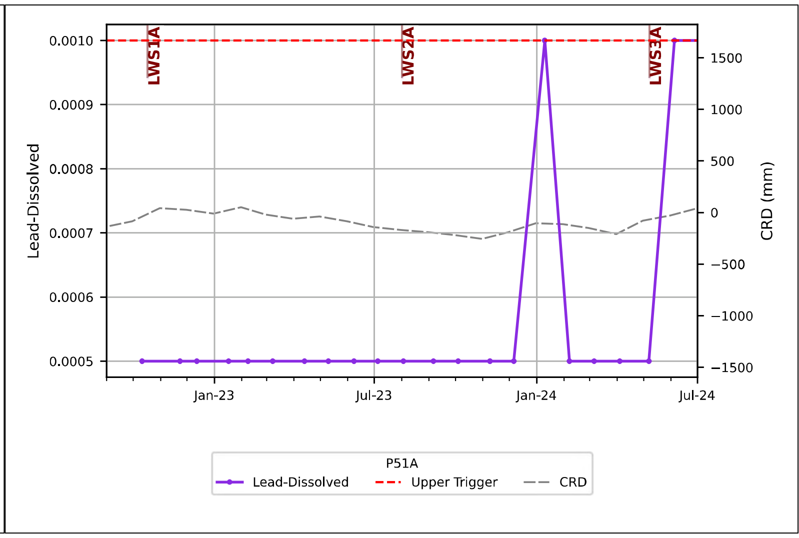


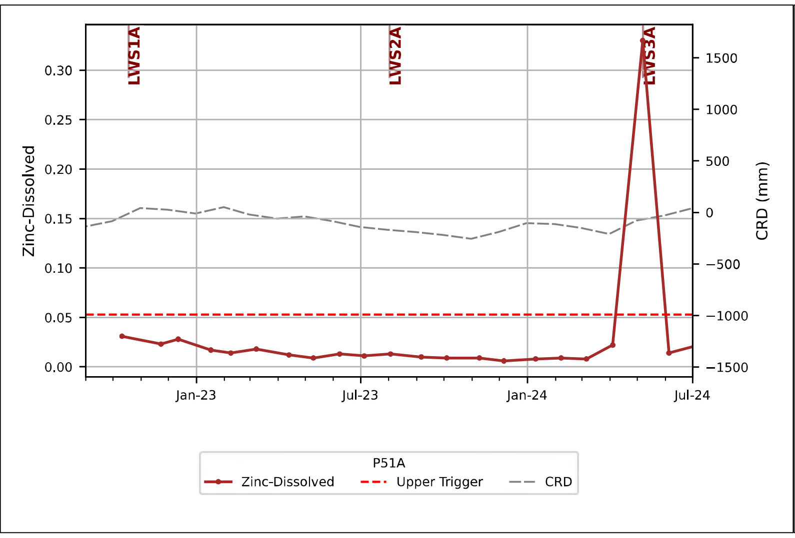
LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Iron-Dissolved
Upper Trigger
CRD

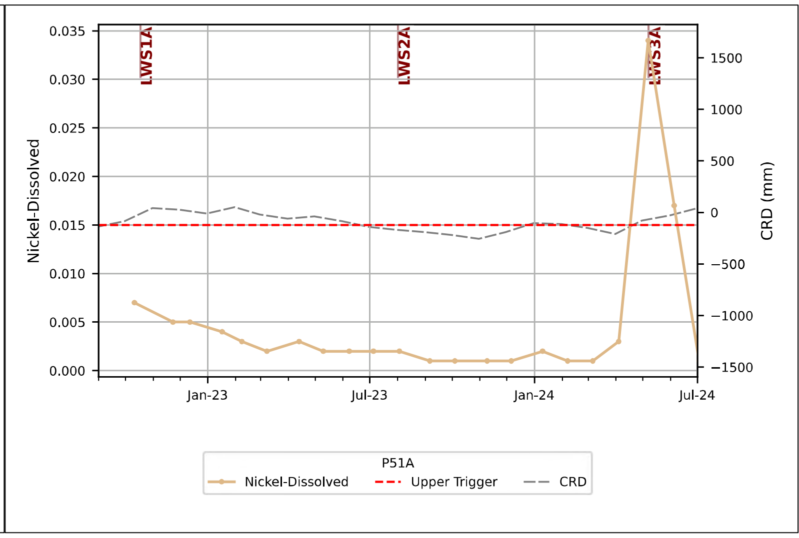


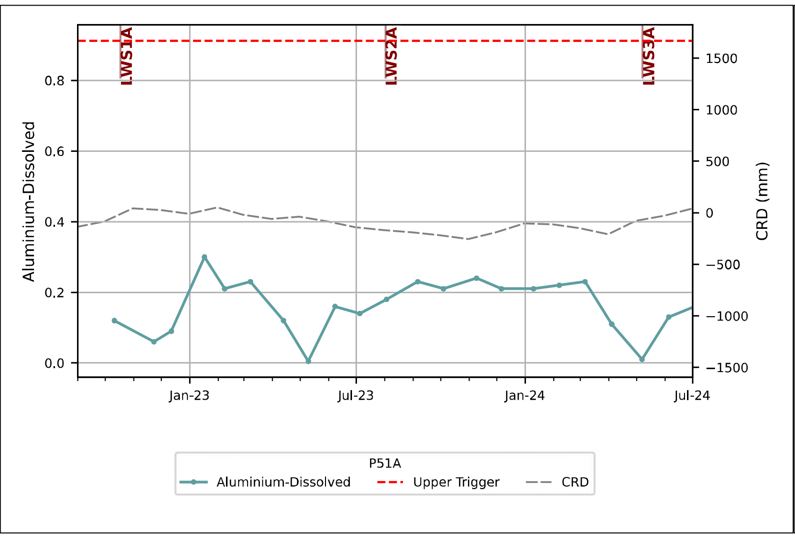
LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Manganese-Dissolved
Upper Trigger
CRD

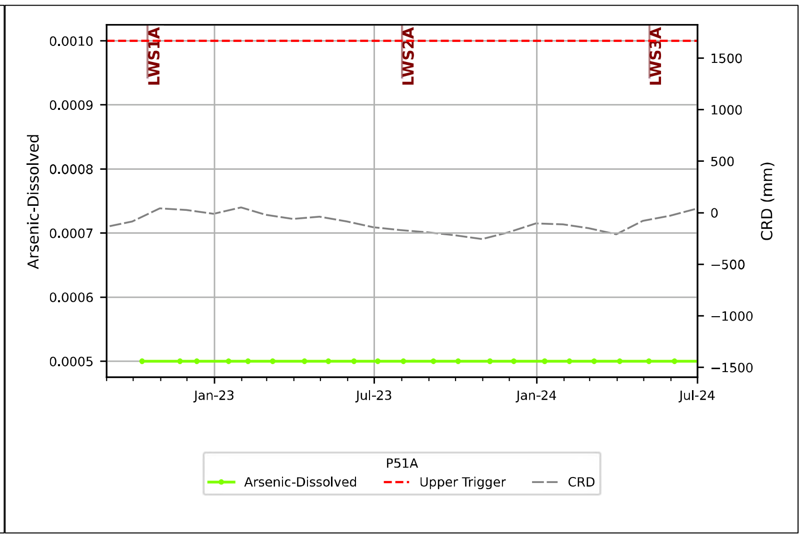

Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Copper-Dissolved
Upper Trigger
CRD

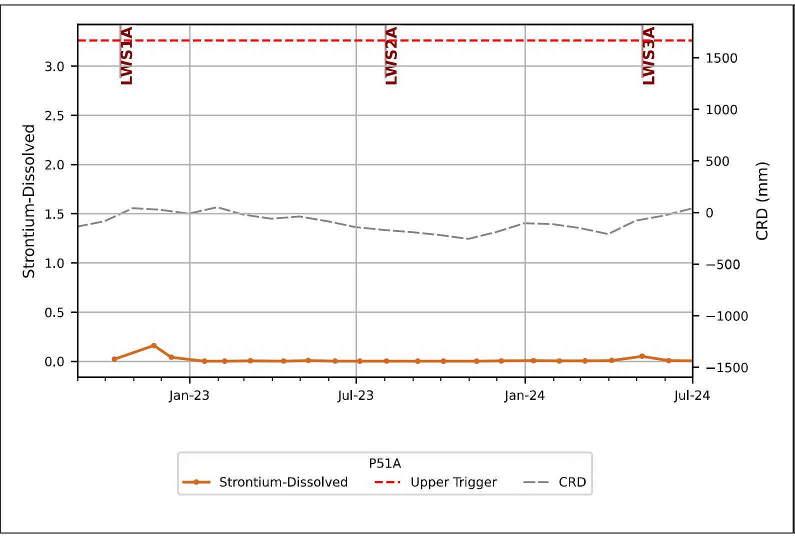

Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Lead-Dissolved
Upper Trigger
CRD

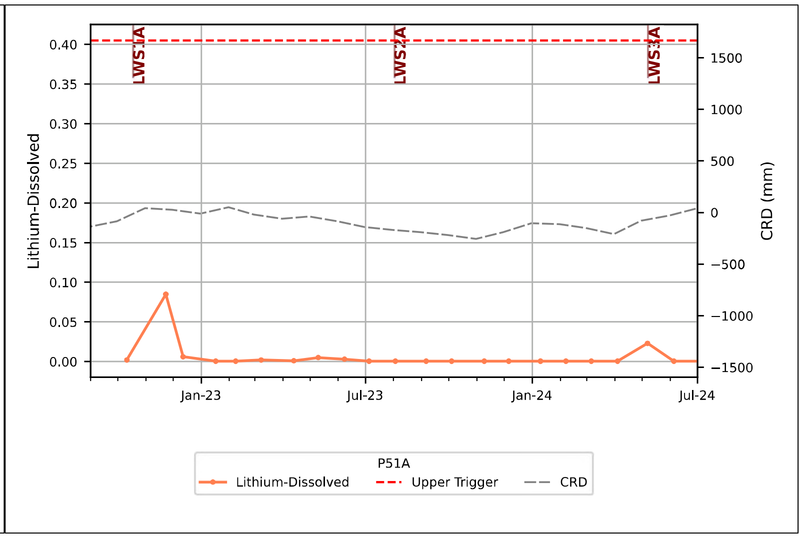

Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Zinc-Dissolved
Upper Trigger
CRD

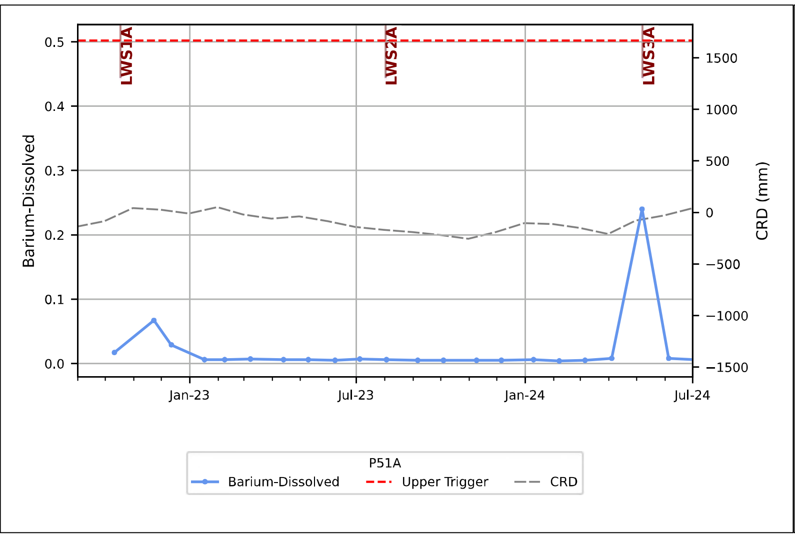

Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Nickel-Dissolved
Upper Trigger
CRD

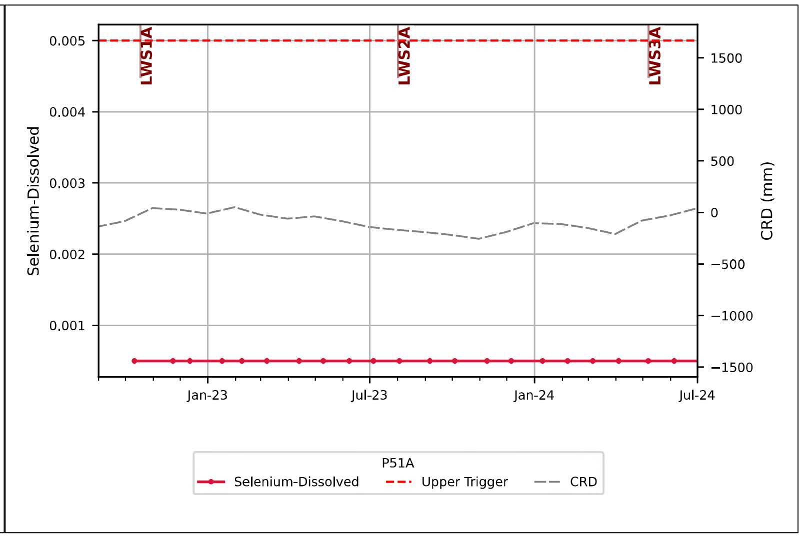

Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Aluminium-Dissolved
Upper Trigger
CRD

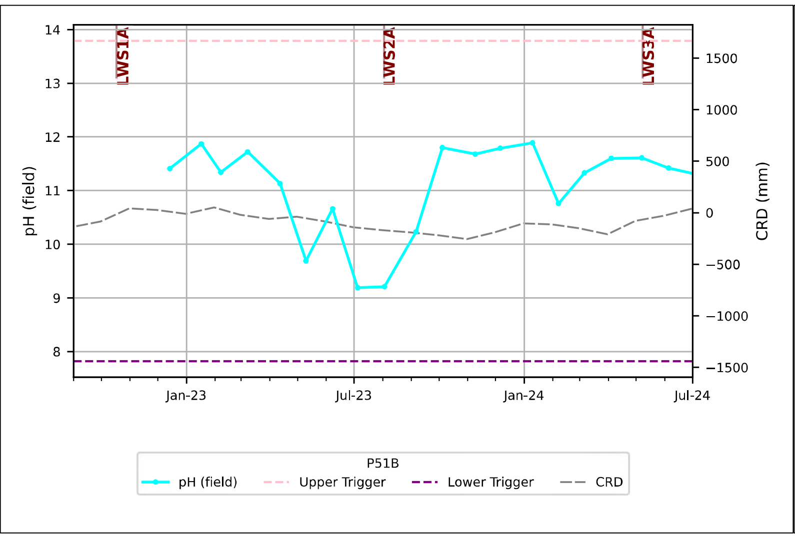

Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Arsenic-Dissolved
Upper Trigger
CRD

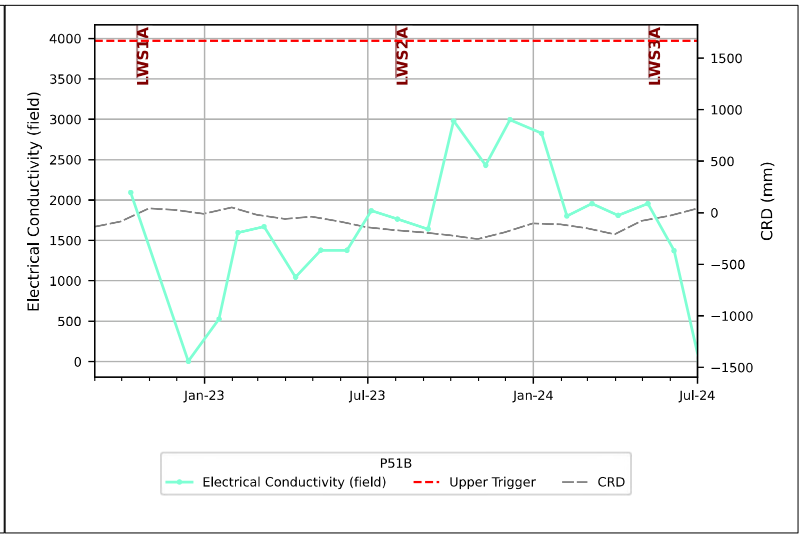

LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Strontium-Dissolved
Upper Trigger
CRD

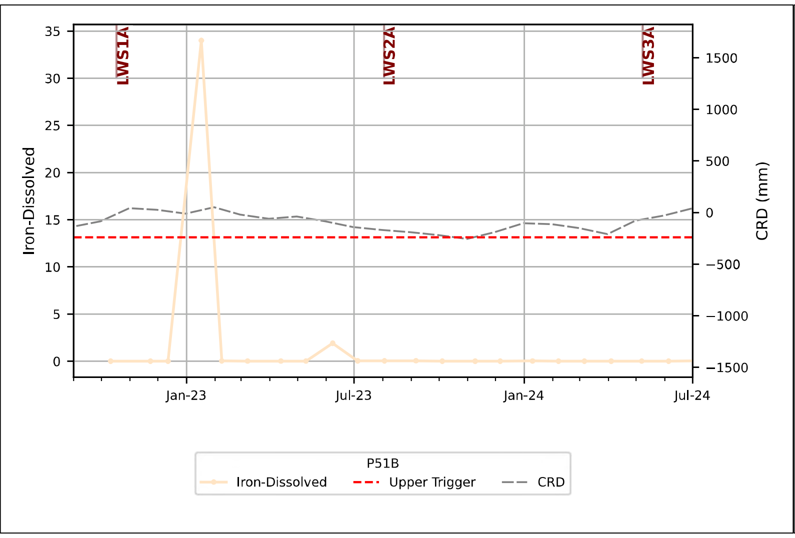

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Lithium-Dissolved
Upper Trigger
CRD

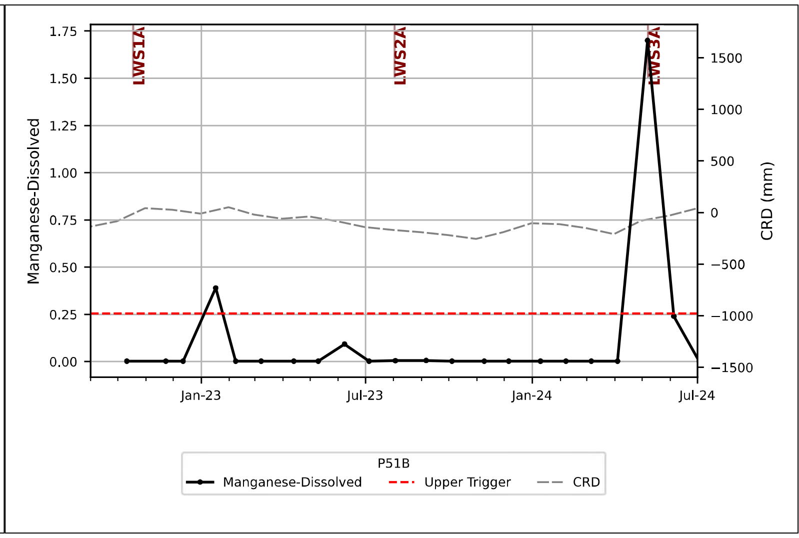

LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Barium-Dissolved
Upper Trigger
CRD

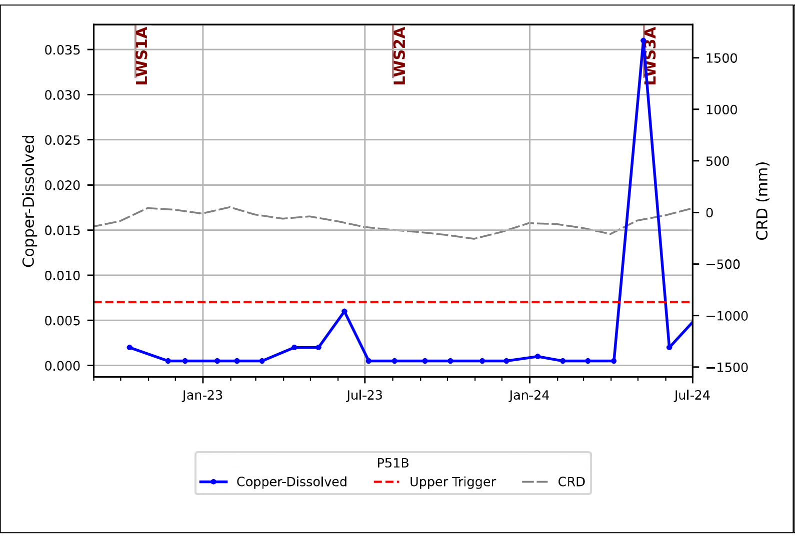

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51A
Selenium-Dissolved
Upper Trigger
CRD

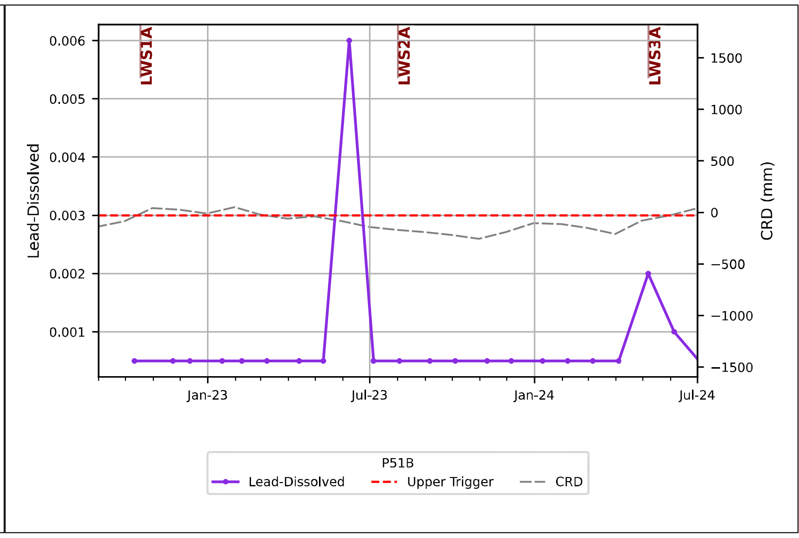

LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
pH (field)
Upper Trigger
Lower Trigger
CRD

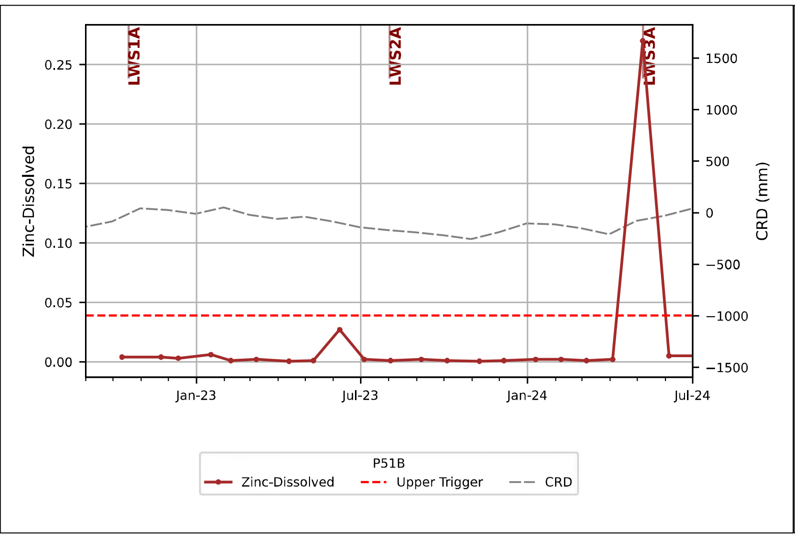

LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Electrical Conductivity (field)
Upper Trigger
CRD

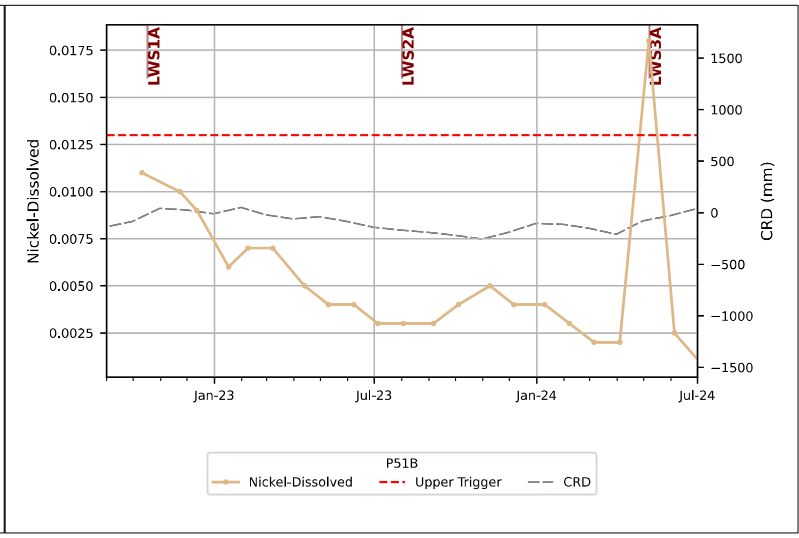

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Iron-Dissolved
Upper Trigger
CRD

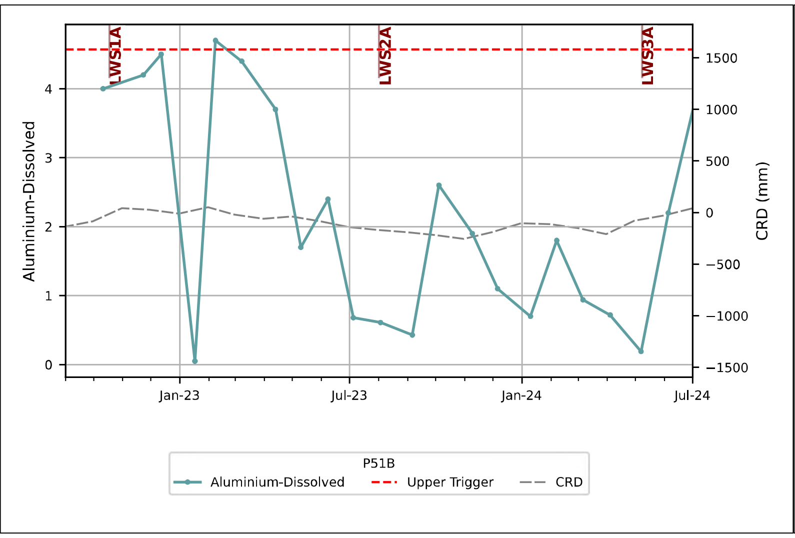

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Manganese-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Copper-Dissolved
Upper Trigger
CRD

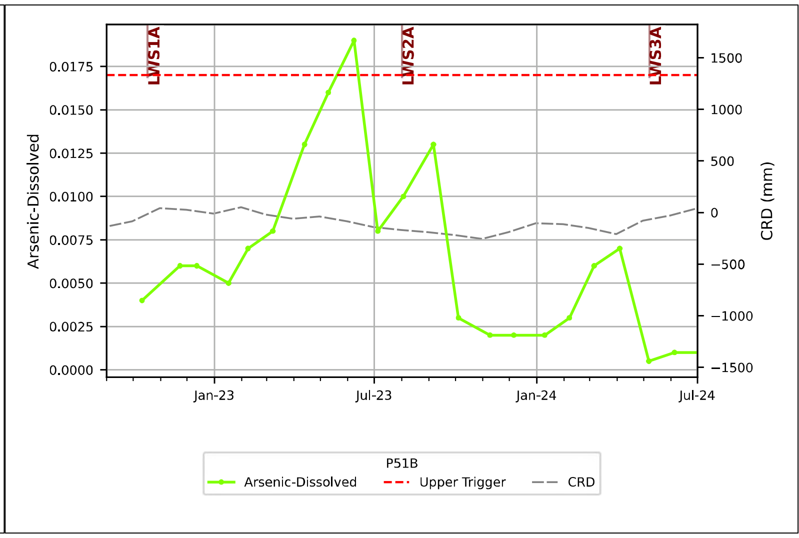

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Lead-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Zinc-Dissolved
Upper Trigger
CRD

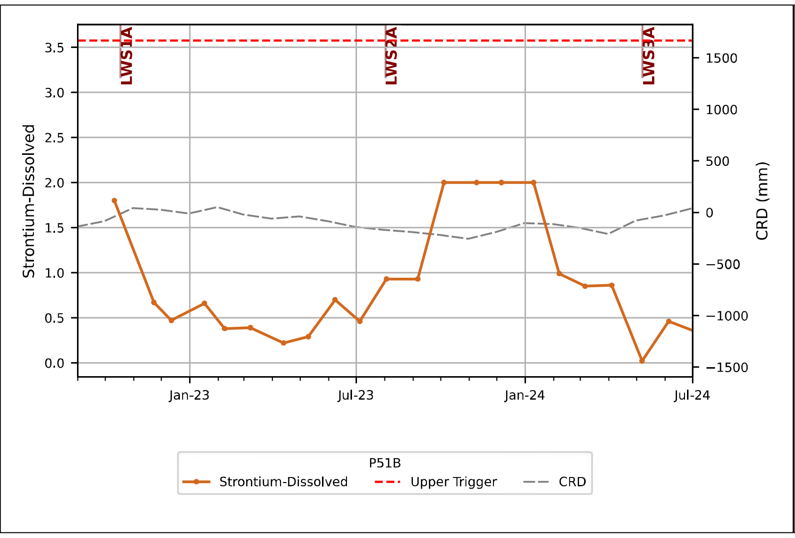

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Nickel-Dissolved
Upper Trigger
CRD



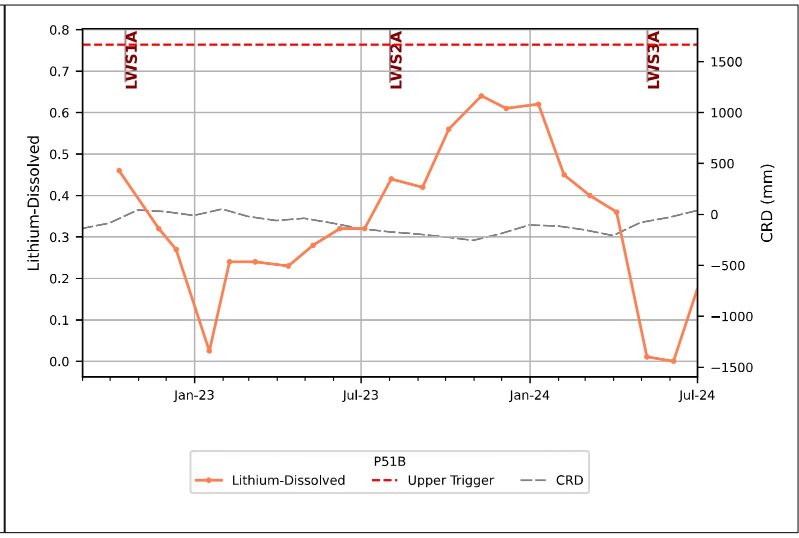
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Aluminium-Dissolved
Upper Trigger
CRD



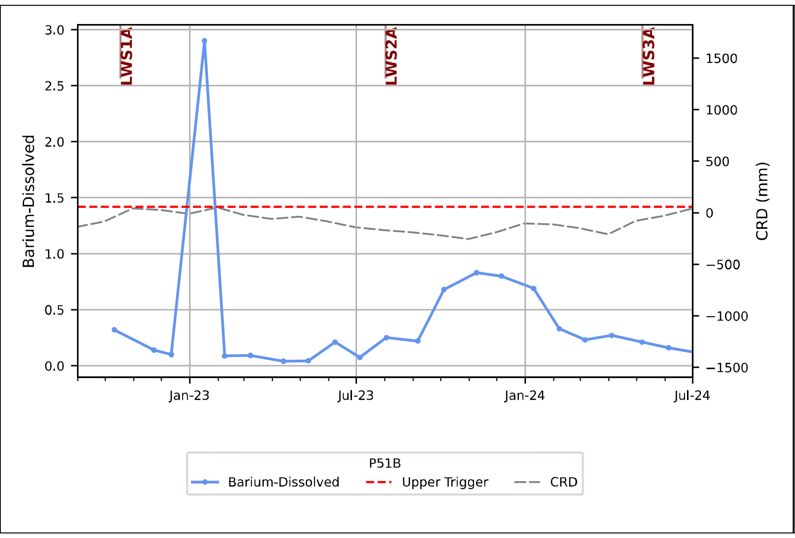
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Arsenic-Dissolved
Upper Trigger
CRD



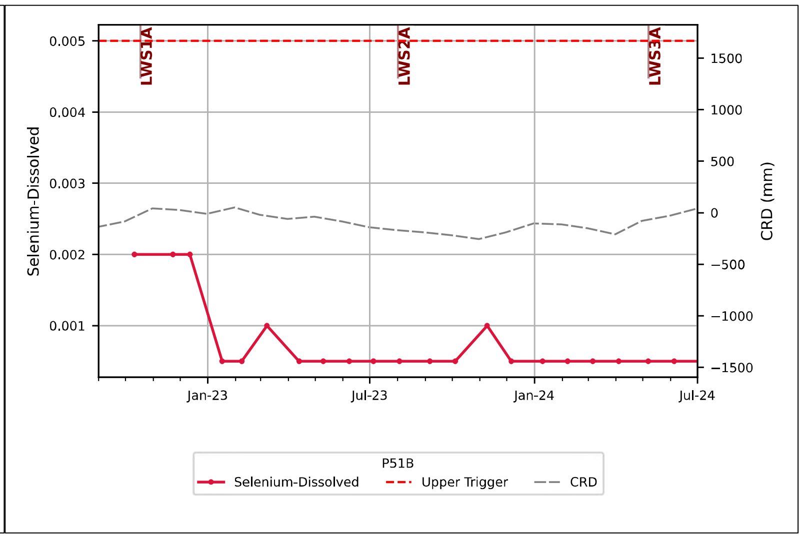
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Strontium-Dissolved
Upper Trigger
CRD



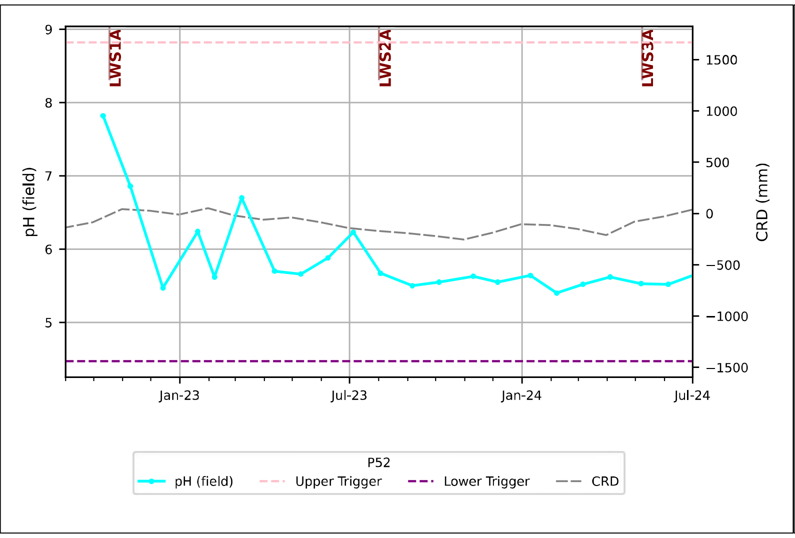
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Lithium-Dissolved
Upper Trigger
CRD



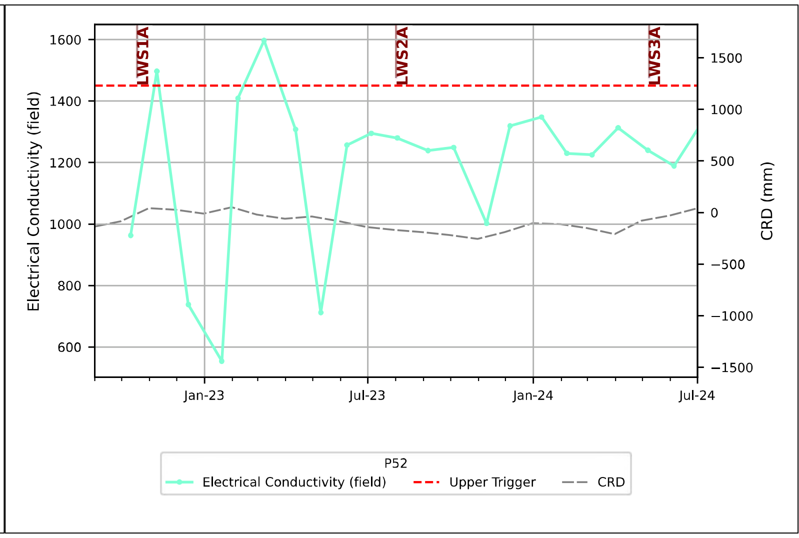
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Barium-Dissolved
Upper Trigger
CRD



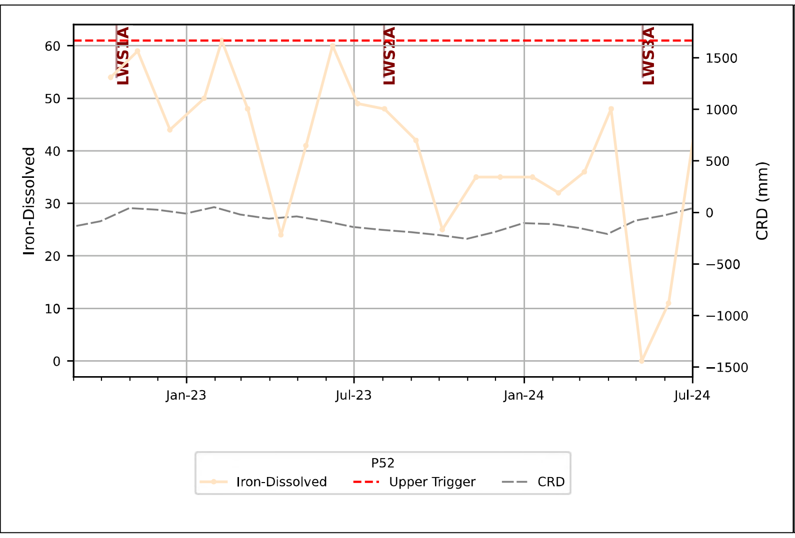
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P51B
Selenium-Dissolved
Upper Trigger
CRD



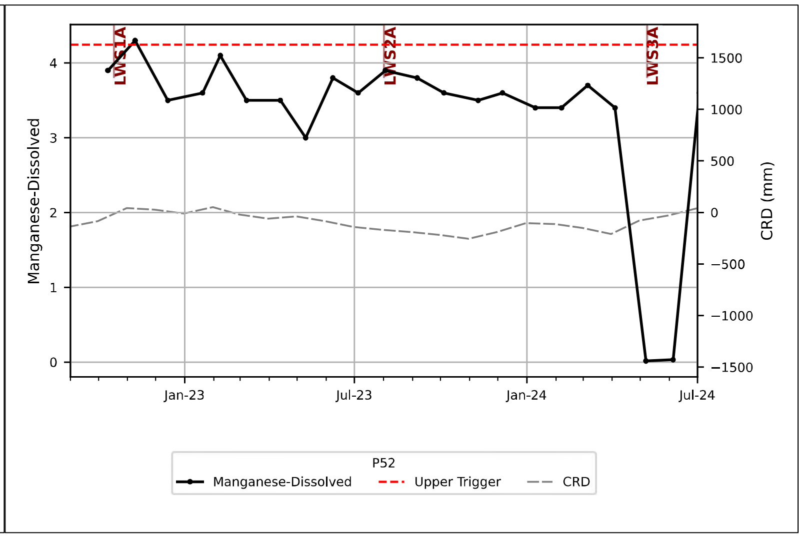
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
pH (field)
Upper Trigger
Lower Trigger
CRD



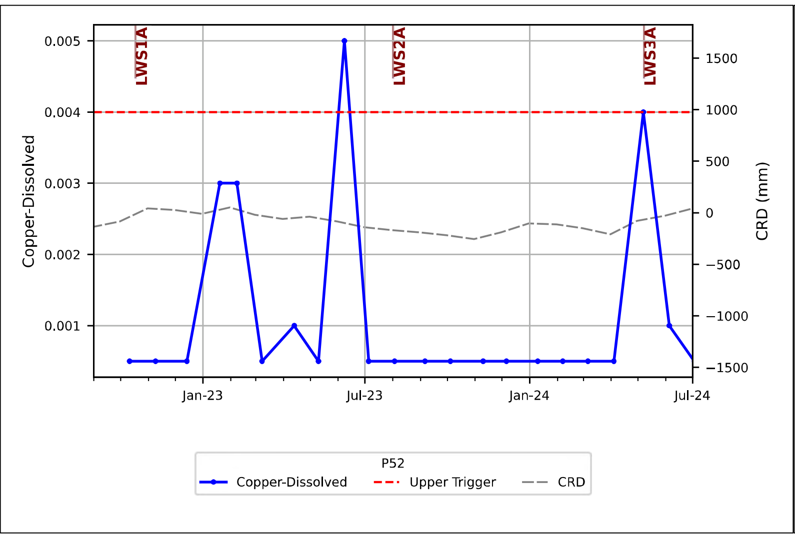
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
Electrical Conductivity (field)
Upper Trigger
CRD



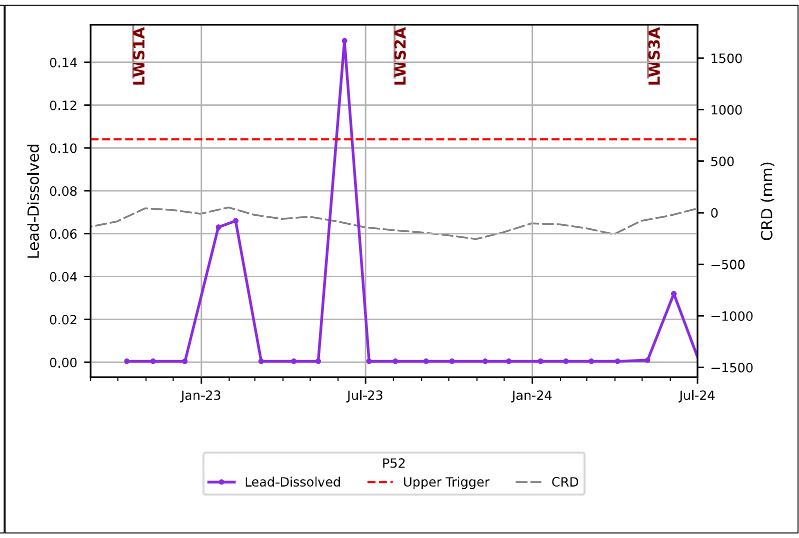
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
Iron-Dissolved
Upper Trigger
CRD



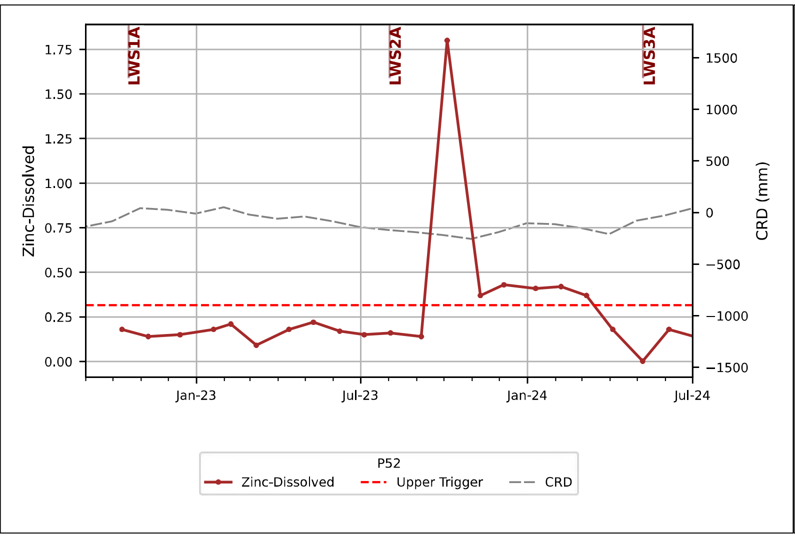
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
Manganese-Dissolved
Upper Trigger
CRD

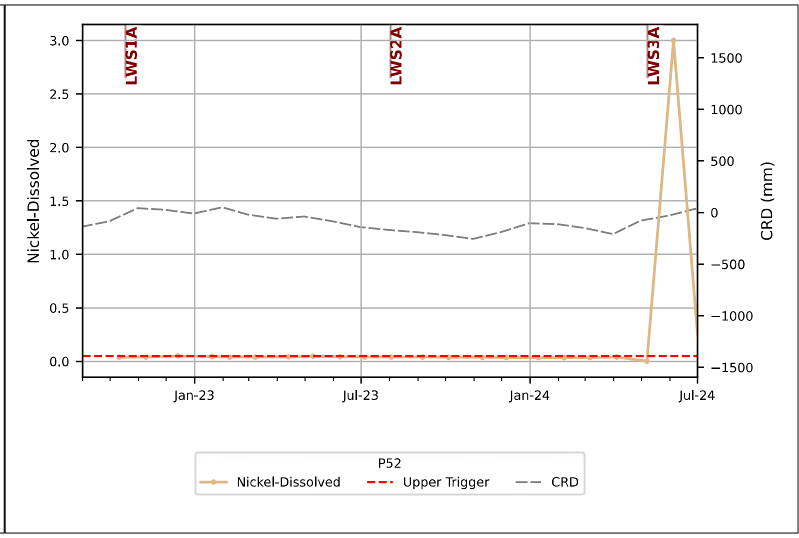


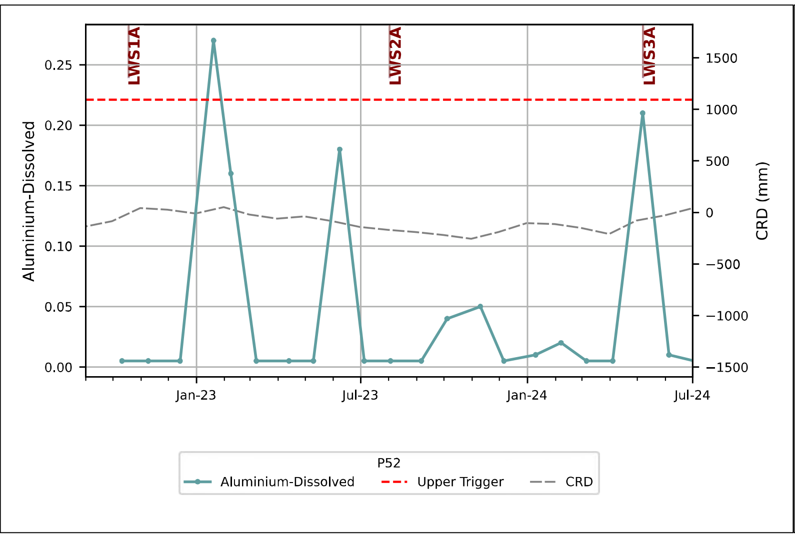
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
Copper-Dissolved
Upper Trigger
CRD

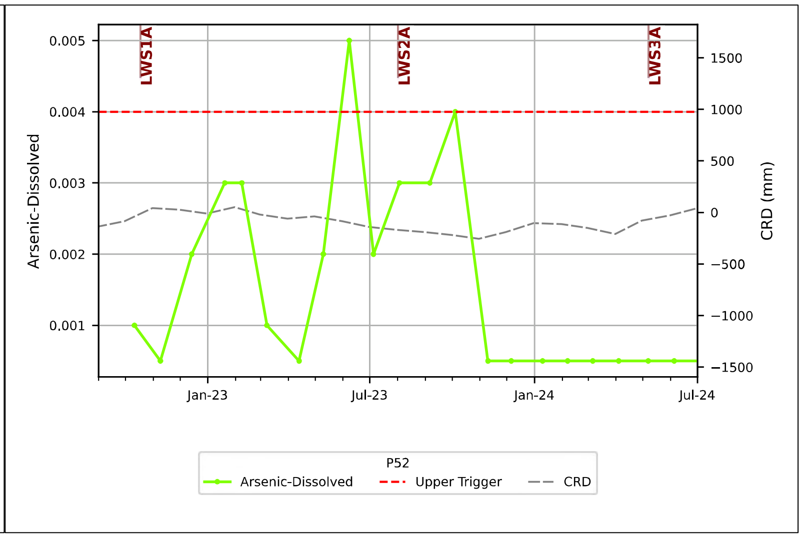


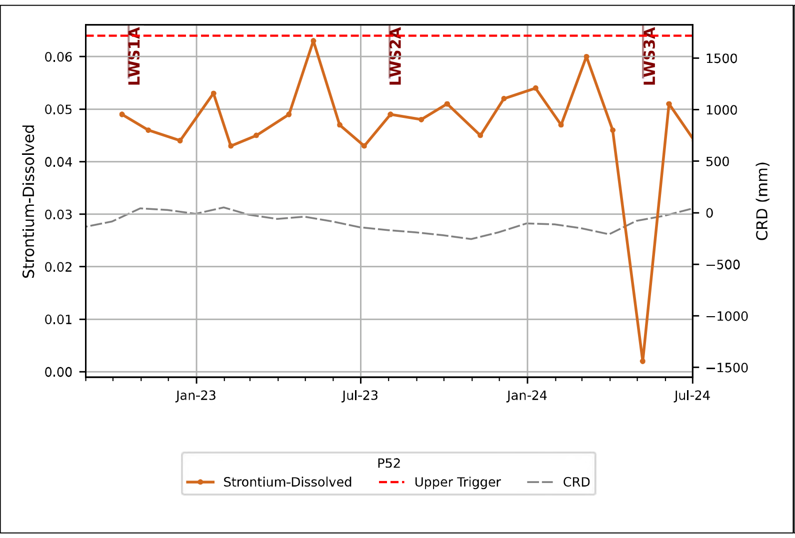
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P52
Lead-Dissolved
Upper Trigger
CRD

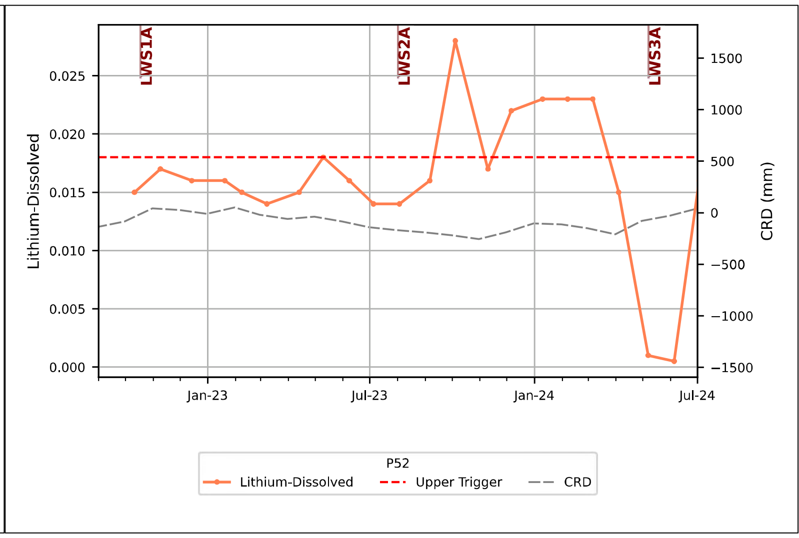

LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Zinc-Dissolved
Upper Trigger
CRD

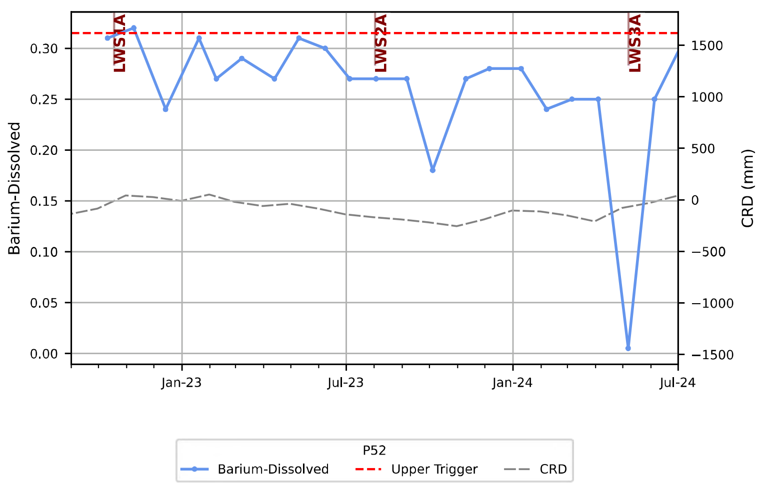

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Nickel-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Aluminium-Dissolved
Upper Trigger
CRD

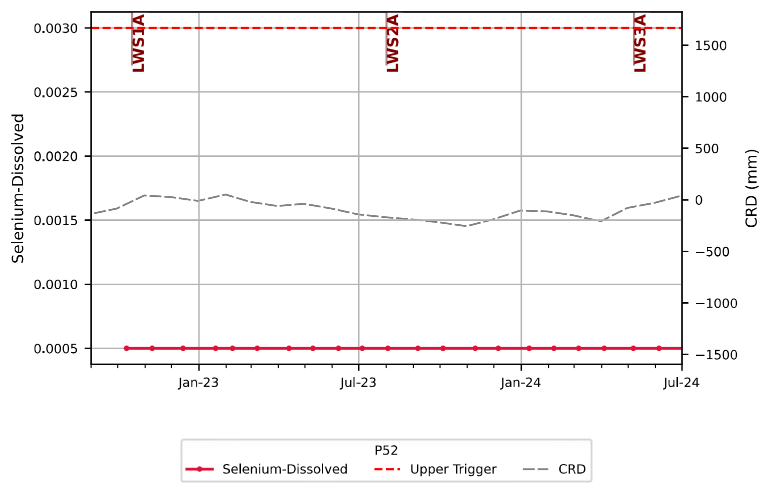

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Arsenic-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Strontium-Dissolved
Upper Trigger
CRD

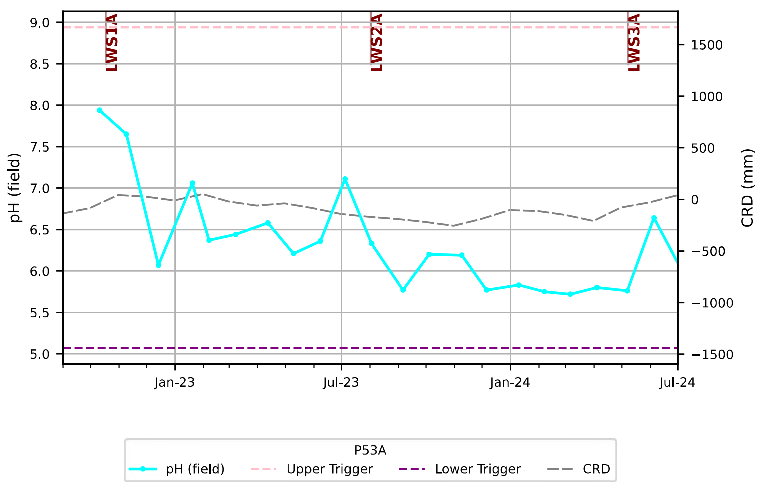

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Lithium-Dissolved
Upper Trigger
CRD



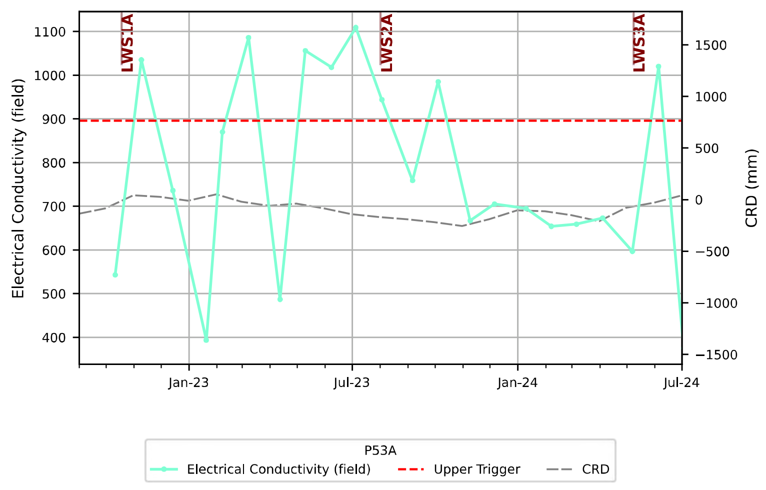
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Barium-Dissolved
Upper Trigger
CRD



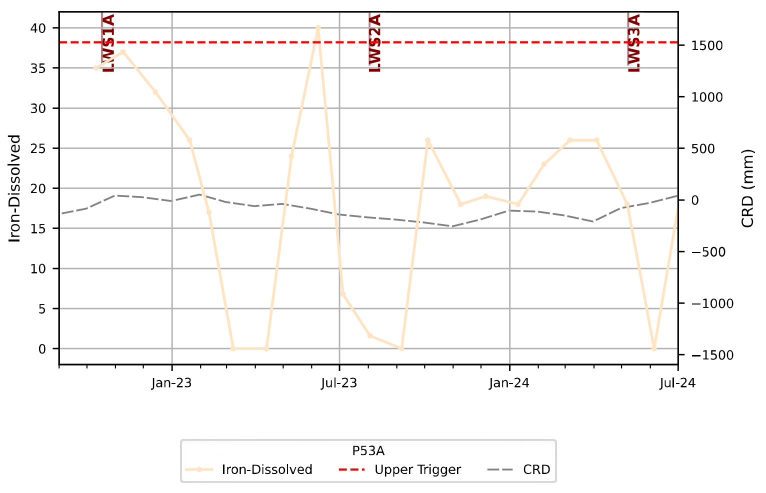
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P52
Selenium-Dissolved
Upper Trigger
CRD



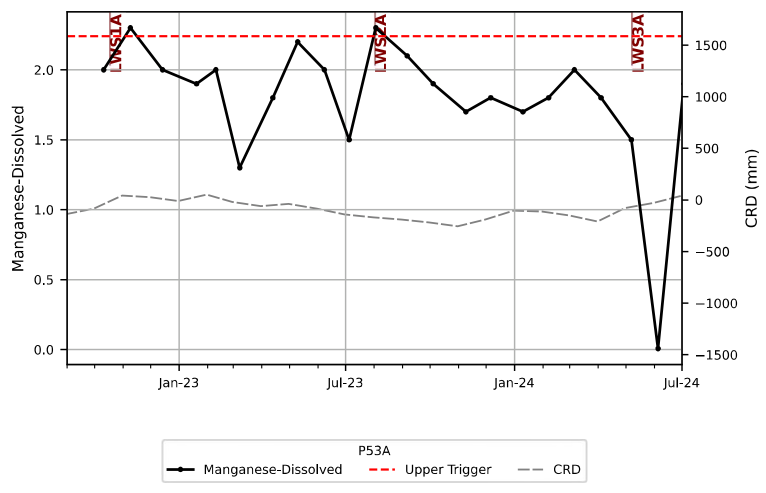
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P53A
pH (field)
Upper Trigger
Lower Trigger
CRD



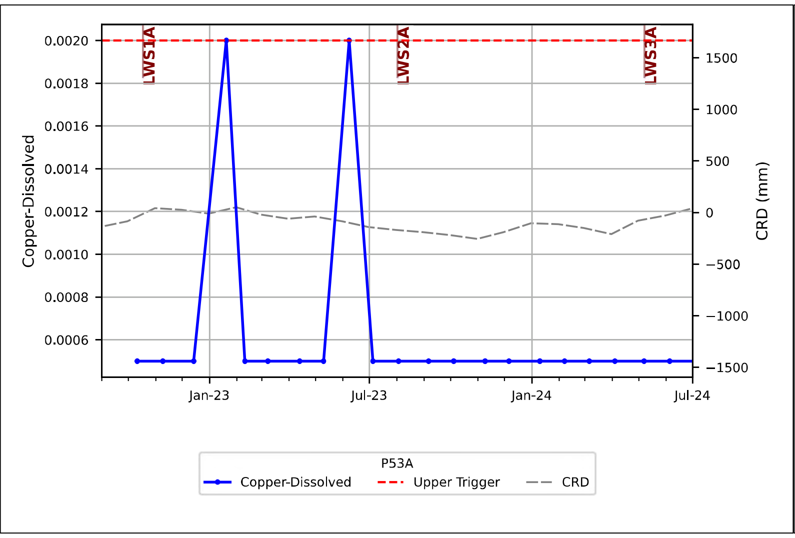
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Electrical Conductivity (field)
Upper Trigger
CRD

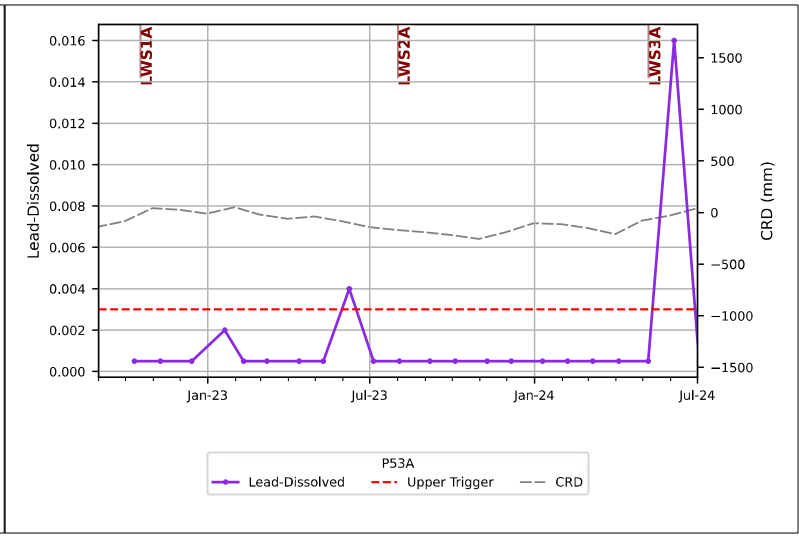


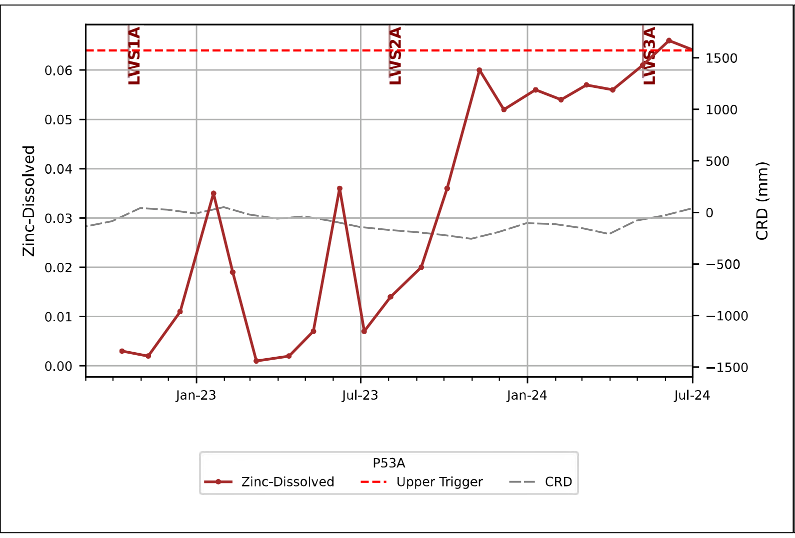
LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Iron-Dissolved
Upper Trigger
CRD

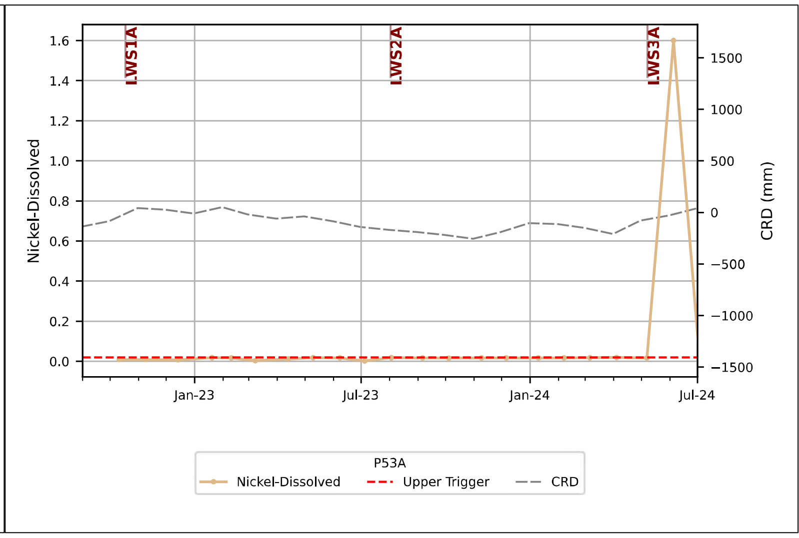


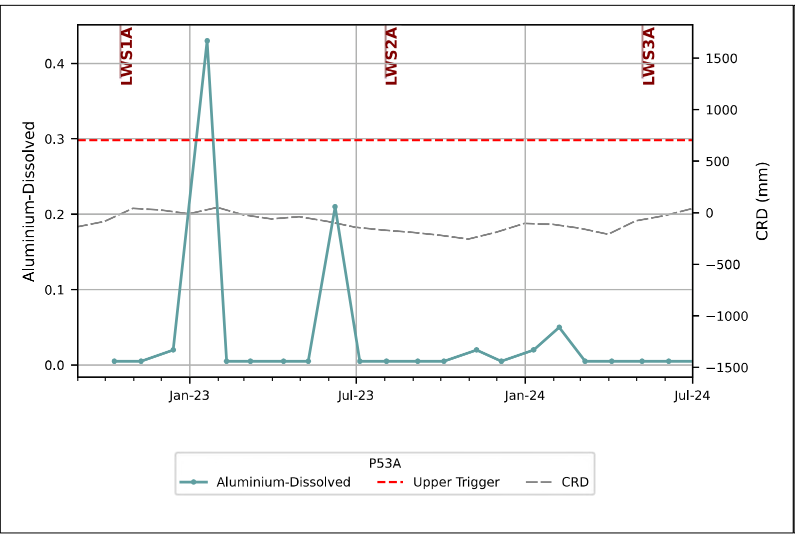
LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Manganese-Dissolved
Upper Trigger
CRD

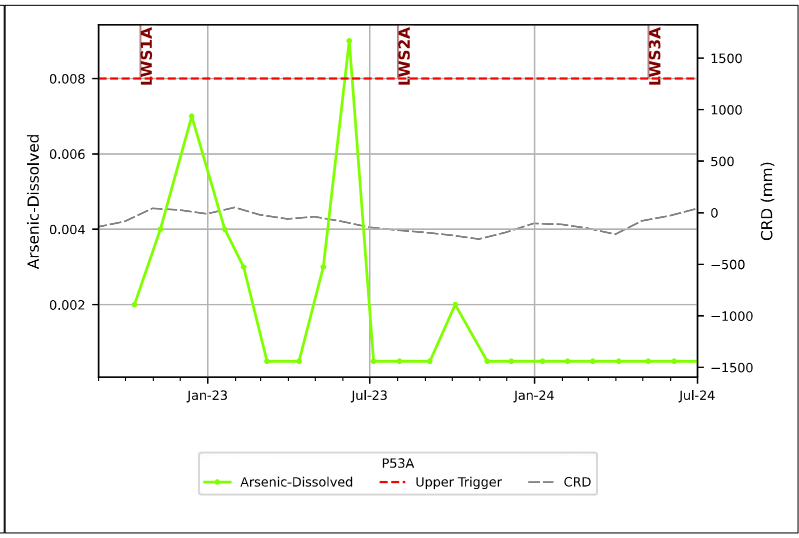

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
P53A
Copper-Dissolved
Upper Trigger
CRD

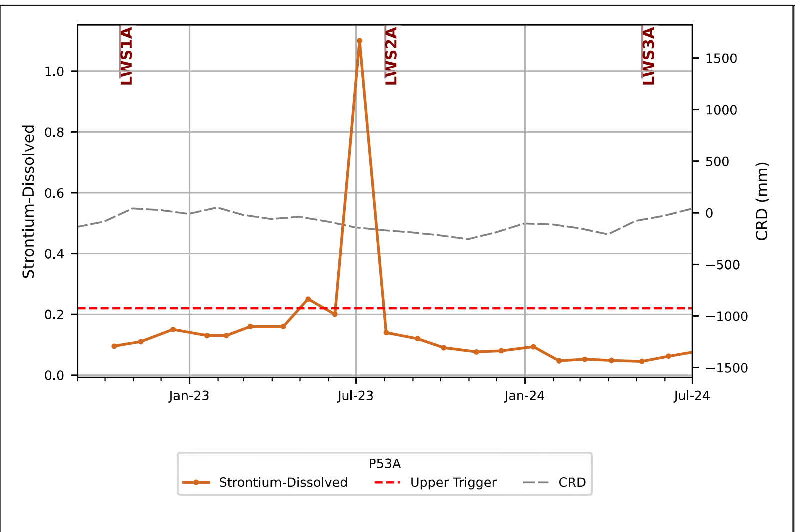

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
P53A
Lead-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
P53A
Zinc-Dissolved
Upper Trigger
CRD

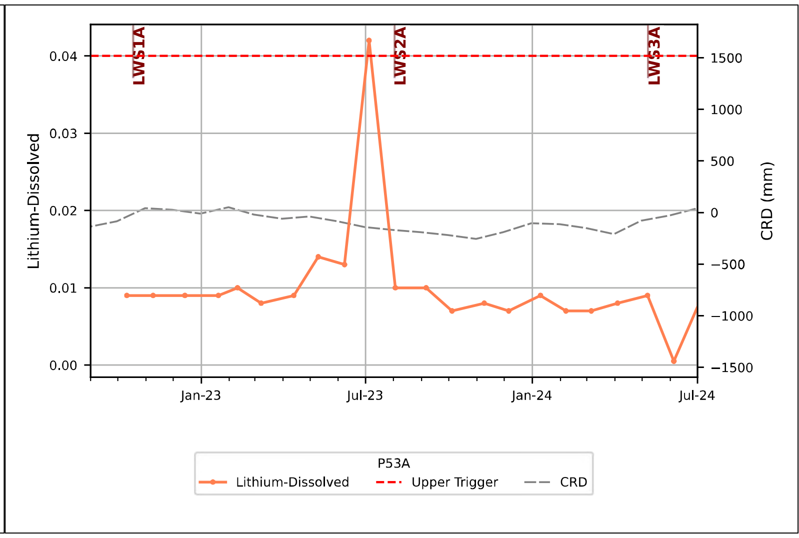

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
P53A
Nickel-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
P53A
Aluminium-Dissolved
Upper Trigger
CRD

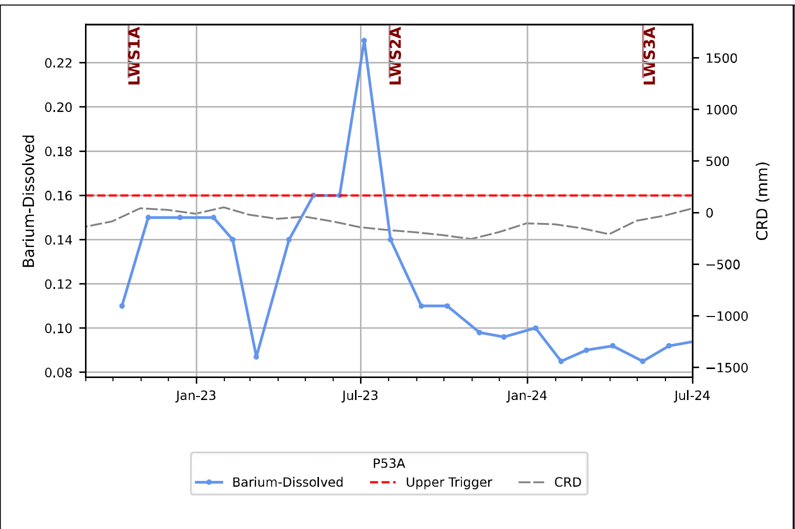

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
P53A
Arsenic-Dissolved
Upper Trigger
CRD



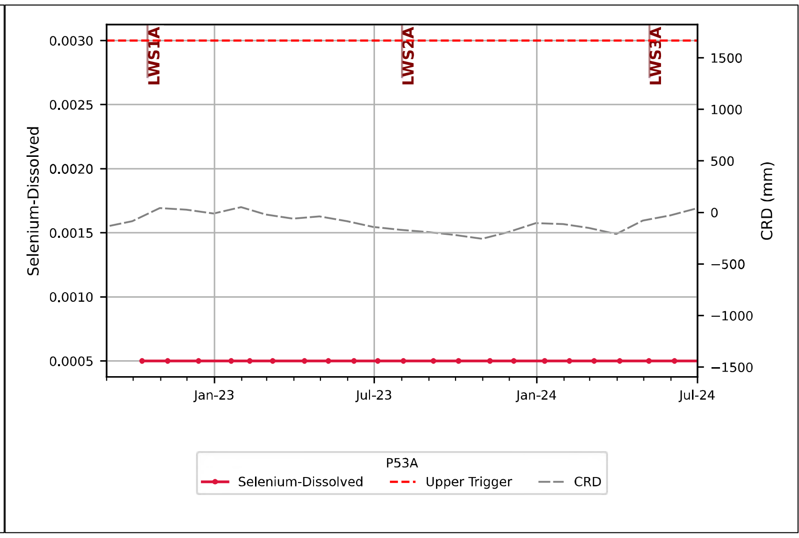
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Strontium-Dissolved
Upper Trigger
CRD



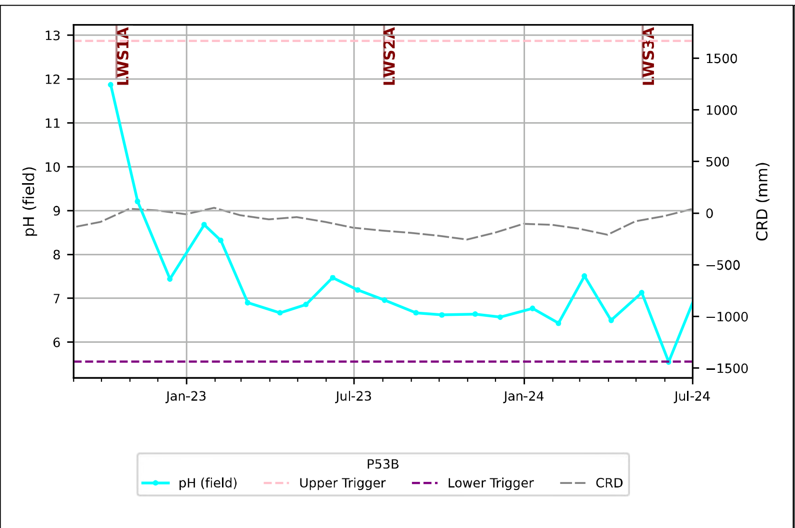
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Lithium-Dissolved
Upper Trigger
CRD



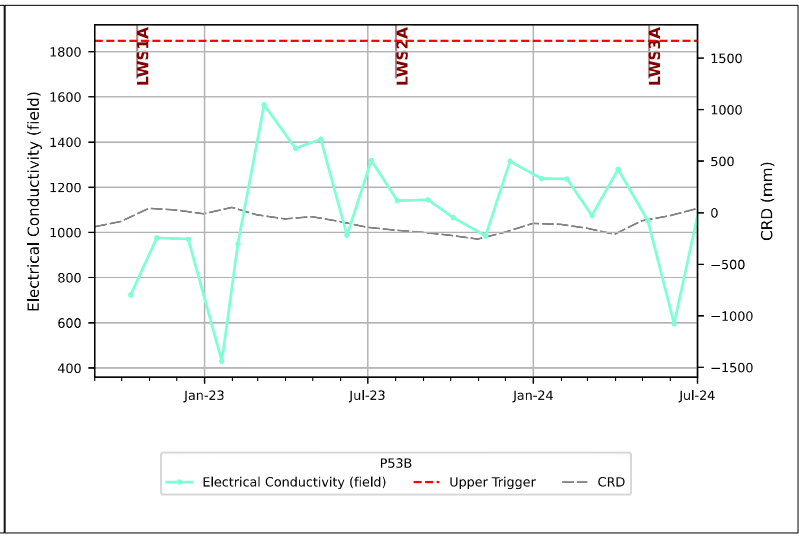
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Barium-Dissolved
Upper Trigger
CRD



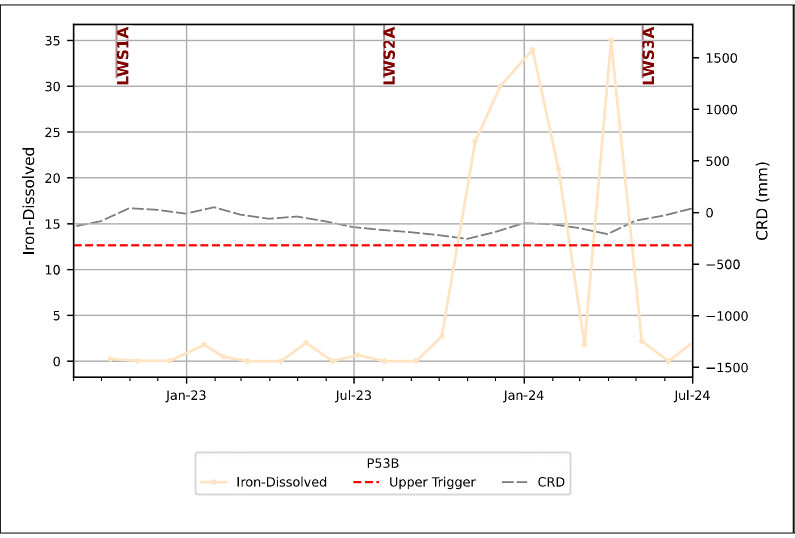
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53A
Selenium-Dissolved
Upper Trigger
CRD



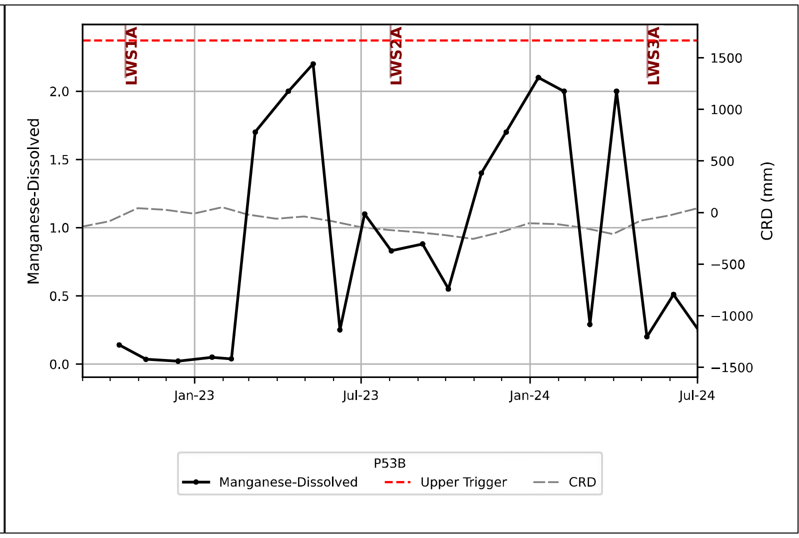
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
pH (field)
Upper Trigger
Lower Trigger
CRD



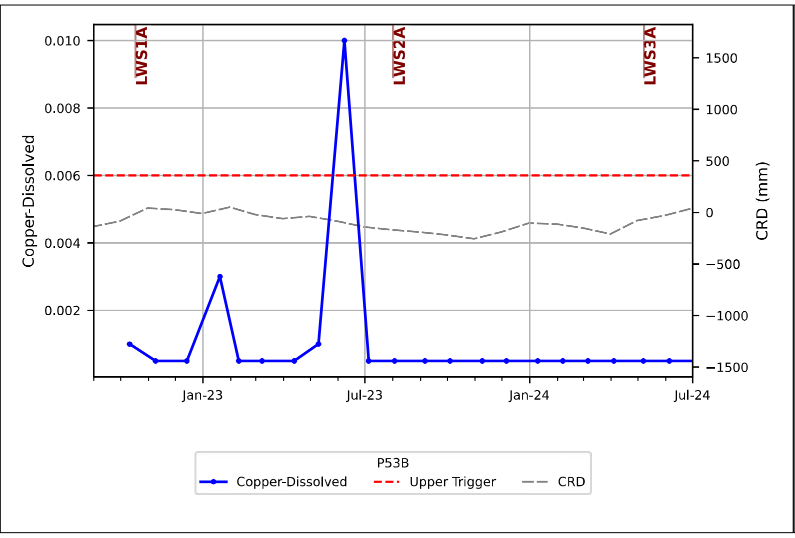
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Electrical Conductivity (field)
Upper Trigger
CRD



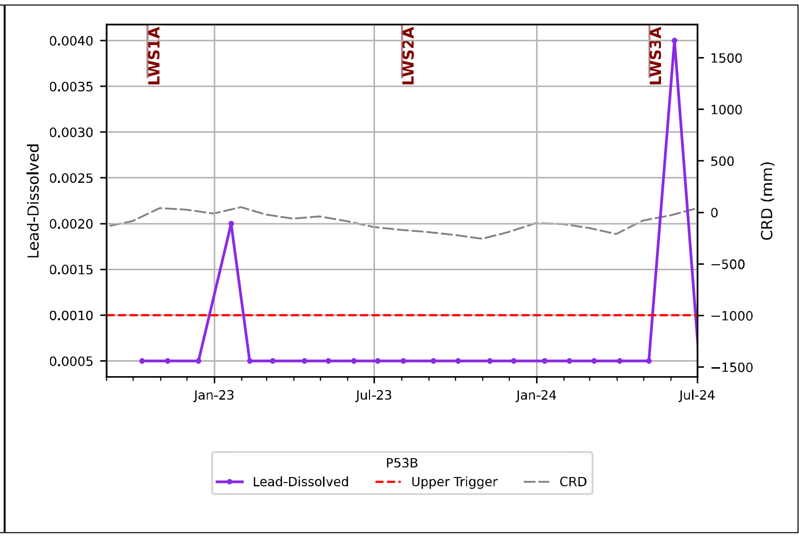
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Iron-Dissolved
Upper Trigger
CRD



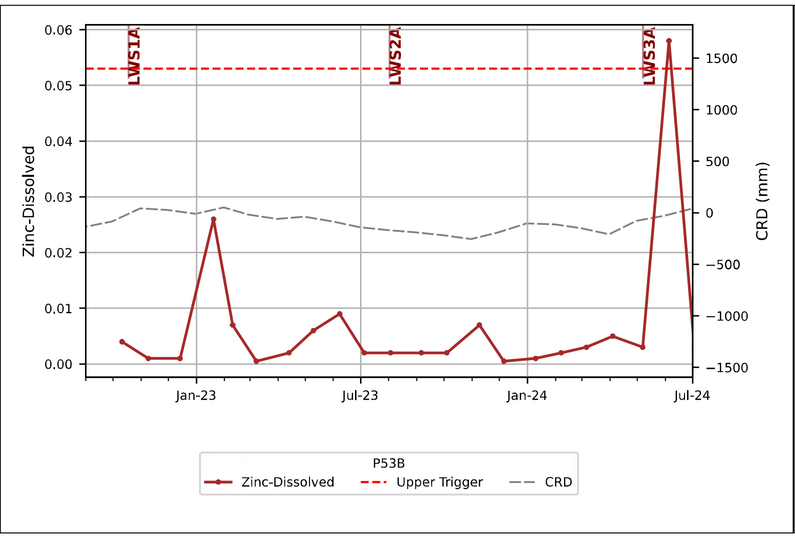
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Manganese-Dissolved
Upper Trigger
CRD



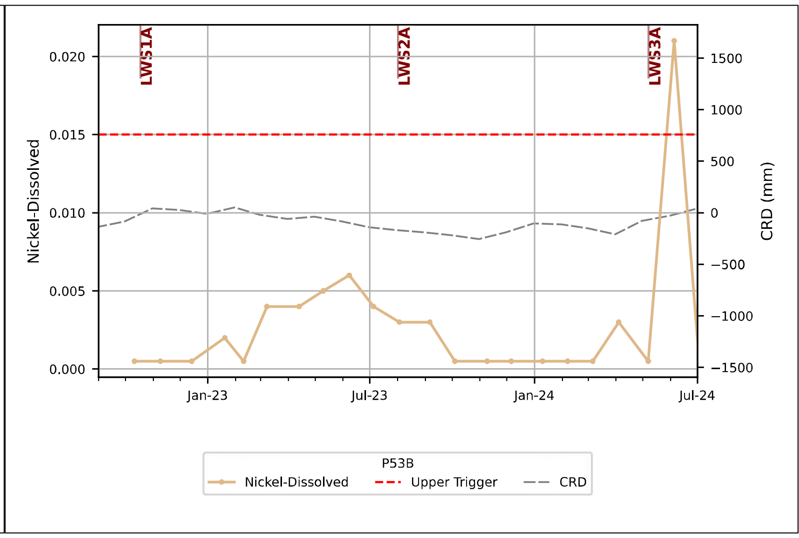
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Copper-Dissolved
Upper Trigger
CRD



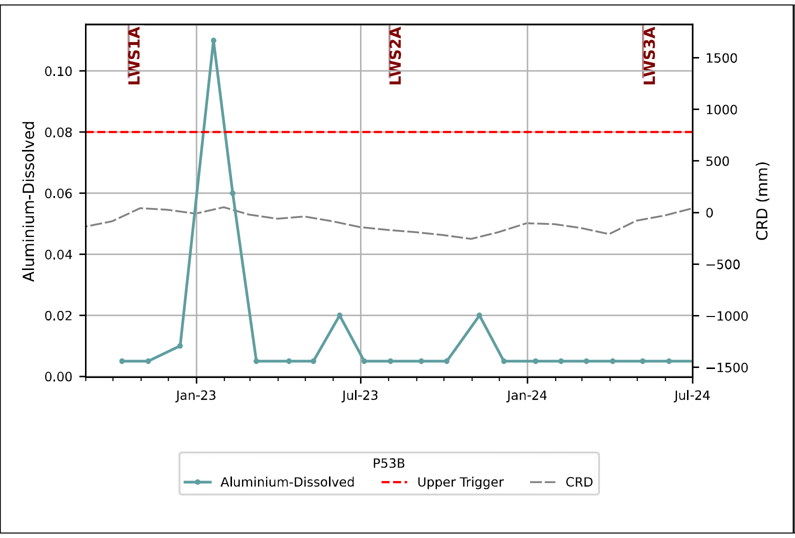
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Lead-Dissolved
Upper Trigger
CRD

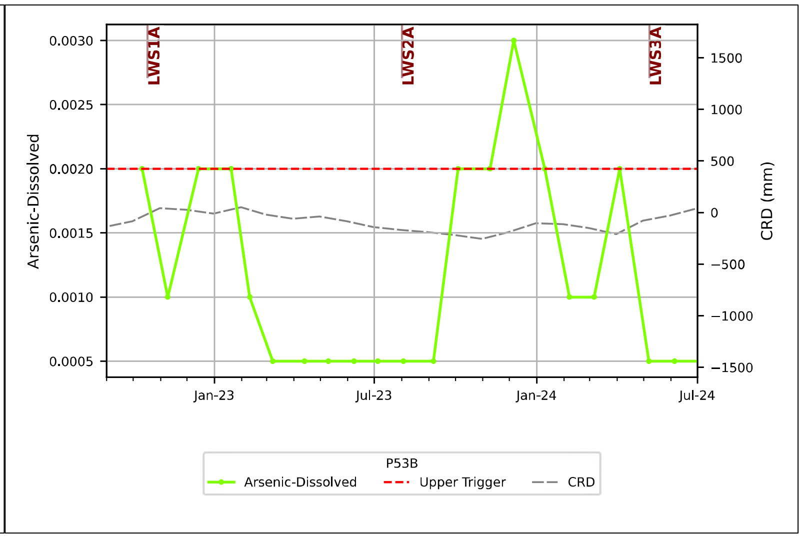


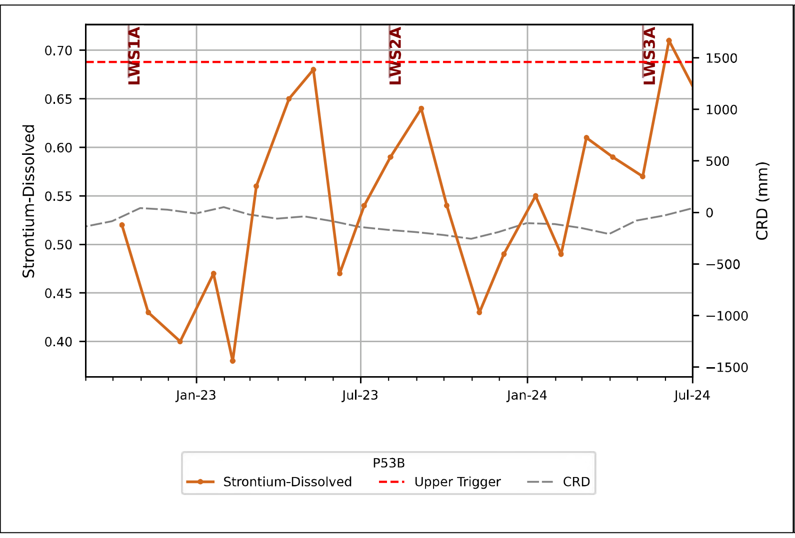
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Zinc-Dissolved
Upper Trigger
CRD

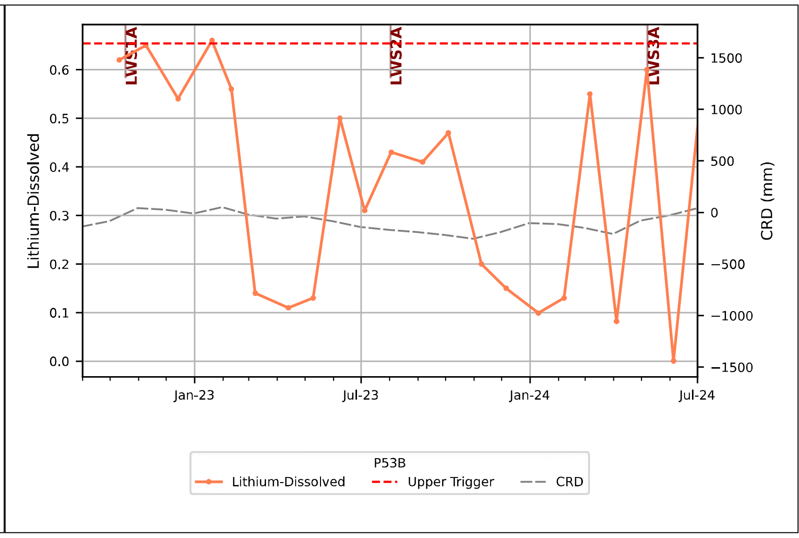


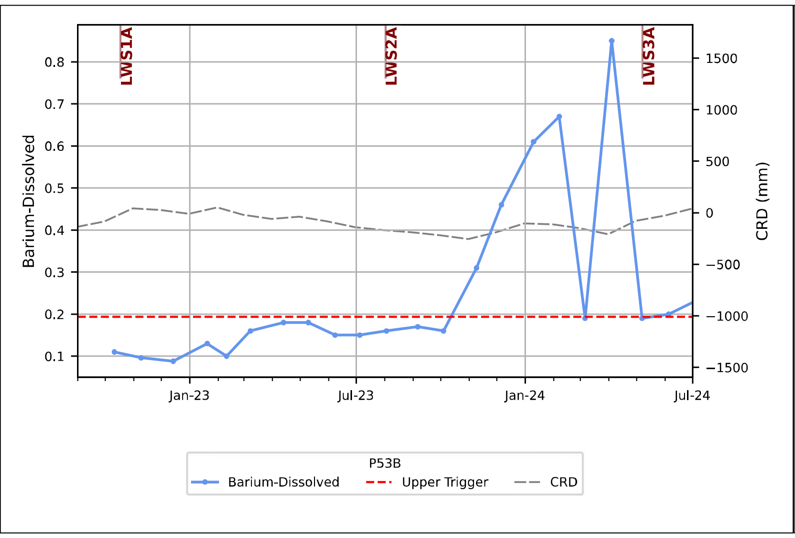
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53B
Nickel-Dissolved
Upper Trigger
CRD

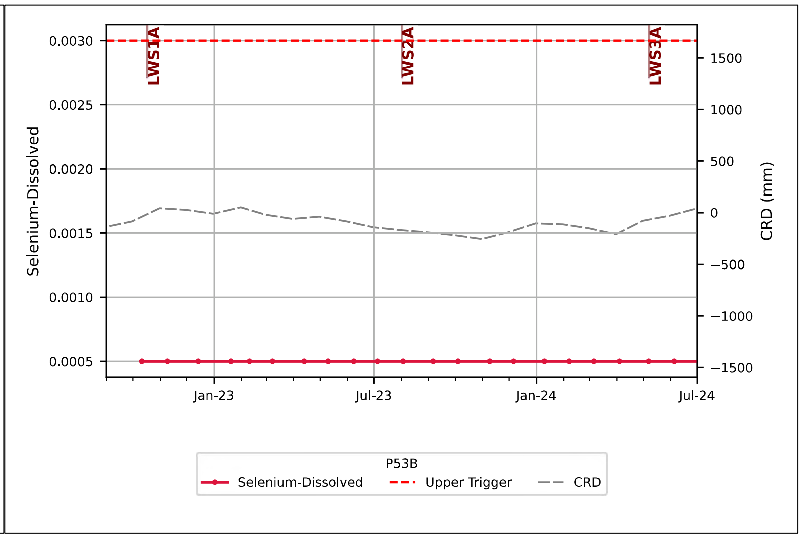

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
P53B
Aluminium-Dissolved
Upper Trigger
CRD

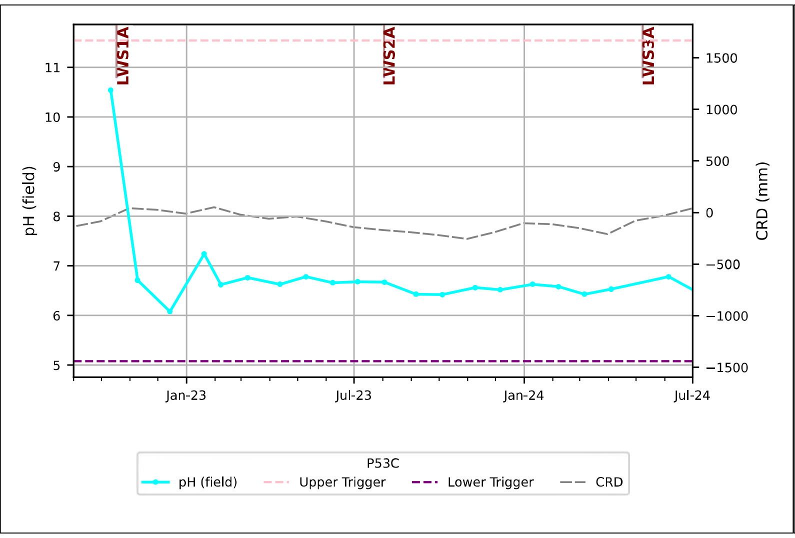

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
P53B
Arsenic-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
P53B
Strontium-Dissolved
Upper Trigger
CRD

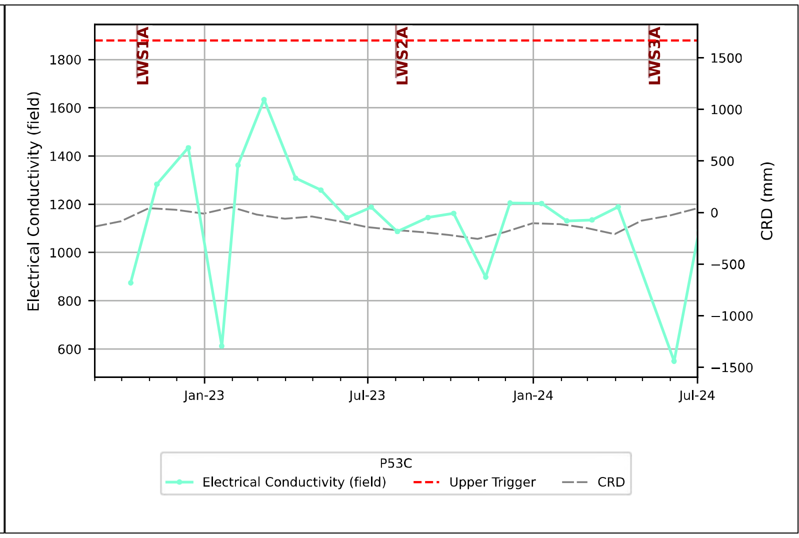

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
P53B
Lithium-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
P53B
Barium-Dissolved
Upper Trigger
CRD

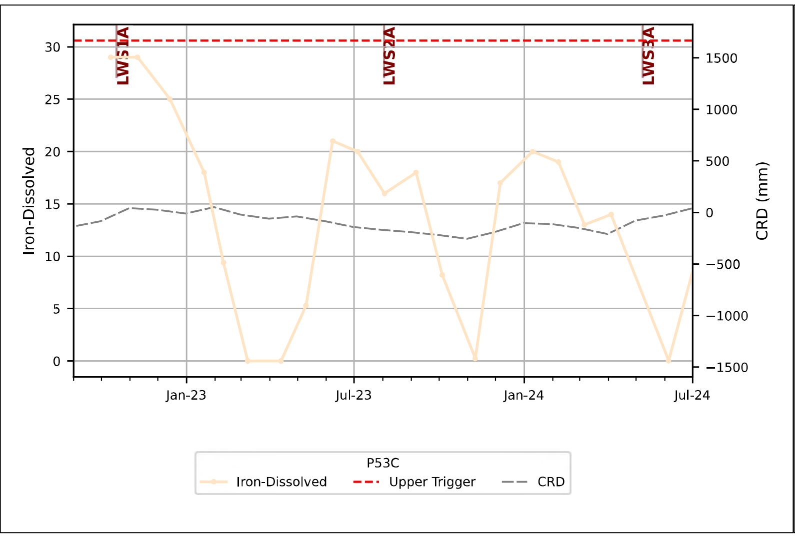

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
P53B
Selenium-Dissolved
Upper Trigger
CRD



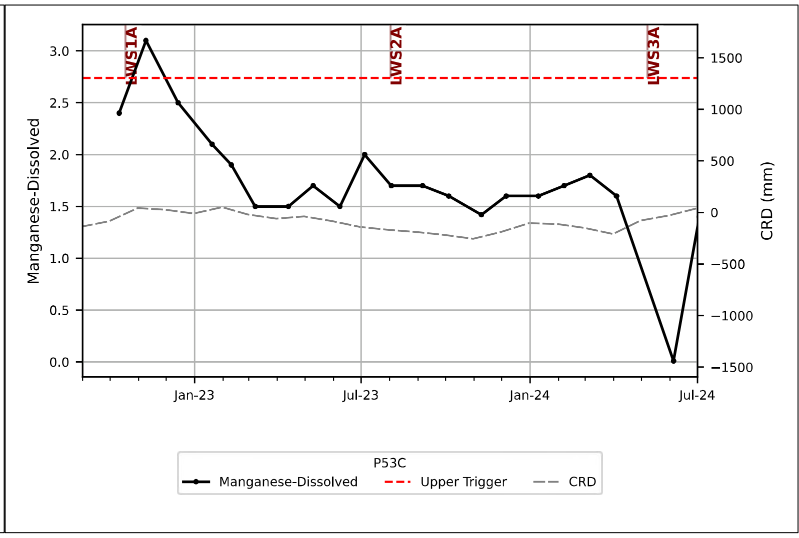
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
pH (field)
Upper Trigger
Lower Trigger
CRD



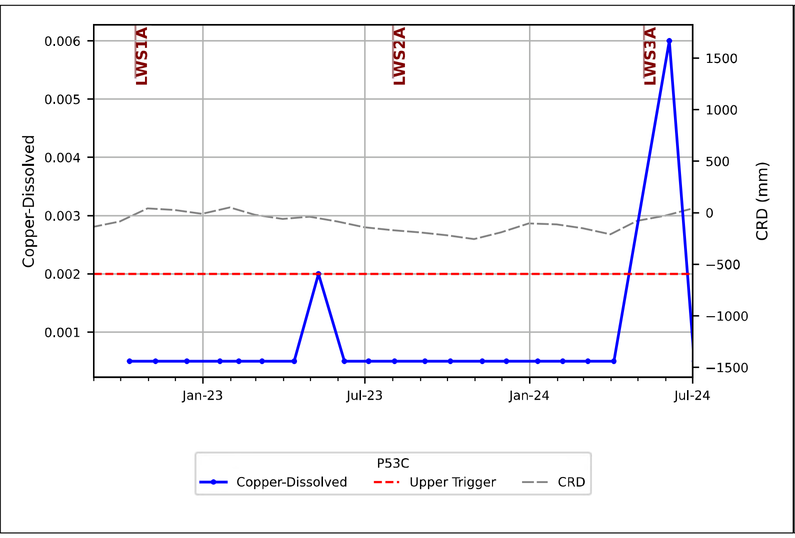
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Electrical Conductivity (field)
Upper Trigger
CRD



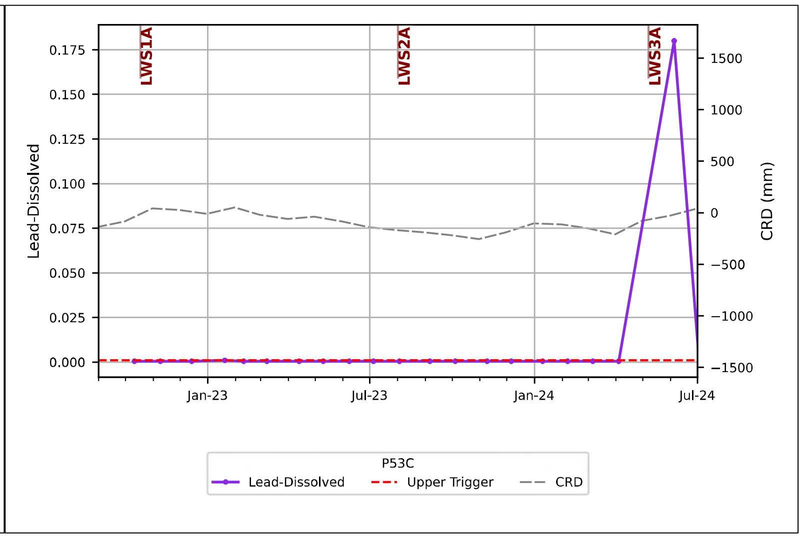
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Iron-Dissolved
Upper Trigger
CRD



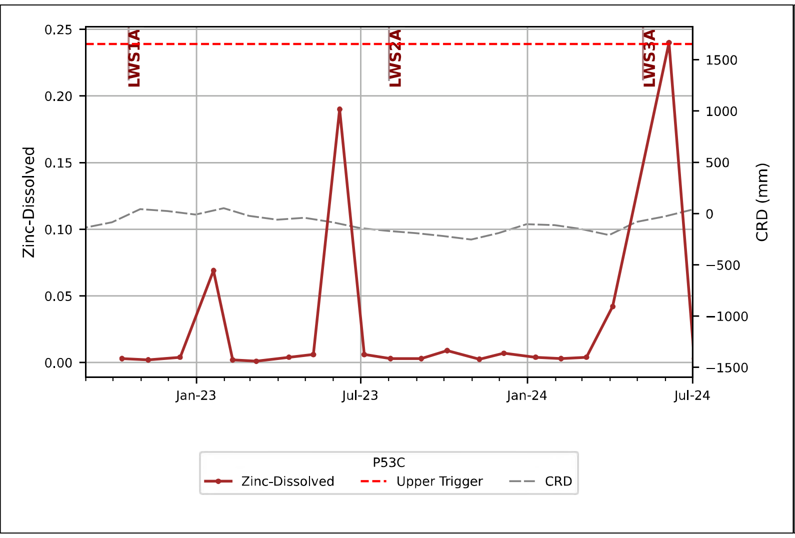
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Manganese-Dissolved
Upper Trigger
CRD

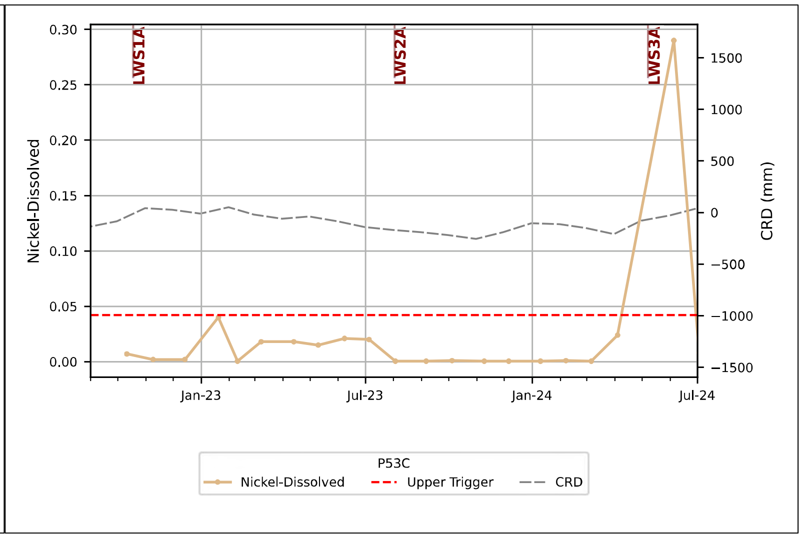


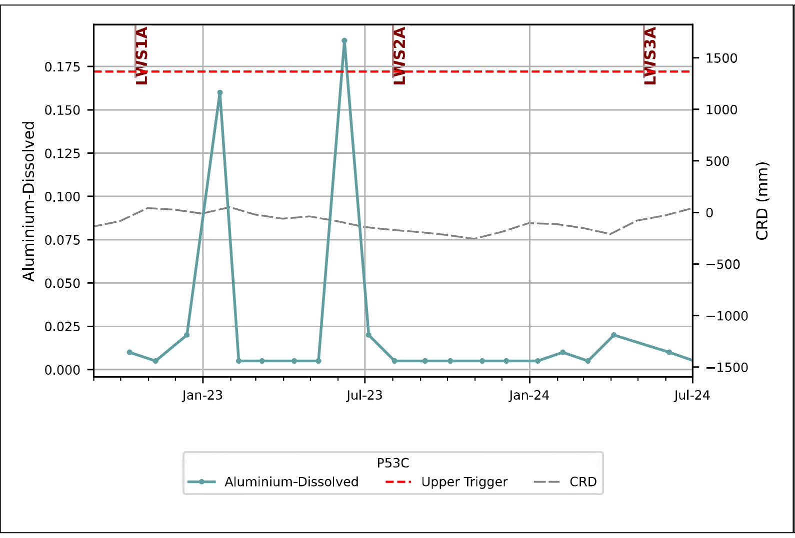
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Copper-Dissolved
Upper Trigger
CRD

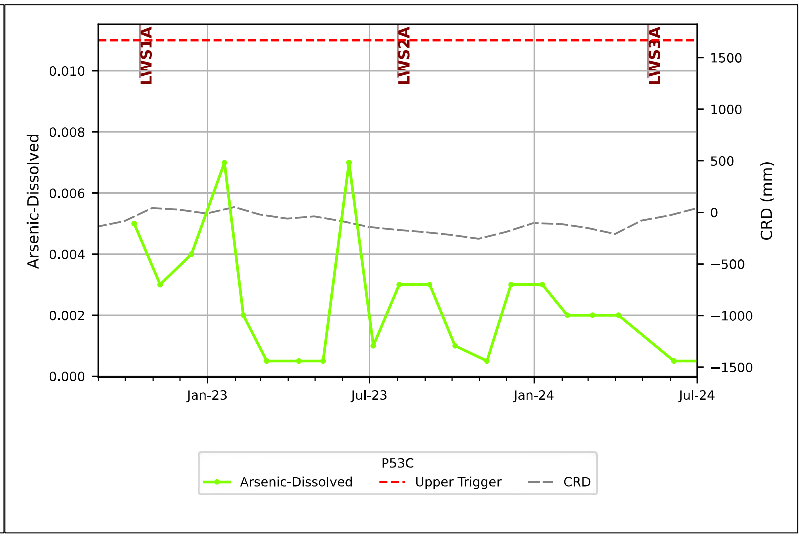


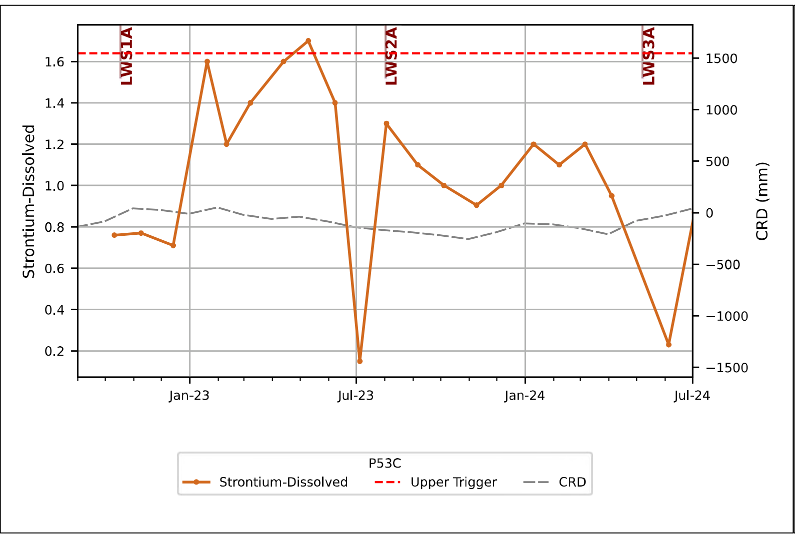
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Lead-Dissolved
Upper Trigger
CRD

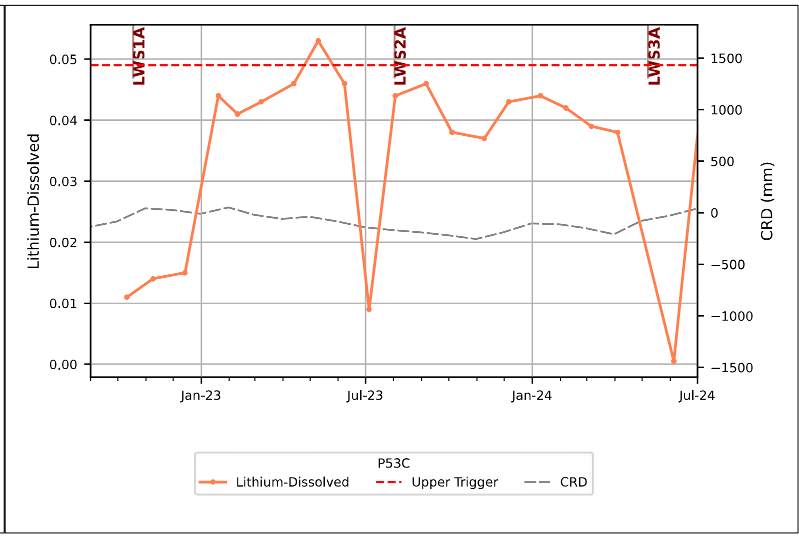

LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
0.25
0.20
0.15
0.10
0.05
0.00
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Zinc-Dissolved
Upper Trigger
CRD

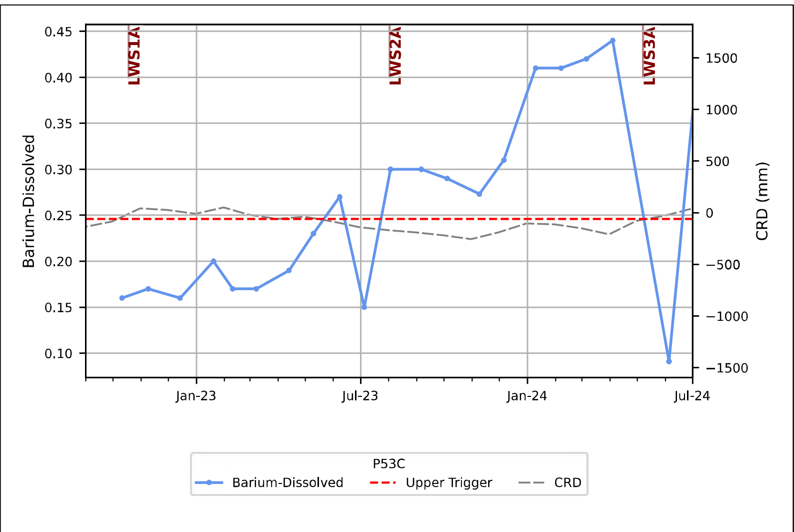

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Nickel-Dissolved
Upper Trigger
CRD

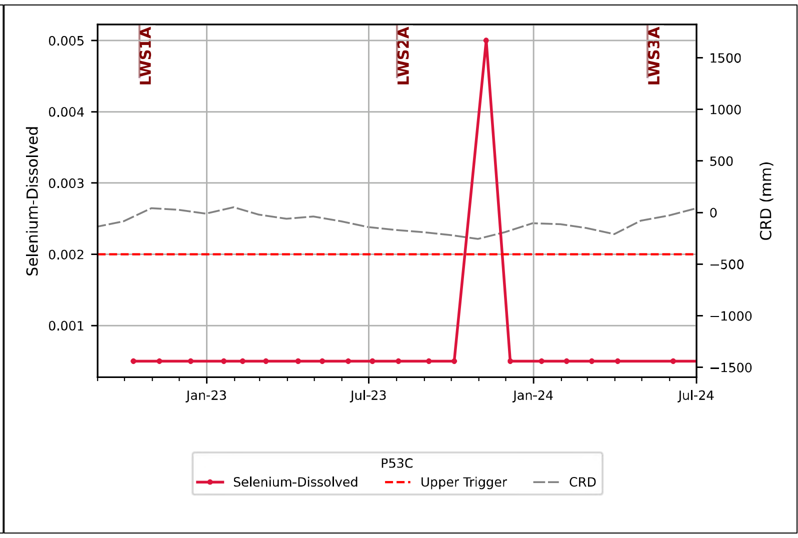

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Aluminium-Dissolved
Upper Trigger
CRD

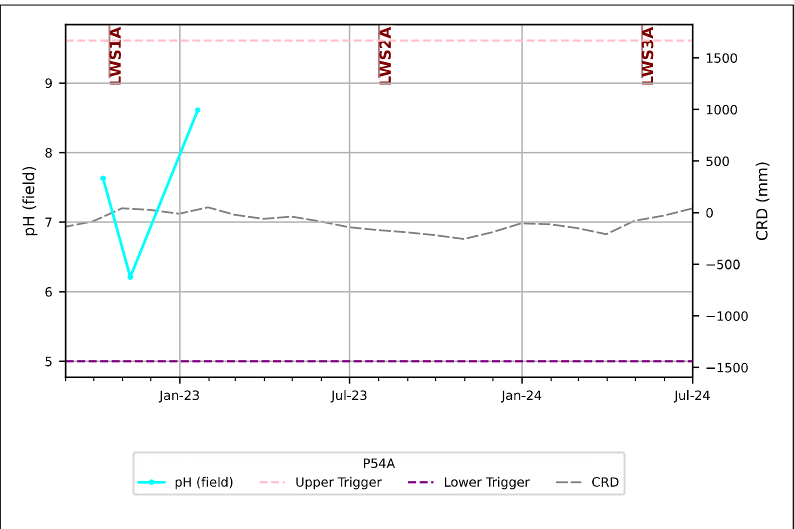

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
0.010
0.008
0.006
0.004
0.002
0.000
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Arsenic-Dissolved
Upper Trigger
CRD

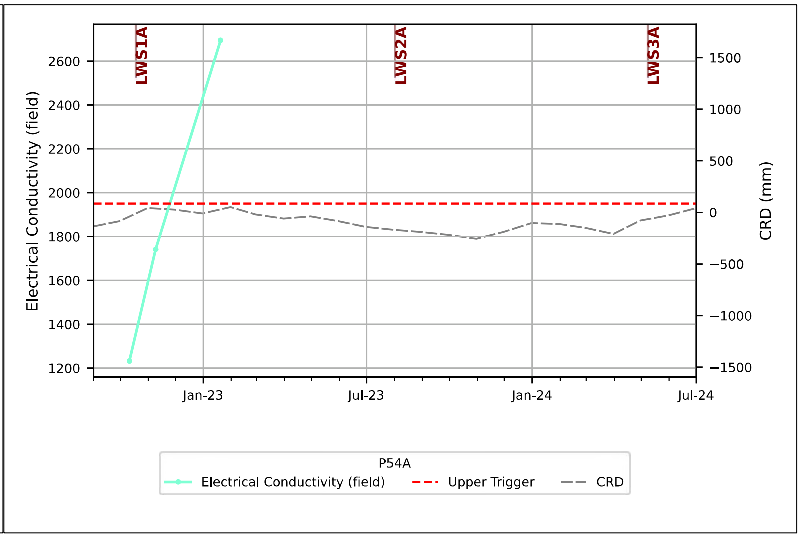

LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Strontium-Dissolved
Upper Trigger
CRD

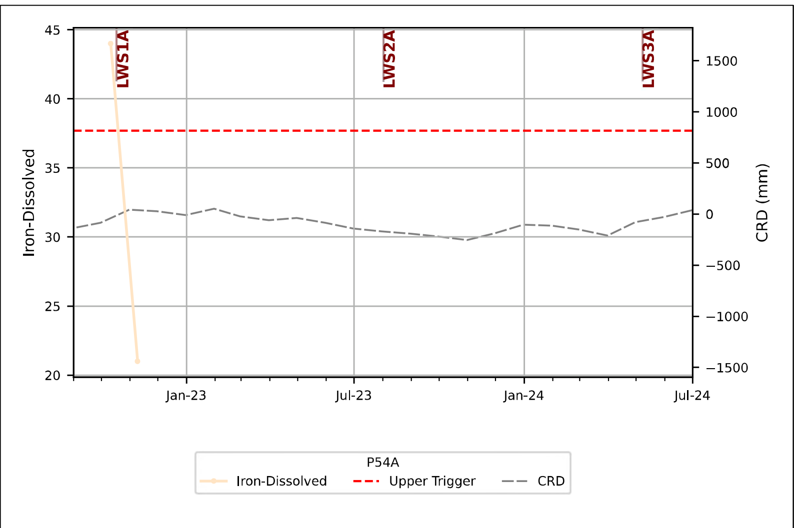

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
0.00
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Lithium-Dissolved
Upper Trigger
CRD

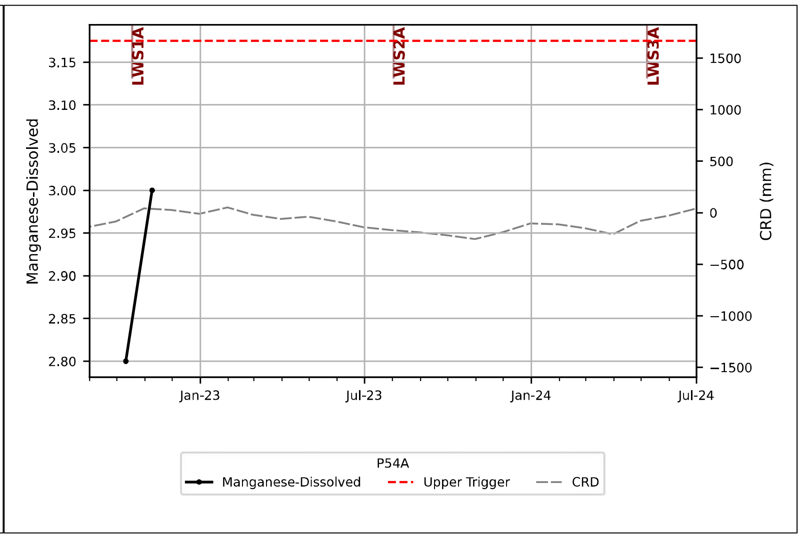

Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Barium-Dissolved
Upper Trigger
CRD

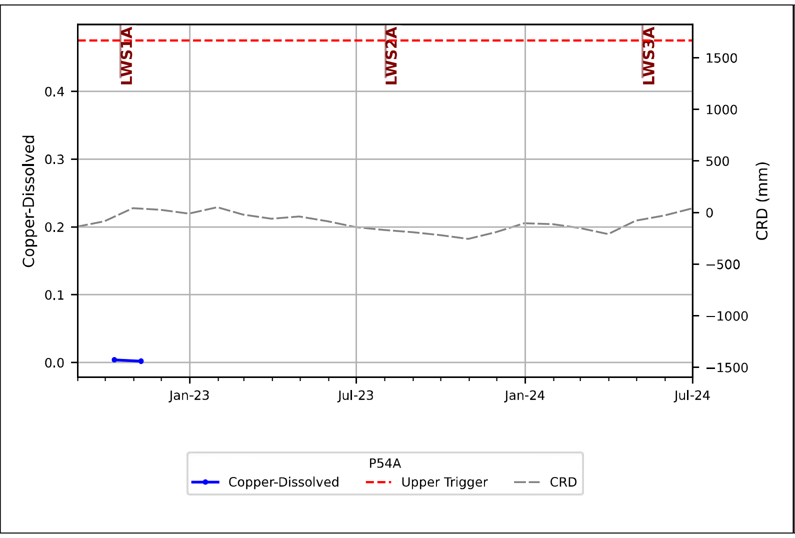

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P53C
Selenium-Dissolved
Upper Trigger
CRD


pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
pH (field)
Upper Trigger
Lower Trigger
CRD

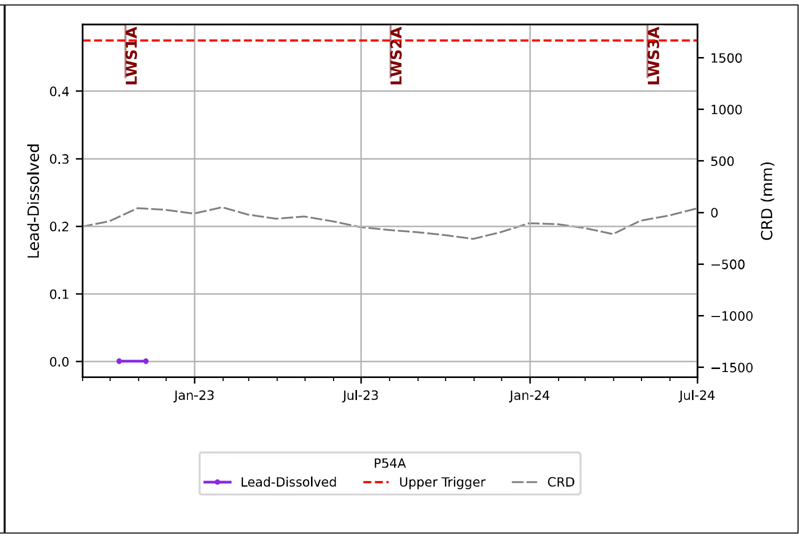

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Electrical Conductivity (field)
Upper Trigger
CRD


Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Iron-Dissolved
Upper Trigger
CRD

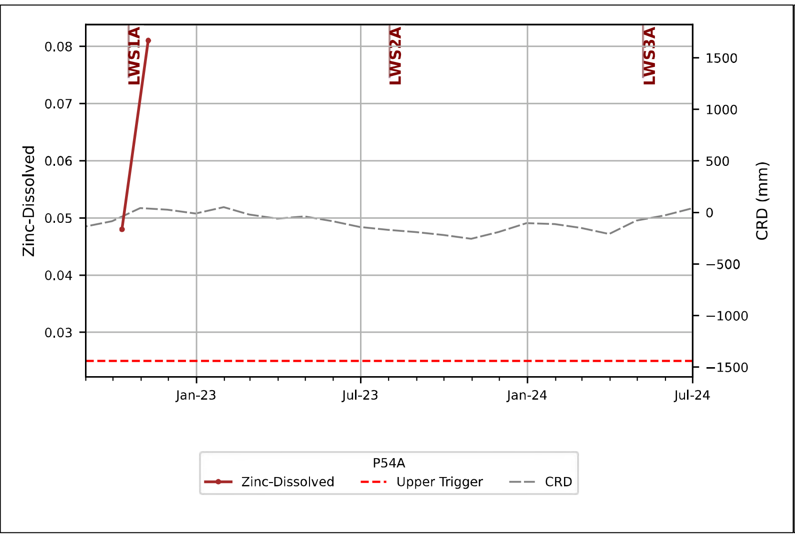

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Manganese-Dissolved
Upper Trigger
CRD



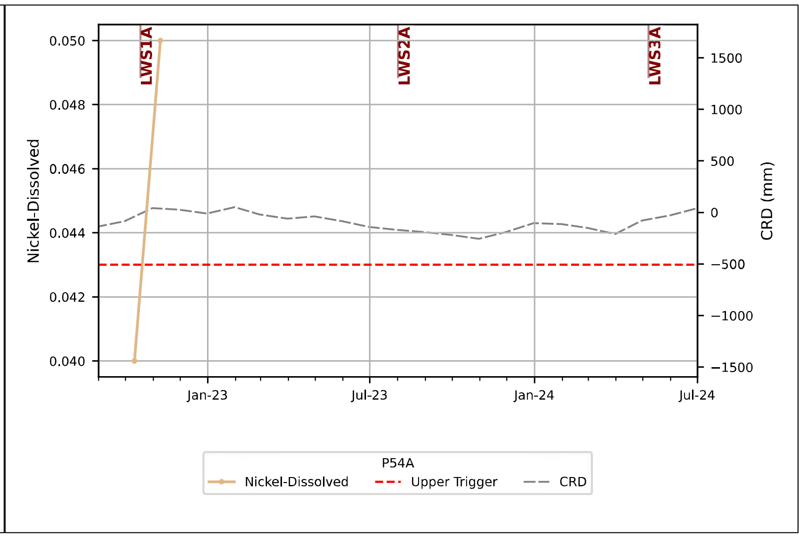
LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Copper-Dissolved
Upper Trigger
CRD



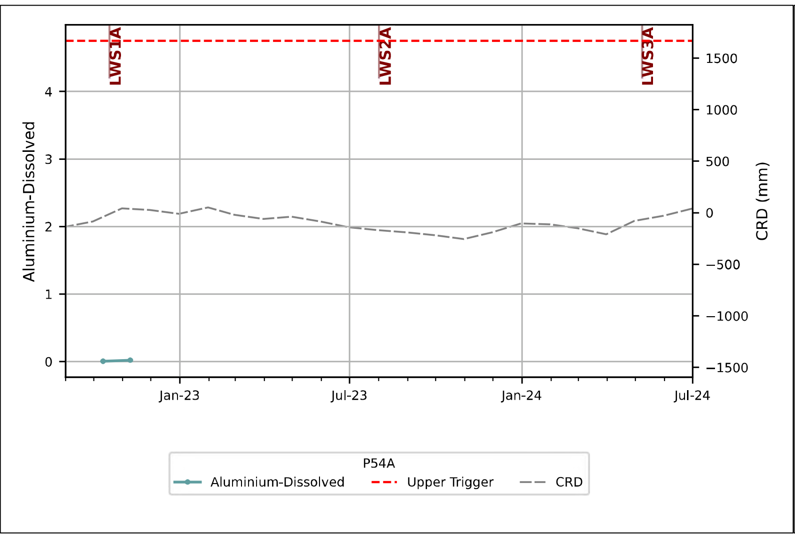
LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Lead-Dissolved
Upper Trigger
CRD



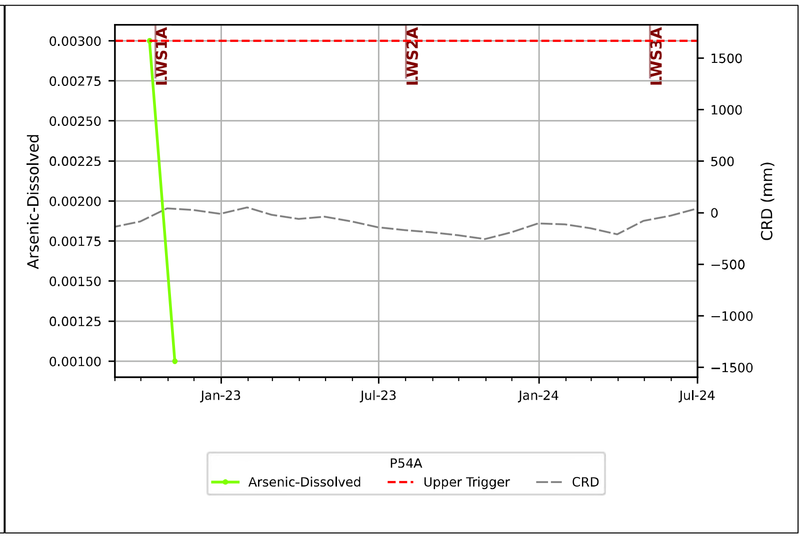
LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Zinc-Dissolved
Upper Trigger
CRD



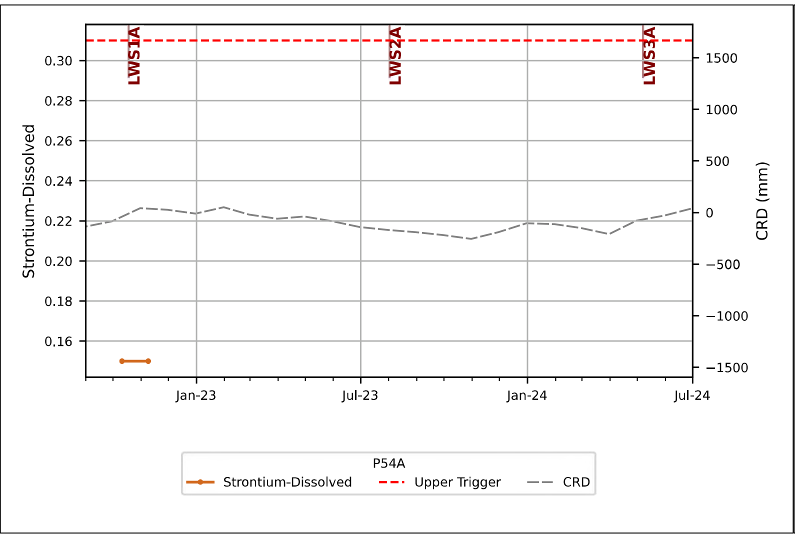
LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Nickel-Dissolved
Upper Trigger
CRD

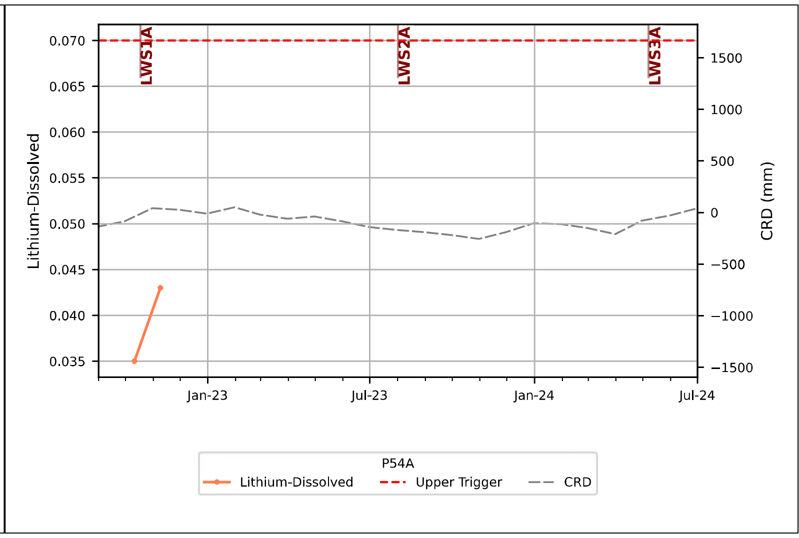


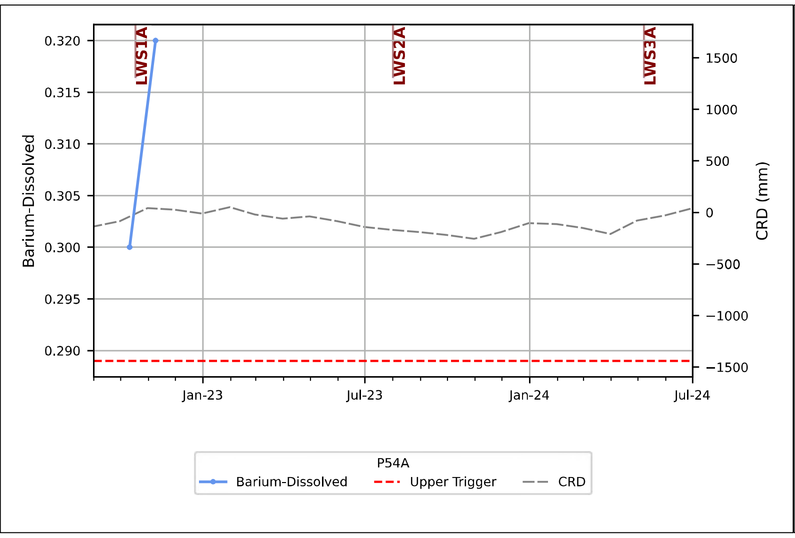
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Aluminium-Dissolved
Upper Trigger
CRD

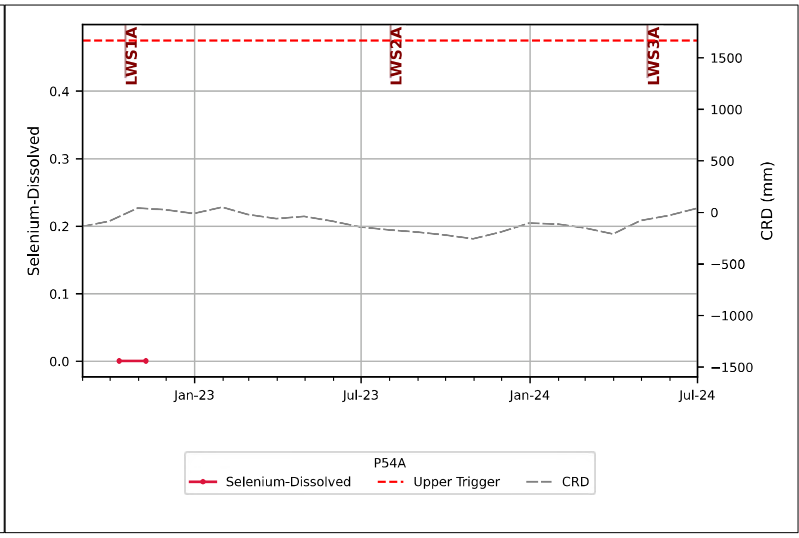


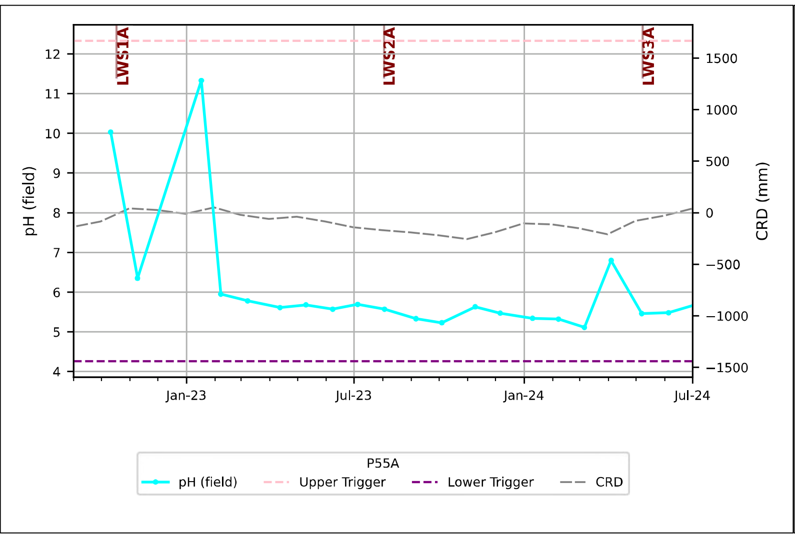
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Arsenic-Dissolved
Upper Trigger
CRD

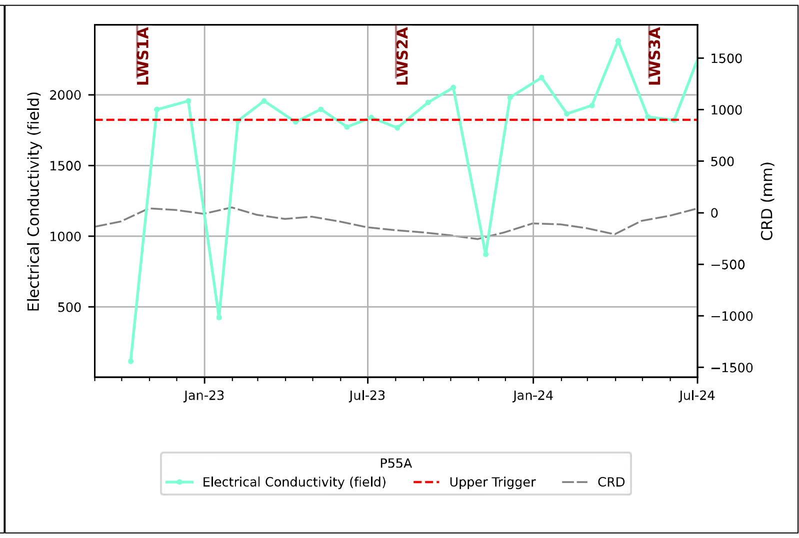

Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Strontium-Dissolved
Upper Trigger
CRD

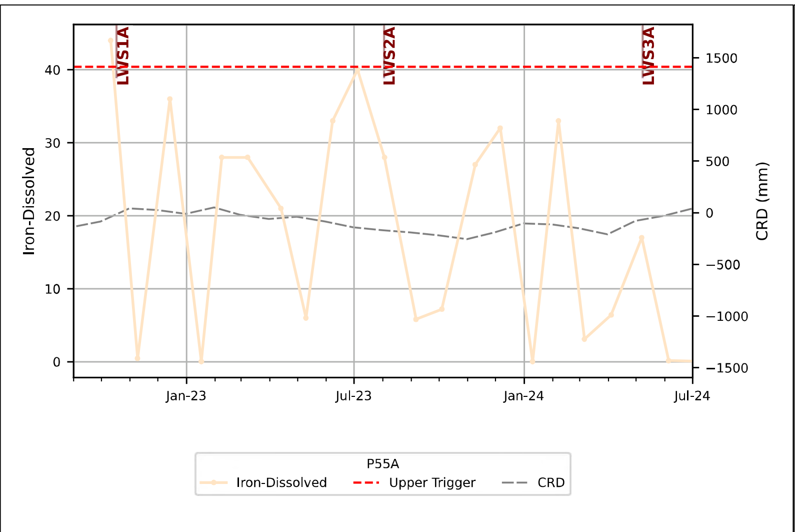

Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Lithium-Dissolved
Upper Trigger
CRD

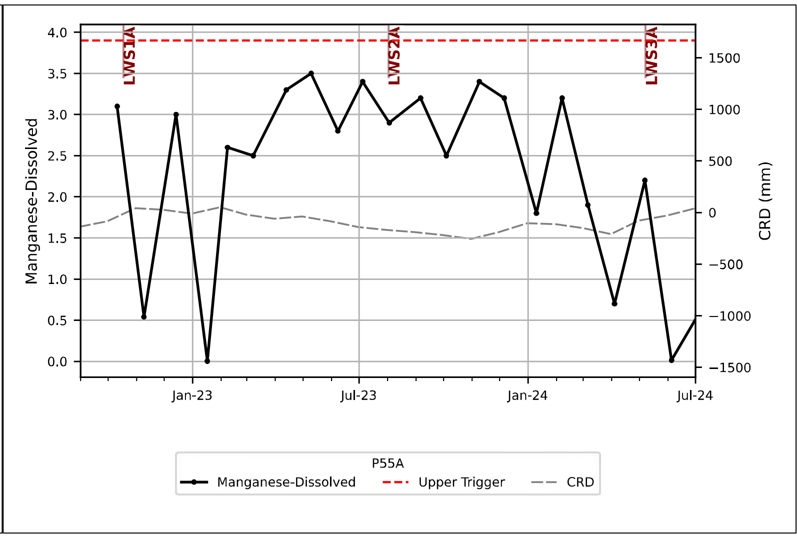

Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Barium-Dissolved
Upper Trigger
CRD

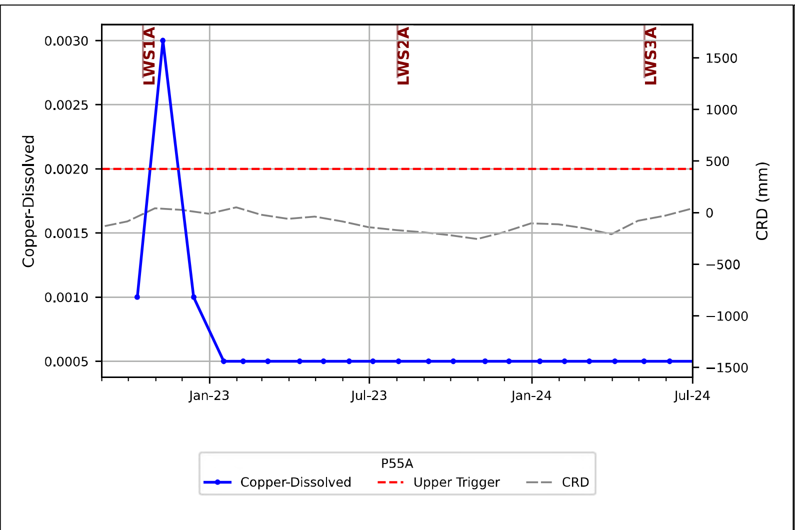

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P54A
Selenium-Dissolved
Upper Trigger
CRD

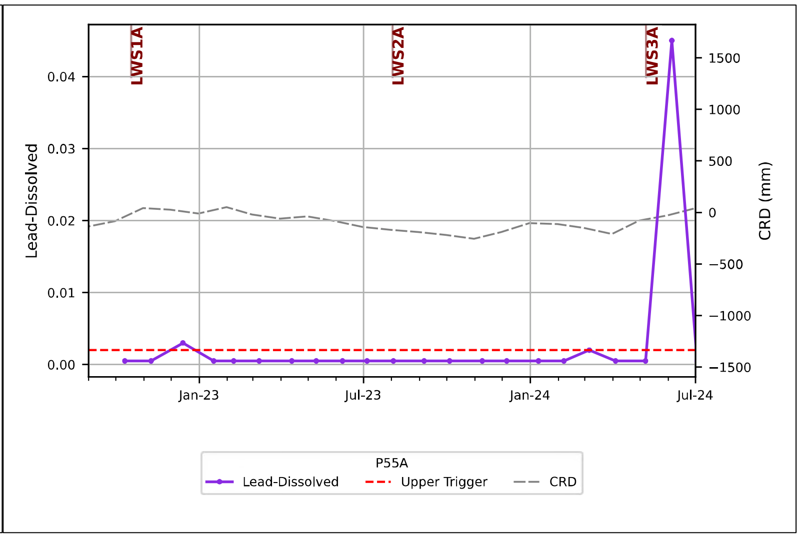

pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P55A
pH (field)
Upper Trigger
Lower Trigger
CRD

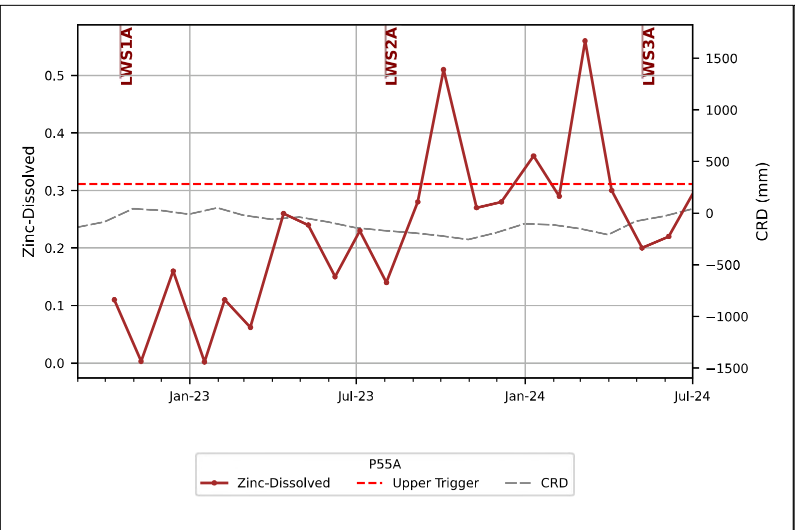

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Electrical Conductivity (field)
Upper Trigger
CRD

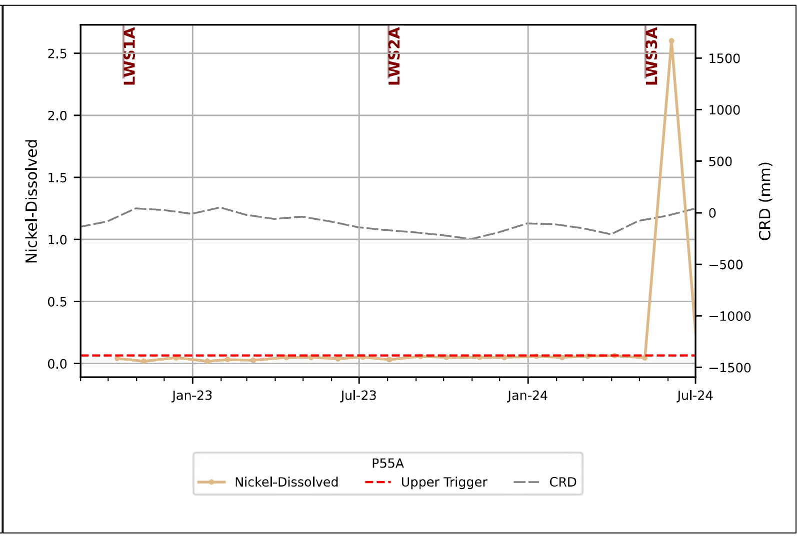

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Iron-Dissolved
Upper Trigger
CRD

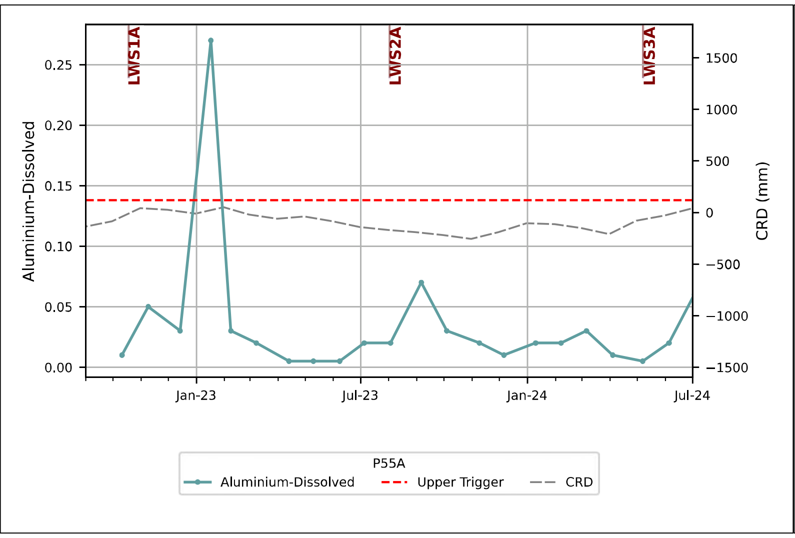

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Manganese-Dissolved
Upper Trigger
CRD

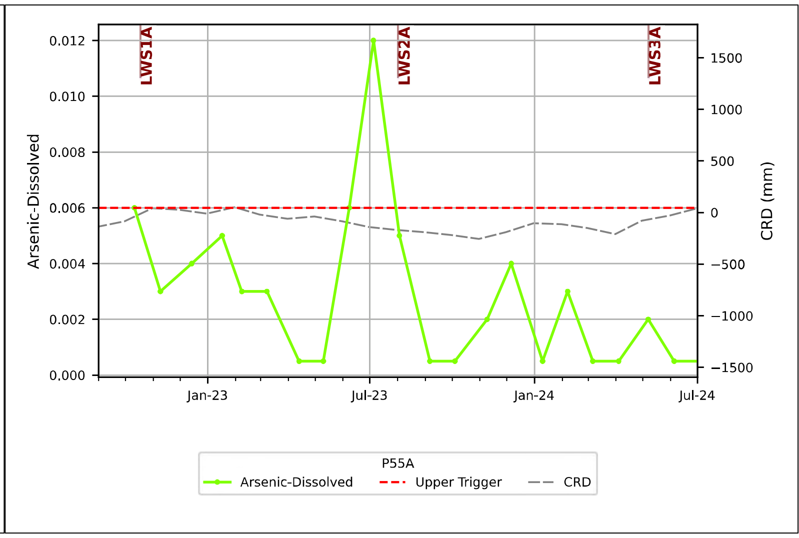

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Copper-Dissolved
Upper Trigger
CRD

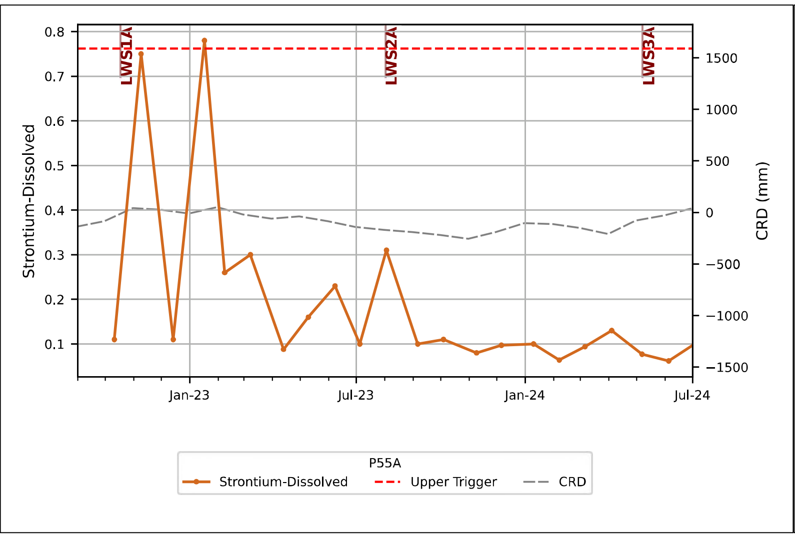

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Lead-Dissolved
Upper Trigger
CRD

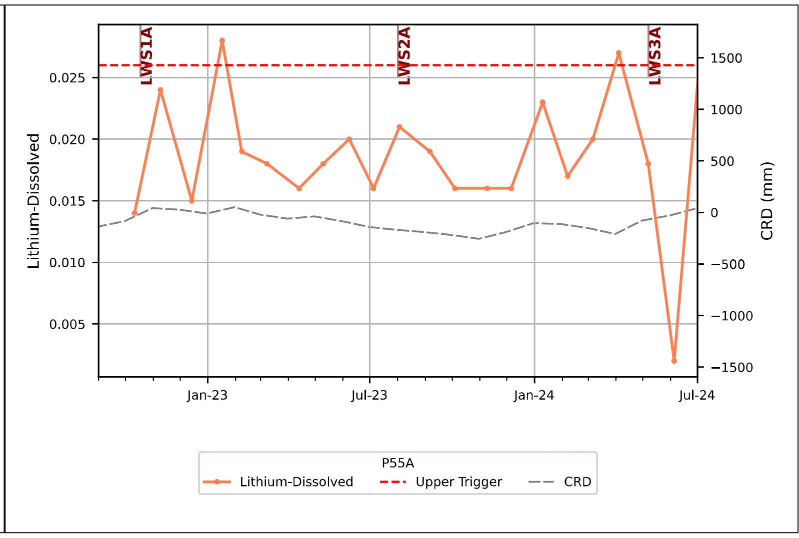

LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Zinc-Dissolved
Upper Trigger
CRD

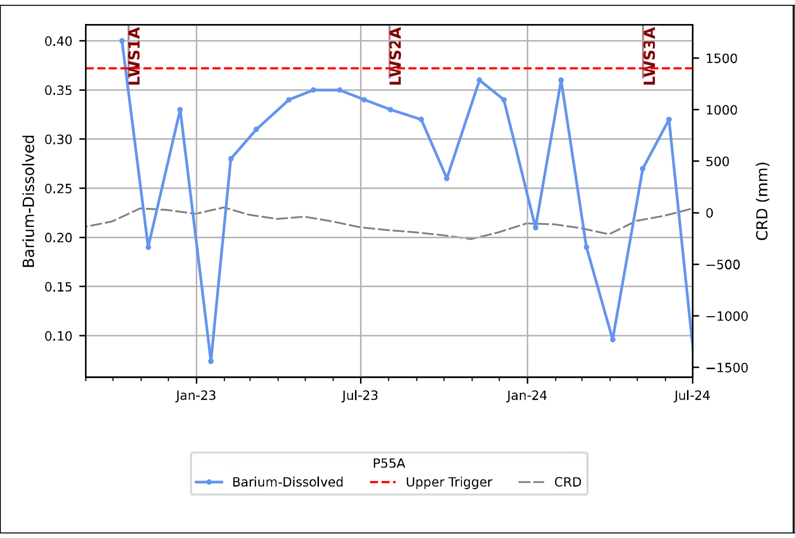

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Nickel-Dissolved
Upper Trigger
CRD

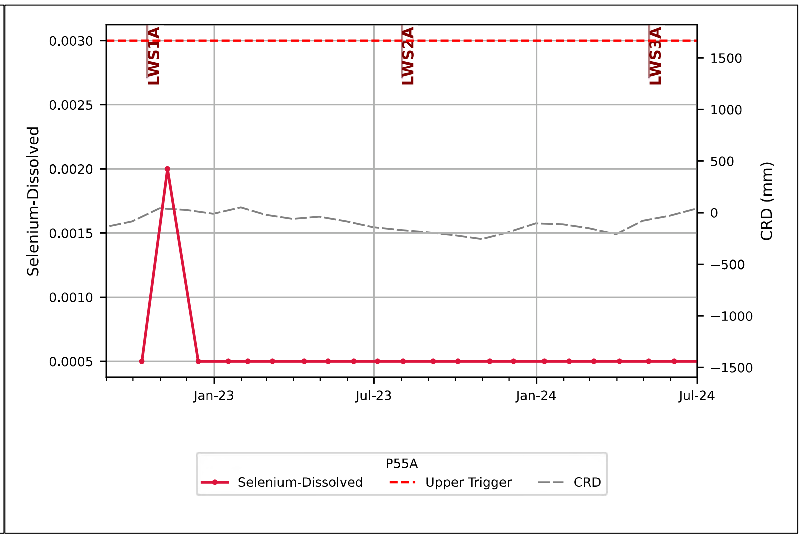

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Aluminium-Dissolved
Upper Trigger
CRD

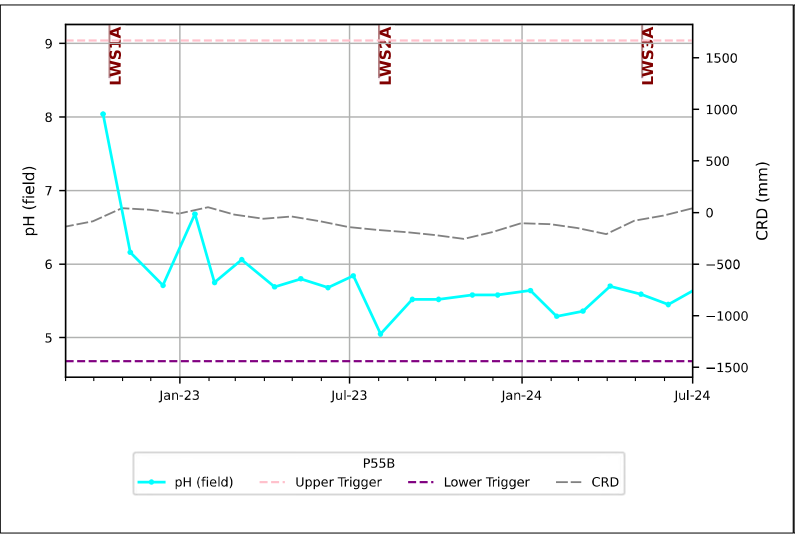

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Arsenic-Dissolved
Upper Trigger
CRD

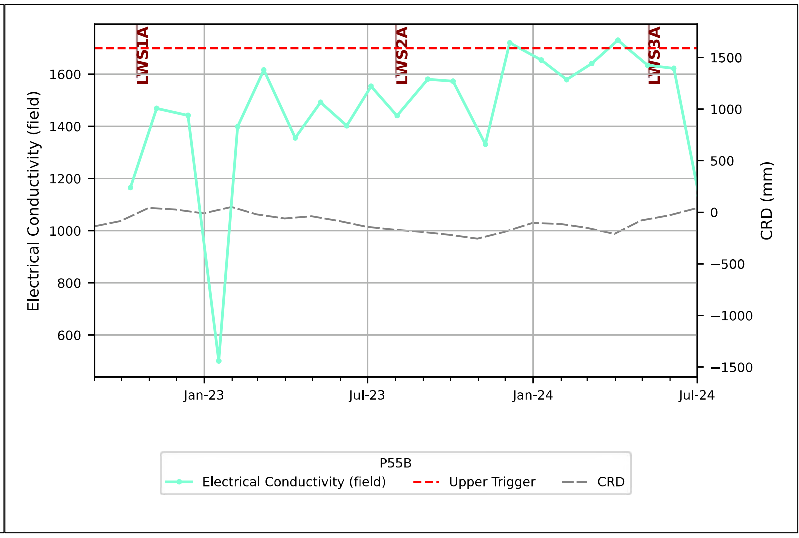

LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Strontium-Dissolved
Upper Trigger
CRD

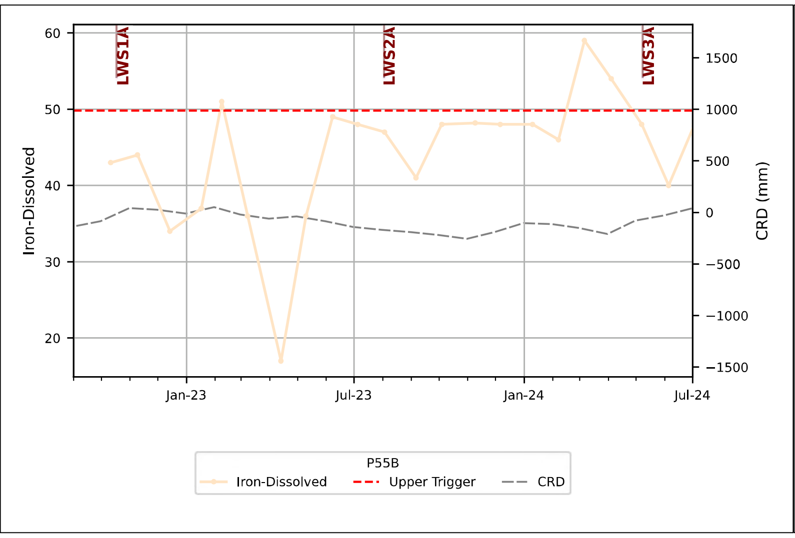

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
0.005
0.010
0.015
0.020
0.025
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Lithium-Dissolved
Upper Trigger
CRD

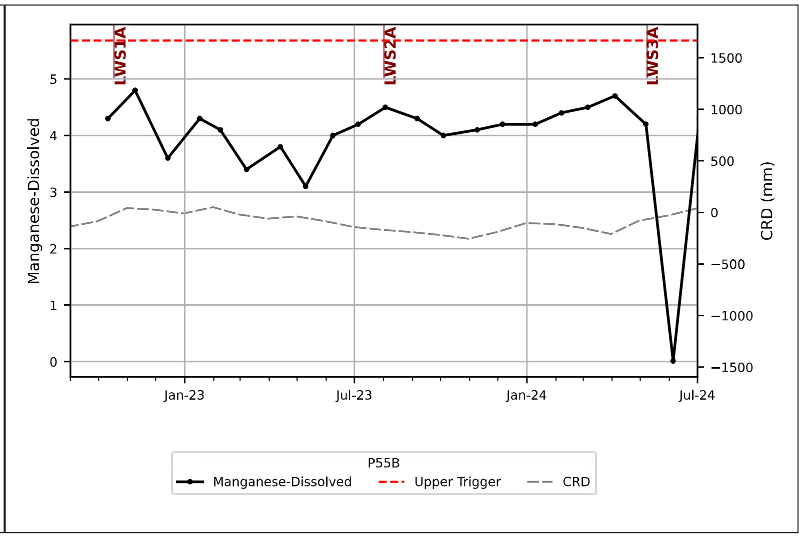

LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
0.10
0.15
0.20
0.25
0.30
0.35
0.40
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Barium-Dissolved
Upper Trigger
CRD

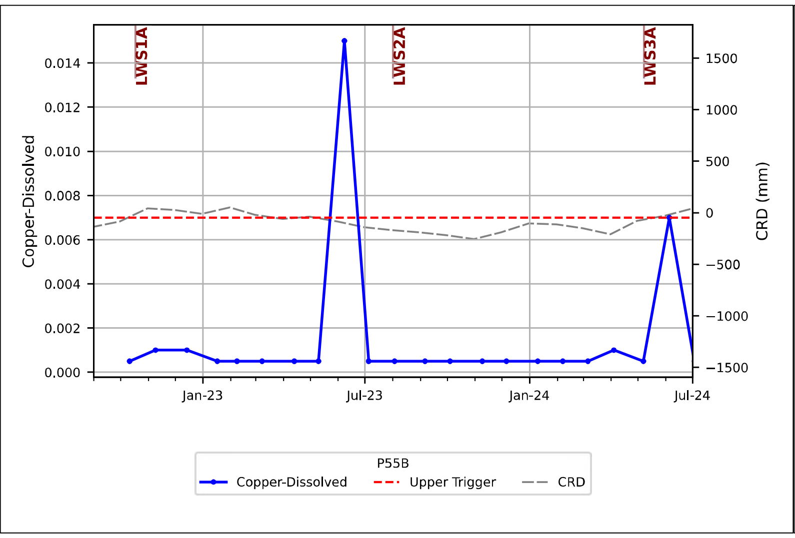

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P55A
Selenium-Dissolved
Upper Trigger
CRD

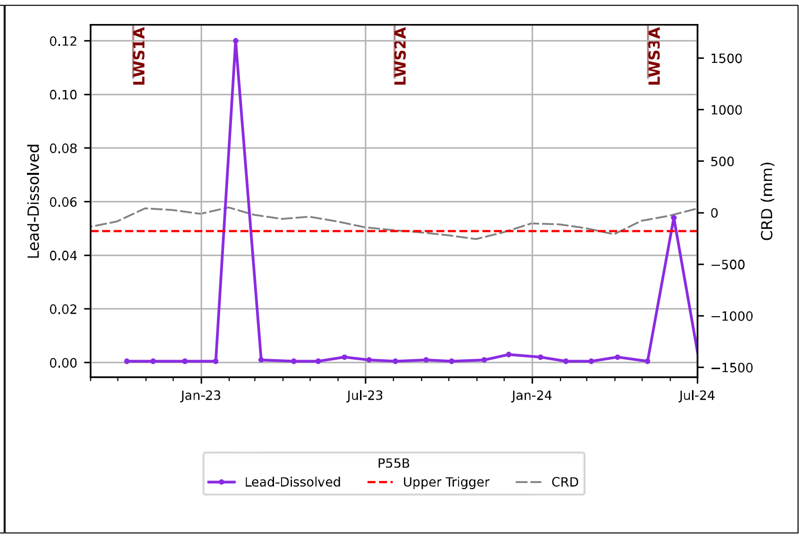

LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
pH (field)
Upper Trigger
Lower Trigger
CRD

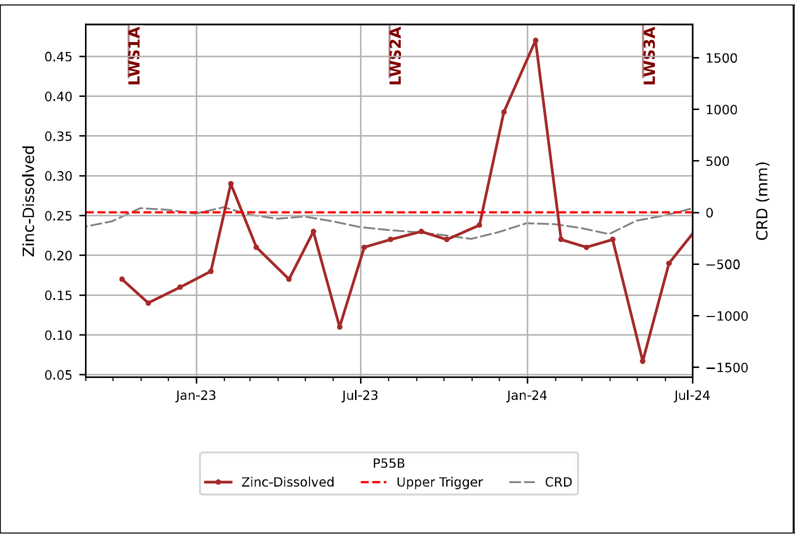

LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Electrical Conductivity (field)
Upper Trigger
CRD

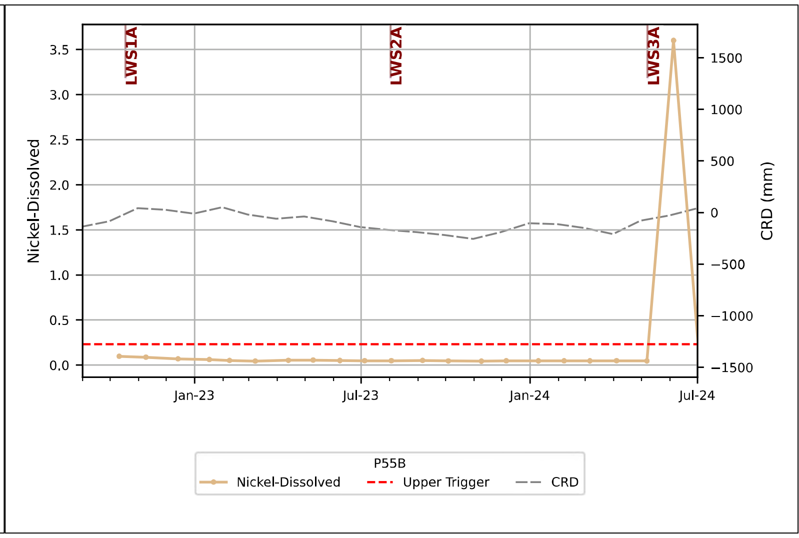

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Iron-Dissolved
Upper Trigger
CRD

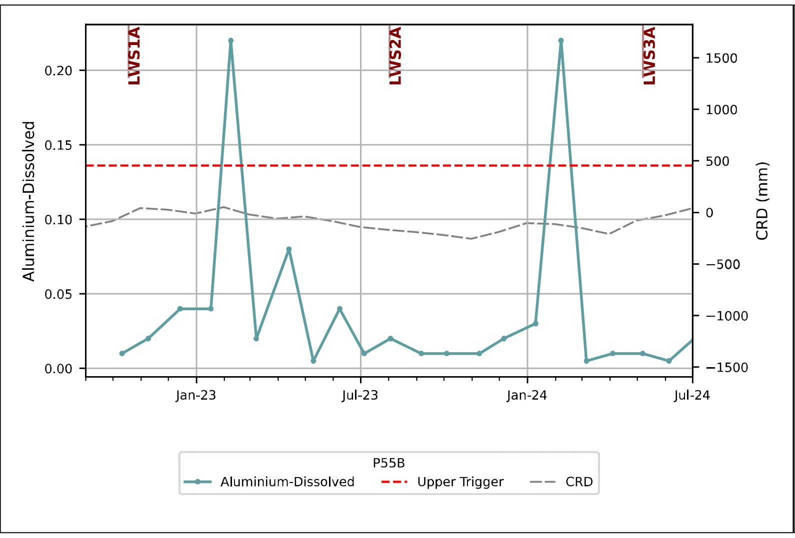

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Manganese-Dissolved
Upper Trigger
CRD

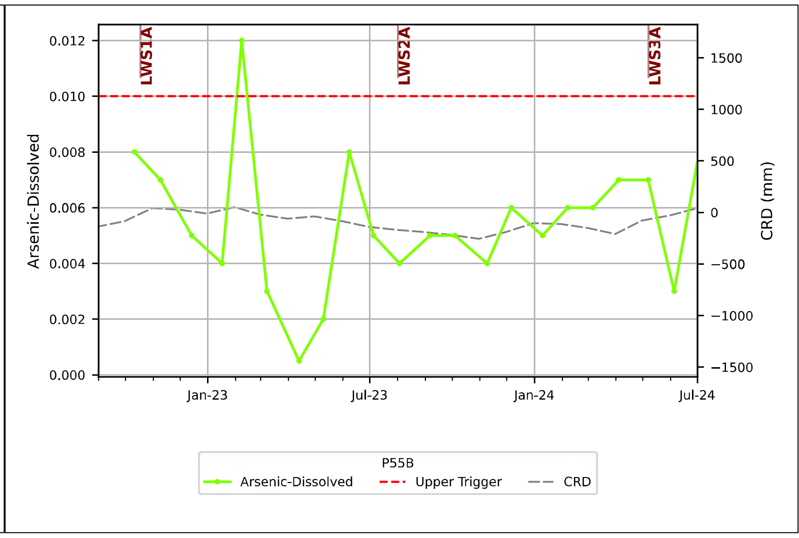

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Copper-Dissolved
Upper Trigger
CRD

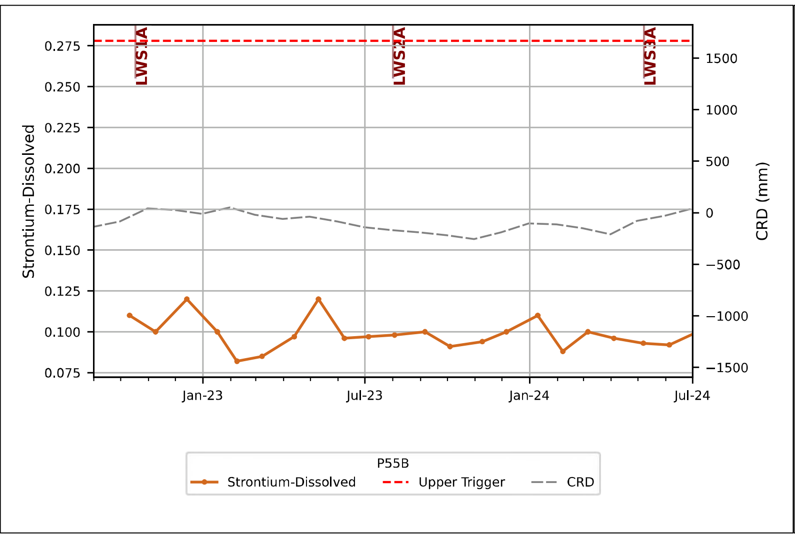

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Lead-Dissolved
Upper Trigger
CRD

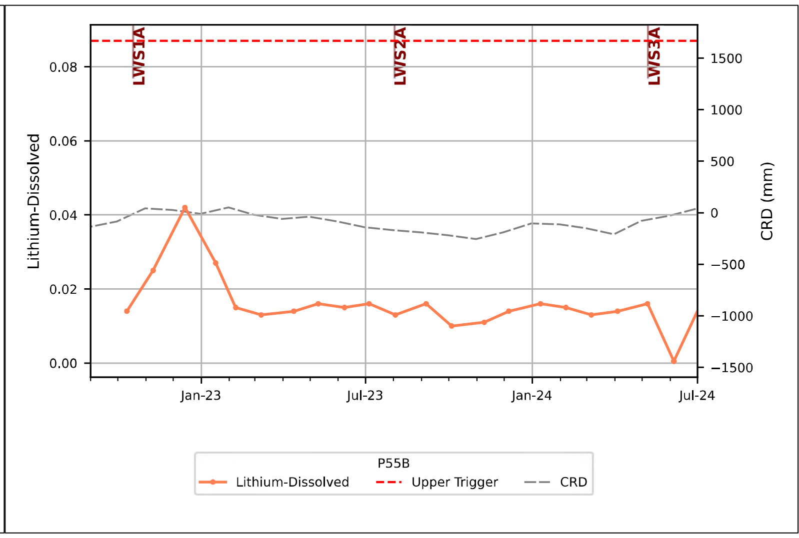

Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Zinc-Dissolved
Upper Trigger
CRD

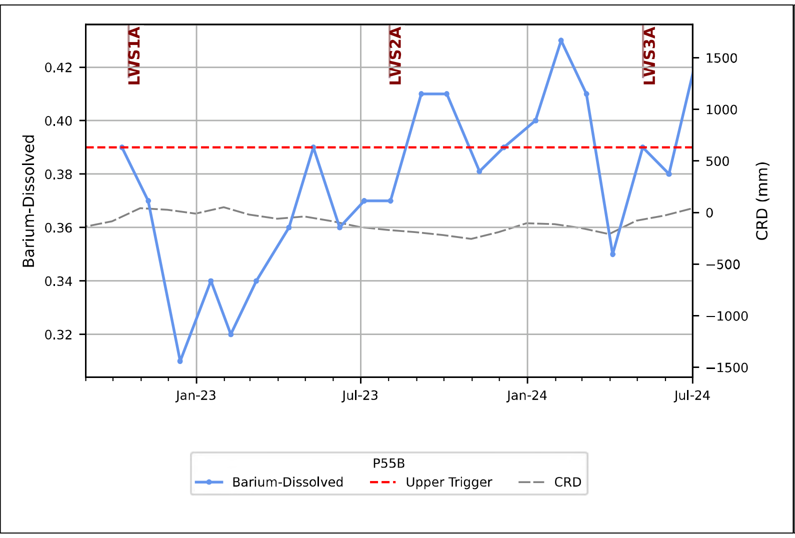

Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Nickel-Dissolved
Upper Trigger
CRD


Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.00 0.05 0.10 0.15 0.20
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Aluminium-Dissolved
Upper Trigger
CRD

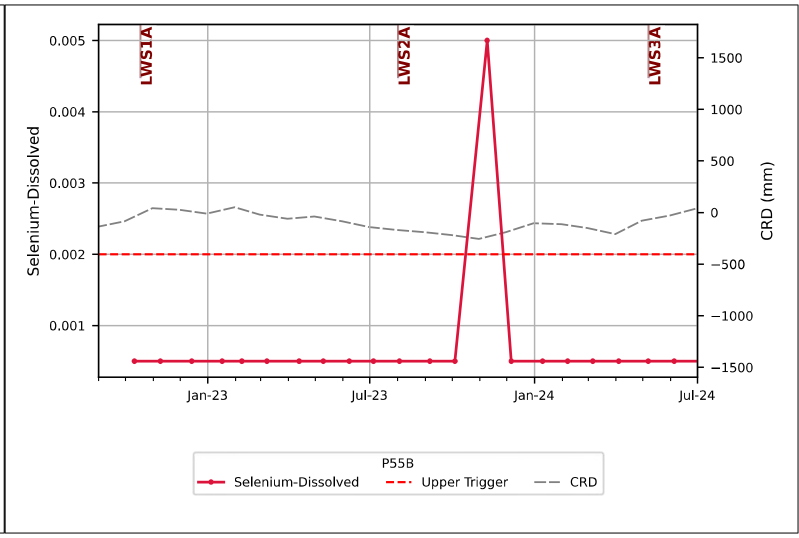

Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.000 0.002 0.004 0.006 0.008 0.010 0.012
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Arsenic-Dissolved
Upper Trigger
CRD


Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.075 0.100 0.125 0.150 0.175 0.200 0.225 0.250 0.275
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Strontium-Dissolved
Upper Trigger
CRD

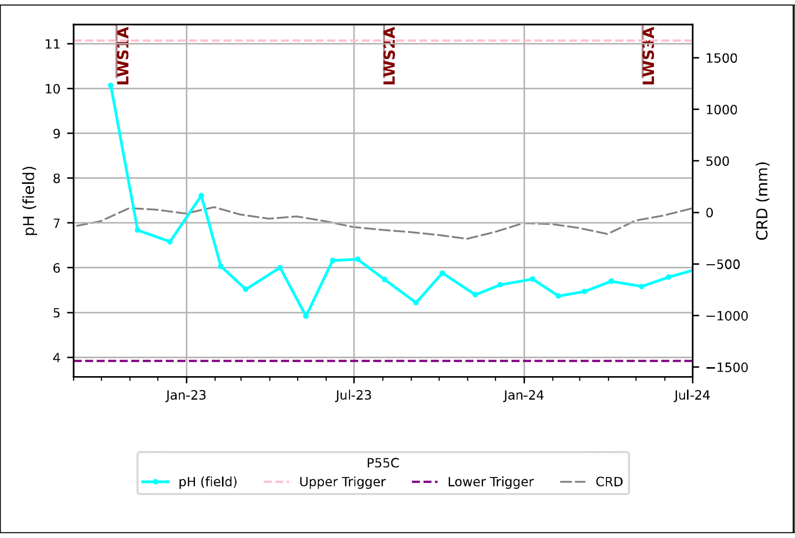

Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.00 0.02 0.04 0.06 0.08
−1500 −1000 −500 0 500 1000 1500
Jan-23 Jul-23 Jan-24 Jul-24
P55B
Lithium-Dissolved
Upper Trigger
CRD



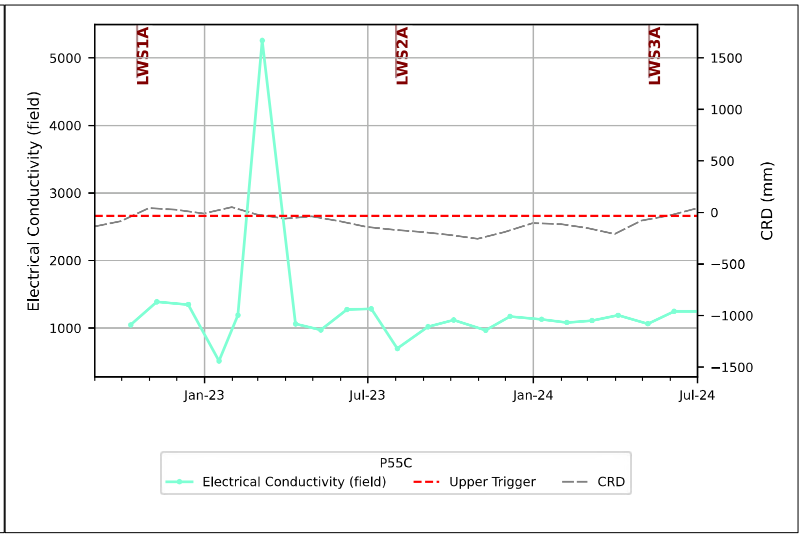
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Barium-Dissolved
Upper Trigger
CRD



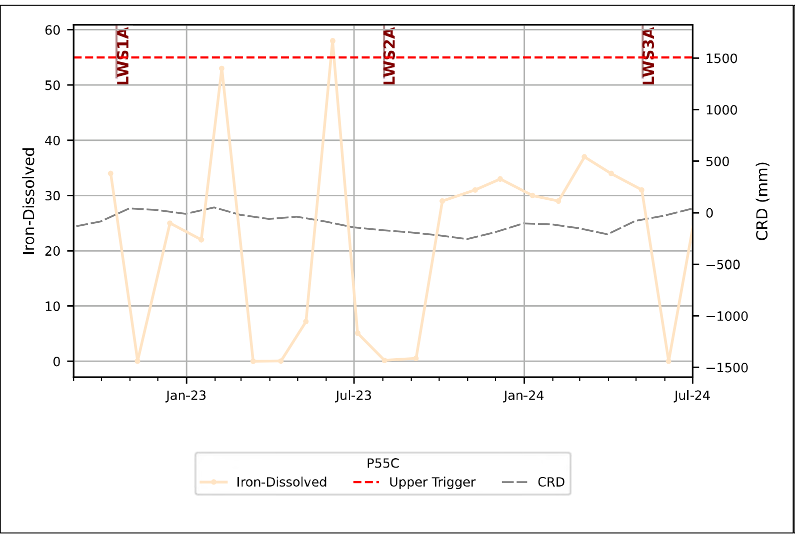
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55B
Selenium-Dissolved
Upper Trigger
CRD



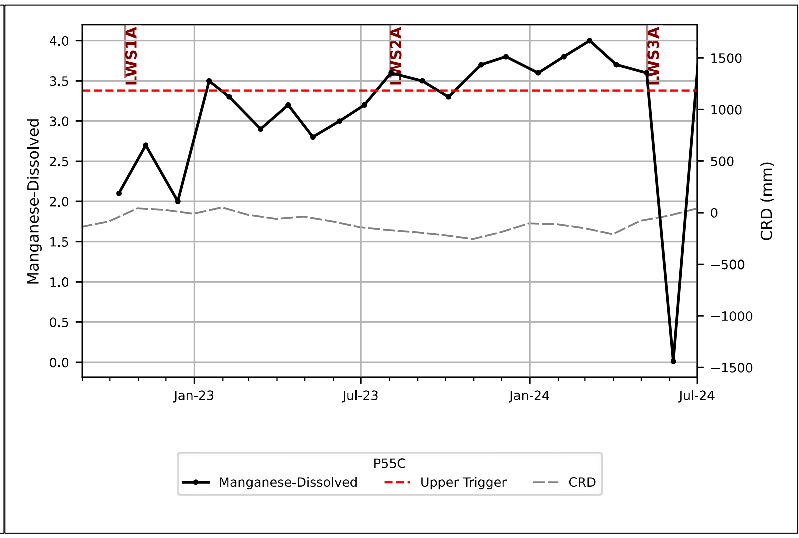
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
pH (field)
Upper Trigger
Lower Trigger
CRD



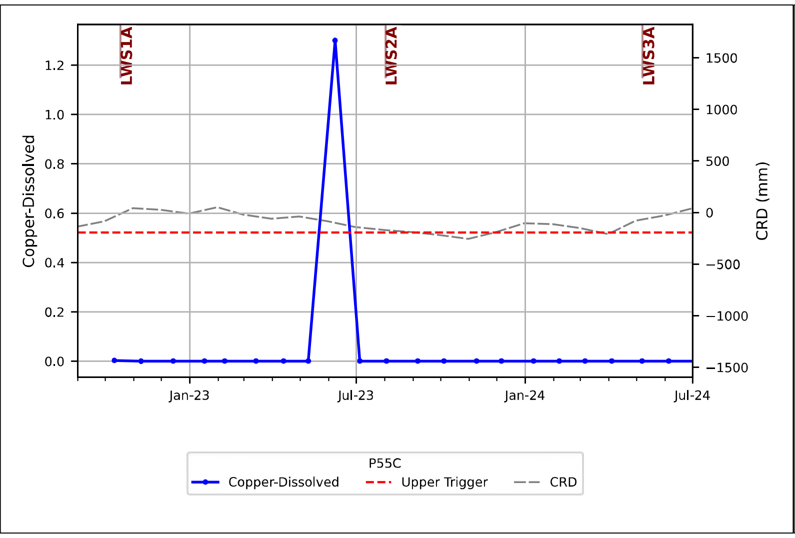
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Electrical Conductivity (field)
Upper Trigger
CRD

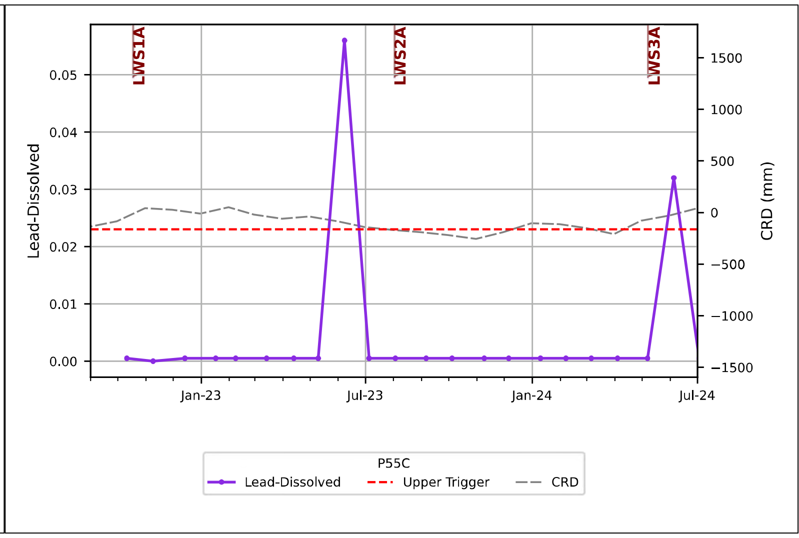


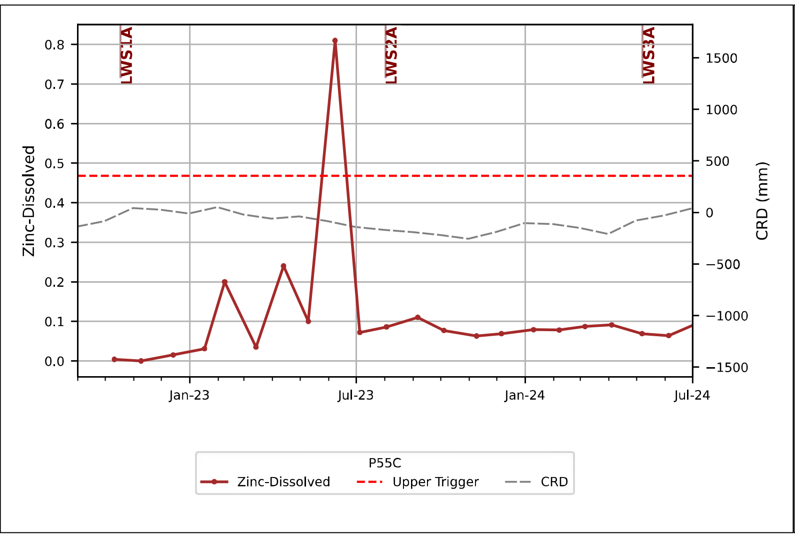
LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Iron-Dissolved
Upper Trigger
CRD

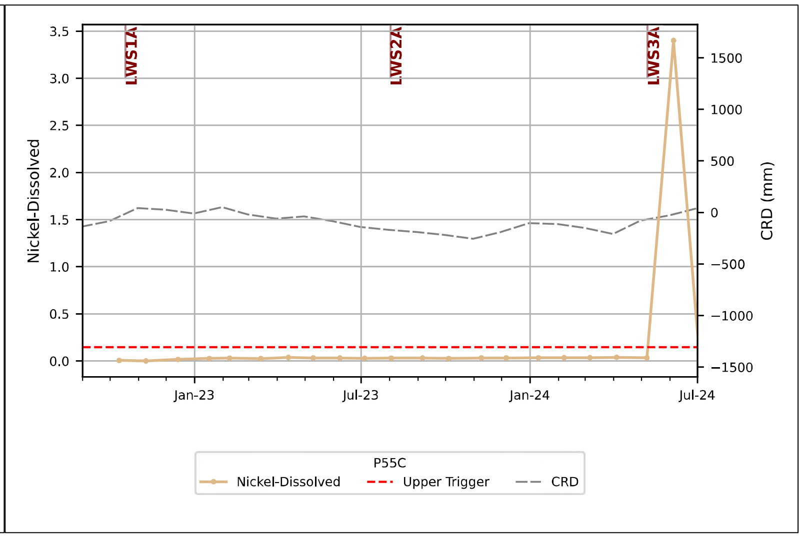


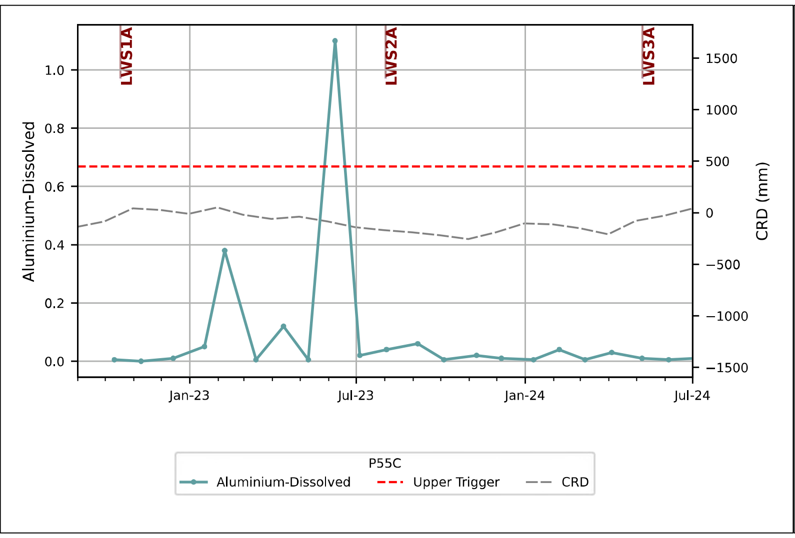
LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Manganese-Dissolved
Upper Trigger
CRD

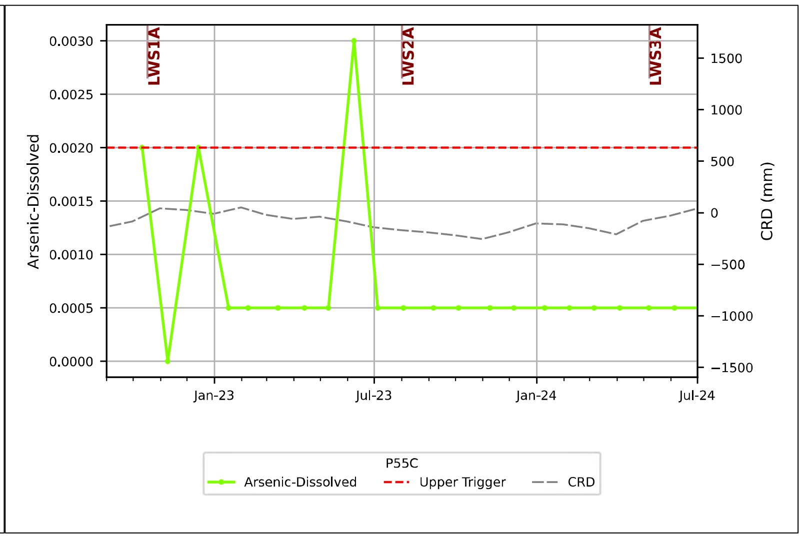

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Copper-Dissolved
Upper Trigger
CRD

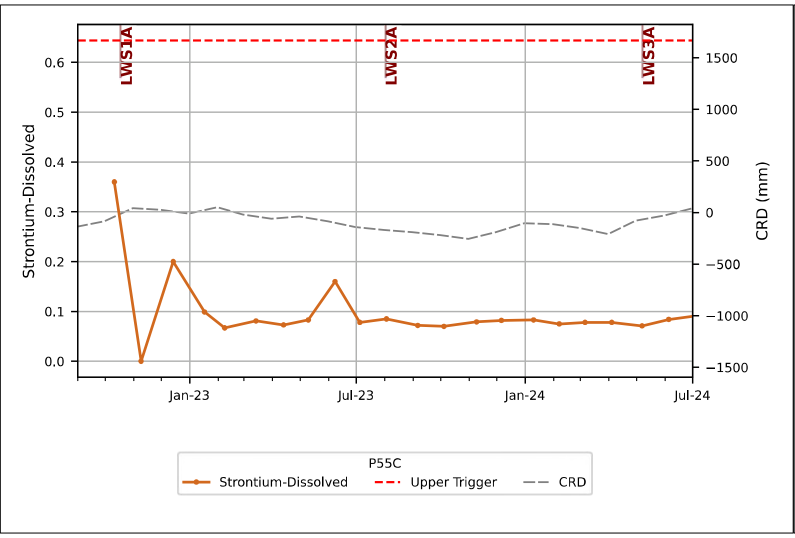

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Lead-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Zinc-Dissolved
Upper Trigger
CRD

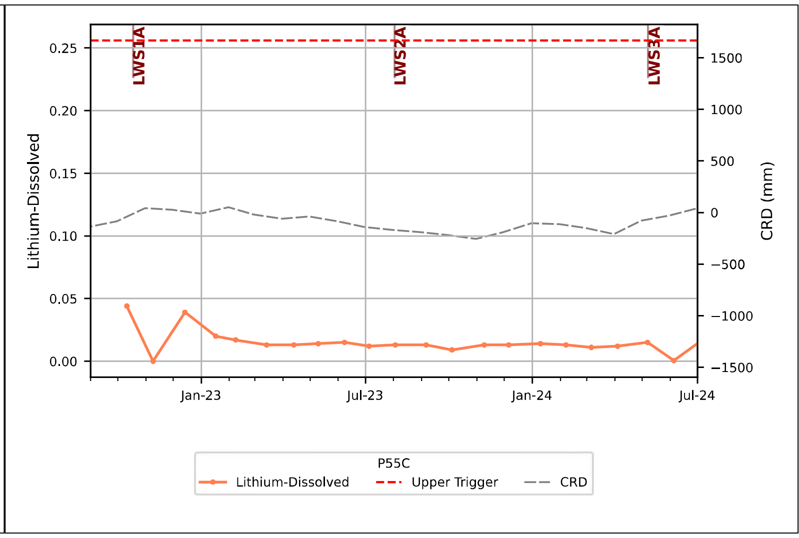

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Nickel-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Aluminium-Dissolved
Upper Trigger
CRD

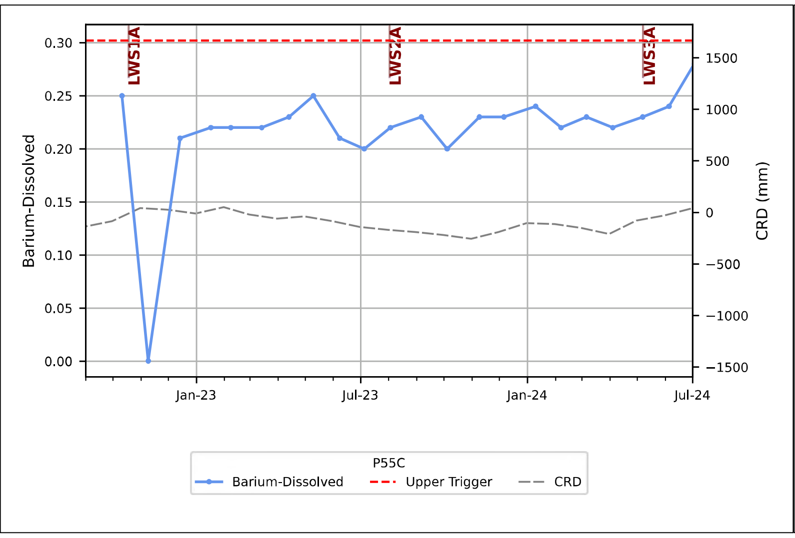

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Arsenic-Dissolved
Upper Trigger
CRD



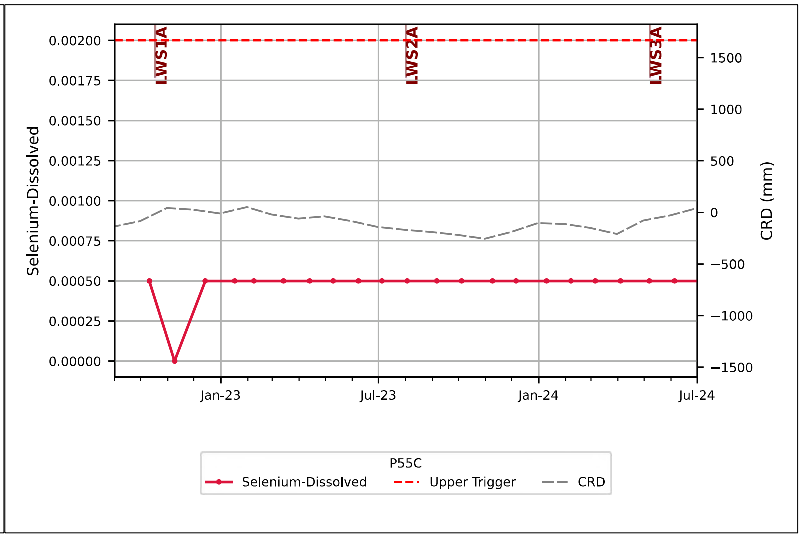
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Strontium-Dissolved
Upper Trigger
CRD



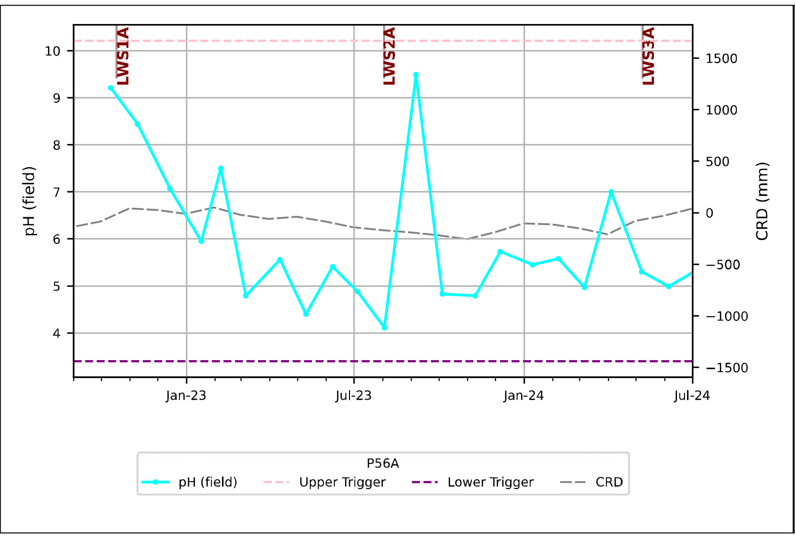
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Lithium-Dissolved
Upper Trigger
CRD



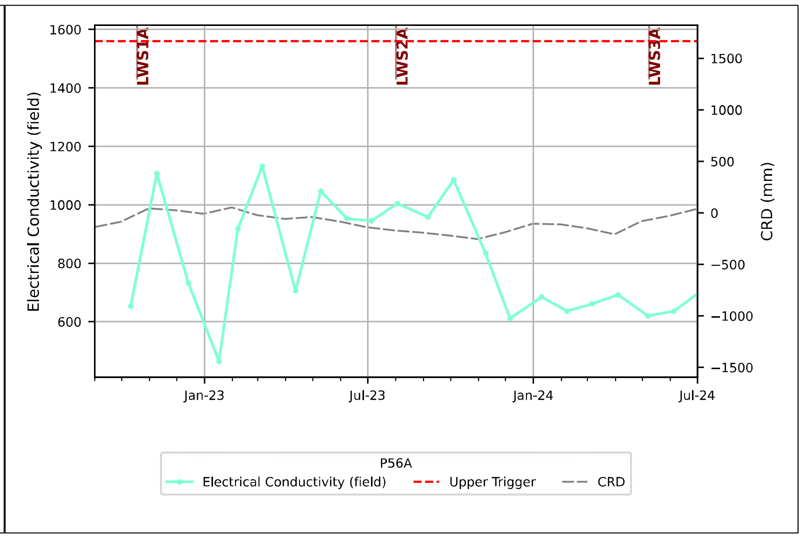
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Barium-Dissolved
Upper Trigger
CRD



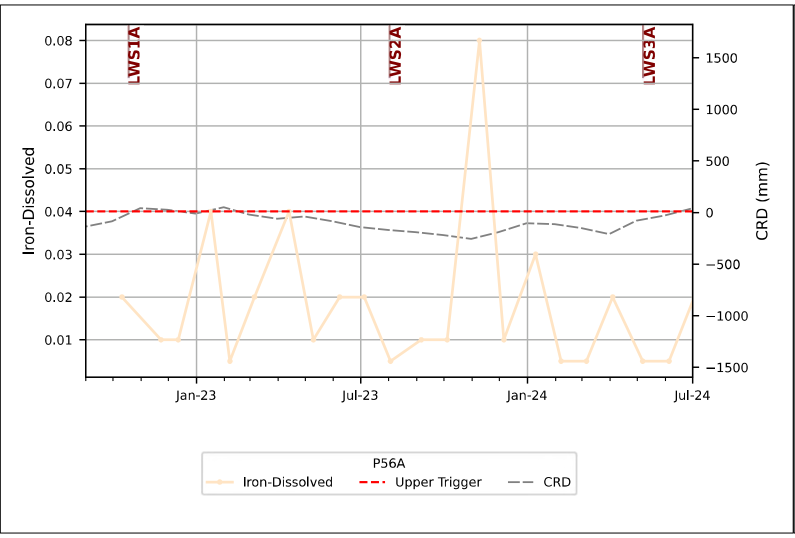
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55C
Selenium-Dissolved
Upper Trigger
CRD

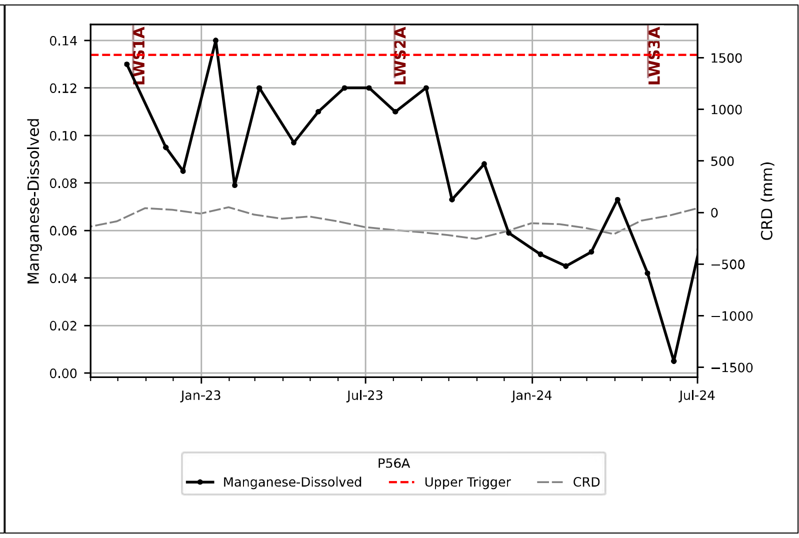


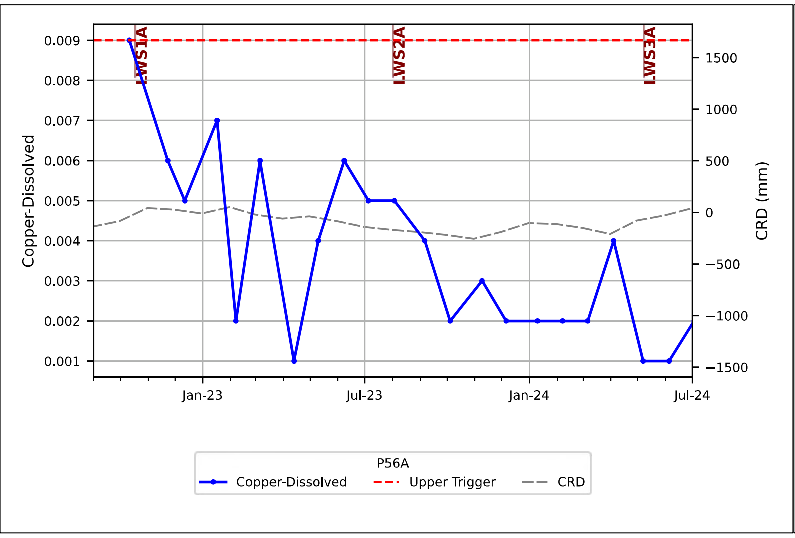
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
pH (field)
Upper Trigger
Lower Trigger
CRD

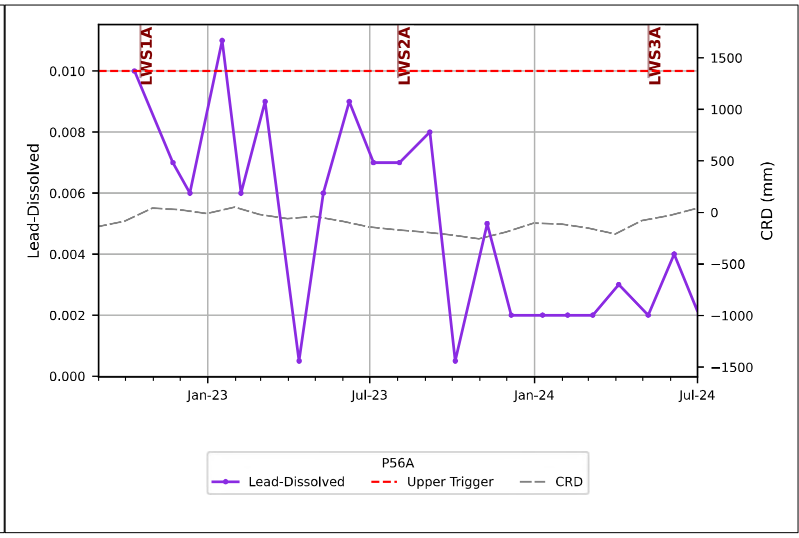


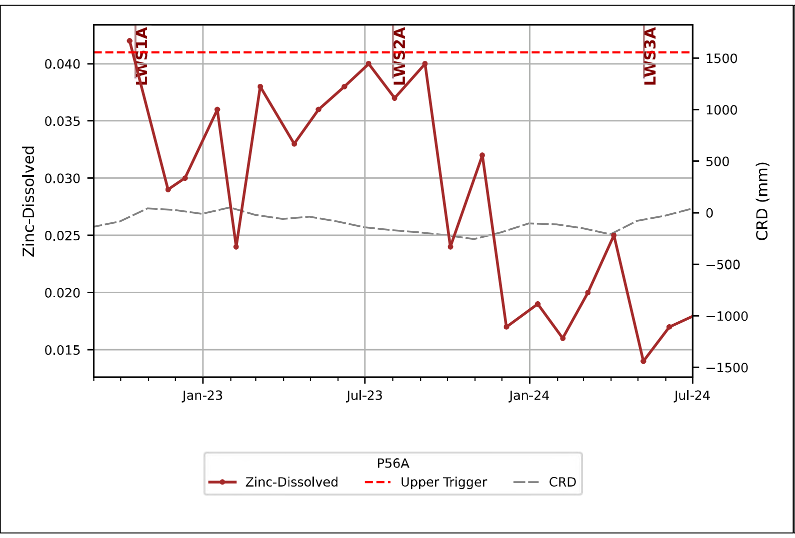
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Electrical Conductivity (field)
Upper Trigger
CRD

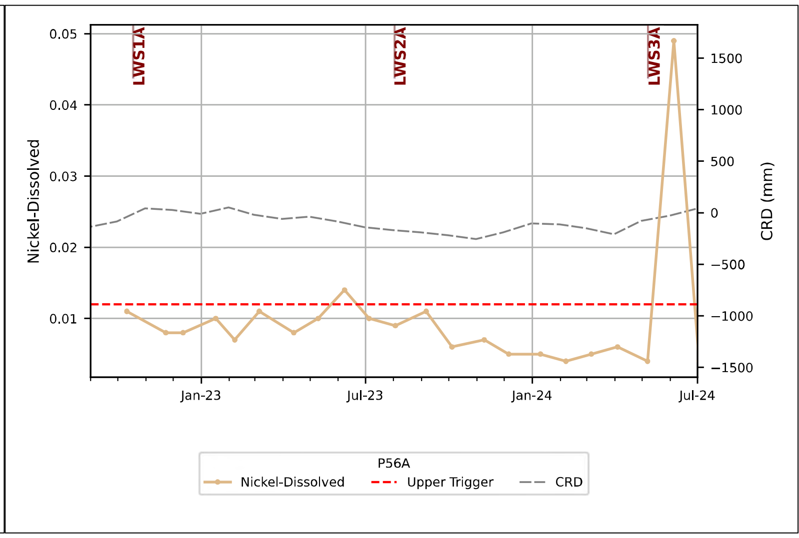

Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Iron-Dissolved
Upper Trigger
CRD

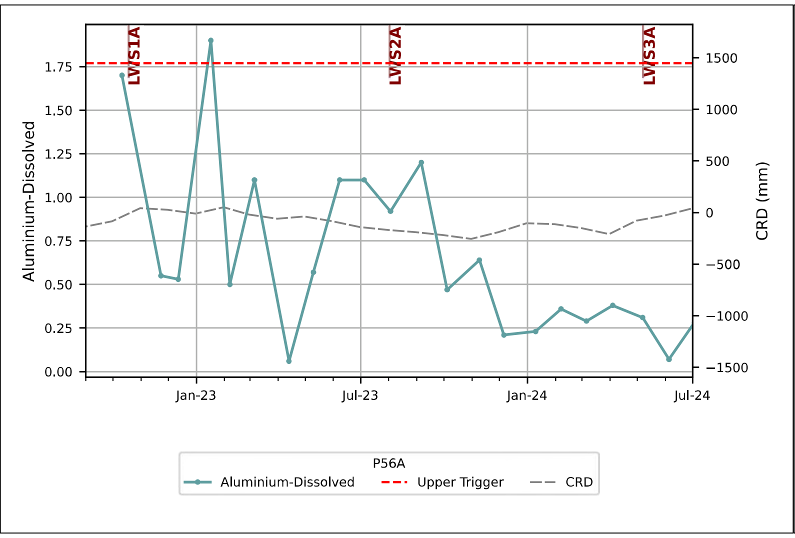

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Manganese-Dissolved
Upper Trigger
CRD

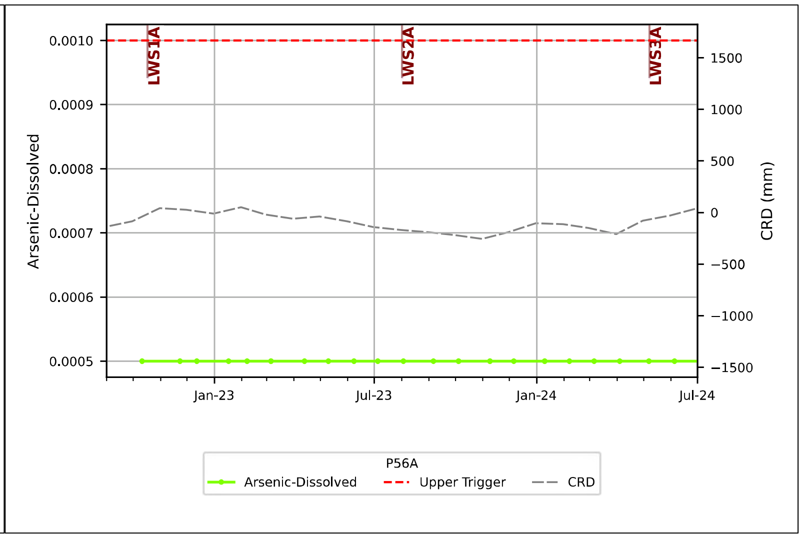

Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Copper-Dissolved
Upper Trigger
CRD

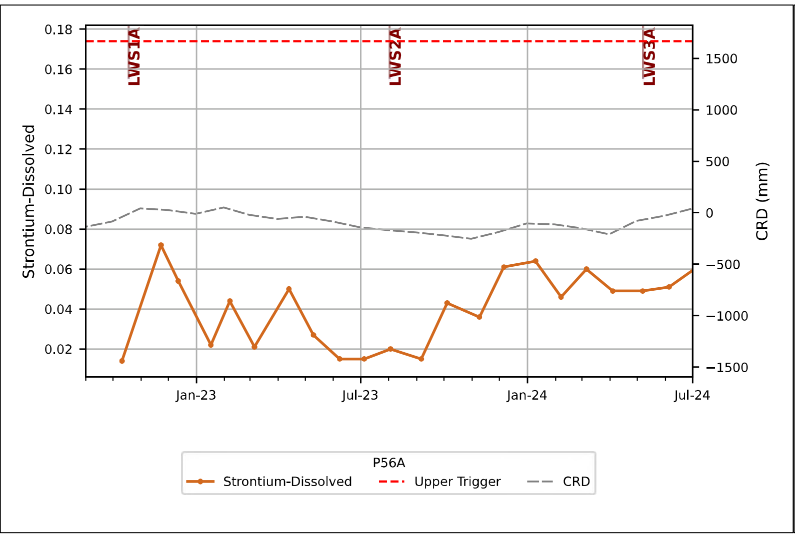

Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Lead-Dissolved
Upper Trigger
CRD

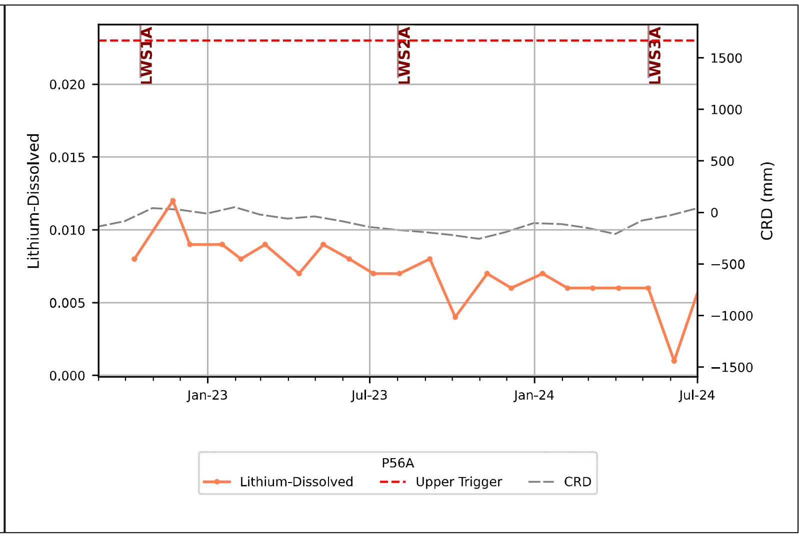

Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Zinc-Dissolved
Upper Trigger
CRD

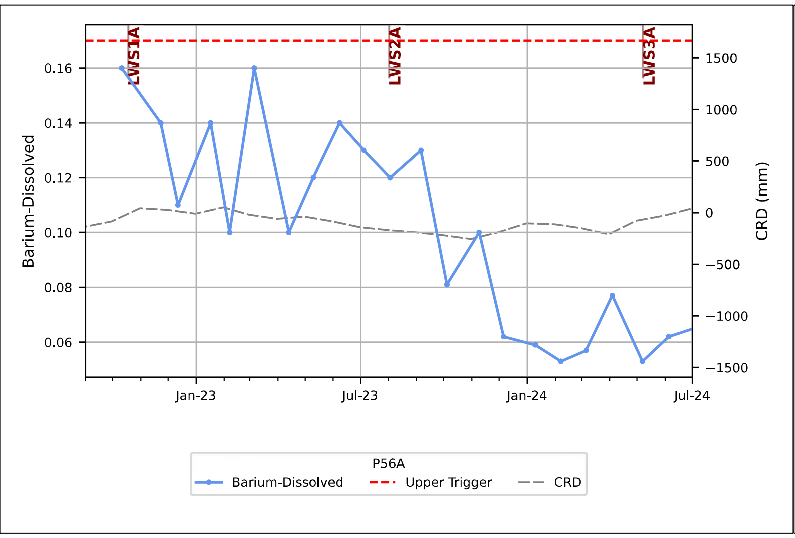

Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Nickel-Dissolved
Upper Trigger
CRD

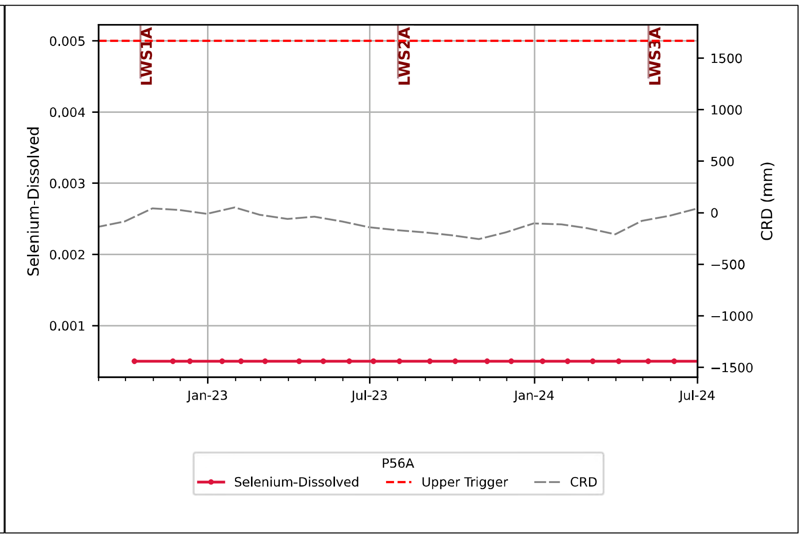

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Aluminium-Dissolved
Upper Trigger
CRD

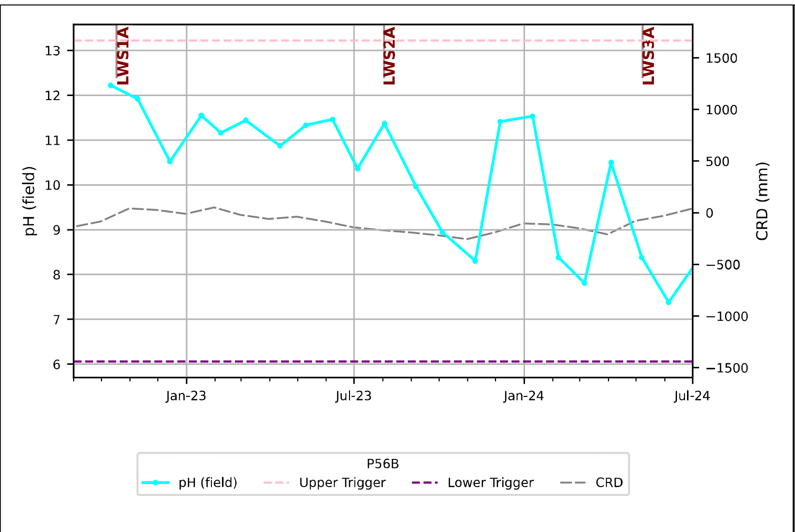

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Arsenic-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Strontium-Dissolved
Upper Trigger
CRD

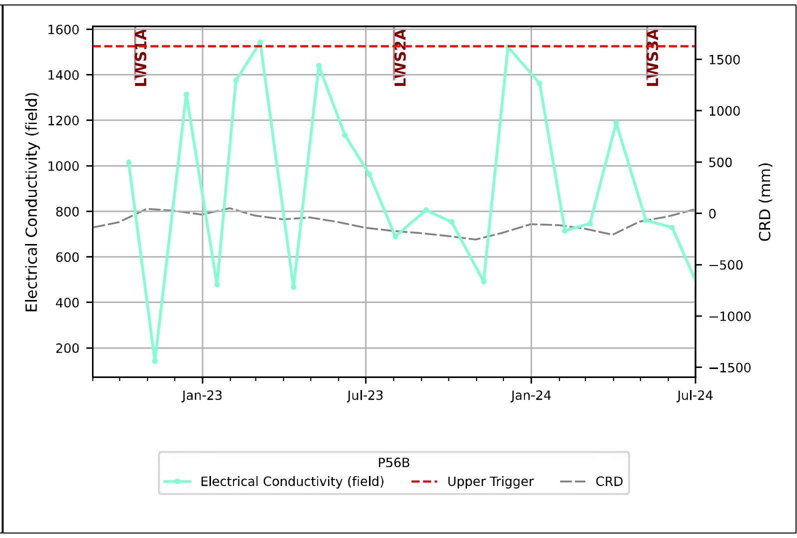

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Lithium-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Barium-Dissolved
Upper Trigger
CRD

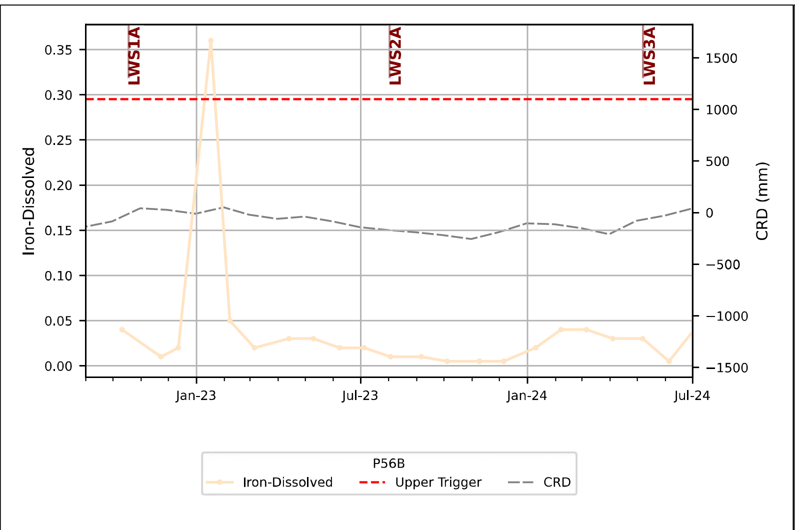

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56A
Selenium-Dissolved
Upper Trigger
CRD



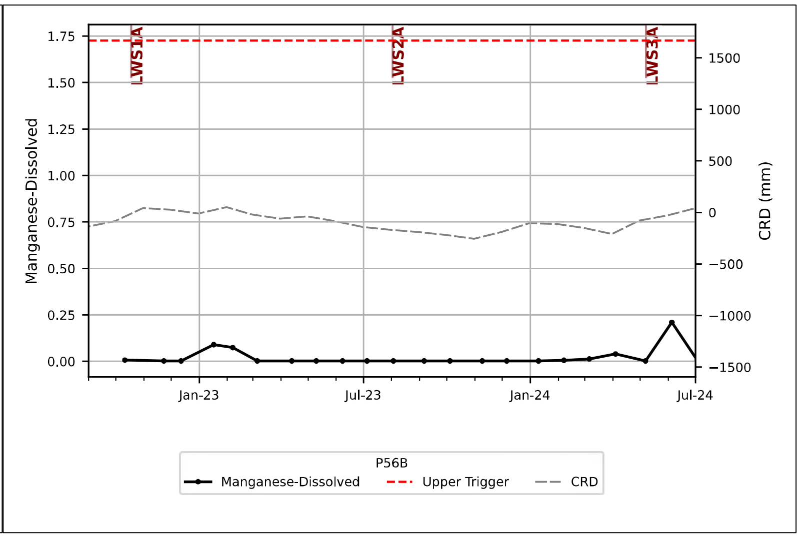
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
pH (field)
Upper Trigger
Lower Trigger
CRD



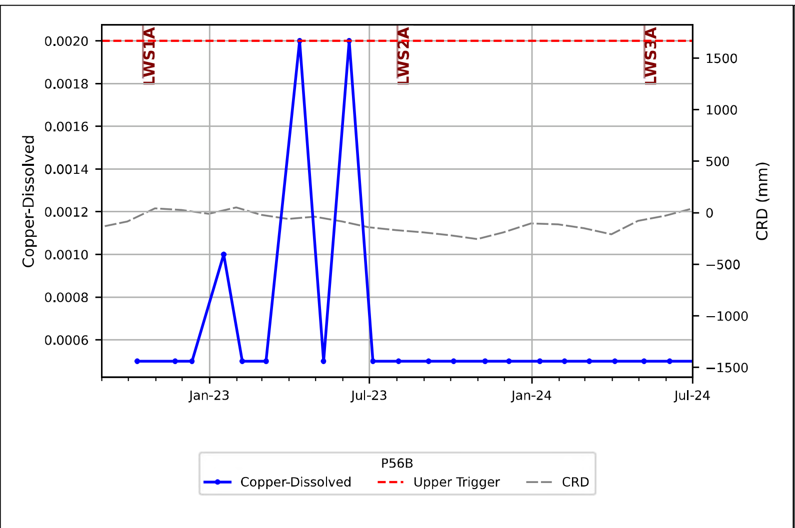
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Electrical Conductivity (field)
Upper Trigger
CRD



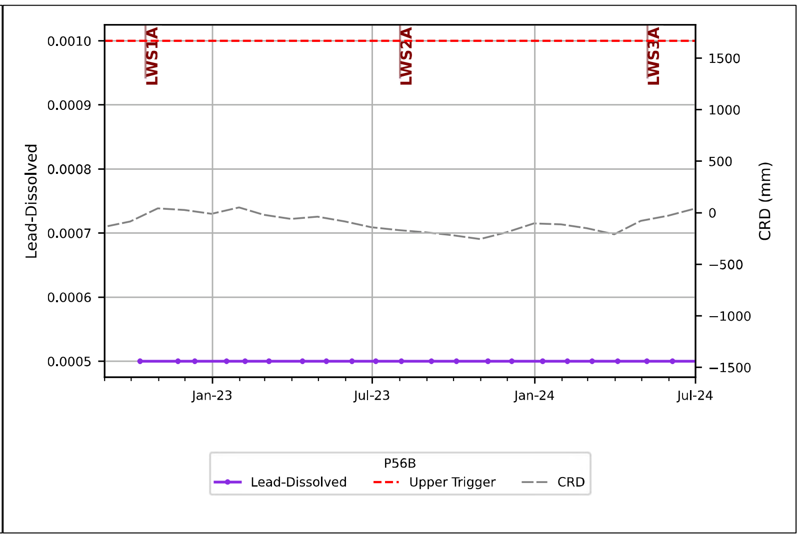
LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Iron-Dissolved
Upper Trigger
CRD



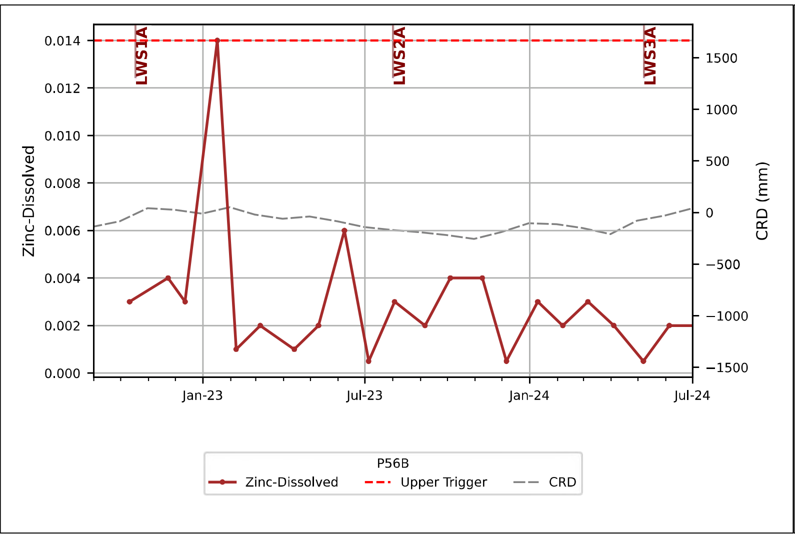
LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Manganese-Dissolved
Upper Trigger
CRD



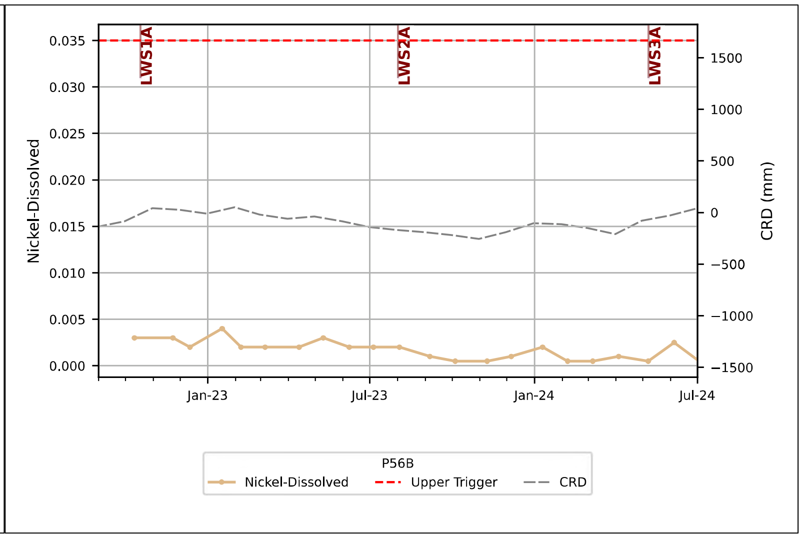
LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Copper-Dissolved
Upper Trigger
CRD



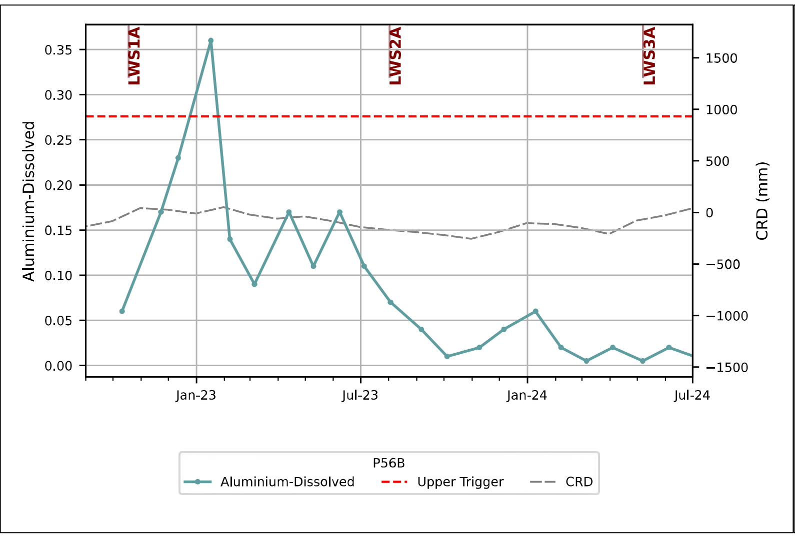
LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Lead-Dissolved
Upper Trigger
CRD



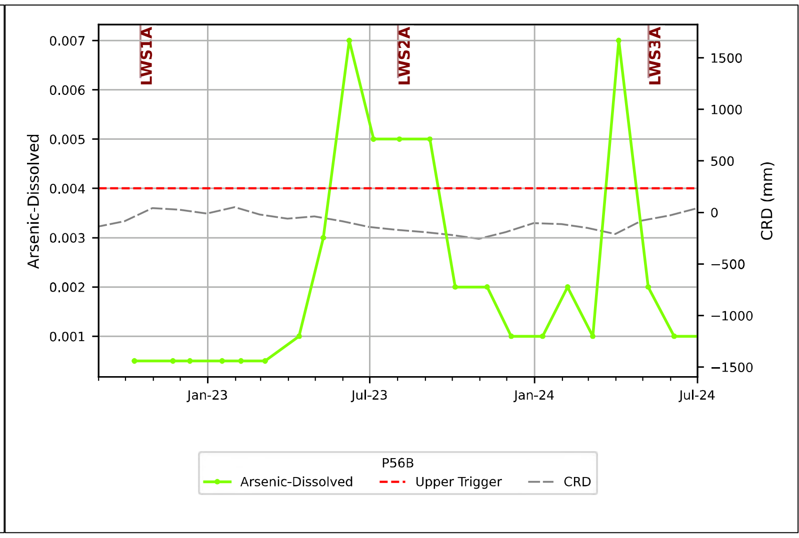
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Zinc-Dissolved
Upper Trigger
CRD



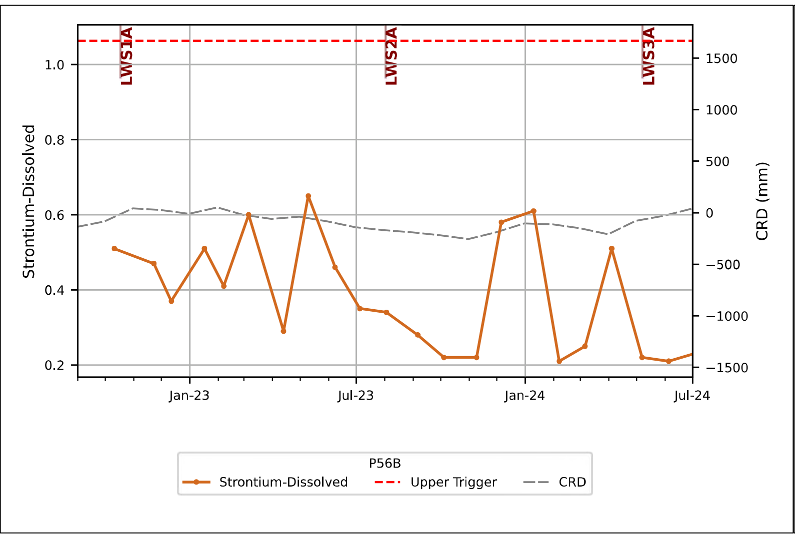
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Nickel-Dissolved
Upper Trigger
CRD



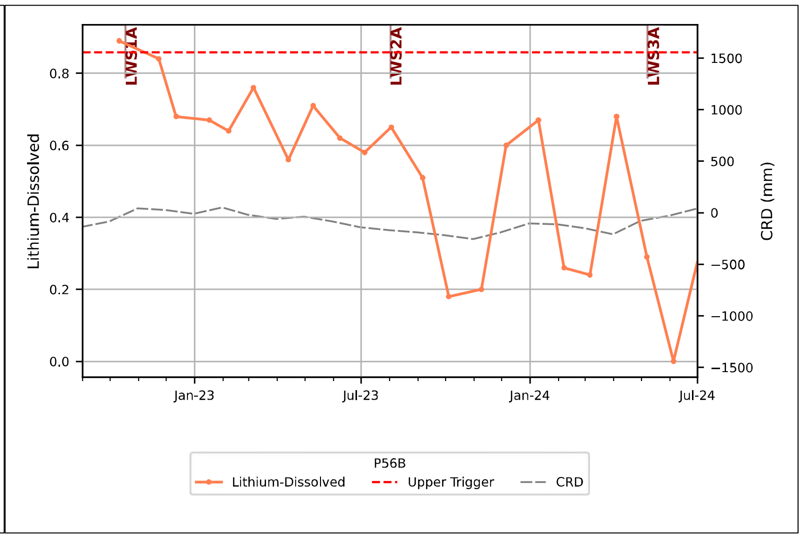
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Aluminium-Dissolved
Upper Trigger
CRD



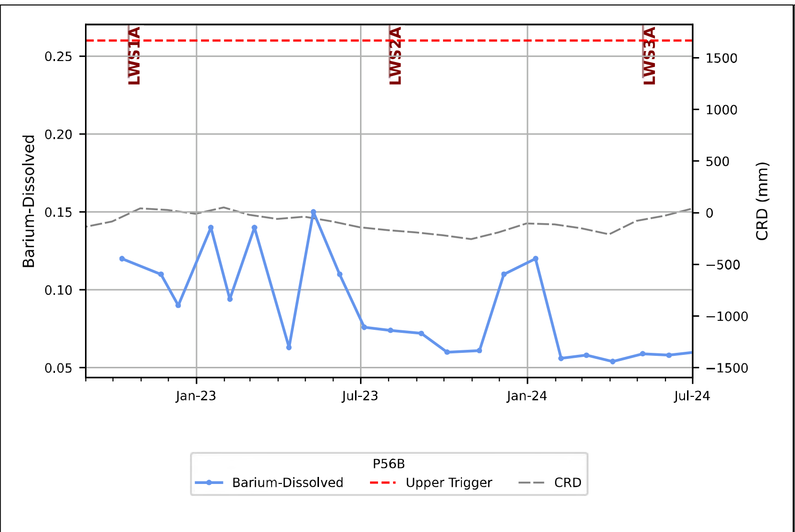
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Arsenic-Dissolved
Upper Trigger
CRD

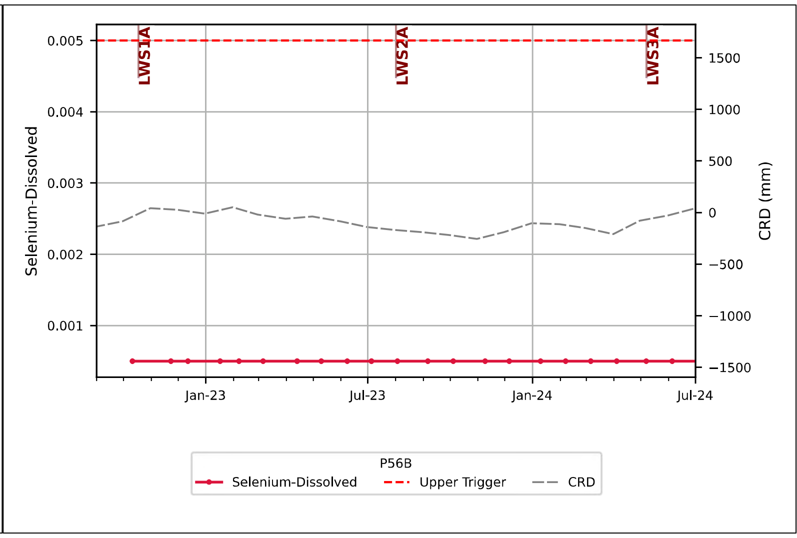


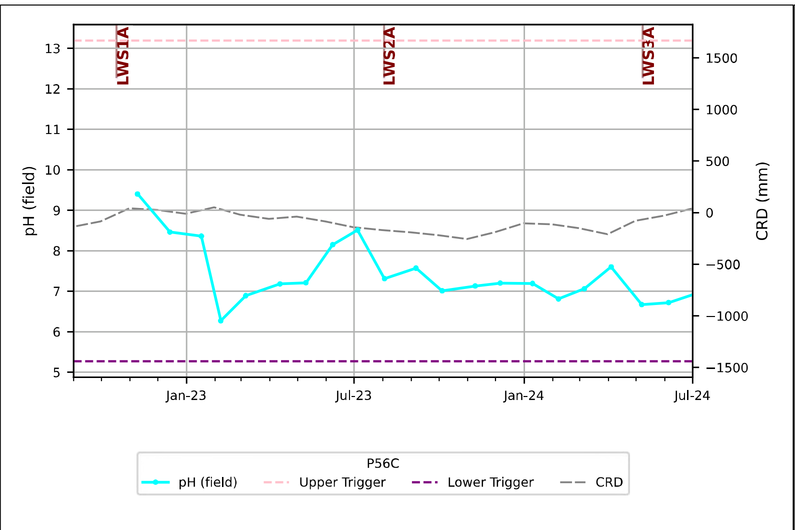
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Strontium-Dissolved
Upper Trigger
CRD

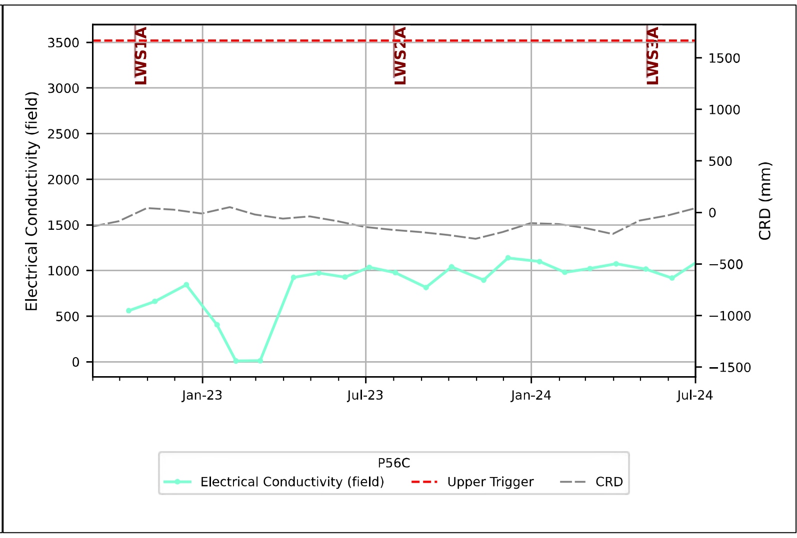


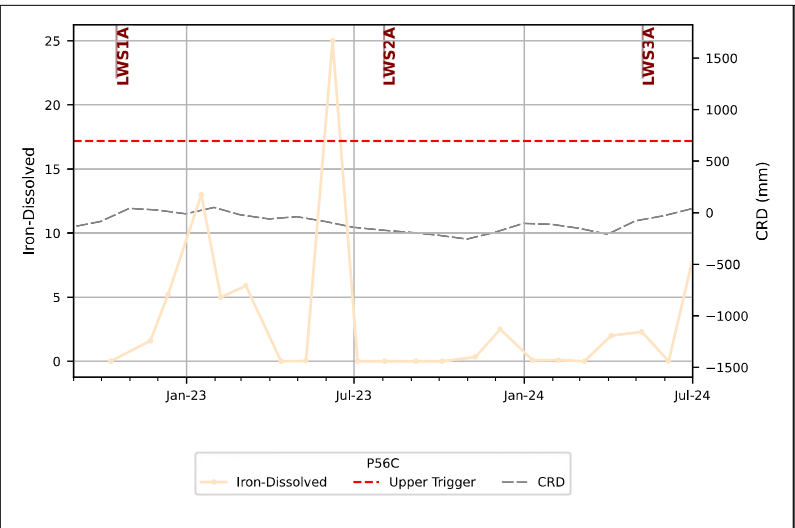
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56B
Lithium-Dissolved
Upper Trigger
CRD

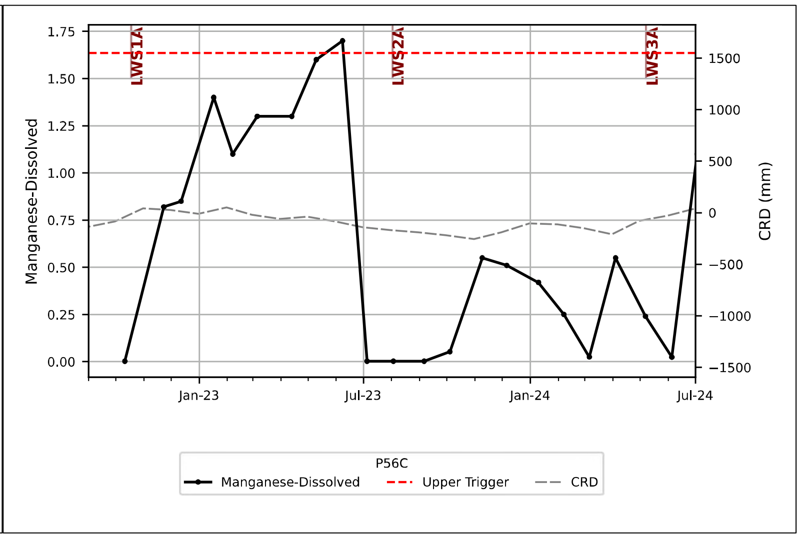

LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
P56B
Barium-Dissolved
Upper Trigger
CRD

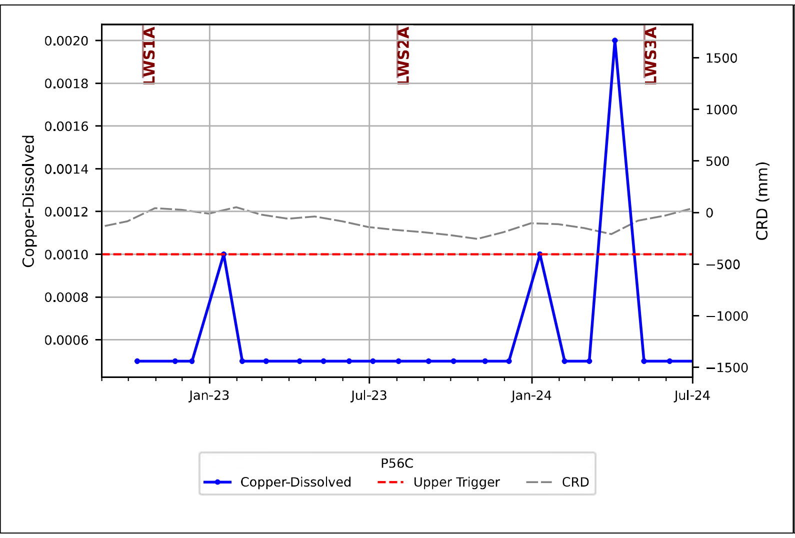

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
P56B
Selenium-Dissolved
Upper Trigger
CRD

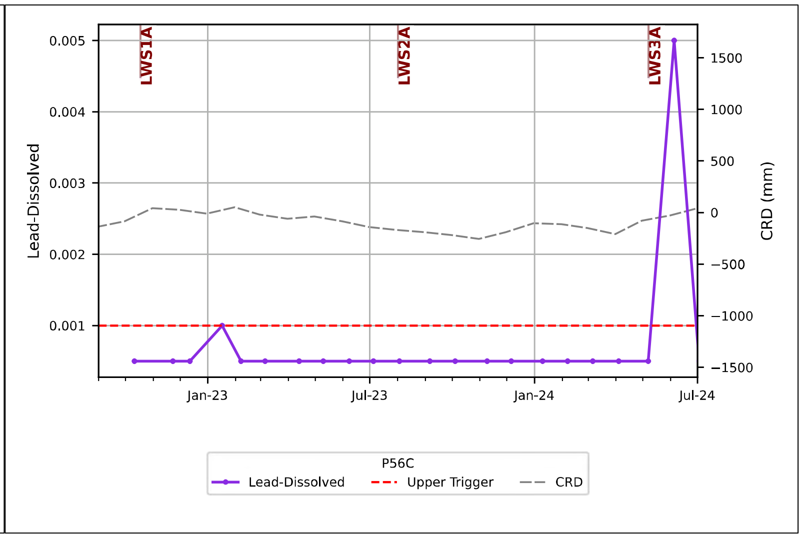

LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
P56C
pH (field)
Upper Trigger
Lower Trigger
CRD

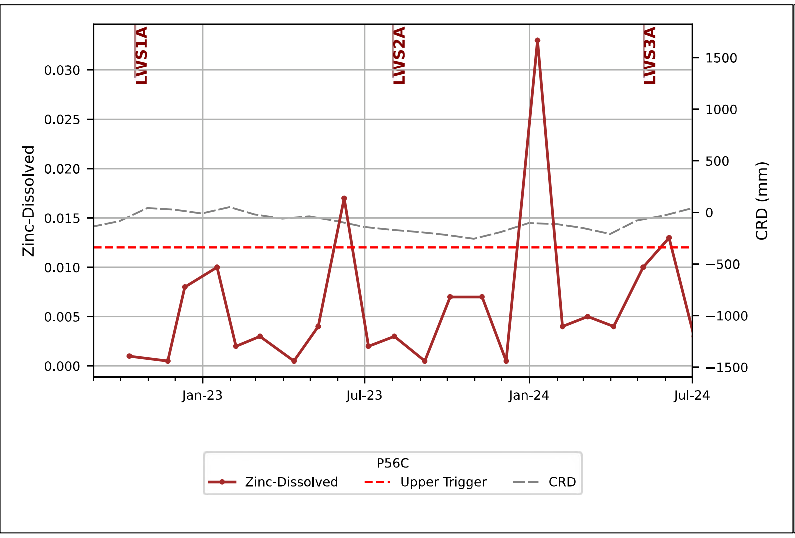

LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
P56C
Electrical Conductivity (field)
Upper Trigger
CRD

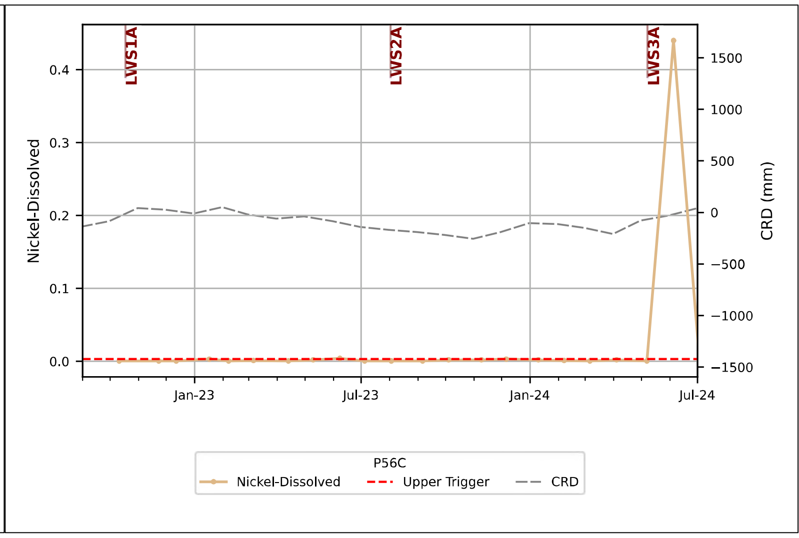

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
P56C
Iron-Dissolved
Upper Trigger
CRD

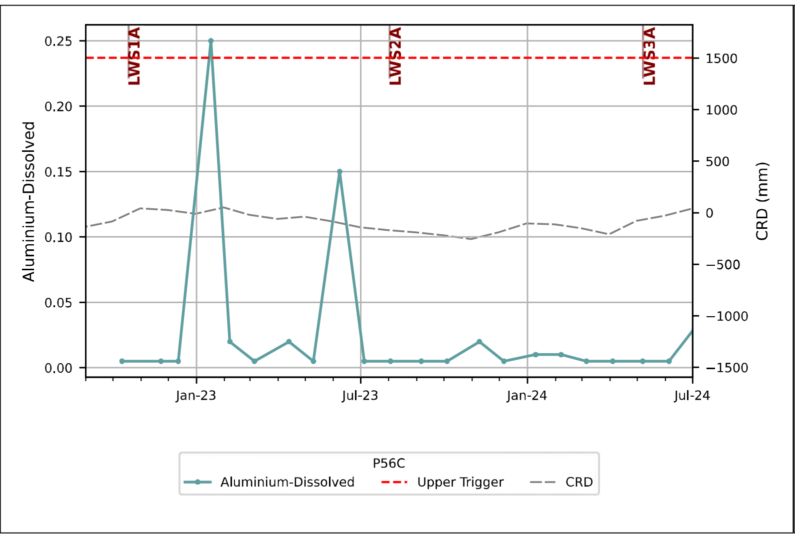

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
P56C
Manganese-Dissolved
Upper Trigger
CRD

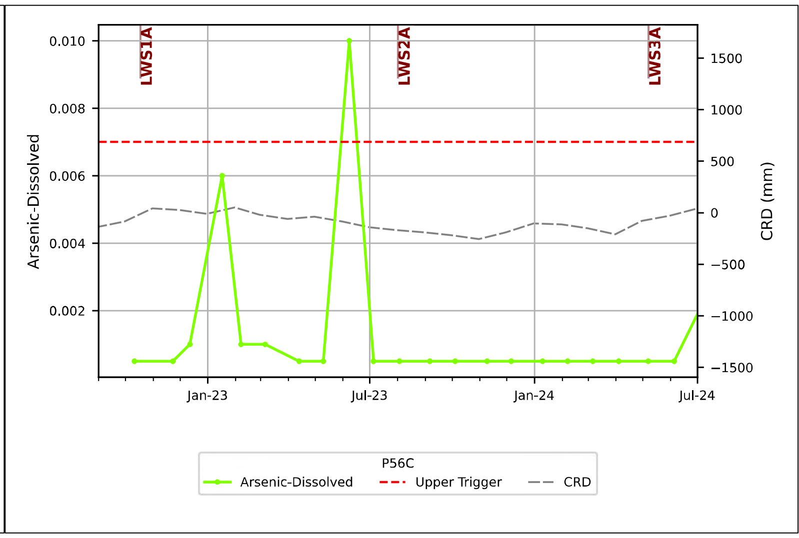

Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Copper-Dissolved
Upper Trigger
CRD

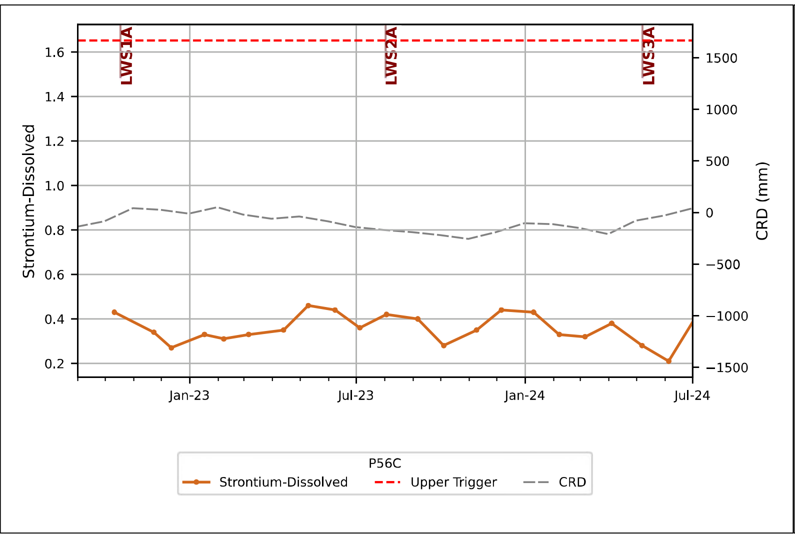

Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Lead-Dissolved
Upper Trigger
CRD


Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Zinc-Dissolved
Upper Trigger
CRD

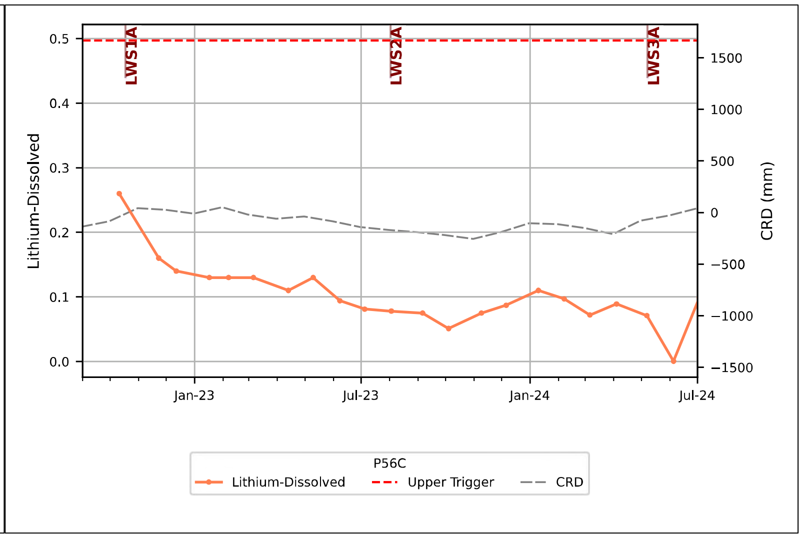

Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Nickel-Dissolved
Upper Trigger
CRD


Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Aluminium-Dissolved
Upper Trigger
CRD

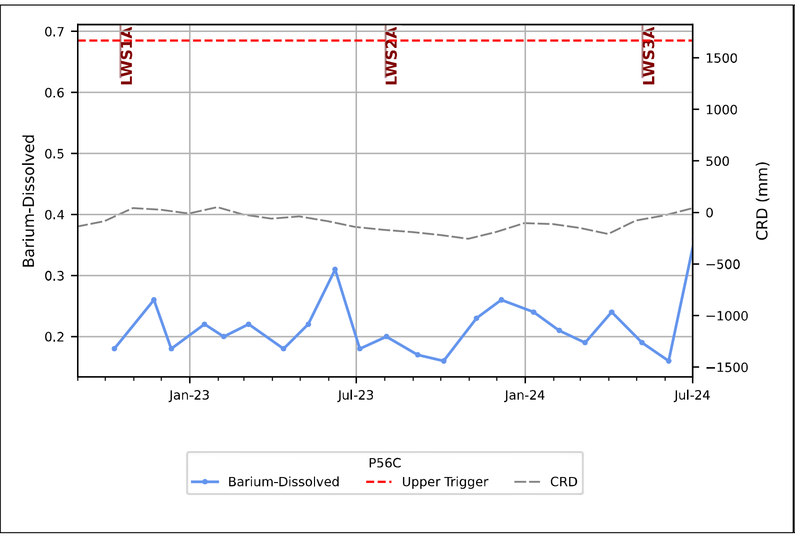

Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Arsenic-Dissolved
Upper Trigger
CRD



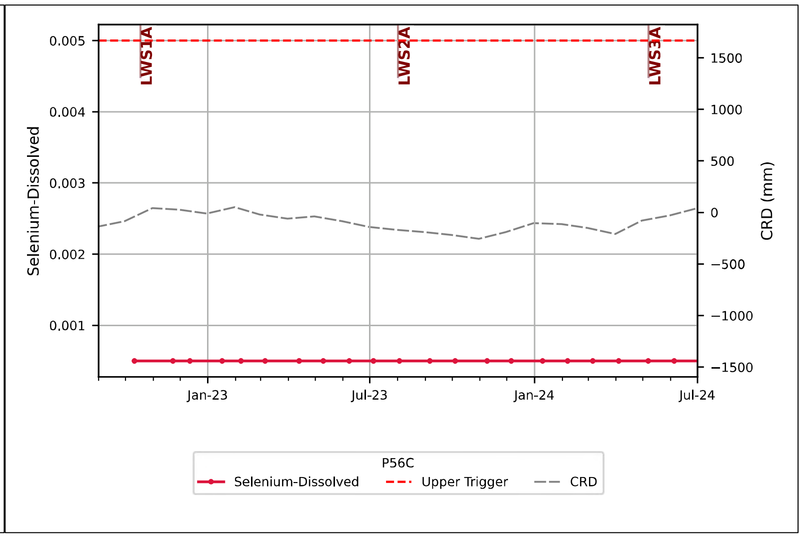
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Strontium-Dissolved
Upper Trigger
CRD



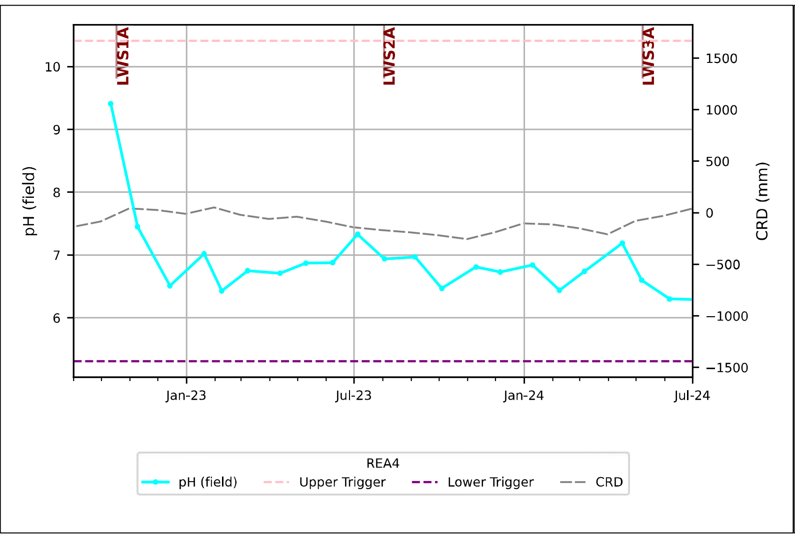
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Lithium-Dissolved
Upper Trigger
CRD



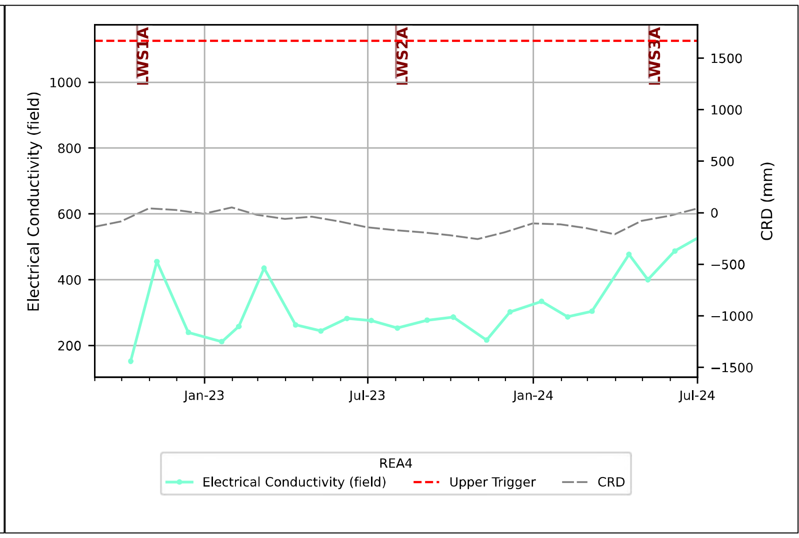
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Barium-Dissolved
Upper Trigger
CRD



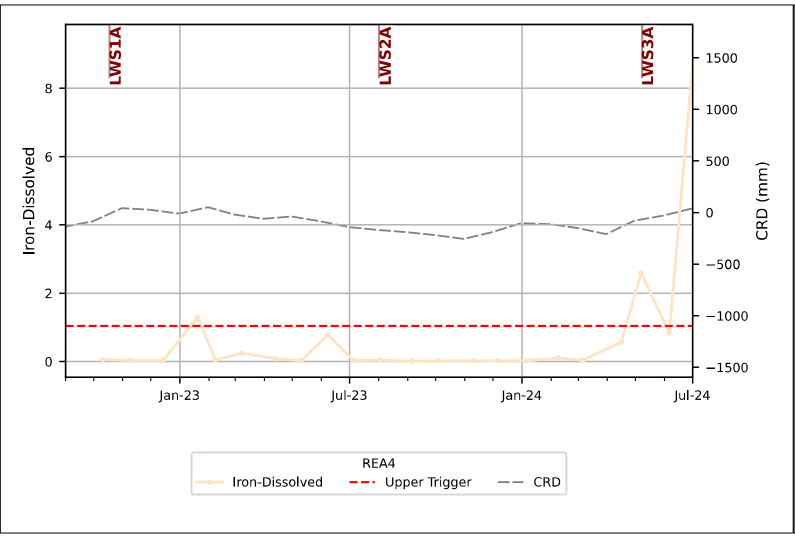
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P56C
Selenium-Dissolved
Upper Trigger
CRD

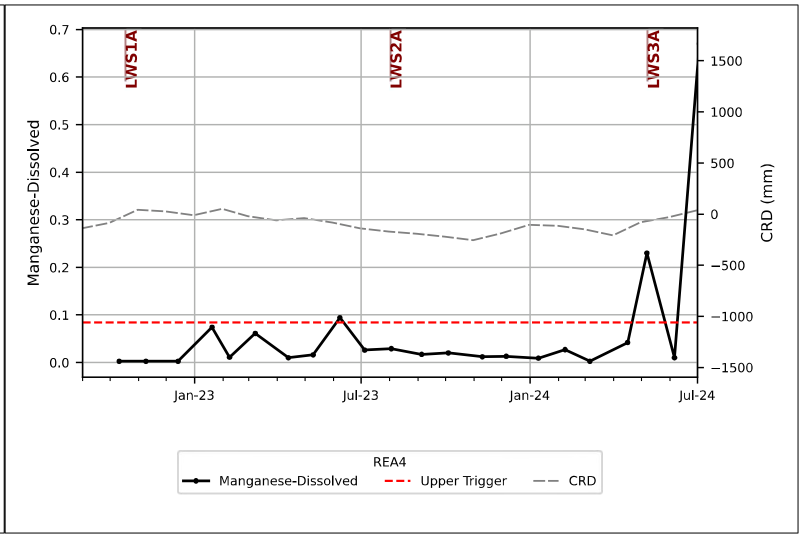


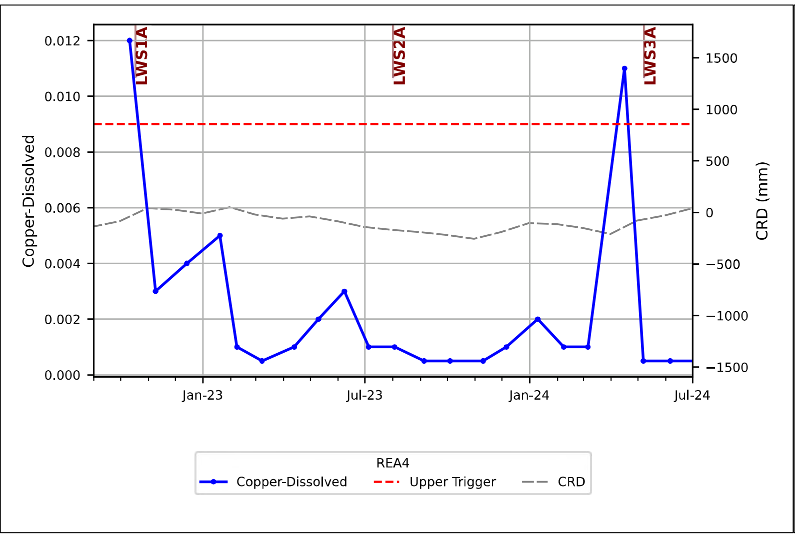
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
pH (field)
Upper Trigger
Lower Trigger
CRD

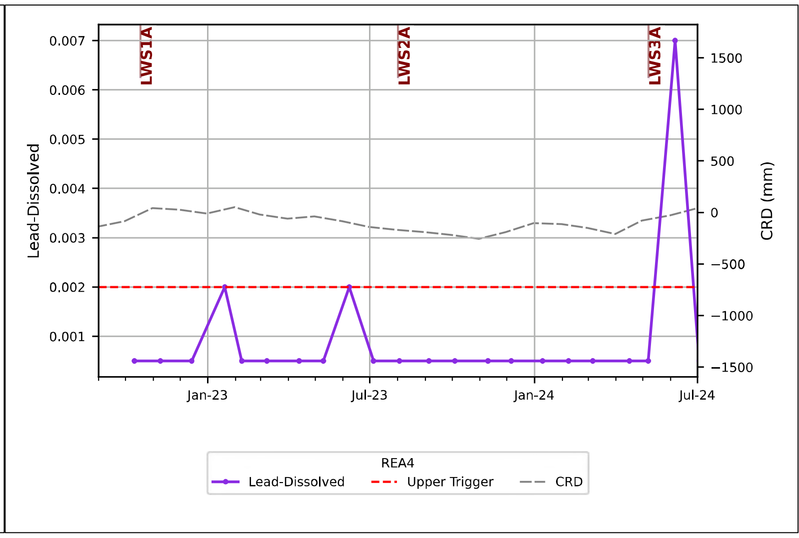


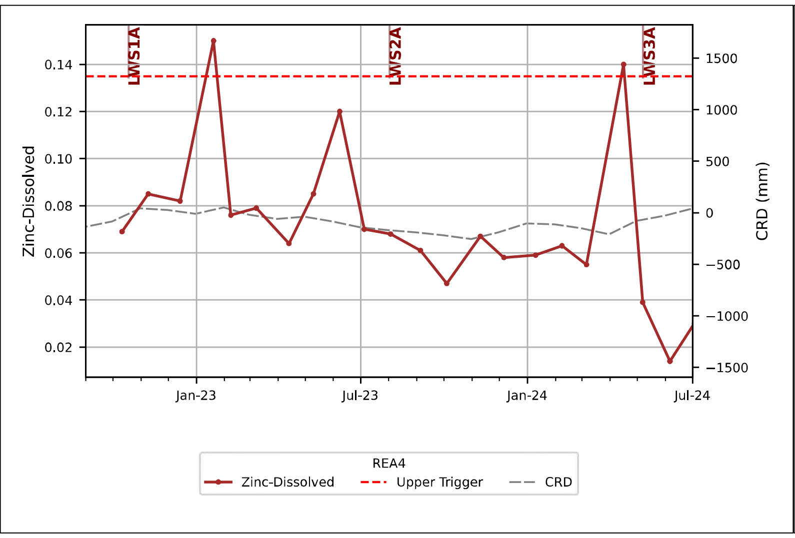
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Electrical Conductivity (field)
Upper Trigger
CRD

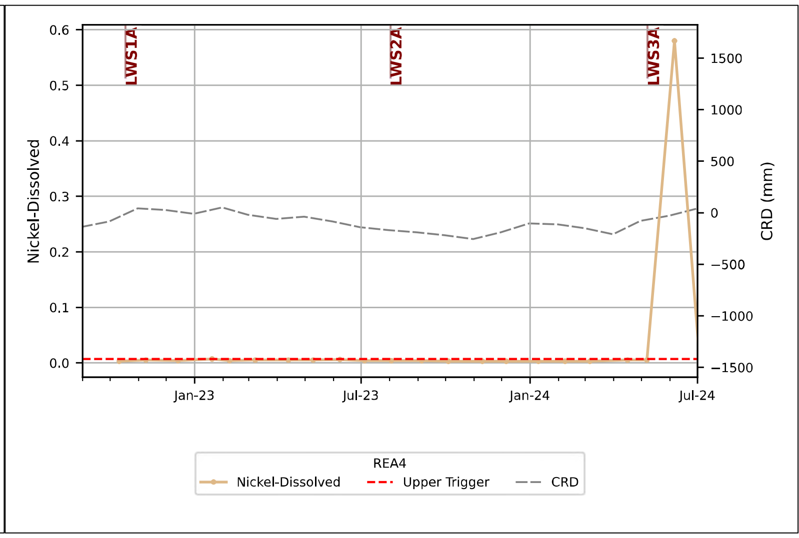

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Iron-Dissolved
Upper Trigger
CRD

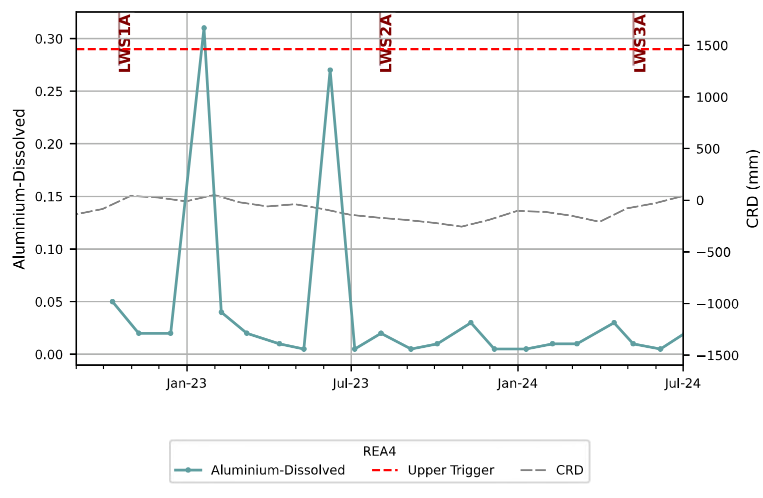

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Manganese-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Copper-Dissolved
Upper Trigger
CRD

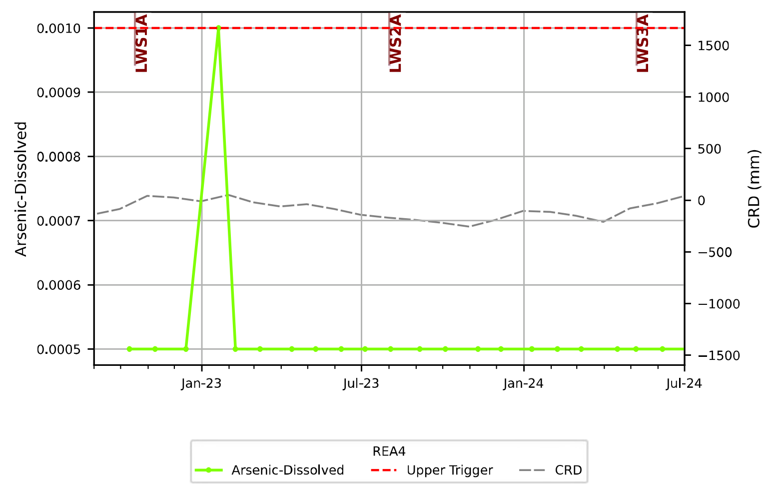

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Lead-Dissolved
Upper Trigger
CRD


LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Zinc-Dissolved
Upper Trigger
CRD

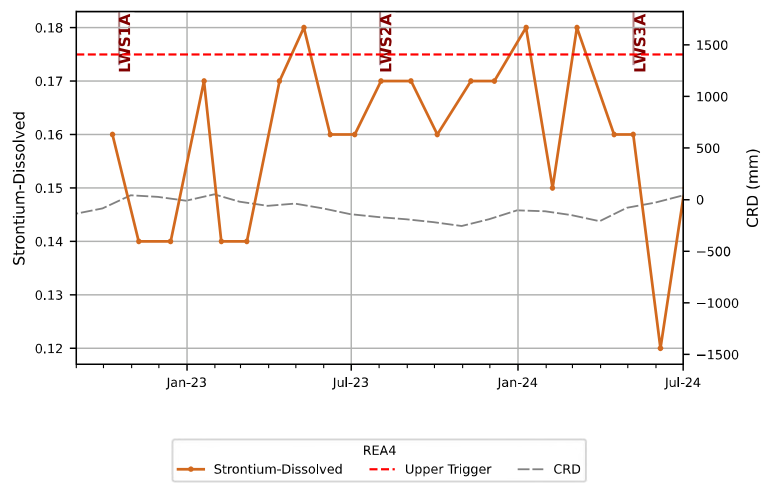

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Nickel-Dissolved
Upper Trigger
CRD



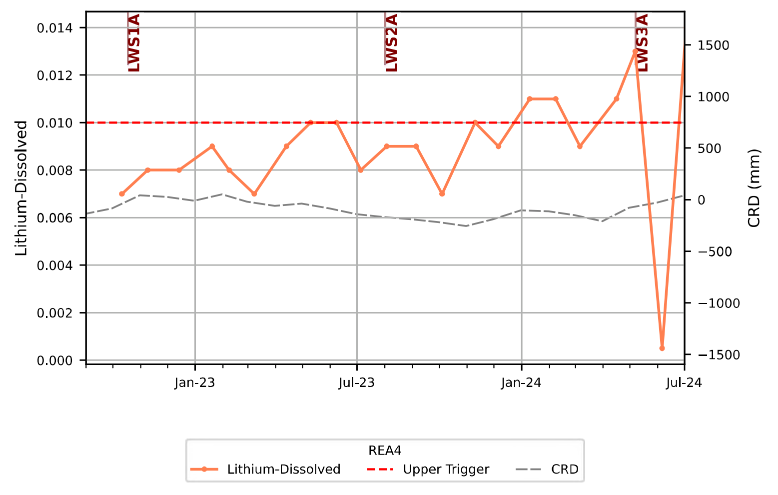
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Aluminium-Dissolved
Upper Trigger
CRD



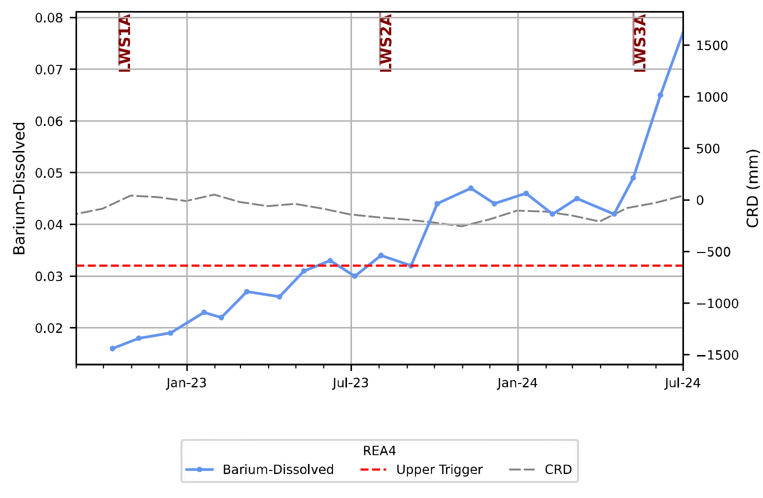
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Arsenic-Dissolved
Upper Trigger
CRD



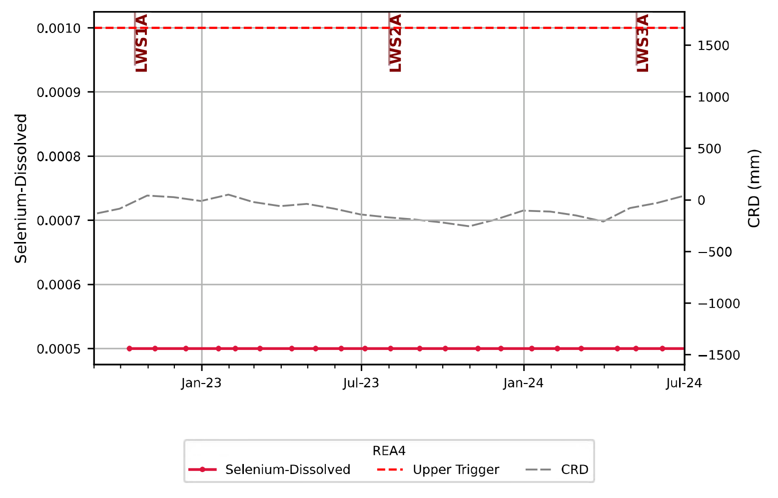
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Strontium-Dissolved
Upper Trigger
CRD



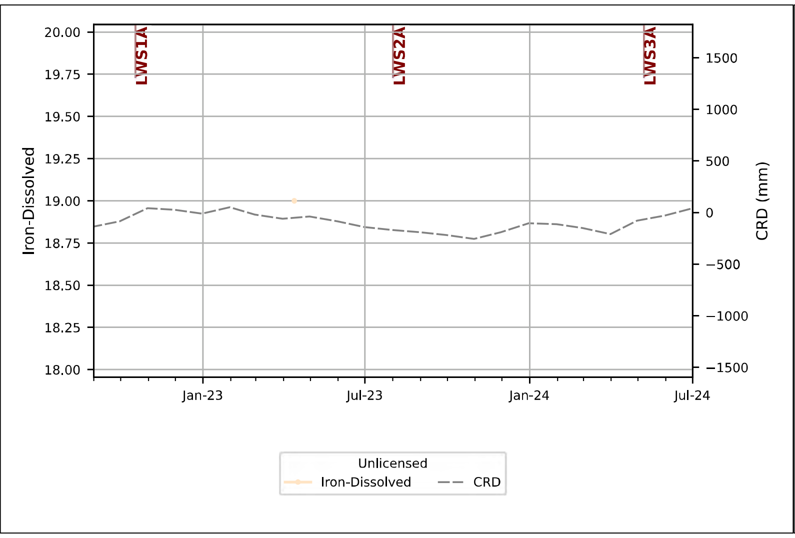
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Lithium-Dissolved
Upper Trigger
CRD

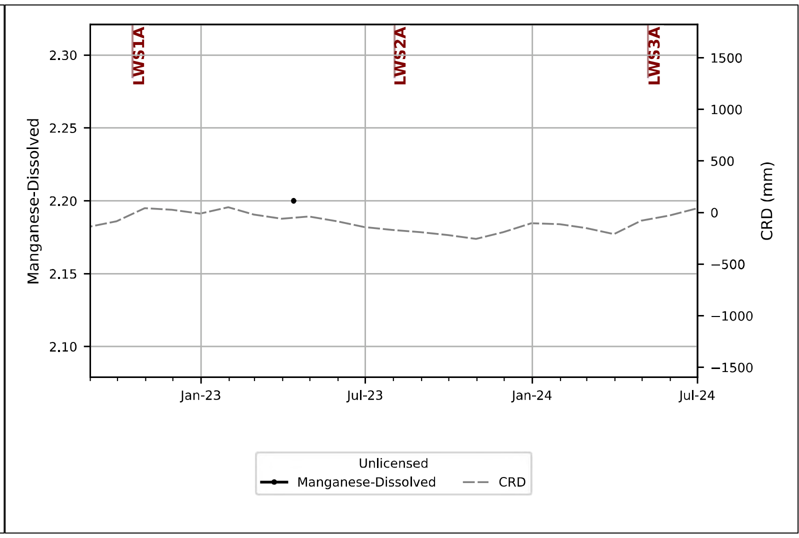


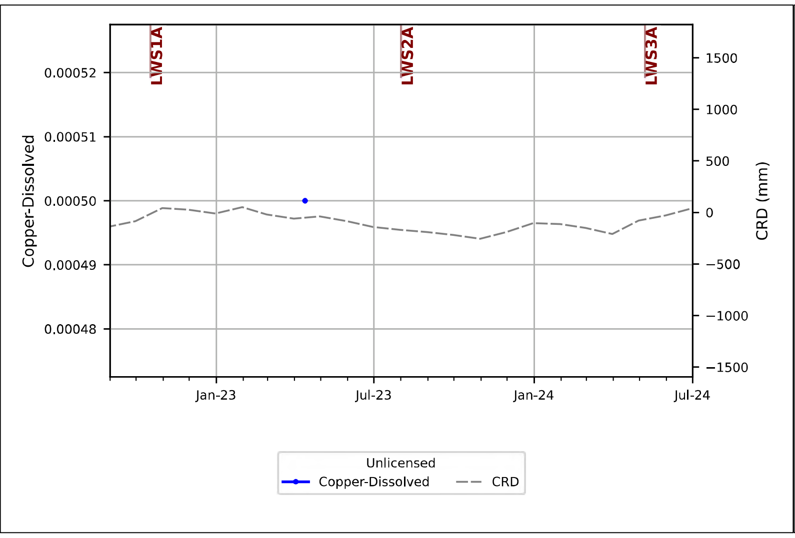
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Barium-Dissolved
Upper Trigger
CRD

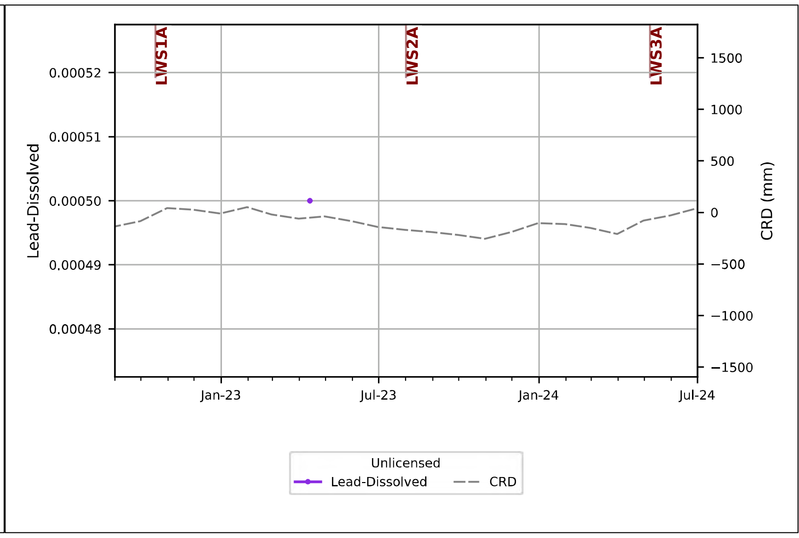


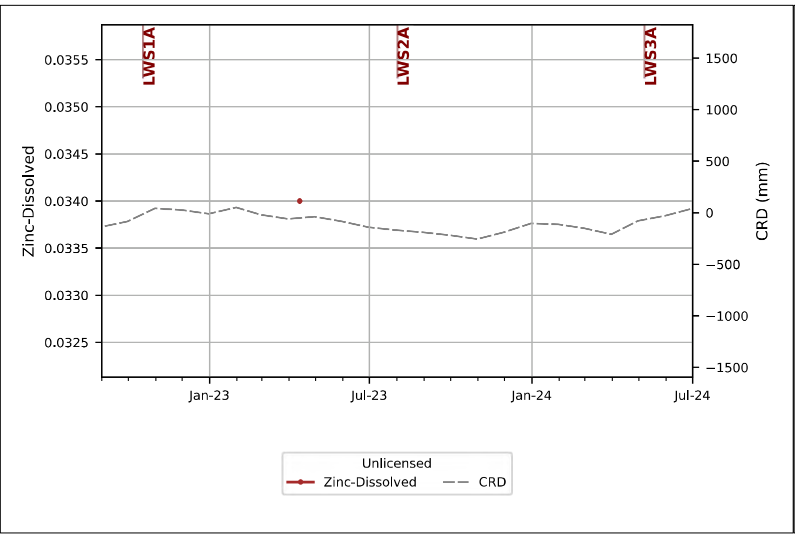
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
REA4
Selenium-Dissolved
Upper Trigger
CRD

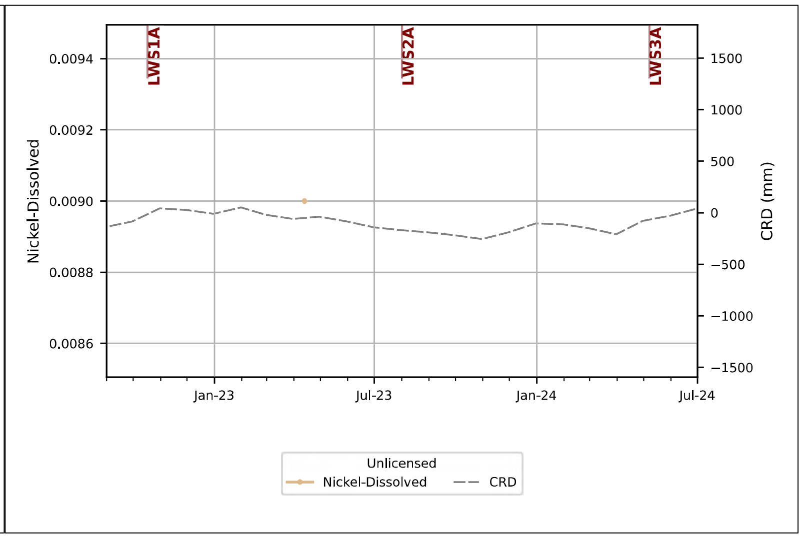

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Iron-Dissolved
CRD

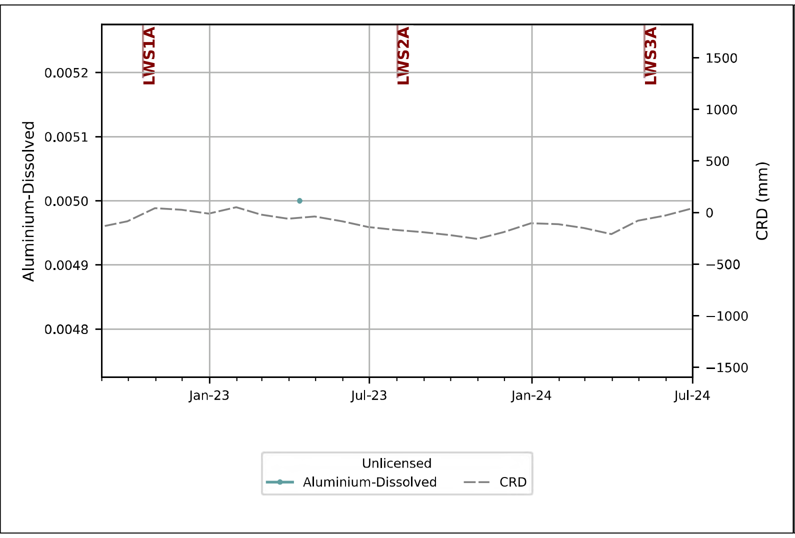

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Manganese-Dissolved
CRD

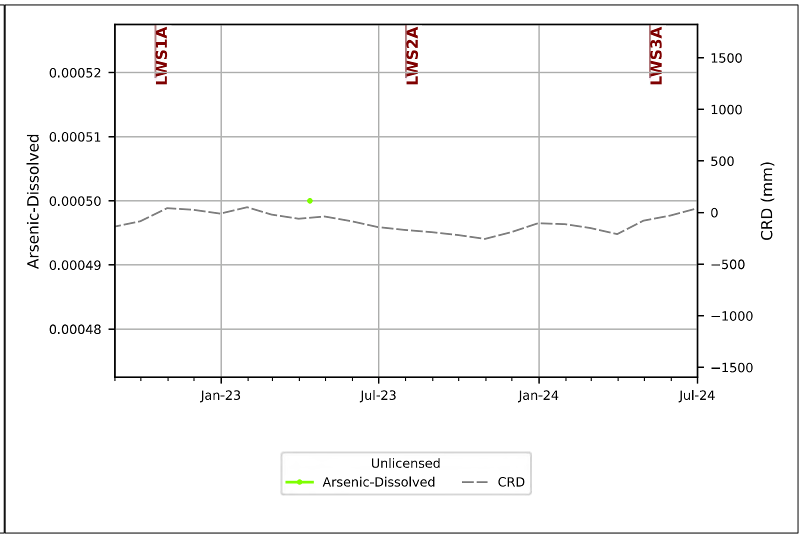

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Copper-Dissolved
CRD

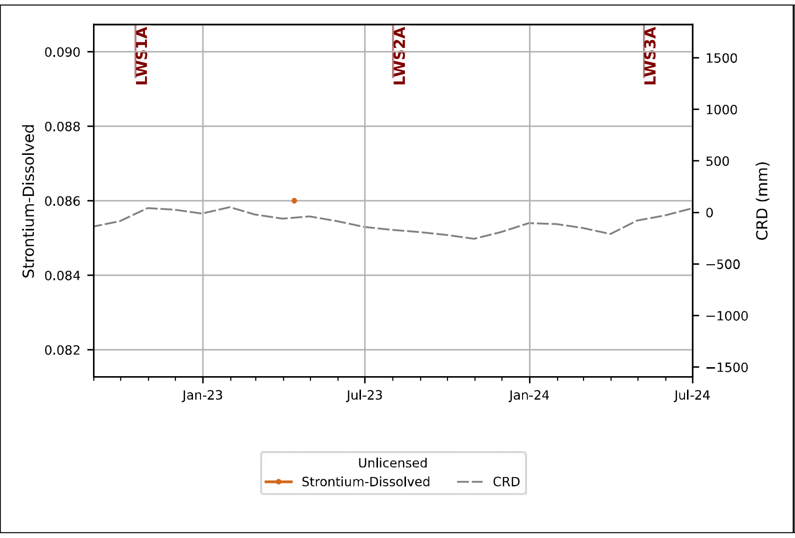

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Lead-Dissolved
CRD

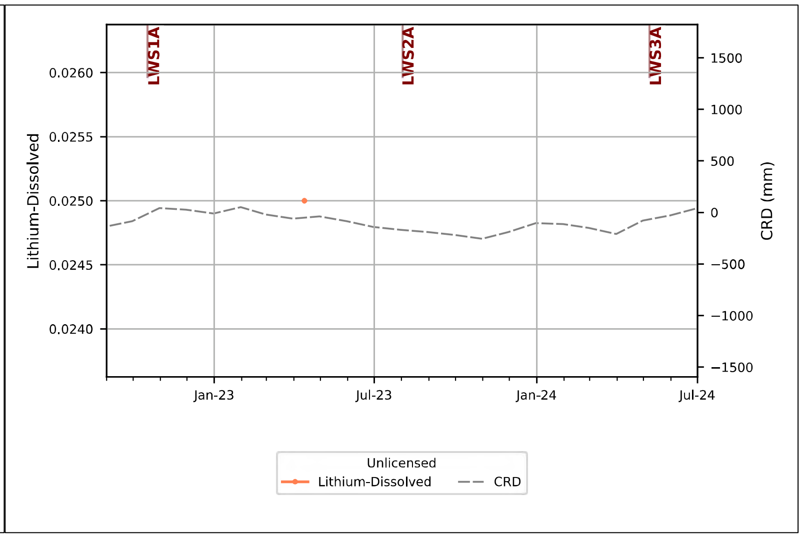

LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Zinc-Dissolved
CRD

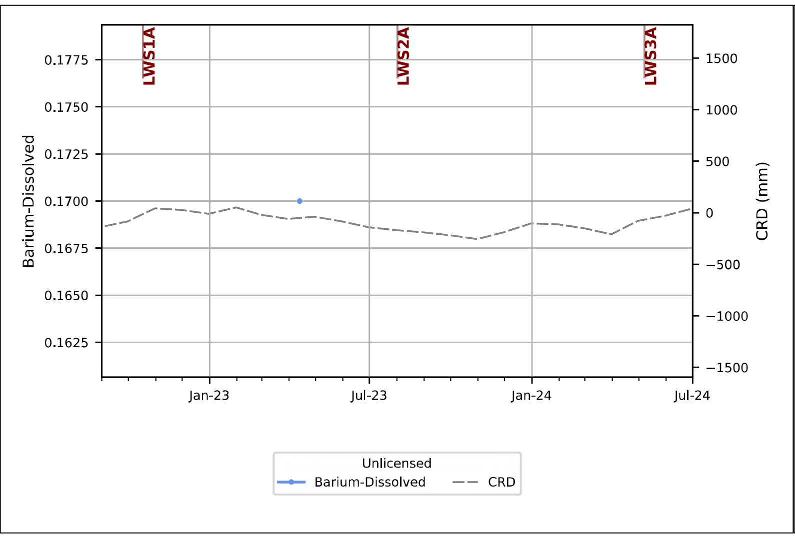

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Nickel-Dissolved
CRD

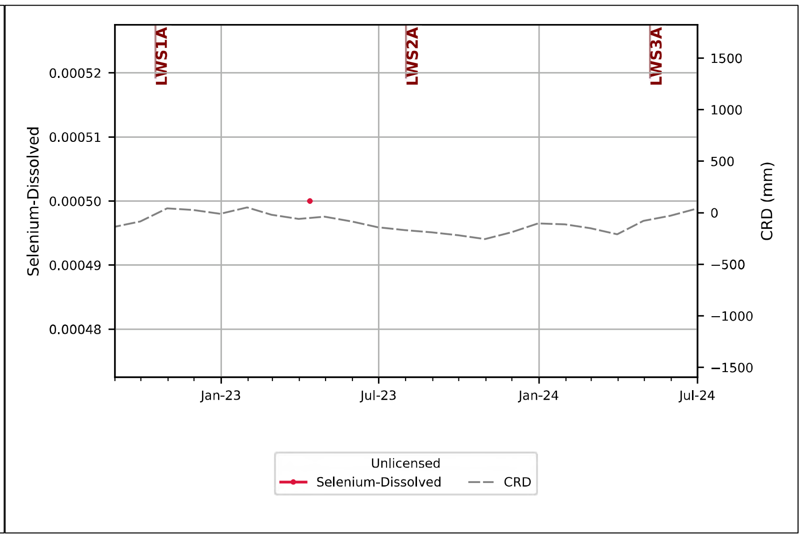

LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
0.0052
0.0051
0.0050
0.0049
0.0048
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Aluminium-Dissolved
CRD

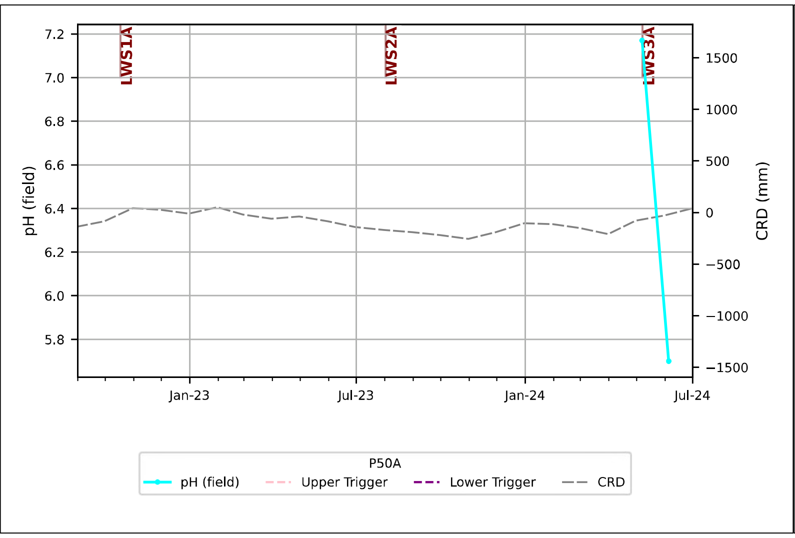

LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Arsenic-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Strontium-Dissolved
0.090
0.088
0.086
0.084
0.082
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Strontium-Dissolved
CRD

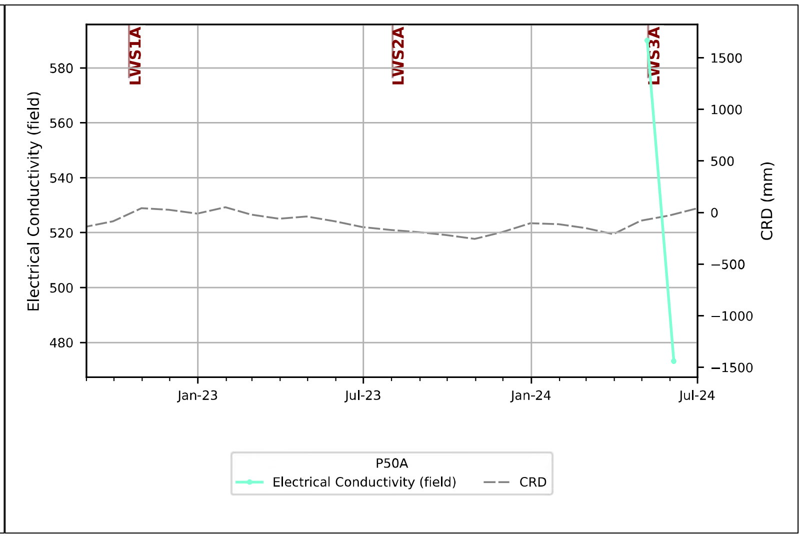

LWS1A
LWS2A
LWS3A
Lithium-Dissolved
0.0260
0.0255
0.0250
0.0245
0.0240
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Lithium-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Barium-Dissolved
0.1775
0.1750
0.1725
0.1700
0.1675
0.1650
0.1625
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Barium-Dissolved
CRD

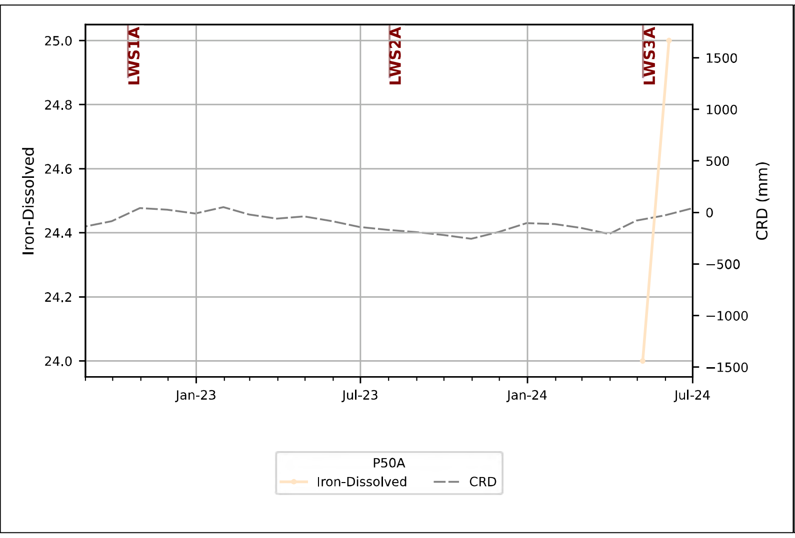

LWS1A
LWS2A
LWS3A
Selenium-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
Unlicensed
Selenium-Dissolved
CRD



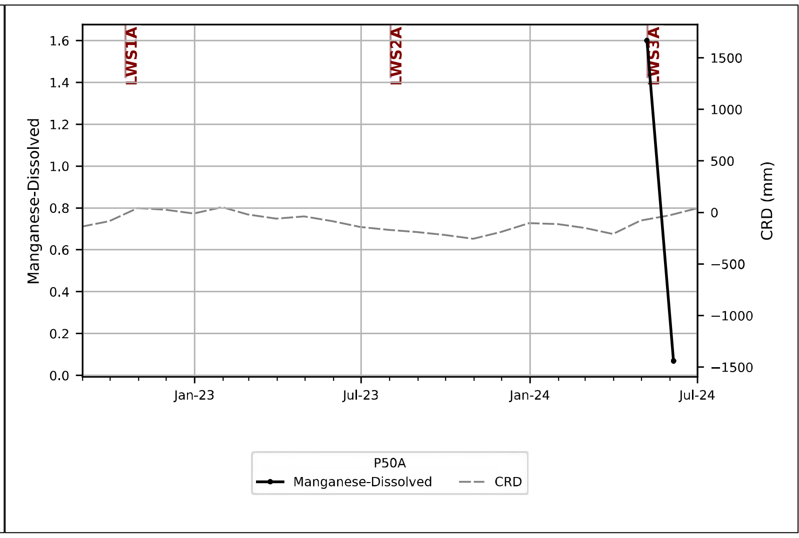
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
pH (field)
Upper Trigger
Lower Trigger
CRD



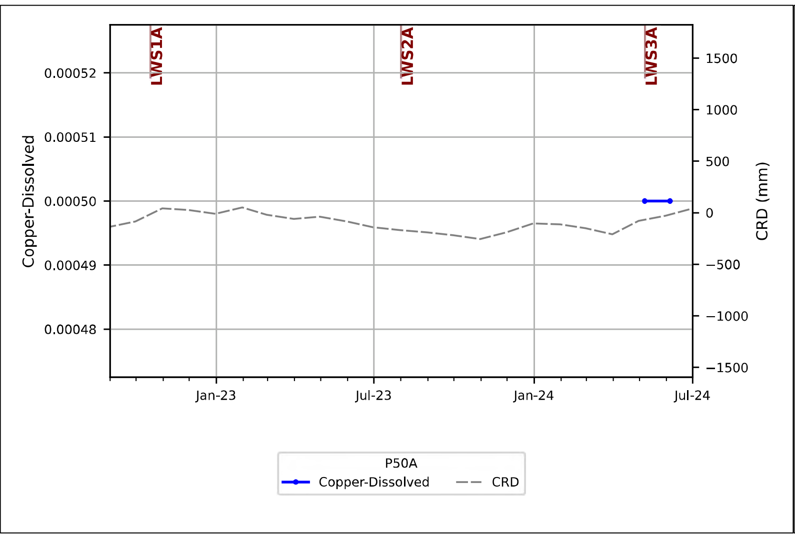
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Electrical Conductivity (field)
CRD



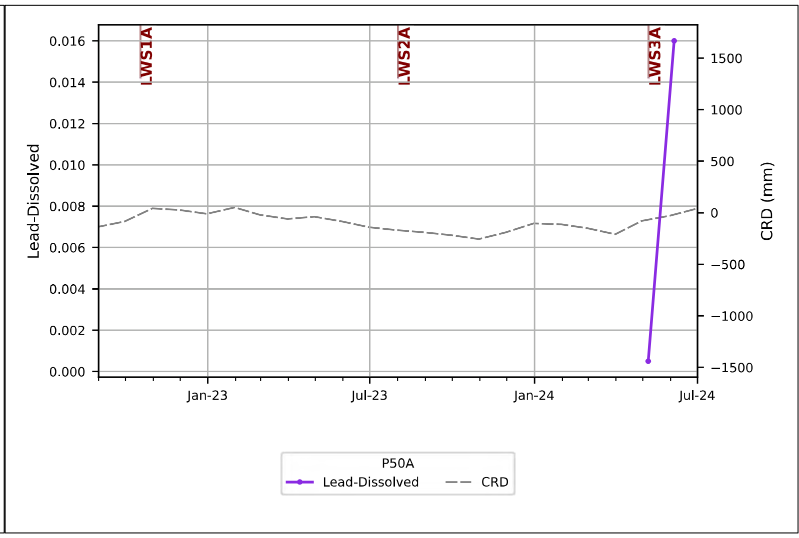
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Iron-Dissolved
CRD



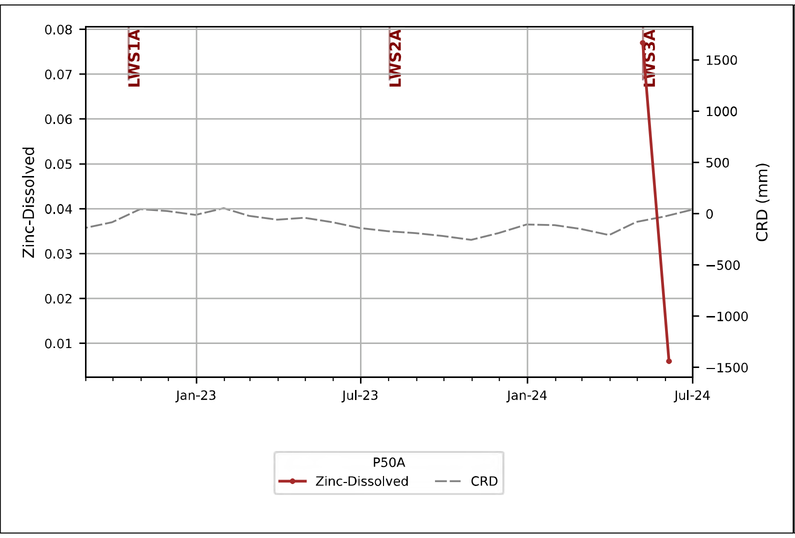
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Manganese-Dissolved
CRD



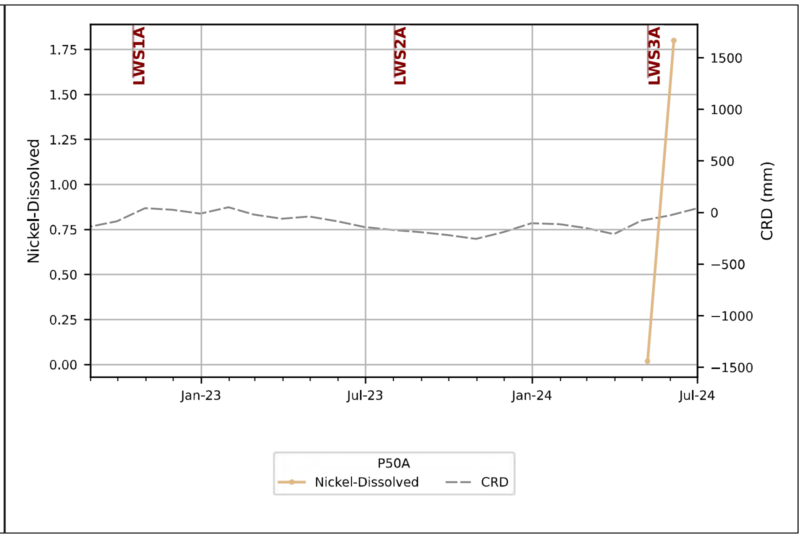
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Copper-Dissolved
CRD



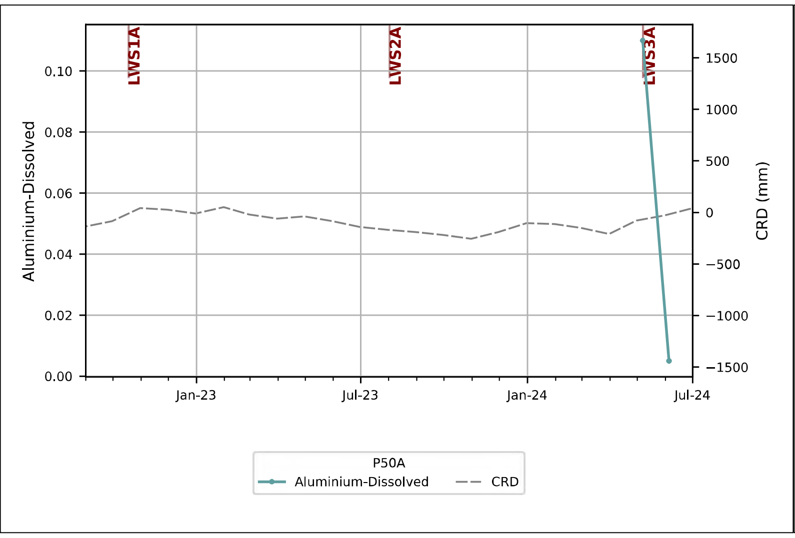
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Lead-Dissolved
CRD



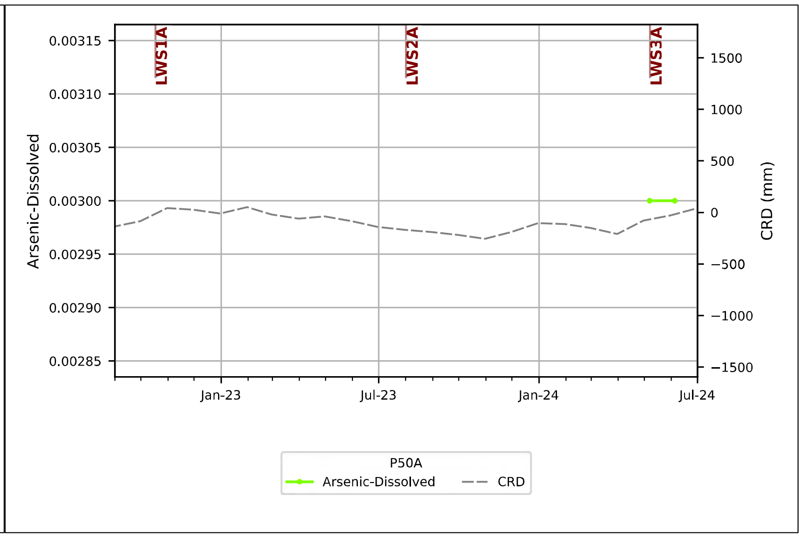
LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Zinc-Dissolved
CRD



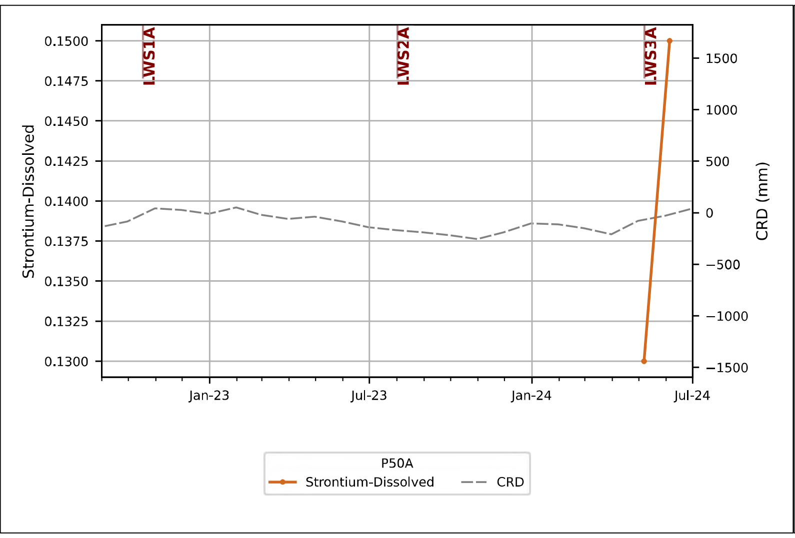
LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Nickel-Dissolved
CRD



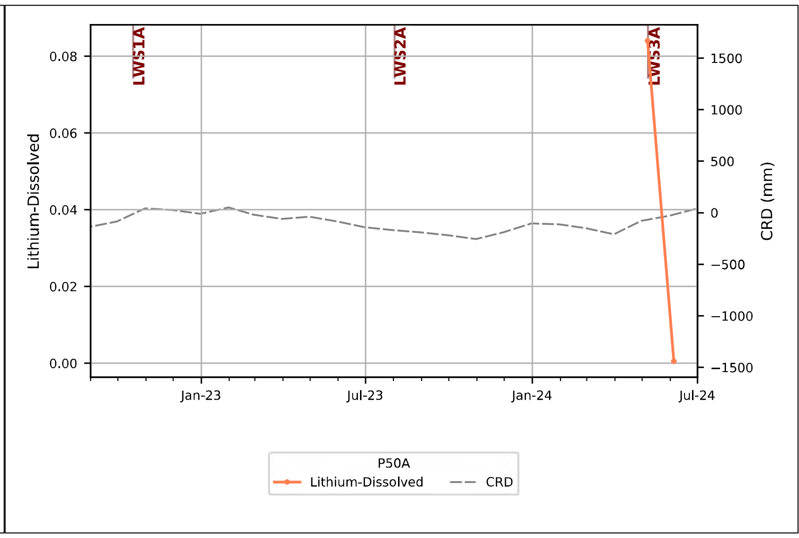
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Aluminium-Dissolved
CRD



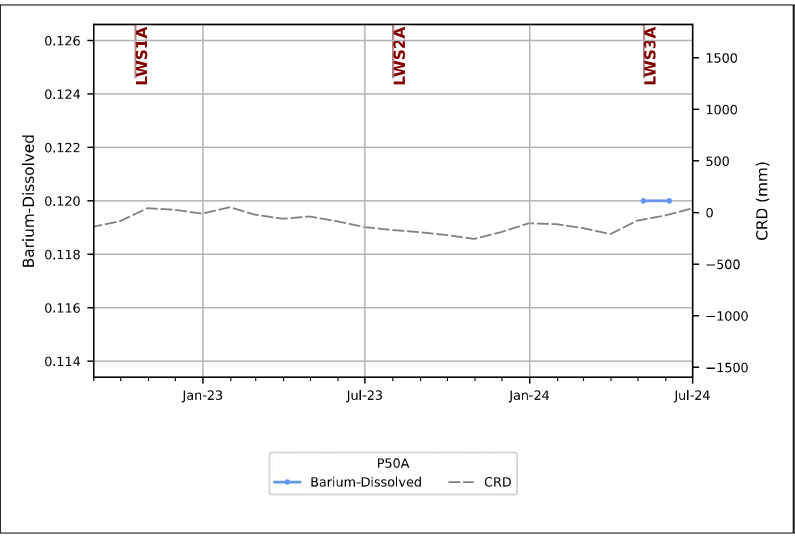
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Arsenic-Dissolved
CRD

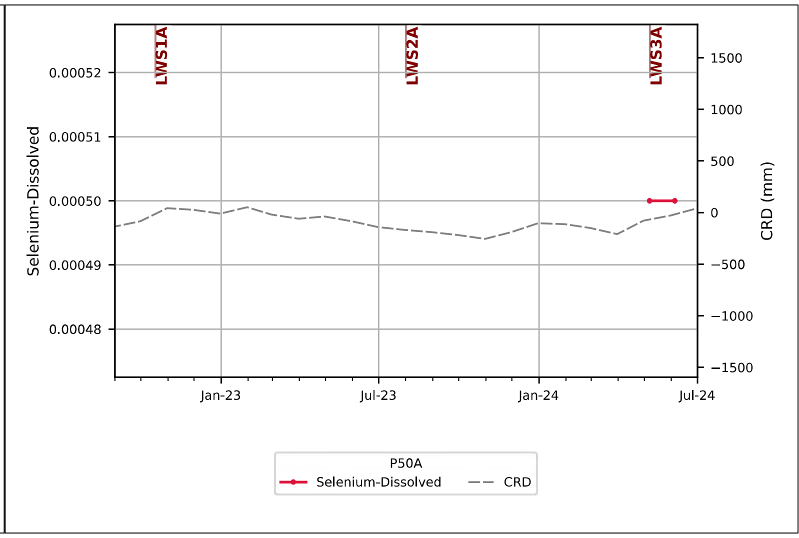


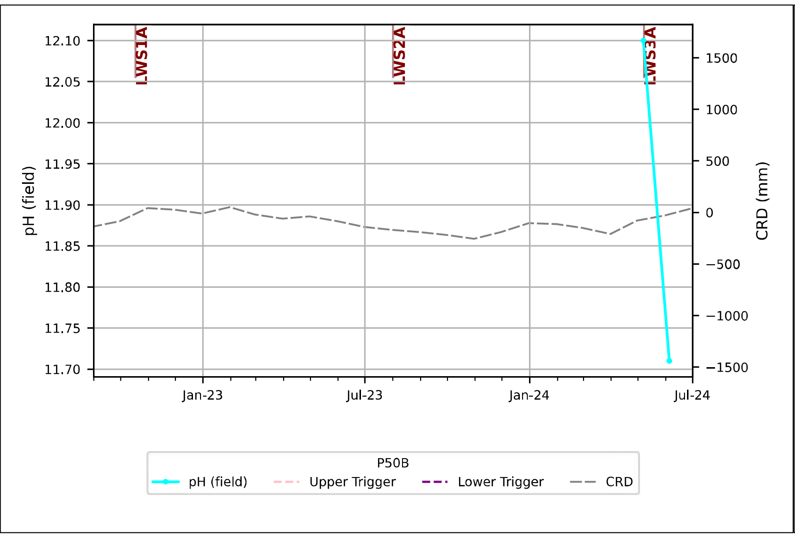
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Strontium-Dissolved
CRD

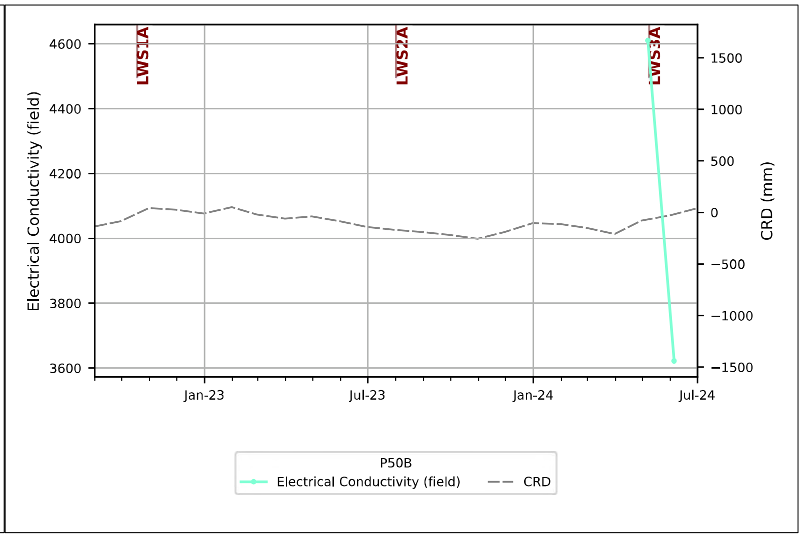


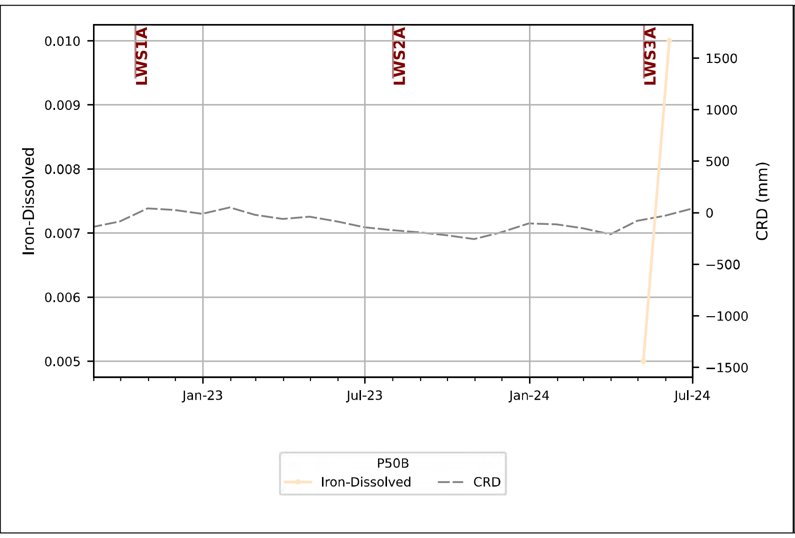
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Lithium-Dissolved
CRD

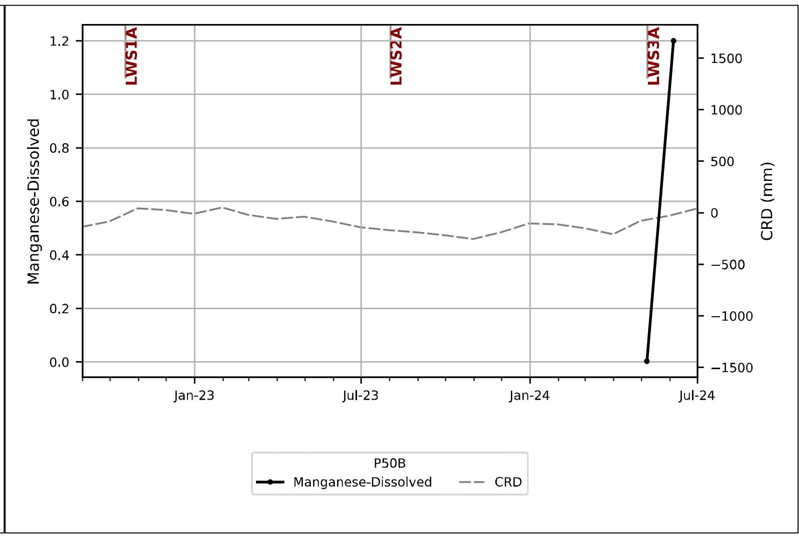

Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Barium-Dissolved
CRD

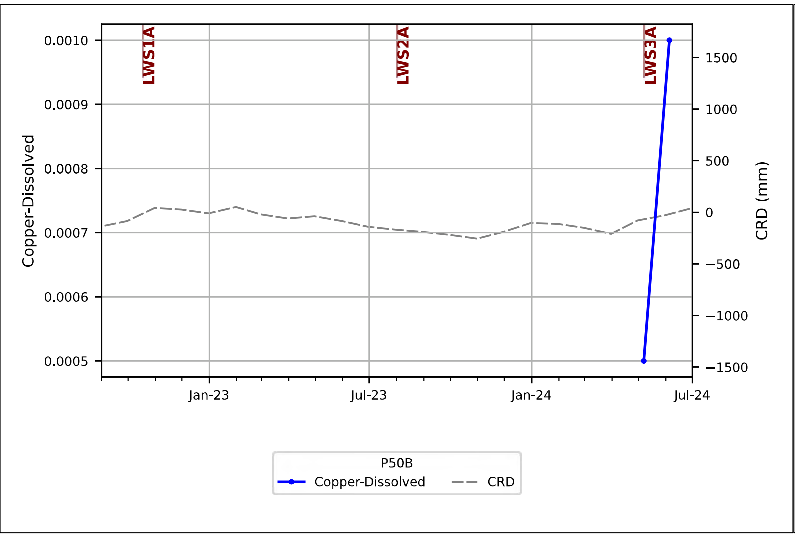

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50A
Selenium-Dissolved
CRD

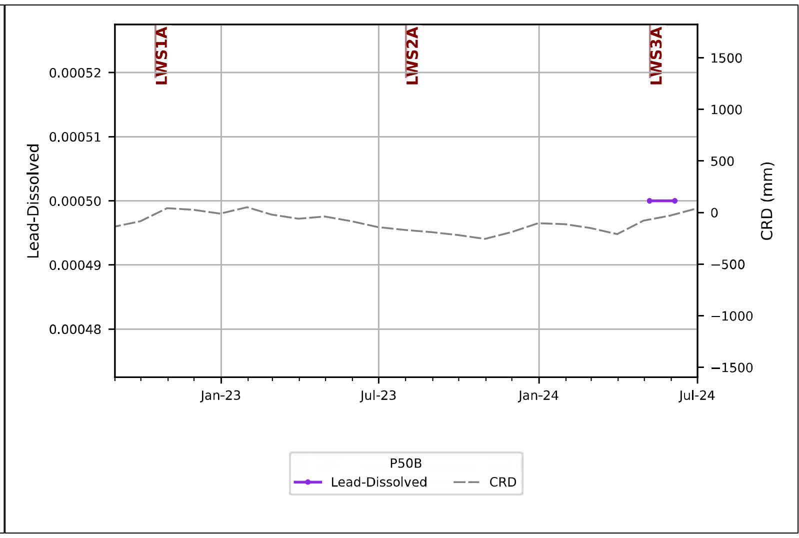

pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50B
pH (field)
Upper Trigger
Lower Trigger
CRD

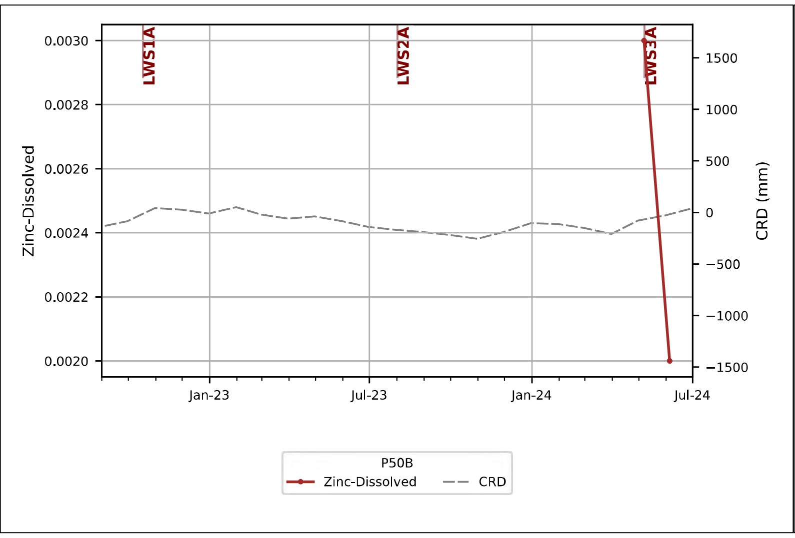

Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Electrical Conductivity (field)
CRD

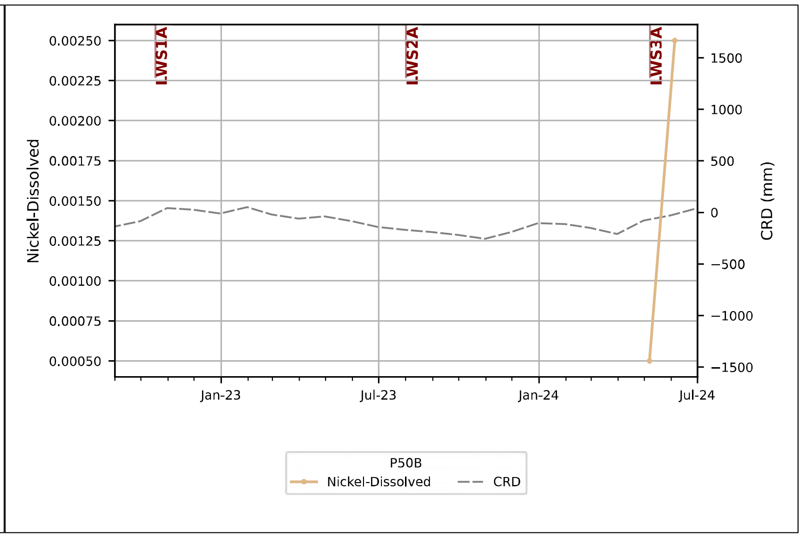

Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Iron-Dissolved
CRD

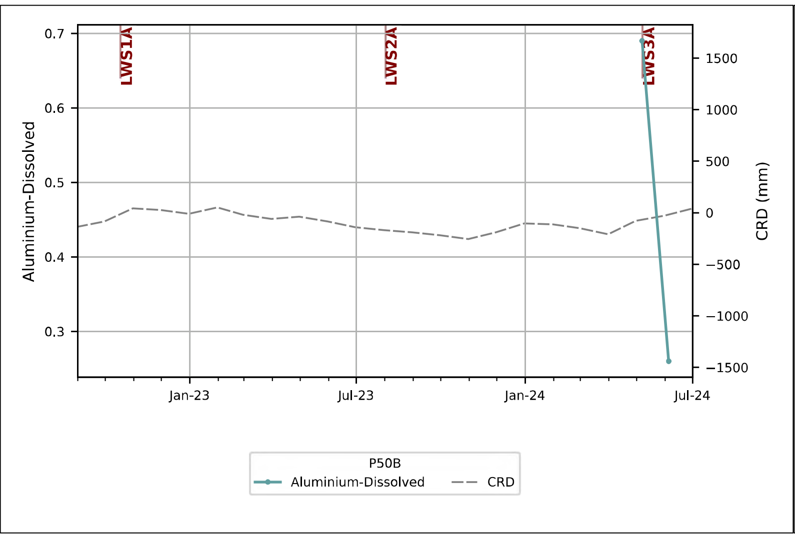

Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Manganese-Dissolved
CRD

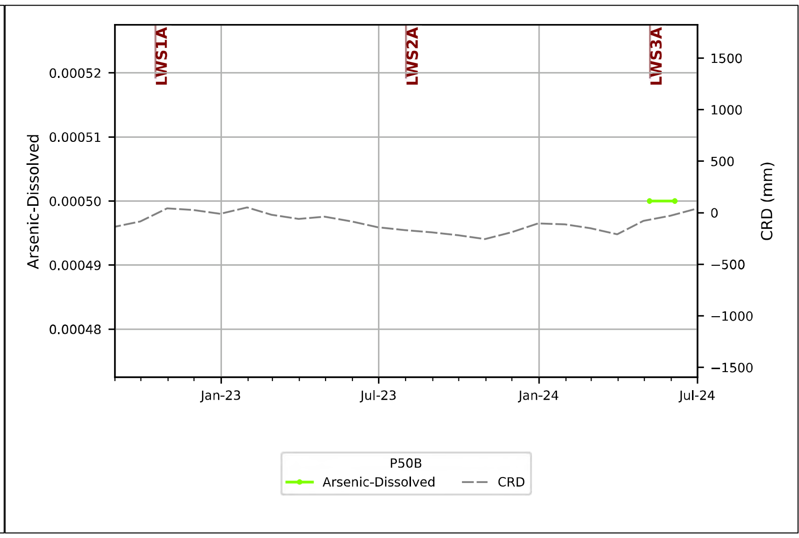

Copper-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Copper-Dissolved
CRD

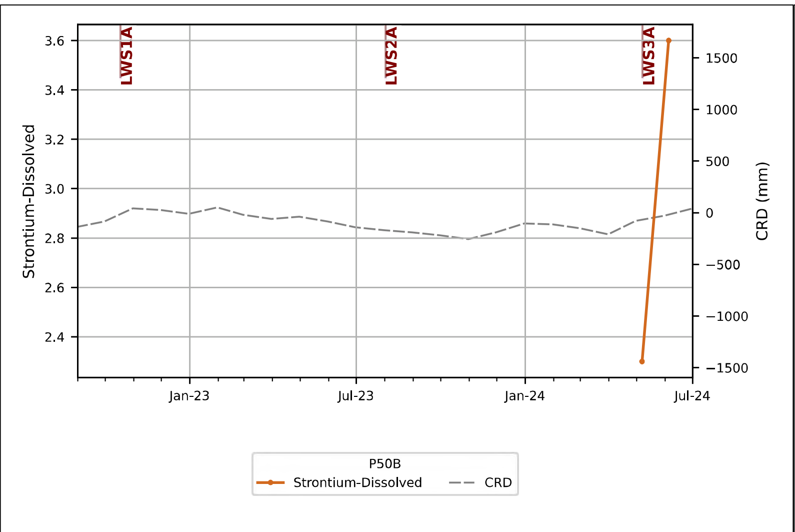

Lead-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Lead-Dissolved
CRD


Zinc-Dissolved
0.0030
0.0028
0.0026
0.0024
0.0022
0.0020
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Zinc-Dissolved
CRD

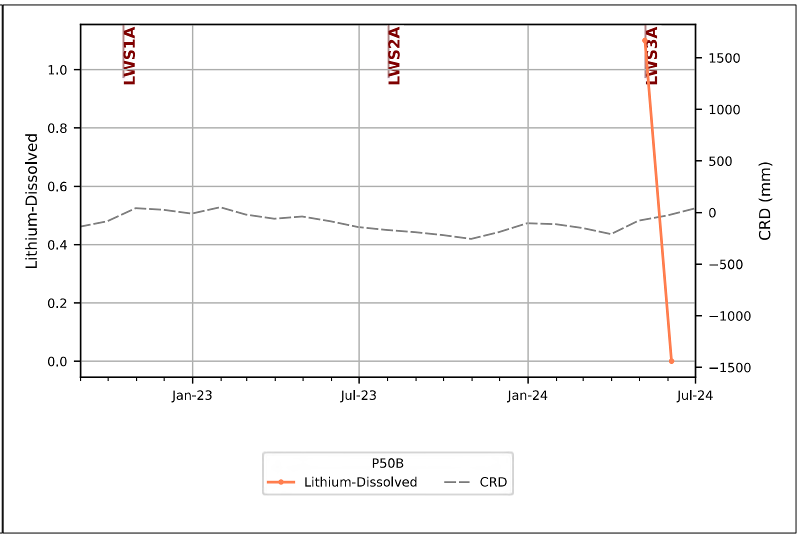

Nickel-Dissolved
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Nickel-Dissolved
CRD


Aluminium-Dissolved
0.7
0.6
0.5
0.4
0.3
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Aluminium-Dissolved
CRD

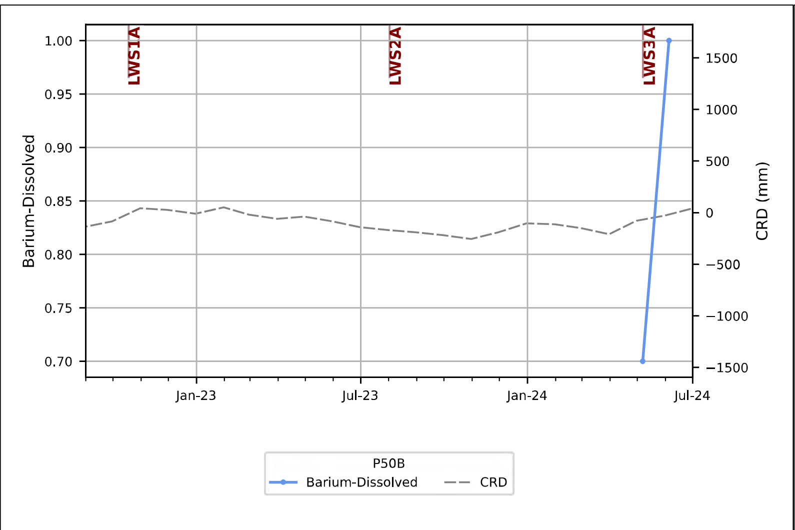

Arsenic-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
LWS1A
LWS2A
LWS3A
1500
1000
500
0
−500
−1000
−1500
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Arsenic-Dissolved
CRD



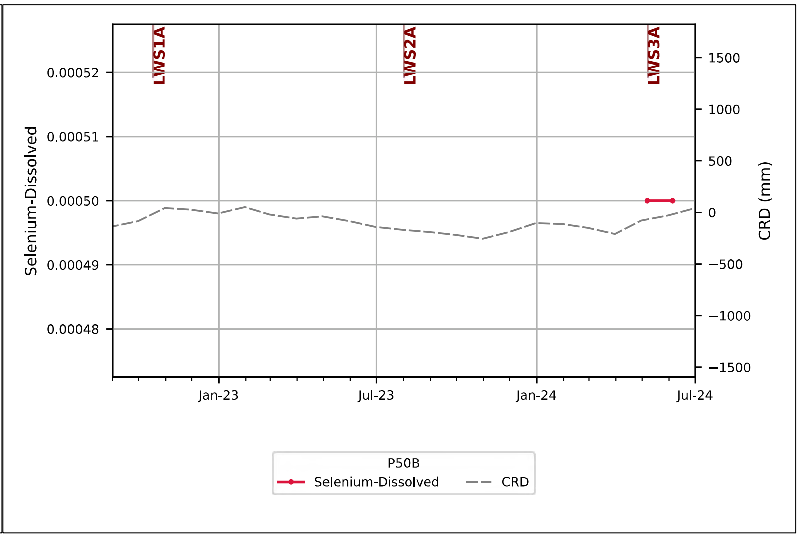
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Strontium-Dissolved
CRD



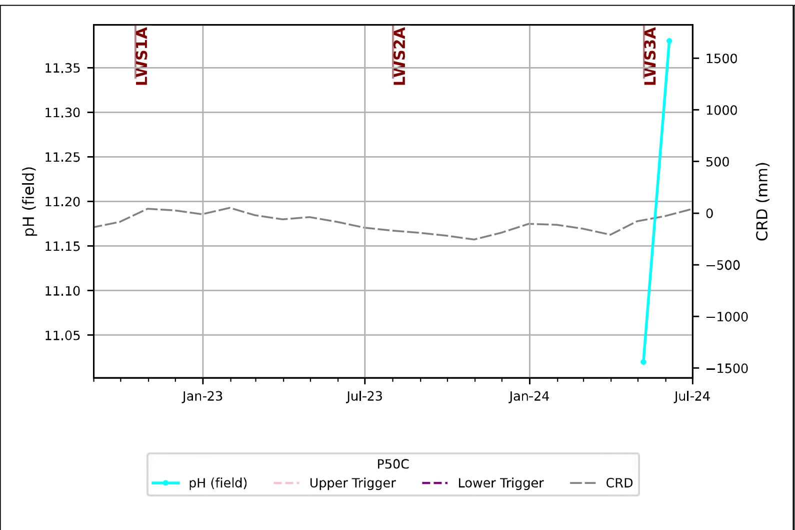
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Lithium-Dissolved
CRD



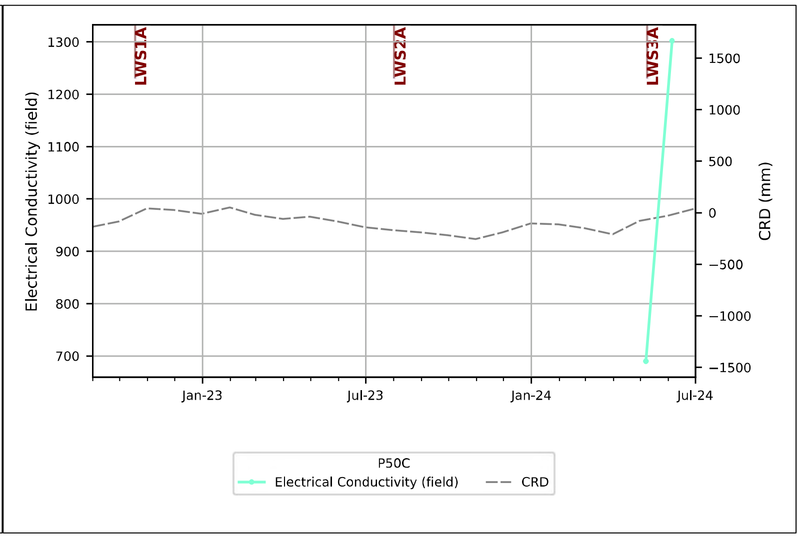
LWS1A
LWS2A
LWS3A
Barium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Barium-Dissolved
CRD



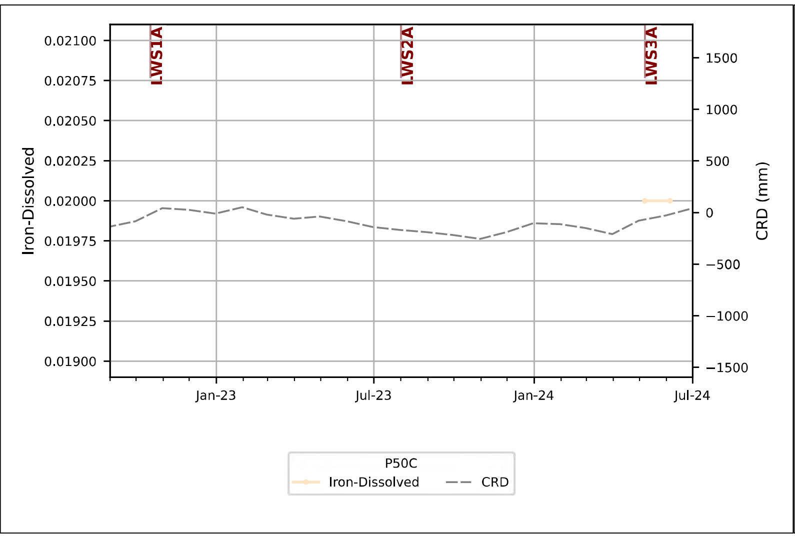
LWS1A
LWS2A
LWS3A
Selenium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50B
Selenium-Dissolved
CRD

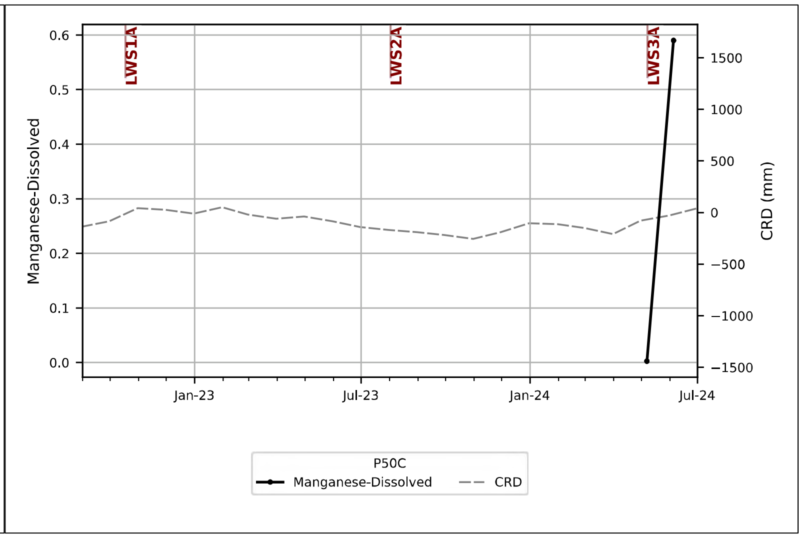


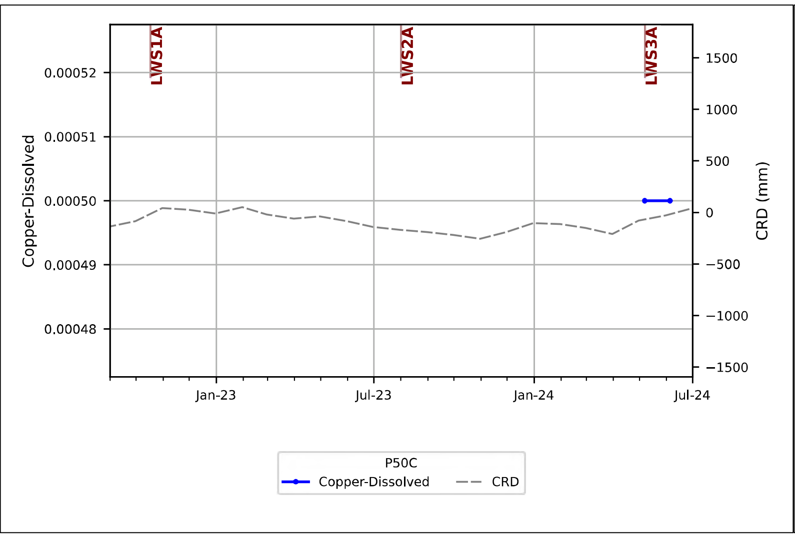
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
pH (field)
Upper Trigger
Lower Trigger
CRD

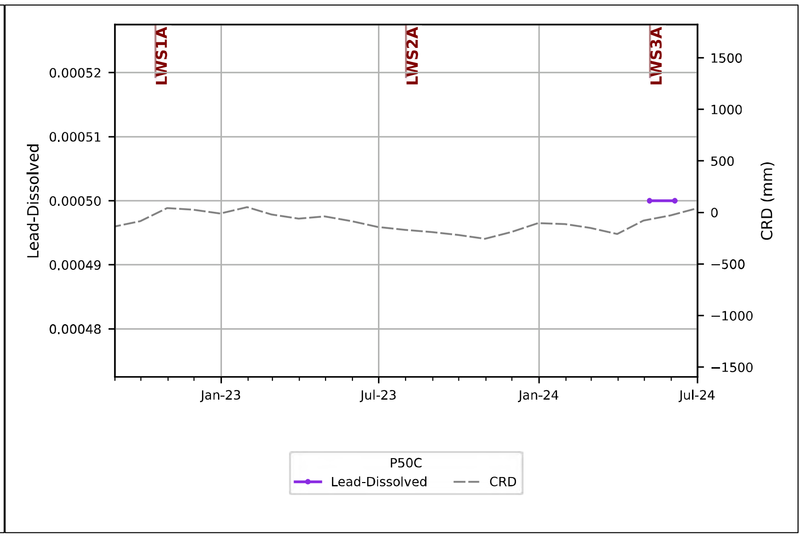


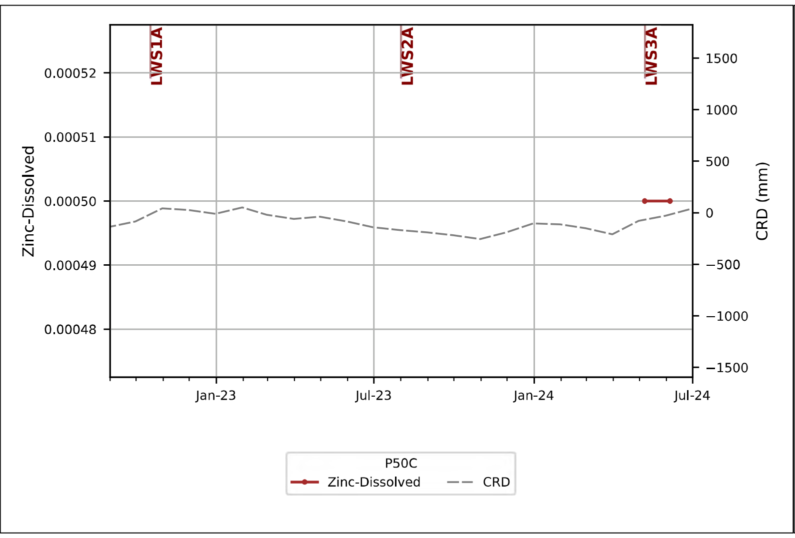
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Electrical Conductivity (field)
CRD

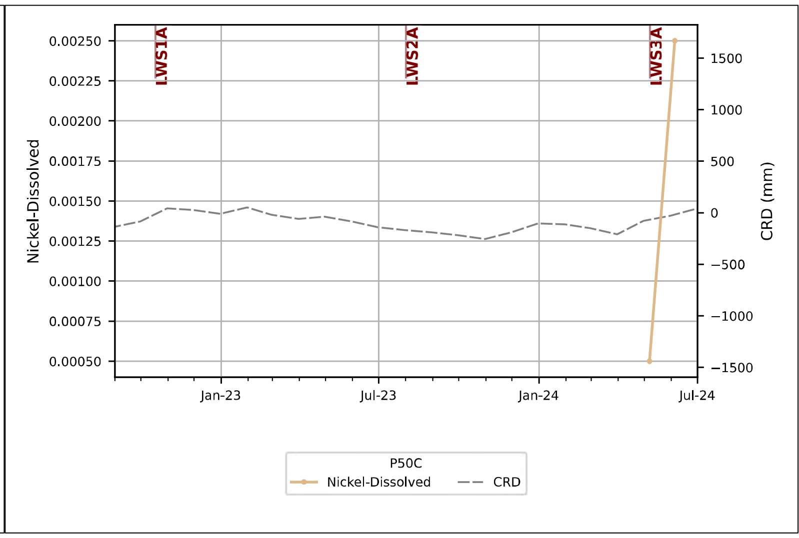

LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Iron-Dissolved
CRD

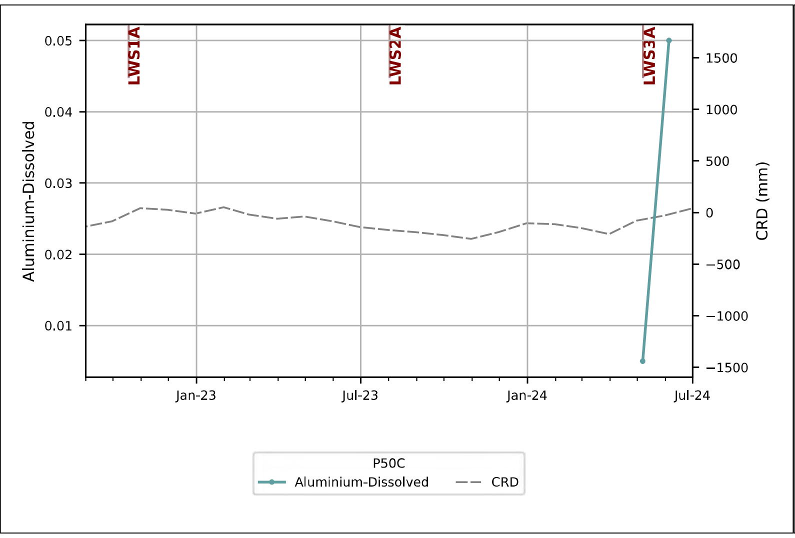

LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Manganese-Dissolved
CRD

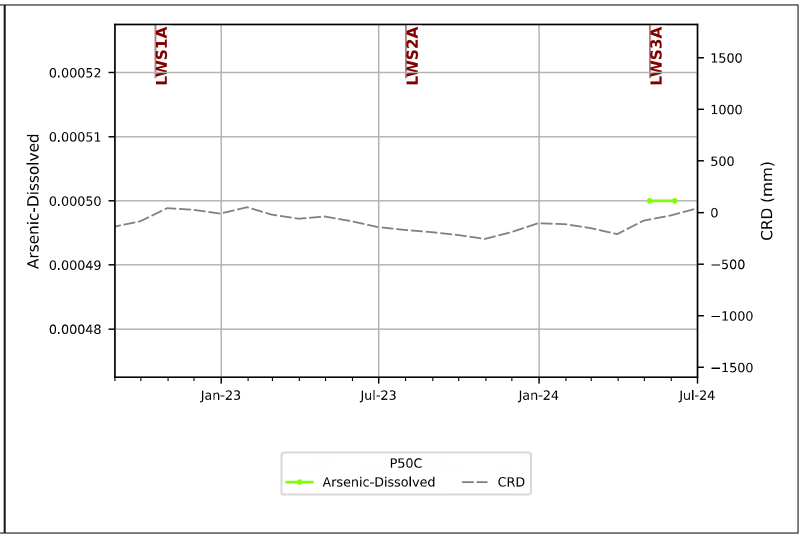

LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Copper-Dissolved
CRD

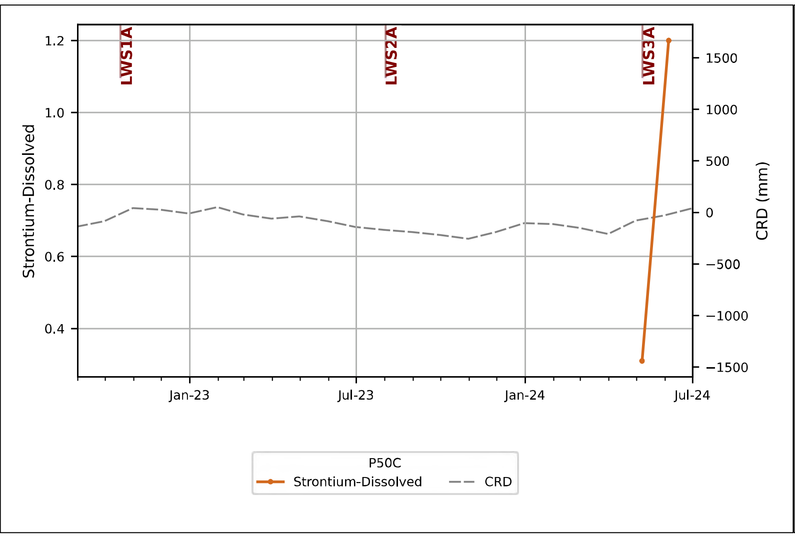

LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Lead-Dissolved
CRD

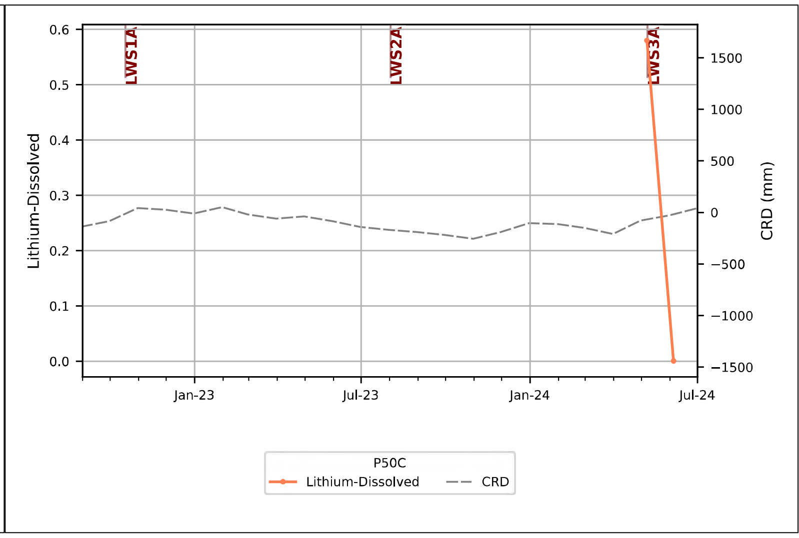

LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Zinc-Dissolved
CRD

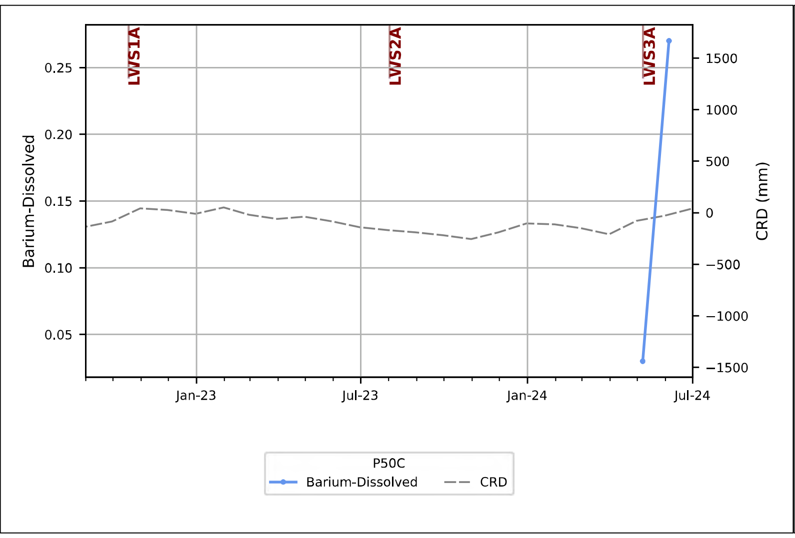

LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Nickel-Dissolved
CRD

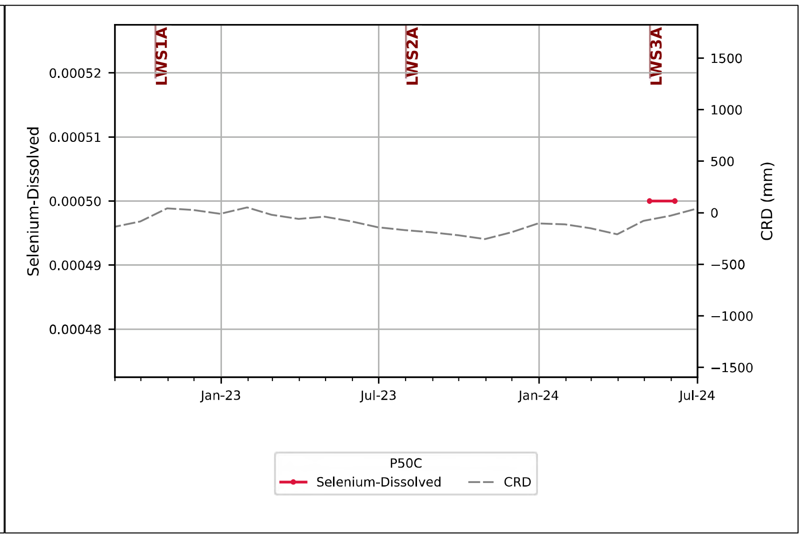

Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Aluminium-Dissolved
CRD

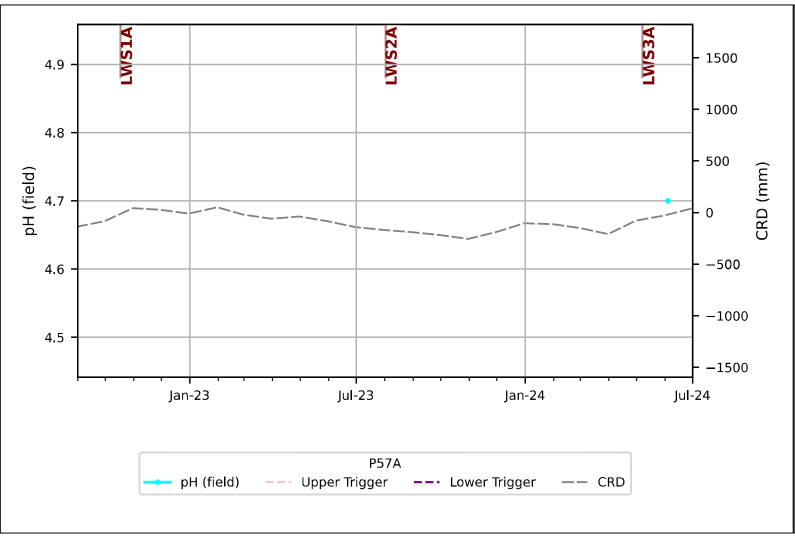

Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Arsenic-Dissolved
CRD


Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Strontium-Dissolved
CRD

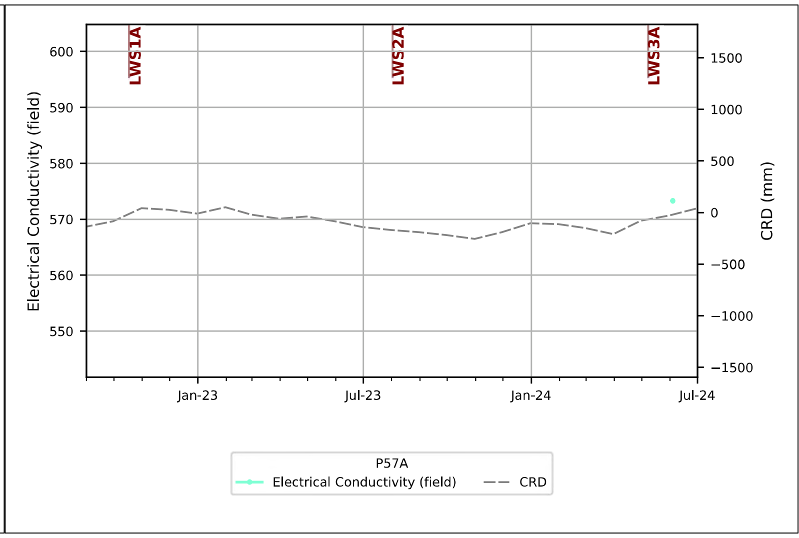

Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Lithium-Dissolved
CRD


Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Barium-Dissolved
CRD

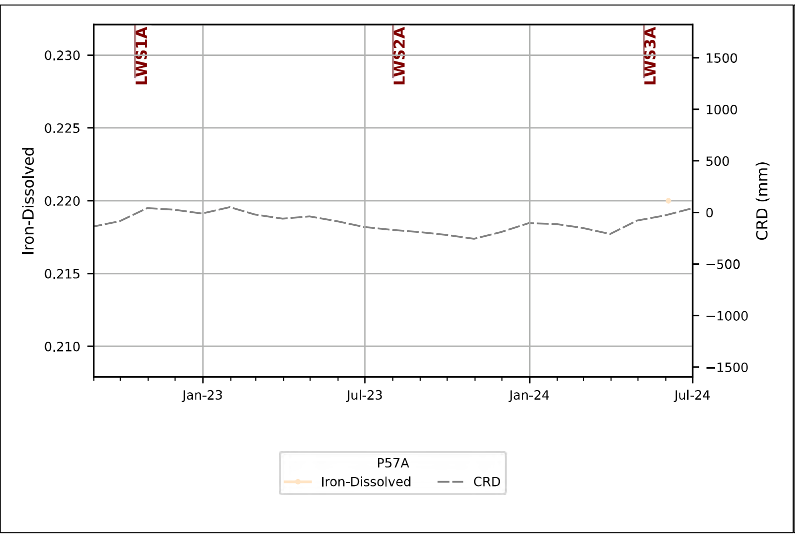

Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
Jan-23
Jul-23
Jan-24
Jul-24
P50C
Selenium-Dissolved
CRD



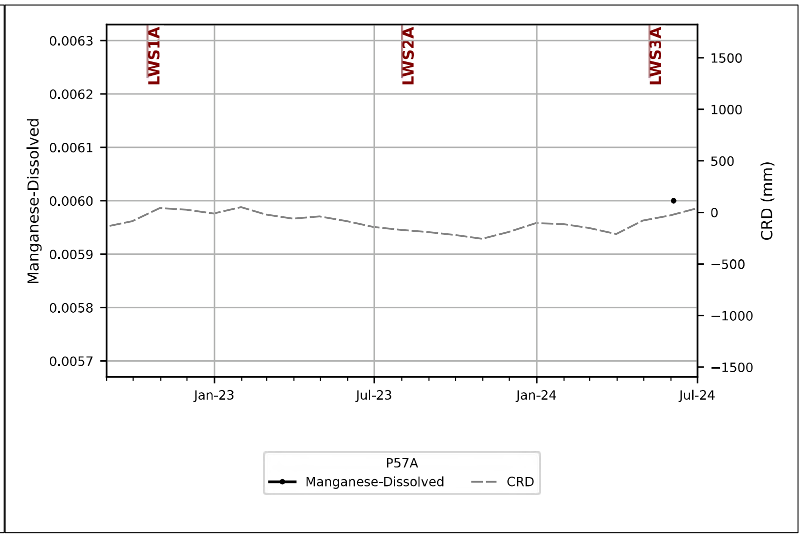
LWS1A
LWS2A
LWS3A
pH (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
pH (field)
Upper Trigger
Lower Trigger
CRD



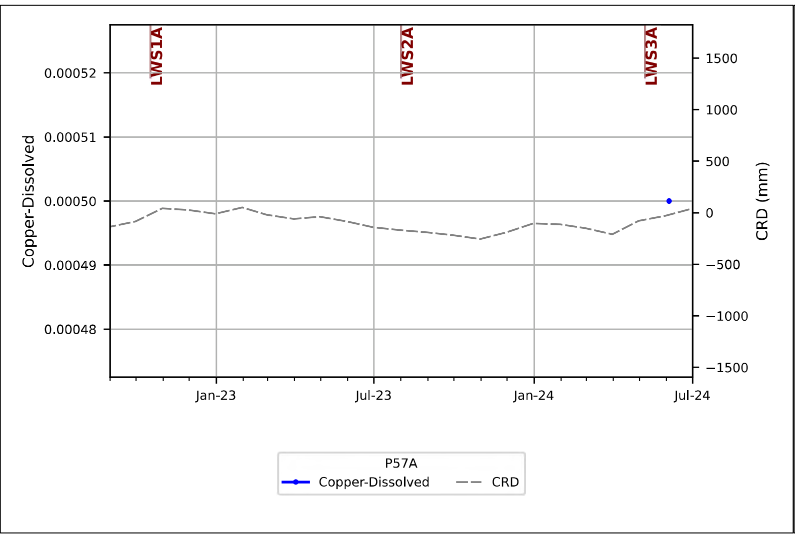
LWS1A
LWS2A
LWS3A
Electrical Conductivity (field)
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Electrical Conductivity (field)
CRD



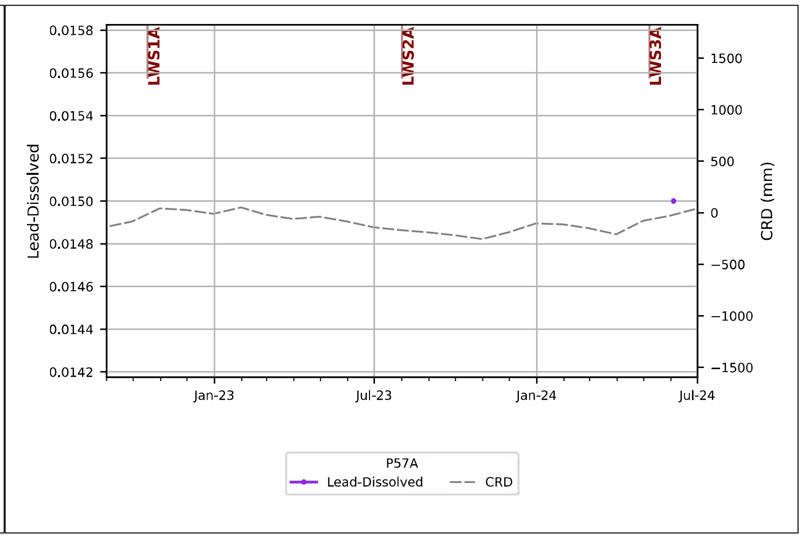
LWS1A
LWS2A
LWS3A
Iron-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Iron-Dissolved
CRD



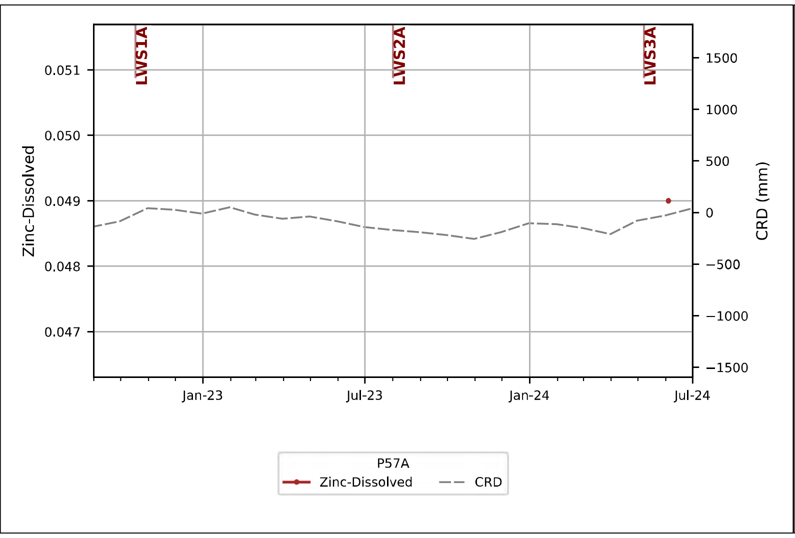
LWS1A
LWS2A
LWS3A
Manganese-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Manganese-Dissolved
CRD



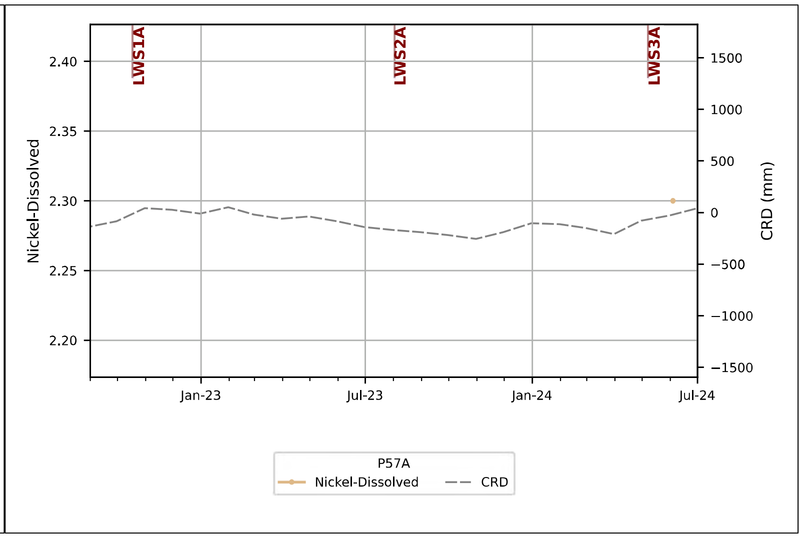
LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Copper-Dissolved
CRD



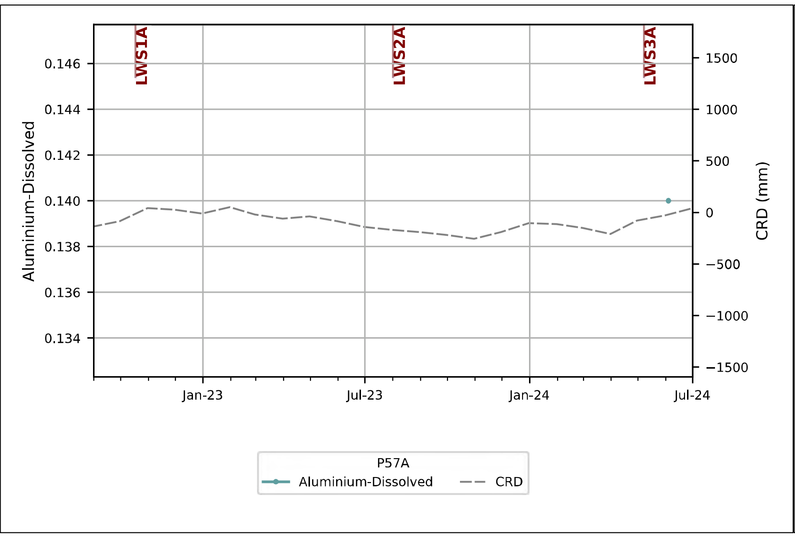
LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Lead-Dissolved
CRD



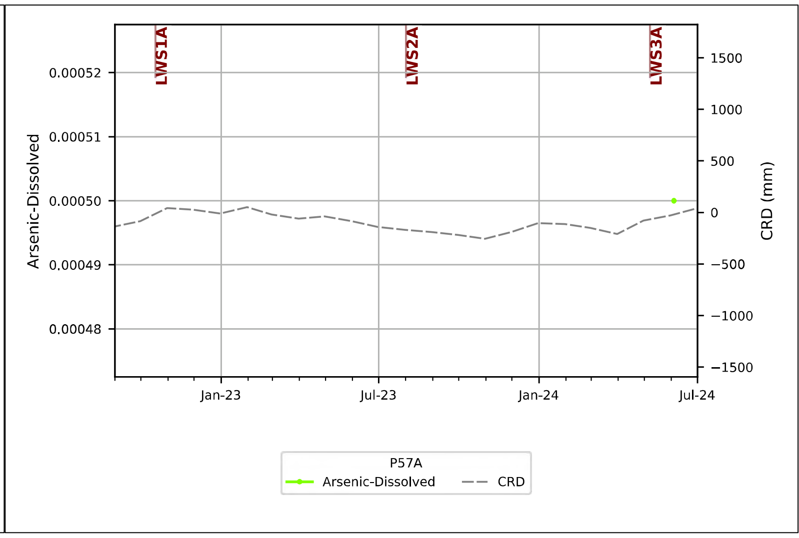
LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Zinc-Dissolved
CRD



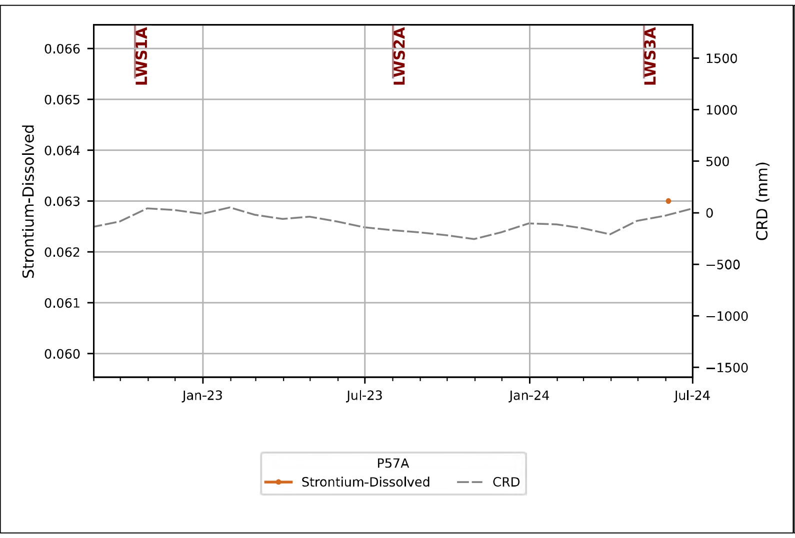
LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Nickel-Dissolved
CRD



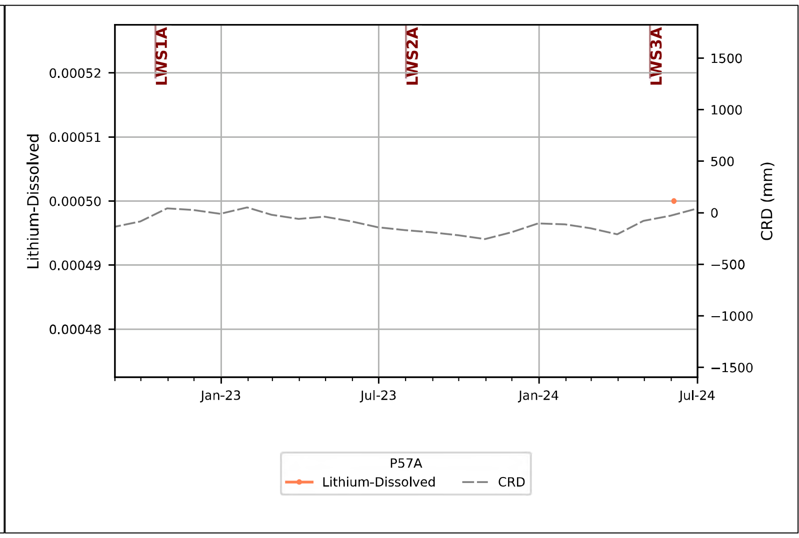
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Aluminium-Dissolved
CRD



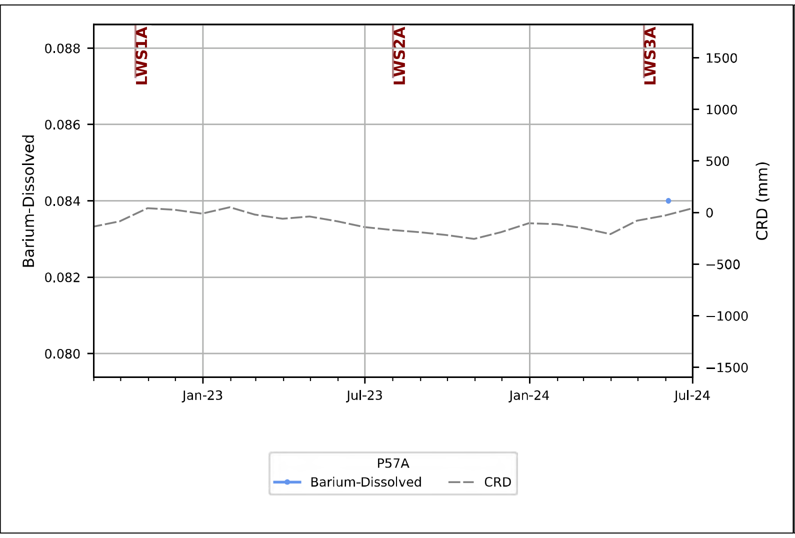
LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Arsenic-Dissolved
CRD



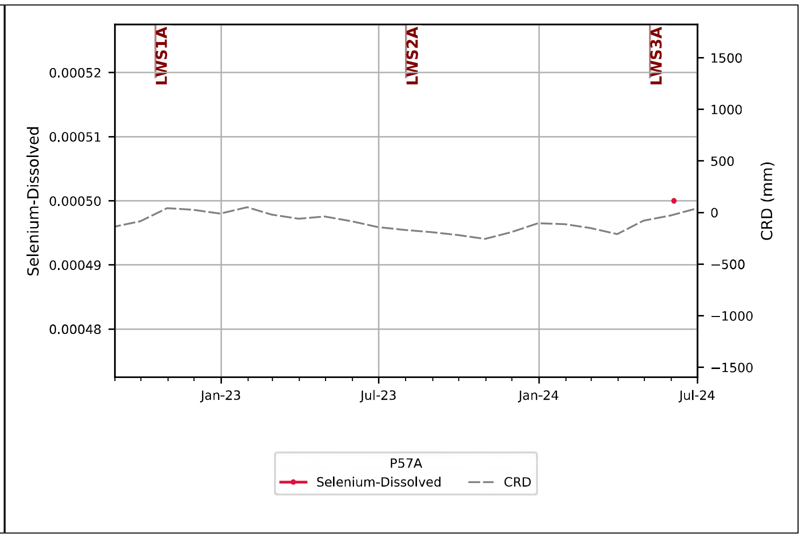
LWS1A
LWS2A
LWS3A
Strontium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Strontium-Dissolved
CRD



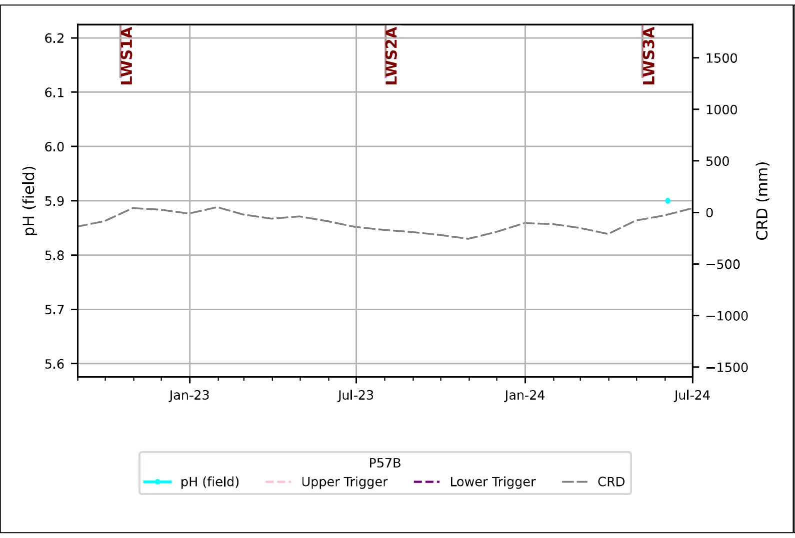
LWS1A
LWS2A
LWS3A
Lithium-Dissolved
CRD (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Lithium-Dissolved
CRD



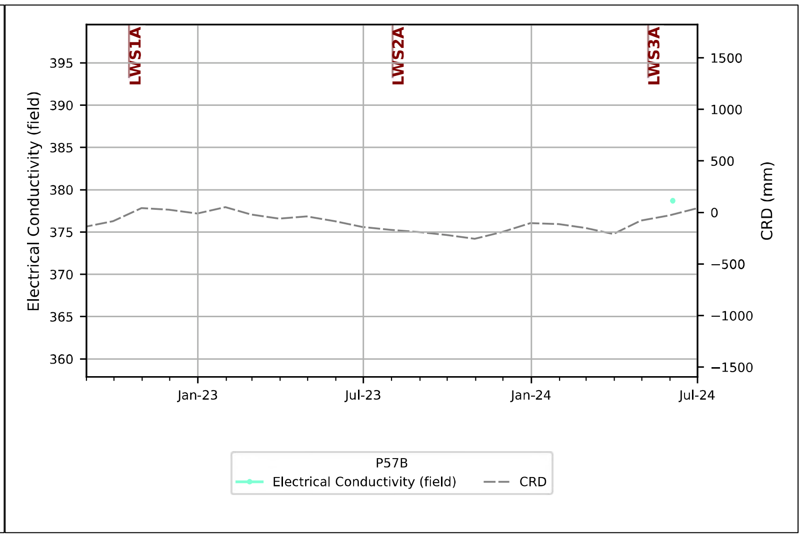
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.088
0.086
0.084
0.082
0.080
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Barium-Dissolved
CRD



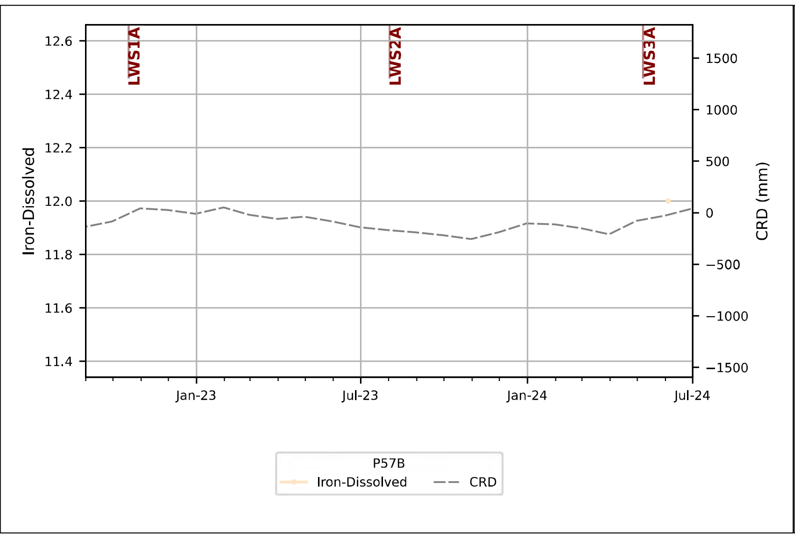
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.00052
0.00051
0.00050
0.00049
0.00048
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57A
Selenium-Dissolved
CRD



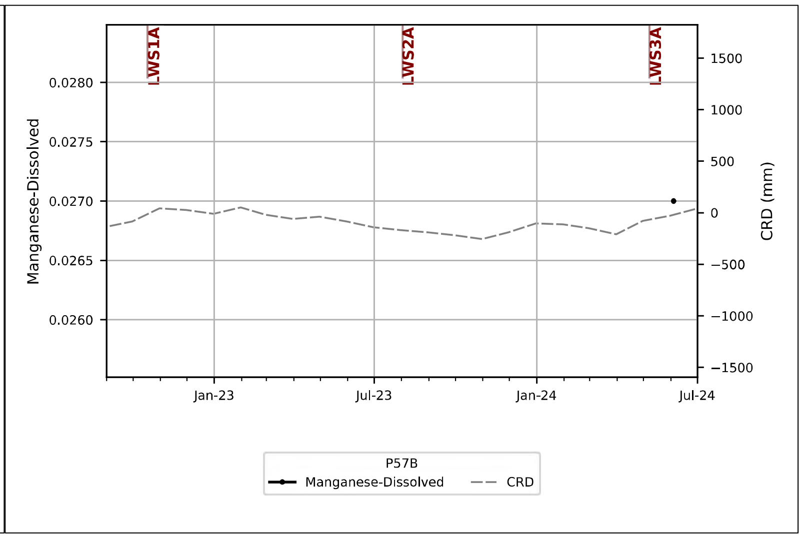
pH (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
6.2
6.1
6.0
5.9
5.8
5.7
5.6
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
pH (field)
Upper Trigger
Lower Trigger
CRD



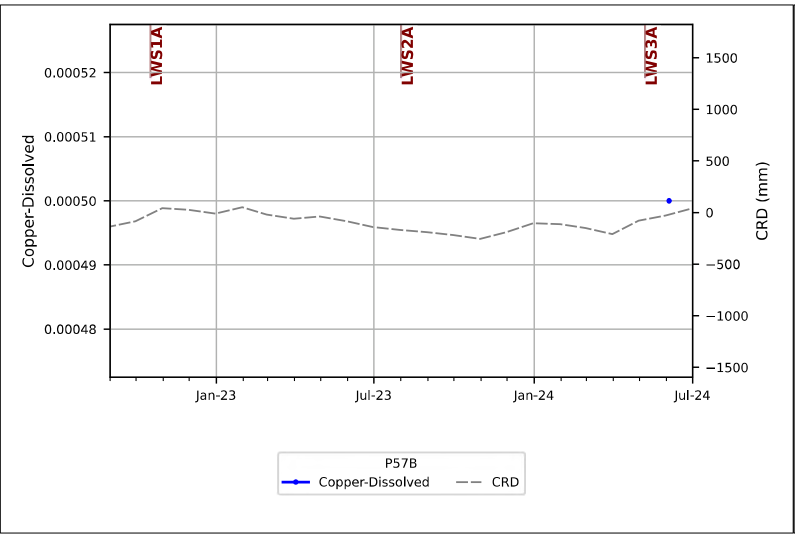
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
LWS3A
395
390
385
380
375
370
365
360
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Electrical Conductivity (field)
CRD



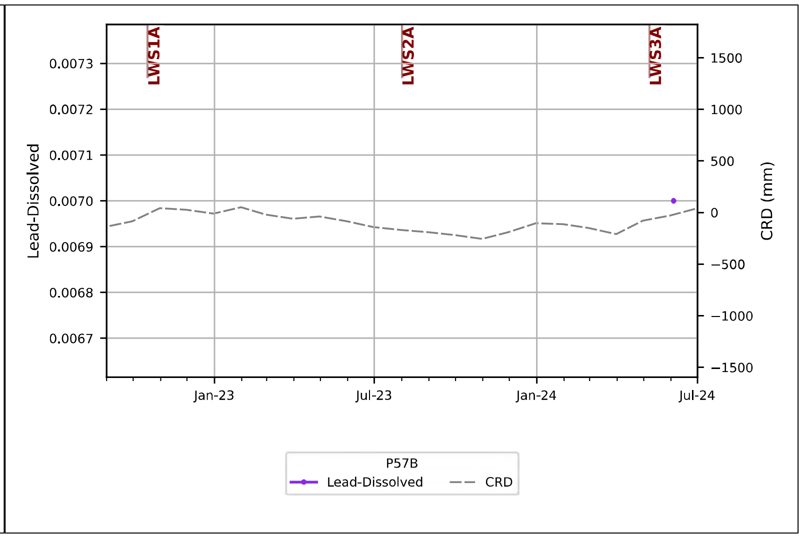
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
12.6
12.4
12.2
12.0
11.8
11.6
11.4
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Iron-Dissolved
CRD



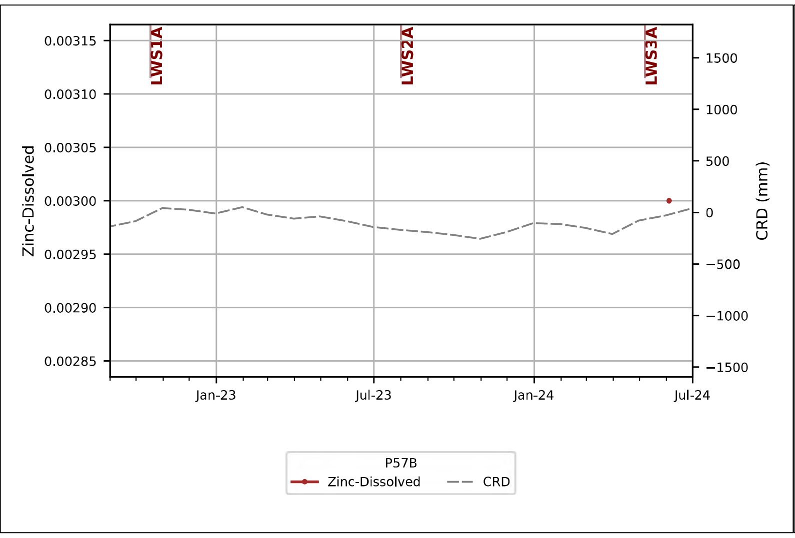
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
LWS3A
0.0280
0.0275
0.0270
0.0265
0.0260
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Manganese-Dissolved
CRD



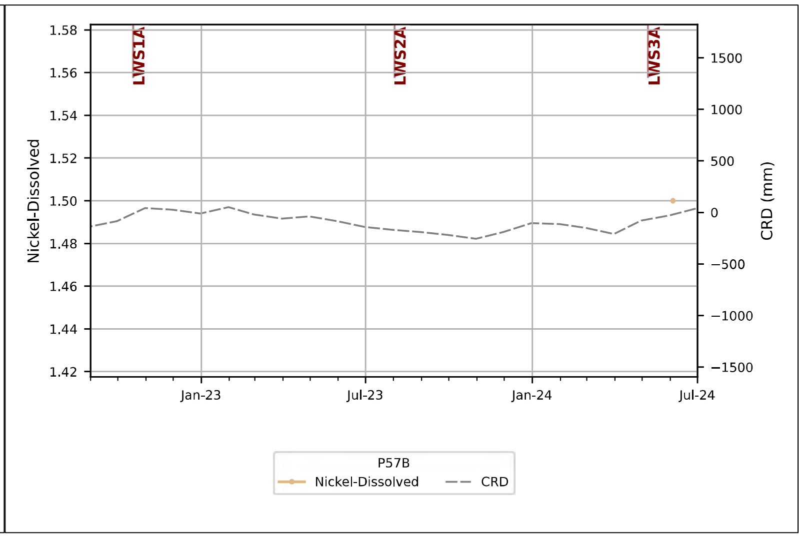
LWS1A
LWS2A
LWS3A
Copper-Dissolved
CRD (mm)
0.00052
0.00051
0.00050
0.00049
0.00048
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Copper-Dissolved
CRD



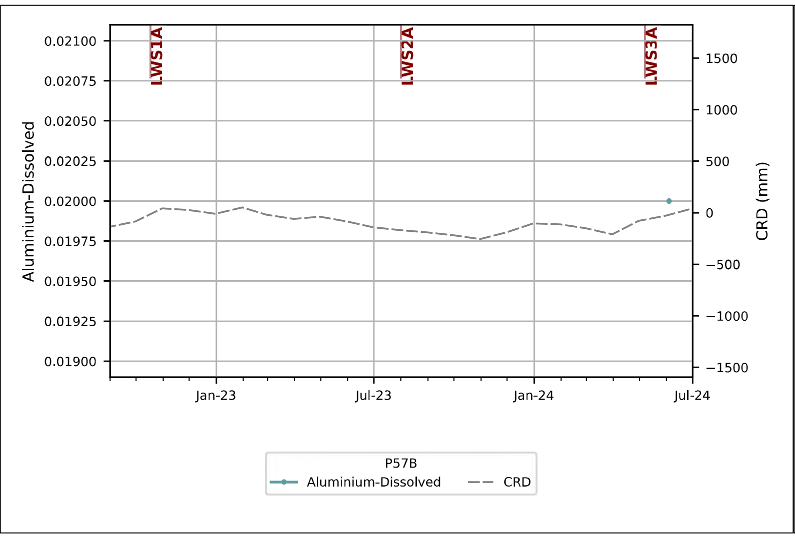
LWS1A
LWS2A
LWS3A
Lead-Dissolved
CRD (mm)
0.0073
0.0072
0.0071
0.0070
0.0069
0.0068
0.0067
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Lead-Dissolved
CRD



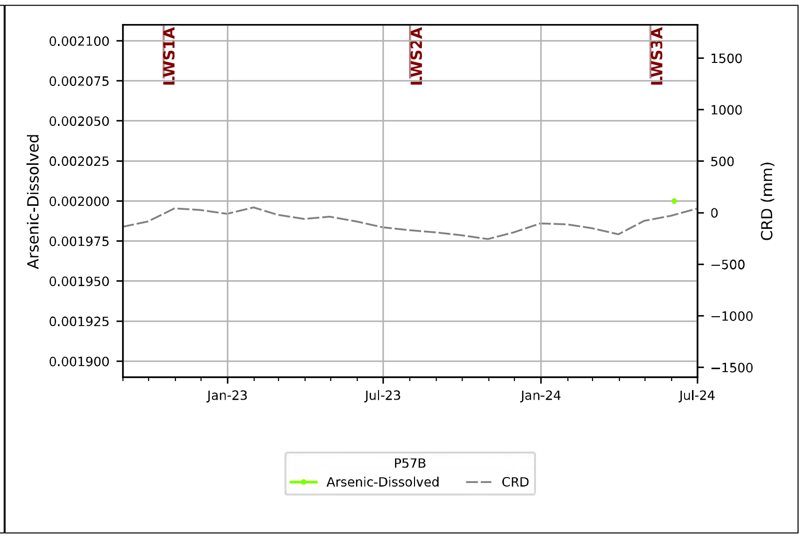
LWS1A
LWS2A
LWS3A
Zinc-Dissolved
CRD (mm)
0.00315
0.00310
0.00305
0.00300
0.00295
0.00290
0.00285
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Zinc-Dissolved
CRD



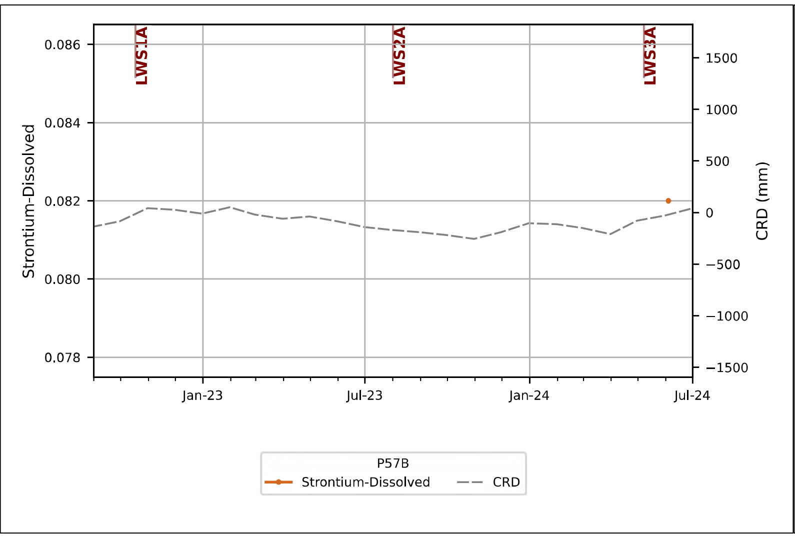
LWS1A
LWS2A
LWS3A
Nickel-Dissolved
CRD (mm)
1.58
1.56
1.54
1.52
1.50
1.48
1.46
1.44
1.42
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Nickel-Dissolved
CRD

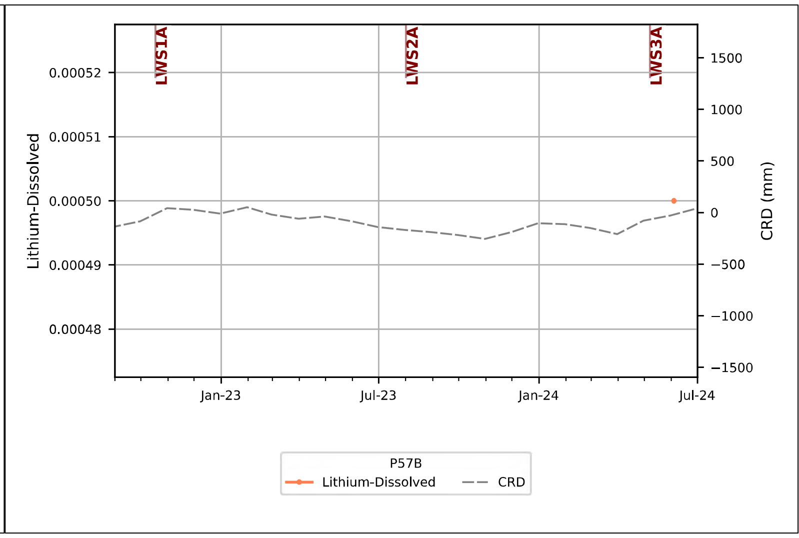


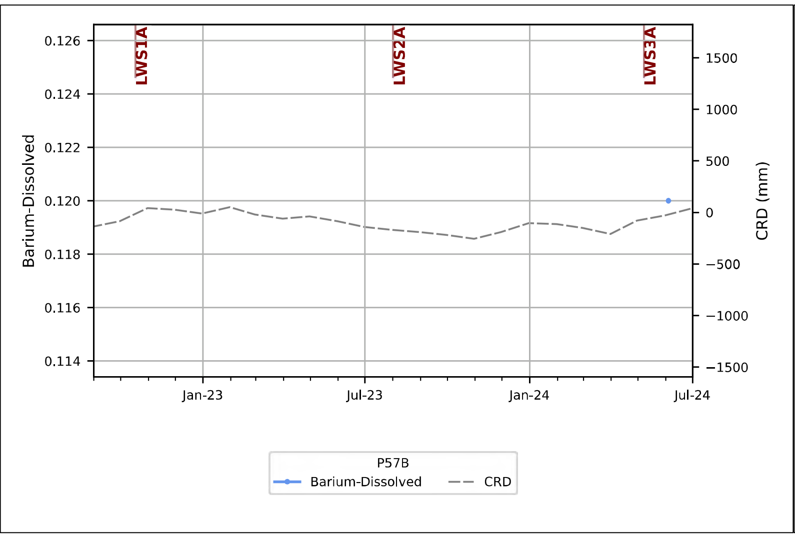
LWS1A
LWS2A
LWS3A
Aluminium-Dissolved
CRD (mm)
0.02100
0.02075
0.02050
0.02025
0.02000
0.01975
0.01950
0.01925
0.01900
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Aluminium-Dissolved
CRD

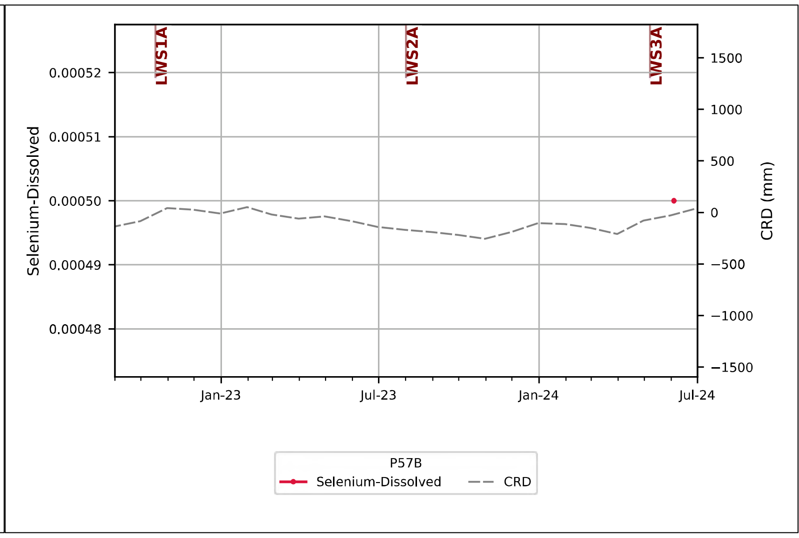


LWS1A
LWS2A
LWS3A
Arsenic-Dissolved
CRD (mm)
0.002100
0.002075
0.002050
0.002025
0.002000
0.001975
0.001950
0.001925
0.001900
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Arsenic-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Strontium-Dissolved
0.086
0.084
0.082
0.080
0.078
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Strontium-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Lithium-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Lithium-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Barium-Dissolved
0.126
0.124
0.122
0.120
0.118
0.116
0.114
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Barium-Dissolved
CRD


LWS1A
LWS2A
LWS3A
Selenium-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
1500
1000
500
0
−500
−1000
−1500
Jan-23
Jul-23
Jan-24
Jul-24
P57B
Selenium-Dissolved
CRD

Appendix F Hydrograph and Subsidence Plots

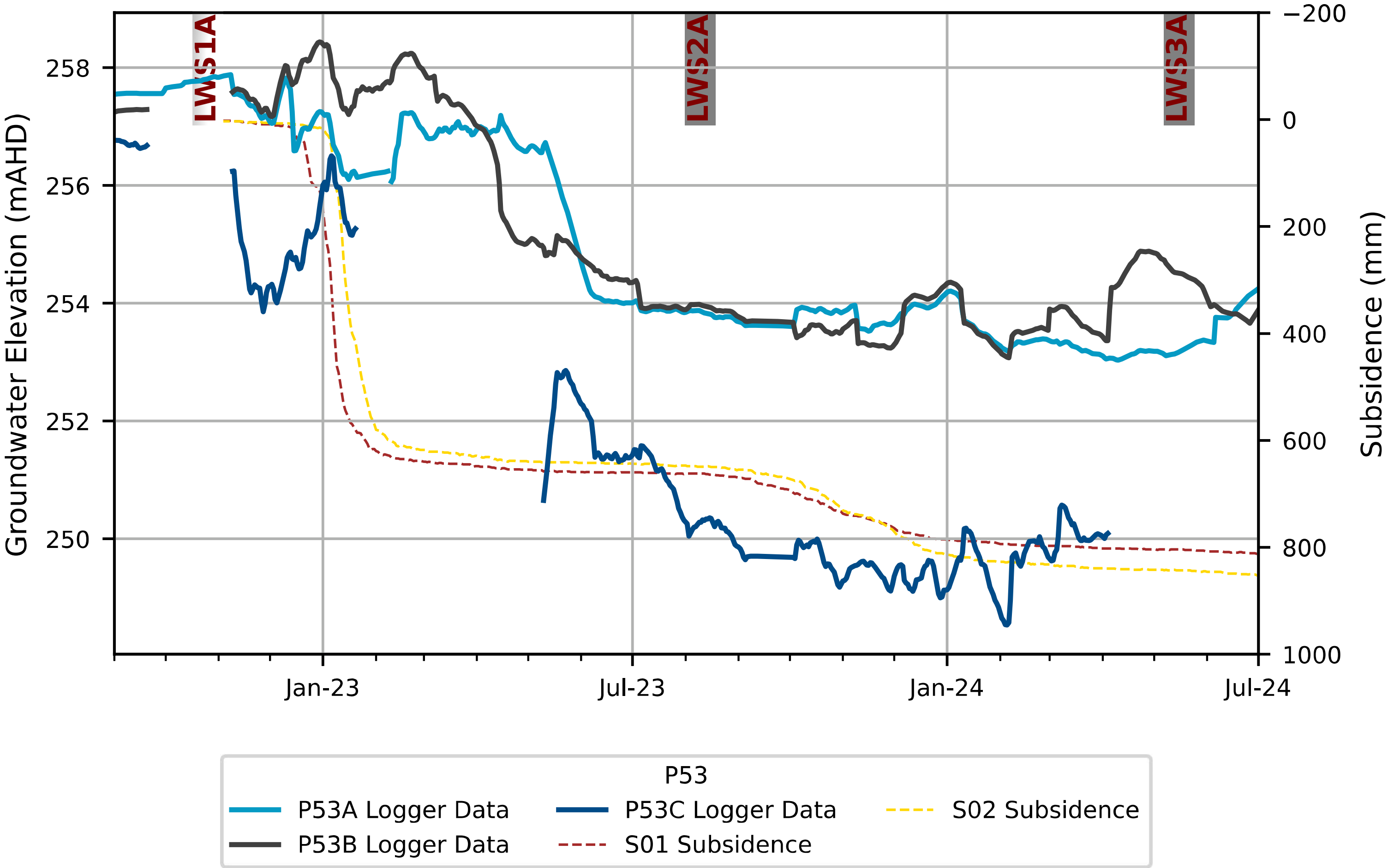
Six-Monthly Groundwater Report: January – June 2024

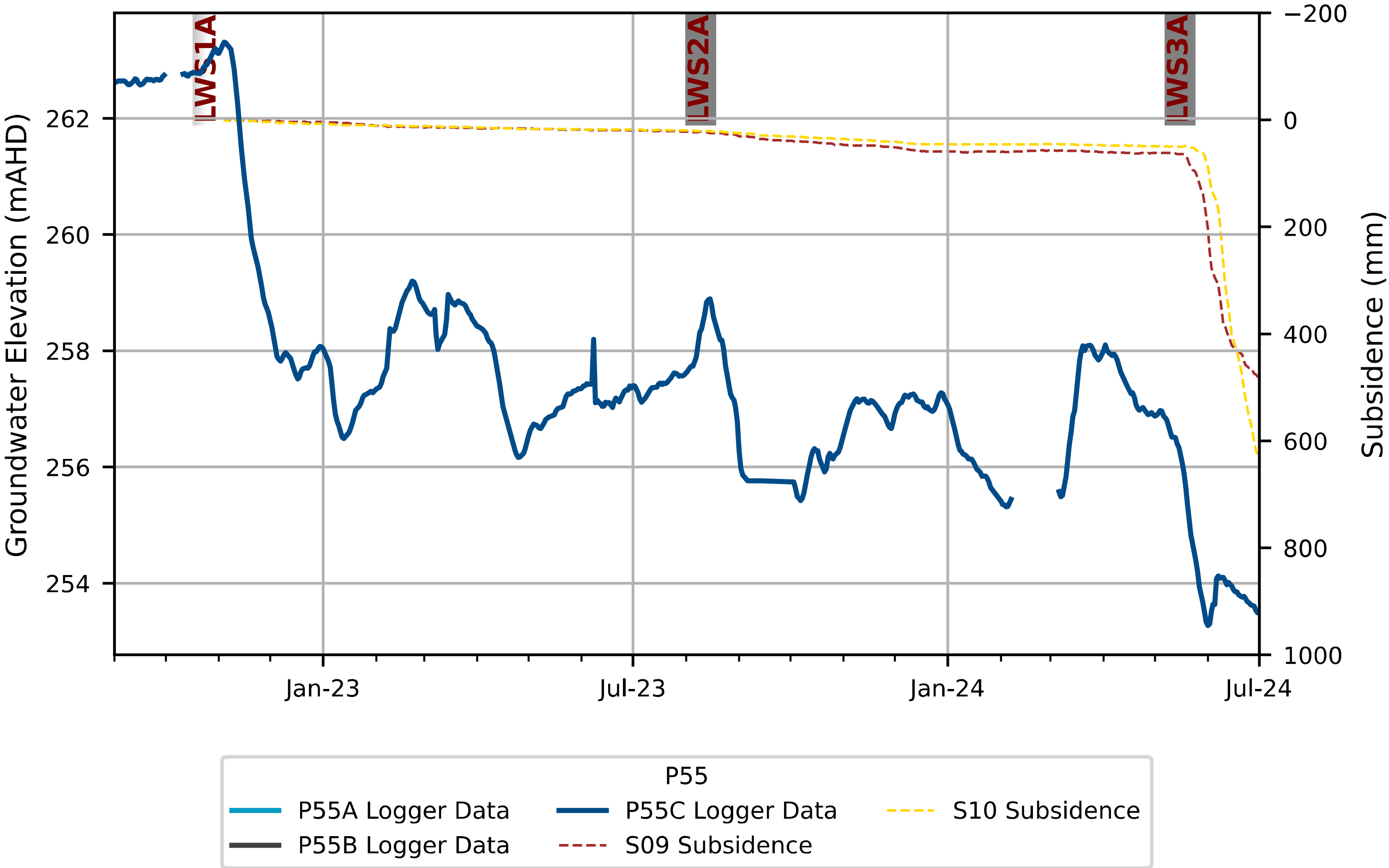
Tahmoor South Domain

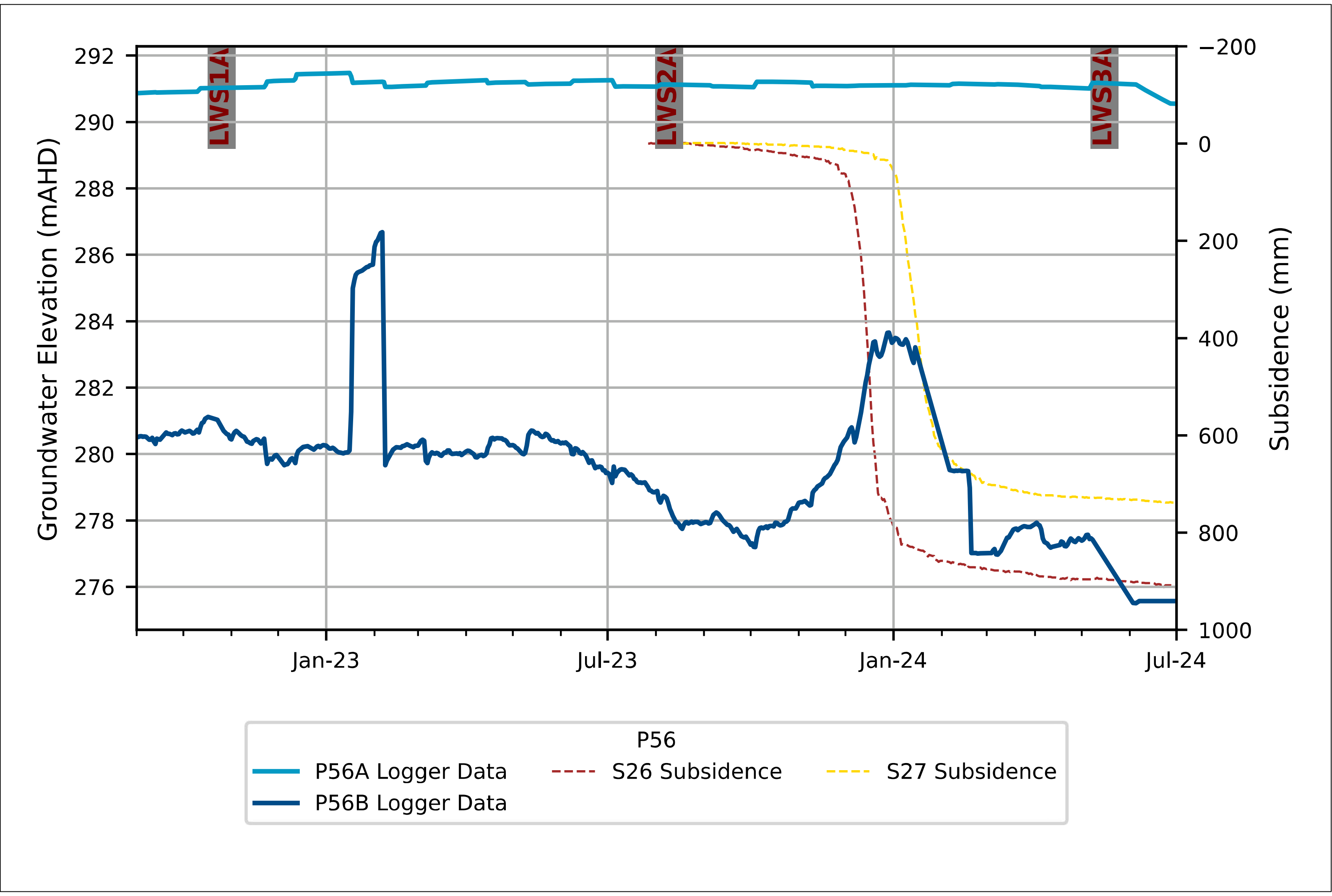
Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00001

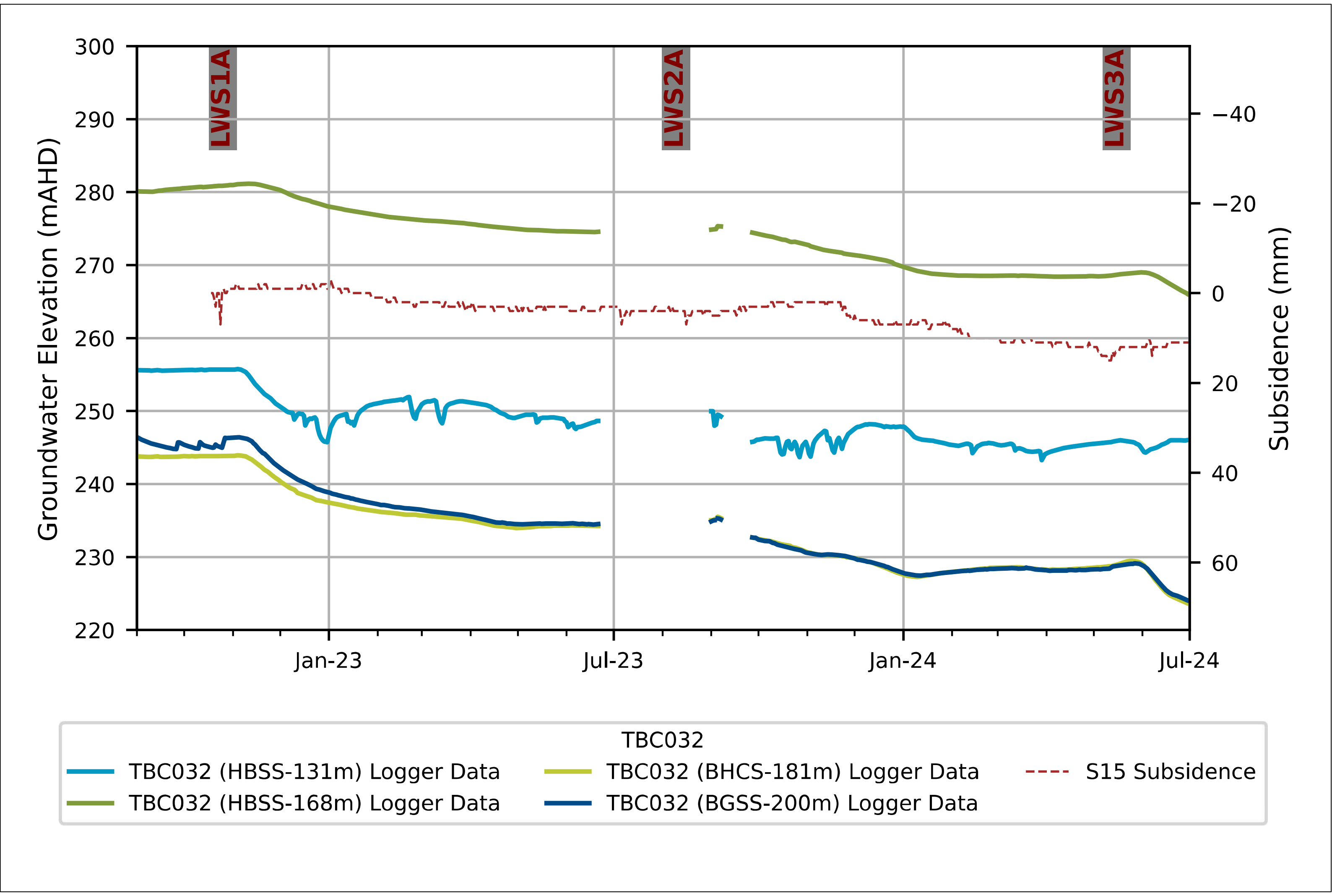
25 September 2024


LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
Subsidence (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P53
P53A Logger Data
P53B Logger Data
P53C Logger Data
S01 Subsidence
S02 Subsidence


LWS1A
LWS2A
LWS3A
Groundwater Elevation (mAHD)
Subsidence (mm)
Jan-23
Jul-23
Jan-24
Jul-24
P55
P55A Logger Data
P55B Logger Data
P55C Logger Data
S09 Subsidence
S10 Subsidence



Groundwater Elevation (mAHD)
Subsidence (mm)
LWS1A
LWS2A
LWS3A
292
290
288
286
284
282
280
278
276
−200
0
200
400
600
800
1000
Jan-23
Jul-23
Jan-24
Jul-24
P56
P56A Logger Data
P56B Logger Data
S26 Subsidence
S27 Subsidence

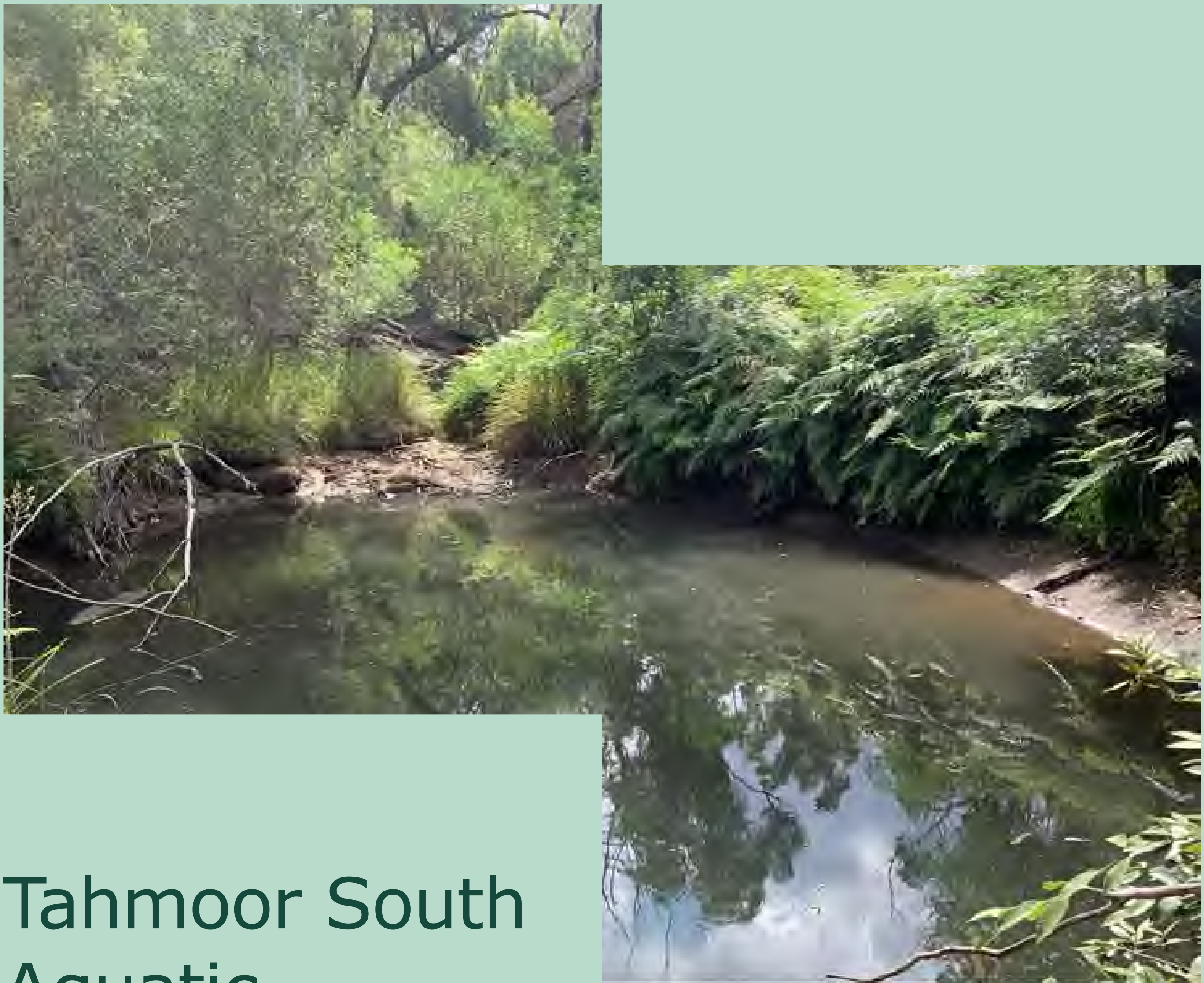


Groundwater Elevation (mAHD)
Subsidence (mm)
LWS1A
LWS2A
LWS3A
300
290
280
270
260
250
240
230
220
−40
−20
0
20
40
60
Jan-23
Jul-23
Jan-24
Jul-24
TBC032
TBC032 (HBSS-131m) Logger Data
TBC032 (HBSS-168m) Logger Data
TBC032 (BHCS-181m) Logger Data
TBC032 (BGSS-200m) Logger Data
S15 Subsidence

Making Sustainability Happen

Appendix D – Aquatic Ecology Report

Niche



Tahmoor South Aquatic Monitoring Report

Autumn 2024

Prepared for Tahmoor Coal | 27/09/2024

Tahmoor South Aquatic Monitoring Report: Autumn 2024

Document control

Project number	Client	Project manager	LGA
8234	Tahmoor Coal	Kayla McGregor	Wollondilly

Version	Author	Review	Status	Comments	Date
D1	Luke Stone	-	Draft	Draft 1	16 July 2024
R1	Alan Davies, David Wilkinson	Kayla McGregor Luke Stone	Version 1		27 September 2024

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Executive summary

Project outline

Tahmoor Coal is extending underground operations and associated infrastructure south, within the Bargo area (study area). The extension of these mining facilities encompasses the Tahmoor South Project (Project) (SSD 8445).

Aquatic ecology monitoring is required as part of the Longwall (LW) South 1A -South 6A (LW S1A-S6A) Extraction Plan (Tahmoor Coal 2023) and Biodiversity Management Plan (BMP) (Tahmoor Coal 2024). This involves sampling of potential impact sites, and non-impacted locations (control sites) that are representative of the waterways present in the locality.

The monitoring program is conducted in autumn and spring each year and began in spring 2019, with baseline monitoring continuing up to and including autumn 2022. The monitoring program has been modified over time, in line with modifications to the mine plan and predicted subsidence impacts, to examine the areas that will potentially be impacted from LW S1A-S6A. The autumn 2024 monitoring data is considered the fourth round of 'during' mining monitoring for the monitoring program.

The central aim of the report is to document and analyse results from the most recent round of 'during' mining sampling, collected from Tea Tree Hollow, Hornes Creek, Moore Creek and a tributary of the Bargo River. The report seeks to identify any indicators of potential impacts to aquatic ecological conditions as a result of longwall mining in comparison to baseline data and control monitoring sites.

Methods

Monitoring is conducted using standard AUSRIVAS (Australian River Assessment System) methods and quantitative benthic macroinvertebrate surveys. Physico-chemical water quality sampling is also completed at aquatic monitoring sites to provide context for the assessment of biological data. The monitoring methods repeat those employed in previous iterations of the monitoring program.

Additional quantitative statistical analysis methods at the pool level have been implemented in autumn 2024 to compensate for limitations associated with the survey term being nested with monitoring period in the existing five-factor statistical design.

Key findings

The autumn 2024 surveys were preceded by above average seasonal rainfall, although much of this rainfall occurred in one rain event. Observed habitat conditions at the impact sites represented a continuation of low flow conditions, observed during recent monitoring. This was reflected in the observations of low flows, limited organic debris and lower flow levels across the monitoring sites.

Impact sites TTH16, TTH13, TTHt9, TTHt17, TTHt17(d/s) and BRt6 were dry during the autumn 2024 surveys, with TTH12 and TTH13(d/s) holding water. All control sites were holding water.

Dry conditions at site TTH13 have not spanned consecutive monitoring surveys but do indicate an ongoing pattern of harsh environmental conditions at this pool since autumn 2023. Further monitoring will be required to establish whether additional time will result in macroinvertebrate assemblage recovery at this site.

The additional AUSRIVAS sample collected at site TTH13(d/s) indicate that mining induced changes upstream at TTH13 do not appear to have translated into acute impacts to macroinvertebrate assemblages downstream. As site TTH13 (d/s) recorded AUSRIVAS scores that were within the range of baseline monitoring results and comparable to control sites.

Site TTH12 recorded AUSRIVAS scores, and water quality readings that were within the range of baseline monitoring results. The quantitative monitoring data does not identify any significant differences between the autumn 2024 survey data and that of previous surveys that indicate a decline in ecosystem health associated with mining induced change.

Conclusions

All impact sites (except for Sites TTH16 and TTHt17) align with a 'Normal' BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP (Trigger Action Response Plan) level.

Sites TTH16 and TTHt17 have now shown a reduction in aquatic pool habitat being observed over three consecutive sampling seasons leading to them aligning with a TARP level 2.

Niche has completed a review of the relevant TARP level actions and responses in consultation with Tahmoor Coal (Section 4.2). No changes to the current monitoring program have been recommended following this review.

A number of sites were dry for the first (non-consecutive) season in autumn 2024 (TTH13, TTHt9, TTHt17(d/s) and BRt6). The biological data collection at sites should be reviewed in detail in the spring 2024 seasonal report, with reference to the latest surface water review findings.

Glossary and list of abbreviations

Term or abbreviation	Definition
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
AUSRIVAS	Australian Rivers Assessment System
BACI	Before After Control Impact experimental design
Baseline	Pre-mining monitoring period
BoM	Bureau of Meteorology
BMP	Biodiversity Management Plan
Control sites	Monitoring sites established outside of the 600 m longwall buffer, not considered to be at risk of potential impacts, to provide a basis to compare against trends or patterns identified among the impact monitoring sites.
DGV	Default Guideline Value
EPL	Environmental Protection Licence
EPT	Ephemeroptera, Plecoptera and Trichoptera
Factor	A statistical variable that may influence the results. The following factors have been included in the statistical design: – Tr = Treatment (control/impact) – Pe = Period (before mining – Se = Season (autumn, spring) – St = Stream (Tea Tree Hollow, Moore Creek, Hornes Creek) – Su = Survey (e.g. autumn 2024) – Si = Site (e.g. TTH12)
Impact sites	Monitoring sites established within the 600 m longwall buffer, at risk of potential impacts. The term 'impact' in this context does not necessarily denote that they have in fact been impacted, rather that they are at risk of impacts based on the location of longwalls.
Modal width	The width which appears most often in a specified length of stream channel
NMDS	Non-metric Multidimensional Scaling
PCoA	Principal Coordinate Analysis
PERMANOVA	Permutational Multivariate Analysis of Variance
ROM	Run of Mine
SILO	Scientific Information for Land Owners
SIGNAL	Stream Invertebrate Grade Number Average Level

Table of contents

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List of Figures

List of Tables

1 Introduction

1.1 Context

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

Tahmoor Coal is extending underground operations and associated infrastructure south, within the Bargo area. The extended underground coal mining area will continue to be accessed via the existing surface facilities at Tahmoor Mine, located between the towns of Tahmoor and Bargo. The extension of these mining facilities encompasses the Tahmoor South Project (the project) (SSD 8445).

The monitoring program involves sampling of potential impact sites and control sites (non-impacted locations) (the study area), that are representative of the waterways present in locality (Figure 1). The monitoring program began in spring 2019 with surveys completed in autumn and spring each year. Previously, Niche has reported on the results of the baseline monitoring period (spring 2019 - autumn 2022) (Niche 2020, 2021, 2022). In the during mining period reports have been prepared following each survey. The autumn 2024 monitoring period that is the focus of this report, represents the fourth survey completed in the 'during mining' period.

This report presents the results of data collected from spring 2019 to autumn 2024 in the Tea Tree Hollow stream network, Bargo River tributary, Hornes Creek and Moore Creek. This report focusses on the initial areas that will be mined under the Longwall (LW) S1A-S6A Extraction Plan (Tahmoor Coal 2023).

The waterways that are likely to be directly impacted include Tea Tree Hollow and associated tributaries. Mining within the study area commenced in October 2022 (Table 1). At the time of the Autumn 2024 field surveys, extraction from LW S1A and LW S2A (Figure 1) was complete (MSEC 2024).

Table 1: Longwall start and completion dates

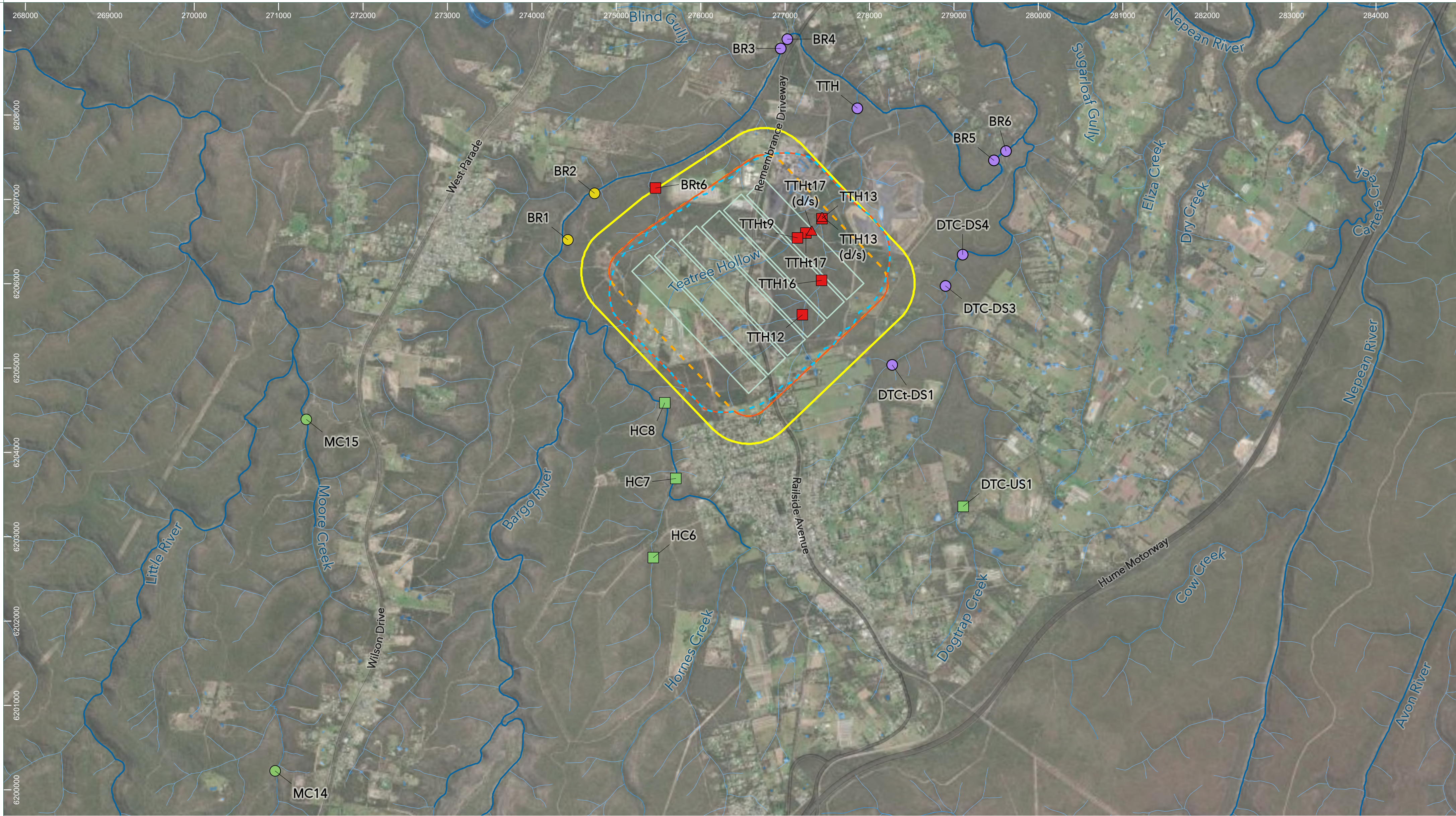
Longwall	Longwall start	Longwall complete
LW S1A	18 October 2022	4 July 2023
LW S2A	2 August 2023	6 April 2024
LW S3A	-	-
LW S4A	-	-
LW S5A	-	-
LW S6A	-	-

1.2 Aims and objectives of this report

The primary aim of this report is to assess the condition of monitored waterways against the Biodiversity Management Plan (BMP) Trigger Action Response Plans (TARPs) for aquatic ecology (Tahmoor Coal 2024). To achieve this, the report documents, and analyses the results from the most recent round of data collection in autumn 2024.

The monitoring program uses a BACI (Before-After, Control-Impact) approach to identify any indicators of mining impacts to stream health.

This process informs the adaptive management of the waterways and monitoring under the BMP (Tahmoor Coal 2024) for the project.



Subject area

Predicted 20mm Total Subsidence

35 Degree Angle of Draw

Longwall

600m Longwall Buffer

Aquatic monitoring locations

Control

AUSRIVAS and quantitative

Quantitative

Assosciated aquatic monitoring site

Impact

AUSRIVAS

AUSRIVAS and quantitative

Assosciated aquatic monitoring site

Transport

Road

Major road

Minor road

Hydrography

Perennial Stream

Non Perennial Stream

Minor Watercourse

Waterbody

0 1,500 m

GDA2020 MGA Zone 56

Niche

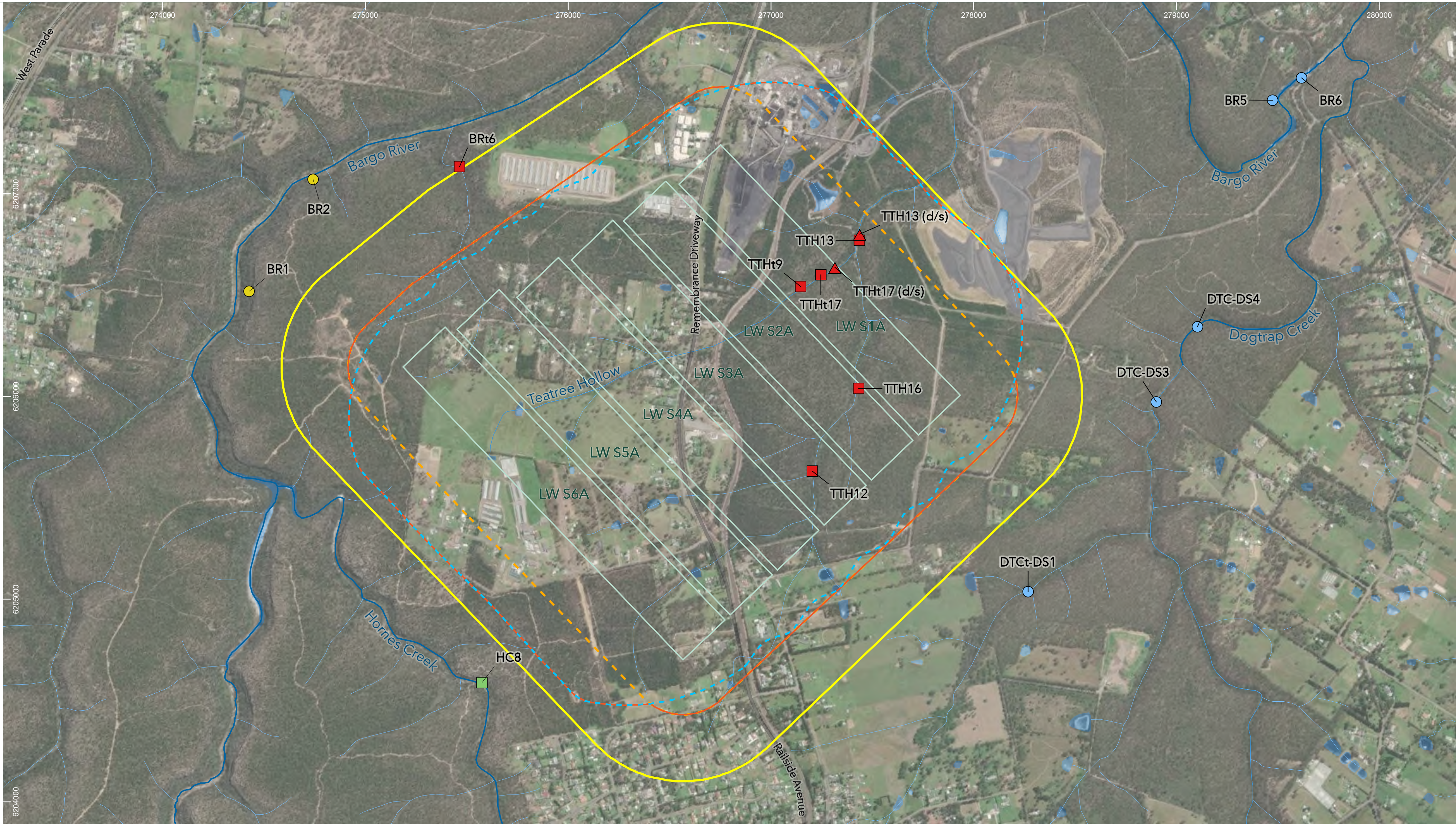
Figure 1

Tahmoor South Aquatic Monitoring Sites Overview

Tahmoor Coal Biodiversity Monitoring

Niche PM: Luke Stone
Niche Proj. #: 8234
Client: Tahmoor Coal Pty Ltd

World Imagery: Earthstar Geographics | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Subject area

Predicted 20mm Total Subsidence

35 Degree Angle of Draw

Longwall

600m Longwall Buffer

Aquatic monitoring locations

Control

AUSRIVAS and quantitative

Associated aquatic monitoring site

Impact

AUSRIVAS

AUSRIVAS and quantitative

Associated aquatic monitoring site

Hydrography

Perennial Stream

Non Perennial Stream

Minor Watercourse

Waterbody

Transport

Major road

Minor road

0 500

m

GDA2020 MGA Zone 56

Niche

Figure 2

Tahmoor South Aquatic Impact Monitoring Sites

Tahmoor Coal Biodiversity Monitoring

Niche PM: Luke Stone
Niche Proj. #: 8234
Client: Tahmoor Coal Pty Ltd

World Imagery: Maxar | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

2 Methods

Autumn 2024 field surveys were completed by David Wilkinson (Aquatic Ecology Consultant) and Alan Davies (Graduate – Aquatic Ecology) of Niche, over four days between 26 March and 5 April 2024.

2.1 Monitoring sites

This report addresses 13 monitoring sites that form the focus of the program. These comprise non-impacted control sites within Hornes Creek and Moore Creek (Figure 1) as well as impact sites within the Tea Tree Hollow stream network and a tributary of the Bargo River (Figure 2), detailed in Table 1.

Impact sites are those that are located within a 600 m buffer of active longwall mining and are therefore at risk of potential impacts. It should be noted that while these sites are referred to as impact sites for the purposes of the monitoring program, this does not necessarily denote that they have been impacted. Rather that they are at risk of potential impacts based upon the predicted longwall progression. Control sites are located outside of the area of predicted subsidence impacts.

Tea Tree Hollow is the primary waterway identified as being at risk of impacts under the Longwall (LW) S1A-S6A Extraction Plan (Tahmoor Coal 2023). Hornes Creek is not anticipated to be impacted by mining as it is outside of the area of predicted subsidence impacts and is utilised for control sites. These sites will continue to be used as control sites for the program as long as no measurable subsidence impact is observed. Should an impact be subsequently detected, they will become impact monitoring sites, and the previous data collected at these sites will provide useful comparisons as a baseline dataset.

A total of 24 sites have been sampled to date as part of the program, and other related programs, within the locality. Additional monitoring sites presented in Figure 1, but not listed in Table 2, are associated with other related monitoring programs in the locality but are not sampled as part of this monitoring program. Data from these sites may be called upon as relevant, to assist in the interpretation of impacts. Details for all relevant monitoring sites are presented in Annex 1.

Table 2 Location of monitoring sites

Side code	Surface water sampling code (ATC Williams)	Waterway	Location	Sample method	Season	Easting	Northing
Control sites							
Hornes Creek							
HC6	-	Hornes Creek	Upstream	AUSRIVAS and quantitative	Spring 2023 – autumn 2024	275438	6202753
HC7	-	Hornes Creek	Mid-section	AUSRIVAS and quantitative	Spring 2019 - autumn 2024	275705	6203691
HC8	HC9	Hornes Creek	Downstream	AUSRIVAS and quantitative	Spring 2019 - autumn 2024	275575	6204588
Moore Creek							
MC14	-	Moore Creek	Upstream	Quantitative	Autumn 2020 - autumn 2024	270959	6200225
MC15	-	Moore Creek	Downstream	Quantitative	Spring 2019 - autumn 2024	271328	6204392
Impact sites							
Tea Tree Hollow tributary (western arm)							
TTHt9	TT9	Tea Tree Hollow tributary (western arm)	Upstream	AUSRIVAS and quantitative	Spring 2023 - autumn 2024	277146	6206543
TTHt17	TT12	Tea Tree Hollow tributary (western arm)	Downstream	AUSRIVAS and quantitative	Spring 2022 – autumn 2024	277246	6206601

Side code	Surface water sampling code (ATC Williams)	Waterway	Location	Sample method	Season	Easting	Northing
TTHt17 (d/s)[1]	-	Tea Tree Hollow tributary (western arm)	Downstream of TTHt17	AUSRIVAS	Autumn 2023 – autumn 2024	277315	6206638
Tea Tree Hollow							
TTH12	TT2	Tea Tree Hollow upstream	Upstream	AUSRIVAS and quantitative	Spring 2019 - autumn 2024	277204	6205632
TTH16	TT3	Tea Tree Hollow (Australian Wildlife Sanctuary)	Mid-section	AUSRIVAS and quantitative	Spring 2022 - autumn 2024	277432	6206040
TTH13	TT13	Tea Tree Hollow downstream	Downstream	AUSRIVAS and quantitative	Autumn 2020 - autumn 2024	277411	6206699
TTH13 (d/s)	-	Tea Tree Hollow - downstream of Site 13	Downstream of TTH13	AUSRIVAS	Autumn 2023 - autumn 2024	277436	6206771
Tributary of Bargo River							
BRt6	BR6	Tributary of Bargo River	-	AUSRIVAS and quantitative	Spring 2023 - autumn 2024	275464	6207135

[1] d/s refers to downstream sites

2.1.1 Changes to the monitoring program

In 2020 Niche advised changes to the monitoring program in response to the mine plan modifications and reduced potential subsidence impacts. These recommendations included the removal of sampling along the Bargo River as this waterway is unlikely to be impacted by the project, is confounded by mine water discharge, and is already comprehensively monitored by the long-term aquatic health monitoring program required under Environmental Protection Licence (EPL) 1389. The data from this program may be interrogated in the unlikely event that ecologically significant impacts occur in the Bargo River from the Project. Other recommendations included the addition of sites in Tea Tree Hollow and consideration of control sites along Moore Creek and Hornes Creek. These recommendations were adopted and have been incorporated into the program.

In 2023 Niche advised changes to the monitoring program in response to longwall progression and detection of indicators of impact. These recommendations included the addition of monitoring sites in the impact and control locations. This included two additional AUSRIVAS monitoring sites, TTH13(d/s) and TTH17(d/s), downstream of sites impacted in autumn 2023 to provide an assessment of aquatic ecological condition in this key section of the stream network and address potential downstream impacts. Impact sites BRt6 and TTHt9 were added to the program in the spring 2023 round of monitoring to assess potential impacts to these sections of waterway associated with potential future Longwall panels LW S3A – S6A. Control site HC6 was also added, in line with the potential future change of downstream site HC8 from control to impact, associated with planned longwall LW S7A.

Baseline monitoring within Dog Trap Creek commenced in spring 2023 and is planned to gather two years of data prior to longwall extraction near this waterway. Dog Trap Creek monitoring sites are identified in Figure 1 and Annex 1. Baseline data from Dog Trap Creek is reported separately to this program.

2.2 Aquatic habitat assessment

Visual assessment of aquatic habitat was conducted using the AUSRIVAS method. The survey is a rapid assessment to describe habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

The aquatic field team also noted observations of any visual indictors of gross environmental change (e.g. surface deformation, pool water loss, flocculant/leachate) that may be indicative of subsidence impacts.

2.3 Water quality

Surface water quality was measured in situ using a Yeokal 618 water quality probe at each site. The following variables were measured:

- Temperature (°C)
- Conductivity (µS/cm)
- pH
- Alkalinity measured with a standard titration kit (mg $CaCO_3$/L)
- Dissolved Oxygen (DO) (% saturation and mg/L)
- Turbidity (Nephelometric Turbidity Units - NTU).

Water quality data was compared with the Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality Default Guideline Values (DGVs) for the region as a benchmark for comparison for the program. Currently, no updated ANZG DGVs for the region have been provided (ANZG 2018). As such the DGVs applied in this report are consistent with the Australian and New Zealand Environment and Conservation Council (ANZECC 2000) physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia default guideline values, as recommended by the ANZG (2018). This is consistent with previous iterations of the monitoring program.

The relevant ANZG Guideline (2018) DTVs for upland streams include:

- Electrical conductivity (30-350 µS/cm).
- Turbidity (2-25 NTU).
- pH (6.5-8.0).
- Dissolved oxygen (90-110%).

2.4 Macroinvertebrate survey

2.4.1 AUSRIVAS

The AUSRIVAS method of sampling both pools and riffles were modified to suit site conditions, as no suitable in-stream riffle features were present. Samples were collected from pool edges for a length of 10-metre either side as a continuous line or in disconnected segments. Sampling in segments was undertaken where possible to ensure the sampling of all micro habitats was achieved to obtain a representative sample of the macroinvertebrate assemblage to occur in the locality. These microhabitats included macrophyte beds, bank overhangs, submerged branches and root mats. Segmented sampling was also employed where pool length was short, and it was logistically difficult to sample in a continuous line (e.g. due to the presence of in-stream logs). A 250 micrometre (µm) dip net was drawn through the water with short sweeps towards the bank to dislodge benthic fauna while scraping submerged rocks and debris, sides of the stream bank and the bed substrate. Further sweeps in the water column targeted suspended fauna.

Each sample was rinsed from the net onto a white sorting tray from which animals were picked using forceps, pipettes and/or paint brushes. Each tray was picked for a minimum period of forty minutes, after which they were picked at 10-minute intervals for either a total of one hour or until no new specimens had been found. Care was taken to collect cryptic and fast-moving macroinvertebrate taxa in addition to those that were conspicuous or slow. The macroinvertebrates collected at each site were placed into a labelled jar containing a 70% ethanol solution.

The chemical and physical variables required for running the AUSRIVAS predictive model were also recorded i.e. alkalinity, modal width and width of the stream, percentage bedrock, boulder, or cobble along with latitude and longitude. The distance from stream source, altitude, land-slope, and rainfall predictor variables were also calculated using desktop data sources.

2.4.2 Quantitative benthic macroinvertebrate sampling

Macroinvertebrates were sampled from three random pool edges at each site. Pool-edge samples were collected from depths of 0.2 - 0.5 metres within two metres of the pool/stream bank. A suction sampler described by Brooks (1994) was placed over the substrate and operated for one minute at each sampling location. The sample was washed thoroughly over a 500 micrometre (µm) mesh sieve. All material retained on sieve was preserved in a 70% ethanol solution for laboratory sorting and identification.

2.4.3 Laboratory methods - invertebrate identification

Macroinvertebrate samples were identified to family level with the exception of Oligochaeta (to class), Polychaeta (to class), Ostracoda (to subclass), Nematoda (to phylum), Nemertea (to phylum), Acarina (to order) and

Chironomidae (to subfamily). Small crustaceans Ostrocoda, Copapoda and Cladocera were not included as part of the analysis. Identification keys used included:

- Dean, J., Rosalind, M., St Clair, M., and Cartwright, D. (2004). Identification keys to Australian families and genera of caddis-fly larvae (Trichoptera). Cooperative Research Centre for Freshwater Ecology.
- Gooderham, J. and Tsyrlin, E. (2002). The Waterbug Book: A guide to the Freshwater Macroinvertebrates of Temperate Australia. CSIRO Publishing.
- Hawking and Theischinger (1999). A guide to the identification of larvae of Australian families and to the identification of ecology of larvae from NSW.
- Madden, C. (2010). Key to genera of Australian Chironomidae. Museum Victoria Science Reports 12,1-31.
- Madden, C. (2011). Draft identification key to families of Diptera larvae of Australian inland waters. La Trobe University.
- Smith, B. (1996). Identification keys to the families and genera of bivalve and gastropod molluscs found in Australian inland waters. Murray Darling Freshwater Research Centre.
- Identification and Ecology of Australian Freshwater Invertebrates. Centre for Freshwater Ecosystems Website - http://www.mdfrc.org.au/bugguide/.

2.4.4 Data analysis

AUSRIVAS

Samples collected using AUSRIVAS protocol were analysed using the predictive models for NSW edge habitats (Turak et al. 2004). The AUSRIVAS model predicts the aquatic macroinvertebrate fauna expected to occur at a site in the absence of environmental stress, such as pollution or habitat degradation. The AUSRIVAS NSW autumn and spring models were used for the data collected. The Observed to Expected ratio (OE50), Stream Invertebrate Grade Number Average Level (SIGNAL2), and taxa richness were the key model outputs and stream health indices used to interpret stream health conditions.

OE50

The OE50 AUSRIVAS model output refers to the ratio of the number of invertebrate families observed at a site (NTC50) to the number of families expected to occur (NTE50) at that site, based upon the reference site data generated by the predictive model. Only macroinvertebrate families with a greater than 50% predicted probability of occurrence are used by the model. The OE50 score provides a measure of biological impairment at the test site. The OE50 ratios are divided into 'Bands' indicating different levels of impairment of the macroinvertebrate assemblage (Table 3).

Table 3 AUSRIVAS band interpretation

Band	Interpretation
Band X	Represents a more biologically diverse community than reference
Band A	Is considered similar to reference condition
Band B	Represents sites significantly impaired
Band C	Represents sites in a severely impaired condition
Band D	Represents sites that are extremely impaired

SIGNAL2 scores

The revised SIGNAL2 biotic index developed by Chessman (2003) was also used to determine the "environmental quality" of sites. This method assigns grade numbers to each macroinvertebrate family, or taxa found, based largely on their response to a range of environmental conditions (Table 4). The sum of all grade numbers for that habitat is then divided by the total number of families recorded in each habitat to calculate the SIGNAL2 index. The SIGNAL2 index therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site. Table 5 provides a broad guide for interpreting the health of the site according to the SIGNAL2 score of the site.

Table 4 SIGNAL2 grade for individual macroinvertebrate taxa and the level of pollution tolerance

Individual taxa SIGNAL2 grade	Pollution tolerance
10-8	Indicates a greater sensitivity to pollution
7-5	Indicates a sensitivity to pollution
4-3	Indicates a tolerance to pollution
2-1	Indicates a greater tolerance to pollution

Table 5 Guide to interpreting the overall SIGNAL2 scores for sites

Site SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution

SIGNAL2 scores are indicative only and 'pollution' does not refer only to anthropogenic pollution. Environmental stress may result in poor water quality occurring naturally in waterways. Low family richness and the occurrence of pollution tolerant invertebrates can give a low SIGNAL2 score even though they are occurring in a natural condition state.

Taxa richness

The richness of macroinvertebrate taxa refers to the number of macroinvertebrate families collected (or class/orders if not identified to family level). The higher the number of taxa recorded, the healthier the aquatic ecosystem.

EPT index

The EPT (Ephemeroptera, Plecoptera and Trichoptera) index is based on the insect orders that contain most of the pollution sensitive taxa (Lenat 1988). All genera of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) were identified, and the number of distinct taxa were counted as an indicator of ecosystem health. The higher the number, the healthier the aquatic ecosystem.

Statistical analysis

The quantitative macroinvertebrate dataset has been provided as an electronic appendix to this report (Annex 3) and forms the basis of all quantitative data summaries and analysis presented within this report. The statistical analysis addressed macroinvertebrate assemblages, taxa abundance and richness as metrics for the analyses.

Statistical analysis was performed on the macroinvertebrate assemblage data collected using the suction sampler with the PERMANOVA+ for Primer statistical software package (Anderson *et al.* 2008). The significance level was set at $p < 0.05$ for all statistical tests.

PERMANOVA is a permutational approach to ANOVA that has a number of advantages over traditional statistical methods. The PERMANOVA procedure was used for both univariate (single variable) and multivariate (many variables) analyses. Assemblage and abundance data was transformed using the fourth-root function to normalise the distribution of the data. For univariate analyses parameters (abundance and richness) the Euclidean distance matrix was applied, while the multivariate analyses were based on Bray-Curtis similarities.

Pairwise comparisons were performed to further investigate any significant results identified in the PERMANOVA for factors/terms of interest. In the case where the number of unique permutations for a particular test was less than 100, Monte Carlo probability values were used to assess the significance of the test as outlined by Anderson *et al.* (2008).

Principal Coordinate Analysis (PCoA), which provides a graphical representation of differences was also applied where relevant. The PCoA analysis itself provides a measure of the amount of variation in the data that can be captured by the first two axes. Vector overlays based on the Spearman's Correlation Coefficients are added to the graphical output base to display the strongest drivers of differences. The PCoA routine allows for the multivariate dataset to be visualised using metric multidimensional scaling. This approach is more appropriate than traditional uses of Non-metric Multidimensional Scaling (NMDS) when PERMANOVA is applied, as it models the actual dissimilarities of interest that provide a direct projection of the points considered using PERMANOVA (Anderson *et al.* 2008).

Overall assessment (five-factor) design

The original statistical analysis design to detect change is described in Niche (2023). This approach was not appropriate for implementation in spring 2023 due to the mining induced dry conditions at impact sites resulting in imbalanced control and impact site numbers and limited spatial representation. Similar limitations have applied to the subsequent datasets. To remedy this limitation, an alternate statistical design has been developed for the autumn 2023 data analysis onwards (removing dry sites).

For this report, a five-factor experimental design following the BACI approach has been implemented (Table 6).

Table 6 Five-factor statistical experimental design

Factor	Type	Levels/Type	Degrees of freedom (DF)
Tr	Fixed – Orthogonal to Pe	Impact, Control	1
Pe	Fixed – Orthogonal to Tr	Before, During	1
St(Tr)	Random nested within Treatment	Impact – Tea Tree Hollow Control – Moore Creek, Hornes Creek	1

Factor	Type	Levels/Type	Degrees of freedom (DF)
Su(Pe)	Random nested within Period	Before: Autumn 2020, Spring 2022, Autumn 2021, Spring 2021, Autumn 2022, Spring 2022 During: Autumn 2023, Spring 2023, Autumn 2024	7
TrxPe	-	-	1
Si(St(Tr))	Random and nested within Stream that is nested within Treatment	HC6, HC7 and HC8 (Hornes Creek) MC14 and MC15 (Moore Creek) TTH11, TTH12 (Tea Tree Hollow)	4
TrxSu(Pe)	-	-	7
PexSt(Tr)	-	-	1
PexSi(St(Tr))	-	-	3
St (Tr) x Su (Pe)	-	-	6
Su(Pe)xSi(St(Tr))	-	-	18
Total	-	-	51

Pool level analysis (one-factor) design

Niche (2024) recommended that the ongoing overall statistical analysis approach be augmented by incorporating longitudinal analysis of the Survey term at the individual impact site level, as relevant. This has been completed to assist in identifying any significant differences at these sites over time, that may be masked by the necessity of having Survey as a nested factor within Period as part of the five-Factor design described above.

The question of interest is whether there are differences in the most recent survey when compared to previous individual surveys (including those within the baseline monitoring period) at the pool level. To complete this, it is necessary to ignore the period term (before/during mining). The results of this analysis should be interpreted with care as the analysis does not include assessment of temporal variability. This has been done to facilitate comparisons between surveys completed in the before mining and during mining periods.

This additional analysis was undertaken on data from site TTH12 in autumn 2024 using a simplified one-factor design (Table 7). As this is the first time this pool level analysis has been applied to the data, all results for comparisons between surveys are presented. Pairwise comparisons between spring and autumn samples are not considered in detail, as differences in macroinvertebrate assemblages between these seasons are well established and allowed for in the monitoring approach.

Table 7 One-factor statistical experimental design (TTH12) – survey

Factor	Type	Levels/Type	Degrees of freedom (DF)
Su	Fixed	Autumn: Autumn 2020, Autumn 2021, Autumn 2022, Autumn 2023, Autumn 2024 Spring: Spring 2019, Spring 2020, Spring 2021, Spring 2022, Spring 2023	10

2.5 Limitations

The physico-chemical water quality data collected provides an indication of conditions at the time of sampling. Some of these parameters are typically variable and may change considerably over short time periods. These parameters should be considered highly sensitive to stochastic events (e.g. high rainfall periods). These physico-chemical readings are used to inform and support the interpretation of the biological analyses only.

Dry conditions at impact sites have required modifications to the statistical analysis design. The results of the five-Factor analysis have been influenced by a number of the potential impact sites being dry (and not sampled). Additional one-Factor analysis at individual impact sites have been completed to remedy this, although comparisons to control sites are not included in these analyses.

In autumn 2024, all data associated with the program has been consolidated into a master dataset (Annex 3) and subjected to additional quality assurance prior to statistical analysis. The current dataset should be considered the most accurate and up-to-date dataset to be used for future iterations of the monitoring program.

Long term rainfall data (1966 -2021) and averages for the area has been obtained from Bureau of Meteorology (BoM) station 68166. As this station does not currently collect data, this dataset has been combined with that available from SILO (Scientific Information for Landowners), hosted by the Queensland Department of Environment and Science) from grid point -34.25, 150.60. Data from SILO may include data that is interpolated from daily observations for that date, representing a location specific and up to date source of information that is otherwise absent from any other nearby localities.

Niche has been provided with relevant surface water reviews (ATC Williams 2024a, 2024b) to assist in the interpretation of biological data. The supporting information utilised is subject to the accuracy of those reports.

These factors notwithstanding, the monitoring program is not subject to any major limitations and the current program data collection and methods of analysis are considered suitable to address the BMP TARPs for aquatic ecology (Tahmoor Coal 2024).

3 Results

3.1 Rainfall

The month of March preceding the autumn 2024 survey was characterized by below above average rainfall (Table 8)), which follows below average rainfall in February and January. Although 31 millimetres of rain fell in the two weeks leading up to the surveys (Figure 3). The biological results must be considered in this context.

Table 8 Monthly rainfall 2024

Month	Median (1966-2021) rainfall	Total rainfall 2024
January 2024	81.3	69.7
February 2024	76.3	69.0
March 2024	81.2	34.8
April 2024	39.2	202.7

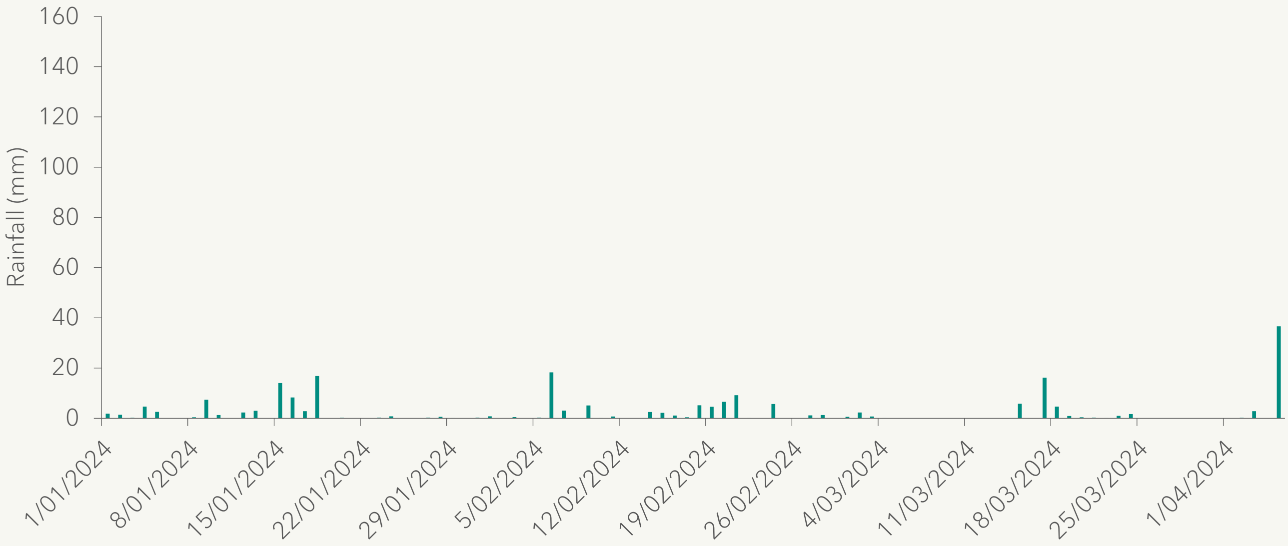


Figure 3 Daily rainfall 2024 (source: SILO: -34.25, 150.60)

3.2 Aquatic habitat observations

Observed site conditions during the autumn 2024 sampling represented a continuation of low flow conditions, observed during recent monitoring. This was reflected in the observations of low flows, limited organic debris and lower flow levels across the monitoring sites. Impact monitoring sites TTH16, TTH13, TTHt9, TTHt17, TTHt17(d/s) and BRt6 were dry during the autumn 2024 surveys. Aquatic habitat conditions were similar at the control sites when compared to previous surveys, with no visual indicators of mining induced change at these locations. A summary of aquatic habitat at each monitoring site for spring 2019 - autumn 2024 is provided in Annex 2.

In previous iterations of the monitoring program (up to autumn 2022), the differences in riparian vegetation and aquatic habitat condition were driven by variability in rainfall and a bushfire, that occurred in December 2019, that burnt vegetation on sites at Hornes Creek, Moore Creek and Bargo River. Since the bushfire, the riparian vegetation has continued to regenerate, contributing to improved riparian vegetation structures. Sites on Moore Creek particularly continued to show improved riparian condition and aquatic habitat between spring 2020 and autumn 2024.

3.3 Hydrological review

Tahmoor Coal has provided Niche with the latest surface water review (ATC Williams 2024b) to inform the interpretation of the biological data. The relevant conclusions made by (ATC Williams 2024b) are summarised in Table 9.

Table 9 Surface water review summary

Side code	Surface water sampling code (ATC Williams)	Conclusions (ATC Williams 2024b)
Impact sites		
Tea Tree Hollow tributary (western arm)		
TTHt9	TT9	- *"A maximum Level 2 trigger exceedance was recorded at monitoring site TT9-QLa due to mining-related effects in combination with climatic conditions."* - *"Notwithstanding, the water level data recorded at pool TT9 during the review indicates a change in water level behaviour and an increase in the rate of water level recession in comparison to historical conditions. Accordingly, it is considered that the decline in water level recorded at pool TT9 during the review period is related to the prevailing climatic conditions in addition to mining effects"*
TTHt17	TT12	- "A maximum Level 2 trigger exceedance was recorded at monitoring site TT12-QLa due to mining-related effects in combination with climatic conditions." - "Mining-related fracturing has previously occurred upstream and downstream of pool TT12. During the review period, no new fractures or further development of existing fractures was reported. Notwithstanding, the decline in water level recorded during the review period is considered atypical and considered related to mining induced fracturing (previously recorded) in combination with the prevailing climatic conditions."
TTHt17 (d/s)	-	N/A
Tea Tree Hollow		
TTH12	TT2	- "A maximum Level 2 trigger exceedance was recorded at monitoring site TT2-QLa due to mining related fracturing immediately upstream of pool TT2 in combination with climatic conditions." - "The water level decline, particularly between March and April recorded at pool TT2, is considered atypical and inconsistent with historical conditions. In

Side code	Surface water sampling code (ATC Williams)	Conclusions (ATC Williams 2024b)
		addition, fracturing has been recorded at and upstream of pool TT2, indicating that mining related effects have occurred in the direct vicinity of pool TT2." - "As such, it is considered that the water level decline recorded at pool TT2 during the review period is related to mining effects in combination with the prevailing climatic conditions."
TTH16	TT3	- *"A maximum Level 3 trigger exceedance was recoded at monitoring site TT3-QLa due to mining related fracturing in the vicinity of pool TT11 and pool TT3 in combination with climatic conditions."* - *"The water level decline recorded at pool TT3 is considered atypical and inconsistent with historical conditions. It is considered that the atypical decline in water level recorded at pool TT3 is related to the diversion of surface flow via upstream mining-related fractures."*
TTH13	TT13	- *"A maximum Level 2 trigger exceedance was recorded at monitoring site TT13-QLa as a result of upstream mining-related fracturing in combination with climatic conditions.'* - *"The declines in water level recorded during the review period are considered related to the cessation of surface water flow in Teatree Hollow tributary due to mining induced fracturing upstream of pool TT11 in combination with the prevailing climatic conditions."*
TTH13 (d/s)	-	N/A
Tributary of Bargo River		
BRt6	BR6	N/A

3.4 Water quality

Water quality results collected between spring 2019 and autumn 2024 are presented in Table 10. The key findings identified in autumn 2024 include:

- Impact sites TTH16, TTH13, TTHt9, TTHt17, TTHt17(d/s) and BRt6 were dry.
- Impact site TTH13 (d/s) recorded electrical conductivity levels above ANZG DGVs.
- Turbidity readings above DGVs were recorded at impact site TTH13 (d/s) and control site HC7.
- All sites that held water recorded dissolved oxygen levels below DGVs (impact and control sites). Although dissolved oxygen levels were lower at the two impact monitoring sites, TTH12 and in particular TTH13(d/s).
- The pH levels were within DGVs at the impact sites which held water, but below DGVs at control sites MC14, MC15 and HC6.
- Alkalinity levels were consistent between the control and impact sites and comparable with previous monitoring seasons.

Table 10 Water quality results

Status	Impact								Control				
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Moore Creek		Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	MC14	MC15	HC6	HC7	HC8
Temperature °C													
Spr 2019	17.70	-	Dry	-	-	-	-	-	Dry	18.64	-	19.20	20.27
Aut 2020	20.34	-	21.16	-	-	-	-	-	17.99	21.29	-	20.64	20.76
Spr 2020	16.09	-	15.36	-	-	-	-	-	-	-	-	15.05	14.84
Aut 2021	17.91	-	17.10	-	-	-	-	-	17.50	18.09	-	17.31	17.98
Spr 2021	13.15	12.98	12.80	-	-	12.71	-	-	17.50	12.12	-	14.22	14.80
Aut 2022	18.15	18.29	19.06	-	-	20.12	-	-	18.58	18.97	-	19.64	19.97
Spr 2022	15.85	16.27	19.80	-	-	17.60	-	-	16.27	17.60	-	16.00	16.70
Aut 2023	15.02	Dry	Dry	16.17	-	Dry	16.94	-	15.50	14.70	-	17.11	14.92
Spr 2023	22.46	Dry	19.91	19.66	Dry	Dry	17.73	21.26	23.34	23.81	22.40	25.57	24.08
Aut 2024	18.64	Dry	Dry	17.77	Dry	Dry	Dry	Dry	15.69	18.74	16.69	16.73	15.25
Electrical conductivity (µS/cm)													
Spr 2019	113	-	Dry	-	-	-	-	-	Dry	133	-	272	115
Aut 2020	39	-	36	-	-	-	-	-	26	26	-	35	37
Spr 2020	213	-	201	-	-	-	-	-	-	-	-	260	252
Aut 2021	179	-	200	-	-	-	-	-	105	109	-	171	174

Status	Impact								Control				
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Moore Creek		Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	MC14	MC15	HC6	HC7	HC8
Spr 2021	197	210	198	-	-	218	-	-	176	196	-	305	**357**
Aut 2022	163	149	151	-	-	156	-	-	61	60	-	122	116
Spr 2022	146	89	167	-	-	93	-	-	89	93	-	144	150
Aut 2023	125	Dry	Dry	**775**	-	Dry	**1155**	-	169	197	-	217	246
Spr-2023	250	Dry	306	**366**	Dry	Dry	288	128	114	141	104	517	244
Aut 2024	120	Dry	Dry	**466**	Dry	Dry	Dry	Dry	90	104	76	152	156
Turbidity (NTU)													
Spr 2019	**29.9**	-	Dry	-	-	-	-	-	Dry	10.8	-	23.2	**129.8**
Aut 2020	6.6	-	12.6	-	-	-	-	-	7.4	13.9	-	8.2	11.0
Spr 2020	16.3	-	5.6	-	-	-	-	-	-	-	-	12.5	9.4
Aut 2021	**112.0**	-	1.9	-	-	-	-	-	2.6	6.8	-	7.3	6.7
Spr 2021	9.8	9.4	3.0	-	-	10.2	-	-	5.5	1.0	-	10.0	6.4
Aut 2022	20.8	19.1	10.5	-	-	**34.4**	-	-	4.1	3.0	-	10.7	9.0
Spr 2022	8.2	3.0	6.8	-	-	1.4	-	-	3.0	1.4	-	9.1	9.0
Aut 2023	11.5	Dry	Dry	20.8	-	Dry	5.3	-	2.8	1.2	-	9.4	3.1
Spr 2023	19.3	Dry	8.7	11.4	Dry	Dry	2.6	2.6	1.6	1.8	3.5	**145.0**	4.0
Aut 2024	17.7	Dry	Dry	**41.7**	Dry	Dry	Dry	Dry	5.0	6.8	5.0	**30.0**	5.0

Status	Impact								Control				
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Moore Creek		Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	MC14	MC15	HC6	HC7	HC8
Dissolved oxygen (% sat)-													
Spr 2019	**23.9**	-	Dry	-	-	-	-	-	Dry	102.4	-	101.4	**74.2**
Aut 2020	**44.1**	-	**53.4**	-	-	-	-	-	47.1	80.8	-	**69.8**	**70.5**
Spr 2020	**83.6**	-	**81.5**	-	-	-	-	-	-	-	-	100.2	94.7
Aut 2021	91.4	-	96.0	-	-	-	-	-	101.5	106.0	-	104.6	107.3
Spr 2021	105.5	104.4	97.6	-	-	103.1	-	-	119.3	99.5	-	114.7	120.8
Aut 2022	100.3	99.6	109.0	-	-	108.8	-	-	99.4	100.4	-	102.7	109.1
Spr 2022	91.2	101.8	98.7	-	-	97.0	-	-	101.8	97.0	-	114.4	103.9
Aut 2023	99.4	Dry	Dry	**76.8**	-	Dry	**42.9**	-	103.0	104.0	-	90.6	114.5
Spr 2023	129.5	Dry	**31.5**	**59.4**	Dry	Dry	**33.2**	**39.6**	**79.7**	**85.1**	**67.4**	**7.6**	107.7
Aut 2024	**44.8**	Dry	Dry	**28.9**	Dry	Dry	Dry	Dry	**74.0**	**82.8**	**87.2**	**82.9**	**62.8**
pH													
Spr 2019	**6.32**	-	Dry	-	-	-	-	-	Dry	**4.55**	-	**5.05**	**5.76**
Aut 2020	7.47	-	7.26	-	-	-	-	-	**8.09**	7.78	-	7.90	7.87
Spr 2020	6.52	-	6.83	-	-	-	-	-	-	-	-	6.99	7.15
Aut 2021	7.01	-	7.48	-	-	-	-	-	**8.30**	8.74	-	7.18	7.20
Spr 2021	**5.88**	**5.82**	**4.50**	-	-	**5.86**	-	-	6.50	**5.04**	-	**4.80**	**5.07**

Status	Impact								Control				
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Moore Creek		Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	MC14	MC15	HC6	HC7	HC8
Aut 2022	7.35	7.38	7.33	-	-	7.39	-	-	6.71	7.03	-	6.76	6.79
Spr 2022	7.10	**6.48**	7.04	-	-	6.57	-	-	**6.48**	6.57	-	7.47	7.73
Aut 2023	7.06	Dry	Dry	**6.26**	-	Dry	**4.17**	-	**5.66**	**4.92**	-	**6.40**	6.66
Spr 2023	6.63	Dry	**6.34**	**6.15**	Dry	Dry	**4.52**	5.70	**5.56**	7.10	**5.57**	**5.15**	8.14
Aut 2024	7.03	Dry	Dry	7.41	Dry	Dry	Dry	Dry	**5.89**	**5.01**	**5.92**	6.61	7.40
Alkalinity (mg CaCO3/L)													
Spr 2019	40	-	Dry	-	-	-	-	-	Dry	10	-	10	40
Aut 2020	20	-	20	-	-	-	-	-	40	20	-	20	20
Spr 2020	20	-	40	-	-	-	-	-	-	-	-	20	40
Aut 2021	20	-	40	-	-	-	-	-	20	20	-	20	20
Spr 2021	20	20	20	-	-	20	-	-	20	20	-	20	20
Aut 2022	40	40	40	-	-	40	-	-	20	20	-	40	60
Spr 2022	20	20	20	-	-	20	-	-	20	20	-	20	20
Aut 2023	20	Dry	Dry	20	-	Dry	<10	-	20	20	-	20	20
Spr 2023	60	Dry	40	20	Dry	Dry	60	20	20	40	20	40	40
Aut 2024	40	Dry	Dry	40	Dry	Dry	Dry	Dry	20	20	20	40	40

Note: Bold cells highlight those variables that exceed the default trigger values.

3.5 AUSRIVAS

The AUSRIVAS results showed all sites recorded OE50 scores within Band B (Table 11, Figure 4). This indicates that overall, the macroinvertebrate assemblages present at all sites were impoverished when compared to the reference site data used by the AUSRIVAS predictive models (at both impact and control sites) representing significant levels of impairment. However, the Band scores are comparable between impact monitoring sites that are part of the Tea Tree Hollow stream network (which held water), and the control monitoring sites in Hornes Creek.

The SIGNAL2 scores for all sites varied between 3.08 and 4.73, which are considered low, indicating moderate to severe levels of impairment and poor to very poor water quality conditions across the sites (Table 11). This includes the control sites. The low scores reflect the dominance of pollution tolerant macroinvertebrates and presence of few pollution-sensitive taxa. This is common in low flow pool edge habitat in the area. Control site HC6 recorded the highest SIGNAL2 score, while impact site TTH12 recorded the lowest. It is noted that the most downstream impact monitoring site that held water, TTH13(d/s), recorded a higher SIGNAL2 score than two of the three controls. The autumn 2024 SIGNAL2 results are generally improved, or consistent with those in spring 2023 (Figure 5). The exception being control monitoring site HC8. There has been a general trend of overall declining SIGNAL2 scores since spring 2022, including at the control sites. This likely reflects the harsher environmental conditions that have occurred during this time, with a transition from consistently elevated rainfall conditions to drier and more sporadic rainfall events.

The EPT index results, showed that few families that are considered sensitive to pollution, were represented at the majority of sites (Table 11). The number of taxa and number of EPT taxa are low, but comparable, across both impact and control sites, as well as to previous data collection.

The autumn 2024 results are generally comparable between the impact and control sites (which held water) and within the range of previous results collected (Figure 5).

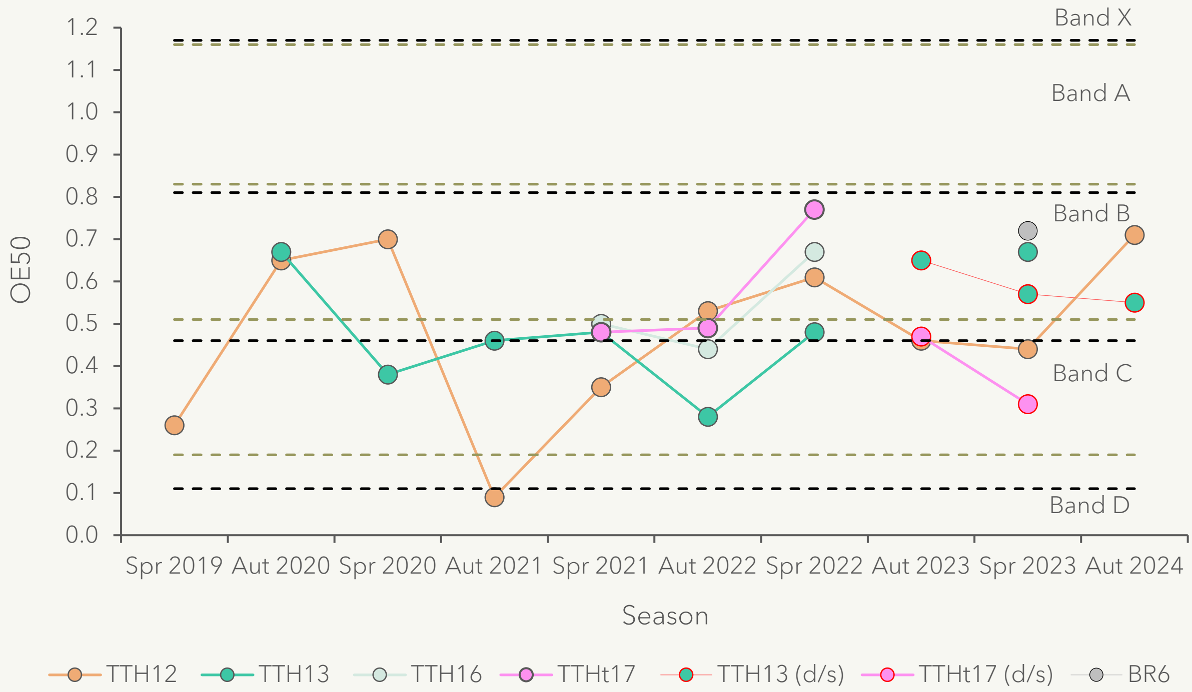
Table 11 AUSRIVAS and macroinvertebrate results

Status	Impact								Control		
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	HC6	HC7	HC8
OE50											
Spr 2019	0.26	-	-	-	-	-	-	-	-	0.52	0.34
Aut 2020	0.65	-	0.67	-	-	-	-	-	-	0.46	0.64
Spr 2020	0.7	-	0.38	-	-	-	-	-	-	0.50	0.59
Aut 2021	0.09	-	0.46	-	-	-	-	-	-	0.55	0.74
Spr 2021	0.35	0.5	0.48	-	-	0.48	-	-	-	0.35	0.59
Aut 2022	0.53	0.44	0.28	-	-	0.49	-	-	-	0.55	0.65
Spr 2022	0.61	0.67	0.48	-	-	0.77	-	-	-	0.64	0.59
Aut 2023	0.46	Dry	Dry	0.65	-	Dry	0.47	-	-	0.37	0.37
Spr 2023	0.44	Dry	0.67	0.57	Dry	Dry	0.31	0.72	0.70	0.49	0.44
Aut 2024	0.71	Dry	Dry	0.55	Dry	Dry	Dry	Dry	0.55	0.55	0.55
Band											
Spr 2019	C	-	Dry	-	-	-	-	-	-	B	C
Aut 2020	B	-	B	-	-	-	-	-	-	C	B
Spr 2020	B	-	C	-	-	-	-	-	-	C	B
Aut 2021	D	-	C	-	-	-	-	-	-	B	B
Spr 2021	C	C	C	-	-	C	-	-	-	C	B

Status	Impact								Control		
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	HC6	HC7	HC8
Aut 2022	B	C	C	-	-	B	-	-	-	B	B
Spr 2022	B	B	C	-	-	B	-	-	-	B	B
Aut 2023	C	Dry	Dry	B	-	Dry	B	-	-	C	C
Spr-2023	C	Dry	B	B	Dry	Dry	C	B	B	C	C
Aut 2024	B	Dry	Dry	B	Dry	Dry	Dry	Dry	B	B	B
SIGNAL2											
Spr 2019	3.00	-	-	-	-	-	-	-	-	2.83	3.25
Aut 2020	3.77	-	3.47	-	-	-	-	-	-	4.07	3.53
Spr 2020	3.8	-	3.11	-	-	-	-	-	-	3.47	3.93
Aut 2021	3.5	-	3.75	-	-	-	-	-	-	4.33	4.09
Spr 2021	3.88	3.80	4.56	-	-	3.67	-	-	-	4.8	4.19
Aut 2022	3.9	3.75	4.33	-	-	3.86	-	-	-	4.21	4.00
Spr 2022	4.07	4.64	4.46	-	-	3.58	-	-	-	3.46	4.31
Aut 2023	4.00	Dry	Dry	3.9	-	Dry	4	-	-	3.78	3.14
Spr 2023	2.88	Dry	3.31	2.38	Dry	Dry	2.4	3.5	4.33	3.2	3.54
Aut 2024	3.08	Dry	Dry	3.73	Dry	Dry	Dry	Dry	4.73	3.15	3.09
No. taxa											
Spr 2019	6	-	Dry			-		-		13	19

Status	Impact								Control		
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	HC6	HC7	HC8
Aut 2020	13	-	15			-		-		14	15
Spr 2020	15	-	9			-		-		15	15
Aut 2021	2	-	9			-		-		11	12
Spr 2021	12	11	13			13		-		11	17
Aut 2022	10	14	9			8		-		19	14
Spr 2022	15	14	13			12		-		13	13
Aut 2023	8	Dry	Dry	10		Dry	9	-		9	7
Spr 2023	8	Dry	13	8	Dry	Dry	5	12	12	10	13
Aut 2024	13	Dry	Dry	12	Dry	Dry	Dry	Dry	11	14	12
EPT taxa											
Spr 2019	0	-	Dry			-		-		1	1
Aut 2020	4	-	3			-		-		4	3
Spr 2020	4	-	2			-		-		3	5
Aut 2021	0	-	2			-		-		3	2
Spr 2021	2	3	4			2		-		3	2
Aut 2022	2	4	4			2		-		4	3
Spr 2022	3	4	3			2		-		3	3
Aut 2023	3	Dry	Dry	3		Dry	2	-		2	1

Status	Impact								Control		
Waterway	Tea Tree Hollow				Tea Tree Hollow tributary (western arm)			Bargo River tributary	Hornes Creek		
Site	TTH12	TTH16	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRT6	HC6	HC7	HC8
Spr 2023	0	Dry	1	0	Dry	Dry	0	3	3	1	1
Aut 2024	2	Dry	Dry	3	Dry	Dry	Dry	Dry	3	1	0



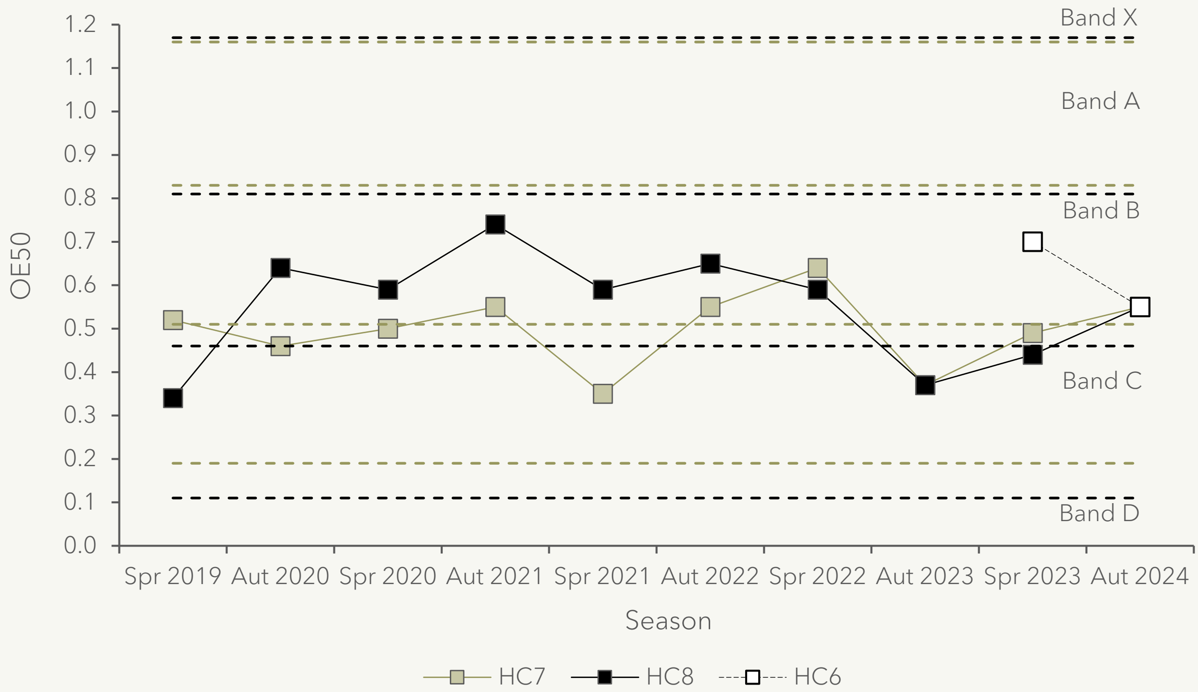
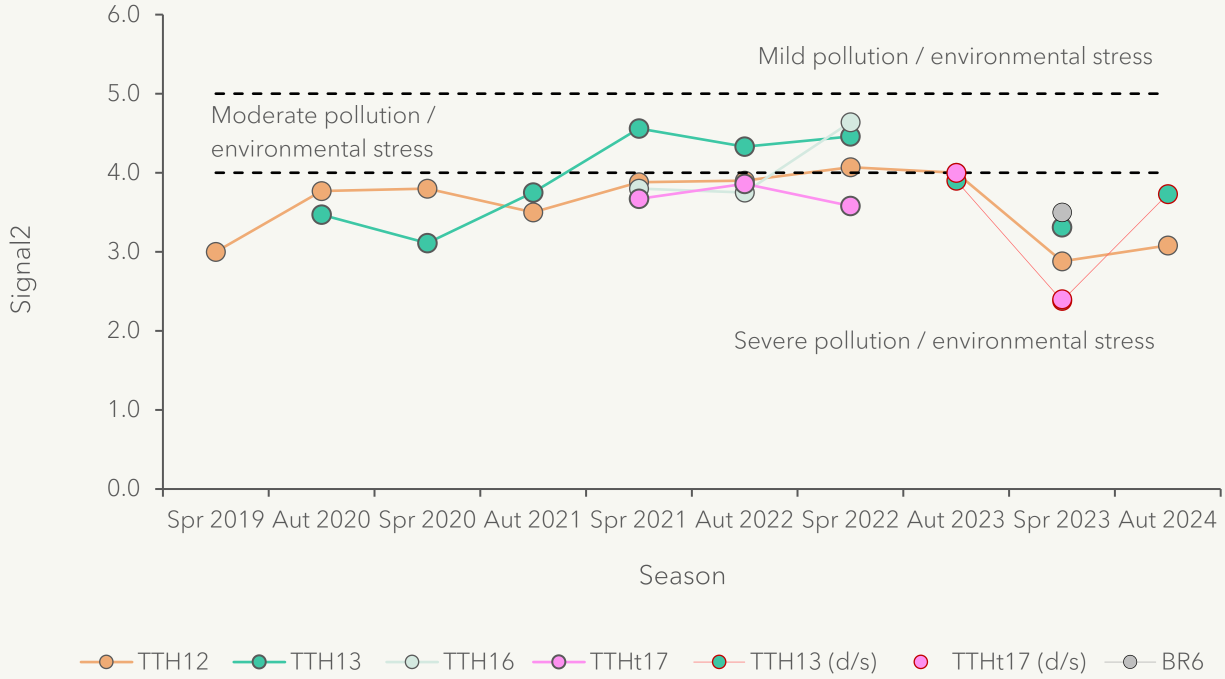


Figure 4 AUSRIVAS OE50 scores recorded at impact sites (above) and control sites (below). Baseline: spring 2019 – autumn 2022, during mining: spring 2022 – autumn 2024.



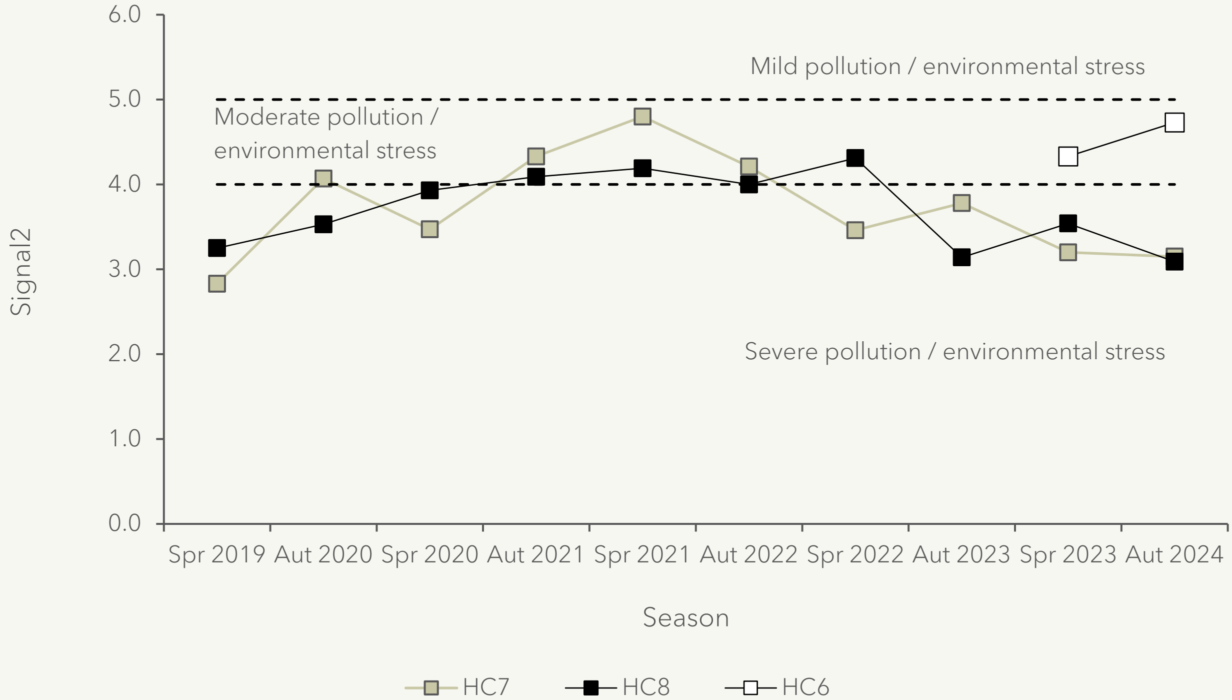


Figure 5 SIGNAL2 scores recorded at impact sites (above) and control sites (below). Baseline: spring 2019 – autumn 2022, during mining: spring 2022 – autumn 2024.

3.6 Macroinvertebrate quantitative analysis

Quantitative analysis has been confined to impact site TTH12 (with all other quantitative impact sites being dry) in autumn 2024.

3.6.1 Overall assessment (five-factor design)

An assessment of the overall quantitative dataset consistent with previous iterations of the program (section 2.4.4 and 2.5), with dry sites excluded, is presented in this section. This includes statistical comparisons to control sites. Significant differences that are confined to the control sites are not explored.

Assemblages

Significant differences were detected for the interaction term of St(Tr) x Su(Pe) (Table 12). Further investigation of the sites factor is limited to comparisons within streams. In this survey, these comparisons are confined to Hornes Creek (control sites) and therefore further investigation is not relevant. For the interaction of stream with survey, comparisons between the autumn 2024 survey and previous surveys within Tea Tree Hollow were of interest, however the pairwise comparisons (Table 13)) did not detect any significant differences within Tree Hollow between the most recent and previous surveys.

Table 12 Macroinvertebrate assemblage PERMANOVA results

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Tr	1	7208	7208	0.6840	0.8870	9914
Pe	1	6120	6120	0.7479	0.8176	9920
St(Tr)	1	9762	9762	1.5333	RED	9916
Su(Pe)	8	52667	6583	3.3244	RED	9880
TrxPe	1	3615	3615	0.8210	0.7256	9898
Si(St(Tr))	2	9928	4964	3.8964	**0.0003**	9910
TrxSu(Pe)	8	19992	2499	1.2619	0.1347	9882
PexSt(Tr)	1	4774	4774	1.6296	0.0855	9920
PexSi(St(Tr))**	1	1676	1676	1.3151	0.2494	9945
St(Tr)xSu(Pe)**	7	14880	2126	1.6685	**0.0169**	9872
Su(Pe)xSi(St(Tr))**	9	11466	1274	1.2381	0.0970	9845
Res	82	84379	1029			
Total	122	247700				

Note: significant values are highlighted in bold.

Table 13 Pairwise comparisons between St(Tr) x Su(Pe) for autumn 2024 within Tea Tree Hollow

Survey	t	P(perm)	Unique perms	P(MC)
Autumn2024, Spring2023	1.902	0	10	0.0525
Autumn2024, Autumn2023	0.714	1	10	0.6364
Autumn2024, Spring2022	1.665	0	10	0.1029

Abundance

Significant differences (Table 14) were detected for the interaction term Su(Pe) x Si(St(Tr)), indicating differences between surveys that were dependent on site, and differences between sites that were dependent on survey. Pairwise comparisons (Table 14) between surveys for the impact sites (TTH12 only) for the during mining period found that the autumn 2024 survey was significantly different to the autumn 2023 and spring 2022 surveys. A review of abundance results throughout the program (Figure 6) identifies that the autumn 2024 result, although low, is within the range of baseline data collected being above that recorded in autumn 2022. Niche (2022) attributed that low result to the intense rainfall conditions prior to sampling. The autumn 2024 result was also above that of spring 2023, which was characterised by low rainfall conditions.

Table 14 Macroinvertebrate abundance PERMANOVA results

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Tr	1	0.43	0.43	0.2039	0.9778	9948
Pe	1	2.21	2.21	0.4159	0.8465	9955
St(Tr)	1	27.12	27.12	2.3572	0.1461	9952
Su(Pe)	8	135.21	16.90	2.9295	RED	9950
TrxPe	1	3.64	3.64	0.7941	0.5907	9963
Si(St(Tr))	2	16.80	8.40	1.4263	RED	9920
TrxSu(Pe)	8	74.13	9.27	1.6062	0.2336	9951
PexSt(Tr)	1	3.03	3.03	1.1551	0.4266	9964
PexSi(St(Tr))**	1	1.74	1.74	0.2947	0.6125	9524
St(Tr)xSu(Pe)**	7	40.21	5.74	0.9752	0.5081	9947
Su(Pe)xSi(St(Tr))**	9	53.01	5.89	2.1563	**0.0366**	9845
Res	82	224.00	2.73			
Total	122	642.73				

Note: significant values are highlighted in bold.

Table 15 Pairwise comparisons between St(Tr) x Su(Pe) for autumn 2024 within Tea Tree Hollow

Survey	Surveys	t	P(perm)	Unique perms	P(MC)
TTH12	Spring2023, Autumn2024	0.66767	0.499	10	0.5354
TTH12	Autumn2024, Spring2022	2.9785	0.1057	10	0.0404
TTH12	Autumn2024, Autumn2023	3.3276	0.0999	10	0.0290

Note: significant values are highlighted in bold.

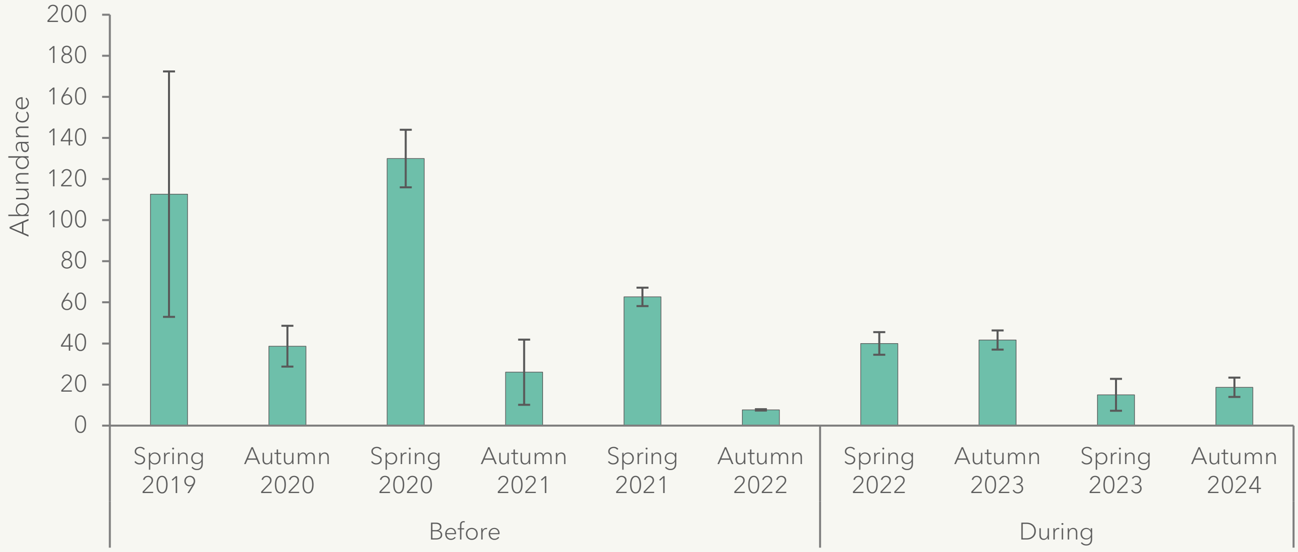


Figure 6 Abundance of taxa ($\bar{x}$, ±SE) recorded at TTH12

Richness

Significant differences were detected for the interaction term Su(Pe) x Si(St(Tr)), indicating differences between surveys that were dependent on site and differences between sites that were dependent on survey (Table 16). Pairwise comparisons did not detect any significant differences between autumn 2024 and other surveys in the during mining period at impact site TTH12 (Table 17).

Table 16 Macroinvertebrate richness PERMANOVA results

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Tr	1	0.43	0.43	0.2039	0.9778	9948
Pe	1	2.21	2.21	0.4159	0.8465	9955
St(Tr)	1	27.12	27.12	2.3572	0.1461	9952
Su(Pe)	8	135.21	16.90	2.9295	RED	9950
TrxPe	1	3.64	3.64	0.7941	0.5907	9963
Si(St(Tr))	2	16.80	8.40	1.4263	RED	9920
TrxSu(Pe)	8	74.13	9.27	1.6062	0.2336	9951
PexSt(Tr)	1	3.03	3.03	1.1551	0.4266	9964
PexSi(St(Tr))**	1	1.74	1.74	0.2947	0.6125	9524
St(Tr)xSu(Pe)**	7	40.21	5.74	0.9752	0.5081	9947
Su(Pe)xSi(St(Tr))**	9	53.01	5.89	2.1563	**0.0366**	9845
Res	82	224.00	2.73			
Total	122	642.73				

Note: significant values are highlighted in bold.

Table 17 Pairwise comparisons between St(Tr) x Su(Pe) for Autumn 2024 within Tea Tree Hollow

Survey	Surveys	t	P(perm)	Unique perms	P(MC)
TTH12	Spring2023, Autumn2024	1.5667	0.3001	6	0.1896
TTH12	Autumn2024, Spring2022	0.61237	0.6992	5	0.5773
TTH12	Autumn2024, Autumn2023	0.61237	0.7051	5	0.5755

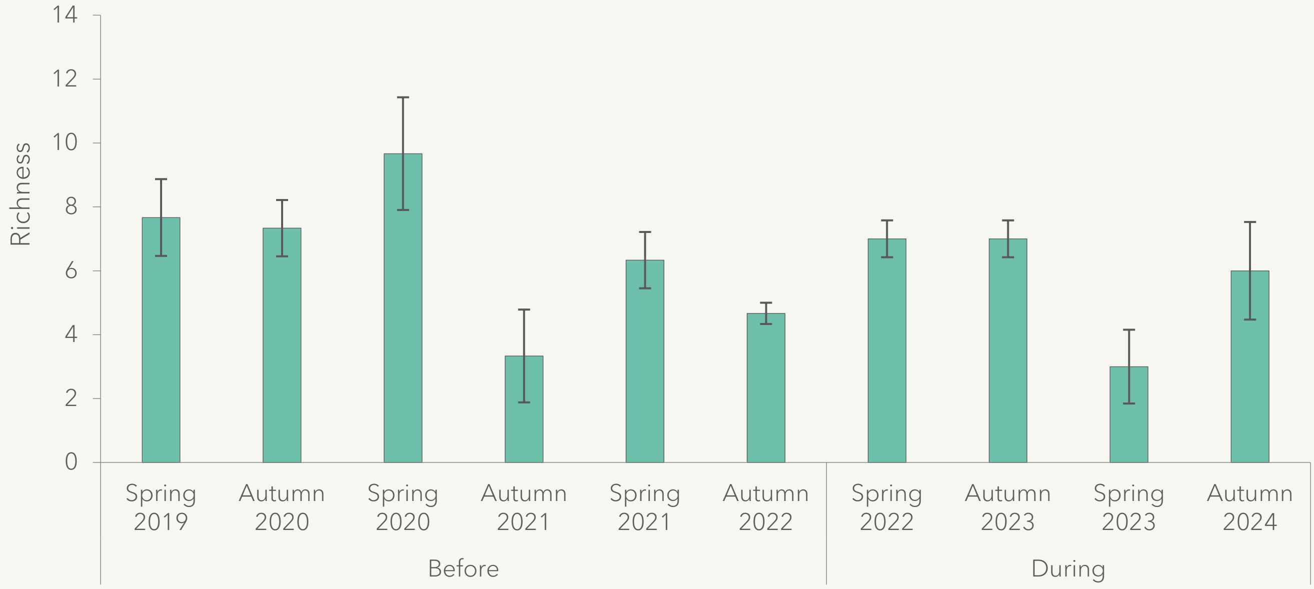


Figure 7 Taxa richness ($\bar{x}$, ±SE) recorded at TTH12

3.6.2 Pool level analysis (one-factor design)

Due to limitations associated with the nested nature of the five-factor design presented above, additional statistical comparisons at the pool level between surveys are presented in this section.

Assemblages

A significant difference was detected for the survey term, when this factor was considered alone (Table 18). Pairwise comparisons (Table 19) did not identify any significant differences between autumn 2024 and previous autumn surveys. Although the autumn 2021 and 2024 comparison approached the significance level (p-value = 0.0501).

Only one autumn-autumn survey comparison (autumn 2020, autumn 2021), was significant (p-value = 0.0298). These surveys were both within the baseline monitoring period and collected under above average rainfall conditions, suggestive of temporal variability at this pool. A number of spring-spring survey comparisons were also significantly different (Table 19). In particular between spring 2019 with spring 2021, 2022 and 2023, spring 2020 with spring 2022 and 2023, spring 2021 with spring 2022.

Table 18 Macroinvertebrate assemblage PERMANOVA results (TTH12) – survey term

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Su	9	40571	4507.9	3.39	**0.0001**	9859
Res	20	26595	1329.8			
Total	29	67166				

Note: significant values are highlighted in bold.

Table 19 Pairwise comparisons of macroinvertebrate assemblages for all surveys (TTH12)

Surveys	t	P(perm)	Unique perms	P(MC)
Autumn2020, Autumn2021	2.3297	0.102	10	**0.0298**
Autumn2020, Autumn2022	1.6107	0.0989	10	0.1038
Autumn2020, Autumn2023	2.8138	0.0931	10	**0.0118**
Autumn2020, Autumn2024	1.7736	0.1013	10	0.0747
Autumn2020, Spring2019	1.8561	0.1014	10	0.0593
Autumn2020, Spring2020	2.433	0.104	10	**0.0162**
Autumn2020, Spring2021	2.7073	0.1036	10	**0.0128**
Autumn2020, Spring2022	1.3837	0.1062	10	0.1687
Autumn2020, Spring2023	1.8688	0.1035	10	0.0511
Autumn2021, Autumn2022	1.4739	0.1012	10	0.1375
Autumn2021, Autumn2023	2.5136	0.1007	10	**0.0274**
Autumn2021, Autumn2024	1.9245	0.0984	10	0.0501
Autumn2021, Spring2019	2.2407	0.1004	10	0.0357
Autumn2021, Spring2020	1.8416	0.1022	10	0.0566
Autumn2021, Spring2021	1.4539	0.1965	10	0.1597
Autumn2021, Spring2022	2.0639	0.0966	10	0.0529
Autumn2021, Spring2023	1.6709	0.1053	10	0.0825
Autumn2022, Autumn2023	0.95035	0.5922	10	0.4445
Autumn2022, Autumn2024	0.51907	1	10	0.8363
Autumn2022, Spring2019	1.7875	0.0966	10	0.0685
Autumn2022, Spring2020	1.8103	0.1022	10	0.0689
Autumn2022, Spring2021	1.6935	0.0918	10	0.0938
Autumn2022, Spring2022	1.3988	0.1948	10	0.1783
Autumn2022, Spring2023	1.2625	0.2975	10	0.2283
Autumn2023, Autumn2024	0.71357	0.8066	10	0.6394
Autumn2023, Spring2019	2.5395	0.0962	10	**0.0153**
Autumn2023, Spring2020	3.102	0.1024	10	**0.008**
Autumn2023, Spring2021	2.5905	0.1062	10	**0.0178**
Autumn2023, Spring2022	2.1603	0.0995	10	**0.0419**

Surveys	t	P(perm)	Unique perms	P(MC)
Autumn2023, Spring2023	2.5261	0.1024	10	**0.0165**
Autumn2024, Spring2019	1.7632	0.1008	10	0.0721
Autumn2024, Spring2020	1.9529	0.1029	10	0.0529
Autumn2024, Spring2021	2.0606	0.0957	10	0.0529
Autumn2024, Spring2022	1.6645	0.1003	10	0.1068
Autumn2024, Spring2023	1.9015	0.0987	10	**0.0476**
Spring2019, Spring2020	1.9168	0.1009	10	0.0547
Spring2019, Spring2021	2.1429	0.0978	10	**0.0281**
Spring2019, Spring2022	2.0882	0.099	10	**0.0318**
Spring2019, Spring2023	1.9656	0.0995	10	**0.0367**
Spring2020, Spring2021	1.8881	0.0941	10	0.0534
Spring2020, Spring2022	2.448	0.1004	10	**0.0172**
Spring2020, Spring2023	1.8675	0.1006	10	**0.0461**
Spring2021, Spring2022	2.2543	0.1054	10	**0.0210**
Spring2021, Spring2023	1.8178	0.1033	10	0.0577
Spring2022, Spring2023	1.8293	0.0986	10	0.0541

Note: significant values are highlighted in bold and autumn 2024 comparisons are highlighted orange

The PCO analysis (Figure 8) found that that the first two axes explain 46.2% of the variation. The PCO plot shows that the autumn 2021 survey is somewhat separated from other surveys. The autumn surveys show a lower degree of overlap with other surveys in contrast to the spring surveys that cluster together to a greater degree. The autumn 2024 survey is shown to overlap to some extent with the autumn 2023 survey. The strongest driver of differences was a negative relationship of Caenidae with both the x and y axis, a positive relationship of Oligochaete with the y axis, a positive relationship of Baetidae with the x axis and negative with the y axis for Ecnomidae. A review of the detection data for these taxa has not identified any significant changes in detection between the baseline and during mining periods, with variability between individual seasons evident.

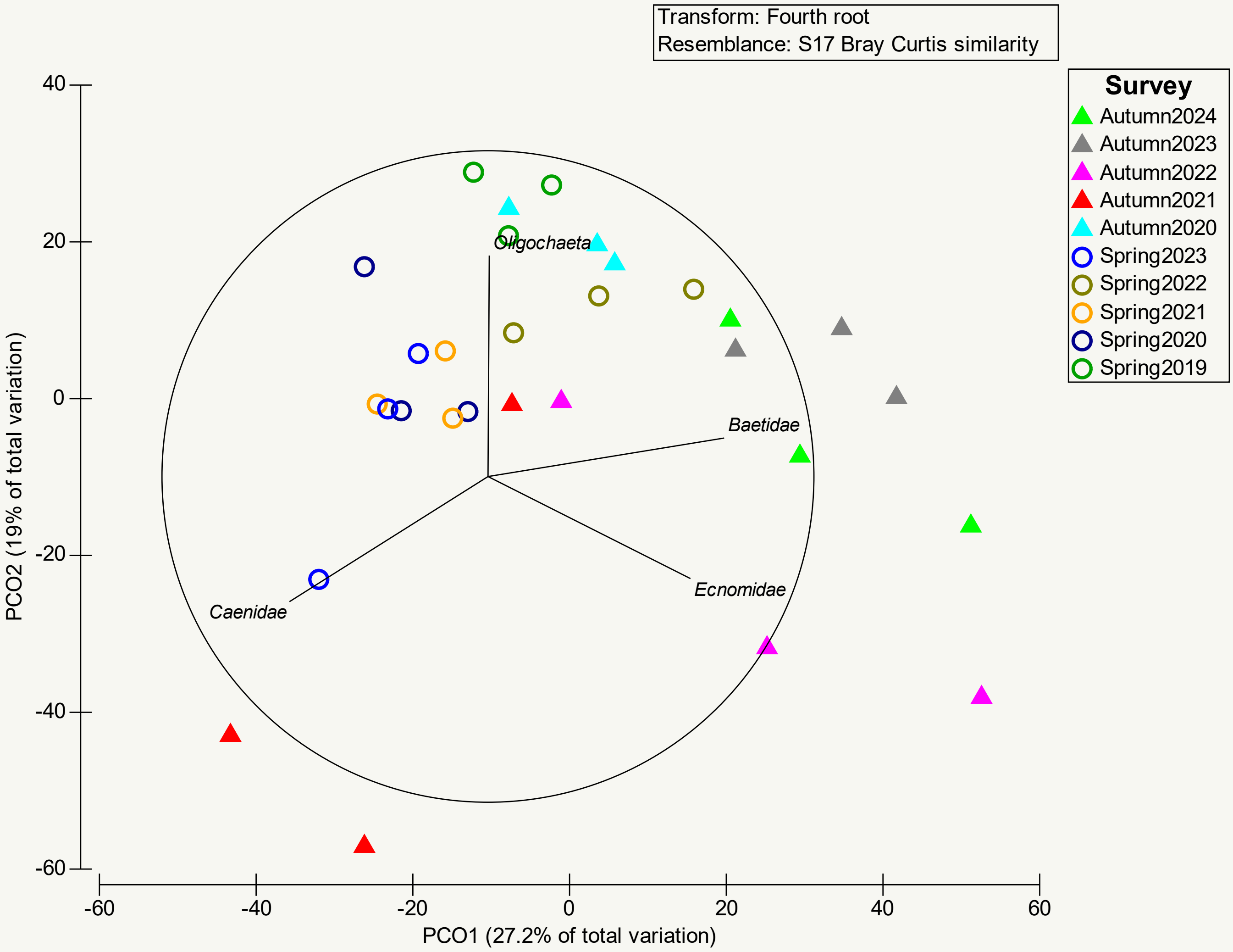


Figure 8 Graph of the two first axis from the PCO analysis for TTH12. Vectors based on Spearman Coefficient> 0.65.

Abundance

A significant difference was detected for the survey term, when this factor was considered alone (Table 22). Pairwise comparisons (Table 21)) detected significant differences between autumn 2024 with autumn 2022 (p-value = 0.0333), and with autumn 2023 (p-value = 0.0305). A review of Figure 6 (presented in section 3.6.1) identifies that this is due to the low abundance levels in autumn 2022 and higher abundance levels in autumn 2023. Figure 6 also shows that the autumn 2024 result, although low, is within the range of baseline data collected being above that recorded in autumn 2022.

A number of spring-spring survey comparisons were also significantly different between 2020 and 2023 (Table 20). This includes differences between spring 2020 and 2021 (p-value = 0.0059) within the baseline monitoring period, indicating natural levels of variability at this pool. However significant differences between the spring 2021 and 2020 baseline surveys with both of the during mining (spring 2022 and 2023) surveys also identified, with Figure 6 showing lower levels of detections in the during mining surveys.

Table 20 Macroinvertebrate abundance PERMANOVA results (TTH12) – survey term

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Su	9	8.0267	0.89186	5.425	**0.001**	9936
Res	20	3.288	0.1644			
Total	29	11.315				

Note: significant values are highlighted in bold

Table 21 Pairwise comparisons of macroinvertebrate abundance (TTH12) – survey term

Surveys	t	P(perm)	Unique perms	P(MC)
Spring2019, Autumn2020	1.2417	0.3086	10	0.2818
Spring2019, Spring2020	0.6488	0.5908	10	0.5559
Spring2019, Autumn2021	1.6387	0.2049	10	0.1759
Spring2019, Spring2021	0.55121	0.7009	10	0.6154
Spring2019, Autumn2022	3.0544	0.095	7	**0.0362**
Spring2019, Spring2022	1.1984	0.3978	10	0.2932
Spring2019, Autumn2023	1.1429	0.3985	10	0.3199
Spring2019, Spring2023	2.2717	0.1981	10	0.0849
Spring2019, Autumn2024	2.1251	0.1908	7	0.0995
Autumn2020, Spring2020	4.9893	0.0978	10	**0.0081**
Autumn2020, Autumn2021	0.94905	0.4003	10	0.3977
Autumn2020, Spring2021	2.1239	0.1929	10	0.1036
Autumn2020, Autumn2022	5.1349	0.0966	7	**0.0071**
Autumn2020, Spring2022	0.23532	0.8004	10	0.8230
Autumn2020, Autumn2023	0.41029	0.8055	7	0.6964
Autumn2020, Spring2023	1.9565	0.2088	10	0.1199
Autumn2020, Autumn2024	2.0594	0.1935	10	0.1147
Spring2020, Autumn2021	2.9531	0.0945	10	**0.0405**
Spring2020, Spring2021	5.1935	0.0992	10	**0.0059**
Spring2020, Autumn2022	17.747	0.097	7	**0.0003**
Spring2020, Spring2022	6.7415	0.1011	10	**0.0023**
Spring2020, Autumn2023	6.9938	0.1024	10	**0.0026**
Spring2020, Spring2023	5.3157	0.0997	10	**0.0062**
Spring2020, Autumn2024	8.4319	0.1074	10	**0.0006**
Autumn2021, Spring2021	1.7638	0.2013	10	0.1568
Autumn2021, Autumn2022	0.7779	0.6948	7	0.4797
Autumn2021, Spring2022	1.077	0.3954	10	0.3407
Autumn2021, Autumn2023	1.1452	0.4033	10	0.3042

Surveys	t	P(perm)	Unique perms	P(MC)
Autumn2021, Spring2023	0.29552	0.8002	10	0.7867
Autumn2021, Autumn2024	9.1285E-2	1	10	0.9300
Spring2021, Autumn2022	20.985	0.1004	7	**0.0001**
Spring2021, Spring2022	3.0276	0.0965	10	**0.0351**
Spring2021, Autumn2023	3.0918	0.1019	10	**0.0333**
Spring2021, Spring2023	3.4891	0.0976	10	**0.0255**
Spring2021, Autumn2024	5.6267	0.101	10	**0.0054**
Autumn2022, Spring2022	9.523	0.102	7	**0.0005**
Autumn2022, Autumn2023	11.56	0.1018	7	**0.0005**
Autumn2022, Spring2023	0.72658	0.7014	7	0.5072
Autumn2022, Autumn2024	3.1315	0.0988	7	**0.0333**
Spring2022, Autumn2023	0.25171	0.8014	10	0.8136
Spring2022, Spring2023	2.2986	0.0997	10	0.0805
Spring2022, Autumn2024	2.9785	0.1003	10	**0.0416**
Autumn2023, Spring2023	2.4330	0.1046	10	0.0748
Autumn2023, Autumn2024	3.3276	0.104	10	**0.0305**
Spring2023, Autumn2024	0.66767	0.4988	10	0.5402

Note: significant values are highlighted in bold and autumn 2024 comparisons are highlighted orange

Richness

A significant difference was detected for the survey term, when this factor was considered alone (Table 22). Pairwise comparisons (Table 23)) did not identify any significant differences between autumn 2024 and previous autumn surveys. One autumn-autumn survey comparison (between autumn 2022 and autumn 2023), was significant (p-value = 0.0236). A review of Figure 7 (presented in section (3.6.1)) shows this difference is due to the high richness levels in autumn 2023 and comparatively low levels in autumn 2022 (during baseline monitoring). A number of spring-spring survey comparisons were also significantly different (Table 20). These were between spring 2023 with spring 2019, spring 2020 and spring 2022. A review of Figure 7 shows that taxa richness during the spring 2023 survey was low in contrast to these other seasons.

Table 22 Macroinvertebrate richness PERMANOVA results (TTH12) – survey

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Su	9	112.8	12.533	3.2982	**0.0109**	189
Res	20	76	3.8			
Total	29	188.8				

Note: significant values are highlighted in bold

Table 23 Pairwise comparisons of macroinvertebrate richness for all surveys (TTH12)

Surveys	t	P(perm)	Unique perms	P(MC)
Spring2019, Autumn2020	0.22361	1	4	0.8297
Spring2019, Spring2020	0.93704	0.6024	6	0.405
Spring2019, Autumn2021	2.2981	0.2015	6	0.0808
Spring2019, Spring2021	0.89443	0.5902	5	0.4193
Spring2019, Autumn2022	2.4054	0.0971	5	0.0743
Spring2019, Spring2022	0.5	0.8971	4	0.6434
Spring2019, Autumn2023	0.5	0.9012	4	0.6466
Spring2019, Spring2023	2.8	0.1046	8	0.0479
Spring2019, Autumn2024	0.85749	0.5049	6	0.4361
Autumn2020, Spring2020	1.1832	0.497	5	0.3012
Autumn2020, Autumn2021	2.3534	0.2003	6	0.0784
Autumn2020, Spring2021	0.80178	0.5901	4	0.4637
Autumn2020, Autumn2022	2.8284	0.0951	5	0.0507
Autumn2020, Spring2022	0.31623	1	3	0.7664
Autumn2020, Autumn2023	0.31623	1	3	0.7665
Autumn2020, Spring2023	2.9824	0.0998	7	0.0410
Autumn2020, Autumn2024	0.75593	0.5929	6	0.4970
Spring2020, Autumn2021	2.7714	0.1038	8	0.0502
Spring2020, Spring2021	1.6903	0.1962	7	0.1621
Spring2020, Autumn2022	2.7854	0.0977	7	0.0480
Spring2020, Spring2022	1.4368	0.2958	5	0.2213
Spring2020, Autumn2023	1.4368	0.3074	5	0.2359
Spring2020, Spring2023	3.1623	0.1046	6	0.0356
Spring2020, Autumn2024	1.5714	0.2968	6	0.1915
Autumn2021, Spring2021	1.765	0.3005	5	0.1463
Autumn2021, Autumn2022	0.89443	0.5912	5	0.4206
Autumn2021, Spring2022	2.3452	0.1982	6	0.0776
Autumn2021, Autumn2023	2.3452	0.2009	6	0.0802
Autumn2021, Spring2023	0.17961	1	4	0.8604
Autumn2021, Autumn2024	1.2649	0.3946	7	0.2781
Spring2021, Autumn2022	1.7678	0.2922	3	0.1498
Spring2021, Spring2022	0.63246	0.8014	4	0.5706
Spring2021, Autumn2023	0.63246	0.803	4	0.5664
Spring2021, Spring2023	2.2942	0.2027	6	0.0805
Spring2021, Autumn2024	0.18898	1	5	0.8583
Autumn2022, Spring2022	3.5	0.1	4	0.0264
Autumn2022, Autumn2023	3.5	0.107	4	0.0236

Surveys	t	P(perm)	Unique perms	P(MC)
Autumn2022, Spring2023	1.3868	0.4001	4	0.2467
Autumn2022, Autumn2024	0.8528	0.9022	3	0.4368
Spring2022, Autumn2023	Negative			
Spring2022, Spring2023	3.0984	0.1069	7	**0.0358**
Spring2022, Autumn2024	0.61237	0.6971	5	0.5710
Autumn2023, Spring2023	3.0984	0.0983	7	**0.0398**
Autumn2023, Autumn2024	0.61237	0.6988	5	0.5729
Spring2023, Autumn2024	1.5667	0.2873	6	0.1932

Note: significant values are highlighted in bold and autumn 2024 comparisons are highlighted orange

4 Discussion

4.1 Ecological trends

The autumn 2024 surveys were preceded by below average seasonal rainfall, although substantial rainfall did occur in the two weeks prior to survey. Observed habitat conditions at the impact sites represented a continuation of low flow conditions, observed during recent monitoring. This was reflected in the observations of low flows, limited organic debris and lower flow levels across the monitoring sites.

Impact sites TTH16, TTH13, TTHt9, TTHt17, TTHt17(d/s) and BRt6 were dry during the autumn 2024 surveys, with TTH12 and TTH13(d/s) holding water. These dry conditions were not as acute at Hornes Creek or Moore Creek, with all control sites were holding water.

Where AUSRIVAS samples could be collected, the biological monitoring results indicate relatively consistent conditions between impact sites TTH12 and TTH13(d/s) and the control sites. When taken together the stream health indices indicate reasonable levels of biological health across these sites in autumn 2024.

The five-factor analysis identified significant differences in macroinvertebrate assemblages as well as taxa abundance and richness at site TTH12 as part of the five-factor design. However, further assessment of the data did not identify indicators of mining induced impact at this site in autumn 2024, with the abundance and richness results being within the range of baseline data collected. Pairwise tests did not detect any significant differences in the macroinvertebrate assemblage at TTH12 between autumn 2024 and previous surveys.

Additional pool level (one-factor) statistical analysis at TTH12 was included for the first time in autumn 2024. These analyses did identify significant differences in macroinvertebrate abundance and richness results between autumn 2024 with autumn 2022 and autumn 2023, but not assemblages. Further analysis identified that the autumn 2024 results, although low, are within the range of baseline data collected. A review of the macroinvertebrate assemblage data did not identify any significant changes in taxa detection between the baseline and during mining periods, with variability between individual seasons evident.

These additional statistical analyses also identified a number of statistical differences between the spring 2023 survey results at TTH12 and those of previous surveys. The quantitative results in spring 2023 were considered low and likely reflect the fluctuation in water levels at this pool prior to sampling (Niche 2023). ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH12, related to mining effects in combination with the prevailing climatic conditions. Although a further review of the biological data identified that the results were overall comparable to results from the baseline period and to trends at control sites. This pool will be re-assessed in detail in following iterations to determine if the macroinvertebrate assemblage continues to recover.

4.2 Assessment of potential impacts

Observations of mining induced change were first recorded in autumn 2023 at Tea Tree Hollow sites TTH16, TTHt17 and TTH13 (Niche 2023, MSEC 2023), with each of these sites being dry. In autumn 2024, sites TTHt17 and TTH16 were again dry (third consecutive season). Site TTH13 was also dry, for the second season (non-consecutive) since autumn 2023.

The outcomes of the review of data collected at each pool and assessment against the BMP1 TARP is presented in Table 24.

Table 24 Summary of stream health indicators at impact sites

Stream	Site	Stream health indicator summary
Tea Tree Hollow	TTH12	– Low dissolved oxygen levels were recorded but were within the range of baseline monitoring results. Other water quality parameters were within DGVs.

Stream	Site	Stream health indicator summary
		– The AUSRIVAS (Band, SIGNAL2, EPT and number of taxa) scores were within the range of baseline monitoring results and comparable to control sites. – The quantitative monitoring data does not identify any significant differences between the autumn 2024 survey data and that of previous surveys that indicate a decline in ecosystem health associated with mining induced change. – On the basis of the above results, no TARP is triggered.
	TTH16	– Pool dry (third consecutive season). – ATC Williams (2024b) reported that *"A maximum Level 3 trigger exceedance was recoded at monitoring site TT3-QLa due to mining related fracturing in the vicinity of pool TT11 and pool TT3 in combination with climatic conditions."* – The results align with a level 2 TARP (Table 21).
	TTH13	– Pool dry (first consecutive season). This pool was also dry in autumn 2023, but not spring 2023. – No aquatic ecology TARP is triggered at this site. – ATC Williams (2024b) reported that: *"A maximum Level 2 trigger exceedance was recorded at monitoring site TT13-QLa as a result of upstream mining-related fracturing in combination with climatic conditions."* – The pattern of dry conditions between autumn 2023 and 2024, pool observations and assessment of macroinvertebrate taxa recorded in spring 2023, suggest ongoing harsh environmental conditions at this site.
	TTH13(d/s)	– Elevated electrical conductivity levels, above ANZG DGVs. Other water quality parameters were within DGVs or comparable to readings from control sites. – The AUSRIVAS scores were within the range of baseline monitoring results and comparable to control sites. – This site does not form part of the TARP assessment, rather providing an indication of potential downstream impacts. – The biological monitoring results suggest reasonable stream health conditions at this pool.
Tea Tree Hollow tributary (western arm)	TTHt9	– Dry (second consecutive season). – ATC Williams (2024b) reported that: *"A maximum Level 2 trigger exceedance was recorded at monitoring site TT9-QLa due to mining-related effects in combination with climatic conditions."* – However, the surface water review covering the spring 2023 season (ATC Williams (2024a) concluded that dry conditions in that period were as a result of the prevailing dry conditions, rather than mining induced change. – No aquatic ecology TARP is triggered at this site.
	TTHt17	– Pool dry (third consecutive season). – ATC Williams (2024b) reported that: *"A maximum Level 2 trigger exceedance was recorded at monitoring site TT12-QLa due to mining-related effects in combination with climatic conditions".* – The results align with a level 2 TARP (Table 21).
	TTHt17(d/s)	– Dry (first season). – This site does not form part of the TARP assessment, rather providing an indication of potential downstream impacts.
Bargo River tributary	BRt6	– Dry (first season). – No TARP is triggered at this site.

4.2.1 TTH13

Niche (2024) recommended detailed assessment of further monitoring findings at pool TTH13.

This pool was dry in autumn 2023, with water returning in spring 2023. ATC Williams (2024a) concluded that there was an atypical water level decline recorded at pool TTH13 between July to November 2023, related to mining effects in combination with the prevailing climatic conditions. This pool recorded poor quantitative macroinvertebrate results (lowest to date) in spring 2023. While the AUSRIVAS results were comparable to control sites, the taxa collected were primarily air breathing, suggesting an early stage of pool recolonisation, potentially indicating more limited water residence at this pool.

This pool was again dry in autumn 2024. ATC Williams (2024b) reported that "*A maximum Level 2 trigger exceedance was recorded at monitoring site TT13-QLa as a result of upstream mining-related fracturing in combination with climatic conditions*."

While an aquatic ecology TARP is not triggered in autumn 2024 as it is not a second consecutive season of dry conditions, the dry conditions at this pool in autumn 2024 suggests an ongoing pattern of harsh environmental conditions associated with upstream mining-related fracturing in combination with climatic conditions.

Further monitoring will be required to establish whether additional time will result in macroinvertebrate assemblage recovery at this site, or harsh conditions continue.

Site TTH13(d/s), established downstream of areas of mining induced change, recorded biological scores comparable to the control sites in autumn 2024. This indicates that the potential impacts that have or are occurring at TTH13 are not impacting downstream conditions. Although it is possible that a decline in stream health indices downstream of areas of mining induced change may be detected over time and should continue to be evaluated in future iterations of the monitoring program.

4.3 Trigger Action Response Plan review

In autumn 2024, the following sites have recorded results that align with BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP:

- TARP level normal:
    - TTH12
    - TTH13
    - TTHt9
    - BRT6
- TARP level 2:
    - TTH16
    - TTHt17

Outcomes of a review against the actions (Table 25) and responses (Table 26) listed in the BMP1 Level 1 TARP are summarised below.

Table 25 Review against BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP actions

Trigger	Action	Outcome
Normal conditions (TTH12, TTH13, TTHt9, BRT6)		
– Visual monitoring indicates aquatic pool habitat parameters are like baseline observations at aquatic ecology monitoring sites. AND – AUSRIVAS score equal to or greater than Band C.	– Continue monitoring and review of data as per monitoring program.	– N/A
Level 1 (no sites)		
– Visual monitoring indicates reduction in aquatic pool habitat compared to baseline observations at aquatic ecology monitoring sites for two consecutive sampling occasions. OR – AUSRIVAS score of Band D recorded for two consecutive sampling occasions at one or more aquatic ecology monitoring site(s).	– Actions as required for Normal Condition.	– Continue monitoring and review of data as per existing monitoring program.
	– Undertake an investigation of BACI quantitative macroinvertebrate data to assess Level 1 observations and determine if mining related or the response to environmental conditions (e.g. drought) within the catchment.	– Not applicable to TTH16 and TTHt17 as no samples could be collected (as relevant to Level 3 review below).
	– Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water monitoring results, groundwater monitoring results).	– ATC Williams (2024b) reported that at TTH16 "*A maximum Level 3 trigger exceedance was recoded at monitoring site TT3-QLa due to mining related fracturing in the vicinity of pool TT11 and pool TT3 in combination with climatic conditions.*" – ATC Williams (2024b) reported that at TTHt17: "*A maximum Level 2 trigger exceedance was recorded at monitoring site TT12-QLa due to mining-related effects in combination with climatic conditions*".
	– Consider and decide on reasonable and feasible options for remediation, where relevant (e.g. limestone cobble for pH management).	– Tahmoor Coal have not proposed any corrective management actions as there are no actions that can currently be completed to correct water level decline. – ATC Williams (2024) note that: *"In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective*

Trigger	Action	Outcome
		Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining."
	– Following investigation, any declines detected that are not attributable to mining impacts (e.g. are a result of environmental conditions or stochastic events) are to be considered 'normal condition' and are continued to be included in the ongoing development of the ecological monitoring dataset.	– Not relevant to TTH16 and TTHt17 to date.
Level 2 (TTH16, TTHt17)		
– Visual monitoring indicates reduction in aquatic pool habitat compared to baseline observations at aquatic ecology monitoring sites for three consecutive sampling occasions. OR – AUSRIVAS score of Band D recorded for three consecutive sampling occasions at one or more aquatic ecology monitoring site(s).	– Actions as stated in Level 1.	– Continue monitoring and review of data as per existing monitoring program. – The outcome of the review of actions for Level 1 are outlined in the cells above.
	– Consider increasing monitoring and review of data frequency where Level 2 has been reached and at other relevant sites, subject to land access.	– Monitoring is completed bi-annually in line with AUSRIVAS monitoring protocols and collection of baseline data. – As mining induced change has so far manifested as pool-drying, rather than water quality decline, there is limited value in increasing biological sampling frequency.
	– Consider the inclusion of additional sites within impact area.	– Additional AUSRIVAS sites downstream of areas of mining induced change observed, TTH13(d/s) and TTH17 (d/s) have been included in the program since autumn 2023 when impacts were first observed. – These additional sites have been established as part of an adaptive monitoring approach to provide

Trigger	Action	Outcome
		an indication of potential impacts downstream of areas of observed mining induced change. – Due to the intermittent nature of the Tea Tree Hollow stream network and prevailing dry conditions, there is limited scope to include additional monitoring sites. – Data from related program sites (Annex 1) may be called upon as relevant, to assist in the interpretation of impacts. This has not been completed to date as the potential impacts to date have so far been primarily via pool drying/reduced flows rather than declining water quality.
	– Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	– Tahmoor Coal have not proposed any corrective management actions as there are no actions that can currently be completed to correct water level decline. – ATC Williams (2024b) note that: *"In accordance with C12 of SSD 8445 and as detailed in the WMP, a Watercourse Corrective Action Management Plan (WCAMP) will be prepared for watercourses damaged by subsidence impacts. The WCAMP will be prepared in consultation with relevant government agencies, as defined in the WMP. The WCAMP will be prepared and implemented at the cessation of subsidence movements associated with Tahmoor South mining*
	– Review Biodiversity Management Plan and modify if necessary.	– No further updates are required in line with the above outcomes.

Table 26 Review against responses, BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP

Trigger	Response	Outcome
Normal conditions (TTH12, TTH13, TTHt9, BRT6)		
– Visual monitoring indicates aquatic pool habitat parameters are similar to baseline observations at aquatic ecology monitoring sites. AND – AUSRIVAS score equal to or greater than Band C.	– No response required.	– N/A
Level 1 (no sites)		
– Visual monitoring indicates reduction in aquatic pool habitat compared to baseline observations at aquatic ecology monitoring sites for two consecutive sampling occasions. OR – AUSRIVAS score of Band D recorded for two consecutive sampling occasions at one or more aquatic ecology monitoring site(s).	– Report trigger exceedance to DPE and key stakeholders.	– Completed as part of this report.
	– Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.	– Completed as part of this report.
	– Provide DPE and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g. limestone cobbles for pH management).	– No CMAs are proposed.
	– Implement CMAs, subject to land access	– No CMAs are proposed.
	– Monitor and report on success of CMAs in Six Monthly Subsidence Impact Report and Annual Review.	– No CMAs are proposed.
	– Continue monitoring to determine if a Level 2 TARP trigger will occur.	– Bi-annual seasonal monitoring (spring and autumn) and review of data is ongoing according to the monitoring program.
Level 2 (TTH16, TTHt17)		
– Visual monitoring indicates reduction in aquatic pool habitat compared to baseline observations at aquatic ecology monitoring sites for three consecutive sampling occasions. OR	– Responses as stated in Level 1.	– Continue monitoring and review of data as per existing monitoring program. – The outcome of the review of responses for Level 1 are outlined in the cells above.
	– Provide findings of CMA review to DPHI and key stakeholders for consultation.	– No CMAs are proposed.

Trigger	Response	Outcome
– AUSRIVAS score of Band D recorded for three consecutive sampling occasions at one or more aquatic ecology monitoring site(s).	– Implement additional CMAs, subject to land access.	– No CMAs are proposed.
	– Advise DPHI and key stakeholders of any required amendments to Biodiversity Management Plan.	– No further updates are required in line with the above outcomes.
	– Continue monitoring to determine if a Level 3 TARP trigger will occur.	– Continue monitoring and review of data as per existing monitoring program.

5 Conclusion

This report presents the results of ten seasons of data collection at impact and control monitoring sites completed to date, with autumn 2024 the fourth 'during' mining season of data collection. The report focusses on describing the findings of the most recent survey and identification of any indicators of potential impact using a suite of aquatic assessment methods. This represents a comprehensive basis upon which to identify and address any potential impacts that may occur under future iterations of the monitoring program during active mining.

Sites TTH16 and TTHt17 have now shown a reduction in aquatic pool habitat being observed over three consecutive sampling seasons leading to them aligning with a TARP level 3. All other impact monitoring sites align with a 'Normal' TARP level in autumn 2024.

Quantitative macroinvertebrate assessment was restricted to site TTH12. Further review of the quantitative macroinvertebrate data identifies that the results are within the range of pre-mining scores and broadly comparable to trends at control sites. Furthermore, nominal AUSRIVAS results were recorded at this pool.

Dry conditions at site TTH13 do not trigger a TARP (dry conditions have not spanned consecutive monitoring surveys) but do indicate an ongoing pattern of harsh environmental conditions at this pool since autumn 2023. Further monitoring will be required to establish whether additional time will result in macroinvertebrate assemblage recovery at this site.

The additional AUSRIVAS samples collected downstream of areas of mining induced change indicate that these changes do not appear to have translated into acute impacts to macroinvertebrate assemblages downstream of TTH13, with site TTH13(d/s) recording AUSRIVAS scores that were within the range of baseline monitoring results and comparable to control sites. Site TTHt17 was dry, with site TTHt17(d/s) that was established downstream, also could not be sampled due to dry conditions.

6 Recommendations

Biological results at sites TTH12 and TTH13 should continue to be reviewed in detail in future iterations to consider if there are any indicators of recovery or declining aquatic ecology conditions in the during mining period.

Dry conditions at a number of impact monitoring sites since autumn 2023 have required modifications to the statistical analysis design. It is recommended that the ongoing overall statistical analysis approach should continue to be augmented by the additional pool level statistical analysis adopted for this iteration of the monitoring program at the individual impact site level, as relevant. This will assist in identifying significant differences at these sites over time that may be masked by the necessity of having survey as a nested factor within period as part of the five-factor design.

In future iterations of the monitoring program, the recently established sites TTH9 and BRt6 should be included for AUSRIVAS sampling only (i.e. remove quantitative sampling), as it has not been possible to collect a quantitative sample at these pools over two seasons due to low water levels.

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8 Annex 1: Monitoring site details

In previous iterations, a number of site code and site numbers have been applied. As of spring 2023, site names have been reviewed and updated for consistency and clarity. Previous site numbers are provided in Table 27.

Table 27 Monitoring site details

Site	Site no. (previous name)	Treatment/ likelihood of impacts	Location	Easting	Northing	Sampling methods	Monitoring period	Comments
BR1	Site 1	Control	Near weir on Bargo River	274424	6206513	Water quality Quantitative	Spring 2019 – autumn 2024	Not sampled in autumn 2020 due to safety and access (landslip and bushfires). Not currently monitored as part of the Tahmoor South program.
BR2	Site 2	Control	Near State Emergency Service 65 Bridge Street	274739	6207065	Water quality Quantitative	Spring 2019 – autumn 2024	Not sampled in autumn 2020 due safety and access (landslip and bushfires). Not currently monitored as part of the Tahmoor South program.
BR3	Site 3	Low	Upstream of Remembrance Drive bridge	276964	6208797	Water quality Quantitative	Spring 2019 – autumn 2024	Not currently monitored as part of the Tahmoor South program. This site is monitored under the aquatic health monitoring program as part of the environmental protection licence (EPL) 1389
BR4	Site 4	Low	Downstream of Remembrance Drive bridge	277034	6208893	Water quality Quantitative	Spring 2019 – autumn 2024	Not currently monitored as part of the Tahmoor South program. This site is monitored under the aquatic health monitoring program as part of the EPL 1389
BR5	Site 5	Downstream potential impact - low	Bargo River upstream of	279490	6207467	Water quality Quantitative	Spring 2019 – autumn 2024	Not currently monitored as part of the Tahmoor South program. This site is monitored under the aquatic health monitoring program as part of the EPL 1389

Site	Site no. (previous name)	Treatment/ likelihood of impacts	Location	Easting	Northing	Sampling methods	Monitoring period	Comments
			Rockford Road bridge					
BR6	Site 6	Downstream potential impact - low	Bargo River downstream of Rockford Road bridge	279630	6207585	Water quality Quantitative	Spring 2019 – autumn 2024	Not currently monitored as part of the Tahmoor South program. This site is monitored under the aquatic health monitoring program as part of the EPL 1389
BRt6	Site 6B	Potential impact	Tributary of Bargo River	275464	6207135	Water quality Quantitative AUSRIVAS	Spring 2023 – autumn 2024	-
TTH	TTH MWD	Downstream potential impact	Tea tree Hollow downstream	277866	6208087	Water quality Quantitative	Autumn 2021 - autumn 2024	Not currently monitored as part of the Tahmoor South program. This site is monitored under the aquatic health monitoring program as part of the EPL 1389
HC6	Site 6	Control	Hornes Creek	275438	6202753	Water quality Quantitative AUSRIVAS	Spring 2023 – Autumn 2024	Located outside of subsidence prediction
HC7	Site 7	Control	Hornes Creek	275705	6203691	Water quality Quantitative AUSRIVAS	Spring 2019 - autumn 2024	Located outside of subsidence prediction
HC8	Site 8	Control	Hornes Creek	275575	6204588	Water quality Quantitative AUSRIVAS	Spring 2019 - autumn 2024	Located outside of subsidence prediction
DTC-US1	DTC4	Control	Dog Trap Creek	279109	6203358	Water quality Quantitative	Spring 2023 – autumn 2024	Upstream control.

Site	Site no. (previous name)	Treatment/ likelihood of impacts	Location	Easting	Northing	Sampling methods	Monitoring period	Comments
						AUSRIVAS		
DTCt-DS1	Site 9 DTC3 DTCTrib DTCt9	Potential impact	Dog Trap Creek	278268	6205037	Water quality Quantitative AUSRIVAS	Spring 2019 – autumn 2020, spring 2023 – autumn 2024	Dry in spring 2019
DTC-DS3	Site 10 DTC2 DTC10 DTCus	Potential impact	Dog Trap Creek	278879	6205973	Water quality Quantitative AUSRIVAS	Spring 2019 – autumn 2020, spring 2023 – autumn 2024	Dry in spring 2019
DTC-DS4	Site 11 DTC11 DTC1	Potential impact	Dog Trap Creek downstream	279194	6206395	Water quality Quantitative AUSRIVAS	Spring 2019 – autumn 2020, spring 2023 – autumn 2024	Dry in spring 2019
TTHt9	Site 9	Potential impact	Tea Tree Hollow tributary (western arm) upstream	277146	6206543	Water quality Quantitative AUSRIVAS	Spring 2023 – autumn 2024	Dry in spring 2023 and autumn 2024
TTH12	Site 12	Potential impact	Tea Tree Hollow upstream	277204	6205632	Water quality Quantitative AUSRIVAS	Spring 2019 - autumn 2024	-
TTH13	Site 13 (TTH11)	Potential impact	Tea tree Hollow downstream	277437	6206801	Water quality Quantitative AUSRIVAS	Autumn 2020 – autumn 2024	Dry in spring 2019, autumn 2023, autumn 2024

Site	Site no. (previous name)	Treatment/ likelihood of impacts	Location	Easting	Northing	Sampling methods	Monitoring period	Comments
TTH13 (d/s)	Site 13 d/s	Potential impact	Tea Tree Hollow – downstream of Site 13	277436	6206771	Water quality AUSRIVAS sampling	Autumn 2023 – autumn 2024	-
MC14	Site 14	Control	Moore Creek upstream	270959	6200225	Water quality Quantitative	Autumn 2020-autumn 2024	Dry in spring 2019
MC15	Site 15	Control	Moore Creek downstream	271328	6204392	Water quality AUSRIVAS	Spring 2019 - autumn 2024	-
TTH16	Site 16 TTH NEW	Potential impact	Tea Tree Hollow at Wimbarra Wildlife Sanctuary	277432	6206040	Water quality Quantitative AUSRIVAS	Spring 2021 – autumn 2024	New site added in between TTH12 and TTH13. Site dry between autumn 2023 to autumn 2024
TTHt17	Site 17 TTH West	Potential impact	Tea Tree Hollow (western arm)	277246	6206601	Water quality Quantitative AUSRIVAS	Spring 2021 – autumn 2024	New site added on western arm of Tea Tree Hollow. Site dry between autumn 2023 to autumn 2024
TTHt17 (d/s)	Site 17 d/s	Potential impact	Tea Tree Hollow tributary (western arm) - Downstream of Site 17	277315	6206638	Water quality AUSRIVAS	Autumn 2023 – autumn 2024	New site added on western arm of Tea Tree Hollow. Dry in autumn 2024

9 Annex 2: Aquatic habitat at monitoring sites

Table 28 Hornes Creek – HC7

Attribute	Note
Vegetation	Dominant canopy species consisted of large smooth barked eucalypt species with a middle stratum dominated by Black Wattle (*Callicoma seratifolia*), *Melaleuca* sp., *Leptospermum* sp., *Acacia longifolia*, *Hakea* sp., *Pomaderris* sp. and *Banksia* sp. The lower stratum was dominated by Spiny-headed Mat-rush (*Lomandra longifolia*), *Banksia spinosa* and the native sedge *Schoenus melanostachys*, with some ferns. Vegetation was burnt in 2020.
Stream shading	Low shading
Exotic vegetation	Present
Modal width (m)	4 m
Substrate	Exposed banks but stable. Slight erosion of lower bank. Bedrock dominated
Flow/depth	Low flow in 2021. Moderate flow in 2022. Depth 1-2 m
Macrophytes/algae	None
Water quality observations	Macrophytes absent
In 2019 the site was sampled further downstream due to lack of water in the system. During 2020-2022 sampling was completed at HC7 as the creek was full.	
Photo log	
	
Spring 2019	Autumn 2020

Attribute	Note
	
Spring 2020	Autumn 2021
	
Spring 2021	Autumn 2022
	

Attribute	Note
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 29 Hornes Creek – HC8

Attribute	Note
Vegetation	The riparian canopy was dominated by Sydney Peppermint (*Eucalyptus piperita*) and Scribbly Gum (*Eucalyptus sp.*), while the middle stratum was dominated by Black Wattle, *Melaleuca sp.*, *Leptospermum sp.*, *Acacia longifolia* and *Hakea sp*. Spiny-headed Mat-rush dominated the lower stratum, with some ferns, exotic grasses and herbs. *Lambertia formosa* was also present. Vegetation burnt in 2020.
Stream shading	Low shading
Exotic vegetation	-
Modal width (m)	5 m
Substrate	Exposed banks but stable. Bedrock dominated.
Flow/depth	Low flow/ <1 metre in 2021. There was higher flow in 2022.
Macrophytes/algae	Macrophytes not present. Moderate levels of filamentous algae were observed in shallow bedrock dominated sections in autumn 2022.
Few scattered anoxic pools in 2019. 2020 post bushfire and rains had many clear pools with some burnt material in them. In 2021 and 2022 water was clear and free of debris.	

Attribute	Note
Photo log	
	
Spring 2019	Autumn 2020
	
Spring 2020	Autumn 2021
	

Attribute	Note
Spring 2021	Autumn 2022
	
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 30 Tree Hollow TTH12

Attribute	Note
Vegetation	Good condition native riparian vegetation. Burnt in 2020. Good recovery in 2021-2022.
Stream shading	Low shading.
Exotic vegetation	Present.
Modal width (m)	5
Substrate	Exposed banks but stable. Slight erosion of lower bank.
Flow/depth	Bedrock and fine sediments.

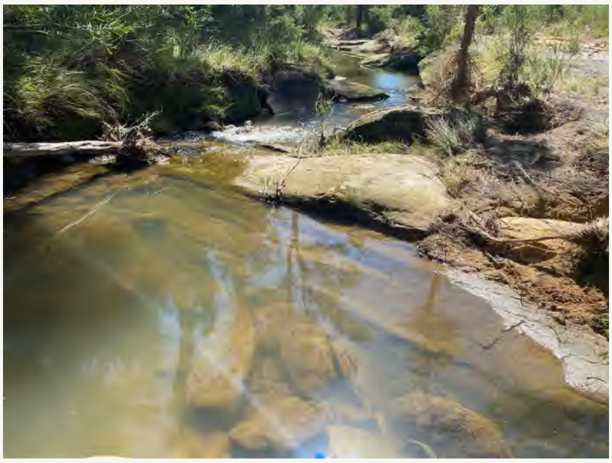
Macrophytes/algae	Very dry in 2019 (only one pool present). Bank full in 2020-2022 1-2 m.
Water quality observations	Macrophytes not present.
Pool has significant amount of organic matter present.	
Photo log	

	
Spring 2019	Autumn 2020
	
Spring 2020	Autumn 2021

	
Spring 2021	Autumn 2022
	
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 31 Tea Tree Hollow – TTH13

Attribute	Note
Vegetation	Good condition native riparian vegetation. Area burnt in 2020. Recovering well in 2022.
Stream shading	Low shading
Exotic vegetation	Crofton weed (*Ageratina adenophora*)
Modal width (m)	2 m
Substrate	Exposed banks but stable. Slight erosion of lower bank. Significant erosion in Autumn 2022. Bedrock dominant, boulders and silt.
Flow/depth	Dry in 2019. Low Flow/ ~1 metre in 2020. Moderate flow in 2022. Dry in autumn 2023. Low to moderate water levels in spring 2023.
Macrophytes/algae	Macrophytes not present.
Creek bed contained a large amount of burnt organic matter in 2020 post bushfire. Creek banks have suffered significant erosion as a result of 2022 floods.	
Photo log	
	
Spring 2019	Autumn 2020

Attribute	Note
	
Spring 2020	Autumn 2021
	
Spring 2021	Autumn 2022
	N/A
Spring 2022	Autumn 2023

Attribute	Note
	
Spring 2023	Autumn 2024

Table 32 Moore Creek – MC14

Attribute	Note
Vegetation	The canopy vegetation was dominated by Sydney Peppermint and Grey Gum (*Eucalyptus punctata*), Present in the mid stratum were Hop Bush (*Dodonaea triquetra*), Tea Tree (*Leptospermum* sp.) and Devils Twine (*Cassytha sp*.). Sedges (*Schoenus melanostachys*) and Bracken Fern (*Pteridium esculentum*) dominated the understorey. Vegetation burnt in 2020. Good recovery in 2022.
Stream shading	Moderate shading
Exotic vegetation	Absent
Modal width (m)	3 m
Substrate	Exposed banks erosion/sedimentation present. Erosion around concrete culvert/crossing structure (downstream of sample collection). Bedrock dominated, boulder, cobble, silt.
Flow/depth	Dry in 2019. Low Flow/ ~1 metre in 2020-2022
Macrophytes/algae	Macrophytes not present.
Very low water level in 2019. Water was clear with slight iron flock and sedimentation present in 2020. Water was clear in 2021 and 2022. Concrete culvert/crossing structure present.	

<table>
<tr><th>Attribute</th><th>Note</th></tr>
<tr><td colspan="2">Photo log</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Spring 2019</td><td>Autumn 2020</td></tr>
<tr><td>N/A</td><td></td></tr>
<tr><td>Spring 2020</td><td>Autumn 2021</td></tr>
<tr><td></td><td></td></tr>
</table>

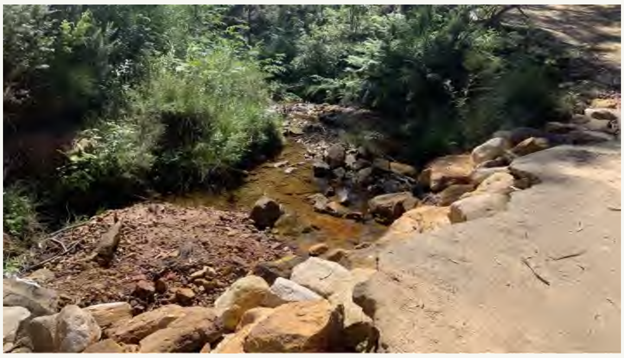
Attribute	Note
Spring 2021	Autumn 2022
	
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 33 Moore Creek – MC15

Attribute	Note
Vegetation	The riparian vegetation consisted of a canopy of Sydney Peppermint and Scribbly Gum with middle stratum species such as Tea Tree., *Acacia sp*., *Callistemon sp*. and *Hakea* sp. The lower stratum was dominated by the sedge *Schoenus melanostachys*, Cone Sticks (*Petrophile sp*.) and Coral Fern (*Gleichenia sp*.).
Stream shading	Low shading
Exotic vegetation	Absent
Modal width (m)	3
Substrate	Stable. Fine sediments; silt, sand and gravel, large sections of bedrock

Attribute	Note
Flow/depth	Low flow/ ~1 metre. Moderate flow in 2022
Macrophytes/algae	Macrophytes not present.
More pools present in 2020 following rain events. Post bushfire impacts of burnt material in the system, darkening the water slightly. Water clear and free of debris in 2022.	
Photo log	
	
Spring 2019	Autumn 2020
-	
Spring 2020	Autumn 2021

Attribute	Note
	
Spring 2021	Autumn 2022
	N/A
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 34 Tea Tree Hollow – TTH16

Attribute	Note
Vegetation	The riparian vegetation consisted of a canopy of Sydney Peppermint and other eucalyptus species, with middle stratum species such as *Melalueca sp*., *Leptospermum trinervium* and *Acacia sp*. The lower stratum was dominated by native rushes (*Juncus sp*., *L. longifolia*), ferns (*Calochlaena dubia*) and grasses (*Cynodon dactylon* as well as other native grasses).
Stream shading	Low shading.
Exotic vegetation	Absent.
Modal width (m)	3 m
Substrate	Stable. Fine sediments, sand and gravel, large sections of bedrock.
Flow/depth	Low flow/ ~1 metre. Dry between autumn 2023 and autumn 2024.
Macrophytes/algae	Macrophytes not present.
Photo log	

Spring 2021

Autumn 2022

Attribute	Note
Spring 2022	Autumn 2023
	
Spring 2023	Autumn 2024

Table 35 Tea Tree Hollow - TTHt17

Attribute	Note
Vegetation	The riparian vegetation consisted of a canopy of Sydney Peppermint and other eucalyptus species, with middle stratum species such as *Melalueca sp*. and *Acacia sp*. The lower stratum was dominated by native rushes (*Juncus sp*., *L. longifolia*), ferns (*C. dubia*) and native grasses.
Stream shading	Low shading
Exotic vegetation	Absent
Modal width (m)	4 m
Substrate	Stable. Fine sediments; silt, sand and gravel, large sections of bedrock
Flow/depth	Low Flow/ ~1 metre
Macrophytes/algae	Macrophytes not present

Attribute	Note
Photo log	
	
Spring 2021	Autumn 2022
	
Spring 2022	Autumn 2023
	

Attribute	Note
Spring 2023	Autumn 2024

10 Annex 3: AUSRIVAS – Macrovertebrate taxa recorded

Table 36 Macroinvertebrate taxa recorded during AUSRIVAS sampling: autumn 2024

Taxa	Code	HC6	HC7	HC8	TTH12	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRt6
Acarina	MM999999	1	0	0	0	0	0	0	0	0	0
Atyidae	OT019999	0	8	3	3	0	0	0	0	0	0
Baetidae	QE029999	0	5	0	0	0	0	0	0	0	0
Chironominae	QDAJ9999	5	5	25	3	0	1	0	0	0	0
Coenagrionidae	QO029999	0	4	0	0	0	0	0	0	0	0
Corixidae	QH659999	0	0	7	1	0	8	0	0	0	0
Crustacea	OZ999999	0	1	1	0	0	2	0	0	0	0
Dytiscidae	QC099999	0	1	0	3	0	9	0	0	0	0
Ecnomidae	QT089999	1	0	0	3	0	1	0	0	0	0
Gomphidae	QO139999	1	8	10	0	0	0	0	0	0	0
Gyrinidae	QC109999	1	0	0	1	0	4	0	0	0	0
Leptoceridae	QT259999	1	0	0	0	0	0	0	0	0	0
Leptophlebiidae	QE069999	4	0	0	62	0	3	0	0	0	0
Libellulidae	QO179999	1	4	20	0	0	0	0	0	0	0
Megapodagrionidae	QO079999	0	3	1	0	0	1	0	0	0	0
Mesoveliidae	QH529999	0	2	2	1	0	2	0	0	0	0
Naucoridae	QH669999	0	0	0	1	0	3	0	0	0	0
Nepidae	QH619999	1	0	0	0	0	0	0	0	0	0

Taxa	Code	HC6	HC7	HC8	TTH12	TTH13	TTH13 (d/s)	TTHt9	TTHt17	TTHt17 (d/s)	BRt6
Notonectidae	QH679999	0	24	8	4	0	27	0	0	0	0
Oligochaeta	LO999999	0	1	0	0	0	0	0	0	0	0
Philorheithridae	QT219999	0	0	0	0	0	1	0	0	0	0
Synthemistidae	QO239999	0	0	1	1	0	0	0	0	0	0
Tanypodinae	QDAE9999	3	3	10	1	0	0	0	0	0	0
Tipulidae	QD019999	1	0	0	0	0	0	0	0	0	0
Veliidae	QH569999	0	5	8	3	0	0	0	0	0	0

11 Annex 4: Quantitative – macroinvertebrate dataset

The quantitative macroinvertebrate dataset has been included as an electronic annex, filename: *8234_TahmoorSouth_QuantitativeDataset_20240603.xlxs*

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Appendix E – Heritage Reports

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10 October 2023

April Hudson
Approvals Specialist
SIMEC Mining
2975 Remembrance Driveway
Tahmoor NSW 2574

Re: Tahmoor South 6C tunnel crack - potential heritage impact

Dear April,

On 29 May 2023, during extraction of LW S1A, two cracks were observed by the structural engineer at the Tahmoor Mine site within the 6C tunnel and vent shaft interface (Plate 4.1 – Plate 4.2). The site continued to be monitored with weekly inspections and on 6 June, four additional cracks were observed (Plate 4.3 - Plate 4.5). An additional crack was detected on 27 June 2023 (Plate 4.6). The site continues to be monitored with weekly inspections.

As the Tahmoor Mine site (Tahmoor Colliery) has been identified as a heritage site as part of the *Heritage Management Plan – Tahmoor South Domain – Longwalls South 1A -South 6A* (2022), impacts to this item must be managed under the Heritage Management Plan Trigger Action Response Plan (TARP).

According to the TARP, this impact is deemed to be a Level 1 trigger:

> Historical heritage site monitoring indicates potential detectable environmental consequences with negligible impacts to the heritage value of the heritage site.

This trigger requires that a qualified archaeologist or heritage architect be consulted in order to determine whether impacts to heritage sites have occurred. This letter responds to this requirement. The desktop assessment has been undertaken by Pamela Chauvel (BA, MA (Research)) who is a qualified archaeologist.

1 Background

Tahmoor Mine Site (also known as Tahmoor Colliery) was identified in the *Macarthur Heritage Study* (1986) and in the *Historical Heritage Assessment: Tahmoor South Project* (HHA) (Niche 2018). However it is not listed on any local or State heritage registers (non-statutory). The HHA assessed the site, which was built in 1972, as having local significance for its role in illustrating the course and pattern of industrial development in Tahmoor.

Subsidence predictions for the existing and proposed longwalls (LW) S1A–S6A prepared by MSEC (2022), assessed the probability of impact from subsidence as ‘possible’. The coal conveyor and associated plant and equipment at Tahmoor Mine site was predicted to subside approximately 1,000 mm over the life of the A series of LW panels at Tahmoor South. Impacts were anticipated to be low and easily managed with careful monitoring. Table 20 in the *LW S1A – S6A Extraction Plan: Heritage Management Plan* (EMM 2022) sets out the subsidence performance indicators:

Site name	Site type	Subsidence Performance Measures	Probability of subsidence impact	Subsidence Performance Indicators
Tahmoor Colliery (Tahmoor Mine Site)	Complex / group	No greater subsidence impacts or loss of heritage values than predicted in the EIS (see HMP Section 4.2.7)	*Possible*	This performance indicator will be considered to be triggered if subsidence impacts cannot be repaired in a manner that preserves the heritage value of the historical heritage items. This performance measure and performance indicator have been incorporated into TARP HMP2 (Historical heritage items).

2 Heritage assessment

It is considered that the hairline cracks (<1 mm) in the concrete within tunnel 6C are minor and, if required, could be repaired in a manner that preserves the heritage value of the mine. The Tahmoor Mine Site is a working site and minor impacts such as hairline cracks are unlikely to affect its heritage values. As the heritage values of the item is not expected to be significantly impacted, this therefore is not considered to be a reportable trigger exceedance under the TARP.

Table 2.1 provides a summary of the seven cracks that have been observed within tunnel 6C.

Table 2.1 Cracks observed within tunnel 6C

Crack ID	Date observed	Dimensions/ notes
Crack A / C1	29/5/2023	<1mm width, increased very marginally on 13/6/2023
Crack B / C2	29/5/2023	<1mm width
Crack C3	6/6/2023	Approaching 1 mm width
Crack C4	6/6/2023	<1mm width
Crack C5	6/6/2023	<1mm width
Crack C6	6/6/2023	<1mm width
Crack C7	27/6/2023	<1mm width

3 Recommendations

1. The site should continue to be monitored and the data reviewed as per the Tahmoor Mine Site Management Plan.

2. At the conclusion of mining of LW S1A – S6A, the cracks within Tunnel 6C should be assessed by a suitably qualified heritage advisor to determine whether remediation is required.

3. If it is determined that remediation of the tunnel is required and/or the impact cannot be repaired at the conclusion of mining of LW S1A – S6A to a level that preserves the heritage values of the site, the TARP requires that the trigger exceedance be reported to DPE and Heritage NSW.

4. The TARP requires that trigger exceedance and investigation outcomes (this letter) be included in the six-monthly Subsidence Impact Report and Annual Review.

4 Closing

If you have any questions, please do not hesitate to contact me.

Yours sincerely

Pamela Chauvel
Senior Archaeologist
pchauvel@emmconsulting.com.au

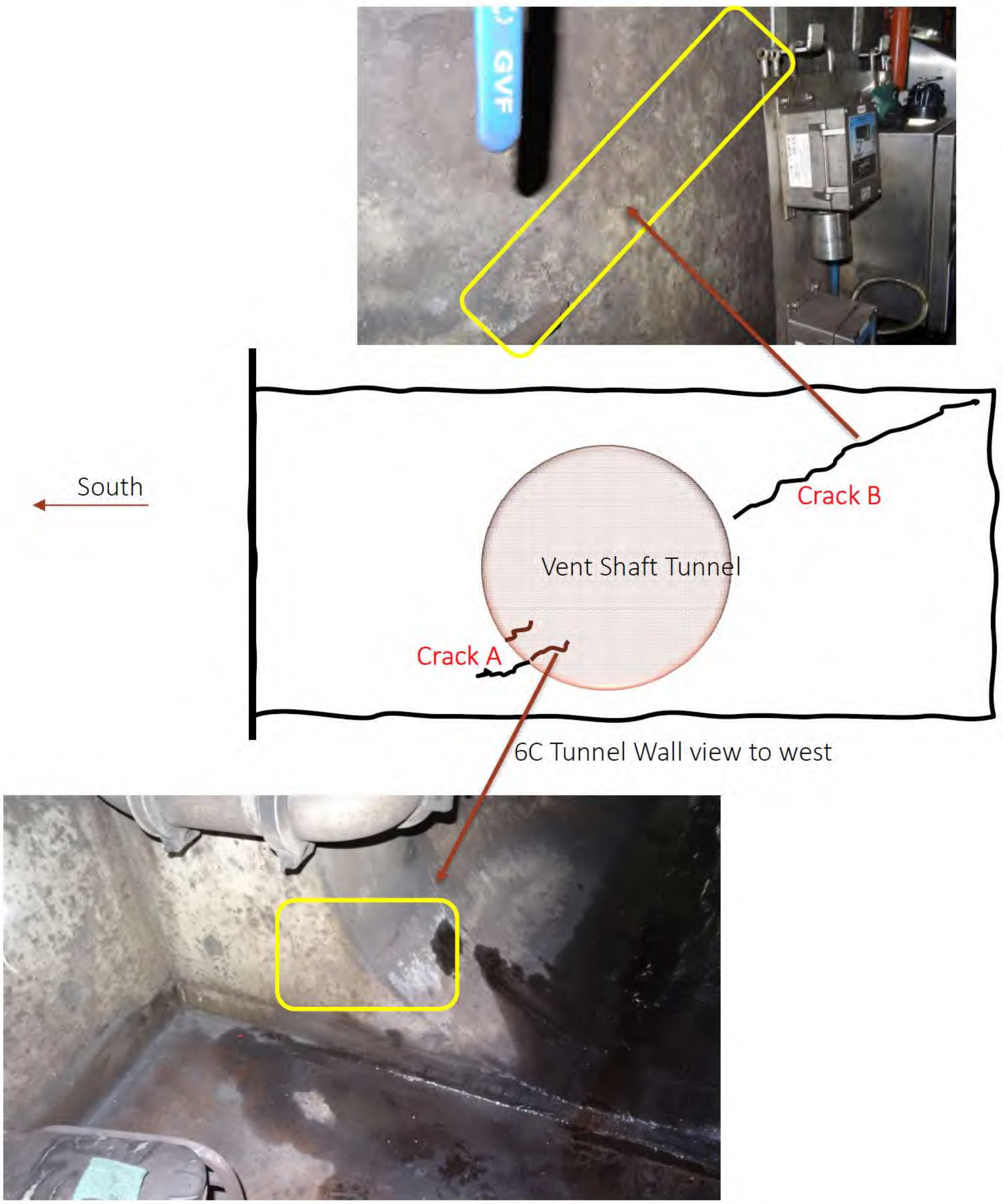


Plate 4.1 Location of cracks A(C1) and B (C2) within Tunnel 6C (David Talbert 29 May 2023).

Plate 4.2 Crack B (C2), width <1 mm (David Talbert 29 May 2023).

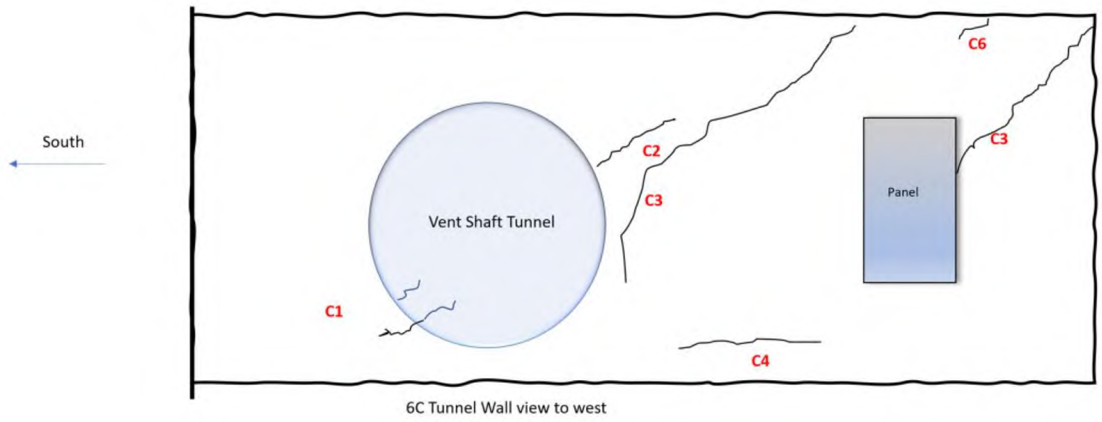


Plate 4.3 Context for the location of cracks C1, C2 and C3 (David Talbert, 6 June 2023).

Plate 4.4 **Crack C4 (David Talbert, 6 June 2023).**

Plate 4.5 **Crack C5 (David Talbert, 6 June 2023).**

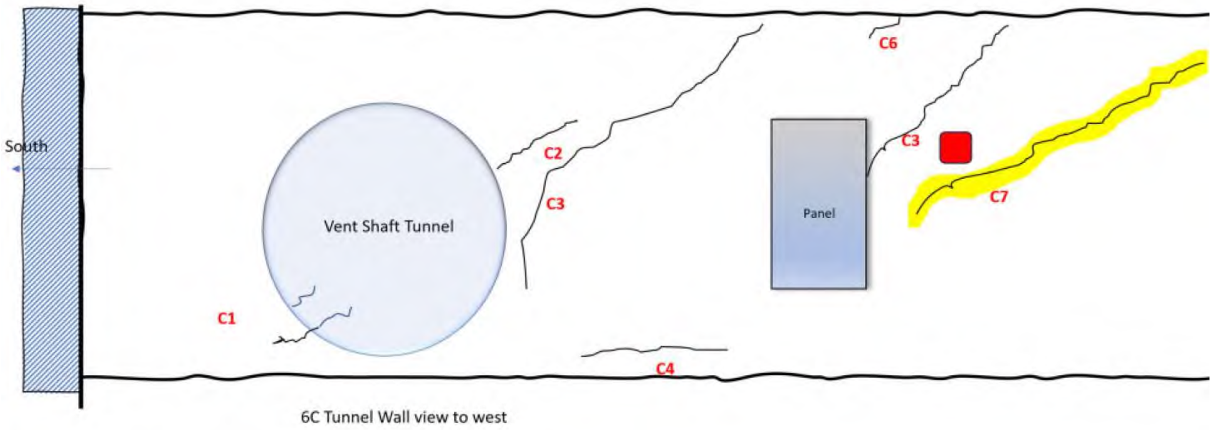


Plate 4.6 Location of C7 (David Talbert, 27 June 2023)

Appendix F – Main Southern Rail Monitoring Reports

TAHMOOR COAL: LW S2A

Subsidence Management Status Report No. 19
During the mining of LW S2A beneath the Main Southern Railway

SIMEC

Reporting Period	**28 February 2024 to 6 March 2024**	
Length of extraction of LW S2A	1601 m	at 5 March 2024. LW S2A commenced extraction on 2 August 2023
Closest distance of LW S2A face to Railway	445 m	to 98.68 km (LW moving away)
Distance travelled by LW since previous report	32 m	since 27 February 2024
Maximum total subsidence along Railway since start of LW S1A	784 mm	at 99.12 km on 6 March 2024
Maximum incremental subsidence along Railway due to LW S2A	727 mm	at 99.12 km on 6 March 2024
Maximum increase in subsidence since previous survey	10 mm	at 98.74 km (27 February to 6 March)
Safety Incidents	No incidents reported	
Rail Operations	No delays incurred	

Summary of monitoring and inspections

Monitoring Activity	**Date**	**Current Frequency**	**Highest Trigger**	**Comments**
Railway Track				
3D ground survey	-	Monthly	N/A	Last survey 27 February. Horizontal movements within expectations.
2D ground survey	6 Mar	Weekly	N/A	Track has experienced most active period of subsidence with rates of change reducing.
Rail creep surveys	6 Mar	Weekly	N/A	No new rail creep this week.
Long bay length survey	6 Mar	Weekly	N/A	Minor ground shortening continuing between ES3 and AP3. Minor changes elsewhere. Rates of change reducing.
Rail stress	Every 5 mins		(false)	Changes in stresses within expectations. False BLUE alarm at 98.86 km Down Main Down Rail due to gauge issue. The gauge will be replaced.
Switch displacements	Every 5 mins			Measurements within tolerances.
Track geometry survey	4 Mar	Weekly		Minor changes were observed this week.
Track centre measurements	-	Monthly	-	Last measurements 16 January. Minor changes observed since the end of LW S1A.
Inspections by Track Certifier	6 Mar	Daily		No further changes noted at 98.80 km and 99.20 km.
Early warning monitoring				
GNSS monitoring S1 to S15	Continuous		N/A	Subsidence developed within predictions.
GNSS monitoring S26 & S27 above centreline of LW S2A	Continuous		N/A	Subsidence continuing to develop at Sites S26 and S27 at reduced rates of change.
Cutting at 99.690 km				
Absolute 3D survey	6 Mar	Weekly		Minor changes observed. Small increase in closure across the base at 99.66 km this week.
Visual inspection	4 Mar	Weekly	N/A	No issues observed. Minor flowing water in Up side cess drain and no flowing water in Down side cess drain.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Embankment and Culvert at 99.338 km				
Absolute 3D survey	6 Mar	Weekly		Minor changes observed. Minor closure on the Up side and minor extension across the crest this week. Measured extension across crest between Pegs B99360 and C99360 is 29 mm, which exceeded Level 1 trigger of 25 mm for second consecutive week. 7 mm of measured change attributed to heavy vehicle movements along the UP crest in July/August 2023. Very little change observed along or across the base of the embankment. Crest extensometer measurements are approaching 15 mm. No issues of concern observed from visual inspections. The RMG reviewed the monitoring results on 8 March and agreed to increase the Level 1 trigger for measured extension of the crest from 99.340 km to 99.400 km from 25 mm to 50 mm.
Extensometers	Every 15 minutes			No change measured this week. It is recommended to reduce the height of the support post and cover the fixed end of the extensometer to minimise vehicle impact post embankment widening. The RMG has reviewed the monitoring results on 8 March and agreed to increase the Level 1 trigger for the extensometer from 25 mm to 40 mm.
Inclinometer	4 Mar	Monthly	N/A	Minor changes observed.
Visual inspection	4 Mar	Weekly	N/A	No changes observed to culvert. Minor groundwater seepage noted at the brick and floor interface. CCTV inspection on 8 February showed no change in culvert condition.
Cutting at 99.165 km				
Visual inspection	4 Mar	Weekly	N/A	No issues observed to batter. No change to offset, minor north-south striking longitudinal cracks first observed on 9 Jan, which may be associated with geological fault.
Embankment and Culvert at 99.035 km				
Absolute 3D survey	6 Mar	Weekly		Subsidence increasing at a reduced rate of change. Minor opening across the crest and minor closure on the Down side.
Visual inspection	4 Mar	Weekly	N/A	No change to small angled hole found above culvert adjacent to access road on the Upside, away from track. Cause is likely due to gap between RCP pipes. CCTV inspection on 8 February showed no change in culvert condition.
Embankment and Culvert at 98.739 km				
Absolute 3D survey	6 Mar	Weekly		Minor changes observed.
Visual inspection	4 Mar	Weekly	N/A	No changes observed since end of LW S1A. CCTV inspection on 8 February showed no change in culvert condition.
Embankment and Culvert at 98.445 km				
Absolute 3D survey	6 Mar	Weekly		Minor changes observed.
Visual inspection	4 Mar	Weekly	N/A	No changes observed. The culvert is partially blocked by a branch and rocks following heavy rainfall and requires clearing. Majority of blockage removed on 7 March. CCTV inspection on 8 February showed no changes in culvert condition.
Coal Conveyor at 98.160 km				
Survey across Railway	5 Mar	Weekly		Minor changes observed.
Laser distancemeter	Hourly			Minor changes observed.
Visual inspection	4 Mar	Daily	N/A	No issued observed.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Bargo River Railway Viaduct at 96.256 km and Remembrance Drive Bridge over Bargo River at 96.385 km				
GNSS units S11 and S12	Continuous		N/A	No measurable movements or change between GNSS units.
Far-field Absolute 3D survey	29 Feb	Monthly	N/A	Very minor changes observed since the end of LW S1A.
Absolute 3D survey	29 Feb	Monthly	N/A	Very minor changes observed since the end of LW S1A.
Precision 2D ground survey between ends of Viaduct and Bridge (valley closure)	29 Feb	Monthly		Very minor changes observed since the end of LW S1A.
Gap between deck and northern abutment of Bridge	29 Feb	Monthly		More than 100 mm capacity available.
Bargo River Road Overbridge at 96.049 km (Potter's Cutting)				
Far-field Absolute 3D survey	29 Feb	Monthly	N/A	Very minor changes observed since the end of LW S1A.
Local 3D survey of structure	29 Feb	Monthly		Very minor changes observed since the end of LW S1A.
Crack gauges	-	Monthly		Last readings 12 February. No measurable change observed.
Wellers Road Overbridge at 101.162 km				
GNSS unit S15	Continuous		N/A	Minor changes observed.
Local 3D survey of structure	-	-		Survey on 5 January measured minor changes since the end of LW S1A. Survey planned at end of LW S2A.
Crack gauges	-	-		Measurement planned at end of LW S2A.

Management Actions

Other management actions since previous report:
- Removal of debris at culvert at 98.445 km, completed 7 March

Any additional and/or outstanding management actions:
- Clean outlet and CCTV inspection of culvert at 100.4 km, planned 8 March

Consultation with stakeholders since previous report:
- RMG meeting held 8 March 2024

Forecast whether continued longwall mining is likely to cause:

A. Track closure for any period unacceptable to ARTC

B. Impact on the safety of operations on the Main Southern Railway

Based on monitoring results to date, and the controls implemented and available under the LW S1A-S6A Management Plan for Longwall Mining beneath and adjacent to the Main Southern Railway, no triggers under this Management Plan are expected to be exceeded in the next week. Accordingly continued longwall mining is not likely to result in the occurrence of either A or B above.

Certified by Tahmoor Coal	
Name	Ross Barber
Position	Project Manager
Signature	Ross Barber
Date	8 March 2024

Copy of Report to:

Daniel Wakefield, Area Manager Ingleburn, ARTC
Sladjan Mitic, Senior Track & Civil Engineer Sydney, ARTC
Brian Cooper, Manager Maintenance North-South, ARTC;
Clint Mason, Production Manager, Tahmoor Mine
Ray Ramage, Principal Inspector – Subsidence, Mine Safety Inspectorate, Resources Regulator
Michael Irons, Property Manager – Wagga, ARTC
Peter Haskard, Manager Engineering, Interstate Network, ARTC
Ian Cochran, Bridges and Structures Specialist, ONRSR

Appendix G – Wollondilly Anglican College Monitoring Reports

This information has been retracted

- For more information contact Tahmoor Coal

Appendix H – Tahmoor Mine Site Monitoring Reports

TAHMOOR COAL: LW S2A

Subsidence Management Status Report No. 03
During the mining of LW S2A beneath and adjacent to the Tahmoor Mine Site

Reporting Period	**13 January 2024 to 19 January 2024**	
Length of extraction of LW S2A	1230 m	On 18 January 2024 LW S2A commenced extraction on 2 August
Closest distance of LW S2A face to Pier 2 on Conveyor 5C	265 m	LW approaching
Distance travelled by LW since previous report	52 m	since 11 January 2024
Maximum total subsidence within Tahmoor Mine Site	387 mm	at 6C-16A on 16 January 2024
Maximum incremental subsidence within Tahmoor Mine Site	36 mm	at GNSS Unit Gantry at Pier 2 on 18 January 2024
Maximum increase in subsidence since previous survey	2 mm	at GNSS Unit Gantry at Pier 2 (11 January to 18 January)
Safety Incidents	No incidents reported.	
Subsidence impacts reported by Tahmoor Mine Site staff	No subsidence impacts reported.	

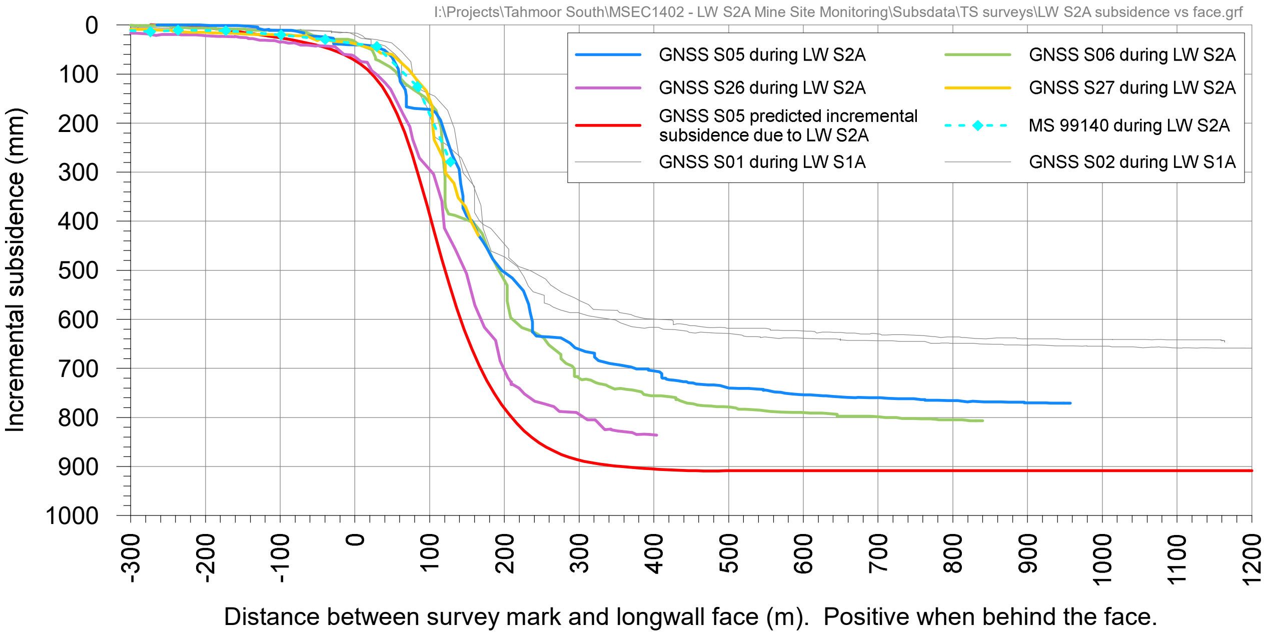
Summary of monitoring and inspections

Monitoring Activity	**Date**	**Current Frequency**	**Highest Trigger**	**Comments**
General Mine Site monitoring				
GNSS Unit Gantry at Pier 2	Continuous		N/A	Residual subsidence gradually developing, approximately 385 mm in magnitude. Moving southeast by 30 mm towards approaching LW face.
GNSS Unit S16 (near Shaft No. 3)	Continuous			Very minor changes since the end of LW S1A. 5 mm increase in subsidence in early Dec 2023, with no measurable change since this time.
Main Southern Railway	16 Jan	Weekly	N/A	Track experiencing most active period of subsidence. Small bumps in subsidence profile and compressive strain developing at creek crossings. Small bump developing at 99.18 km above LW S2A.
Rail Loop	-	Monthly	N/A	Last survey 5 January. Very minor changes since end of LW S1A. Weekly surveys commence after 1300 m of extraction.
Remembrance Drive	15 Jan	Weekly	N/A	Gradual development of non-conventional compressive strain along Remembrance Drive between Pegs R47 and R48 and bump in observed subsidence profile at Peg R47. Location is south of Pier 2 and the Stockpile Area. Minor changes this week.
Visual inspections	16 Jan	Weekly		No issues reported.
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C				
Reclaim Tunnel survey	16 Jan	-		Minor changes observed since end of LW S1A. Very slight 10 mm extension observed along its length since the end of LW S1A.
Conveyor 5C survey	16 Jan	-	N/A	Minor changes in the distances between the trestles. Very gradual bending along the conveyor over time
Inclinometer surveys	16 Jan	Weekly		Minor changes observed since the end of LW S1A.
Tilt monitoring at Pier 2	Continuous		N/A	Minor changes observed.
Tilt monitoring at T4	Continuous		N/A	Minor changes observed.
Displacement monitoring at T4	Continuous			Minor changes observed.
Stress monitoring at T4	Continuous		N/A	Minor changes in response to stockpile loading.
Gap in tripper rail	22 Jan	Weekly	N/A	Rail joint has opened 14-15 mm since 17 Jul 23 during LW S1A, and 2 mm this week.
Joint monitoring in Reclaim Tunnel between T6 and Pier 2	22 Jan	Weekly	N/A	No measurable changes observed.

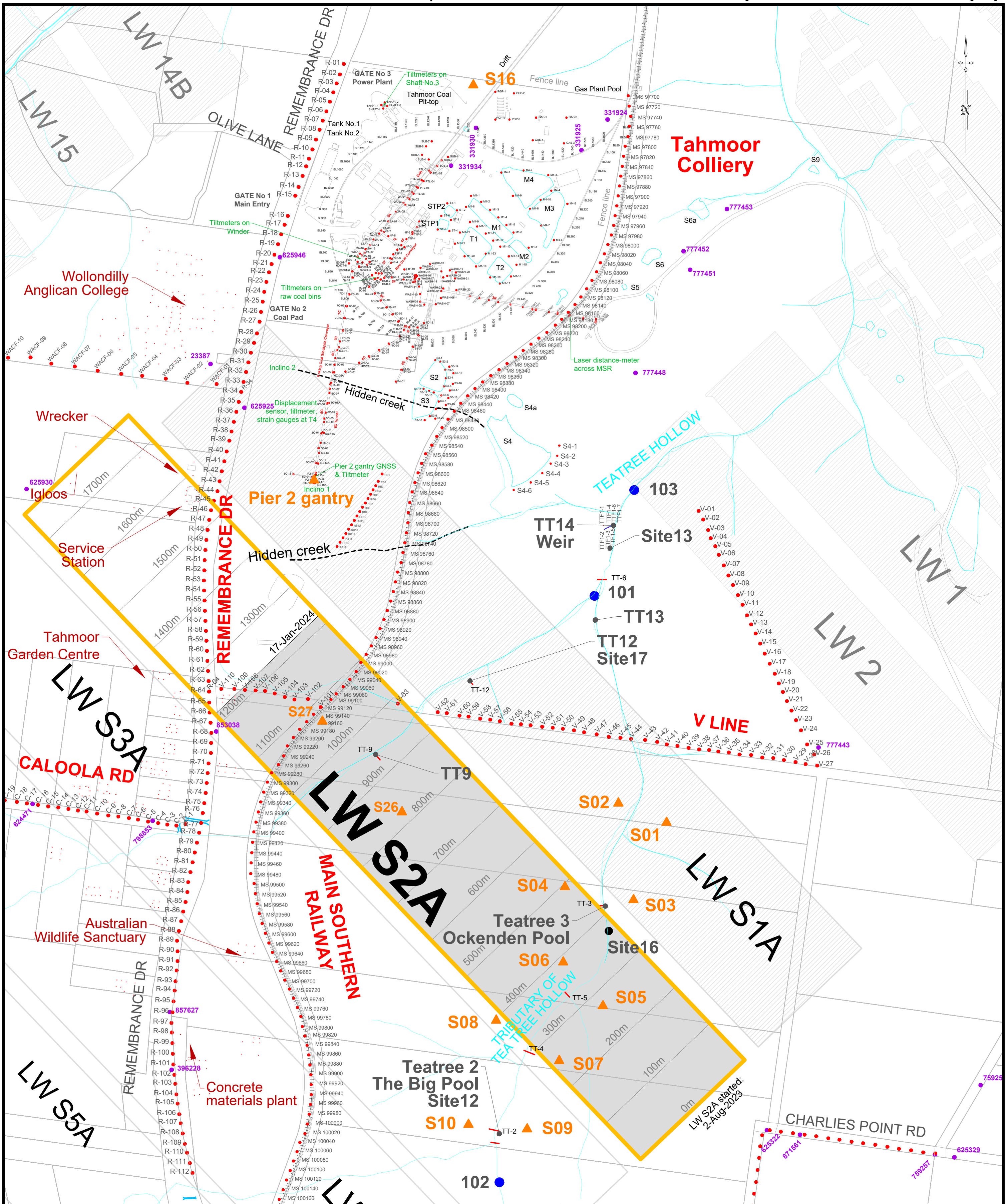
Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C (continued)				
Visual inspections	22 Jan	Weekly	(cracks found in 6C Tunnel)	Minor new cracking (< 1mm) at location of cracking identified during LW S1A. Minor new cracking (< 1mm) in eastern and southern walls. The wall needs to be hosed down to determine if there is any further cracking. Structure gap across expansion joint at T4 has opened 2 mm since 17 Jul 23 during LW S1A, and 1-2 mm this week.
Overhead conveyors				
Conveyor trestle surveys	16 Jan	-		Minor changes observed this week.
Laser distancemeter at Conveyor 3R across Railway	Continuous			Minor changes observed. Targets may require a clean to improve readings.
Visual inspection	22 Jan	Weekly		No issues reported.
Drift				
Drift survey	-	-		Weekly surveys commence after 1500 m of extraction.
Visual inspection	Daily		N/A	No issues reported.
Winder				
Tiltmeters on Winder	Continuous			Minor changes observed.
Visual inspection	-	-	N/A	Inspections commence after 1500 m of extraction.
Rail Loop				
Long bay length survey	-	Monthly		Last survey 5 January. Very minor changes since end of LW S1A. Weekly surveys commence after 1300 m of extraction.
Road culvert survey	-	Monthly	N/A	Last survey 5 January. Very minor changes since end of LW S1A. Weekly surveys commence after 1300 m of extraction.
Track geometry survey	-	-		Survey after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.
Track inspection	-		N/A	Inspect after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.
Mine Site Structures				
Tiltmeters on Raw Coal Bins	Continuous			Minor changes observed.
Rail Loader survey	16 Jan	-		Minor changes observed this week.
Reject Bin survey	-	Monthly		Last survey 5 January. Very minor changes since end of LW S1A Weekly surveys commence after 1200 m of extraction.
Visual inspections	16 Jan	-		No issues observed.
Overhead crane and monorails				
Crane rail survey	-	-		Weekly surveys commence after 1300 m of extraction.
Visual inspections	-	-		Weekly inspections start after 1300 m of extraction.
Shaft No. 3				
Tiltmeters on shaft winder	Continuous			Minor changes observed.
Clearance measurements at 135m depth	-	-		Weekly surveys commence after 1500 m of extraction.
Visual inspection	Daily		N/A	No issues reported.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Dams, embankments and site services				
Dam S4 survey	17 Jan	Weekly	N/A	Minor subsidence and closure observed.
Dam S2 and S3 survey	-	-	N/A	Weekly surveys commence after 1200 m of extraction.
Visual inspections by building inspector, incl high pressure water pipeline	16 & 18 Jan	Weekly		No issues observed at Dam S2 and S4. Erosion of loose fill of embankment at Dam S4 following heavy rainfall. Further cracking noted adjacent to the pump shed.
Geotech inspections on mine site	-	-		Monthly inspections during active subsidence.
Geotech inspections of Dams S2 and S3 from railway	15 Jan	Weekly		No issues observed by geotechnical engineer.
Track inspections of Dams S2 and S3 from railway	Daily		N/A	No issues observed by Track Certifier
Management Actions				
Other management actions since previous report: ● Nil				
Any additional and/or outstanding management actions: ● Nil				
IMG meeting since previous report: ● Weekly IMG meetings commence after 1300 m of extraction				
Forecast whether continued longwall mining is likely to cause impact on the safety of operations at Tahmoor Mine Site Based on monitoring results to date, and the controls implemented and available under the LW S1A-S6A Management Plan for Longwall Mining beneath and adjacent to the Tahmoor Mine Site, no triggers under this Management Plan are expected to be exceeded in the next month. Accordingly continued longwall mining is not likely to result in the occurrence of either A or B above.				
Certified by Tahmoor Coal				
Name	David Talbert			
Position	Project Manager			
Signature				
Date	24 January 2024			

Copy of Report to:
IMG
Ray Ramage, Principal Inspector – Subsidence, Mine Safety Inspectorate, Resources Regulator


I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\Subsdata\TS surveys\LW S2A subsidence vs face.grf
GNSS S05 during LW S2A
GNSS S06 during LW S2A
GNSS S26 during LW S2A
GNSS S27 during LW S2A
GNSS S05 predicted incremental subsidence due to LW S2A
MS 99140 during LW S2A
GNSS S01 during LW S1A
GNSS S02 during LW S1A
Incremental subsidence (mm)
0
100
200
300
400
500
600
700
800
900
1000
-300
-200
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Distance between survey mark and longwall face (m). Positive when behind the face.

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-01 LWS2A Monitoring.dwg



LEGEND

- WATER MONITORING SITE
- MONITORING LINES
- MONITORING PEGS
- GNSS
- BOREHOLES
- CRITICAL POLES MONITORING
- ROADS & TRACKS
- WATERCOURSE

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TAHMOOR SOUTH MINE SITE - LW S2A

MONITORING PLAN

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	1:10000	MSEC1402-01	03

Tahmoor South LW S2A - Main Southern Railway
Total subsidence profiles
Survey date: 16 January 2024

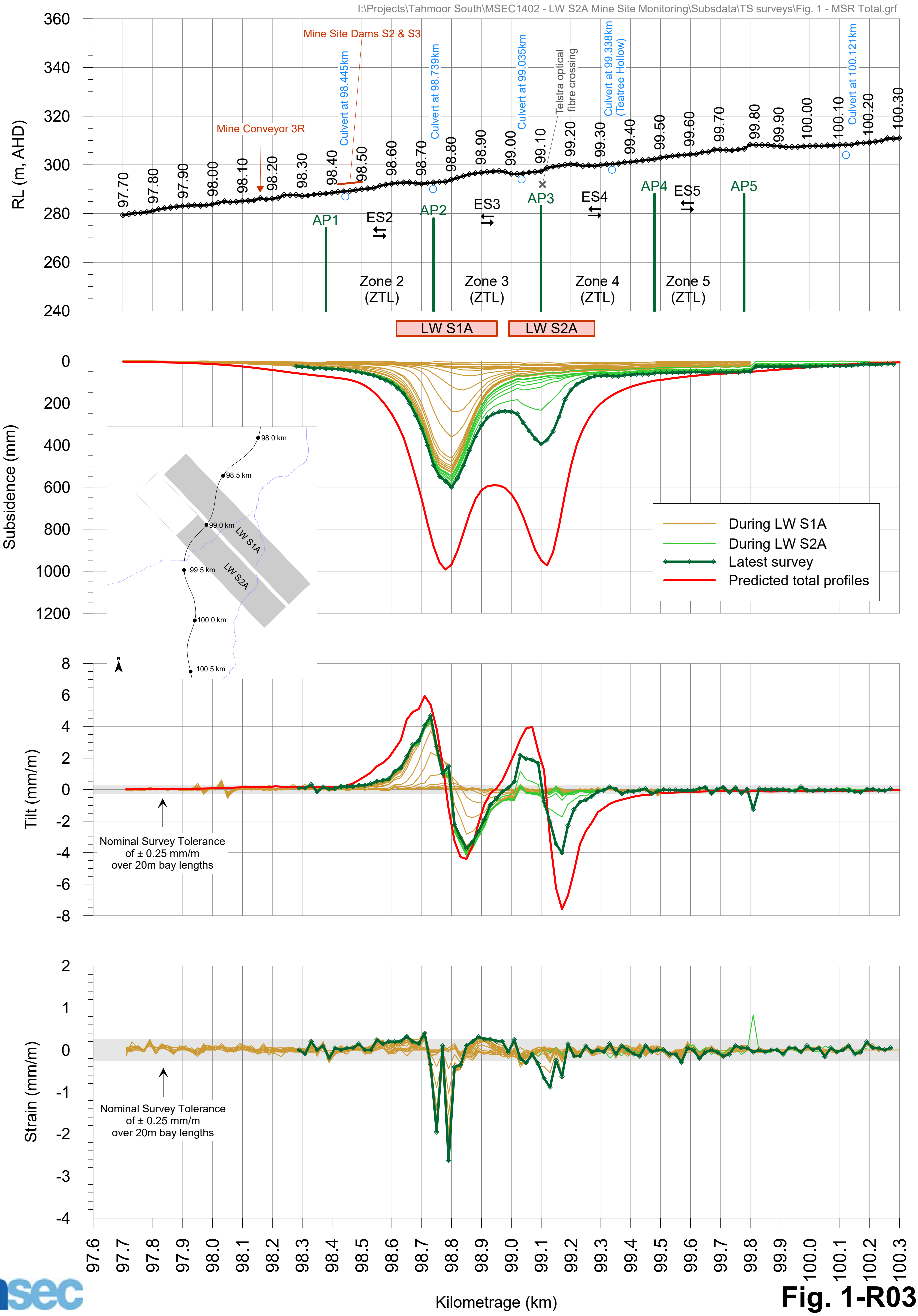

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Fig. 1-R03

Tahmoor South LW S2A
Total subsidence profiles along V-Line

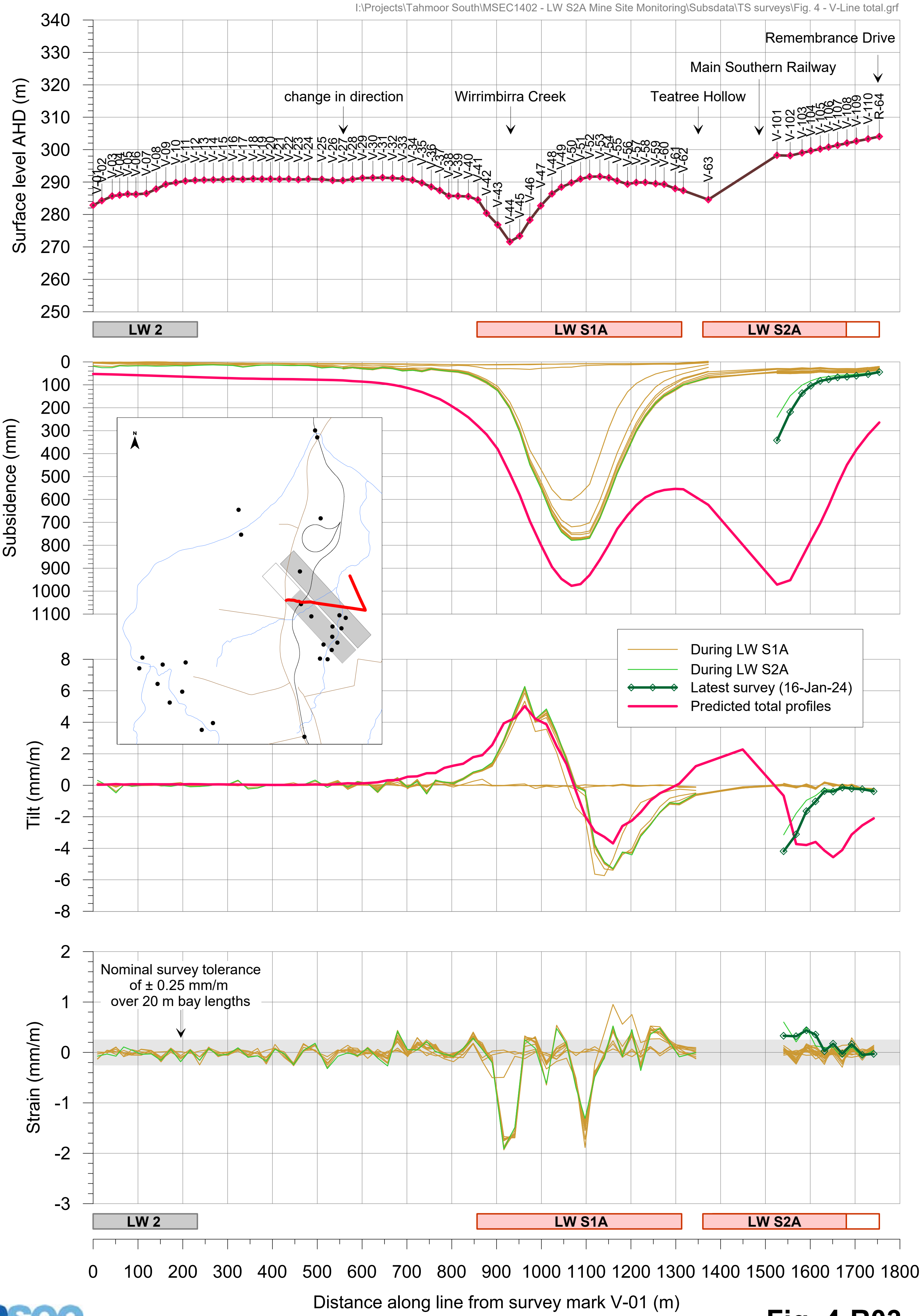

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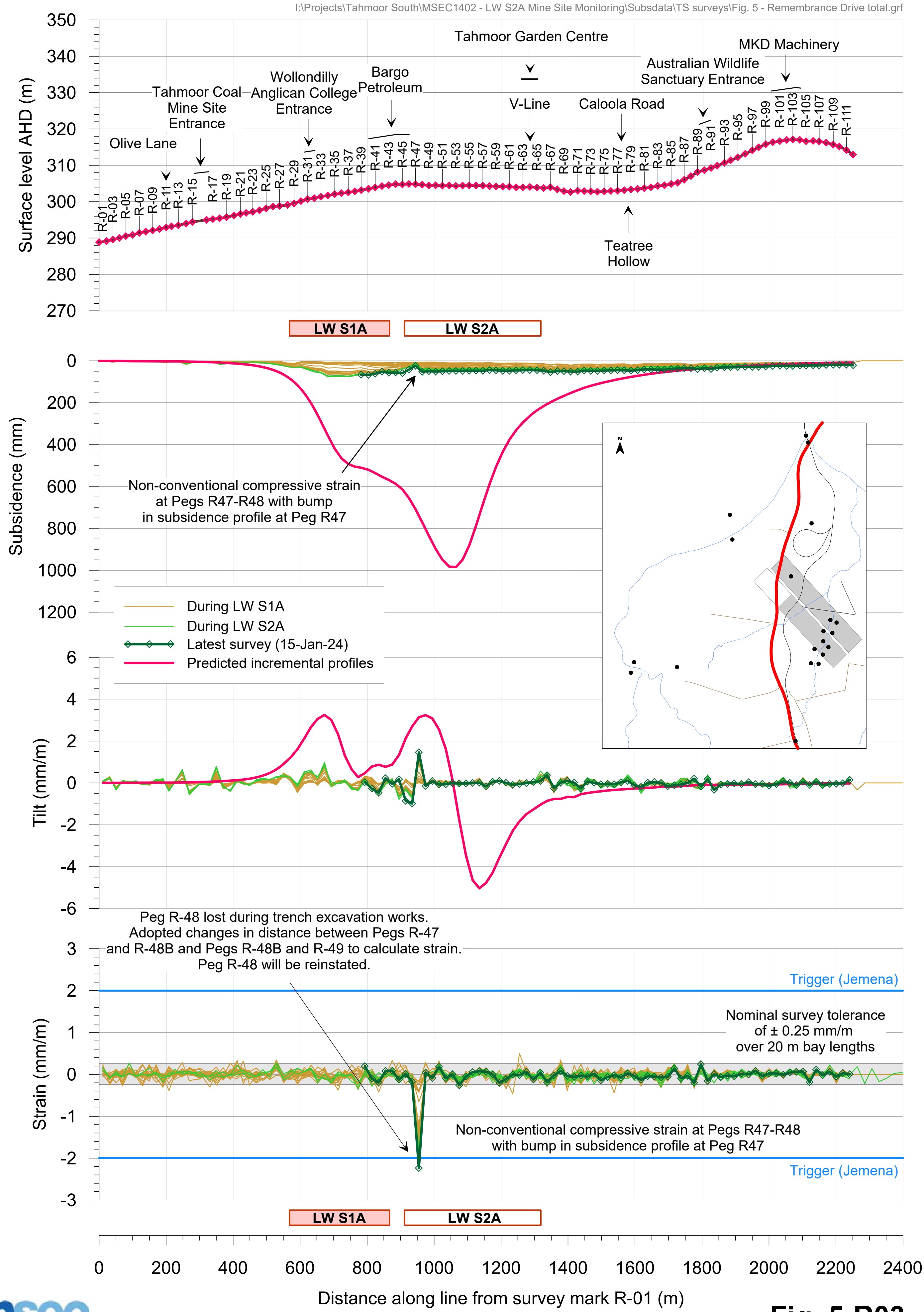
Fig. 4-R03

Tahmoor South LW S2A
Total subsidence profiles along Remembrance Drive



msec

Fig. 5-R03

Tahmoor South LW S2A - GNSS Monitoring
Site S16 at Tahmoor Mine site

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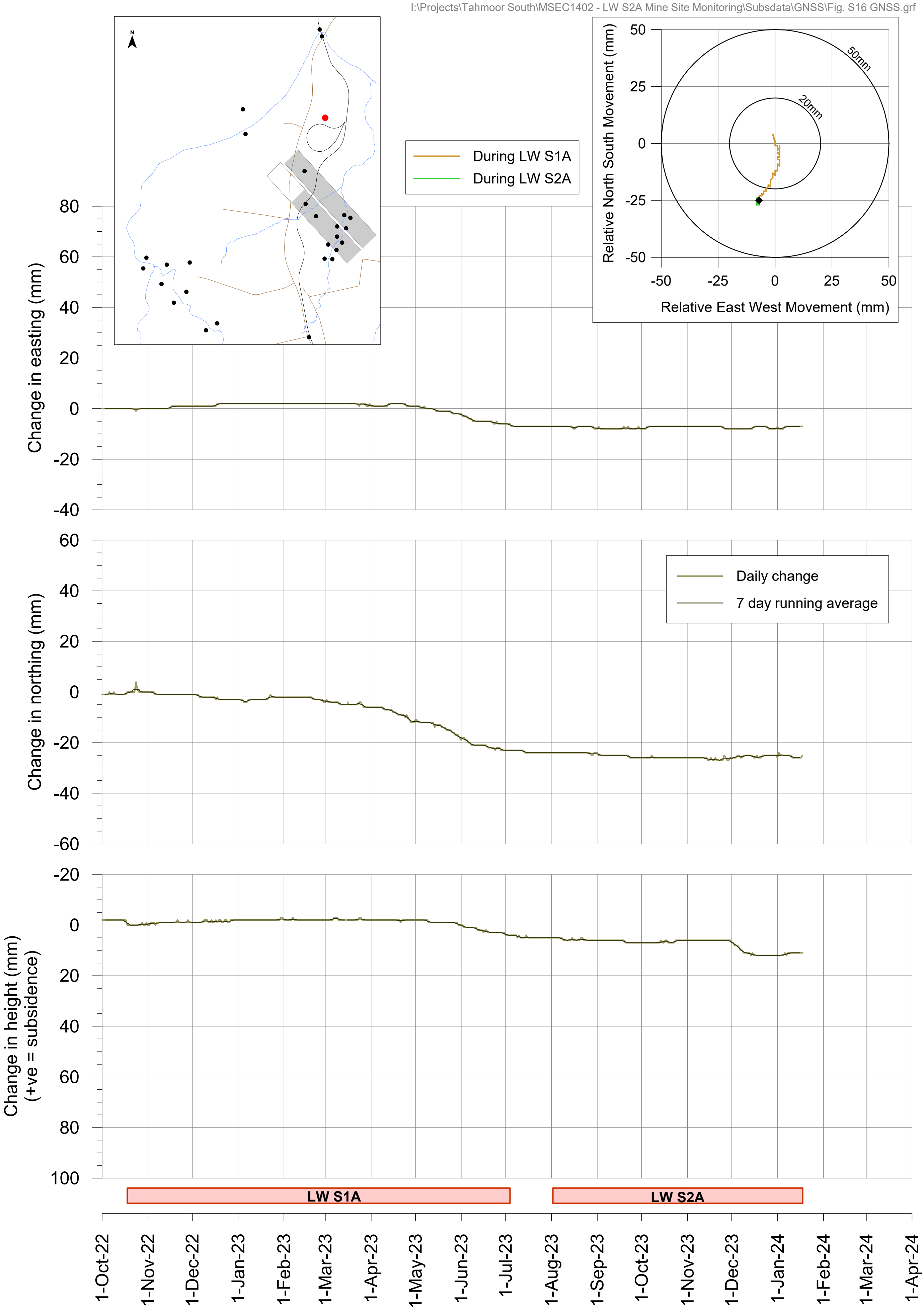


Fig. S16-R03

Tahmoor South LW S2A - GNSS Monitoring

Pier 2 gantry at Tahmoor Mine site

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\Subsdata\GNSS\Fig. TM GNSS gantry.grf

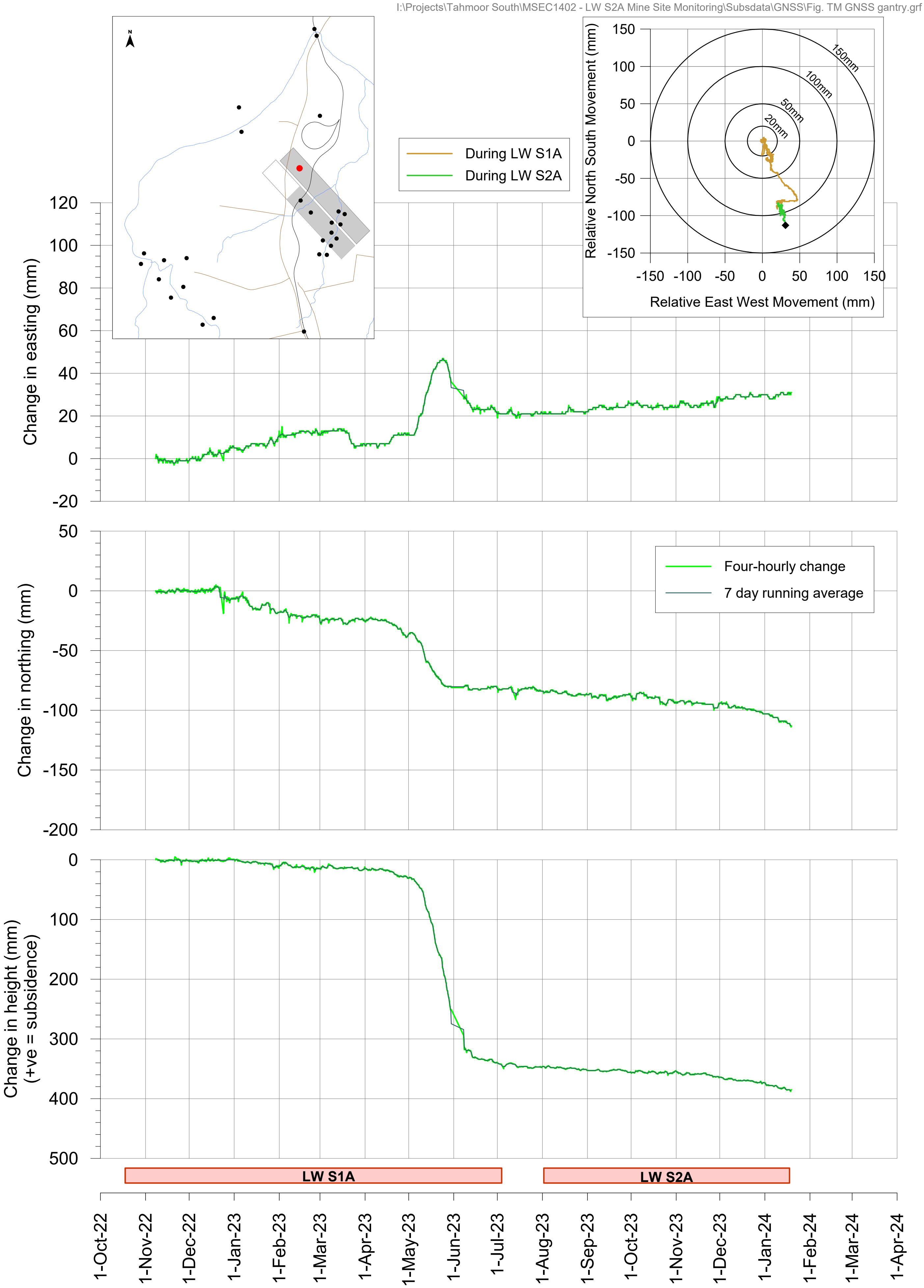
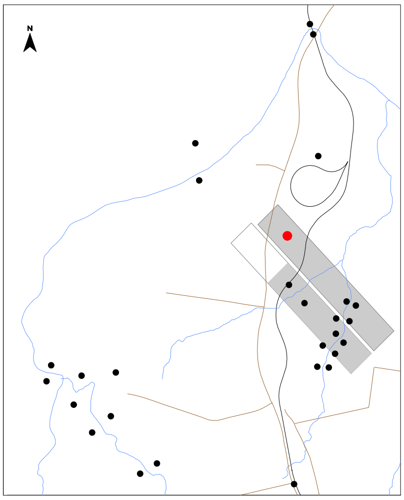


Fig. TM-R03

Tahmoor South LW S2A - GNSS Monitoring

Pier 2 gantry at Tahmoor Mine site



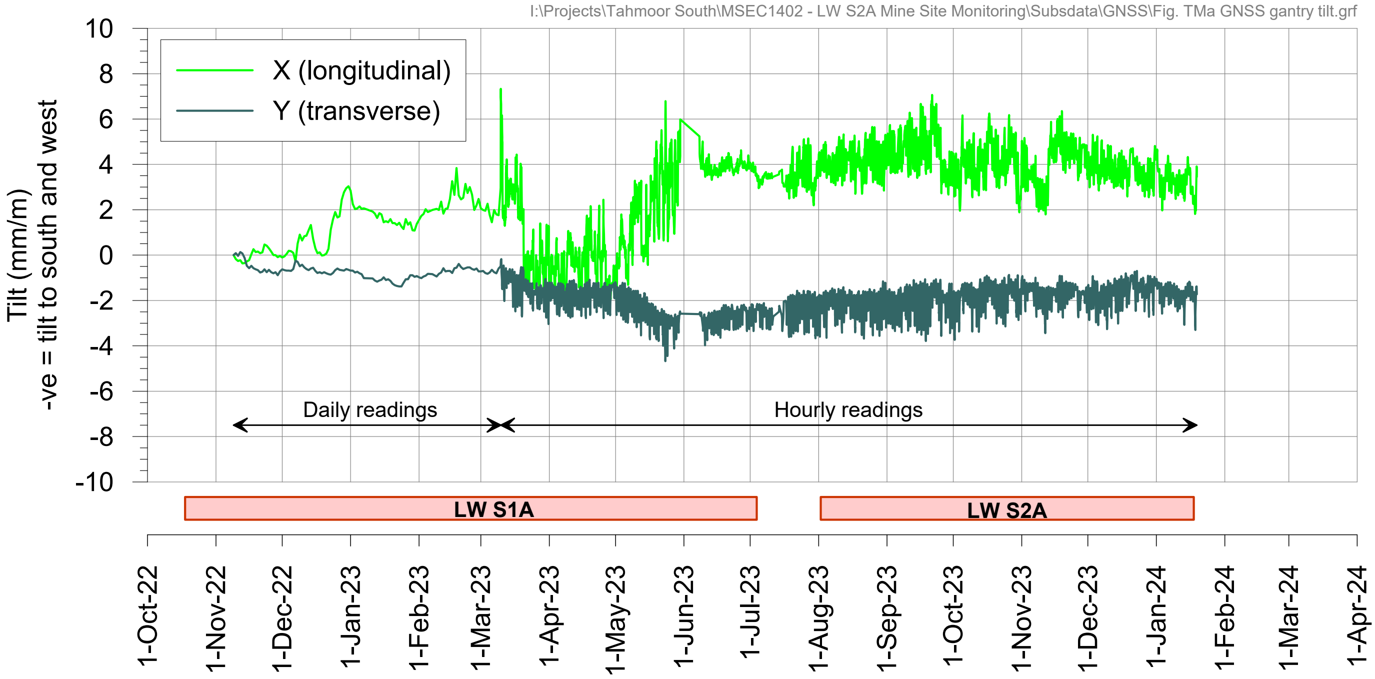


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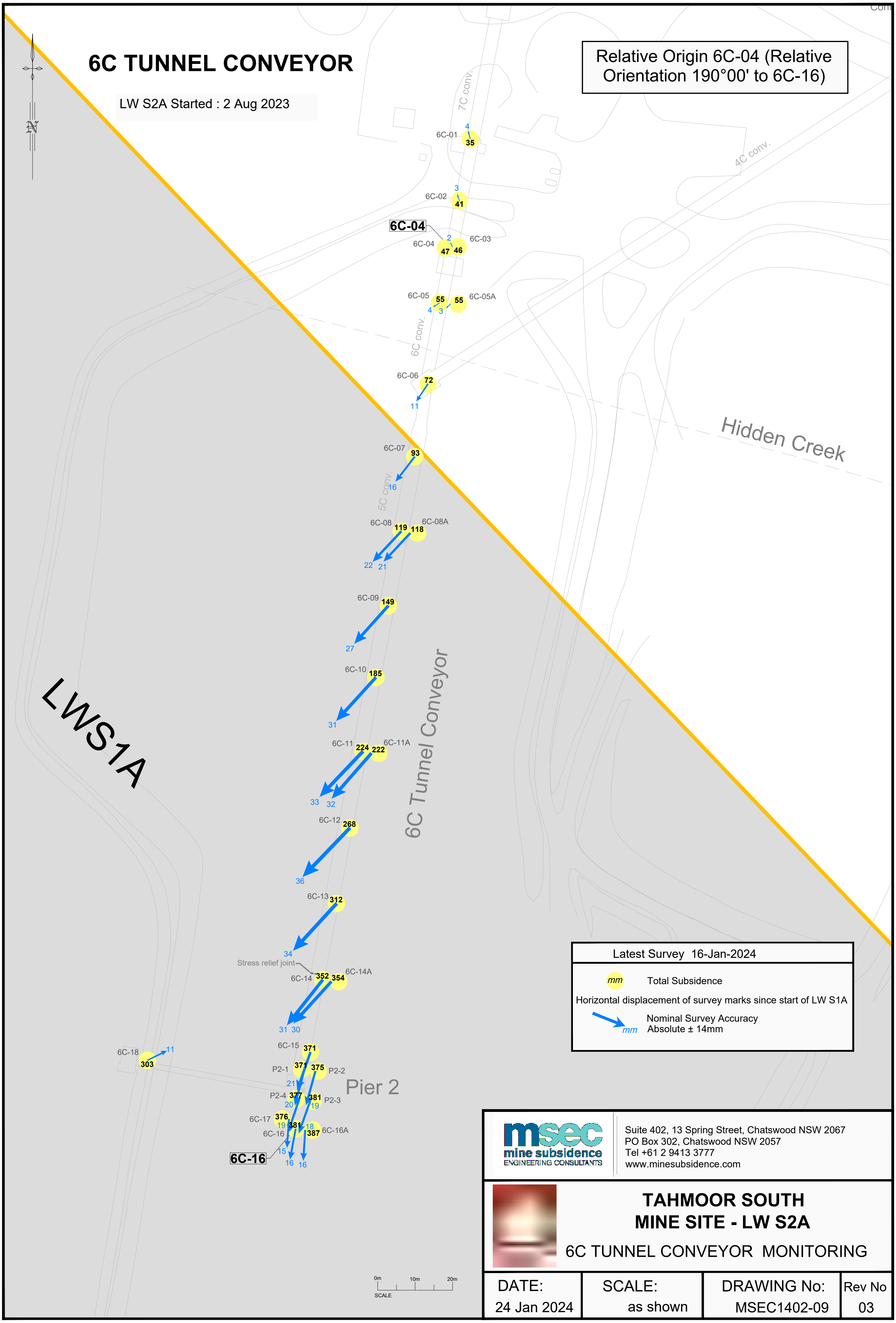
Fig. TMa-R03

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-09 Tunnel Conveyor 6C.dwg

6C TUNNEL CONVEYOR

LW S2A Started : 2 Aug 2023

Relative Origin 6C-04 (Relative Orientation 190°00' to 6C-16)



Latest Survey 16-Jan-2024

mm Total Subsidence

Horizontal displacement of survey marks since start of LW S1A

mm Nominal Survey Accuracy Absolute ± 14mm

0m 10m 20m
SCALE

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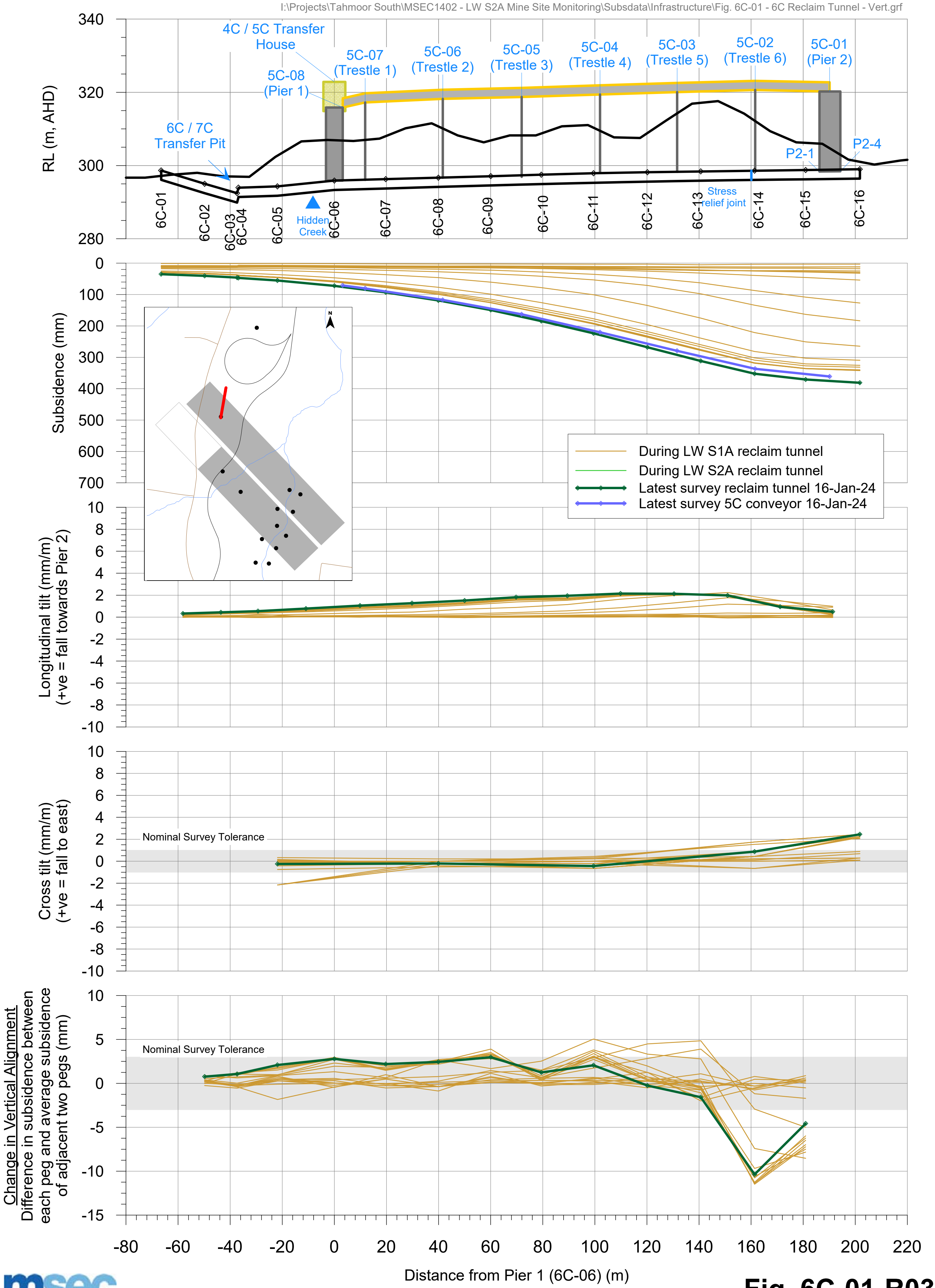
MINE SITE - LW S2A

6C TUNNEL CONVEYOR MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	as shown	MSEC1402-09	03

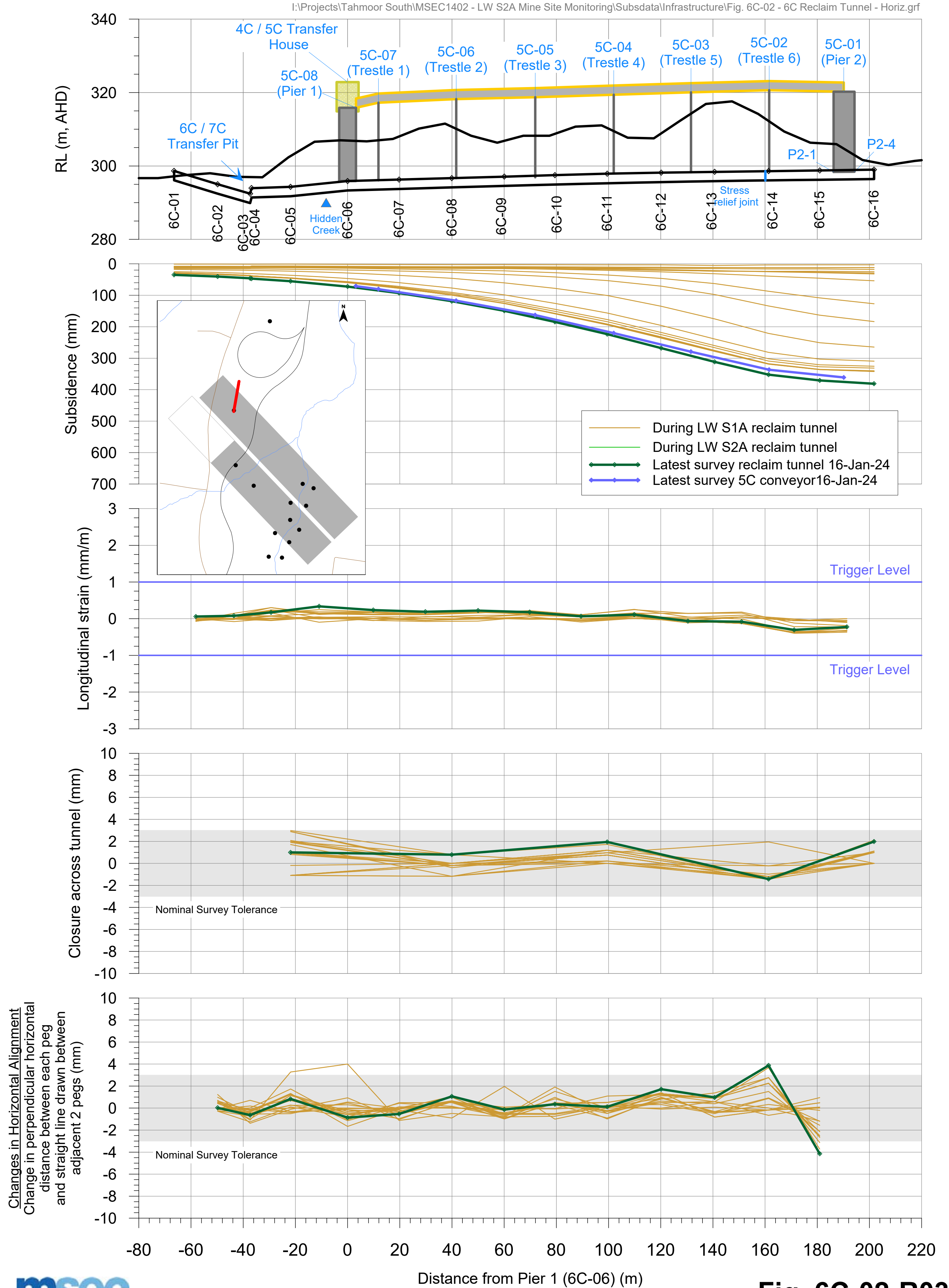
Tahmoor South LW S2A - Conveyor 6C Reclaim Tunnel
Total subsidence, tilt and changes in vertical alignment



msec

Fig. 6C-01-R03

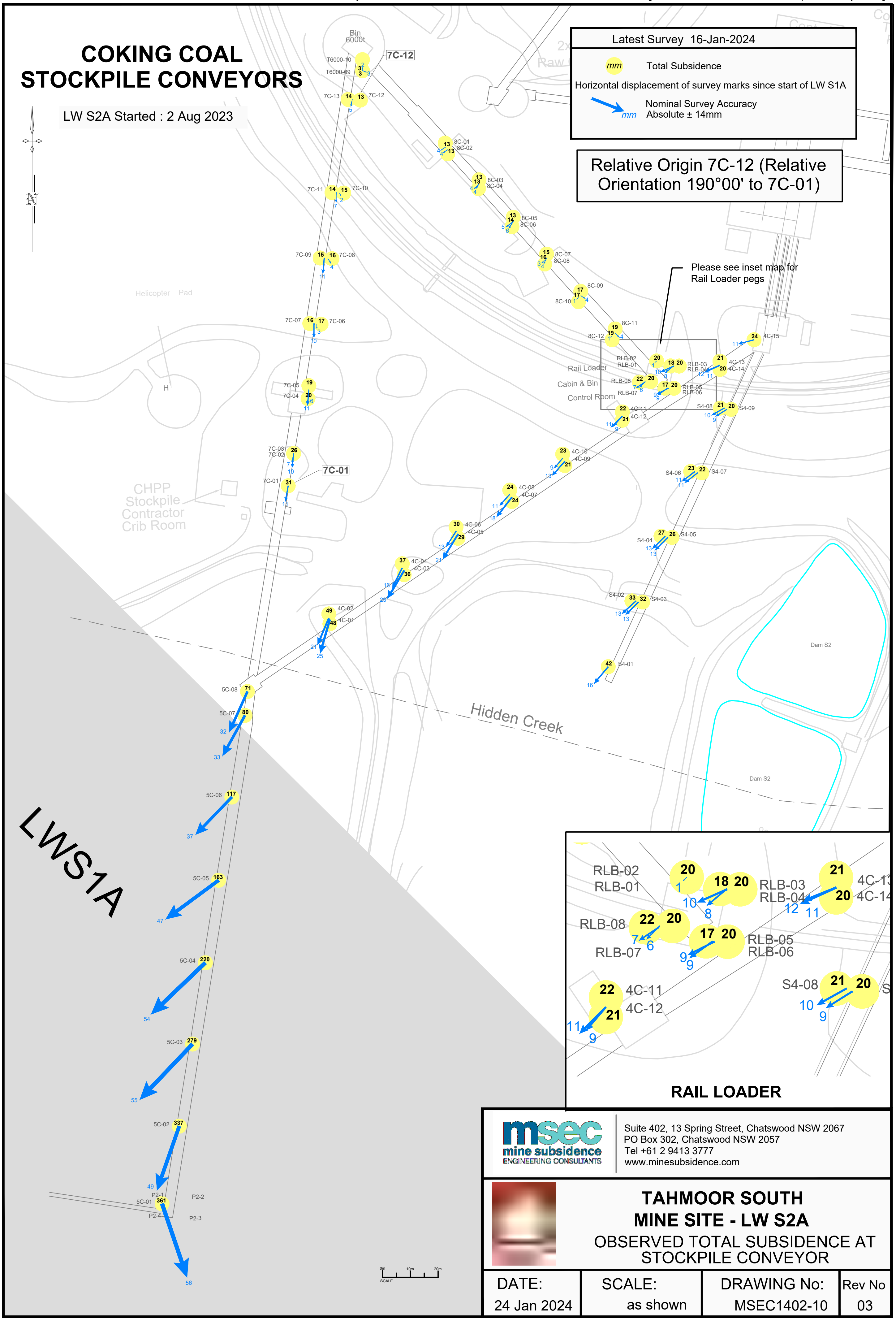
Tahmoor South LW S2A - Conveyor 6C Reclaim Tunnel
Observed Total differential horizontal movements



msec

Fig. 6C-02-R03

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-10 Stockpile Conveyor.dwg



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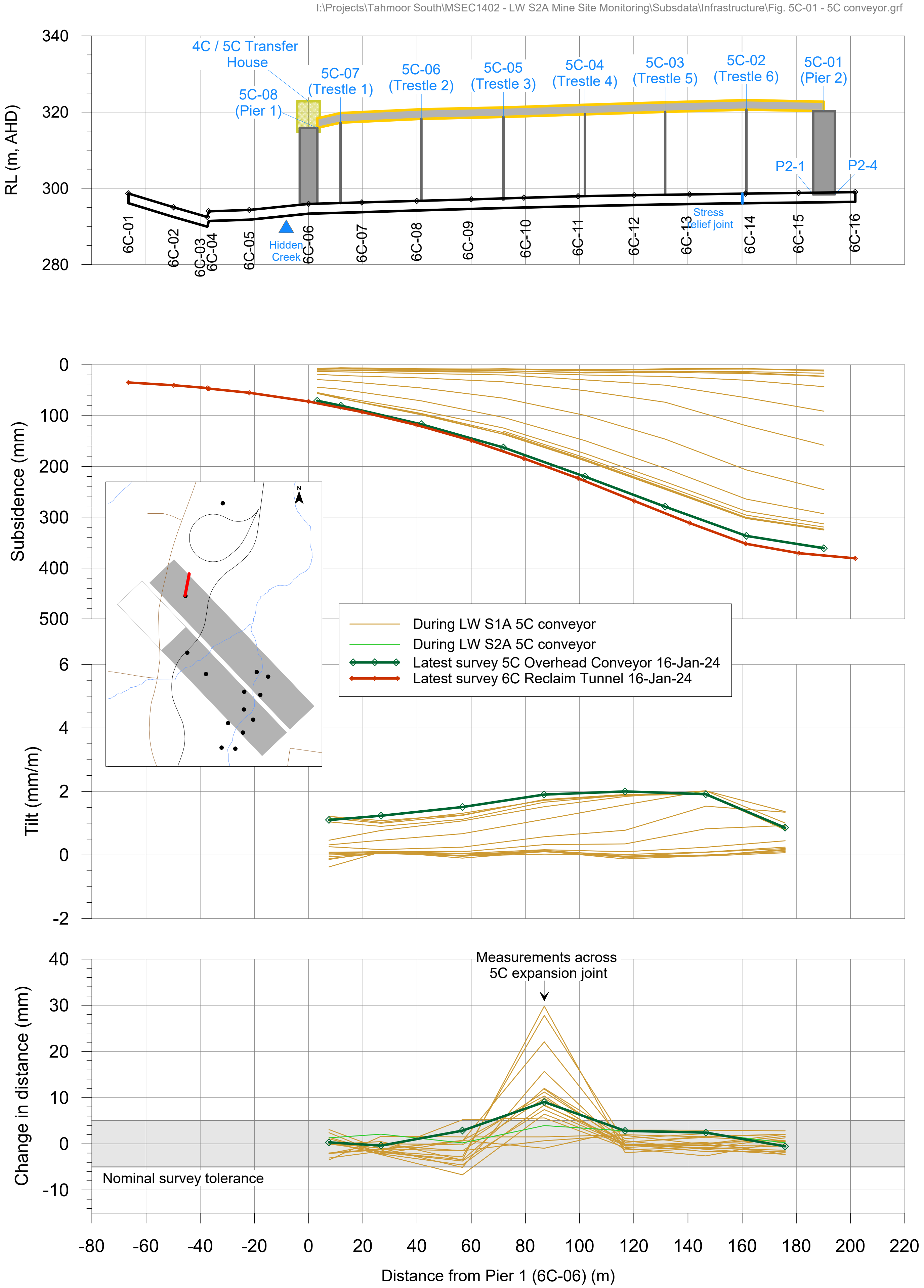
TAHMOOR SOUTH
MINE SITE - LW S2A
OBSERVED TOTAL SUBSIDENCE AT STOCKPILE CONVEYOR

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	as shown	MSEC1402-10	03

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at 5C conveyor

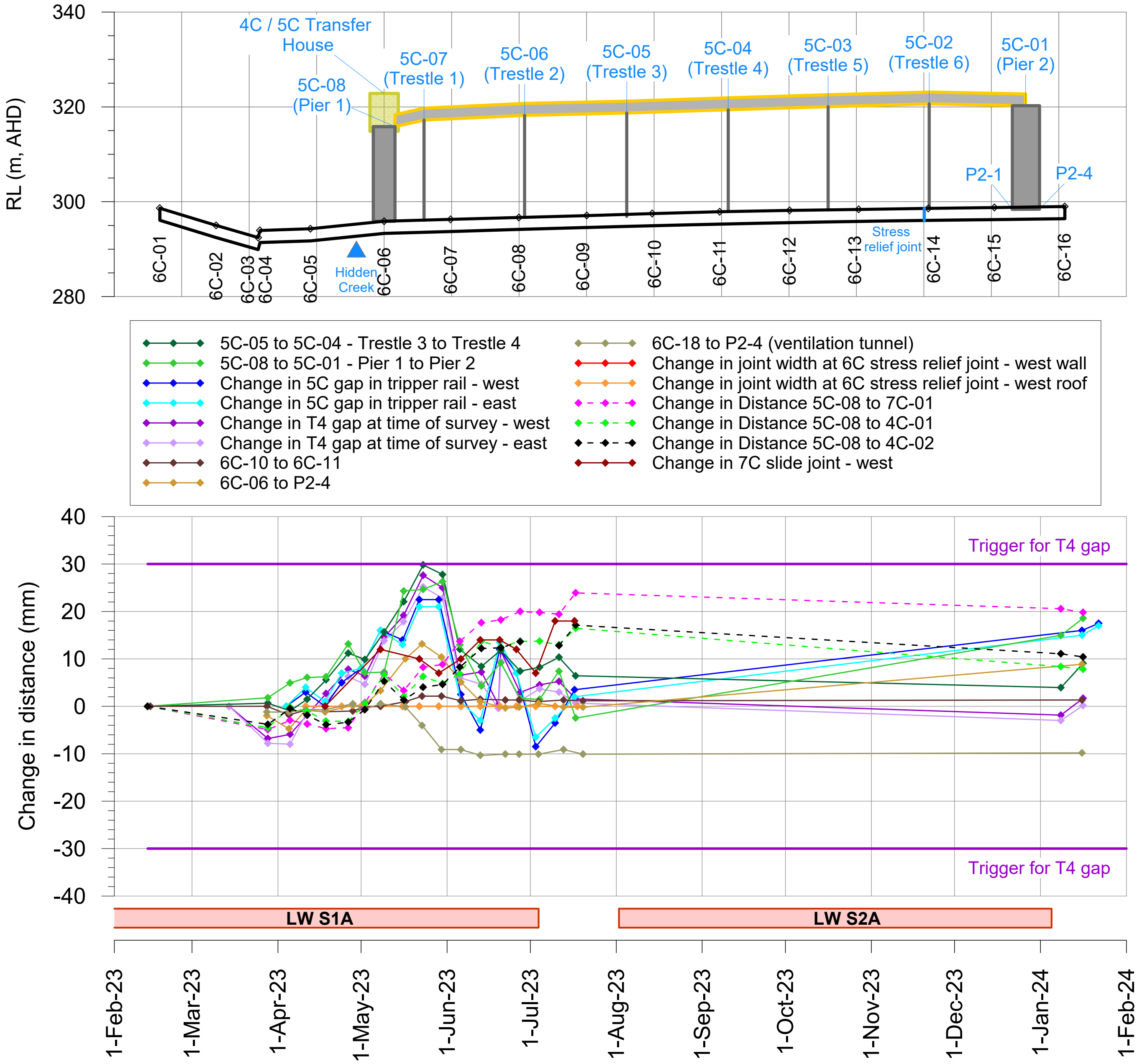


msec

Fig. 5C-01-R03

Tahmoor South LW S2A - Tahmoor Mine Site
Total changes in distance at 5C conveyor

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\Subsdata\Infrastructure\Fig. 5C-02 - 5C conveyor changes in distance.grf



msec

Fig. 5C-02-R03

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at top of 4C & 4S conveyors

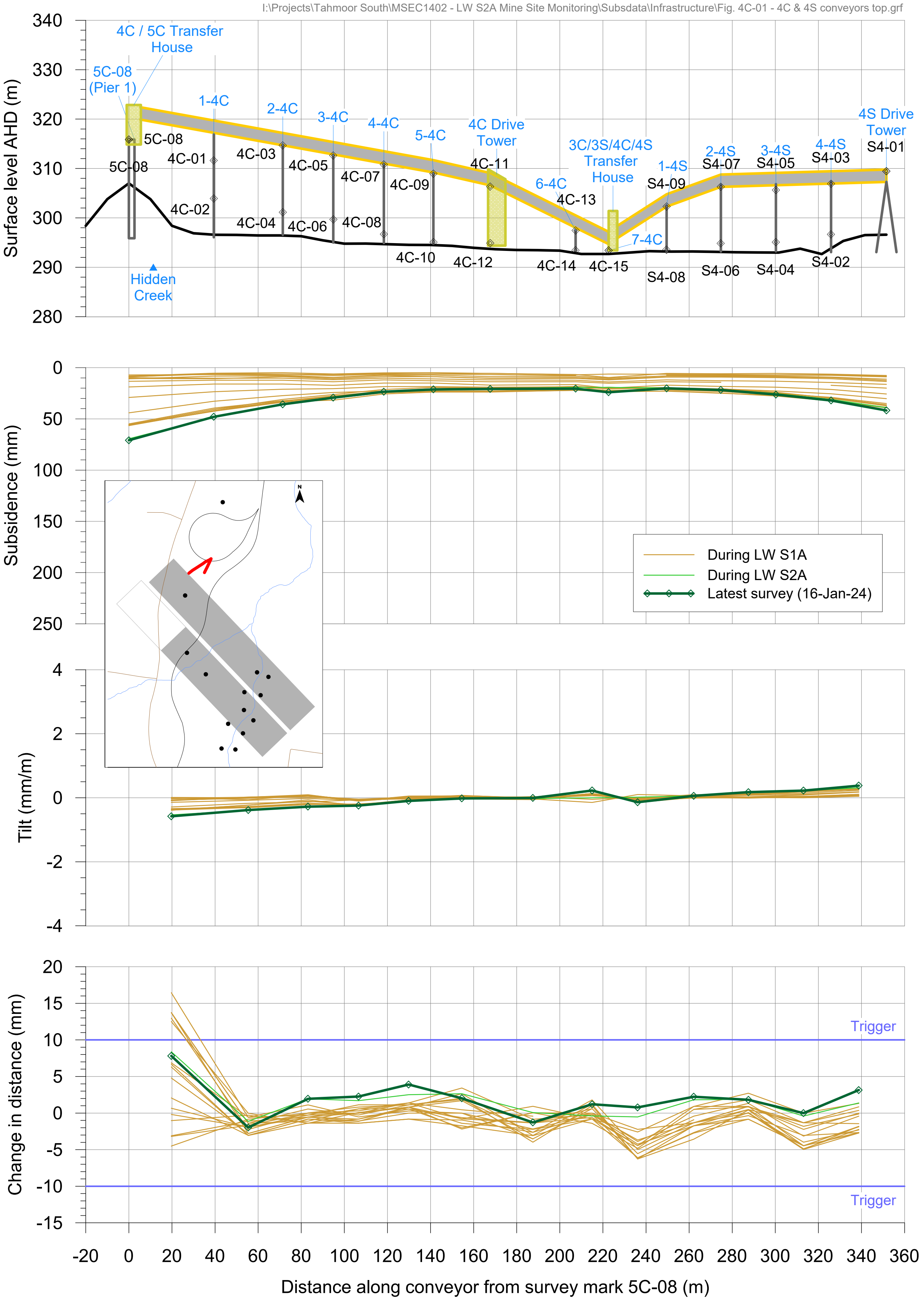


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Fig. 4C-01-R03

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 4C & 4S conveyors

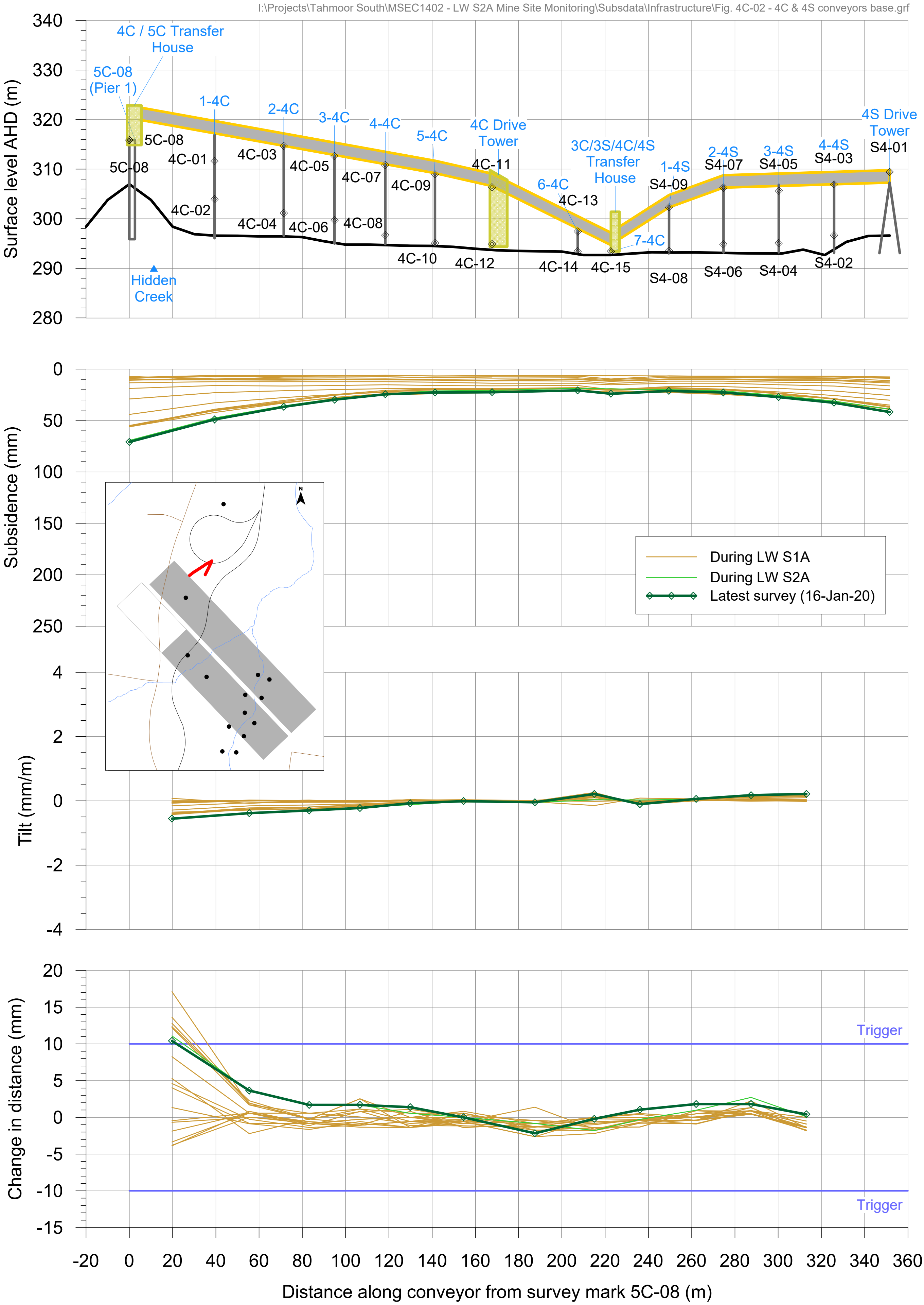
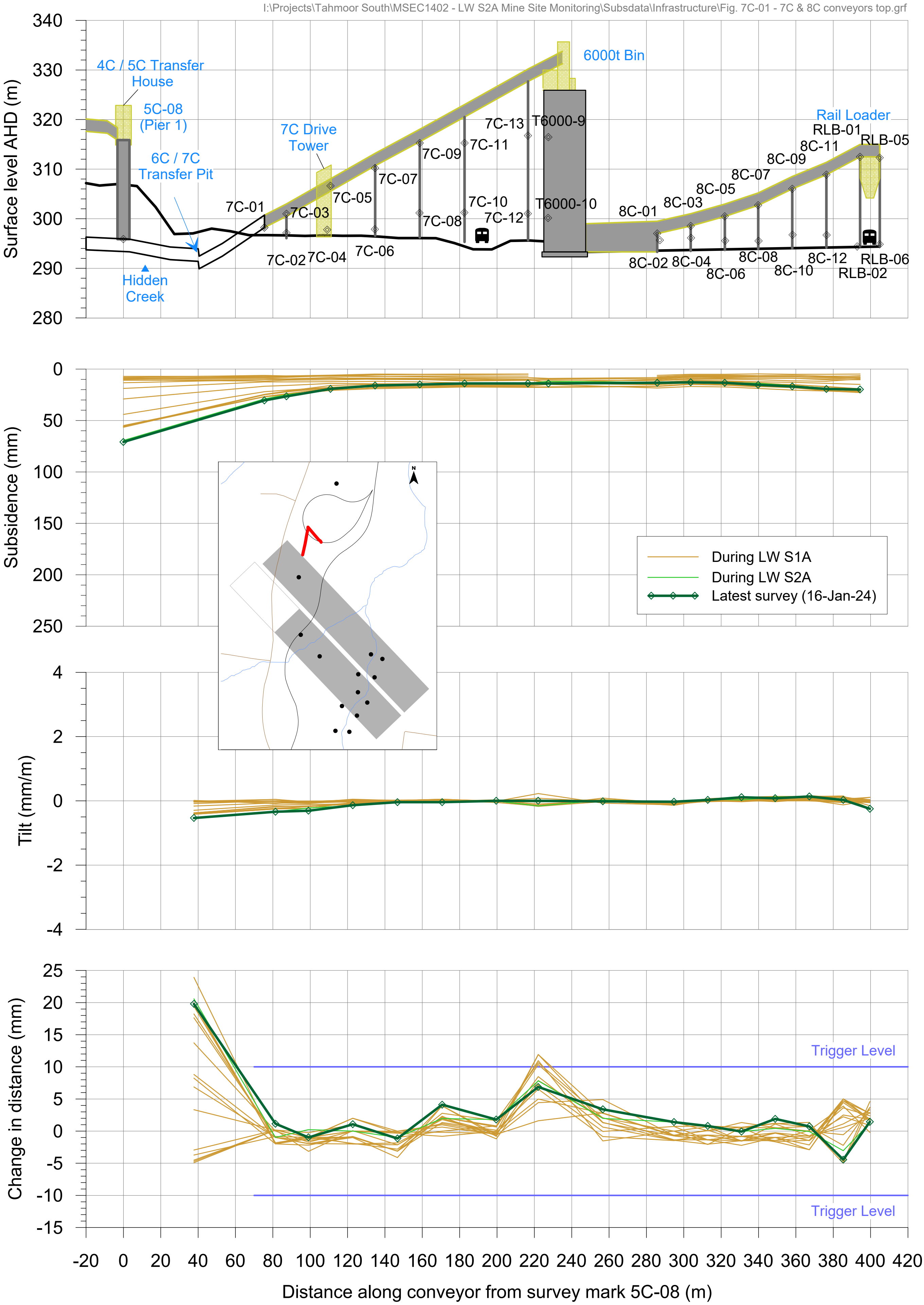


Fig. 4C-02-R03

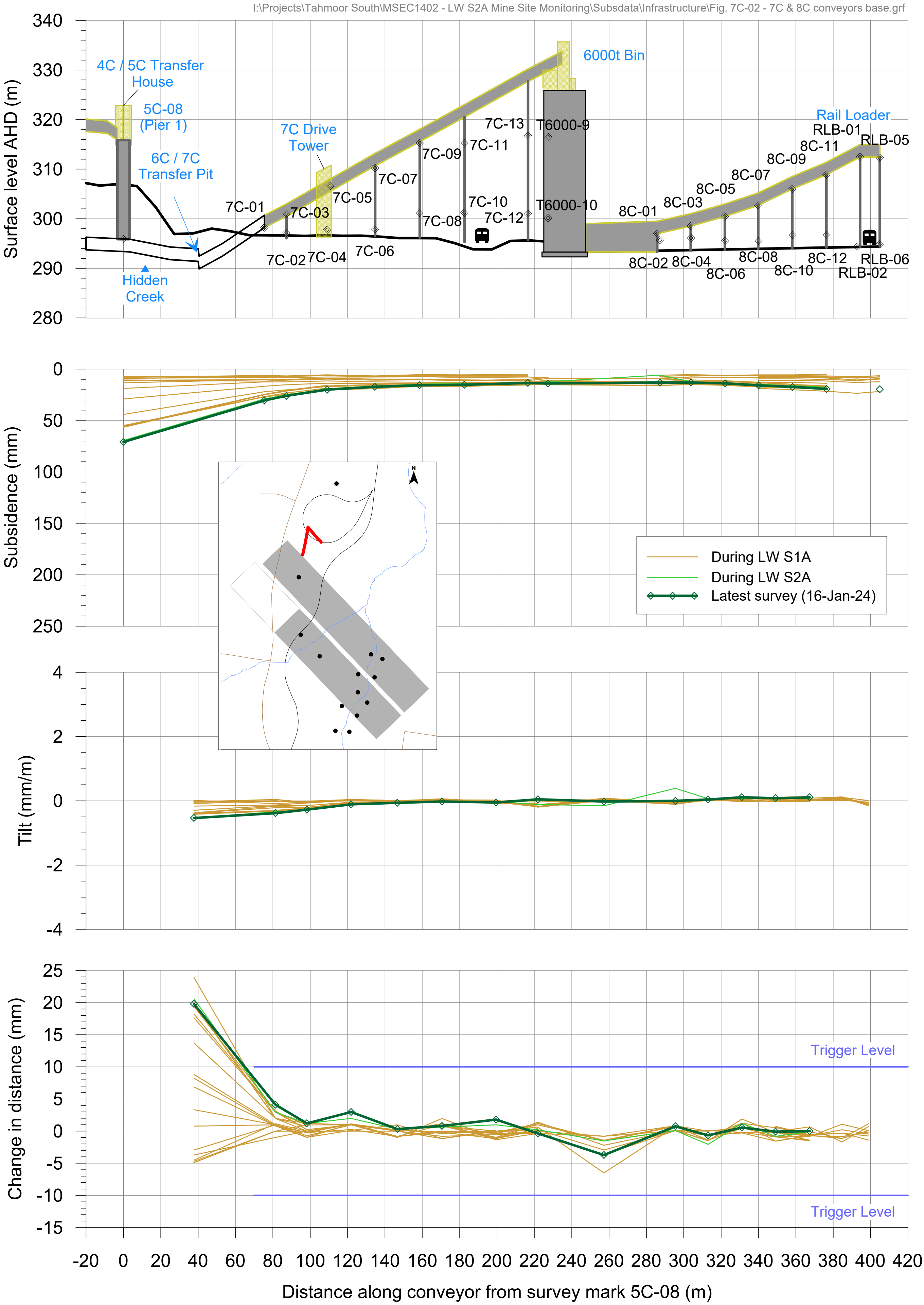
Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at top of 7C & 8C conveyors



msec

Fig. 7C-01-R03

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 7C & 8C conveyors



msec

Fig. 7C-02-R03

Conveyor 3R across Main Southern Railway

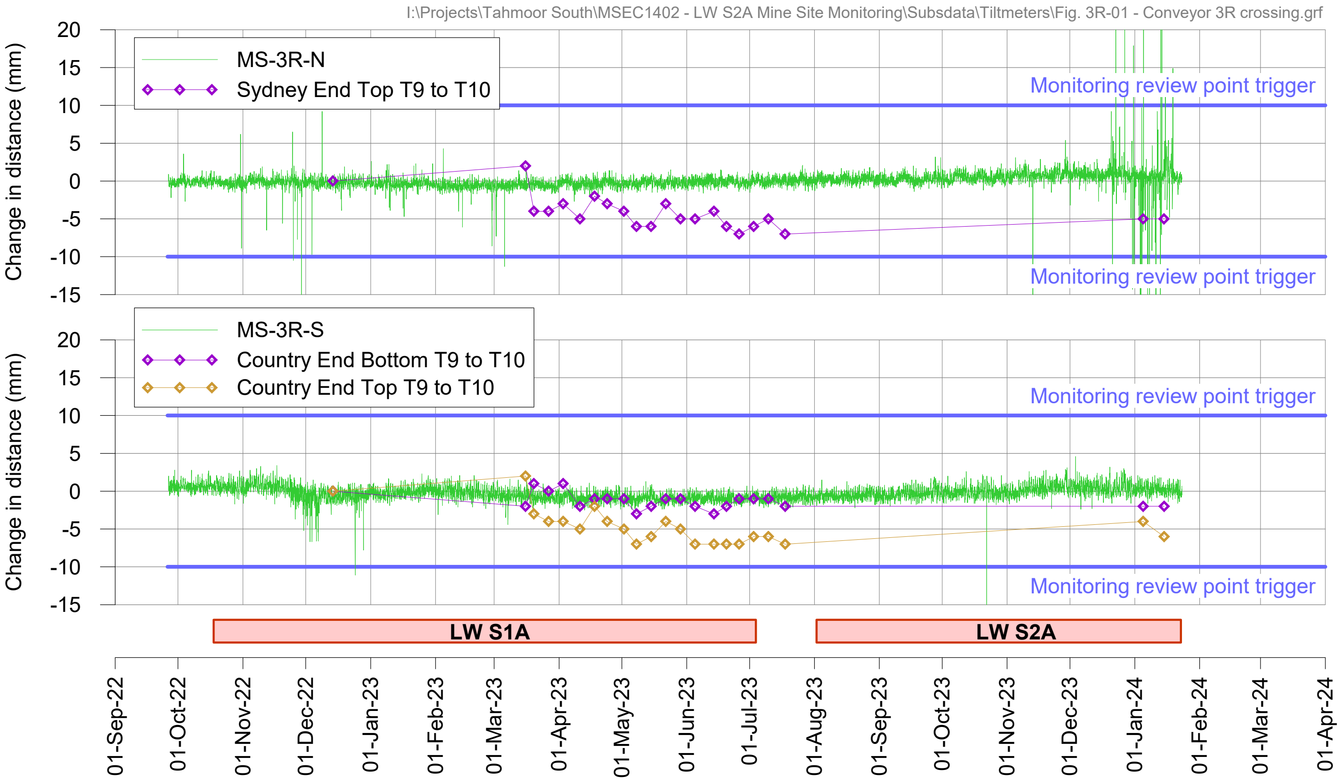


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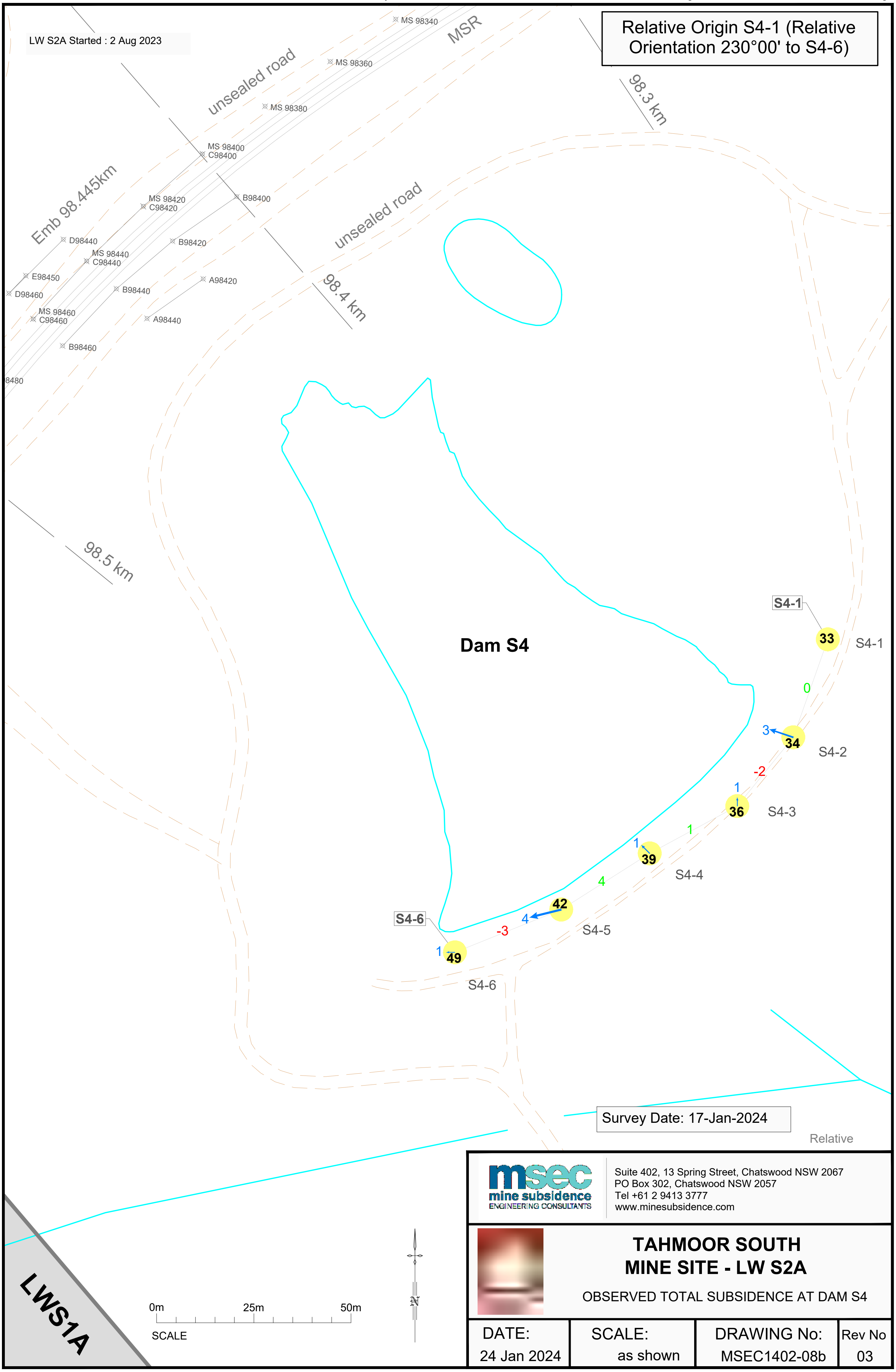
Fig. 3R-01-R03

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-08b Dam S4.dwg



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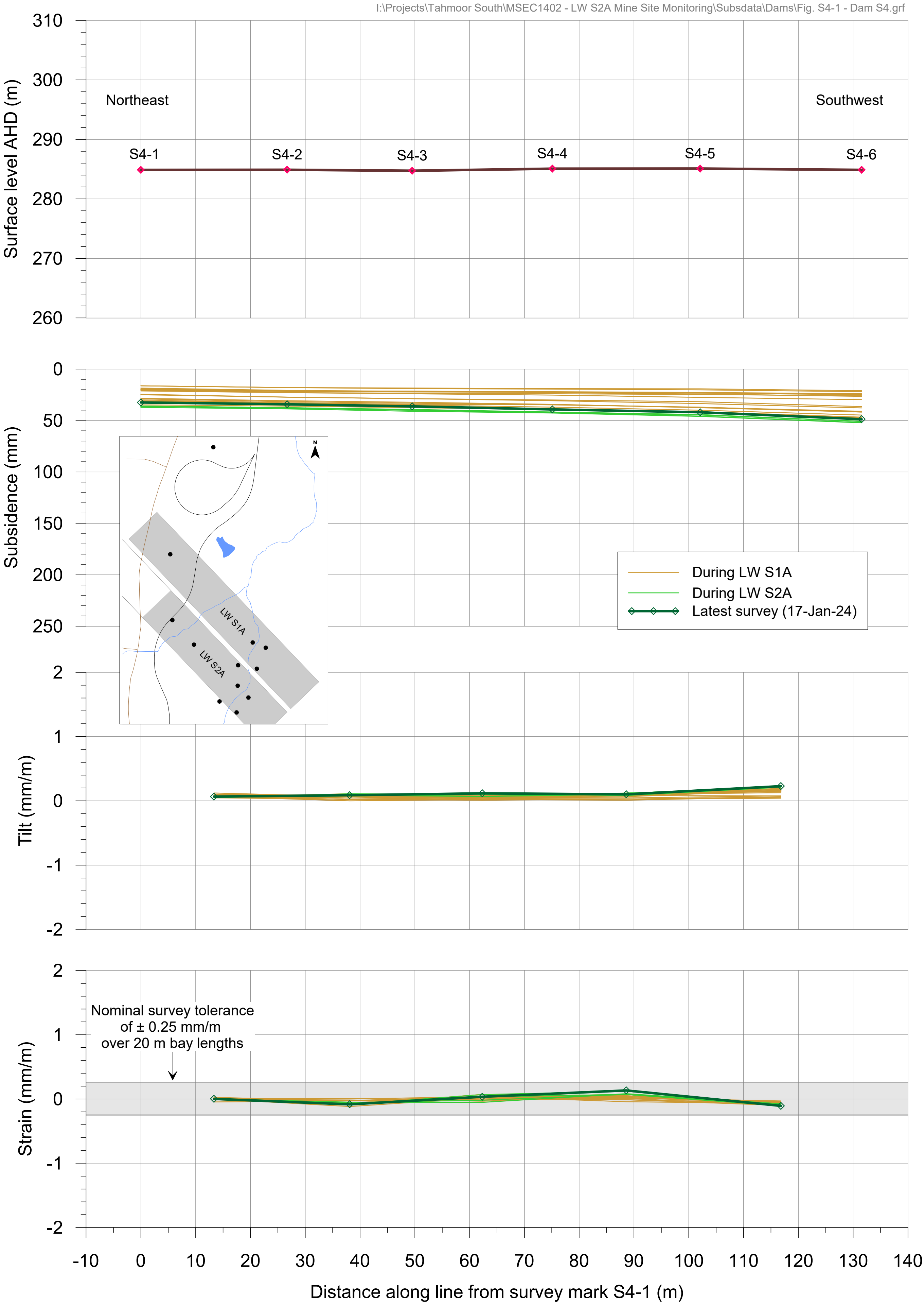
MINE SITE - LW S2A

OBSERVED TOTAL SUBSIDENCE AT DAM S4

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	as shown	MSEC1402-08b	03

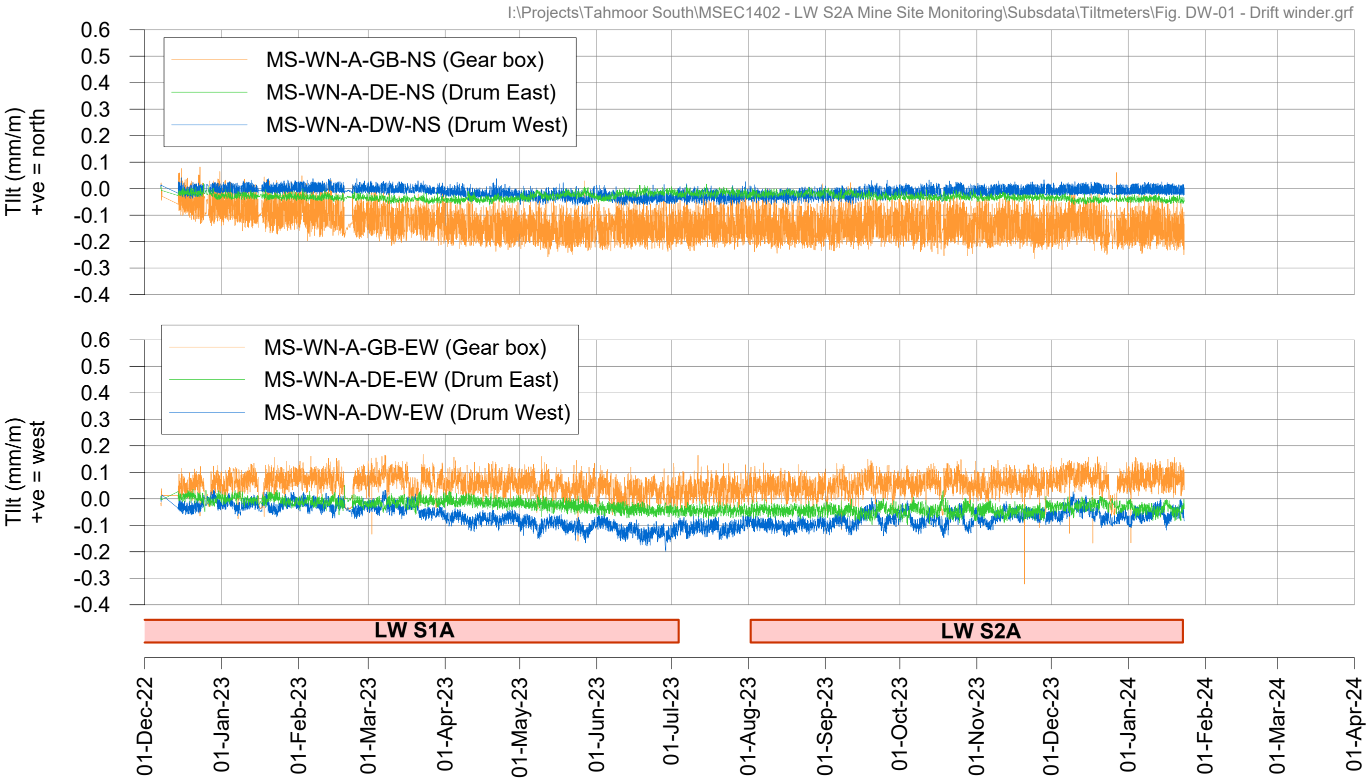
Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at Dam S4



msec

Fig. S4-1-R03

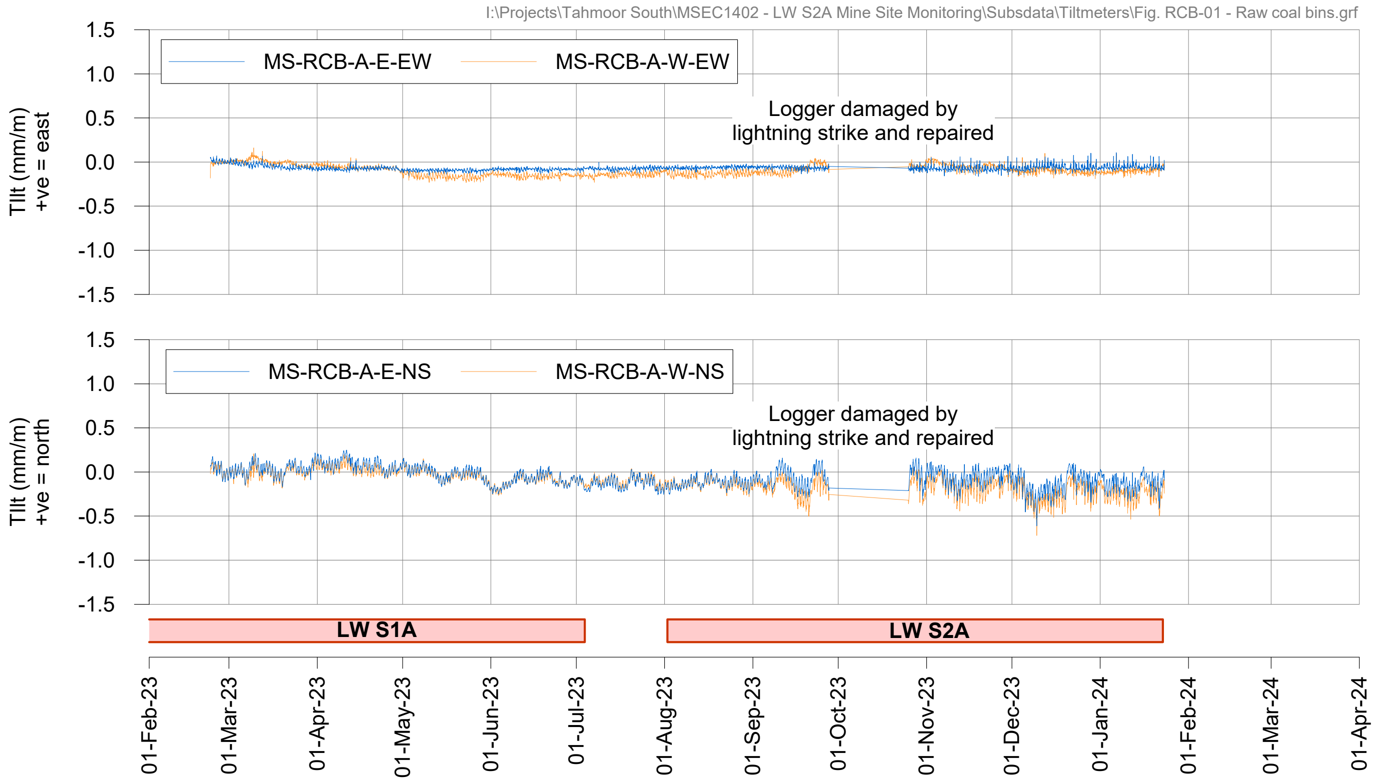
Drift Winder tiltmeters



msec

Fig. DW-01-R03

Raw coal bins tiltmeters



msec

Fig. RCB-01-R03

Shaft 3 tiltmeters

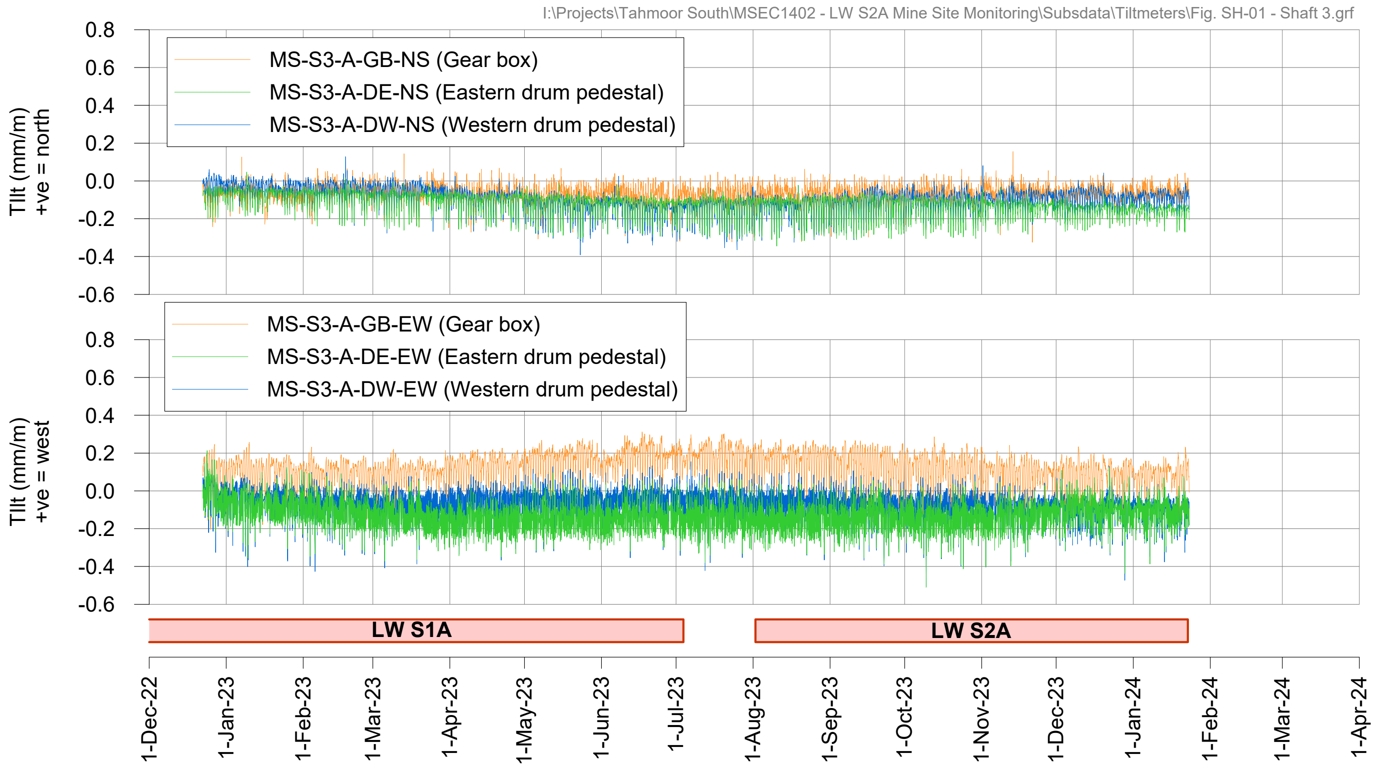


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Fig. SH-01-R03

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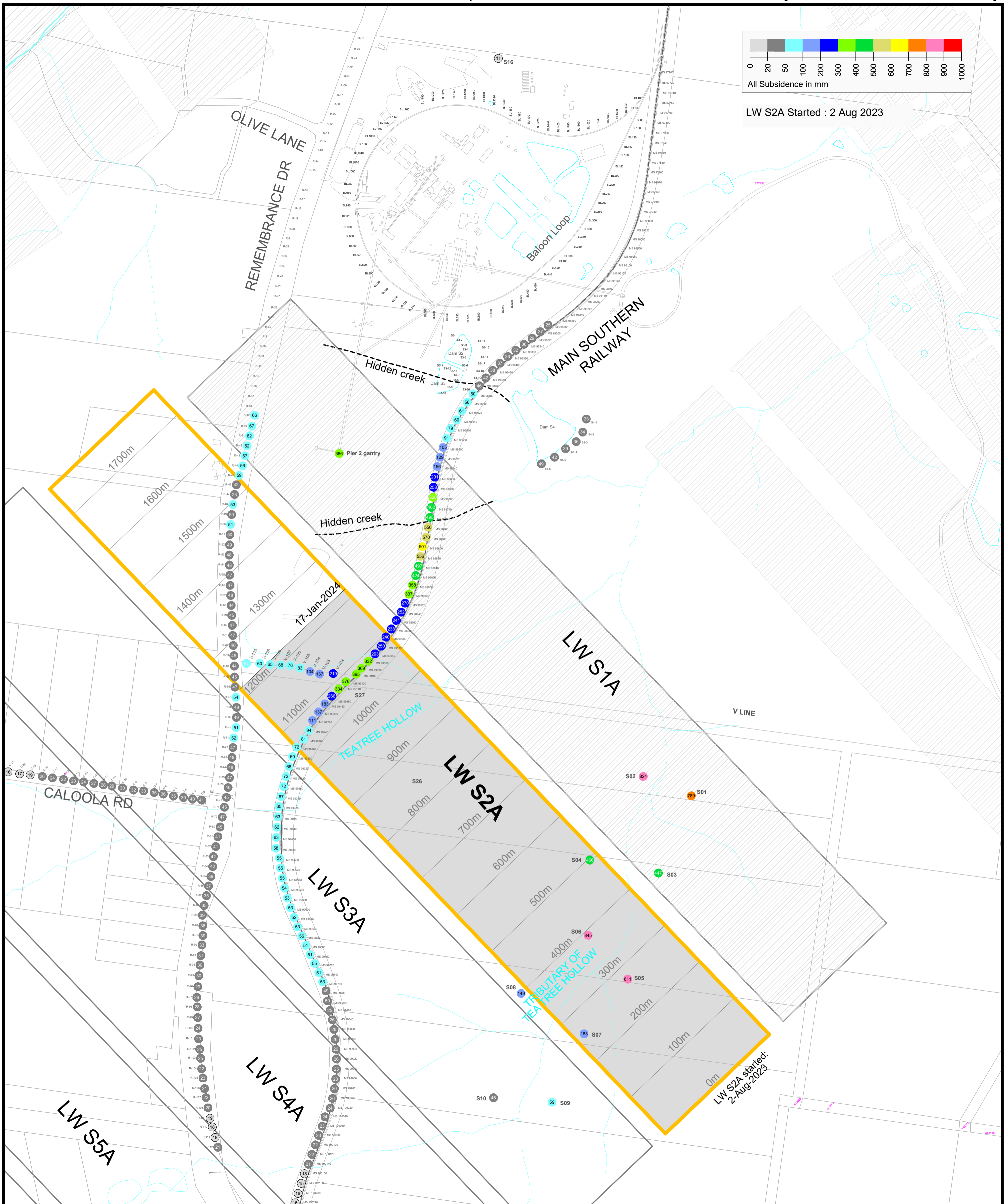

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TAHMOOR SOUTH
MINE SITE - LW S2A

OBSERVED TOTAL SUBSIDENCE

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	1:10000	MSEC1402-02	03

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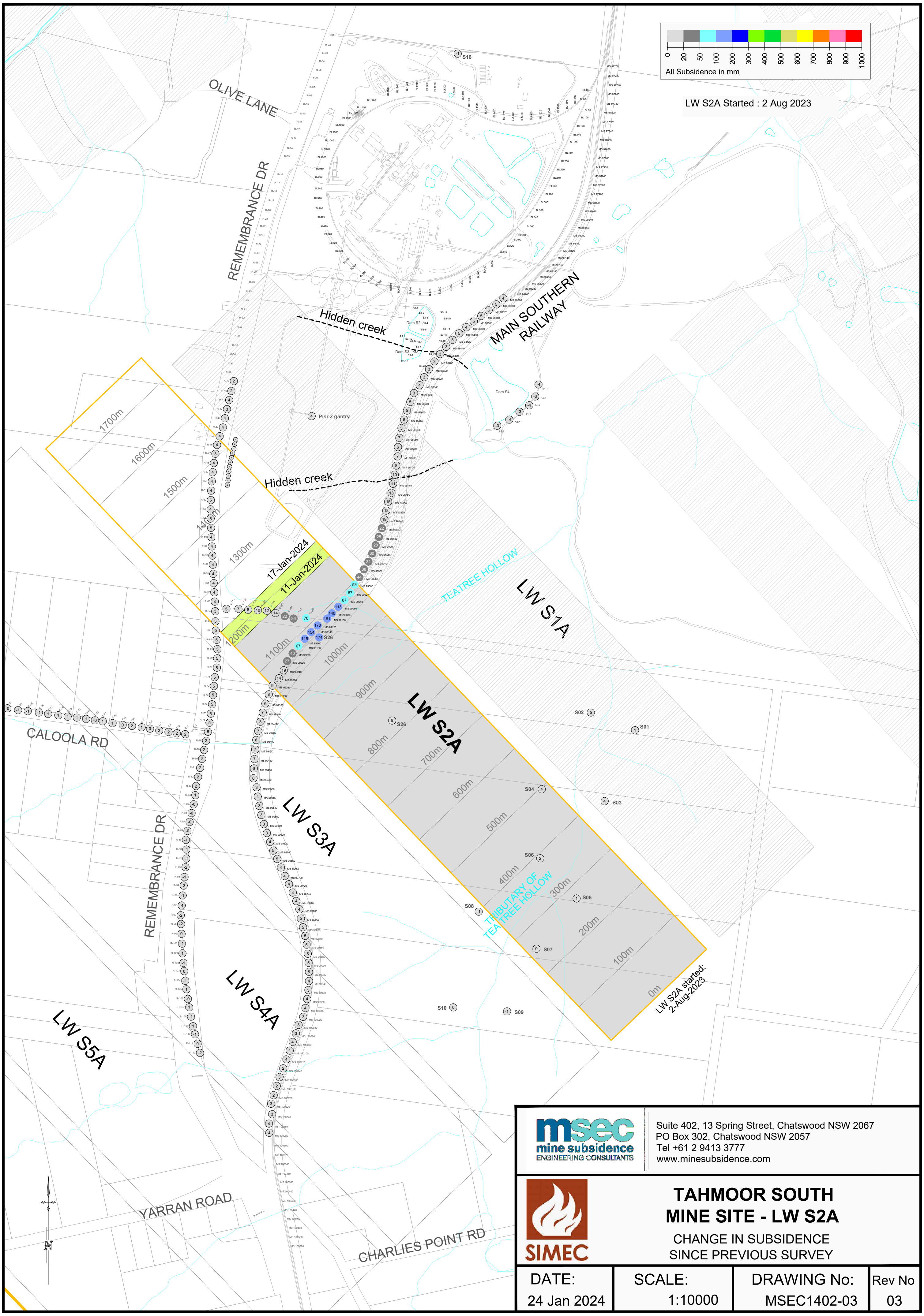

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TAHMOOR SOUTH
MINE SITE - LW S2A

CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	1:10000	MSEC1402-03	03

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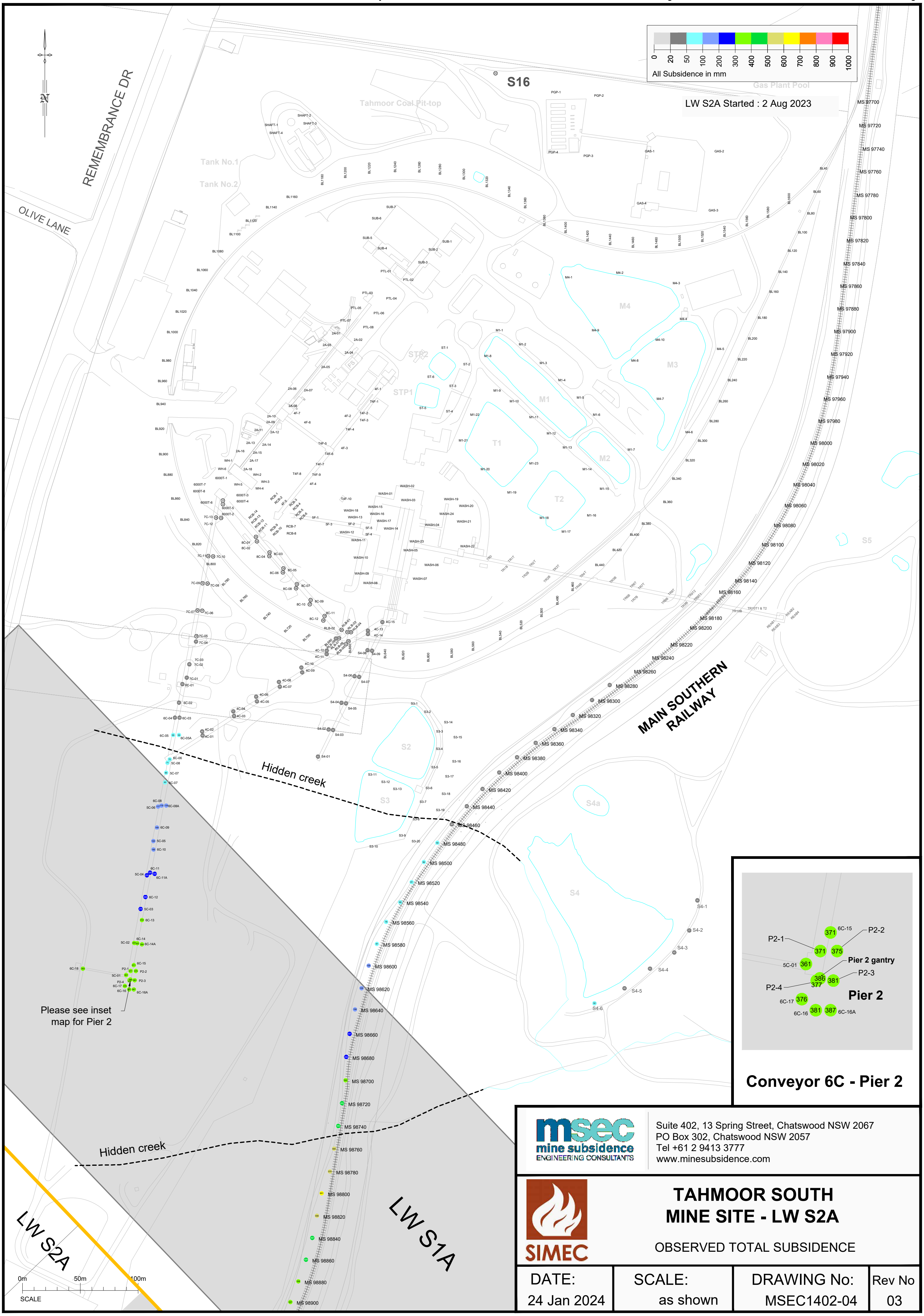

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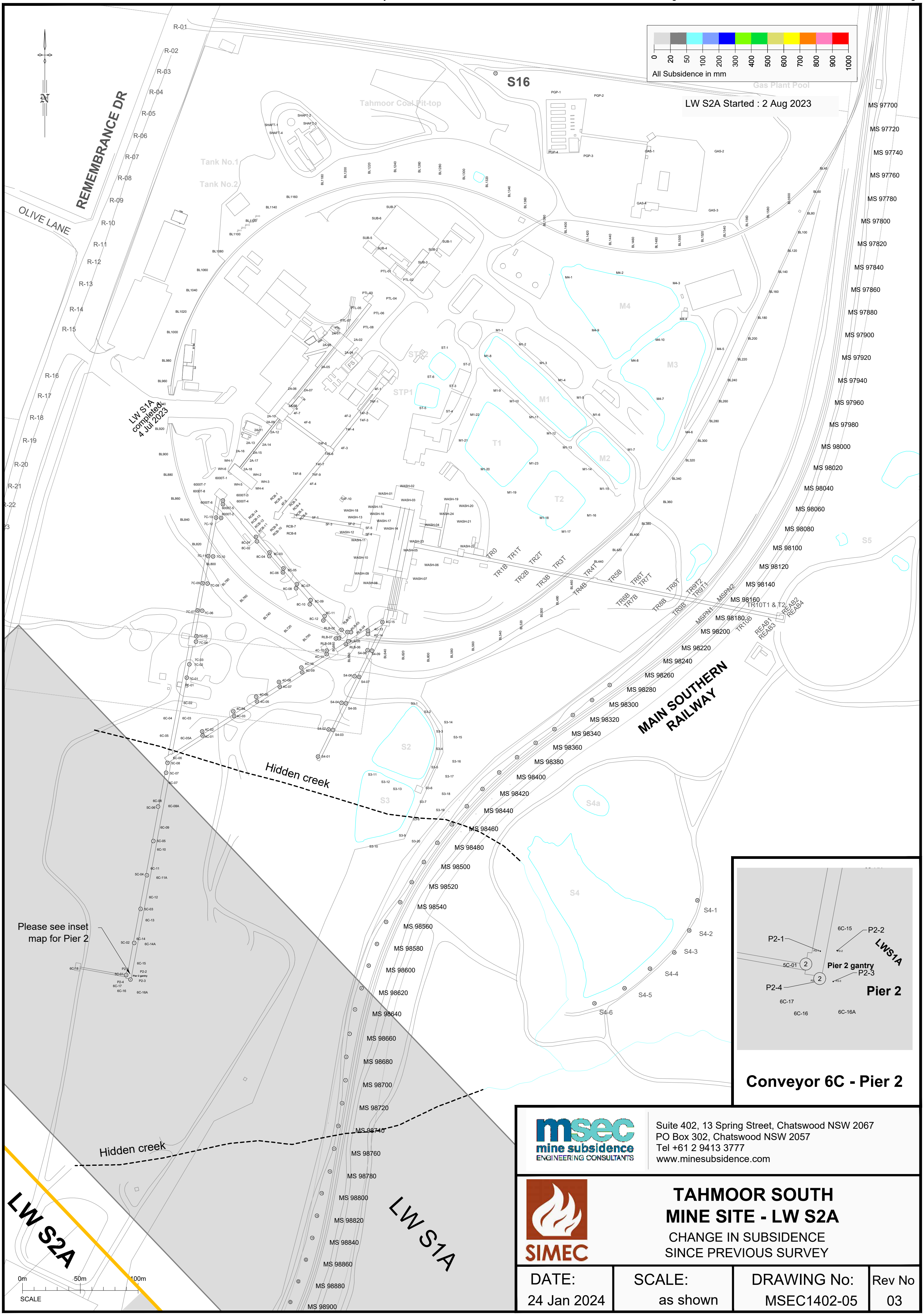
MINE SITE - LW S2A

OBSERVED TOTAL SUBSIDENCE

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	as shown	MSEC1402-04	03



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TAHMOOR SOUTH
MINE SITE - LW S2A
CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
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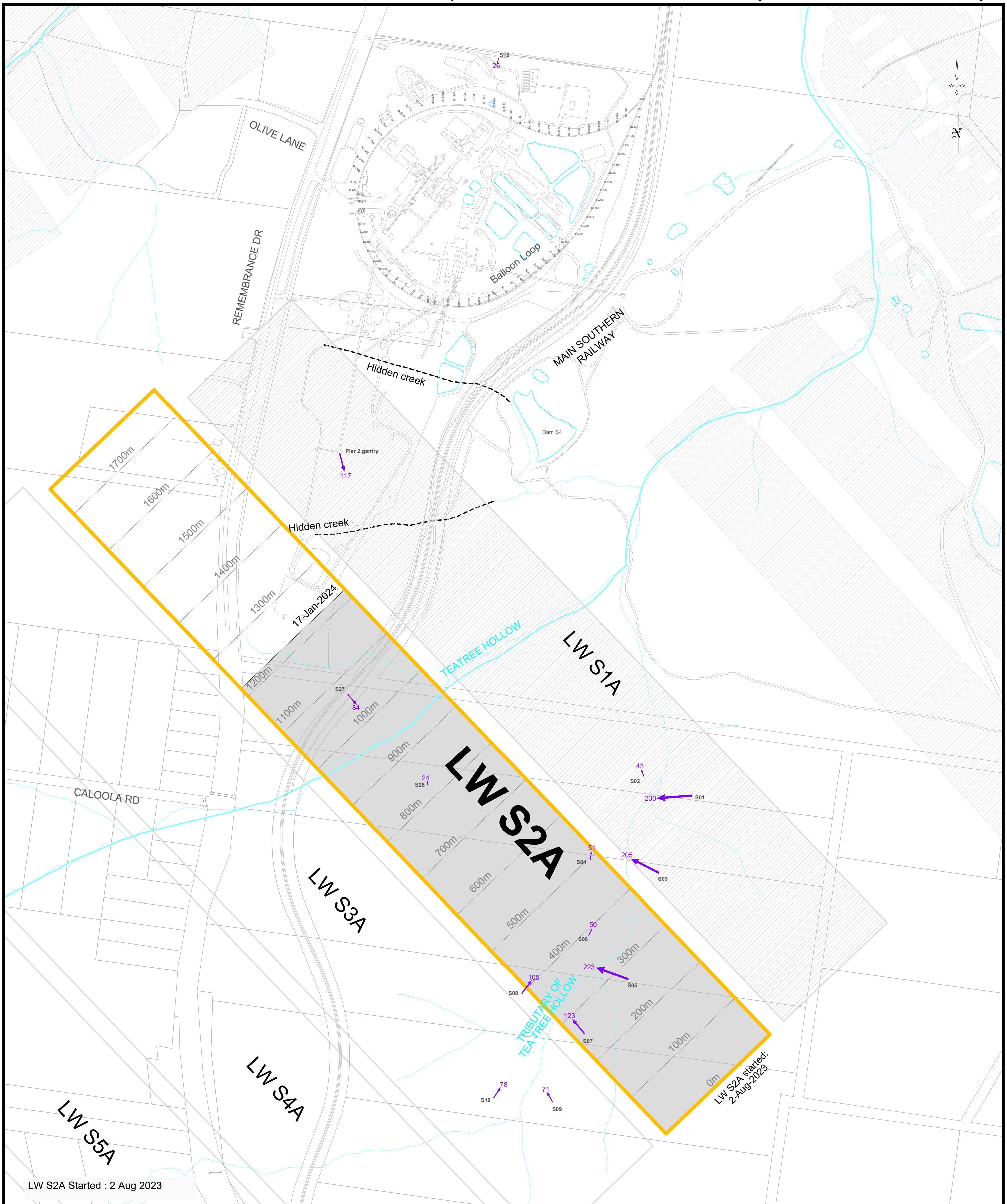

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TAHMOOR SOUTH
MINE SITE - LW S2A

OBSERVED TOTAL ABSOLUTE HORIZONTAL
MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	1:10000	MSEC1402-06	03

LEGEND

Horizontal displacements shown in mm at survey mark locations

GNSS horizontal displacements shown in mm at unit locations

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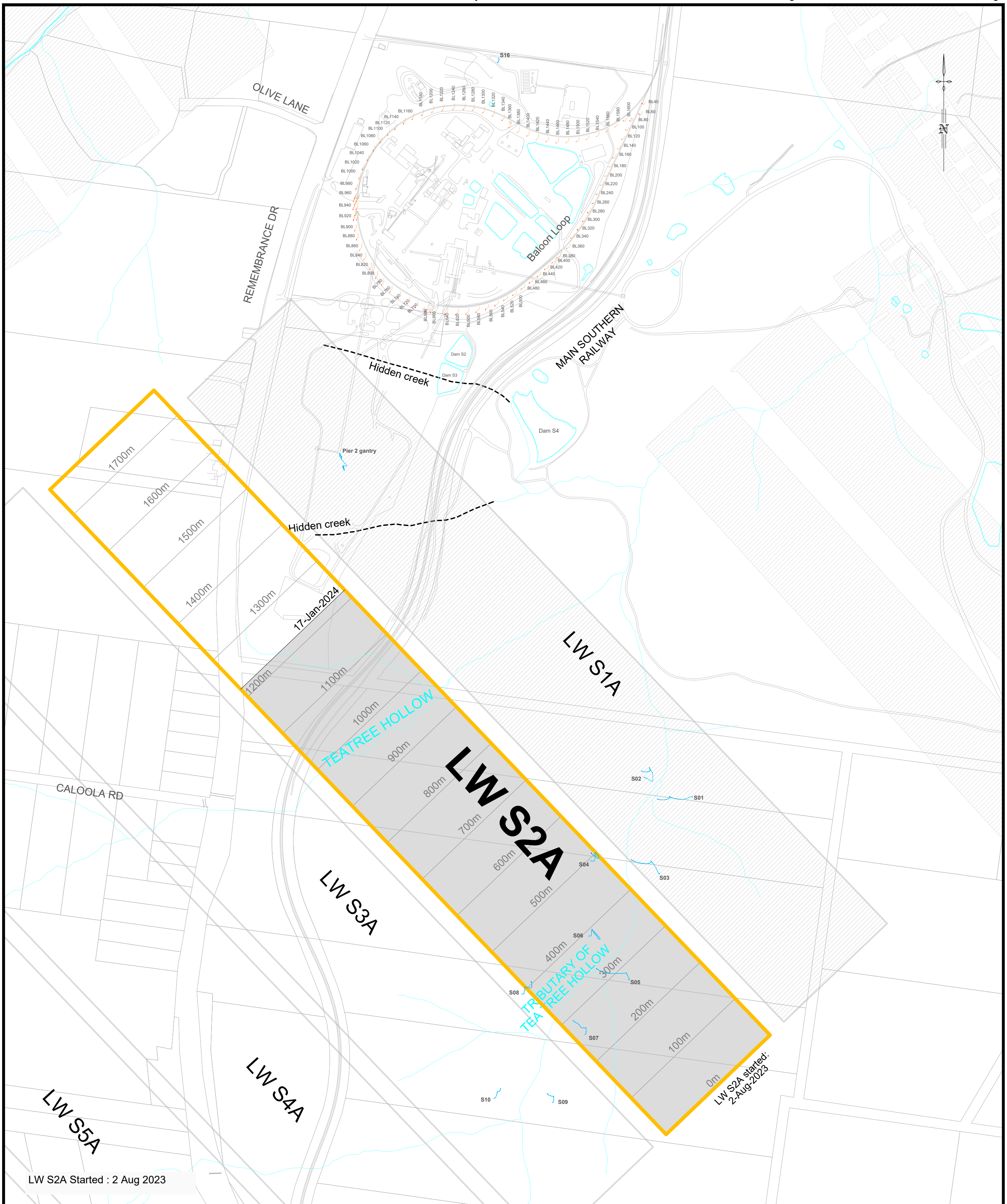

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TAHMOOR SOUTH
MINE SITE - LW S2A
OBSERVED PATH OF TOTAL ABSOLUTE
HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
24 Jan 2024	1:10000	MSEC1402-07	03

LEGEND
- Path of horizontal movement during LWS1A
- Path of horizontal movement during LWS2A
- Path of GNSS horizontal movement during LWS1A
- Path of GNSS horizontal movement during LWS2A

TAHMOOR COAL: LW S2A

Subsidence Management Status Report No. 09
During the mining of LW S2A beneath and adjacent to the Tahmoor Mine Site

Reporting Period	24 February 2024 to 1 March 2024	
Length of extraction of LW S2A	1601 m	On 1 March 2024 LW S2A commenced extraction on 2 August
Closest distance of LW S2A face to Pier 2 on Conveyor 5C	250 m	LW moving away from Pier 2
Distance travelled by LW since previous report	90 m	since 23 February 2024
Maximum total subsidence within Tahmoor Mine Site	488 mm	at 6C-16A in reclaim tunnel on 29 February
Maximum incremental subsidence within Tahmoor Mine Site	140 mm	at 6C-16 and 6C-16A in reclaim tunnel on 29 February
Maximum increase in subsidence since previous survey	30 mm	at 6C-16, 6C-16A and 6C-17 in reclaim tunnel (23 February to 26 February)
Safety Incidents	No incidents reported.	
Subsidence impacts reported by Tahmoor Mine Site staff	No subsidence impacts reported.	

Summary of monitoring and inspections

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
General Mine Site monitoring				
GNSS Unit Gantry at Pier 2	Continuous		N/A	Subsidence gradually developing, approximately 477 mm in magnitude. Small horizontal movements to the south towards LW face.
GNSS Unit S16 (near Shaft No. 3)	Continuous			Very minor changes since the end of LW S1A. 5 mm increase in subsidence in early Dec 2023, with no measurable change since this time.
Main Southern Railway	27 Feb	Weekly	N/A	Track has experienced most active period of subsidence. Small bumps in subsidence profile and compressive strain developing at creek crossings. Small bump developing at 99.18 km above LW S2A.
Rail Loop	26 Feb	Weekly	N/A	Very minor changes since end of LW S1A.
Remembrance Drive	26 Feb	Weekly	N/A	Gradual development of non-conventional compressive strain along Remembrance Drive between Pegs R47 and R48 and bump in observed subsidence profile at Peg R47. Location is south of Pier 2 and the Stockpile Area. Minor changes this week. New non-conventional compressive strain developing along Remembrance Drive between Pegs R54 and R55 and bump in observed subsidence profile at Peg R54.
Visual inspections	1 Mar	Weekly		No issues reported.
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C				
Reclaim Tunnel survey	29 Feb	Weekly		Gradually increasing extension between Pier 1 and Pier 2 up to 26 mm and spread evenly along Tunnel.
Conveyor 5C survey	27 Feb	Weekly	N/A	Gradually increasing extension up to 43 mm observed from Pier 1 to Pier 2. NO change measured this week. Very gradual lateral and vertical bending along the conveyor over time
Inclinometer surveys	26 Feb	Weekly		Minor changes observed since the end of LW S1A.
Tilt monitoring at Pier 2	Continuous		N/A	Minor changes observed.
Tilt monitoring at T4	Continuous		N/A	Minor changes observed.
Displacement monitoring at T4	Continuous			Gradual increase in gap between Trestles 3 and 4.
Stress monitoring at T4	Continuous		N/A	Minor changes in response to stockpile loading.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C (continued)				
Gap in tripper rail	4 Mar	Weekly	N/A	Rail joint has been measured to open 10 to 12 mm this week, in a reverse of last week's closure between Piers 1 and 2. Installation of an additional spacer may be required next week.
Joint monitoring in Reclaim Tunnel between T6 and Pier 2	4 Mar	Weekly	N/A	No measurable changes observed.
Visual inspections	4 Mar	Weekly	(cracks found in 6C Tunnel)	Very little change in previously observed cracking in eastern and western walls. Structure gap across expansion joint at T4 on eastern side has opened 12 mm this week, consistent with measurements at the tripper rail. Very little change at wall and roof joints along tunnel. No change at failure joint.
Overhead conveyors				
Conveyor trestle surveys	27 Feb	-		Minor changes observed this week. Further reduction in closure observed between 8C-11 and RLB-01 at top of 8C conveyor, with no measurable change at the base. Increase in closure measured on 3R conveyor at connection to Reject Bin this week. Both observations are considered to be due to changes in thermal expansion and contraction of the superstructure. Visual inspections have identified changes at slide joints but otherwise no impacts.
Laser distancemeter at Conveyor 3R across Railway	Continuous			Minor changes observed.
Visual inspection	4 Mar	Weekly		No issues reported. 7C connection to bins has moved south by approx. 8 mm to near neutral position. 4S slide joint has moved north by approx. 8 mm in a reverse of last week's movement. The stockpile over the trestle was relatively high at time of measurement.
Drift				
Drift survey	29 Feb	-		Very minor changes since end of LW S1A.
Visual inspection	Daily		N/A	No issues reported.
Winder				
Tiltmeters on Winder	Continuous			Minor changes observed.
Visual inspection	1 Mar	Weekly	N/A	No issues reported.
Rail Loop				
Long bay length survey	26 Feb	Weekly		Very minor changes since end of LW S1A but very minor growth to 13 mm in ground shortening between BL600 and BL700, consistently exceeding the trigger level. A 1 mm decrease was measured this week. It is currently planned to restress the track at the completion of LW S2A but the plan is reviewed on an ongoing basis by the Rail Management Group.
Road culvert survey	26 Feb	Weekly	N/A	Very minor changes since end of LW S1A.
Track geometry survey	-	-		Survey after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.
Track inspection	-		N/A	Inspect after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Mine Site Structures				
Tiltmeters on Raw Coal Bins	Continuous			Minor changes observed.
Rail Loader survey	27 Feb	-		Minor changes observed this week.
Reject Bin survey	26 Feb	Monthly		Very minor changes since end of LW S1A.
Visual inspections	1 Mar	-		No issues observed.
Overhead crane and monorails				
Crane rail survey	26 Feb	Weekly		Very minor changes since end of LW S1A.
Visual inspections	1 Mar	Weekly		No impacts observed.
Shaft No. 3				
Tiltmeters on shaft winder	Continuous			Minor changes observed.
Clearance measurements at 135m depth	27 Feb	Weekly		Clearances between 280 mm and 294 mm this week, greater than minimum clearance of 180 mm.
Visual inspection	Daily		N/A	No issues reported.
Dams, embankments and site services				
Dam S4 survey	28 Feb	Weekly	N/A	Minor subsidence and closure observed. Surveys will cease as the LW face has travelled past the survey line by more than 450 metres.
Dam S2 and S3 survey	29 Feb	Weekly	N/A	Minor changes observed since the end of LW S1A. S3-8, S3-9 and S3-10 destroyed during excavation works.
Visual inspections by building inspector, incl high pressure water pipeline	26 & 27 Feb	Weekly		Clearing has been undertaken at Dams S2 and S3. The water level has reduced at Dam S4 due to pumping.
Geotech inspections on mine site	8 Feb	Monthly		No issues reported.
Geotech inspections of Dams S2 and S3 from railway	26 Feb	Weekly		No issues observed by geotechnical engineer.
Track inspections of Dams S2 and S3 from railway	Daily		N/A	No issues observed by Track Certifier

Management Actions

Other management actions since previous report:
- Ongoing review of changes in long bay length along the Rail Loop between Pegs BL600 and BL700 by the Rail Management Group.

Any additional and/or outstanding management actions:
- Nil

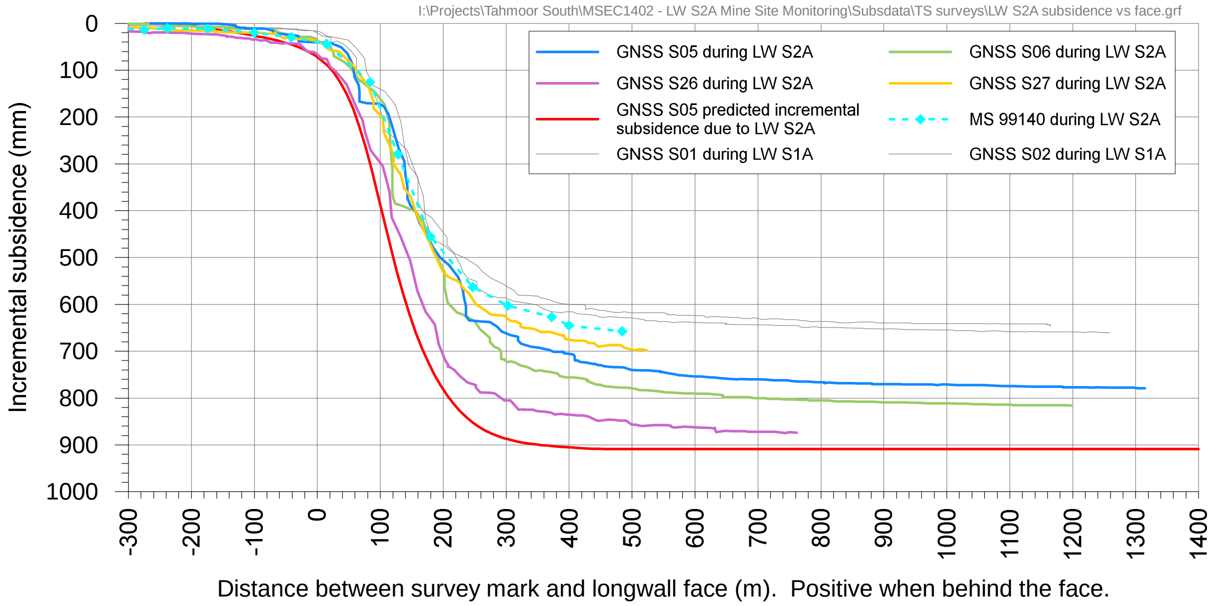
IMG meeting since previous report:
- IMG meeting held 6 March

Forecast whether continued longwall mining is likely to cause impact on the safety of operations at Tahmoor Mine Site

Based on monitoring results to date, and the controls implemented and available under the LW S1A-S6A Management Plan for Longwall Mining beneath and adjacent to the Tahmoor Mine Site, no triggers under this Management Plan are expected to be exceeded in the next week. Accordingly continued longwall mining is not likely to result in the occurrence of either A or B above.

Certified by Tahmoor Coal	
Name	Ross Barber
Position	Project Manager
Signature	Ross Barber
Date	6 March 2024

Copy of Report to:
IMG
Ray Ramage, Principal Inspector – Subsidence, Mine Safety Inspectorate, Resources Regulator



TAHMOOR COAL: LW S2A

Subsidence Management Status Report No. 18
During the mining of LW S2A beneath and adjacent to the Tahmoor Mine Site

Reporting Period	**27 April 2024 to 3 May 2024**	
Length of extraction of LW S2A	1767 m	LW S2A completed extraction 6 April 2024
Closest distance of LW S2A face to Pier 2 on Conveyor 5C	-	
Distance travelled by LW since previous report	-	LW S2A completed extraction 6 April 2024
Maximum total subsidence within Tahmoor Mine Site	553 mm	at 6C-16A at reclaim tunnel on 29 April
Maximum incremental subsidence within Tahmoor Mine Site	226 mm	at 6C-18 at reclaim tunnel on 29 April
Maximum increase in subsidence since previous survey	3 mm	at TR5B at 3R conveyor (22 April to 30 April)
Safety Incidents	No incidents reported.	
Subsidence impacts reported by Tahmoor Mine Site staff	No subsidence impacts reported.	

Summary of monitoring and inspections

Monitoring Activity	**Date**	**Current Frequency**	**Highest Trigger**	**Comments**
General Mine Site monitoring				
GNSS Unit Gantry at Pier 2	Continuous		N/A	Subsidence gradually developing, approximately 540 mm in magnitude. Small horizontal movements to the south and west.
GNSS Unit S16 (near Shaft No. 3)	Continuous			Very minor changes since the end of LW S1A. 5 mm increase in subsidence in early Dec 2023, with no measurable change since this time.
Main Southern Railway	30 Apr	Monthly	N/A	Track has experienced most active period of subsidence. Small bumps in subsidence profile and compressive strain observed at creek crossings. Small bump at 99.18 km above LW S2A.
Rail Loop	30 Apr	Cease	N/A	Very minor increase in ground shortening since end of LW S1A.
Remembrance Drive	30 Apr	Cease	N/A	Gradual development of non-conventional compressive strain along Remembrance Drive between Pegs R47 and R48 and bump in observed subsidence profile at Peg R47. Location is south of Pier 2 and the Stockpile Area. New site of increased compressive strain developing along Remembrance Drive between Pegs R54 and R55 and bump in observed subsidence profile at Peg R54. The pavement was resurfaced at both sites on 8 April. No significant changes at both sites this week.
Visual inspections	29 Apr	Weekly		No issues reported.
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C				
Reclaim Tunnel survey	29 Apr	Cease		Gradually increased extension between Pier 1 and Pier 2 up to 28 mm and spread evenly along Tunnel. A 1 mm increase was measured this week.
Conveyor 5C survey	29 Apr	Cease	N/A	Gradually increasing extension up to 51 mm observed from Pier 1 to Pier 2. A 2 mm decrease was measured this week. Very gradual lateral and vertical bending along the conveyor over time.
Inclinometer surveys	30 Apr	Cease		Minor changes observed during the mining of LW S2A. Measured reduction of previously measured shear at 37.5m depth in BH1 on 30 Apr that may be due to relaxation of rock mass or due to measuring through previously observed distortion in borehole at that depth. No changes above 37.5m depth and measured change not consistent with GNSS data at nearby Pier 2 or other survey measurements.
Tilt monitoring at Pier 2	Continuous		N/A	Minor changes observed.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C (continued)				
Tilt monitoring at T4	Continuous		N/A	Minor changes observed.
Displacement monitoring at T4	Continuous			Gradual increase in gap between Trestles 3 and 4 up to 37 mm this week. An 11 mm increase was measured this week in a reversal of last week's change.
Stress monitoring at T4	Continuous		N/A	Minor changes in response to stockpile loading.
Gap in tripper rail	29 Apr	Cease	N/A	Rail joint has been measured to open 1 mm to 2 mm this week. Additional 10 mm and 15 mm spacers installed 25 March.
Joint monitoring in Reclaim Tunnel between T6 and Pier 2	29 Apr	Cease	N/A	No measurable changes observed.
Visual inspections	29 Apr	Cease	(cracks found in 6C Tunnel)	No change in previously observed cracking in eastern and western walls. The most significant cracks are adjacent to the ventilation shaft western wall and are approximately 1.2 mm wide. Structure gap across expansion joint at T4 on eastern side has opened 1 mm this week, and has opened 3 mm on western side, consistent with measurements at the tripper rail. The changes are likely due to be loading of the trestles beneath the slide joint. No change at roof joints along tunnel. Existing wall joints appear to be continuing to open. Inspection by structural and mechanical engineers on 25 March found no issues.
Overhead conveyors				
Conveyor trestle surveys	29 Apr	Cease		Minor changes observed this week. Ino change in closure observed between 8C-11 and RLB-01 at top of 8C conveyor and no measurable change at the base. Minor change measured on 3R conveyor at connection to Reject Bin this week. Both observations are considered to be due to changes in thermal expansion and contraction of the superstructure. Visual inspections have identified changes at slide joints but otherwise no impacts.
Laser distancemeter at Conveyor 3R across Railway	Continuous			Minor changes observed.
Visual inspection	29 Apr	Cease		No issues reported. 7C connection to bins has moved south by 10 mm. No change to 4S slide joint this week.
Drift				
Drift survey	29 Apr	-		Very minor changes since end of LW S1A.
Visual inspection	Daily		N/A	No issues reported.
Winder				
Tiltmeters on Winder	Continuous			Minor changes observed.
Visual inspection	29 Apr	Cease	N/A	No issues reported.
Rail Loop				
Long bay length survey	30 Apr	Cease		No change in ground shortening between BL600 and BL700was measured this week. It is currently planned to restress the track at the completion of LW S2A but the plan is reviewed on an ongoing basis by the Rail Management Group.
Road culvert survey	30 Apr	Cease	N/A	Very minor changes since end of LW S1A.
Track geometry survey	-	-		Survey after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.
Track inspection	-		N/A	Inspect after 20 mm subsidence measured along Rail Loop during LW S2A, and after every additional 20 mm subsidence measured thereafter.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Mine Site Structures				
Tiltmeters on Raw Coal Bins	Continuous			Minor changes observed. Very slight differences between sensors in north-south direction. Slight tilt to the north and west observed in last two months.
Rail Loader survey	29 Apr	Cease		Minor changes observed this week.
Reject Bin survey	30 Apr	Cease		Very minor changes since end of LW S1A.
Visual inspections	29 Apr	Cease		No issues observed. Drone inspection of raw coal bins showed cracks in connection joint on south side, which are very likely pre-existing. A structural inspection is recommended. Crack gauges installed in 2 locations on 18 April.
Overhead crane and monorails				
Crane rail survey	-	Cease		Last survey 22 April. Very minor changes since end of LW S1A. No access to washery this week.
Visual inspections	29 Apr	Cease		No impacts observed.
Shaft No. 3				
Tiltmeters on shaft winder	Continuous			Minor changes observed.
Clearance measurements at 135m depth	2 May	Cease		Clearances between 260 mm and 300 mm this week, greater than minimum clearance of 180 mm.
Visual inspection	Daily		N/A	No issues reported.
Dams, embankments and site services				
Dam S4 survey	-	Cease	N/A	Minor subsidence and closure observed. Surveys have ceased as the LW face has travelled past the survey line by more than 450 metres.
Dam S2 and S3 survey	29 Apr	Cease	N/A	Minor changes observed since the end of LW S1A. S3-8, S3-9 and S3-10 destroyed during excavation works. S3-12 likely disturbed by earthworks.
Visual inspections by building inspector, incl high pressure water pipeline	-	Cease		Last inspection 9 April. Stockpile overflowing into Dam S2 following significant rainfall. Scouring observed at toe of the embankment at Dam S3.
Geotech inspections on mine site	-	Cease		Last inspection 8 April. No issues observed by geotechnical engineer.
Geotech inspections of Dams S2 and S3 from railway	-	Cease		Last inspection 10 April. No issues observed by geotechnical engineer.
Track inspections of Dams S2 and S3 from railway	Twice weekly		N/A	No issues observed by Track Certifier

Management Actions

Other management actions since previous report:
- Ongoing review of changes in long bay length along the Rail Loop between Pegs BL600 and BL700 by the Rail Management Group

Any additional and/or outstanding management actions:
- JMA to provide recommendations for repair method to reduce mining-induced build-up of stresses in 5C conveyor structure (ongoing, targeting May 2024)

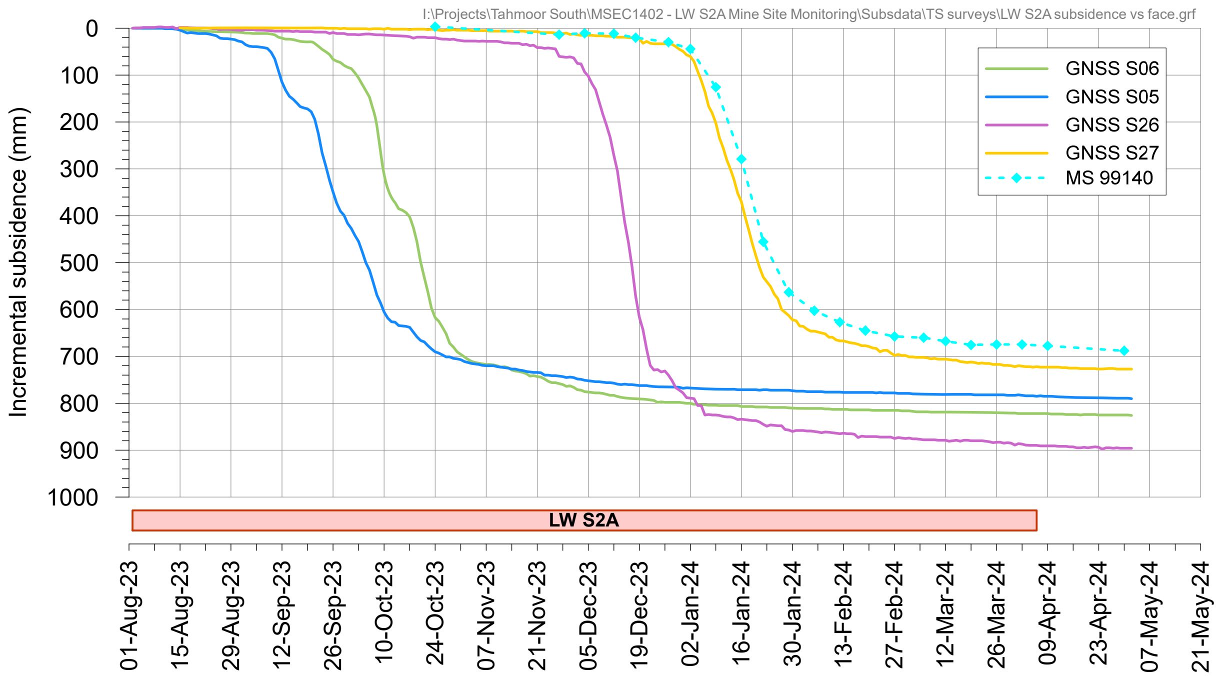
IMG meeting since previous report:
- Final IMG meeting for LW S2A held 1 May

Forecast whether residual subsidence movement from LW S2A is likely to cause impact on the safety of operations at Tahmoor Mine Site

Based on monitoring results to date, and the controls implemented and available under the LW S1A-S6A Management Plan for Longwall Mining beneath and adjacent to the Tahmoor Mine Site, no triggers under this Management Plan are expected to be exceeded in the next week. Accordingly residual subsidence movement is not likely to result in the occurrence of either A or B above.

Certified by Tahmoor Coal	
Name	Ross Barber
Position	Project Manager
Signature	
Date	10 May 2024

Copy of Report to:
IMG
Ray Ramage, Principal Inspector – Subsidence, Mine Safety Inspectorate, Resources Regulator



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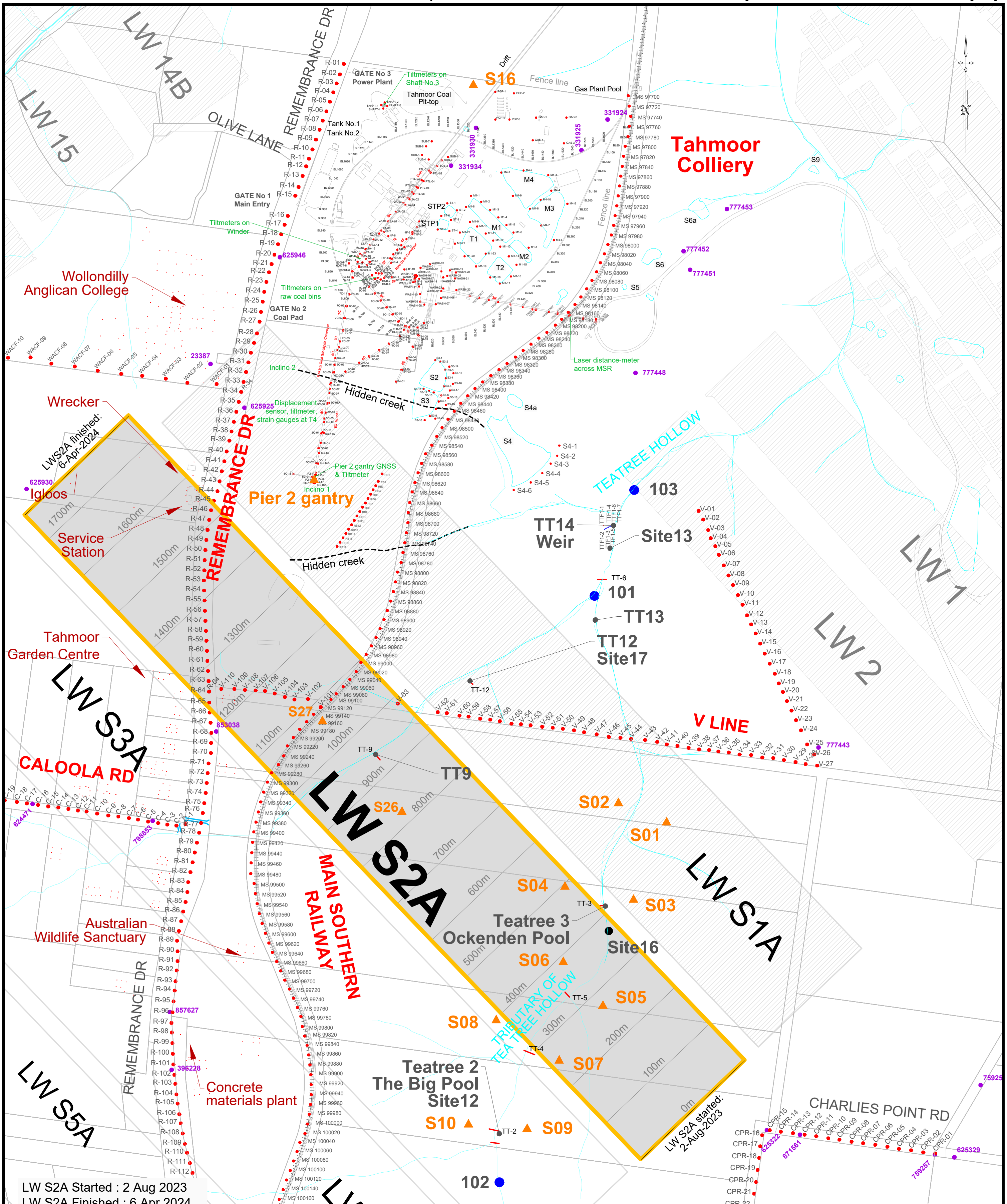

LEGEND

- WATER MONITORING SITE
- MONITORING LINES
- MONITORING PEGS
- GNSS
- BOREHOLES
- CRITICAL POLES MONITORING
- ROADS & TRACKS
- WATERCOURSE

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TAHMOOR SOUTH
MINE SITE - LW S2A
MONITORING PLAN

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	1:10000	MSEC1402-01	18

Tahmoor South LW S2A - Main Southern Railway
Total subsidence profiles
Survey date: 30 April 2024

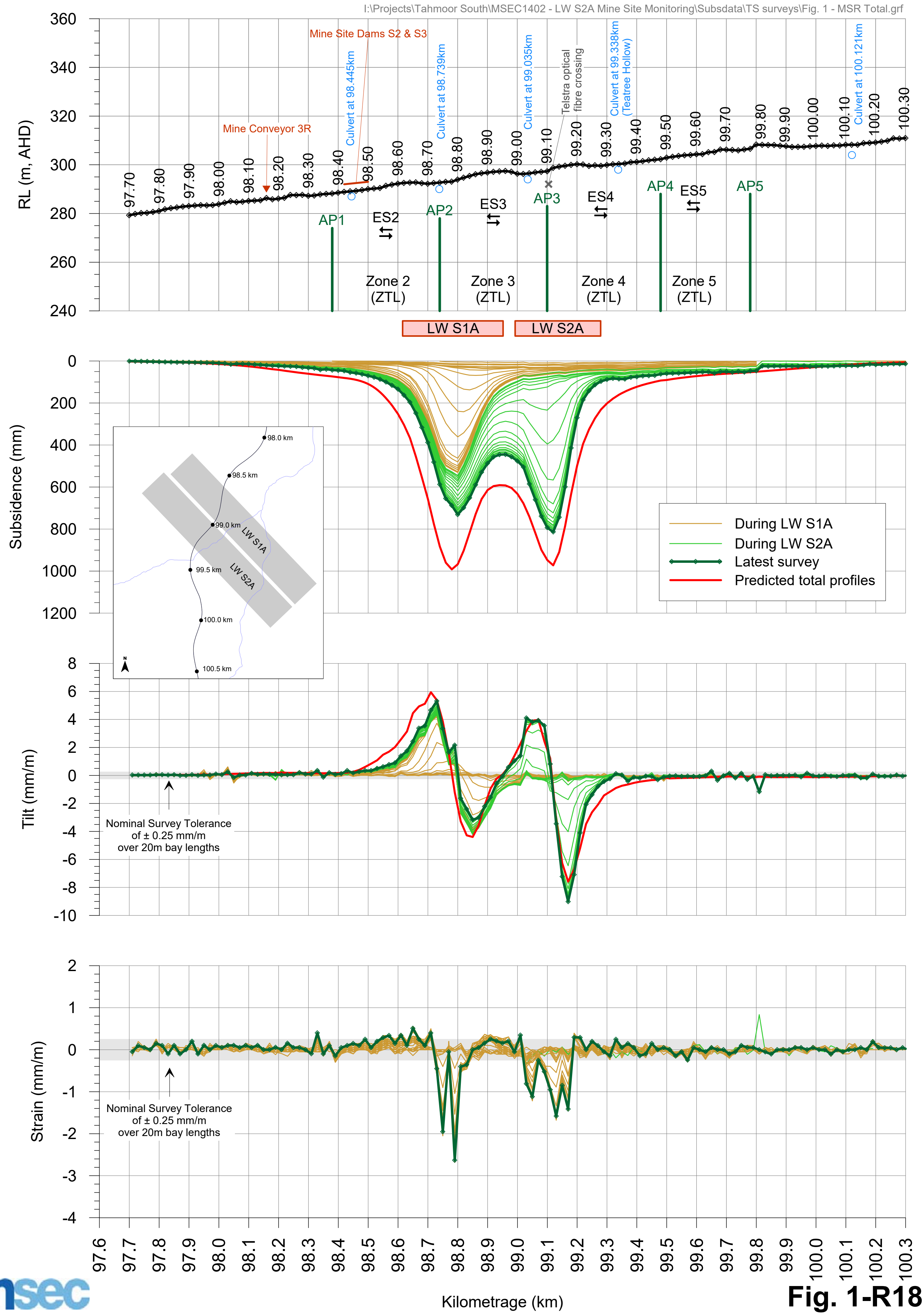

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Fig. 1-R18

Tahmoor South LW S2A - Mine Site Rail Loop
Total subsidence profiles
Survey date: 30 April 2024

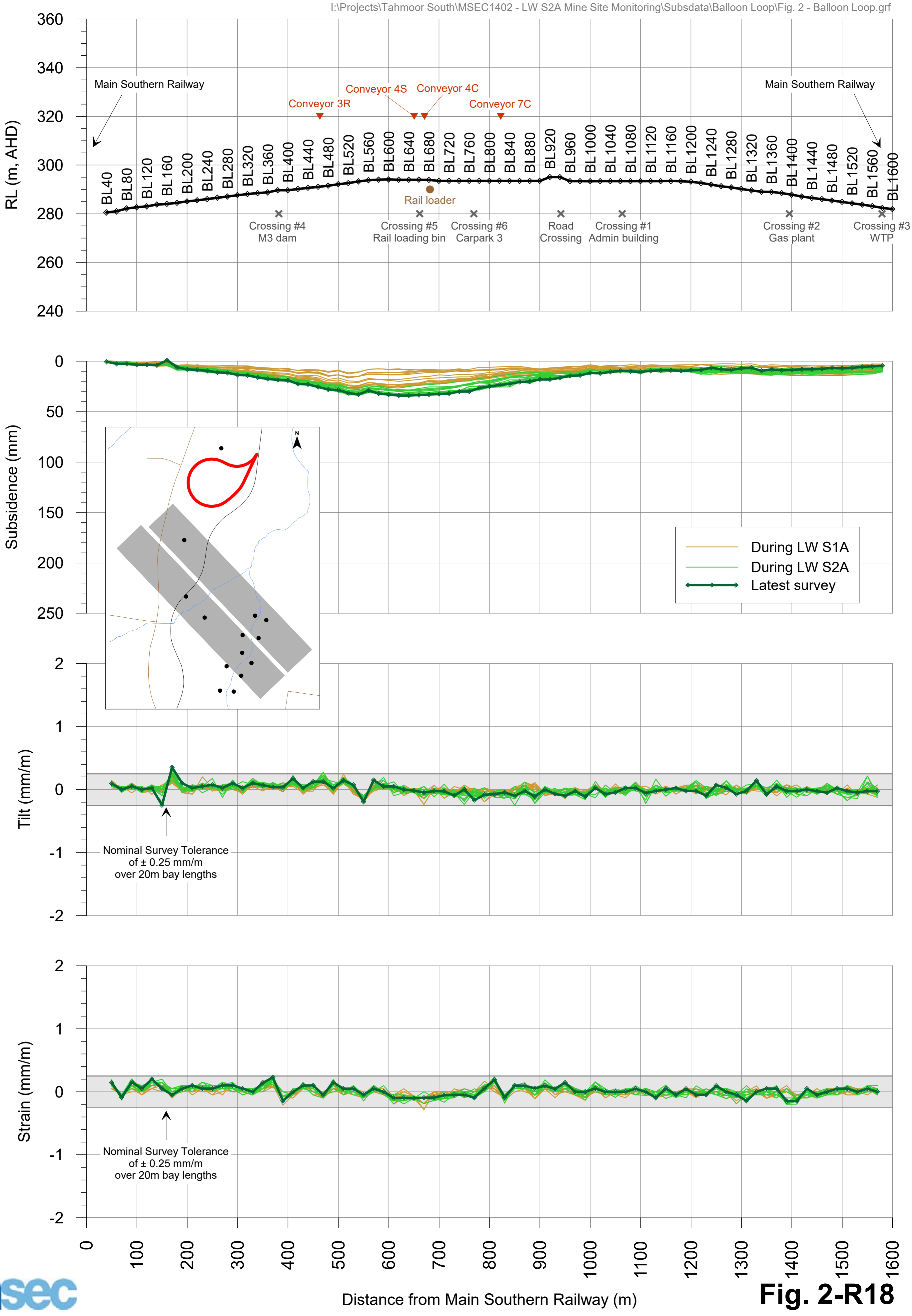

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Fig. 2-R18

Tahmoor South LW S2A - Mine Site Rail Loop
Long bay surveys
Survey date: 30 April 2024

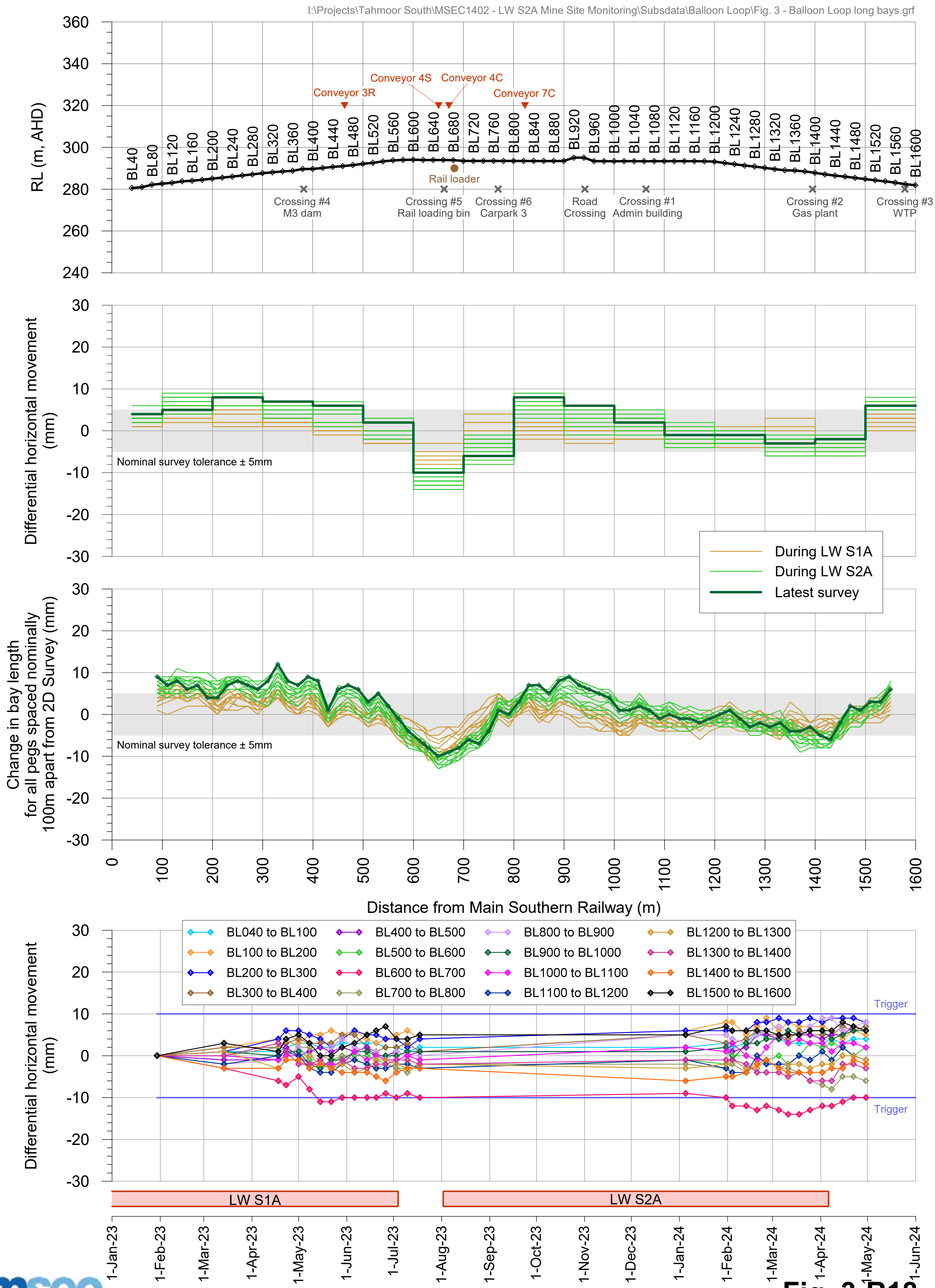

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Fig. 3-R18

Tahmoor South LW S2A
Total subsidence profiles along Remembrance Drive

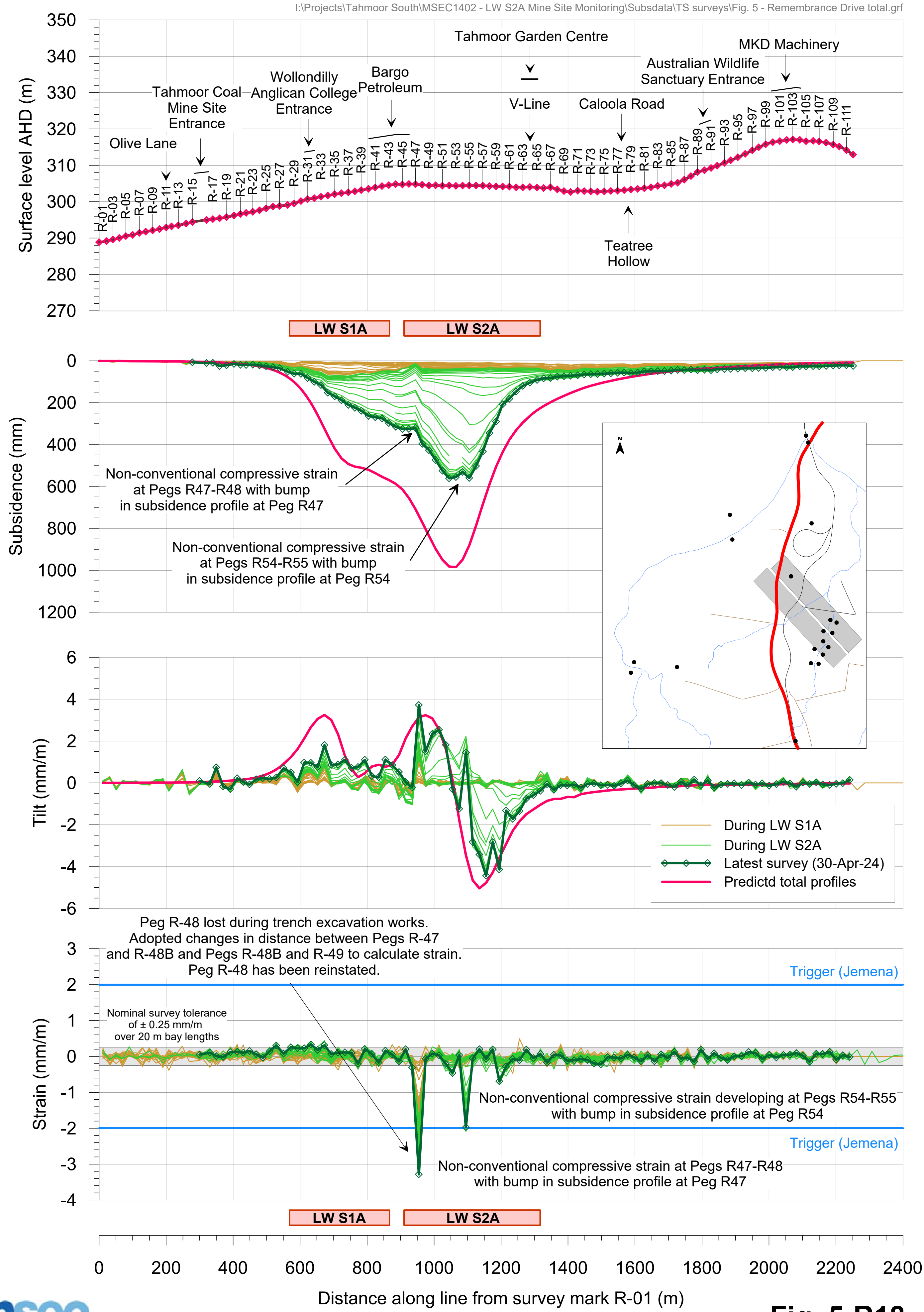

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Fig. 5-R18

Tahmoor South LW S2A - GNSS Monitoring
Site S16 at Tahmoor Mine site

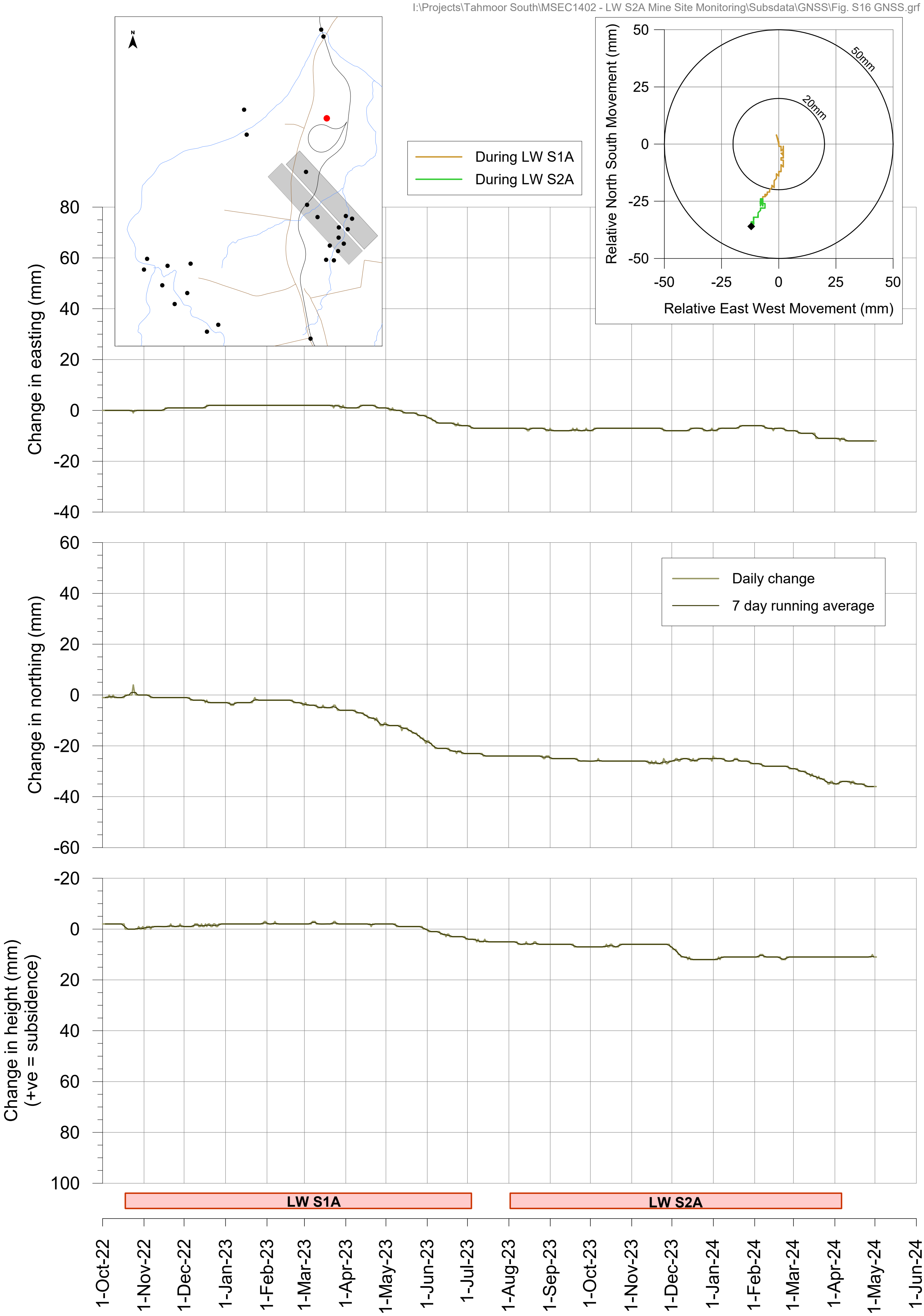

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Fig. S16-R18

Tahmoor South LW S2A - GNSS Monitoring
Pier 2 gantry at Tahmoor Mine site

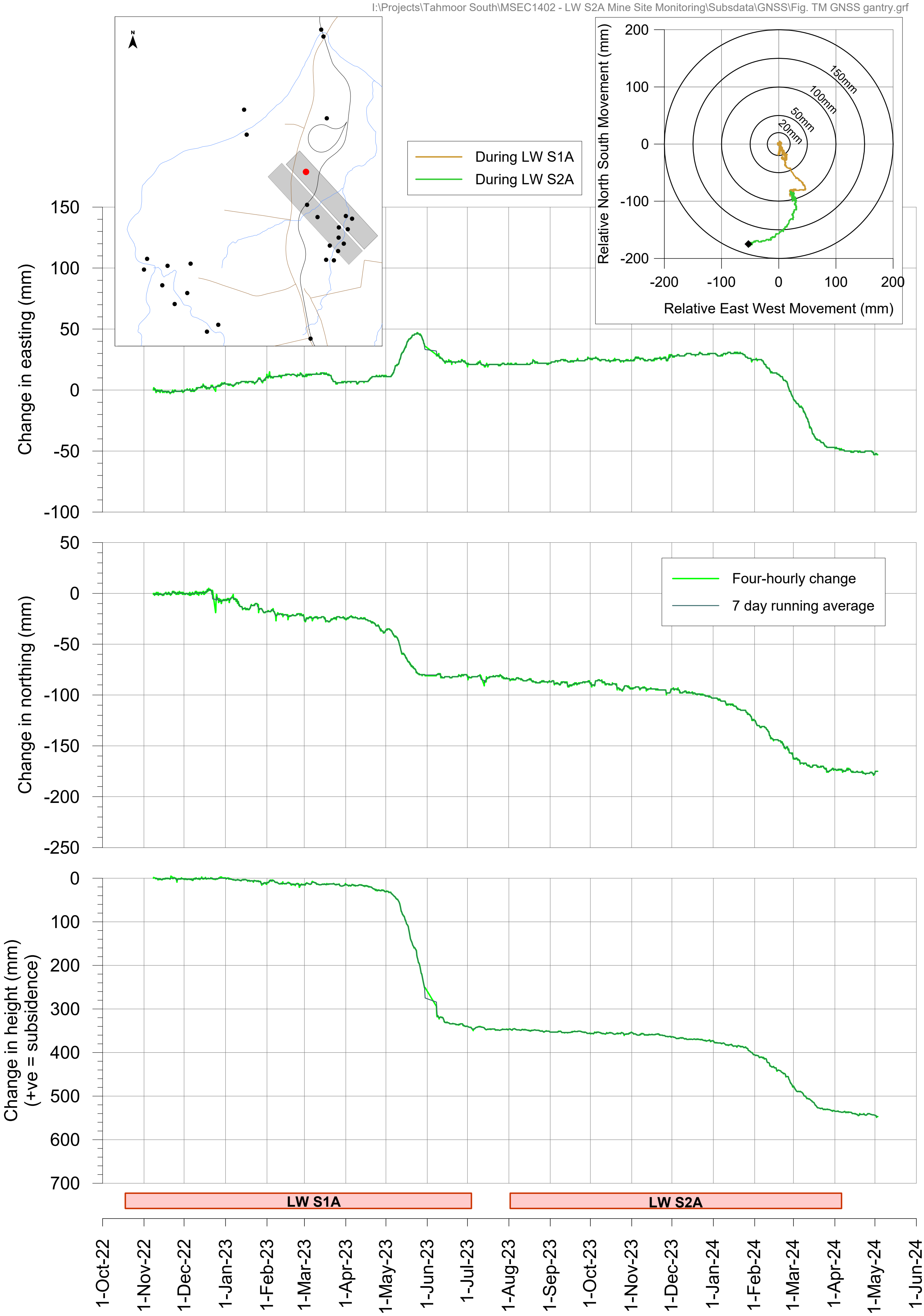

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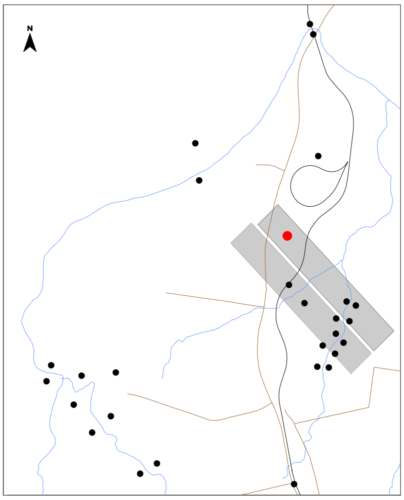
Fig. TM-18

Tahmoor South LW S2A - GNSS Monitoring

Pier 2 gantry at Tahmoor Mine site



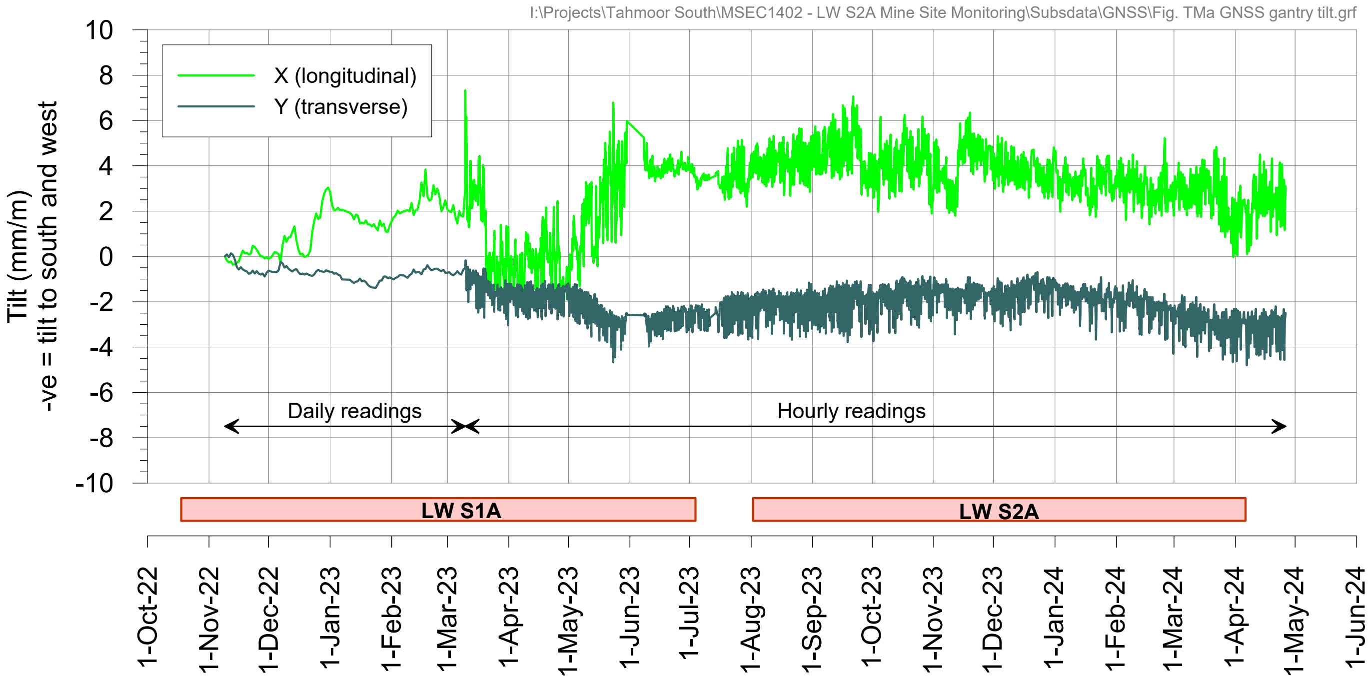


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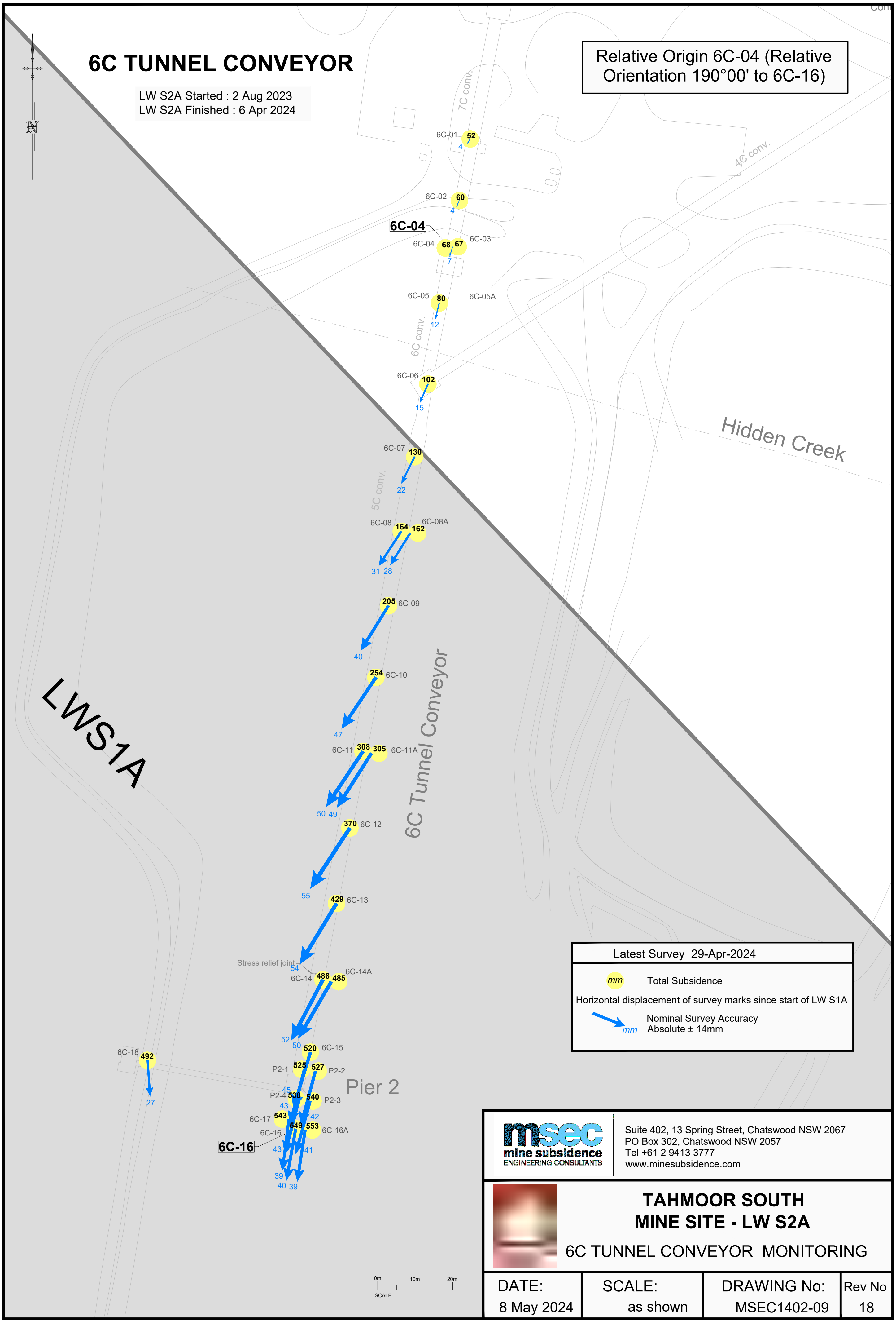
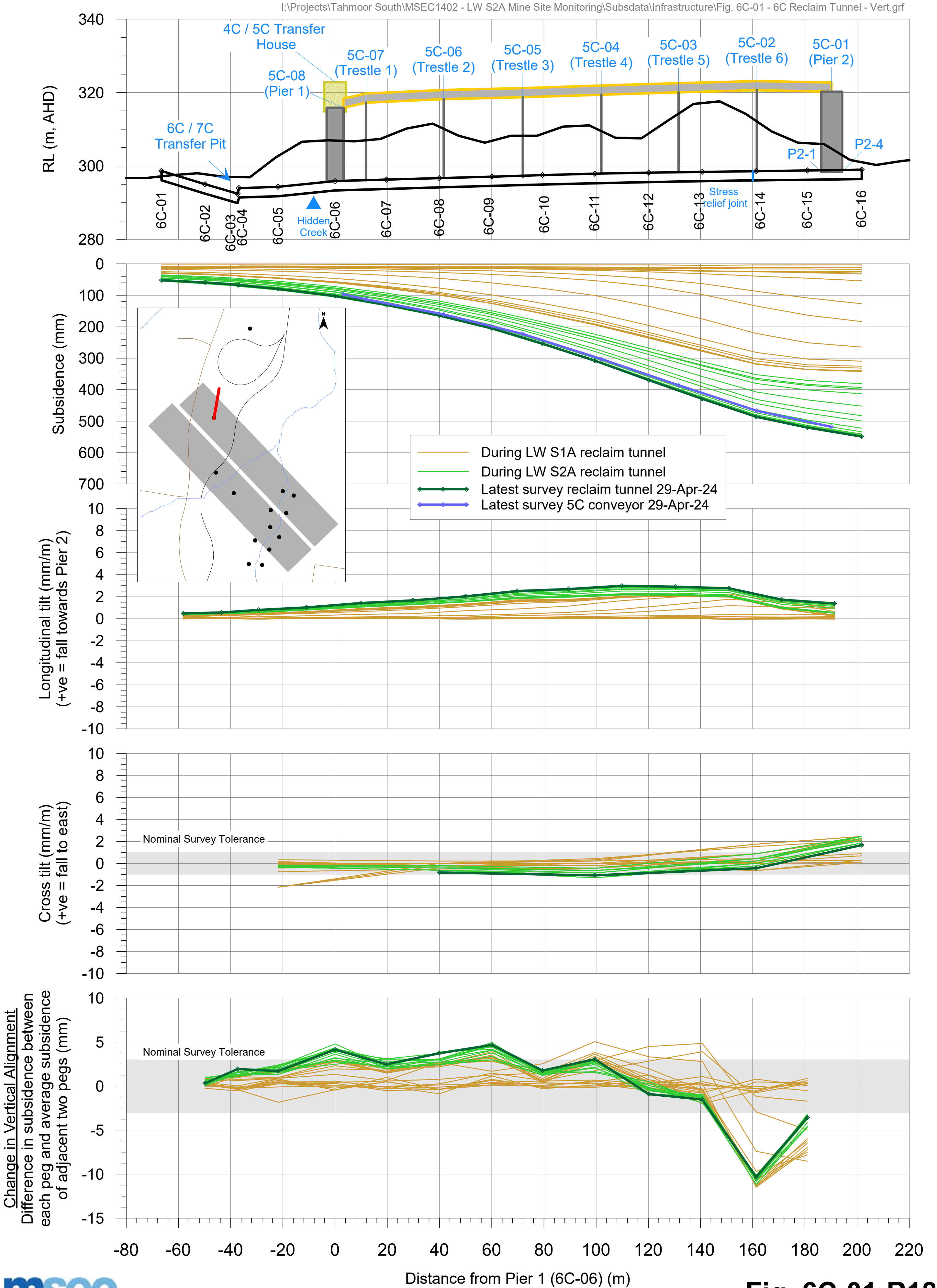
Fig. TMa-R18

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-09 Tunnel Conveyor 6C.dwg



Tahmoor South LW S2A - Conveyor 6C Reclaim Tunnel
Total subsidence, tilt and changes in vertical alignment



msec

Fig. 6C-01-R18

Tahmoor South LW S2A - Conveyor 6C Reclaim Tunnel
Observed Total differential horizontal movements

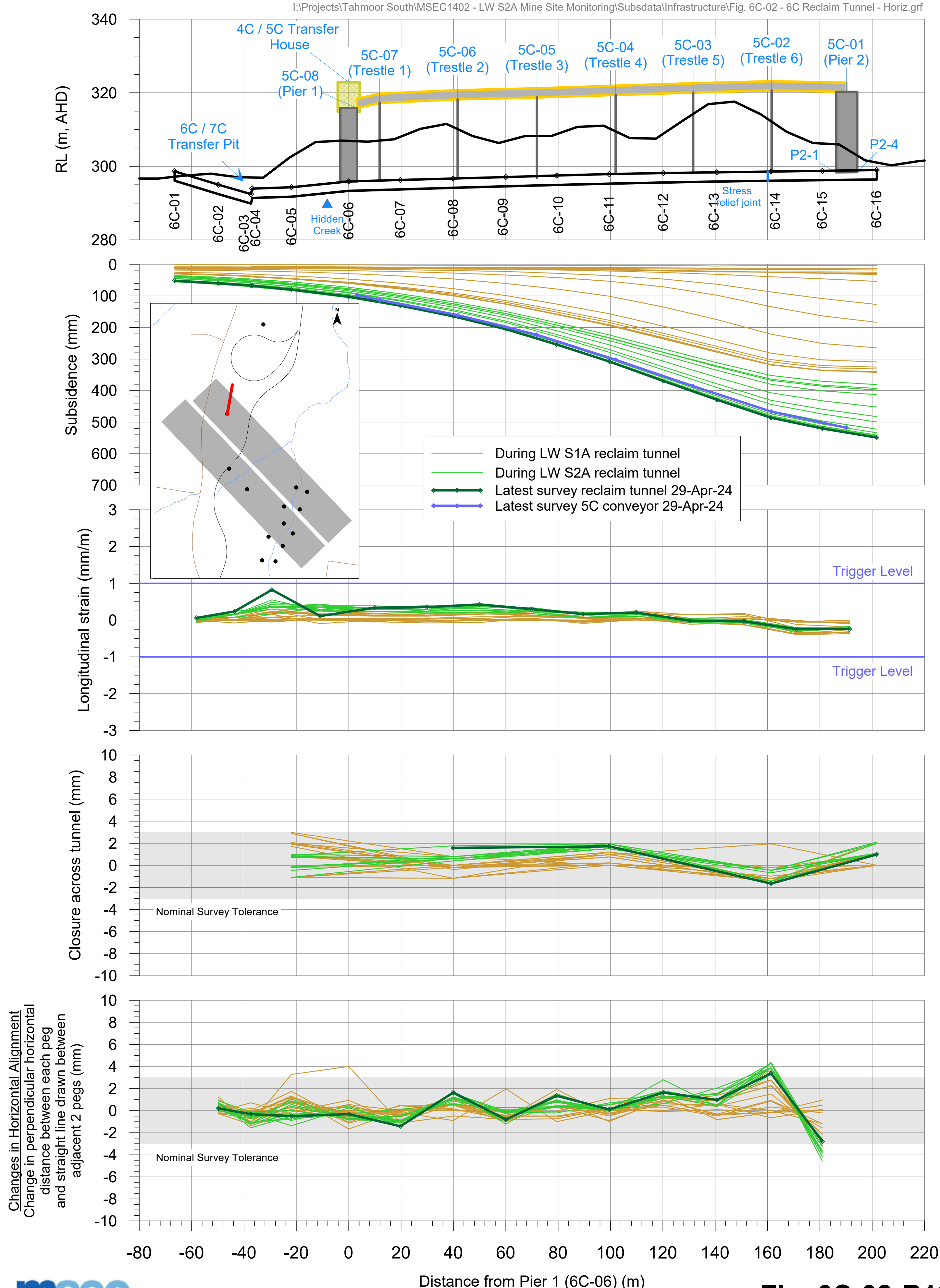
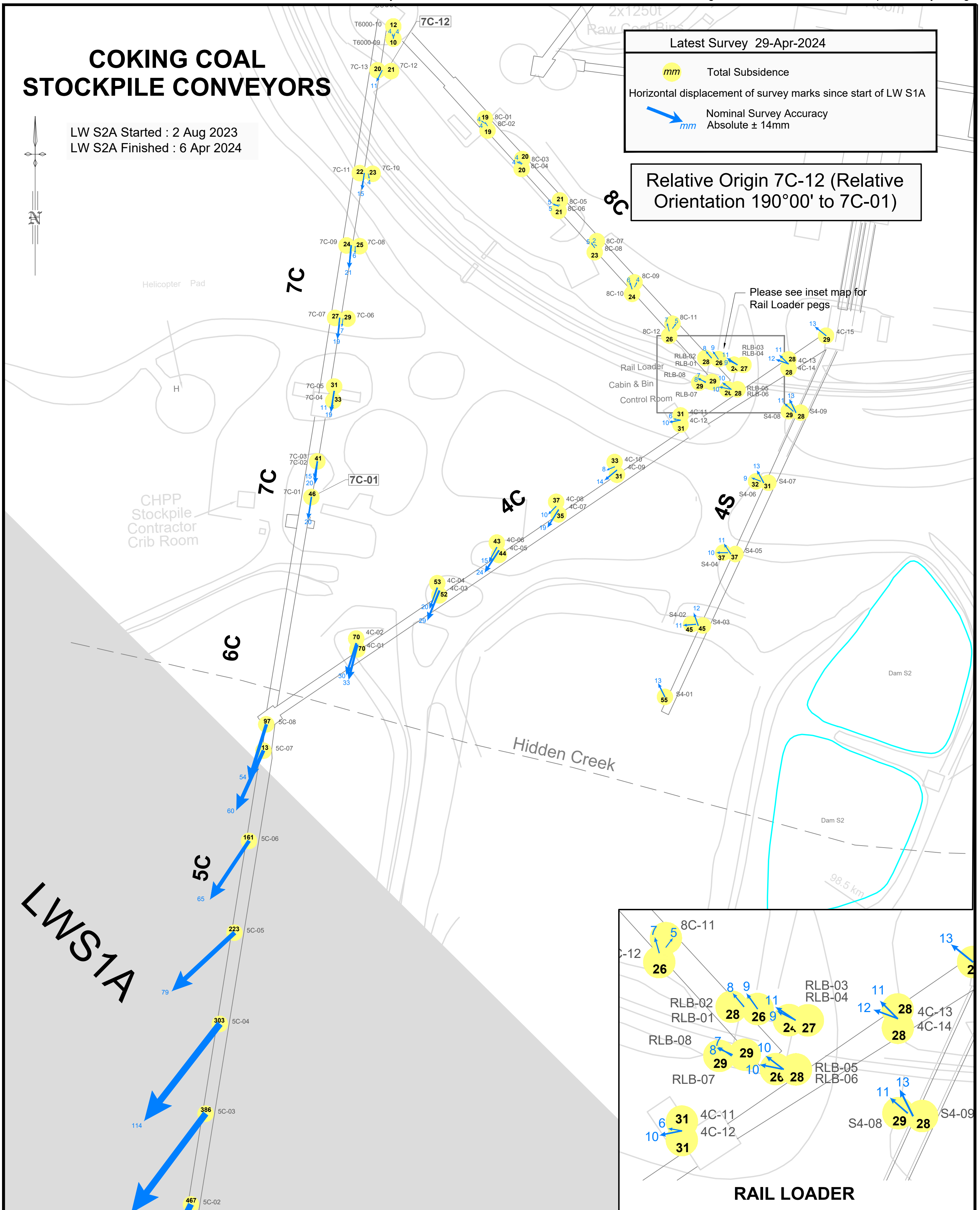


Fig. 6C-02-R18



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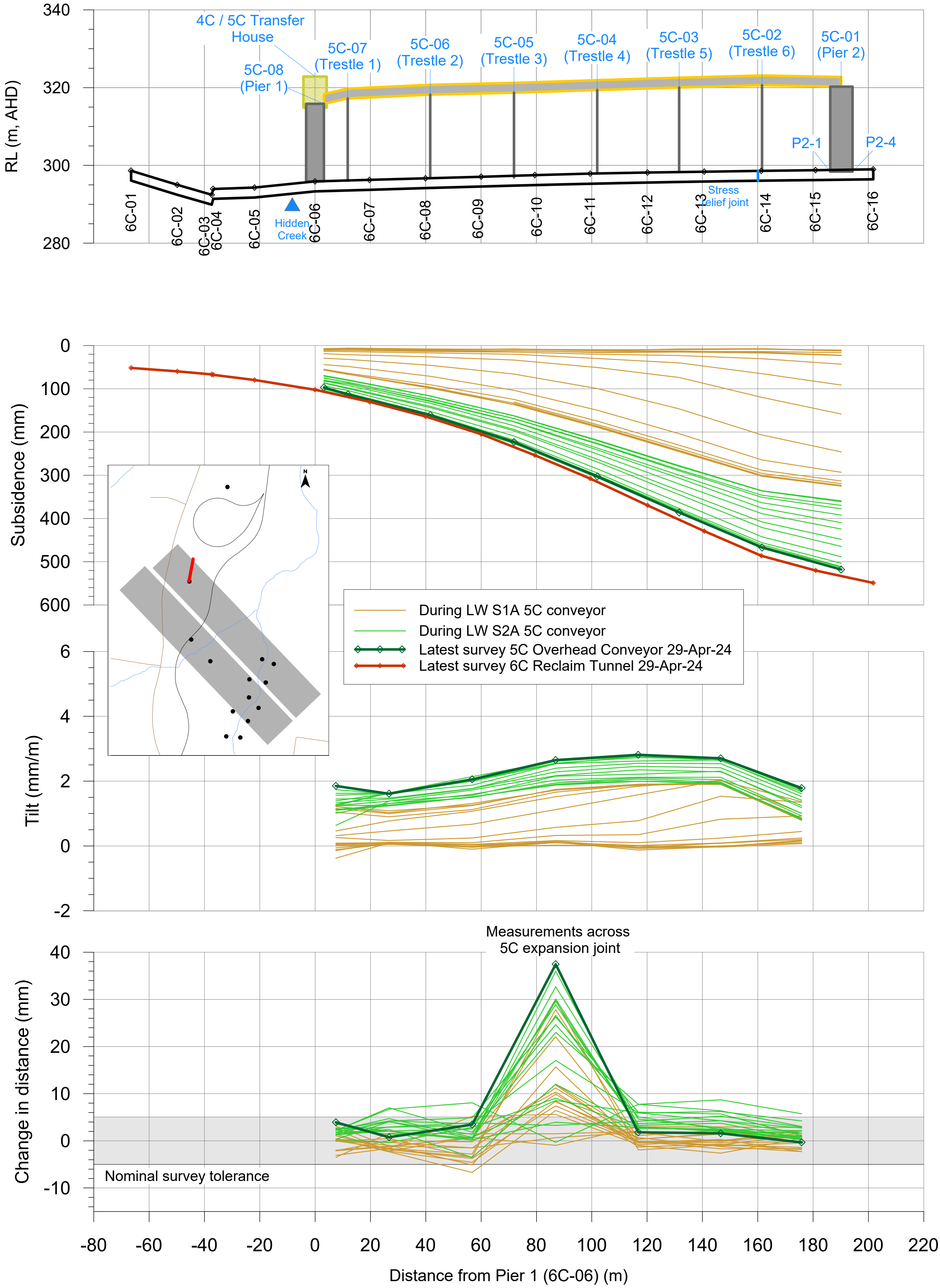
TAHMOOR SOUTH
MINE SITE - LW S2A
OBSERVED TOTAL SUBSIDENCE AT STOCKPILE CONVEYOR

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	as shown	MSEC1402-10	18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at 5C conveyor

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\Subsdata\Infrastructure\Fig. 5C-01 - 5C conveyor.grf

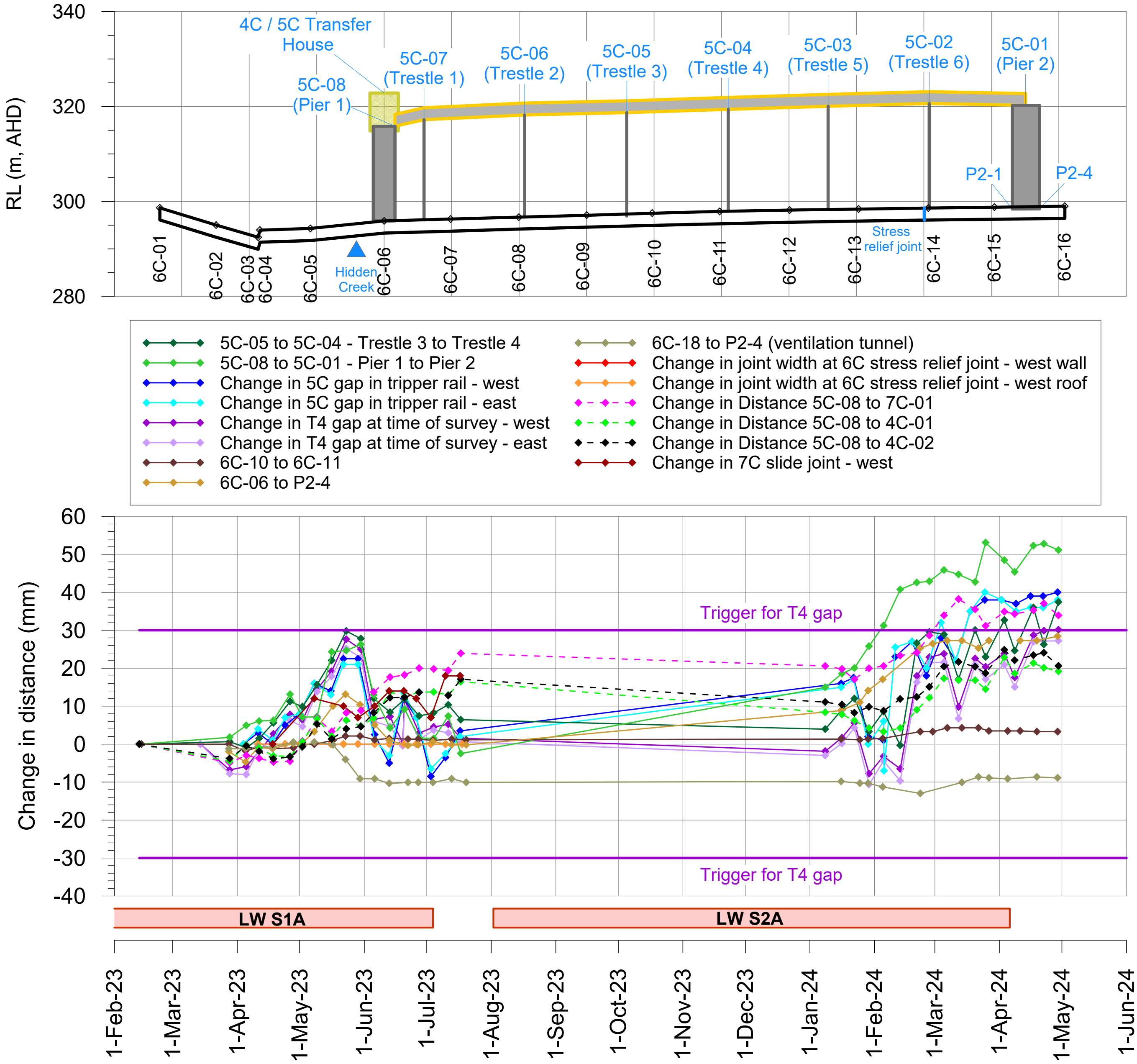


msec

Fig. 5C-01-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total changes in distance at 5C conveyor

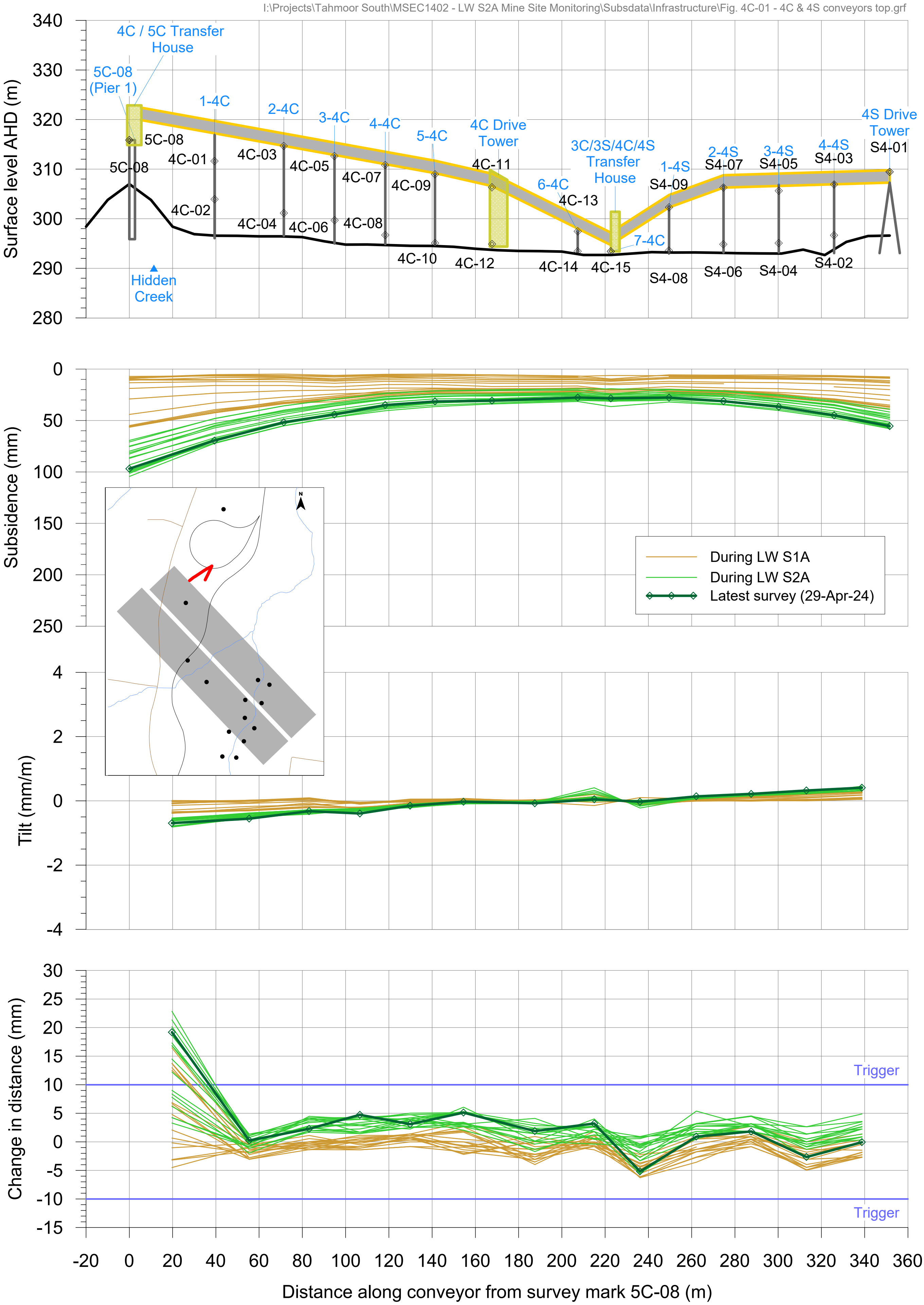
I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\Subsdata\Infrastructure\Fig. 5C-02 - 5C conveyor changes in distance.grf



msec

Fig. 5C-02-R18

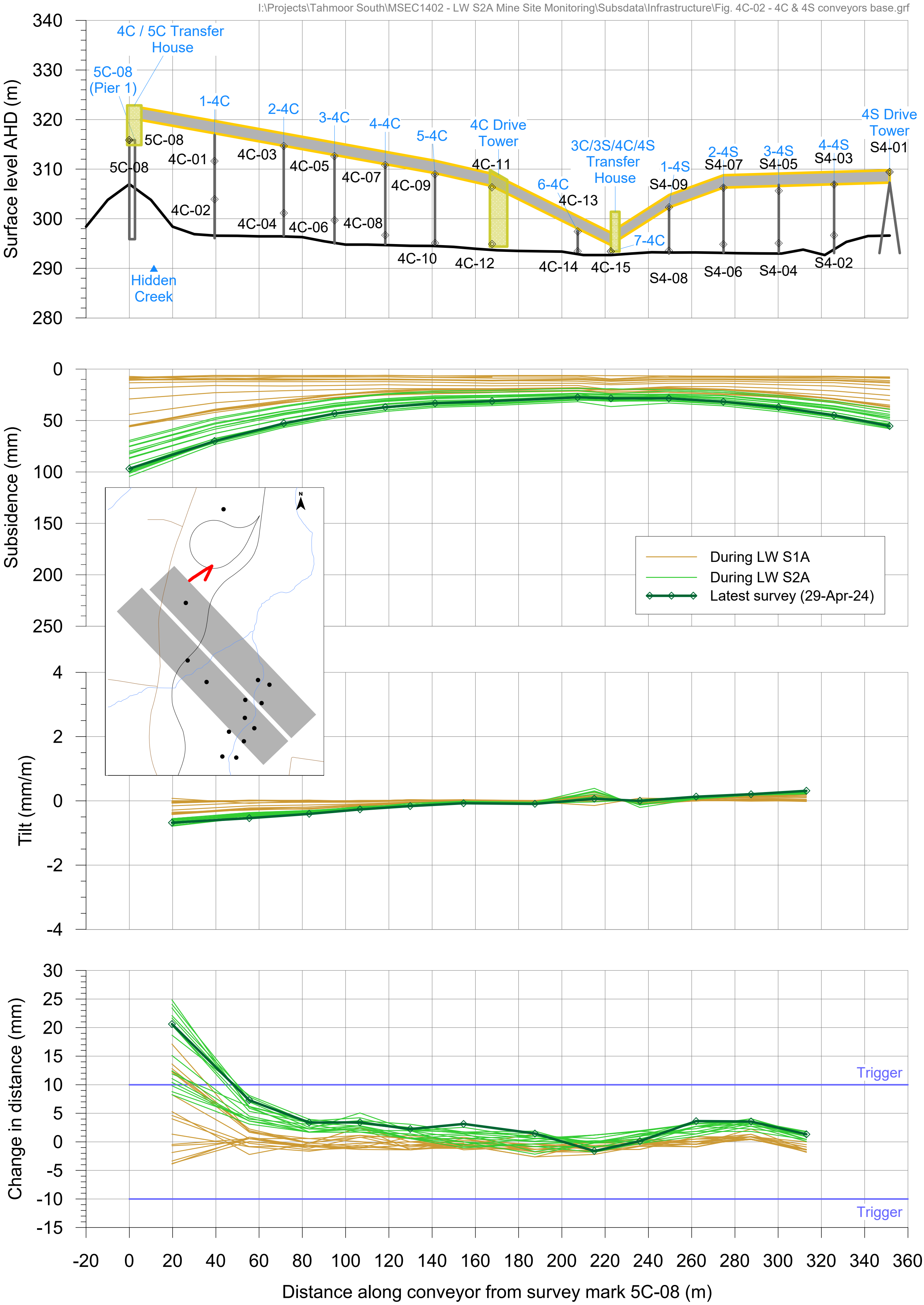
Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at top of 4C & 4S conveyors



msec

Fig. 4C-01-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 4C & 4S conveyors



msec

Fig. 4C-02-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at top of 7C & 8C conveyors

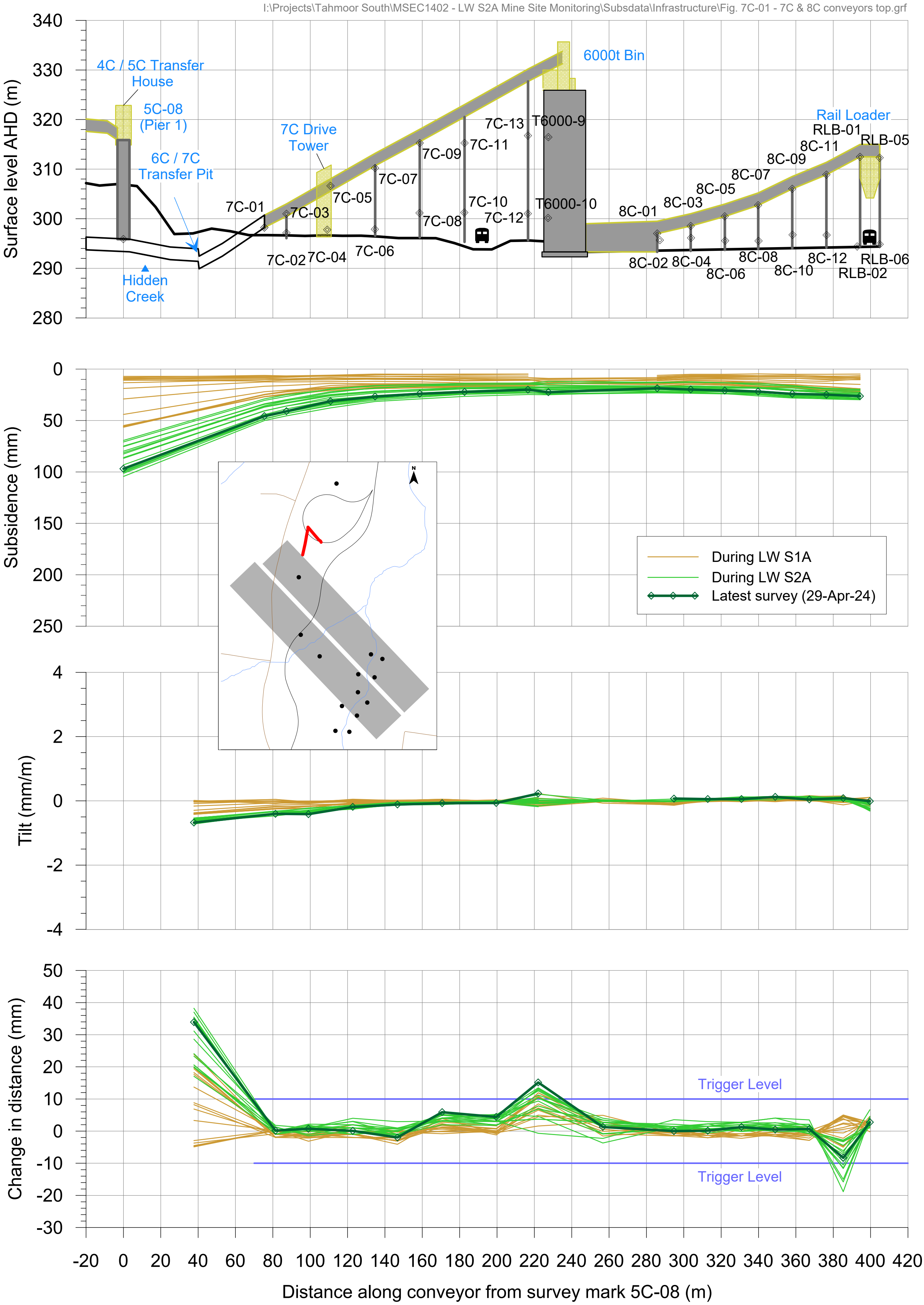


Fig. 7C-01-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 7C & 8C conveyors

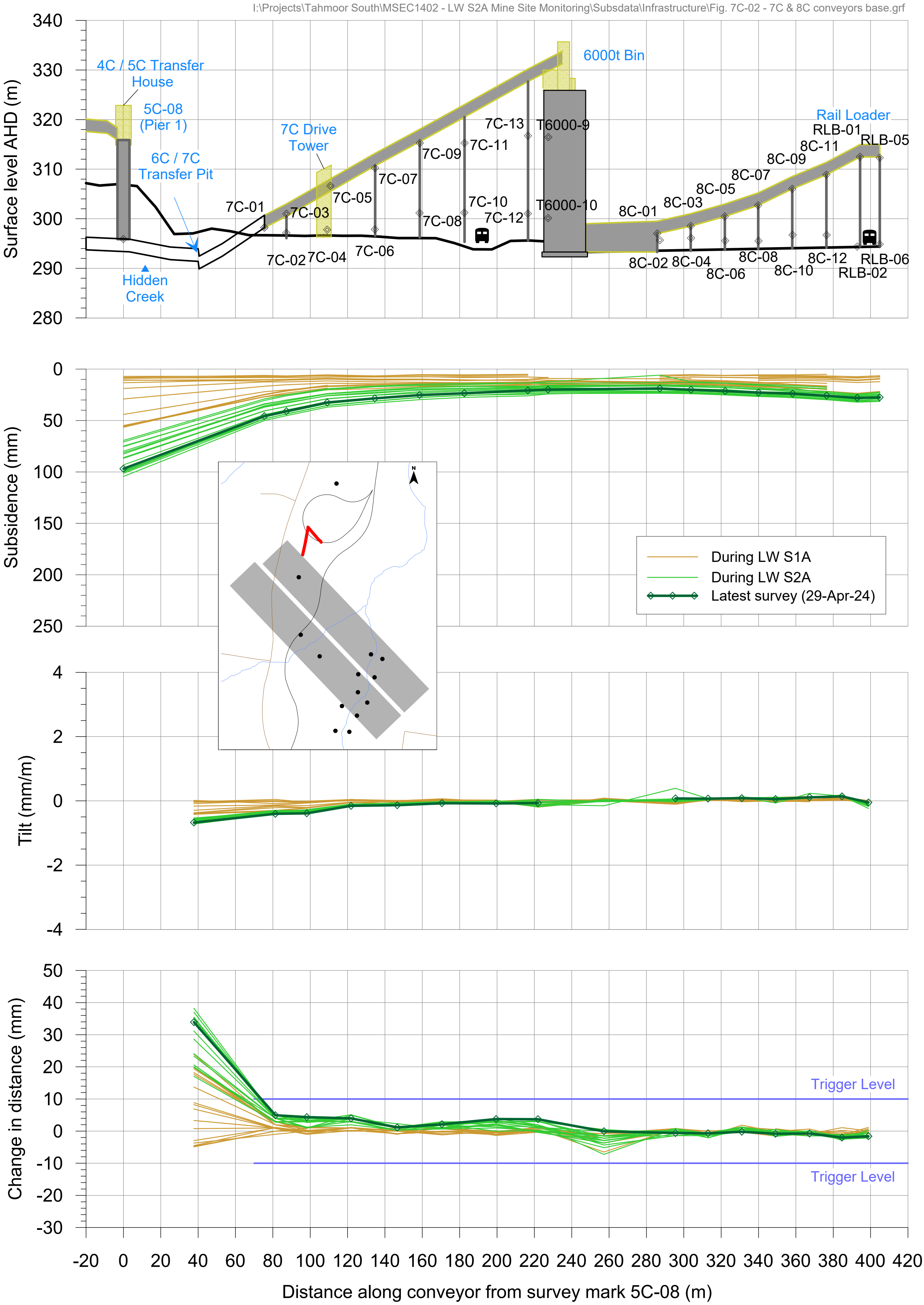


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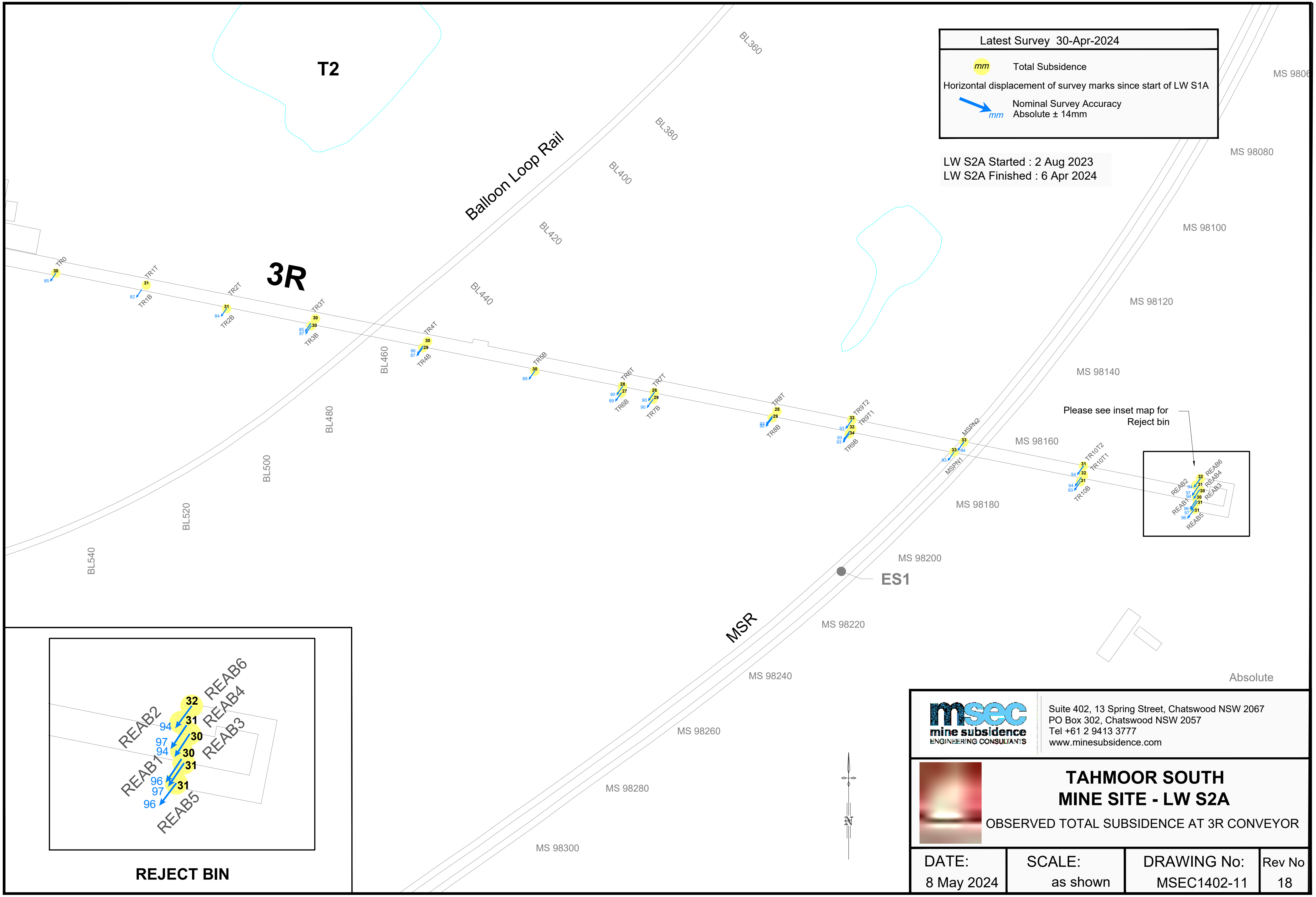
Fig. 7C-02-R18

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-11 Conveyor 3R.dwg



Conveyor 3R across Main Southern Railway

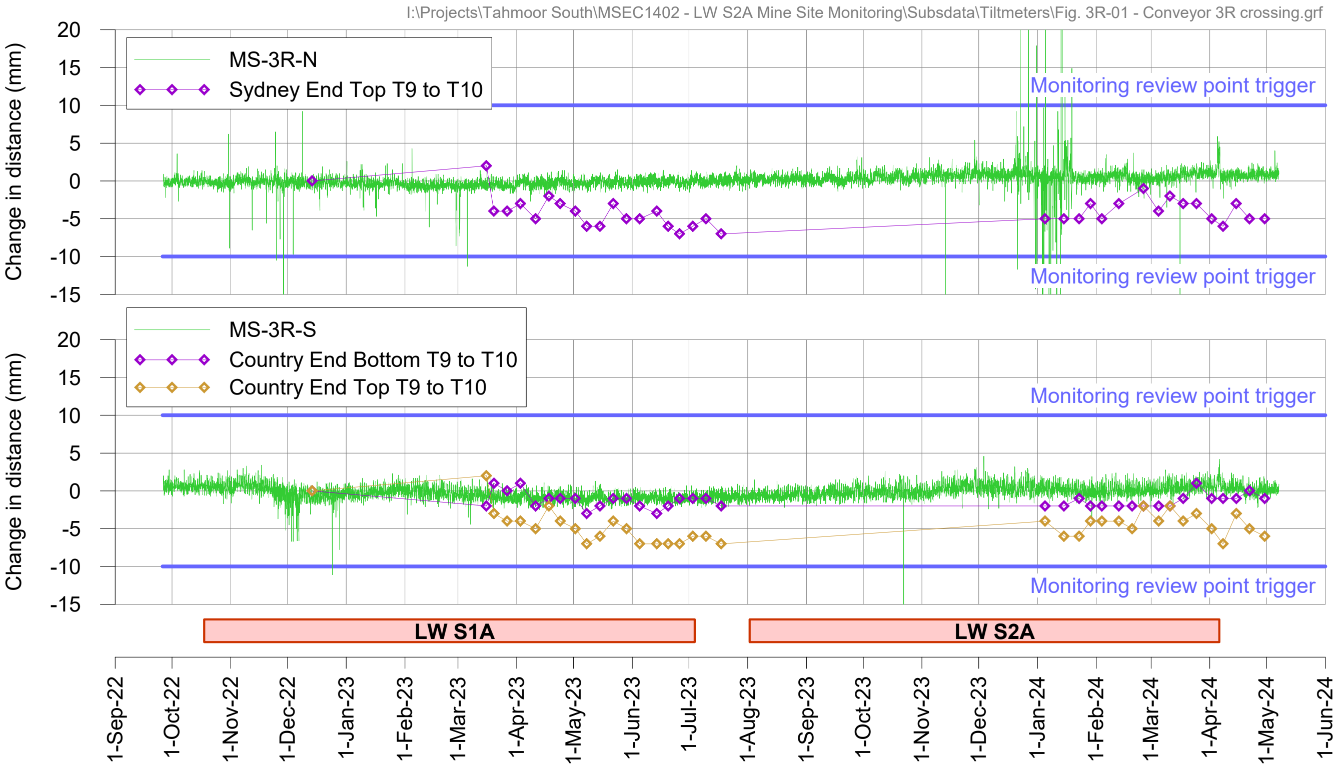
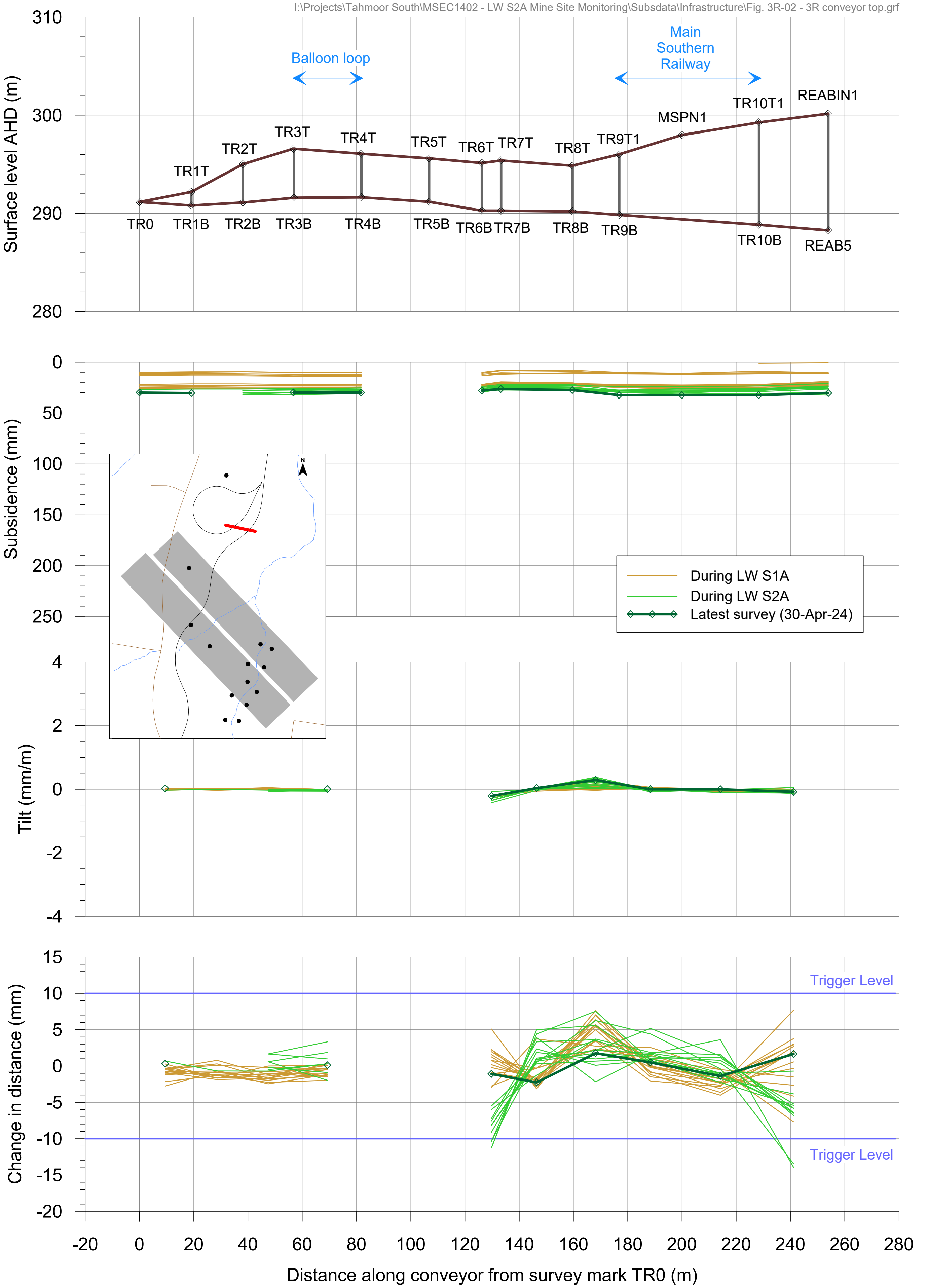


Fig. 3R-01-R18

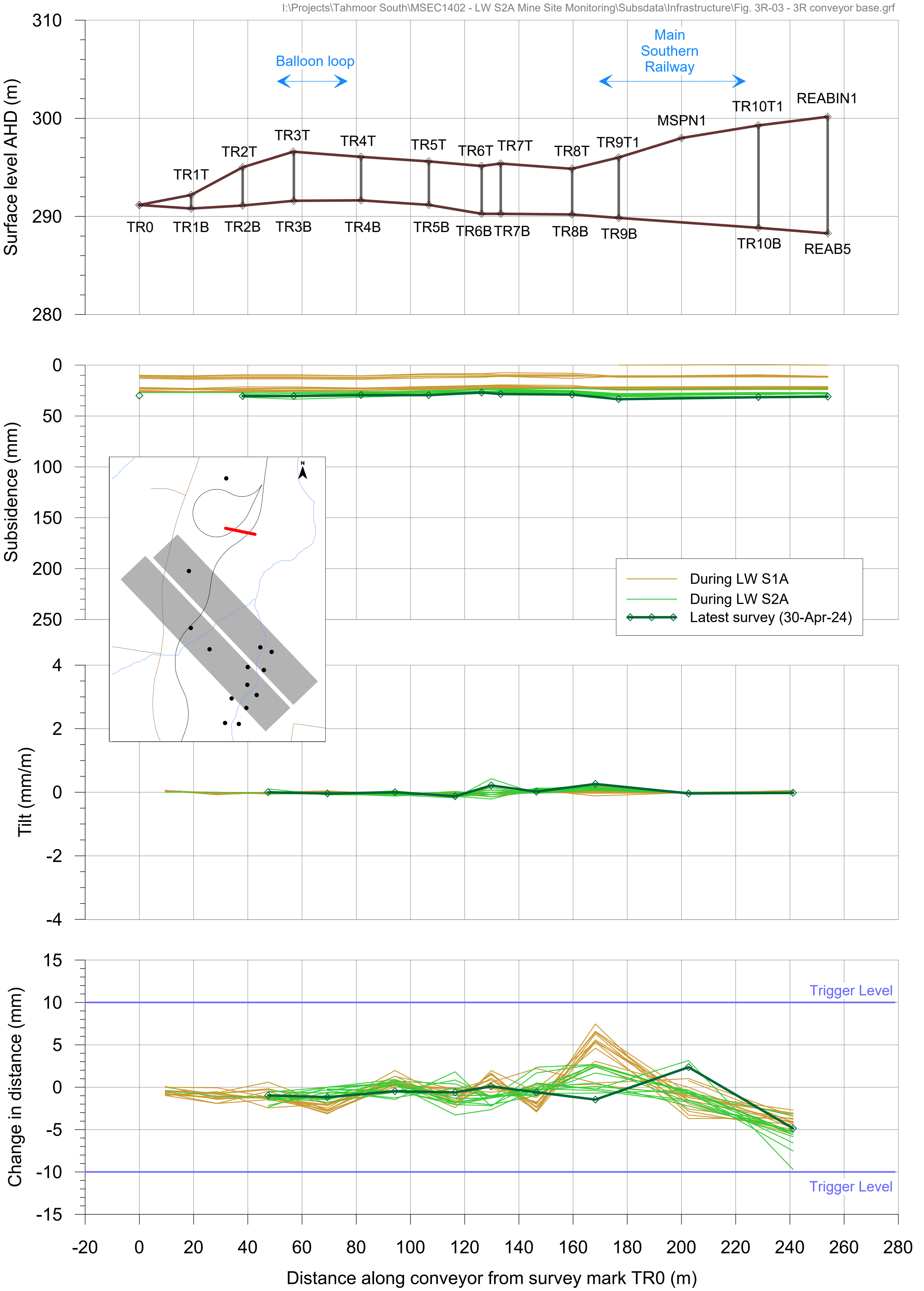
Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at top of 3R conveyor



msec

Fig. 3R-02-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 3R conveyor



msec

Fig. 3R-03-R18

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-12a Raw Conveyor_Drift_2A.dwg

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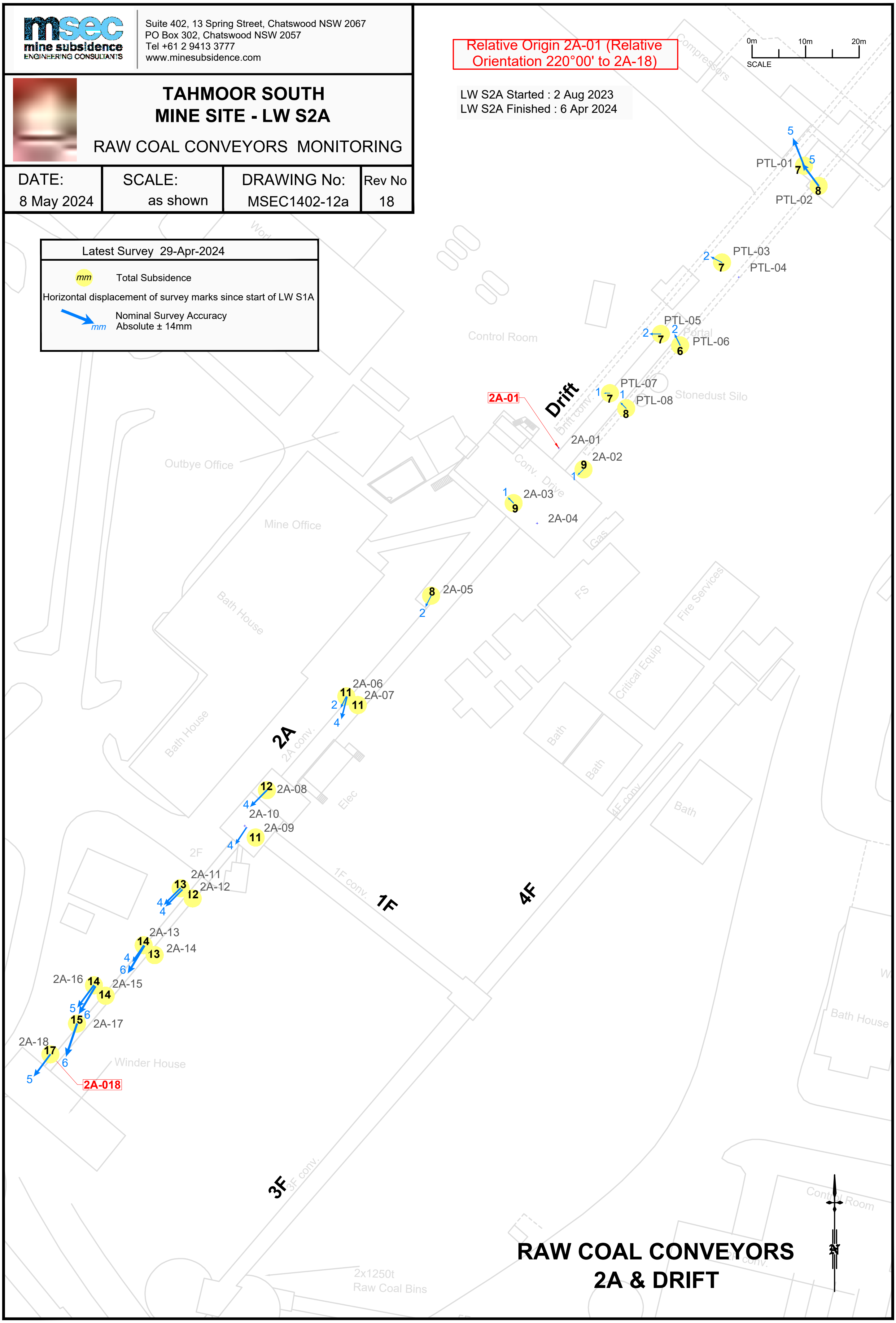
TAHMOOR SOUTH
MINE SITE - LW S2A

RAW COAL CONVEYORS MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	as shown	MSEC1402-12a	18



RAW COAL CONVEYORS
2A & DRIFT

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles at base of 2A conveyor and drift portal

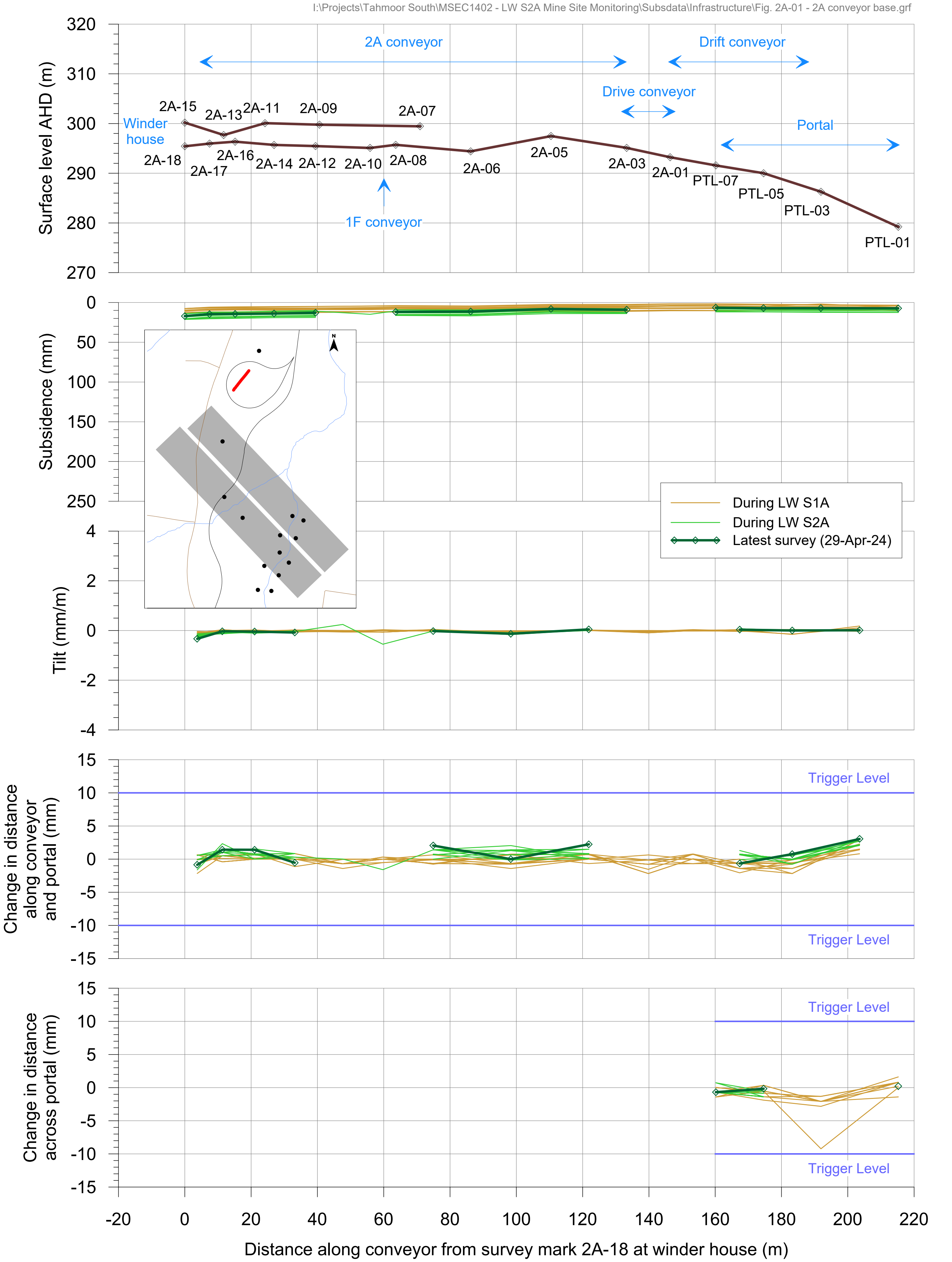


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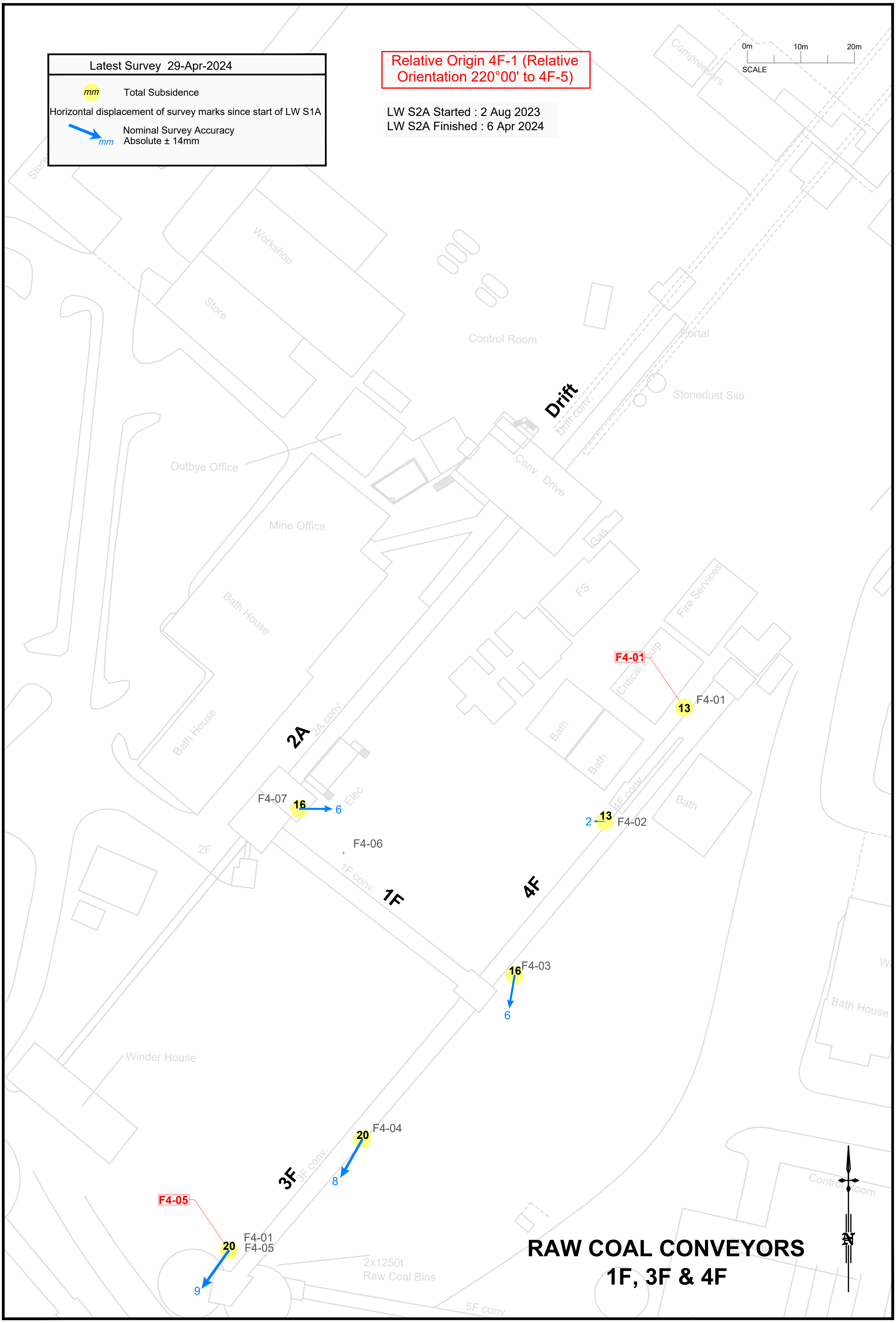
Fig. 2A-01-R18


Latest Survey 29-Apr-2024
mm
Total Subsidence
Horizontal displacement of survey marks since start of LW S1A
mm
Nominal Survey Accuracy
Absolute ± 14mm
Relative Origin 4F-1 (Relative Orientation 220°00' to 4F-5)
LW S2A Started : 2 Aug 2023
LW S2A Finished : 6 Apr 2024
0m
10m
20m
SCALE
Compressors
Store
Workshop
Store
Control Room
Portal
Stonedust Silo
Drift
Drift conv.
Conv. Drive
Outbye Office
Mine Office
Gas
FS
Fire Services
Bath House
Bath House
Critical Equip
Bath
Bath
Bath
2A
2A conv.
Elec
F4-01
13
F4-01
F4-07
16
6
4F conv.
2
13
F4-02
2F
F4-06
1F conv.
1F
4F
16
F4-03
6
Bath House
Winder House
F4-04
20
8
3F
3F conv.
F4-05
F4-01
20
F4-05
9
2x1250t
Raw Coal Bins
5F conv.
Control Room
RAW COAL CONVEYORS
1F, 3F & 4F

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles along crest of Dams S2 and S3

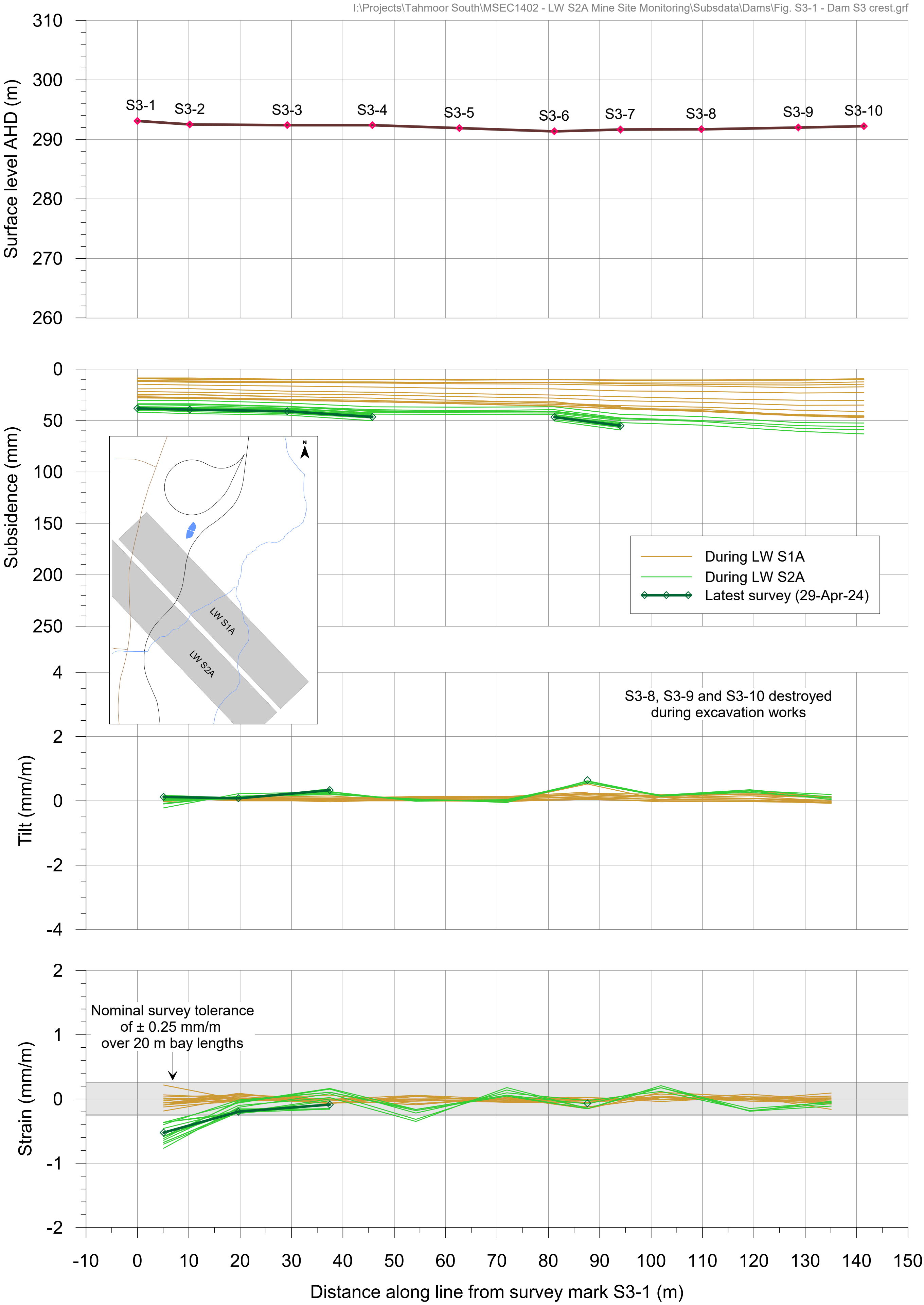


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Fig. S3-1-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles along base of Dams S2 and S3

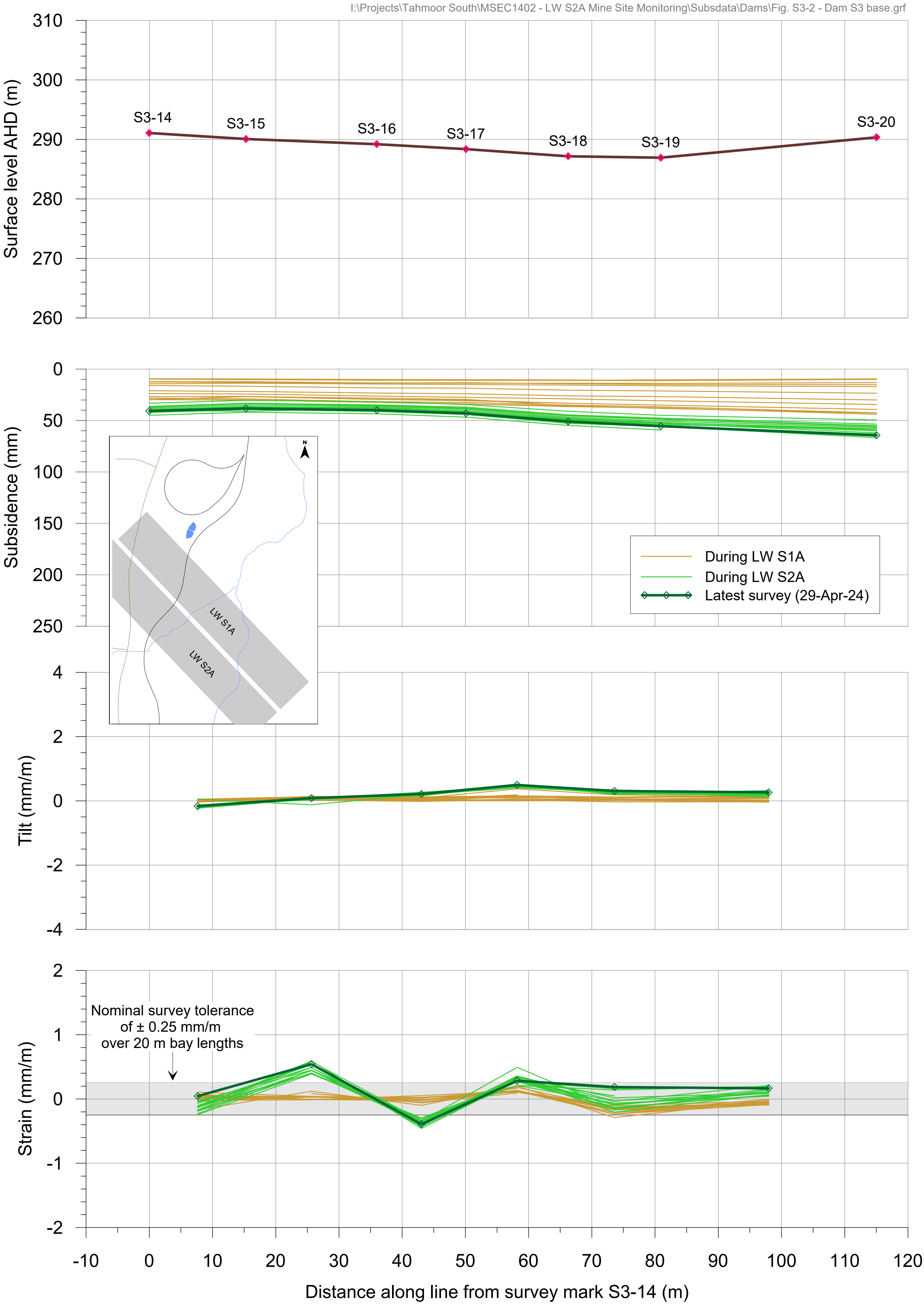

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Fig. S3-2-R18

Tahmoor South LW S2A - Tahmoor Mine Site
Total subsidence profiles along pipe between Dams S2 and S3

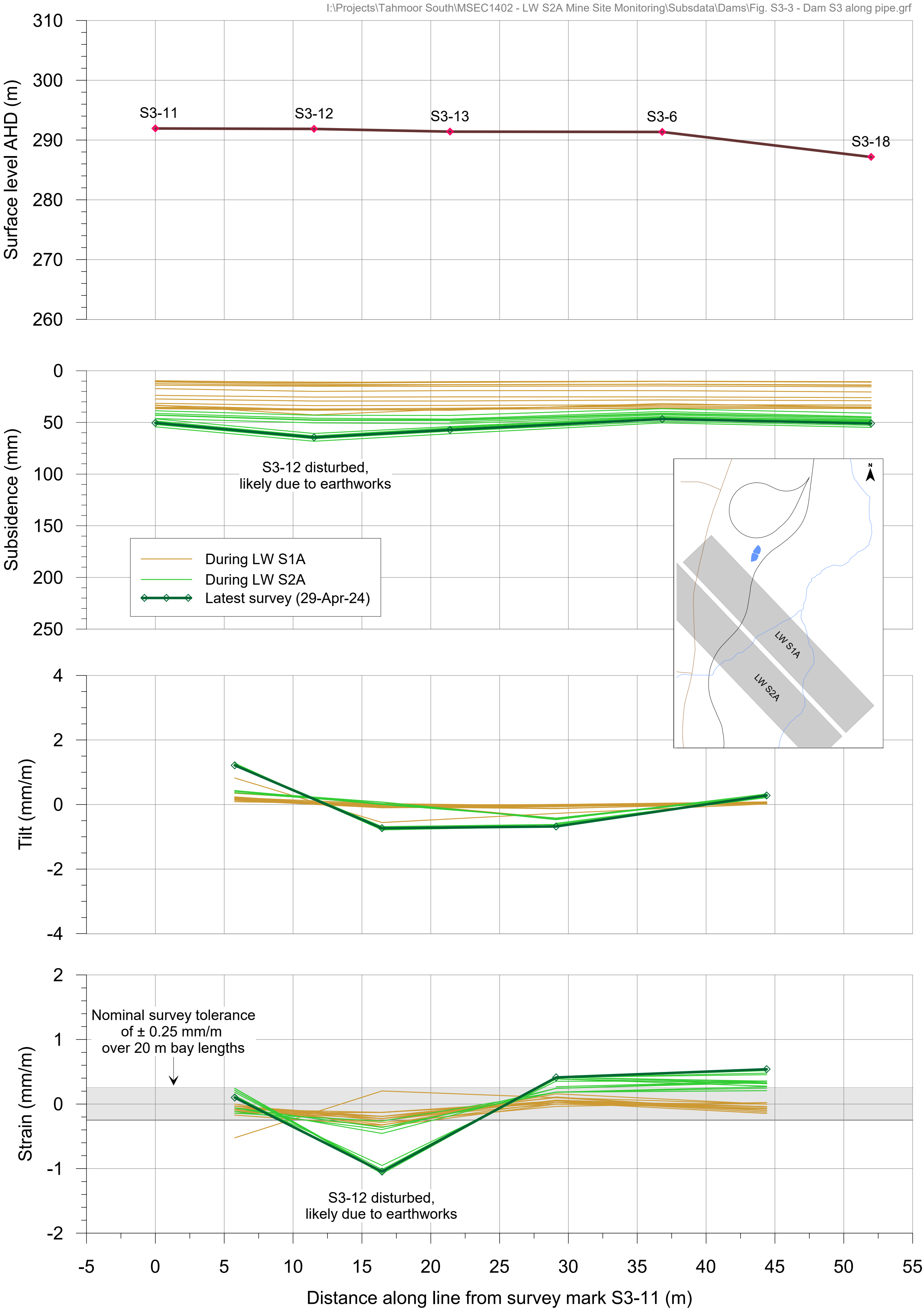

Fig. S3-3-R18

Drift Winder tiltmeters

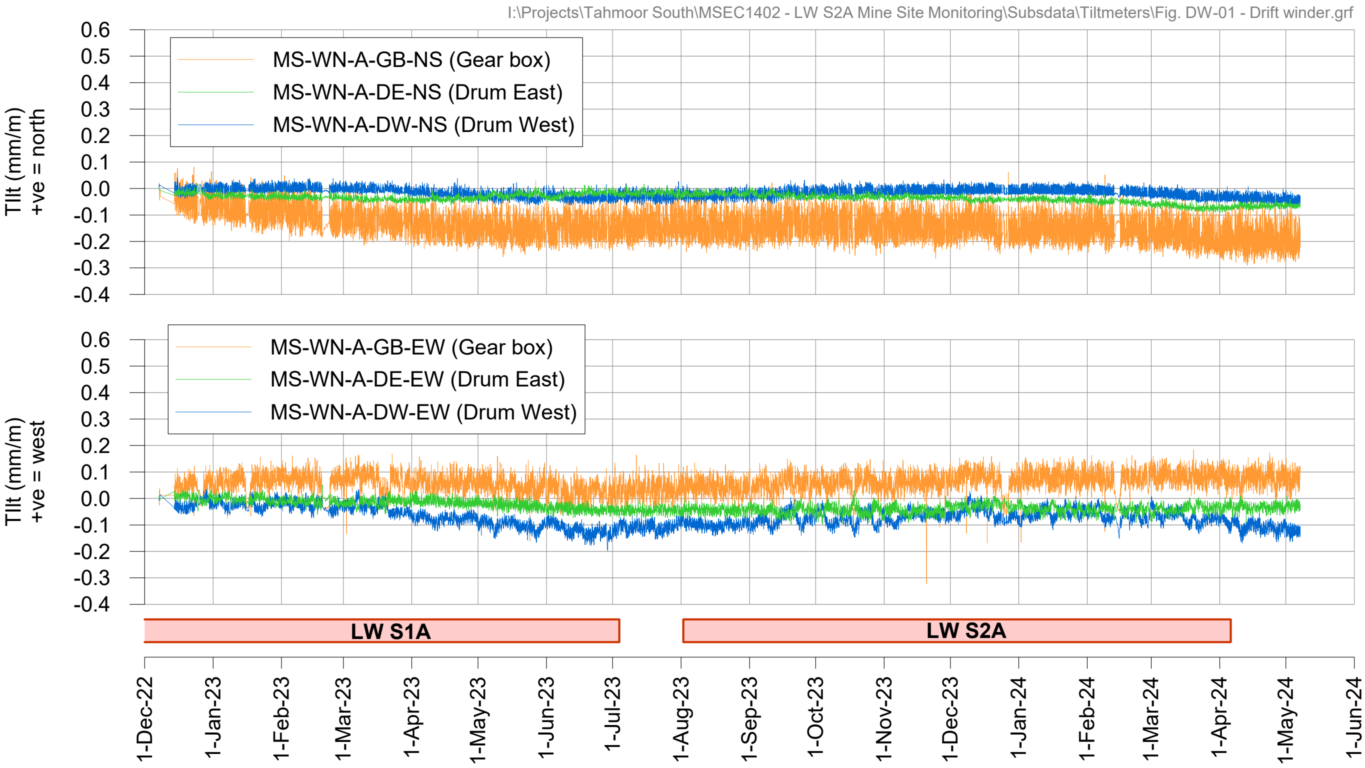

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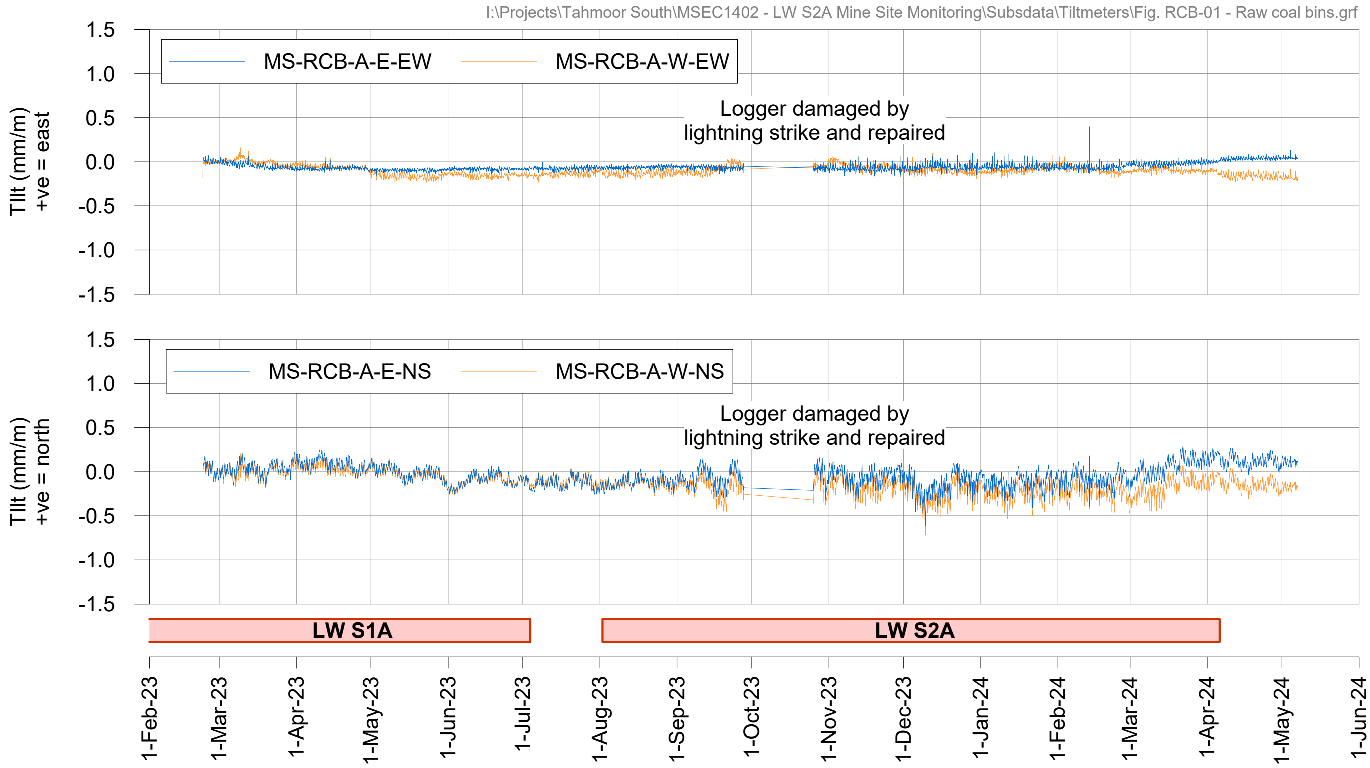
Fig. DW-01-R18

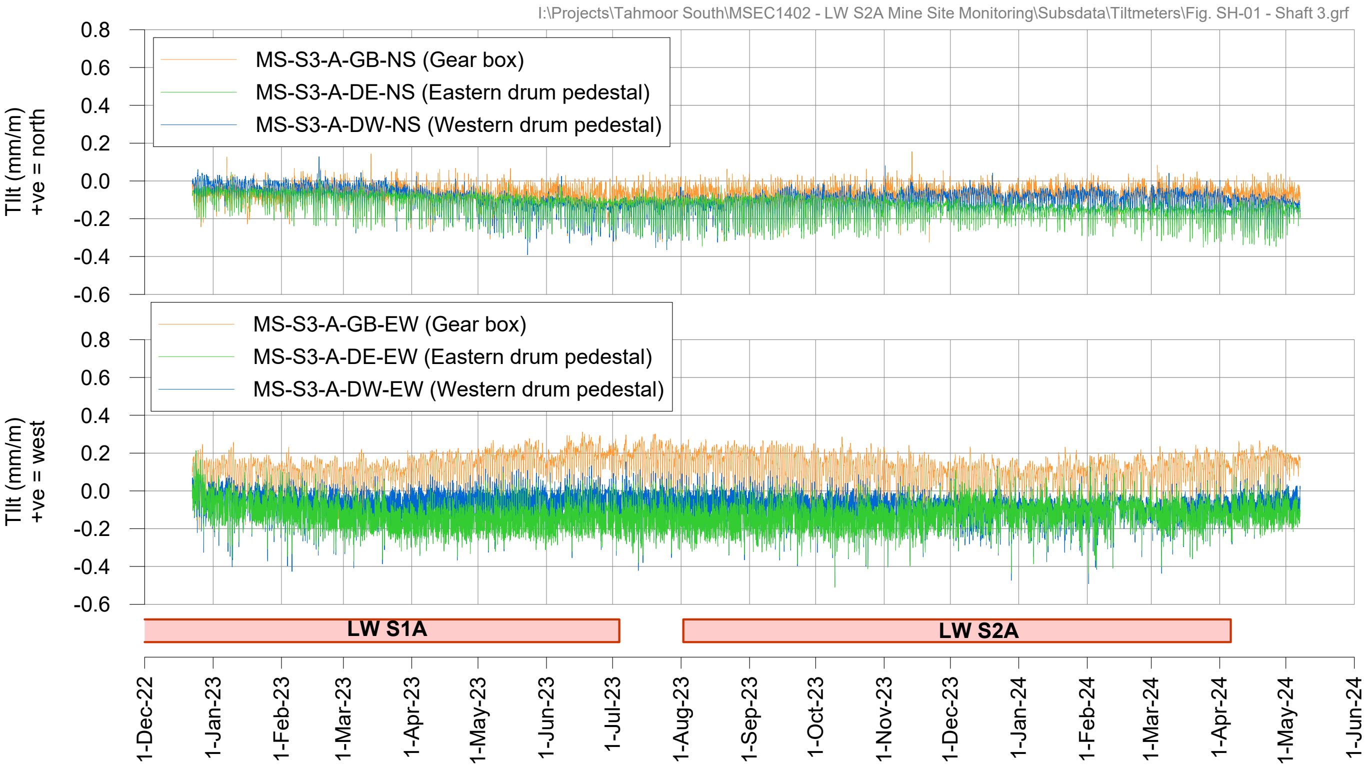
Raw coal bins tiltmeters



msec

Fig. RCB-01-R18

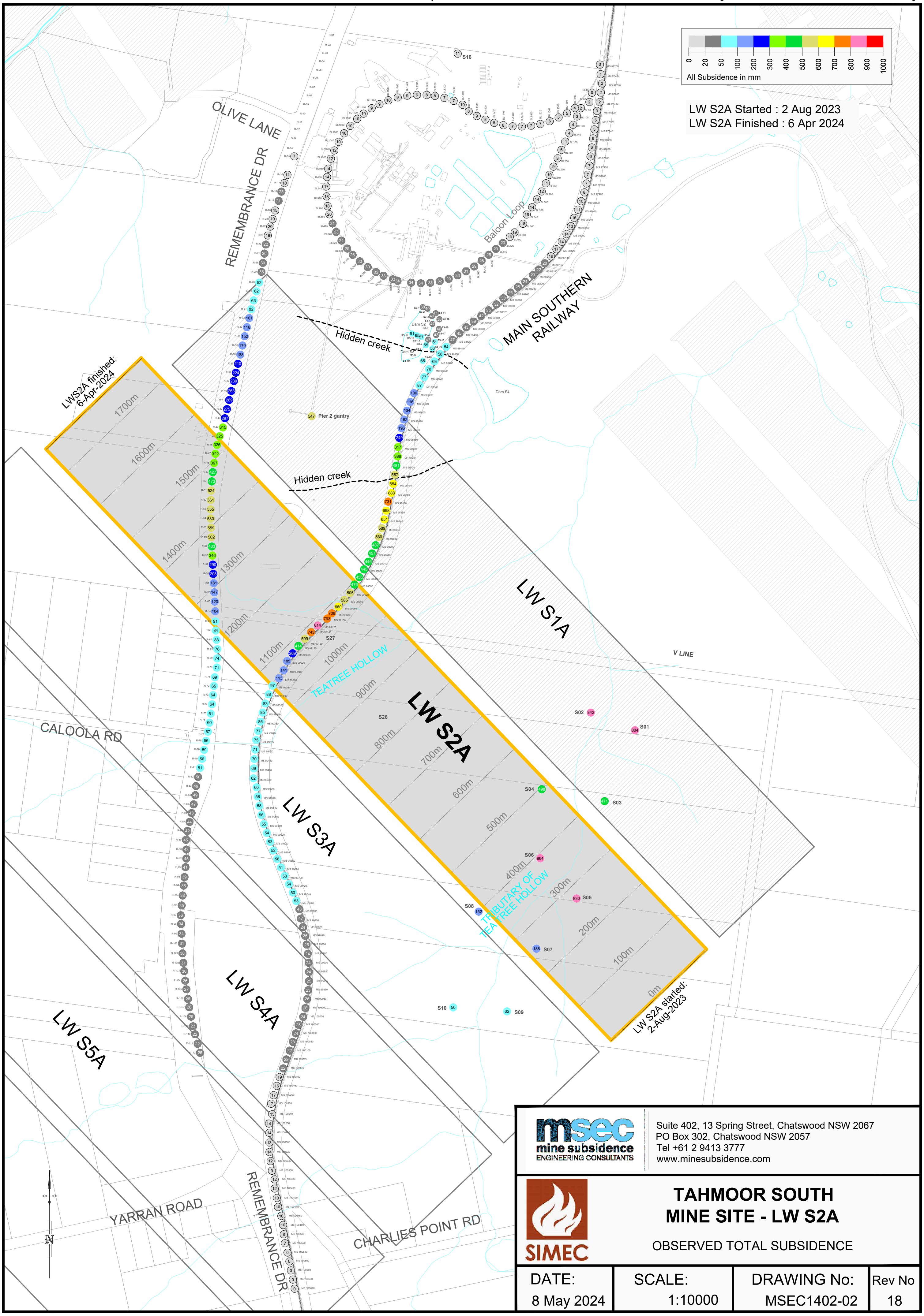
Shaft 3 tiltmeters



msec

Fig. SH-01-R18

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-02 Total Subs.dwg



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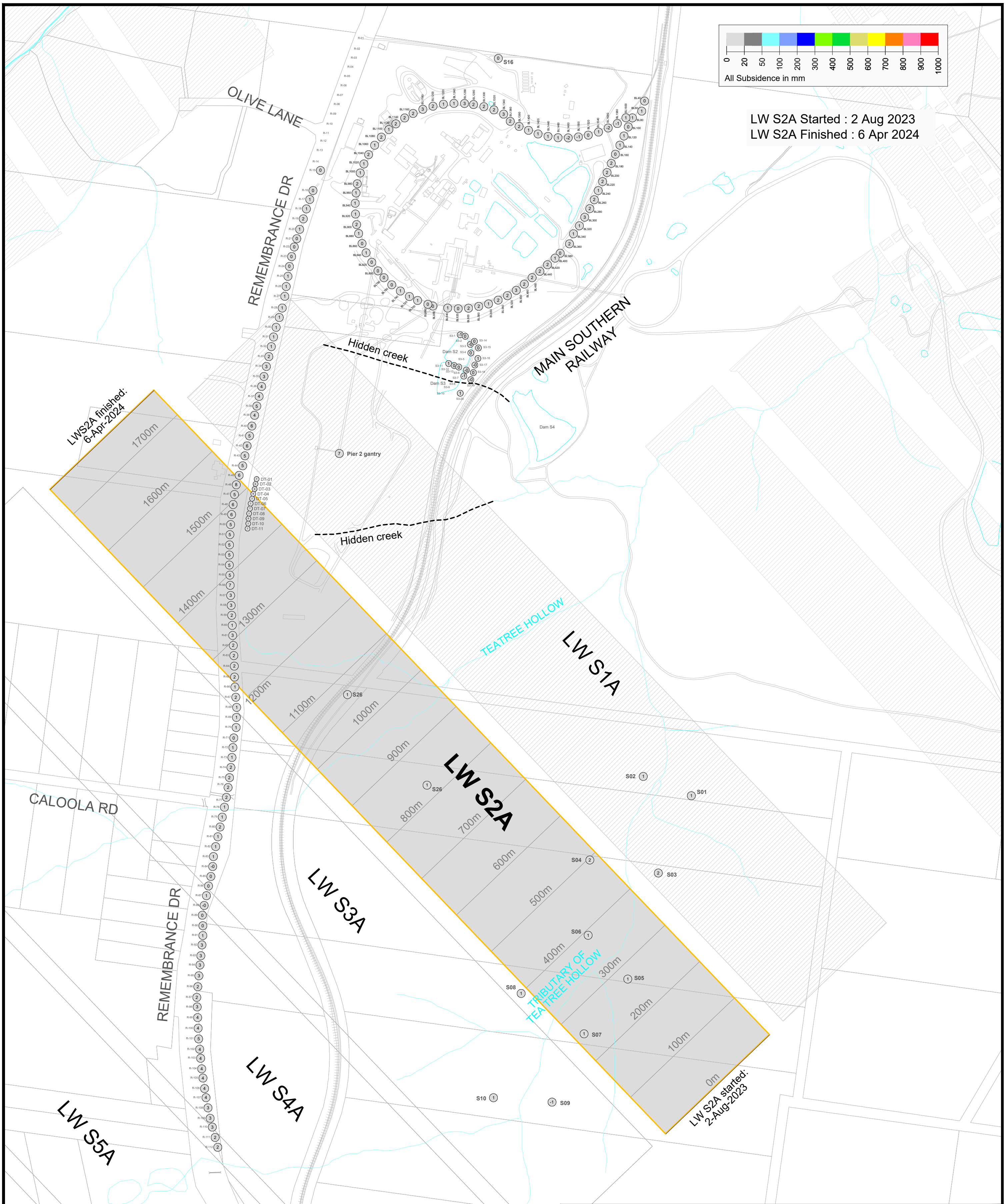
TAHMOOR SOUTH MINE SITE - LW S2A

OBSERVED TOTAL SUBSIDENCE

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	1:10000	MSEC1402-02	18



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TAHMOOR SOUTH MINE SITE - LW S2A

CHANGE IN SUBSIDENCE SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	1:10000	MSEC1402-03	18

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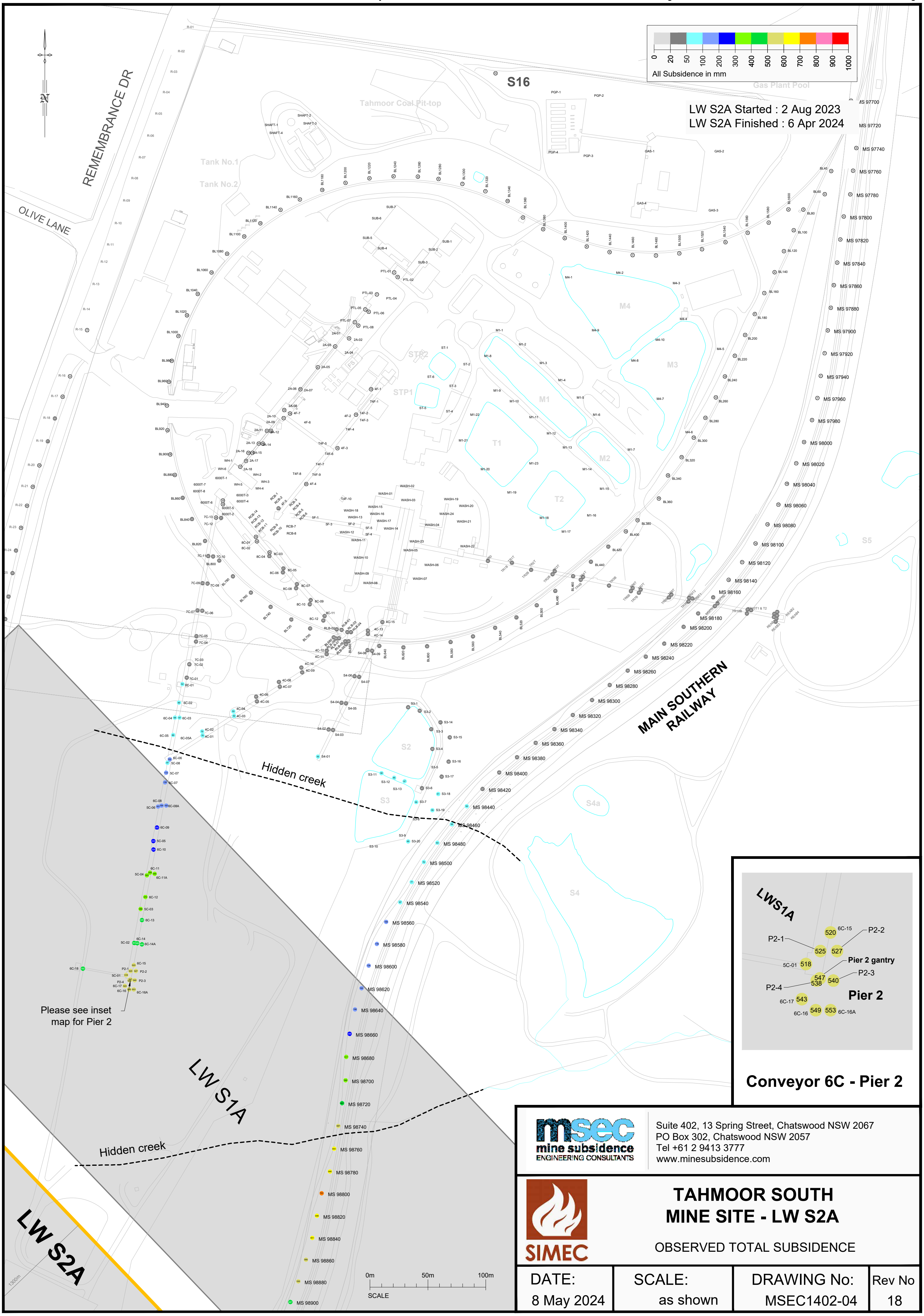

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TAHMOOR SOUTH MINE SITE - LW S2A

OBSERVED TOTAL SUBSIDENCE

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	as shown	MSEC1402-04	18

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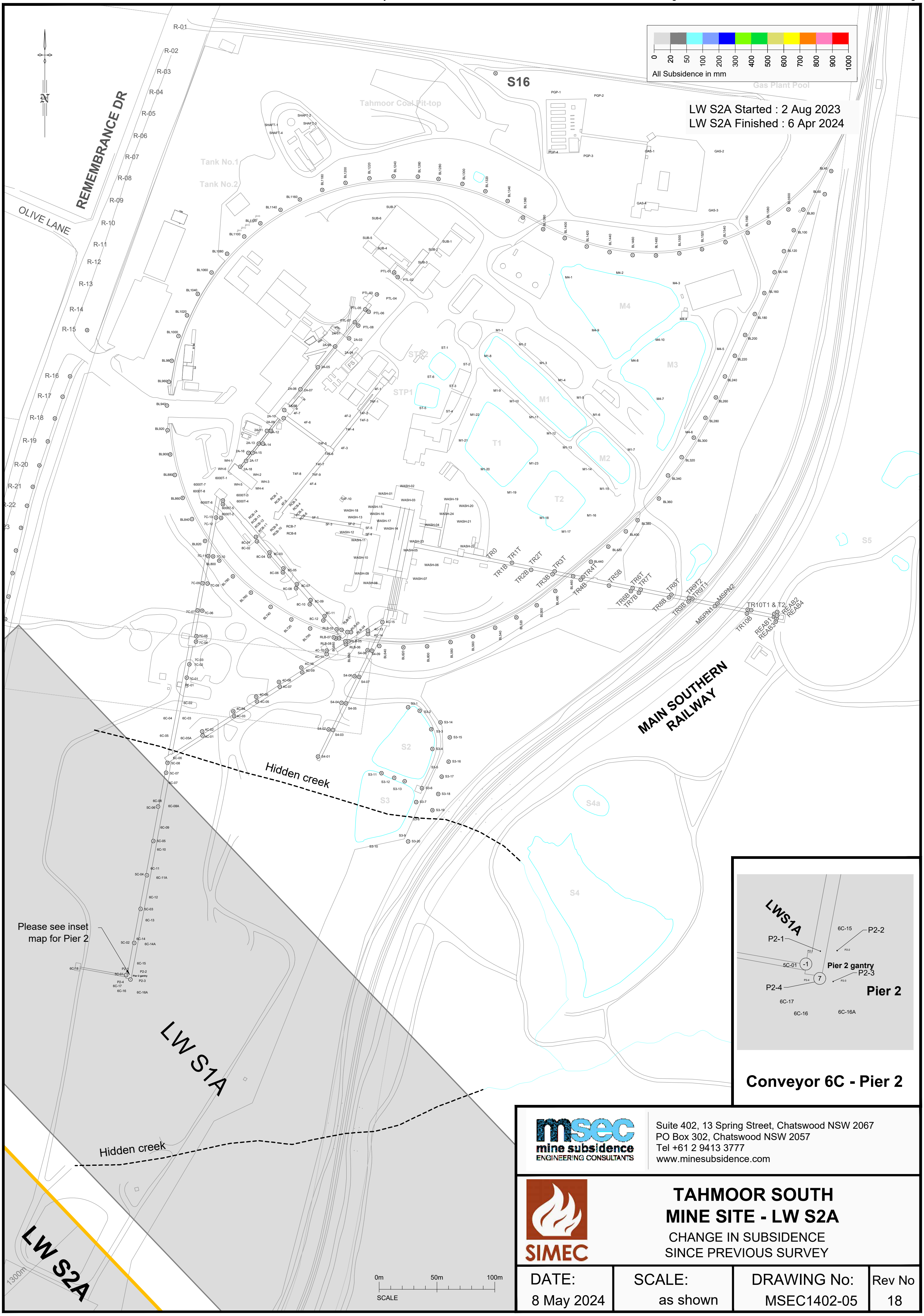

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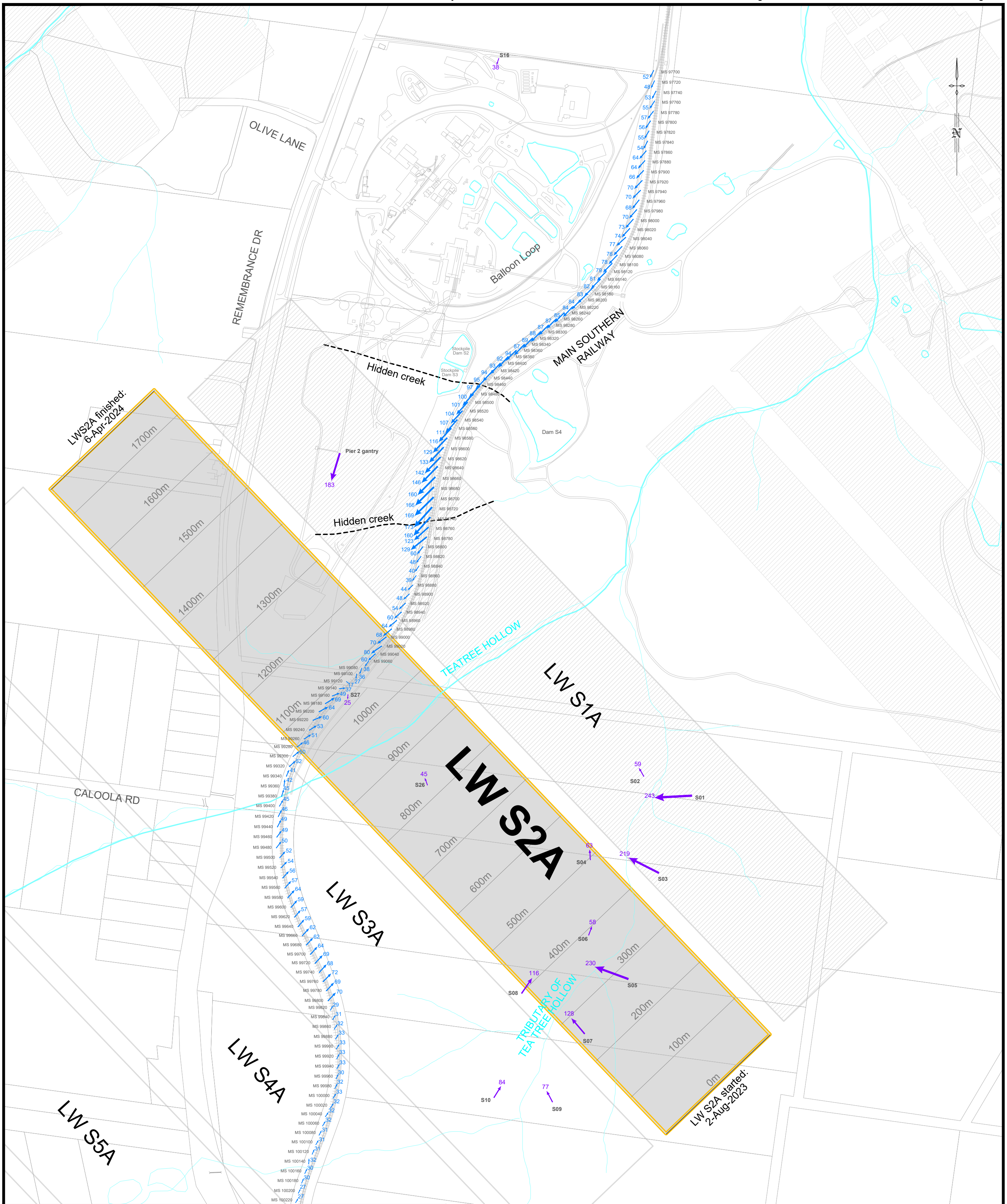
TAHMOOR SOUTH MINE SITE - LW S2A

CHANGE IN SUBSIDENCE SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	as shown	MSEC1402-05	18



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LW S2A Started : 2 Aug 2023
LW S2A Finished : 6 Apr 2024

TAHMOOR SOUTH MINE SITE - LW S2A

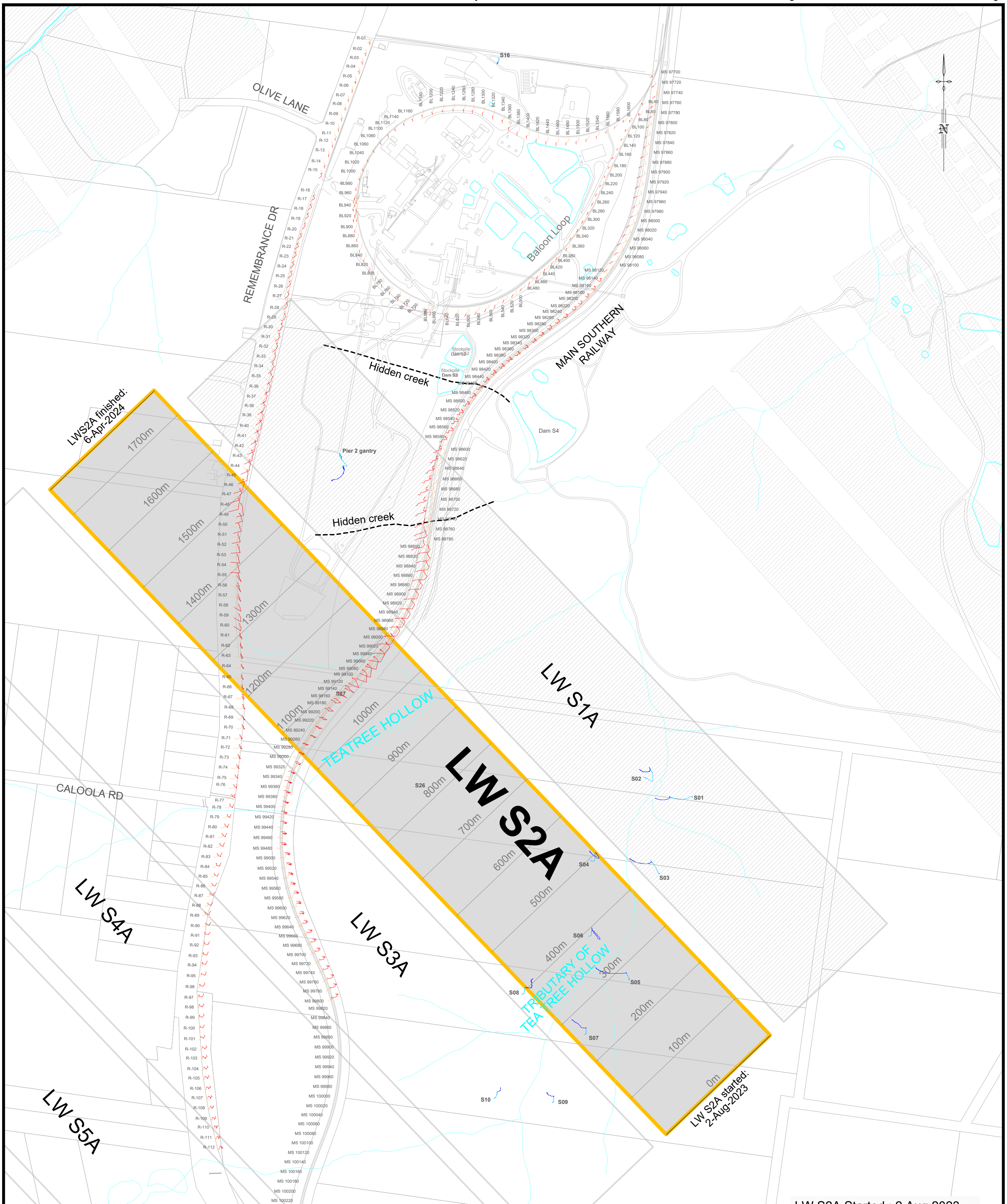
OBSERVED TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	1:10000	MSEC1402-06	18

LEGEND

- Horizontal displacements shown in mm at survey mark locations
- GNSS horizontal displacements shown in mm at unit locations

I:\Projects\Tahmoor South\MSEC1402 - LW S2A Mine Site Monitoring\AcadData\MSEC1402-07 Total Loci.dwg



LW S2A Started : 2 Aug 2023
LW S2A Finished : 6 Apr 2024

LEGEND

- Path of horizontal movement during LWS1A
- Path of horizontal movement during LWS2A
- Path of GNSS horizontal movement during LWS1A
- Path of GNSS horizontal movement during LWS2A

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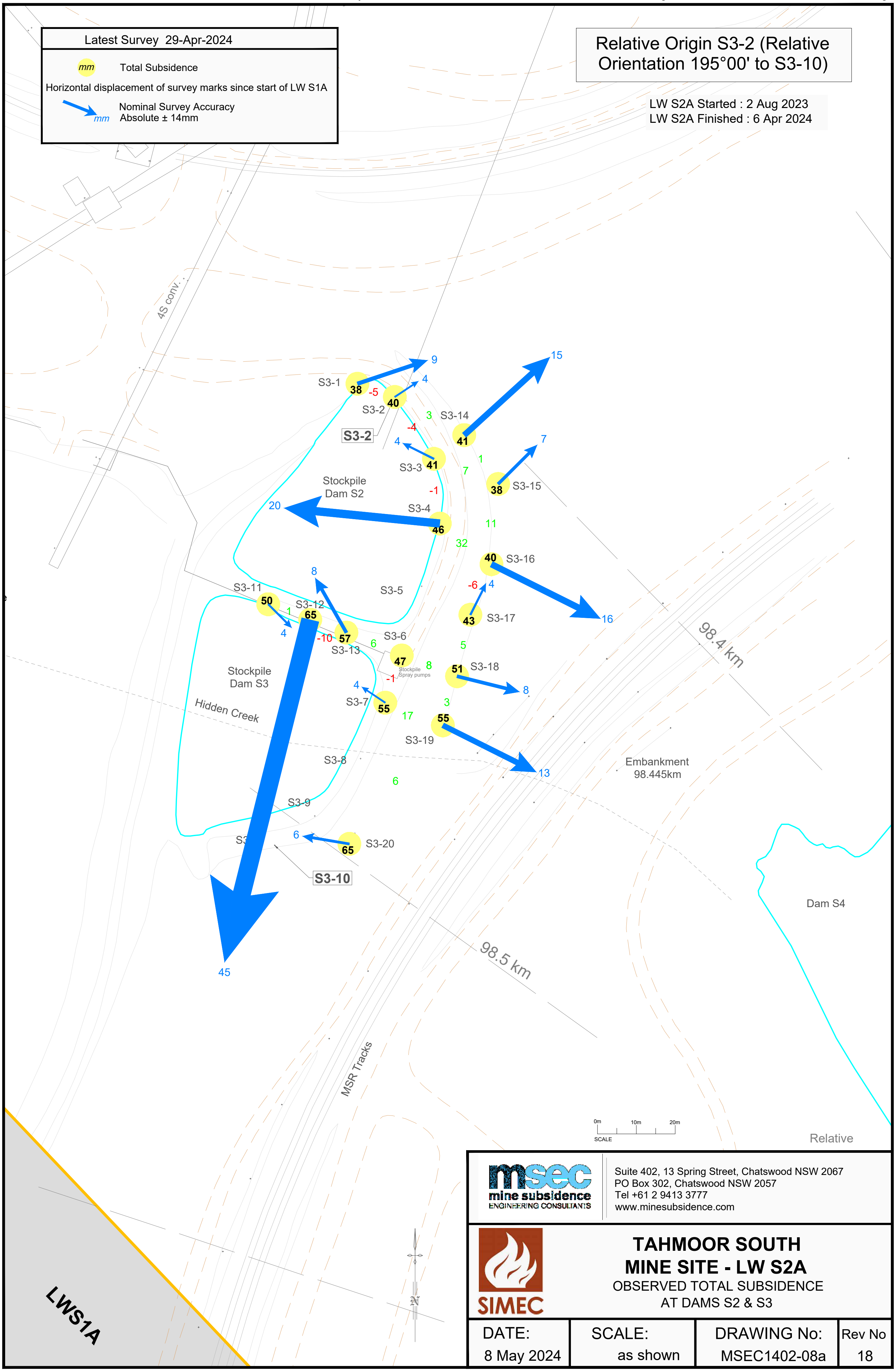
TAHMOOR SOUTH
MINE SITE - LW S2A
OBSERVED PATH OF TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	1:10000	MSEC1402-07	18



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TAHMOOR SOUTH
MINE SITE - LW S2A
OBSERVED TOTAL SUBSIDENCE AT DAMS S2 & S3

DATE:	SCALE:	DRAWING No:	Rev No
8 May 2024	as shown	MSEC1402-08a	18

Appendix I – Australian Wildlife Sanctuary Monitoring Reports

SIMEC

This information has been retracted

- For more information contact Tahmoor Coal

Appendix J – 3030 Remembrance Drive Monitoring Reports

This information has been retracted

- For more information contact Tahmoor Coal