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Tahmoor Coal Pty Ltd

SIX MONTHLY SUBSIDENCE IMPACT REPORT

Tahmoor South Domain Longwalls South 1A – South 6A

1 July 2023 – 31 December 2023

Report 3 – March 2024

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Document Control

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Executive Summary

This report is the third 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 1147 m of LW S2A had been extracted as of 5 January 2024.

The reporting period of this report is from 1 July 2023 to 31 December 2023 and includes observations noted during the extraction of LW S1A and LW S2A.

During the reporting period, a maximum of 841 mm of vertical subsidence relating to the extraction of LW S2A was recorded at GNSS S06.

During the reporting period, ten (10) TARPs for environmental and built features were triggered as summarised:

- Surface Water Quality TARP (WMP1) – Elevated concentrations of analytes at various sites resulted in Level 1, 2 and 3 triggers during the reporting period. This included a Level 2 TARP trigger in dissolved zinc and iron and a Level 3 TARP trigger for electrical conductivity, both triggers occurring during July and August 2023 at monitoring site TT7. These elevated concentrations were attributed to prevailing evapoconcentration of salinity due to period of below average rainfall and water level decline, and interaction of underflow with subsurface geology and re-emergence of underflow as surface flow. No further actions other than ongoing monitoring is required;
- 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, TT12 and 113. 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 site visit to the sites of the Level 3 TARP triggers was offered to DPIE (now DPHI) and NRAR, and a site visit with representatives from National Trust and the Australian Wildlife Sanctuary was undertaken on 22 November 2023. 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, increased iron staining and the development of new or existing fractures resulted in Level 1, 2 and 3 triggers during this reporting period. This included Level 3 TARP triggers at monitoring sites TT2, TT3, TT11, TT12 and TT13. 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. A site visit to the sites of the Level 3 TARP triggers was offered to DPIE (now DPHI) and NRAR, and a site visit with representatives from National Trust and the Australian Wildlife Sanctuary was undertaken on 22 November 2023. A WCAMP will be prepared and implemented (if required) following the cessation of subsidence movements associated with Tahmoor South mining;
- Groundwater Level TARP (WMP8) – Level 1 triggered at P51B, P53A, P53B, P55B and GW104659, and Level 2 triggered at P53C, P55C and P56C due to groundwater level reduction. Groundwater level decline at P53 and P56 nested bores could be 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 – Surface Water Interaction TARP (WMP12) – A review of groundwater – surface water interaction between P53 nested bores (Level 1 and 2 triggered for TARP WMP8) and associated surface water monitoring site TT13-QRLa did not find any apparent correlation between the two sites. No further actions other than ongoing monitoring is required;
- Aquatic Habitat and Macroinvertebrate Indicators (BMP1) – Level 1 triggered at aquatic ecology monitoring sites TTH16 and TTHt7 due to reduced aquatic pool habitats (dry pools) compared to baseline observations for two 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 to poor track geometry at 98.8 km as a result of mining-induced movements. Resurfacing of the track was completed during the reporting period which resulted in a resolution of this trigger. No further actions other than ongoing monitoring is required;
- Tahmoor Mine Site TARP – Blue trigger due to closure 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. Assessment of the strain on the rail loop will be completed after LW S2A mining. Ongoing monitoring is required; and
- 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. Notification of this trigger was provided to AWS in October 2023, and a site inspection with National Trust and AWS staff of Wirrimbirra Creek was conducted in November 2023. A WCAMP will be prepared (if required) and implemented following the cessation of subsidence movements associated with Tahmoor South mining.

The finalisation of consultation on proposed amendments to the LW S1A-S6A Water Management Plan with NSW DPHI and NSW DCCEEW, and implementation of the updated plan once approved, remains outstanding.

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.

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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. The A series, Longwalls South 1A to South 6A (LW S1A-S6A), were the focus of the LW S1A-S6A Extraction Plan, for which approval was granted on 20 September 2022. The Study Area for this extraction plan is provided in **Figure 1-2**.

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 1147 m of LW S2A had been extracted as of 5 January 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 2023 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 third 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 July 2023 to 31 December 2023, and covers subsidence impacts observed during the extraction of LW S1A and LW S2A.

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° 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 report only)
Water Management Plan	Surface Water	Streamflow Pool water level Stream water quality	• ALS • SMEC	• ATC Williams	• Report for 1 July to 31 December 2023	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 • Annual Headwater Report (September 2023)	Sections 3.2.2, 3.2.3	Appendix C
	Groundwater	Groundwater quality Groundwater bore level at open standpipes and private bores Shallow groundwater pressures Deep groundwater pressures	• CES	• SLR	• Report for 1 July to 31 December 2023	Section 3.3	Appendix D
		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 S1A (July 2023)	Section 3.4.4	Available on request
Biodiversity Management Plan	Aquatic Ecology	Macroinvertebrates	• Niche	• Niche	• Aquatic Ecology Monitoring Report for Spring 2023 (December 2023)	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 Spring 2023 (November and December 2023)	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 S1A (July 2023)	Section 3.6.1	Appendix E

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	Picton Weir	• SMEC • BIS	• MSEC	• Weekly reports during mining	Sections 3.6.2, 3.7.13	Appendix A (referenced report only)
		Great Southern Road (partial)				Sections 3.6.2, 3.7.2	
		Bargo Cemetery	• SMEC • BIS	• MSEC	• Weekly reports during mining	Sections 3.6.2, 3.7.9	Appendix A (referenced report only)
			• 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 H (referenced reports 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 G (referenced reports only)
			• Tahmoor Coal	• Tahmoor Coal • EMM	• Tahmoor Mine Site Photo Reports (weekly during active subsidence) • Historical Heritage Review letter (October 2023)	Sections 3.6.2, 3.7.11	Appendix E (letter only)
		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 G (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	Available on request
		Tahmoor Mine Site	• SMEC • BIS	• MSEC	• Tahmoor Mine Site Status Reports (weekly during active subsidence)	Sections 3.6.2, 3.7.11	Appendix G (referenced report 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 H (referenced reports only)
		Bargo Petroleum	• SMEC	• MSEC	• Petrol Station Status Report (weekly during active subsidence)	Section 3.7.14	Available on request
		Tahmoor Garden Centre	• SMEC	• MSEC	• Tahmoor Garden Centre Status Report (weekly during active subsidence)	Section 3.7.16	Available on request

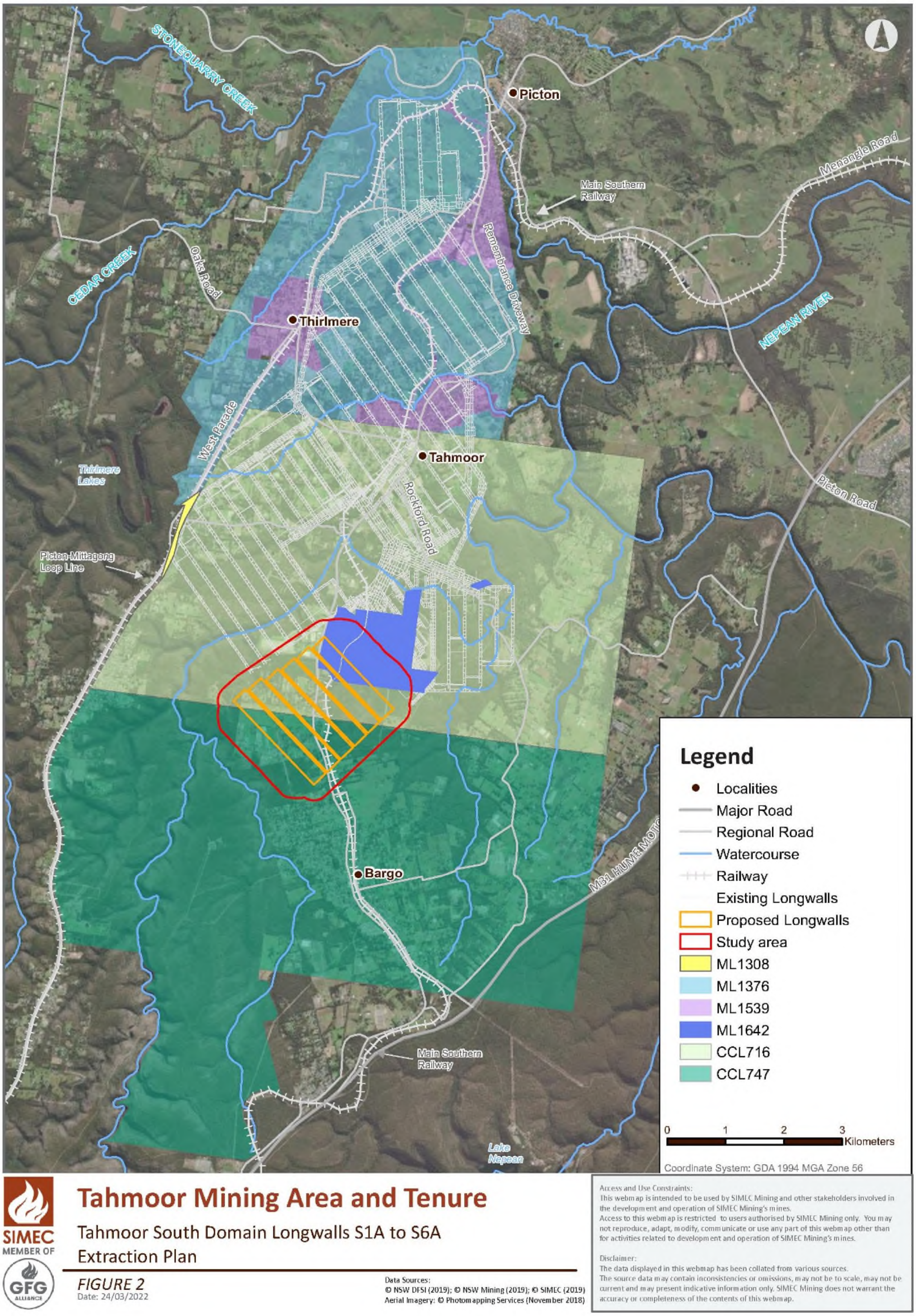

Figure 1-1 Tahmoor Mine Area and Tenure (source: LW S1A-S6A Extraction Plan)

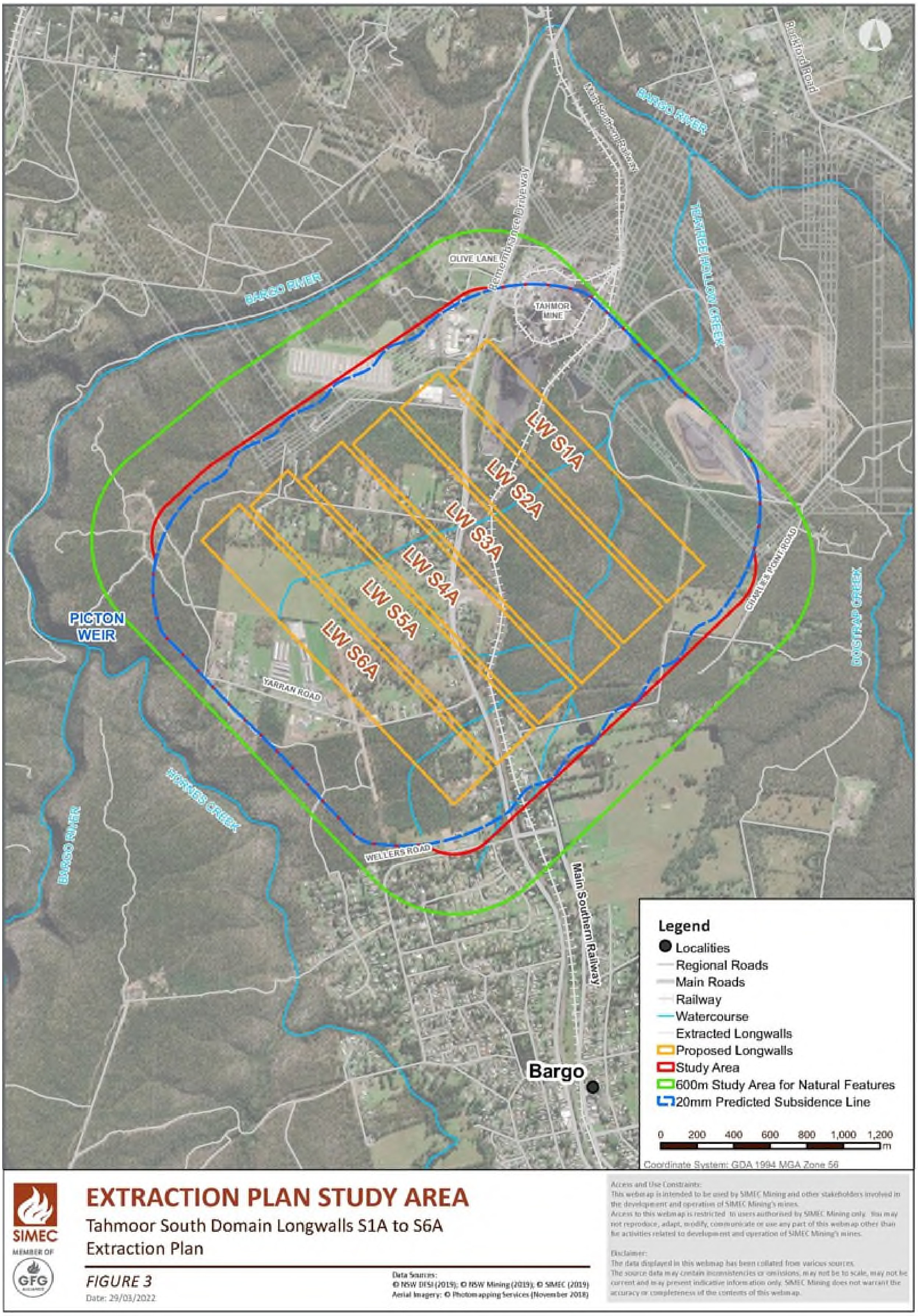

Figure 1-2 LW S1A-S6A Extraction Plan Study Area (source: LW S1A-S6A Extraction Plan)

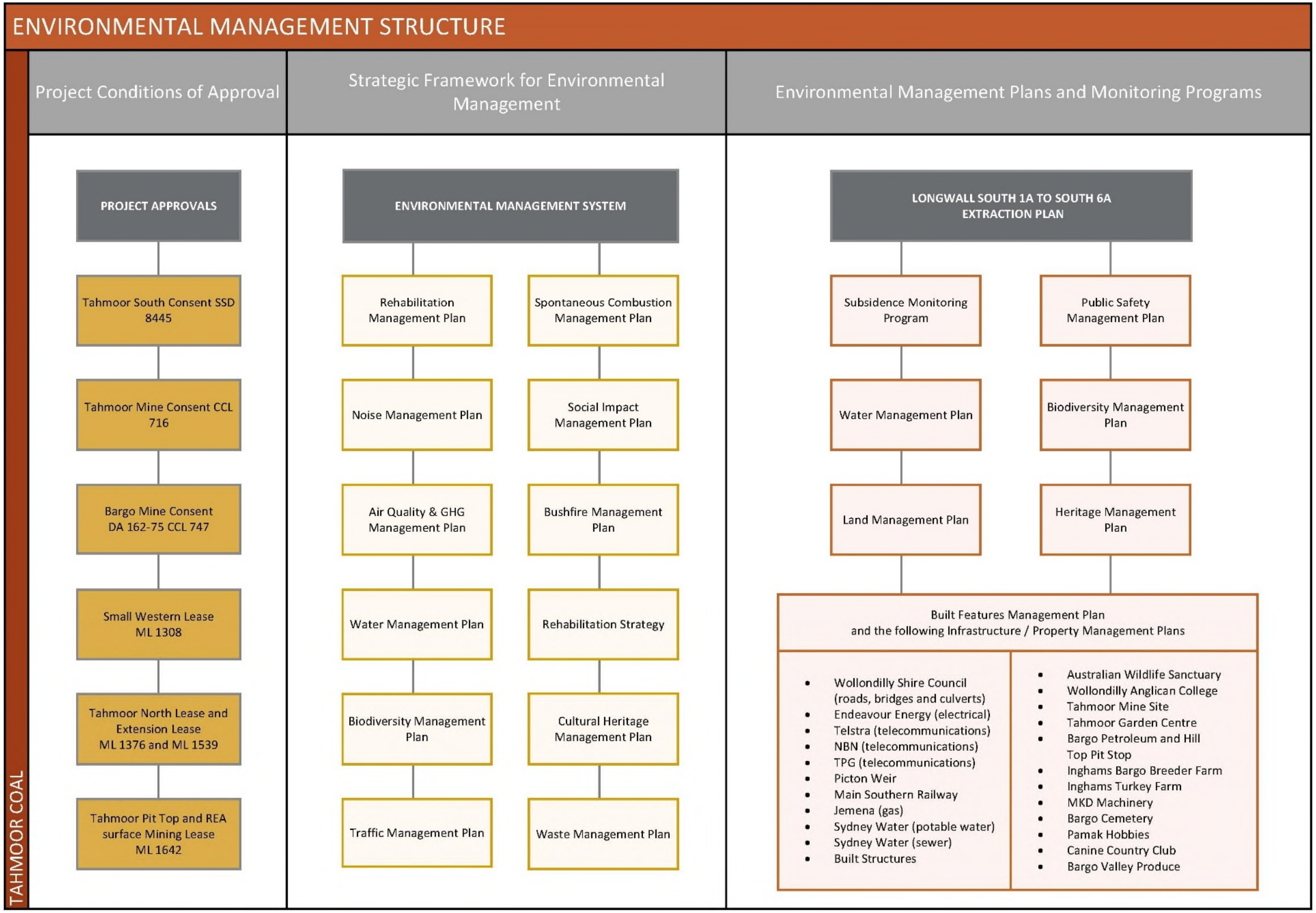

Figure 1-3 Overview of Environmental Management Structure for Tahmoor Coal (source: LW S1A-S6A Extraction Plan)

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 July to December 2023

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
Water Management Plan	WMP1	**Stream Water Quality for all Watercourses within the Subsidence Area**	LEVEL 2 TRIGGERED[2] Exceedance of an SSGV occurred at a given potential impact site in four or five consecutive months at TT7 (dissolved zinc, dissolved iron).	LEVEL 1 TRIGGERED[1] Exceedance of an SSGV occurred at a given potential impact site in three consecutive months at TT7 (dissolved nickel).	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.	LEVEL 1 TRIGGERED[1] Exceedance of an SSGV occurred at a given potential impact site in three consecutive months at TT2 (dissolved aluminium).	Exceedance of an SSGV did not occur or occurred for less than three consecutive months.
				LEVEL 2 TRIGGERED[2] Exceedance of an SSGV occurred at a given potential impact site in four or five consecutive months at TT7 (dissolved zinc, dissolved iron).				
			LEVEL 3 TRIGGERED[3] Exceedance of an SSGV occurred at a given potential impact site in six consecutive months at TT7 (electrical conductivity) and the same has not occurred at the reference site(s).	LEVEL 3 TRIGGERED[3] Exceedance of an SSGV occurred at a given potential impact site in six consecutive months at TT7 (electrical conductivity) and the same has not occurred at the reference site(s).				
	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 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT3 (11 – 17 January 2023).	LEVEL 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (5 August to 5 October 2023).	LEVEL 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (5 August to 5 October 2023).	LEVEL 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (5 August to 5 October 2023) and TT9 (6 October to 28 November 2023).	LEVEL 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT7 (5 August to 5 October 2023) and TT9 (6 October to 28 November 2023).	LEVEL 1 TRIGGERED[4] The recorded water level declined by greater than 10 centimetres (cm) below the recorded baseline minimum level at TT3 (3 December 2023).
			LEVEL 2 TRIGGERED[5] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT2 (13 July to 12 August 2023)	LEVEL 2 TRIGGERED[5] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT2 (13 July to 12 August 2023).		LEVEL 2 TRIGGERED[5] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT7 (6 October to 9 November 2023).	LEVEL 2 TRIGGERED[5] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT7 (6 October to 9 November 2023).	LEVEL 2 TRIGGERED[5] The recorded water level declined atypically below the recorded baseline minimum level for less than one month (as a consecutive period) at TT3 (6-19 and 24 December 2023), TT12 (7-13 and 15-19 December 2023), and TT13 (10-19 December 2023).
			LEVEL 3 TRIGGERED[6] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT3 (1 July to 28 November 2023), TT12 (1 July to 28 November 2023), and TT13 (1 July to 28 November 2023).	LEVEL 3 TRIGGERED[6] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT2 (13 August to 28 November 2023), TT3 (1 July to 28 November 2023), TT12 (1 July to 28 November 2023), and TT13 (1 July to 28 November 2023).	LEVEL 3 TRIGGERED[6] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT2 (13 August to 28 November 2023), TT3 (1 July to 28 November 2023), TT12 (1 July to 28 November 2023), and TT13 (1 July to 28 November 2023).	LEVEL 3 TRIGGERED[6] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT2 (13 August to 28 November 2023), TT3 (1 July to 28 November 2023), TT12 (1 July to 28 November 2023), and TT13 (1 July to 28 November 2023).	LEVEL 3 TRIGGERED[6] The recorded water level declined atypically for greater than one month (as a consecutive period) at TT2 (13 August to 28 November 2023), TT3 (1 July to 28 November 2023), TT7 (10-28 November 2023), TT12 (1 July to 28 November 2023), and TT13 (1 July to 28 November 2023).	
	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).

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
	WMP5	Physical Features and Natural Behaviour of Watercourses within the Subsidence Area	LEVEL 1 TRIGGERED[7] Visually observed anomalous change observed for one month at monitoring sites TT10 and TT15.	LEVEL 1 TRIGGERED[7] Visually observed anomalous change observed for one month at monitoring sites TT15.	LEVEL 2 TRIGGERED[8] Visually observed anomalous change observed for two consecutive months at monitoring sites TT10 and TT15.	LEVEL 2 TRIGGERED[8] Visually observed anomalous change observed for two consecutive months at monitoring sites TT10 and TT15.	LEVEL 2 TRIGGERED[8] Visually observed anomalous change observed for two consecutive months at monitoring sites TT10 and TT15.	LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT11, and TT12.
			LEVEL 2 TRIGGERED[8] Visually observed anomalous change observed for two consecutive months at monitoring sites TT2, TT3, TT11.	LEVEL 2 TRIGGERED[8] Visually observed anomalous change observed for two consecutive months at monitoring sites TT2, TT10.				
			LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT7, TT12, and TT13.	LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT3, TT7, TT11, TT12, and TT13.	LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT7, TT11, TT12, and TT13.	LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT7, TT11, TT12, and TT13.	LEVEL 3 TRIGGERED[9] Visually observed anomalous change observed for three consecutive months at monitoring sites TT2, TT3, TT7, TT11, TT12, and TT13.	
	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.
	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.	No further development of soft knickpoints or increased erosion of headwater streams.	No further development of soft knickpoints or increased erosion of headwater streams.
	WMP8	Shallow Groundwater Level (Open Standpipes and Private Bores)	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P55C and P56C.	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P55C and P56C.	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P53B, P55C, P56C, and GW104659.	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, P53C, P55B, P55C, and GW104659.	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, P53C, P55B, and GW104659.	LEVEL 1 TRIGGERED[10] Greater than 2 m water level reduction for a period of 6 months at P51B, P53A, P53B, P55B, and GW104659.
						LEVEL 2 TRIGGERED[11] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P56C.	LEVEL 2 TRIGGERED[11] Water level reduction below the average of 2 m water level reduction and maximum modelled drawdown for a period of 6 months at P55C and P56C.	LEVEL 2 TRIGGERED[11] 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.
	WMP9	Shallow Groundwater Pressure (VWP Sensors < 200 m Depth) – original TARP	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).	No observed mining induced changes at VWP intakes, and no water level reduction greater than 5 metres in VWP intakes following the commencement of extraction for a period of less than six months (revised TARP wording*).
	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 (revised TARP wording*).	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 (revised TARP wording*).	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 (revised TARP wording*).	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 (revised TARP wording*).	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 (revised TARP wording*).	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 (revised TARP wording*).
	WMP11	Groundwater Quality (Open Standpipes and Private Bores)	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**	No observed changes in salinity, pH or metals outside of the baseline variability (revised TARP wording*).**

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
	WMP12	**Groundwater – Surface Water Interaction**	An assessment under this TARP was not initiated during this month.	An assessment under this TARP was not initiated during this month.	LEVEL 1 TRIGGERED[12] 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 P53B.	LEVEL 1 TRIGGERED[12] 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, and P53C.	LEVEL 1 TRIGGERED[12] 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, and P53C.	LEVEL 1 TRIGGERED[12] 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 and P53B. LEVEL 2 TRIGGERED[13] 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.
	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**	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.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
Biodiversity Management Plan	**BMP1**	**Aquatic Habitat and Macroinvertebrate Indicators (Stream Health)**	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	LEVEL 1 TRIGGERED[14] Visual monitoring indicates aquatic pool habitat parameters have been impacted by mining at Impact Sites TT16 and TTHt17 for two consecutive sampling occasions.
	BMP2	**Amphibian Populations**	NA – No monitoring required.	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.
	BMP3	**Riparian Vegetation**	NA – No monitoring required.	NA – No monitoring required.	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.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
	BMP4	Threatened Species, Threatened Populations and Endangered Ecological Communities	NA – No monitoring required.	NA – No monitoring required.	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.
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[15] An environmental consequence of mining was detected at the Tahmoor Mine Site (cracking of the 6C Tunnel and shortening on rail loop).	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.
Built Features Management Plan	1. Main Southern Railway Management Plan	Main Southern Railway Infrastructure	BLUE TRIGGER Poor track geometry observed at 98.8 km.	BLUE TRIGGER Poor track geometry observed at 98.8 km.	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.
	2. Wellers Road Overbridge Management Plan	Wellers Road Overbridge	NA – This structure is located outside the active subsidence zone of LW S1A.	NA – This structure is located outside the active subsidence zone of S2A.	NA – This structure is located outside the active subsidence zone of S2A.	NA – This structure is located outside the active subsidence zone of S2A.	NA – This structure is located outside the active subsidence zone of S2A.	NA – This structure is located outside the active subsidence zone of S2A.
	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.	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.	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.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.

Management Plan	TARP Reference / Sub-Management Plan	TARP Description	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
	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.	No mining impacts or environmental consequences observed.	No mining impacts or environmental consequences observed.
	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.	No mining impacts observed.	No mining impacts observed.
	12. Bargo Cemetery Management Plan	Bargo Cemetery (Heritage Site)	NA – This property is outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.
	13. Wollondilly Anglican College Management Plan	Wollondilly Anglican College	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	14. Tahmoor Mine Site Management Plan	Tahmoor Mine Site	BLUE TRIGGER Cracks observed in 6C Tunnel and long bay length survey reporting shortening on rail loop.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	15. Australian Wildlife Sanctuary Management Plan	Australian Wildlife Sanctuary	No mining impacts observed.	No mining impacts observed.	No mining impacts observed.	LEVEL 4 TRIGGERED[16] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[16] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.	LEVEL 4 TRIGGERED[16] Reduction in pool water level and fracturing observed in Wirrimbirra Creek.
	16. Picton Weir Management Plan	Picton Weir	NA – This property is outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.
	17. 3030 Remembrance Drive Management Plan	Bargo Petroleum and Hill Top Pit Stop	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	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.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	19. Inghams Bargo Turkey Farm Management Plan	Inghams Bargo Turkey Farm	NA – This property is outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.
	20. Tahmoor Garden Centre Management Plan	Tahmoor Garden Centre	No mining impacts observed.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.	NA – No monitoring required.
	21. MKD Machinery Management Plan	MKD Machinery	NA – No monitoring required.	NA – No monitoring required.	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 outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.
	23. Canine Country Club Management Plan	Canine Country Club	NA – This property is outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.
	24. Pamak Hobbies Management Plan	Pamak Hobbies	NA – This property is outside the active subsidence zone of LW S1A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.	NA – This property is outside the active subsidence zone of LW S2A.

Notes:

NR – Monitoring not required this month.

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

* A review of TARPs WMP9, WMP10, WMP11 and WMP13 was required due to multiple triggers in October to December 2022 from short term fluctuations in parameters demonstrated that the TARP triggers were too sensitive. Re-assessment of groundwater data against the revised TARPs was completed following this review process. This table presents the TARP triggers in accordance with the revised TARPs. Further discussion of these TARP triggers and the TARP review process is provided in Section 1.3 of the Groundwater Monitoring Report (Appendix C).

** A review of water quality triggers based on extended baseline data was completed during this reporting period in order to capture natural fluctuations originally not captured due to short baseline. This table presents the TARP triggers in accordance with the previous and revised TARP water quality triggers. Further discussion of these revised triggers is provided in Section 3.2.2.2 of the Groundwater Monitoring Report (Appendix C).

[1] TARP WMP1 Level 1 Trigger (LW S1A-S6A Water Management Plan): Exceedance of an SSGV occurs at a given potential impact site in three consecutive months and the same has not occurred at the reference site(s).

[2] TARP WMP1 Level 2 Trigger (LW S1A-S6A Water Management Plan): Exceedance of an SSGV occurs at a given potential impact site in four or five consecutive months and the same has not occurred at the reference site(s).

[3] TARP WMP1 Level 3 Trigger (LW S1A-S6A Water Management Plan): Exceedance of an SSGV occurs at a given potential impact site in six consecutive months and the same has not occurred at the reference site(s).

[4] 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).

[5] 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).

[6] 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).

[7] 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.

[8] 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).

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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.

[14] TARP BMP1 Level 1 (LW S1A-S6A Biodiversity Management Plan): 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).

[15] 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).

[16] TARP Level (Australina 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.

Extraction of LW S2A commenced on 2 August 2023, and as of 5 January 2024 had progressed a distance of 1147 metres from its starting position. LW S1A had been completed on 4 July 2023 and this reporting period includes observations noted during the extraction of LW S1A and LW S2A.

Table 3-1 summarises the maximum observed ground movements within the active subsidence zone at the start and end of this reporting period (following completion of LW S1A extraction). During the reporting period, a maximum of 841 mm of vertical subsidence relating to the extraction of LW S2A was recorded at GNSS S06.

Table 3-1 Subsidence Monitoring Observations for LW S2A to end of this Reporting Period (source: MSEC1368 Report 19a, Appendix A)

	MSEC1368 LW S2A Subsidence Monitoring Report 19a	
Monitoring Period	2 August 2023 to 5 January 2024	
Progress of extraction	LW S2A extraction – 11147 metres LW S2A commenced extraction on 2 August 2023	
Observed Ground Movement Parameters	**Maximum Observed Total**	**Location**
Subsidence (mm)	841	GNSS S06
Tilt (mm/m)	4.5	Main Southern Railway
Hogging Curvature (km^{-1})	0.11	Remembrance Drive
Sagging Curvature (km^{-1})	-0.19	Main Southern Railway
Tensile Strain (mm/m)	0.3	Main Southern Railway
Compressive Strain (mm/m)	-2.6	Main Southern Railway

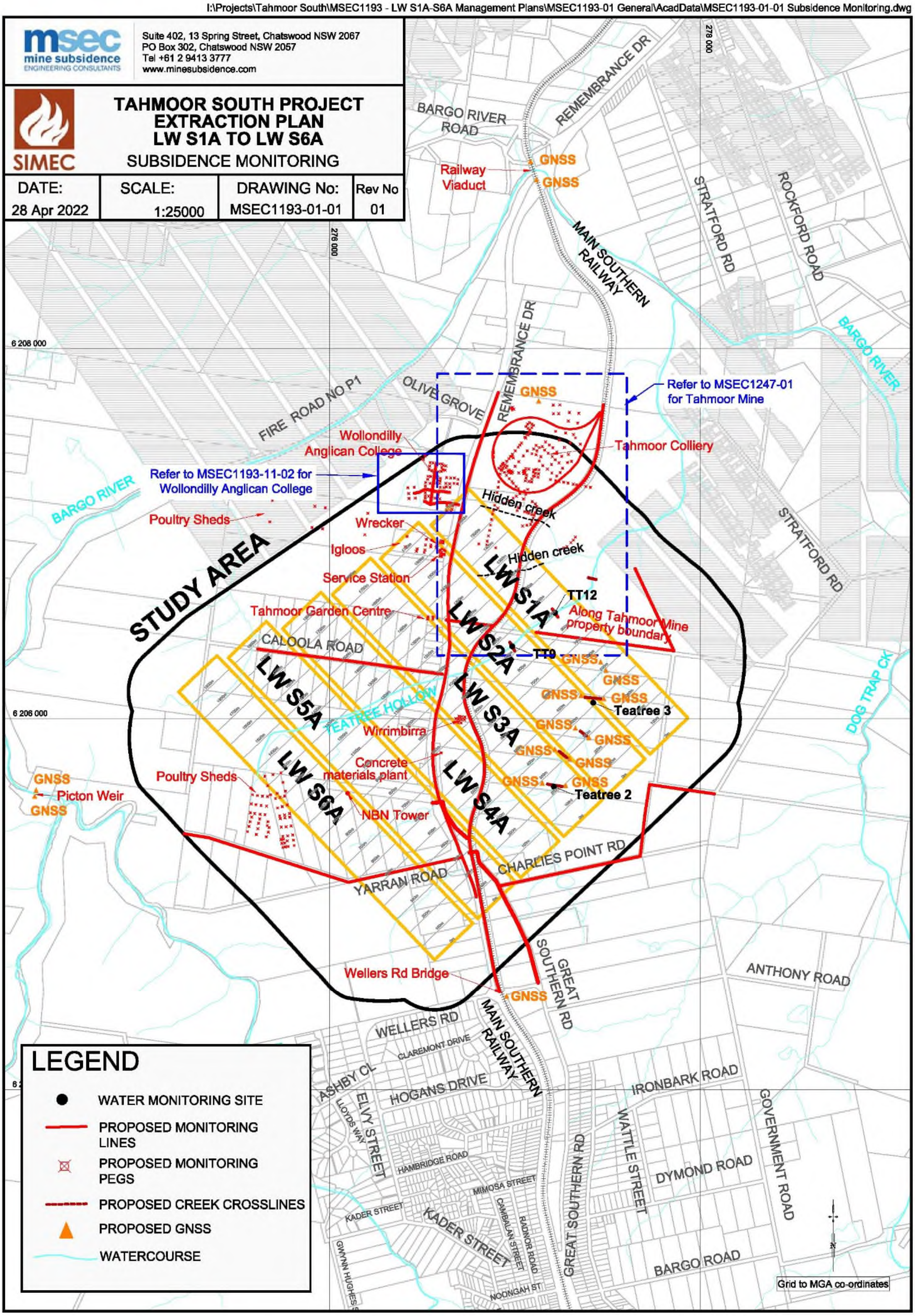

Figure 3-1 LW S1A-S6A Subsidence Monitoring Program (source: LW S1A-S6A Subsidence Monitoring Program)

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 19a (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 2 of the MSEC Subsidence Monitoring Report 19a (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 30 August 2023. Very minor changes have been observed since the completion of LW S1A.

3.1.3 GNSS Unit Results

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

Mining-induced movements are developing at the GNSS units, with maximum incremental subsidence of 805 mm at Site S26 since the commencement of LW S2A. Subsidence is increasing at Site S26 above LW S2A and rates of change are beginning to reduce. Subsidence is also increasing at Site S27 above LW S2A, but at a reduced magnitude at the equivalent stages of mining compared to GNSS S26. Subsidence at Sites S05 and S06 are reducing, as is expected at this stage of extraction (MSEC Subsidence Monitoring Report 19a (**Appendix A**)).

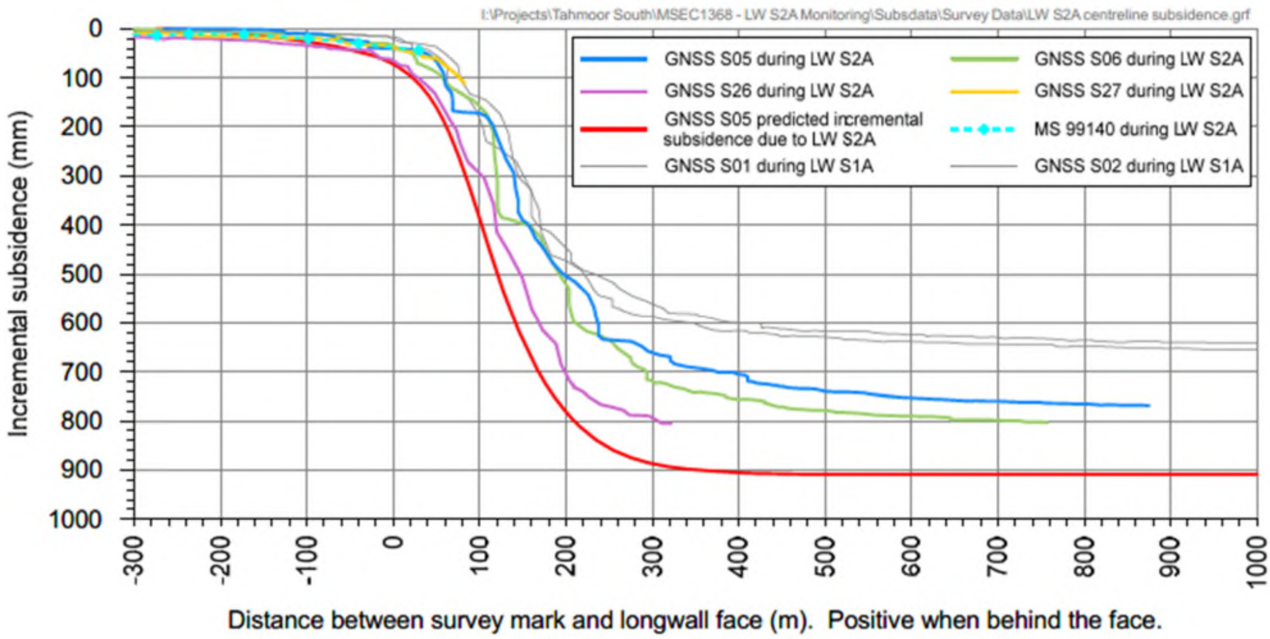

*Figure 3-2 Development of observed subsidence above LW S2A (source: MSEC, Subsidence Monitoring Report 19a, **Appendix A**)*

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 3-3**. 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. Rates of change between these two locations has not reducted to low levels;
- 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 is developing across Teatree Hollow between Sites S26 and S27 directly above LW S2A.

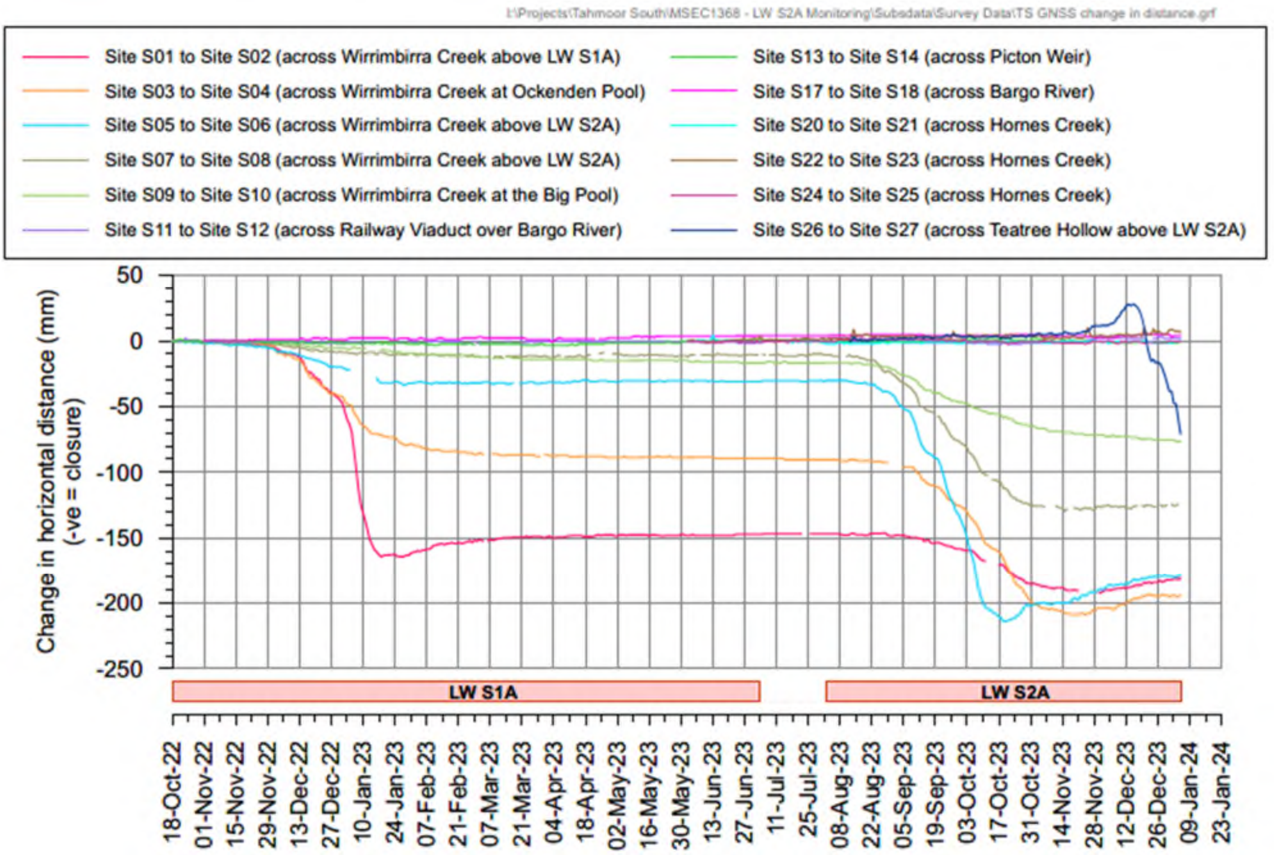

*Figure 3-3 Observed changes in horizontal distances between GNSS units during LW S2A extraction (source: MSEC, Subsidence Monitoring Report 19a, **Appendix A**).*

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 and fortnightly monitoring data reviewed and reported 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, as well as a fortnightly basis for impacted sites (reports available on request).

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 3-4**):

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

Water quality data consisted of constituents which are considered to be primary indicators of minine. 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 S1A and LW S2A 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:

- TT2-QLa:
  - o Elevated concentration of dissolved aluminium in September 2023;
  - o Slightly elevated dissolved iron concentration in July 2023;
- TT3-QLa:
  - o Elevated concentration of dissolved aluminium in December 2023;
- TT7-QLa:
  - o Reduced pH recorded in August 2023;
  - o Elevated EC value in July 2023;
  - o Elevated concentration of dissolved aluminium in December 2023;
  - o Elevated dissolved iron concentration in July 2023;
  - o Slightly elevated concentration of dissolved manganese in July 2023;
- TT9-QLa:
  - o Elevated concentration of dissolved aluminium in December 2023.

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

Background

During the reporting period, a number of surface water quality TARP triggers occurred as summarised below:

- Monitoring site TT2:
    - Level 1 trigger in November 2023 for dissolved aluminium;
- Monitoring site TT7:
    - Level 2 trigger in July and August 2023 for dissolved zinc and dissolved iron;
    - Level 3 trigger in July and August 2023 for electrical conductivity; and
    - Level 1 trigger in August 2023 for dissolved nickel.

At TT7, the electrical conductivity site specific guideline value (SSGV) was exceeded for six consecutive months from March to August 2023 (inclusive), equating to a Level 3 trigger. Similar elevated EC values were not recorded at the upstream reference site (TT1-QLa) during the corresponding period. The elevated EC values recorded at pool TT7 from March to August 2023 are considered related to the following:

- Evapoconcentration of salinity during periods of below average rainfall and water level decline.
- Interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7.

During the reporting period, the SSGVs for dissolved iron, zinc and nickel were exceeded at monitoring site TT7. Dissolved nickel SSGV was exceeded for three consecutive months from June to August 2023, resulting in a Level 1 TARP trigger. Dissolved iron and zinc SSGVs were exceeded for five consecutive months from April to August 2023, resulting in a Level 2 TARP trigger. Similar elevated dissolved nickel, iron and zinc concentrations were not recorded at the upstream reference site (TT1-QLa) during the corresponding periods.

The elevated dissolved metal concentrations recorded at pool TT7 from April to August 2023 are considered related to the interaction of underflow with subsurface geology and re-emergence of elevated dissolved iron, zinc and nickel underflow as surface flow in the vicinity of pool TT7. It was also noted that iron staining was observed on exposed bedrock at the upstream extent of the pool during the review period. As similar elevated metal concentrations were not recorded at the downstream monitoring site (TT14-QLa), it was considered that the elevated metal concentrations at TT7 are unlikely to have influenced the water quality of the downstream reach of Teatree Hollow.

At TT2, the dissolved aluminium SSGV was exceeded for four consecutive months from September to December 2023. Between September and November 2023, similar elevated dissolved aluminium concentrations were not recorded at the upstream reference site (TT1-QLa). It was considered that the elevated dissolved aluminium concentrations recorded at pool TT2 reflected the low volume of stagnant, ponded water present in the pool at the time of sampling. As such, it is considered that the aluminium concentrations recorded are reflective of a drying phase for pool TT2 rather than typical flow conditions.

Further discussion of these triggers is provided in the Surface Water Report (refer **Appendix B**) for this reporting period.

Actions and Responses Completed

Table 3-2 outlines the actions and responses that are required to be completed in accordance with a Level 1 and 2 TARP triggers for pool water quality (TARP WMP1), 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 Quality Reduction (TARP WMP1)

Action / Response from TARP WMP1	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 Assess if the trigger was exceeded during the baseline period prior to commencement of mining activities.	Exceedance of the trigger level during the baseline period was reviewed (refer Section 6.2.3 of **Appendix B**). A Level 1 trigger was recorded for dissolved aluminium at pool TT2 during the 1 July to 31 December 2023 review period. A Level 1 trigger or above for dissolved aluminium was not recorded at pool TT2 during the baseline monitoring period. A Level 2 trigger or above for EC, dissolved iron was not recorded at pool TT7 during the baseline monitoring period. A Level 2 trigger for dissolved zinc was recorded at pool TT7 during the baseline monitoring period. A Level 3 trigger was recorded for EC at pool TT7 during the 1 July to 31 December 2023 review period. A Level 2 trigger was recorded for dissolved iron and zinc during the 1 July to 31 December 2023 review period.
Level 1, 2 and 3 trigger Review water quality trends along watercourse (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water quality trends were reviewed for the watercourse reach (refer Section 6.2.3 of **Appendix B**).
Level 1, 2 and 3 trigger Discuss findings with and obtain other relevant information from key specialists (e.g. subsidence monitoring results, groundwater quality monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer Section 6 of **Appendix B**).
Level 1, 2 and 3 trigger Consider and decide on reasonable and feasible options for remediation as relevant (e.g. limestone cobbles for increasing pH level).	Reasonable and feasible options for remediation were considered where relevant (refer Section 7.3 of **Appendix B**). With respect to the water quality trigger exceedances recorded at TT7-QLa and TT2-QLa during the review period of 1 July to 31 December 2023, there are limited feasible corrective management actions (CMAs) that could be implemented prior to the cessation of subsidence movements associated with mining of LW S1A-S6A. Presently, there is negligible indication of a material impact to the water quality of Teatree Hollow, given that there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023 with limited potential for transport of elevated EC, dissolved aluminium, iron, zinc and nickel. Accordingly, it is considered that water quality effects are limited to pool TT7 and TT2 with negligible indication of material environmental harm to Teatree Hollow. Therefore, no CMAs are not considered reasonable or feasible at this stage.

Action / Response from TARP WMP1	Tahmoor Coal response
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; and • 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 a water quality change).	Increased monitoring and review of data frequency was considered (refer Section 6.2.3 of **Appendix B**). With respect to the dissolved nickel trigger exceedance reported at Pool TT2, the causation was assessed to be related to the drying phase for pool TT2, with concentrations not considered to be reflective of typical flow conditions. With respect to dissolved iron and zinc trigger exceedance reported at Pool TT7, the causation was assessed to be related to interaction of underflow with surface geology and re-emergence of elevated dissolved iron underflow as surface flow in the vicinity of pool TT7. The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7. The monitoring frequency was not increased given that causation was identified and there is negligible indication of a material impact to the water quality of Teatree Hollow (as there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023).
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water quality trends along creek (upstream to downtream) to identify spatial changes with consideration to climatic conditions.	Increased monitoring was not undertaken during the reporting period.
Level 2 and 3 trigger Review CMAs in light of findings from further investigations and consider additional remediation options.	CMAs are not considered reasonable or feasible.
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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. Following the submission of this report, 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.

Action / Response from TARP WMP1	Tahmoor Coal response
Level 3 trigger Increase monitoring and review of data frequency to fortnightly for sites where Level 3 has been reached and at corresponding reference sites, subject to land access.	The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7. The monitoring frequency was not increased given that causation was identified (related to subsidence induced fracturing and the prevailing climate) and there is negligible indication of a material impact to the water quality of Teatree Hollow (as there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023).
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, effects unrelated to mining or the prevailing climate.	A detailed investigation to assess if the change in behaviour is related to mining effects was undertaken (refer Section 6.1.3 of **Appendix B**). The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7 (related to subsidence induced fracturing and the prevailing climate).
Responses	
Level 1, 2 and 3 trigger Report trigger exceedance to DPE and key stakeholders.	Trigger exceedance during the reporting period were notified to DPE (now DPHI) and NRAR on 16 August 2023, 10 November 2023 and 23 February 2024. Tahmoor Colliery Community Consultative Committee was advised of water quality triggers on 7 September 2023, 7 December 2023, and 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 this report.
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.

Action / Response from TARP WMP1	Tahmoor Coal response
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 this report, 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. • 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.	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. 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 3-2**), the following actions and responses remain outstanding:

- Finalisation of consultation on proposed amendments to the LW S1A-S6A Water Management Plan with DPHI and implementation of the updated plan once approved;
- 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 30 September 2024.

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 3-4**. 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, no flow was recorded at the TT-F1 streamflow site from July to late November 2023, indicating below average rainfall conditions. The rate of streamflow decline recorded during the review period is considered consistent with that recorded from April to November 2021, prior to the commencement of mining of LW S1A and consistent with the rate of rainfall decline recorded during these periods.

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 periods of late October and November 2023, consistent with below average rainfall conditions;
- Monitoring site TT2 – water level was recorded below the cease to flow level from July to 23 October 2023, and below the sensor level or dry from 24 October to late November 2023;
- Monitoring site TT3 - Except for brief periods during and following rainfall, the water level was below the sensor level or the pool was dry;
- Monitoring site TT7 – water level was recorded below the cease to flow and the baseline minimum from September to October 2023, and the pool was reported to be dry in November 2023.
- Monitoring site TT9 – water level declined to a historical minimum from mid-October to late November 2023, although did not decline below the sensor level;
- Monitoring site TT12 –water level remained below the sensor level or the pool was dry for the majority of the review period, except for brief intervals during and following rainfall events;
- Monitoring site TT13 – water level was below the sensor level or the pool was dry from July to mid-November 2023.

From late November 2023 to the end of the review period, flow events occurred in response to above average rainfall. Following this period of above average rainfall, pool water level in the majority of pools rose in response. With the exception of TT3 and TT12, all pools recovered to levels above the cease to flow level at the end 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 July, Level 2 TARP triggered from July to August, Level 3 TARP triggered from August to November 2023;
- Monitoring site TT3: Level 1 TARP triggered in December 2023, Level 2 TARP triggered in December 2023 and Level 3 TARP triggered from July to November 2023;
- Monitoring site TT7: Level 1 TARP triggered from August to October, Level 2 TARP triggered from October to November, and Level 3 TARP triggered in November 2023;

- Monitoring site TT9: Level 1 TARP triggered from October to November;
- Monitoring site TT12: Level 2 TARP triggered in December, and Level 3 TARP triggered from July to November 2023.
- Monitoring site TT13: Level 2 TARP triggered in December, and Level 3 TARP triggered from July to November 2023.

Further discussion of these triggers, including confirmation of direct and indirect mining imapcts, 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 3-3 outlines the actions and responses that are required to be completed in accordance with a 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 3-3 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 period of 1 July to 31 December 2023. The rate of streamflow decline recorded during the review period is considered to be consistent with that recorded from April to November 2021 prior to the commencement of mining of LW S1A and consistent with the rate of rainfall decline recorded during these periods.
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. Reasons for not increasing monitoring frequency could include confident identification of causation (e.g. singular, anthropogenic, non-mining related change 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, TT12-QLa and TT13-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 TT7-QLa, TT12-QLa and TT13-QLa. For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency was increased to fortnightly as real-time telemetry data is available for these sites.

Action / Responses from TARP WMP3	Tahmoor Coal response
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water level trends along creek (upstream to downtream) 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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. Following the submission of this report, 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 3 trigger Increase monitoring and review of data frequency to fortnightly for sites where Level 3 has been reached and at corresponding reference sites, subject to land access.	Causation was identified for the Level 3 triggers equated for TT2-QLa, TT3-QLa, TT7-QLa, TT12-QLa and TT13-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 TT7-QLa, TT12-QLa and TT13-QLa. For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency was increased to fortnightly as telemetry data is available for these sites.
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 DPE and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) and NRAR on 16 August 2023, 10 November 2023 and 23 February 2024. Tahmoor Colliery Community Consultative Committee was advised of water quality triggers on 7 September 2023, 7 December 2023, and 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 this report.
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 this report, 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.

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 DPE and other key stakeholders. • 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.	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. 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 actions and responses remain outstanding:

- Finalisation of consultation on proposed amendments to the LW S1A-S6A Water Management Plan with DPHI and implementation of the updated plan once approved;
- 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 30 September 2024.

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 S1A and LW S2A. An increase in frequency to fortnightly has been completed for mining impacted pools.

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 3-5**.

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

- Pool TT1 (reference site):
    - Water level decline was observed from July to November 2023. Surface flow ceased shorly downstream of pool TT1 from July to mid-October 2023, and in late October and November no flow was observed downstream of pool TT1;
- Pool TT2:
    - A notable decline in water level was observed from July to November 2023;
    - Two fractures on the immediate upstream boundary of TT2 were observed in July 2023, and an increase in fracture size was reported from September 2023 onwards;
    - Low to moderate turbidity was observed during the reporting period;
- Pool TT3:
    - The pool was observed as dry from July to November 2023. Pooled water was observed in December 2023 with no overland connective flow;
- Pool TT7:
    - A decline in water level was observed from July to Ocobter, and the pool was reported as dry in November 2023;
    - Iron staining was observed on exposed bedrock at the upstream extent of the pool during the reporting period;
- Pool TT9:
    - A decline in water level was observed at times from July to November 2023;
- Pool TT10:
    - The pool was observed as dry from July to mid-September 2023, and minor ponding was observed in the pool in September, October and November 2023;
- Pool TT11:
    - The pool was observed as dry from July to early December 2023;
    - Additional fractures and an increase in the size of an existing fracture was observed during the reporting period;
    - Minor gas bubbling was observed in the centre of the pool in late December 2023;
- Pool TT12:
    - The pool was observed as dry from July to November 2023;
    - An increase in the extent of fracturing upstream and downstream of the pool was observed during the reporting period;
    - Iron staining was observed, consistent with that observed in the previous reporting period;
    - Moderate to high turbidity was observed in December 2023;
- Pool TT13:
    - The pool was observed as dry from July to November 2023;
    - Moderate turbidity was observed in December 2023;
- Pool TT15:
    - The pool was observed as dry in July, August, October and November 2023; and
    - Moderate turbidity was noted in December 2023.

Similarly to pool water level, it was noted that following above average rainfall in late November 2023, pool water level in the majority of pools rose in response. With the exception of TT3, overland connective flow was observed at pools, particularly trickle flow over the hydraulic controls.

Figure 3-7 demonstrates the location of flow re-emergence, fracturing, ponded water, iron staining and overland flow observed towards the end of the reporting period (November 2023) prior to above average rainfall in late November 2023.

A summary of mining related impacts to pools and stream reaches as a result of mining of LW S1A and LW S2A is provided in **Table 3-4** below. It is noted that the LW S1A and LW S2A 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 3-4 Summary of mining related impacts (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 TT11	• Pool water level	Indirect mining impact
Reach of Teatree Hollow tributary from pool TT11 to 95 m upstream of pool TT11	• Physical (fractures)	Direct mining impact
Pool TT7	• Pool water level • Pool water quality • Iron staining	Indirect mining impact
Pool TT12	• Pool water level • Physical (fractures) • Iron staining	Direct mining impact
Pool TT13	• Pool water level • Physical (fractures)	Direct mining impact

Pool TT2

At Pool TT2, an increase in the rate of closure was recorded at pool TT2 (Big Pool) from August to October 2023, following the commencement of mining of LW S2A, with approximately 70 mm of closure recorded at the end of the review period. Fracturing was initially observed directly upstream of pool TT2 in July 2023 with an increase in the size of the fracture observed to occur from September 2023 (**Appendix B**).

A geotechnical inspection of the fractured boulder upstream of pool TT2 was conducted during the reporting period (**Appendix A**). The fractured boulder was 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. 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 resulting 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 (**Appendix A**).

Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the upper headwaters of Teatree Hollow tributary, the water level decline recorded at pool TT2 is considered atypical and inconsistent with historical conditions. In addition, widening of the fracture observed immediately upstream of pool TT2 indicates that mining related effects have occurred at this site. 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**).

Pools TT3 and TT11

Approximately 90 mm of closure developed at pool TT3 (Ockenden Pool) during mining of LW S1A with a maximum of approximately 210 mm recorded during mining of LW S2A to December 2023. During the reporting period, additional fractures and an increase in the size of an existing fracture was observed at pool TT11, located directly upstream of pool TT3. In addition, minor gas bubbling was observed at pool TT11 in December 2023 indicating disturbance of pool substrate (**Appendix B**).

Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the reach of Teatree Hollow tributary downstream of pool TT1, the water level decline recorded at pool TT3 is considered atypical and inconsistent with historical conditions. Additional fracturing and widening of existing fractures at pool TT11, in addition to the observation of minor gas bubbling, indicate that mining related effects have occurred in the vicinity of pool TT11 and pool TT3 (**Appendix B**).

Pool TT7

It is considered that the decline in water level at pool TT7 is predominately related to the prevailing climatic conditions. However, mine induced fracturing has occurred upstream of pool TT7 which has likely resulted in a change in surface flow behaviour in the vicinity of pool TT7 (**Appendix B**).

Pool TT9

Although the water level declined intermittently during the review period, the water level decline is not considered atypical. Based on the monitoring data recorded during the review period, it is considered that the decline in water level recorded at pool TT9 during the review period is related to the prevailing climatic conditions and unrelated to mining effects associated with LW S1A or LW S2A (**Appendix B**).

Pools TT10 and TT15

Pools TT10 and TT15 are located on a minor tributary which discharges to Teatree Hollow tributary immediately upstream of pool TT2. No fractures have been observed and no surface flow was observed in the upstream reach of the minor tributary from July to November 2023. In addition, no surface flow was present in the upstream reach of Teatree Hollow tributary in late October and November 2023. It is considered that the decline in surface flow in the upper headwaters of Teatree Hollow tributary was related to the prevailing climatic conditions and unrelated to mining effects (**Appendix B**).

Pool TT12

It is considered that the water level behaviour at pool TT12 recorded during the review period is atypical and inconsistent with historical conditions. During the review period, an increase in the extent of fracturing upstream and downstream of pool TT12 was recorded. As such, the change in water level behaviour at pool TT12 is considered related to mining induced fracturing in combination with the prevailing climatic conditions (**Appendix B**).

Pool TT13

Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the reach upstream of pool TT13 (in the vicinity of the reference site pool TT1), the water level decline recorded at pool TT13 is considered atypical in comparison to baseline conditions. The decline in water level recorded during the review period is considered related to the cessation of surface water flow in Teatree Hollow tributary due to mining induced fracturing (in the vicinity of pool TT1) upstream of pool TT13 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 2 triggered from July to August 2023, Level 3 triggered from September to the end of the reporting period;
- Pool TT3: Level 2 triggered in July 2023, Level 3 triggered from August to the end of the reporting period;
- Pool TT7: Level 3 triggered from July to November 2023;
- Pool TT10: Level 1 triggered in July 2023, Level 2 triggered from August to November 2023;
- Pool TT11: Level 2 triggered in July 2023, Level 3 triggered from August to the end of the reporting period;
- Pool TT12: Level 3 triggered for the entire reporting period;
- Pool TT13: Level 3 triggered from July to November 2023; and
- Pool TT15: Level 1 triggered from July to August 2023, Level 2 triggered from September to November 2023.

Further discussion of these triggers, including confirmation of direct and indirect mining imapcts, 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 a 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 3-5 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 (or more frequent) 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**).

Action / Responses from TARP WMP5	Tahmoor Coal response
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. Reasons for not increasing monitoring frequency coulc 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).	Monitoring and review of data frequency was increased to fortnightly at pools TT2, TT3, TT7, TT11, TT12 and TT13, as well as relevant reference sites (pools TT1 and TT9). Changes at TT10 and TT15 were not confirmed to be related to mining effects.
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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. Following the submission of this report, 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 If the changes have been confirmed to be related to mining effects: • Increase monitoring and review of data frequency to fortnightly for sites where Level 2 has been reached and at corresponding reference sites, subject to land access.	Monitoring and review of data frequency was increased to fortnightly at pools TT2, TT3, TT7, TT11, TT12 and TT13, as well as relevant reference sites (pools TT1 and TT9). Changes at TT10 and TT15 were not confirmed to be related to mining effects.
Responses	
Level 1, 2 and 3 trigger Report trigger exceedance to DPE and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) and NRAR on 16 August 2023, 10 November 2023 and 23 February 2024. Tahmoor Colliery Community Consultative Committee was advised of water quality triggers on 7 September 2023, 7 December 2023, and 7 March 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 this report.
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 this report, 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.

Action / Responses from TARP WMP5	Tahmoor Coal response
Level 3 trigger 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.
Level 3 trigger 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.	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:

- Finalisation of consultation on proposed amendments to the LW S1A-S6A Water Management Plan with DPHI and implementation of the updated plan once approved;
- 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 30 September 2024.

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 3-5**.

During this reporting period, visual inspections were largely noted to be comparable to those observed in baseline visual inspection records for September 2022 (headwater sites) and October 2022 (channel morphology sites and knickpoints). No evidence of increased erosion or sedimentation in comparison to baseline conditions, with the exeption of the following:

- CM3: In November 2023, CM3 was reported to be disturbed by earthworks conducted at the railway corridor;
- CM7: Fracturing was observed at CM7 in July 2023, however the extent of fracturing was not observed to change during the reporting period.

3.2.4.2 TARP WMP7 – Channel Stability, Sedimentation and Erosion

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

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 July to December 2023 (**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 30 September 2024.

It was also recommended that the potential impact site CM3 be removed from the monitoring program due to works associated with the railway corridor. These works resulted in non-mining anthropogenic changes to the natural features of the channel at this location.

3.2.5.2 Previous Surface Water Monitoring Recommendations

The recommendation made in the previous Six Monthly Subsidence Impact Report (January to June 2023, submitted in September 2023) 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
- *The baseline minimum for pool TT9 is revised to consider the water level data recorded to the cessation of mining of LW S1A (4 July 2023)* – The baseline minimum was revised to incorporate all water level data available up to the cessation of mining of LW S1A (4 July 2023). Subsequently, the updated baseline minimum resulted in an updated TARP trigger level for water level at pool TT9.

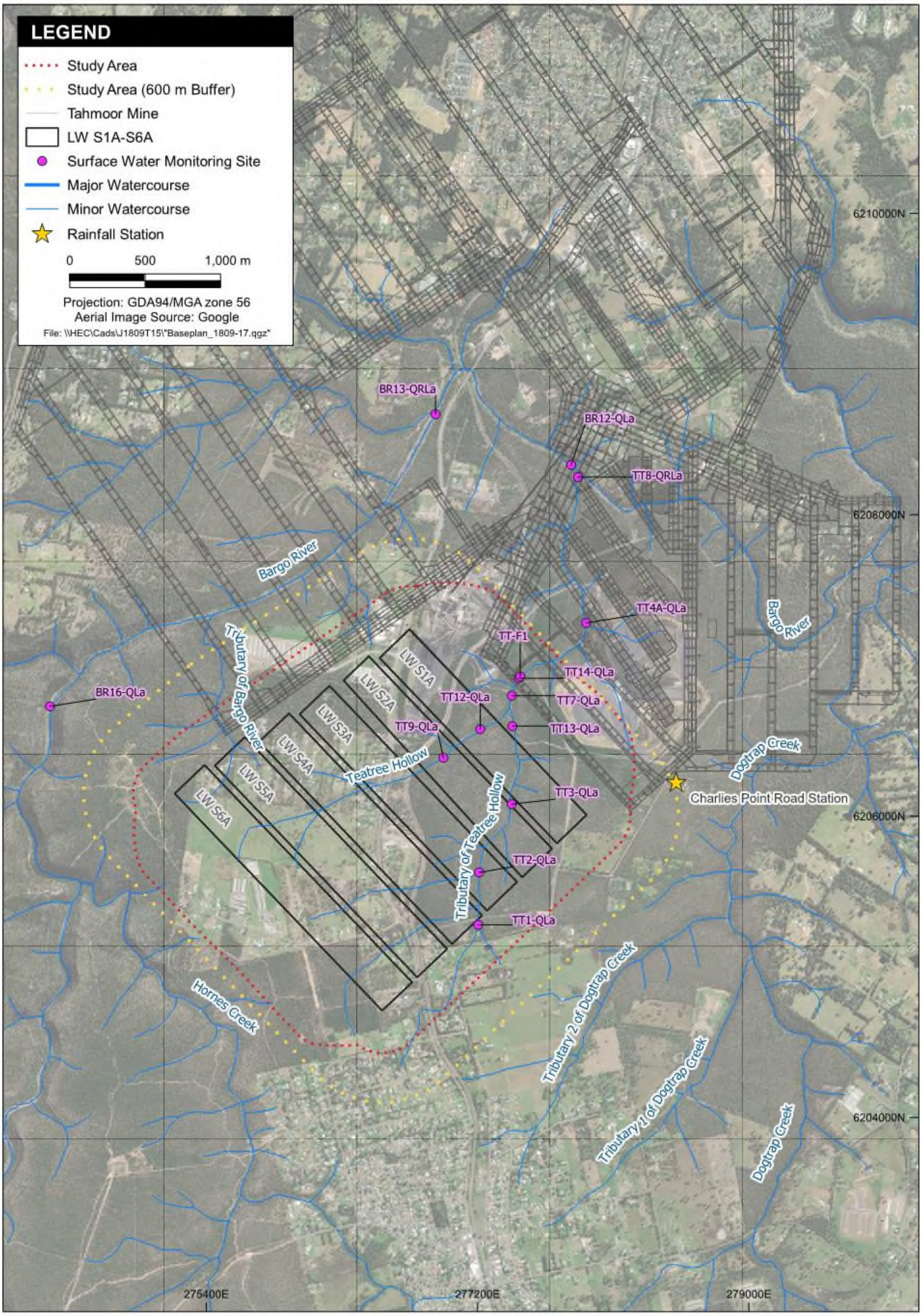

Figure 3-4 LW S1A-S6A Surface Water Monitoring Sites Specific to LW S1A-S6A (source: ATC Williams, 2024; ***Appendix B****)*

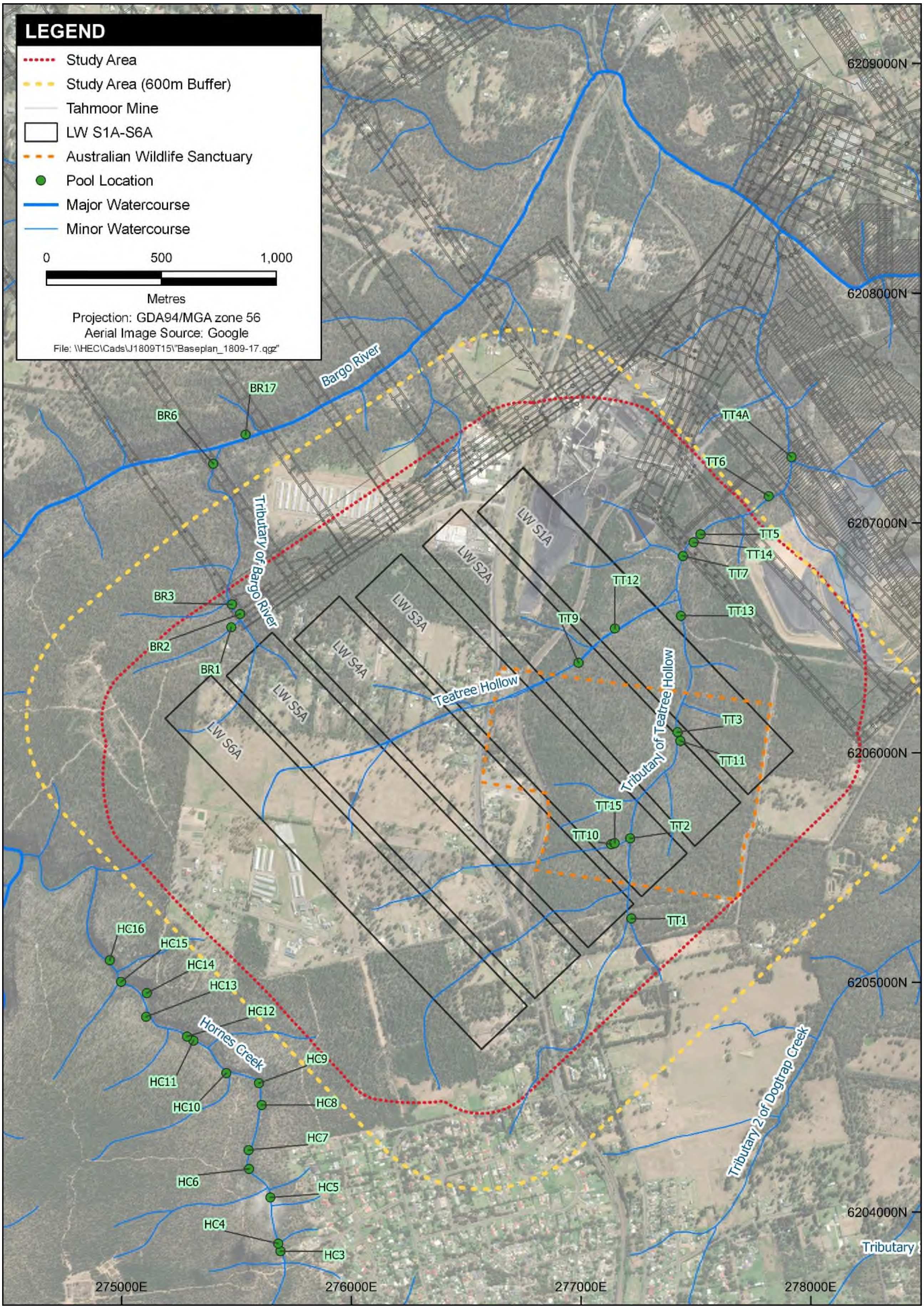

Figure 3-5 LW S1A-S6A Pool Visual Inspection Sites (source: LW S1A-S6A Water Management Plan)

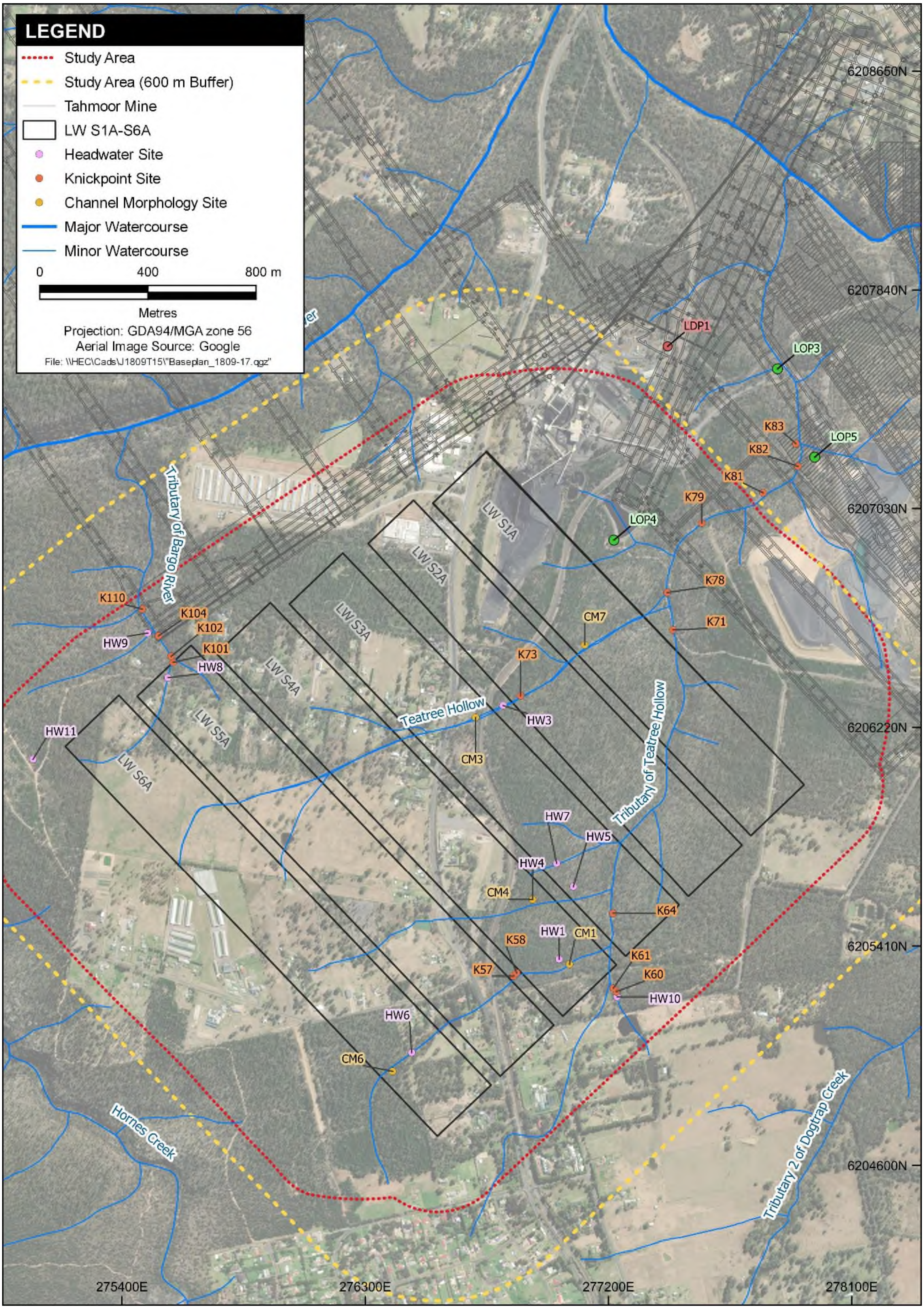

Figure 3-6 LW S1A-S6A Morphology and Channel Stability Monitoring Sites (source: LW S1A-S6A Water Management Plan)

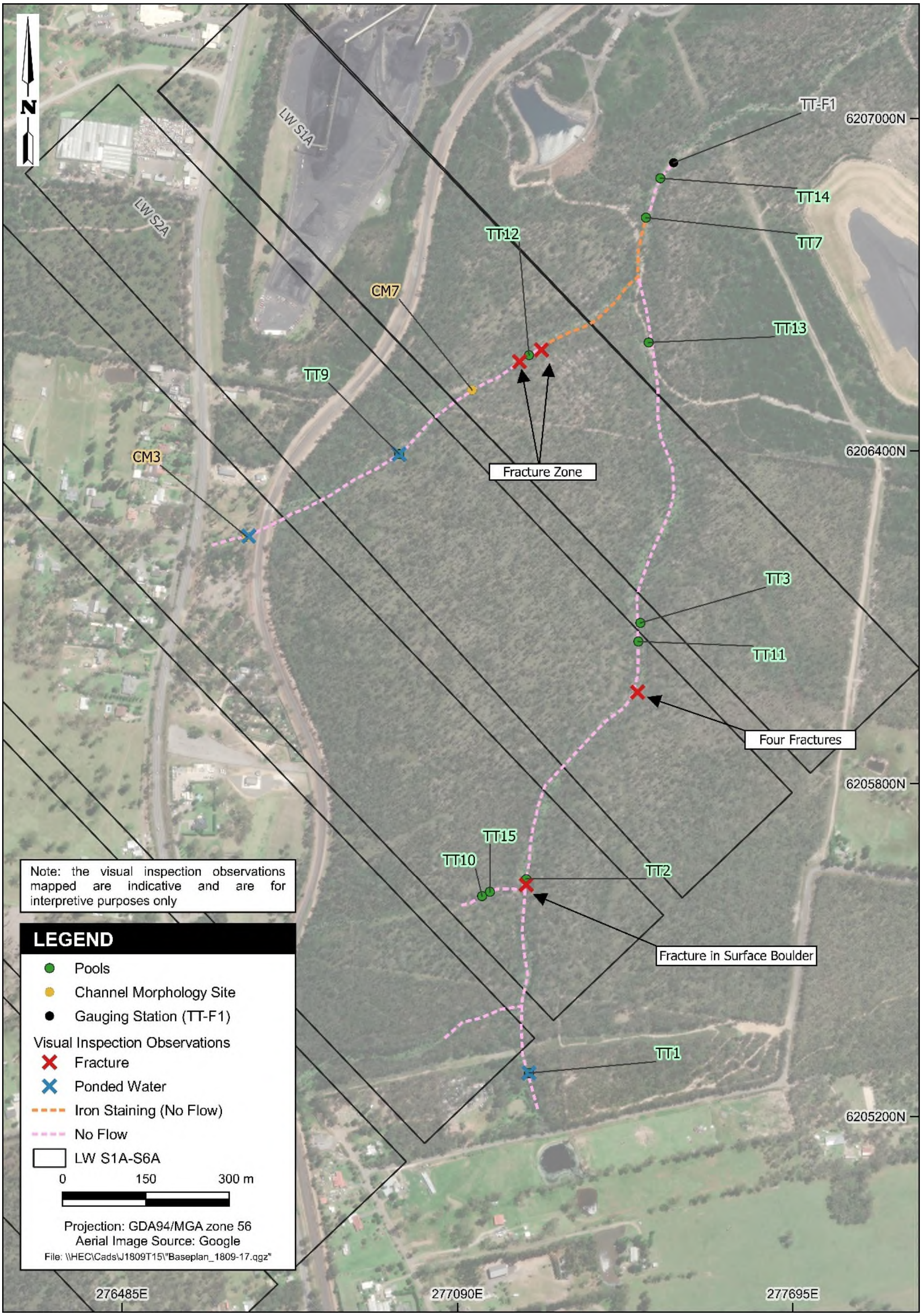

*Figure 3-7 Visual depiction of surface water characteristics and physical effects in early November 2023 (source: **Appendix B**)*

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 and reported 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 3-8**.

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 the deepest Open Standpipes at P53 (P53C), P55 (P55C) and P56 (P56C). Trends of groundwater elevation at Open Standpipes are described below:

- P53C has been declining since January 2023. Groundwater elevation at P53A and P53B has reduced significantly since April 2023 and stable since July 2023;
- P55C has reduced significantly in November 2022 and appear to be decreasing gradually since. Groundwater elevation at P55A is stable, however, at P55B is decreasing; and
- P56C has reduced in November 2022 and significantly again in April 2023, however, water levels have stabilised since June 2023. However, groundwater elevation at the shallower bores, P56A and P56B, are stable.

This groundwater depressurisation at P53 could be due to an ongoing mining effect (LWS1A and LWS2A progression). However, the shallower bores, groundwater levels at P55A and P56A&B are stable. Groundwater levels at P55B appear to be decreasing since April 2023. Additionally, given the relative stability of the water level in P55C since an initial decline in November 2022 and in P56C since April 2023 (i.e., no ongoing declining trend) this cannot definitively be attributed to extraction activities. Tahmoor Coal will continue to review the trends in this bore and the associated nested bores in coming months to better understand the trends (SLR, 2024).

At P51B, the groundwater elevation has fluctuated by approximately 2 m with an overall decreasing groundwater trend since January 2023. A review of the cumulative rainfall departure (CRD) indicates groundwater elevation is potentially reacting to rainfall in the area. Hence, it is uncertain whether groundwater depressurisation is a result of ongoing mining. It is potentially a combination of both factors influencing the groundwater levels (SLR, 2024).

At P56C, a steep decline in April/May 2023 correlates with the similar trend observed at P53, however these are located on opposite sides of LWS2A and there is no obvious link in timing to longwall progression. Since this point, there has been minor fluctuations both up and down, not a typical representative of groundwater depressurisation due to longwall mining. Tahmoor Coal will continue ongoing monitoring and analyse of this trend.

Numerous sites (P52 and REA4) are showing some consistent decline in water levels since approximately November 2022, however it is unconfirmed at this stage if these declines are related to mining impacts (SLR, 2024).

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 (SLR, 2024).

Shallow VWPs (sensors <200 metres)

Shallow VWPs are showing variation in responses since commencement of extraction. TBC009 (HBSS – 30m) has experienced a small steady decline of approximately 2.5 m since November 2022, however the deeper sensors are remaining relatively stable. TBC018 is also showing approximately 3 m drawdown in the three shallowest sensors (70m, 117m, 164m), approximately 1.5 metres decline in the sensor at 179 m and has remained stable in the deepest sensor at 198 m. TBC027 is showing some small steady decline, ranging between 0.5 m to 2 m across all depth sensors, although there is no apparent relationship in the depressurisation incurred and the depth profile. TBC032 is the closest VWP to current extraction activities and is showing depressurisation of up to 15 metres in the deepest sensor (200m). The shallower sensors are all showing some minor trends in depressurisation ranging between 1 and 7 metres. TBC034 remains stable and TBC039 has observed an increase in water level (SLR, 2024).

Deep VWPs (sensors >200 metres)

The deep VWPs overall are showing some depressurisation but this is not consistent spatially or across depth profiles at individual sites (SLR, 2024).

TBC009 is showing maximum depressurisation of 15 m between December 2022 and December 2023 at sensor depth 357 m, however recovery was observed subsequently. Approximately 4 m of drawdown was observed in the sensors above and below (343 m and 391 m) between November 2022 and December 2023. TBC018 has observed steady drawdown to a maximum of 3.5 m since November 2022, with less drawdown followed by stabilisation and some recovery 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 of approximately 7 metres between June 2023 and December 2023 however a 4 m recovery was observed subsequently, though fluctuated to a maximum of an overall 8.5 m drawdown (SLR, 2024).

TBC026 has shown significant fluctuations in water levels and with some overall drawdown occurring, but also an increase above baseline conditions in the deepest sensor (440m). 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 – 18 m drawdown, 237m sensor – 5.5 m drawdown, 294 metre sensor – 7 m drawdown). TBC039 is not showing any clear response to mining with water levels stable, increasing above baseline conditions or some drawdown and stabilisation (SLR, 2024).

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: Reduction below Level 1 since May 2023, resulting in a trigger of the Level 1 TARP in October 2023;
- Monitoring bore P53A: Reduction below Level 1 since May 2023, resulting in a trigger of the Level 1 TARP in October 2023;
- Monitoring bore P53B: Reduction below Level 1 since April 2023, resulting in a trigger of the Level 1 TARP in September 2023;
- Monitoring bore P53C: Level 1 TARP trigger in October 2023 and Level 2 TARP trigger in December 2023;
- Monitoring bore P55B: Reduction below Level 1 since May 2023, resulting in a trigger of the Level 1 TARP in October 2023;
- Monitoring bore P55C: Level 1 TARP trigger since July 2023 and Level 2 TARP trigger in November 2023;
- Monitoring bore P56C: Level 1 TARP trigger since July 2023 and Level 2 TARP trigger in October 2023; and
- Private bore GW104659: Reduction below Level 1 since April 2023, resulting in a trigger of the Level 1 TARP in September 2023.

The spatial distribution of these triggers is illustrated in **Figure 3-9**. Further discussion of these triggers is provided in the Groundwater Monitoring Report (refer **Appendix C**).

Actions and Responses Completed

Table 3-6 outlines the actions and responses that are required to be completed in accordance with a Level 1 and Level 2 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 and 2 TARP Triggers for Groundwater Level Reduction (TARP WMP8)

Action / Response from TARP WMP8	Tahmoor Coal response
Actions	
Level 1 and 2 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 WMP8	Tahmoor Coal response
Level 1 and 2 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline at P51B, P53A, P53B, P53C, P55B, P55C, P56C and GW104659 is provided in **Section 3.3.1.3** and Section 4.0 of **Appendix C.** Groundwater level decline at P53 and P56 could be due to ongoing mining effect. However, at the remaining locations, it cannot definitely be attributed to extraction activities.
Level 1 and 2 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 regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 1 and 2 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 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).	Groundwater at P53 could be due to ongoing mining effect. However, at the remaining locations (P51, P55 and GW104659) it cannot definitely be attributed to extraction activities. WMP12 has been initiated for P53 nested bores only.
Level 2 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 solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change).	Level 2 TARP has been triggered at P53C, P55C and P56C, although only P53 is showing relatively steady decline (across all nested bores) indicative of potential mining impacts. Loggers installed in these bores monitoring water level every 15 minutes, 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 TARP Compare against base case and deterministic model scenarios.	The Tahmoor Mine numerical model is currently undergoing update and subsequently, review of the deterministic model scenarios will be undertaken.
Level 2 TARP Review Water Management Plan and modify if necessary.	Planned update of the WMP will occur within three months submission of this 6-monthly review.

Action / Response from TARP WMP8	Tahmoor Coal response
Level 2 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.
Responses	
Level 1 and 2 TARP Report trigger exceedance to DPE and key stakeholders.	Notification of this exceedance to DPE (now DPHI) is 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 If the changes have been confirmed to be related to mining effects: For Private Bores: • 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 (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 changes in private bores confirmed to be related to mining. No further action required at this time.
Level 2 TARP Advise DPE 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.
Level 2 TARP For Private Bores: Provide findings of CMA review to DPE and key stakeholders for consultation.	No CMA required at this point.
Level 2 TARP For Private Bores: Implement additional CMAs, subject to land access.	No CMA required at this point.

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 30 September 2024.

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

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

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 3-8**.

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)

As part of this Six Monthly Report, groundwater quality triggers were redefined based on extended baseline data in order to capture natural fluctuations originally not captured due to short baseline (only three data points in some cases). A technical memorandum summarising the methodology and findings is presented in Appendix C of the Groundwater Montioring Report (SLR, 2024; **Appendix C**).

In light of the revised trigger levels, the defined groundwater quality trigger levels were breached for numerous parameters for more than three months. However, of these parameters, the analytes did not appear to be showing similar trends across multiple observation points. Consequently none of the analytes trigger the TARP triggers for TARP WMP11 during the reporting period.

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. However, as only groundwater level changes at P53 could be due to ongoing mining effect (as discussed in **Section 3.3.1.1**), TARP WMP12 is initiated only for these nested bores.

As discussed in **Section 3.3.1.2**, all three nested bores at P53 triggered a TARP level for TARP WMP8:

- Monitoring bore P53A: Reduction below Level 1 since May 2023, resulting in a trigger of the Level 1 TARP in October 2023;
- Monitoring bore P53B: Reduction below Level 1 since April 2023, resulting in a trigger of the Level 1 TARP in September 2023; and
- Monitoring bore P53C: Level 1 TARP trigger in October 2023, and Level 2 TARP trigger in December 2023.

Monitoring bores P53A-C are associated with surface water monitoring site TT13-QRLa, and together they can be considered when reviewing the surface water – groundwater connectivity TARP (WMP12). TT13-QLa is located approximately 300 m west of the monitoring bores P53A-C in the Teatree Hollow tributary. Groundwater level at monitoring bore P53C was noted to exhibit groundwater depressurisation attributed to mining of LWS1A and LWS2A.

A comparison of groundwater level recorded at P53A (shallowest bore in the series) with water levels at TT13-QRLa inferred that negligible change in baseflow contributions to Teatree Hollow tributary in the vicinity of TT13-QRLa have occurred during the review period. Therefore, it was concluded that there was no apparent correlation at this point in time between the apparent decline in groundwater level at and the nearby surface water gauging station.

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

Actions and Responses Completed

Table 3-7 outlines the actions and responses that are required to be completed in accordance with a Level 1 and Level 2 TARP triggers for groundwater – surface water interaction (TARP WMP12), as well as how these actions and responses have been addressed.

Table 3-7 Actions and Responses for Level 1 and 2 TARP Triggers for Groundwater – Surface Water Interactions (TARP WMP12)

Action / Response from TARP WMP12	Tahmoor Coal response
Actions	
Level 1 and 2 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 and 2 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 nested bores due to the assessment that groundwater level decline at P53 could be due to ongoing mining effect. The relevant surface water site is TT13-QRLa. Further 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 extraction at LW S1A and LW S2A is influencing groundwater – surface water interactions during the reporting period.

Action / Response from TARP WMP12	Tahmoor Coal response
Level 1 and 2 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 4.2 of **Appendix C**).
Level 2 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).	The logger installed in P53C monitors water level every 15 minutes, 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 TARP Compare against base case and deterministic model scenarios.	The Tahmoor Mine numerical model is currently undergoing update and subsequently, review of the model scenarios will be undertaken.
Level 2 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 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.
Level 2 TARP Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	CMA not required at this point (no correlation between groundwater impacts and the surface water site noted at this point).
Level 2 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.
Responses	
Level 1 and 2 TARP Report trigger exceedance to DPE and key stakeholders.	Notification of this exceedance to DPE (now DPHI) is 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.

Action / Response from TARP WMP12	Tahmoor Coal response
Level 1 and 2 TARP 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.	It was determined that it is unlikely that extraction at LW S1A and LW S2A is currently impacting groundwater – surface water interactions. Therefore, these responses have not been enacted at this time.
Level 2 TARP Provide findings of CMA review to DPE and key stakeholders for consultation.	CMA not required at this point.
Level 2 TARP Implement additional CMAs, subject to land access.	CMA not required at this point.
Level 2 TARP Advise DPE 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

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 30 September 2024.

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, which include water make from the Western Domain.

SLR completed an analysis of water make for Tahmoor Mine recorded between 1 January 2009 to 31 December 2023 (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 31 December 2023, the cumulative groundwater make for the water year 2023-24 is 673 ML, which remained below the groundwater entitlement of 1,642 ML per annum (i.e. water year) (refer **Figure 3-10**).

3.3.5 Recommendations and Actions

3.3.5.1 Current Groundwater Monitoring Recommendations

As discussed in the Groundwater Review for July to December 2023 (SLR, 2024; **Appendix C**), the following groundwater recommendations were made for this reporting period by SLR:

- Adopt the revised groundwater quality trigger levels provided in **Appendix C**;
- Remove monitoring site GW062068 from the groundwater monitoring program due to infrastructure issues that render the bore unsuitable for ongoing monitoring;
- Complete a review of the VWP network, inclusive of:
    - 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;
    - 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;
    - 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;
- Continue the monitoring program, and the reporting of groundwater level and quality data in monthly groundwater monitoring reporting; and
- 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.

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 3-8 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 3-8 Groundwater recommendations from the previous Six Monthly Subsidence Impact Report and Current Progress

Item	Previous Recommendation	Progress of Recommendation
1	Revise the trigger levels for dissolved metals, specifically barium, strontium and manganese, by including the 12-month period of monitoring data from October 2022 to October 2023 in the 'baseline' period from which trigger values can be recalculated, such that the trigger levels capture the natural variability of the system.	Completed: Trigger level revision has been undertaken and incorporated into this 6-monthly report.

Item	Previous Recommendation	Progress of Recommendation
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.	Ongoing: work is currently underway with review and cleanse of VWP historical data.
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.	Ongoing: work is currently underway with review and cleanse of VWP historical data.
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.	Ongoing: work is currently underway with review and cleanse of VWP historical data.
6	Continue the monitoring program, and the reporting of groundwater level and quality data in the monthly groundwater monitoring reporting.	Completed: monthly 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	Install and commence monitoring at P50, in order to replace P51 as an early warning bore in WMP13.	Completed: Installation of three open standpipes at the P50 site has been completed and the bores incorporated into the monitoring program.

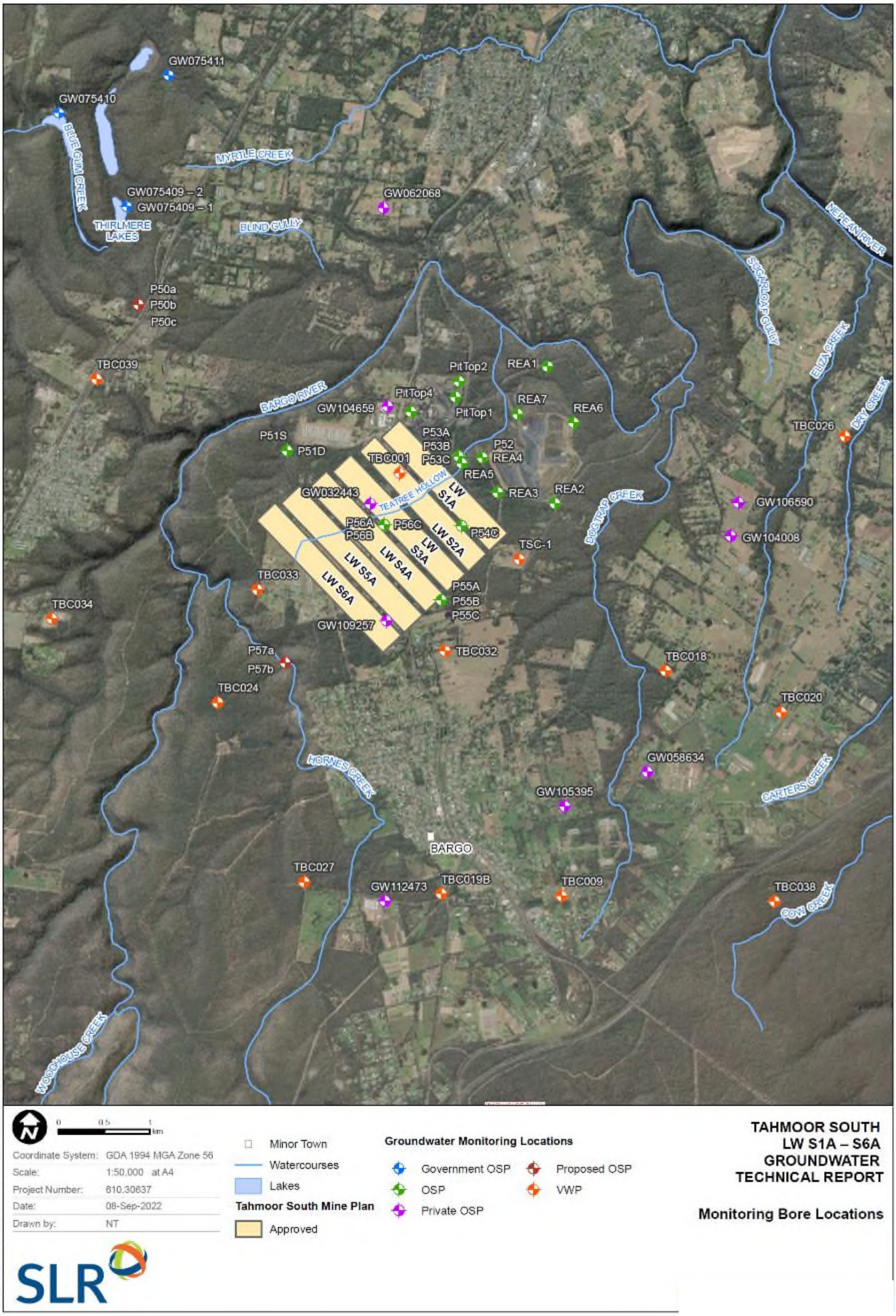

Figure 3-8 LW S1A-S6A Groundwater Monitoring Site (source: LW S1A-S6A Water Management Plan)

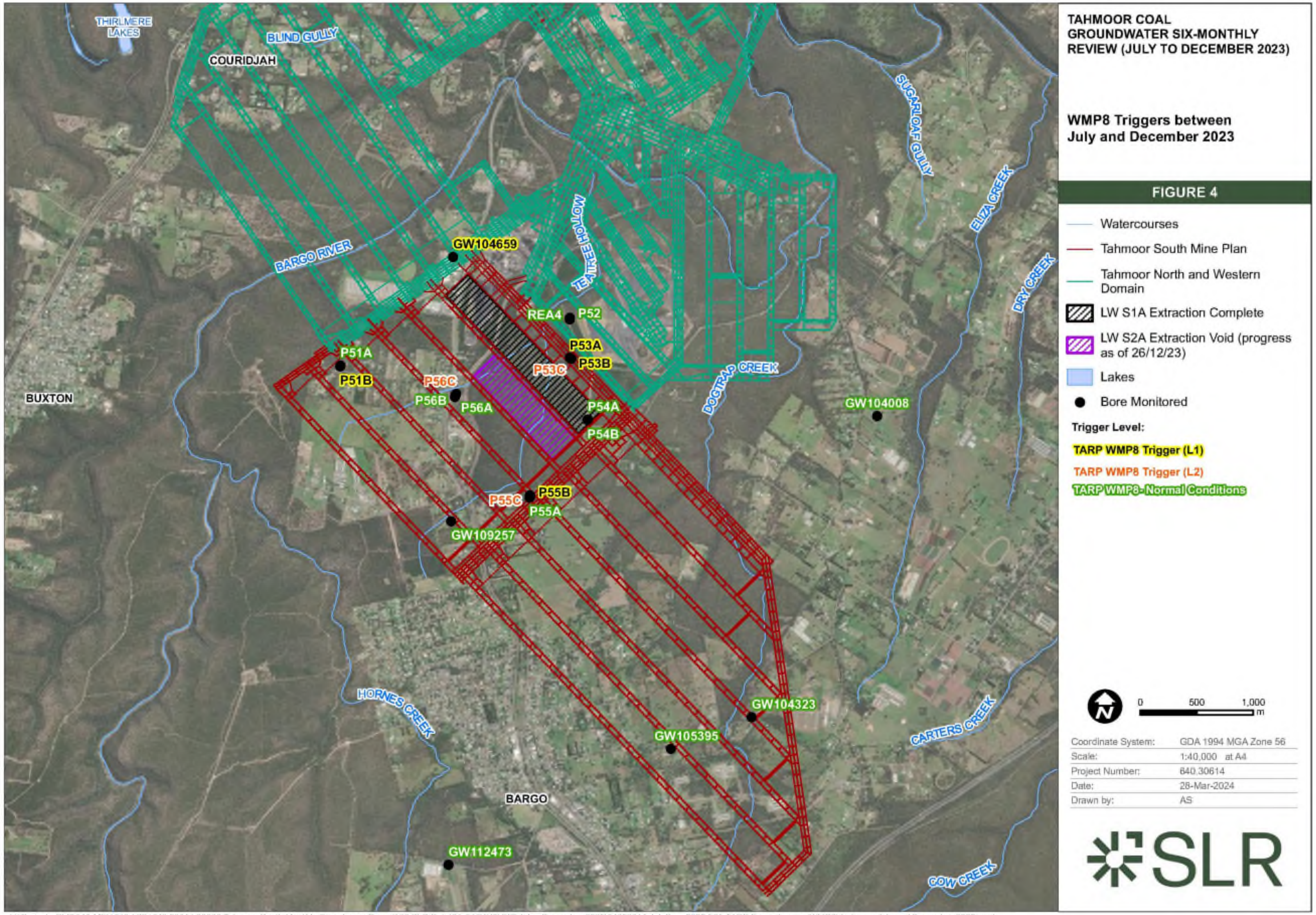

*Figure 3-9 Groundwater TARP triggers (source SLR 2023; Groundwater Monitoring Report; **Appendix C**).*

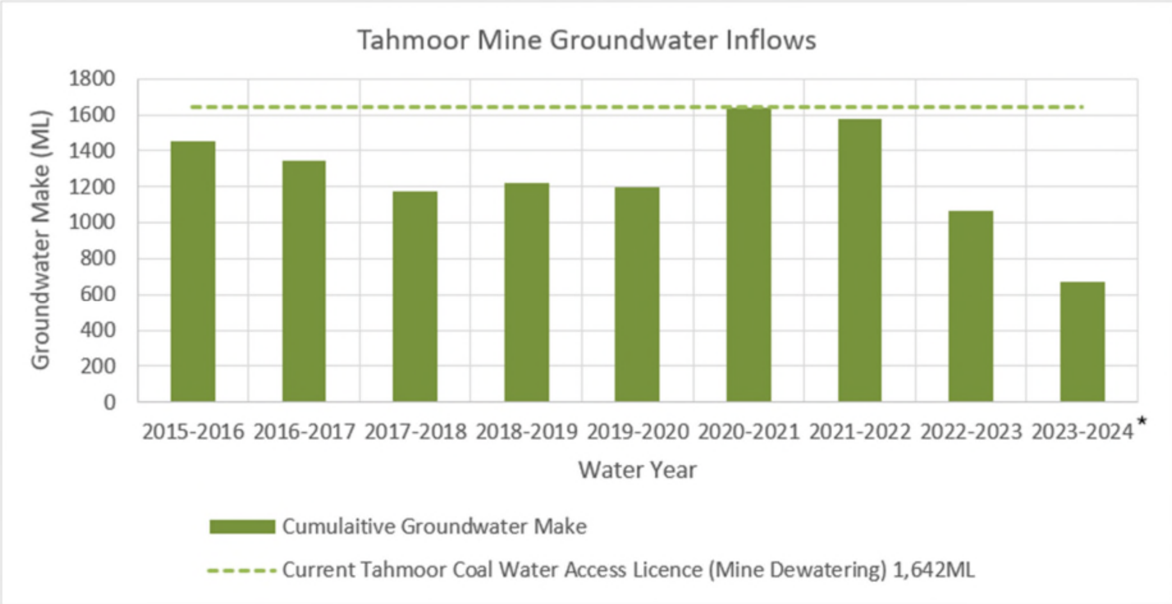

Figure 3-10 *Groundwater Make per Water Year (financial year) from 2015/16 to 2023/24 (source SLR 2023; Groundwater Monitoring Report;* ***Appendix C****).*

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). No 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 July 2023 following the completion of LW S1A (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 3-11**.

During the reporting period, no visual inspections of cliffs were required according to the LW S1A-S6A Land Management Plan.

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 3-12**.

During the reporting period, visual and photographic surveys of natural steep slopes were completed monthly for features within the LW S1A 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 since the September 2023 inspection. 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 further movement was noted for the remainder of the reporting period. 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 3-12**.

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 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 from July to November 2023 observed ongoing reduction of water level due to dryer weather. However, water levels in dams rose in response to rainfall events in November 2023, which was particularly noted at dams FD6 and FD8 in January 2024.

At FD8 and FD9, erosion and voids within the upstream face were noted in March 2023, and were indicated to be due to sodic soil conditions in the farm dam embankment fill which are prone to erosion. This erosion was not observed to change during the reporting period.

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 3-13**.

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 4 July 2023 following the completion of LW S1A 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 assests or land that were associated with potential hazards as a result of LW S1A extraction.

3.4.4.2 TARP LMP4 – Agricultural Land

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

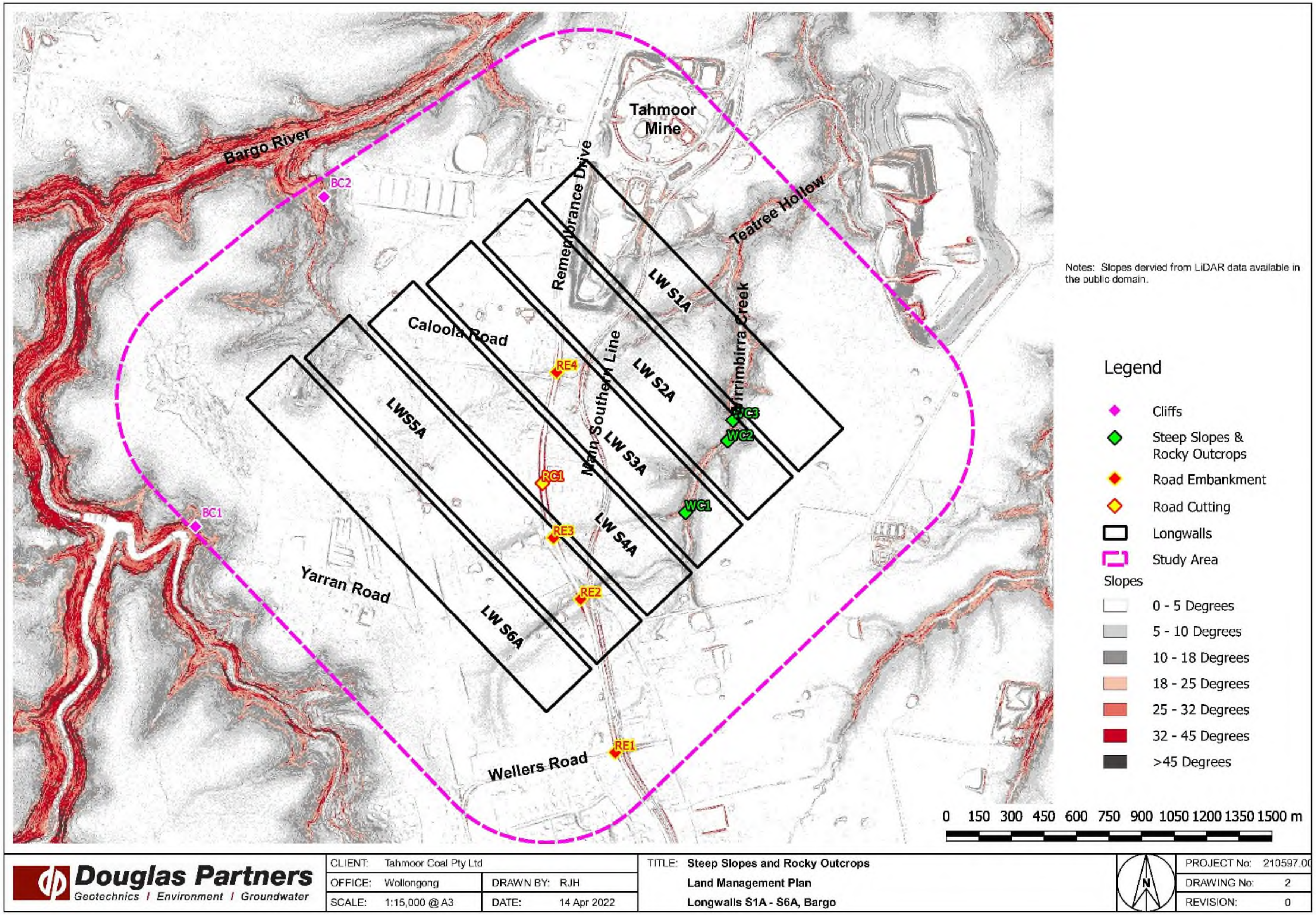

Figure 3-11 Cliffs and natural steep slopes within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)

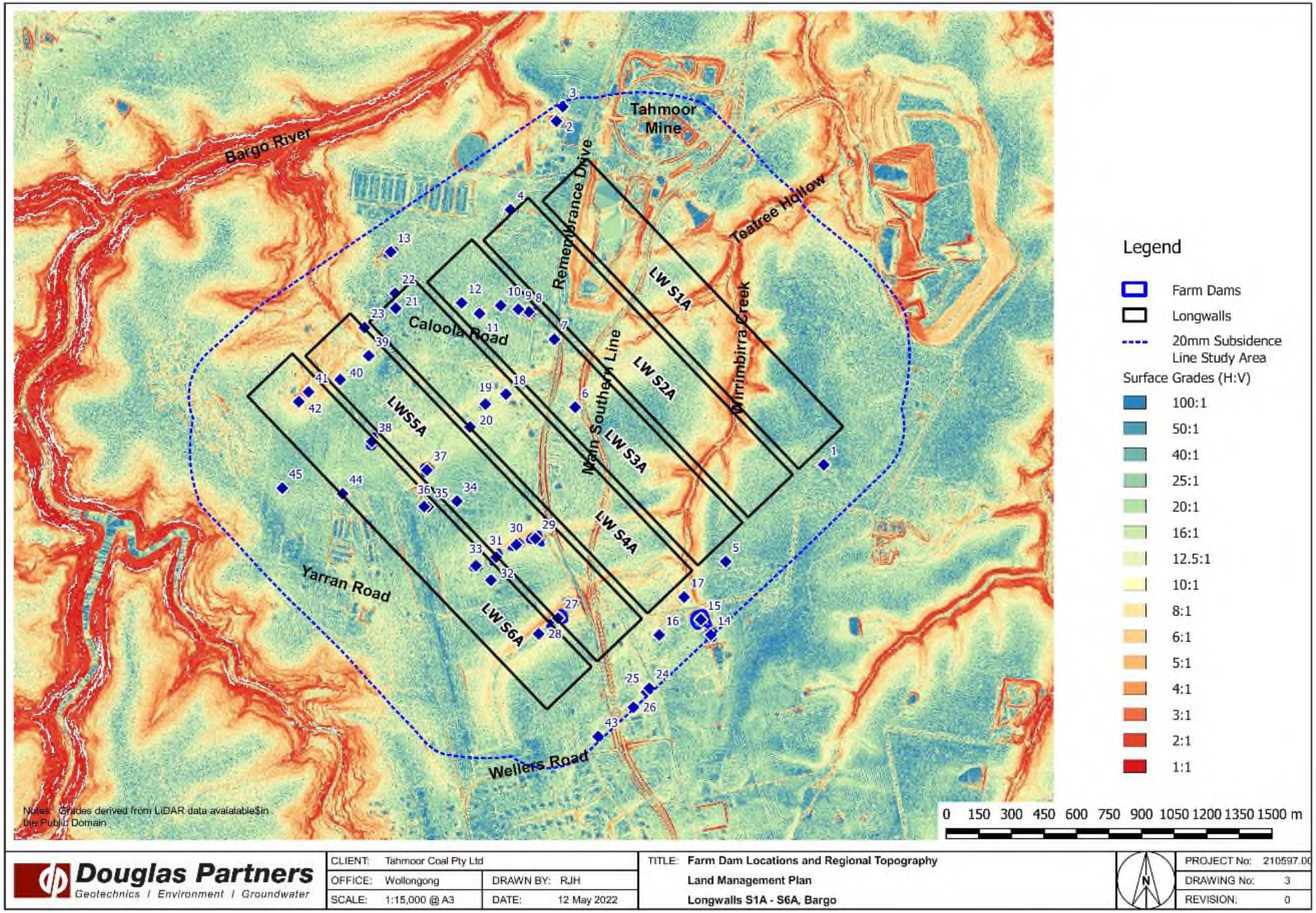

Figure 3-12 Dams within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)

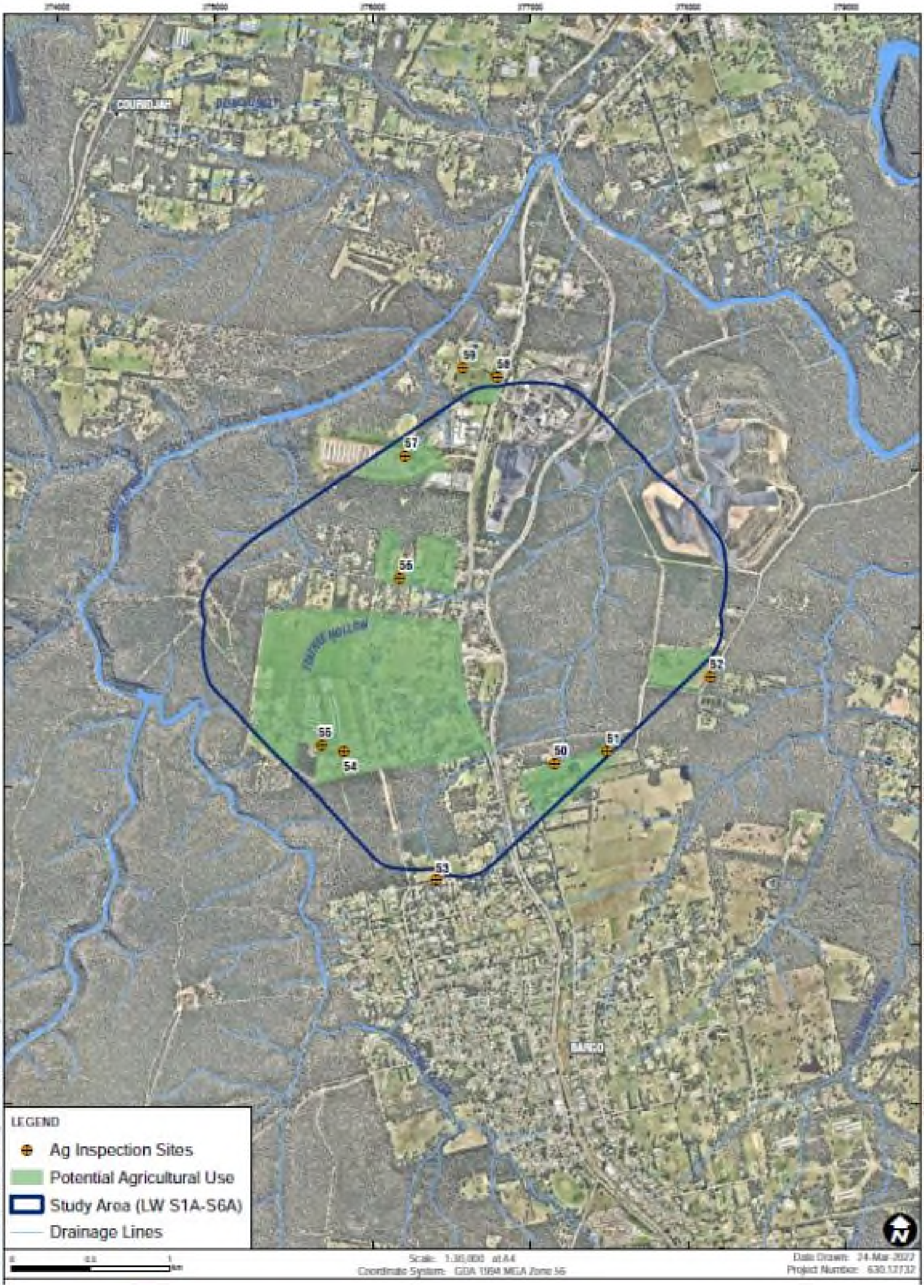

Figure 3-13 Agricultural land and inspection sites within the LW S1A-S6A Study Area (source: LW S1A-S6A Land Management Plan)

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 spring 2023 was conducted by Niche Environment and Heritage between 8 and 13 December 2023. 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 3-14**.

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 awaterway associated with potential future longwall panels.

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

- Spring 2023 sampling represented a continuation of flow conditions being more typically in line with baseflow levels, than in contrast to autumn 2023 and spring 2022 that were dominated by elevated flows and significant rainfall. The current season observed low flows, limited organic debris and lower pool levels across the monitoring sites (other than Sites TTHt9, TTH16 and TTHt17 which were dry);

- Observations of mining induced changes to aquatic habitats were observed at Impact Sites TTH16 and TTHt17 (loss of pool water), but not at Site TTH12. Pool water was observed to return at Site TTH13, while new Site TTHt19 was dry;
- The water quality readings collected at Impact Site 12 (upstream of observed areas of mining induced change) along Tea Tree Hollow are comparable to baseline data, and also to that of the Control sites;
- The water quality reasings collected at impact monitoring sites (downstream of areas of mining induced change) are suggestive of impaired water quality conditions, with elevated electrical conductivity levels, and low dissolved oxygen and pH levels. However these are comparable to low values recorded in Teatree Hollow in the pre-mining period, and are within the range of values recorded at the control sites;
- AUSRIVAS samples indicate tha mining induced changes do not appear to have translated into acute impacts to macroinvertebrate assemblages immediately downstream, as these sites recorded biological scores comparable to baseline data, and also to the Control sites in spring 2023;
- Quantitative macroinvertebrate montoring data identified low results across a number of indicators at Site TTH12. These results are noted to be within the range of pre-mining scores and broadly comparable to trends at Control sites. Furthermore, nominal AUSRIVAS results were recorded at this pool; and
- At Site TTH13, the quantitative macroinvertebrate analysis identified the lowest results in all three indicators across the monitoring period. Despite this, moderate AUSRIVAS results were recorded, including the presence of one sensitive taxa. Further analysis of these data indicate that the macroinvertebrate assemblage at this pool may be in an early stage of development, which tallies with the observations that pool water levels may have recently increased. Further assessment over time will be required to determine whether this pool is on a trajectory of continued recovery.

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 spring 2023.

A level 1 TARP trigger exceedance (TARP BMP1) was reported for sites TTH16 and TTHt17 in spring 2023 in relating to a reduction in aquatic pool habitat being observed over two 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 associated with LW S1A-S2A and also prevailing climatic conditions.

Further discussion of these triggers is provided in the Aquatic Monitoring Report Spring 2023 (Niche, 2024a; **Appendix D**).

Actions and Responses Completed

Table 3-9 outlines the actions and responses that are required to be completed in accordance with a Level 1 TARP trigger for aquatic habitat and macroinvertebrate indicators (stream health) (TARP BMP1), as well as how these actions and responses have been addressed.

Table 3-9 Actions and Responses for Level 1 TARP Triggers for Aquatic Habitat and Macroinvertebrate Indicators (stream health) (TARP BMP1)

Action / Responses from TARP BMP1	Tahmoor Coal response
Actions	
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.
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.
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.
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.
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.
Responses	
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.

Action / Responses from TARP BMP1	Tahmoor Coal response
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.

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 30 September 2024.

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 spring 2023 was conducted by Niche Environment and Heritage on 20 November and 6 December 2023. 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 3-15**.

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):

- The Spring 2023 round of monitoring included the establishment of two additional amphibian control Sites on Hornes Creek and a Bargo River Tributary, and an additional impact Site along Teatree Hollow Creek.
- There was a significant effect of Control-Impact on frog detections for all data and Spring data (meaning, frog numbers are higher control Sites, when compared to impact Sites). Despite this, there were no significant BACI interactions for frog detections across sampling seasons.

- Frog detection rates were variable across Spring monitoring events. The species driving this variation was the Common Eastern Froglet (*Crinia signifera*). At the time of Spring 2023 monitoring, there were consecutive months of substantially below average monthly rainfall totals leading up to November, followed by higher-than-average monthly rainfall in November and December.
- A total of eight frog species were detected across the Spring 2023 monitoring event, with five species detected across impact Sites and eight species across control Sites. This represents an increased level of species detection that was observed across both control and impact monitoring sites in comparison to the Spring 2022 surveys. It is the highest number of species detected in total and at control Sites since Spring 2020, and the highest number of species detected at impact Sites since Spring 2021.
- The targeted threatened frog species appears to not be present in the Study Area. 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:
    - Absence of suitable non-breeding habitat for Giant Burrowing Frog at most monitoring Sites post-fire (due to heavy weed encroachment and erosion). Leaf litter has now shown to increase substantially in the past year but is unlikely to support Giant Burrowing Frog habitat.
    - 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 spring 2023 was conducted by Niche Environment and Heritage on 20 November and 6 December 2023. 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 3-15**.

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 and the extension of the 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 baseline Vegetation Integrity (VI) scores for these plots ranged between 69.8 to 75.6.
- There was a significant effect of Control-Impact and Before-After for vegetation cover across Spring sampling events, as well as a significant BACI interaction. Despite this, VI scores have increased between spring sampling seasons across all Sites, which indicates an overall improvement in vegetation condition across impact and control Sites.
- According to the Fire Extent Severity Mapping (FESM), all riparian Sites were burnt in the 2019/2020 bushfires (prior to the commencement of monitoring) and are within a 'Moderate' to 'Extreme' severity burnt class, where all stratum layers were severely burnt to canopy height. Many species and communities will take years to recover, particularly those not adapted to fire or impacted by prolonged drought or other threatening processes. As monitoring continues, the residual impacts of fire are becoming less evident.

- Dominant species in terms of percent cover for Spring 2023 riparian plots include *Pteridium esculentum* (particularly dominant at control Site 4), *Eucalyptus piperita*, *Cynodon dactylon* (particularly at impact Site 2), *Acacia terminalis* (particularly dominant at impact Site 9), *Melaleuca linariifolia*, *Eucalyptus punctata* and *Acacia longifolia*. Most dominant exotic species included *Solanum sisymbriifolium*, *Anagallis arvensis*, *Cyperus eragrostis* and *Modiola caroliniana*.
- Across all sampling seasons, native species richness at riparian control Sites has decreased overall since monitoring commenced in Spring 2020, however it increased in Autumn and Spring 2023. Native species richness at impact sites has remained relatively stable throughout monitoring and there was a substantial increase in Spring 2023.
- 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 (impact Site 3, 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 69.8 to 75.6 (moderate to high condition). The VI scores for Spring 2023 ranged between 26.1 (impact Site 3) to 83.7 (control Site 5). 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 spring 2023 was conducted by Niche Environment and Heritage on 20 November and 6 December 2023. 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 3-15**.

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). Three rounds of monitoring have occurred after the commencement of mining (Spring 2022, Autumn 2023 and Spring 2023).

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 Spring 2023 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 20 November and 6 December 2023. TEC vegetation 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 spring 2023 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.

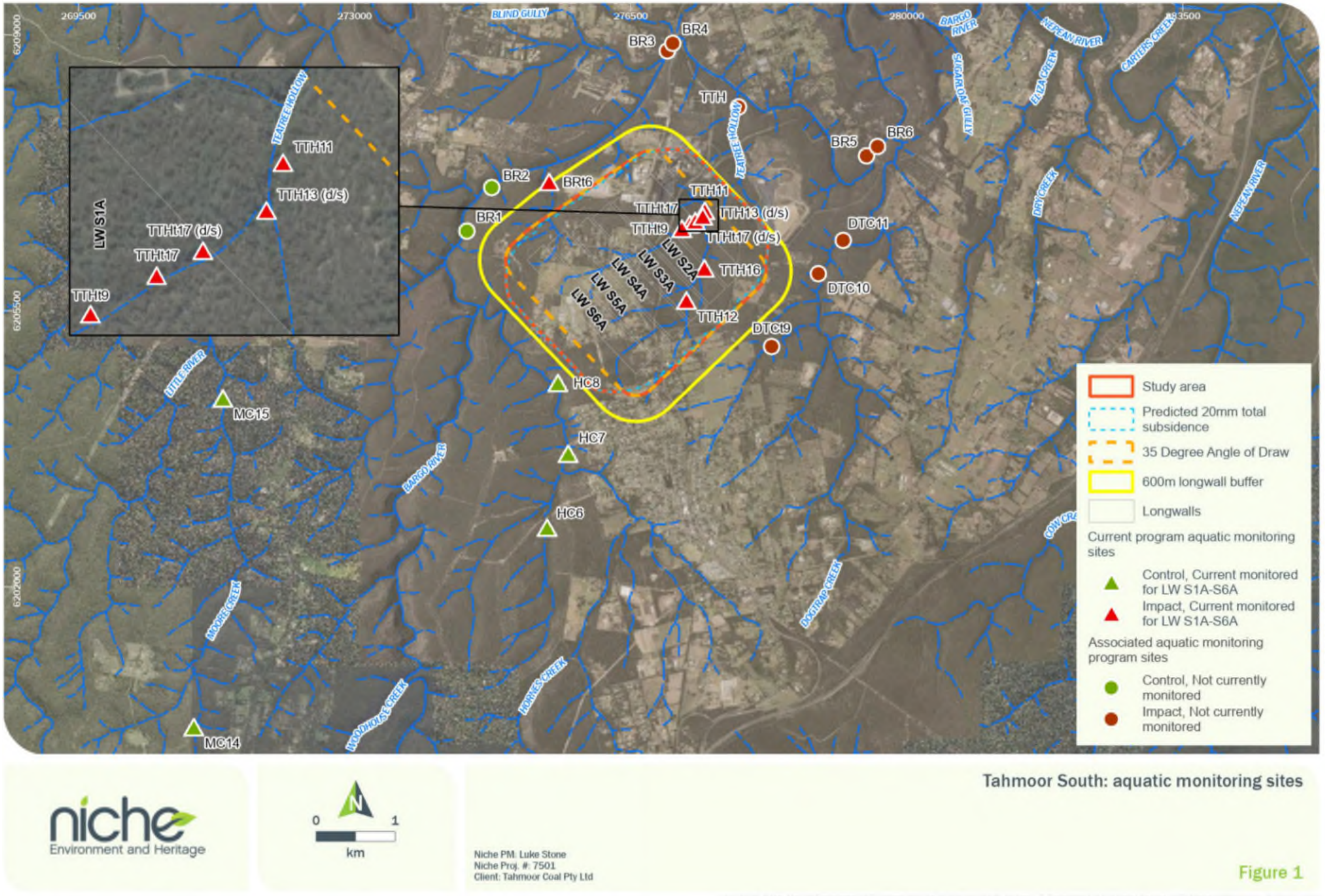

Figure 3-14 LW S1A-S6A Aquatic Ecology Monitoring Locations (source: Niche, 2024a)

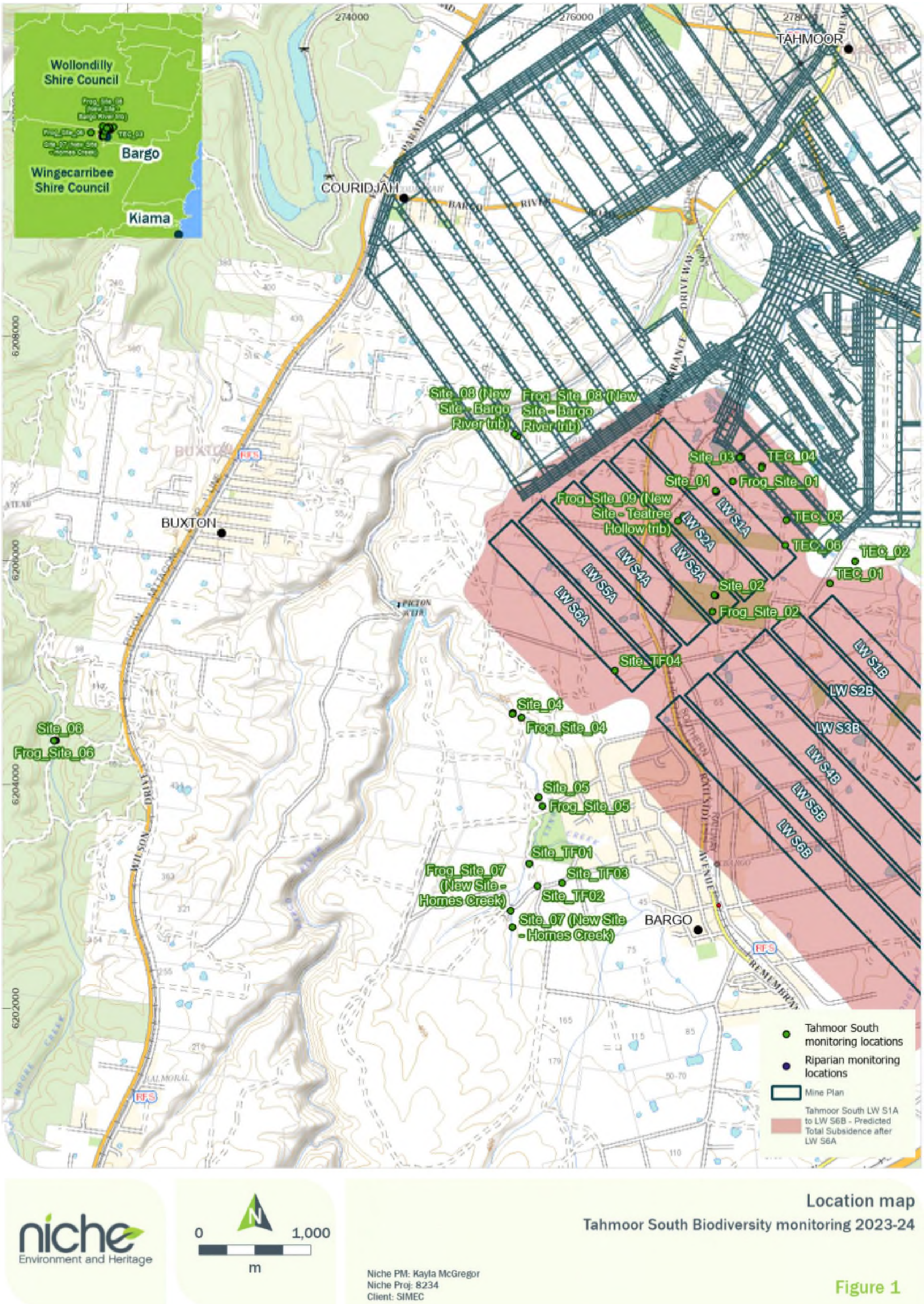

Figure 3-15 LW S1A-S6A Riparian Vegetation and Amphibian Monitoring Locations (source: Niche, 2024b)

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 3-16**). 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 S1A was completed on 10 July 2023, and the results have been included in this report (refer **Appendix E**).

It is noted that the artefact scatter Remebrance 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, minor ground 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 S1A end of panel inspection completed on 10 July 2023 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 (**Appendix E**).

A small patch of the rear wall at the southern end of the site appeared to exhibit signs of fresh abrasion, however this was noted to likely 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 (**Appendix E**).

Teatree Hollow Creek adjacent to the rockshelter was notably empy at the time of the site inspection. While not part of the rockshleter site itself, the proximity of the site to the creek provides both a probable reason for its original use in the past and contributes to its aesthetic significance. Further discussion of changes in creek flow in relation to mining and climatic conditions is discussed in **Section 3.2.3.1**.

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 3-17**):

- 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 H** for referenced report) and ;
  - 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 G** for referenced report) and Mine Site Photo Reports by Tahmoor Coal;
  - Letter report from heritage consultant (refer **Appendix E** for letter);
- 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 until the end of monitoring of LW S1A (21 July 2023) (refer to **Appendix G** for further information):

- 11 mm of closure between Pegs BL600 and BL700 of the rail loop, initially observed 15 May 2023. It is noted that this change has not resulted in any damage to the rail loop; and
- Cracks observed at two locations at 6C Tunnel and vent shaft interface initially observed on 29 May 2023. The number of cracks grew to seven (7) by the end of the monitoring period, all of them being less than 1 mm in width.

Impacts to Tahmoor Mine Site infrastructure were noted to be *possible* in the LW S1A-S6A Heritage Management Plan. A review of the changes observed at the 6C Tunnel noted that the hairline cracks are minor and, if required, could be repaired in a manner that preserves the heritage value of the mine (refer **Appendix E**). 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 are 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):

- 11 mm of closure between Pegs BL600 and BL700 of the rail loop, initially observed 15 May 2023; and
- Cracks observed at two locations at 6C Tunnel and vent shaft interface initially observed on 29 May 2023. The number of cracks grew to seven (7) by the end of the monitoring period, all of them being less than 1 mm in width.

These triggers resolved at the end of the LW S1A monitoring period (21 July 2023), and no new triggers have been observed during the extraction of LW S1A and LW S2A.

Actions and Responses Completed

Table 3-10 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 3-10 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.

Action / Response from TARP HMP2	Tahmoor Coal response
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 servicable. The changes to the rail loop track were discussed by Mine Site and Rail Management Groups on 19 May 2023. It was noted that closure is distributed over bay lengths, with a maximum of 4 mm closure between BL600 and BL620. No bump was observed in the subsidence profile and the site does not coincide with creek crossings or known geological structures. Gradual rates of changes were noted to be observed. No issues with rail stress were noted until summer, when restressing is planned prior to hot temperatures. A focused inspection will be conducted along the track, Rail Loader, Conveyors 4S and 4C and Washery, which are located in this area.
Consult with a qualified archaedologist 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 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 DPE and Heritage NSW.	Notification of this exceedance to DPE (now 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 DPE (now 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.

With regards to the Rail Loop, Tahmoor Coal will seek to assess the strain post mining of LW S2A and adjust the track if required. Tahmoor Coal also propose to continue monitoring the 6C Tunnel and associated cracking.

SIMEC

This information has been retracted

- For more information contact Tahmoor Coal

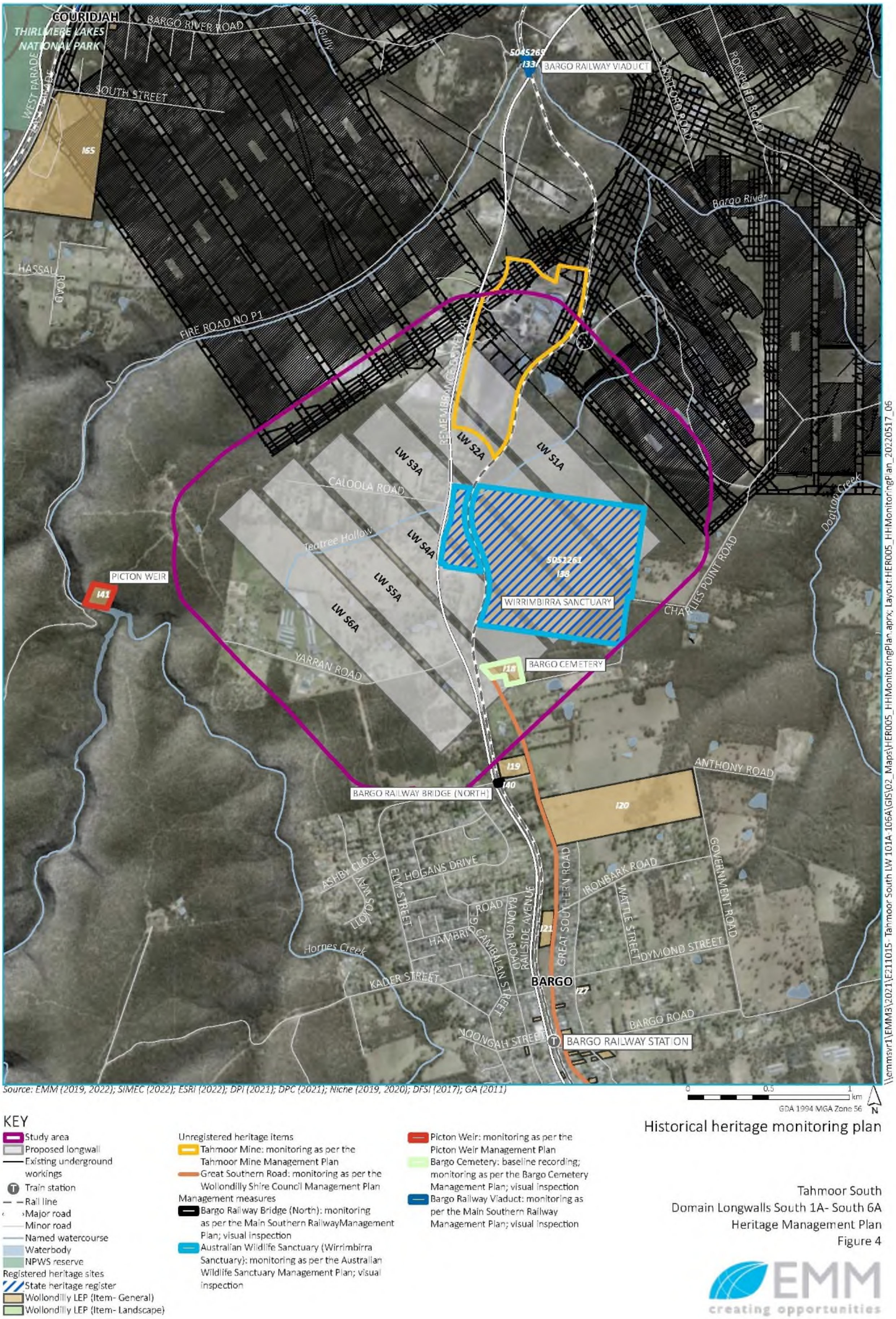

Figure 3-17 Historical Heritage Sites in the LW S1A-S6A Study Area and Surrounds (Source LW S1A-S6A Heritage Management Plan)

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 S1A (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 during LW S1A and S2A. 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 (refer Report 27 in **Appendix F**).

During the previous reporting period, poor track geometry at 98.8 km was noted 15 April 2023 to have occurred. The cause of this change was confirmed to be due to mining-induced movements. Resurfacing on 3 June 2023 was noted to have improved track condition on both tracks. Additional deterioration has also occurred since maintenance work at the Down Main at 98.824 km and Up Main at 98.807 km.

During the reporting period, there were no adverse impacts were observed on bridges or the Viaduct. In addition, the Main Southern Railway was maintained in a safe and serviceable conditions during mining of LW S1A and LW S2A.

3.7.1.2 Main Southern Railway TARP

Background

As discussed in the previous section (**Section 3.7.1.1**) and the Main Southern Railway Report 27 (refer to **Appendix F**), a blue trigger occurred from 15 April due to poor track geometry at 98.8 km. The cause of this change was confirmed to be due to mining-induced movements.

This trigger resolved at the end of the LW S1A monitoring period (22 August 2023), and no new triggers have been observed during the extraction of LW S2A.

Actions and Responses Completed

During the current reporting period, the blue trigger for poor track geometry was resolved after the following actions were completed:

- Local resurfacing was completed in August 2023 resulting in improved track geometry; and
- Resurfacing by tamper and regulator was completed on 23-24 September 2023.

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 S1A and LW S2A in accordance with the Wollondilly Shire Council Managment 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 3-18**). A focused visual inspection was conducted on 31 May, which identified a small compression bump in the southbound lane of Remembrance Drive between Pegs R47 and R48 (refer to **Figure 3-19**). 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.

Monthly surveys during the early stages of mining of LW S2A measured ongoing residual subsidence and compressive strain developing between Pegs R47 and R48 up to 2.0 mm/m. Trench excavation works were conducted in mid-December 2023 to relieve stresses in the Jemena gas pipe, and Peg R48 was damaged during this work and could not be surveyed on 28 December 2023. In anticipation of peg disturbances, Tahmoor Coal installed backup pegs (Peg R46B to R49B) immediately adjacent to the original pegs and an initial survey was conducted on 6 November 2023. On 28 December 2023, very minor changes (within survey tolerance) were observed at the backup pegs.

An increase in compressive strain was observed in December 2023, with very minor changes in vertical misalignment.

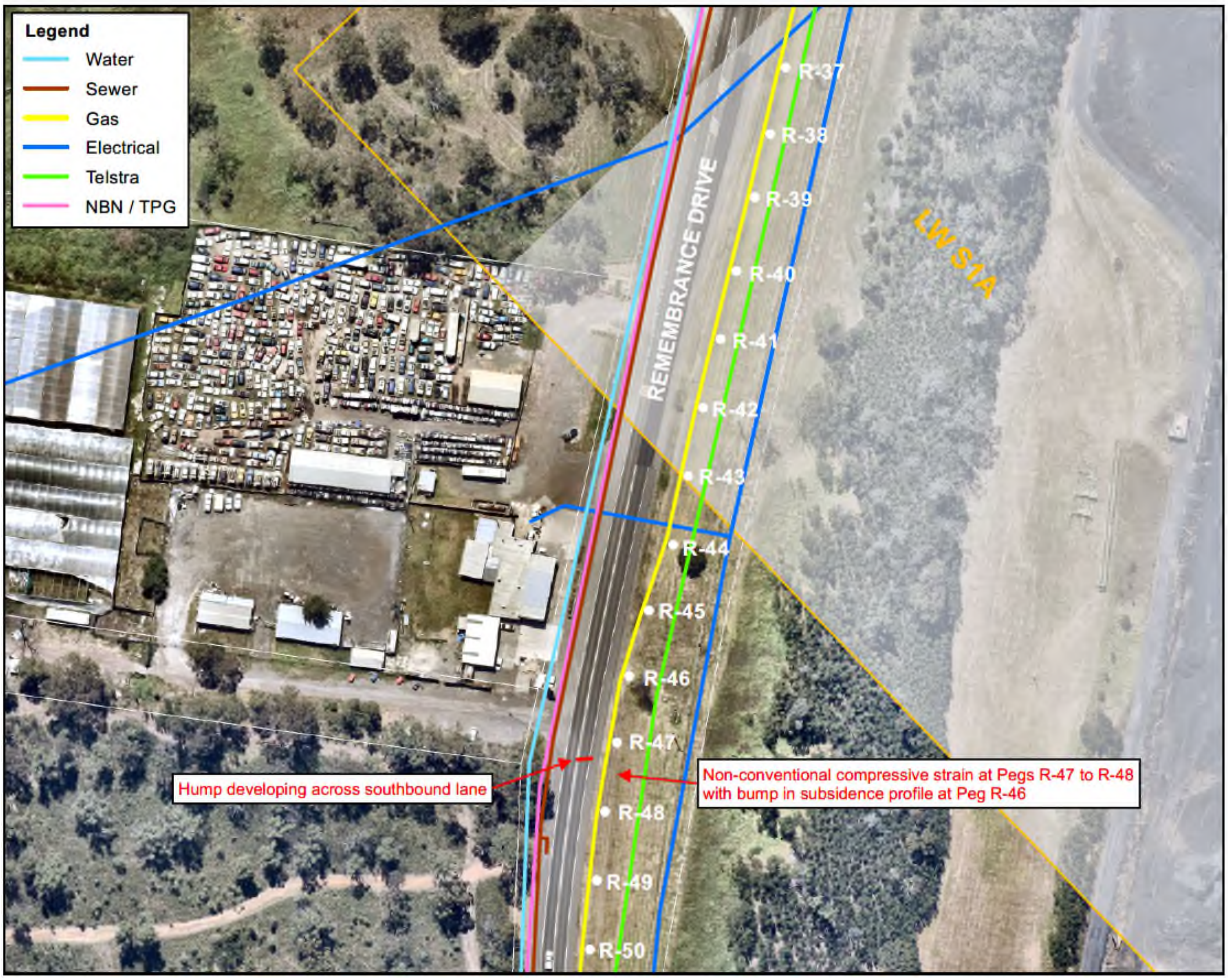

Figure 3-18 Location of non-convensional compressive strain, bump and hump in southbound lane of Remembrance Drive near Peg R46 (Source: MSEC1368 Report 19a, Appendix A)

Figure 3-19 Small bump observed in southbound land of Remembrance Drive near Peg R46 on 31 May 2023 (Source: MSEC1368 Report 19a, Appendix A)

Other Roads

Monthly ground surveys have been conducted along Charlies Point Road, with very minor changes observed on 27 November 2023. A visual inspection of Charlies Point Road on 4 December 2023 found no issues. Maintenance repairs of potholes and pavement edging has been completed.

Surveys of Rockford Road Bridge and Arina Road Bridge were conducted on 18 December 2023 found no issues.

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. The observation exceeds 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

Following the trigger of numerous management plans, the Structures Review Group discussed the observation, and implemented the following management actions:

- Increase 2D survey of the over the target location by Tahmoor Coal to twice weekly;
- Increase visual inspections over the target location by Tahmoor Coal to twice weekly;
- Weekly Gas Detection Survey; and
- Increase testing of the Telstra cable line in the area as required.

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

- Notification to Wollondilly Shire Council on 31 May.
- Meeting with representatives from Tahmoor Coal, Wollondilly Shire Council and MSEC on 2 June 2023 and 23 August to review the latest observations and decide whether any additional management measures are required. Council advised that a speed restriction was 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, and monthly surveys continue);
    - Frequency of surveys has returned to weekly as LW S2A approaches the site;
    - Frequency of focussed visual inspections is currently weekly;
    - 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 by direct communication if required;
    - 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. Any identified actions from the various meetings that have not yet been implemented will be implemented by Tahmoor Coal as required.

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 S1A and LW S2A in accordance with the Wollondilly Shire Council Managment 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.

No impacts to Sydney Water potable water infrastructure was observed during the 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. The observation exceeds 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

Following the trigger of numerous management plans, the Structures Review Group discussed the observation, and implemented the following management actions:

- Increase 2D survey of the over the target location by Tahmoor Coal to twice weekly;
- Increase visual inspections over the target location by Tahmoor Coal to twice weekly;
- Weekly Gas Detection Survey; and
- Increase testing of the Telstra cable line in the area as required.

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;
- Tahmoor Coal met with Sydney Water to inspect the impact site on 1 June and via teleconference on 2 June and 5 September 2023 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 and monthly surveys continue);
    - Frequency of surveys has returned to weekly as LW SA approaches the site;
    - Frequency of focussed visual inspections is currently weekly;
    - 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 will arrange for an acoustic detector to identify leaks along this section of the water main;
    - Tahmoor Coal and Sydney Water plan to install an expansion joint (e.g. gibault joint) near the site prior to the influence of LW S2A. The joints were installed on 11 September 2023;
    - 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 (last consultation was 11 September 2023);
    - 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. Any identified actions from the various meetings that have not yet been implemented will be implemented by Tahmoor Coal as required.

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 S1A and LW S2A in accordance with the Wollondilly Shire Council Managment 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.

No impacts to Sydney Water sewer infrastructure was observed during the 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. The observation exceeds 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

Following the trigger of numerous management plans, the Structures Review Group discussed the observation, and implemented the following management actions:

- Increase 2D survey of the over the target location by Tahmoor Coal to twice weekly;
- Increase visual inspections over the target location by Tahmoor Coal to twice weekly;
- Weekly Gas Detection Survey; and
- Increase testing of the Telstra cable line in the area as required.

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;
- Tahmoor Coal met with Sydney Water to inspect the impact site on 1 June and via teleconference on 2 June and 5 September 2023 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 and monthly surveys continue);
    - Frequency of surveys has returned to weekly as LW SA approaches the site;
    - Frequency of focussed visual inspections is currently weekly;
    - Sydney Water confirmed that there are no signs of impact on the sewerage system from automated monitoring results 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.

Proposed Actions

The current monitoring program will continue in accordance with the various Management Plans discussed in the sections above. Any identified actions from the various meetings that have not yet been implemented will be implemented by Tahmoor Coal as required.

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 S1A and LW S2A in accordance with the Wollondilly Shire Council Managment 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. It is noted that no odours have been detected during visual inspections.

No impacts to Jemena gas infrastructure was observed during the 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. The observation exceeds 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

Following the trigger of numerous management plans, the Structures Review Group discussed the observation, and implemented the following management actions:

- Increase 2D survey of the over the target location by Tahmoor Coal to twice weekly;
- Increase visual inspections over the target location by Tahmoor Coal to twice weekly;
- Weekly Gas Detection Survey; and
- Increase testing of the Telstra cable line in the area as required.

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

- Notification to Jemena on 31 May;
- Representatives from Tahmoor Coal, Jemena and MSEC met on 5 June 2023, 22 August 2023 and 11 October 2023 to review the latest observations and decide whether any additional management measures are required. 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 and monthly surveys continue);
    - Frequency of surveys has returned to weekly as LW S2A approaches the site;
    - Frequency of focussed visual inspections is currently weekly;
    - Following engineering analyses of observed ground movements, Tahmoor Coal and Jemena agreed to excavate and expose 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.

- Weekly gas detection surveys along affected section of Remembrance Drive. This will be conducted by Tahmoor Coal. Jemena will also investigate deploying its recently commissioned vehicle mounted gas detector (to be confirmed);
- 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 by direct communication if required; 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. Any identified actions from the various meetings that have not yet been implemented will be implemented by Tahmoor Coal as required.

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 18 December 2023. Observations have been reported in the weekly Subsidence Monitoring Reports (refer to in **Appendix A** for referenced report).

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

No impacts to Endeavour Energy electrical infrastructure was 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 S1A and LW S2A in accordance with the Wollondilly Shire Council Managment 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.

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.

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. The observation exceeds 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

Following the trigger of numerous management plans, the Structures Review Group discussed the observation, and implemented the following management actions:

- Increase 2D survey of the over the target location by Tahmoor Coal to twice weekly;
- Increase visual inspections over the target location by Tahmoor Coal to twice weekly;
- Weekly Gas Detection Survey; and
- Increase testing of the Telstra cable line in the area as required.

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.
- 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 and monthly surveys continue);
- Frequency of surveys has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- Increase frequency of OTDR testing of the Telstra cable from weekly to twice weekly;
- Comms Network Solutions to continue to keep Telstra, NBN and TPG informed on the status of ground movements, visual inspections and OTDR;
- Telstra and Comms Network Solutions to excavate and expose the buried cables, commencing on 16 January 2024 prior to the expected influence of LW S2A; and
- Comms Network Solutions remains on standby to locally excavate and expose the buried cables if required.

In addition, due to minor loss as detected by ODTR since 27 December 2023, twice weekly monitoring will continue until the planned cable protection works are conducted, commencing 16 January 2024.

Proposed Actions

The current monitoring program will continue in accordance with the various Management Plans discussed in the sections above. Any identified actions from the various meetings that have not yet been implemented will be implemented by Tahmoor Coal as required.

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 S1A and LW S2A, 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 S1A and LW S2A, 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.

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 Angligan 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 S1A and LW S2A, a gate to the side of Clifford Warne Auditorium was noted to be jammed in July 2023. This gate was repaired. No other impacts have been observed at this property during the reporting period.

3.7.10.2 Wollondilly Anglican College TARP

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

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 S1A and LW S2A 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 servies, and the reject emplacement area. In addition, Weekly Photo Reports are also prepared by Tahmoor Coal of infrastructure).

The latest survey was conducted on 2 January 2024, and the rates of change have reduced to very low levels.

During the reporting period, the following changes were observed:

- 11 mm of closure between Pegs BL600 and BL700 of the rail loop, initially observed 15 May 2023; and
- Cracks observed at two locations at 6C Tunnel and vent shaft interface initially observed on 29 May 2023. The number of cracks grew to seven (7) by the end of the monitoring period, all of them being less than 1 mm in width.

A schematic of the cracks at 6C Tunnel and a photo example of one crack is provided in **Figure 3-20**.

The mine site remained safe and serviceable during LW S1A and LW S2A extraction. A structural engineer inspected the cracks in the 6C Tunnel on 30 May 2023 and reported no immediate concerns.

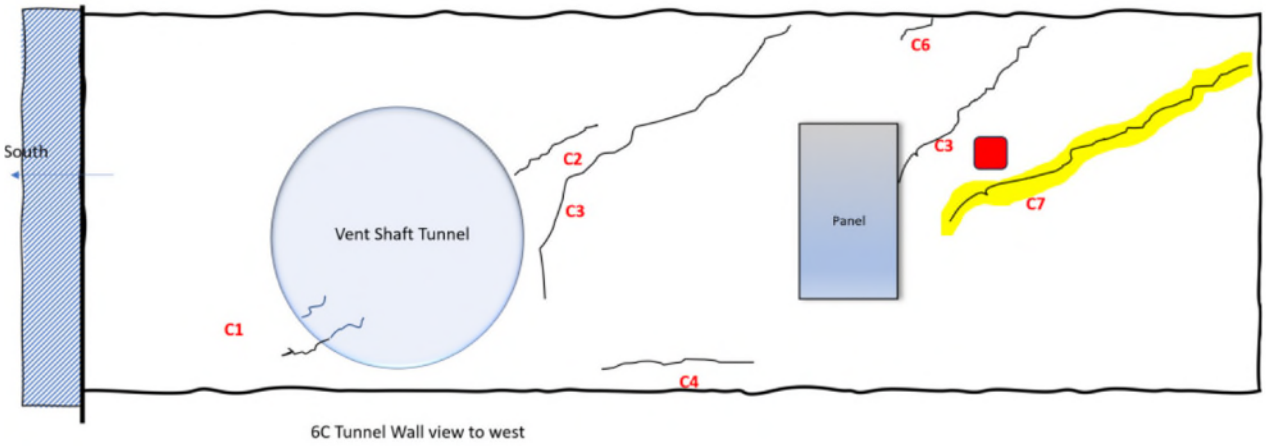

Figure 3-20 Schematic of cracks located in 6C Tunnel and example of crack (crack C7 taken 27 June 2023) (Source: Photo report: Tahmoor Mine Conveyors 27/9/2023, Appendix F)

3.7.11.2 Tahmoor Mine Site TARP

Background

As discusssed in the above section (**Section 3.7.11.1**), the following blue triggers occurred during the reporting period (refer to Report 22, **Appendix G**):

- 15 May 2023 – Blue trigger as a result of 11 mm of closure between Pegs BL600 and BL700 of the rail loop, exceeding the 10 mm trigger level; and
- 29 May 2023 – Blue trigger as a result of cracks observed at two locations at 6C Tunnel and vent shaft interface, one along the western face and one at the edge of the vent shaft. Cracks were less than 1 mm in width.

These triggers resolved at the end of the LW S1A monitoring period (21 July 2023), and no new triggers have been observed during the extraction of LW S2A.

Actions and Responses Completed

Mine Site and Rail Management Groups met on 19 May 2023 to discuss the trigger associated with the rail loop. It was noted that closure is distributed over bay lengths, with a maximum of 4 mm closure between BL600 and BL620. No bump was observed in the subsidence profile and the site does not coincide with creek crossings or known geological structures. Gradual rates of changes were noted to be observed. No issues with rail stress were noted until summer, when restressing is planned prior to hot temperatures. A focused inspection will be conducted along the track, Rail Loader, Conveyors 4S and 4C and Washery, which are located in this area.

A structural engineer inspected the cracks in the 6C Tunnel on 30 May 2023 and reported no immediate concerns.

Proposed Actions

The current monitoring program will continue in accordance with the Main Southern Railway Management Plan.

With regards to the Rail Loop, Tahmoor Coal will seek to assess the strain post mining of LW S2A and adjust the track if required. Tahmoor Coal also propose 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 S1A and LW S2A, 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 reports in **Appendix H**). These changes are summarised below:

- Surface flow were noted to decrease in Wirrimbirra Creek during the reporting period:
  - 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 28 September 2023, trickle flows were noted to stop downstream of Pool TT1 and no flows were noted in or out of Pool TT2.
  - On 15 November 2023, no flows were observed into or out of Pool TT1.
  - During the reporting period, flows were observed to re-emerge downstream from the junction to Teatree Hollow at Pool TT7. While sections of Wirrimbirra Creek have been previously observed as dry during periods of dry weather, the observations indicate that the changes are likely to be mining-induced.
- 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 bould 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 Nvember 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.

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 during the LW S1A end of panel inspection (completed 10 July 2023) 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 Wildife Sanctuary TARP (refer to **Appendix H**). This trigger was noted from 7 October 2023 till the end of the reporting period.

Actions and Responses Completed

Table 3-11 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 3-11 Actions and Responses for 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 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.	Monitoring of water level and visual observations have been increased from monthly to fortnightly at a number of pools on Wirrimbirra Creek, as required in accordance with the relevant TARPs in the Water Management Plan. Refer to **Section 3.2** of this report for further information.
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 completion of subsidence effects from LW S1A-S6A.
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 S1A and LW S2A.

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, a loss trend was observe for the buried premium unleaded tank between 31 December 2023 and 26 January 2024. This is being investigated internally. The cause of the blue trigger is unlikely to be a mining issue. Surveys around the tank measure very small ground strains that are close to survey tolerance. No mining-related impacts were observed at this property.

3.7.14.2 3030 Remembrance Drive TARP

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

3.7.15 Inghams Farms

3.7.15.1 Overview of Monitoring Results

During the reporting period, there were no triggers under the Inhams 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 these TARPs.

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 (July 2023), which summarise monitoring and inspection results from the Remembrance Drive, structures, and outdoor storage racks.

During the reporting period and the mining of LW S1A and LW S2A, 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 (December 2023 onwards), 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 S1A and LW S2A.

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 S1A and LW S2A.

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 S1A and LW S2A.

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.	Addessed 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 July to 31 December 2023, prepared for Tahmoor Coal, 25 March 2024.

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

Niche (2024a), Tahmoor South, Aquatic Monitoring Report Spring 2023, prepared for Tahmoor Coal, 15 March 2024.

Niche (2024b), Tahmoor Mine South, Terrestrial Ecology Monitoring Report: Spring riparing vegetation and amphibian baseline monitoring 2023, prepared for Tahmoor Coal, 21 February 2024.

SLR (2024), Six-Monthly Groundwater Monitoring: July to December 2023, Tahmoor South Domain, prepared for Tahmoor Coal, 27 March 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^{o}) and 2 in 1 (200% or 63.4^{o}).
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
DPE - Resources Regulator (Subsidence)	(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
DRNSW – Mining Exploration and Geoscience	(General email)	(General email)	resource.operations@planning.nsw.gov.au

Agency	Contact Person	Position	Electronic Copy
DRNSW – Resources Regulator – Mining Act Inspectorate	(General email)	(General email)	nswresourcesregulator@service-now.com
	Greg Kininmonth	Manager Environmental Operations (Southern)	greg.kininmonth@planning.nsw.gov.au
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
	John Johnston	Technical Manager	John.Johnston@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

Six Monthly Subsidence Monitoring Report for Tahmoor South LW S2A

Summary	
Monitoring period	2 August 2023 to 5 January 2024
Length of extraction of LW S2A	1147 metres on 5 January 2024 LW commenced extraction on 2 August 2023
Distance to completion of LW S2A	621 m

Summary of observed ground movements

Subsidence Parameter		Maximum observed during LW S2A	Location
Subsidence (mm)	Inc Total	805 841	GNSS S26 GNSS S06
Tilt (mm/m)	Inc Total	0.9 4.5	Remembrance Drive Main Southern Railway
Hogging Curvature (km^{-1})	Inc Total	0.06 0.11	Remembrance Drive Remembrance Drive
Sagging Curvature (km^{-1})	Inc Total	-0.07 -0.19	Remembrance Drive Main Southern Railway
Tensile Strain (mm/m)	Inc Total	0.3 0.3	Main Southern Railway Main Southern Railway
Compressive Strain (mm/m)	Inc Total	-0.4 -2.6	Remembrance Drive Main Southern Railway

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 at the time of this report had progressed a distance of 1147 metres from its start position. The mine layout and the monitoring peg positions are shown in Drawing No. MSEC1368-01.

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	7 779	0.2 6.3	0.01 0.08	-0.01 -0.16	0.1 0.5	-0.1 -1.9
Charlies Point Road	Inc Total	37 58	0.4 0.7	0.02 0.03	-0.03 -0.04	0.2 0.3	-0.2 -0.3
Remembrance Drive	Inc Total	23 75	0.9 1.4	0.06 0.11	-0.07 -0.07	0.1 0.2	-0.4 -2.1
Main Southern Railway	Inc Total	67 573	0.5 4.5	0.02 0.07	-0.02 -0.19	0.3 0.3	-0.3 -2.6
Caloola Road	Inc Total	9 41	0.1 0.2	0.01 0.01	-0.01 -0.01	0.2 0.2	-0.0 -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 30 August. Very minor changes observed since the completion of LW S1A.

Main Southern Railway

Weekly surveys have commenced, with small changes observed on 2 January. Visual inspections have not identified any issues at this stage.

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 are developing at the GNSS units, with maximum measured incremental subsidence of 805 mm at Site S26 since the commencement of LW S2A. Subsidence is increasing at Site S26 above LW S2A and rates of change are beginning to reduce. Subsidence is also increasing at Site S27 above LW S2A, but at a reduced magnitude at the equivalent stages of mining compared to GNSS S26.

Observed development of subsidence above LW S2A relative to face distance is shown in Figure A. Subsidence is increasing at Sites S05 and S06 though rates of change per metre of longwall travel are reducing, as expected at this stage of extraction.

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

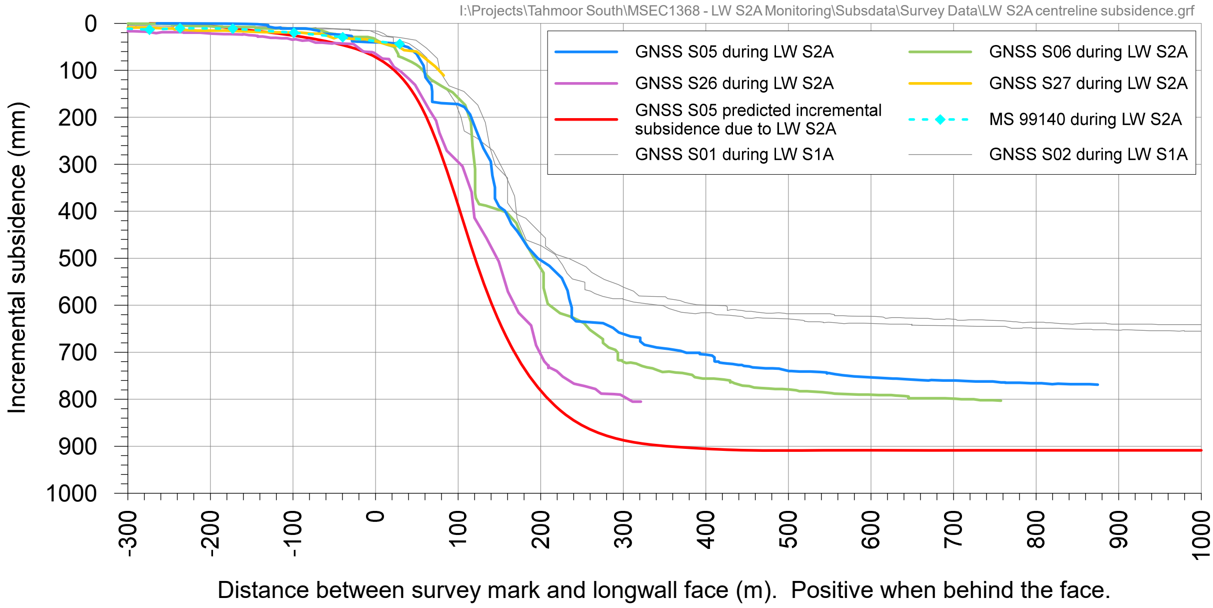

Figure A Observed development of incremental subsidence above LW S2A relative to position of longwall face

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. Rates of change have reduced to low levels. 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 is developing across Teatree Hollow between Sites S26 and S27 directly above LW S2A.

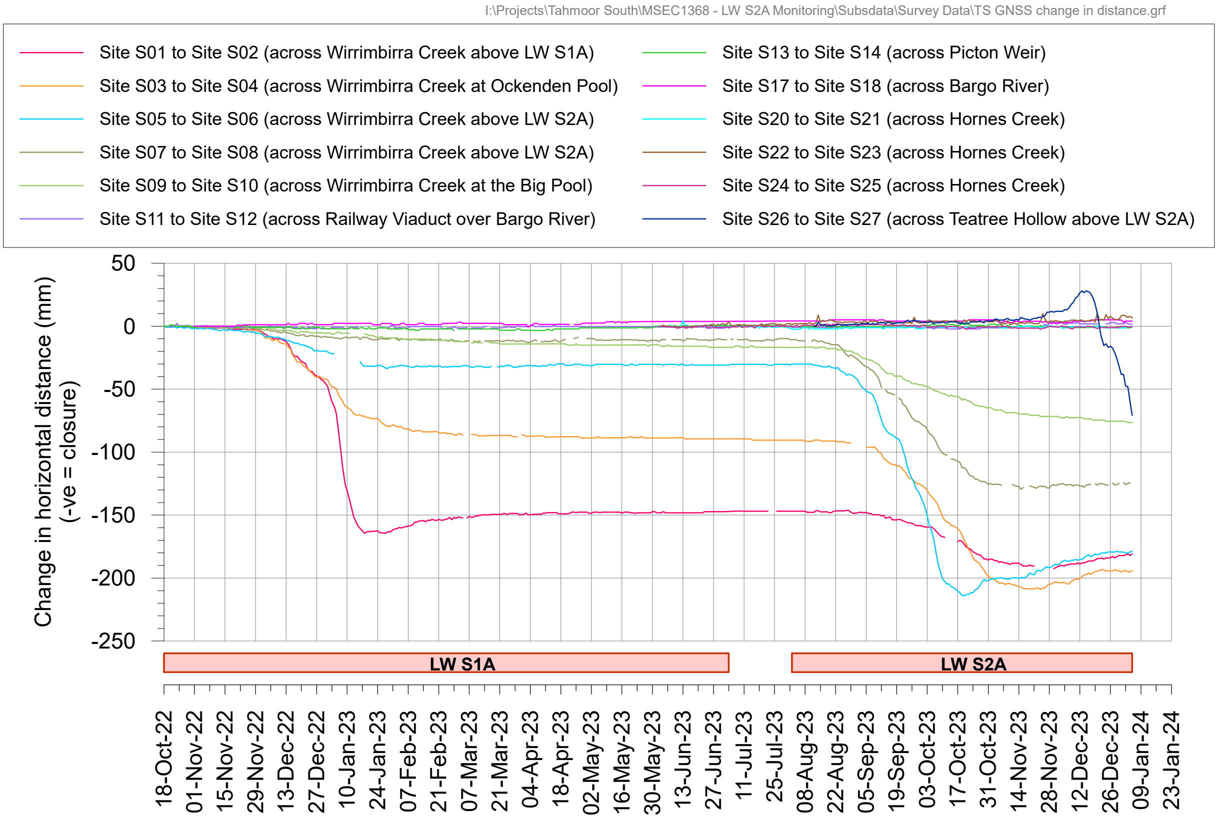

Figure B Observed changes in horizontal distances between GNSS units

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 observed development of compressive strain is shown in Figure C. Increased compressive strain and a small bump in the observed subsidence profile was first identified from the ground survey on 22 May 2023.

Compressive strain was measured to have increased between Pegs R47 and R48 on 29 May 2023. A localised resurvey of strain distances on 31 May 2023 found that compressive strain had reduced very slightly but remained approximately 1 mm/m. Compressive strain was measured to have increased between Pegs R47 and R48 on 6 June to approximately 1.4 mm/m. A localised resurvey of strain distances on 8 June found that compressive strain had increased very slightly to approximately 1.5 mm/m. No change was measured on 13 June. A localised resurvey of strain distances on 15 June found that compressive strain had increased very slightly to approximately 1.6 mm/m. No change was measured on 19 June. A localised resurvey of strain distances on 22 June found that compressive strain had increased very slightly to approximately 1.7 mm/m.

Monthly surveys during the early stages of mining of LW S2A measured ongoing residual subsidence and compressive strain developing between Pegs R47 and R48 up to 2.0 mm/m. Trench excavation works were conducted in mid-December 2023 to relieve stresses in the Jemena gas pipe. Peg R48 was damaged during the excavation works and could not be surveyed this week on 28 December 2023. In anticipation of peg disturbances, Tahmoor Coal installed back up Pegs R46B to R49B immediately adjacent to the original pegs and an initial survey was conducted on 6 November 2023. To preserve continuity of data, changes in surveyed levels and horizontal distances between pegs have been adopted for the temporarily lost Peg R48 on 28 December 2023 and adopted for the replacement peg when it was first surveyed on 2 January 2024.

Very minor changes (within survey tolerance) were observed this week.

An increase in compressive strain was observed this month, with very minor changes in vertical misalignment. The observation is consistent with measured changes in horizontal distance over a bay length of 40 metres between Pegs R47 and R49.

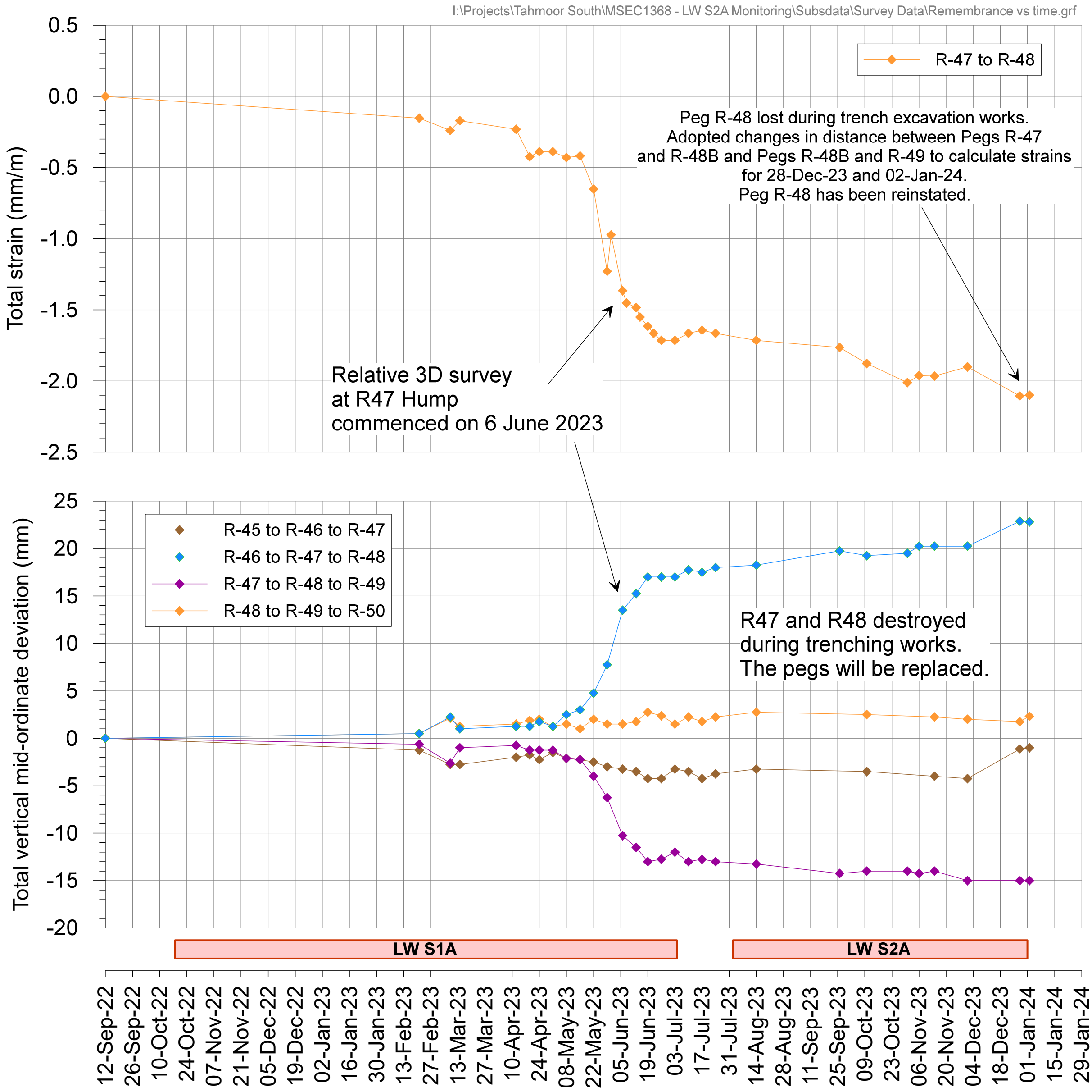

Figure C Observed development of ground strain and changes in vertical alignment at selected pegs along Remembrance Drive

As shown in Figure C, the observed compressive strain between Pegs R47 and R48 is accompanied by a bump in the observed subsidence profile at Peg R46, and the dip in the observed subsidence profile at Peg R47. The survey on 29 May 2023 found that the bumps in the observed subsidence profile had increased since 22 May 2023. The survey on 6 June 2023 found that the bumps in the observed subsidence profile had increased since 29 May 2023. Minor changes were observed in the survey of 14 August.

Monthly surveys are continuing as LW S2A is extracted. Minor changes were observed in the survey of 2 January.

A focussed visual inspection 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 D. A map showing the location and orientation of the bump relative to nearby building structures and utility services is shown in Figure E. 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 D 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 owners 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.

Visual inspections were conducted on 3 January and a photograph of the bump is shown in Figure F. No significant changes have been observed since the inspection on 18 August. A faint bump is visible on the edge line of the northbound lane south of Peg R46.

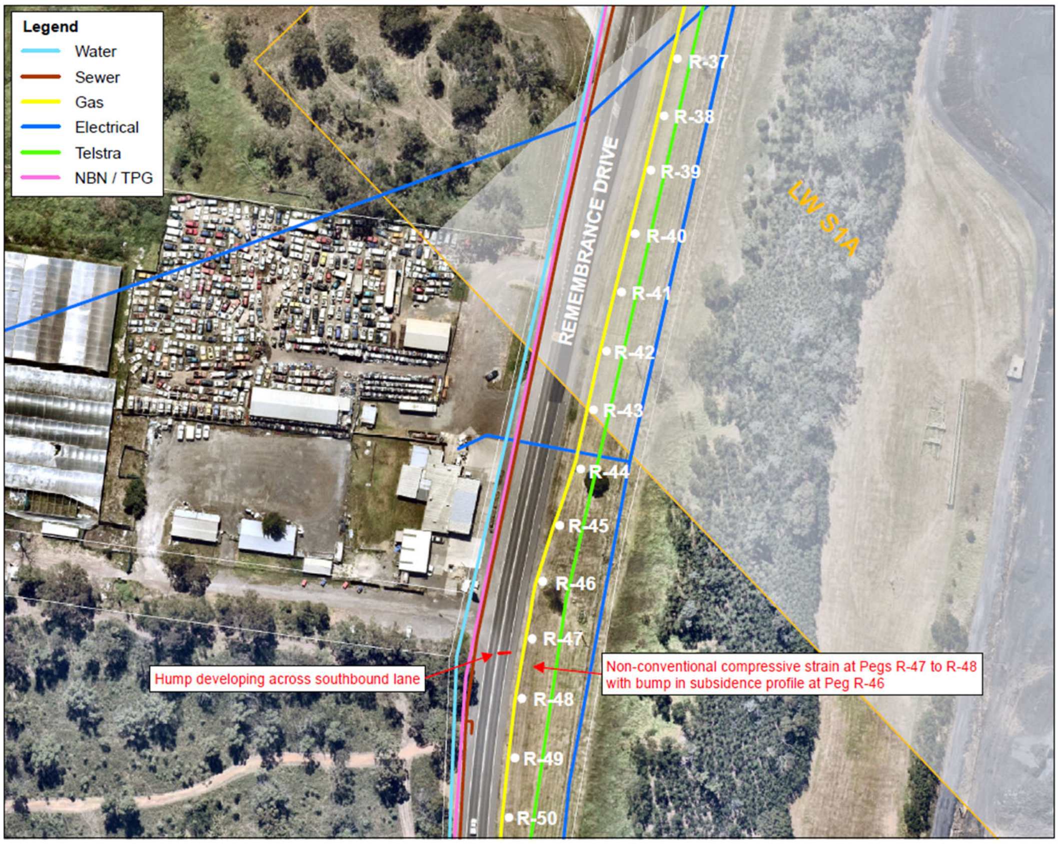

Figure E Location of small bump observed in southbound lane of Remembrance Drive near Peg R46 on 2 June 2023

Photograph courtesy Building Inspection Services

Figure F Small bump observed in southbound lane of Remembrance Drive near Peg R46 on 3 January 2024 (no significant change)

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.

A survey was conducted on 4 December along ground survey lines that were installed across the Tributary to Teatree Hollow, and a summary is shown in Figure G. 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.

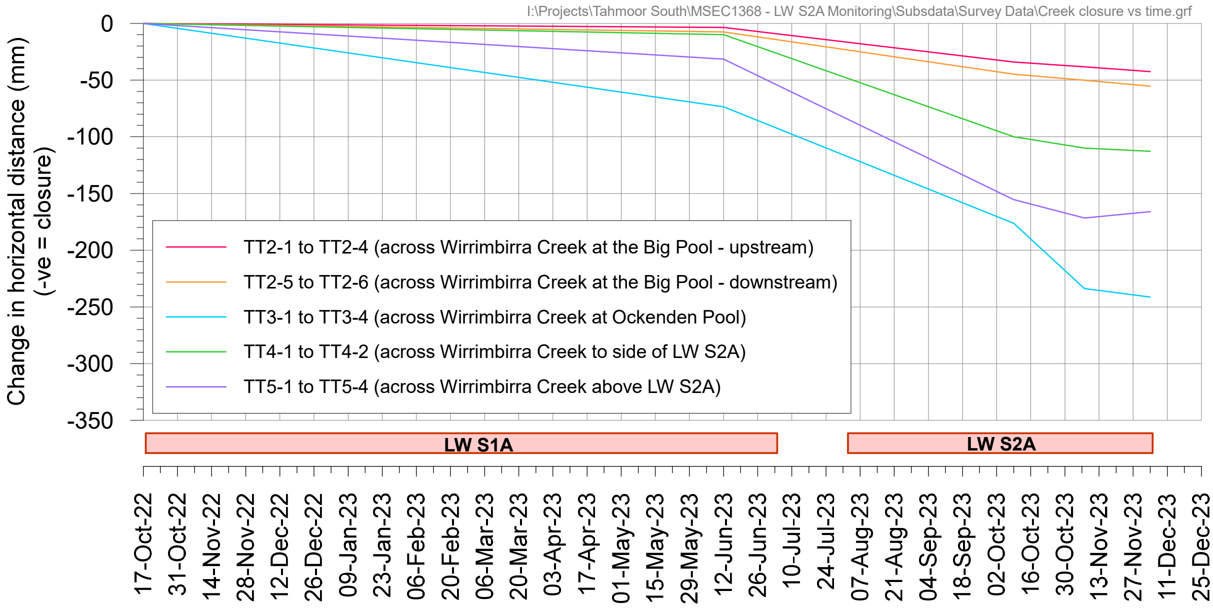

Figure G Observed development of closure across Tributary to Teatree Hollow from ground surveys

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 15 November, flows in the creek are declining. No flow was observed into and out of TT1 before drying up approximately 65 metres downstream of TT1, which is approximately 30 metres further upstream than observed during the previous inspection.

No water was flowing into or out of TT2, as observed during the previous inspection. Additional impacts have been observed at TT2 during October and November 2023. A fracture within a surface boulder upstream of Pool TT2 has been observed to increase in size during September, October and November. 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.

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 H. 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. This month's survey on 4 December measured minor changes.

Water levels in Pool TT2 remain low. While the observed rates of water level recession at Pool TT2 are consistent with previously observed rates and consistent with evaporation rates, surface and ground water assessments have found that the low water levels are atypical than what would be considered 'normal' conditions and are likely due to mining-induced reduction in groundwater baseflow into the pool.

An inspection was conducted on 15 November, with similar observations to 25 October though the fracture within the boulder field upstream of Pool TT2 has increased slightly.

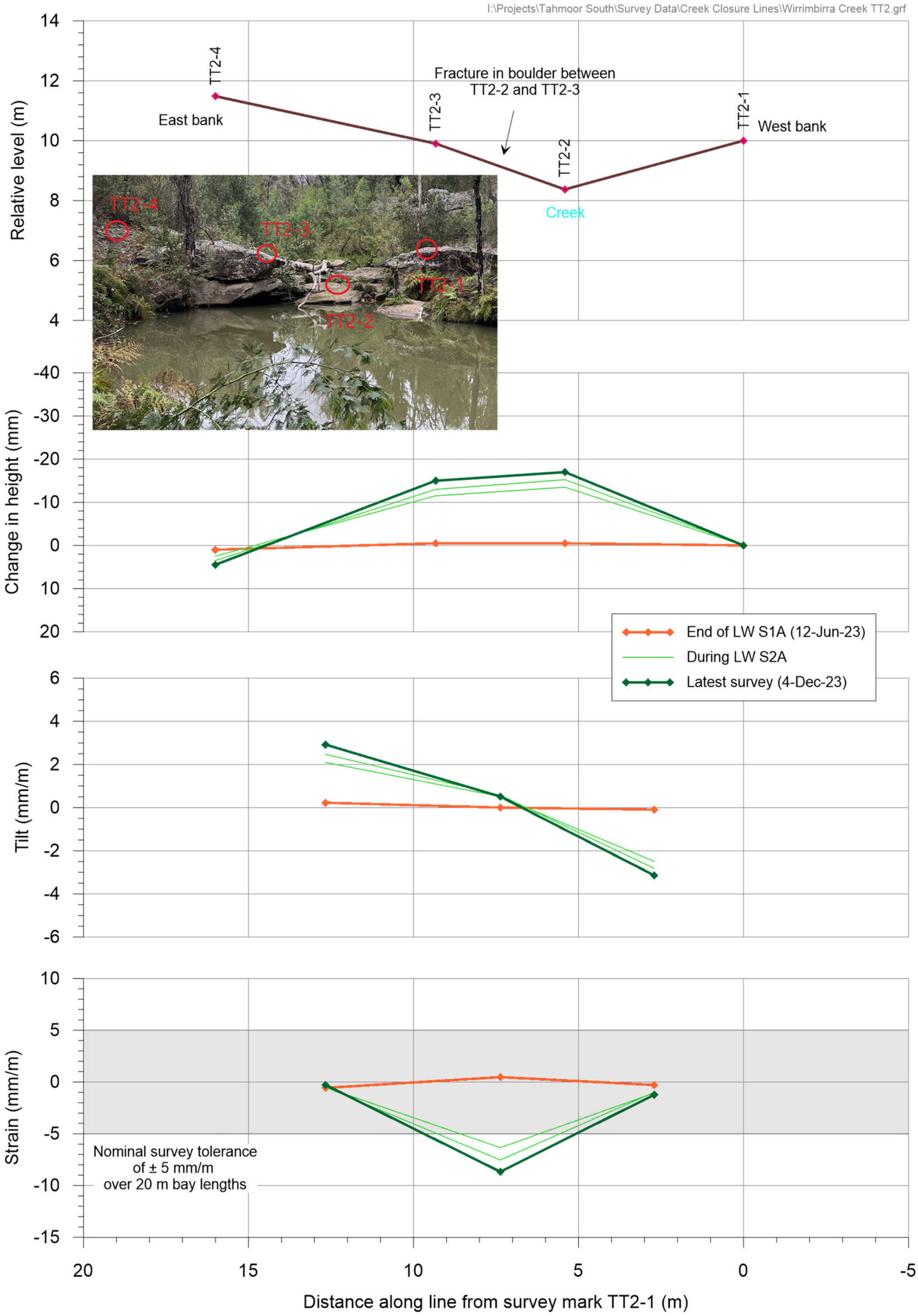

Figure H Observed subsidence, tilt and strain along TT2 line, upstream of Pool TT2

In February 2023, surface water was first observed to re-emerge downstream of LW S1A at a location that was upstream of monitoring site TT13. On 15 November, no surface flows were observed at the junction to Teatree Hollow at TT7. Flows re-emerged approximately 50 metres upstream of TT8, which is also upstream of the Licensed Discharge Point. 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. It is further noted from recent baseline inspections in November 2023 that adjoining catchments are also currently dry in response to prolonged dry weather.

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.

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 and 4 December. Very little closure is observed at TT6, TT9 and TT12 (5 mm or less). GNSS units S26 and S27 have been installed across Teatree Hollow directly above LW S2A to measure valley closure. Closure has not 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. Minor changes were observed on 15 November. As observed in the Tributary to Teatree Hollow, surface flows were not observed in the creek upstream of the mining area. No flow was observed into or out of TT9. Surface cracking is observed at monitoring site TT12 and downstream of TT12. No flow was observed at TT12 and TT13. The inspection on 15 November observed no changes since the previous inspection on 25 October.

Structures

Weekly surveys and inspections continue at the Australian Wildlife Sanctuary and inspections continue at MKD Machinery. Weekly inspections have commenced at the Tahmoor Garden Centre. No issues have been observed.

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. No significant changes were observed on 3 January.

MSEC notified Wollondilly Shire Council on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Wollondilly Shire Council and MSEC met on 2 June 2023 and 23 August 2023 to review the latest observations and decide whether any additional management measures are required. Council advised that a speed restriction was 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 has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- 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 by direct communication if required;
- 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.

Monthly ground surveys have commenced along Charlies Point Road, with very minor changes observed on 27 November. A visual inspection of Charlies Point Road on 4 December found no issues. Maintenance repairs of potholes and pavement edging has been completed.

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 on 25 July, with no issues observed.

MSEC notified Jemena on behalf of Tahmoor Coal on 31 May. Representatives from Tahmoor Coal, Jemena and MSEC met on 5 June 2023, 22 August and 11 October to review the latest observations and decide whether any additional management measures are required. The following additional management measures have been 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 has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- Following engineering analyses of observed ground movements, Tahmoor Coal and Jemena agreed to excavate and expose 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.
- Weekly gas detection surveys were conducted along the affected section of Remembrance Drive. This was conducted by Tahmoor Coal. Jemena will also investigate deploying its recently commissioned vehicle mounted gas detector (to be confirmed);
- 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 by direct communication if required; and
- Jemena remains on standby to conduct repairs if required.

Electrical 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. 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 18 December.

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 has been 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. 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.

The following additional management measures are being conducted:

- 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 has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- Increase frequency of OTDR testing of the Telstra cable from weekly to twice weekly;
- Comms Network Solutions to continue to keep Telstra, NBN and TPG informed on the status of ground movements, visual inspections and OTDR;
- Telstra and Comms Network Solutions plan to excavate and expose the buried cables, commencing on 16 January 2024 prior to the expected influence of LW S2A; and
- Comms Network Solutions remains on standby to locally excavate and expose the buried cables if required.

On 27 December, a minor loss was detected by OTDR on 27 December at the location of the bump and high compressive strain on Remembrance Drive. The cable was retested 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.

An increase in loss was observed on 4 and 8 January. Twice weekly testing will continue as LW S2A approaches the site.

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.

Twice weekly monitoring will continue until the planned cable protection works are conducted, commencing on 16 January.

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.

MSEC notified Sydney Water on behalf of Tahmoor Coal on 31 May. Tahmoor Coal met with Sydney Water to inspect the impact site on 1 June and via teleconference on 2 June and 5 September 2023 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 has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- 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 will arrange for an acoustic detector to identify leaks along this section of the water main;
- Tahmoor Coal and Sydney Water plan to install an expansion joint (e.g. Gibault joint) near the site prior to the influence of LW S2A. The joints were installed on 11 September;
- 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 (last consultation was 5 September); and
- Sydney Water remains on standby to conduct repairs if required.

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 has returned to weekly as LW S2A approaches the site;
- Frequency of focussed visual inspections is currently weekly;
- 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.

Water levels in dams have risen in response to recent rainfall events. The water level had increased at dam FD-6 on 3 January due to rainfall. No significant changes were observed at Dam FD-7 on 3 January. The water level had increased at dam FD-8 on 5 January due to rainfall.

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 of surveys and inspections completed

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 is shown in Figure I.

Figure I Surveys and inspections during LW S2A

A summary of surveys and inspections is provided in Table 2.

Table 2 Surveys and inspections conducted during LW S2A

Inspection / Survey	Responsibility	Number of Inspections / Surveys
Ground Monitoring Surveys		
GNSS	GNSS Monitoring	157
Local road surveys	SMEC	44
Local road inspections	BIS	35
Local road bridge surveys	SMEC	9
Local road bridge inspections	BIS	11
Sub-Total		**256**
Natural Features		
Teatree Hollow and Wirrimbirra Creek Survey Lines	SMEC	4
Teatree Hollow and Wirrimbirra Creek Visual inspections	Brienan Environment & Safety ENRS	9
Surface water manual monitoring	ATC Williams	3
Groundwater manual monitoring	SLR	1
Cliffs and steep slopes geotechnical inspections	Douglas Partners	5
Sub-Total		**22**
Main Southern Railway		
Ground Surveys	Southern Rail Surveys	7
Track Geometry Surveys	BloorRail	6
Track Inspections	BloorRail	66
Main Southern Railway structure surveys	Southern Rail Surveys	6
Embankments and cutting surveys	Southern Rail Surveys	26
Embankments and cuttings geotechnical inspections	Newcastle Geotech	7
Sub-Total		**118**
Utilities		
Endeavour Energy Power Pole Surveys	SMEC	27
Telecommunications Monitoring	CNS	16
Gas Detection Surveys	BIS	-
Sub-Total		**43**
Mine Site		
Rail Loop Surveys	Southern Rail Surveys	1
Conveyor and Tunnel Surveys	SMEC	1
Structure Surveys	SMEC	-
Dam Surveys	SMEC	4
Visual inspections	Tahmoor Coal & BIS	41
Sub-Total		**47**
Public Amenities		
Public Amenity Ground Surveys	SMEC	13
Public Amenity Visual inspections	BIS	26
Sub-Total		**39**
Commercial and Business		
Commercial Ground Surveys	SMEC	-
Commercial Visual inspections	BIS	14
Sub-Total		**14**
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	1
Private property dam inspections	BIS	29
Sub-Total		**30**
Total		**569**

A comparison between assessed and observed impacts to surface features is summarised in Table 3. The assessed and observed impacts to surface features compare reasonably well with predictions.

Table 3 Summary of predicted and observed impacts during LW S2A

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.
Natural vegetation	No impacts anticipated.	No impacts observed during LW S2A.
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. 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. Faint bump visible on the edge line of the northbound lane south of Peg R47. 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. Additional mitigation measures installed to reduce potential for impacts to water main near Peg R47.
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.
Gas pipelines	Impacts possible at isolated locations, particularly at creek crossings. Gas pipelines will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A. Additional mitigation measures installed to reduce potential for impacts to gas main near Peg R47.
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.

Surface Feature	Predicted Impacts	Observed Impacts
Public Utilities		
Telecommunication infrastructure	Impacts possible at isolated locations, particularly at creek crossings. Telecommunications cables will remain safe and serviceable with a management plan in place.	No impacts observed to services during LW S2A. Minor losses detected in optic fibre cable near location of compressive strain on Remembrance Drive. Additional mitigation measures installed to reduce potential for impacts to optic fibre cable near Peg R47.
Public Amenities		
Wollondilly Anglican College	Damage may occur in isolated locations but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A.
Australian Wildlife Sanctuary	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A.
Bargo Cemetery	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A. 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.
Bargo Petroleum	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A.
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.
Tahmoor Mine Site	Damage may occur but will remain safe and serviceable with a management plan in place.	No impacts observed during LW S2A.
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.
Fences	Potential for impacts to fences and gates.	No impacts reported to fences on farm properties during LW S2A.
Farm dams	Potential adverse effects on dam walls and storage capacity.	No impacts observed during LW S2A.
Wells or bores	Potential impact to groundwater bores, particularly bores located directly above LWs.	No impacts observed during LW S2A.
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 S1A.
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. Picton Weir is located west of LW S6A.
Permanent Survey Control Marks	Ground movement predicted at identified survey marks.	Ground movement occurred.

Surface Feature	Predicted Impacts	Observed Impacts
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.
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.
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.
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.

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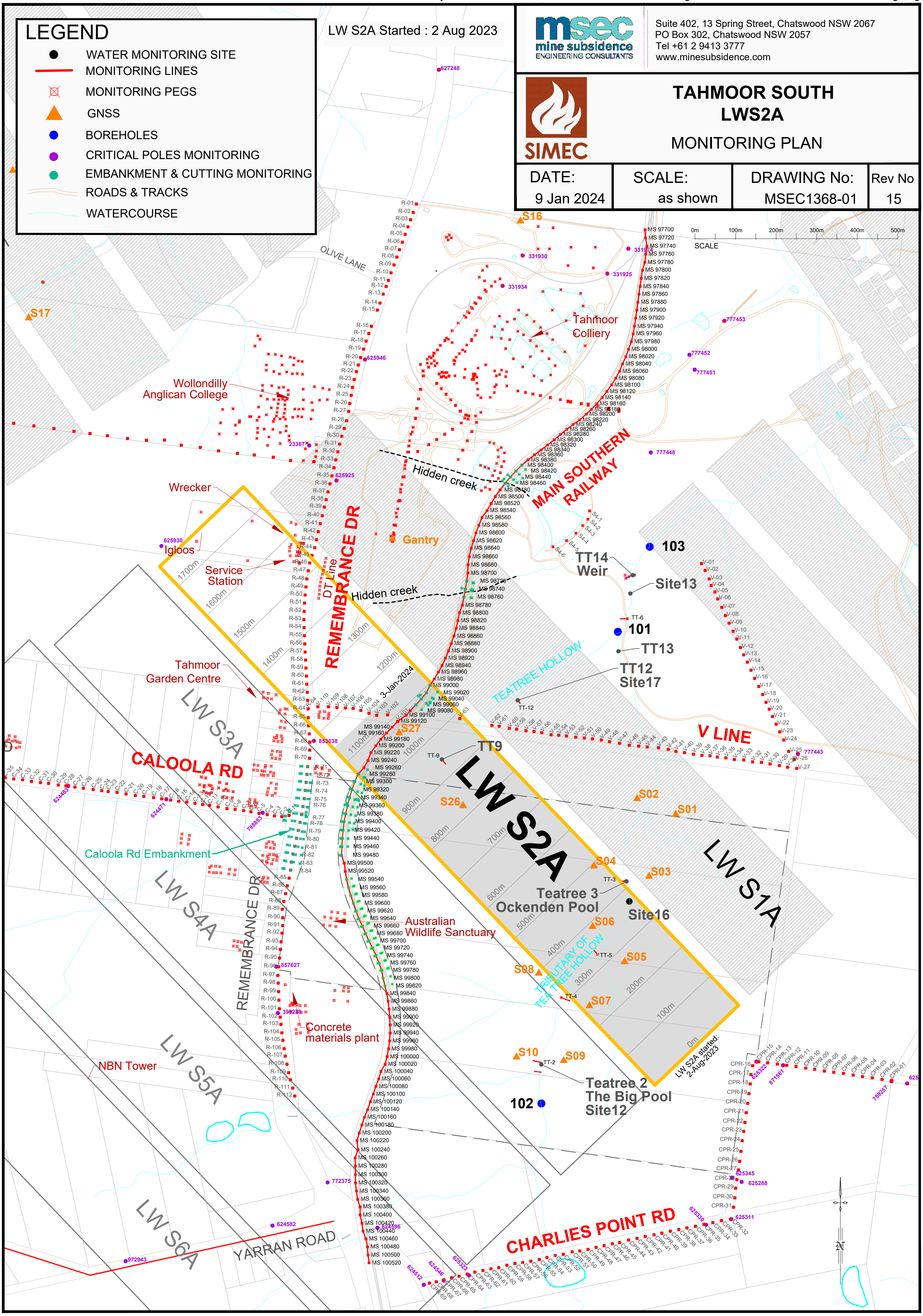

Tahmoor South LW S2A
Incremental subsidence profiles along Remembrance Drive

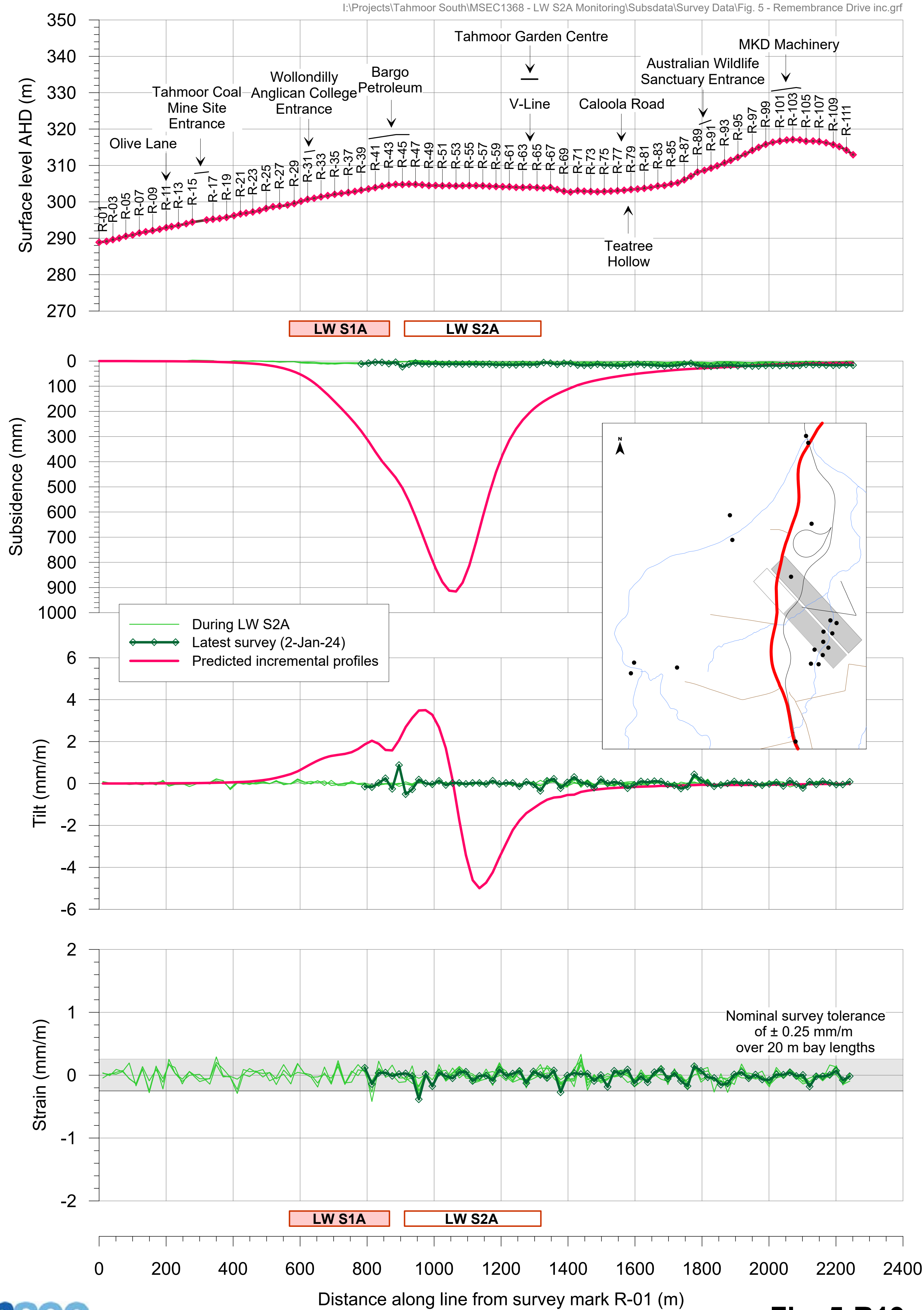

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Fig. 5-R19

Tahmoor South LW S2A
Total subsidence profiles along Remembrance Drive

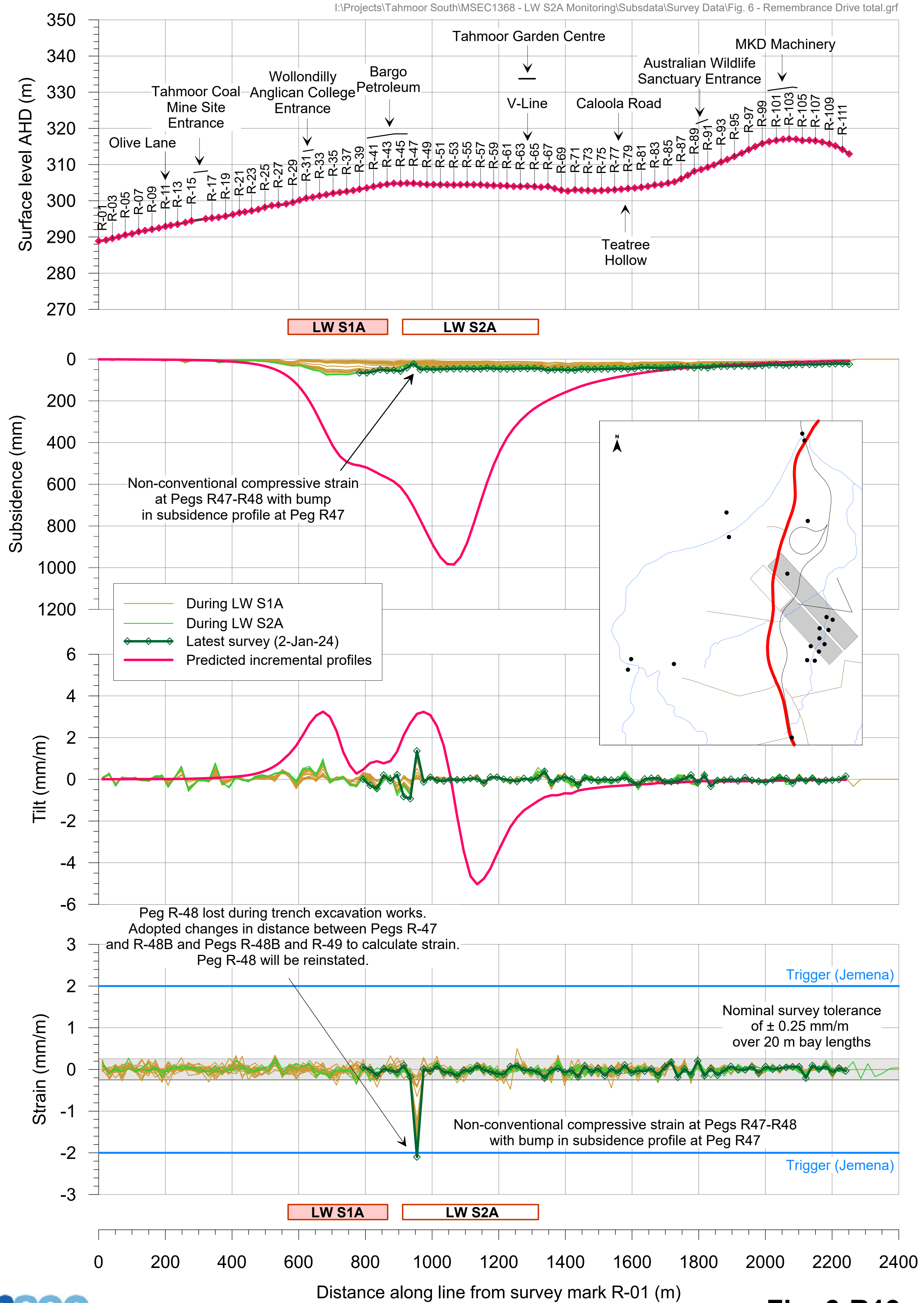

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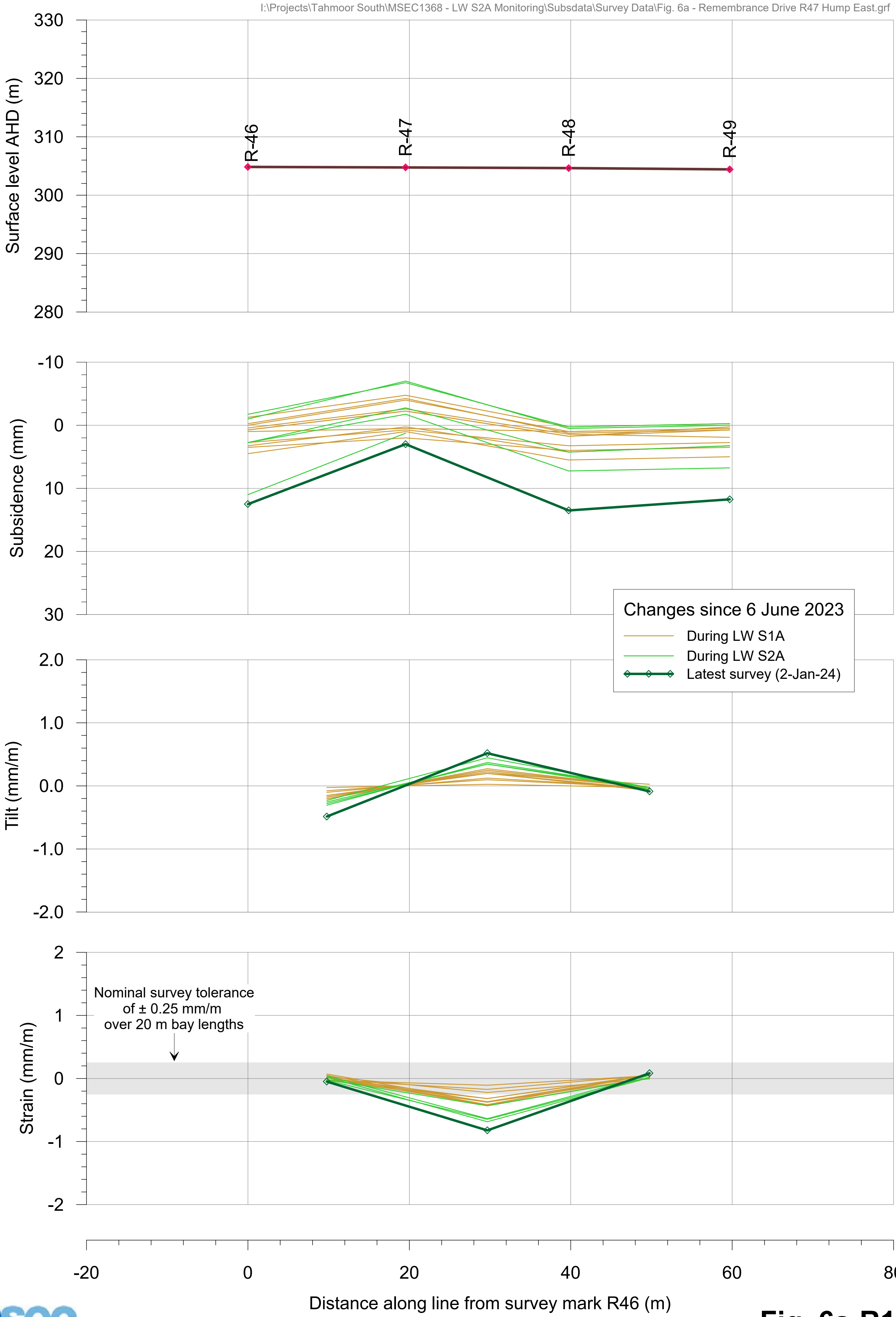
Fig. 6-R19

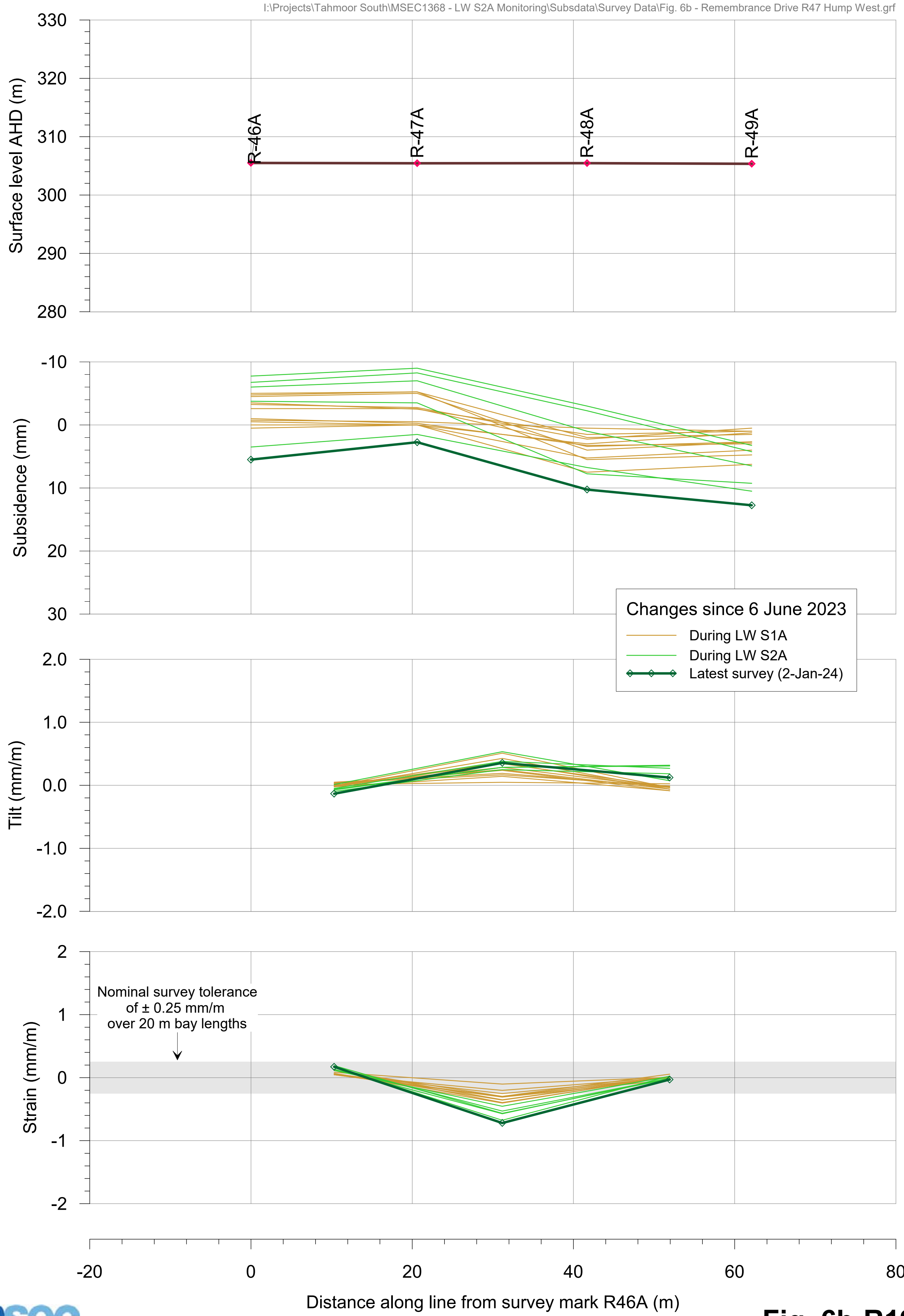
Tahmoor South LW S2A - Remembrance Drive R47 Hump
Total subsidence profiles along eastern side of pavement



msec

Fig. 6a-R19

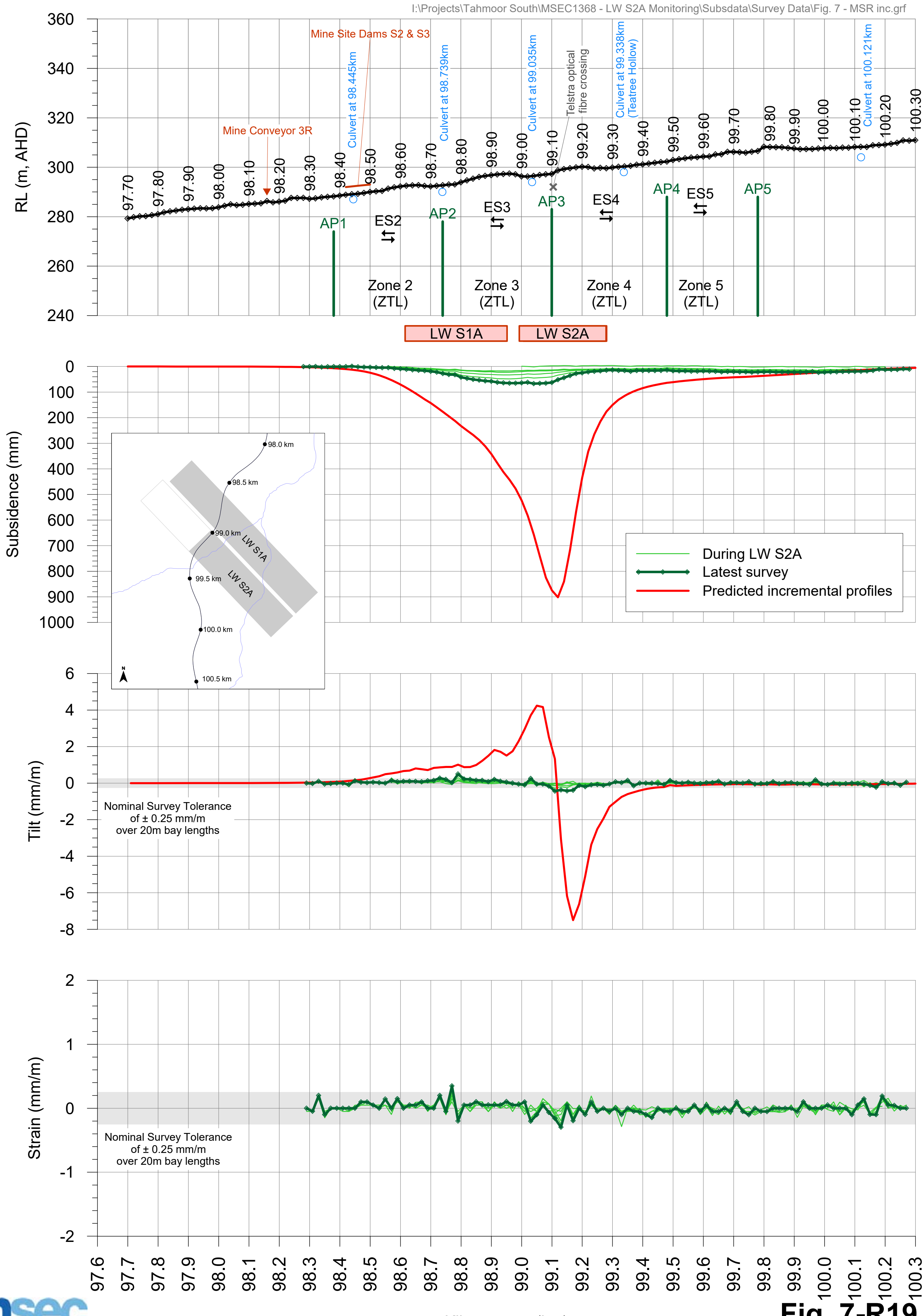
Tahmoor South LW S2A - Remembrance Drive R47 Hump
Total subsidence profiles along western side of pavement



msec

Fig. 6b-R19

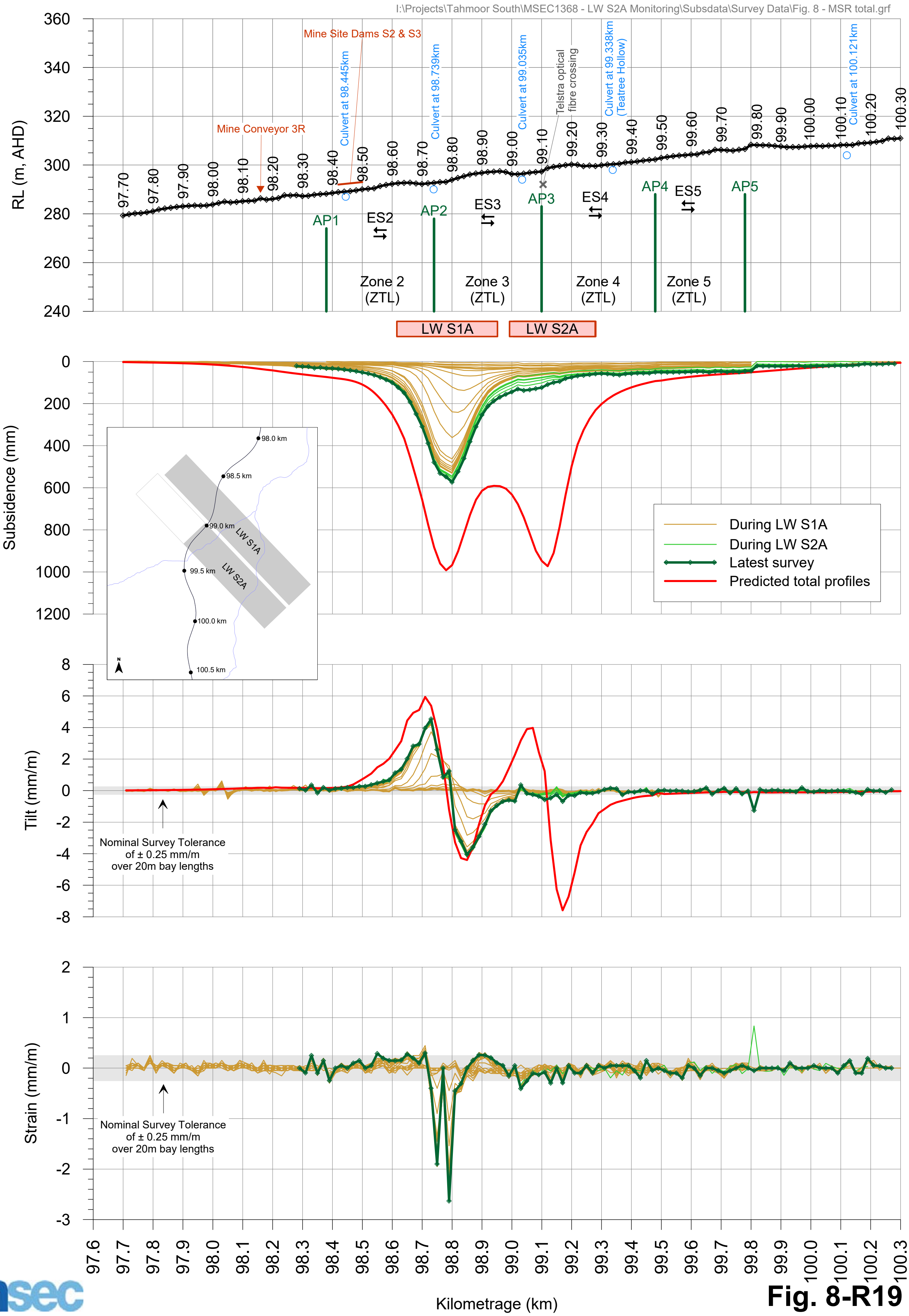
Tahmoor South LW S2A - Main Southern Railway
Incremental subsidence profiles
Survey date: 2 January 2024



msec

Fig. 7-R19

Tahmoor South LW S2A - Main Southern Railway
Total subsidence profiles
Survey date: 2 January 2024



msec

Fig. 8-R19

Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental subsidence profiles along southbound crest

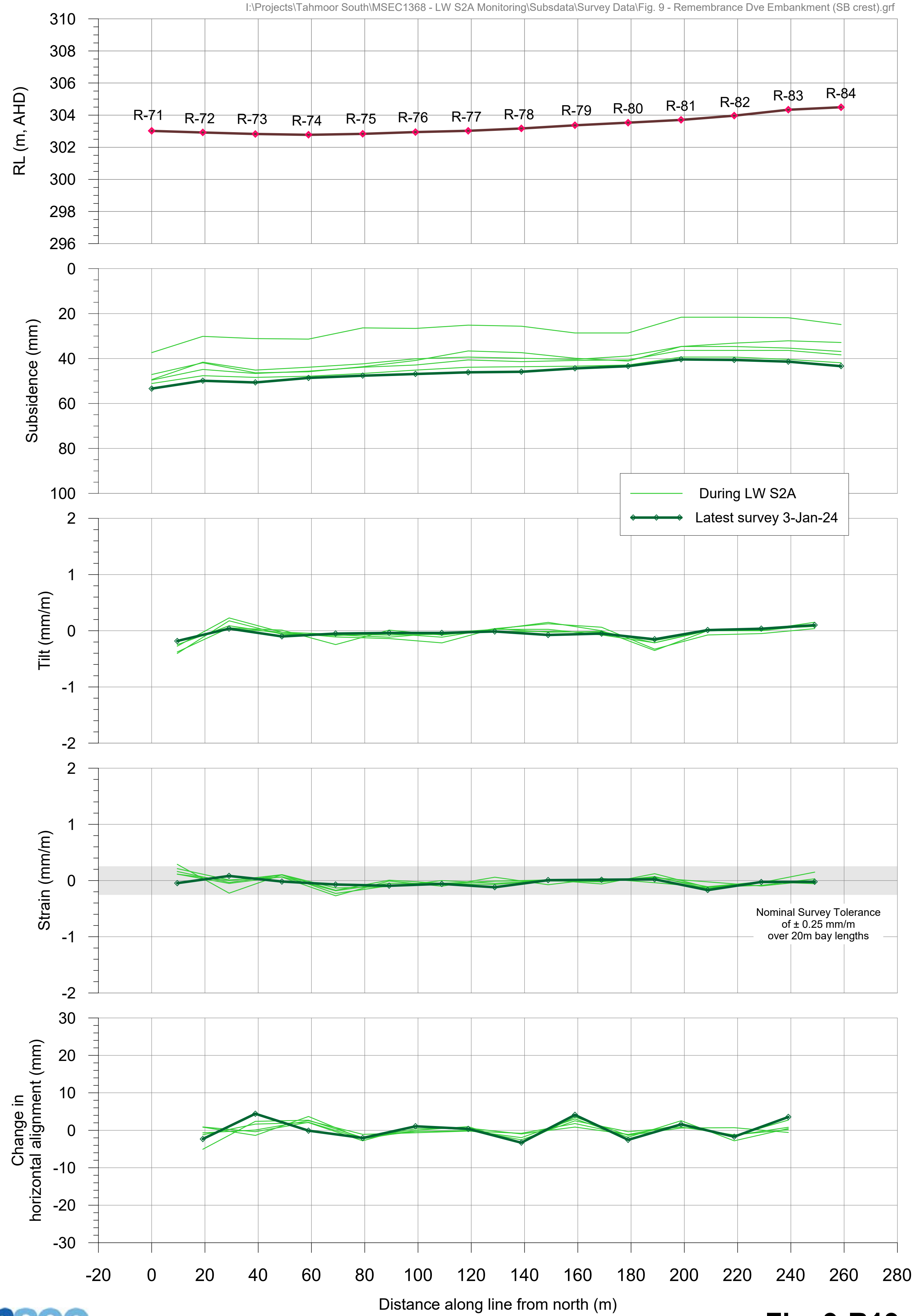


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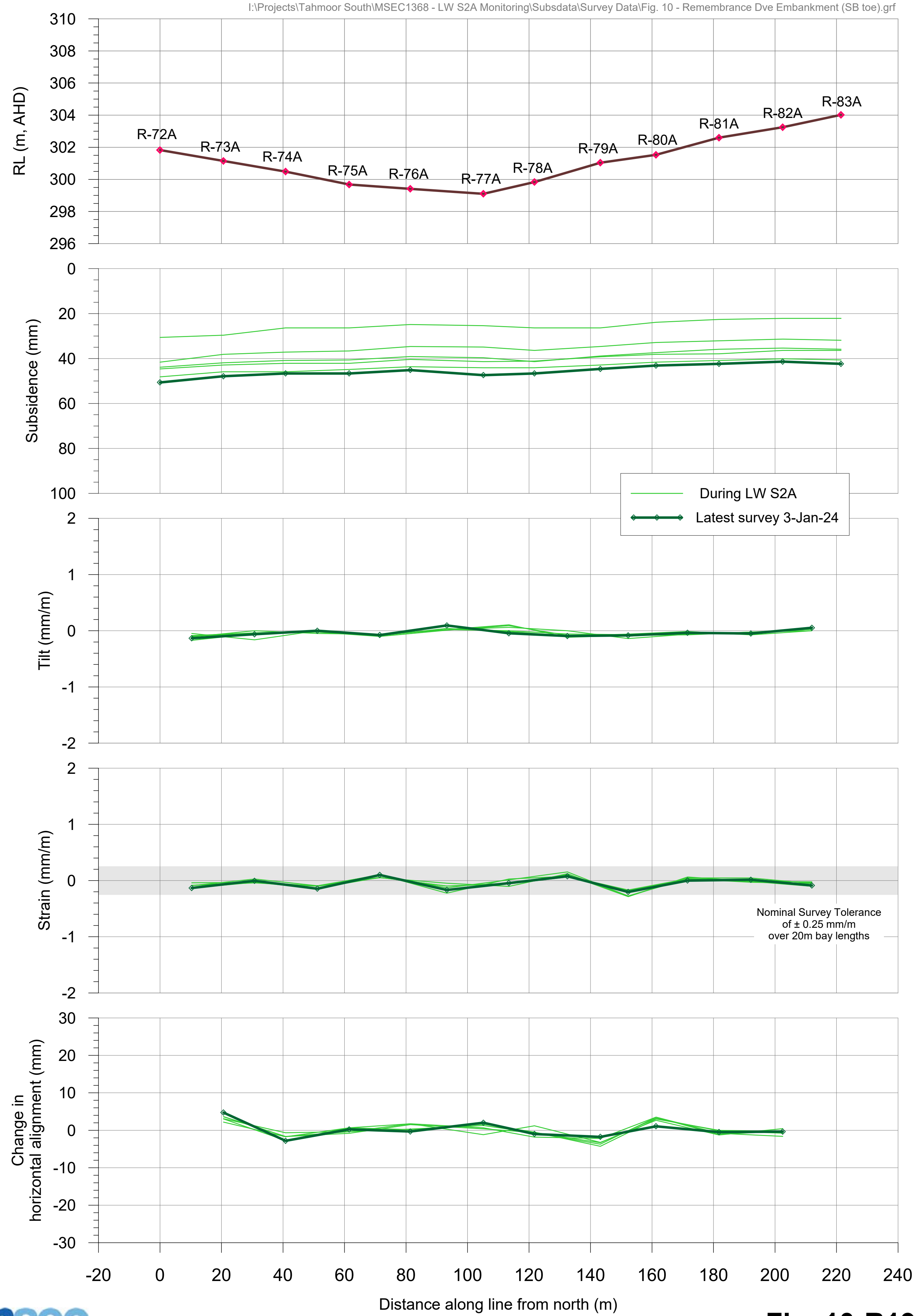
Fig. 9-R19

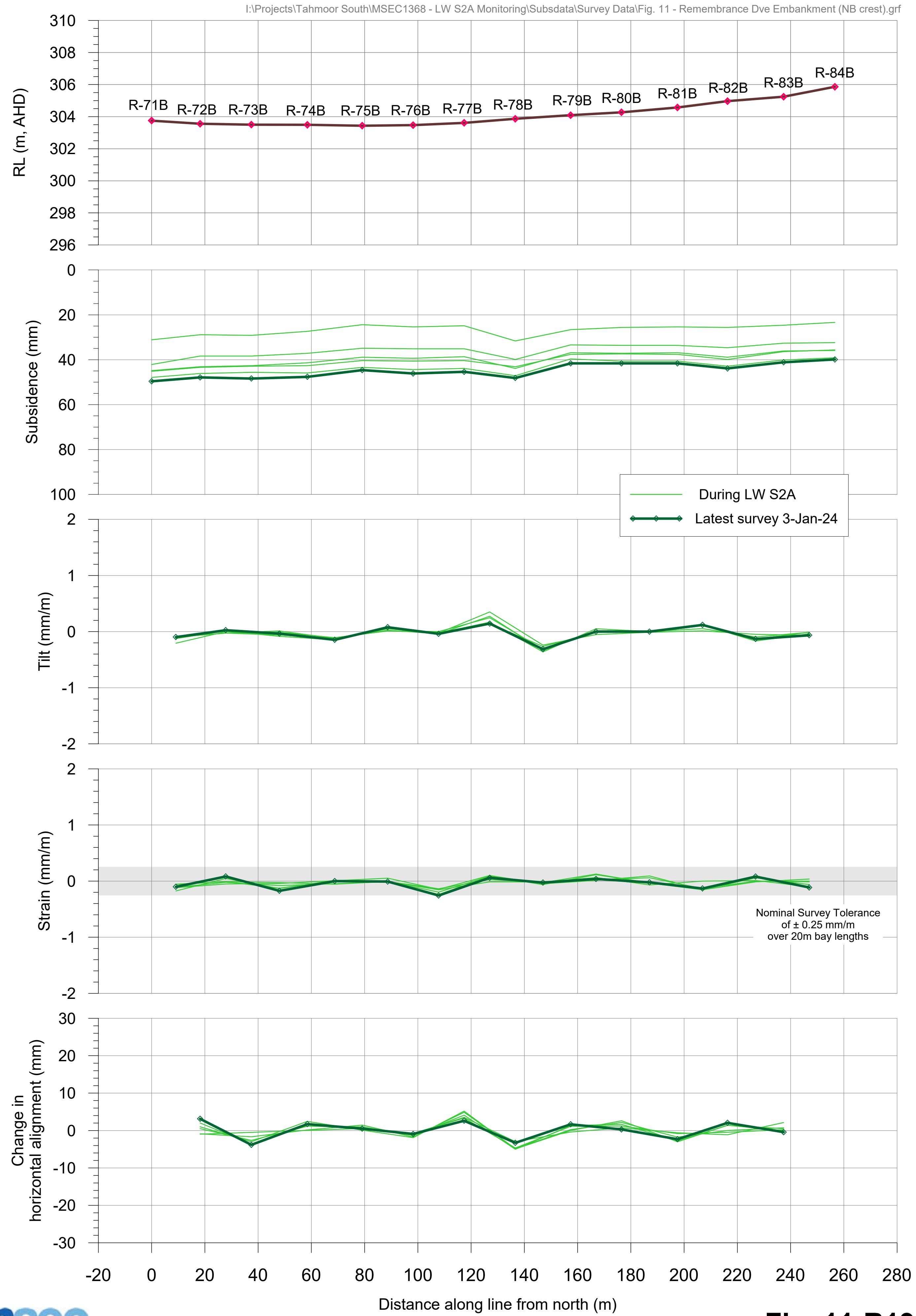
Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental subsidence profiles along southbound toe



msec

Fig. 10-R19

Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental subsidence profiles along northbound crest



msec

Fig. 11-R19

Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental subsidence profiles along northbound toe

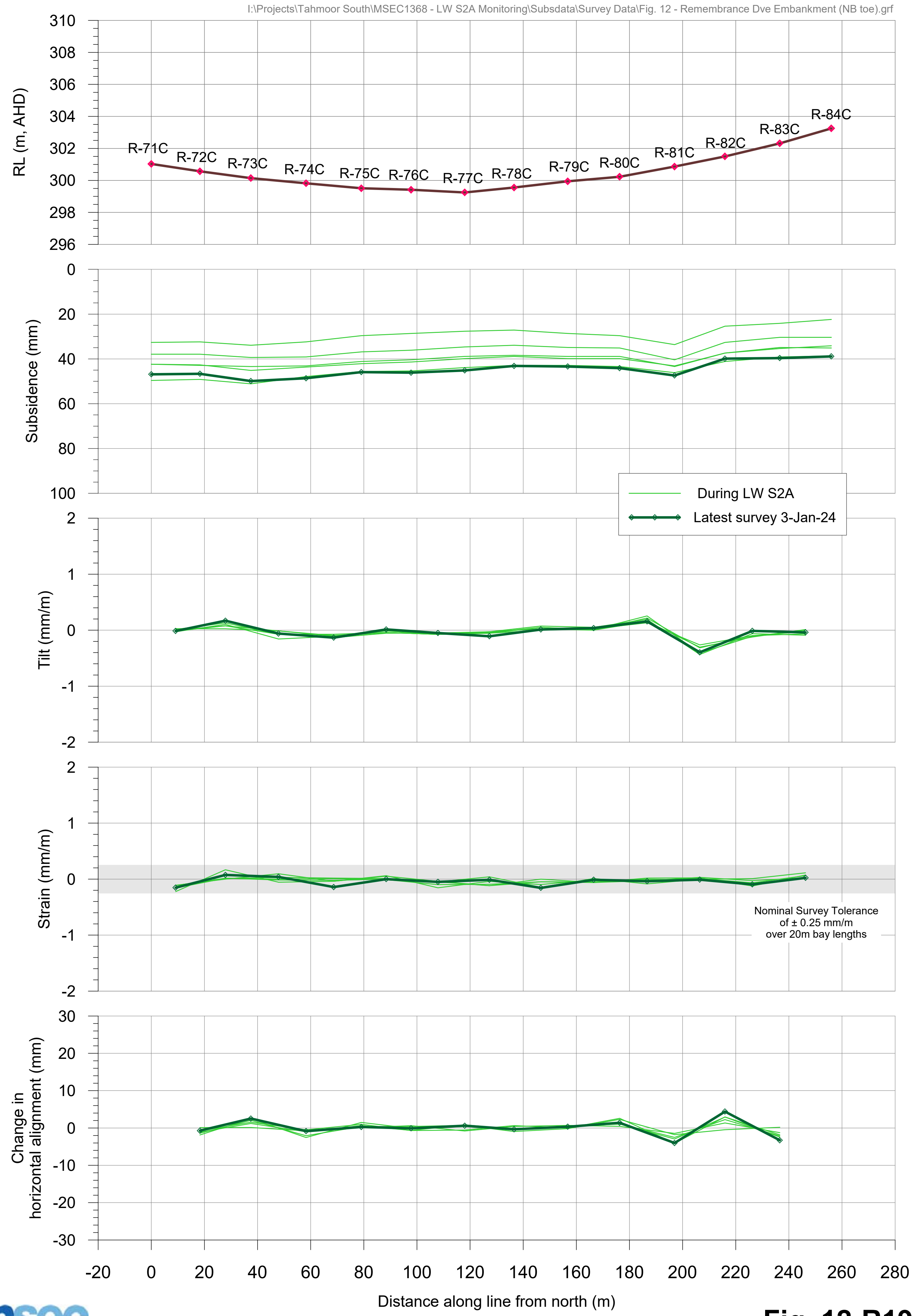


Fig. 12-R19

Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental subsidence profiles along southbound fence

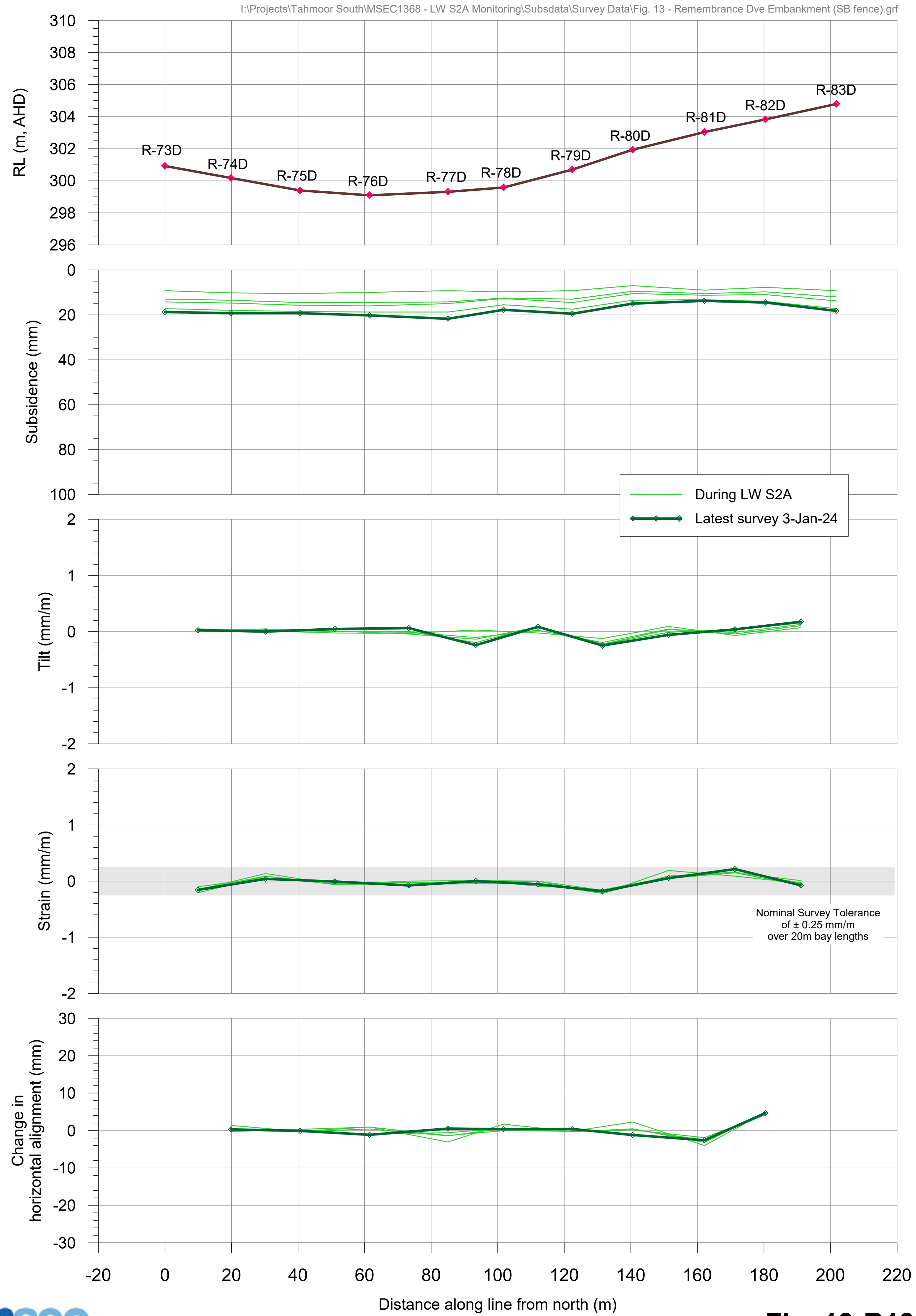


Fig. 13-R19

Tahmoor South LW S2A - Remembrance Drive Embankment
Incremental closure across the embankment

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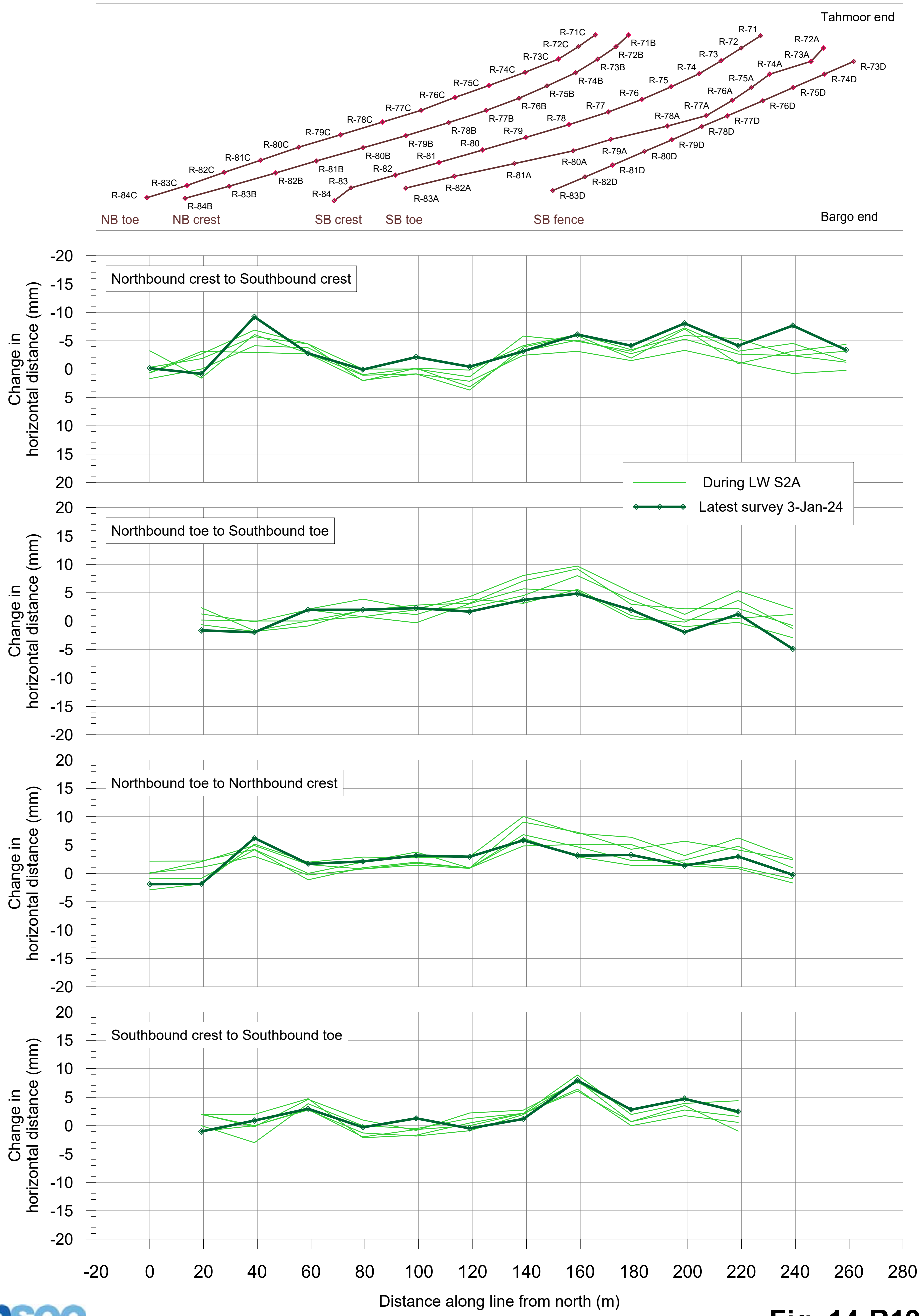
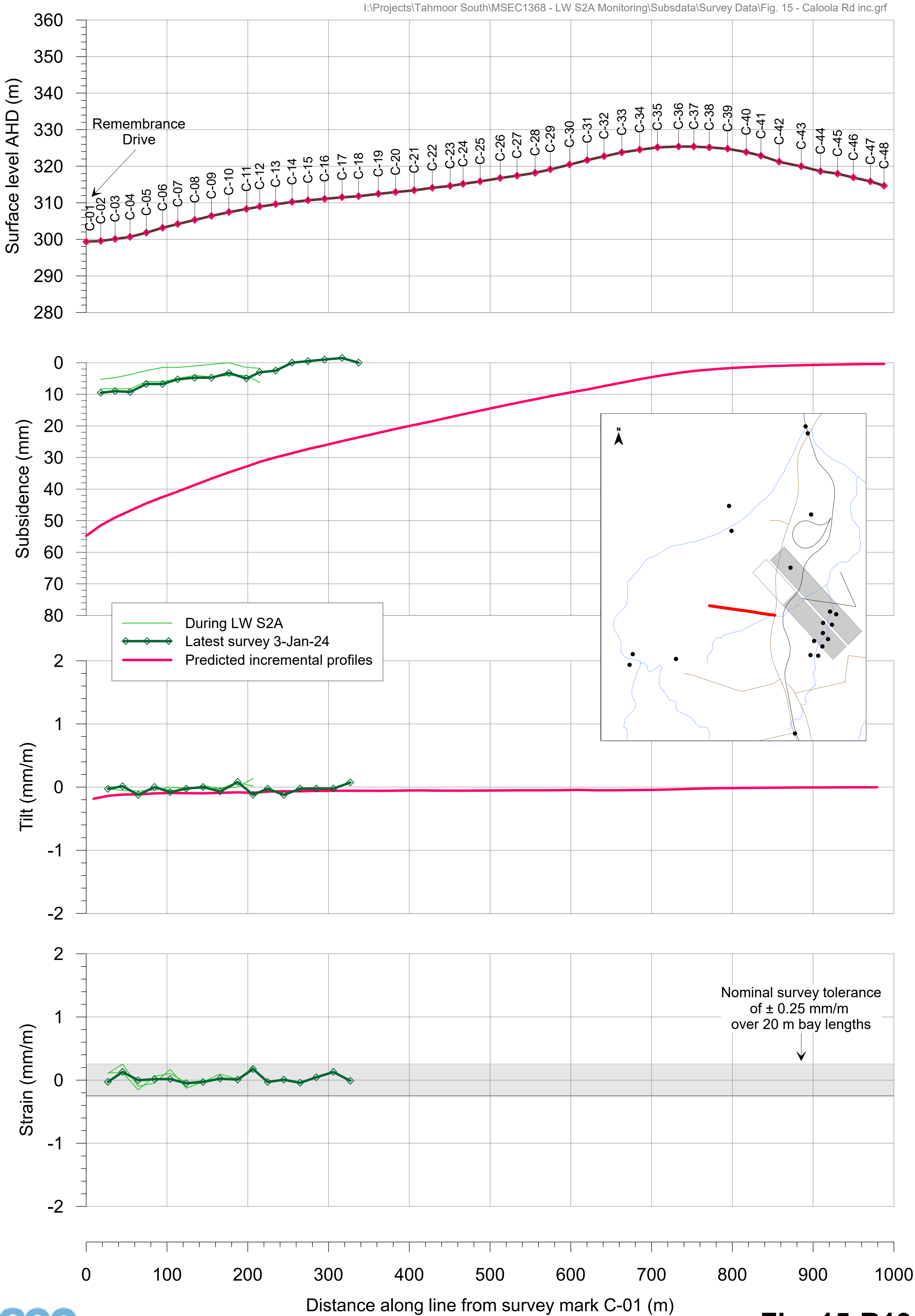


Fig. 14-R19

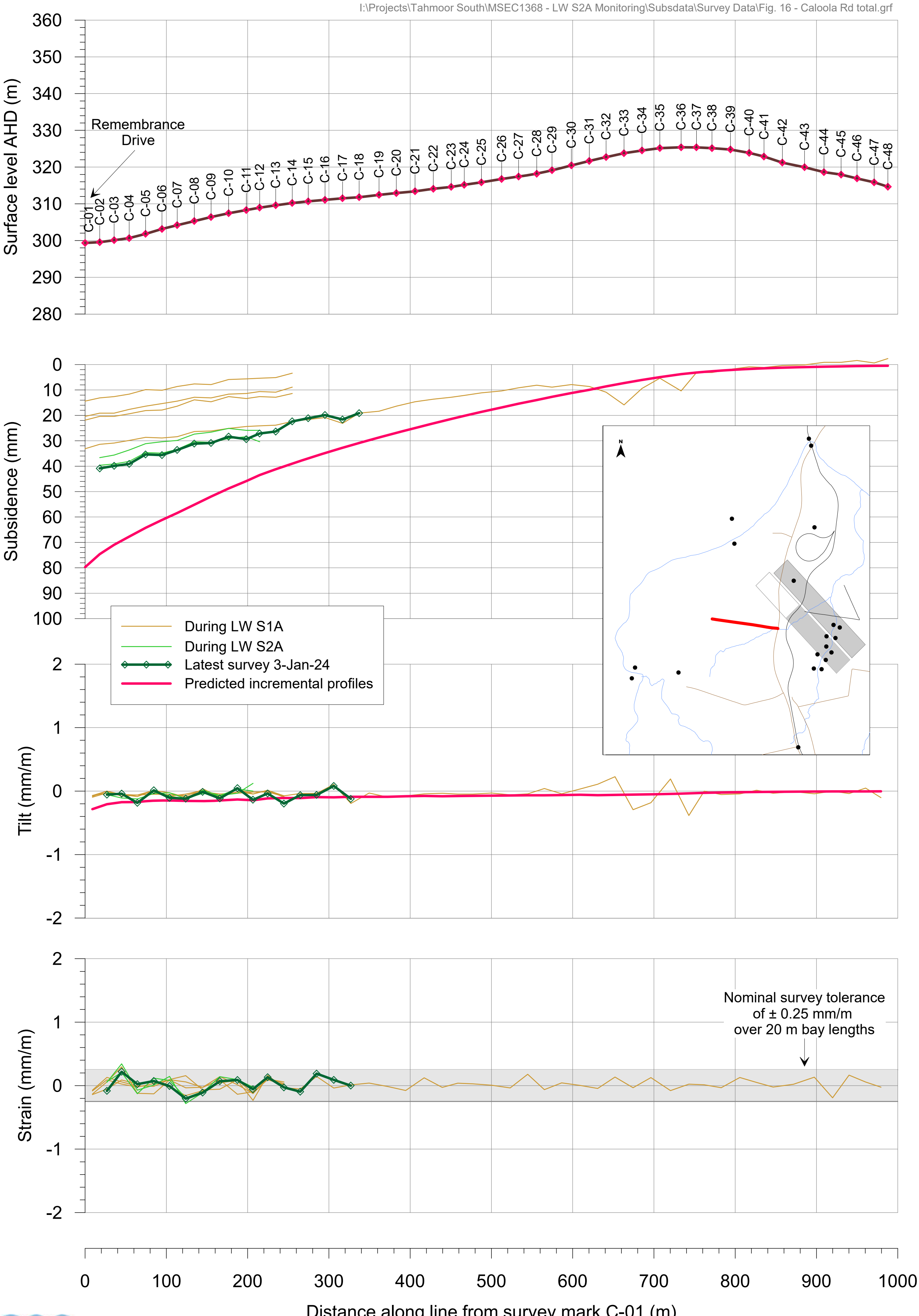
Tahmoor South LW S2A
Incremental subsidence profiles along Caloola Road



msec

Fig. 15-R19

Tahmoor South LW S2A
Total subsidence profiles along Caloola Road



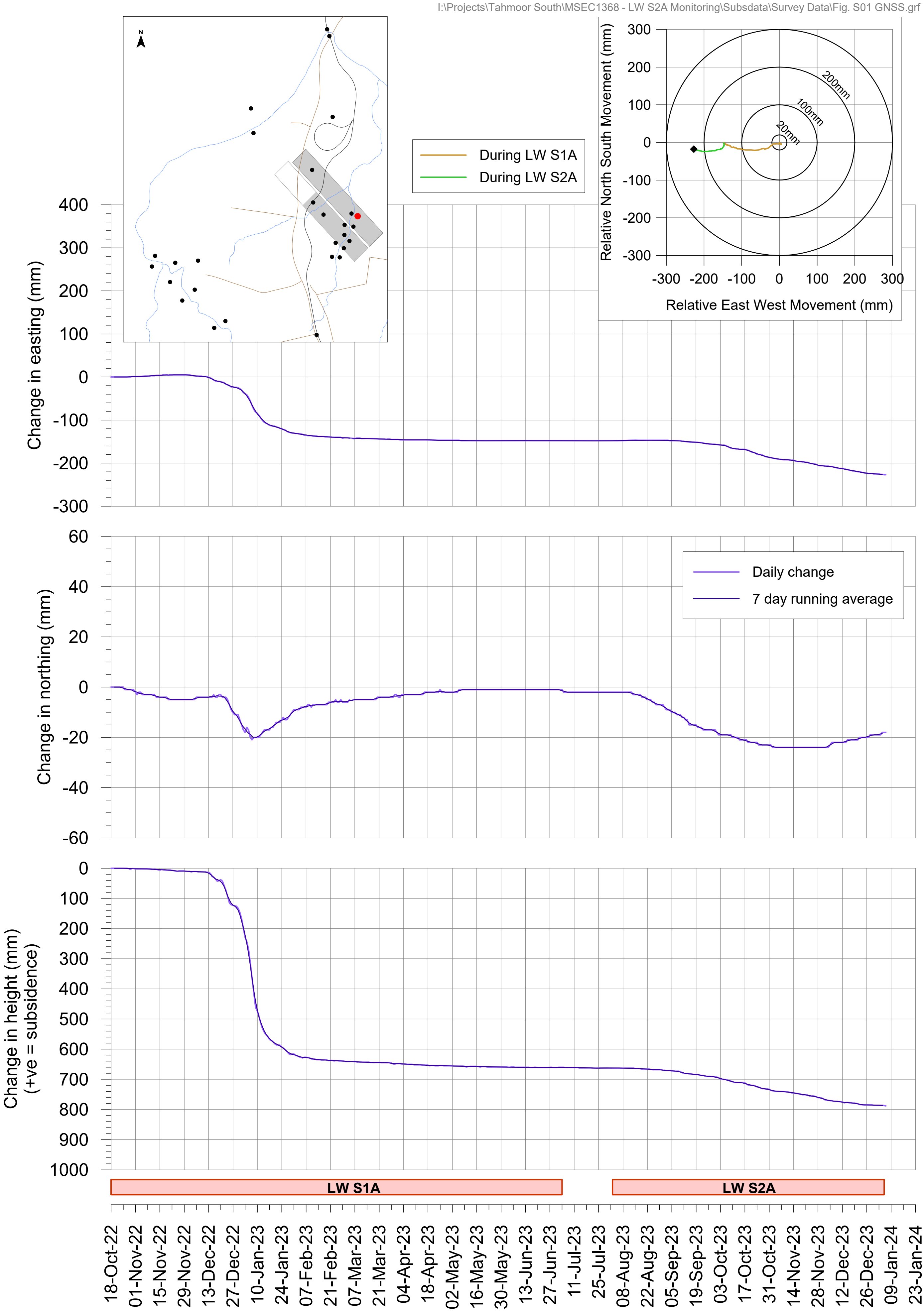
msec

Fig. 16-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S01 above LW S1A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S01 GNSS.grf



msec

Fig. S01-R19

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

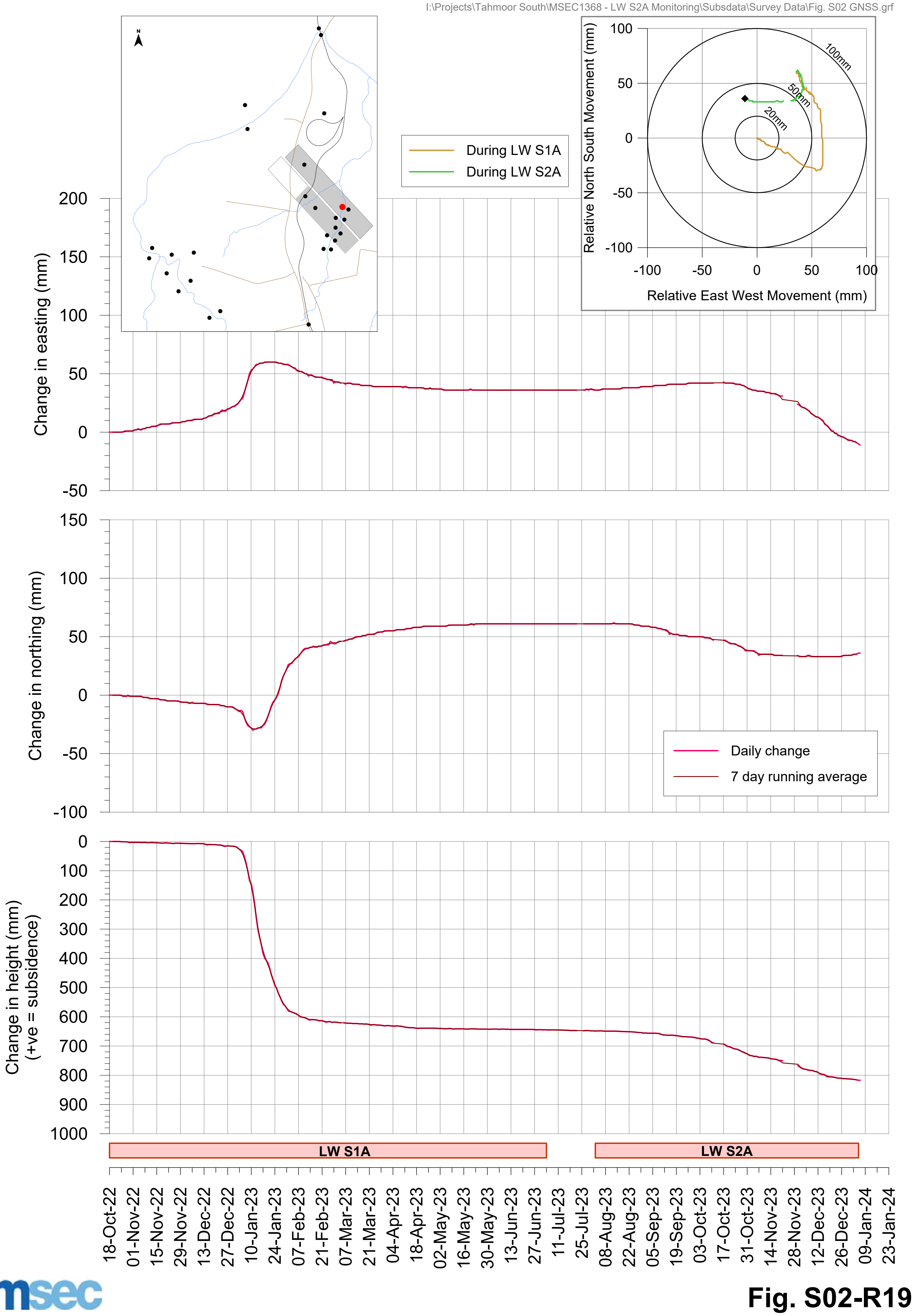
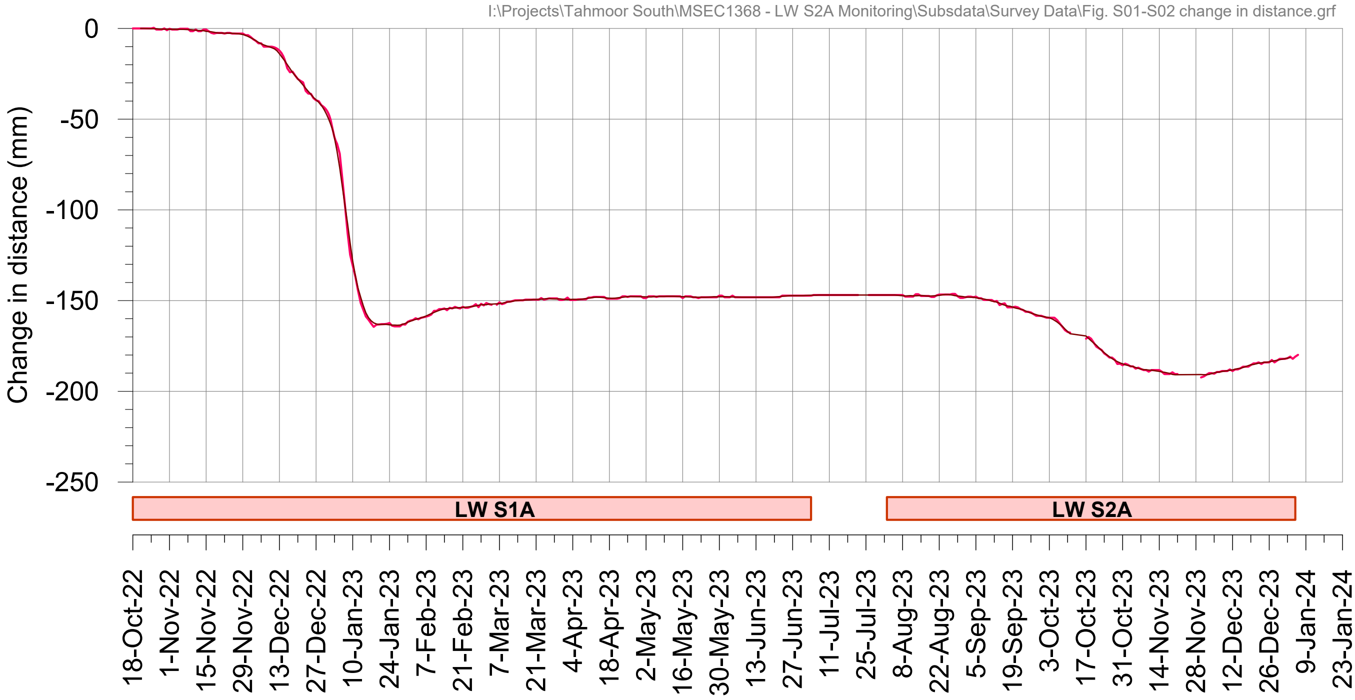


Fig. S02-R19

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



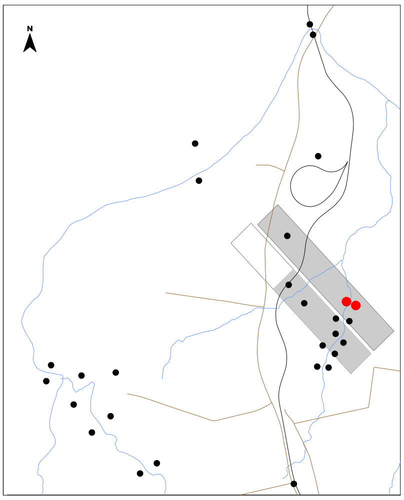
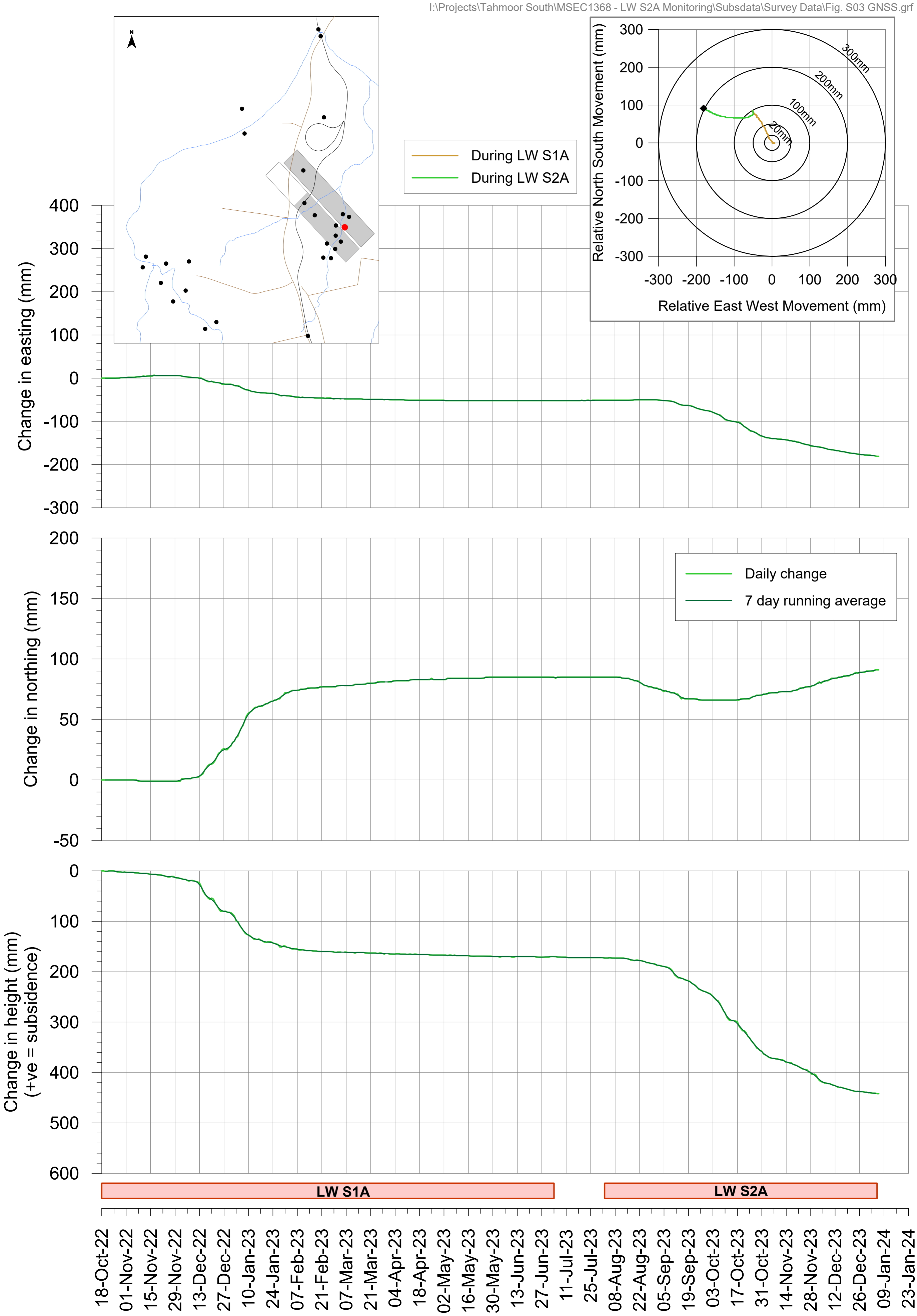


Fig. S01-S02-R19

Tahmoor South LW S2A - GNSS Monitoring
Site S03 above LW S1A at Teatree 3

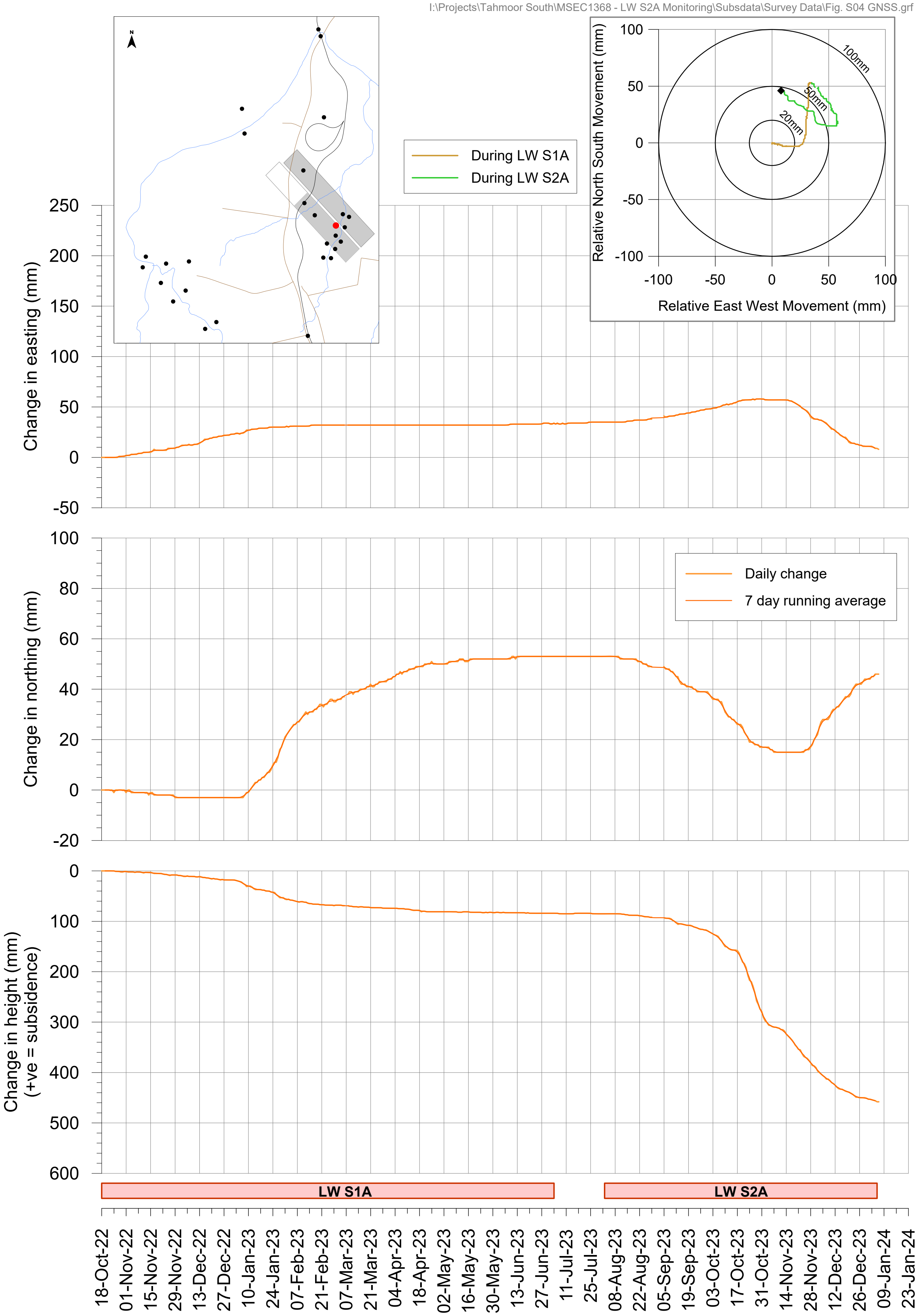


msec

Fig. S03-R19

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

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S04 GNSS.grf

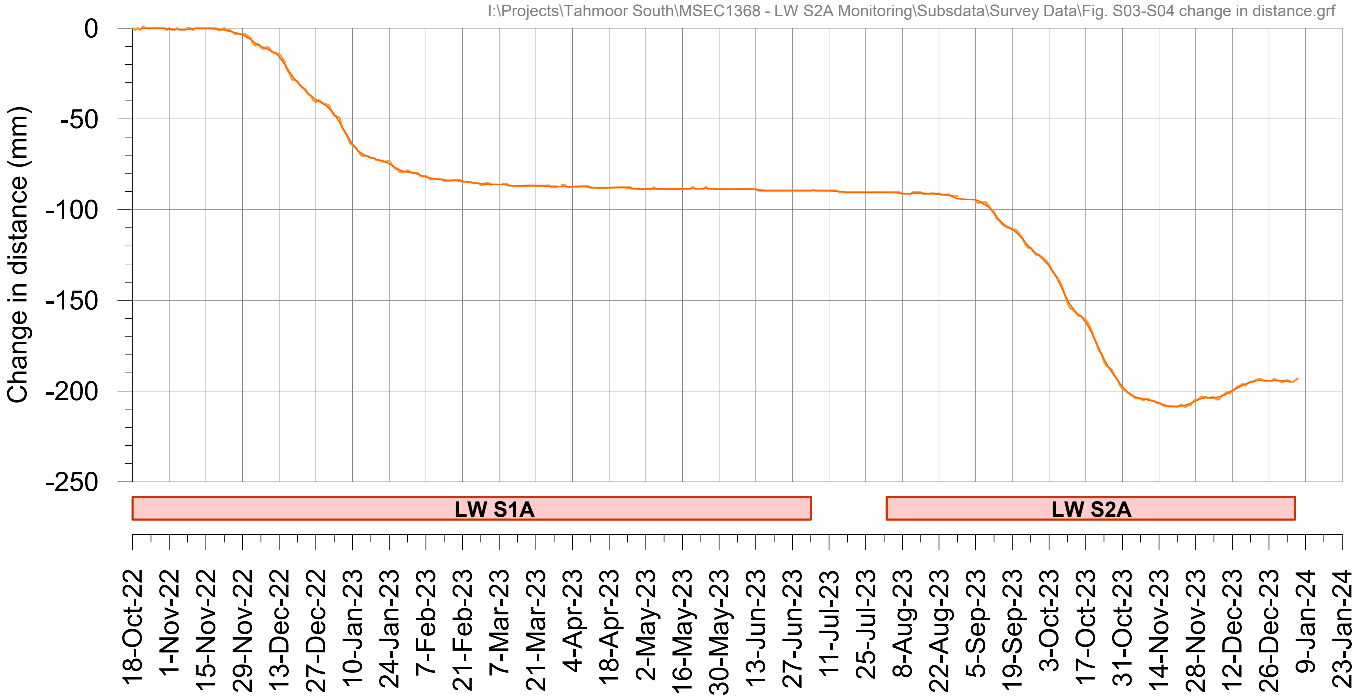


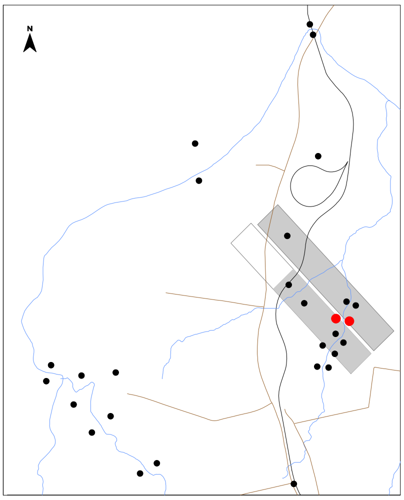
msec

Fig. S04-R19

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

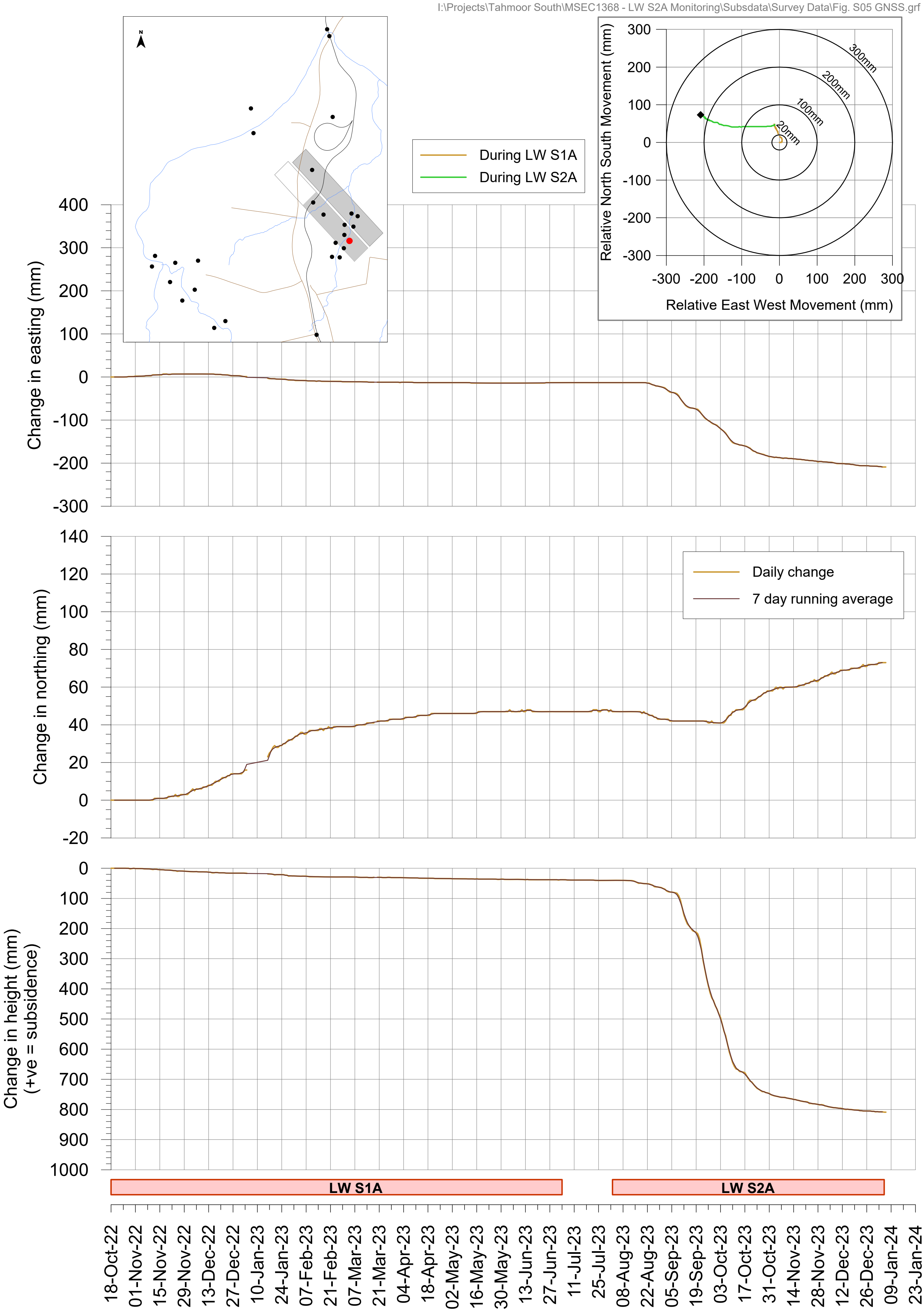




msec

Fig. S03-S04-R19

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



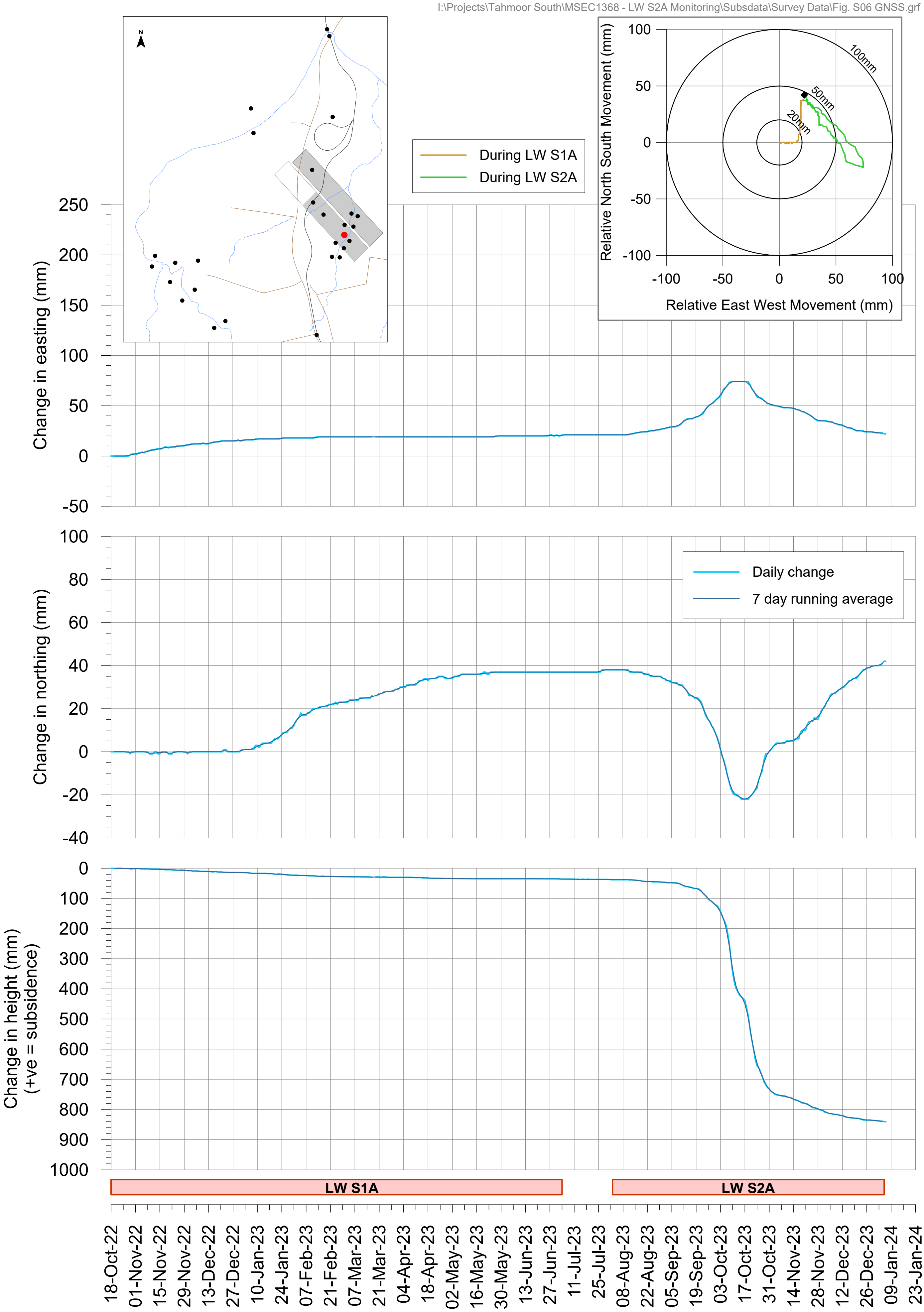
msec

Fig. S05-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S06 above LW S2A

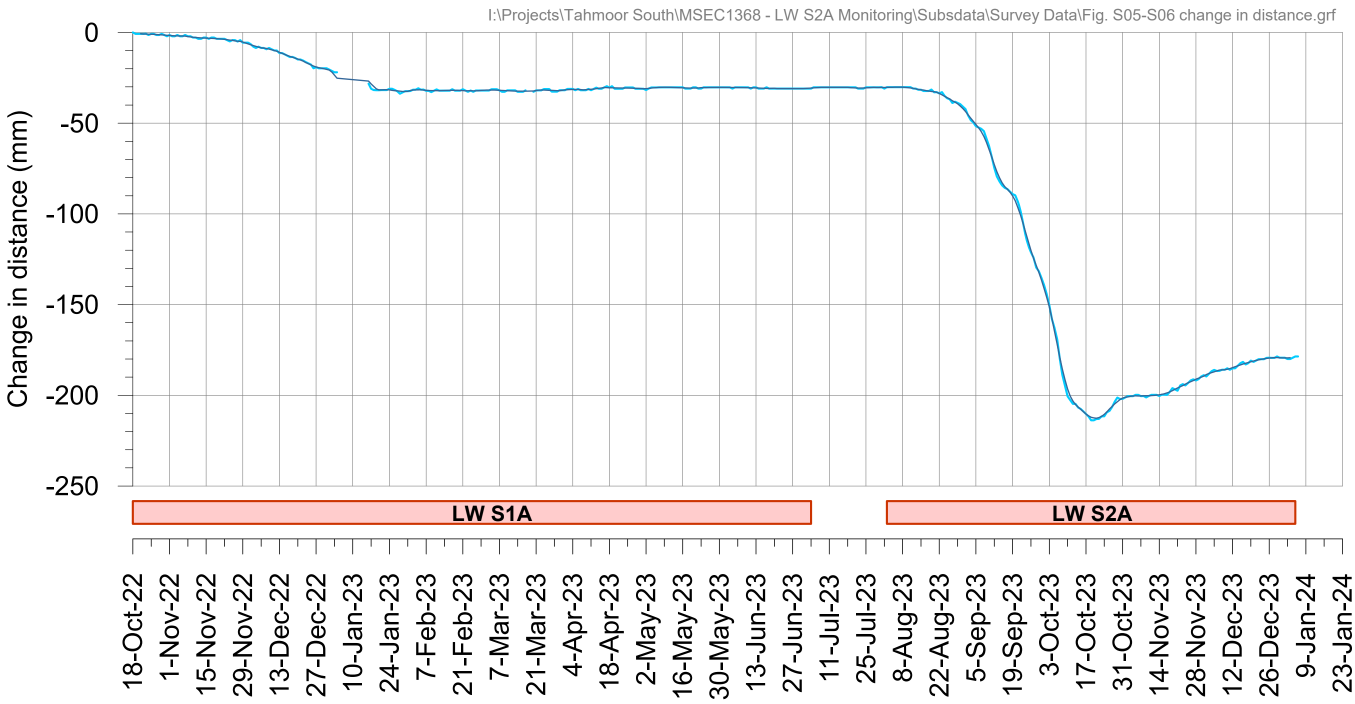
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S06 GNSS.grf

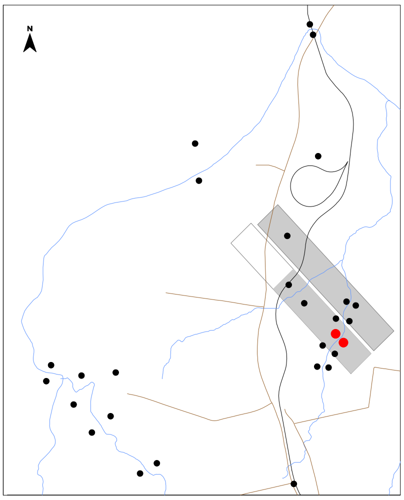


msec

Fig. S06-R19

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





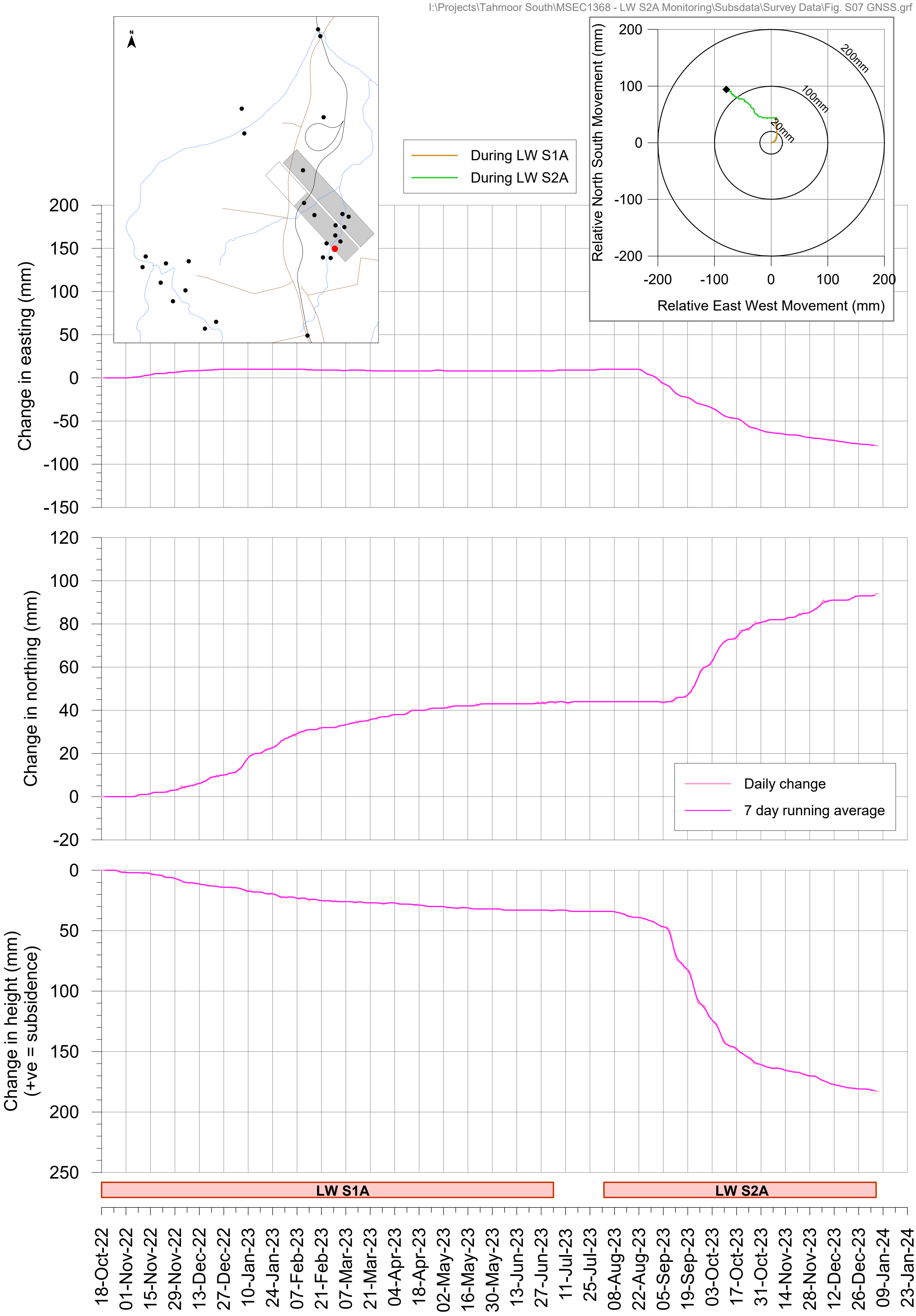
msec

Fig. S05-S06-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S07 above LW S2A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S07 GNSS.grf



msec

Fig. S07-R19

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

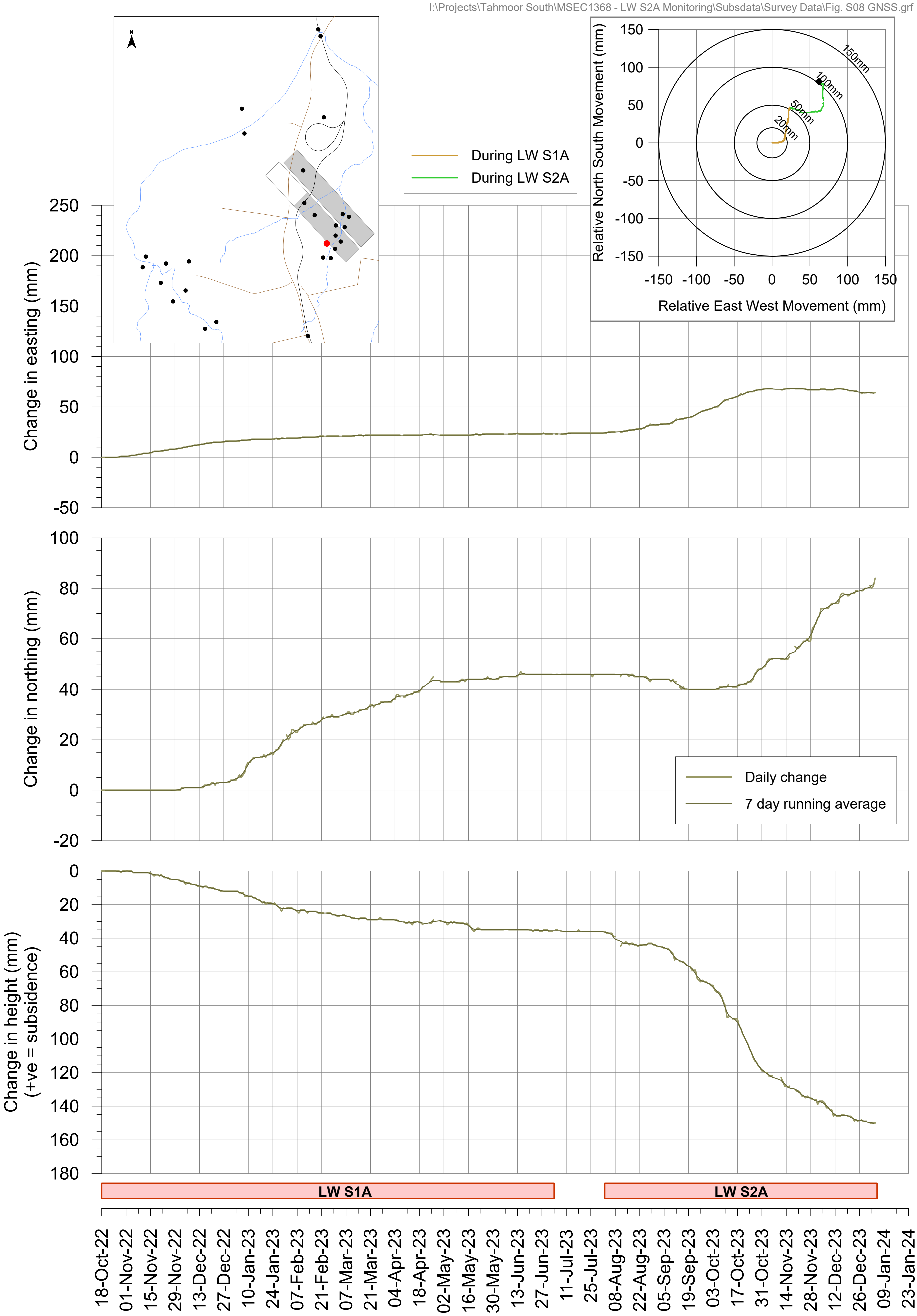
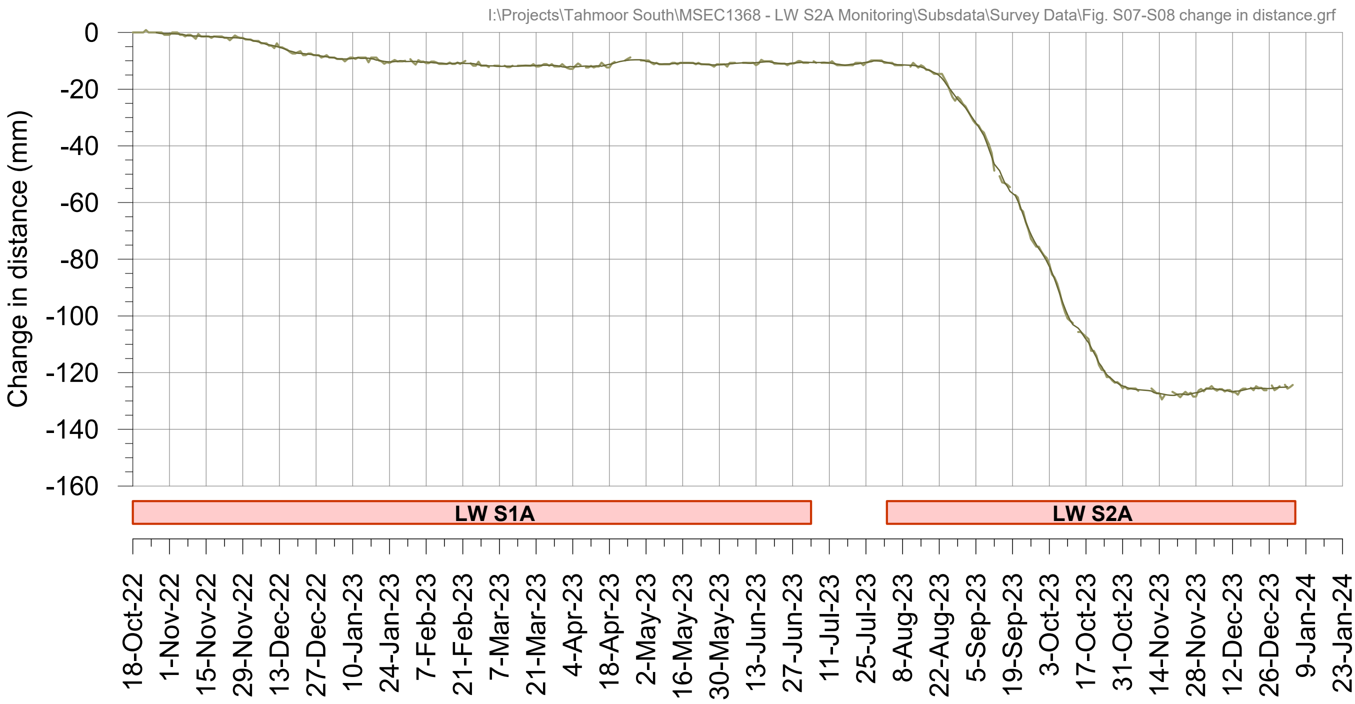


Fig. S08-R19

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



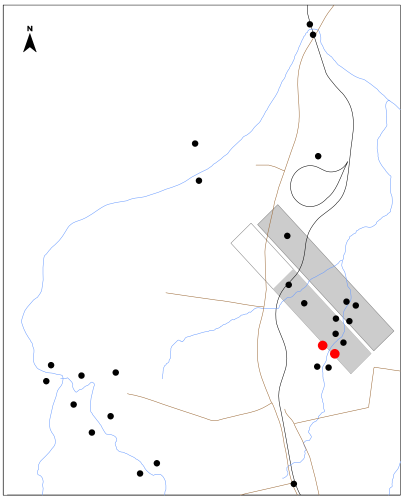
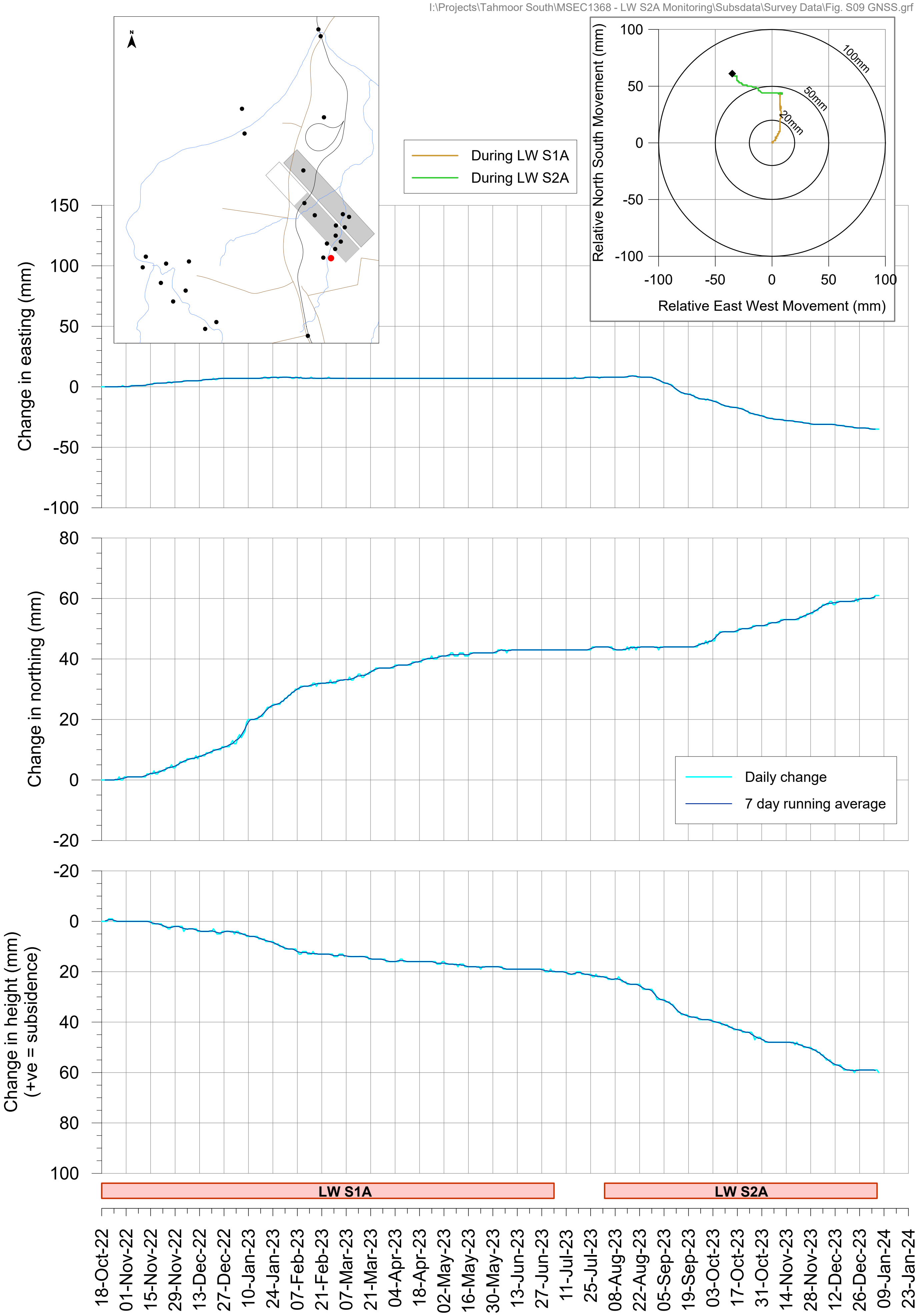


Fig. S07-S08-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S09 above LW S3A at Teatree 2

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S09 GNSS.grf

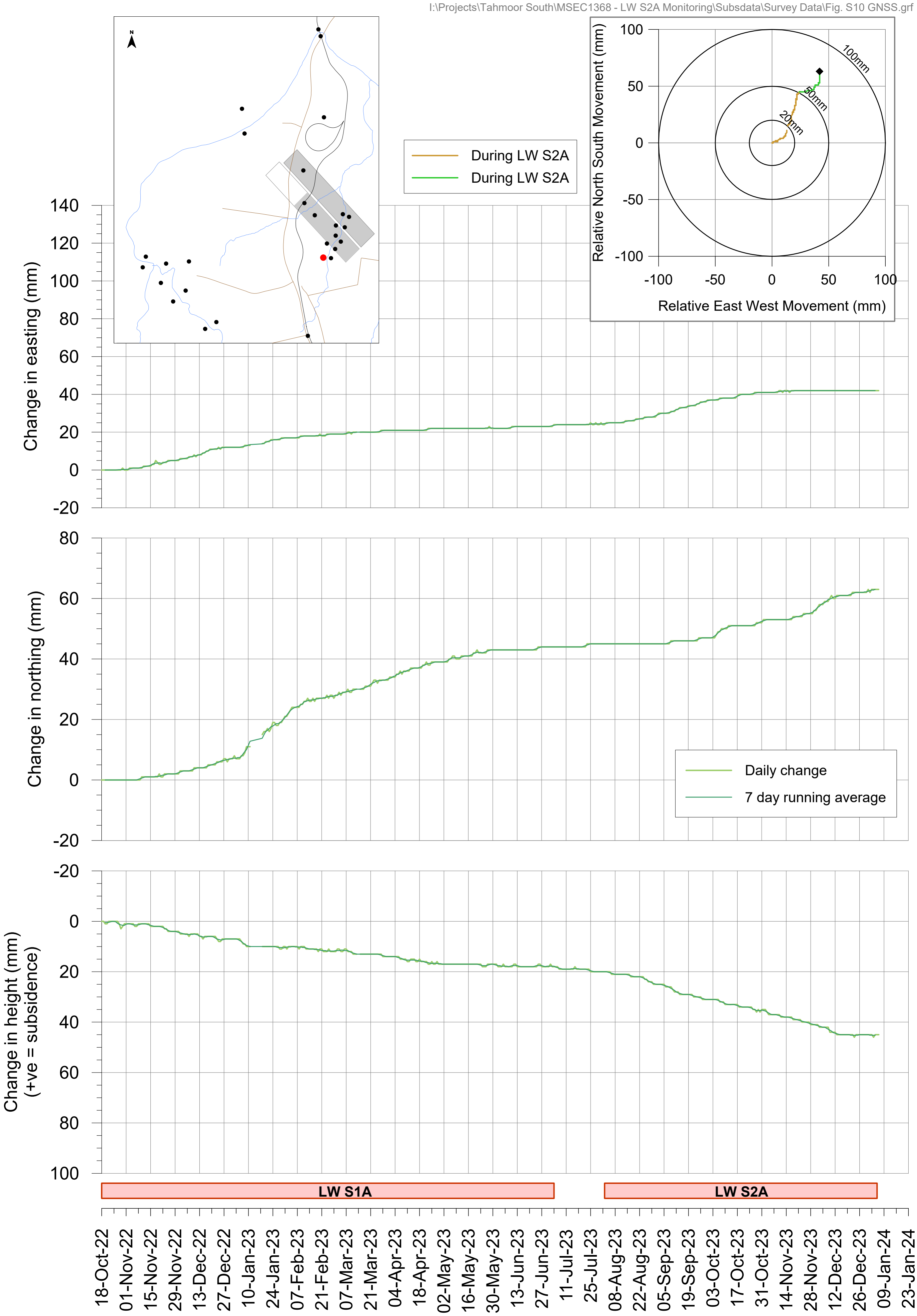


msec

Fig. S09-R19

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

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S10 GNSS.grf

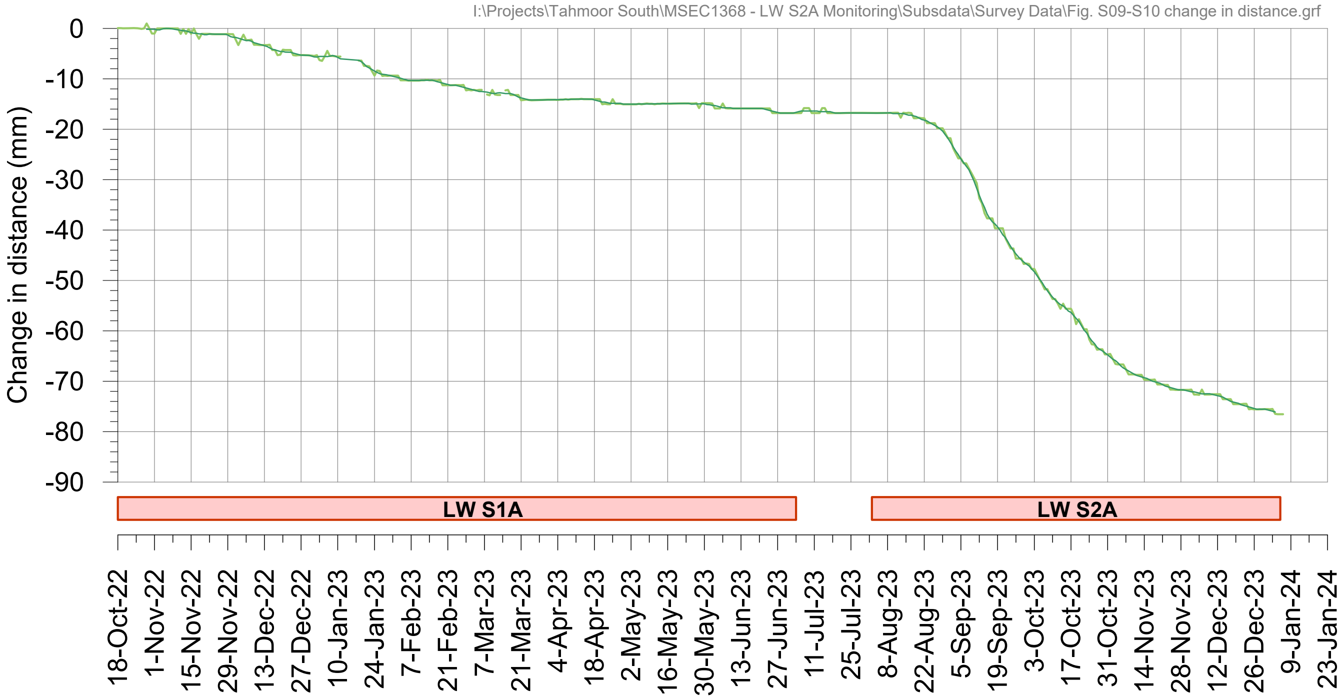


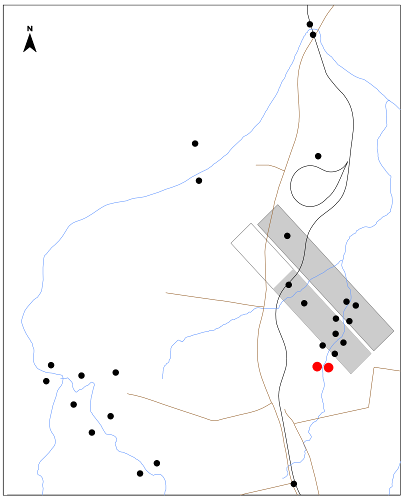
msec

Fig. S10-R19

Tahmoor South LW S2A - GNSS Monitoring

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



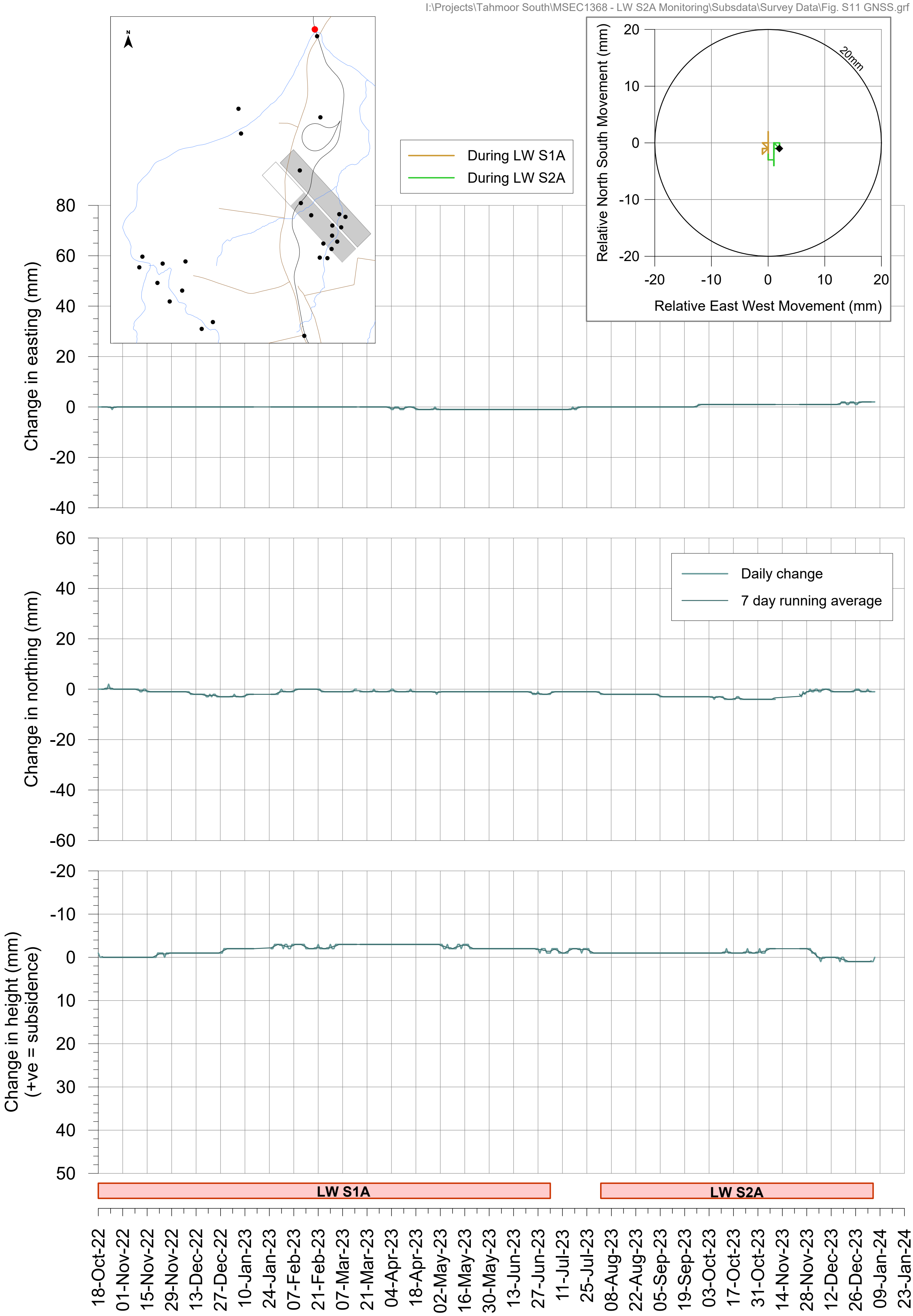


msec

Fig. S09-S10-R19

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

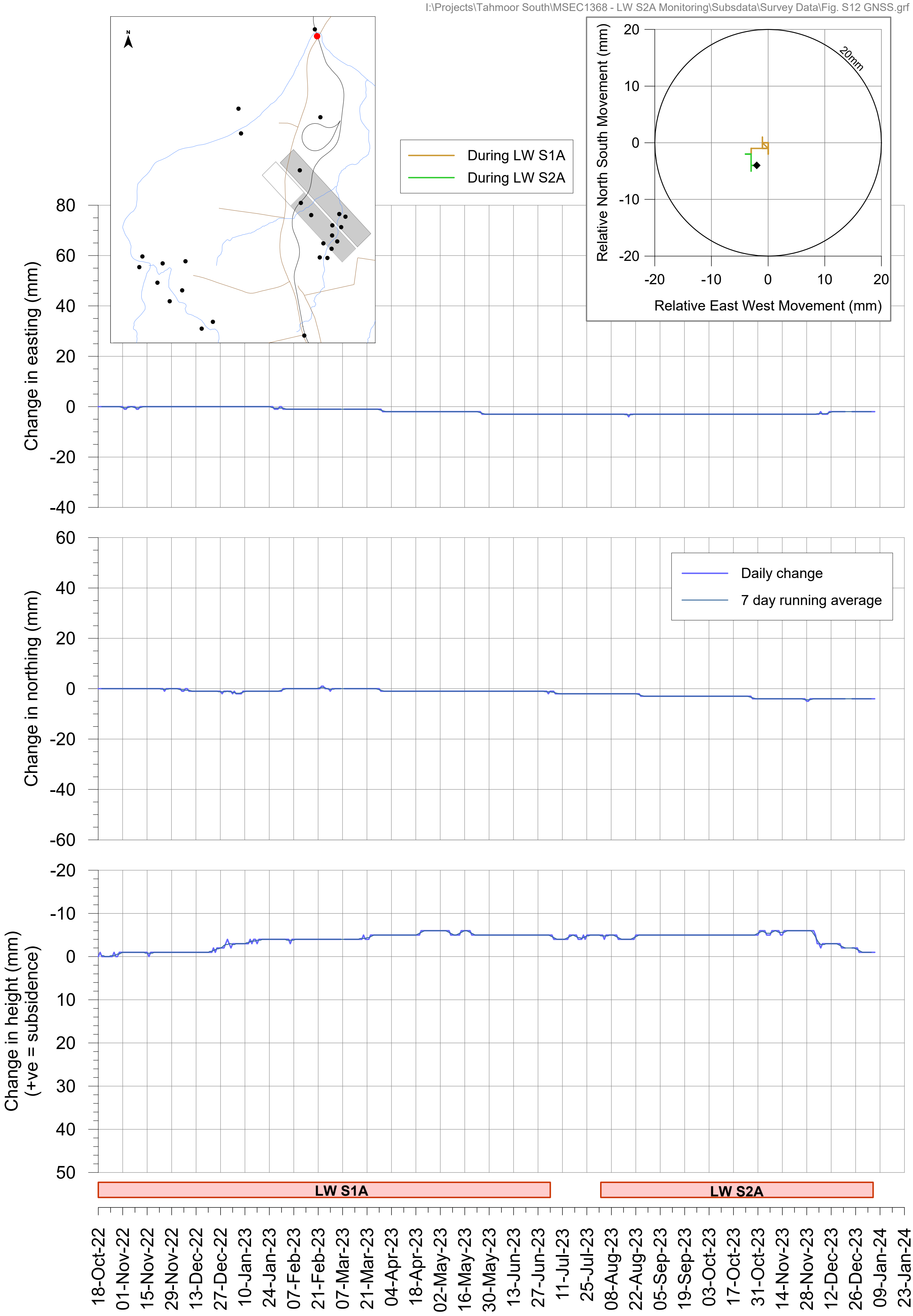


msec

Fig. S11-R19

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

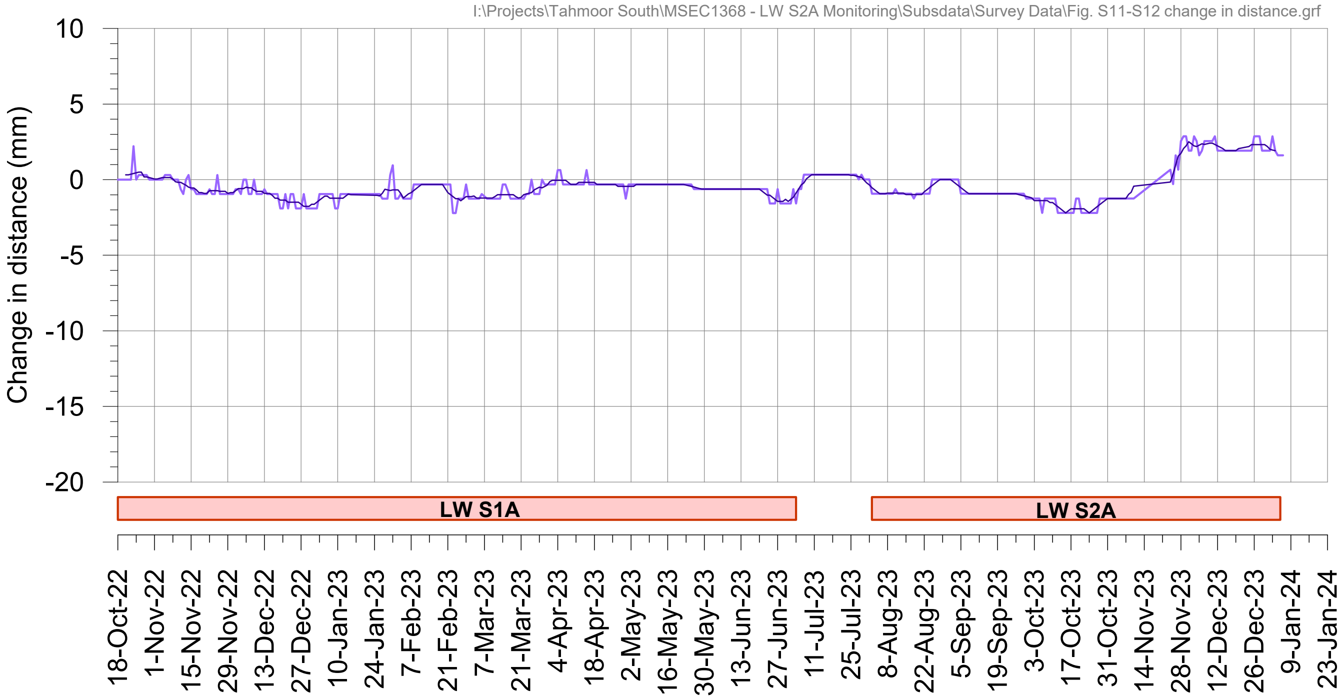


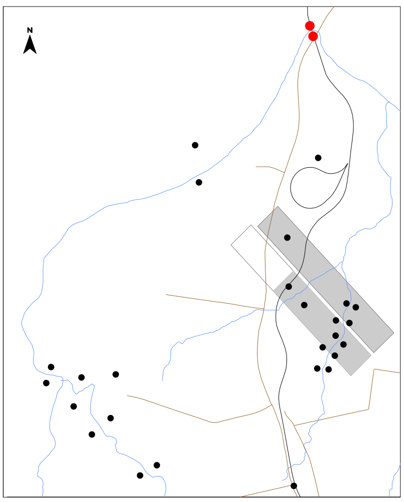
msec

Fig. S12-R19

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Railway Viaduct over Bargo River
Sites S11 and S12

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S11-S12 change in distance.grf

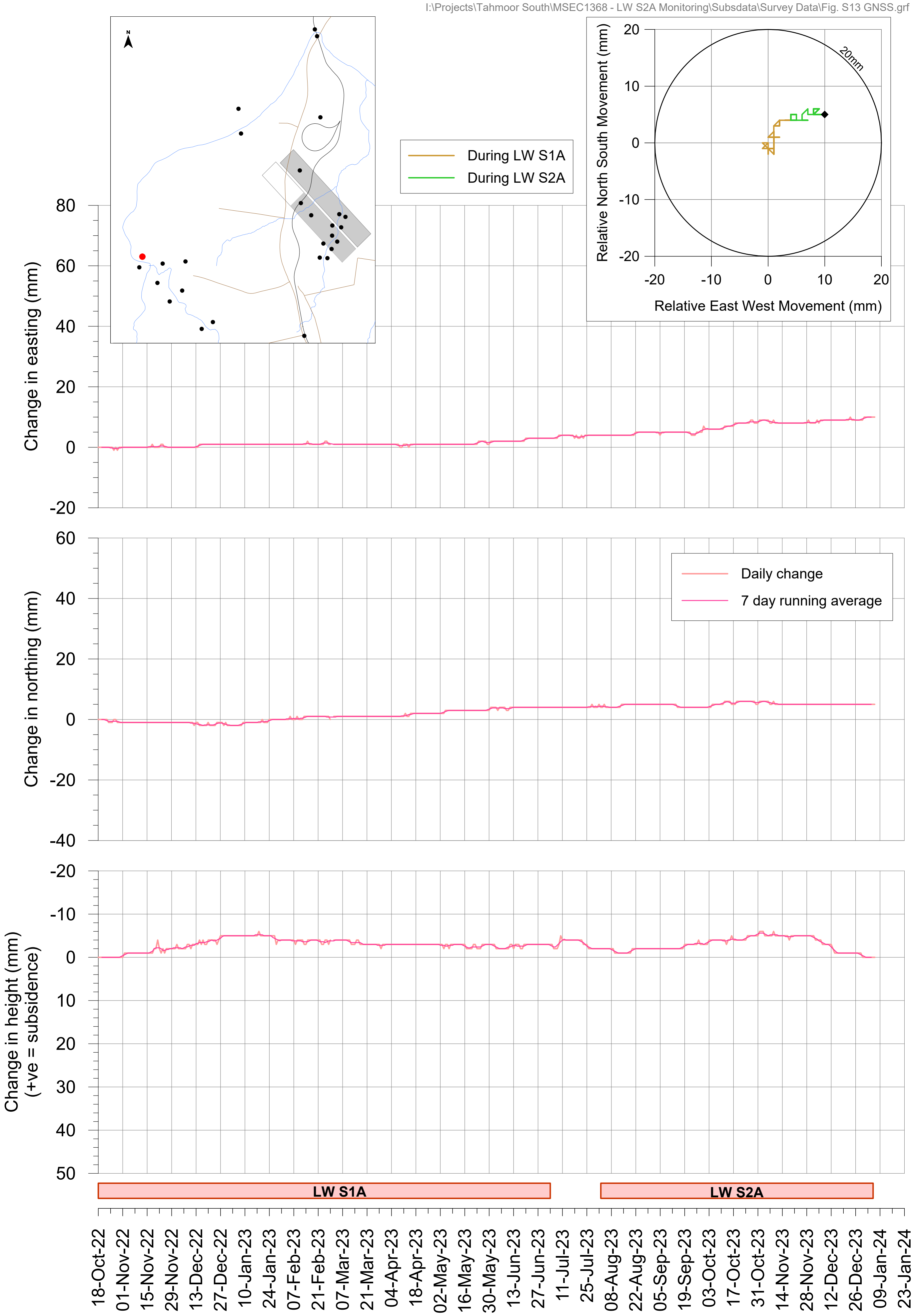




msec

Fig. S11-S12-R19

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



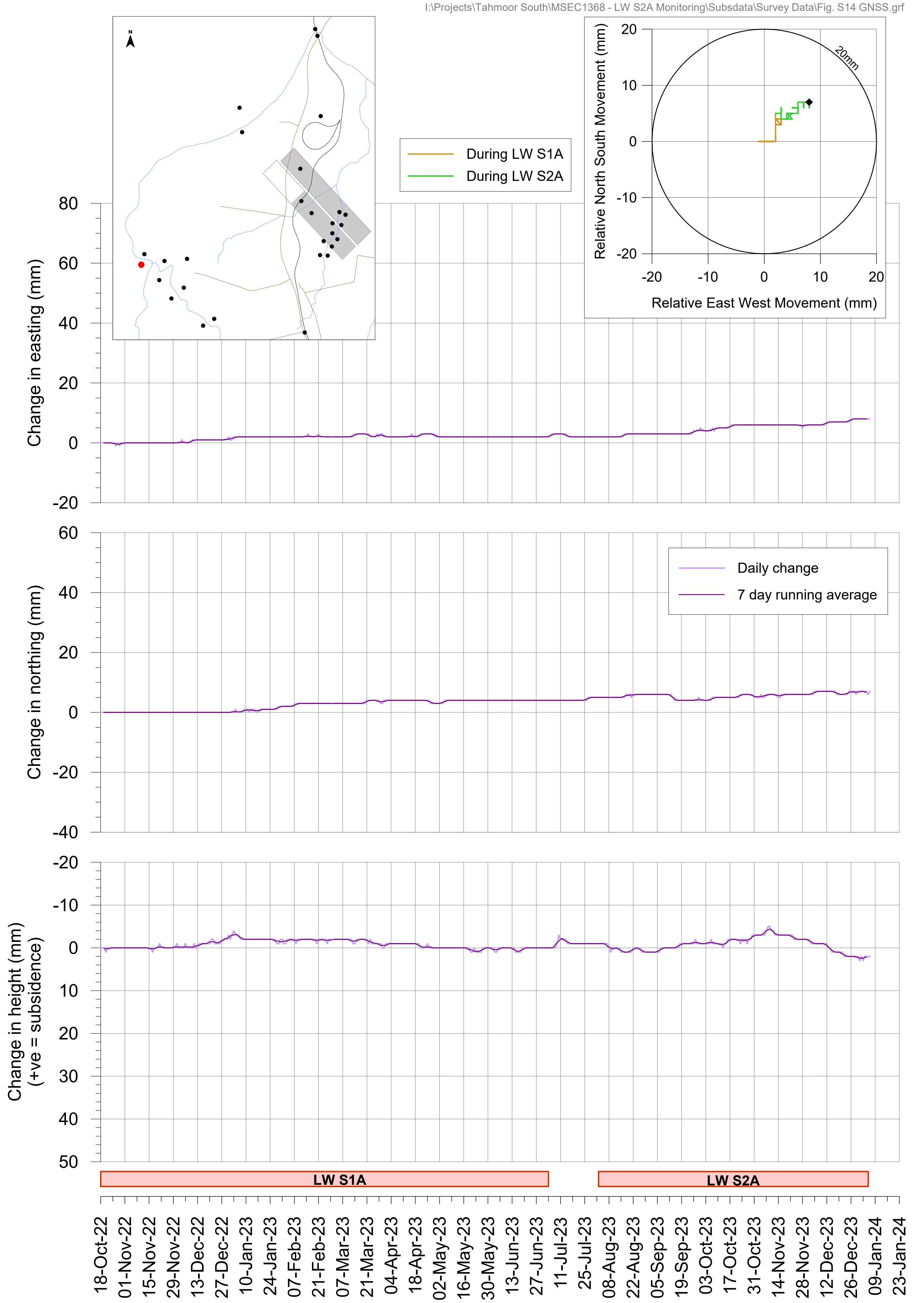
msec

Fig. S13-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S14 on southern side of Picton Weir

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S14 GNSS.grf

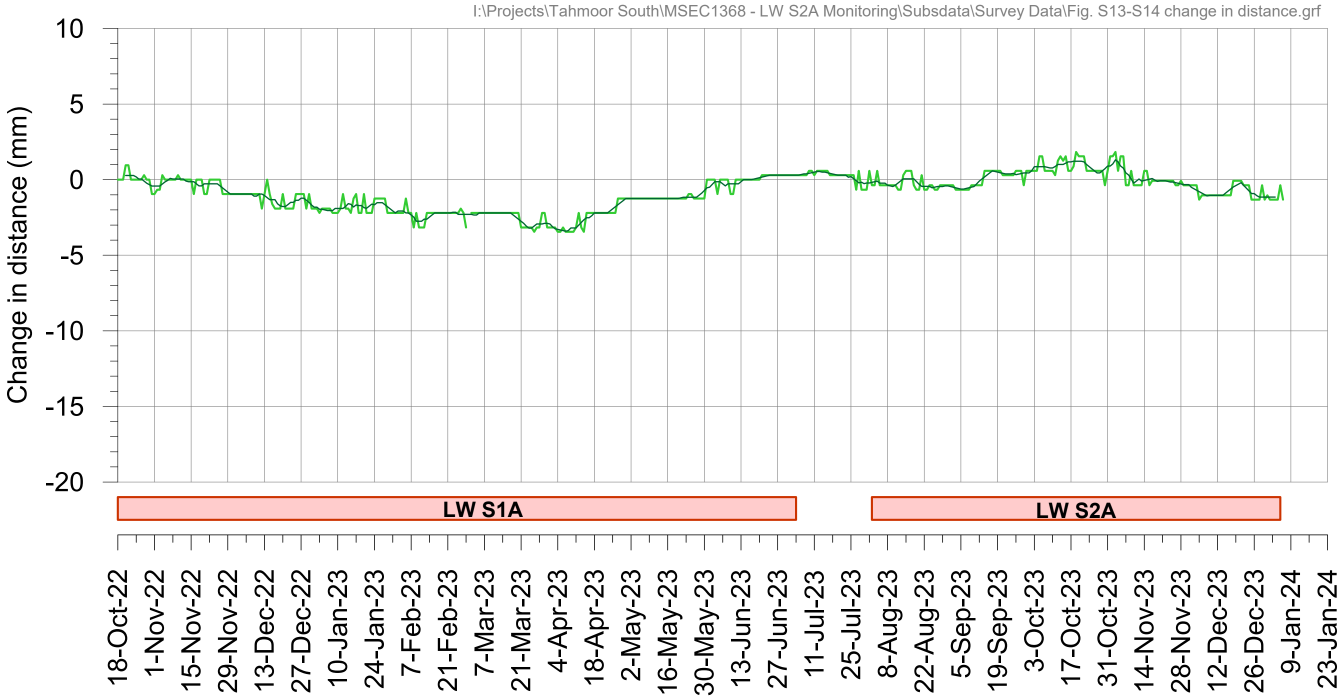


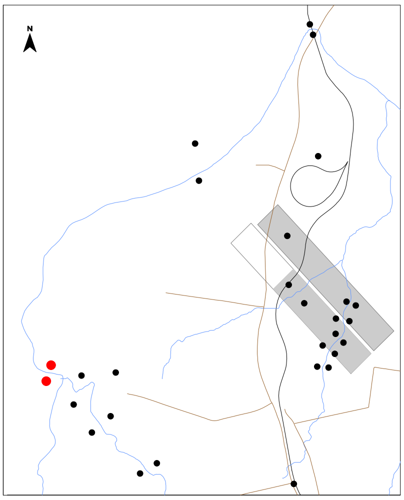
msec

Fig. S14-R19

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Picton Weir
Sites S13 and S14

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S13-S14 change in distance.grf



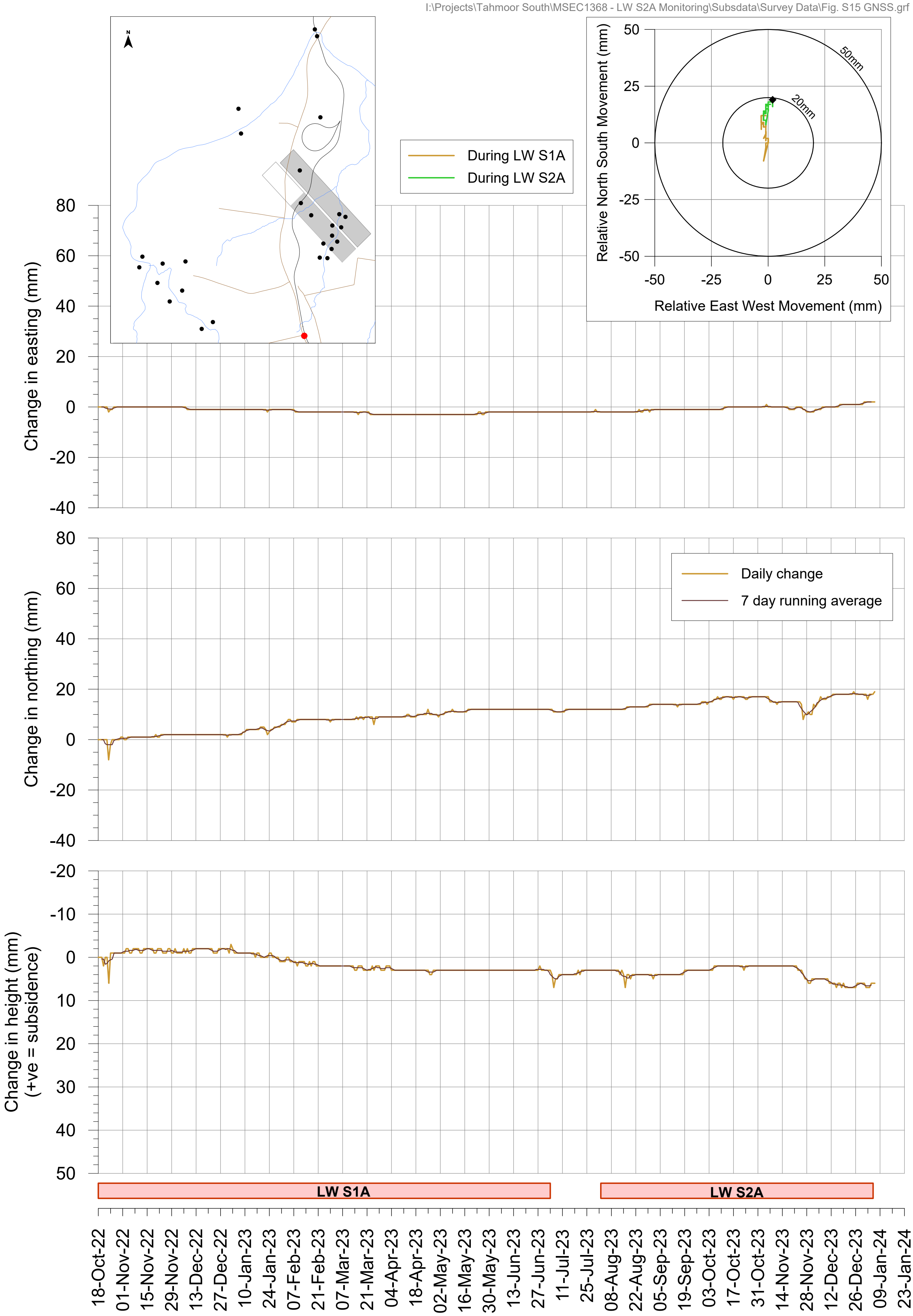


msec

Fig. S13-S14-R19

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-R19

Tahmoor South LW S2A - GNSS Monitoring
Site S16 at Tahmoor Mine site

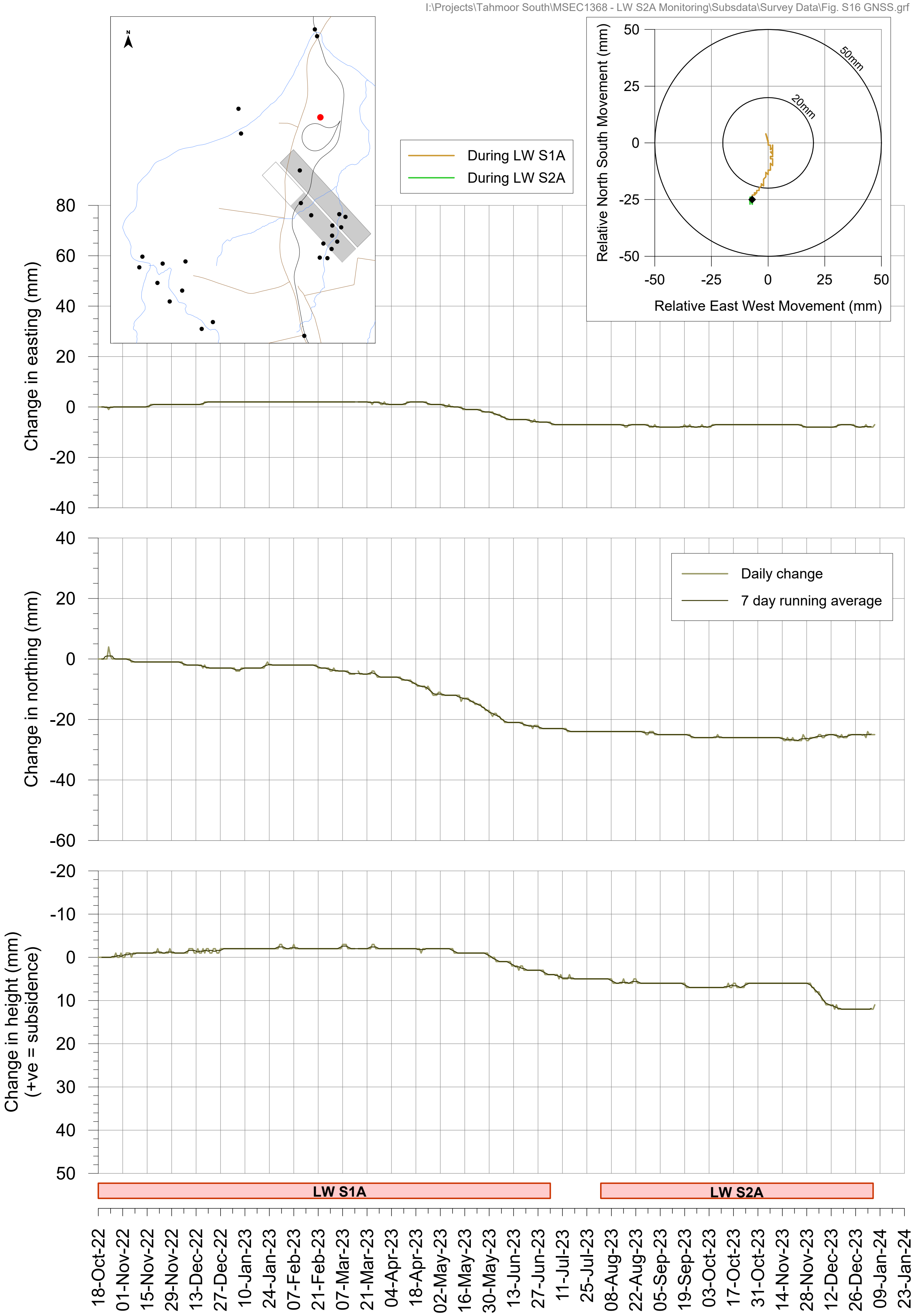
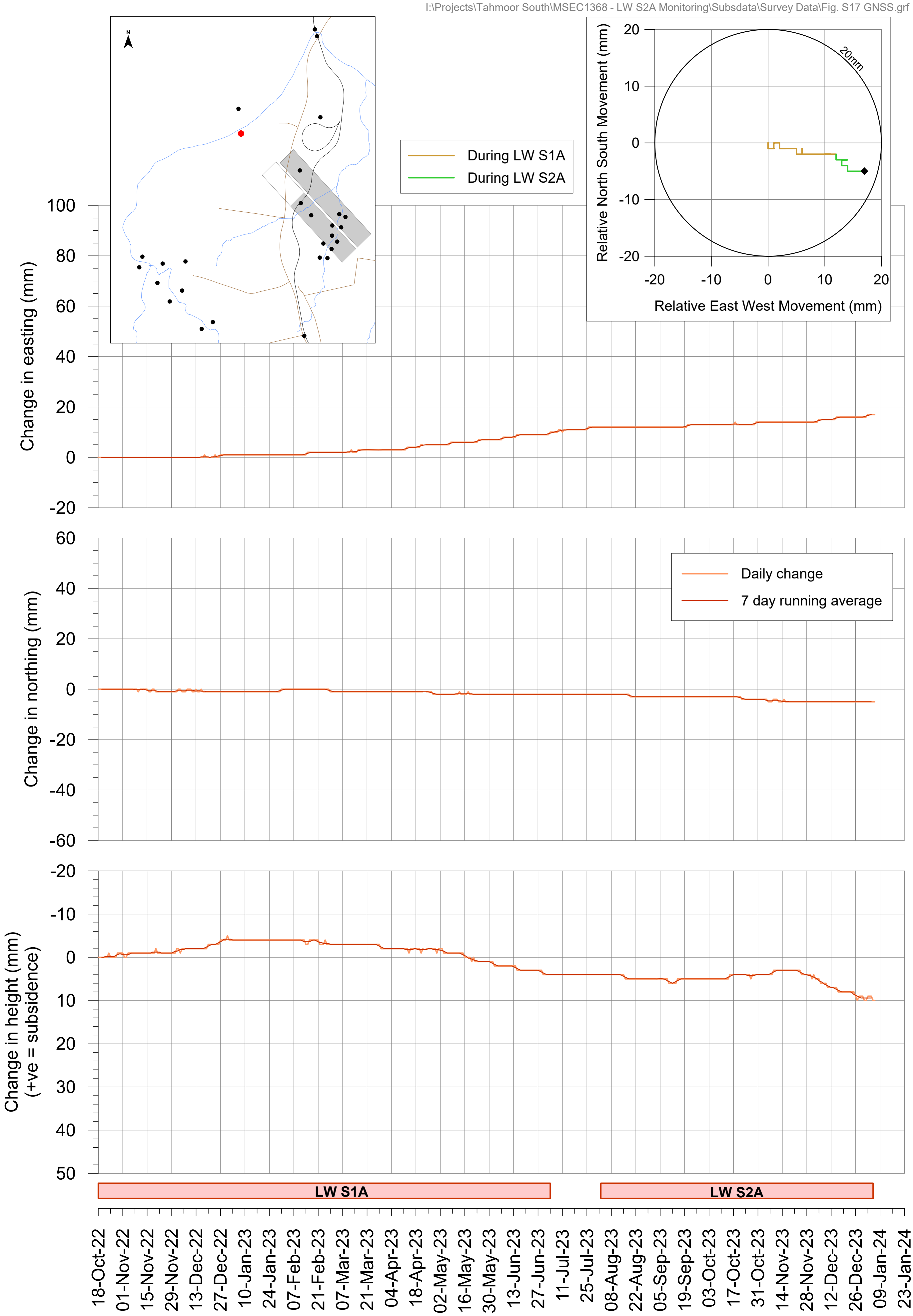


Fig. S16-R19

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



msec

Fig. S17-R19

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

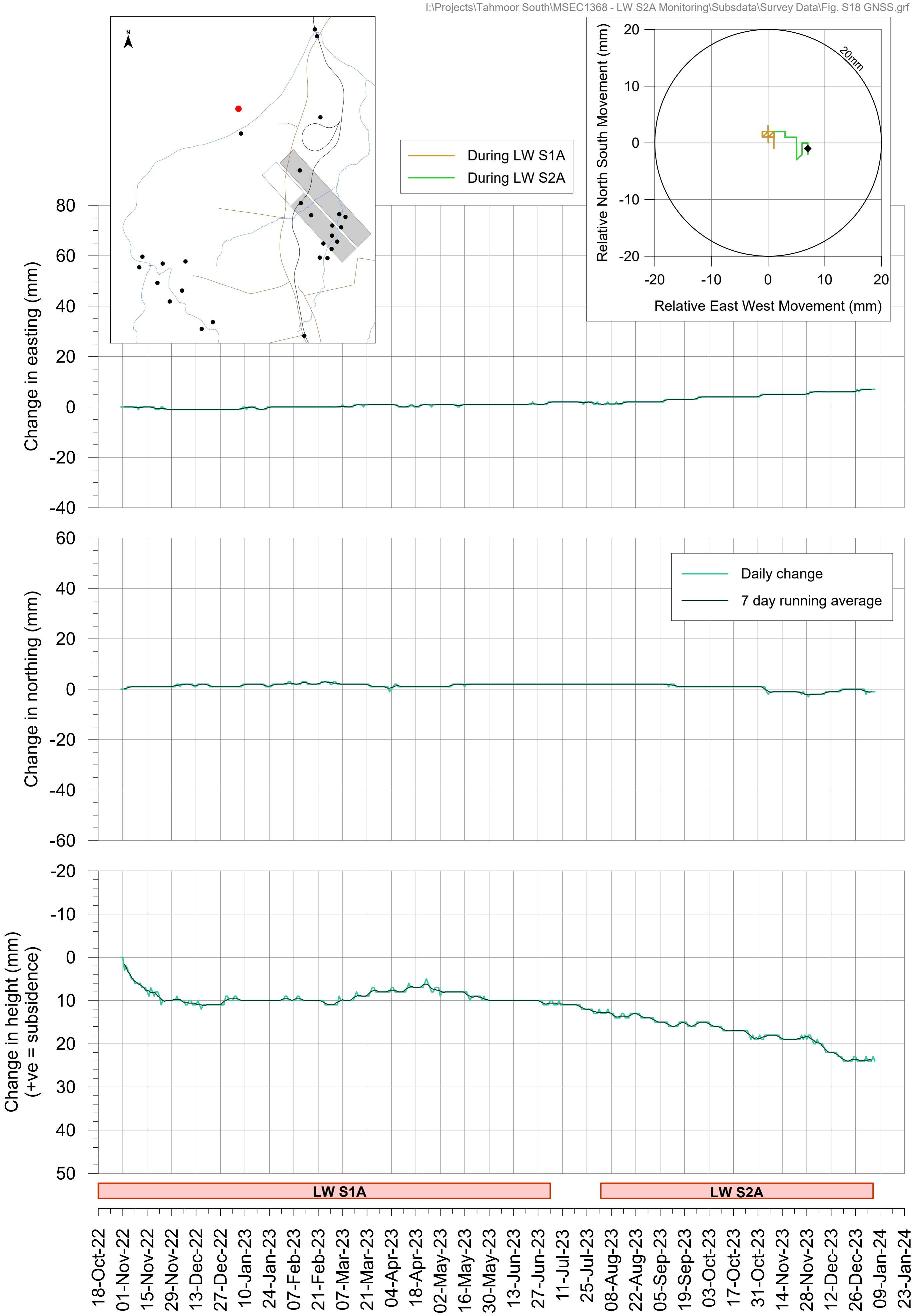
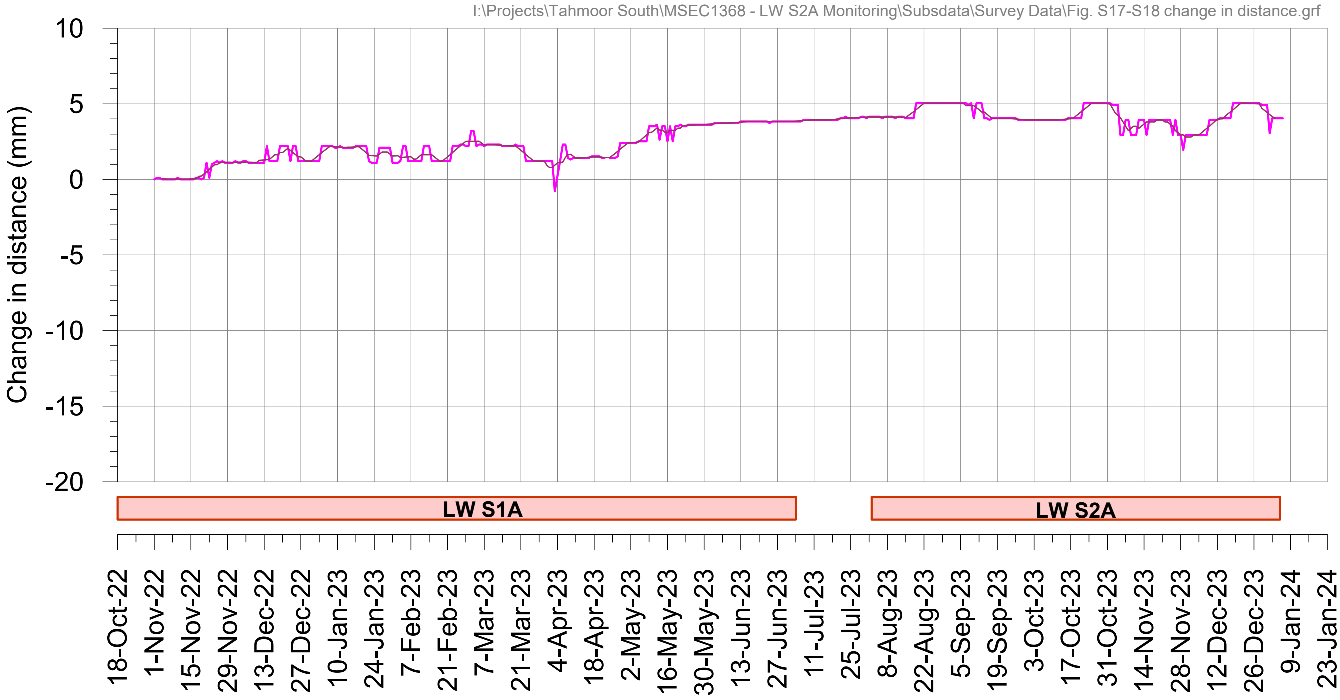
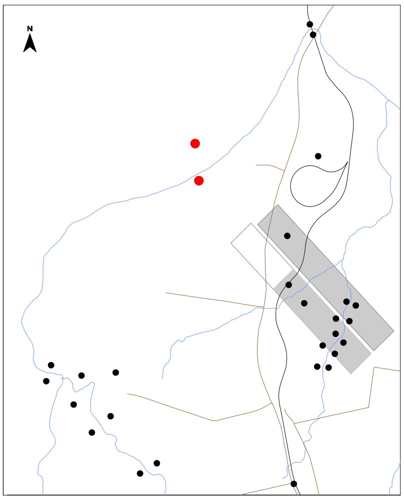


Fig. S18-R19

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





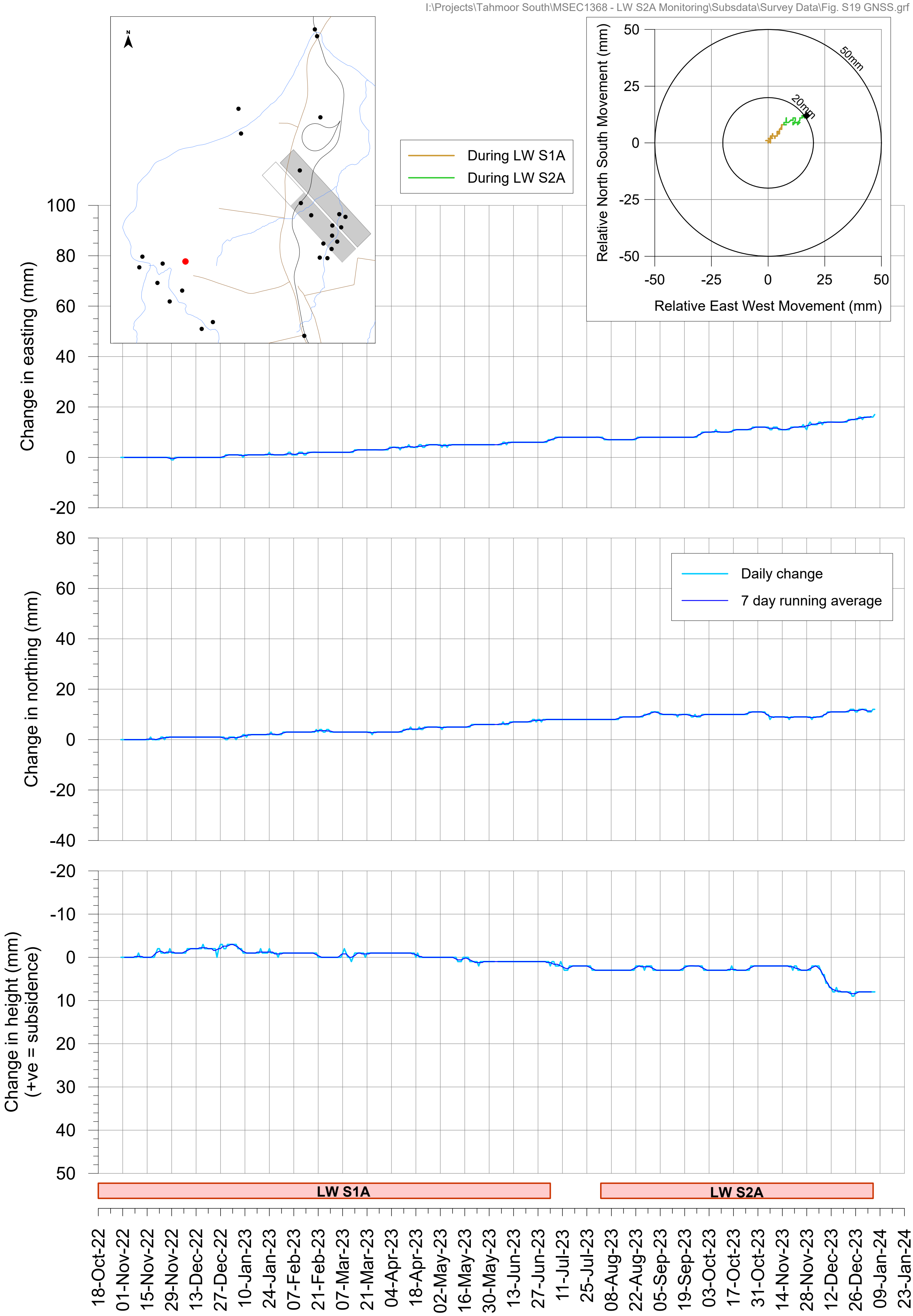
msec

Fig. S17-S18-R19

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-R19

Tahmoor South LW S2A - GNSS Monitoring

Gantry at Tahmoor Mine site

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

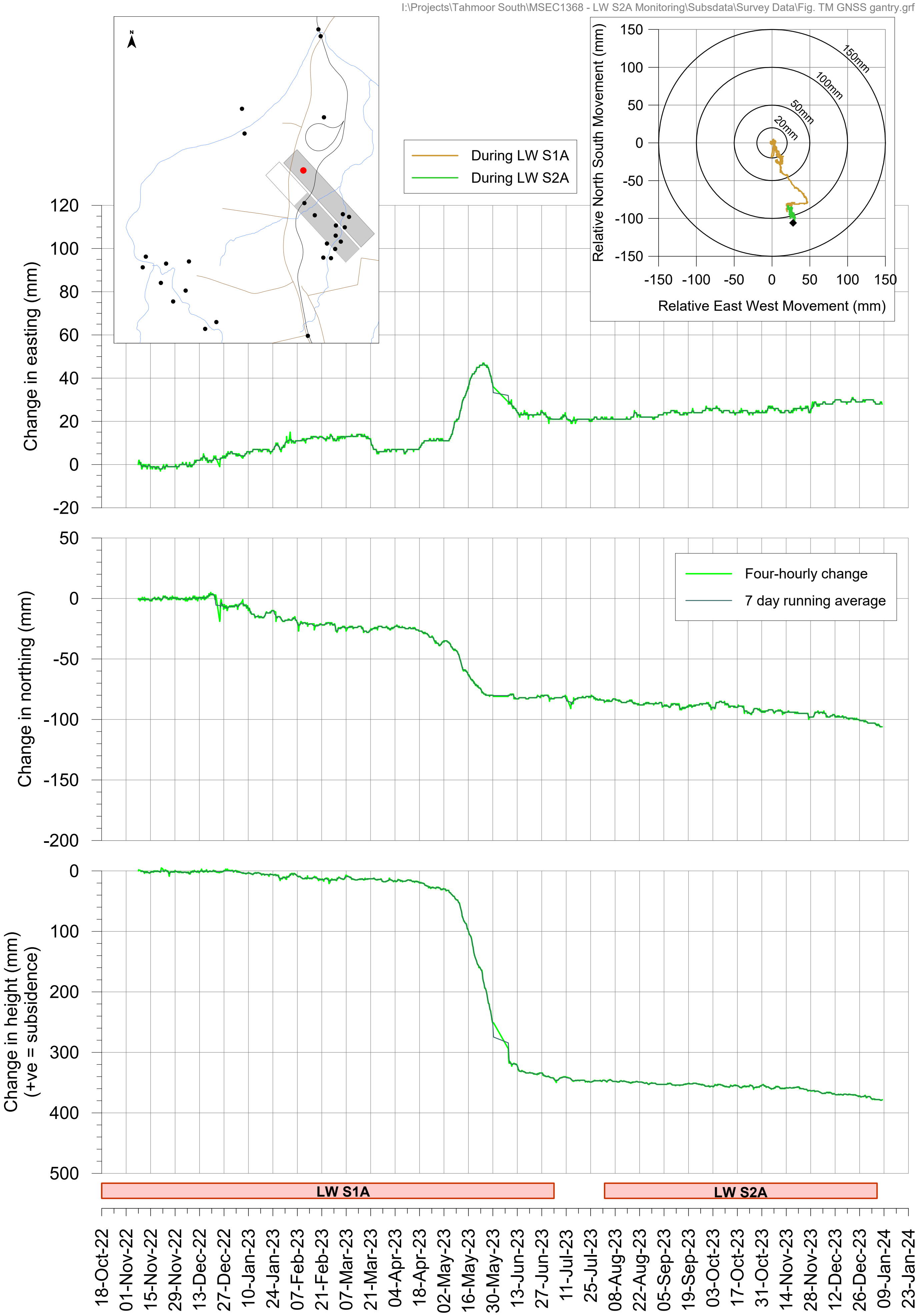
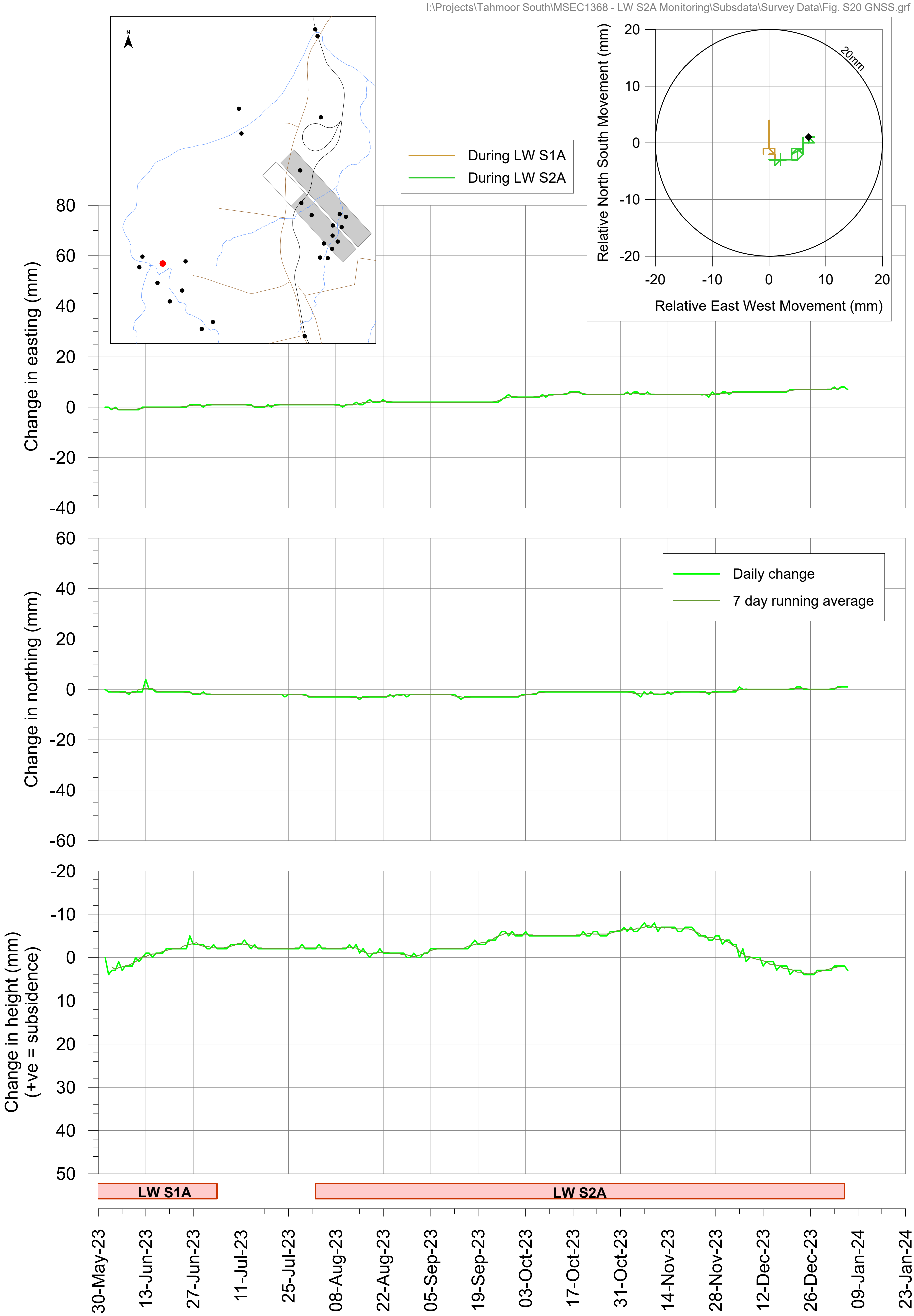


Fig. TM-R19

Tahmoor South LW S2A - GNSS Monitoring
Site S20 on northern side of Hornes Creek

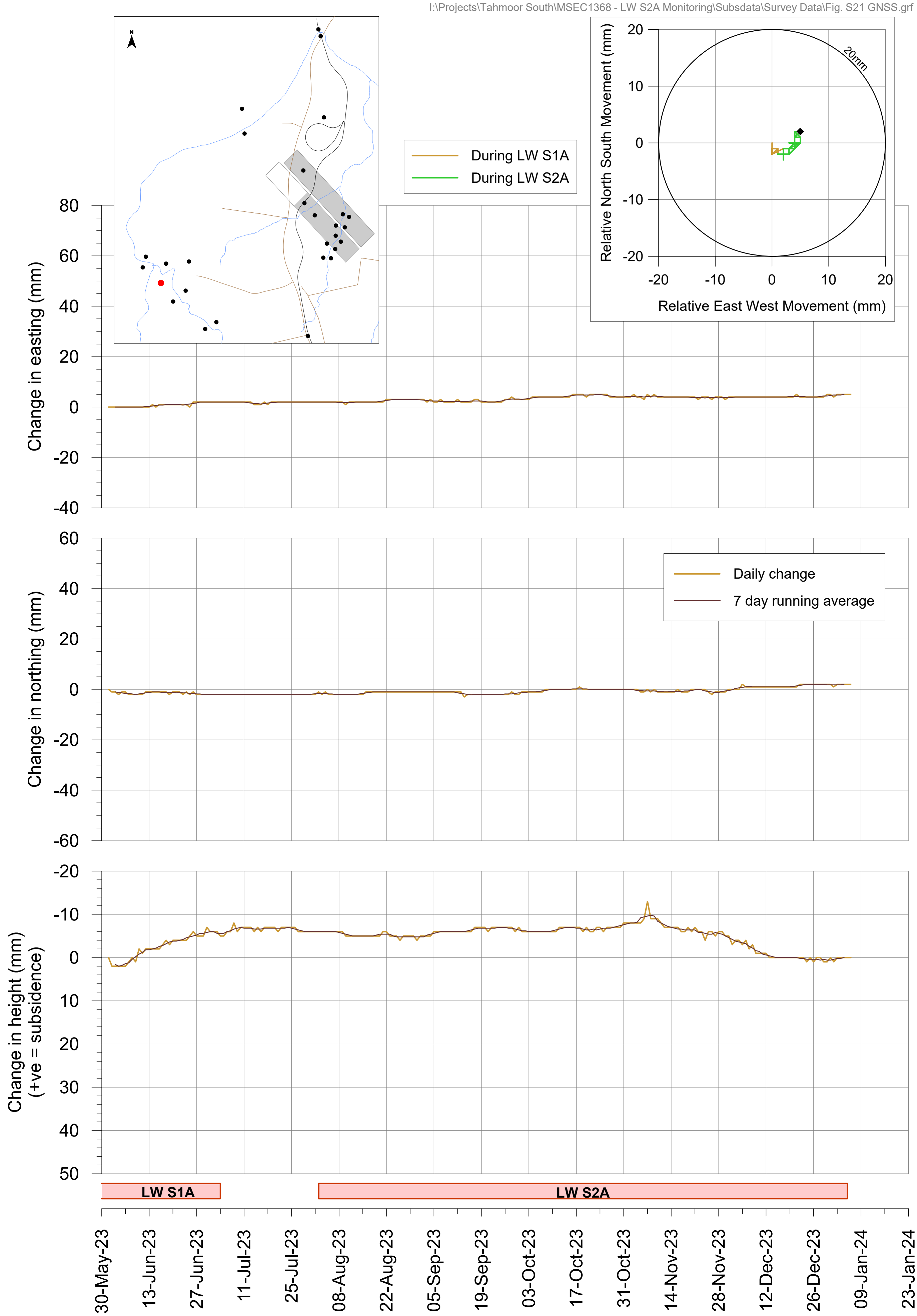
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S20 GNSS.grf



msec

Fig. S20-R19

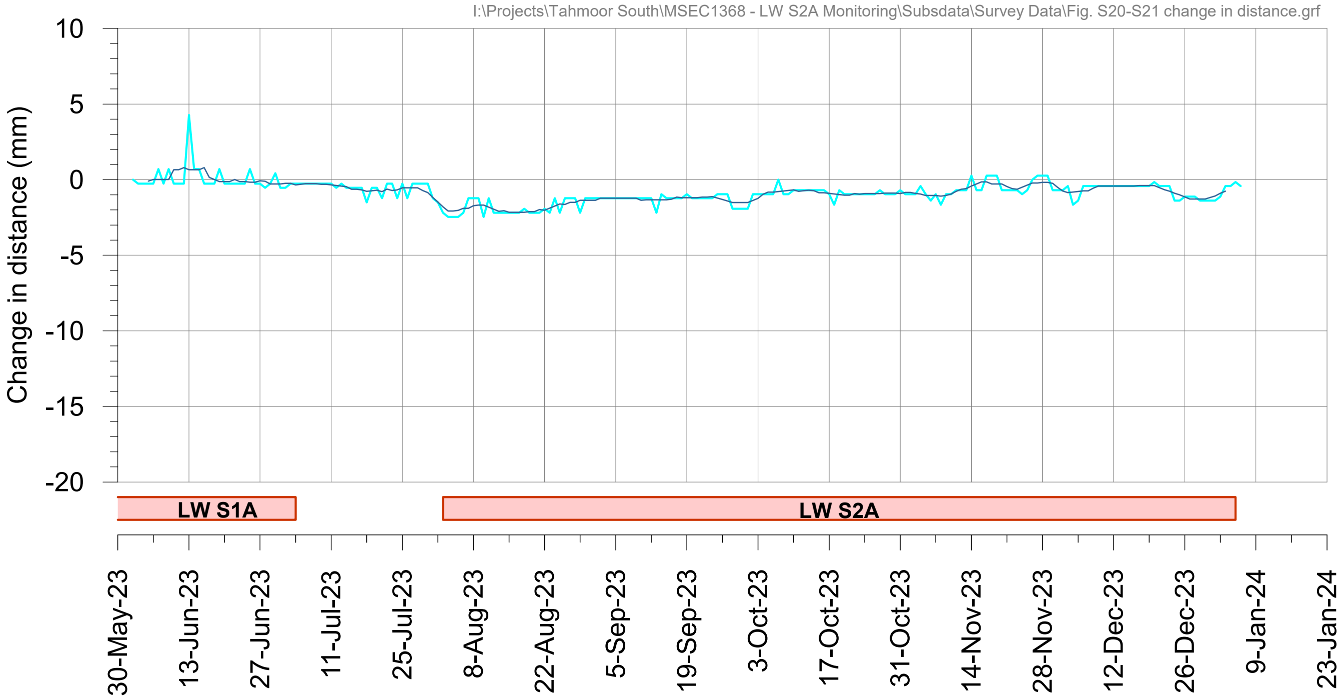
Tahmoor South LW S2A - GNSS Monitoring
Site S21 on southern side of Hornes Creek

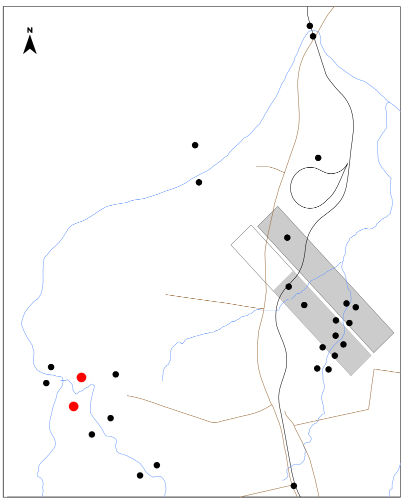


msec

Fig. S21-R19

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



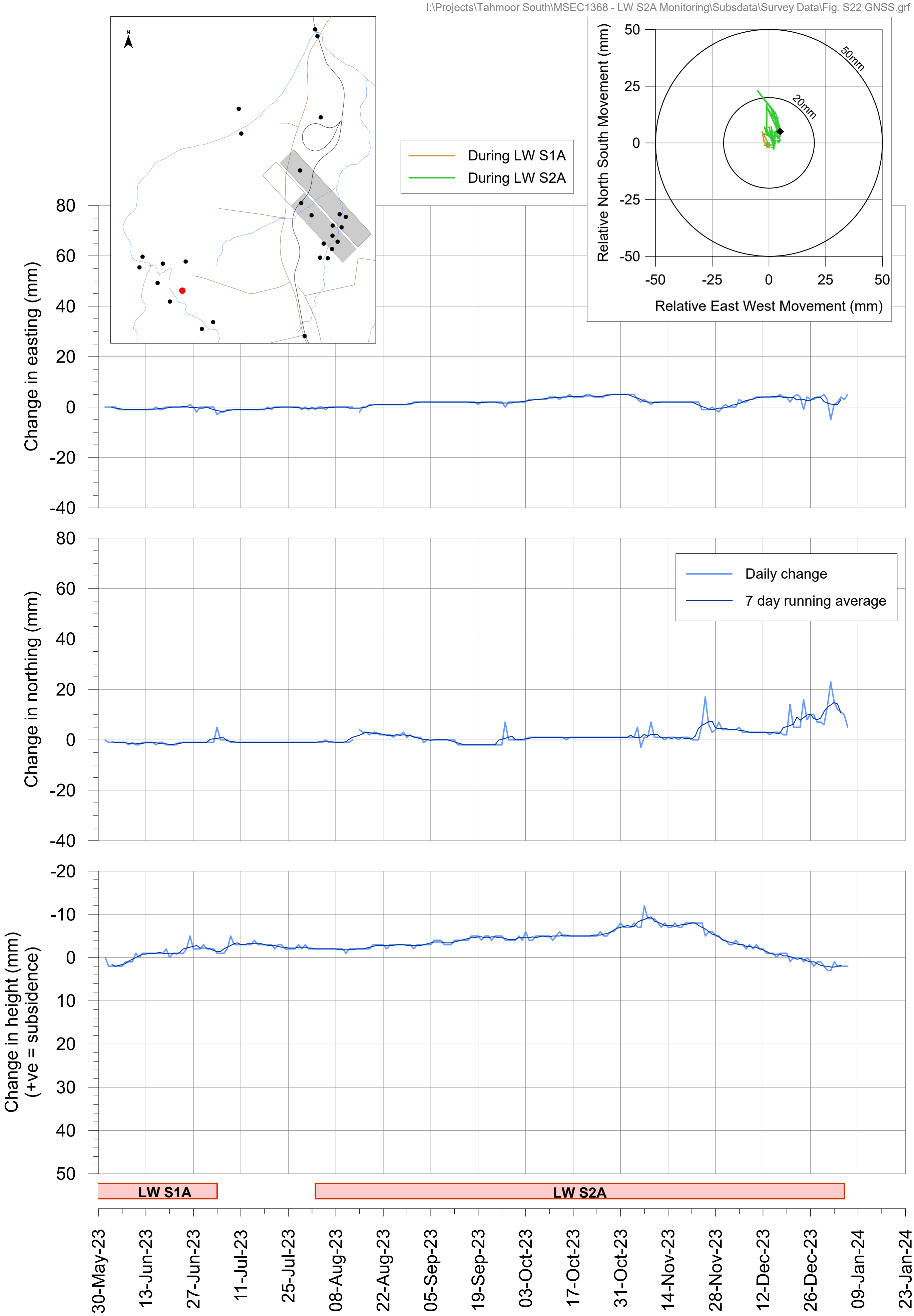


msec

Fig. S20-S21-R19

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

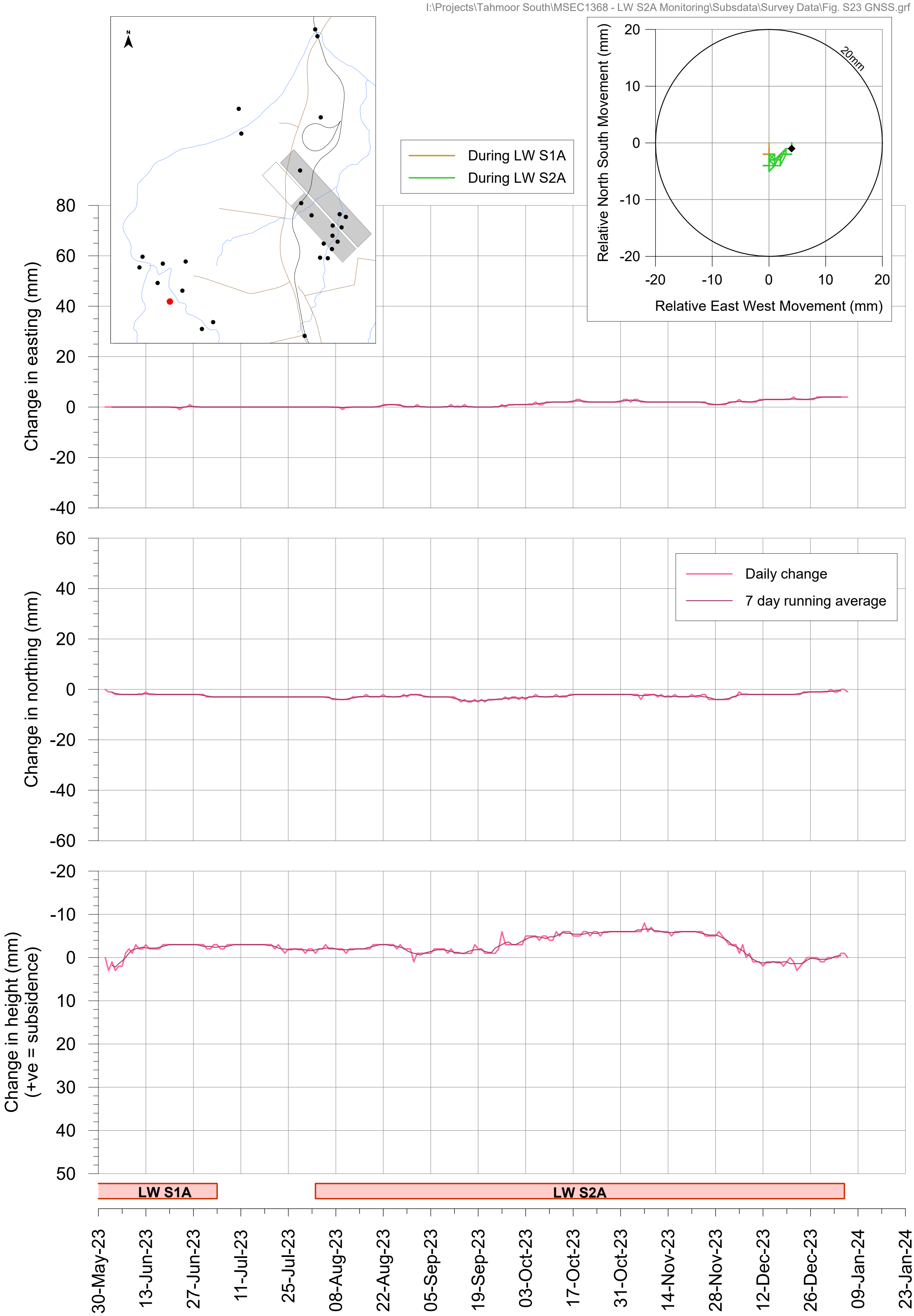


msec

Fig. S22-R19

Tahmoor South LW S2A - GNSS Monitoring
Site S23 on southern side of Hornes Creek

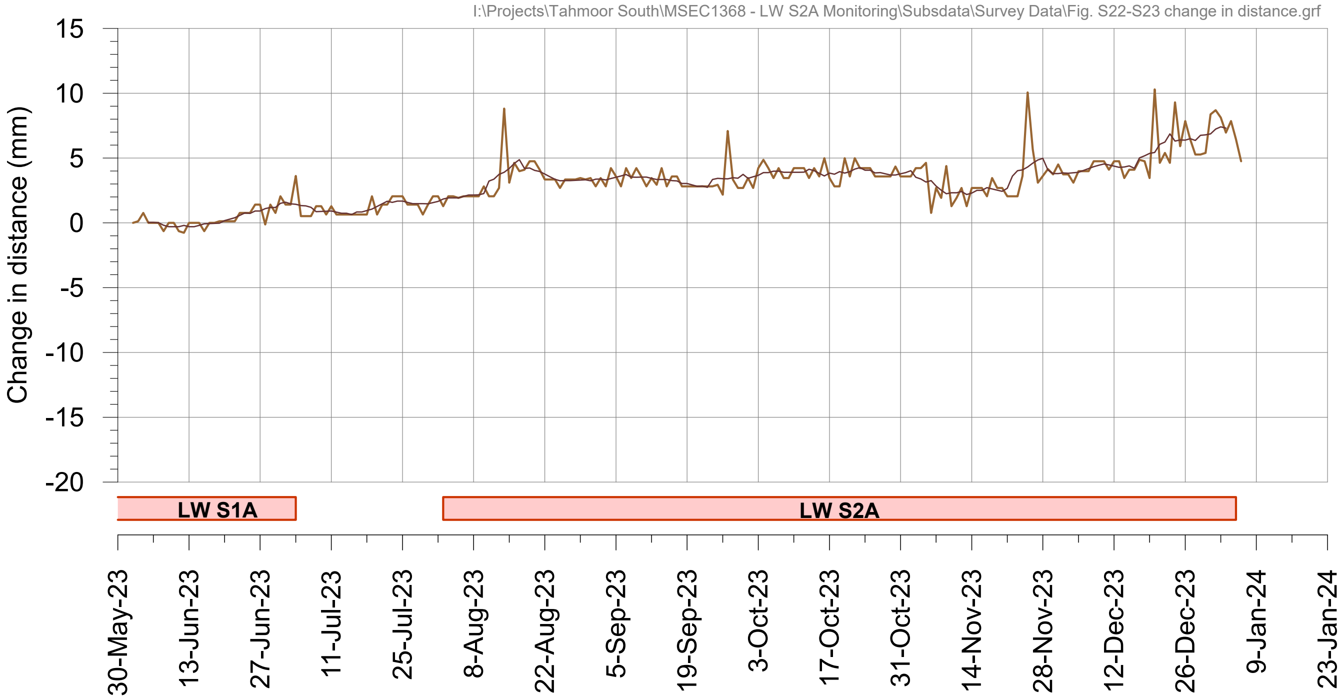
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S23 GNSS.grf



msec

Fig. S23-R19

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



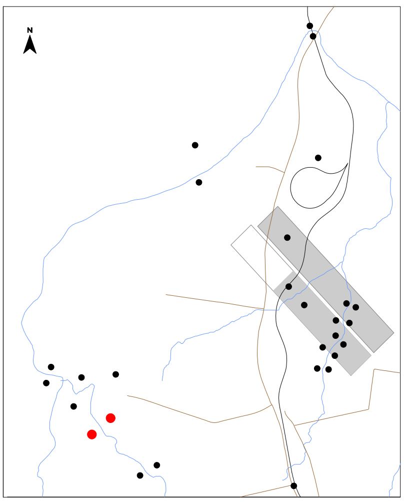
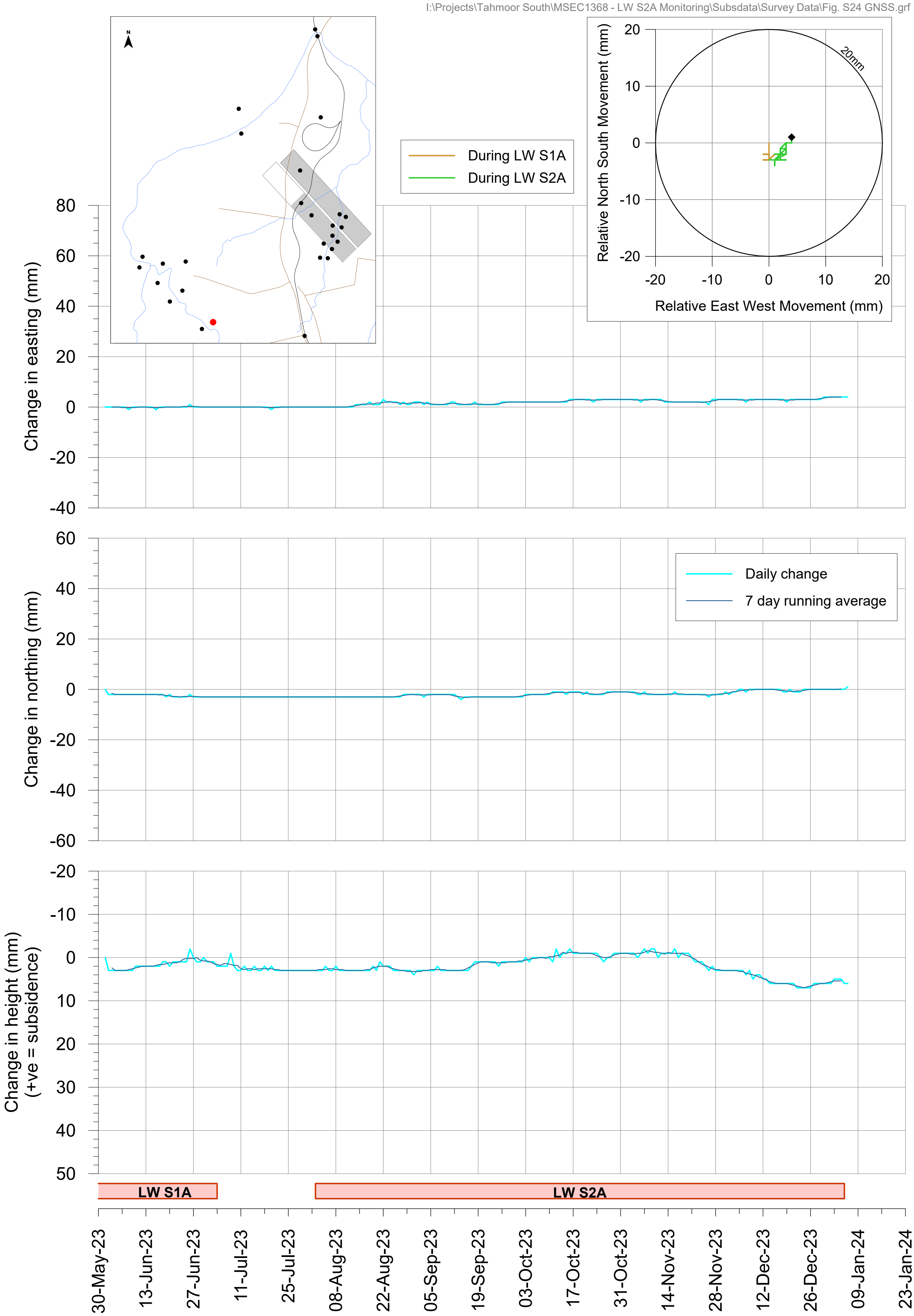


Fig. S22-S23-R19

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

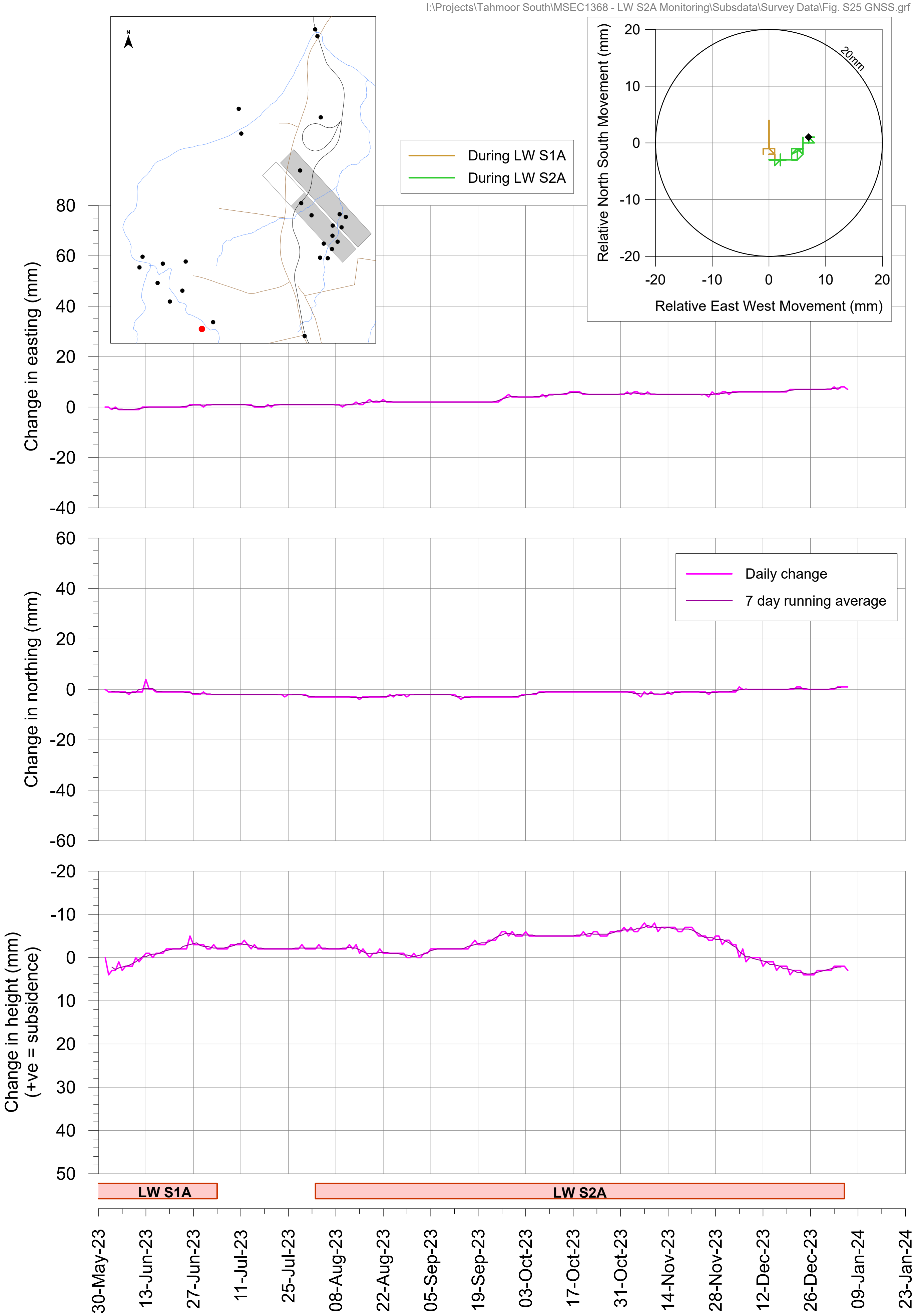
I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S24 GNSS.grf



msec

Fig. S24-R19

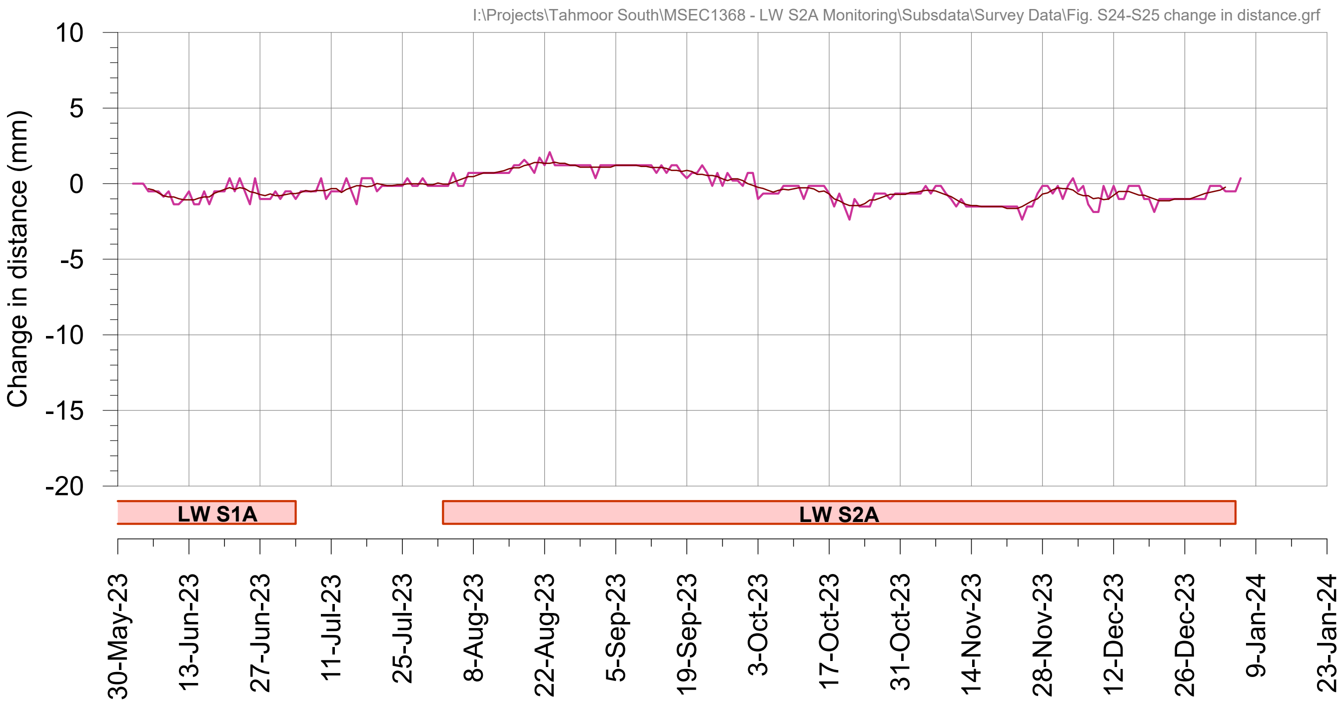
Tahmoor South LW S2A - GNSS Monitoring
Site S25 on southern side of Hornes Creek

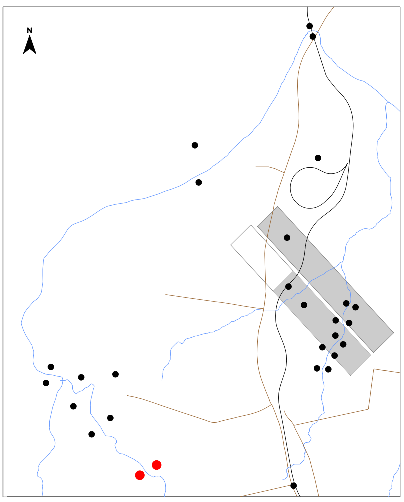


msec

Fig. S25-R19

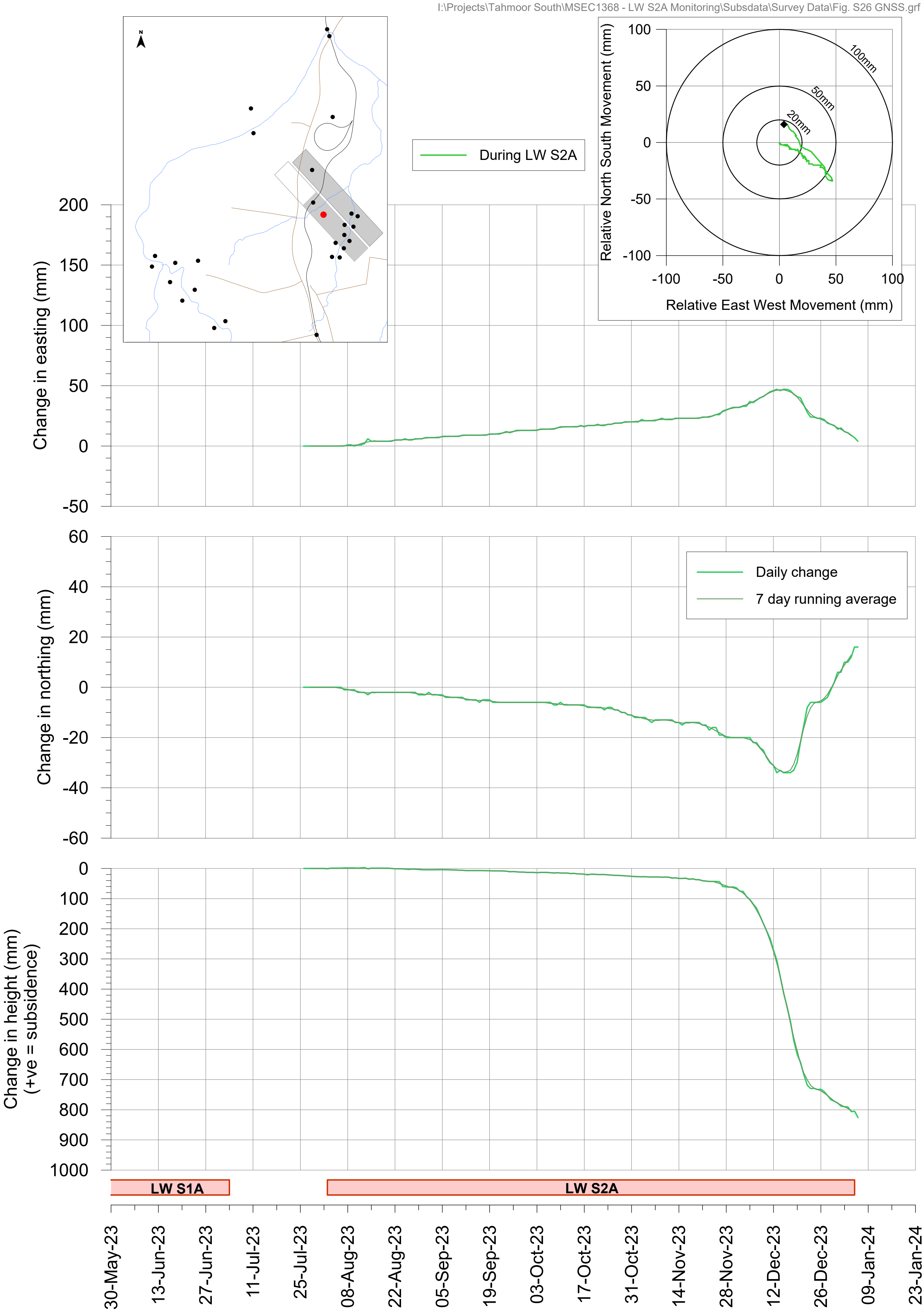
Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Hornes Creek
Sites S24 and S25





Tahmoor South LW S2A - GNSS Monitoring

Site S26 above LW S2A



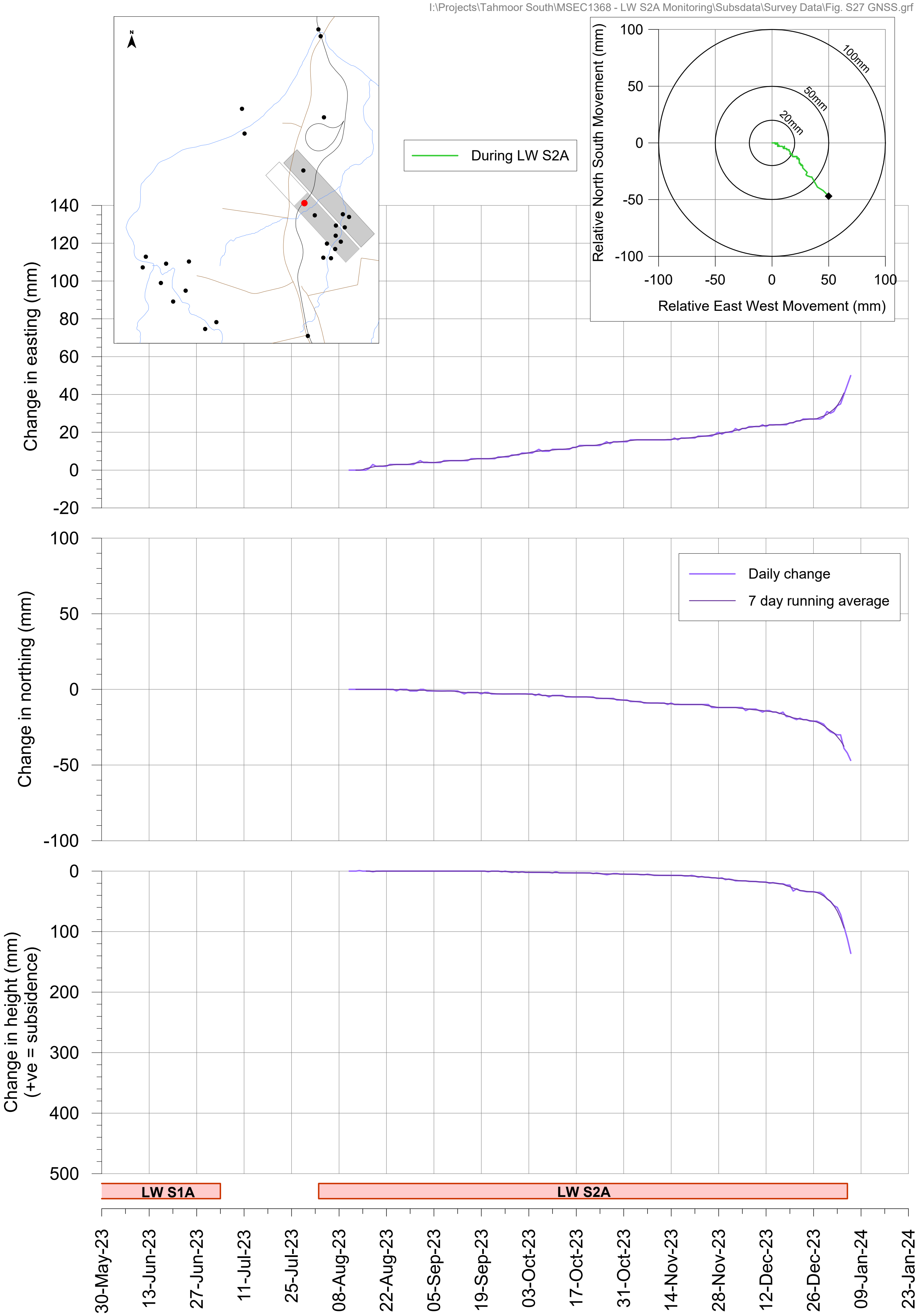
msec

Fig. S26-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S27 on railway embankment above LW S2A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S27 GNSS.grf

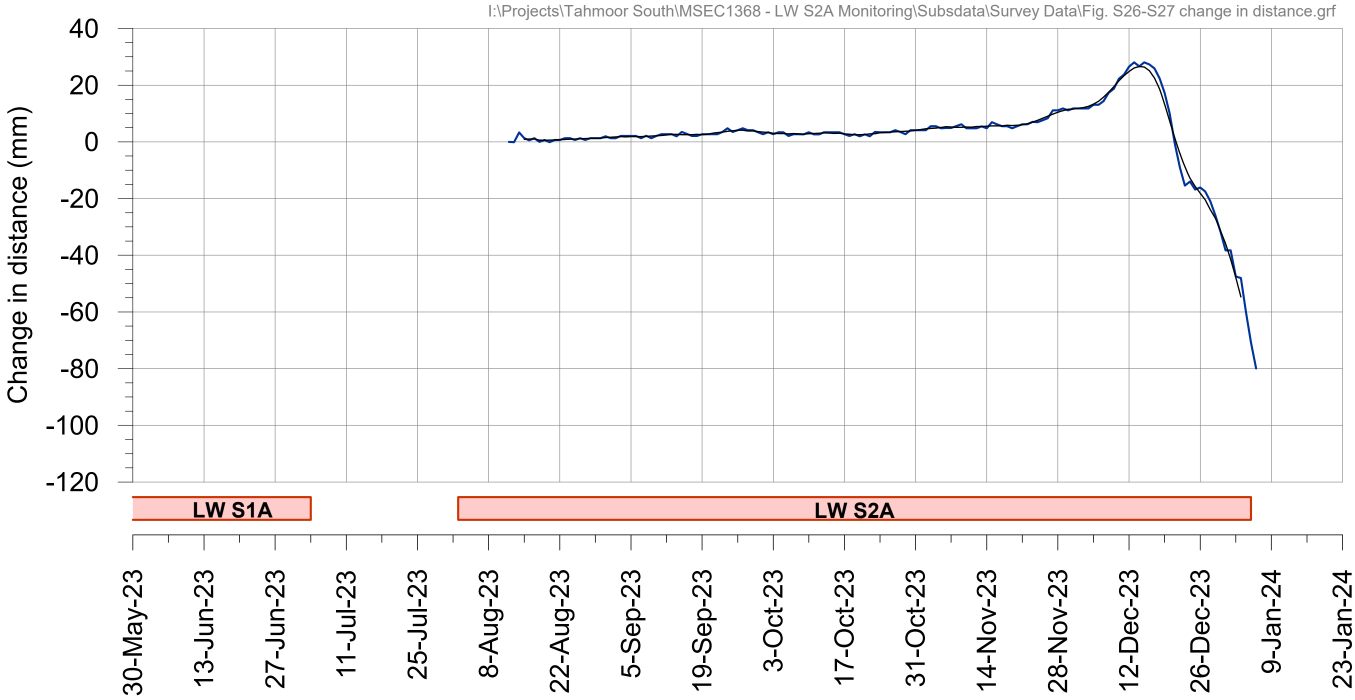


msec

Fig. S27-R19

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Teatree Hollow above LW S2A
Sites S26 and S27



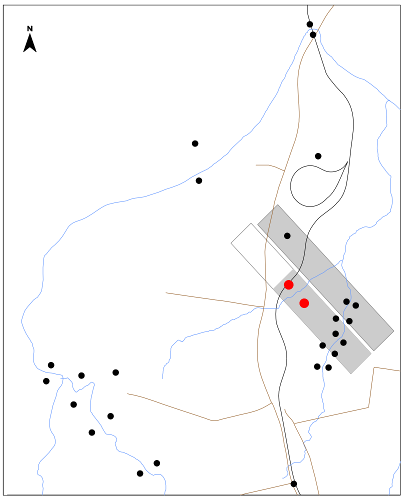


Fig. S26-S27-R19

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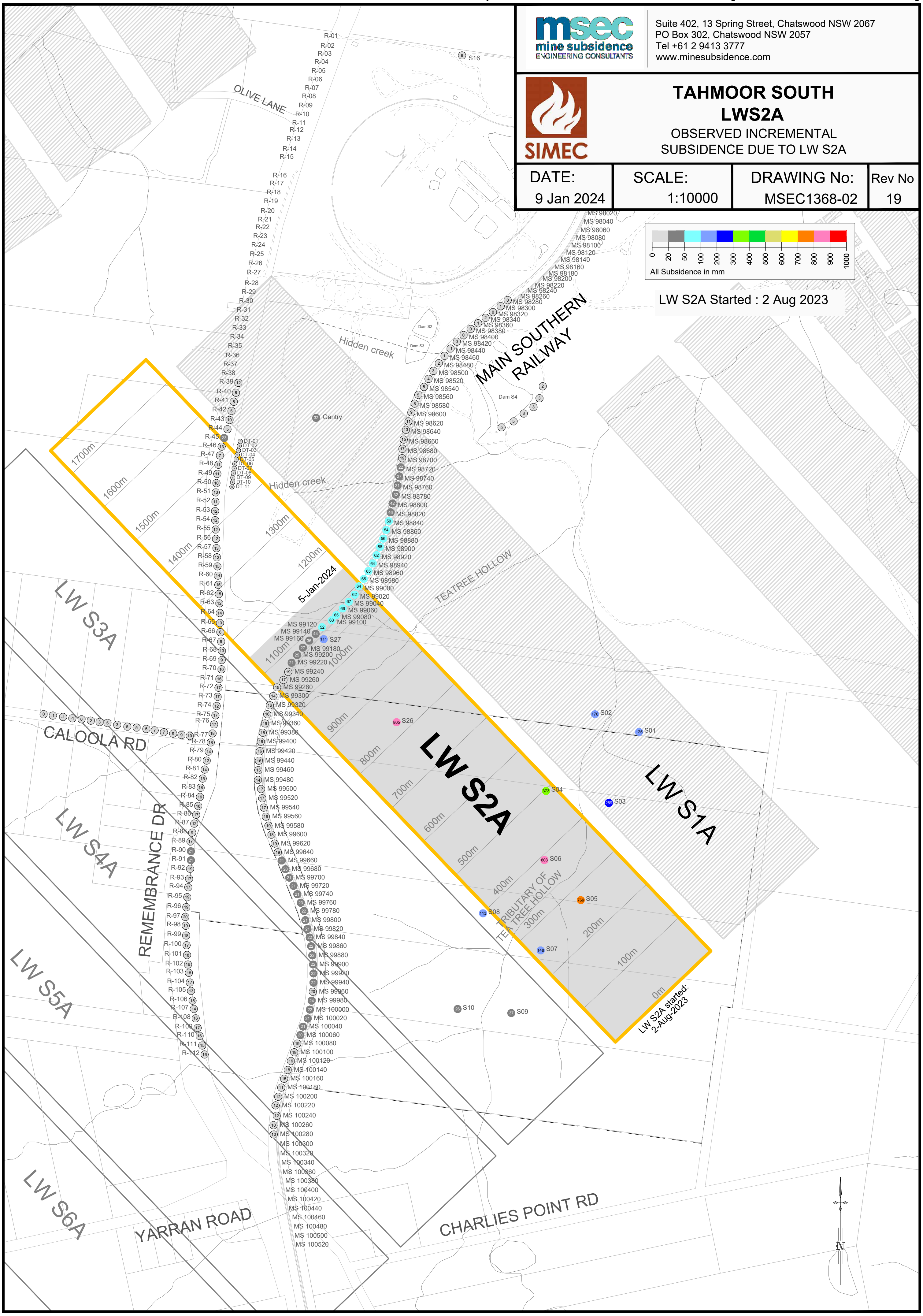

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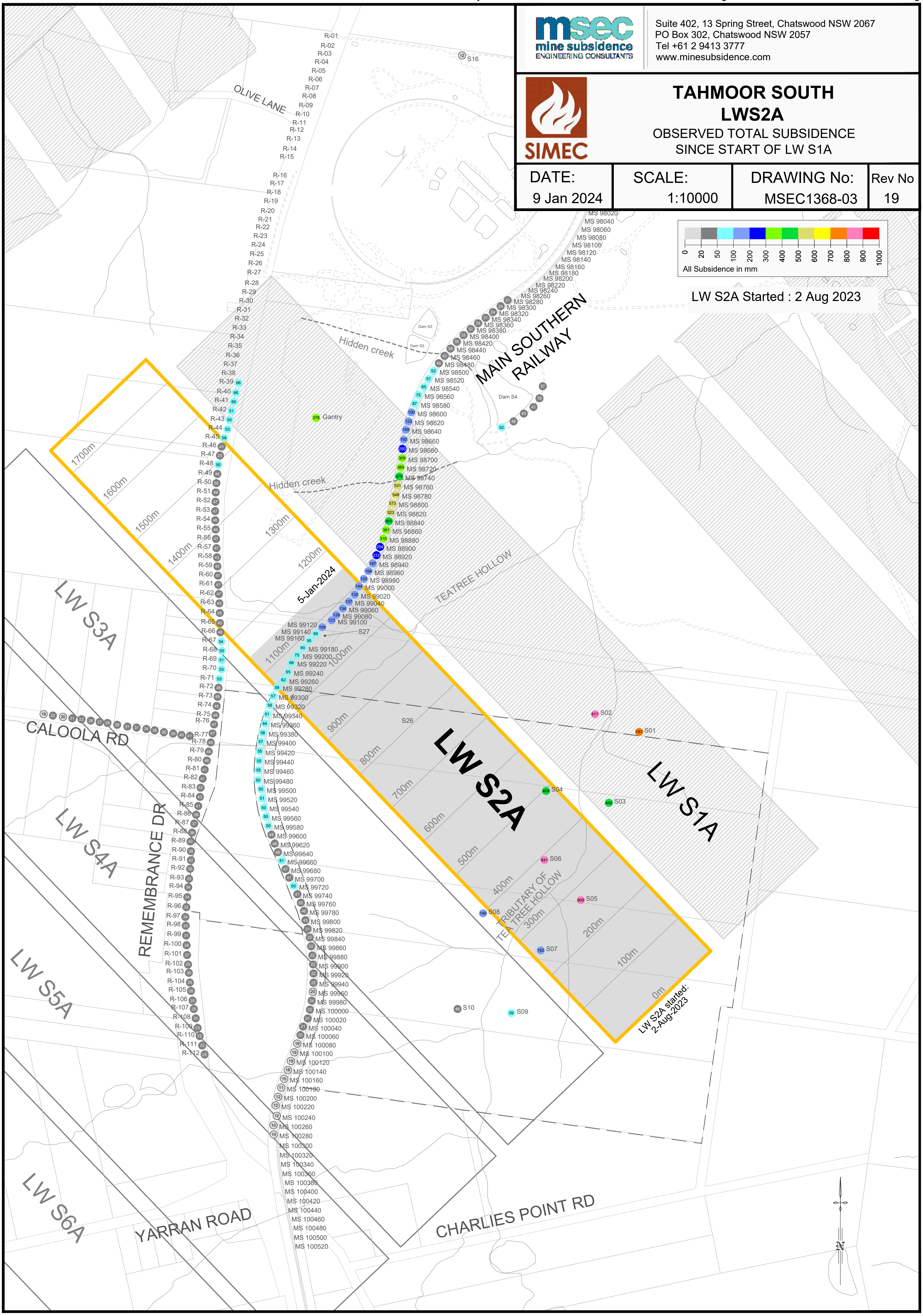

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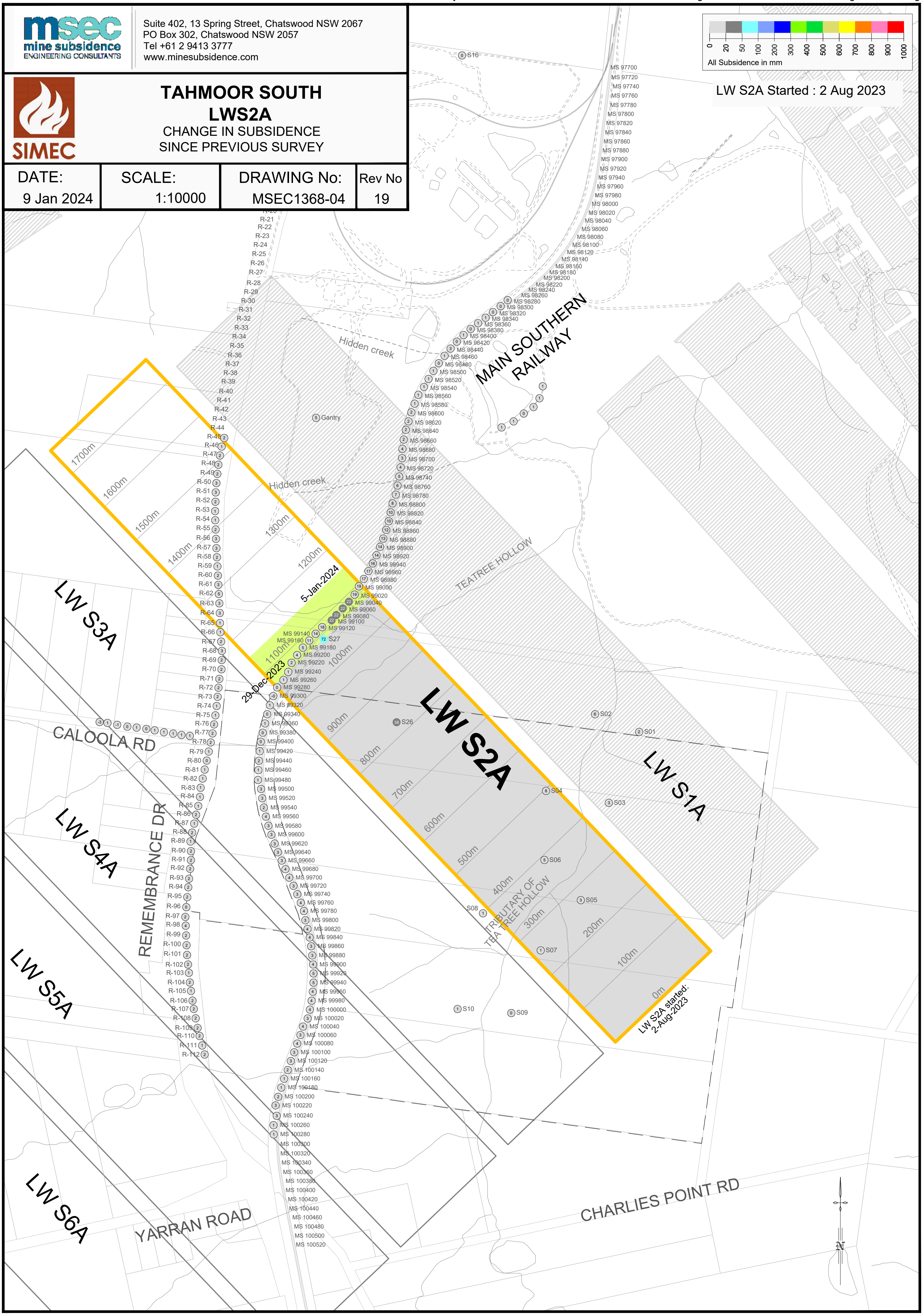
SIMEC

TAHMOOR SOUTH LWS2A

CHANGE IN SUBSIDENCE SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	1:10000	MSEC1368-04	19



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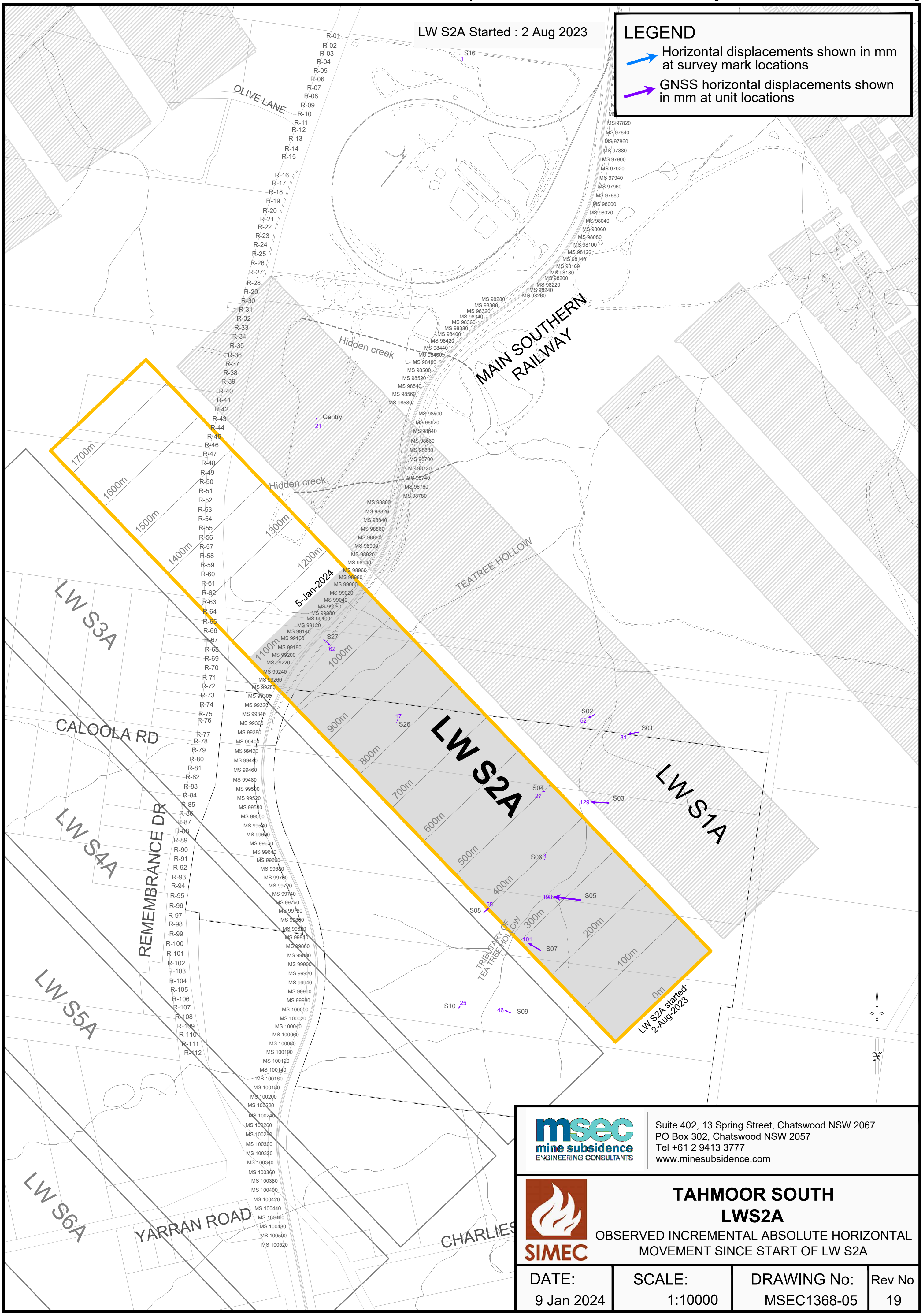

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TAHMOOR SOUTH
LWS2A
OBSERVED INCREMENTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S2A

DATE:	SCALE:	DRAWING No:	Rev No
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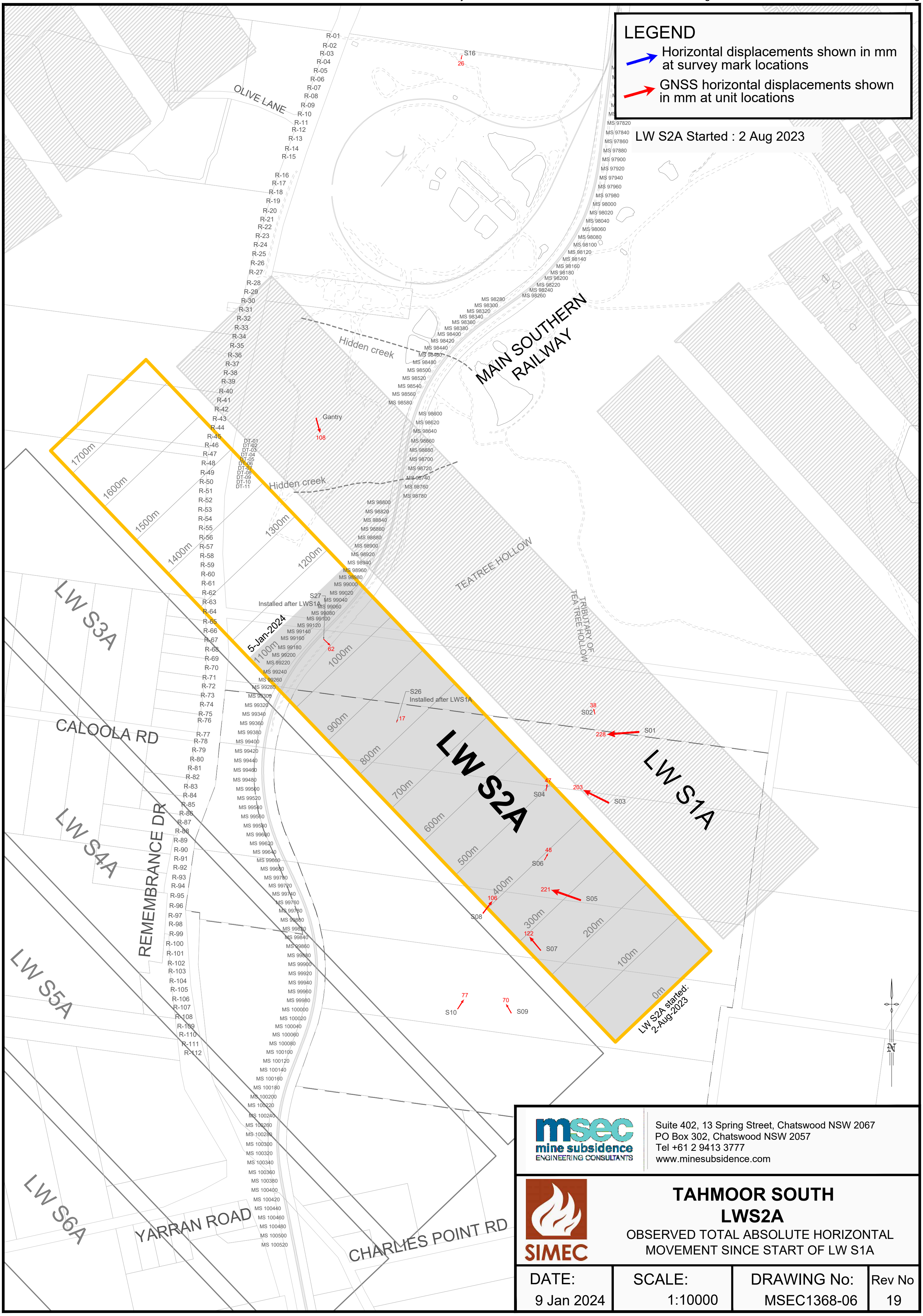

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TAHMOOR SOUTH
LWS2A
OBSERVED TOTAL ABSOLUTE HORIZONTAL MOVEMENT SINCE START OF LW S1A

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	1:10000	MSEC1368-06	19

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

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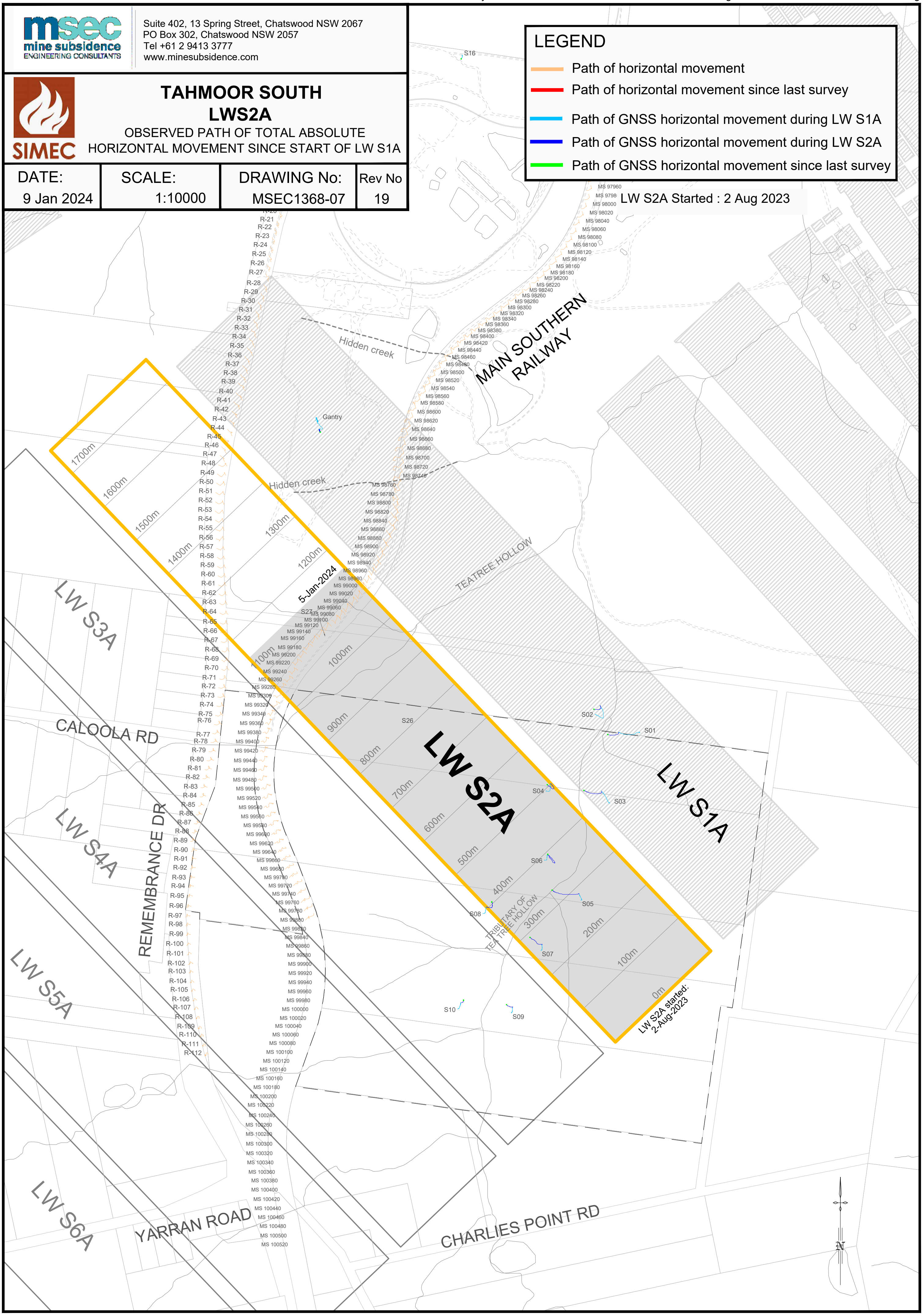

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\AcadData\MSEC1368-08 Remembrance Dr Embkmt.dwg

Survey Date : 3-Jan-2024

mm	Incremental Subsidence

Horizontal displacement of survey marks since start of LW S2A

mm	Vector & magnitude of observed horizontal movement (mm)

Change in horizontal distance between Survey Marks

mm	Closure
mm	Opening

LW S2A Started : 2 Aug 2023

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TAHMOOR SOUTH - LW S2A

REMEMBRANCE DRIVE EMBANKMENT

GROUND MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	as shown	MSEC1368-08	19

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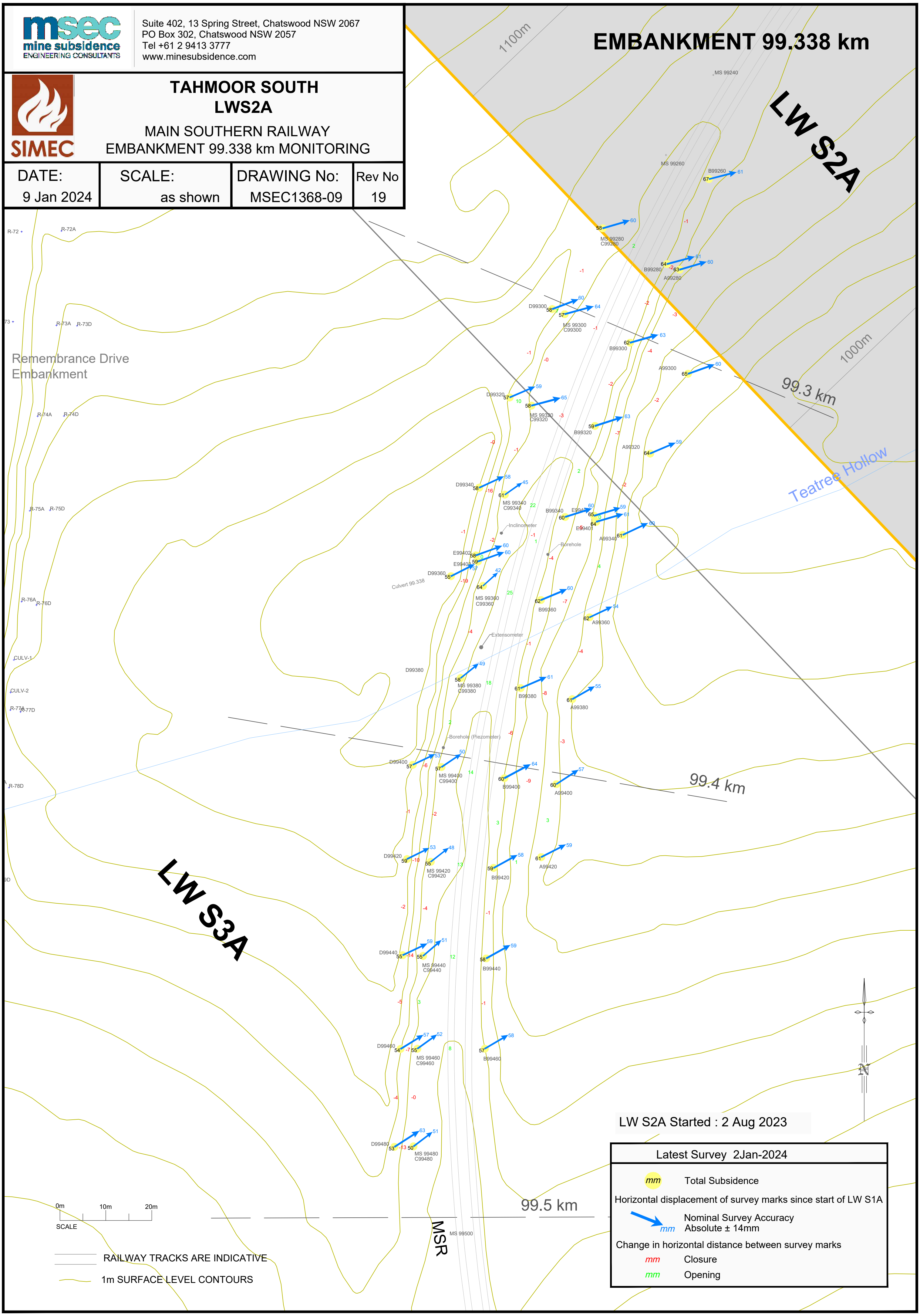
TAHMOOR SOUTH
LWS2A

MAIN SOUTHERN RAILWAY
EMBANKMENT 99.338 km MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	as shown	MSEC1368-09	19



Appendix B – Surface Water Monitoring Report

ATC WILLIAMS

REPORT

TAHMOOR COAL PTY LTD
ABN: 97076663968

Tahmoor South Domain

Surface Water Review
1 July to 31 December 2023

121171-26R001-rev0
MARCH 2024

TAILINGS.WATER.WASTE.

Document Control

Project Name:	Tahmoor South Domain Surface Water Review
Document Title:	Surface Water Review 1 July to 31 December 2023
File Location:	N:\Synergy\Projects\121\121171 1809 Tahmoor (SIMEC) Surface Water Assistance\26 2024 SW Assessments\Documents\R001 (SD)\Text\121171-26R001-rev0.docx
Document Number:	121171-26R001-rev0

Revision History

Revision	Issue	Issue Date	Prepared by	Reviewed by
A	Draft	7 March 2024	Pamella Grangeiro	Camilla West
B	Draft	25 March 2024	Pamella Grangeiro	Camilla West
0	Final	25 March 2024	Pamella Grangeiro	Camilla West

Issue Register

Distribution List	Date
Tahmoor Coal Pty Ltd	25 March 2024

ATC Williams Company Details

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1 INTRODUCTION

1.1 Background

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 (LWs) S1A-S6A within Tahmoor South was approved on 23 April 2021 in accordance with SSD 8445. The location of LWs S1A-S6A and the associated Study Area are illustrated in **Map 1**.

Mining of Longwall (LW) S1A commenced on 18 October 2022 and was completed on 4 July 2023. Mining of LW S2A commenced on the 2 August 2023 and is currently in progress.

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

To support 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**.

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 the Tahmoor South for the period of 1 July 2023 to 31 December 2023. The groundwater and subsidence review and analysis were undertaken by independent specialists, with relevant detail summarised in this report.

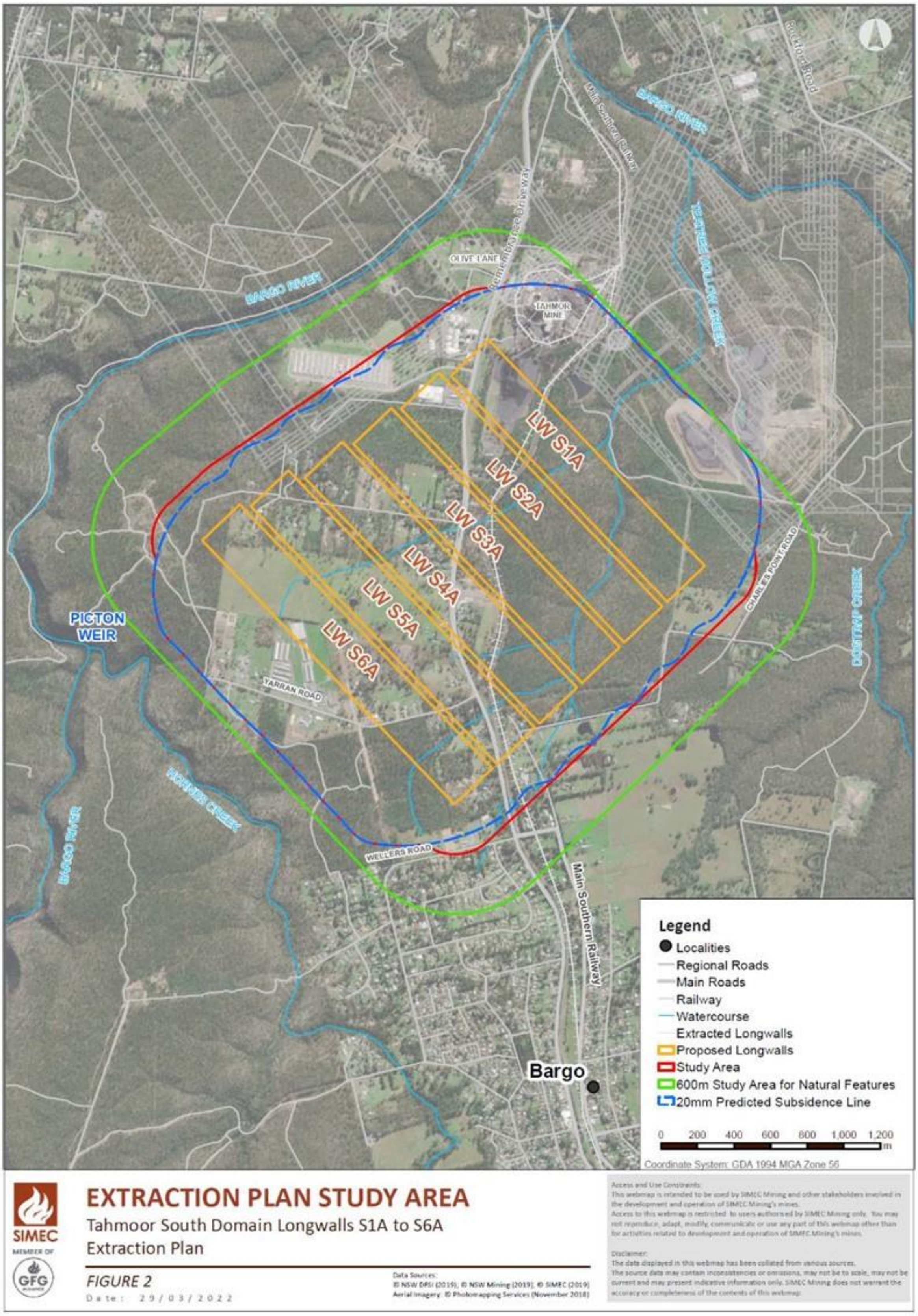
1.2 Scope and Report Purpose

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 July to 31 December 2023 - referred to as the review period herein;
- assessment against the performance measures and performance indicators for surface water; and
- 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.

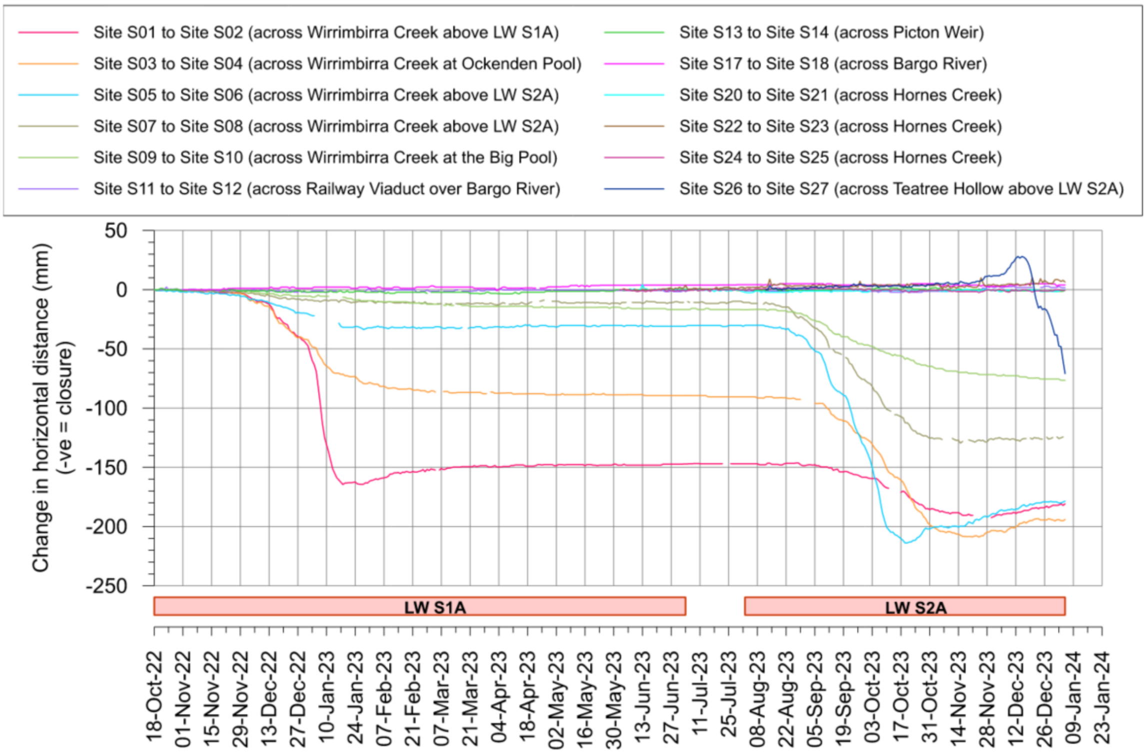
MAP 1: TAHMOOR SOUTH MINING AREA



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 monthly subsidence monitoring reports prepared by Mine Subsidence Engineering Consultants (MSEC) 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**.

DIAGRAM 1: OBSERVED CHANGES IN HORIZONTAL DISTANCES BETWEEN GNSS UNITS (SOURCE: MSEC, 2023)



From the commencement of LW S1A to December 2023, including completion of LW S1A on 4 July 2023 and commencement of LW S2A on 2 August 2023, the following was recorded (MSEC, 2023):

- Approximately 150 millimetre (mm) of closure developed between Site S01 and Site S02 (across Wirrimbirra Creek[2] above LW S1A) during mining of LW S1A with a maximum of approximately 190 mm recorded during mining of LW S2A to December 2023.
- Approximately 90 mm of closure developed between Site S03 and Site S04 (across Wirrimbirra Creek at Ockenden Pool[3]) during mining of LW S1A with a maximum of approximately 210 mm recorded during mining of LW S2A to December 2023.
- Less than 50 mm of closure developed across Wirrimbirra Creek between Site S05 and S06, S07 and S08 and S09 and S10 during mining of LW S1A. Following the commencement of mining of LW S2A, greater than 200 mm closure developed between Site S05 and S06, with less than 130 mm and 80 mm closure recorded between S07 and S08 and S09 and S10 respectively.

---

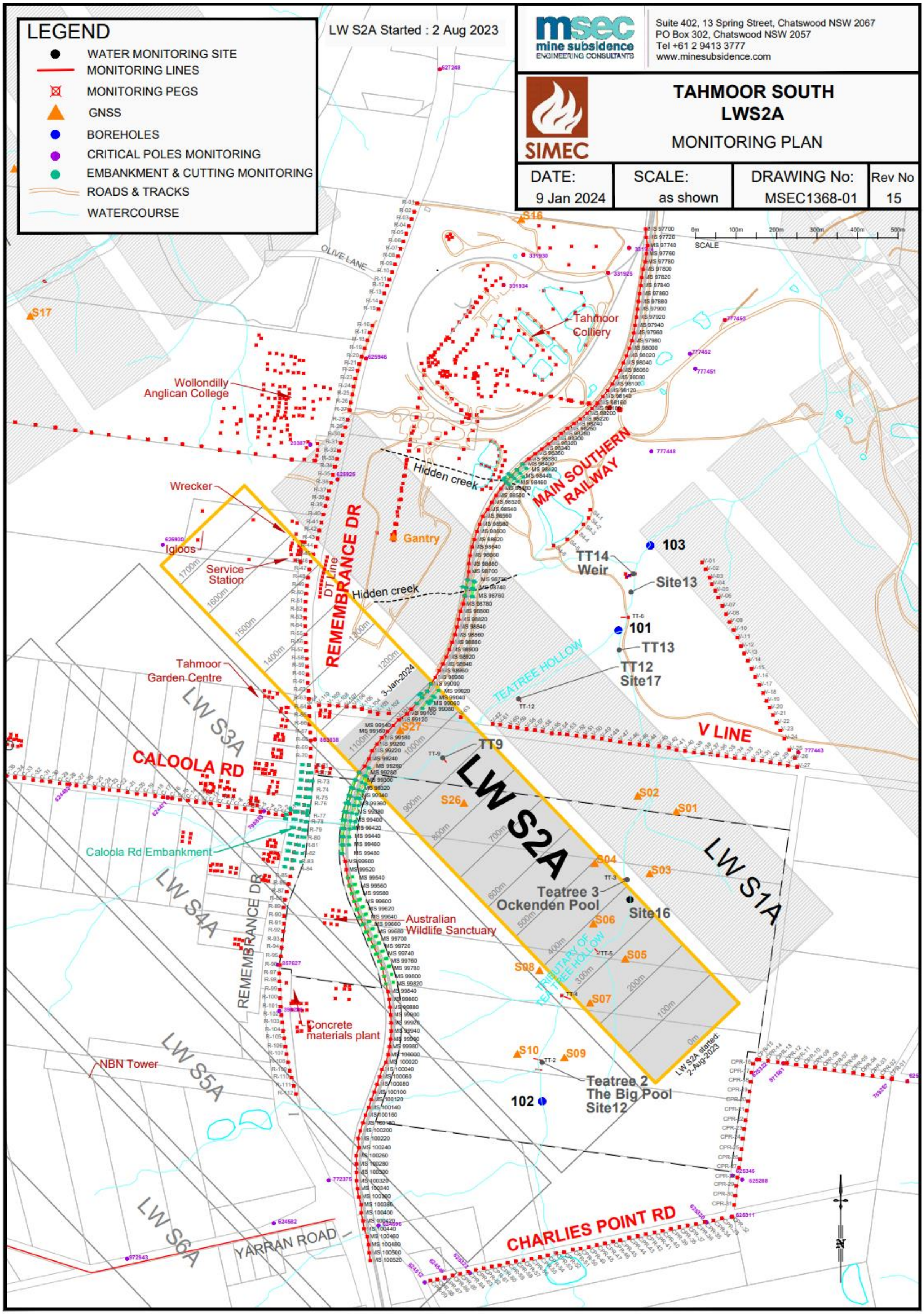
[1] Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure absolute horizontal and vertical positions at a location in real time.

[2] Teatree Hollow is colloquially referred to as Wirrimbirra Creek.

[3] Ockenden Pool is referred to as Pool TT3 in the remainder of this report.

- A reduction in closure from approximately October 2023 has been recorded between sites S05 and S06, S01 and S02 and S03 and S04.
- From approximately October 2023 to mid-December 2023, opening was recorded across Tea Tree Hollow between Site S26 and S27. From mid-December 2023, closure has developed between these sites.
- 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 2023)



3 SUMMARY OF GROUNDWATER LEVEL TRENDS

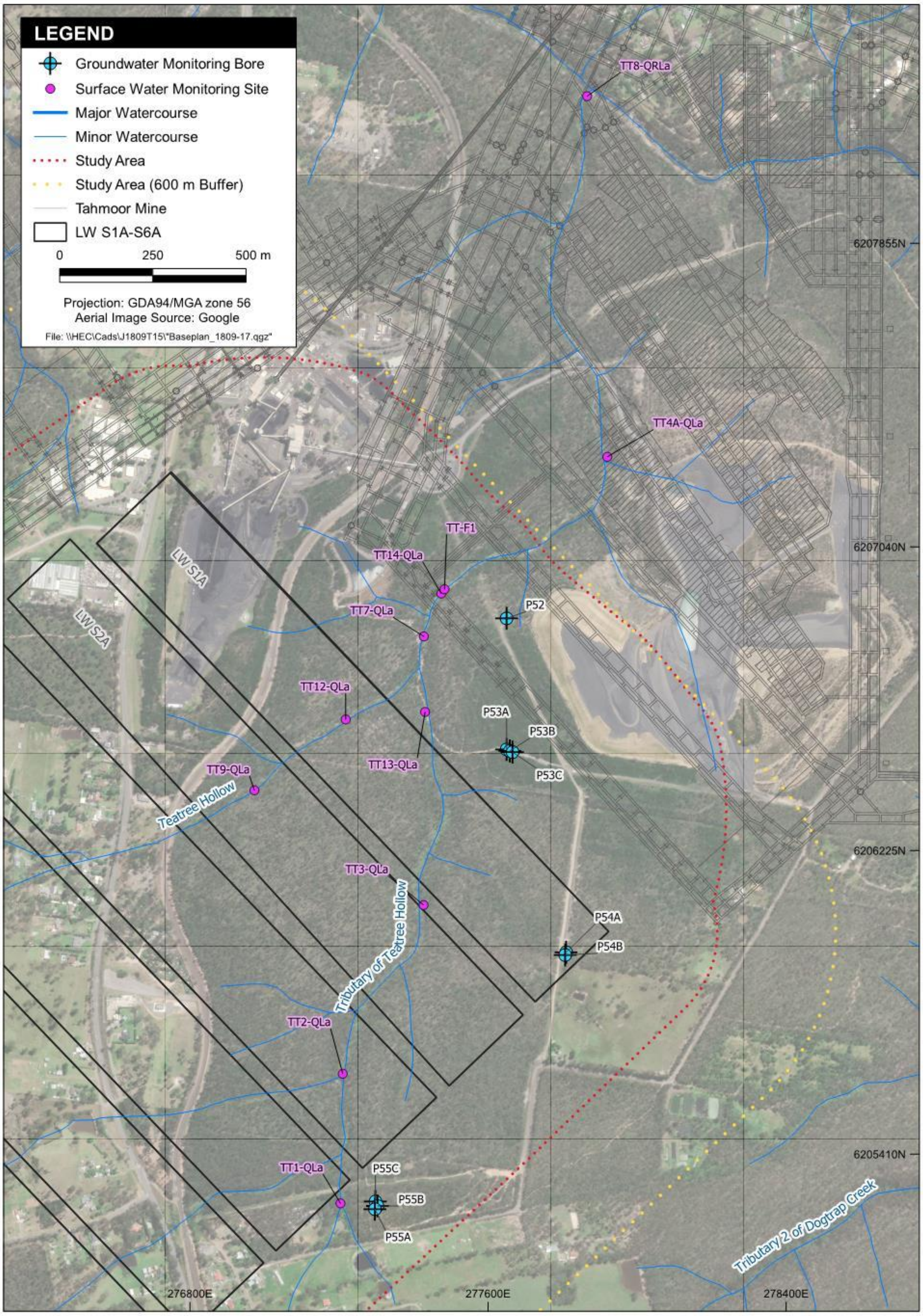
Detailed discussion of groundwater monitoring data recorded within and adjacent to the Study Area is presented in SLR (2024).

Groundwater levels were reviewed to assess the potential for baseflow contribution and surface water-groundwater interaction within the Study Area. The following presents a summary of groundwater level trends recorded during the review period of 1 July to 31 December 2023 at groundwater monitoring bores in close proximity to surface water monitoring sites within the Study Area (refer to **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.

- Monitoring Bore P55A-C
  - Monitoring bore P55A-C is located approximately 100 m to the east of monitoring site TT1-QLa in Teatree Hollow tributary.
  - A TARP Level 1 exceedance for groundwater level was reported at P55B from October to December 2023 and at P55C from July to October 2023.
  - A TARP Level 2 exceedance for groundwater level was reported at P55C in November and December 2023.
  - No trigger exceedances were reported for P55A during the review period.
  - The maximum groundwater level recorded at P55A during the review period was approximately 21 m below the bed elevation of Teatree Hollow tributary at TT1-QLa (approximately 291.9 m AHD).
  - Based on the groundwater levels recorded at monitoring bore P55A-C for the period of record, it is inferred that baseflow contribution (groundwater discharge to the surface water system) is likely negligible in the vicinity of TT1-QLa.
- Monitoring Bore P54A-B
  - Monitoring bore P54A-B is 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.
  - SLR (2023) indicated that the base of bore P54 is well below the base of Teatree Hollow tributary and, as such, the likelihood of groundwater-surface water connectivity in the vicinity of bore P54 is considered low.
- Monitoring Bore P53A-C
  - Monitoring bore P53A-C is located approximately 250 m to the south-east of monitoring site TT13-QLa in Teatree Hollow tributary.
  - A TARP Level 1 exceedance for groundwater level was reported at P53A from October to December 2023 and at P53B from September to December 2023.
  - A TARP Level 1 exceedance for groundwater level was reported at P53C in October and November 2023 and a TARP Level 2 exceedance in December 2023.
  - The maximum groundwater level recorded at P53A during the review period was approximately 13 m below the bed elevation of Teatree Hollow tributary at TT13-QLa.
  - Based on the recorded groundwater levels at monitoring bore P53A-C, it is inferred that there was negligible baseflow contribution (groundwater discharge to the surface water system) occurring in the vicinity of TT13-QLa during the review period.
- Monitoring Bore P52
  - Monitoring bore P52 is 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.
  - The groundwater level recorded at P52 declined by approximately 1.5 m from July to early-December 2023.

- The maximum groundwater level recorded at P52 during the review period was approximately 14 m below the bed elevation of Teatree Hollow at TT7-QLa.
- Based on the recorded groundwater levels at monitoring bore P52, it is inferred that there was negligible baseflow contribution (groundwater discharge to the surface water system) occurring in the vicinity of TT7-QLa during the review period.

MAP 3: GROUNDWATER MONITORING BORES PROXIMAL TO TEATREE HOLLOW



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4 SURFACE WATER MONITORING PROGRAM

4.1 Overview

Tahmoor Coal has implemented an extensive surface water monitoring program within and adjacent to the Study Area, as detailed in the WMP. The LW S1A-S6A surface water monitoring program includes water level, streamflow and water quality monitoring sites in addition to visual inspection sites. The purpose of the surface water monitoring program is 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; and
- surface water quality.

The monitoring program aimed to develop a baseline (before) dataset for a range of surface water features and to assess operational and post-mining (after) impacts through the monitoring of reference sites (control) and potential impact sites (impact).

The monitoring sites are characterised as follows:

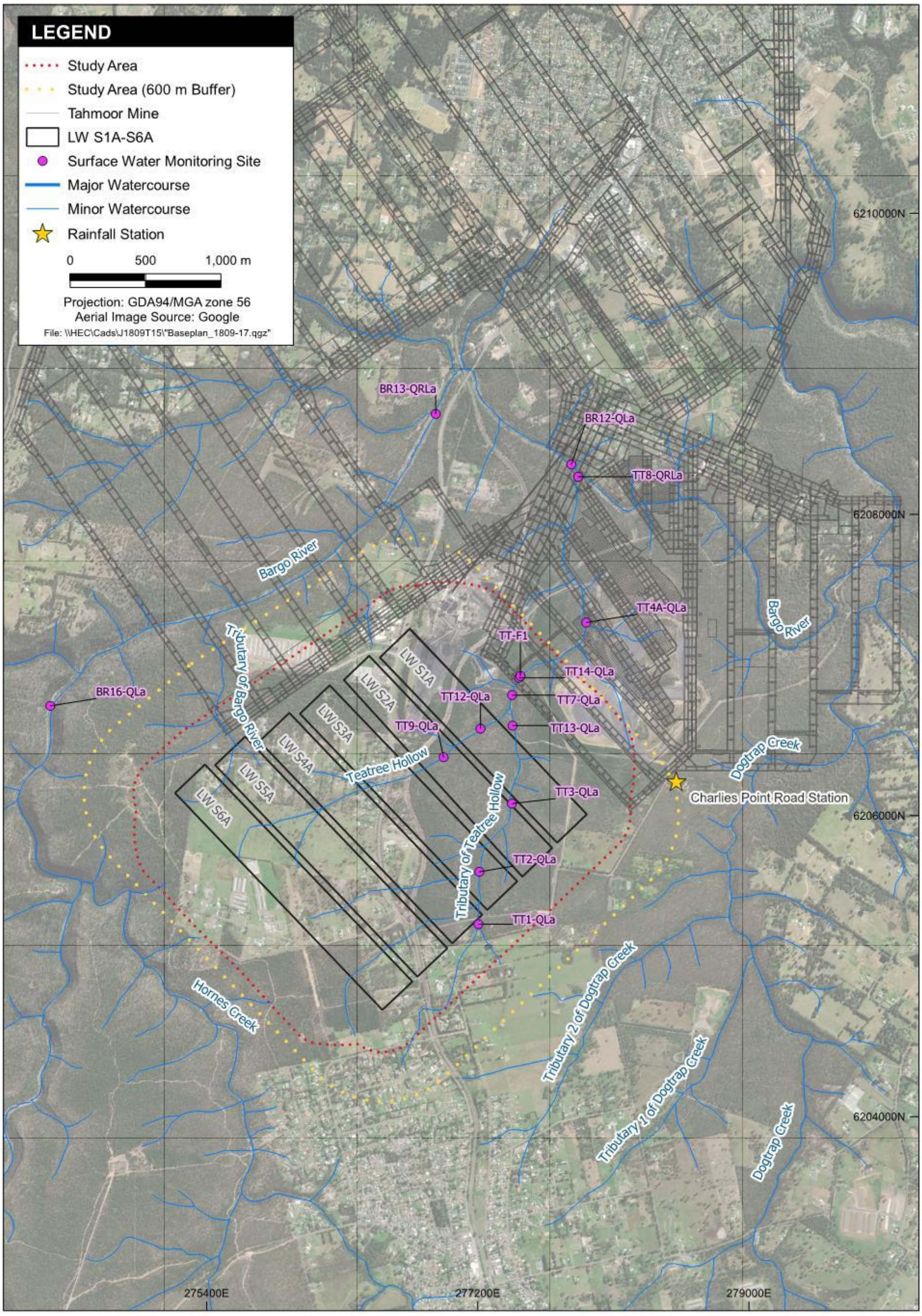
Baseline Site:	Surface water monitoring site that has been monitored for water level and quality prior to the commencement of mining in the Western Domain. Baseline surface water monitoring data was used to derive water quality Site Specific Guideline Values (SSGVs) and water level trigger values.
Reference Site:	Surface water monitoring site that is located upstream of the subsidence impact zone and is 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.

4.2 Monitoring Program Summary

Surface water monitoring sites are located on key watercourses within and adjacent to the Study Area, including 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 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: water quality (Q), automated (continuous) water level monitoring (La), streamflow (F), channel morphology (CM), knickpoint (K) and headwater reaches (HW). The surface water monitoring program for LWS1A-S6A is summarised in **Appendix A.**

MAP 4: RELEVANT RAINFALL STATIONS, SURFACE WATER MONITORING SITES AND GROUNDWATER MONITORING BORES SPECIFIC TO LWS1A-S6A



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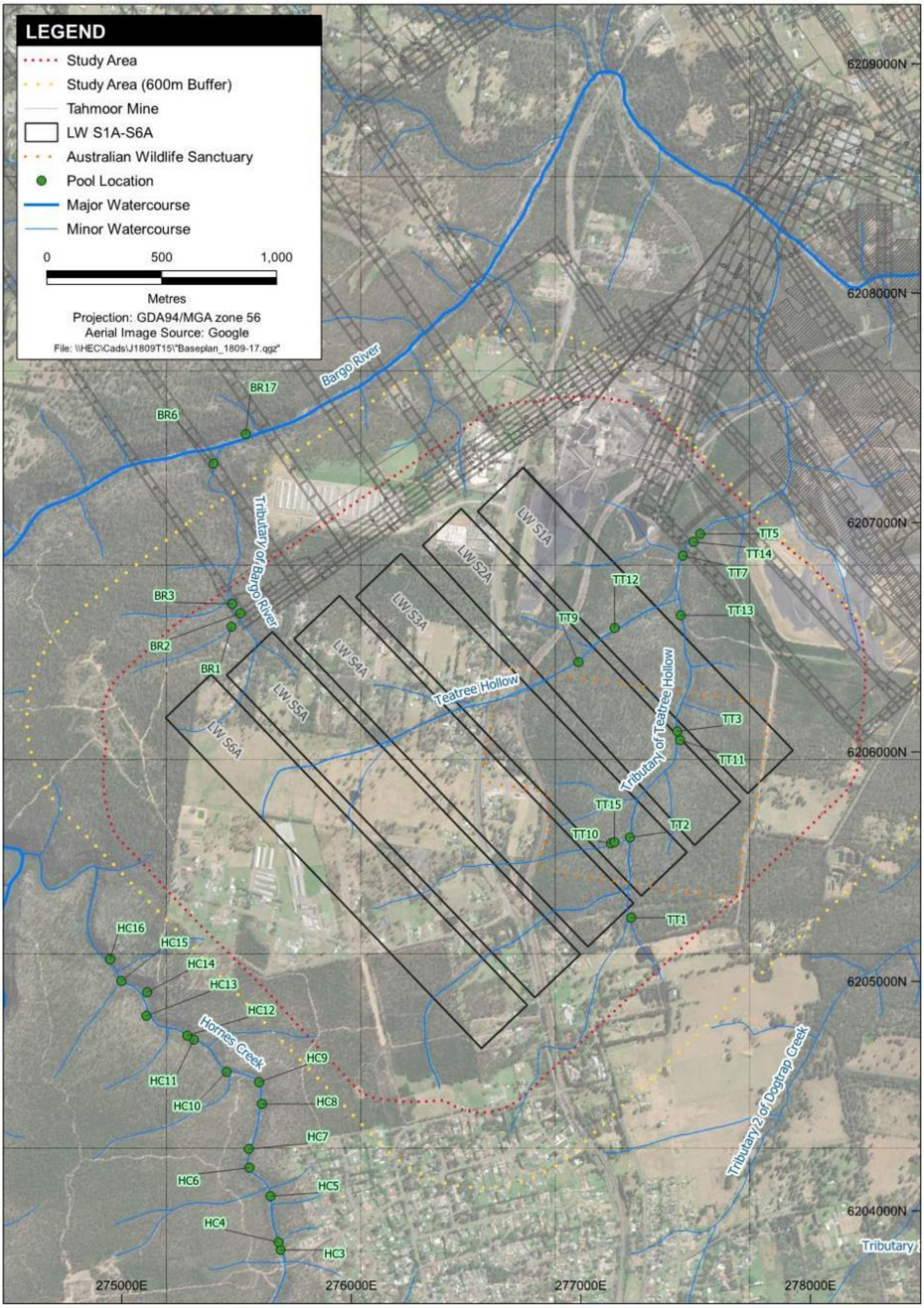
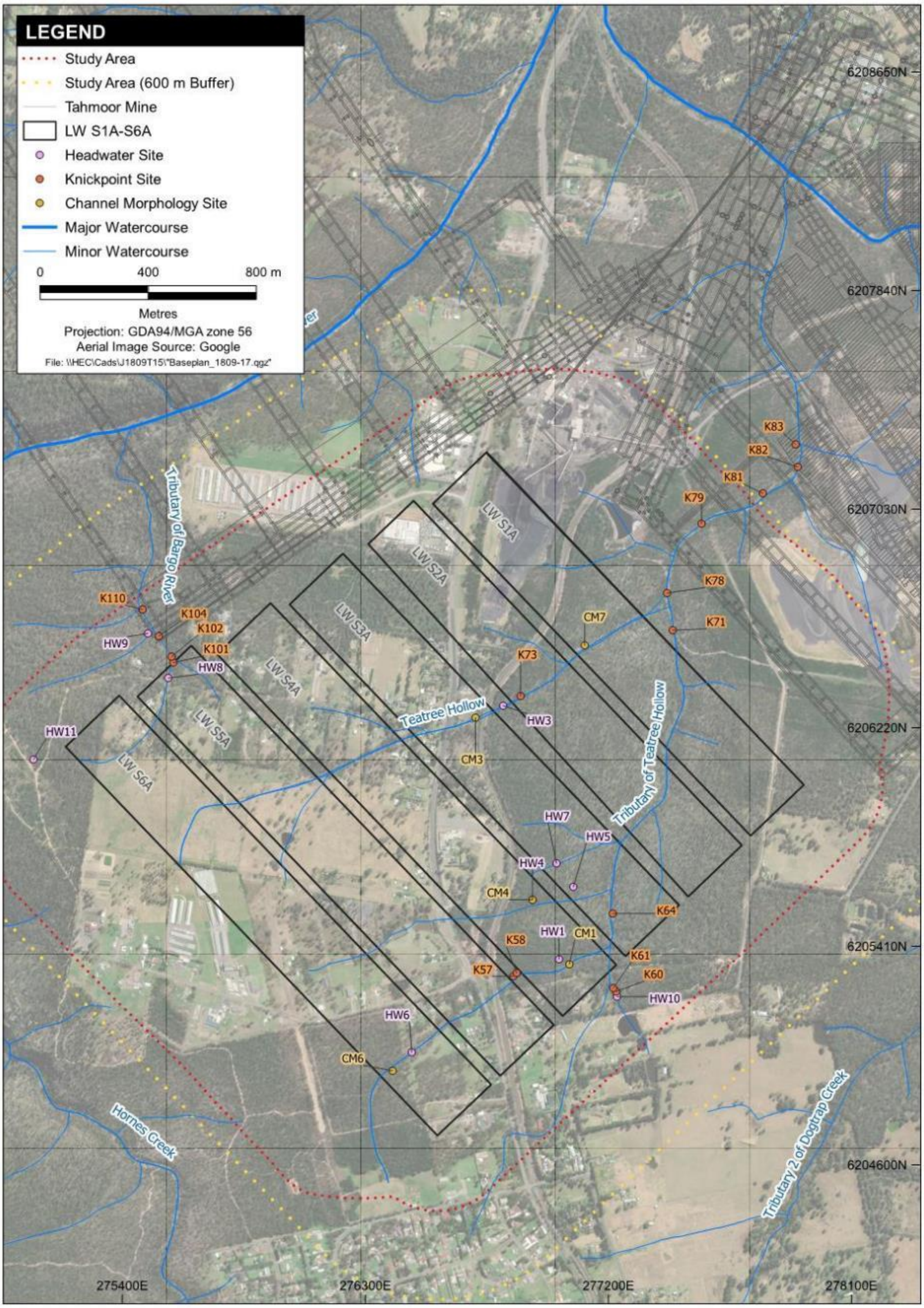
MAP 5: POOL VISUAL INSPECTION SITES SPECIFIC TO LWS1A-S6A



MAP 6: MORPHOLOGY AND CHANNEL STABILITY MONITORING SITES SPECIFIC TO LWS1A-S6A



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5 SURFACE WATER MONITORING DATA REVIEW

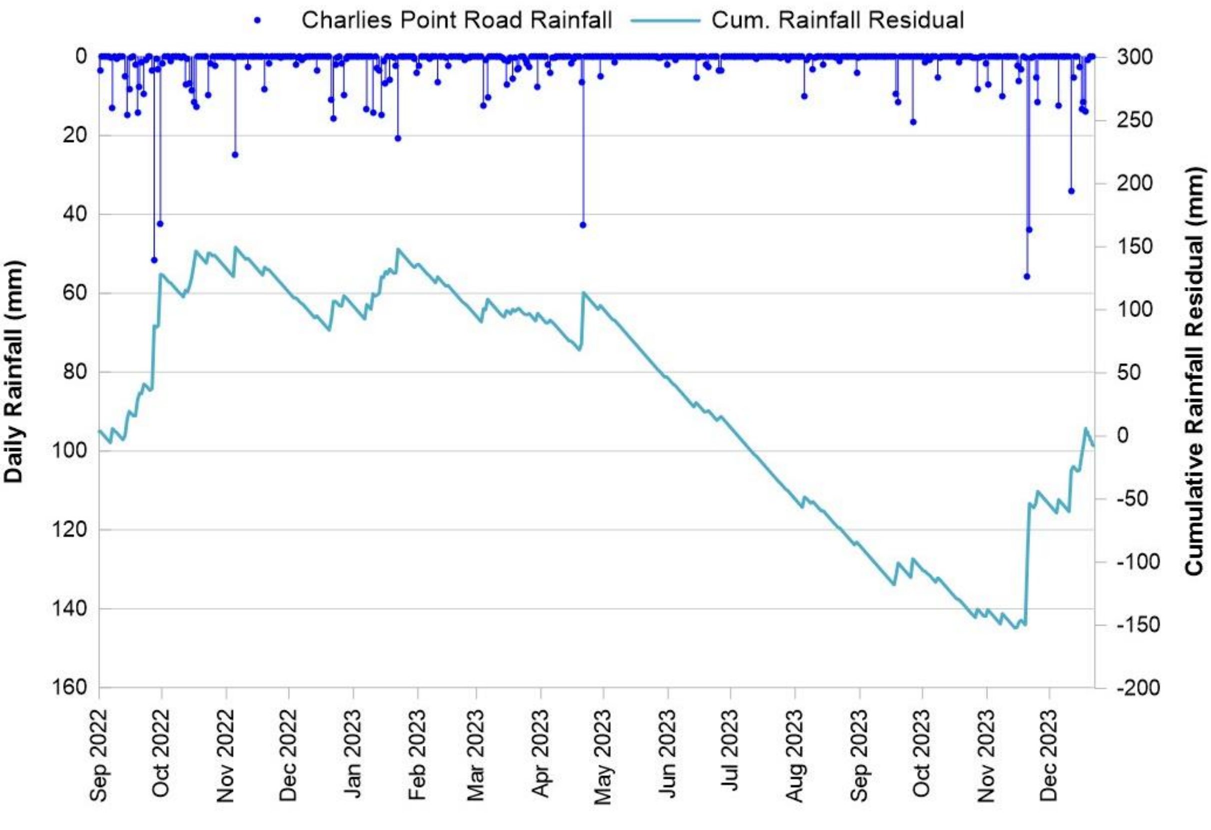
The following sections present a summary of the monitoring data for the period of review. Monitoring sites on Hornes Creek and Bargo River tributary, in addition to monitoring sites BR17-QLa and BR18-QLa on the Bargo River (refer **Map 4**), are located outside of the subsidence zone associated with mining of LW S1A and LW S2A. As such, review of the monitoring data for these sites has been excluded from the assessment for the current review period.

Section 6 presents an assessment of monitoring data against the TARP trigger levels defined in the WMP.

5.1 Rainfall Trends

Diagram 2 presents daily rainfall data recorded at the Tahmoor Coal rainfall station, referred to as "Charlies Point Road", for the period from 8 September 2022 (refer **Map 4** for station location). The cumulative rainfall residual[4] is also presented which was calculated for the period January 2000 to December 2023 to illustrate climatic trends over a long-term period. The cumulative rainfall residual was calculated from SILO Point Data for the period 1 January 2000 to 7 September 2022 and Charlies Point Road data for the period 8 September 2022 to 31 December 2023. The SILO Point Data was obtained for a location in close proximity to Tahmoor South.

DIAGRAM 2: DAILY RAINFALL AND CUMULATIVE RAINFALL RESIDUAL



The cumulative rainfall residual depicted in **Diagram 2** indicates generally average rainfall conditions from January to April 2023 with an overall declining trend in rainfall from May to November 2023. From late November 2023, generally above average rainfall was recorded.

[4] 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.

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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). In the event that 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 1 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 1,** 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 1: SUMMARY OF WATER LEVEL TRENDS - 1 JULY TO 31 DECEMBER 2023

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 declined below the CTF level for periods of late October and November 2023, consistent with below average rainfall conditions. In response to above average rainfall conditions from late November 2023, the water level rose and was recorded above the CTF level at the end of the review period.	B1.1
TT2-QLa	Potential Impact Site	The water level was recorded below the CTF level from July to 23 October 2023 and below the sensor level or dry from 24 October to late November 2023. In response to above average rainfall conditions from late November 2023, the water level rose and was recorded above the CTF level until 31 December 2023.	B1.2
TT3-QLa	Potential Impact Site	Except for brief intervals during rainfall events, the water level was recorded 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 from July to August 2023. From September to October 2023, the water level was recorded below the CTF and the baseline minimum. In November 2023 the pool was reported as dry. In response to above average rainfall conditions from late November 2023, the water level rose and was recorded above the CTF level until 31 December 2023.	B1.4

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Monitoring Site	Classification	Summary of Water Level Trends	Appendix B - Graph Reference
TT9-QLa	Potential Impact Site	The water level rose and fell periodically in response to rainfall conditions. From mid-October to late November 2023, the water level declined to a historical minimum, although did not decline below the sensor level. In response to above average rainfall conditions from late November 2023, the water level rose and was recorded above the CTF level at the end of the review period.	B1.5
TT12-QLa	Potential Impact Site	The water level remained below the sensor level or the pool was dry for the majority of the review period, except for brief intervals during and following rainfall events.	B1.6
TT13-QLa	Potential Impact Site	The water level remained below the sensor level or the pool was dry from July to mid-November 2023. In response to above average rainfall conditions from late November 2023, the water level rose and was recorded above the sensor level at the end of the review period.	B1.7
Bargo River			
BR16-QLa	Reference Site	The water level trends were consistent with climatic conditions for the duration of the review period.	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

5.3 Streamflow Data

The TT-F1 streamflow data is presented in **Diagram 3** in comparison to SILO Point Data and Charlies Point Road rainfall data for the period of record. **Diagram 4** presents the cumulative rainfall and streamflow residual for the period of record.

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, no flow was recorded from July to late November 2023, consistent with below average rainfall conditions. From late November 2023 to the end of the review period, flow events occurred in response to above average rainfall.

The comparison of the cumulative rainfall and streamflow residual presented in **Diagram 4** indicates that streamflow trends have been consistent with rainfall trends for the duration of the review period. The rate of streamflow decline recorded during the review period is considered consistent with that recorded from April to November 2021, prior to the commencement of mining of LW S1A and consistent with the rate of rainfall decline recorded during these periods.

DIAGRAM 3: TEATREE HOLLOW (TT-F1) STREAMFLOW AND RAINFALL

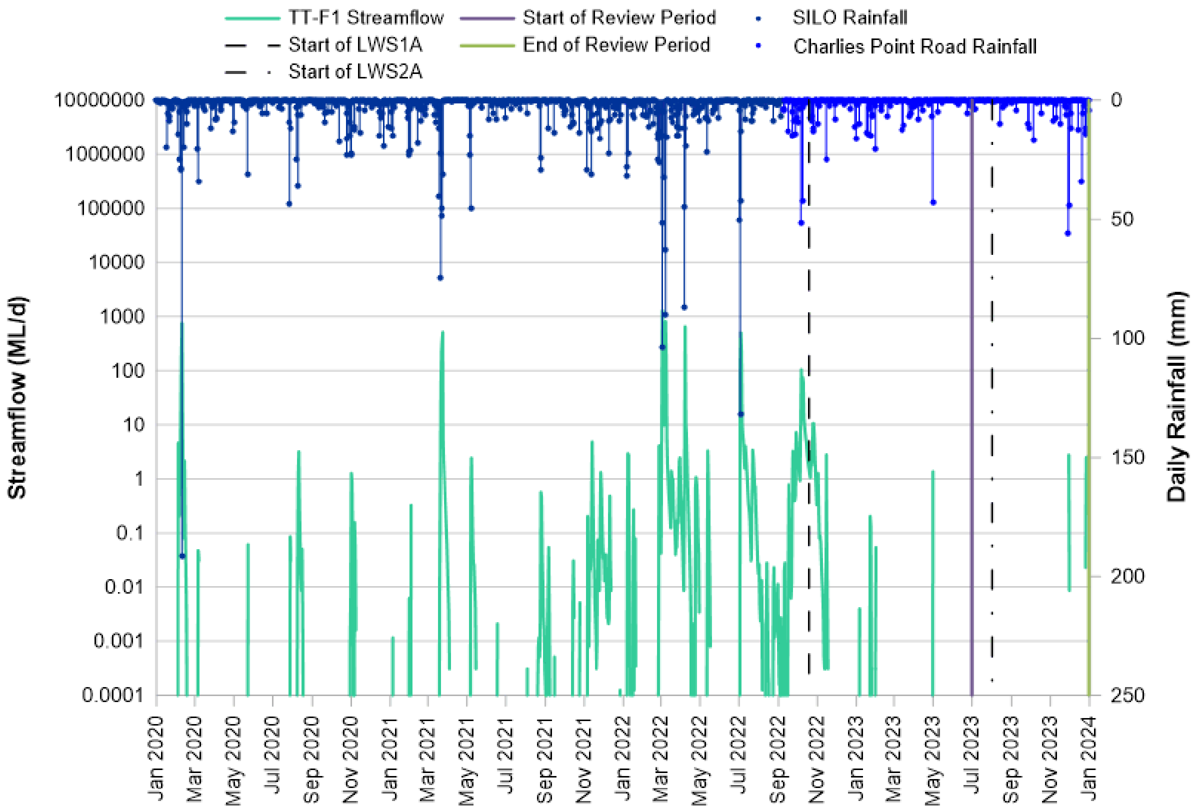
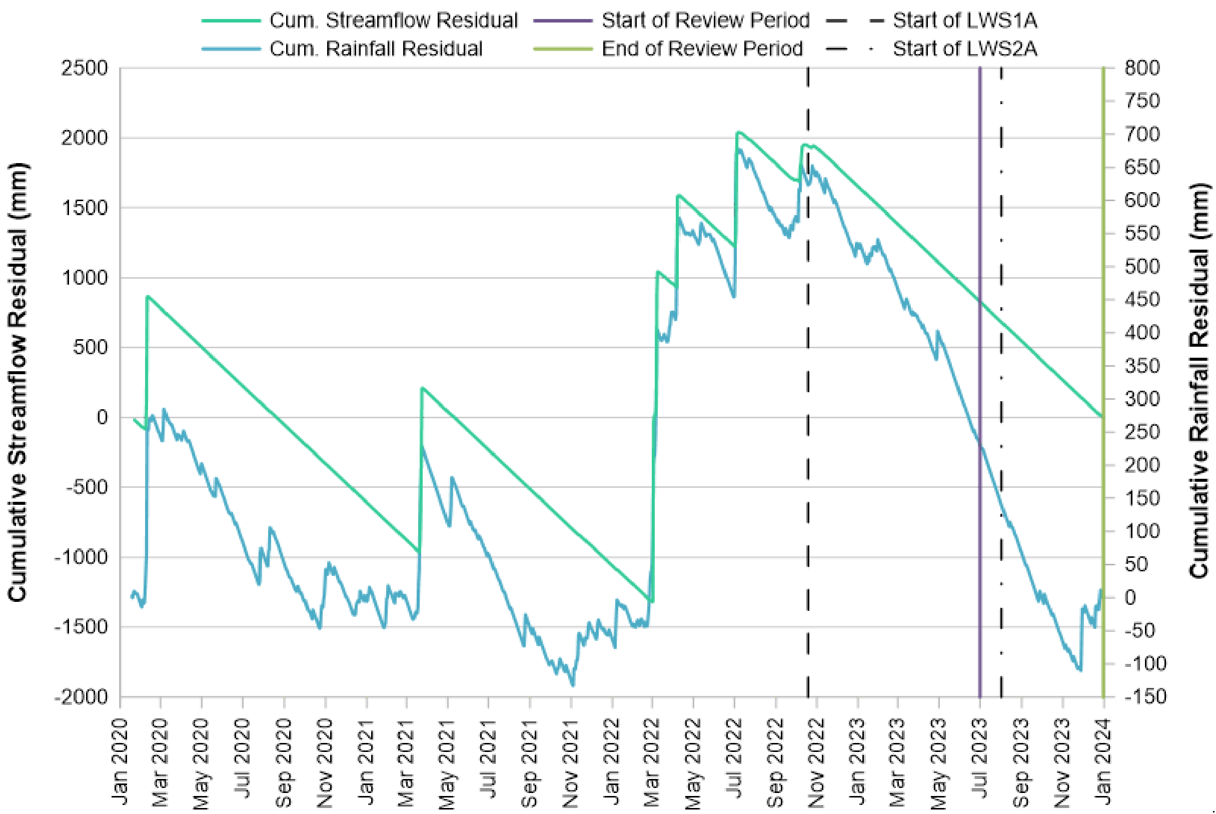


DIAGRAM 4: TEATREE HOLLOW (TT-F1) STREAMFLOW AND RAINFALL



5.4 Surface Water Quality

Water quality monitoring data is presented as a series of graphs in **Appendix C**. **Table 2** presents a summary of the water quality data for the following constituents which are considered to be primary indicators of a potential mining related effect (refer WMP):

- pH;
- Electrical conductivity (EC); and
- Specific dissolved metals: aluminium, copper, iron, manganese, nickel and zinc.

TABLE 2: SUMMARY OF KEY WATER QUALITY CONSTITUENTS – 1 JULY TO 31 DECEMBER 2023

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 (potential impact sites)
Field pH	• Near neutral to slightly acidic pH recorded at all monitoring sites. • The pH values recorded during the review period were within the range of baseline values with the exception of TT7-QLa. • Historically low pH recorded at TT7-QLa in August 2023 (pH 5.63).	• Slightly alkaline to slightly acidic pH recorded at all monitoring sites. • 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 with the exception of TT7-QLa. • A historically high EC value was recorded at TT7-QLa in July 2023 (1,044 µS/cm).	• 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 December 2023 in comparison to the remainder of the review period.
Dissolved Aluminium	• Dissolved aluminium concentrations were within the range of baseline concentrations with the exception of TT2-QLa in September 2023 and TT3-QLa, TT7-QLa and TT9-QLa in December 2023. • A historically high concentration of dissolved aluminium was recorded at site TT2-QLa in September 2023 (0.64 mg/L) and at TT3-QLa (0.23 mg/L), TT7-QLa (0.3 mg/L) and TT9-QLa (0.41 mg/L) in December 2023.	• Dissolved aluminium concentrations were within the range of baseline concentrations for the duration of the review period. • A minor increase in dissolved aluminium was recorded at all sites in December 2023 in comparison to the remainder of the review period.
Dissolved Copper	• Dissolved copper concentrations were less than 0.002 mg/L for the duration of the review period.	• Dissolved copper concentrations were equal to or less than the limit of reporting for the duration of the review period.

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 (potential impact sites)
Dissolved Iron	• Dissolved iron concentrations were within the range of baseline concentrations with the exception of TT2-QLa in November 2023 and TT7-QLa in July 2023. • An elevated dissolved iron concentration of 6.92 mg/L was recorded at site TT7-QLa in July 2023. • A slightly elevated dissolved iron concentration of 1.2 mg/L was recorded at TT2-QLa in July 2023.	• 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 with the exception of TT7-QLa. • A slightly elevated concentration of dissolved manganese was recorded at site TT7-QLa in July 2023 (1.99 mg/L).	• Dissolved manganese concentrations recorded at all sites were within the range of baseline values.
Dissolved Nickel	• Dissolved nickel concentrations were less than or equal to the limit of detection at all sites with the exception of TT7-QLa in July and August 2023.	• 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 with the exception of TT7-QLa in July and August 2023.	• 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 physical features and natural behaviour of pools is undertaken on a minimum monthly basis to record visual observations of:

- pool water level and surface flow in the downstream reach (natural behaviour);
- iron staining, gas release and turbidity (physical features); and
- fracturing (physical features).

The visual inspection observations recorded during active mining have been compared to the baseline visual inspection records for October 2022, conducted prior to the commencement of mining of LW S1A.

A summary of key visual observations recorded during the review period is presented in **Table 3**.

TABLE 3: SUMMARY OF POOL VISUAL INSPECTION RECORDS – 1 JULY TO 31 DECEMBER 2023

Pool	Classification	Summary of Visual Inspection Records
TT1	Reference Site	• The pool physical features observed during the review period were consistent with that of baseline conditions. • In comparison to baseline conditions, a decline in water level was observed at pool TT1 from July to November 2023, corresponding with low rainfall. • From July to mid-October 2023, surface flow was observed to cease shortly downstream of pool TT1. In late October and November 2023, no flow was observed downstream of pool TT1. • Following above average rainfall in late November 2023, water was noted flowing into and out of the pool.
TT2	Potential Impact Site	• In comparison to baseline conditions, a decline in water level was observed at pool TT2 from July to November 2023, corresponding with low rainfall. • An increase in water level was observed in December 2023 following above average rainfall. • Two fractures on the immediate upstream boundary of TT2 pool were observed in July 2023. An increase in the fracture size was reported from September 2023. • Low to moderate turbidity was observed during the review period.
TT3	Potential Impact Site	• The pool was visually observed as dry during the inspection events from July to November 2023. • Pooled water was observed in December 2023, with no overland connective flow. • No mining related fractures were observed.
TT7	Potential Impact Site	• A decline in water level was observed at pool TT7 from July to October 2023. In November 2023, the pool was reported as dry. Following above average rainfall in December 2023, the water level was observed to be higher than that observed during the baseline inspection, with trickle flow in and out of the pool. • Iron staining was observed on exposed bedrock at the upstream extent of the pool during the review period. • No new mining related fractures were observed. • No gas discharge was observed. Low to moderate turbidity was noted from July to December 2023.
TT9	Potential Impact Site	• A decline in water level, in comparison to baseline conditions, was observed during the visual inspections conducted between July to November 2023. The water level increased in December 2023 to a level consistent with that observed during the baseline inspection. • No gas discharge or iron staining were observed. Moderate turbidity was observed, consistent with baseline conditions. • No development of historical fractures was observed.

Pool	Classification	Summary of Visual Inspection Records
TT10	Potential Impact Site	• The pool was observed as dry from July to mid-September 2023, with no surface flow observed in the upstream reach of the tributary. • Minor ponding was observed in the pool in September, October and November 2023. • The water level increased in December 2023 with trickle flow observed into and out of the pool. • No gas discharge, turbidity or iron staining was observed. • No fractures were observed.
TT11	Potential Impact Site	• Pool TT11 was observed as dry on all inspection occasions with the exception of late December 2023 when the pool was flowing. • No gas discharge, turbidity or iron staining was observed. • During the review period, additional fractures and an increase in the size of an existing fracture was observed. • In late December 2023, minor gas bubbling was observed in the centre of the pool.
TT12	Potential Impact Site	• Pool TT12 was observed as dry from July to November 2023. Following above average rainfall in December 2023, trickle flow was observed over the hydraulic control. • An increase in the extent of fracturing upstream and downstream of the pool was observed during the review period. • Iron staining was observed during the review period, consistent with the previous review period. • No gas discharge was observed. • Moderate to high turbidity was observed in December 2023.
TT13	Potential Impact Site	• The pool was observed as dry from July to November 2023. Flow over the hydraulic control was observed in December 2023. • No gas discharge or iron staining was observed. • Moderate turbidity was observed in December 2023.
TT15	Potential Impact Site	• The pool was observed as dry in July, August, October and November 2023. No surface flow was observed in the upstream reach of the tributary from July to November 2023. • Minor ponding was observed in the base of pool in late September 2023. • Trickle flow into and out of the pool was observed in December 2023. • No gas discharge or iron staining was observed. • Moderate turbidity was noted in December 2023. • 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; and
- erosion and sedimentation.

In addition, annual visual inspections are conducted at headwater sites to characterise erosion and sedimentation.

The visual inspection observations recorded during active mining have been compared to the baseline visual inspection records for September 2022 (headwater sites) and October 2022 (channel morphology sites and knickpoints), conducted 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**.

TABLE 4: SUMMARY OF VISUAL INSPECTION RECORDS FOR CHANNEL MORPHOLOGY, KNICKPOINT AND HEADWATER SITES – 1 JULY TO 31 DECEMBER 2023

Pool	Classification	Summary of Visual Inspection Records
CM1	Potential Impact Site	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions.
CM3	Potential Impact Site	• From July to October 2023, no visual evidence of increased erosion or sedimentation was observed in comparison to baseline conditions. • In November 2023, CM3 was reported as disturbed by earthworks conducted at the railway corridor. No comparison to baseline conditions could be made in November and December 2023. • From July to October 2023, trickle flow was observed over the hydraulic control at CM3, with trickle flow observed intermittently between CM3 and TT9. • Iron staining was observed from July to October 2023, consistent with baseline conditions. • No gas discharge was observed, and turbidity was considered consistent with baseline conditions from July to October 2023.
CM4	Potential Impact Site	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions.
CM7	Potential Impact Site	• No visual evidence of increased erosion or sedimentation in comparison to baseline conditions. • Fracturing was observed at CM7 in July 2023 however the extent of fracturing was not observed to change during the review period. • Ponded water was observed at CM7 in July 2023 however surface flow had ceased. From August to November 2023, CM7 was observed as dry. • Iron staining was observed, consistent with baseline conditions. • No gas discharge was observed and turbidity was considered consistent with baseline conditions
K71, K73 and K78	Potential Impact Sites	• No further development of knickpoints was observed during the review period.
K60, K61 and K64	Potential Impact Site	• No further development of knickpoints was observed during the review period.
HW6, HW8, HW9, HW10 and HW11	Reference site	• No visible increase of erosion or sedimentation was observed during the annual inspections conducted on 11 and 25 October 2023.
HW1, HW3, HW4, HW5 and HW7	Potential Impact Site	• No visible increase of erosion or sedimentation was observed during the annual inspections conducted on 11 and 25 October 2023.

6 SURFACE WATER TRIGGER EXCEEDANCE ASSESSMENT

6.1 Surface Water Trigger Level Summary

The surface water trigger levels exceeding 'Normal Condition' for the period of 1 July to 31 December 2023 (the review period) are summarised in **Table 5**.

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, 2023a-f) and represents conditions observed in early November 2023 (below average rainfall period).

TABLE 5: SURFACE WATER TARP SIGNIFICANCE LEVELS AND ACTIONS – 1 JULY TO 31 DECEMBER 2023

Date	Location(s)	Comment	TARP Significance	Actions
Surface Water Level				
1 July to 12 July 2023	TT2	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).	Level 1	• Water level trends for all sites in Teatree Hollow and Teatree Hollow tributary were reviewed with consideration to climatic conditions (refer **Section 6.1.1**). • Streamflow data recorded at TT-F1 was reviewed and streamflow reduction assessment conducted (refer **Section 5.3** and **Section 6.1.1**). • Relevant information was obtained from key specialists necessary to inform assessment (refer **Section 6.1.1**).
3 December 2023	TT3			
2 August to 5 October 2023	TT7			
6 October to 28 November 2023	TT9			
13 July to 12 August 2023	TT2	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).	Level 2	• Actions as per Level 1. • Detailed investigation undertaken to identify cause of atypical water level decline (refer **Section 6.1.1**).
6 to 19 and 24 December 2023	TT3			
6 October to 9 November 2023	TT7			
7 to 13 and 15 to 19 December 2023	TT12			
10 to 19 December 2023	TT13			
13 August to 28 November 2023	TT2	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**).
1 July to 28 November 2023	TT3			
10 to 28 November 2023	TT7			
1 July to 28 November 2023	TT12 and TT13			

Date	Location(s)	Comment	TARP Significance	Actions
Physical Features and Natural Pool Behaviour				
July 2023	TT10, TT15	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 6.1.1**). • Monitoring and review of data frequency increased to fortnightly. • Relevant information was obtained from key specialists necessary to inform assessment (refer **Section 6.1.1**).
August 2023	TT15			
July 2023	TT2, TT3, TT11	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 6.1.1**).
August 2023	TT2, TT10			
September, October and November 2023	TT10, TT15			
July 2023	TT7, TT12, TT13	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.
August 2023	TT3, TT7, TT11, TT12, TT13			
September, October and November 2023	TT2, TT3, TT7, TT11, TT12, TT13			
December 2023	TT2, TT3, TT11, TT12			

<table>
<thead>
<tr><th>Date</th><th>Location(s)</th><th>Comment</th><th>TARP Significance</th><th>Actions</th></tr>
</thead>
<tbody>
<tr><td colspan="5">Surface Water Quality</td></tr>
<tr><td>August 2023</td><td>TT7</td><td>Exceedance of the dissolved nickel SSGV occurred at potential impact site TT7 in three consecutive months and the same has not occurred at the reference site(s)</td><td rowspan="2">Level 1</td><td rowspan="2">Exceedance of the trigger level during the baseline period was reviewed (refer Section 6.1.3).
Water quality trends were reviewed for the watercourse reach (refer Section 6.1.3).
Relevant information was obtained from key specialists necessary to inform assessment (refer Section 6.1.1).
Reasonable and feasible options for remediation were considered where relevant (refer Section 7.3).</td></tr>
<tr><td>November 2023</td><td>TT2</td><td>Exceedance of the dissolved aluminium SSGV occurred at potential impact site TT2 in three consecutive months and the same has not occurred at the reference site(s)</td></tr>
<tr><td>July and August 2023</td><td>TT7</td><td>Exceedance of the dissolved zinc and dissolved iron SSGV occurred at potential impact site TT7 in four or five consecutive months and the same has not occurred at the reference site(s).</td><td>Level 2</td><td>Actions as stated in Level 1.
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, 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 a water quality change).
If increased monitoring is adopted, undertake further analysis of water quality trends along creek (upstream to downstream) to identify spatial changes with consideration to climatic conditions.
Review CMAs in light of findings from further investigations and consider additional remediation options.
Review Water Management Plan and modify if necessary.</td></tr>
</tbody>
</table>

Date	Location(s)	Comment	TARP Significance	• Actions
Surface Water Quality				
July and August 2023	TT7	Exceedance of the electrical conductivity SSGV occurred at potential impact site TT7 in six consecutive months and the same has not occurred at the reference site(s).	Level 3	• Actions as per Level 1. • Increased monitoring and review of data frequency was considered (refer **Section 6.1.3**). • The Water Management Plan was reviewed and modifications considered (refer **Section 7.3**).

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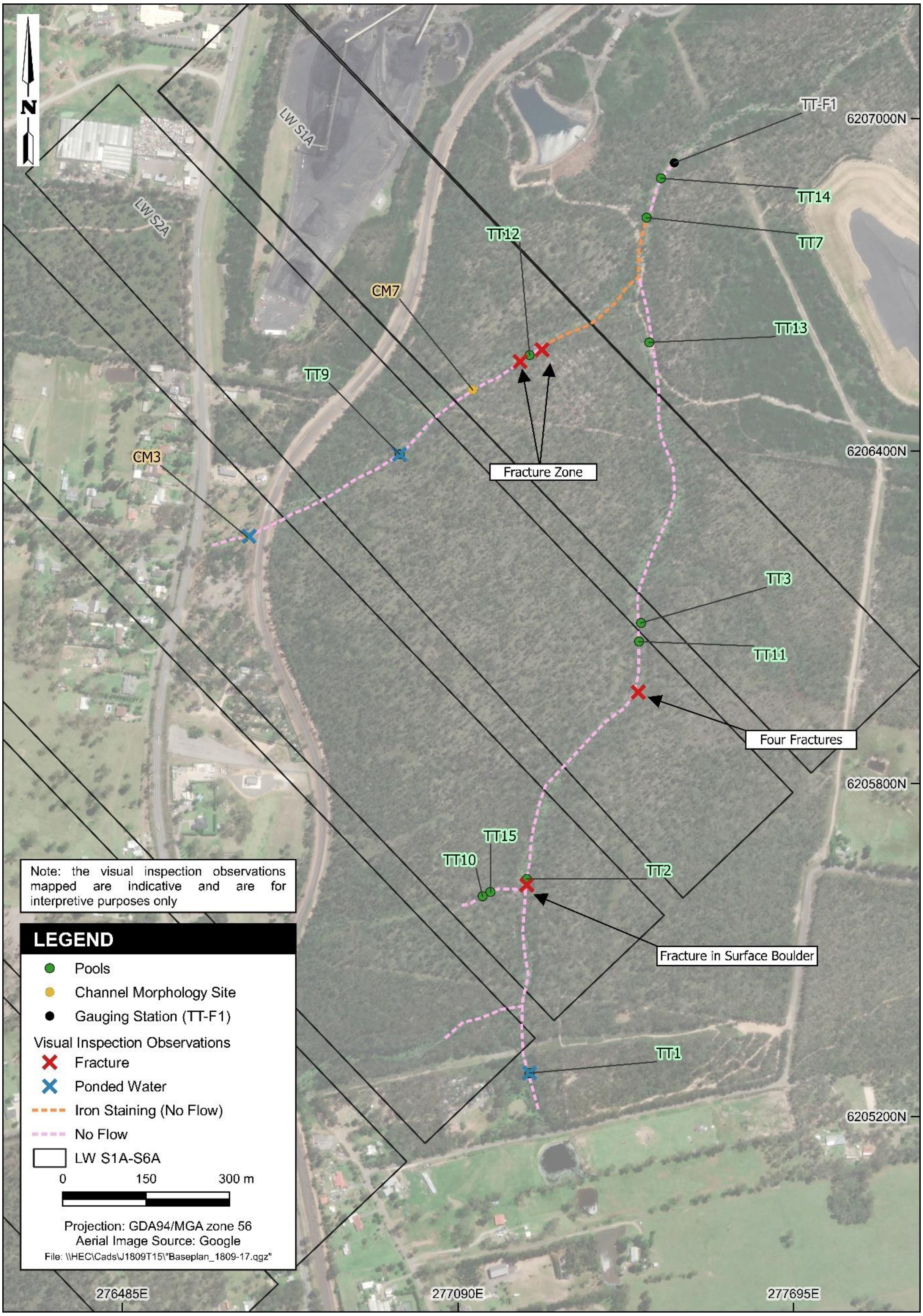
MAP 7: VISUAL DEPICTION OF SURFACE WATER CHARACTERISTICS AND PHYSICAL EFFECTS (EARLY NOVEMBER 2023)



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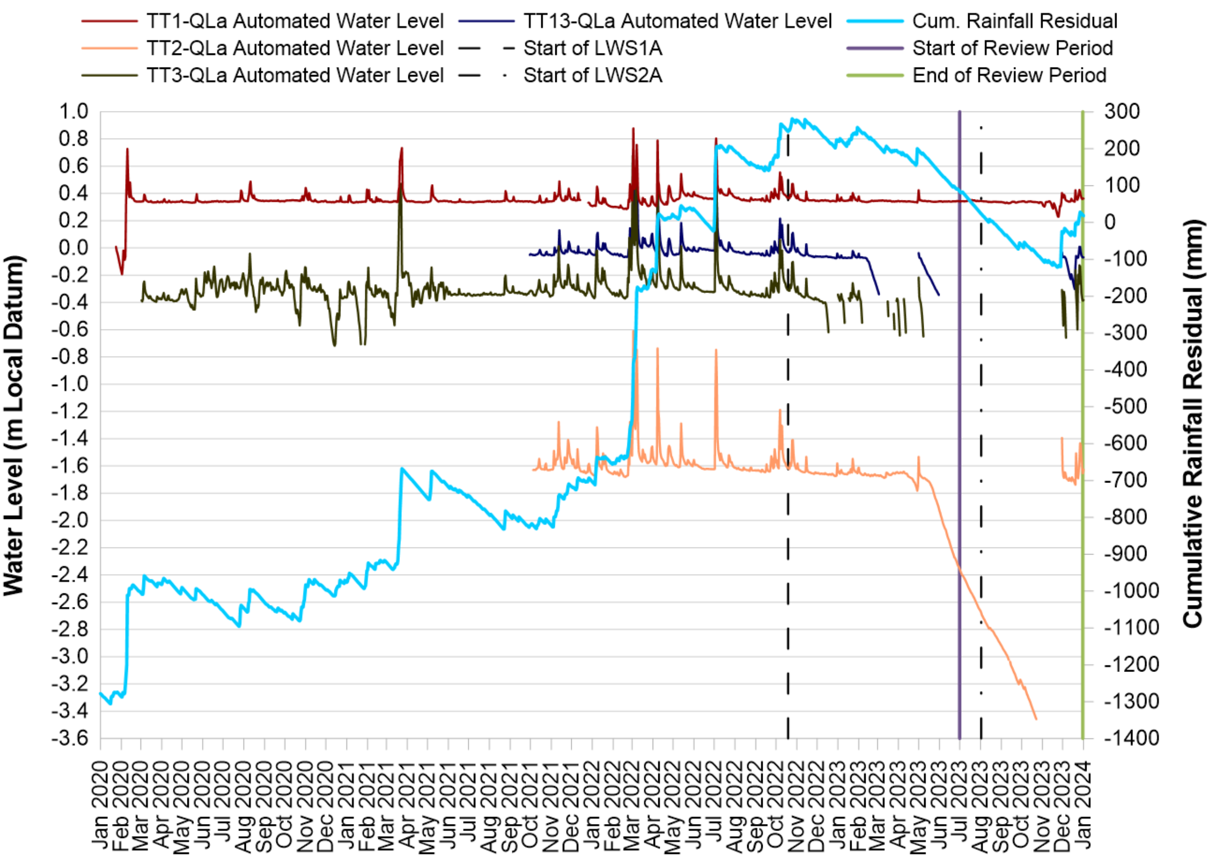
6.1.1 Water Level Assessment

6.1.1.1 Teatree Hollow Tributary

Diagram 5 presents a comparison of the water level records (converted to metres local datum for comparative purposes) for monitoring sites on Teatree Hollow tributary for the period of record. The cumulative rainfall residual is also presented (calculated for the period 1 January 2000 to 31 December 2023).

DIAGRAM 5: TEATREE HOLLOW TRIBUTARY WATER LEVEL COMPARISON



<u>*Pool TT1 (Reference Site TT1-QLa)*</u>

As illustrated in **Diagram 5**, the water level at pool TT1 (reference site TT1-QLa) generally remained low to December 2023, consistent with below average rainfall conditions. As stated in **Table 3**, from July to mid-October 2023, surface flow was observed to cease shortly downstream of pool TT1. In late October and November 2023, the water level declined below the CTF level and no surface flow was present downstream of pool TT1 (refer **Map 7**).

It is noted that pool TT1 is located upstream of the zone of active subsidence. Based on the groundwater levels recorded at monitoring bore P55A-C for the period of record, it is inferred that baseflow contribution (groundwater discharge to the surface water system) is likely negligible in the vicinity of TT1-QLa. As such, the decline in water level recorded at pool TT1 during the review period is unlikely related to a decline in baseflow contribution.

<u>*Pool TT10, Pool TT15 and Pool TT2 (Monitoring Site TT2-QLa)*</u>

From July to late November 2023, the water level at pool TT2 declined atypically, with the water level recorded below the sensor level from 24 October to 28 November 2023. The pool was reported as dry on 8 November 2023 (refer **Diagram 5**). It is noted that pool TT2 was last observed as dry in early December 2019 during a major drought.

As shown in **Section 2**, an increase in the rate of closure was recorded at pool TT2 (Big Pool) from August to October 2023, following the commencement of mining of LW S2A, with approximately 70 mm of closure recorded at the end of the review period. Fracturing was initially observed directly upstream of pool TT2 in July 2023 with an increase in the size of the fracture observed to occur from September 2023.

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. It is noted that no surface flow was observed in the upstream reach of the minor tributary from July to November 2023. In addition, no surface flow was present in the upstream reach of Teatree Hollow tributary in late October and November 2023. It is considered that the decline in surface flow in the upper headwaters of Teatree Hollow tributary was related to the prevailing climatic conditions and unrelated to mining effects.

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.

Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the upper headwaters of Teatree Hollow tributary, the water level decline recorded at pool TT2 is considered atypical and inconsistent with historical conditions. In addition, widening of the fracture observed immediately upstream of pool TT2 indicates that mining related effects have occurred at this site.

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.

Pool TT11 and Pool TT3 (Monitoring Site TT3-QLa)

From July to November 2023, the water level at pool TT3 was recorded below the sensor level. The pool was reported as dry during the visual inspections conducted from July to November 2023. It is noted that the pool water level has been recorded below the sensor level since mid-December 2022, except for brief intervals during or following rainfall (refer **Diagram 5**).

As shown in **Section 2**, approximately 90 mm of closure developed at pool TT3 (Ockenden Pool) during mining of LW S1A with a maximum of approximately 210 mm recorded during mining of LW S2A to December 2023. During the review period, additional fractures and an increase in the size of an existing fracture was observed at pool TT11, located directly upstream of pool TT3. In addition, minor gas bubbling was observed at pool TT11 in December 2023 indicating disturbance of pool substrate.

As indicated by SLR (2024), 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.

Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the reach of Teatree Hollow tributary downstream of pool TT1, the water level decline recorded at pool TT3 is considered atypical and inconsistent with historical conditions. Additional fracturing and widening of existing fractures at pool TT11, in addition to the observation of minor gas bubbling, indicate that mining related effects have occurred in the vicinity of pool TT11 and pool TT3.

Pool TT13 (Monitoring Site TT13-QLa)

From July to November 2023, the water level at pool TT13 was recorded below the sensor level. The pool was reported as dry during the visual inspections undertaken from July and November 2023. It is noted that the pool water level has been recorded below the sensor level since early-March 2023, except for short intervals during or following rainfall.

Approximately 150 mm of closure developed between Site S01 and Site S02 across Teatree Hollow (Wirrimbirra Creek) during mining of LW S1A with a maximum of approximately 190 mm recorded during mining of LW S2A to December 2023 (refer **Section 2**).

As indicated by SLR (2024), 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.

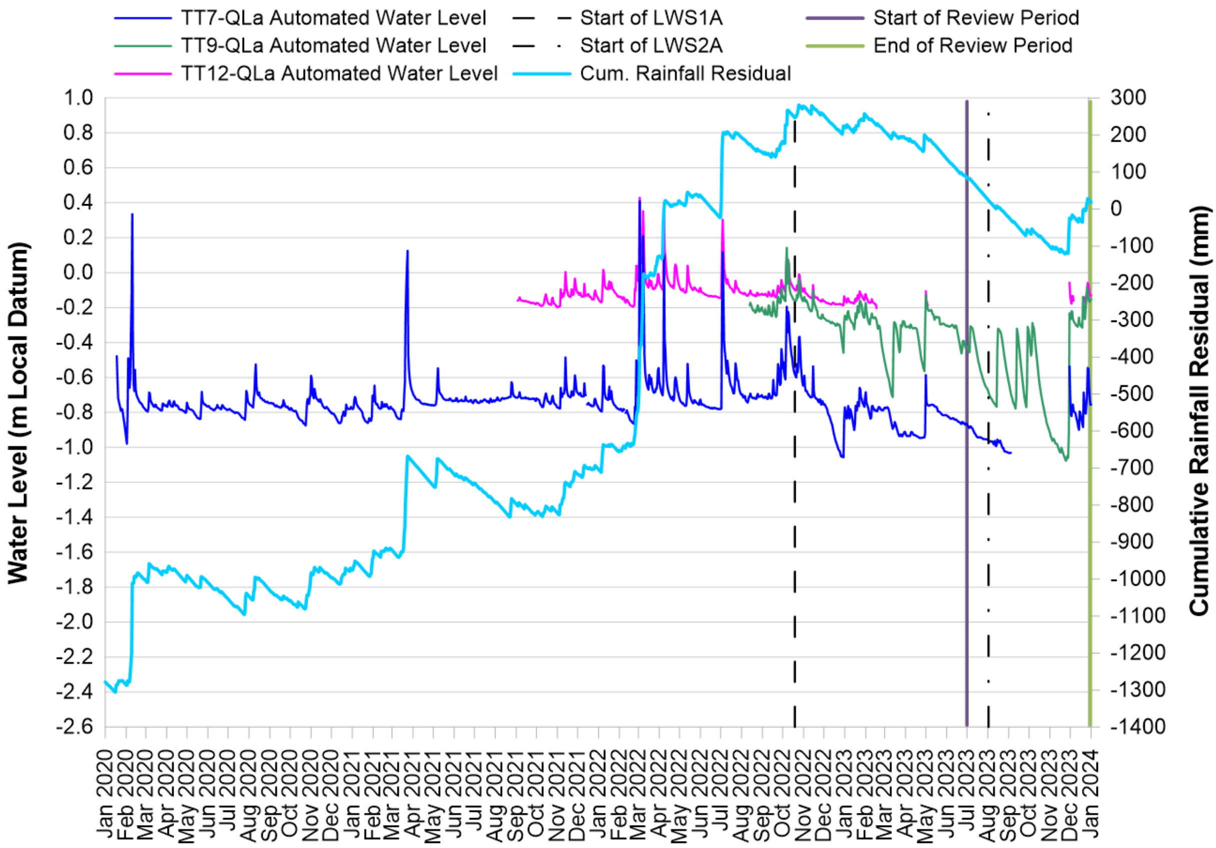
Although below average rainfall conditions occurred from July to November 2023 and surface flow ceased in the reach of Teatree Hollow tributary downstream of pool TT1, the water level decline recorded at pool TT13 is considered atypical in comparison to baseline conditions.

The decline in water level recorded during the review period is 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.

6.1.1.2 Teatree Hollow

Diagram 6 presents a comparison of the water level records (converted to metres local datum for comparative purposes) for monitoring sites on Teatree Hollow for the period of record. The cumulative rainfall residual is also presented (calculated for the period 1 January 2000 to 31 December 2023).

DIAGRAM 6: TEATREE HOLLOW WATER LEVEL COMPARISON



Pool TT9 (Monitoring Site TT9-QLa)

As stated in **Table 1**, pool TT9 water level declined intermittently below the CTF level and the baseline minimum during periods of below average rainfall from July to November 2023. 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.

Although the water level declined intermittently during the review period, the water level decline is not considered atypical. It is also noted that:

- no mining induced fracturing has been observed at pool TT9;
- between July to October 2023 trickle flow was observed over the hydraulic control at monitoring site CM3 (upstream of the influence of mining related effects), with trickle flow observed intermittently between CM3 and TT9 ENRS (2023d); and,
- in November 2023, ERNS (2023e) recorded pool TT9 as having ponded water with no inflow or outflow over the hydraulic controls.

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.

Based on the monitoring data recorded during the review period, it is considered that the decline in water level recorded at pool TT9 during the review period is related to the prevailing climatic conditions and unrelated to mining effects associated with LW S1A or LW S2A.

Pool TT12 (Monitoring Site TT12-QLa)

The water level at pool TT12 remained below the sensor level for the majority of the review period. The pool was reported as dry during the visual inspections conducted from July to November 2023. It is noted that the pool water level has been recorded below the sensor level since late February 2023, except for short intervals during or following rainfall. It is considered that the water level behaviour at pool TT3 recorded during the review period is atypical and inconsistent with historical conditions.

During the review period, an increase in the extent of fracturing upstream and downstream of pool TT12 was recorded. As such, the change in water level behaviour at pool TT12 is considered related to mining induced fracturing in combination with the prevailing climatic conditions.

Pool TT7 (Monitoring Site TT7-QLa)

As shown in **Diagram 6**, the pool TT7 water level generally declined from May to mid-September 2023, and was recorded below the sensor level from 5 September to 28 November 2023. In November 2023 the pool was observed as dry. It should be noted that the derived trigger level for TT7 (10 cm below the baseline minimum) equates to the pool being dry. It is also noted that:

- the water level at reference site TT1-QLa trended just above and periodically declined below the CTF level between 25 October to 28 November 2023; and
- there was negligible surface water reporting to the catchment from upstream Teatree Hollow or Teatree Hollow tributary (upstream of the influence of mining related effects).

Based on the above, it is considered that the decline in water level at pool TT7 is predominately related to the prevailing climatic conditions. However, mine induced fracturing has occurred upstream of pool TT7 which has likely resulted in a change in surface flow behaviour in the vicinity of pool TT7.

As stated in **Section 3**, based on the groundwater levels recorded at monitoring bore P52 during the review period, it is inferred that baseflow contribution (groundwater discharge to the surface water system) was likely negligible in the vicinity of TT7-QLa. If the groundwater system was contributing baseflow to Teatree Hollow in the vicinity of pool TT7, it may be inferred that a slight decline in baseflow contribution has likely occurred during the review period based on the slight decline in groundwater level recorded at monitoring bore P52. However, it is considered that the slight decline in groundwater level recorded at monitoring bore P52 is consistent with a decline in rainfall recharge during the review period and unrelated to mining effects.

6.1.2 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 in Teatree Hollow have been consistent with rainfall trends for the period of July to December 2023. The rate of streamflow decline recorded during the review period is considered to be consistent with that recorded from April to November 2021 prior to the commencement of mining of LW S1A and consistent with the rate of rainfall decline recorded during these periods.

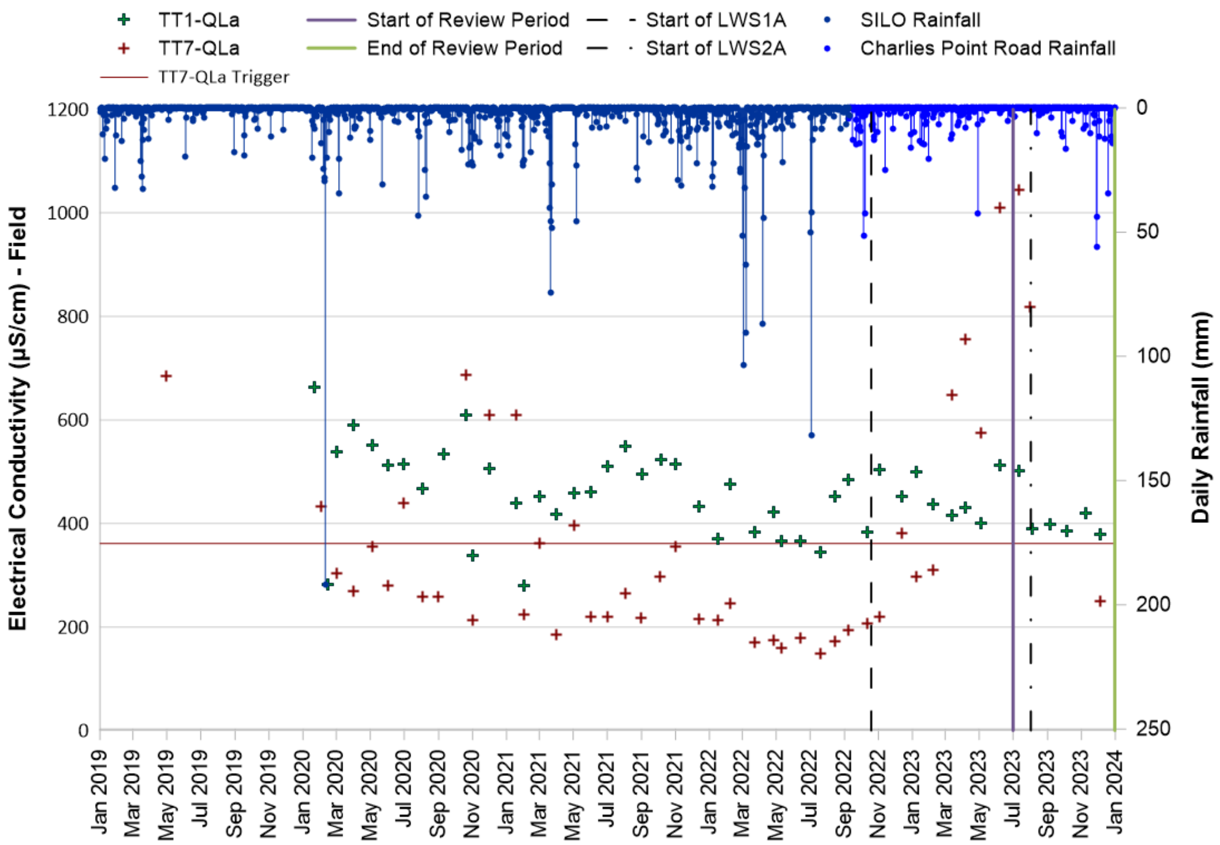
Notwithstanding, a streamflow reduction assessment has been conducted for the period from commencement of mining of LW S1A (October 2022) to end December 2023 to estimate the volume of surface water reduction attributable to mining effects. In accordance with the SSD 8445, the surface water reduction 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)*.

6.1.3 Water Quality Assessment

6.1.3.1 Electrical Conductivity

The field EC values recorded at reference site TT1-QLa, potential impact site TT7-QLa and downstream monitoring site TT14-QLa are shown on **Diagram 7**.

DIAGRAM 7: FIELD ELECTRICAL CONDUCTIVITY



The data presented in **Diagram 7** indicates that:

- TT7-QLa EC SSGV (361 µS/cm) was exceeded for six consecutive months from March to August 2023 (inclusive), equating to a Level 3 trigger.
- Similarly elevated EC values were not recorded at the upstream reference site (TT1-QLa) during the corresponding period.
- Pool TT7 was dry during the September to November sampling events.
- The EC value recorded at TT7-QLa in December 2023 was below the SSGV.
- A Level 1 trigger or above for EC (i.e. an exceedance of the SSGV for three consecutive months or greater) was not recorded at TT7-QLa during the baseline monitoring period prior to commencement of mining.

As stated in **Section 6.1.1**, a decline in water level was recorded at pool TT7 (monitoring site TT7-QLa) from July to November 2023, consistent with below average rainfall conditions. Despite the prevailing climatic conditions, pool TT7 was, to some extent, considered to be supported by surface flow that had been diverted as underflow from upstream reaches of Teatree Hollow and Teatree Hollow tributary.

Accordingly, the elevated EC values recorded at pool TT7 from March to August 2023 are considered related to the following:

- Evapoconcentration of salinity during periods of below average rainfall and water level decline.
- Interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7.

As causation is considered to be confidently identified, the frequency of monitoring was not increased during the review period.

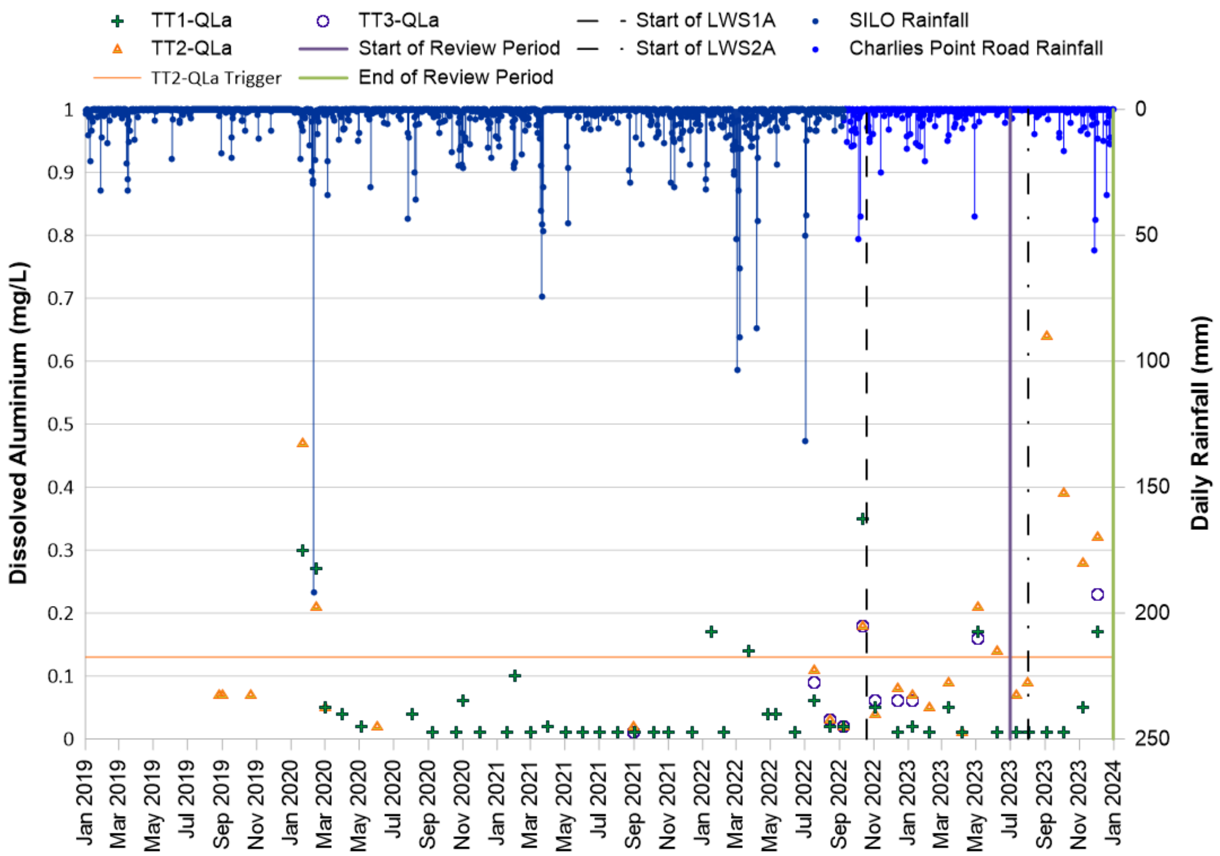
As shown in **Diagram 3**, negligible surface flow reported to the downstream reach of Teatree Hollow from March 2023. As such, it is considered that the elevated EC values recorded at TT7-QLa from March to August 2023 are unlikely to have influenced the water quality of the downstream reach of Teatree Hollow.

6.1.3.2 Dissolved Metals

Dissolved Aluminium Exceedance

The dissolved aluminium concentration recorded at reference site TT1-QLa, potential impact site TT2-QLa and downstream monitoring site TT3-QLa are shown on **Diagram 8**.

DIAGRAM 8: DISSOLVED ALUMINIUM CONCENTRATIONS



The data presented in **Diagram 8** indicates that:

- The TT2-QLa dissolved aluminium SSGV (0.13 mg/L) was exceeded for four consecutive months from September to December 2023 (inclusive). However, in December 2023 the dissolved aluminium concentration recorded at TT1-QLa (upstream reference site) also exceeded the TT1-QLa SSGV. As such, a Level 1 trigger applies for the period of September to November 2023.
- Between September and November 2023, similar elevated dissolved aluminium concentrations were not recorded at the upstream reference site (TT1-QLa).

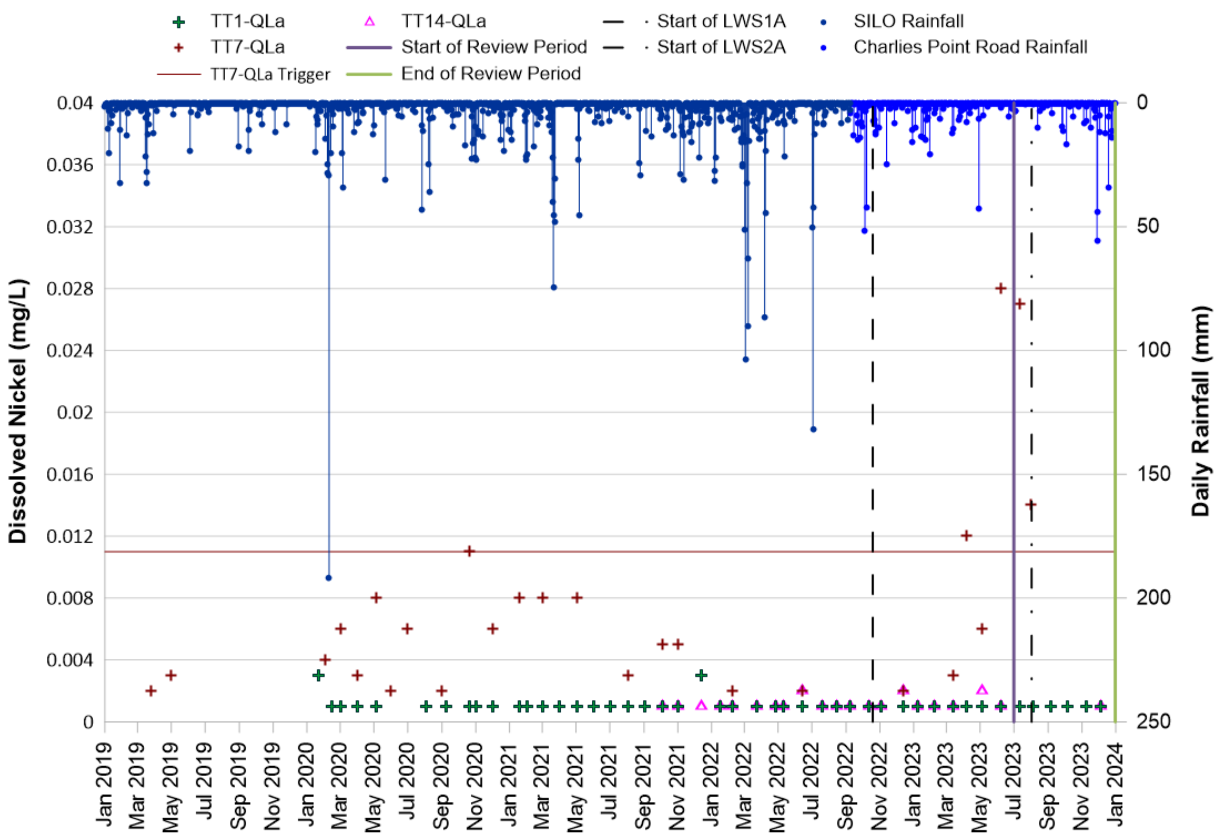
- The downstream monitoring site TT3-QLa was dry during the corresponding period.
- A similar elevated dissolved aluminium concentration was recorded at TT2-QLa in early January 2020 (during the baseline period).
- A Level 1 trigger or above for dissolved aluminium (i.e. an exceedance of the SSGV for three consecutive months or greater) was not recorded at TT2-QLa during the baseline monitoring period prior to commencement of mining.

It is considered that the elevated dissolved aluminium concentrations recorded at pool TT2 from September to December 2023 reflect the low volume of stagnant, ponded water present in the pool at the time of sampling. As such, it is considered that the aluminium concentrations recorded are reflective of a drying phase for pool TT2 rather than typical flow conditions.

<u>Dissolved Nickel Exceedance</u>

The dissolved iron concentrations recorded at reference site TT1-QLa, potential impact site TT7-QLa and downstream monitoring site TT14-QLa are shown on **Diagram 9**.

DIAGRAM 9: DISSOLVED NICKEL CONCENTRATIONS



The data presented in **Diagram 9** indicates that:

- The TT7-QLa dissolved nickel SSGV (0.011 mg/L) was exceeded for three consecutive months from June to August 2023 (inclusive) i.e., Level 1 trigger for June to August 2023. Following rainfall events in December 2023, the concentration of dissolved nickel returned to historical range below or at LOR.
- Similar elevated dissolved nickel concentrations were not recorded at the upstream reference site (TT1-QLa) during the corresponding period.
- Downstream monitoring site TT14-QLa was dry during the sampling events within the corresponding period, therefore, no comparison can be made. However, in December 2023, the concentration of dissolved nickel was below or at the LOR.

- Elevated dissolved nickel concentrations have been recorded historically, however concentrations did not exceed the SSGV previously.
- A Level 1 trigger or above for dissolved nickel (i.e. an exceedance of the SSGV for three consecutive months or greater) was not recorded at TT7-QLa during the baseline monitoring period prior to commencement of mining.

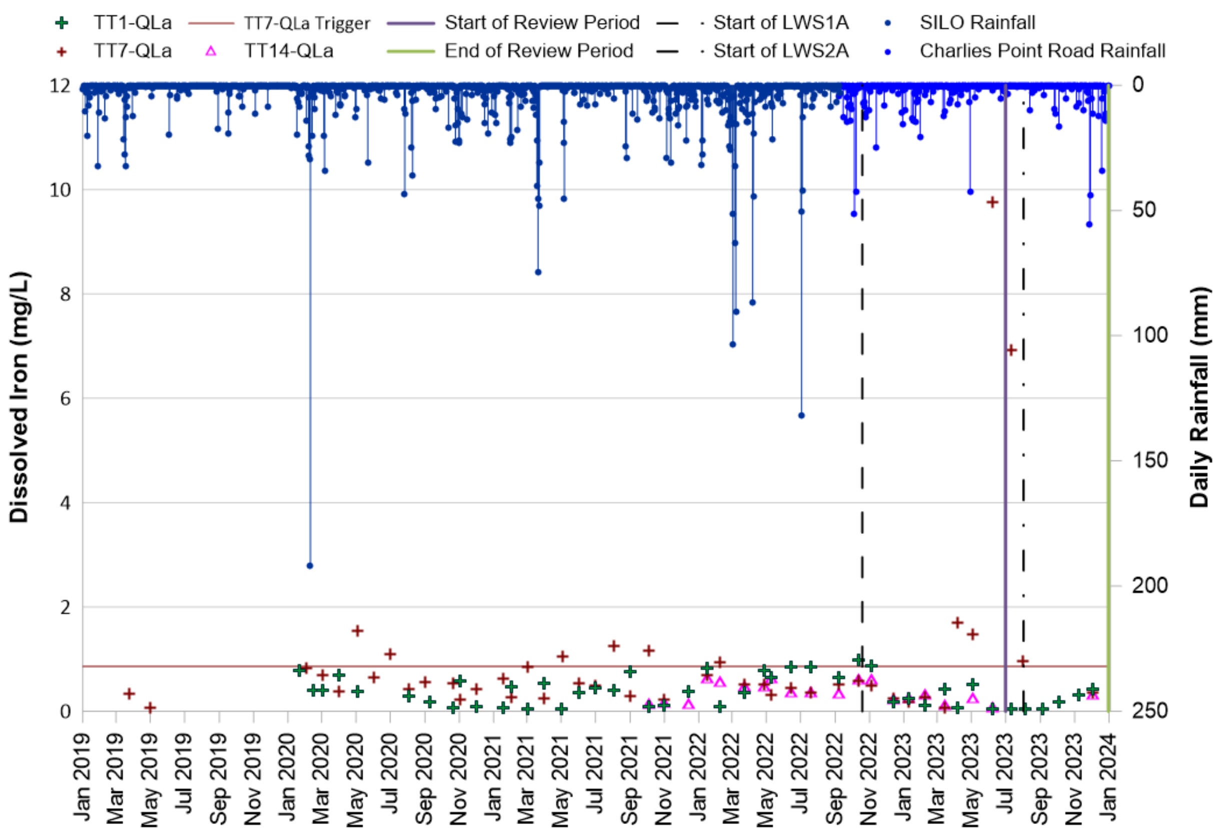
The elevated dissolved nickel concentrations recorded at pool TT7 from June to August 2023 is considered unlikely to have influenced the water quality of the downstream reach of Teatree Hollow as pool TT14 was dry during the corresponding period. The concentrations recorded at pool TT7 from June to August 2023 are considered related to the interaction of underflow with subsurface geology and re-emergence of elevated dissolved nickel underflow as surface flow in the vicinity of pool TT7.

Although June and July 2023 recorded the historically high concentration of nickel, elevated levels have been previously recorded.

<u>Dissolved Iron Exceedance</u>

The dissolved iron concentrations recorded at reference site TT1-QLa and potential impact sites TT7-QLa and TT14-QLa are shown on **Diagram 10**.

DIAGRAM 10: DISSOLVED IRON CONCENTRATIONS



The data presented in **Diagram 10** indicates that:

- The TT7-QLa dissolved iron SSGV (0.86 mg/L) was exceeded for five consecutive months from April to August 2023 (inclusive) as such a Level 2 trigger applies.
- Similar elevated dissolved iron concentrations were not recorded at the upstream reference site (TT1-QLa) during the corresponding period.
- Downstream monitoring site TT14-QLa was dry during April to August 2023 (inclusive).
- Similar elevated dissolved iron concentrations have not been recorded during the baseline period for TT7-QLa at the site.

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- Following rainfall events in December 2023, the concentration of dissolved iron returned to within historical range at 0.36 mg/L.
- A Level 1 trigger or above for dissolved iron (i.e. an exceedance of the SSGV for three consecutive months or greater) have been recorded at TT7-QLa during the baseline monitoring period prior to commencement of mining.

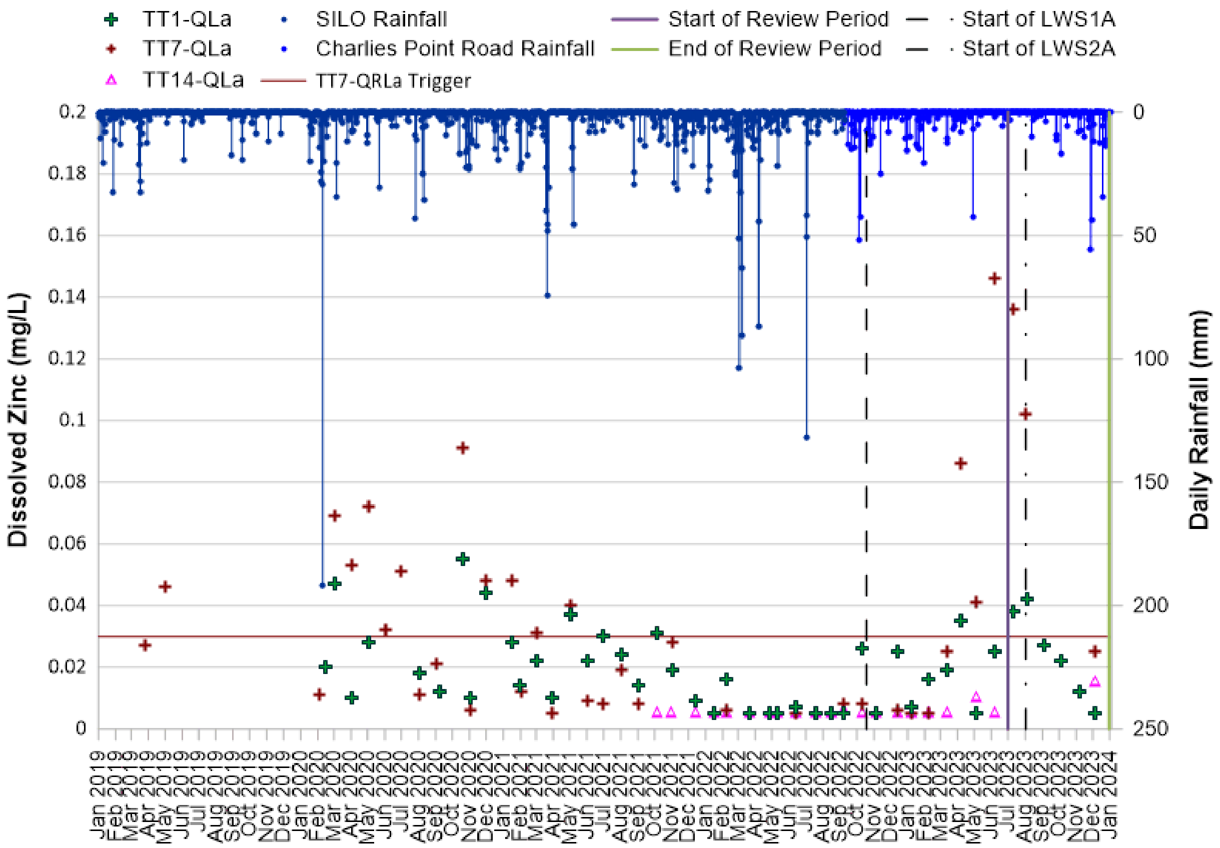
The elevated dissolved iron concentrations recorded at pool TT7 from April to August 2023 are considered related to the interaction of underflow with subsurface geology and re-emergence of elevated dissolved iron underflow as surface flow in the vicinity of pool TT7. As stated in **Table 3**, iron staining was observed on exposed bedrock at the upstream extent of the pool during the review period.

The downstream monitoring site (TT14-QLa) was recorded as dry from April to August 2023. As such, it is considered that the elevated dissolved zinc concentrations recorded at TT7-QLa are unlikely to have influenced the water quality of the downstream reach of Teatree Hollow.

<u>Dissolved Zinc Exceedance</u>

The dissolved zinc concentrations recorded at reference site TT1-QLa and potential impact sites TT7-QLa and TT14-QLa are shown on **Diagram 11**.

DIAGRAM 11: DISSOLVED ZINC CONCENTRATIONS



The data presented in **Diagram 11** indicates that:

- The TT7-QLa dissolved zinc SSGV (0.03 mg/L) was exceeded for five consecutive months from April to August 2023 (inclusive) as such a Level 2 trigger applies.
- Similar elevated dissolved zinc concentrations were not recorded at the upstream reference site (TT1-QLa) during the corresponding period.
- Downstream monitoring site TT14-QLa was dry during April to August 2023 (inclusive).
- Similar elevated dissolved zinc concentrations have been recorded at TT7-Qla during the baseline period prior to commencement of mining.

- Following rainfall events in December 2023, the concentration of dissolved zinc returned to historical range at 0.25 mg/L.
- A Level 2 trigger or above for dissolved zinc (i.e. an exceedance of the SSGV for four or five consecutive months) has been recorded at TT7-QLa during the baseline monitoring period prior to commencement of mining.

Similarly to the dissolved iron trigger exceedance, the elevated dissolved zinc concentrations recorded at pool TT7 from April to August 2023 are considered related to the interaction of underflow with subsurface geology and re-emergence of elevated dissolved iron underflow as surface flow in the vicinity of pool TT7.

The downstream monitoring site (TT14-QLa) was recorded as dry from April to August 2023. As such, it is considered that the elevated dissolved zinc concentrations recorded at TT7-QLa are unlikely to have influenced the water quality of the downstream reach of Teatree Hollow.

7 REVIEW OF SURFACE WATER PERFORMANCE

7.1 Subsidence Impact Performance Measures

The subsidence impact performance measures and performance indicators for natural features defined in the WMP are summarised in **Table 6.** 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 6**.

TABLE 6: 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 7 summarises the features considered to be directly or indirectly impacted by mining of LW S1A and LW S2A during the review period.

TABLE 7: SUMMARY OF MINING RELATED IMPACTS

Watercourse Feature	Impact Feature	Impact Type
TT2	• Pool water level • Physical (fractures)	Direct
TT3	• Pool water level	Indirect
TT11	• Pool water level	Indirect
Reach of Teatree Hollow tributary*	• Physical (fractures)	Direct
TT7	• Pool water level • Pool water quality • Iron staining	Indirect
TT12	• Pool water level • Physical (fractures) • Iron staining	Direct
TT13	• Pool water level • Physical (fractures)	Direct

* From pool TT11 to 95 m upstream of pool TT11.

As detailed in the *Tahmoor South Project Environmental Impact Statement* (SIMEC, 2019), where Teatree Hollow and Teatree Hollow tributary are directly mined beneath, subsidence effects were expected to be of sufficient magnitude to result in the buckling of underlying strata and associated surface fracturing at some locations. At these locations it was considered likely that water would be diverted from the watercourse into the underlying dilated strata. The diverted flow would be conveyed via the dilated strata and remerge further downstream in the watercourse as surface flow. As such, although Teatree Hollow and Teatree Hollow tributary were likely to incur localised reductions in pool water level and streamflow associated with fracturing in the vicinity of LW S1-S6A, the net reduction in streamflow conveyed from Teatree Hollow to the Bargo River was expected to be negligible.

Isolated, episodic pulses in salinity and dissolved metals were expected to occur in 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 and LW S2A mining related impacts to the watercourse features listed in **Table 7** 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

With respect to the water quality trigger exceedances recorded at TT7-QLa and TT2-QLa during the review period of 1 July to 31 December 2023, there are limited feasible corrective management actions (CMAs) that could be implemented prior to the cessation of subsidence movements associated with mining of LW S1A-S6A.

Presently, there is negligible indication of a material impact to the water quality of Teatree Hollow, given that there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023 with limited potential for transport of elevated EC, dissolved aluminium, iron, zinc and nickel.

Accordingly, it is considered that water quality effects are limited to pool TT7 and TT2 with negligible indication of material environmental harm to Teatree Hollow.

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. However, there is negligible indication of a non-natural reduction in surface flow reporting to the downstream reach of Teatree Hollow (downstream of TT-F1) i.e. the reduction in surface flow recorded at TT-F1 during the review period is considered consistent with natural (climatic) variability. As such, there is negligible indication of material environmental harm to Teatree Hollow or other watercourses.

Surface water monitoring and data review will continue to be undertaken in accordance with the WMP. It is noted that the WMP was reviewed and revised during the current review period. Specifically, revisions to the monitoring site SSGVs and TARPs were proposed. The proposed revisions to the WMP are currently in review by relevant government agencies and awaiting approval.

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.

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 SUMMARY AND RECOMMENDATIONS

Review and assessment of surface water monitoring data recorded prior to and during the review period of 1 July to 31 December 2023 has indicated the following:

- Surface Water Level:
  - a maximum Level 1 trigger exceedance was recorded at monitoring site TT9-QLa. It is considered that the decline in water level at monitoring site TT9-Qla is related to low rainfall conditions and a reduction in surface water reporting to the catchment from upstream Teatree Hollow or Teatree Hollow tributary (upstream of the influence of mining related effects).
  - a maximum Level 3 trigger exceedance was recorded at monitoring site TT7-Qla. It is considered that the decline in water level at monitoring site TT7-Qla is related to low rainfall conditions and a reduction in surface water reporting to the catchment from upstream Teatree Hollow or Teatree Hollow tributary (upstream of the influence of mining related effects). Additionally, mine induced fracturing has occurred upstream of pool TT7 and has likely resulted in a change in surface flow behaviour in the vicinity of pool TT7.
  - a maximum Level 3 trigger exceedance was recorded for monitoring sites TT2-Qla, TT3-Qla, TT12-Qla and TT13-QLA. It is considered that the decline in water level at these sites is related to the:
    - cessation of surface water flow in Teatree Hollow and Teatree Hollow Tributary due to mining induced fracturing upstream of pools in Teatree Hollow (pool TT11) within a reach of Teatree Hollow Tributary (pool TT12) and within pool TT13; and
    - low rainfall conditions.
  - All other monitoring sites were ‘normal condition’ for the duration of the review period.
- Physical Features and Natural Behaviour of Pools:
  - a maximum Level 2 trigger exceedance was recorded for pools TT10 and TT15. Visually anomalous change in water level was recorded for pools for these pools.
  - a maximum Level 3 trigger exceedance was recorded for pools TT2, TT3, TT7, TT11, TT12 and TT13. Anomalous change in water level was recorded for pools TT2, TT3, TT7, TT11, TT12 and TT13. In addition, fracturing was observed at pool TT11 with fractures observed in a surface boulder located at pool TT2.
  - in November 2023, channel CM3 was reported as disturbed by earth works to the railway corridor, with the amplification of the embarkment within the inspected area.
  - dry conditions were observed at channels CM4 and CM7 in November 2023, at knickpoints K71 between October and December 2023 and K73 and K78 in November and December.
- Surface Water Quality:
  - water quality TARP trigger exceedances were recorded for electrical conductivity, dissolved nickel, dissolved iron and dissolved zinc at monitoring site TT7-Qla. It is considered that the water quality exceedances recorded at monitoring site TT7-Qla was related to the following:
    - evapoconcentration of salinity during periods of below average rainfall and water level decline; and
    - the interaction of underflow with subsurface geology and re-emergence of underflow (with elevated salinity, dissolved iron, nickel and aluminium) as surface flow in the vicinity of pool TT7 and TT2.

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- a water quality TARP trigger exceedances was recorded for dissolved aluminium was recorded at monitoring site TT2-Qla. It is considered that the aluminium concentrations recorded are reflective of a drying phase for pool TT2 rather than typical flow conditions.

Based on the monitoring data for the period of 1 July to 31 December 2023, following commencement of mining LW S1A and its completion on 4 July 2023, additionally to mining commencement of LW S2A on 2 August 2023, mining related impacts to the watercourse features are considered consistent with that predicted in the EIS.

8.1 Current Surface Water Monitoring Recommendations

Based on the assessment outcomes contained herein, it is recommended that ongoing review of surface monitoring data is continued to be undertaken in accordance with the WMP.

It is recommended to remove 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.

8.2 Previous Surface Water Monitoring Recommendations

Recommendations from the previous review period (1 January to 30 June 2023, ATCW 2023) and the subsequent status/actions are summarised in **TABLE 8**.

TABLE 8: 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	The baseline minimum for pool TT9 is revised to consider the water level data recorded to the cessation of mining of LW S1A (4 July 2023)	The baseline minimum was revised to incorporate all water level data available up to the cessation of mining of LW S1A (4 July 2023). Subsequently, the updated baseline minimum resulted in an updated TARP trigger level for water level at pool TT9.

REFERENCES

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ENRS (2023b). August 2023 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, August.

ENRS (2023c). September 2023 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, September.

ENRS (2023d). October 2023 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, October.

ENRS (2023e). November 2023 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, November.

ENRS (2023f). December 2023 Tahmoor South Visual Inspections of Waterways. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, December.

ENRS (2023). Annual Headwater Inspection 2023, Tahmoor South. Report by Environment & Natural Resource Solutions prepared for Tahmoor Coal Pty Ltd, November.

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SLR (2023). “Tahmoor South Groundwater Levels, September 2022 to December 2023”. Prepared by SLR Consulting Australia Pty Ltd (SLR) on behalf of Tahmoor Coal, March 2024.

MSEC (2023). “Tahmoor LW S2A Subsidence Monitoring Report, Monitoring Period 9 December to 15 December 2023”. Report Number: MSEC1368, December.

Tahmoor Coal (2023). Tahmoor South Domain – Longwalls South S1A-S6A Water Management Plan, January.

ATCW (2023). Tahmoor South Domain – Surface Water Review 1 January to 30 June 2023. October 2023.

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APPENDICES

APPENDIX A – SUMMARY OF SURFACE WATER MONITORING PROGRAM

<table>
<tr><th rowspan="2">Feature</th><th rowspan="2">Locations</th><th colspan="3">Monitoring</th></tr>
<tr><th>Prior to Mining</th><th>During Mining</th><th>Post Mining</th></tr>
<tr><td>Streamflow</td><td>Streamflow gauging stations:
• TT-F1 (Existing)
• DT-F1 (Proposed)</td><td>Continuous record. Data downloaded prior to the commencement of secondary extraction in relevant catchment.</td><td>Continuous record. Data downloaded and reviewed monthly.</td><td>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*.</td></tr>
<tr><td rowspan="2">Surface Water Quality</td><td rowspan="2">Existing sites:
TT1-QLa, TT2-QLa, TT3-QLa, TT7-QLa, TT9-QLa, TT12-QLa, TT13-QLa, TT14-QLa, HC1-QLa, HC3-QLa, HC19-QLa, BR3-QLa, BR6-QLa, BR13-QRLa, BR12-QLa, BR16-QLa, BR17-QLa, BR18-QLa
Proposed sites:
HC13-QLa, HC16-QLa</td><td>Monthly sampling for a minimum of 12 months prior to secondary extraction.</td><td>Monthly sampling and analysis.</td><td>Monthly sampling and analysis for 12 months following the completion of relevant mining activities. This period may be extended as per decision by the Environmental Response Group.</td></tr>
<tr><td colspan="3">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.</td></tr>
</table>

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, HC3-QLa, HC19-QLa, BR3-QLa, BR6-QLa, BR12-QLa, BR13-QRLa, BR16-QLa, BR17-QLa, BR18-QLa Proposed sites: HC13-QLa, HC16-QLa	Continuous record and monthly manual measurements for a minimum of 12 months prior to secondary extraction. Data downloaded prior to the commencement of secondary extraction in relevant catchment.	Continuous record and monthly manual measurements. Data downloaded and reviewed monthly.	Continuous record and monthly manual measurements. 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.
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

APPENDIX B1 – TEATREE HOLLOW WATER LEVEL PLOTS

DIAGRAM B1.1: MONITORING SITE TT1-QLA WATER LEVEL RECORDS

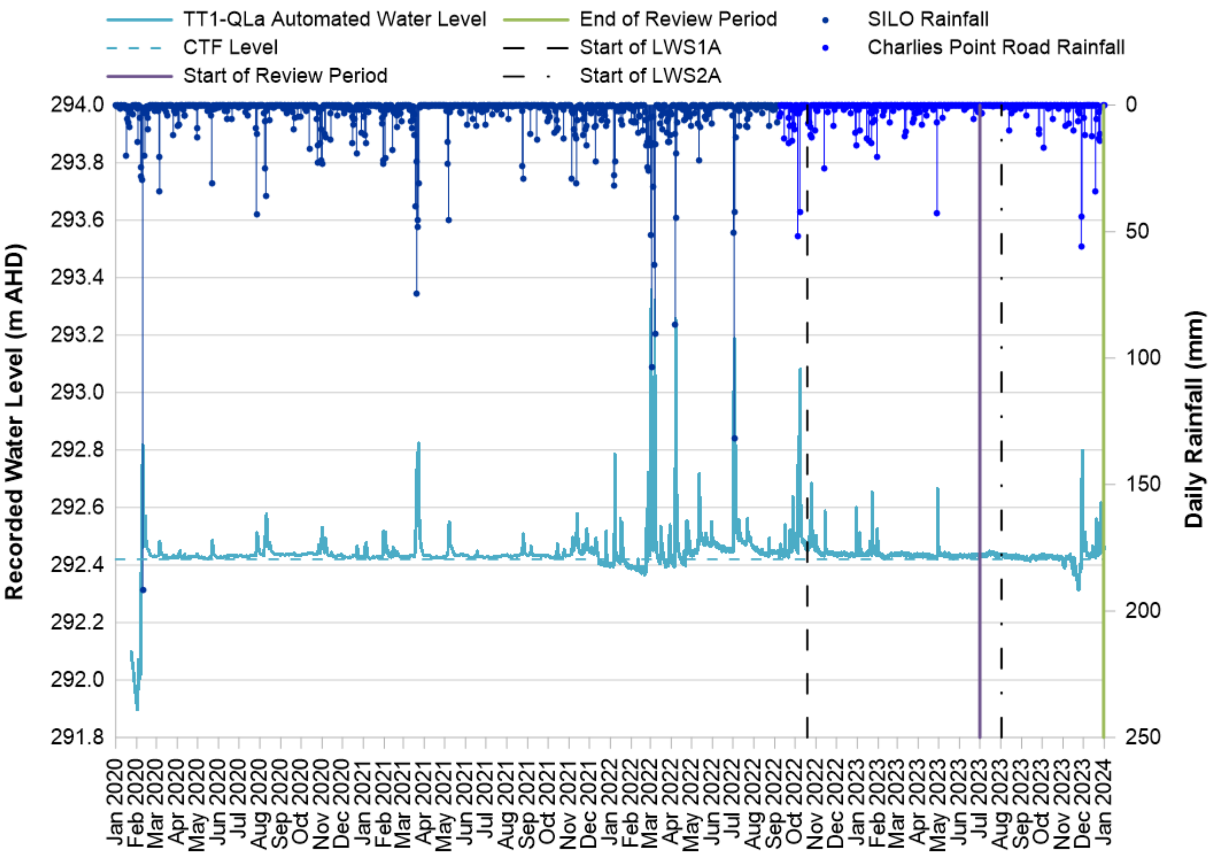

DIAGRAM B1.2: MONITORING SITE TT2-QLA WATER LEVEL RECORDS

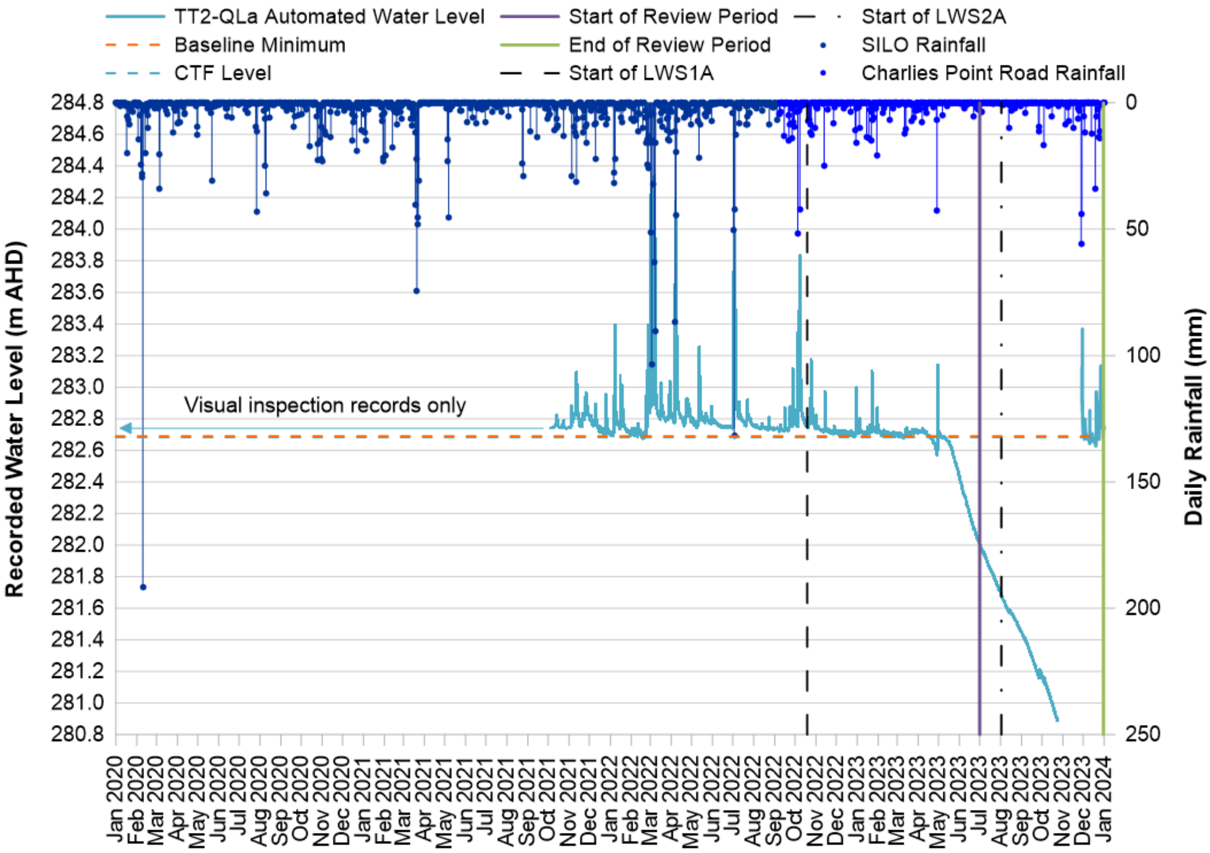

DIAGRAM B1.3: MONITORING SITE TT3-QLA WATER LEVEL RECORDS

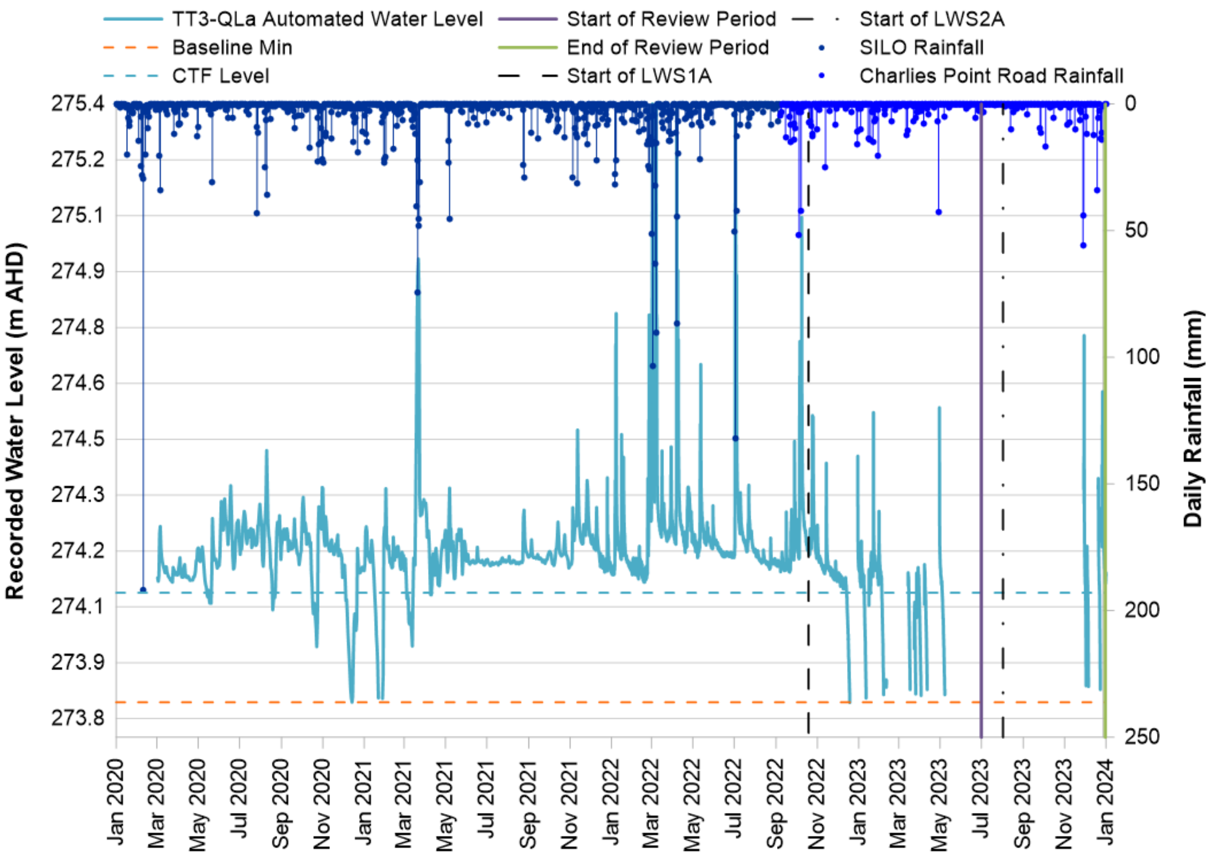

DIAGRAM B1.4: MONITORING SITE TT7-QLA WATER LEVEL RECORDS

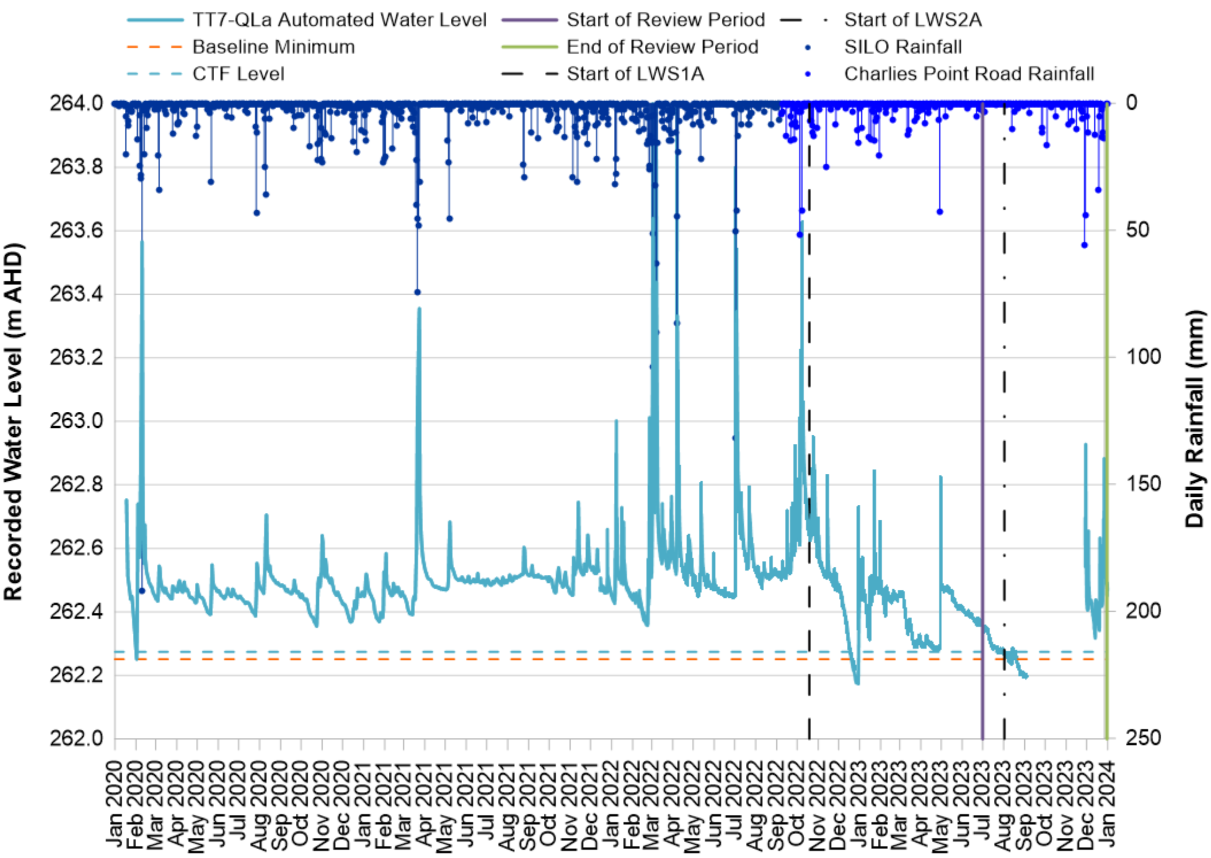

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DIAGRAM B1.5: MONITORING SITE TT9-QLA WATER LEVEL RECORDS

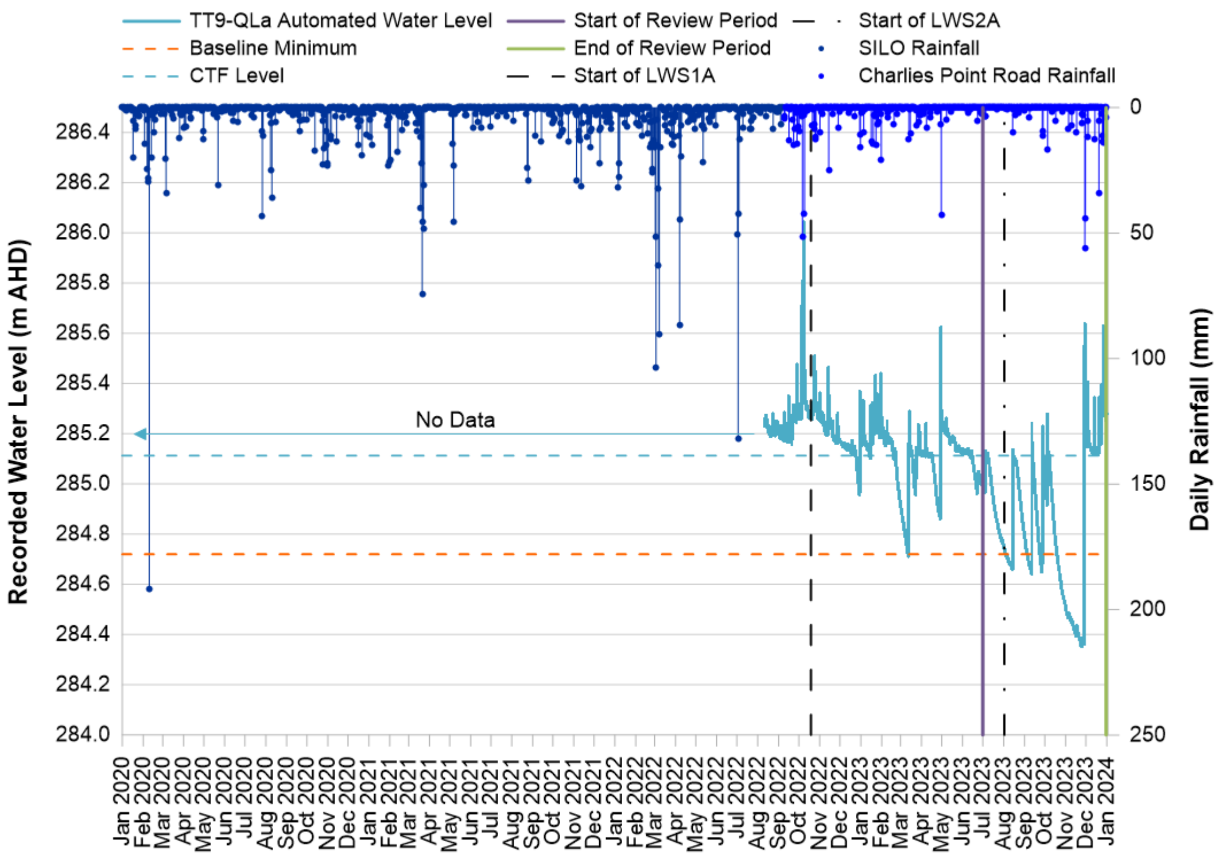

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DIAGRAM B1.6: MONITORING SITE TT12-QLA WATER LEVEL RECORDS

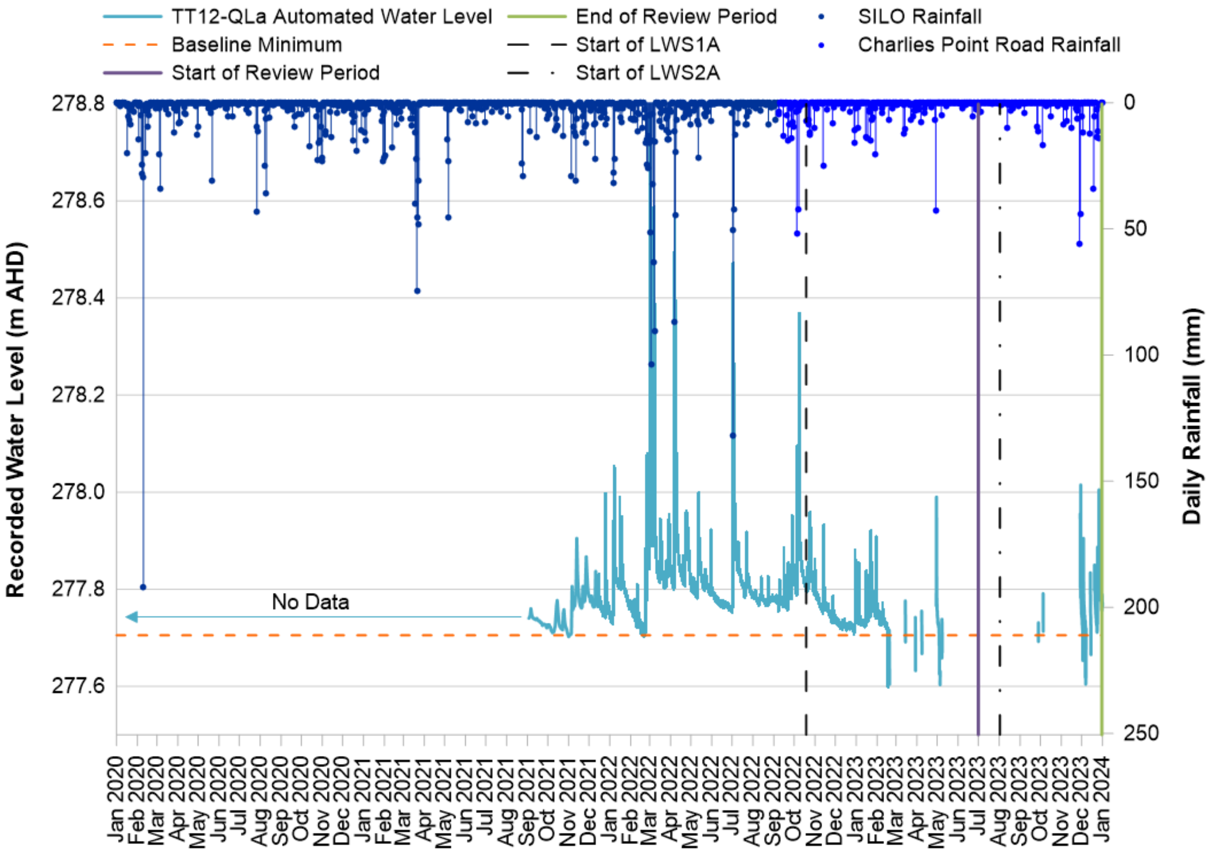
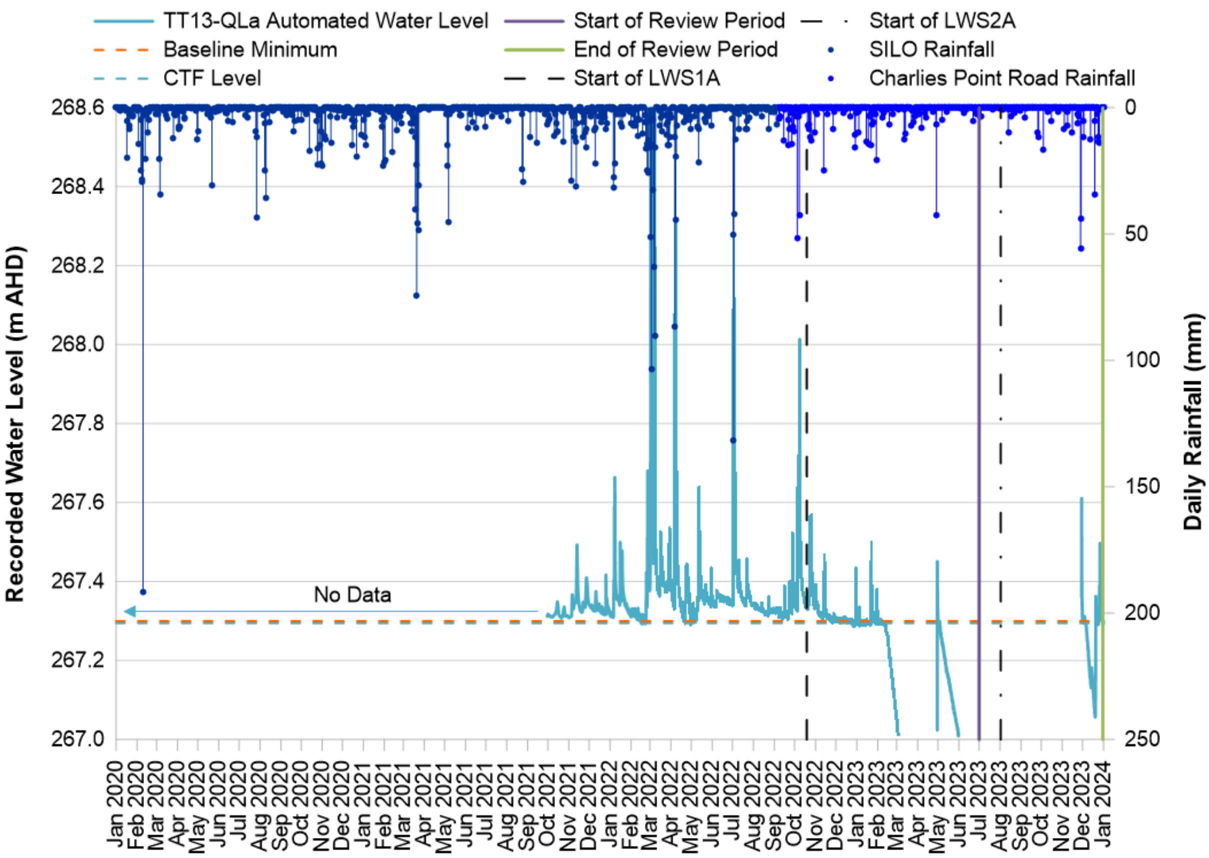


DIAGRAM B1.7: MONITORING SITE TT13-QLA WATER LEVEL RECORDS



APPENDIX B2 – BARGO RIVER WATER LEVEL PLOTS

DIAGRAM B2.1: MONITORING SITE BR12-QLA WATER LEVEL RECORDS

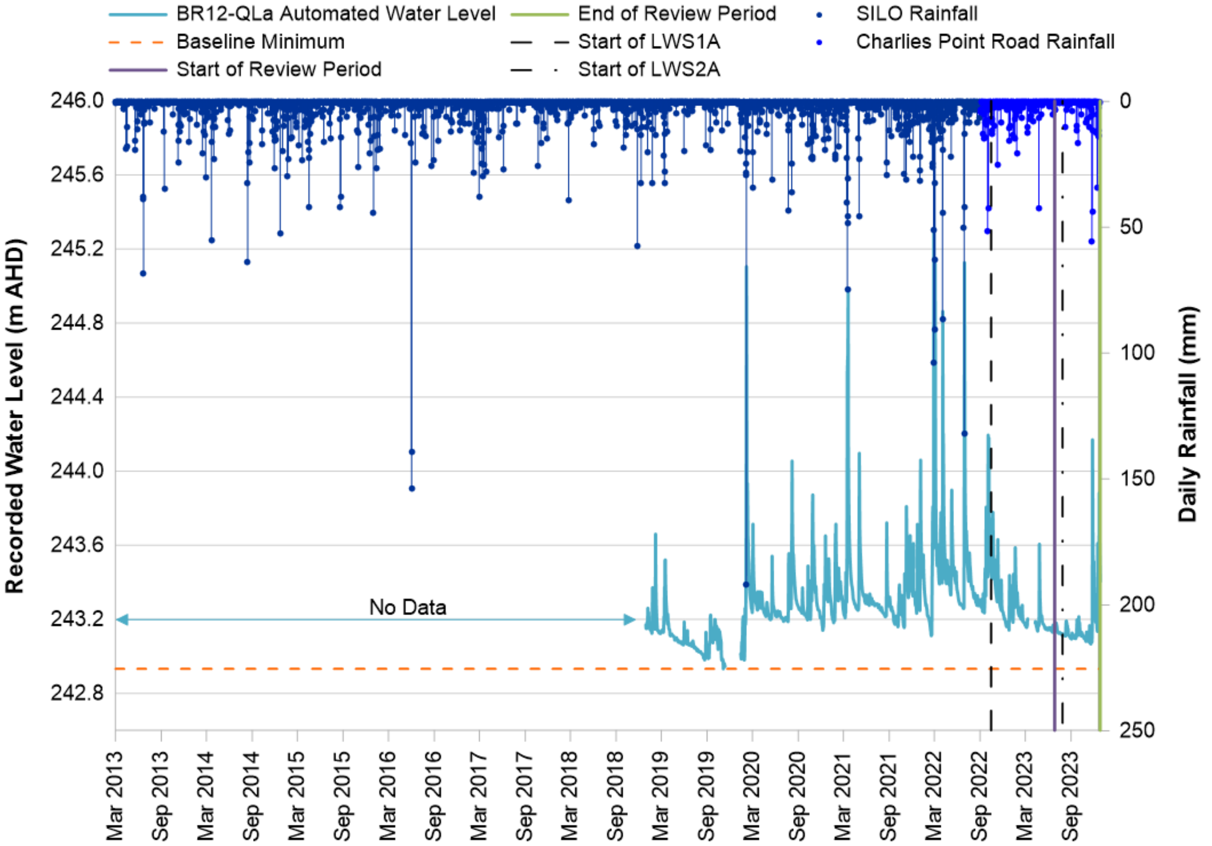


DIAGRAM B2.2: MONITORING SITE BR13-QLA WATER LEVEL RECORDS

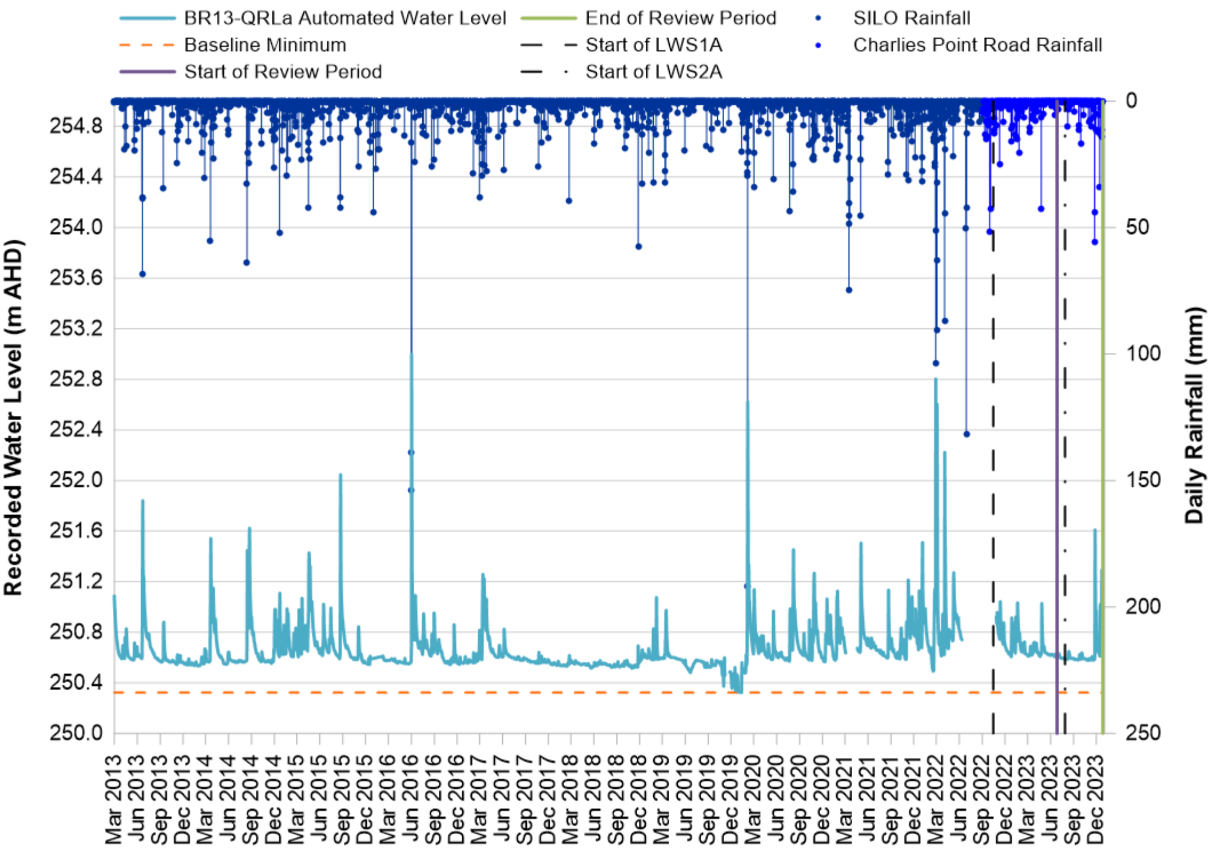
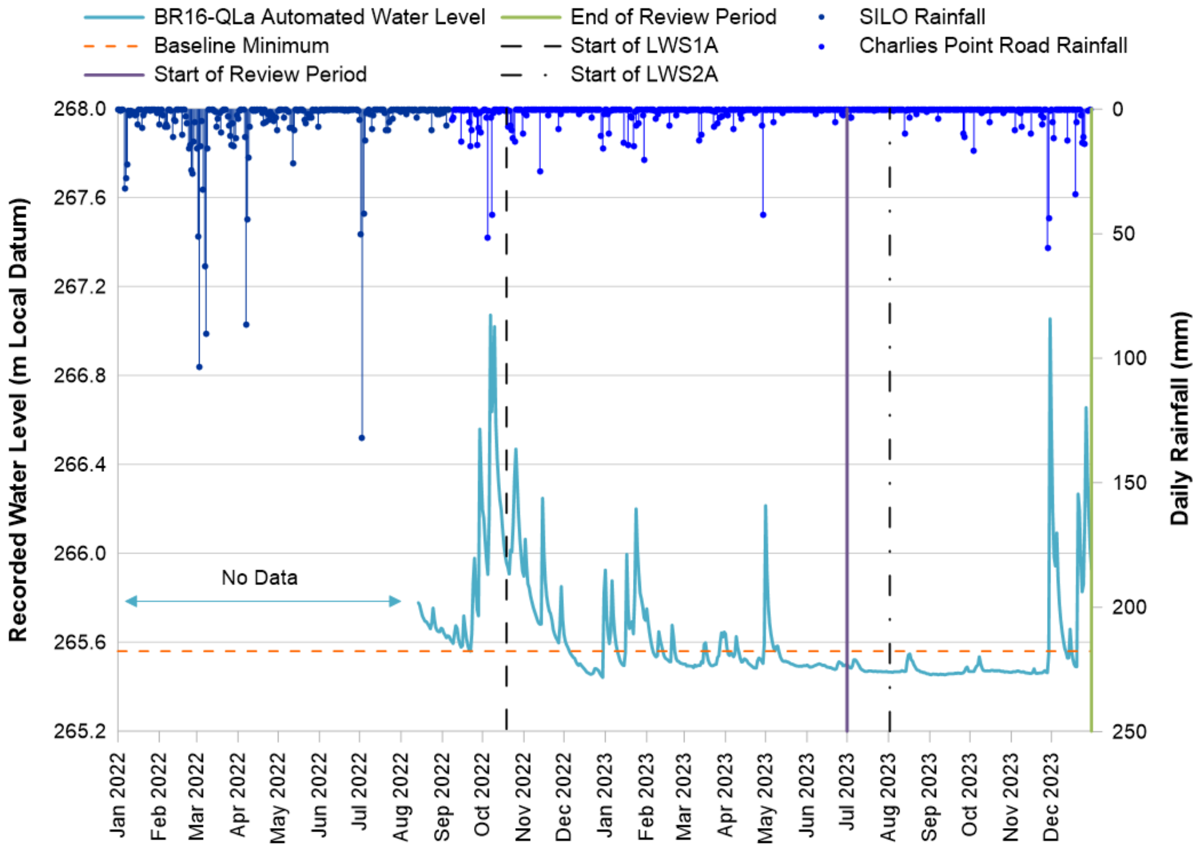


DIAGRAM B2.3: MONITORING SITE BR16-QLA WATER LEVEL RECORDS

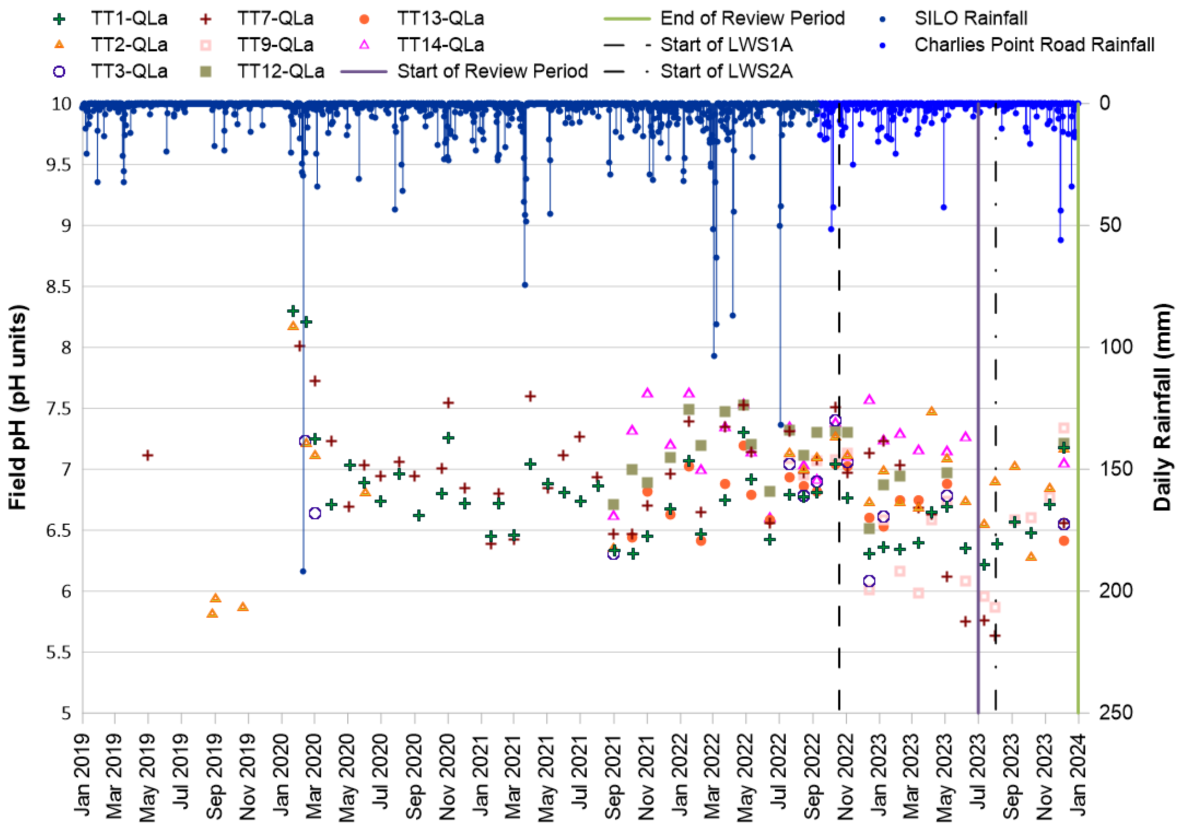


APPENDIX C – WATER QUALITY PLOTS [5]

[5] 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

DIAGRAM C1.1: FIELD AND LABORATORY PH RECORDS



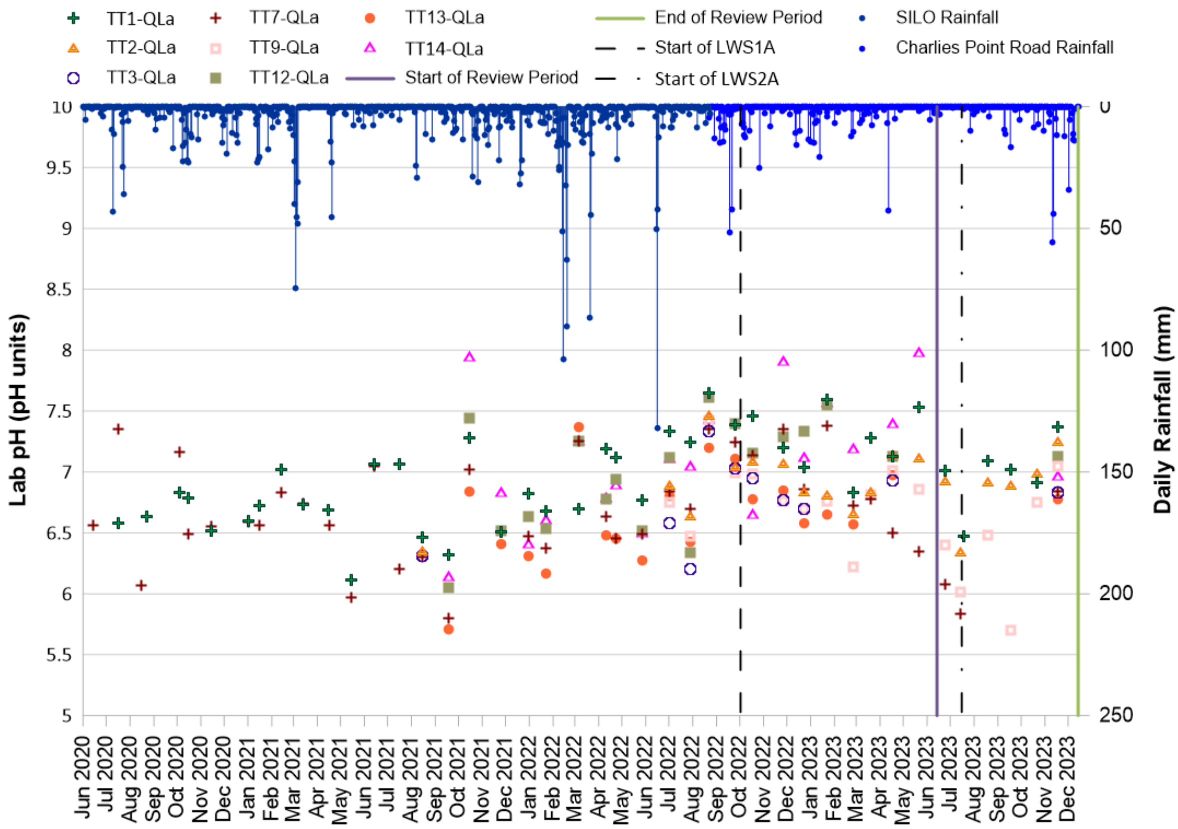
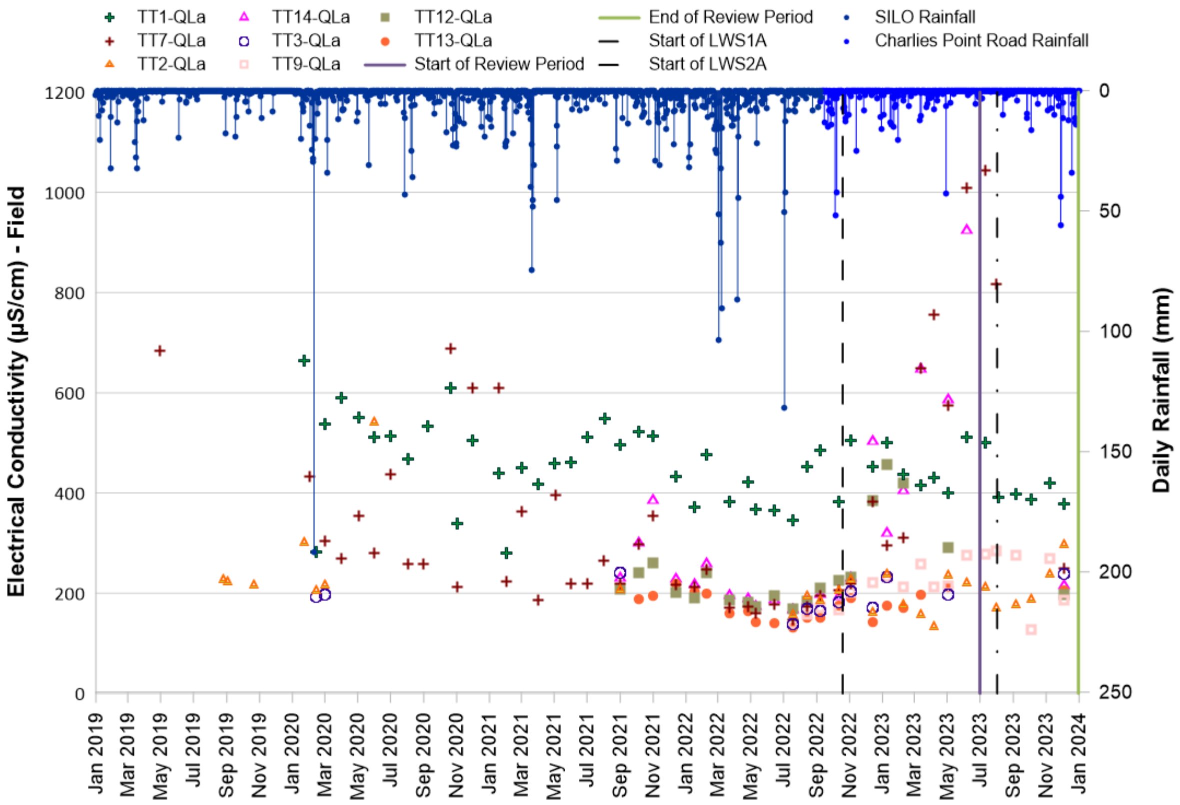


DIAGRAM C1.2: FIELD AND LABORATORY ELECTRICAL CONDUCTIVITY RECORDS



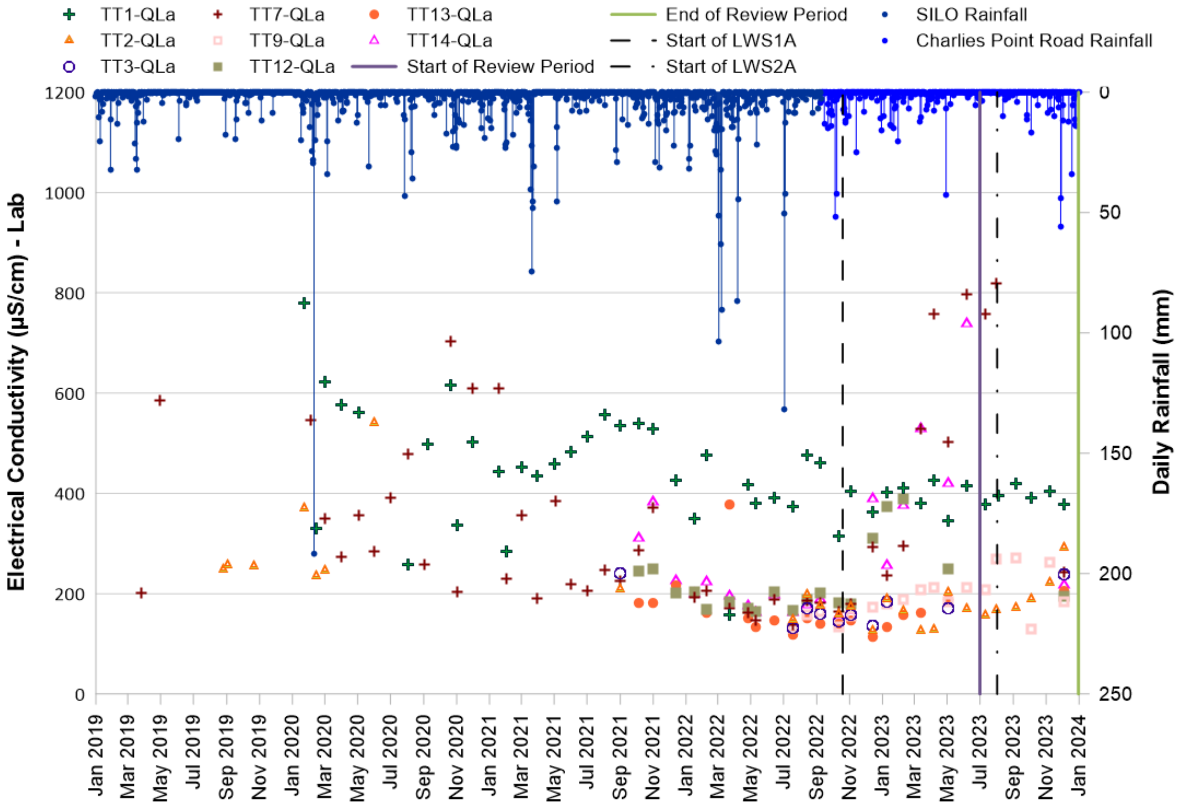


DIAGRAM C1.3: DISSOLVED ALUMINIUM RECORDS

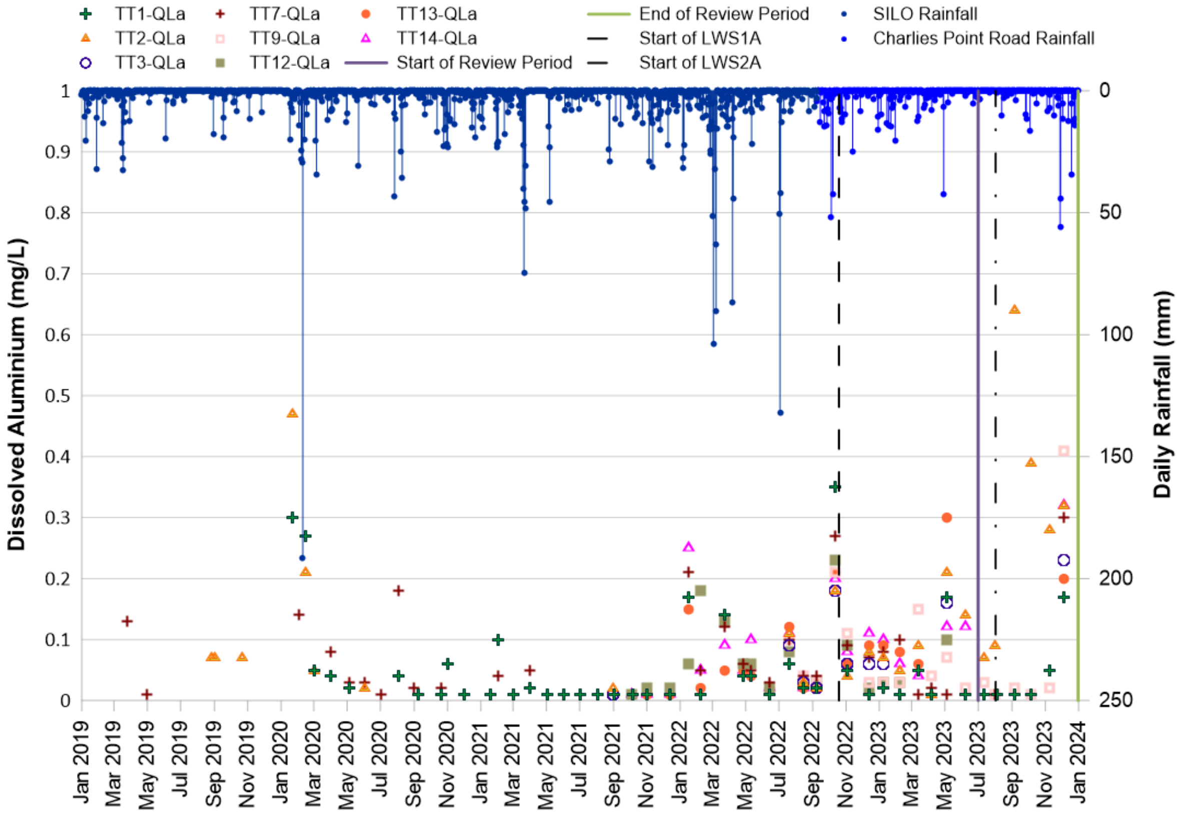


DIAGRAM C1.4: DISSOLVED COPPER RECORDS

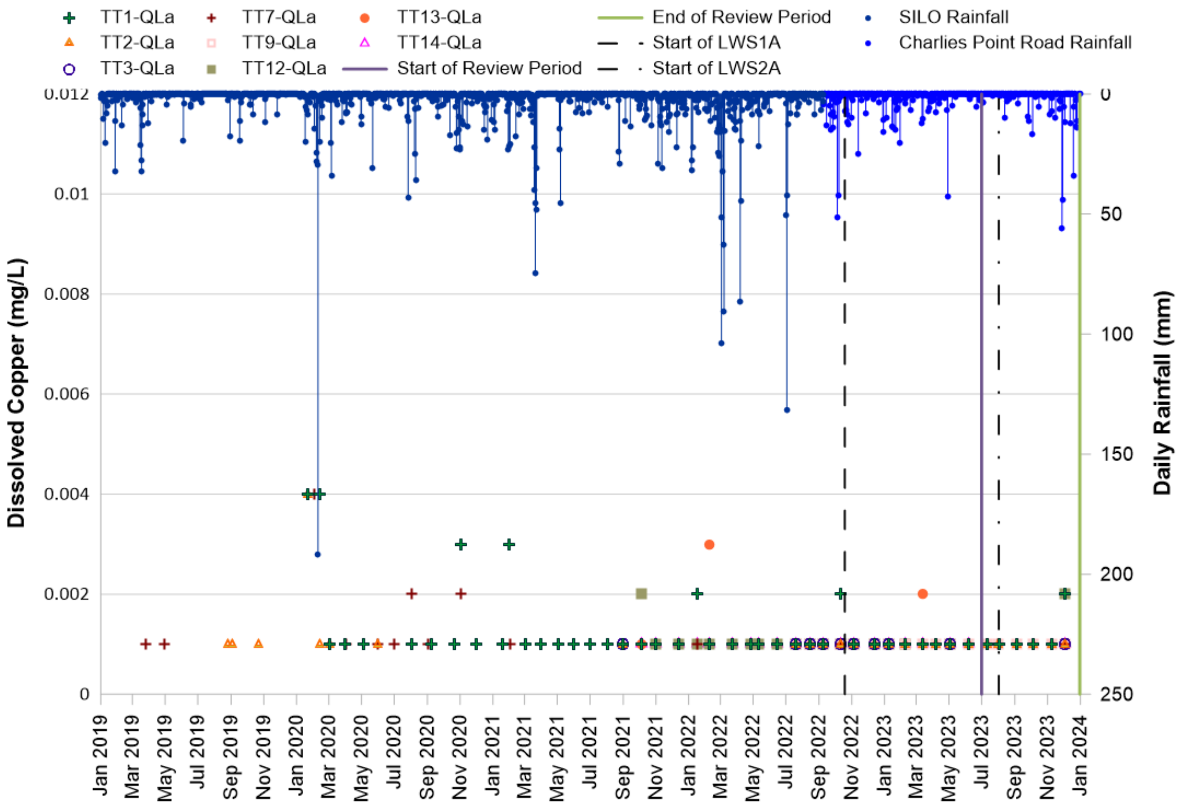


DIAGRAM C1.5: DISSOLVED IRON RECORDS

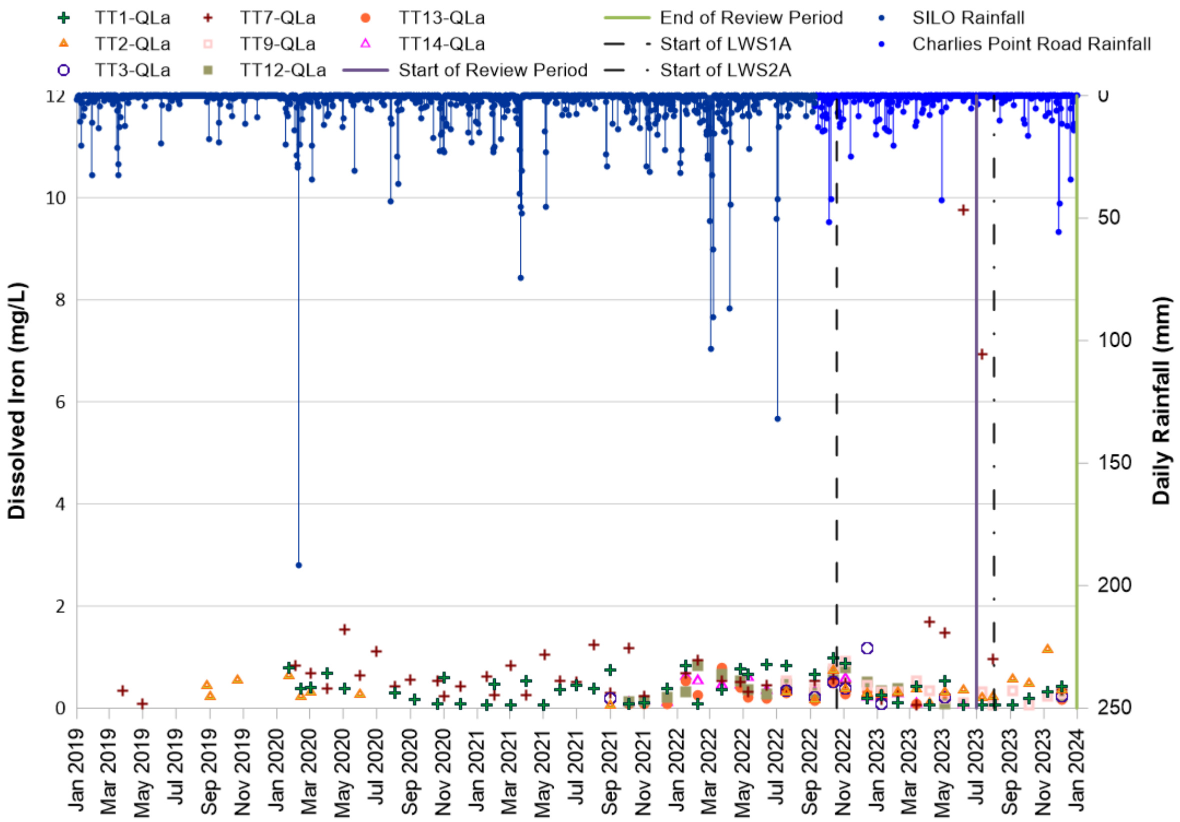


DIAGRAM C1.6: DISSOLVED MANGANESE RECORDS

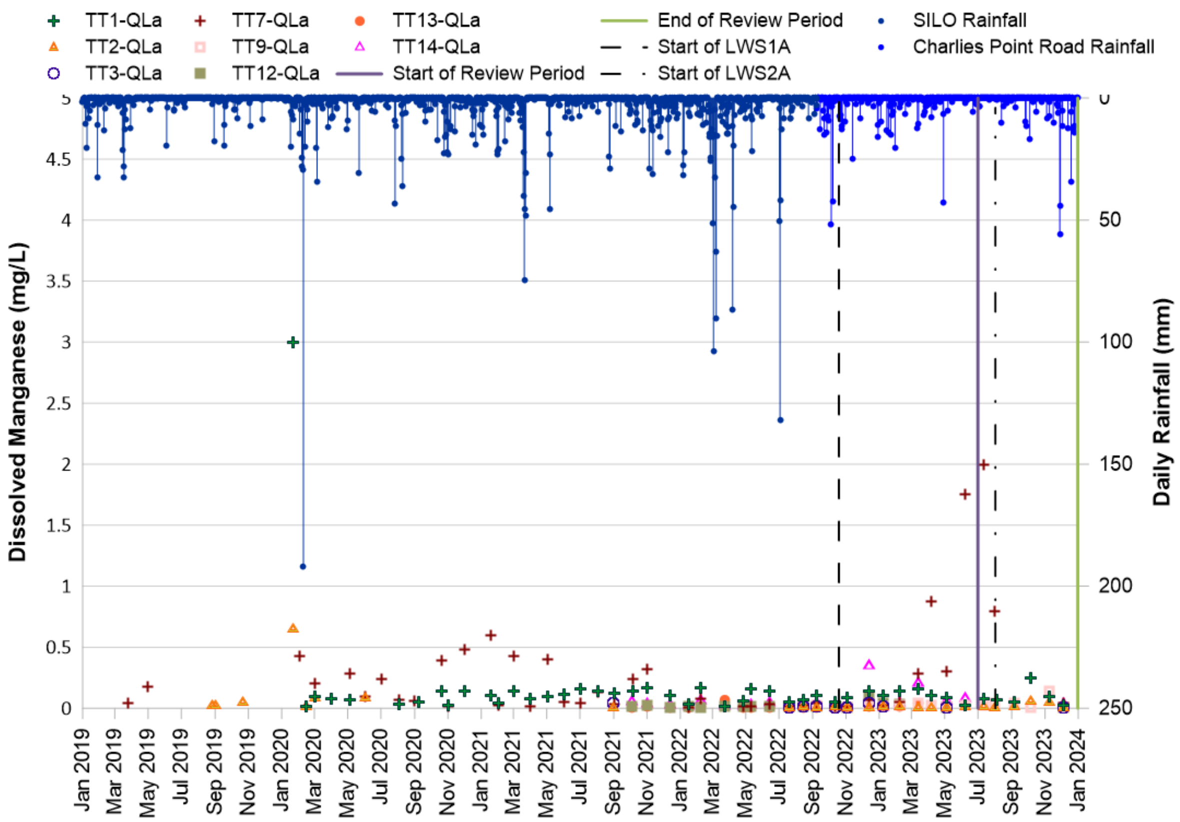


DIAGRAM C1.7: DISSOLVED NICKEL RECORDS

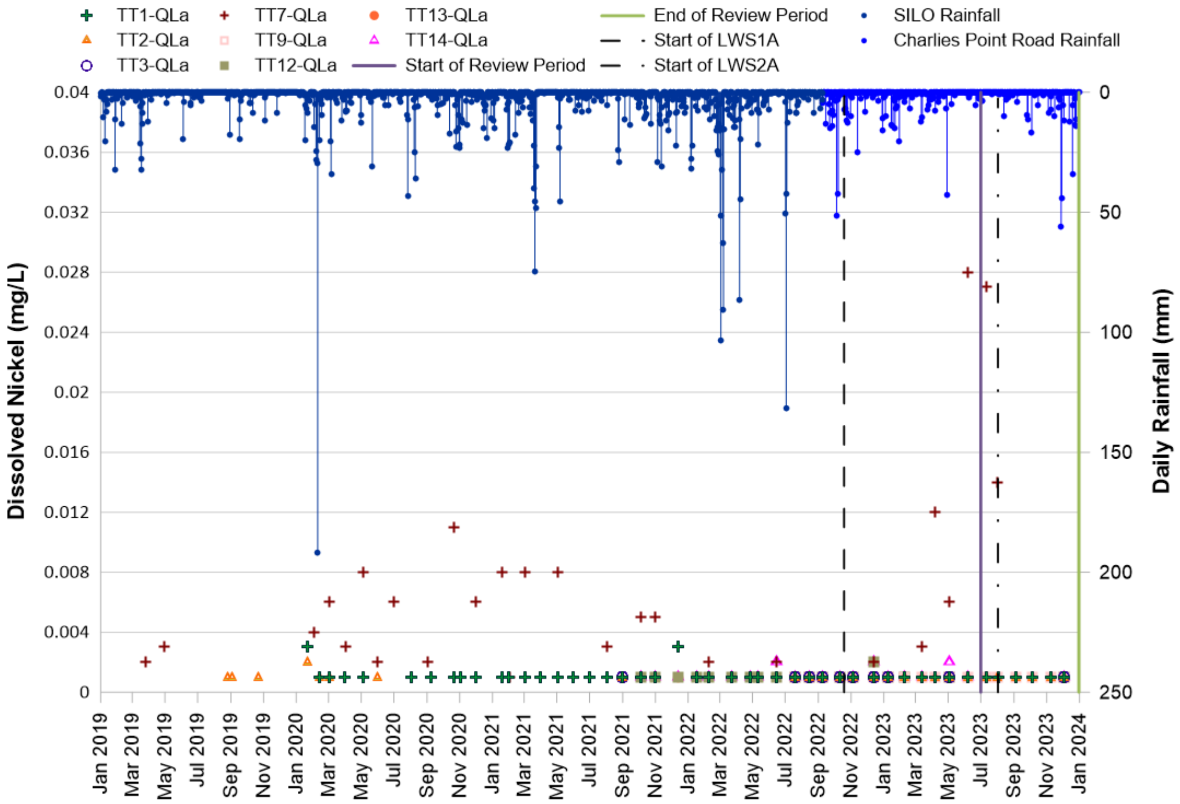
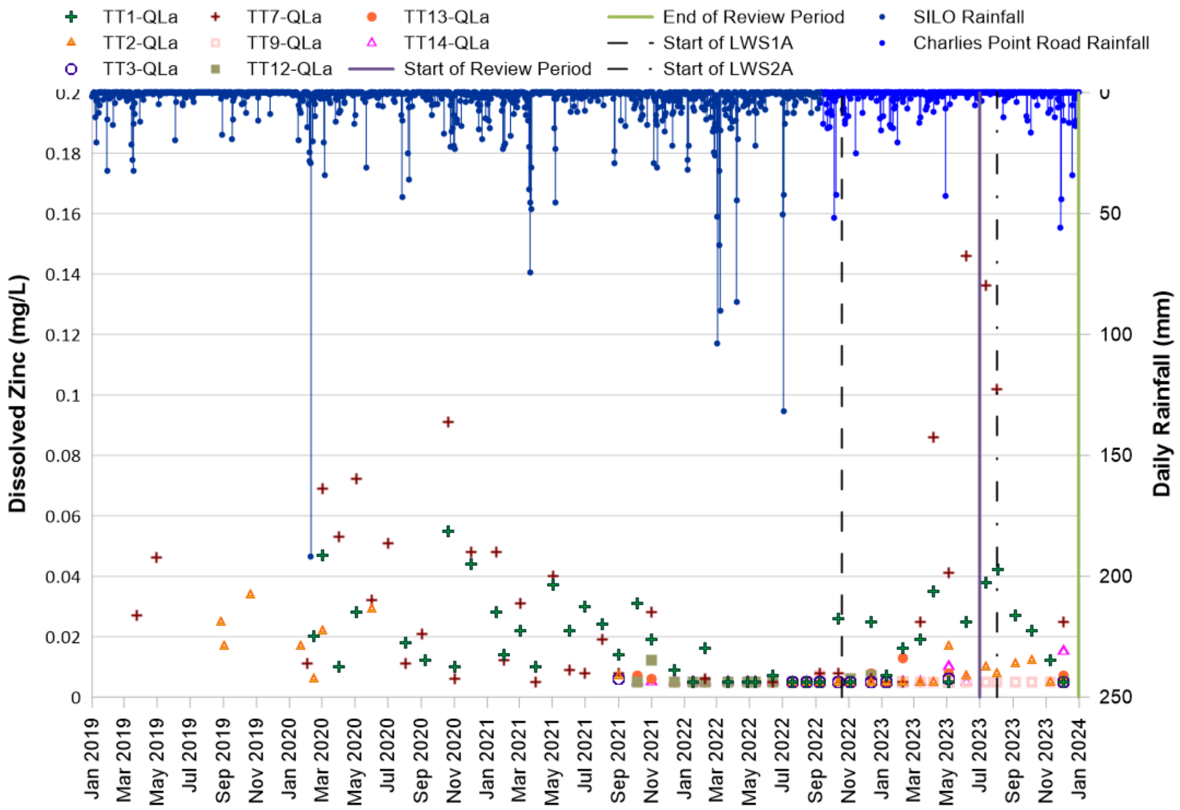
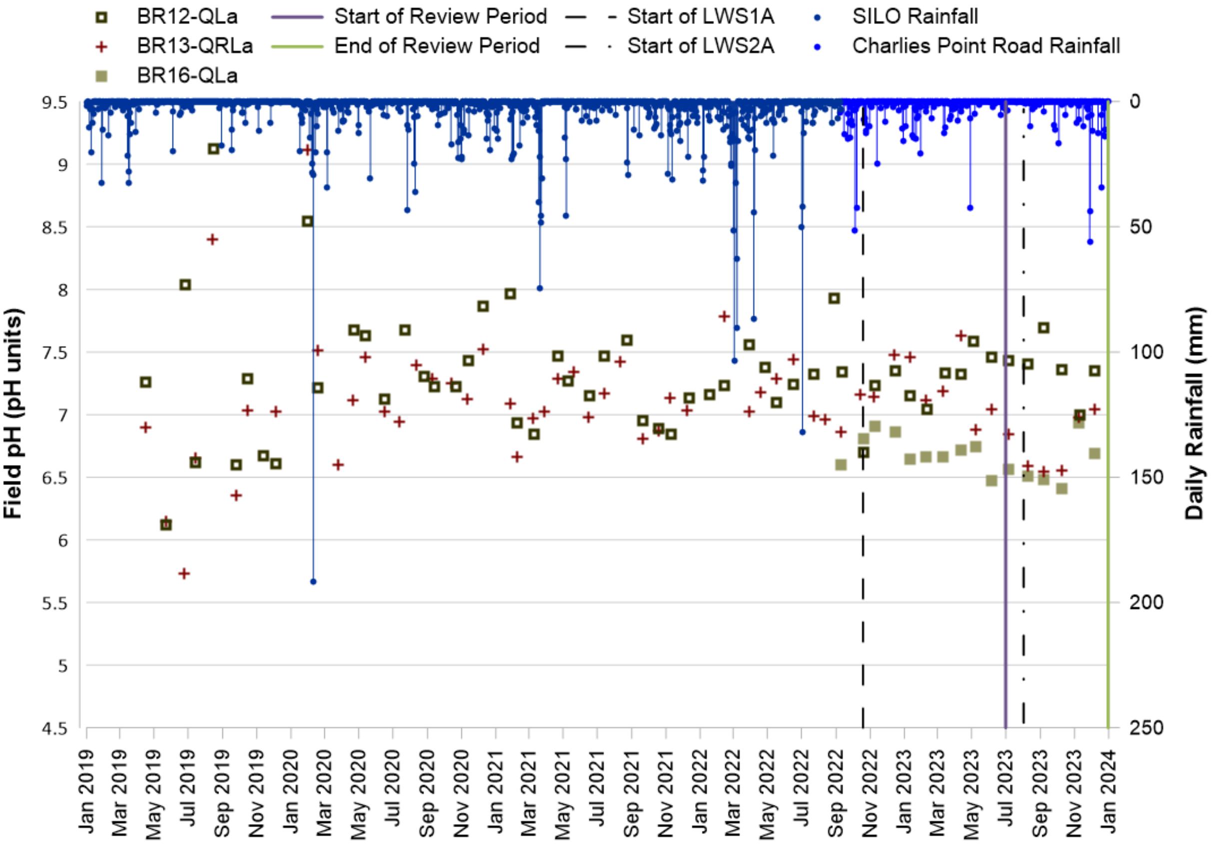


DIAGRAM C1.8: DISSOLVED ZINC RECORDS



APPENDIX C2 – BARGO RIVER WATER QUALITY PLOTS

DIAGRAM C2.1: FIELD AND LABORATORY PH RECORDS



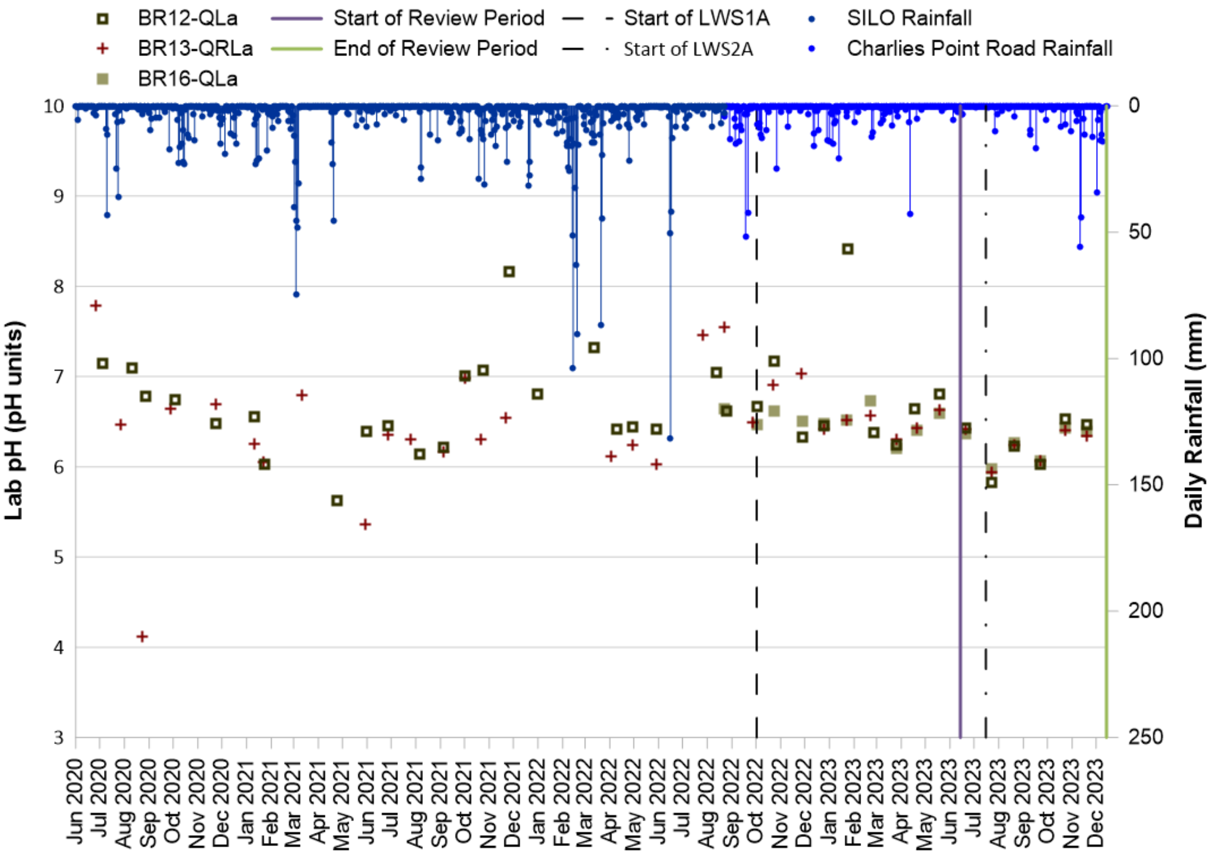
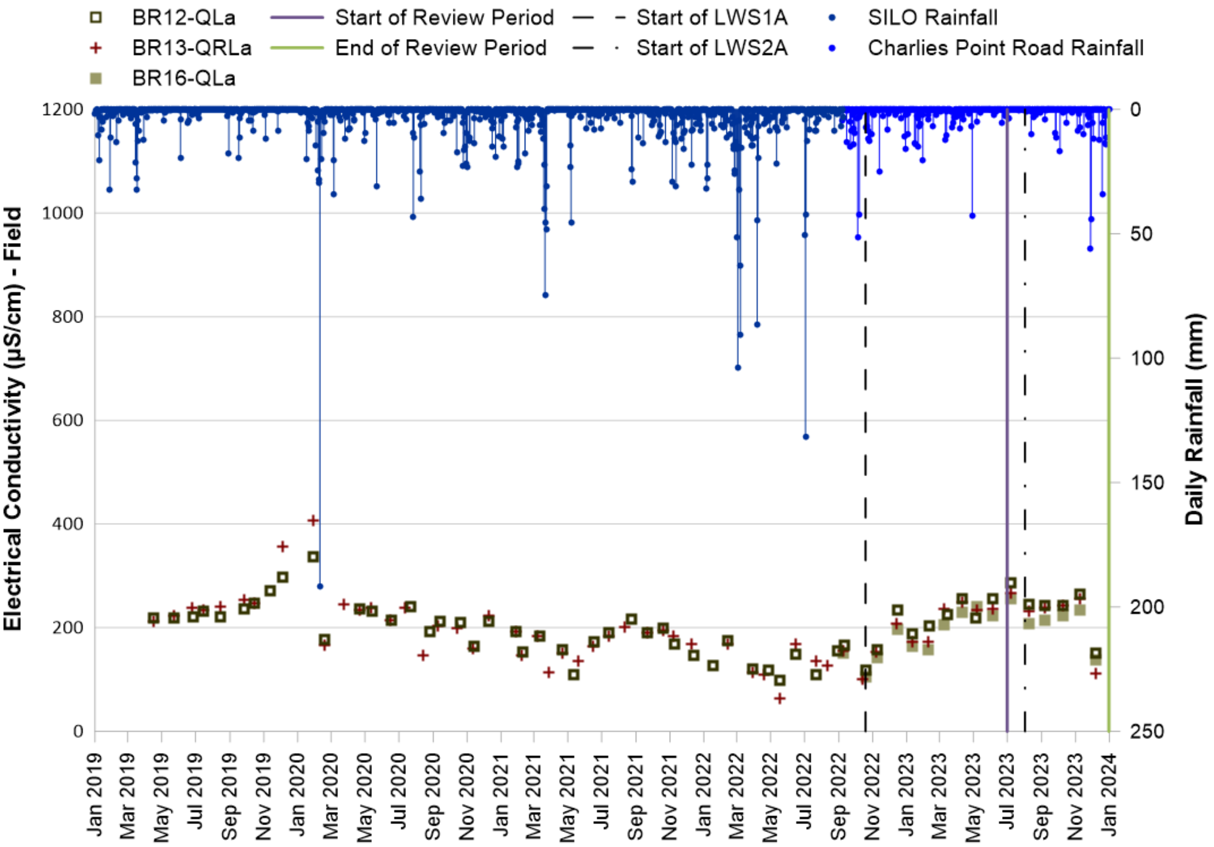


DIAGRAM C2.2: FIELD AND LABORATORY ELECTRICAL CONDUCTIVITY RECORDS



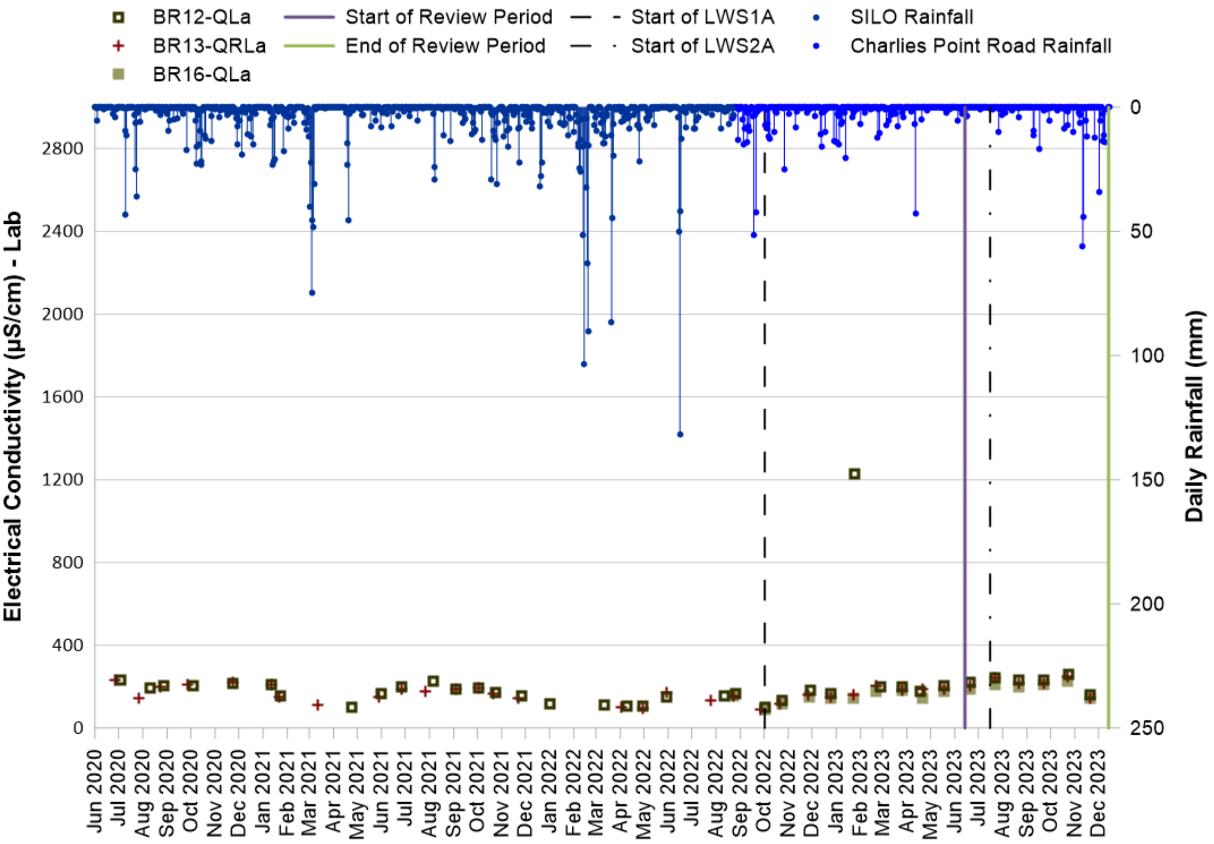


DIAGRAM C2.3: DISSOLVED ALUMINIUM RECORDS

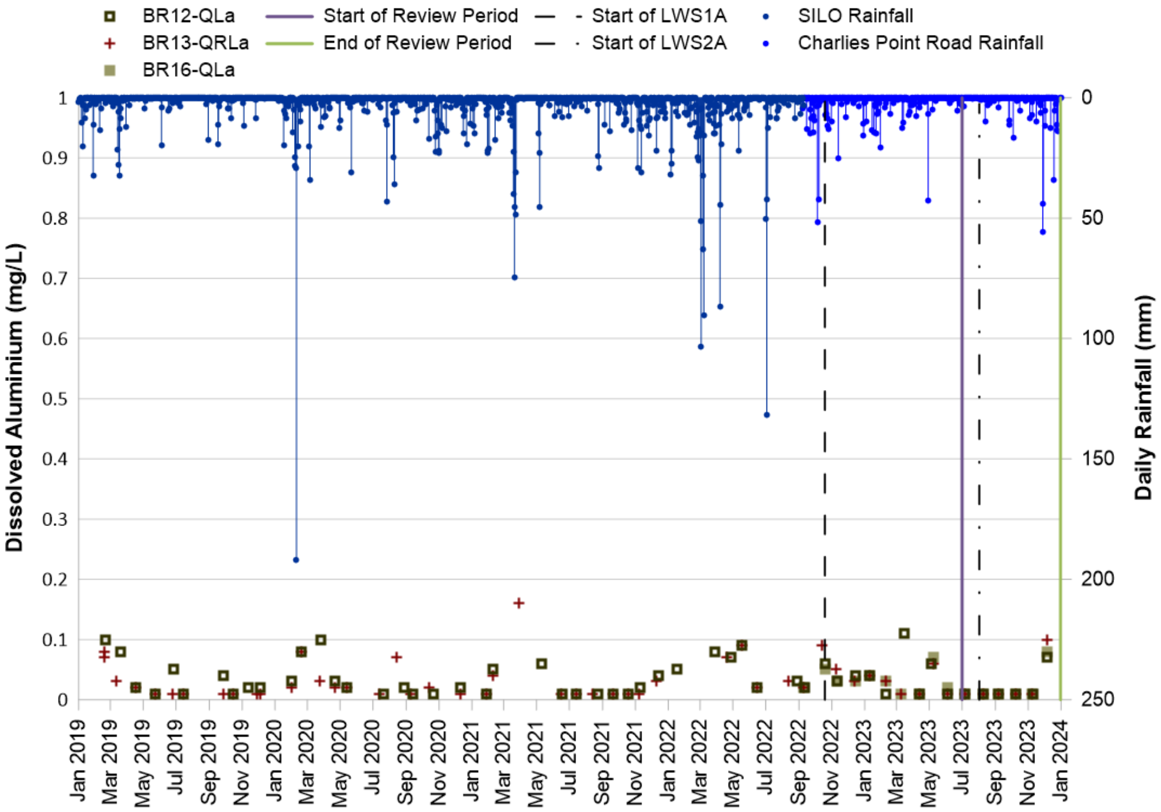


DIAGRAM C2.4: DISSOLVED COPPER RECORDS

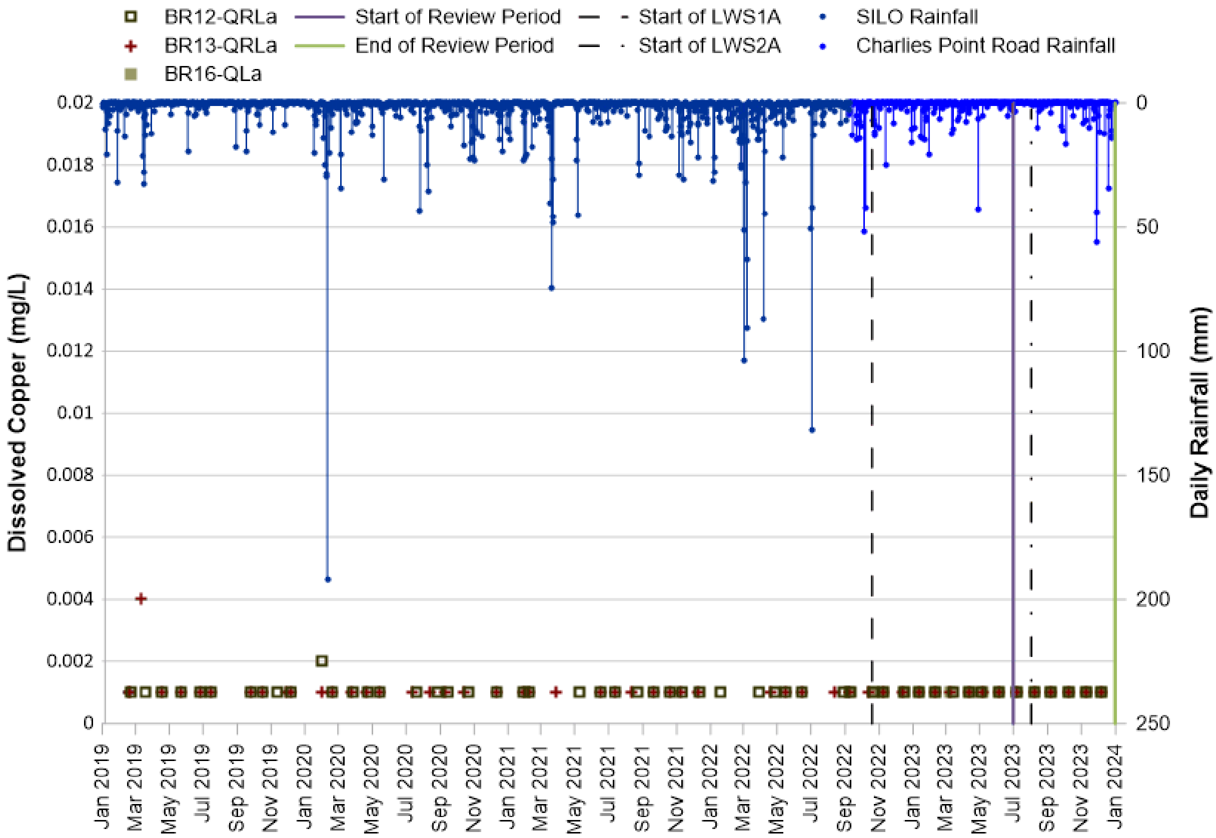


DIAGRAM C2.5: DISSOLVED IRON RECORDS

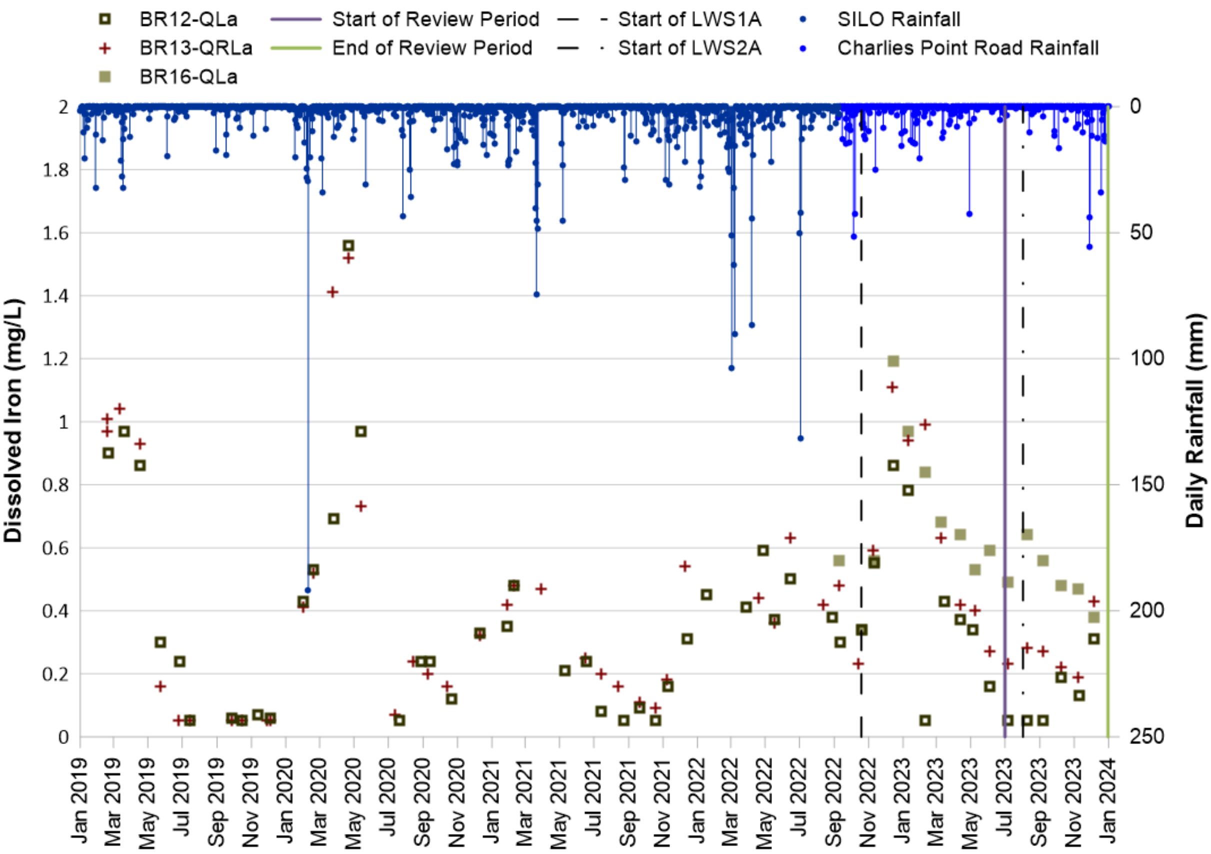


DIAGRAM C2.6: DISSOLVED MANGANESE RECORDS

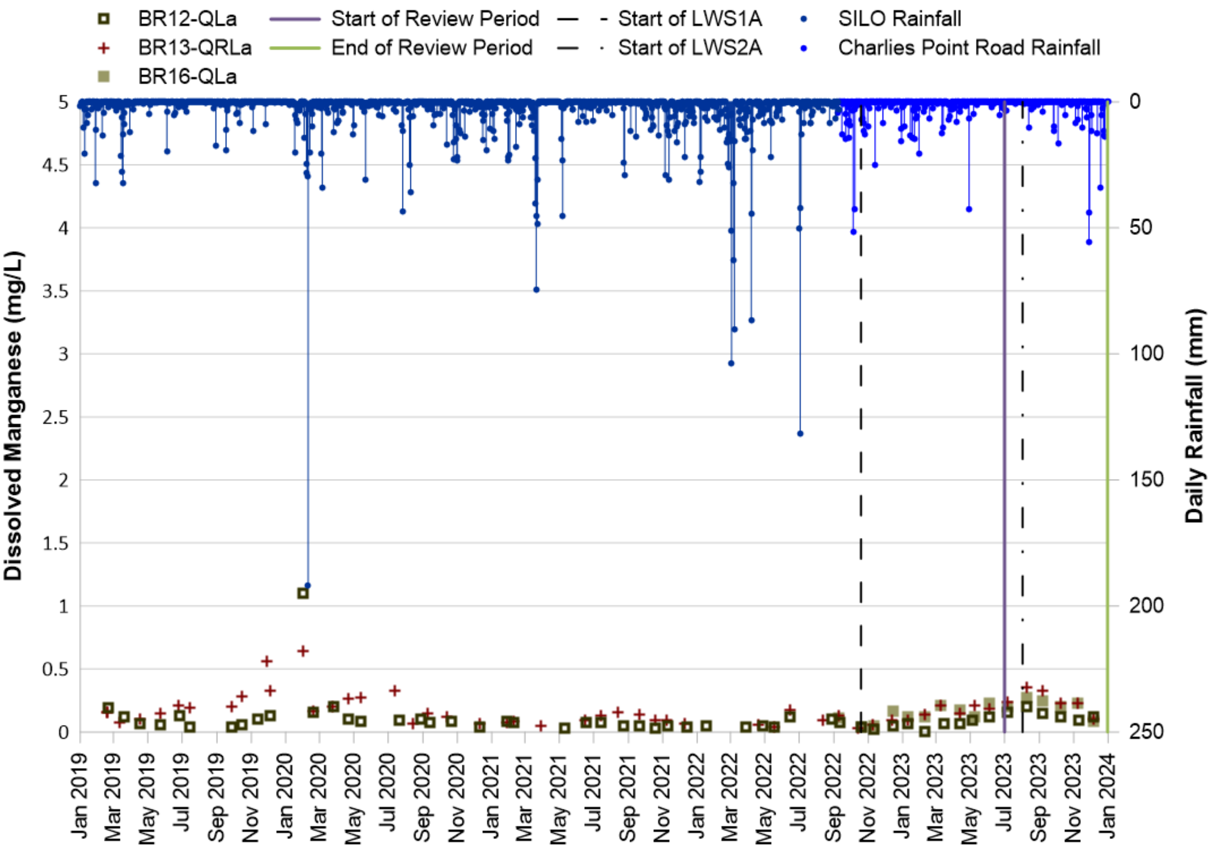


DIAGRAM C2.7: DISSOLVED NICKEL RECORDS

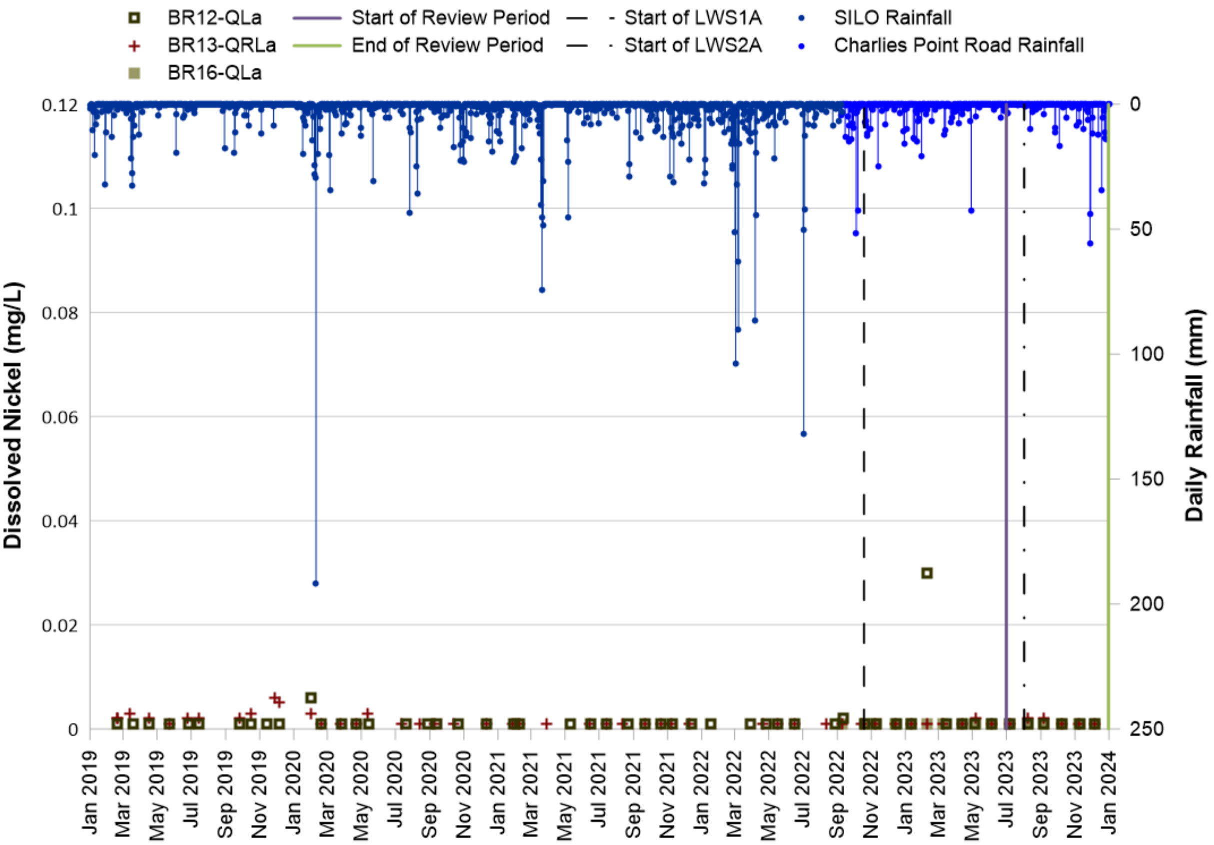
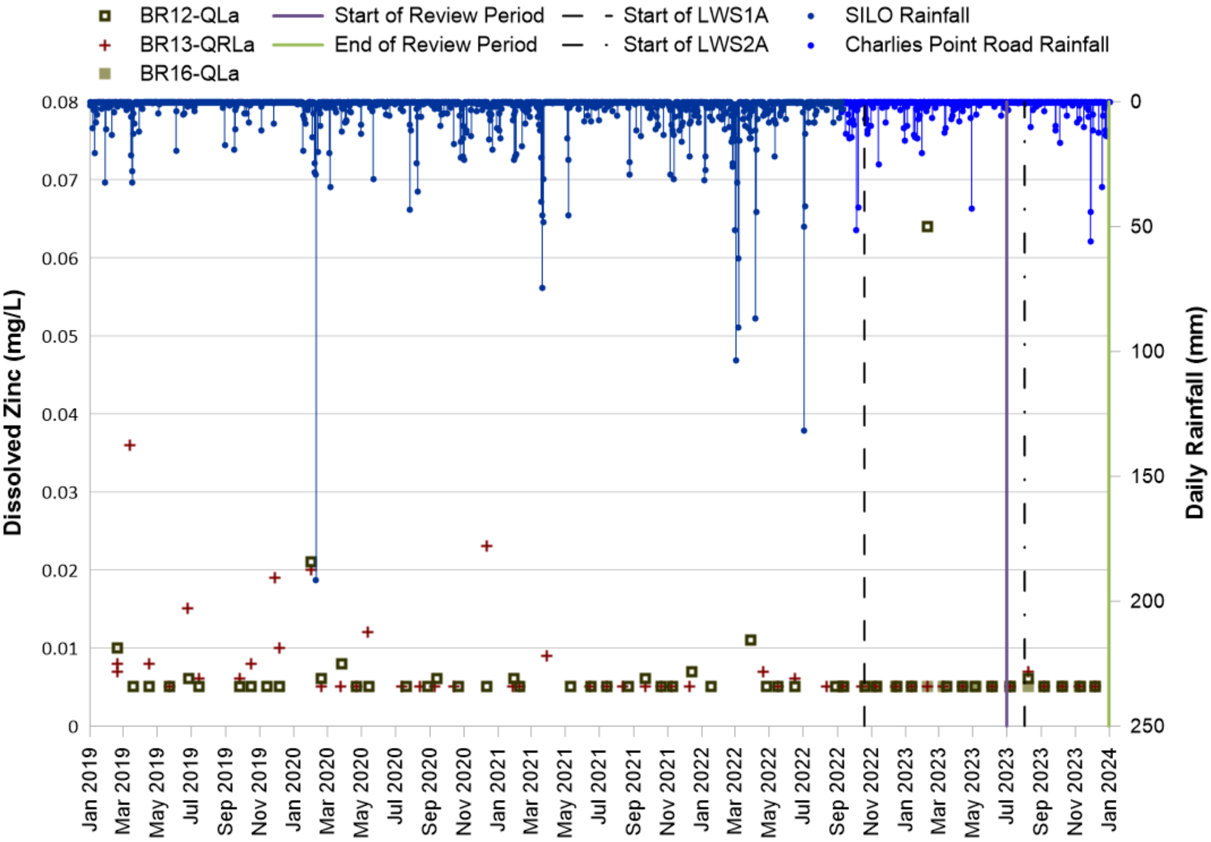


DIAGRAM C2.8: DISSOLVED ZINC RECORDS



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APPENDIX D – TAHMOOR COAL RESPONSES TO TARP ACTION AND RESPONSE REQUIREMENTS

APPENDIX D1.1 – STREAM WATER QUALITY FOR ALL WATERCOURSES WITHIN THE SUBSIDENCE AREA: WMP1 ACTIONS

Action from TARP WMP1	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 Assess if the trigger was exceeded during the baseline period prior to commencement of mining activities.	Exceedance of the trigger level during the baseline period was reviewed (refer **Section 6.1.3**). A Level 1 trigger was recorded for dissolved aluminium at pool TT2 during the 1 July to 31 December 2023 review period. A Level 1 trigger or above for dissolved aluminium was not recorded at pool TT2 during the baseline monitoring period. A Level 2 trigger or above for EC, dissolved iron was not recorded at pool TT7 during the baseline monitoring period. A Level 2 trigger for dissolved zinc was recorded at pool TT7 during the baseline monitoring period. A Level 3 trigger was recorded for EC at pool TT7 during the 1 July to 31 December 2023 review period. A Level 2 trigger was recorded for dissolved iron and zinc during the 1 July to 31 December 2023 review period.
Level 1, 2 and 3 trigger Review water quality trends along watercourse (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Water quality trends were reviewed for the watercourse reach (refer **Section 6.1.3**).
Level 1, 2 and 3 trigger Discuss findings with and obtain other relevant information from key specialists (e.g. subsidence monitoring results, groundwater quality monitoring results) necessary to inform assessment.	Relevant information was obtained from key specialists necessary to inform assessment (refer **Section 6**).
Level 1, 2 and 3 trigger Consider and decide on reasonable and feasible options for remediation as relevant (e.g. limestone cobbles for increasing pH level).	Reasonable and feasible options for remediation were considered where relevant (refer **Section 7.3**). With respect to the water quality trigger exceedances recorded at TT7-QLa and TT2-QLa during the review period of 1 July to 31 December 2023, there are limited feasible corrective management actions (CMAs) that could be implemented prior to the cessation of subsidence movements associated with mining of LW S1A-S6A. Presently, there is negligible indication of a material impact to the water quality of Teatree Hollow, given that there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023 with limited

Action from TARP WMP1	Tahmoor Coal Response
	potential for transport of elevated EC, dissolved aluminium, iron, zinc and nickel. Accordingly, it is considered that water quality effects are limited to pool TT7 and TT2 with negligible indication of material environmental harm to Teatree Hollow. Therefore, no CMAs are not considered reasonable or feasible at this stage.
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; and • 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 a water quality change).	Increased monitoring and review of data frequency was considered (refer **Section 6.2.3**). With respect to the dissolved nickel trigger exceedance reported at Pool TT2, the causation was assessed to be related to the drying phase for pool TT2, with concentrations not considered to be reflective of typical flow conditions. With respect to dissolved iron and zinc trigger exceedance reported at Pool TT7, the causation was assessed to be related to interaction of underflow with surface geology and re-emergence of elevated dissolved iron underflow as surface flow in the vicinity of pool TT7. The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7. The monitoring frequency was not increased given that causation was identified and there is negligible indication of a material impact to the water quality of Teatree Hollow (as there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023).
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water quality trends along creek (upstream to downstream) to identify spatial changes with consideration to climatic conditions.	Increased monitoring was not undertaken during the reporting period.
Level 2 and 3 trigger Review CMAs in light of findings from further investigations and consider additional remediation options.	CMAs are not considered reasonable or feasible.
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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. 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.

Action from TARP WMP1	Tahmoor Coal Response
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.	The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7. The monitoring frequency was not increased given that causation was identified (related to subsidence induced fracturing and the prevailing climate) and there is negligible indication of a material impact to the water quality of Teatree Hollow (as there has been negligible surface flow reporting to the downstream reach of Teatree Hollow since February 2023).
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, effects unrelated to mining or the prevailing climate.	A detailed investigation to assess if the change in behaviour is related to mining effects was undertaken (refer **Section 6.1.3**). The elevated EC values recorded at pool TT7 are considered to be related to evapoconcentration of salinity during period of below average rainfall and interaction of underflow with subsurface geology and re-emergence of elevated EC underflow as surface flow in the vicinity of pool TT7 (related to subsidence induced fracturing and the prevailing climate).

APPENDIX D1.2 – 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 exceedance during the reporting period were notified to DPE (now DPHI) on 16 August 2023, 10 November 2023 and 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 September 2023, 7 December 2023, and 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:	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.

Response from TARP WMP1	Tahmoor Coal Response
• Offer site visit with DPE and other key stakeholders. • 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.	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 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**).
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 6.1.2**). The streamflow assessment indicated that streamflow trends recorded at monitoring site TT-F1 in Teatree Hollow have been consistent with rainfall trends for the period of 1 July to 31 December 2023. The rate of streamflow decline recorded during the review period is considered to be consistent with that recorded from April to November 2021 prior to the commencement of mining of LW S1A and consistent with the rate of rainfall decline recorded during these periods.
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 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, TT12-QLa and TT13-QLa (related to subsidence induced fracturing and the prevailing climate, refer **Section 7.3.2**). As such, the monitoring frequency was not increased TT7-QLa, TT12-QLa and TT13-QLa. For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency was increased to fortnightly as real-time telemetry data is available for these sites.
Level 2 and 3 trigger If increased monitoring is undertaken, conduct further analysis of water level trends along creek (upstream to downtream) 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**).

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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. 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 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 TT2-QLa, TT3-QLa, TT7-QLa, TT12-QLa and TT13-QLa (related to subsidence induced fracturing and the prevailing climate, refer **Section 7.3.2**). As such, the monitoring frequency was not increased TT7-QLa, TT12-QLa and TT13-QLa. For sites TT2-QLa and TT3-QLa, monitoring and review of data frequency was increased to fortnightly as telemetry data is available for these sites.
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**). Direct and indirect impacts from mining have been confirmed at the pools in question, as summarised in **Table 7** of **Section 7.2**.

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 DPE and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) on 16 August 2023, 10 November 2023 and 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 September 2023, 7 December 2023, and 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 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 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. • 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.	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. 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 (or more frequent) 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**).
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 increased to fortnightly at pools TT2, TT3, TT7, TT11, TT12 and TT13, as well as relevant reference sites (pools TT1 and TT9). Changes at TT10 and TT15 were not confirmed to be related to mining effects.
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 **Table 7** of **Section 7.2**
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 to the plan were submitted to DPE (now DPHI) on 5 July 2023 for approval. 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 If mining related impact unconfirmed, increase monitoring and review of data frequency at	Monitoring and review of data frequency was increased to fortnightly at pools TT2, TT3, TT7,

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.	TT11, TT12 and TT13, as well as relevant reference sites (pools TT1 and TT9). Changes at TT10 and TT15 were not confirmed to be related to mining effects.

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 DPE and key stakeholders	Trigger exceedance during the reporting period were notified to DPE (now DPHI) on 16 August 2023, 10 November 2023 and 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 September 2023, 7 December 2023, and 7 March 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 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 3 trigger 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.
Level 3 trigger 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.	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 C – Groundwater Monitoring Report

Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

Tahmoor Coal Pty Ltd

2975 Remembrance Driveway, Bargo NSW 2574

Prepared by:

SLR Consulting Australia Pty Ltd

Level 11, 176 Wellington Parade, East Melbourne,
VIC, Australia, 3002

SLR Project No.: 640.30614.00000

26 March 2024

Revision: 1.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	1 March 2024	S. Bhattachan	KJ Wallis / S Hulbert	KJ Wallis / S Hulbert

Basis of Report

This report has been prepared by SLR Consulting Australia Pty Ltd (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.

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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 July 2023 and 31st December 2023.

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.

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 1" (L2) and "Level 3" (L3), where 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 presented in **Appendix A** and **Appendix B**.

1.3 Trigger Action Response Plan Amendments

The Water Management Plan, 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. In light of this review, amendments were proposed to the original TARPs. These are detailed in the 2022 Annual Review documentation.

Recent correspondence from the NSW Department of Environment (DPE) (REF: OUT23/14318) considered the proposed amendments and all pertinent here have been accepted, excluding the proposed change to WMP10. Consequently, this six-monthly review reports against the updated TARPs, with some additional discussion included relevant to the ongoing review of WMP10.

In addition, based on the recommendations of the monthly compliance reporting a revision of the groundwater quality trigger levels has been undertaken as part of this six-monthly review. These will be updated in the Groundwater Management Plan (GWMP) and WMP accordingly, within three months of submission of this document. See **Appendix D** for further detail.

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 1 July 2023 to 31 December 2023 (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 subsequent monthly reports and the overarching Annual Review.

2.0 Monitoring Period Summary

2.1 Mine Operation

Mining at LW S1A was undertaken at Tahmoor South during the reporting period, with bolt up of LW 1A commencing on 12 June 2023 and broke chain on 4 July 2023. LWS2A commenced extraction on 2 August 2023.

The extraction void progressed for LWS2A to 1,035 m as of 26 December 2023. The extraction void progression as of 26 December 2023 (1035 m) is shown in **Figure 1**.

TAHMOOR COAL GROUNDWATER SIX-MONTHLY REVIEW (JULY TO DECEMBER 2023)

Groundwater Monitoring Network

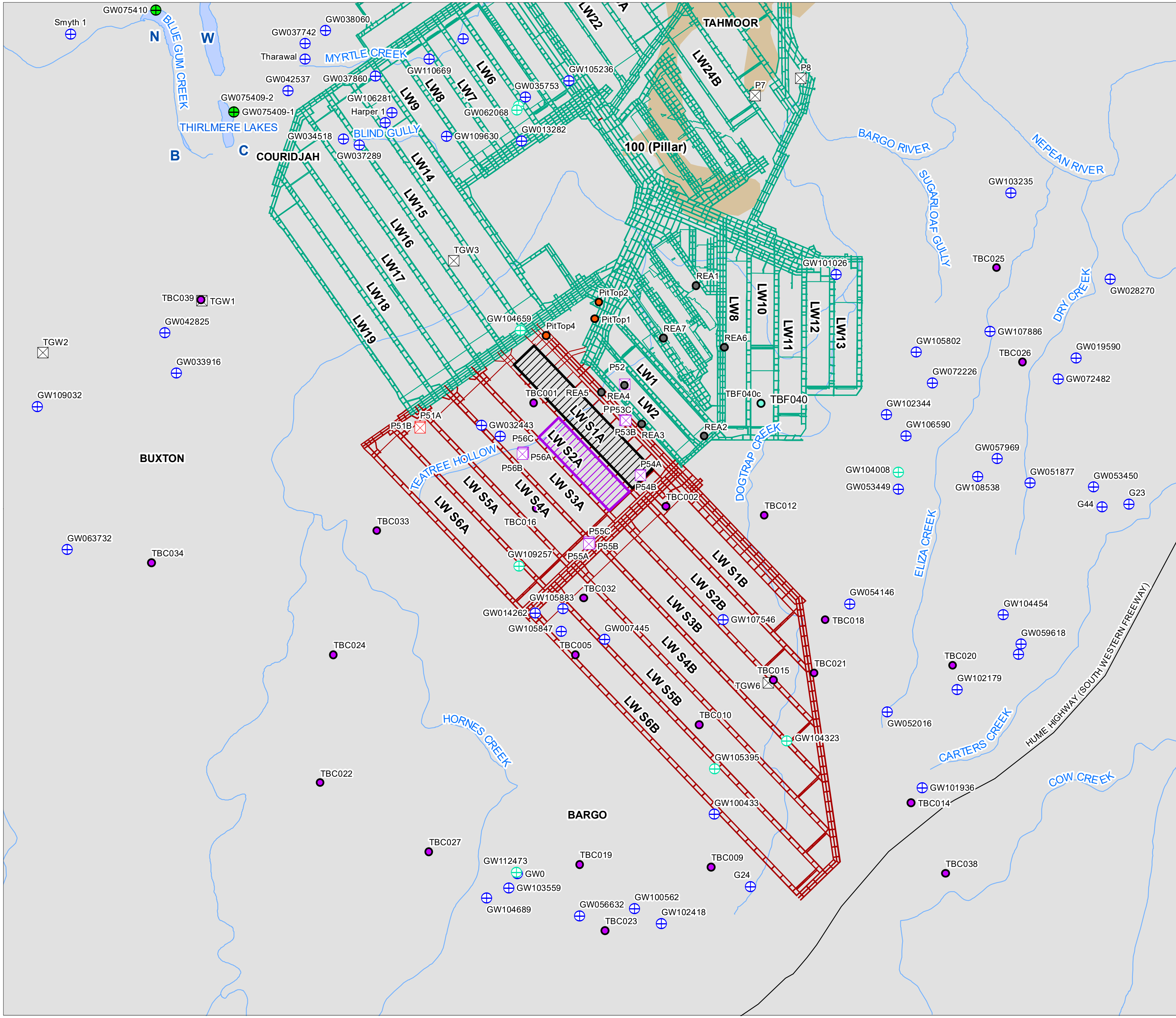


FIGURE 1

- LW S2A Extraction Void (progress as of 26/12/23)
- LW S1A Extraction Complete
- Tahmoor South Mine Plan
- Tahmoor North and Western Domain
- Major Roads
- Watercourses
- Lakes
- Wianamatta Formation
- Hawkesbury Sandstone

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
- NSW govt monitoring
- Regional groundwater bore
- Regional groundwater bore (part of TARP)

0 500 1,000 m

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:50,000 at A4
Project Number:	640.30614
Date:	29-Feb-2024
Drawn by:	AS

SLR

\\au.slr.local\Corporate\Projects-SLR\640-MEL\640-MEL\640.30614.00000 Tahmoor South Monthly Compliance Report\06 SLR Data\01 CADGIS\GIS\July - December 2023\64030614 Groundwater Monthly Review (Dec 2023).mxd

2.2 Rainfall Analysis

Rainfall over the past 12 months, in comparison to the long-term average (i.e., January 1900 – present) is shown in **Table 2**. 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).

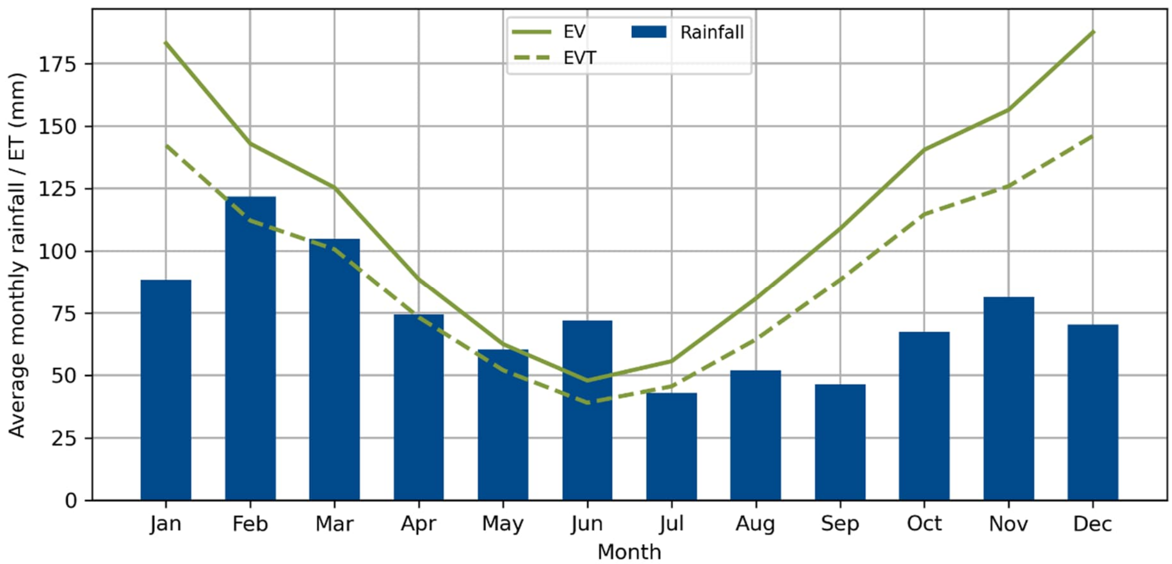
January, April, November and December 2023 were particularly wet months, where above average rainfall observed with a total monthly total rainfall of 147.3mm, 94.1mm, 149.5 mm and 154.5 mm respectively. Comparatively, the remainder of the reporting period was relatively dry with below average rainfall observed. May, June and July 2023 were particularly dry conditions with a total monthly rainfall of 10.3 mm, 13.6 mm and 8.8 mm respectively.

Table 1: Monthly Rainfall vs Long-Term Average Rainfall

SILO (-34.25, 150.60)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Long-term average rainfall (mm)	84.6	113.7	98.9	69.4	53.6	63.2	39.6	47.0	43.6	63.6	81.2	67.9
January – December 2023 monthly rainfall (mm)	147.3	32.8	54.8	94.1	10.3	13.6	8.8	32.7	15.1	30	149.5	154.5

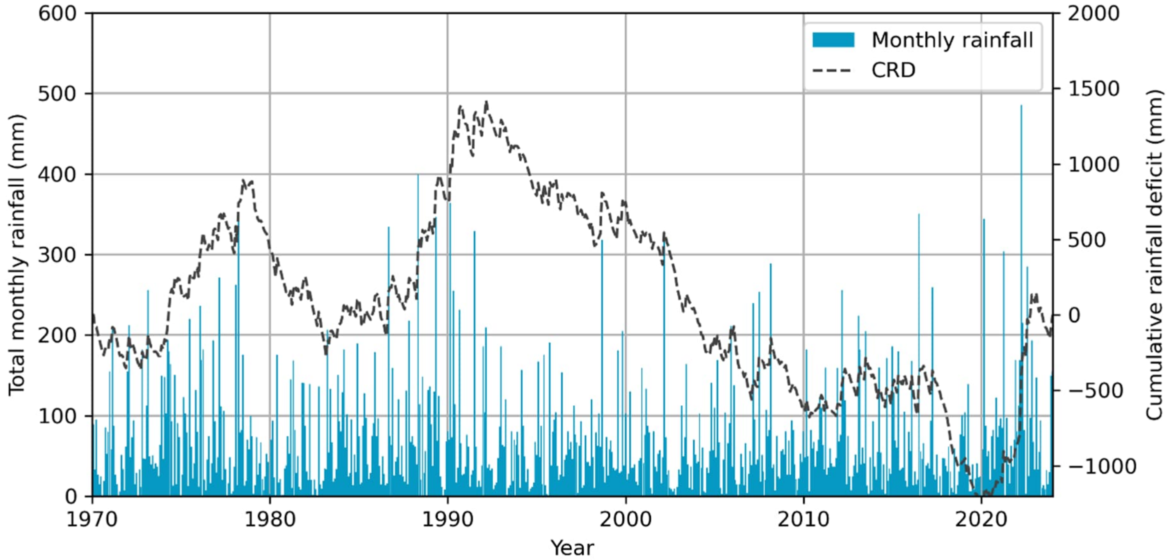
Long-term monthly average rainfall, potential evaporation and estimated actual evapotranspiration is presented in **Figure 2.** The evaporation and evapotranspiration are, on average, higher than rainfall between July and December 2023.

Figure 2: 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 3** 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 3: Cumulative Residual Departure and Total Monthly Rainfall



2.3 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.
- REA4 – data not available after 5 August 2023 as the data cable was not operational.
- TBC026 (ECSL-460m): data appeared erroneous in August 2023 and was omitted from the analysis
- TBC032 (all sensors): data was not available for download in July 2023.
- TBC032 (BGSS-200m) – data not available for download in September, October and November 2023
- TBC024: no data available for downloaded in August 2023 except for one sensor (TBC024-240 m).

2.4 Site Matters

General site matter noted for the reporting period include:

- Fracturing was observed upstream of Teatree Hollow pool site TT3 on 8 February 2023.
- Fracturing was observed upstream of Teatree Hollow pool site TT12 on 1 March 2023.

2.5 General Groundwater Conditions Summary

2.5.1 Shallow OSP Bores

Groundwater depressurisation has been observed in the deepest Open Standpipes at P53 (P53C), P55 (P55C) and P56 (P56C). Groundwater elevation:

- at P53C has been declining since January 2023. Groundwater elevation at P53A and P53B has reduced significantly since April 2023 and has been stable since July 2023.
- at P55C has reduced significantly in November 2022 and appear to be decreasing gradually since. Groundwater elevation at P55A is stable, however, at P55B is decreasing.
- at P56C has reduced in November 2022 and significantly again in April 2023, however, water levels have stabilised since June 2023. Groundwater elevation at the shallower bores, P56A and P56B, are stable.

This groundwater depressurisation at P53(A-C) could be due to an ongoing mining effect (LWS1A and LWS2A progression). However, the shallower bores, groundwater levels at P55A and P56A&B are stable. Groundwater levels at P55B appear to be decreasing since April 2023. Additionally, given the relative stability of the water level in P55C since an initial decline in November 2022 and in P56C since April 2023 (i.e., no ongoing declining trend) this cannot definitively be attributed to extraction activities. It is recommended to continue to review the trends in this bore and the associated nested bores in coming months to better understand the trends.

P51B and GW10459 trigger TARP Level 1 appears to be decreasing however appears to be reactive to rainfall CRD.

P52 and REA4 are showing some consistent decline in water levels since approximately November 2022, although did not trigger TARP WMP8 in the reporting period.

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.

Monitoring bores P55A-C are associated with surface water monitoring site TT1-QRLa, and P53A-C are associated with surface water monitoring site TT13-QRLa, and together they can be considered when reviewing the surface water – groundwater connectivity TARP (WMP12).

Although only P53A-C have been identified as incurring potential impacts due to longwall extraction, a comparison of groundwater level recorded at P53A and P55A (shallowest bore in the series) with water levels at TT1-QRLa and TT13-QRLa was undertaken for completeness to review likelihood of groundwater – surface water connectivity. It was found that limited, if any, connection is present.

Analysis inferred that negligible change in baseflow contributions to Teatree Hollow tributary in the vicinity of TT13-QRLa have occurred during the review period. Therefore, it was concluded that there was no apparent correlation at this point in time between the decline in groundwater level at P53C and the nearby surface water gauging station.

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 (sensors <200 metres)

Shallow VWPs are showing variation in responses since commencement of extraction. TBC009 (HBSS – 30m) has experienced a small steady decline of approximately 2.5 m since November 2022, however the deeper sensors are remaining relatively stable. TBC018 is also showing approximately 3 m drawdown in the three shallowest sensors (70m, 117m, 164m), approximately 1.5 m decline in the sensor at 179 m and has remained stable in the deepest sensor at 198 m. TBC027 is showing some small steady decline, ranging between 0.5 m to 2 m across all depth sensors, although there is no apparent relationship in the depressurisation incurred and the depth profile. TBC032 is the closest VWP to current extraction activities and is showing depressurisation of up to 15 m in the deepest sensor (200m). The shallower sensors are all showing some minor trends in depressurisation ranging between 1 m and 7 m. TBC034 remains stable and TBC039 has observed an increase in water level.

2.5.5 Deep VWPs (sensors >200metres)

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 is showing maximum depressurisation of 15 m between December 2022 and December 2023 at sensor depth 357 m, however recovery was observed subsequently. Approximately 4 m of drawdown was observed in the sensors above and below (343 m and 391 m) between November 2022 and December 2023. TBC018 has observed steady drawdown to a maximum of 3.5 m since November 2022, with less drawdown followed by stabilisation and some recovery 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 of approximately 7 m between June 2023 and December 2023 however a 4 m recovery was observed subsequently, though fluctuated to a maximum of an overall 8.5 m drawdown.

TBC026 has shown significant fluctuations in water levels and with some overall drawdown occurring, but also an increase above baseline conditions in the deepest sensor (440m). 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 – 18 m drawdown, 237m sensor – 5.5 m drawdown, 294 metre sensor – 7 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 Electrical Conductivity (Salinity) 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 Overview of TARP performance

A review of the trigger levels associated with each TARP has been undertaken. The outcomes of this analysis is summarised for each TARP as follows;

- WMP8 Shallow Groundwater Level (Open Standpipes and Private Bores): WMP8 was triggered, based on a number of bores where trigger levels were exceeded for a period of greater than 6 months. Analysis of data associated with TARP WMP8 is provided in this report.
- WMP9 Shallow Groundwater Pressure Vibrating Wire Piezometer (VWP) Sensors <200 m Depth): review of the data for WMP9 indicated no trigger level exceedances, and consequently WMP9 TARP has not been triggered.
- WMP10 Groundwater Pressure Deep (VWP Sensor >200 m Depth, excluding monitoring the Bulli Coal Seam): review of the data for WMP10 indicated no trigger level exceedances, and consequently WMP10 TARP has not been triggered.
- WMP11 Groundwater Quality (Open Standpipes and Private Bores): Water quality triggers were redefined based on extended baseline data in order to capture natural fluctuations originally not captured due to short baseline (only three data points in some cases). A technical memorandum summarising the methodology and findings is presented in **Appendix D**. Groundwater quality data collected between June 2022 and June 2023 was utilised as the baseline due to its lack of mining impact, mirroring the pre-mining phase. The process involved setting the 95th percentile value for dissolved metals and adjusting pH triggers based on the baseline period data. However, due to limited EC data availability for certain months in 2022, the salinity triggers remained unchanged. During the reporting period, the defined groundwater quality trigger levels were breached for numerous parameters for more than three months. However, of these parameters, the analytes did not appear to be showing similar trends across multiple observation points. Consequently none of the analytes meet with Criteria 1 and 2 in comparison to the revised water quality trigger levels for the 1 July 2023 to 31 December 2023 period, and TARP WMP11 was not triggered.
- WMP12 Groundwater-Surface Water Interaction: bore associated with WMP12 had trigger level exceedances during the reporting period that resulted in TARP WMP12 bring triggered.
- WMP13 Groundwater Monitoring Bores for Thirlmere Lakes: To enact WMP13, a minimum of two early warning bores are required to exceed the trigger level for either groundwater quality or groundwater level. As of December 2023, there are no active trigger level exceedances associated with the WMP13 bores, and therefore WMP13 TARP has not been triggered.

Further discussion on the TARPs triggered, WMP8 and WMP12 are provided below.

3.2 TARP Trigger Summary

A full review of the six-monthly monitoring data, for trigger level breaches and exceedances, is presented in Appendix C. Temporal plots, showing groundwater monitoring data against the trigger levels, for all relevant monitoring locations, are presented in **Appendix E** (groundwater level triggers) and **Appendix F** (groundwater quality triggers). A complete list of TARPs across the reporting period, are summarised in **Table 2** and **Table 3**.

A TARP (WMP8 and/or WMP12) Level 1 trigger for groundwater level occurred at P51B, P53A, P53B, P55B and GW104659 and Level 2 trigger for groundwater level occurred at P53C, P55C and P56C as of 31 December 2023.

During the reporting period, no groundwater quality trigger levels were exceeded based on the revised groundwater quality trigger levels (as discussed in greater detail in Section 1.3,and technical memo provided in **Appendix D**), and therefore TARP WMP11 was not triggered.

A summary of TARP triggers that occurred over the reporting period are show in in **Figure 4.**

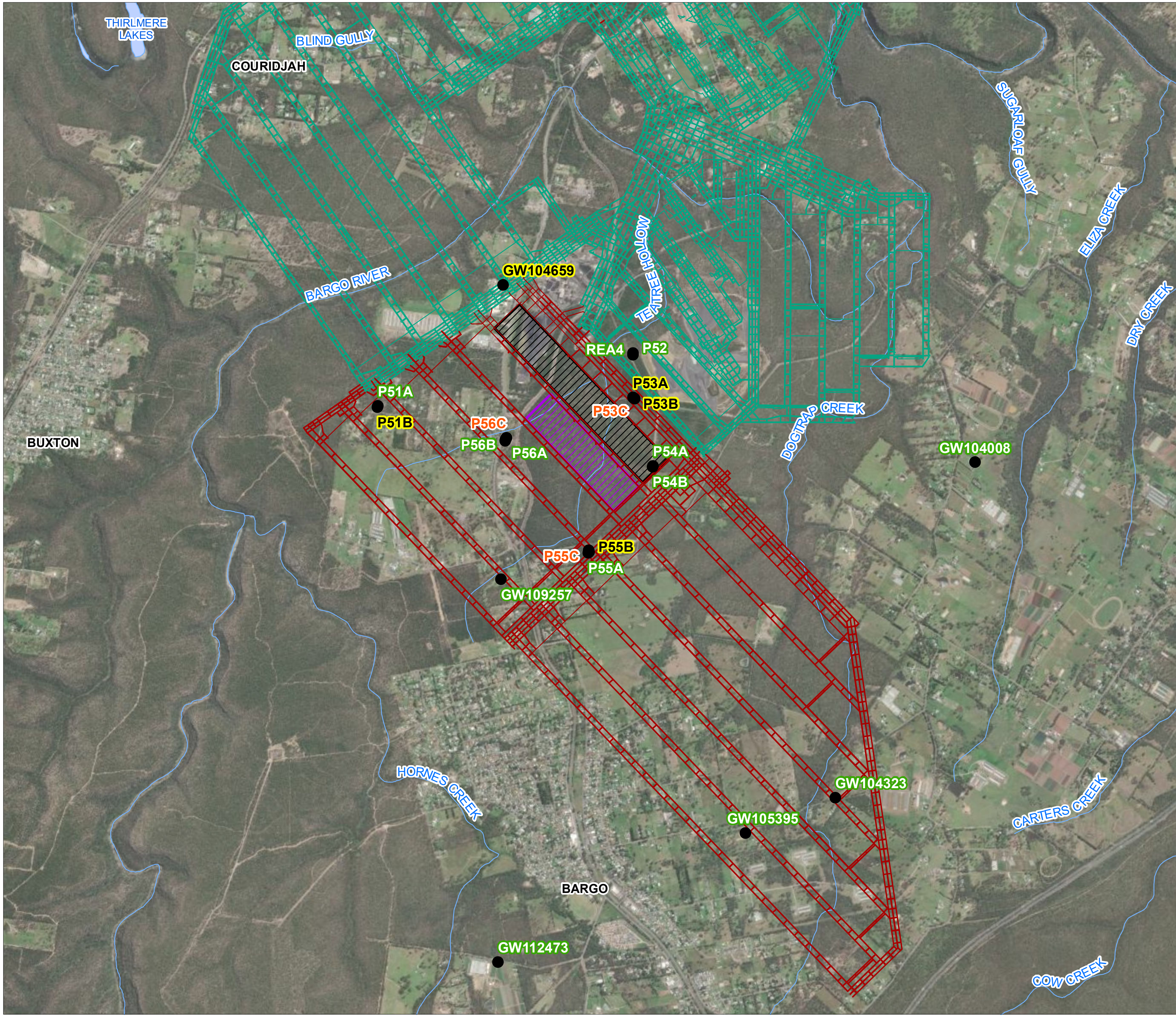
Groundwater TARP triggers occurred at bores located within the immediate vicinity of LWS1A and LWS1B (predominantly in the deeper bores in the east, west and south-west and shallow bores in the north) while groundwater quality exceedances occurred north, south, east, and west of LWS1A and LWS2A.

Table 2: WMP8 TARP Triggers

TARP Significance	Sites	Months Active	Comment
Level 1	P51B	Oct, Nov, Dec	Greater than 2 metre water level reduction for a period of greater than 6 months following the commencement of extraction.
	P53A	Oct, Nov, Dec	
	P53B	Sept, Oct, Nov, Dec	
	P55B	Oct, Nov, Dec	
	GW104659	Sept, Oct, Nov, Dec	
Level 2	P53C	Dec	Water level declines below Trigger Level 2 for a period of greater than 6 months P55C and P56C not determinedly found to be due to extraction. Monitoring to continue.
	P55C	Nov, Dec	
	P56C	Oct, Nov, Dec	

Table 3: WMP 12 TARP Triggers

TARP Significance	Sites	Months Active	Comment	Action
Level 1	P53A	Oct, Nov, Dec	Groundwater levels noted decline at monitoring sites neighbouring surface water monitoring sites. Analysis indicates low likelihood for groundwater – surface water interaction.	Investigation in cause and if mining related complete. Discussed with relevant specialists.
	P53B	Sept, Oct, Nov, Dec		
Level 2	P53C	Dec	Groundwater levels noted decline at monitoring sites neighbouring surface water monitoring sites Analysis indicates low likelihood for groundwater – surface water interaction.	Review of surface water data complete. Ongoing monitoring and review to be completed.



TAHMOOR COAL GROUNDWATER SIX-MONTHLY REVIEW (JULY TO DECEMBER 2023)

WMP8 Triggers between July and December 2023

FIGURE 4

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
Bore Monitored

Trigger Level:

TARP WMP8 Trigger (L1)
TARP WMP8 Trigger (L2)
TARP WMP8- Normal Conditions

Coordinate System:	GDA 1994 MGA Zone 56
Scale:	1:40,000 at A4
Project Number:	640.30614
Date:	28-Mar-2024
Drawn by:	AS

SLR

H:\Projects-SLR\640-MEL\640-MEL\640.30614.00000 Tahmoor South Monthly Compliance Report\06 SLR Data\01 CADGIS\GIS\July - December 2023\64030614 Jul_Dec_2023 F05 TARP Exceedances (WMP8) between July and December 2023.mxd

4.0 Potential Influences

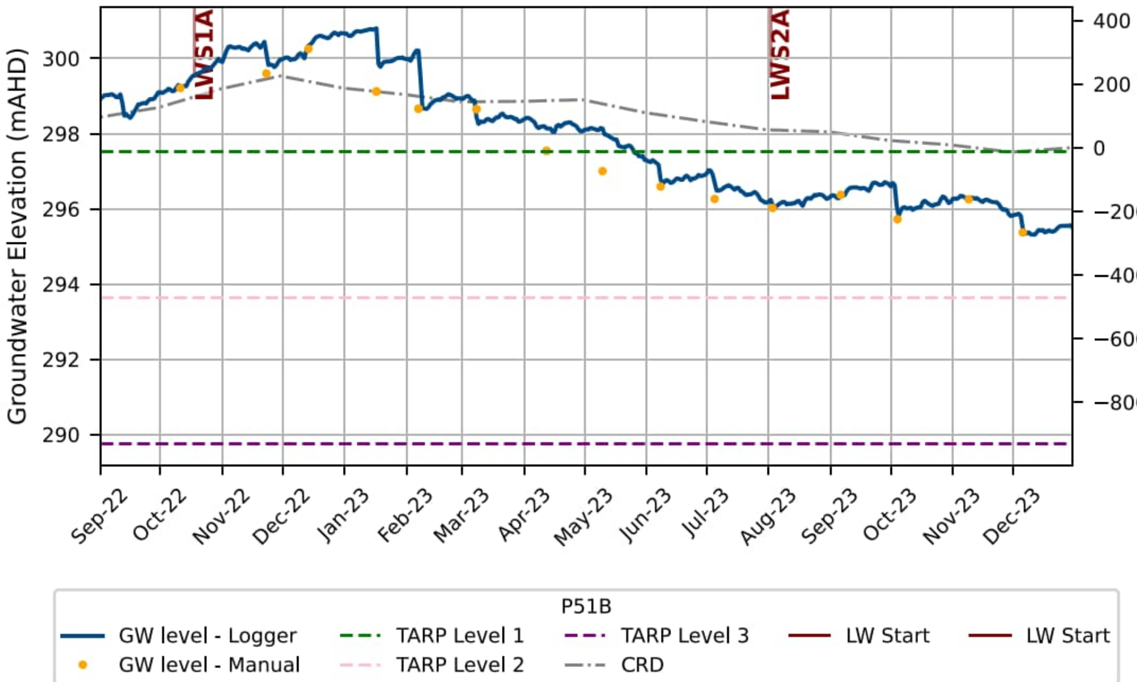
4.1 TARP WMP8

The potential influences driving the observed trigger level exceedances at P51B, P53A, P53B, P53C, P55B, P55C, P56C and GW104659, as listed in **Table 2,** are discussed in this section. The spatial distribution of observed groundwater levels above the trigger level, and the identified TARP Level 1 and Level 2 triggers are shown in **Figure 4.**

4.1.1 P51B

As of 31 December 2023, an exceedance of the TARP Level one trigger level occurred at P51B. This observed exceedance is presented in **Figure 5.**

Figure 5: TARP WMP8 Level 1 Exceedance – P51B



At P51B, the groundwater elevation was lower than the TARP Trigger Level 1 since May 2023. Over the monitoring period between July 2023 and December 2023, the groundwater elevation has fluctuated by approximately 2 m with an overall decreasing groundwater trend since January 2023.

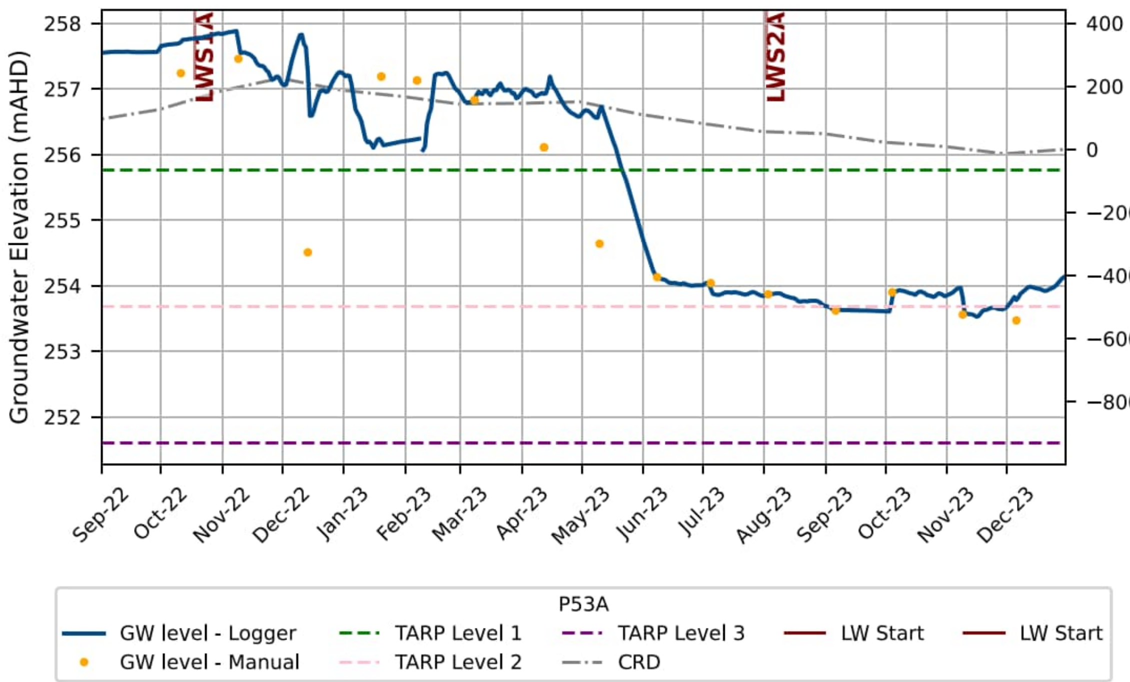
The groundwater elevation at P51A has remained relatively steady throughout the reporting period, with the groundwater elevation above the TARP Level 1 trigger level. Review of the cumulative rainfall departure (CRD) indicates groundwater elevation is potentially reacting to rainfall in the area. Hence, it is uncertain whether groundwater depressurisation is a result of ongoing mining. It is potentially a combination of both factors influencing the groundwater levels.

With the exceedance of the trigger level at Site P51 only occurring in the deepest bore (P51B), it is suggested to continue to review the trends in this bore and the associated nested bores in coming months to better understand the cause of the apparent decline.

4.1.2 P53A

As of 31 December 2023, an exceedance of the TARP Level 1 trigger level occurred at P53A. This observed exceedance is presented in **Figure 6**.

Figure 6: TARP WMP8 Level 1 Exceedance – P53A



At P53A, the groundwater elevation was lower than TARP Level 1 trigger in all monitoring rounds since May 2023 with groundwater elevation fluctuating approximately 4 m between May and June 2023. Over the reporting period between July 2023 and December 2023, the groundwater elevation has remaining relatively stable and only fluctuating by approximately 1 m. Groundwater elevation was noted to temporarily decrease below Level 2 trigger levels in September 2023 and November 2023.

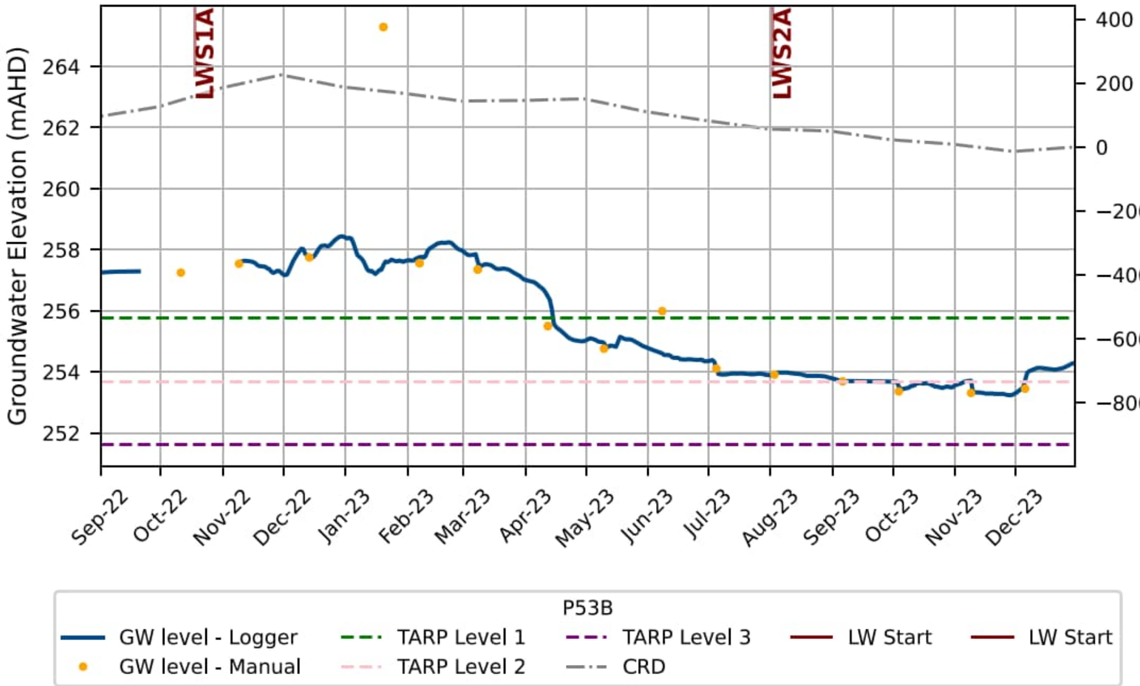
The groundwater elevation at P53A decreased significantly in May 2023 and have remained stable since. The groundwater elevation at P53B has been steadily decreasing since March 2023 and is below TARP Level 1 trigger level. The groundwater elevation at P53C has been decreasing since December 2022 with the groundwater elevation decreasing below TARP Level 2 Trigger level in July 2023.

With the exceedance at Site P53 occurring at all bores, the groundwater elevation depressurisation at P53A in May 2023 could be due to an ongoing mining effect (LWS2A), however the groundwater elevation has remained stable since June 2023. The decline observed in May 2023 does not correlate with the extraction progression, with LWS1A nearing completion at this time (i.e. not mining adjacent to the bores at this time).

4.1.3 P53B

As of December 2023, an exceedance of the TARP Level 1 trigger level occurred at P53B. This observed exceedance is presented in **Figure 7**.

Figure 7: TARP WMP8 Level 1 Exceedance – P53B



At P53B, the groundwater elevation was lower than the TARP Level 1 since April 2023. Over the monitoring period between July 2023 and December 2023, the groundwater elevation has fluctuated by approximately 1 m with an overall decreasing trend since March 2023.

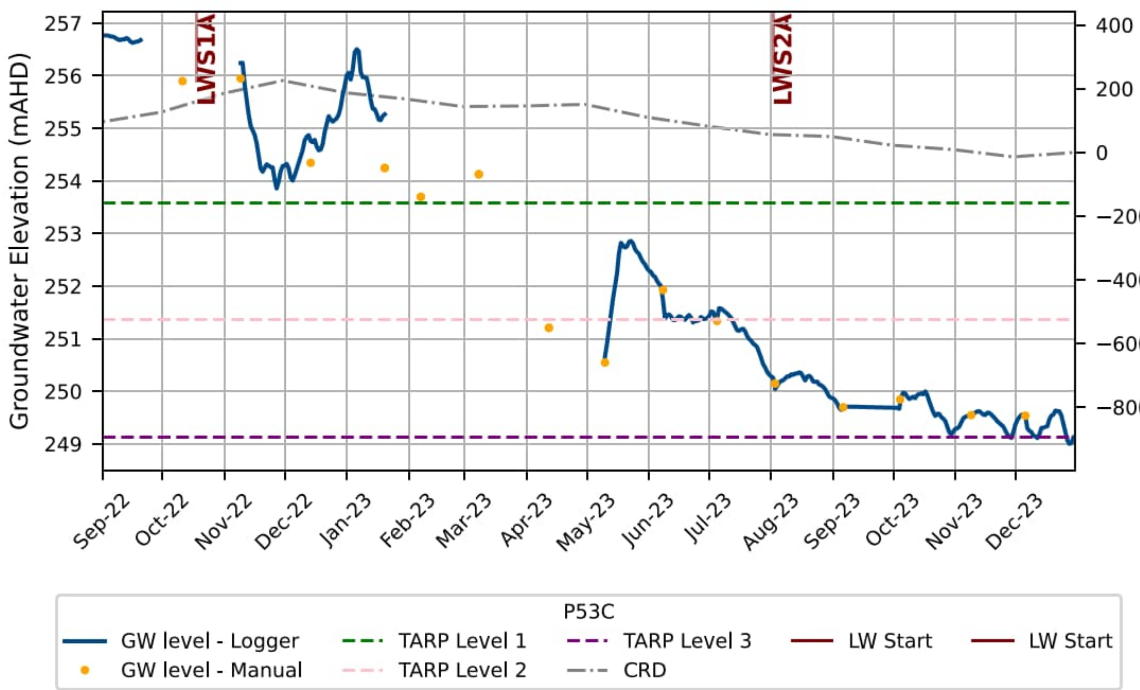
The groundwater elevation at P53B has remained relatively steady throughout the reporting period, with the groundwater elevation decreasing to below the TAPR L1 trigger level since April 2023. The groundwater elevation at P53A decreased significantly in May 2023 and have remained stable since. The groundwater elevation at P53C has been decreasing since December 2022 with the groundwater elevation decreasing below TARP Level 2 Trigger level in July 2023.

With the exceedance at Site P53 occurring at all bores, the groundwater depressurisation at P53B could be due to an ongoing mining effect (LWS1A and LW2SA). The all follow the similar trend of maximum decline occurring in May 2023, with relatively stable levels since, although P53B is a subdued reflection of this trend comparatively.

4.1.4 P53C

As of 31 December 2023, an exceedance of the TARP Level 2 trigger level occurred at P53C. This observed exceedance is presented in **Figure 8**.

Figure 8: TARP WMP8 Level 2 Exceedance – P53C



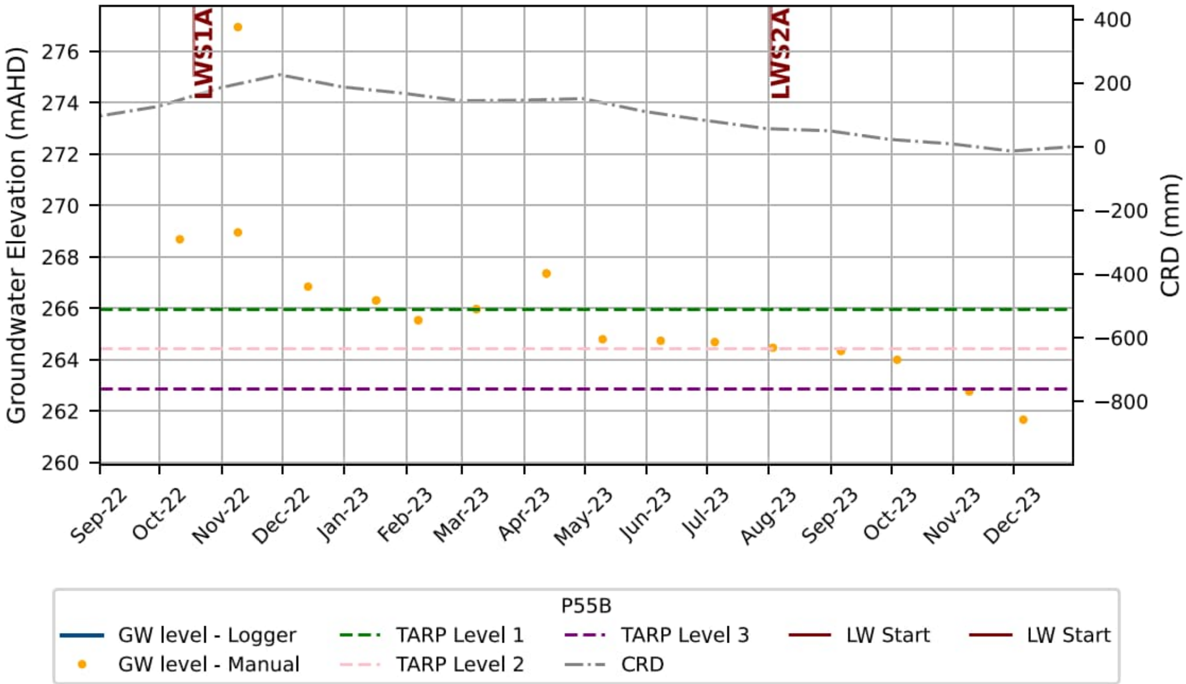
At P53C, the groundwater elevation was lower than the TARP Level 2 trigger level in all monitoring rounds since July 2023. Over the reporting period, the groundwater level has fluctuated by approximately 2.5 m with groundwater elevation with groundwater elevation decreasing by approximately 1.5 m between July and August 2023 and steadily stabilising since.

The groundwater elevation at P53C appears to be decreasing since December 2022 with the groundwater elevation decreasing below Level 1 in April 2023 and decreasing below Level 2 in July 2023. This groundwater depressurisation in the deeper bore could be due to an ongoing mining event.

4.1.5 P55B

As of 31 December 2023, an exceedance of the TARP Level 1 trigger level occurred at P55B. This observed exceedance is presented in **Figure 9**.

Figure 9: TARP WMP8 Level 2 Exceedance – P55B



At P55B, the groundwater elevation was lower than TARP Level 1 trigger level in all monitoring rounds since May 2023. Over the reporting period between July 2023 and December 2023, the groundwater elevation has overall decreased by approximately 3 m with groundwater levels decreasing to below TARP Level 2 trigger levels in September 2023 and TARP Level 3 trigger levels in November 2023.

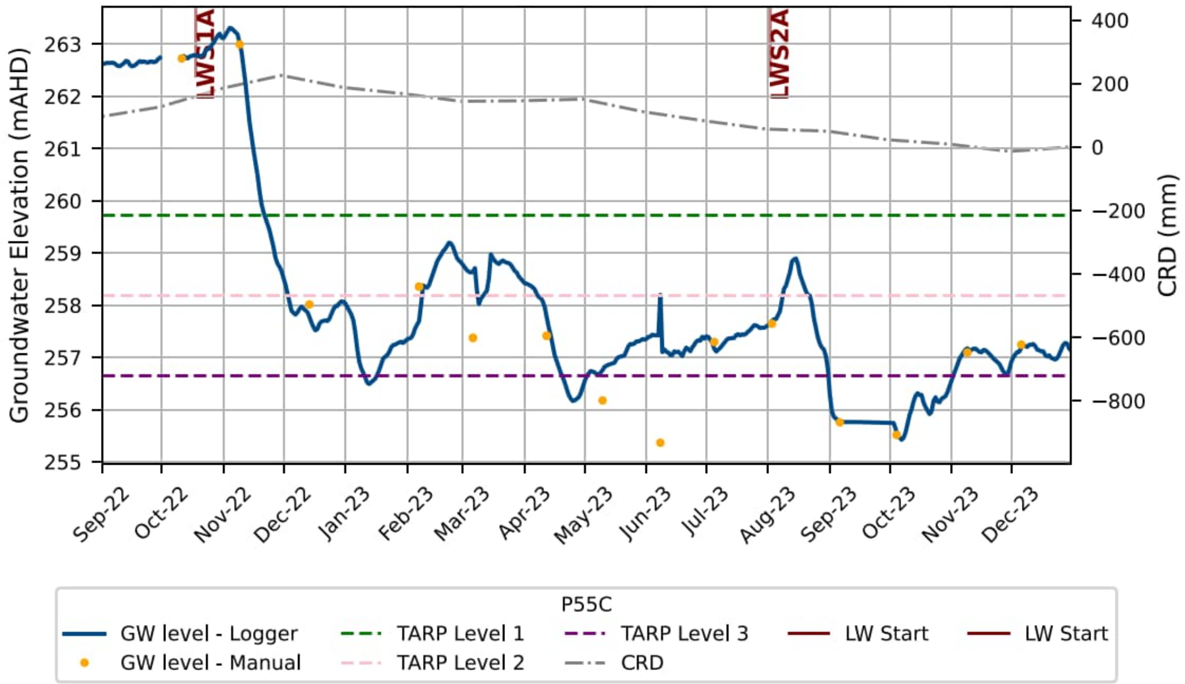
The groundwater elevation at P55B has been steadily decreasing since December 2022, and is below the TARP Level 1 trigger level, throughout the reporting period. The groundwater elevation at P55A has remained relatively steady, and above the TARP Level 1 trigger level, throughout the reporting period. The groundwater elevation at P55C is fluctuating below TARP Level 2 trigger level.

With the exceedance at Site P55 occurring at P55B and P55C and given that the groundwater elevation at P55B has been steadily decreasing, this groundwater depressurisation could be due to an ongoing mining effect (LWS2A progression). Continuous monitoring groundwater loggers have been reinstated in P55A and P55B in early 2024 to assist in closely monitoring this trend.

4.1.6 P55C

As of 31 December 2023, an exceedance of the TARP Level 2 trigger level occurred at P55C. This observed exceedance is presented in **Figure 10.**

Figure 10: TARP WMP8 Level 2 Exceedance – P55C



At P55C, the groundwater elevation was lower than the TARP Level 1 trigger level in all monitoring rounds since November 2022. Over the reporting period between July 2023 and December 2023, the groundwater elevation has fluctuated by approximately 4.5 m with groundwater levels decreasing to below the TARP Level 3 trigger level in August and September 2023 before slightly increasing to below the TARP Level trigger level in November and December 2023.

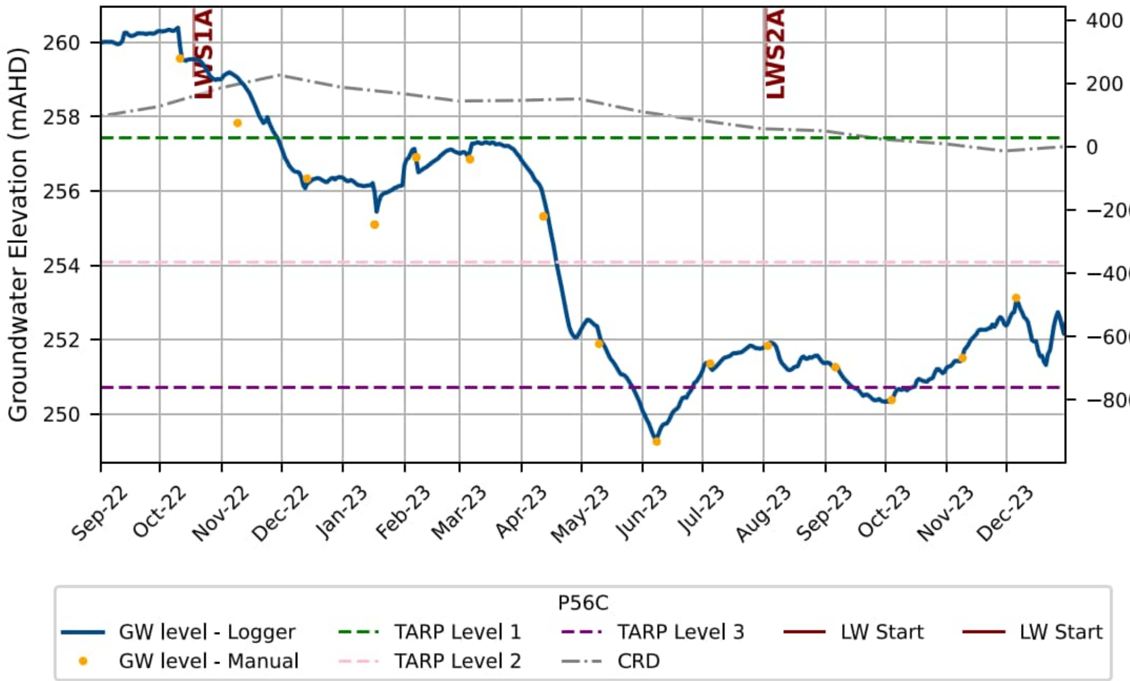
The groundwater elevation at P55A has remained relatively steady, and above the TARP Level 1 trigger level, throughout the reporting period. The groundwater elevation at P55B has been steadily decreasing and is below TARP Level 1 trigger level.

With the exceedance at Site P55 occurring at P55B and P55C, this groundwater depressurisation in the deeper bore could be due to an ongoing mining effect (LWS1A progression).

4.1.7 P56C

As of 31 December 2023, an exceedance of the TARP Level 2 trigger level occurred at P56C. This observed exceedance is presented in **Figure 11.**

Figure 11: TARP WMP8 Level 2 Exceedance – P56C



At P56C, the groundwater elevation was lower than the TARP Level 1 trigger level since December 2022 and lower than TARP Level 2 trigger level since June 2023. Over the reporting period between July 2023 and December 2023, the groundwater elevation has overall increased by approximately 3 m, however the groundwater are below the TARP Level 2 trigger level.

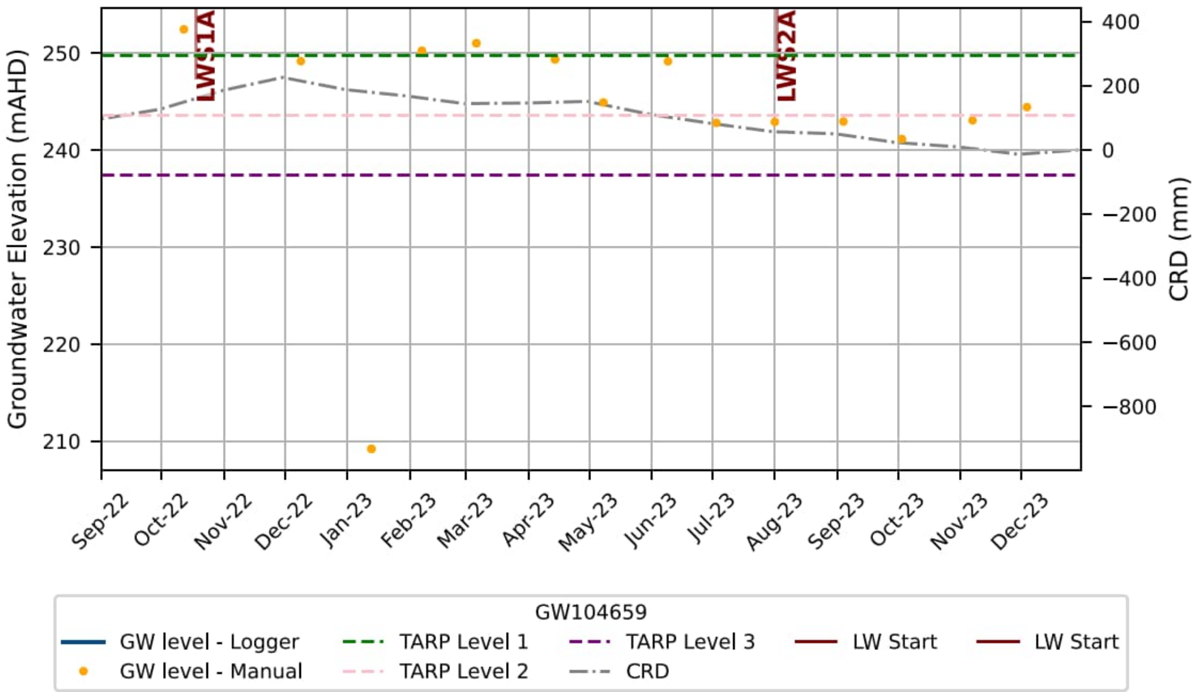
The groundwater elevation at P56A has remained relatively steady, and above the TARP Level 1 trigger level, throughout the reporting period. The groundwater elevation at P56B has been generally steady, except for short-term spike in early 2023, slowly decreasing since June 2023 below TARP Level 1 between July 2023 to November 2023 and increasing above the TARP L1 trigger level after. Consequently, the exceedance at Site P56 only occurring in the deepest bore (P56C).

The steep decline in April/May 2023 correlates with the similar trend observed at P53, however these are located on opposite sides of LWS2A and there is no obvious link in timing to longwall progression. Since this point, there has been minor fluctuations both up and down, not a typical representative of groundwater depressurisation due to longwall mining. Ongoing monitoring and continued analyse of this trend is required.

4.1.8 GW104659

As of 31 December 2023, an exceedance of the TARP Level 1 trigger level occurred at GW104659. This observed exceedance is presented in **Figure 12**.

Figure 12: TARP WMP8 Level 1 Exceedance – GW104659



At GW104659, the groundwater elevation was lower than TARP Level 1 since April 2023. Over the monitoring period between July 2023 and December 2023, the groundwater elevation was relatively steadily decreasing below TARP Level 2 since July 2023, before showing an increase in November 2023 and increasing above TARP Level 2 in December 2023.

The relatively steady decline at this site this groundwater depressurisation in the deeper bore could be due to an ongoing mining effect or in response to overall lower than average rainfall.

4.2 TARP WMP12

Monitoring bores P55A-C are associated with surface water monitoring site TT1-QRLa, and P53A-C are associated with surface water monitoring site TT13-QRLa, and together they can be considered when reviewing the surface water – groundwater connectivity TARP (WMP12).

Although only P53A-C have been identified as incurring potential impacts due to longwall extraction, a comparison of groundwater level recorded at P53A and P55A (shallowest bore in the series) with water levels at TT1-QRLa and TT13-QRLa was undertaken for completeness to review likelihood of groundwater – surface water connectivity, and to align with the surface water 6-monthly reporting analysis.

4.2.1 TT1-QRLa and P55C

P55C is associated with surface water monitoring site TT1-QRLa and the two can be considered together when reviewing the surface water – groundwater connectivity TARP (WMP12). The water level plot for TT1-QRLa is provided in **Figure 13,** and the groundwater hydrograph reproduced again here for context in **Figure 14**.

The cease to flow level at this surface water site is 292.42 m above height datum (AHD), and the baseline minimum is 291.897 m AHD. The groundwater elevation range recorded at P55C (the deepest of the nested bores at P55) is 256 m AHD to 265 m AHD.

Groundwater level data for the shallow bores was contoured to create a shallow water table map, used in conjunction with site details and the local LIDAR data, to create a cross section for these sites (**Figure 15**). Conceptually, the groundwater level is notably lower than the base of the Creek, indicating a disconnected system.

There is no apparent correlation at this point in time between the apparent decline in groundwater level and trigger breach at P55C and the nearby surface water gauging station.

Figure 13: Recorded Water Level and Daily Rainfall for TT1-QRLa

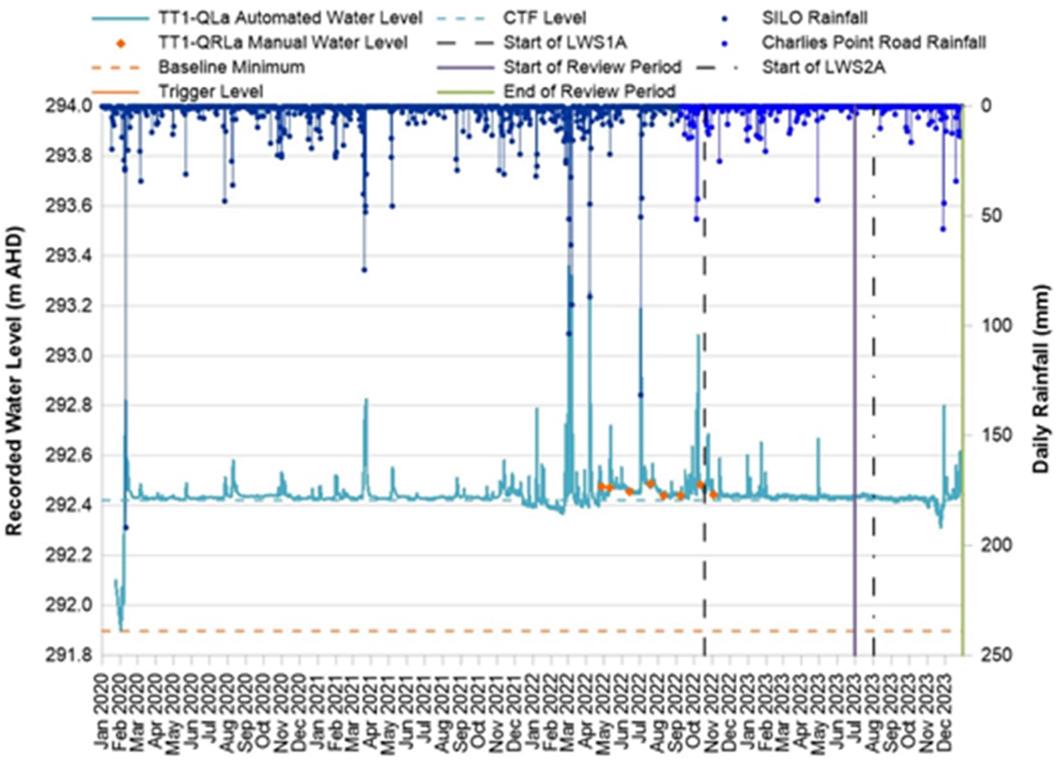


Figure 14: Groundwater Elevation at P55C

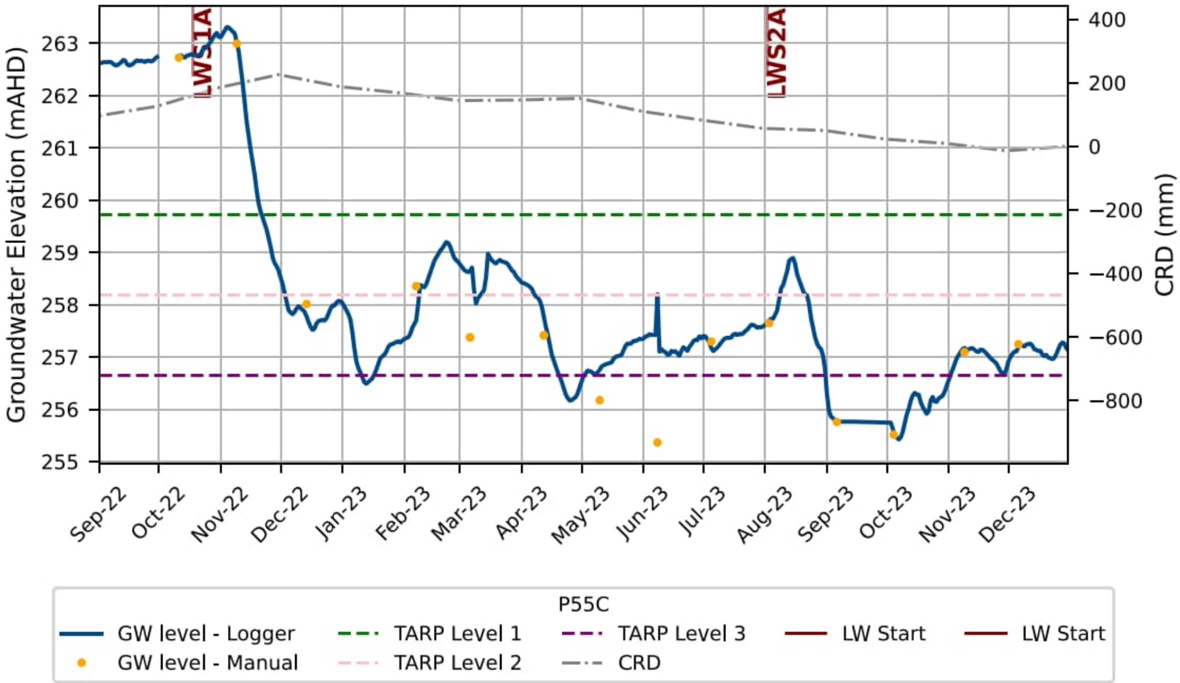
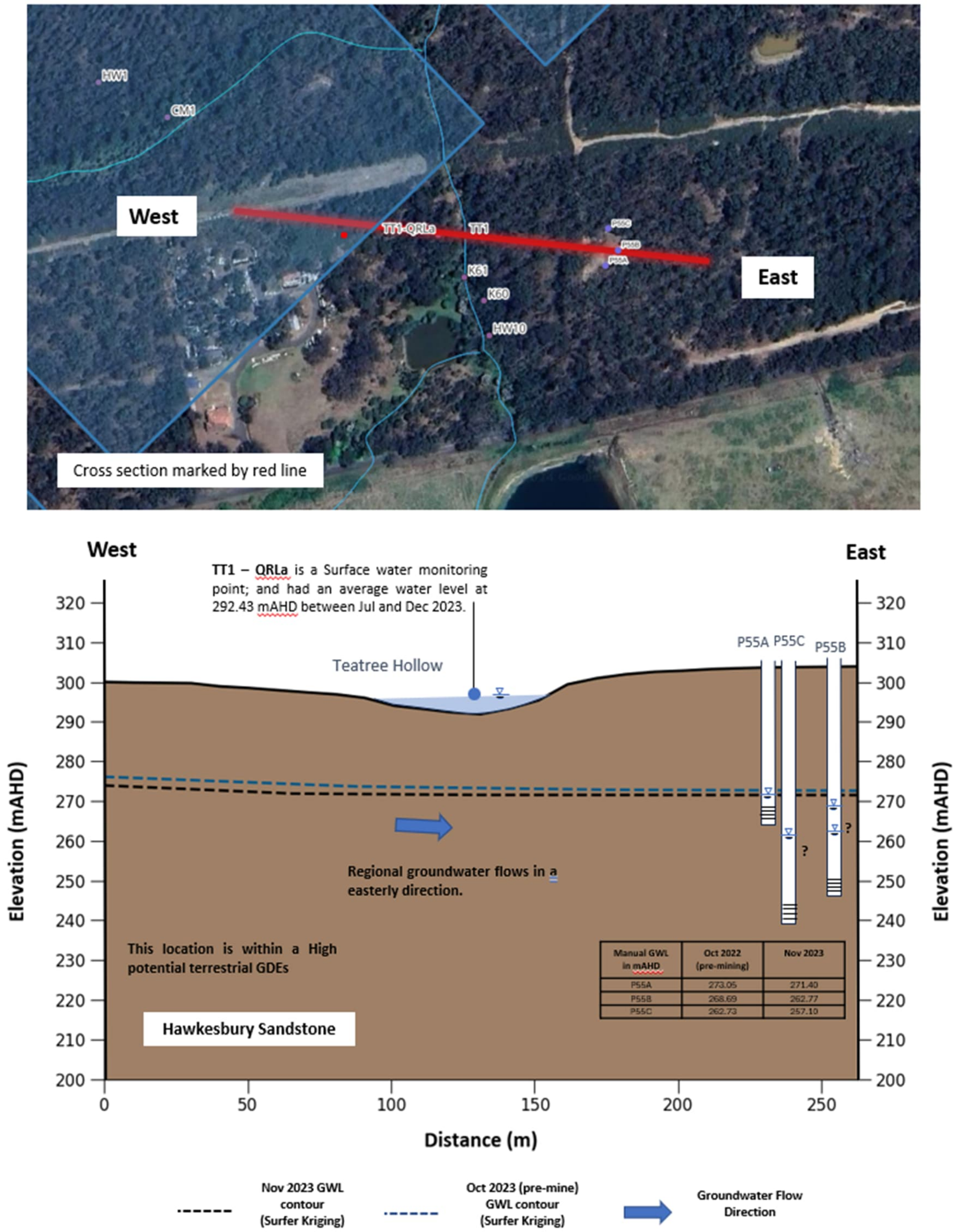


Figure 15: Cross-Sectional Conceptual Model for Groundwater – Surface Water Connectivity at TT1-QRLa and P55.



4.2.2 TT13-QRLa and P53C

P53C is associated with surface water monitoring site TT13-QRLa and the two can be considered together when reviewing the surface water – groundwater connectivity TARP (WMP12). The water level plot for TT13-QRLa is provided in **Figure 16**, and the groundwater hydrograph reproduced again here for context in **Figure 17**.

The cease to flow level at this surface water site is 267.3 m AHD, and the baseline minimum is 267.3 m AHD. The groundwater elevation range recorded at P53C (the deepest of the nested bores at P53) is 249 m AHD and 257 m AHD.

Groundwater level data for the shallow bores was contoured to create a shallow water table map, used in conjunction with site details and the local LIDAR data, to create a cross section for these sites (**Figure 18**). Conceptually, the groundwater level is notably lower than the base of the Creek, indicating a disconnected system.

There is no apparent correlation at this point in time between the apparent decline in groundwater level and trigger breach at P53C and the nearby surface water gauging station.

Figure 16: Recorded Water Level and Daily Rainfall for TT13-QRLa

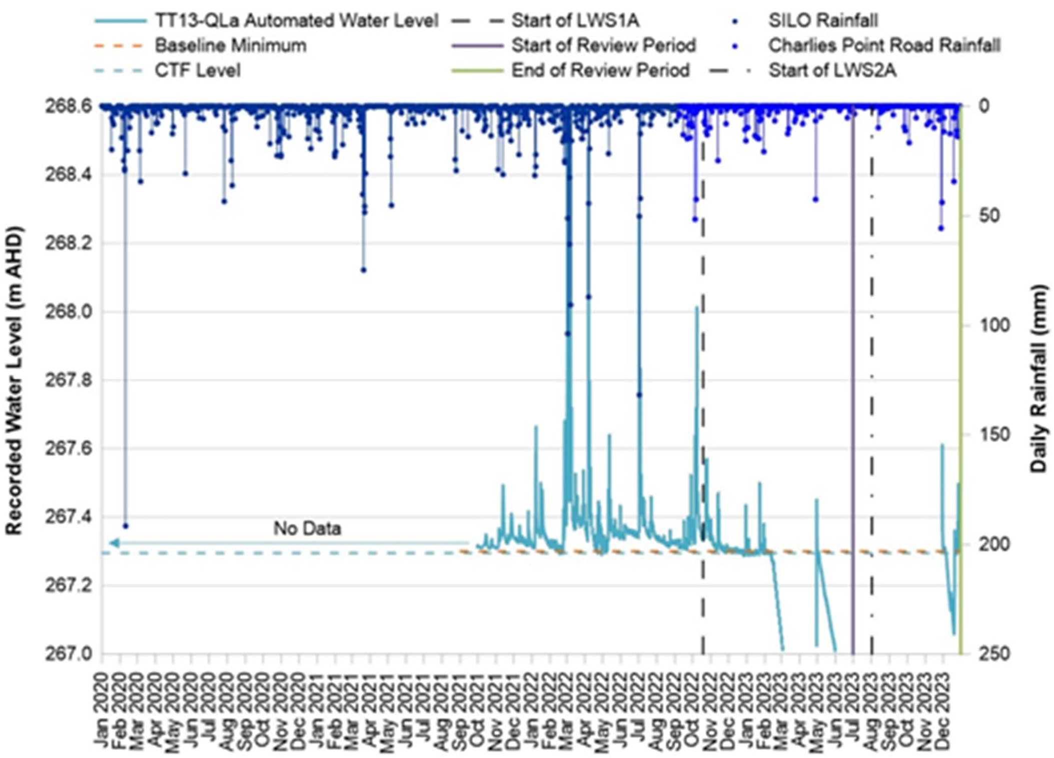


Figure 17: Groundwater Elevation at P53C

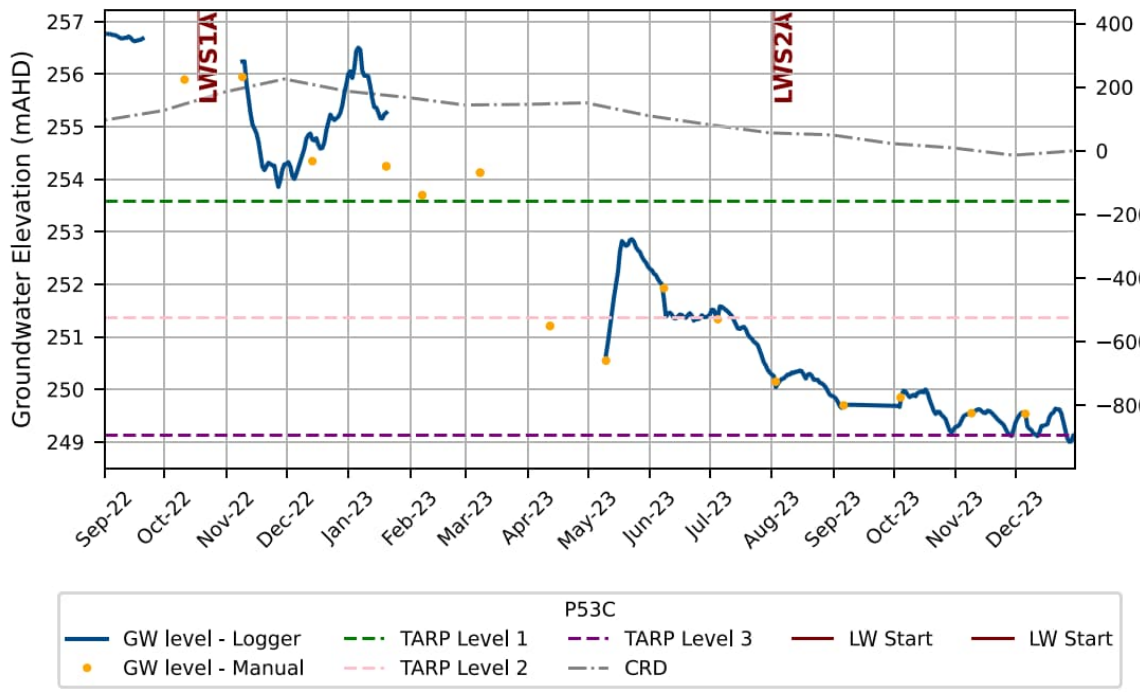
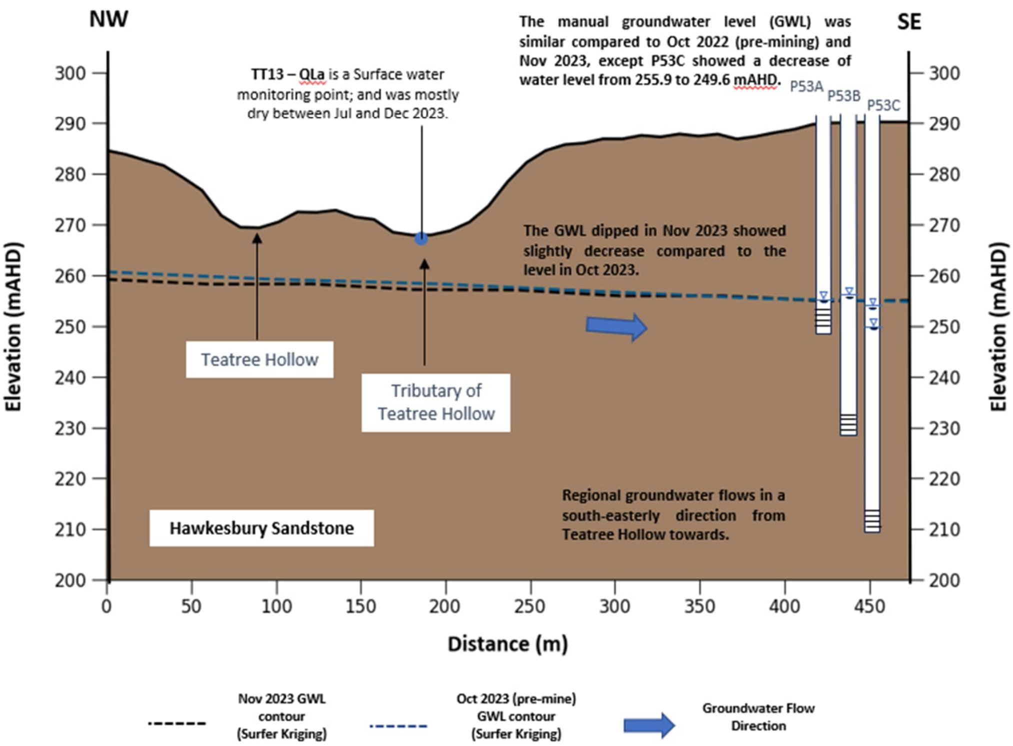


Figure 18: Cross-Sectional Conceptual Model for Groundwater – Surface Water Connectivity at TT1-QRLa and P53.



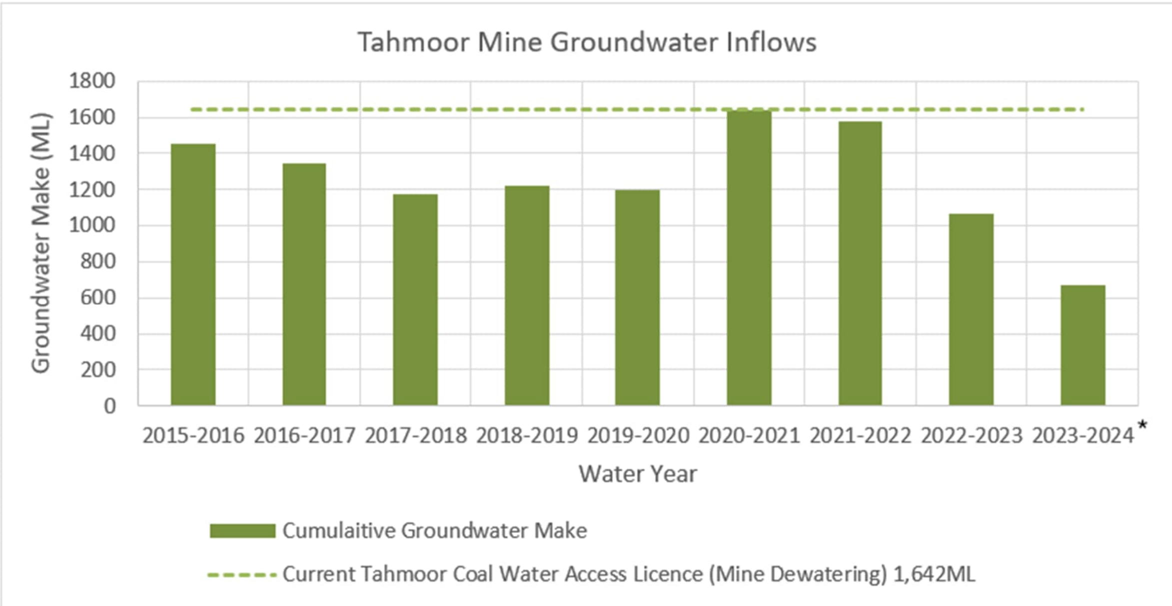
5.0 Mine Inflows

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 19**.

The reporting period occurs within the water year 2023-24. As of 31 December 2023, the cumulative groundwater make for water year 2023-24 is 673 ML, which remains below the groundwater entitlement of 1,642 ML/y (**Figure 19**).

Figure 19: Tahmoor Mine Groundwater Inflows



(*July 2023 – December 2023)

6.0 Action and Response

Table 4 and **Table 5** summarise the Actions and Responses in line with each relevant TARP that has been triggered.

Table 4: Actions and Responses for Level 1 TARP Triggers for WMP8 (Shallow Groundwater Levels)

Action / Response from TARP WMP8	Tahmoor Coal response
Actions	
Level 1 and 2 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 and 2 TARP Undertake an investigation to assess cause and determine if mining related.	An investigation to assess cause of the water level decline at P51B, P53A, P53B, P53C, P55B, P55C, P56C and GW104659 is provided in **Section 4.0.** Groundwater level decline at P53 and P56 could be due to ongoing mining effect. However, at the remaining locations, it cannot definitely be attributed to extraction activities.
Level 1 and 2 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 regional aquifer drawdown is occurring of that any impact would be observed in existing water supply works.
Level 1 and 2 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 4.0**).
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).	Groundwater at P53 could be due to ongoing mining effect. However, at the remaining locations (P51, P55 and GW104659), it cannot definitely be attributed to extraction activities. It is noted that WMP12 has been initiated for P53 nested bores only.
Level 2 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 solid identification causation that do not require further monitoring (e.g.	Level 2 TARP has been triggered at P53C, P55C and P56C, although only P53 is showing relatively steady decline (across all nested bores) indicative of potential mining impacts. Loggers installed in these bores monitoring water level every 15 minutes, with monthly reivew 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).

Action / Response from TARP WMP8	Tahmoor Coal response
singular anthropogenic impact resulting in water level change).	
Level 2 TARP Compare against base case and deterministic model scenarios.	The Tahmoor numerical model is currently undergoing update and subsequently, review of the deterministic model scenarios will be undertaken.
Level 2 TARP Review Water Management Plan and modify if necessary.	Planned update of the WMP will occur within three months submission of this 6-monthly review.
Level 2 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 TARP triggers have occurred for private bores.
Responses	
Level 1 and 2 TARP Report trigger exceedance to DPE and key stakeholders.	Notification of exceedances to DPE is 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 If the changes have been confirmed to be related to mining effects: For Private Bores: • 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 (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 changes in private bores confirmed to be related to mining. No further action required at this time.
Level 2 TARP Advise DPE 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.
Level 2 TARP For Private Bores: Provide findings of CMA review to DPE and key stakeholders for consultation.	No CMA required at this point.
Level 2 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.	

Table 5: Actions and Responses for Level 1 TARP Triggers for WMP12 (Groundwater – Surface Water Interaction)

Action / Response from TARP WMP12	Tahmoor Coal response
Actions	
Level 1 and 2 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 and 2 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 undertaken in **Section 4.2.** TARP WMP12 has been initiated for P53 due to TARP triggers (WMP8) and the assessment that groundwater level decline at P53 could be due to ongoing mining effect. The relevant surface water site is and TT13-QRLa. Further 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 extraction at LW S1A and LW S2A is influencing groundwater – surface water interactions during the reporting period.
Level 1 and 2 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 **4.2**).
Level 2 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).	The logger installed in P53C monitors water level every 15 minutes, 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 TARP Compare against base case and deterministic model scenarios.	The Tahmoor numerical model is currently undergoing update and subsequently, review of the model scenarios will be undertaken.
Level 2 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 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.
Level 2 TARP Review CMAs in light of findings from further investigations and consider additional reasonable and feasible options.	CMA not required at this point (no correlation between groundwater impacts and the surface water site noted at this point).
Level 2 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.

Action / Response from TARP WMP12	Tahmoor Coal response
Responses	
Level 1 and 2 TARP Report trigger exceedance to DPE and key stakeholders.	Notification of this exceedance to DPE is 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 If the changes have been confirmed to be related to mining effects: For Private Bores: • Provide DPE 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 at LWS1A and LWS2A is currently impacting groundwater – surface water interactions.. Therefore, these responses have not been enacted at this time.
Level 2 TARP Provide findings of CMA review to DPE and key stakeholders for consultation.	CMA not required at this point.
Level 2 TARP Implement additional CMAs, subject to land access.	CMA not required at this point.
Level 2 TARP Advise DPE 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

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:

- Adopt the revised trigger levels provided in the Technical Memo **Appendix D.** in the WMP11.
- Remove monitoring site GW062068 from the groundwater monitoring program due to infrastructure issues that render the bore unsuitable for ongoing monitoring.
- Complete a review of the VWP network, inclusive of:
  - 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.
  - 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.
  - 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.
- Continue the monitoring program, and the reporting of groundwater level and quality data in 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 6 provides a summary of the status of the recommendations made in the previous 6-monthly report (January through June 2023).

Table 6: Update on Recommendation in Previous 6-Monthly Reporting.

Item	Previous Recommendation	Progress of Recommendation
1	Revise the trigger levels for dissolved metals, specifically barium, strontium and manganese, by including the 12-month period of monitoring data from October 2022 to October 2023 in the 'baseline' period from which trigger values can be recalculated, such that the trigger levels capture the natural variability of the system.	Complete: Trigger level revision has been undertaken and incorporated into this 6-monthly report.
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	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.	Ongoing: work is currently underway with review and cleanse of VWP historical data.
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.	Ongoing: work is currently underway with review and cleanse of VWP historical data.
5	Following a review of the VWP configuration, consider removing VWPs TBC024 (BHCS-168m), TBC032 (in particular, HBSS-95m)	Ongoing: work is currently underway with review and cleanse of VWP historical data.

Item	Previous Recommendation	Progress of Recommendation
	and TBC034 (BHCS-176m) from the monitoring regime as data appears to be erroneous due to faulty loggers.	
6	Continue the monitoring program, and the reporting of groundwater level and quality data in the monthly groundwater monitoring reporting.	Complete: monthly 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	Install and commence monitoring at P50, in order to replace P51 as an early warning bore in WMP13.	Complete: Installation of three open standpipes at the P50 site has been completed and the bores incorporated into the monitoring program.

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

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 TARP WMP8 – WMP13 (Tahmoor Coal, 2022)

Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

26 March 2024

WMP8 Shallow Groundwater Levels (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">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.</td><td rowspan="8">Locations
Open standpipes
Existing sites:
P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P54c, P55a, P55b, P55c, P56a, P56b, P56c

Proposed sites:
P50a, P50b, P50c, P57a, P57b

Private bores
GW109257, GW104008, GW112473, GW104659, GW062068, GW105395, 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.</td><td colspan="3">Normal Condition</td></tr>
<tr><td>• Groundwater level remains consistent with baseline variability and pre-mining trends with reductions in groundwater level less than two meters.</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>• Greater than 2 m water level reduction[1] for a period of 6 months following the commencement of extraction.</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 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.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• 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:
For Private Bores:
• 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 (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.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• 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.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Actions as stated in Level 1.
• 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).
• 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.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Responses as stated in Level 1.
• Advise DPE and key stakeholders of any required amendments to Water Management Plan.
For Private Bores:
• Provide findings of CMA review to DPE and key stakeholders for consultation.
• Implement additional CMAs, subject to land access.</td></tr>
<tr><td colspan="3">Level 3</td></tr>
<tr><td>• Water level reduction greater than the maximum modelled drawdown[1] for a period of 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.</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, 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).</td><td>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 DPE and key stakeholders.
• Implement Rehabilitation Management Plan, subject to land access.</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

WMP9 Shallow Groundwater Pressures (VWP sensors < 200 m)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management – Trigger	Management – Action	Management – Response
<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. <u>Assessment Criteria</u> Bore specific trigger values based on baselines data for each reporting level.	<u>Locations</u> TBC032, TBC033, TBC009, TBC018, TBC0039 Monitoring of all VWP < 200 m depth intakes. Reference Sites: TBC024, TBC027, TBC034, TBC038 All monitoring locations are shown in Figure 23 of the Water Management Plan. <u>Monitoring Frequency</u> 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 DPE 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. Reasons for not increasing frequency of data review could include solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change). • Compare against base case and deterministic model scenarios[2]. • Review Water Management Plan and modify if necessary.	• *Responses as stated in Level 1.* • Advise DPE 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 review of data frequency for sites where Level 3 has been reached. • 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.

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"><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.

<u>Assessment Criteria</u>
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"><u>Locations</u>
TBC009, TBC0018, TBC020, TBC026, TBC032, TBC033, TBC039

Reference sites: TBC024, 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.

<u>Monitoring Frequency</u>
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 DPE 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.
• Determine suitability of increasing frequency of data review at sites where Level 2 has been reached. 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 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 DPE 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.
• 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
TBC18_282	8	BUSS Mid
TBC18_366	8	BUSS Mid
TBC18_377	13	WBCS
TBC18_404	15	Bulli Seam
TBC18_426	17	Wongawilli
TBC18_432	17	Wongawilli
TBC20_211	8	BUSS Mid

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
TBC32_237	8	BUSS Mid
TBC32_257	8	BUSS Mid
TBC32_294	8	BUSS Mid
TBC32_314	8	BUSS Mid
TBC33_247	8	BUSS Mid
TBC33_306	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				

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">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 quality as it pertains to groundwater dependent ecosystems (GDEs) (Thirlmere Lakes) is covered.

Assessment Criteria
Bore specific trigger values based on baselines data for each reporting level.</td><td rowspan="8">Locations
Open standpipes
Existing sites:
P51a, P51b, P52, REA4, P53a, P53b, P53c, P54a, P54b, P55a, P55b, P55c, P56a, P56b, P56c

Proposed sites:
P50a, P50b, P50c, P57a, P57b

Private bores
GW109257, GW104008, GW112473, GW104659, GW062068, GW105395, GW104323

All monitoring locations are shown in Figure 23 of the Water Management Plan.

Monitoring Frequency
Pre-mining
Monthly water quality sampling.

During Mining
Monthly water quality sampling

Post-mining
Quarterly water quality sampling.

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>• 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 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:
For Private Bores:
• Provide DPE 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 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 quality change).
• 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.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Responses as stated in Level 1.
• Advise DPE and key stakeholders of any required amendments to Water Management Plan.
For Private Bores:
• Provide findings of CMA review to DPE 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, 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).
• 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 DPE 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.</td></tr>
</table>

WMP12 Groundwater – surface water Interaction

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management – Trigger	Management – Action	Management – Response
<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.	<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.	**Normal Condition** • 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.	• Continue monitoring and review of data as per monitoring program.	• No response required.
		Level 1 • 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.	• *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).	• 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.
		Level 2 • 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.	• *Actions as stated in Level 1.* • 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). • 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.	• *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, including reporting on relationship of observations to baseline and deterministic model scenarios, as necessary.
		Level 3 • 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.	• *Actions as stated in Level 2.* • Increase frequency of data review for sites where Level 3 has been reached, 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.	• *Responses as stated in Level 2.* • Develop a Rehabilitation Management Plan in consultation with DPE and key stakeholders. • Implement Rehabilitation Management Plan, subject to land access.

Notes:
[1] "Deterministic" model scenario refers to the predictive scenario modelling utilised to determine the trigger level.

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:
<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>• 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).
• Update numerical groundwater model and re-run predictive scenarios to determine the likely extent and depth of depressurisation in the vicinity</td></tr>
</table>

				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 TARP WMP8 – WMP13 Triggers (Tahmoor Coal, 2022)

Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

26 March 2024

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
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

Bore	Type	TARP Reference Level	TARP Level 1	TARP Level 2	TARP Level 3
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
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
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.

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	7.590	3.250	927.000	0.382	0.001	0.190	0.007	1.852	0.007	1.404	0.025	0.001	0.005	0.025	0.115
GW104008	7.110	4.590	1983.000	0.016	0.001	0.160	0.001	32.600	0.066	2.100	0.018	0.001	0.001	0.097	0.017
GW112473	6.620	4.620	574.000	0.564	0.001	0.126	0.003	9.120	0.005	1.080	0.014	0.004	0.001	0.014	0.056
GW104659	7.050	4.320	685.000	0.014	0.001	0.152	0.009	28.600	0.015	1.660	0.010	0.001	0.001	0.028	0.038
GW062068	6.100	2.590	2070.000	7.520	0.002	0.218	0.030	0.090	0.011	2.980	0.024	0.015	0.001	0.019	0.142
GW105395	8.240	4.660	4635.000	0.014	0.001	0.081	0.001	37.800	0.077	1.880	0.040	0.001	0.001	0.176	0.038
GW104323	6.950	2.760	1541.000	3.320	0.002	0.290	2.320	0.068	0.010	2.660	0.069	0.182	0.001	0.013	4.540
P51A	12.660	5.230	299.000	0.466	0.002	0.284	0.031	0.026	0.204	0.135	0.014	0.001	0.005	1.866	0.051
P51B	12.790	7.820	3971.000	3.380	0.003	0.620	0.005	0.032	0.762	0.084	0.013	0.001	0.005	3.500	0.022
P52	7.240	4.690	1450.000	0.016	0.001	0.310	0.002	58.600	0.018	4.040	0.045	0.001	0.003	0.062	0.324
P53A	9.200	5.150	896.000	0.014	0.001	0.108	0.001	17.268	0.040	2.000	0.019	0.001	0.003	0.138	0.064
P53B	8.370	5.560	1848.000	0.014	0.001	0.194	0.001	11.908	0.474	2.252	0.013	0.001	0.003	0.652	0.039
P53C	8.460	5.650	1879.000	0.014	0.011	0.164	0.001	27.000	0.014	2.400	0.040	0.001	0.002	0.716	0.143
P54A	7.620	5.000	1951.000	4.001	0.003	0.568	0.400	33.800	0.067	3.100	0.043	0.400	0.400	0.310	0.024
P54B	7.370	5.180	2182.000	0.025	0.002	0.273	0.001	35.460	0.079	2.964	0.040	0.001	0.004	0.493	0.043
P55A	8.070	4.260	1822.000	0.024	0.003	0.351	0.001	37.400	0.020	3.900	0.062	0.001	0.002	0.372	0.221
P55B	8.350	5.110	1699.000	0.011	0.005	0.322	0.001	27.600	0.087	5.680	0.232	0.001	0.002	0.278	0.126
P55C	8.420	5.090	2663.000	0.014	0.001	0.296	0.001	38.000	0.256	2.780	0.141	0.001	0.002	0.644	0.007
P56A	8.500	4.540	1560.000	0.682	0.001	0.170	0.008	0.026	0.021	0.122	0.011	0.007	0.005	0.154	0.037
P56B	11.870	7.060	1526.000	0.016	0.001	0.254	0.001	0.076	0.830	1.676	0.032	0.001	0.005	1.036	0.005
P56C	12.190	7.360	3520.000	0.142	0.001	0.640	0.001	0.064	0.481	0.007	0.001	0.001	0.005	1.458	0.003

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)
REA4	8.010	4.200	1126.000	0.040	0.002	0.011	0.003	0.050	0.005	0.005	0.002	0.002	0.002	0.110	0.058

WMP12 Groundwater-Surface Water Interaction

Refer to Table B-1 in **Appendix B** for the relevant bores, as per **Appendix A**.

Appendix C Trigger Level Breach and Exceedance Discussion

Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

26 March 2024

Trigger Breach Discussion

Trigger Breaches & Exceedances As detailed in **Section 1.2 (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.

WMP10 TARP Review

As discussed in **Section 1.3**, amendments to WMP10 are still under review and discussion with NSW DPE. A summary of the proposed changes is provided in Table C-3.

Table C-3: Proposed WMP10 TARP Amendments

Proposed Changes	Reasoning
Normal Conditions – update wording to reflect that within 30 metres of modelled drawdown is considered 'normal conditions', or if drawdown exceeds modelled impacts by greater than 30 metres for a period of less than three months. Level 1 – Observed drawdown exceeds the modelled predicted drawdown, by greater than 30 metres for more than three consecutive months. Level 2 – Observed drawdown exceeds the modelled predicted drawdown, by greater than 30 metres for more than six consecutive months.	The current trigger levels have NO level of variation below modelled drawdown which is too sensitive. The revision also adds a temporal scale in order to determine trends rather than triggers from isolated fluctuations. For example: Level 1: initially stated '*within 30 metres of predicted drawdown for a period of less than six months*. If exceedance beyond model drawdown is by 2 cm for one month this would trigger Level 1. However, this is considered to be within the bounds of the model accuracy and not representative of a trend and therefore does not warrant a trigger. The Independent Expert Advisory Panel for Mining (IAPUM) feedback stated:

Proposed Changes	Reasoning
Level 3 – Observed drawdown exceeds the modelled predicted drawdown, by greater than 30 metres for more than twelve consecutive months.	*"For the trigger level wording: - the normal condition should be more clearly stated as 'observed levels are within (some measurable value – 10m?) of predicted impacts', - for each of the levels 1, 2 and 3 start with the words observed drawdown exceeds….' "* The 'normal' condition should allow for some reasonable variation from predicted impacts (not 'does not exceed' as is current). It is believed, in consideration of the overall level of predicted depressurisation, 30 metres beyond model predictions may be cause for review. Historically, the 30 metres has proven to be a successful and reasonable measure when utilised in the Western Domain WMP and TARPs. Within 30 metres of the modelled predicted drawdown should be considered 'normal conditions'. Given the point accuracy of the groundwater model at each point, using a value of less than 30 metres here is considered unreasonable, with review undertaken at the model review every three years. Additionally, if predicted impacts are exceeded by greater than 30 metres but for a period of less than 3 months, this is not considered representative of a trend and is still within 'normal conditions'. To enact various TARP Levels, the temporal scale over which we observe this variation from modelled drawdown will be instated. This is a logical and realistic approach to identify potential exceedances in impact via extraction to the groundwater system. Wording edited from 'for a period of' to 'consecutive months' for consistency and clarity across the TARPs.

Feedback from DPE indicated that the additional of the temporal scale was accepted.

Question over the suitability of the 30-metre groundwater level drawdown criteria has been raised, noting the preliminary IAPUM feedback indicated 10 metres. If the criteria were edited to reflect this, a Level 1 criteria would then be described as:

- Level 1 – Observed drawdown exceeds the modelled predicted drawdown, by greater than 10 metres for more than three consecutive months.

Only TBC032 (BGSS – 200m) has exceeded modelled predicted drawdown by greater than 10 metres, however, this has only occurred for a period of three months, not greater.

Consequently, whichever version of the TARPs are reported against, the findings of the subsequent sections are the same.

Water Levels (TARP WMP8, WMP9, WMP10, WMP12, WMP13)

Table C-4 provides a summary of all Groundwater Level/Pressure trigger level breaches and exceedances over the reporting period.

Table C-4: Groundwater Level Trigger Summary (TARP WMP8, WMP9, WMP10, WMP12, WMP13) July 2023 to December 2023

Bore	Type	TARP WMP	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023
P51A	Shallow Open Standpipe	8, 12						
P51B	Shallow Open Standpipe	8, 12	B1	B1	B1	L1	L1	L1
P52	Shallow Open Standpipe	8, 12						B1
P53A	Shallow Open Standpipe	8, 12	B1	B1	B2	L1	L1, B2	L1, B2
P53B	Shallow Open Standpipe	8, 12	B1	B2	L1, B2	L1, B2	L1, B2	L1, B2
P53C	Shallow Open Standpipe	8, 12	B2	B2	B2	L1, B2	L1, B2	L2
P54A	Shallow Open Standpipe	8, 12	^	^	^	^	^	^
P54B	Shallow Open Standpipe	8, 12	^	^	^	^	^	^
P54C	Shallow Open Standpipe	8, 12	^	^	^	^	^	^
P55A	Shallow Open Standpipe	8, 12						B1
P55B	Shallow Open Standpipe	8, 12	B1	B1	B2	L1, B2	L1, B3	L1, B3
P55C	Shallow Open Standpipe	8, 12	L1, B2	L1, B3	L1, B3	L1, B3	L2	L2
P56A	Shallow Open Standpipe	8						
P56B	Shallow Open Standpipe	8	B1	B1	B1	B1		
P56C	Shallow Open Standpipe	8	L1, B2	L1, B2	L1, B3	L2, B3	L2	L2
REA4	Shallow Open Standpipe	8, 12		B1	B2	B1	B1	B1
GW104008	Private Bore	8						
GW104323	Private Bore	8	B1	B3	B3	B3	B3	
GW104659	Private Bore	8, 13	B2	B2	L1, B2	L1, B2	L1, B2	L1
GW105395	Private Bore	8						
GW109257	Private Bore	8		B1	B1	B1	B1	B1
GW112473	Private Bore	8	B1		B1	B1		B1
TBC09 (HBSS-30m)	Shallow VWP	9						

Bore	Type	TARP WMP	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023
TBC09 (HBSS-75m)	Shallow VWP	9						
TBC09 (BHCS-182m)	Shallow VWP	9						
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		#ND				
TBC024 (HBSS-139m)	Shallow VWP	9	B3*	#ND	B3*	B3*	B3*	B3*
TBC024 (BHCS-168m)	Shallow VWP	9	B3*	#ND	B3*	B3*	B3*	B3*
TBC024 (BGSS-185m)	Shallow VWP	9	B3*	#ND	B3*	B3*	B3*	B3*
TBC027 (HBSS-95m)	Shallow VWP	9						
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	#ND	#ND	B3*			
TBC032 (HBSS-131m)	Shallow VWP	9	#ND	#ND	B3*	B3*	B3*	B3*
TBC032 (HBSS-168m)	Shallow VWP	9	#ND	#ND	B3*			
TBC032 (BHCS-181m)	Shallow VWP	9	#ND	#ND	B3*	B1*	B1*	B2*
TBC032 (BGSS-200m)	Shallow VWP	9	#ND	#ND	#ND	B1	B1	B1
TBC034 (HBSS-65m)	Shallow VWP	9						
TBC034 (HBSS-113m)	Shallow VWP	9						

Bore	Type	TARP WMP	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023
TBC034 (HBSS-161m)	Shallow VWP	9						
TBC034 (BHCS-176m)	Shallow VWP	9	B3*	B3*	B3*	B3*	B3*	B3*
TBC034 (BGSS-196m)	Shallow VWP	9						
TBC039 (HBSS-65m)	Shallow VWP	9, 13						
TBC09 (BGSS-332m)	Deep VWP	10						
TBC09 (BGSS-343m)	Deep VWP	10						
TBC09 (SBSS-357m)	Deep VWP	10						
TBC09 (BUSM-381m)	Deep VWP	10	~NC	~NC	~NC	~NC	~NC	~NC
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	~NC	~NC	~NC	~NC	~NC
TBC018 (BUSM-404m)	Deep VWP	10						
TBC018 (WWCO-432m)	Deep VWP	10	#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	~NC	~NC	~NC	~NC	~NC
TBC020 (BGSS-411m)	Deep VWP	10						
TBC020 (WO-434m)	Deep VWP	10						
TBC020 (WO-439m)	Deep VWP	10	~NC	~NC	~NC	~NC	~NC	~NC
TBC026 (BGSS-211m)	Deep VWP	10						
TBC026 (BGSS-278m)	Deep VWP	10						

Bore	Type	TARP WMP	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023
TBC026 (BGSS-344m)	Deep VWP	10						
TBC026 (WBCS-409m)	Deep VWP	10						
TBC026 (BUSM-432m)	Deep VWP	10	B1*					
TBC026 (ECSL-440m)	Deep VWP	10						
TBC026 (ECSL-460m)	Deep VWP	10			B1*			
TBC032 (BGSS-200m)	Deep VWP	10	#ND	#ND	#ND			
TBC032 (BGSS-237m)	Deep VWP	10	#ND	#ND	B1*			
TBC032 (BGSS-294m)	Deep VWP	10	#ND	#ND	B1*			
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.
* Logger 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

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.

TARP WMP11 and WMP13

During the reporting period, the defined groundwater quality trigger levels were breached for numerous parameters for more than three months. However, of these parameters, the following analytes appear to be showing similar trends across multiple observation points, consequently these analytes (**bolded in Table C-4**) meet with Criteria 1 and 2 and are considered to be an exceedance in agreement with TARP (WMP11) Level 1 for the 1 July 2023 to 31 December 2023 period:

- Iron (P53A, P55B, GW104323, GW105395, GW112473)
- Manganese (GW104659, GW105395, GW112473, P55C, P56C, REA4)
- Zinc (GW105395, P55A, P55B, P55C, P52, P56A, REA4)
- Nickel (P56C, GW105395, GW112473, REA4)
- Aluminium (P55C, P56A, P56B)
- Arsenic (P51B, P52, P55A, P56B)
- Barium (P53C, P55B, REA4, GW105395, P51B, P53A)
- Lithium (GW105395, GW109257, GW112473, GW104323, P52, P53C, REA4)
- Strontium (GW104323, GW112473, P53C, REA4, GW109257)

Table C-5: Groundwater Quality Trigger Summary (TARP WMP11 and WMP13) – July 2023 to December 2023

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW104008	11	Jul-23				B1	B1		B1		B1	B1				**L1**	
GW104008	11	Aug-23						B1									
GW104008	11	Sep-23									B1			B1		B1	
GW104008	11	Oct-23					B1										
GW104008	11	Nov-23				B1	B1				B1						
GW104008	11	Dec-23				B1	B1				B1			B1	B1	B1	
GW104323	11	Jul-23				L1						B1	B1		B1		
GW104323	11, 13	Aug-23		B1		B1								B1	B2		
GW104323	11	Sep-23				L1						B1		B1	**L1**	B1	
GW104323	11	Oct-23				L1							B1	**L1**		B1	

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW104323	11	Nov-23				**L1**								**L1**	B1		
GW104323	11	Dec-23				**L1**								**L1**	B1		
GW104659	11, 13	Jul-23					B1								B1		
GW104659	11	Aug-23													B2		
GW104659	11, 13	Sep-23					B1					B1		B1	B1	B1	
GW104659	11, 13	Oct-23				B1	B1										
GW104659	11, 13	Nov-23				B1	**L1**								B1		
GW104659	11, 13	Dec-23					**L1**							B1	B1	B1	
GW105395	11	Jul-23					B1			B1	B1			B1	**L1**	**L1**	
GW105395	11, 13	Aug-23					**L1**			L1					L1		
GW105395	11	Sep-23					**L1**			**L1**				B1	**L1**	B1	
GW105395	11	Oct-23				B1	**L1**			**L1**	B1					B1	
GW105395	11	Nov-23				B1	**L1**			**L1**	B1			B1	B1		
GW105395	11	Dec-23				**L1**	**L1**			**L1**	**L1**			B1		**L1**	
GW109257	11	Jul-23				B1	B1								**L1**		
GW109257	11	Aug-23					B2								L1		
GW109257	11	Sep-23										B1			**L1**		
GW109257	11	Oct-23										B1		B1			
GW109257	11	Nov-23												B1	B1		
GW109257	11	Dec-23										B1		**L1**	B1	B1	
GW112473	11	Jul-23		L1	B1				L1	B1	B1	B1			B1	B1	
GW112473	11	Aug-23			B2					B2	B2					B2	
GW112473	11	Sep-23				B1	B1				L1			B1	**L1**		
GW112473	11	Oct-23				B1	B1				L1			B1	**L1**		
GW112473	11	Nov-23				**L1**	**L1**			B1	L1			**L1**	**L1**		
GW112473	11	Dec-23			B1	**L1**	**L1**			B1	**L1**			**L1**	**L1**	B1	
P51A	11	Jul-23															
P51A	11	Aug-23		B1													
P51A	11	Sep-23		B1													
P51A	11	Oct-23															
P51A	11	Nov-23															
P51A	11	Dec-23		B1													
P51B	11	Jul-23											**L1**				
P51B	11	Aug-23											L1 *				
P51B	11	Sep-23											**L1**				
P51B	11	Oct-23														B1	
P51B	11	Nov-23														B1	
P51B	11	Dec-23														**L1**	
P52	11	Jul-23											**L1**				

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P52	11	Aug-23											**L1**				
P52	11	Sep-23											**L1**				
P52	11	Oct-23								B1		B1	L1		B1		
P52	11	Nov-23								B1		B1					
P52	11	Dec-23								**L1**					**L1**		
P53A	11	Jul-23			L1									L1	B1	**L1**	
P53A	11	Aug-23			L1		B1							L1		**L1**	
P53A	11	Sep-23					B1									**L1**	
P53A	11	Oct-23			B1	B1							B1			**L1**	
P53A	11	Nov-23				B1						B1					
P53A	11	Dec-23				**L1**											
P53B	11	Jul-23															
P53B	11	Aug-23															
P53B	11	Sep-23															
P53B	11	Oct-23											B1				
P53B	11	Nov-23				B1						B1	B1			B1	
P53B	11	Dec-23				B1							L1			B1	
P53C	11	Jul-23										B2					
P53C	11	Aug-23												B1	B1	B1	
P53C	11	Sep-23												B1	B1	B1	
P53C	11	Oct-23												**L1**	**L1**	**L1**	
P53C	11	Nov-23												**L1**	**L1**	**L1**	
P53C	11	Dec-23												**L1**	**L1**	**L1**	
P54A	11	Jul-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Aug-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Sep-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Oct-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Nov-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Dec-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Jul-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Aug-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Sep-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Oct-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Nov-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Dec-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P55A	11	Jul-23			B1	B1				B1			B2				
P55A	11	Aug-23											**L1**		B1		
P55A	11	Sep-23			B1					B1		B1					
P55A	11	Oct-23			B1					B1		B1					
P55A	11	Nov-23								**L1**						B1	
P55A	11	Dec-23			B1					**L1**			B1				
P55B	11	Jul-23				L1				B1			B2			**L1**	

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P55B	11	Aug-23		B1		L1				B2		B1				**L1**	
P55B	11	Sep-23				L1				**L1**		B1	B1			**L1**	
P55B	11	Oct-23				L1				L1			B1			L1	
P55B	11	Nov-23				**L1**				**L1**						**L1**	B1
P55B	11	Dec-23		B1	L1				B1	**L1**		B1	B1			**L1**	
P55C	11	Jul-23					L1			L1		B2					
P55C	11	Aug-23					**L1**			L1		L1					
P55C	11	Sep-23					**L1**			**L1**		**L1**					
P55C	11	Oct-23					**L1**			**L1**							
P55C	11	Nov-23					**L1**			**L1**		B1					
P55C	11	Dec-23					**L1**			**L1**							
P56A	11	Jul-23								B2		B2					
P56A	11	Aug-23		B1								L1					
P56A	11	Sep-23	B1						B1	**L1**		**L1**					
P56A	11	Oct-23															
P56A	11	Nov-23				B1											
P56A	11	Dec-23															
P56B	11	Jul-23										L1	**L1**				
P56B	11	Aug-23										L1 *	**L1**				
P56B	11	Sep-23										**L1**	**L1**				
P56B	11	Oct-23											L1				
P56B	11	Nov-23										B1	L1				
P56B	11	Dec-23			B1							B1	L1				
P56C	11	Jul-23															
P56C	11	Aug-23		B1													
P56C	11	Sep-23															
P56C	11	Oct-23		B1			B1			B1	B1						
P56C	11	Nov-23		B1		B1	B1			B1	B1						
P56C	11	Dec-23		L1		B1	**L1**				**L1**						
REA4	11	Jul-23					L1			L1	L1			L1	**L1**	**L1**	
REA4	11	Aug-23					**L1**			L1 *	L1 *			L1 *	L1 *	**L1**	
REA4	11	Sep-23					**L1**			**L1**	L1			L1	**L1**	**L1**	
REA4	11	Oct-23					**L1**				L1			**L1**	**L1**	**L1**	
REA4	11	Nov-23					**L1**			B1	L1			**L1**	**L1**	**L1**	
REA4	11	Dec-23					**L1**				**L1**			**L1**	**L1**	**L1**	

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.

Revised Water Quality Trigger Levels

Water quality triggers were redefined based on extended baseline data in order to capture natural fluctuations originally not captured due to short baseline (only three data points in some cases). A technical memorandum summarising the methodology and findings is presented in **Table C-6**. Groundwater quality data collected between June 2022 and June 2023 was utilised as the baseline due to its lack of mining impact, mirroring the pre-mining phase. The process involved setting the 95th percentile value for dissolved metals and adjusting pH triggers based on the baseline period data. However, due to limited EC data availability for certain months in 2022, the salinity triggers remained unchanged.

During the reporting period, the defined groundwater quality trigger levels were breached for numerous parameters for more than three months. However, of these parameters, the analytes did not appear to be showing similar trends across multiple observation points. Consequently none of the analytes meet with Criteria 1 and 2 in comparison to the revised water quality trigger levels for the 1 July 2023 to 31 December 2023 period.

Table C-6: Groundwater Quality Trigger Summary (TARP WMP11 and WMP13) – July 2023 to December 2023

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW104008	11	Jul-23					B1		B1	B1		B1					
GW104008	11	Aug-23															
GW104008	11	Sep-23															
GW104008	11	Oct-23															
GW104008	11	Nov-23															
GW104008	11	Dec-23									B1			B1			
GW104323	11	Jul-23											B1				
GW104323	11, 13	Aug-23															
GW104323	11	Sep-23														B1	
GW104323	11	Oct-23											B1			B1	
GW104323	11	Nov-23				B1								B1	B1		
GW104323	11	Dec-23															
GW104659	11, 13	Jul-23													B1		
GW104659	11	Aug-23															
GW104659	11, 13	Sep-23										B1					
GW104659	11, 13	Oct-23					B1										
GW104659	11, 13	Nov-23															
GW104659	11, 13	Dec-23												B1			
GW105395	11	Jul-23					B1				B1			B1	B1		
GW105395	11, 13	Aug-23															
GW105395	11	Sep-23								B1				B1	B1		
GW105395	11	Oct-23					B1				B1						
GW105395	11	Nov-23				B1	B1			B1	B1			B1			

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
GW105395	11	Dec-23				B1	L1			B1	L1			B1			
GW109257	11	Jul-23					B1										
GW109257	11	Aug-23															
GW109257	11	Sep-23		B1													
GW109257	11	Oct-23		B1													
GW109257	11	Nov-23															
GW109257	11	Dec-23												B1		B1	
GW112473	11	Jul-23			B1					B1							
GW112473	11	Aug-23			B1					B1							
GW112473	11	Sep-23												B1	B1		
GW112473	11	Oct-23				B1								B1			
GW112473	11	Nov-23				B1								L1			
GW112473	11	Dec-23			B1					B1	B1			L1			
P51A	11	Jul-23															
P51A	11	Aug-23		B1													
P51A	11	Sep-23		B1													
P51A	11	Oct-23															
P51A	11	Nov-23															
P51A	11	Dec-23		B1													
P51B	11	Jul-23															
P51B	11	Aug-23															
P51B	11	Sep-23															
P51B	11	Oct-23															
P51B	11	Nov-23															
P51B	11	Dec-23															
P52	11	Jul-23															
P52	11	Aug-23															
P52	11	Sep-23															
P52	11	Oct-23								B1			B1		B1		
P52	11	Nov-23								B1							
P52	11	Dec-23								L1					B1		
P53A	11	Jul-23			B1									B1	B2	B3	
P53A	11	Aug-23			B1		B1										
P53A	11	Sep-23															
P53A	11	Oct-23			B1												
P53A	11	Nov-23															
P53A	11	Dec-23															
P53B	11	Jul-23															

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P53B	11	Aug-23															
P53B	11	Sep-23											B1				
P53B	11	Oct-23											B1				
P53B	11	Nov-23				B1							L1			B1	
P53B	11	Dec-23				B1							L1			B1	
P53C	11	Jul-23															
P53C	11	Aug-23												B1			
P53C	11	Sep-23												B1			
P53C	11	Oct-23												L1			
P53C	11	Nov-23												L1			B1
P53C	11	Dec-23												L1			
P54A	11	Jul-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Aug-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Sep-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Oct-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Nov-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54A	11	Dec-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Jul-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Aug-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Sep-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Oct-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Nov-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P54B	11	Dec-23	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P55A	11	Jul-23			B1												
P55A	11	Aug-23															
P55A	11	Sep-23			B1												
P55A	11	Oct-23			B1					B1							
P55A	11	Nov-23															
P55A	11	Dec-23			B1												
P55B	11	Jul-23															
P55B	11	Aug-23															
P55B	11	Sep-23														B1	
P55B	11	Oct-23														B1	
P55B	11	Nov-23															B1
P55B	11	Dec-23			B1					B1						B1	
P55C	11	Jul-23															
P55C	11	Aug-23					B1										
P55C	11	Sep-23					B1										

Bore	TARP WMP	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Sr	Li	Ba	Se
P55C	11	Oct-23															
P55C	11	Nov-23					B1										
P55C	11	Dec-23					B1										
P56A	11	Jul-23															
P56A	11	Aug-23															
P56A	11	Sep-23															
P56A	11	Oct-23															
P56A	11	Nov-23				B1											
P56A	11	Dec-23															
P56B	11	Jul-23											B1				
P56B	11	Aug-23											B1				
P56B	11	Sep-23															
P56B	11	Oct-23															
P56B	11	Nov-23			B1												
P56B	11	Dec-23															
P56C	11	Jul-23															
P56C	11	Aug-23															
P56C	11	Sep-23															
P56C	11	Oct-23															
P56C	11	Nov-23															
P56C	11	Dec-23									B1						
REA4	11	Jul-23															
REA4	11	Aug-23															
REA4	11	Sep-23															
REA4	11	Oct-23														B1	
REA4	11	Nov-23													B1	B1	
REA4	11	Dec-23														L1	

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.

Trigger Level Breach and Exceedance Summary

The following tables provide a summary of the Trigger Level breaches and Exceedances.

Table C-7: Active December 2023 Trigger Exceedances – WMP8, WMP12

Exceedance Site	Trigger Parameter	TARP Level	TARP
P51B	Groundwater level	1	WMP8, WMP12
P53A	Groundwater level	1	WMP8, WMP12
P53B	Groundwater level	1	WMP8, WMP12

Exceedance Site	Trigger Parameter	TARP Level	TARP
P53C	Groundwater level	2	WMP8, WMP12
P55B	Groundwater level	1	WMP8, WMP12
P55C	Groundwater level	2	WMP8, WMP12
P56C	Groundwater level	2	WMP8
GW104659	Groundwater level	1	WMP8, WMP12

Table C-8: Active December 2023 Trigger Breaches and Exceedances – WMP 11

Exceedance Site	Breach Parameter (Criterion 1 met)	Exceedance Parameter (Criteria 1 and 2 met)	TARP Level	TARP
P51B		**Ba**	1	WMP11
P52		**Zn, Li**	1	WMP11
P53A		**Fe**	1	WMP11
P53B	As		1	WMP11
P53C		**Sr**, **Li, Ba**	1	WMP11
P55A		**Zn**	1	WMP11
P55B	EC	**Zn, Ba**	1	WMP11
P55C		**Zn**	1	WMP11
P56C	pH Lower	**Mn, Ni**	1	WMP11
REA4		**Mn, Ni, Sr, Li, Ba**	1	WMP11
GW109257		**Sr**	1	WMP11
GW104323		**Fe, Sr**	1	WMP11
GW104659		**Mn**	1	WMP11
GW105395		**Fe, Mn, Zn, Ni, Ba**	1	WMP11
GW112473		**Fe, Mn, Ni, Sr, Li**	1	WMP11

Note: for water quality exceedances (WMP11) those **bolded** are the only parameters that fulfil both criteria 1 and 2 of the TARP.

Table C-9: Active December 2023 Trigger Breaches and Exceedances – Revised Trigger Levels

Exceedance Site	Breach Parameter (Criterion 1 met)	Exceedance Parameter (Criteria 1 and 2 met)	Exceedance Level
P52	Zn		1
P53B	As		1
P53C	Sr		1
REA4	Ba		1
GW105395	Mn, Ni		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 Revised TARP Technical Memorandum

Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

26 March 2024

Technical Memorandum

To: April Hudson

Company: Tahmoor Coal Pty Ltd

From: Sneha Bhattachan

SLR Consulting Australia

Date: 23 February 2024

Project No. 665.10010.00507

RE: Tahmoor South
TARP WMP11 Trigger Value Revision

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) was engaged by Tahmoor Coal Pty Ltd (Tahmoor Coal) to undertake a review of groundwater quality data has been collected by primarily by Consulting Earth Scientists Pty Ltd (CES), to revise the WMP11 water quality trigger values, for the Tahmoor South Domain (Tahmoor South) of the Tahmoor Coal Mine (Tahmoor Mine).

1.1 Background

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 **Attachment A**. The current trigger values for TARP WMP11 Groundwater Quality (Open Standpipes and Private Bores) are summarised in **Attachment B**.

The Six-Monthly Groundwater Monitoring report (SLR, 2023a) found that:

- Groundwater trigger levels were calculated using a short baseline period which could result in a conservative trigger level for barium, strontium and manganese.
- While the observed groundwater quality trends for barium, strontium and manganese were not found to be attributable to mining activities in the reporting period of January to June 2023, it was noted that a full 12-month period of monitoring data was yet to be collected. As such, climatic drivers and seasonality had not been fully reflected in the monitoring data.
- A revision of the trigger levels for dissolved metals, specifically barium, strontium and manganese were recommended. The 'baseline' period for the recalculation of trigger values was to include a 12-month period of monitoring data, as this would allow for consideration of the natural variability of the system.

1.2 Objective

The purpose of this assessment is to recalculate the trigger levels, based on a 'baseline' period of 12-months, such that the revised trigger levels capture a longer baseline period, climatic drivers, seasonality and natural variability of the groundwater system and are therefore appropriate for use in assessing groundwater monitoring data against TARP WMP11.

1.3 Scope

Trigger values were recalculated for the 15 parameters and 22 monitoring bores (open standpipes [OSPs] and private bores) identified in **Table 1**.

Table 1 Scope of Trigger Value Revision

Water Quality Parameters	Monitoring Bores	
	Private Bores	OSPs
pH Upper	GW104008	P51A
pH Lower	GW104323	P51B
Electrical Conductivity (EC)	GW104659	P52
Iron (Fe) Filtered (mg/L)	GW105395	P53A
Manganese (Mn) Filtered (mg/L)	GW109257	P53B
Copper (Cu) Filtered (mg/L)	GW112473	P53C
Lead (Pb) Filtered (mg/L)	REA4	P54A
Zinc (Zn) Filtered (mg/L)		P54B
Nickel (Ni) Filtered (mg/L)		P54C
Aluminium (Al) Filtered (mg/L)		P55A
Arsenic (As) Filtered (mg/L)		P55B
Strontium (Sr) Filtered (mg/L)		P55C
Lithium (Li) Filtered (mg/L)		P56A
Barium (Ba) Filtered (mg/L)		P56B
Selenium (Se) Filtered (mg/L)		P56C

2.0 Methodology

2.1 Baseline Period

The January to June 2023 six-monthly groundwater monitoring report (SLR 2023a) recommended considering data between October 2022 and October 2023 in revising the trigger levels. However, upon reviewing the water quality data, the 'baseline' period for the recalculation of trigger values was considered most representative between June 2022 and June 2023 (inclusive). This period was selected on the basis that:

- Mining for LWS1A was undertaken since August 2023, and the data gathered between July 2022 and December 2022 were not considered to be representative of mining impacts.
- Additionally, no mining impact was observed during the reporting period January through June 2023 (SLR, 2023a), therefore data between January 2023 and July Calculations

The Groundwater Technical Report (SLR, 2022) established an approach for developing triggers for groundwater quality parameters, which included:

- Setting the 95th percentile value recorded in the pre-mining dataset for each parameter at each bore as a single level trigger for dissolved (not total) metals.
- Setting the maximum and minimum pH value recorded in the available dataset, minus/plus one pH unit if the maximum/minimum pH is within four pH units (otherwise, the maximum/minimum pH is utilised).
- Setting the maximum EC concentration recorded in the pre-mining dataset, plus 10%, at each bore as a single level trigger for salinity.

The recalculation of trigger values included:

- Setting the 95th percentile value recorded in the 'baseline' period dataset for each parameter at each bore as a single level trigger for dissolved (not total) metals.
- Setting the maximum and minimum pH value recorded in the 'baseline' period dataset, minus/plus one pH unit if the maximum/minimum pH is within four pH units (otherwise, the maximum/minimum pH is utilised).

The Groundwater Technical Report (SLR, 2022) established that the EC trigger value would be reviewed upon collection of more data, prior to any extraction impacts incurred. Given that mining commenced in October 2022, and EC data was not collected for several bores during June 2022 – September 2022 (**Table 2**), the available EC data was insufficient to recalculate the EC trigger value. The current EC (salinity) trigger value remains for each bore.

2.2 Data Availability

Data which was not available in the baseline period, and therefore excluded from the recalculation process, is listed in **Table 2**.

Also, it is noted that GW062068 was removed from the ongoing monitoring regime in June 2023 due to bore infrastructure issues (SLR, 2023a). As such, trigger values were not recalculated for GW062068.

Table 2 Unavailable Data

Monitoring Round	Bore ID	Data Type
June 2022	P54A, GW109257, GW112473,	Dissolved metals, pH and EC
	GW104008, GW104323, GW104659, GW105395, REA4	Dissolved metals
July 2022	P51A, GW112473	pH and EC
	P51B, P52, P54A, P54B, P55A, P55B, P55C, P56A, P56B, P56C	Dissolved metals, pH and EC
	P53C	Dissolved metals
August 2022	P54B	Dissolved metals, pH and EC
September 2022	P54A, GW112473	Dissolved metals, pH and EC
	P52, P53A, P53B, P53C, P54B, P55A, P55B, P55C	pH and EC
	REA4	Dissolved metals

Monitoring Round	Bore ID	Data Type
October 2022	GW104008, GW104323, GW104659, GW105395, GW109257, GW112473, P54A	Dissolved metals
	GW104008, GW105395, P54A	pH and EC
	P51B, P56C	pH (data erroneous)
November 2022	P51A, P51B, P54A	Dissolved metals, pH and EC
December 2022	P54A, P54B	Dissolved metals, pH and EC
	P55A	pH (data erroneous)
January 2023	P54A	Dissolved metals
	P54B	Dissolved metals, pH and EC
February 2023	P54A, P54B	Dissolved metals, pH and EC
	GW104659, GW109257	Dissolved metals
March 2023	P54A, P54B	Dissolved metals, pH and EC
April 2023	P54A, P54B	Dissolved metals, pH and EC
May 2023	P54A, P54B	Dissolved metals, pH and EC
	GW104008	Dissolved metals, pH and EC
June 2023	P54A, P54B	Dissolved metals, pH and EC

3.0 Results

Trigger values were recalculated for all shallow OSPs and private bores.

The revised trigger values are summarised in **Attachment C**.

The 95th percentile, maximum and minimum values recorded in the 'baseline' period for all parameters at each bore, along with other water quality statistics, are presented in **Attachment D**.

4.0 Recommendations

It is recommended that the revised trigger values (**Attachment C**) are implemented in future assessments of groundwater monitoring data against TARP WMP11.

5.0 References

SLR, 2022. *Extraction Plan Groundwater Technical Report*. Prepared for Tahmoor Coal, October 2022. SLR Report: 610.30637.00000-R01.

SLR, 2023a. *Six-Monthly Groundwater Monitoring: January – June 2023*. Prepared for Tahmoor Coal, October 2023. SLR Report: 640.30614.00000-R02.

SLR, 2023b. *Tahmoor South Groundwater Reporting Oct – Dec 2022*. Prepared for Tahmoor Coal, March 2023. SLR Report: 640.30614.00000-R01.

Tahmoor Coal Pty Ltd, 2022. *Water Management Plan – Tahmoor South Domain – Longwalls South 1A-South 6A.* May 18,2022. Report: TAH-HSEC-00361.

Attachment A – TARPs

WMP8 Shallow Groundwater Levels (Open standpipes and private bores)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management: Trigger	Management: Action	Management: 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 Proposed sites: P50a, P50b, P50c, P57a, P57b Private bores GW109257, GW104008, GW112473, GW104659, GW062068, GW105395, 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 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 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: For Private Bores: • 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 (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 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). • 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 DPE and key stakeholders of any required amendments to Water Management Plan. For Private Bores: • Provide findings of CMA review to DPE 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 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, 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).	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 DPE and key stakeholders. • Implement Rehabilitation Management Plan, subject to land access.

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.

WMP9 Shallow Groundwater Pressures (VWP sensors < 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"><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.

<u>Assessment Criteria</u>
Bore specific trigger values based on baselines data for each reporting level.</td><td rowspan="8"><u>Locations</u>
TBC032, TBC033, TBC009, TBC018, TBC0039
Monitoring of all VWP < 200 m depth intakes.

Reference Sites: TBC024, TBC027, TBC034, TBC038

All monitoring locations are shown in Figure 23 of the Water Management Plan.

<u>Monitoring Frequency</u>
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>• 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</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>• Greater than 5 m water level reduction in VWP intakes[1] following the commencement of extraction for a period of greater than six months</td><td>• 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).</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.</td></tr>
<tr><td colspan="3">Level 2</td></tr>
<tr><td>• 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.</td><td>• 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. Reasons for not increasing frequency of data review could include solid identification causation that do not require further monitoring (e.g. singular anthropogenic impact resulting in water level change).
• 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.
• Advise DPE and key stakeholders of any required amendments to Water Management Plan.</td></tr>
<tr><td colspan="3">Level 3</td></tr>
<tr><td>• 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.</td><td>• Actions as stated in Level 2.
• Increase review of data frequency for sites where Level 3 has been reached.
• 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.</td><td>• Responses as stated in Level 2.</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

WMP10 Groundwater level/pressure Deep VWPs (> 200 m)

Performance Measure and Indicator, TARP Objective and Assessment Criteria	Monitoring Program	Management – Trigger	Management – Action	Management – Response
<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. <u>Assessment Criteria</u> 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.	<u>Locations</u> TBC009, TBC0018, TBC020, TBC026, TBC032, TBC033, TBC039 Reference sites: TBC024, 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. <u>Monitoring Frequency</u> 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**		
		• 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	• Continue monitoring and review of data as per monitoring program.	• No response required.
		Level 1		
		• Observed drawdown exceeds the modelled predicted drawdown[1], by greater than 30 metres for greater than three consecutive months.	• *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).	• Report trigger exceedance to DPE and key stakeholders. • Report trigger exceedance and investigation outcomes in Six Monthly Subsidence Impact Report and Annual Review.
		Level 2		
		• Observed drawdown is exceeds modelled predicted drawdown[1], by more than 30 metres greater than 6 consecutive months. •	• *Actions as stated in Level 1.* • Determine suitability of increasing frequency of data review at sites where Level 2 has been reached. 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 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.	• *Responses as stated in Level 1.* • Inclusion of more regional VWPs into data review to determine likely extent and depth of depressurisation. • Advise DPE and key stakeholders of any required amendments to Water Management Plan.
		Level 3		
		• Observed drawdown exceeds modelled predicted drawdown[1] by 30 m, for 12 consecutive months or more.	• *Actions as stated in Level 2.* • Increase review of data frequency for sites where Level 3 has been reached. • 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.	• *Responses as stated in Level 2.*

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.

Sensor	Model Layer	Model Geology	Sensor	Model Layer	Model Geology
TBC09_322	8	BUSS Mid	TBC26_344	8	BUSS Mid
TBC09_343	8	BUSS Mid	TBC26_409	13	WBCS
TBC09_357	12	SBSS Lower	TBC26_432	15	Bulli Seam
TBC09_381	10	SPCS	TBC26_440	16	Eckersley
TBC09_391	15	Bulli Seam	TBC26_460	16	Eckersley
TBC09_397	17	Wongawilli	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				

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

Proposed sites:
P50a, P50b, P50c, P57a, P57b

Private bores
GW109257, GW104008, GW112473, GW104659, GW062068, GW105395, 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:
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>• 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 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:
For Private Bores:
• Provide DPE 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 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 quality change).
• 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.</td><td>For Private Bores and Open Standpipe Monitoring Bores
• Responses as stated in Level 1.
• Advise DPE and key stakeholders of any required amendments to Water Management Plan.
For Private Bores:
• Provide findings of CMA review to DPE 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, 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).
• 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 DPE 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.</td></tr>
</table>

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 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>• 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.
• 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).
• 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 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, 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, 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 DPE 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>

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">Performance Measure Feature
GDEs including Thirlmere Lakes[1].

Performance Measure
Negligible impacts including:
• Negligible change in groundwater levels; and
• Negligible change in groundwater quality.

Performance Indicator
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.

TARP Objective
This TARP defines levels of deviation at Thirlmere Lakes from 'normal' 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.</td>
<td rowspan="8">Locations
"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.

Monitoring Frequency (for "early warning" bores)
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).
• Update numerical groundwater model and re-run predictive scenarios to determine the likely extent and depth of depressurisation in the vicinity</td></tr>
</table>

				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.

Attachment B – Groundwater Quality Triggers (Current)

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	7.590	3.250	927	0.382	0.001	0.190	0.007	1.852	0.007	1.404	0.025	0.001	0.005	0.025	0.115
GW104008	7.110	4.590	1983	0.016	0.001	0.160	0.001	32.600	0.066	2.100	0.018	0.001	0.001	0.097	0.017
GW112473	6.620	4.620	574	0.564	0.001	0.126	0.003	9.120	0.005	1.080	0.014	0.004	0.001	0.014	0.056
GW104659	7.050	4.320	685	0.014	0.001	0.152	0.009	28.600	0.015	1.660	0.010	0.001	0.001	0.028	0.038
GW105395	8.240	4.660	4635	0.014	0.001	0.081	0.001	37.800	0.077	1.880	0.040	0.001	0.001	0.176	0.038
GW104323	6.950	2.760	1541	3.320	0.002	0.290	2.320	0.068	0.010	2.660	0.069	0.182	0.001	0.013	4.540
P51A	12.660	5.230	299	0.466	0.002	0.284	0.031	0.026	0.204	0.135	0.014	0.001	0.005	1.866	0.051
P51B	12.790	7.820	3971	3.380	0.003	0.620	0.005	0.032	0.762	0.084	0.013	0.001	0.005	3.500	0.022
P52	7.240	4.690	1450	0.016	0.001	0.310	0.002	58.600	0.018	4.040	0.045	0.001	0.003	0.062	0.324
P53A	9.200	5.150	896	0.014	0.001	0.108	0.001	17.268	0.040	2.000	0.019	0.001	0.003	0.138	0.064
P53B	8.370	5.560	1848	0.014	0.001	0.194	0.001	11.908	0.474	2.252	0.013	0.001	0.003	0.652	0.039
P53C	8.460	5.650	1879	0.014	0.011	0.164	0.001	27.000	0.014	2.400	0.040	0.001	0.002	0.716	0.143
P54A	7.620	5.000	1951	4.001	0.003	0.568	0.400	33.800	0.067	3.100	0.043	0.400	0.400	0.310	0.024
P54B	7.370	5.180	2182	0.025	0.002	0.273	0.001	35.460	0.079	2.964	0.040	0.001	0.004	0.493	0.043
P55A	8.070	4.260	1822	0.024	0.003	0.351	0.001	37.400	0.020	3.900	0.062	0.001	0.002	0.372	0.221
P55B	8.350	5.110	1699	0.011	0.005	0.322	0.001	27.600	0.087	5.680	0.232	0.001	0.002	0.278	0.126
P55C	8.420	5.090	2663	0.014	0.001	0.296	0.001	38.000	0.256	2.780	0.141	0.001	0.002	0.644	0.007
P56A	8.500	4.540	1560	0.682	0.001	0.170	0.008	0.026	0.021	0.122	0.011	0.007	0.005	0.154	0.037
P56B	11.870	7.060	1526	0.016	0.001	0.254	0.001	0.076	0.830	1.676	0.032	0.001	0.005	1.036	0.005
P56C	12.190	7.360	3520	0.142	0.001	0.640	0.001	0.064	0.481	0.007	0.001	0.001	0.005	1.458	0.003
REA4	8.010	4.200	1126	0.040	0.002	0.011	0.003	0.050	0.005	0.005	0.002	0.002	0.002	0.110	0.058

Attachment C – Groundwater Quality Triggers (Revised)

Bore	pH Lower	pH Upper	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	4.010	10.180	927	14.650	1.550	0.008	0.001	0.130	0.027	0.465	0.001	0.028	0.009	0.210	0.003
GW104008	4.500	7.150	1983	38.200	2.210	0.003	0.001	0.017	0.020	0.016	0.001	0.099	0.073	0.186	0.001
GW112473	3.320	7.080	574	24.750	1.710	0.003	0.005	0.063	0.016	0.621	0.001	0.017	0.007	0.157	0.001
GW104659	4.120	7.080	685	31.200	1.800	0.008	0.001	0.037	0.011	0.020	0.001	0.030	0.017	0.177	0.001
GW105395	4.500	8.240	4635	40.500	2.000	0.001	0.001	0.050	0.041	0.100	0.001	0.180	0.084	0.098	0.001
GW104323	2.630	6.950	1541	17.000	2.700	2.250	0.175	4.250	0.067	3.800	0.002	0.021	0.014	0.295	0.001
P51A	5.180	12.660	299	0.027	0.139	0.031	0.001	0.053	0.015	0.912	0.001	3.261	0.405	0.502	0.005
P51B	7.820	13.790	3971	13.135	0.255	0.007	0.003	0.039	0.013	4.570	0.017	3.575	0.764	1.418	0.005
P52	4.470	8.820	1450	61.000	4.245	0.004	0.104	0.316	0.049	0.221	0.004	0.064	0.018	0.315	0.003
P53A	5.070	8.940	896	38.200	2.240	0.002	0.003	0.064	0.019	0.298	0.008	0.220	0.040	0.160	0.003
P53B	5.560	12.870	1848	12.640	2.372	0.006	0.001	0.053	0.015	0.080	0.002	0.688	0.654	0.194	0.003
P53C	5.080	11.540	1879	30.600	2.740	0.002	0.001	0.239	0.042	0.172	0.011	1.640	0.049	0.246	0.002
P54A	5.000	9.610	1951	37.700	3.175	0.475	0.475	0.025	0.043	4.750	0.003	0.310	0.070	0.289	0.475
P54B	5.180	8.630	2182	43.400	2.997	0.004	0.001	0.076	0.049	0.029	0.003	0.515	0.082	0.317	0.004
P55A	4.260	12.330	1822	40.400	3.900	0.002	0.002	0.311	0.066	0.138	0.006	0.762	0.026	0.372	0.003
P55B	4.680	9.040	1699	49.800	5.680	0.007	0.049	0.254	0.232	0.136	0.010	0.278	0.087	0.390	0.002
P55C	3.920	11.070	2663	55.000	3.380	0.522	0.023	0.468	0.146	0.668	0.002	0.644	0.256	0.302	0.002
P56A	3.400	10.210	1560	0.040	0.134	0.009	0.010	0.041	0.012	1.770	0.001	0.174	0.023	0.170	0.005
P56B	6.060	13.220	1526	0.295	1.726	0.002	0.001	0.014	0.035	0.276	0.004	1.063	0.858	0.260	0.005
P56C	5.270	13.190	3520	17.200	1.635	0.001	0.001	0.012	0.003	0.237	0.007	1.652	0.497	0.685	0.005
REA4	5.310	10.410	1126	1.040	0.084	0.009	0.002	0.135	0.007	0.290	0.001	0.175	0.010	0.032	0.001

Attachment D – Water Quality Summary Statistics

Bore	Statistic	pH	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)
GW104008	Total Number	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	From	22-06-2022	22-06-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	5.5	591	24	1.7	5.00E-04	5.00E-04	0.008	0.015	0.005	5.00E-04	0.074	0.05	0.13	5.00E-04
	5th Percentile	5.5405	910.05	26.7	1.835	5.00E-04	5.00E-04	0.0107	0.0159	0.005	5.00E-04	0.0794	0.05495	0.1435	5.00E-04
	20th Percentile	5.646	1374.16	31.6	2	5.00E-04	5.00E-04	0.014	0.017	0.005	5.00E-04	0.0932	0.0618	0.16	5.00E-04
	Median	5.875	1600	33	2.1	5.00E-04	5.00E-04	0.014	0.019	0.005	5.00E-04	0.096	0.0665	0.165	5.00E-04
	80th Percentile	5.974	1810.6	35.2	2.1	0.0012	5.00E-04	0.0146	0.019	0.01	5.00E-04	0.098	0.0702	0.172	5.00E-04
	95th Percentile	6.132	1880.6	38.2	2.21	0.00255	0.001325	0.017	0.01955	0.0155	5.00E-04	0.09855	0.0732	0.1855	5.00E-04
	Maximum	6.15	1913	40	2.3	0.003	0.002	0.017	0.02	0.02	5.00E-04	0.099	0.075	0.19	5.00E-04
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
GW104323	Total Number	12	12	11	11	11	11	11	11	11	11	11	11	11	11
	From	22-06-2022	22-06-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	3.63	343.7	0.05	1.3	0.003	5.00E-04	0.038	0.009	0.1	5.00E-04	0.01	0.009	0.094	5.00E-04
	5th Percentile	3.7015	538.015	0.05	1.35	0.004	5.00E-04	0.0475	0.01	0.105	5.00E-04	0.0105	0.009	0.0945	5.00E-04
	20th Percentile	4.024	1054.6	0.07	1.7	0.017	0.014	0.14	0.022	1.8	5.00E-04	0.011	0.01	0.22	5.00E-04
	Median	4.21	1280	0.11	2.2	0.049	0.036	0.21	0.029	2.5	5.00E-04	0.012	0.011	0.28	5.00E-04
	80th Percentile	5.366	1359.4	6.2	2.6	0.27	0.089	0.54	0.032	3.3	0.001	0.016	0.012	0.29	5.00E-04
	95th Percentile	5.84	1394.62	17	2.7	2.25	0.175	4.25	0.0665	3.8	0.0015	0.0205	0.014	0.295	5.00E-04
	Maximum	5.95	1401	18	2.7	2.6	0.21	5.7	0.077	4	0.002	0.021	0.014	0.3	5.00E-04
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
GW104659	Total Number	12	12	10	10	10	10	10	10	10	10	10	10	10	10
	From	22-06-2022	22-06-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	5.12	366.8	4	1.4	5.00E-04	5.00E-04	0.009	0.008	0.005	5.00E-04	0.025	0.011	0.13	5.00E-04
	5th Percentile	5.23	410.635	5.575	1.49	5.00E-04	5.00E-04	0.009	0.008	0.005	5.00E-04	0.0259	0.01235	0.1345	5.00E-04
	20th Percentile	5.37	507.8	15.9	1.6	5.00E-04	5.00E-04	0.0098	0.0088	0.005	5.00E-04	0.0278	0.014	0.14	5.00E-04
	Median	5.695	586.6	22.5	1.65	0.00175	5.00E-04	0.016	0.009	0.005	5.00E-04	0.028	0.015	0.155	5.00E-04
	80th Percentile	5.91	620	26.6	1.72	0.0032	5.00E-04	0.0308	0.0092	0.02	5.00E-04	0.029	0.0162	0.16	5.00E-04
	95th Percentile	6.0635	713.95	31.2	1.8	0.0084	5.00E-04	0.0373	0.01055	0.02	5.00E-04	0.02955	0.017	0.1765	5.00E-04
	Maximum	6.08	819	33	1.8	0.012	5.00E-04	0.04	0.011	0.02	5.00E-04	0.03	0.017	0.19	5.00E-04
	Trend	No	No	No	No	Yes-Downward	No	Yes-Downward	Yes-Downward	No	No	No	No	No	No
GW105395	Total Number	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	From	22-06-2022	22-06-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	5.5	3463	31	1.7	5.00E-04	5.00E-04	0.034	0.028	0.005	5.00E-04	0.15	0.068	0.076	5.00E-04
	5th Percentile	5.54	3522.5	31.5	1.7	5.00E-04	5.00E-04	0.0345	0.029	0.005	5.00E-04	0.15	0.07	0.0785	5.00E-04
	20th Percentile	5.62	3635	35	1.7	5.00E-04	5.00E-04	0.036	0.032	0.005	5.00E-04	0.15	0.072	0.081	5.00E-04
	Median	5.84	3819	36	1.8	5.00E-04	5.00E-04	0.038	0.036	0.005	5.00E-04	0.16	0.078	0.085	5.00E-04
	80th Percentile	5.91	3979	38	2	5.00E-04	5.00E-04	0.042	0.039	0.02	5.00E-04	0.17	0.081	0.091	5.00E-04
	95th Percentile	6.68	4158.55	40.5	2	0.00075	5.00E-04	0.05	0.041	0.1	5.00E-04	0.18	0.084	0.0975	5.00E-04
	Maximum	7.24	4214	42	2	0.001	5.00E-04	0.053	0.042	0.18	5.00E-04	0.18	0.084	0.1	5.00E-04
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
GW109257	Total Number	12	11	11	11	11	11	11	11	11	11	11	11	11	11
	From	06-07-2022	26-07-2022	09-07-2022	09-07-2022	09-07-2022	09-07-2022	09-07-2022	09-07-2022	09-07-2022	09-07-2022	07-07-2022	09-07-2022	09-07-2022	09-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	4.01	419.7	0.03	1.3	0.002	5.00E-04	0.079	0.021	0.14	5.00E-04	0.025	0.006	0.17	5.00E-04
	5th Percentile	4.0155	450.9	0.035	1.35	0.002	5.00E-04	0.0845	0.0215	0.22	5.00E-04	0.025	0.0065	0.17	5.00E-04
	20th Percentile	4.218	693	0.17	1.4	0.002	5.00E-04	0.094	0.022	0.31	5.00E-04	0.025	0.007	0.18	5.00E-04
	Median	4.43	793	1.2	1.4	0.002	5.00E-04	0.11	0.024	0.37	5.00E-04	0.025	0.008	0.19	5.00E-04
	80th Percentile	4.818	843	1.93	1.41	0.006	5.00E-04	0.12	0.025	0.4	5.00E-04	0.026	0.009	0.2	5.00E-04
	95th Percentile	8.2055	1018.5	14.65	1.55	0.0075	0.00125	0.13	0.0265	0.465	5.00E-04	0.028	0.009	0.21	0.00275
	Maximum	10.18	1062	22	1.6	0.009	0.002	0.13	0.027	0.51	5.00E-04	0.028	0.009	0.22	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	Yes-Upward	No	No	No
GW112473	Total Number	9	9	10	10	10	10	10	10	10	10	10	10	10	10
	From	17-08-2022	17-08-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022	26-07-2022
	To	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023	09-06-2023
	Minimum	4.32	372.2	2.2	0.69	5.00E-04	5.00E-04	0.041	0.011	0.07	5.00E-04	0.01	0.004	0.1	5.00E-04
	5th Percentile	4.336	427.32	3.235	0.7125	5.00E-04	5.00E-04	0.04235	0.0119	0.0835	5.00E-04	0.01045	0.00445	0.1045	5.00E-04

	20th Percentile	4.444	517.2	7.62	0.948	5.00E-04	5.00E-04	0.0504	0.0138	0.172	5.00E-04	0.0118	0.005	0.11	5.00E-04
	Median	5.1	574.6	9.55	1.1	0.00075	0.003	0.056	0.014	0.4	5.00E-04	0.015	0.0055	0.135	5.00E-04
	80th Percentile	5.602	639.8	18.8	1.52	0.0022	0.004	0.0588	0.016	0.57	5.00E-04	0.016	0.006	0.14	5.00E-04
	95th Percentile	5.896	732.8	24.75	1.71	0.003	0.00455	0.06255	0.016	0.621	5.00E-04	0.01655	0.00655	0.1565	5.00E-04
	Maximum	6.08	782	27	1.8	0.003	0.005	0.063	0.016	0.63	5.00E-04	0.017	0.007	0.17	5.00E-04
	Trend	Yes-Downward	No	No	No	Yes-Downward	No	No	No	No	No	No	No	No	No
P51A	Total Number	13	12	14	14	14	14	14	14	14	14	14	14	14	14
	From	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	5.18	86.4	0.005	0.003	5.00E-04	5.00E-04	0.0025	0.002	0.005	5.00E-04	0.002	5.00E-04	0.004	5.00E-04
	5th Percentile	5.21	97.455	0.005	0.0212	0.001475	5.00E-04	0.006725	0.002	0.02125	5.00E-04	0.002	5.00E-04	0.00465	5.00E-04
	20th Percentile	5.518	116.4	0.005	0.0332	0.0052	5.00E-04	0.0126	0.0026	0.05	5.00E-04	0.003	0.0016	0.006	5.00E-04
	Median	6.27	151.7	0.005	0.0505	0.0125	5.00E-04	0.0205	0.0045	0.105	5.00E-04	0.0235	0.0025	0.011	5.00E-04
	80th Percentile	9.478	210.16	0.016	0.114	0.0248	5.00E-04	0.0402	0.0104	0.218	5.00E-04	0.0564	0.0054	0.0278	5.00E-04
	95th Percentile	11.646	296.375	0.02675	0.13945	0.0314	5.00E-04	0.0532	0.01475	0.9125	0.001025	3.261	0.40525	0.50205	0.005
	Maximum	12.66	326.9	0.03	0.157	0.034	5.00E-04	0.061	0.018	2.05	0.002	9.02	1	1.31	0.005
	Trend	No	No	No	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	No	No	Yes-Downward	No	No	Yes-Downward
P51B	Total Number	12	12	14	14	14	14	14	14	14	14	14	14	14	14
	From	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	8.82	4.4	0.005	0.0025	5.00E-04	5.00E-04	5.00E-04	0.004	0.02	5.00E-04	0.032	0.01	0.003	5.00E-04
	5th Percentile	8.8695	130.185	0.005	0.0025	5.00E-04	5.00E-04	0.000825	0.004	0.0395	5.00E-04	0.1542	0.01975	0.02705	5.00E-04
	20th Percentile	9.884	391.18	0.005	0.0025	5.00E-04	5.00E-04	0.0016	0.0046	1.052	0.0026	0.344	0.1564	0.0698	5.00E-04
	Median	11.375	1315	0.015	0.0025	0.002	5.00E-04	0.004	0.008	3.5	0.0055	0.576	0.275	0.137	0.002
	80th Percentile	11.84	1655.4	0.042	0.0726	0.0034	5.00E-04	0.0084	0.011	4.28	0.01	1.88	0.524	0.464	0.003
	95th Percentile	12.3225	2775.65	13.135	0.25545	0.00705	0.00275	0.0389	0.01305	4.57	0.01705	3.575	0.7635	1.418	0.005
	Maximum	12.79	3610	34	0.39	0.009	0.006	0.061	0.015	4.7	0.019	3.9	0.77	2.9	0.005
	Trend	No	No	No	No	No	No	Yes-Downward	Yes-Downward	No	Yes-Upward	No	No	No	Yes-Downward
P52	Total Number	11	11	12	12	12	12	12	12	12	12	12	12	12	12
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	5.47	554	11.6	2.69	5.00E-04	5.00E-04	0.091	0.039	0.005	5.00E-04	0.043	0.014	0.24	5.00E-04
	5th Percentile	5.545	633	18.42	2.8605	5.00E-04	5.00E-04	0.0943	0.03955	0.005	5.00E-04	0.04355	0.01455	0.2444	5.00E-04
	20th Percentile	5.66	738	41.6	3.5	5.00E-04	5.00E-04	0.142	0.04	0.005	6.00E-04	0.0452	0.015	0.27	5.00E-04
	Median	5.88	1250	52	3.7	0.001	5.00E-04	0.175	0.0415	0.005	0.001	0.049	0.016	0.305	5.00E-04
	80th Percentile	6.7	1409	59.8	4.06	0.0028	0.0505	0.204	0.0466	0.13	0.0028	0.0554	0.0178	0.31	5.00E-04
	95th Percentile	7.34	1547	61	4.245	0.0039	0.1038	0.31585	0.0489	0.2205	0.0039	0.06435	0.018	0.3145	0.002525
	Maximum	7.82	1597	61	4.3	0.005	0.15	0.433	0.05	0.27	0.005	0.066	0.018	0.32	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
P53A	Total Number	12	10	13	13	13	13	13	13	13	13	13	13	13	13
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	6.07	393.6	0.005	1.3	5.00E-04	5.00E-04	0.001	0.003	0.005	5.00E-04	0.074	0.008	0.087	5.00E-04
	5th Percentile	6.114	435.63	0.005	1.462	5.00E-04	5.00E-04	0.0016	0.0048	0.005	5.00E-04	0.0866	0.0086	0.093	5.00E-04
	20th Percentile	6.24	531.8	4.66	1.68	5.00E-04	5.00E-04	0.0024	0.0078	0.005	5.00E-04	0.11	0.009	0.0994	5.00E-04
	Median	6.51	842.125	24	2	5.00E-04	5.00E-04	0.011	0.016	0.005	0.002	0.13	0.01	0.14	5.00E-04
	80th Percentile	6.99	1039.2	33.8	2	0.0008	0.0008	0.0356	0.018	0.016	0.004	0.16	0.0136	0.15	5.00E-04
	95th Percentile	7.7805	1072.5	38.2	2.24	0.002	0.0028	0.0638	0.0188	0.298	0.0078	0.22	0.0396	0.16	0.0026
	Maximum	7.94	1086	40	2.3	0.002	0.004	0.074	0.02	0.43	0.009	0.25	0.045	0.16	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	Yes-Upward	No	Yes-Upward	Yes-Downward
P53B	Total Number	12	11	13	13	13	13	13	13	13	13	13	13	13	13
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	6.56	429.9	0.005	0.021	5.00E-04	5.00E-04	5.00E-04	5.00E-04	0.005	5.00E-04	0.098	0.014	0.088	5.00E-04
	5th Percentile	6.6205	576.45	0.005	0.0288	5.00E-04	5.00E-04	5.00E-04	5.00E-04	0.005	5.00E-04	0.2672	0.0716	0.0928	5.00E-04
	20th Percentile	6.866	949	0.014	0.0428	5.00E-04	5.00E-04	0.001	5.00E-04	0.005	5.00E-04	0.412	0.134	0.104	5.00E-04
	Median	7.405	988	0.24	0.44	5.00E-04	5.00E-04	0.002	0.002	0.005	0.001	0.52	0.5	0.16	5.00E-04
	80th Percentile	8.608	1412	1.392	2	0.001	5.00E-04	0.0082	0.0046	0.016	0.0016	0.638	0.596	0.18	5.00E-04
	95th Percentile	10.407	1622.3	12.64	2.372	0.0058	0.0014	0.0532	0.0152	0.08	0.002	0.688	0.654	0.194	0.0026
	Maximum	11.87	1679.6	28.6	2.63	0.01	0.002	0.094	0.029	0.11	0.002	0.7	0.66	0.215	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes-Downward
P53C	Total Number	13	13	13	13	13	13	13	13	13	13	13	13	13	13

	From	02-06-2022	02-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	6.08	612	0.005	1.5	5.00E-04	5.00E-04	0.001	5.00E-04	0.005	5.00E-04	0.166	0.011	0.14	5.00E-04
	5th Percentile	6.404	769.2	0.005	1.5	5.00E-04	5.00E-04	0.0016	0.0014	0.005	5.00E-04	0.4744	0.0122	0.1448	5.00E-04
	20th Percentile	6.638	995.6	6.94	1.58	5.00E-04	5.00E-04	0.002	0.0032	0.005	5.00E-04	0.704	0.014	0.16	5.00E-04
	Median	6.73	1283	18	2.1	5.00E-04	5.00E-04	0.004	0.018	0.005	0.004	0.77	0.015	0.17	5.00E-04
	80th Percentile	7.104	1432.88	27.4	2.4	5.00E-04	5.00E-04	0.053	0.036	0.02	0.007	1.52	0.0452	0.196	5.00E-04
	95th Percentile	8.692	1663.6	30.6	2.74	0.002	0.0007	0.2392	0.0416	0.172	0.0108	1.64	0.0488	0.246	0.0023
	Maximum	10.54	1708	33	3.1	0.002	0.001	0.313	0.044	0.19	0.015	1.7	0.053	0.27	0.005
	Trend	No	No	No	Yes-Downward	No	No	No	No	No	No	Yes-Upward	Yes-Upward	Yes-Upward	No
P54A	Total Number	3	2	2	2	2	2	2	2	2	2	2	2	2	2
	From	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022	01-08-2022
	To	20-01-2023	20-01-2023	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022	18-08-2022
	Minimum	6	1774	13	2.7	5.00E-04	5.00E-04	0.019	0.041	0.005	0.002	0.31	0.05	0.26	5.00E-04
	5th Percentile	6.062	1820.05	14.3	2.725	0.025475	0.025475	0.0193	0.0411	0.25475	0.00205	0.31	0.05105	0.2615	0.025475
	20th Percentile	6.248	1958.2	18.2	2.8	0.1004	0.1004	0.0202	0.0414	1.004	0.0022	0.31	0.0542	0.266	0.1004
	Median	6.62	2234.5	26	2.95	0.25025	0.25025	0.022	0.042	2.5025	0.0025	0.31	0.0605	0.275	0.25025
	80th Percentile	7.814	2510.8	33.8	3.1	0.4001	0.4001	0.0238	0.0426	4.001	0.0028	0.31	0.0668	0.284	0.4001
	95th Percentile	8.411	2648.95	37.7	3.175	0.475025	0.475025	0.0247	0.0429	4.75025	0.00295	0.31	0.06995	0.2885	0.475025
	Maximum	8.61	2695	39	3.2	0.5	0.5	0.025	0.043	5	0.003	0.31	0.071	0.29	0.5
	Trend	na	na	na	na	na	na	na	na	na	na	na	na	na	na
P54B	Total Number	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	From	02-06-2022	02-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022	09-11-2022
	Minimum	6.18	1232	17.3	2.8	5.00E-04	5.00E-04	0.036	0.037	0.005	0.001	0.15	0.035	0.246	5.00E-04
	5th Percentile	6.1845	1308.35	17.855	2.815	5.00E-04	5.00E-04	0.03735	0.03745	0.005	0.001	0.15	0.03575	0.2511	5.00E-04
	20th Percentile	6.198	1537.4	19.52	2.86	5.00E-04	5.00E-04	0.0414	0.0388	0.005	0.001	0.15	0.038	0.2664	5.00E-04
	Median	6.29	1855.95	30.5	2.94	0.00125	5.00E-04	0.0465	0.0405	0.0125	0.0015	0.15	0.0415	0.29	5.00E-04
	80th Percentile	6.874	1976.14	41.6	2.988	0.0028	5.00E-04	0.0612	0.0446	0.024	0.0024	0.3216	0.0614	0.308	0.0023
	95th Percentile	7.441	1982.035	43.4	2.997	0.0037	5.00E-04	0.07605	0.04865	0.0285	0.00285	0.51465	0.0821	0.317	0.004325
	Maximum	7.63	1984	44	3	0.004	5.00E-04	0.081	0.05	0.03	0.003	0.579	0.089	0.32	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
P55A	Total Number	11	11	13	13	13	13	13	13	13	13	13	13	13	13
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	5.26	116.3	0.03	0.0025	5.00E-04	5.00E-04	0.002	0.019	0.005	5.00E-04	0.088	0.014	0.074	5.00E-04
	5th Percentile	5.415	270.55	0.282	0.325	5.00E-04	5.00E-04	0.0026	0.0196	0.005	5.00E-04	0.1012	0.0146	0.1436	5.00E-04
	20th Percentile	5.61	1648	7.52	2.54	5.00E-04	5.00E-04	0.0554	0.029	0.005	7.00E-04	0.118	0.0168	0.292	5.00E-04
	Median	5.78	1808	28	3.1	5.00E-04	5.00E-04	0.11	0.042	0.02	0.003	0.23	0.018	0.34	5.00E-04
	80th Percentile	6.54	1897	36.6	3.42	0.001	5.00E-04	0.208	0.0478	0.03	0.0046	0.378	0.02	0.35	5.00E-04
	95th Percentile	10.68	1956	40.4	3.9	0.0018	0.0015	0.3112	0.0656	0.138	0.006	0.762	0.0256	0.3718	0.0032
	Maximum	11.33	1956	44	3.9	0.003	0.003	0.388	0.089	0.27	0.006	0.78	0.028	0.4	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No
P55B	Total Number	12	12	13	13	13	13	13	13	13	13	13	13	13	13
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	5.68	501.3	12.6	2.27	5.00E-04	5.00E-04	0.046	0.045	0.005	5.00E-04	0.082	0.013	0.25	5.00E-04
	5th Percentile	5.6855	866.335	14.64	2.768	5.00E-04	5.00E-04	0.0688	0.0486	0.005	5.00E-04	0.0838	0.0136	0.286	5.00E-04
	20th Percentile	5.718	1285.6	19	3.48	5.00E-04	5.00E-04	0.114	0.0524	0.005	0.0011	0.0964	0.0144	0.31	5.00E-04
	Median	6.085	1422	36	4.1	5.00E-04	5.00E-04	0.16	0.062	0.02	0.004	0.11	0.021	0.34	5.00E-04
	80th Percentile	6.634	1533.6	43.6	4.86	0.0008	0.0008	0.198	0.1232	0.04	0.0076	0.1482	0.0576	0.366	5.00E-04
	95th Percentile	7.6605	1576.675	49.8	5.68	0.0066	0.0492	0.254	0.232	0.136	0.0096	0.278	0.087	0.39	0.0023
	Maximum	8.04	1616	51	5.8	0.015	0.12	0.29	0.25	0.22	0.012	0.32	0.099	0.39	0.005
	Trend	Yes-Downward	No	No	No	No	No	No	Yes-Downward	No	No	Yes-Downward	Yes-Downward	Yes-Upward	No
P55C	Total Number	12	11	13	13	13	13	13	13	13	13	13	13	13	13
	From	21-06-2022	21-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	4.92	511.5	0.005	0.01	5.00E-07	5.00E-07	1.70E-05	1.60E-05	5.00E-07	1.00E-06	0.00022	4.20E-05	0.00025	5.00E-07
	5th Percentile	5.25	740.25	0.0212	1.204	0.0003002	0.0003002	0.0003068	0.0003064	0.0030002	0.0003004	0.040288	0.0078168	0.1261	0.0003002
	20th Percentile	6.006	1045	0.052	2.34	5.00E-04	5.00E-04	0.0027	0.0094	0.005	5.00E-04	0.0762	0.0134	0.21	5.00E-04
	Median	6.37	1253	22	2.8	5.00E-04	5.00E-04	0.015	0.026	0.01	5.00E-04	0.14	0.02	0.22	5.00E-04
	80th Percentile	7.334	1347	40	3.12	5.00E-04	5.00E-04	0.16	0.0316	0.092	0.0016	0.296	0.0626	0.246	5.00E-04

	95th Percentile	8.717	3323	55	3.38	0.5218	0.0227	0.468	0.1462	0.668	0.0024	0.644	0.2556	0.302	0.0023
	Maximum	10.07	5258	58	3.5	1.3	0.056	0.81	0.31	1.1	0.003	0.875	0.474	0.38	0.005
	Trend	Yes-Downward	No	No	No	No	No	Yes-Upward	No	No	No	No	Yes-Downward	No	No
P56A	Total Number	13	13	14	14	14	14	14	14	14	14	14	14	14	14
	From	24-06-2022	24-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	4.4	464.8	0.005	0.079	5.00E-04	5.00E-04	0.024	0.007	0.06	5.00E-04	0.014	0.007	0.1	5.00E-04
	5th Percentile	4.634	577.72	0.005	0.0829	0.000825	0.000825	0.02725	0.00765	0.073	5.00E-04	0.01465	0.00765	0.1	5.00E-04
	20th Percentile	5.462	716.8	0.01	0.0962	0.002	0.006	0.0318	0.008	0.518	5.00E-04	0.0216	0.008	0.116	5.00E-04
	Median	6.38	953	0.02	0.112	0.0055	0.007	0.0355	0.01	0.57	5.00E-04	0.052	0.009	0.145	5.00E-04
	80th Percentile	7.328	1082.8	0.027	0.124	0.0074	0.009	0.038	0.011	1.1	5.00E-04	0.0964	0.0144	0.16	5.00E-04
	95th Percentile	8.748	1117	0.04	0.1335	0.00935	0.01035	0.04135	0.01205	1.77	5.00E-04	0.1735	0.0225	0.17	0.005
	Maximum	9.21	1132	0.04	0.14	0.01	0.011	0.042	0.014	1.9	5.00E-04	0.258	0.029	0.17	0.005
	Trend	No	No	No	No	No	No	No	No	No	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward
P56B	Total Number	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	From	02-06-2022	02-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022	04-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	7.06	141.6	0.005	0.0025	5.00E-04	5.00E-04	5.00E-04	0.002	0.005	5.00E-04	0.29	0.213	0.063	5.00E-04
	5th Percentile	7.8725	353.11	0.00825	0.0025	5.00E-04	5.00E-04	0.000825	0.002	0.005	5.00E-04	0.342	0.2845	0.076	5.00E-04
	20th Percentile	10.67	592.04	0.02	0.0025	5.00E-04	5.00E-04	0.001	0.002	0.005	5.00E-04	0.44	0.596	0.0924	5.00E-04
	Median	11.245	1183.6	0.0275	0.0025	5.00E-04	5.00E-04	0.00225	0.0025	0.1	5.00E-04	0.5	0.695	0.115	5.00E-04
	80th Percentile	11.678	1379.8	0.044	0.0804	7.00E-04	5.00E-04	0.0048	0.0034	0.17	7.00E-04	0.62	0.83	0.144	5.00E-04
	95th Percentile	12.025	1476.05	0.295	1.7255	0.002	5.00E-04	0.014	0.0354	0.2755	0.0044	1.063	0.8575	0.26005	0.005
	Maximum	12.22	1543	0.36	1.94	0.002	5.00E-04	0.014	0.051	0.36	0.007	1.18	0.89	0.288	0.005
	Trend	No	No	No	No	Yes-Upward	No	No	No	Yes-Upward	Yes-Upward	No	No	No	Yes-Downward
P56C	Total Number	13	14	14	14	14	14	14	14	14	14	14	14	14	14
	From	02-06-2022	02-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022	03-06-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	6.27	9.54	0.005	0.001	5.00E-04	5.00E-04	5.00E-04	5.00E-04	0.005	5.00E-04	0.27	0.094	0.15	5.00E-04
	5th Percentile	6.642	10.6385	0.005	0.001975	5.00E-04	5.00E-04	5.00E-04	5.00E-04	0.005	5.00E-04	0.296	0.1044	0.1695	5.00E-04
	20th Percentile	7.192	498.68	0.023	0.0025	5.00E-04	5.00E-04	0.0016	5.00E-04	0.005	5.00E-04	0.33	0.13	0.18	5.00E-04
	Median	8.36	848	0.07	0.835	5.00E-04	5.00E-04	0.00275	5.00E-04	0.01	5.00E-04	0.395	0.15	0.22	5.00E-04
	80th Percentile	10.26	1012.16	5.48	1.34	5.00E-04	5.00E-04	0.0056	0.0014	0.132	0.001	0.62	0.374	0.338	5.00E-04
	95th Percentile	12.022	1876.635	17.2	1.635	0.001	0.000675	0.01245	0.00335	0.237	0.0074	1.6515	0.49745	0.68535	0.005
	Maximum	12.19	3200.1	25	1.7	0.001	0.001	0.017	0.004	0.25	0.01	2.49	0.567	0.881	0.005
	Trend	Yes-Downward	No	No	Yes-Upward	No	No	No	Yes-Upward	No	No	Yes-Downward	Yes-Downward	No	Yes-Downward
REA4	Total Number	13	13	11	11	11	11	11	11	11	11	11	11	11	11
	From	21-06-2022	21-06-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022	28-07-2022
	To	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023	08-06-2023
	Minimum	6.31	141.1	0.02	0.0025	5.00E-04	5.00E-04	0.044	0.001	0.005	5.00E-04	0.11	0.003	0.009	5.00E-04
	5th Percentile	6.34	147.76	0.025	0.0025	0.00075	5.00E-04	0.053	0.0015	0.0075	5.00E-04	0.11	0.004	0.0105	5.00E-04
	20th Percentile	6.462	180.34	0.03	0.0025	0.001	5.00E-04	0.064	0.003	0.02	5.00E-04	0.14	0.007	0.016	5.00E-04
	Median	6.87	239.8	0.05	0.01	0.003	5.00E-04	0.079	0.005	0.04	5.00E-04	0.14	0.008	0.022	5.00E-04
	80th Percentile	7.272	274.2	0.24	0.061	0.004	0.001	0.085	0.005	0.05	5.00E-04	0.17	0.009	0.027	5.00E-04
	95th Percentile	8.234	443.08	1.04	0.084	0.0085	0.002	0.135	0.0065	0.29	0.001	0.175	0.01	0.032	0.00075
	Maximum	9.41	455.2	1.3	0.094	0.012	0.002	0.15	0.007	0.31	0.001	0.18	0.01	0.033	0.001
	Trend	No	Yes-Upward	No	Yes-Upward	No	No	No	Yes-Upward	No	No	Yes-Upward	Yes-Upward	Yes-Upward	No

Appendix E Hydrographs – Groundwater Level TARPS

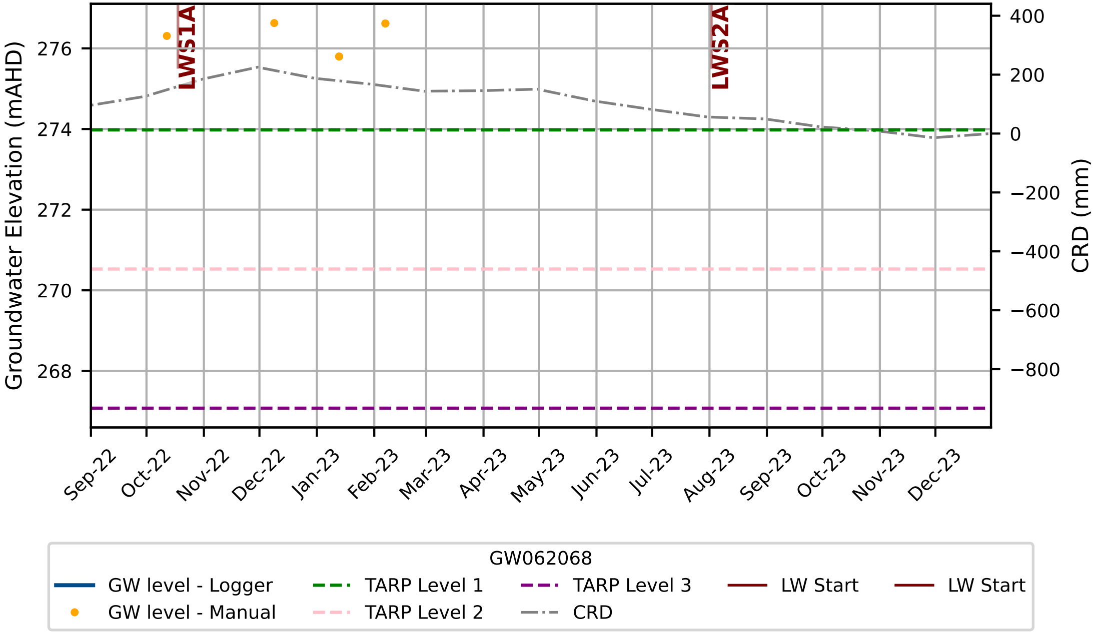
Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

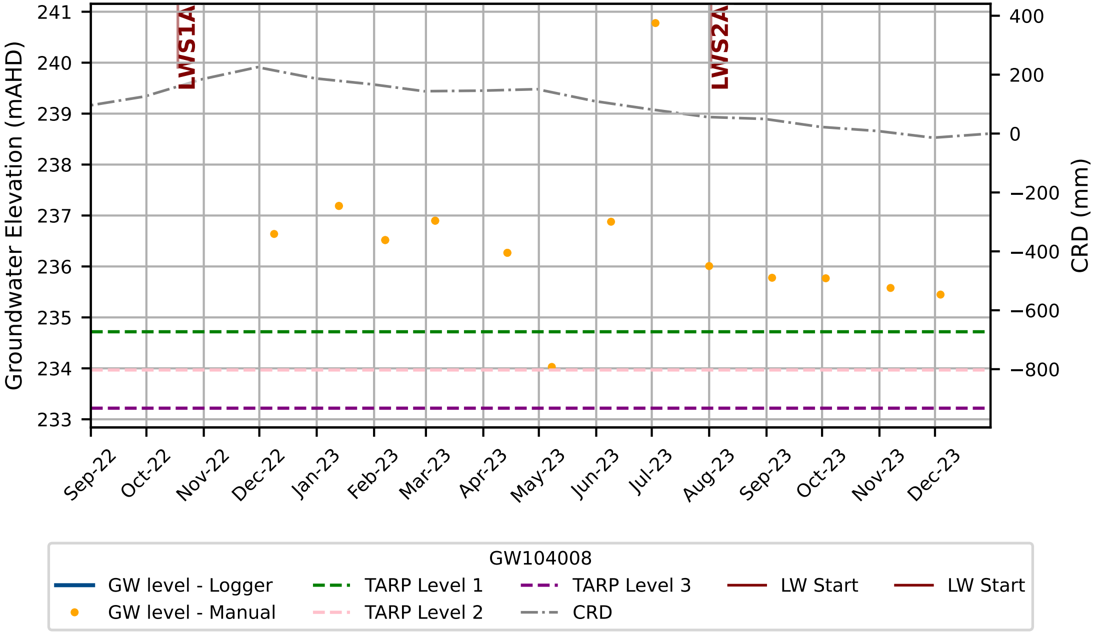
Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

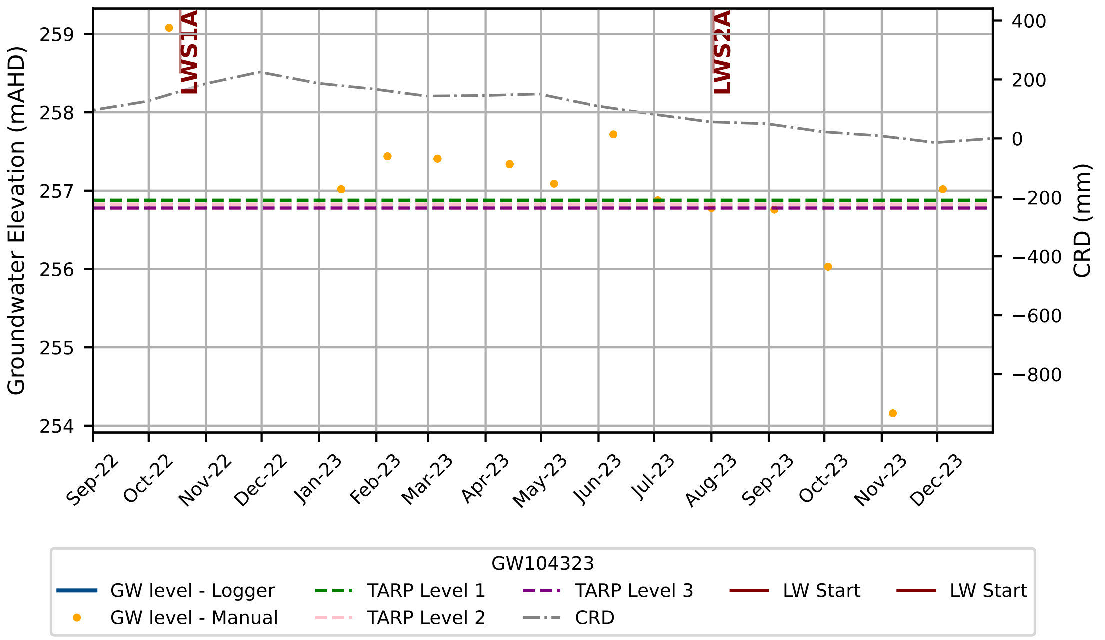
26 March 2024



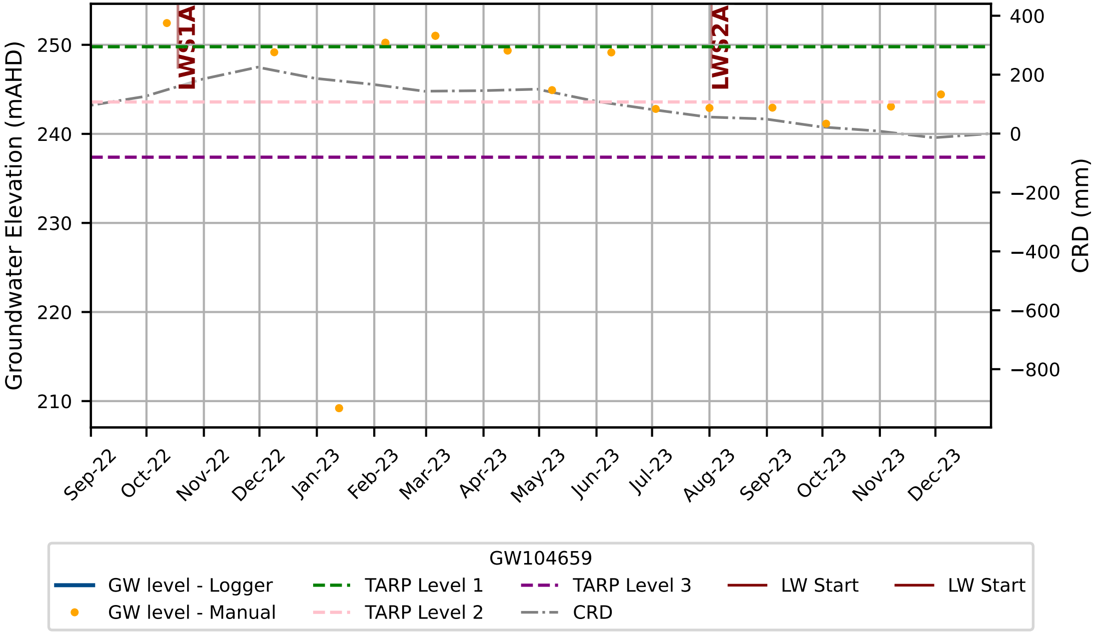
GW062068
Groundwater Elevation (mAHD)
CRD (mm)
268
270
272
274
276
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



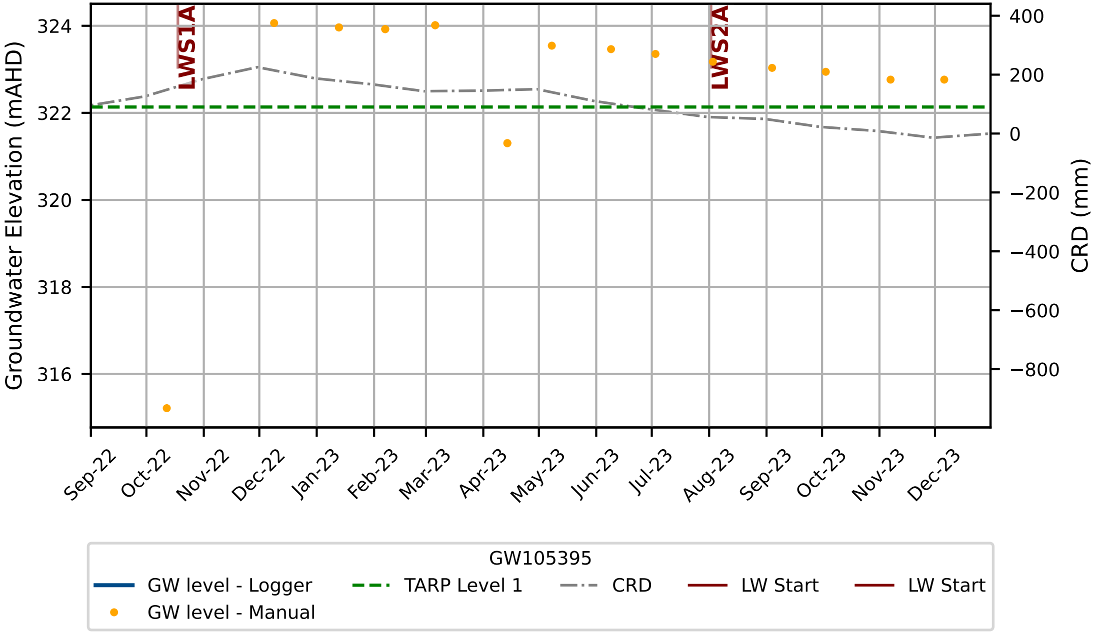
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
241
240
239
238
237
236
235
234
233
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



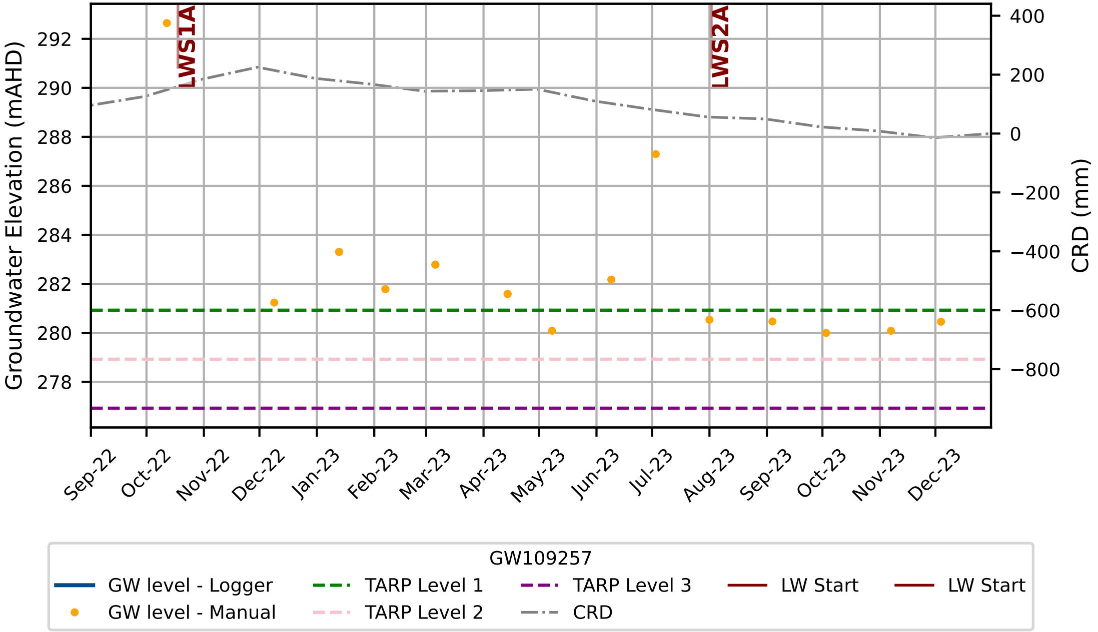
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
259
258
257
256
255
254
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



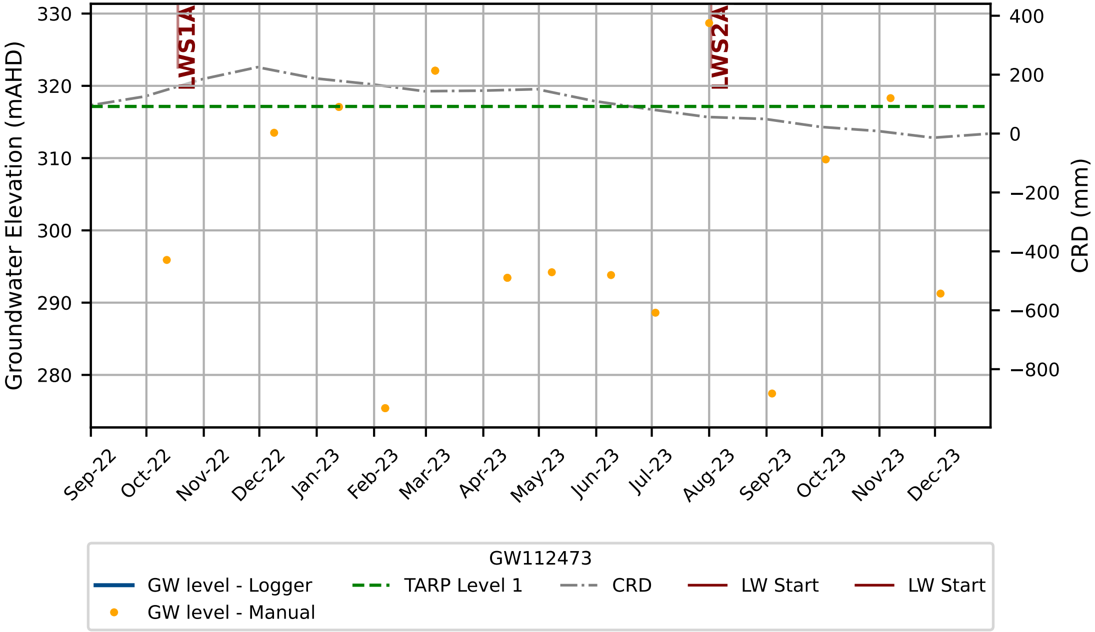
Groundwater Elevation (mAHD)
CRD (mm)
250
240
230
220
210
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



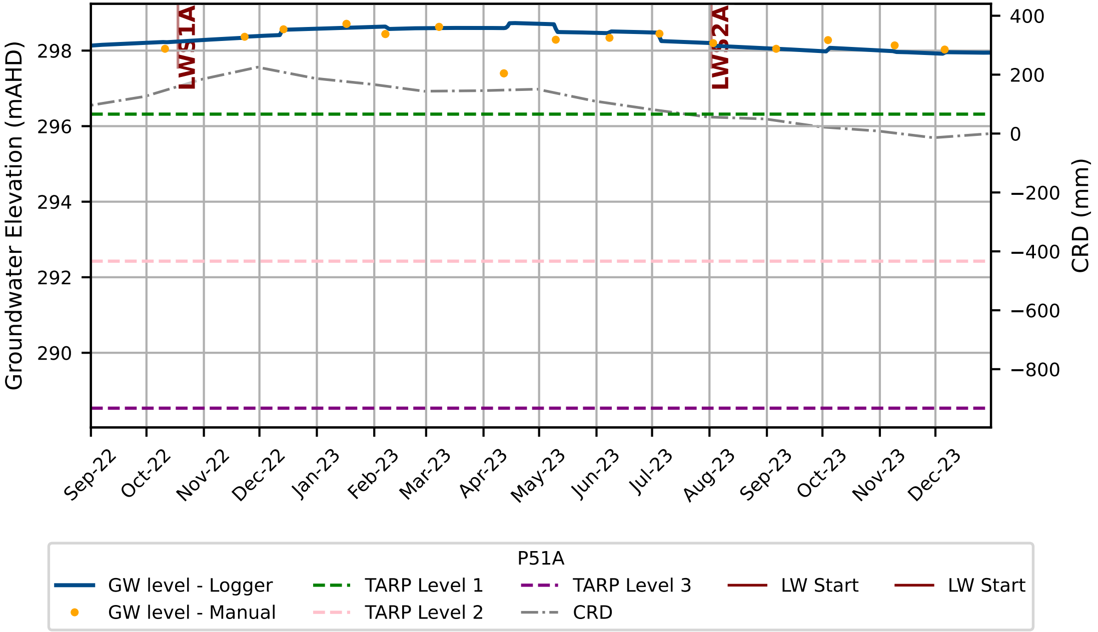
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
324
322
320
318
316
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start
GW level - Manual

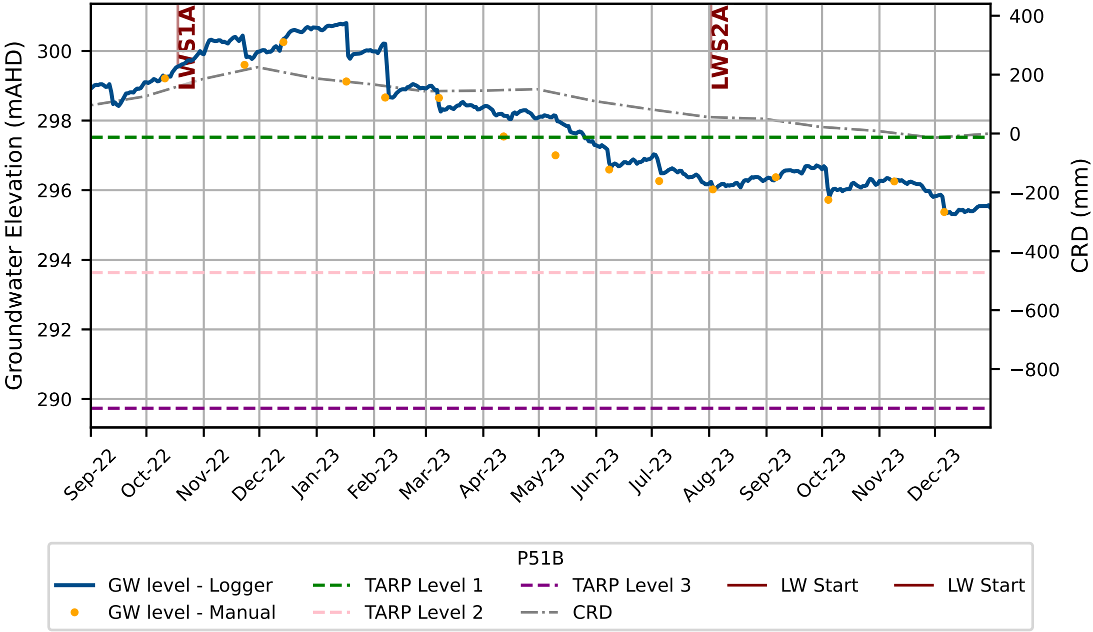


Groundwater Elevation (mAHD)
CRD (mm)
292
290
288
286
284
282
280
278
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

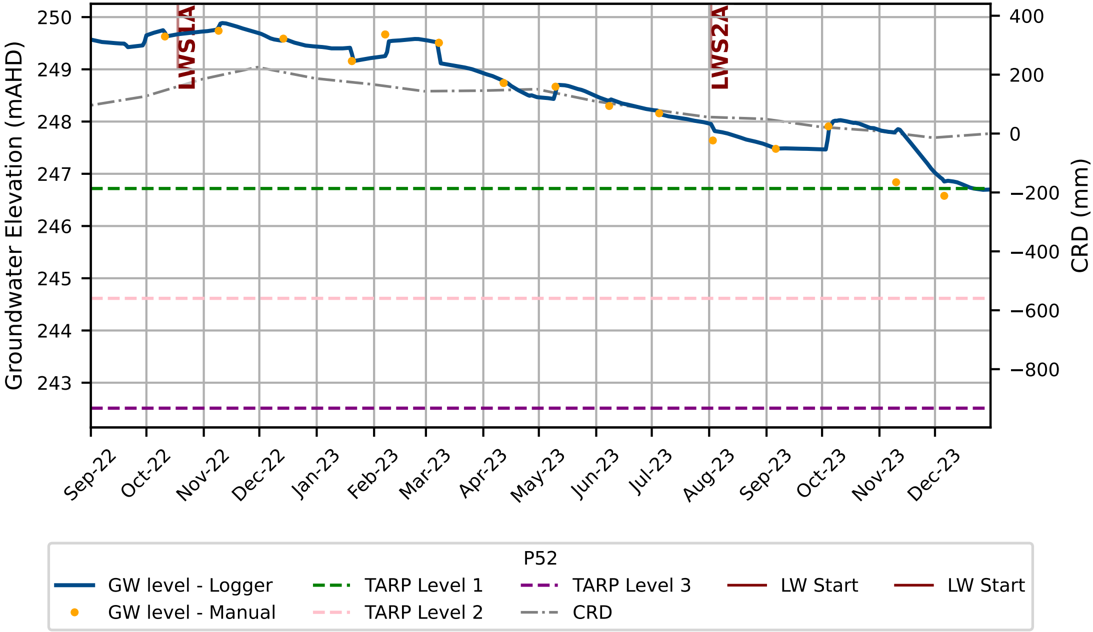


Groundwater Elevation (mAHD)
CRD (mm)
330
320
310
300
290
280
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start
GW level - Manual

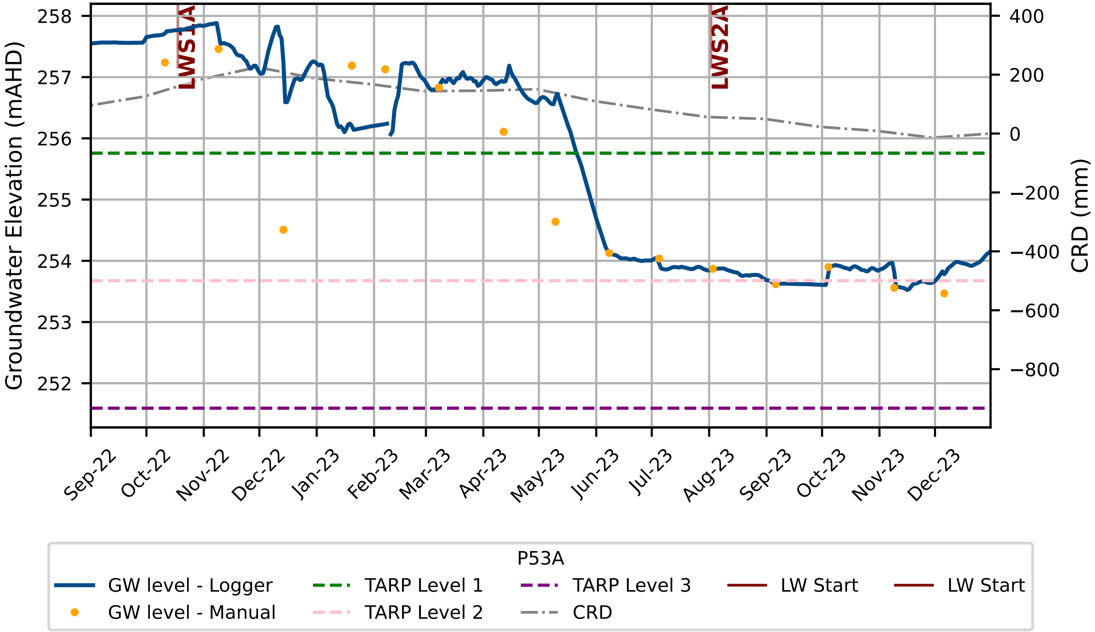

Groundwater Elevation (mAHD)
CRD (mm)
298
296
294
292
290
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

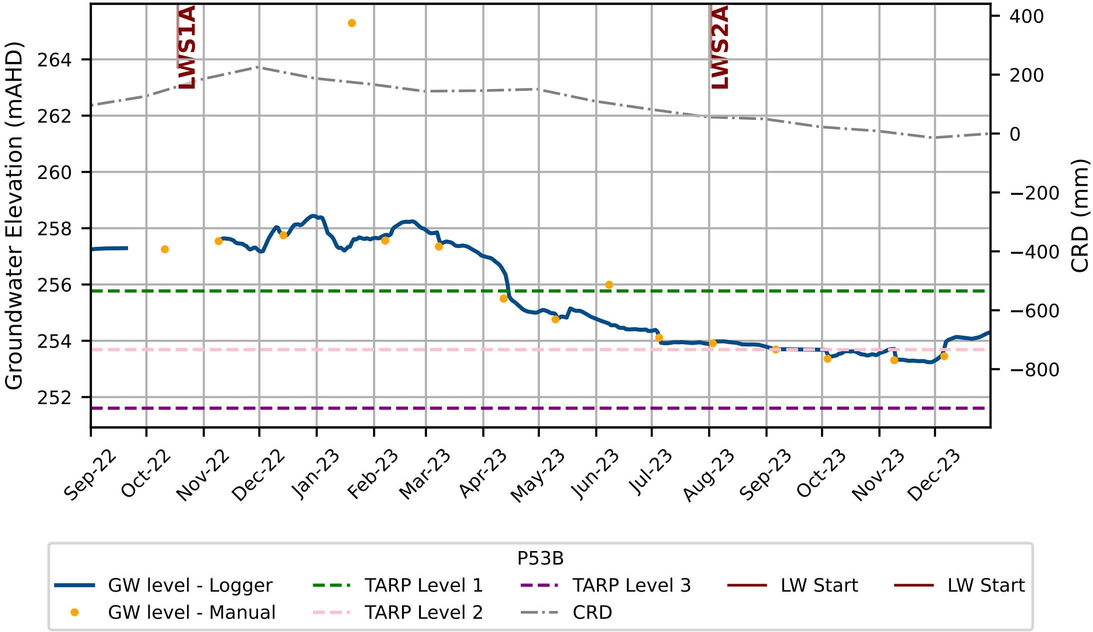


LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
300
298
296
294
292
290
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

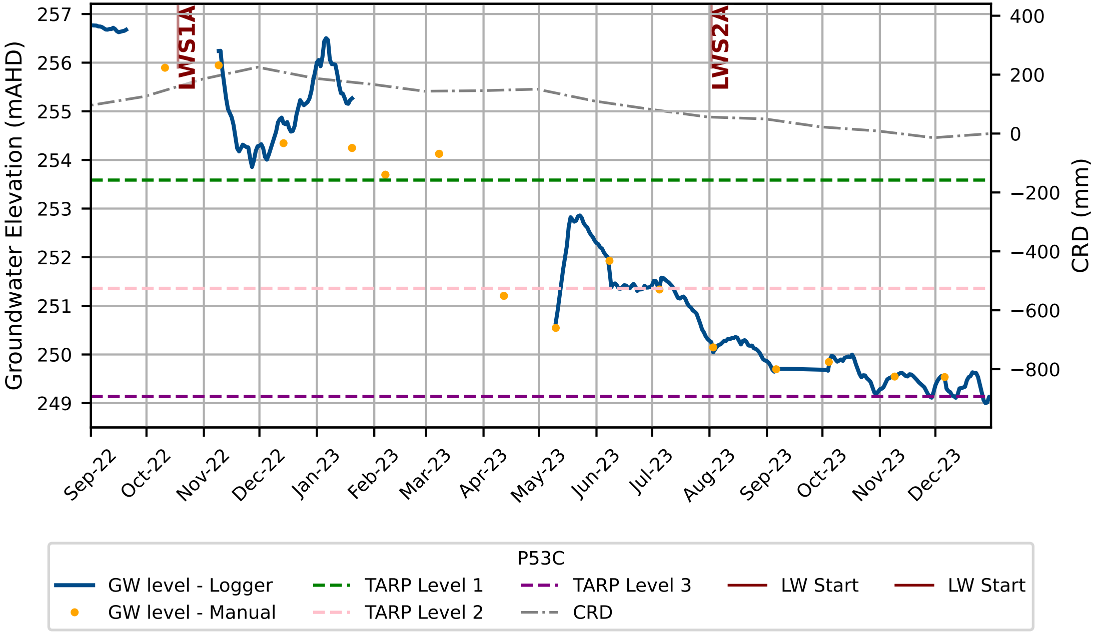


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
250
249
248
247
246
245
244
243
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

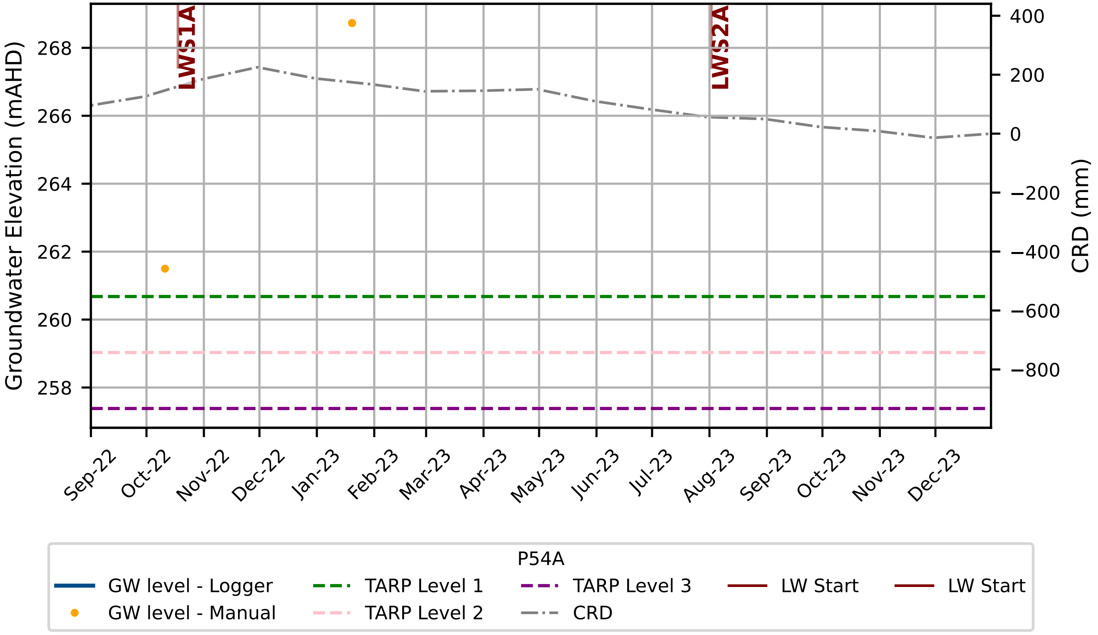

Groundwater Elevation (mAHD)
CRD (mm)
258
257
256
255
254
253
252
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



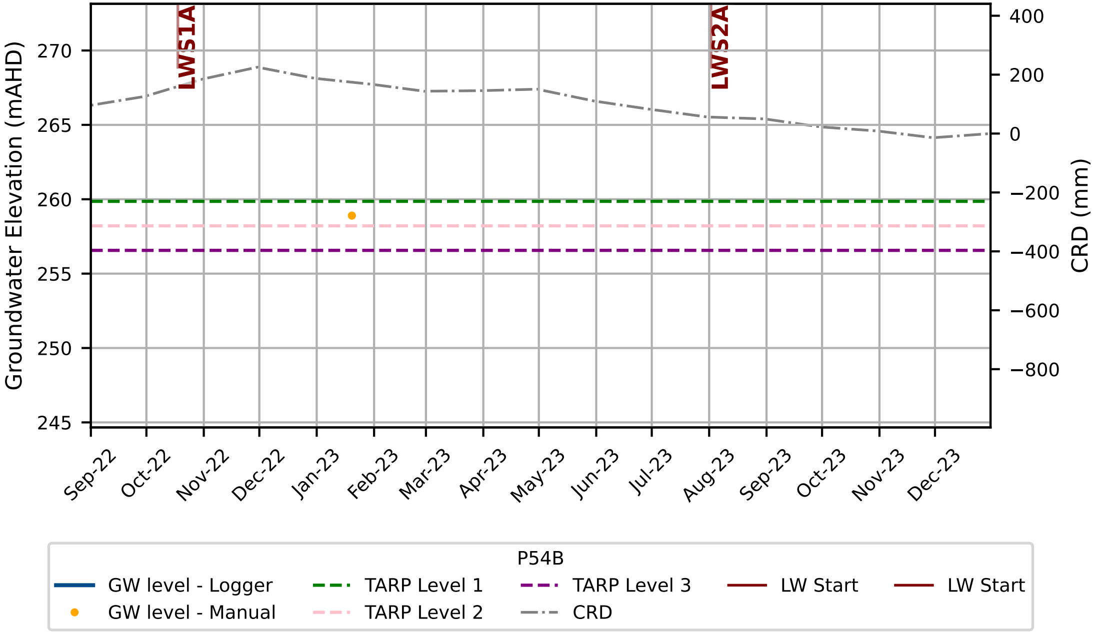
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
264
262
260
258
256
254
252
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



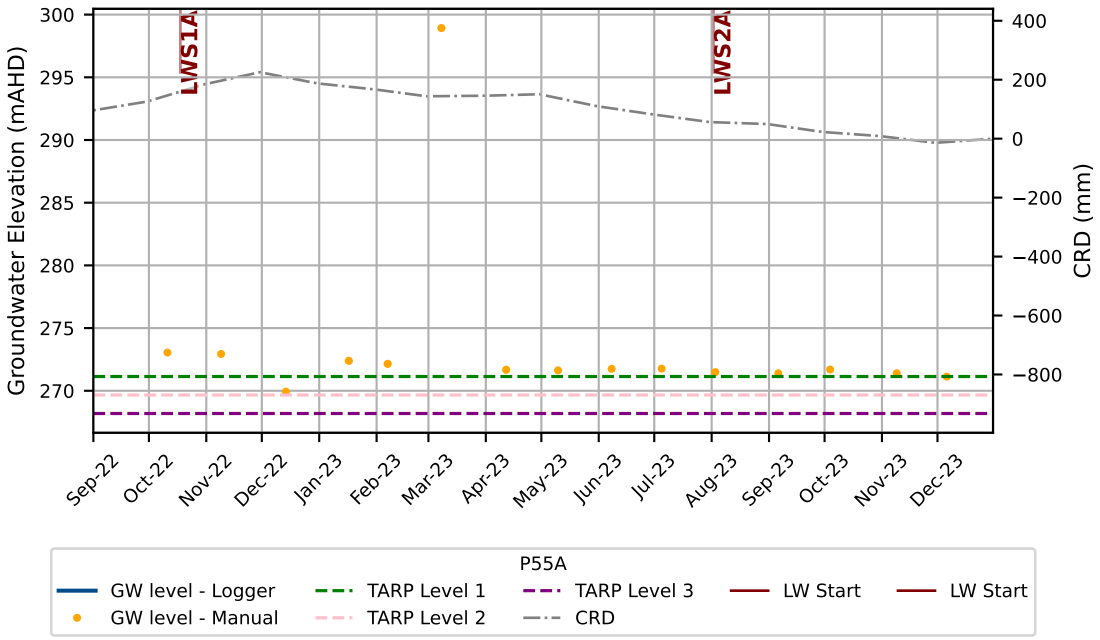
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
257
256
255
254
253
252
251
250
249
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



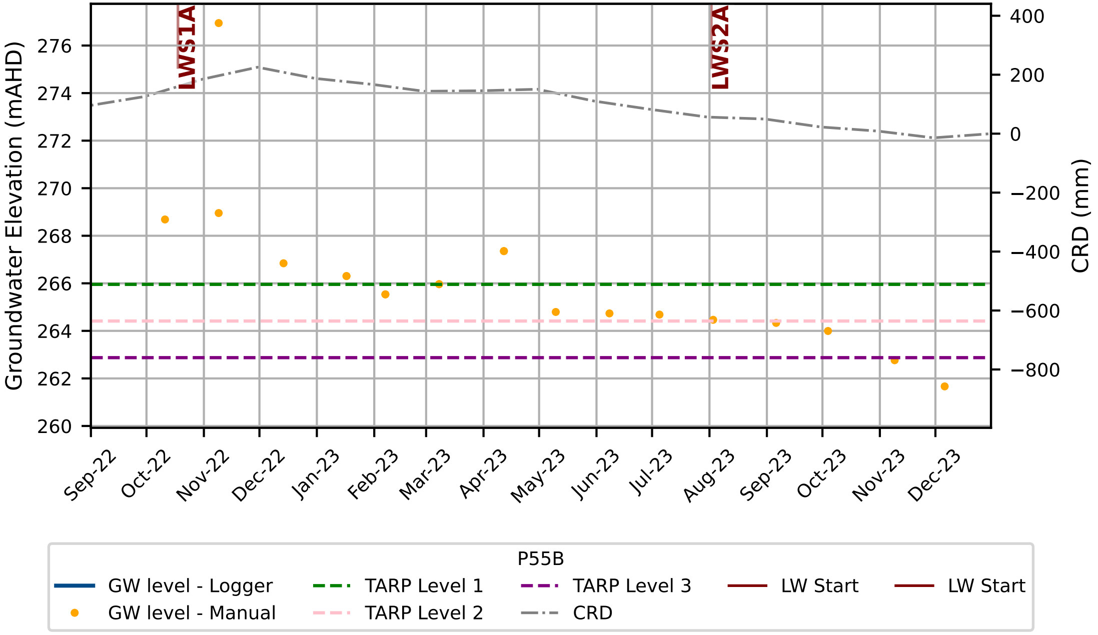
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
258
260
262
264
266
268
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



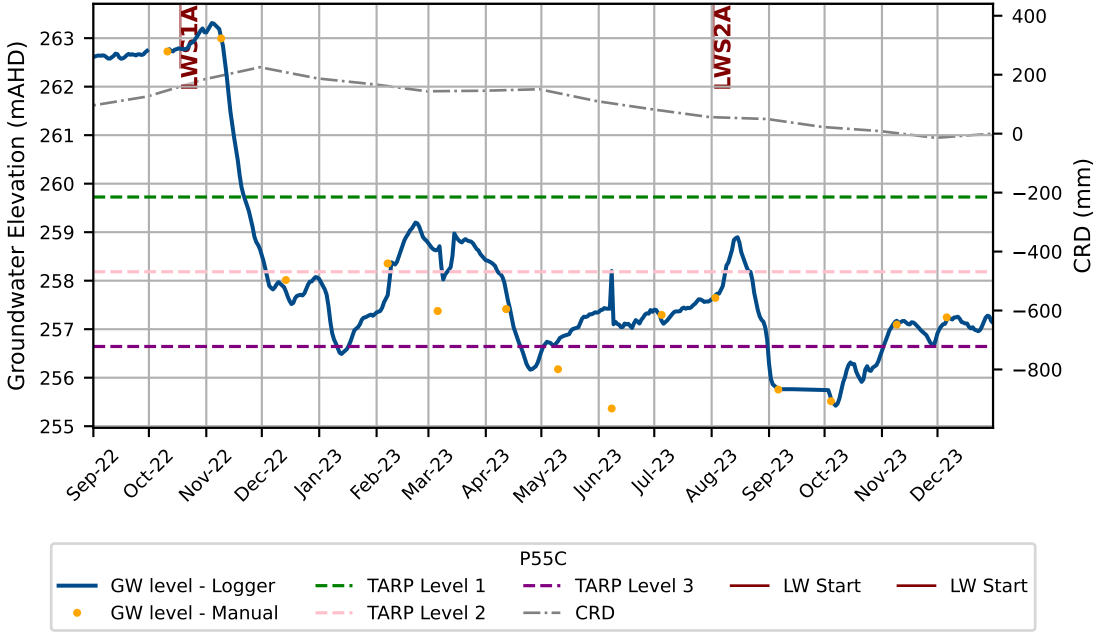
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
270
265
260
255
250
245
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



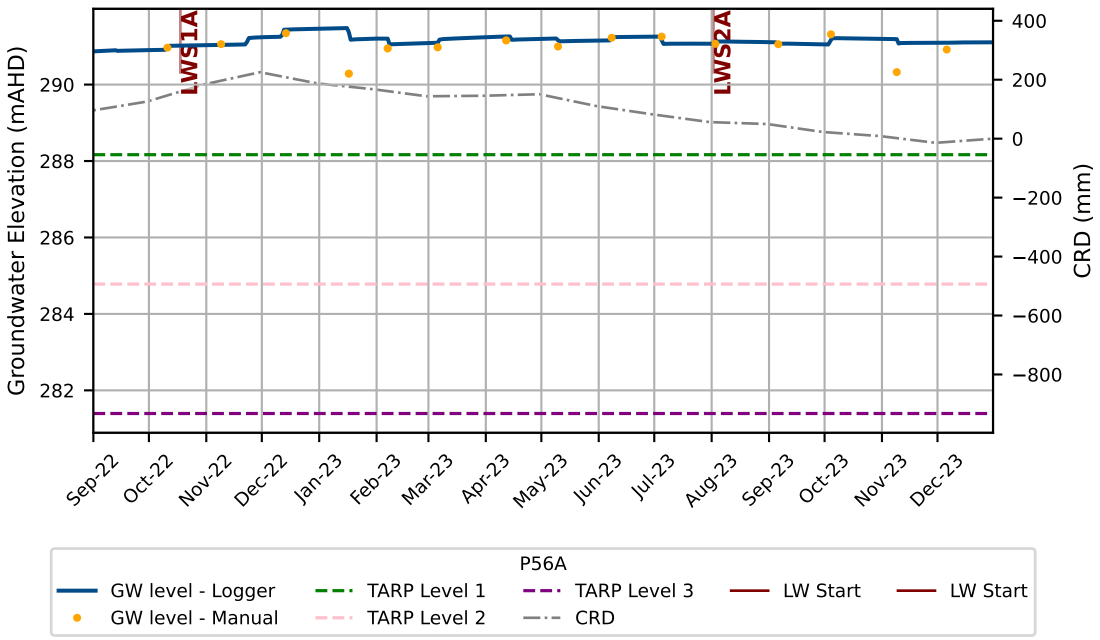
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
300
295
290
285
280
275
270
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



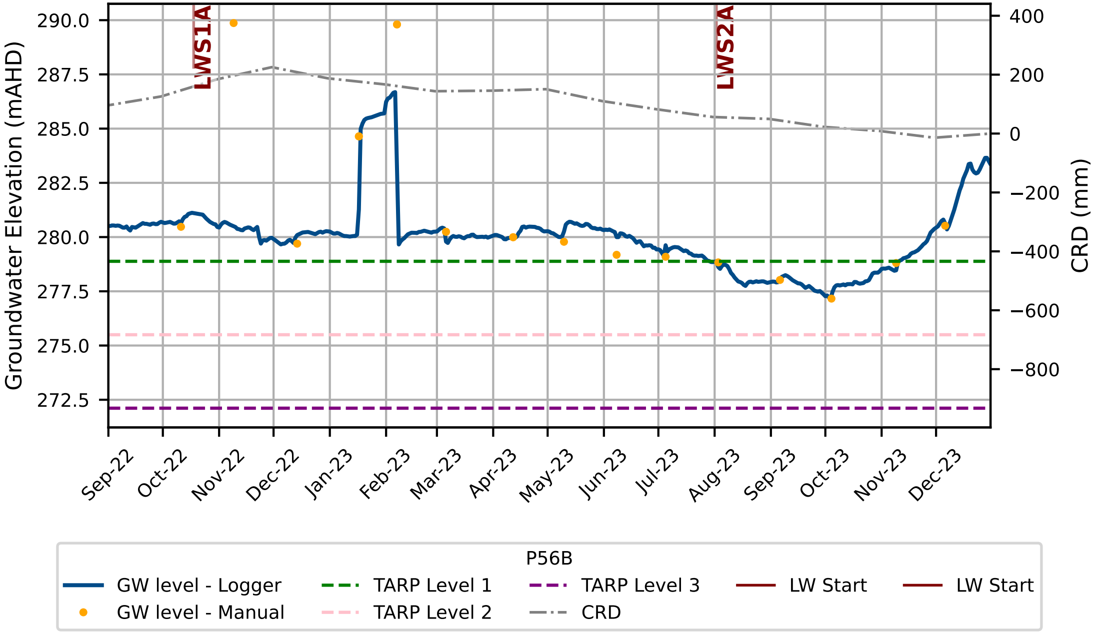
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
260
262
264
266
268
270
272
274
276
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



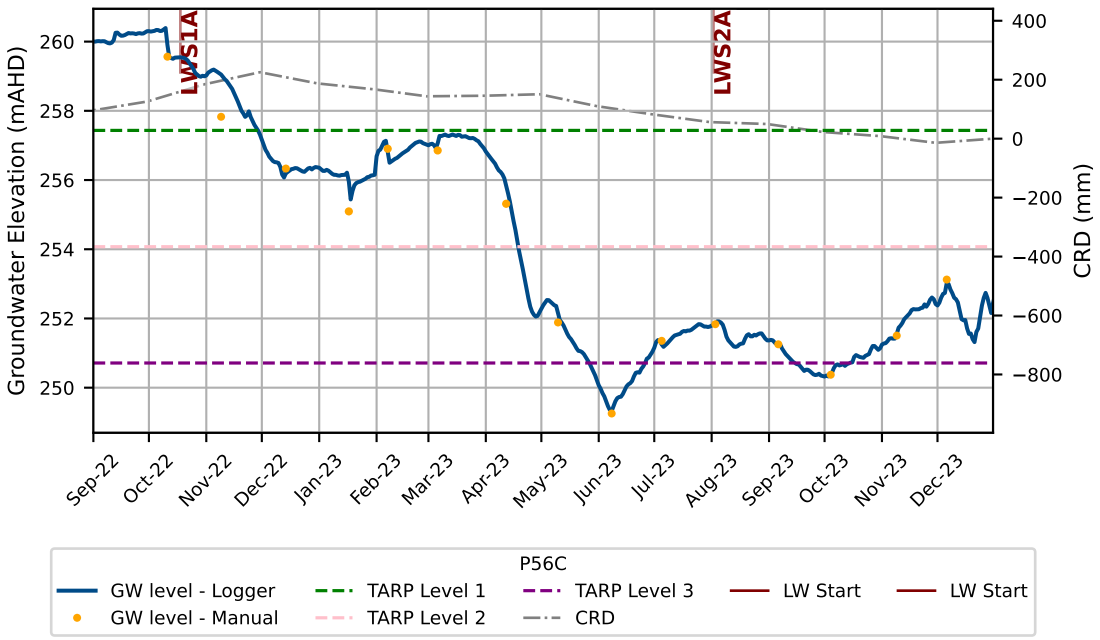
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
263
262
261
260
259
258
257
256
255
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



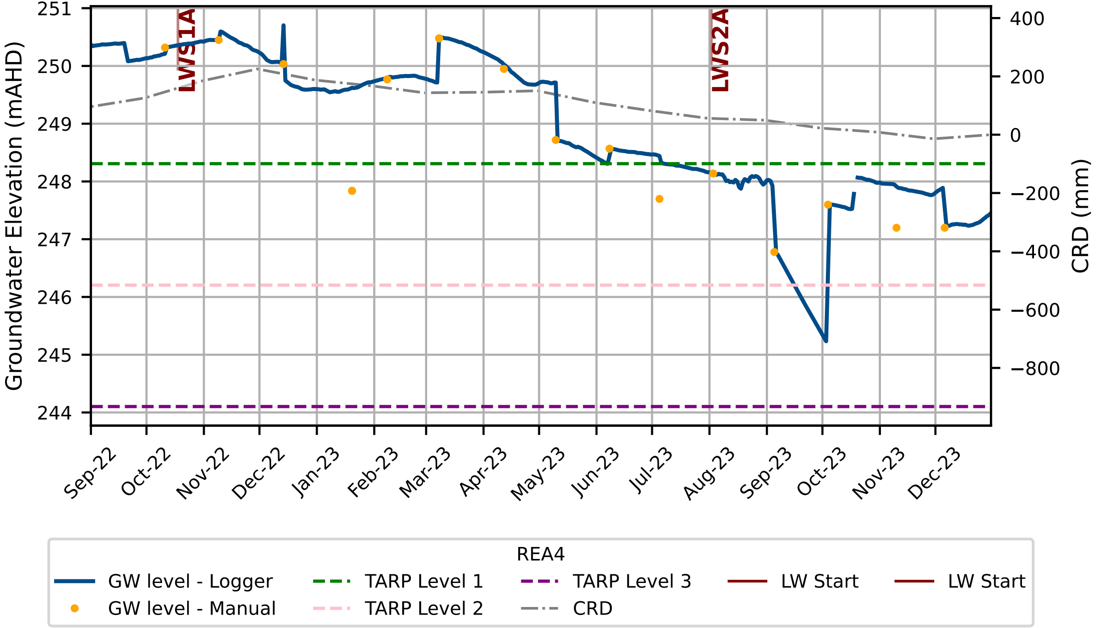
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
290
288
286
284
282
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



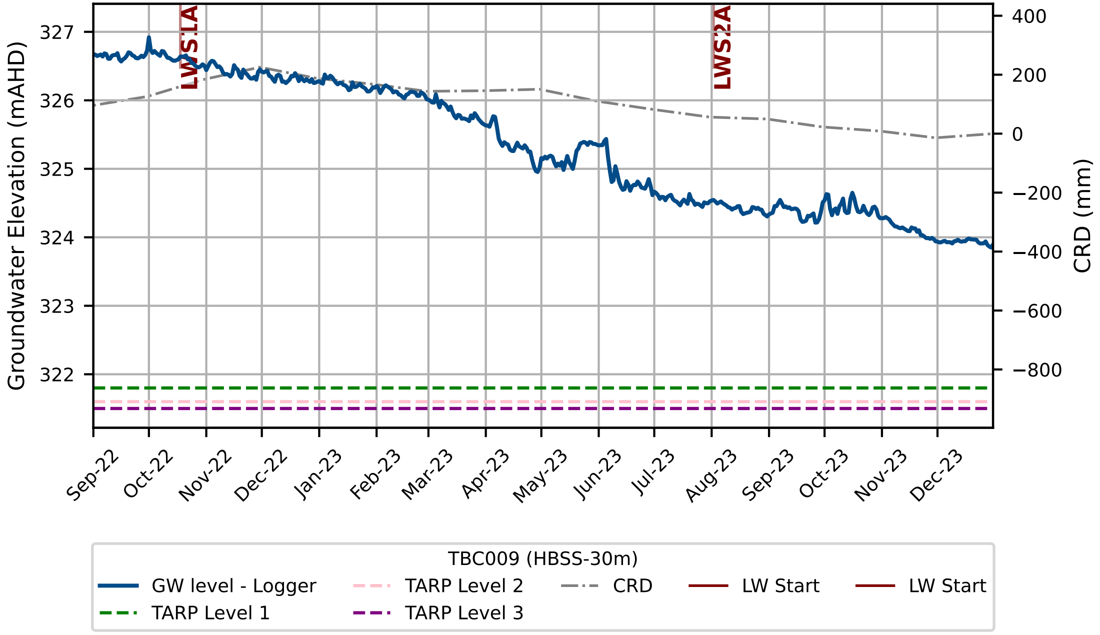
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
290.0
287.5
285.0
282.5
280.0
277.5
275.0
272.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



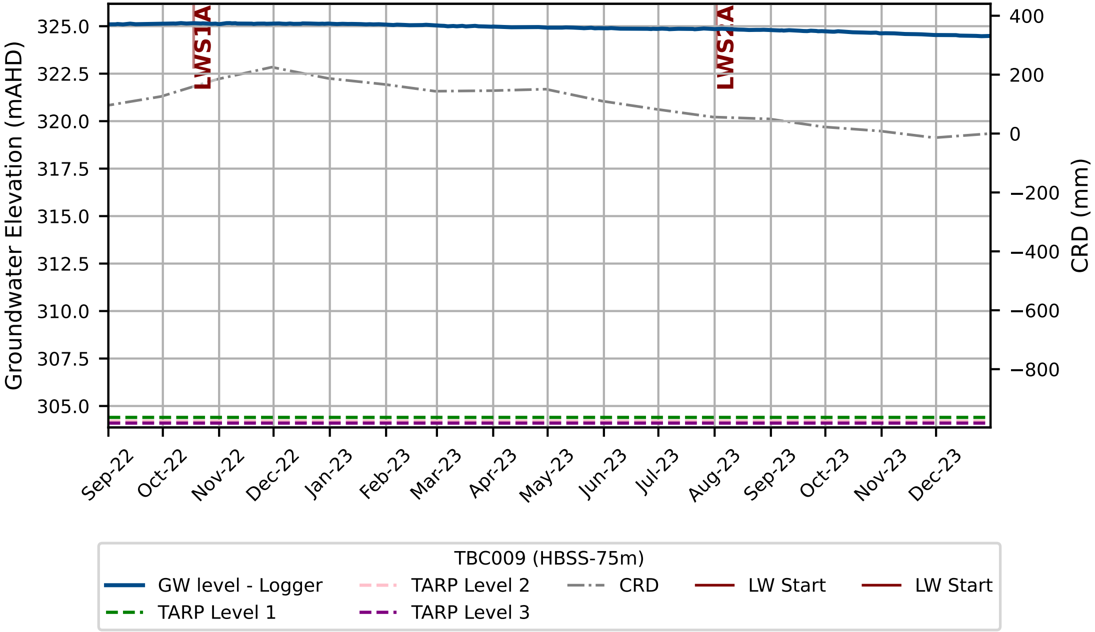
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
260
258
256
254
252
250
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



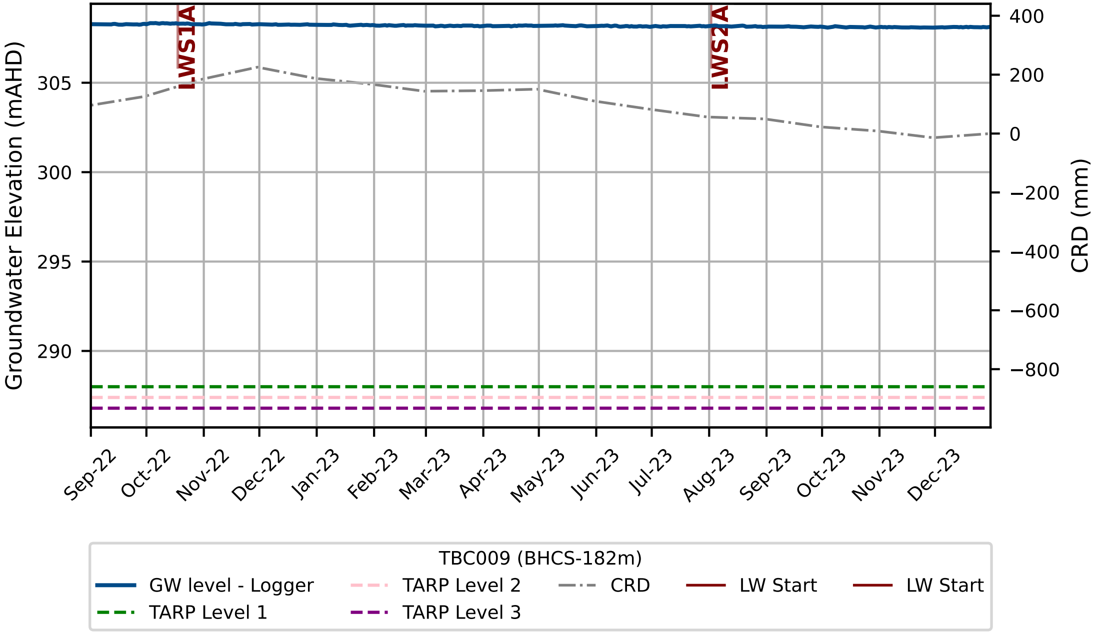
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
251
250
249
248
247
246
245
244
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
GW level - Logger
GW level - Manual
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



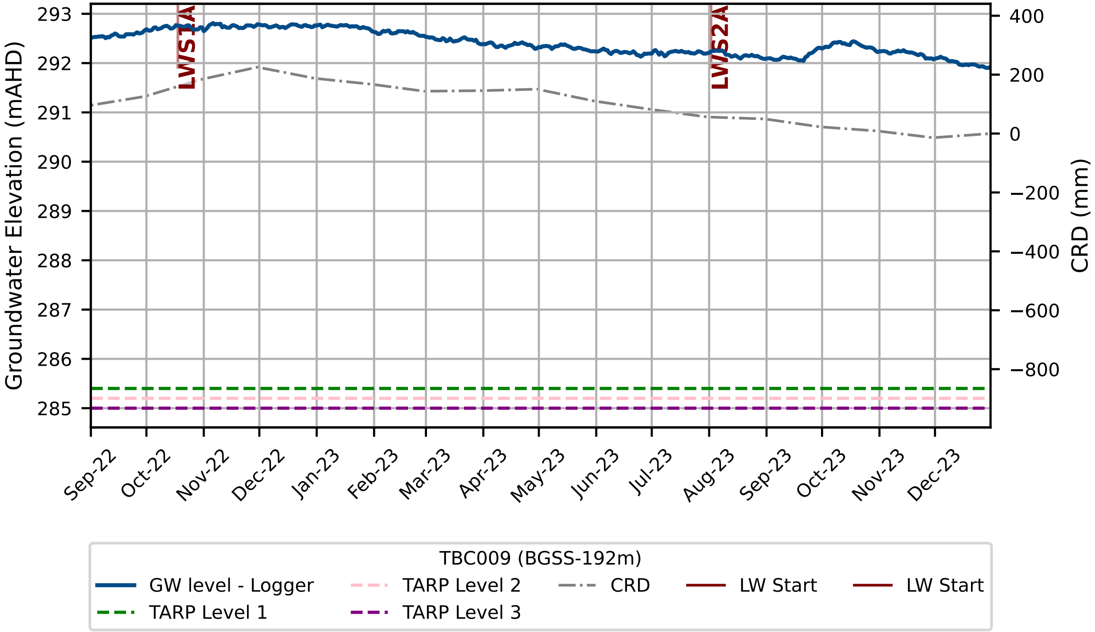
LW S1A
LW S2A
Groundwater Elevation (mAHD)
327
326
325
324
323
322
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (HBSS-30m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



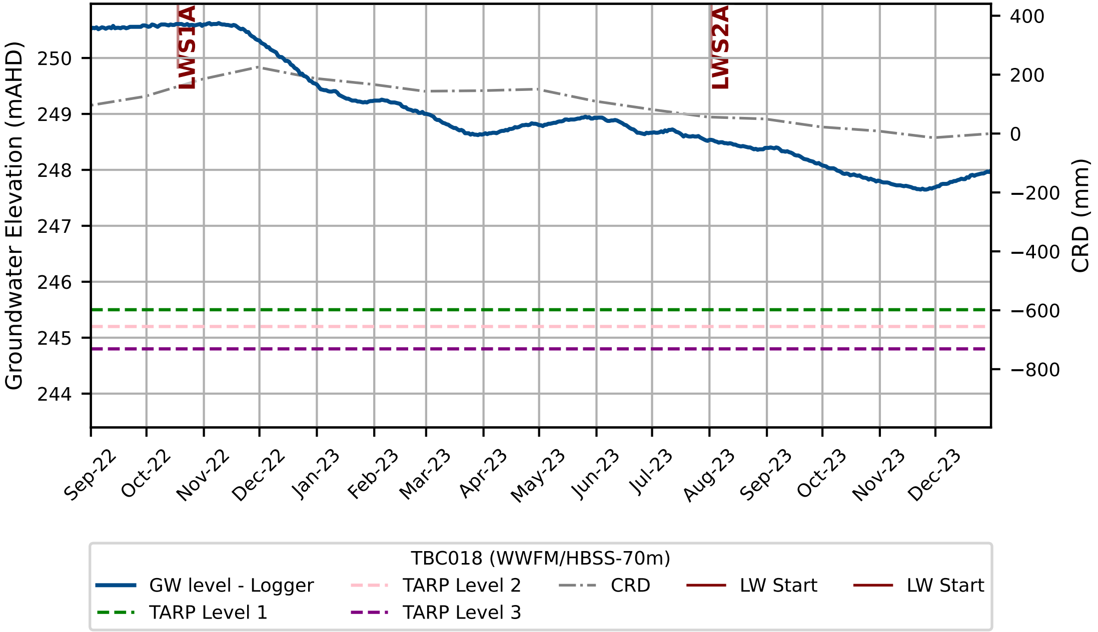
Groundwater Elevation (mAHD)
CRD (mm)
325.0
322.5
320.0
317.5
315.0
312.5
310.0
307.5
305.0
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (HBSS-75m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



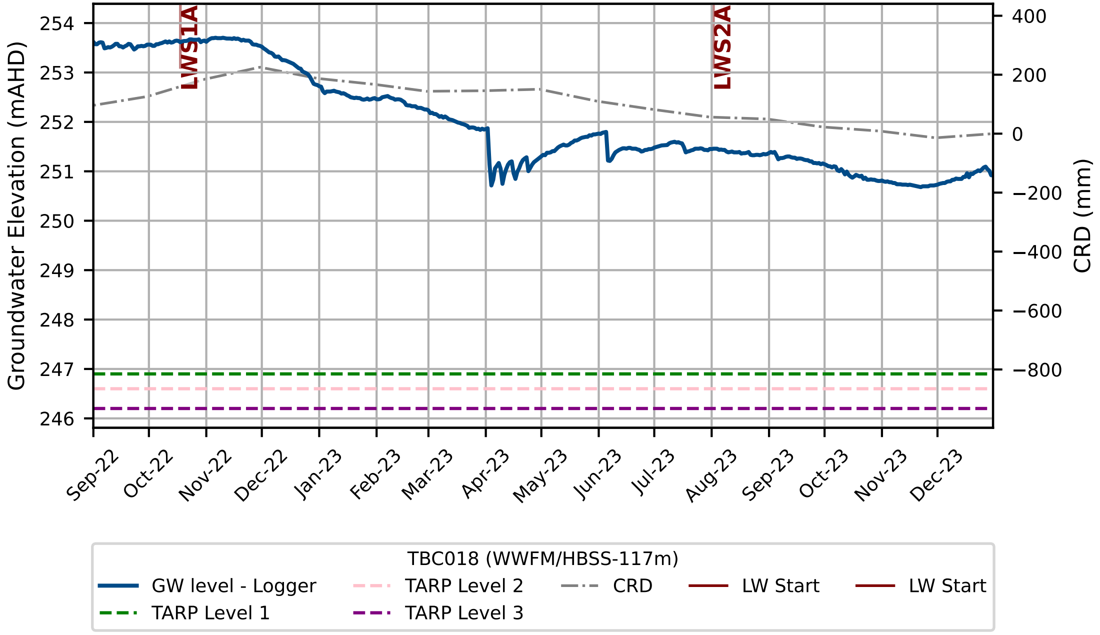
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
305
300
295
290
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (BHCS-182m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



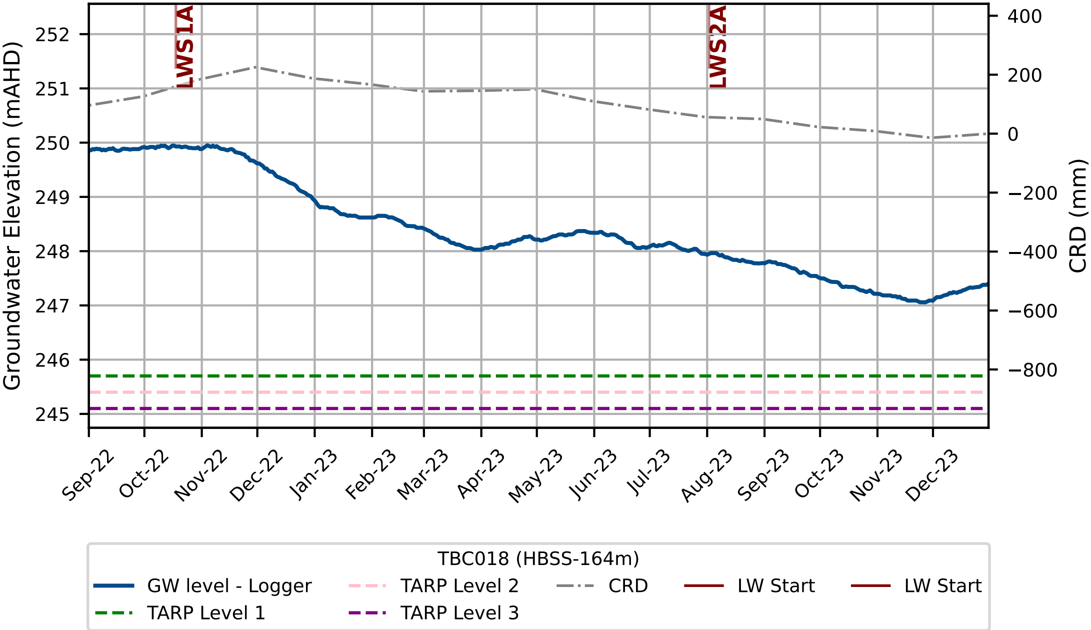
Groundwater Elevation (mAHD)
CRD (mm)
293
292
291
290
289
288
287
286
285
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (BGSS-192m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



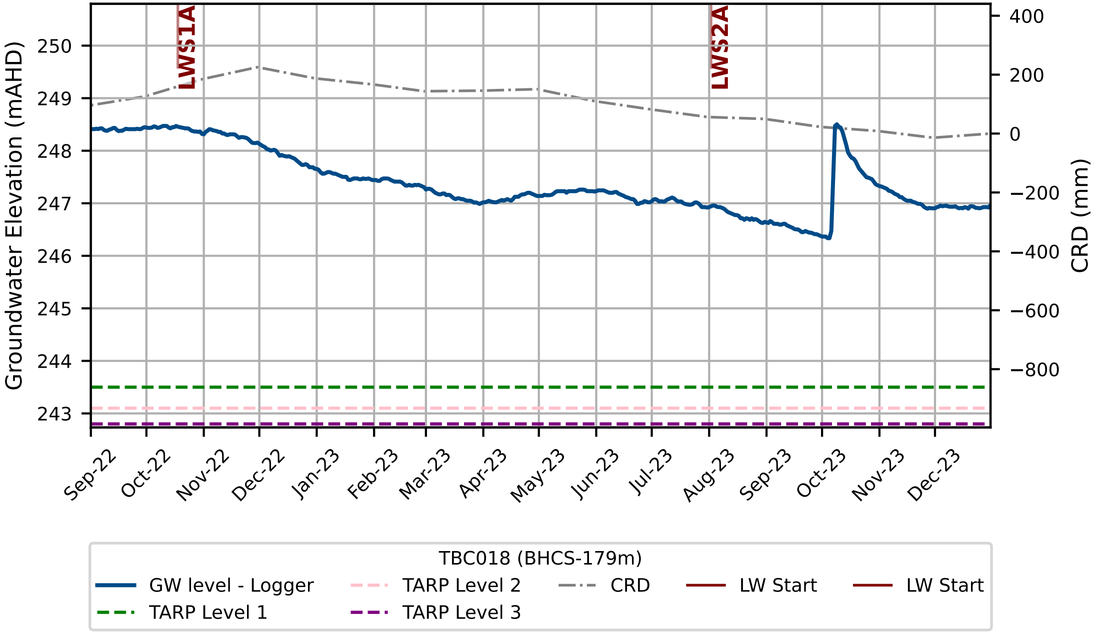
Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
250
249
248
247
246
245
244
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (WWFM/HBSS-70m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



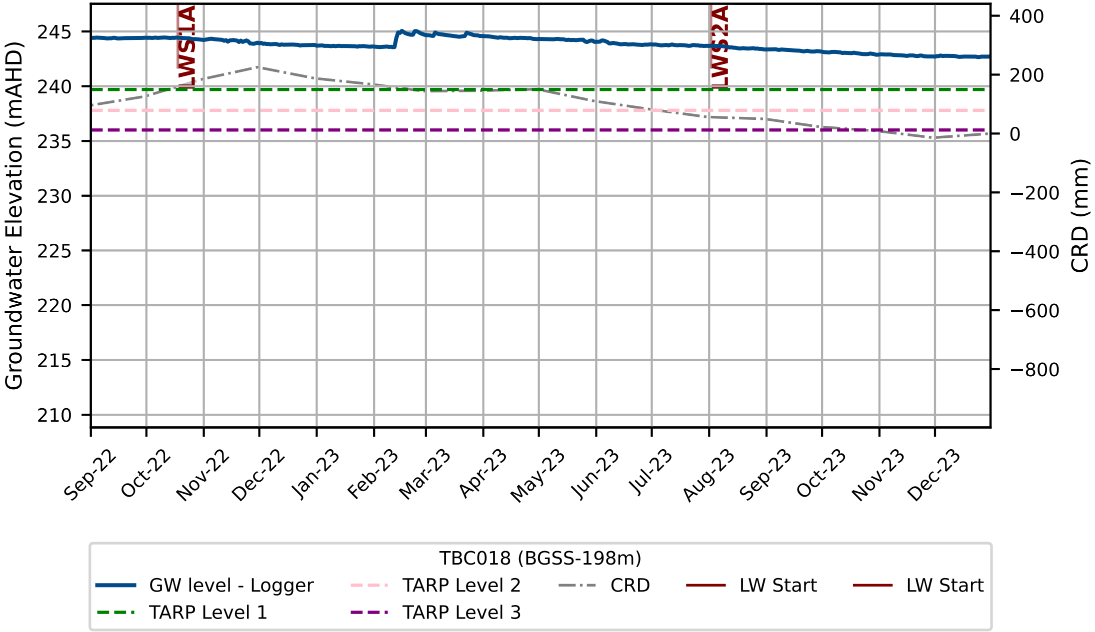
Groundwater Elevation (mAHD)
CRD (mm)
254
253
252
251
250
249
248
247
246
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (WWFM/HBSS-117m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



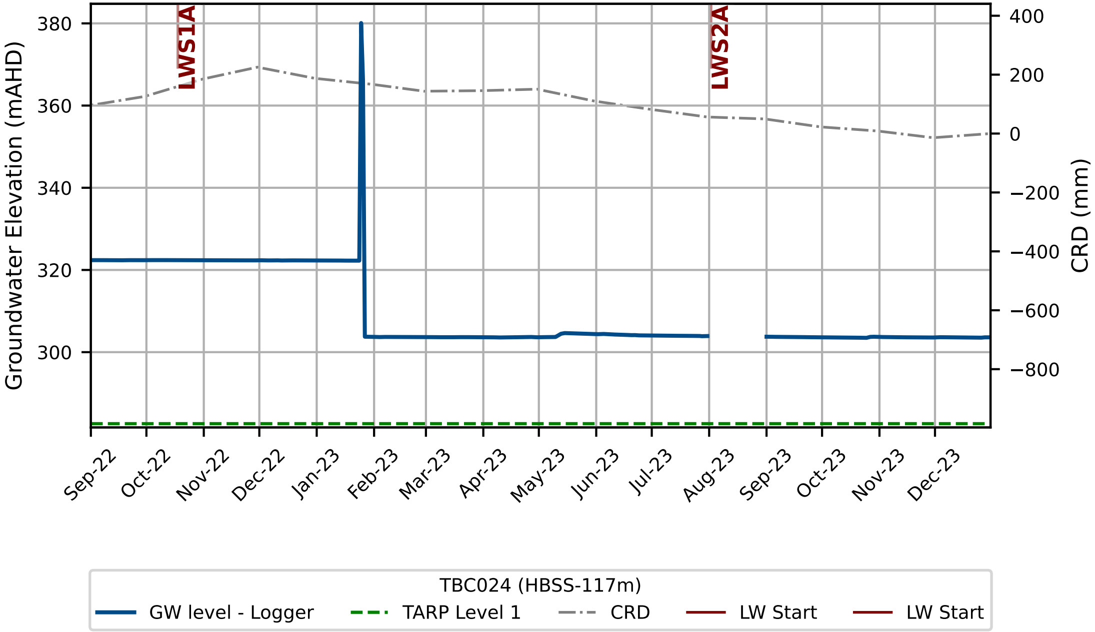
LWS1A
LWS2A
Groundwater Elevation (mAHD)
252
251
250
249
248
247
246
245
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (HBSS-164m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



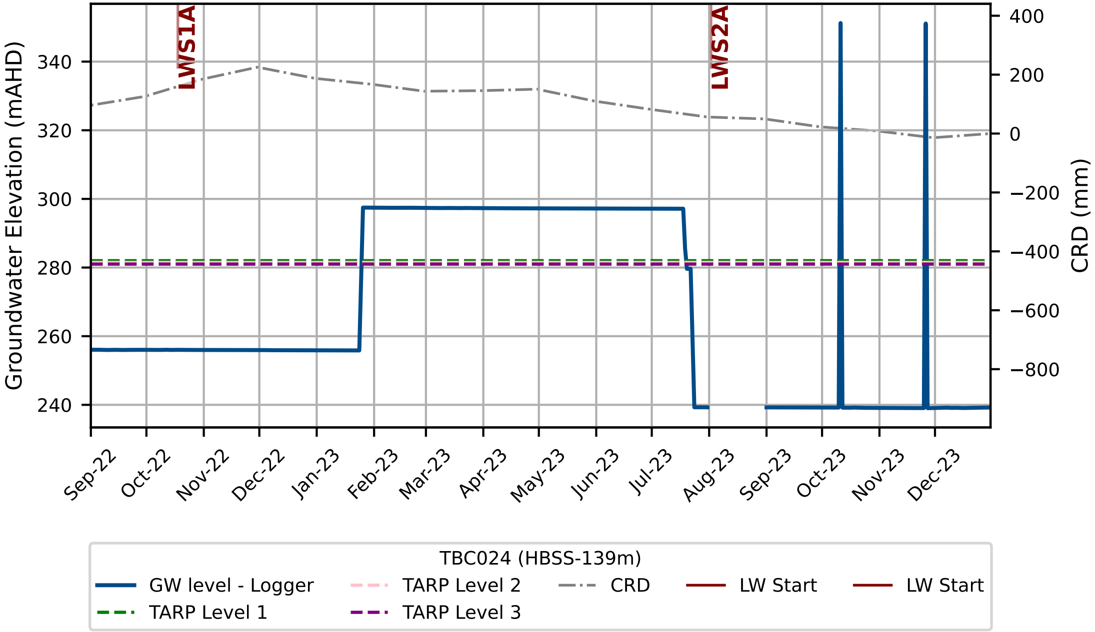
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
250
249
248
247
246
245
244
243
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (BHCS-179m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



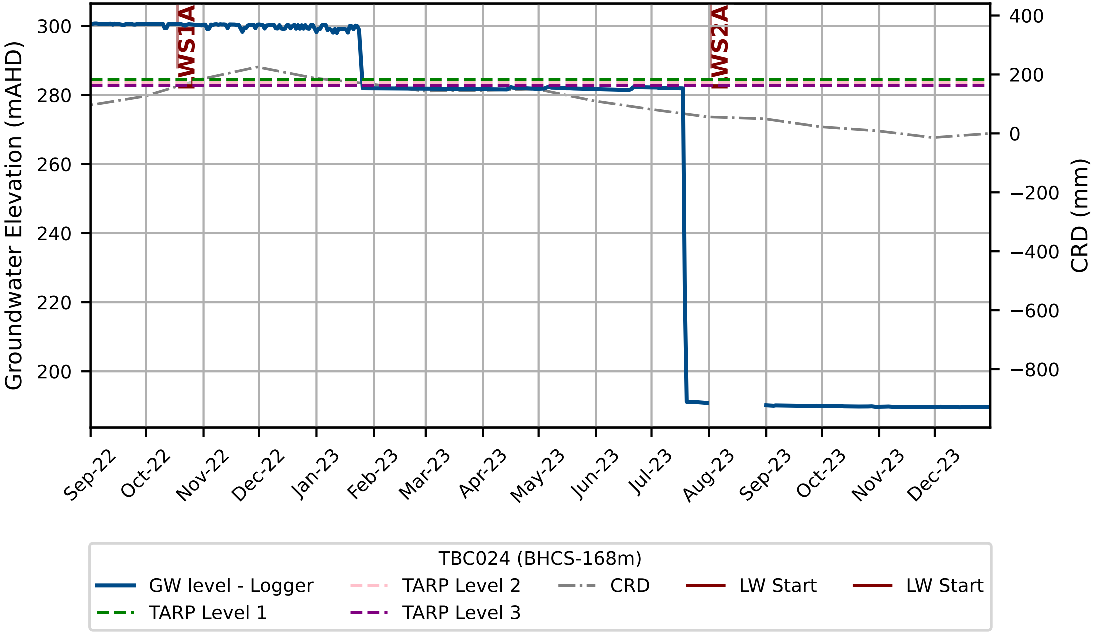
Groundwater Elevation (mAHD)
CRD (mm)
245
240
235
230
225
220
215
210
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (BGSS-198m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



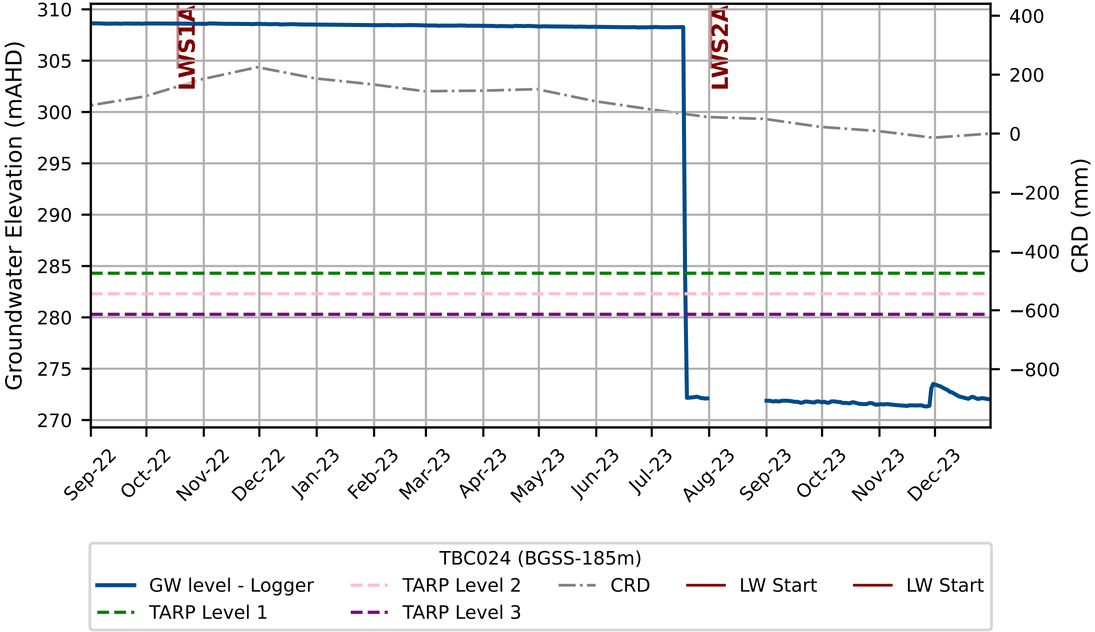
Groundwater Elevation (mAHD)
CRD (mm)
380
360
340
320
300
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC024 (HBSS-117m)
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start



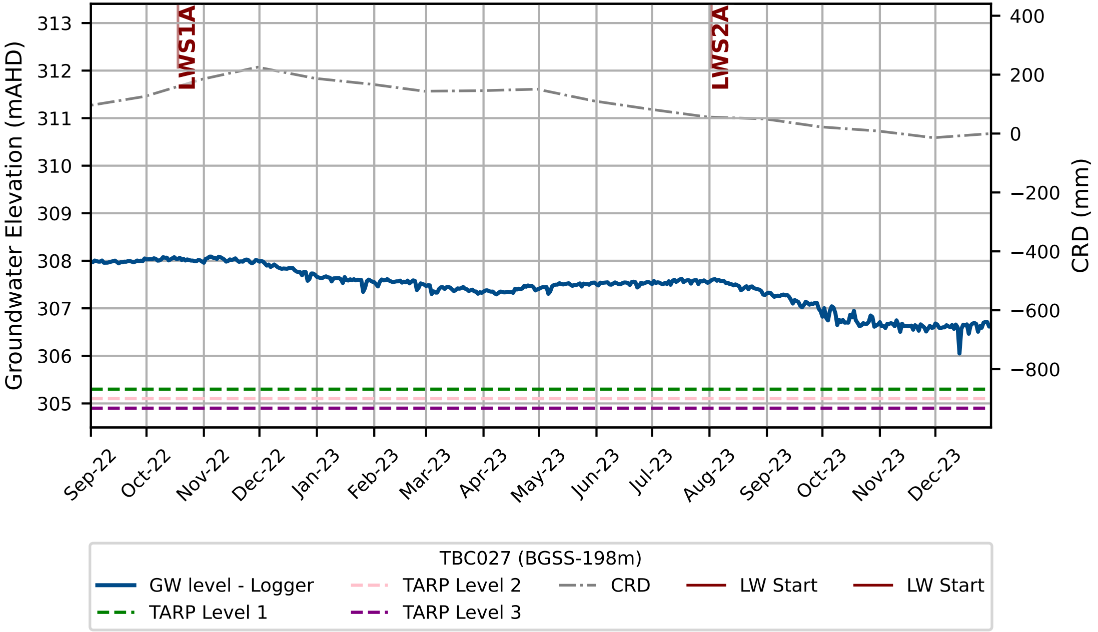
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
340
320
300
280
260
240
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC024 (HBSS-139m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



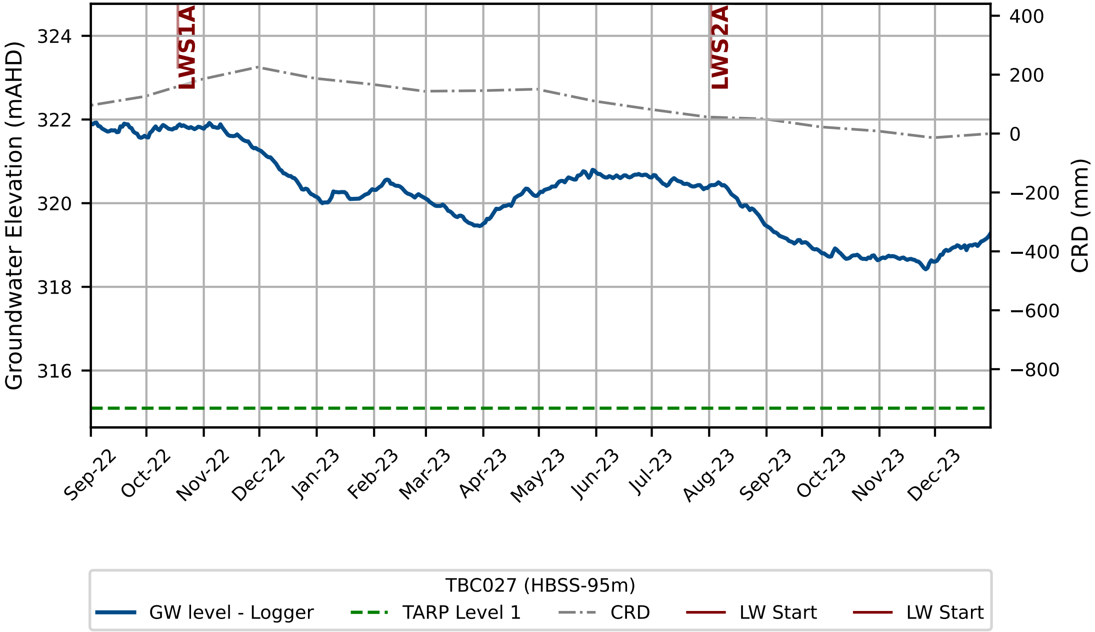
Groundwater Elevation (mAHD)
CRD (mm)
300
280
260
240
220
200
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC024 (BHCS-168m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



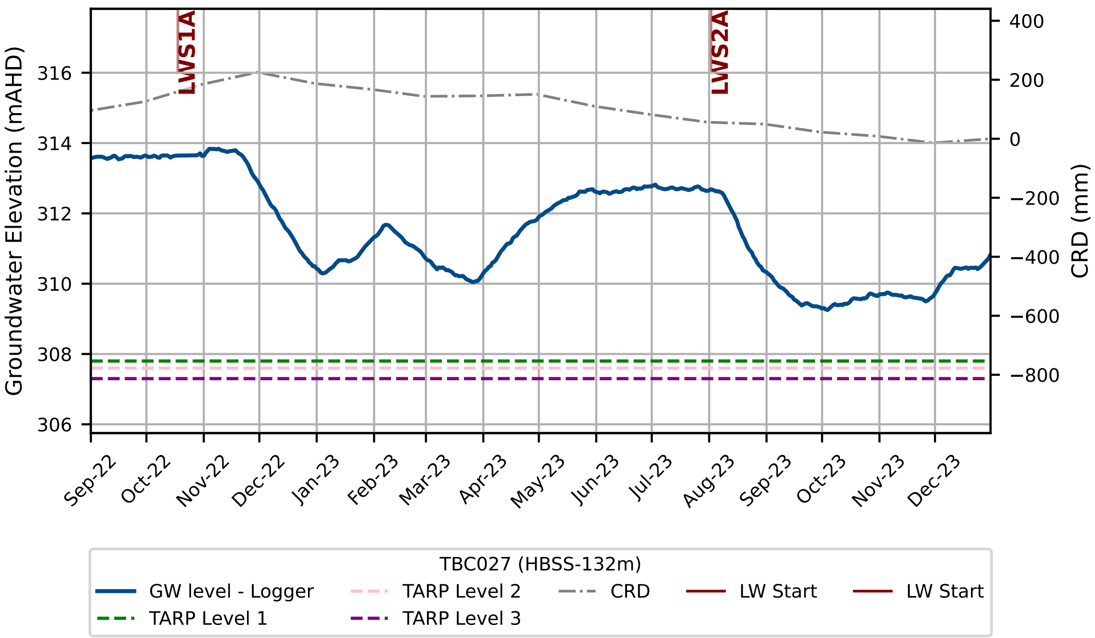
Groundwater Elevation (mAHD)
CRD (mm)
310
305
300
295
290
285
280
275
270
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC024 (BGSS-185m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



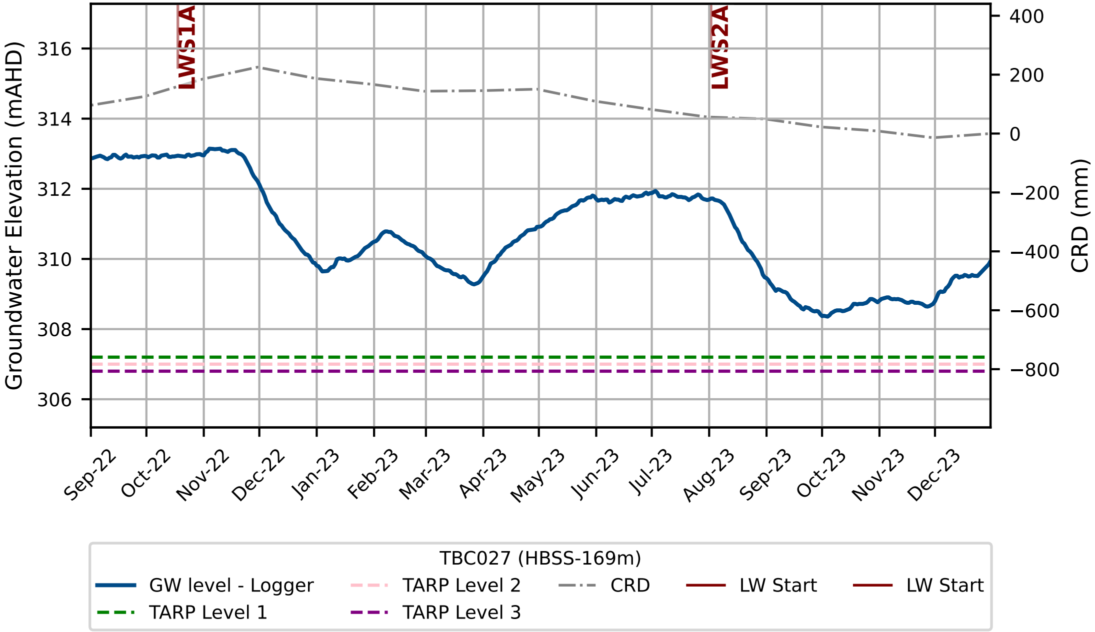
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
313
312
311
310
309
308
307
306
305
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC027 (BGSS-198m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



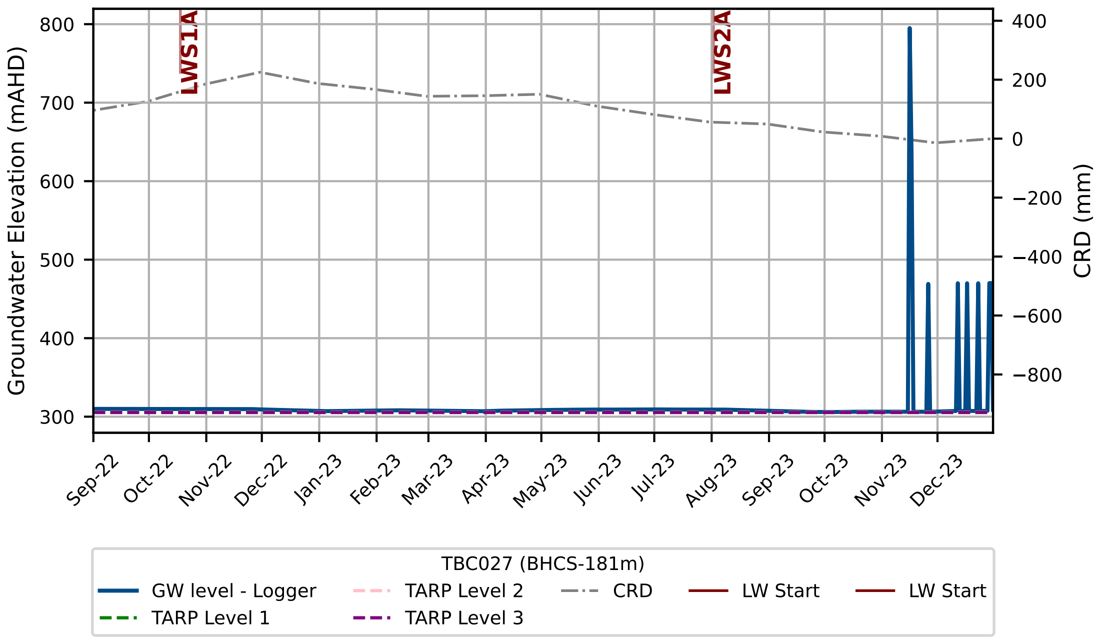
Groundwater Elevation (mAHD)
CRD (mm)
324
322
320
318
316
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC027 (HBSS-95m)
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start



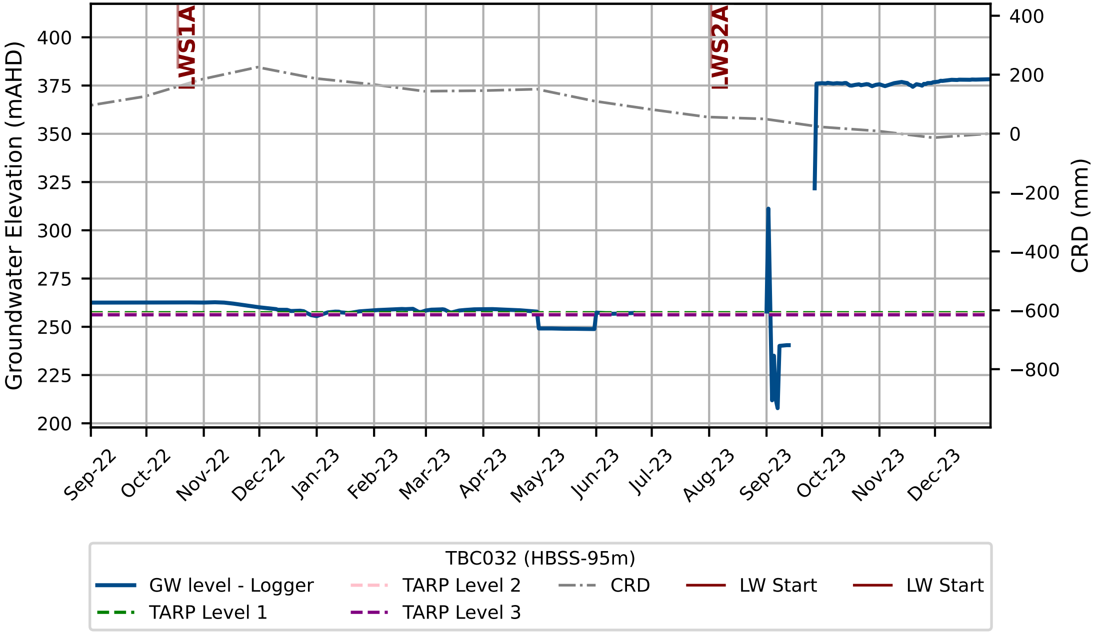
Groundwater Elevation (mAHD)
CRD (mm)
306
308
310
312
314
316
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC027 (HBSS-132m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



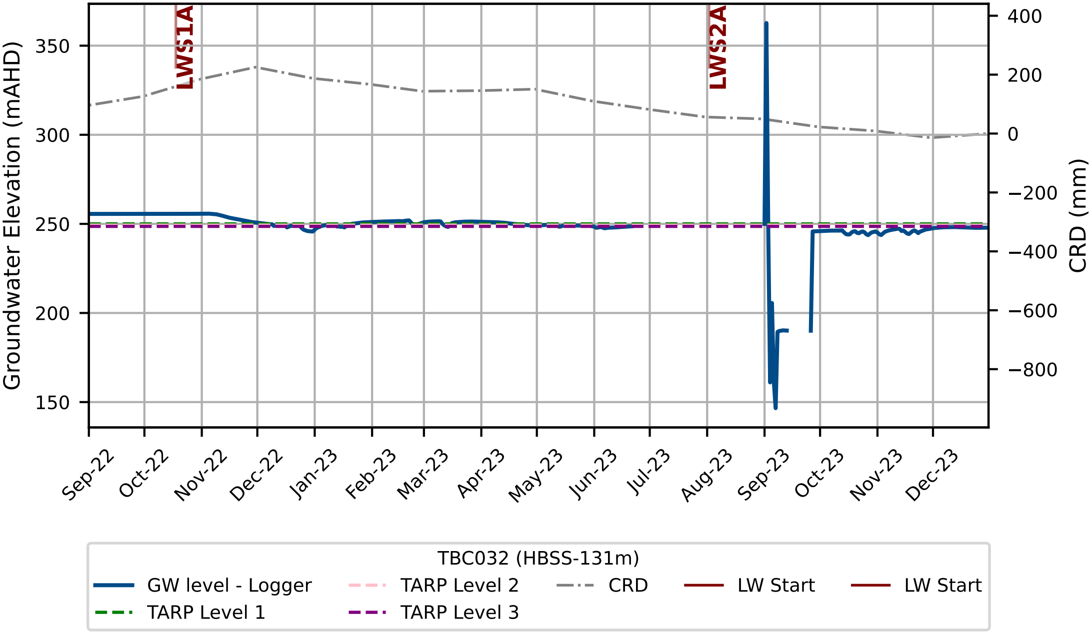
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
316
314
312
310
308
306
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC027 (HBSS-169m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



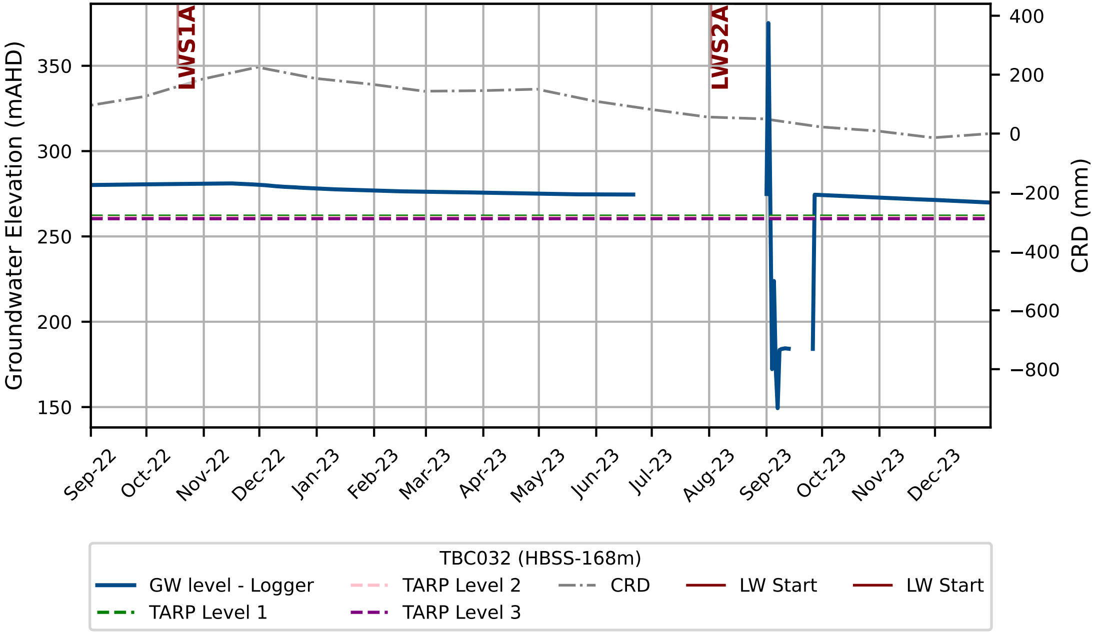
LWS1A
LWS2A
Groundwater Elevation (mAHD)
800
700
600
500
400
300
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC027 (BHCS-181m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



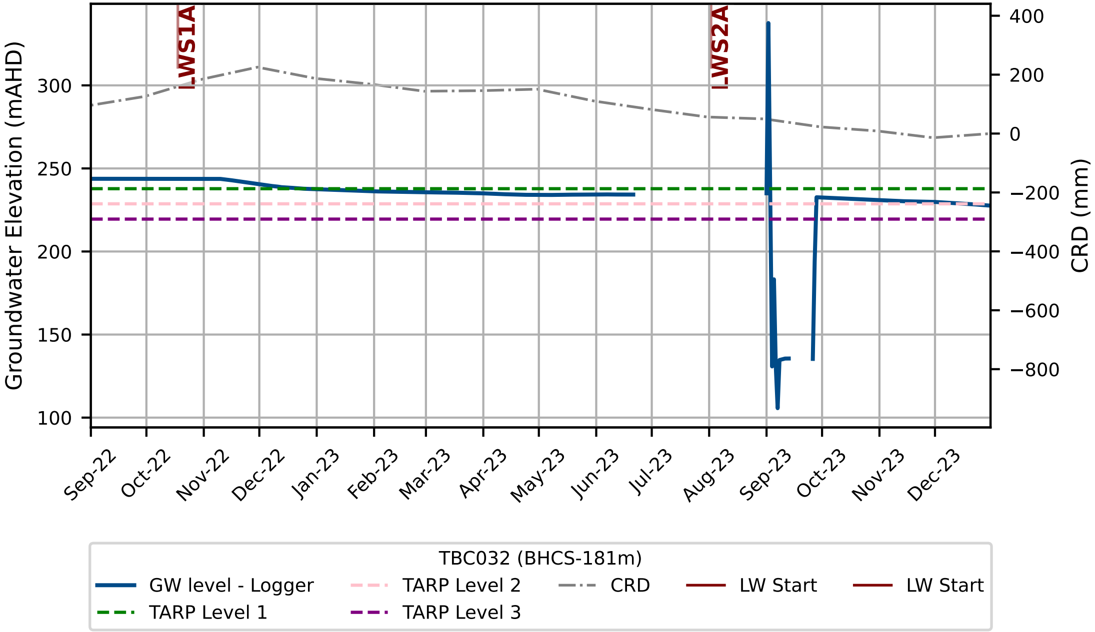
LW1A
LW2A
Groundwater Elevation (mAHD)
CRD (mm)
400
375
350
325
300
275
250
225
200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (HBSS-95m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



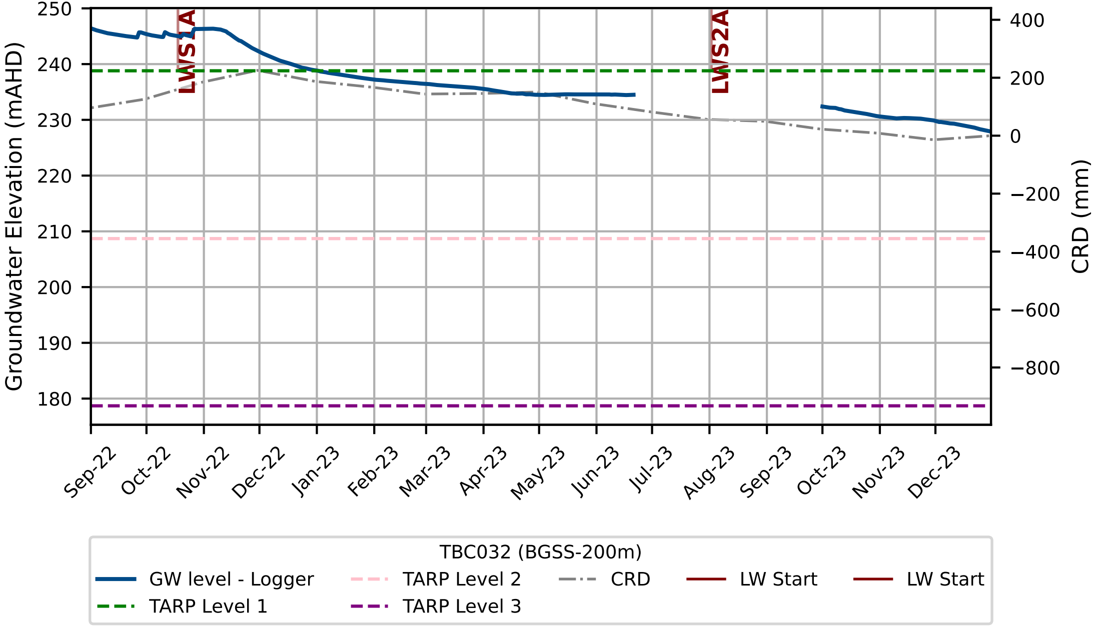
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
350
300
250
200
150
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (HBSS-131m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start



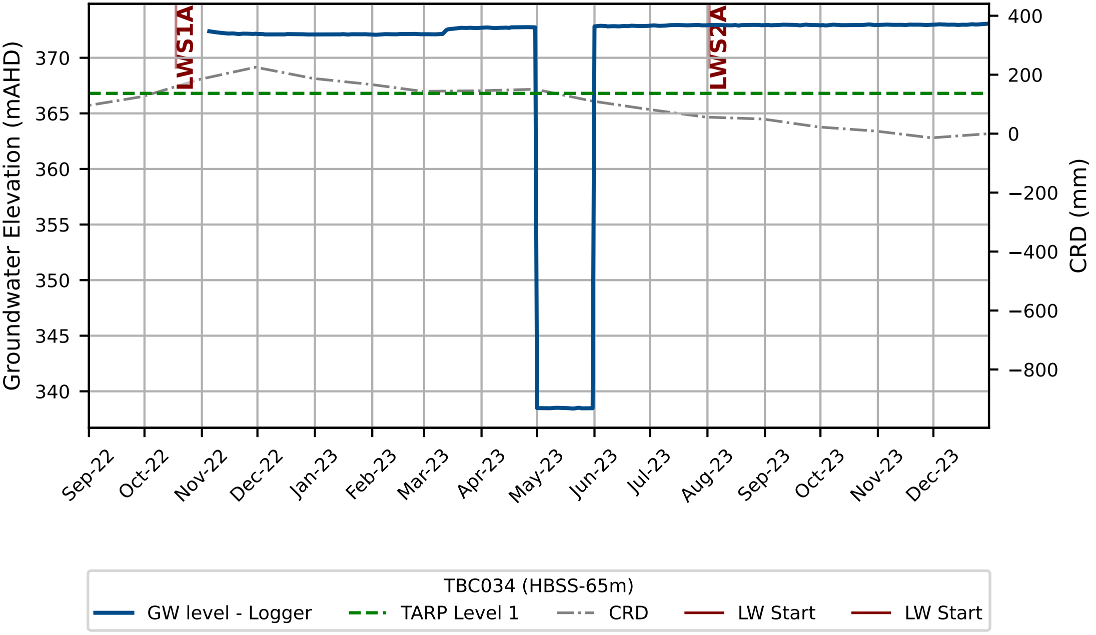
LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
350
300
250
200
150
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (HBSS-168m)
GW level - Logger
TARP Level 2
CRD
LW Start
LW Start
TARP Level 1
TARP Level 3

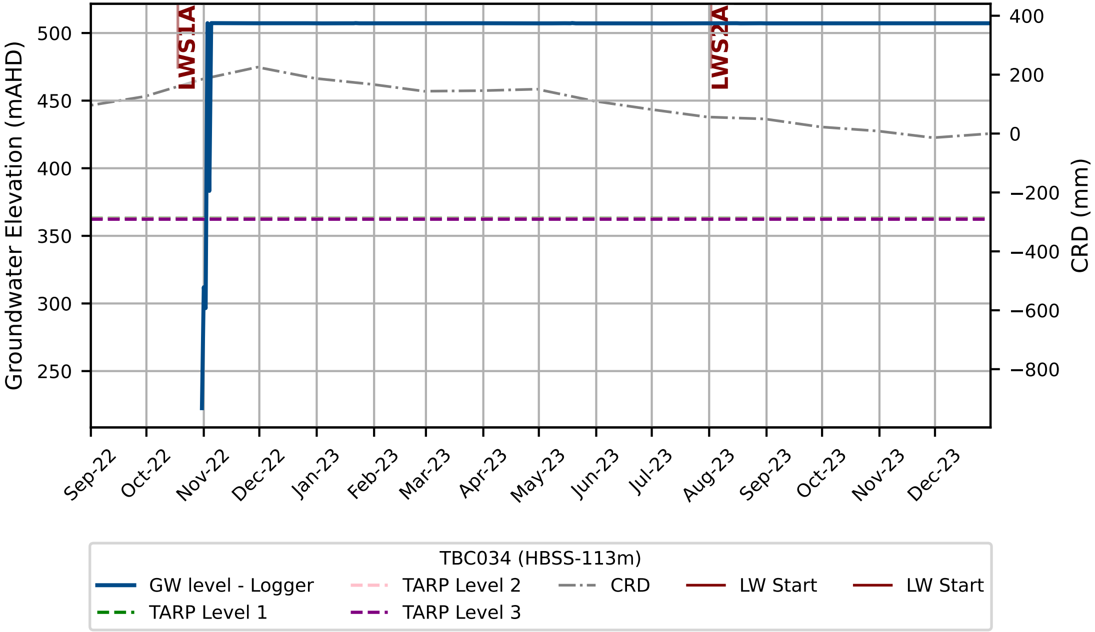


LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
100
150
200
250
300
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (BHCS-181m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

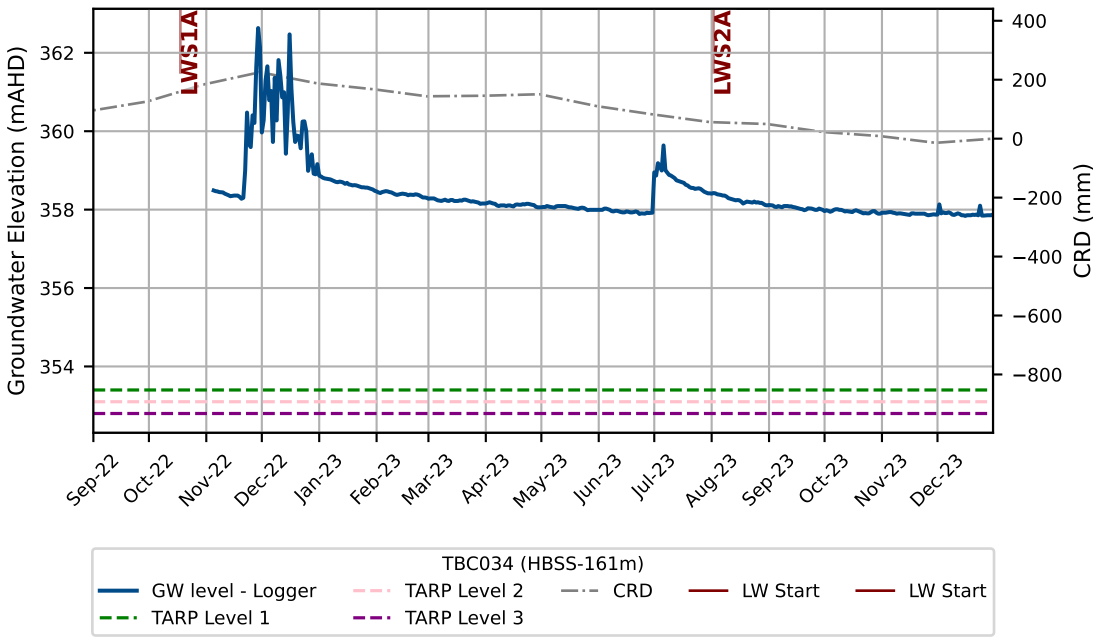


Groundwater Elevation (mAHD)
CRD (mm)
250
240
230
220
210
200
190
180
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (BGSS-200m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

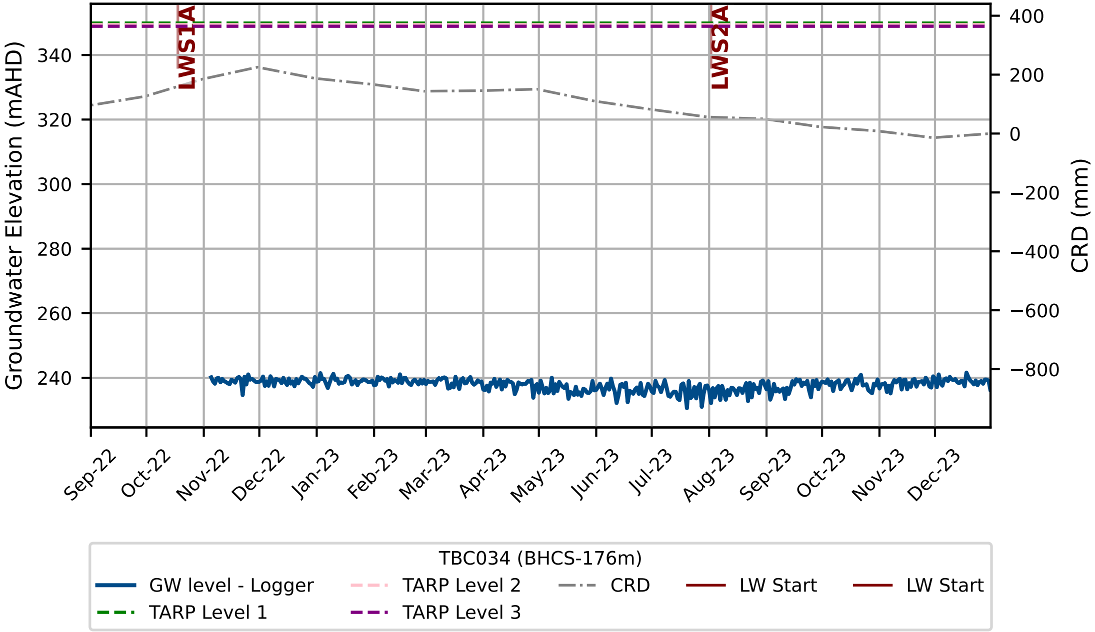

Groundwater Elevation (mAHD)
CRD (mm)
370
365
360
355
350
345
340
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC034 (HBSS-65m)
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start

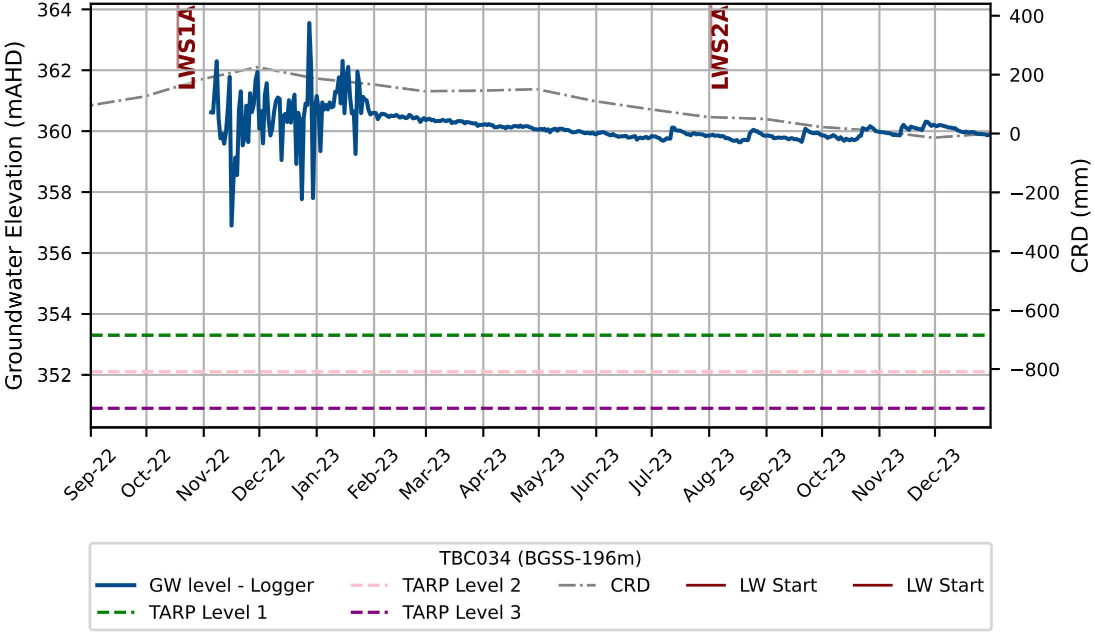


Groundwater Elevation (mAHD)
CRD (mm)
500
450
400
350
300
250
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC034 (HBSS-113m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

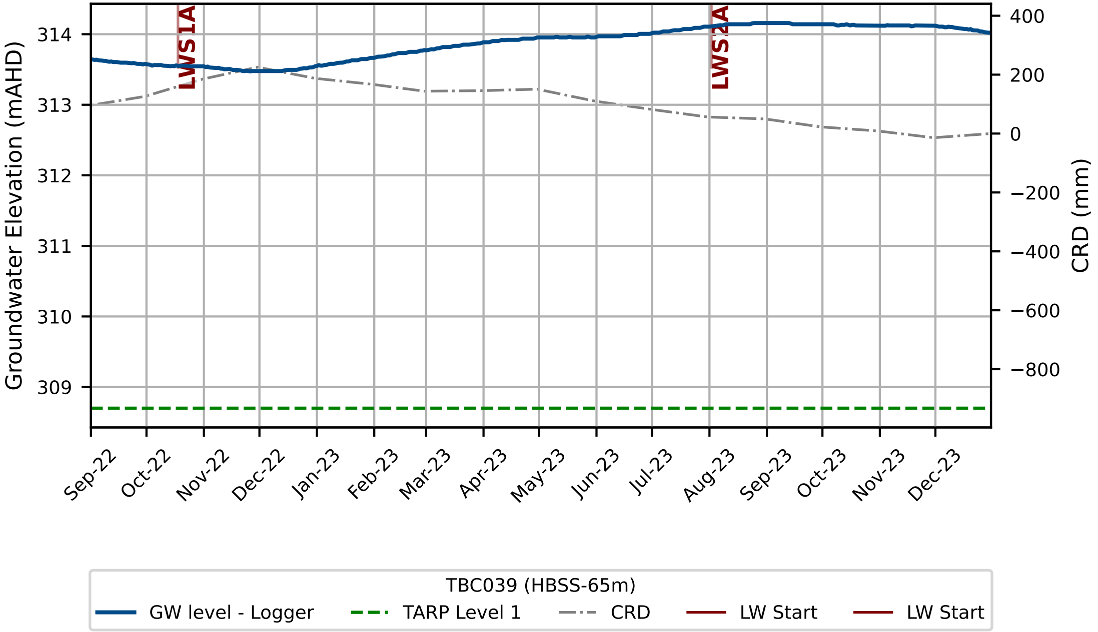


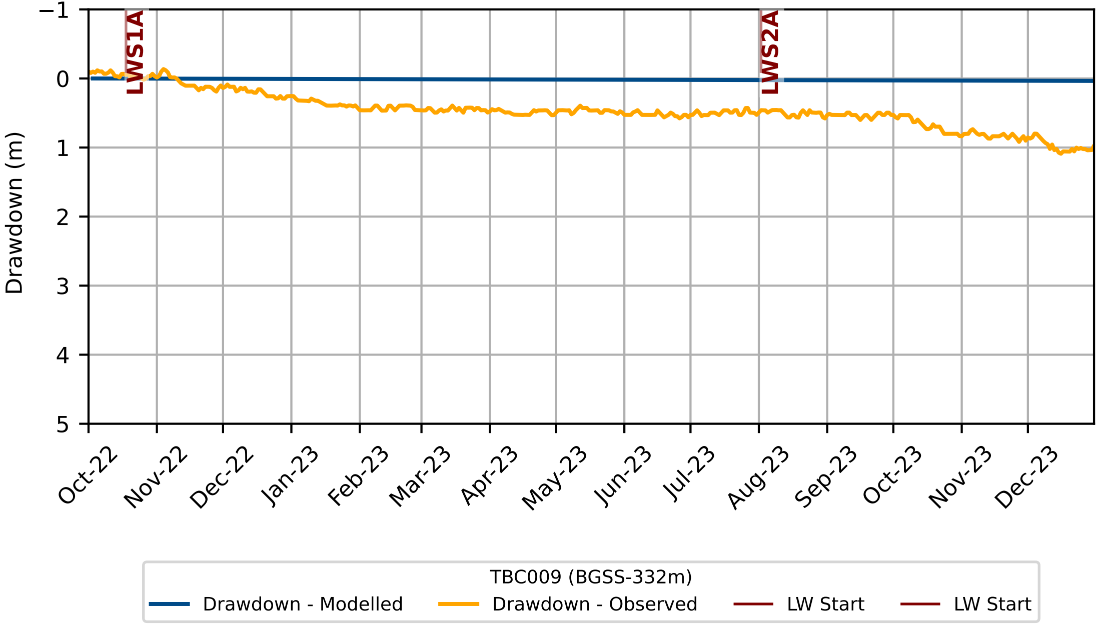
Groundwater Elevation (mAHD)
362
360
358
356
354
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC034 (HBSS-161m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start


Groundwater Elevation (mAHD)
CRD (mm)
LWS1A
LWS2A
340
320
300
280
260
240
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC034 (BHCS-176m)
GW level - Logger
TARP Level 2
CRD
LW Start
LW Start
TARP Level 1
TARP Level 3

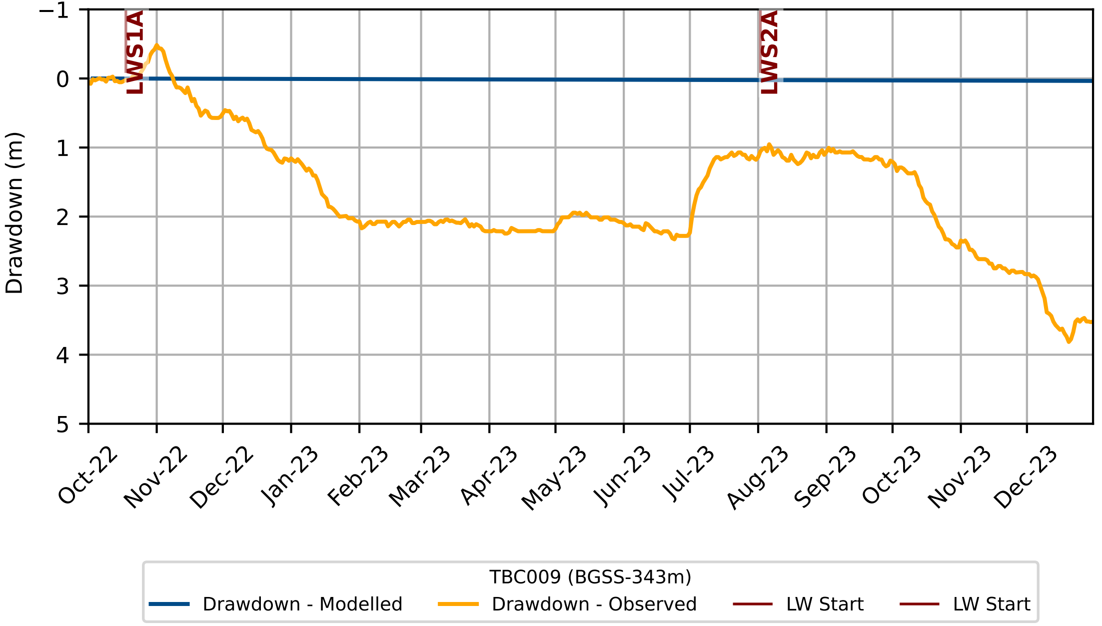


LWS1A
LWS2A
Groundwater Elevation (mAHD)
CRD (mm)
364
362
360
358
356
354
352
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC034 (BGSS-196m)
GW level - Logger
TARP Level 1
TARP Level 2
TARP Level 3
CRD
LW Start
LW Start

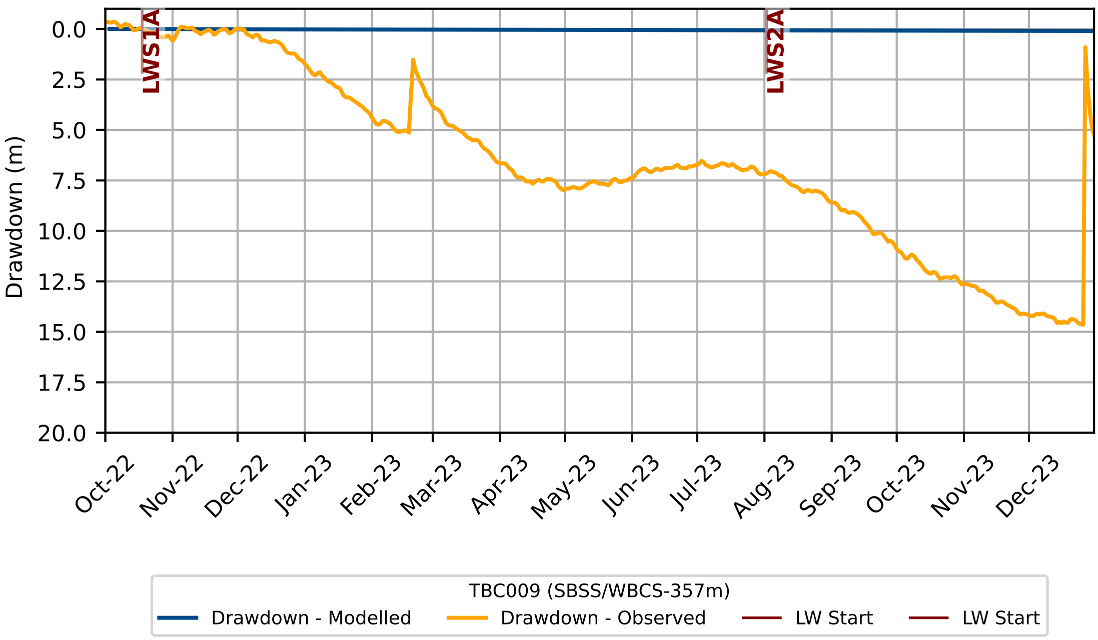

Groundwater Elevation (mAHD)
CRD (mm)
314
313
312
311
310
309
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (HBSS-65m)
GW level - Logger
TARP Level 1
CRD
LW Start
LW Start



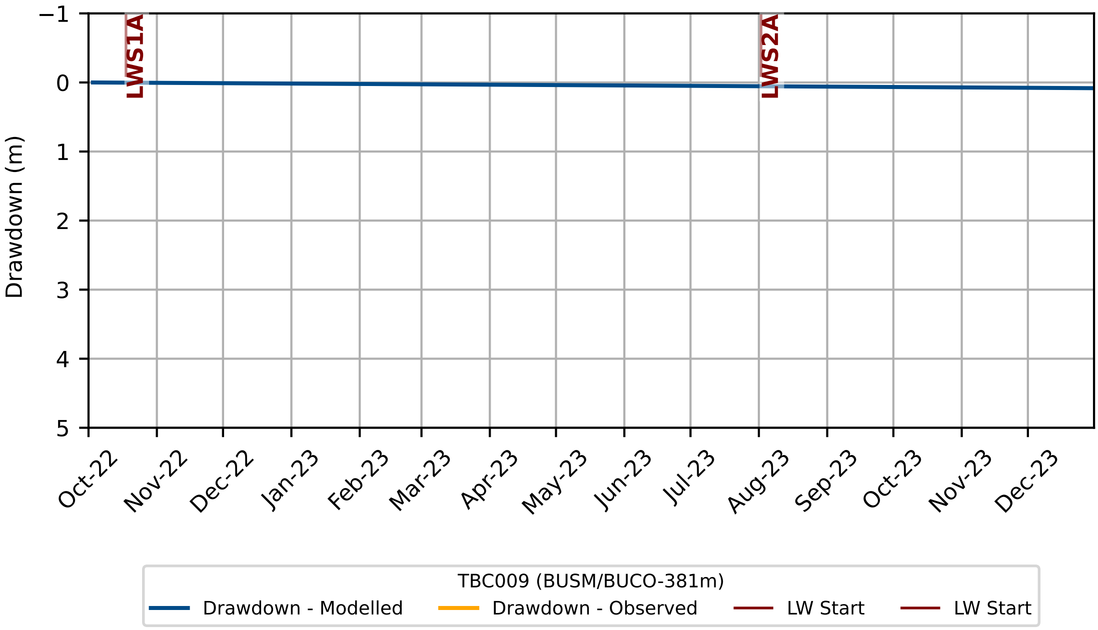
LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (BGSS-332m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



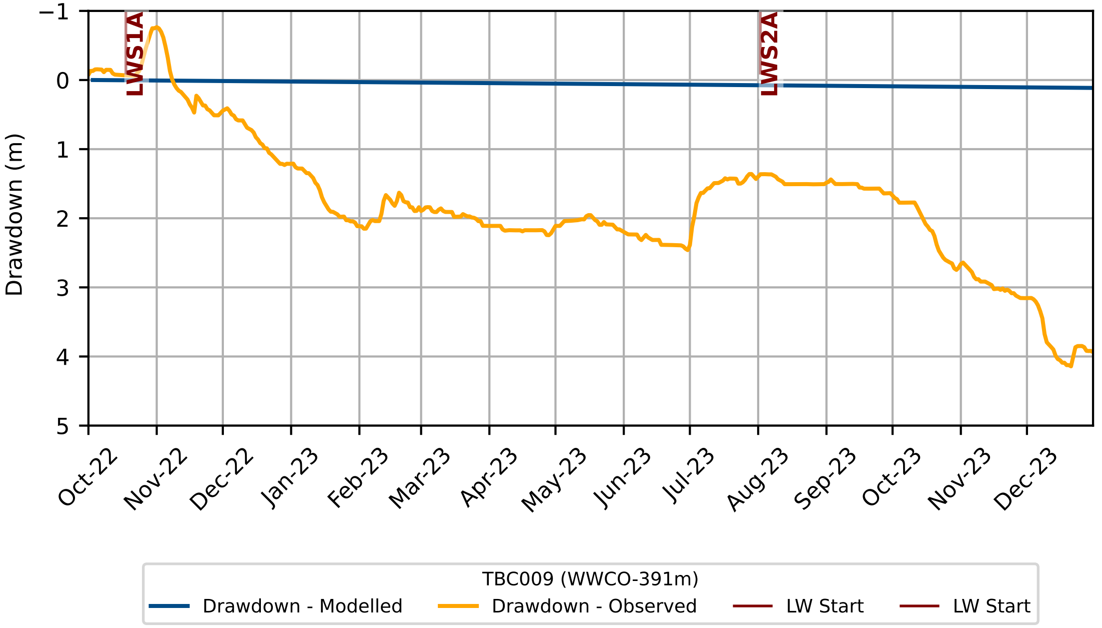
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (BGSS-343m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



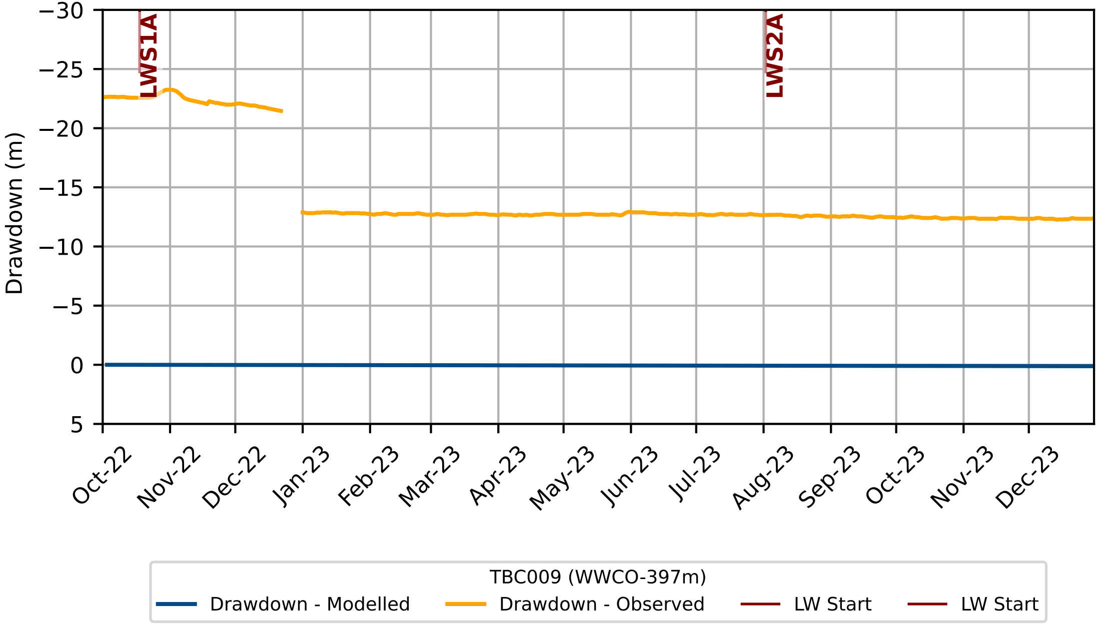
LWS1A
LWS2A
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (SBSS/WBCS-357m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



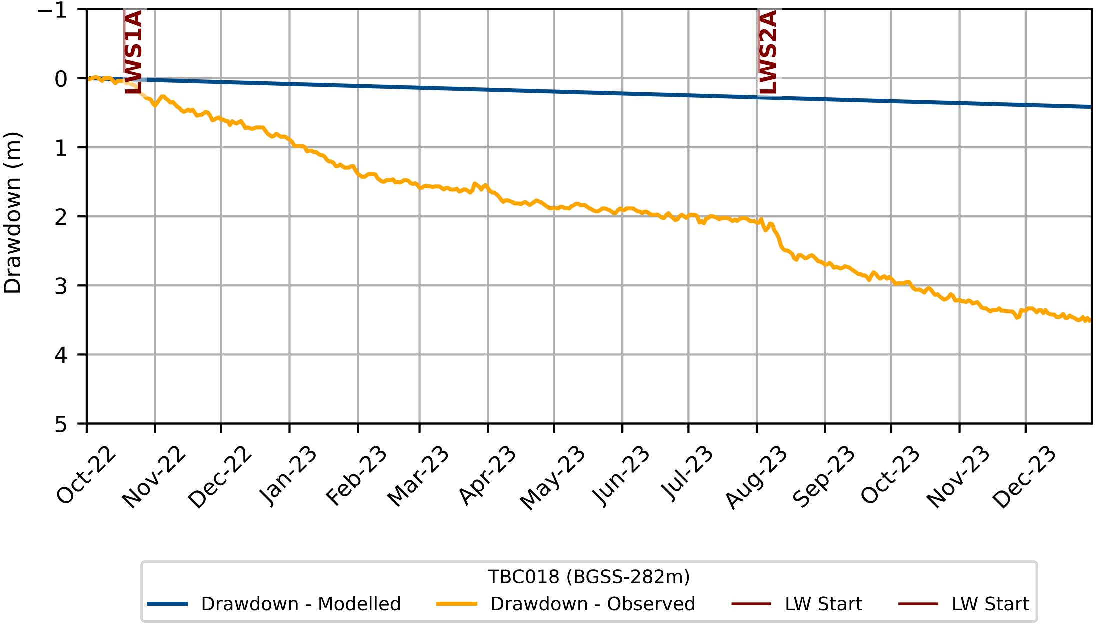
LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (BUSM/BUCO-381m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



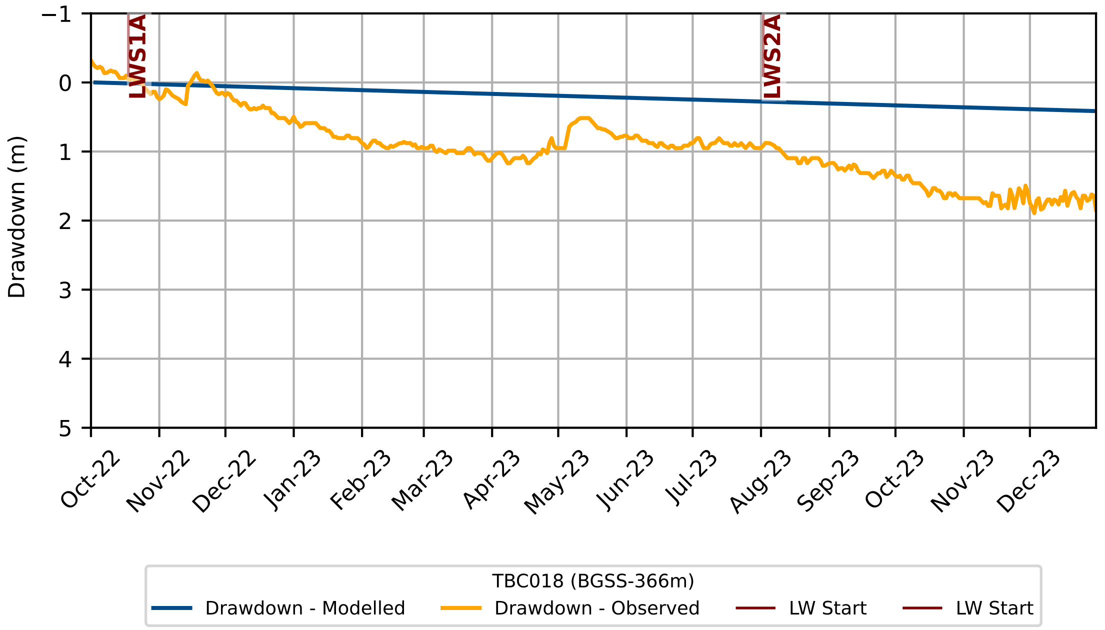
LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (WWCO-391m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



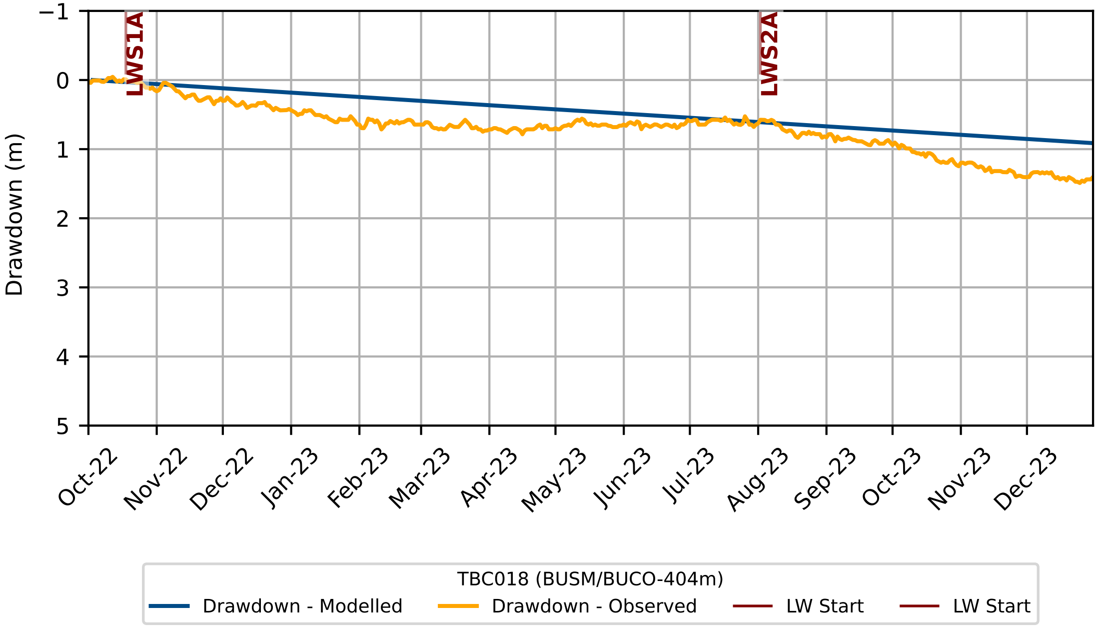
−30
−25
−20
−15
−10
−5
0
5
Drawdown (m)
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC009 (WWCO-397m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



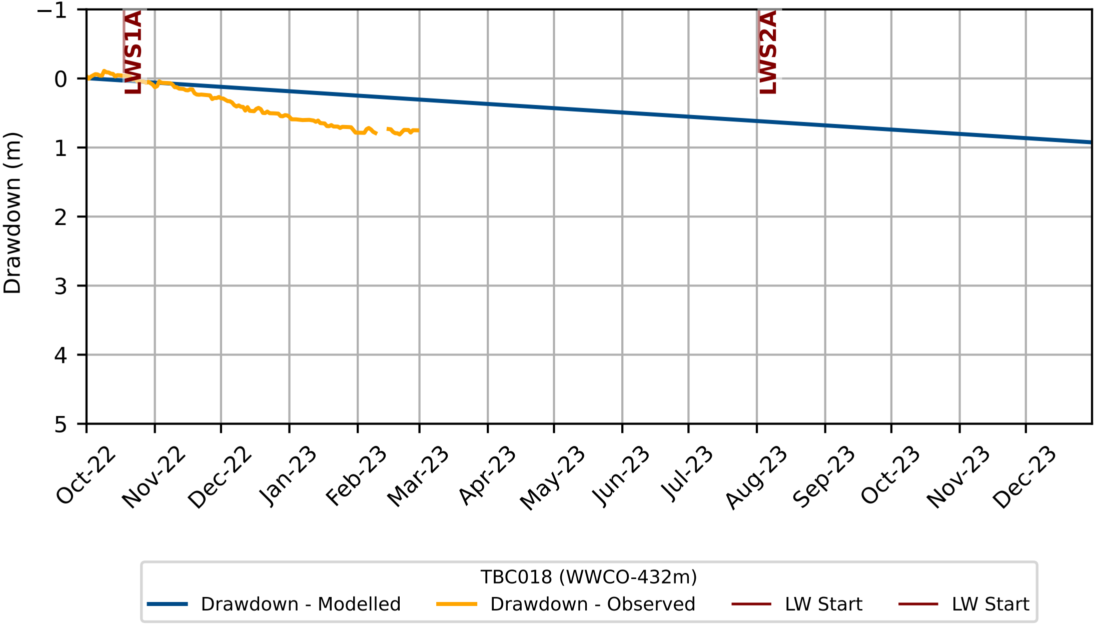
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (BGSS-282m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



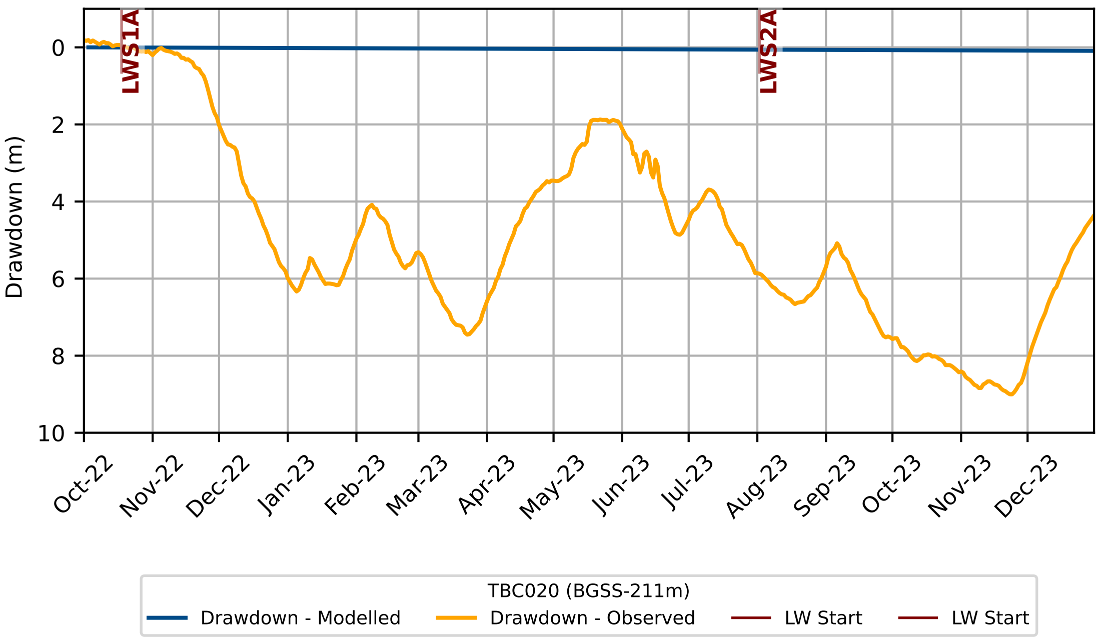
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (BGSS-366m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



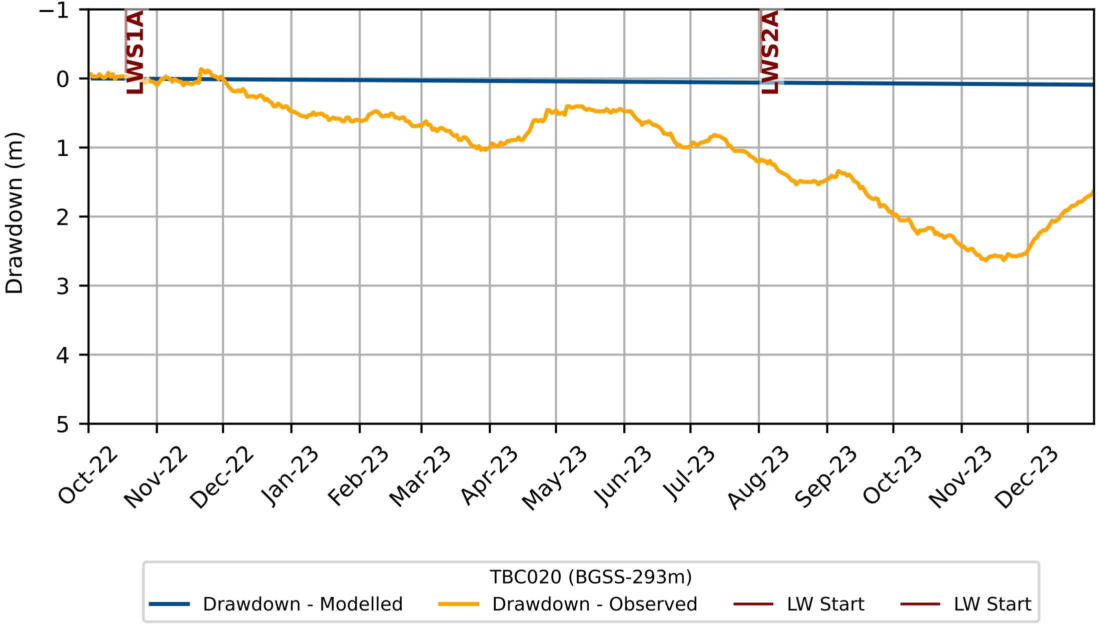
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (BUSM/BUCO-404m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



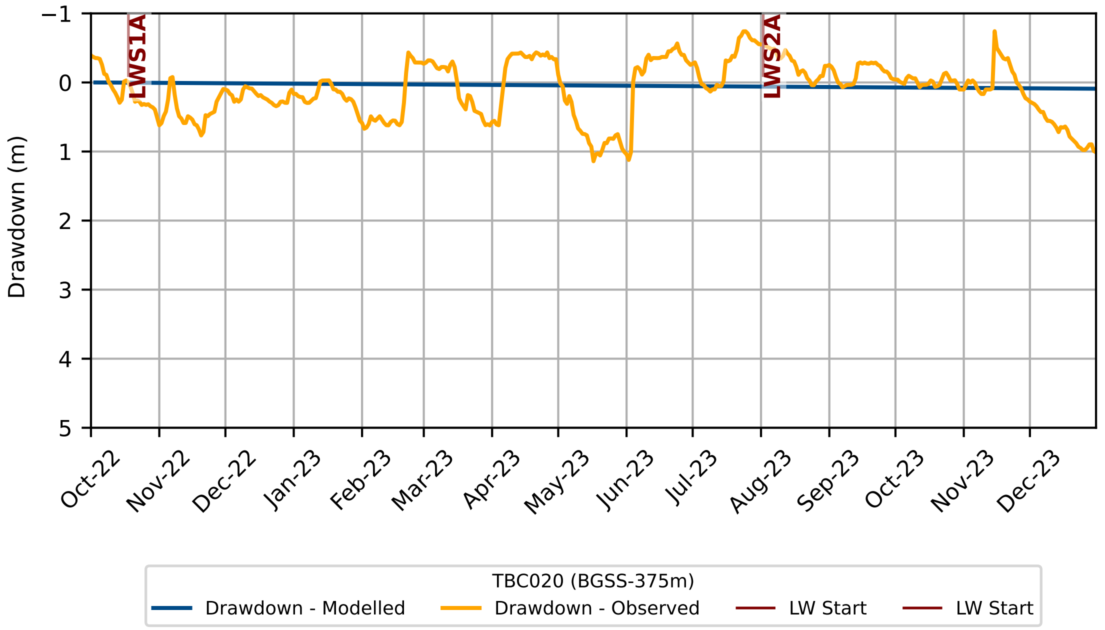
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC018 (WWCO-432m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



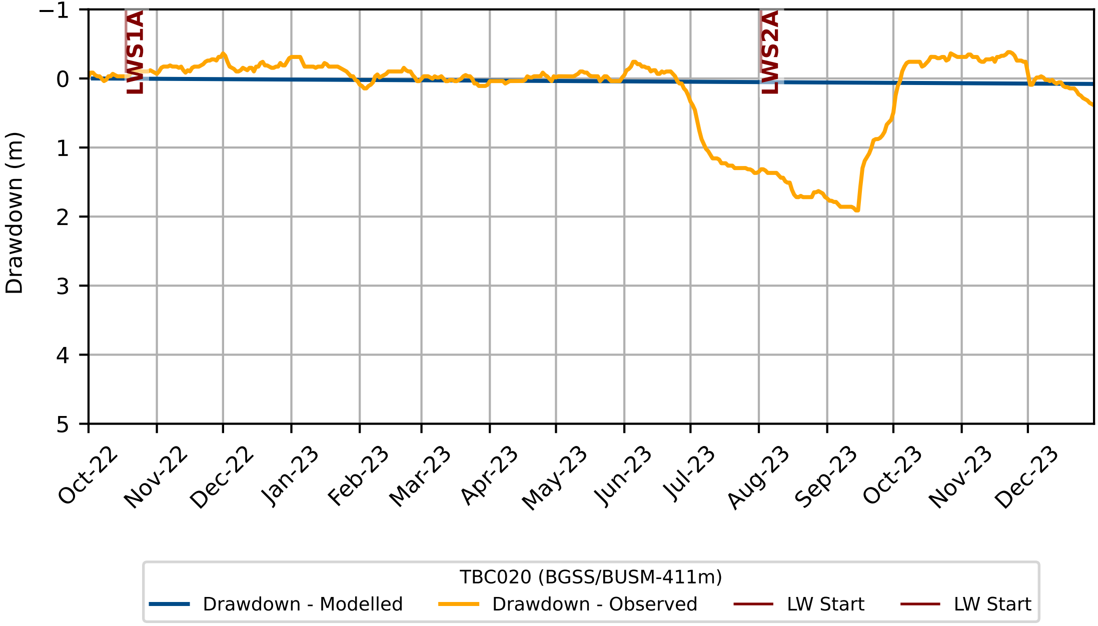
LWS1A
LWS2A
0
2
4
6
8
10
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC020 (BGSS-211m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



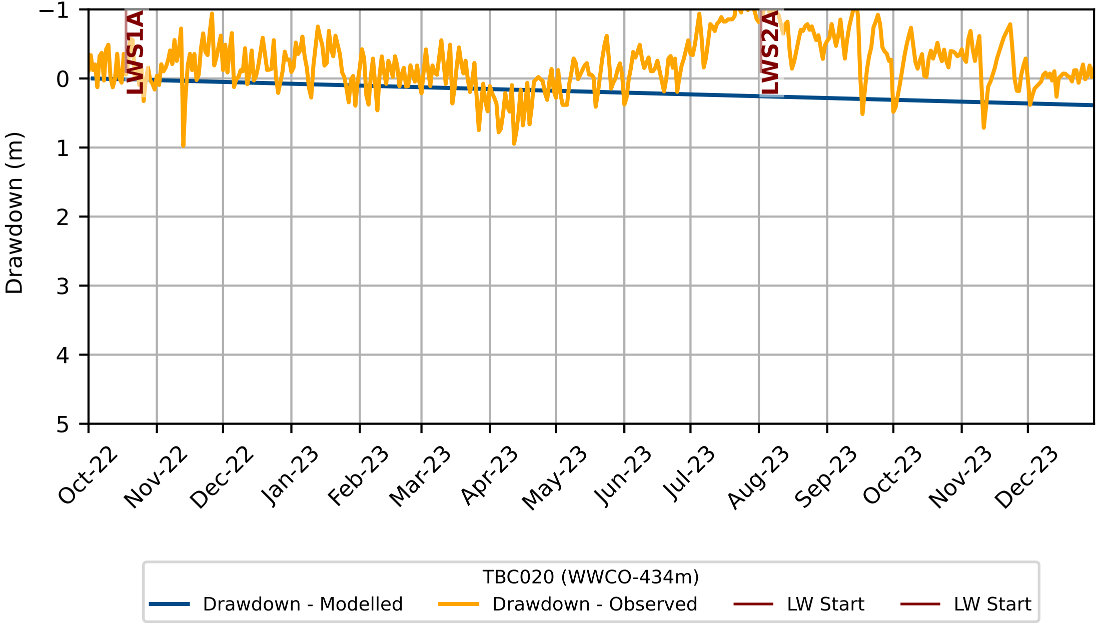
−1
0
1
2
3
4
5
Drawdown (m)
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC020 (BGSS-293m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



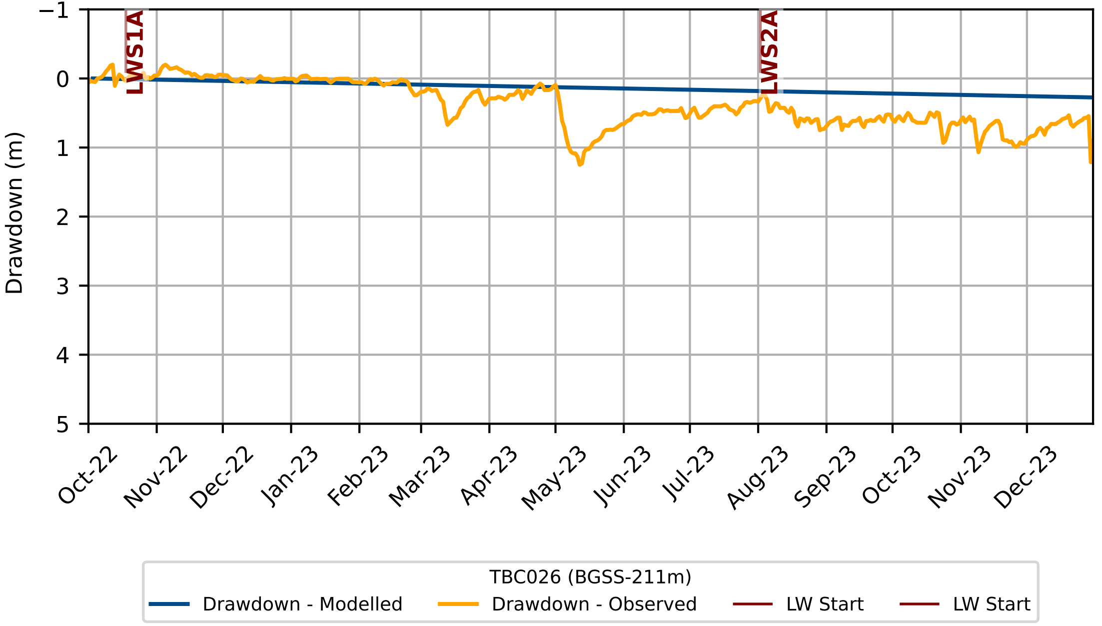
−1
0
1
2
3
4
5
Drawdown (m)
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC020 (BGSS-375m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



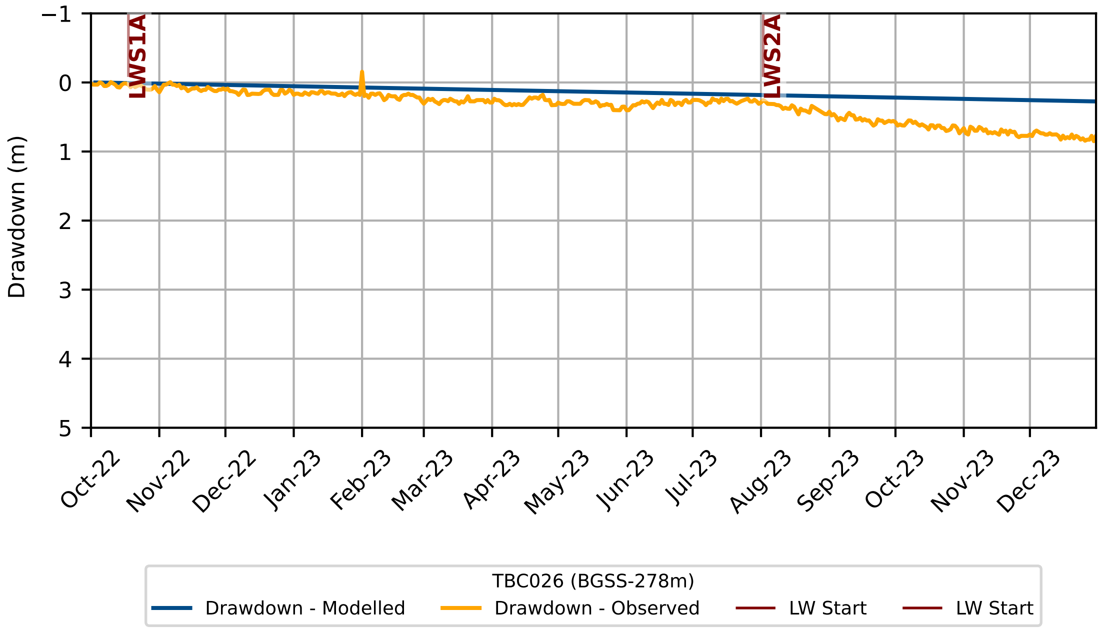
−1
0
1
2
3
4
5
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
LWS1A
LWS2A
TBC020 (BGSS/BUSM-411m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



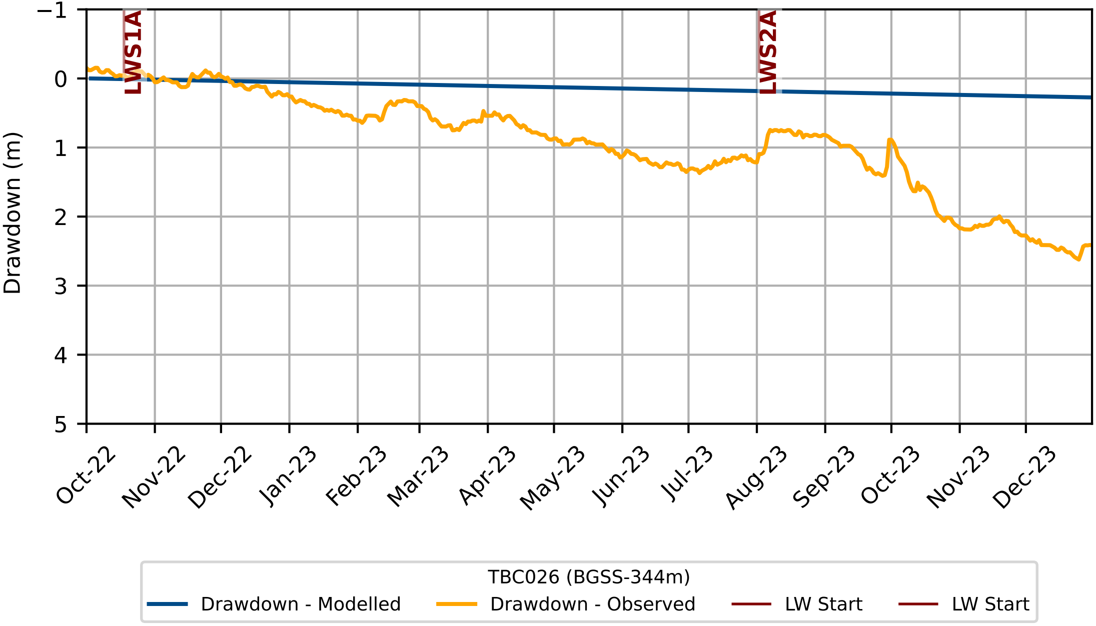
Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC020 (WWCO-434m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



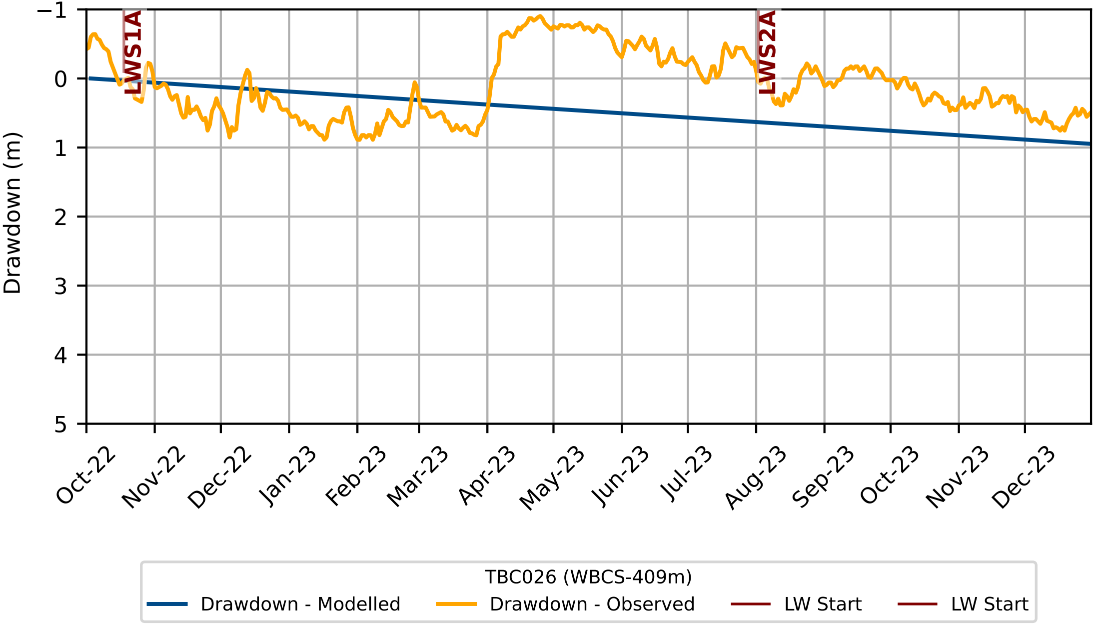
Drawdown (m)
-1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (BGSS-211m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



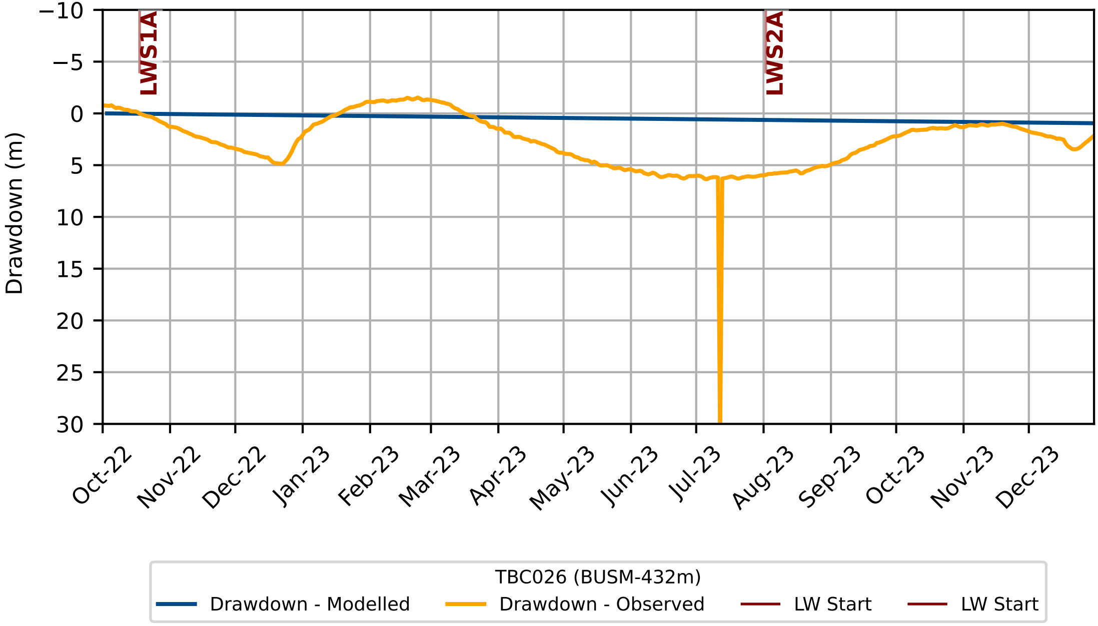
LWS1A
LWS2A
−1
0
1
2
3
4
5
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (BGSS-278m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



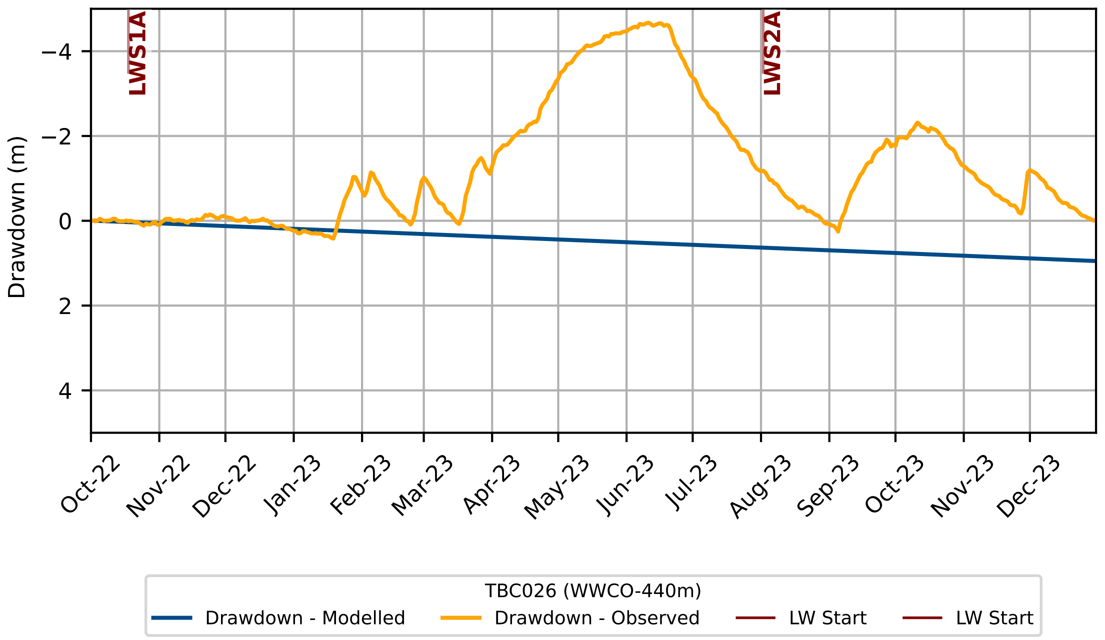
LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (BGSS-344m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



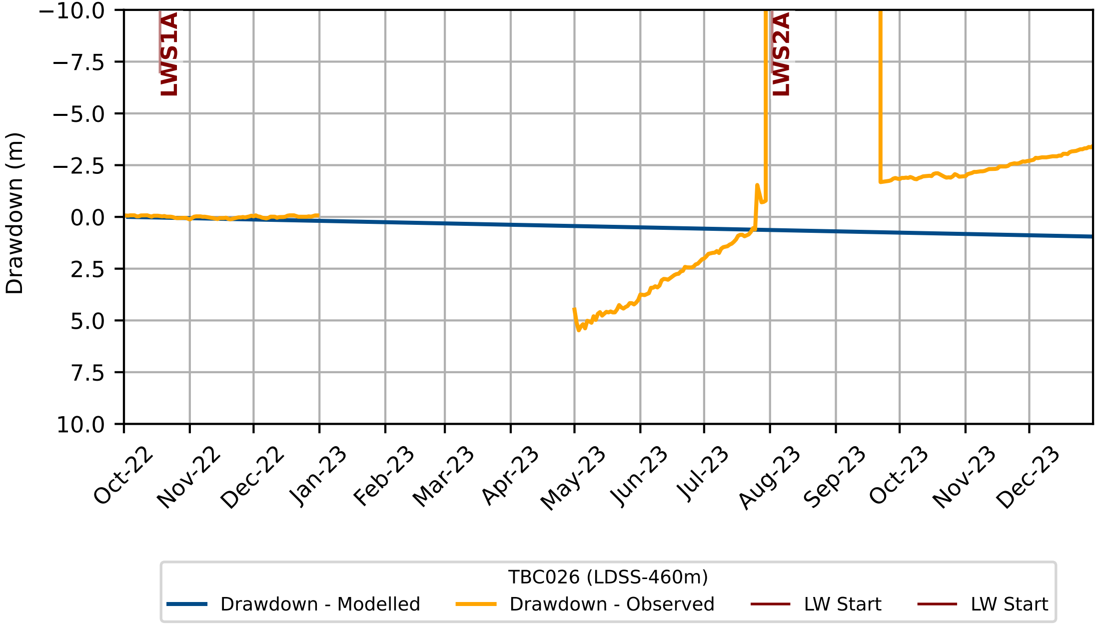
LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (WBCS-409m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



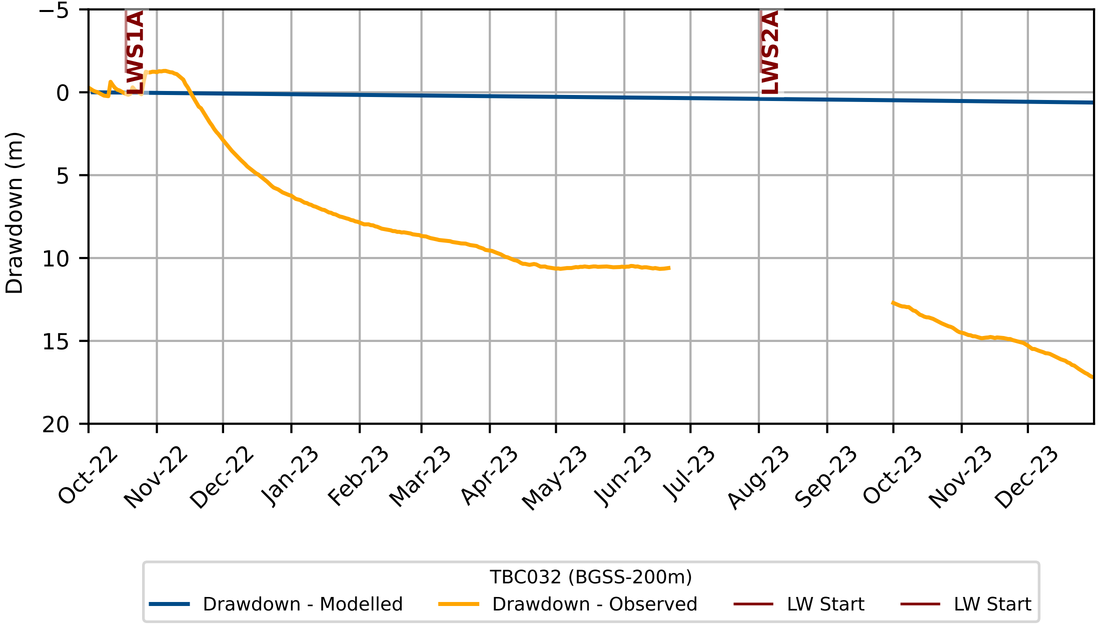
LWS1A
LWS2A
Drawdown (m)
−10
−5
0
5
10
15
20
25
30
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (BUSM-432m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



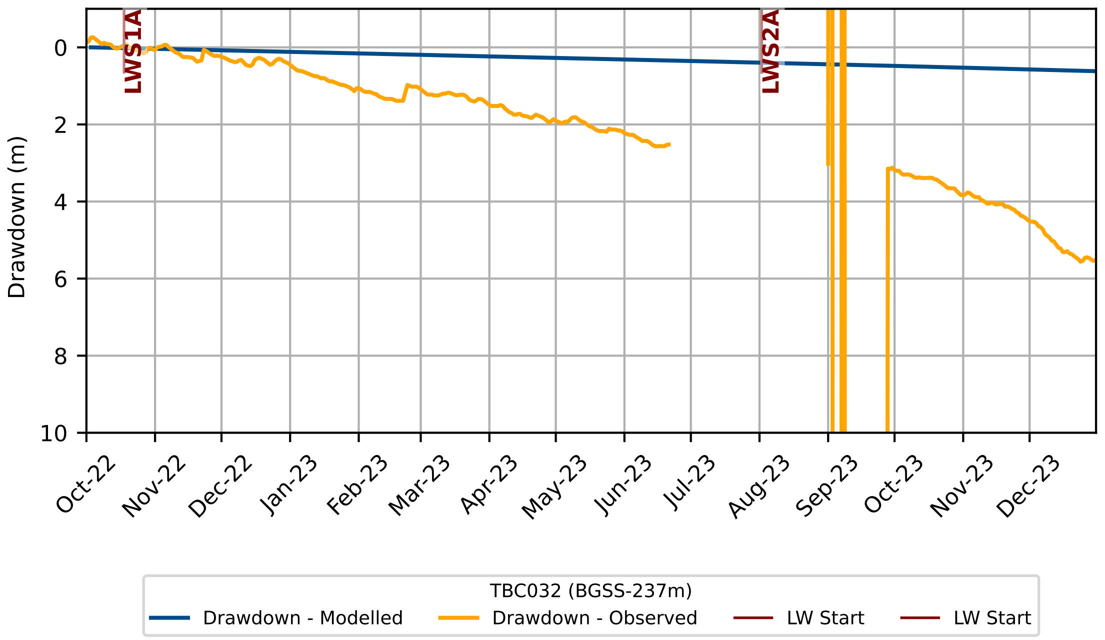
LWS1A
LWS2A
−4
−2
0
2
4
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (WWCO-440m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



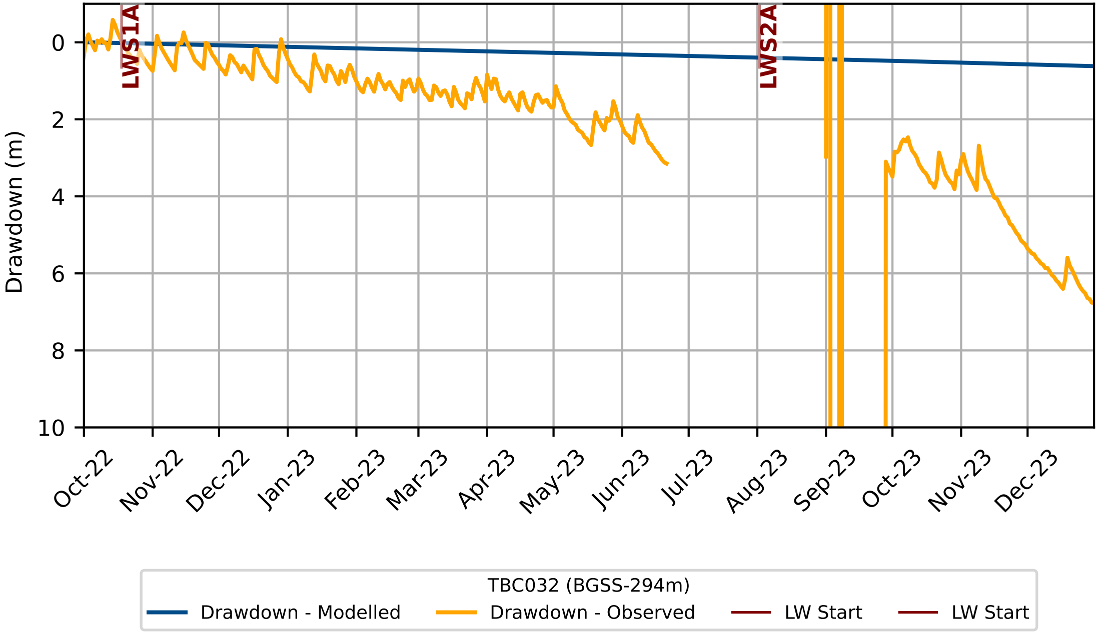
LWS1A
LWS2A
Drawdown (m)
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC026 (LDSS-460m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



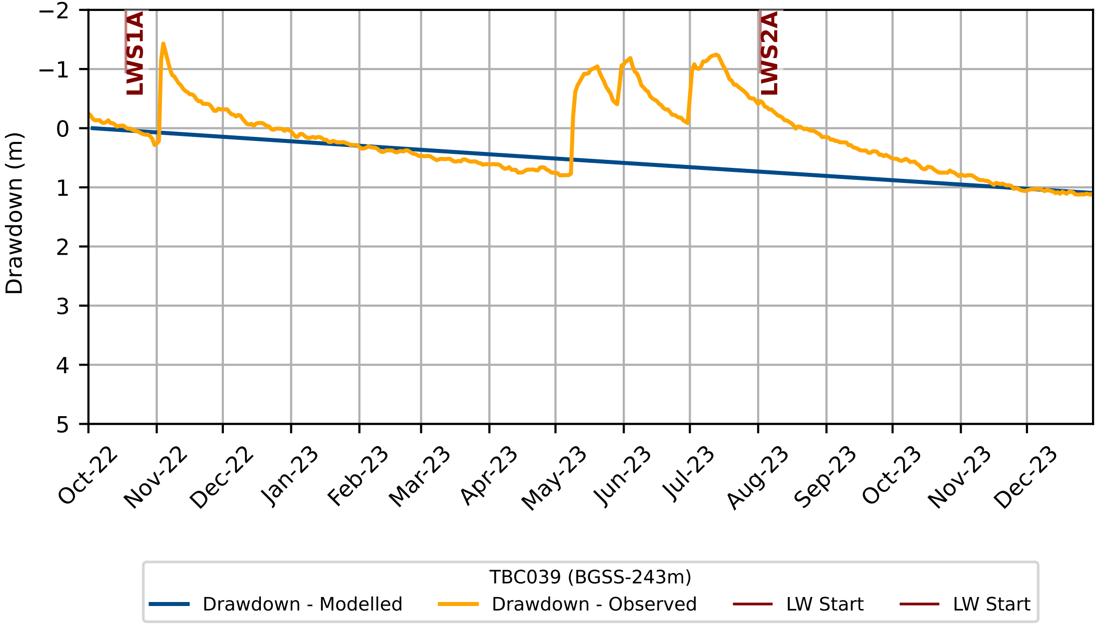
−5
0
5
10
15
20
Drawdown (m)
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (BGSS-200m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



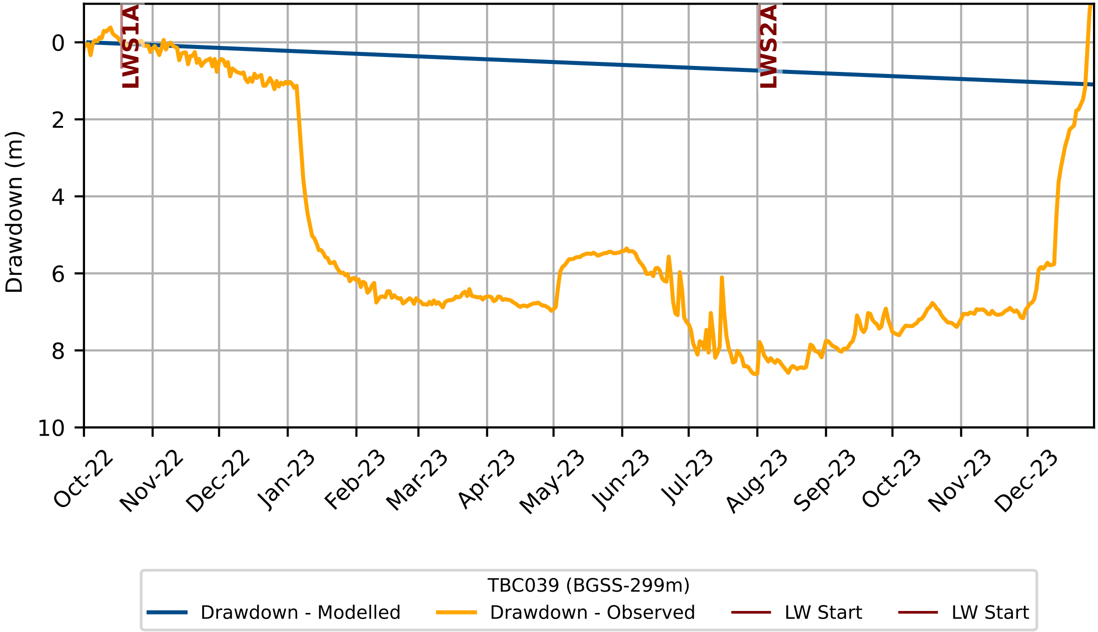
LWS1A
LWS2A
Drawdown (m)
0
2
4
6
8
10
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (BGSS-237m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start

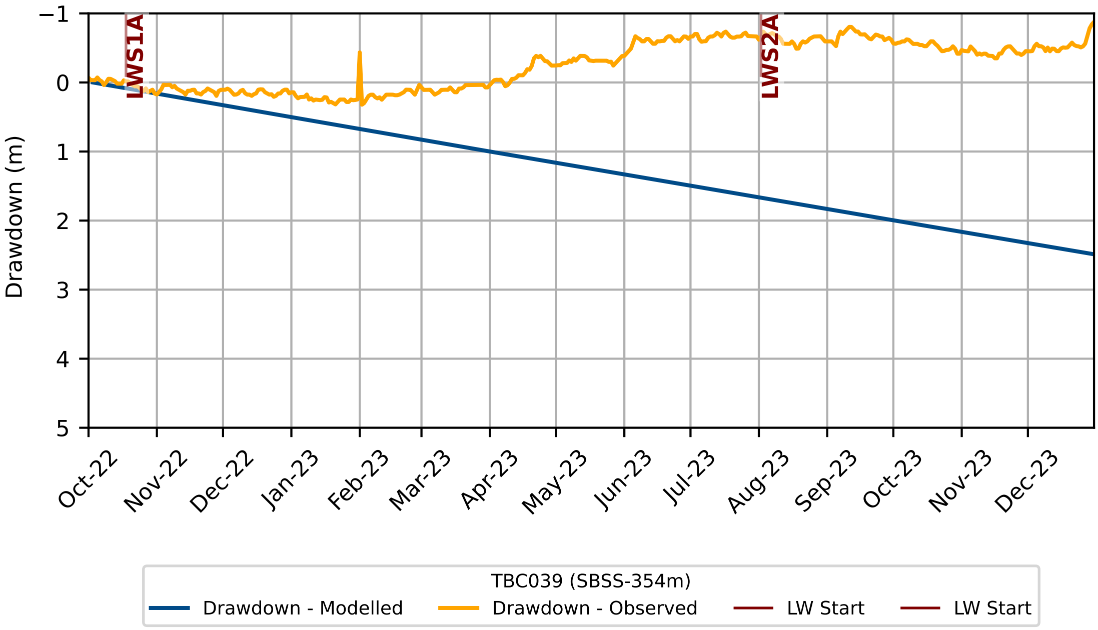


LWS1A
LWS2A
Drawdown (m)
0
2
4
6
8
10
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC032 (BGSS-294m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start

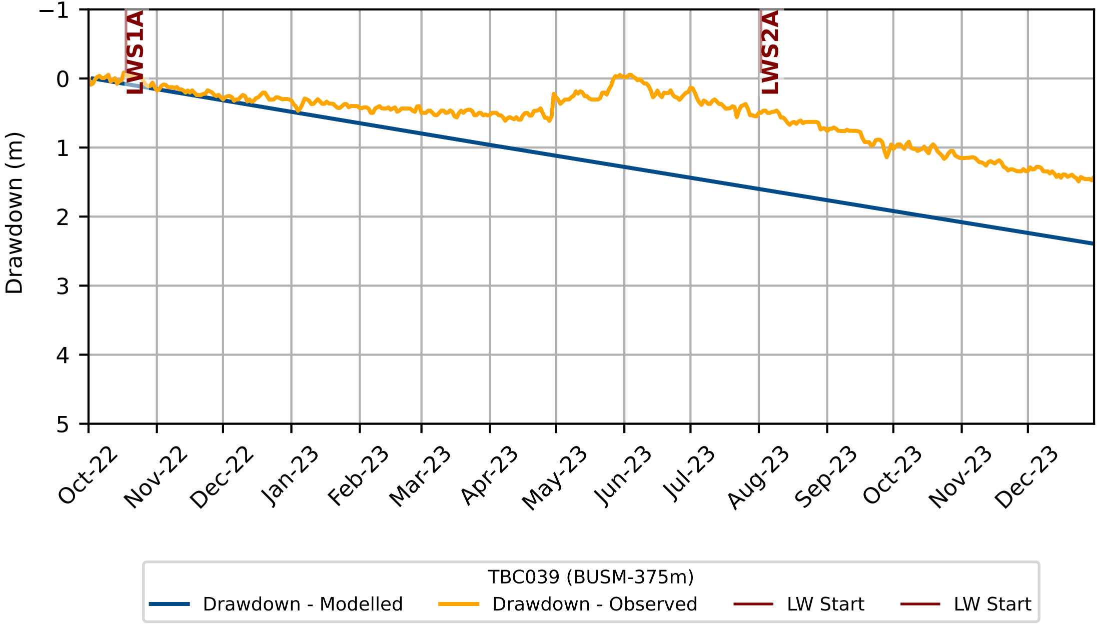


Drawdown (m)
−2
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (BGSS-243m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start

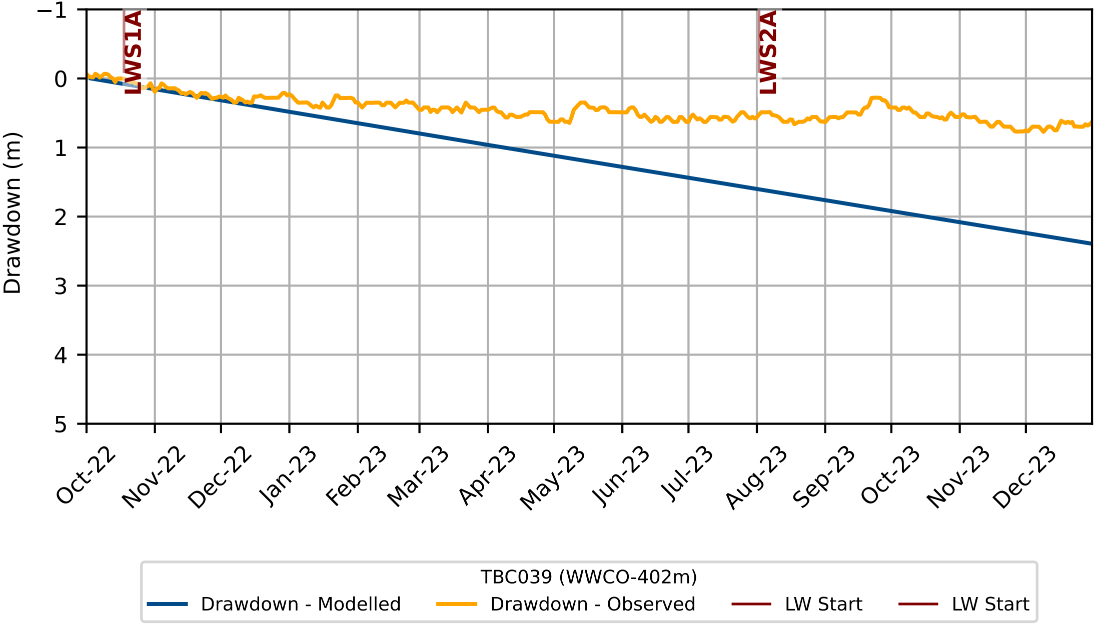

LWS1A
LWS2A
0
2
4
6
8
10
Drawdown (m)
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (BGSS-299m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (SBSS-354m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



LWS1A
LWS2A
Drawdown (m)
−1
0
1
2
3
4
5
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (BUSM-375m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start



Drawdown (m)
−1
0
1
2
3
4
5
LWS1A
LWS2A
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
TBC039 (WWCO-402m)
Drawdown - Modelled
Drawdown - Observed
LW Start
LW Start

Appendix F Plots – Groundwater Quality TARPs

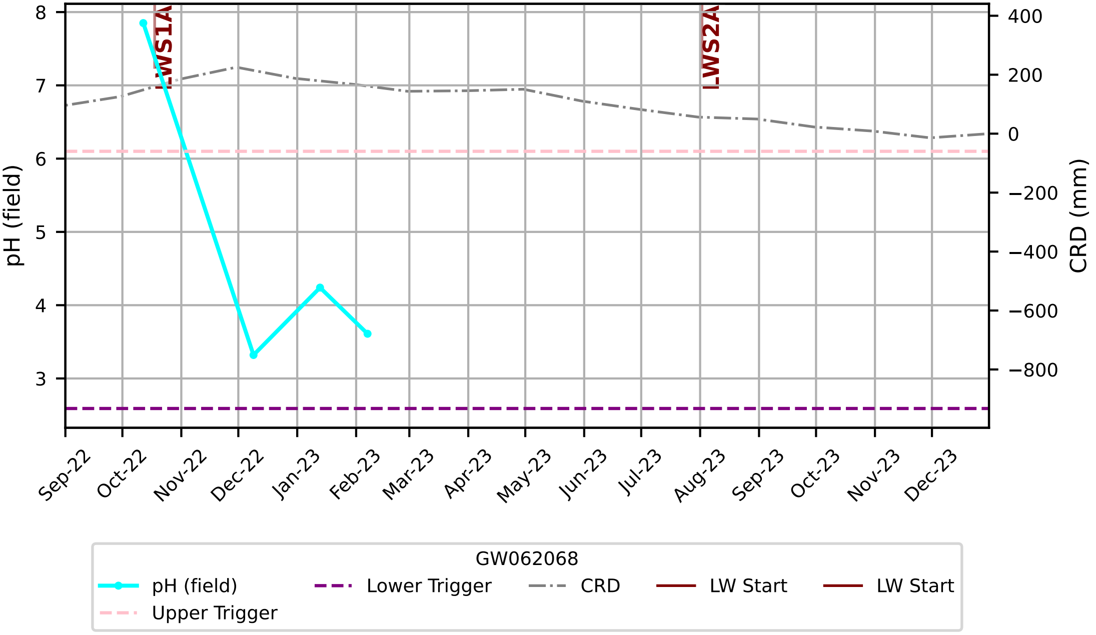
Six-Monthly Groundwater Monitoring: July – December 2023

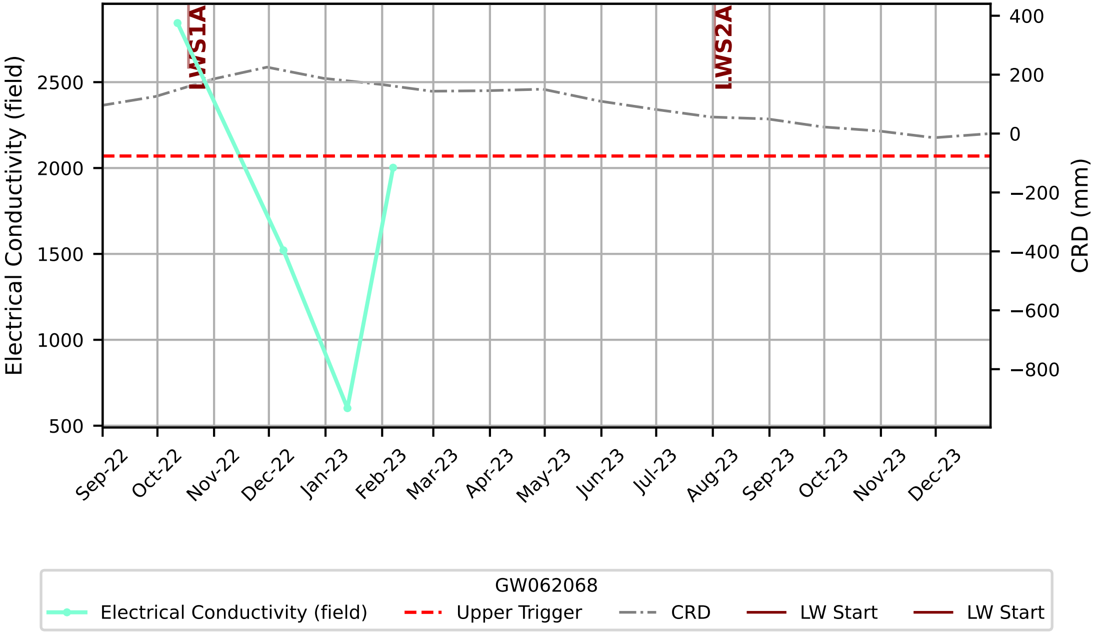
Tahmoor South Domain

Tahmoor Coal Pty Ltd

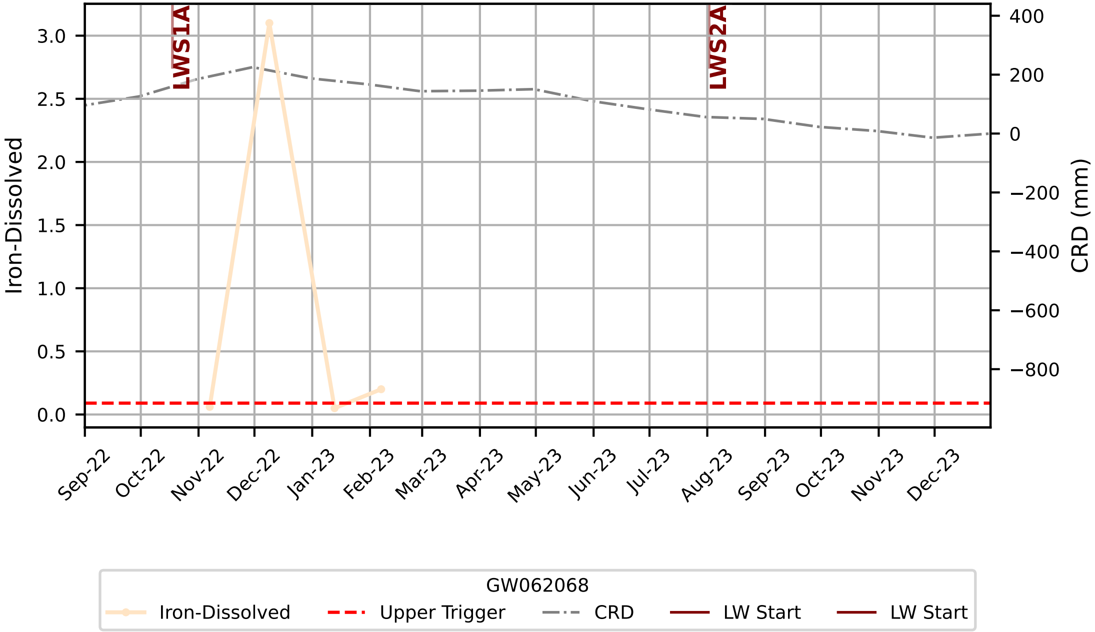
SLR Project No.: 640.30614.00000

26 March 2024

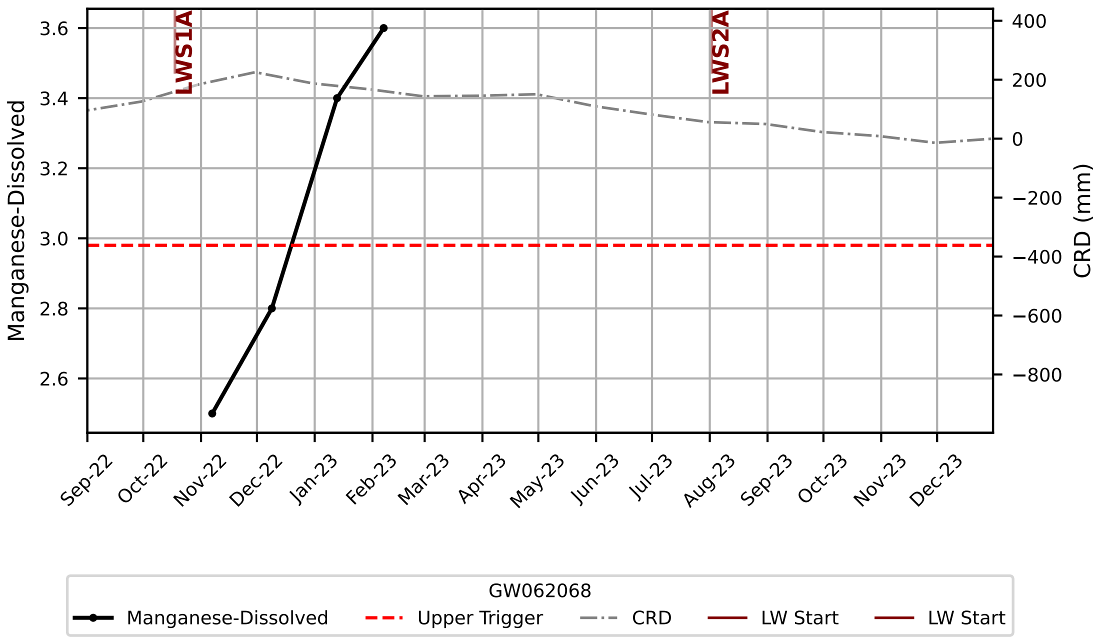

LWS1A
LWS2A
8
7
6
5
4
3
pH (field)
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
pH (field)
Upper Trigger
Lower Trigger
CRD
LW Start
LW Start



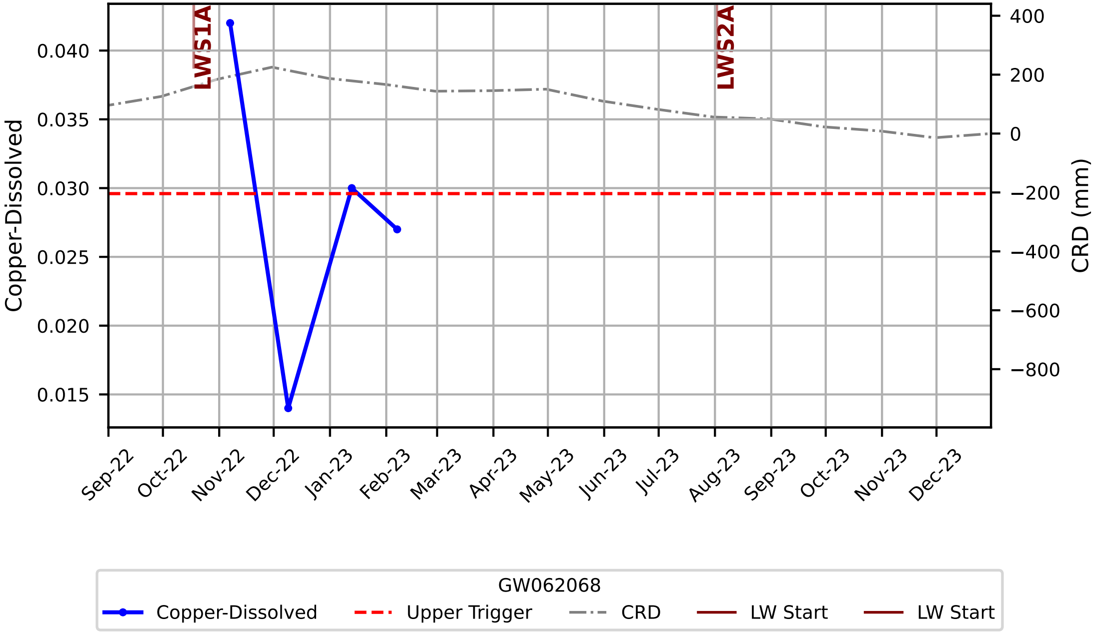
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
500
1000
1500
2000
2500
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



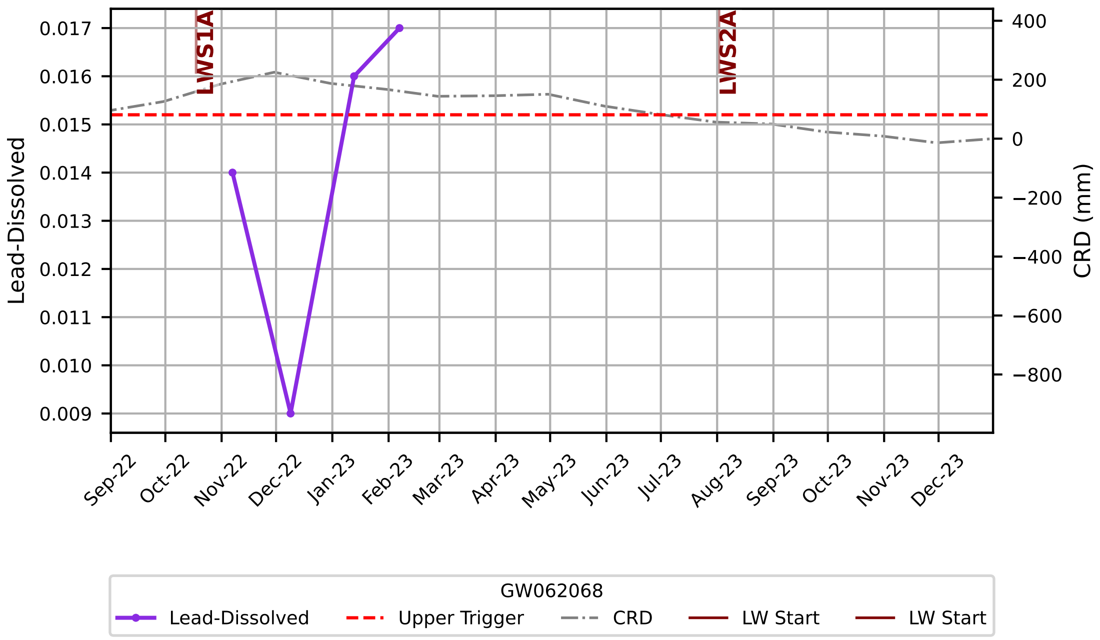
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



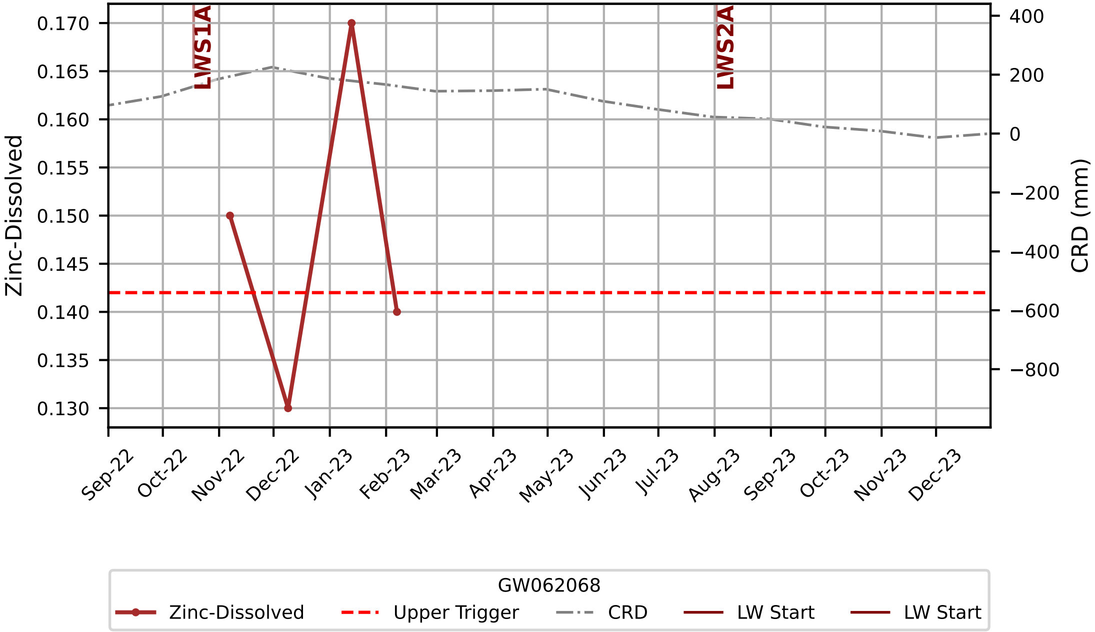
Manganese-Dissolved
CRD (mm)
3.6
3.4
3.2
3.0
2.8
2.6
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

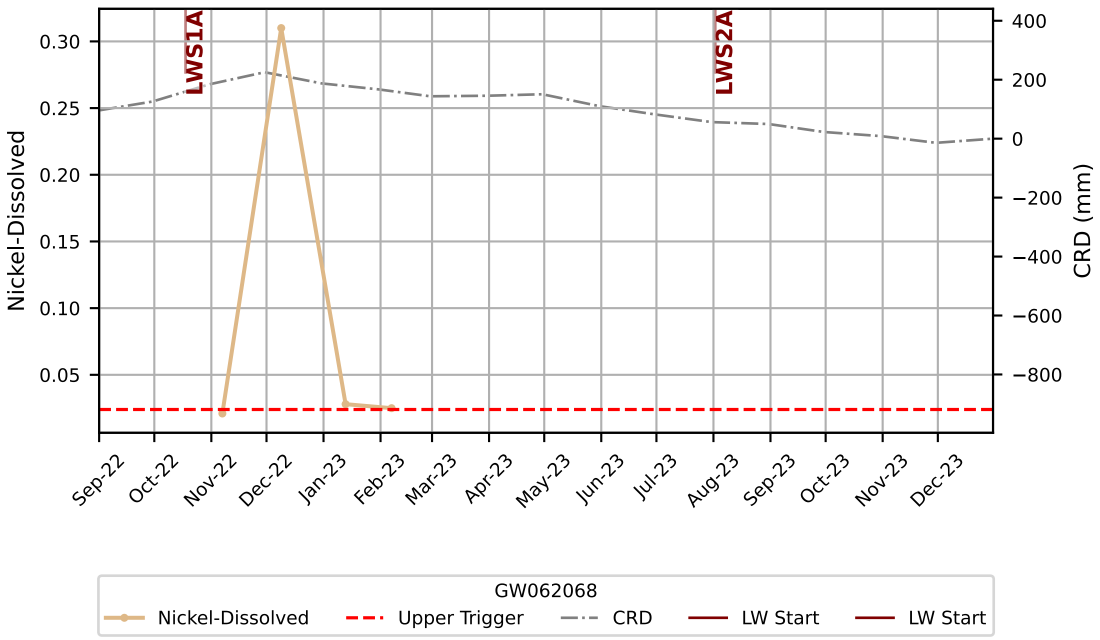


LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

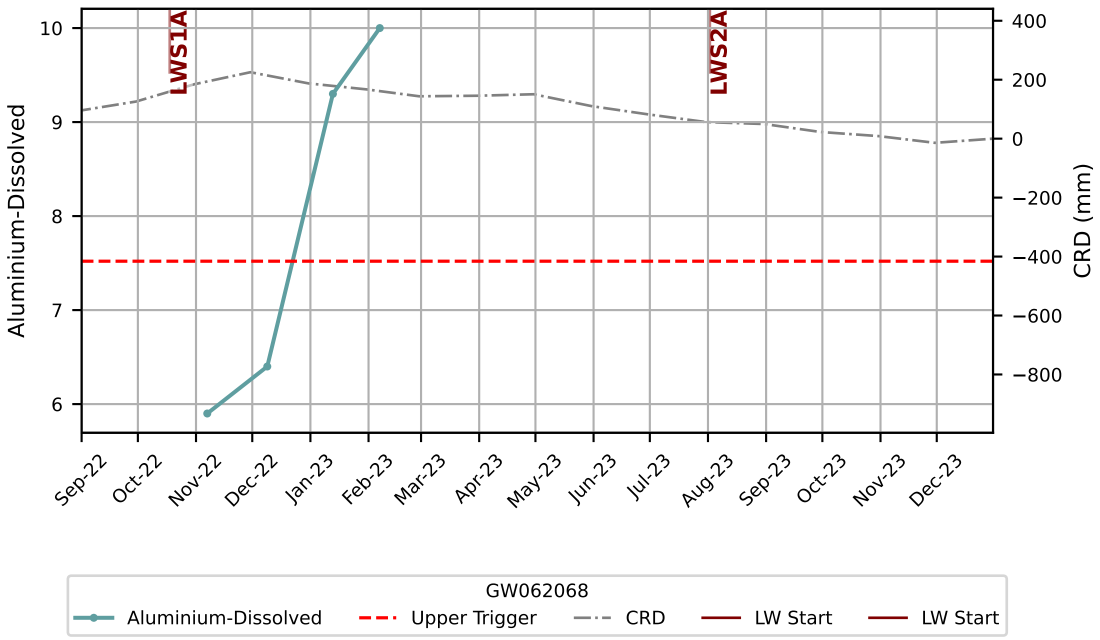


LWS1A
LWS2A
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.010
0.009
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

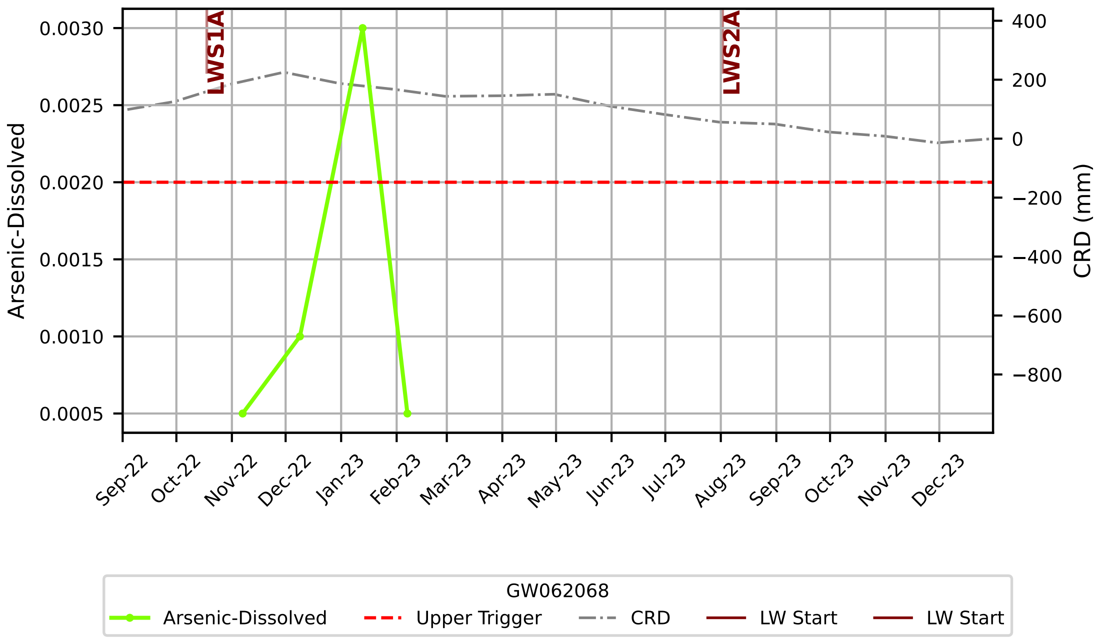

LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.170
0.165
0.160
0.155
0.150
0.145
0.140
0.135
0.130
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



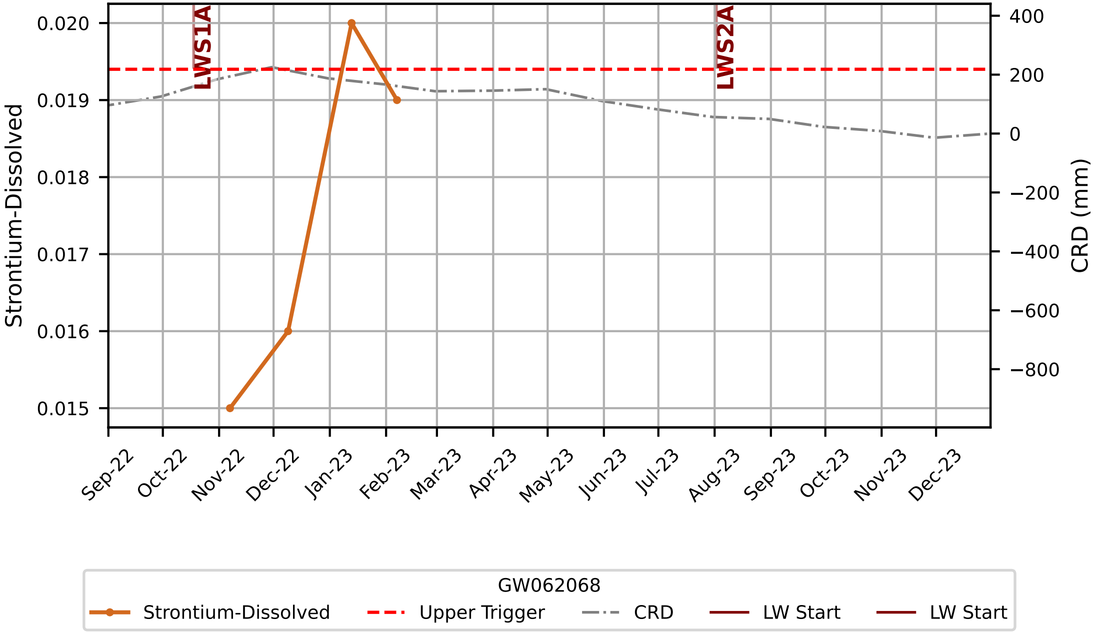
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.30
0.25
0.20
0.15
0.10
0.05
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



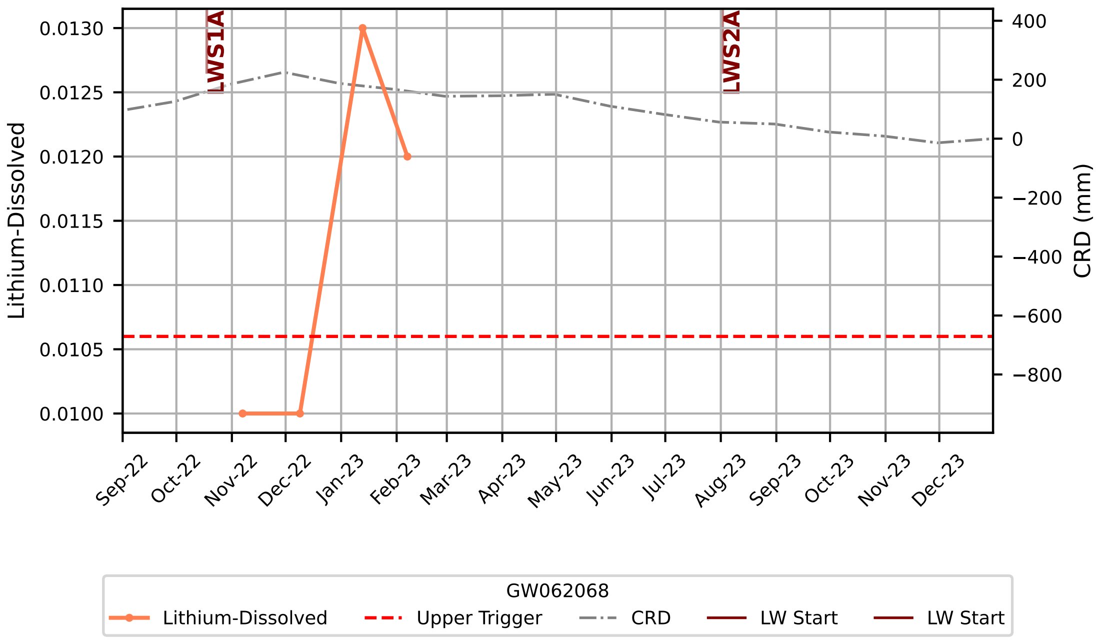
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



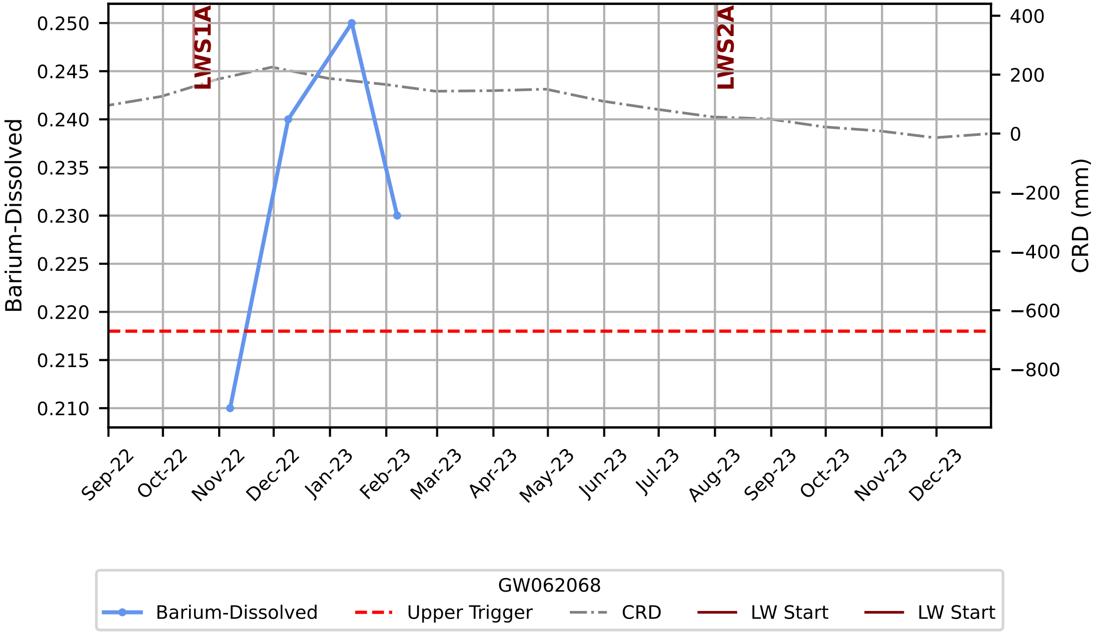
LWS1A
LWS2A
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



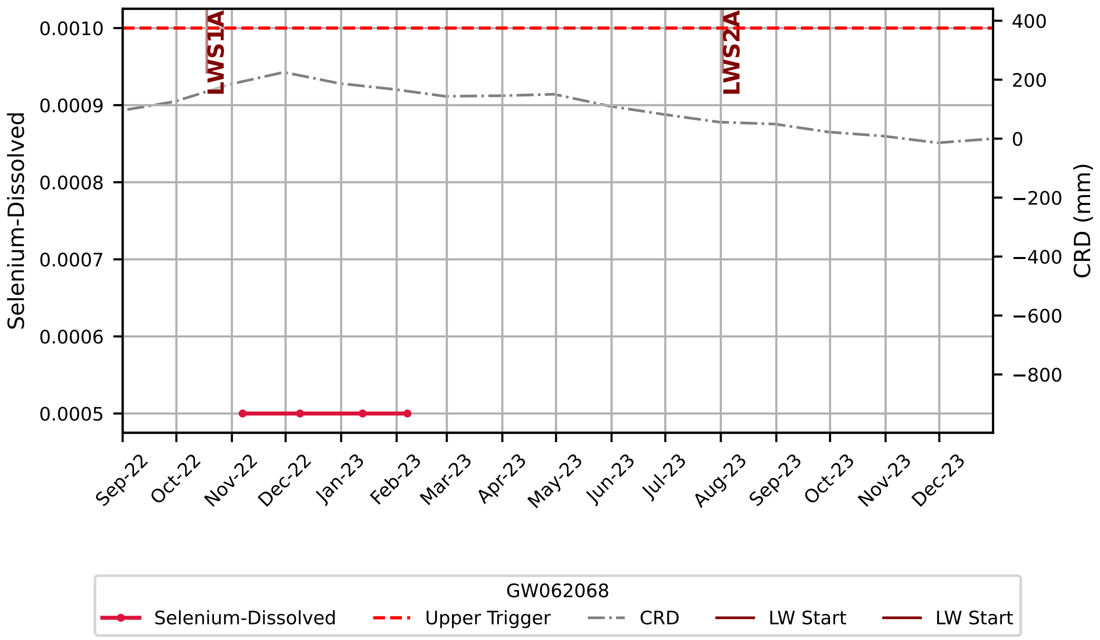
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.020
0.019
0.018
0.017
0.016
0.015
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



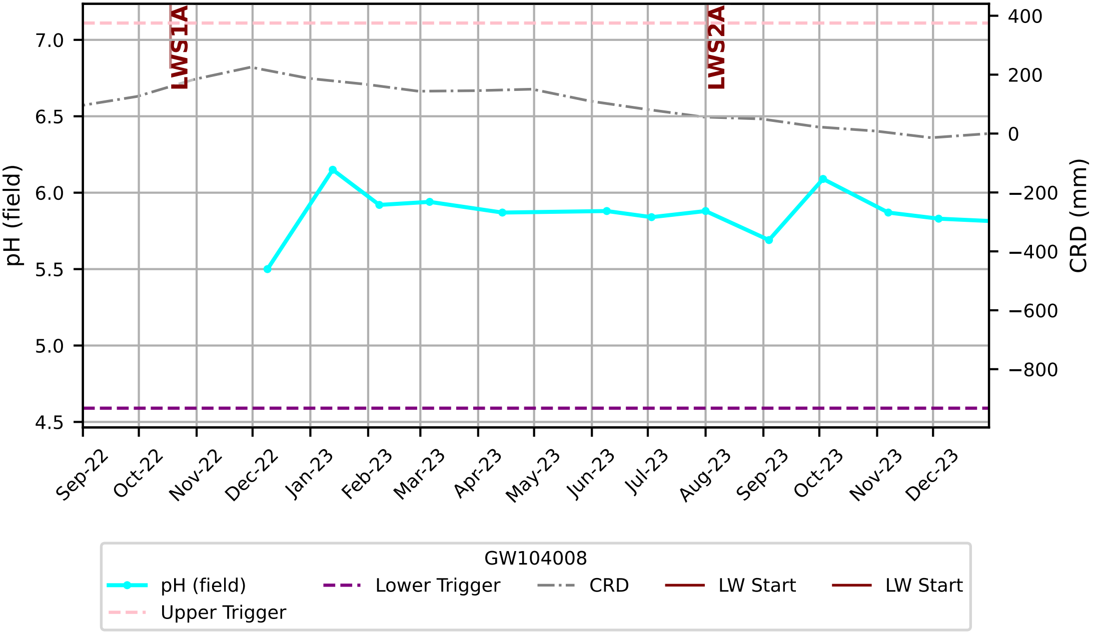
Lithium-Dissolved
CRD (mm)
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



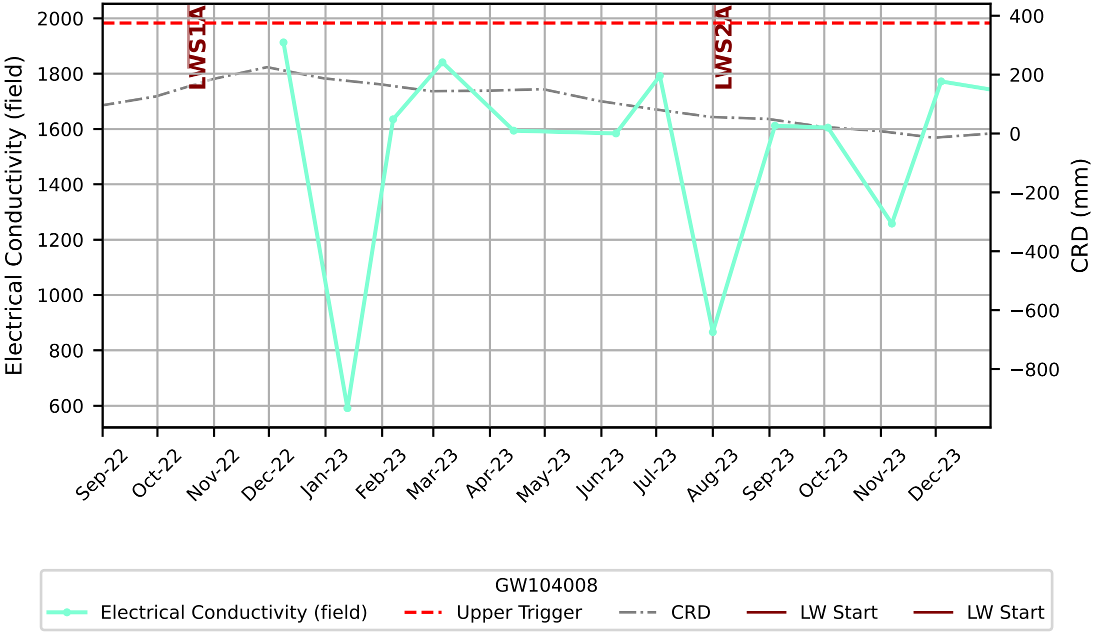
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.250
0.245
0.240
0.235
0.230
0.225
0.220
0.215
0.210
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



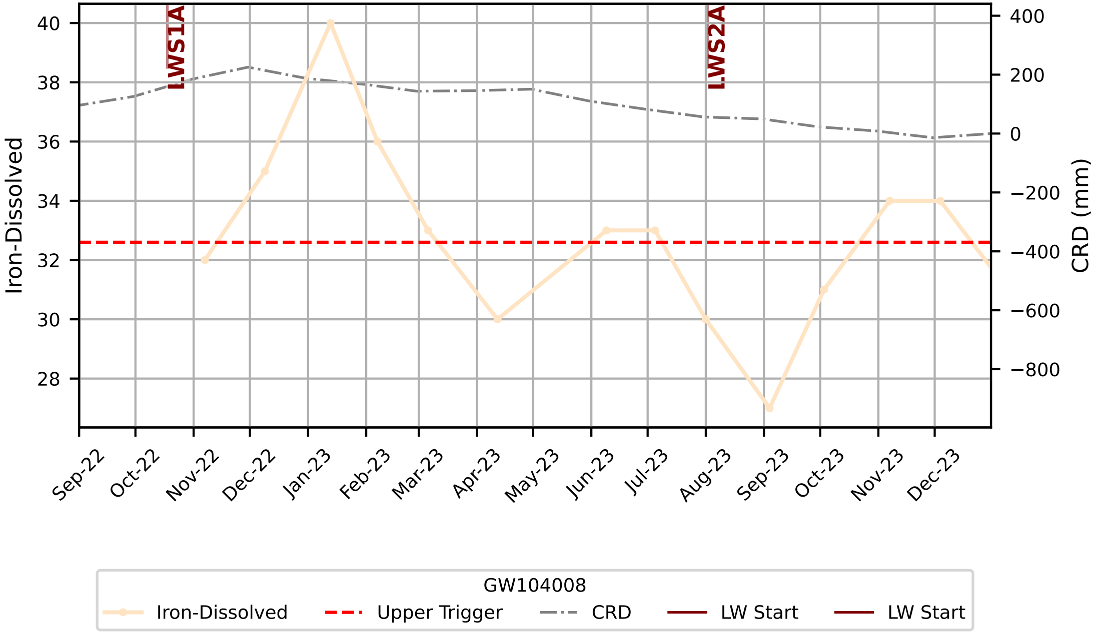
Selenium-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



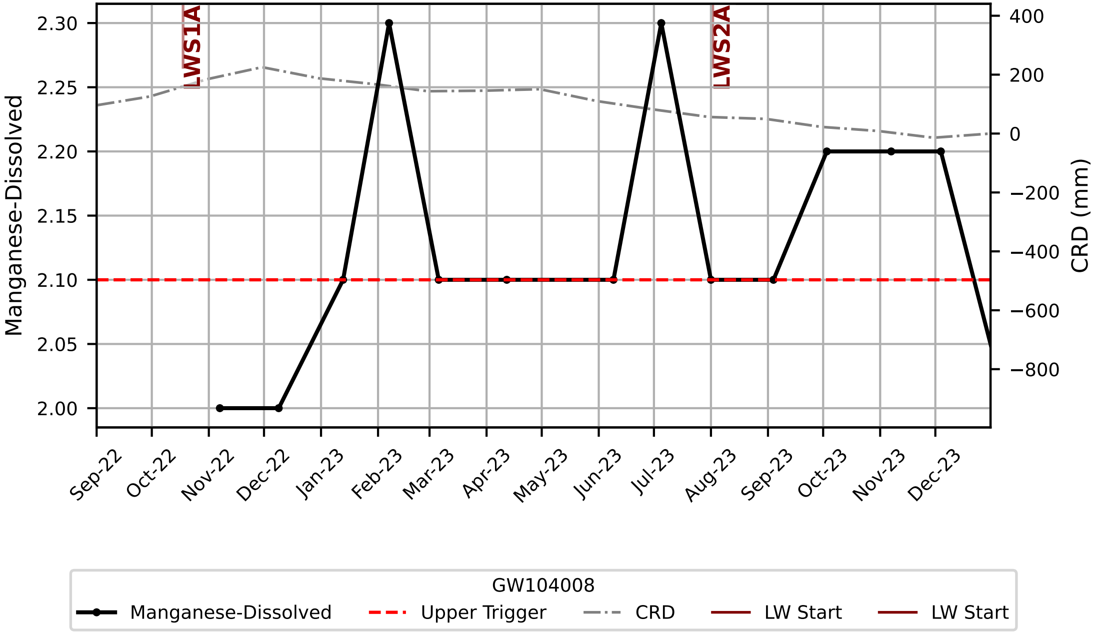
LWS1A
LWS2A
pH (field)
CRD (mm)
7.0
6.5
6.0
5.5
5.0
4.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

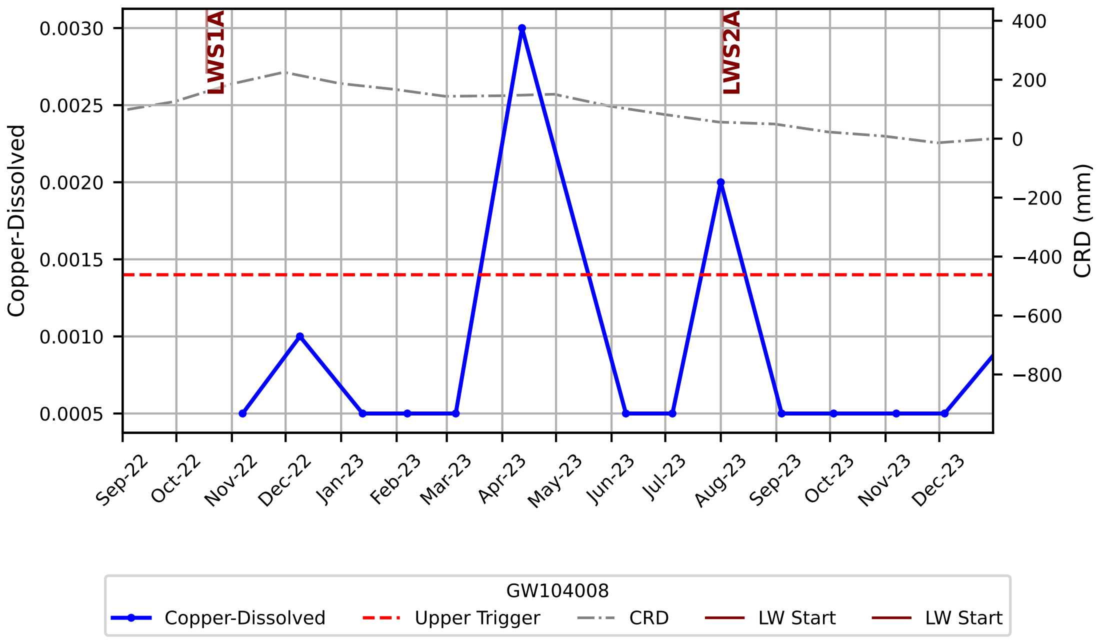


LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start

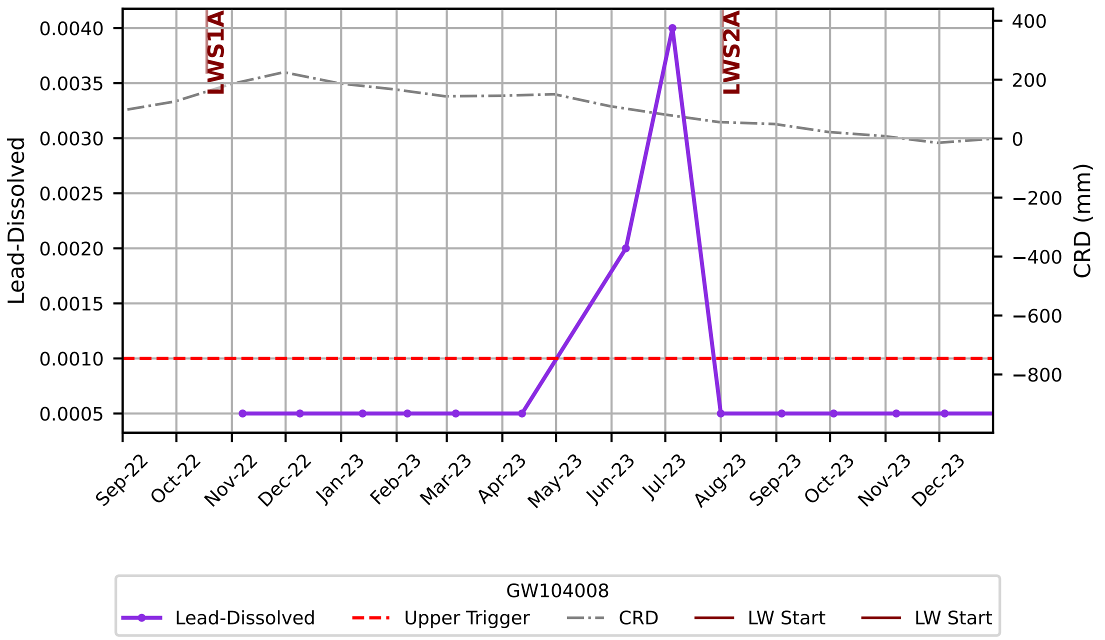


LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
40
38
36
34
32
30
28
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start

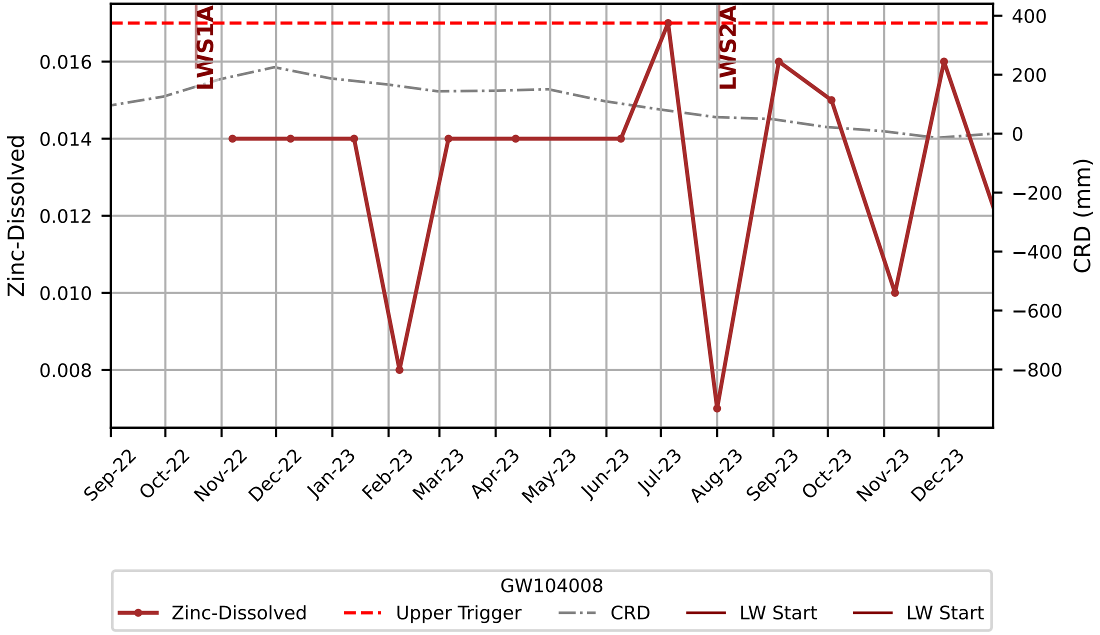

LWS1A
LWS2A
Manganese-Dissolved
2.30
2.25
2.20
2.15
2.10
2.05
2.00
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



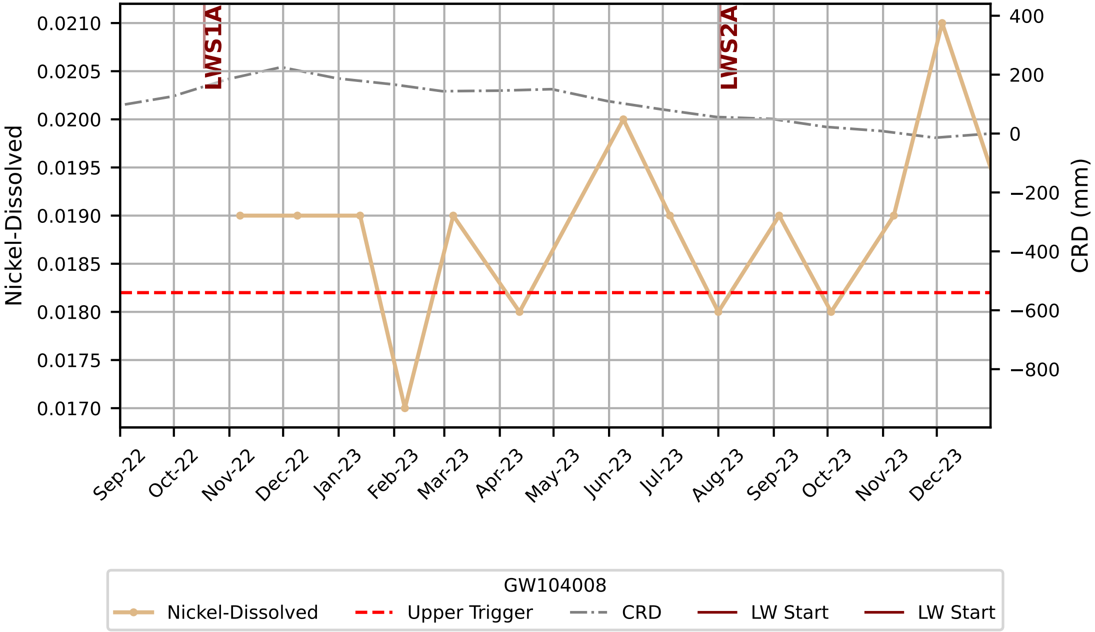
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

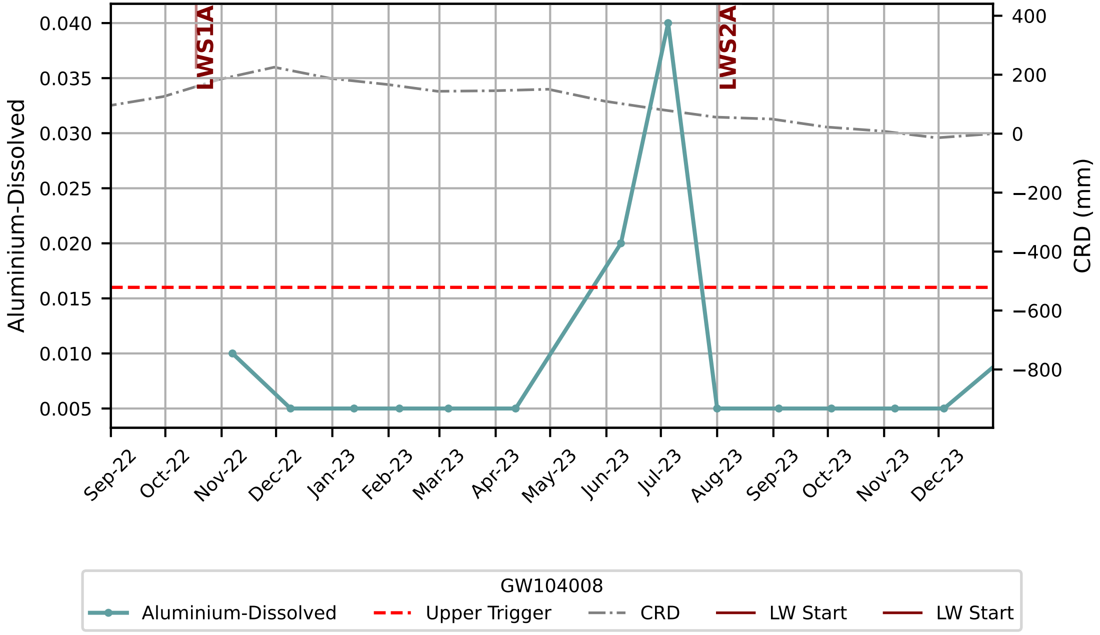


0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

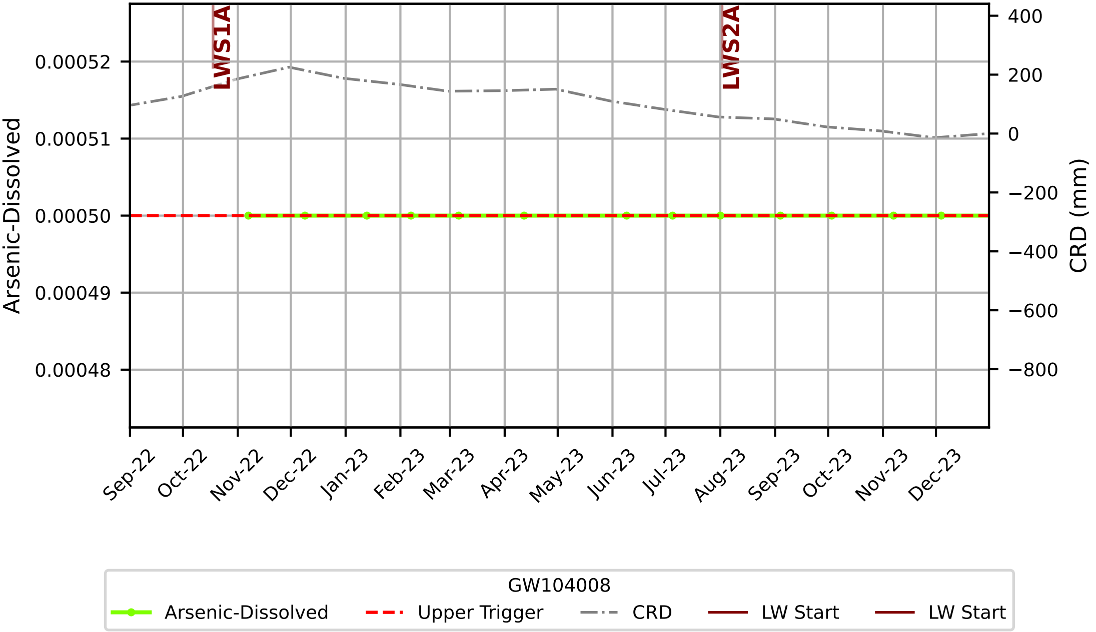


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.016
0.014
0.012
0.010
0.008
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

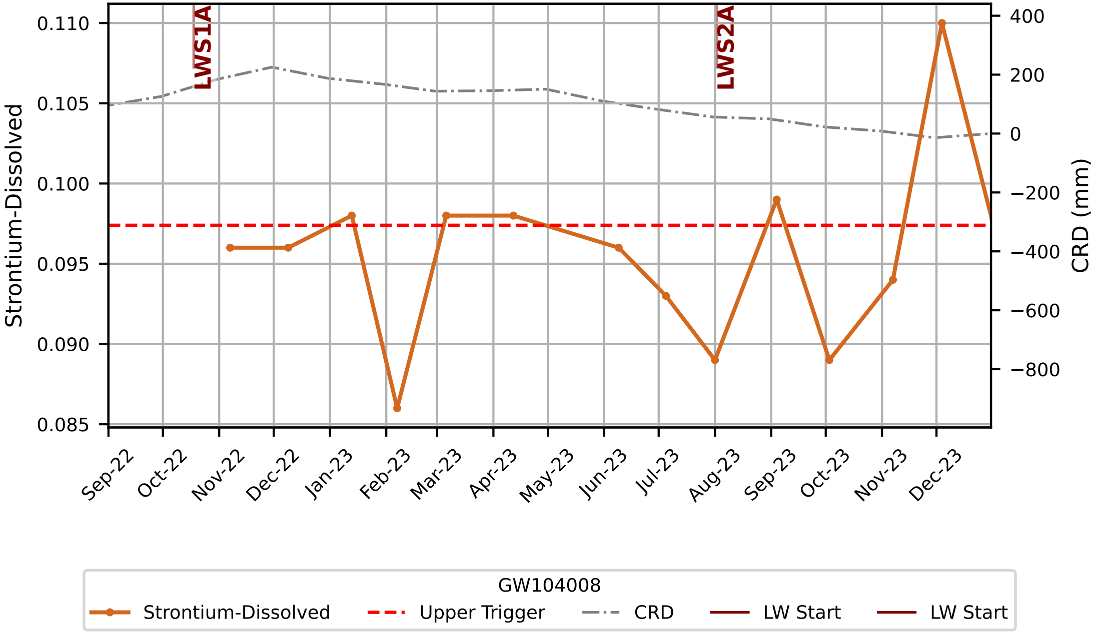

LWS1A
LWS2A
Nickel-Dissolved
0.0210
0.0205
0.0200
0.0195
0.0190
0.0185
0.0180
0.0175
0.0170
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



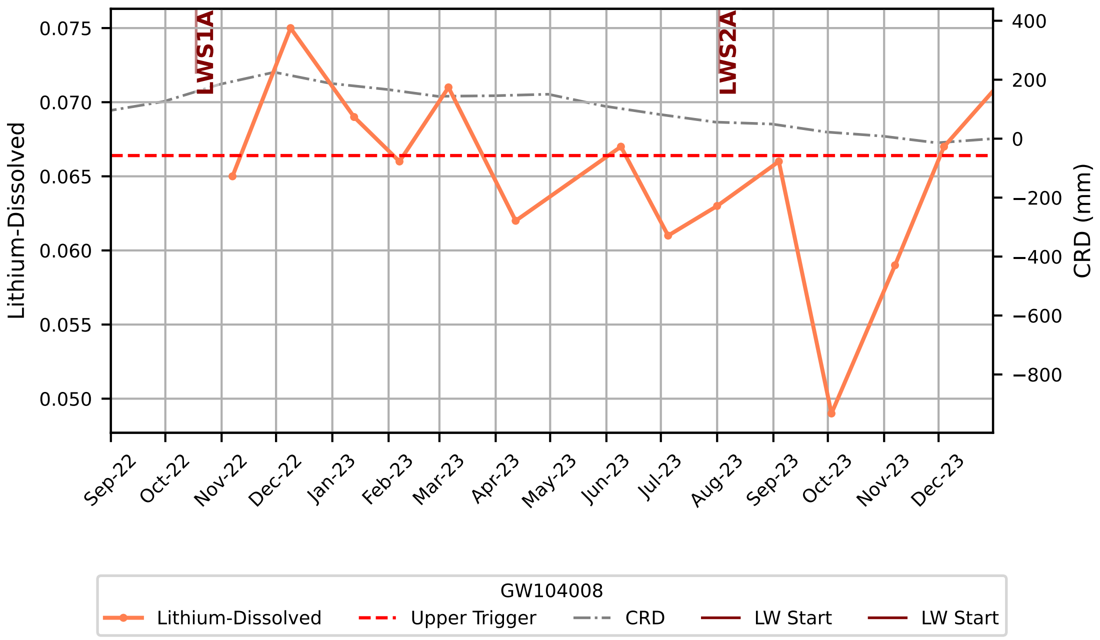
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



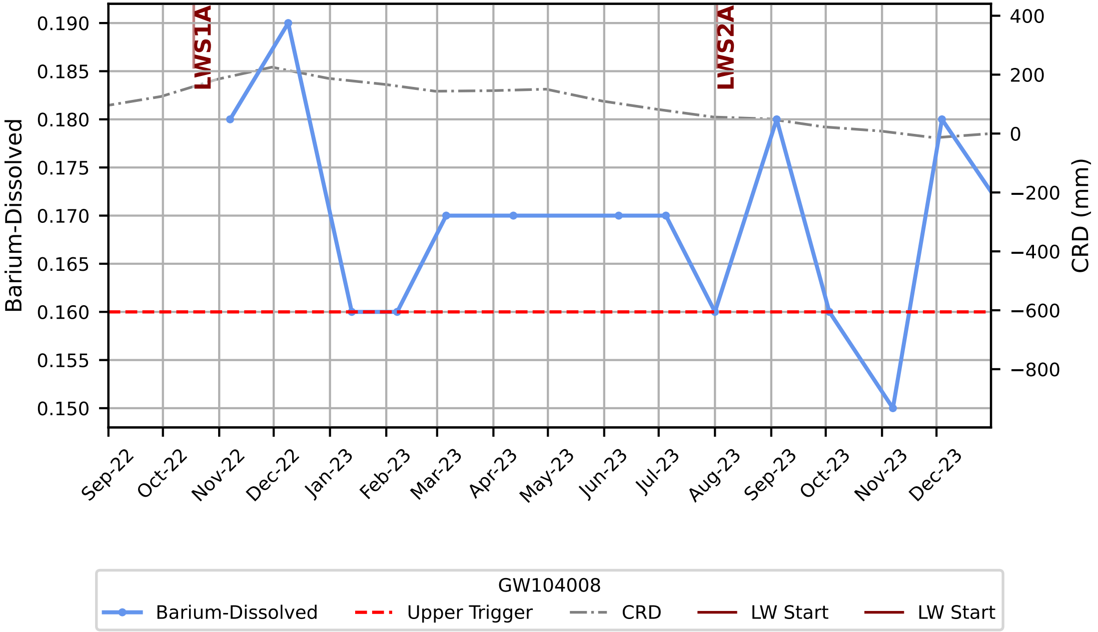
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



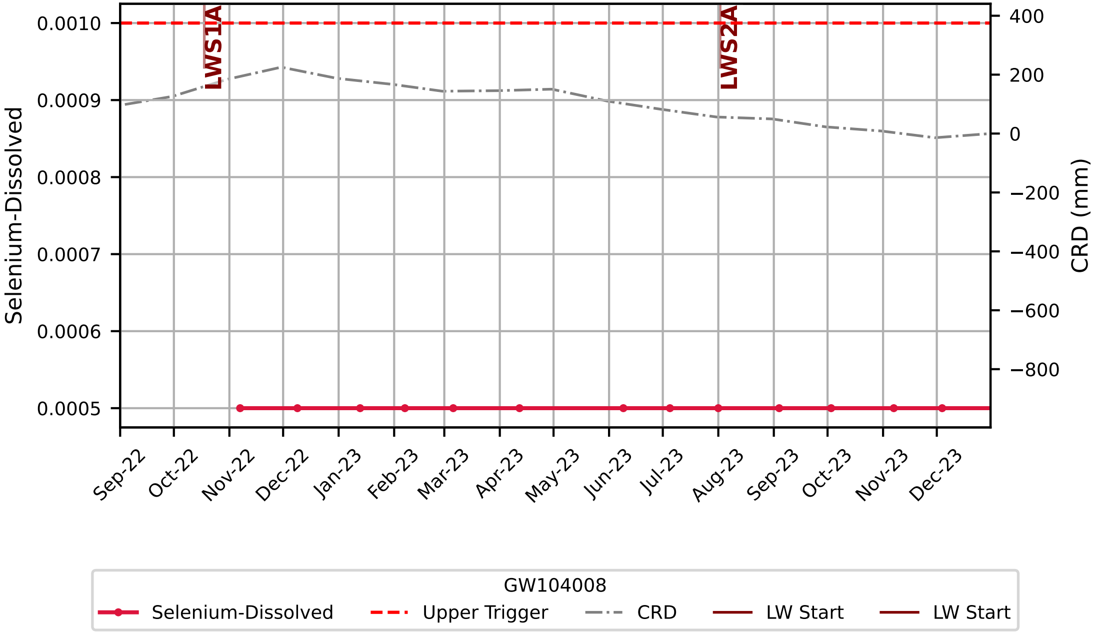
LWS1A
LWS2A
0.110
0.105
0.100
0.095
0.090
0.085
Strontium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



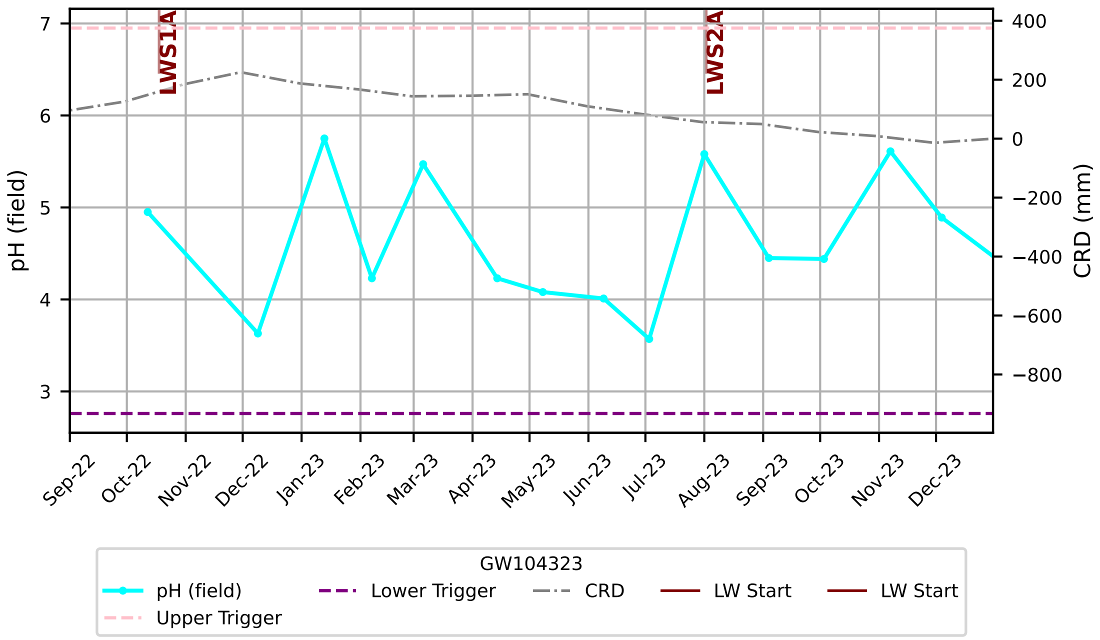
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.075
0.070
0.065
0.060
0.055
0.050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



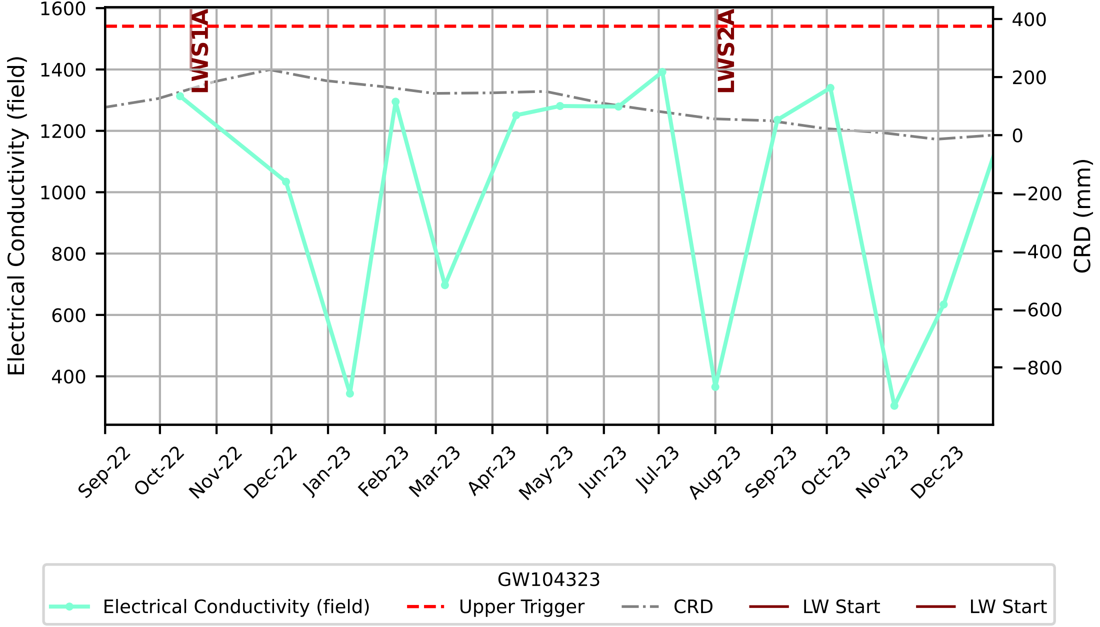
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.190
0.185
0.180
0.175
0.170
0.165
0.160
0.155
0.150
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



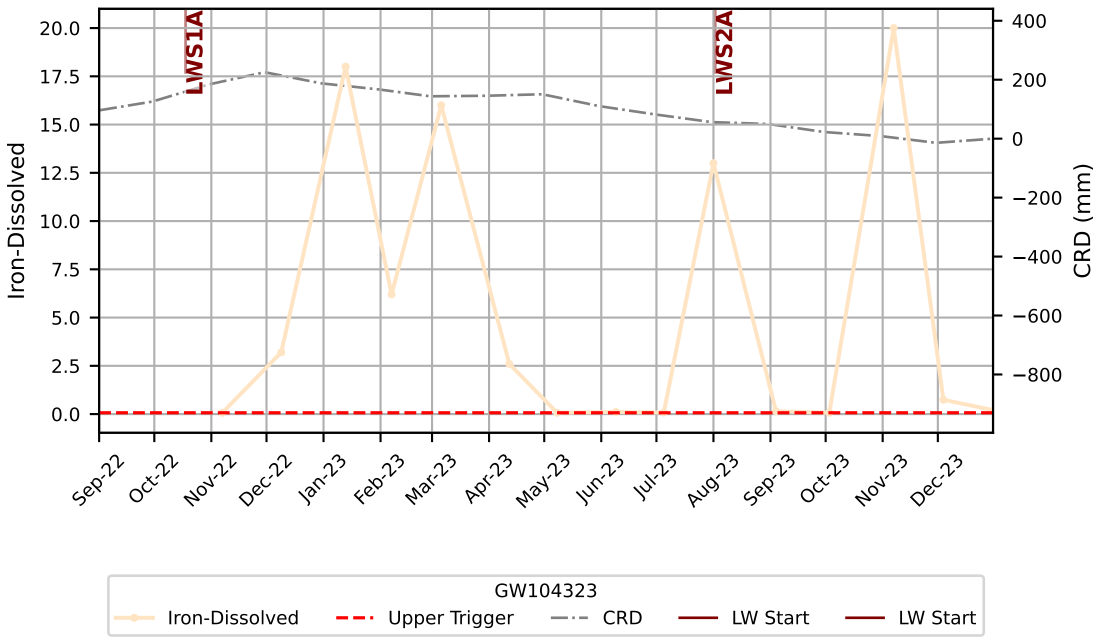
Selenium-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



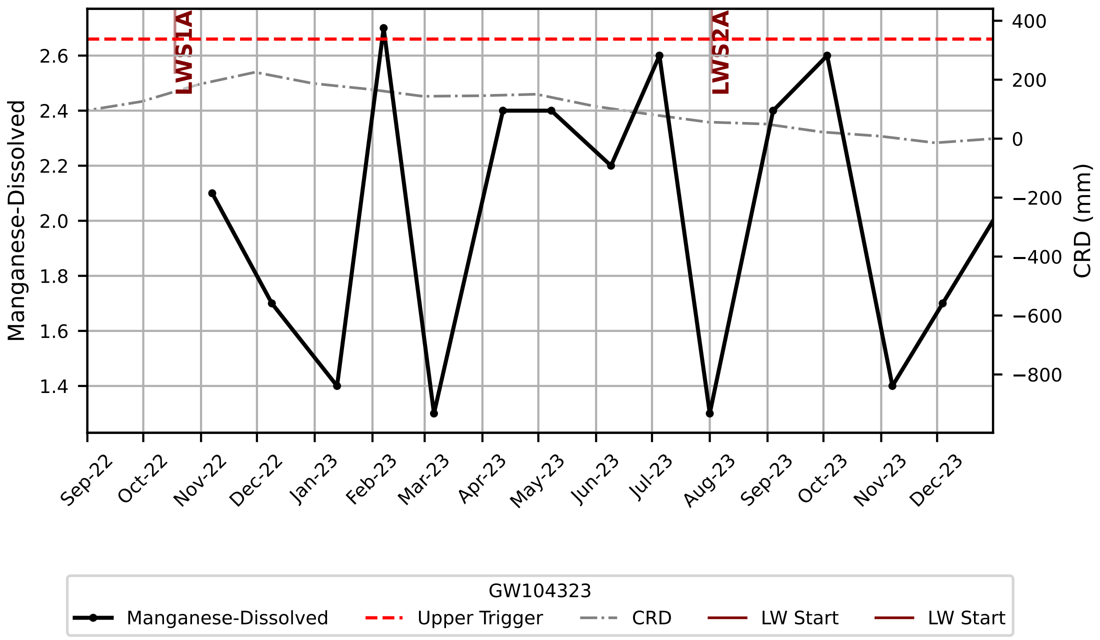
LWS1A
LWS2A
pH (field)
CRD (mm)
7
6
5
4
3
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



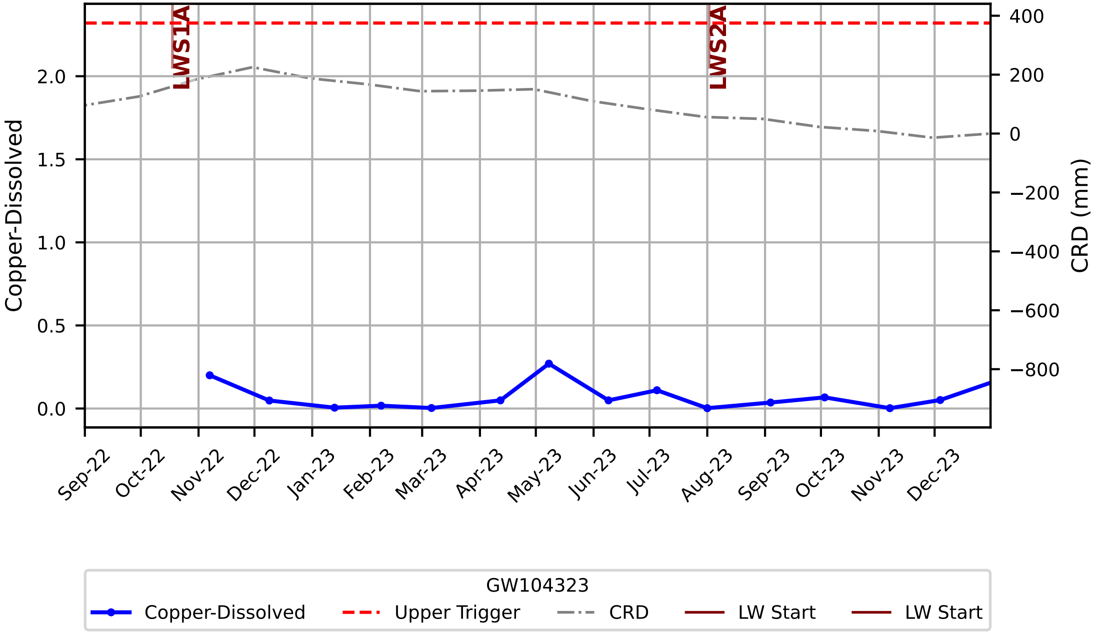
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



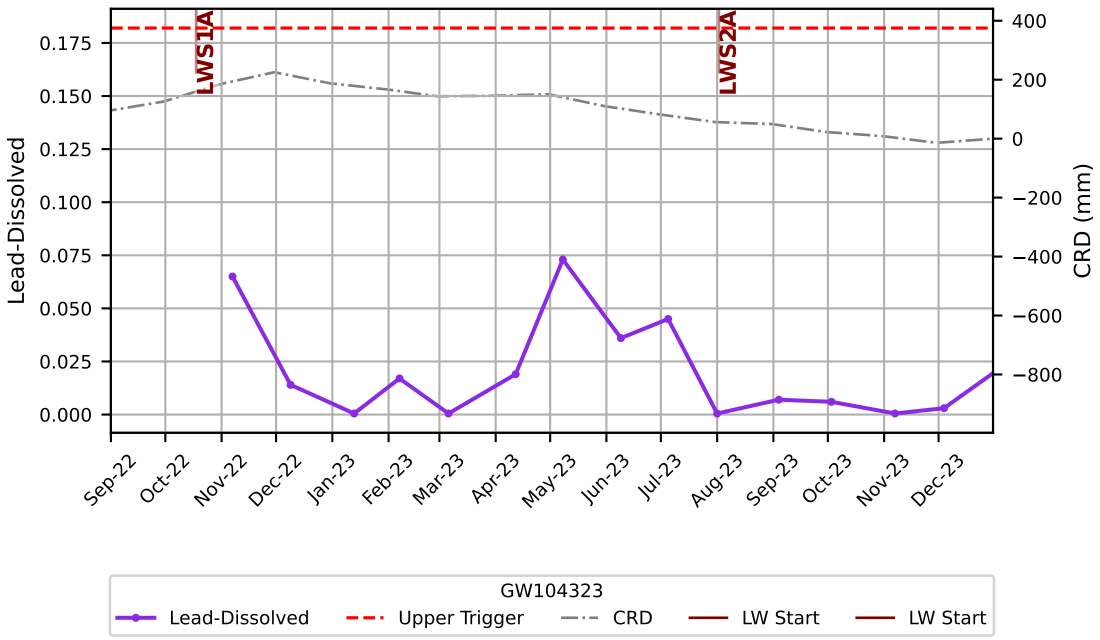
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



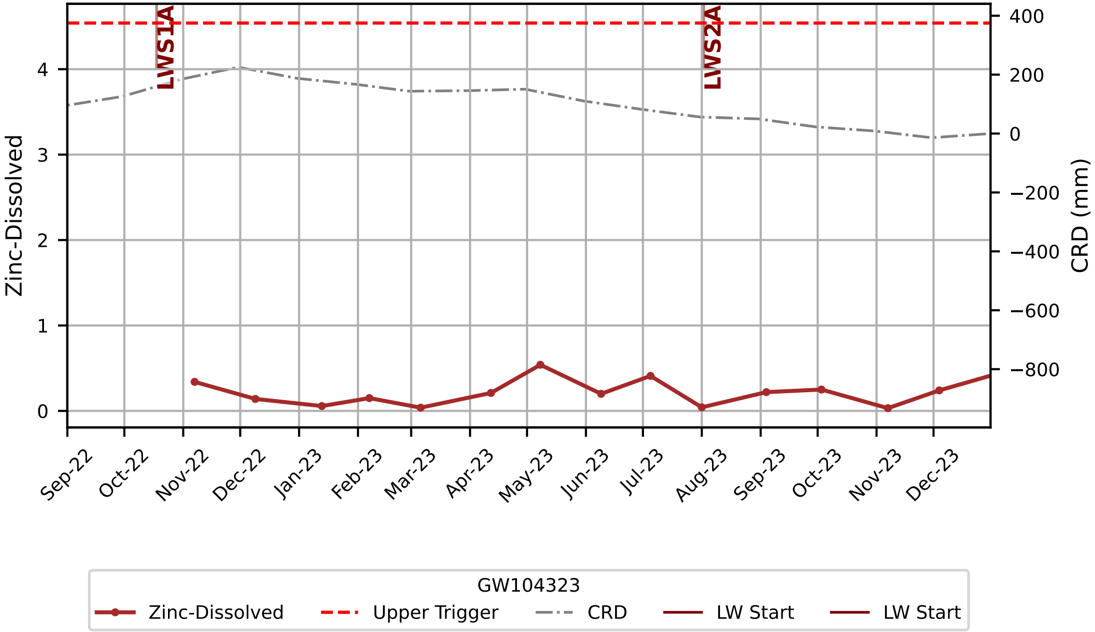
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
2.6
2.4
2.2
2.0
1.8
1.6
1.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



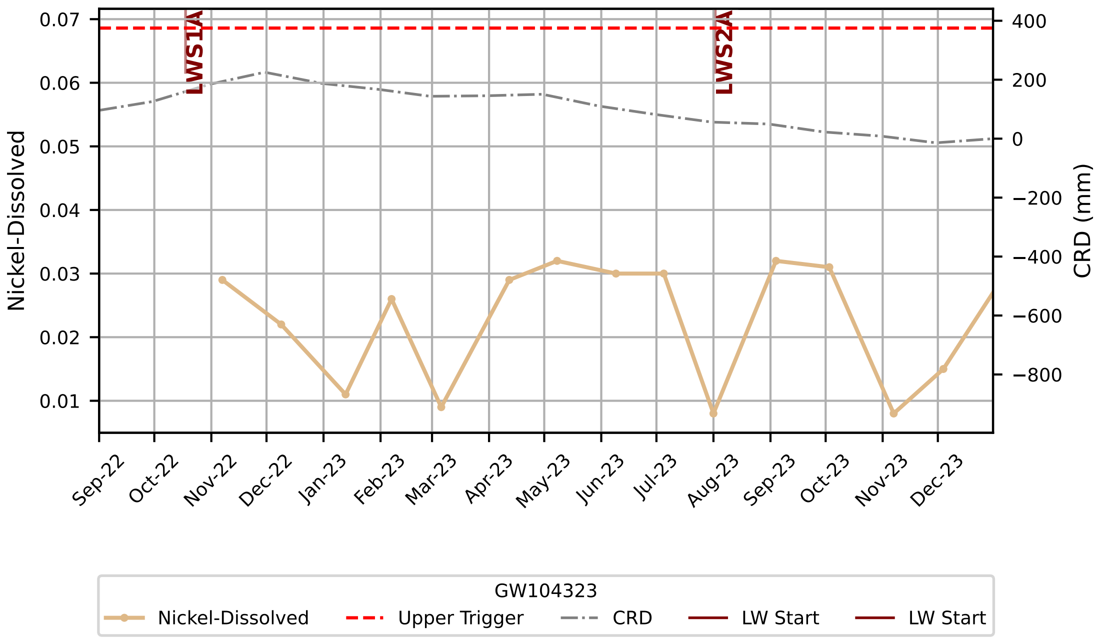
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



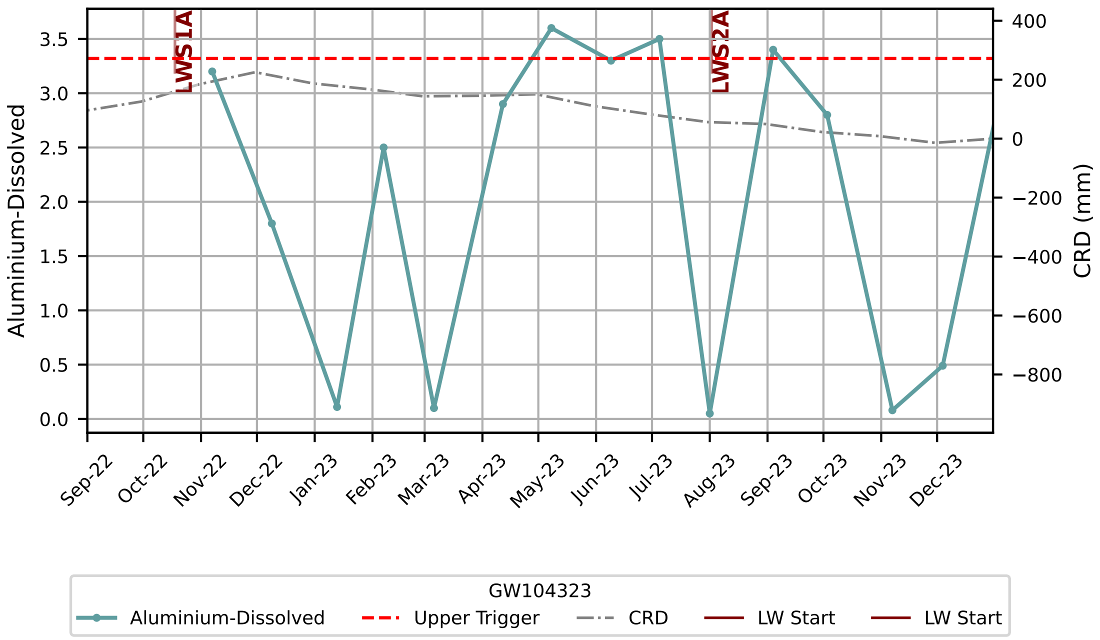
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



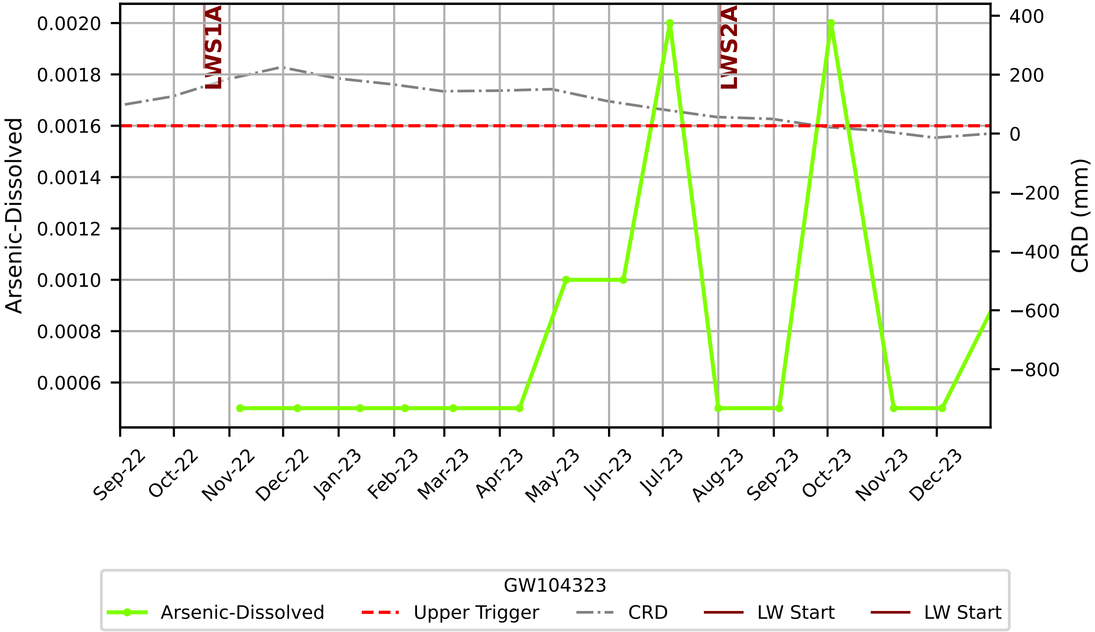
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0
1
2
3
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



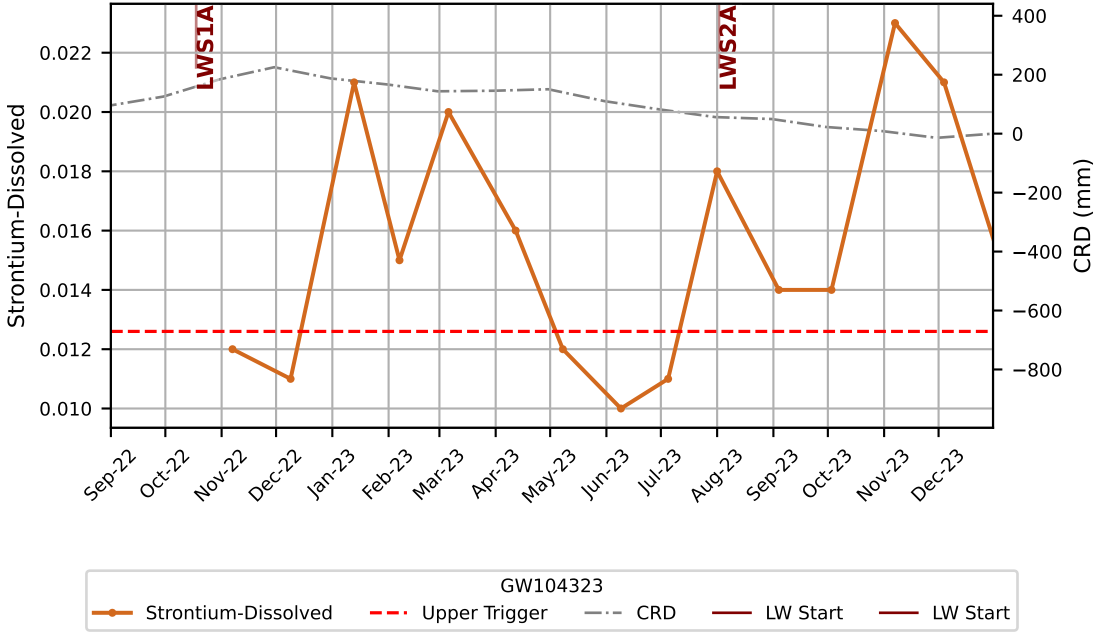
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
0.07
0.06
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

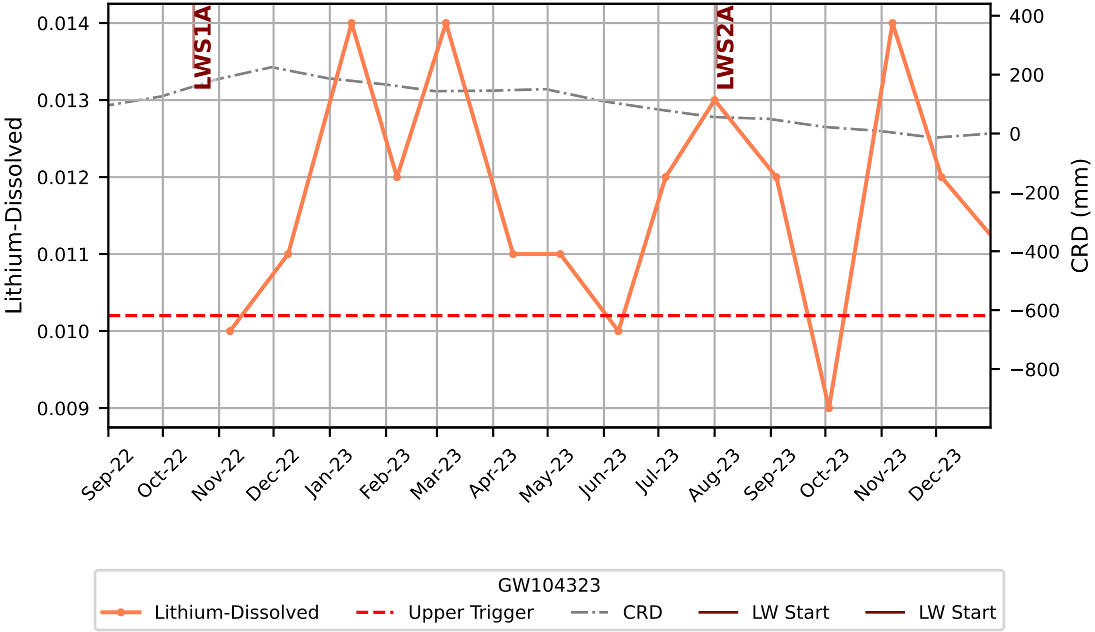


Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

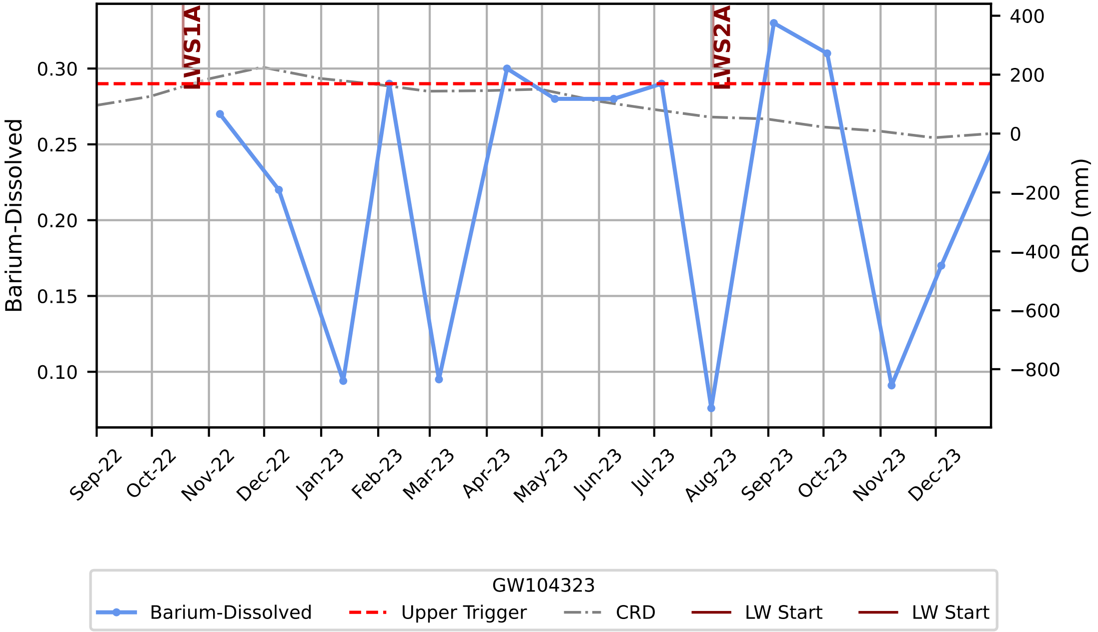


LWS1A
LWS2A
Arsenic-Dissolved
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

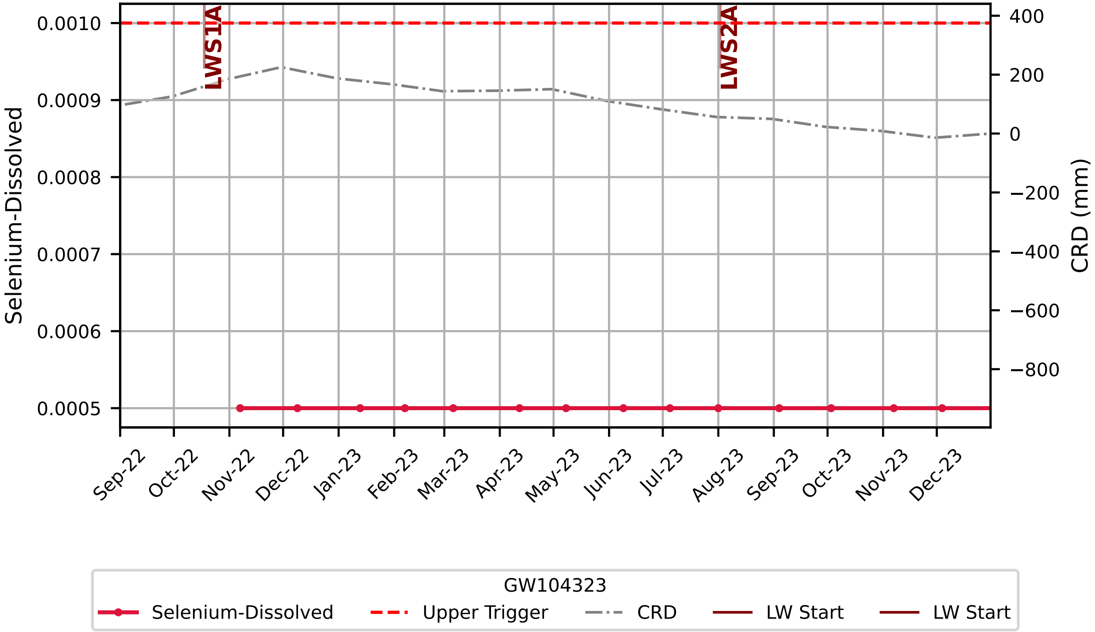

LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.010
0.012
0.014
0.016
0.018
0.020
0.022
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



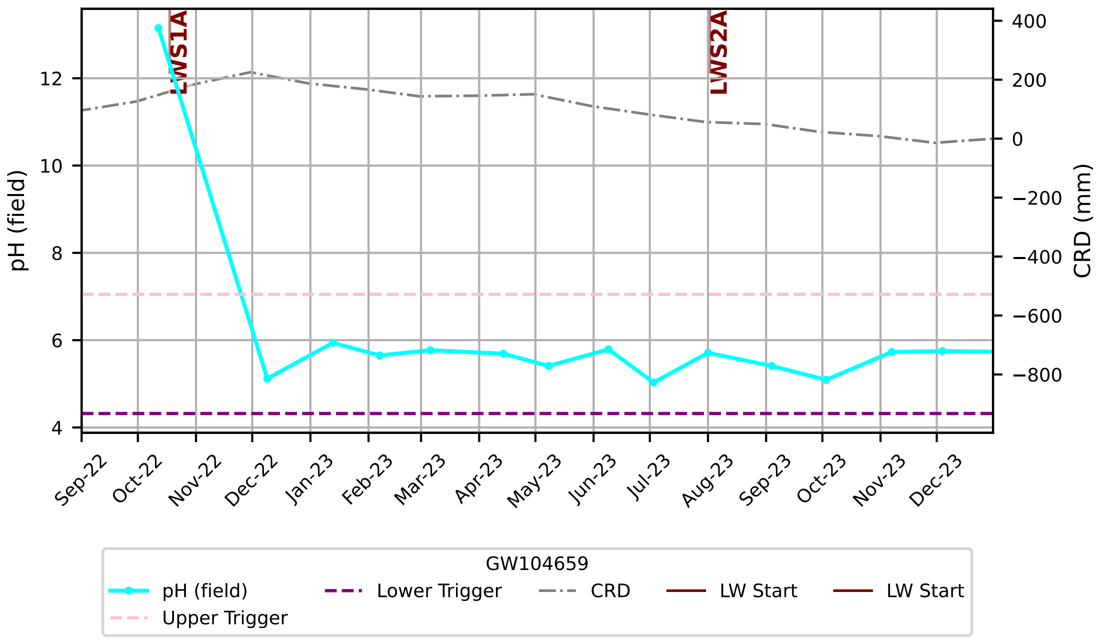
LWS1A
LWS2A
0.014
0.013
0.012
0.011
0.010
0.009
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



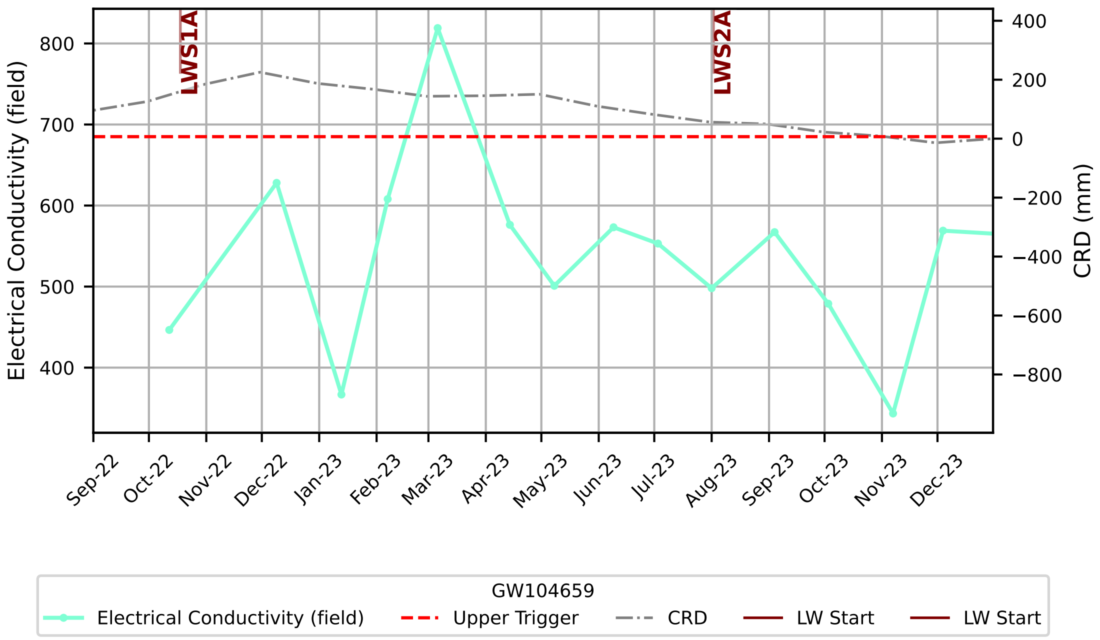
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.30
0.25
0.20
0.15
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



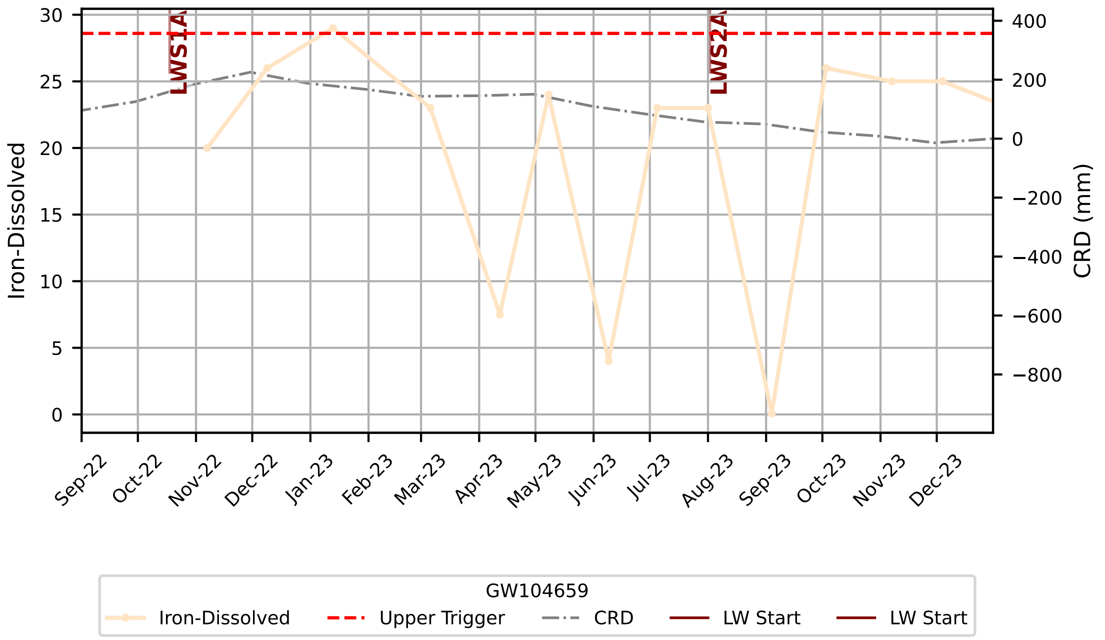
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

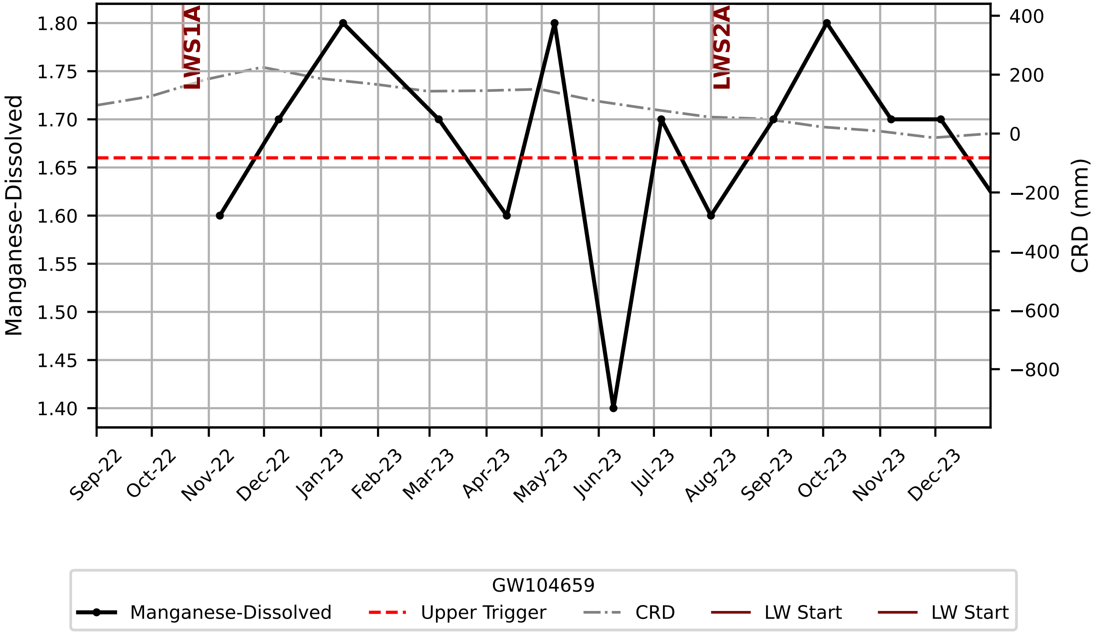


LWS1A
LWS2A
pH (field)
CRD (mm)
12
10
8
6
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

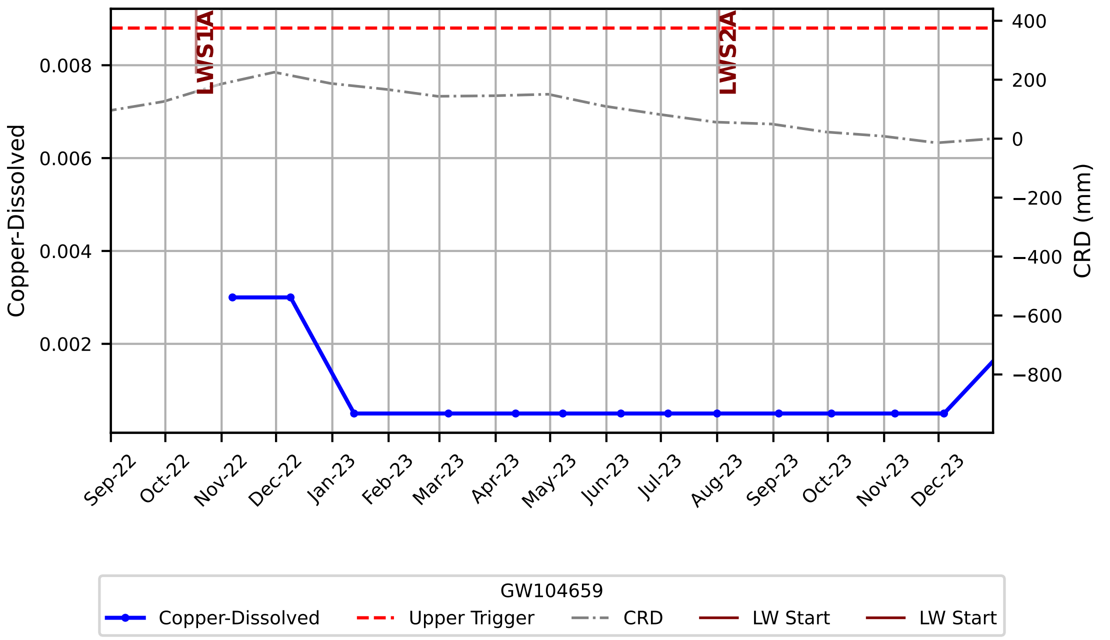


LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start

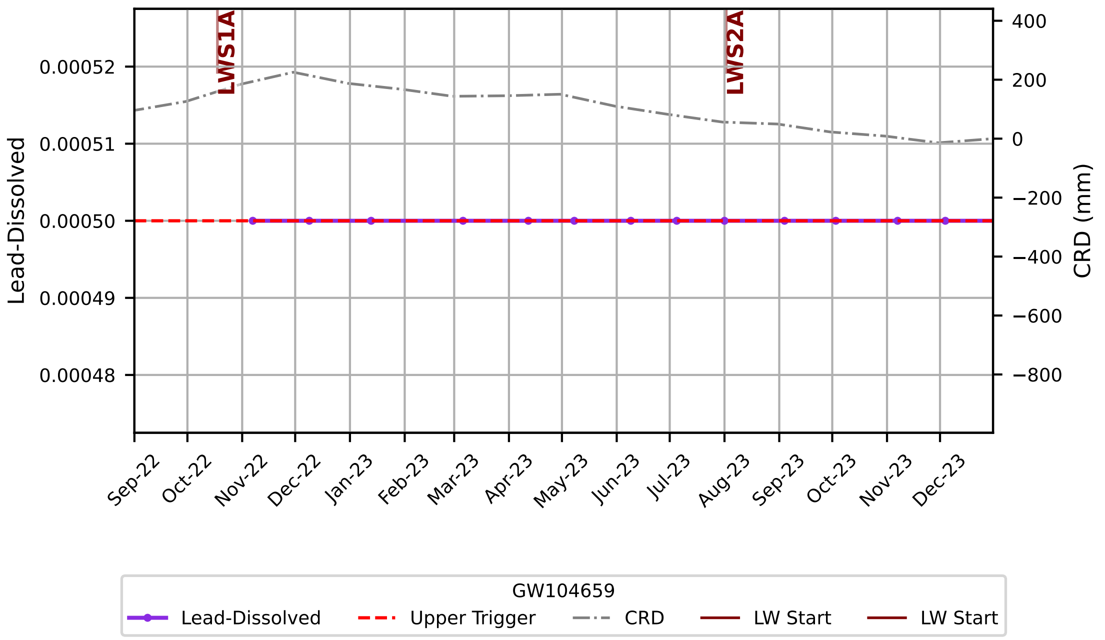

LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



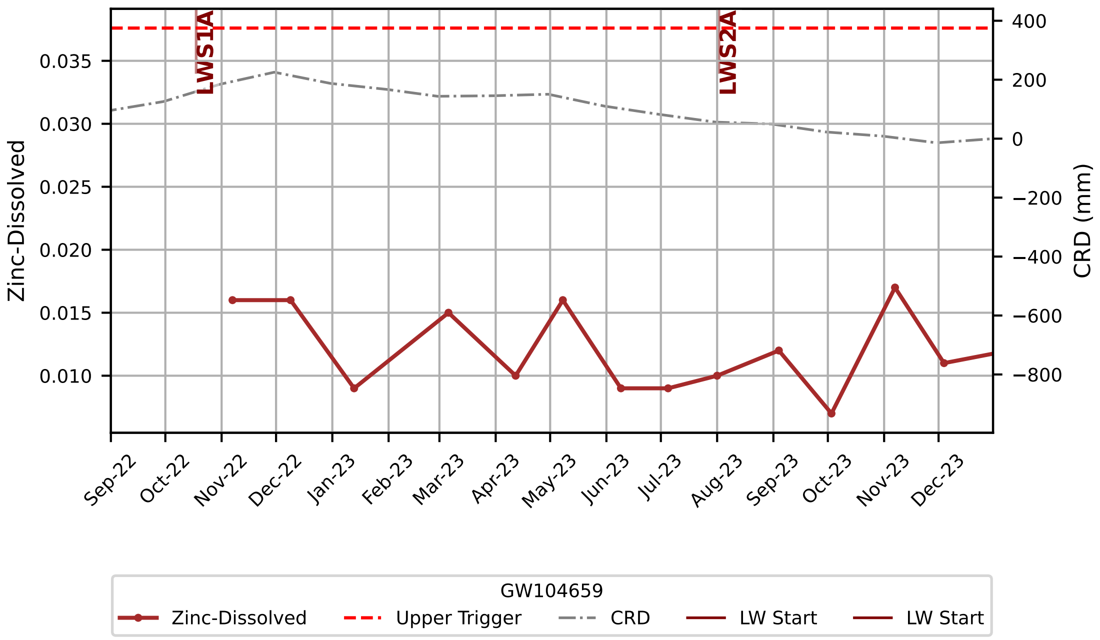
Manganese-Dissolved
CRD (mm)
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



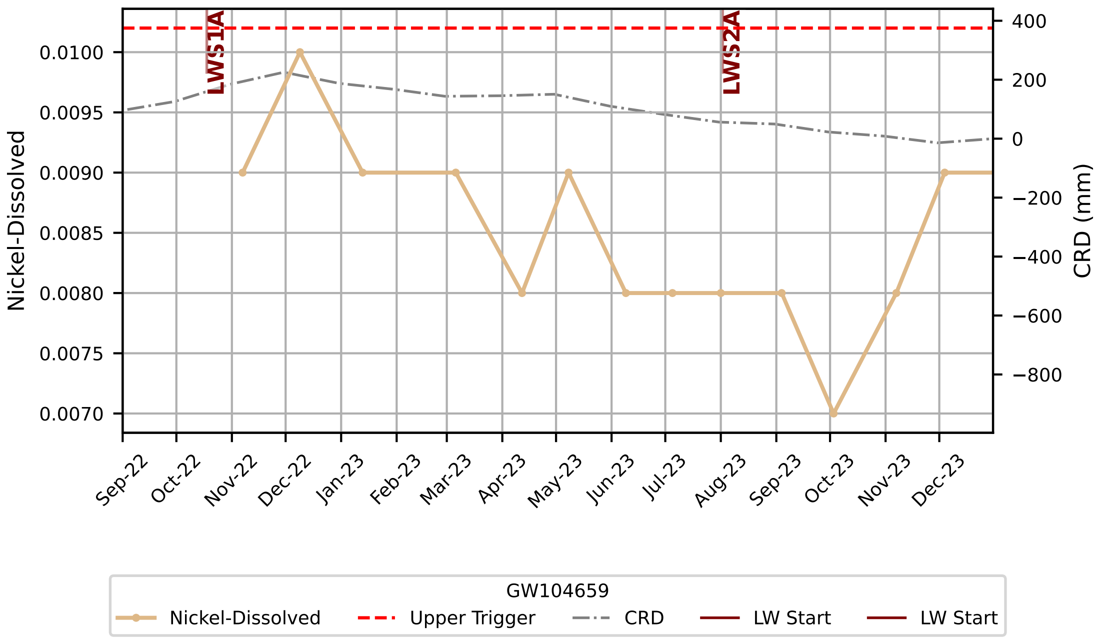
LWS1A
LWS2A
Copper-Dissolved
0.008
0.006
0.004
0.002
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



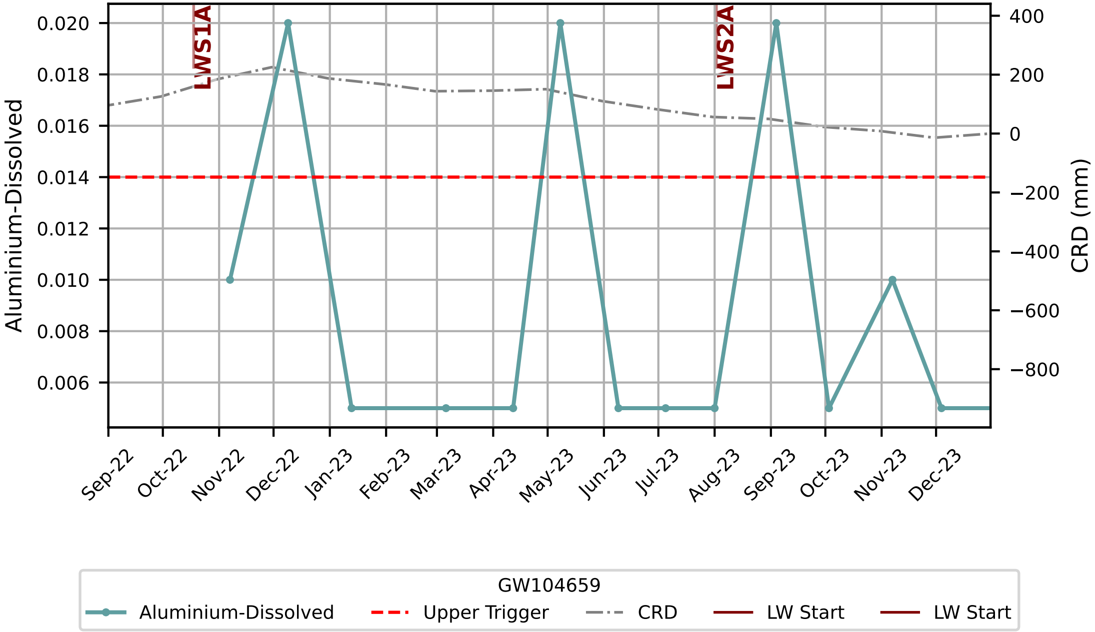
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



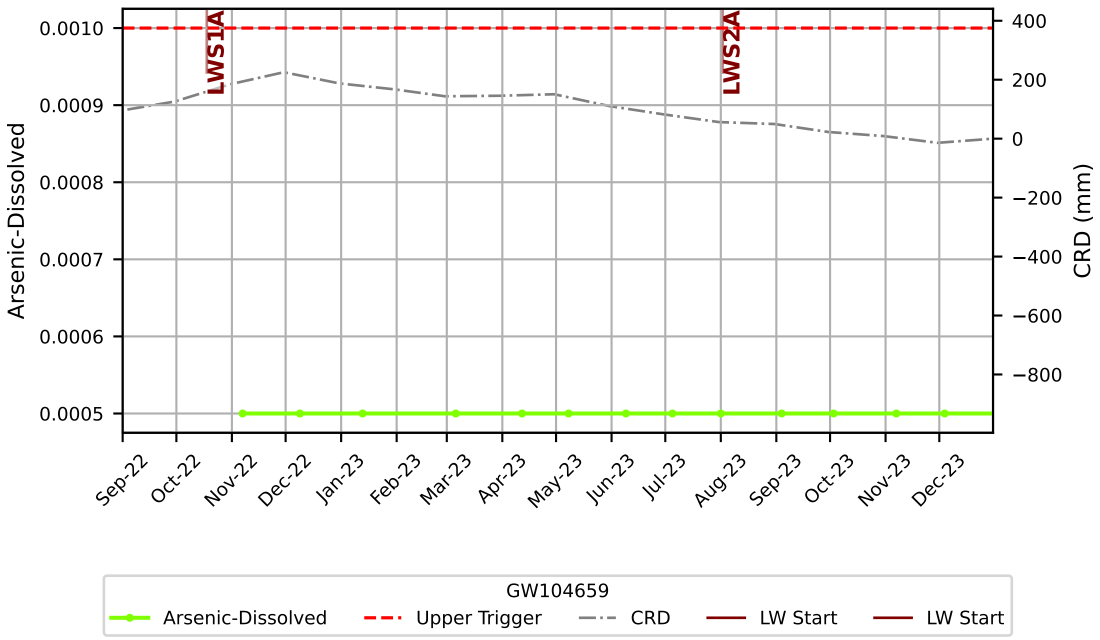
LWS1A
LWS2A
0.035
0.030
0.025
0.020
0.015
0.010
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



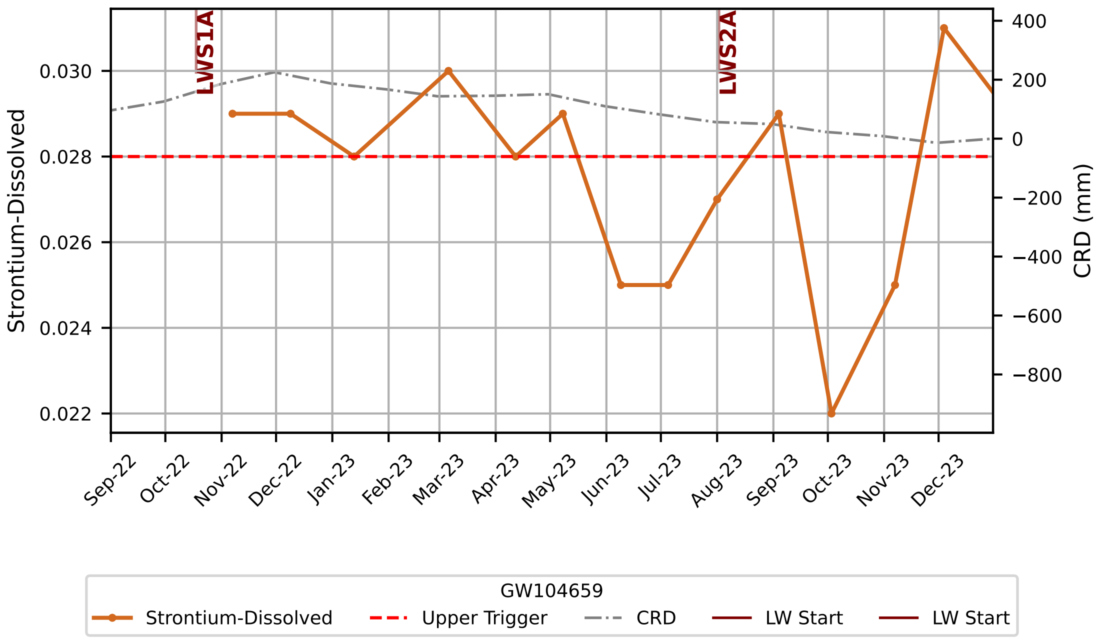
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



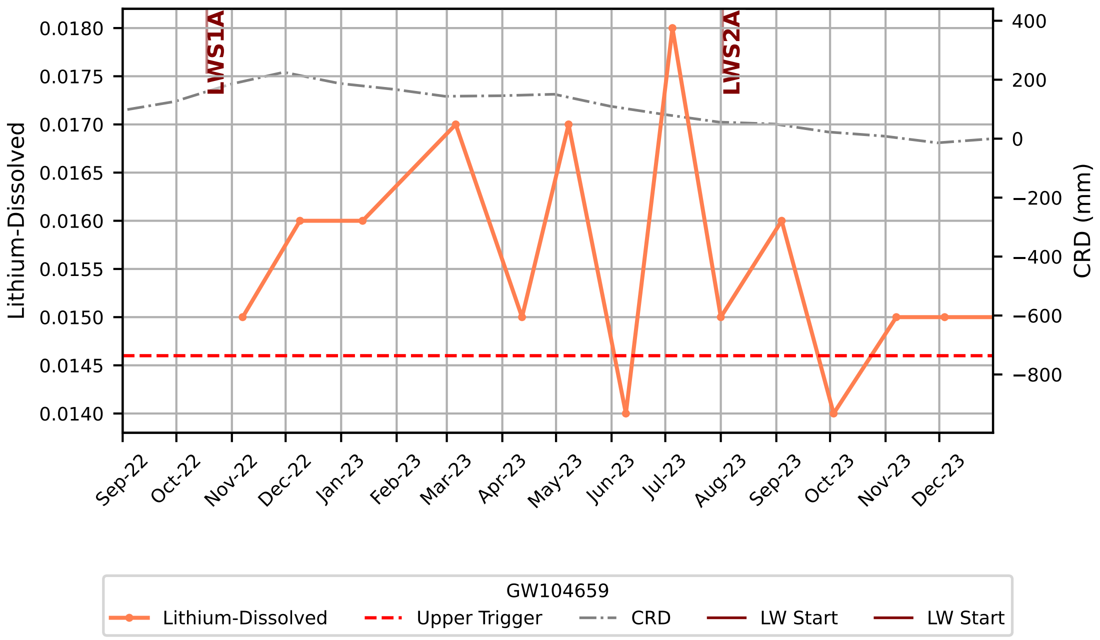
LWS1A
LWS2A
Aluminium-Dissolved
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



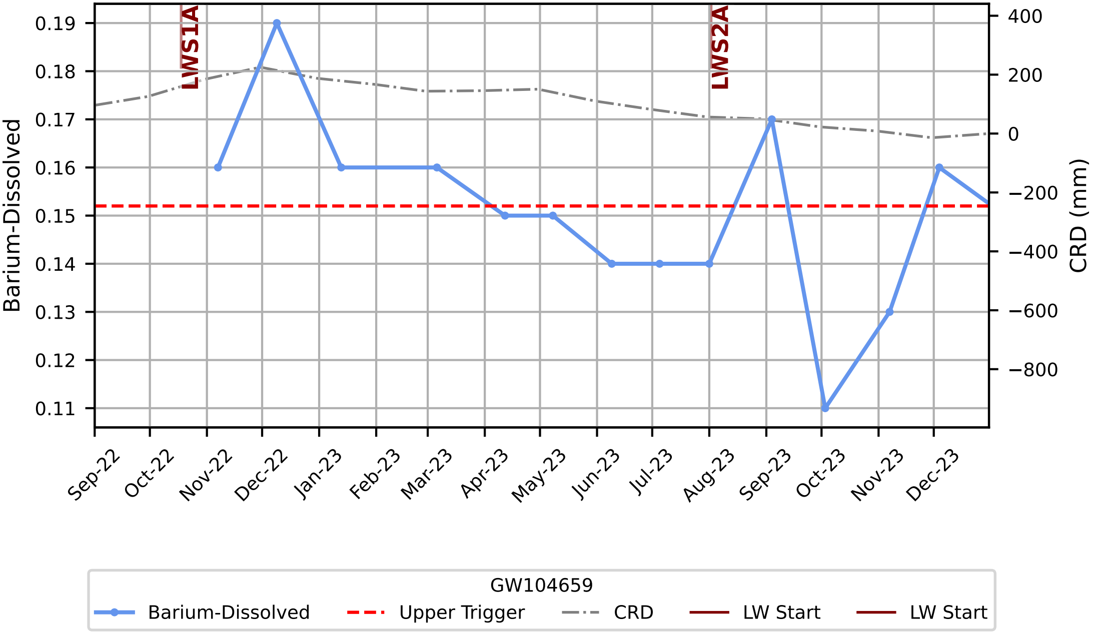
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



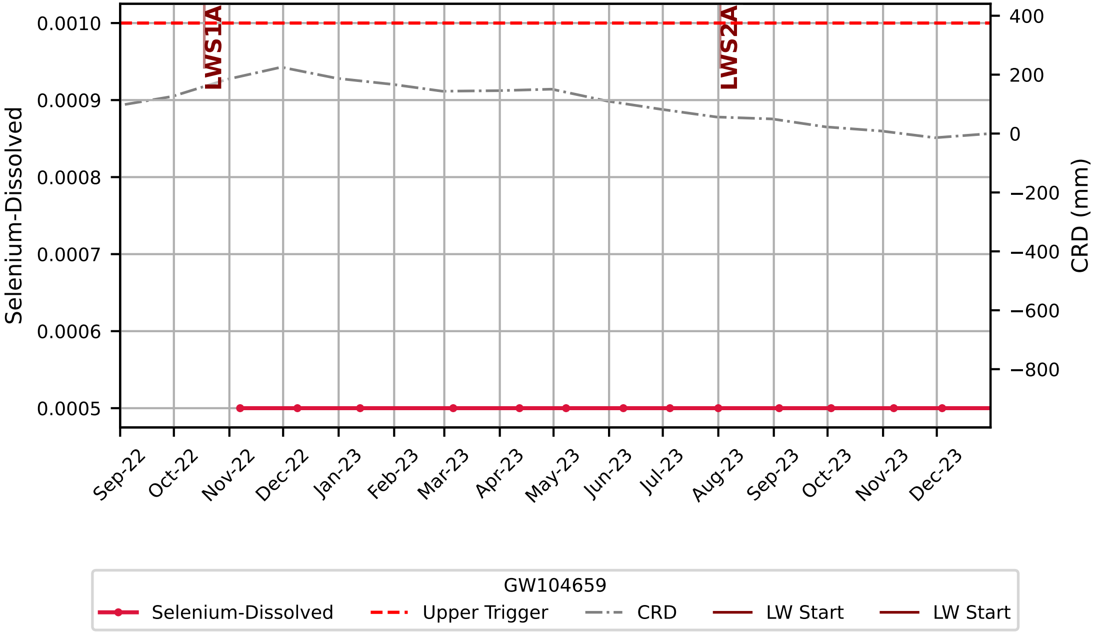
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.030
0.028
0.026
0.024
0.022
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



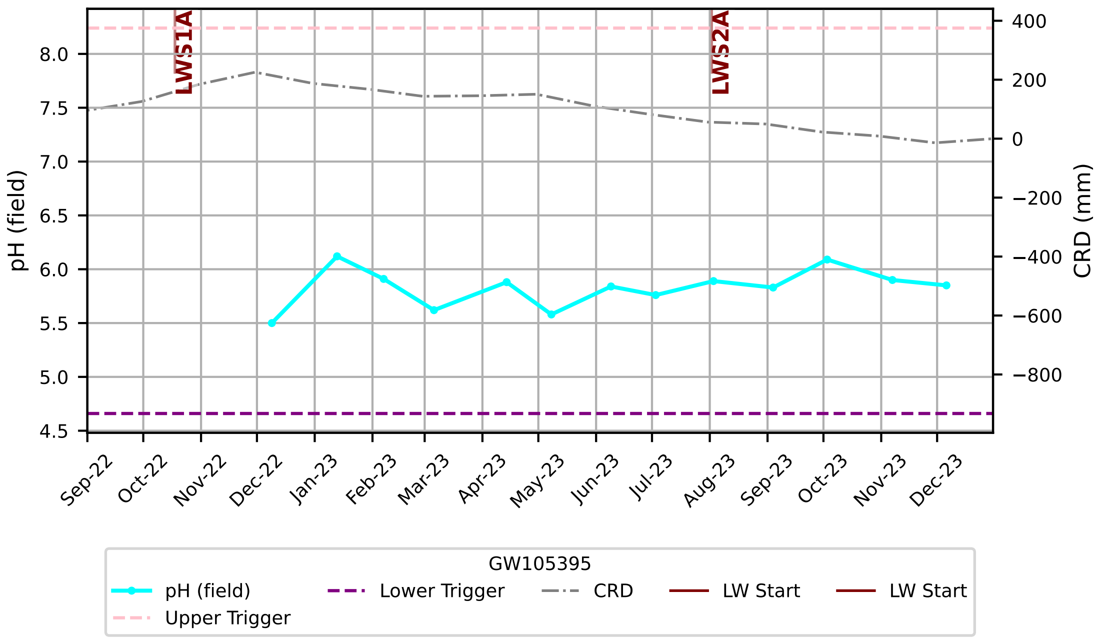
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0180
0.0175
0.0170
0.0165
0.0160
0.0155
0.0150
0.0145
0.0140
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



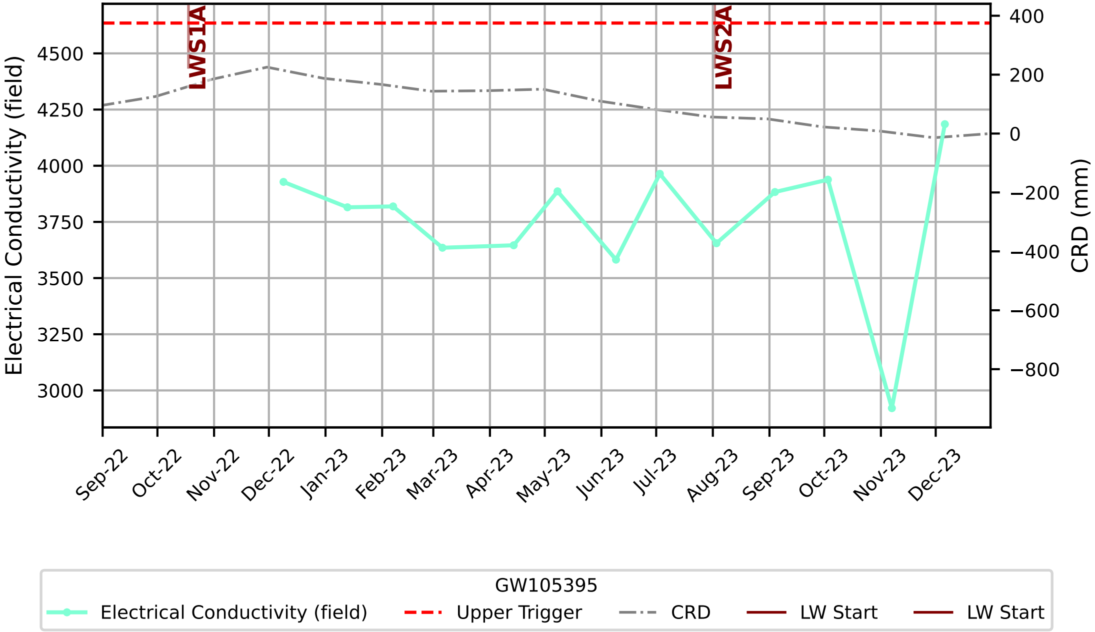
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



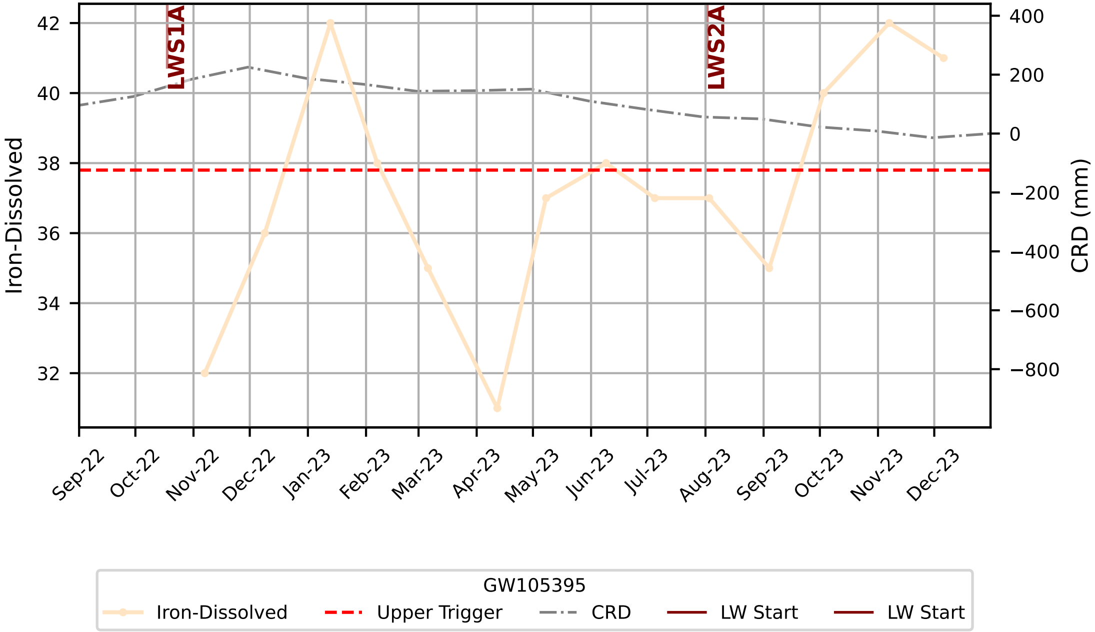
LWS1A
LWS2A
Selenium-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



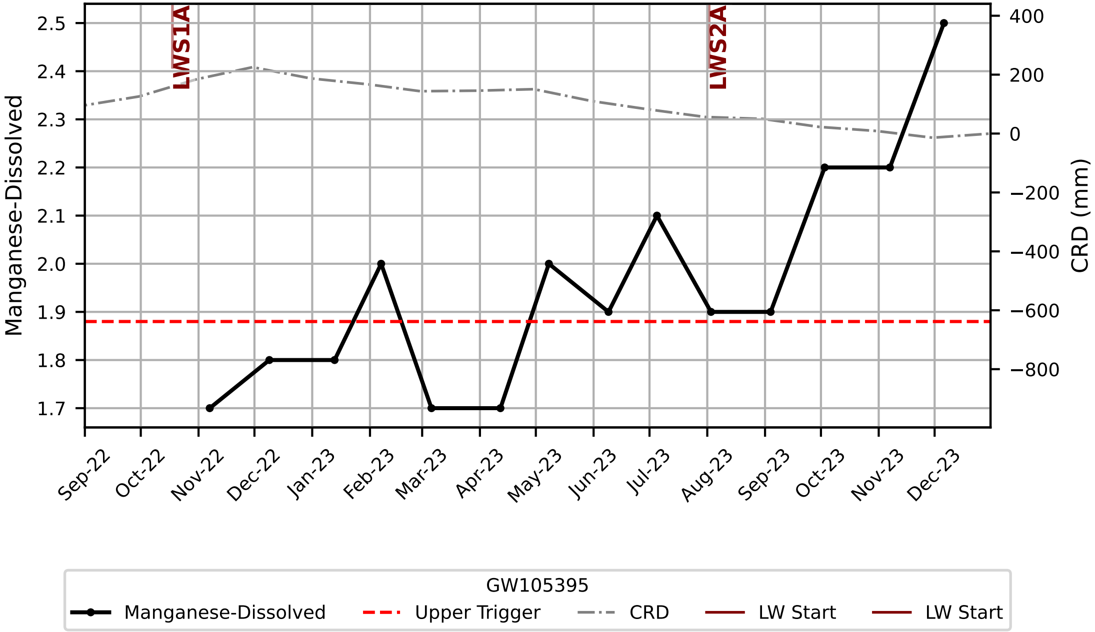
LWS1A
LWS2A
pH (field)
CRD (mm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



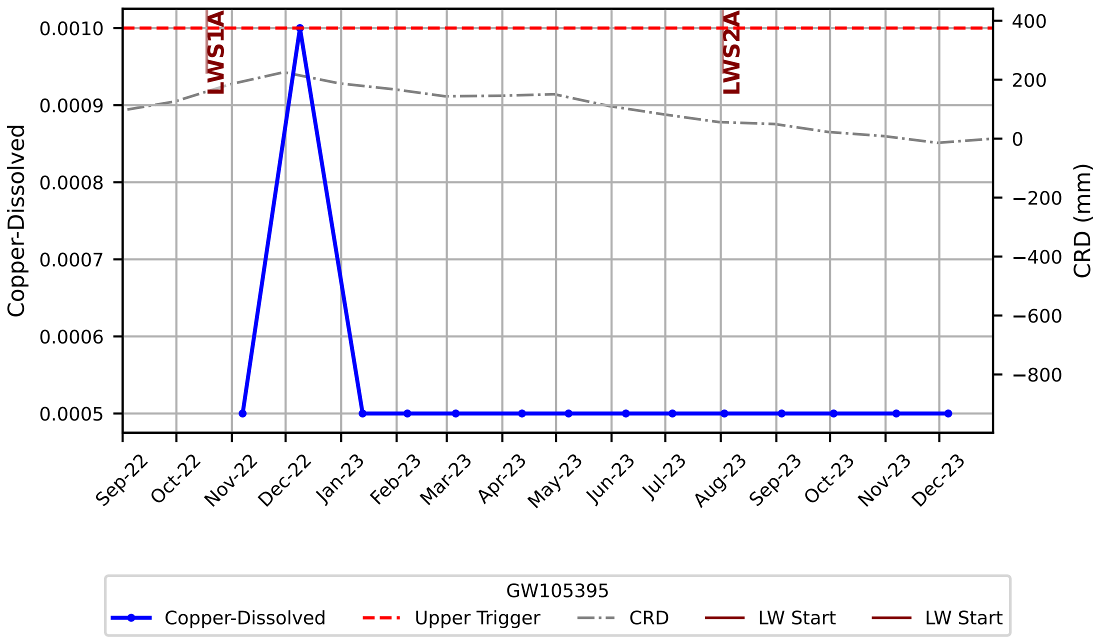
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
4500
4250
4000
3750
3500
3250
3000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



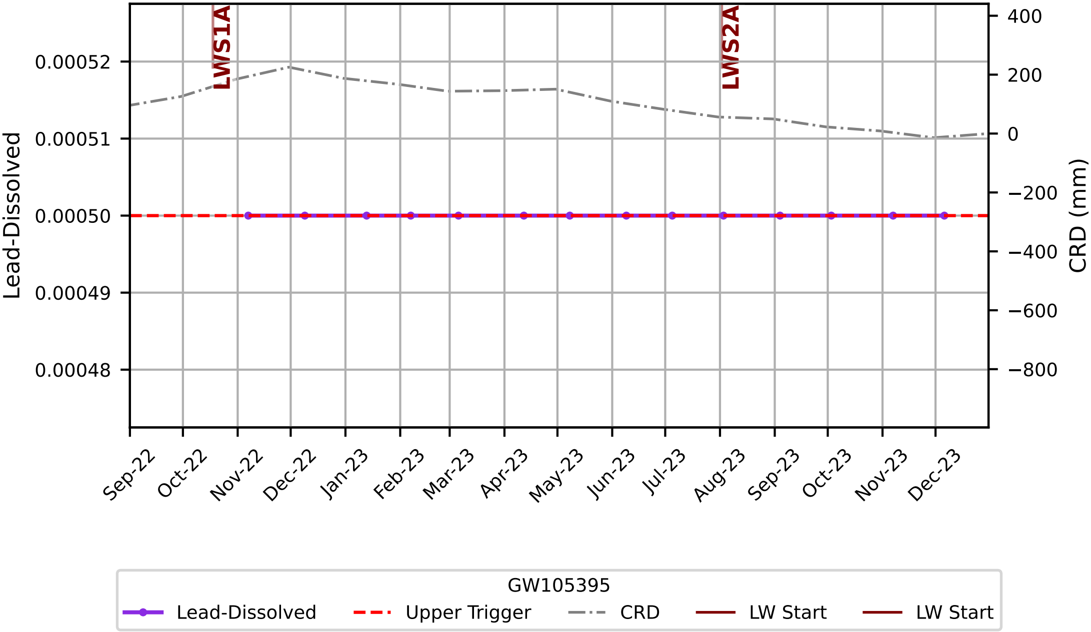
LWS1A
LWS2A
42
40
38
36
34
32
Iron-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



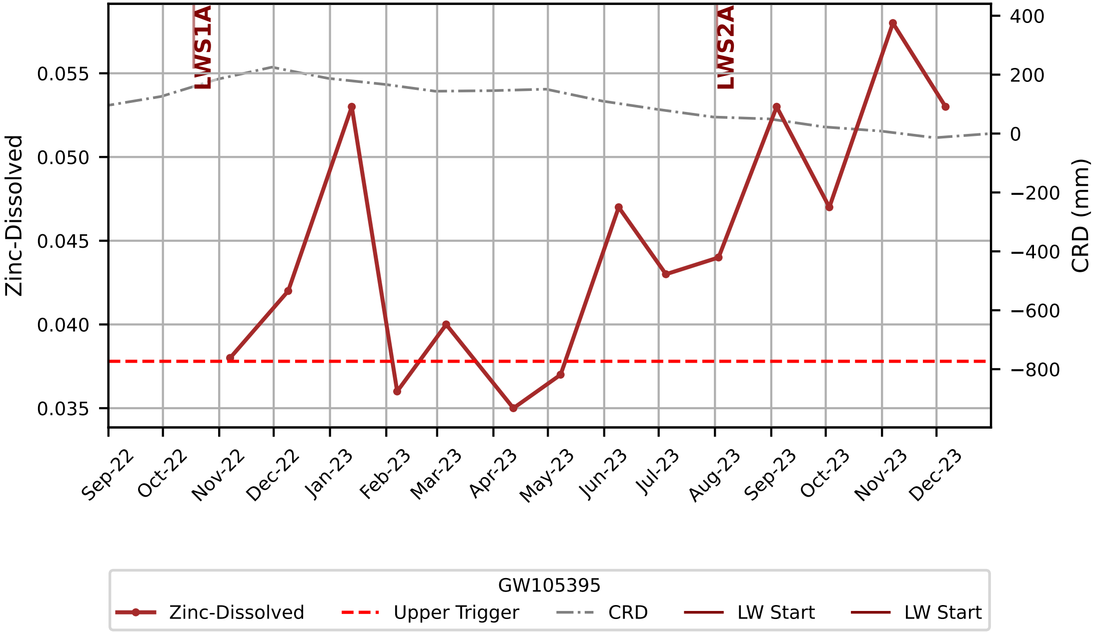
Manganese-Dissolved
CRD (mm)
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



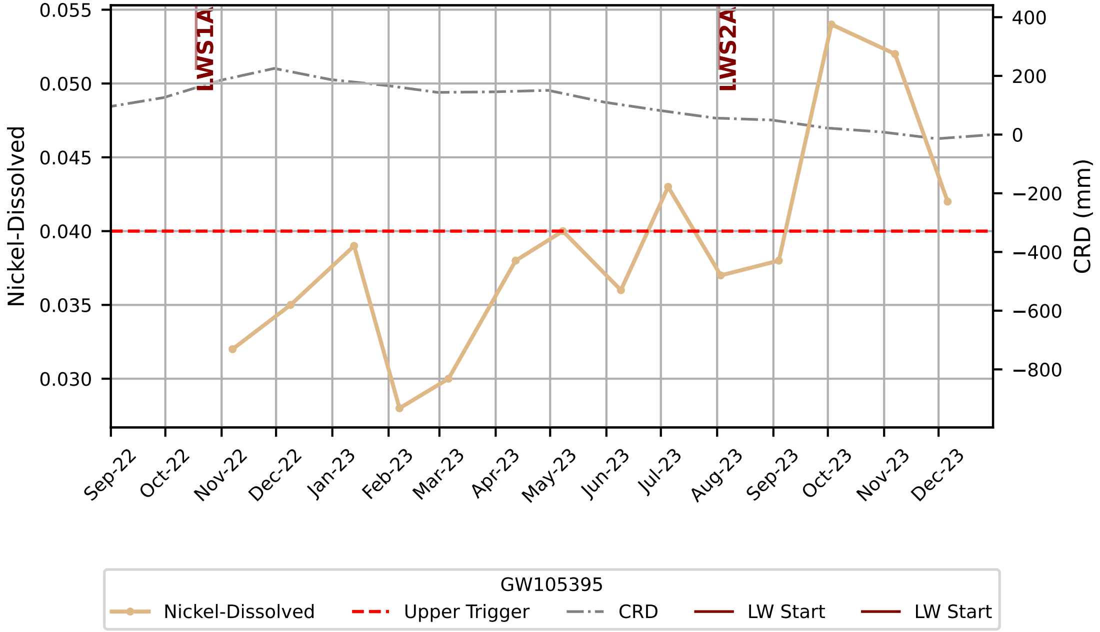
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



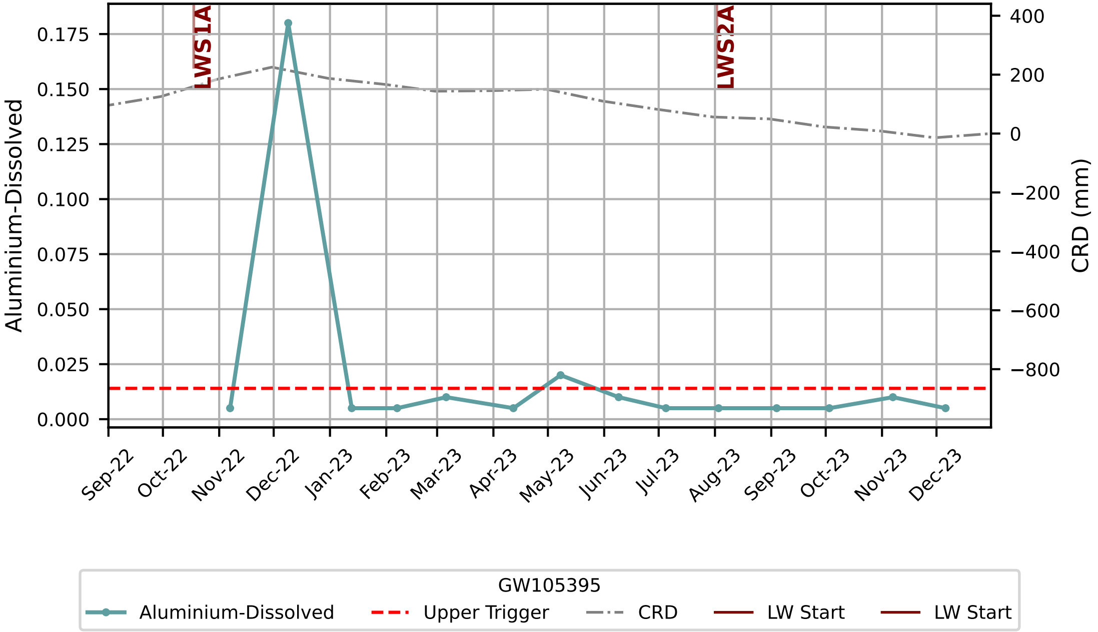
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



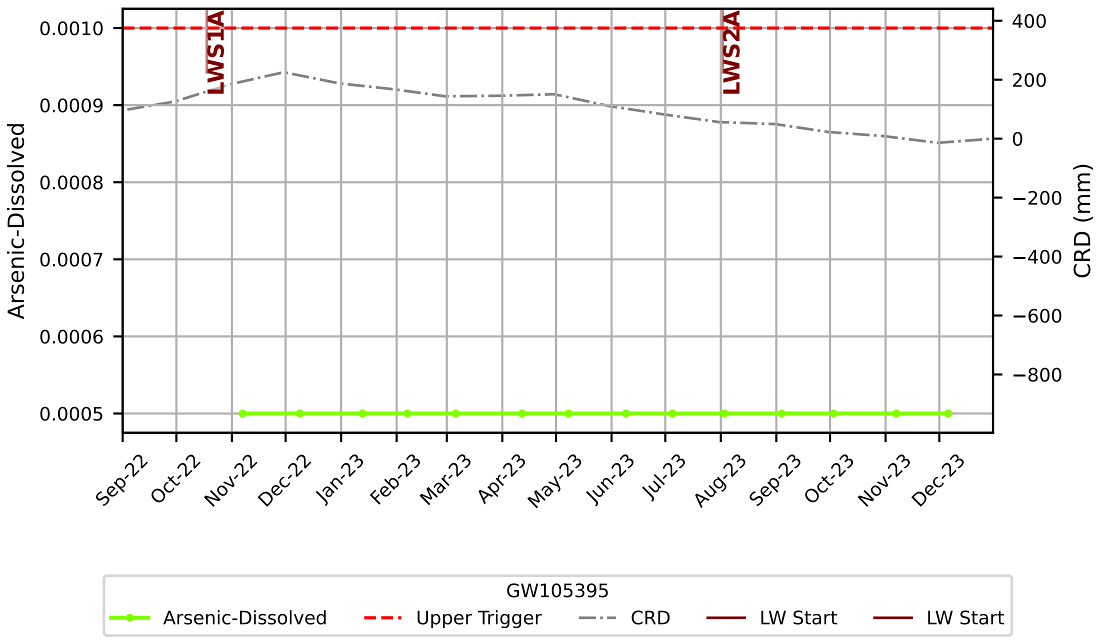
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.055
0.050
0.045
0.040
0.035
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



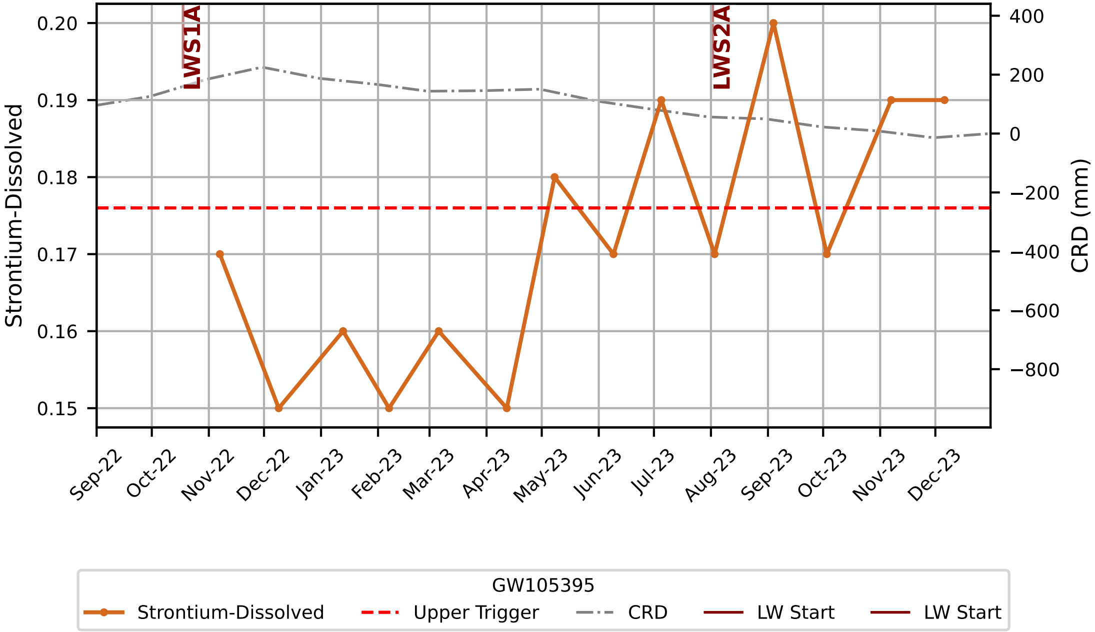
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.055
0.050
0.045
0.040
0.035
0.030
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



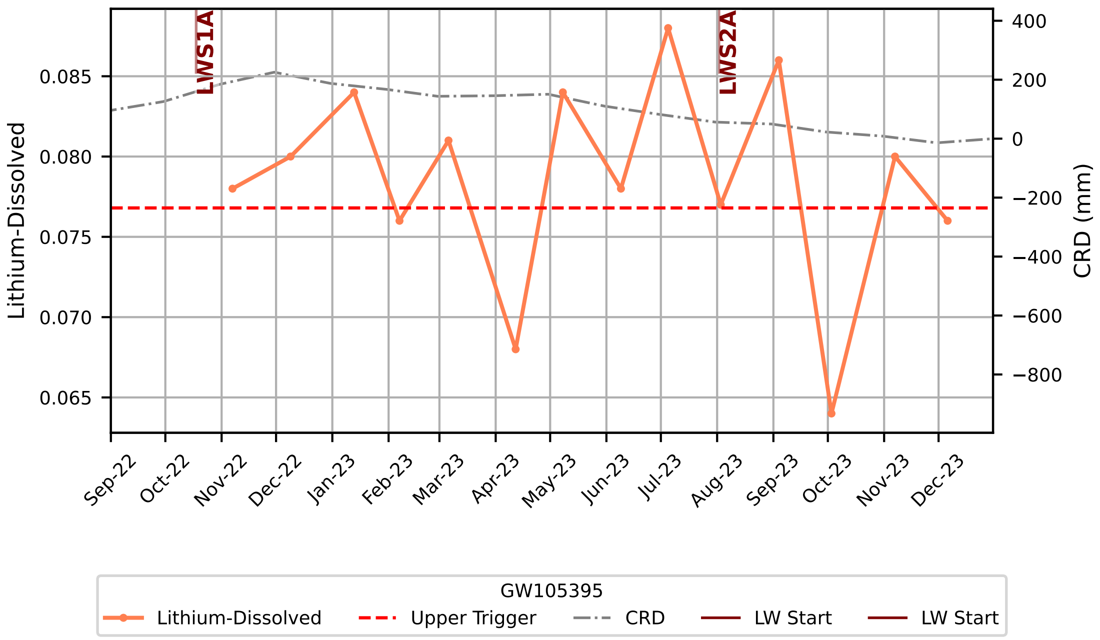
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



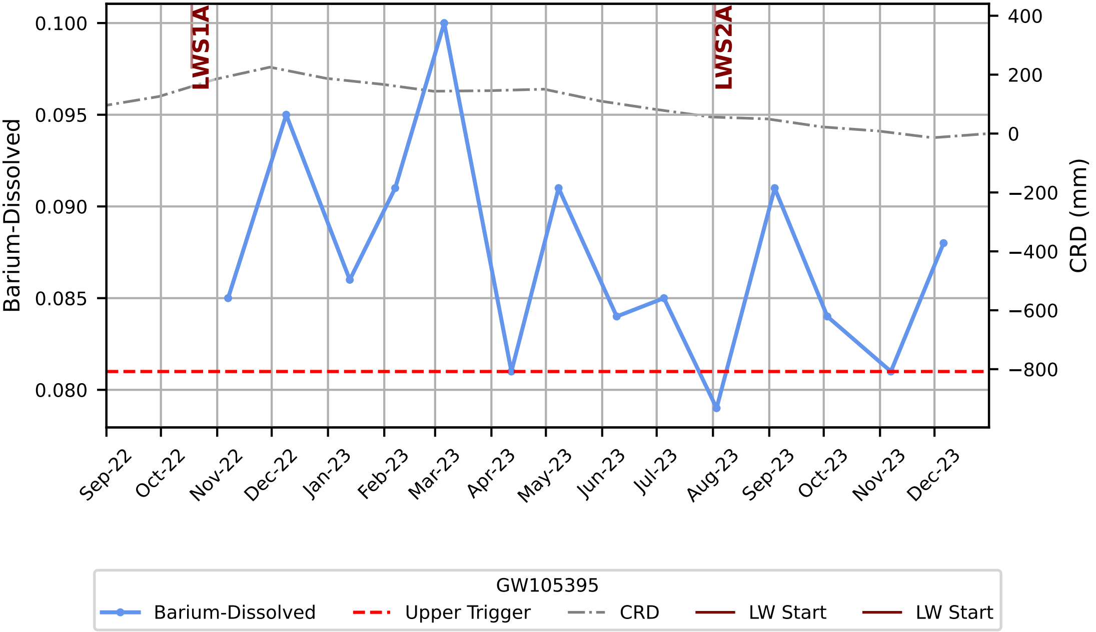
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



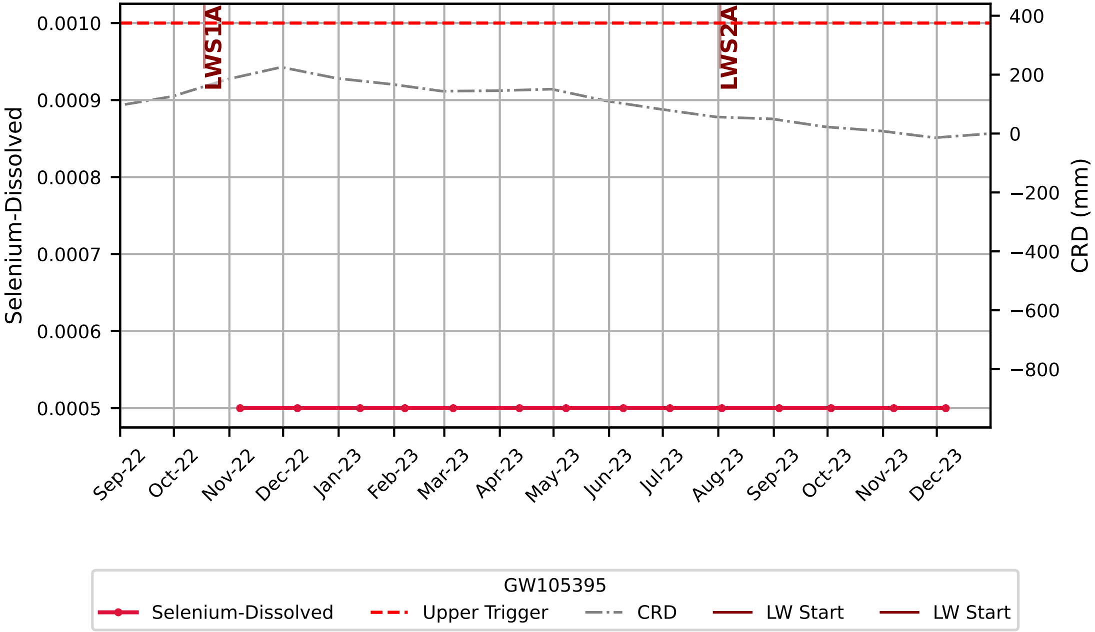
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.20
0.19
0.18
0.17
0.16
0.15
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



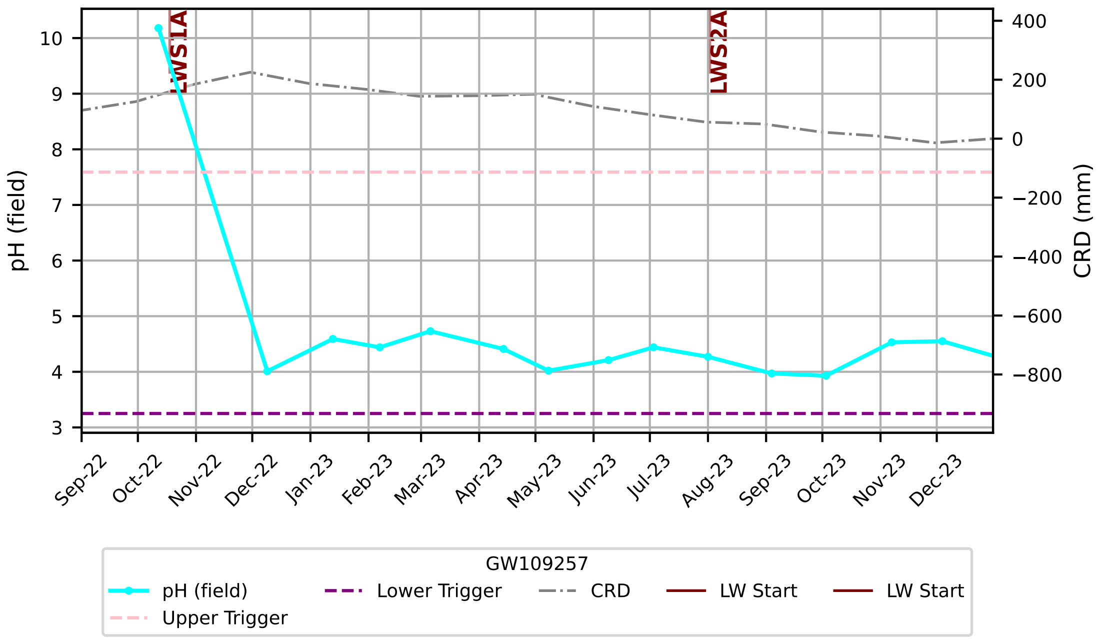
LWS1A
LWS2A
0.085
0.080
0.075
0.070
0.065
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



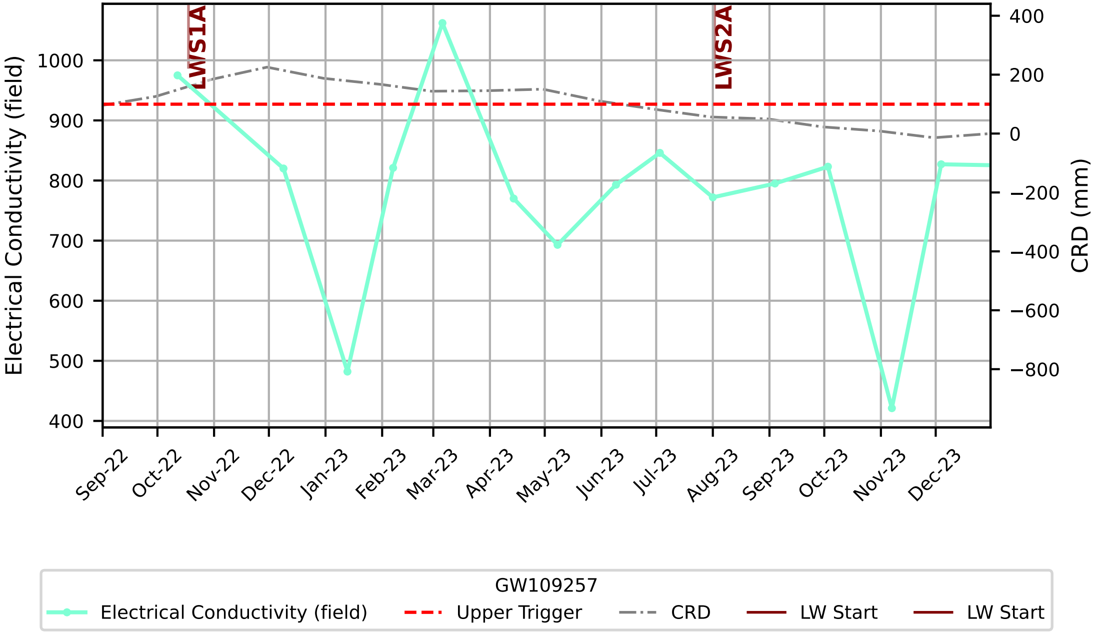
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.100
0.095
0.090
0.085
0.080
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



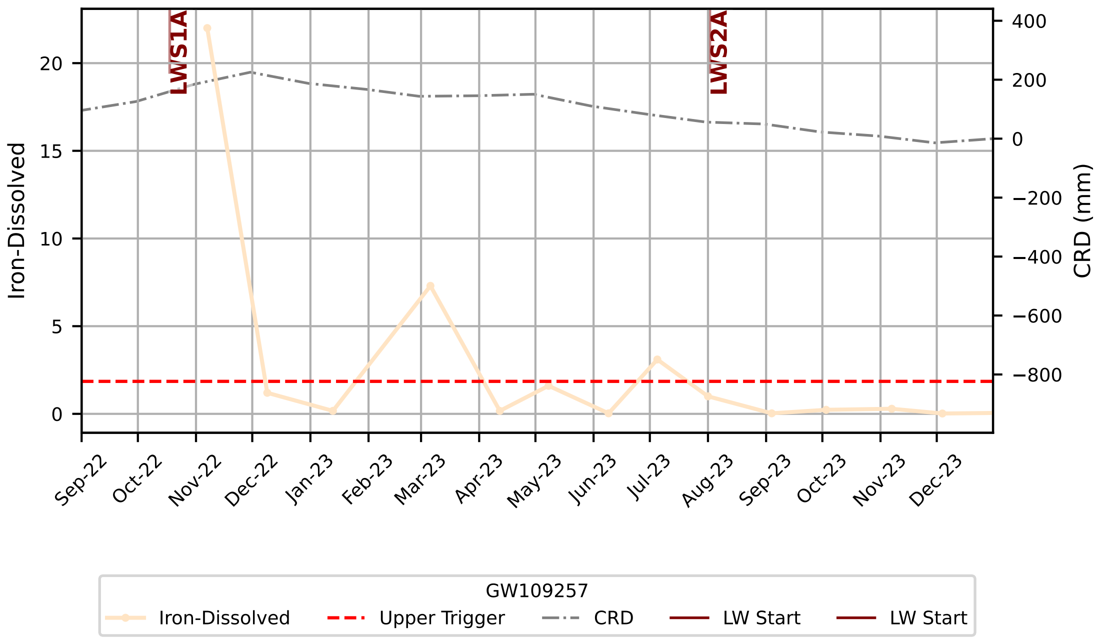
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



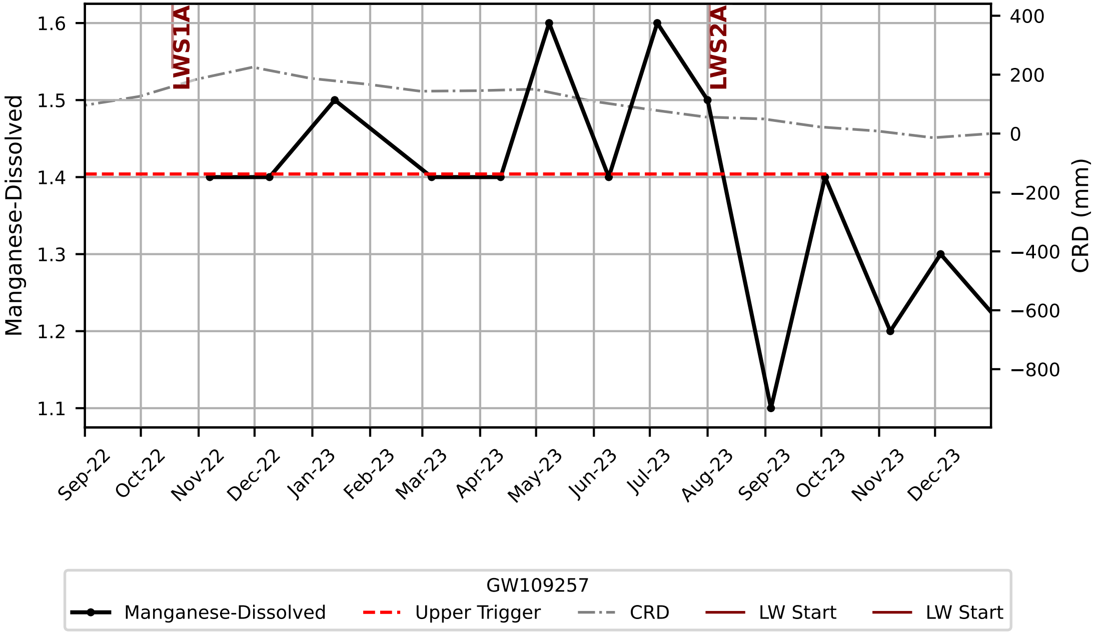
LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
5
4
3
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



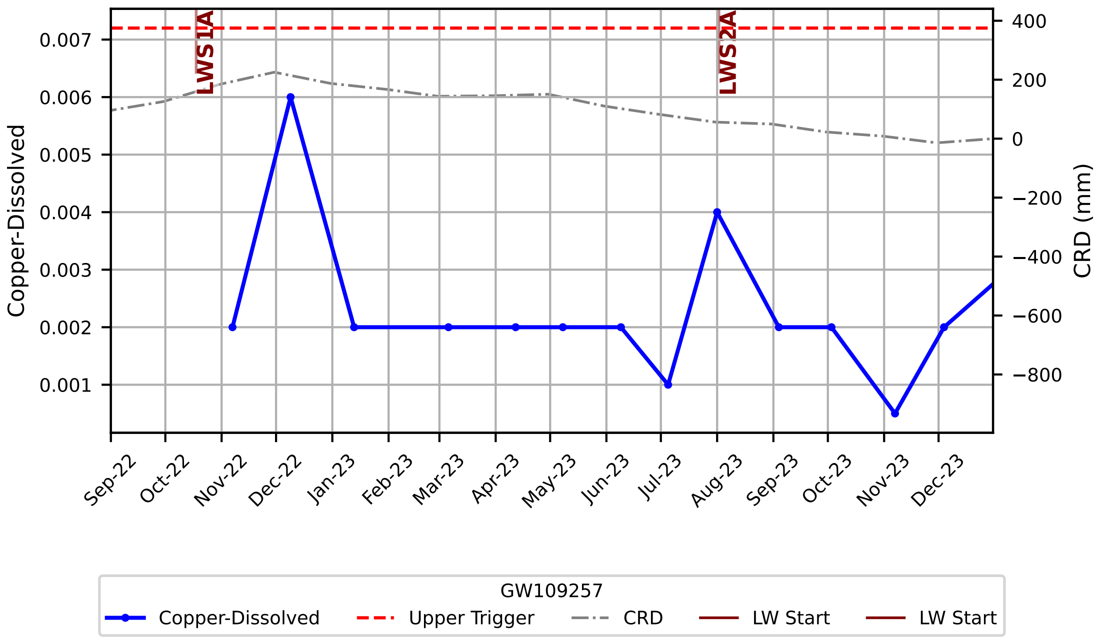
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1000
900
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



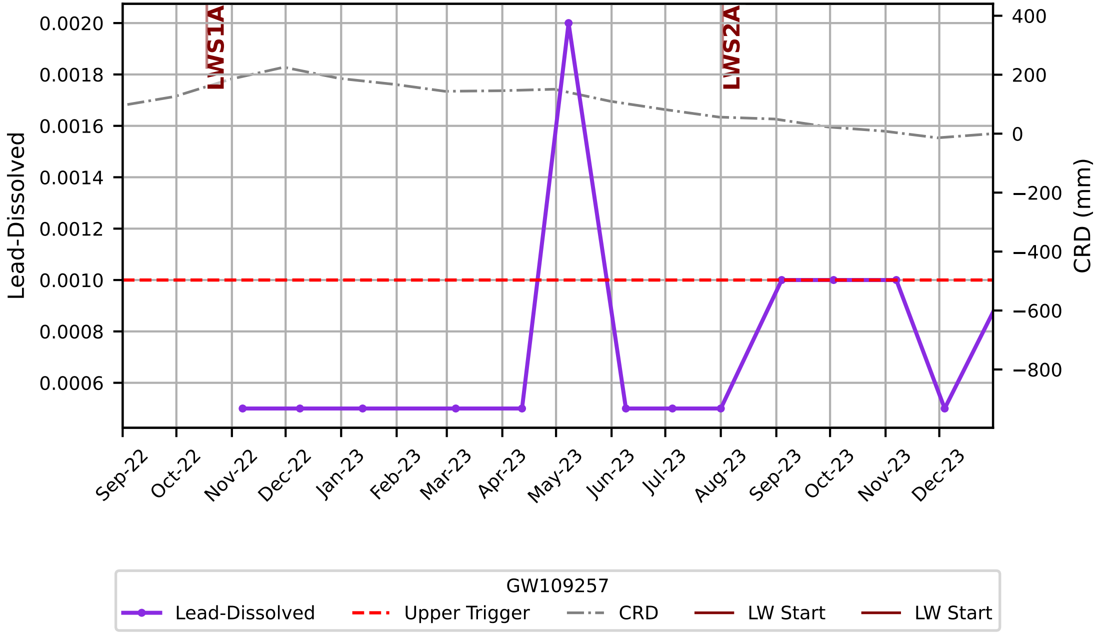
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0
5
10
15
20
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



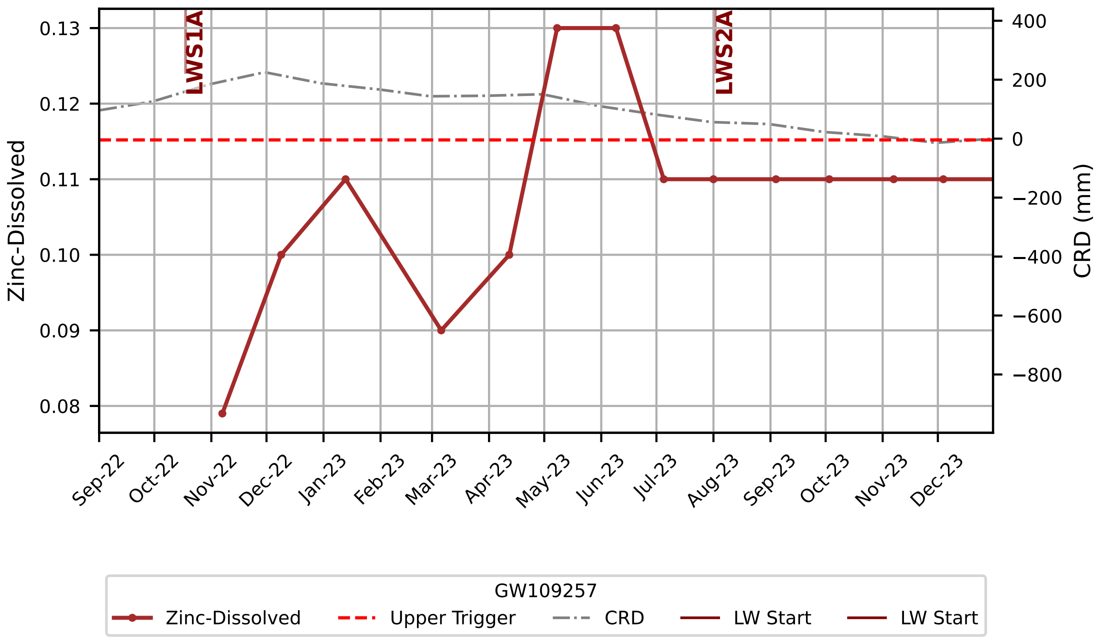
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
1.6
1.5
1.4
1.3
1.2
1.1
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



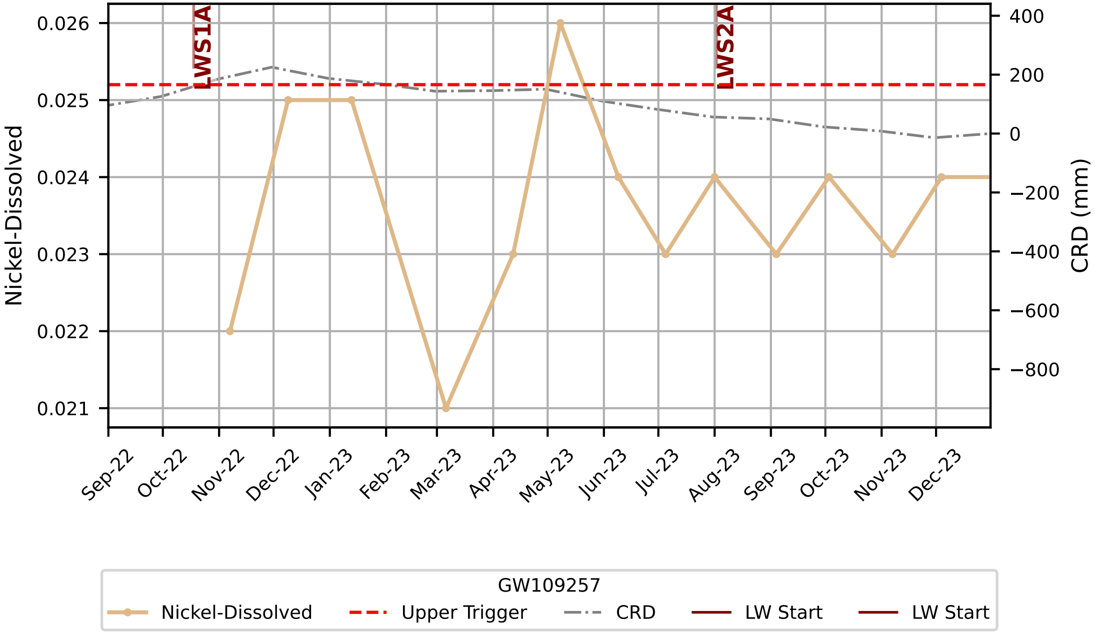
LWS1A
LWS2A
Copper-Dissolved
0.007
0.006
0.005
0.004
0.003
0.002
0.001
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

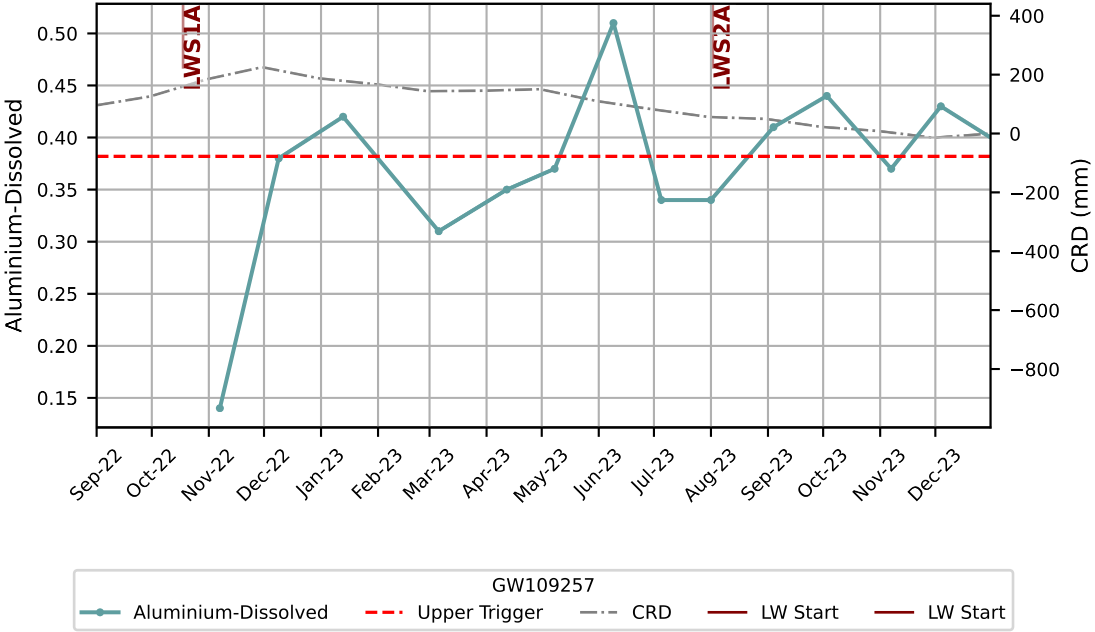


LWS1A
LWS2A
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

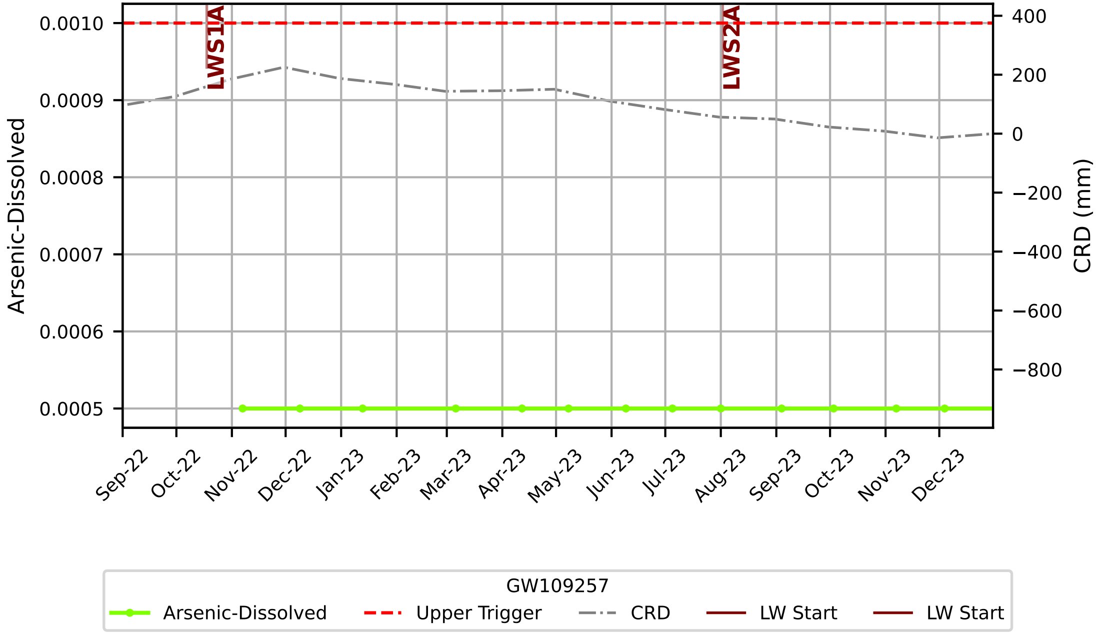


Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
0.13
0.12
0.11
0.10
0.09
0.08
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

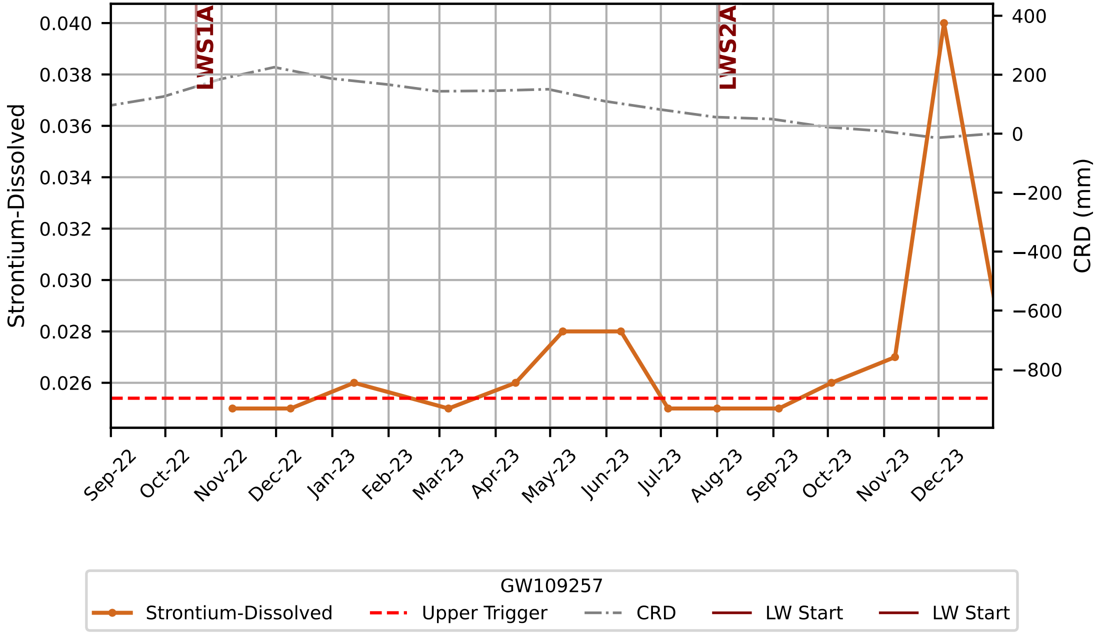

LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.026
0.025
0.024
0.023
0.022
0.021
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



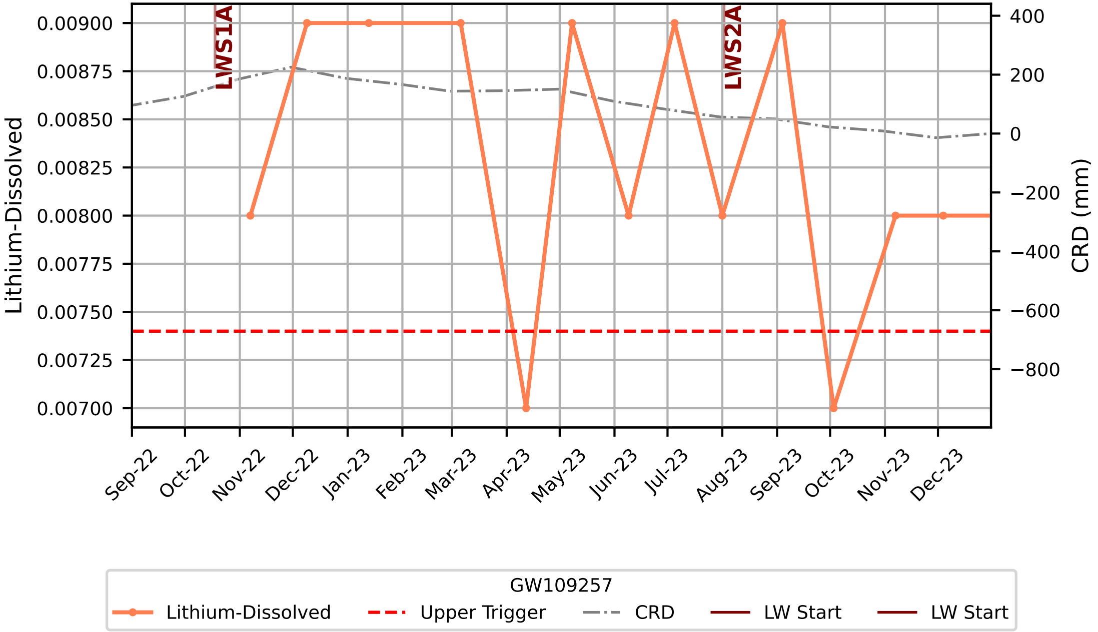
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



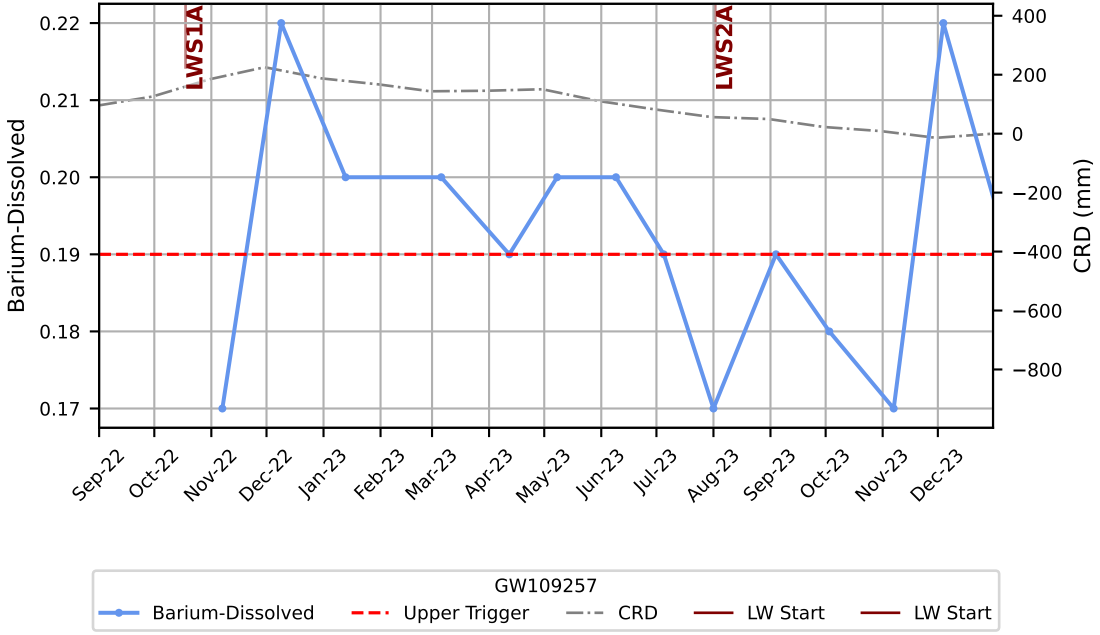
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



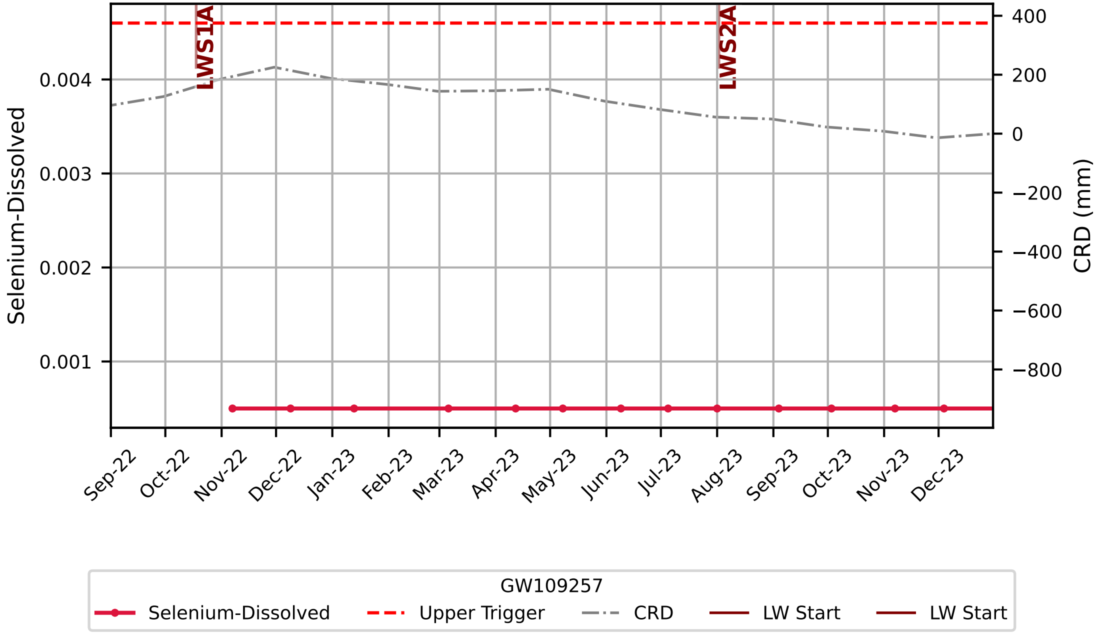
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.040
0.038
0.036
0.034
0.032
0.030
0.028
0.026
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



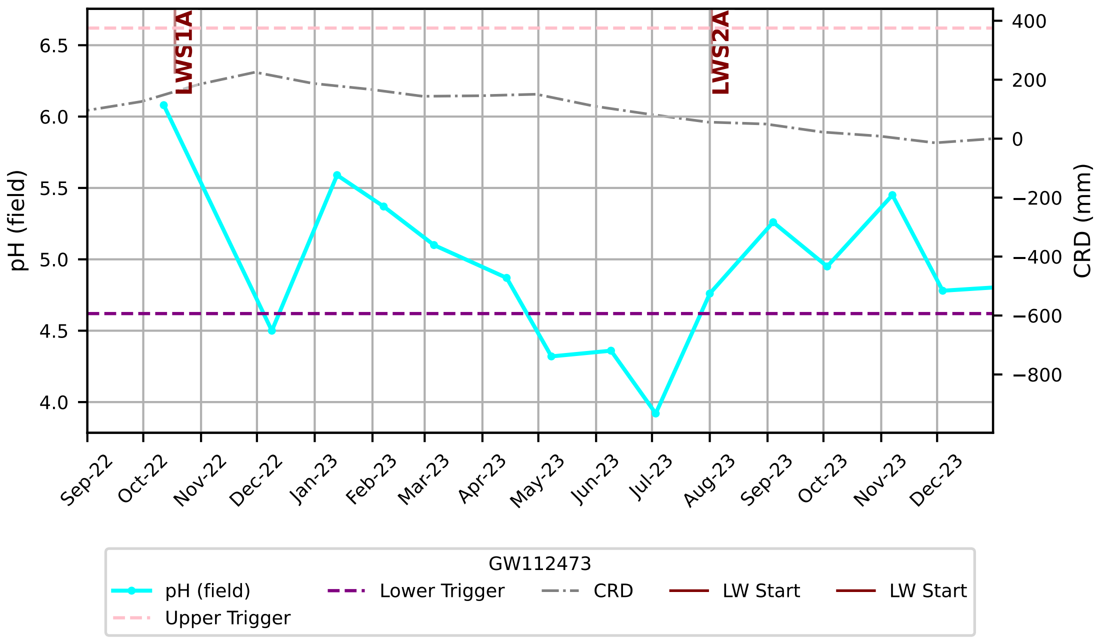
LWS1A
LWS2A
Lithium-Dissolved
0.00900
0.00875
0.00850
0.00825
0.00800
0.00775
0.00750
0.00725
0.00700
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



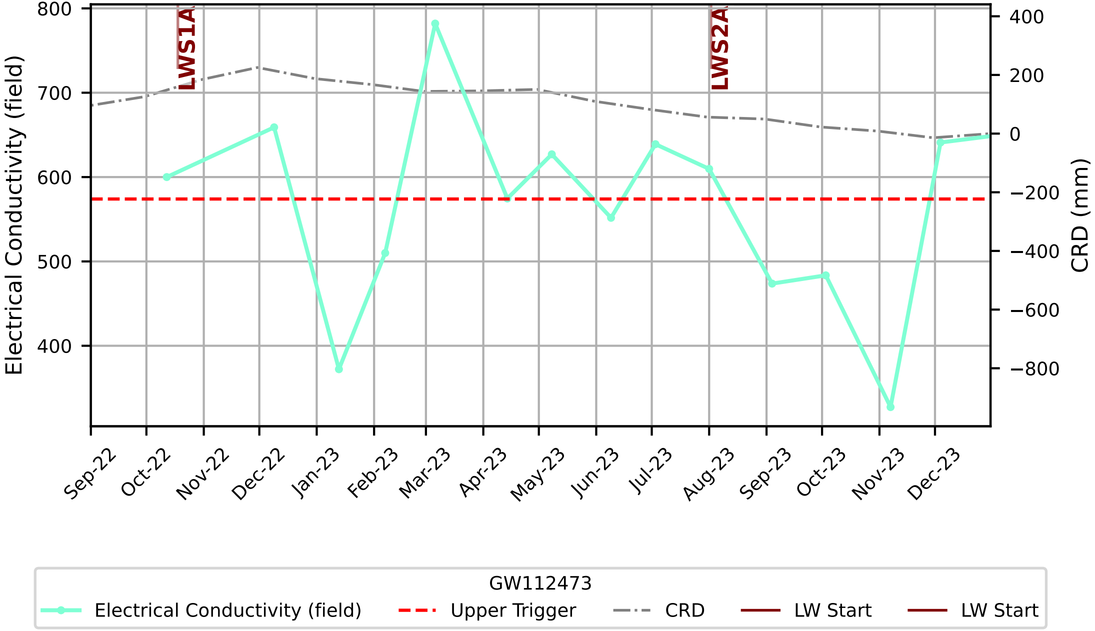
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.22
0.21
0.20
0.19
0.18
0.17
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



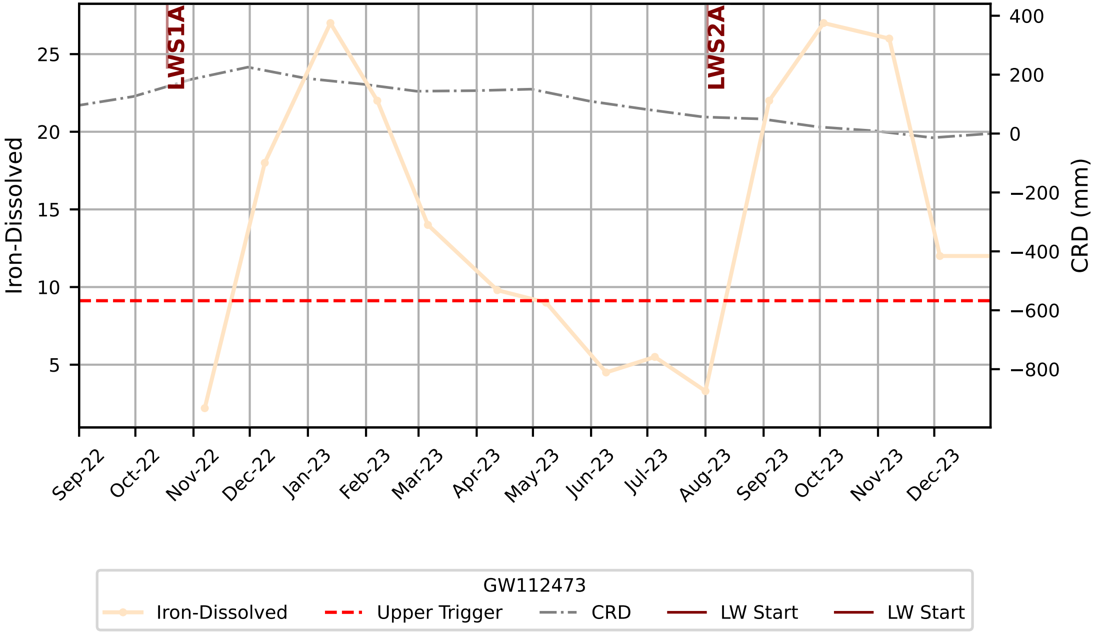
LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



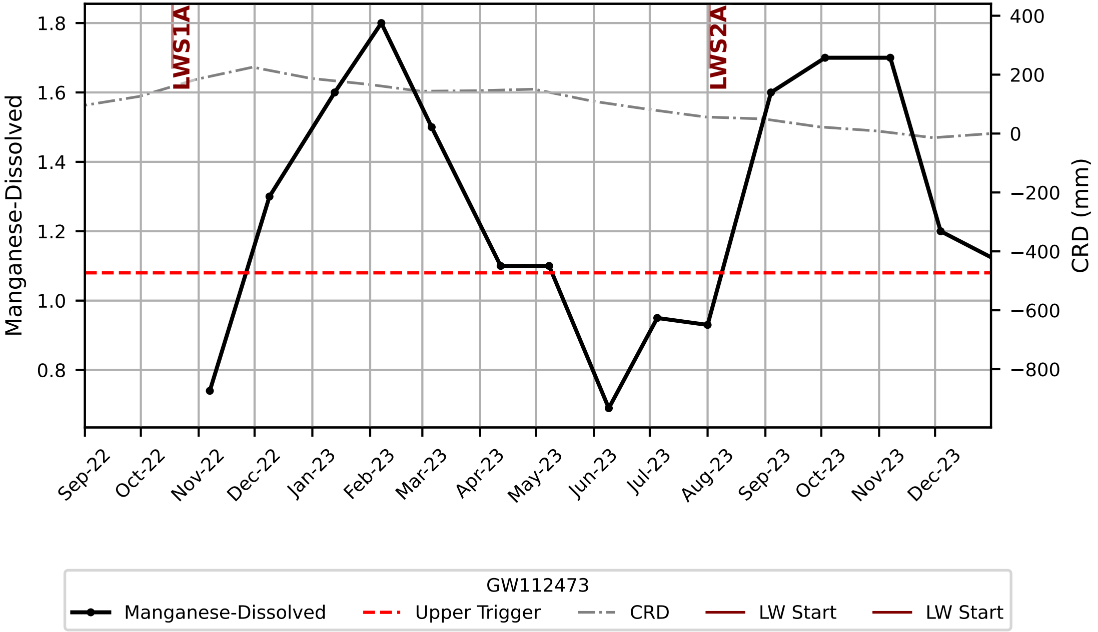
LWS1A
LWS2A
pH (field)
CRD (mm)
6.5
6.0
5.5
5.0
4.5
4.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



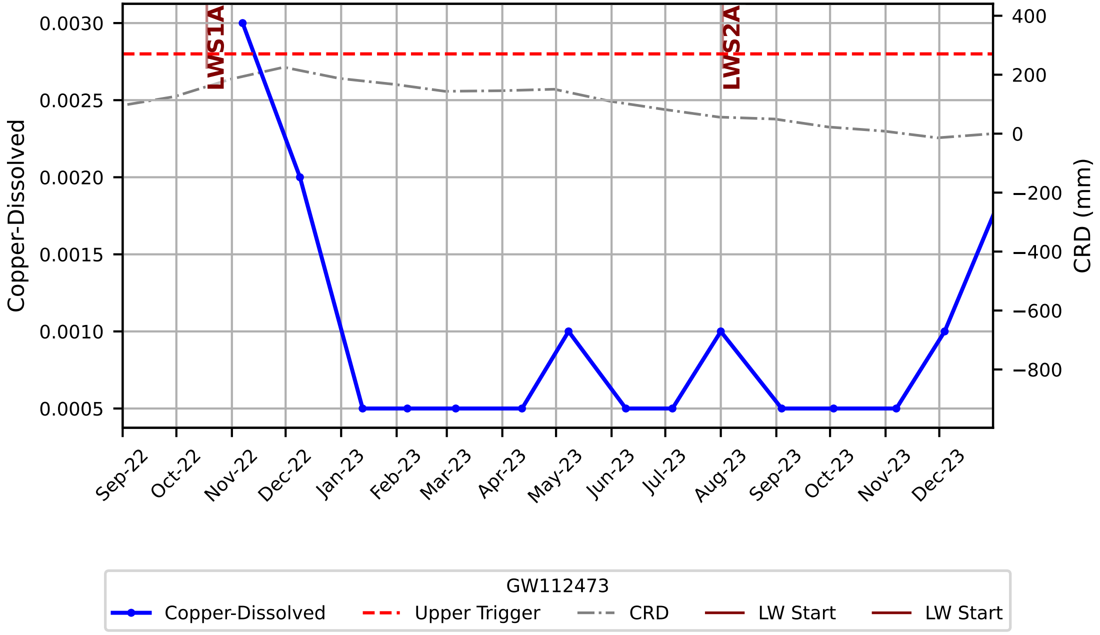
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



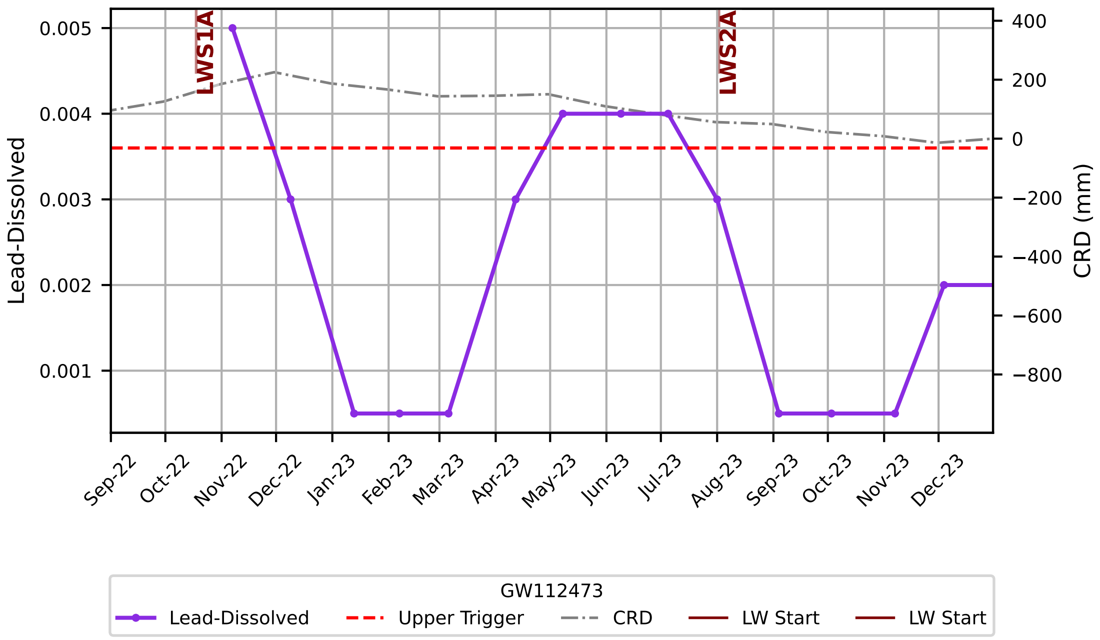
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
25
20
15
10
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



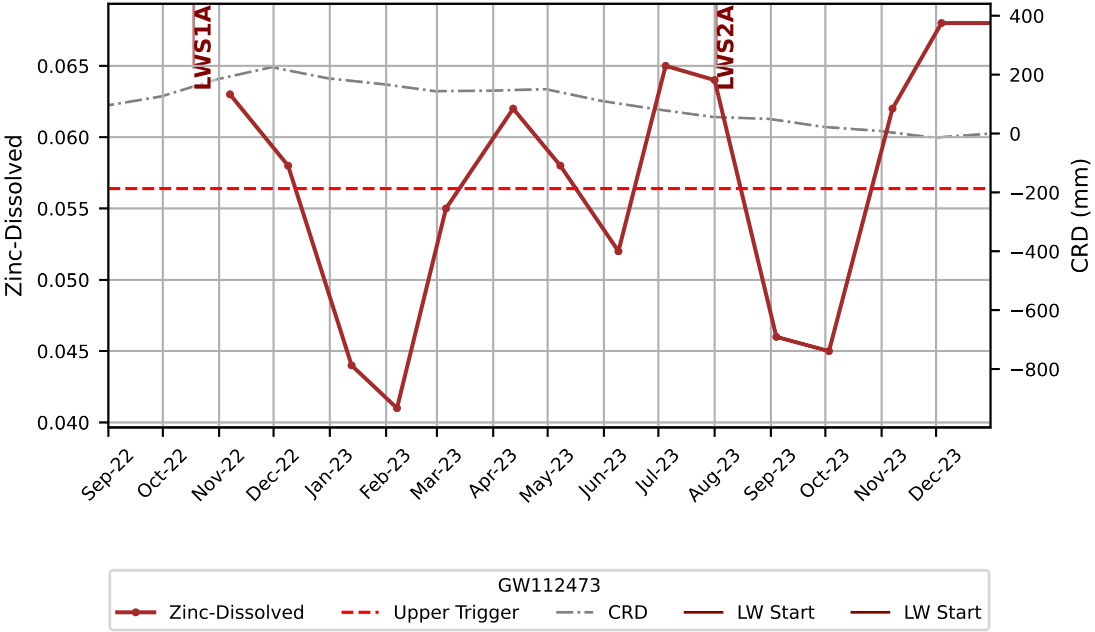
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
1.8
1.6
1.4
1.2
1.0
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



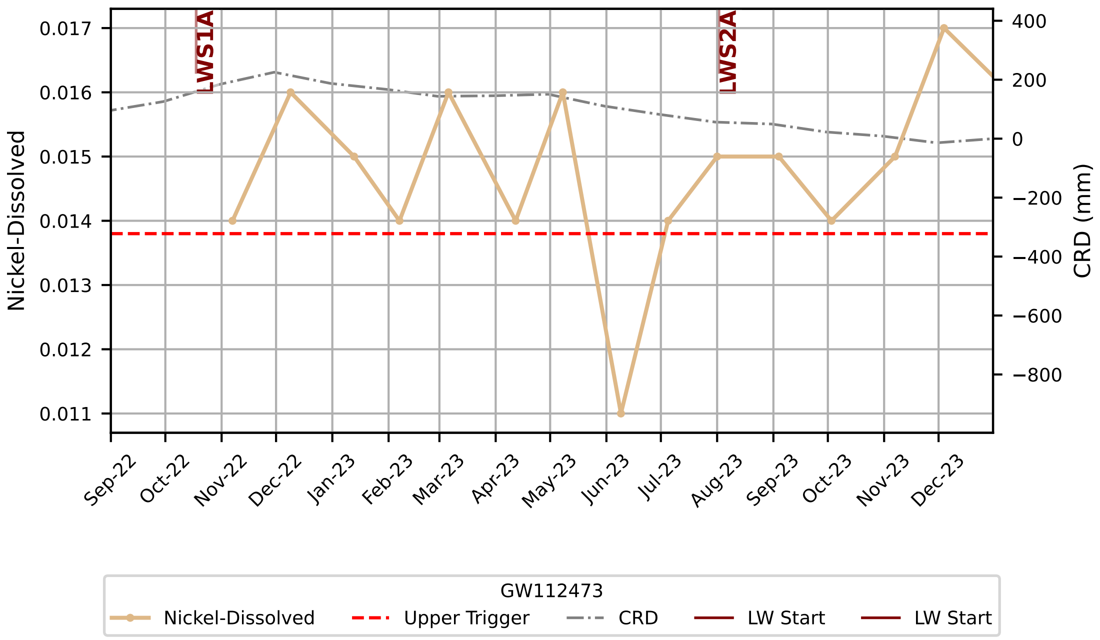
Copper-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



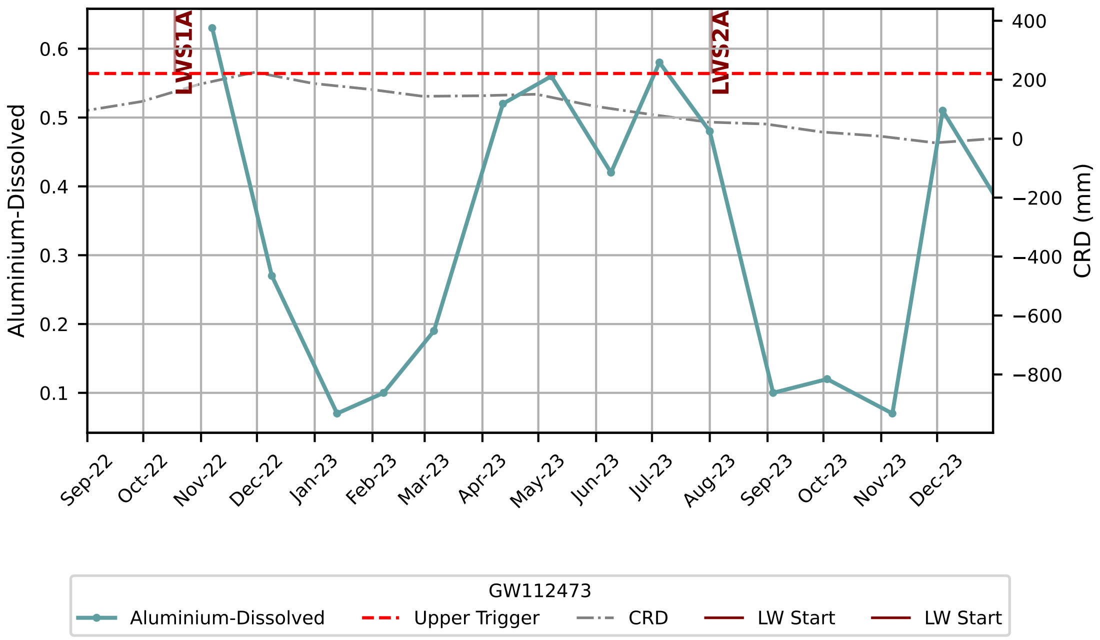
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



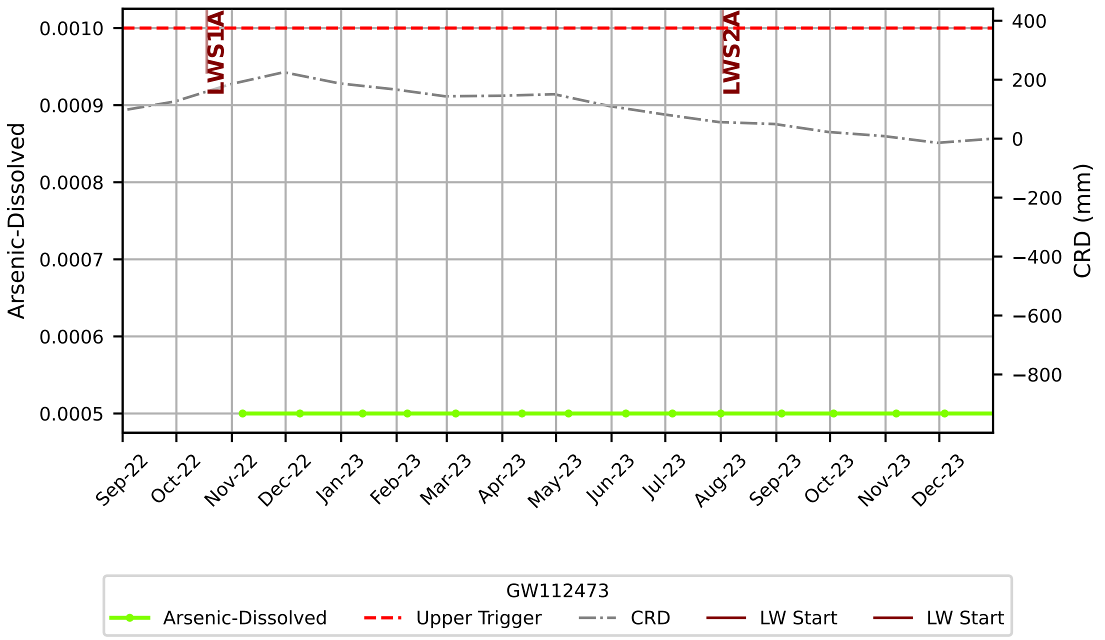
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.065
0.060
0.055
0.050
0.045
0.040
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



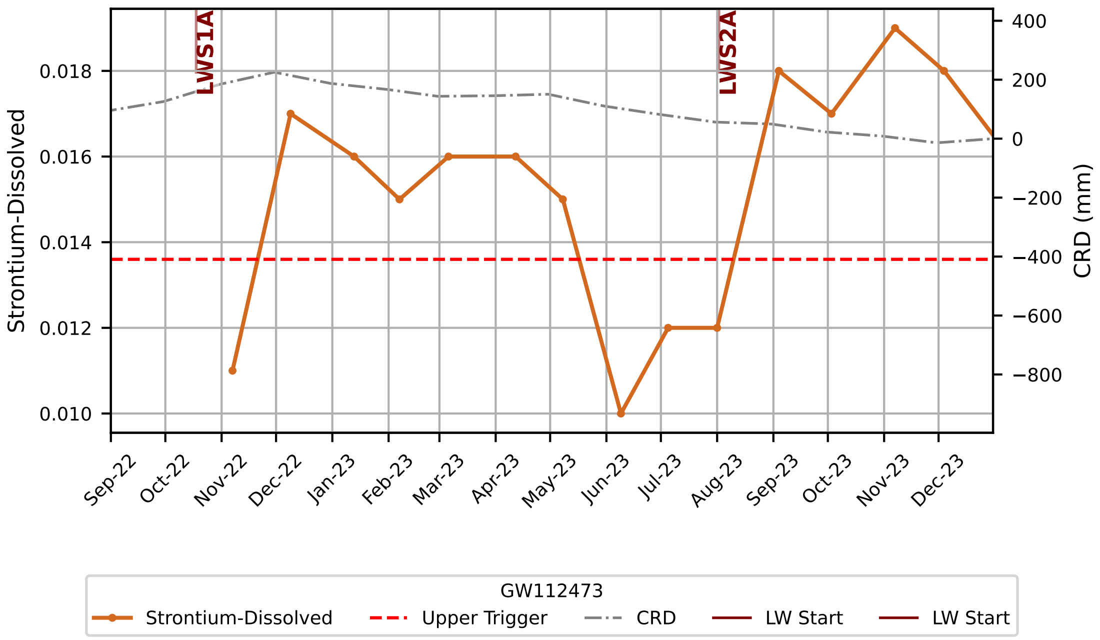
LWS1A
LWS2A
Nickel-Dissolved
0.017
0.016
0.015
0.014
0.013
0.012
0.011
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



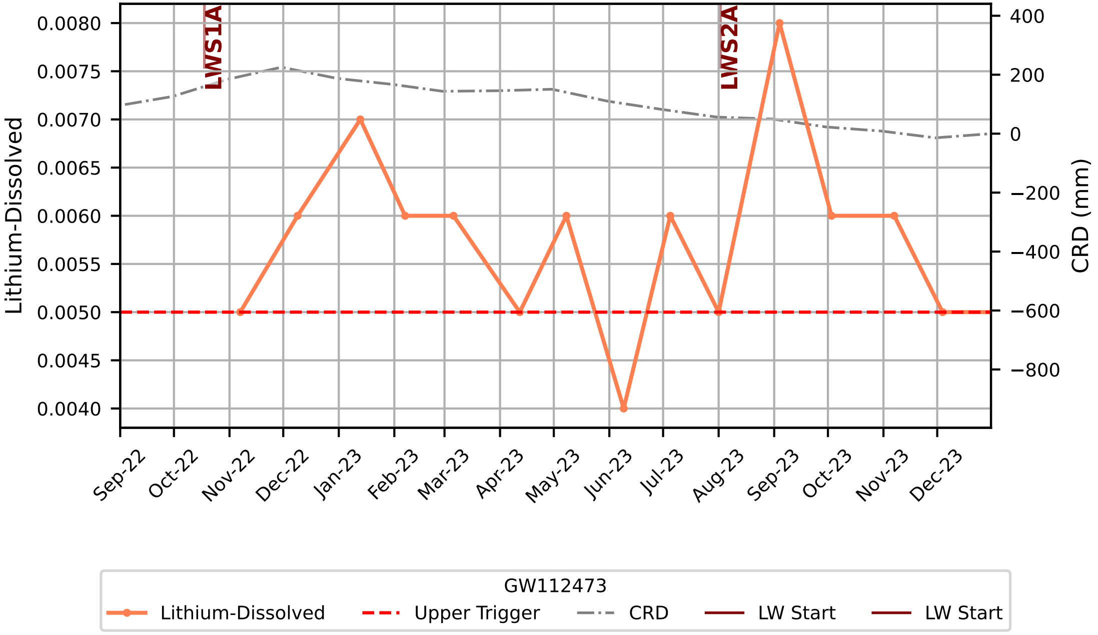
Aluminium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.1
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



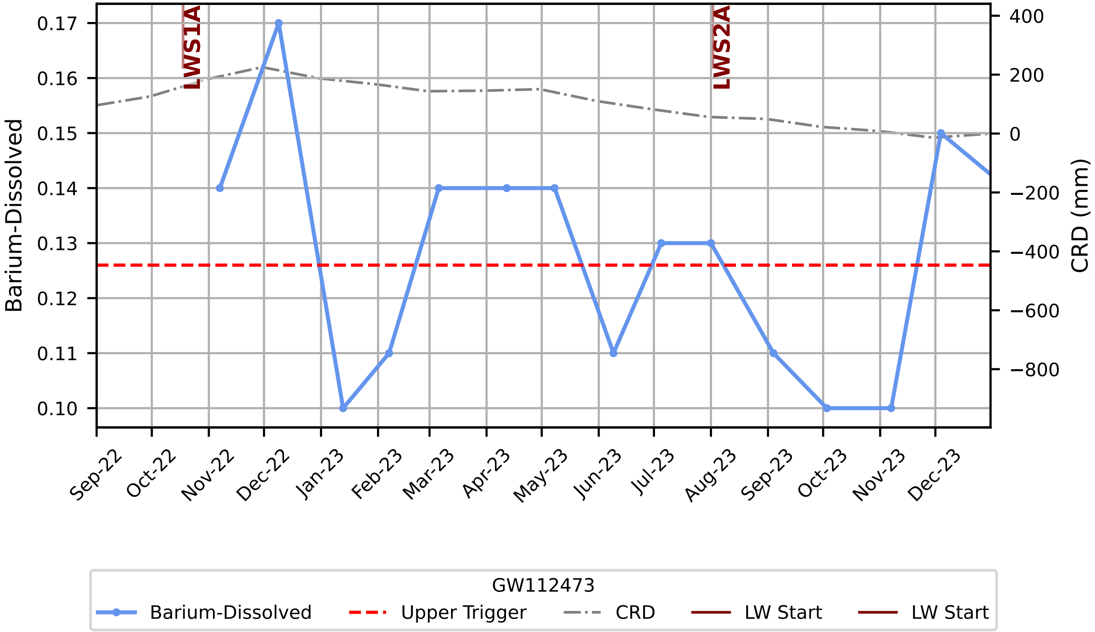
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

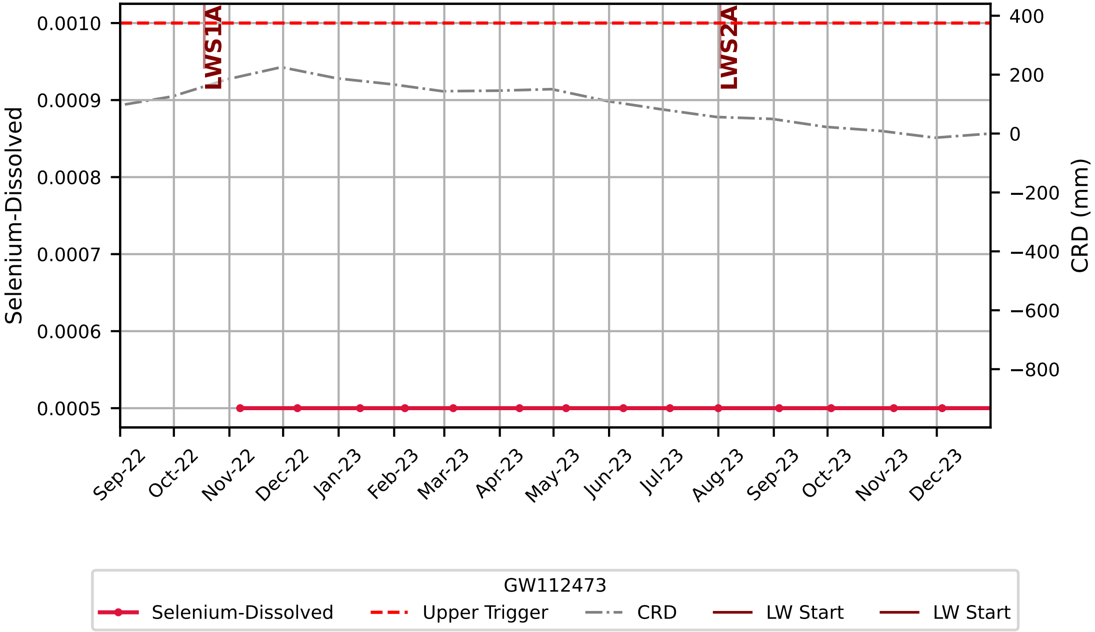


LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.018
0.016
0.014
0.012
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

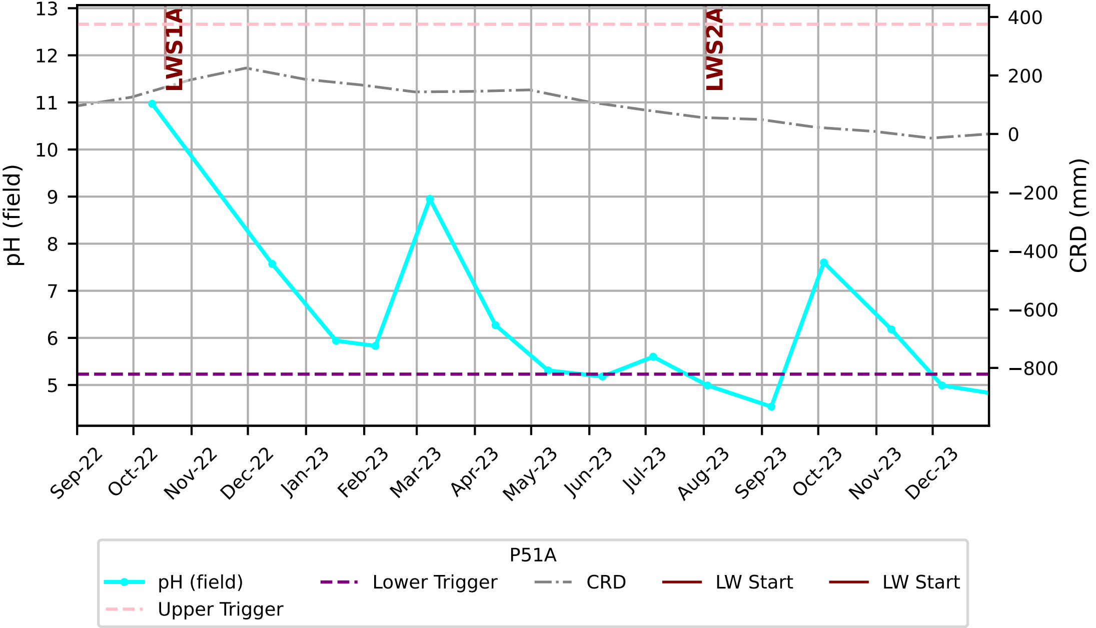


LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

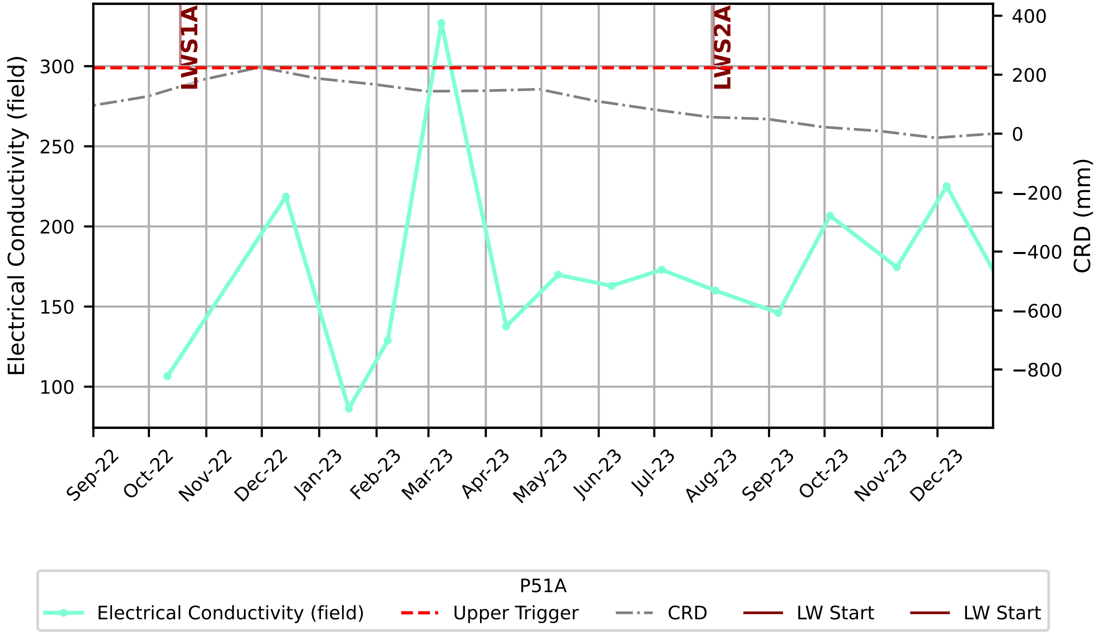

LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



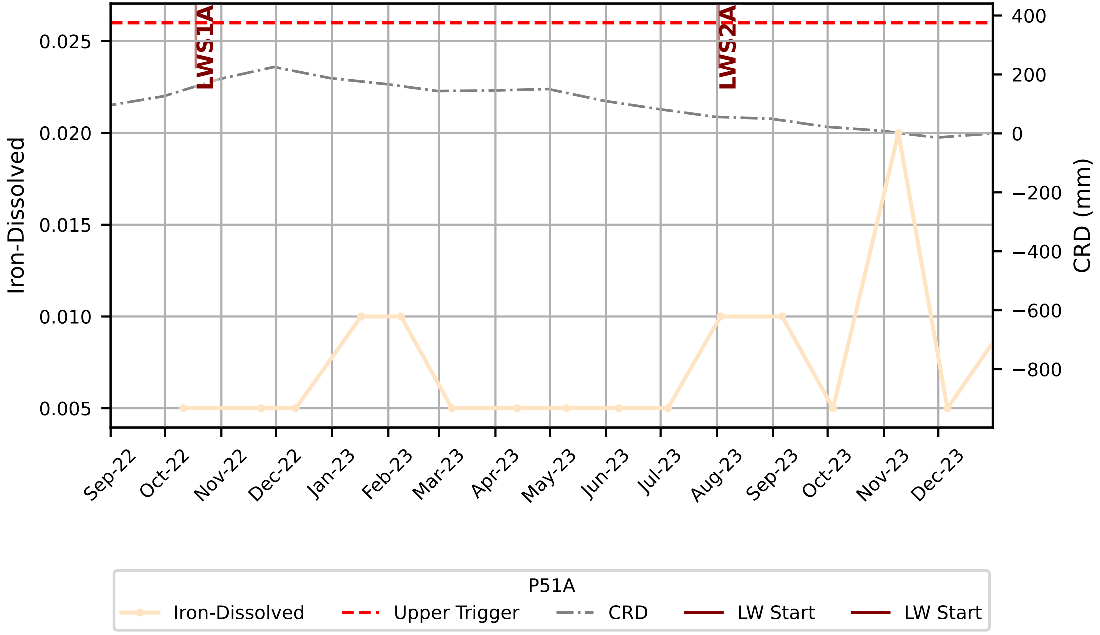
Selenium-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



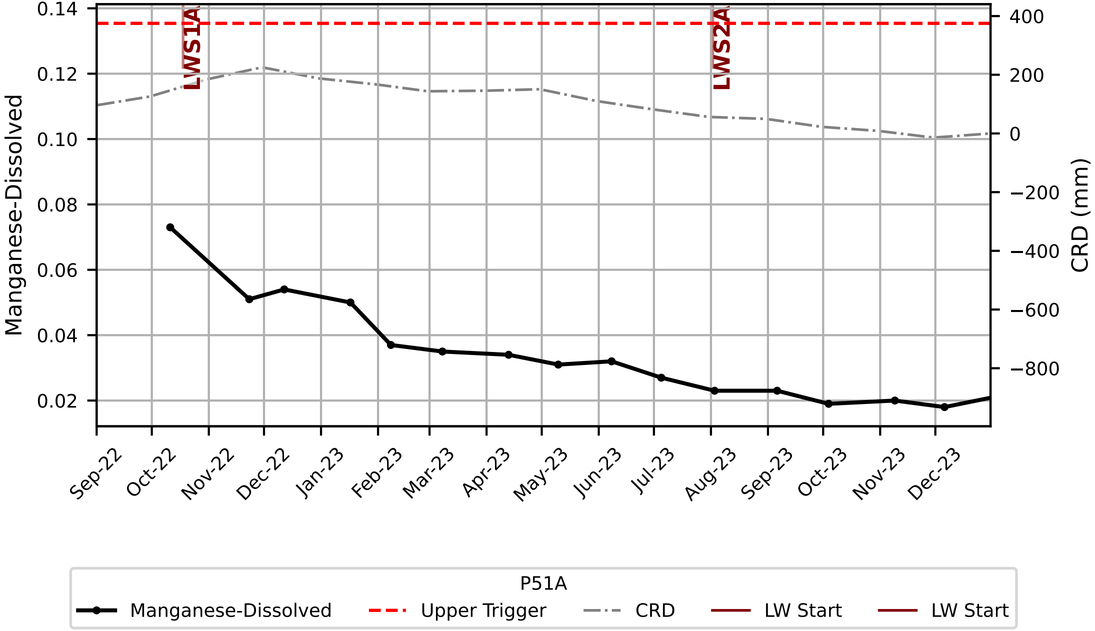
pH (field)
CRD (mm)
LWS1A
LWS2A
13
12
11
10
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



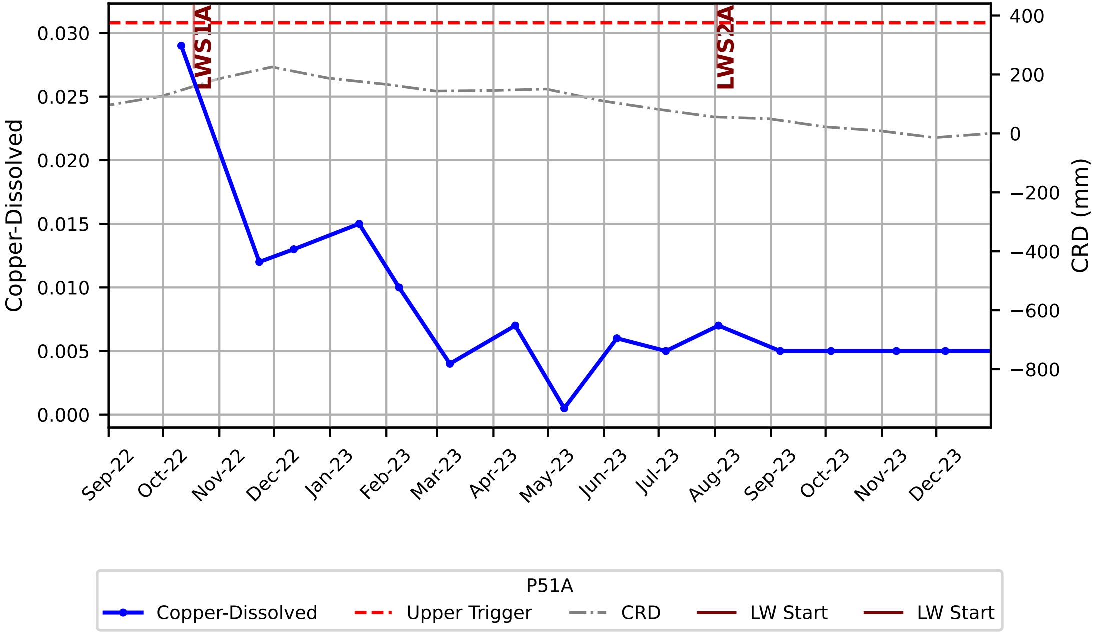
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
300
250
200
150
100
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



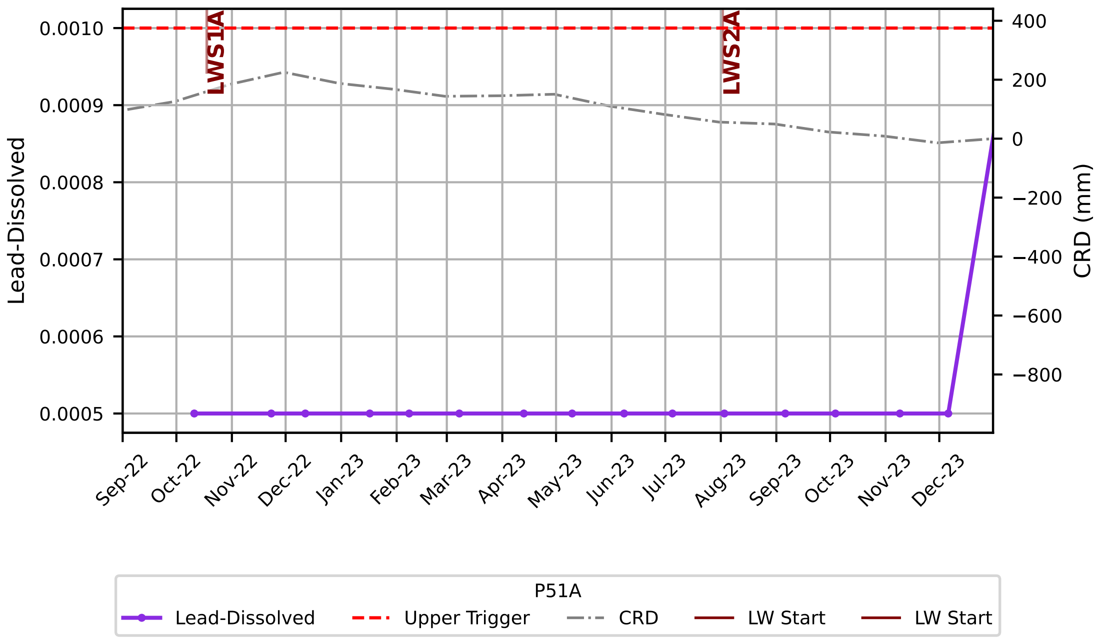
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.025
0.020
0.015
0.010
0.005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



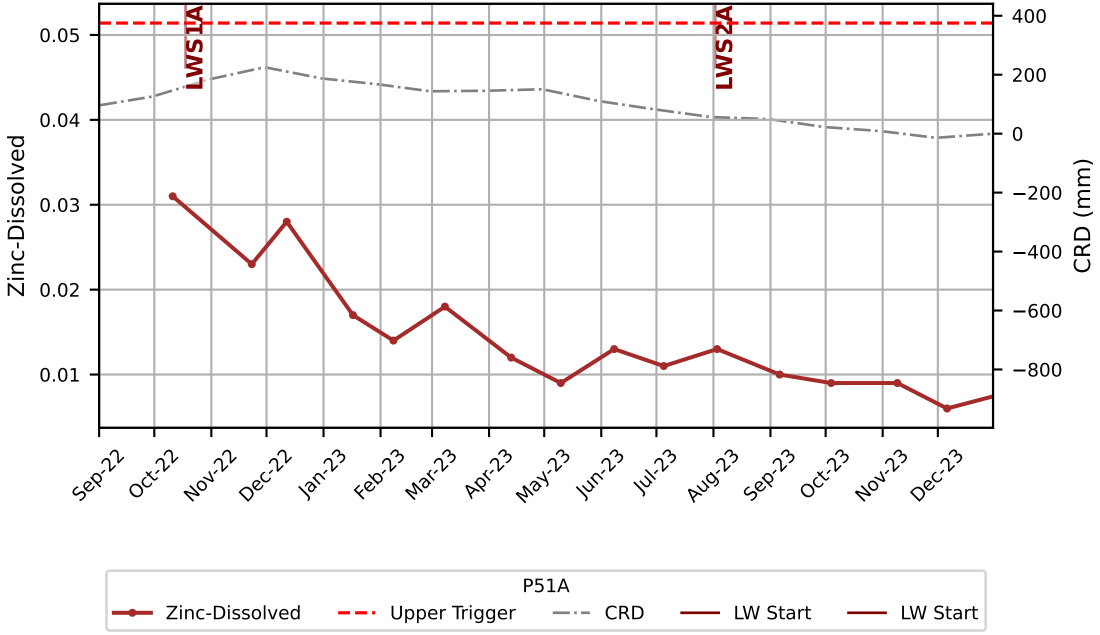
LWS1A
LWS2A
0.14
0.12
0.10
0.08
0.06
0.04
0.02
Manganese-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



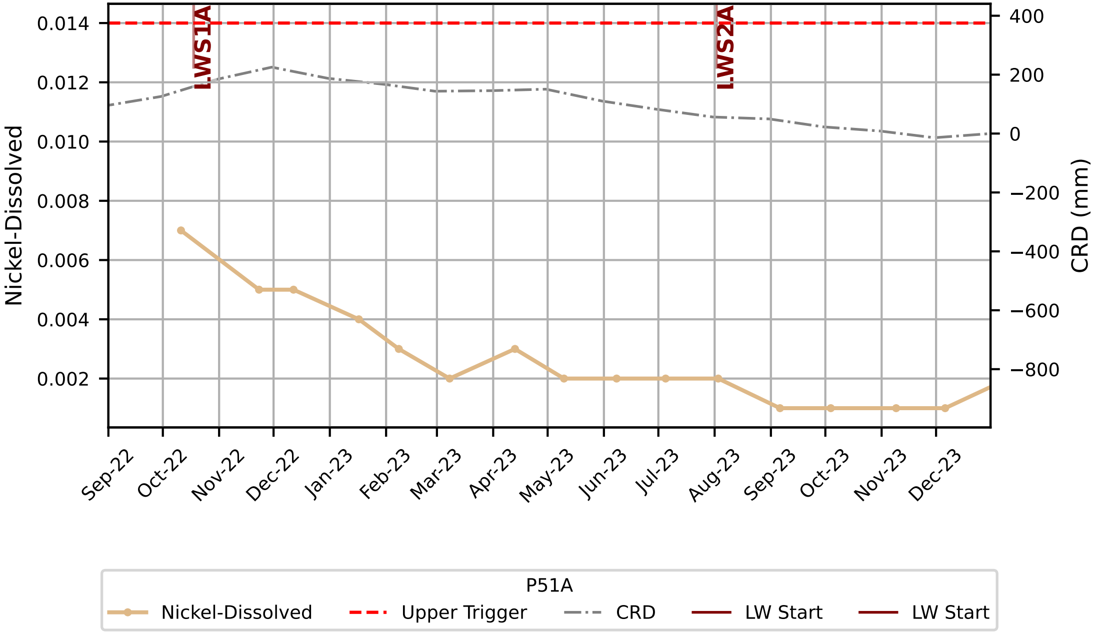
Copper-Dissolved
0.030
0.025
0.020
0.015
0.010
0.005
0.000
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



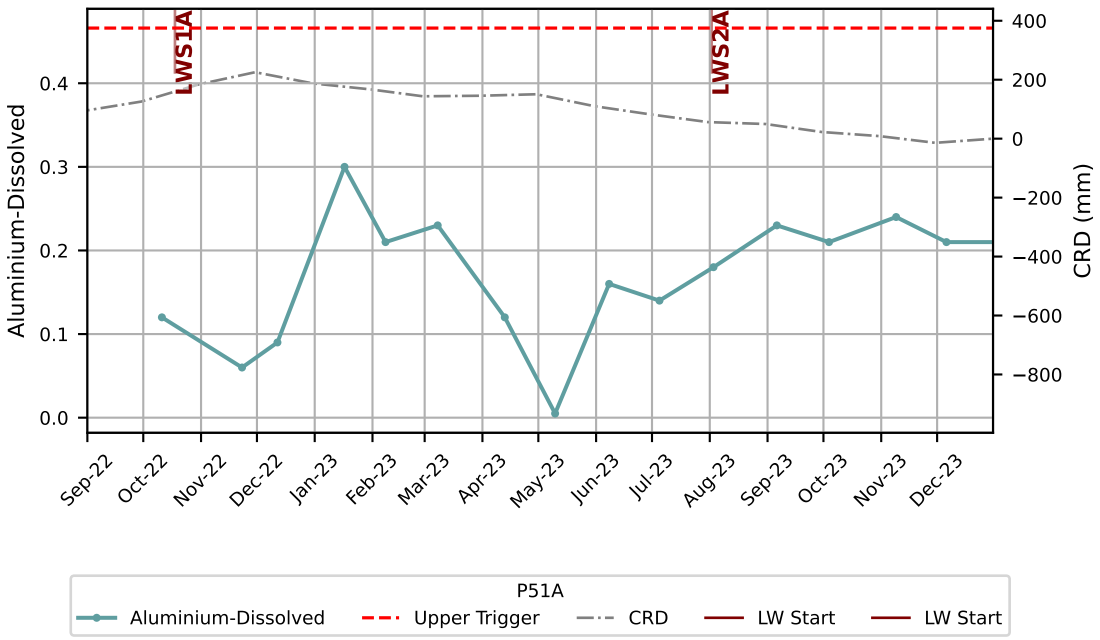
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



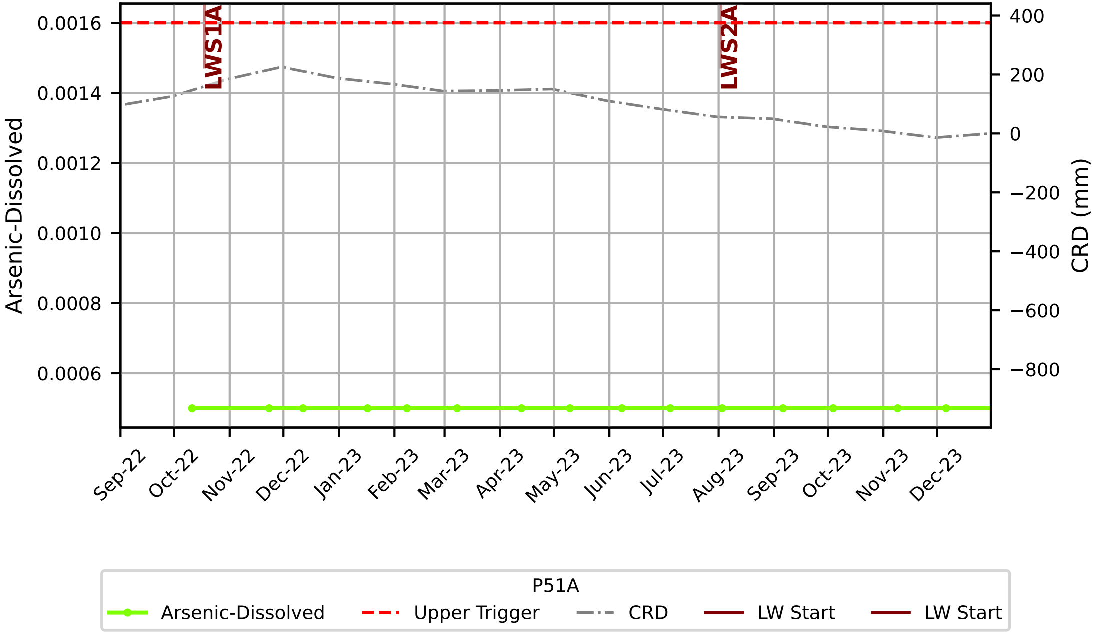
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

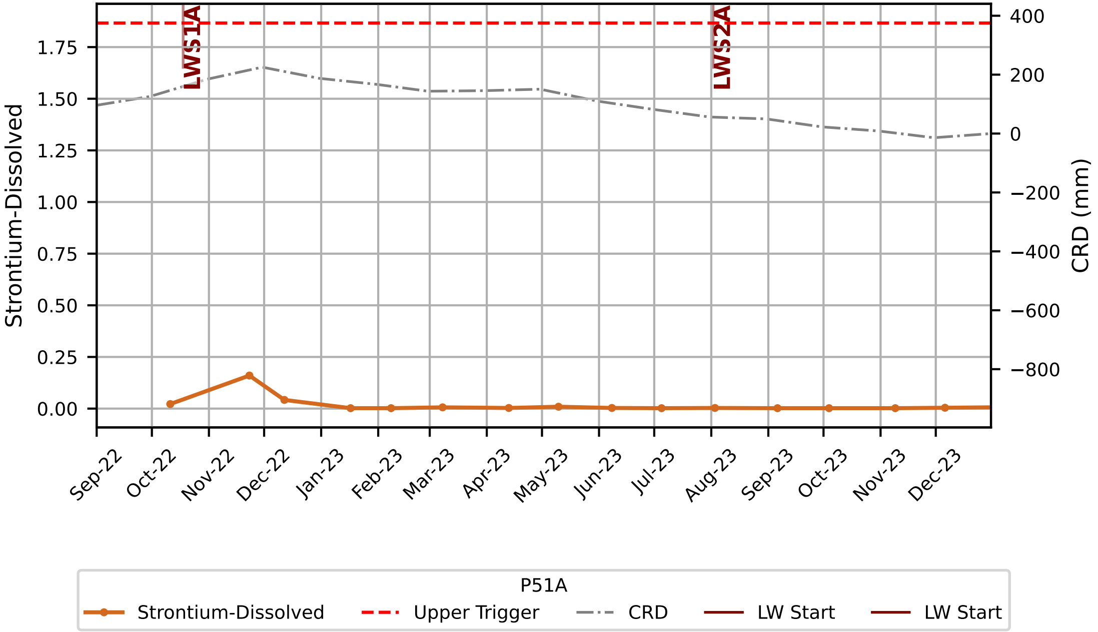


LWS1A
LWS2A
0.014
0.012
0.010
0.008
0.006
0.004
0.002
Nickel-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

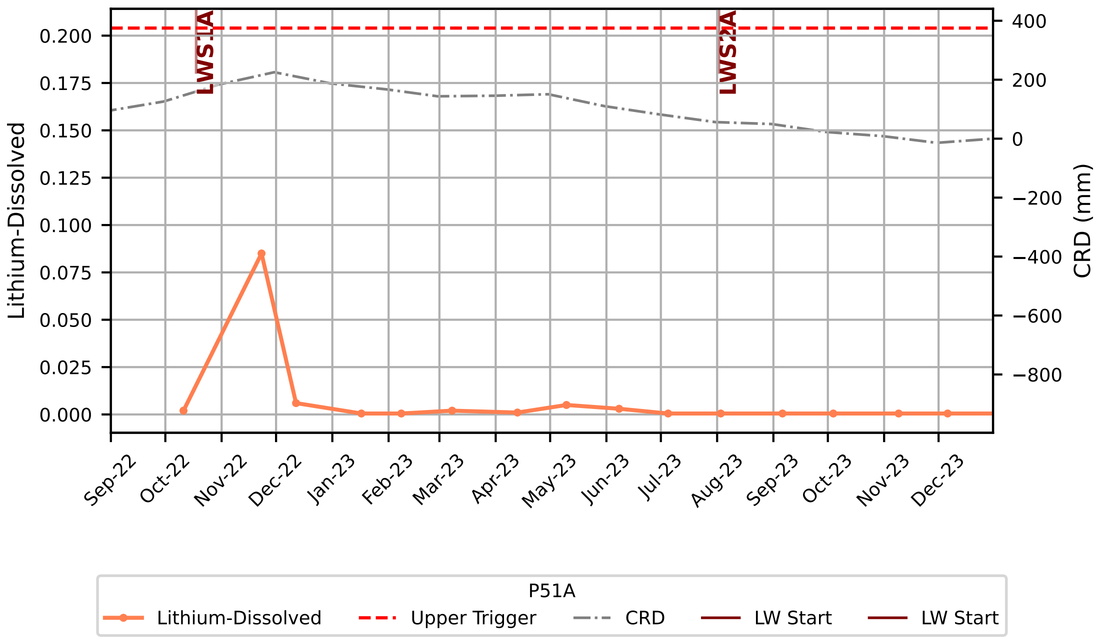


LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

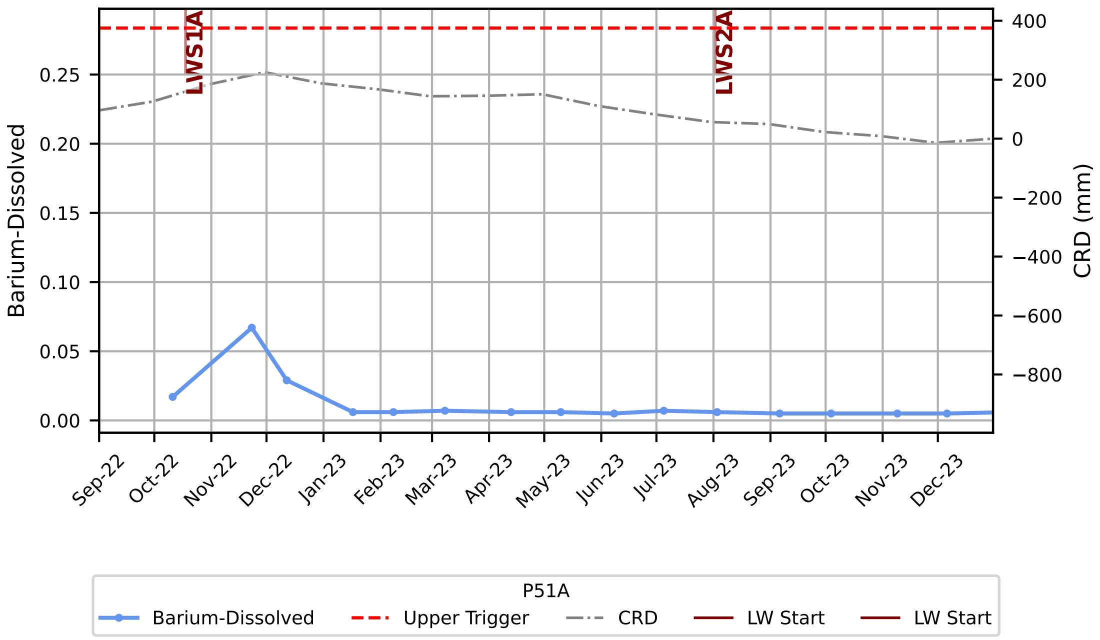

LWS1A
LWS2A
Arsenic-Dissolved
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



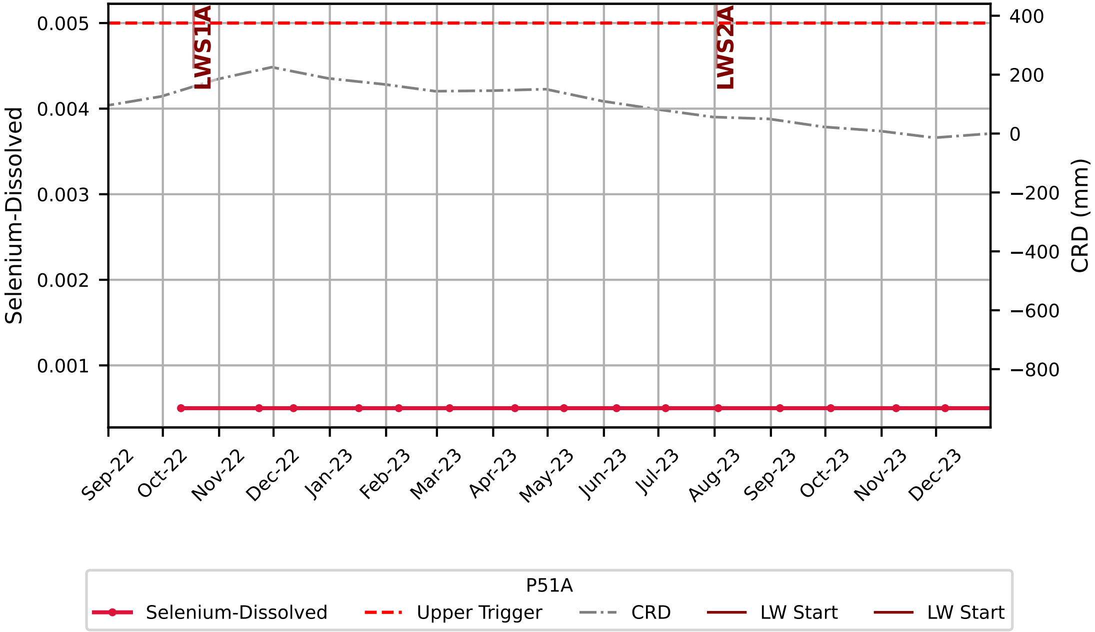
Strontium-Dissolved
CRD (mm)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



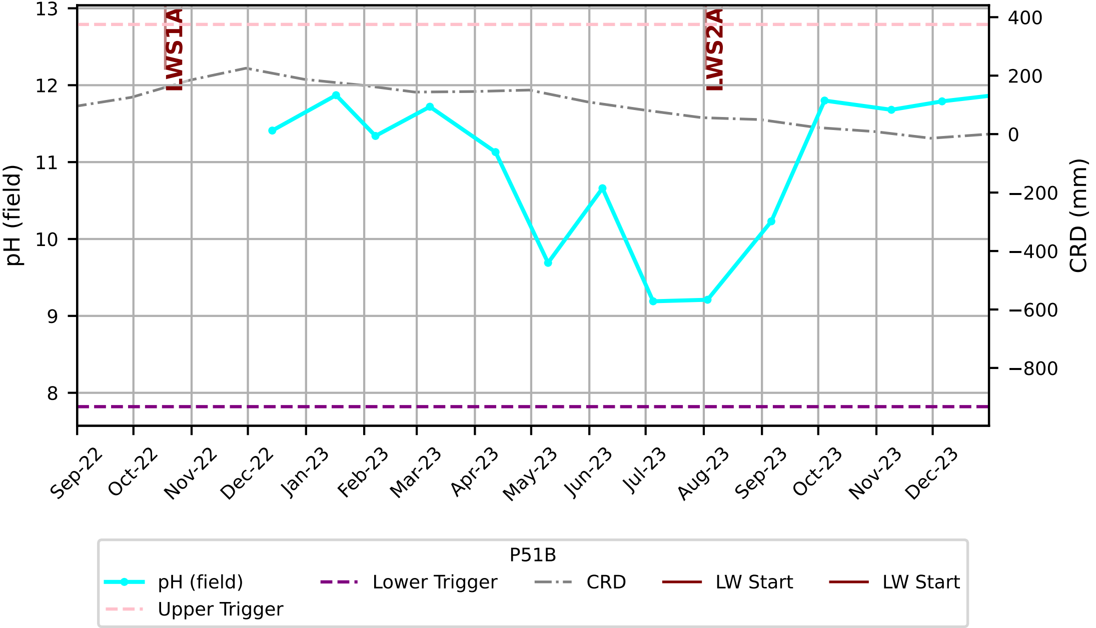
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



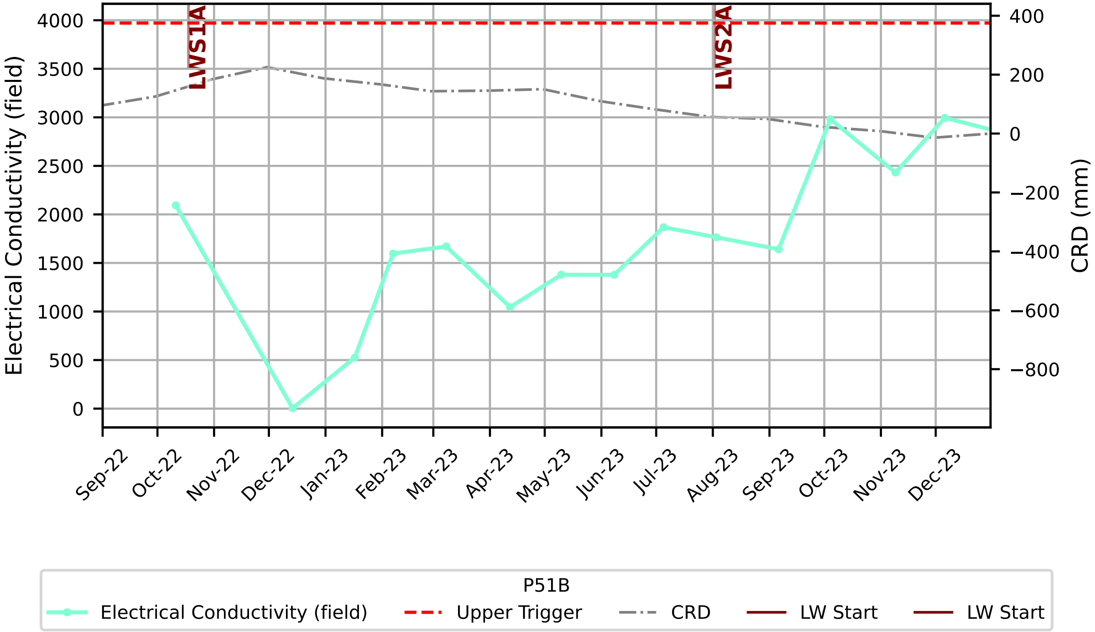
LWS1A
LWS2A
0.25
0.20
0.15
0.10
0.05
0.00
Barium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



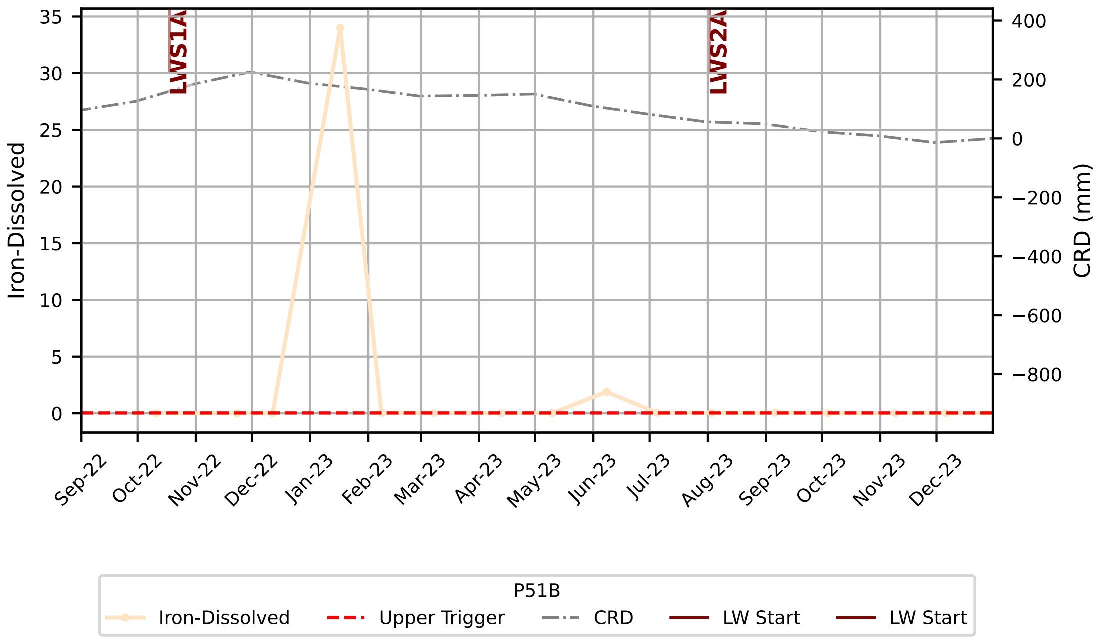
Selenium-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



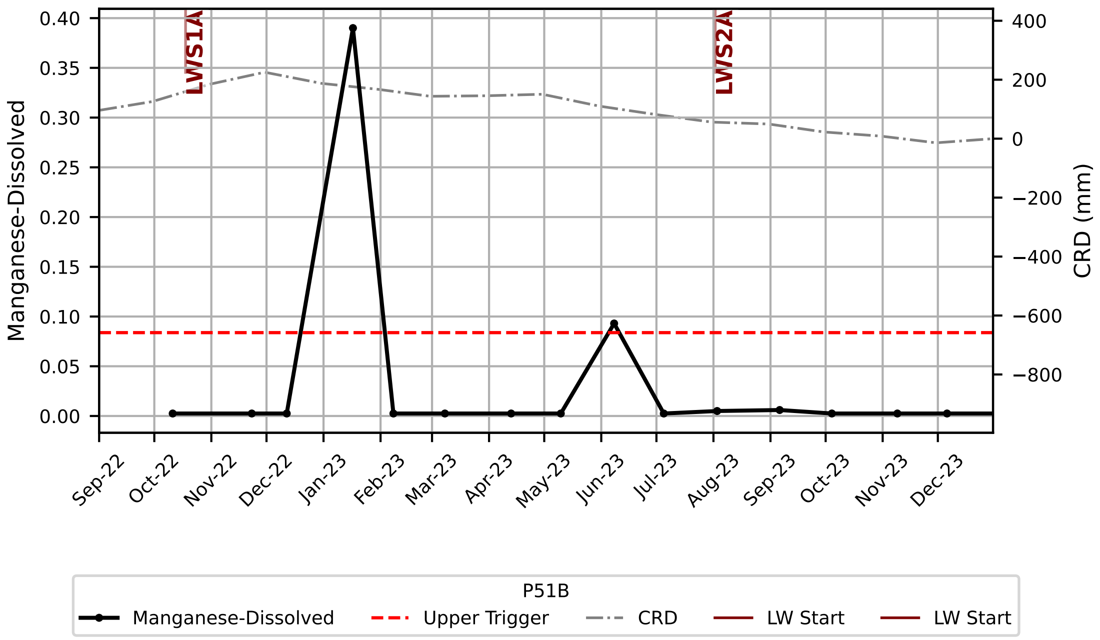
pH (field)
CRD (mm)
LWS1A
LWS2A
13
12
11
10
9
8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



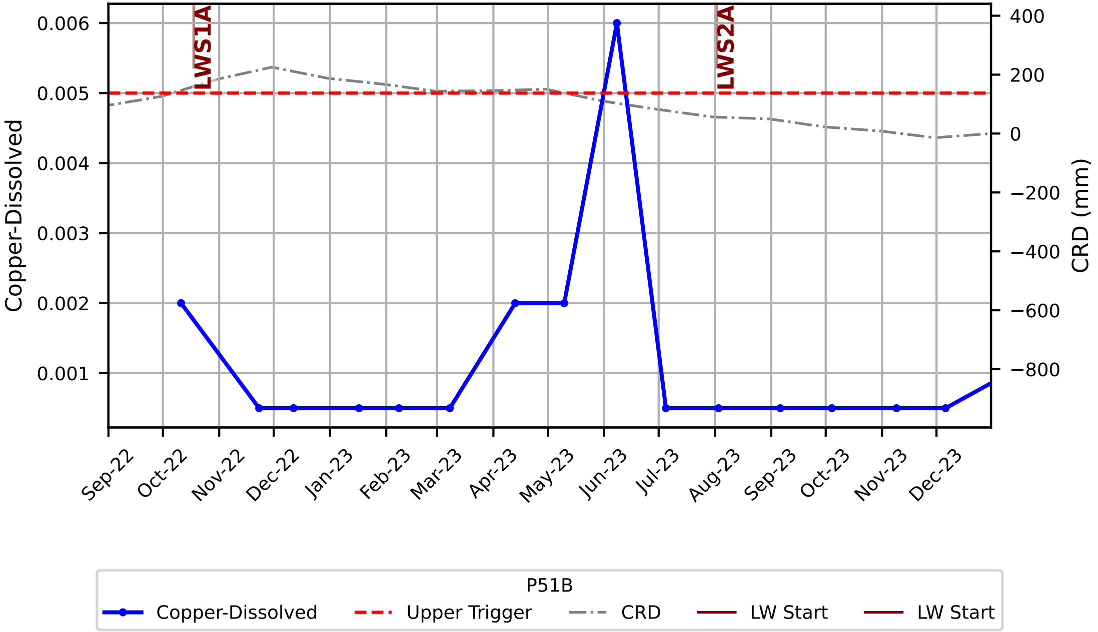
Electrical Conductivity (field)
CRD (mm)
4000
3500
3000
2500
2000
1500
1000
500
0
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



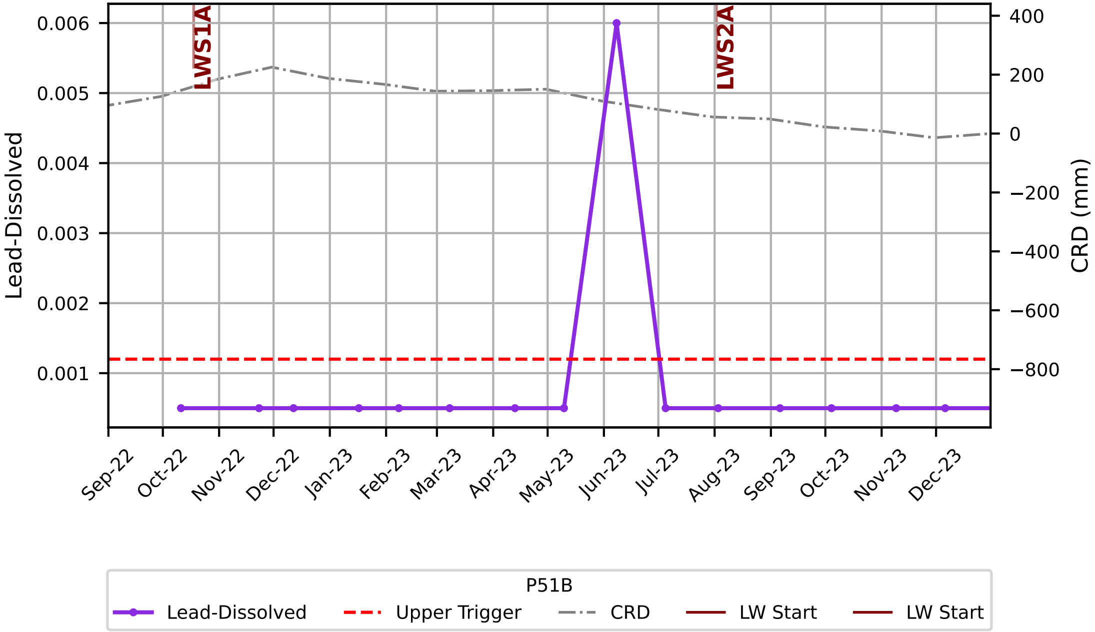
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



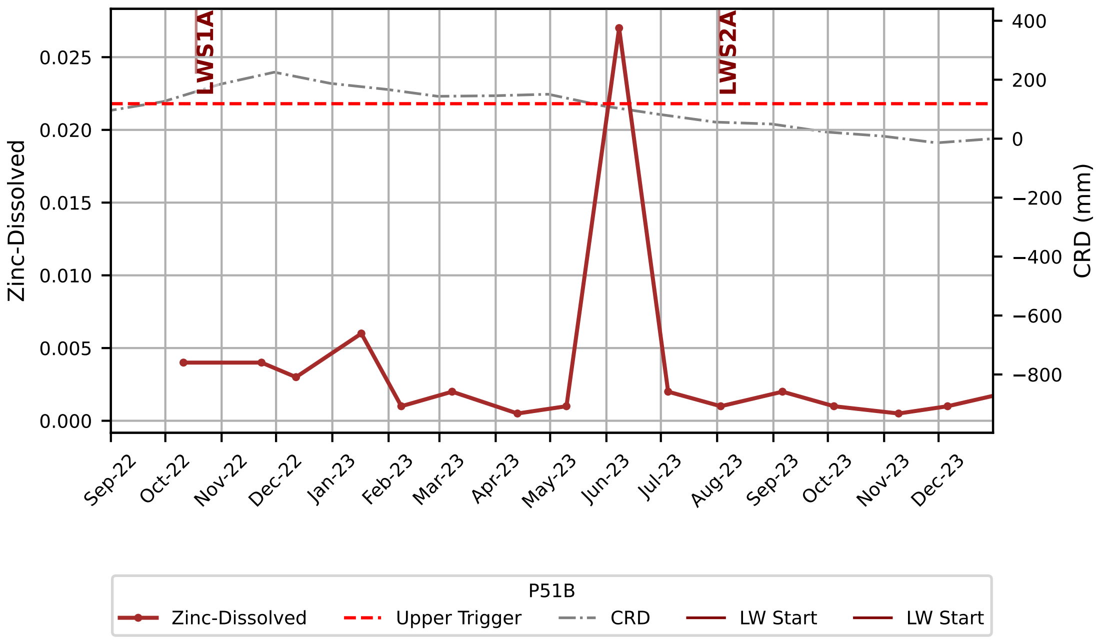
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



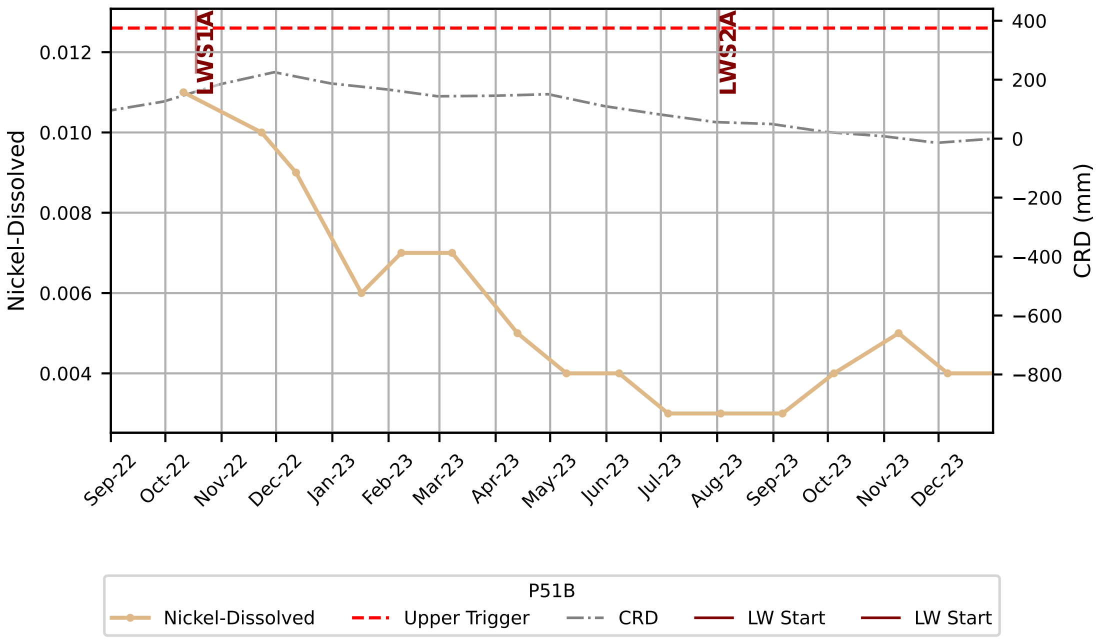
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



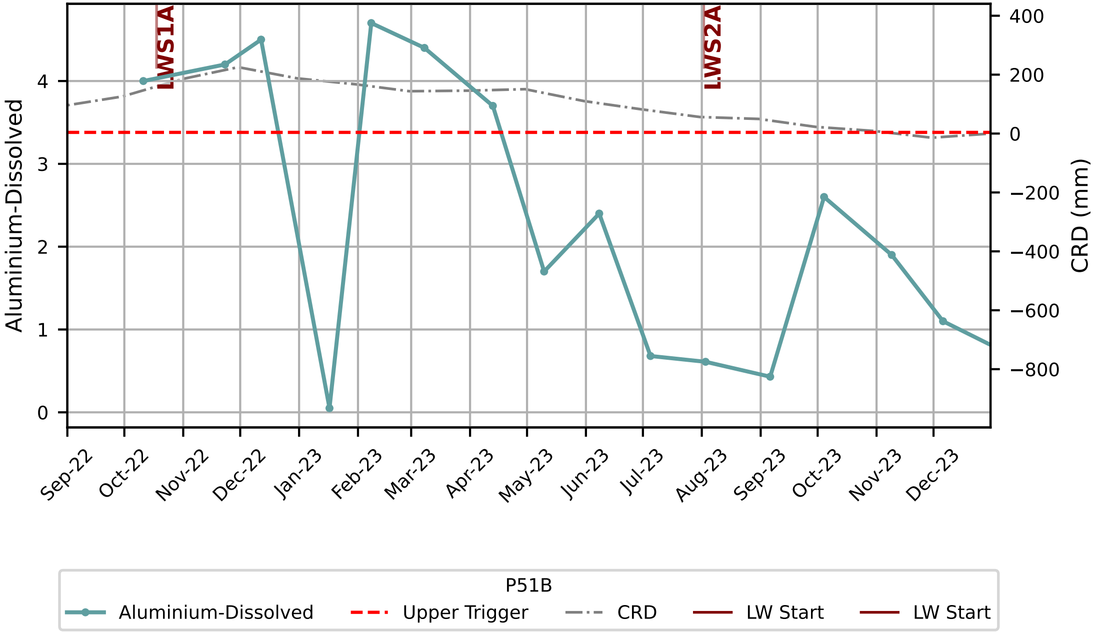
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



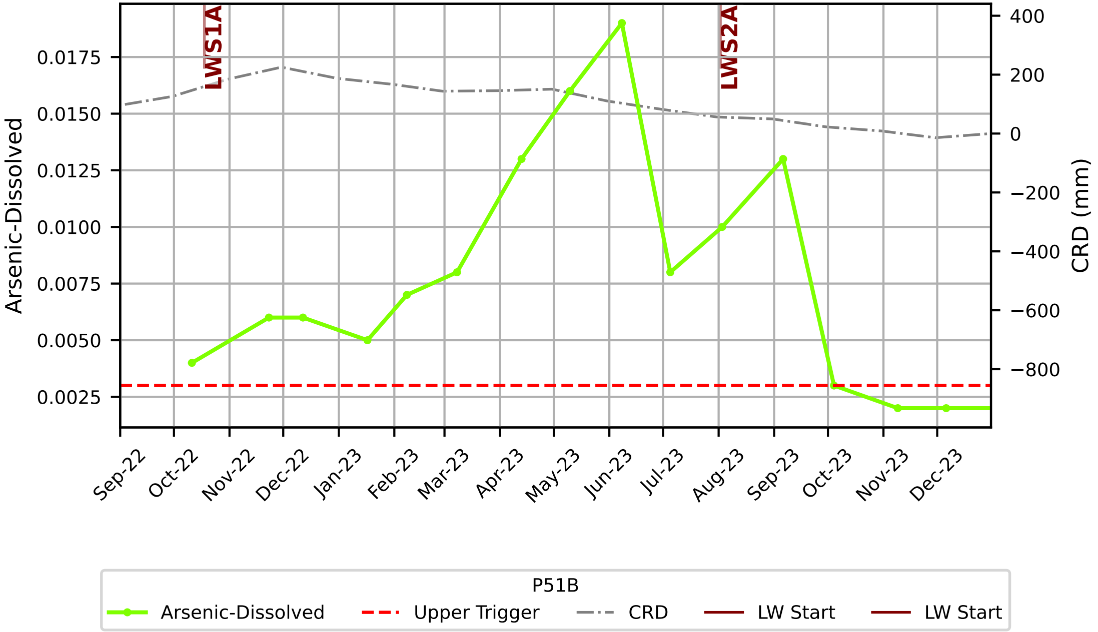
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



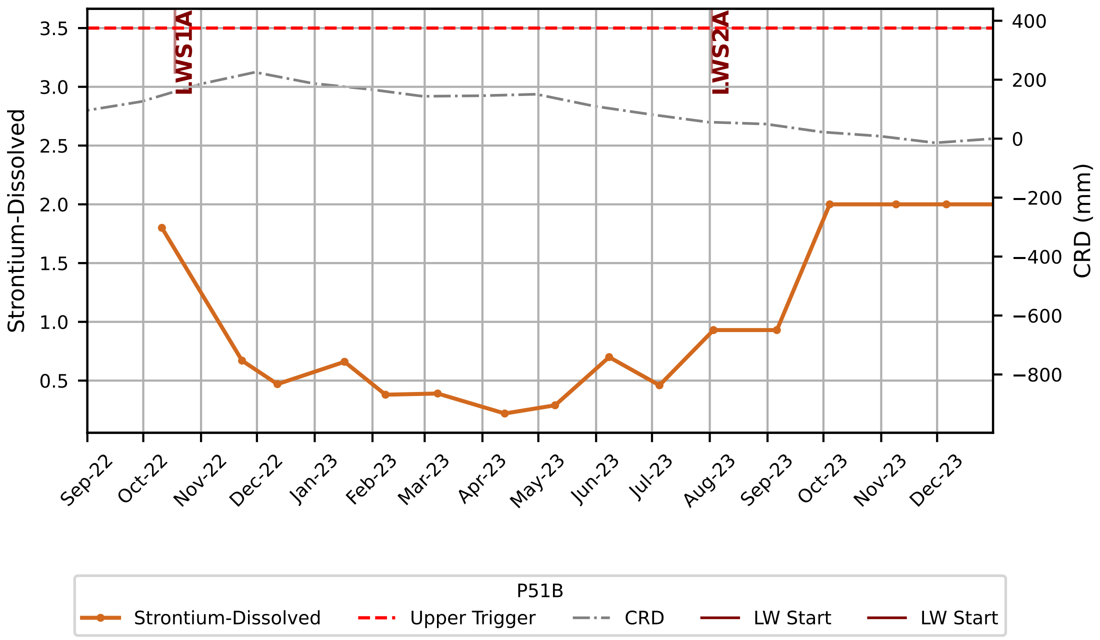
Nickel-Dissolved
CRD (mm)
0.012
0.010
0.008
0.006
0.004
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



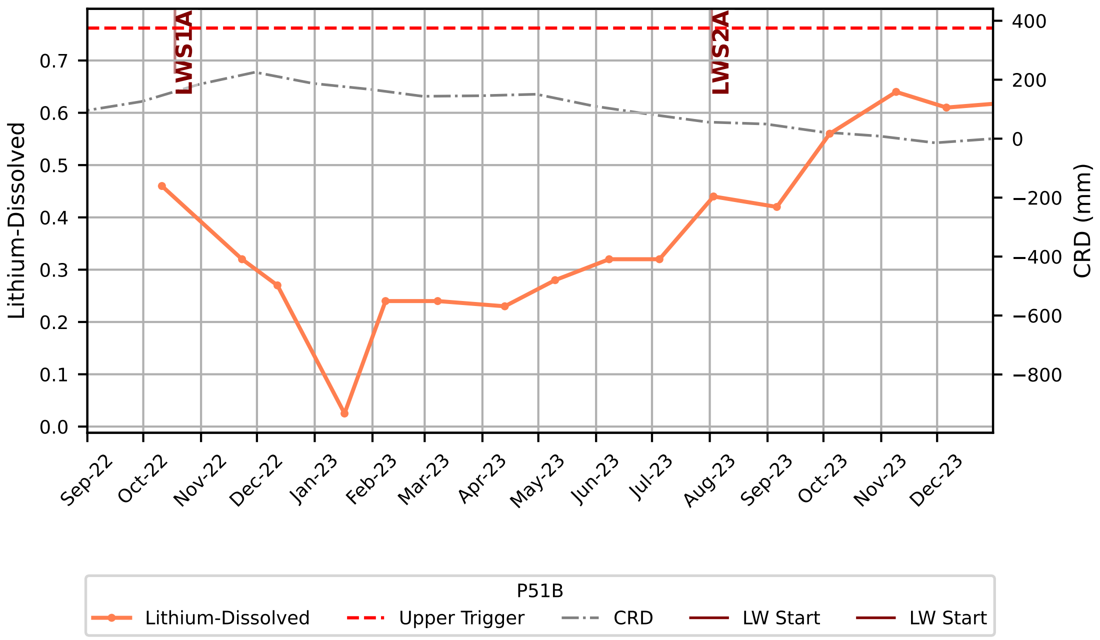
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0
1
2
3
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



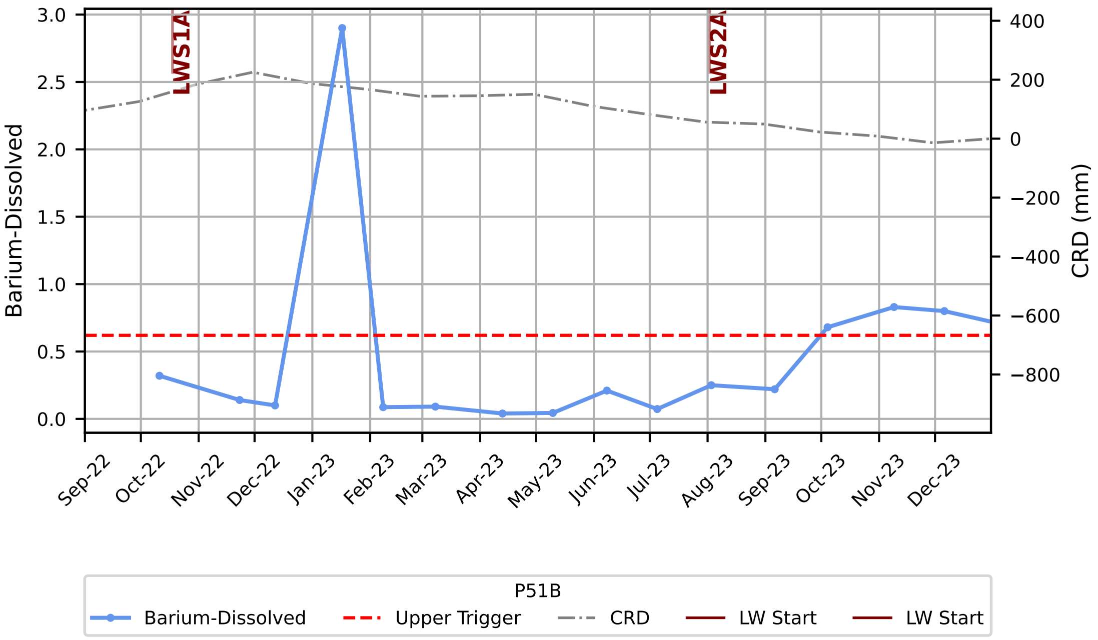
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



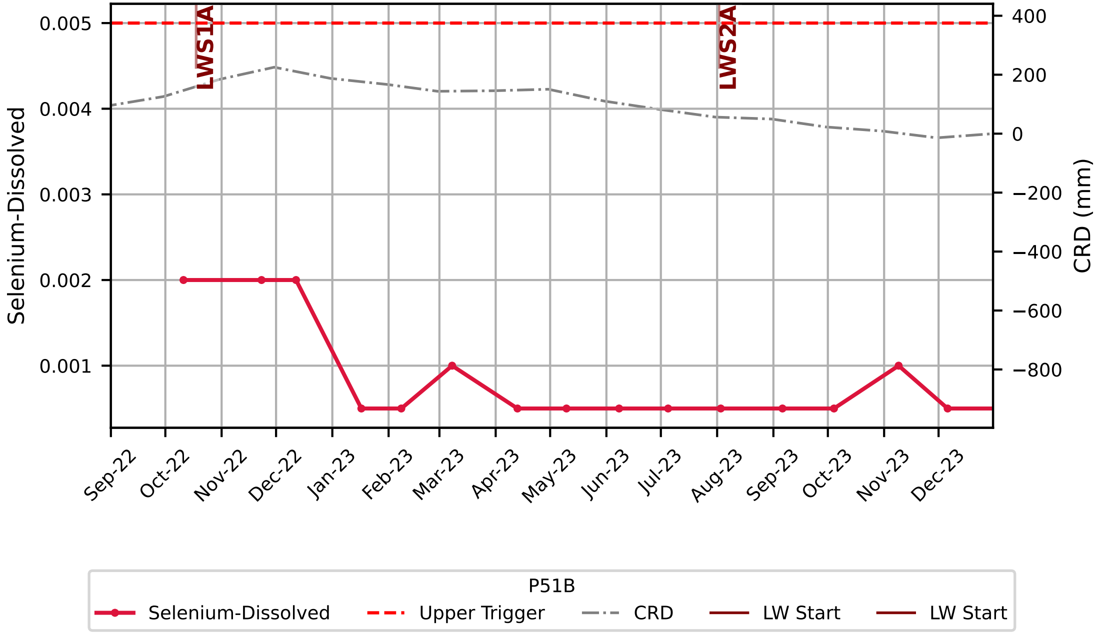
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
3.5
3.0
2.5
2.0
1.5
1.0
0.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



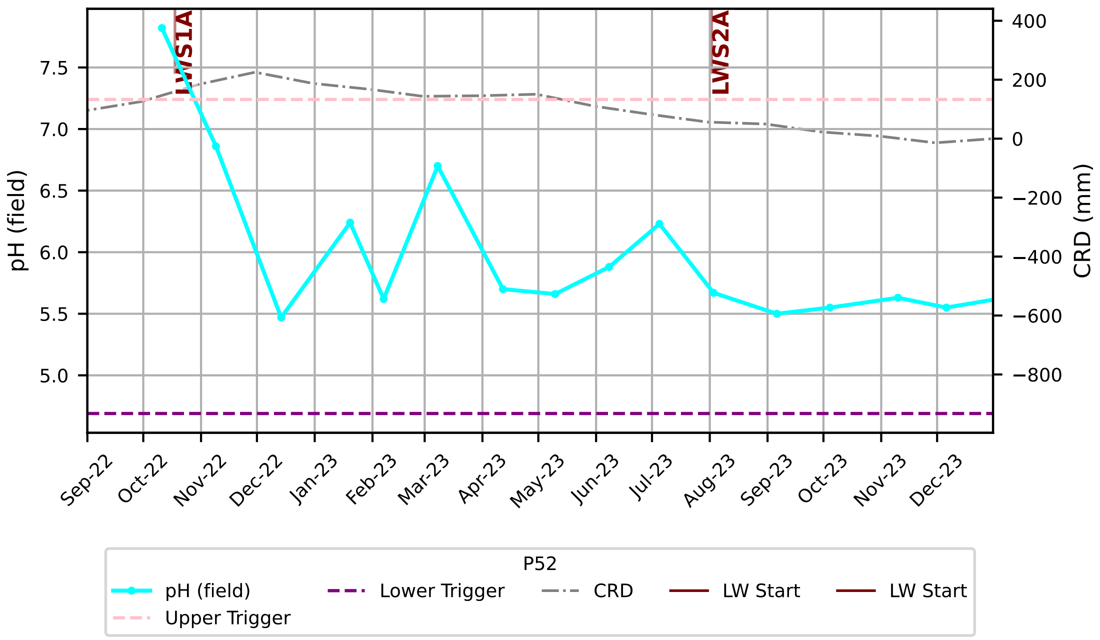
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



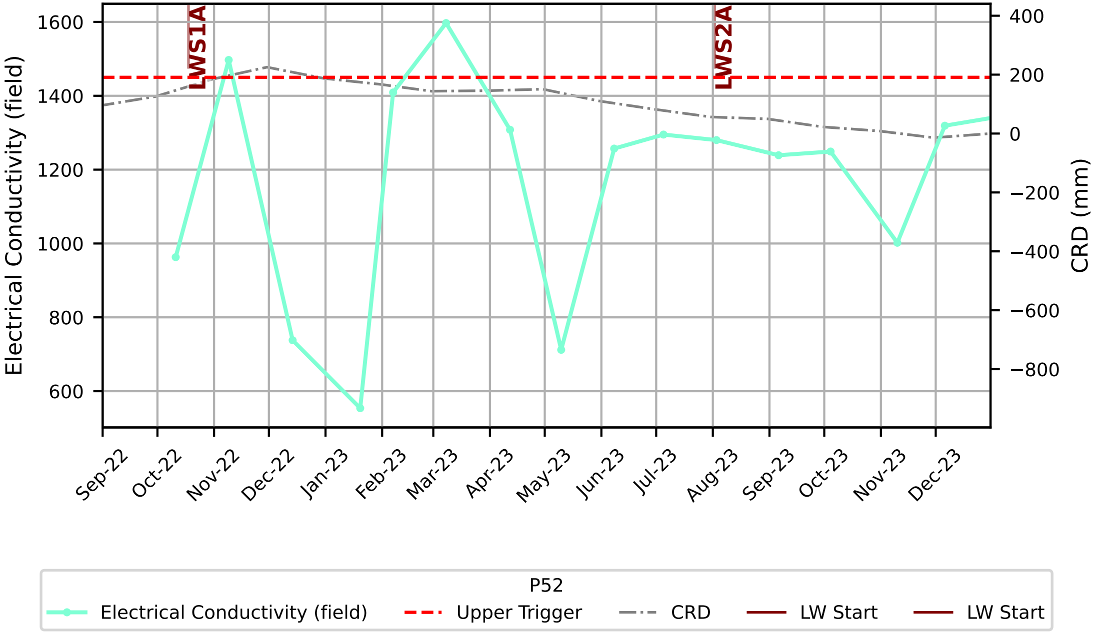
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



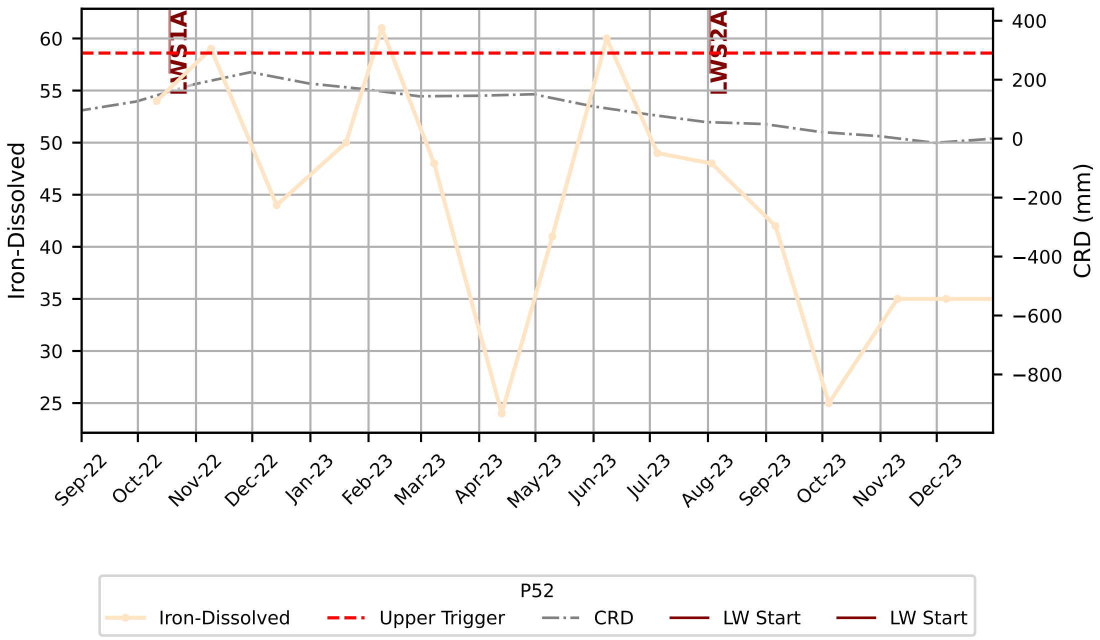
Selenium-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



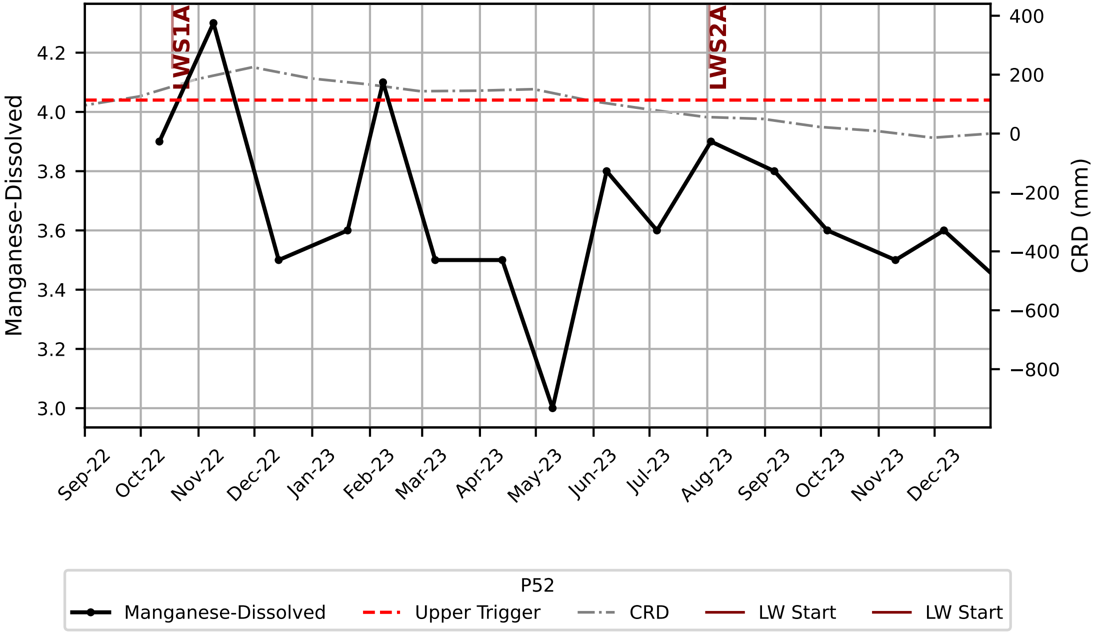
LWS1A
LWS2A
pH (field)
CRD (mm)
7.5
7.0
6.5
6.0
5.5
5.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



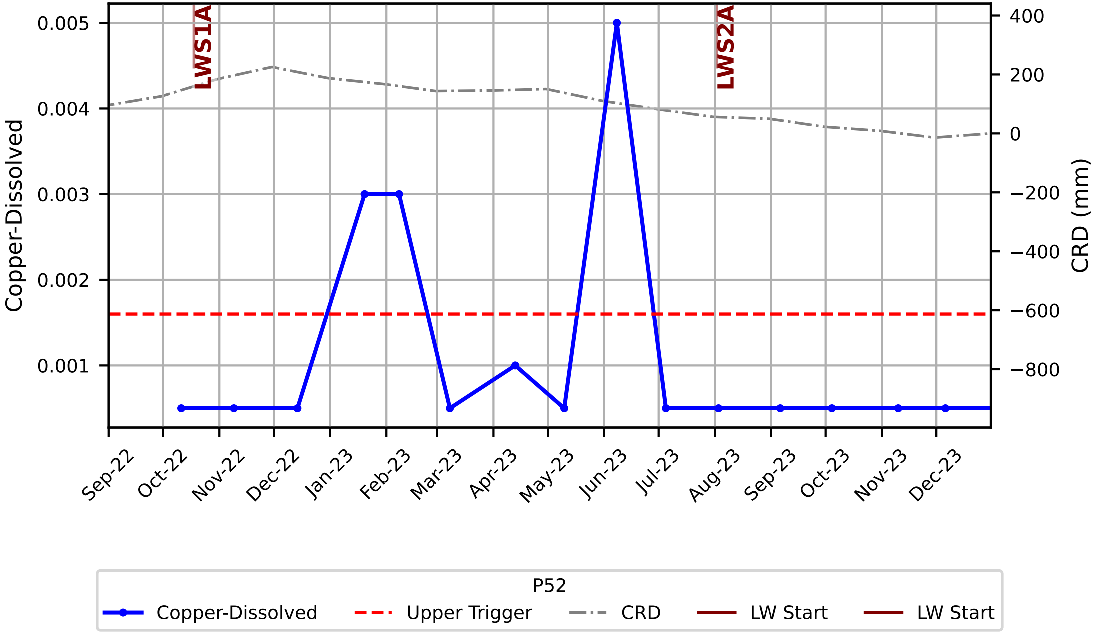
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



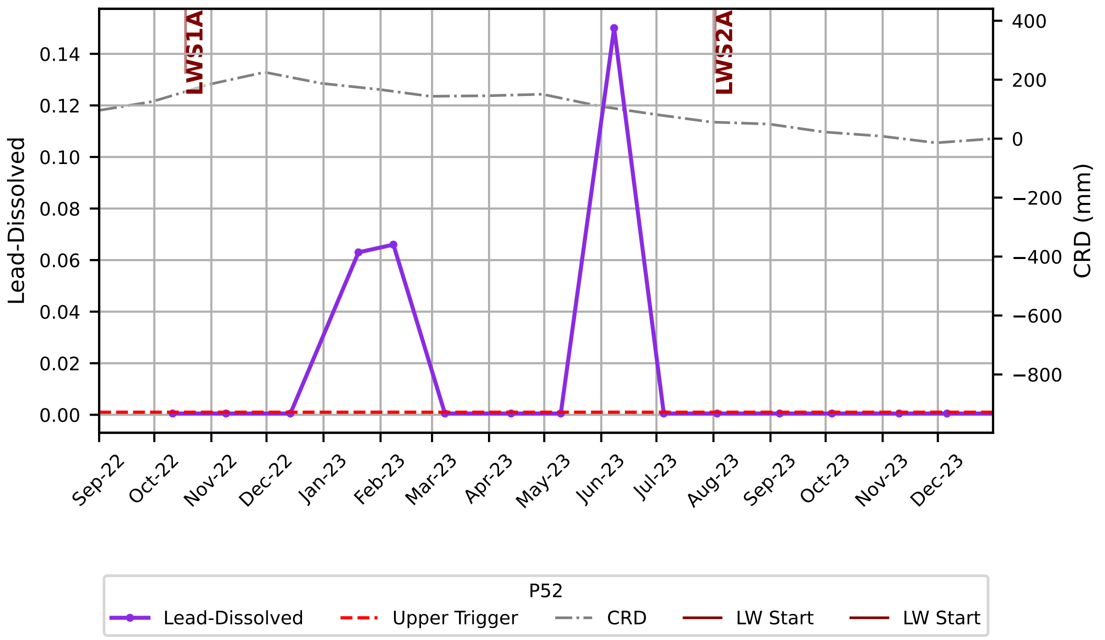
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
60
55
50
45
40
35
30
25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



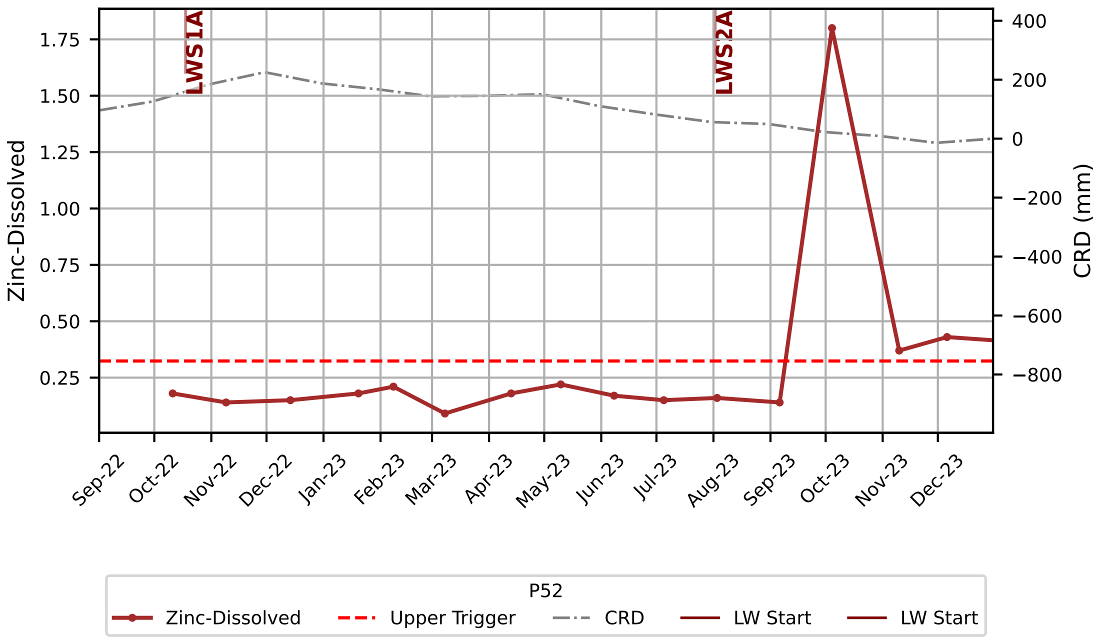
LWS1A
LWS2A
Manganese-Dissolved
4.2
4.0
3.8
3.6
3.4
3.2
3.0
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



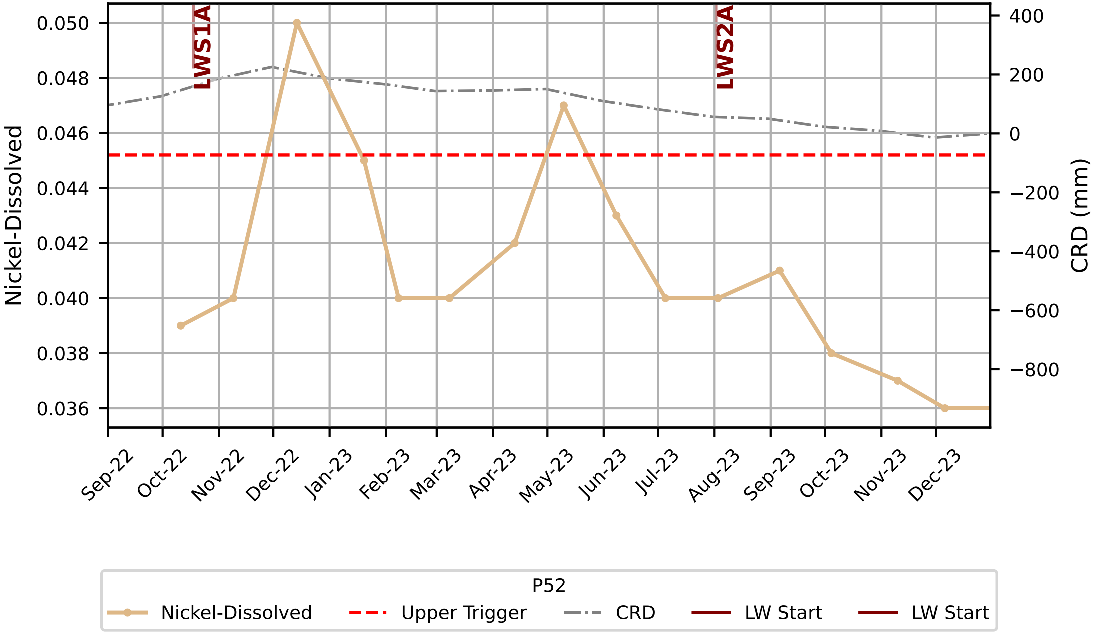
Copper-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



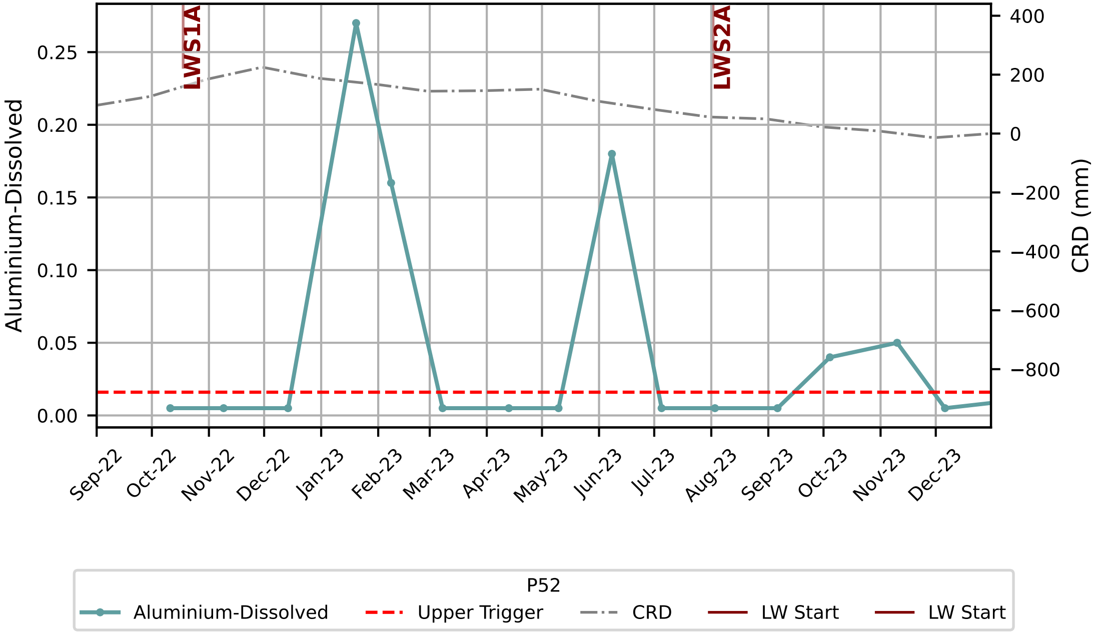
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



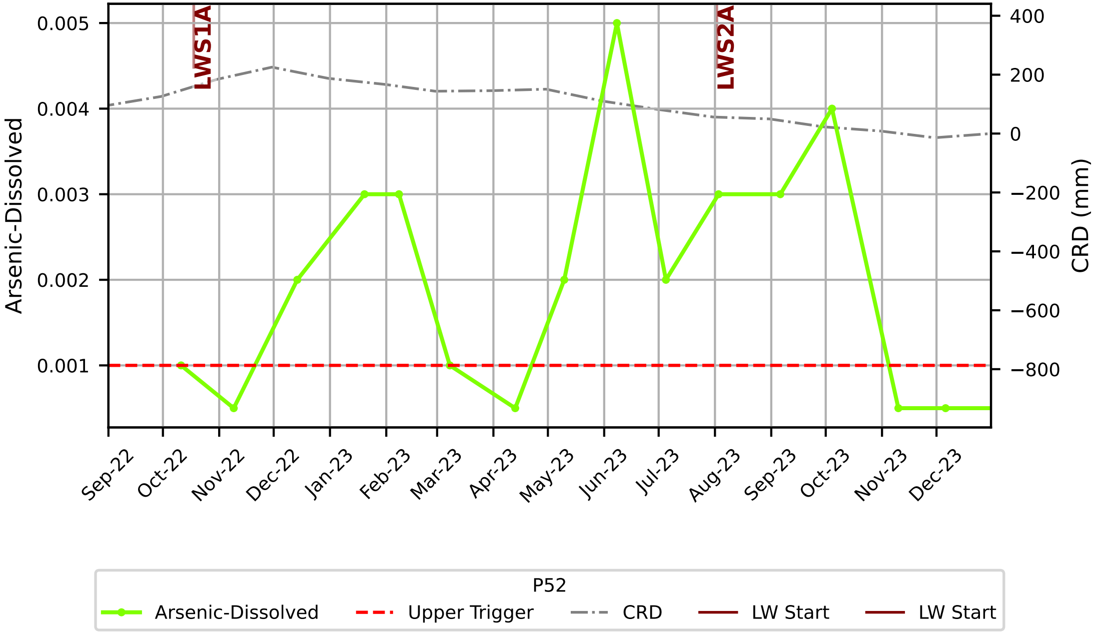
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



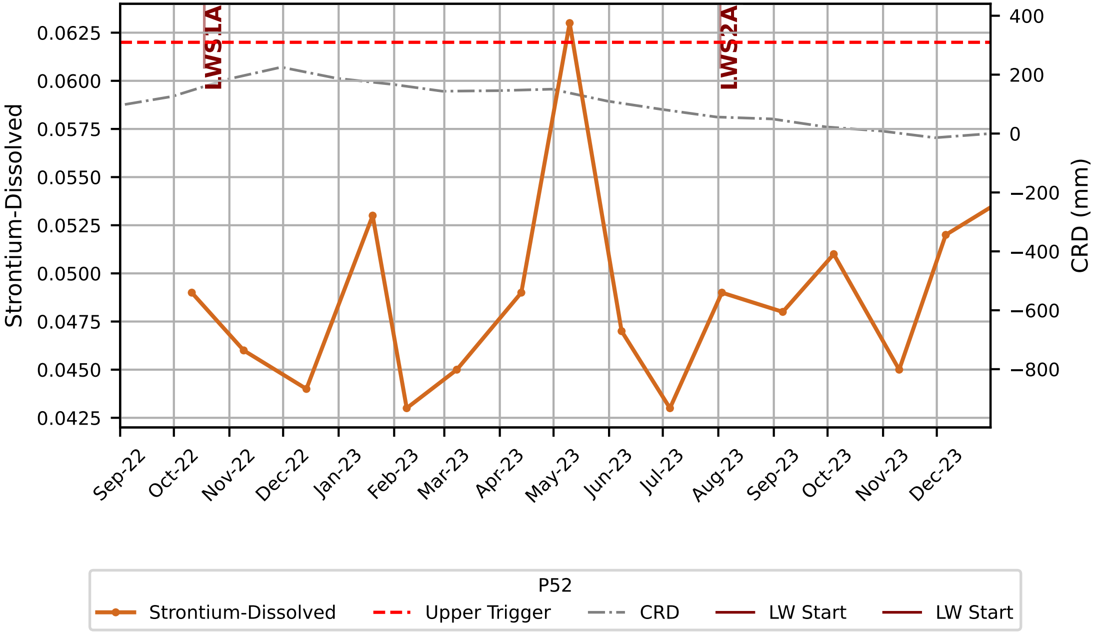
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.050
0.048
0.046
0.044
0.042
0.040
0.038
0.036
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



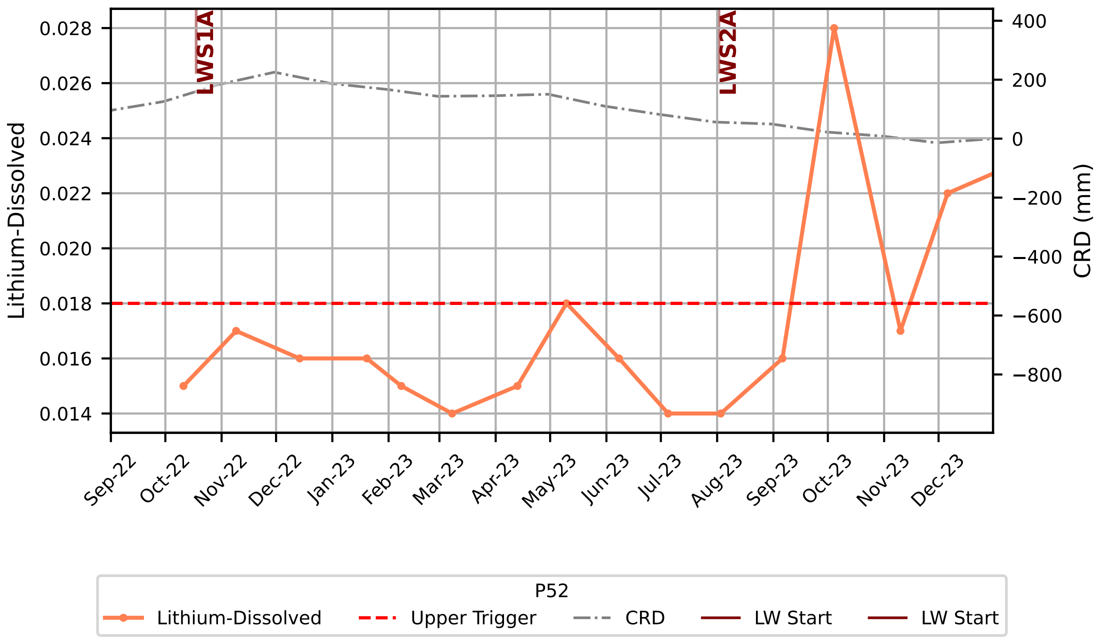
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



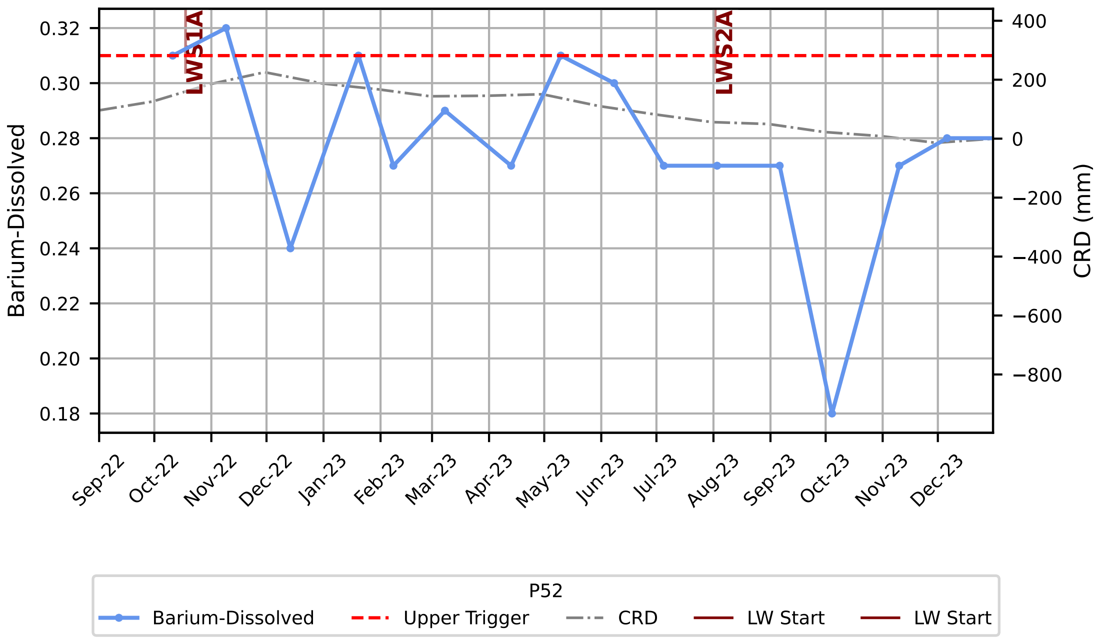
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



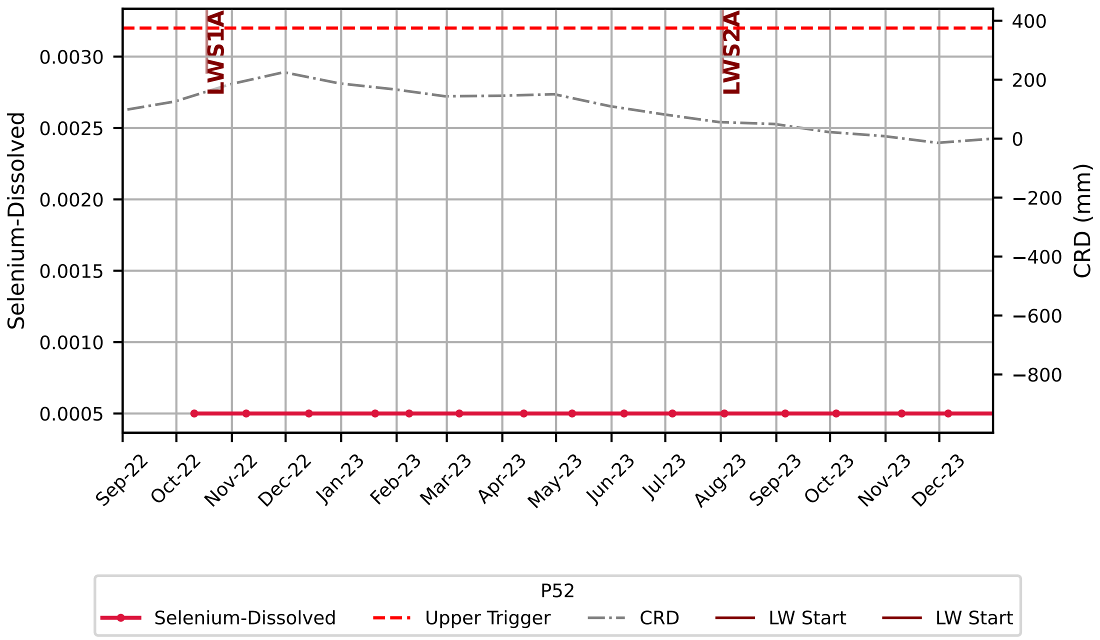
Strontium-Dissolved
CRD (mm)
0.0625
0.0600
0.0575
0.0550
0.0525
0.0500
0.0475
0.0450
0.0425
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



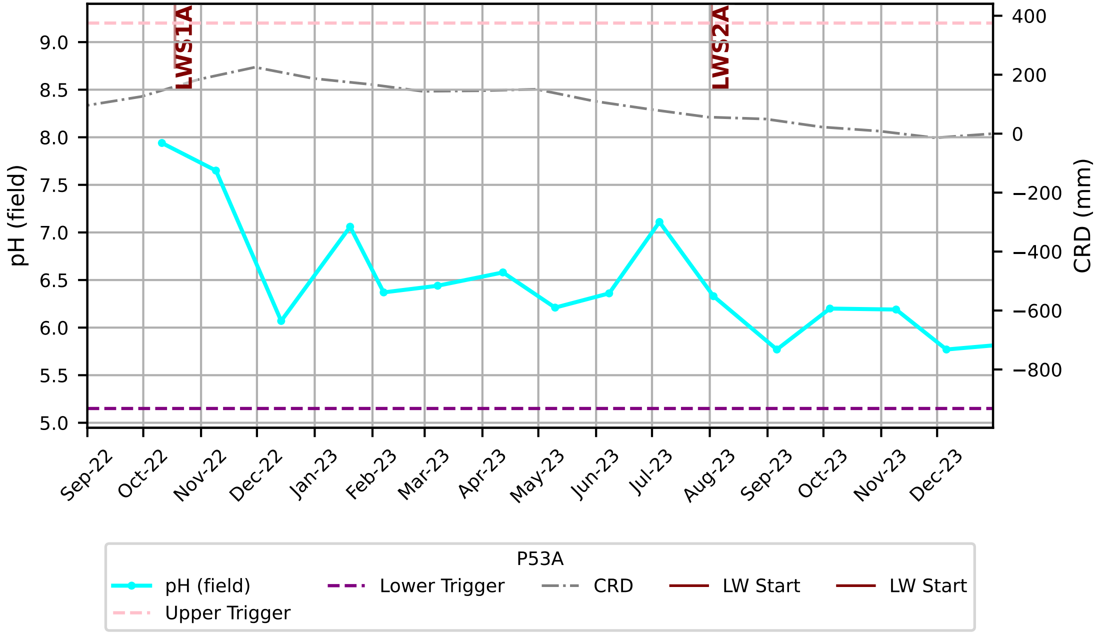
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.028
0.026
0.024
0.022
0.020
0.018
0.016
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



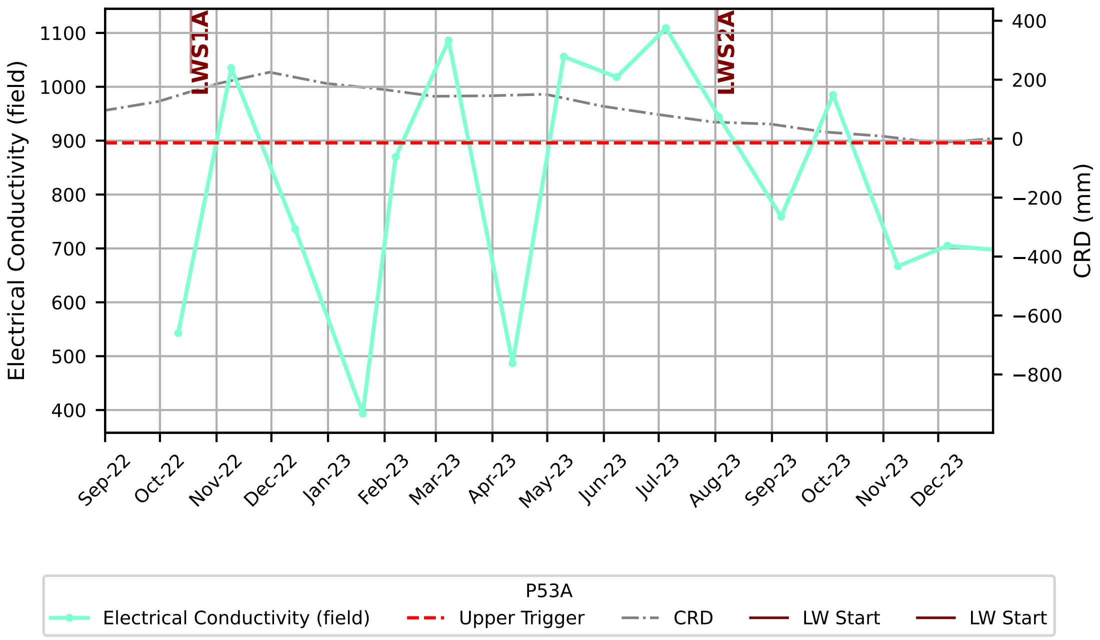
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



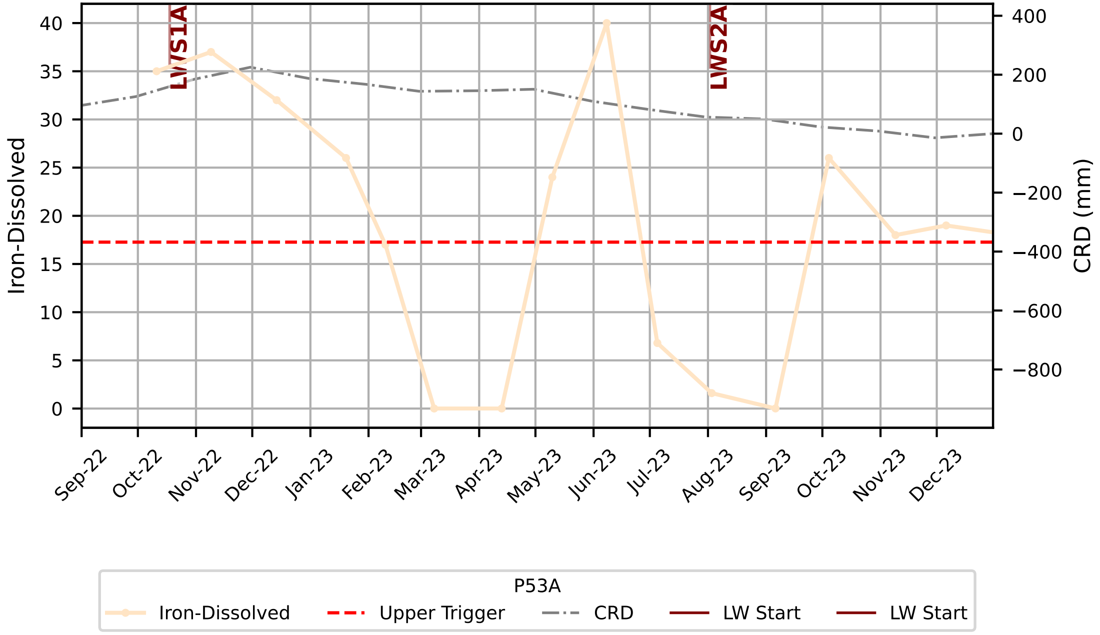
LWS1A
LWS2A
Selenium-Dissolved
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



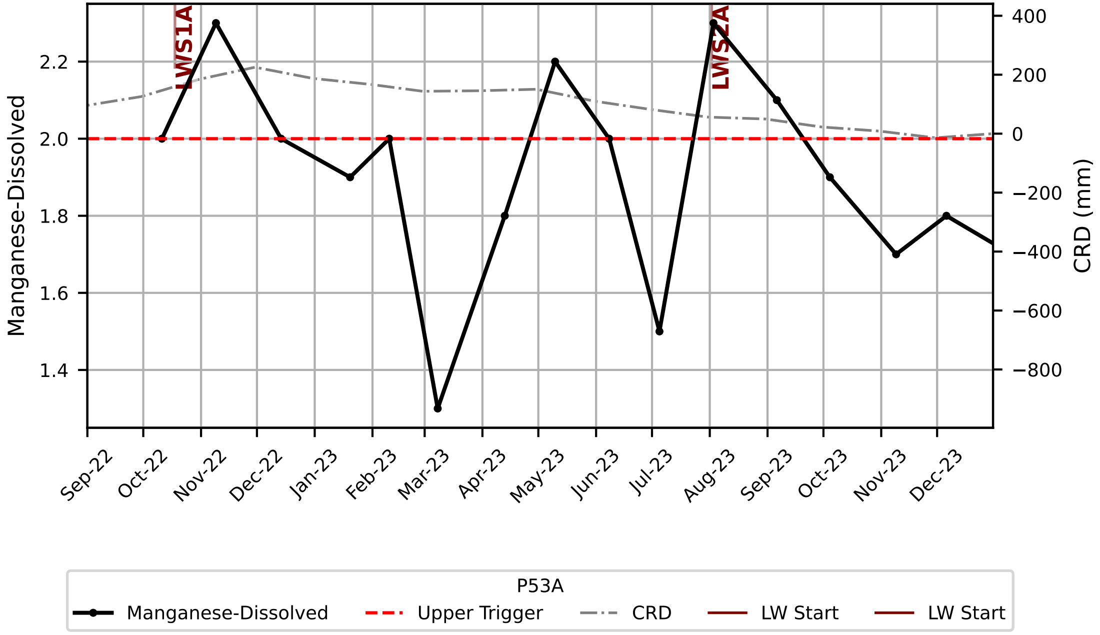
LWS1A
LWS2A
pH (field)
CRD (mm)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



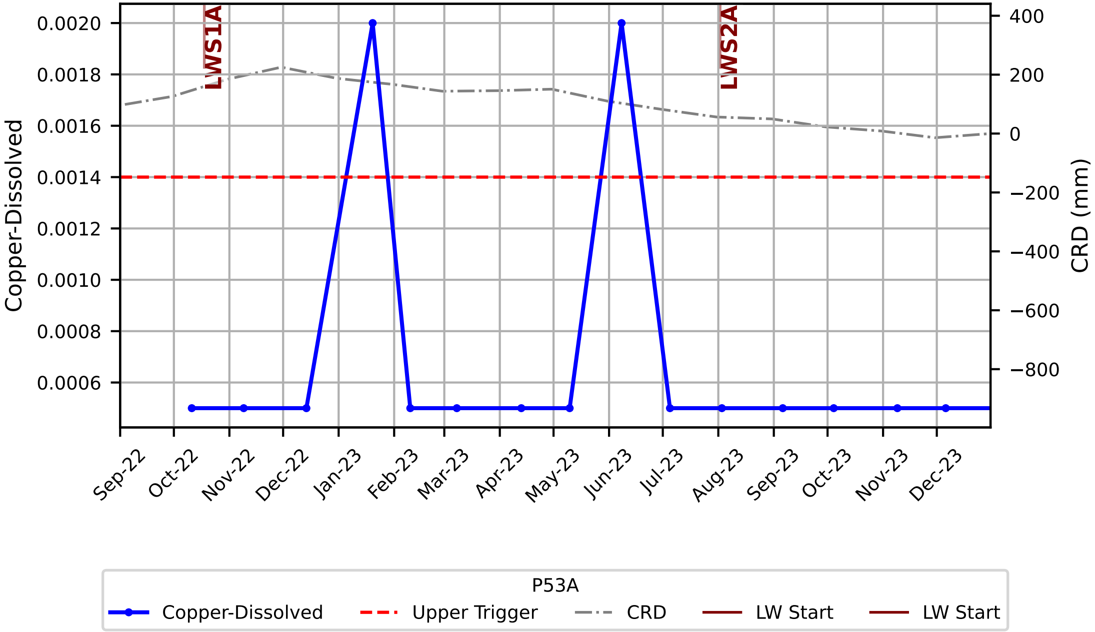
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1100
1000
900
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



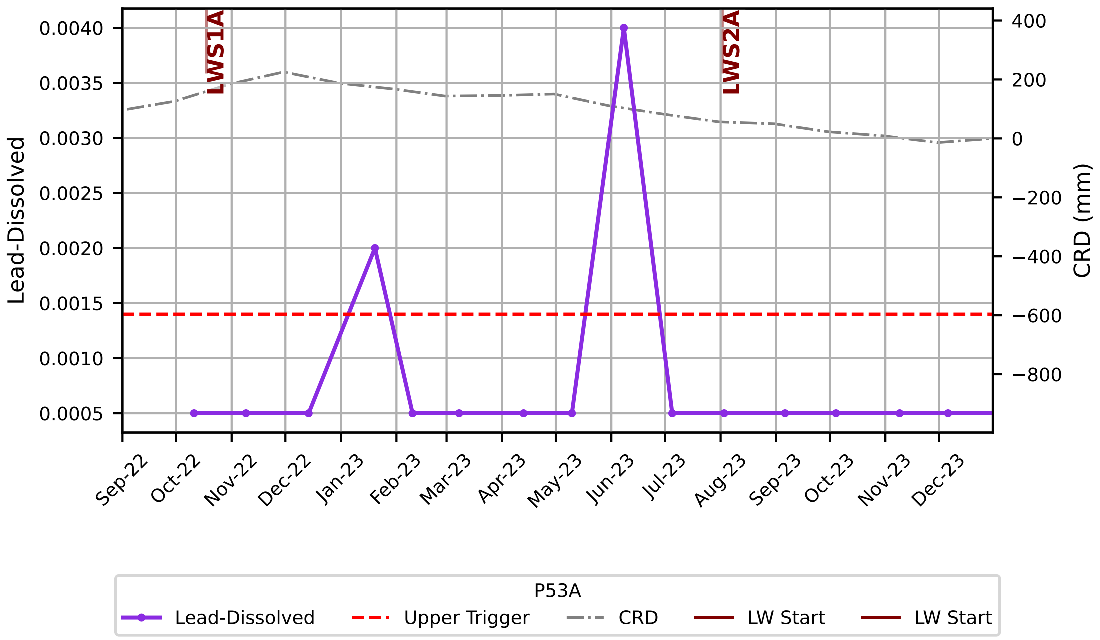
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
40
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start

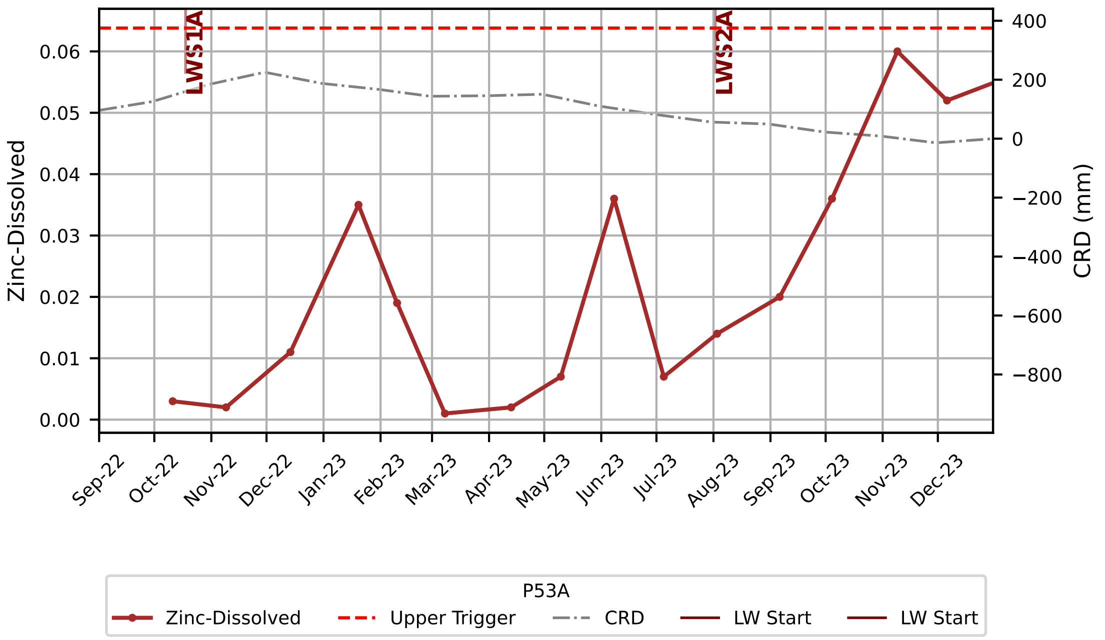


LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
2.2
2.0
1.8
1.6
1.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

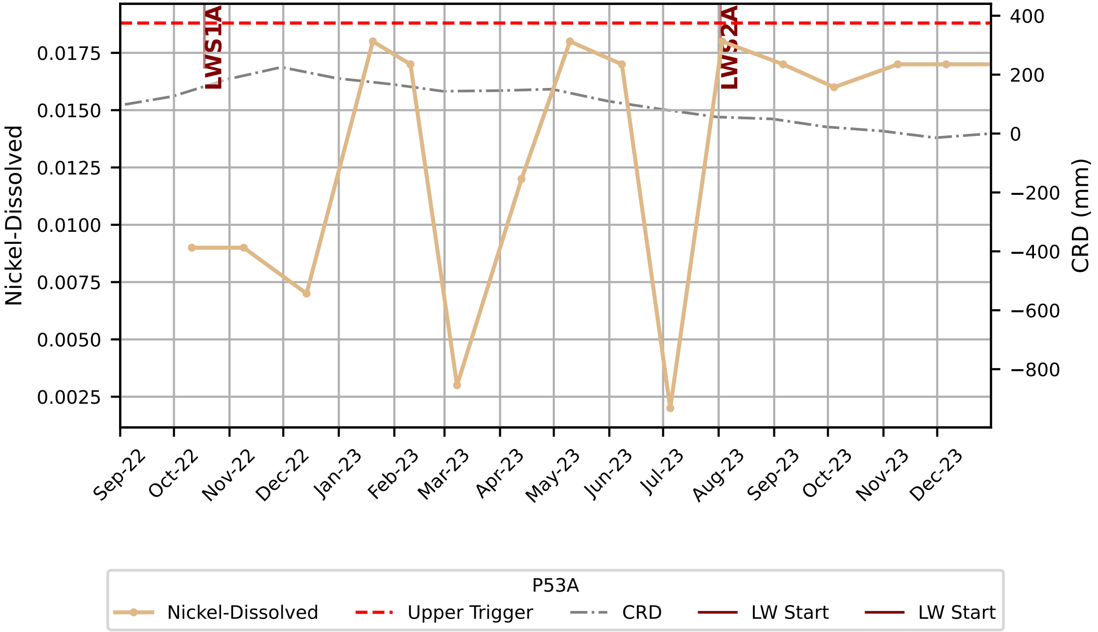


LWS1A
LWS2A
Copper-Dissolved
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

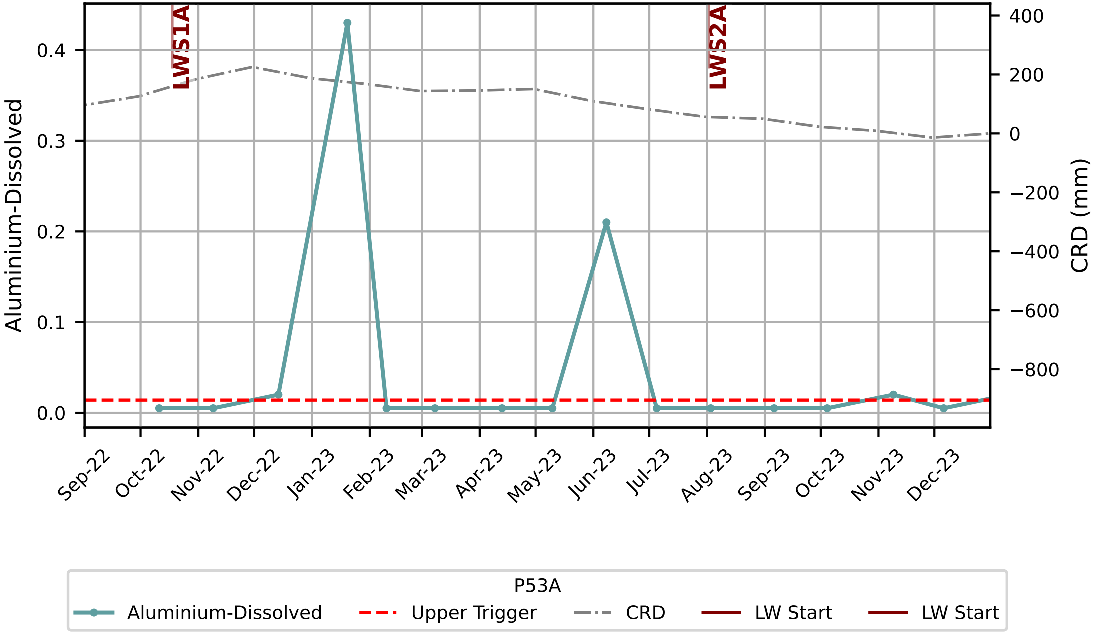

LWS1A
LWS2A
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



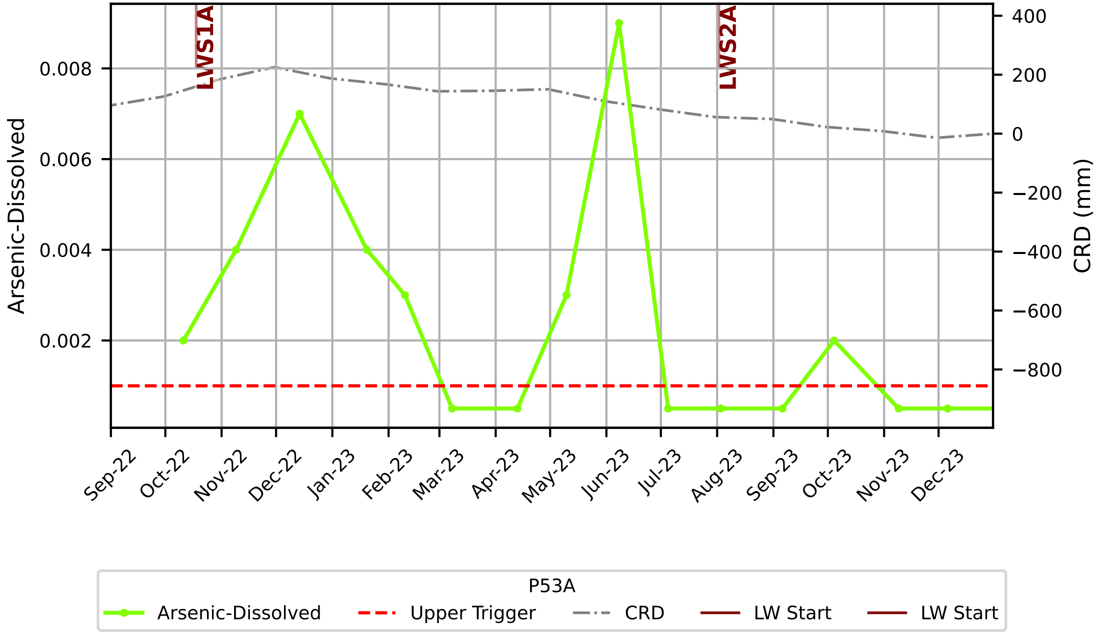
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



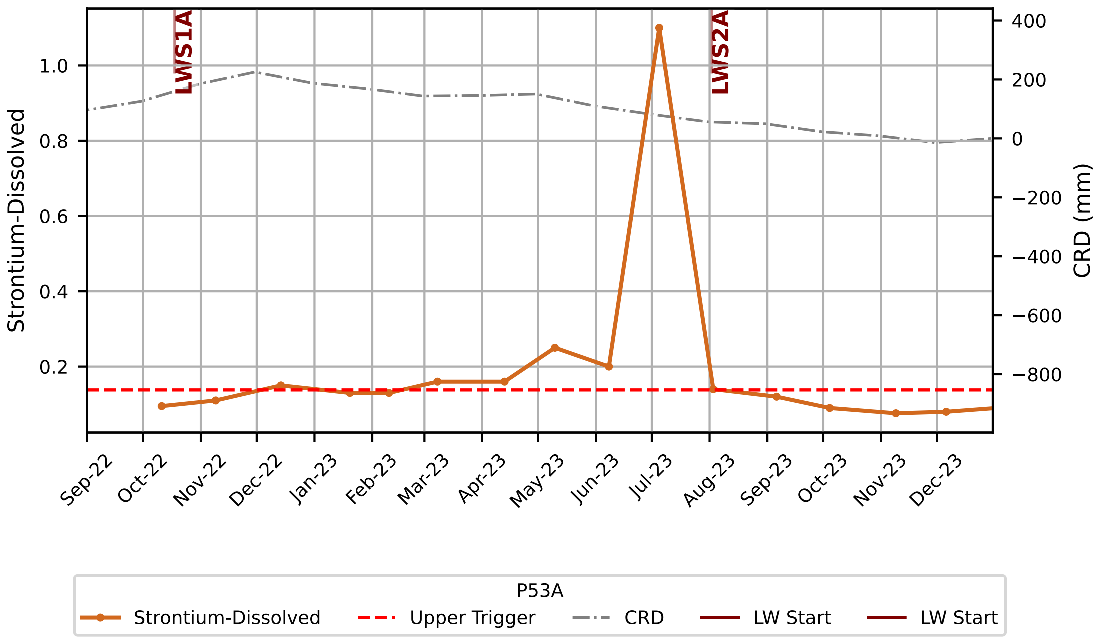
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



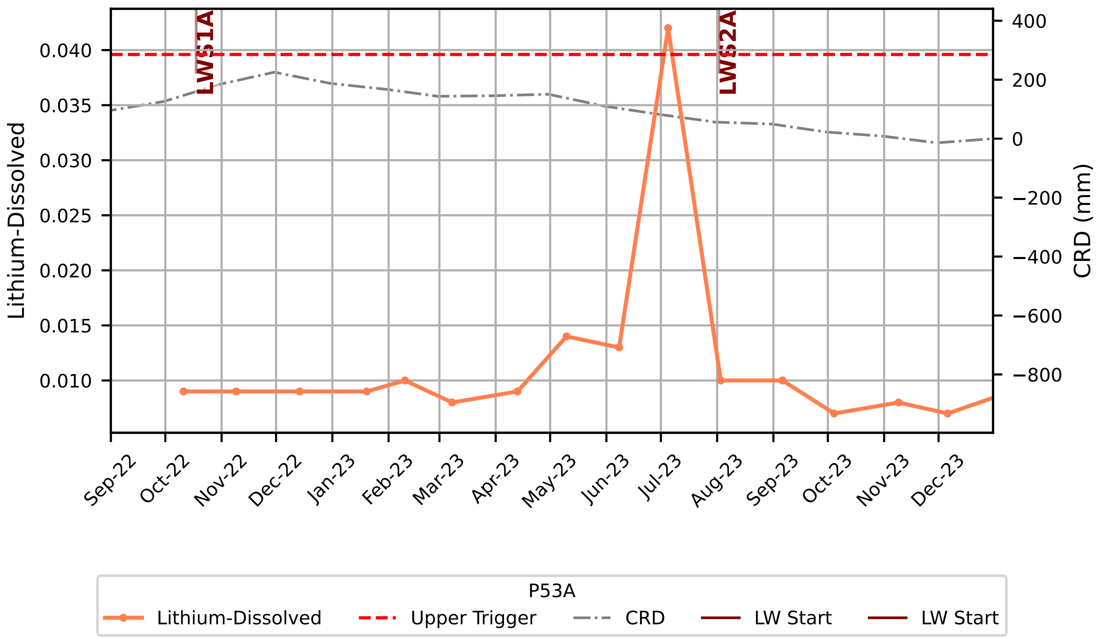
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



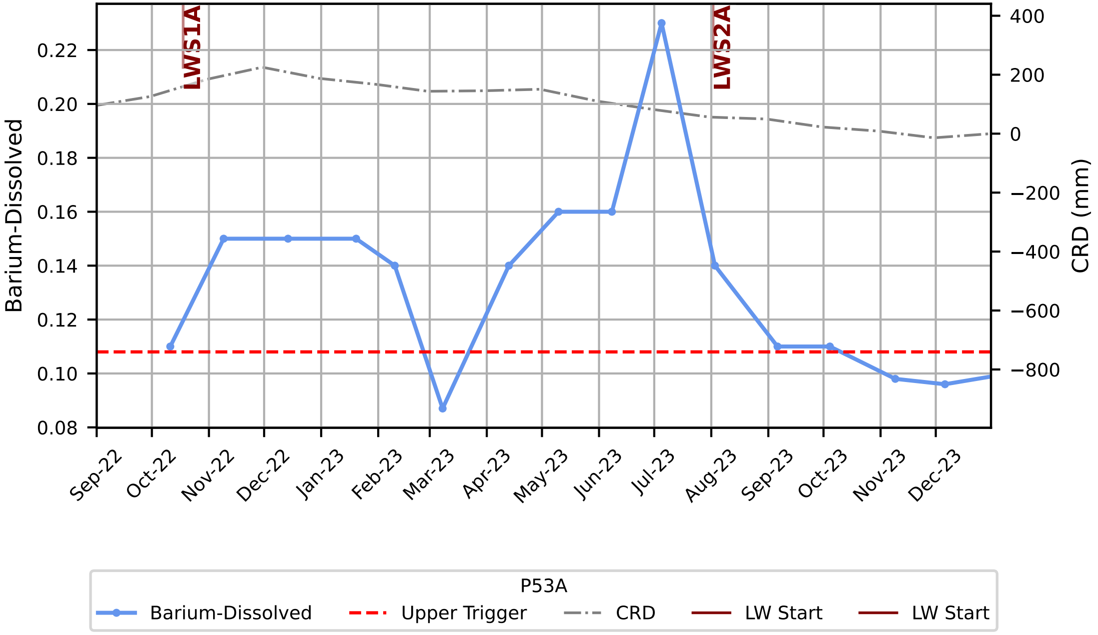
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.008
0.006
0.004
0.002
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



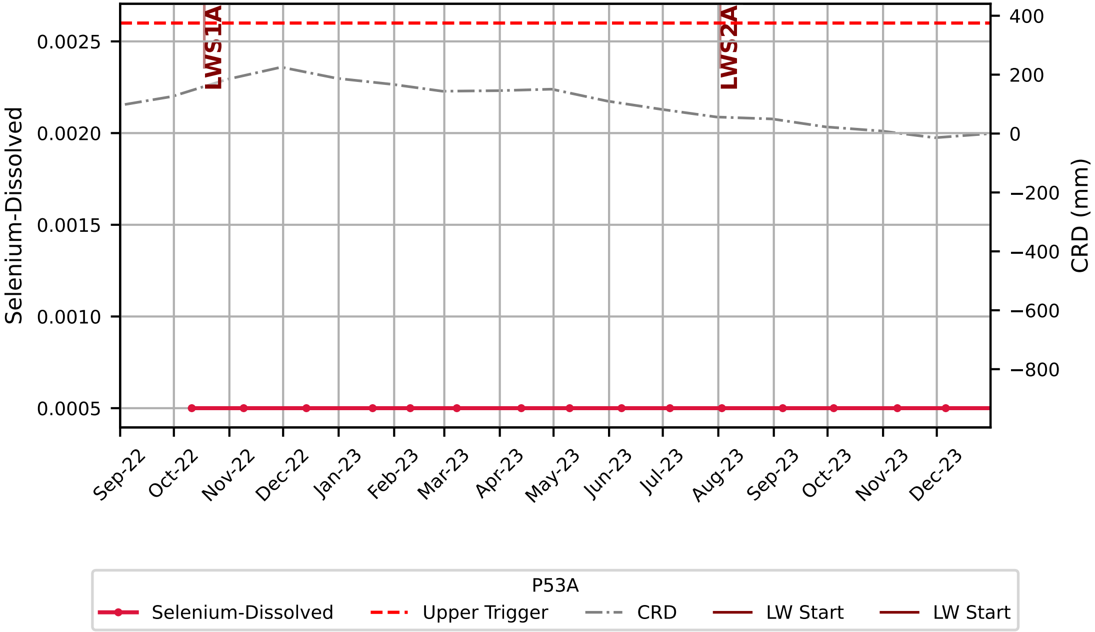
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.0
0.8
0.6
0.4
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



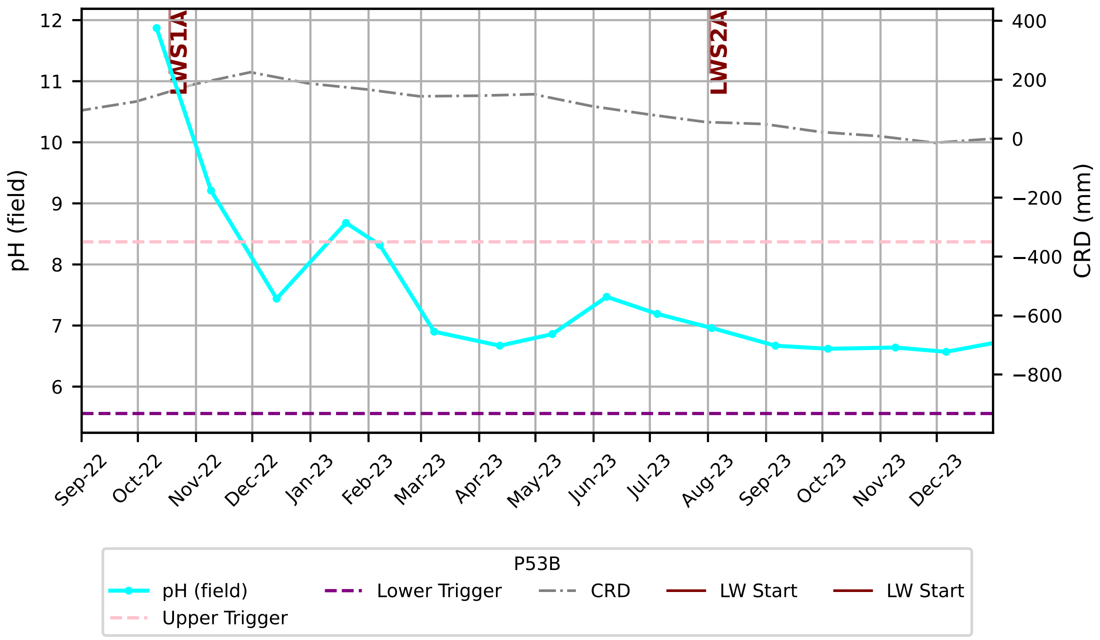
LWS1A
LWS2A
0.040
0.035
0.030
0.025
0.020
0.015
0.010
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



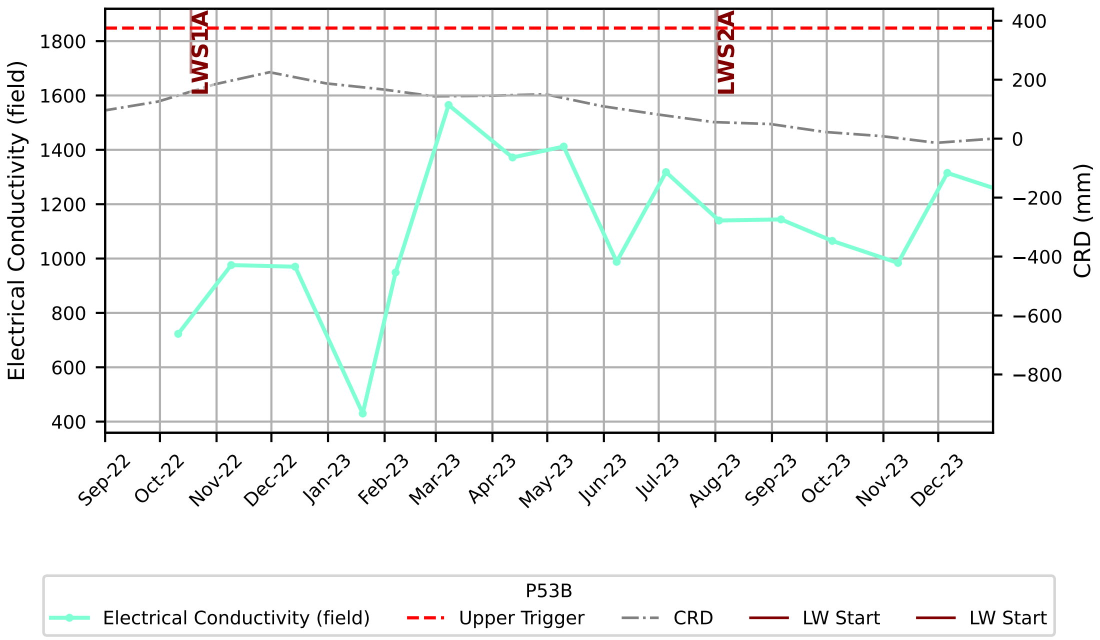
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



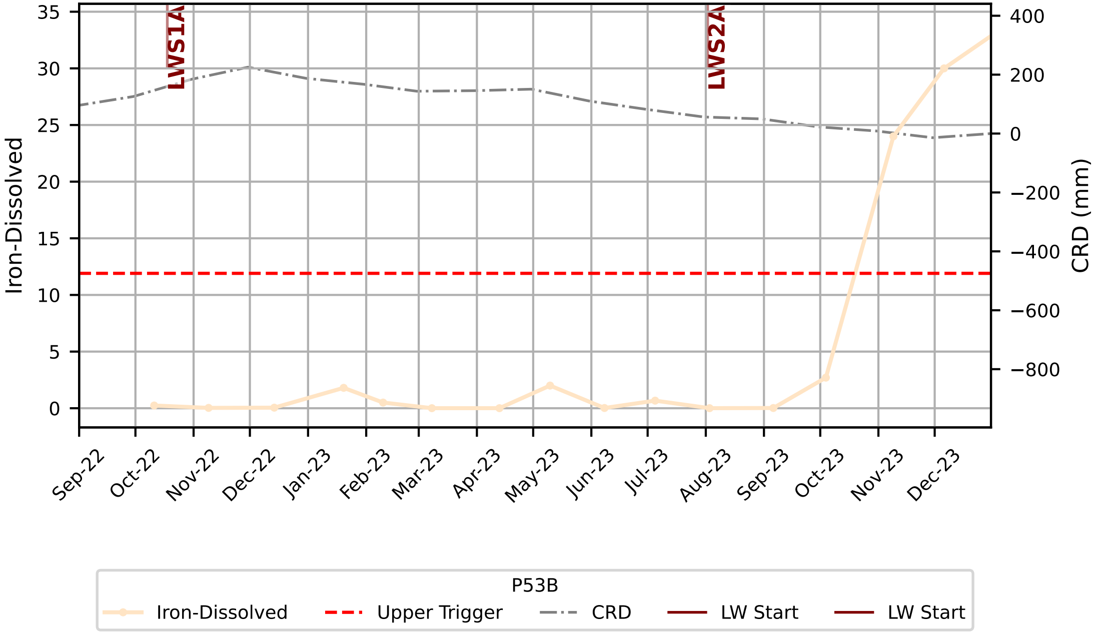
LWS1A
LWS2A
Selenium-Dissolved
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



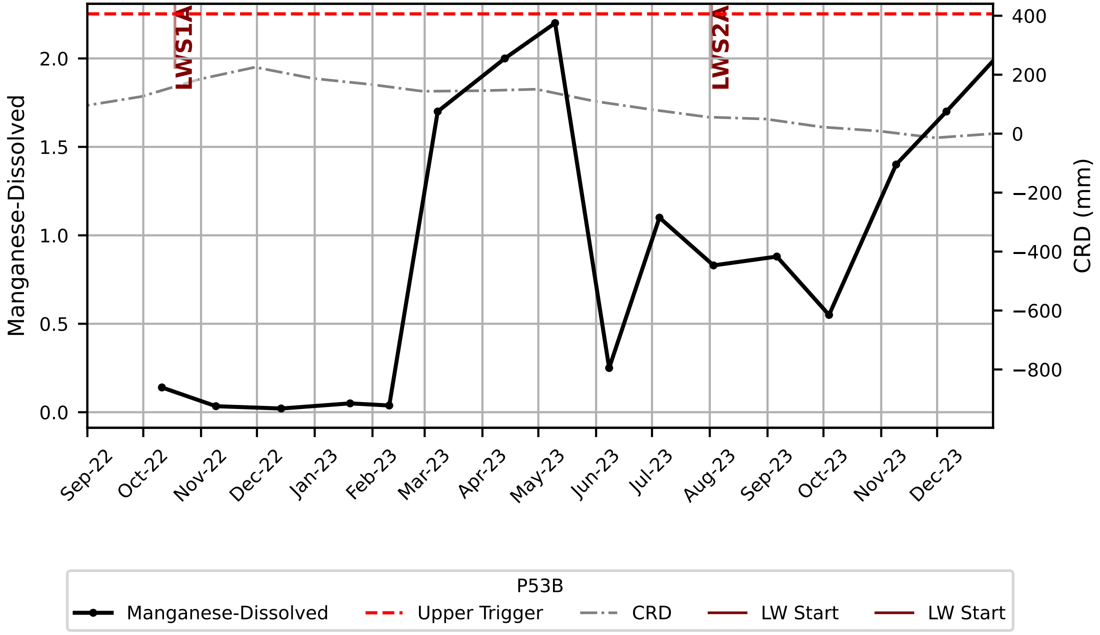
pH (field)
CRD (mm)
LWS1A
LWS2A
12
11
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



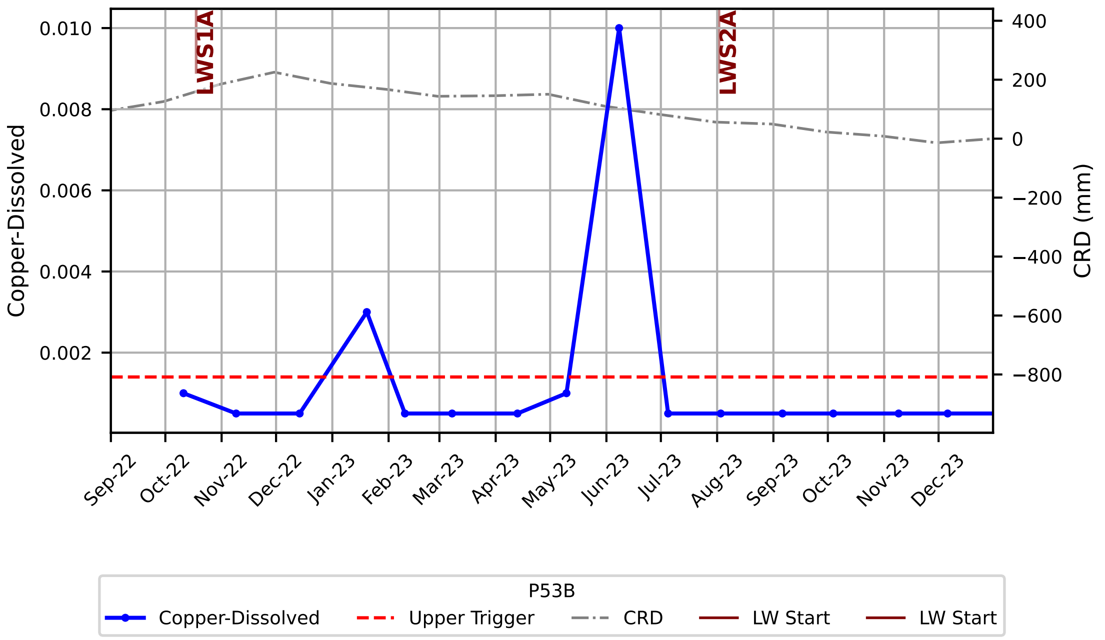
Electrical Conductivity (field)
CRD (mm)
1800
1600
1400
1200
1000
800
600
400
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



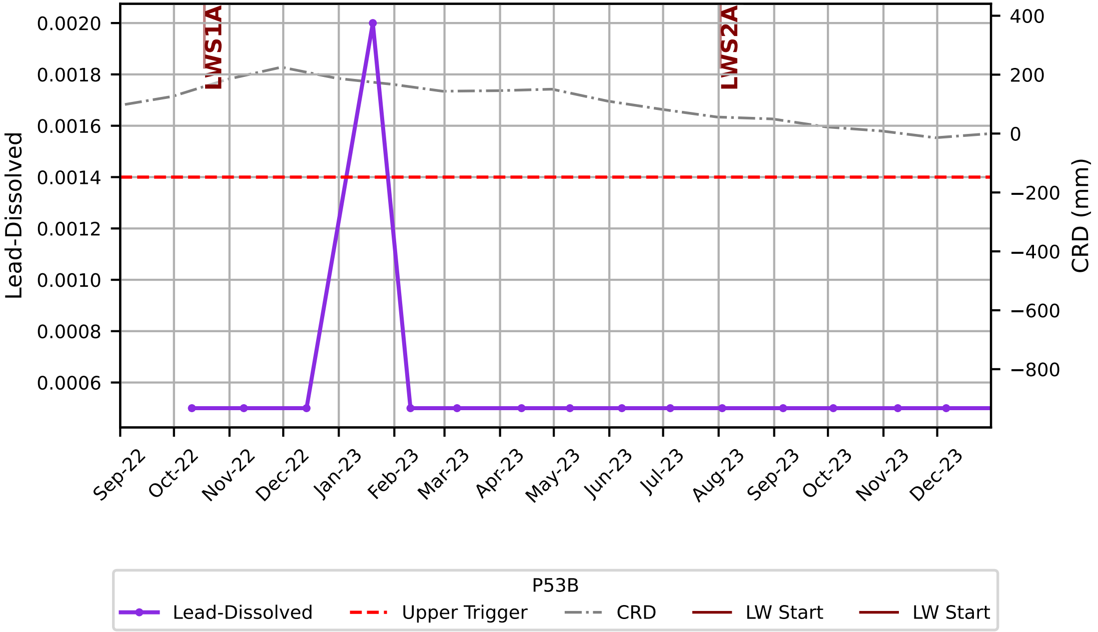
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



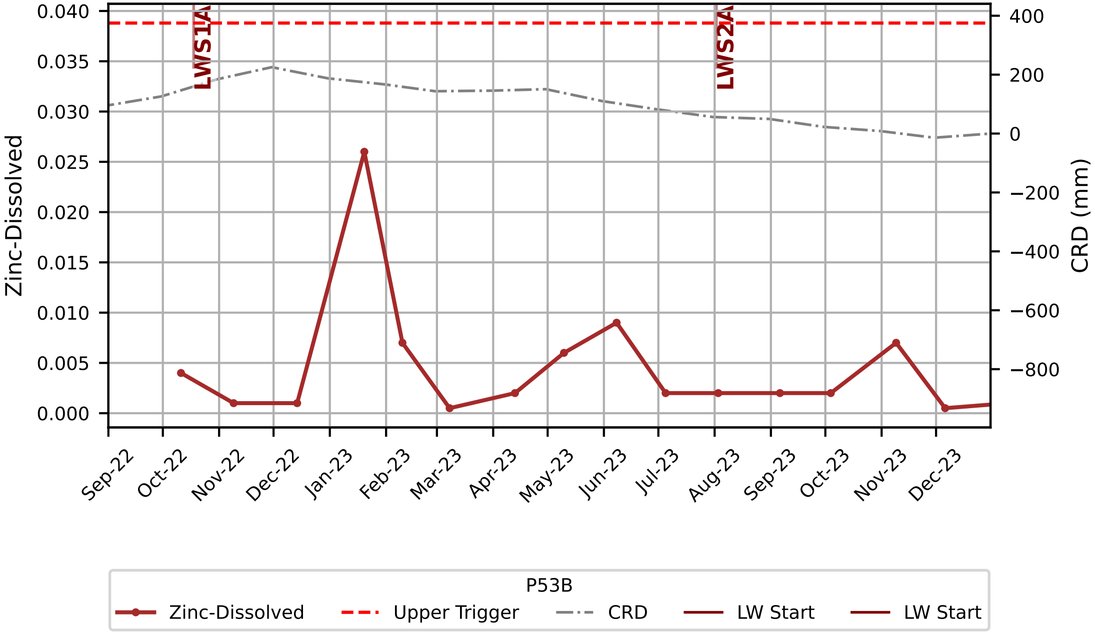
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.0
0.5
1.0
1.5
2.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



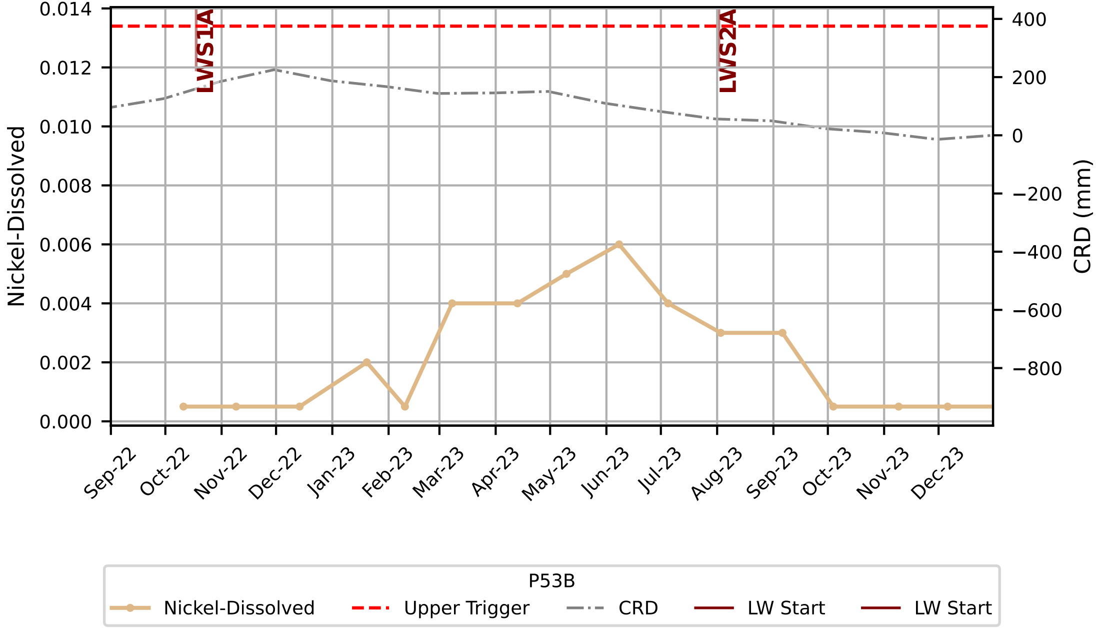
LWS1A
LWS2A
Copper-Dissolved
0.010
0.008
0.006
0.004
0.002
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



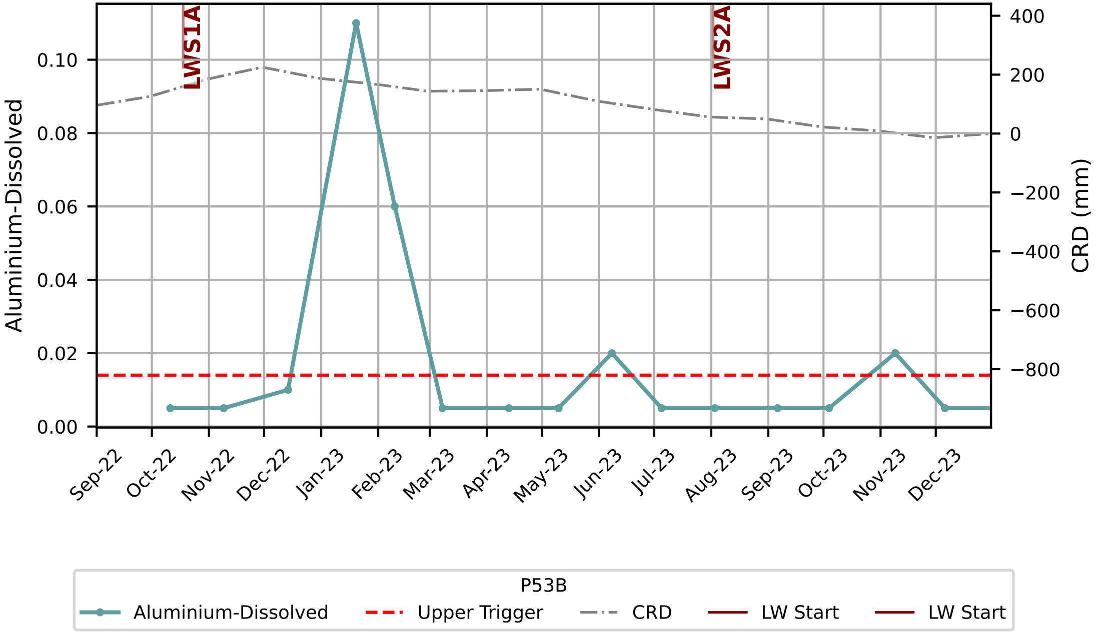
LWS1A
LWS2A
Lead-Dissolved
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



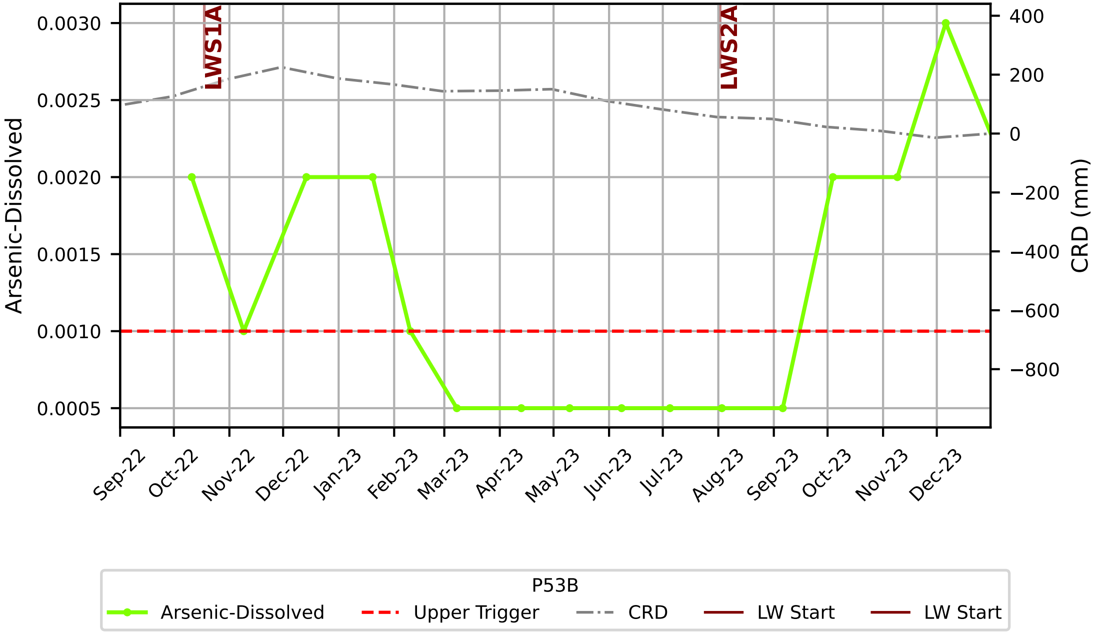
Zinc-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



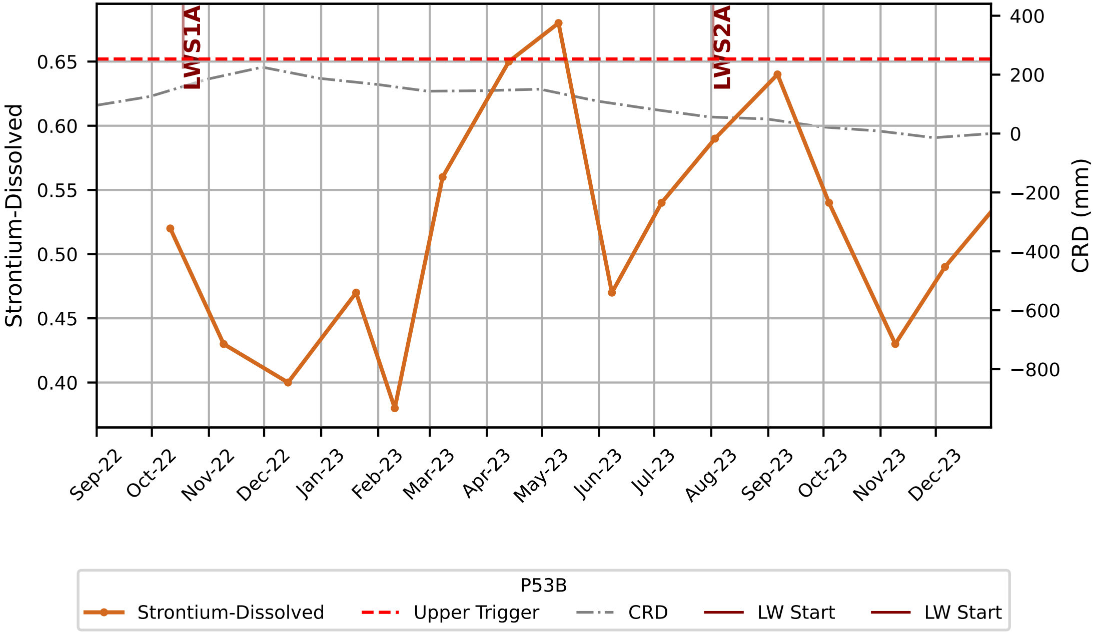
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



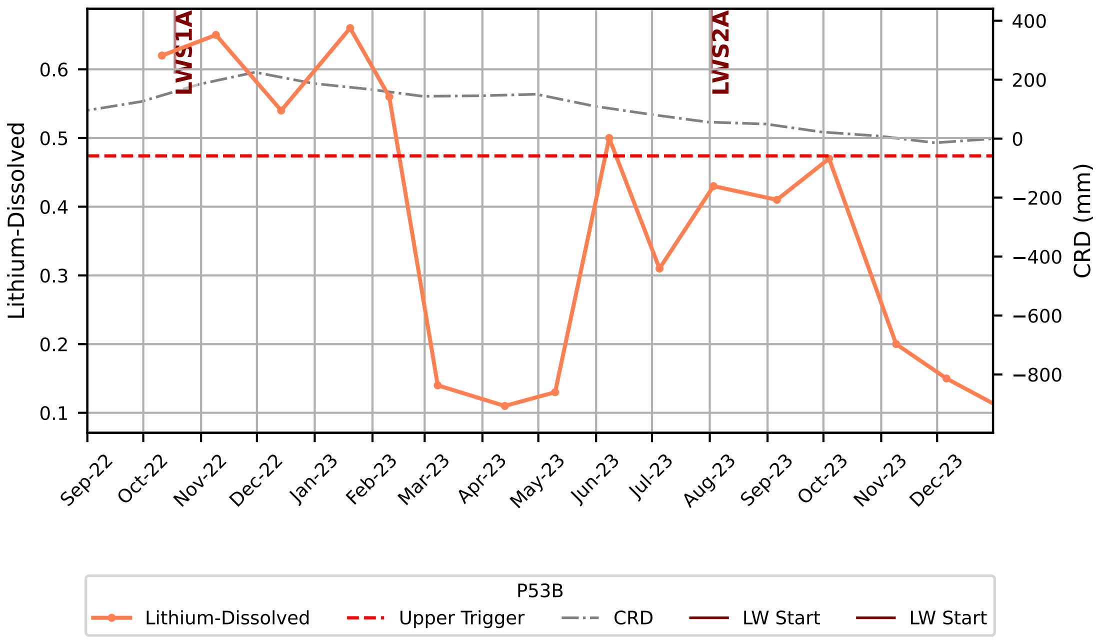
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.02
0.04
0.06
0.08
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



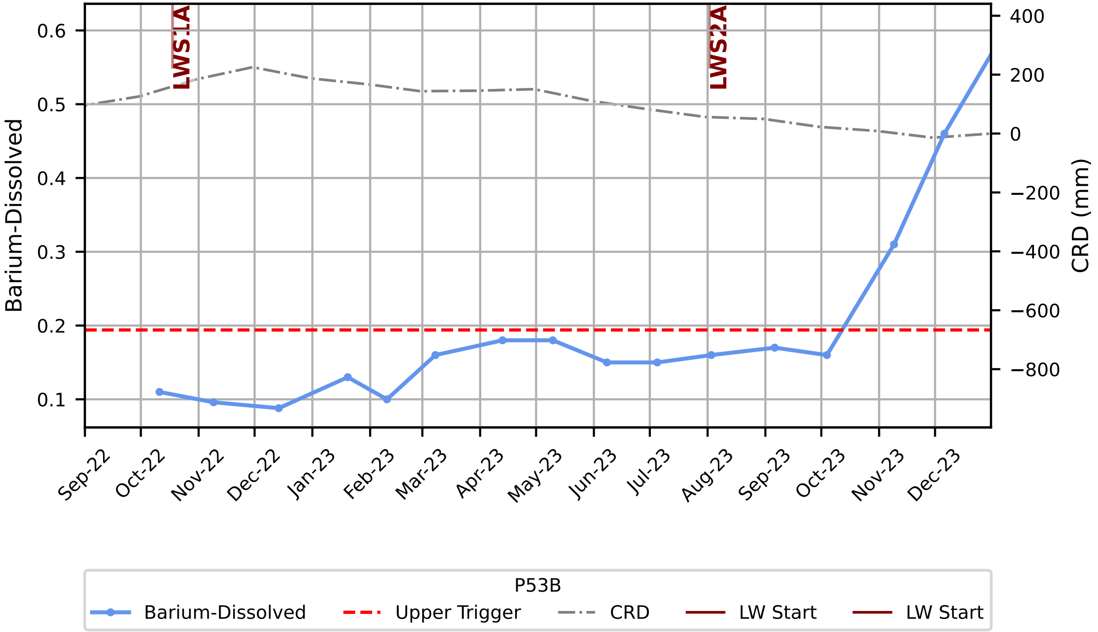
LWS1A
LWS2A
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



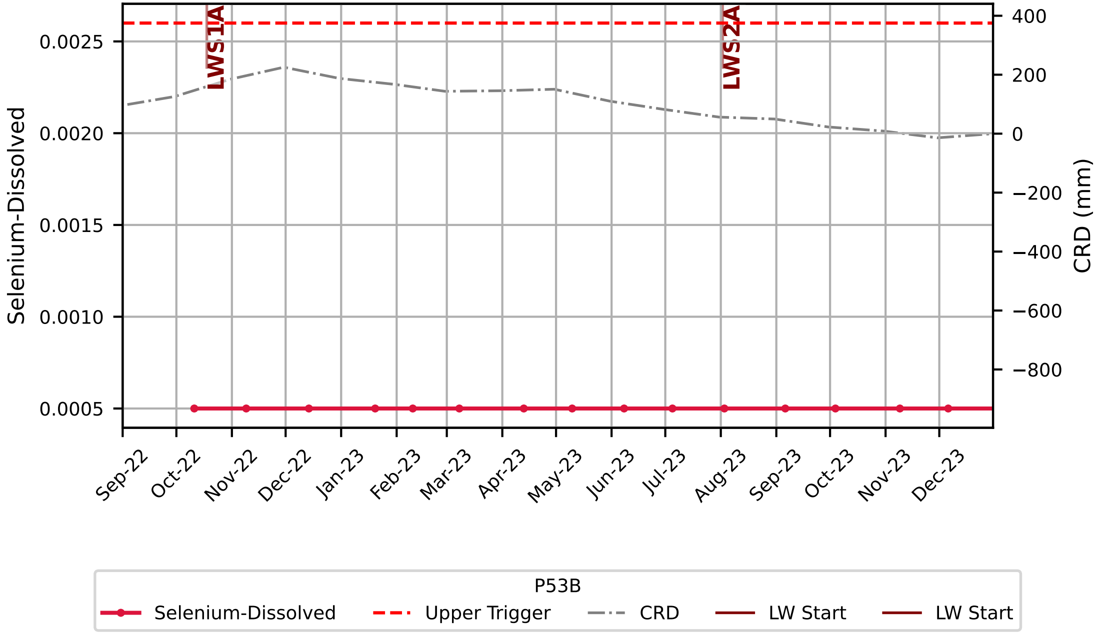
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.40
0.45
0.50
0.55
0.60
0.65
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



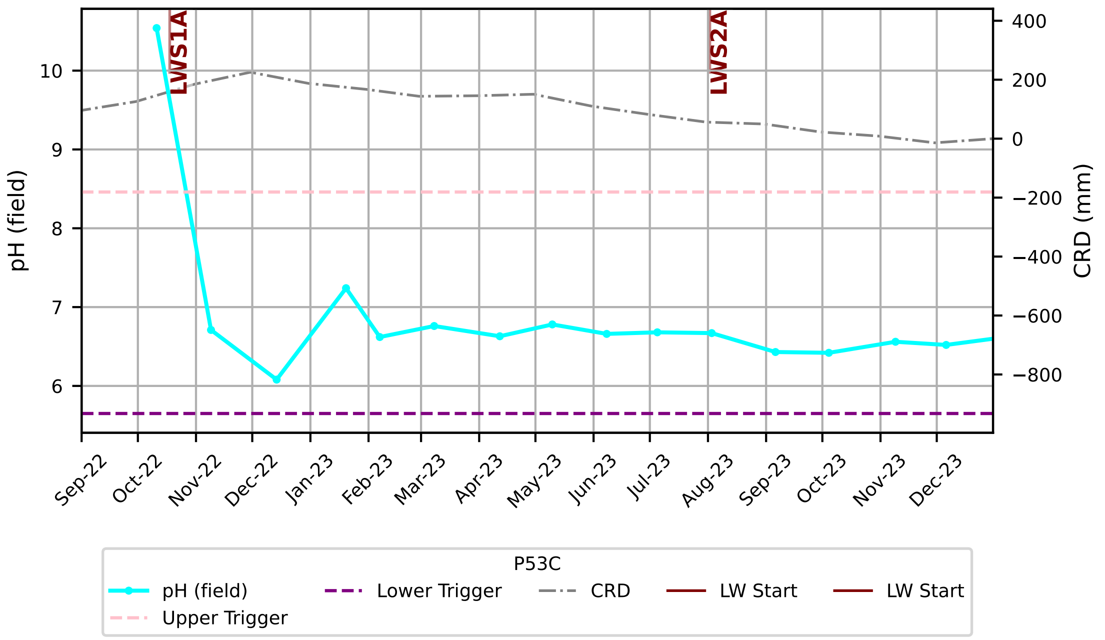
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.1
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



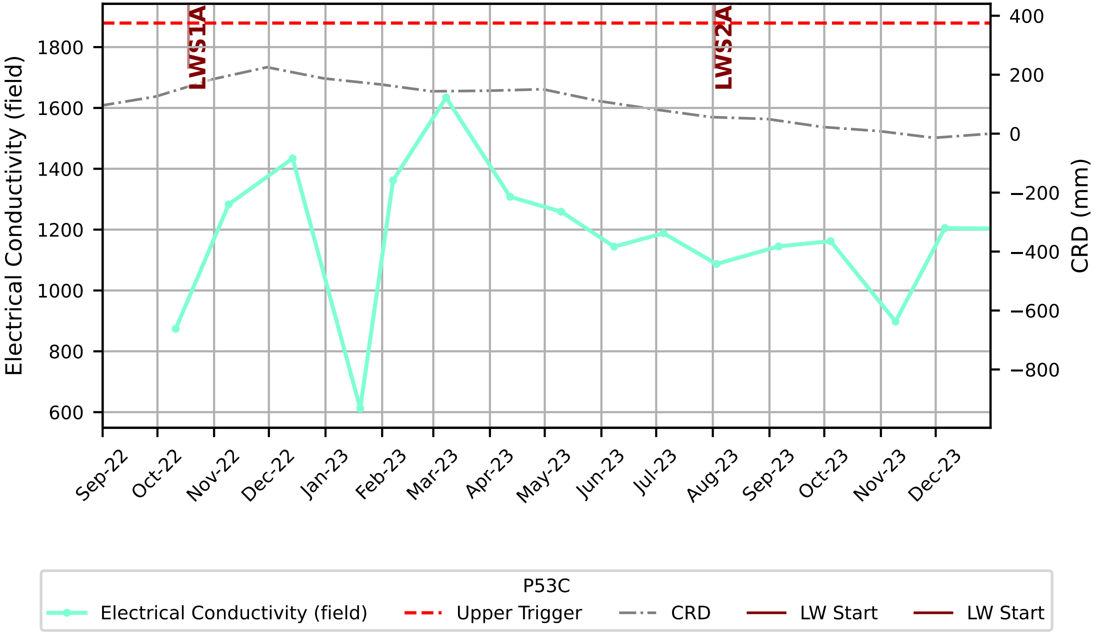
Barium-Dissolved
CRD (mm)
0.6
0.5
0.4
0.3
0.2
0.1
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



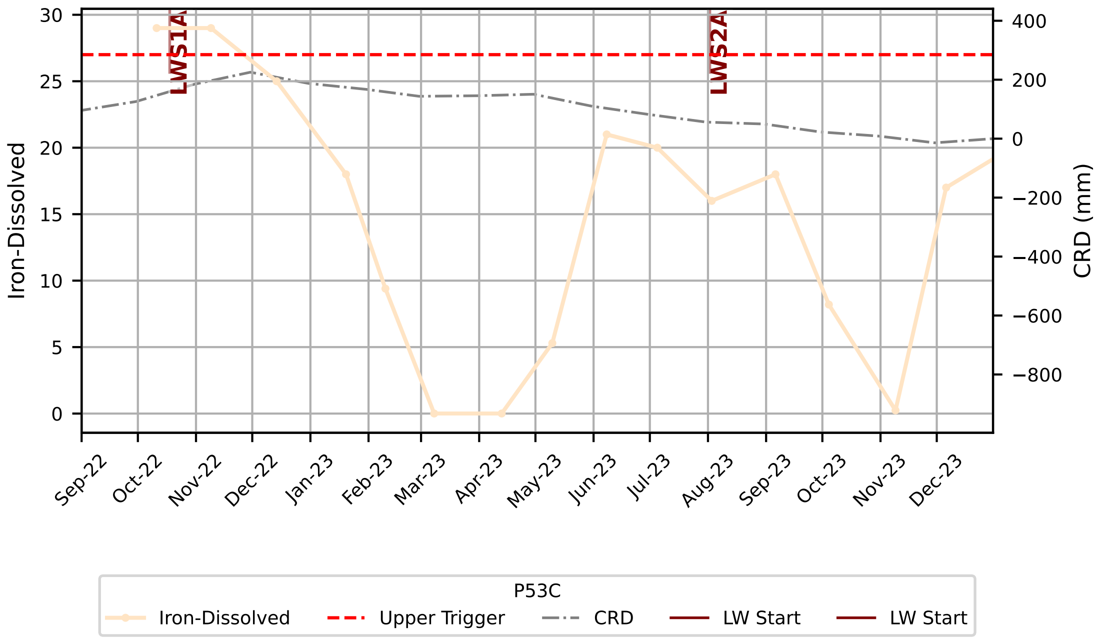
LWS1A
LWS2A
Selenium-Dissolved
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



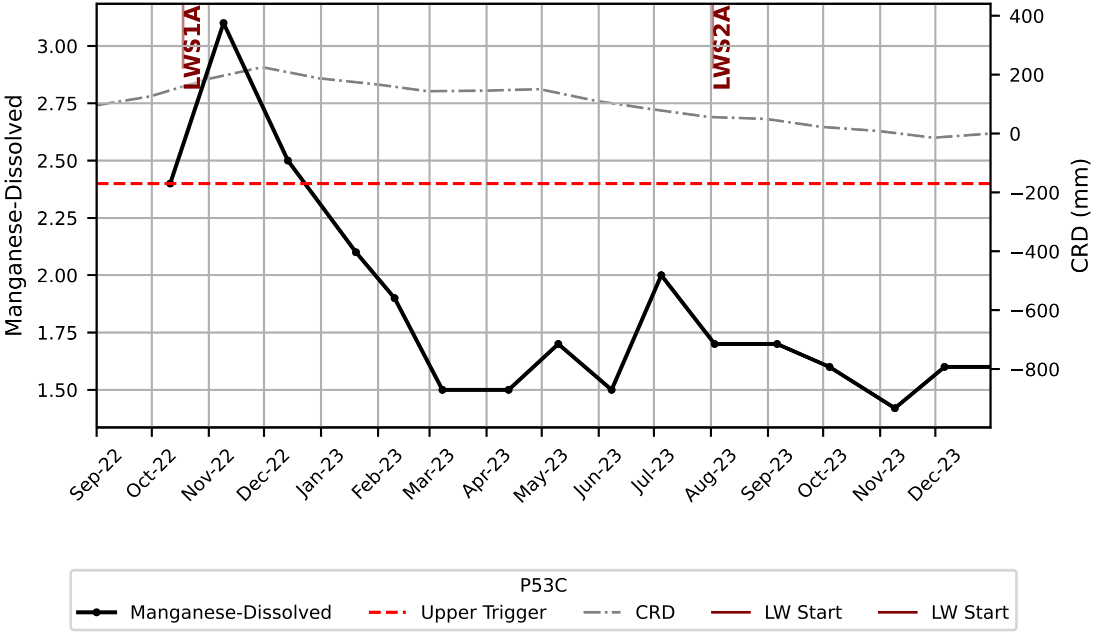
LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



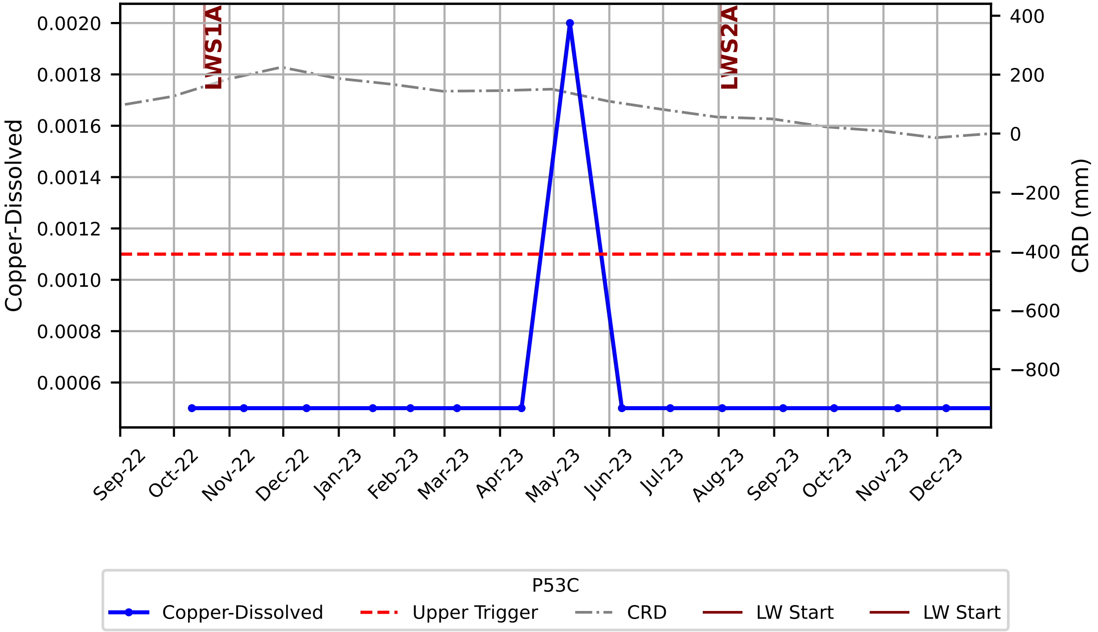
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1800
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



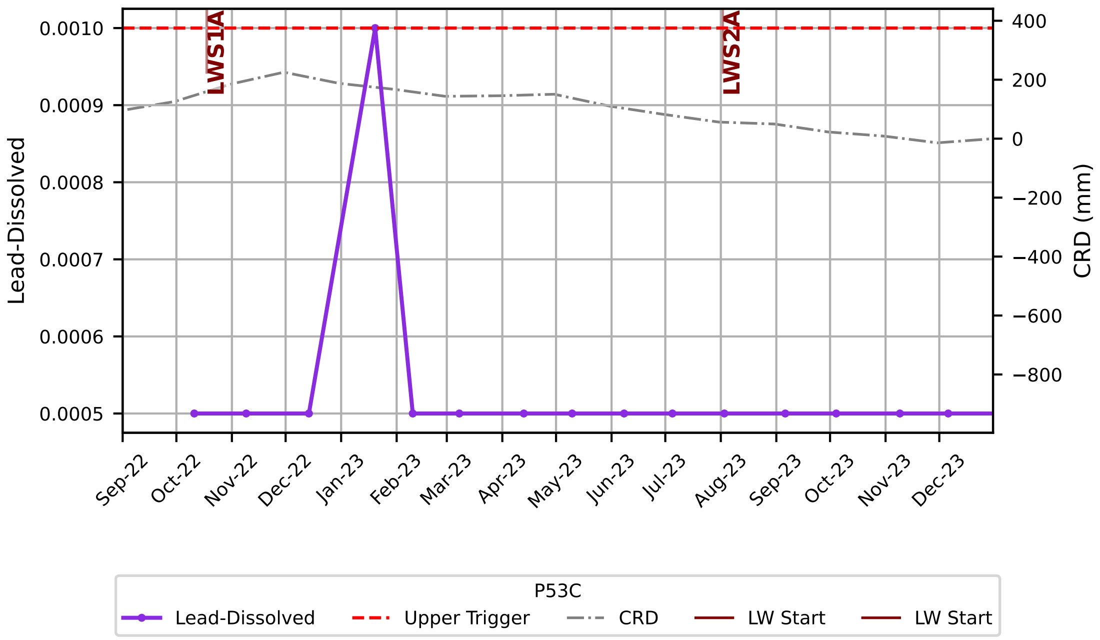
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



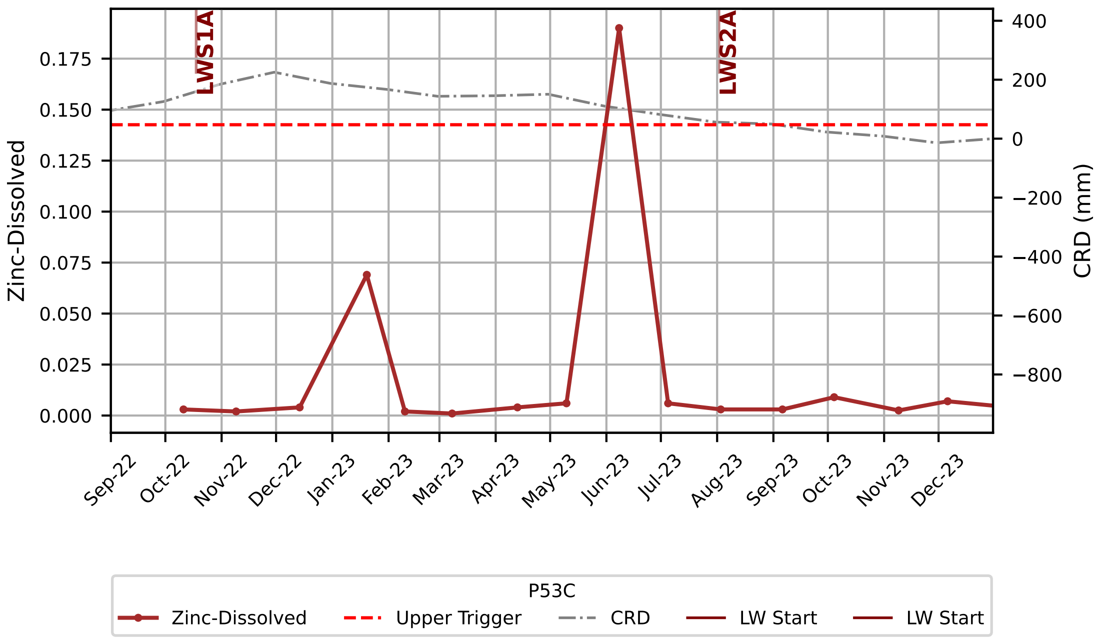
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
3.00
2.75
2.50
2.25
2.00
1.75
1.50
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

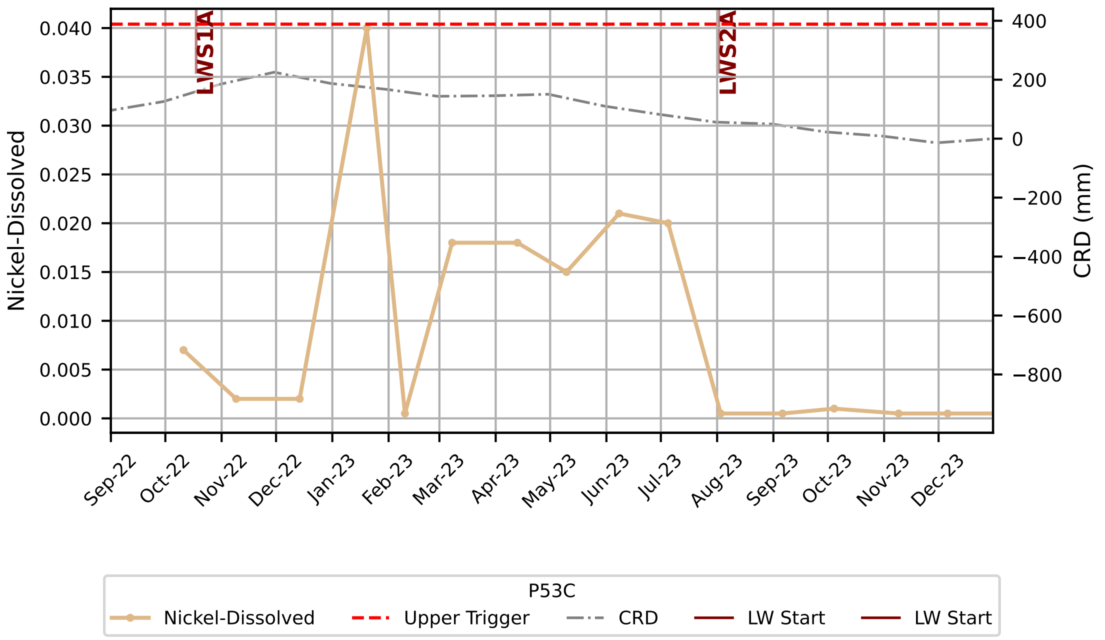


LWS1A
LWS2A
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

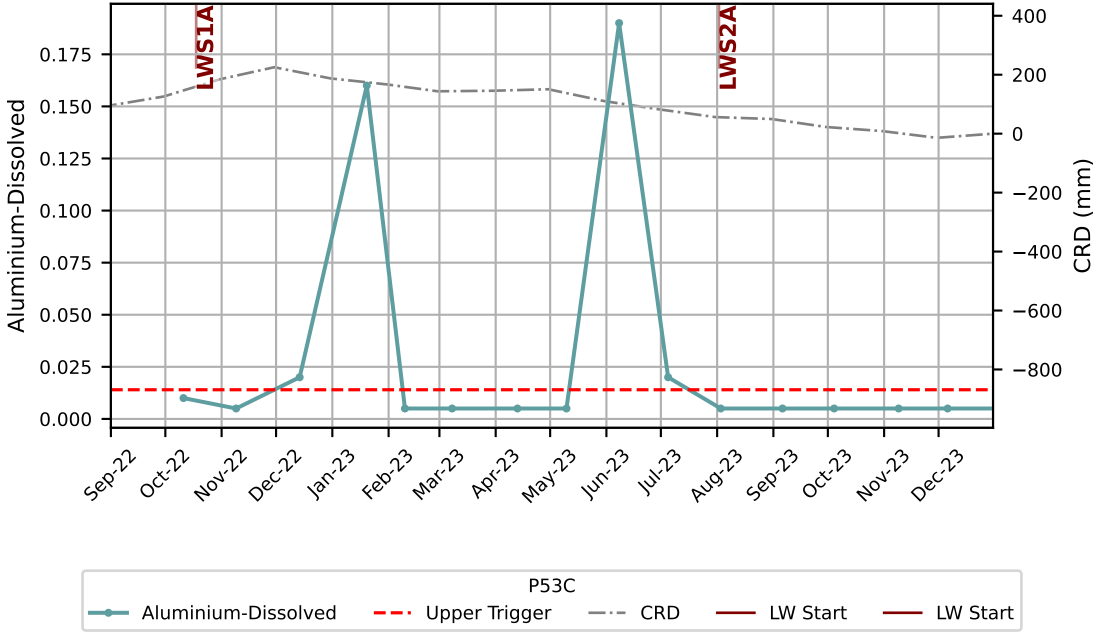


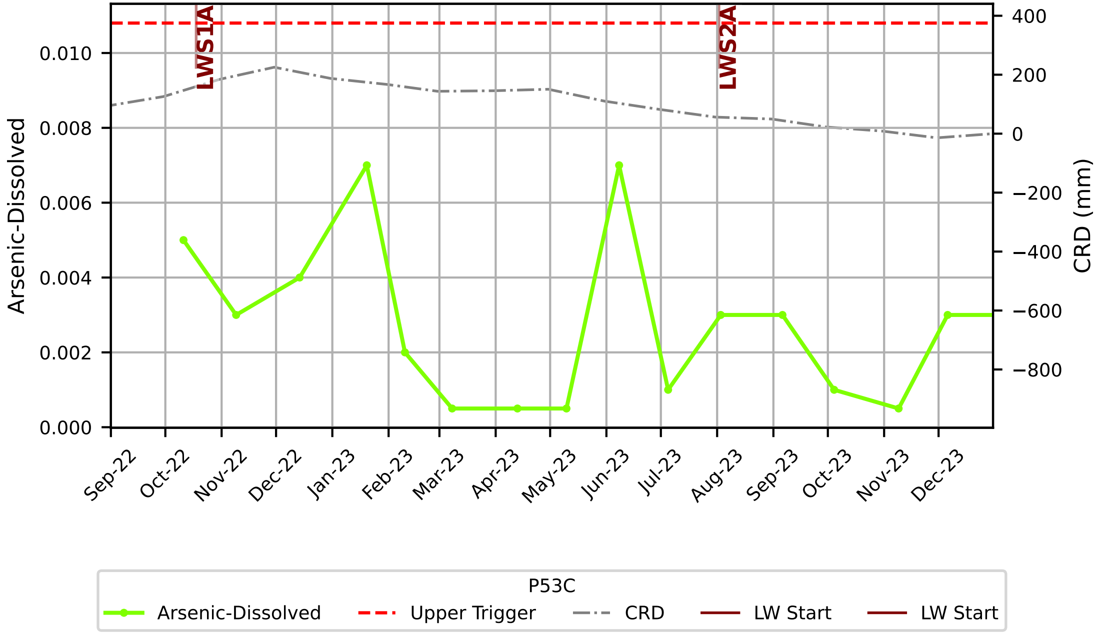
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

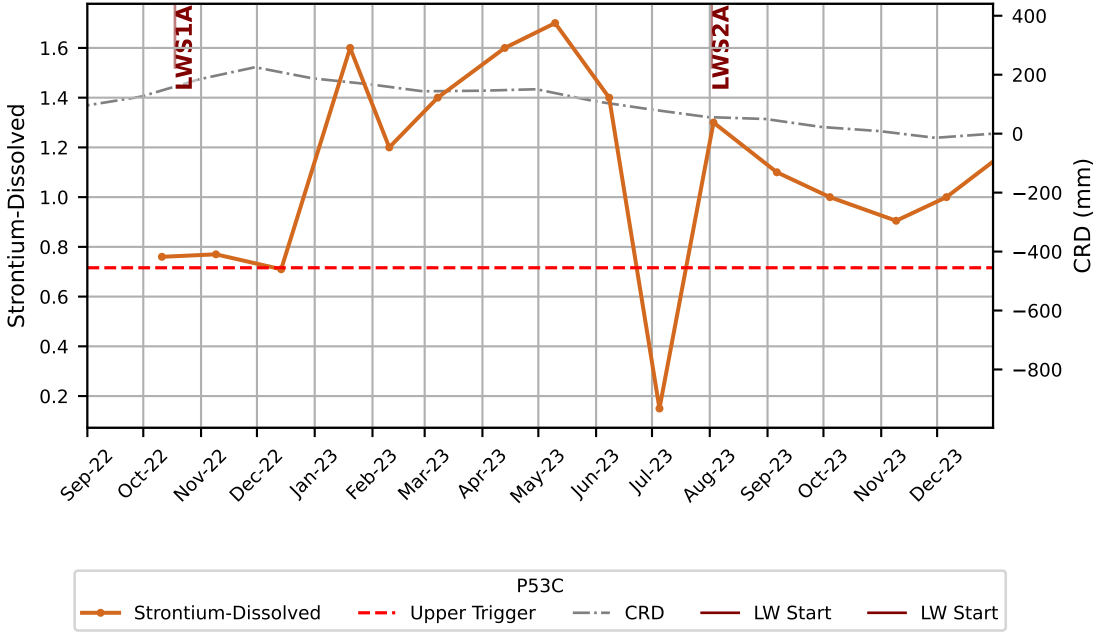


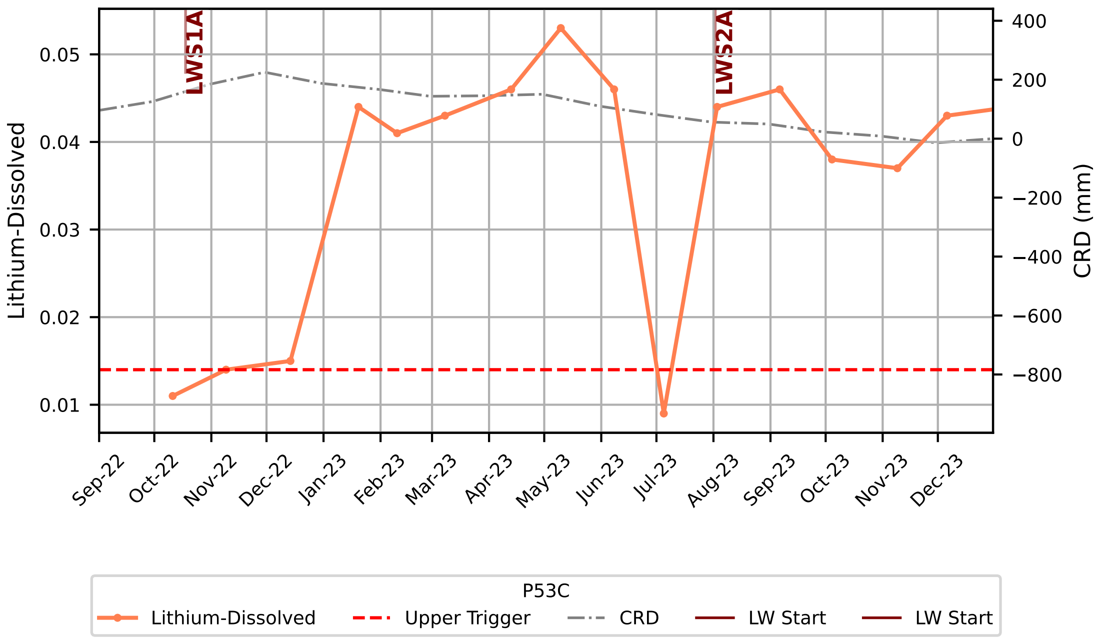
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start


LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

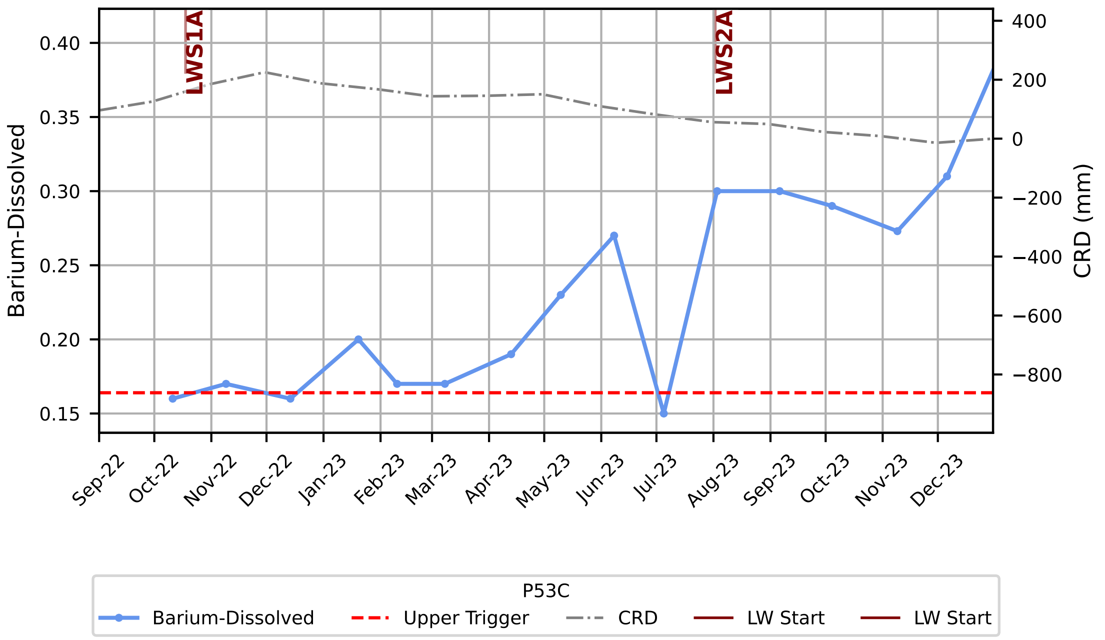


Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
0.000
0.002
0.004
0.006
0.008
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

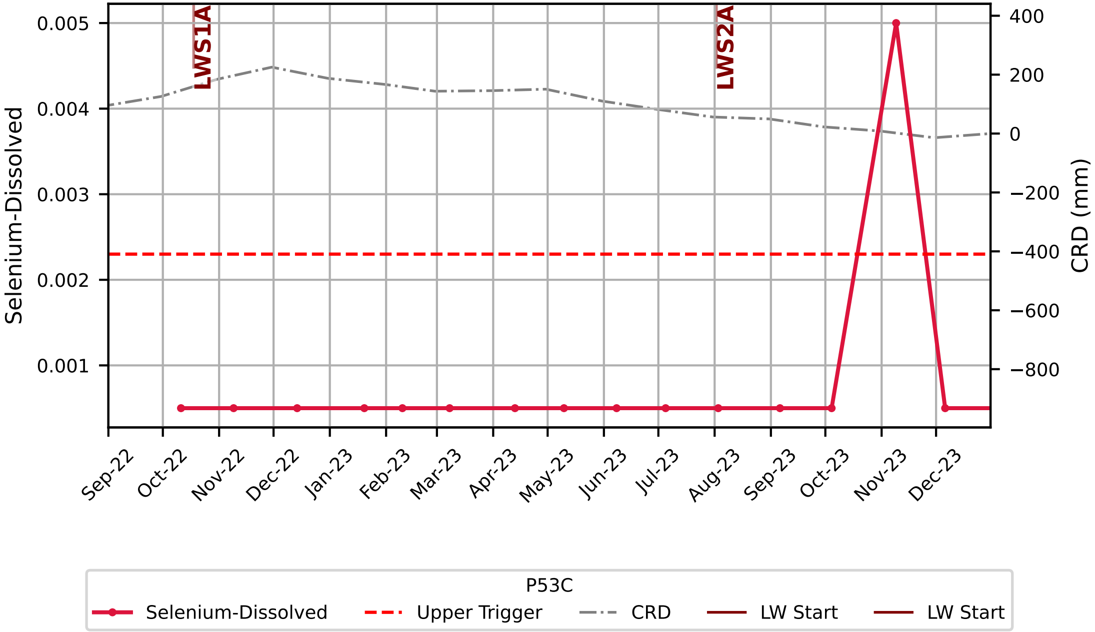

LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



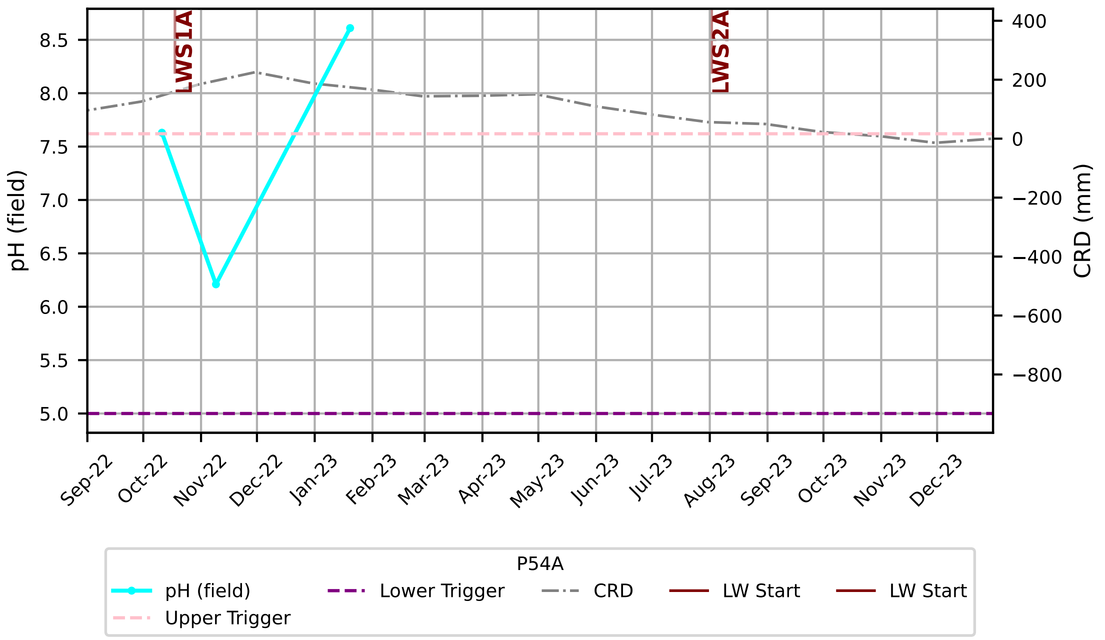
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



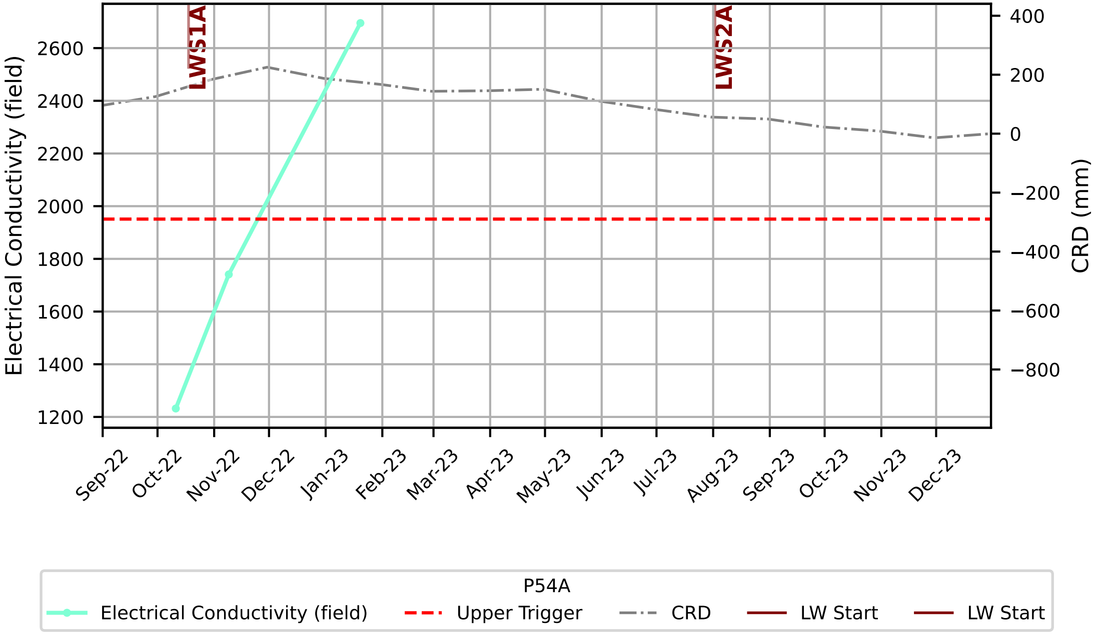
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



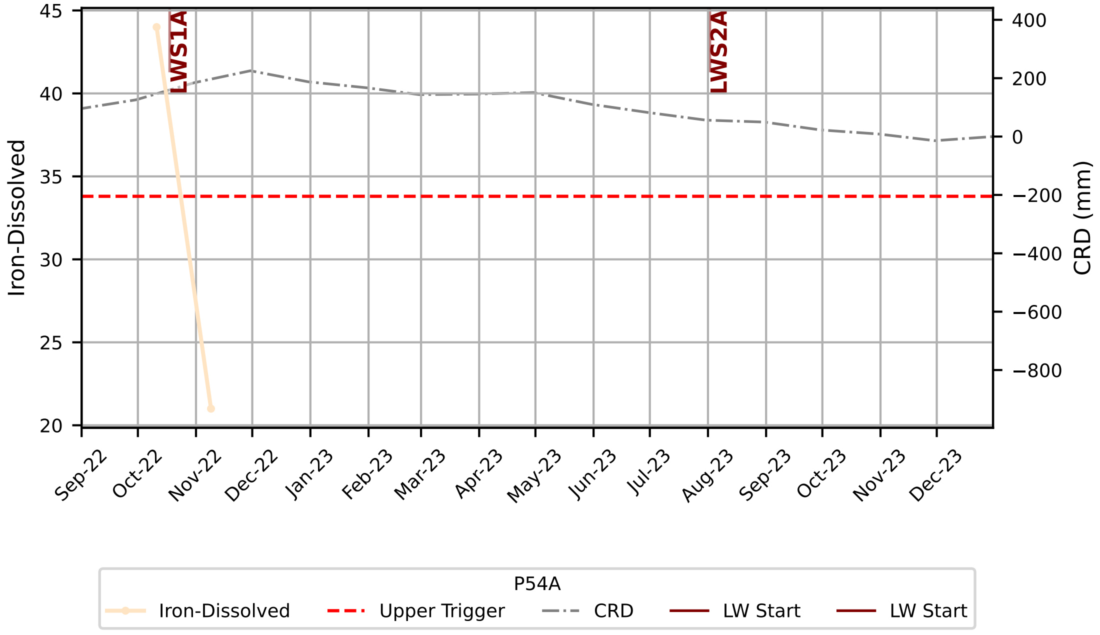
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



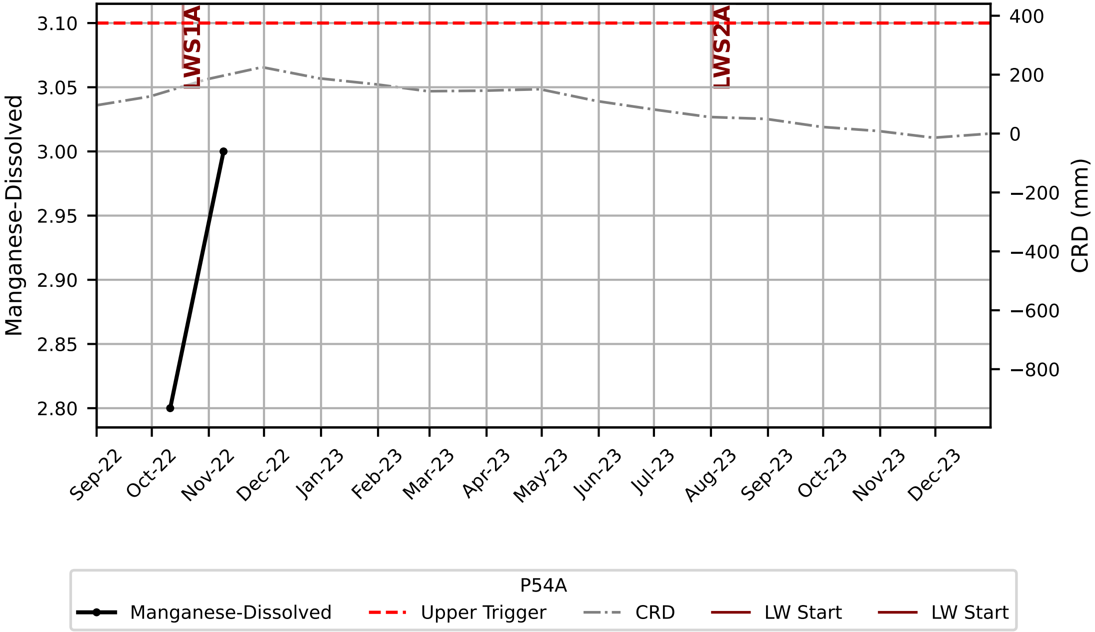
LWS1A
LWS2A
pH (field)
CRD (mm)
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



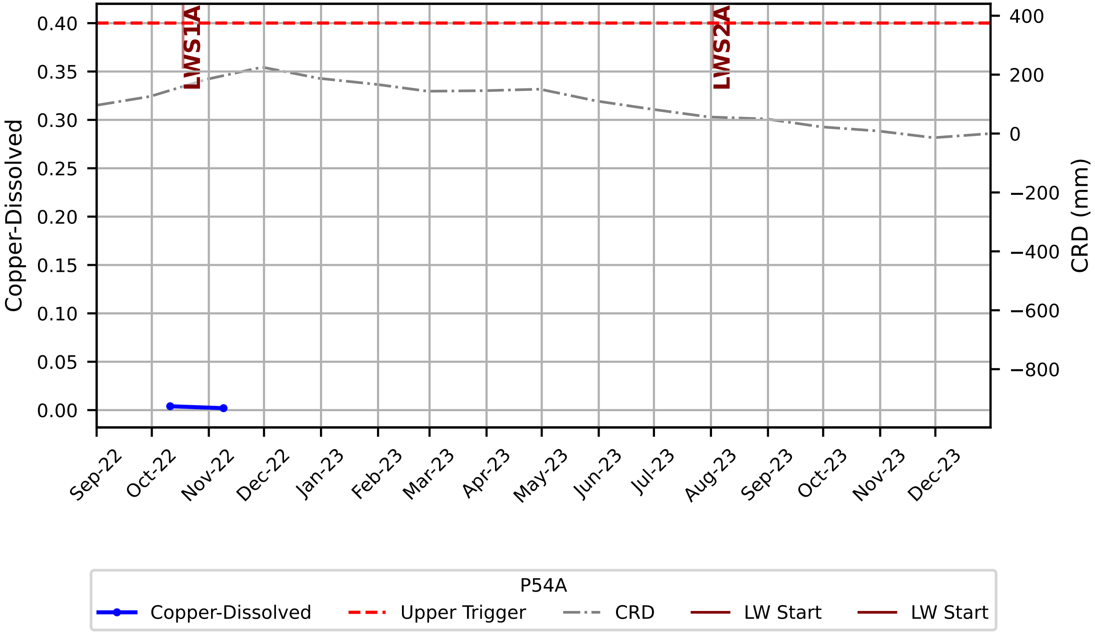
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
2600
2400
2200
2000
1800
1600
1400
1200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



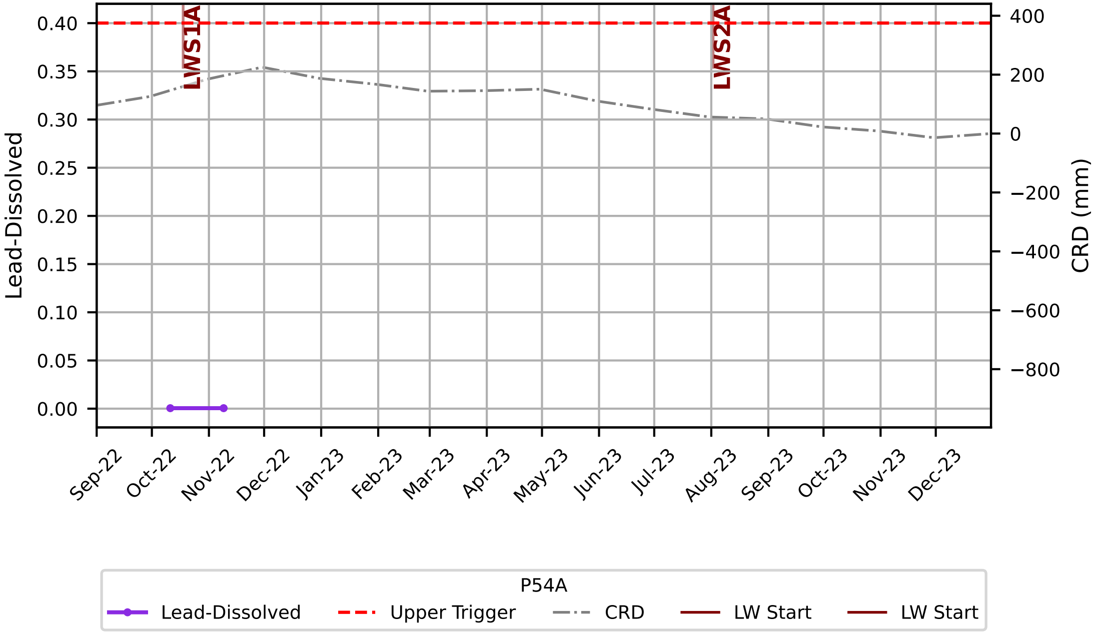
45
40
35
30
25
20
Iron-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



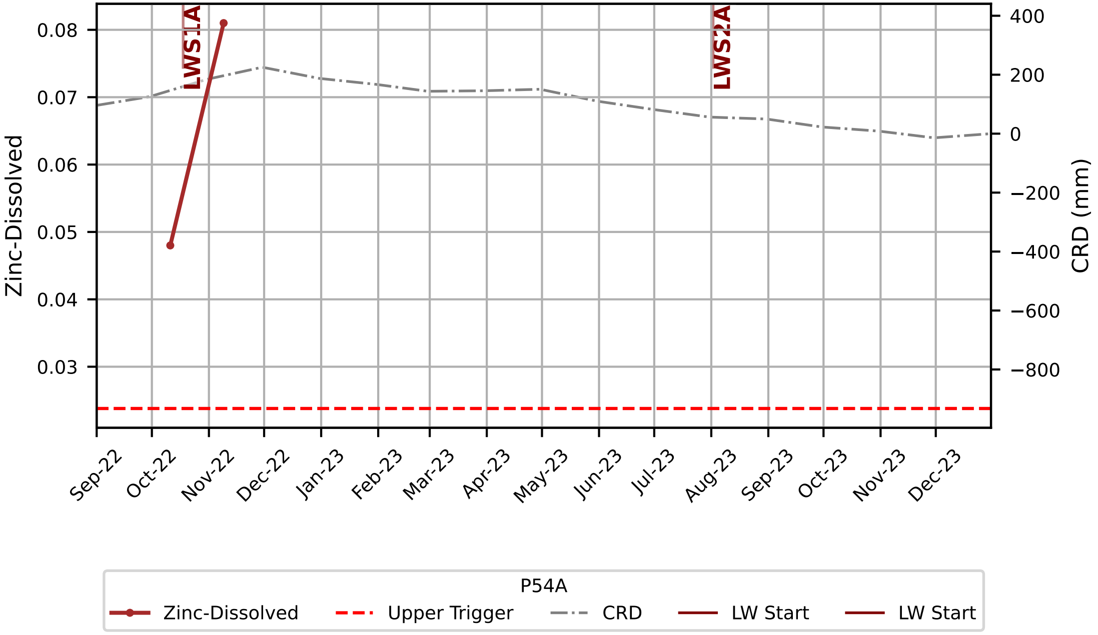
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
3.10
3.05
3.00
2.95
2.90
2.85
2.80
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



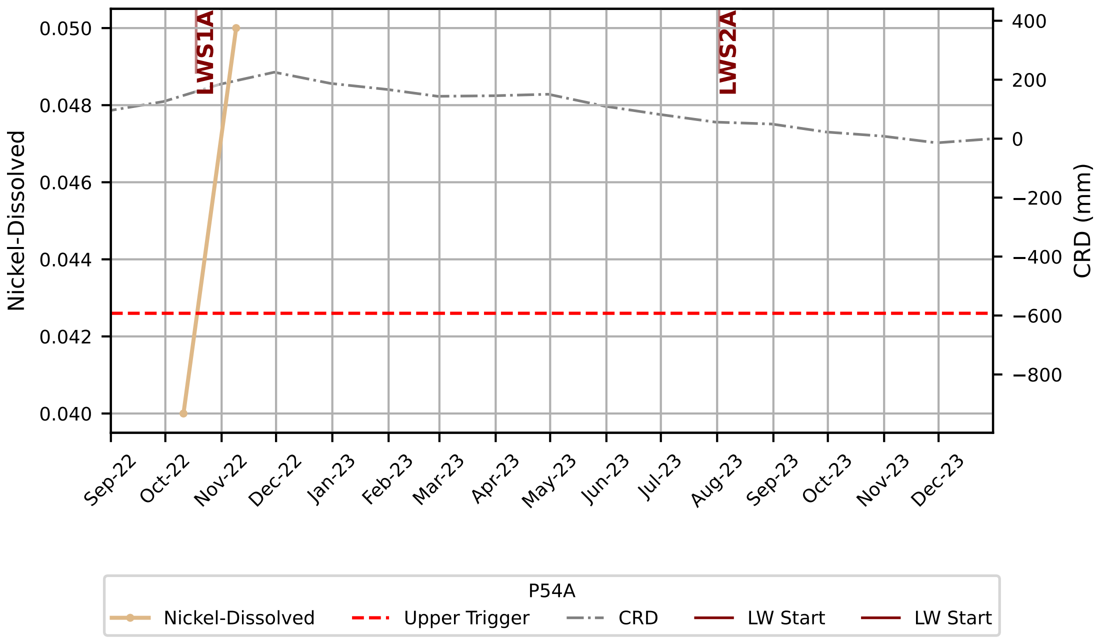
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



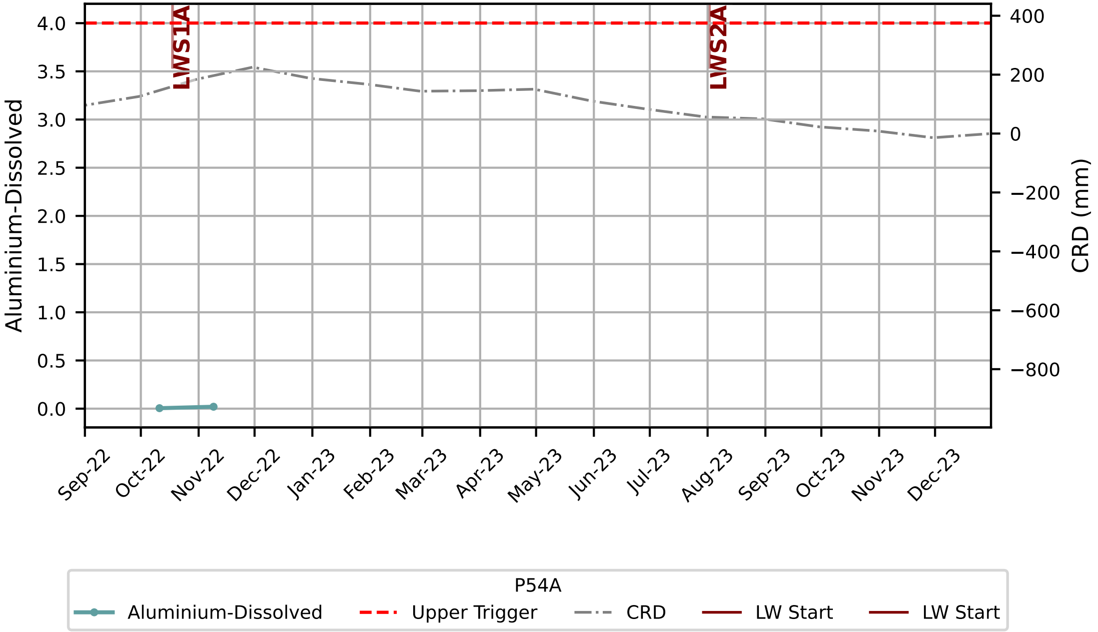
Lead-Dissolved
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



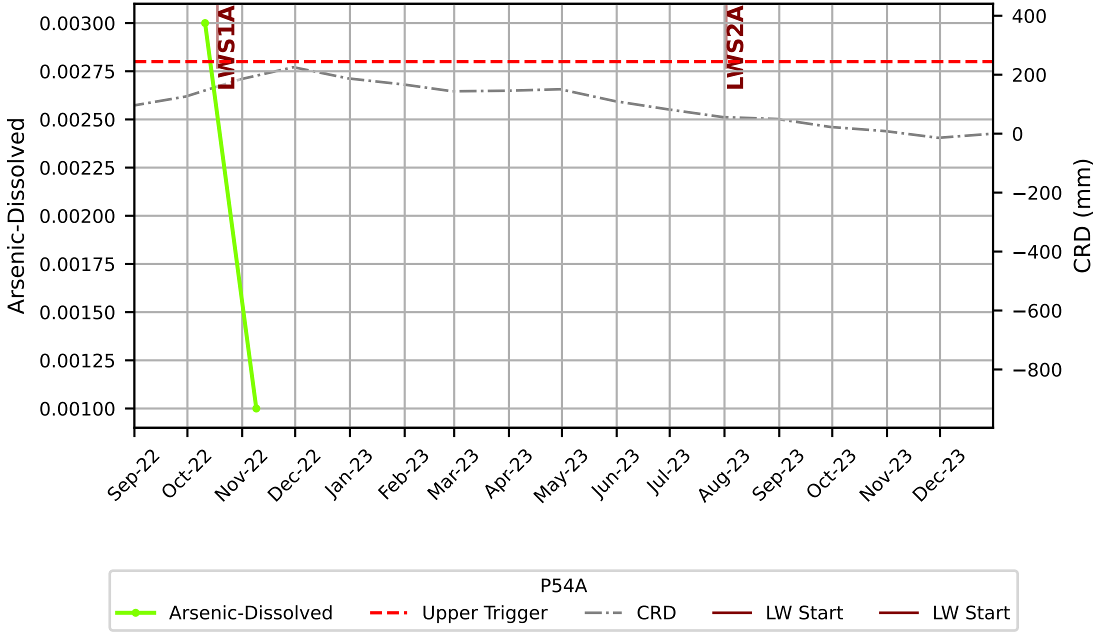
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.08
0.07
0.06
0.05
0.04
0.03
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



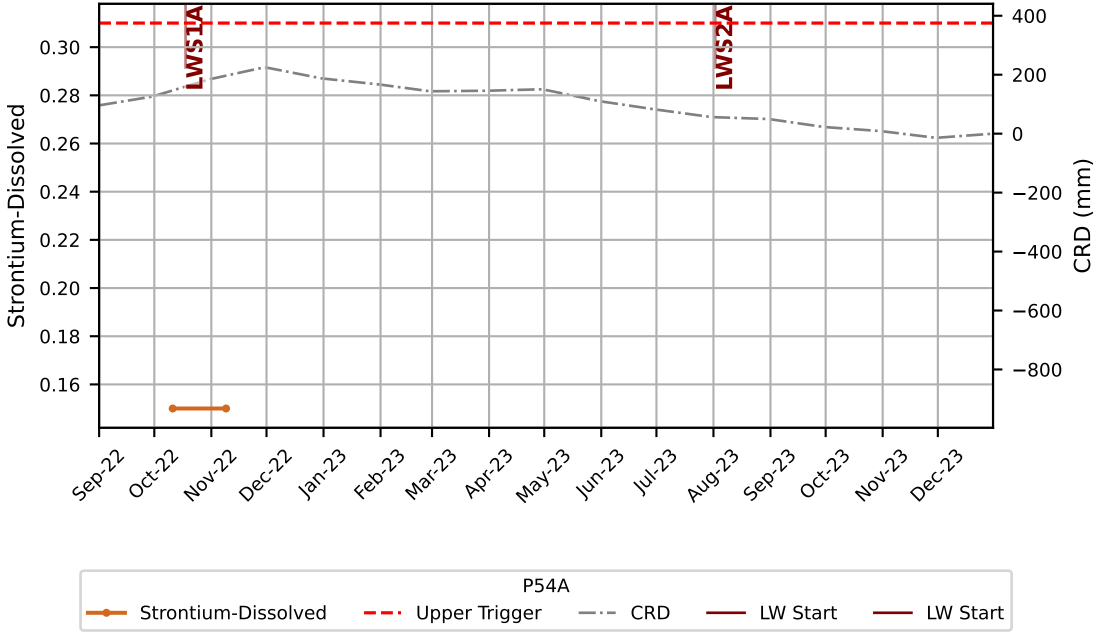
Nickel-Dissolved
0.050
0.048
0.046
0.044
0.042
0.040
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



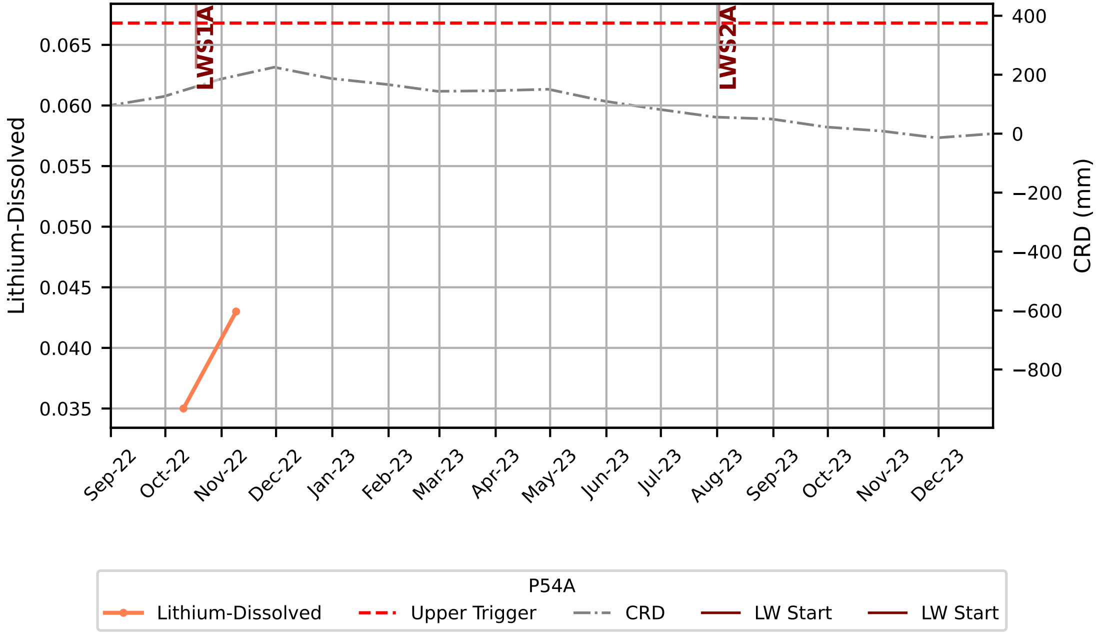
Aluminium-Dissolved
CRD (mm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



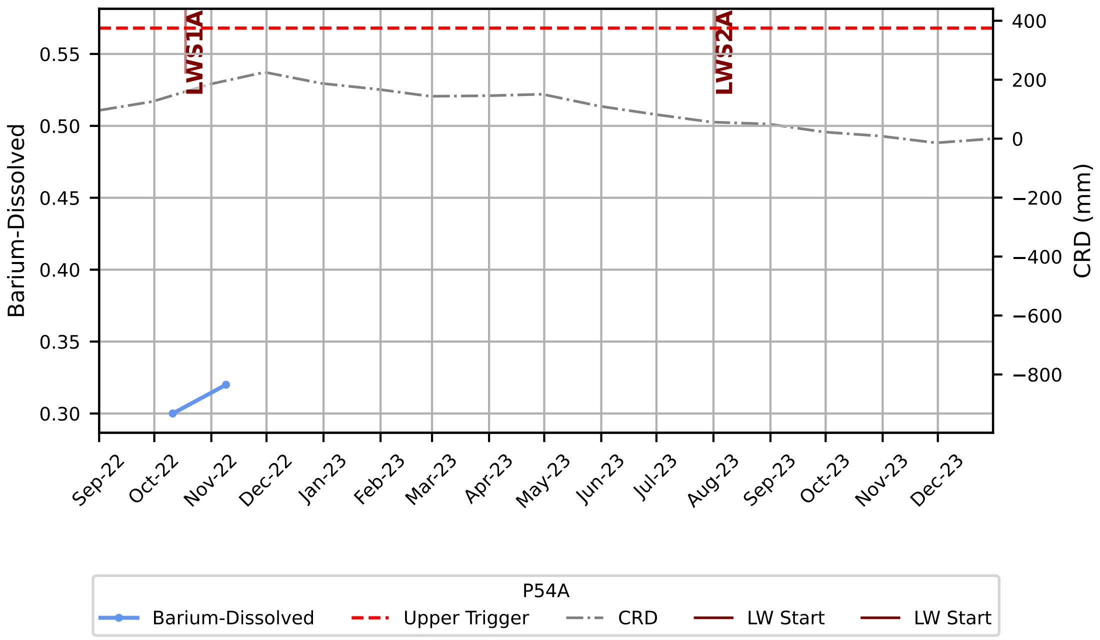
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.00300
0.00275
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



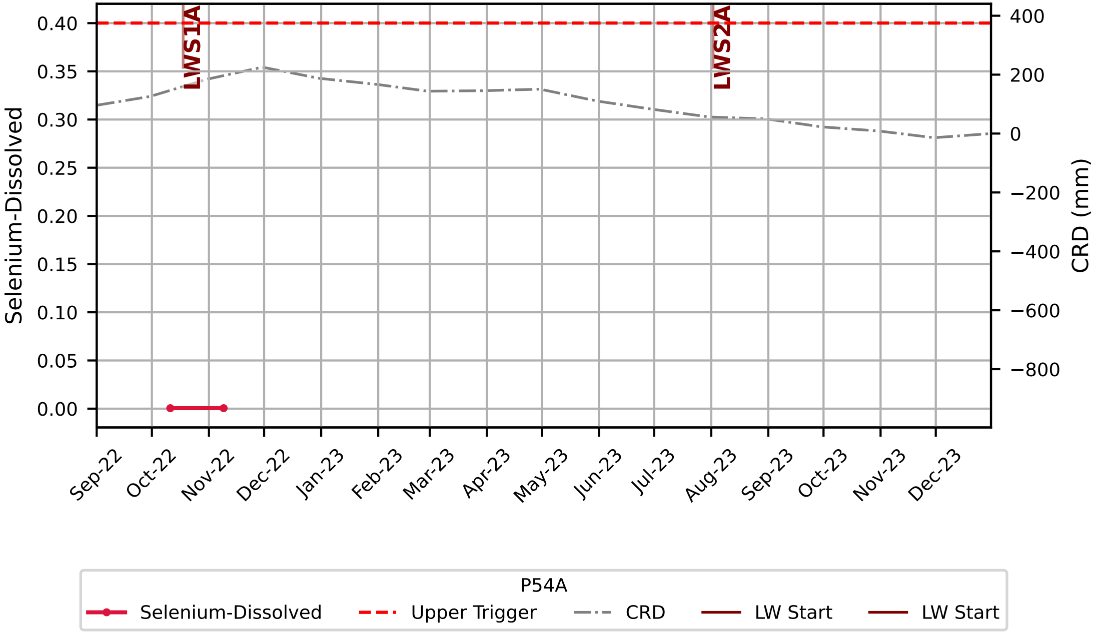
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



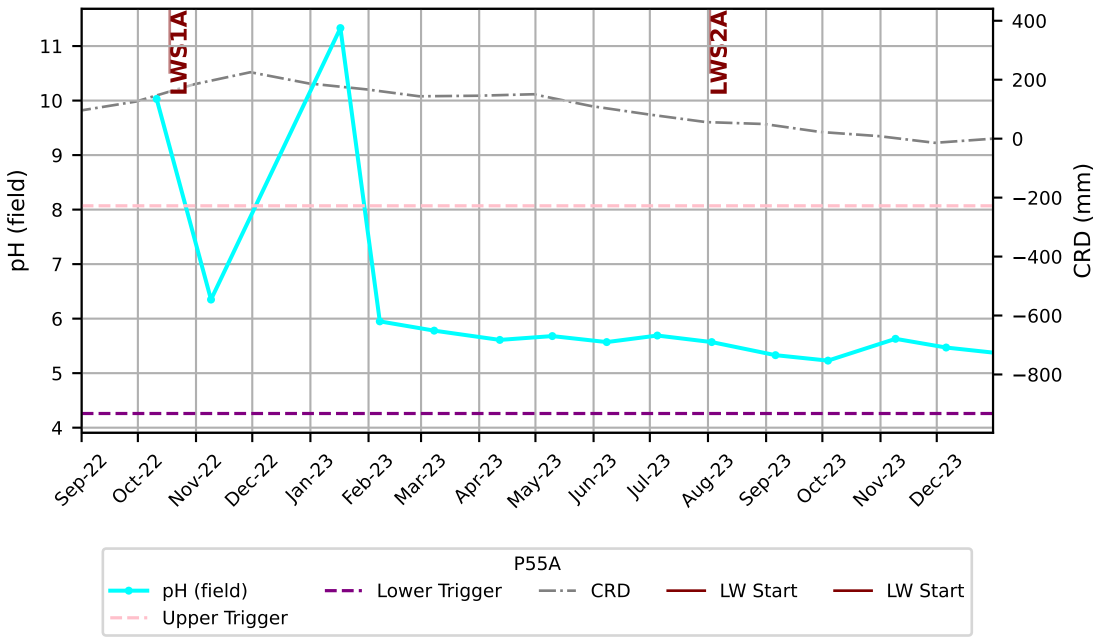
LWS1A
LWS2A
Lithium-Dissolved
0.065
0.060
0.055
0.050
0.045
0.040
0.035
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



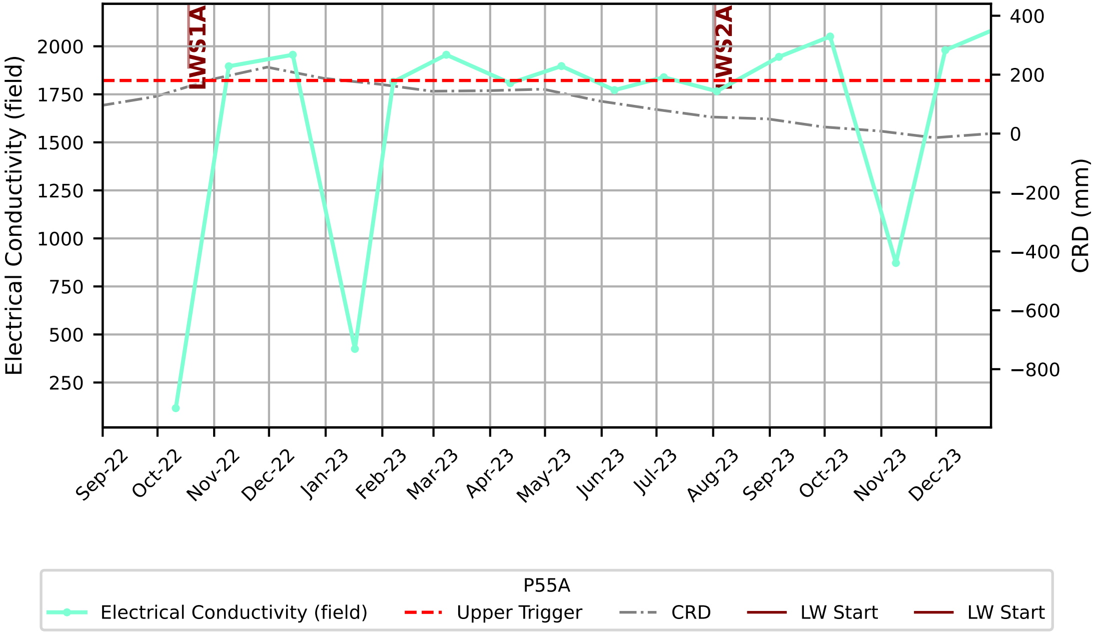
LWS1A
LWS2A
Barium-Dissolved
0.30
0.35
0.40
0.45
0.50
0.55
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



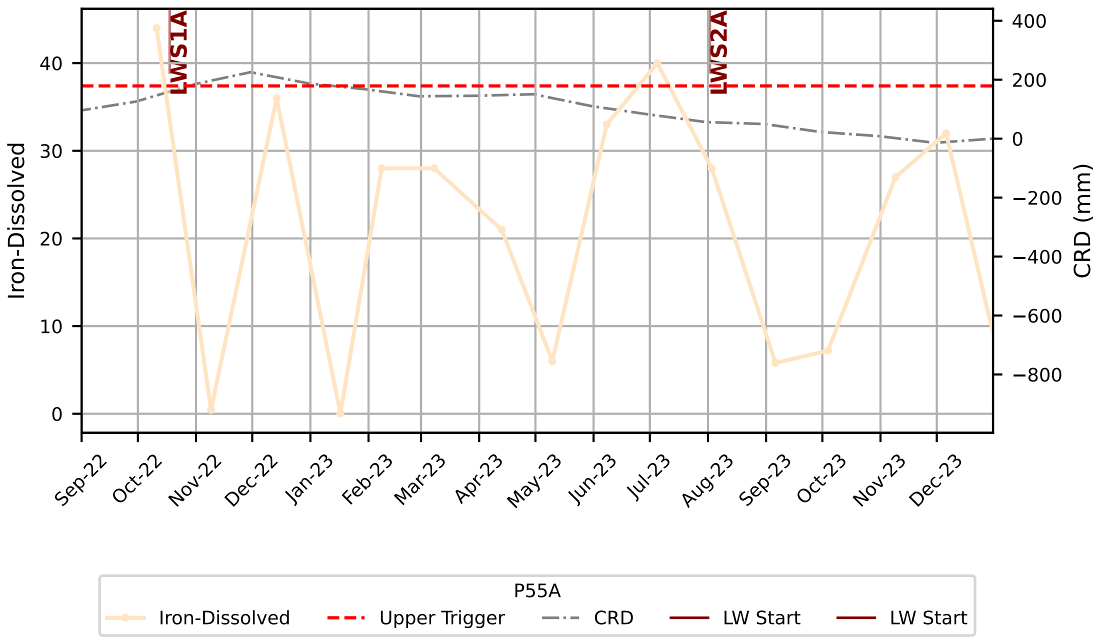
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

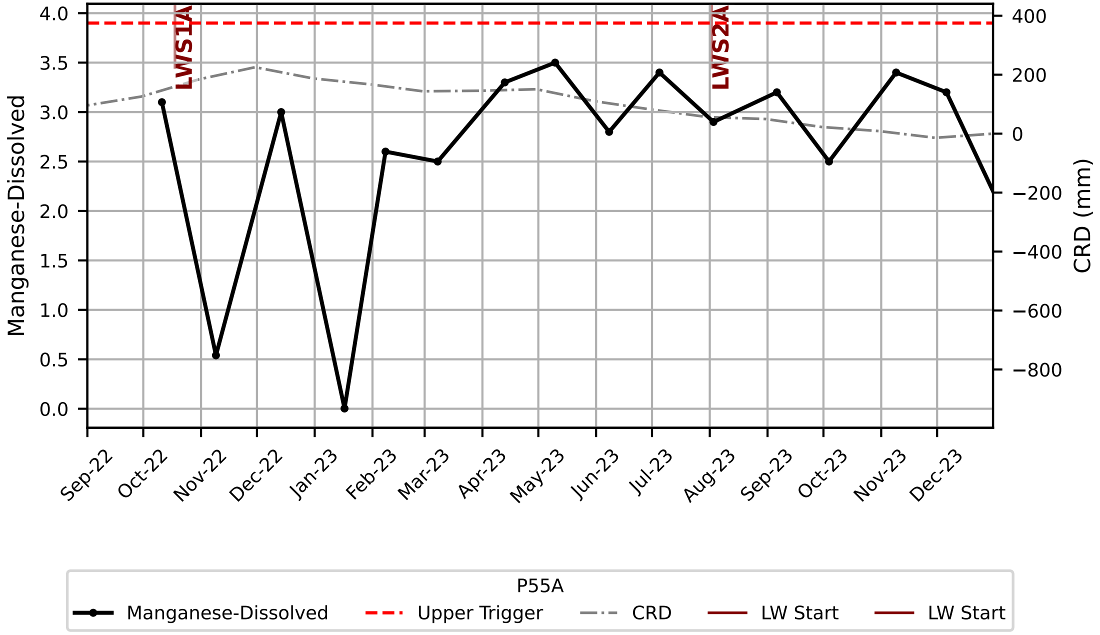


LWS1A
LWS2A
pH (field)
CRD (mm)
11
10
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

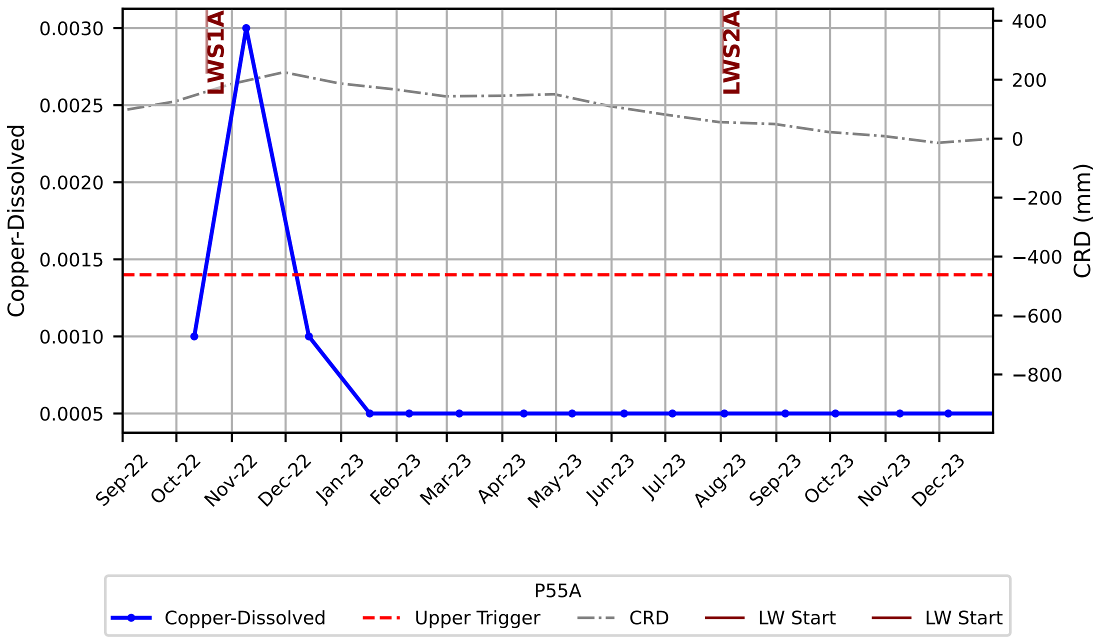


LWS1A
LWS2A
Electrical Conductivity (field)
2000
1750
1500
1250
1000
750
500
250
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start

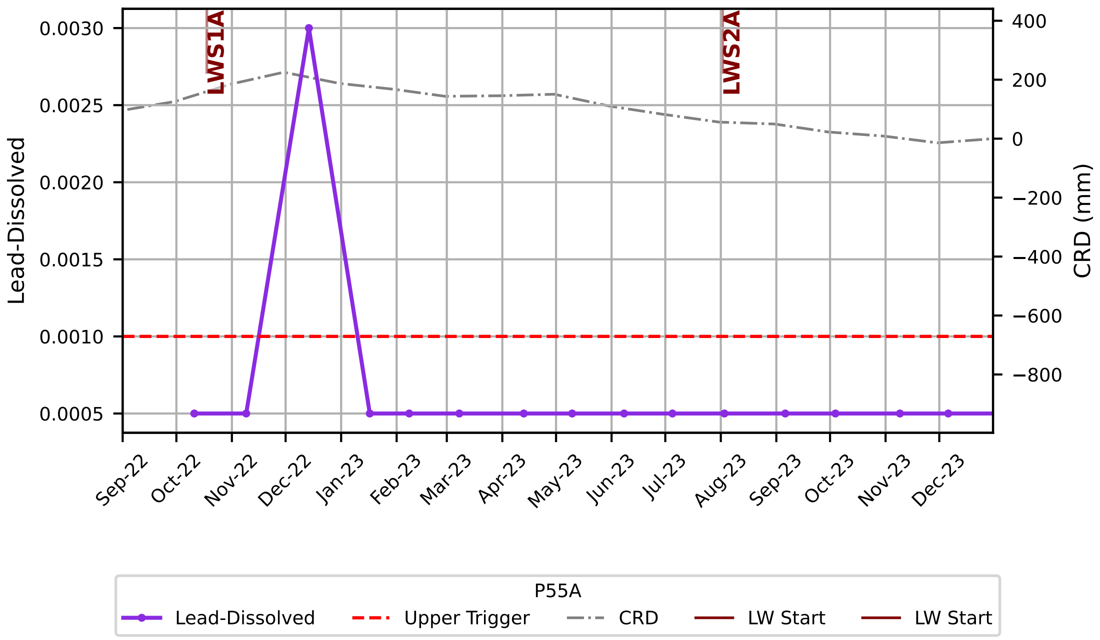

LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0
10
20
30
40
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



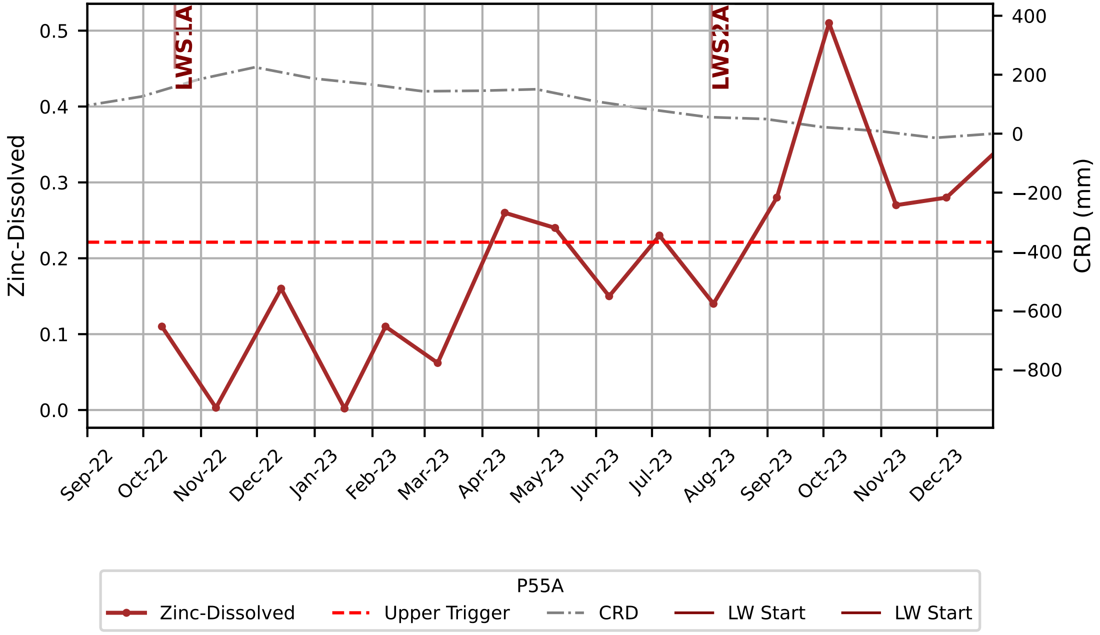
Manganese-Dissolved
CRD (mm)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



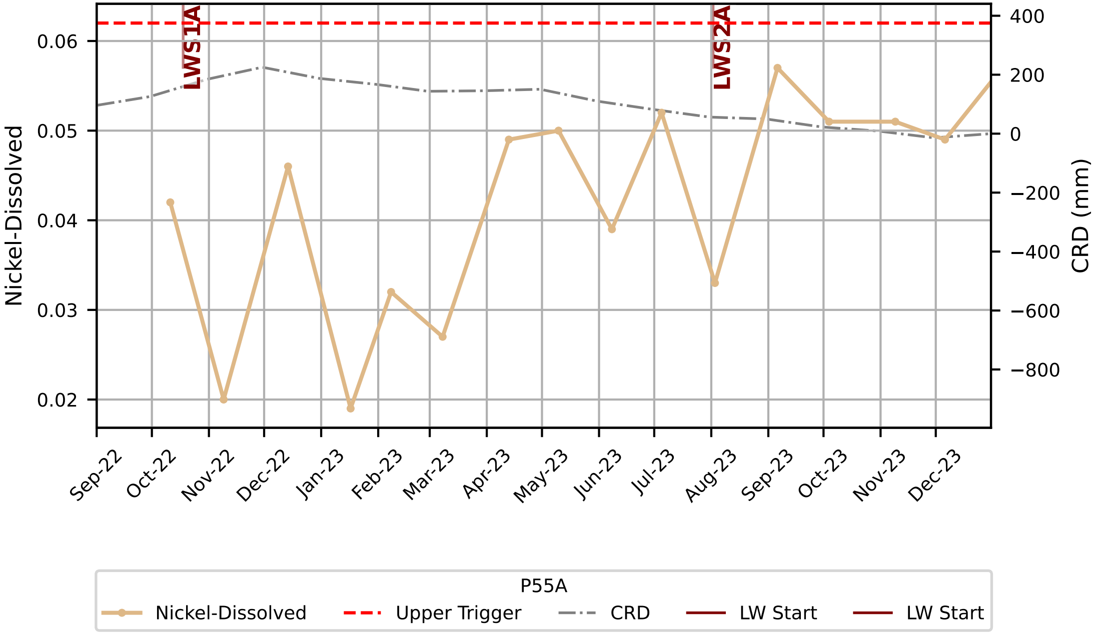
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



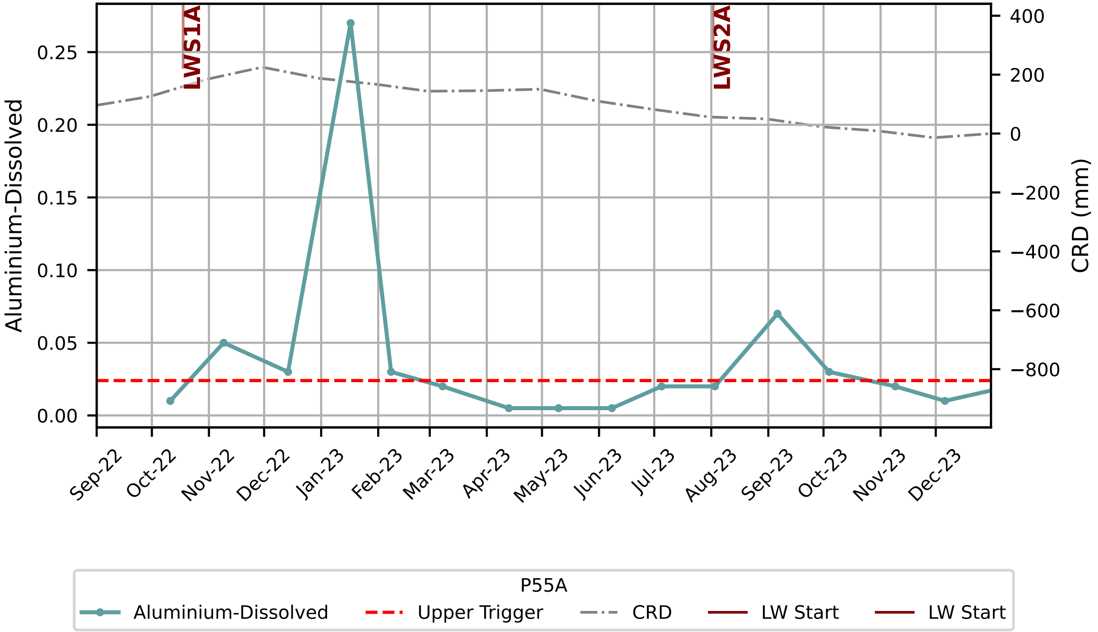
LWS1A
LWS2A
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



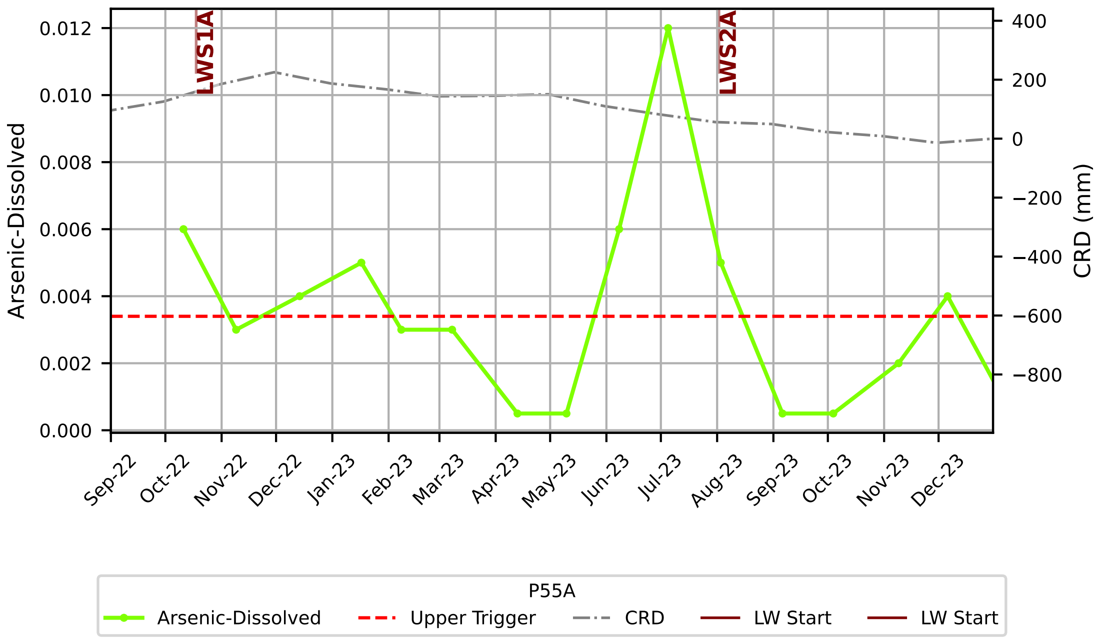
LWS1A
LWS2A
0.5
0.4
0.3
0.2
0.1
0.0
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



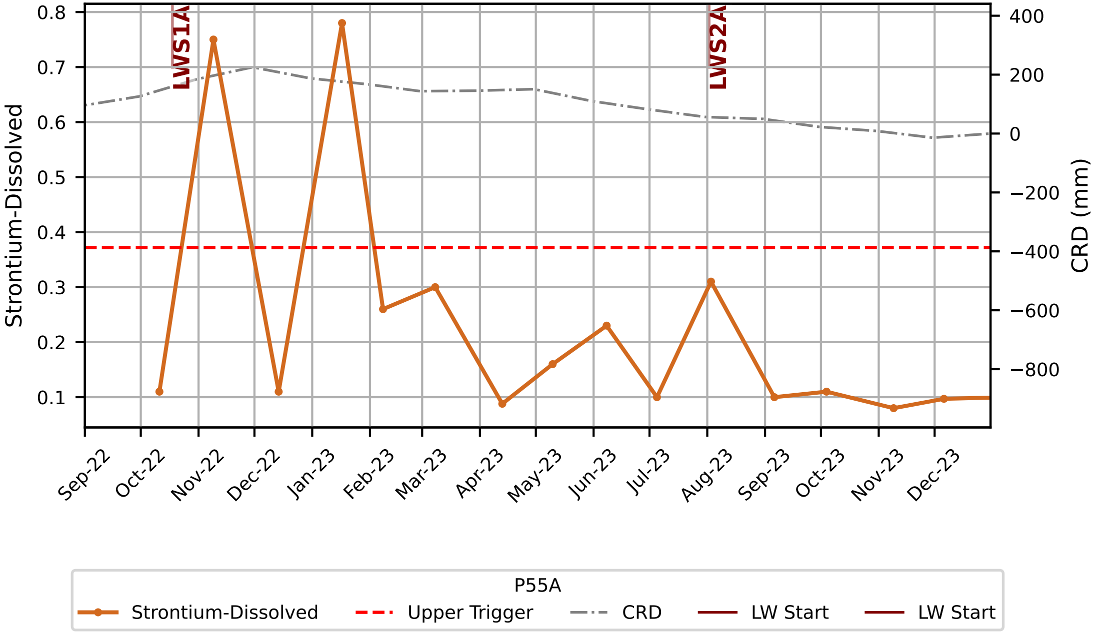
LWS1A
LWS2A
Nickel-Dissolved
0.06
0.05
0.04
0.03
0.02
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



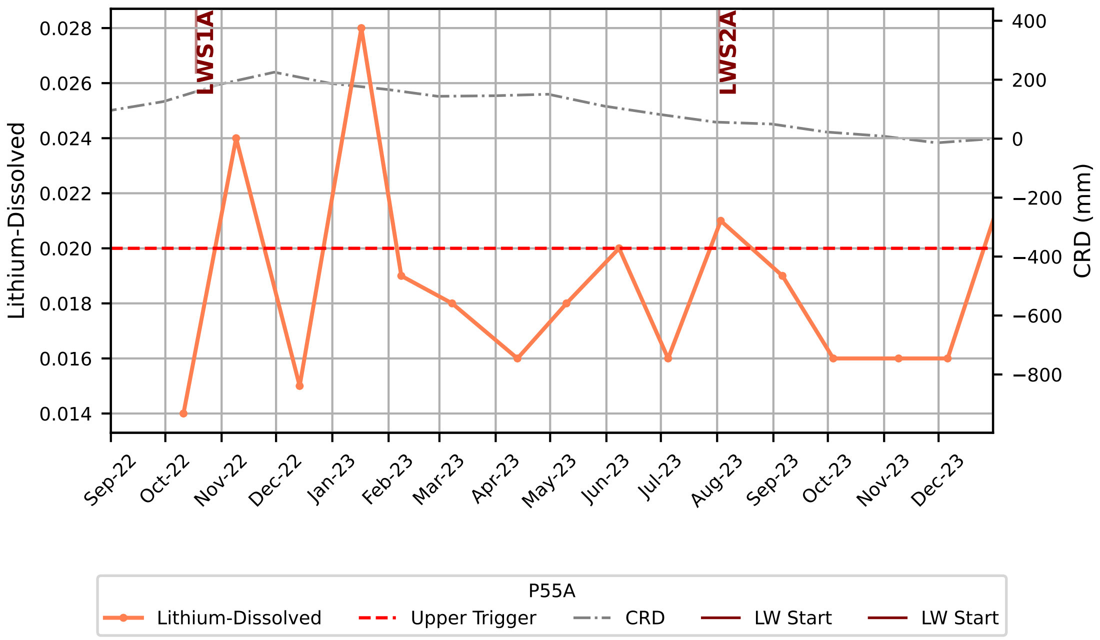
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



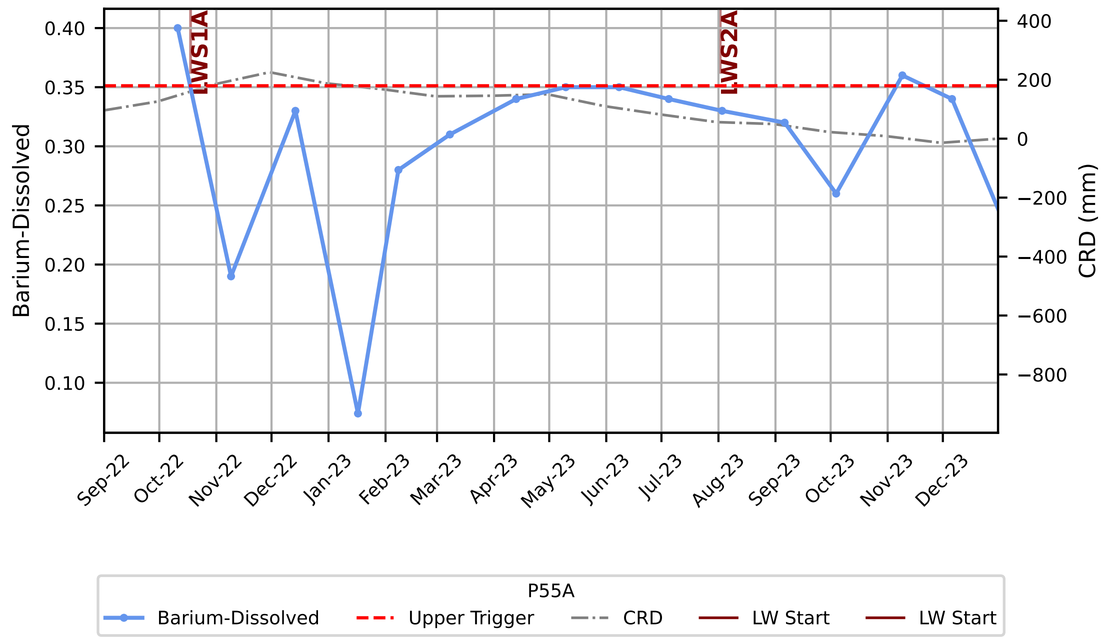
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



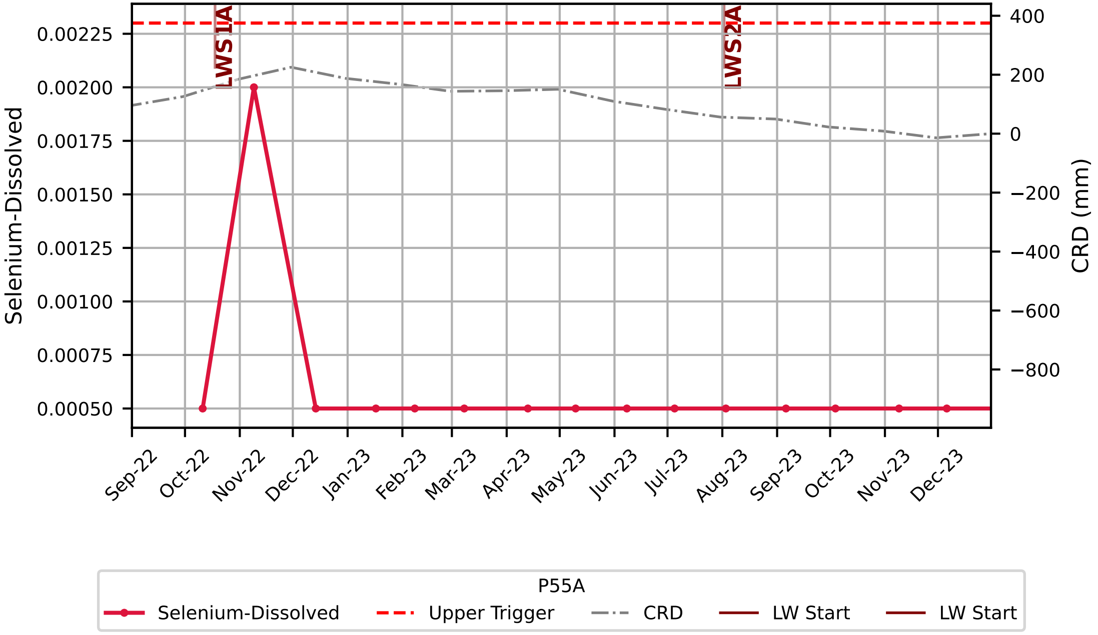
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



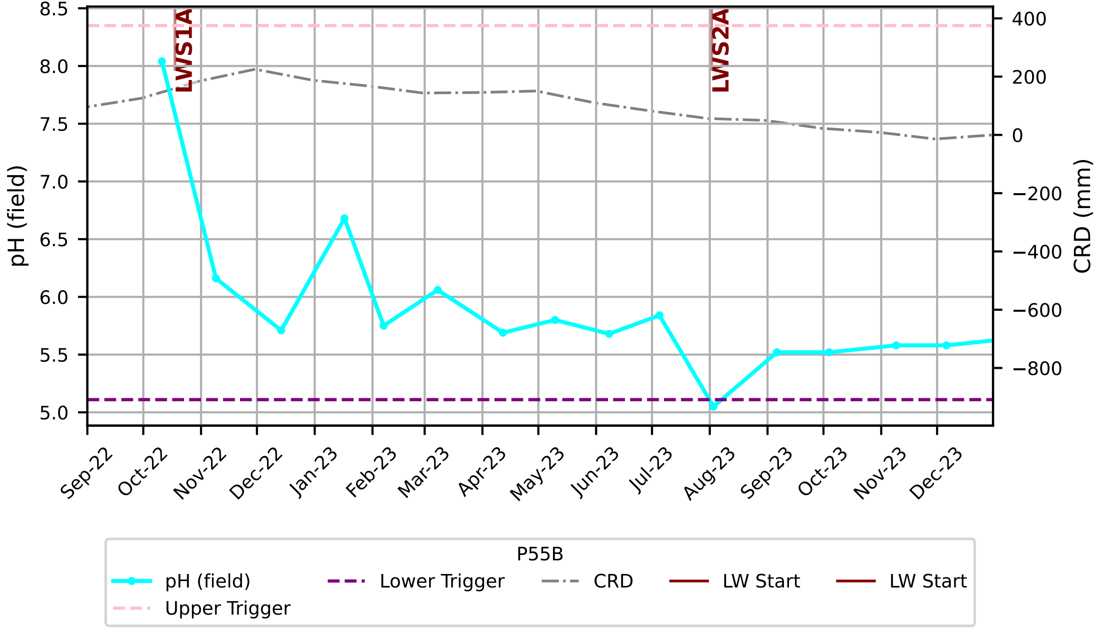
LWS1A
LWS2A
0.028
0.026
0.024
0.022
0.020
0.018
0.016
0.014
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



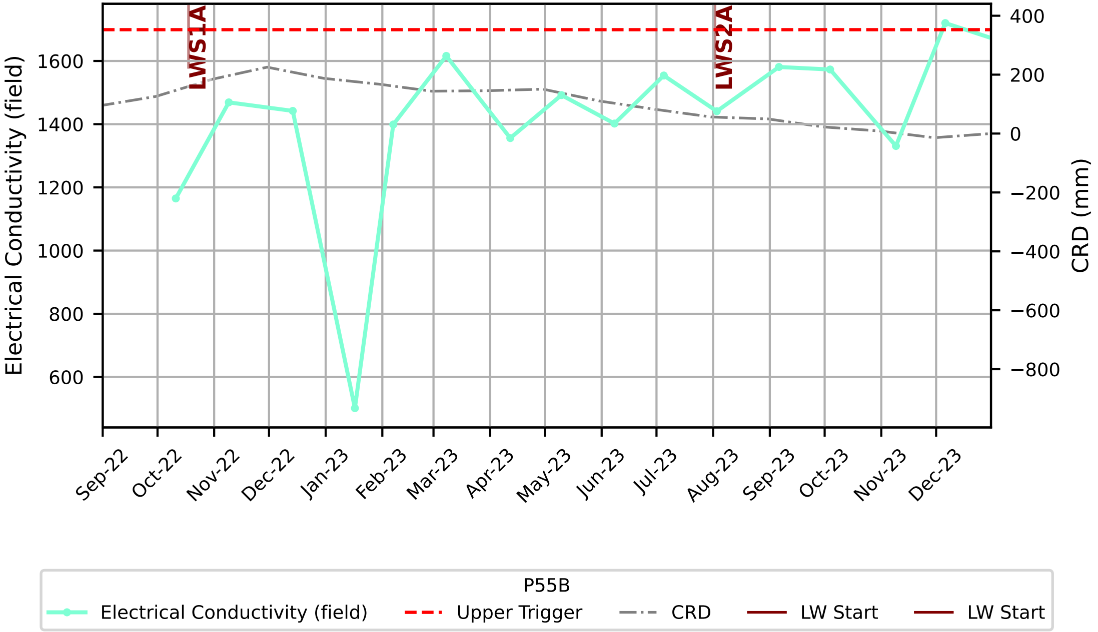
Barium-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



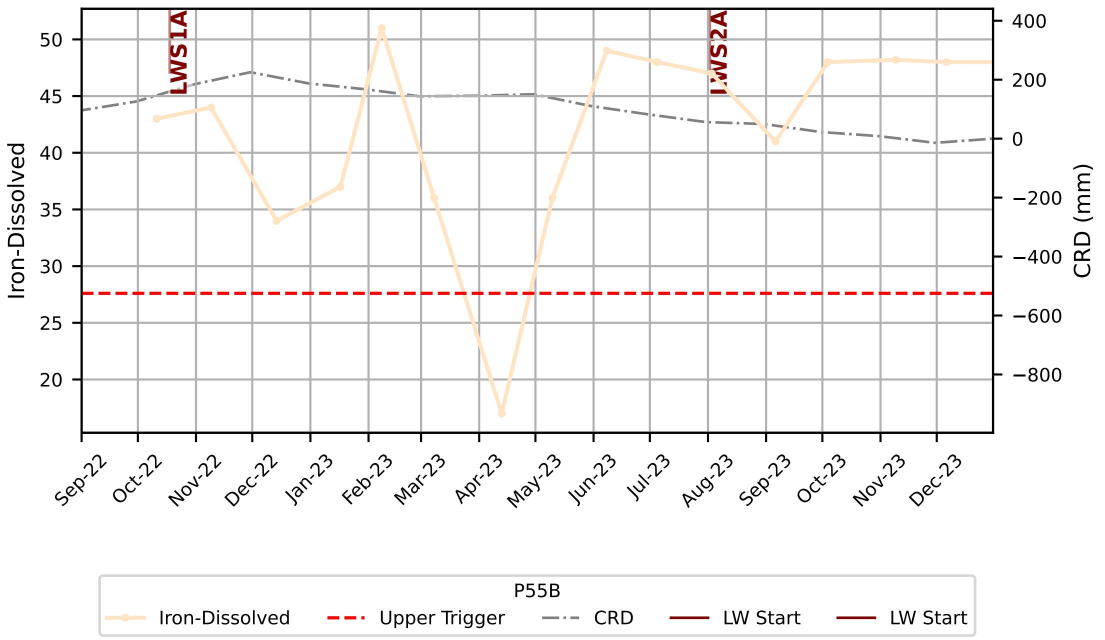
LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



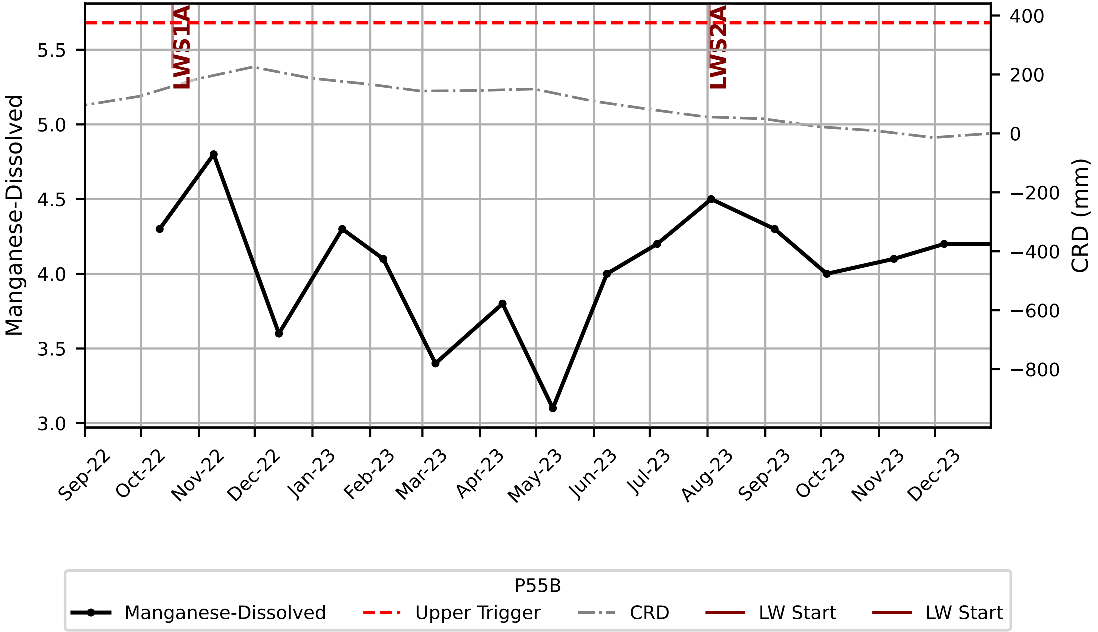
LWS1A
LWS2A
pH (field)
CRD (mm)
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



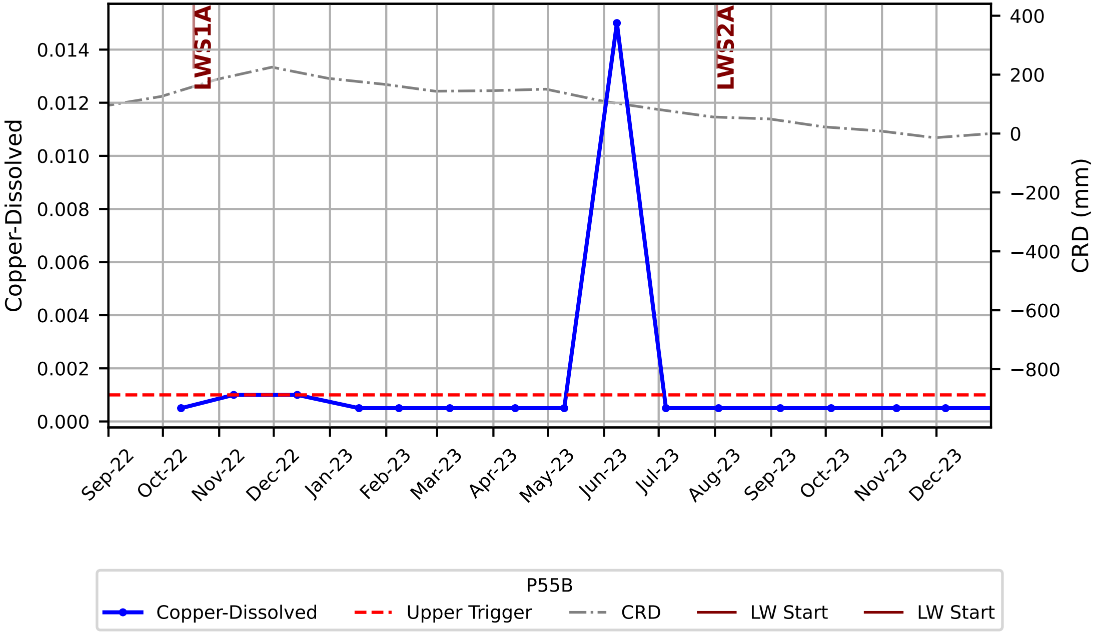
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



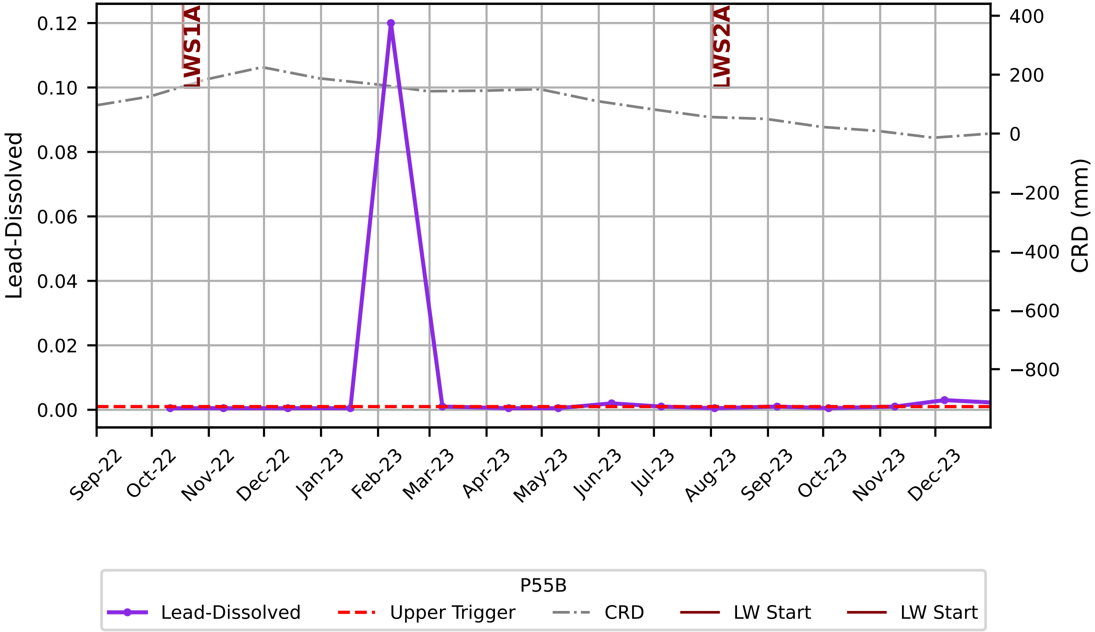
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
50
45
40
35
30
25
20
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



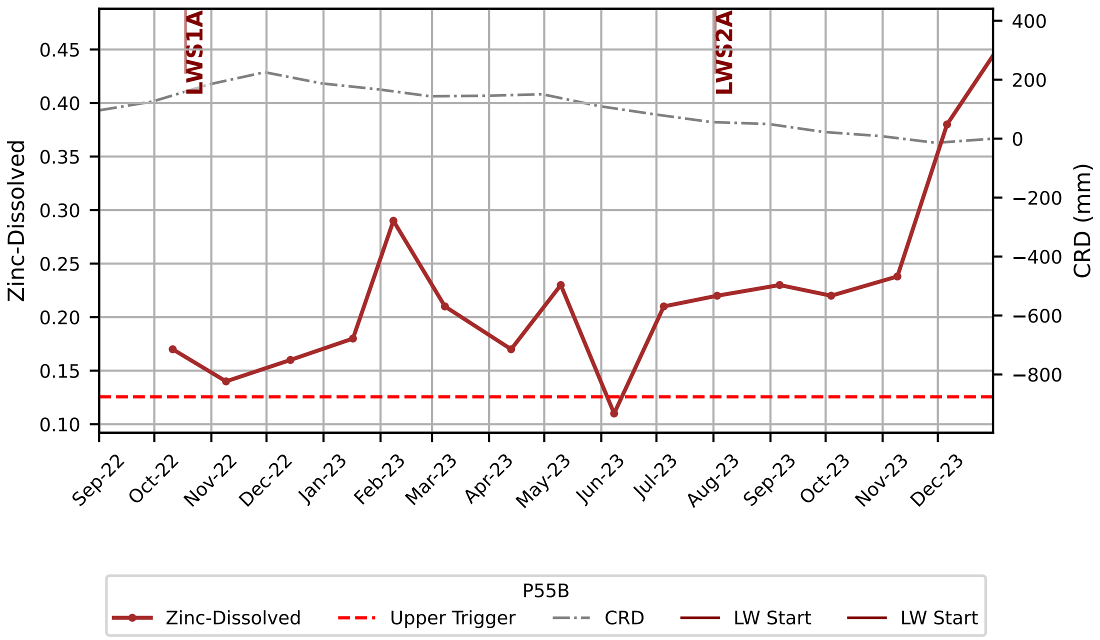
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
3.0
3.5
4.0
4.5
5.0
5.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



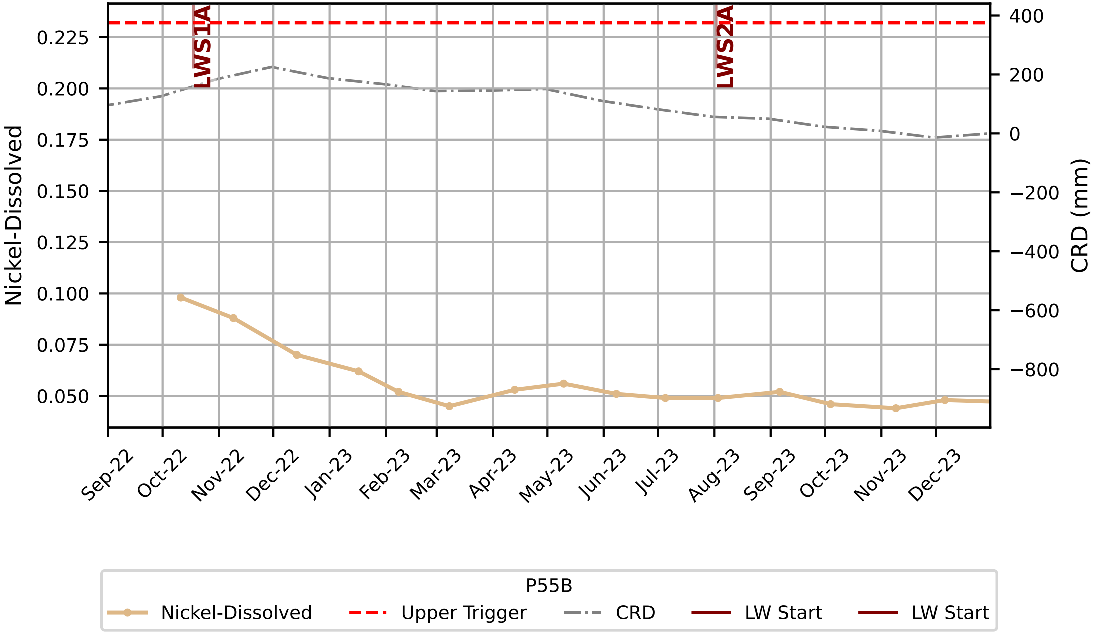
LWS1A
LWS2A
Copper-Dissolved
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

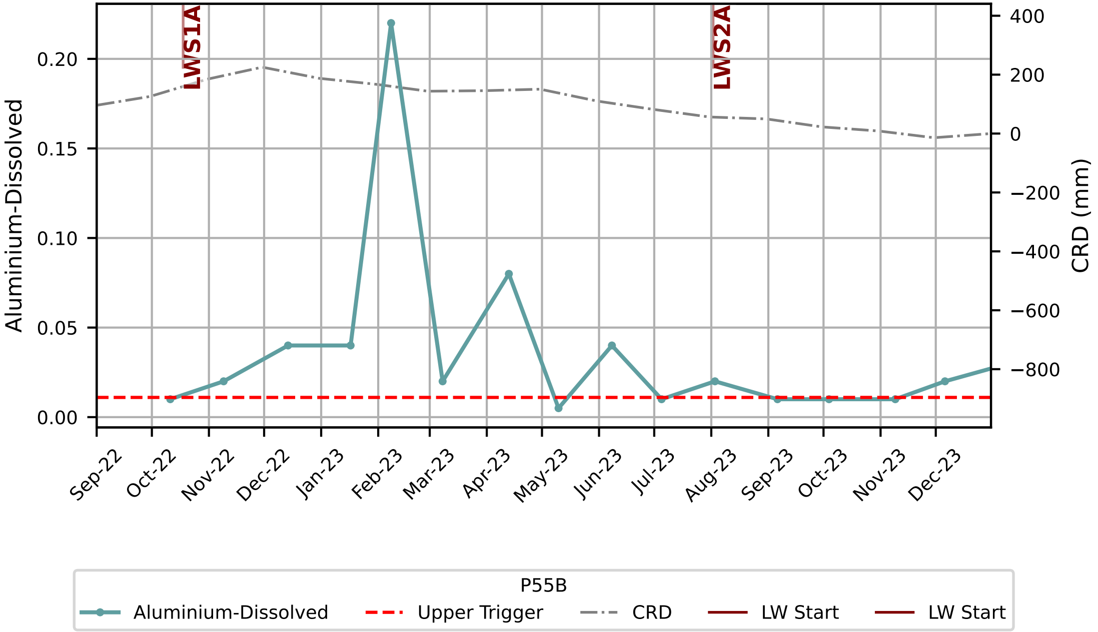


LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

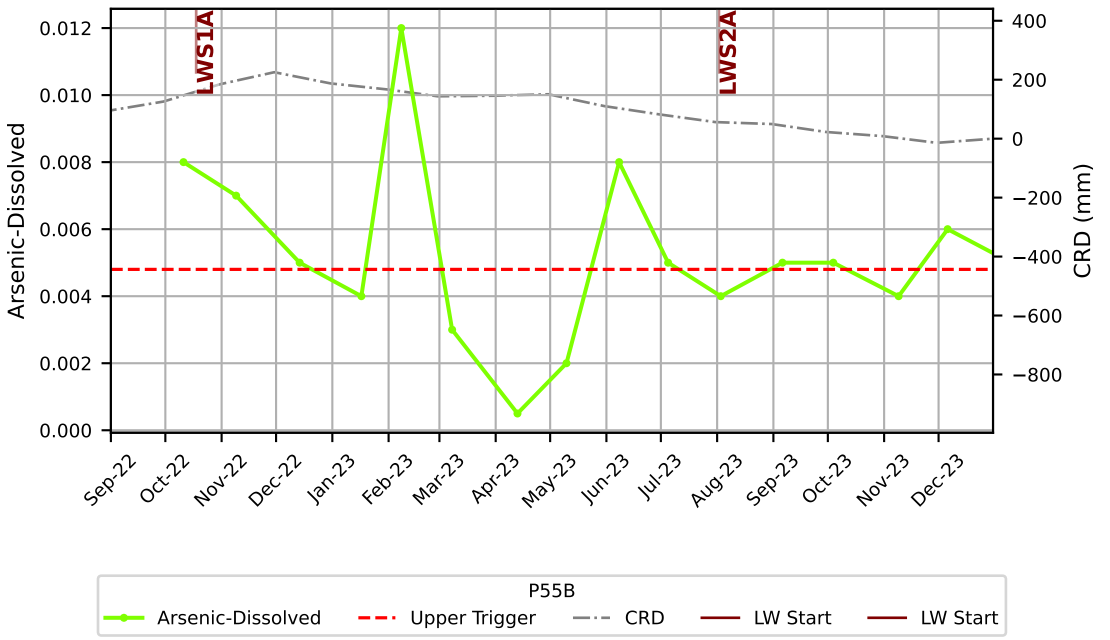


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

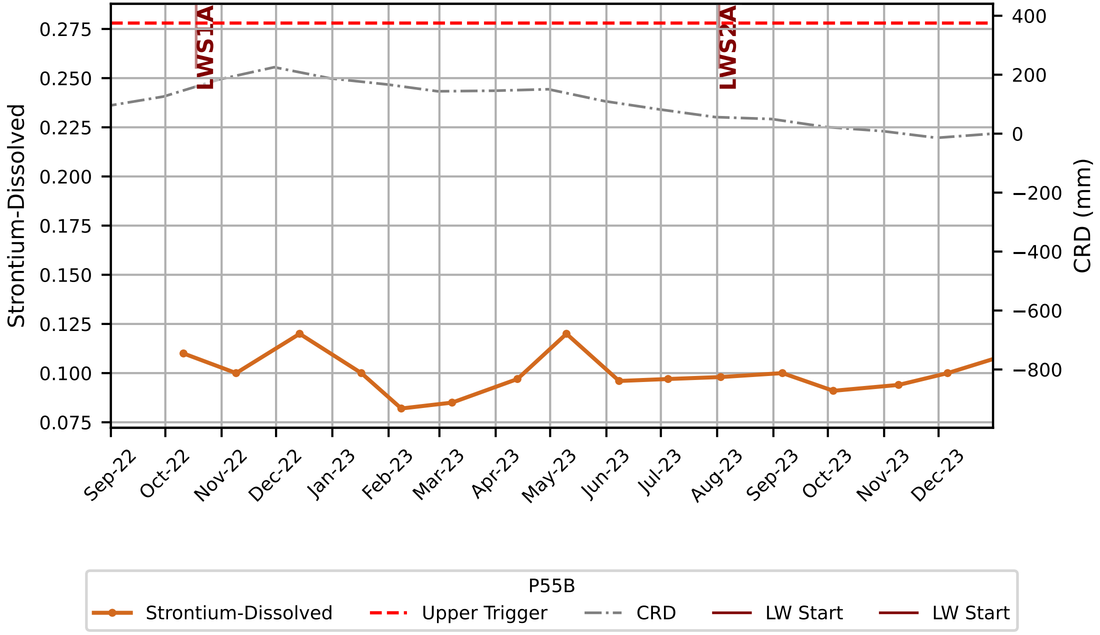

LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



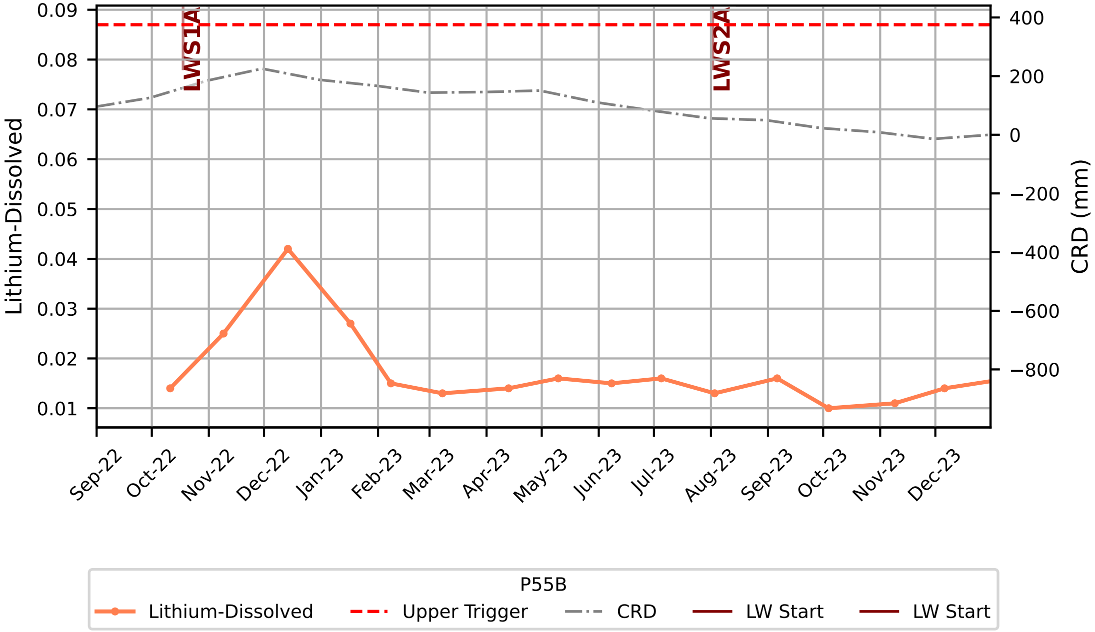
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



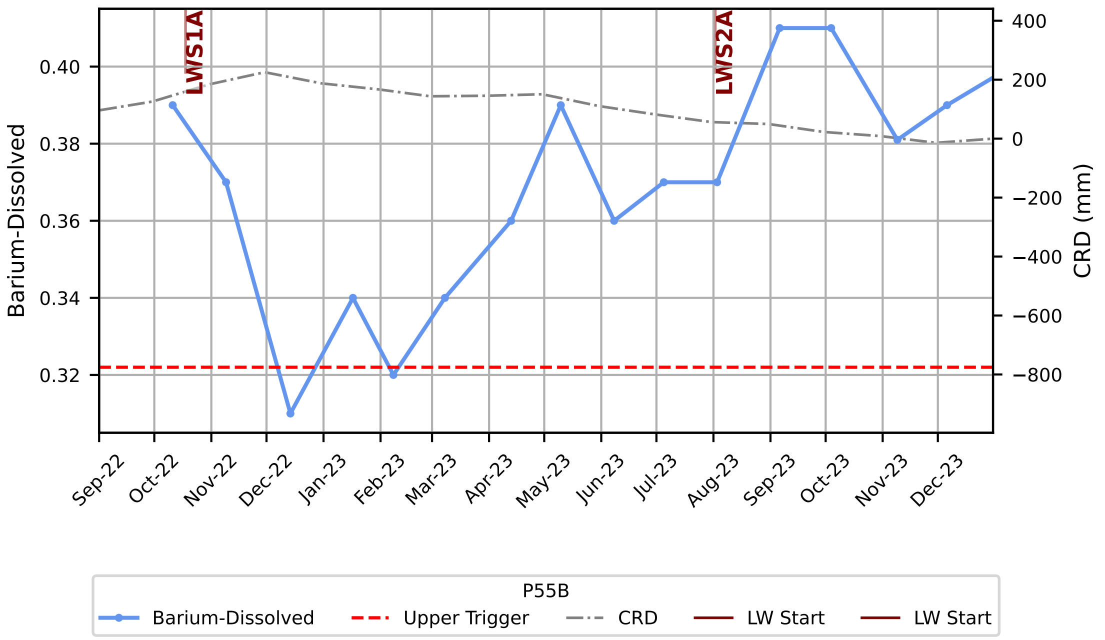
LWS1A
LWS2A
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



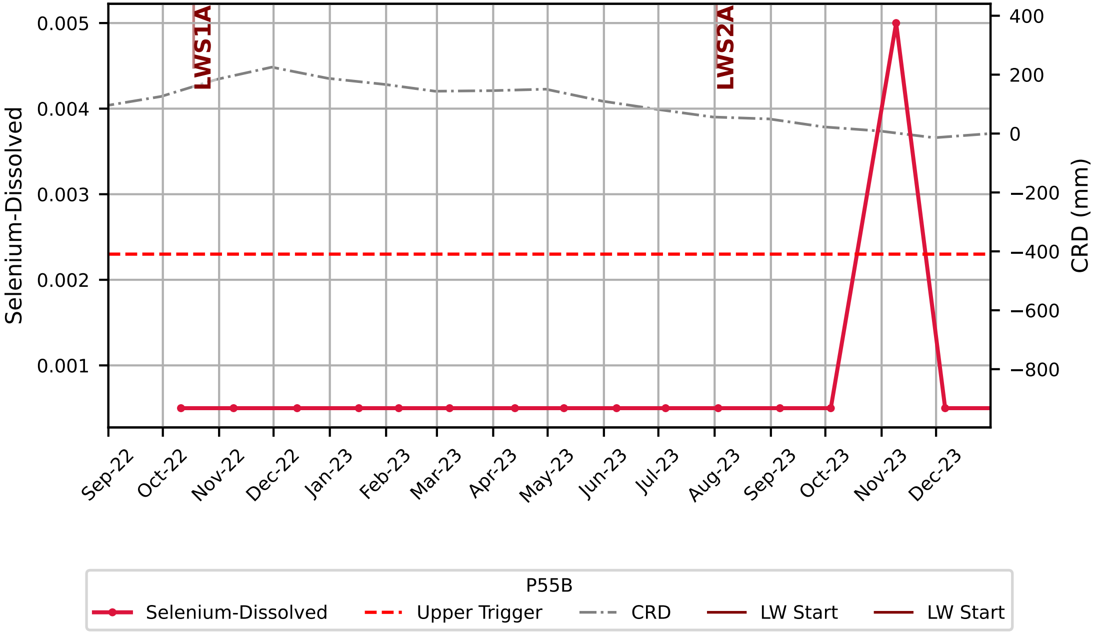
Strontium-Dissolved
CRD (mm)
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



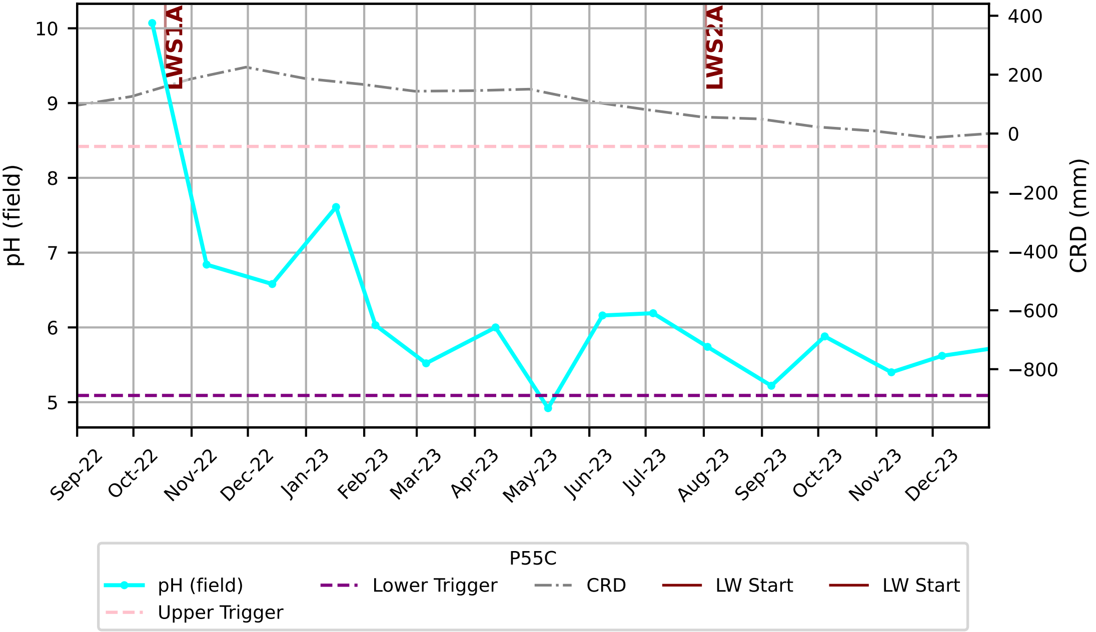
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



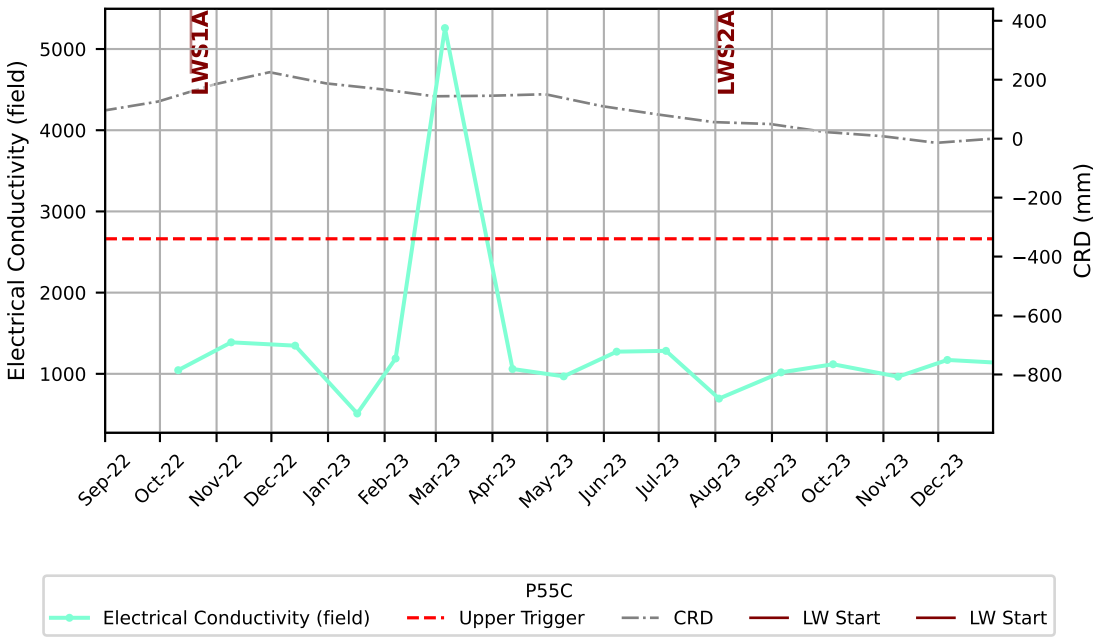
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.40
0.38
0.36
0.34
0.32
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



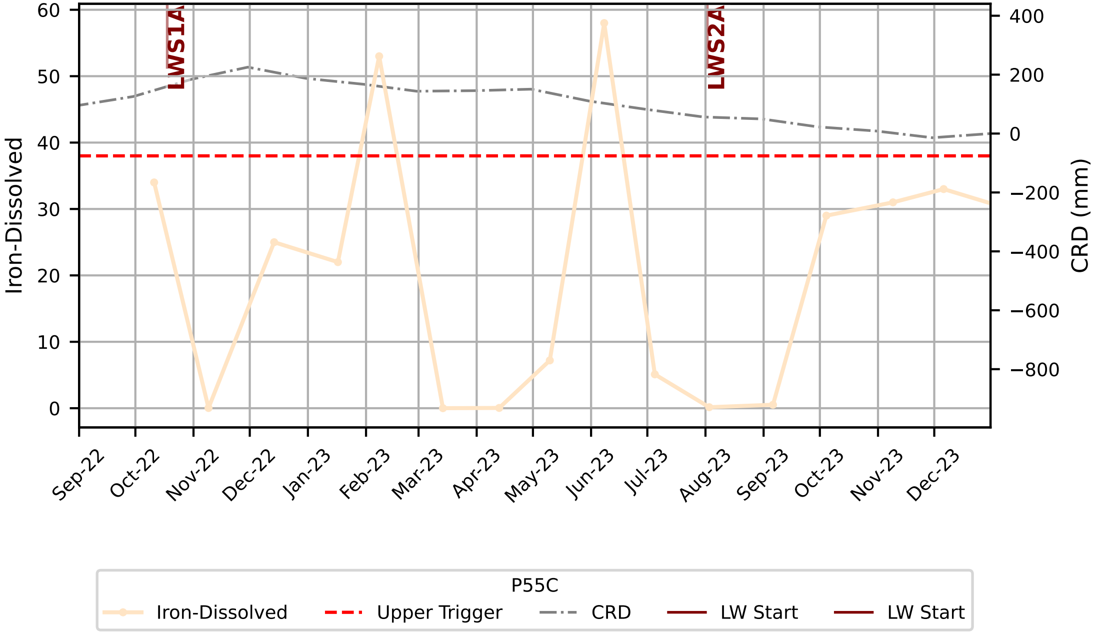
Selenium-Dissolved
0.005
0.004
0.003
0.002
0.001
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



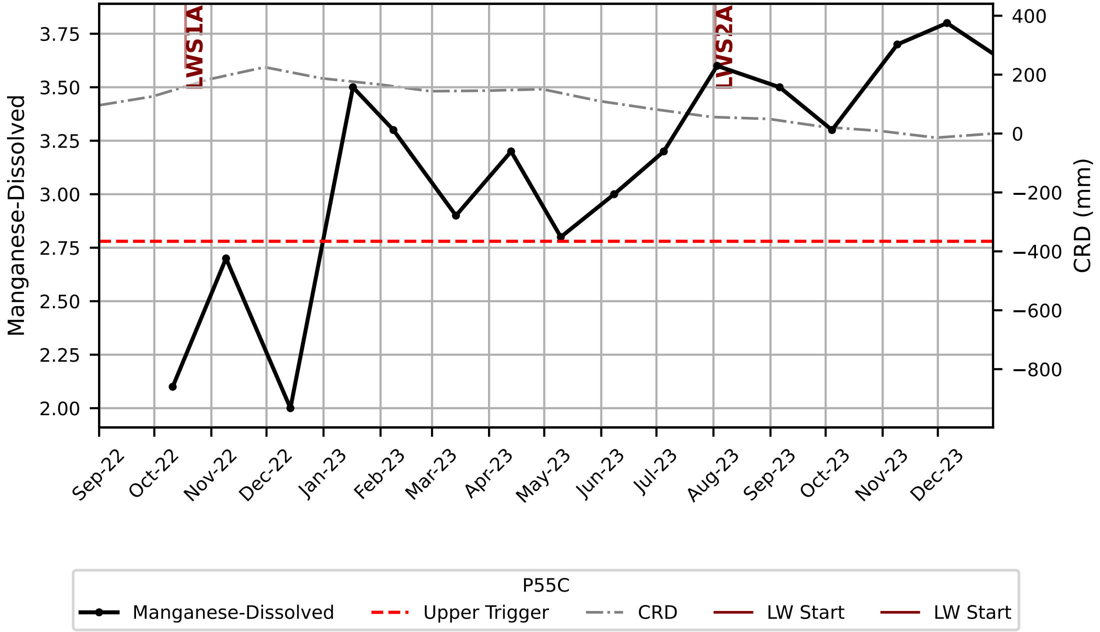
LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



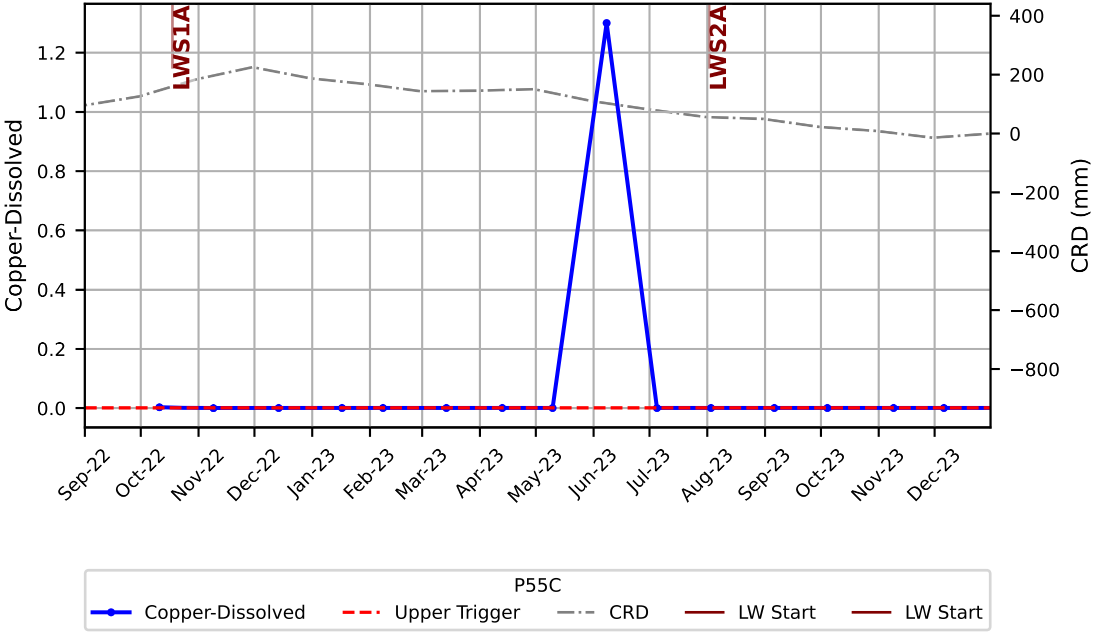
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
5000
4000
3000
2000
1000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



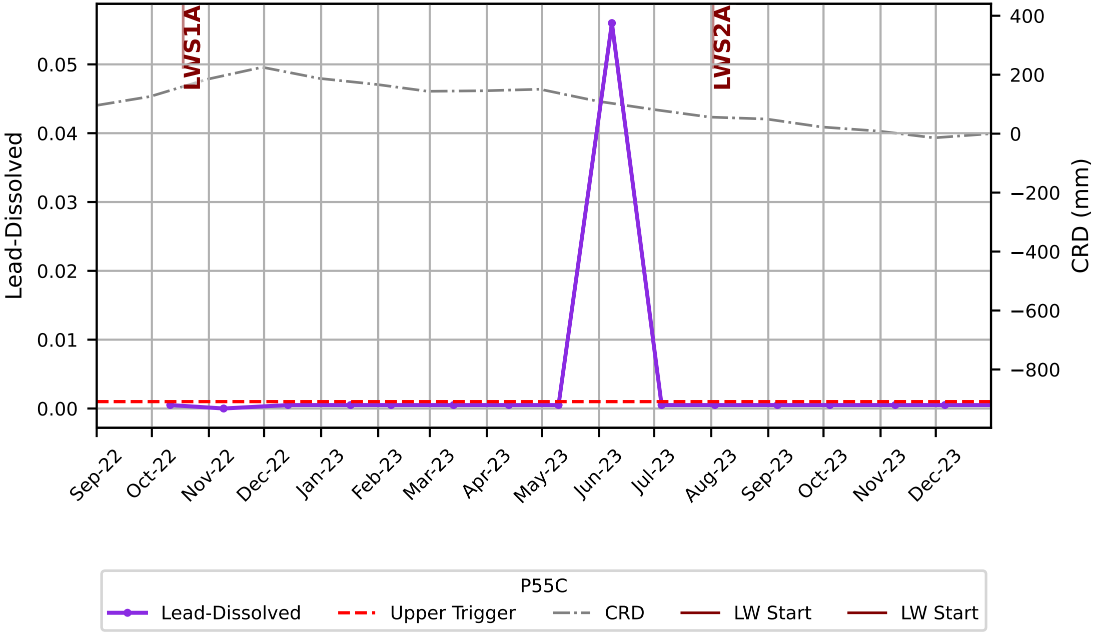
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0
10
20
30
40
50
60
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



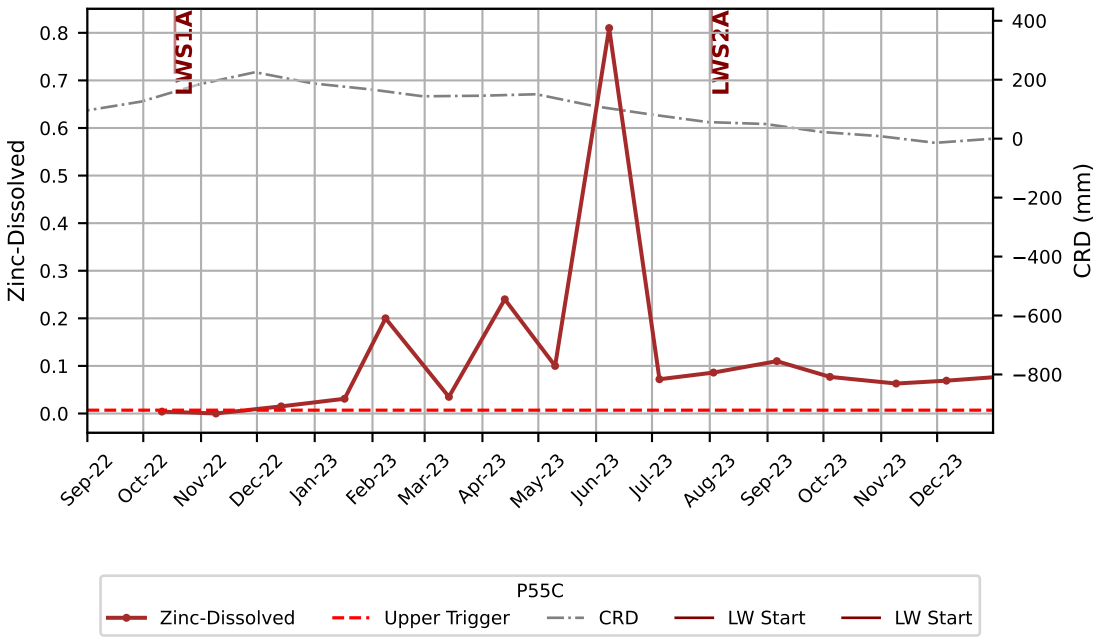
Manganese-Dissolved
CRD (mm)
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



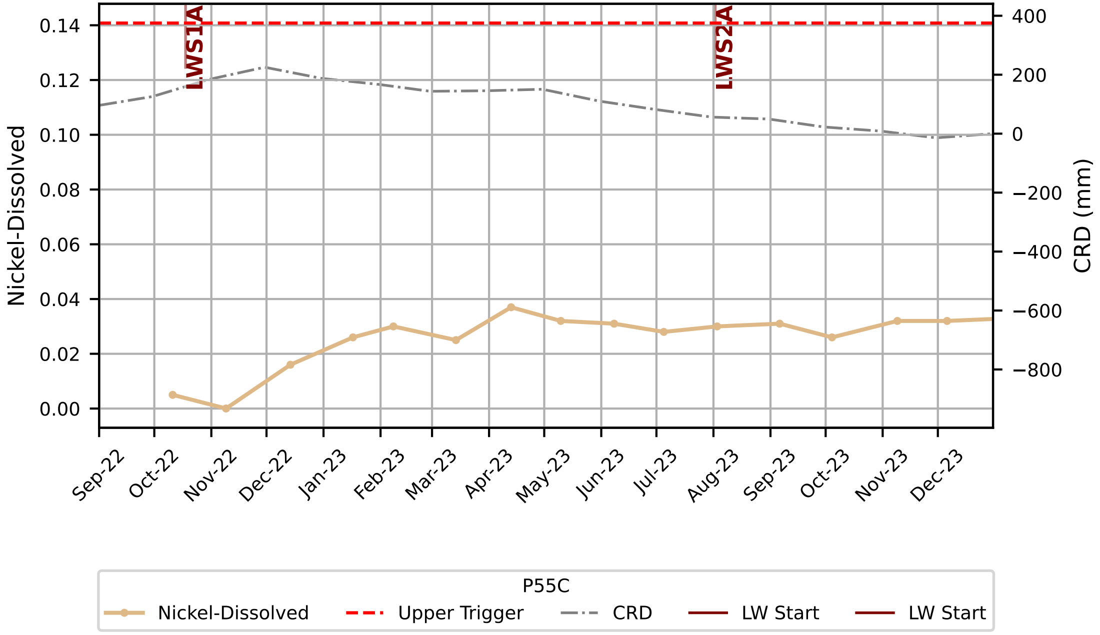
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



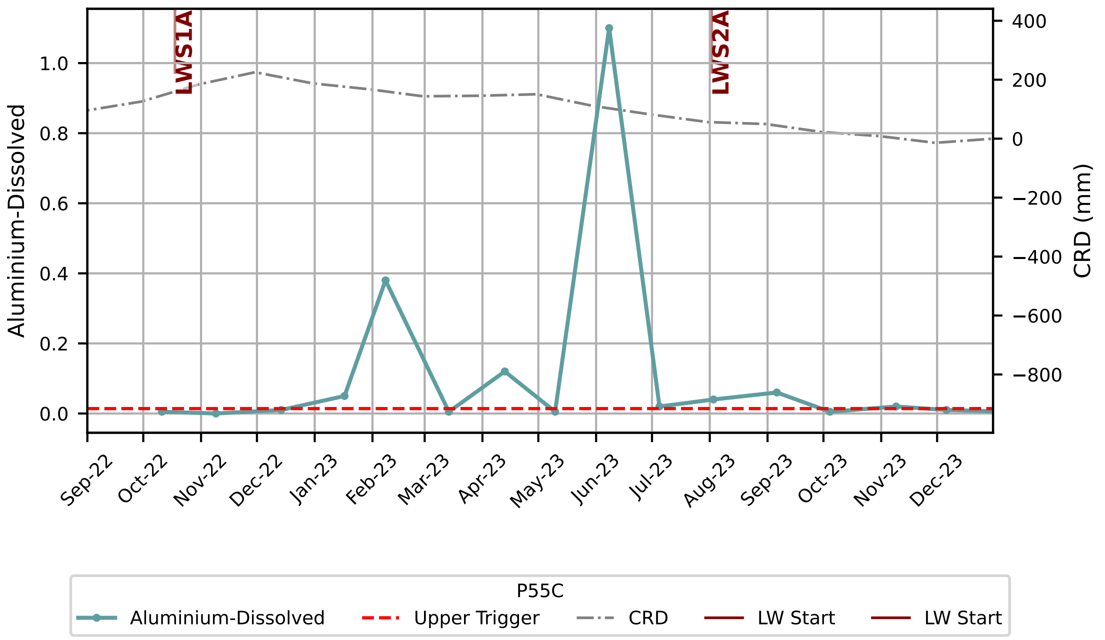
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.00
0.01
0.02
0.03
0.04
0.05
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



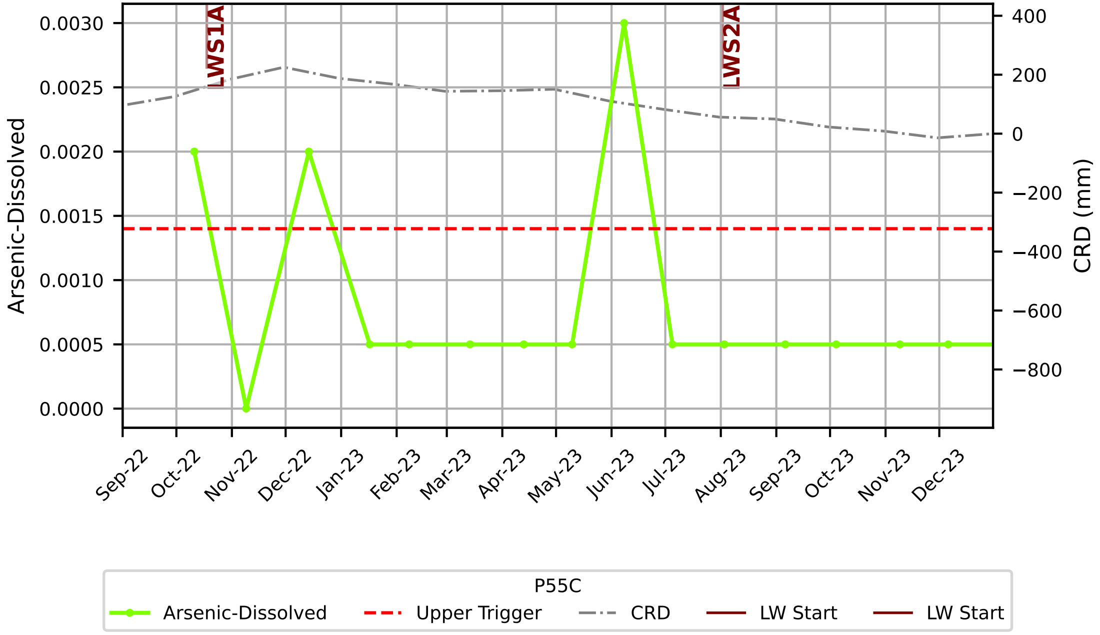
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



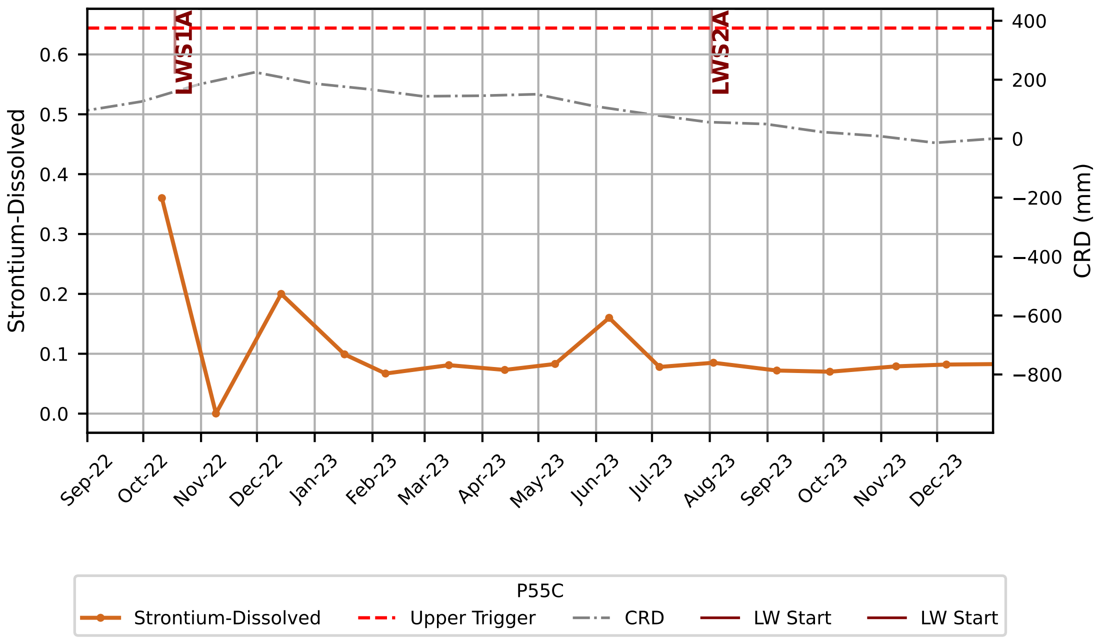
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



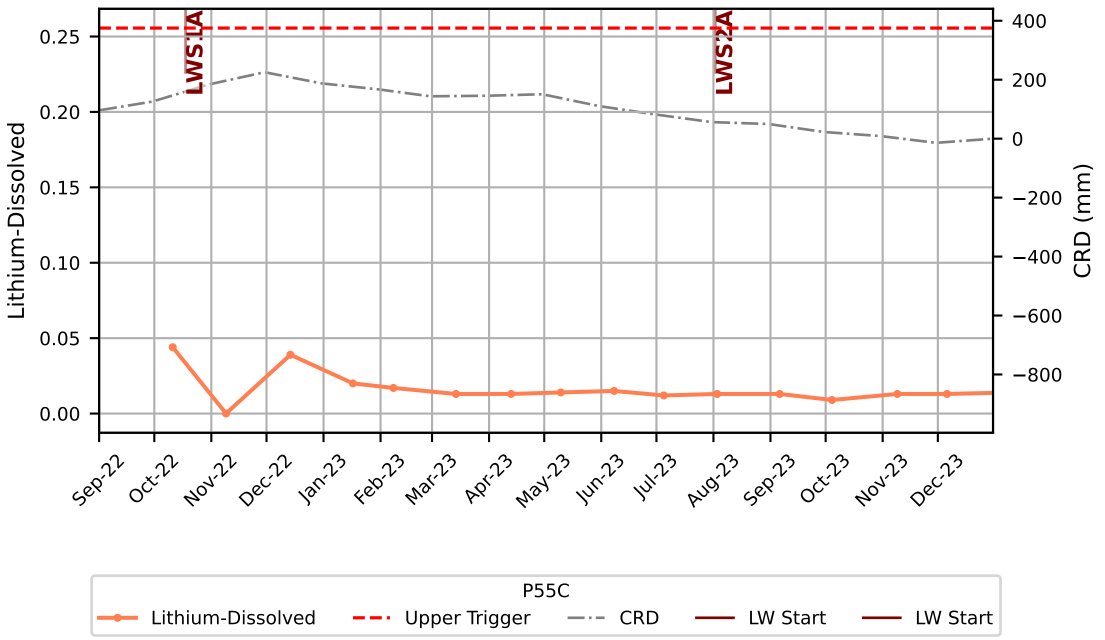
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
1.0
0.8
0.6
0.4
0.2
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



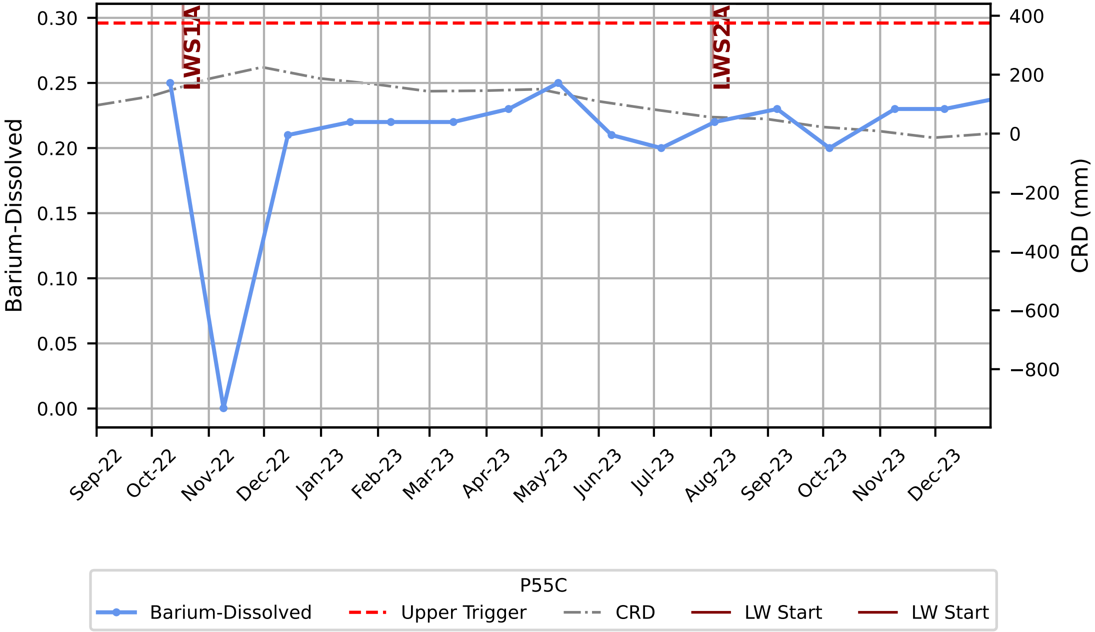
LWS1A
LWS2A
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



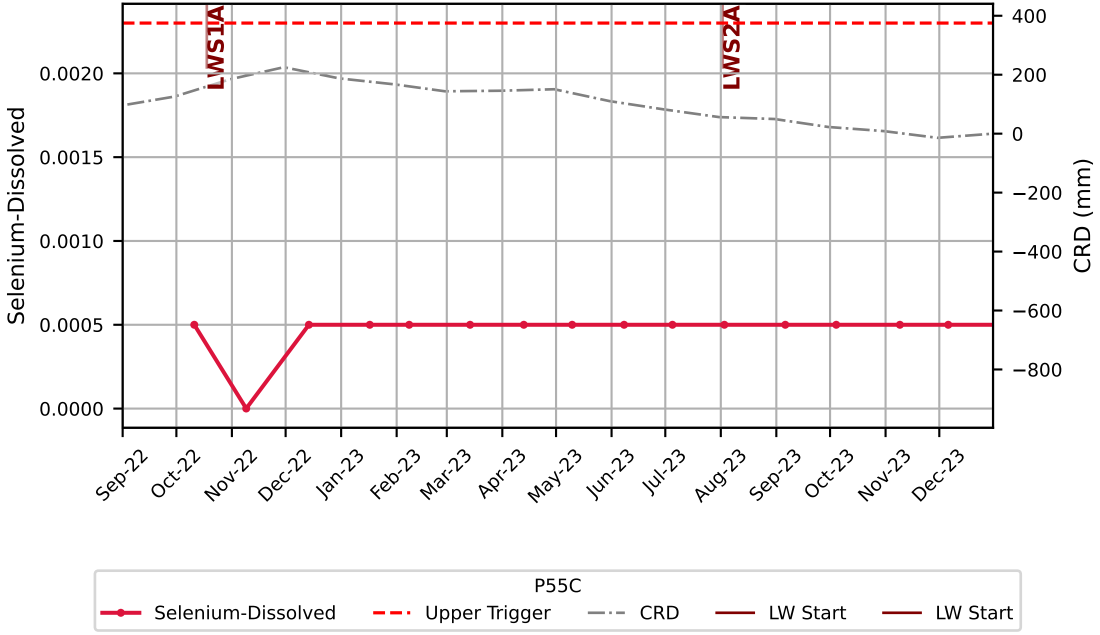
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

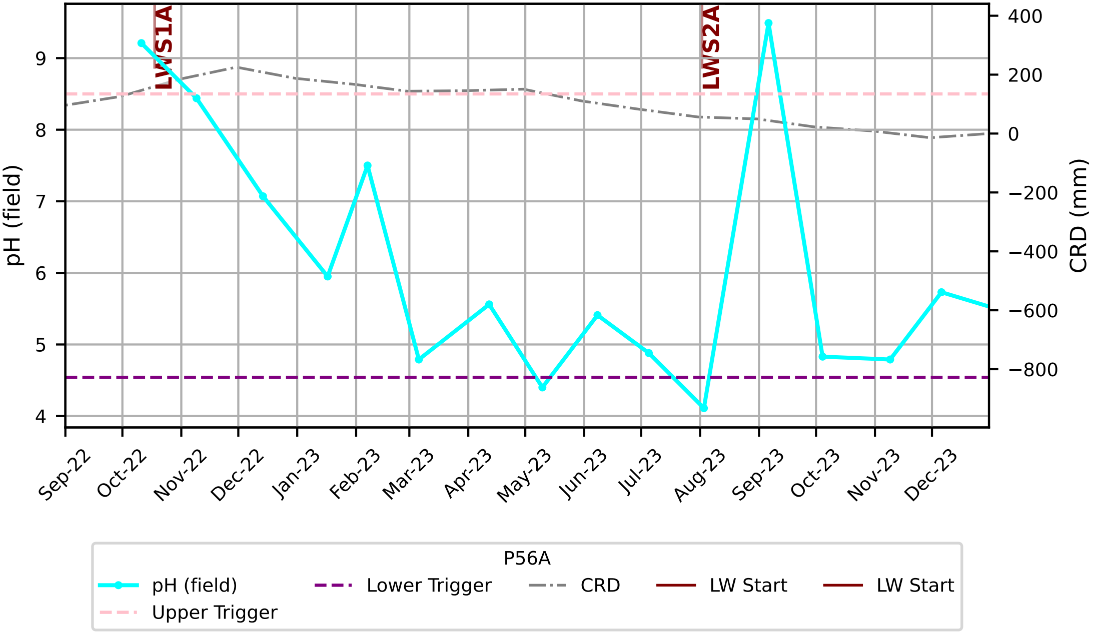


Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

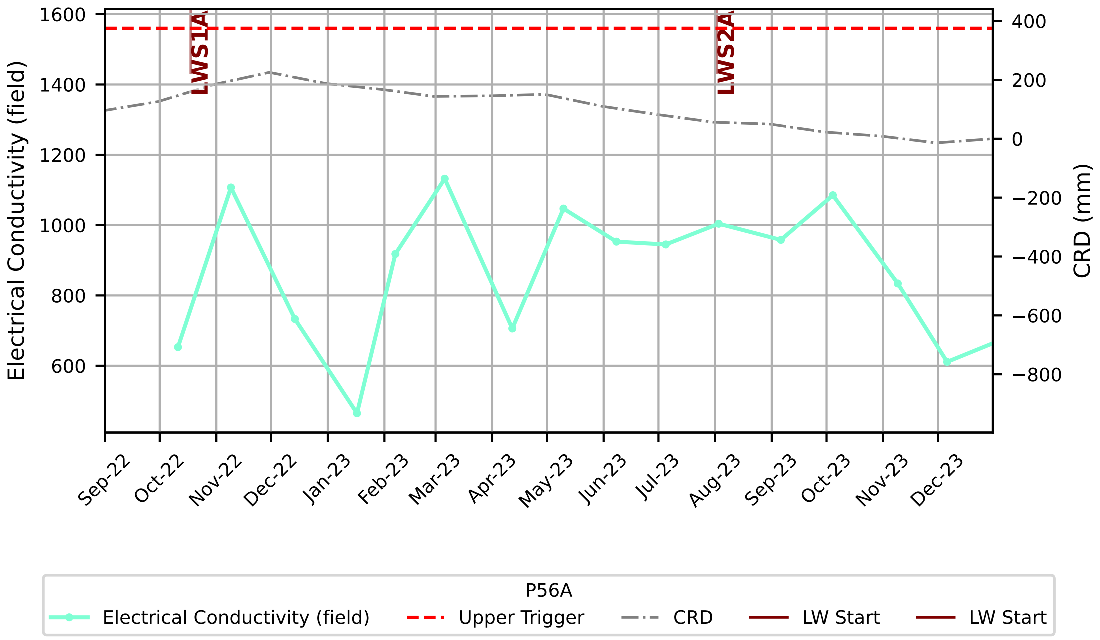


Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

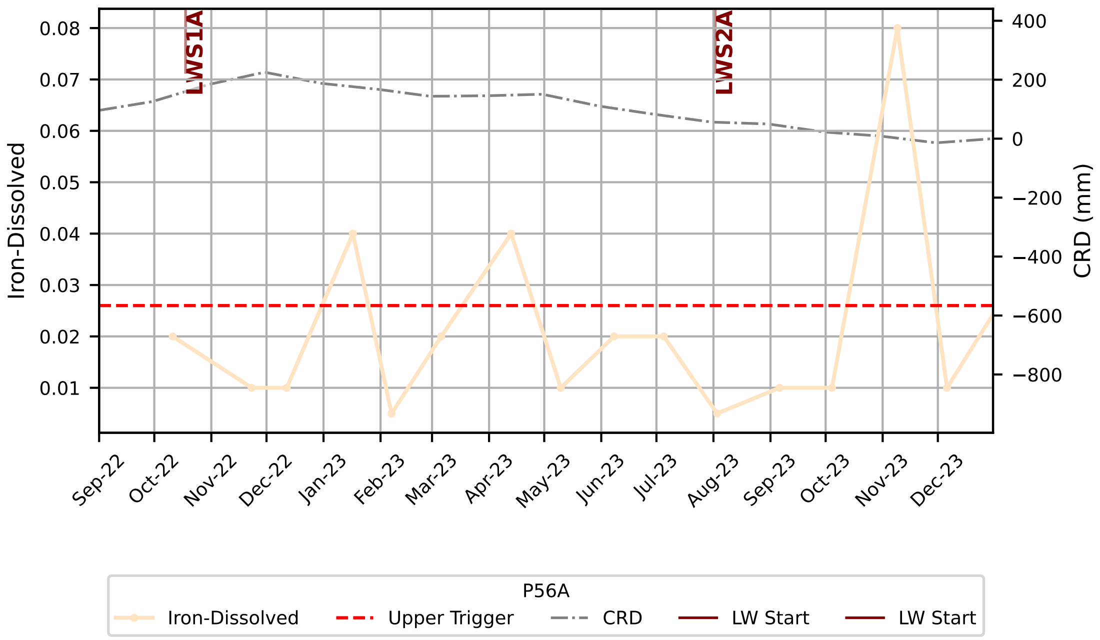

LWS1A
LWS2A
Selenium-Dissolved
0.0020
0.0015
0.0010
0.0005
0.0000
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



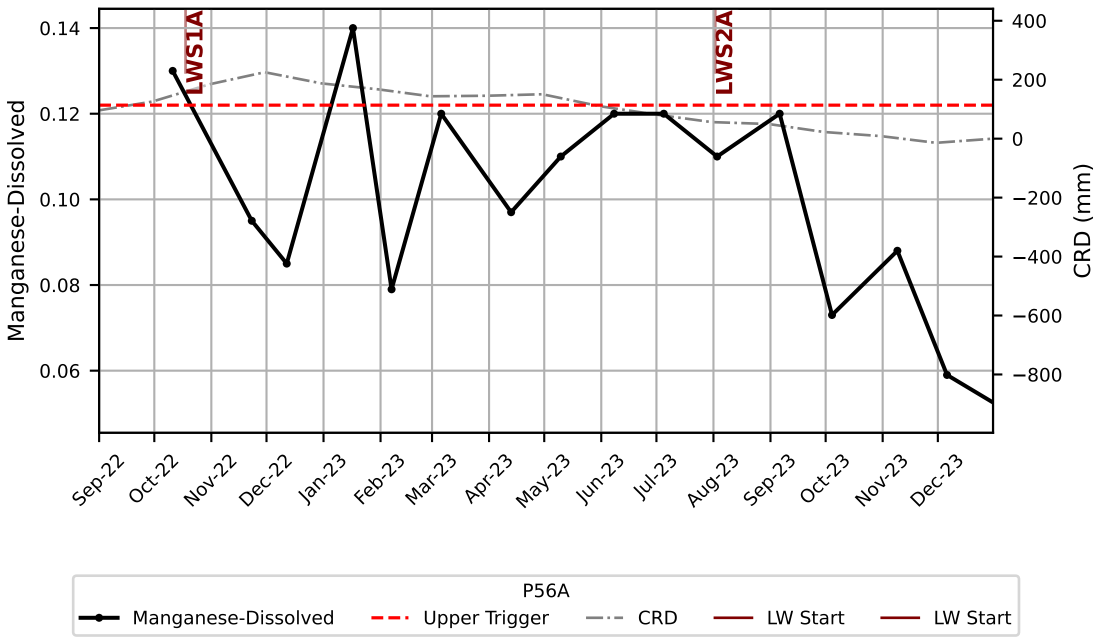
LWS1A
LWS2A
pH (field)
CRD (mm)
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



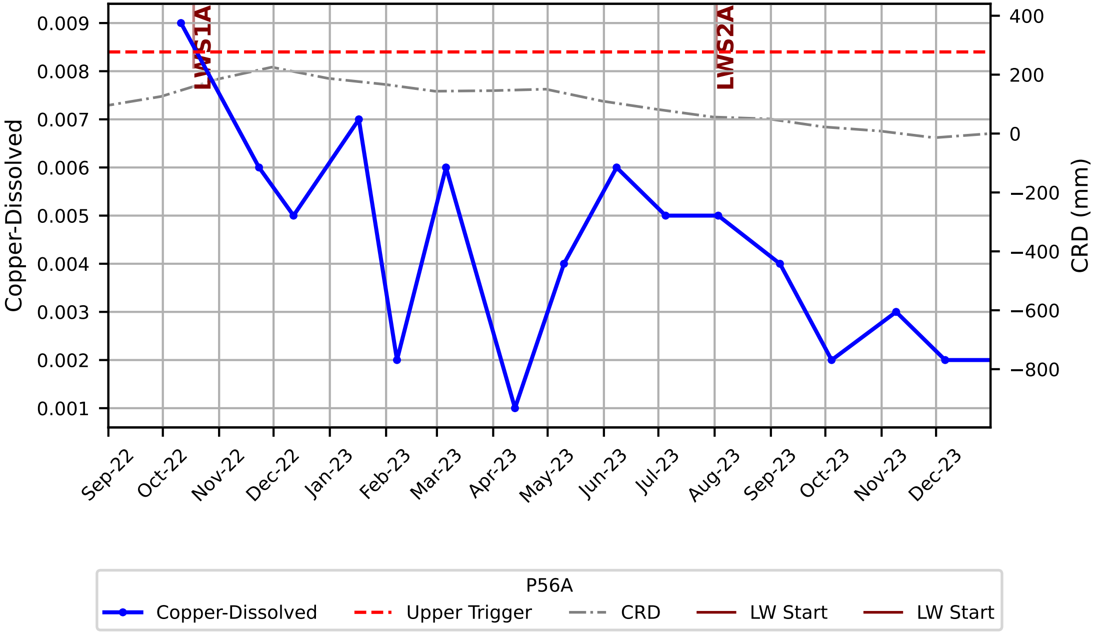
1600
1400
1200
1000
800
600
Electrical Conductivity (field)
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



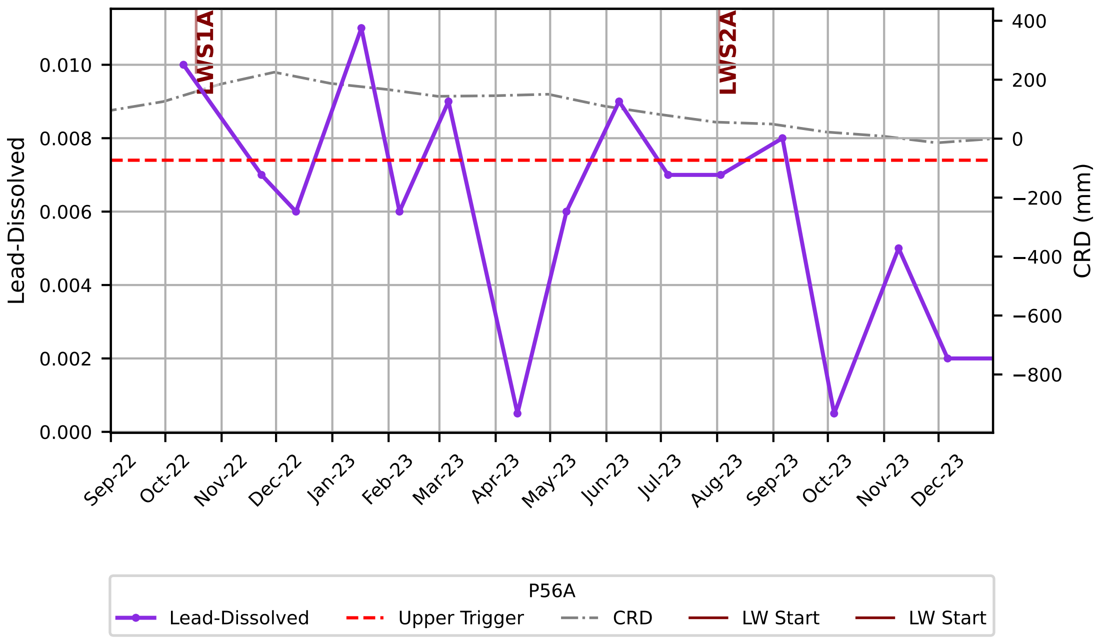
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start

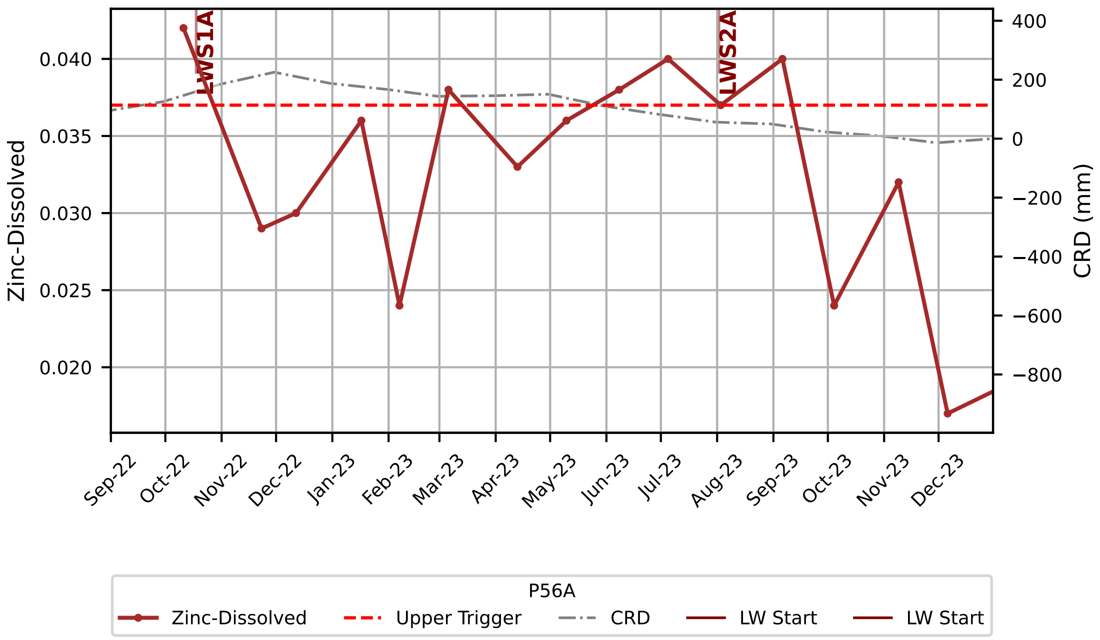


LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

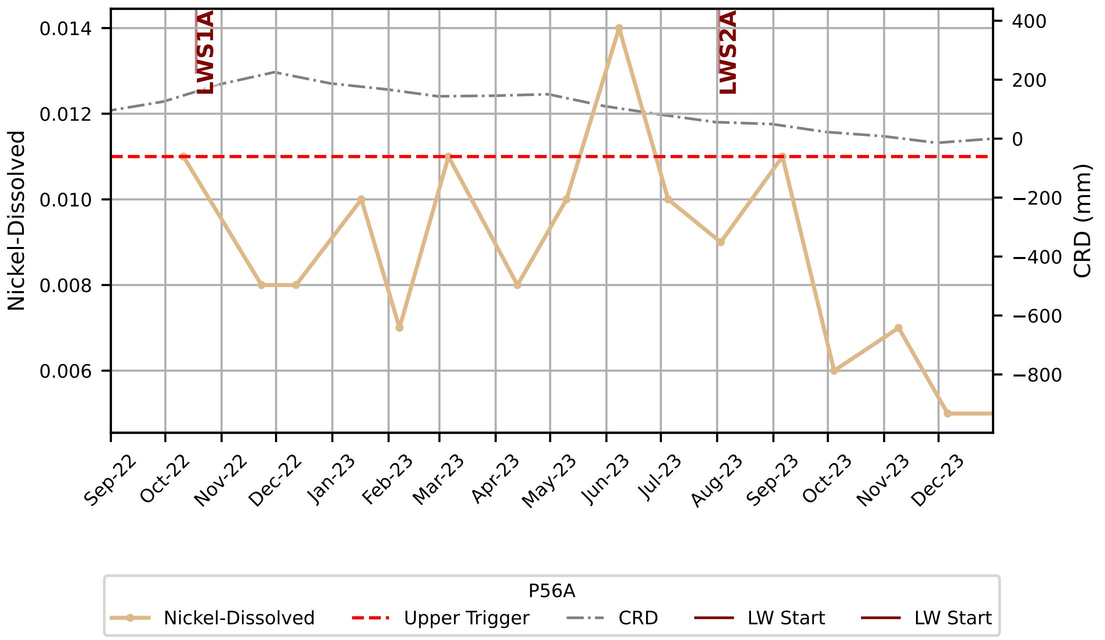


LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

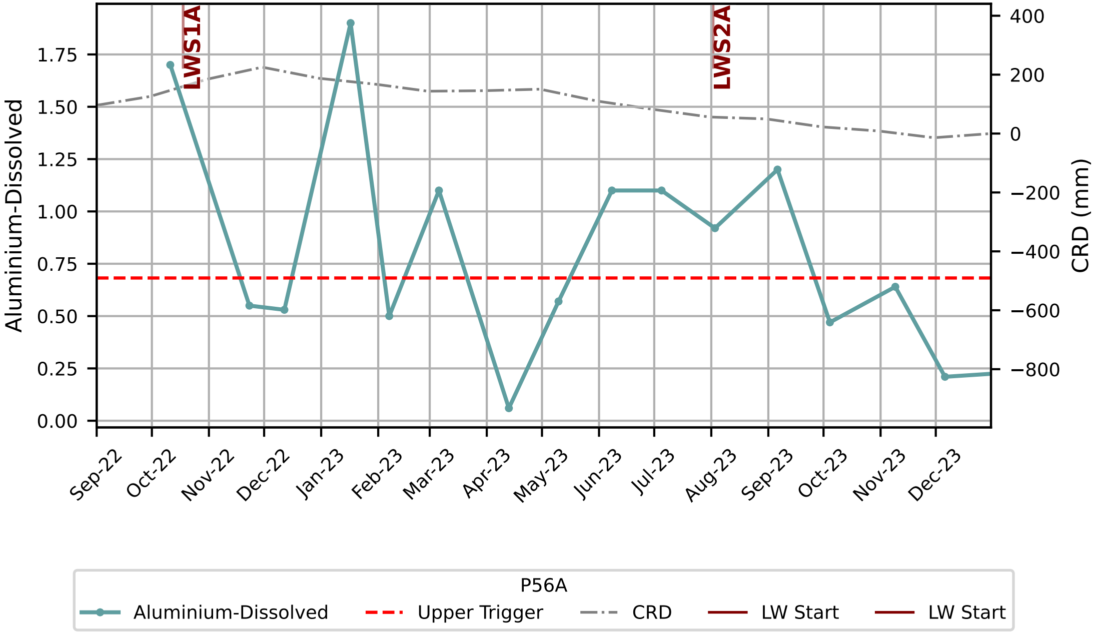

LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



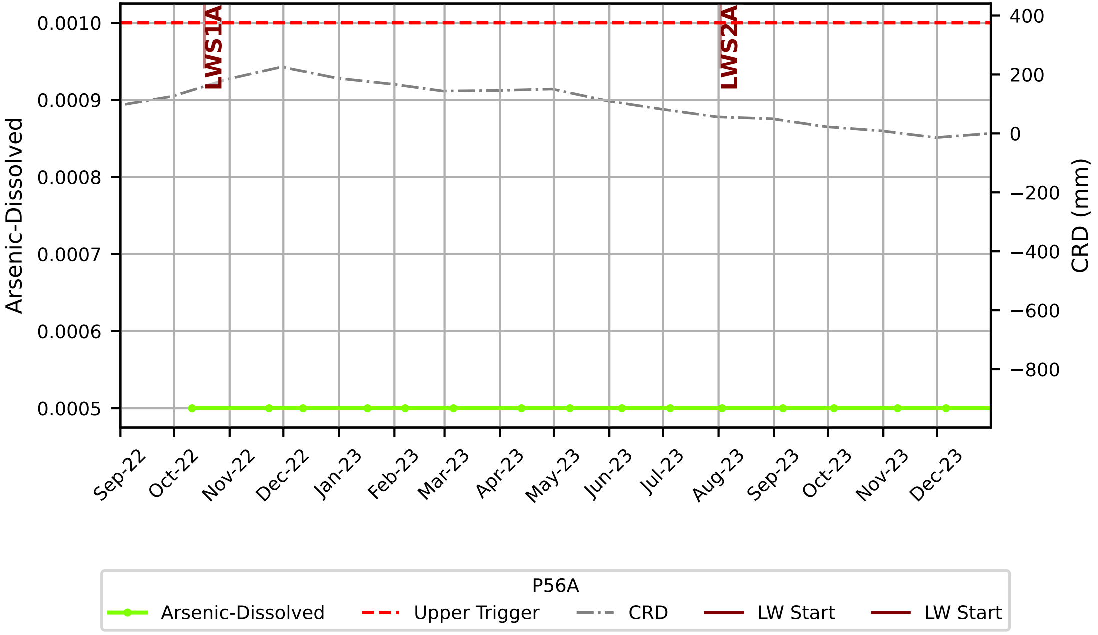
LWS1A
LWS2A
Zinc-Dissolved
0.040
0.035
0.030
0.025
0.020
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



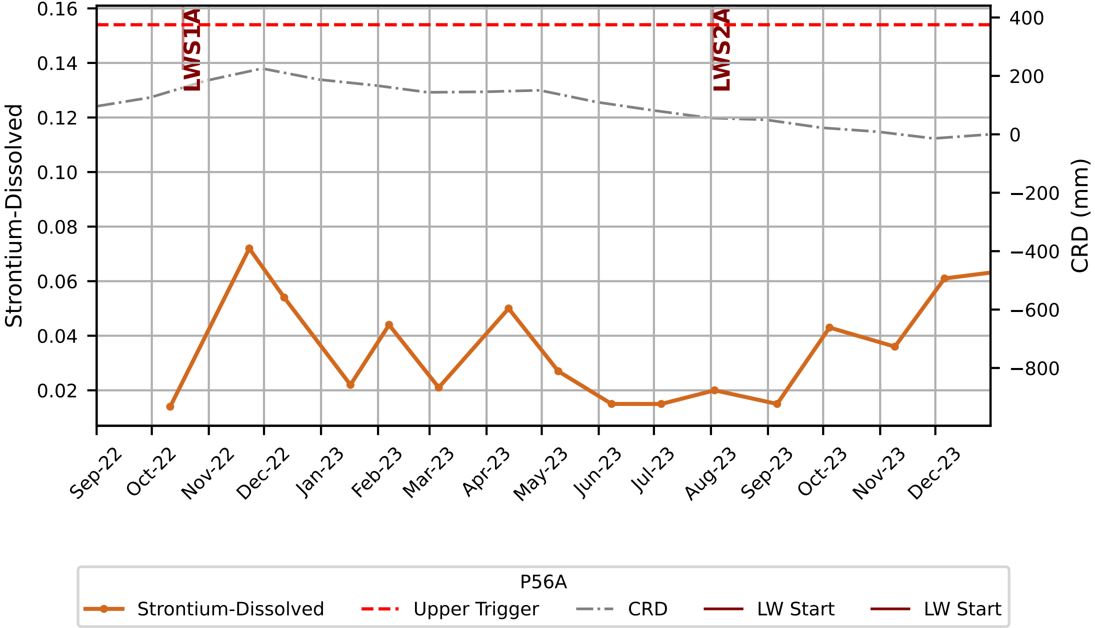
LWS1A
LWS2A
0.014
0.012
0.010
0.008
0.006
Nickel-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



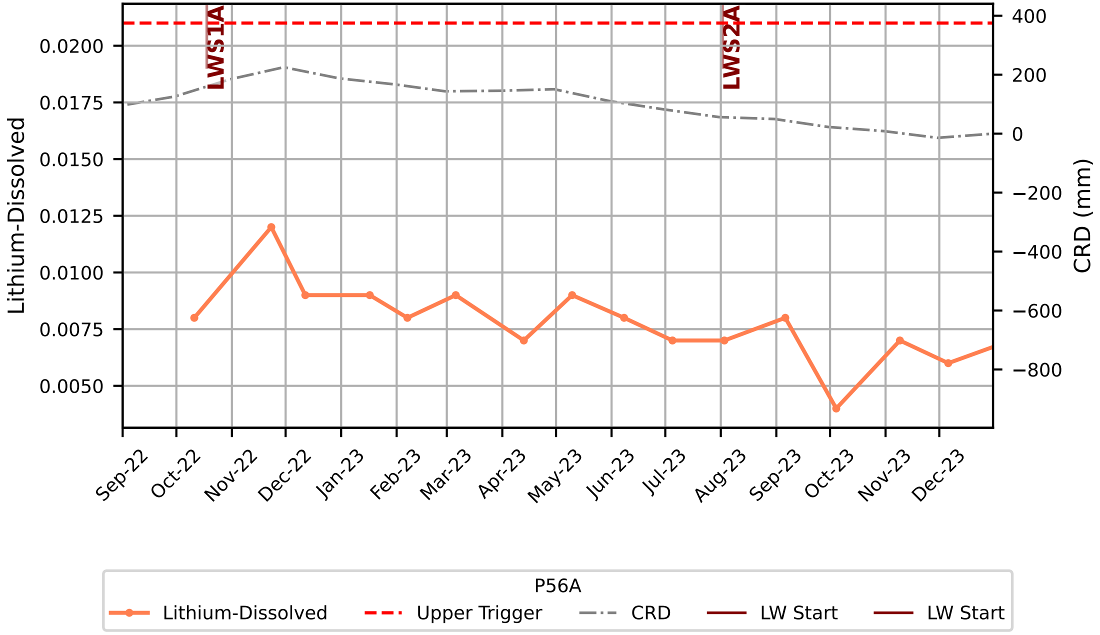
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



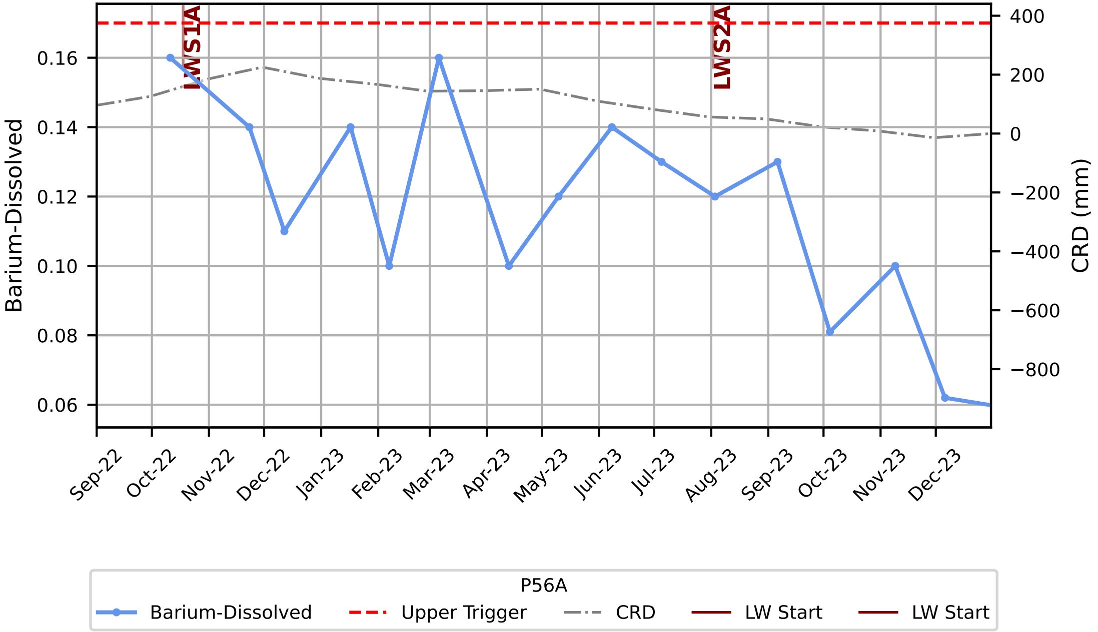
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



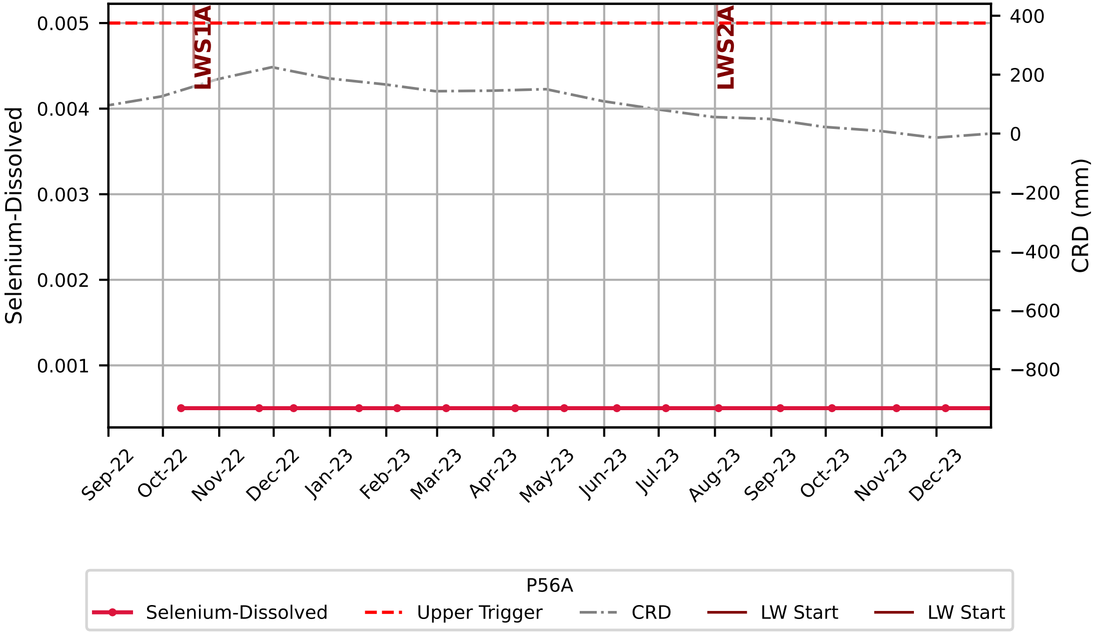
Strontium-Dissolved
CRD (mm)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



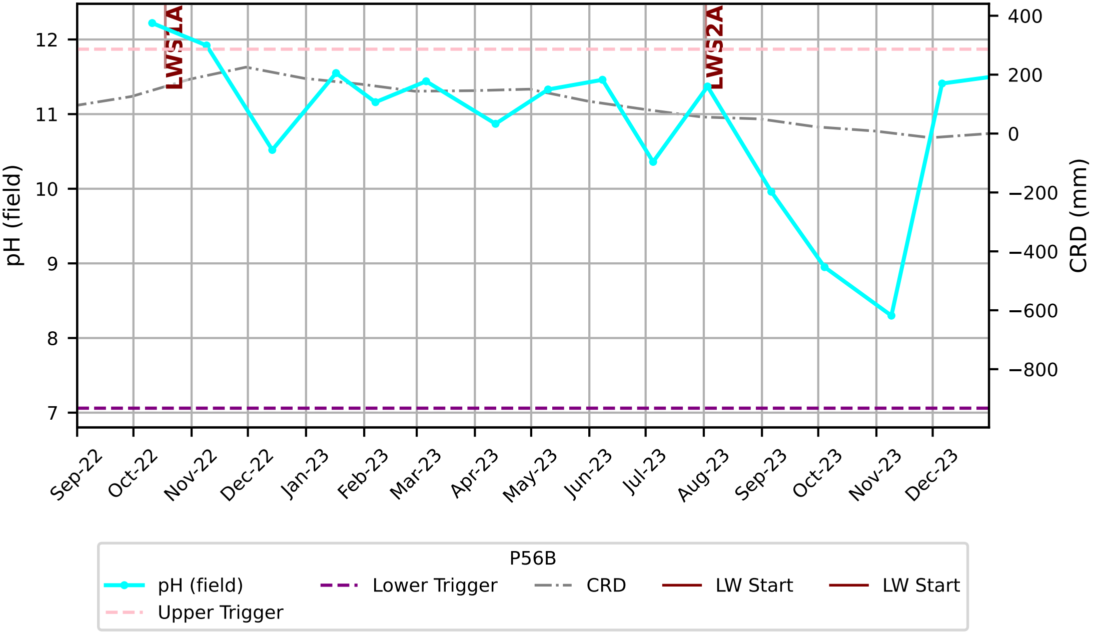
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



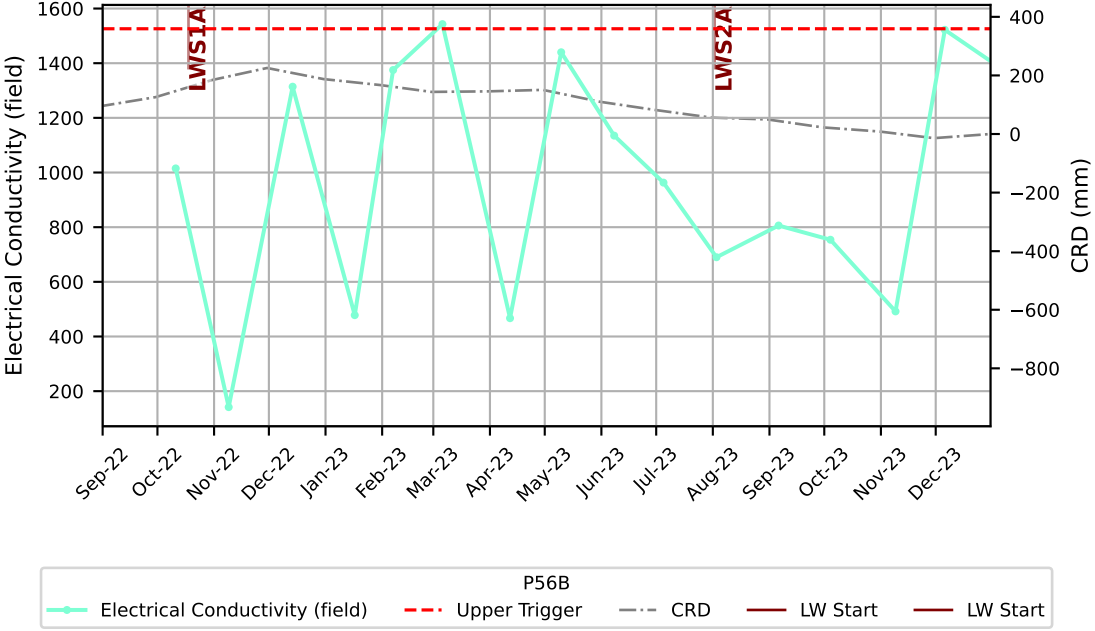
LWS1A
LWS2A
Barium-Dissolved
0.16
0.14
0.12
0.10
0.08
0.06
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



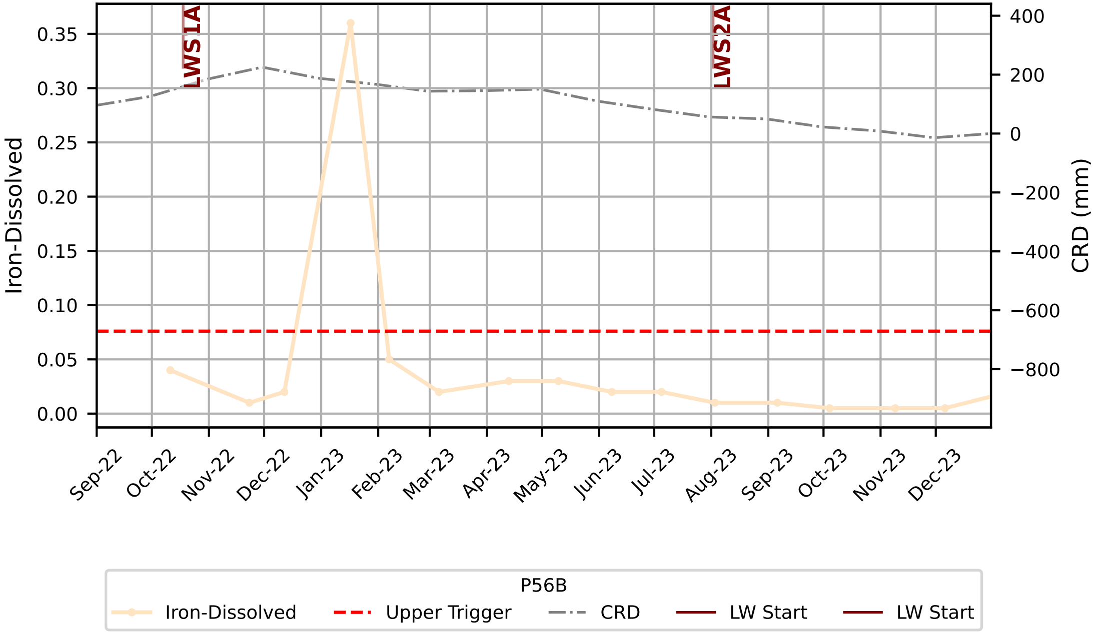
Selenium-Dissolved
0.005
0.004
0.003
0.002
0.001
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



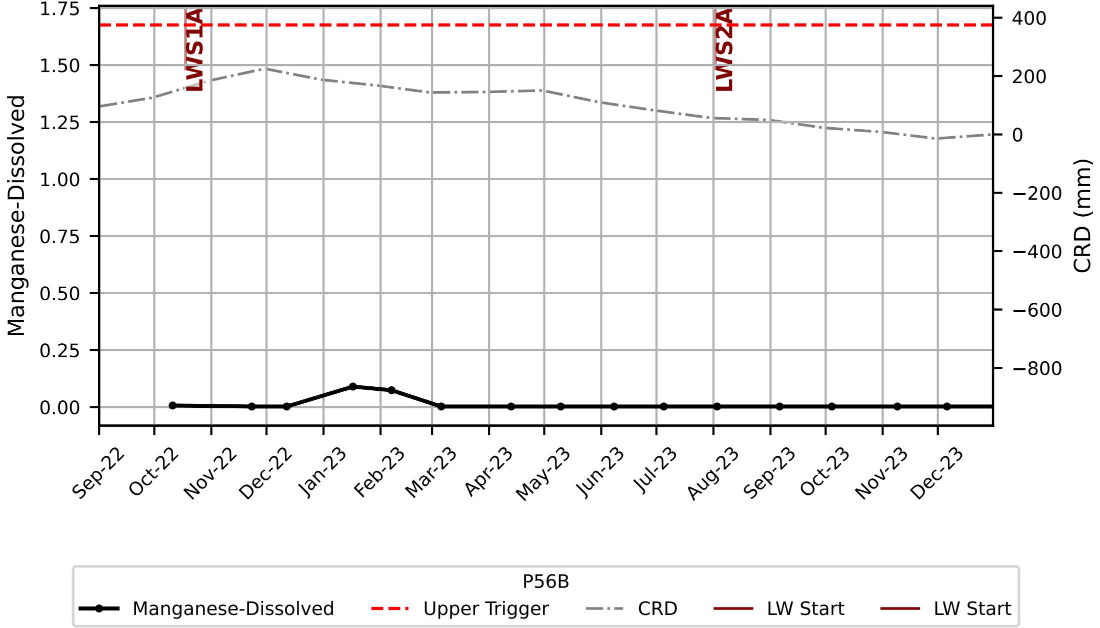
LWS1A
LWS2A
pH (field)
CRD (mm)
12
11
10
9
8
7
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



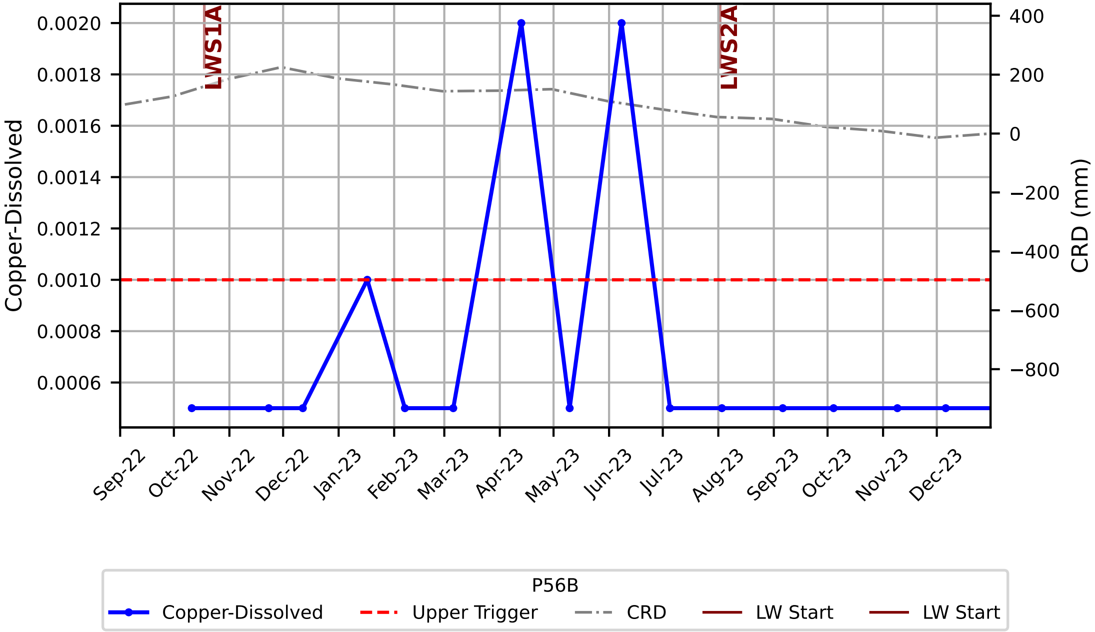
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



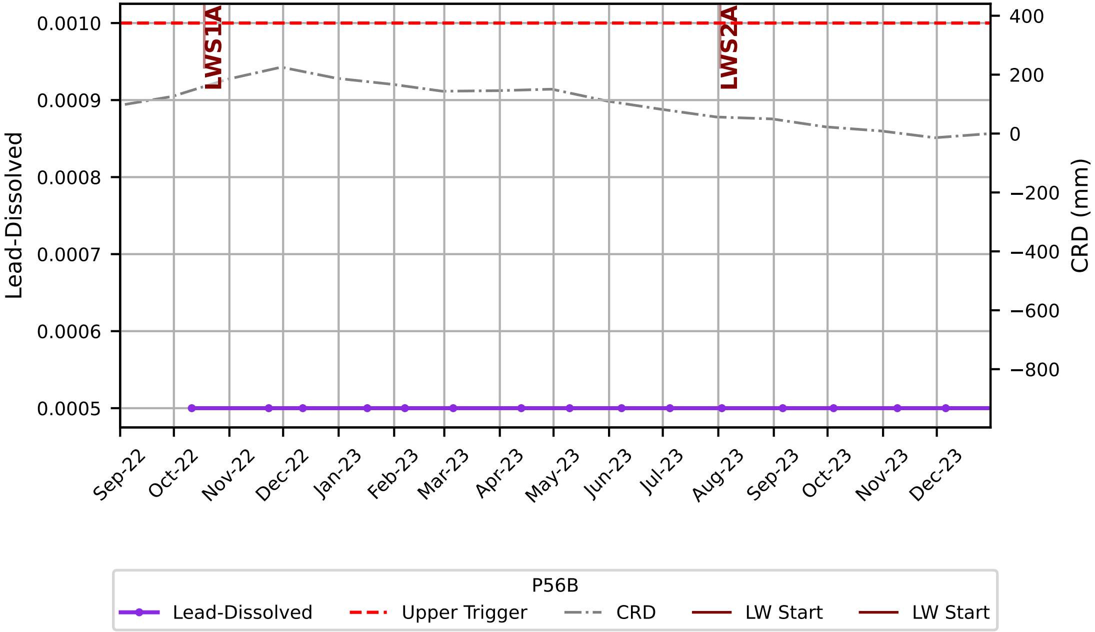
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start

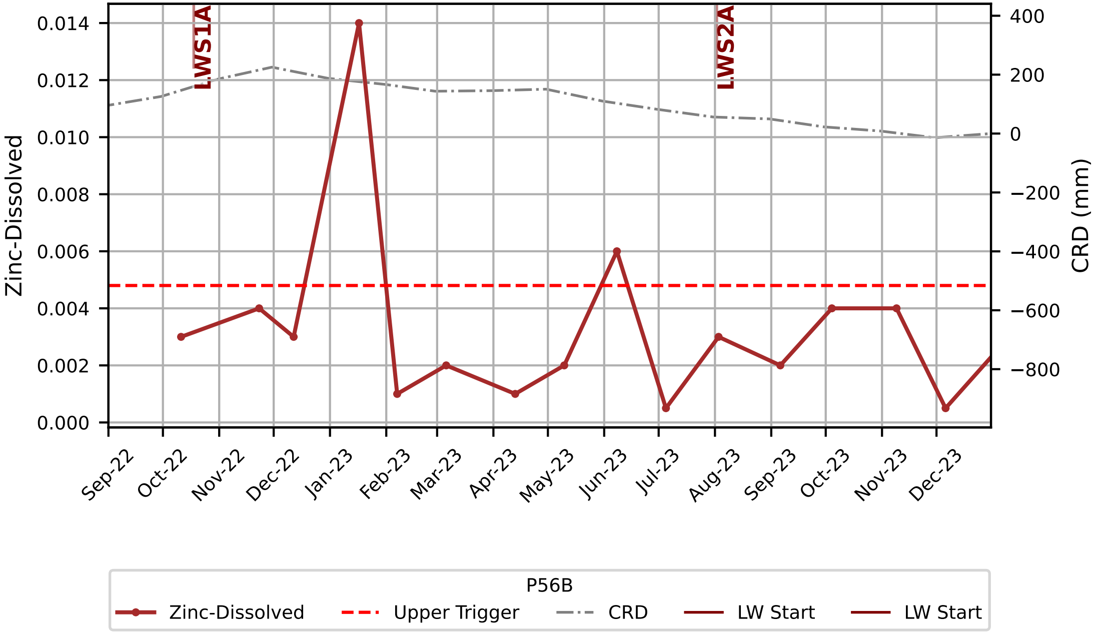


Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

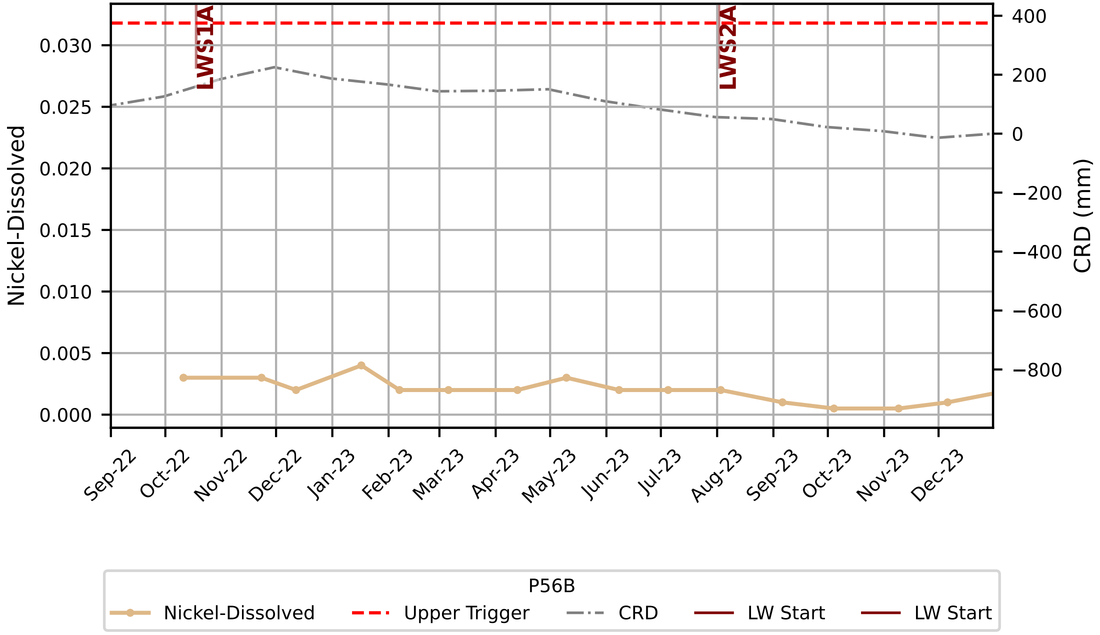


LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

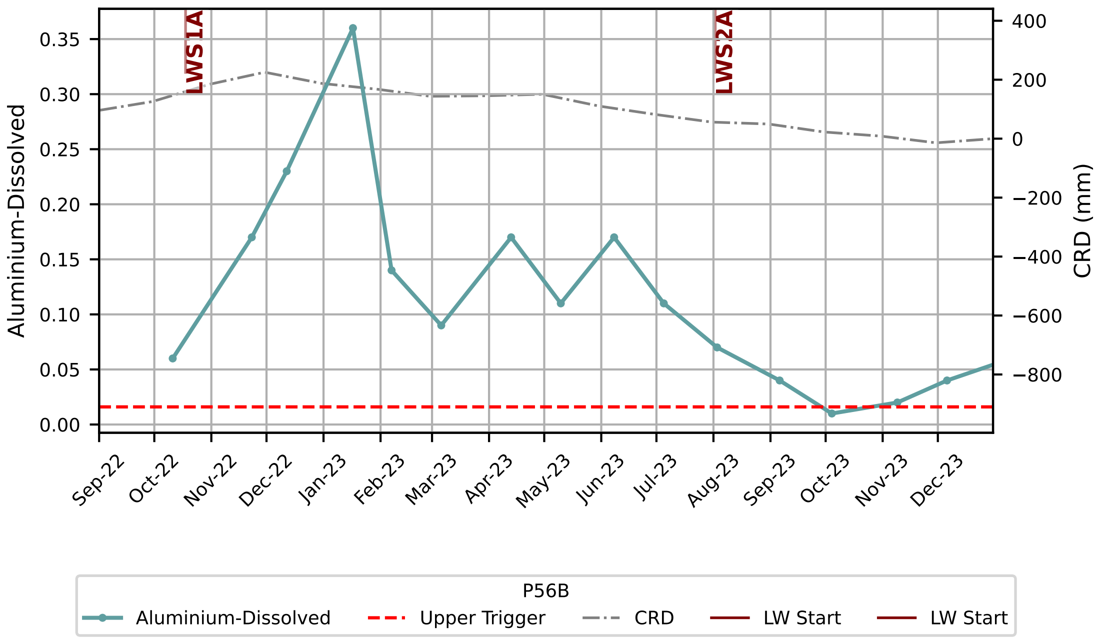

LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



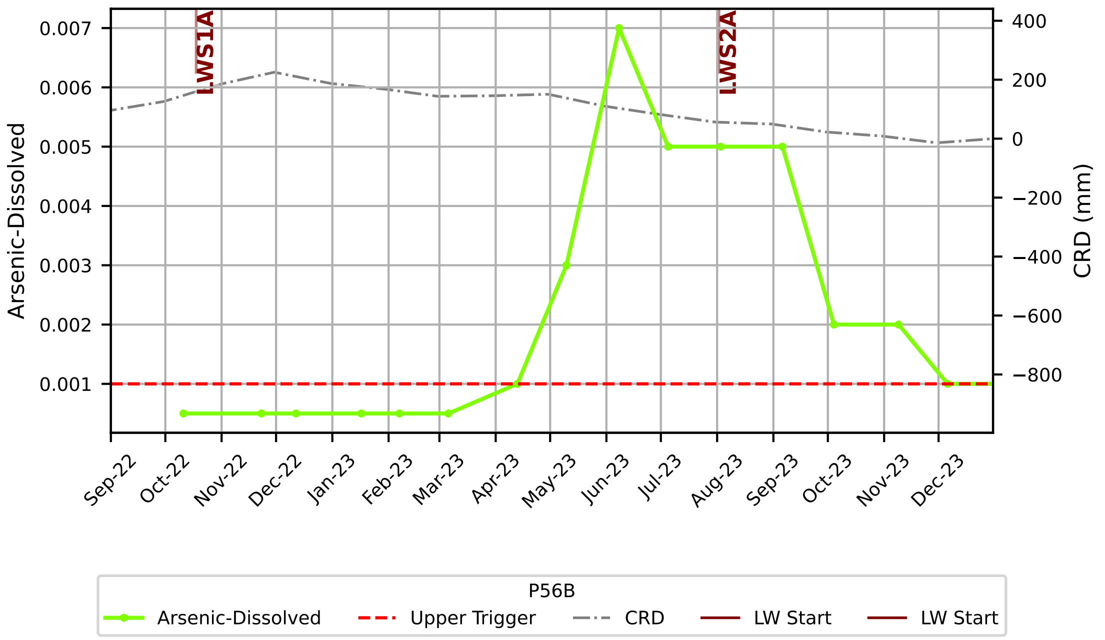
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



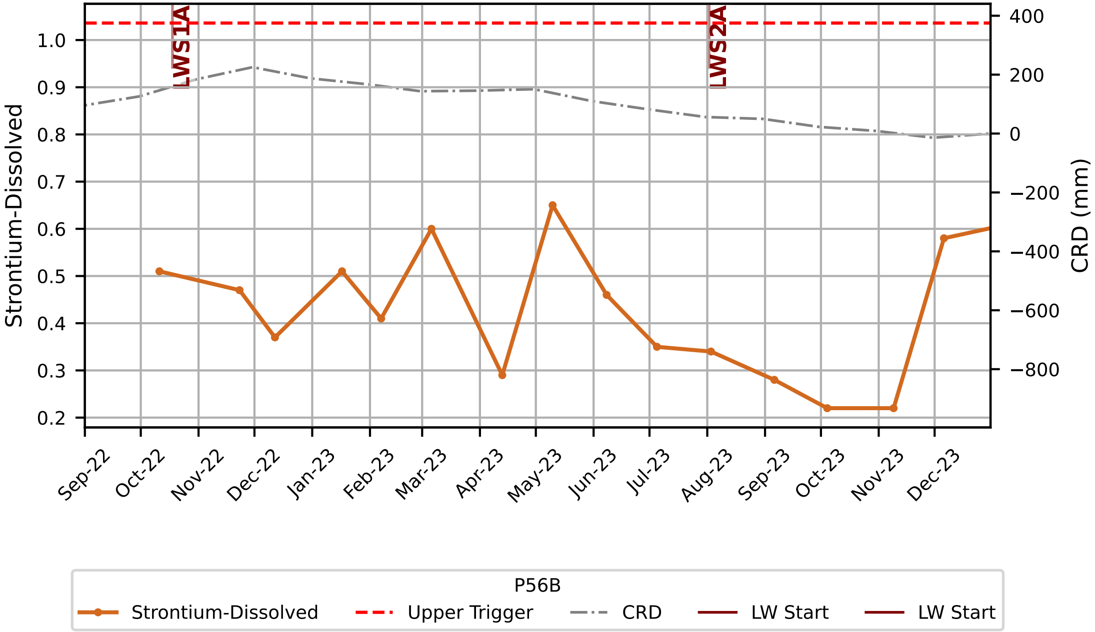
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



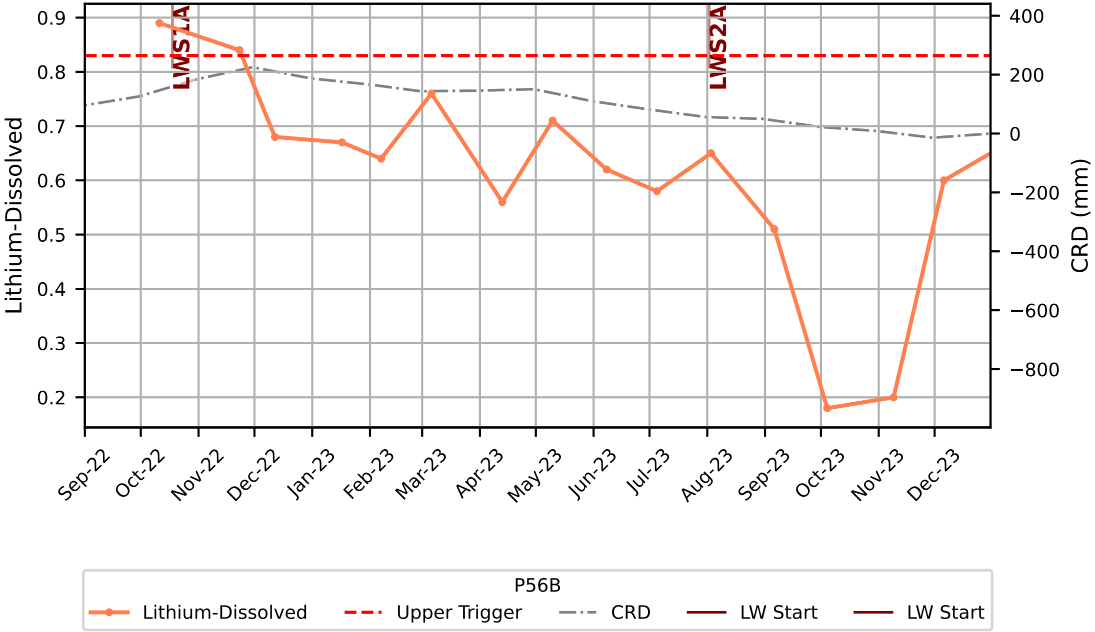
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



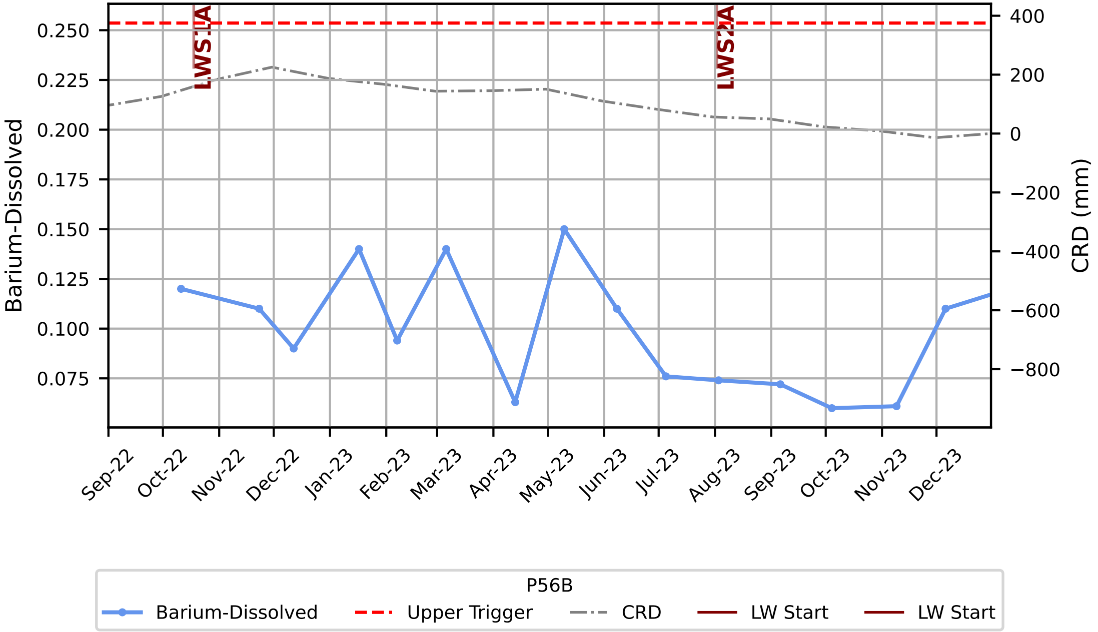
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



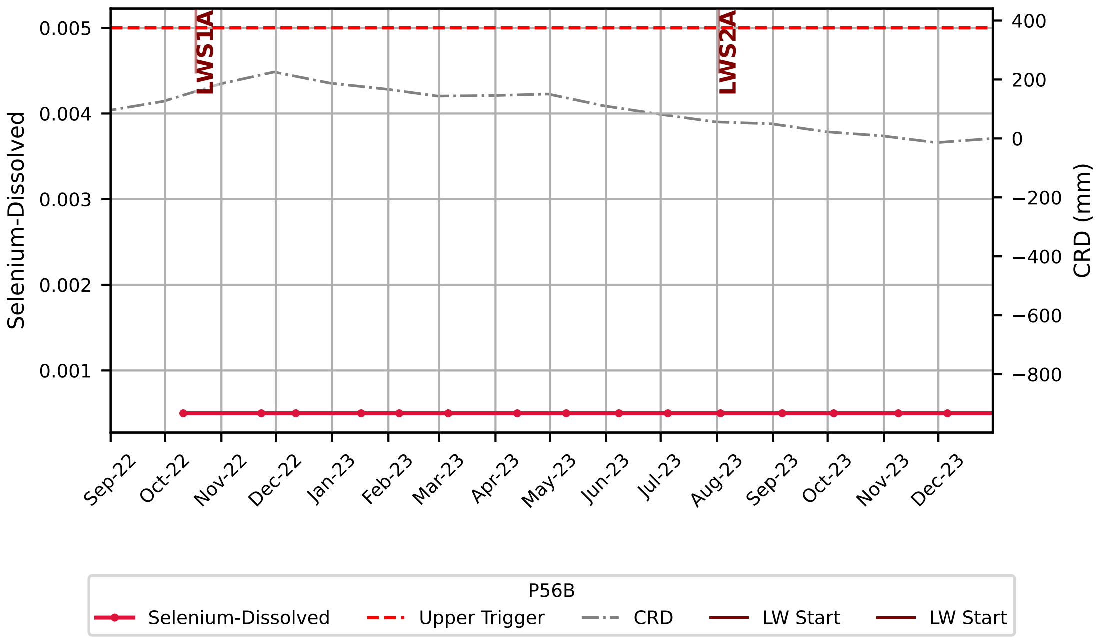
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



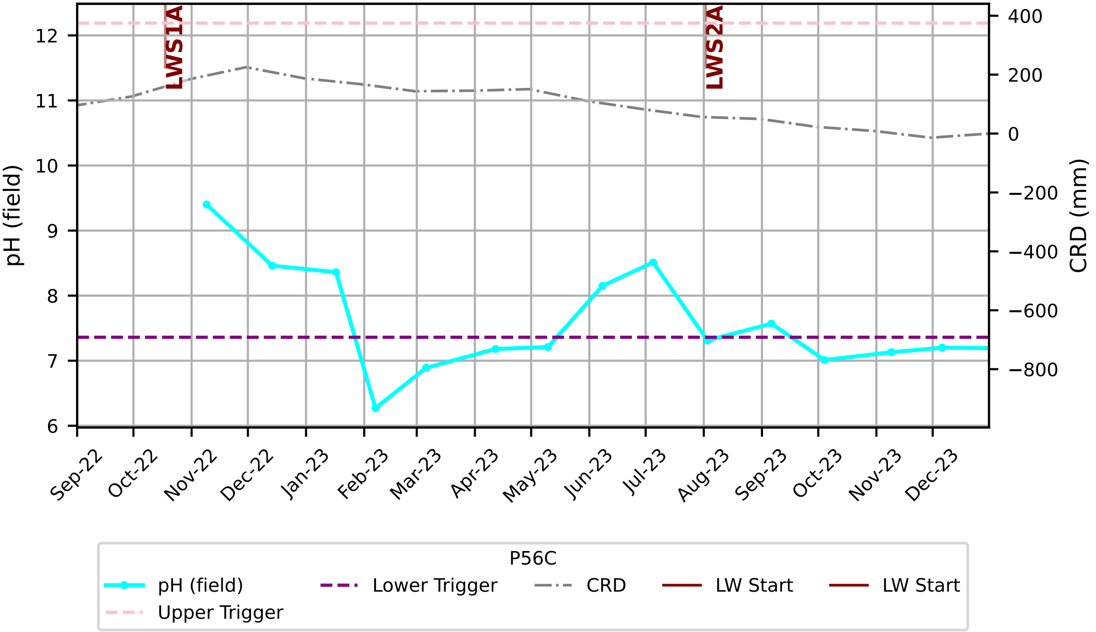
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



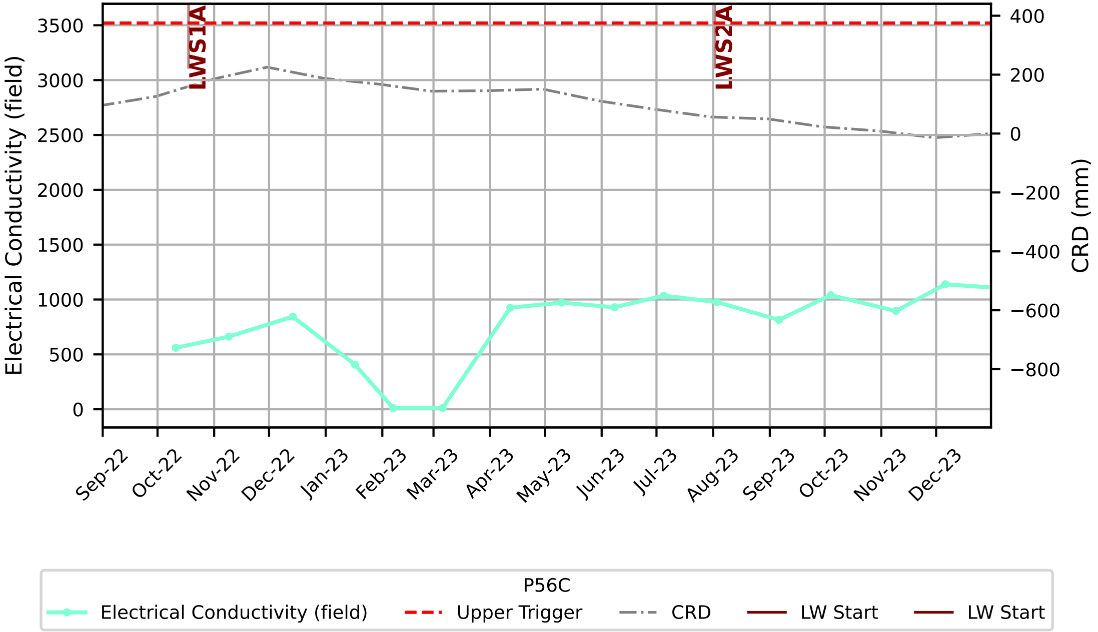
LWS1A
LWS2A
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
Barium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



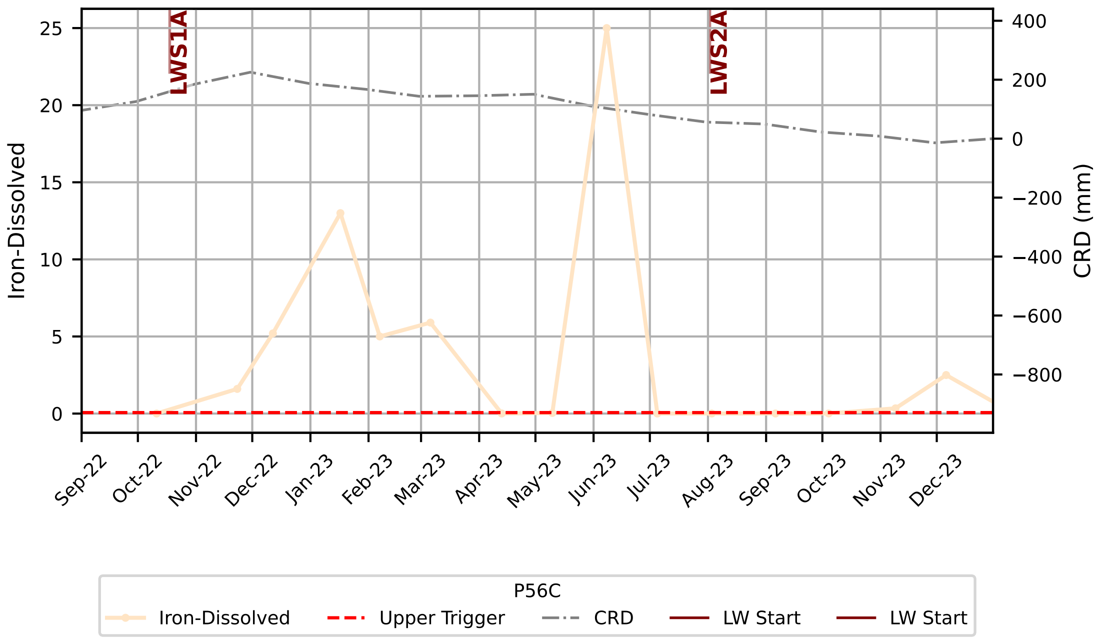
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



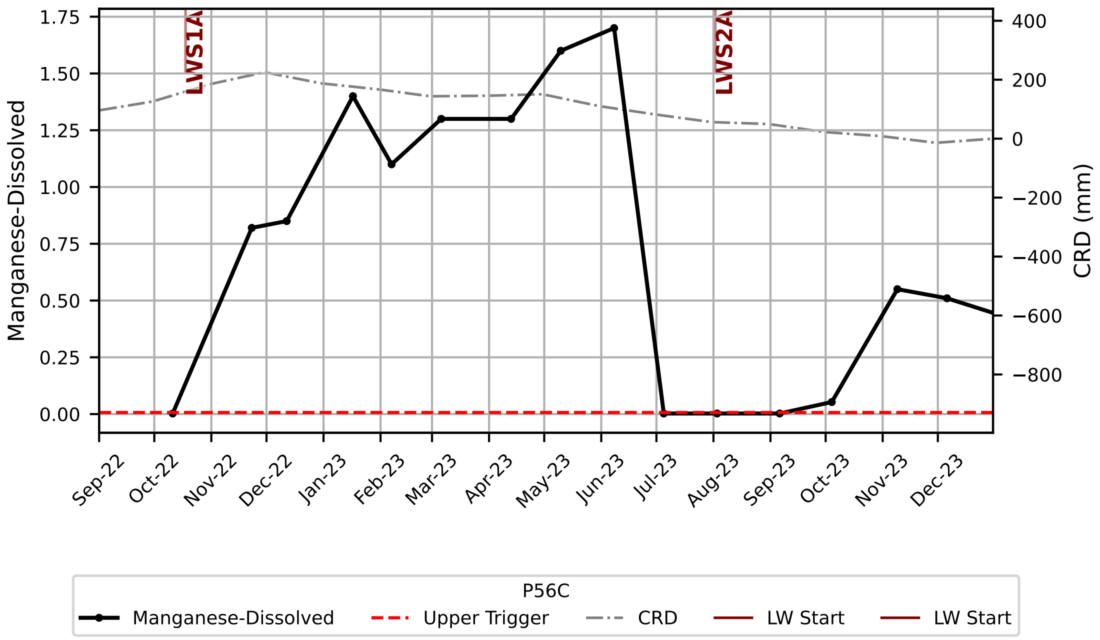
LWS1A
LWS2A
pH (field)
CRD (mm)
12
11
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



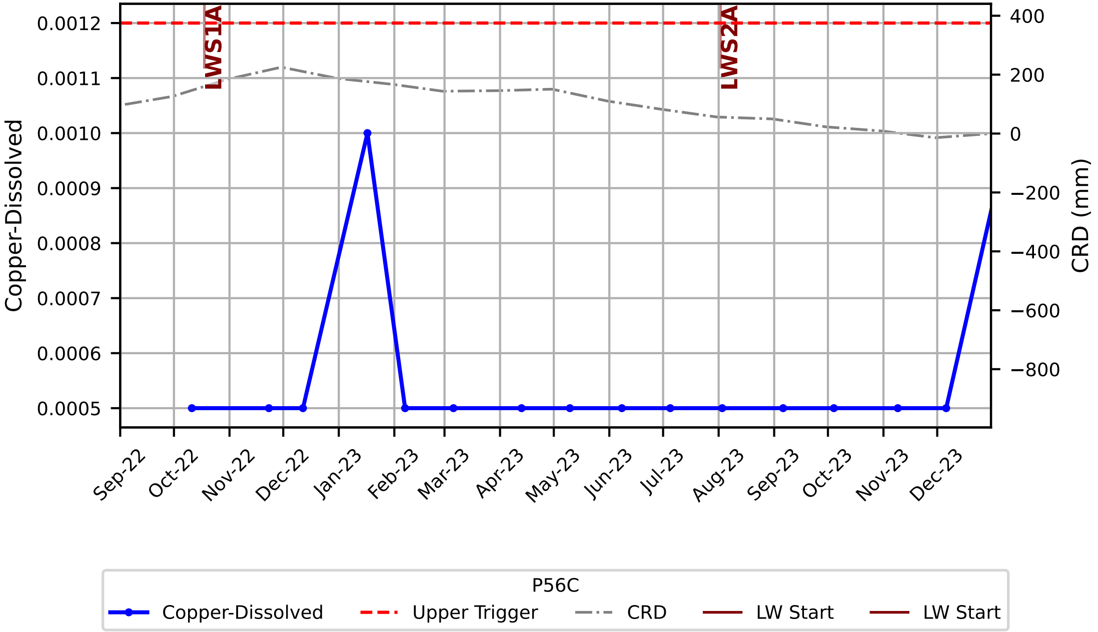
LWS1A
LWS2A
3500
3000
2500
2000
1500
1000
500
0
Electrical Conductivity (field)
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



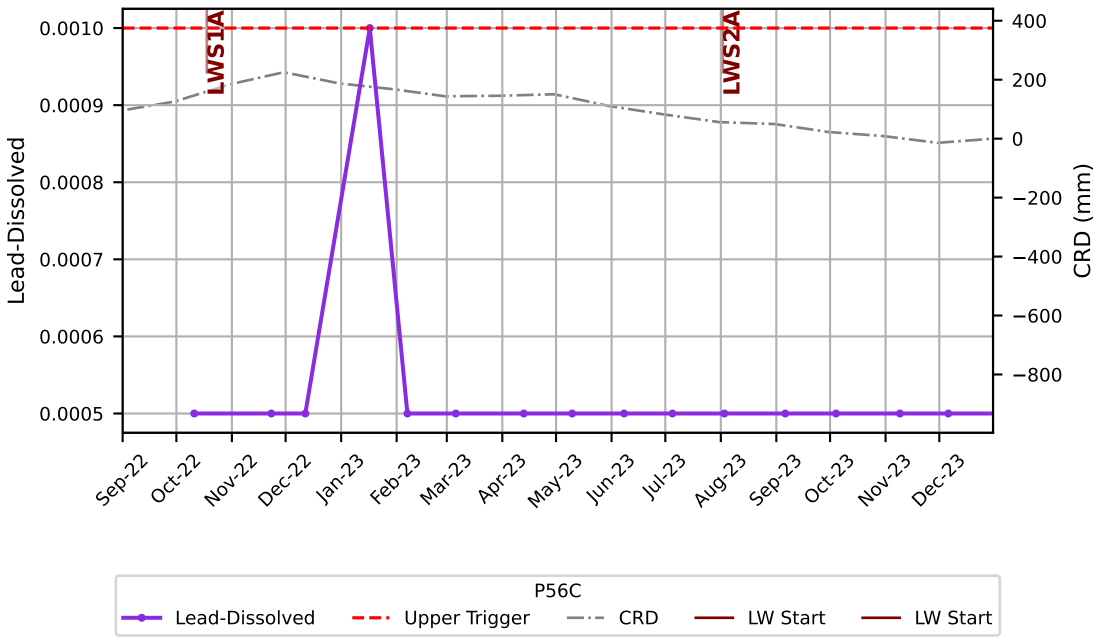
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



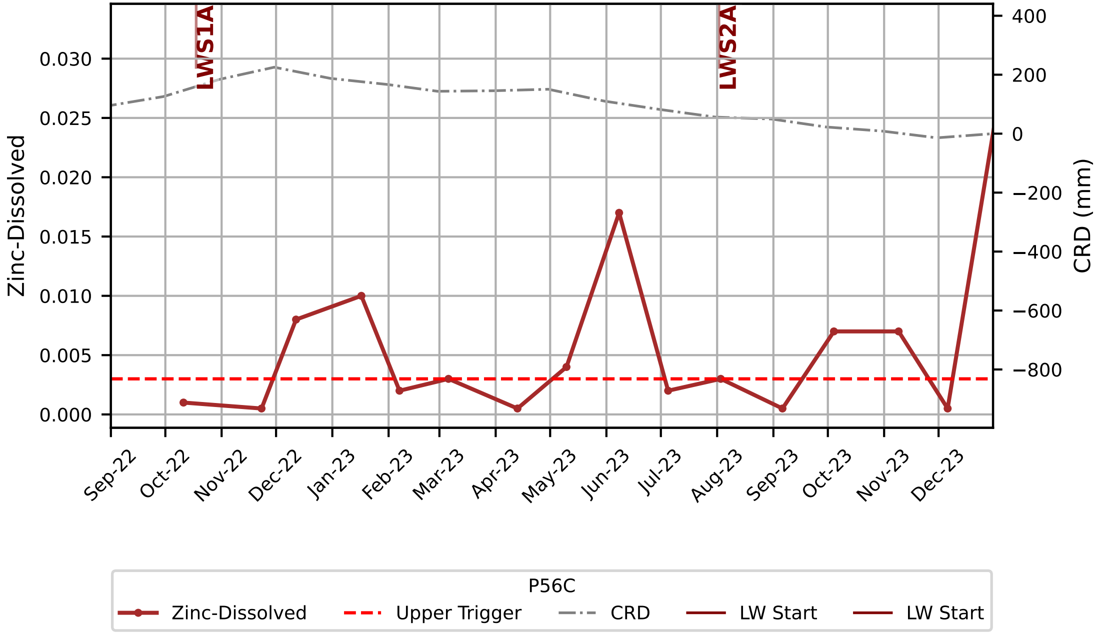
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



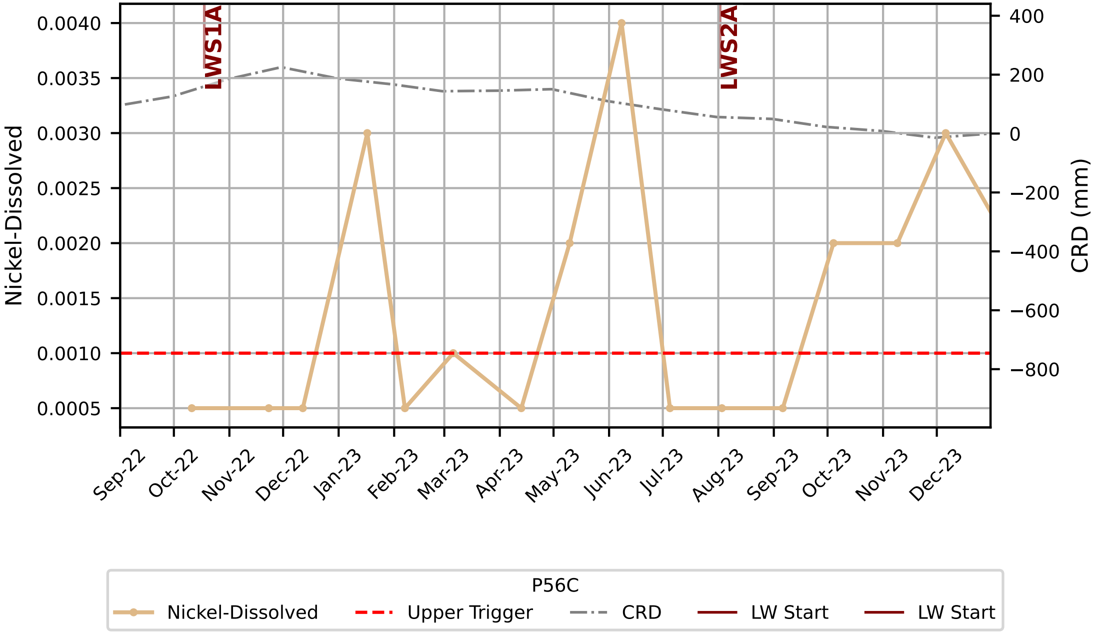
LWS1A
LWS2A
Copper-Dissolved
0.0012
0.0011
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



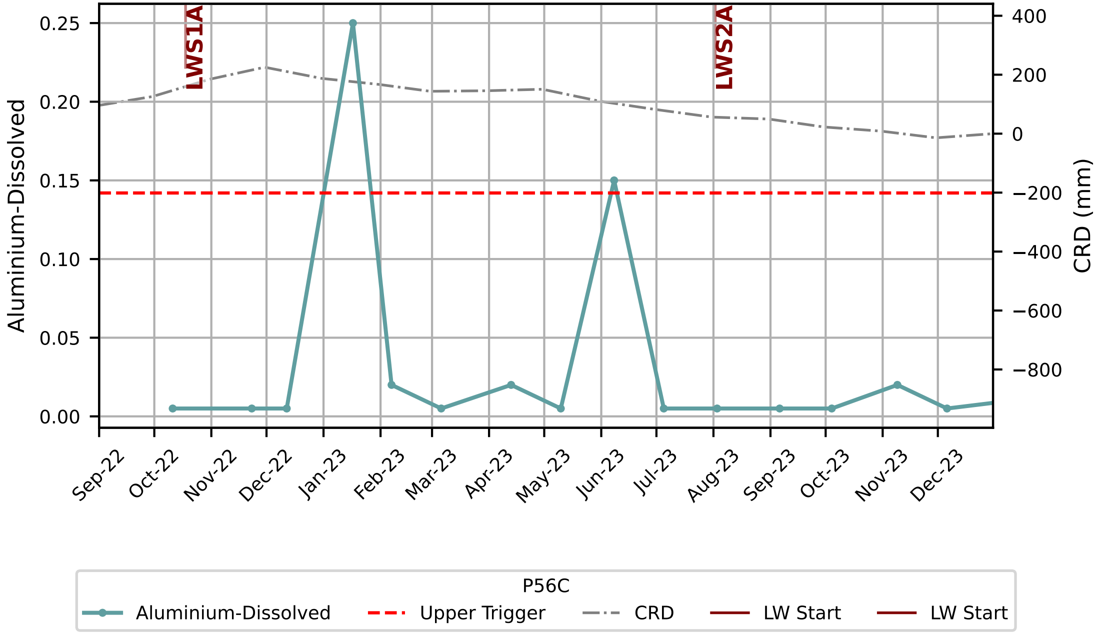
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



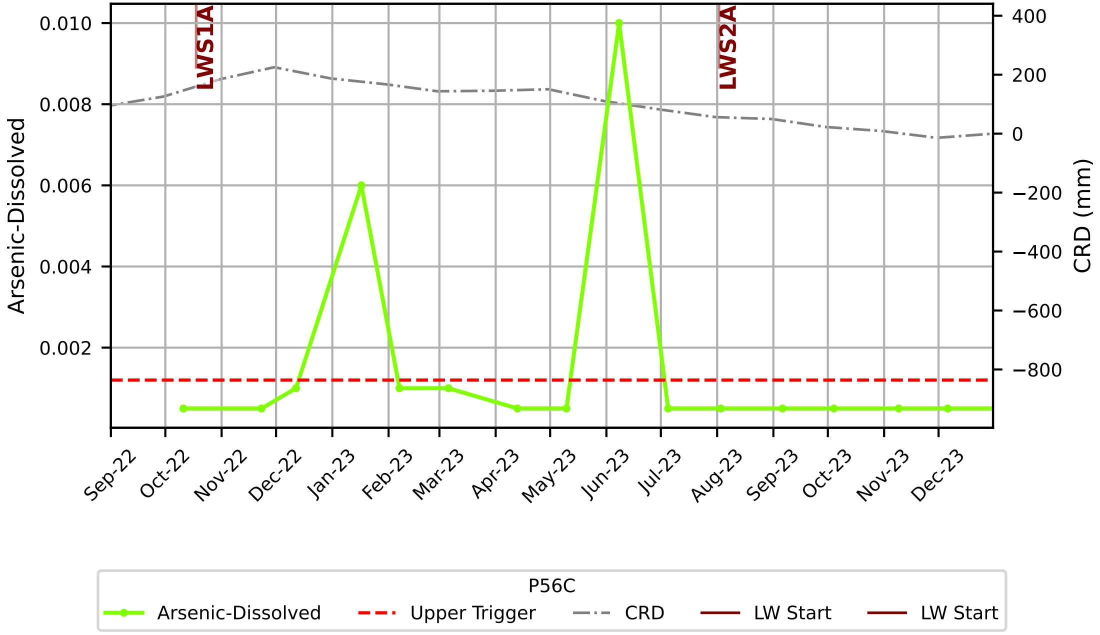
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.030
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



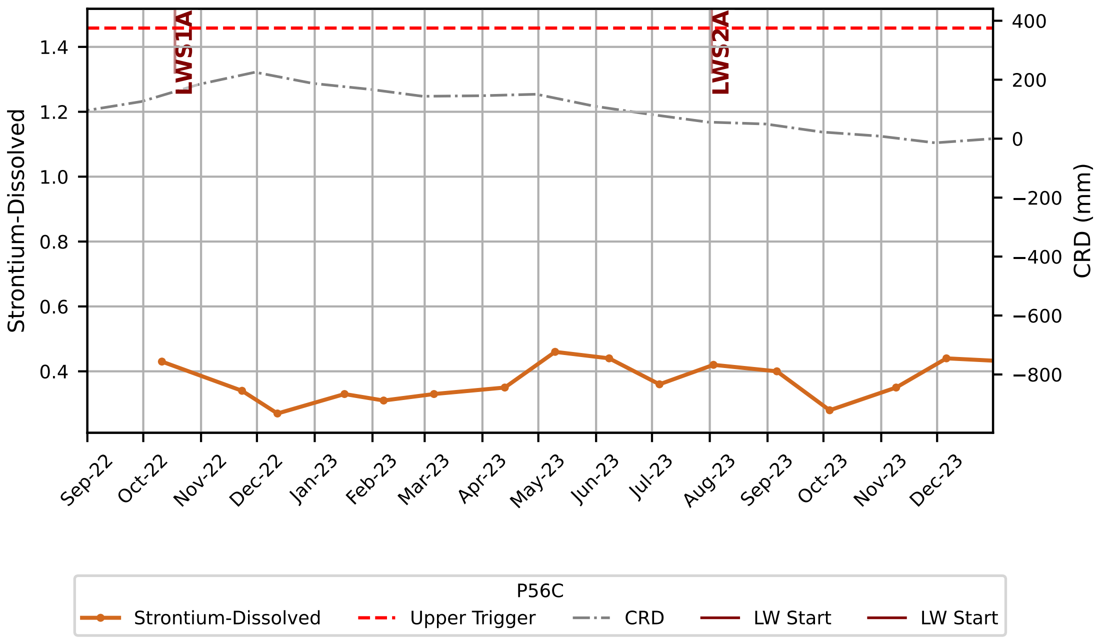
Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



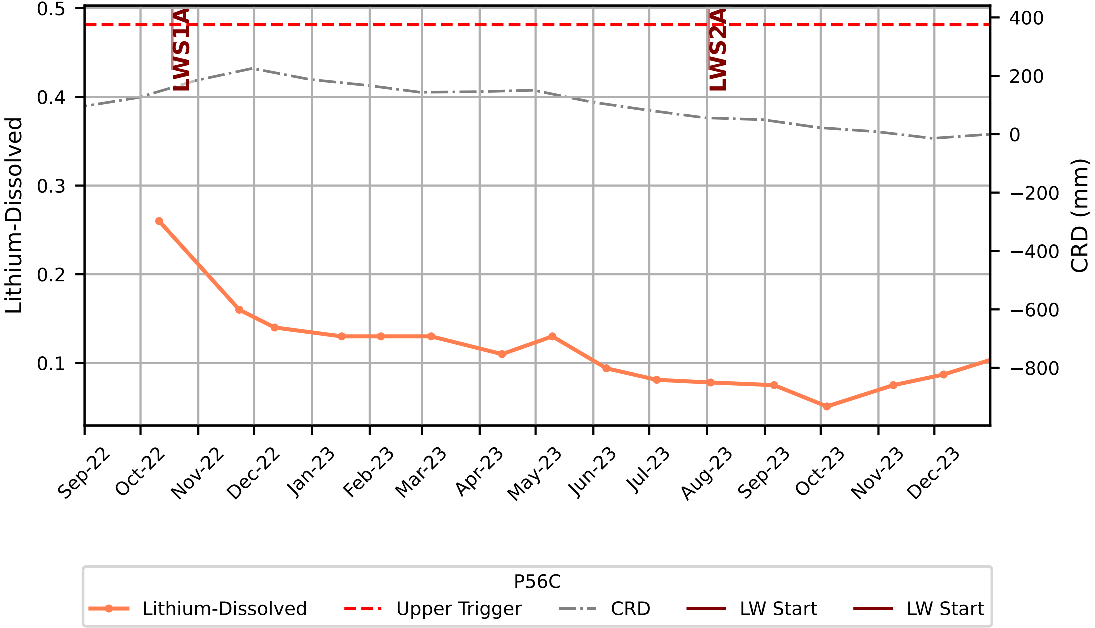
LWS1A
LWS2A
0.25
0.20
0.15
0.10
0.05
0.00
Aluminium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



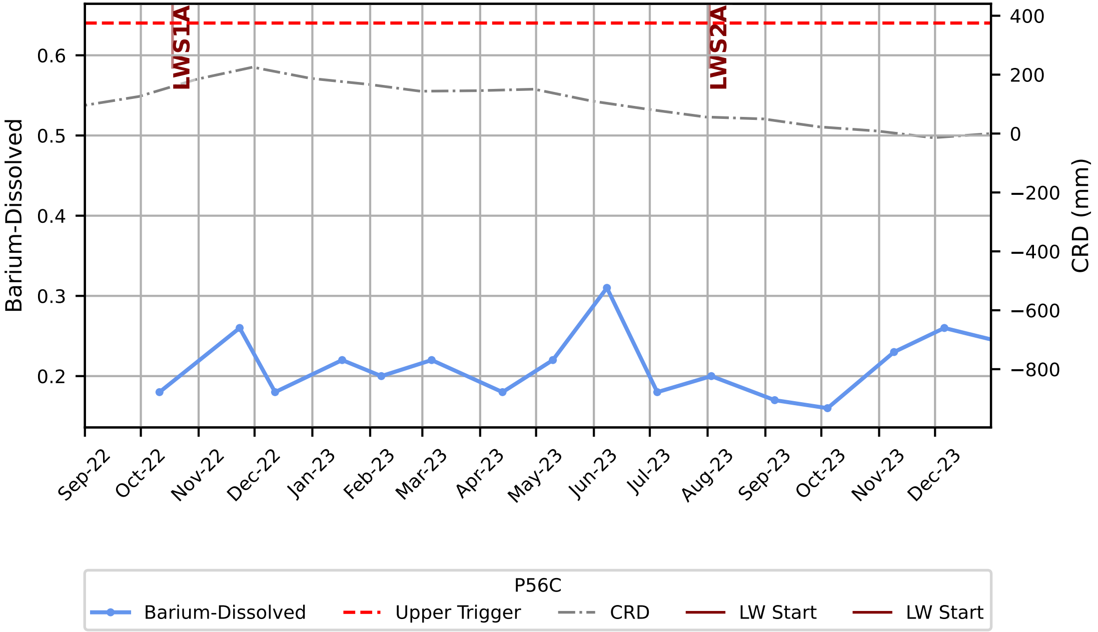
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.010
0.008
0.006
0.004
0.002
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



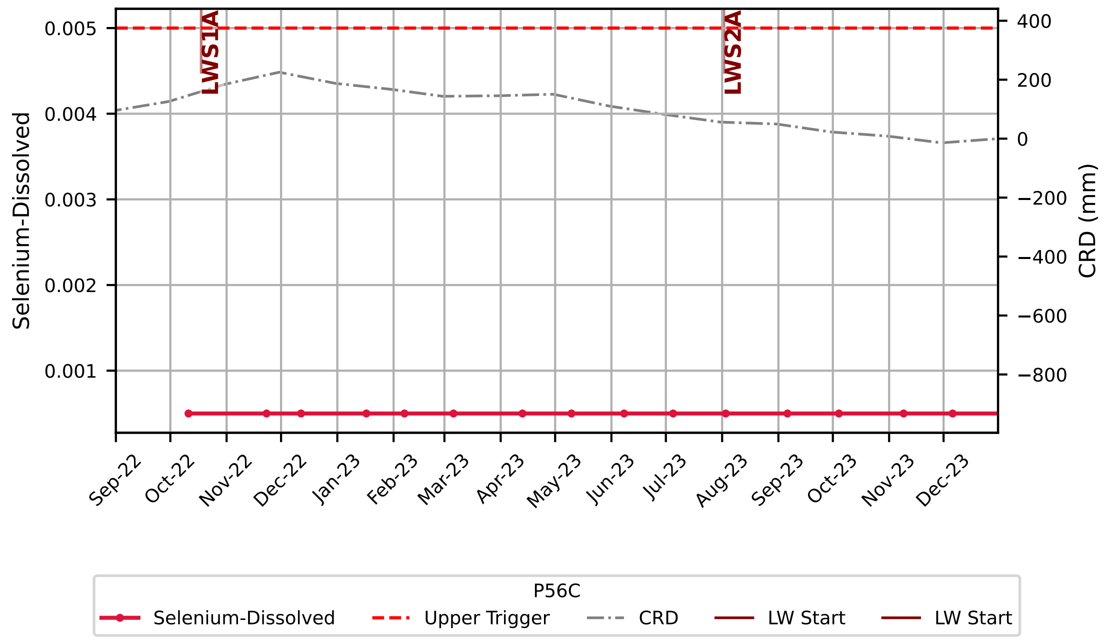
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.4
1.2
1.0
0.8
0.6
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



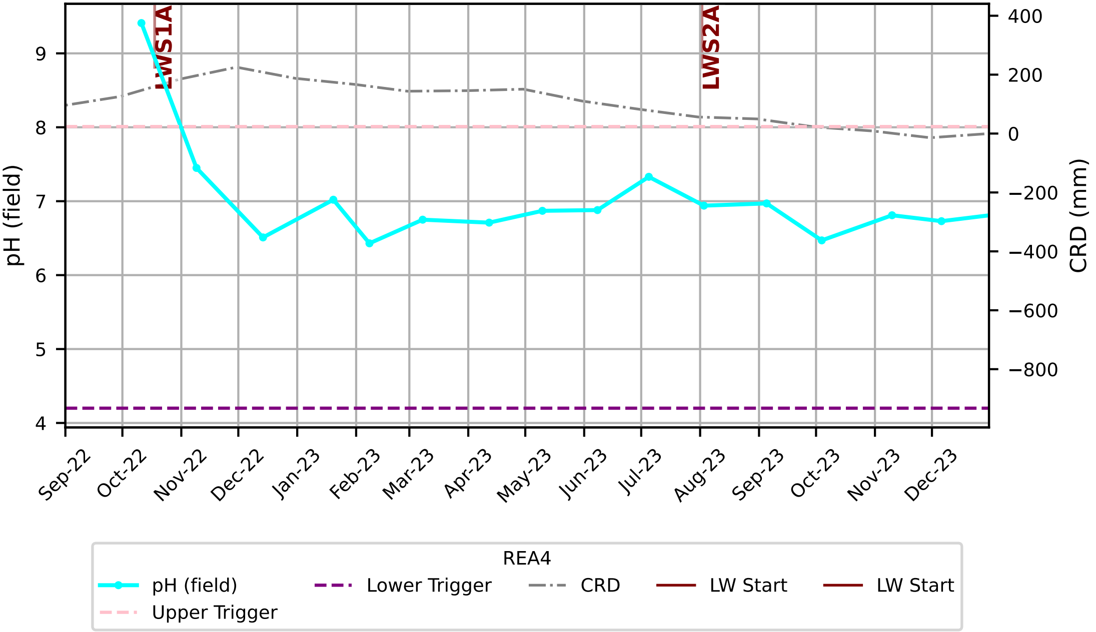
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.5
0.4
0.3
0.2
0.1
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

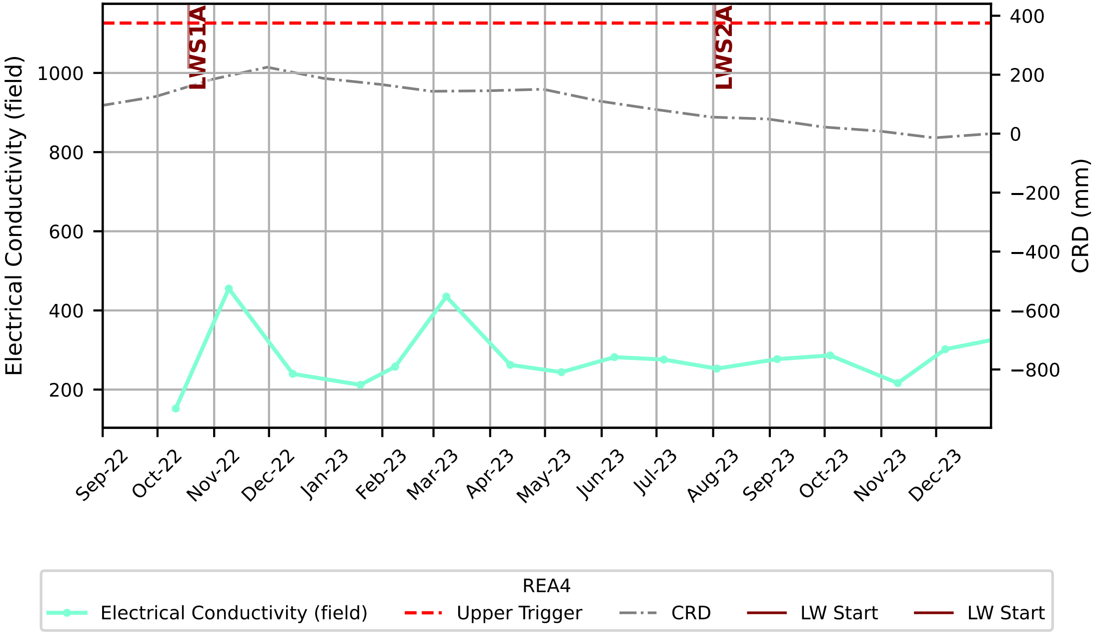


LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

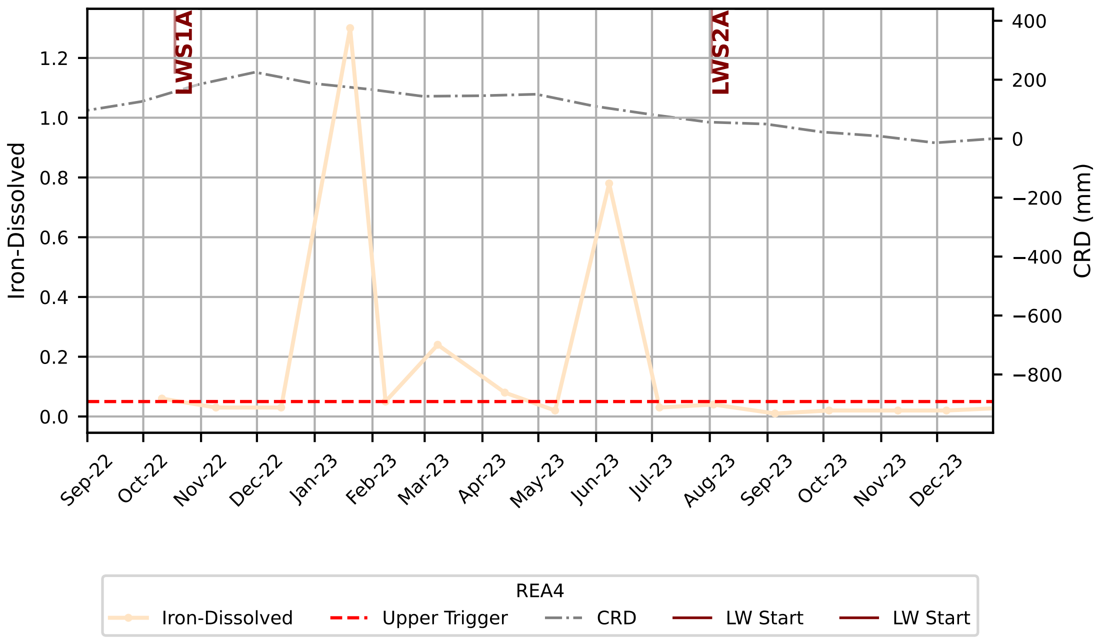


LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

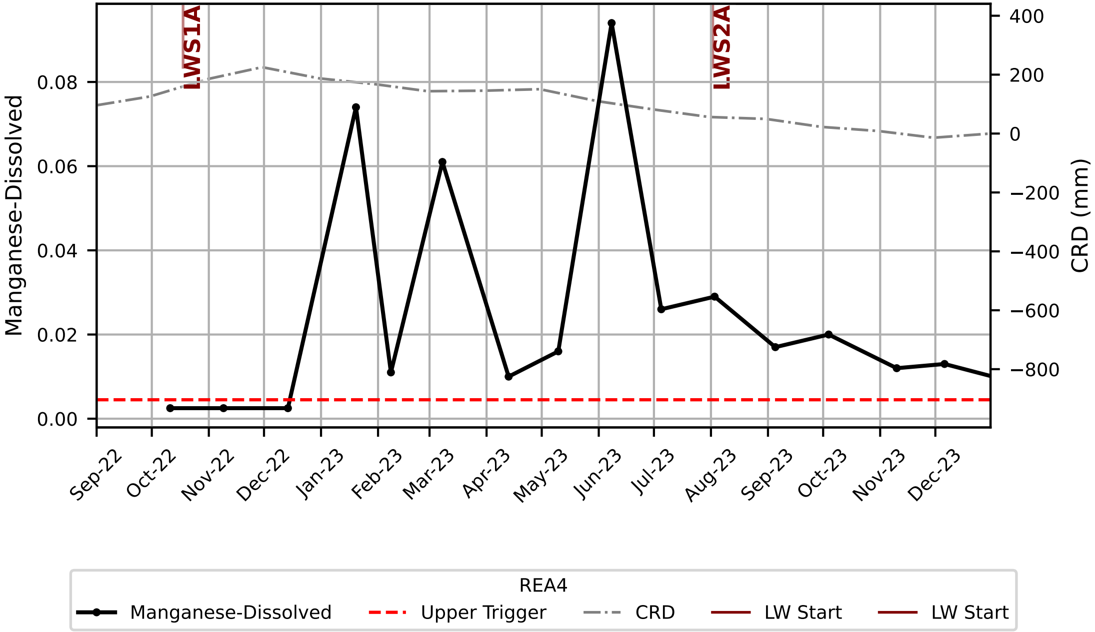

LWS1A
LWS2A
pH (field)
CRD (mm)
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



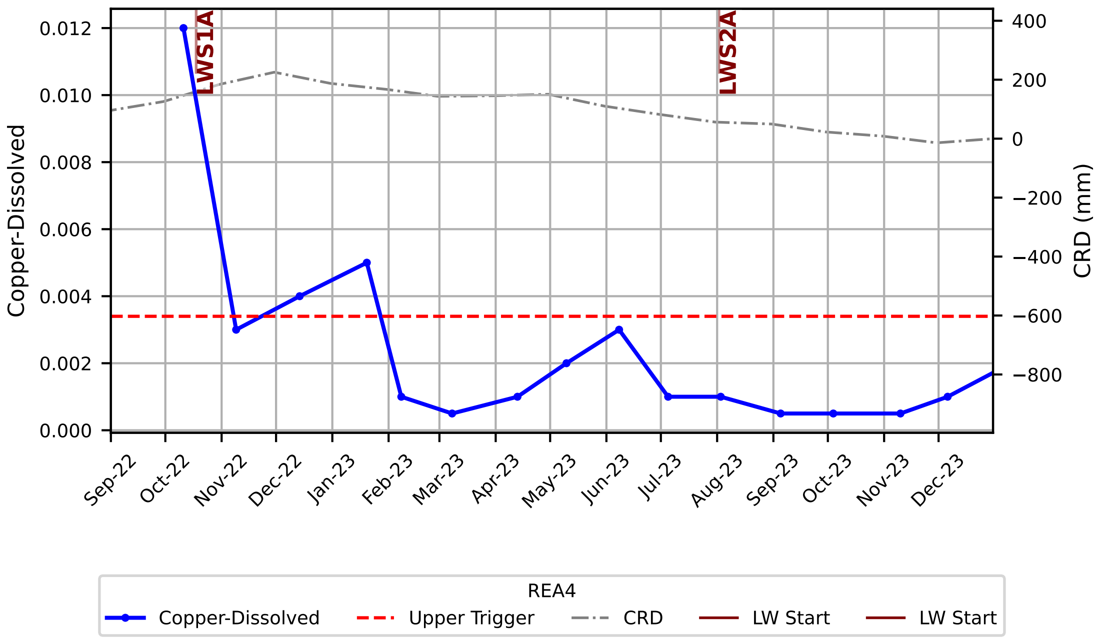
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1000
800
600
400
200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



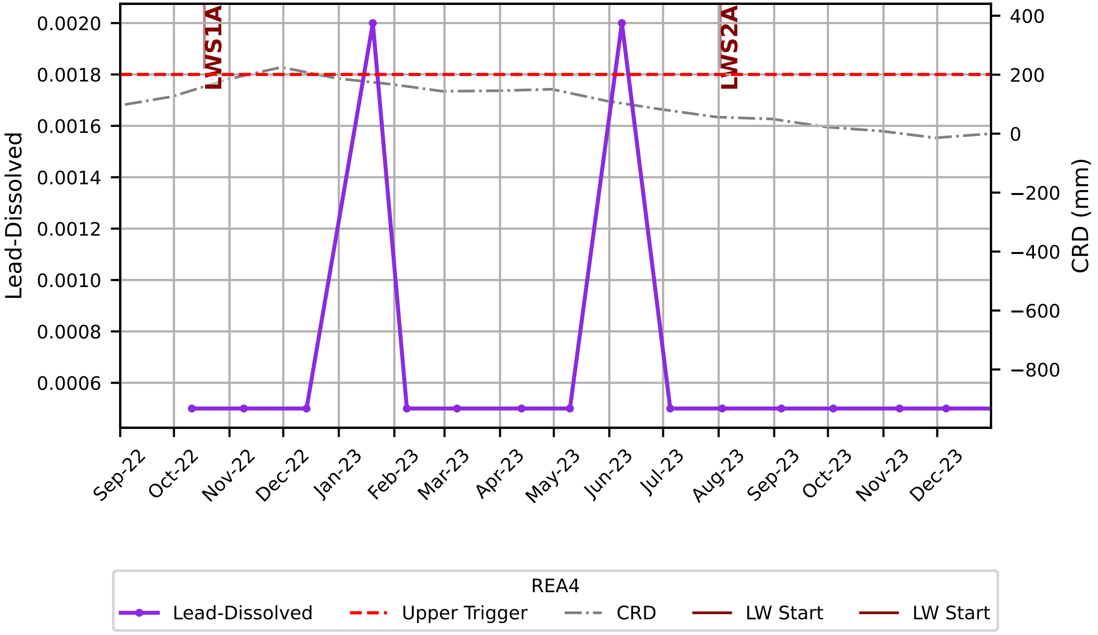
LWS1A
LWS2A
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Iron-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



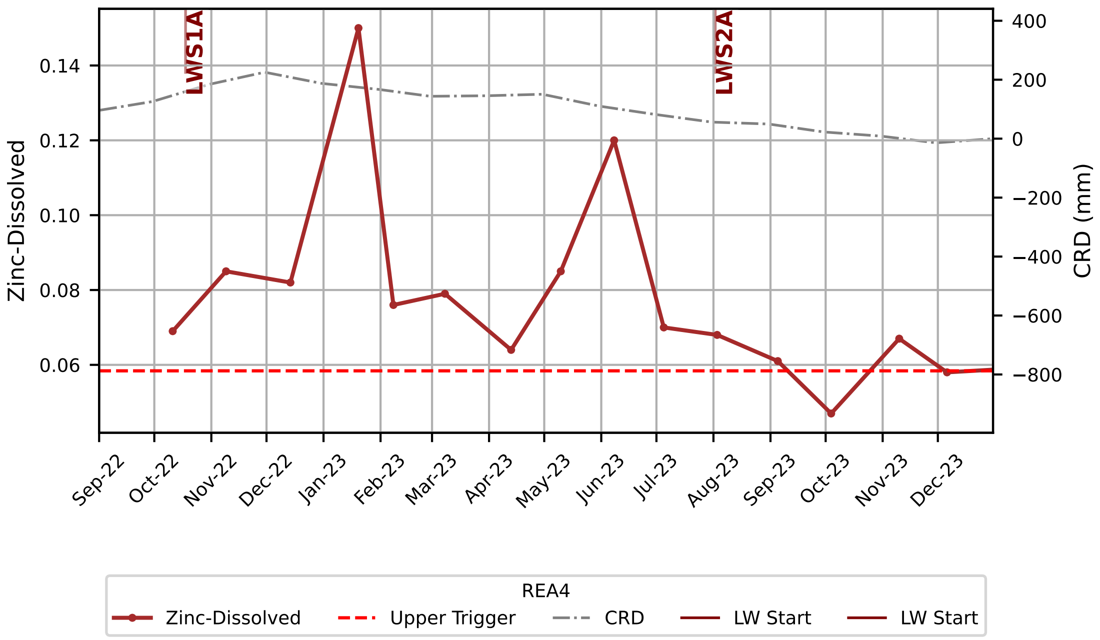
LWS1A
LWS2A
Manganese-Dissolved
0.00
0.02
0.04
0.06
0.08
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



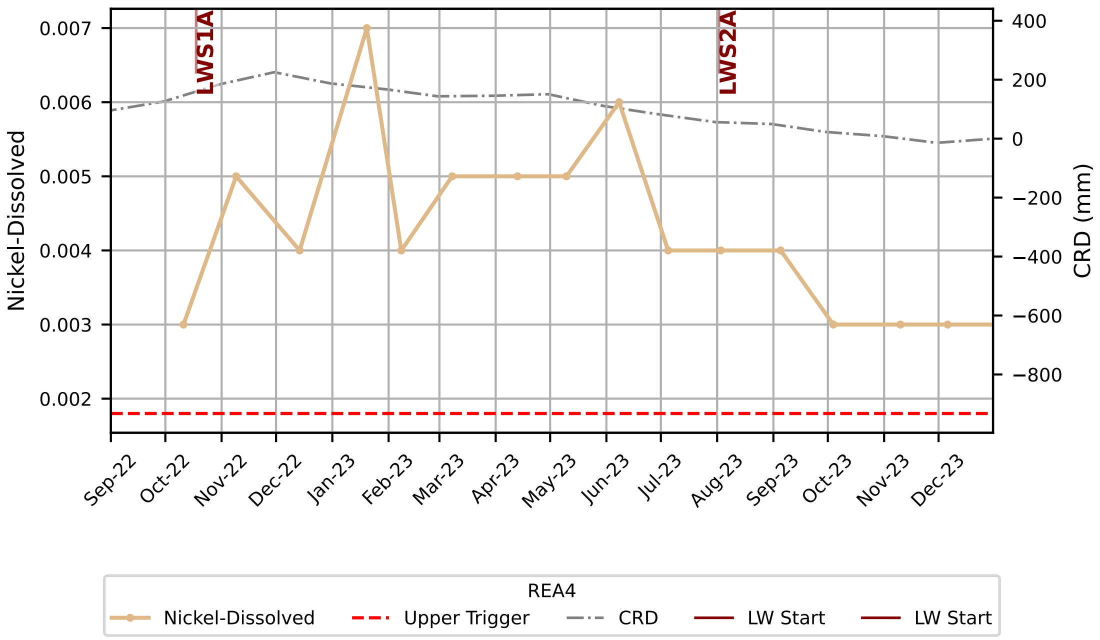
Copper-Dissolved
0.000
0.002
0.004
0.006
0.008
0.010
0.012
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



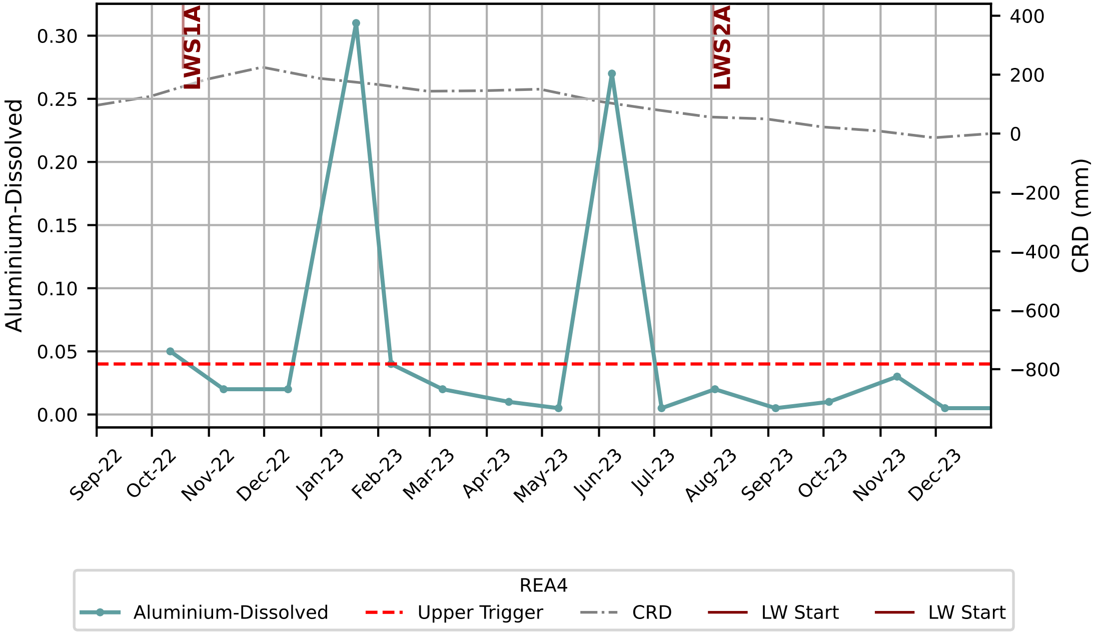
LWS1A
LWS2A
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



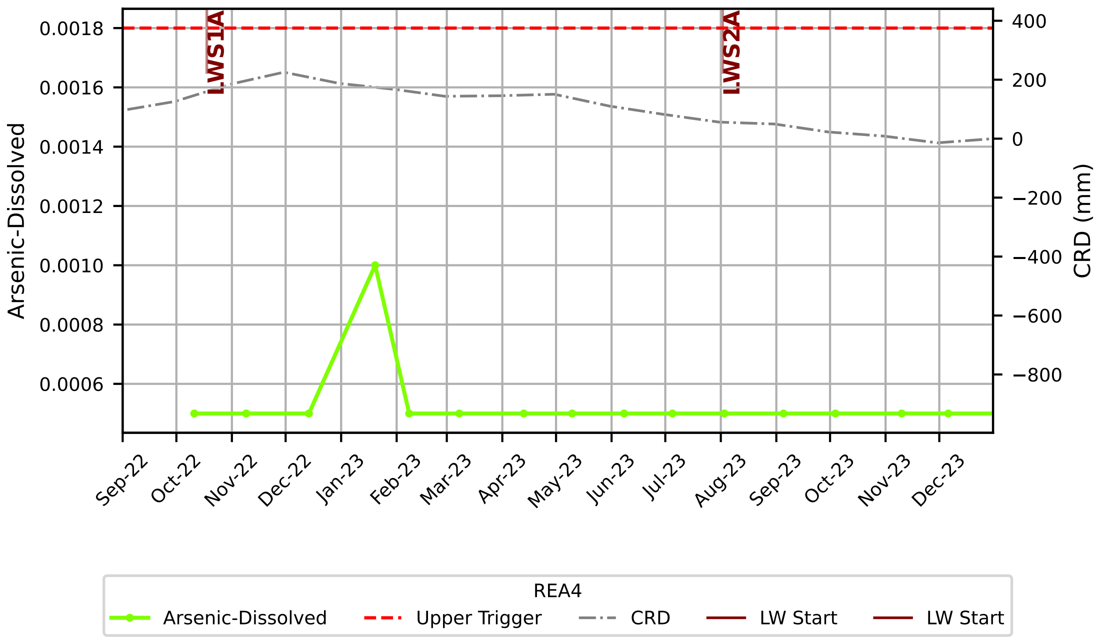
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



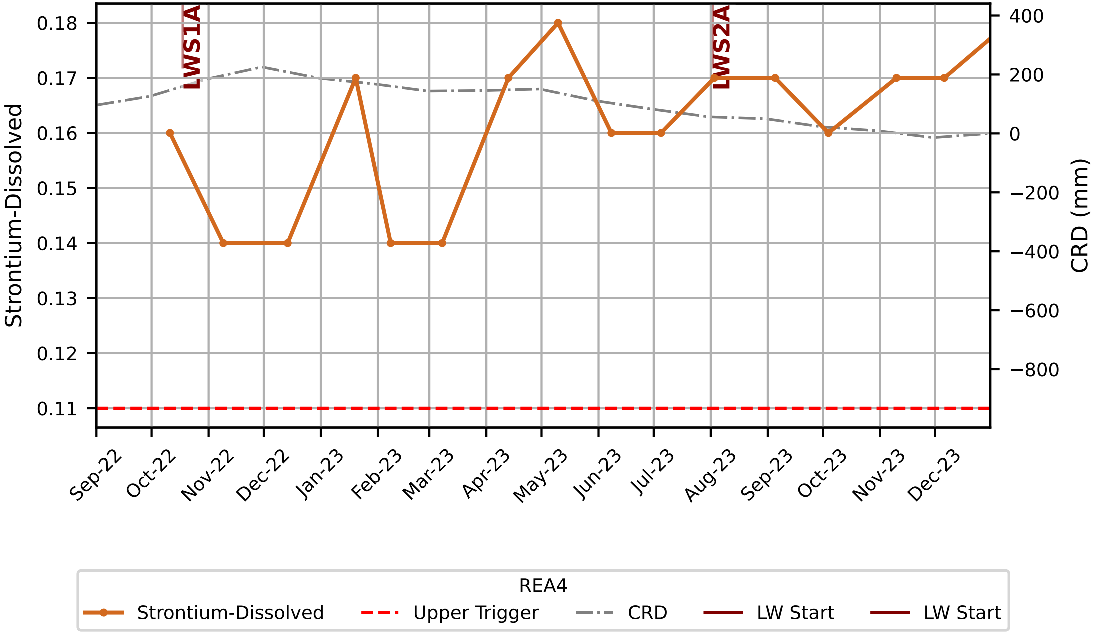
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.007
0.006
0.005
0.004
0.003
0.002
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



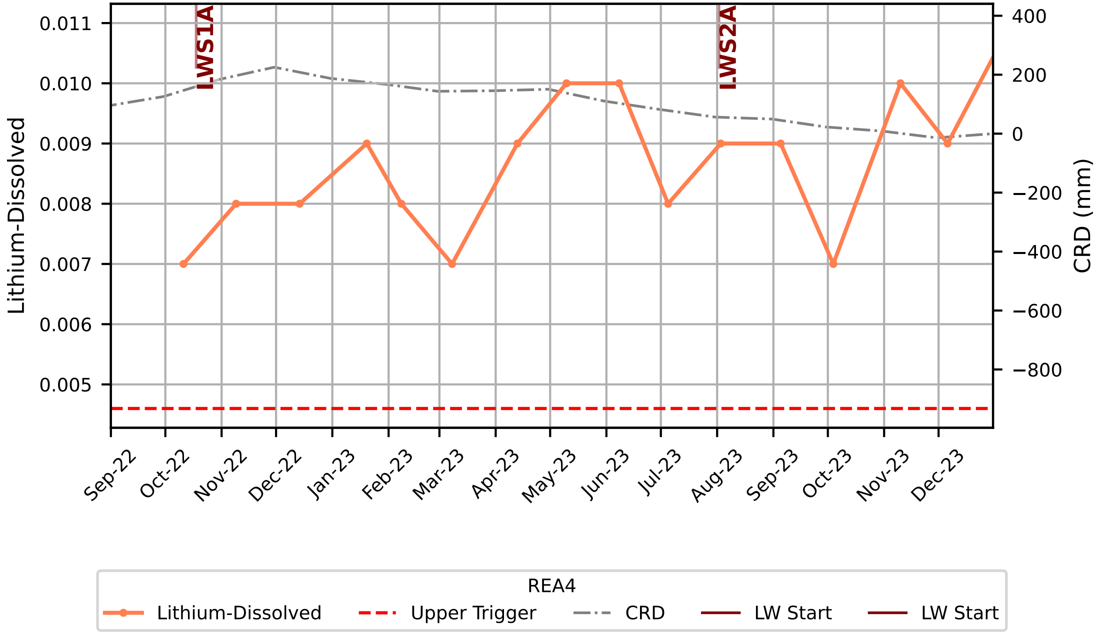
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



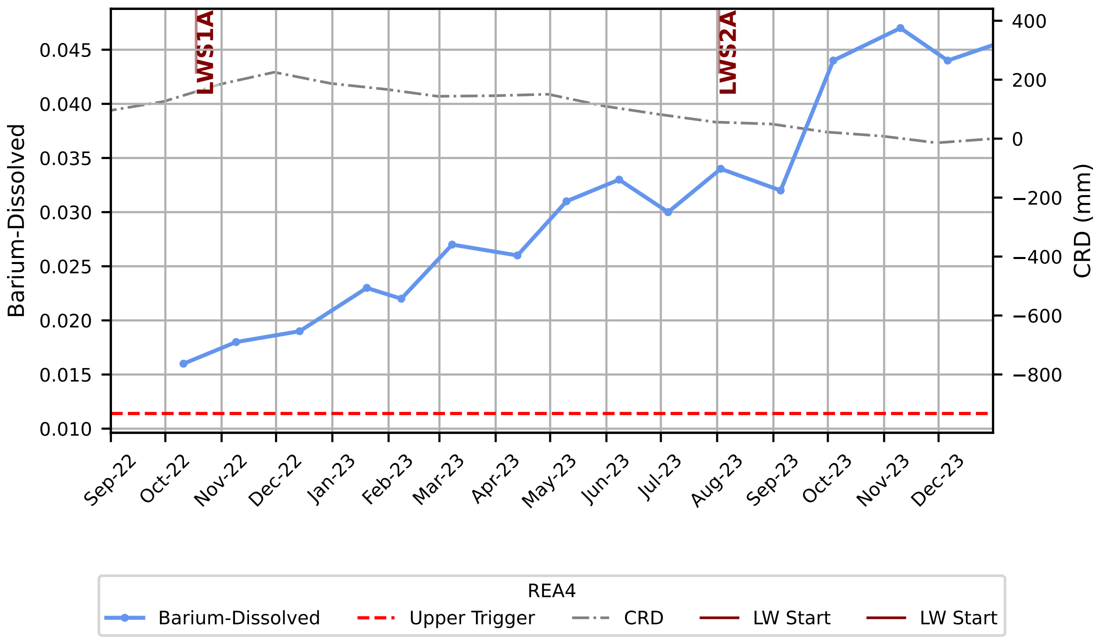
Arsenic-Dissolved
CRD (mm)
LWS1A
LWS2A
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



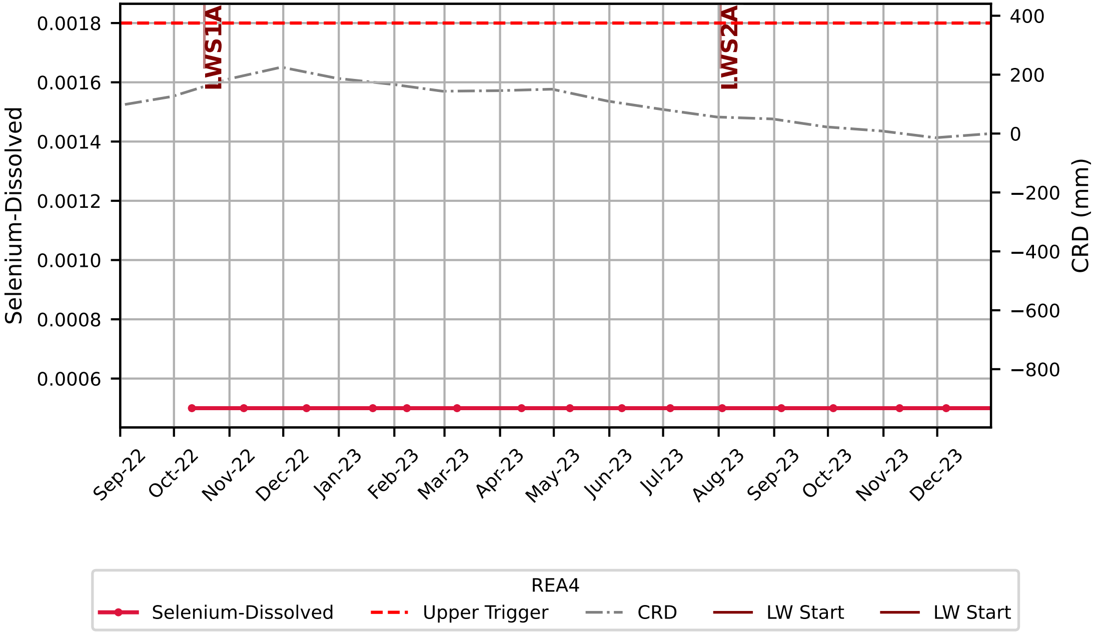
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



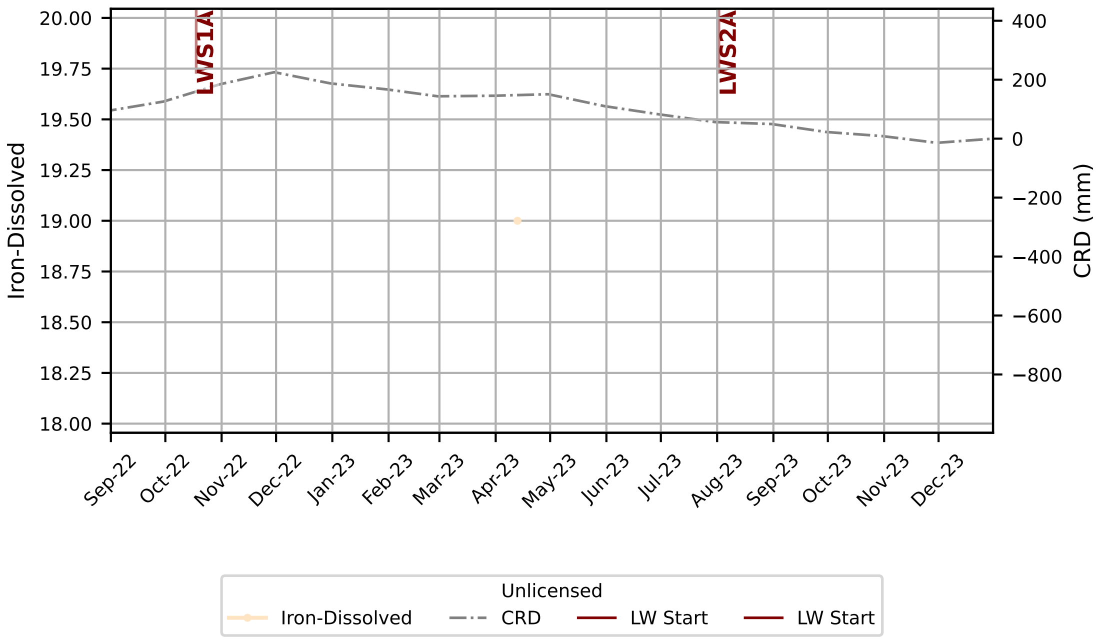
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



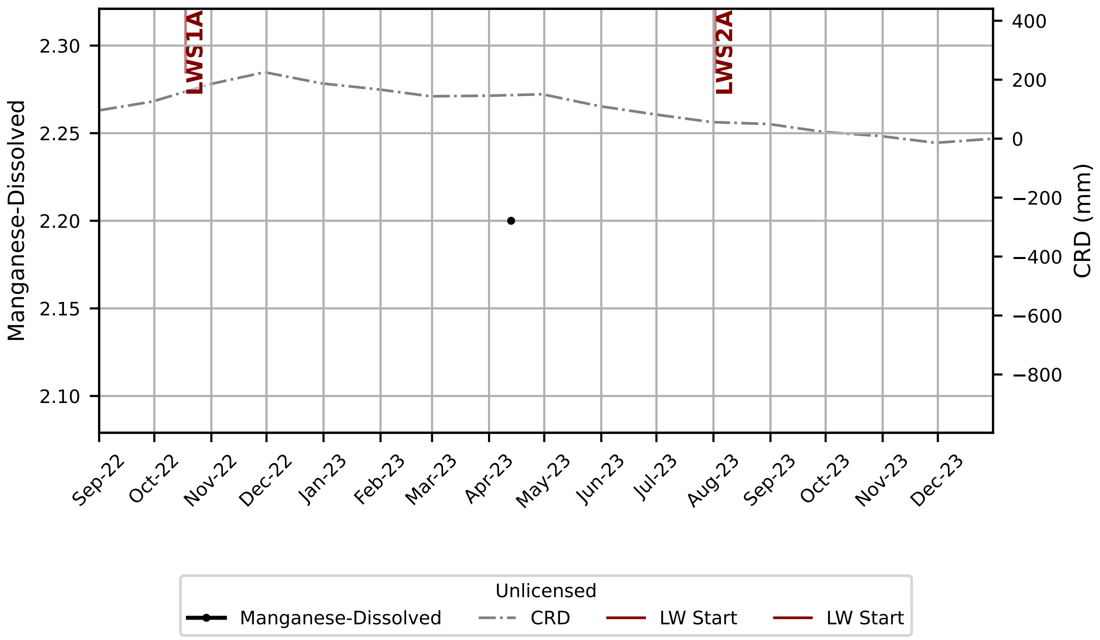
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



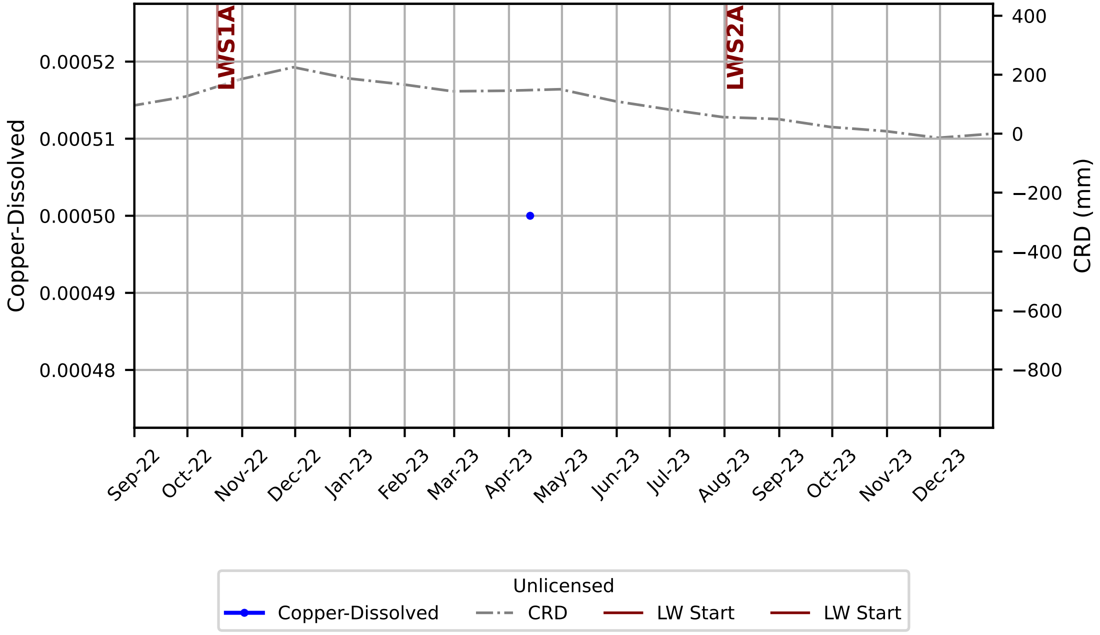
Selenium-Dissolved
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



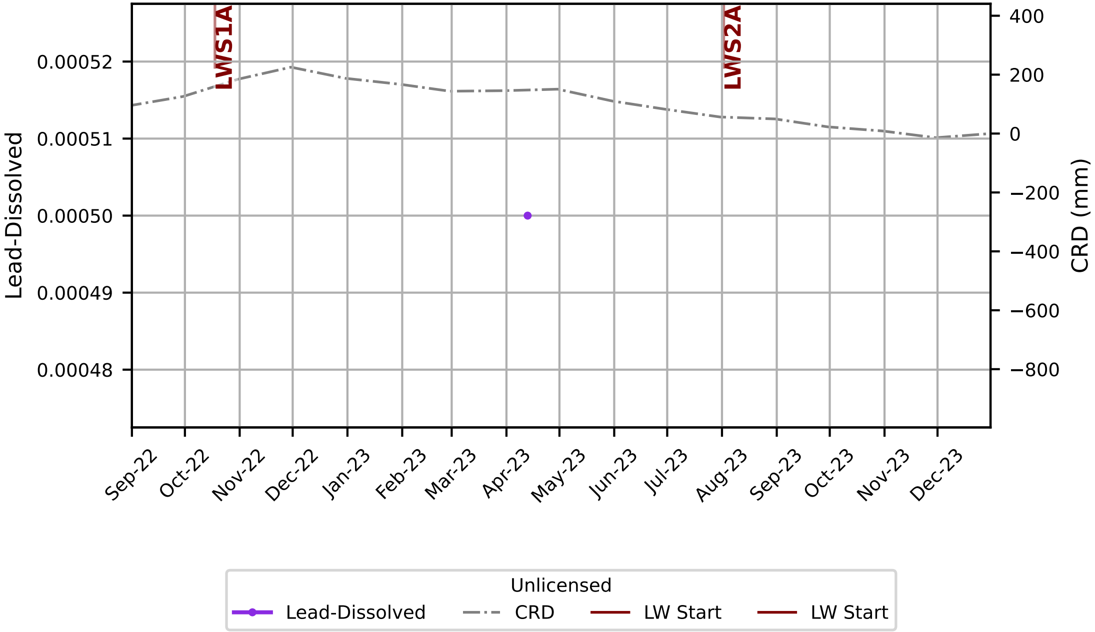
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
20.00
19.75
19.50
19.25
19.00
18.75
18.50
18.25
18.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Iron-Dissolved
CRD
LW Start
LW Start



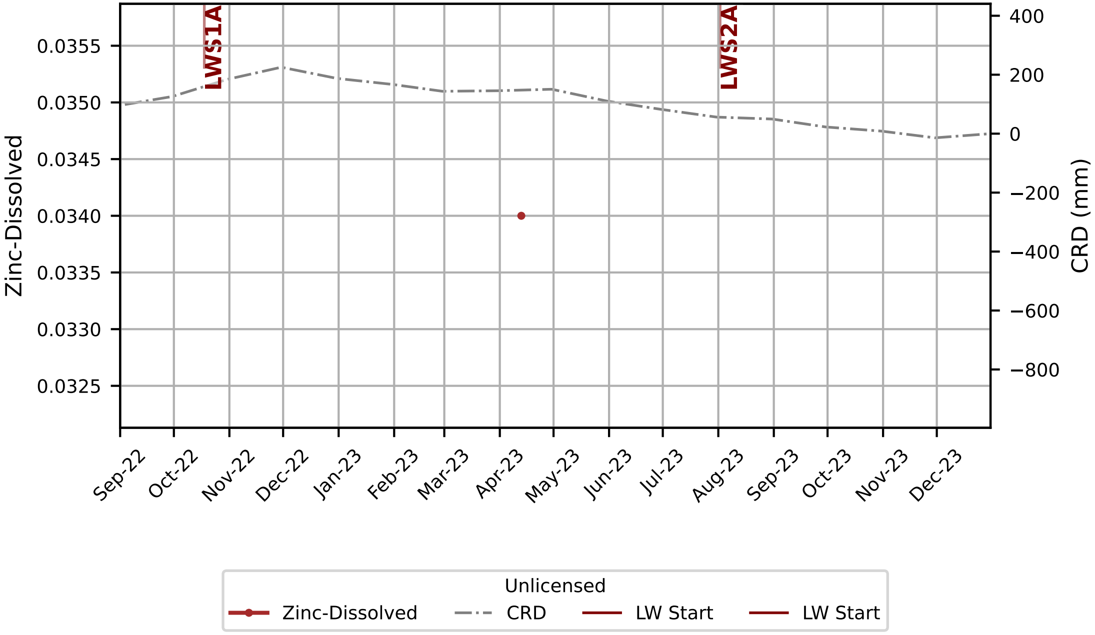
LWS1A
LWS2A
Manganese-Dissolved
2.30
2.25
2.20
2.15
2.10
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Manganese-Dissolved
CRD
LW Start
LW Start



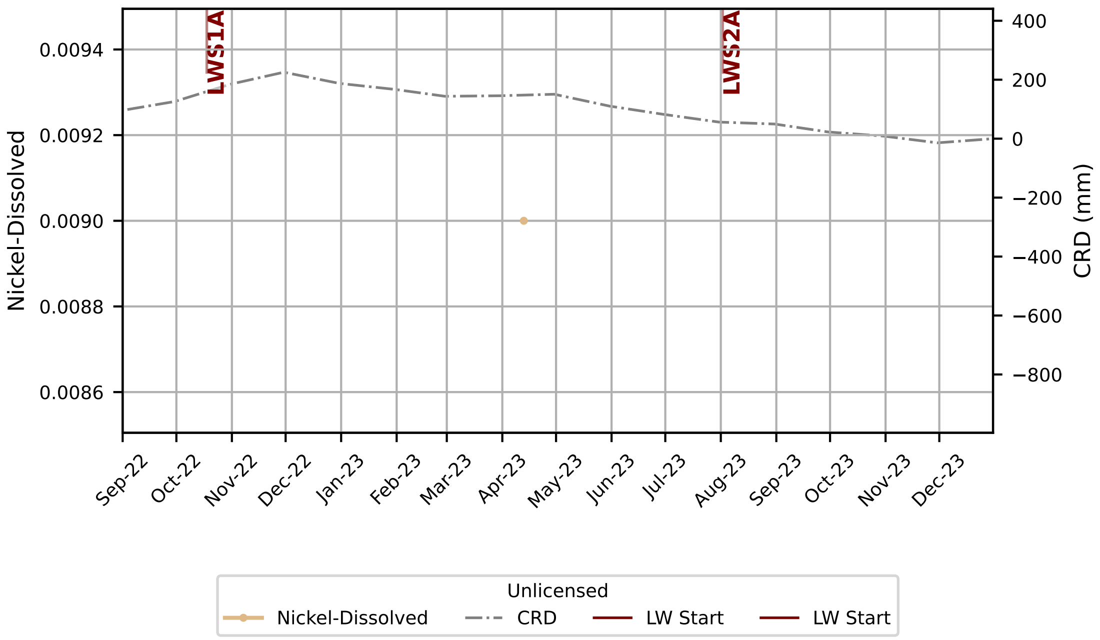
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Copper-Dissolved
CRD
LW Start
LW Start



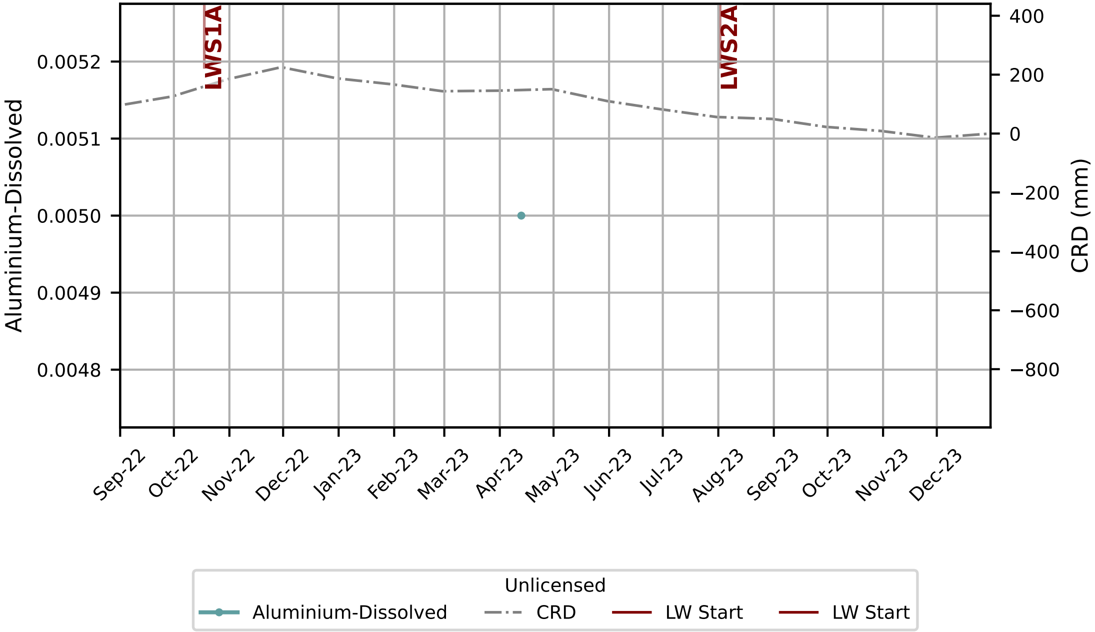
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Lead-Dissolved
CRD
LW Start
LW Start



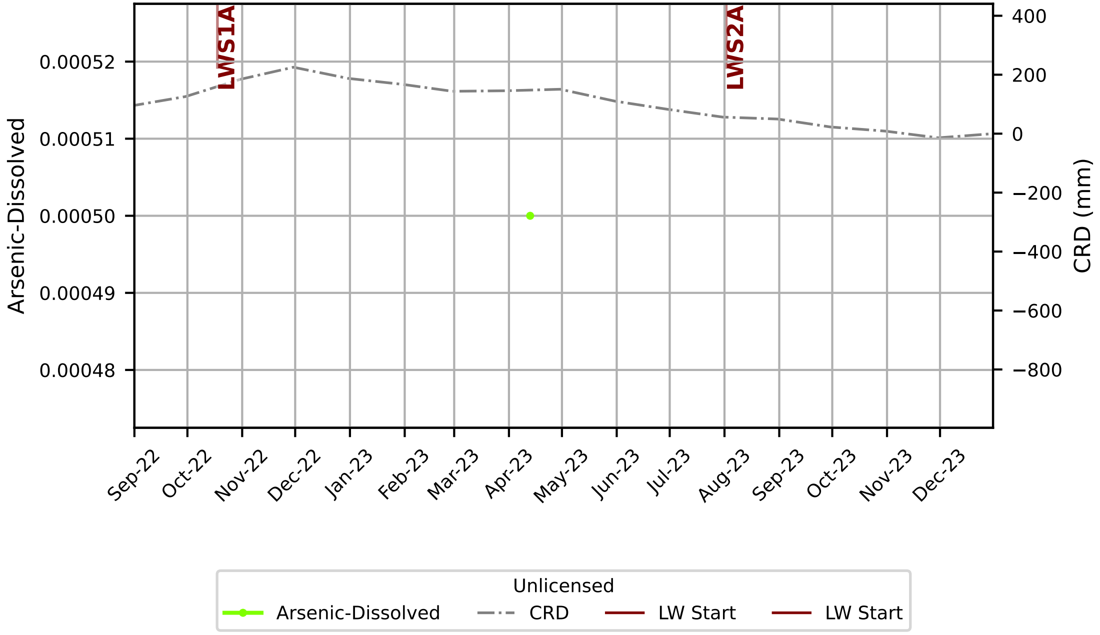
Zinc-Dissolved
CRD (mm)
0.0355
0.0350
0.0345
0.0340
0.0335
0.0330
0.0325
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Zinc-Dissolved
CRD
LW Start
LW Start



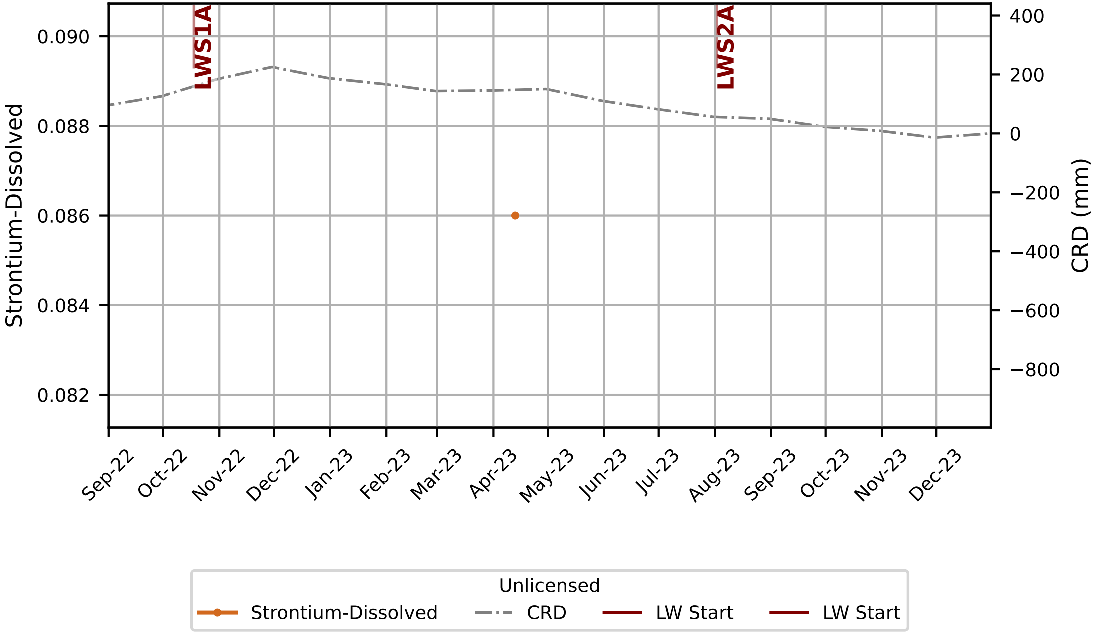
Nickel-Dissolved
CRD (mm)
0.0094
0.0092
0.0090
0.0088
0.0086
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Nickel-Dissolved
CRD
LW Start
LW Start



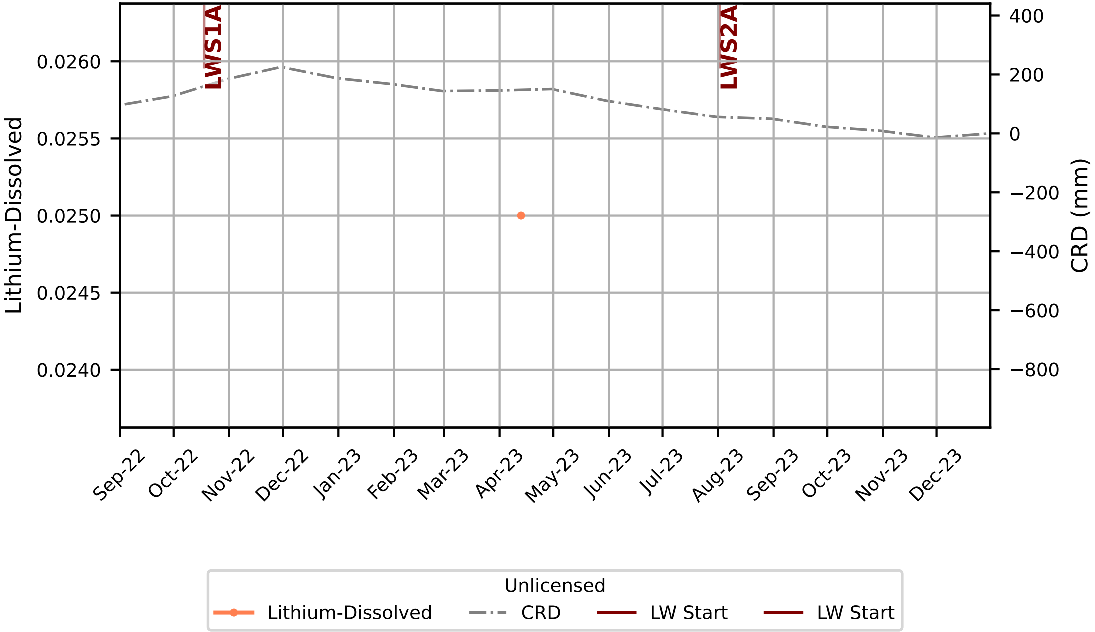
Aluminium-Dissolved
CRD (mm)
0.0052
0.0051
0.0050
0.0049
0.0048
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Aluminium-Dissolved
CRD
LW Start
LW Start



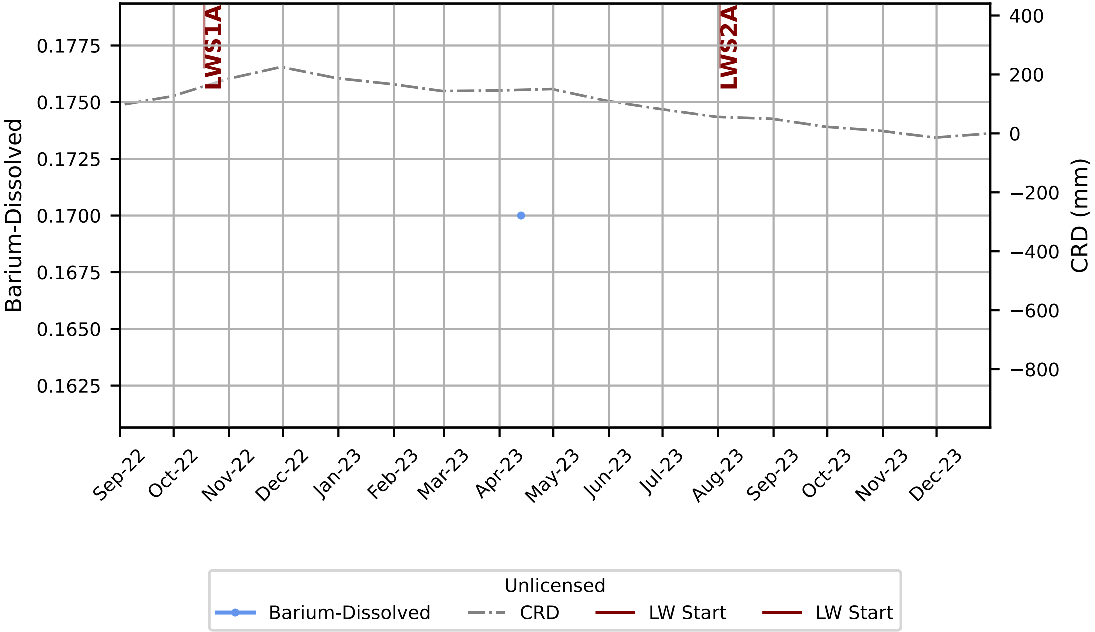
LWS1A
LWS2A
Arsenic-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Arsenic-Dissolved
CRD
LW Start
LW Start



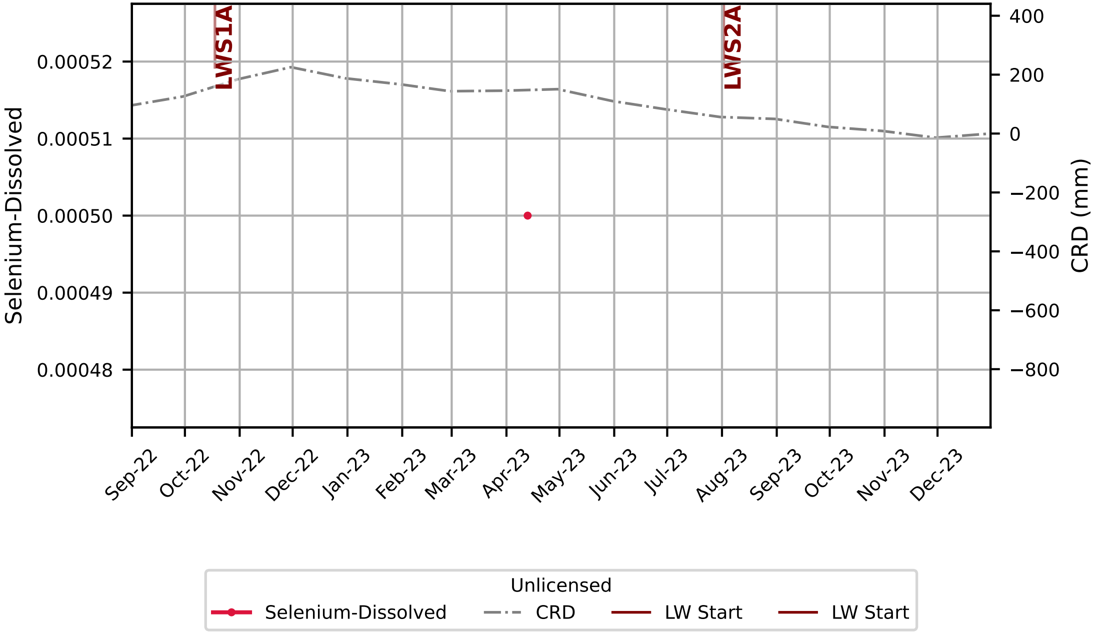
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.090
0.088
0.086
0.084
0.082
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Strontium-Dissolved
CRD
LW Start
LW Start



LWS1A
LWS2A
0.0260
0.0255
0.0250
0.0245
0.0240
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Lithium-Dissolved
CRD
LW Start
LW Start



Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.1775
0.1750
0.1725
0.1700
0.1675
0.1650
0.1625
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Barium-Dissolved
CRD
LW Start
LW Start



LWS1A
LWS2A
Selenium-Dissolved
0.00052
0.00051
0.00050
0.00049
0.00048
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Selenium-Dissolved
CRD
LW Start
LW Start

Appendix G Plots – Groundwater Quality – Revised TARPs

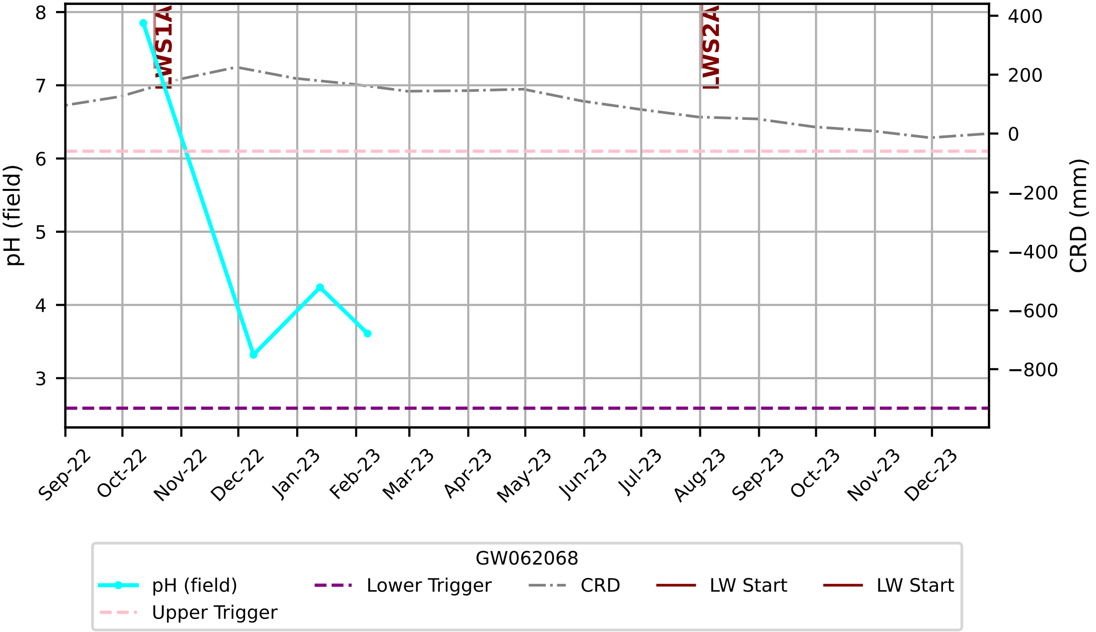
Six-Monthly Groundwater Monitoring: July – December 2023

Tahmoor South Domain

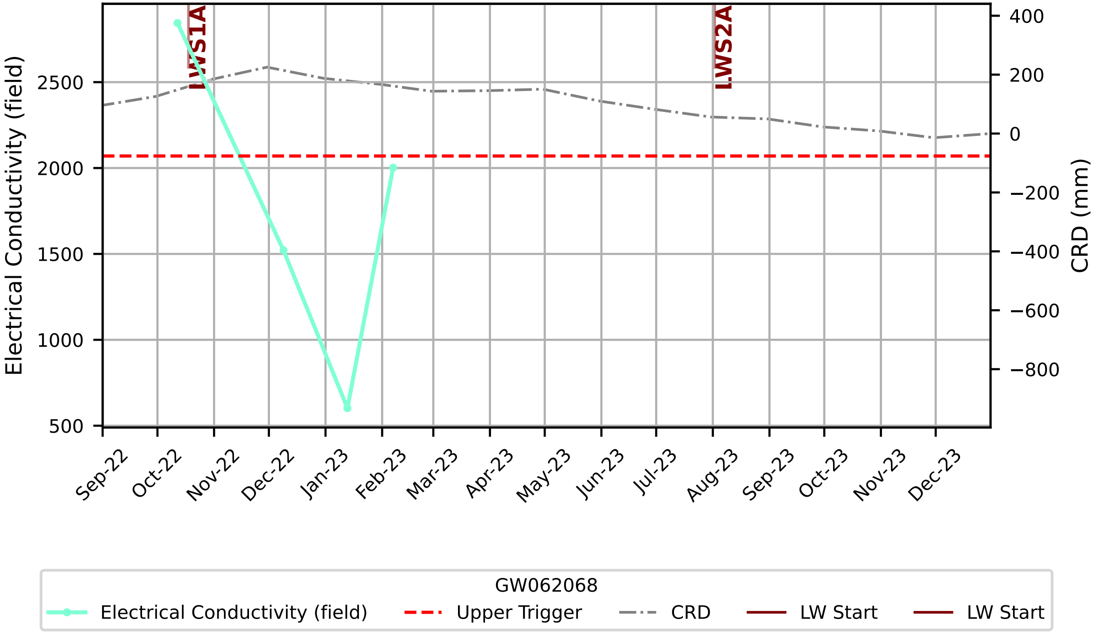
Tahmoor Coal Pty Ltd

SLR Project No.: 640.30614.00000

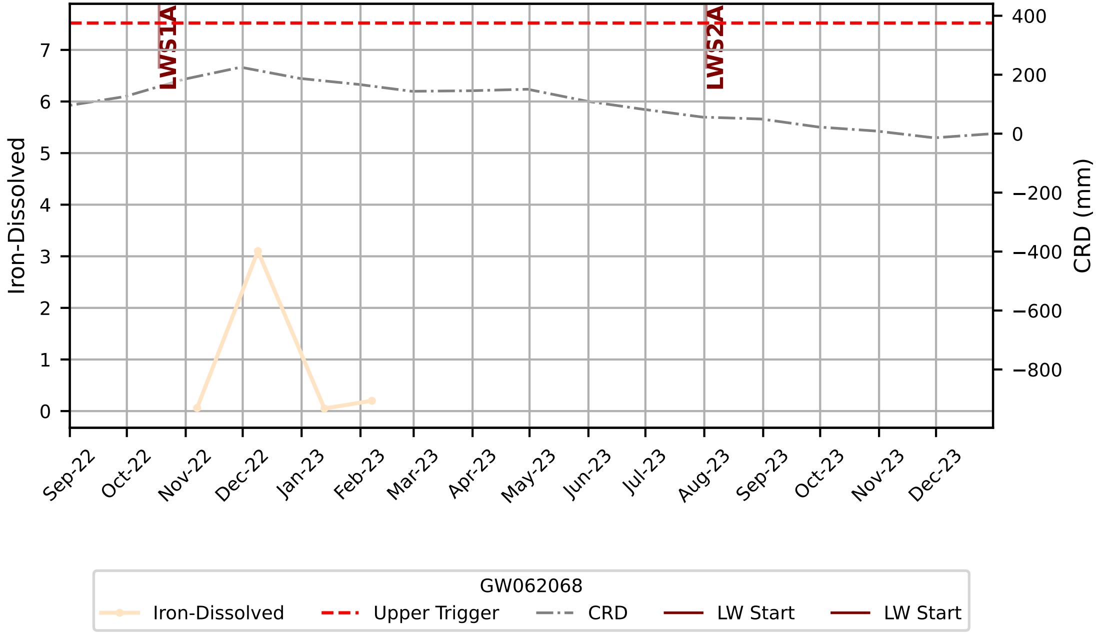
26 March 2024



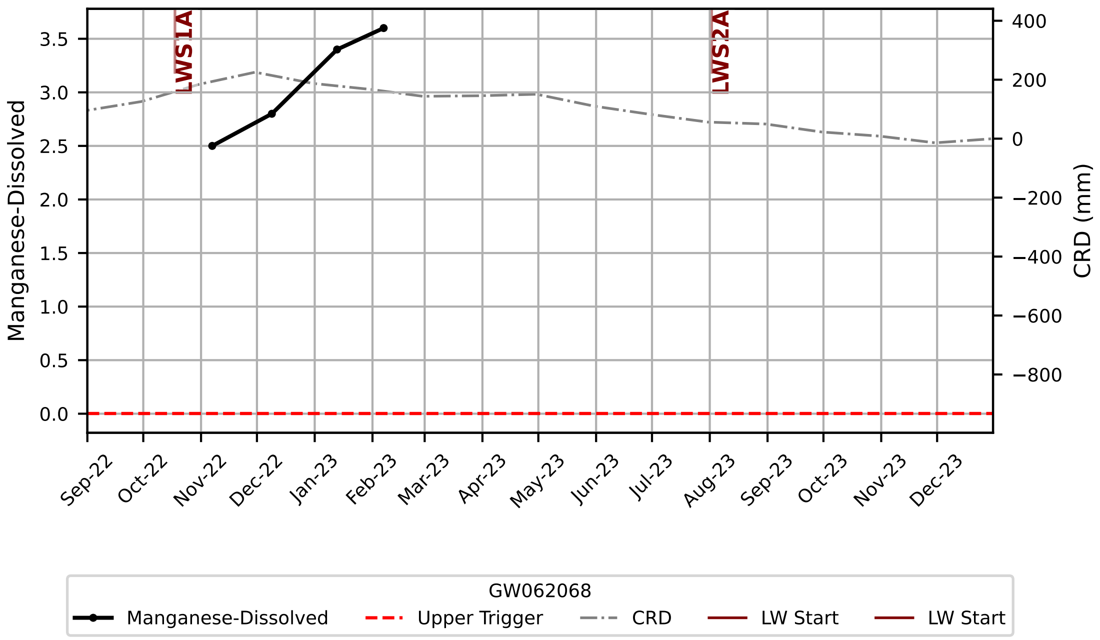
LWS1A
LWS2A
pH (field)
CRD (mm)
8
7
6
5
4
3
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



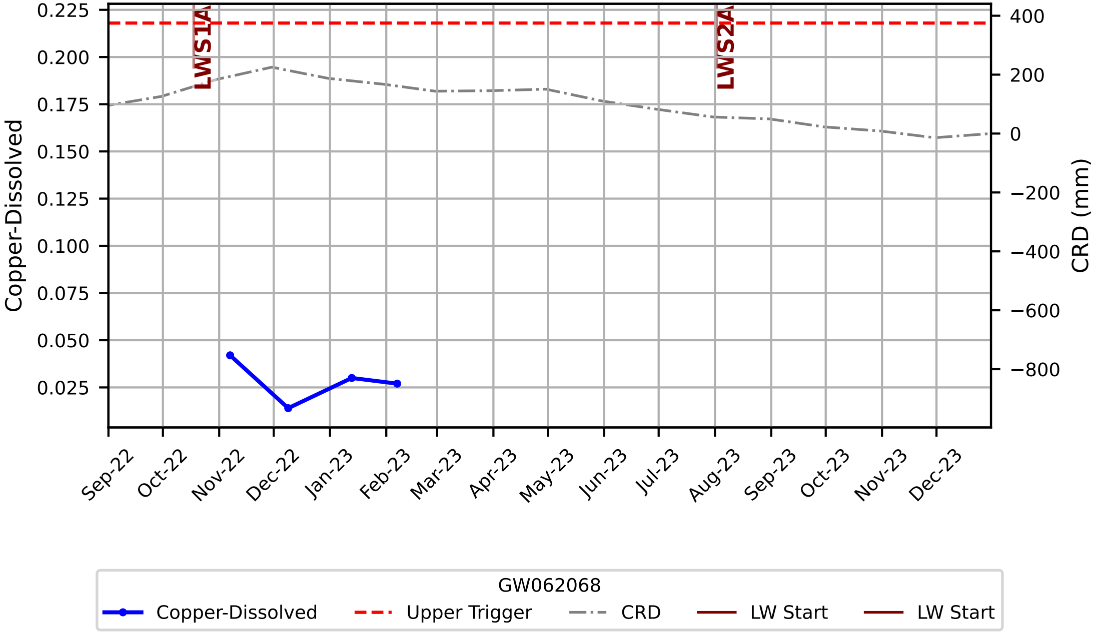
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
2500
2000
1500
1000
500
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



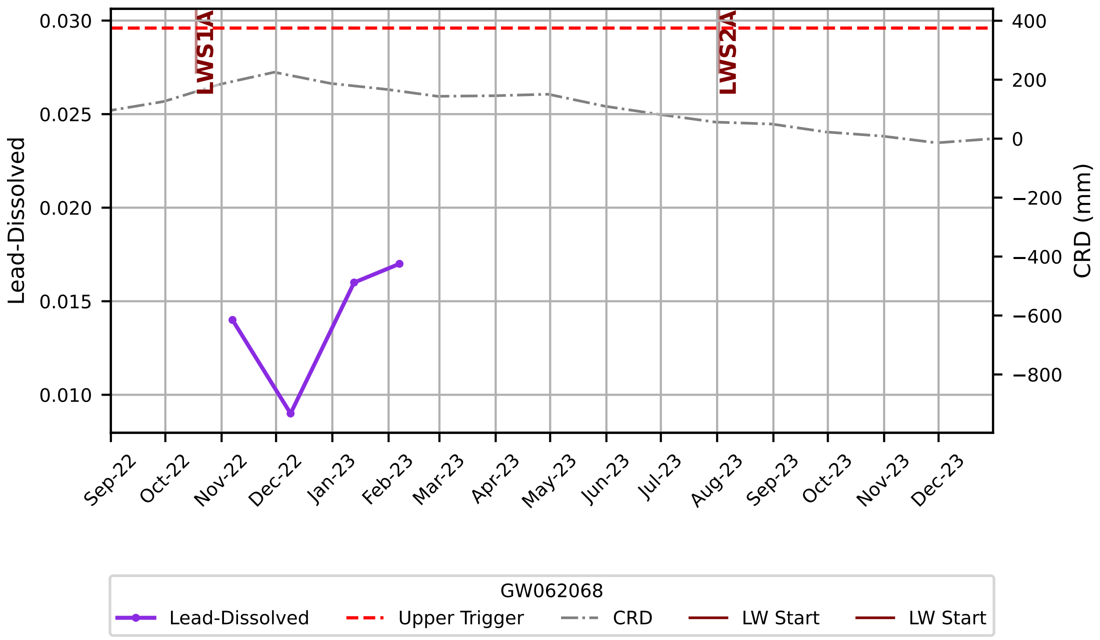
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0
1
2
3
4
5
6
7
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



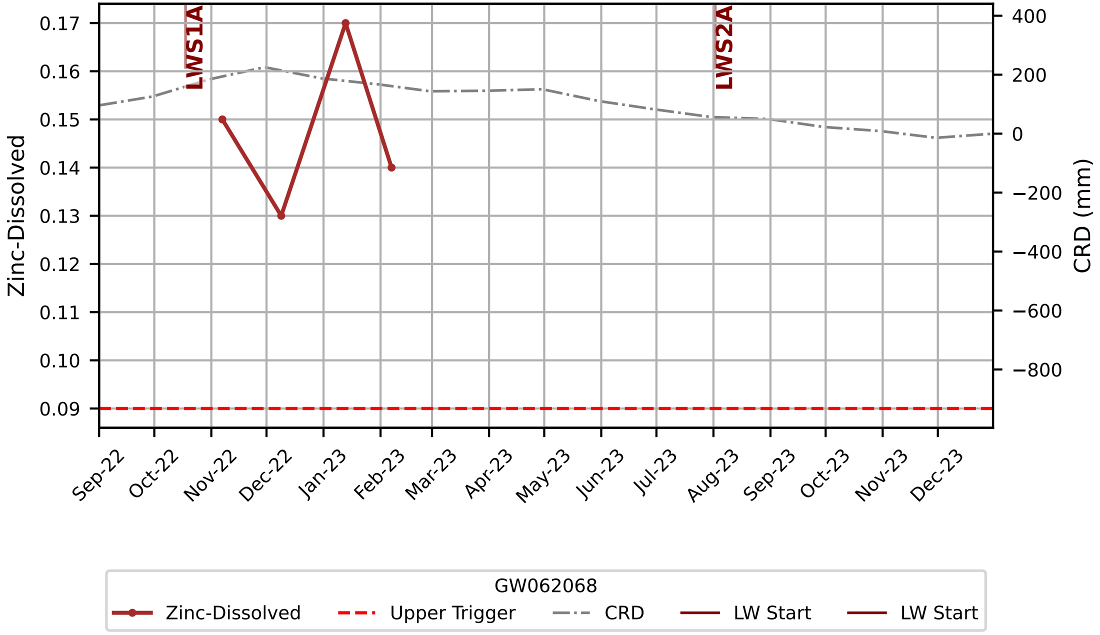
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



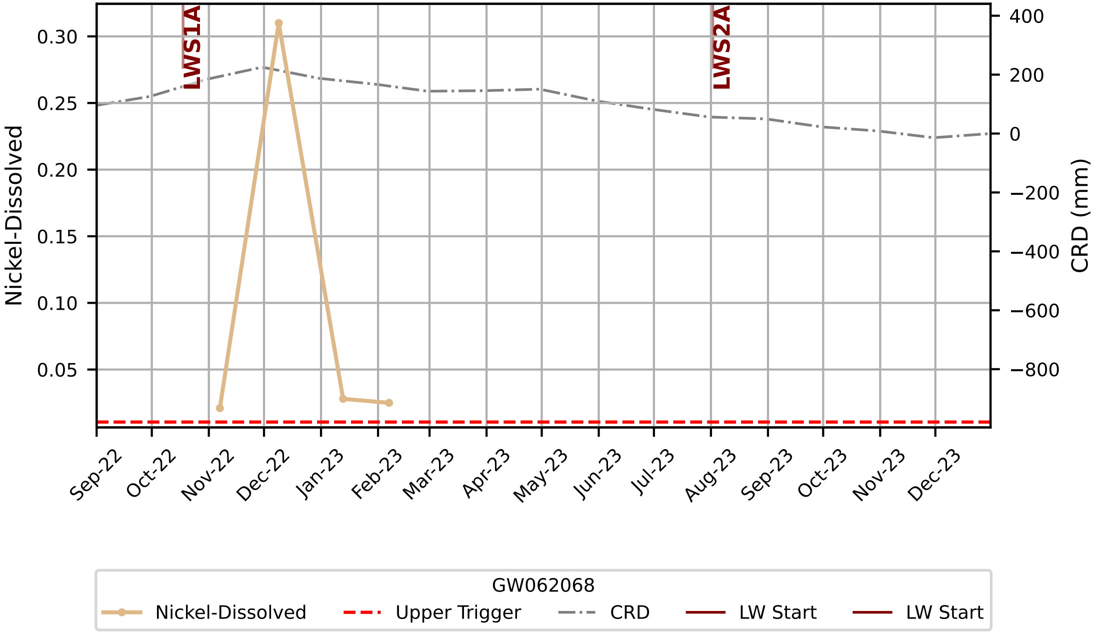
Copper-Dissolved
CRD (mm)
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



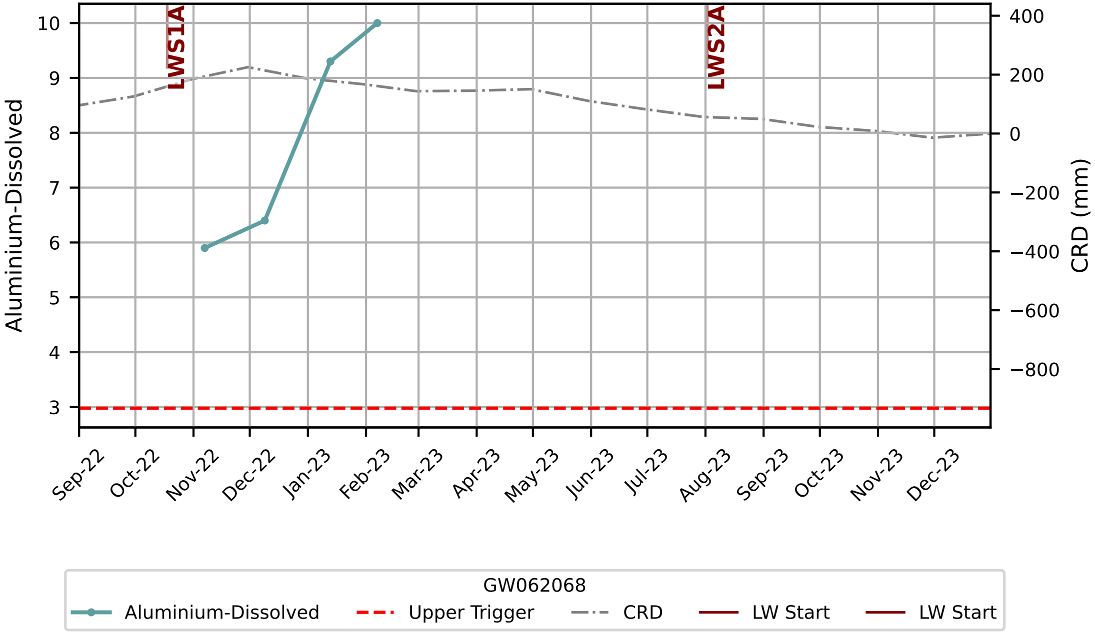
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
0.030
0.025
0.020
0.015
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



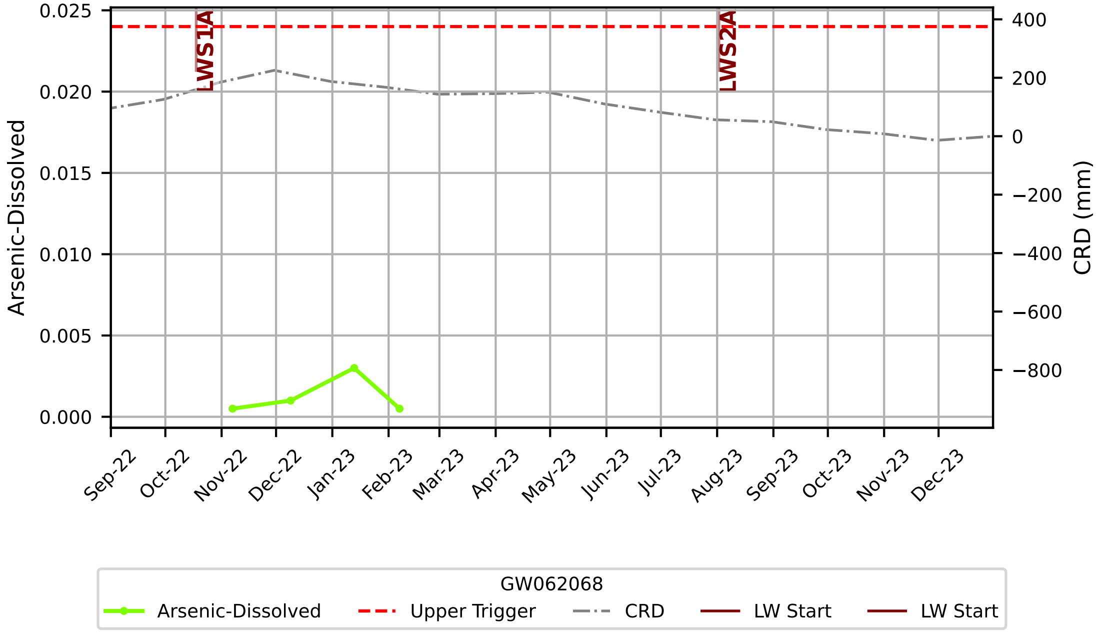
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



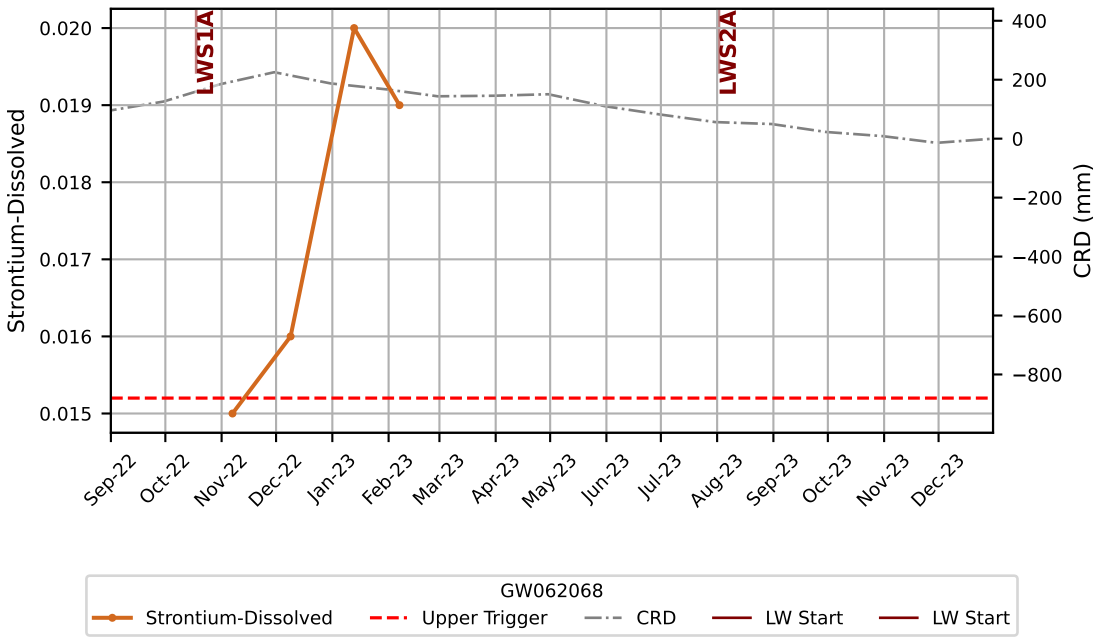
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.30
0.25
0.20
0.15
0.10
0.05
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



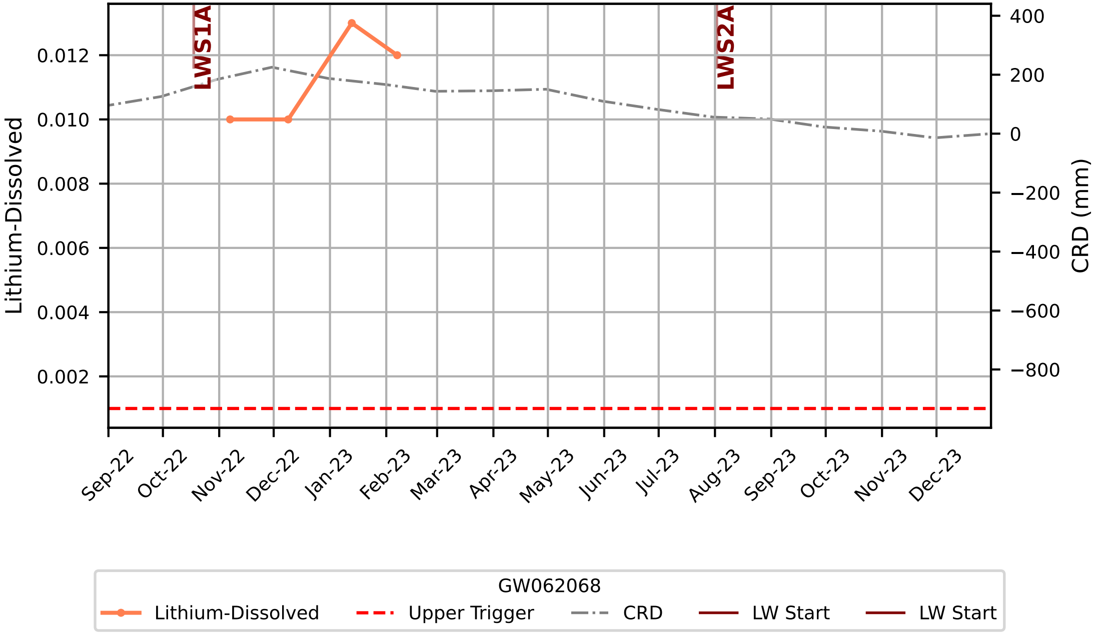
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
10
9
8
7
6
5
4
3
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



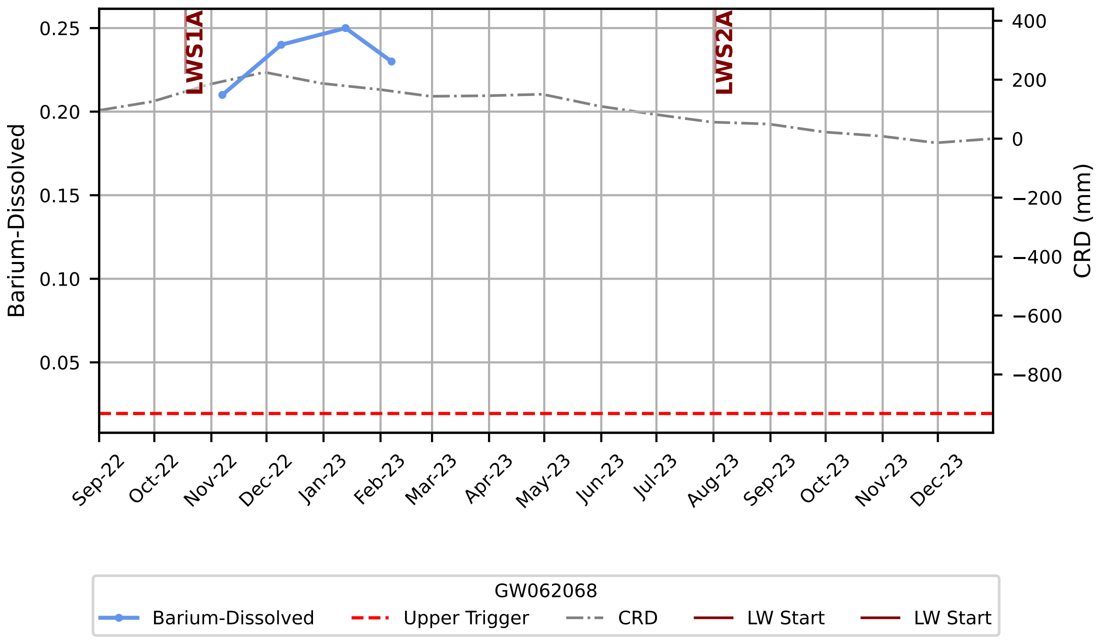
Arsenic-Dissolved
CRD (mm)
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



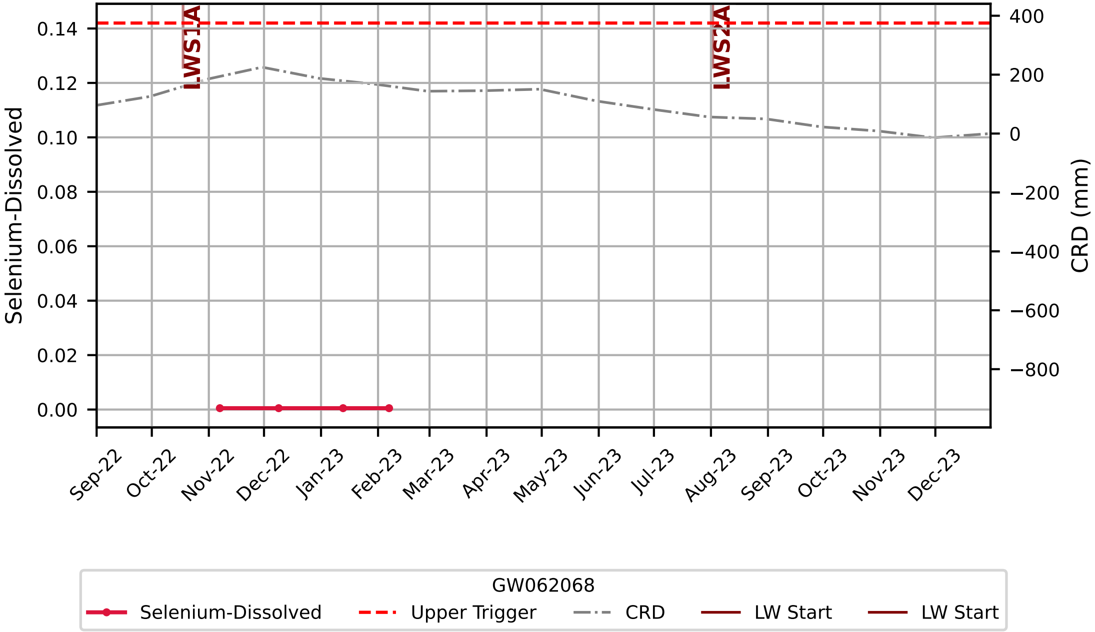
LWS1A
LWS2A
0.020
0.019
0.018
0.017
0.016
0.015
Strontium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

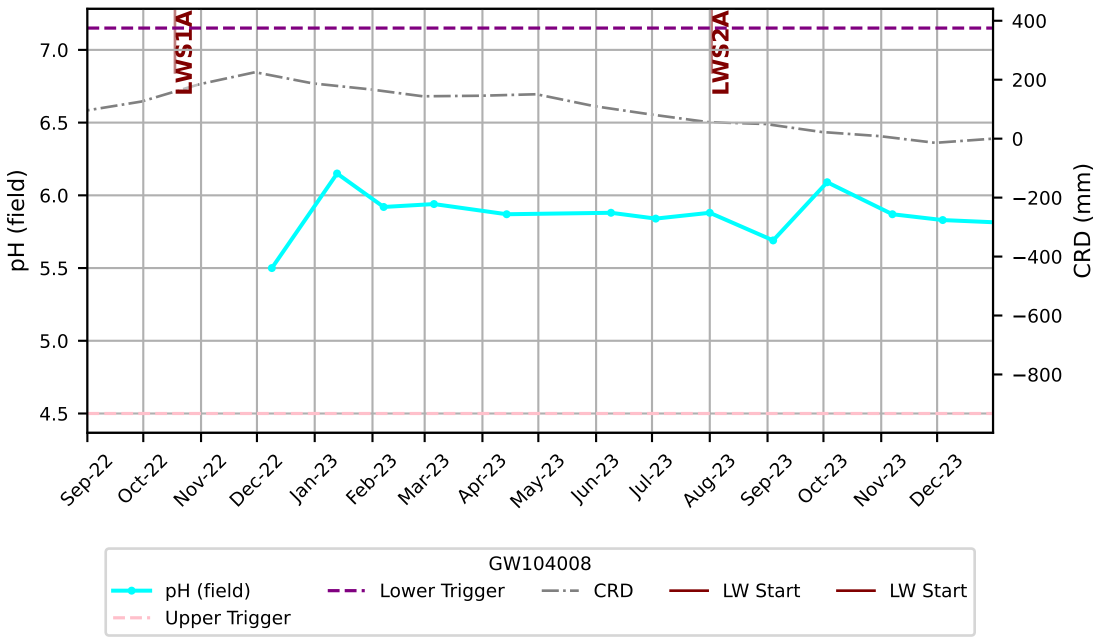


Lithium-Dissolved
CRD (mm)
0.012
0.010
0.008
0.006
0.004
0.002
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

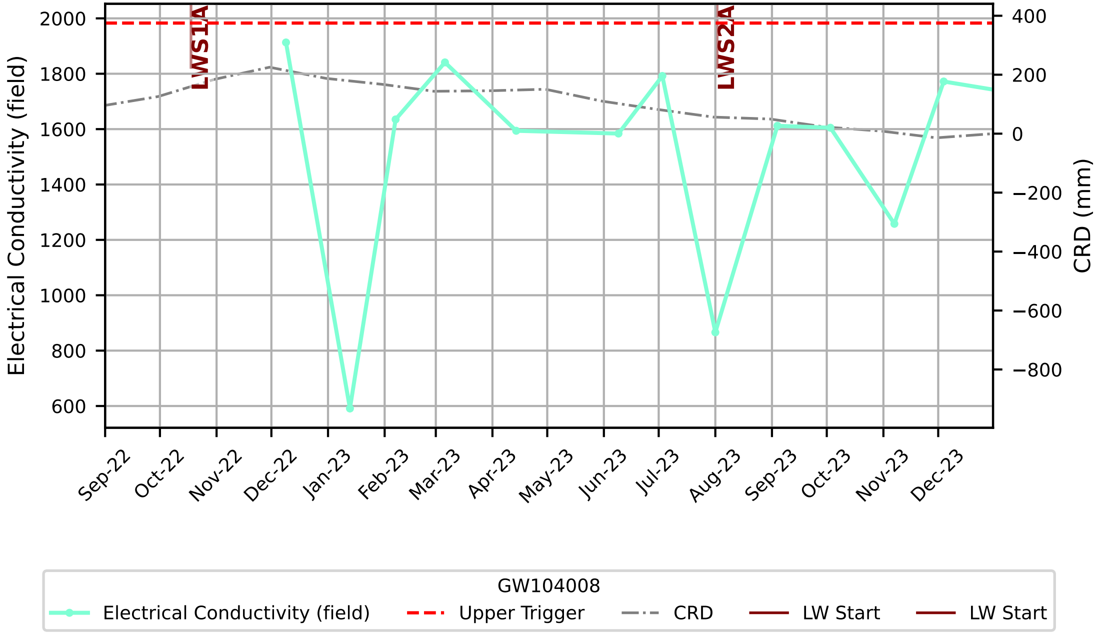


Barium-Dissolved
CRD (mm)
0.25
0.20
0.15
0.10
0.05
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

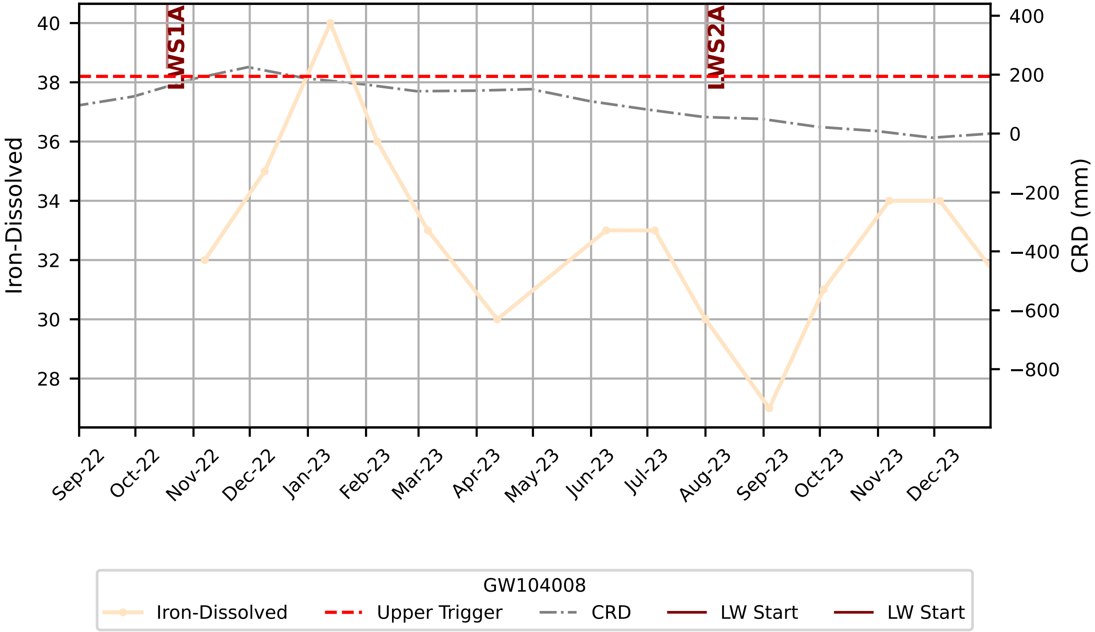

LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW062068
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



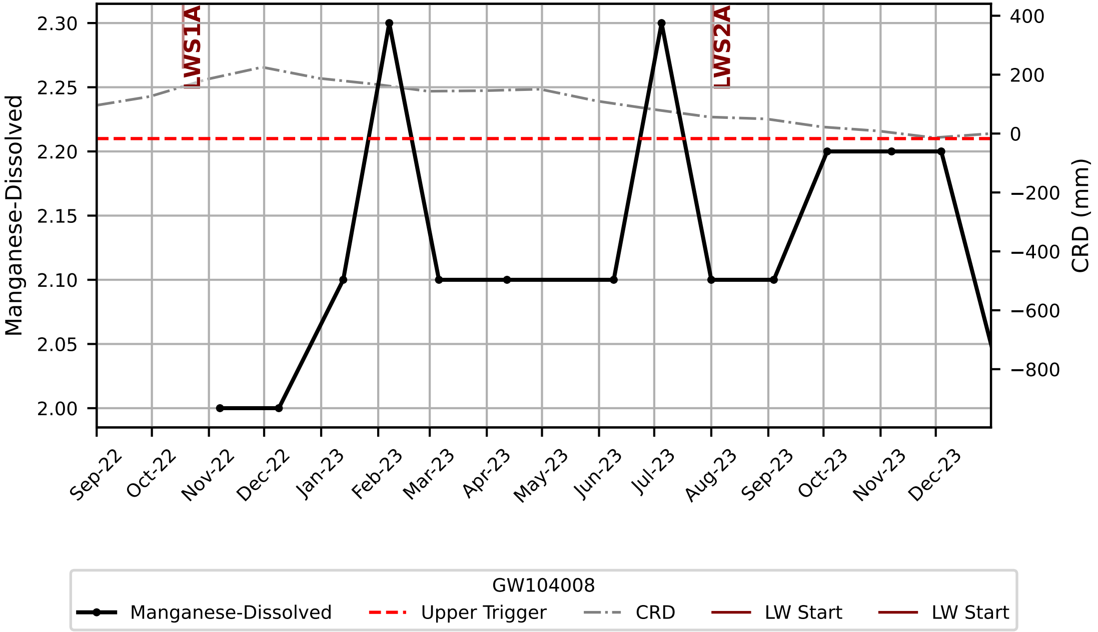
GW104008
pH (field)
CRD (mm)
LWS1A
LWS2A
7.0
6.5
6.0
5.5
5.0
4.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



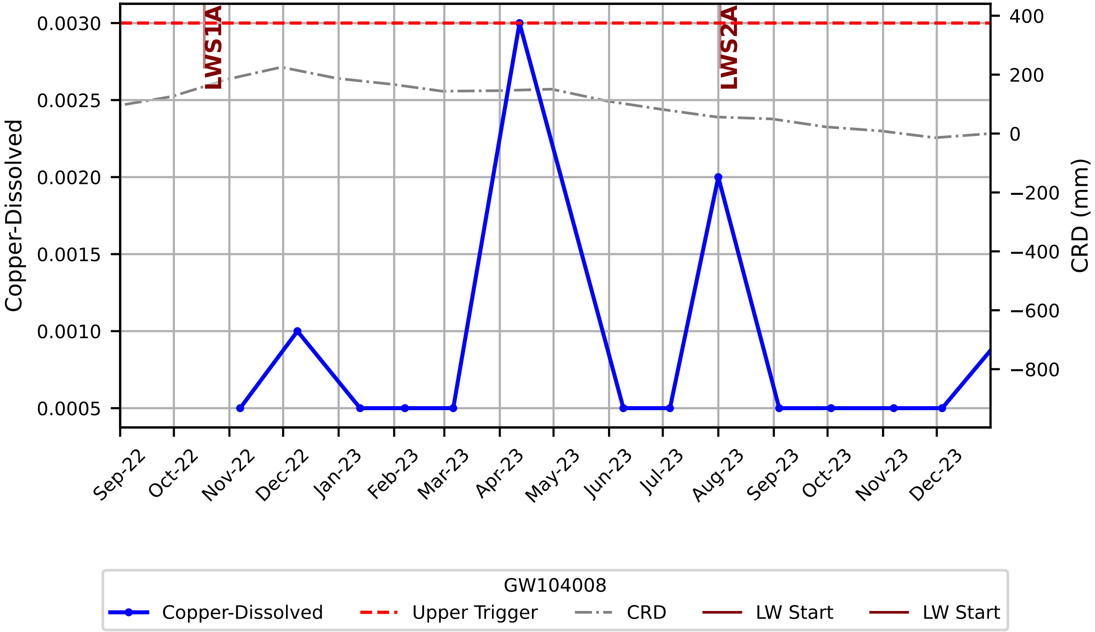
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



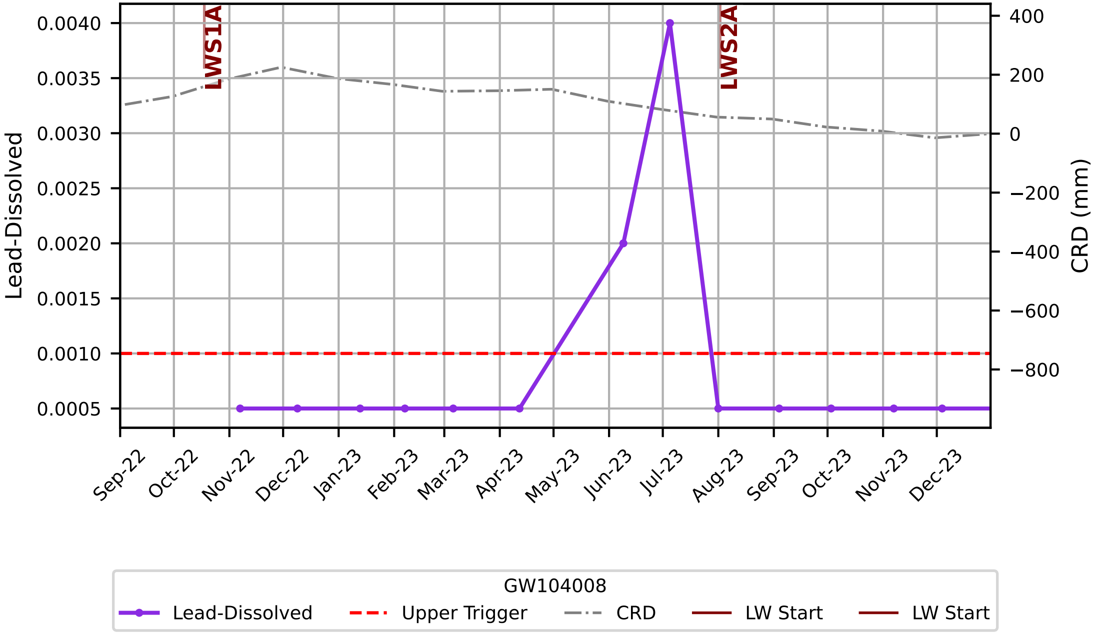
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
40
38
36
34
32
30
28
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



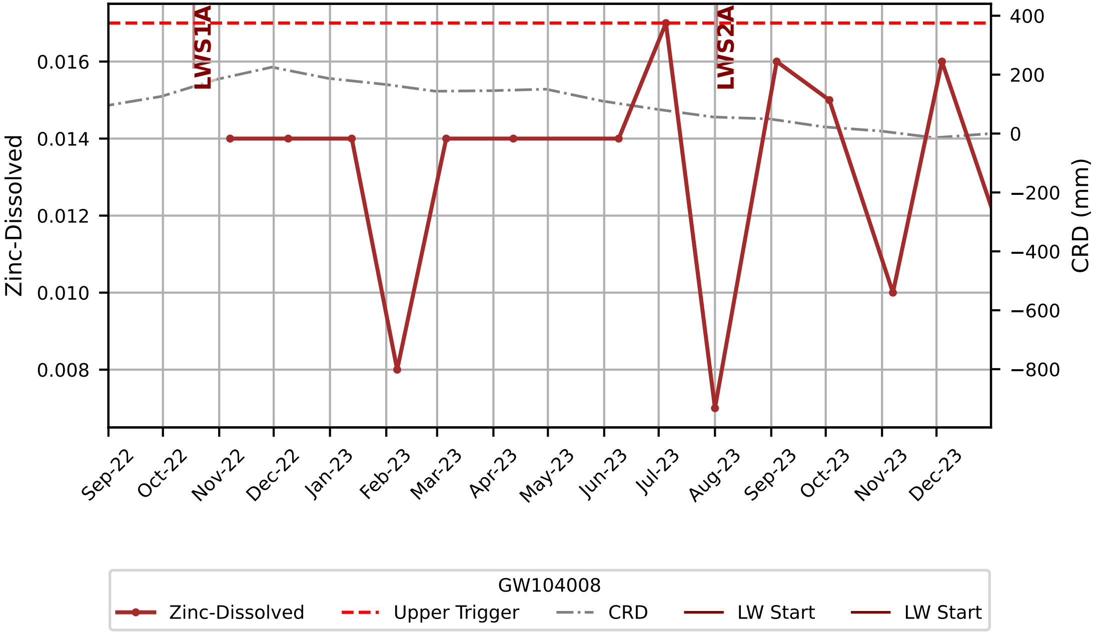
LWS1A
LWS2A
2.30
2.25
2.20
2.15
2.10
2.05
2.00
Manganese-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



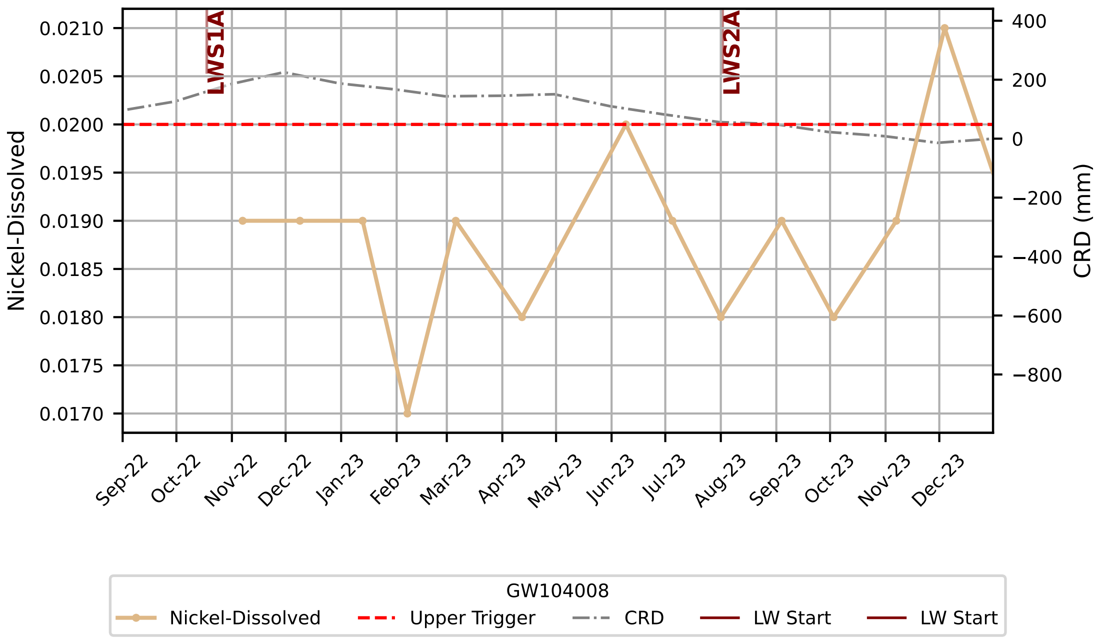
Copper-Dissolved
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



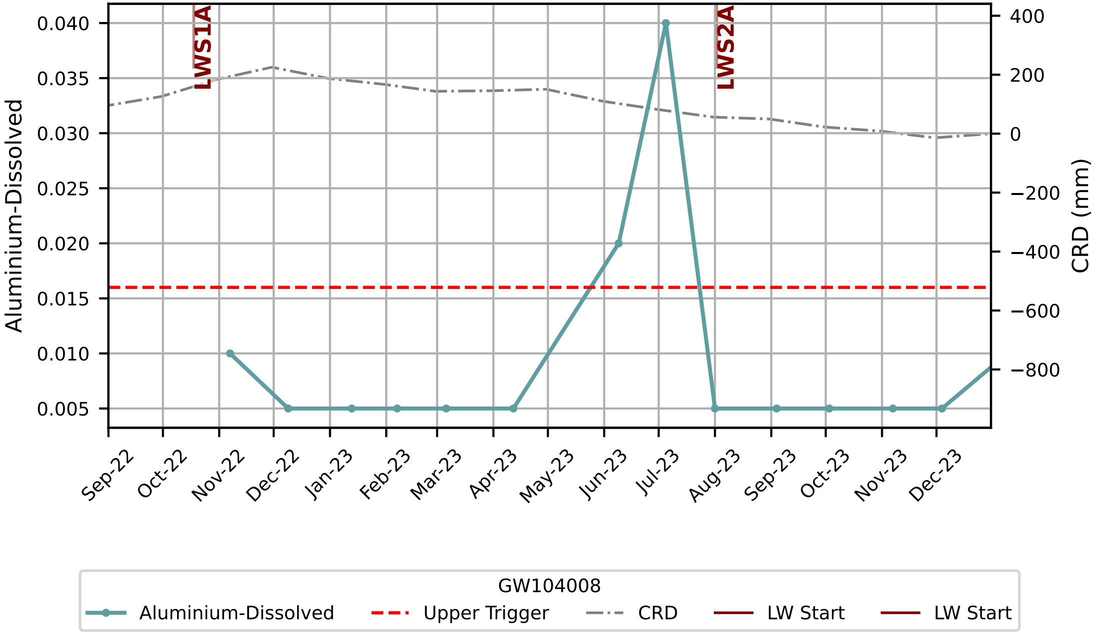
LWS1A
LWS2A
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



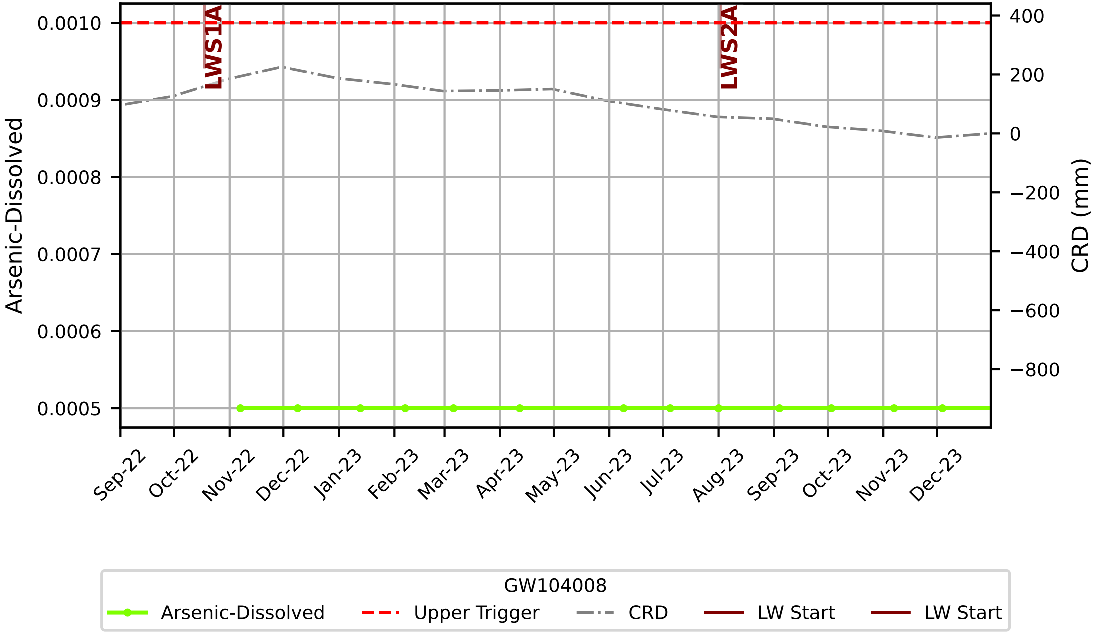
LWS1A
LWS2A
0.016
0.014
0.012
0.010
0.008
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



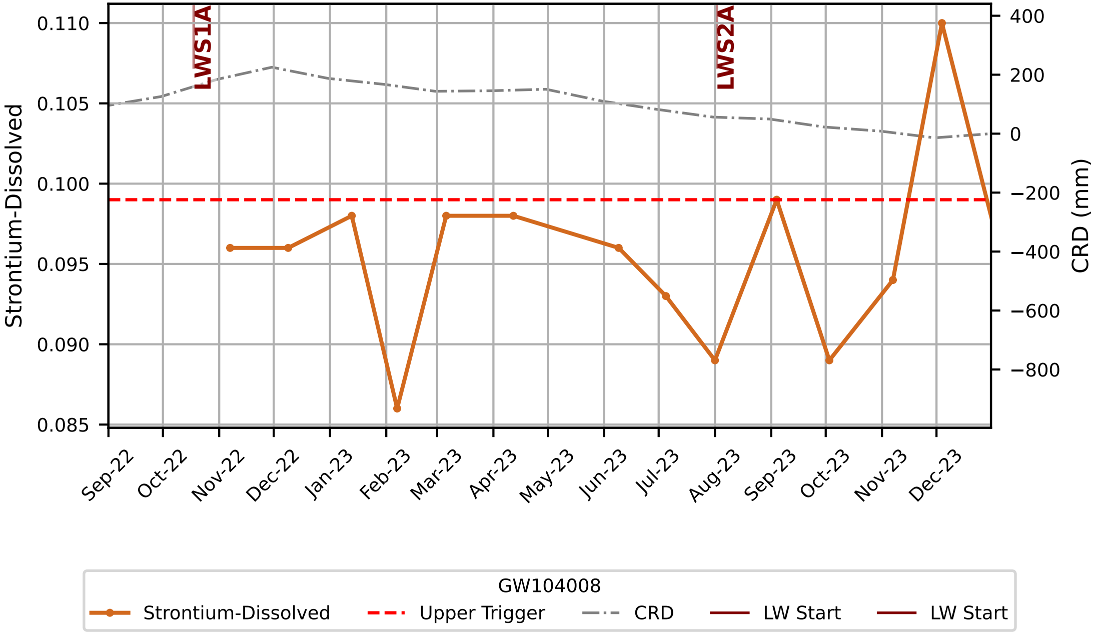
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.0210
0.0205
0.0200
0.0195
0.0190
0.0185
0.0180
0.0175
0.0170
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



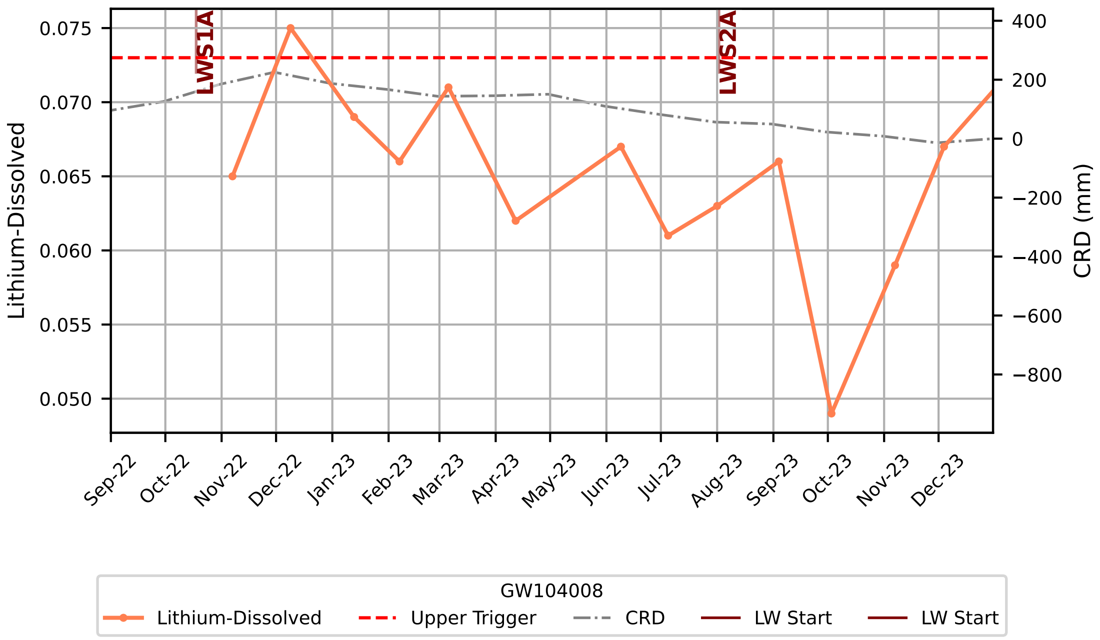
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



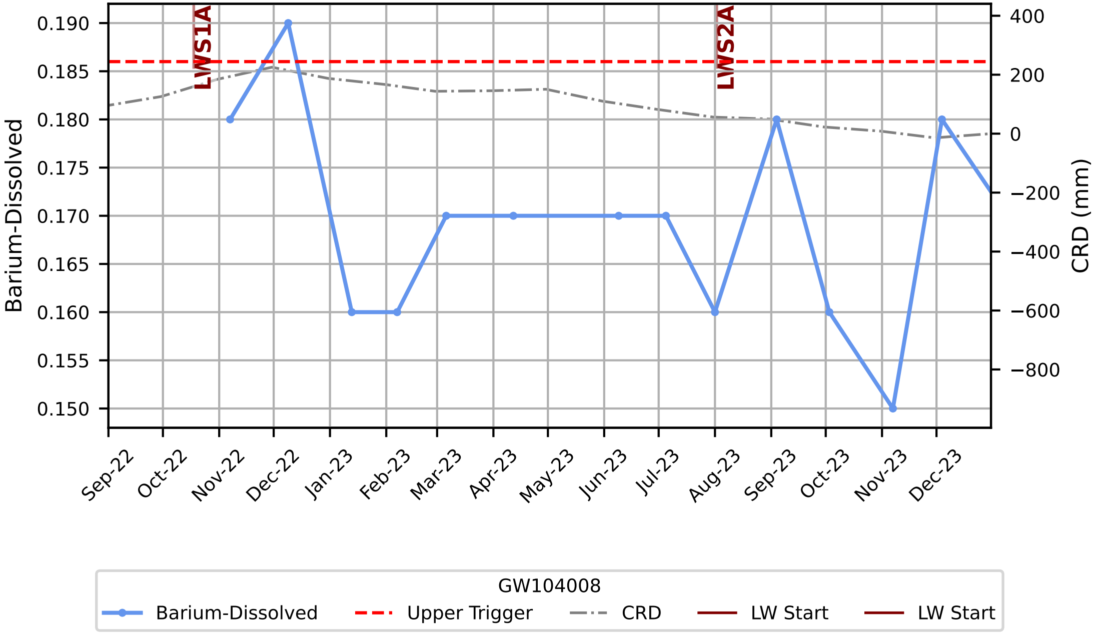
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



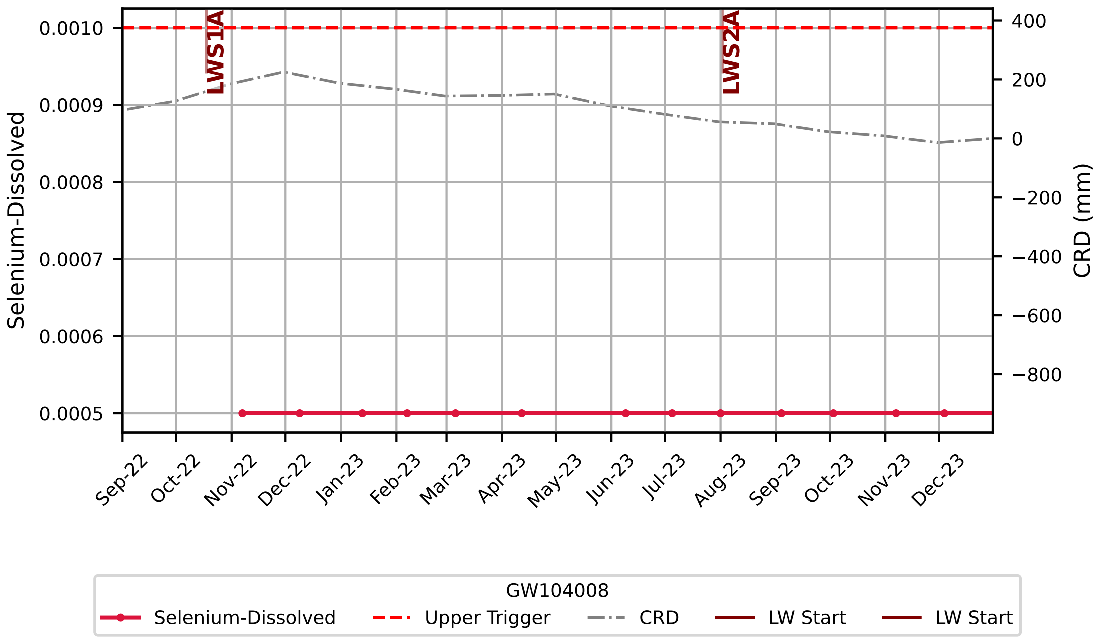
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.110
0.105
0.100
0.095
0.090
0.085
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



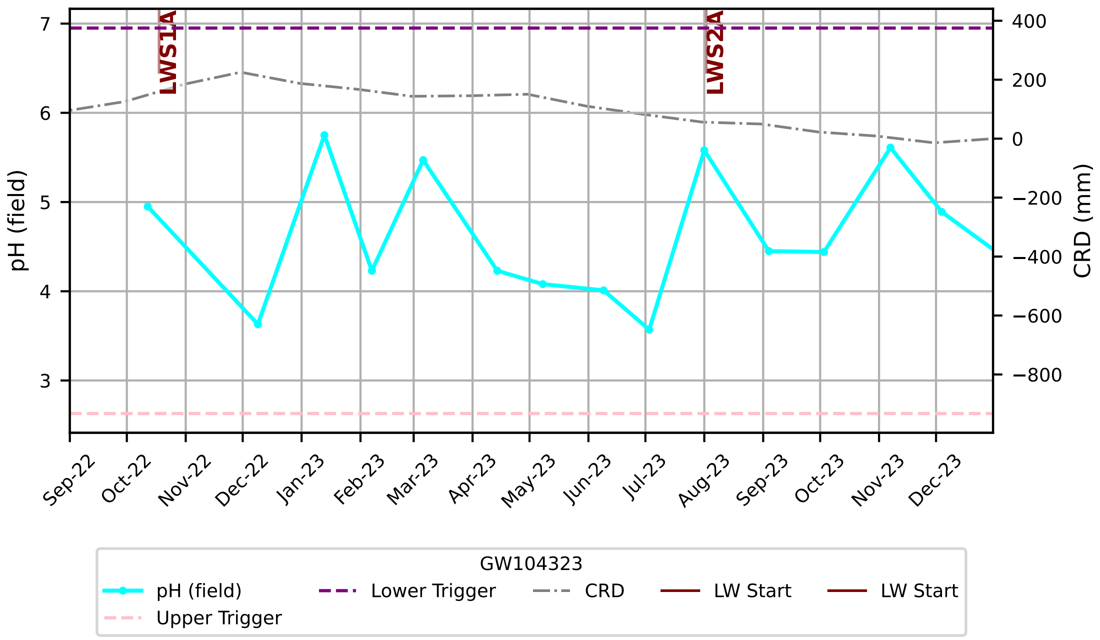
Lithium-Dissolved
CRD (mm)
0.075
0.070
0.065
0.060
0.055
0.050
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



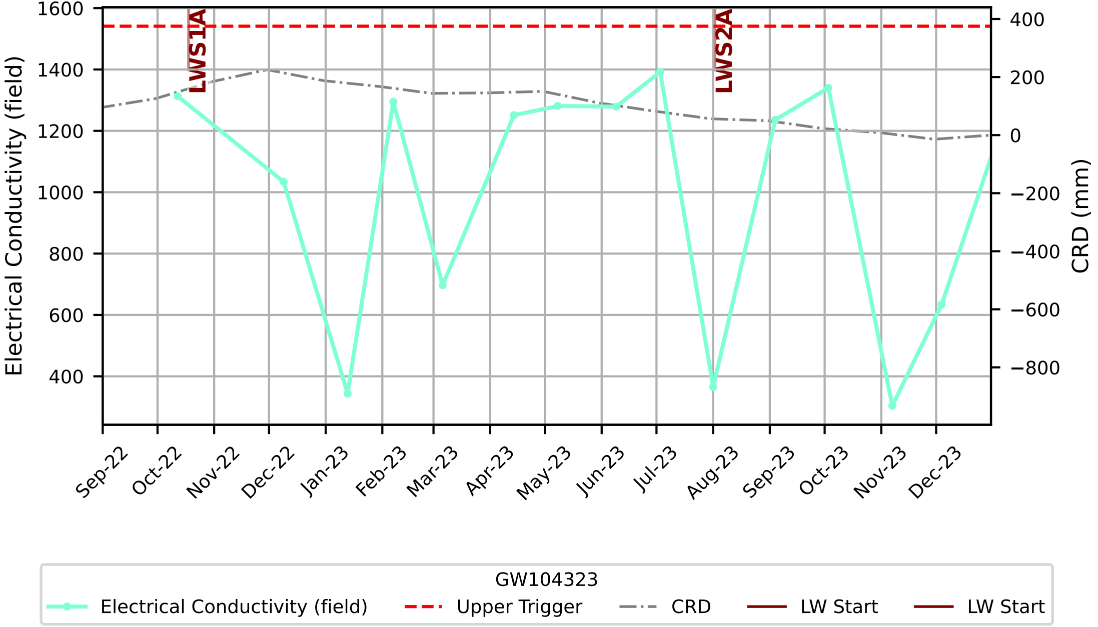
LWS1A
LWS2A
0.190
0.185
0.180
0.175
0.170
0.165
0.160
0.155
0.150
Barium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



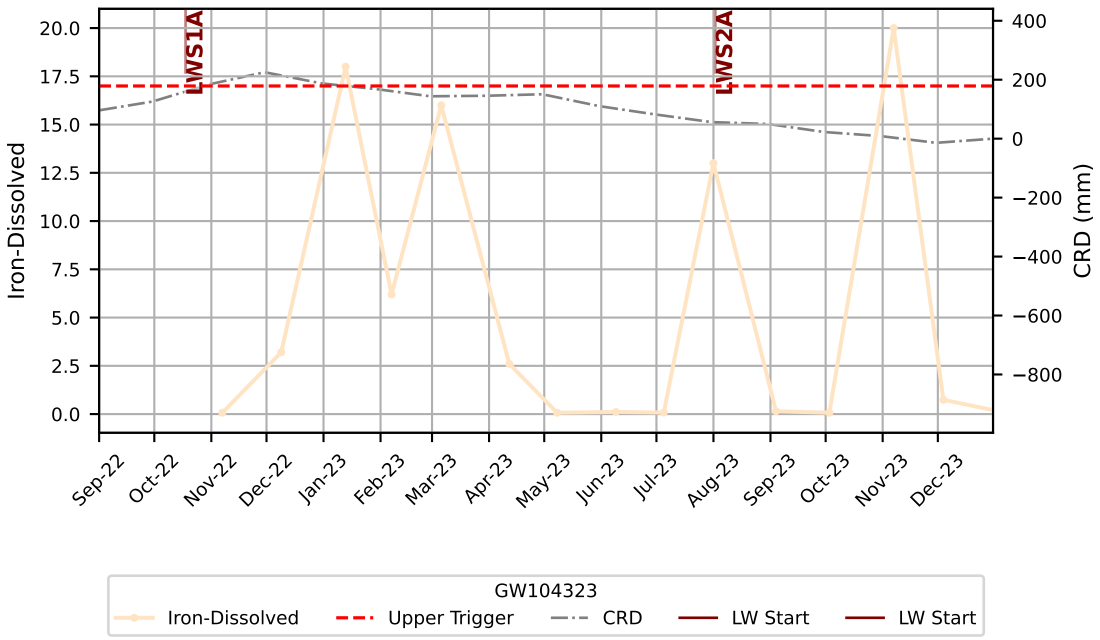
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104008
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



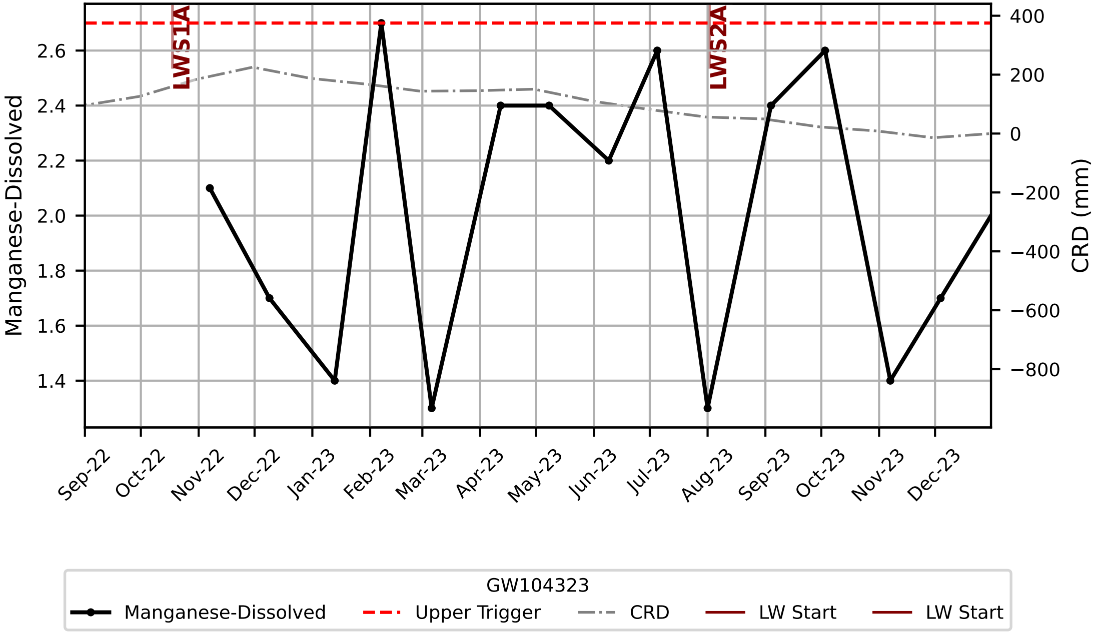
LWS1A
LWS2A
pH (field)
CRD (mm)
7
6
5
4
3
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



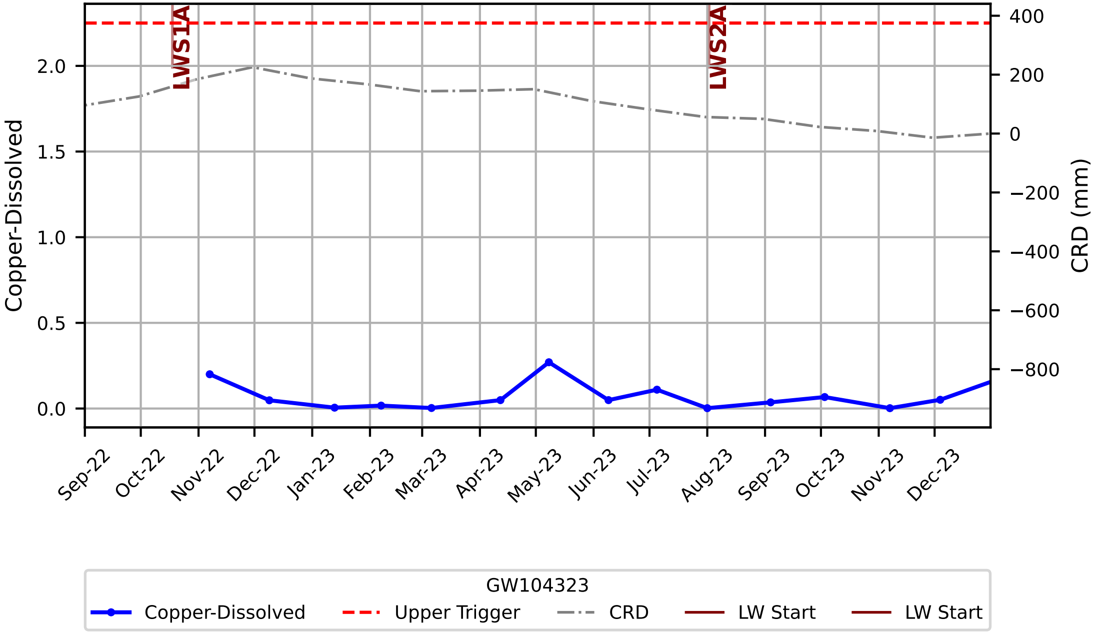
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



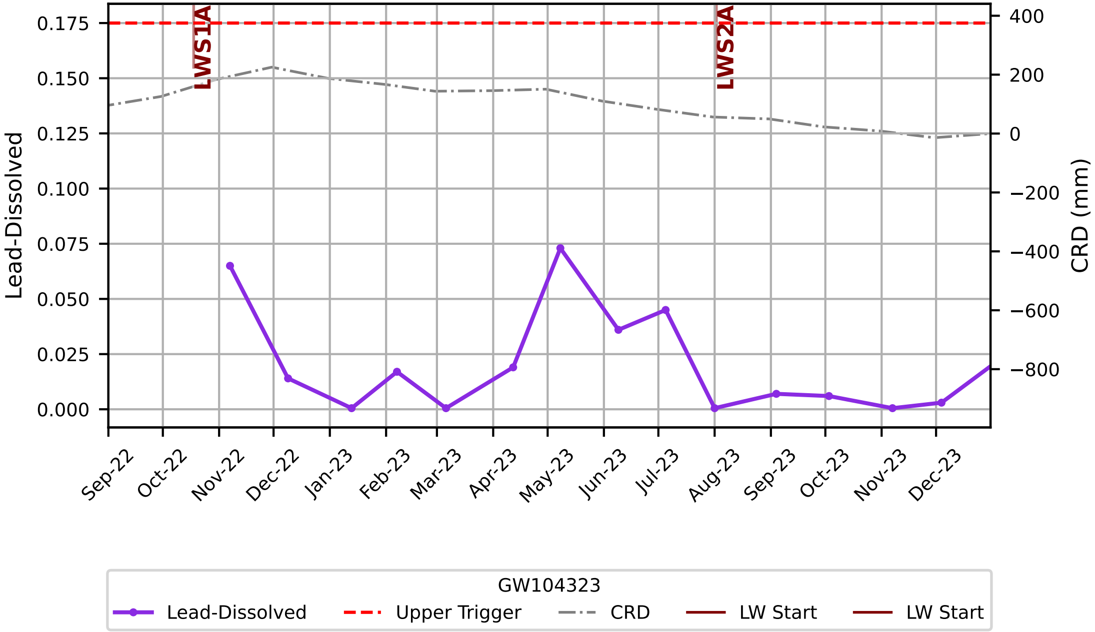
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



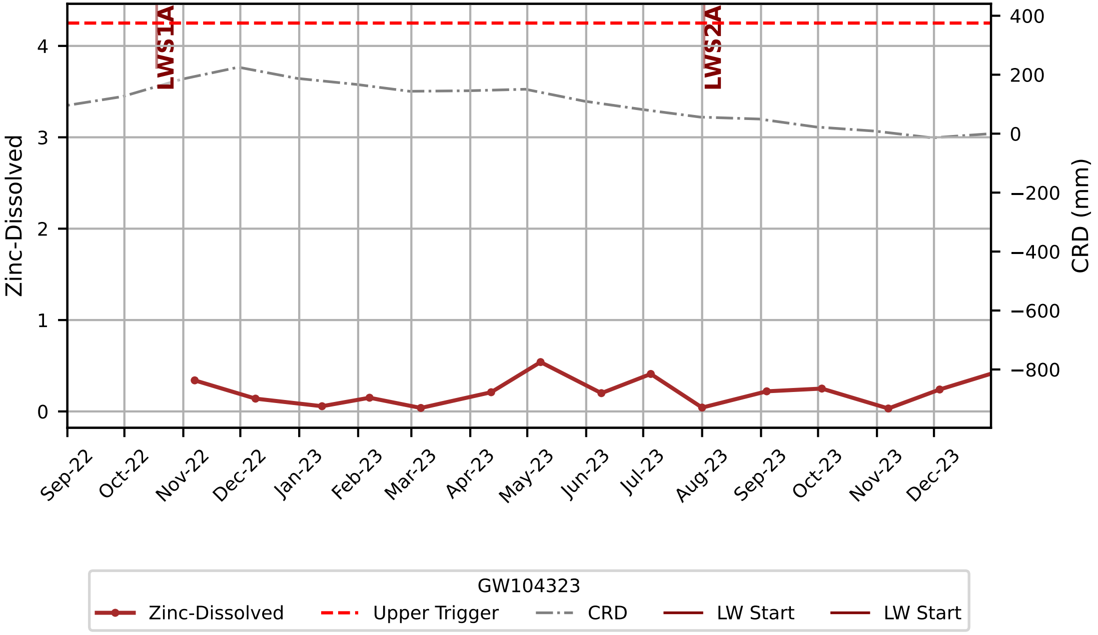
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
2.6
2.4
2.2
2.0
1.8
1.6
1.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



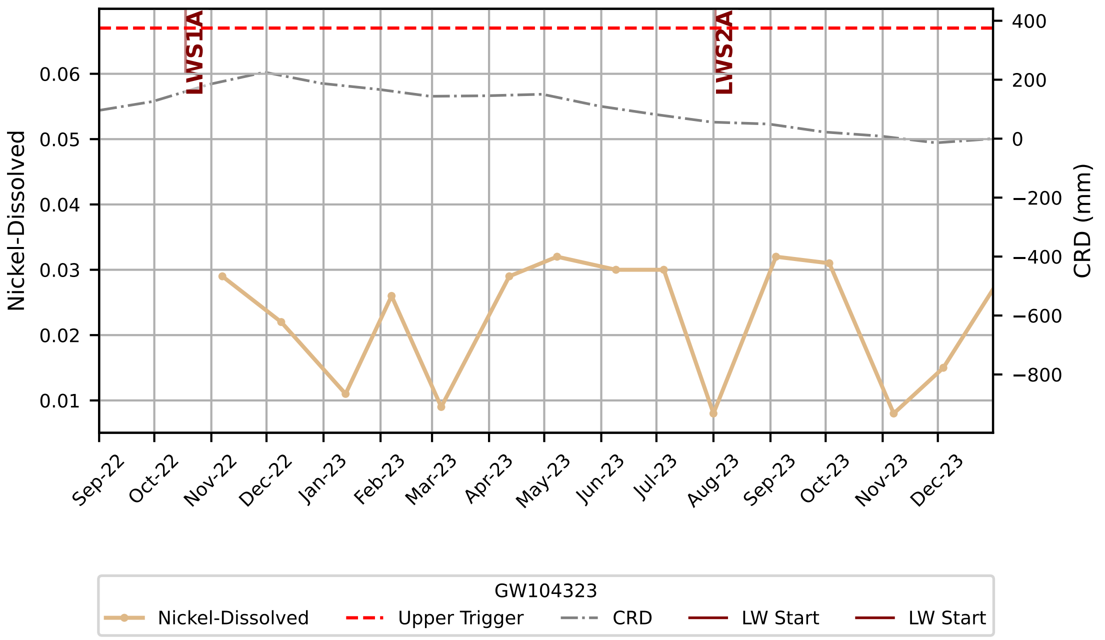
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



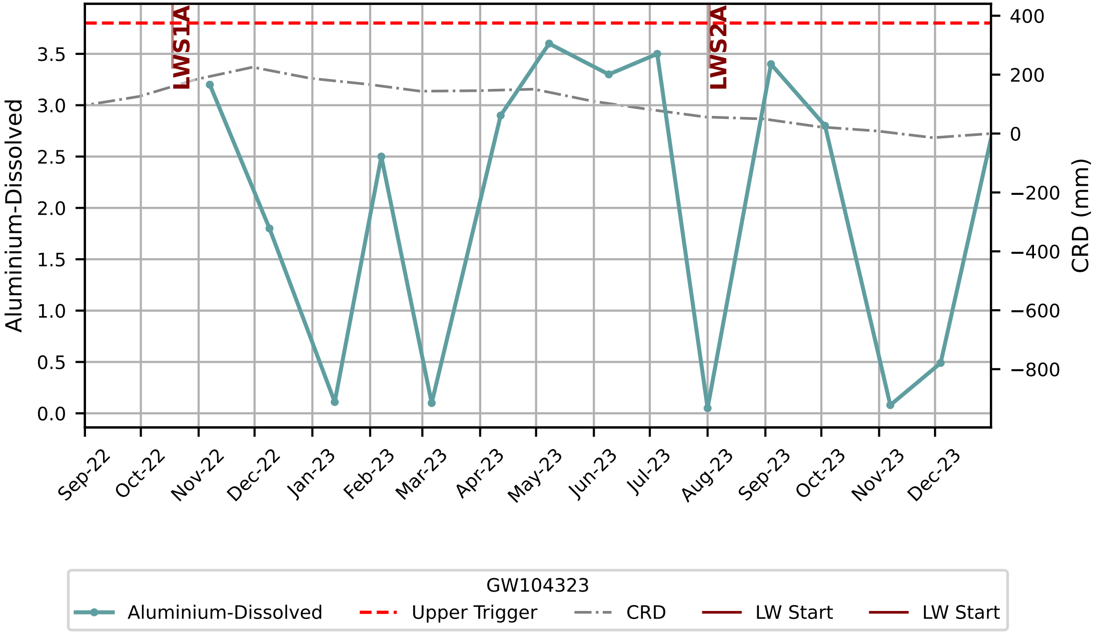
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



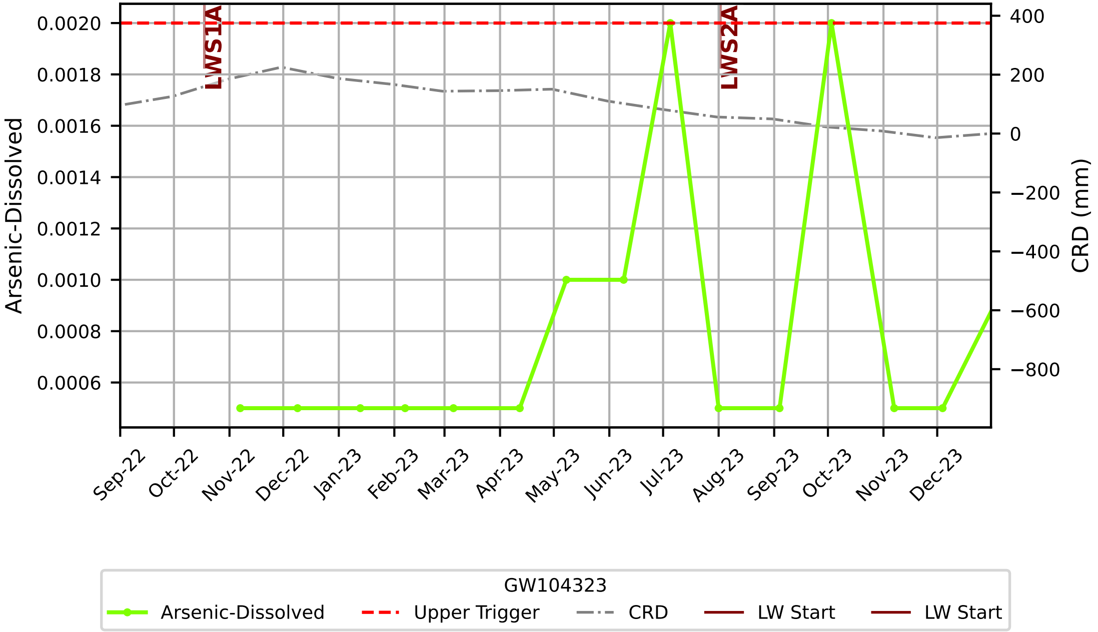
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
0
1
2
3
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



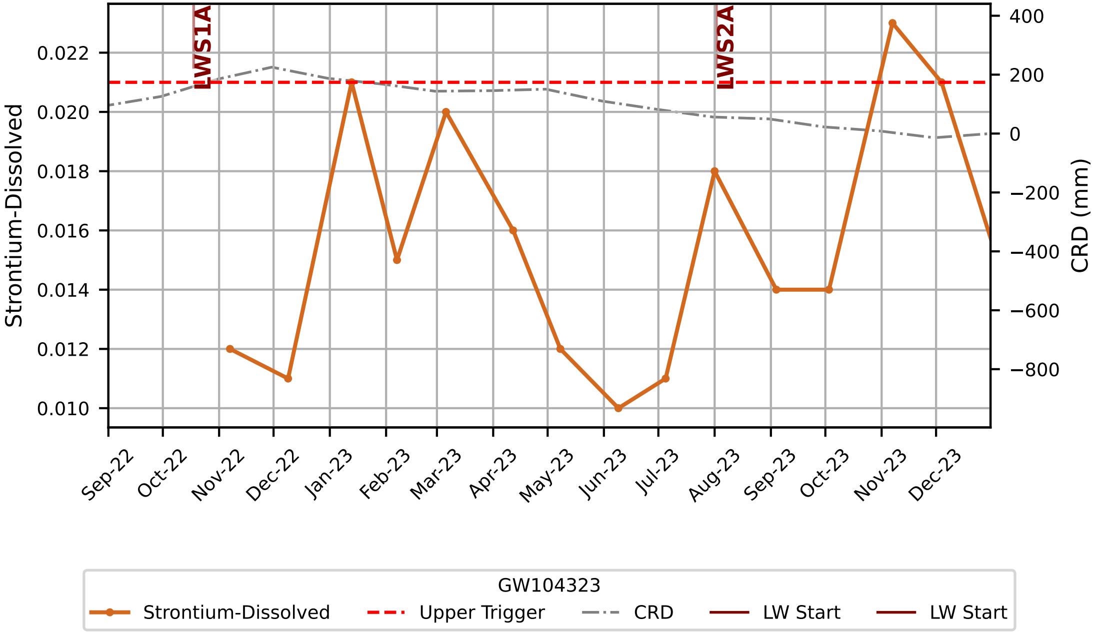
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.06
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



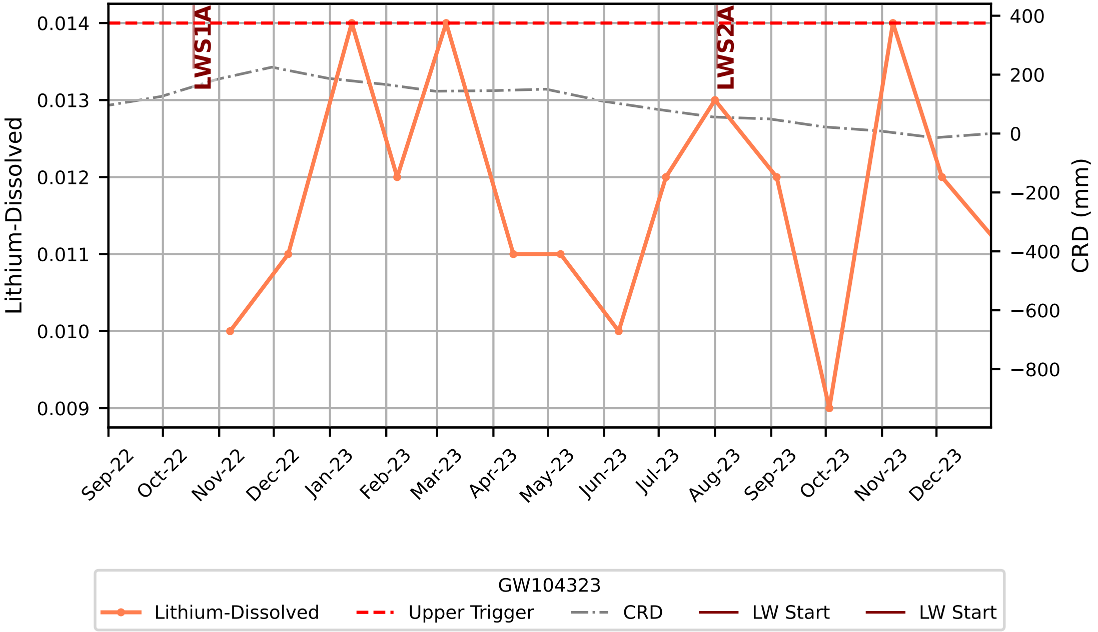
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



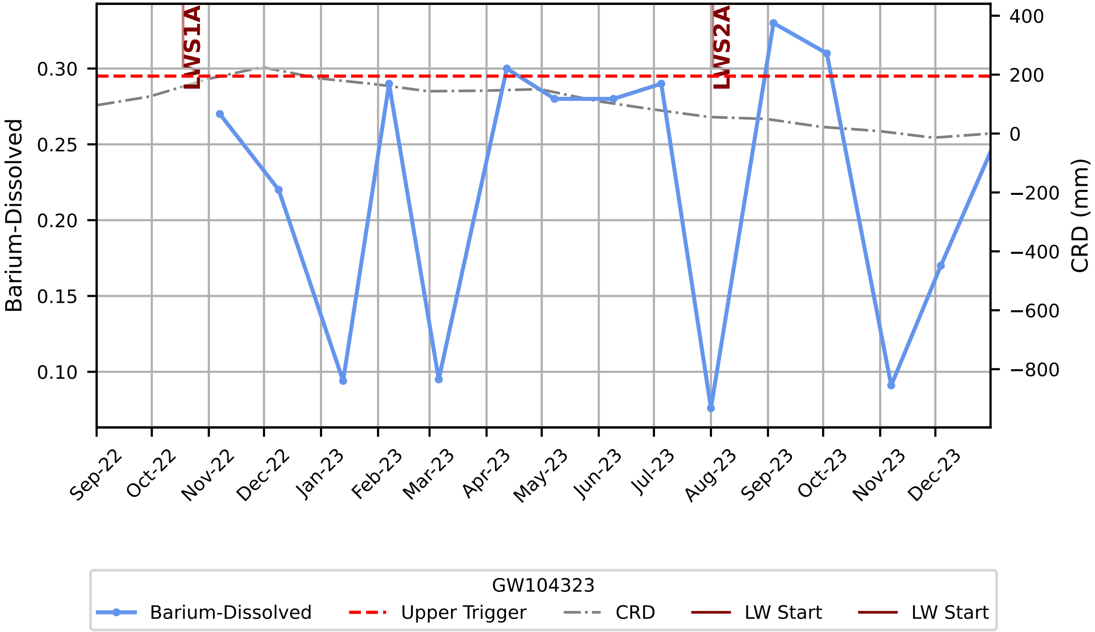
Arsenic-Dissolved
CRD (mm)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



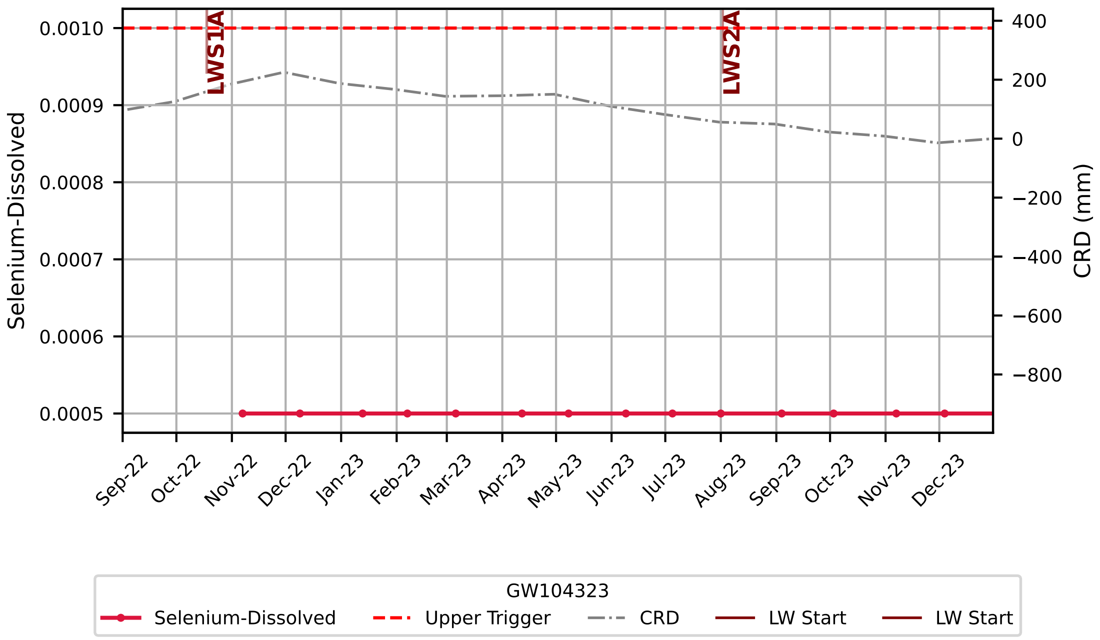
LWS1A
LWS2A
Strontium-Dissolved
0.022
0.020
0.018
0.016
0.014
0.012
0.010
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



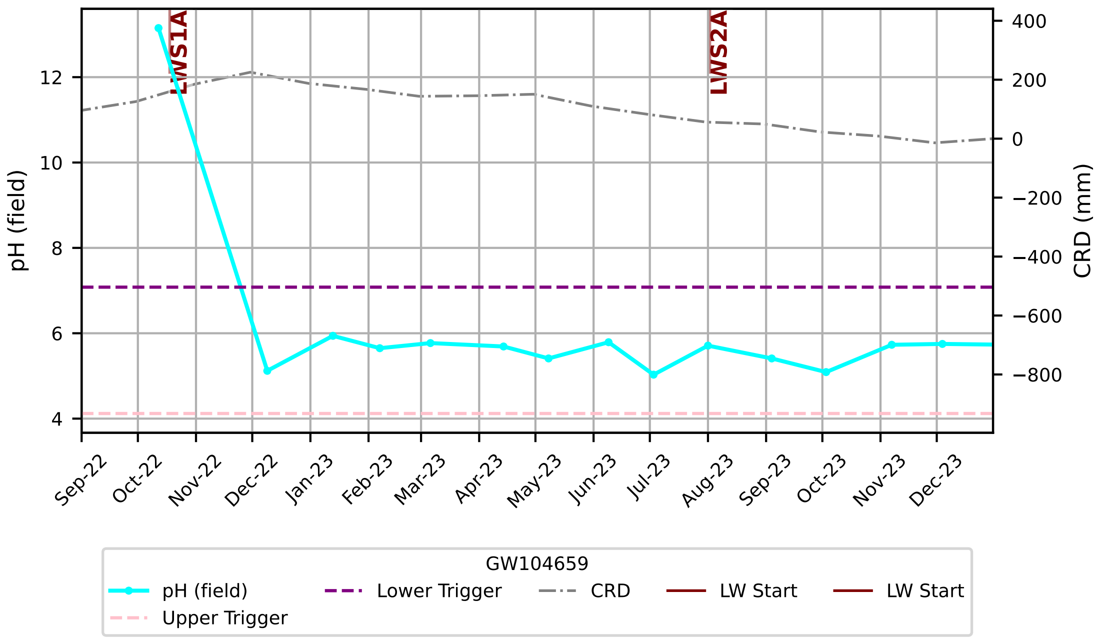
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.014
0.013
0.012
0.011
0.010
0.009
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



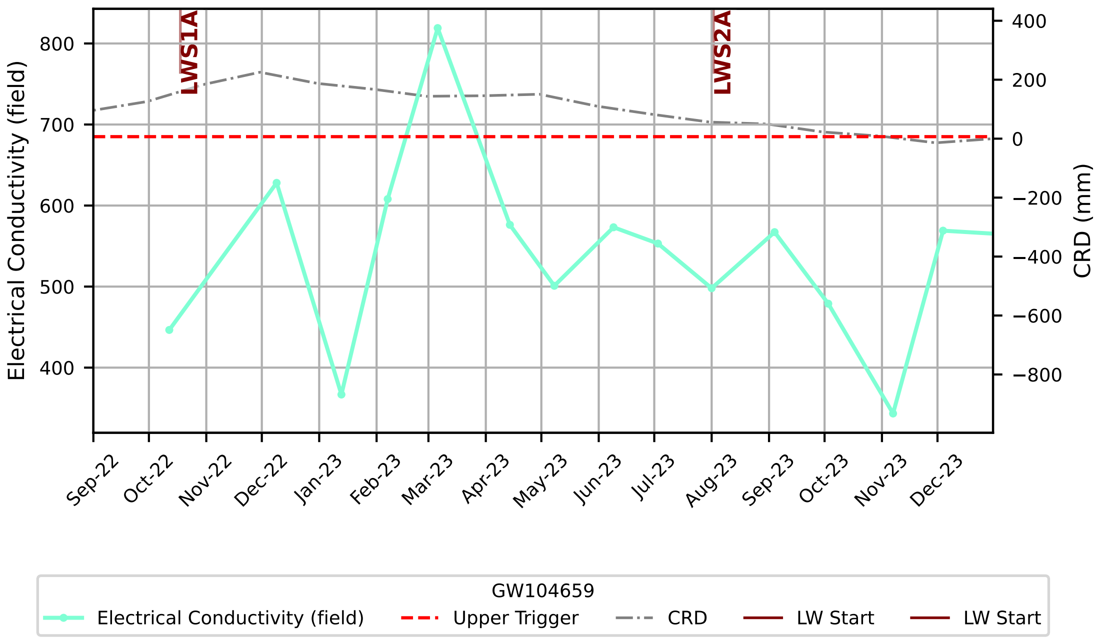
LWS1A
LWS2A
0.30
0.25
0.20
0.15
0.10
400
200
0
−200
−400
−600
−800
Barium-Dissolved
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



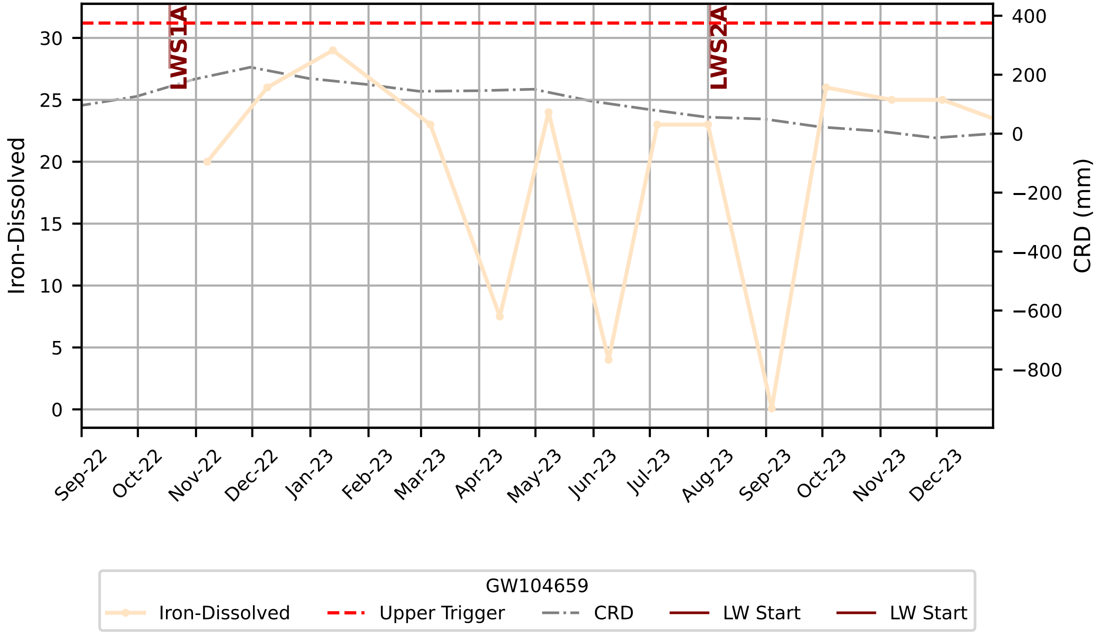
Selenium-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104323
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



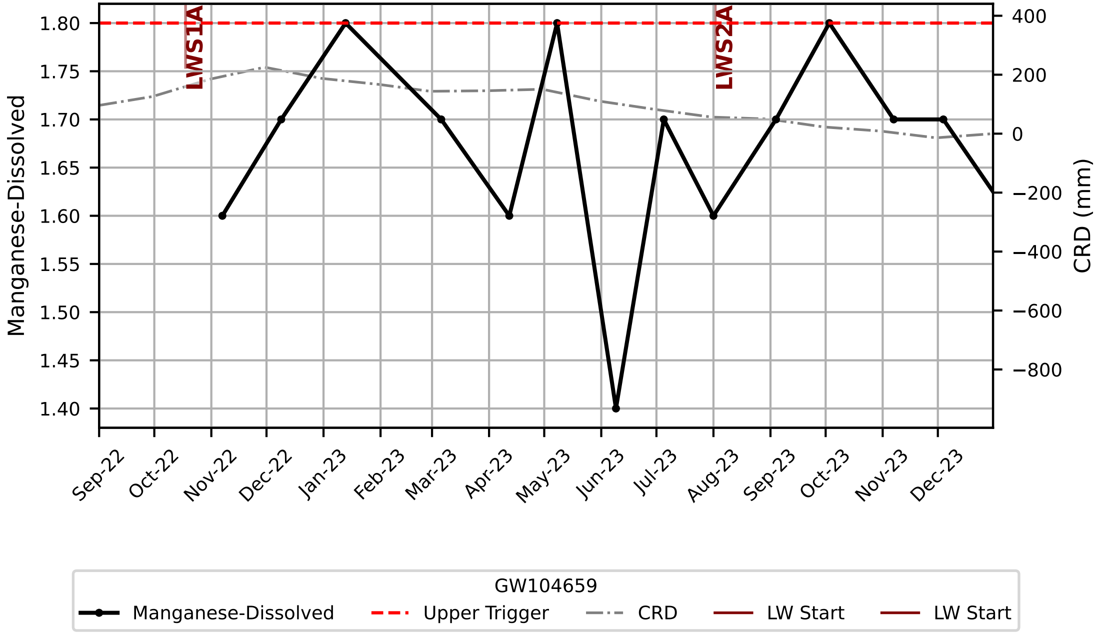
LWS1A
LWS2A
pH (field)
CRD (mm)
12
10
8
6
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

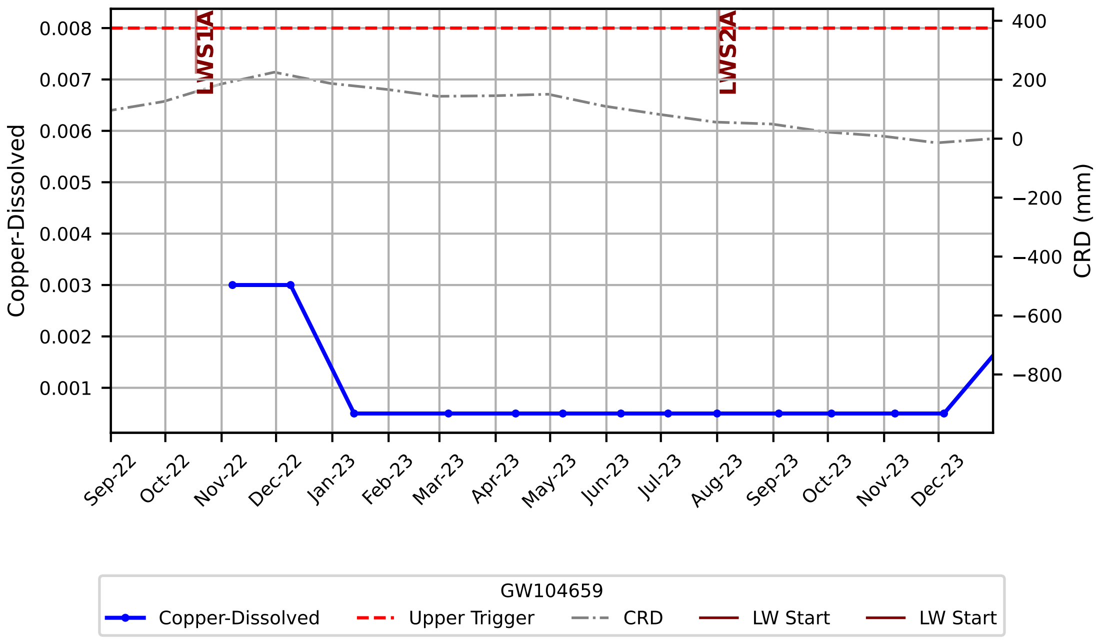


LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start

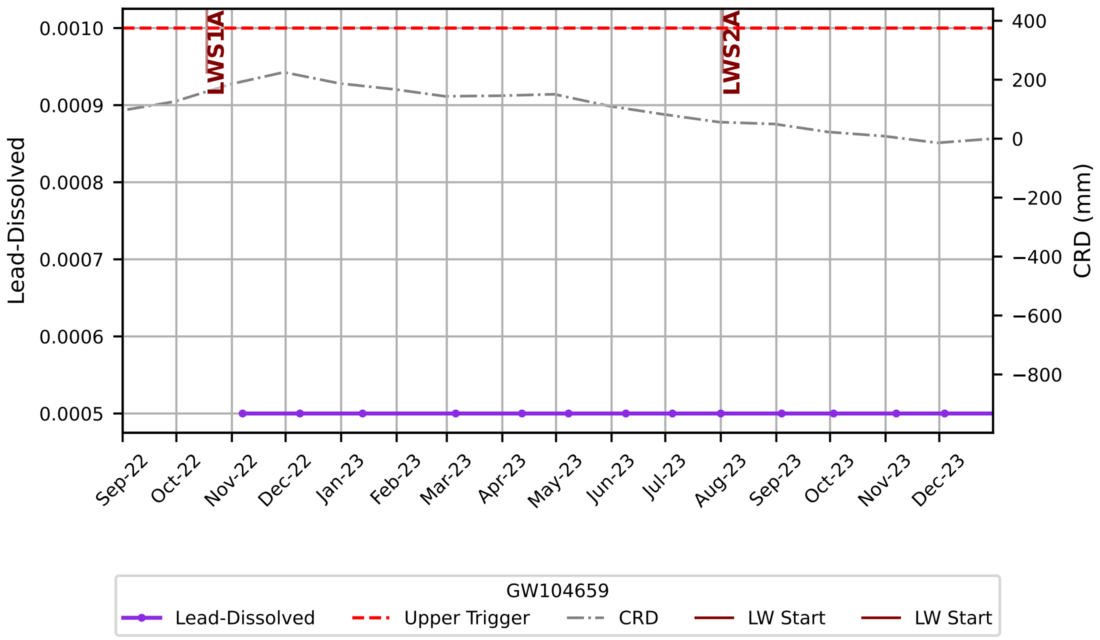


LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start

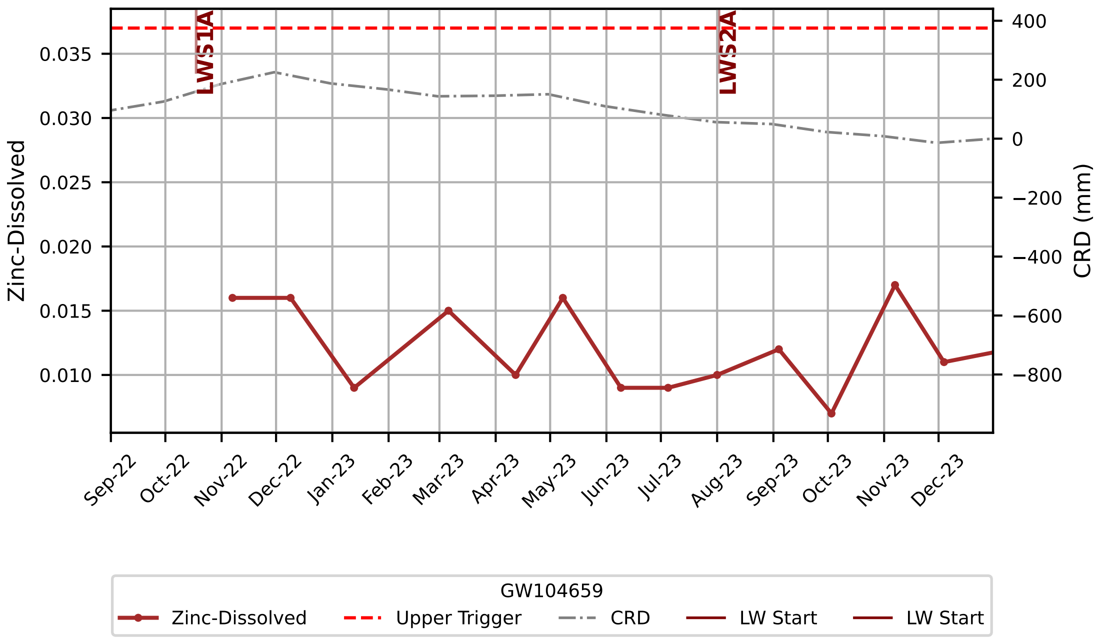

GW104659
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23



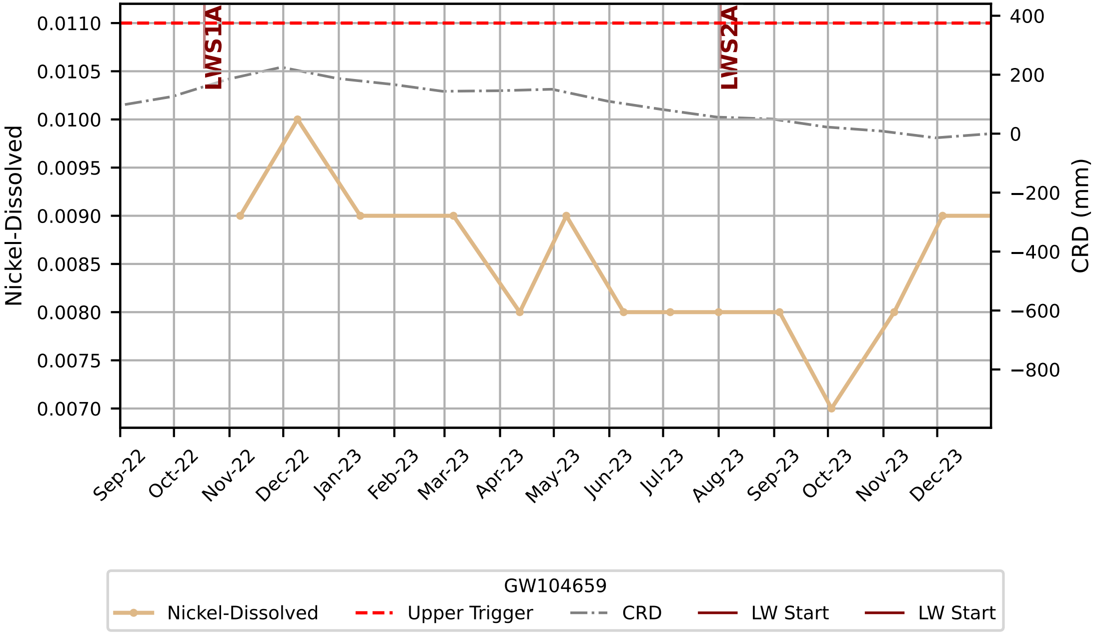
Copper-Dissolved
CRD (mm)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



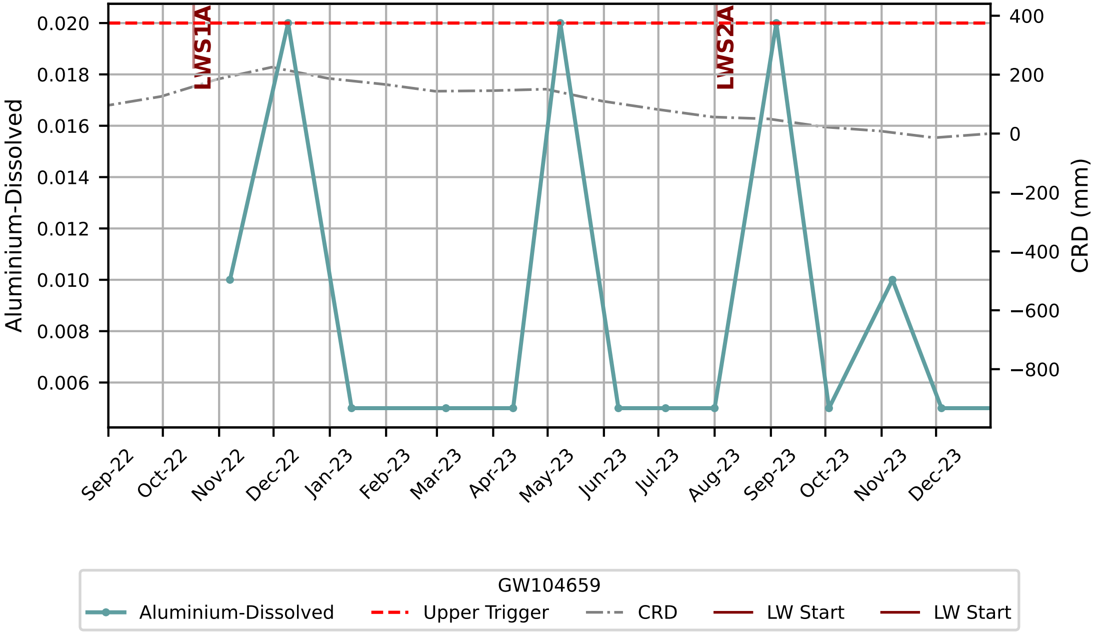
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



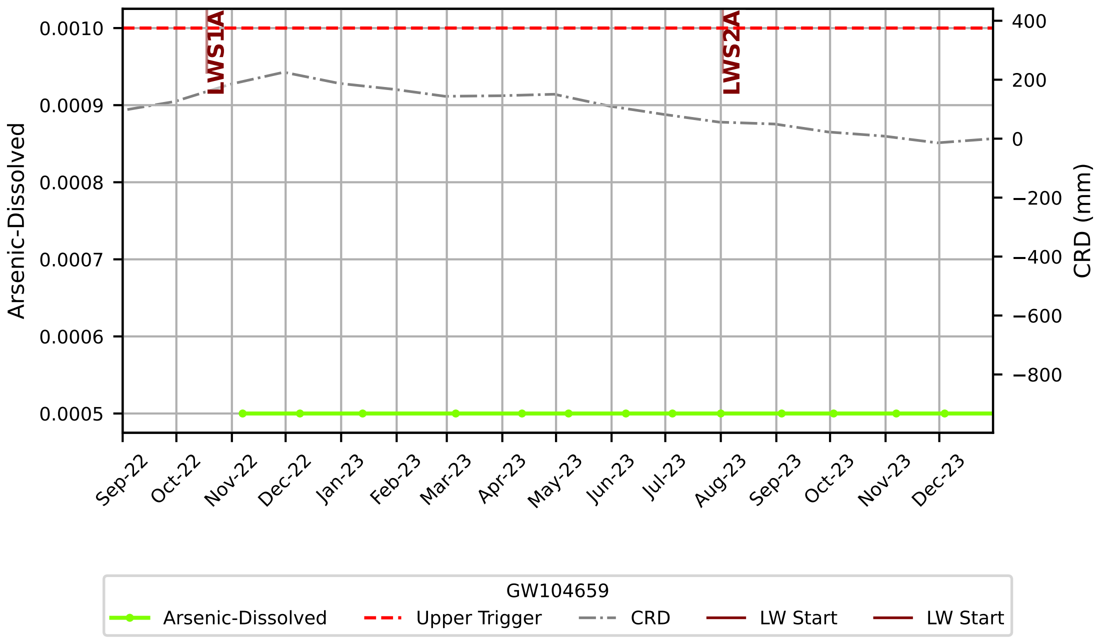
LWS1A
LWS2A
0.035
0.030
0.025
0.020
0.015
0.010
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



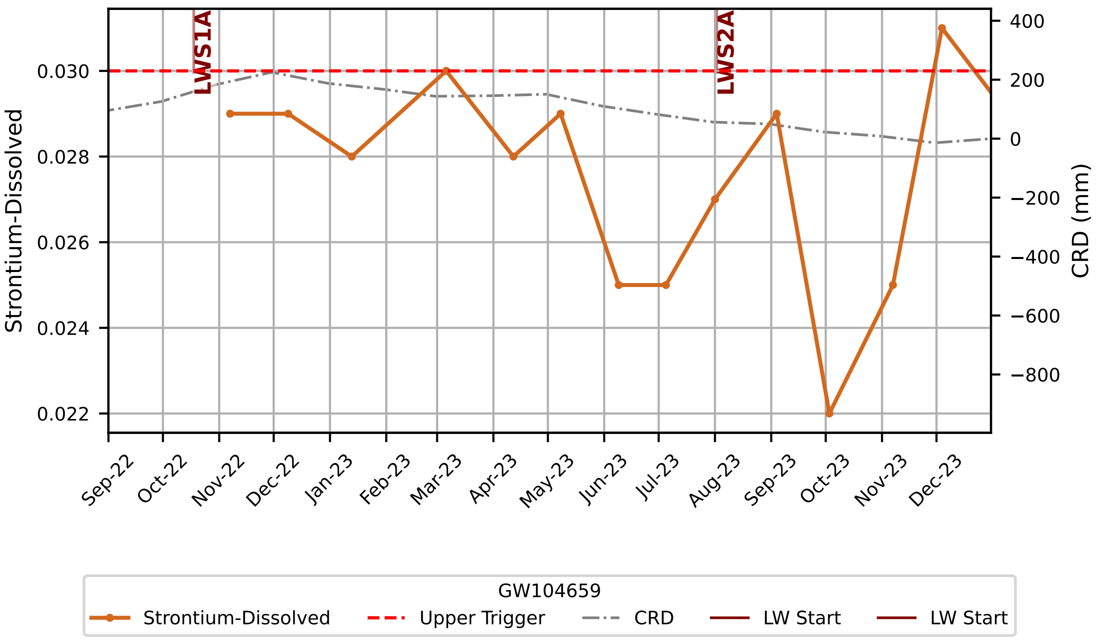
Nickel-Dissolved
CRD (mm)
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

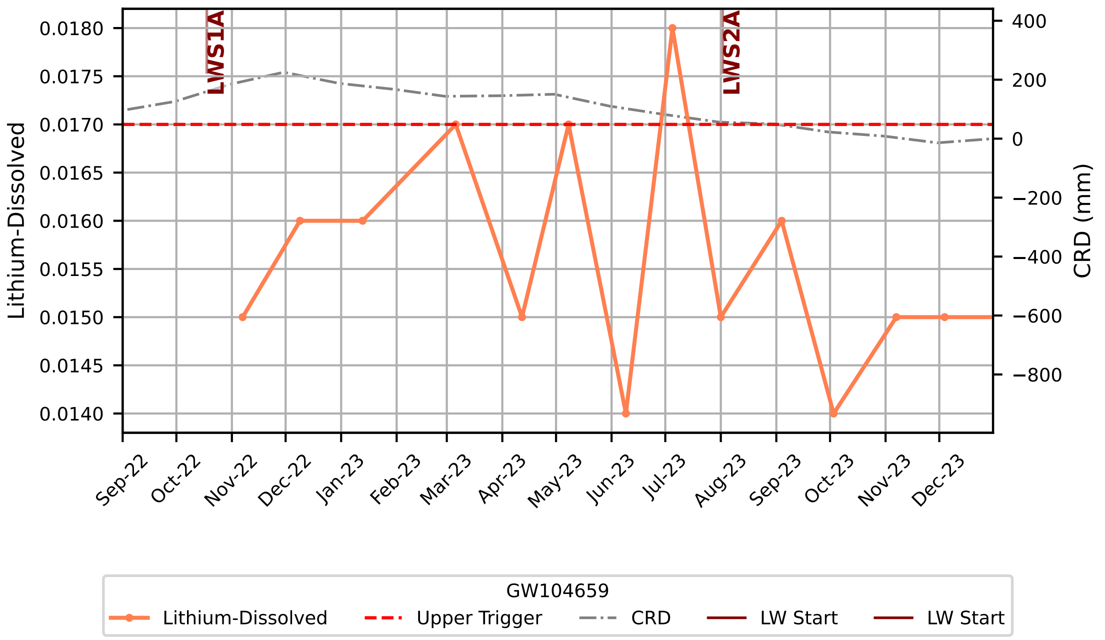


LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

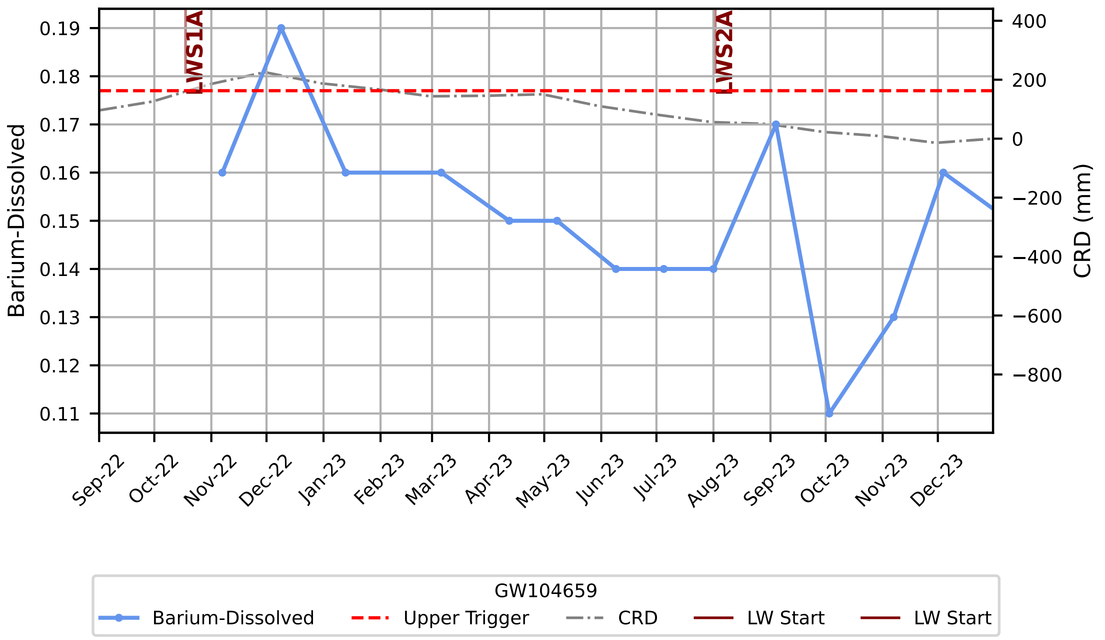


LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

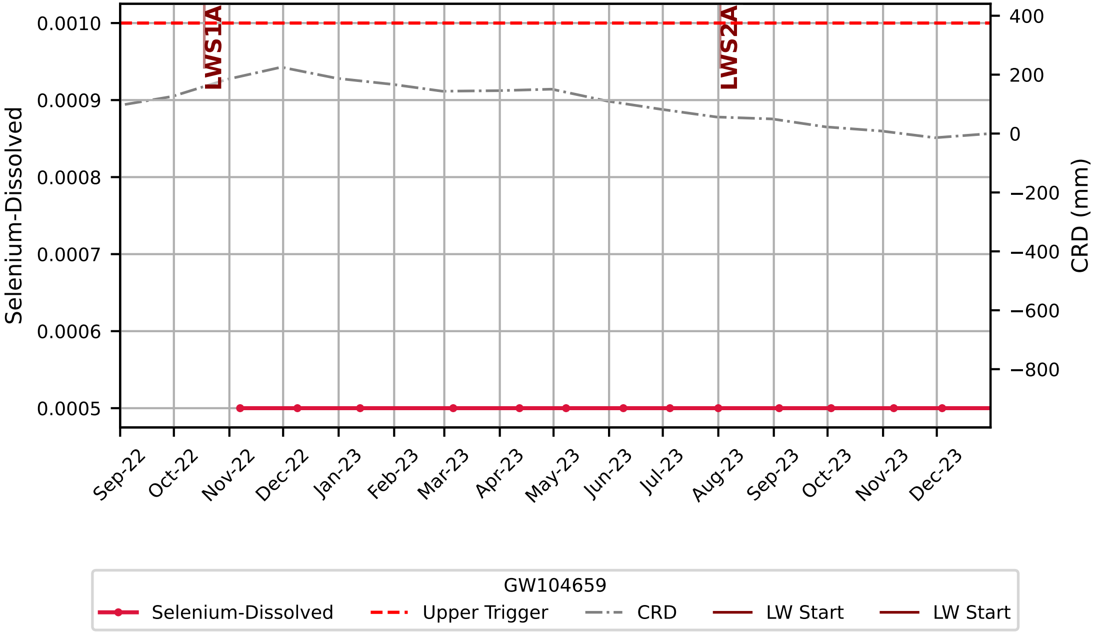

LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.030
0.028
0.026
0.024
0.022
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



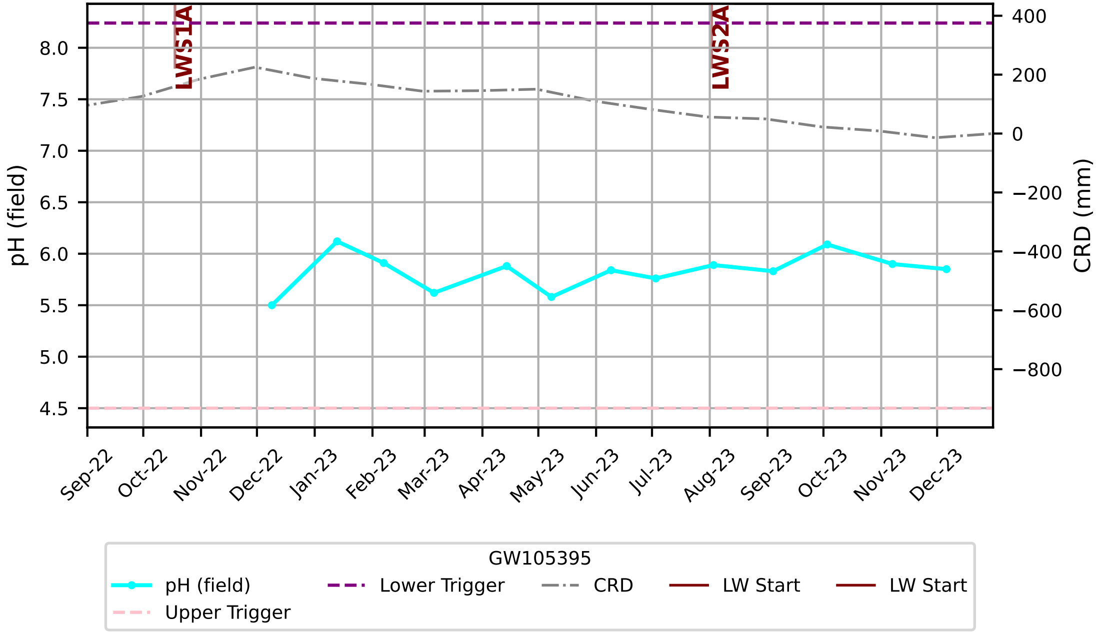
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0180
0.0175
0.0170
0.0165
0.0160
0.0155
0.0150
0.0145
0.0140
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



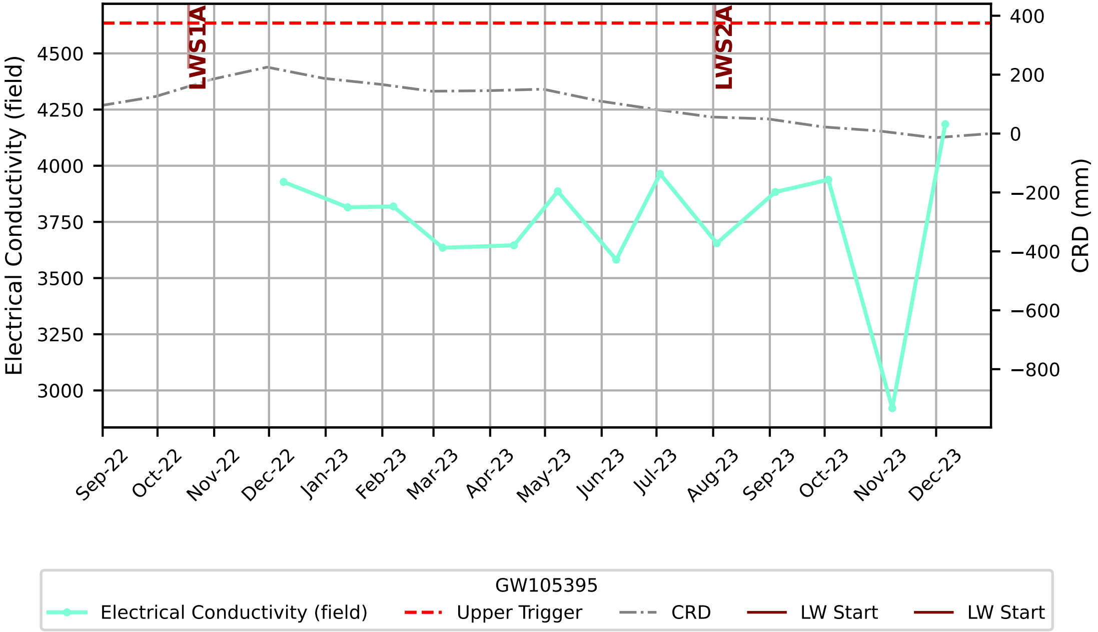
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



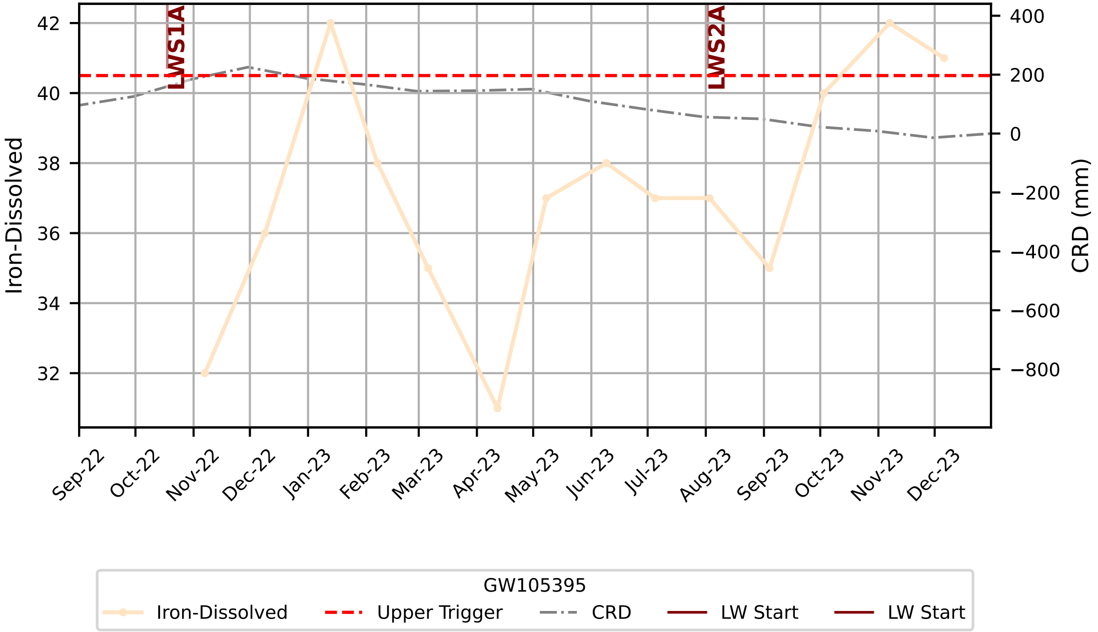
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW104659
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



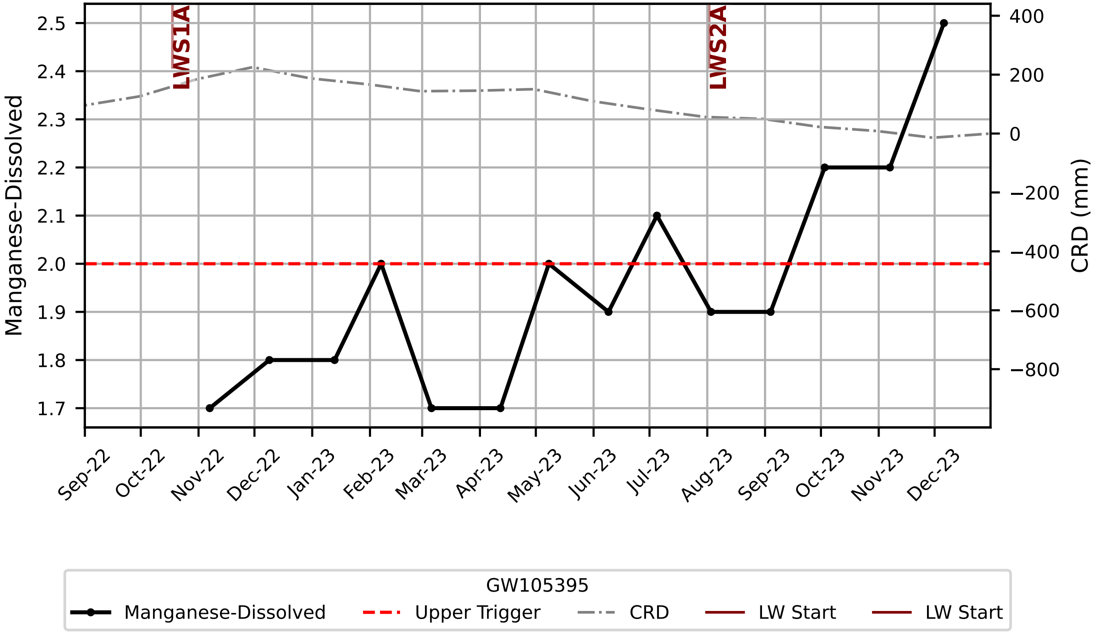
LWS1A
LWS2A
pH (field)
CRD (mm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



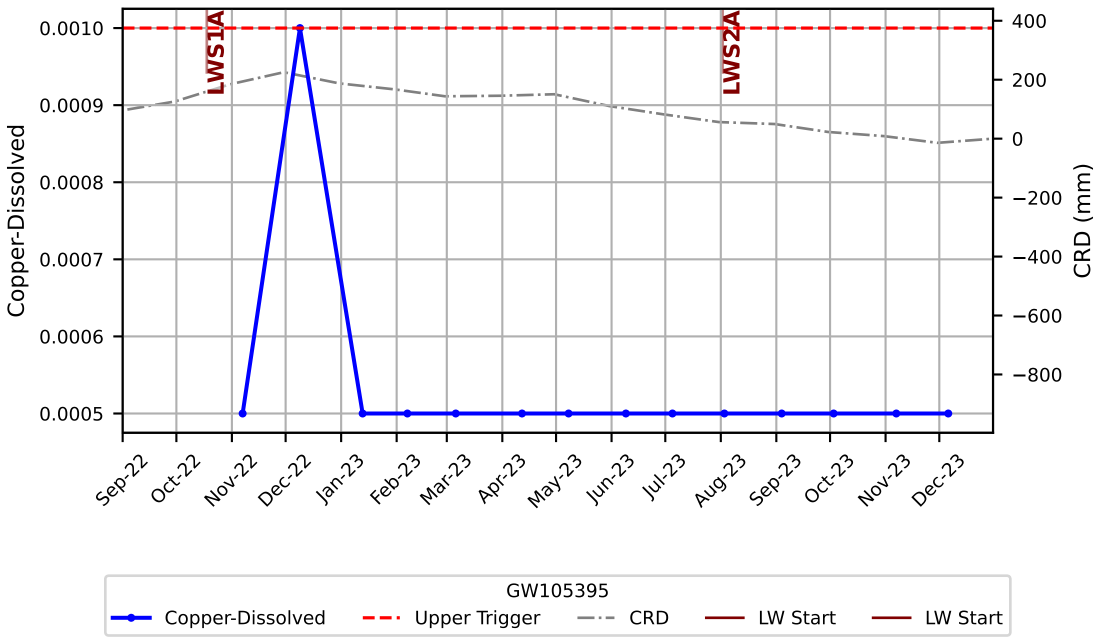
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
4500
4250
4000
3750
3500
3250
3000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



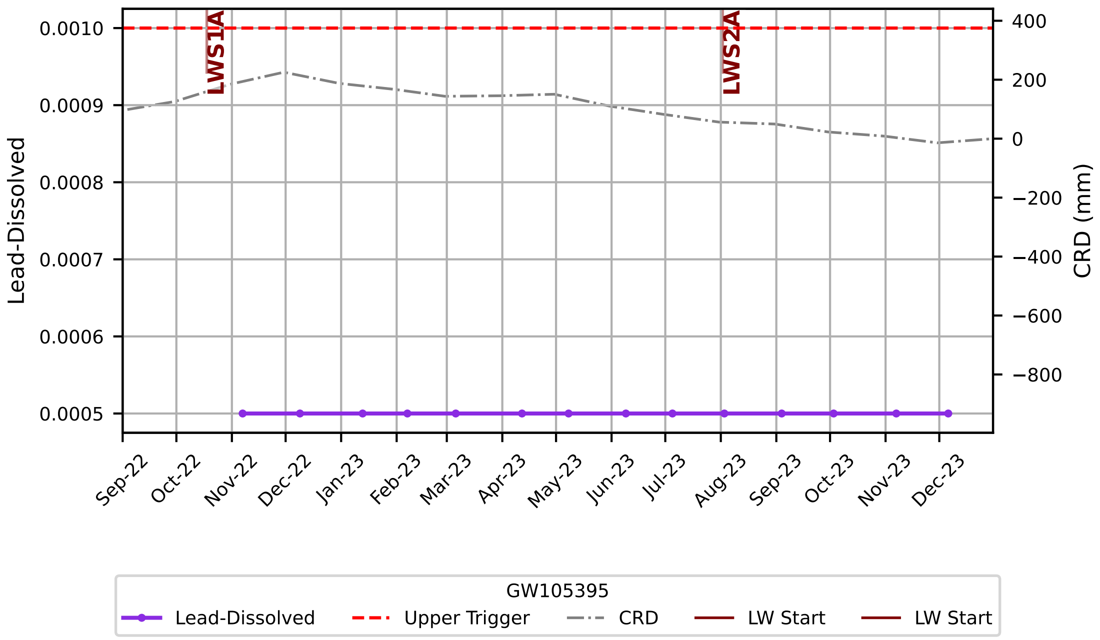
LWS1A
LWS2A
42
40
38
36
34
32
400
200
0
−200
−400
−600
−800
Iron-Dissolved
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



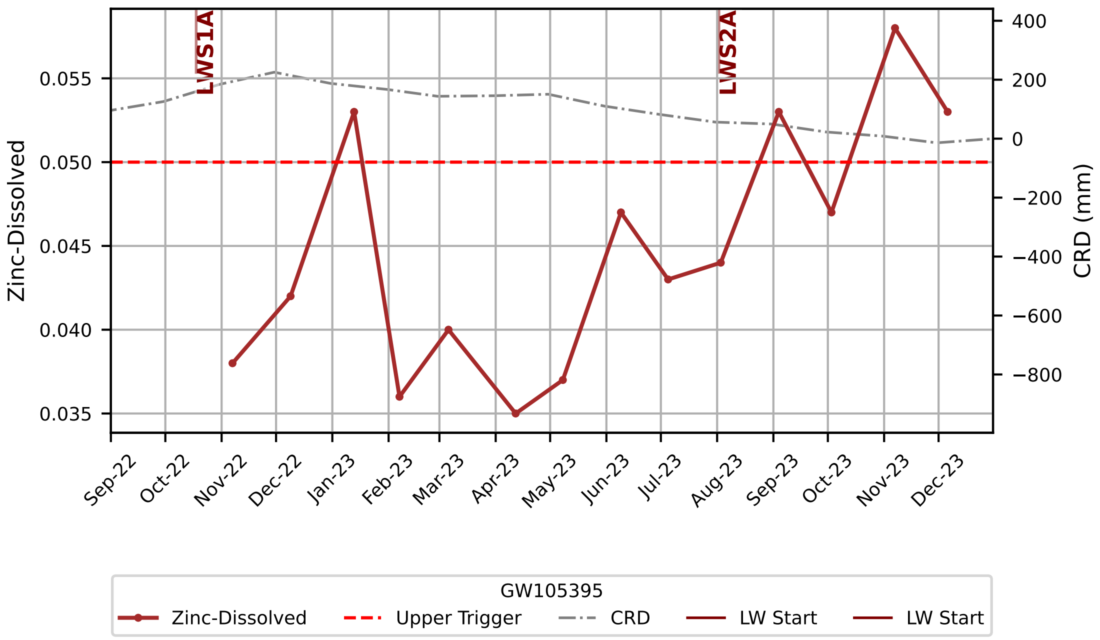
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



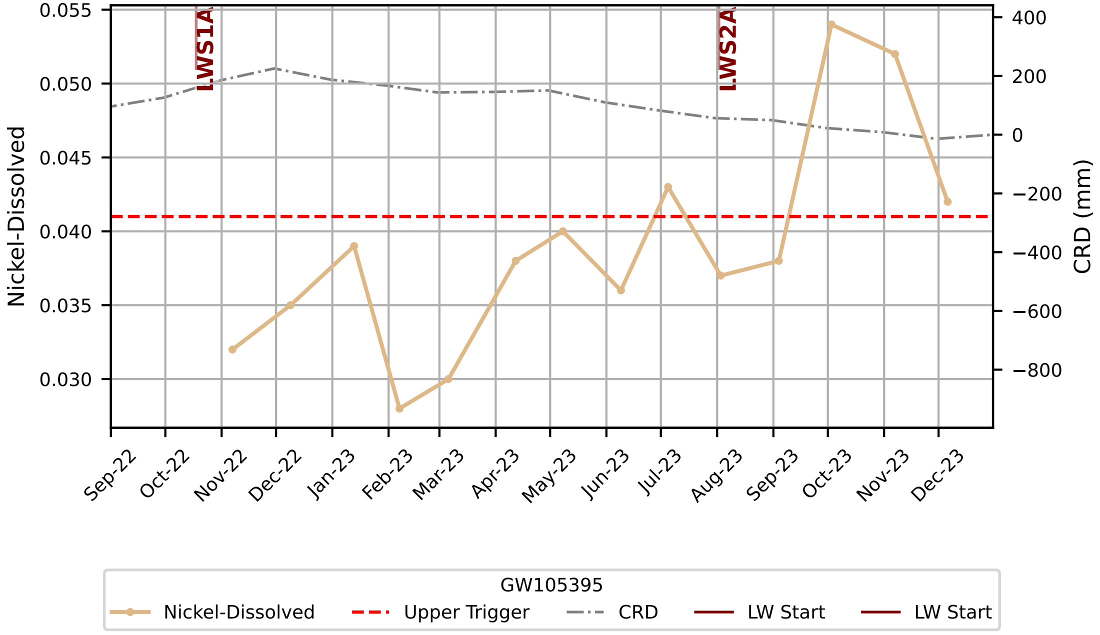
Copper-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



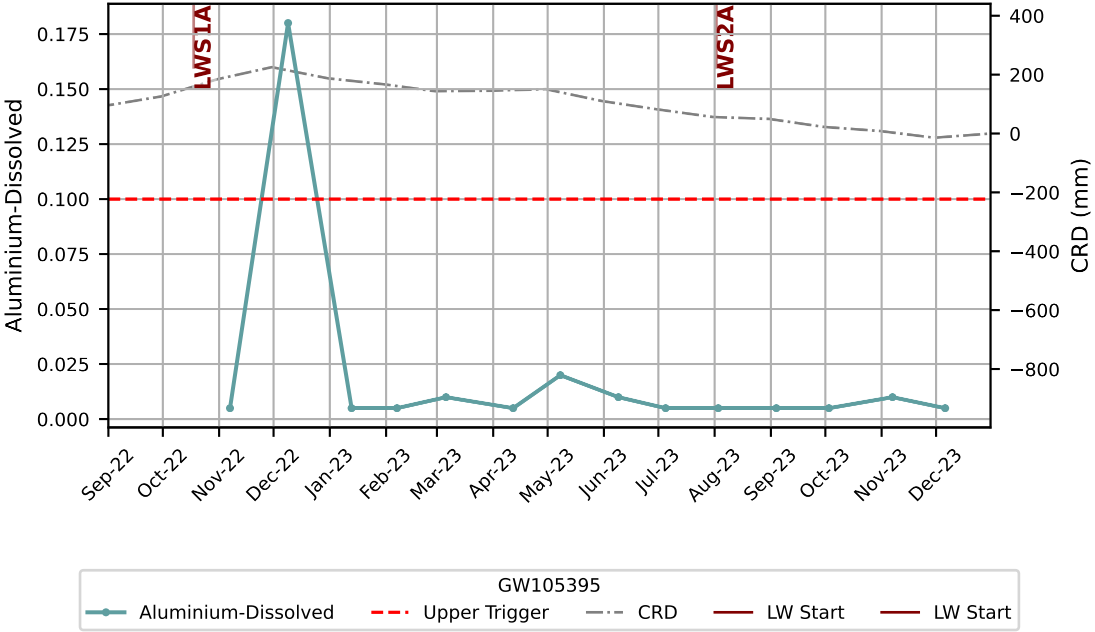
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



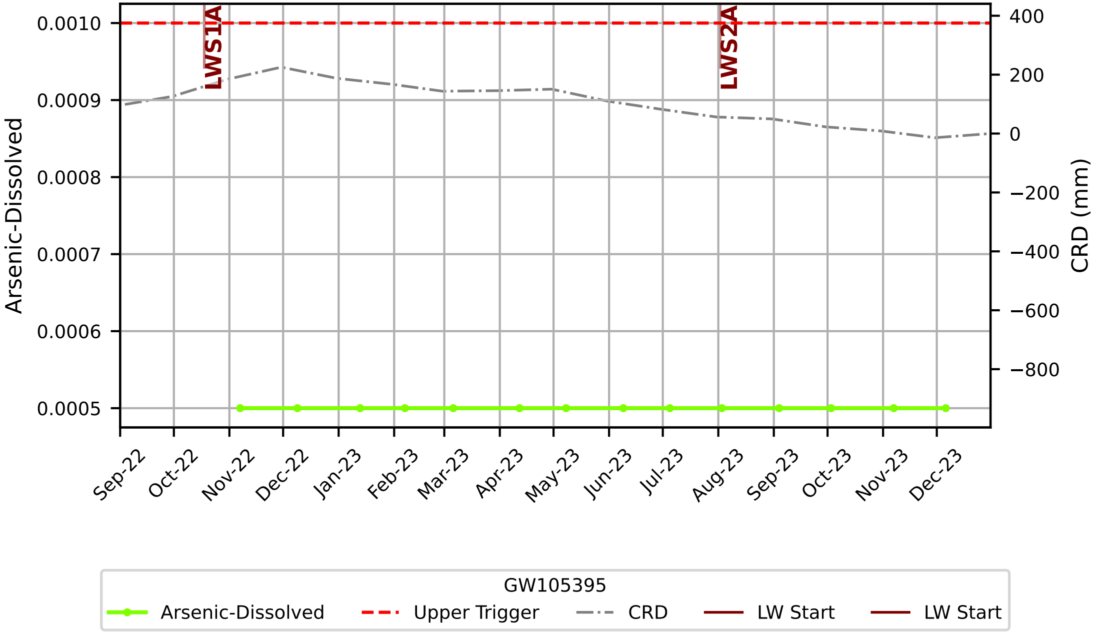
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.055
0.050
0.045
0.040
0.035
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



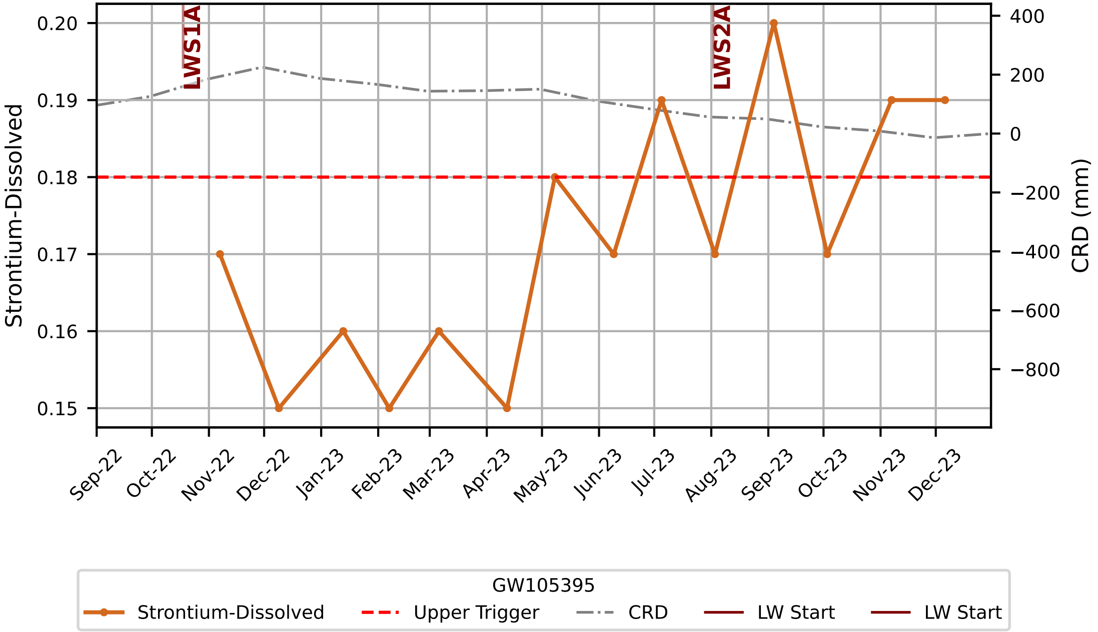
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.055
0.050
0.045
0.040
0.035
0.030
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



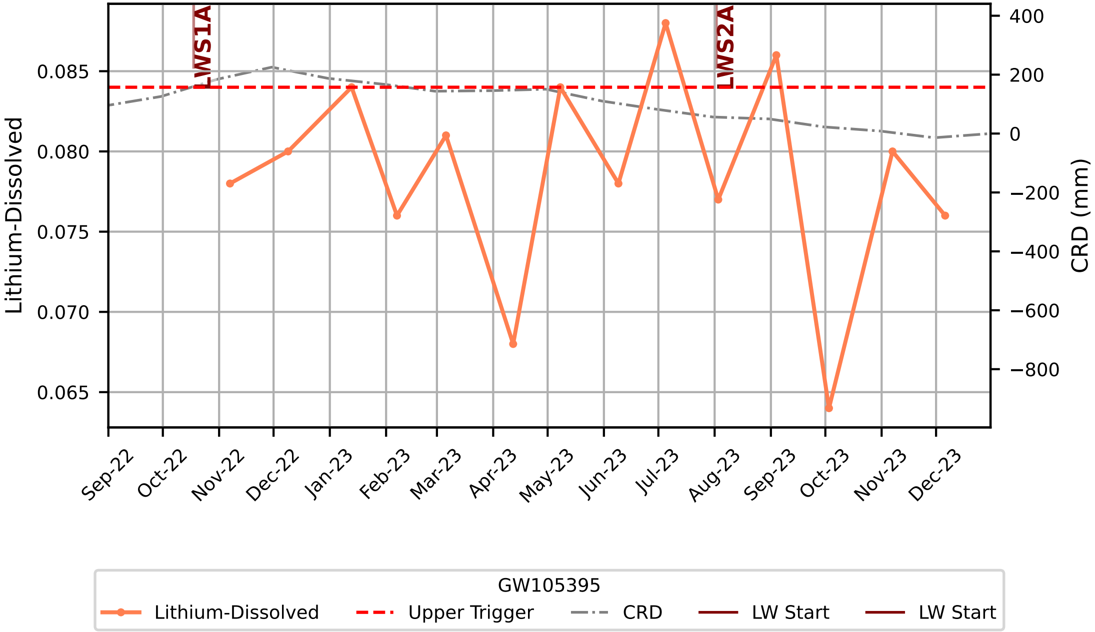
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



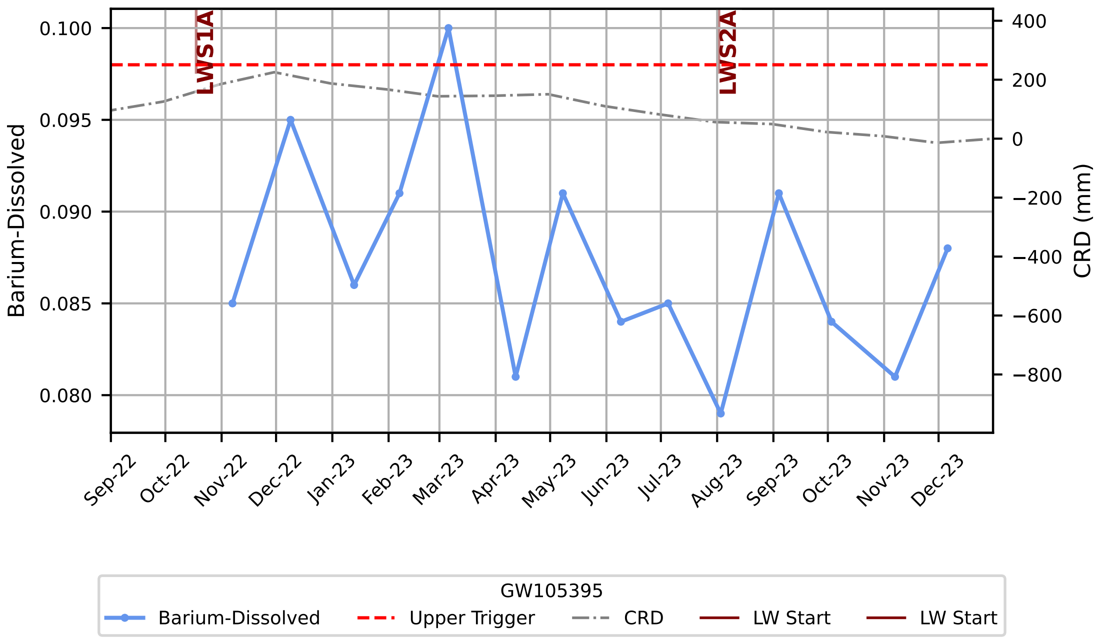
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



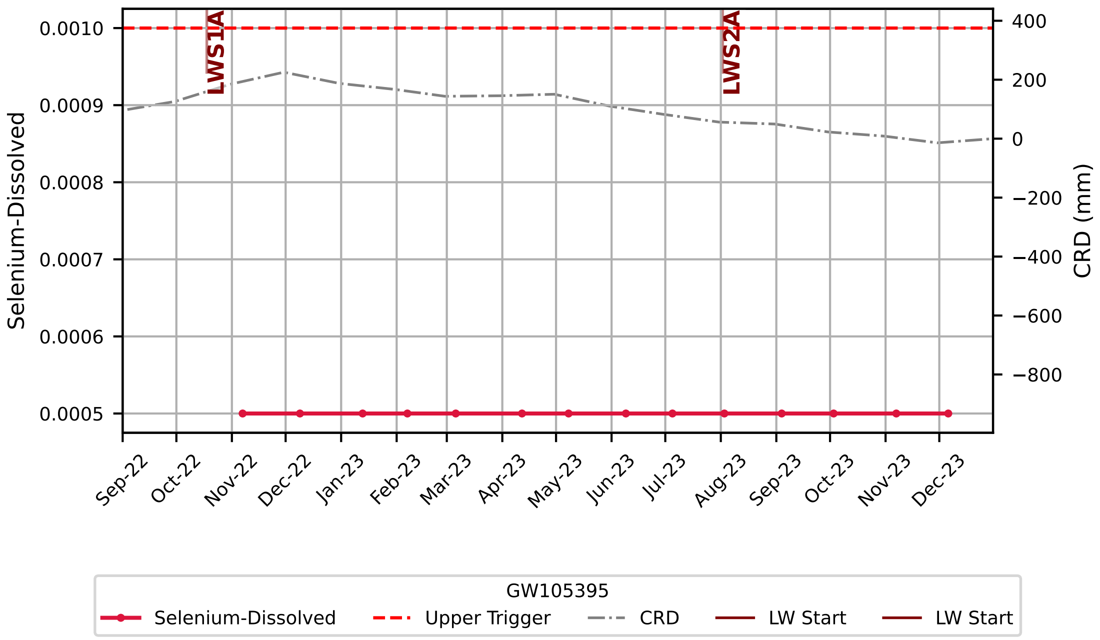
Strontium-Dissolved
CRD (mm)
0.20
0.19
0.18
0.17
0.16
0.15
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



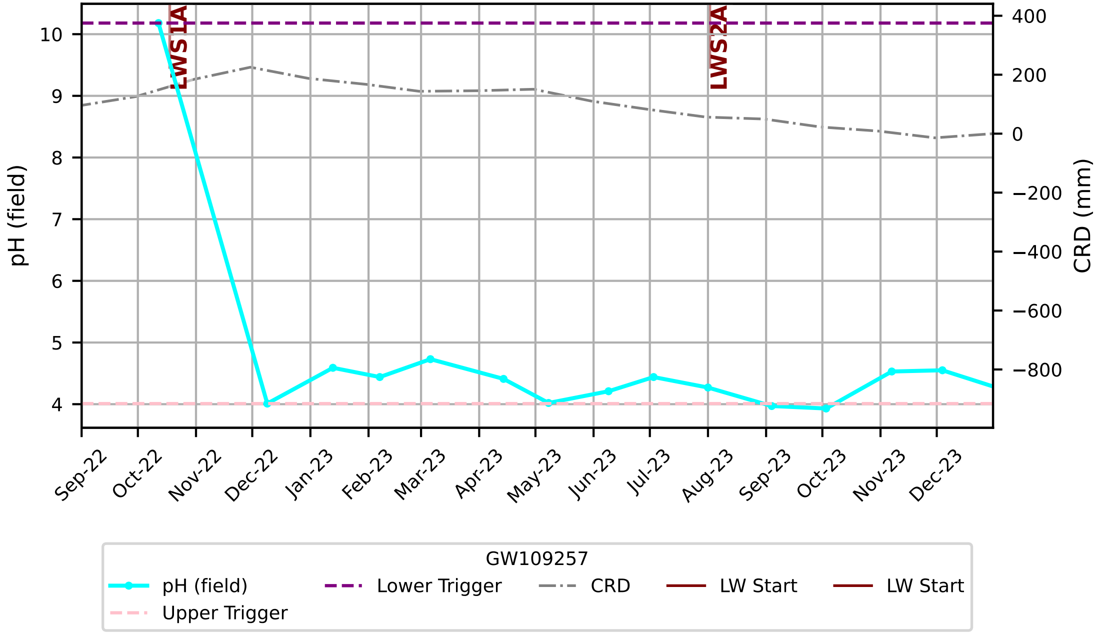
LWS1A
LWS2A
0.085
0.080
0.075
0.070
0.065
Lithium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



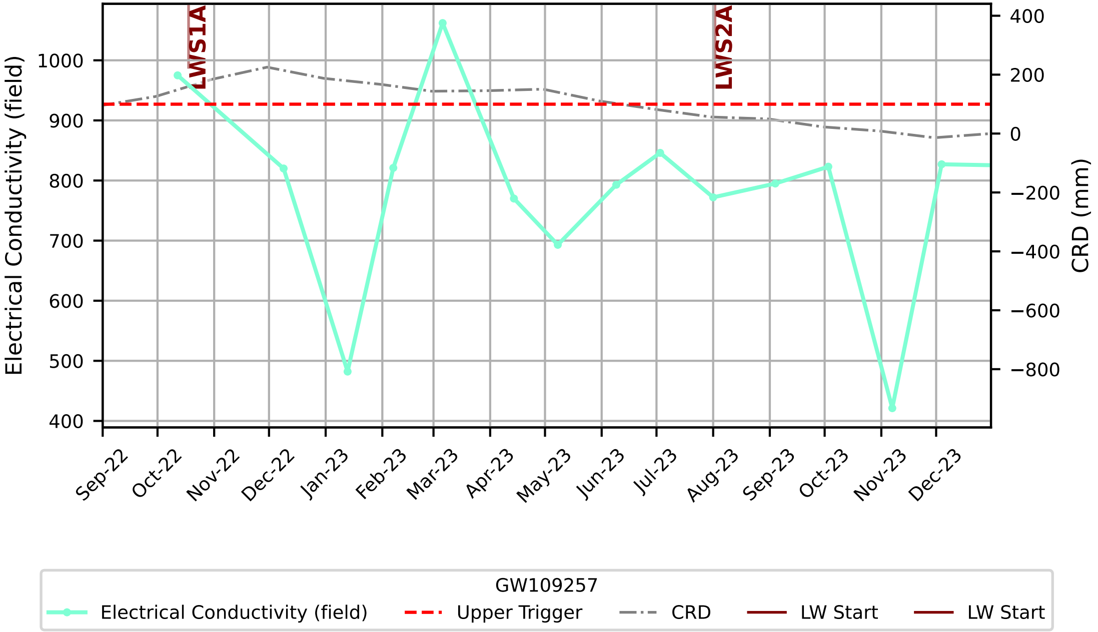
Barium-Dissolved
CRD (mm)
0.100
0.095
0.090
0.085
0.080
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



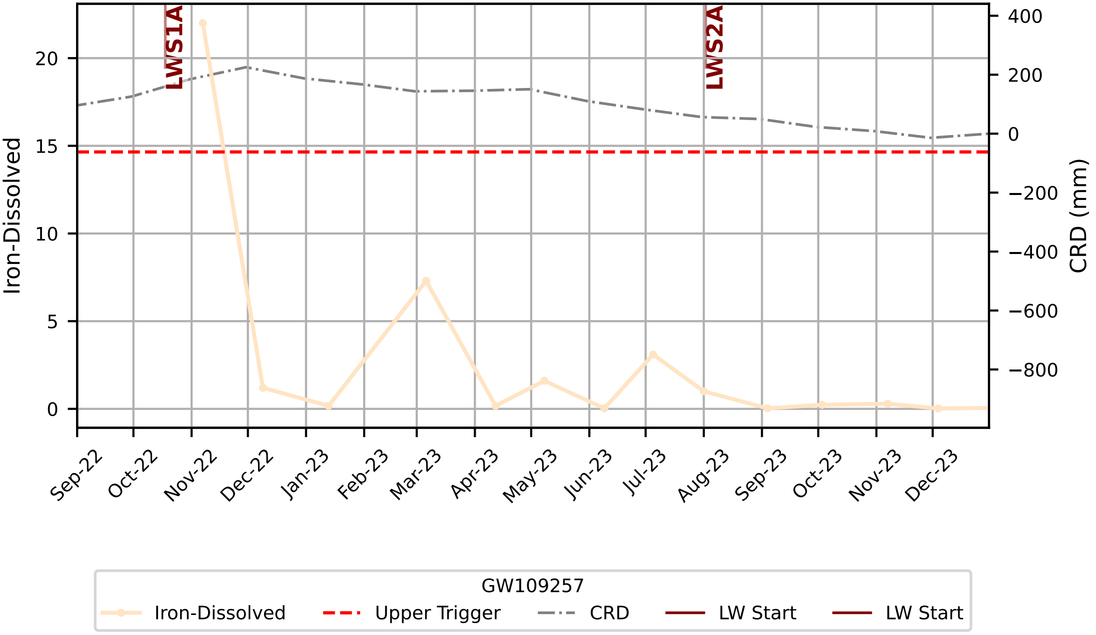
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW105395
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



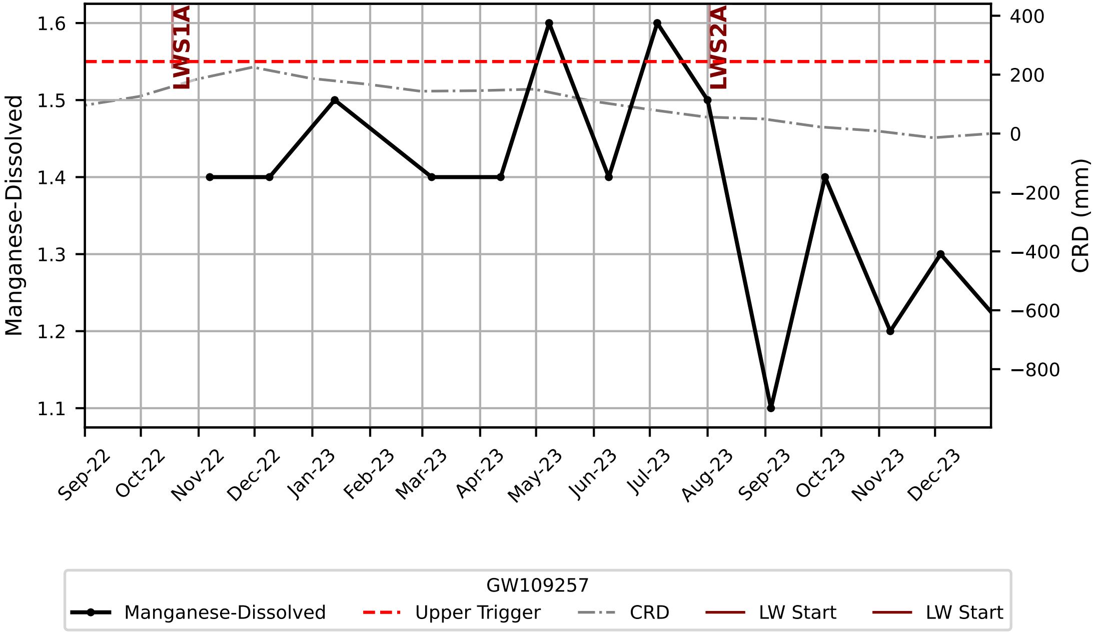
LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



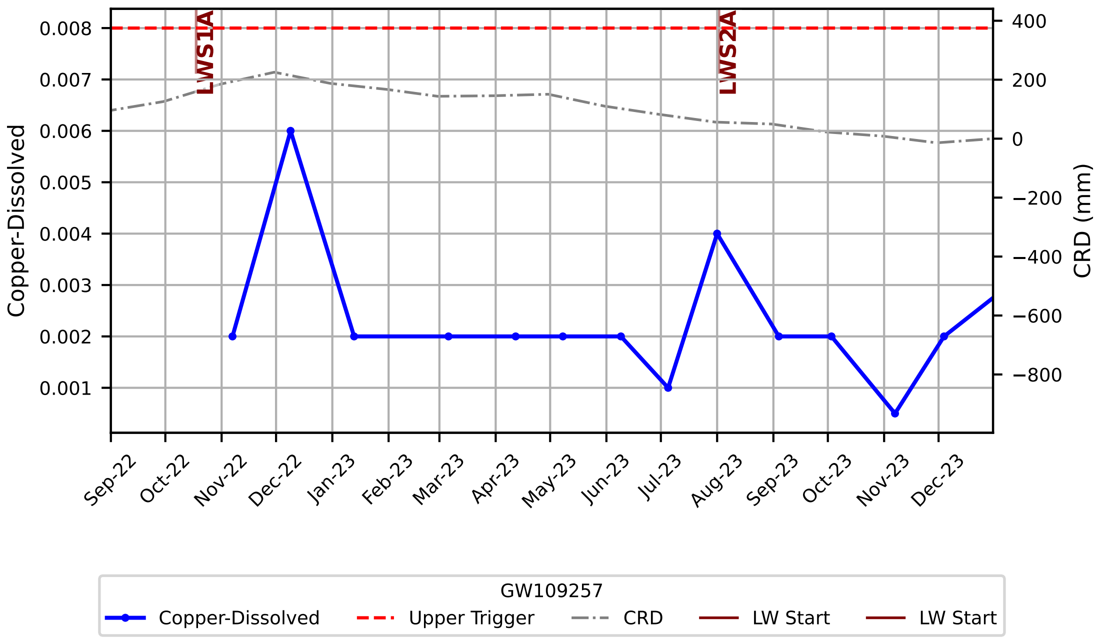
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1000
900
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



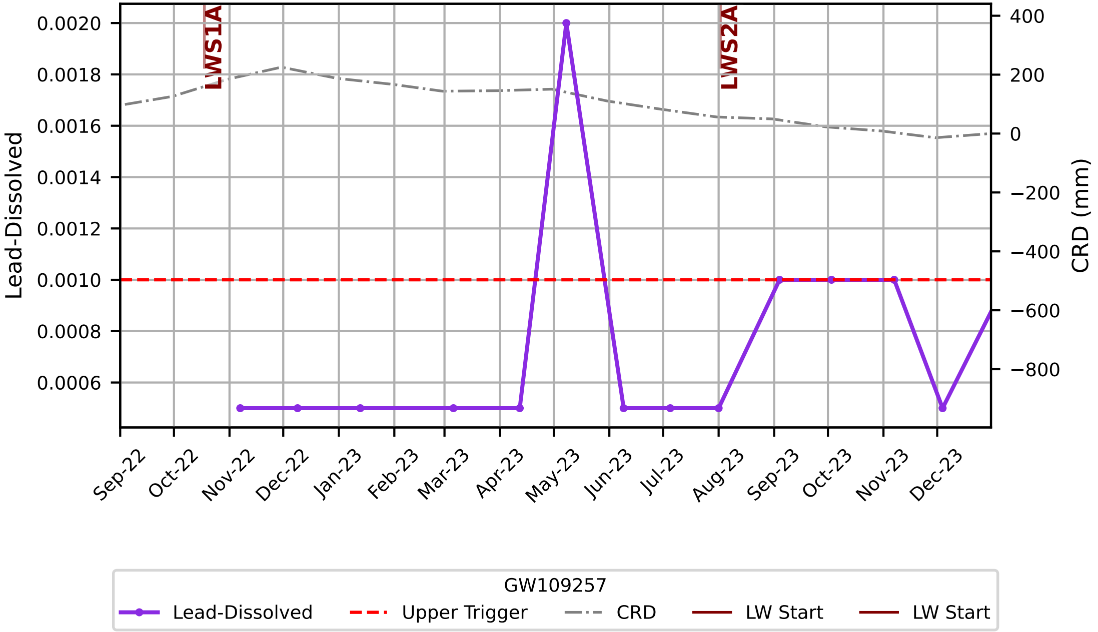
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



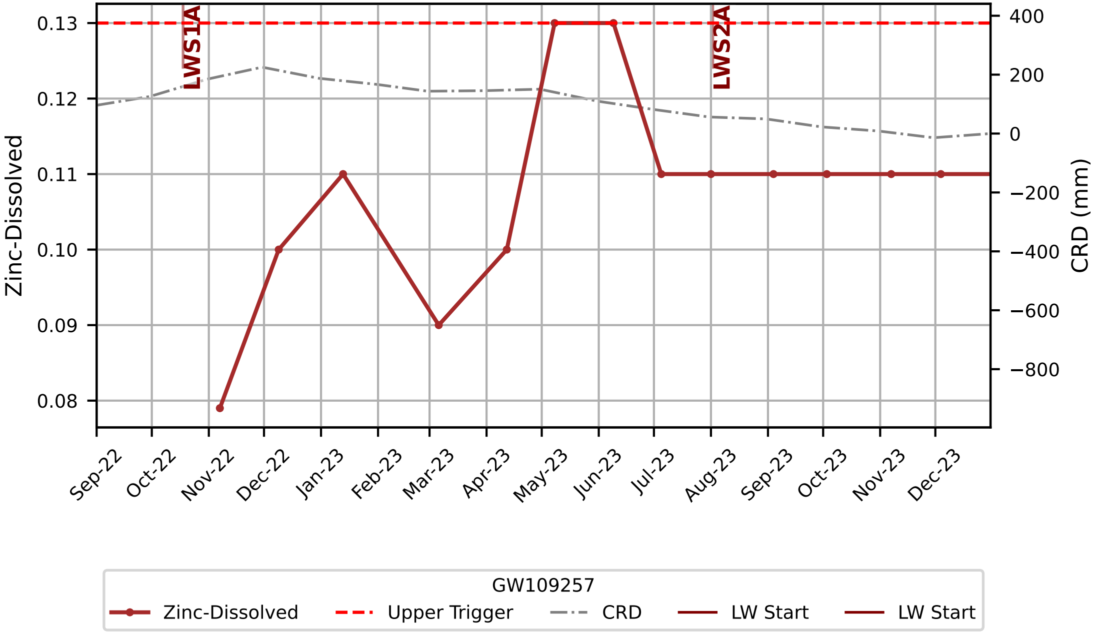
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
1.6
1.5
1.4
1.3
1.2
1.1
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



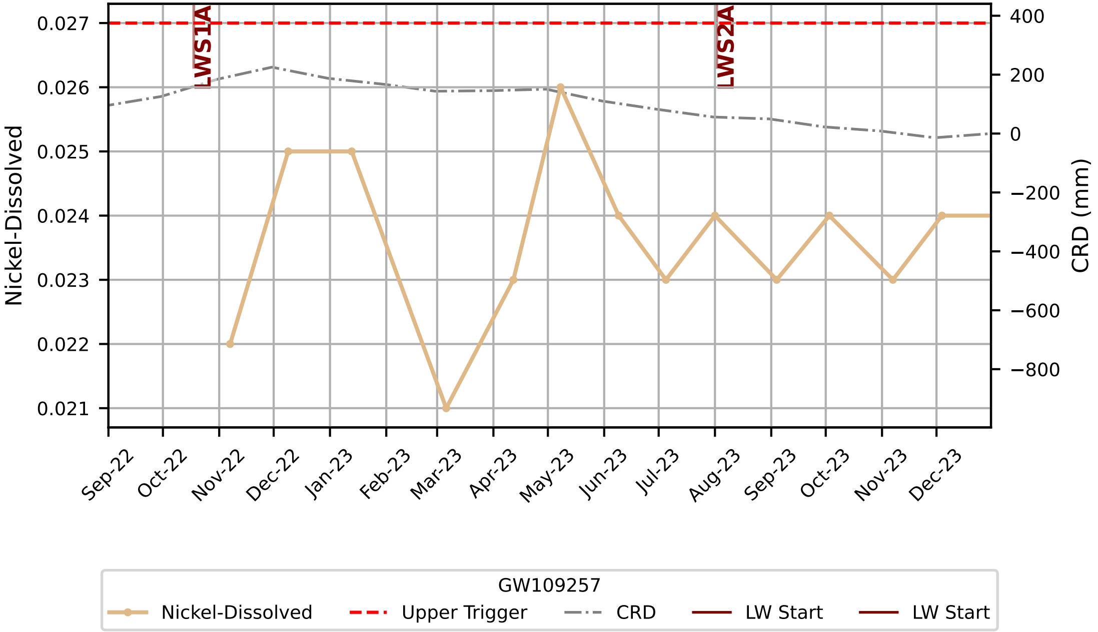
LWS1A
LWS2A
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



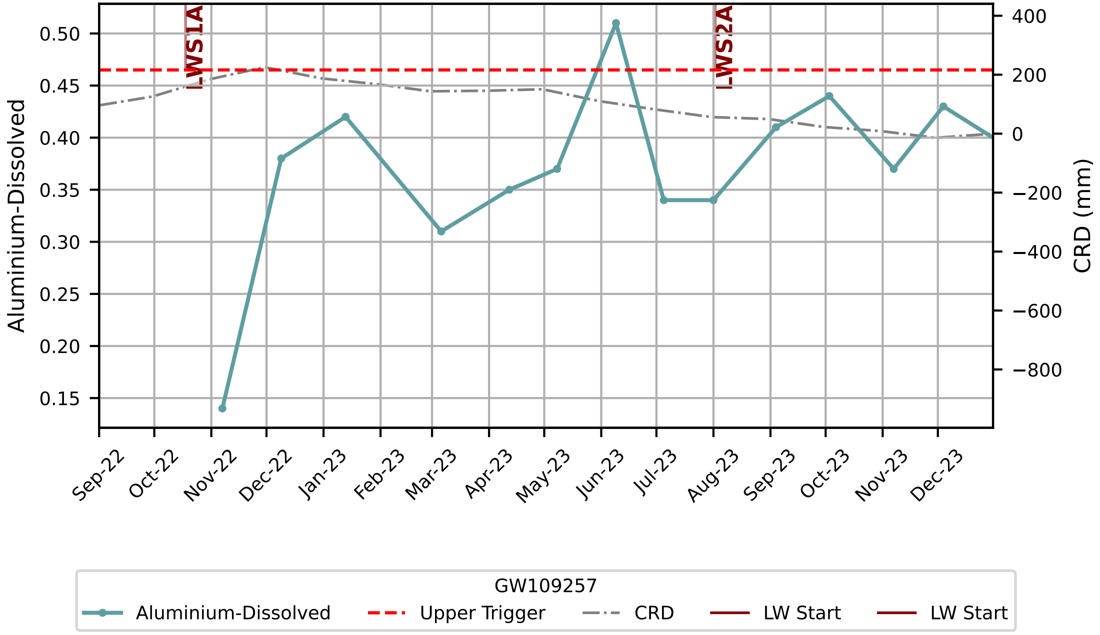
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

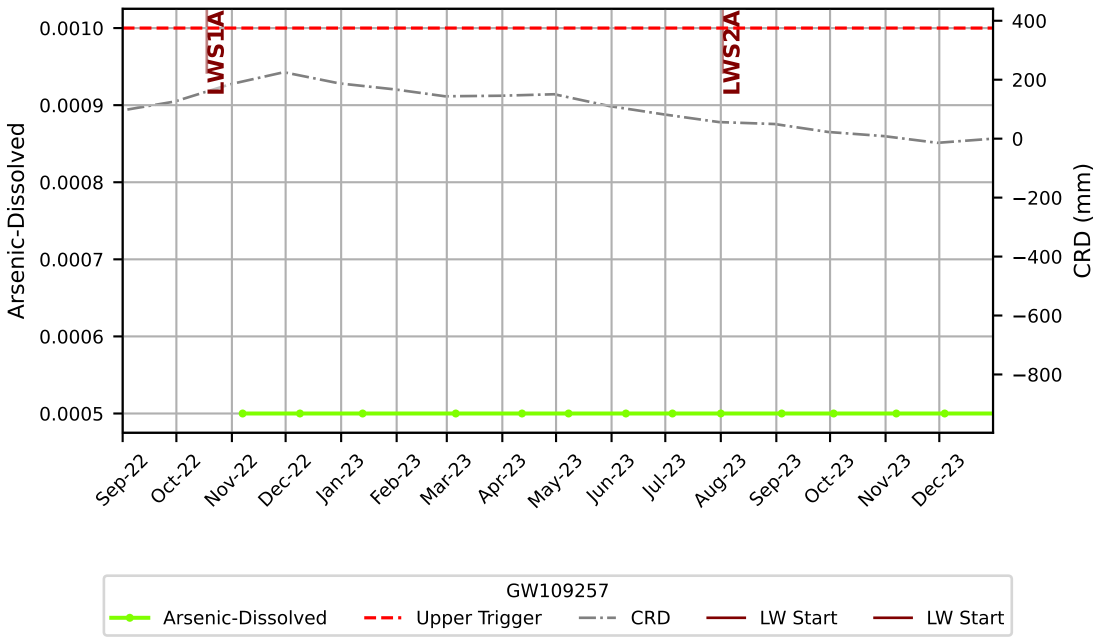


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.13
0.12
0.11
0.10
0.09
0.08
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

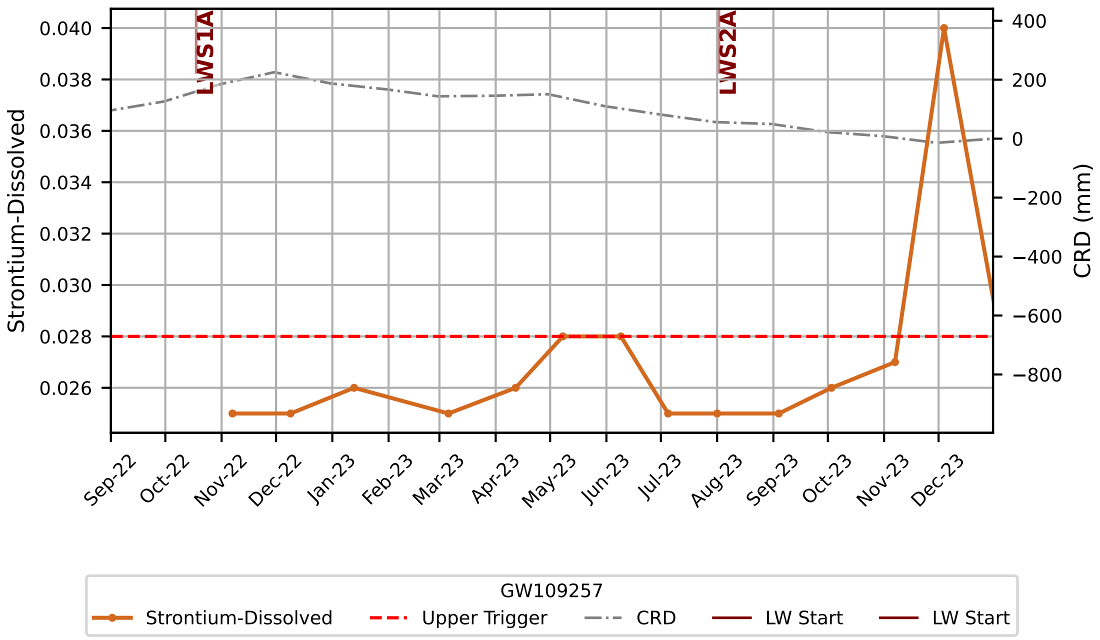


Nickel-Dissolved
CRD (mm)
LWS1A
LWS2A
0.027
0.026
0.025
0.024
0.023
0.022
0.021
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

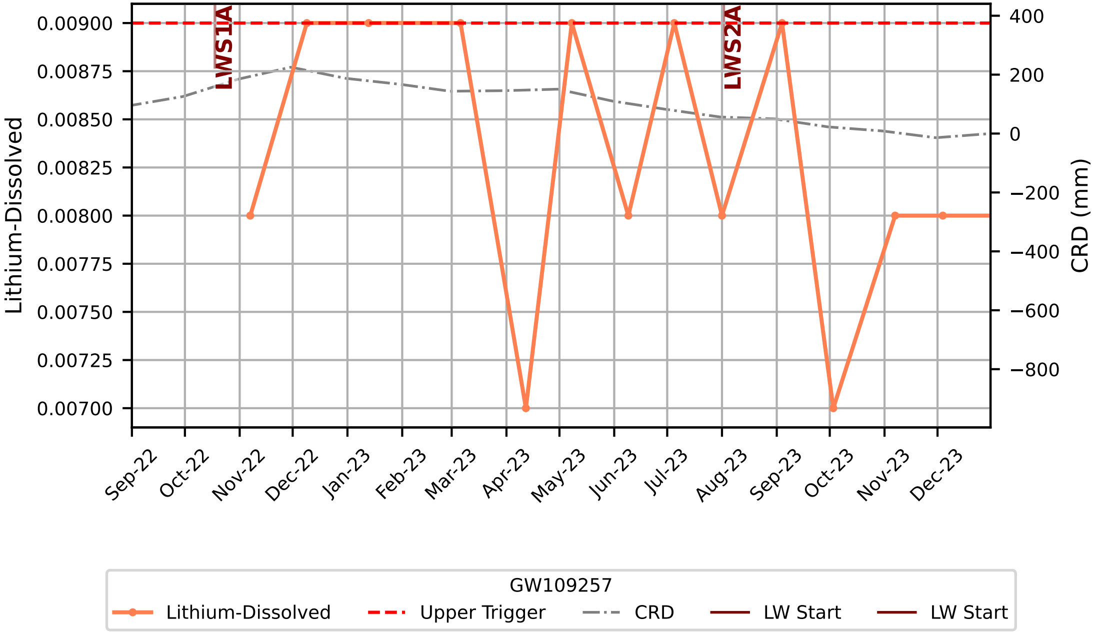

LW51A
LW52A
Aluminium-Dissolved
CRD (mm)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

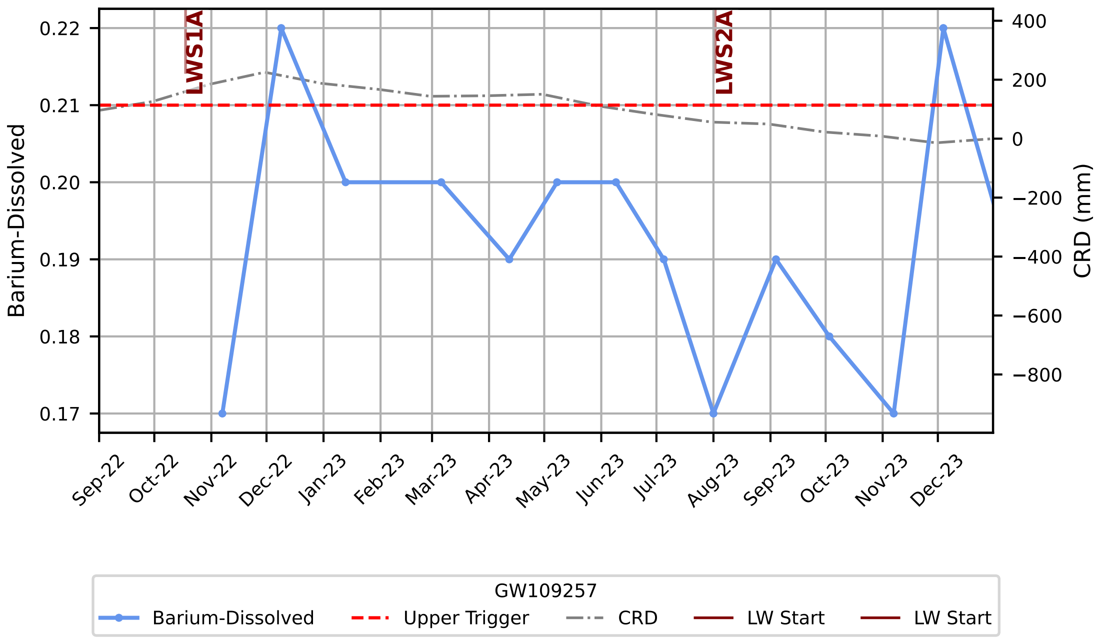


Arsenic-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

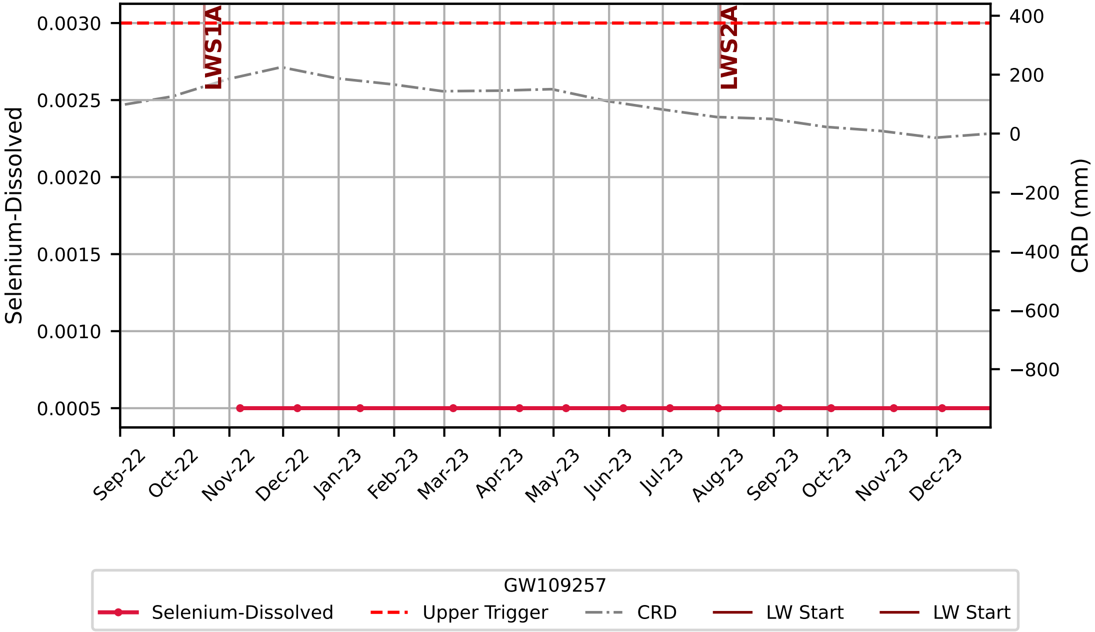


LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.040
0.038
0.036
0.034
0.032
0.030
0.028
0.026
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

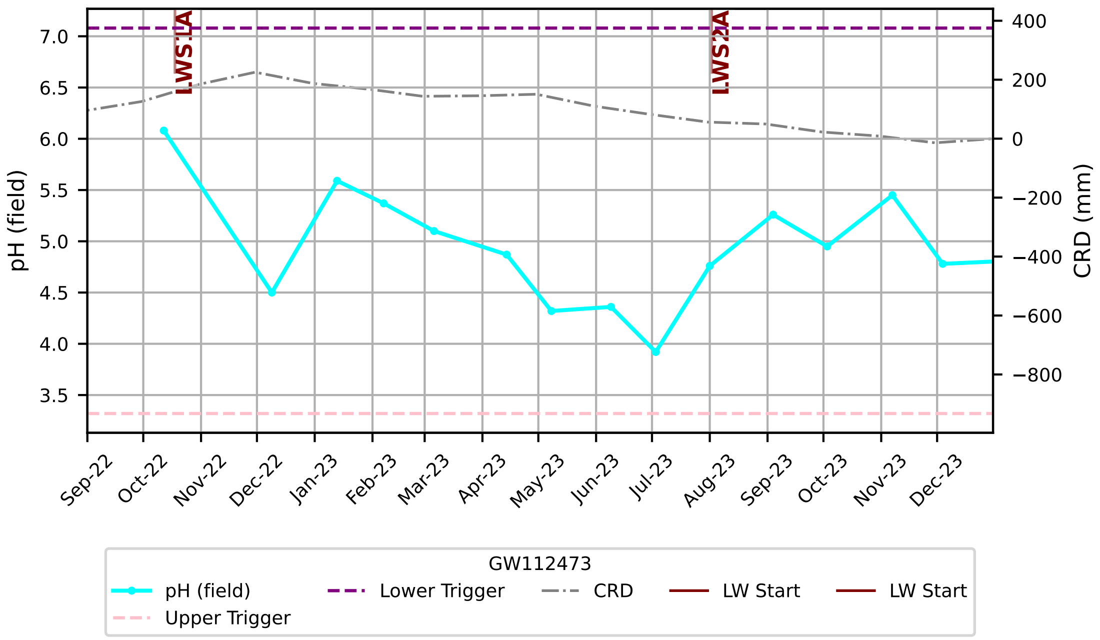

LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.00900
0.00875
0.00850
0.00825
0.00800
0.00775
0.00750
0.00725
0.00700
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



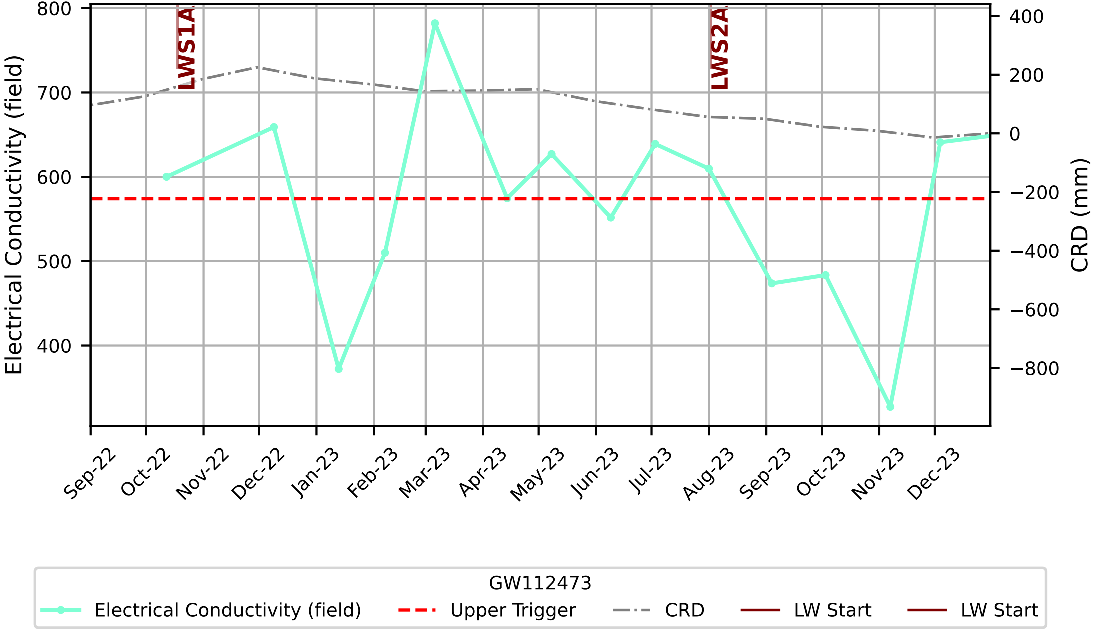
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.22
0.21
0.20
0.19
0.18
0.17
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



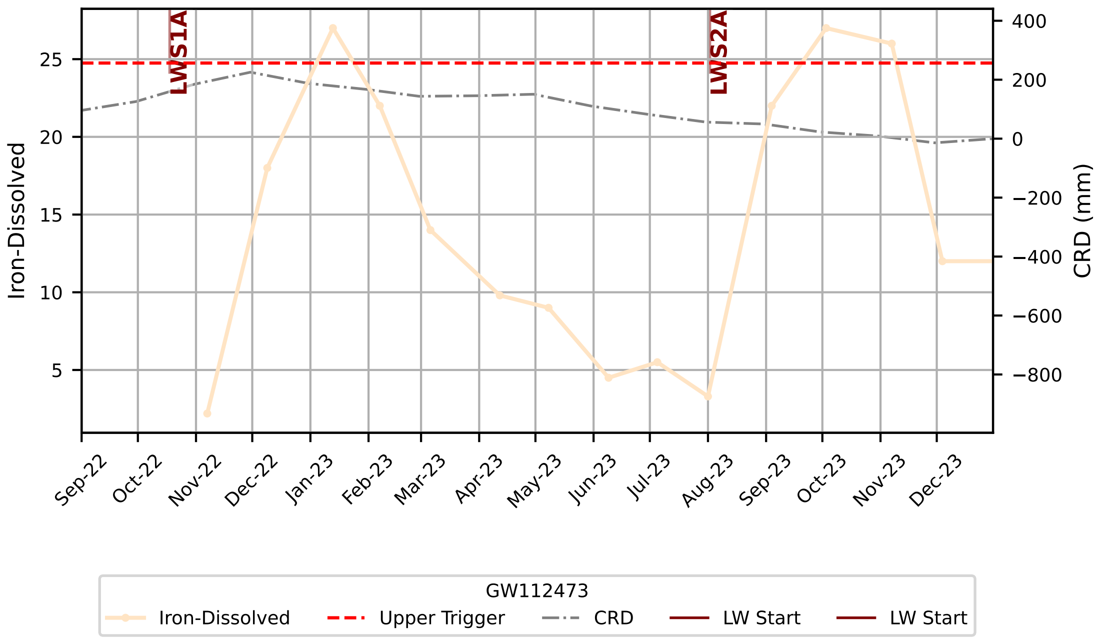
LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW109257
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



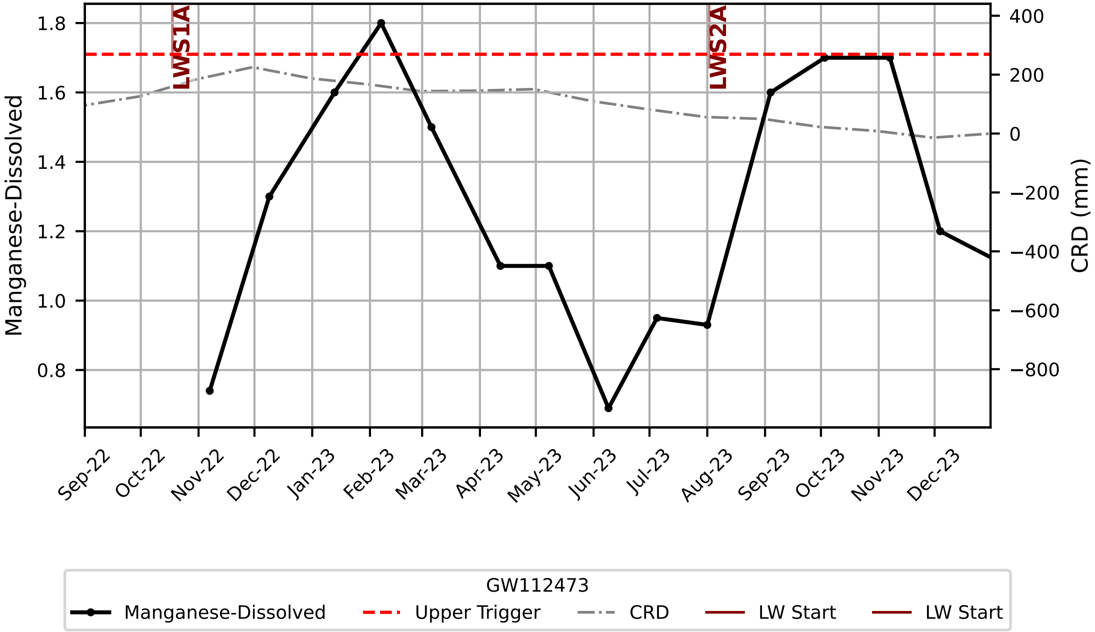
LWS1A
LWS2A
pH (field)
CRD (mm)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



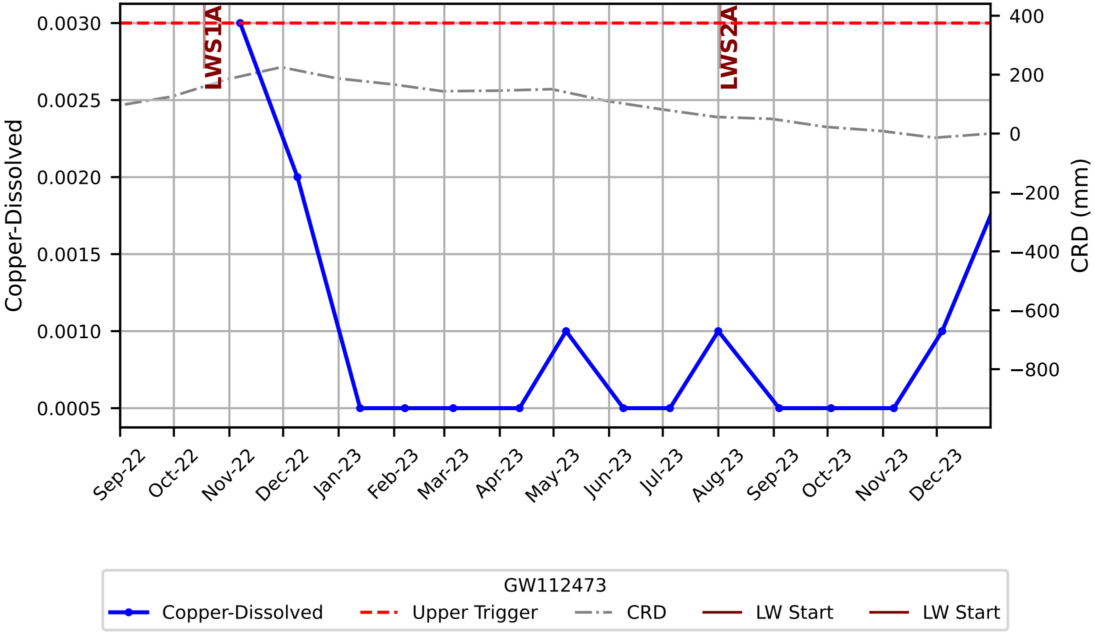
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
800
700
600
500
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



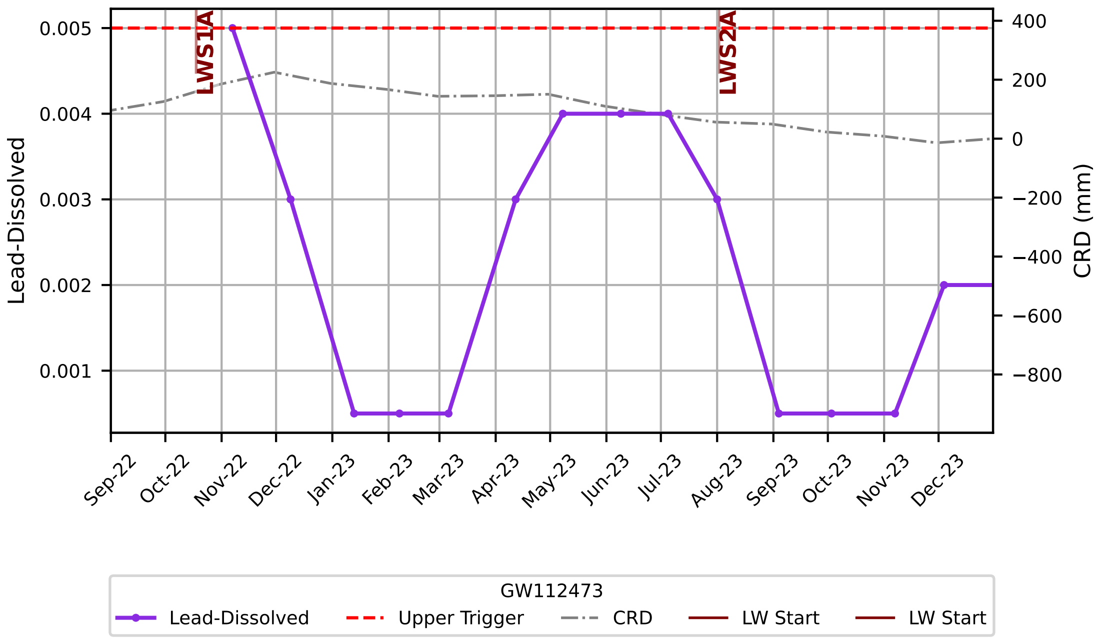
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
25
20
15
10
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



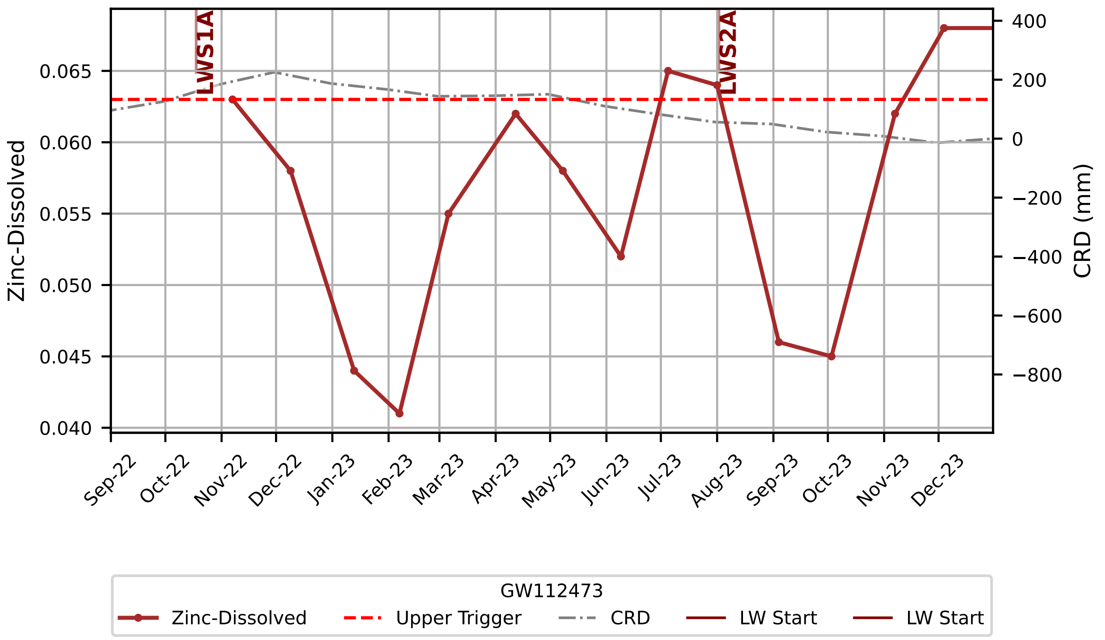
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
1.8
1.6
1.4
1.2
1.0
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



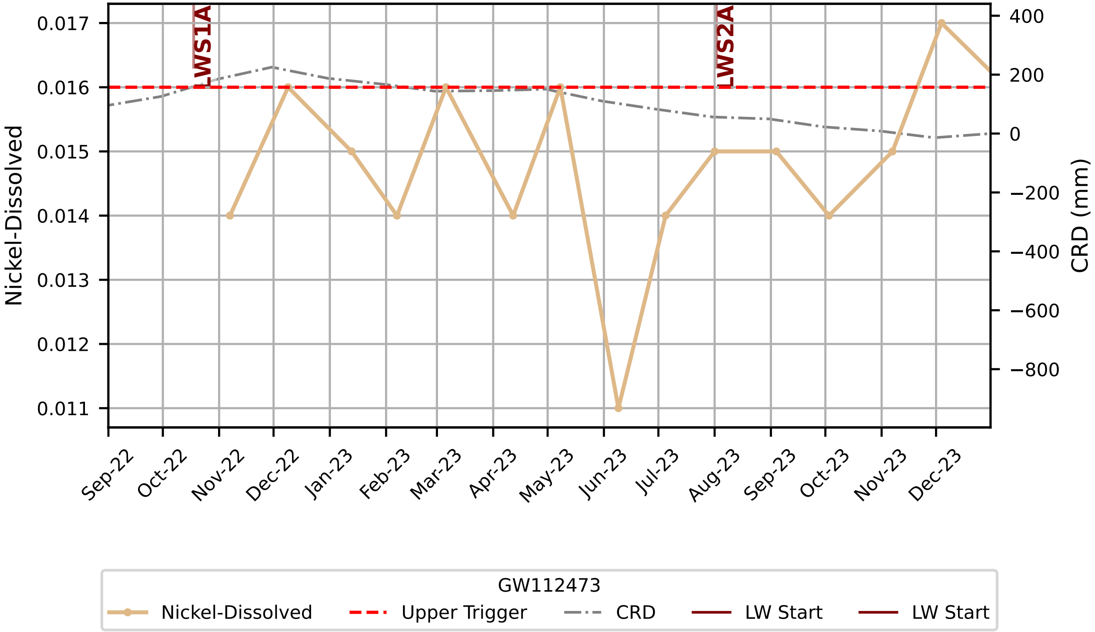
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



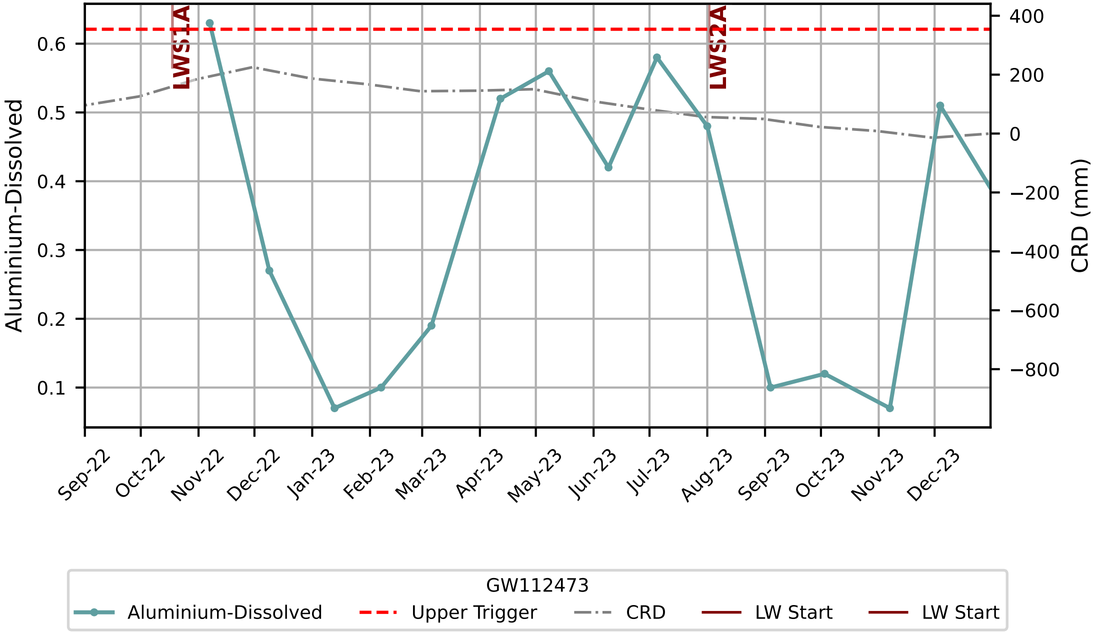
Lead-Dissolved
0.005
0.004
0.003
0.002
0.001
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



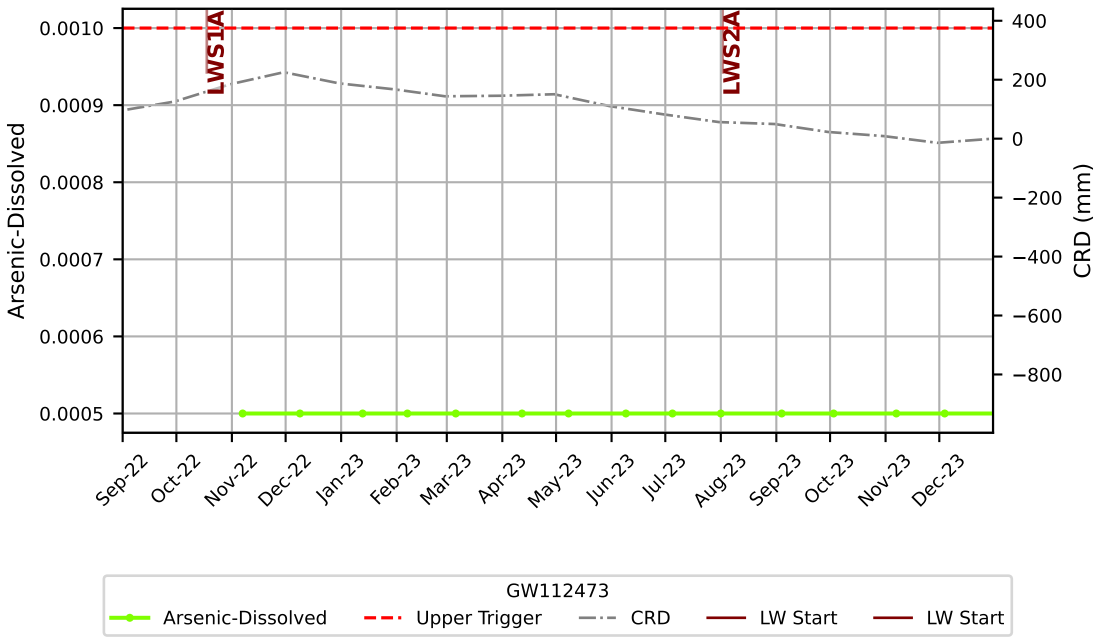
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.065
0.060
0.055
0.050
0.045
0.040
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



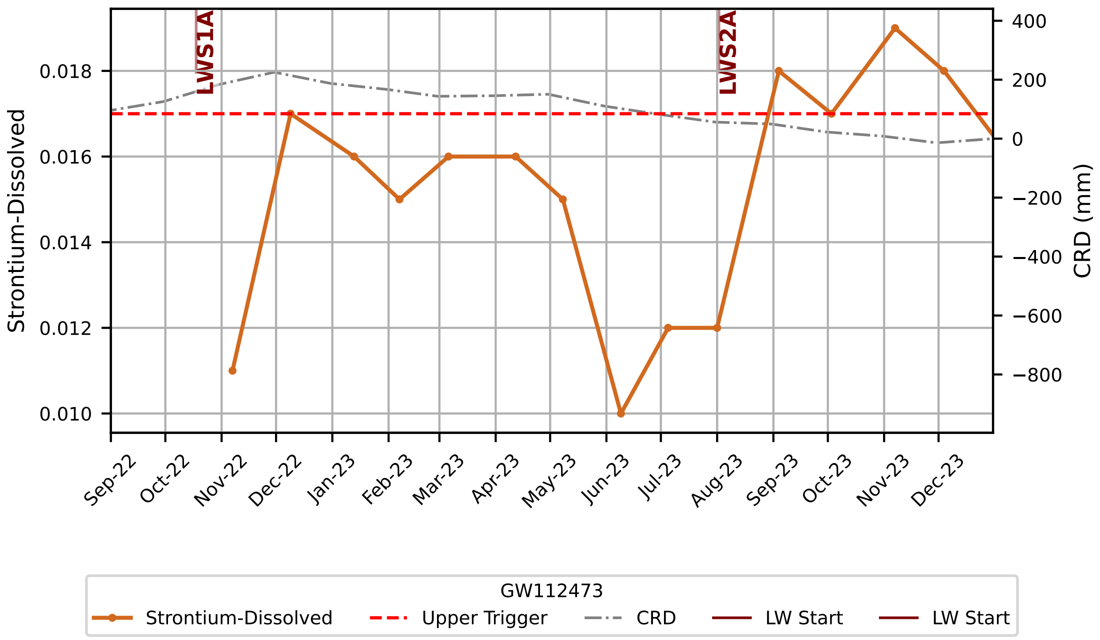
LWS1A
LWS2A
Nickel-Dissolved
0.017
0.016
0.015
0.014
0.013
0.012
0.011
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



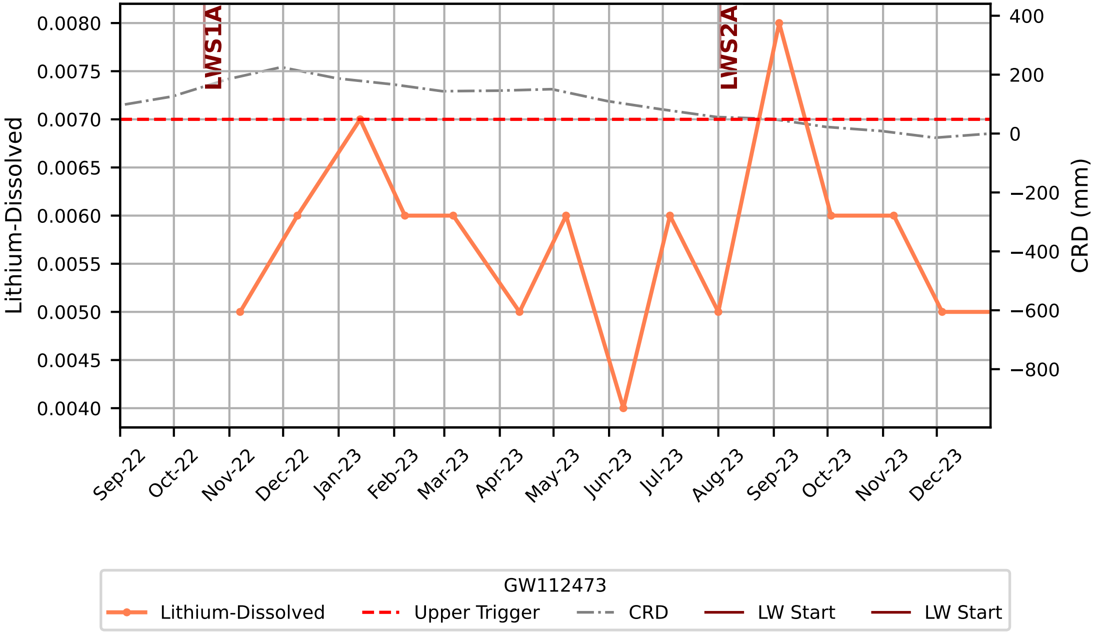
Aluminium-Dissolved
CRD (mm)
0.1
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

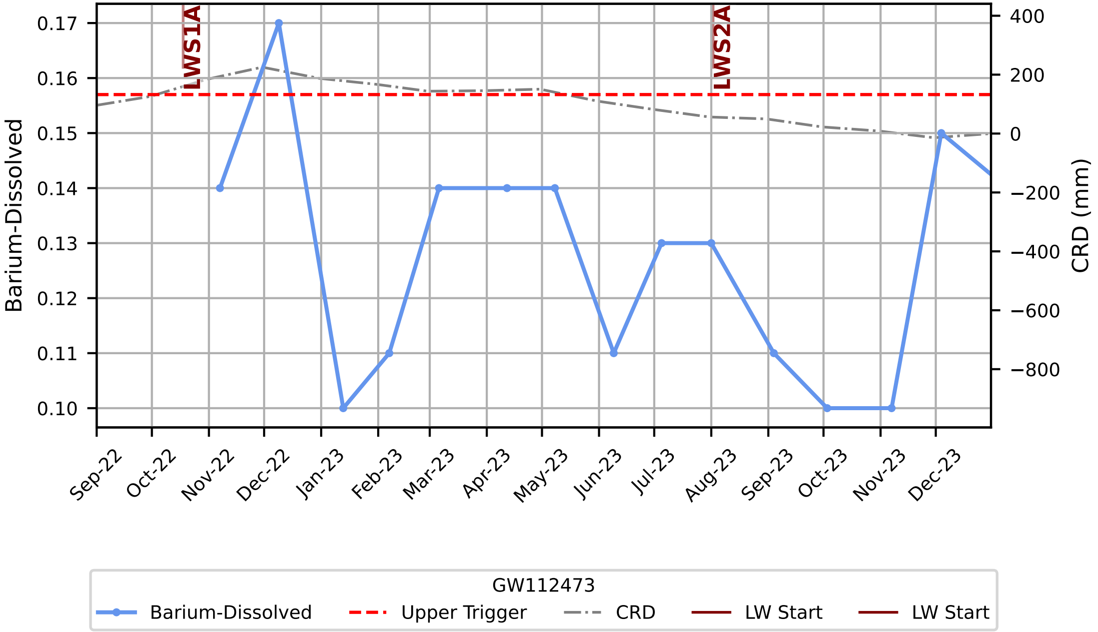


LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

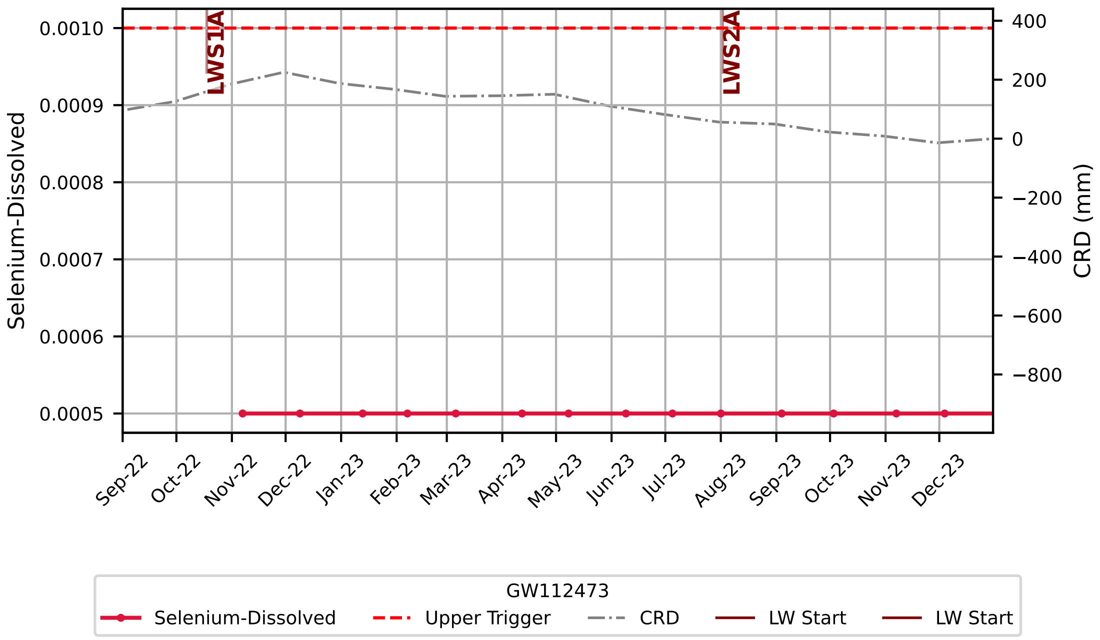


LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.018
0.016
0.014
0.012
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

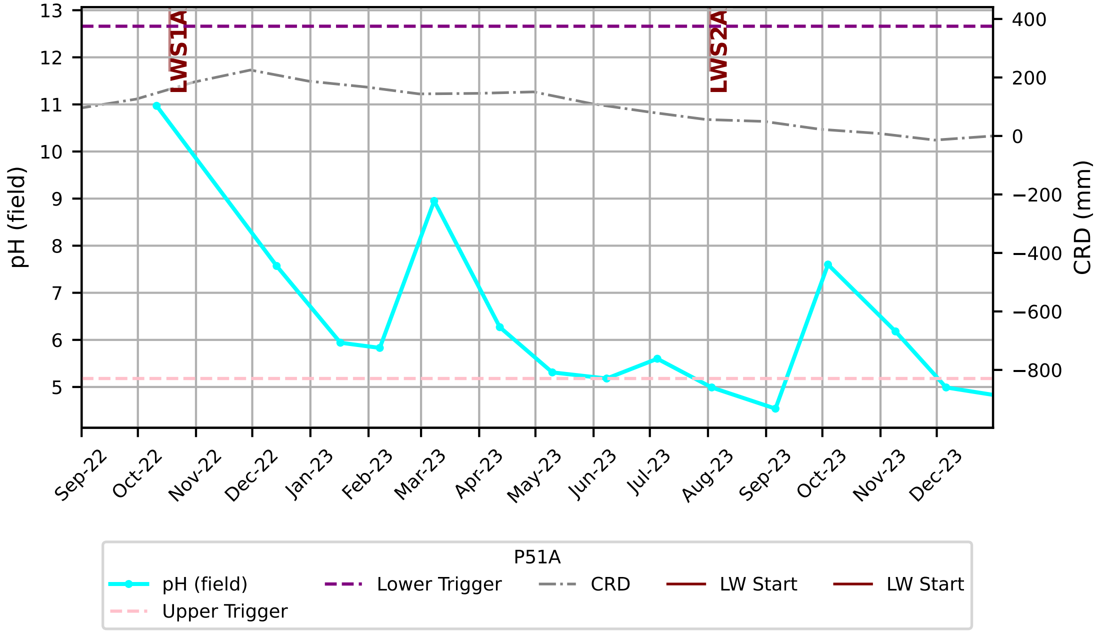

LWS1A
LWS2A
Lithium-Dissolved
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



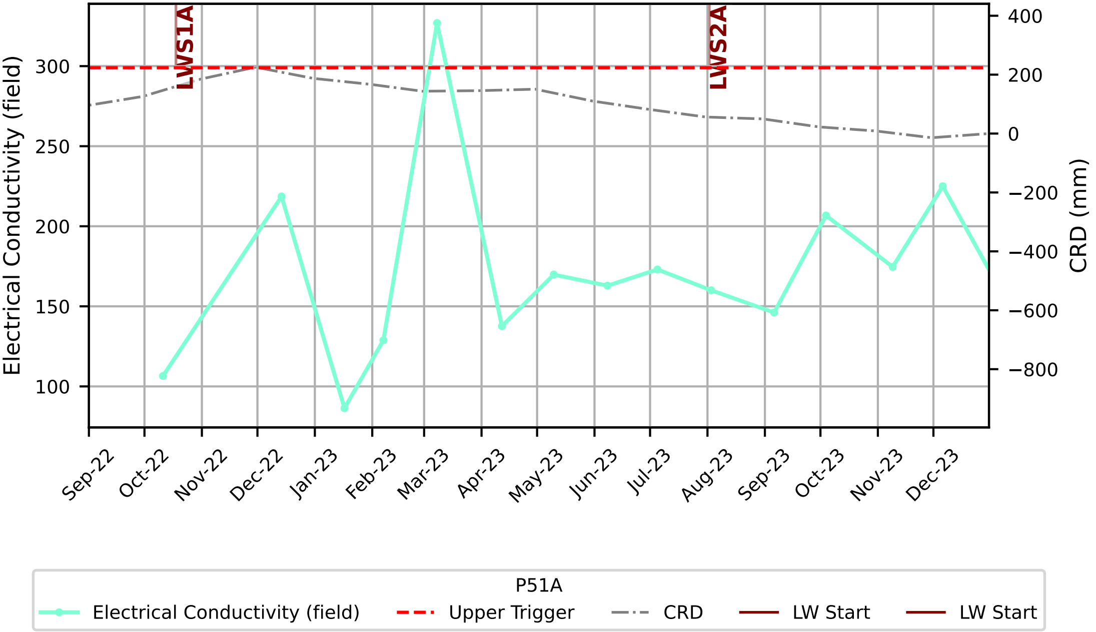
LWS1A
LWS2A
Barium-Dissolved
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



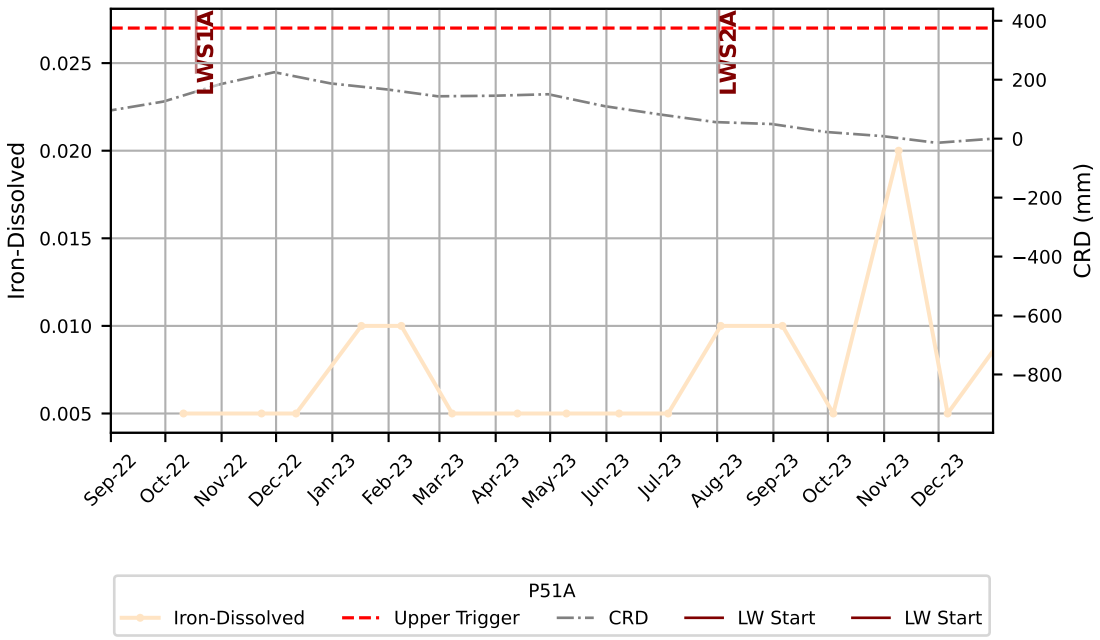
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
GW112473
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



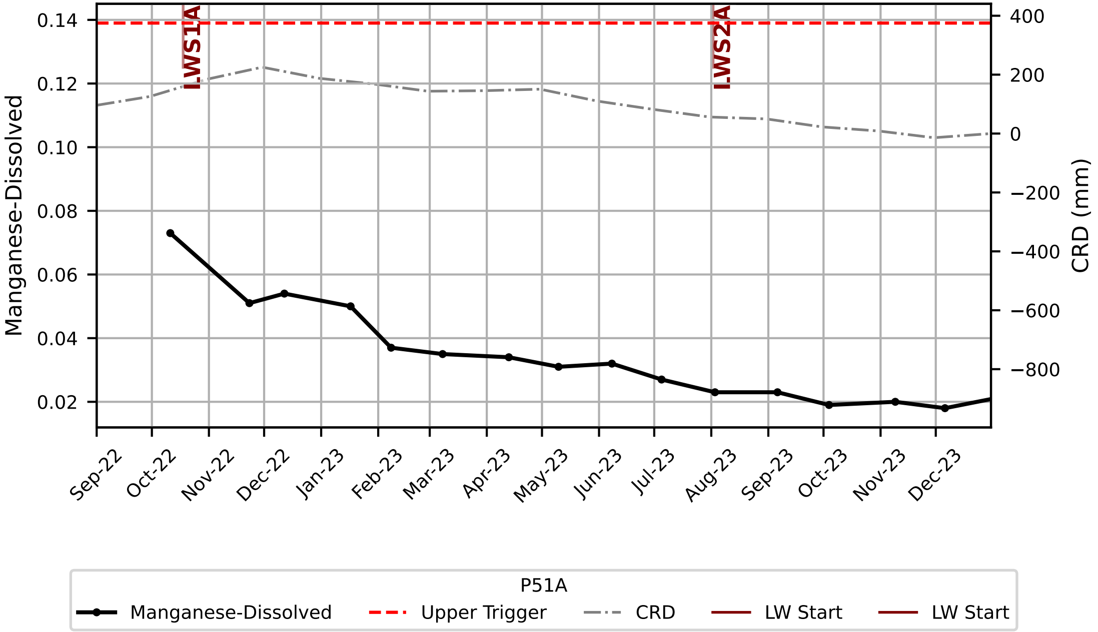
LWS1A
LWS2A
pH (field)
CRD (mm)
13
12
11
10
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



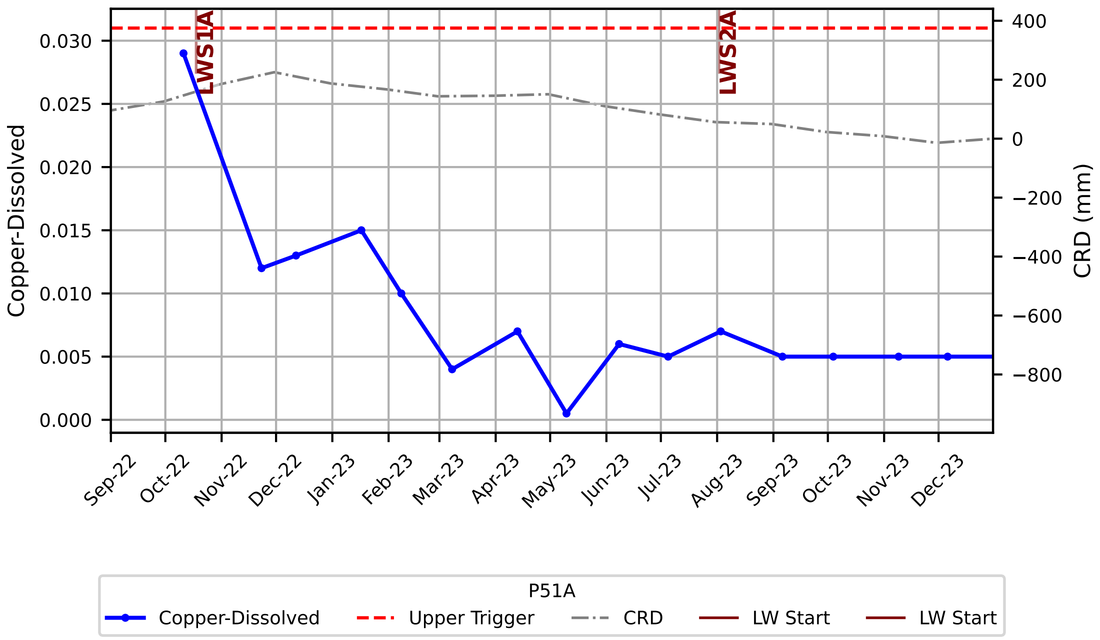
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
300
250
200
150
100
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



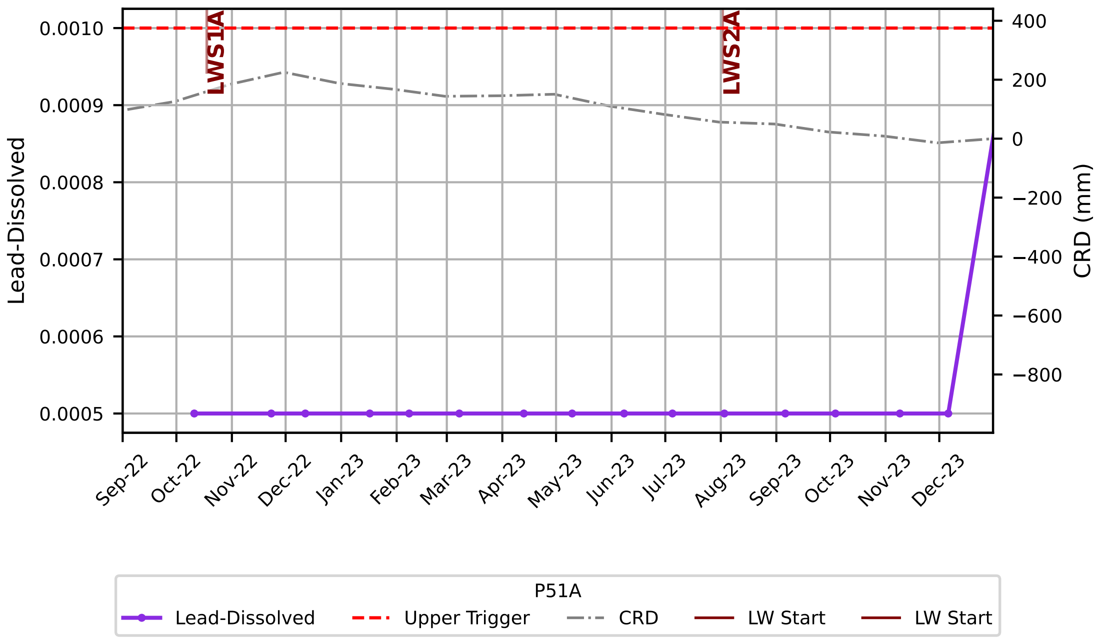
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.005
0.010
0.015
0.020
0.025
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



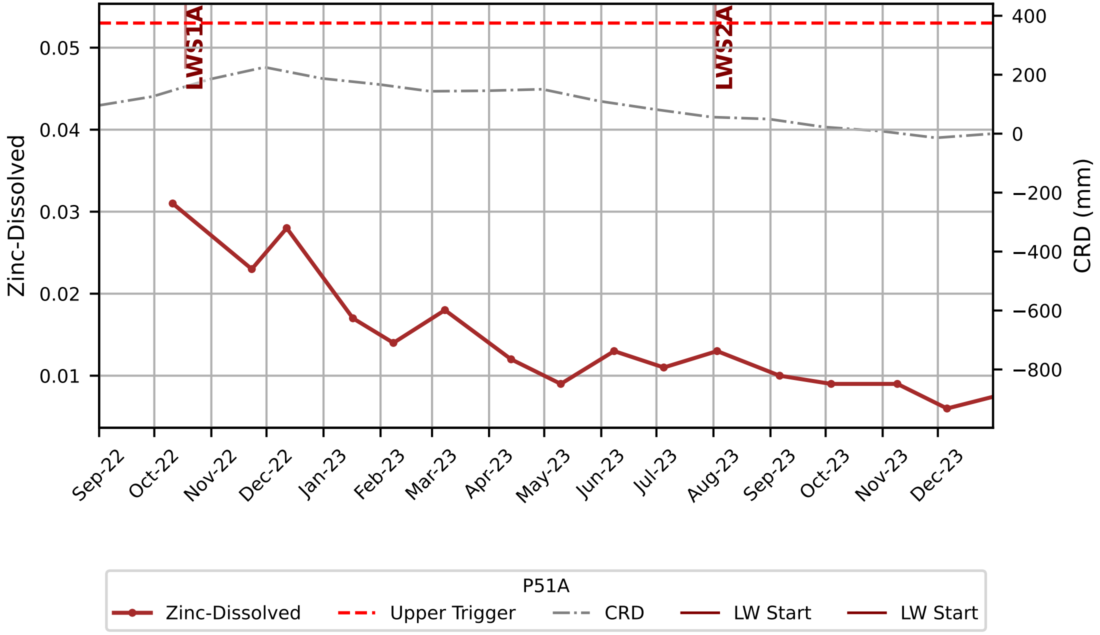
Manganese-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



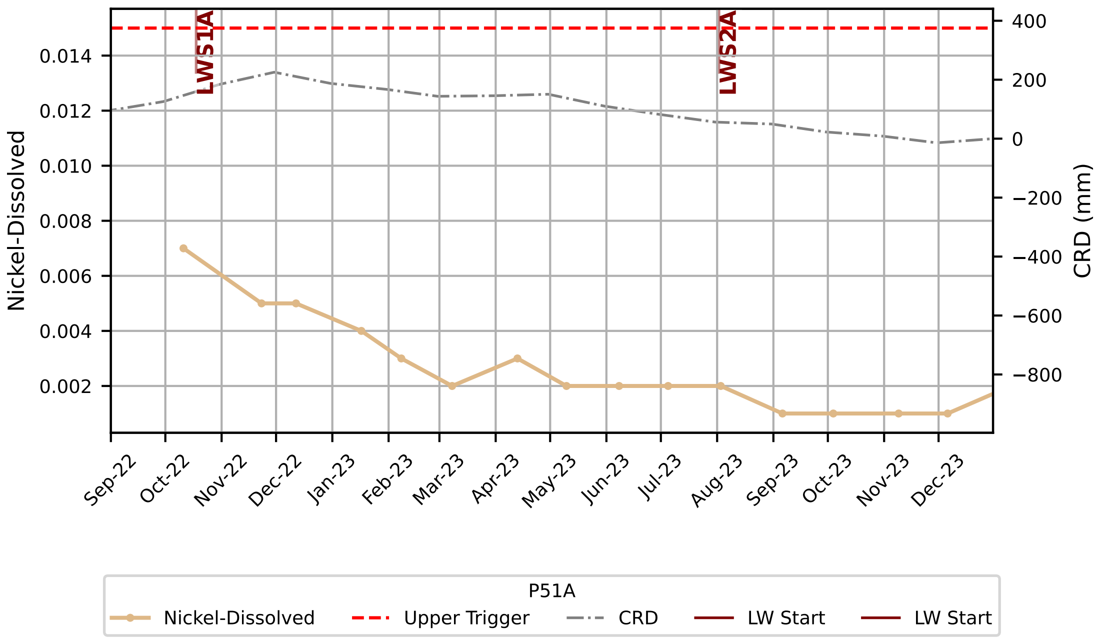
Copper-Dissolved
CRD (mm)
0.000
0.005
0.010
0.015
0.020
0.025
0.030
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



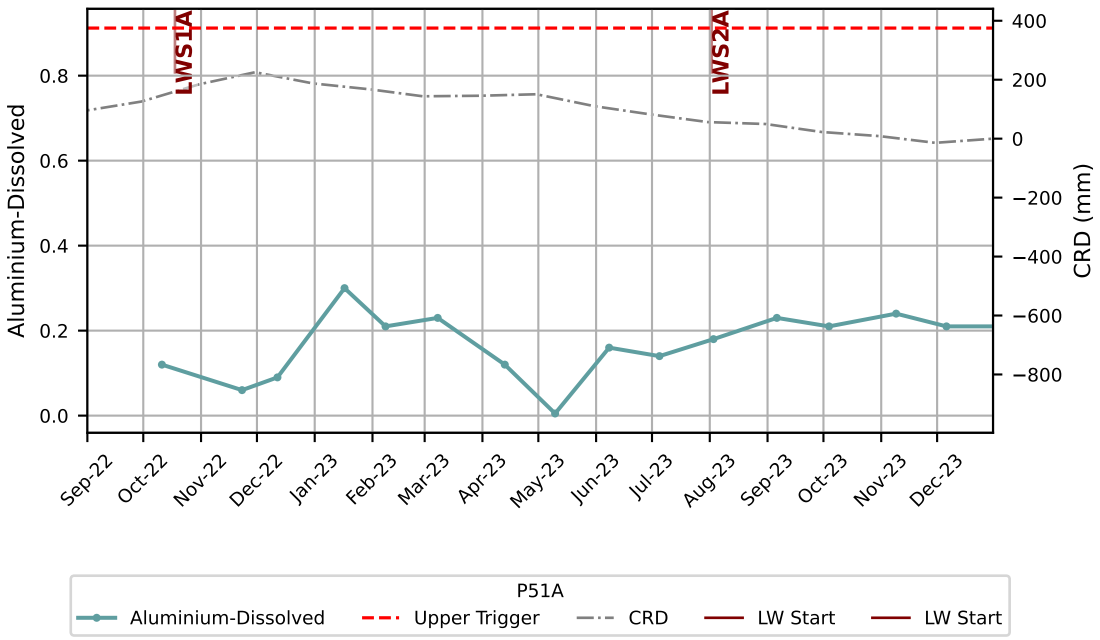
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



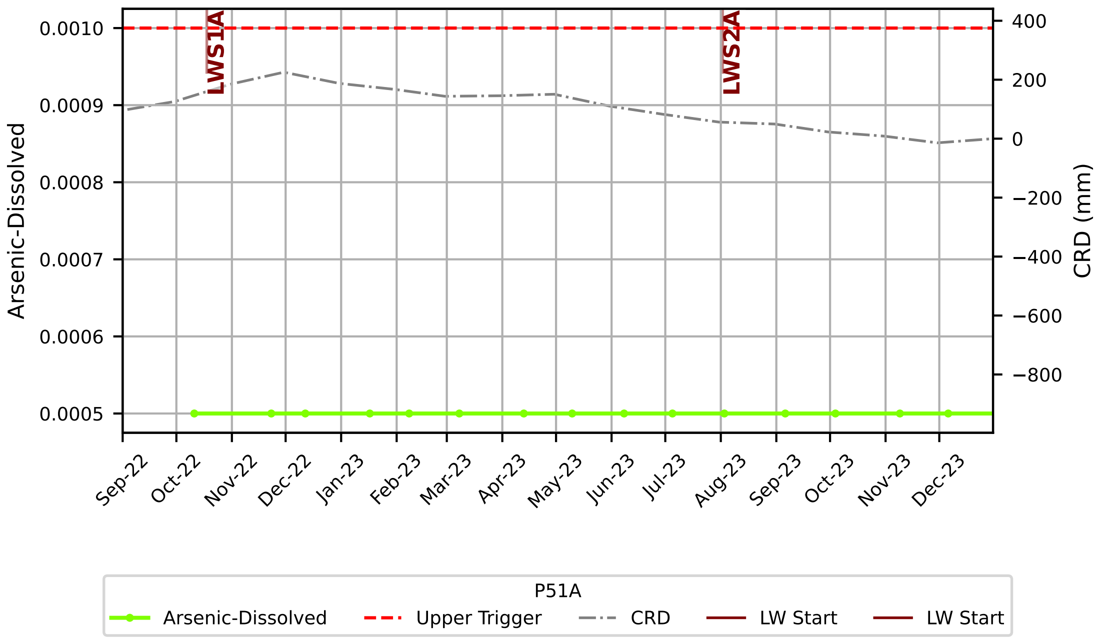
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



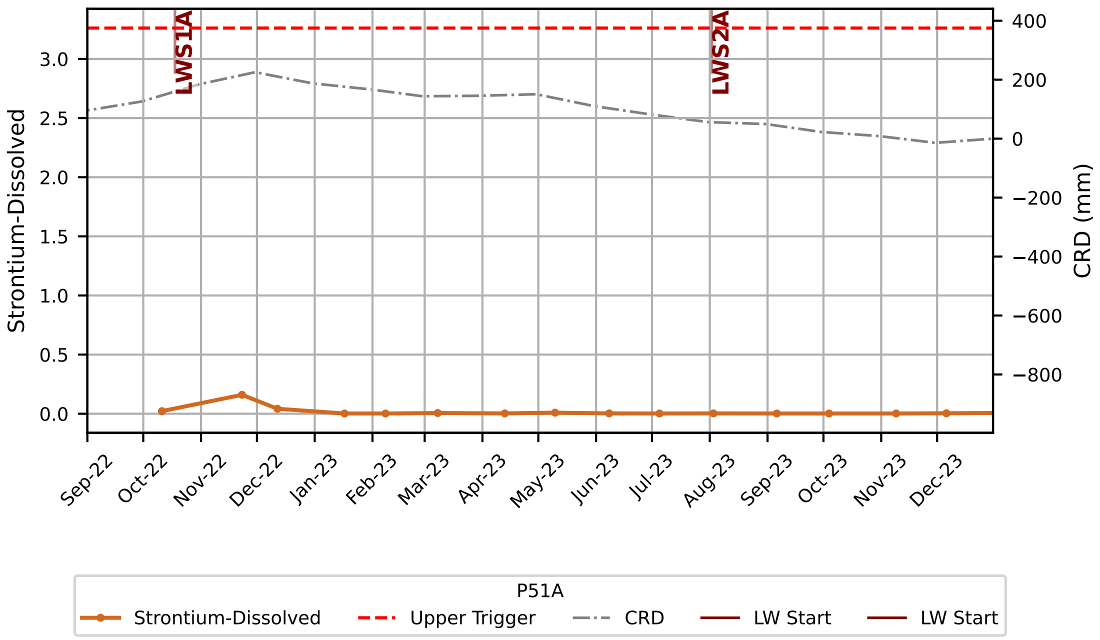
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



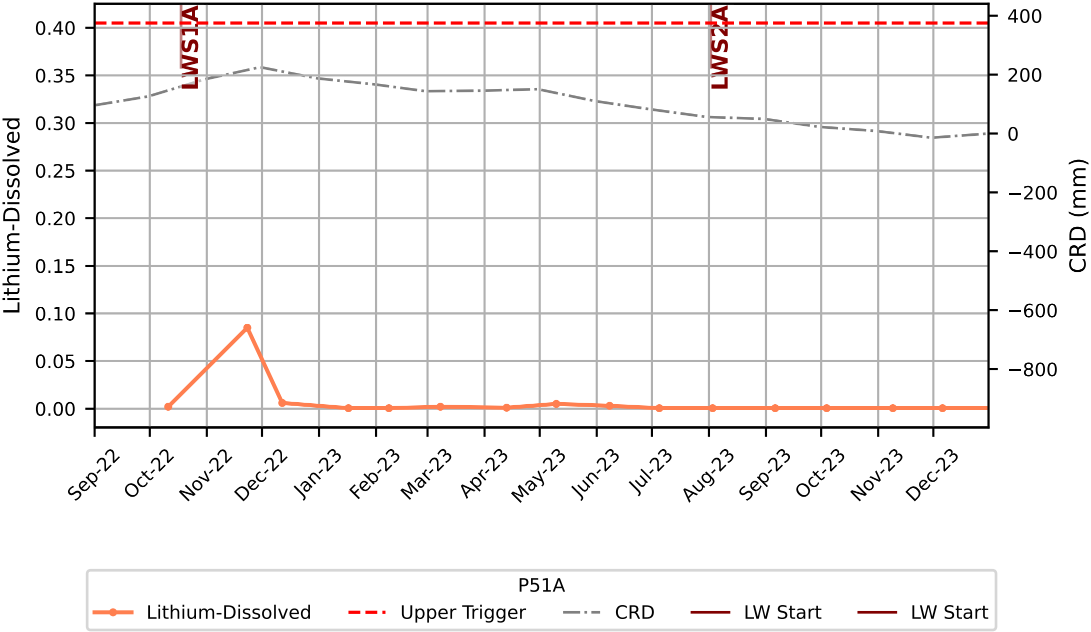
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.0
0.2
0.4
0.6
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



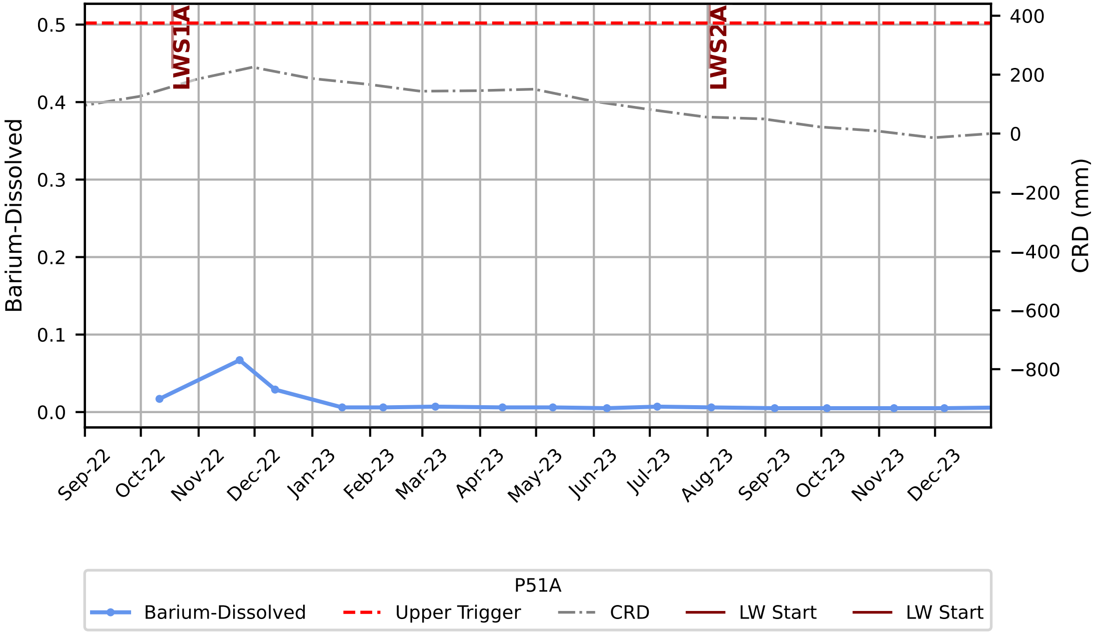
LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



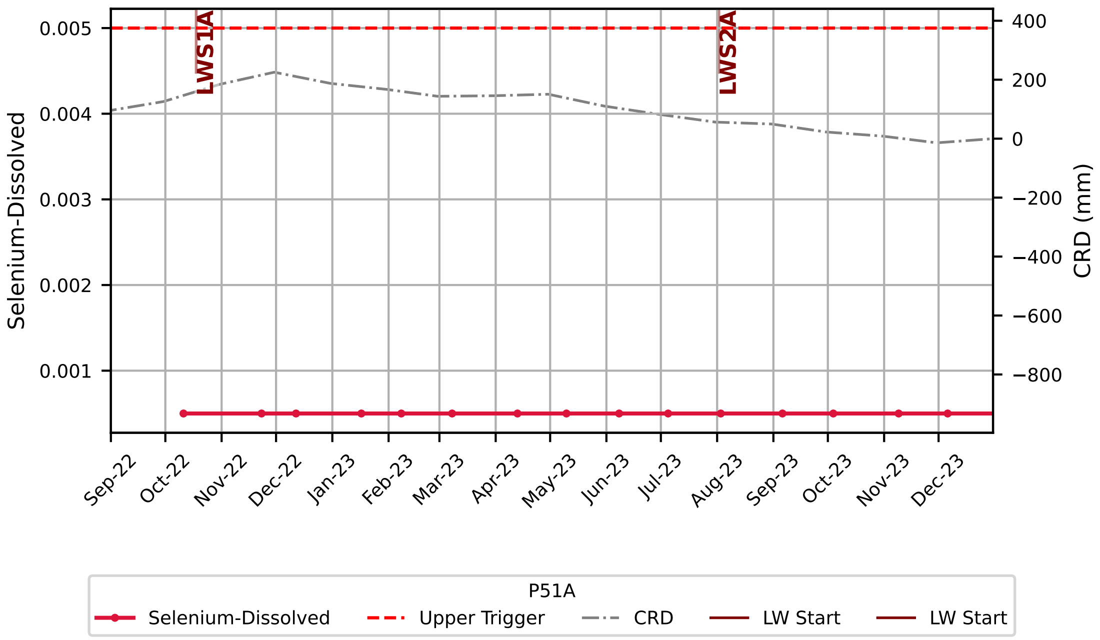
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



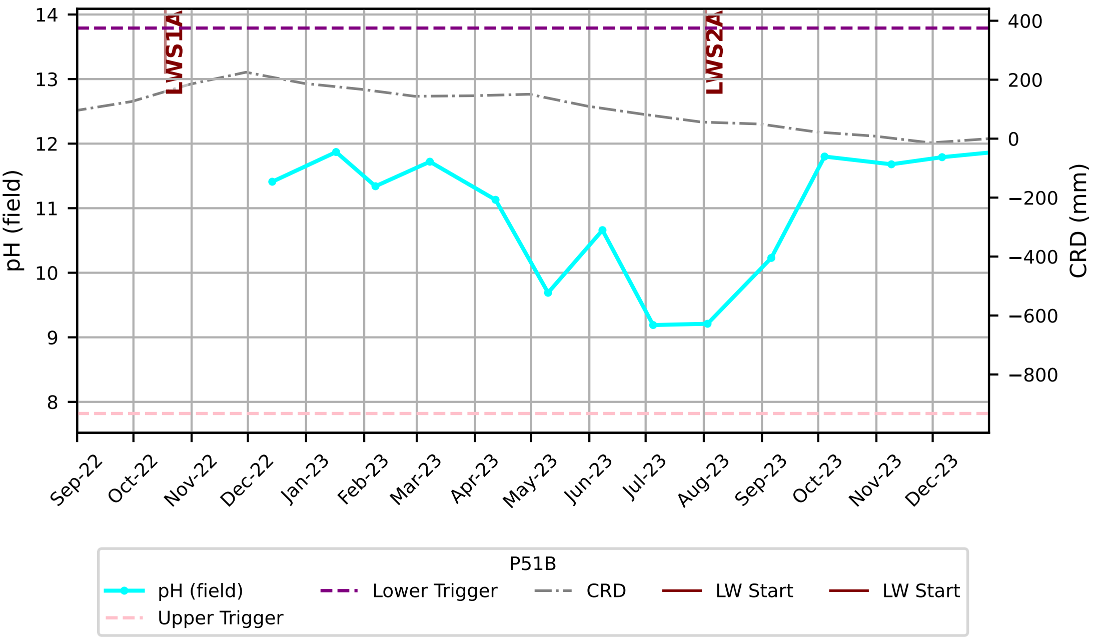
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



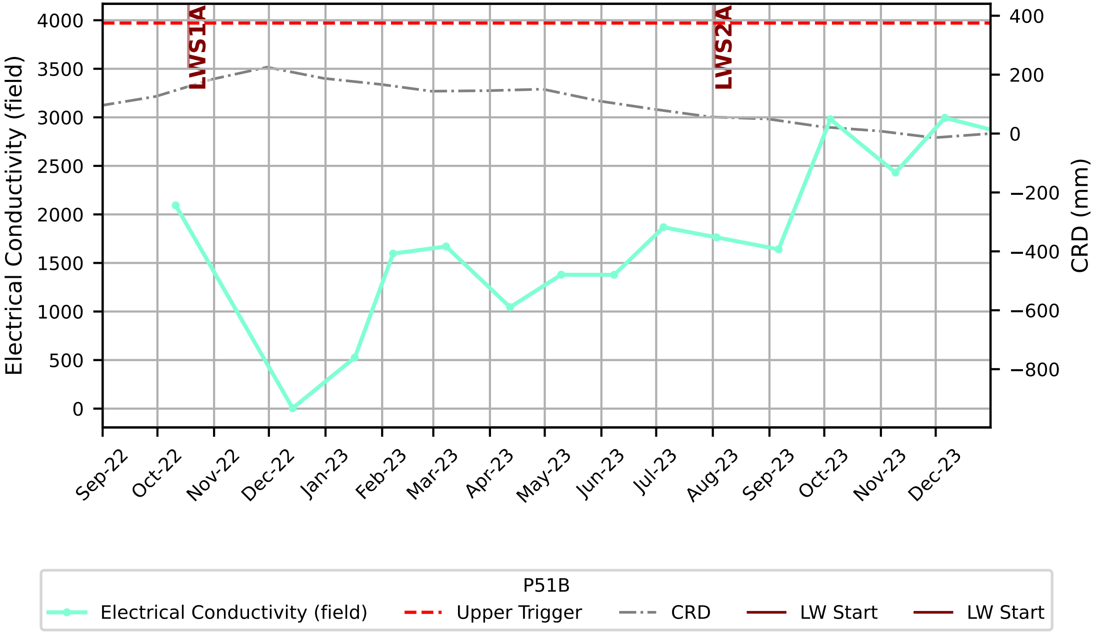
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.5
0.4
0.3
0.2
0.1
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



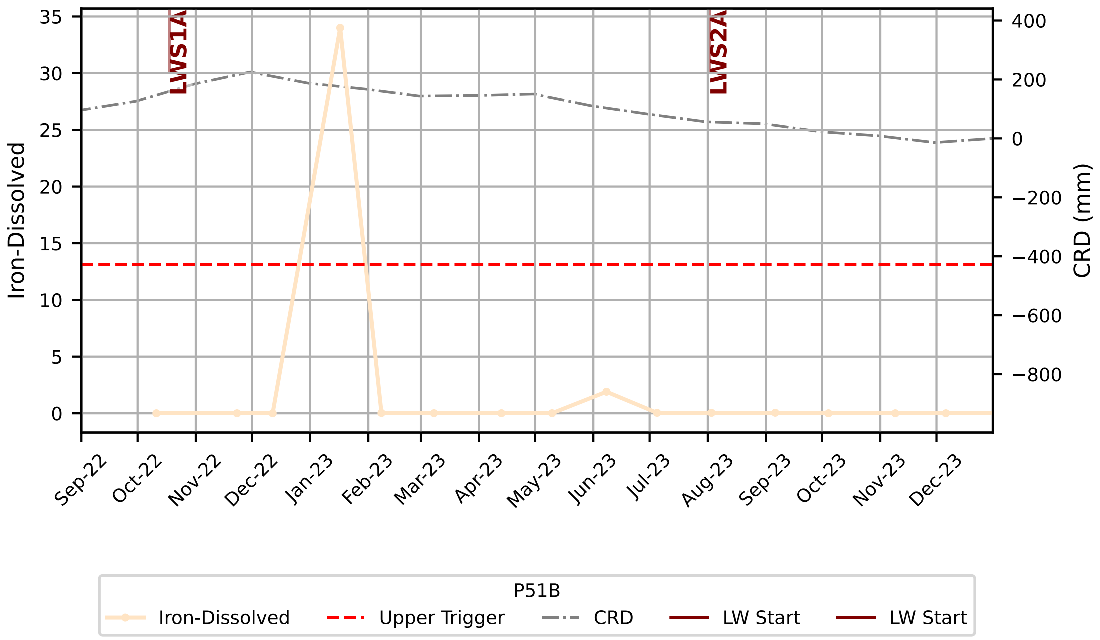
LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



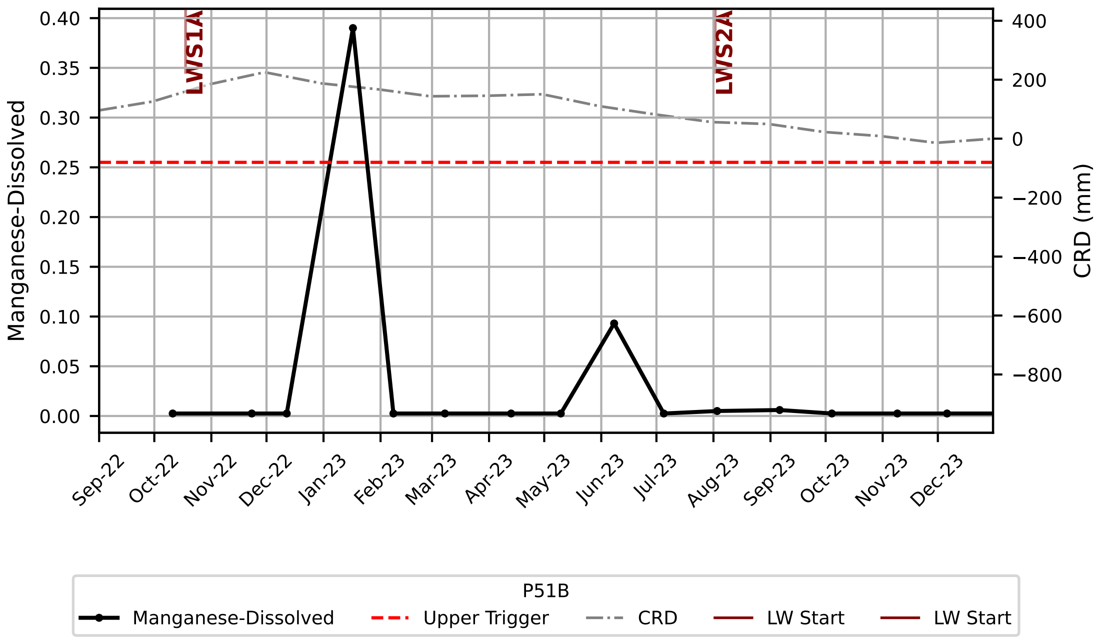
pH (field)
CRD (mm)
14
13
12
11
10
9
8
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



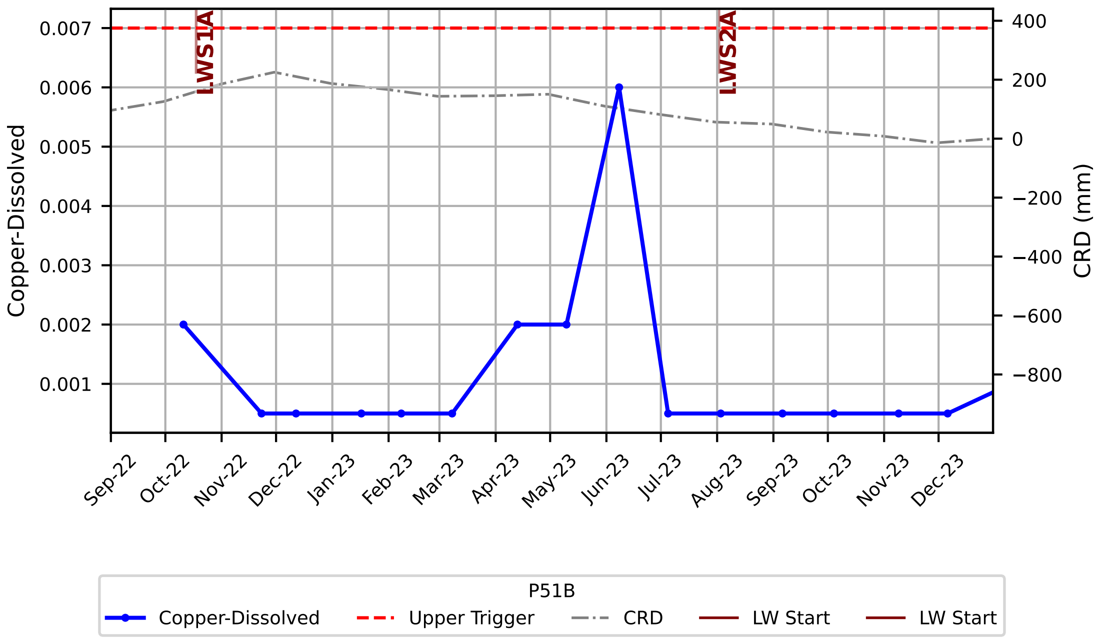
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
4000
3500
3000
2500
2000
1500
1000
500
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



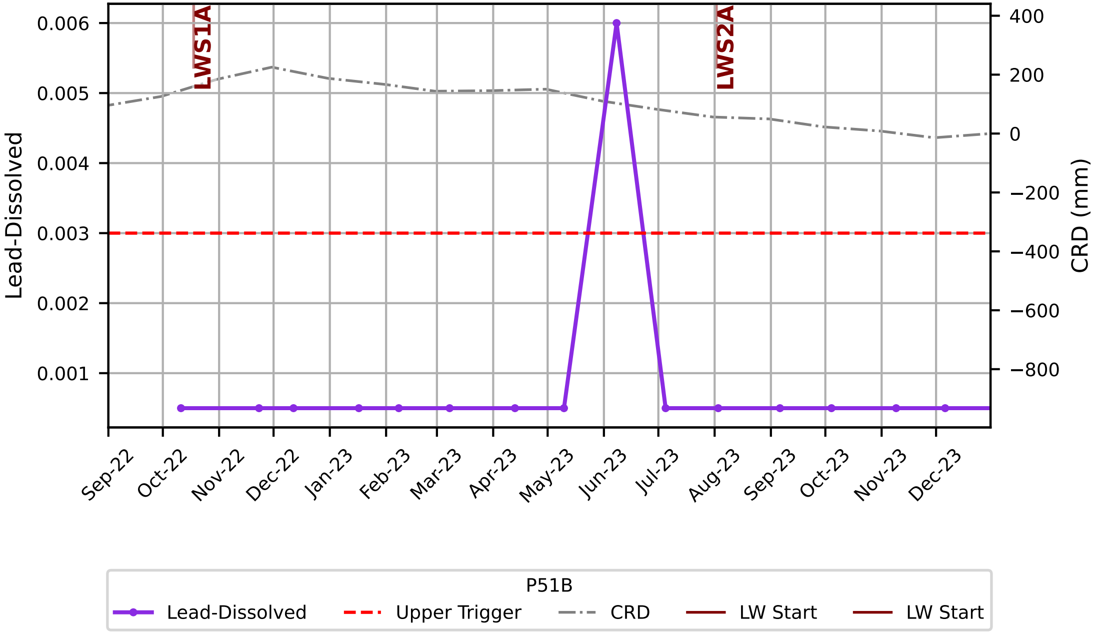
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



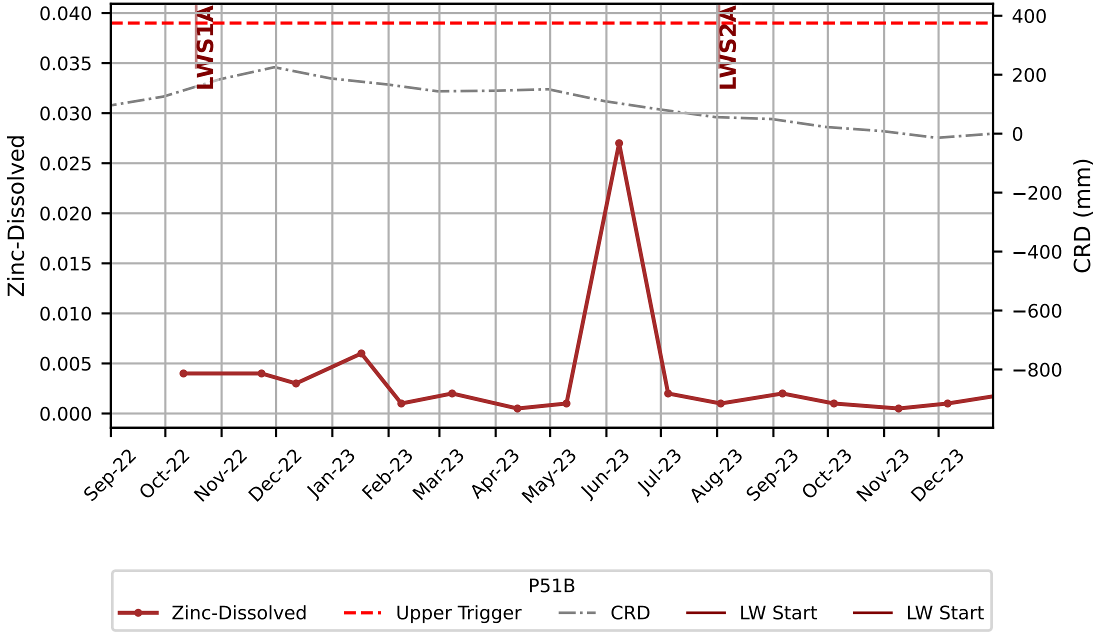
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



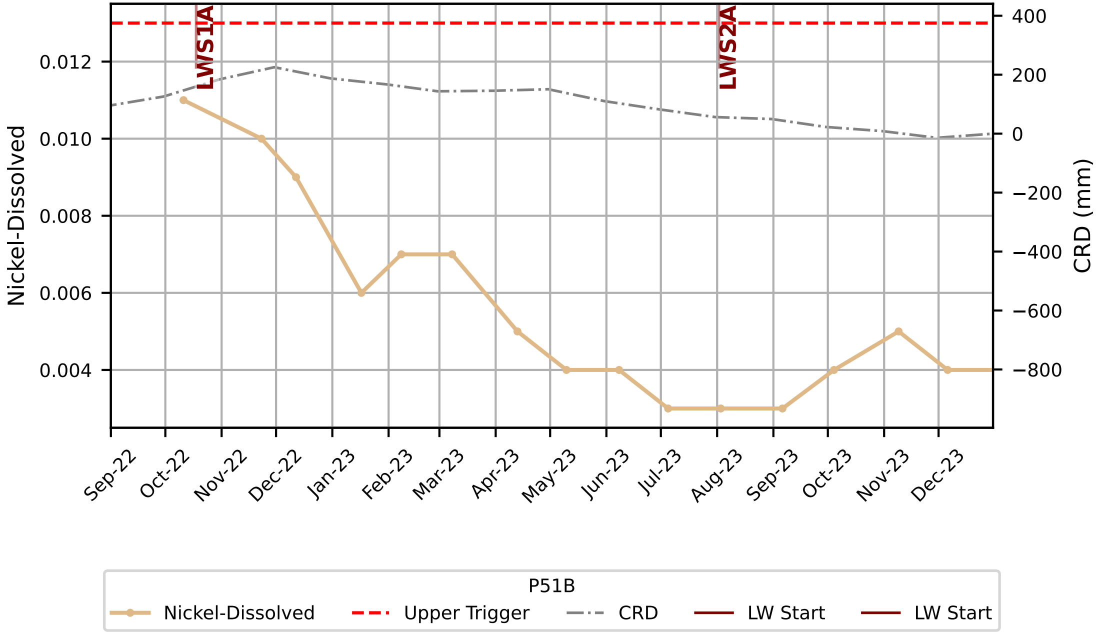
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



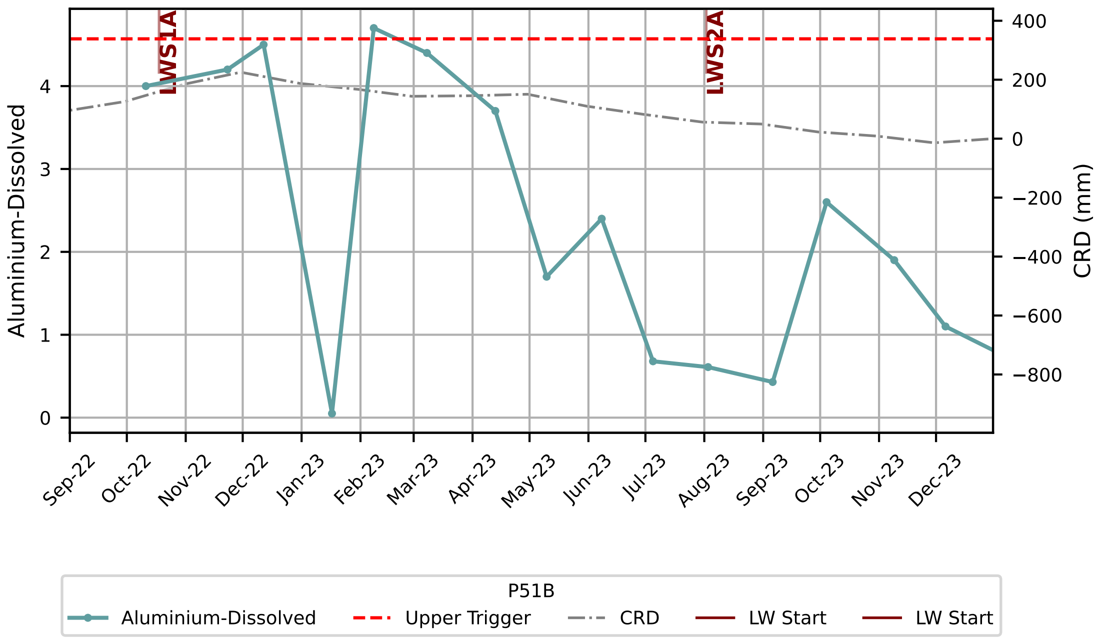
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



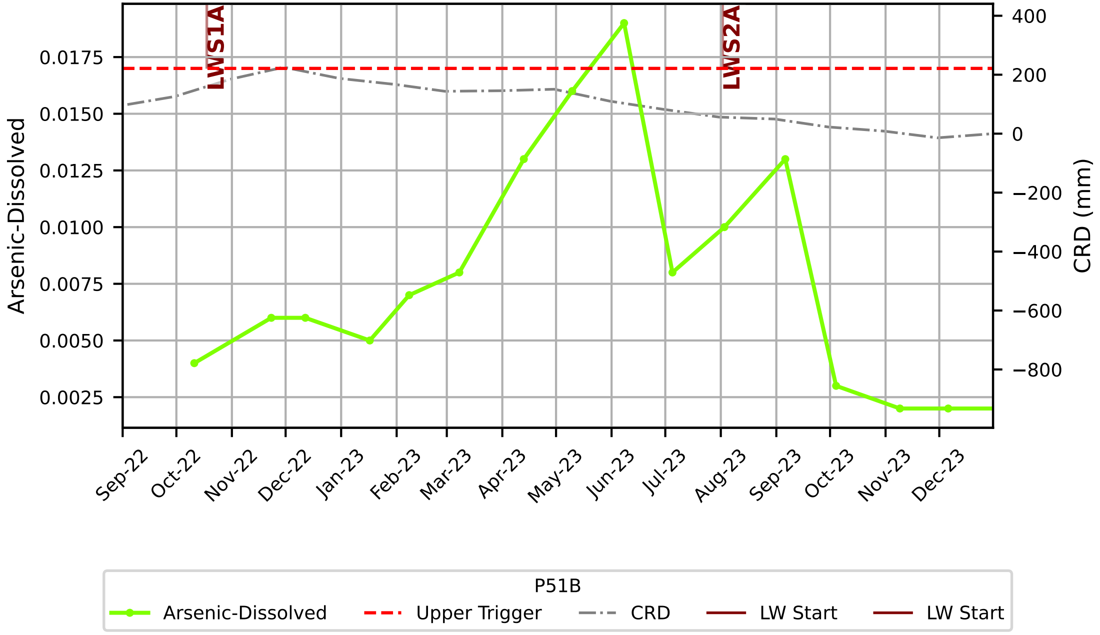
LWS1A
LWS2A
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



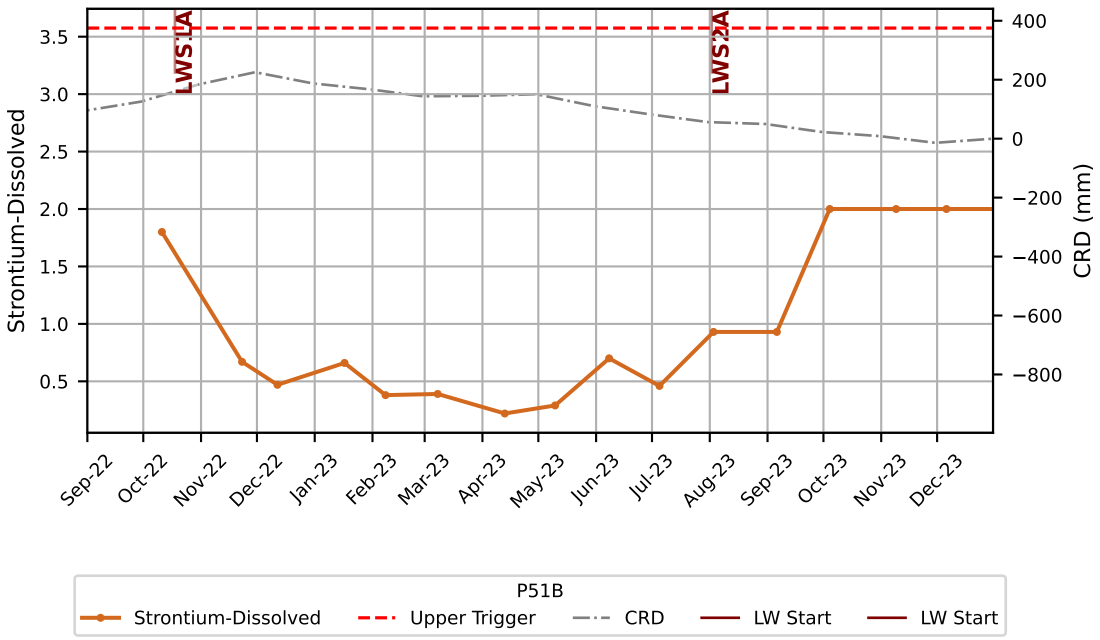
LWS1A
LWS2A
Nickel-Dissolved
0.012
0.010
0.008
0.006
0.004
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



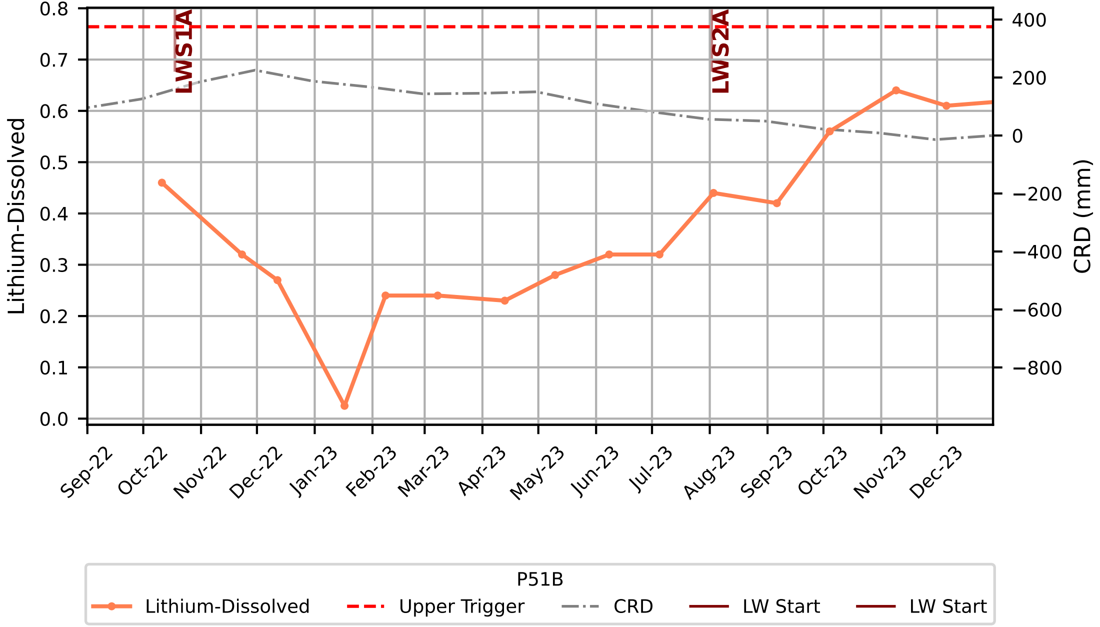
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0
1
2
3
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



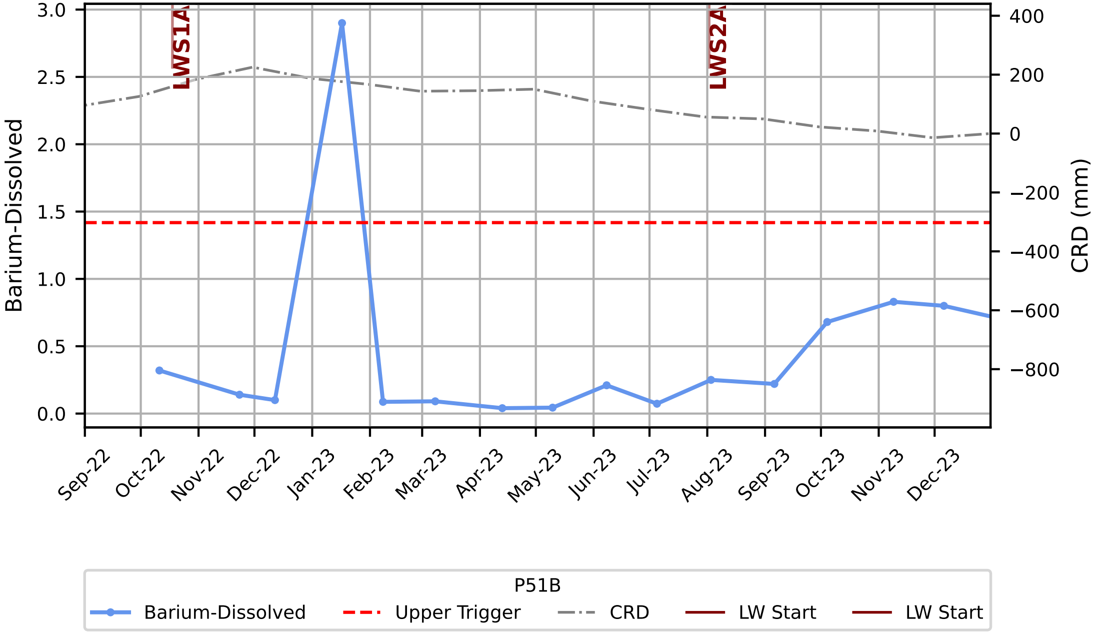
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



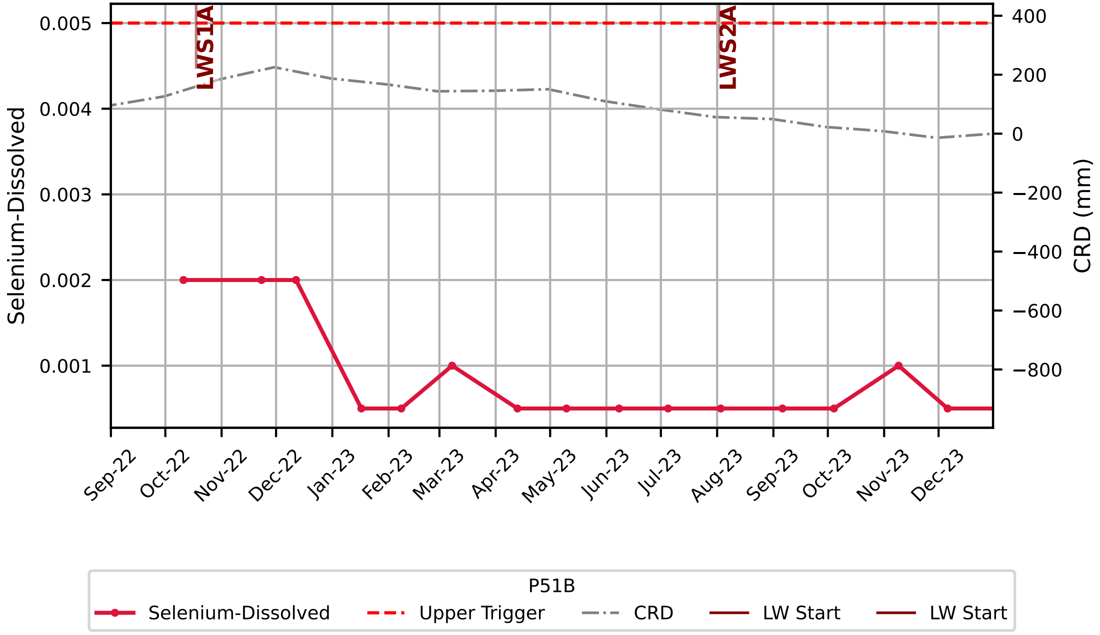
Strontium-Dissolved
CRD (mm)
LWS1A
LWS2A
3.5
3.0
2.5
2.0
1.5
1.0
0.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



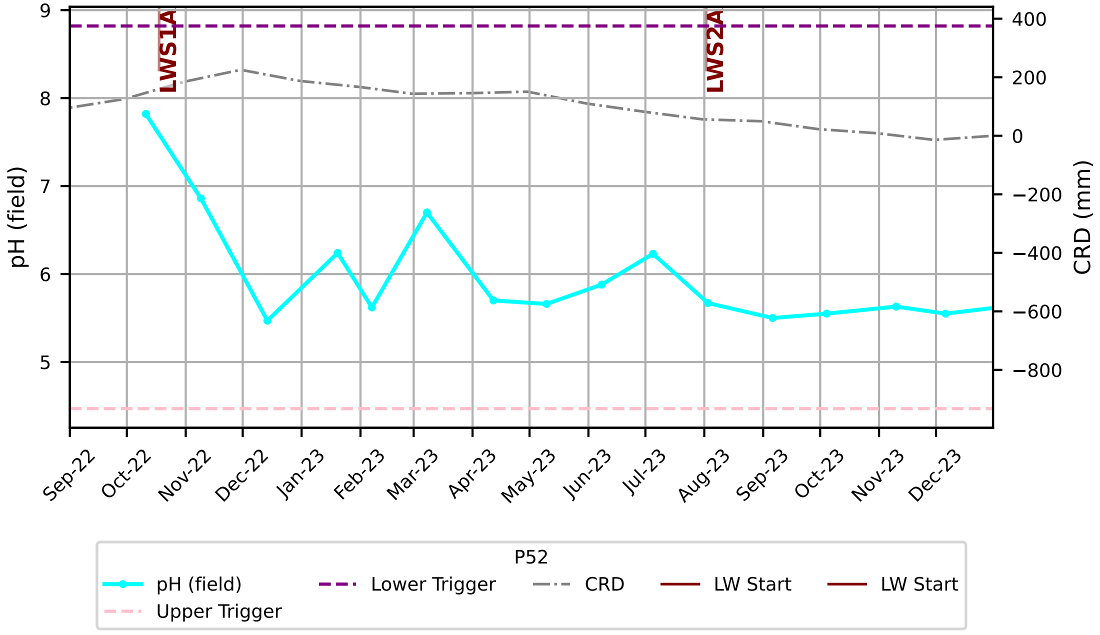
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



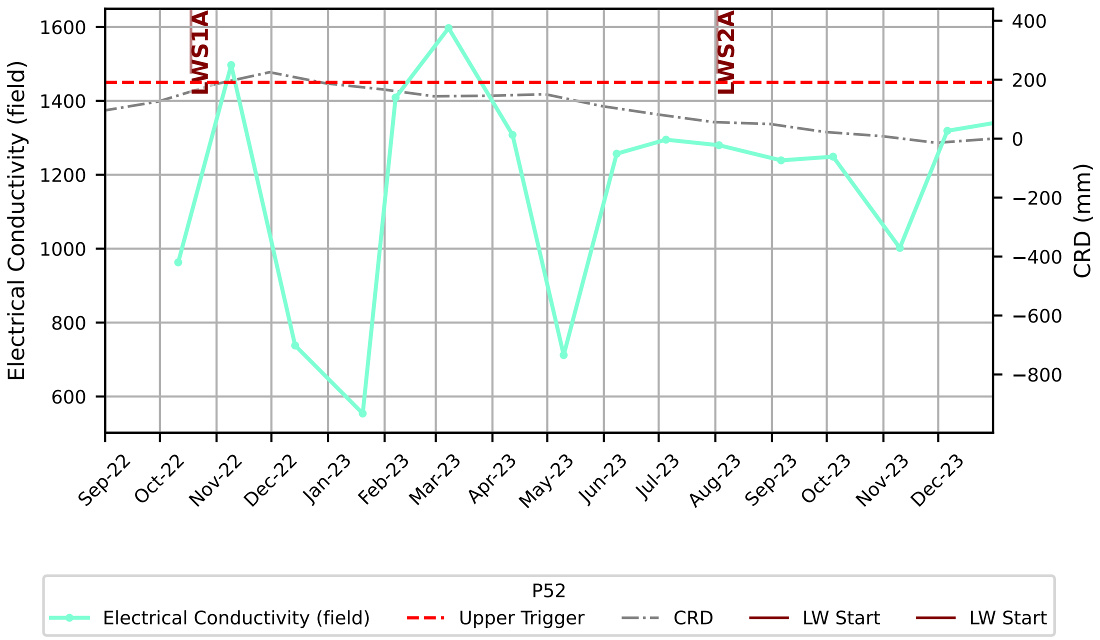
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Barium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



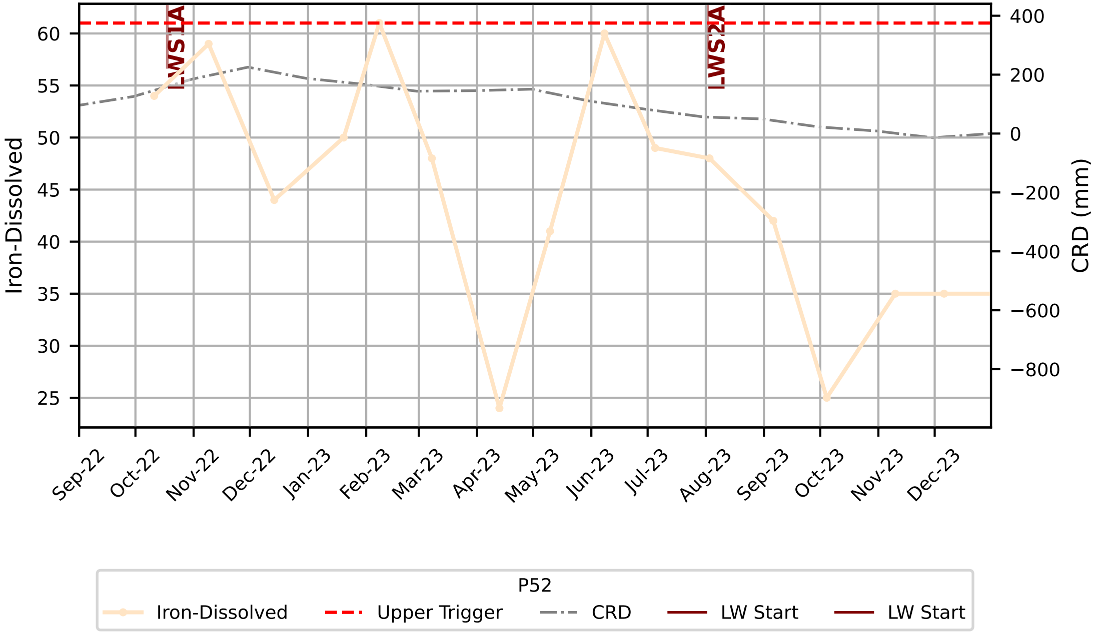
Selenium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P51B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



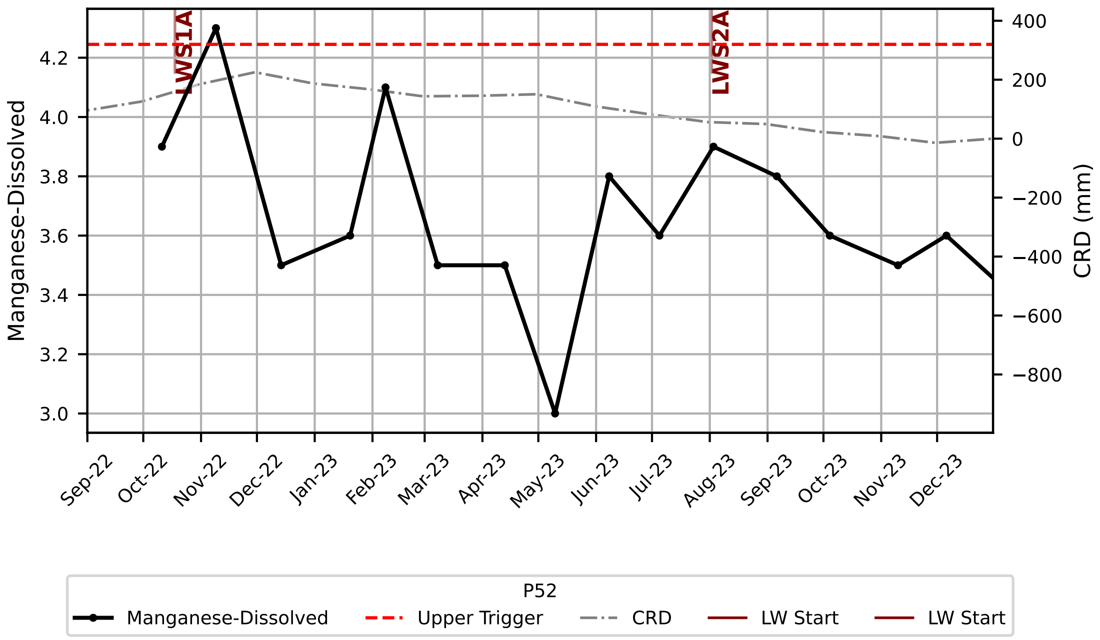
LWS1A
LWS2A
pH (field)
CRD (mm)
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



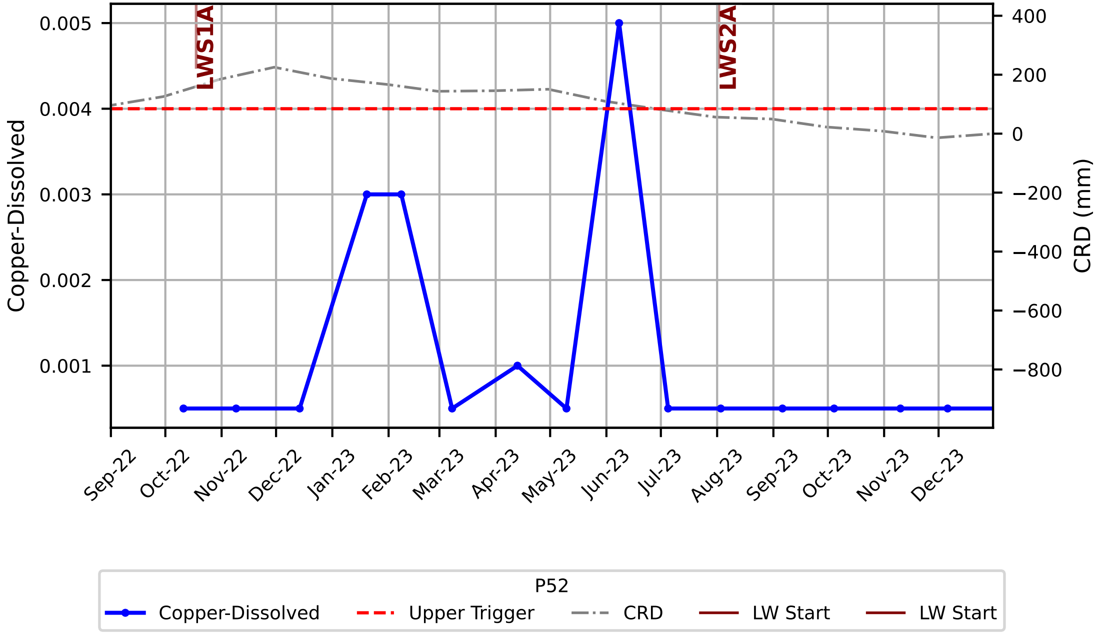
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



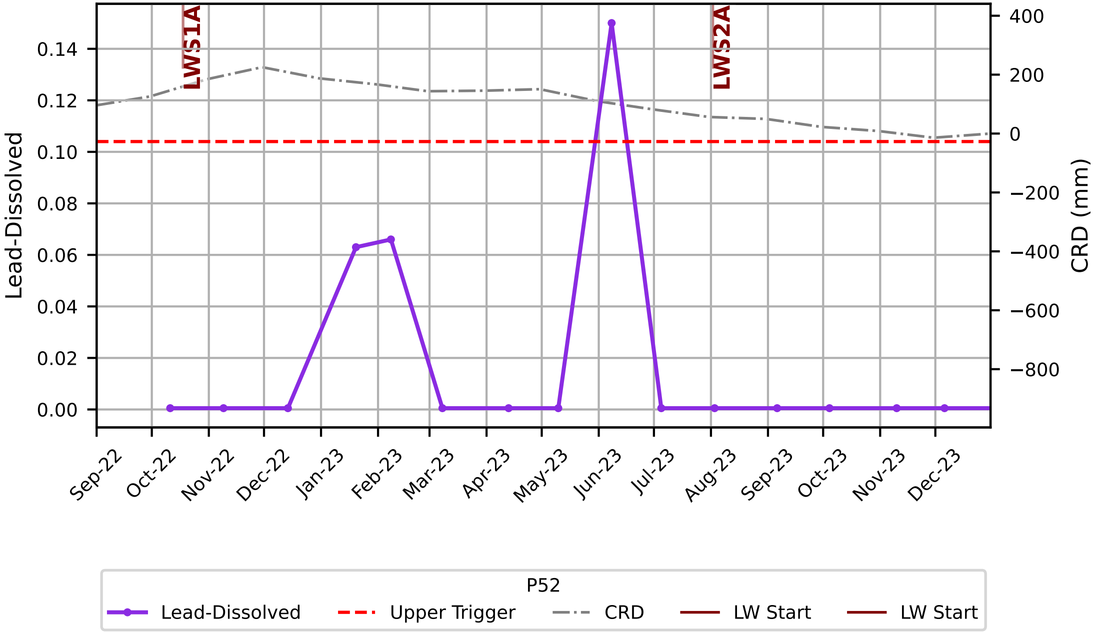
Iron-Dissolved
CRD (mm)
LWS1A
LWS2A
60
55
50
45
40
35
30
25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



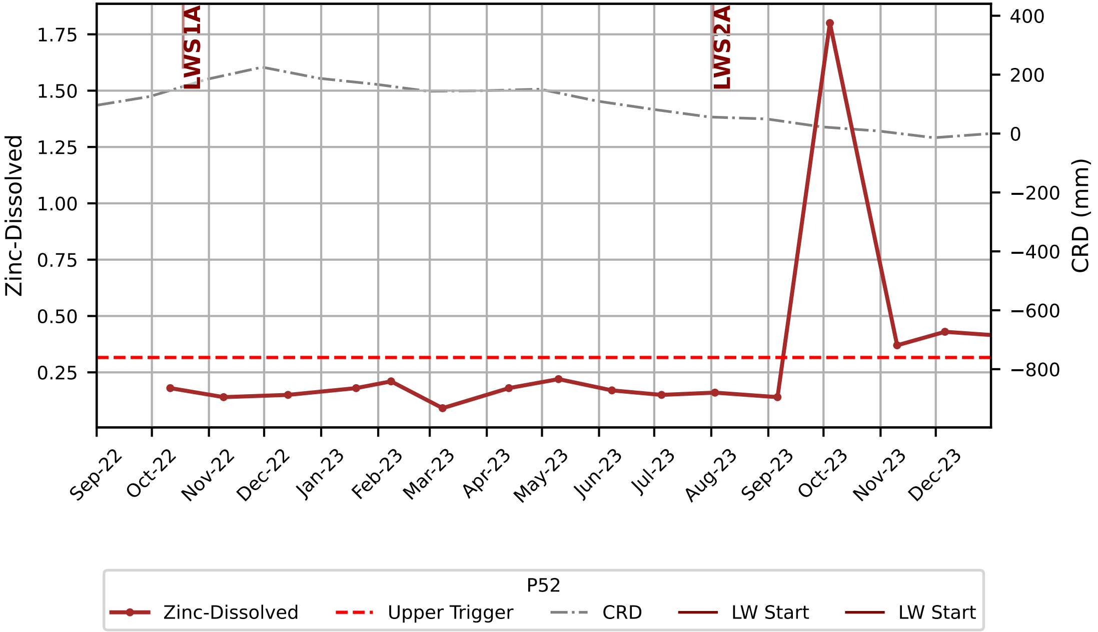
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
4.2
4.0
3.8
3.6
3.4
3.2
3.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



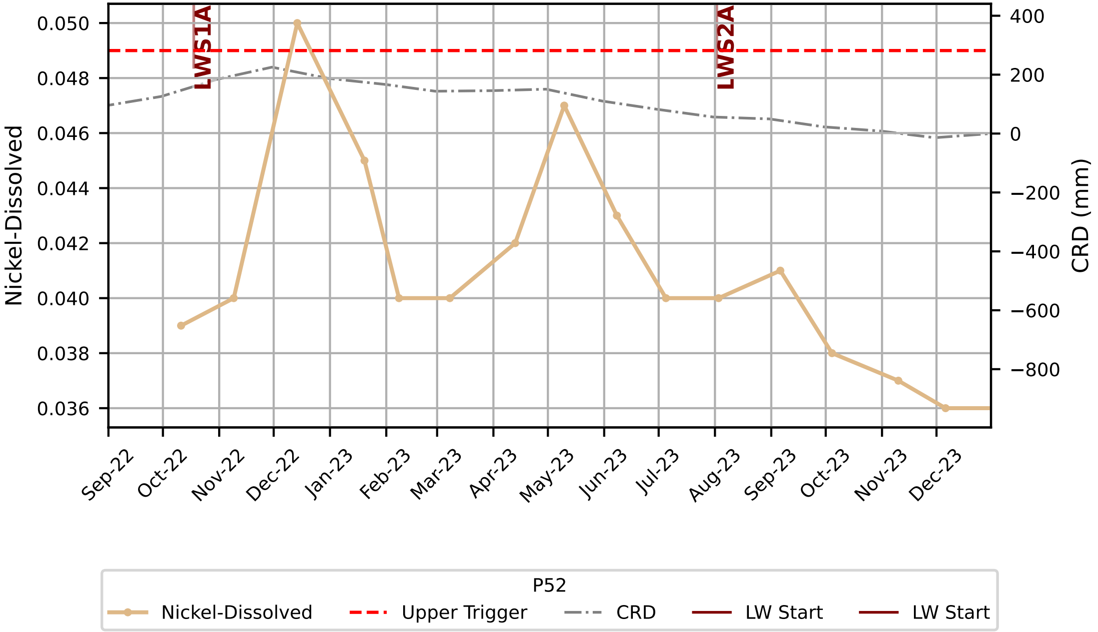
Copper-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



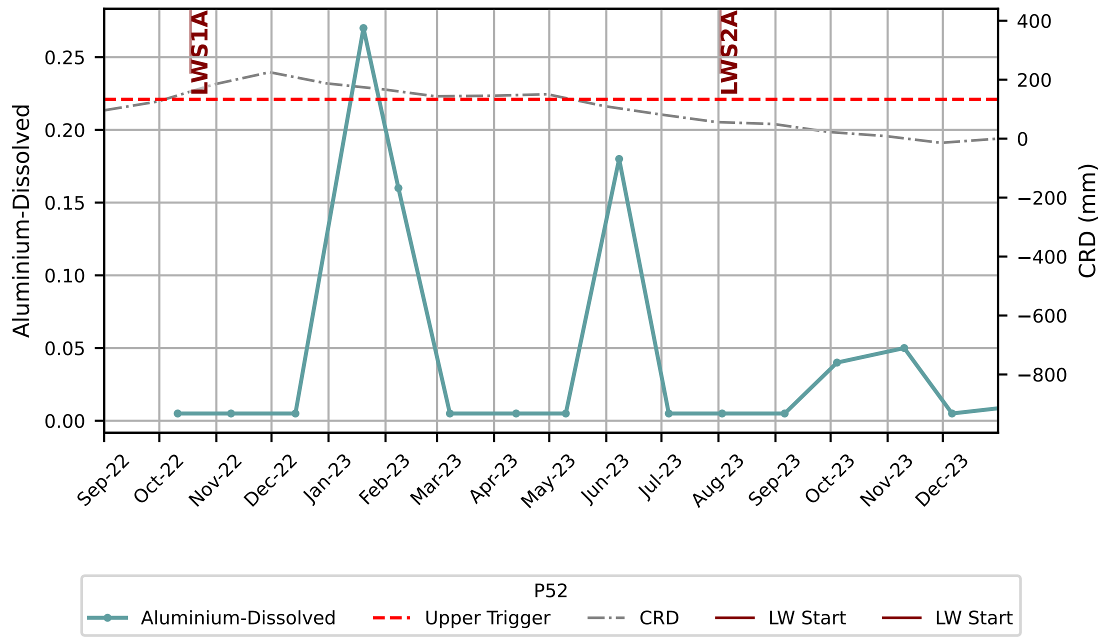
LWS1A
LWS2A
Lead-Dissolved
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



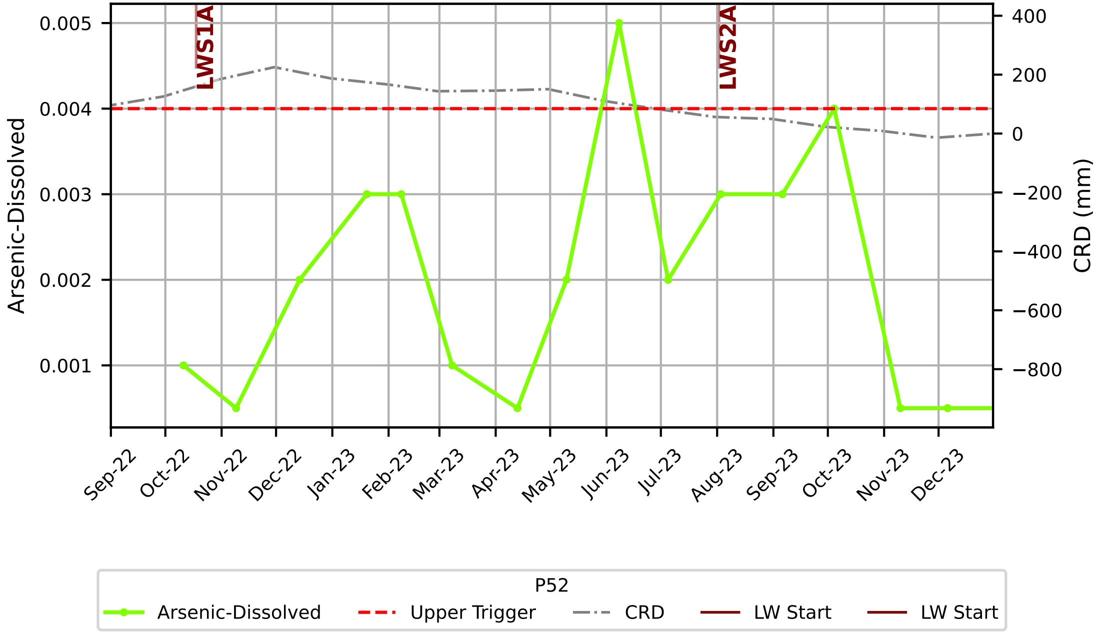
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
1.75
1.50
1.25
1.00
0.75
0.50
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



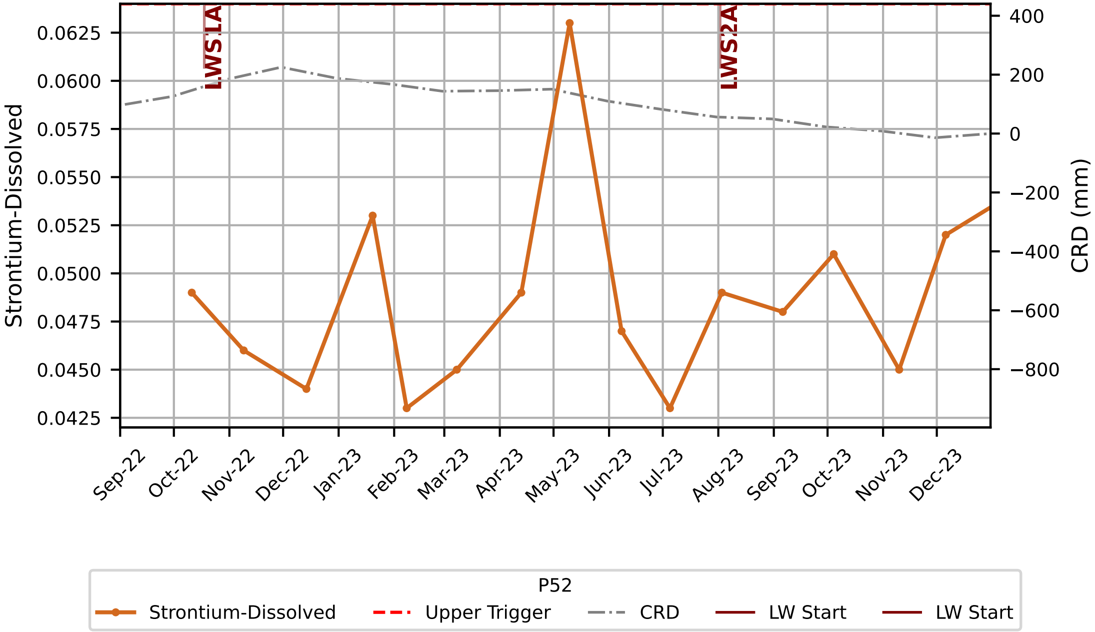
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.050
0.048
0.046
0.044
0.042
0.040
0.038
0.036
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



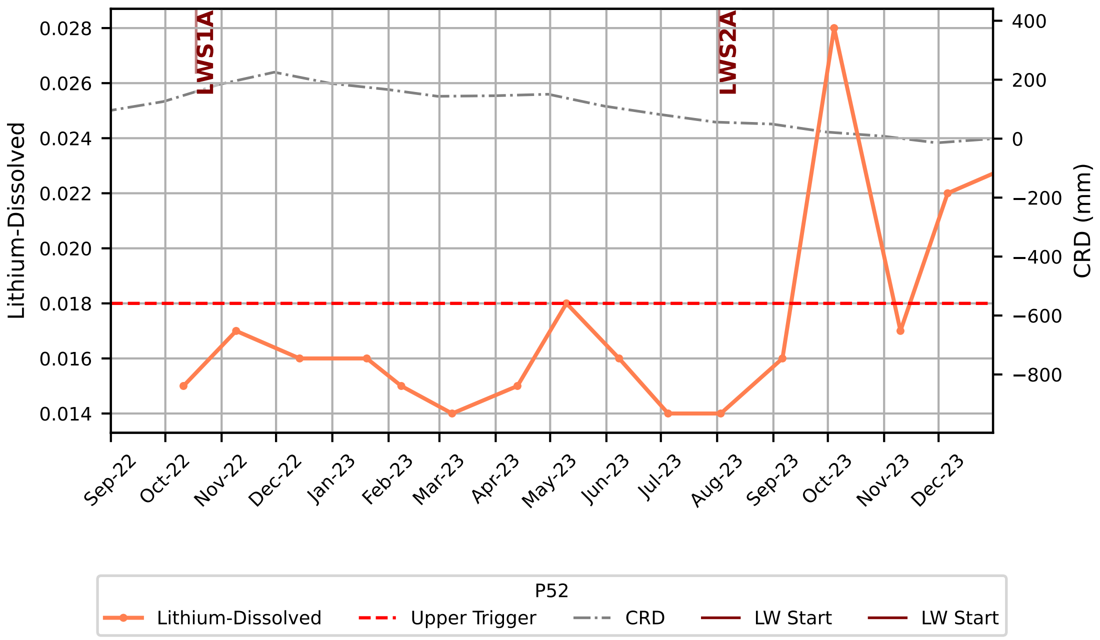
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



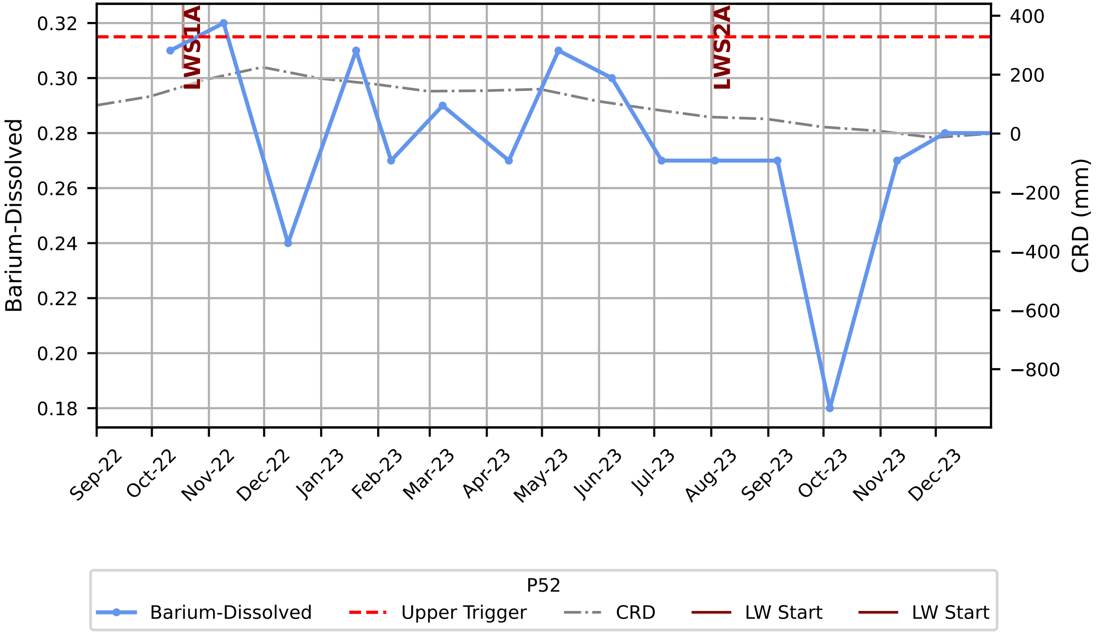
LWS1A
LWS2A
Arsenic-Dissolved
0.005
0.004
0.003
0.002
0.001
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

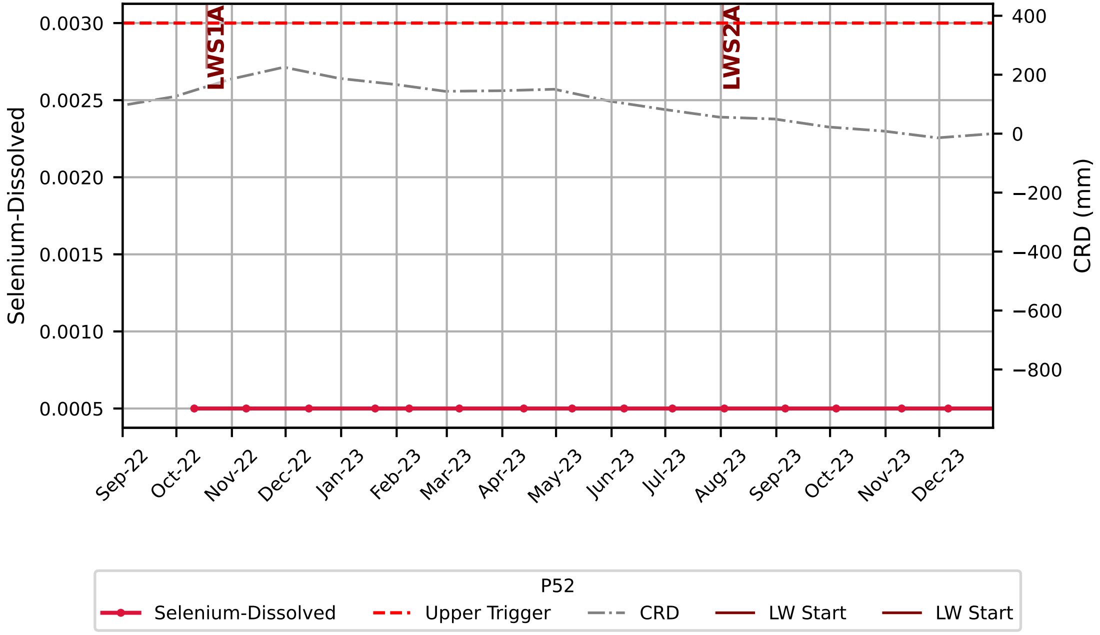


LWS1A
LWS2A
Strontium-Dissolved
0.0625
0.0600
0.0575
0.0550
0.0525
0.0500
0.0475
0.0450
0.0425
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

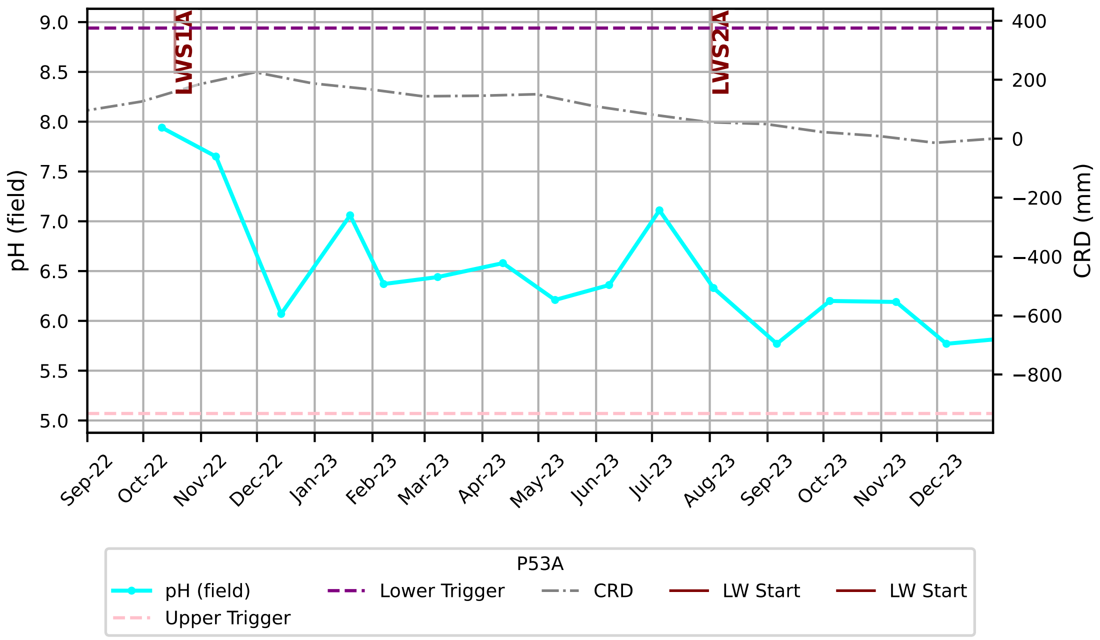


LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.028
0.026
0.024
0.022
0.020
0.018
0.016
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

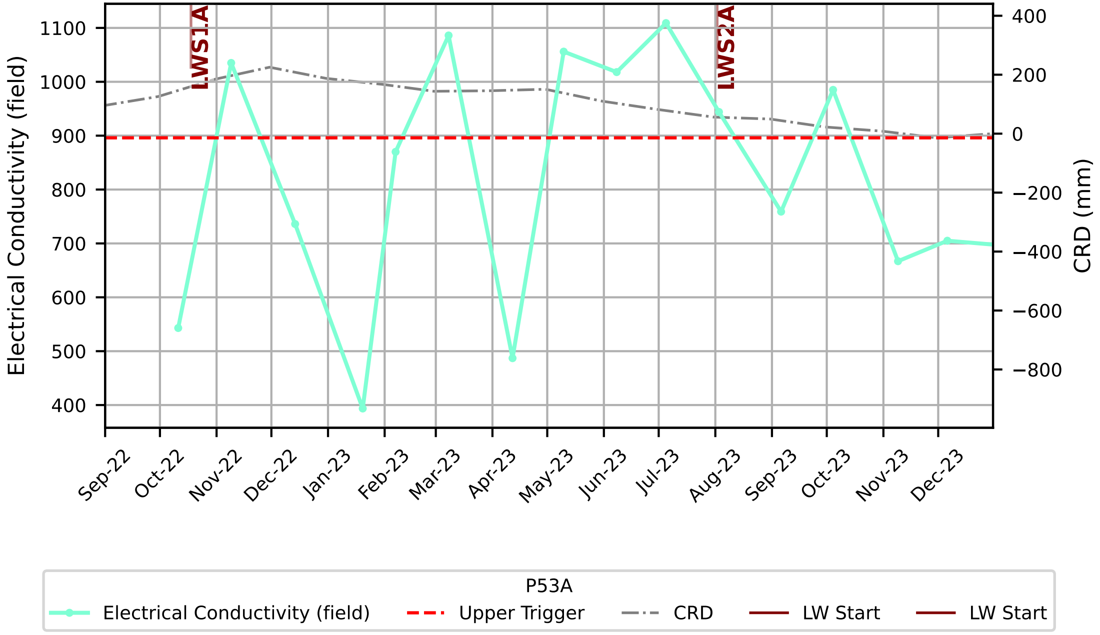

LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



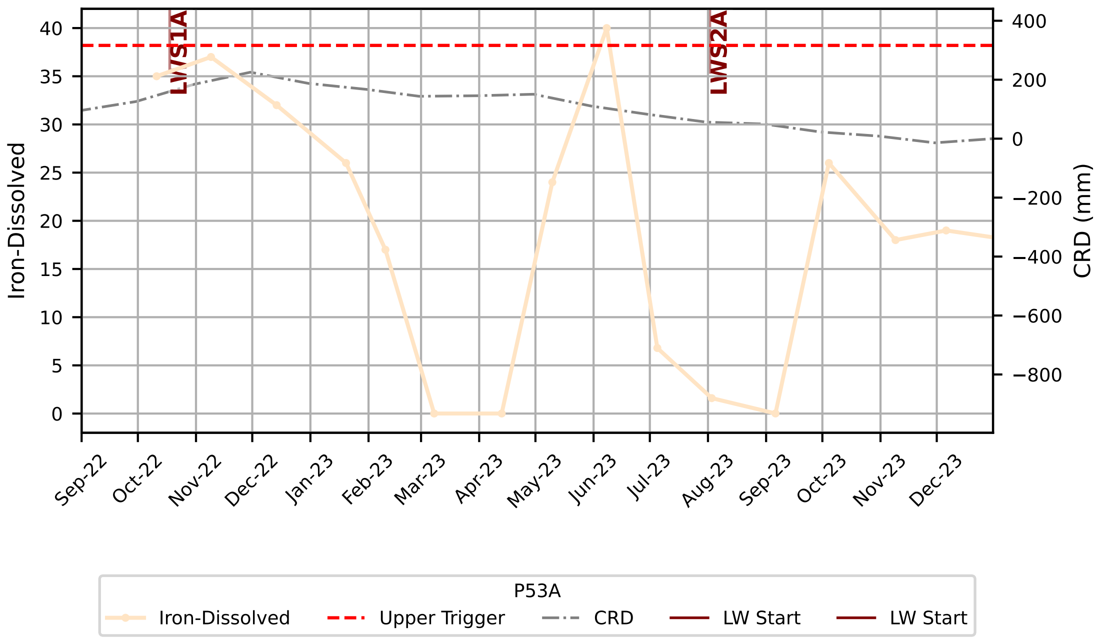
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P52
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



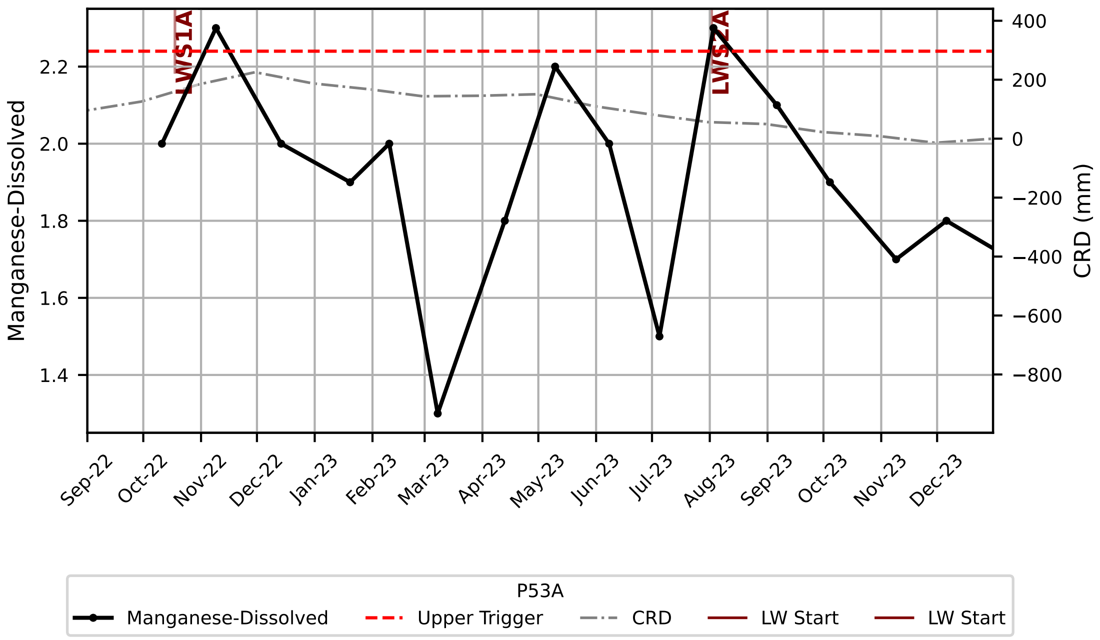
pH (field)
CRD (mm)
LWS1A
LWS2A
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



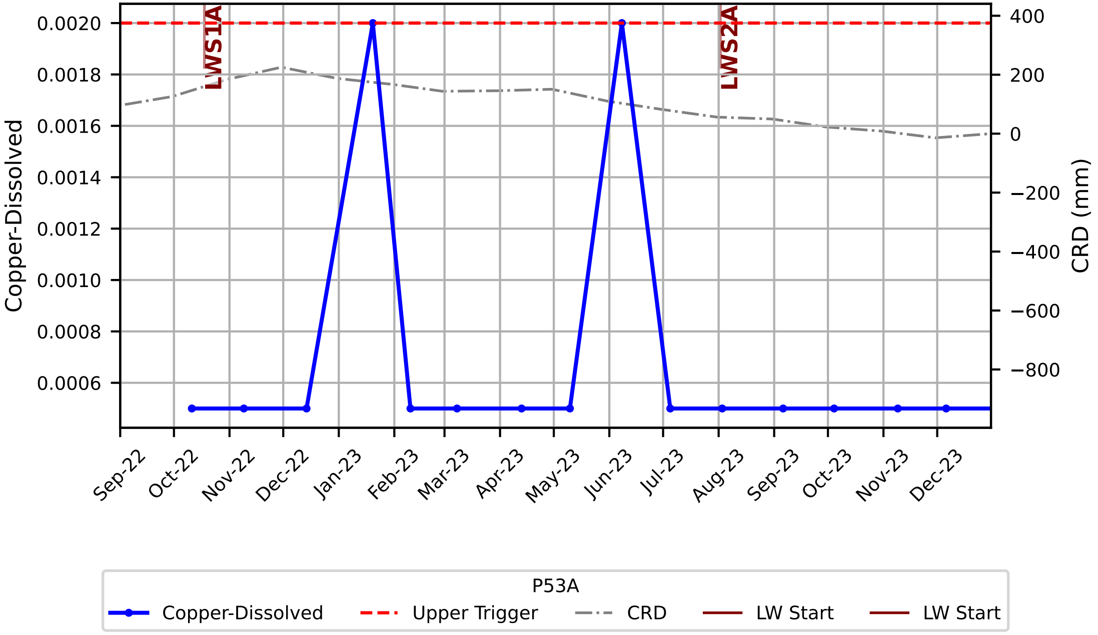
LWS1A
LWS2A
Electrical Conductivity (field)
1100
1000
900
800
700
600
500
400
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



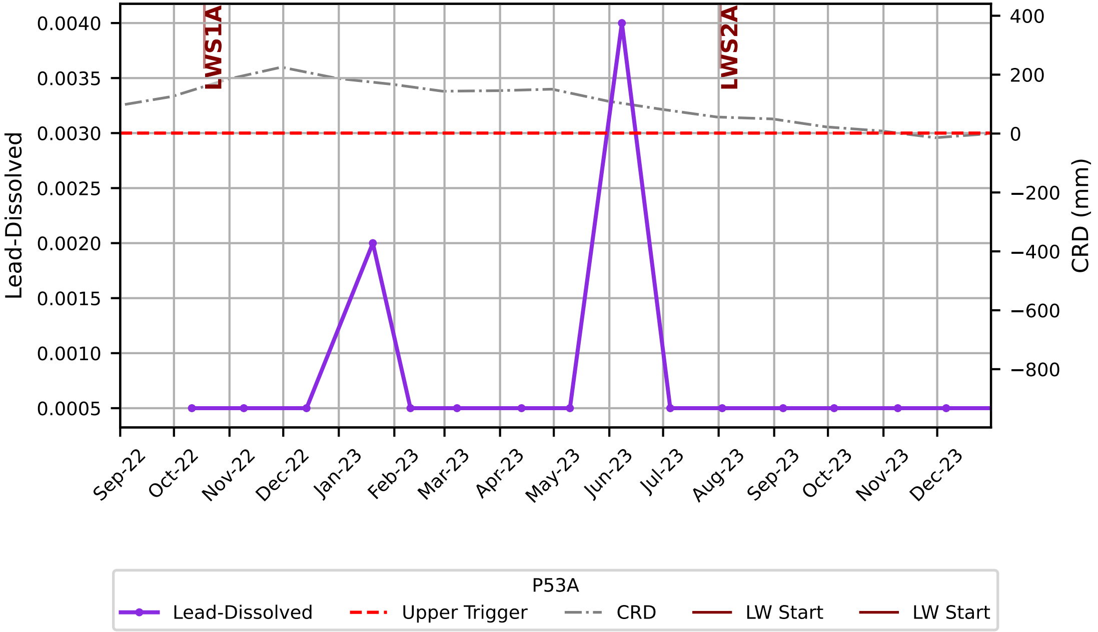
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
40
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



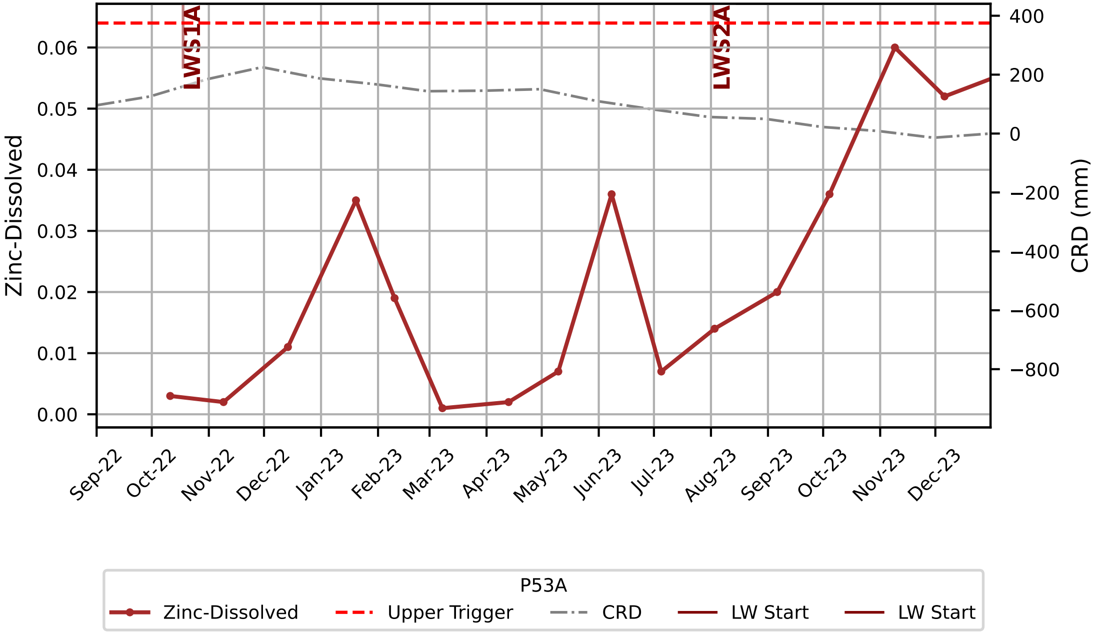
Manganese-Dissolved
CRD (mm)
2.2
2.0
1.8
1.6
1.4
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



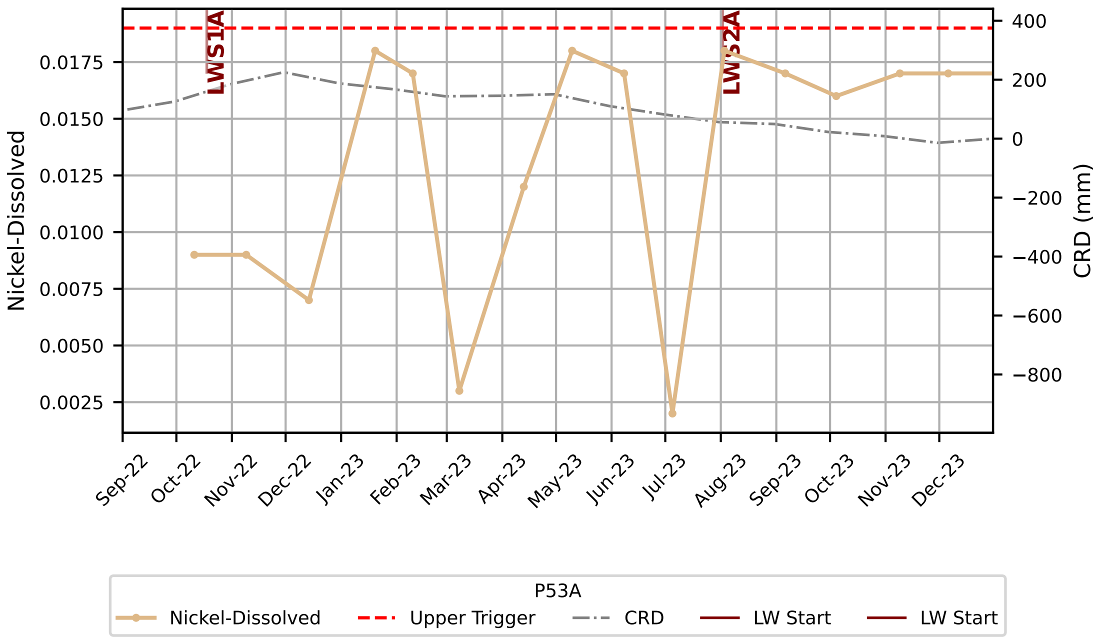
LWS1A
LWS2A
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



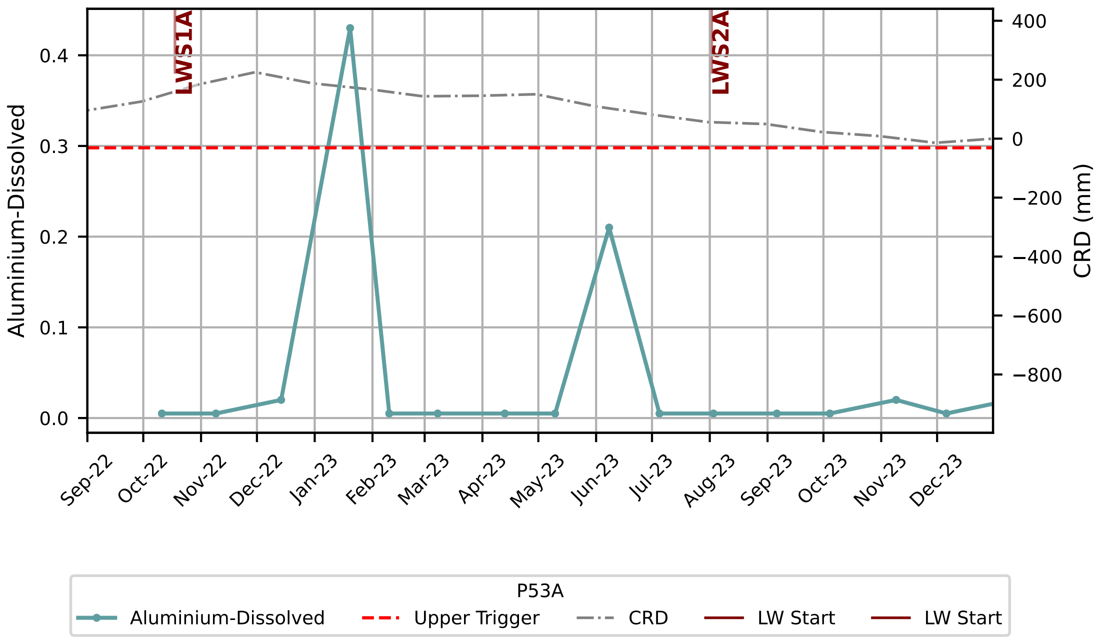
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

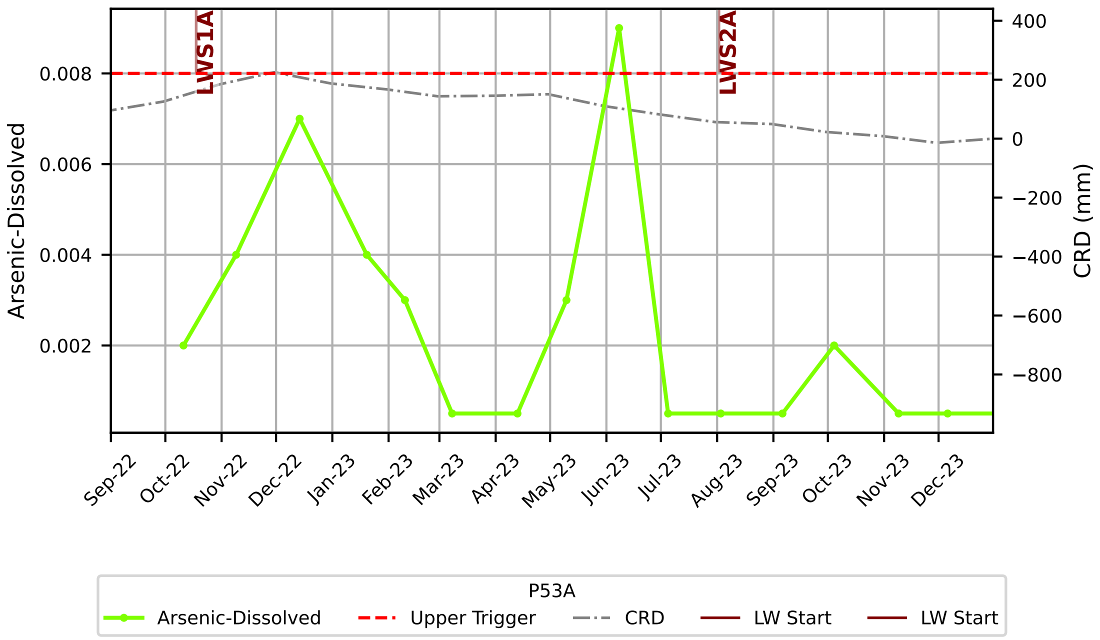


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

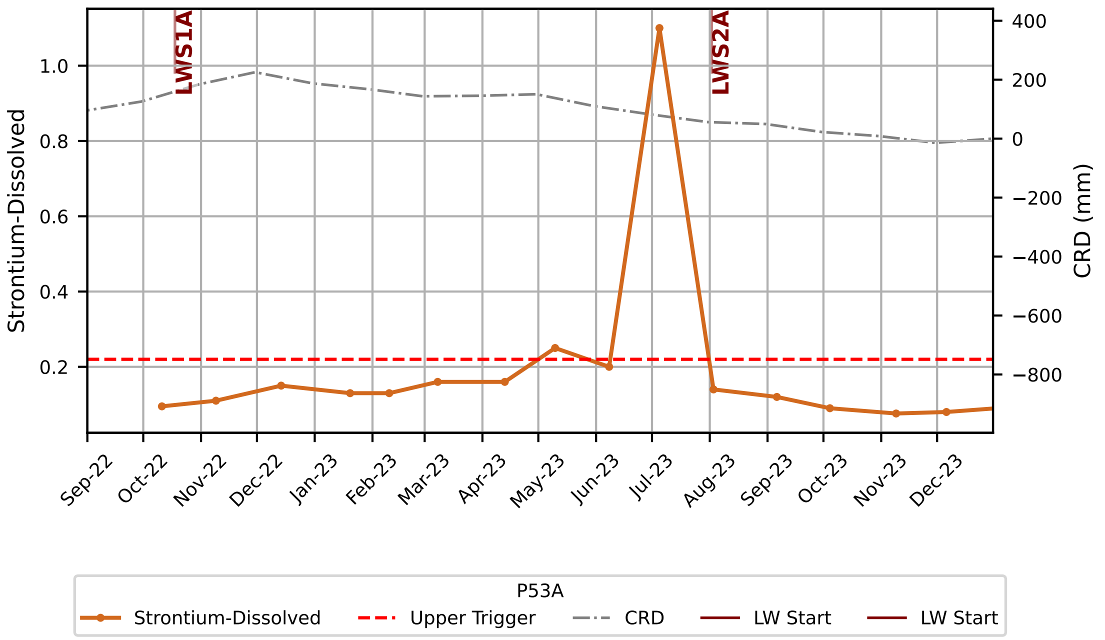


LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

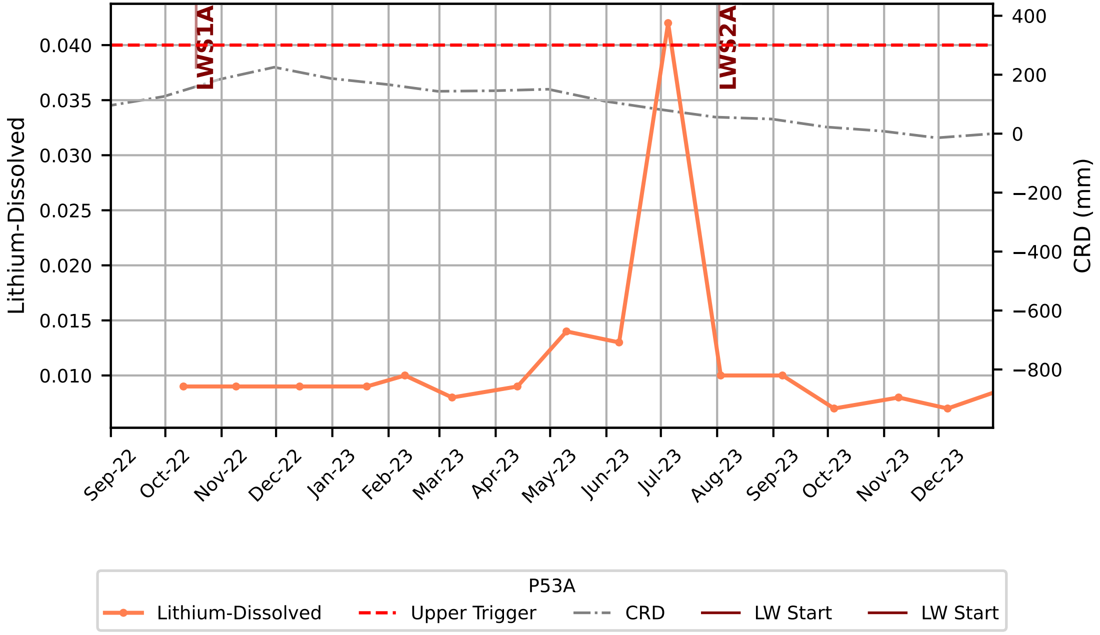

LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



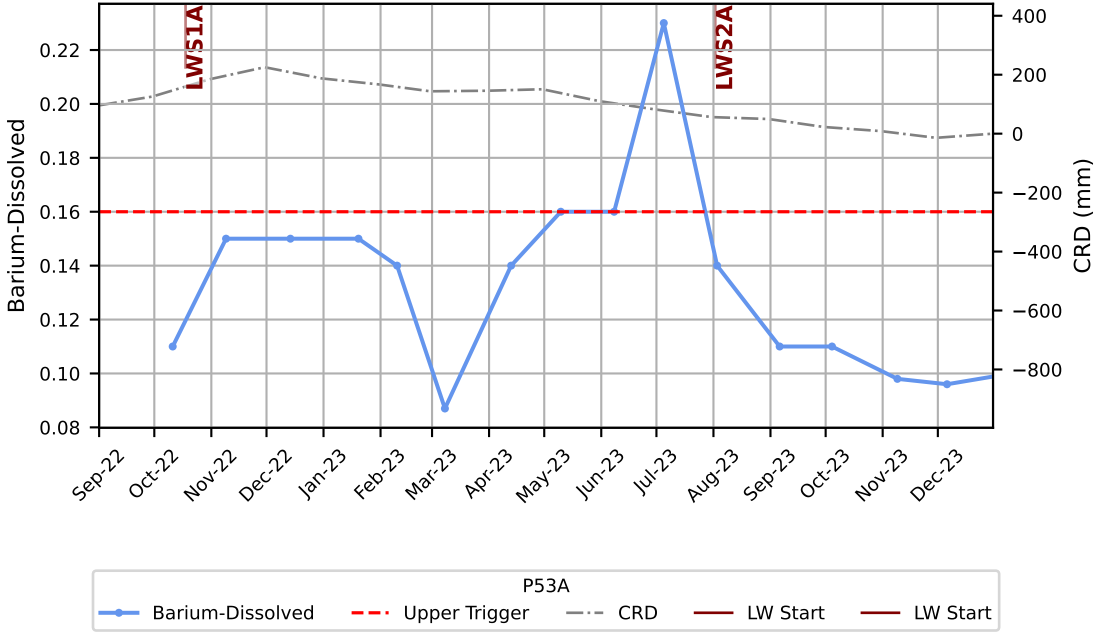
LWS1A
LWS2A
Arsenic-Dissolved
0.008
0.006
0.004
0.002
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



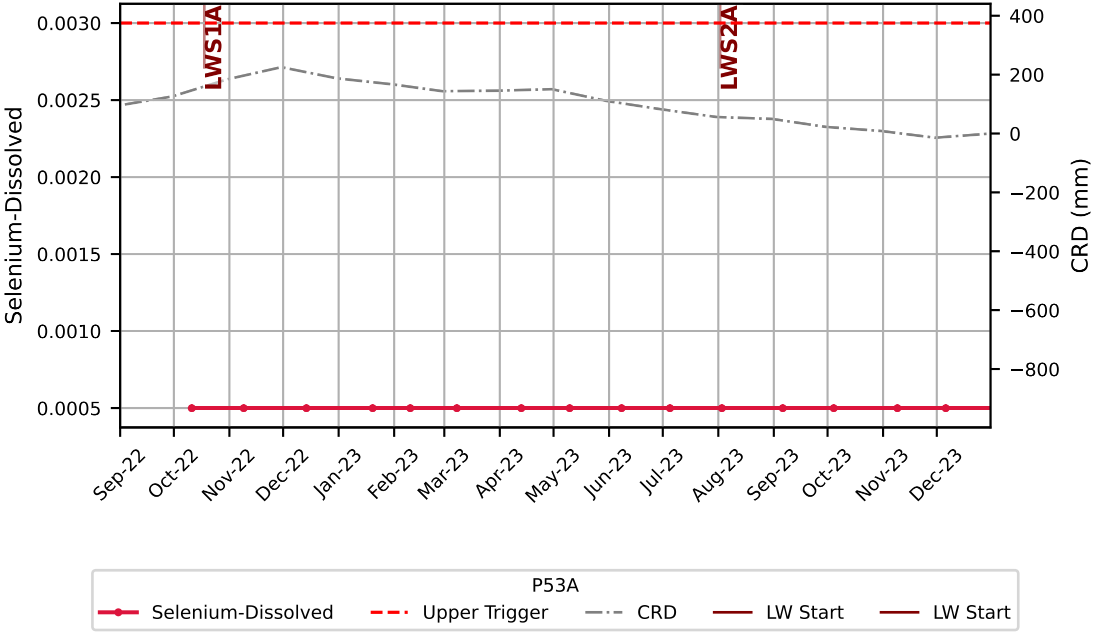
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.0
0.8
0.6
0.4
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



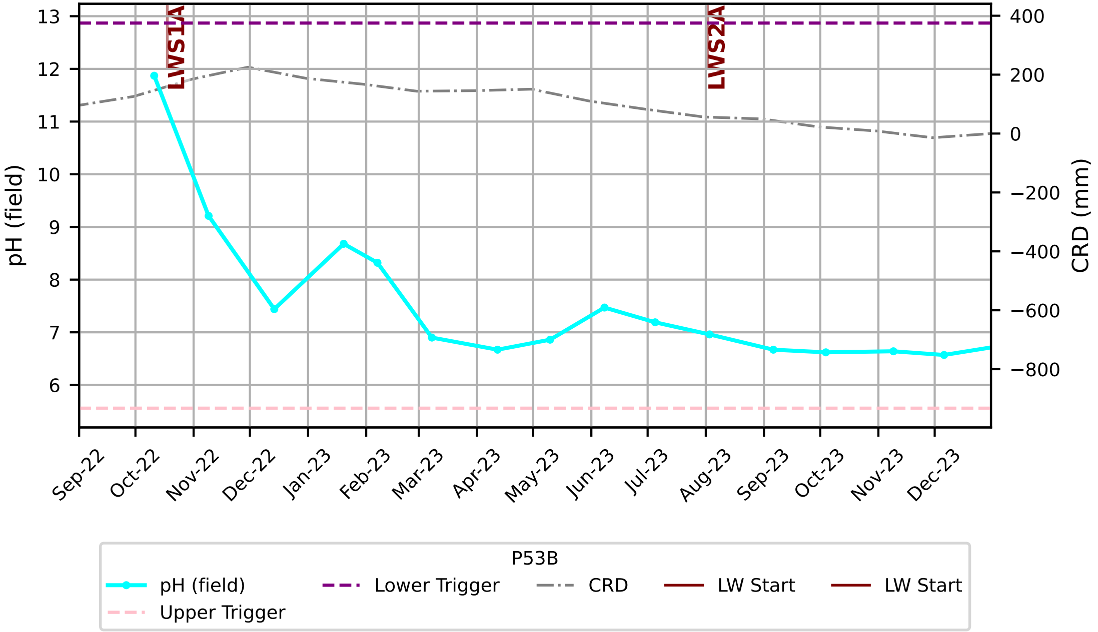
Lithium-Dissolved
CRD (mm)
0.040
0.035
0.030
0.025
0.020
0.015
0.010
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



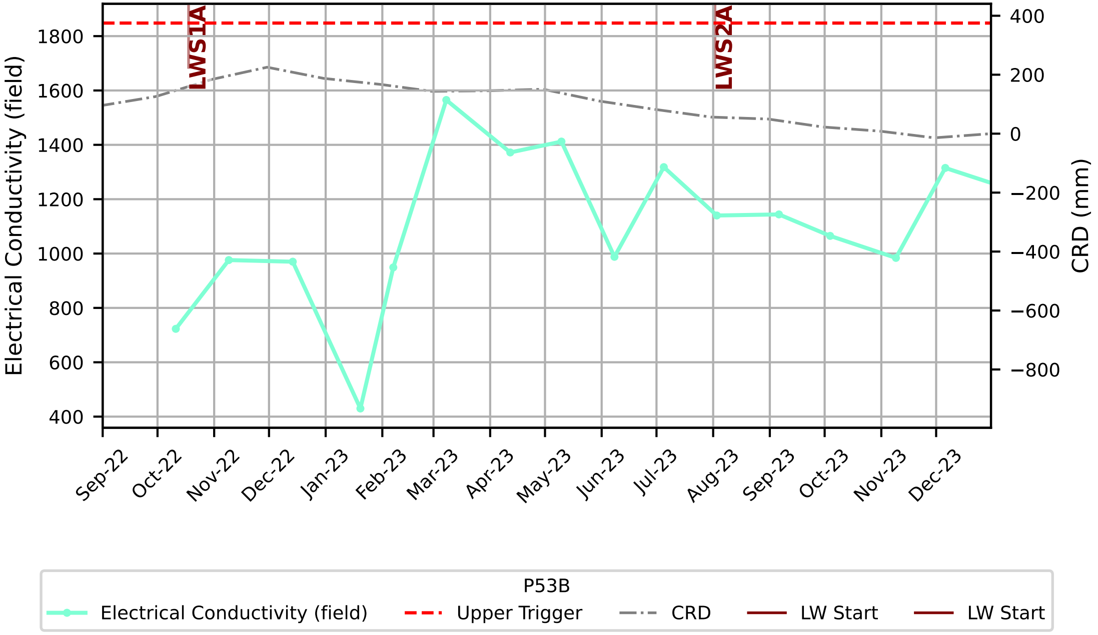
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

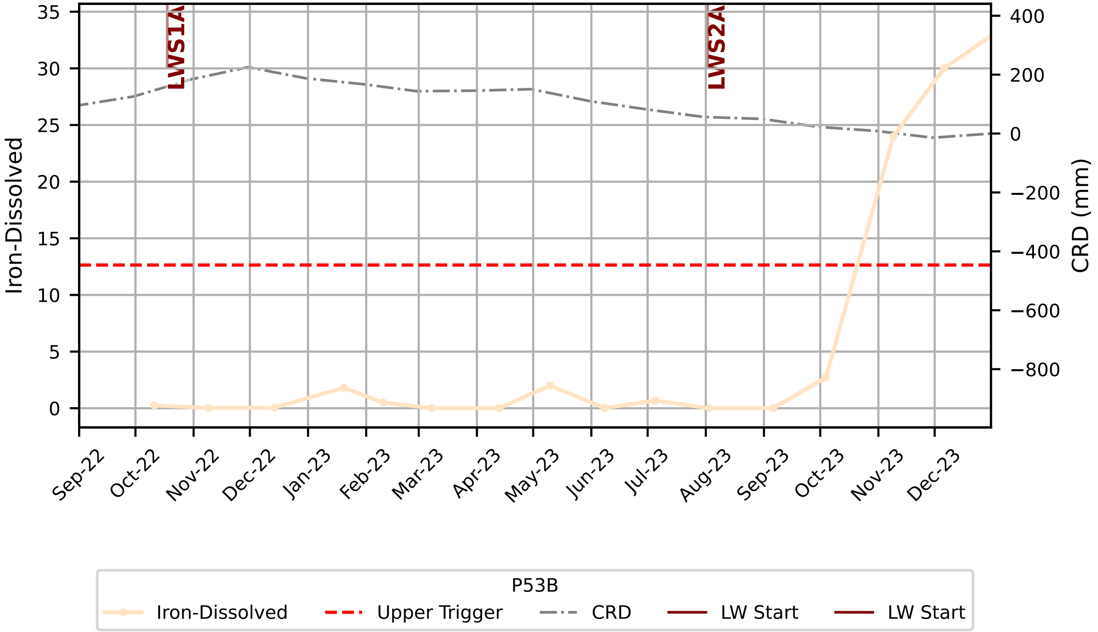


Selenium-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

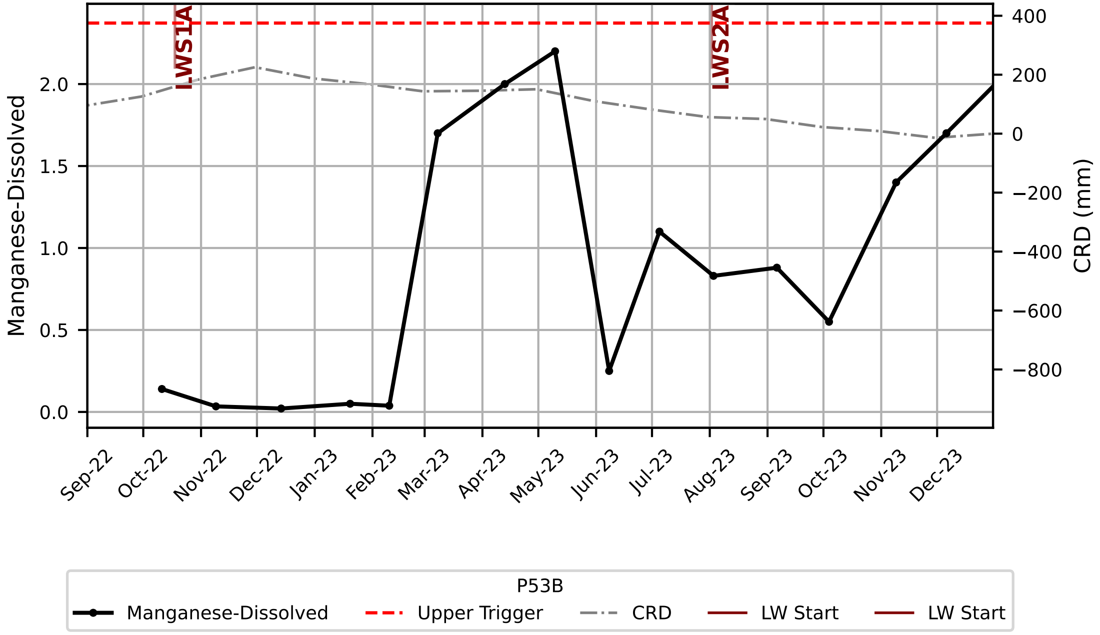


pH (field)
CRD (mm)
LWS1A
LWS2A
13
12
11
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

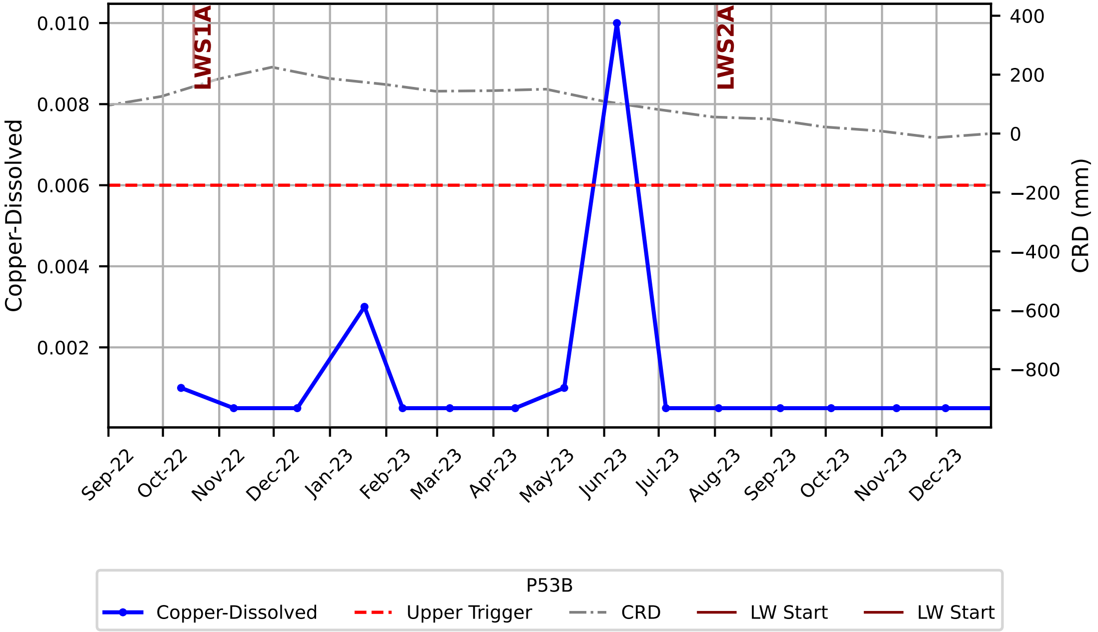

LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1800
1600
1400
1200
1000
800
600
400
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



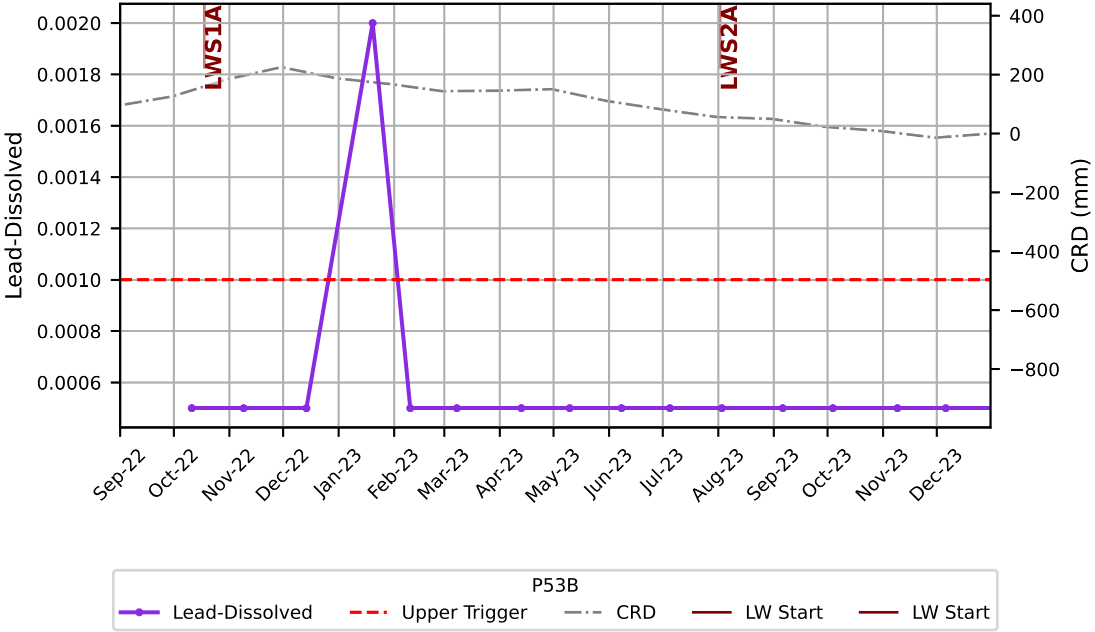
LWS1A
LWS2A
35
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Iron-Dissolved
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



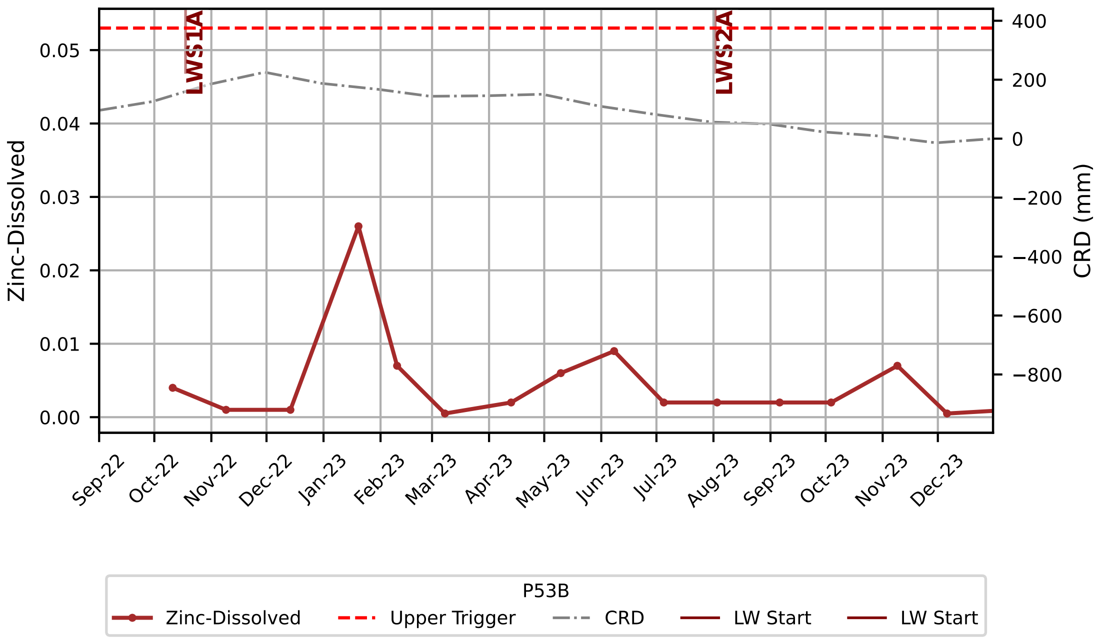
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.0
0.5
1.0
1.5
2.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



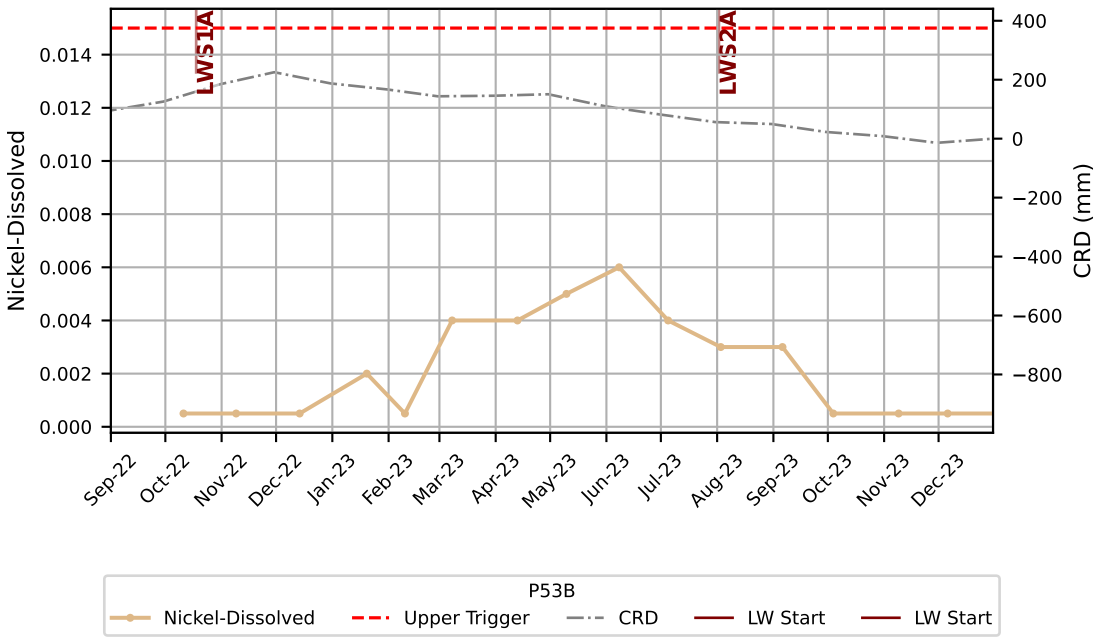
LWS1A
LWS2A
0.010
0.008
0.006
0.004
0.002
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



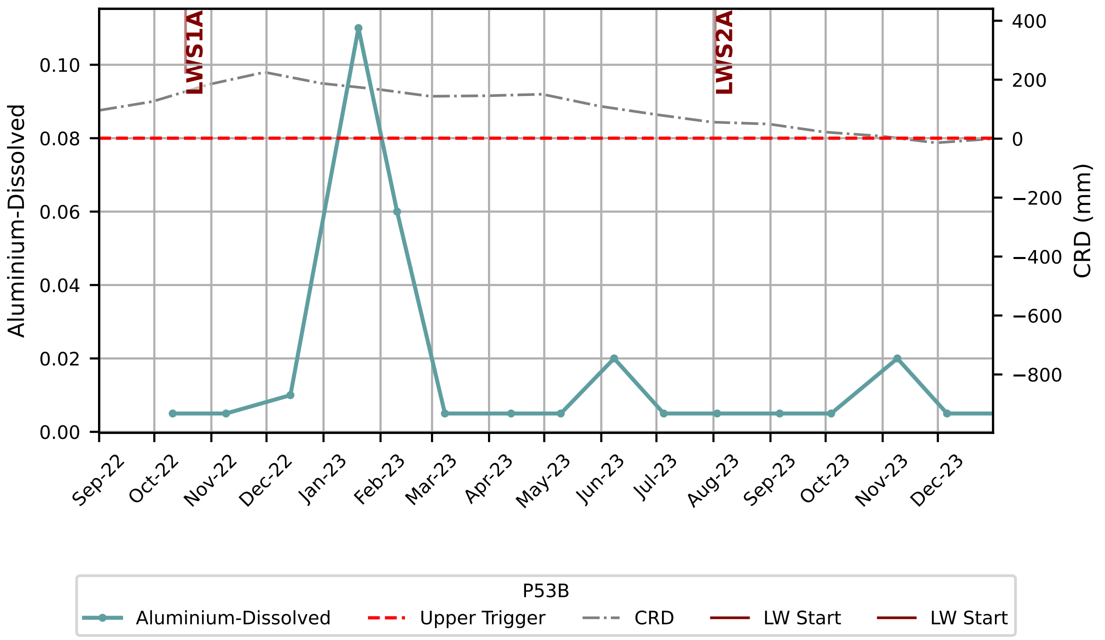
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

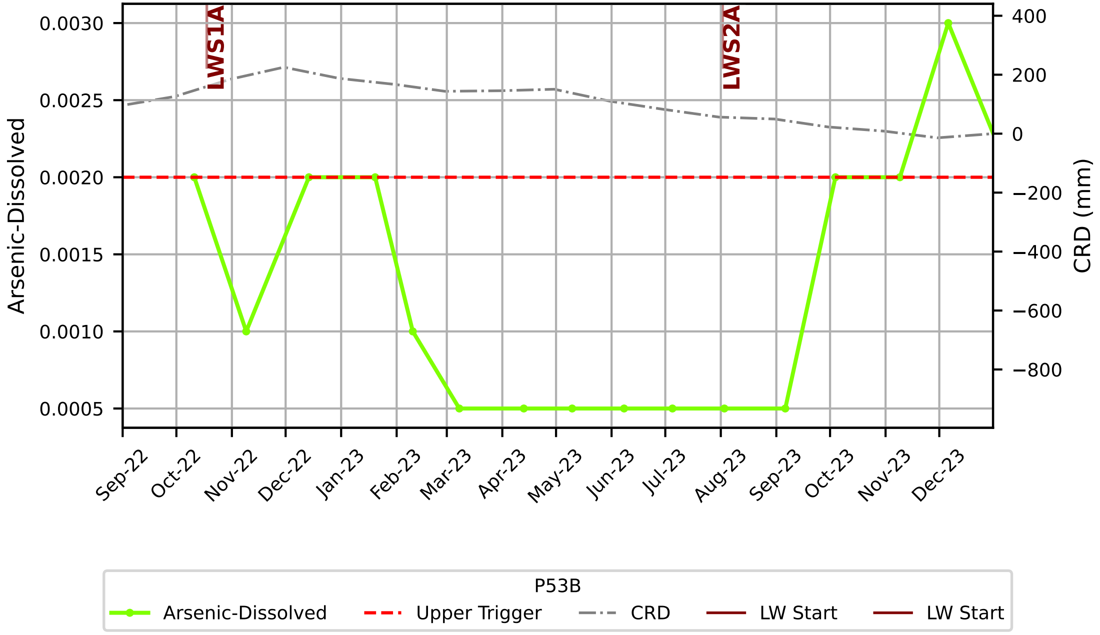


LWS1A
LWS2A
0.05
0.04
0.03
0.02
0.01
0.00
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

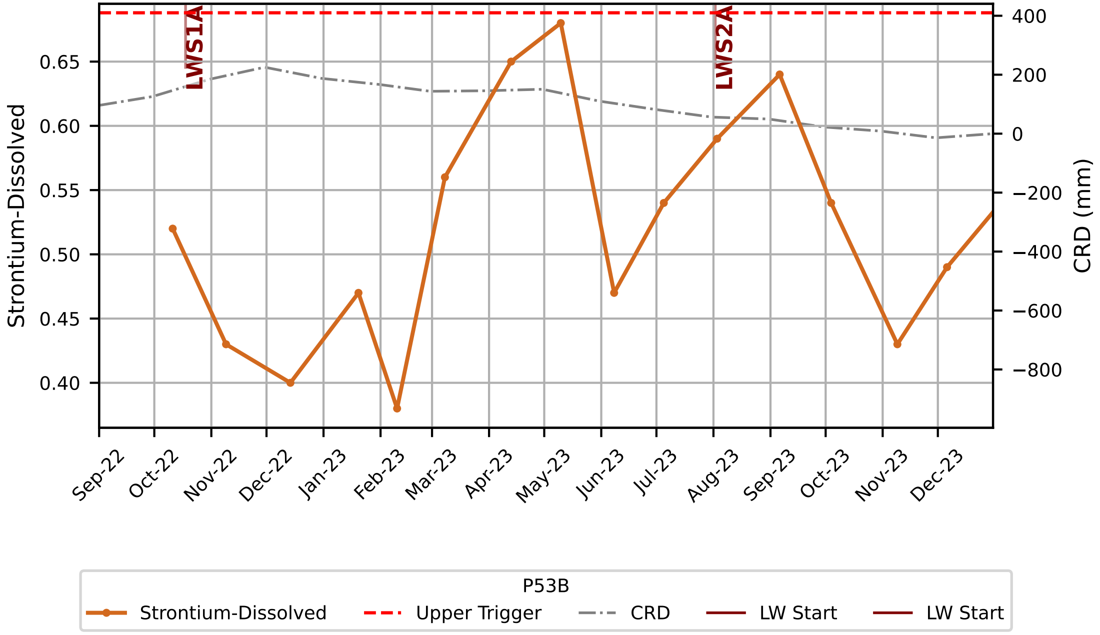


LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

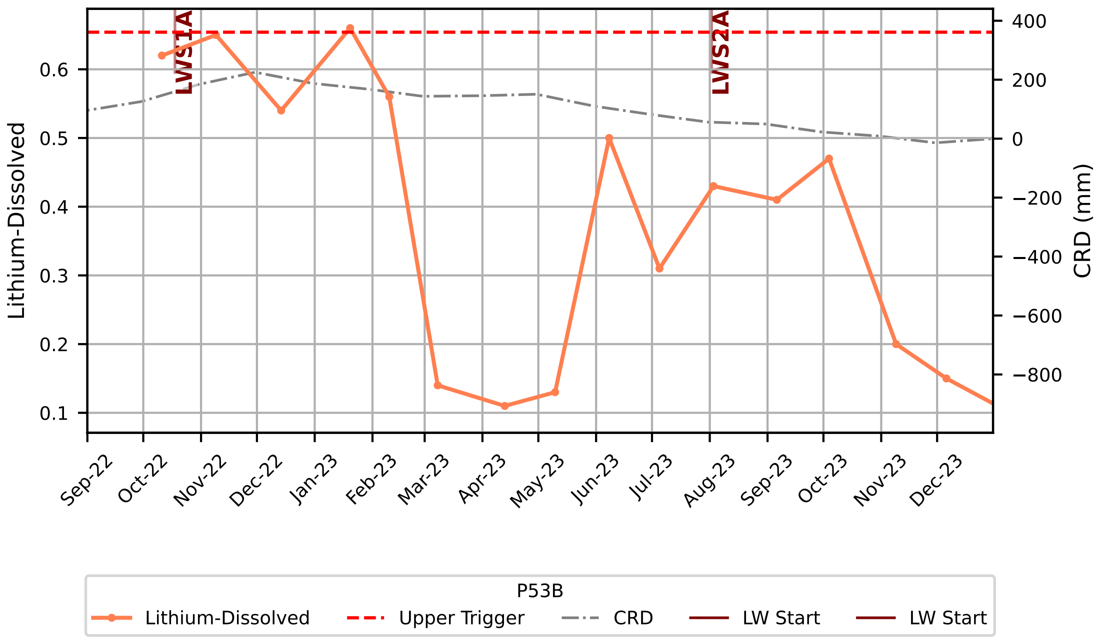

LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.02
0.04
0.06
0.08
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



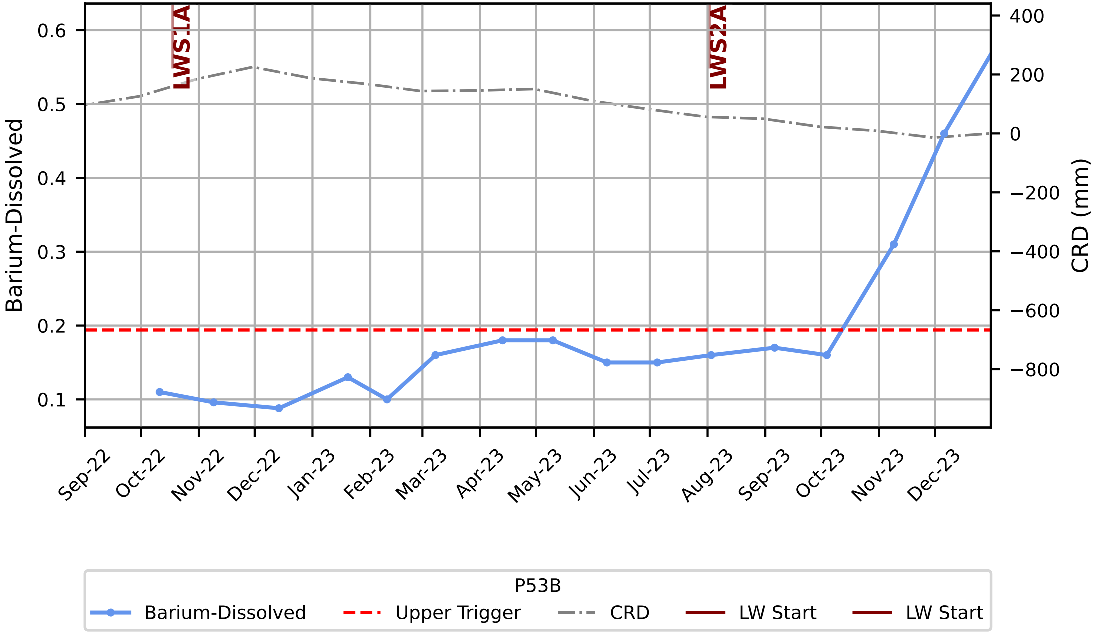
LWS1A
LWS2A
Arsenic-Dissolved
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



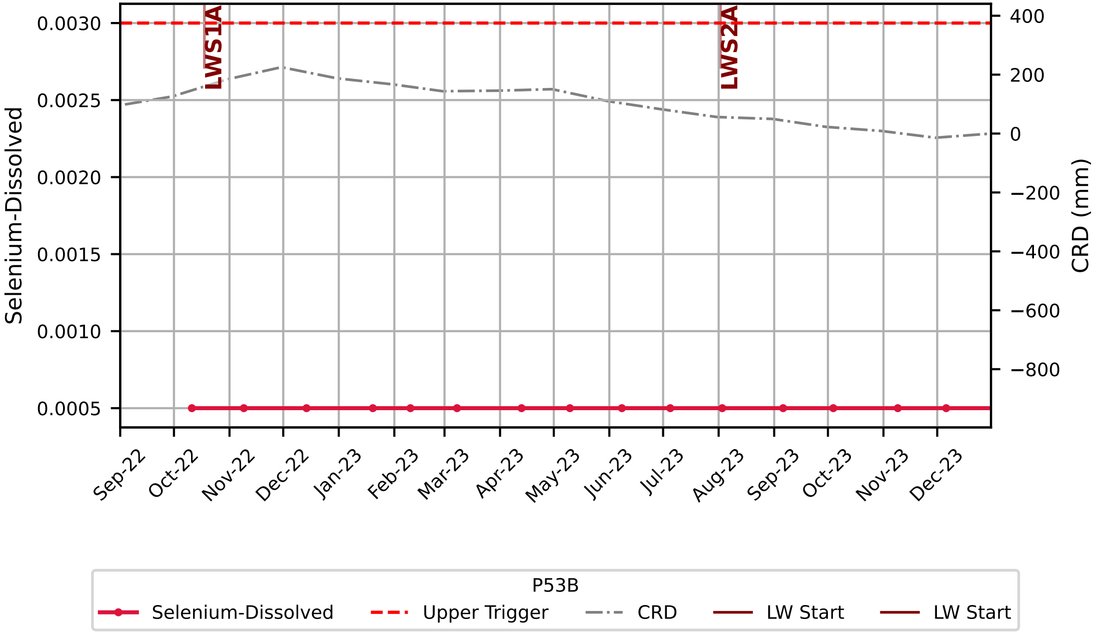
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.65
0.60
0.55
0.50
0.45
0.40
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



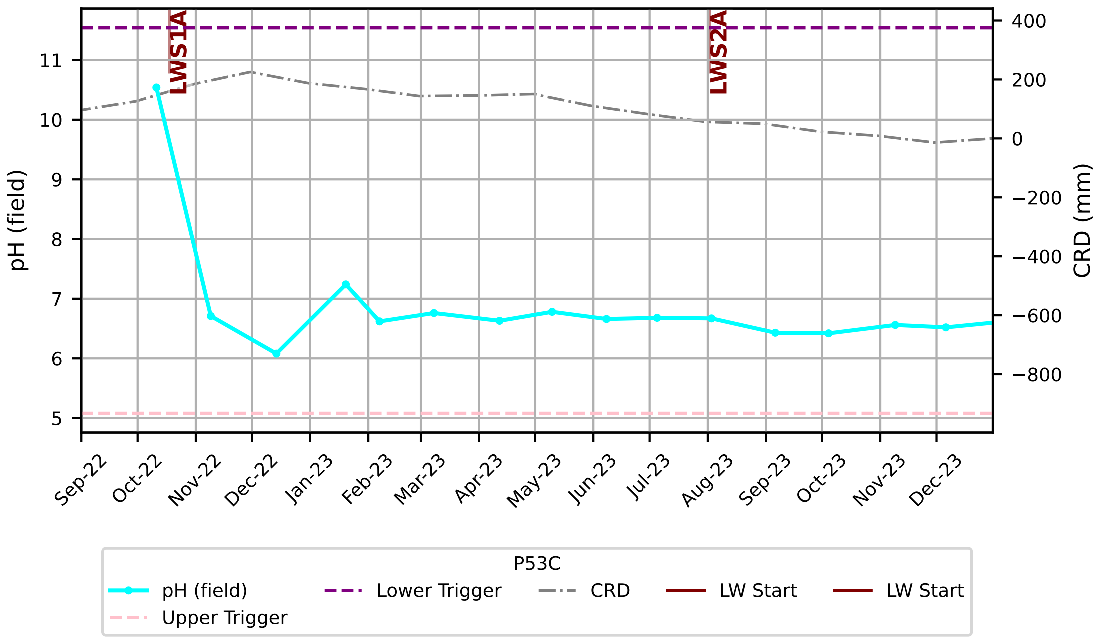
LWS1A
LWS2A
Lithium-Dissolved
0.1
0.2
0.3
0.4
0.5
0.6
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



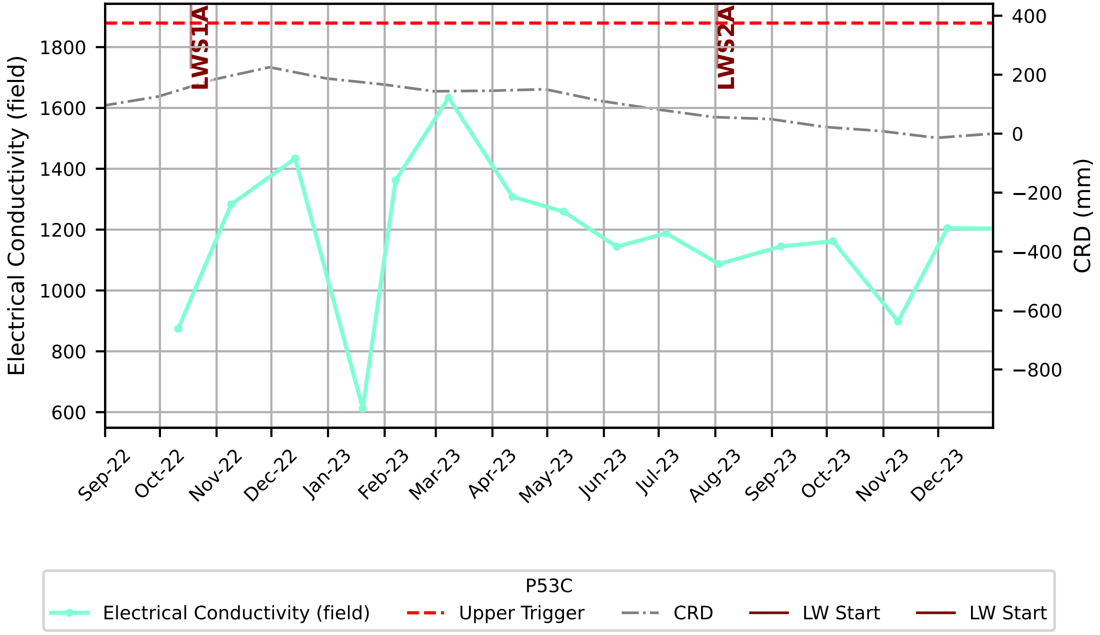
LWS1A
LWS2A
0.6
0.5
0.4
0.3
0.2
0.1
Barium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



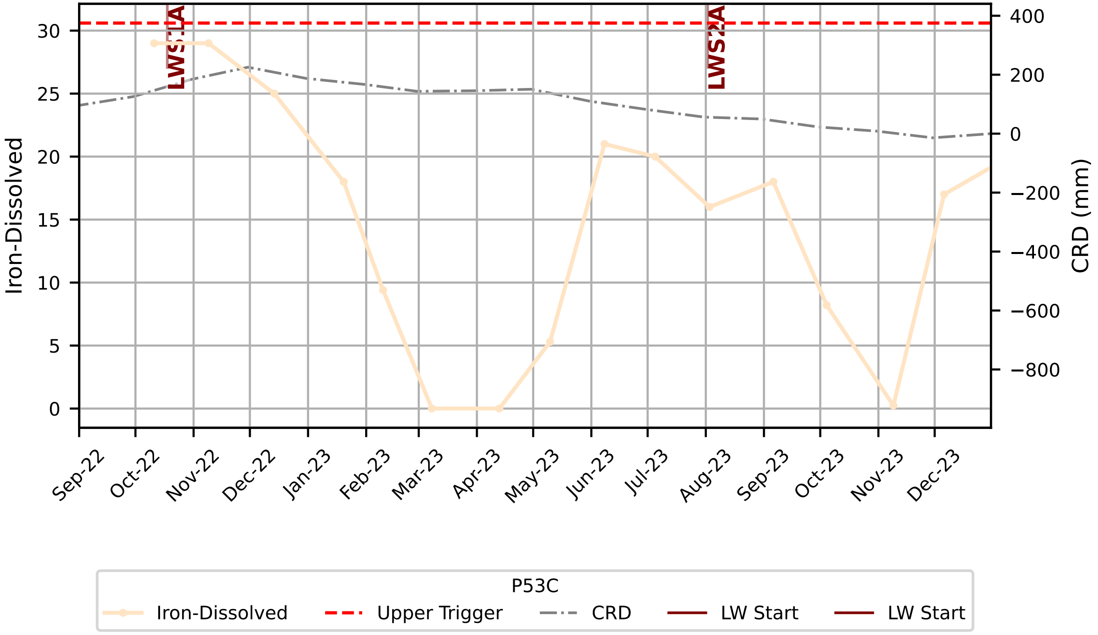
Selenium-Dissolved
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



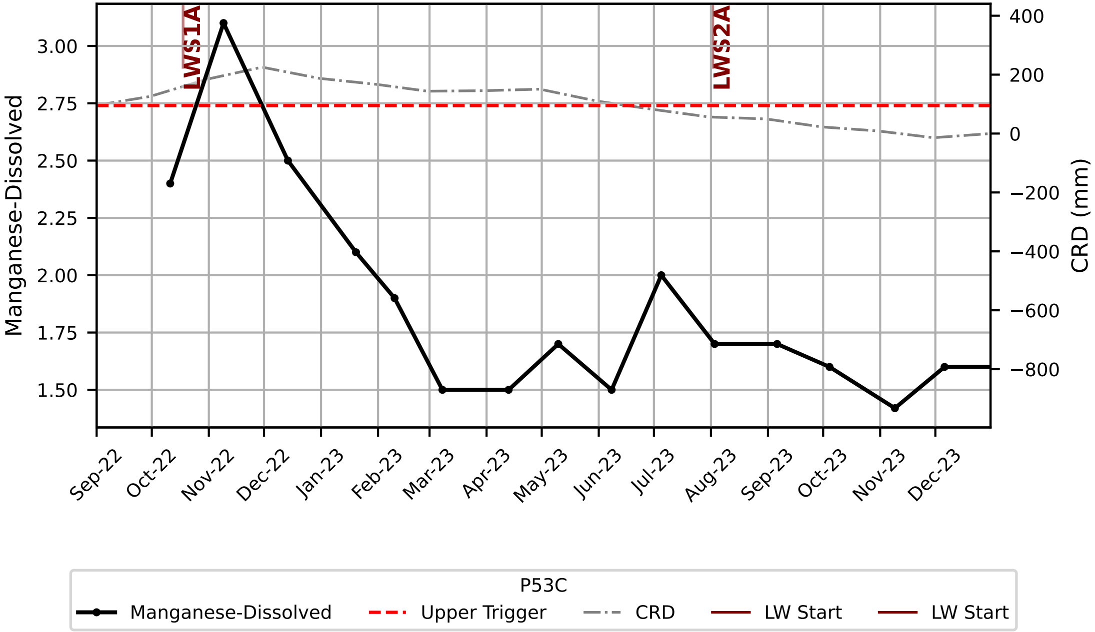
LWS1A
LWS2A
pH (field)
CRD (mm)
11
10
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



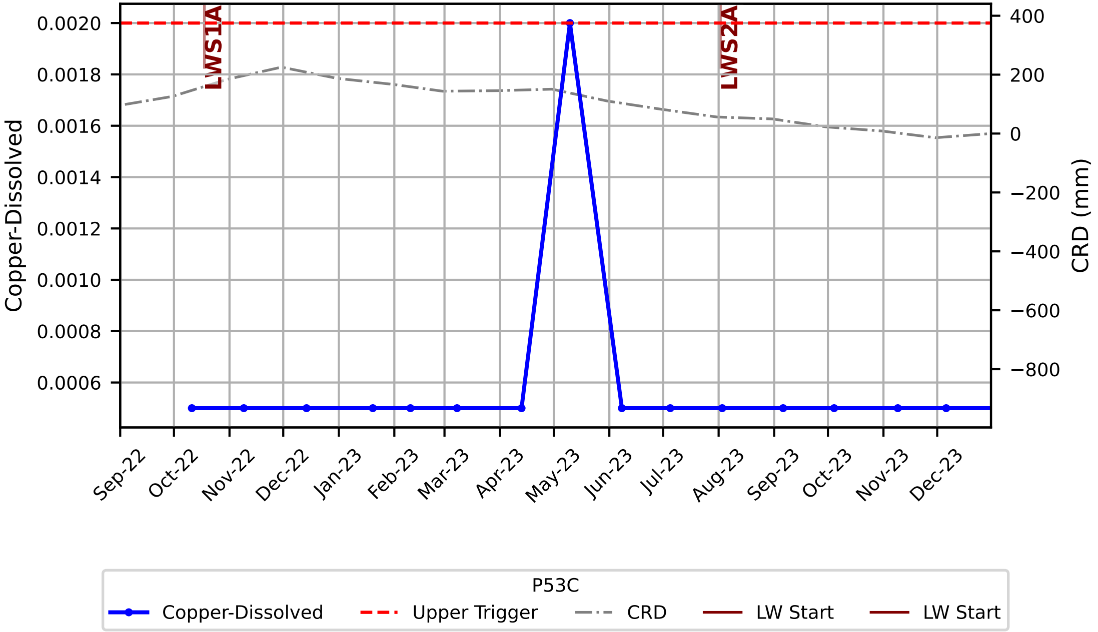
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1800
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



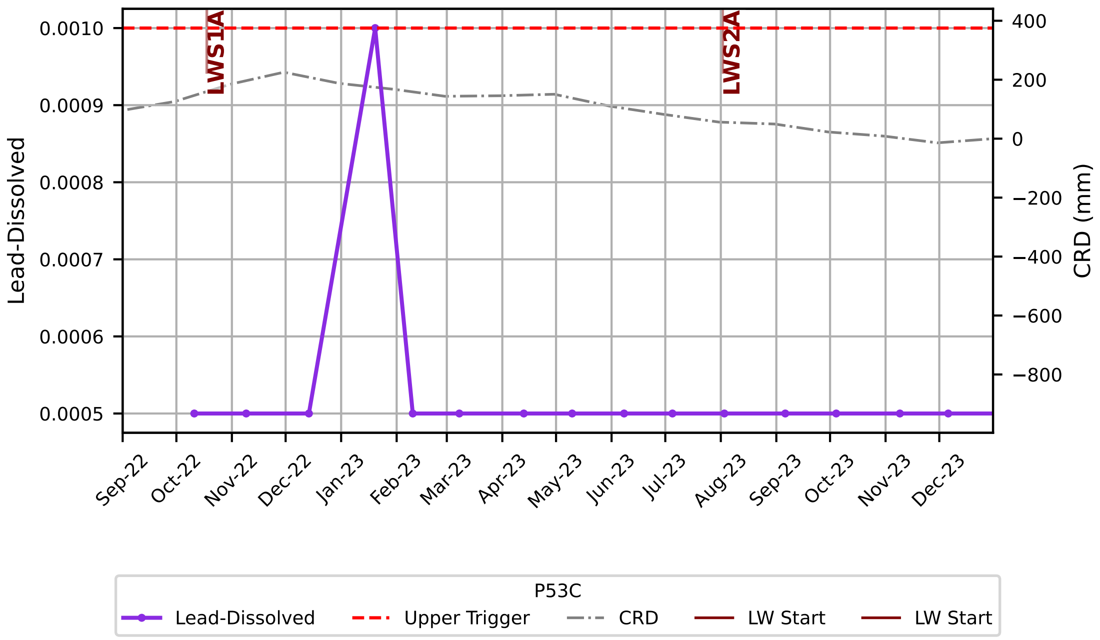
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
30
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



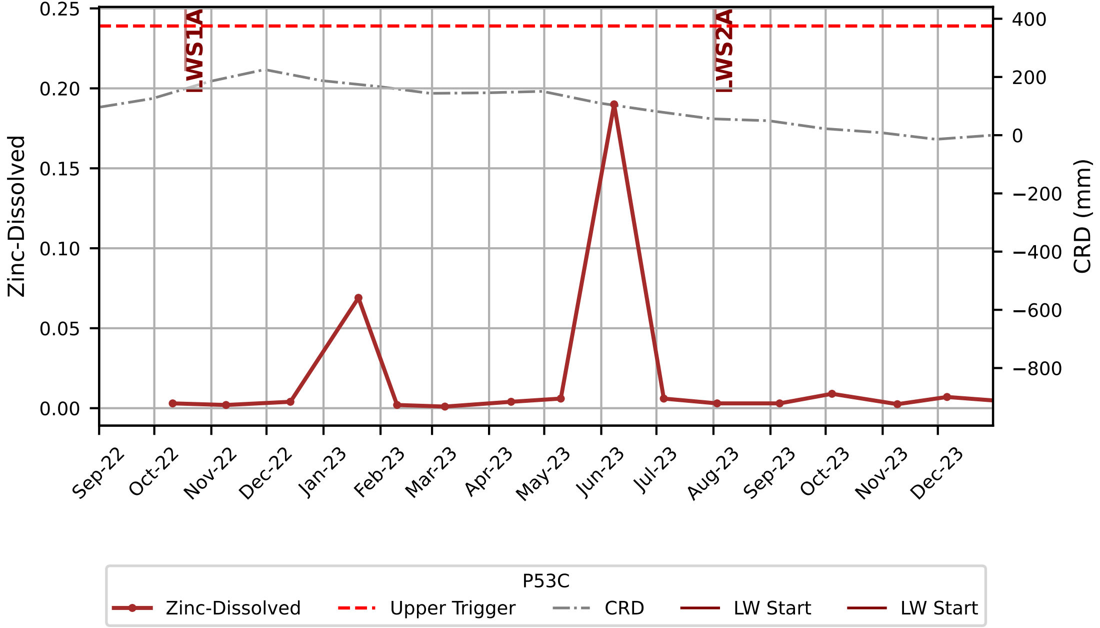
LWS1A
LWS2A
3.00
2.75
2.50
2.25
2.00
1.75
1.50
Manganese-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



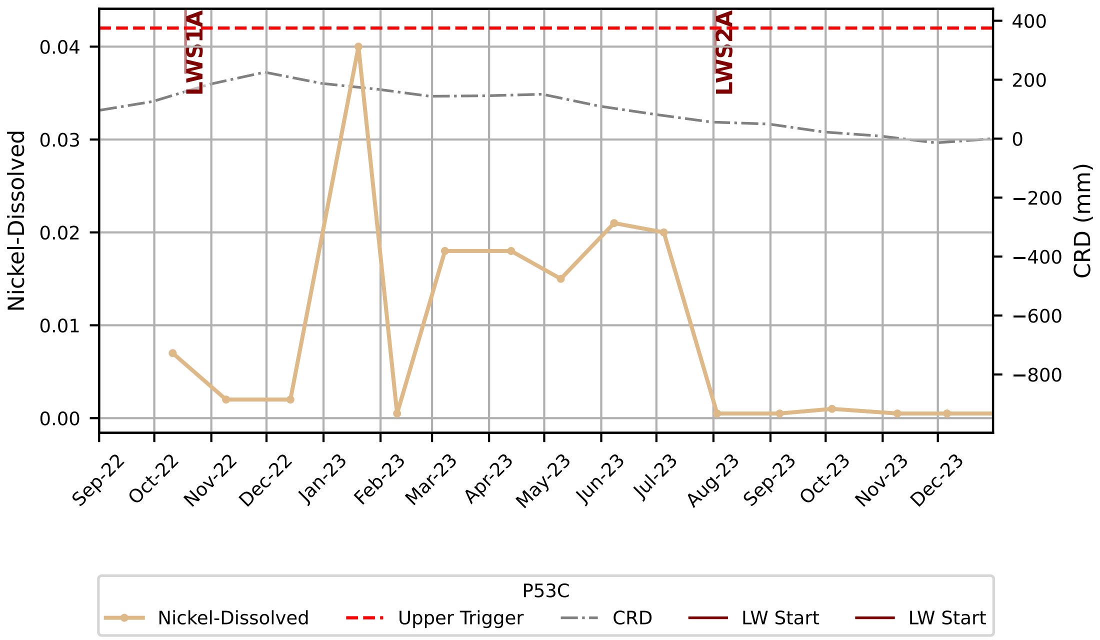
Copper-Dissolved
CRD (mm)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



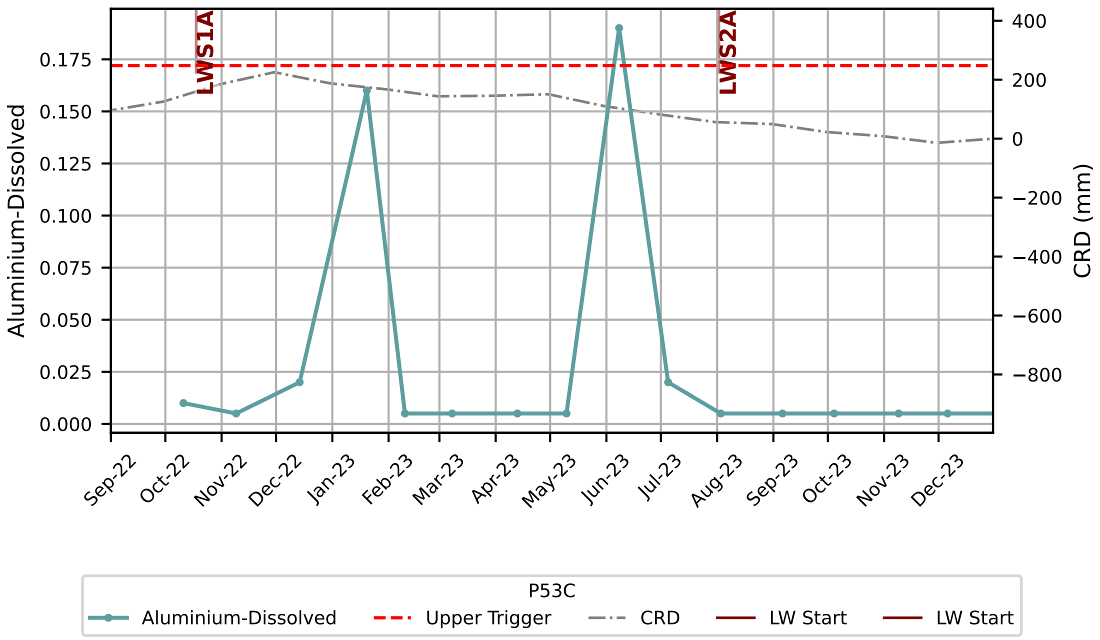
Lead-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



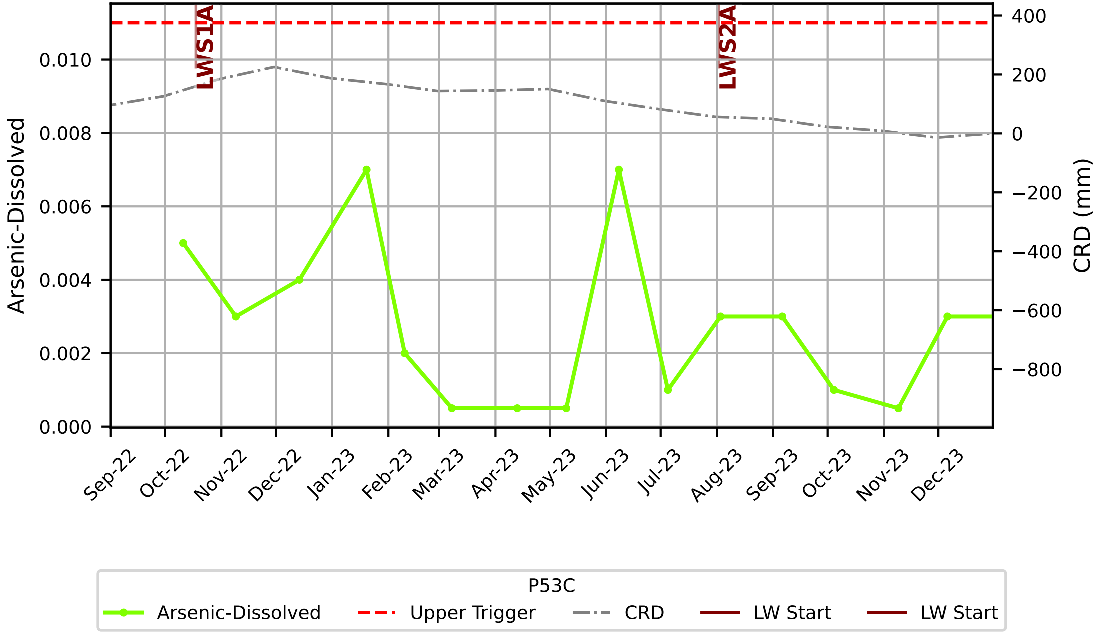
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



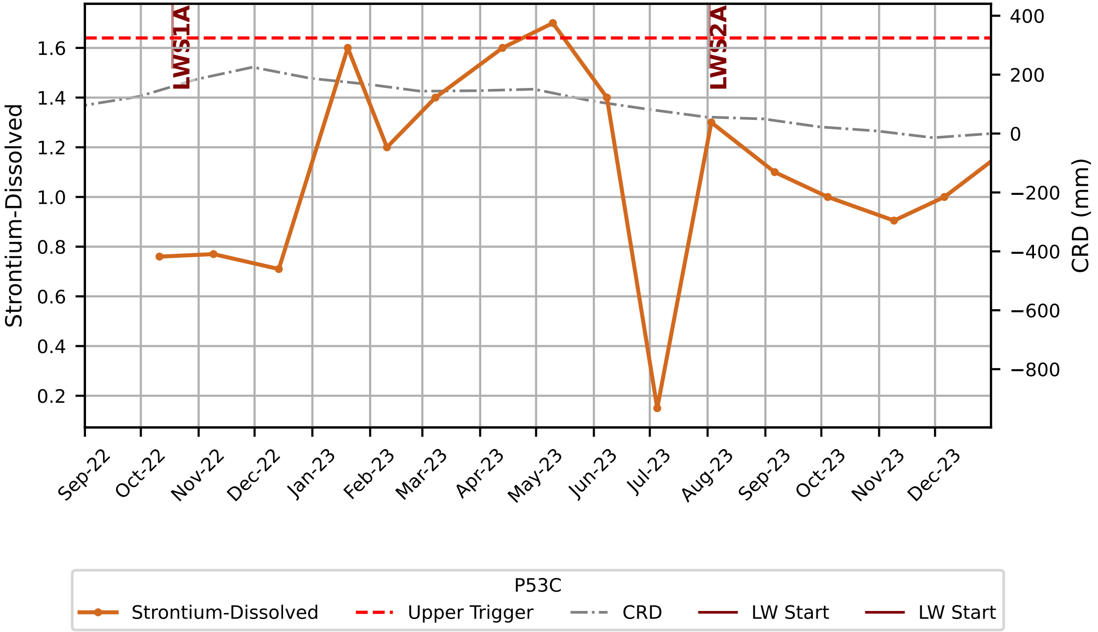
LWS1A
LWS2A
Nickel-Dissolved
0.00
0.01
0.02
0.03
0.04
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



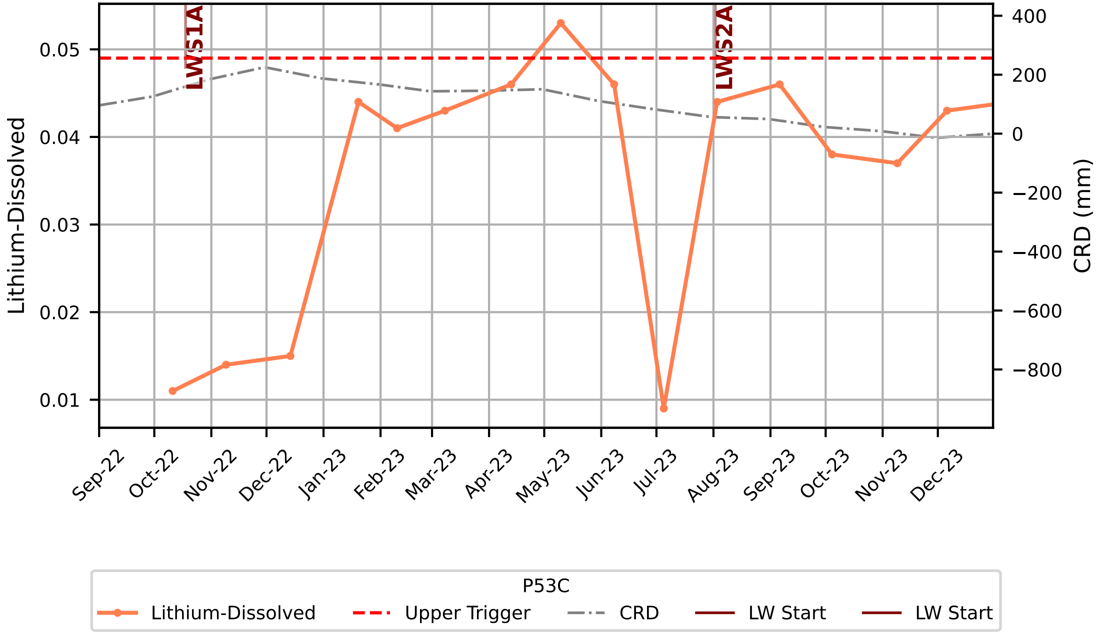
LWS1A
LWS2A
Aluminium-Dissolved
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



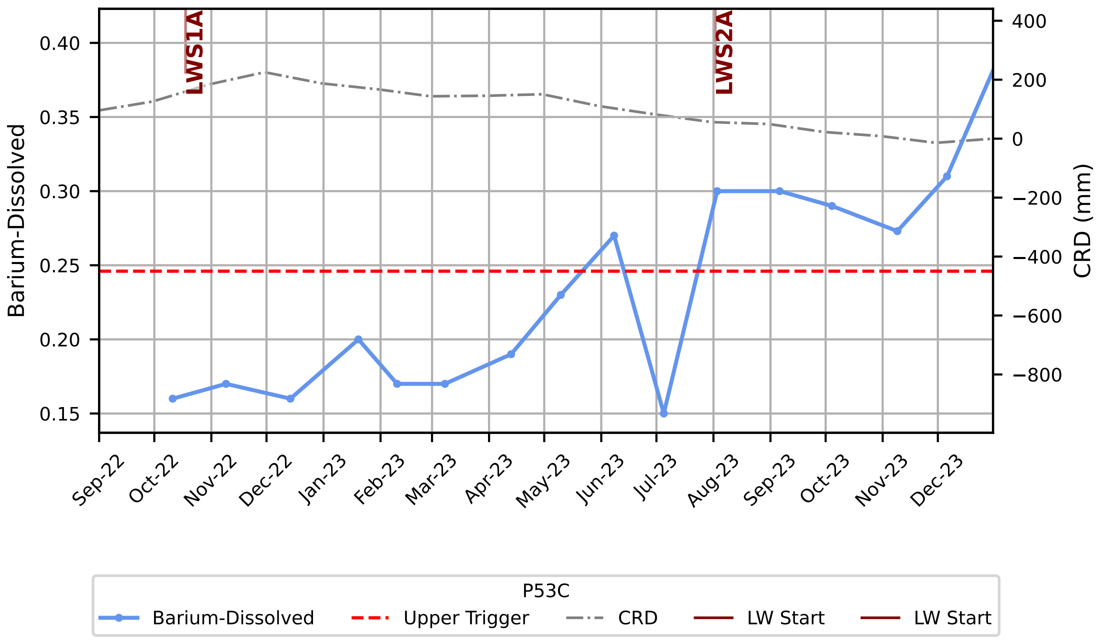
LWS1A
LWS2A
0.010
0.008
0.006
0.004
0.002
0.000
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



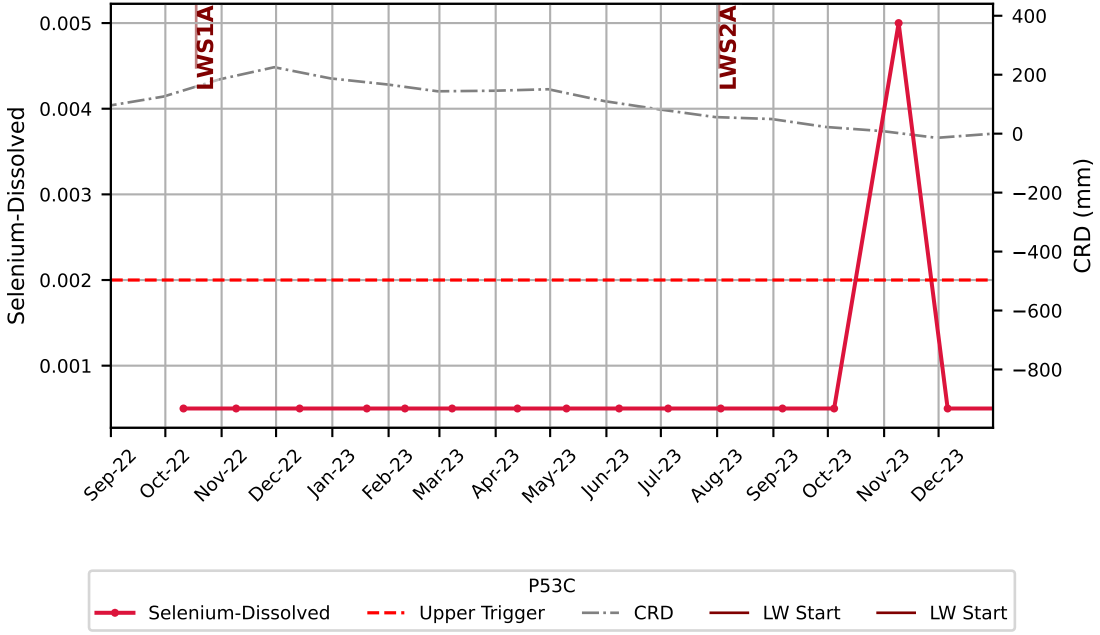
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



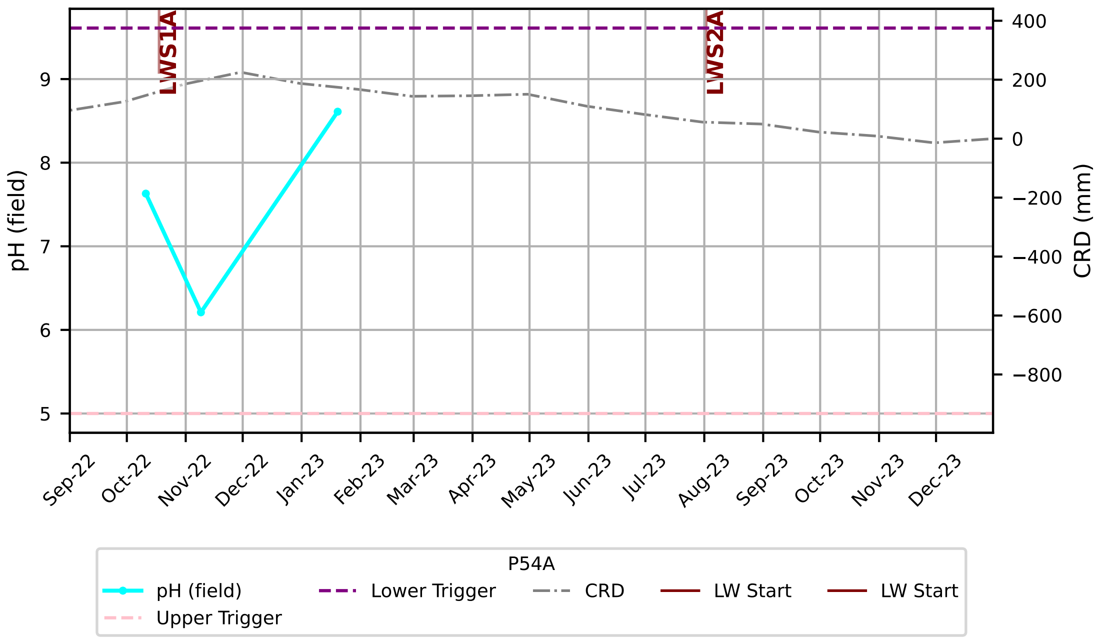
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



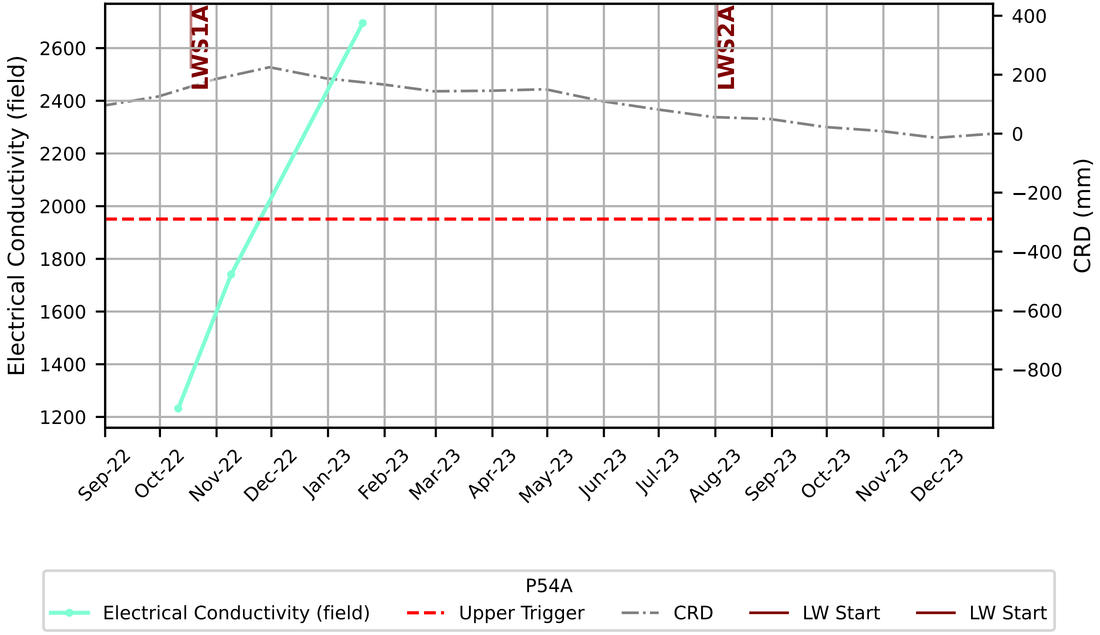
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



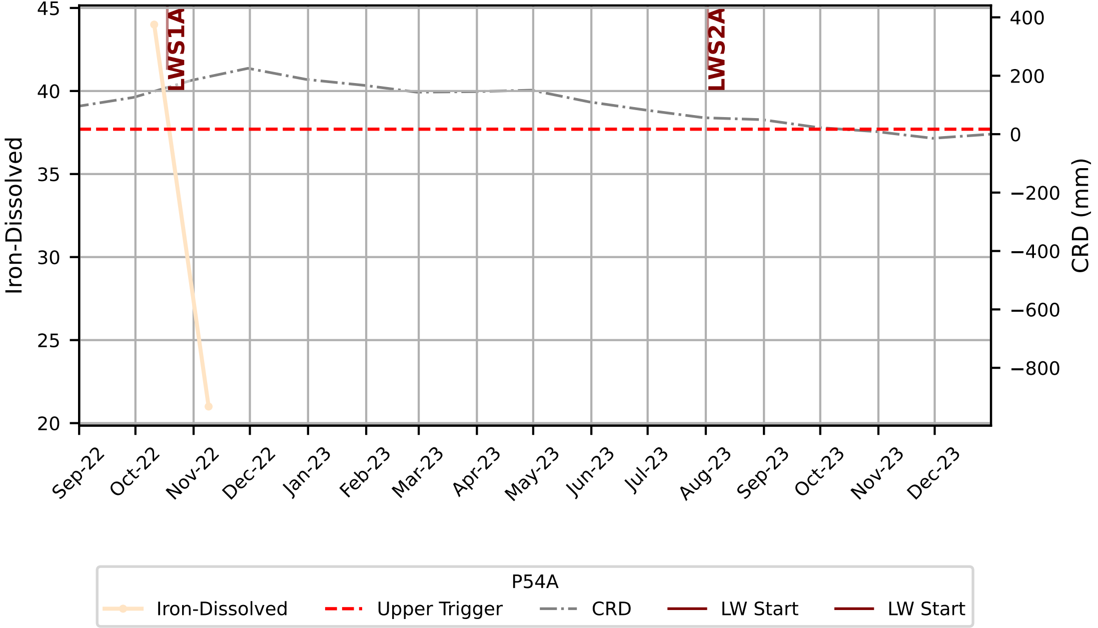
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Selenium-Dissolved
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P53C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



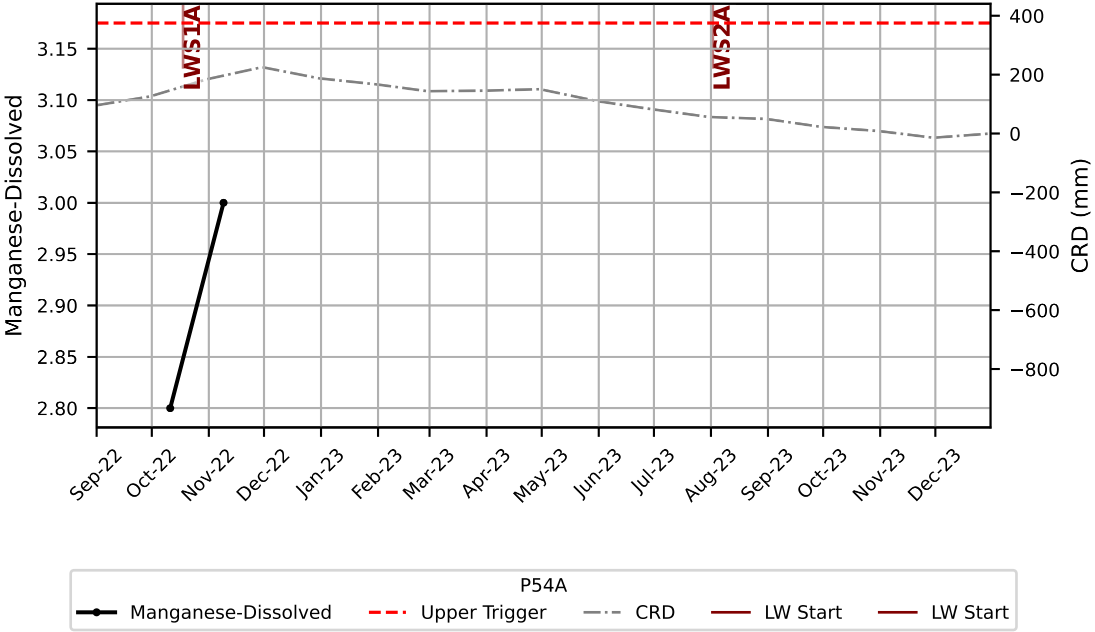
LWS1A
LWS2A
pH (field)
CRD (mm)
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



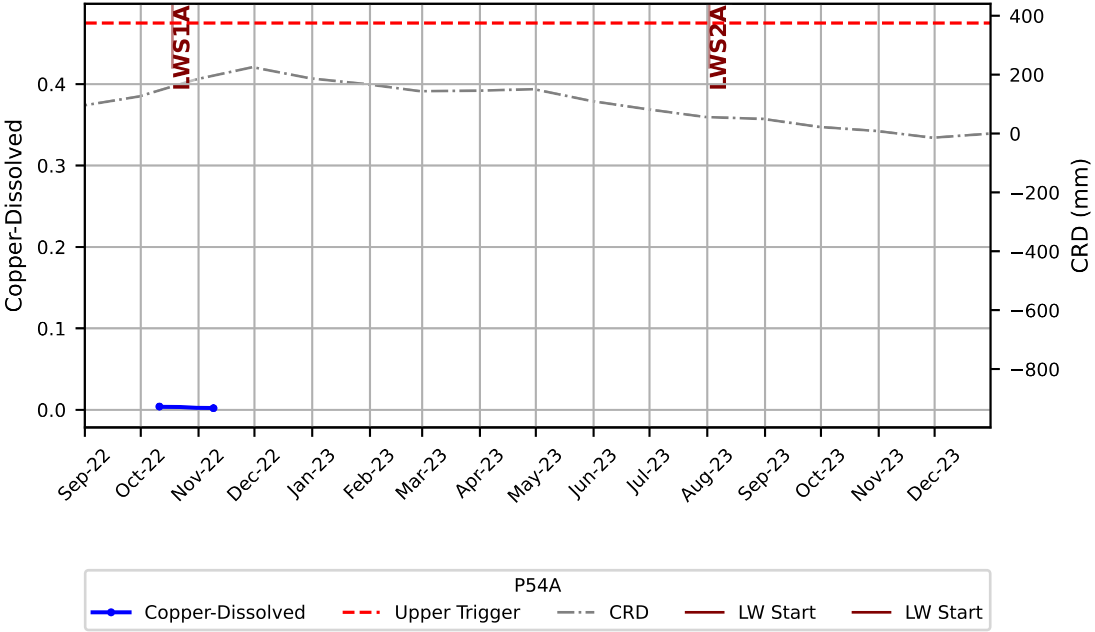
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
1200
1400
1600
1800
2000
2200
2400
2600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



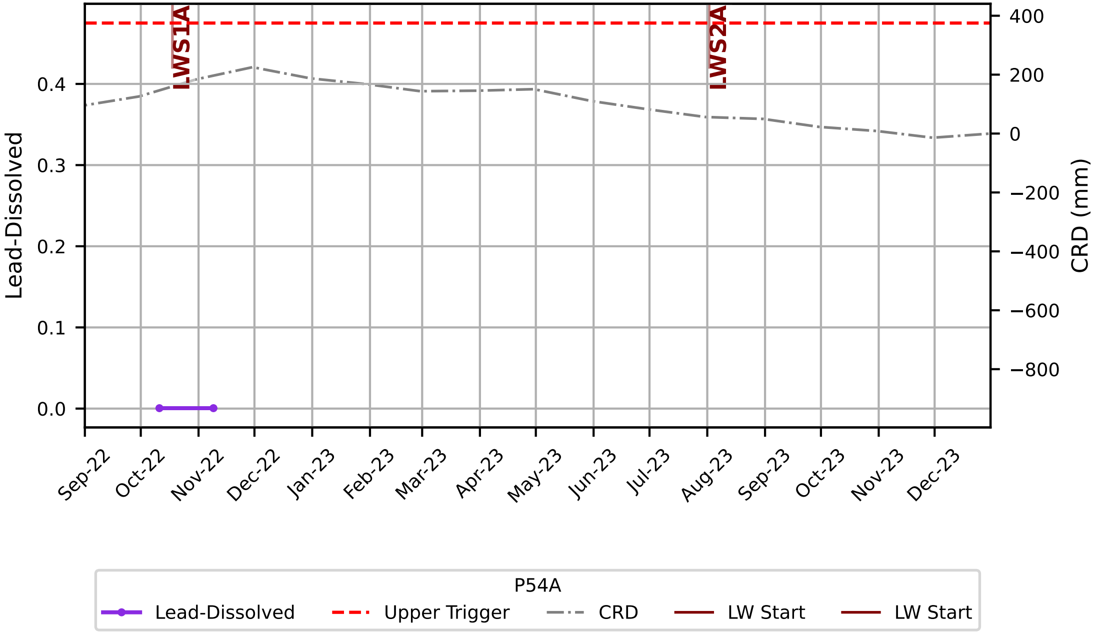
Iron-Dissolved
CRD (mm)
45
40
35
30
25
20
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



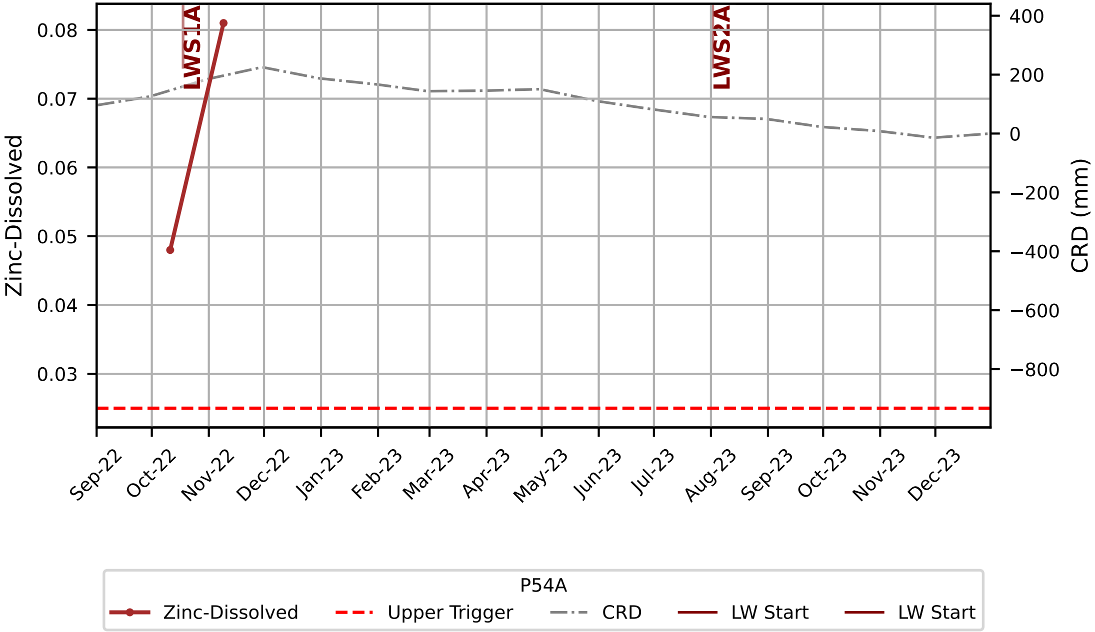
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
3.15
3.10
3.05
3.00
2.95
2.90
2.85
2.80
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



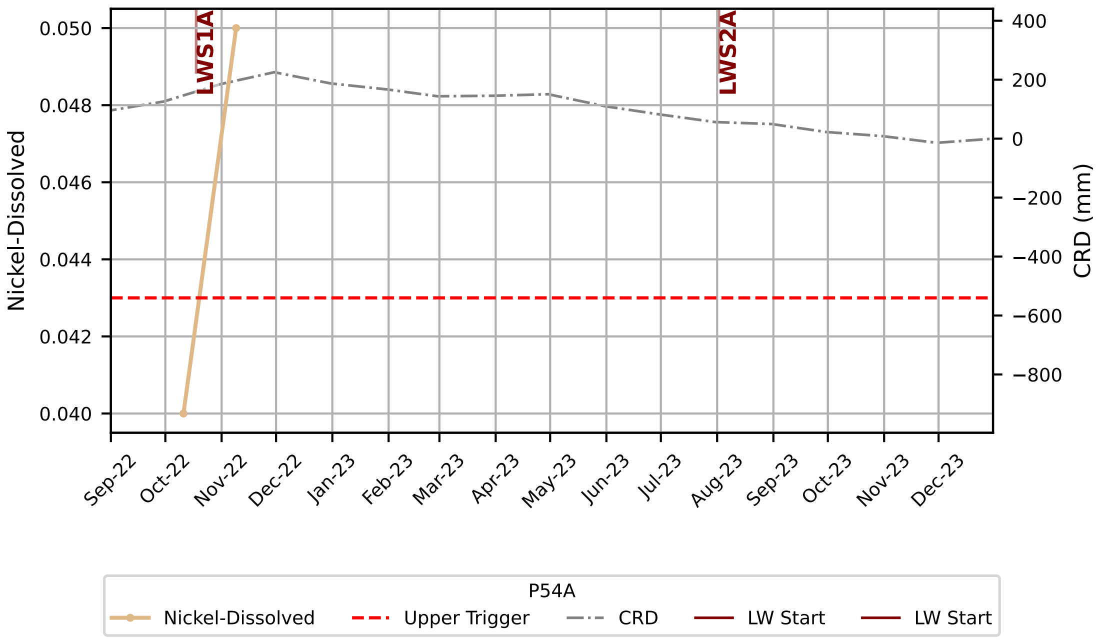
LWS1A
LWS2A
Copper-Dissolved
0.0
0.1
0.2
0.3
0.4
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



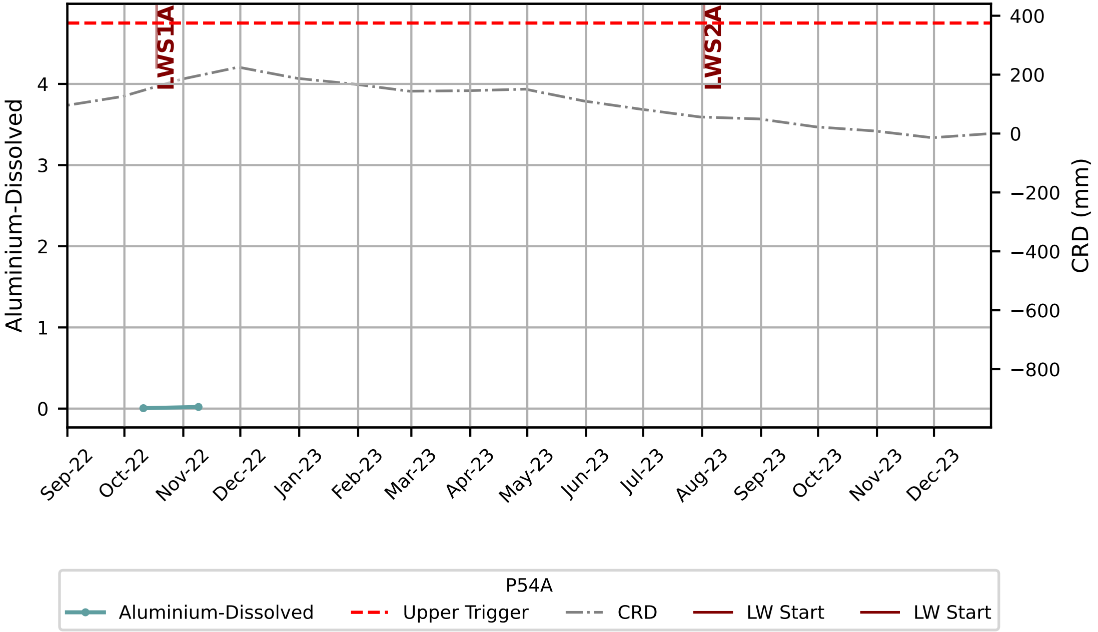
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



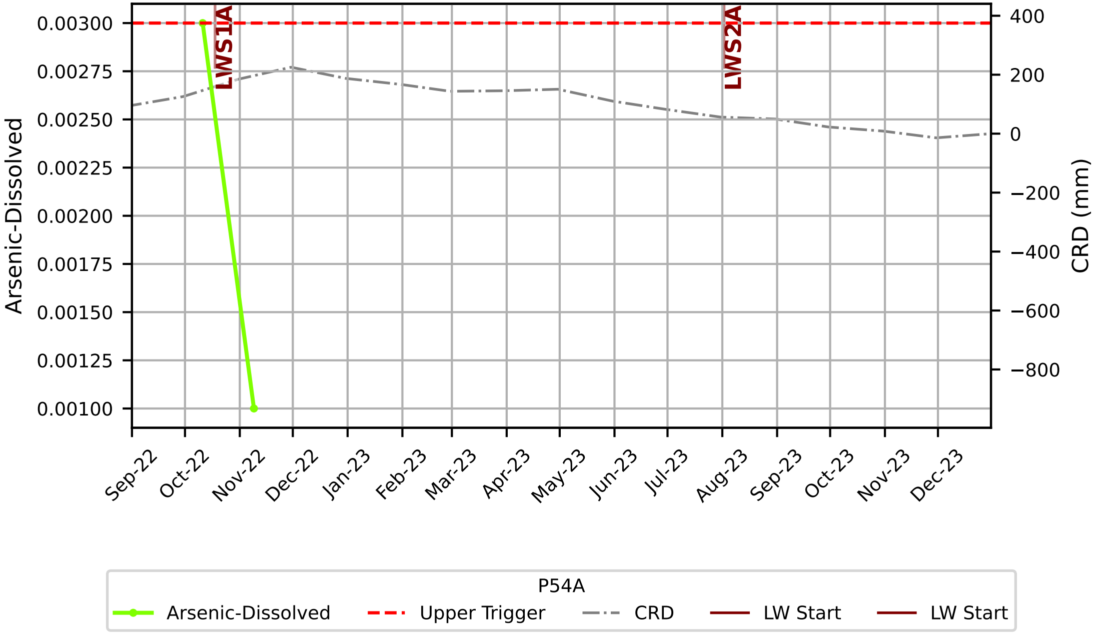
LWS1A
LWS2A
Zinc-Dissolved
0.08
0.07
0.06
0.05
0.04
0.03
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



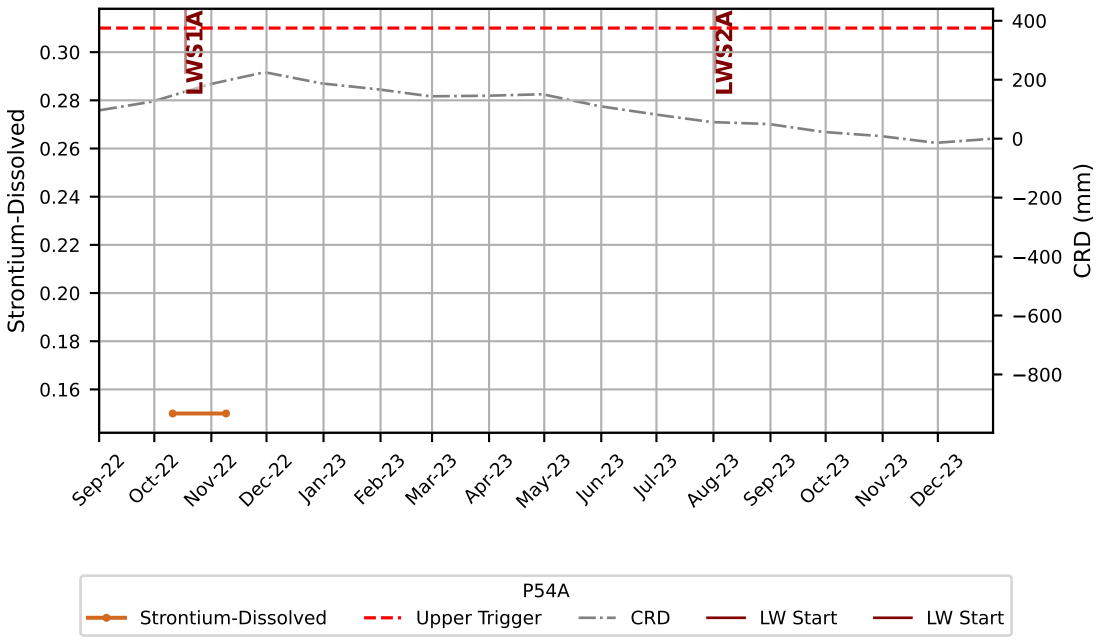
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.050
0.048
0.046
0.044
0.042
0.040
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



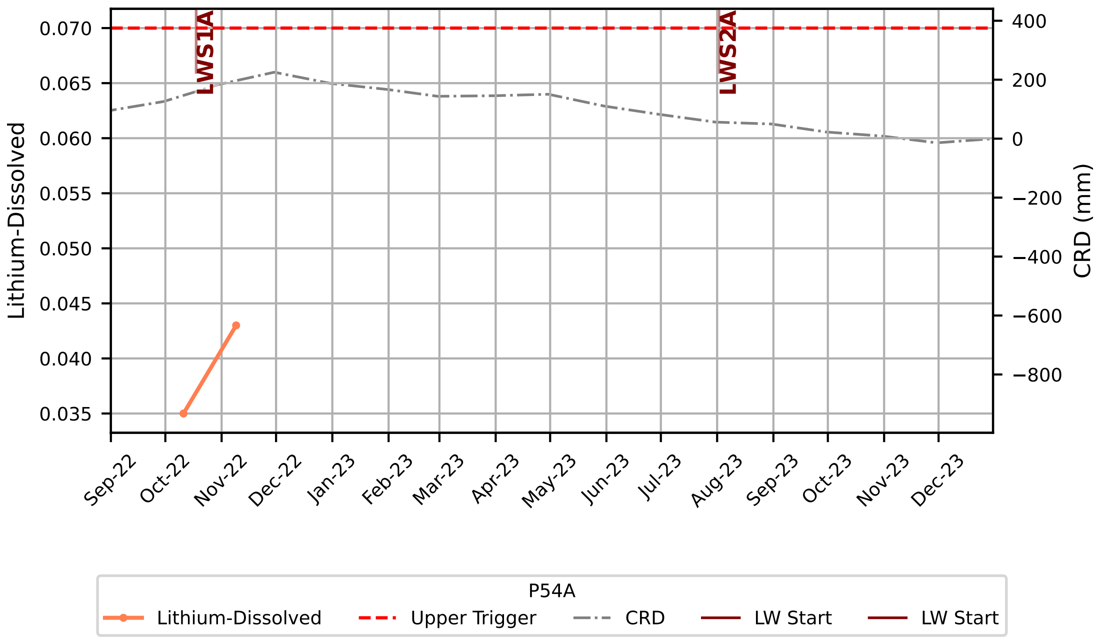
LWS1A
LWS2A
4
3
2
1
0
Aluminium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

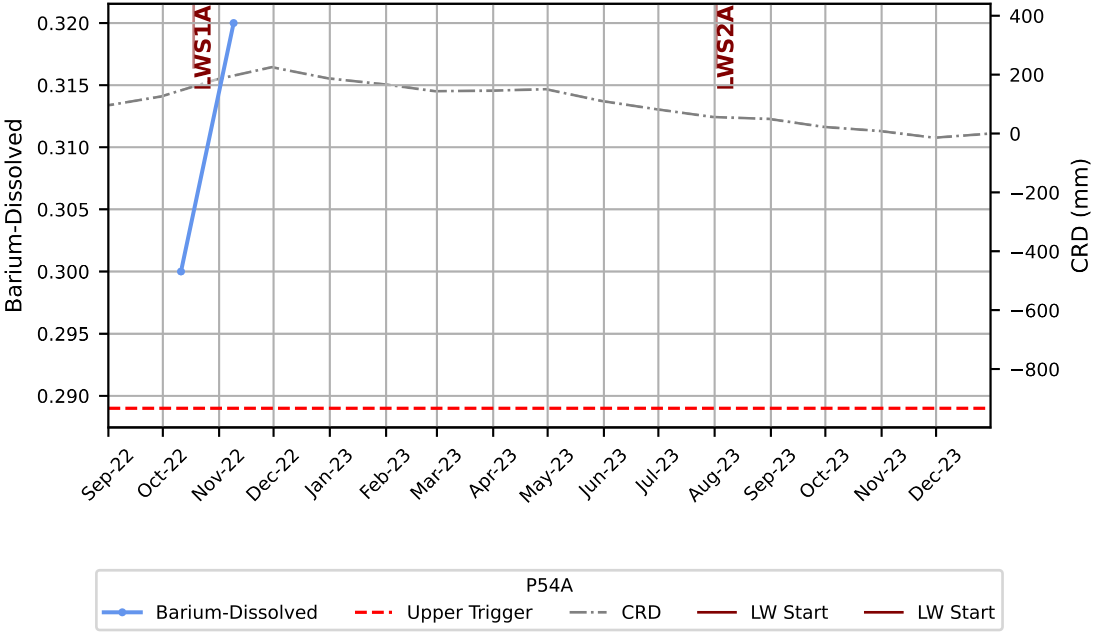


Arsenic-Dissolved
CRD (mm)
0.00300
0.00275
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start

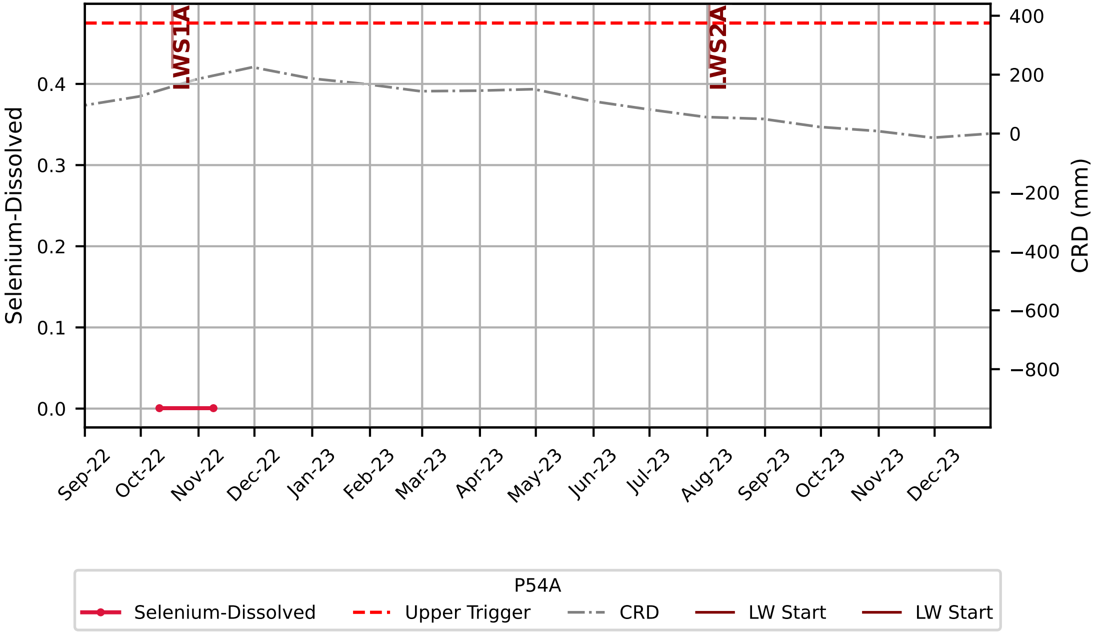


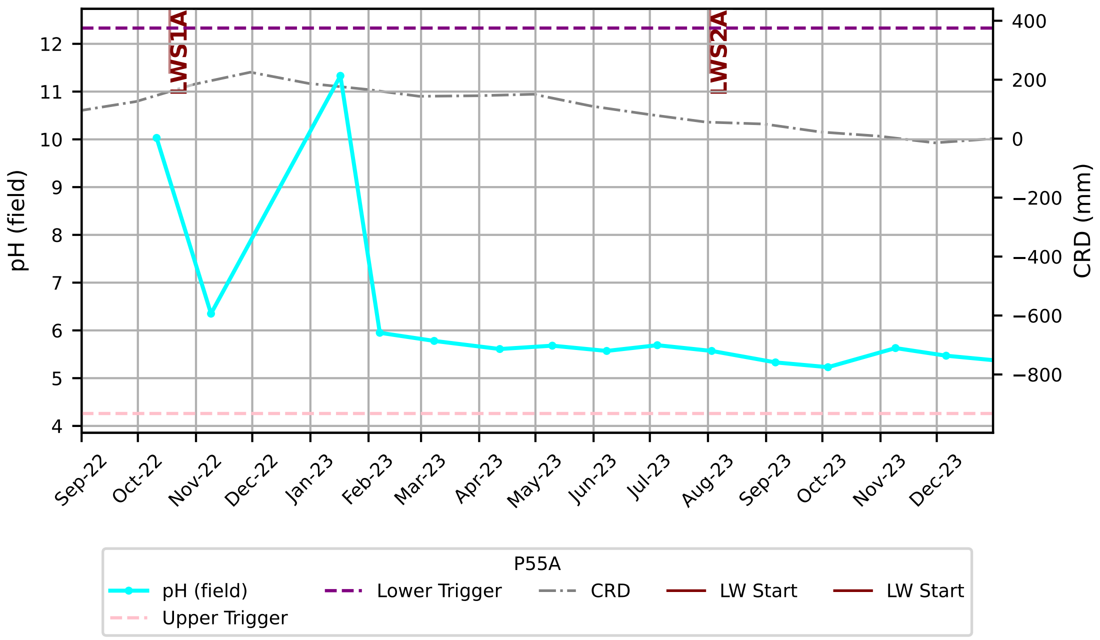
Strontium-Dissolved
CRD (mm)
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

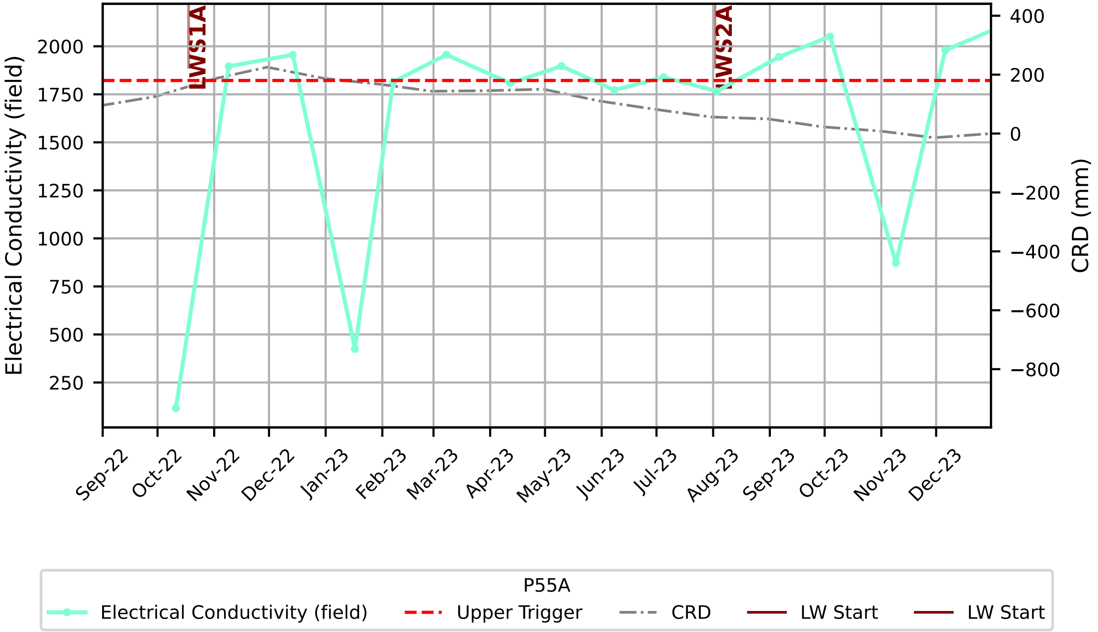

LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



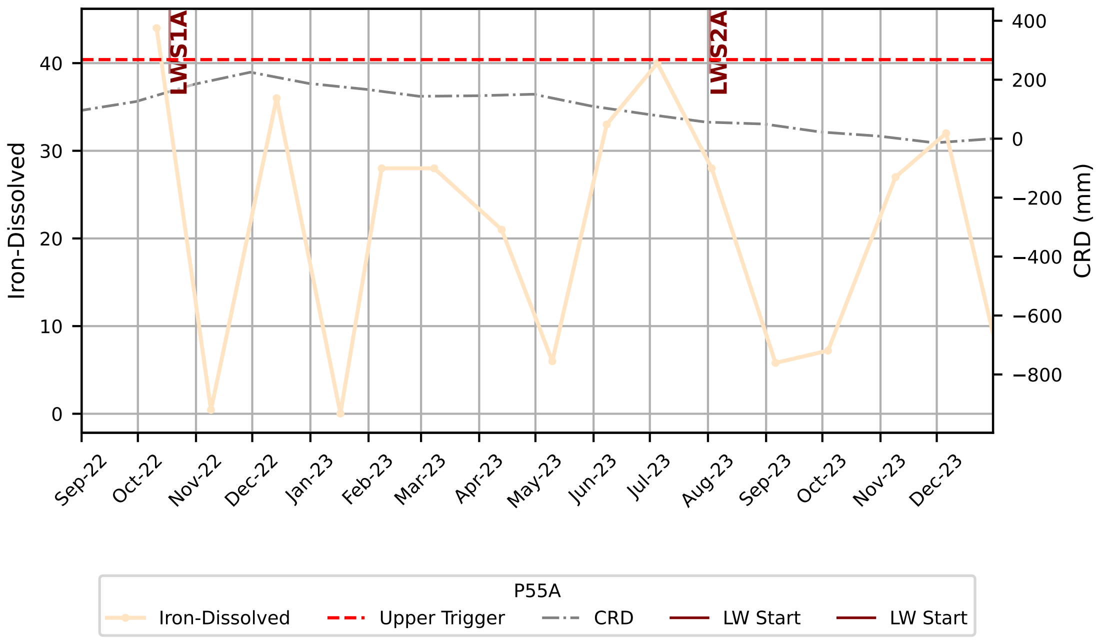
Barium-Dissolved
CRD (mm)
0.320
0.315
0.310
0.305
0.300
0.295
0.290
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start


LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P54A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

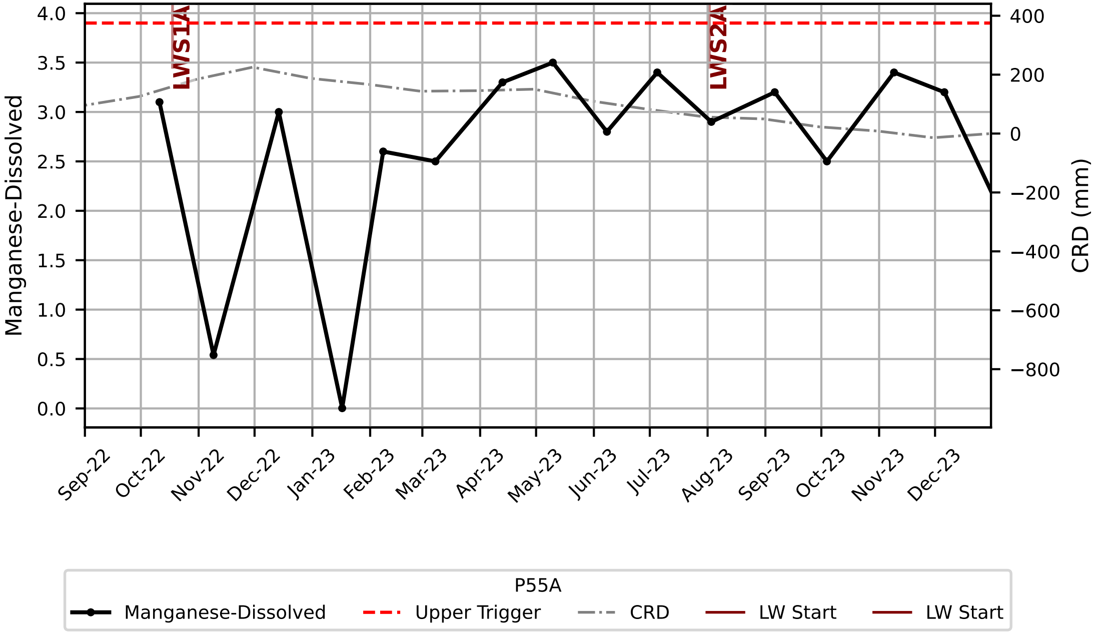

LWS1A
LWS2A
pH (field)
CRD (mm)
12
11
10
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



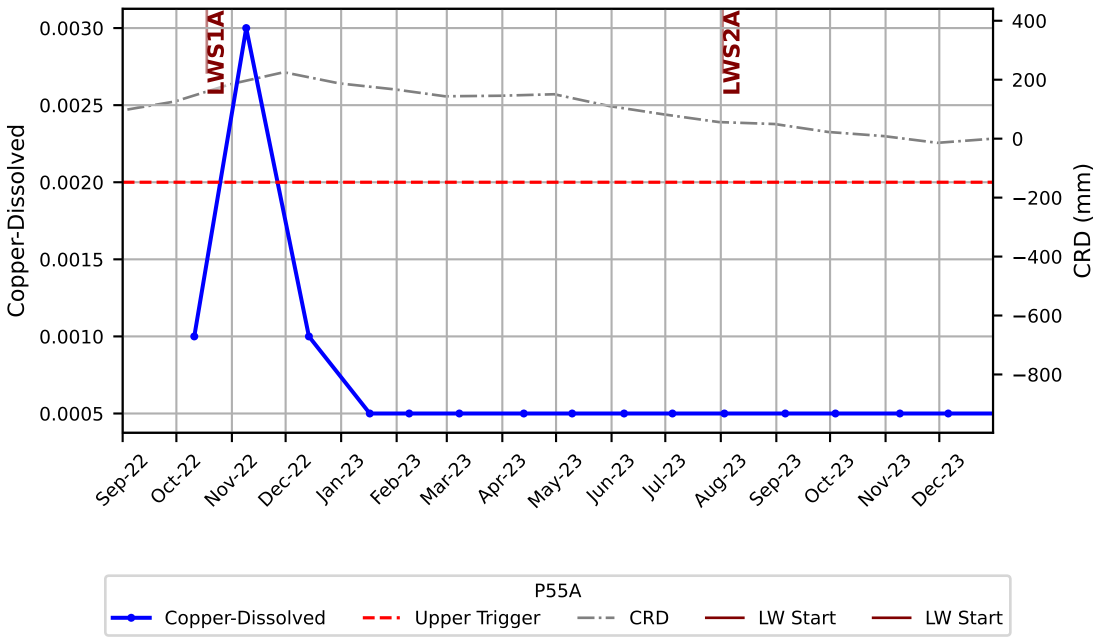
Electrical Conductivity (field)
CRD (mm)
2000
1750
1500
1250
1000
750
500
250
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



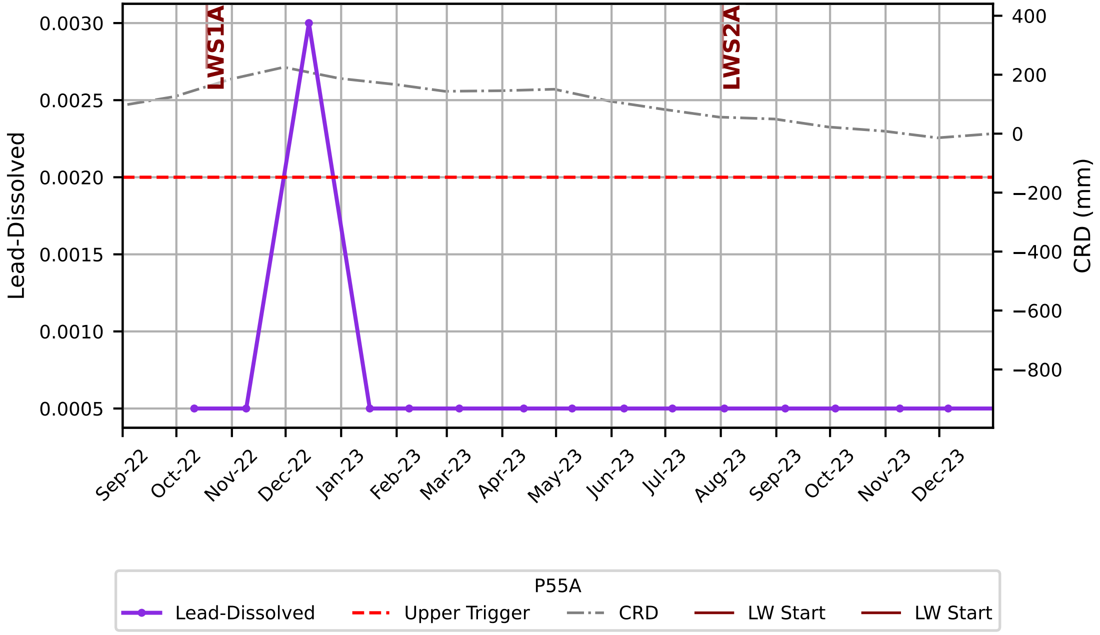
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0
10
20
30
40
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



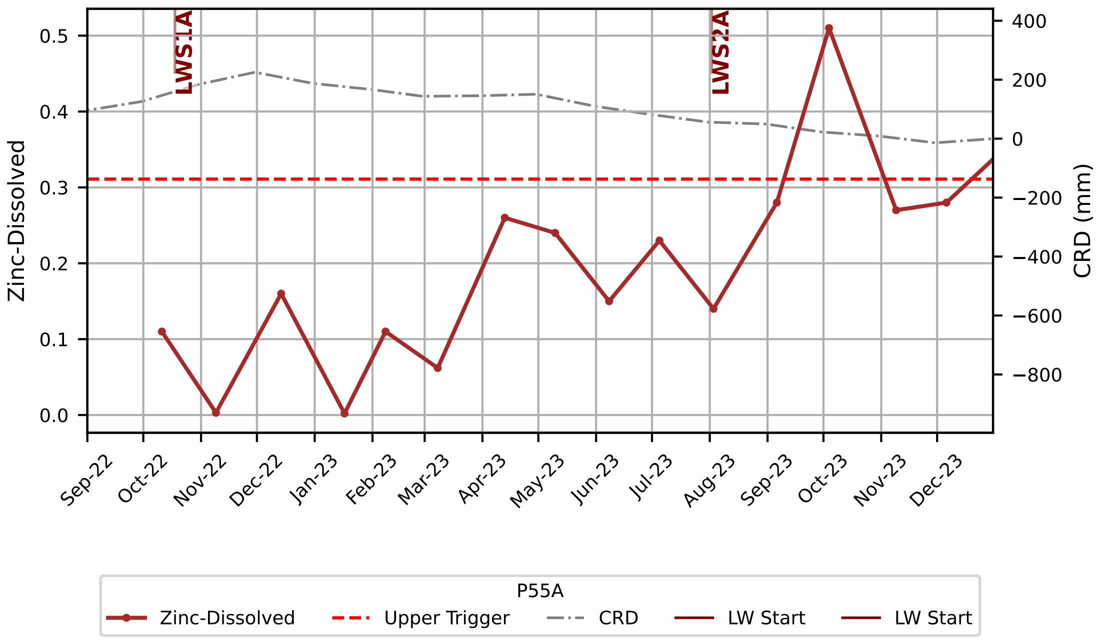
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



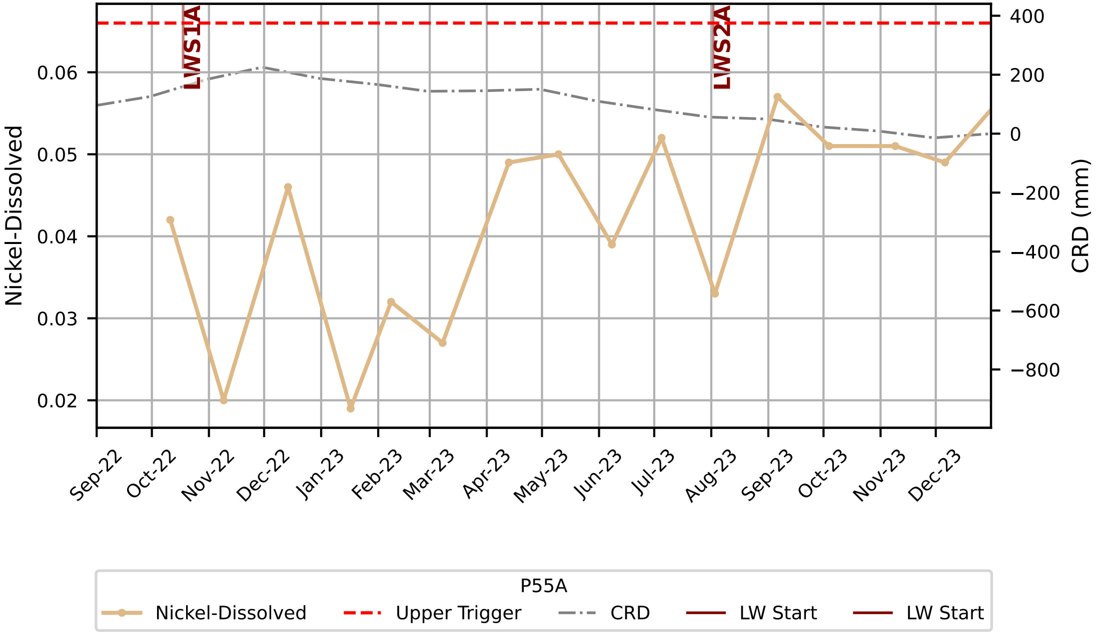
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



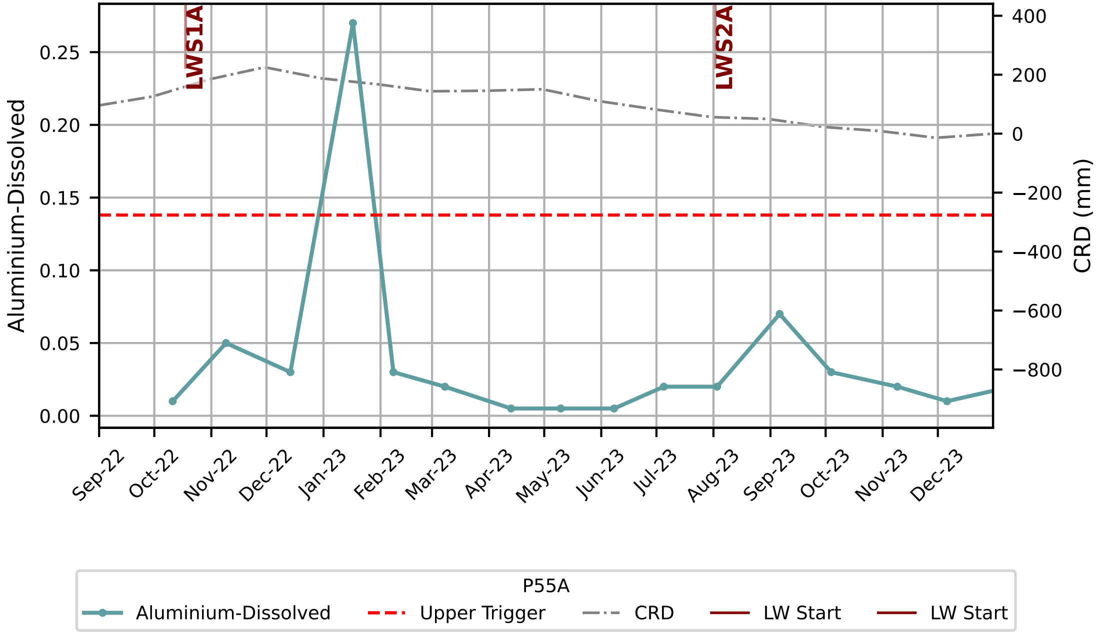
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



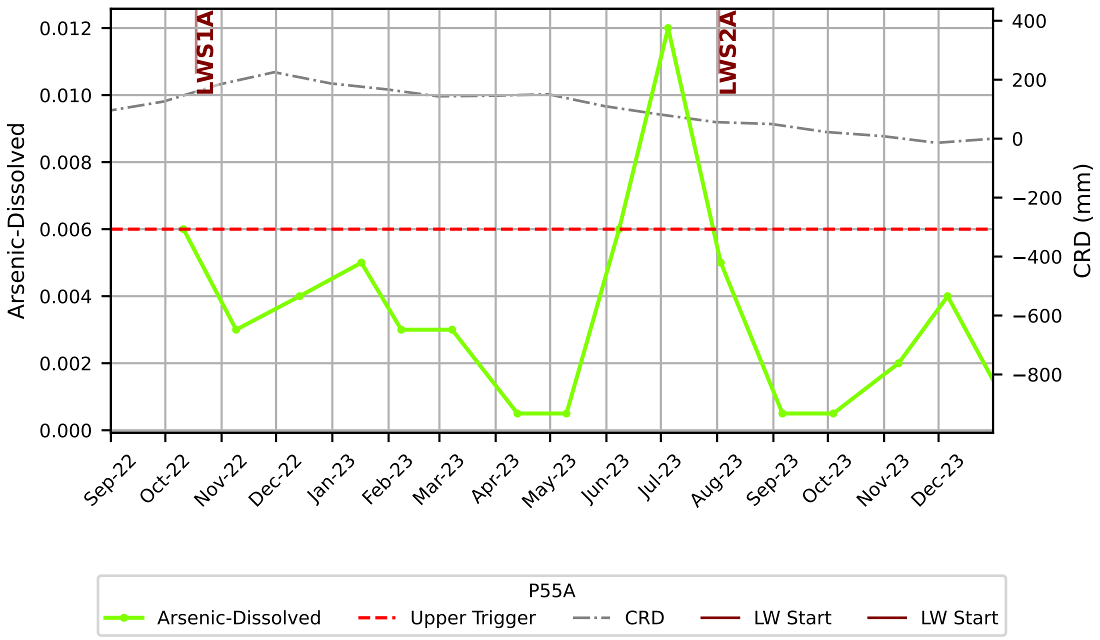
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



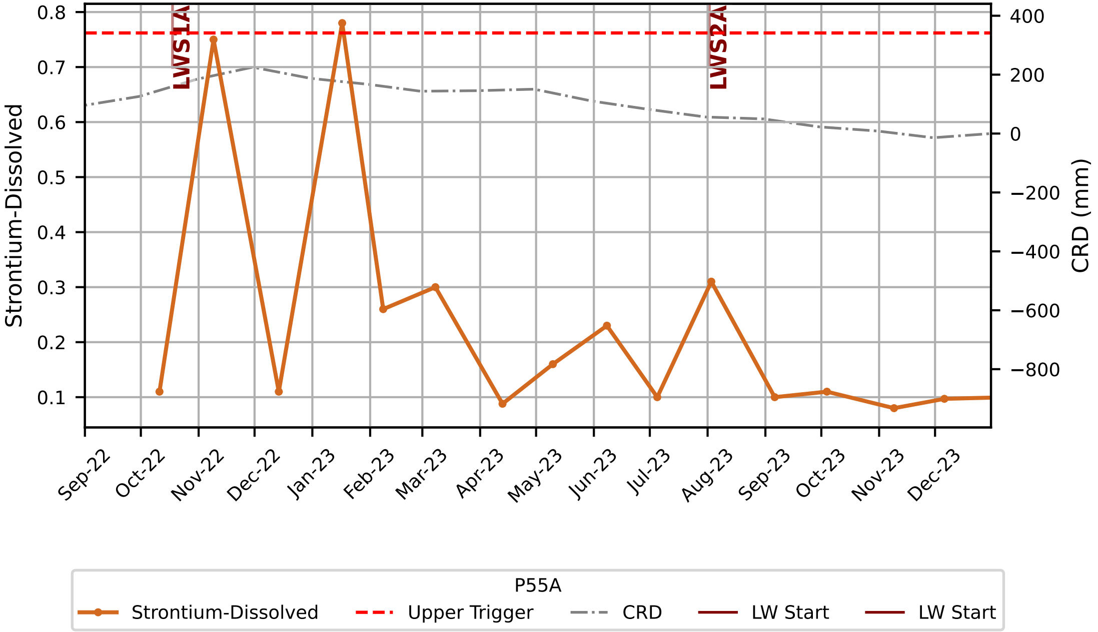
LWS1A
LWS2A
Nickel-Dissolved
0.06
0.05
0.04
0.03
0.02
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



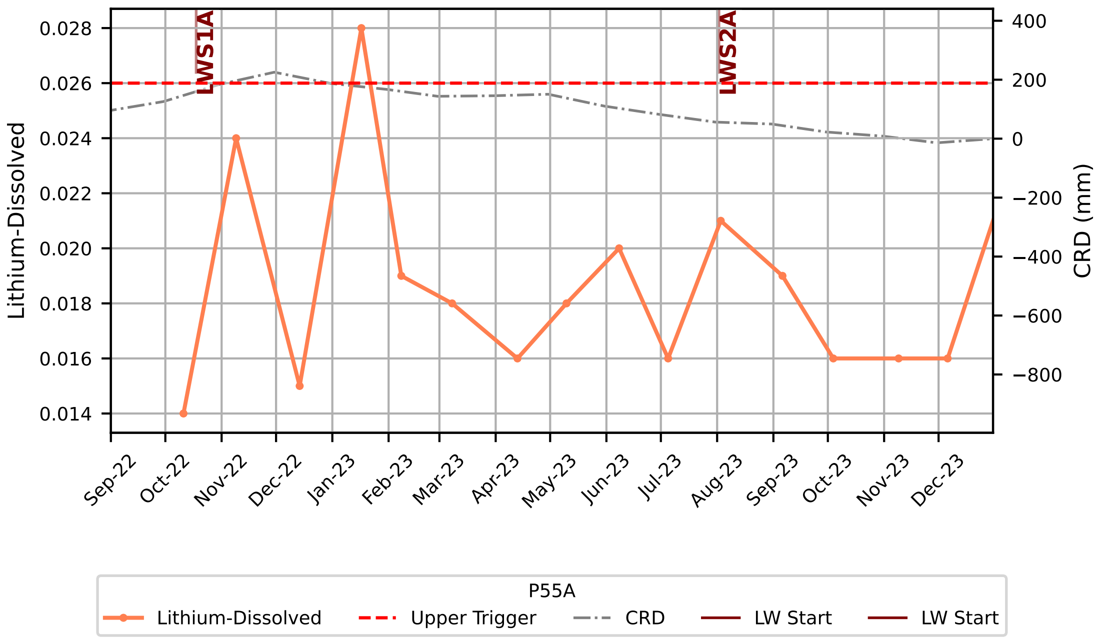
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.05
0.10
0.15
0.20
0.25
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



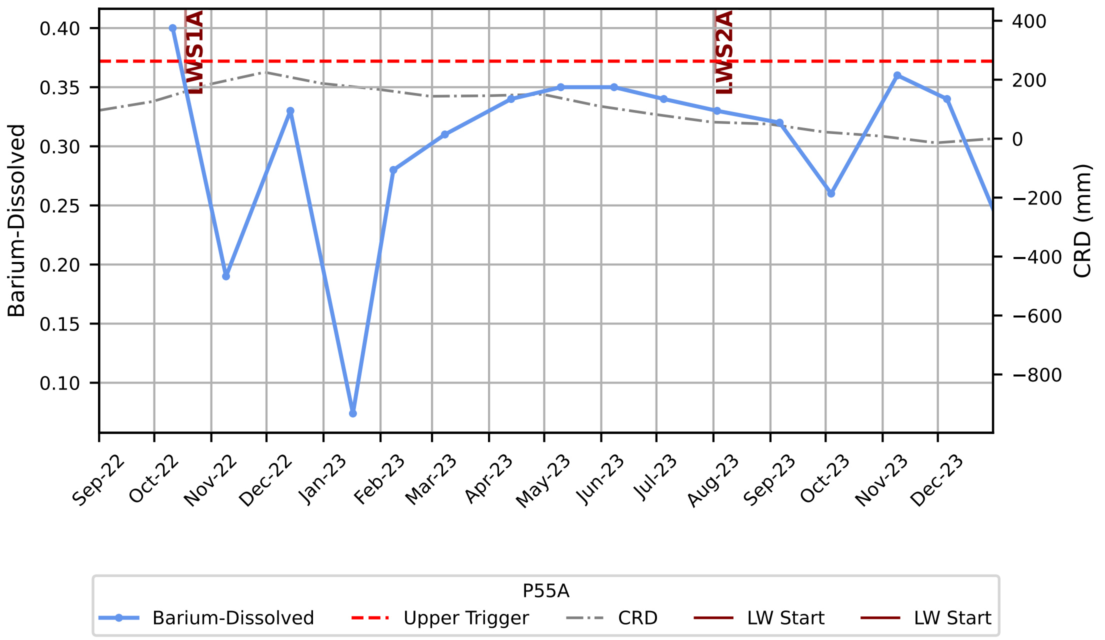
Arsenic-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



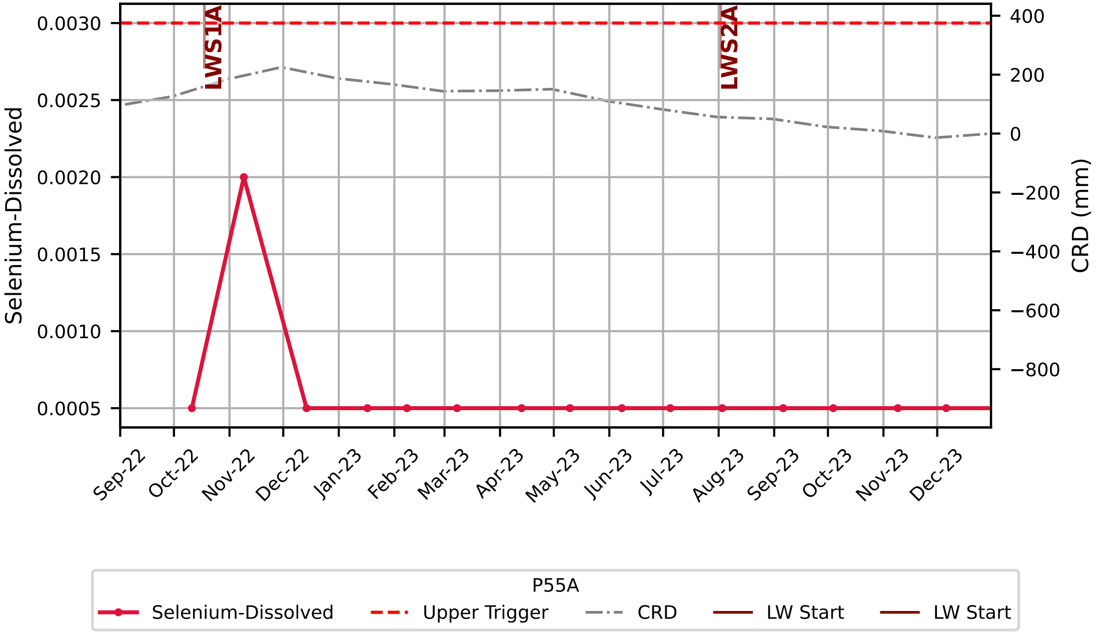
LWS1A
LWS2A
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Strontium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



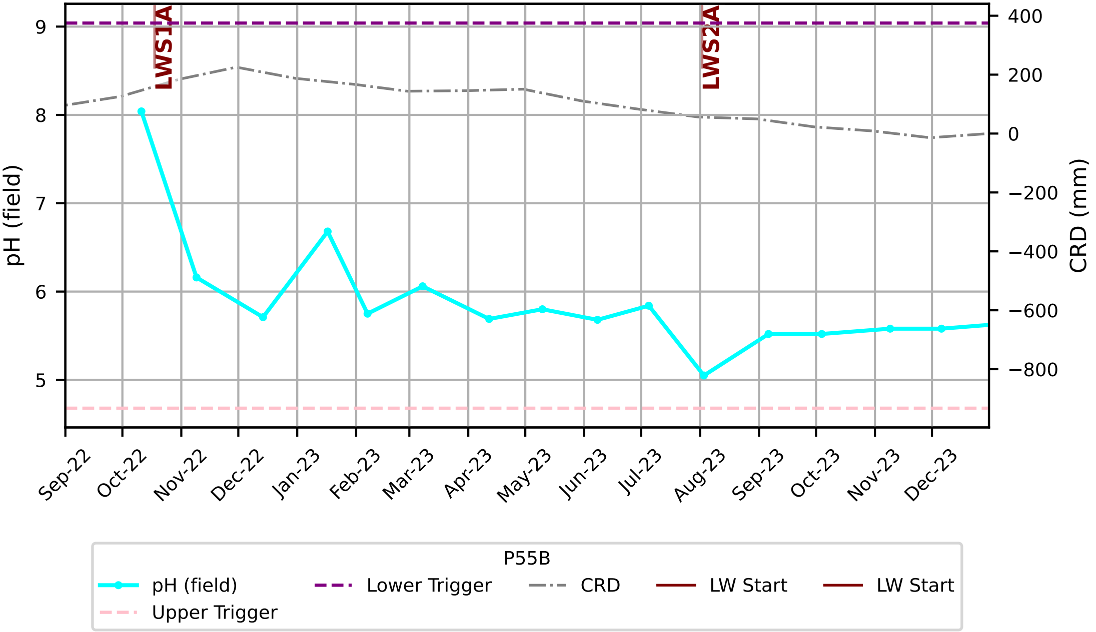
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.028
0.026
0.024
0.022
0.020
0.018
0.016
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



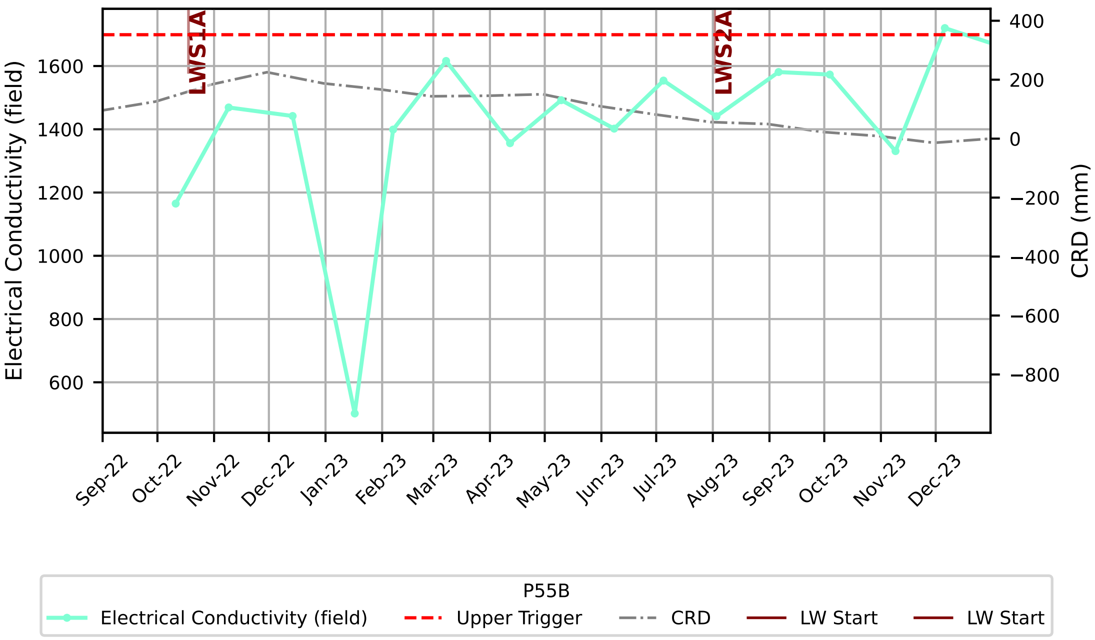
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



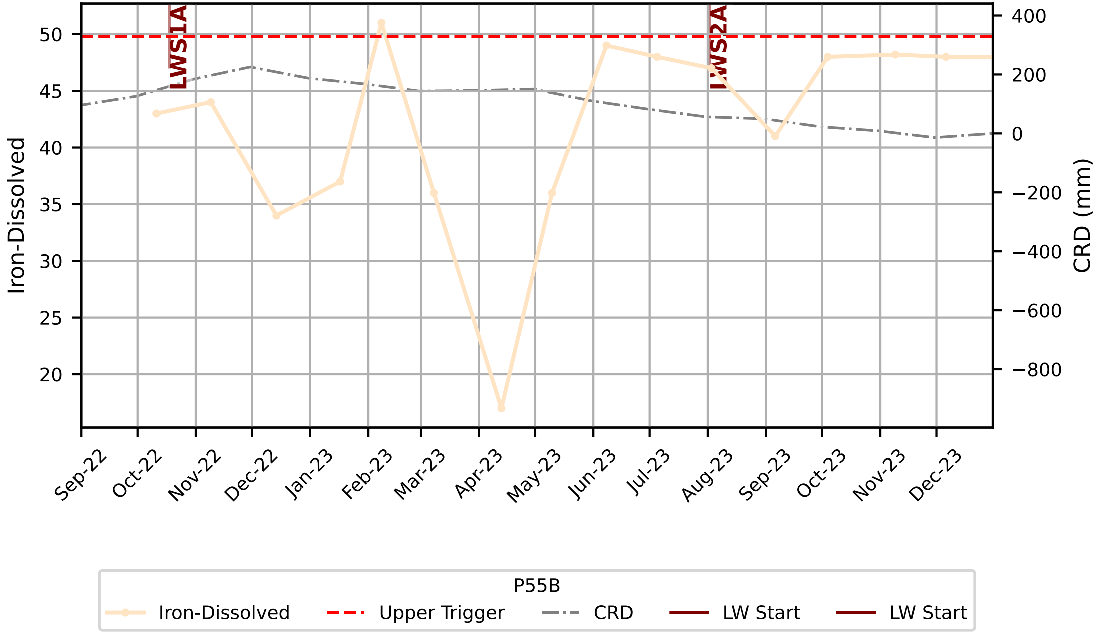
LWS1A
LWS2A
Selenium-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



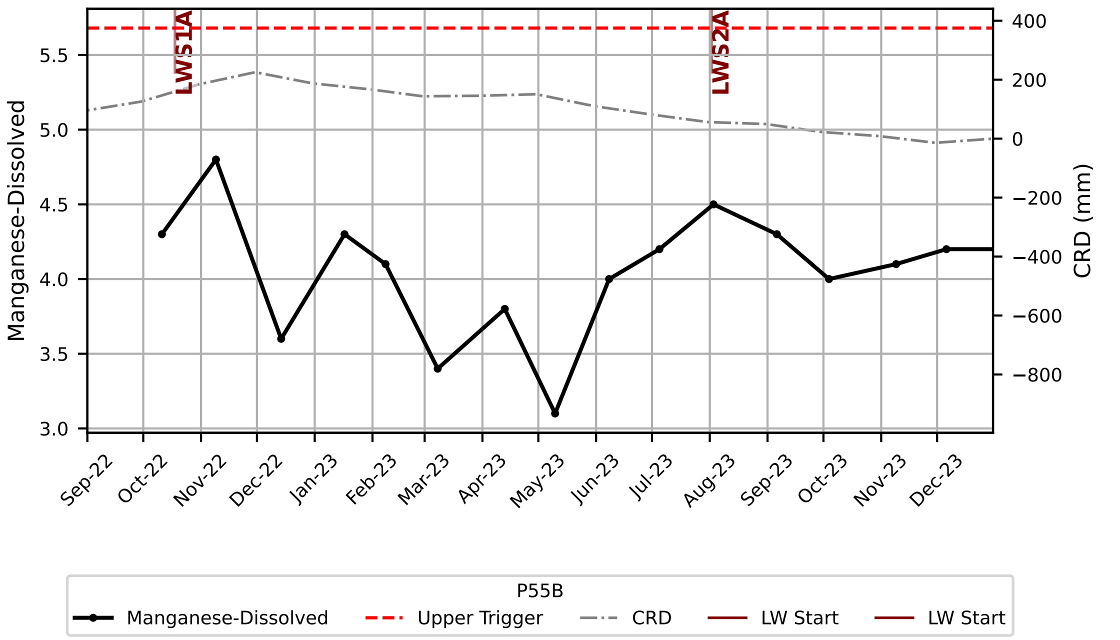
LWS1A
LWS2A
pH (field)
CRD (mm)
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



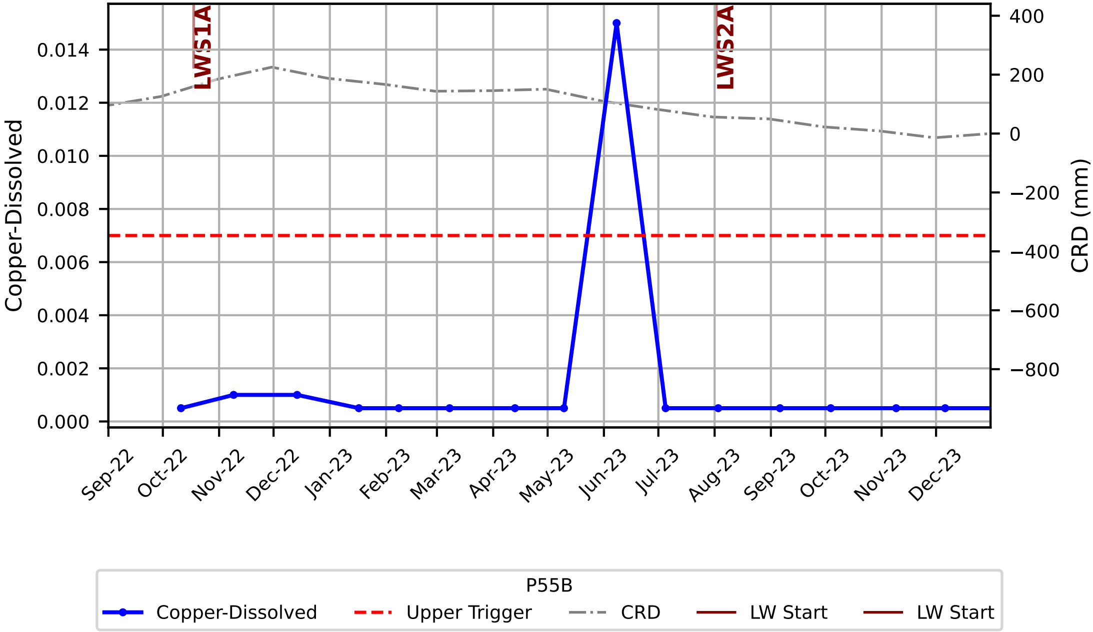
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



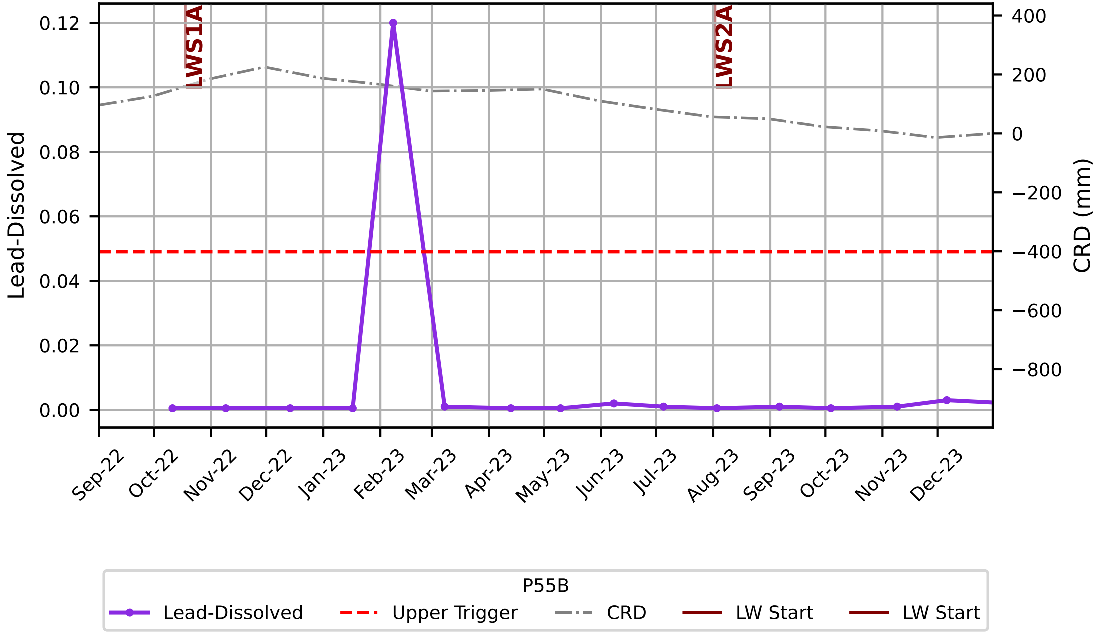
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
50
45
40
35
30
25
20
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



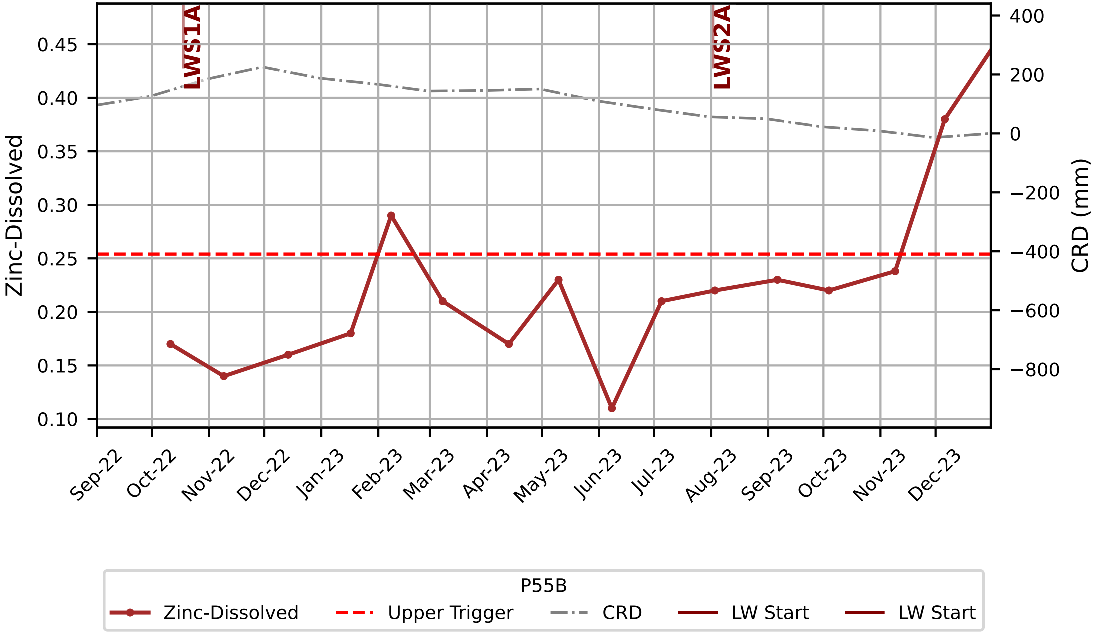
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
5.5
5.0
4.5
4.0
3.5
3.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



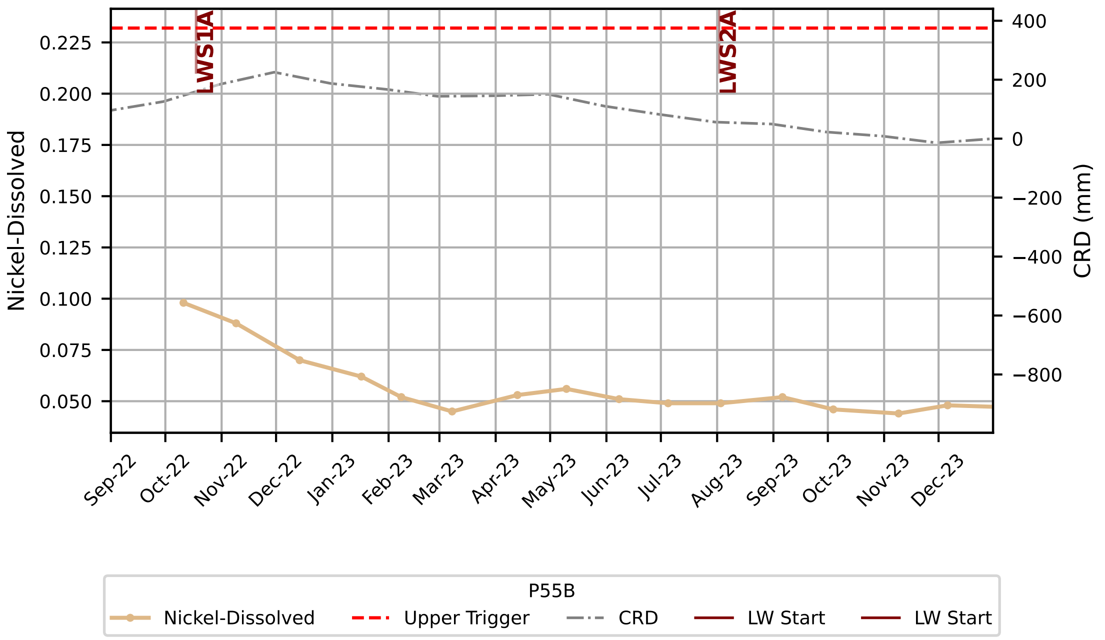
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



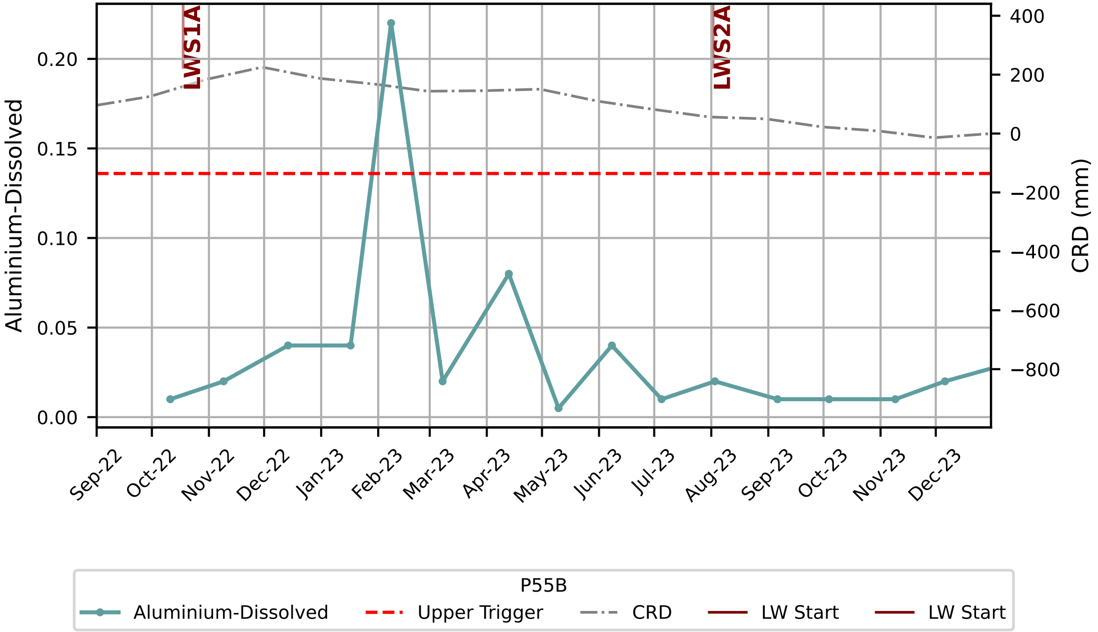
LWS1A
LWS2A
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

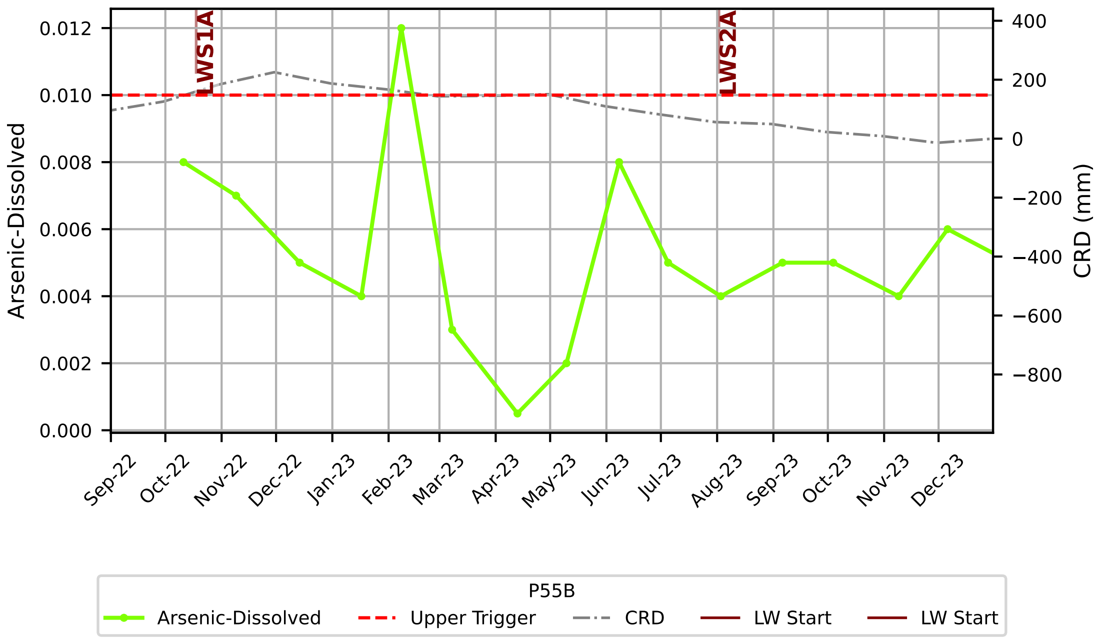


LWS1A
LWS2A
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
Zinc-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

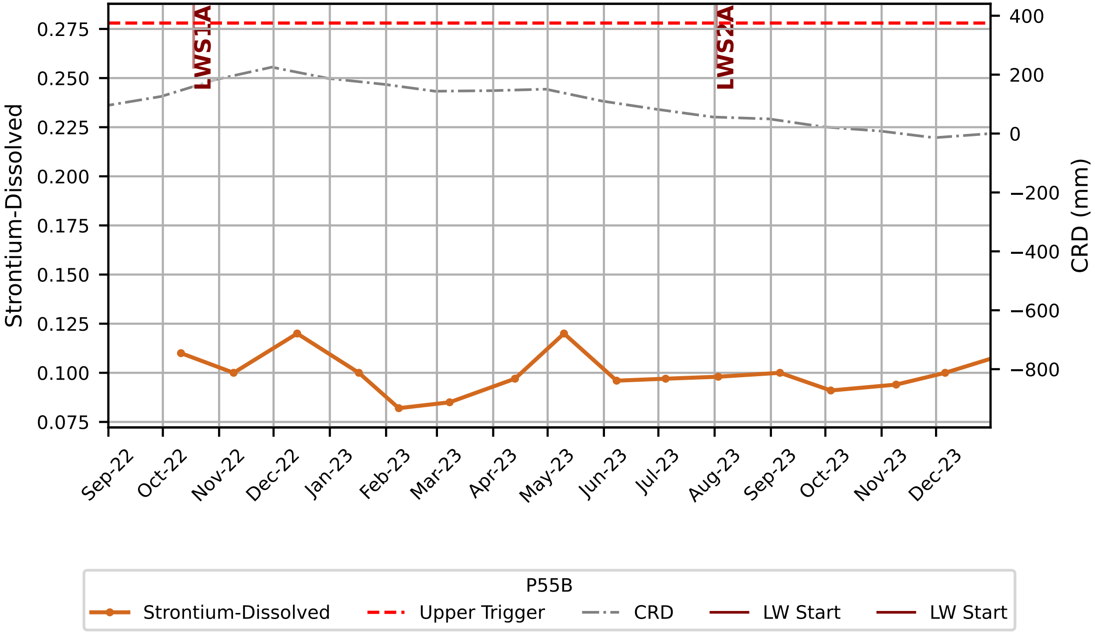


LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start

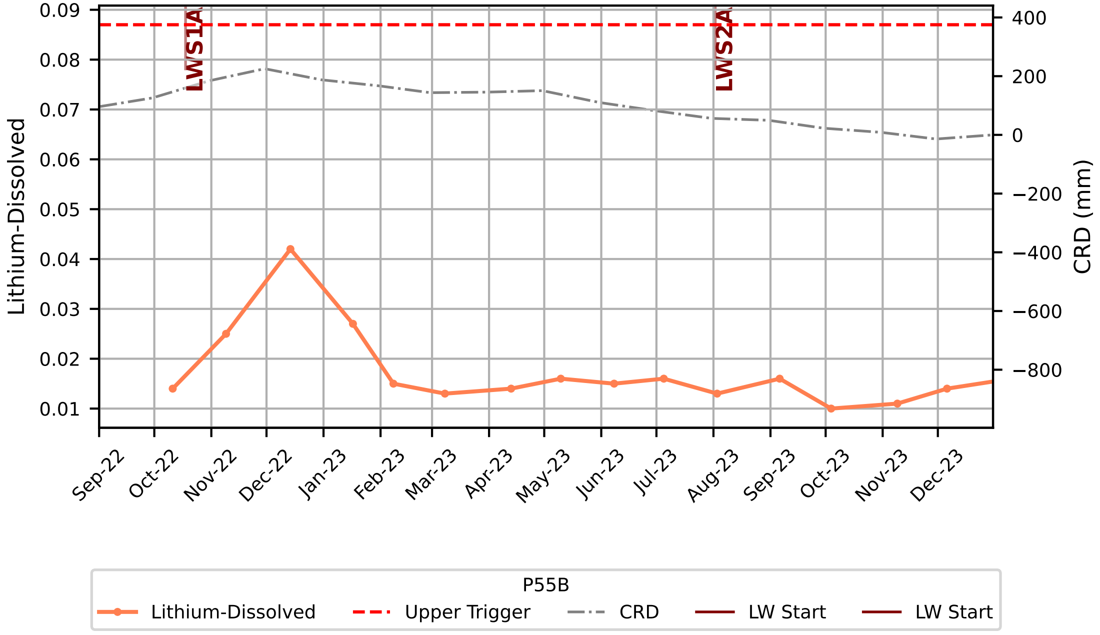

LWS1A
LWS2A
Aluminium-Dissolved
0.00
0.05
0.10
0.15
0.20
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



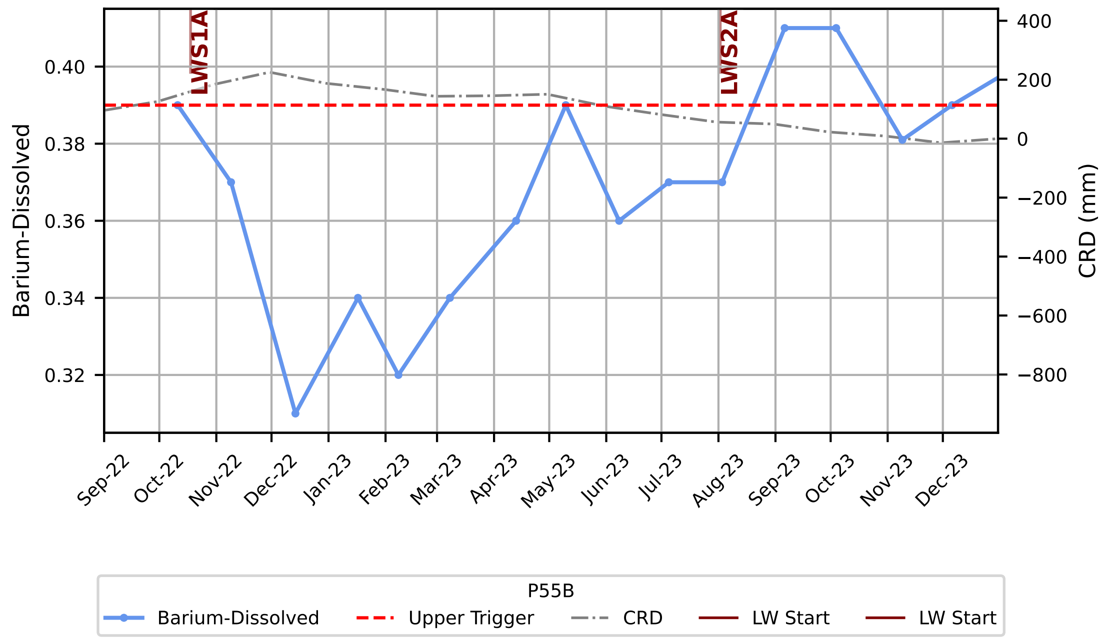
LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



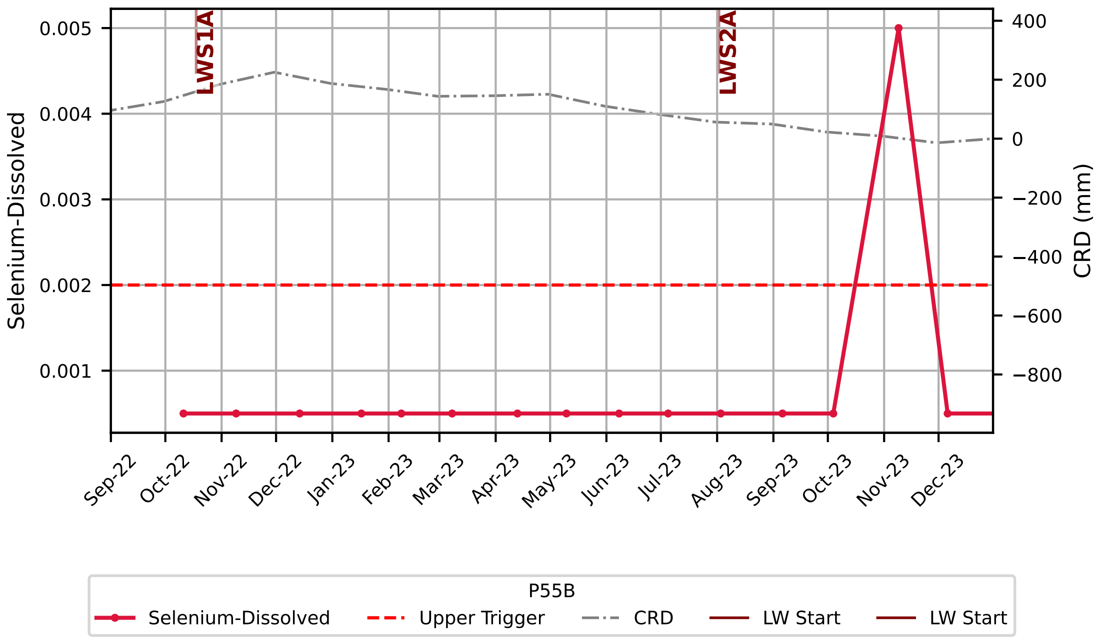
Strontium-Dissolved
CRD (mm)
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



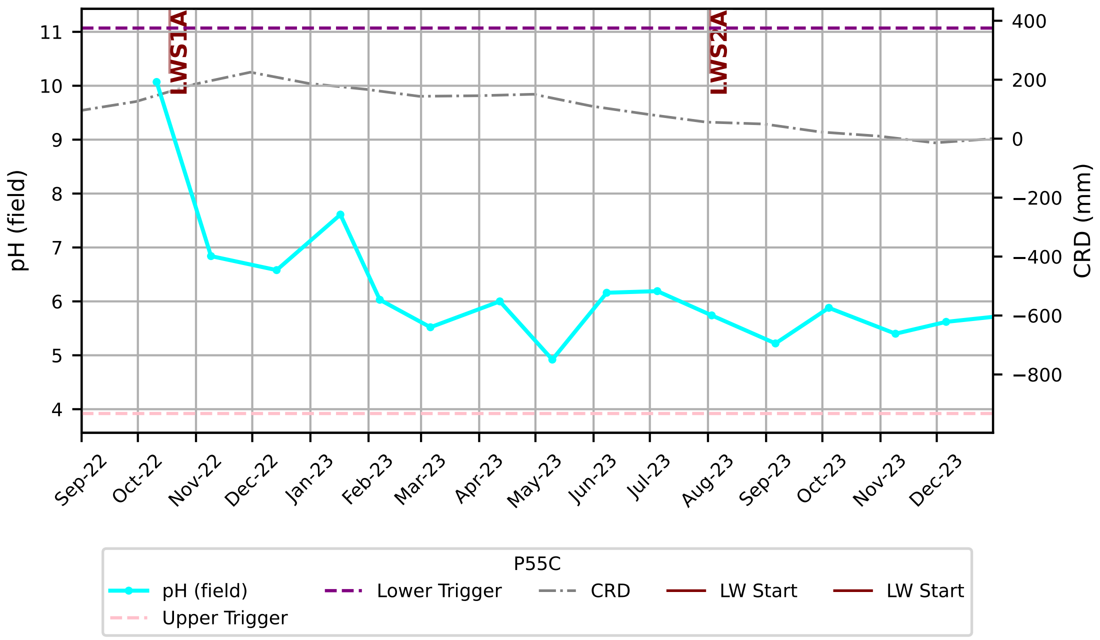
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



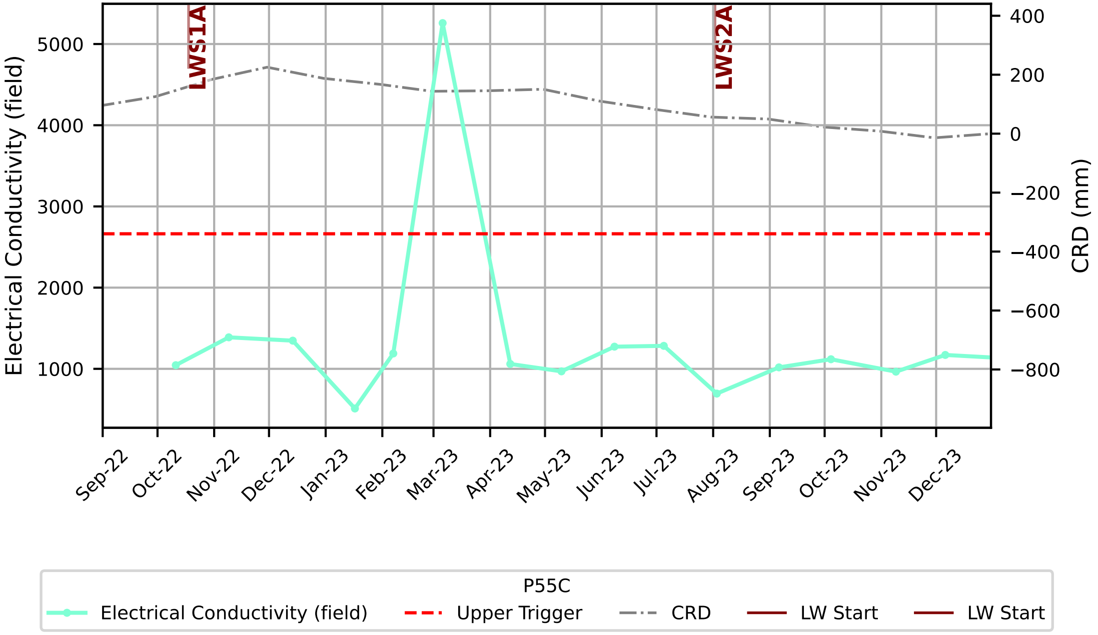
LWS1A
LWS2A
Barium-Dissolved
0.40
0.38
0.36
0.34
0.32
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



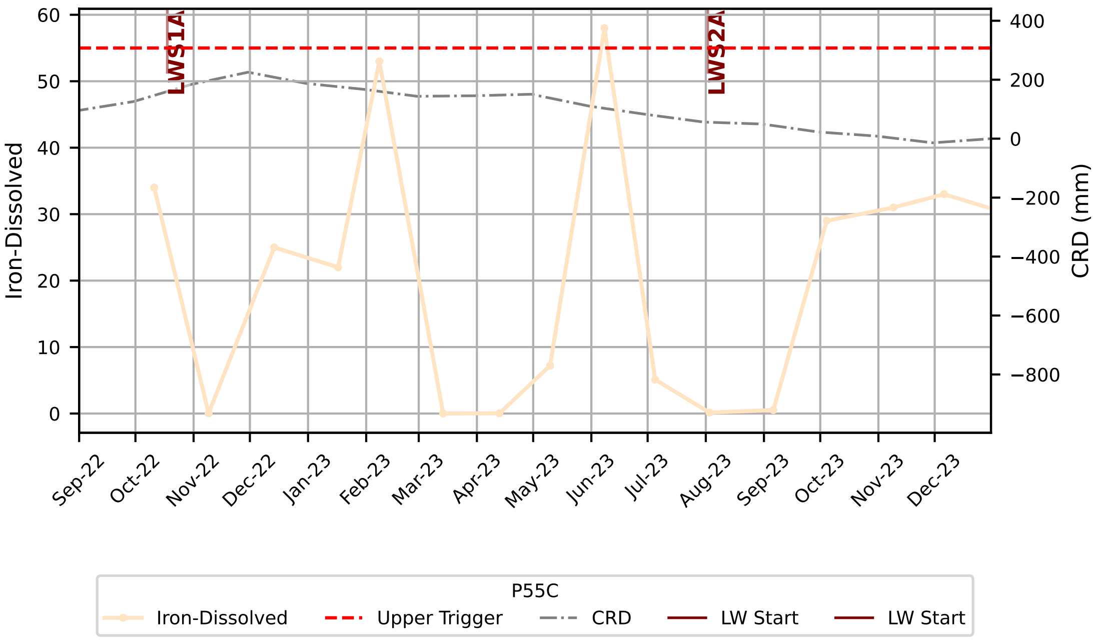
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



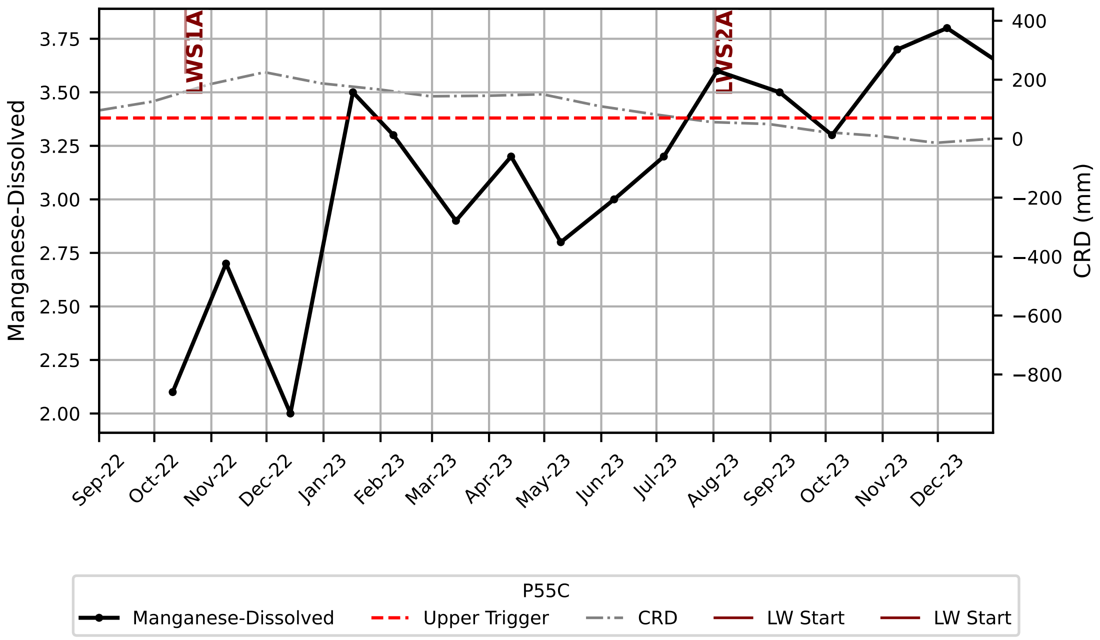
LWS1A
LWS2A
pH (field)
CRD (mm)
11
10
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



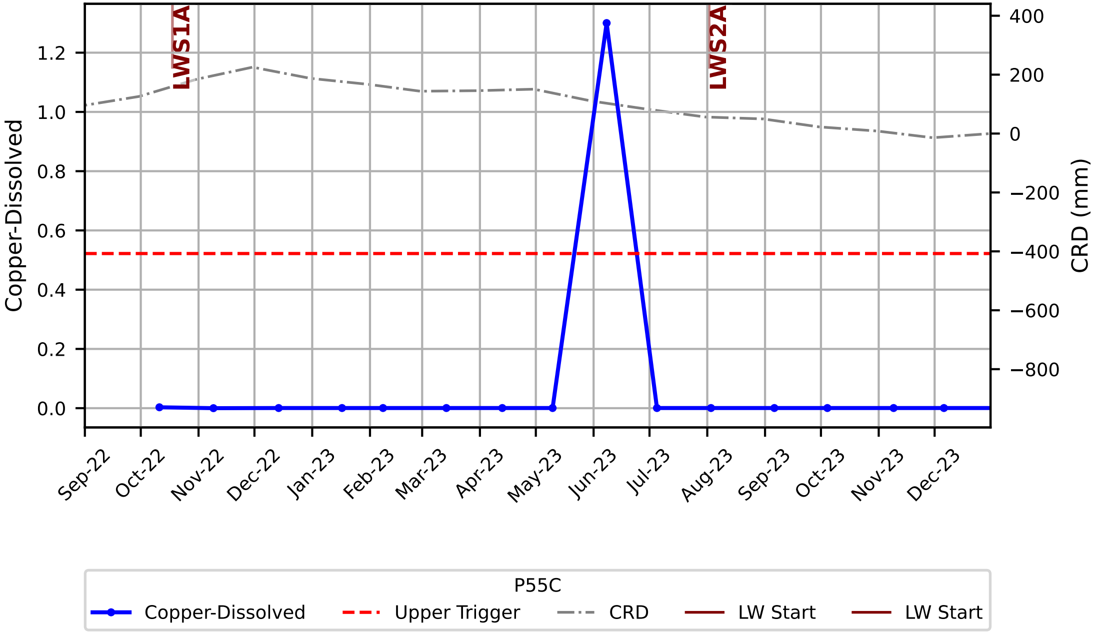
LWS1A
LWS2A
5000
4000
3000
2000
1000
Electrical Conductivity (field)
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



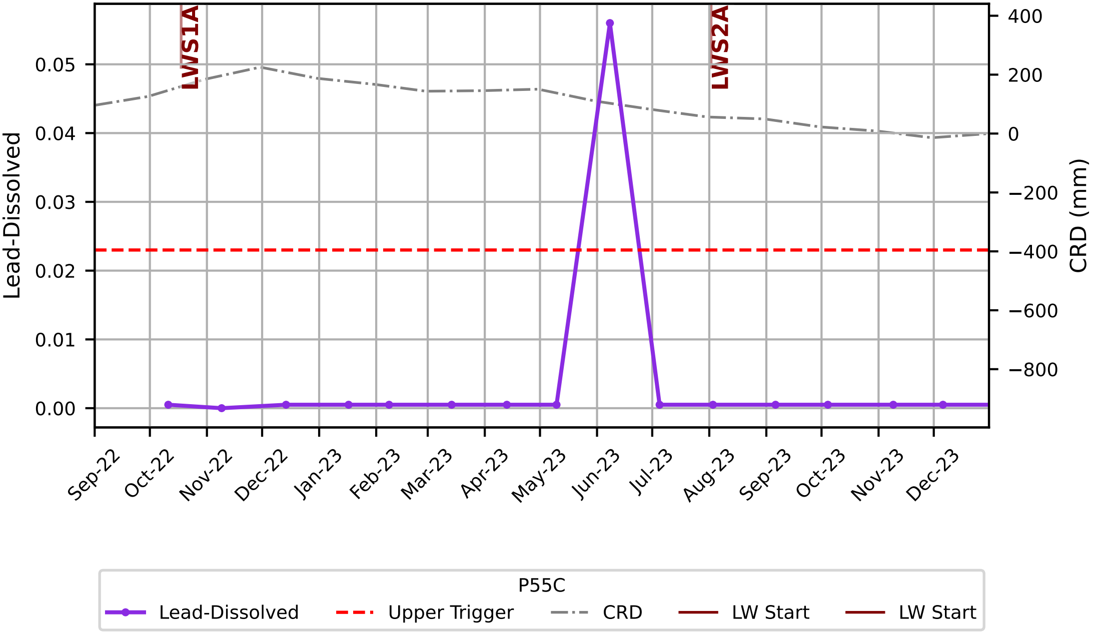
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
60
50
40
30
20
10
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



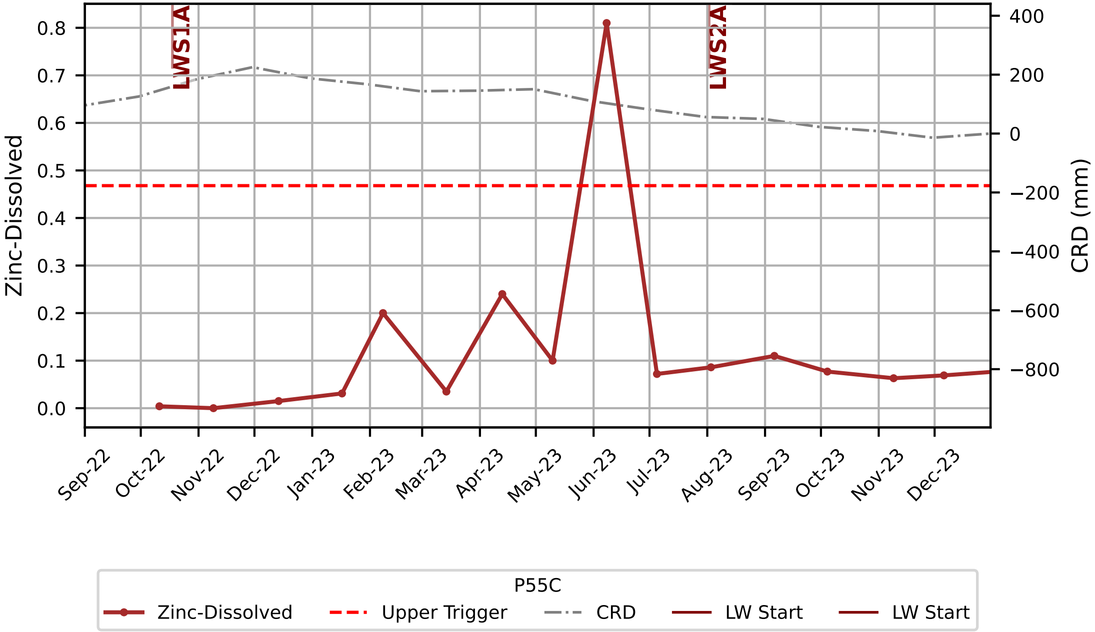
LWS1A
LWS2A
Manganese-Dissolved
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



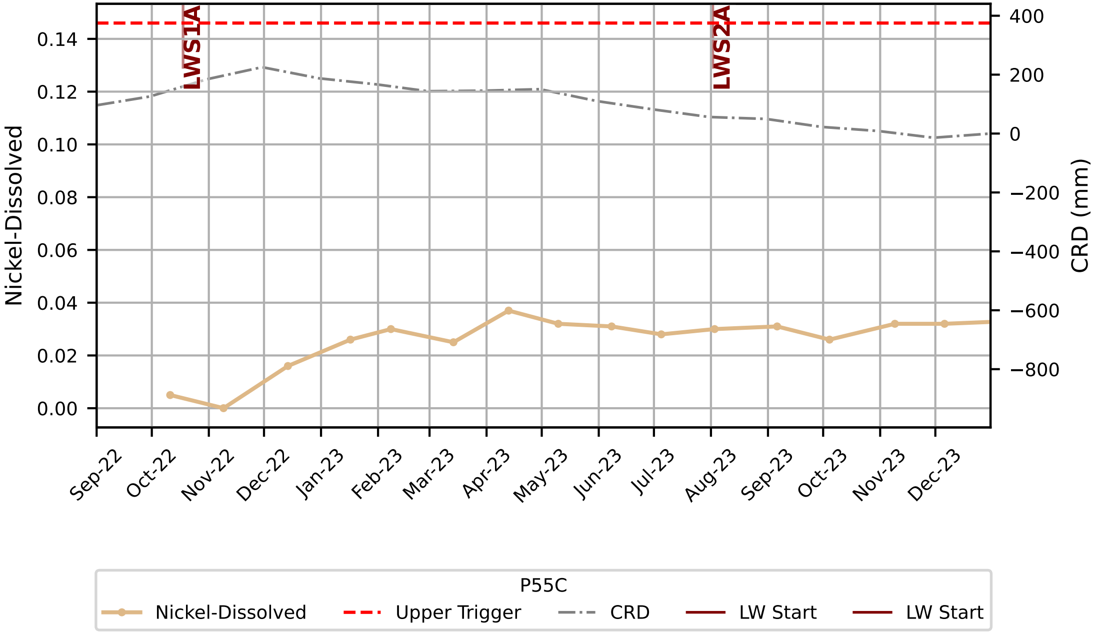
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



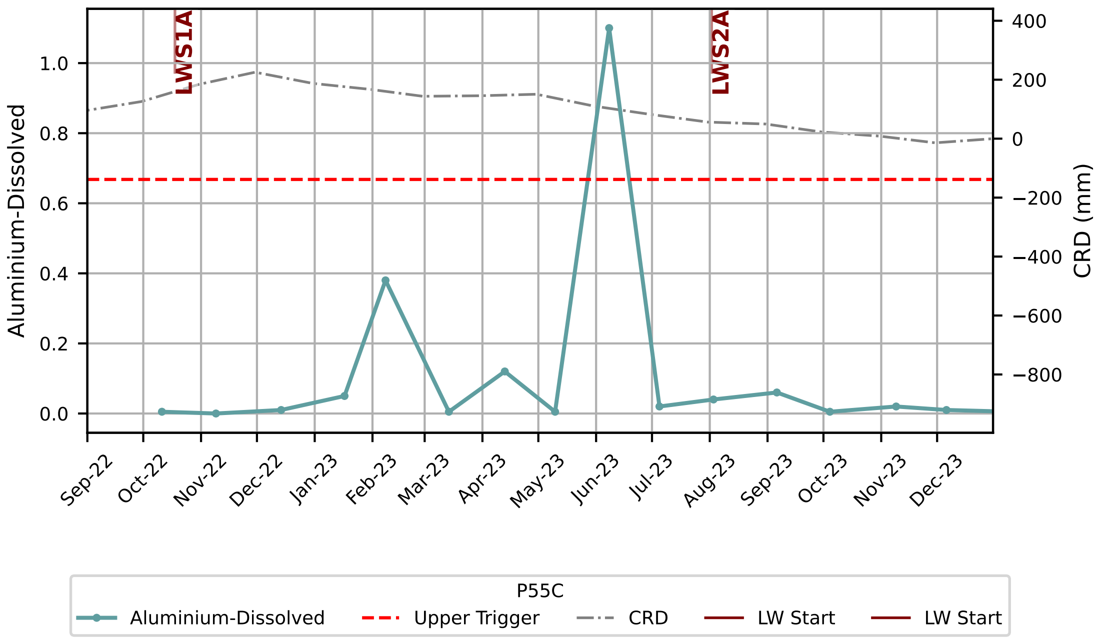
Lead-Dissolved
CRD (mm)
0.05
0.04
0.03
0.02
0.01
0.00
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



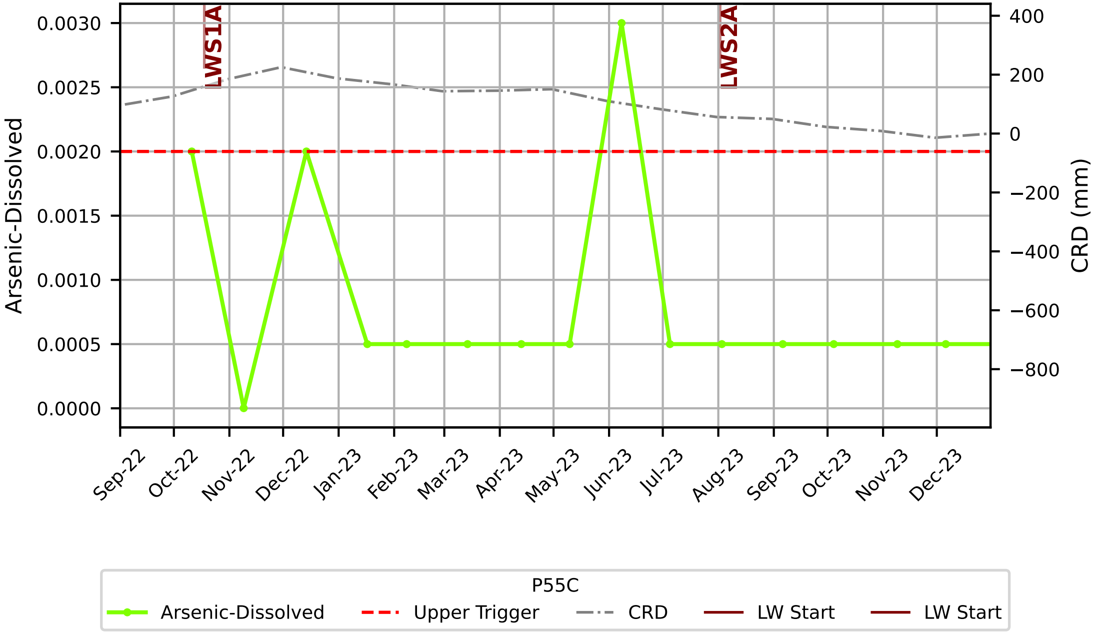
LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



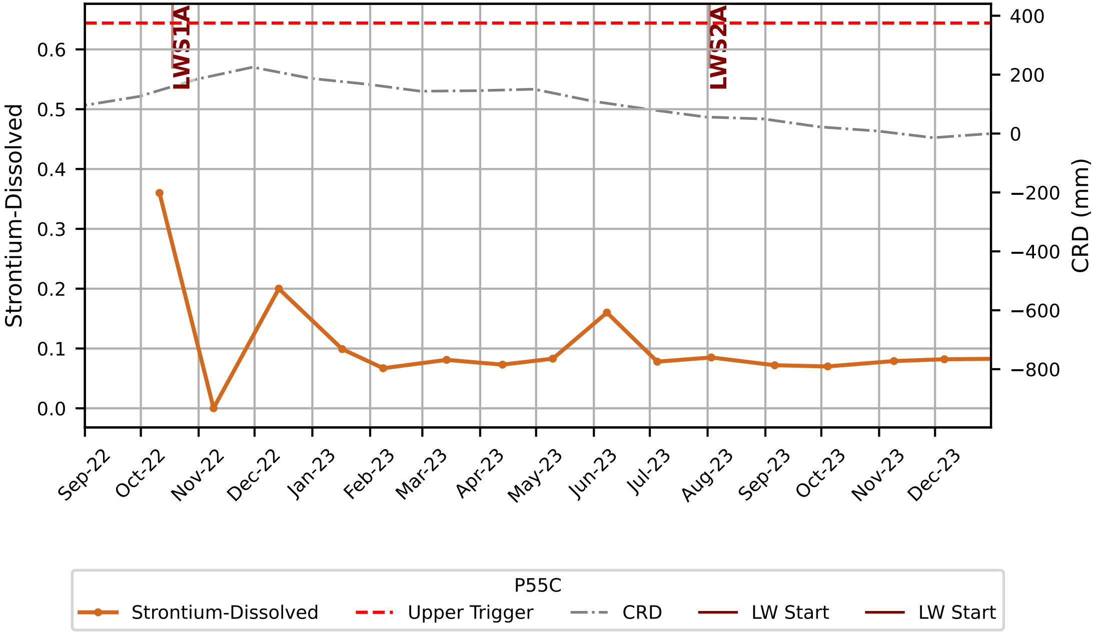
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



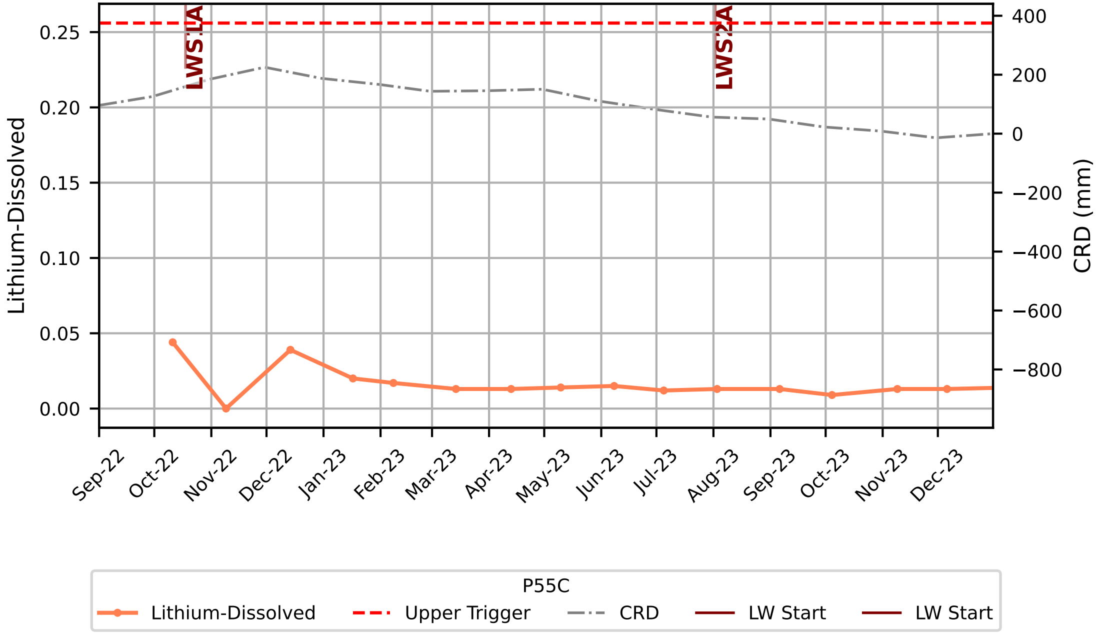
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
1.0
0.8
0.6
0.4
0.2
0.0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



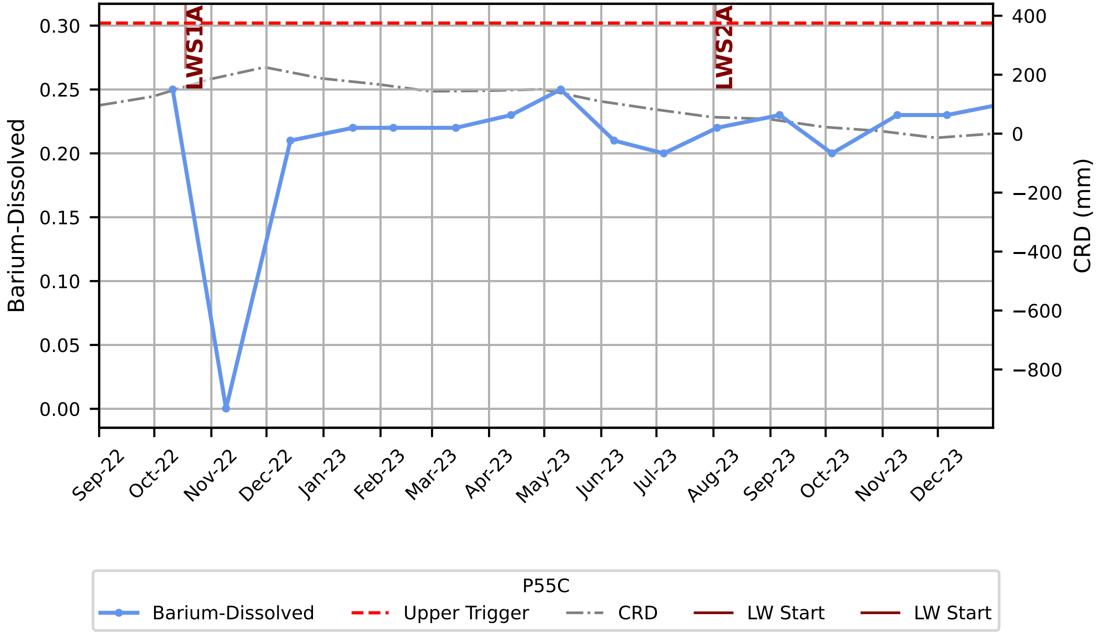
Arsenic-Dissolved
CRD (mm)
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



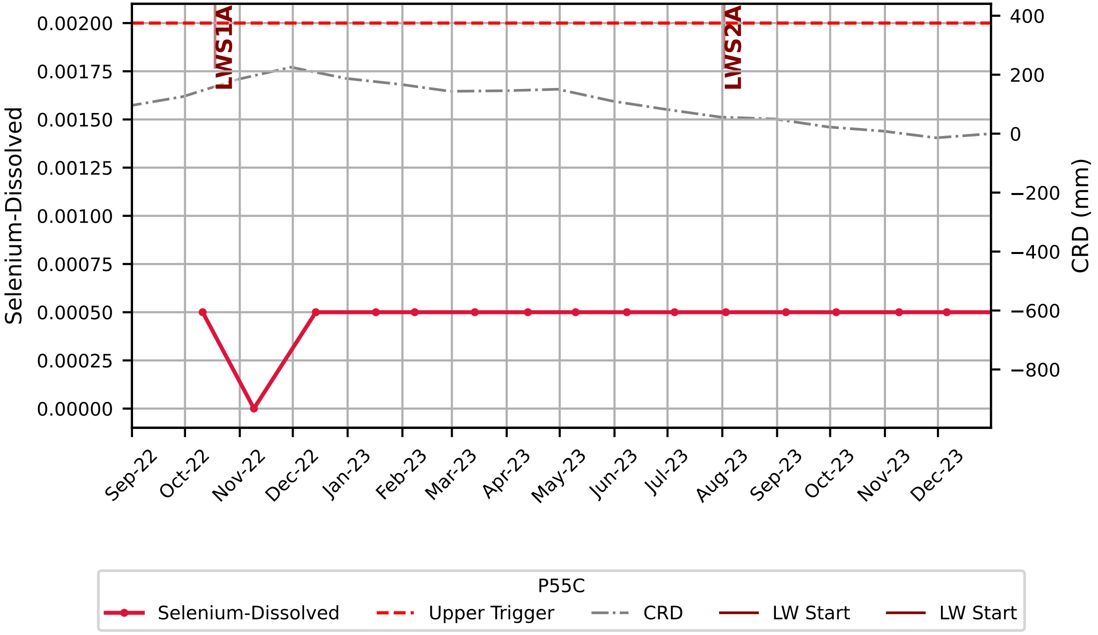
LWS1A
LWS2A
Strontium-Dissolved
CRD (mm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



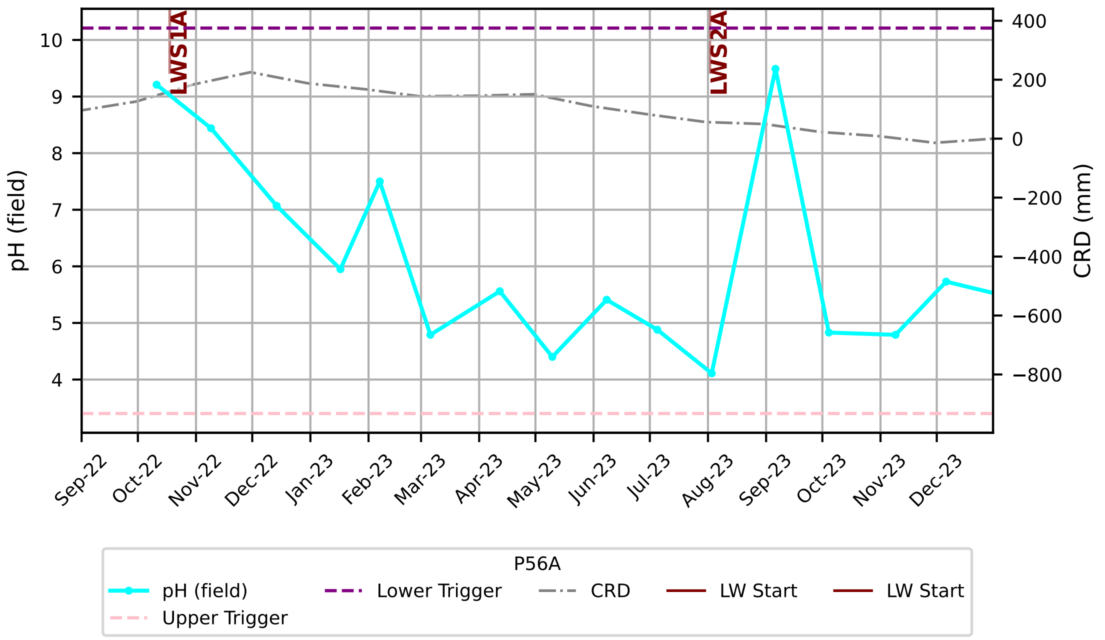
Lithium-Dissolved
CRD (mm)
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



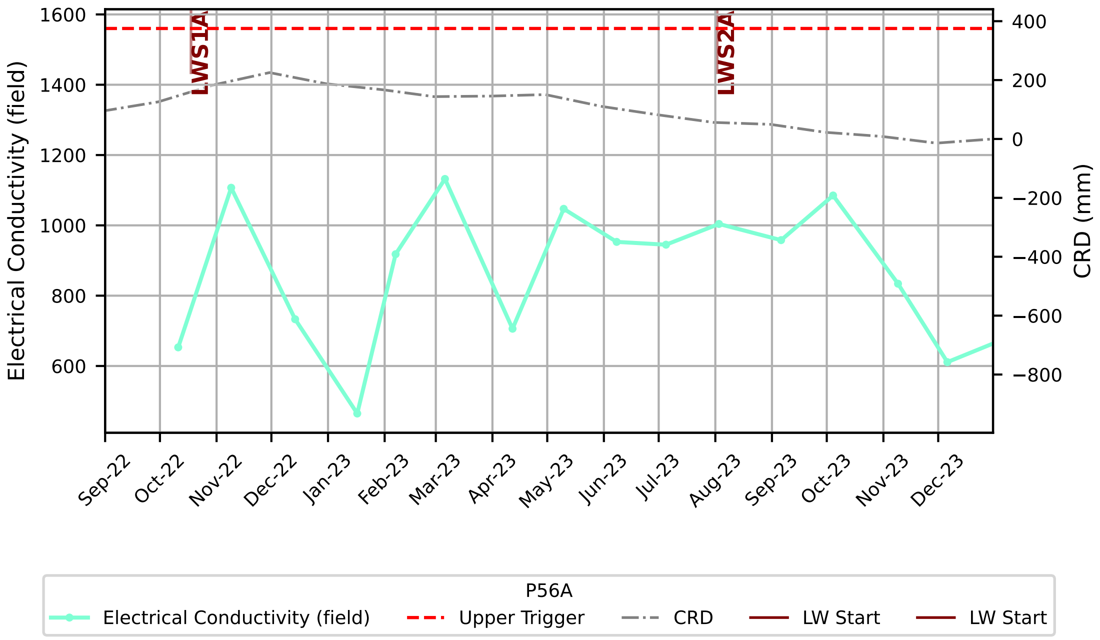
LWS1A
LWS2A
Barium-Dissolved
0.30
0.25
0.20
0.15
0.10
0.05
0.00
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



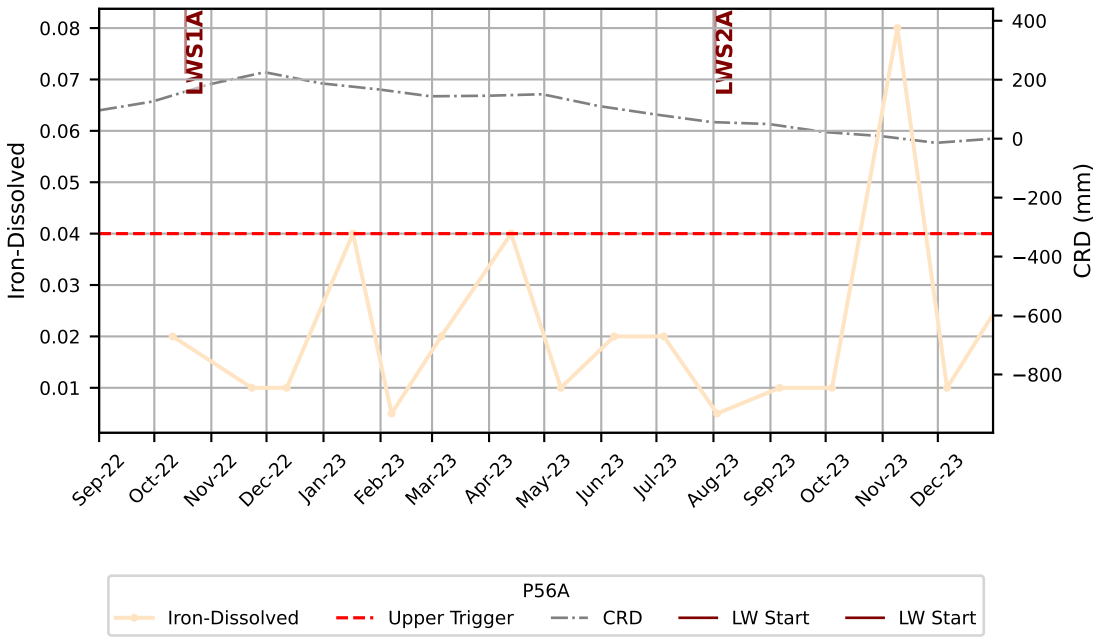
LWS1A
LWS2A
Selenium-Dissolved
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
0.00025
0.00000
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P55C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



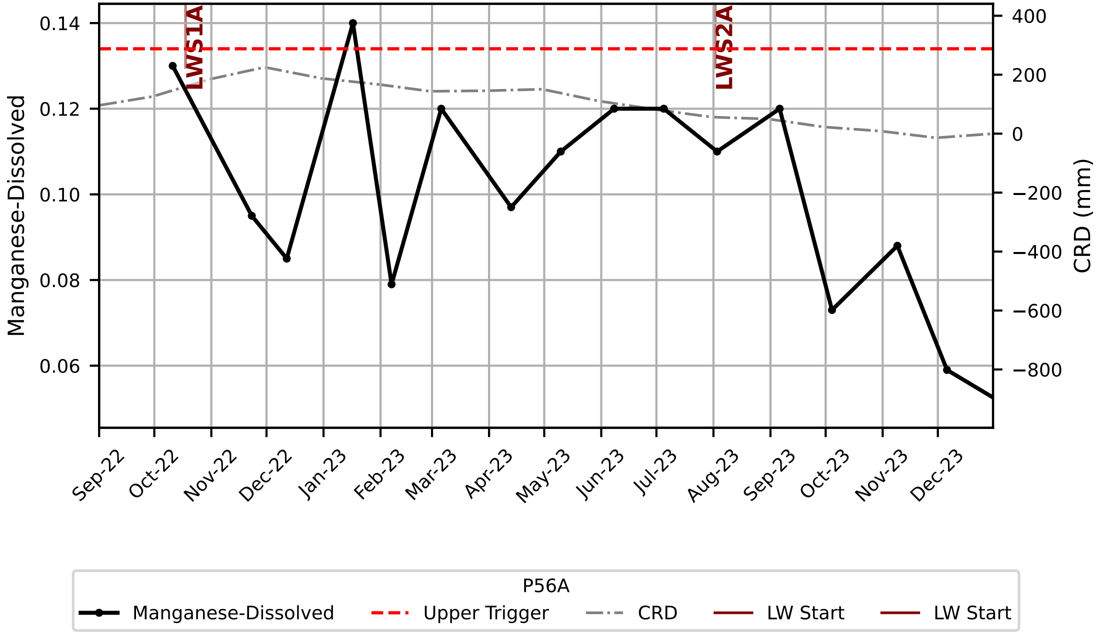
LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
5
4
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



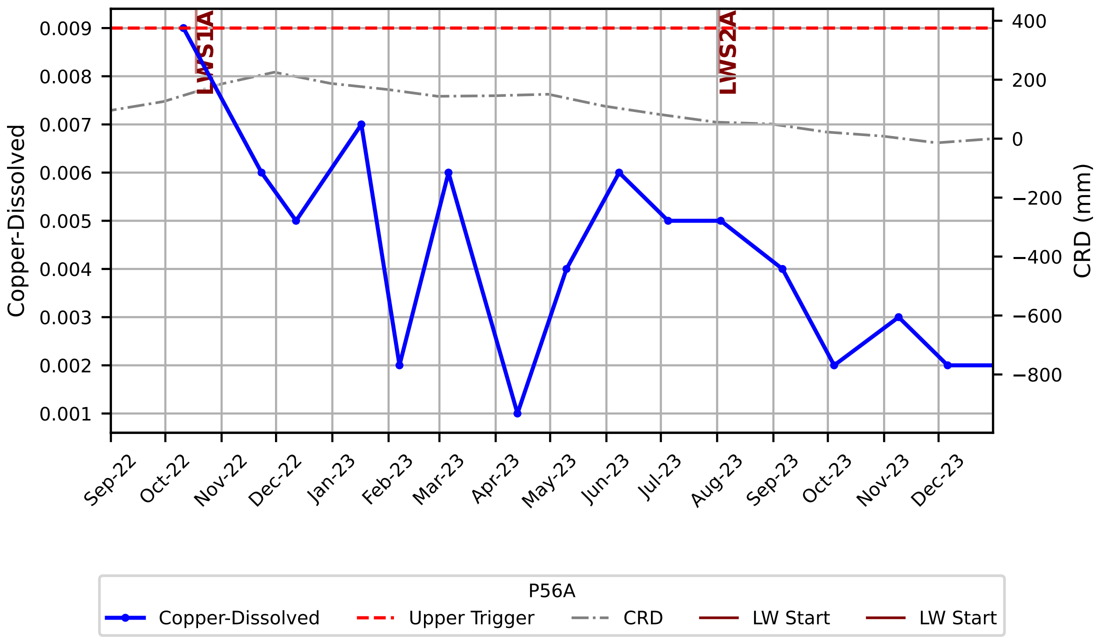
Electrical Conductivity (field)
CRD (mm)
1600
1400
1200
1000
800
600
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



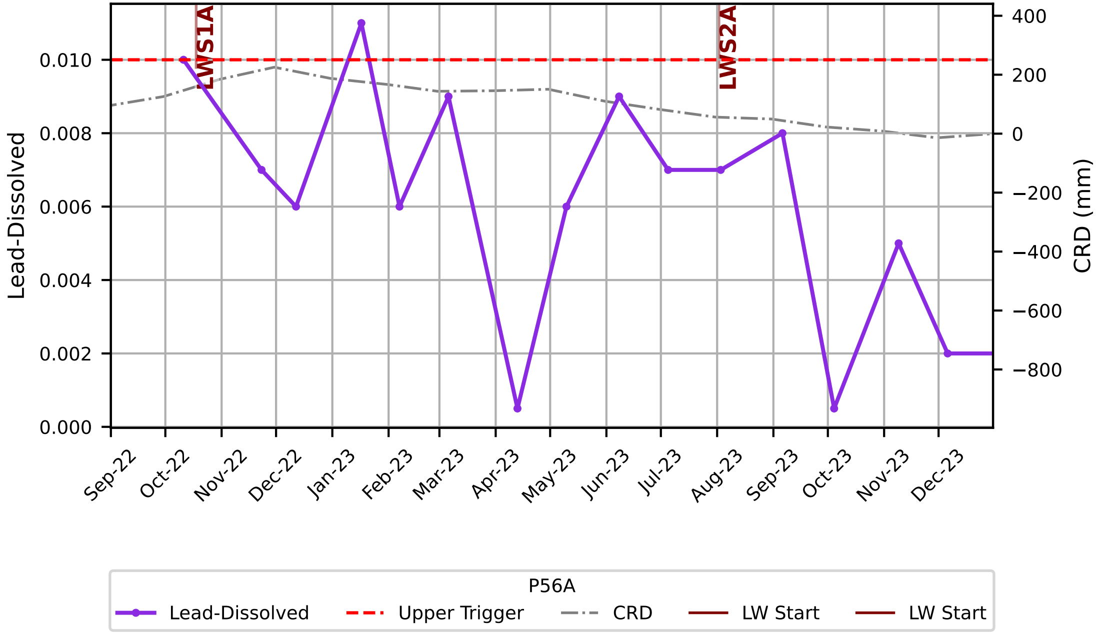
LWS1A
LWS2A
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
Iron-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



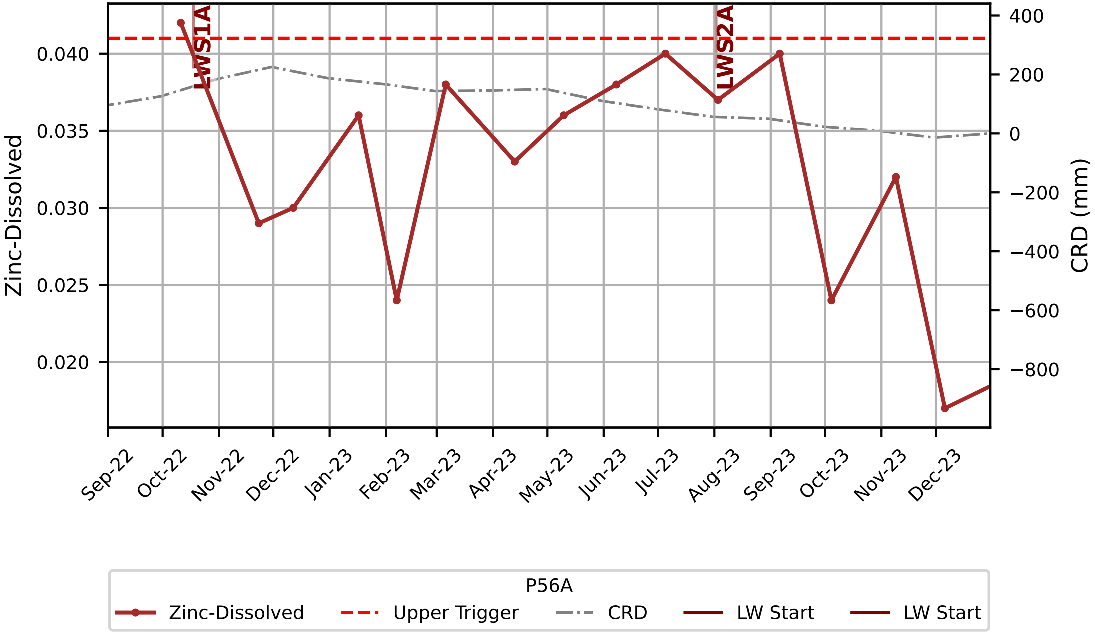
LWS1A
LWS2A
Manganese-Dissolved
CRD (mm)
0.14
0.12
0.10
0.08
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



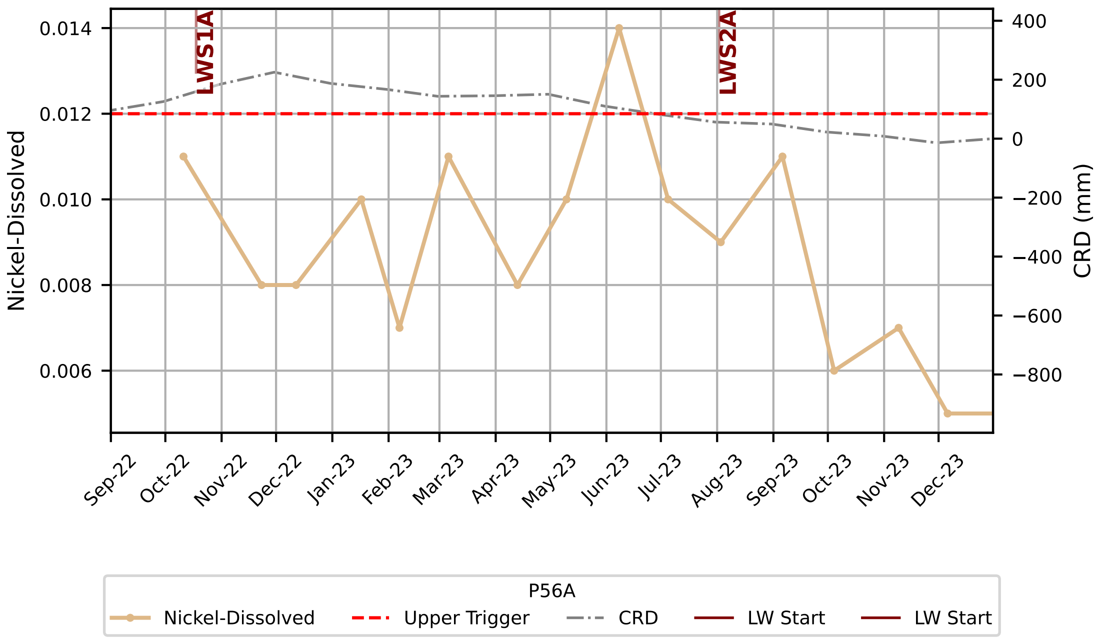
LWS1A
LWS2A
Copper-Dissolved
CRD (mm)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



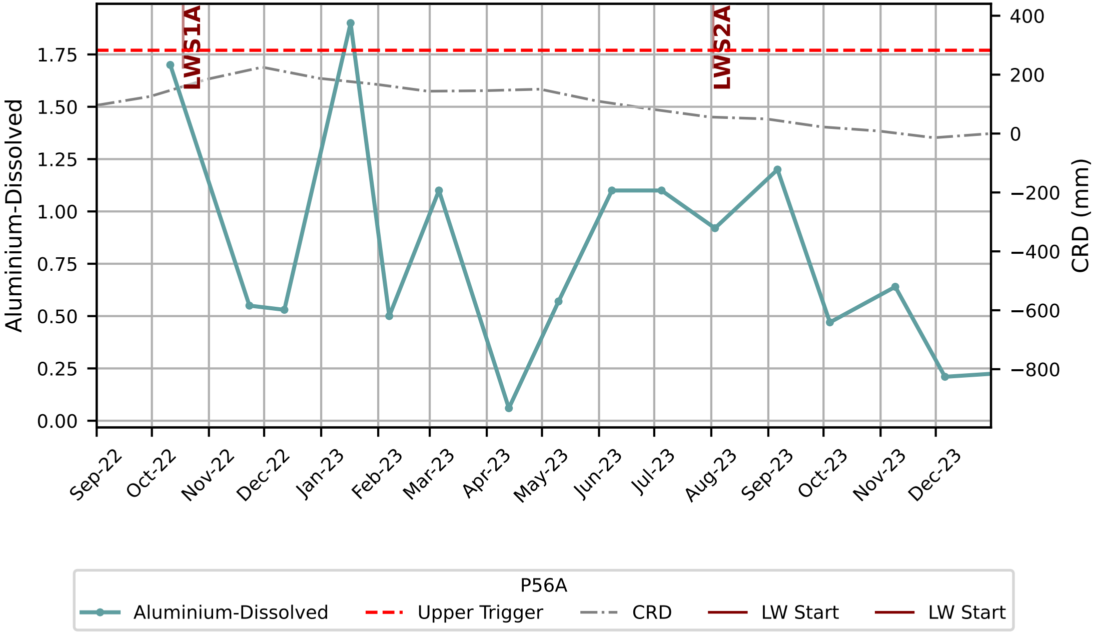
LWS1A
LWS2A
Lead-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



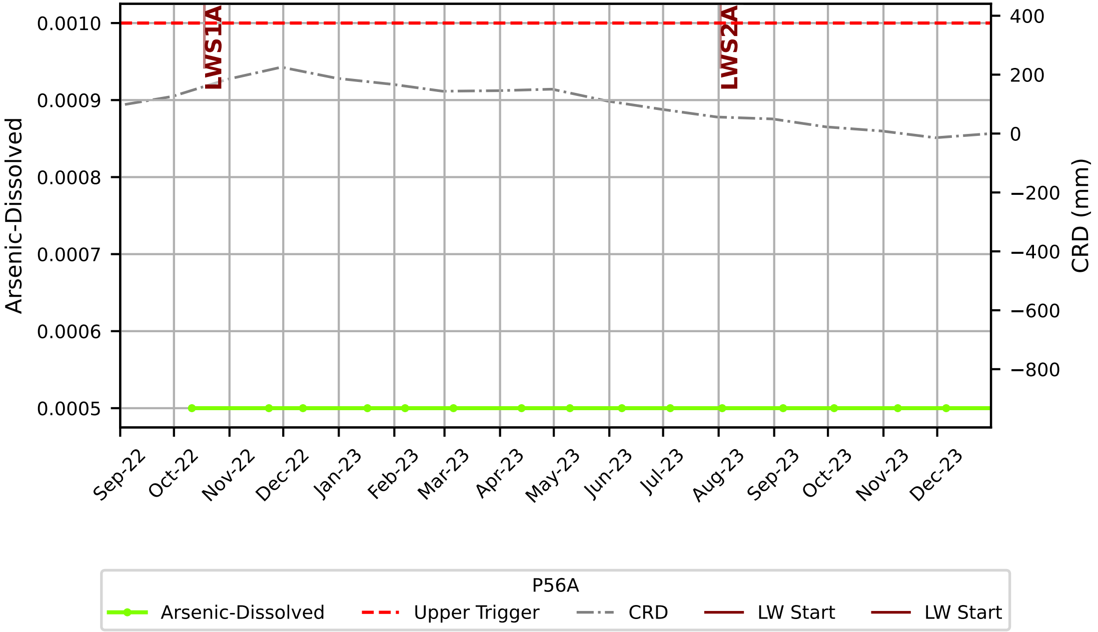
LWS1A
LWS2A
Zinc-Dissolved
0.040
0.035
0.030
0.025
0.020
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



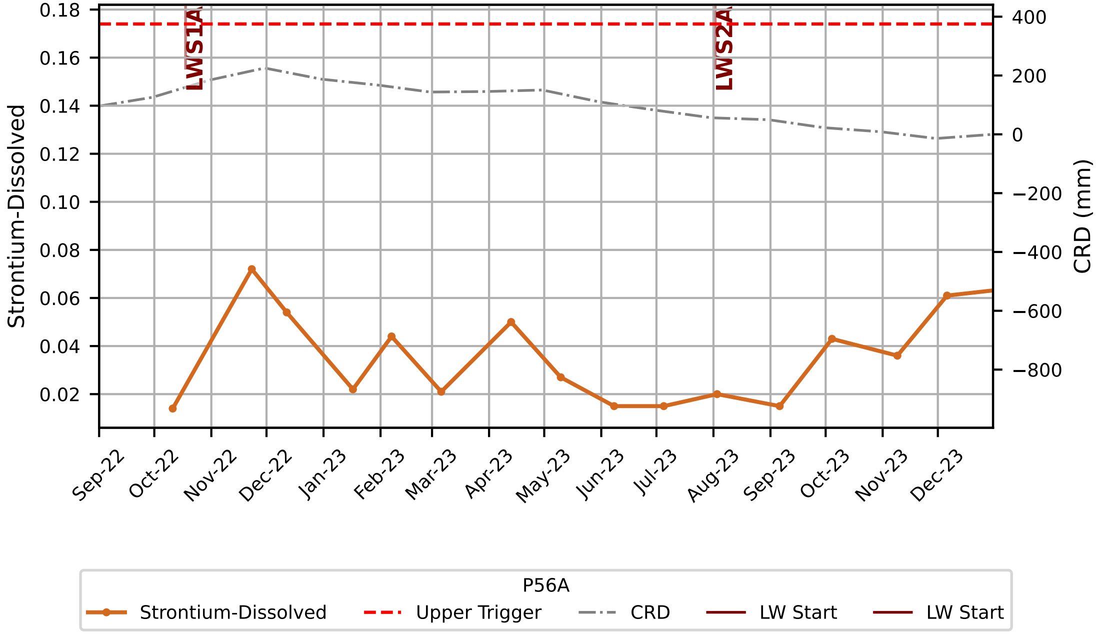
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.014
0.012
0.010
0.008
0.006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



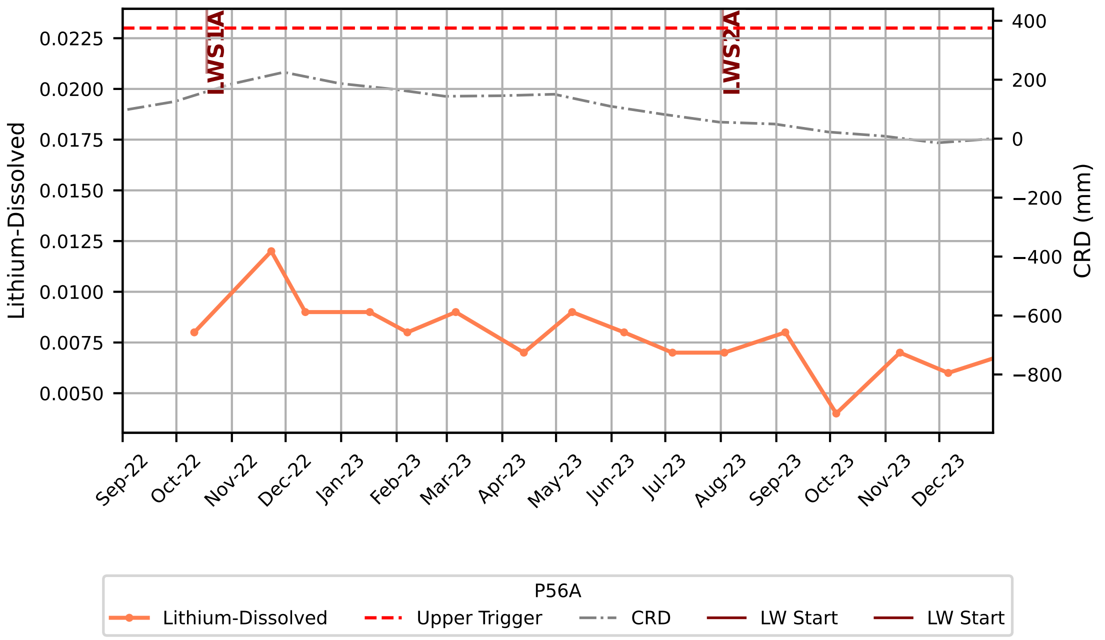
LWS1A
LWS2A
Aluminium-Dissolved
CRD (mm)
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



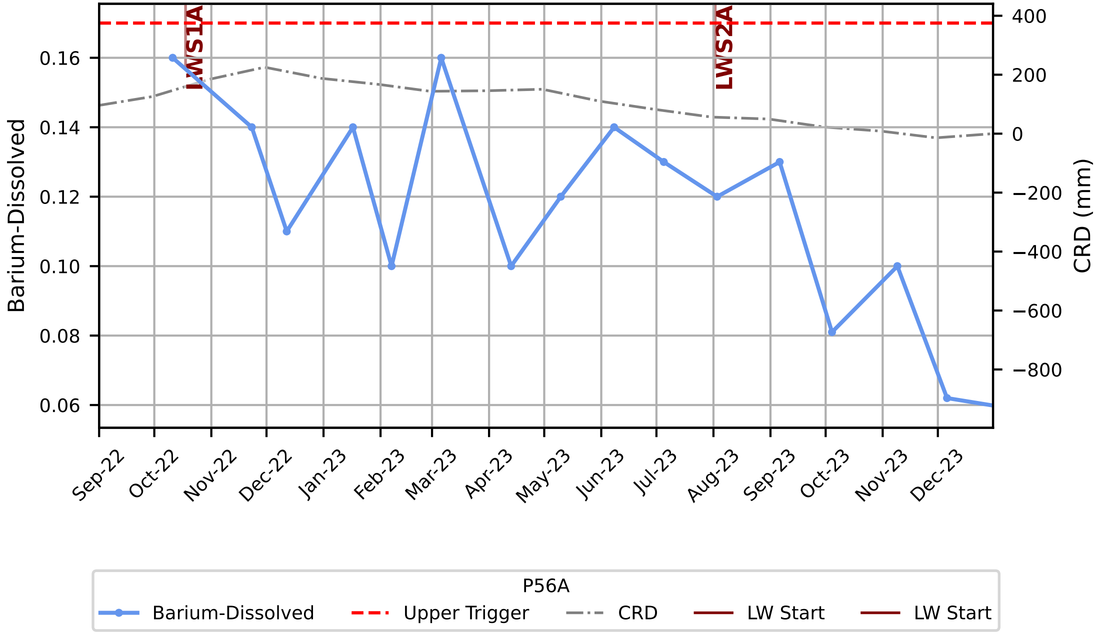
Arsenic-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



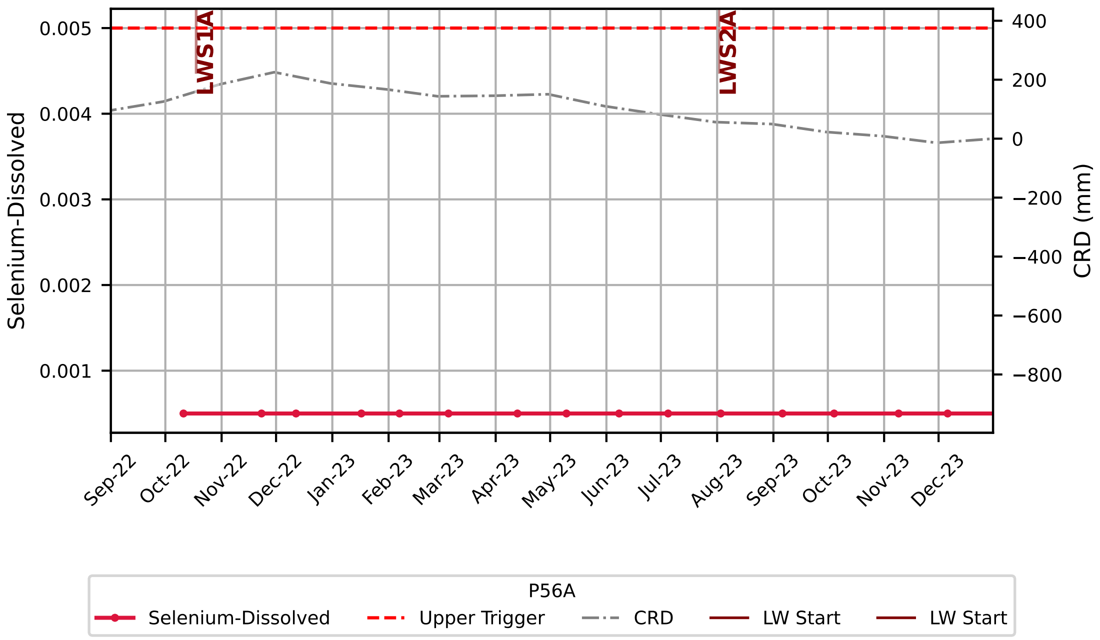
Strontium-Dissolved
CRD (mm)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



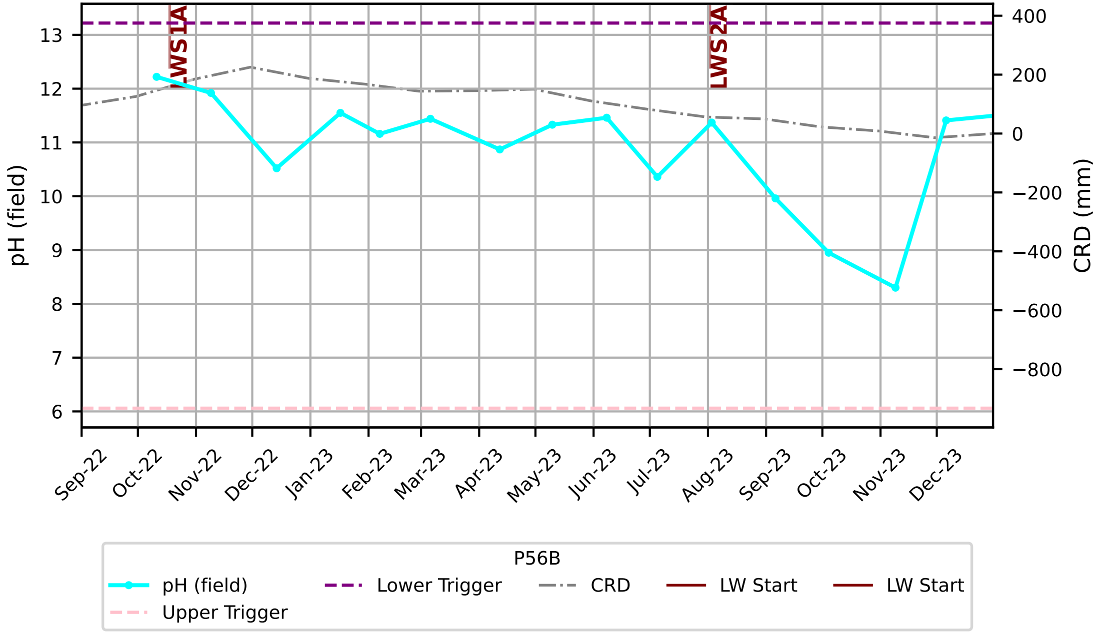
LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



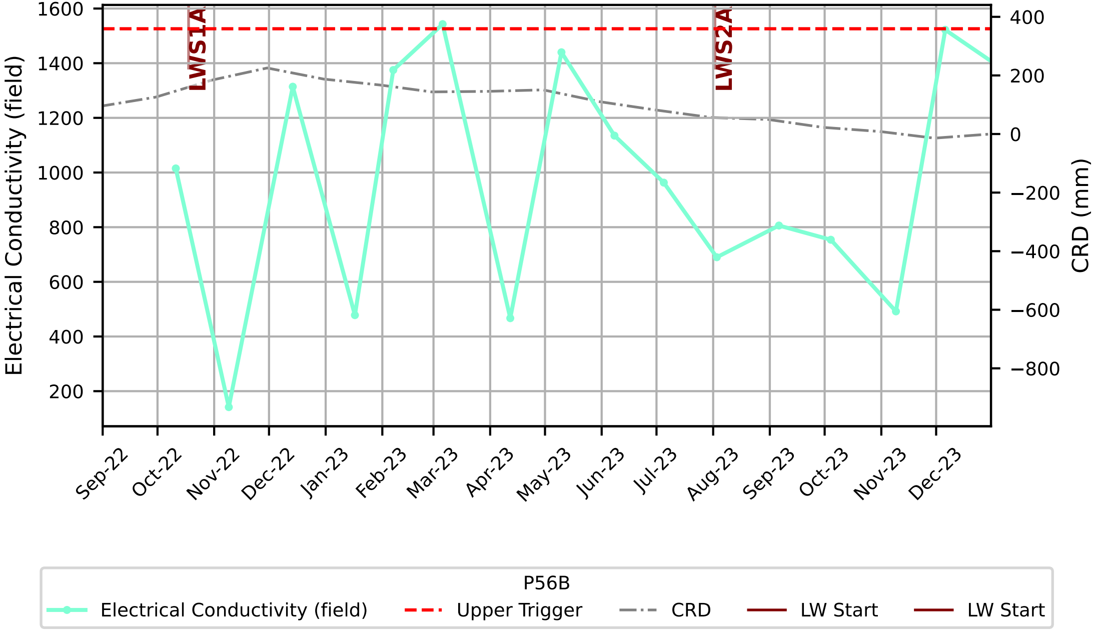
LWS1A
LWS2A
Barium-Dissolved
CRD (mm)
0.16
0.14
0.12
0.10
0.08
0.06
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



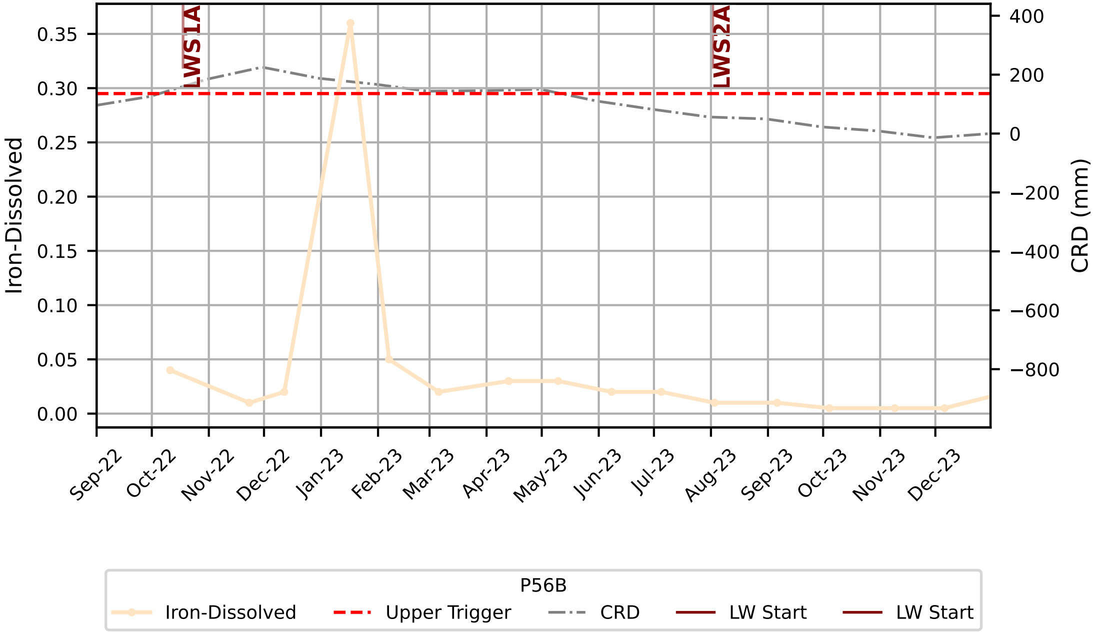
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56A
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



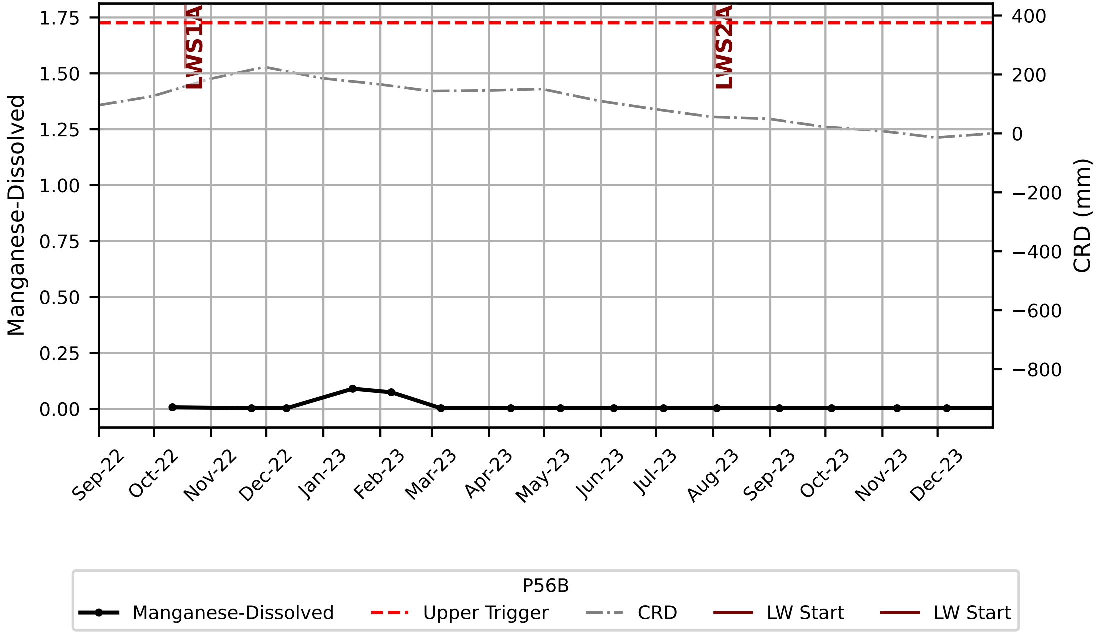
LWS1A
LWS2A
pH (field)
CRD (mm)
13
12
11
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



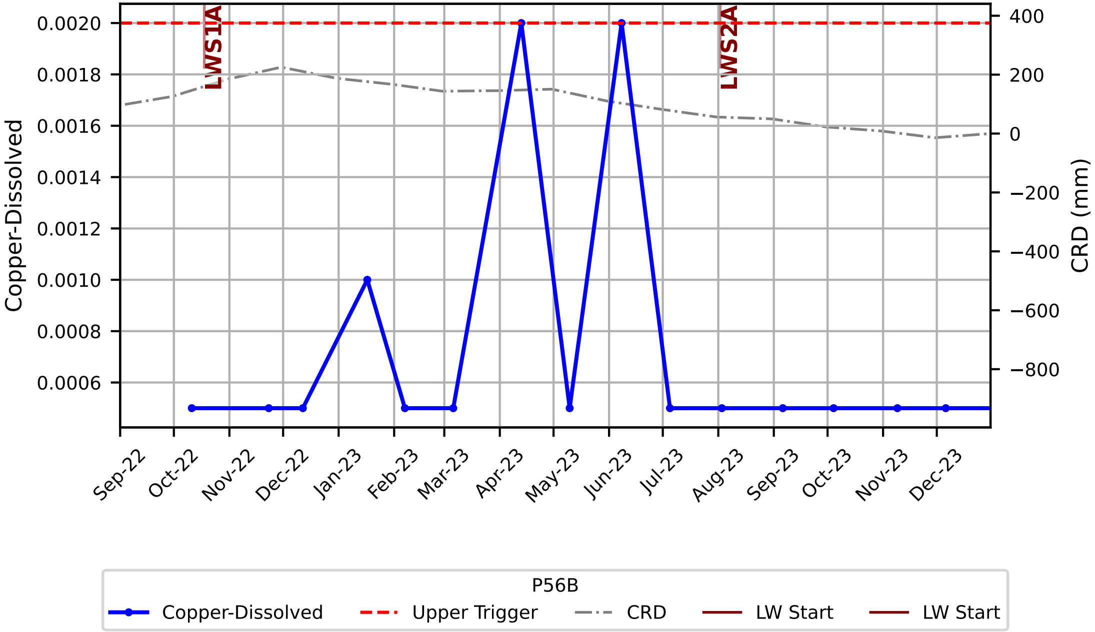
Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
1600
1400
1200
1000
800
600
400
200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



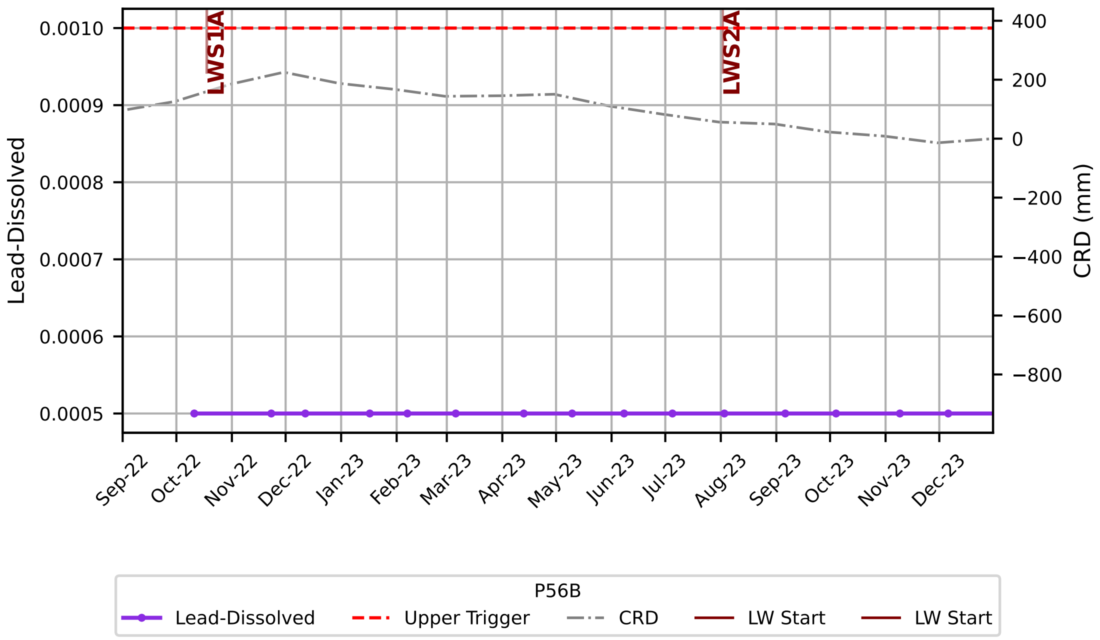
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



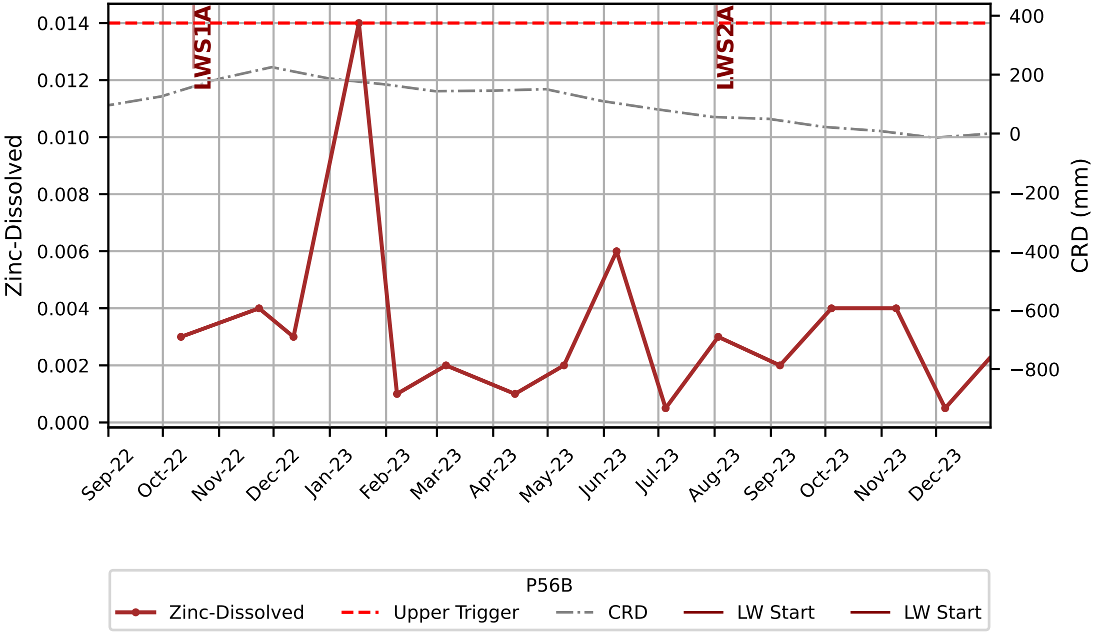
Manganese-Dissolved
CRD (mm)
LWS1A
LWS2A
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



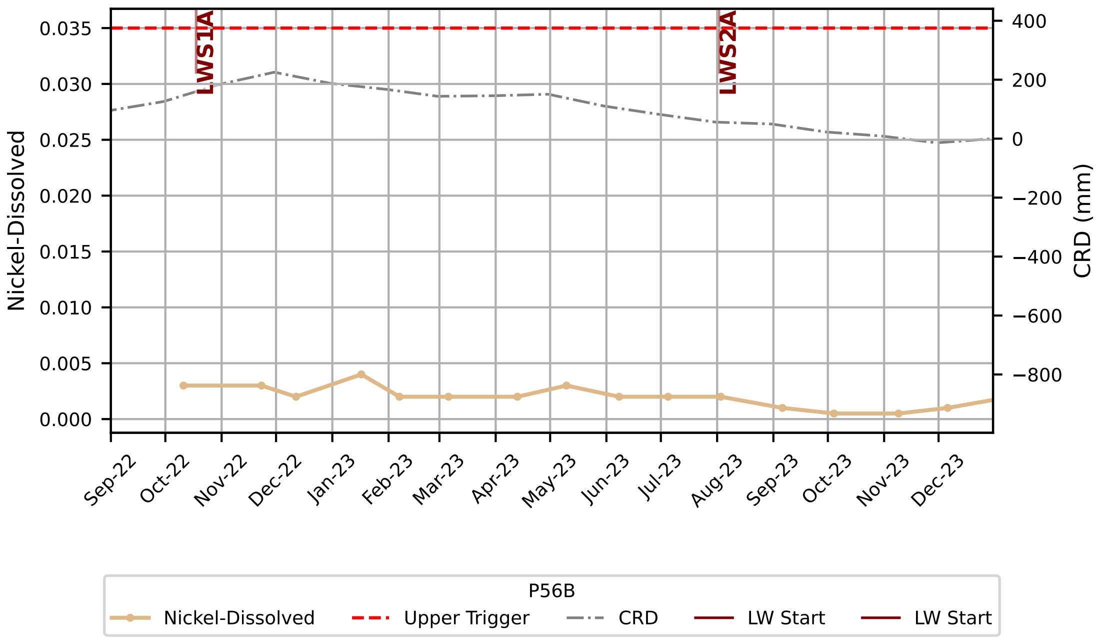
Copper-Dissolved
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

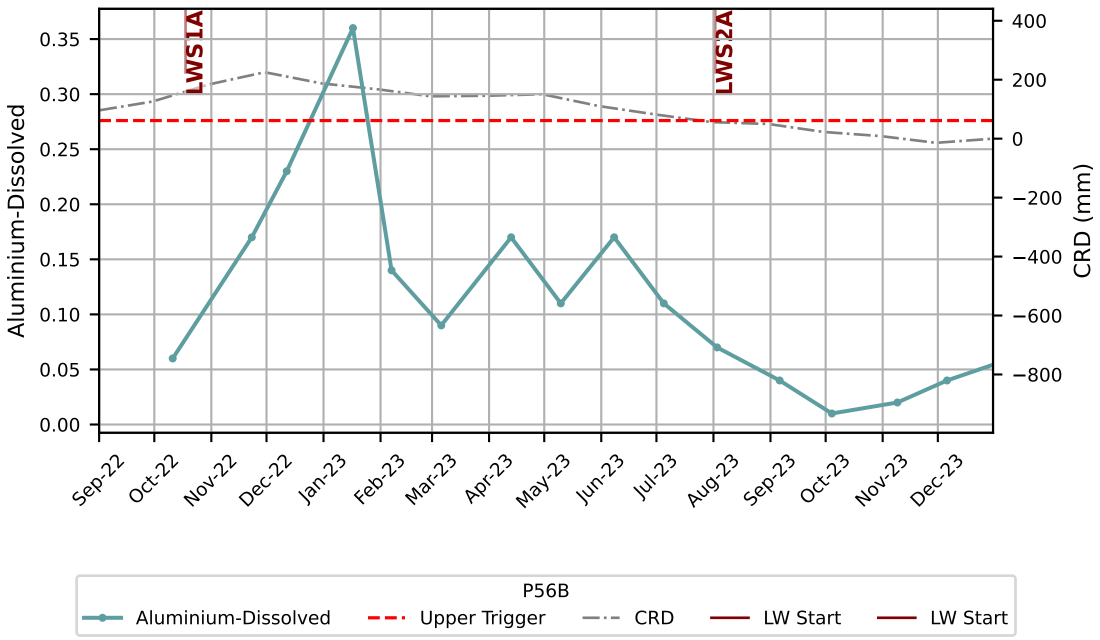


Lead-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

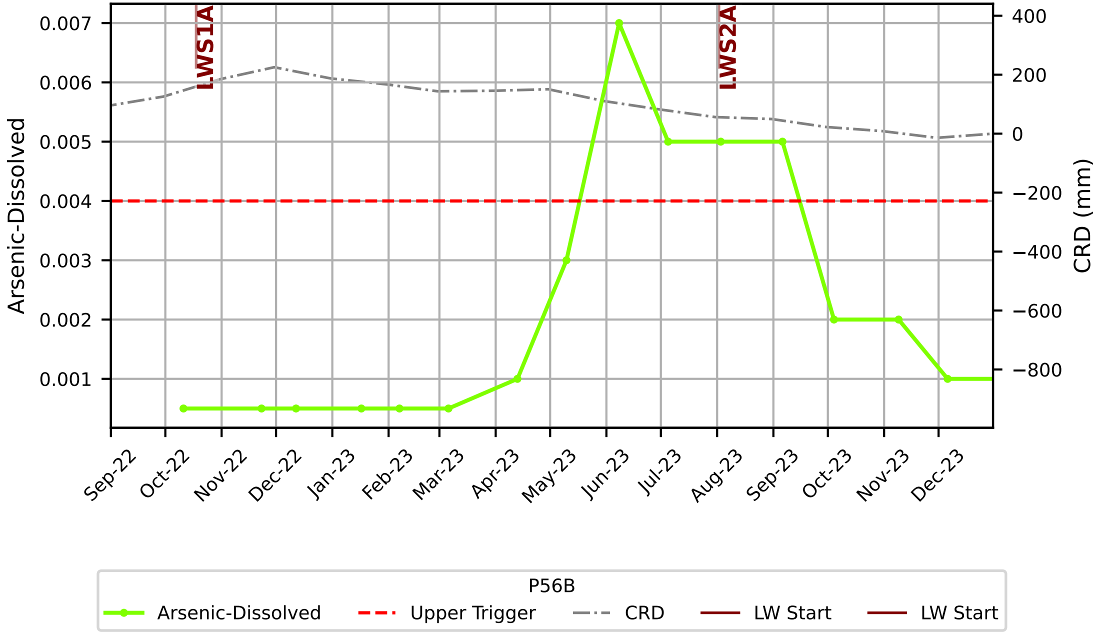


LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start

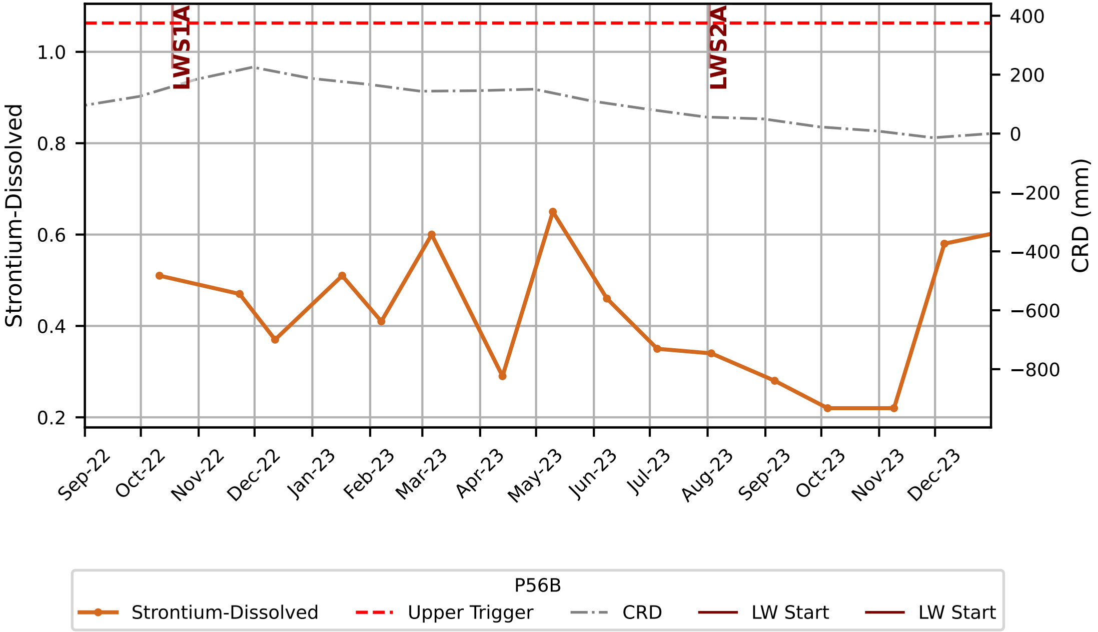

LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



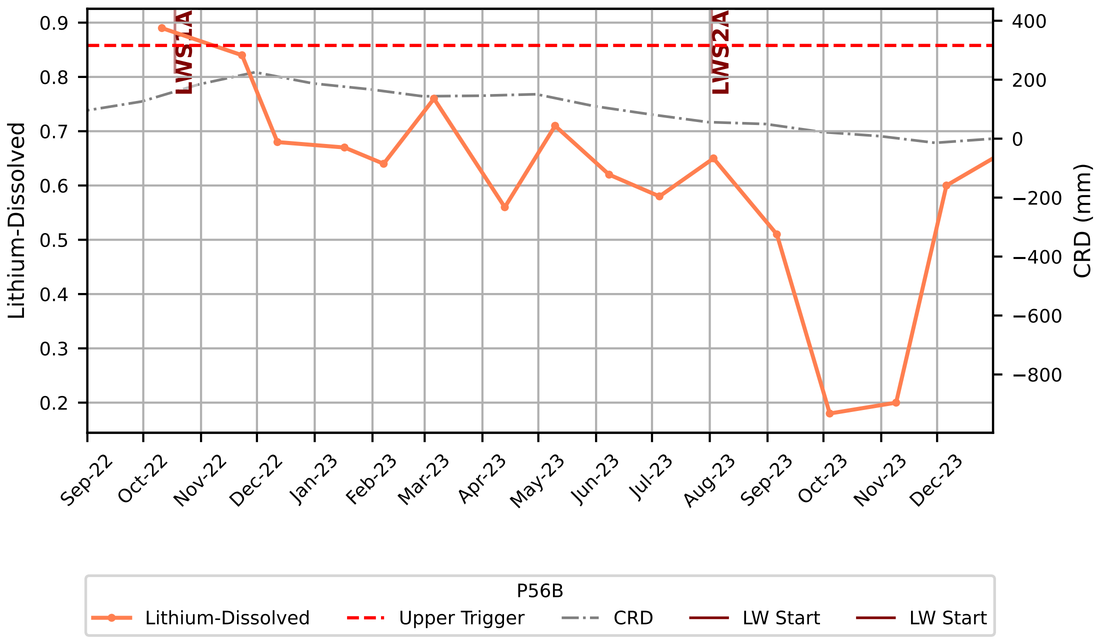
LWS1A
LWS2A
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Aluminium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



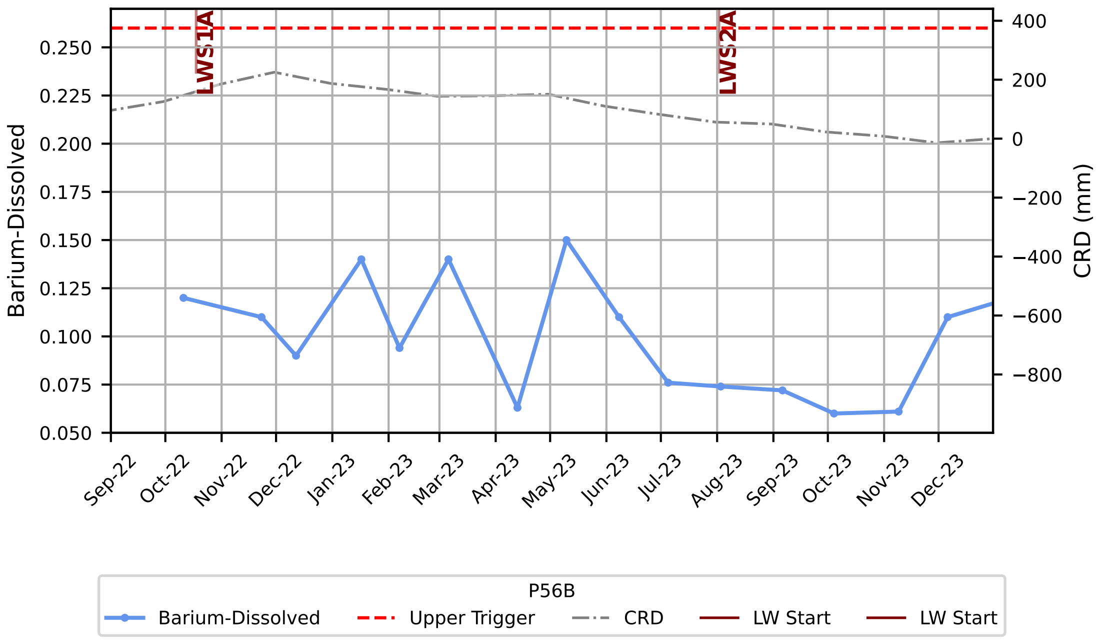
LWS1A
LWS2A
0.007
0.006
0.005
0.004
0.003
0.002
0.001
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



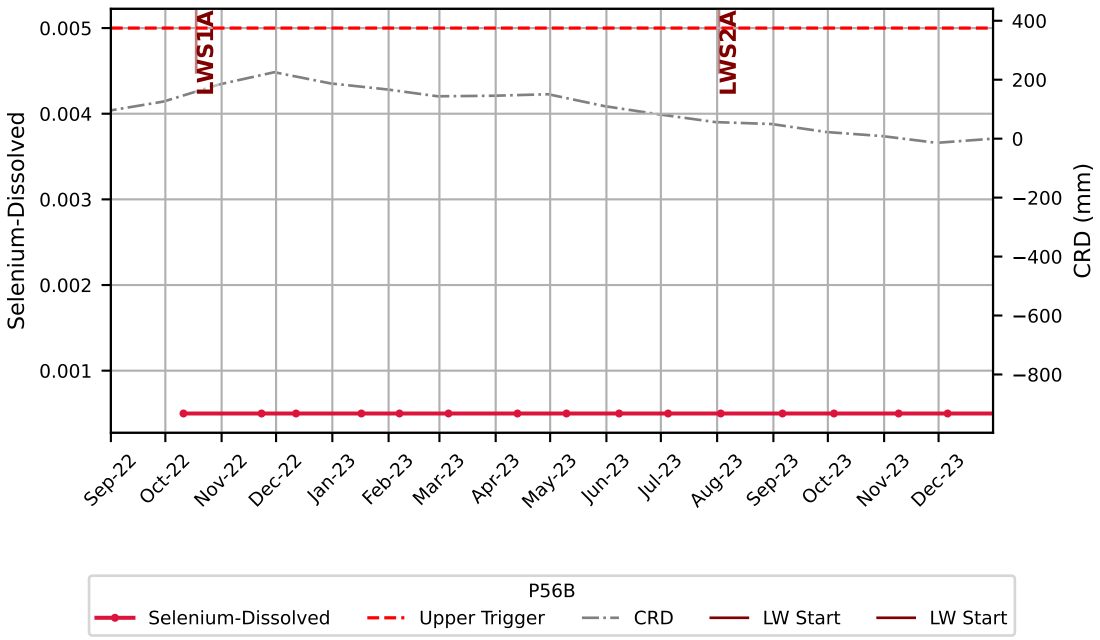
Strontium-Dissolved
CRD (mm)
1.0
0.8
0.6
0.4
0.2
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



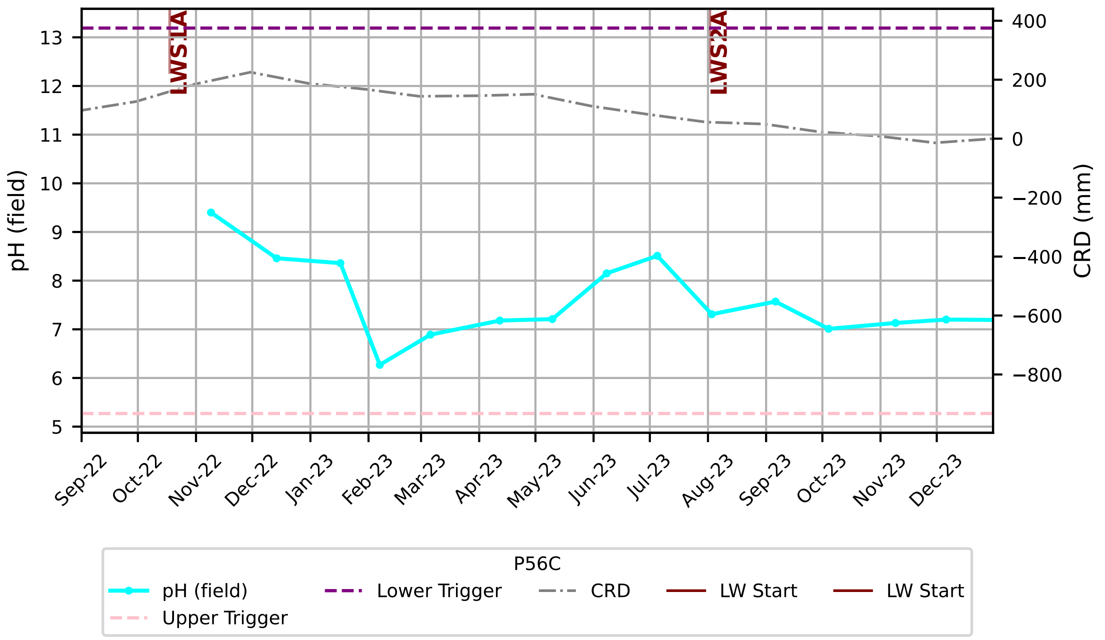
Lithium-Dissolved
CRD (mm)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



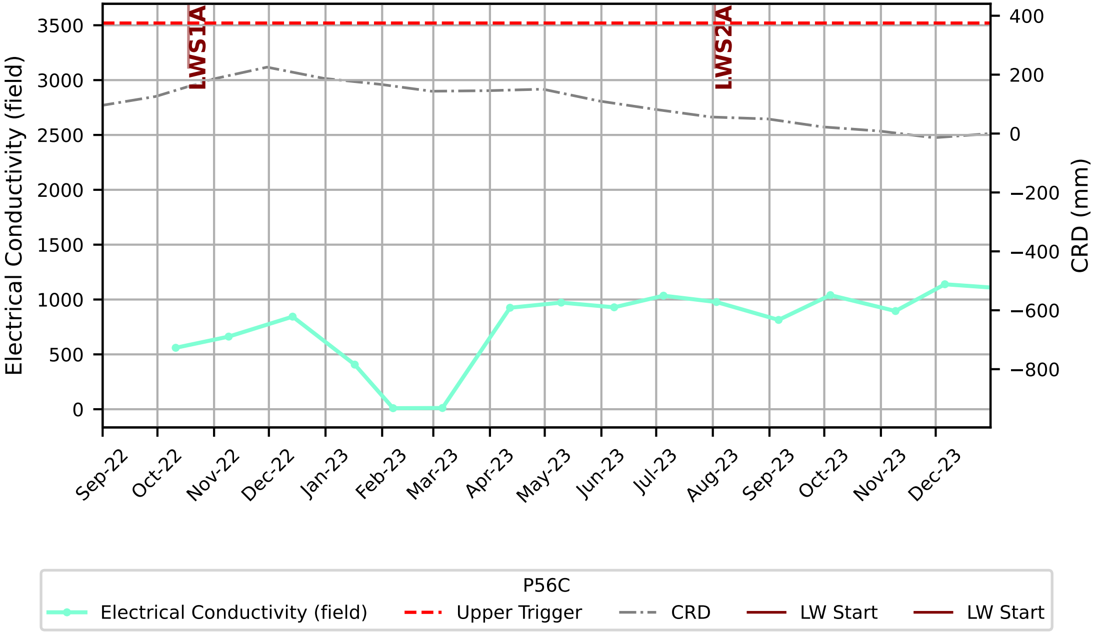
Barium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.050
0.075
0.100
0.125
0.150
0.175
0.200
0.225
0.250
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



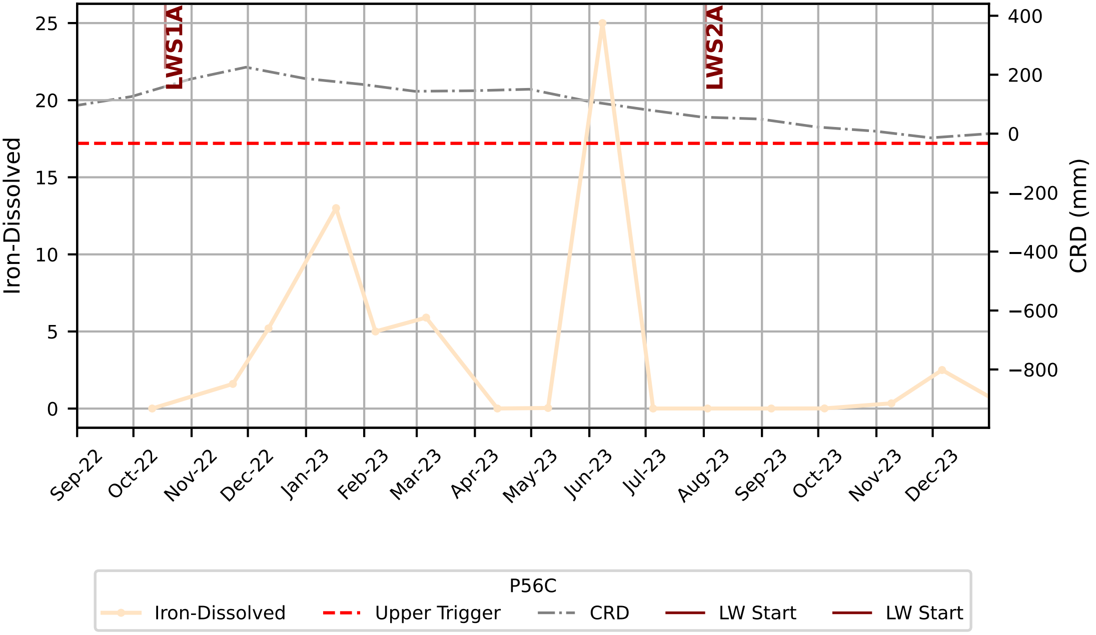
Selenium-Dissolved
CRD (mm)
0.005
0.004
0.003
0.002
0.001
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56B
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



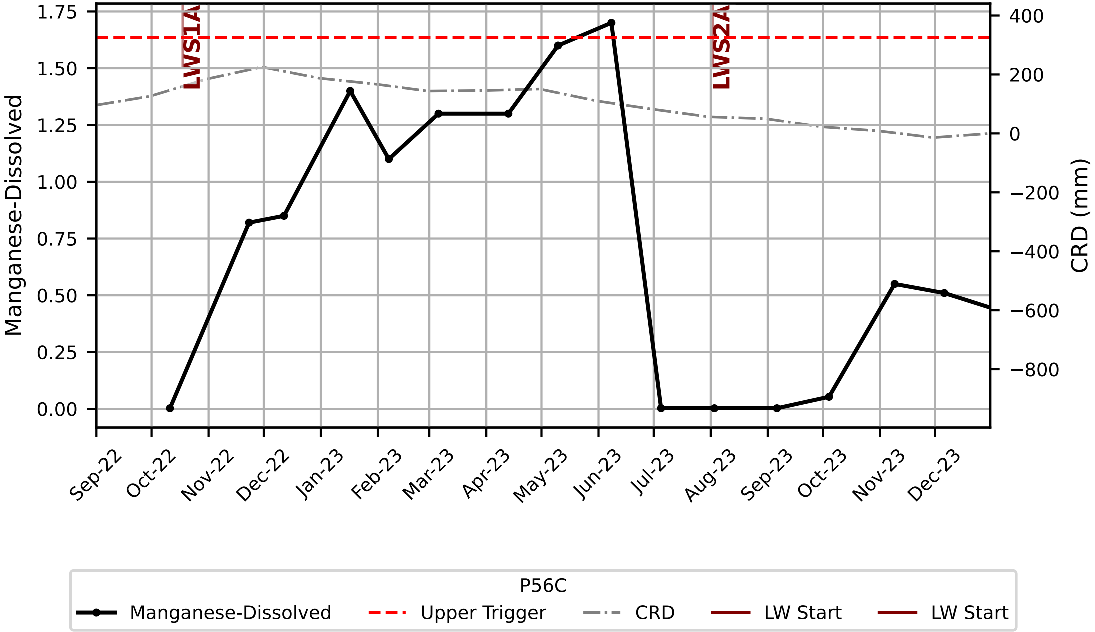
LWS1A
LWS2A
pH (field)
CRD (mm)
13
12
11
10
9
8
7
6
5
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger



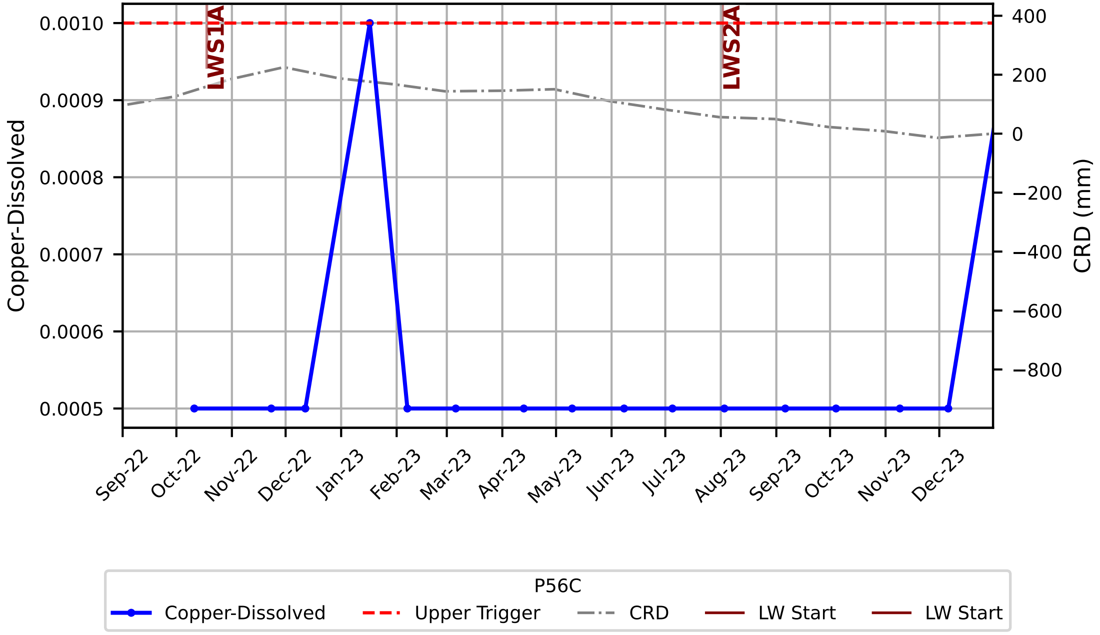
LWS1A
LWS2A
Electrical Conductivity (field)
CRD (mm)
3500
3000
2500
2000
1500
1000
500
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start



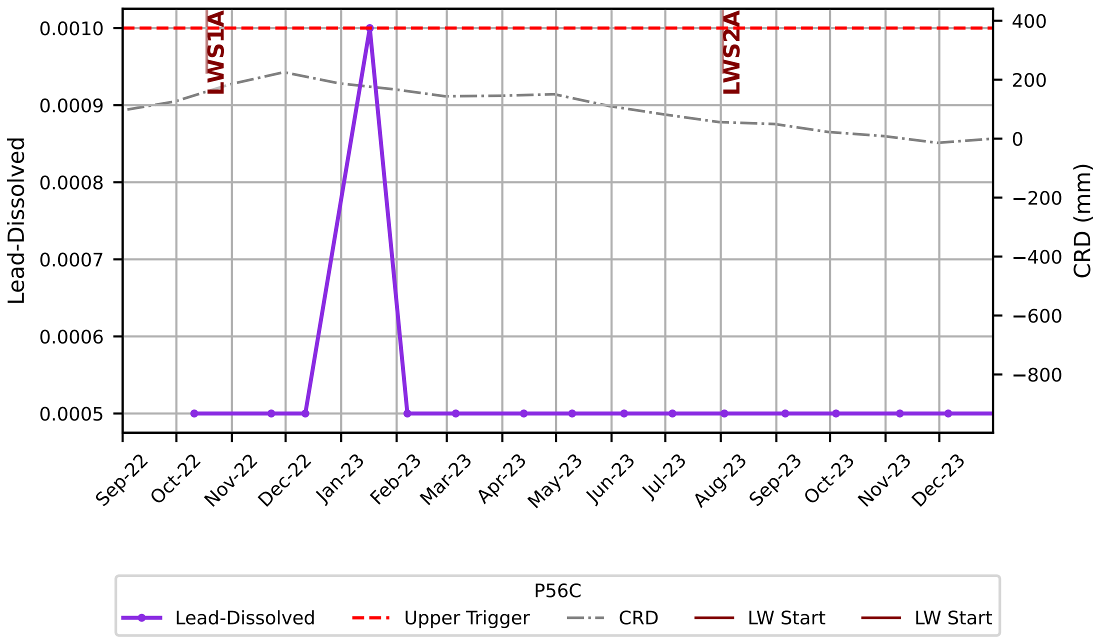
LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
25
20
15
10
5
0
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



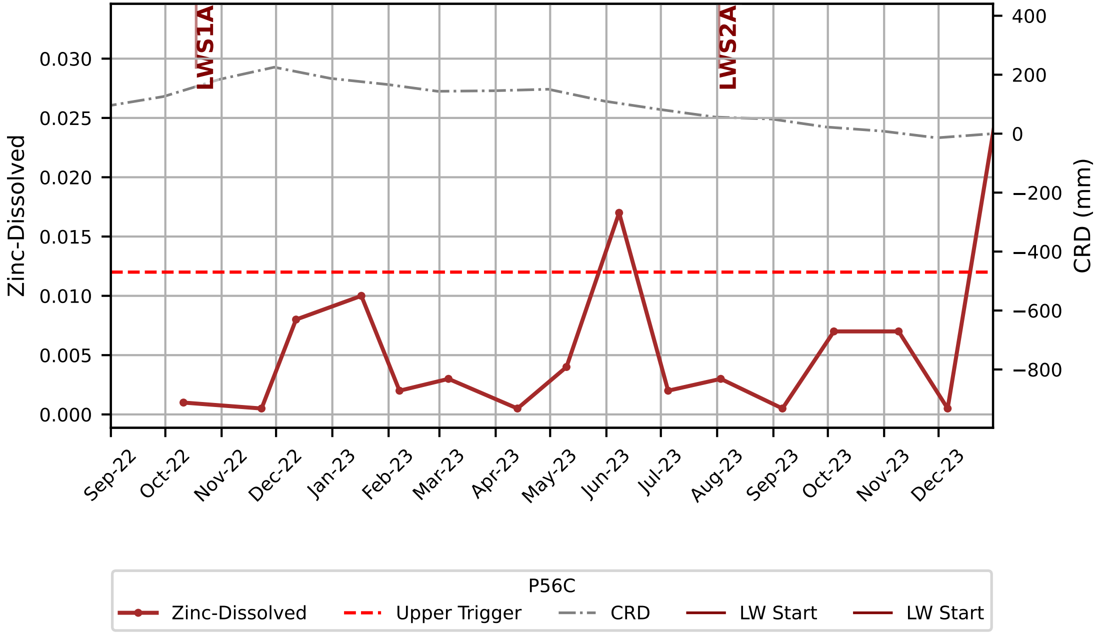
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Manganese-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start

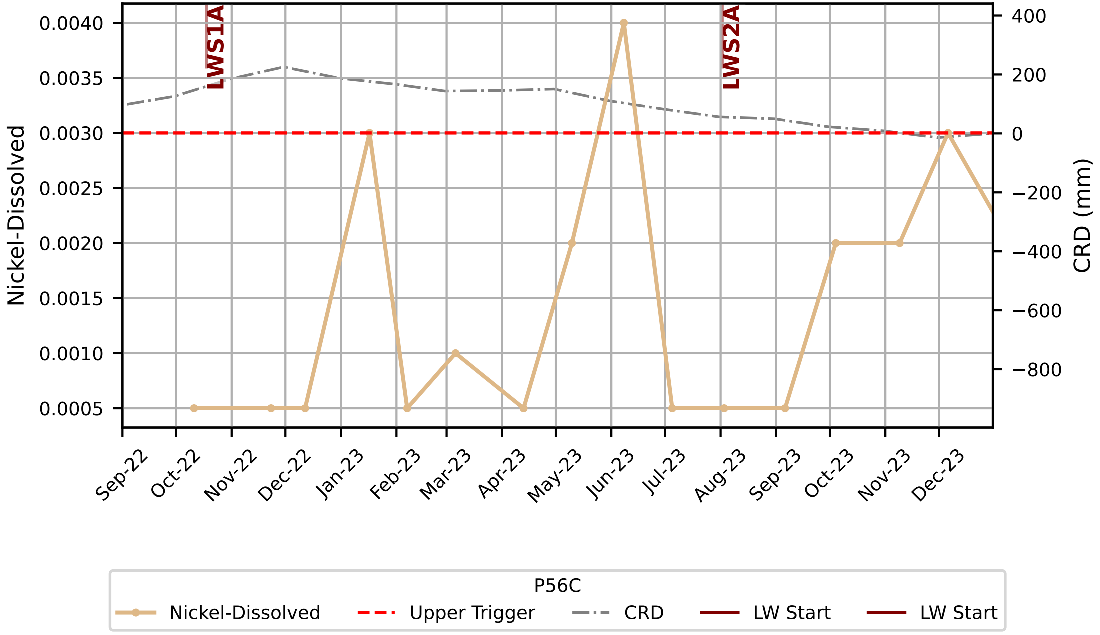


LWS1A
LWS2A
Copper-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start

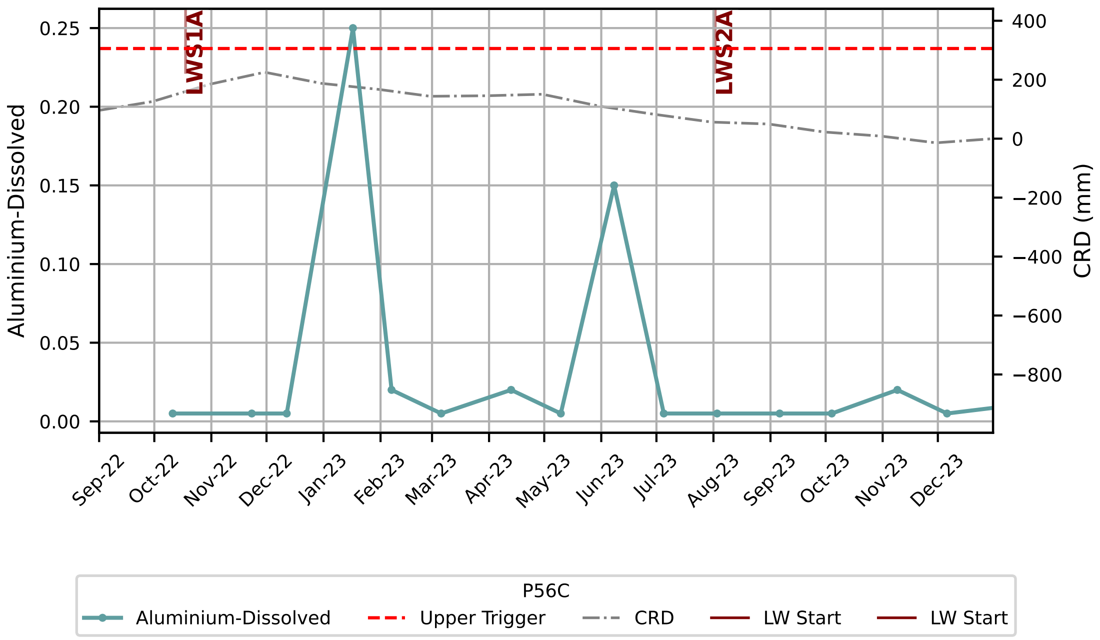


LWS1A
LWS2A
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start

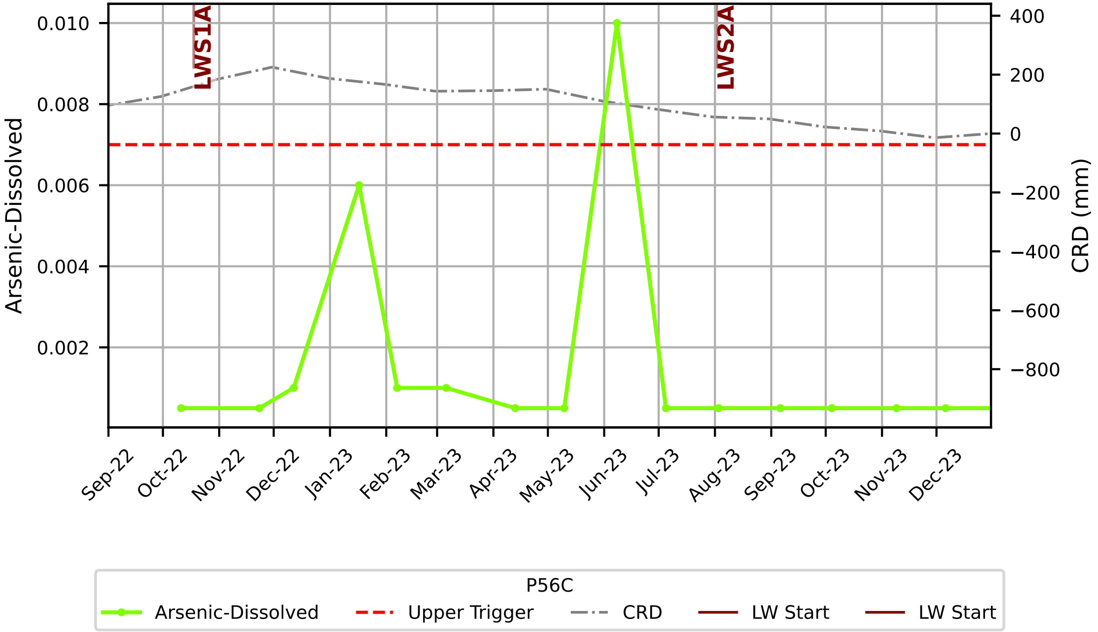

LWS1A
LWS2A
Zinc-Dissolved
CRD (mm)
0.000
0.005
0.010
0.015
0.020
0.025
0.030
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



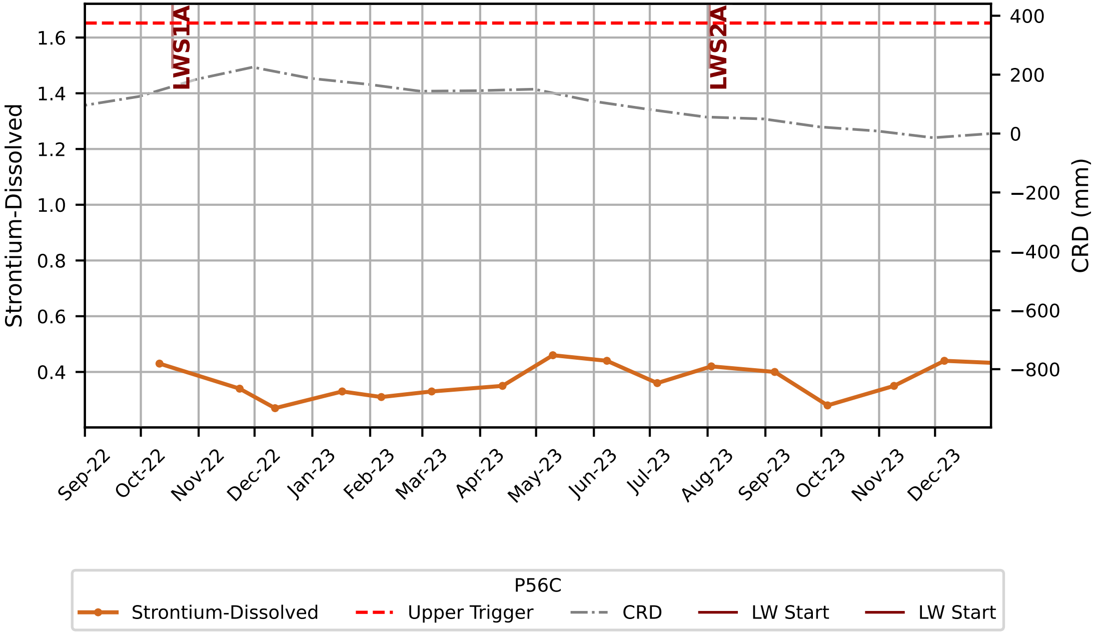
LWS1A
LWS2A
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Nickel-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



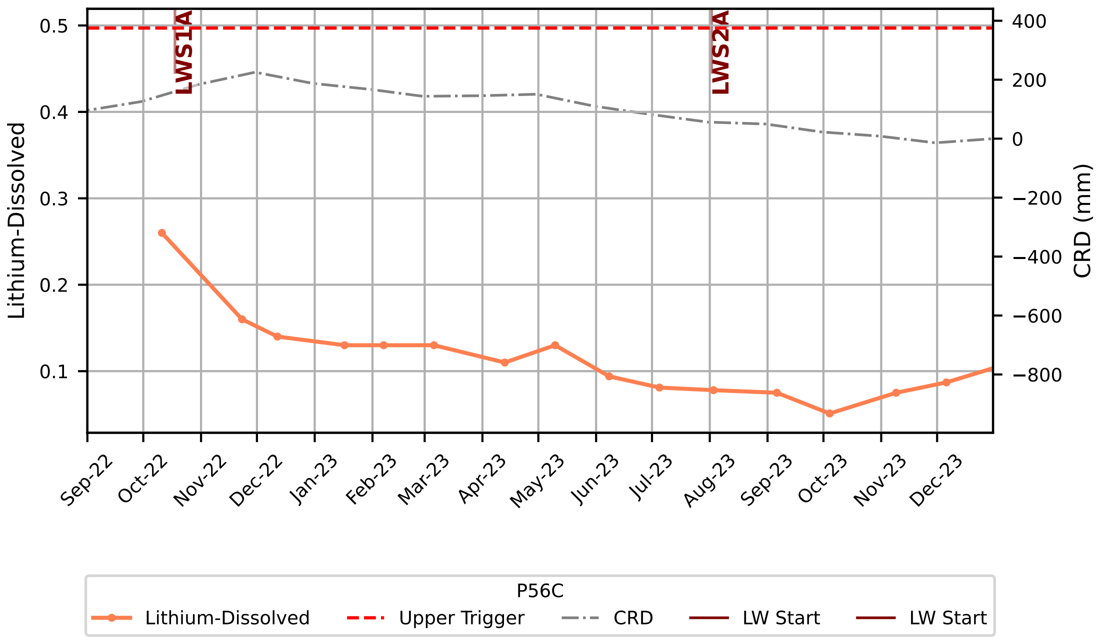
LWS1A
LWS2A
0.25
0.20
0.15
0.10
0.05
0.00
Aluminium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



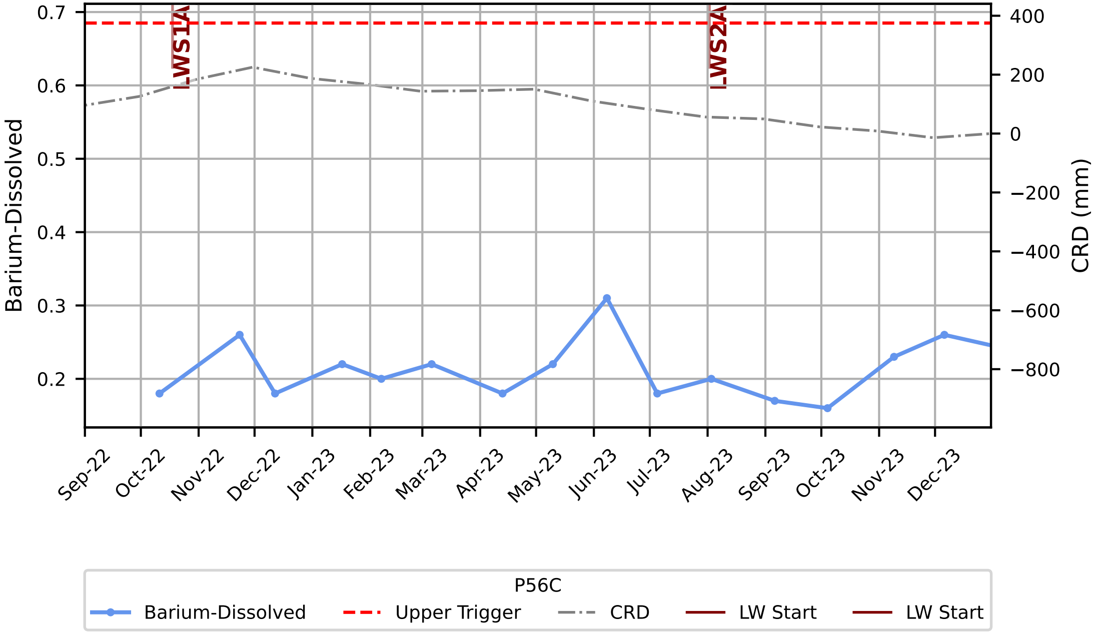
LWS1A
LWS2A
0.010
0.008
0.006
0.004
0.002
Arsenic-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



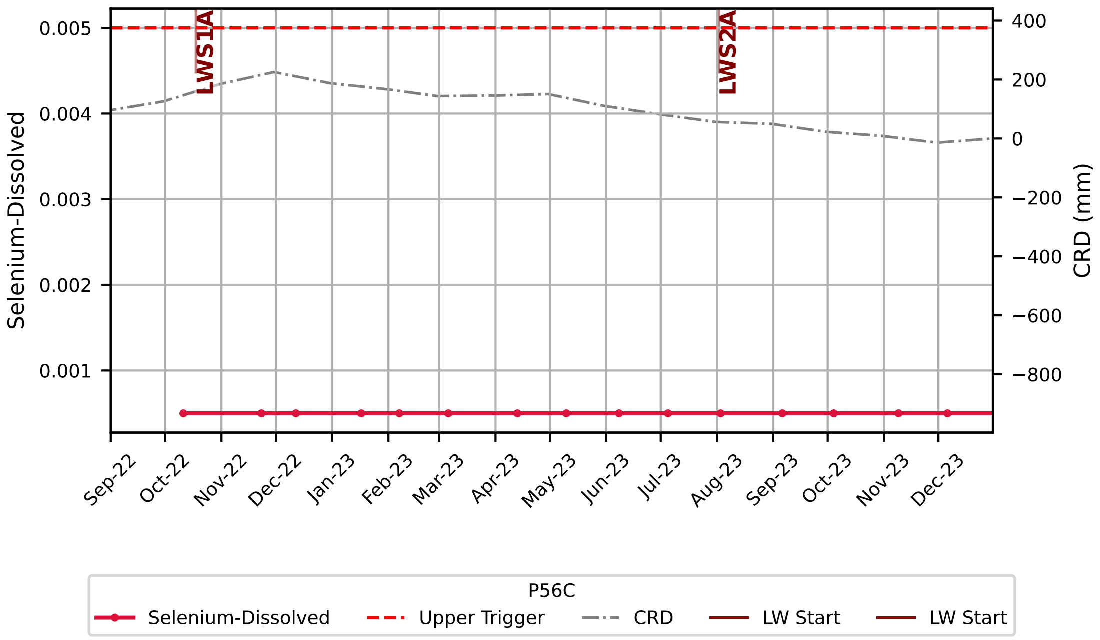
Strontium-Dissolved
CRD (mm)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



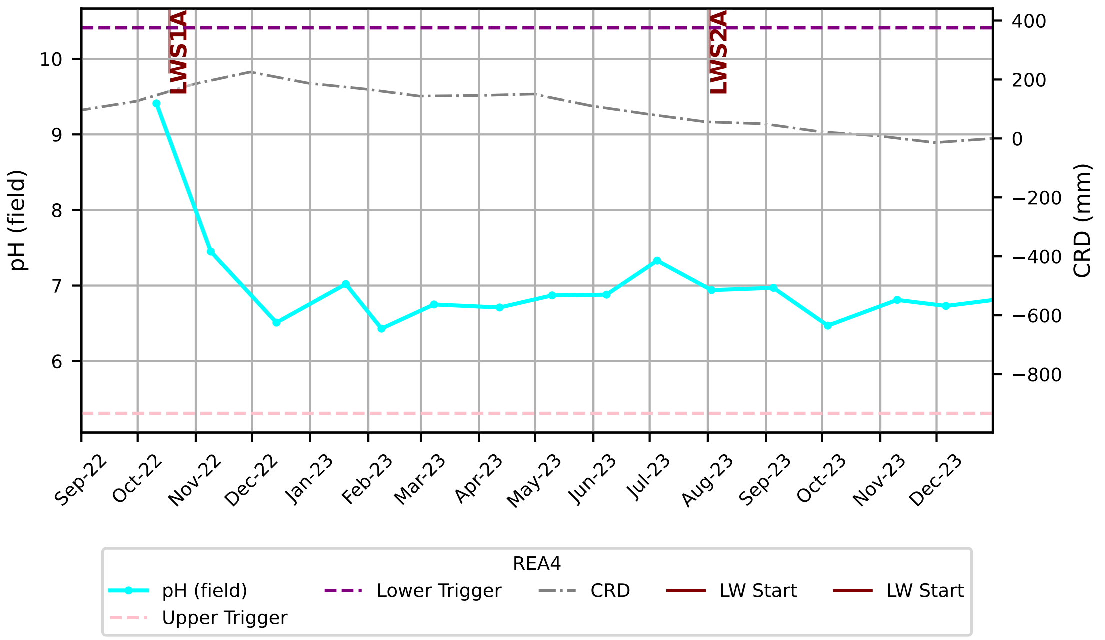
Lithium-Dissolved
CRD (mm)
LWS1A
LWS2A
0.5
0.4
0.3
0.2
0.1
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



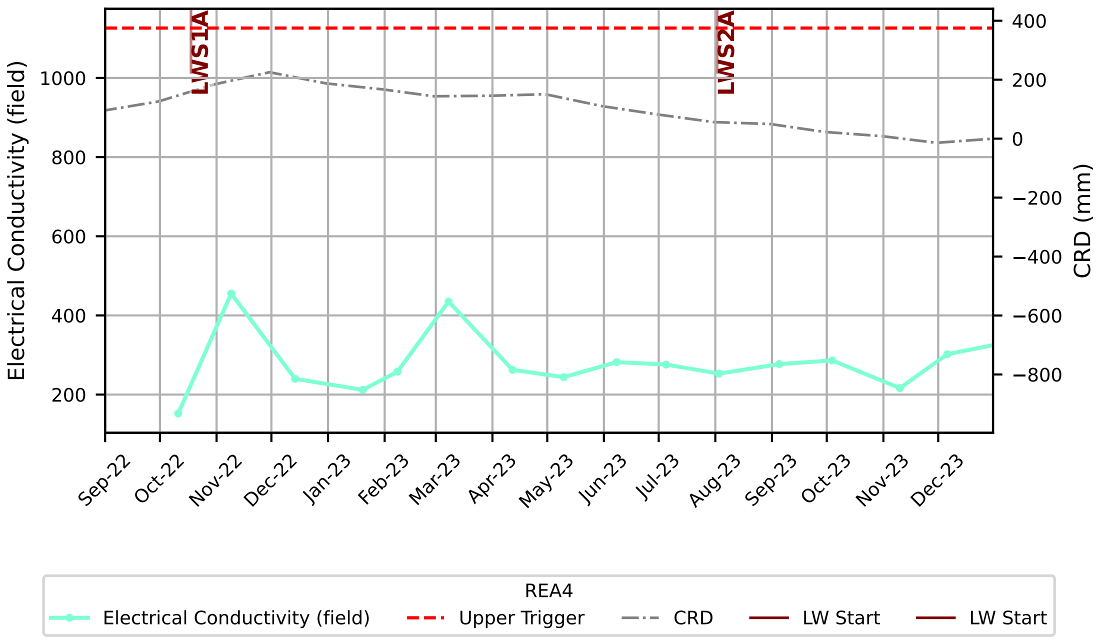
LWS1A
LWS2A
0.7
0.6
0.5
0.4
0.3
0.2
400
200
0
−200
−400
−600
−800
Barium-Dissolved
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



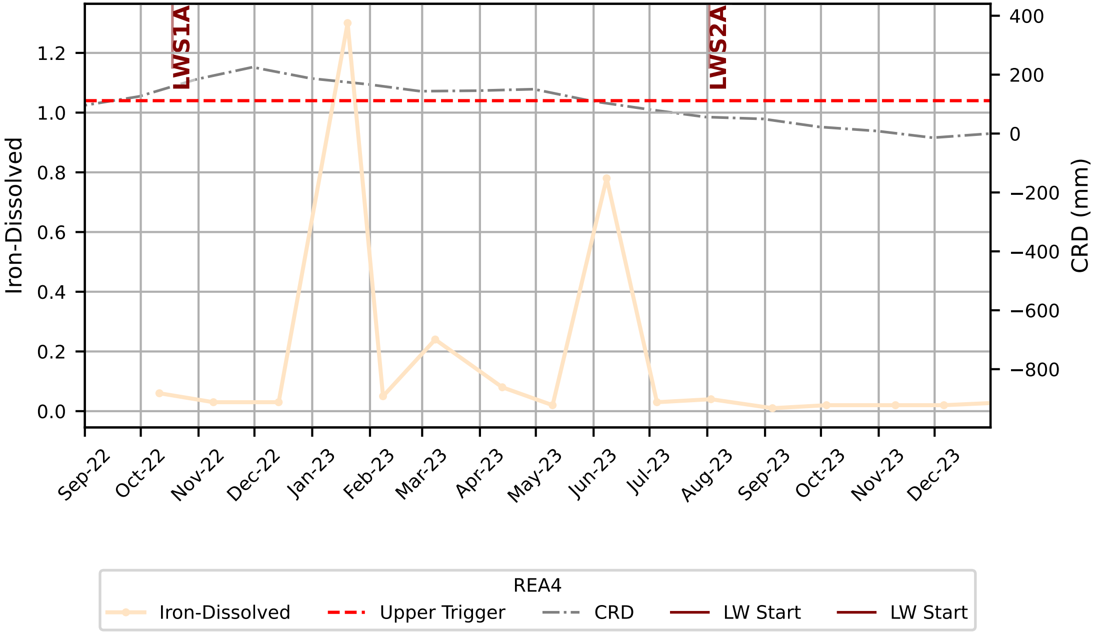
LWS1A
LWS2A
0.005
0.004
0.003
0.002
0.001
Selenium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
P56C
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

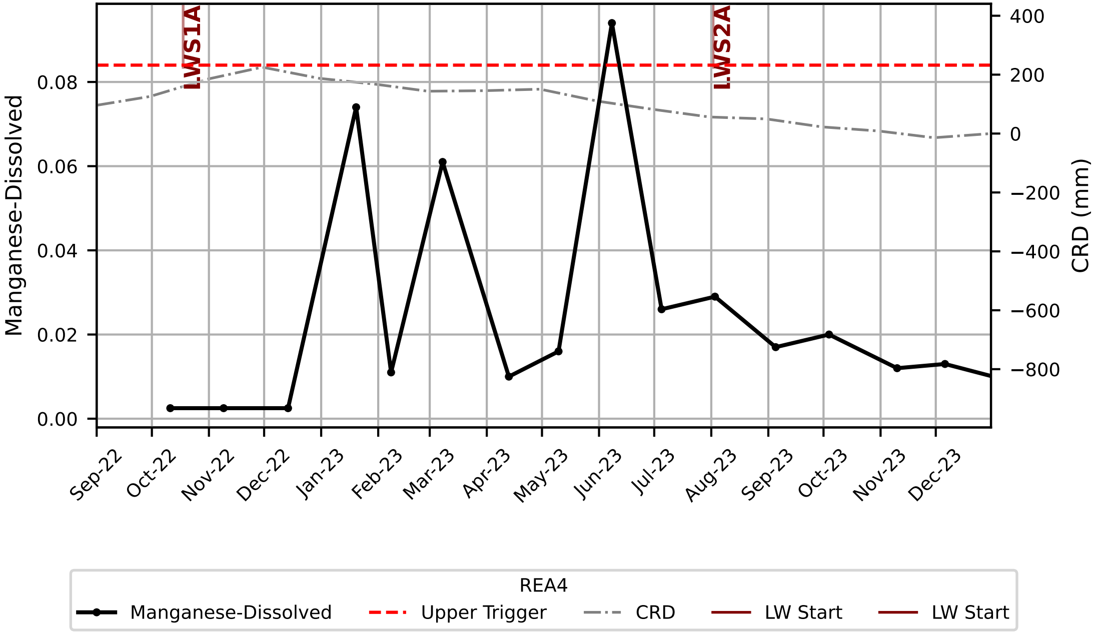


LWS1A
LWS2A
pH (field)
CRD (mm)
10
9
8
7
6
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
pH (field)
Lower Trigger
CRD
LW Start
LW Start
Upper Trigger

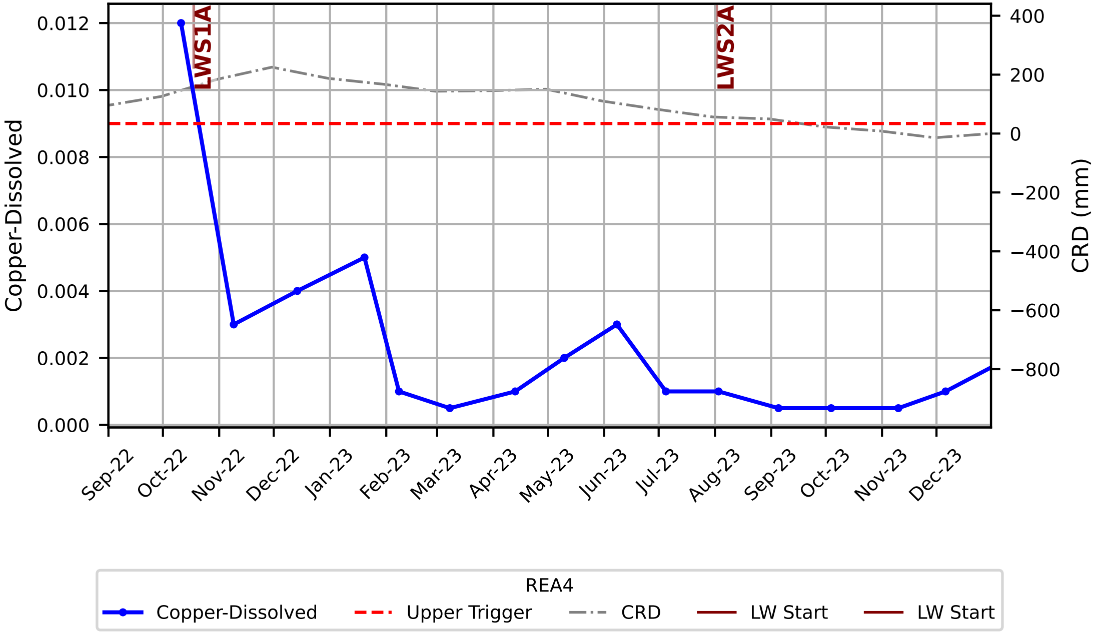


Electrical Conductivity (field)
CRD (mm)
LWS1A
LWS2A
1000
800
600
400
200
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Electrical Conductivity (field)
Upper Trigger
CRD
LW Start
LW Start

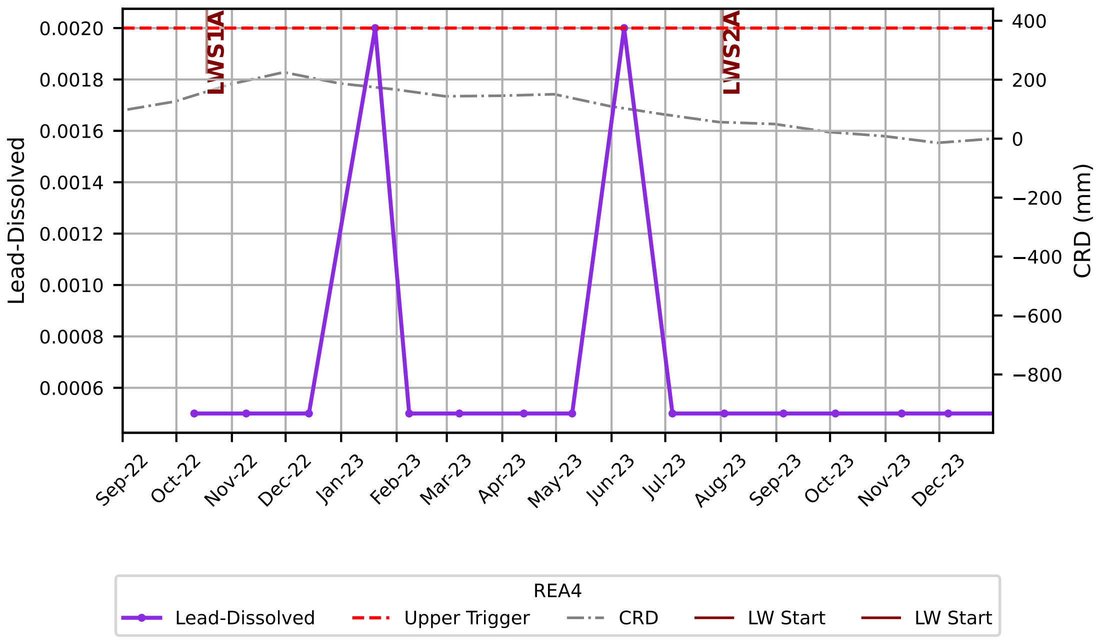

LWS1A
LWS2A
Iron-Dissolved
CRD (mm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Iron-Dissolved
Upper Trigger
CRD
LW Start
LW Start



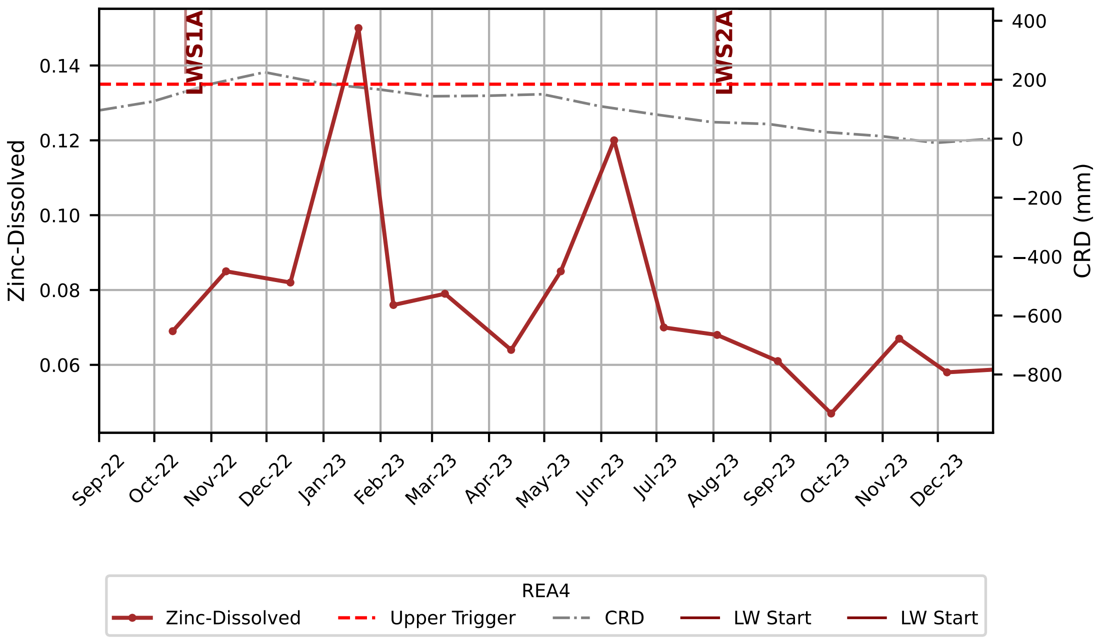
LWS1A
LWS2A
Manganese-Dissolved
0.00
0.02
0.04
0.06
0.08
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Manganese-Dissolved
Upper Trigger
CRD
LW Start
LW Start



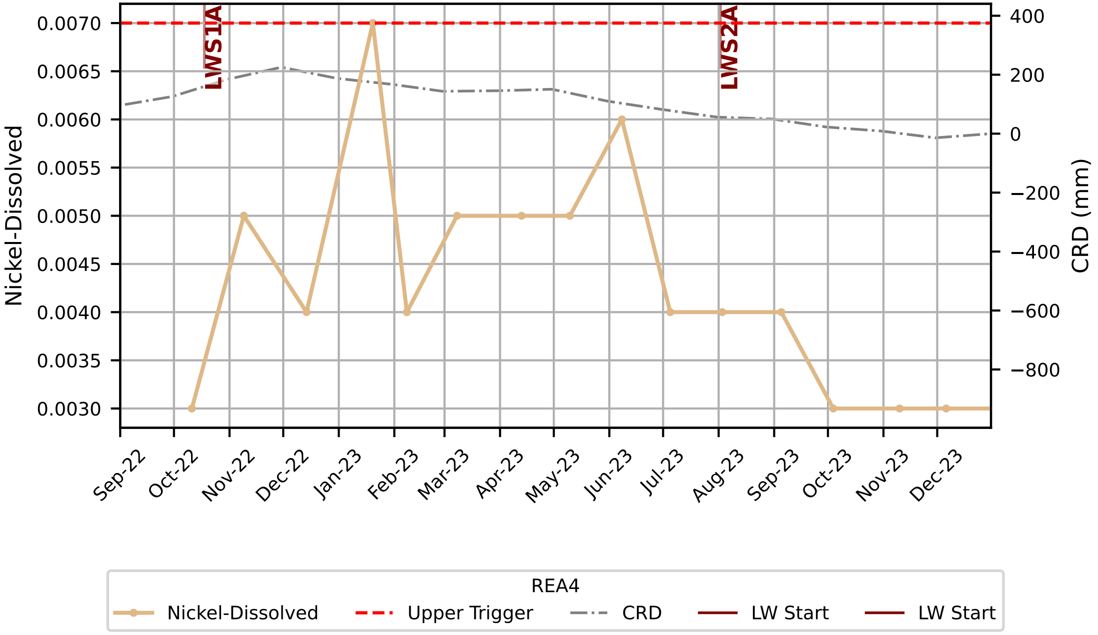
Copper-Dissolved
CRD (mm)
LWS1A
LWS2A
0.000
0.002
0.004
0.006
0.008
0.010
0.012
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Copper-Dissolved
Upper Trigger
CRD
LW Start
LW Start



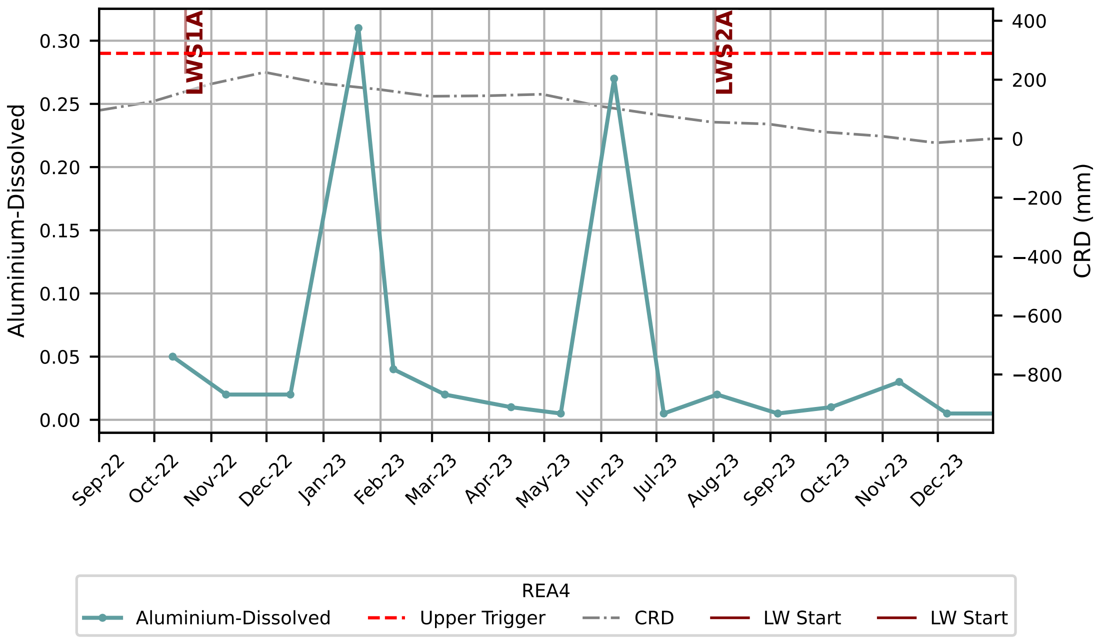
Lead-Dissolved
CRD (mm)
LWS1A
LWS2A
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Lead-Dissolved
Upper Trigger
CRD
LW Start
LW Start



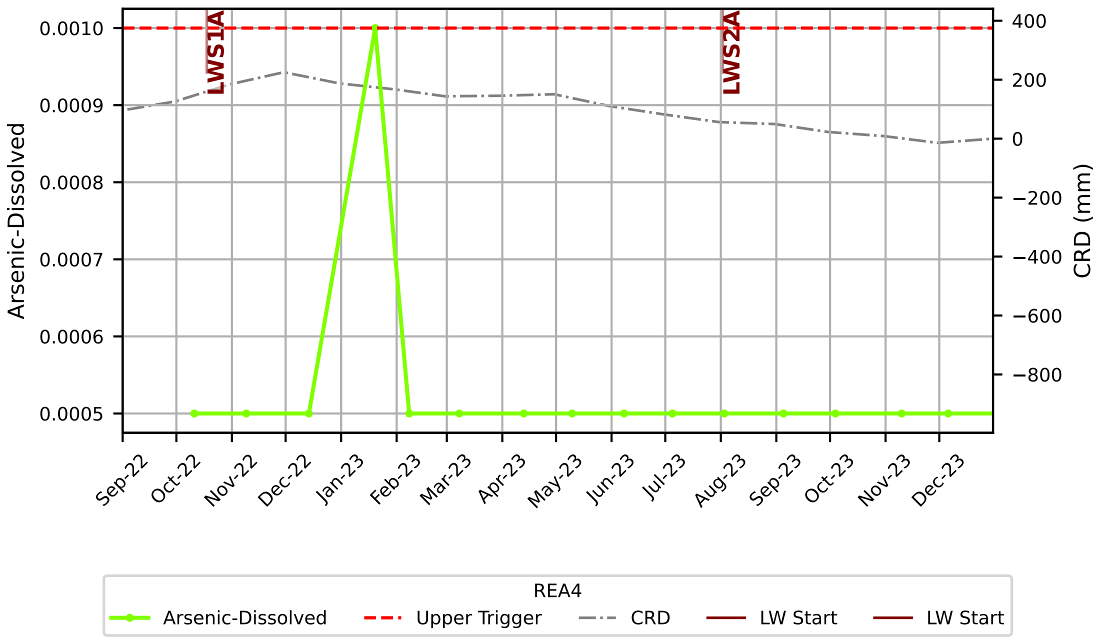
LWS1A
LWS2A
Zinc-Dissolved
0.14
0.12
0.10
0.08
0.06
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Zinc-Dissolved
Upper Trigger
CRD
LW Start
LW Start



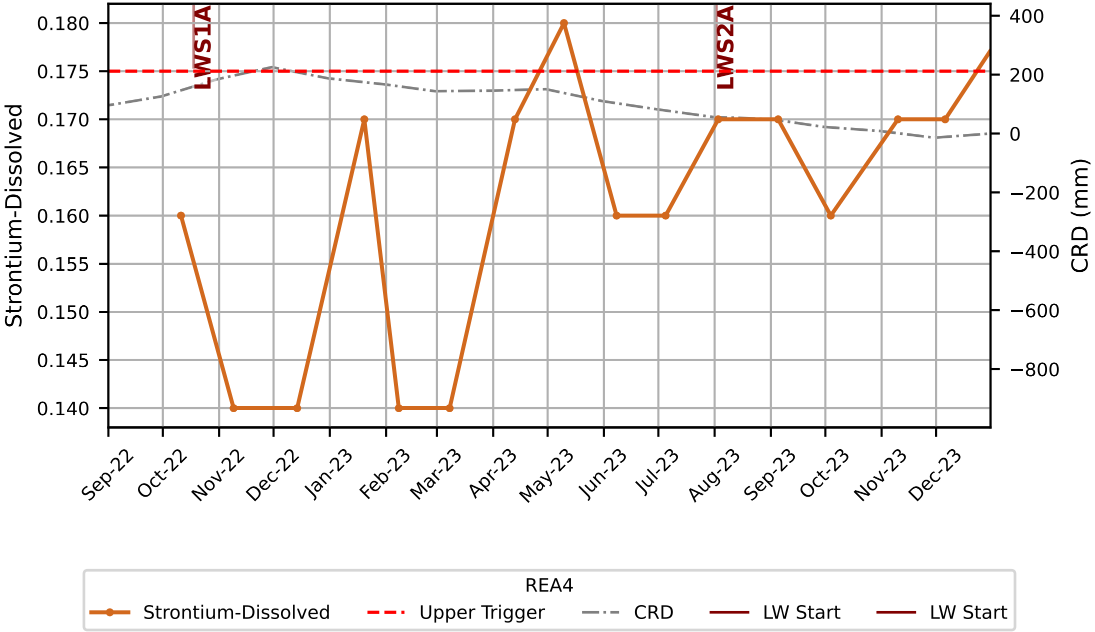
LWS1A
LWS2A
Nickel-Dissolved
CRD (mm)
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Nickel-Dissolved
Upper Trigger
CRD
LW Start
LW Start



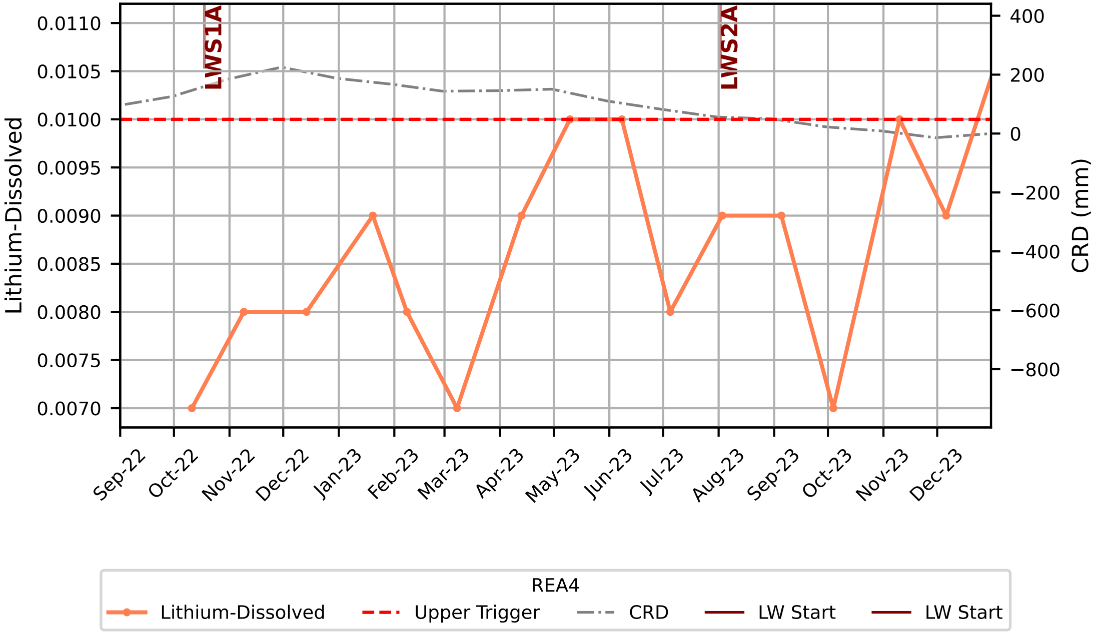
LWS1A
LWS2A
Aluminium-Dissolved
0.30
0.25
0.20
0.15
0.10
0.05
0.00
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Aluminium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



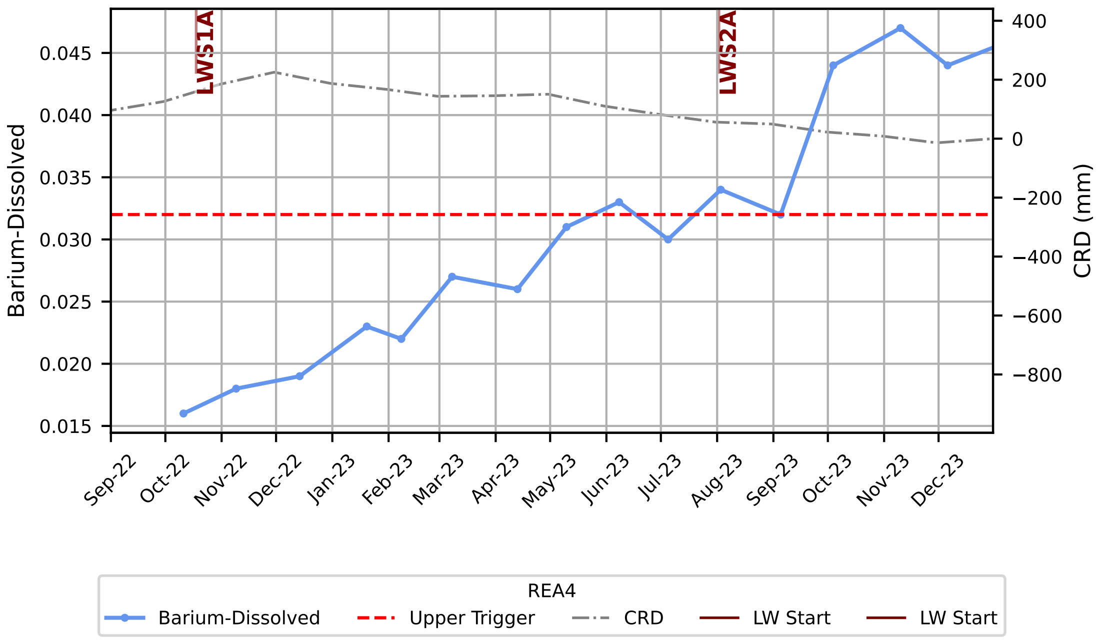
Arsenic-Dissolved
CRD (mm)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Arsenic-Dissolved
Upper Trigger
CRD
LW Start
LW Start



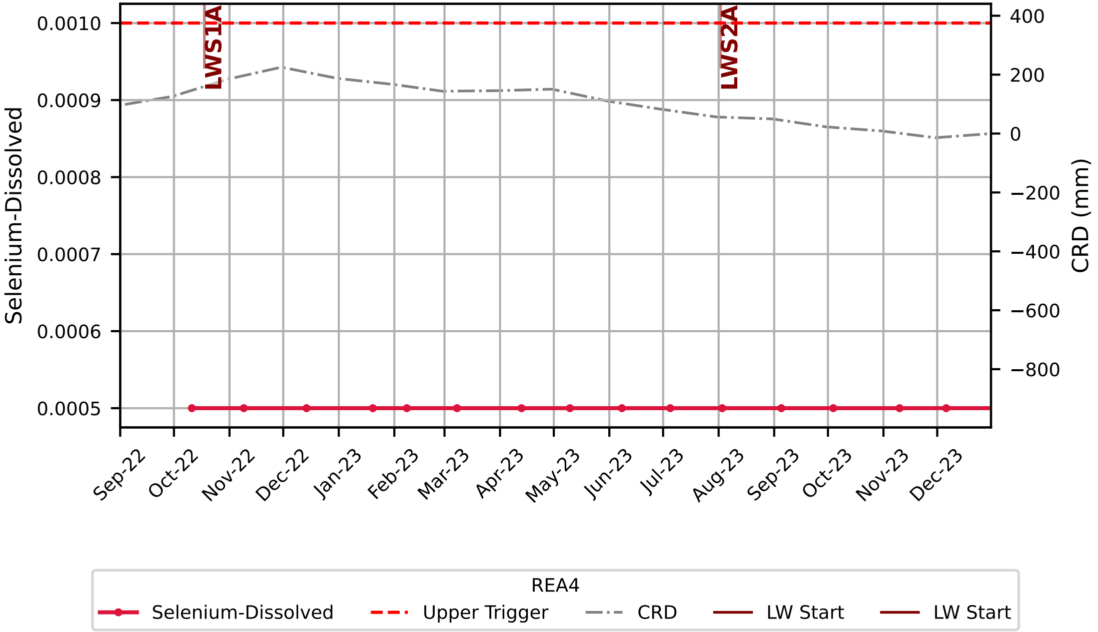
LWS1A
LWS2A
Strontium-Dissolved
0.180
0.175
0.170
0.165
0.160
0.155
0.150
0.145
0.140
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Strontium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

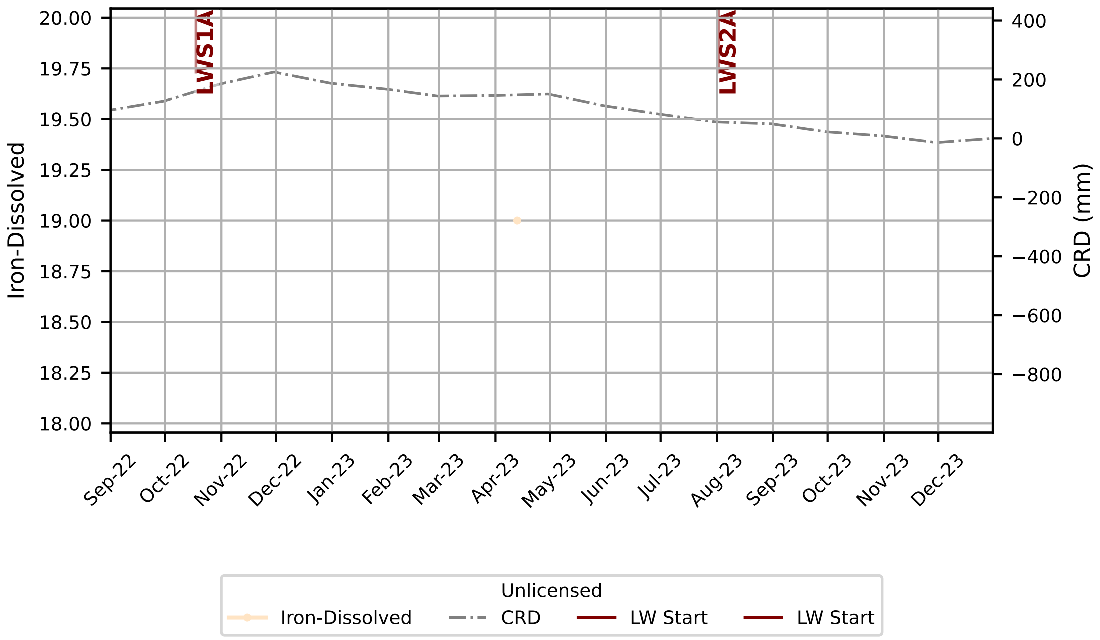


LWS1A
LWS2A
Lithium-Dissolved
CRD (mm)
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Lithium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

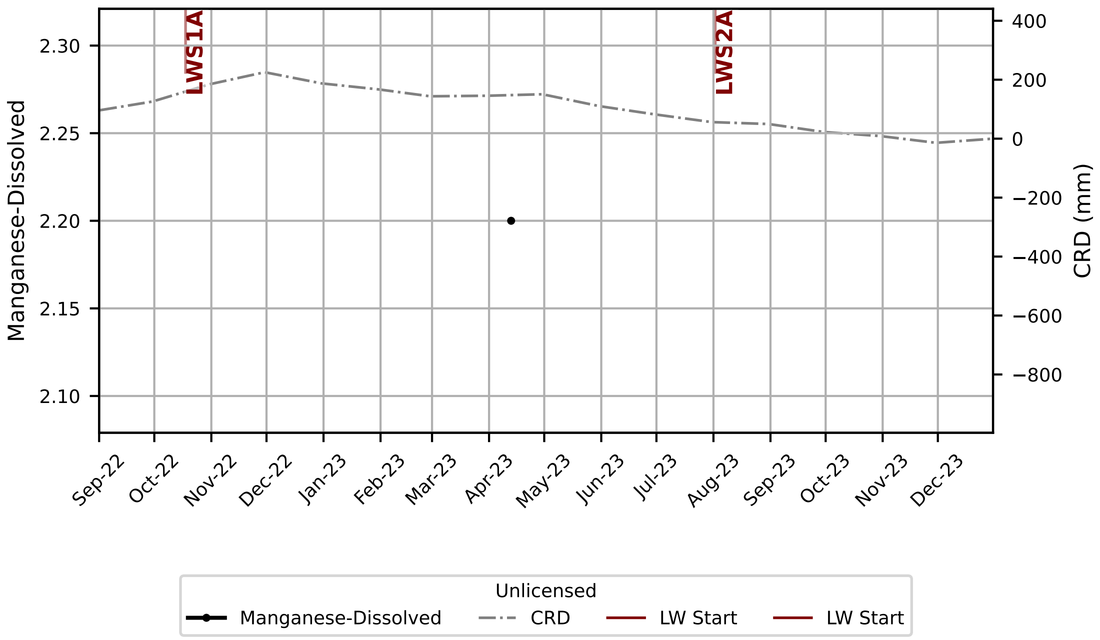


LWS1A
LWS2A
Barium-Dissolved
0.045
0.040
0.035
0.030
0.025
0.020
0.015
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Barium-Dissolved
Upper Trigger
CRD
LW Start
LW Start

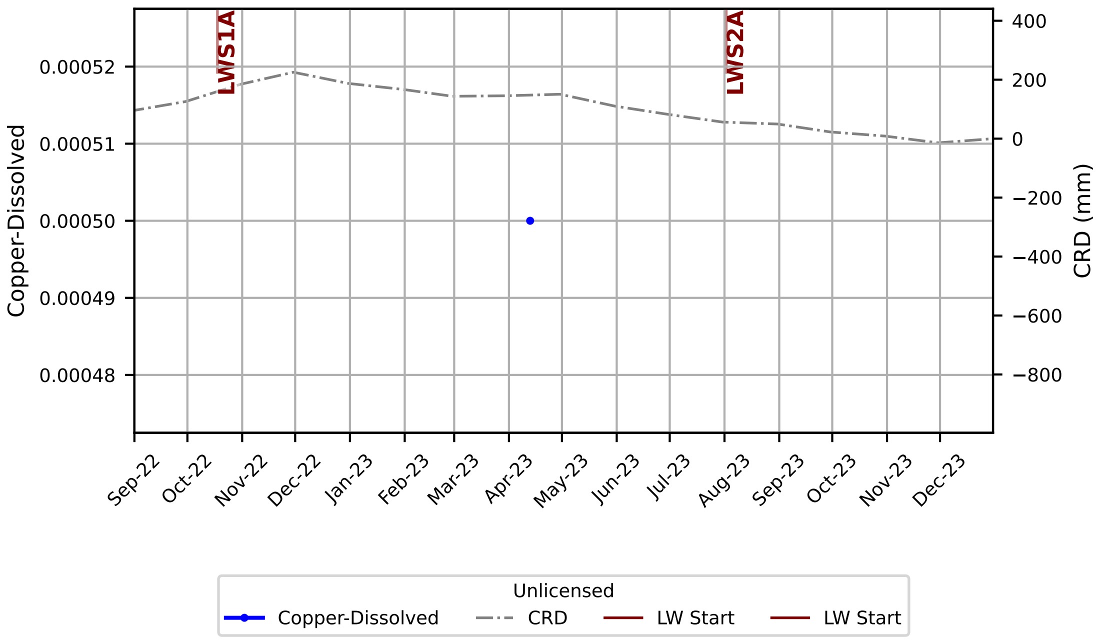

LWS1A
LWS2A
Selenium-Dissolved
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
REA4
Selenium-Dissolved
Upper Trigger
CRD
LW Start
LW Start



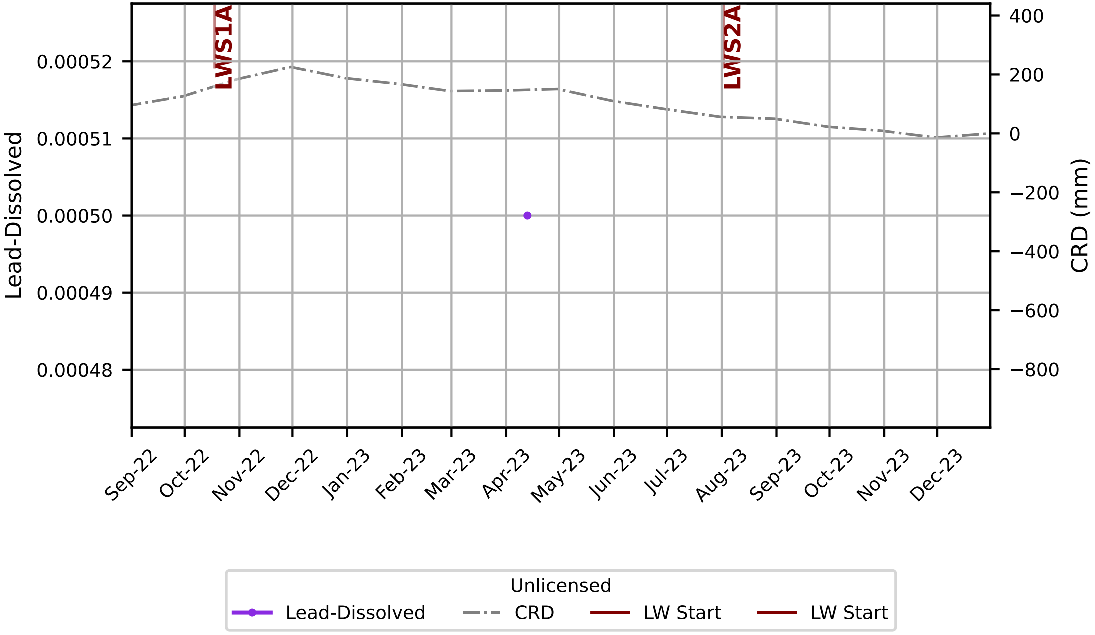
Iron-Dissolved
20.00
19.75
19.50
19.25
19.00
18.75
18.50
18.25
18.00
CRD (mm)
400
200
0
−200
−400
−600
−800
LWS1A
LWS2A
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Iron-Dissolved
CRD
LW Start
LW Start



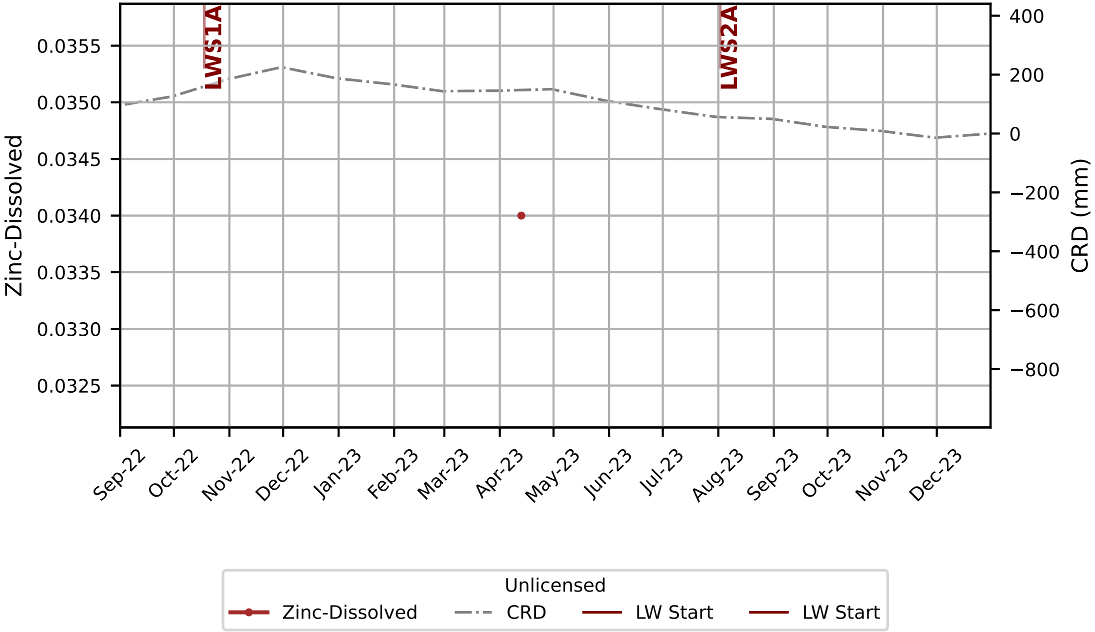
LWS1A
LWS2A
Manganese-Dissolved
2.30
2.25
2.20
2.15
2.10
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Manganese-Dissolved
CRD
LW Start
LW Start



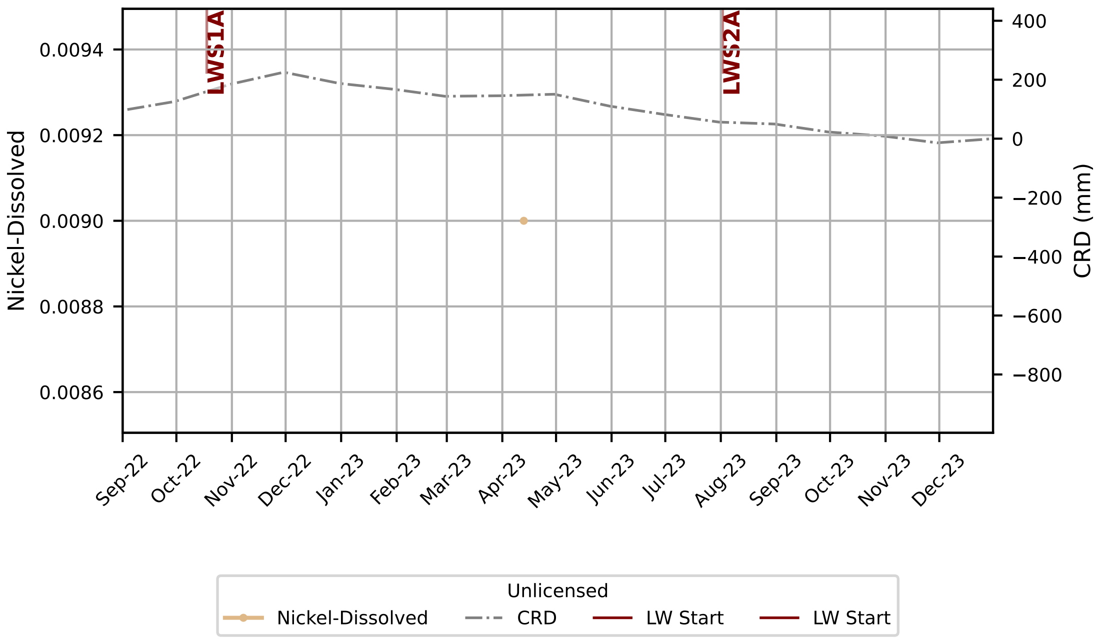
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Copper-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Copper-Dissolved
CRD
LW Start
LW Start



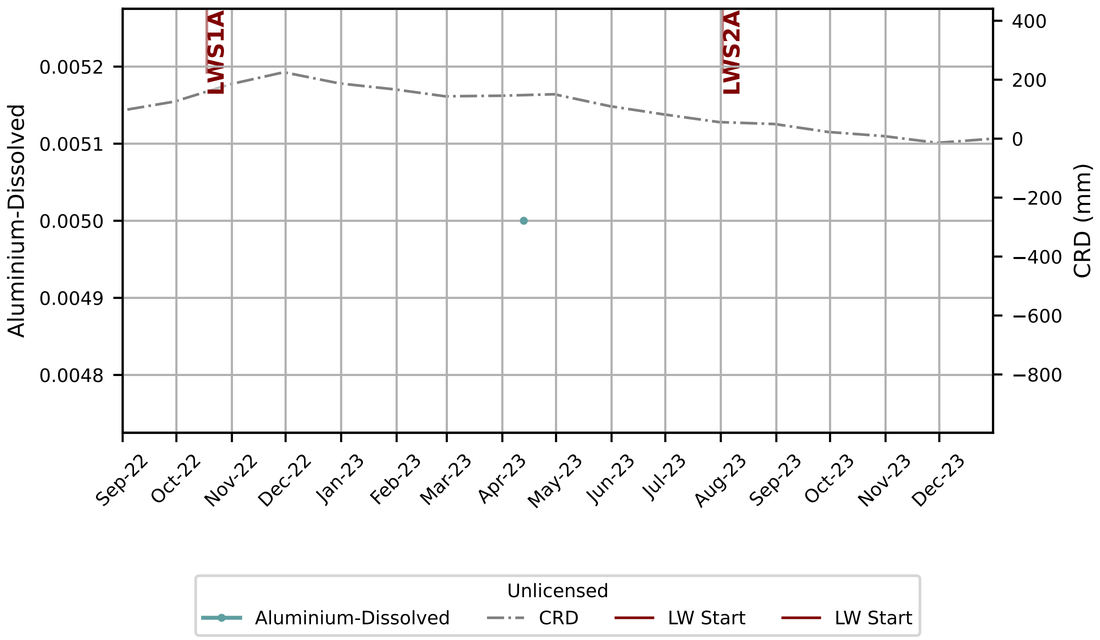
LWS1A
LWS2A
0.00052
0.00051
0.00050
0.00049
0.00048
Lead-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Lead-Dissolved
CRD
LW Start
LW Start



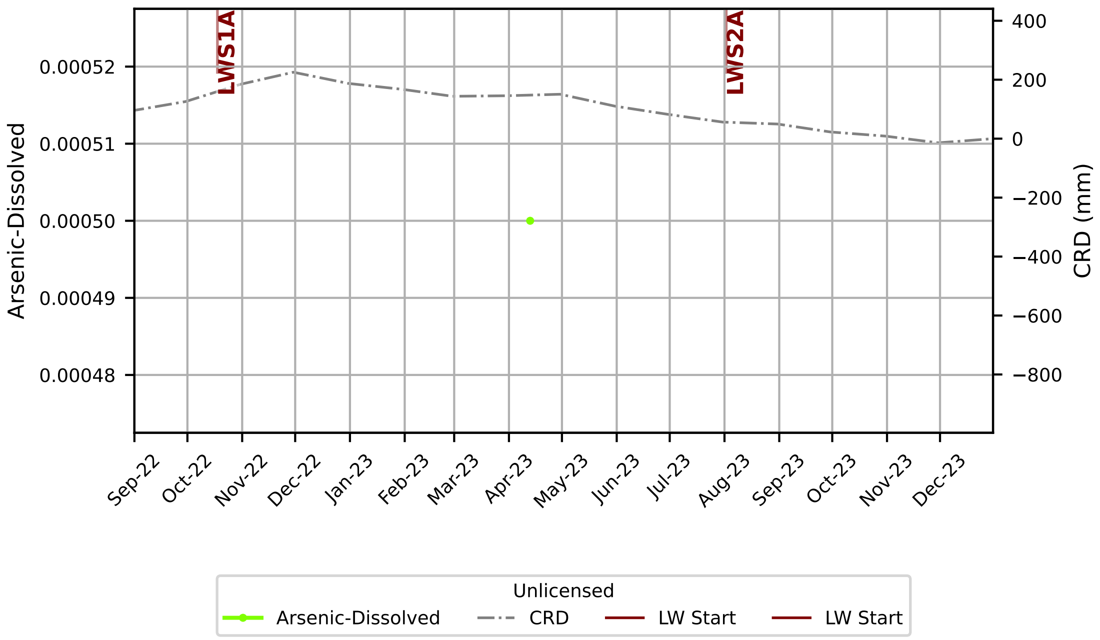
Zinc-Dissolved
CRD (mm)
LWS1A
LWS2A
0.0355
0.0350
0.0345
0.0340
0.0335
0.0330
0.0325
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Zinc-Dissolved
CRD
LW Start
LW Start



LWS1A
LWS2A
0.0094
0.0092
0.0090
0.0088
0.0086
Nickel-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Nickel-Dissolved
CRD
LW Start
LW Start



LWS1A
LWS2A
0.0052
0.0051
0.0050
0.0049
0.0048
Aluminium-Dissolved
400
200
0
−200
−400
−600
−800
CRD (mm)
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Unlicensed
Aluminium-Dissolved
CRD
LW Start
LW Start



LWS1A
LWS2A
Arsenic-Dissolved
CRD (mm)
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0.00051
0.00050
0.00049
0.00048
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
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Sep-23
Oct-23
Nov-23
Dec-23
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Arsenic-Dissolved
CRD
LW Start
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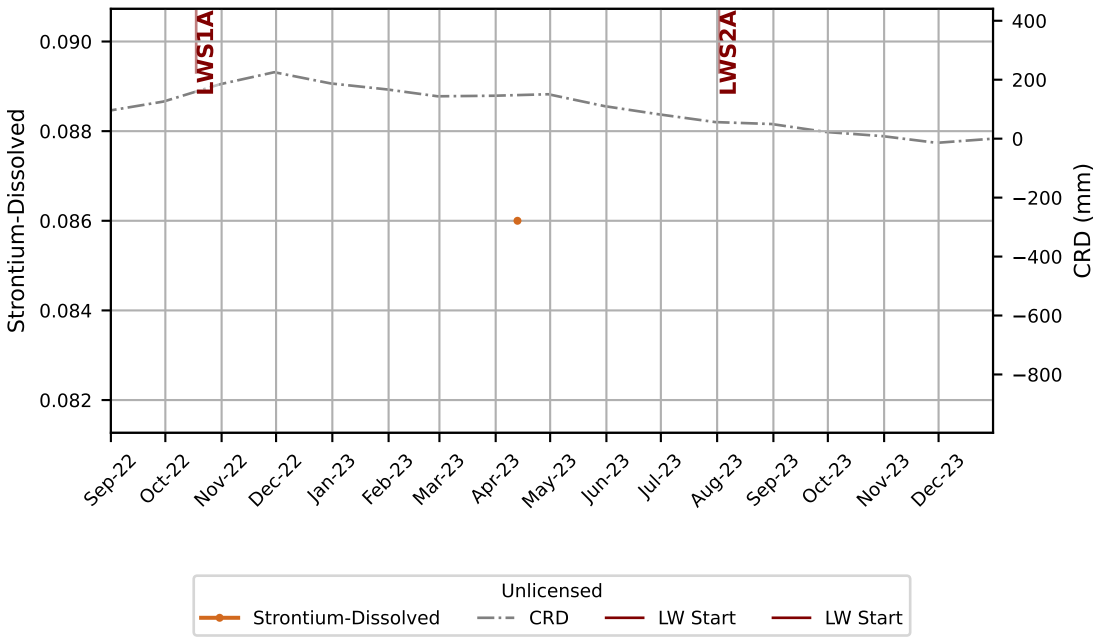

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LWS2A
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0.086
0.084
0.082
CRD (mm)
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−600
−800
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Nov-22
Dec-22
Jan-23
Feb-23
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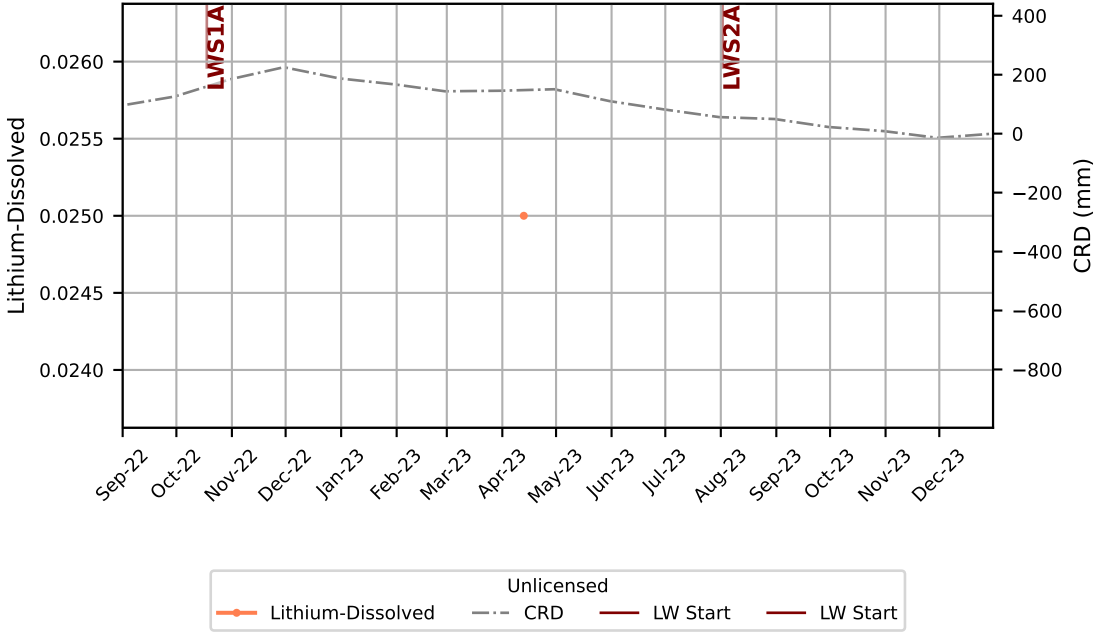
CRD
LW Start
LW Start



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LWS2A
Lithium-Dissolved
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0.0255
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0.0245
0.0240
CRD (mm)
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200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
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Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
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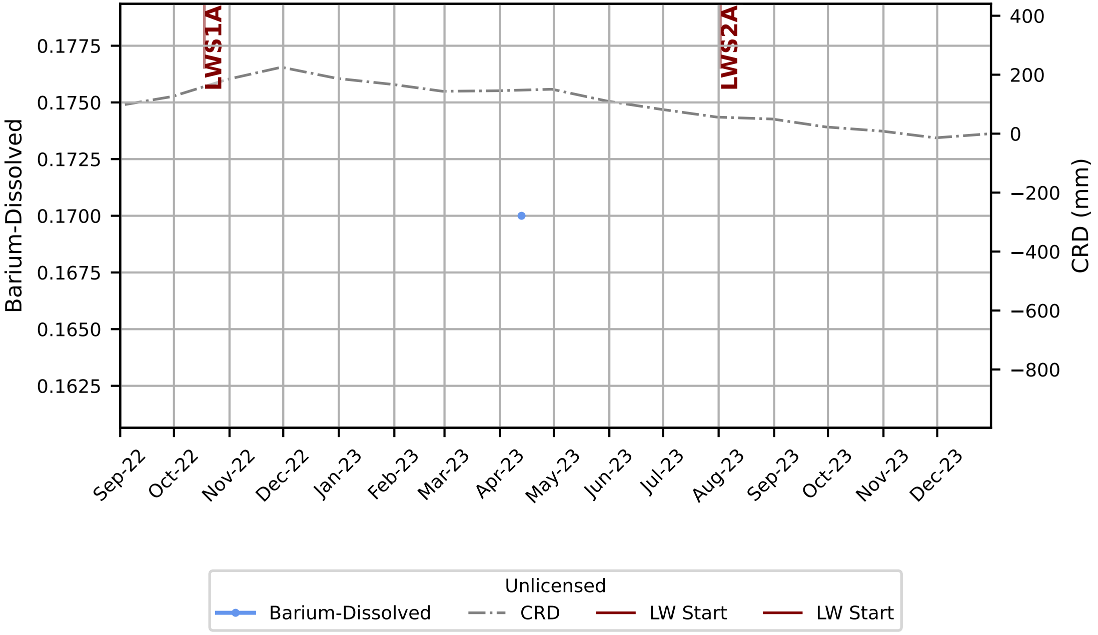
CRD
LW Start
LW Start



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LWS2A
Barium-Dissolved
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0.1750
0.1725
0.1700
0.1675
0.1650
0.1625
CRD (mm)
400
200
0
−200
−400
−600
−800
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
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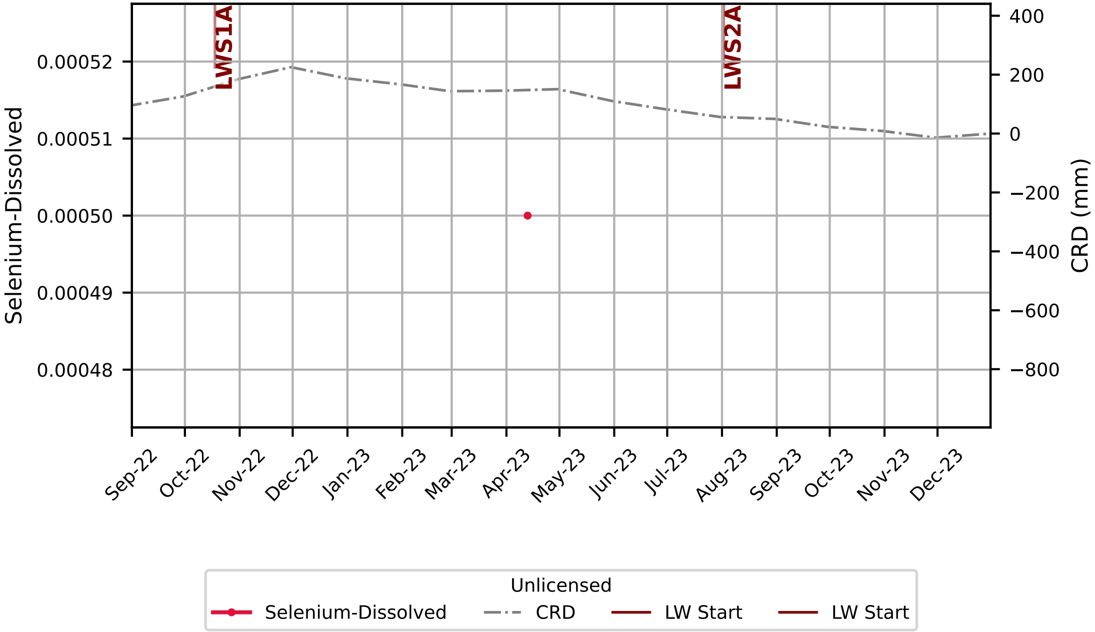
CRD
LW Start
LW Start



Selenium-Dissolved
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0.00050
0.00049
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−200
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Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
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Aug-23
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Dec-23
Unlicensed
Selenium-Dissolved
CRD
LW Start
LW Start

Making Sustainability Happen

Appendix D – Aquatic Ecology Report

Excellence in your environment

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Tahmoor South

Aquatic monitoring report: Spring 2023

Prepared for Tahmoor Coal | 15 March 2024

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Document control

Project number	Client	Project manager	LGA
8234	Tahmoor Coal	Kayla McGregor	Wollondilly

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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 2022). This involves sampling of potential impact sites and non-impacted locations (control sites) that are representative of the waterways present in the study area. The monitoring program is conducted in autumn and spring each year and began in spring 2019. Niche have previously reported on the results of the baseline monitoring period (spring 2019 - autumn 2022. The monitoring program has been modified over time, in line with modifications to the mine plan and reduced potential subsidence impacts, to examine the areas that will potentially be impacted from the LW S1A-S6A only. The baseline aquatic monitoring report (spring 2019 - autumn 2022) presented the collated results of baseline data collected from spring 2019 to autumn 2022 in Tea Tree Hollow, Bargo River, Dog trap Creek, Hornes Creek and Moore Creek (Niche 2022).

The mining of Tahmoor South LW S1A commenced on 18 October 2022. The spring 2023 monitoring data is considered the third round of 'during' mining monitoring for Tahmoor South, having commenced in spring 2022.

The central aim of the report is to document and analyse results from the most recent round of 'during' mining data collection in spring 2023, collected from Tea Tree Hollow, Hornes Creek, Moore Creek and a tributary of 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.

Results

Spring 2023 monitoring results show the following:

- Spring 2023 sampling represented a continuation of flow conditions being more typically in line with baseflow levels, than in contrast to autumn and spring 2022 that were dominated by elevated flows and significant rainfall.
- This was reflected in the observations of low flows, limited organic debris and lower pool levels across the monitoring sites (other than Sites TTHt9, TTH16 and TTHt17 which were dry).
- Observations of mining induced changes to aquatic habitats were observed at Impact Sites TTH16 and TTHt17 (loss of pool water), but not at Site TTH12. Pool water was observed to return at Site TTH13, while new Site TTHt9 was dry.
    - Sites TTH16 and TTHt17 have now shown a reduction in aquatic pool habitat being observed over two consecutive sampling occasions leading to them aligning with a TARP level 1.

- It should be noted that ATC Williams (2024) conclude that the reduction of water levels at TTH16 (surface water monitoring site TT3) and TTHt17 (surface water monitoring site TT12) is related to both mining-induced impacts in combination with prevailing dry weather conditions.

- The water quality readings collected at Impact Site TTH12 (upstream of observed areas of mining induced change) along Tea Tree Hollow are comparable to baseline data, and also to that of the Control sites (TTH12 did however, record its highest dissolved oxygen reading to date in spring 2023).
- The water quality readings collected at Impact monitoring sites (downstream of areas of mining induced change) are suggestive of impaired water quality conditions, with elevated electrical conductivity levels, and low dissolved oxygen and pH levels. However, these are comparable to low values recorded in Tea Tree Hollow in the pre-mining period, and are within the range of values recorded at the Control sites.
- AUSRIVAS samples (collected downstream of areas of mining induced change) indicate that these mining induced changes do not appear to have translated into acute impacts to macroinvertebrate assemblages immediately downstream, as these sites recorded biological scores comparable to baseline data, and also to the Control sites in spring 2023.
- Quantitative macroinvertebrate monitoring data identified low results across a number of indicators at Site TTH12.
  - ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH12 (surface water monitoring site TT2) between July to late November 2023, related to mining effects in combination with the prevailing climatic conditions.
  - 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. In addition, nominal AUSRIVAS results were recorded at this pool.
  - The low macroinvertebrate assemblage results likely reflect the fluctuation in water levels prior to sampling. This pool will be re-assessed in detail in following iterations to determine if the macroinvertebrate assemblage continues to recover.
- At Site TTH13, the quantitative macroinvertebrate analysis identified the lowest results in all three indicators across the monitoring period.
  - ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH13 (surface water monitoring site TT13) between July to November 2023, related to mining effects in combination with the prevailing climatic conditions.
  - Despite this, moderate AUSRIVAS results were recorded, including the presence of one sensitive taxa. Further analysis of the biological data indicate that the macroinvertebrate assemblage at this pool may be in an early stage of development, which tallies with the observations that pool water levels may have recently increased.
  - Further assessment over time will be required to determine whether this pool is on a trajectory of continued recovery.

Conclusions

All impact monitoring sites (with the exception of Sites TTH16 and TTHt17) align with a 'Normal' BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP (Trigger Action Response Plan) level in spring 2023.

Sites TTH16 and TTHt17 have now shown a reduction in aquatic pool habitat being observed over two consecutive sampling occasions leading to them aligning with a TARP level 1. It should be noted that ATC Williams (2024) conclude that the reduction of water levels at TTH16 (surface water monitoring site TT11) and TTHt17 (surface water monitoring site TT12) is related to both mining-induced impacts in combination with prevailing dry weather conditions.

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
Control monitoring 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.
DPI	The NSW Department of Primary Industries
DGV	Default Guideline Value
EPL	Environmental Protection Licence
EPT	Ephemeroptera, Plecoptera and Trichoptera
FM Act	*Fisheries Management Act 1994* (NSW)
Impact monitoring 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.
Km / m / mm	Kilometres / Metres / millimetres
Modal Width	The width which appears most often in a specified length of stream channel
SIGNAL	Stream Invertebrate Grade Number Average Level

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1. Introduction

1.1 Context

The Tahmoor Coal Mine (Tahmoor Mine) is an underground coal mine located approximately 80 kilometres (km) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (NSW). Tahmoor Mine 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 (study 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 (Project) (SSD 8445).

The monitoring program involves sampling of potential impact sites and non-impacted locations (control sites) that are representative of the waterways present in the study area. The monitoring program began in spring 2019 and is conducted 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). The spring 2023 monitoring period that is the focus of this report, represents the third survey completed in the 'during mining' period, with the first being spring 2022.

This report presents the annual results of data collected from spring 2019 to spring 2023 in Tea Tree Hollow, Hornes Creek, Moore Creek, Bargo River Tributary, Bargo River, and Dog Trap Creek. This report focusses on the initial areas that are being mined under the extraction plan (Tahmoor Coal 2023). The waterways that are likely to be directly impacted include Tea Tree Hollow and associated tributaries.

This report focusses on the initial areas that will be mined under the Longwall (LW) S1A-S6A Extraction Plan (Tahmoor Coal 2023). Mining of LW S1A began 18 October 2022 (Table 1). At the time of the spring 2023 field surveys, extraction from LW S1A was complete, and 946 metres of coal had been extracted from the LW 2SA, as of 15 December 2023 (MSEC 2023).

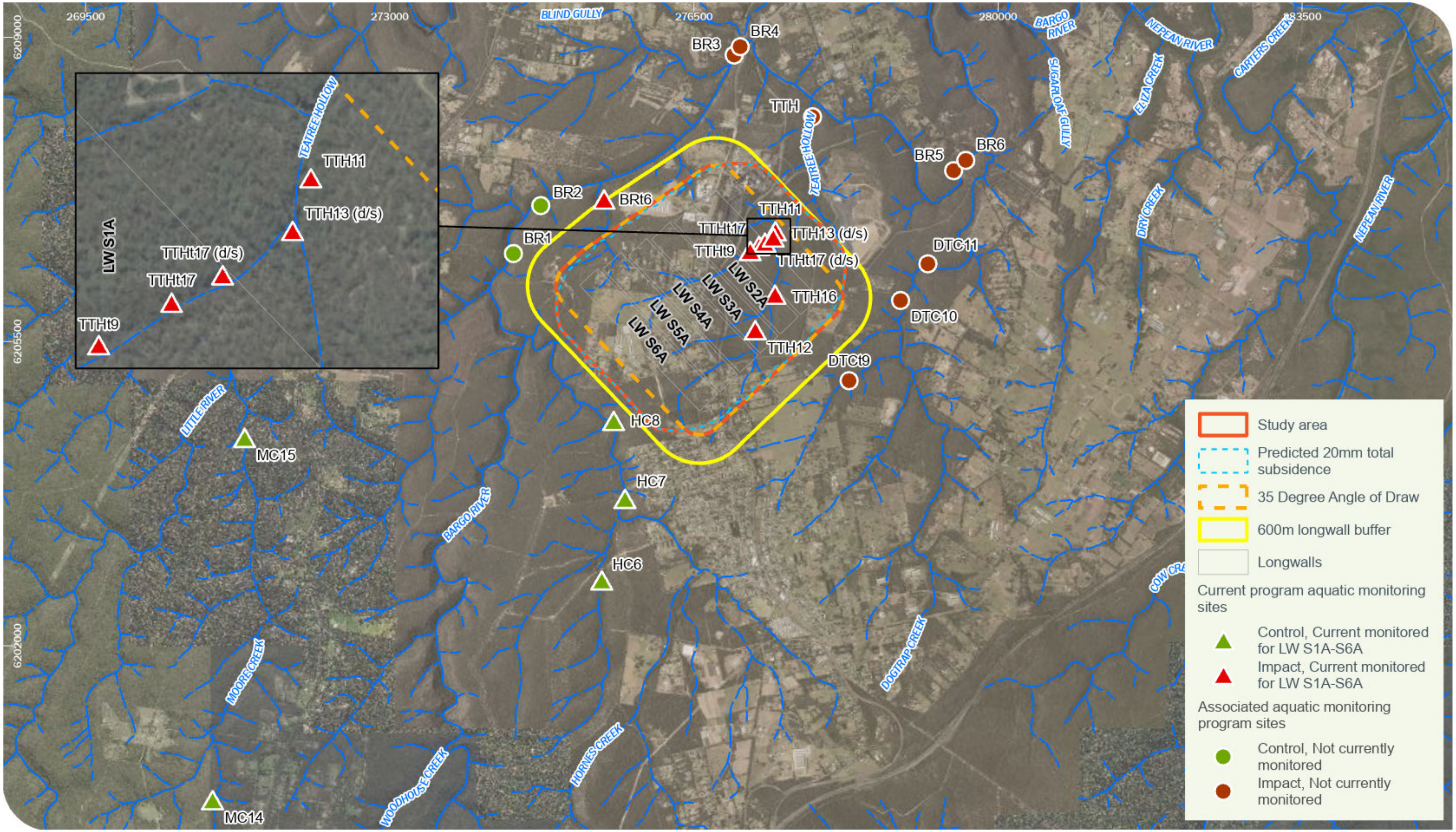
Table 1: Longwall start and completion dates

Longwall	Longwall start	Longwall progress
LW S1A	18 October 2022	7706 metres (complete) on 4 July 2023
LW S2A	2 August 2023	946 metres on 15 December 2023
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) TARPs (Trigger Action Response Plans) for aquatic ecology (Tahmoor Coal 2022). To achieve this, the report documents, and analyses results from the most recent annual round of data collection in spring 2023, during mining. Baseline data collected from spring 2020 to autumn 2022 has been previously reported on (Niche 2022), however relevant data has also been presented and analysed in this report. The monitoring program uses a BACI (Before-After, Control-Impact) approach to identify any indicators of mining impacts to stream health.

Monitoring was conducted using standard Australian Rivers Assessment System (AUSRIVAS) methods and quantitative macroinvertebrate survey techniques. This process informs the adaptive management of the waterways and monitoring under the BMP for the Project.



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Environment and Heritage

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Tahmoor South: aquatic monitoring sites

Niche PM: Luke Stone
Niche Proj. #: 7501
Client: Tahmoor Coal Pty Ltd

Figure 1

2. Methods

2.1 Subsidence study area and sampling locations

The study area is based on the potential subsidence area of Tahmoor Mine and also includes Control sites that will not be impacted by mining (Figure 1). The current monitoring program includes Hornes Creek, Moore Creek, Tea Tree Hollow and a Tributary of Bargo River.

This report assesses thirteen monitoring sites that form the focus of the current monitoring program. These comprise potential Impact sites along Tea Tree Hollow and Control sites (non-impacted) within Hornes Creek and Moore Creek. Control Site HC6 and impact Sites BRt6 and TTHt9 have been added to the program in the spring 2023 round of monitoring in order to assess potential impacts to these sections of waterway associated with potential future Longwall panels.

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 monitoring 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. This is the case for BRt6 on the tributary of Bargo River. 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 Extraction Plan. 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. However, should an impact be subsequently detected, data collected at these sites will provide useful comparisons for the pre-mining baseline period. These sites will continue to be used as Control sites for the program as long as no measurable subsidence impact is observed.

The current monitoring sites are presented in Table 2 and are shown in Figure 1. Additional site details are presented in Annex 1 (Table 16). Please note that as of spring 2023, site names have been reviewed and updated for consistency and clarity. Previous site names, codes and numbers can be found in Annex 1 (Table 16).

Table 2: Current aquatic monitoring sites

Site	Surface water sampling code (ATC Williams 2024)	Location	Monitoring period	Easting	Northing
Control monitoring sites					
HC6*	-	Hornes Creek (upstream)	Spring 2023	275438	6202753
HC7*	-	Hornes Creek	Spring 2019 - Spring2023	275705	6203691
HC8*	HC9	Hornes Creek (downstream)	Spring 2019 - Spring 2023	275575	6204588
MC14**	-	Moore Creek (upstream)	Autumn 2020 - Spring 2023	270959	6200225
MC15**	-	Moore Creek (downstream)	Spring 2019 - Spring 2023	271328	6204392

Site	Surface water sampling code (ATC Williams 2024)	Location	Monitoring period	Easting	Northing
Impact monitoring sites					
TTHt9	TT9	Tea Tree Hollow Tributary (western arm) upstream	Spring 2023	277146	6206543
TTH12	TT2	Tea Tree Hollow upstream	Spring 2019 - Spring 2023	277204	6205632
TTH13 (TTH11)	TT13	Tea Tree Hollow downstream	Autumn 2020 - Spring2023	277437	6206801
TTH13 (d/s)	-	Tea Tree Hollow – downstream of TTH13 (Site 13/TTH11)	Autumn 2023 – Spring 2023	277436	6206771
TTH16	TT3	Tea Tree Hollow (Australian Wildlife Sanctuary)	Spring 2021 - spring 2023	277432	6206040
TTHt17	TT12	Tea Tree Hollow tributary (Western arm) – downstream of Site 17	Spring 2021 - spring 2023	277246	6206601
TTHt17 (d/s)	-	Tea Tree Hollow Tributary (western arm) – downstream of Site 17	Autumn 2023 – Spring 2023	277315	6206638
BRt6	BR6	Tributary of Bargo River	Spring 2023	275464	6207135

**Upstream of, and outside of, the area of predicted subsidence impacts. Should an unexpected impact be subsequently detected, site will be utilised as an additional impact monitoring site (with pre-impact baseline data).*
***Quantitative and water quality monitoring only*

Pre-mining (baseline) monitoring within Dog Trap Creek has 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 (Table 16). Pre-mining data from Dog Trap Creek will be reported separately to this program.

A total of 23 sites have been sampled to date as part of the program or associated programs in the locality. Data from these sites may be called upon if any indicators of impacts are identified to assist in the interpretation and identification of impacts. Site details for all relevant monitoring sites are presented in Annex 1 (Table 16).

Changes to the monitoring program

In 2020 Niche advised changes to the monitoring program in response to the modified mine plan and reduced potential subsidence impacts. These recommendations included removal of Bargo River from the monitoring program 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 EPL 1389. The data from this program could 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 the use of Moore Creek and Hornes Creek as control sites. These recommendations have been adopted by the program.

In 2023 Niche advised changes to the monitoring program again 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.

The program was modified in 2021 in response to the mining schedule and mine design changes. As such, sites on Bargo River and Dog Trap Creek are not currently monitored. The Bargo River was removed from the program as recommended in Niche (2020) as it is unlikely to be impacted by the Project, is confounded by mine water discharge, and already comprehensively monitored by the long-term Aquatic Health Monitoring Program required under Environmental Protection Licence (EPL) 1389. The data from this program could be interrogated in the unlikely event that ecologically significant impacts occur in the Bargo River from the Project. Predicted mining progression and impacts at monitoring sites in the previous iteration of the monitoring program have prompted Niche to modify the program. As such the monitoring sites will include the same as in the 2022 iteration of the program, as well as the addition of the following:

- Two additional AUSRIVAS (only) 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.
- One additional AUSRIVAS and quantitative impact monitoring site (TTHt9) at surface water monitoring location TT9 (along Tea Tree Hollow), upstream of current monitoring sites to address potential impacts to this creek associated with LW S3A – S6A.
- One additional AUSRIVAS and quantitative impact monitoring site at surface water monitoring location BRt6 (Tributary of the Bargo River), to address potential impacts to this tributary associated with LW S4A- S6A.
- One additional AUSRIVAS and quantitative control monitoring site along Hornes Creek, HC6, to account for the predicted future change of HC8 from control to impact, associated with LW S7A.

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 made 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.

2.4 Macroinvertebrate survey

2.4.1 AUSRIVAS

The AUSRIVAS method of sampling both pools and riffles was 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 m either side as a continuous line or in disconnected segments. Sampling in segments was undertaken to ensure the sampling of all sub-habitats, such as 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 animals in addition to those that were conspicuous or slow. The animals collected at each site were placed into a labelled jar containing 70% ethanol.

The chemical and physical variables required for running the AUSRIVAS predictive model were also recorded i.e. alkalinity, modal depth and width of the stream, percentage bedrock, boulder, or cobble along with latitude and longitude. Distance from stream source, altitude, land-slope, and rainfall were also calculated.

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 m within 2 m of the 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 µm mesh sieve. All material retained on the 500 µm mesh sieve was preserved in 70% ethanol 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 pool 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. Observed to Expected ratio (OE50), Stream Invertebrate Grade Number Average Level (SIGNAL2), and number of taxa were the indices used to interpret stream health.

OE50

The OE50 is the ratio of the number of invertebrate families observed at a site (NTC50) to the number of families expected (NTE50) at that site. Only macroinvertebrate families with a greater than 50% predicted probability of occurrence are used by the model. OE50 provides a measure of biological impairment at the test site. Bands derived from the OE50 indicate the level of impairment of the assemblage. The OE50 ratios are divided into bands representing different levels of impairment (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 and the level of pollution tolerance

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

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

Note: SIGNAL2 scores are indicative only and pollution does not refer to just 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 SIGNAL score even though they are occurring in a natural condition state.

Taxa Richness

The richness of macroinvertebrate families (or class/orders if not identified to family level) was calculated as an indicator of stream health. The higher the number, the healthier the aquatic ecosystem.

EPT Index

The EPT (Ephemeroptera, Plecoptera and Trichoptera) index is based on the insect orders that contain a majority of 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

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 original statistical analysis design to detect change is described in Niche (2023b). 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. Further discussion of this limitation is detailed in section 2.5. Similar limitations have applied to the autumn 2023 data. To remedy this limitation, an alternate statistical design has been developed for the autumn 2023 data analysis (removing SitesTTHt9, TTH16, TTHt17). Site BRt6 will be incorporated into the statistical analysis design once a suitable number of seasonal replicates have been collected and the site becomes at risk of impacts.

For this report, a five-Factor experimental design following the BACI approach has been implemented (Table 6).

Table 6: Statistical experimental design (spring 2023)

Factor	Type	Levels/Type	Degrees of freedom (DF)
Tr	Fixed – Orthogonal to Pe	Impact, Reference	1
Pe	Fixed – Orthogonal to Tr	Before, During	1
St(Tr)	Random nested within Treatment	Impact – Tea Tree hollow Reference – Moore Creek, Hornes Creek	1
Su(Pe)	Random nested within Period	Before: Autumn 2020, Spring 2022, Autumn 2021, Spring 2021, Autumn 2022, Spring 2022 During: Autumn 2023, Spring 2023	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

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). The significance level was set at $p < 0.05$ for all statistical tests.

Pairwise comparisons were performed to further investigate significant Factors identified in the PERMANOVA for comparisons 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 in Anderson et al. (2008).

Principle Coordinates Analysis (PCoA) was used to provide a graphical representation of the macroinvertebrate assemblage. Vector overlays based on the Spearman's Correlation Coefficients were added to the graphical output base to display the strongest drivers of differences. The PCoA routine allows for the multivariate assemblages to be visualised using metric multidimensional scaling. This approach is more appropriate when PERMANOVA is applied than traditional uses of non-metric Multidimensional Scaling (nMDS), as it models the actual dissimilarities of interest that provide a direct projection of the points considered using PERMANOVA (Anderson et al 2008). The PCoA analysis itself provides a measure of the amount of variation in the data that can be captured by the first two axes.

The PCoA routine was used to further investigate the relationship between all sites during the spring 2023 survey, and sites along Tea Tree Hollow across surveys.

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 in spring 2023 have required modifications to the statistical analysis design.

Rainfall at the Buxton (Amaroo) weather station (no. 68166) (Bureau of Meteorology [BoM] 2023) was recorded between January 1967 to November 2021 only, with some gaps in the record. Therefore, rainfall data from SILO point data (-34.25, 150.6), which includes interpolated rainfall data, has been used to provide a complete and up to date rainfall record to aid this assessment. Summary data from the Buxton (Amaroo) weather station has been used as a basis for comparison to long term averages.

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 monitoring TARPs.

3. Results

3.1 Aquatic habitat

The spring 2023 field survey was conducted between 8 and 13 December 2023.

3.1.1 Observations of mining induced change

Observations of mining induced change were recorded in autumn 2023 at Tea Tree Hollow sites TTH16 TTHt17 and TTH13 (Niche 2023), with each of these sites being dry. ATC Williams (2024) confirmed that these are associated with mining impacts that have occurred to Tea Tree Hollow. In spring 2023, sites TTHt17 and TTH16 were again dry (second consecutive season). Site TTH13 was holding water, this appeared to be the result of relatively recent rainfall as water clarity was high and there was little organic matter or biofilm buildup. New site, TTHt9 was also dry. Aquatic habitat conditions were similar at the sites along the Tea Tree Hollow, Bargo River tributary, and the Control sites when compared to previous surveys, with no visual indicators of mining induced change at these locations.

3.1.2 Rainfall

The winter preceding the spring survey period was relatively dry, with only 41.5 mm of rainfall across all winter months. This contrasts with spring, with 361.4 mm of rainfall over the spring months (Figure 2). In the two weeks immediately preceding the spring survey, 125 mm of rain was recorded including three rain events greater than 10 mm. This high level of rainfall was characteristic of the spring 2023 season, occurring primarily in short events. The biological results must be considered in this context.

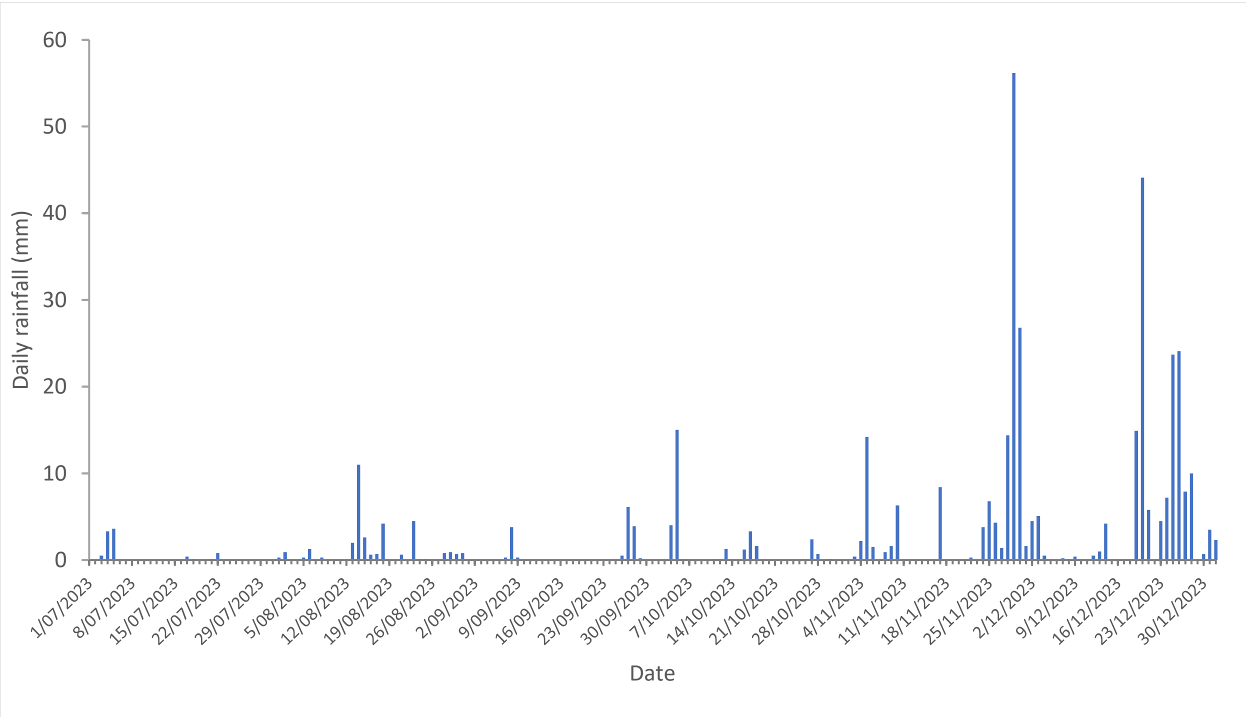


Figure 2: Rainfall Jan 2023 – December 2023 (SILO: -34.25, 150.6)

Observed site conditions during the spring 2023 sampling respresented a continued return to flow conditions being more typically in line with baseflow levels than in 2022. This was reflected in the observations of low flows, limited organic debris and lower flow levels across the monitoring sites (other than Sites TTHt9, TTH16 and TTHt17). A summary of aquatic habitat at each monitoring site for spring 2019 - spring 2023 is provided in Annex 2.

3.2 Water quality

Water quality results for spring 2019 - spring 2023 monitoring periods are presented in Table 7. The key findings identified in spring 2023 include:

- No water quality readings could be collected at Tea Tree Hollow Impact Sites TTHt9, TTH16 and TTHt17 as the pools were dry.
- Water quality conditions at Impact Site TTH12 (upstream of observed areas of mining induced change) along Tea Tree Hollow were nominal and within guideline values. With the exception of dissolved oxygen (129.5%) which exceeded the DVGs (85-110%).
- Water quality conditions at Impact Site TTH13 (within the observed areas of mining induced change) along Tea Tree Hollow were nominal and within guideline values. With the exception of dissolved oxygen and pH which were both below DVGs, but comparable to Control sites.
- Readings collected at the monitoring sites downstream of areas of mining induced change recorded:
  - Elevated electrical conductivity levels at Site TTH13 (d/s). While this exceeds that recorded in the pre-mining period along Tea Tree Hollow, it is within the range of values recorded at the control sites in spring 2023. Electrical conductivity levels at Site TTHt17 (d/s) were within DGV's.
  - Decreased dissolved oxygen levels were recorded at Sites TTH13 (d/s) and TTHt17 (d/s), however these are within the range of values recorded at the control sites in spring 2023, and within the range of pre-mining data along Tea Tree Hollow.
  - pH levels at Site TTH13 (d/s) were below DGV's. However, they are within the range of values recorded at the control sites in spring 2023, and within the range of pre-mining data along Tea Tree Hollow.
  - The pH levels were below DGV's by a more considerable margin at Site TTHt17 (d/s). However, the reading was comparable to low values recorded during pre-mining data at sites along Tea Tree Hollow.
- Among the Control monitoring sites, readings collected from Hornes Creek as well as Moore Creek recorded:
  - Elevated electrical conductivity levels at Site HC7, exceeding all prior recordings at this site. While all other control sites were within DGV's.
  - Site HC8 recorded pH levels that were marginally above the DTVs and this is not considered to indicate deleterious conditions for aquatic biota.
  - The pH reading was low at Site HC7, although this is comparable to low readings collected previously at Site HC7. With Site HC6 also recording a low pH reading comparable to Site HC7.
  - Decreased dissolved oxygen levels were recorded at Sites HC6 and HC7 with both sites being below DGV's, while Site HC8 was within DGV's. Site HC7 recorded a very low dissolved oxygen level, likely associated with the heavy concentration of iron floc in the water during the time of sampling.
- Alkalinity was low and generally consistent among all sites ranging from 20-60 mg $CaCO_3$/L.

Table 7: Water quality results Tahmoor South (spring 2019 – spring 2023)

Status	Impact								Control				
Waterway	Tea Tree Hollow							Bargo River Tributary	Moore Creek		Hornes Creek		
Site	TTHt9	TTH12	TTH13	TTH13 (d/s)	TTH16	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	12.80	-	12.98	12.71	-	-	17.50	12.12	-	14.22	14.80
Aut 2022	-	18.15	19.06	-	18.29	20.12	-	-	18.58	18.97	-	19.64	19.97
Spr 2022	-	15.85	19.80	-	16.27	17.60	-	-	16.27	17.60	-	16.00	16.70
Aut 2023	-	15.02	DRY	16.17	DRY	DRY	16.94	-	15.50	14.70	-	17.11	14.92
Spr-2023	Dry	22.46	19.91	19.66	DRY	DRY	17.73	21.26	23.34	23.81	22.40	25.57	24.08
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
Spr 2021	-	197	198	-	210	218	-	-	176	196	-	305	357
Aut 2022	-	163	151	-	149	156	-	-	61	60	-	122	116
Spr 2022	-	146	167	-	89	93	-	-	89	93	-	144	150
Aut 2023	-	125	DRY	775	DRY	DRY	1155	-	169	197	-	217	246
Spr-2023	Dry	250	306	366	DRY	DRY	288	128	114	141	104	517	244
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

Status	Impact								Control				
Waterway	**Tea Tree Hollow**							**Bargo River Tributary**	**Moore Creek**		**Hornes Creek**		
Site	**TTHt9**	**TTH12**	**TTH13**	**TTH13 (d/s)**	**TTH16**	**TTHt17**	**TTHt17 (d/s)**	**BRt6**	**MC14**	**MC15**	**HC6**	**HC7**	**HC8**
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	3.0	-	9.4	10.2	-	-	5.5	1.0	-	10.0	6.4
Aut 2022	-	20.8	10.5	-	19.1	34.4	-	-	4.1	3.0	-	10.7	9.0
Spr 2022	-	8.2	6.8	-	3	1.4	-	-	3.0	1.4	-	9.1	9.0
Aut 2023	-	11.5	DRY	20.8	DRY	DRY	5.3	-	2.8	1.2	-	9.4	3.1
Spr 2023	Dry	19.3	8.7	11.4	DRY	DRY	2.6	2.6	1.6	1.8	3.5	145.0	4.0
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	97.6	-	104.4	103.1	-	-	119.3	99.5	-	114.7	120.8
Aut 2022	-	100.3	109.0	-	99.6	108.8	-	-	99.4	100.4	-	102.7	109.1
Spr 2022	-	91.2	98.7	-	101.8	97.0	-	-	101.8	97.0	-	114.4	103.9
Aut 2023	-	99.4	DRY	76.8	DRY	DRY	42.9	-	103.0	104.0	-	90.6	114.5
Spr 2023	Dry	129.5	31.5	59.4	DRY	DRY	33.2	39.6	79.7	85.1	67.4	7.6	107.7
pH													
Spr 2019	-	6.32	DRY	-	-	-	-	-	DRY	4.55	-	5.05	5.76
Aut 2020	-	7.47	7.26	-	-	-	-	-	8.09	7.78	-	7.9	7.87
Spr 2020	-	6.52	6.83	-	-	-	-	-	-	-	-	6.99	7.15
Aut 2021	-	7.01	7.48	-	-	-	-	-	8.3	8.74	-	7.18	7.2
Spr 2021	-	5.88	4.5	-	5.82	5.86	-	-	6.5	5.04	-	4.8	5.07
Aut 2022	-	7.35	7.33	-	7.38	7.39	-	-	6.71	7.03	-	6.76	6.79

Status	Impact								Control				
Waterway	Tea Tree Hollow							Bargo River Tributary	Moore Creek		Hornes Creek		
Site	TTHt9	TTH12	TTH13	TTH13 (d/s)	TTH16	TTHt17	TTHt17 (d/s)	BRt6	MC14	MC15	HC6	HC7	HC8
Spr 2022	-	7.1	7.04	-	6.48	6.57	-	-	6.48	6.57	-	7.47	7.73
Aut 2023	-	7.06	DRY	6.26	DRY	DRY	4.17	-	5.66	4.92	-	6.40	6.66
Spr 2023	Dry	6.63	6.34	6.15	DRY	DRY	4.52	5.70	5.56	7.10	5.57	5.15	8.14
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	20	DRY	DRY	<10	-	20	20	-	20	20
Spr 2023	Dry	60	40	20	DRY	DRY	60	20	20	40	20	40	40

NOTES: ANZ Guidelines (2018) for upland streams: Electrical conductivity (30-350 µS/cm), Turbidity (2-25 NTU), pH (6.5-8.0), Dissolved Oxygen (90-110%). Cells highlighted red indicates those variables that exceed the default trigger values.

In summary the readings collected at Impact Site TTH12 (upstream of observed areas of mining induced change) along Tea Tree Hollow are comparable to baseline data at this site, and also to that of the Control sites in spring 2023. However, the readings collected at monitoring sites (downstream of areas of mining induced change) are suggestive of impaired water quality conditions, with elevated electrical conductivity levels, low dissolved oxygen and low pH levels. This is most acute at Site TTH13 (d/s). While the individual readings are comparable to some low control site readings in spring 2023, these would compared to HC7 where high levels of iron flocc have accumulated in low flows. Although it should also be noted that the readings are comparable to some pre-mining data collected along Tea Tree Hollow sites, it is noted that this is a continuation of the general pattern observed in autumn 2023.

3.3 AUSRIVAS

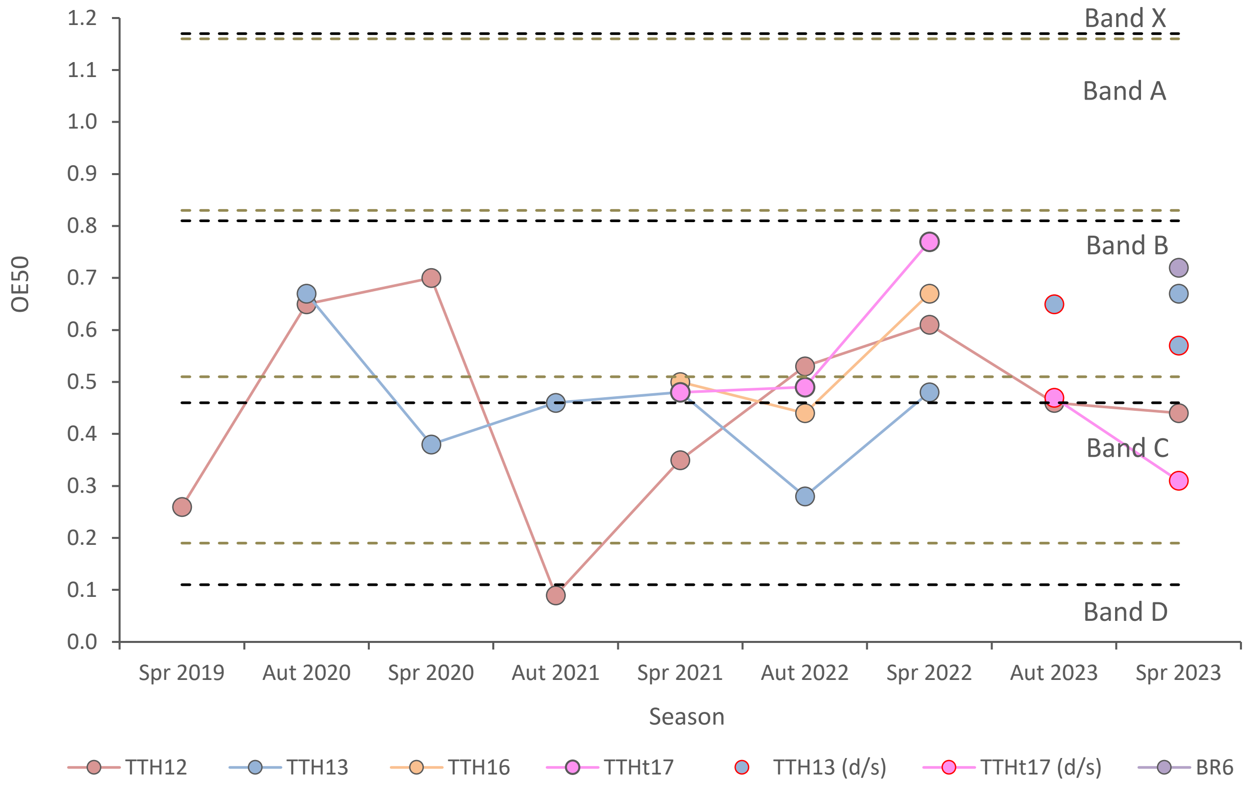
The AUSRIVAS results showed sites recorded OE50 scores that ranged between Band B to Band C (Table 8), Figure 3) indicating that overall, the macroinvertebrate assemblages present at all sites were impoverished when compared to the reference site data used by the AUSRIVAS predictive models (at both impact and control sites). Generally, 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. Impact monitoring site TTHt17 (d/s) is an exception to this, recording somewhat lower scores overall, and in comparison, to pre-mining results from site TTHt17, although no pre-mining data is available specifically for TTHt17 (d/s) itself. This may reflect potentially limited water permanence at this site in spring 2023.

The Signal2 scores for all sites varied between 2.38 and 3.54, which are considered low, indicating moderate to severe levels of impairment and poor to very poor water quality conditions across the sites (Table 8), including the control monitoring sites. New control monitoring site HC6 recorded the highest SIGNAL2 score (4.33), while impact monitoring site TTHt17 (d/s) recorded the lowest (2.40). when considered as a group, the SIGNAL2 scores were somewhat greater at the control sites when compared to the impact monitoring sites. There is a general trend of overall declining SIGNAL2 scores since Spring 2022, including at the control monitoring sites. This likely reflects the harsher environmental conditions that have occurred during this time, with a transition from elevated rainfall conditions to drier and more sporadic rainfall events. The low scores reflect the dominance of pollution tolerant macroinvertebrates and presence of few pollution-sensitive taxa. However, this is common in low flow pool edge habitat in the area. While the results are somewhat decreased on those of spring 2022, they are comparable between the impact and control groups and within the range of previous results (Figure 3).

The EPT (Ephemeroptera, Plecoptera, Trichoptera) index, showed that few families of the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddis flies), which are considered sensitive to pollution, were represented at most sites (Table 8). The number of taxa and number of EPT taxa are low across both impact and control monitoring sites. The numbers of taxa and EPT taxa recorded from TTH12, TTH13 (d/s) and TTHt17 (d/s) are slightly lower than those at the control monitoring sites and previous data collection. This may potentially reflect harsher environmental conditions along these waterways (e.g. lower levels of water or water permanence).

Table 8: Macroinvertebrate results: spring 2023

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	0.44	Dry	0.67	0.57	Dry	Dry	0.31	0.72	0.70	0.49	0.44
Band	C	Dry	B	B	Dry	Dry	C	B	B	C	C
SIGNAL2	2.88	Dry	3.31	2.38	Dry	Dry	2.40	3.50	4.33	3.20	3.54
No. taxa	8	Dry	13	8	Dry	Dry	5	12	12	10	13
EPT taxa	0	Dry	1	0	Dry	Dry	0	3	3	1	1



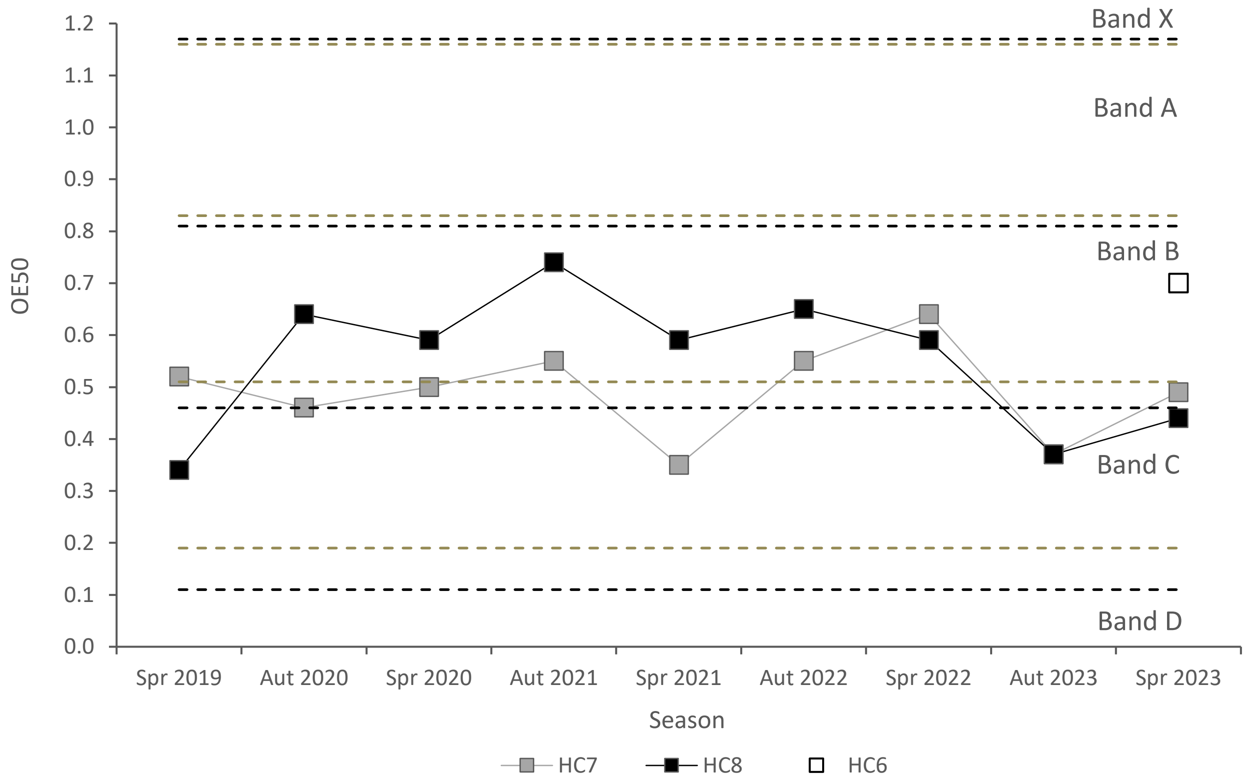
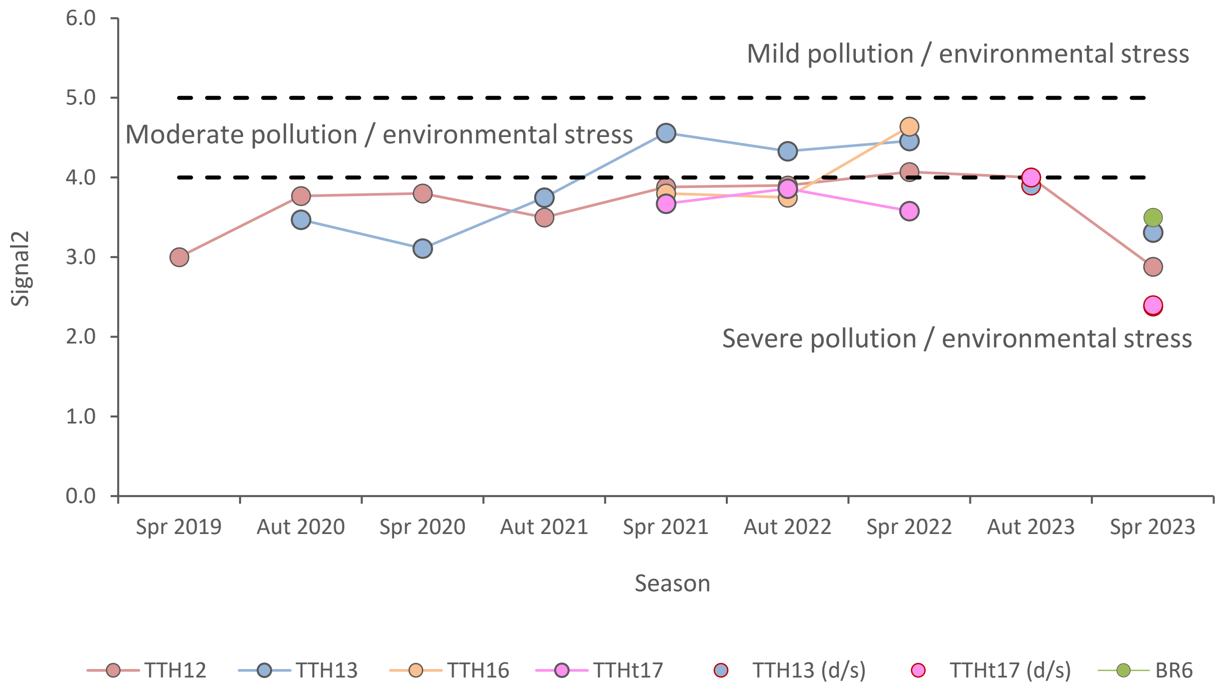


Figure 3: AUSRIVAS OE50 scores recorded at impact sites (above) and control sites (below). Pre-mining: spring 2019 – autumn 2022, post mining: spring 2022 – spring 2023. (NB: The black dashes represent the Band levels in Autumn and the grey dashes Spring)



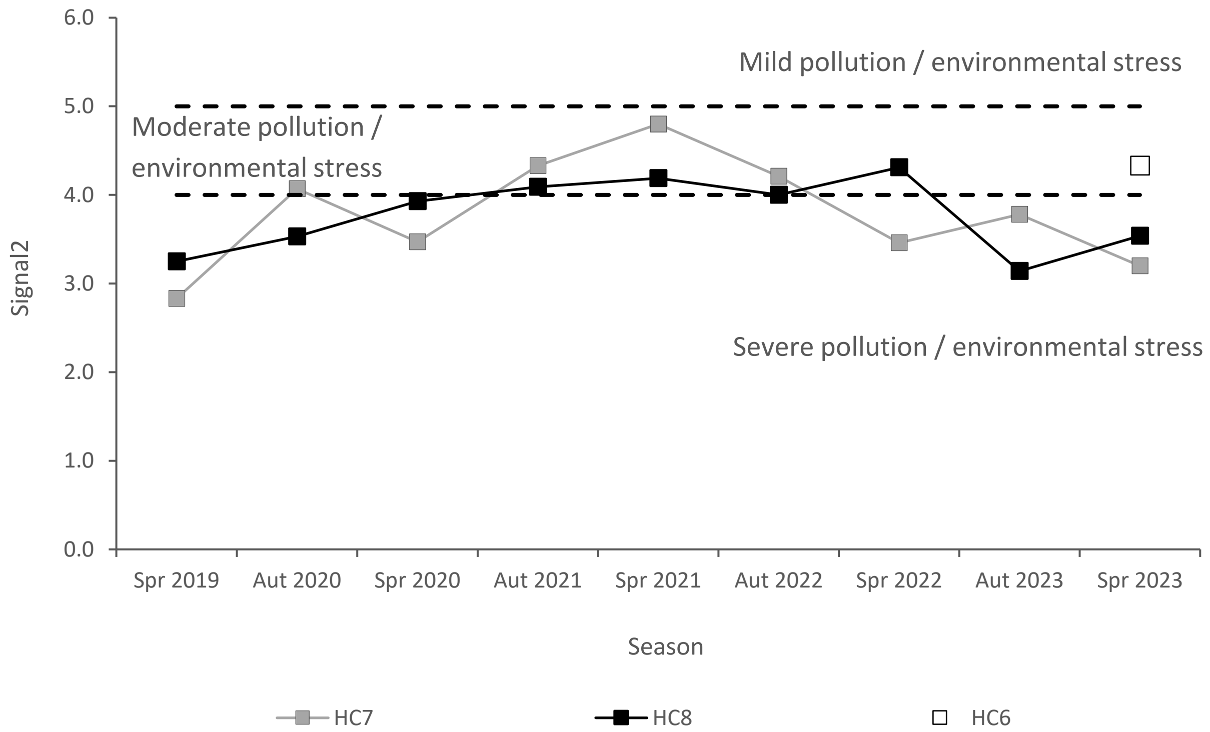


Figure 4: SIGNAL2 scores recorded at impact sites (above) and control sites (below). Pre-mining: spring 2019 – autumn 2022, post mining: spring 2022 – spring 2023.

3.4 Macroinvertebrate quantitative analysis

3.4.1 Assemblages

Significant differences were confined to the two lower-level interaction terms (Table 9). The first interaction term relates to differences between Streams that were dependant on Survey and Surveys that were dependant on Stream. The second interaction term relates to Surveys that were dependant on Site and differences between Sites that were dependant on Surveys.

Table 9: Macroinvertebrate assemblage PERMANOVA results 2023

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms
Tr	1	7016.8	7016.8	0.8662	0.6785	9926
Pe	1	14944.0	14944.0	1.2653	0.2399	9915
St(Tr)	1	7468.6	7468.6	2.1513	RED	9932
Su(Pe)	7	73755.0	10536.0	3.4965	RED	9882
TrxPe	1	2189.0	2189.0	0.7350	0.8075	9900
Si(St(Tr))	4	9620.1	2405.0	1.5169	RED	9904
TrxSu(Pe)	7	23156.0	3308.0	1.0977	0.3552	9894
PexSt(Tr)	1	4403.1	4403.1	1.2149	0.2282	9899
PexSi(St(Tr))**	3	4181.2	1393.7	0.8790	0.6230	9907
St(Tr)xSu(Pe)**	6	20492.0	3415.4	2.1541	**0.0015**	9883
Su(Pe)xSi(St(Tr))**	13	20612.0	1585.5	1.5372	**0.0012**	9822
Res	92	94894.0	1031.5			
Total	137	323740.0				

RED = Redundant factor; significant terms in **bold**.

Investigation of the Pairwise Comparisons (Table 10) between Surveys for the first interaction term found that the spring and autumn Surveys in 2023 were significantly different between all Streams. Investigation of the Pairwise Comparisons between Surveys for the Impact sites for the During period (second interaction term) found that the spring 2023 Survey was significantly different to the spring 2022 Survey at Site TTH13 and the autumn 2022 Survey at TTH12.

Table 10: Pairwise Comparisons between St(Tr)xSu(Pe) and Su(Pe) x Si(St(Tr)) for Survey at Impact Sites for the During period

Site	Period	t	P(perm)	Unique perms	P(MC)
Hornes Creek	Spring2023, Spring2022	0.76559	0.705	30	0.6853
Hornes Creek	Spring2023, Autumn2023	4.7918	0.0352	30	**0.0063**
Moore Creek	Spring2023, Spring2022	2.2022	0.1673	6	0.0511
Moore Creek	Spring2023, Autumn2023	2.6491	0.3322	6	**0.0479**
Tea Tree Hollow	Spring2023, Spring2022	2.3273	0.1697	6	0.0739
Tea Tree Hollow	Spring2023, Autumn2023	2.8688	0.0236	795	**0.0039**
TTH13	Spring2023, Spring2022	2.7968	0.098	10	**0.0126**
TTH12	Spring2023, Spring2022	1.8293	0.1031	10	0.0566
TTH12	Spring2023, Autumn2023	2.9008	0.0987	10	**0.0089**

Significant terms in **bold**.

Further exploration of data at Site TTH12 (Figure 5 and Figure 6) identifies that macroinvertebrate density and richness in spring 2023 was below that of autumn 2023. Macroinvertebrate density was lower in autumn 2022, however this season was affected by significant flow events, while the richness result in spring 2023 was the lowest to date. Visually however, the results are comparable to pre-mining data at this site.

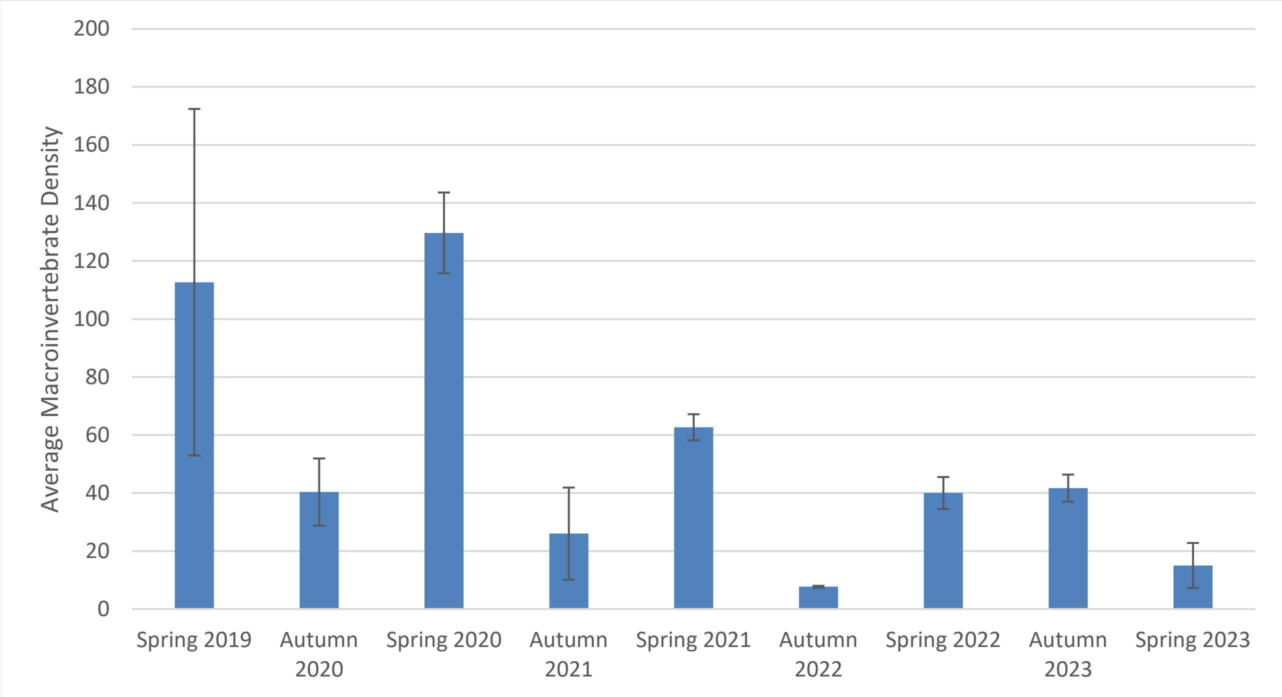


Figure 5: Comparison of average density (x̄, ±SE) between Surveys for TTH12

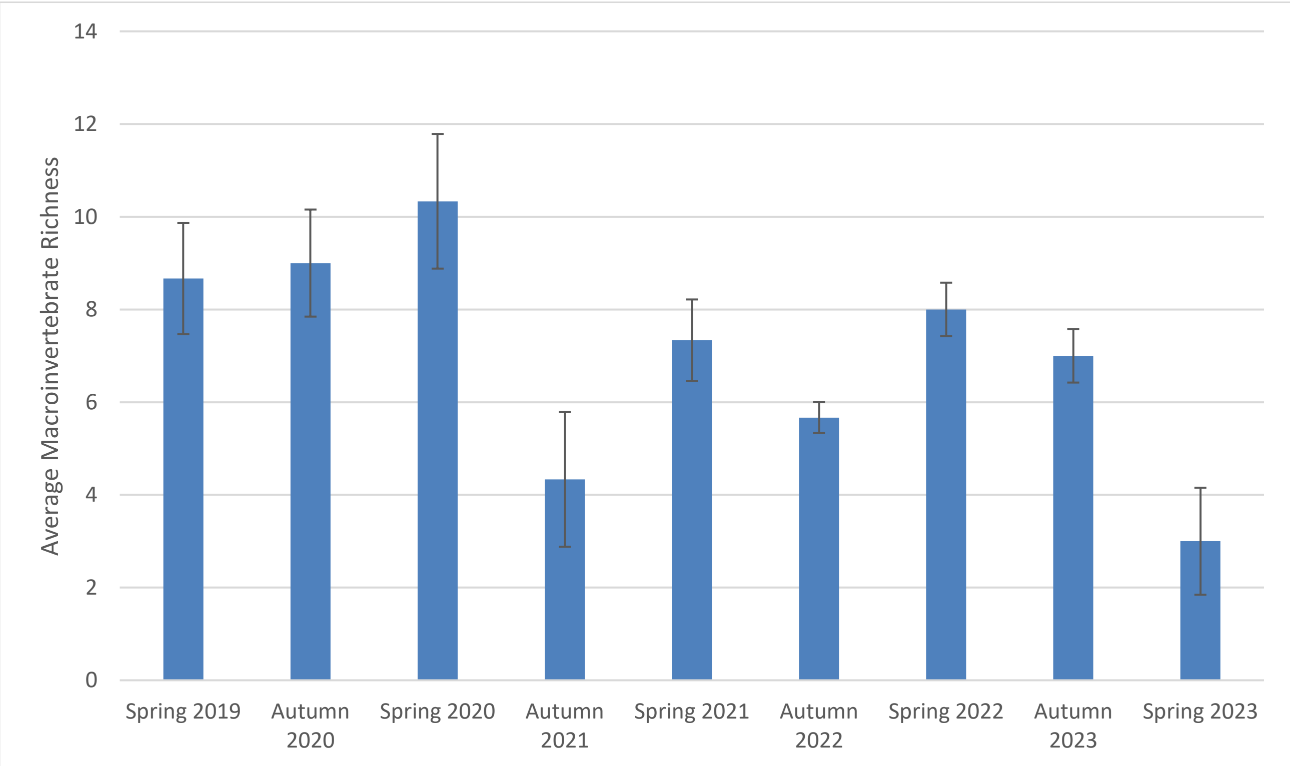


Figure 6: Comparison of average richness (x̄, ±SE) between Surveys at TTH12

Further investigation of data from Site TTH13 identified that both macroinvertebrate richness and density were lower in spring 2023 when compared to spring 2022, in fact these were the lowest totals (outside of dry conditions). With the spring 2022 (first season of monitoring in the 'during mining' period) recording higher levels. It is noted that water levels were generally elevated in that season. Visual assessment of the data indicates that the results in spring 2023 are also lower than in the pre-mining period.

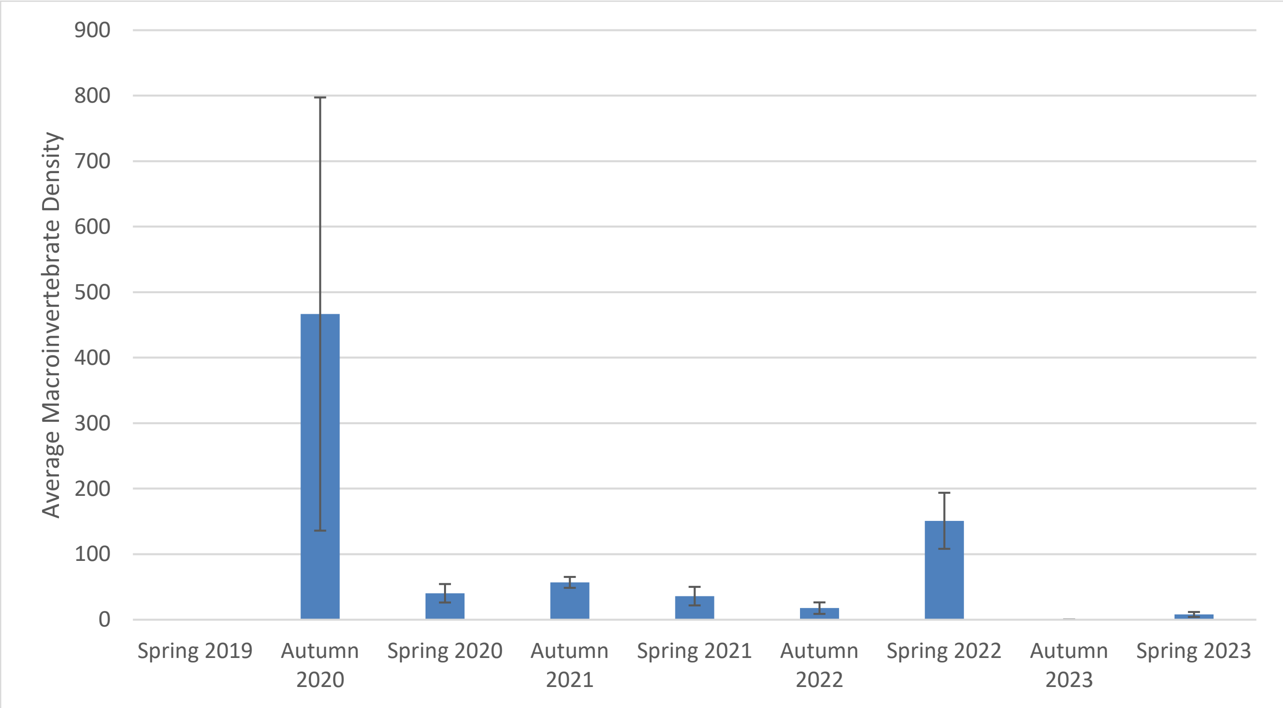


Figure 7: Comparison of average density (x̄, ±SE) between Surveys for TTH13

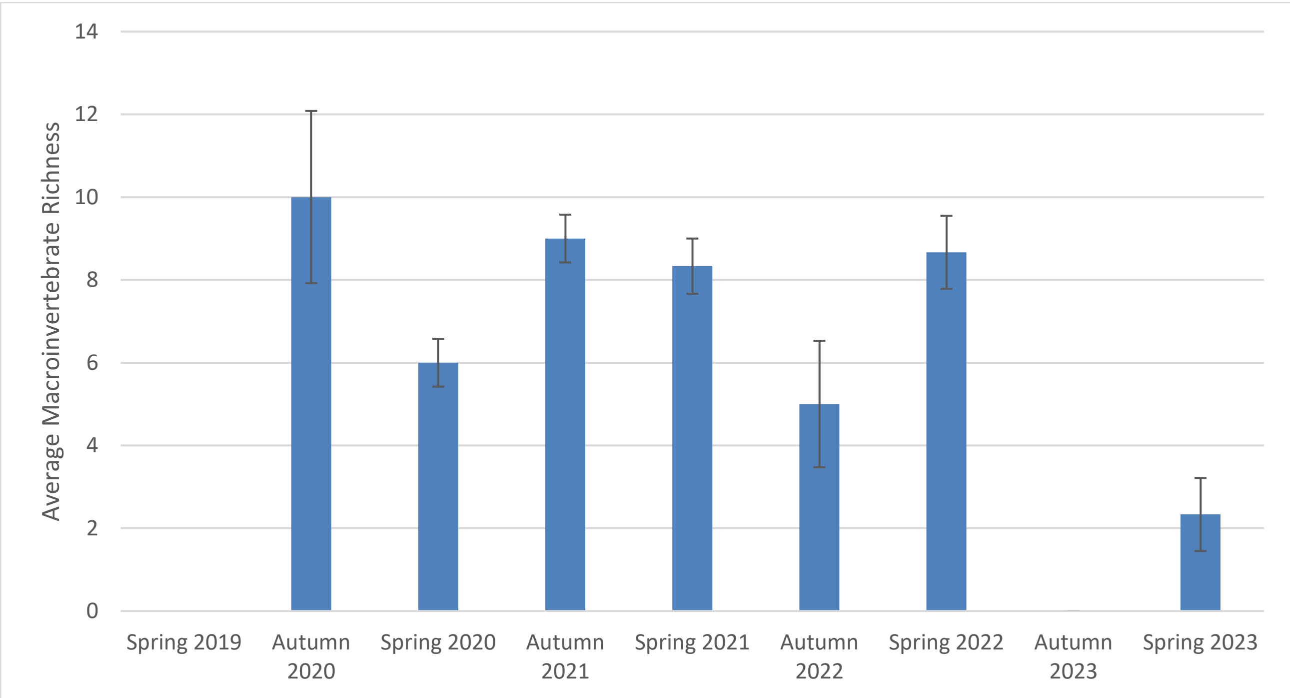


Figure 8: Comparison of average richness (x̄, ±SE) between Surveys at TTH13

The PCO analysis found that that the first two axes explain 53.4% of the variation (Figure 9) when Sites are considered. The PCO plot shows that the Tea Tree Hollow sites had greater overlap with Hornes Creek and minimal with Moore Creek in the spring 2023 survey. The strongest driver of the differences in the spring

2023 Survey was a positive relationship of *Chironominae* with the Y Axis and a negative relationship with the Y Axis and a positive relationship with the X Axis of *Tipulidae* and *Leptophelbiidae*.

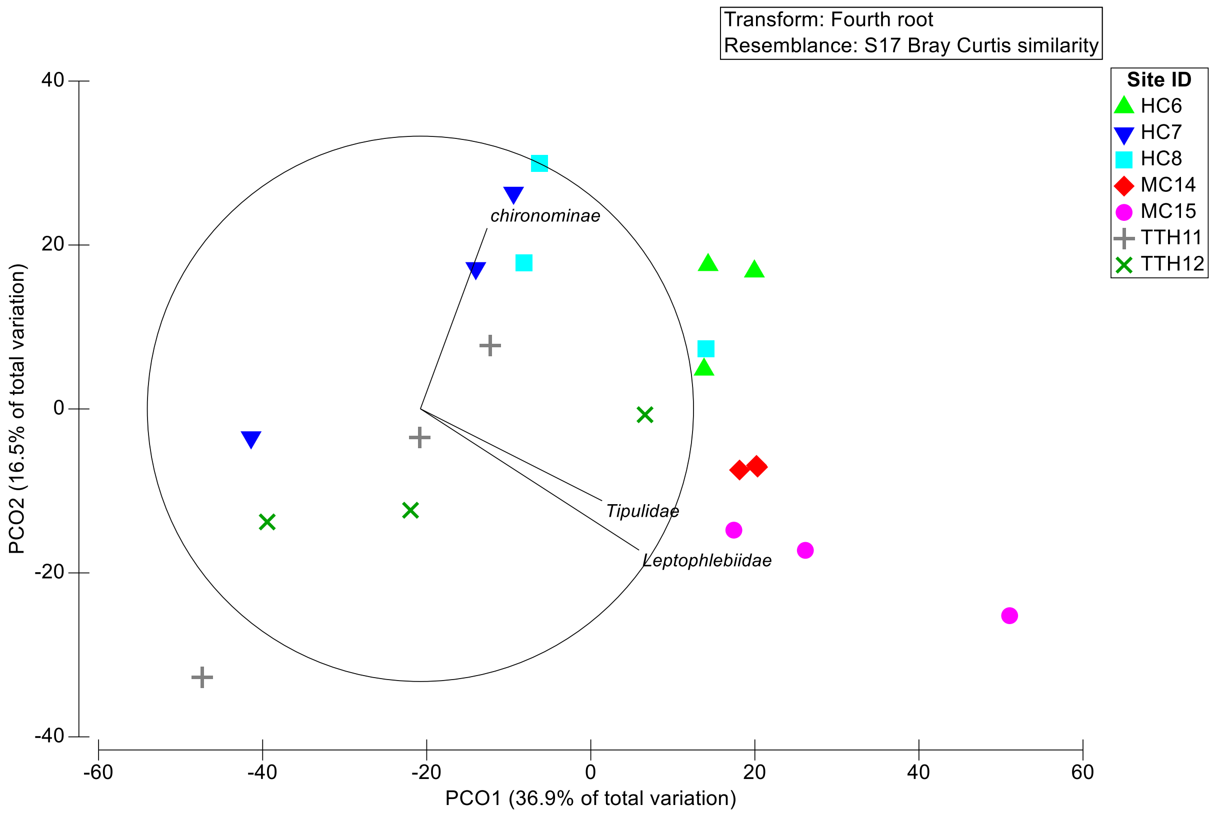


Figure 9: Graph of the two first axis from the PCO analysis for data from the Spring 2023 Survey. Vectors based on Spearman Coefficient >0.7

The PCO analysis found that the first two axis explain 39.4% of the variation (Figure 10) when Survey at Tea Tree Hollow is considered. The PCO Plot indicates that for Tea Tree Hollow, the most recent Survey (spring 2023) was much more variable than previous surveys, including the more recent surveys from the During period. The strongest driver of differences in the spring 2023 survey was a positive relationship of *Chironominae* and *Tipulidae* with the X Axis.

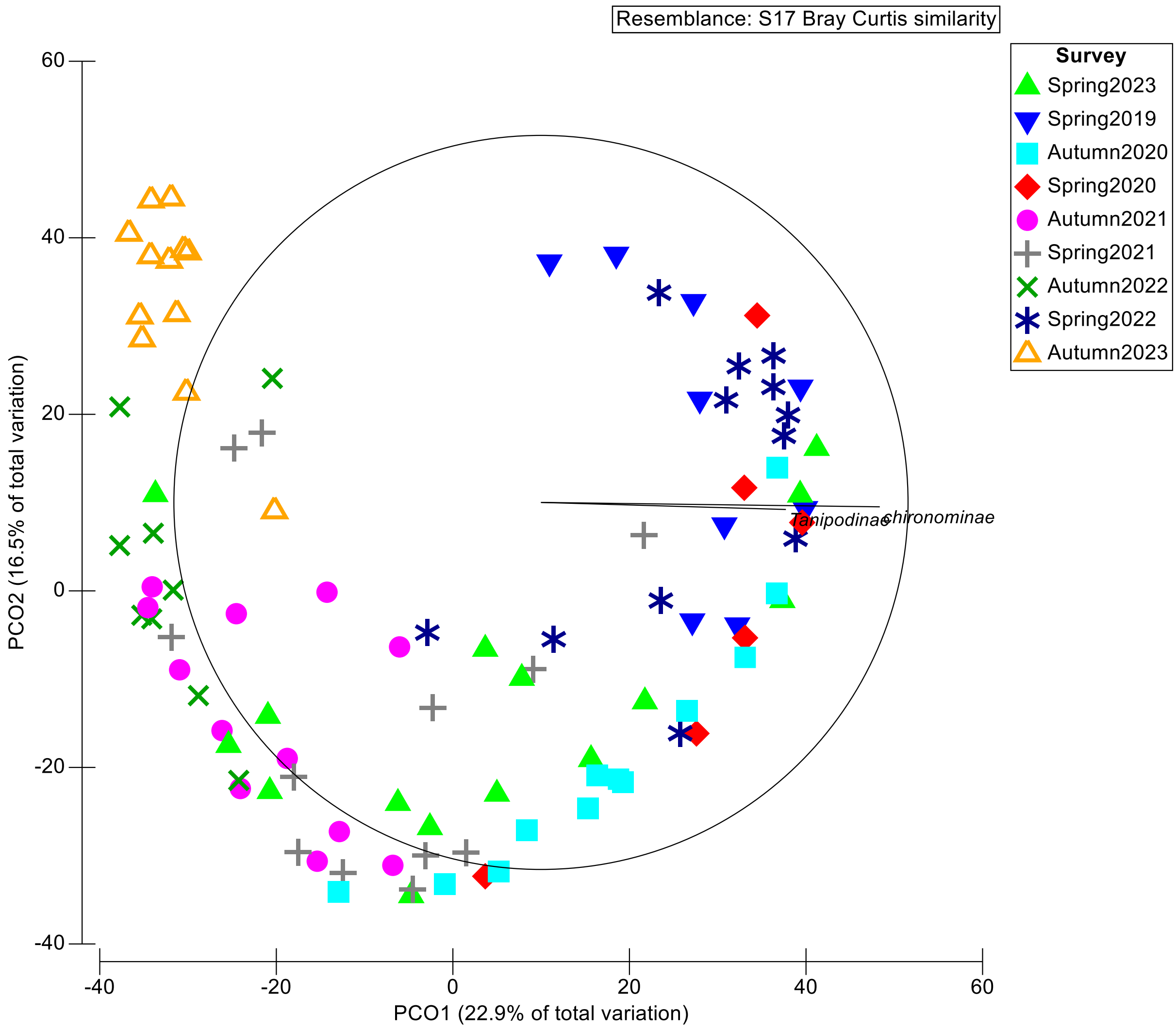


Figure 10: Graph of the two first axis from the PCO analysis for data from Tea Tree Hollow. Vectors based on Spearman Coefficient >0.6

3.4.2 Taxonomic density

Significant differences were confined to differences between surveys that were dependant on Site and differences between Sites that were dependent on surveys (Table 11).

Table 11: Macroinvertebrate density PERMANOVA results 2023

Source	Degrees of freedom (df)	Sum of squares (SS)	Mean sum of squares (MS)	Pseudo-F	*p value* (perm)	Unique Permutations
Tr	1	69.07	69.07	4.3598	0.0642	9967
Pe	1	48.38	48.38	0.3419	0.8648	9970
St(Tr)	1	0.02	0.02	0.4180	0.5989	9934
Su(Pe)	7	1084.10	154.87	18.3240	RED	9956
TrxPe	1	75.55	75.55	2.4866	0.1699	9964
Si(St(Tr))	4	40.95	10.24	0.3120	RED	9958
TrxSu(Pe)	7	176.34	25.19	2.9807	0.1129	9958
PexSt(Tr)	1	7.72	7.72	1.4302	0.2869	9955

Source	Degrees of freedom (df)	Sum of squares (SS)	Mean sum of squares (MS)	Pseudo-F	*p value* (perm)	Unique Permutations
PexSi(St(Tr))**	3	60.59	20.20	0.6155	0.6157	9950
St(Tr)xSu(Pe)**	6	49.23	8.20	0.2500	0.9496	9956
Su(Pe)xSi(St(Tr))**	18	590.62	32.81	3.7582	**0.0001**	9917
Res	102	890.53	8.73			
Total	152	3391.80				

Significant terms in **bold**.

Investigation of the Pairwise Comparisons between surveys for the Impact sites during the During period found that the spring 2023 Survey was significantly different to both previous surveys at Site TTH13 (Table 12, Figure 11) in the 'during mining' period.

Table 12: Pairwise Comparisons between Su(Pe) x Si(St(Tr))for Survey at Impact Sites for the During period

Site	Period	t	P(perm)	Unique perms	P(MC)
TTH13	Spring2023, Spring2022	4.641	0.102	10.0000	**0.0090**
TTH13	Spring2023, Autumn2023	3.152	0.102	4.0000	**0.0381**
TTH12	Spring2023, Spring2022	2.445	0.097	10	0.0663
TTH12	Spring2023, Autumn2023	2.630	0.100	10	0.0544

The graph (Figure 11) shows the significant difference between the average density recorded between spring 2023 and spring 2022 (with autumn 2023 being dry and as such being unsamplable) at TTH13. Further assessment of this data identifies that the densities recorded at this site in spring 2023 are also lower than that recorded in the pre-mining dataset. Relatively low results are also recorded at the Control sites (Figure 12), indicating the prevailing environmental conditions are likely to suppress macroinvertebrate results in spring 2023.

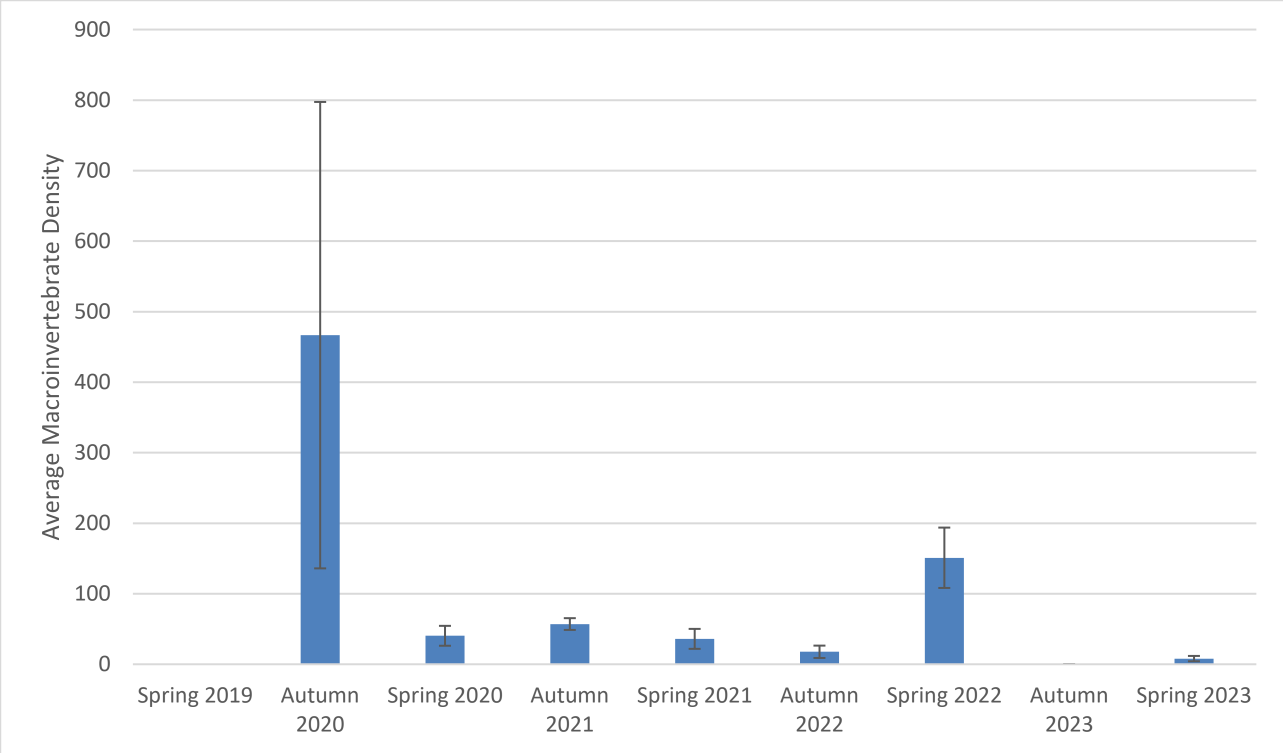


Figure 11: Comparison of average density (x̄, ±SE) between Surveys for Site TTH13

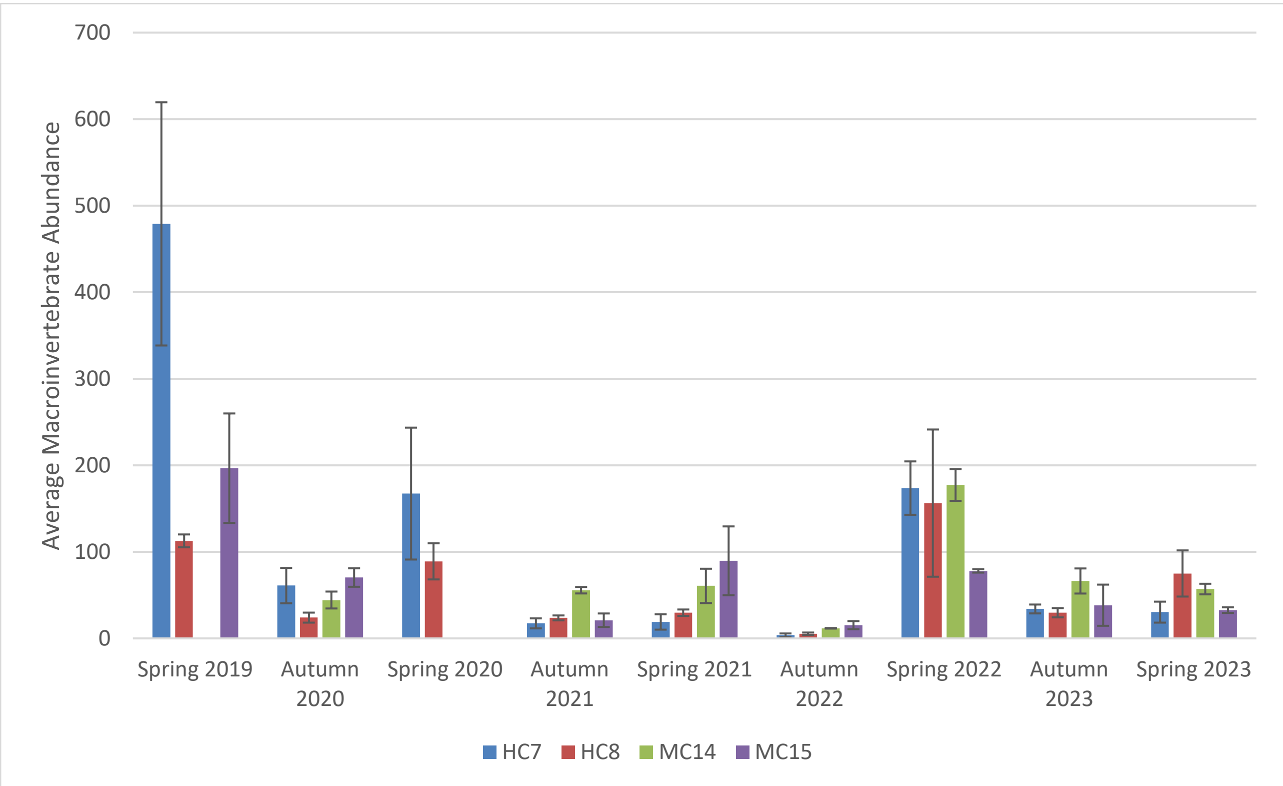


Figure 12: Comparison of average density (x̄, ±SE) between Surveys for Control Sites.

3.4.3 Taxonomic richness

Significant differences were confined to differences between surveys that were dependant on Site and differences between Sites that were dependant on surveys (Table 13).

Table 13: Macroinvertebrate richness PERMANOVA results

Source	Degrees of freedom (df)	Sum of squares (SS)	Mean sum of squares (MS)	Pseudo-F	*p value* (perm)	Unique Permutations
Pe	1	1	1	0.1884	RED	9765
Tr	1	8	8	0.2773	0.7973	60
Se	1	35	35	3.6642	RED	9821
Si(Tr)	3	87	29	6.1591	RED	9954
PexTr	1	2	2	0.2536	0.6495	9793
PexSe	1	0	0	0.0183	RED	9859
TrxSe	1	0	0	0.0597	0.8367	9808
PexSi(Tr)	3	22	7	1.5409	RED	9941
SexSi(Tr)	3	27	9	1.9471	0.1235	9960
PexTrxSe	1	6	6	0.3409	0.6015	9861
PexSexSi(Tr)	3	52	17	3.6947	**0.0168**	9951
Res	91	427	5			
Total	110	692				

RED = Redundant factor, significant terms in **bold**.

Investigation of the Pairwise Comparisons between Surveys for the Impact sites during the During period found that the spring 2023 survey was significantly different to both previous surveys at Site TTH12 and the spring 2023 survey at Site TTH13 (Table 14).

Table 14: Pairwise Comparisons between Su(Pe) x Si(St(Tr)) for Survey at Impact Sites for the During period

Site	Period	t	P(perm)	Unique perms	P(MC)
TTH13	Spring2023, Spring2022	5.078	0.0988	7	**0.0081**
TTH13	Spring2023, Autumn2023	2.646	0.0988	4	0.0636
TTH12	Spring2023, Spring2022	3.873	0.1014	7	**0.0174**
TTH12	Spring2023, Autumn2023	3.098	0.1011	7	**0.0371**

Richness results recorded at TTH12 (Figure 13) and TTH13 (Figure 14) in spring 2023 were the lowest recorded to date, including the pre-mining period. Results at the Control sites in the same period are variable (Figure 15). While the scores are on average lower than spring 2022 and autumn 2023, lower richness results have been recorded at each Control site during the whole monitoring period.

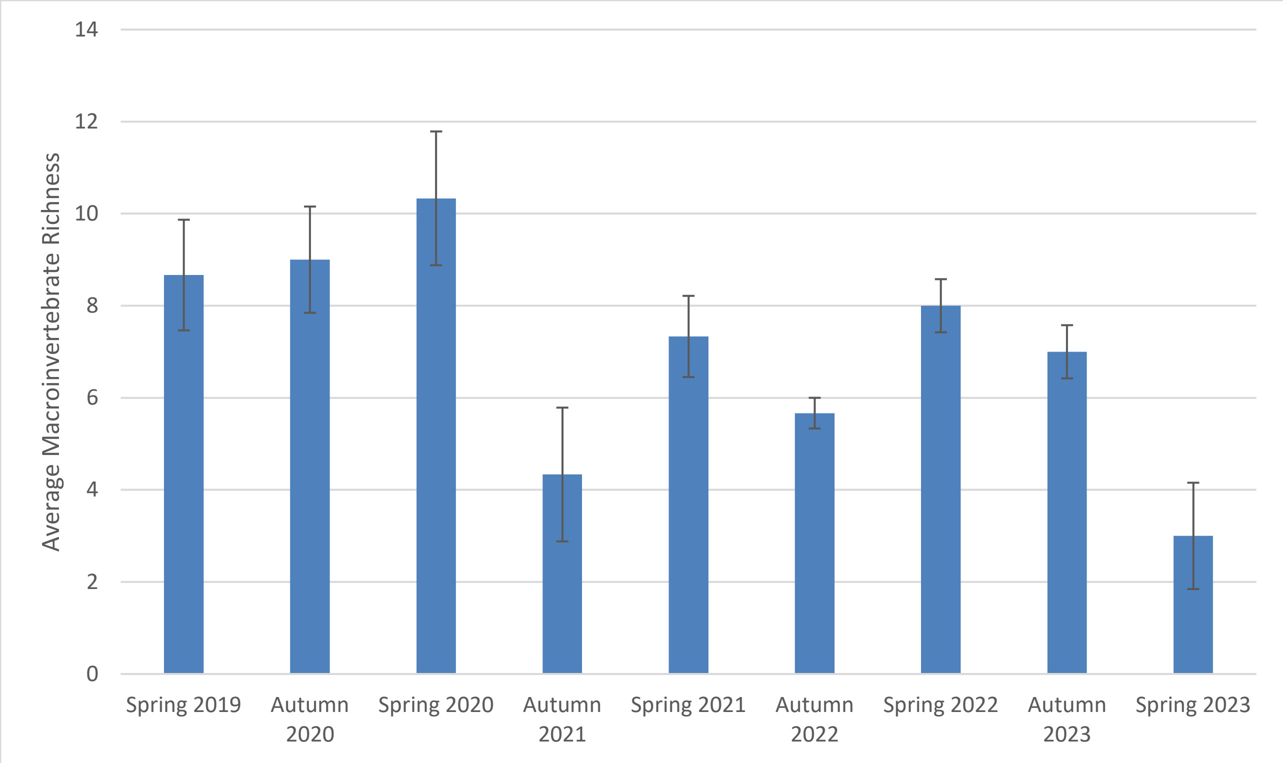


Figure 13: Comparison of average richness (x̄, ±SE) between Surveys at TTH12

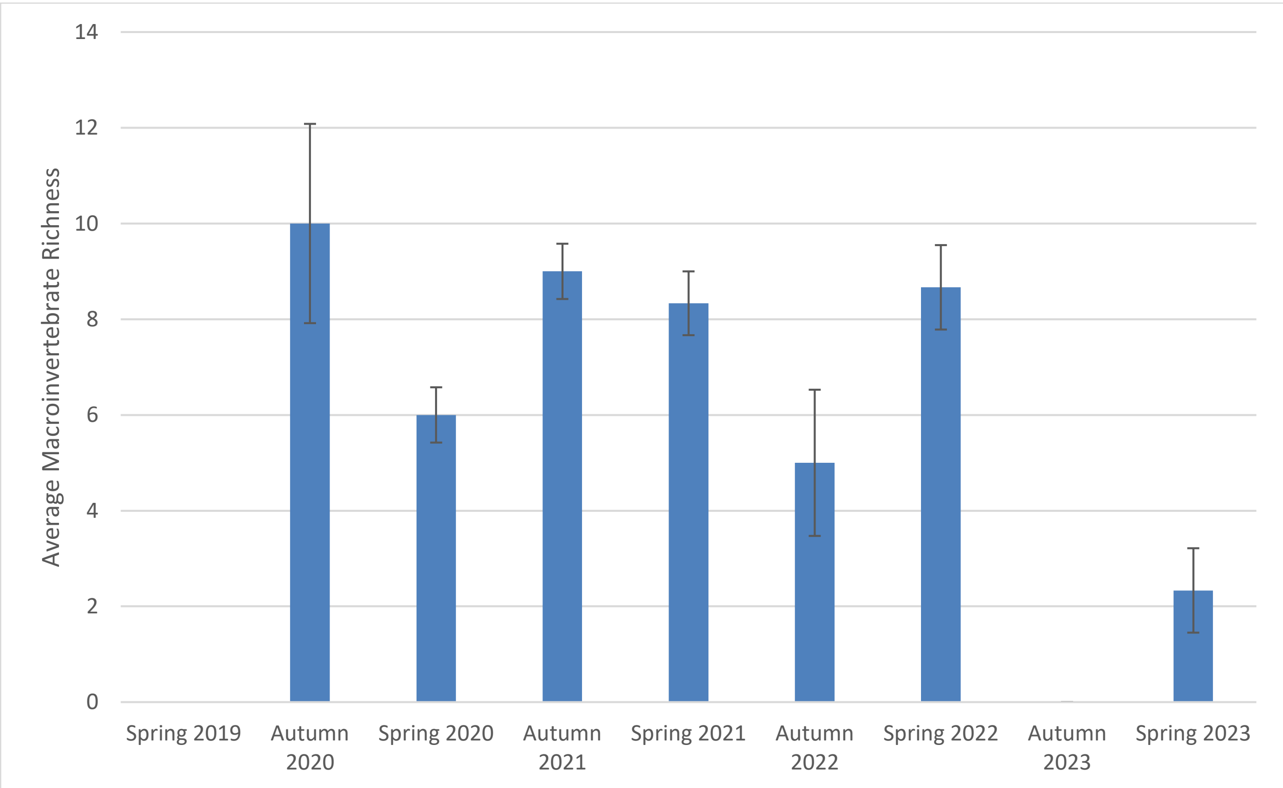


Figure 14: Comparison of average richness (x̄, ±SE) between Surveys at TTH13

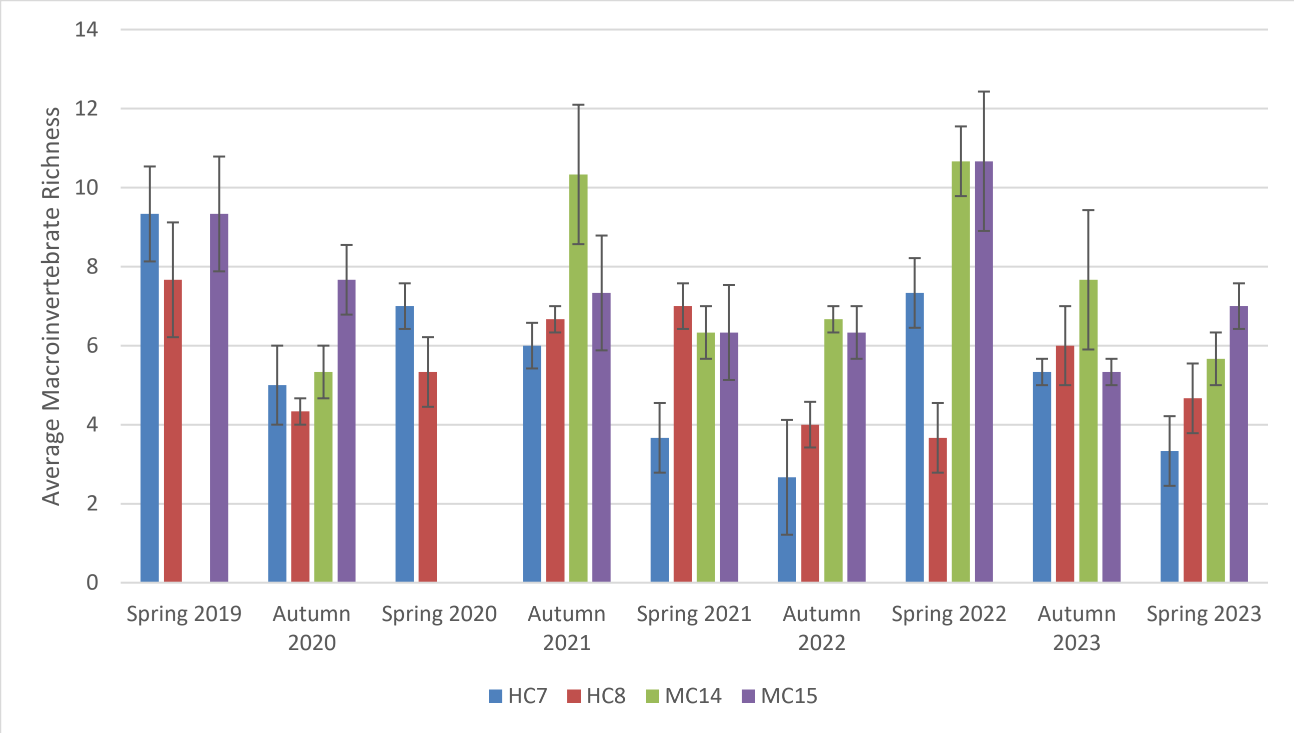


Figure 15: Comparison of average richness (x̄, ±SE) between Surveys at Control Sites

4. Discussion

4.1 Aquatic habitat observations

Visual indicators of subsidence impacts were observed at Site TTH16 and TTHt17 in spring 2023. Each site was dry, similar to the previous monitoring season (autumn 2023). Water did return approximately 50-100 metres downstream of Site TTH17, although observations of bedrock deformation were also recorded at these locations. Water was observed to return to site TTH13 in spring 2023, following dry conditions in autumn 2023. New site TTHt9 was also dry. While the winter and early part of the spring season were dry, heavy falls did occur immediately before sampling. However, no highly significant evidence of this rainfall was reflected in the observations of generally low flows within Tea Tree Hollow, or Controls. This may reflect a more limited residence time in this relatively high slope bedrock dominated pools that drain a small sub-catchment area. This combined with limited evidence of organic debris or biofilm build up may suggest prevailing low flow conditions within Tea Tree Hollow, downstream of Site TTH12 which held relatively high levels of water.

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 spring 2023.

4.2 Water quality

Water quality conditions in spring 2023 were generally comparable between the Impact and Control monitoring sites and were comparable to pre-mining results. No indicators of highly acute water quality issues were identified. TTHt17 (d/s) continued to record much lower pH levels consistent with autumn 2023. However, the reading was comparable to low values recorded during pre-mining data at sites along Tea Tree Hollow. As there is no pre-mining data at this site, there are limitations to determine whether this is nominal for this site.

4.3 AUSRIVAS monitoring

The dry conditions at Impact monitoring sites TTH16 and TTH17 are the second consecutive season of dry conditions at these sites, following the observations of mining induced change at these sites in autumn 2023 (Niche 2023). These sites will continue to be assessed in detail in future monitoring reports. The sites downstream of these locations, including recently added sites, where water is present show results that are comparable to the range of results that have been recorded across the impact monitoring sites during the pre-mining period. In other words, these potential impacts do not appear to have translated into acute impacts to macroinvertebrate assemblages at the downstream monitoring locations. Further monitoring will assist in identifying whether these conditions are part of any trajectory of decreasing condition in Tea Tree Hollow, and whether any future amelioration of aquatic habitats occurs at sites TTH16 and TTH17.

Impact monitoring site TTH13 also recorded dry conditions in autumn 2023, however water returned to the pool in spring 2023. The stream health results recorded at this site are superior to the other impact monitoring sites and are comparable to the control sites in spring 2023. Further analysis in the quantitative assessment of macroinvertebrate assemblages however has identified a decline in assemblage metrics at Site TTH13 and TTH12 (section 4.4). It is noted that the majority of taxa recorded from TTH13 during AUSRIVAS sampling were air breathing, with very low abundances of all taxa recorded.

The low scores in general 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 locality. The sites (where samples could be collected) recorded generally lower stream health index results than in recent (2022) seasons. However, these scores in spring 2023 are within the typical range of results recorded throughout the program, with this overall trajectory also observed at the Control sites. These trends are likely driven by the reduced stream flows in 2023 in comparison to the elevated flows in 2022, primarily driven by reduced rainfall. The stream health results in the Tea Tree Hollow stream network are generally somewhat lower than in the Control sites in spring 2023, this may be driven by the more intermittent nature of this stream system, although at the site level (e.g. dry sites TTH16, TTHt9 and TTHt17) mining induced effects may also be operating. A relatively dry winter followed by more consistent spring rainfall likely has resulted in samples that have been taken from newly replenished or recently flushed pools where macroinvertebrate presence may not be fully established.

4.4 Quantitative macroinvertebrate monitoring

Previous quantitative analysis at impact Site TTH12 in autumn 2023 identified more variable assemblages in the 'during mining' period, but not significant differences in macroinvertebrate richness or density (Niche 2023). However, in spring 2023, significant differences were identified within the 'during mining' period for both the macroinvertebrate assemblage and macroinvertebrate richness, but not macroinvertebrate density. Due to the statistical design requiring that Survey be nested within Period, assessment of change over time is tested in higher order interactions, but this may not be sensitive at the individual pool level. Further assessment of results at TTH12 identified that the macroinvertebrate richness results were the lowest recorded to date but were comparable to that recorded in autumn 2021 in the pre-mining period. The macroinvertebrate density results were low but were lower in autumn 2022 (pre-mining). When the Control sites are considered, the scores are on average lower in spring 2023 than in spring 2022 and autumn 2023, however lower richness results have been recorded at each Control site during the whole monitoring period. It is noted that the AUSRIVAS results from this pool are nominal and comparable to the Controls in the same period.

At Site TTH13, significant differences in the 'during mining' period were detected for macroinvertebrate assemblage, density and richness data. Both average richness and density results were the lowest recorded at this site to date and reflect very low results. This follows the pool being dry in autumn 2023 (with this pool also dry in 2019 in the pre-mining period). While the AUSRIVAS results by contrast are comparable to the Control sites, further examination of the AUSRIVAS data identifies very low abundances and primarily air breathing taxa. These results are likely to reflect an early stage of macroinvertebrate assemblage establishment and potentially indicate more limited water residence at this pool. Further monitoring will be required to establish whether additional time will result in continued macroinvertebrate assemblage recovery at this site or represents a continued trend of ongoing poor results.

Dry conditions at impact monitoring sites in autumn and spring 2023 have required modifications to the statistical analysis design. It is recommended that the ongoing overall statistical analysis approach be augmented in the following iteration of the monitoring program (spring 2023) to incorporate longitudinal analysis of the Survey and Period terms at the individual Impact site level as relevant. This will assist in determining 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 5-factor design.

4.5 Assessment of potential impacts

The pools at TTH16 and TTHt17 have been dry for two consecutive seasons. ATC Williams (2024) recorded reduced water levels at TTH16 (surface water monitoring site TT3) between July to November 2023, noting that the pool water levels had been recorded below the sensor level since mid-December 2022, except for brief intervals during or following rainfall. ATC Williams (2024) consider that the water level decline recorded at pool TT3 is atypical and inconsistent with historical conditions, indicating that mining related effects have occurred in the vicinity of this pool. At TTHt17 (surface water monitoring site TT12), the pool water level was below the sensor level since late February 2023 and recorded as being dry during the visual inspections between July to November 2023 (ATC Williams 2024). Water levels have been recorded in this pool only for short intervals during or following rainfall. ATC Williams (2024) considered that the water level behaviour at pool TT12 during the review period is atypical and inconsistent with historical conditions. The surface water review (ATC Williams 2024) concluded that the water level declines at TTH16 and TTHt17 are related to both mining-induced impacts in combination with prevailing dry weather conditions.

TTHt9 has been surveyed for the first time in spring 2023 and was dry at the time of survey. The surface water review conclude that this was a result of the prevailing dry conditions, rather than mining induced change (ATC Williams 2024).

TTH12 recorded nominal AUSRIVAS results when compared to the Controls and pre-mining data, but a decline in macroinvertebrate quantitative results in the 'during mining' period. ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH12 (surface water monitoring site TT2) between July to late November 2023, related to mining effects in combination with the prevailing climatic conditions. 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. The low macroinvertebrate assemblage results likely reflect the fluctuation in water levels prior to sampling. This pool will be re-assessed in detail in following iterations to determine if the macroinvertebrate assemblage continues to recover.

TTH13 was dry in autumn 2023, with water returning in spring 2023. ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH13 (surface water monitoring site TT13) between July to November 2023, related to mining effects in combination with the prevailing climatic conditions. Niche also recorded dry conditions at this pool in 2019 in the pre-mining period. This pool recorded poor quantitative macroinvertebrate results (lowest to date) in spring 2023. While the AUSRIVAS results from this pool were comparatively much better and were comparable to Control sites, the taxa collected were primarily air breathing and may suggest an early stage of pool recolonisation, potentially indicating more limited water residence at this pool. Despite this, an AUSRIVAS Band B and one EPT taxa was recorded in spring 2023 with the returning water levels. Further monitoring will be required to establish whether additional time will result in continued overall macroinvertebrate assemblage recovery at this site, or if this is part of an ongoing pattern of harsh environmental conditions.

The new additional sites established downstream of areas of mining induced change recorded biological scores comparable to baseline Impact site data, and at the Control sites in spring 2023. It is possible that a decline in stream health indices may be detected over time, downstream of areas of mining induced change, and should be evaluated in future iterations of the monitoring program.

4.6 Trigger Action Response Plan

The LW S1A-S6A Extraction Plan (Tahmoor Coal 2023) defines a Level 1 TARP (BMP1 aquatic habitat and macroinvertebrate indicators [stream health]) as:

> *"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)."

Impact monitoring sites TTH16 and TTHt17 have recorded reduced aquatic pool habitats (dry pools) compared to baseline observations for two consecutive sampling occasions. The results align with a level 1 TARP at sites TTH16 and TTHt17 in spring 2023. Although it is noted that ATC Williams (2024) conclude that the reduction of water levels at TTH16 (surface water monitoring site TT11) and TTHt17 (surface water monitoring site TT12) is related to both mining-induced impacts in combination with prevailing dry weather conditions. Outcomes of a review against the actions and responses listed in the BMP1 Level 1 TARP are summarised below (Table 15).

Table 15: Review against actions and responses for 'Level 1' BMP1 aquatic habitat and macroinvertebrate indicators (stream health) TARP actions

Action/Response	Outcome
Action	
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 (no samples could be collected).
Discuss findings and obtain other relevant information from key specialists (e.g. subsidence monitoring results, surface water monitoring results, groundwater monitoring results).	ATC Williams (2024) conclude that the reduction of water levels at TTH16 (surface water monitoring site TT11) and TTHt17 (surface water monitoring site TT12) is related to both mining-induced impacts in combination with prevailing dry weather 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 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.
Response	
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.

Action/Response	Outcome
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.
Report trigger exceedance to DPE and key stakeholders.	Completed as part of this report.

TTH13 has not recorded a TARP level 1, with pool water levels returning in Spring 2023, and the Site recording an AUSRIVAS Band B. Further monitoring data will be required at this site to determine whether this is a trend of ongoing recovery.

All other impact monitoring sites align with a 'Normal' TARP level in spring 2023, with these pools holding water and recording nominal stream health results. Further analysis of the quantitative monitoring data over time will assist in identifying any fine scale change in macroinvertebrate assemblages present that may be indicative of impacts not detected in the AUSRIVAS analysis, if any.

5. Conclusions

This report presents the results of ten seasons of data collection at Impact and Control monitoring sites completed to date, and the results of the third ‘during’ mining season of data collection. The report focusses on describing the findings of the most recent survey (spring 2023) and identification of any indicators of potential impact using a suite of 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 two consecutive sampling occasions leading to them aligning with a TARP level 1. It should be noted that ATC Williams (2024) conclude that the reduction of water levels at TTH16 (surface water monitoring site TT11) and TTHt17 (surface water monitoring site TT12) is related to both mining-induced impacts in combination with prevailing dry weather conditions.

All other impact monitoring sites (with the exception of Sites TTH16 and TTHt17) align with a ‘Normal’ TARP level in spring 2023.

Quantitative macroinvertebrate monitoring data identified low results across a number of indicators at Site TTH12. ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH12 (surface water monitoring site TT2) between July to late November 2023, related to mining effects in combination with the prevailing climatic conditions. 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. The low macroinvertebrate assemblage results likely reflect the fluctuation in water levels prior to sampling. This pool will be re-assessed in detail in following iterations to determine if the macroinvertebrate assemblage continues to recover.

At Site TTH13, the quantitative macroinvertebrate analysis identified the lowest results in all three indicators across the monitoring period. ATC Williams (2024) concluded that there was an atypical water level decline recorded at pool TTH13 (surface water monitoring site TT13) between July to November 2023, related to mining effects in combination with the prevailing climatic conditions. Despite this, moderate AUSRIVAS results were recorded, including the presence of one sensitive taxa. Further analysis of the biological data indicate that the macroinvertebrate assemblage at this pool may be in an early stage of development, which tallies with the observations that pool water levels may have recently increased. Further assessment over time will be required to determine whether this pool is on a trajectory of continued recovery or reflects harsher instream conditions than the pre-mining period.

The additional AUSRIVAS samples 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 Sites TTH16 and TTHt17 during spring 2023, as these sites recorded biological scores comparable to baseline data and Control Sites in spring 2023. It is possible that a decline in stream health indices downstream of areas of mining induced change may be detected over time.

6. Recommendations

Dry conditions at impact monitoring sites in autumn and spring 2023 have required modifications to the statistical analysis design. It is recommended that the ongoing overall statistical analysis approach is augmented in the following iteration of the monitoring program (autumn 2024) to incorporate longitudinal analysis of the Survey and Period terms at the individual Impact Site level as relevant. This will assist in determining 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 5-factor design.

Biological results at Site TTH12 and TTH13 will 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.

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Annex 1: Aquatic monitoring site details

Table 16: Monitoring site attributes

Site Code	Site Number	Treatment/likelihood of impacts	Location description	Easting	Northing	Sampling methods	Monitoring period	Comments
BR1	Site 1	Control	Near weir on Bargo River	274424	6206513	Water quality and quantitative benthic sampling	Spring 2019 – autumn 2023	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 and quantitative benthic sampling	Spring 2019 – autumn 2023	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 and quantitative benthic sampling	Spring 2019 – autumn 2023	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, and quantitative benthic sampling	Spring 2019 – autumn 2023	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 Rockford Road bridge	279490	6207467	Water quality, and quantitative benthic sampling	Spring 2019 – autumn 2023	Not currently monitored as part of the Tahmoor South program. This site is monitored

Site Code	Site Number	Treatment/likelihood of impacts	Location description	Easting	Northing	Sampling methods	Monitoring period	Comments
								under the aquatic health monitoring program as part of the EPL 1389
BR6	Site 6	Downstream potential impact - low	Bargo River downstream of Rockford Road bridge	279630	6207585	Water quality and quantitative benthic sampling	Spring 2019 – autumn 2023	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 and quantitative benthic sampling and AUSRIVAS sampling	Spring 2023	None.
TTH	TTH MWD	Downstream potential impact	Tea tree Hollow downstream	277866	6208087	Water quality and quantitative benthic sampling,	Autumn 2021 - autumn 2023	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 and quantitative benthic sampling and AUSRIVAS sampling	Spring 2023	Located outside of subsidence prediction.
HC7	Site 7	Control	Hornes Creek	275705	6203691	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Spring 2019 - autumn 2023	Located outside of subsidence prediction.
HC8	Site 8	Control	Hornes Creek	275575	6204588	Water quality and quantitative benthic sampling, and	Spring 2019 - autumn 2023	Located outside of subsidence prediction.

Site Code	Site Number	Treatment/likelihood of impacts	Location description	Easting	Northing	Sampling methods	Monitoring period	Comments
						AUSRIVAS sampling		
DTC9	Site 9	Potential impact	Dog Trap Creek tributary	277626	6206496	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Autumn 2020	Dry in spring 2019. Not currently monitored.
DTC10	Site 10	Potential impact	Dog Trap Creek upstream	278879	6205973	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Autumn 2020	Dry in spring 2019. Not currently monitored.
DTC11	Site 11	Potential impact	Dog Trap Creek downstream	279194	6206395	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Autumn 2020	Dry in spring 2019. Not currently monitored.
TTHt9	Site 9	Potential impact	Tea Tree Hollow tributary (western arm) upstream	277146	6206543	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Spring 2023	Dry in spring 2023
TTH12	Site 12	Potential impact	Tea Tree Hollow upstream	277204	6205632	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Spring 2019 - autumn 2023	None.
TTH13	Site 13 (TTH11)	Potential impact	Tea tree Hollow downstream	277437	6206801	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Autumn 2020 – autumn 2023	Dry in spring 2019 and autumn 2023
TTH13 (d/s)	Site 13 d/s	Potential impact	Tea Tree Hollow – downstream of Site 13	277436	6206771	Water quality and AUSRIVAS sampling	Autumn 2023 – spring 2023	
MC14	Site 14	Control	Moore Creek upstream	270959	6200225	Water quality and quantitative benthic sampling	Autumn 2020- autumn 2023	Dry in spring 2019

Site Code	Site Number	Treatment/likelihood of impacts	Location description	Easting	Northing	Sampling methods	Monitoring period	Comments
MC15	Site 15	Control	Moore Creek downstream	271328	6204392	Water quality and quantitative benthic sampling	Spring 2019 - autumn 2023	None.
TTH16	Site 16	Potential impact	Tea Tree Hollow at Wimbarra Wildlife Sanctuary (TTH NEW)	277432	6206040	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Spring 2021 – autumn 2023	New site added in between Tea Tree Hollow 12 and 13. Site dry in autumn 2023 and spring 2023
TTHt17	Site 17	Potential impact	Tea Tree Hollow (Western Arm) (TTH West)	277246	6206601	Water quality and quantitative benthic sampling, and AUSRIVAS sampling	Spring 2021 – autumn 2023	New site added on western arm of Tea Tree Hollow. Site dry in autumn 2023 and spring 2023.
TTHt17 (d/s)	Site 17 d/s	Potential impact	Tea Tree Hollow tributary (Western Arm) - Downstream of Site 17	277315	6206638	Water quality and AUSRIVAS sampling	Autumn 2023 – Spring 2023	New site added on western arm of Tea Tree Hollow

**Upstream of, and outside of, the area of predicted subsidence impacts. Should an unexpected impact be subsequently detected, site will be utilised as an additional impact monitoring site (with pre-impact baseline data).*

***Quantitative and water quality monitoring only.*

Annex 2: Aquatic habitat at monitoring sites

Hornes Creek – HC7

A: Spring 2019

B: Autumn 2020

C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2022

H: Autumn 2023

G: Spring 2023

Category	Attribute	HC7
Riparian	**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
Stream characteristics	**Modal width**	4 m
	Bank condition	Exposed banks but stable. Slight erosion of lower bank.
	Substrate	Bedrock dominated
	Flow/depth	Low Flow in 2021. Moderate flow in 2022. Depth 1-2 m.

Category	Attribute	HC7
	Macrophytes/algae	Macrophytes absent
	Water quality observations	Dark yellow stained water in 2019. Clear water post 2019
Comments		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.

Hornes Creek- HC8

A: Spring 2019

B: Autumn 2020

C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2022

H: Autumn 2023

I: Spring 2023

Category	Attribute	HC8
Riparian	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	-
Stream characteristics	Modal width	5 m
	Bank condition	Exposed banks but stable. Banks are comprised of bedrock
	Substrate	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.
	Water quality observations	Dark anoxic water in 2019. Clear water in 2020-2022. Some sedimentation.
Comments		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.

Tea Tree Hollow TTH12

A: Spring 2019

B: Autumn 2020

C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2022

H: Autumn 2023

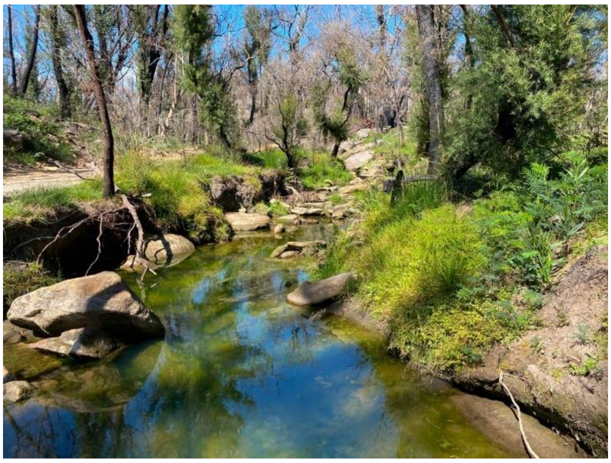
I: Spring 2023

Category	Attribute	TTH12
Riparian	Vegetation	Good condition native riparian vegetation. Burnt in 2020. Good recovery in 2021-2022.
	Stream shading	Low shading
	Exotic vegetation	Present
Stream characteristics	Modal width	5 m
	Bank condition	Exposed banks but stable. Slight erosion of lower bank.
	Substrate	Bedrock and fine sediments.
	Flow/depth	Very DRY in 2019 (only one pool present). Bank full in 2020-2022 1-2 m.
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Clear but high organic matter.
Comments		Pool has significant amount of organic matter present.

Tea Tree Hollow - TTH13

A: Spring 2019

B: Autumn 2020



C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2023

H: Autumn 2023

I: Spring 2023

Category	Attribute	TTH13 (TTH11)
Riparian	Vegetation	Good condition native riparian vegetation. Area burnt in 2020. Recovering well in 2022.
	Stream shading	Low shading
	Exotic vegetation	Crofton weed (*Ageratina adenophora*)
Stream characteristics	Modal width	2 m
	Bank condition	Exposed banks but stable. Slight erosion of lower bank. Significant erosion in Autumn 2022.
	Substrate	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.
	Water quality observations	Clear water
Comments		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.

Moore Creek - MC14

A: Spring 2019

B: Autumn 2020

-

C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2022

H: Autumn 2023

I: Spring 2023

Category	Attribute	MC14
Riparian	**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
Stream characteristics	**Modal width**	3 m
	Bank condition	Exposed banks erosion/sedimentation present. Erosion around concrete culvert/crossing structure (downstream of sample collection).
	Substrate	Bedrock dominated, boulder, cobble, silt
	Flow/depth	DRY in 2019. Low Flow/ ~1 metre in 2020-2022
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Clear water
Comments		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.

Moore Creek – MC15

A: Spring 2019

B: Autumn 2020

-

C: Spring 2020

D: Autumn 2021

E: Spring 2021

F: Autumn 2022

G: Spring 2022

H: Spring 2023

Category	Attribute	MC15
Riparian	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
Stream characteristics	Modal width	3 m
	Bank condition	Stable
	Substrate	Fine sediments; silt, sand and gravel, large sections of bedrock
	Flow/depth	Low Flow/ ~1 metre. Moderate flow in 2022
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Clear water
Comments		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.

Tea Tree Hollow– TTH16

A: Spring 2021

B: Autumn 2022

G: Spring 2022

H: Autumn 2023

I: Spring 2023

Category	Attribute	TTH16
Riparian	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
Stream characteristics	Modal width	3 m
	Bank condition	Stable
	Substrate	Fine sediments; silt, sand and gravel, large sections of bedrock
	Flow/depth	Low Flow/ ~1 metre
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Clear water
Comments		Water clear with some deeper sections.

Tea Tree Hollow Western Arm– TTHt17

A: Spring 2021

B: Autumn 2022

G: Spring 2022

Autumn 2023

I: Spring 2023

Category	Attribute	TTHT17
Riparian	**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
Stream characteristics	**Modal width**	4 m
	Bank condition	Stable
	Substrate	Fine sediments; silt, sand and gravel, large sections of bedrock
	Flow/depth	Low Flow/ ~1 metre
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Visually turbid water
Comments		-

Annex 3: AUSRIVAS – Macroinvertebrate taxa recorded

Macroinvertebrate data: spring 2021 - spring 2023

AUSRIVAS spring 2019 - autumn 2020

Taxa	Spring 2019							Autumn 2020								
Site	BR4	BR5	BR6	HC7	HC8	TTH12	TTH13	BR5	BR6	HC7	HC8	TTHt9	DTC10	DTC11	TTH12	TTH13
Turbellaria	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Physidae	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	2
Corbiculidae	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	3	0	0	0	0	1	0	1	0	0	0	0
Acarina	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0
Atyidae	27	4	1	0	28	0	3	0	2	1	1	0	0	0	0	0
Parastacidae	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	1
Dytiscidae	4	0	1	1	1	12	0	0	2	3	8	30	5	14	26	31
Gyrinidae	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	2
Elmidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Haliphidae	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0
Hydrophilidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Scirtidae	0	2	0	2	0	0	0	0	0	0	0	0	1	0	0	2
Dixidae	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Culicidae	0	0	0	3	0	0	1	0	0	0	0	0	0	1	0	1
Tanypodinae	1	1	0	0	0	0	0	2	0	0	10	0	0	1	2	5
Orthocladiinae	0	2	0	0	0	0	3	0	0	4	8	0	0	0	0	0
Chironominae	5	6	4	5	13	0	1	14	14	24	18	1	13	10	21	18
Baetidae	4	3	14	0	0	0	23	28	4	30	22	2	17	1	7	24

Taxa	Spring 2019							Autumn 2020								
Site	BR4	BR5	BR6	HC7	HC8	TTH12	TTH13	BR5	BR6	HC7	HC8	TTHt9	DTC10	DTC11	TTH12	TTH13
Leptophlebiidae	3	7	4	0	5	0	2	0	0	1	1	114	13	11	1	0
Caenidae	0	4	4	0	0	0	0	15	8	0	2	0	0	0	8	11
Mesoveliidae	0	0	0	7	0	0	0	0	0	0	0	0	1	0	0	0
Veliidae	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0
Gelastocoridae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Gerridae	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Corixidae	0	0	0	0	0	0	0	62	18	5	6	0	4	0	12	12
Notonectidae	3	1	16	8	1	10	6	7	3	0	9	0	3	0	2	7
Coenagrionidae	17	4	1	30	0	0	0	1	0	1	0	0	2	1	0	0
Isostictidae	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Aeshnidae	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0
Gomphidae	7	0	1	0	0	1	0	0	3	0	0	0	1	0	0	0
Telephlebiidae	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synthemistidae	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Hemicorduliidae	3	2	6	2	9	1	0	0	0	7	1	0	1	0	2	3
Cordulephyidae	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Libellulidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Hydroptilidae	0	0	3	0	0	0	0	0	0	3	0	0	1	0	0	0
Ecnomidae	0	2	4	0	0	0	0	1	0	0	0	0	0	0	0	0
Calamoceratidae	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptoceridae	3	34	8	22	0	0	1	5	4	3	0	0	0	0	3	1

AUSRIVAS spring 2020 - autumn 2021

Taxa	Spring 2020								Autumn 2021								
Site	**BR4**	**BR5**	**BR6**	**HC7**	**HC8**	**TTH12**	**TTH13**	**BR3**	**BR5**	**BR6**	**HC7**	**HC8**	**TTHt9**	**DTC10**	**DTC11**	**TTH12**	**TTH13**
Turbellaria	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Sialidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Physidae	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	2
Corbiculidae	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta	0	0	0	0	3	0	0	0	0	0	1	0	1	0	0	0	0
Acarina	0	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0
Atyidae	27	4	1	0	28	0	0	3	0	2	1	1	0	0	0	0	0
Parastacidae	0	0	0	0	0	0	1	0	0	0	3	0	0	1	0	0	1
Dytiscidae	4	0	1	1	1	12	11	0	0	2	3	8	30	5	14	26	31
Gyrinidae	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	2	2
Elmidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haliphidae	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0
Hydrophilidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Scirtidae	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	2
Dixidae	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Simuliidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Culicidae	0	0	0	3	0	0	0	1	0	0	0	0	0	0	1	0	1
Ceratopognidae	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Tanypodinae	1	1	0	0	0	0	5	0	2	0	0	10	0	0	1	2	5
Orthocladiinae	0	2	0	0	0	0		3	0	0	4	8	0	0	0	0	0
Chironominae	5	6	4	5	13	0	3	1	14	14	24	18	1	13	10	21	18
Baetidae	4	3	14	0	0	0	0	23	28	4	30	22	2	17	1	7	24
Leptophlebiidae	3	7	4	0	5	0	0	2	0	0	1	1	114	13	11	1	0
Caenidae	0	4	4	0	0	0	0	0	15	8	0	2	0	0	0	8	11
mesoveliidae	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0

Taxa	Spring 2020								Autumn 2021								
Site	**BR4**	**BR5**	**BR6**	**HC7**	**HC8**	**TTH12**	**TTH13**	**BR3**	**BR5**	**BR6**	**HC7**	**HC8**	**TTHt9**	**DTC10**	**DTC11**	**TTH12**	**TTH13**
Veliidae	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0
Gelastocoridae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Gerridae	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Corixidae	0	0	0	0	0	0	1	0	62	18	5	6	0	4	0	12	12
Notonectidae	3	1	16	8	1	10	1	6	7	3	0	9	0	3	0	2	7
Coenagrionidae	17	4	1	30	0	0	0	0	1	0	1	0	0	2	1	0	0
Isostictidae	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Aeshnidae	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0
Gomphidae	7	0	1	0	0	1	0	0	0	3	0	0	0	1	0	0	0
Telephlebiidae	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Synthemistidae	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Hemicorduliidae	3	2	6	2	9	1	0	0	0	0	7	1	0	1	0	2	3
Cordulephyidae	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Libellulidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Hydroptilidae	0	0	3	0	0	0	2	0	0	0	3	0	0	1	0	0	0
Ecnomidae	0	2	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Calamoceratidae	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptoceridae	3	34	8	22	0	0	0	1	5	4	3	0	0	0	0	3	1

AUSRIVAS spring 2021 - autumn 2022

Taxa	Spring 2021						Autumn 2022					
Site	HC7	HC8	TTH12	TTH13	TTH16	TTHt17	HC7	HC8	TTH12	TTH13	TTH16	TTHt17
Aeshnidae	0	0	0	0	0	0	0	0	0	0	1	0
Atyidae	2	13	4	0	2	4	2	4	19	0	4	7
Baetidae	0	0	0	5	0	0	8	12	1	1	1	4
Caenidae	0	0	13	9	12	0	0	0	0	0	1	0
Carabidae	0	0	0	0	0	0	0	0	0	0	3	0
Ceratopogonidae	0	0	0	0	0	2	0	0	0	0	0	0
Chironominae	13	4	3	10	6	9	0	12	0	4	0	3
Coenagrionidae	0	1	0	0	0	0	2	0	0	0	1	0
Corixidae	0	1	0	2	2	1	0	1	0	2	7	1
Dytiscidae	0	0	1	0	5	1	4	0	1	0	3	0
Ecnomidae	1	0	0	0	0	2	0	0	0	1	1	0
Elmidae	0	0	0	0	0	0	1	0	0	0	0	0
Gelastocoridae	0	0	0	0	0	0	0	0	1	0	0	0
Gomphidae	0	0	0	0	0	0	1	0	0	0	0	0
Gyrinidae	0	0	0	1	0	0	0	0	0	0	3	0
Hemicorduliidae	0	4	0	0	0	0	1	0	0	0	1	0
Hydrochidae	0	0	0	0	0	0	0	0	0	0	0	0
Hydrometridae	0	0	0	0	0	0	0	1	0	0	0	0
Hydrophilidae	0	0	0	0	0	0	1	0	0	0	0	0
Hydroptilidae	0	0	0	0	0	0	1	0	0	1	0	0
Leptoceridae	1	9	0	1	1	0	17	9	0	0	0	1
Leptophlebiidae	10	4	8	4	14	1	12	10	2	17	14	0
Megapodagrionidae	4	2	0	0	1	1	1	0	0	0	0	0
Naucridae	0	0	0	0	0	0	1	0	0	0	0	0

Taxa	Spring 2021						Autumn 2022					
Site	HC7	HC8	TTH12	TTH13	TTH16	TTHt17	HC7	HC8	TTH12	TTH13	TTH16	TTHt17
Notonectidae	0	1	0	0	2	3	1	3	1	0	0	1
Oligochaeta	0	1	0	0	0	0	0	0	1	0	0	0
Orthocladiinae	0	11	0	0	0	1	1	4	0	0	0	0
Parastacidae	1	0	2	0	2	3	1	3	1	1	0	5
Physidae	0	0	0	0	0	0	1	0	0	0	0	0
Polycentropodidae	0	0	0	0	0	0	0	0	0	0	0	0
Psephenidae	0	1	0	0	0	0	0	0	1	0	0	0
Scirtidae	0	0	0	0	0	0	2	3	0	0	1	1
Stratiomiyidae	0	0	1	0	0	0	0	1	0	0	0	0
Synthemistidae	9	2	0	0	0	0	0	0	0	0	1	0
Tanypodinae	1	4	0	1	0	1	0	4	0	1	0	0
Telephlebiidae	3	4	0	0	0	0	0	0	0	0	0	0
Tipulidae	0	1	1	1	0	0	3	1	0	2	0	0
Veliidae	0	0	0	0	0	0	0	0	1	0	0	0

AUSRIVAS spring 2022 – autumn 2023

Taxa	Spring 2022						Autumn 2023				
Site	HC7	HC8	TTH12	TTH13	TTH16	TTHt17	HC7	HC8	TTH12	TTH13 (d/s)	TTHt17 (d/s)
Aeshnidae	0	0	0	0	0	0	0	0	0	0	0
Atyidae	0	0	0	3	8	0	0	0	3	0	0
Baetidae	0	0	18	8	8	3	0	0	0	0	0
Caenidae	0	0	0	0	0	0	0	0	0	0	0
Carabidae	0	0	2	0	2	1	0	0	0	0	0
Ceratopogonidae	0	0	1	0	0	0	1	0	0	0	0
Chironominae	105	49	1	1	0	8	12	18	0	0	0
Coenagrionidae	0	0	1	0	0	0	0	0	0	0	0
Corixidae	4	1	3	5	0	9	1	8	3	1	0
Curculionidae	0	0	0	1	0	0	0	0	0	0	0
Dixidae	0	0	1	0	7	0	0	0	0	0	0
Dytiscidae	8	0	2	0	3	1	0	0	0	1	1
Ecnomidae	0	0	1	0	2	0	3	1	1	10	1
Elmidae	0	0	0	0	0	0	0	0	0	0	0
Gelastocoridae	0	0	0	0	0	0	0	0	0	0	0
Gerridae	0	0	0	0	0	2	0	0	0	1	1
Gomphidae	0	0	0	0	0	0	2	0	0	2	2
Gyrinidae	0	0	0	0	0	0	0	0	0	0	0
Hemicorduliidae	0	3	0	0	2	0		5	0	0	0
Hydrobiosidae	0	0	0	1	0	0	0	0	0	0	0
Hydrochidae	0	0	0	0	0	0	0	0	0	0	0
Hydrometridae	0	0	0	0	0	0	0	0	0	0	0
Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0
Hydroptilidae	1	1	0	0	0	0	0	0	0	0	0
Leptoceridae	4	6	0	0	1	0	2	0	3	2	0

Taxa	Spring 2022						Autumn 2023				
Site	HC7	HC8	TTH12	TTH13	TTH16	TTHt17	HC7	HC8	TTH12	TTH13 (d/s)	TTHt17 (d/s)
Leptophlebiidae	17	6	58	60	52	1	0	0	13	9	1
Megapodagrionidae	1	1	0	0	2	0	0	0	0	0	5
Naucridae	0	0	0	0	0	0	0	0	0	0	0
Notonectidae	9	8	4	6	6	16	4	2	4	3	23
Oligochaeta	0	2	0	0	0	0	0	0	0	0	0
Orthocladiinae	1	4	0	1	0	0	0	0	0	0	0
Parastacidae	0	0	1	0	1	0	0	0	0	0	0
Physidae	8	0	0	0	0	0	0	0	0	0	0
Polycentropodidae	0	0	0	0	0	0	0	0	0	0	0
Psephenidae	0	0	0	2	0	0	0	0	0	0	0
Scirtidae	0	0	0	0	0	2	0	0	0	0	0
Stratiomiyidae	0	0	0	0	0	0	0	0	0	0	0
Synthemistidae	1	0	0	0	0	6	0	0	0	0	0
Tanypodinae	3	1	2	1	0	2	8	9	0	1	3
Telephebiidae	0	2	1	5	15	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	0	1	0	0
Veliidae	1	4	13	2	14	1	0	1	5	12	2

AUSRIVAS spring 2023

Taxa	Spring 2023										
Site	HC6	HC7	HC8	TTHt9	TTH12	TTH13	TTH13 (d/s)	TTH16	TTH17	TTHt17 (d/s)	BRt6
Acarina	0	0	0	DRY	0	1	0	DRY	DRY	0	0
Aeshnidae	0	1	0	DRY	0	0	0	DRY	DRY	0	0
Atyidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Baetidae	1	0	0	DRY	0	1	0	DRY	DRY	0	1
Caenidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Carabidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Ceratopogonidae	0	0	0	DRY	3	0	0	DRY	DRY	0	0
Chironominae	19	3	4	DRY	1	5	0	DRY	DRY	0	12
Coenagrionidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Cordulephyidae	0	0	1	DRY	0	0	0	DRY	DRY	0	0
Corduliidae	0	7	0	DRY	0	1	0	DRY	DRY	0	0
Corixidae	0	6	12	DRY	4	1	1	DRY	DRY	0	1
Culicidae	0	0	0	DRY	0	8	6	DRY	DRY	0	4
Curculionidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Dixidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Dytiscidae	4	1	0	DRY	2	1	5	DRY	DRY	2	4
Ecnomidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Elmidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Gelastocoridae	0	0	1	DRY	0	0	0	DRY	DRY	0	0
Gerridae	0	0	0	DRY	0	1	3	DRY	DRY	0	0
Gomphidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Gyrinidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Hemicorduliidae	0	-	0	DRY	0	-	0	DRY	DRY	0	0
Hydrobiosidae	-	0	0	DRY	0	0	0	DRY	DRY	0	0
Hydrochidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0

Taxa	Spring 2023										
Site	HC6	HC7	HC8	TTHt9	TTH12	TTH13	TTH13 (d/s)	TTH16	TTH17	TTHt17 (d/s)	BRt6
Hydrometridae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Hydrophilidae	0	0	0	DRY	0	1	1	DRY	DRY	1	1
Hydroptilidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Isostictidae	0	0	1	DRY	0	0	0	DRY	DRY	0	0
Leptoceridae	9	1	1	DRY	0	0	0	DRY	DRY	0	2
Leptophlebiidae	17	0	0	DRY	0	0	0	DRY	DRY	0	0
Libellulidae	0	0	1	DRY	0	0	0	DRY	DRY	0	0
Megapodagrionidae	1	0	0	DRY	0	0	0	DRY	DRY	0	0
Naucridae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Notonectidae	3	6	9	DRY	3	0	2	DRY	DRY	6	1
Oligochaeta	0	1	2	DRY	0	1	0	DRY	DRY	0	0
Orthocladiinae	1	0	0	DRY	0	0	0	DRY	DRY	0	0
Parastacidae	0	0	8	DRY	2	1	0	DRY	DRY	1	0
Philorheithridae	0	0	0	DRY	0	0	0	DRY	DRY	0	1
Physidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Polycentropodidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Psephenidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Scirtidae	0	0	1	DRY	0	0	0	DRY	DRY	0	0
Stratiomiyidae	0	0	0	DRY	0	0	0	DRY	DRY	0	0
Synthemistidae	4	0	1	DRY	0	-	0	DRY	DRY	0	0
Tanypodinae	3	1	0	DRY	2	1	2	DRY	DRY	0	1
Telephebiidae	3	0	0	DRY	0	0	0	DRY	DRY	0	0
Tipulidae	0	0	0	DRY	0	0	0	DRY	DRY	0	1
Veliidae	3	1	6	DRY	12	3	11	DRY	DRY	4	4

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Heritage management
Aboriginal heritage
Historical heritage
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Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting
Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)

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

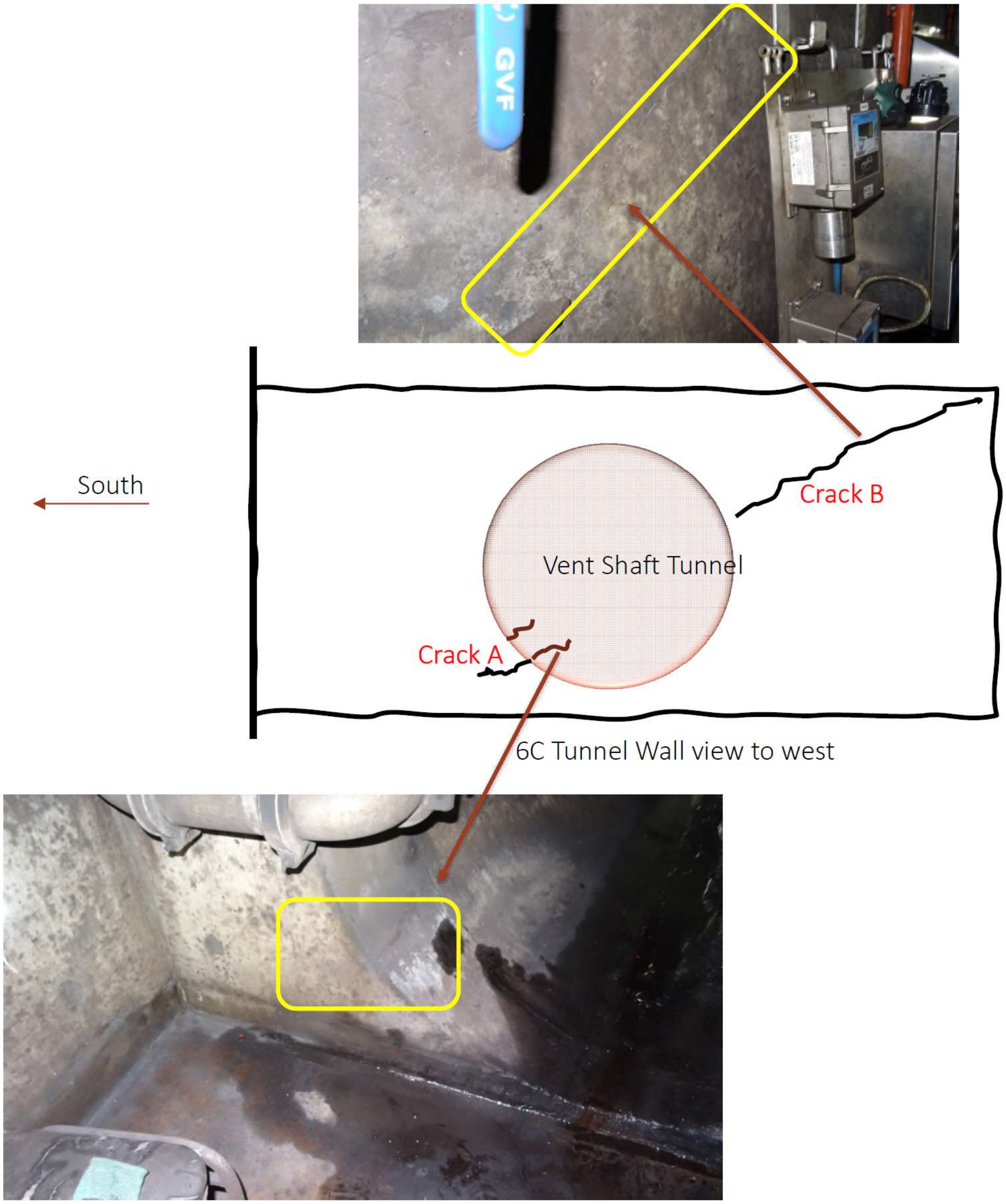

Plate 4.1 Location of cracks A(C1) and B (C2) within Tunnel 6C (David Talbert 29 May 2023).

Plate 4.2 Crack B (C2), width <1 mm (David Talbert 29 May 2023).

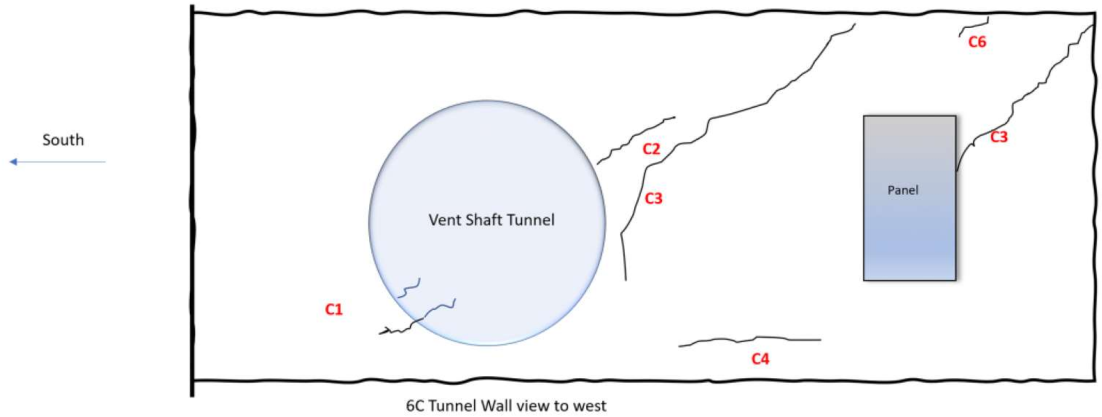

Plate 4.3 Context for the location of cracks C1, C2 and C3 (David Talbert, 6 June 2023).

Plate 4.4 Crack C4 (David Talbert, 6 June 2023).

Plate 4.5 Crack C5 (David Talbert, 6 June 2023).

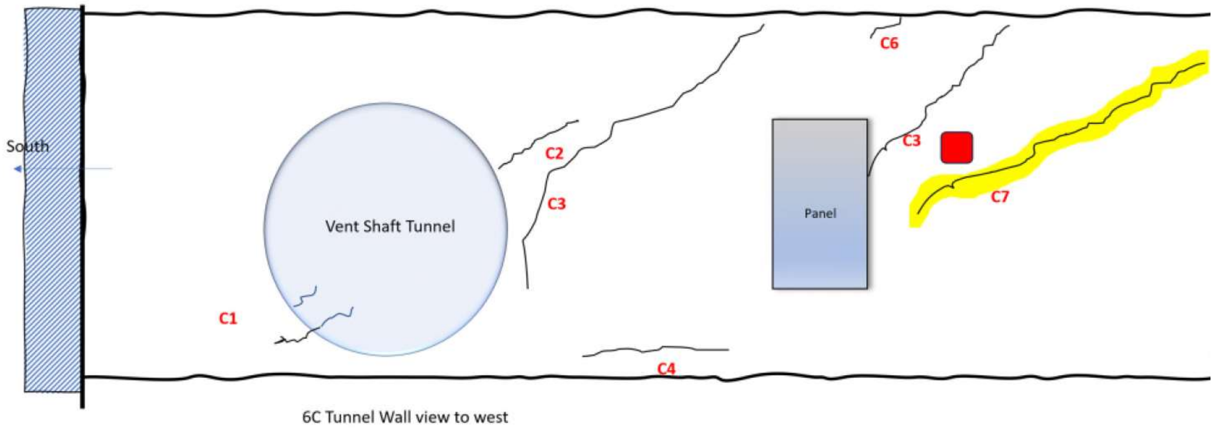

Plate 4.6 Location of C7 (David Talbert, 27 June 2023)

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Archaeological Monitoring (July 2023)

27 July 2023

To: April Hudson, SIMEC Mining

From: Dr Alan Williams FRSA FSA FRSN MAACAI MEIANZ

Subject: Teatree Hollow rockshelter 2013.1 (#52-2-4471) - post-longwall monitoring - findings

Dear April,

Background and context

Tahmoor Coal Pty Ltd (Tahmoor Coal) is currently implementing the Tahmoor South Coal Project, near Bargo, which was approved as State Significant Development (SSD-8445) in April 2021. This project includes the southern expansion of underground longwall coal extraction from the existing Tahmoor mine operations, Remembrance Drive, Tahmoor, NSW. Specifically, six longwalls, LWS1A-S6A, are being excavated beneath a relatively unmodified piece of bushland between Remembrance Drive and Charlies Point Road, and within which flows Teatree Hollow Creek. An Extraction Plan for these six longwalls was approved in September 2022.

As part of the Extraction Plan, an heritage management plan (HMP) was developed that provided direction on the management of Aboriginal cultural materials that may interact with the proposed development activities (EMM, 2022). One of the requirements was the ongoing monitoring of a documented rockshelter, Teatree Hollow 2013.1 (AHIMS #52-2-4471), situated on the eastern bank of Teatree Hollow Creek, during the development activities. This site was proactively investigated in advance of the longwall in the event of unexpected impacts, and these activities are reported on in EMM (2023).

This letter provides observations of the rockshelter that was visited following the completion of LWS1A in July 2023 to identify whether the subsidence impacts had occurred.

Results and findings

A site inspection was undertaken by Alan Williams (EMM) and Kirsty Chalker (Cubbitch Barta Native Title Claimants Aboriginal Corporation) on 10 July 2023.[1]

Overall, the rockshelter appeared in a similar condition to when previously visited by these personnel as part of archaeological excavations in November 2022 (Plates 1-5). The site inspection 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.

1 Tharawal LALC was also invited to participate, but due to existing commitments did not attend the site inspection.

A small patch of the rear wall at the southern end of the site appear to exhibit signs of fresh abrasion (Plate 5), but which may have been 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 that was full at the time of the previous excavations was empty at the time of site inspection (Plates 3 and 4). While not part of the rockshelter site itself, this was noted, since the proximity of the site to the creek provides both a probable reason for its original use in the past, and contributes to its aesthetic significance. SIMEC Mining is currently investigating the changes in creek flow in relation to mining and climatic conditions – the creek being ephemeral and having been subject of several dry months – but is managing this change through Trigger Action Response Plan (TARP) triggers for low flow within the approved LWS1A-S6A Water Management Plan.

Conclusions and next steps

The site inspection identified no direct subsidence impacts to the site. The drying out of Teatree Hollow Creek has resulted in some indirect impacts to the site's value. Based on this, the following recommendations are proposed:

- Based on the site inspection, no corrective or remedial actions are required for the Teatree Hollow 2013.1 (AHIMS #52-2-4471) following the completion of LWS1A.

- In relation to the water flow regime changes at Teatree Hollow Creek, any corrective actions should be undertaken in accordance with approved Water Management Plan, and consider the association and importance of the creek to Teatree Hollow 2013.1 (AHIMS #52-2-4471). As part of the consultative process for any corrective actions, a copy of plans and proposed actions will be provided to the registered Aboriginal parties for comment prior to finalisation.

- In accordance with the HMP, a further site monitoring inspection of the rockshelter should be undertaken at the completion of LWS2A.

If you have any questions or comments, please contact me on 0438 104 740.

Yours sincerely

Dr Alan Williams FRSA FSA FRSN MAACAI MEIANZ
Technical Lead, Aboriginal Heritage
awilliams@emmconsulting.com.au

References

EMM (2022) Heritage Management Plan – Tahmoor South Domain – Longwalls South 1A – South 6A. *Unpublished report to Tahmoor Coal Pty Limited.*

EMM (2023) Teatree Hollow rockshelter (#52-2-4471) - archaeological excavations - completion of excavations and results. Unpublished report to SIMEC Mining Pty Limited.

Plate 1 Teatree Hollow rockshelter immediately following archaeological excavations in November 2022, looking south.

Plate 2 Teatree Hollow rockshelter during site inspection in July 2023, looking south.

Plate 3 Teatree Hollow rockshelter during archaeological excavations in November 2022, looking southwest. Note the water-level of Teatree Hollow Creek in the foreground.

Plate 4 Teatree Hollow creek during the site inspection in July 2023, looking south. The rockshelter is immediately left (east) of photograph.

Plate 5 Some abrasion (the bright yellow) on the back wall at the south of the rockshelter, and which may reflect recent damage as a result of animal use or climatic changes.

Appendix F – Main Southern Rail Monitoring Reports

TAHMOOR COAL: LW S1A

Subsidence Management Status Report No. 27
During the mining of LW S1A beneath the Main Southern Railway

Reporting Period	9 August 2023 to 22 August 2023	
Length of extraction of LW S1A	1706 m	LW S1A completed extraction on 4 July 2023 LW S2A commenced extraction on 2 August and has extracted 188 m as at 22 August 2023.
Closest distance of LW S1A face to Railway		
Distance travelled by LW since previous report		
Maximum incremental subsidence along Railway due to LW S1A	531 mm	at 98.80 km on 10 August 2023
Maximum increase in subsidence since previous survey	3 mm	at 99.46 km (17 July to 10 August 2023)
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	10 Aug	Monthly	N/A	No change this month in horizontal misalignment at 98.80 km where increased compressive strain and change in vertical alignment is observed.
2D ground survey	10 Aug	Cease	N/A	Rates of change reducing to very low levels. No change in compressive strain of 2.4 mm/m between 98.78 km and 98.80 km, with change in vertical alignment. No change in compressive strain of 1.8 mm/m between 98.74 km and 98.76 km at creek crossing.
Rail creep surveys	-	Monthly	N/A	Last survey 17 July. No new creep observed.
Long bay length survey	-	Cease	N/A	Last survey 17 July. Minor changes observed. ARTC authorised change to Stage 3 subsidence management. Surveys have ceased.
Rail stress	Every 5 mins			Changes in stresses within expectations.
Switch displacements	Every 5 mins			Measurements within tolerances. ARTC authorised change to Stage 3 subsidence management. ZTL clips will be replaced with standard resilient fastenings between AP0 and AP1 in the next week. Planned removal of ES1 Up Main on 9 September, and Down Main on 16 September.
Track geometry survey	19 Aug	Fortnightly		Rates of change reducing to very low levels. Poor track geometry at 98.800 km due to mining-induced movements. Track geometry was observed to gradually deteriorate over since maintenance work was completed at the Down Main at 98.824 km and Up Main at 98.807 km in mid July, as per previous experience. This fortnight's survey showed minor changes. Local resurfacing has been completed this fortnight, resulting in improved track geometry. Resurfacing by tamper and regulator planned 23-24 September.
Track centre measurements	10 Aug	Monthly	-	Minor changes observed.
Inspections by Track Certifier	15 Aug	Daily		Poor track noted 98.8 km.
Early warning monitoring				
GNSS monitoring S1 to S15	Continuous		N/A	Rates of change reduced to very low levels.
V-Line along Tahmoor Mine property boundary	-	Cease	N/A	Last survey 5 July. Subsidence up to 774 mm and valley closure observed across Tributary to Teatree Hollow. Minor changes since previous survey.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Embankment and Culvert at 98.445 km, including Tahmoor Mine Site embankment upstream				
Absolute 3D survey	10 Aug	Cease	N/A	Minor changes observed.
Visual inspection	-	Cease	N/A	Inspections have ceased.
Embankment and Culvert at 98.739 km				
Absolute 3D / relative 3D survey	10 Aug	Cease	N/A	Minor changes observed. Small closure across the crest. No changes to compressive strain of 1.8 mm/m from 98.740 km to 98.760 km on Up side and 0.6 mm/m on Down side.
Visual inspection	-	Cease	N/A	Inspections have ceased.
Embankment and Culvert at 99.035 km				
Absolute 3D / relative 3D survey	10 Aug	Cease	N/A	Minor changes observed.
Visual inspection	-	Cease	N/A	Inspections have ceased.
Embankment and Culvert at 99.338 km				
Absolute 3D / relative 3D survey	10 Aug	Cease	N/A	Minor changes observed. Small increases in opening across the crest, and closure on the Up side, between 99.34 km and 99.46 km, likely due to disturbance by machinery during installation of ES5. Four prisms normalised.
Extensometers	Every 15 minutes		N/A	Minor changes this fortnight.
Inclinometer	-	Cease	N/A	Last readings 17 July. Monitoring has ceased.
Piezometer	Every 15 minutes		N/A	No water flow through the culvert this fortnight.
Visual inspection	-	Cease	N/A	Inspections have ceased.
Cuttings				
Visual inspection	-	Cease	N/A	Inspections have ceased.
Coal Conveyor at 98.160 km				
Survey across Railway	-	Cease		Surveys have ceased.
Laser distancemeter	Hourly			Minor changes observed.
Visual inspection	-	Cease	N/A	Inspections have ceased.
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	-	Cease	N/A	Surveys have ceased.
Absolute 3D structure survey	-	Cease	N/A	Surveys have ceased.
Precision 2D ground survey between ends of Viaduct and Bridge (valley closure)	-	Cease		Surveys have ceased.
Gap between deck and northern abutment of Bridge	-	Cease		Surveys have ceased.
Bargo River Road Overbridge at 96.049 km (Potter's Cutting)				
Far-field Absolute 3D survey	-	Cease	N/A	Surveys have ceased.
Local 3D survey of structure	-	Cease		Surveys have ceased.
Crack gauges	-	Cease		Inspections have ceased.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Wellers Road Overbridge at 101.162 km				
GNSS unit S15	Continuous		N/A	Very minor movement observed to the north and west.
Local 3D survey of structure	-	End of LW S1A		Last survey 2 March. Very minor movement observed to the north, as per the GNSS unit survey. No measurable change across the bridge span. Next survey planned at end of LW S1A.
Crack gauges	-	End of LW S1A		Measurement planned at end of LW S1A.

Management Actions

Other management actions since previous report:

- Localised tamping Up and Down Main at 98.800 km completed

Any additional and/or outstanding management actions:

- Removal of ZTLs in zone 1, planned completion late August
- Remove ES1 - Up Main planned 9 September, Down Main planned 16 September
- Resurfacing by tamper and regulator planned 23-24 September
- Adjust SFT on Up Main north of AP0 before early Spring. Adjustment planned late September
- Repair and widening of Down side of embankment at 98.338 km. Planned completion late September

Consultation with stakeholders since previous report:

- RMG meeting on 11 August. Next meeting planned on 25 August.
- Request for change to Stage 3 Subsidence Management submitted to ARTC on 16 August

Forecast whether residual subsidence 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 new triggers under this Management Plan are expected to be exceeded in the next week. Rates of change in track geometry have reduced to very low levels in the vicinity of 98.8 km where Blue trigger levels have been exceeded. While the track condition is poor, the Track Certifier has advised that a temporary speed restriction is not required. Additional resurfacing will be completed if required. Accordingly residual subsidence 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	24 August 2023

Copy of Report to:

Daniel Wakefield, Area Manager Ingleburn, ARTC
Sladjan Mitic, Senior Track Engineer Ingleburn, ARTC
Michael Irons, Property Manager – Wagga, ARTC
Brian Cooper, Manager Maintenance North-South, ARTC;
Peter Haskard, Manager Engineering, Interstate Network, ARTC
Clint Mason, Production Manager, Tahmoor Mine
Ian Cochran, Bridges and Structures Specialist, ONRSR
Ray Ramage, A/Principal Inspector – Subsidence Engineering, Mine Safety Inspectorate

Appendix G – Tahmoor Mine Site Monitoring Reports

TAHMOOR COAL: LW S1A

Subsidence Management Status Report No. 22
During the mining of LW S1A beneath the Tahmoor Mine Site

Reporting Period	15 July 2023 to 21 July 2023	
Length of extraction of LW S1A	1706 m	LW completed extraction on 4 July 2023
Closest distance of LW S1A face to Pier 2 on Conveyor 5C		
Distance travelled by LW since previous report	-	LW completed extraction on 4 July 2023
Maximum incremental subsidence within Tahmoor Mine Site	348 mm	at 6C-16A on 20 July 2023
Maximum change in subsidence since previous survey	2 mm	at 6C-08 since 12 July 2023
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	Very minor increase in subsidence for this period, total subsidence is 346mm.
GNSS Unit S16 (near Shaft No. 3)	Continuous		N/A	Minor horizontal movement to the south.
V-Line along Tahmoor Mine property boundary	17 Jul	Cease for LW S1A	N/A	Very minor changes observed.
Main Southern Railway	17 Jul	Cease for LW S1A	N/A	Rates of change reduced to low levels.
Rail Loop	18 Jul	Cease for LW S1A	N/A	Very minor changes observed.
Remembrance Drive	17 Jul	Cease for LW S1A	N/A	Compressive strain at Pegs R47-R48 and bump in subsidence profile at Peg 46. Minor changes this week.
Visual inspections	21 Jul	Cease for LW S1A		No significant change observed this week.
Stockpile Area: Conveyor 5C and Reclaim Tunnel Conveyor 6C				
Reclaim Tunnel survey	20 Jul	Cease for LW S1A		Minor changes observed.
Conveyor 5C survey	17 Jul	Cease for LW S1A	N/A	Minor changes observed.
Inclinometer surveys	17 Jul	Cease for LW S1A	N/A	No significant change observed this week.
Tilt monitoring at Pier 2	Continuous		N/A	Minor changes in tilts this week.
Tilt monitoring at T4	Continuous		N/A	Minor changes in response to temperature.
Displacement monitoring at T4	Continuous			Minor opening of expansion joint, returning towards baseline. Measurements consistent with survey and manual measurements.
Stress monitoring at T4	Continuous		N/A	Minor changes in response to stockpile loading as per recommended plan.
Gap in tripper rail	17 Jul	Cease for LW S1A	N/A	Rail joint has opened 4-6mm this week likely temperature related.
Joint monitoring in Reclaim Tunnel between T5 and T6	17 Jul	Cease for LW S1A	N/A	No noticeable change.
Visual inspections	17 Jul	Cease for LW S1A	(cracks found in 6C Tunnel)	Structure gap across expansion joint has opened slightly this week at T4. No noticeable change in cracking this week.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Overhead conveyors				
Conveyor trestle surveys	17 Jul	Cease for LW S1A	(change in distance)	The slide joint at the 7C conveyor is moving as expected and the movement is likely temperature related.
Laser distancemeter at Conveyor 3R across Railway	Continuous			Minor changes observed.
Visual inspection	17 Jul	Cease for LW S1A		4S slide joint has not changed this week. 8C slide joint has not changed this week. 7C slide joint has not changed this week.
Drift				
Drift survey	19 Jul	Cease for LW S1A		Very minor changes across the portal this week.
Visual inspection	Daily		N/A	No issues reported.
Winder				
Tiltmeters on Winder	Continuous			Minor changes observed.
Visual inspection	17 Jul	Cease for LW S1A	N/A	No issues observed.
Rail Loop				
Long bay length survey	18 Jul	Cease for LW S1A		Minor changes in measured distance for long bay distance between Pegs BL600 and BL700, with ground shortening at 10mm trigger level. No issues with rail stress until summer and it is planned to restress prior to hot temperatures.
Road culvert survey	18 Jul	Cease for LW S1A	N/A	Results within survey tolerance.
Track geometry survey	18 Jul	Cease for LW S1A		No issues reported.
Track inspection	Daily		N/A	No issues reported.
Mine Site Structures				
Tiltmeters on Raw Coal Bins	Continuous			Minor changes observed.
Rail Loader survey	17 Jul	Cease for LW S1A		Results within survey tolerance.
Reject Bin survey	18 Jul	Cease for LW S1A		Minor changes observed.
Visual inspections	17 Jul	Cease for LW S1A		No issues reported.
Overhead crane and monorails				
Crane rail survey	18 Jul	Cease for LW S1A		Minor changes observed.
Visual inspections	14 Jul	Cease for LW S1A		No issues reported.
Shaft No. 3				
Tiltmeters on shaft winder	Continuous			Minor changes observed.
Clearance measurements at 135m depth	18 Jul	Cease for LW S1A		Clearances between 260 mm and 300 mm this week, greater than minimum clearance of 180 mm.
Visual inspection	Daily		N/A	No issues reported.

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Dams, embankments and site services				
Dam S4 survey	-	End of LW	N/A	Final survey at end of LW S1A.
Dam S2 and S3 survey	-	End of LW	N/A	Final survey at end of LW S1A.
Visual inspections by building inspector, incl high pressure water pipeline	-	Cease for LW S1A		No issues observed. Inspections for LW S1A have ceased.
Geotech inspections on mine site	-	Monthly		Last inspection June 23. No issues observed by geotechnical engineer.
Geotech inspections of Dams S2 and S3 from railway	12 Jul	Cease for LW S1A		No issues observed by geotechnical engineer.
Track inspections of Dams S2 and S3 from railway	Daily		N/A	No issues observed by Track Certifier.
Reject Emplacement Area				
Visual inspections	-	Cease		No issues observed. Weekly inspections have ceased as LW face has moved well away from this area.
Management Actions				

Other management actions since previous report: • Nil

Any additional and/or outstanding management actions: • Nil

IMG meeting since previous report: • IMG meeting held 19 July.
• It was agreed by the IMG on 17 July to seek Mine Management approval to cease weekly general mine site monitoring as of 19 July 2023. Mine Management approved the change on 18 July and the change in monitoring status was communicated to the Resources Regulator on 18 July.

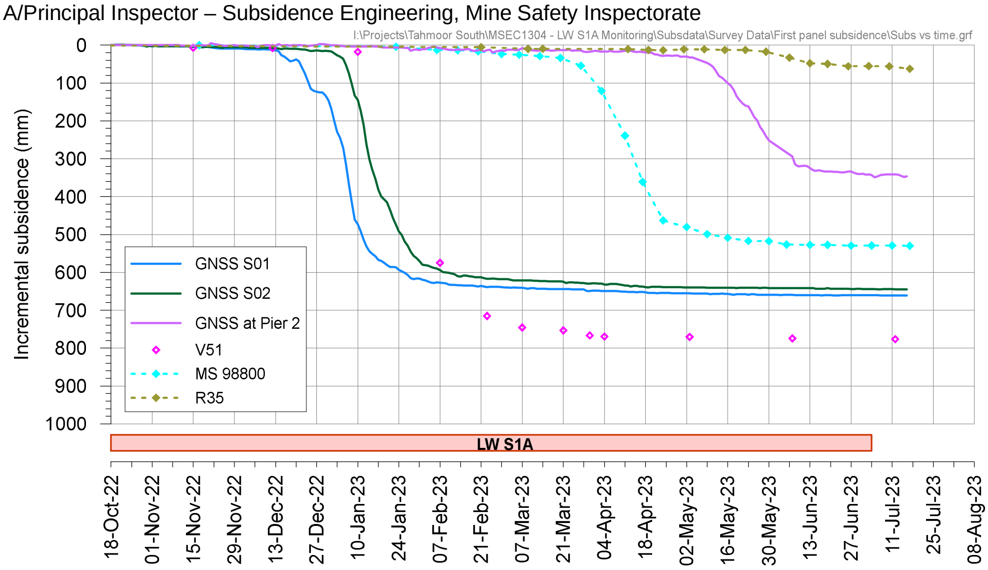
Forecast whether continued longwall mining is likely to cause impact on the safety of operations at Tahmoor Mine Site

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. Accordingly continued residual subsidence 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	26 July 2023

Copy of Report to:
IMG
Ray Ramage, A/Principal Inspector – Subsidence Engineering, Mine Safety Inspectorate



Appendix H – Australian Widlife Sanctuary Monitoring Reports

TAHMOOR COAL: Longwall S2A

Australian Wildlife Sanctuary Subsidence Status Report No. 07

Reporting Period	7 October 2023 to 13 October 2023	
Length of extraction of LW S2A	510 m	On 12 October 2023 LW S2A commenced extraction on 2 August
Length of extraction remaining of LW S2A	1258 m	
Distance travelled by LW since previous report	27 m	since 6 October 2023
Closest distance of LW S2A face to AWS property	0 m	LW face directly beneath property north of Wirrimbirra Creek
Closest distance of LW S2A face to AWS structures	370 m	to Dingo shed
Maximum incremental subsidence since start of LW S2A	626 mm	GNSS Sie S05 on 12 October 2023
Maximum total subsidence since start of LW S1A	779 mm	V-Line on 30 August 2023
Maximum increase in subsidence since previous report	228 mm	GNSS Site S06 since 5 October

Summary of monitoring and inspections

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
GNSS units				
Site S01 to S10	Continuous		N/A	Subsidence increasing, particularly at Sites S05, S06 and S07 above LW S2A.
Valley closure across Wirrimbirra Creek as measured by GNSS units				
Sites S01 and S02 above LW S1A	Continuous		N/A	Closure has gradually developed, up to 169 mm. Minor changes since start of LW S2A.
Sites S03 and S04 at Ockenden Pool	Continuous		N/A	Closure has gradually developed, up to 155 mm. Small changes since start of LW S2A.
Sites S05 and S06 above LW S2A	Continuous		N/A	Closure has gradually developed, up to 205 mm. Closure increasing since start of LW S2A.
Sites S07 and S08 above LW S2A	Continuous		N/A	Approximately 103 mm closure developed. Closure increasing since start of LW S2A.
Sites S09 and S10 at the Big Pool	Continuous		N/A	Approximately 55 mm closure developed. Small changes since start of LW S2A.
Tahmoor Mine Boundary Line (V-Line)				
V-Line along Tahmoor Mine property boundary	-	Monthly	N/A	Last survey 30 August. Very minor changes observed.
Main Southern Railway				
Ground surveys	-	-	N/A	Surveys commence after 550 m of extraction.
Local streets				
Ground survey along Charlies Point Road	-	Monthly	N/A	Last survey 25 September. Very minor subsidence observed.
Ground survey along Remembrance Drive	10 Oct	Monthly	N/A	Very minor changes observed. Gradual development of non-conventional compressive strain along Remembrance Drive between Pegs R47 and R48 and bump in observed subsidence profile at Peg R47. Small bump observed in southbound lane at this location.
Visual inspections along local roads	13 Oct	Weekly		Inspection on 13 October found no significant changes. Small bump observed in southbound lane of Remembrance Drive at location of compressive strain between Pegs R47 and R48. A faint bump is visible on the edge line of the northbound lane south of Peg R46. No issues observed along Charlies Point Road on 10 October. Repair of potholes and pavement edging has been completed this week,

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Natural features				
Ground survey across Wirrimbirra Creek	9 Oct	End of LW	N/A	Surveys have measured closure and upsidence along TT2 line, upstream of Pool TT2
Water level and water quality monitoring	Continuous	Download monthly-	Level 4	While the observed rates of water level recession at Pool TT2 are consistent with previously observed rates and consistent with evaporation rates, surface and ground water assessments have found that the low water levels are atypical than what would be considered 'normal' conditions and are likely due to mining-induced reduction in groundwater baseflow into the pool.
Visual inspections of streams and small cliffs	28 Sep	Fortnightly	Level 4	Surface water flows in Wirrimbirra Creek first observed on 8 Feb to stop 120 m 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 28 Sep, trickle flows were observed into and out of TT1 and stopping downstream of TT1. No surface water observed flowing into and out of TT2. Fracture within a surface boulder upstream of TT2 has found to have increased in size during September. 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. Flows observed to re-emerge downstream from the junction to Teatree Hollow at TT7. While sections of Wirrimbirra Creek have been previously observed to be dry during periods of dry weather, the observations indicate that the changes are likely be mining-induced. The combination of observed increase in fracturing and pool water level assessment at Pool TT2 exceed the Level 4 trigger level in the AWS Management Plan. Tahmoor Coal will develop a CMAP in consultation with AWS as required under the Management Plan. Temporary water supply continues to be maintained since installed on 25 Jul 2023. Visual inspection of rock shelter on 25 Sep found the creek bed was dry and no impacts to rock shelter.
Structures				
Local 3D surveys	11 Oct	Weekly	N/A	Minor subsidence and changes in horizontal distances between pegs observed since baseline survey.
Visual inspections	13 Oct	Weekly	N/A	First inspection completed. No immediate issues of concern observed. The outer perimeter fence around the Dingo enclosure has a number of breaches that have been blocked by logs and rocks.
Asbestos air monitoring	11 Oct	Weekly	N/A	Weekly monitoring commenced, with results to be issued next week.
Visual inspections				
Dingo Sanctuary	-	-	N/A	Weekly inspections commence next week.
Farm dam	-	-	N/A	Weekly inspections commence next week.
External pavements, fences and gates	-	-	N/A	Weekly inspections commence next week.
Walking trails	-	-	N/A	Weekly inspections commence next week.

Other management actions since previous report:
- Additional ground survey conducted across Wirrimbirra Creek

Any additional and/or outstanding management actions:
- Tahmoor Coal will develop a CMAP in consultation with AWS.

Consultation with stakeholders since previous report:
- Weekly reports will be issued during the mining of LW S2A

Forecast whether residual subsidence is likely to cause impacts on the health and safety of people who may be present at the property due to the extraction of LW S2A:

Based on monitoring results to date, and the controls implemented and available under the LW S2A Management Plan, no triggers under this Management Plan are expected to be exceeded in the next week.

Certified by Tahmoor Coal	
Name	Ross Barber
Position	Project Manager
Signature	Ross Barber
Date	17 October 2023

Copy of Report to:

Gerry Hayes, General Manager Properties, National Trust of Australia (NSW)
Brad Wilson, Managing Director, Australian Wildlife Sanctuary
Luci Ellem, Managing Director, Bargo Dingo Sanctuary
Australian Native Dog Conservation Society
Clint Mason, Production Manager, Tahmoor Mine
Ray Ramage, A/Principal Inspector – Subsidence Engineering, Mine Safety Inspectorate

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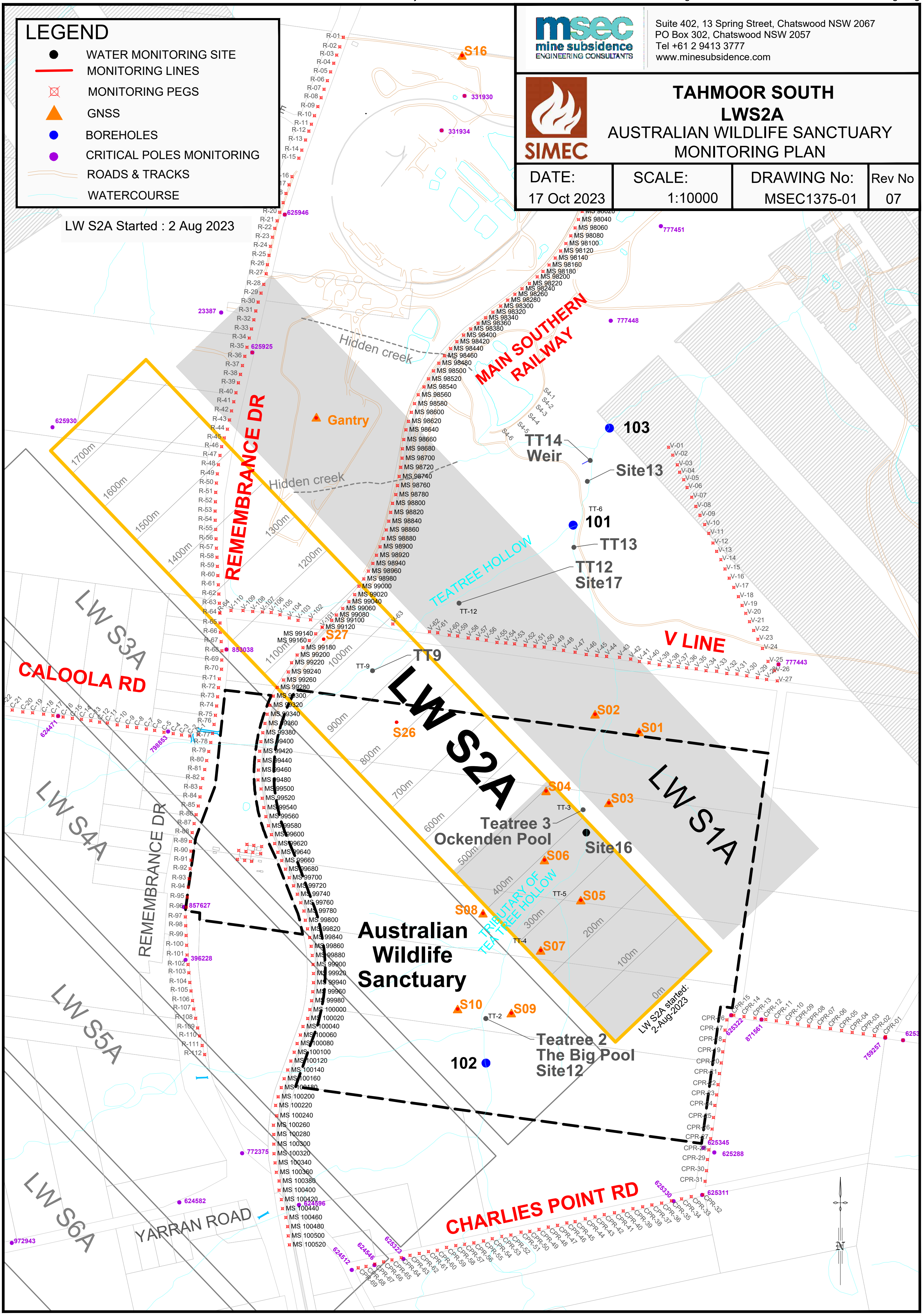
SIMEC

TAHMOOR SOUTH LWS2A AUSTRALIAN WILDLIFE SANCTUARY MONITORING PLAN

DATE:	SCALE:	DRAWING No:	Rev No
17 Oct 2023	1:10000	MSEC1375-01	07



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

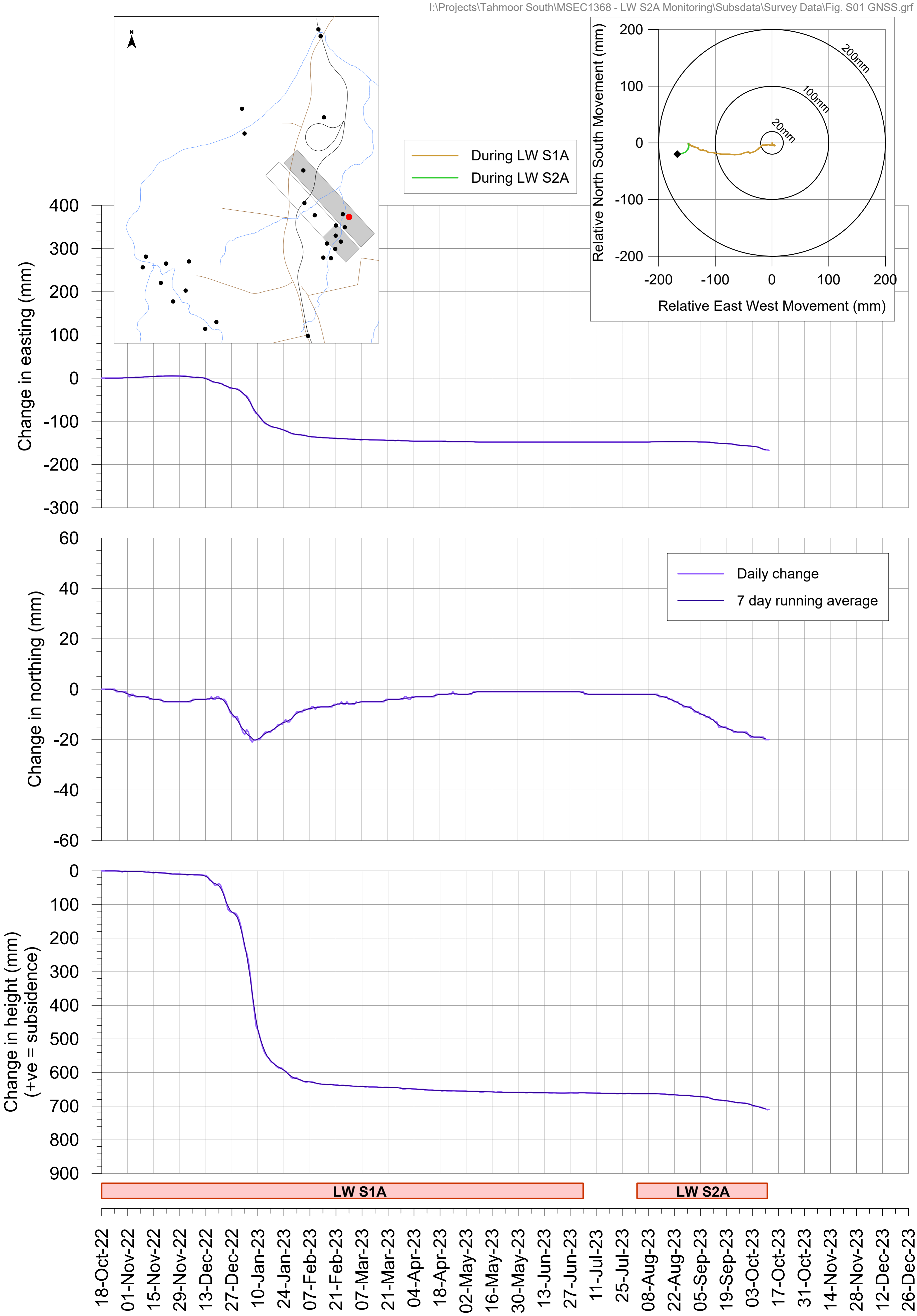


Fig. S01-R07

Tahmoor South LW S2A - GNSS Monitoring

Site S02 above LW S1A

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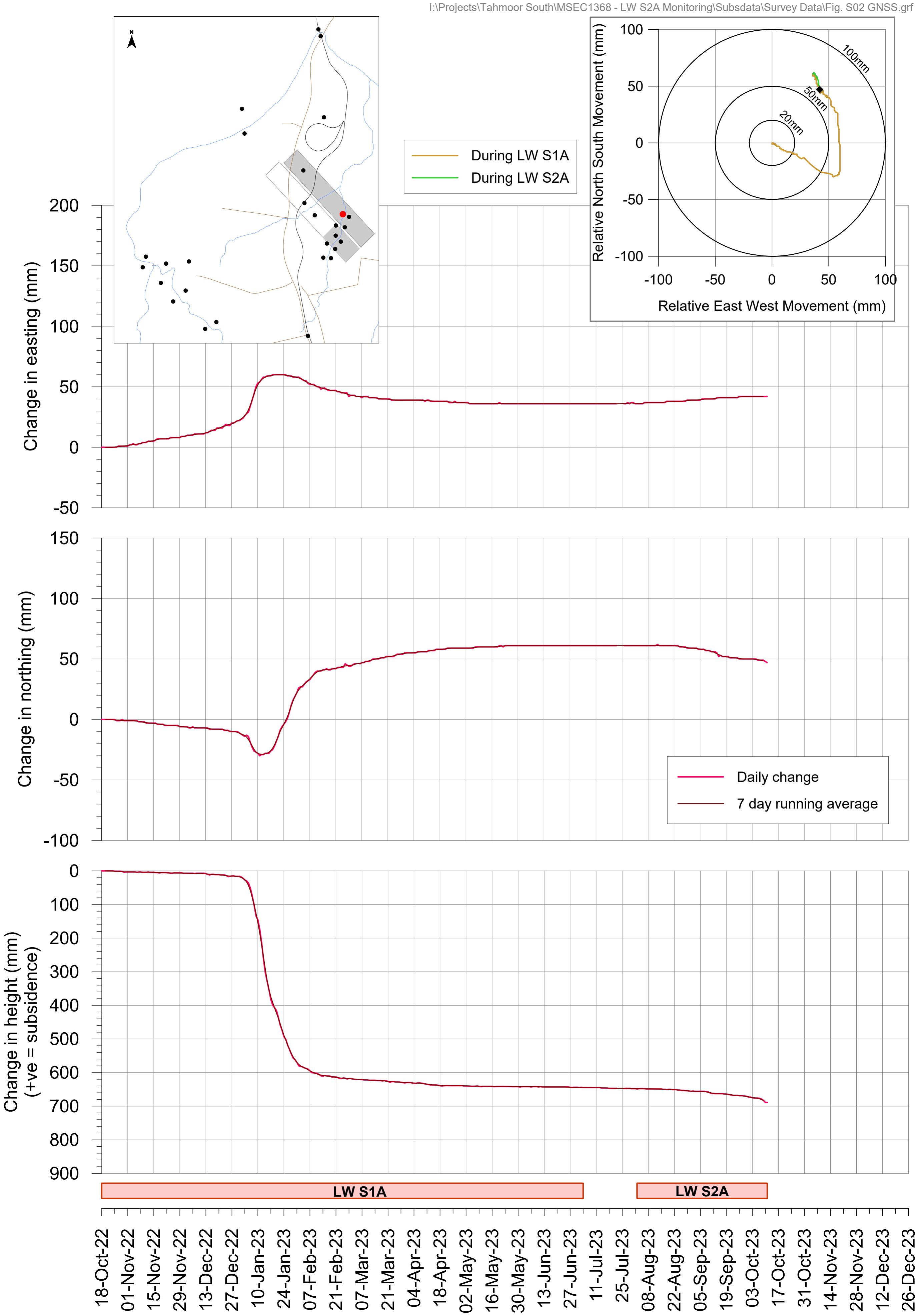
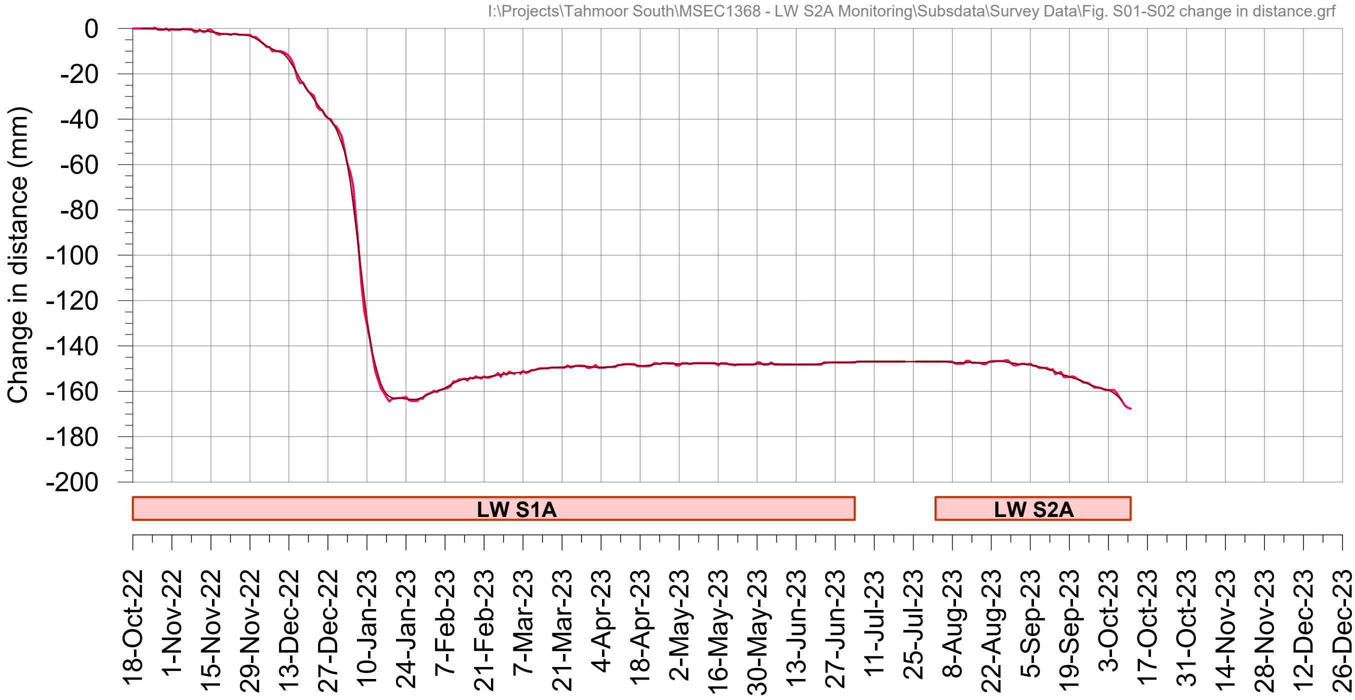


Fig. S02-R07

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



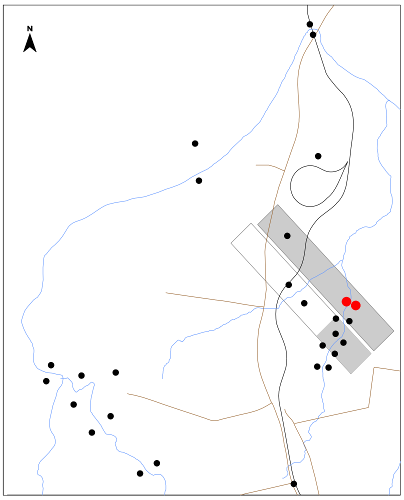


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Fig. S01-S02-R07

Tahmoor South LW S2A - GNSS Monitoring
Site S03 above LW S1A at Teatree 3

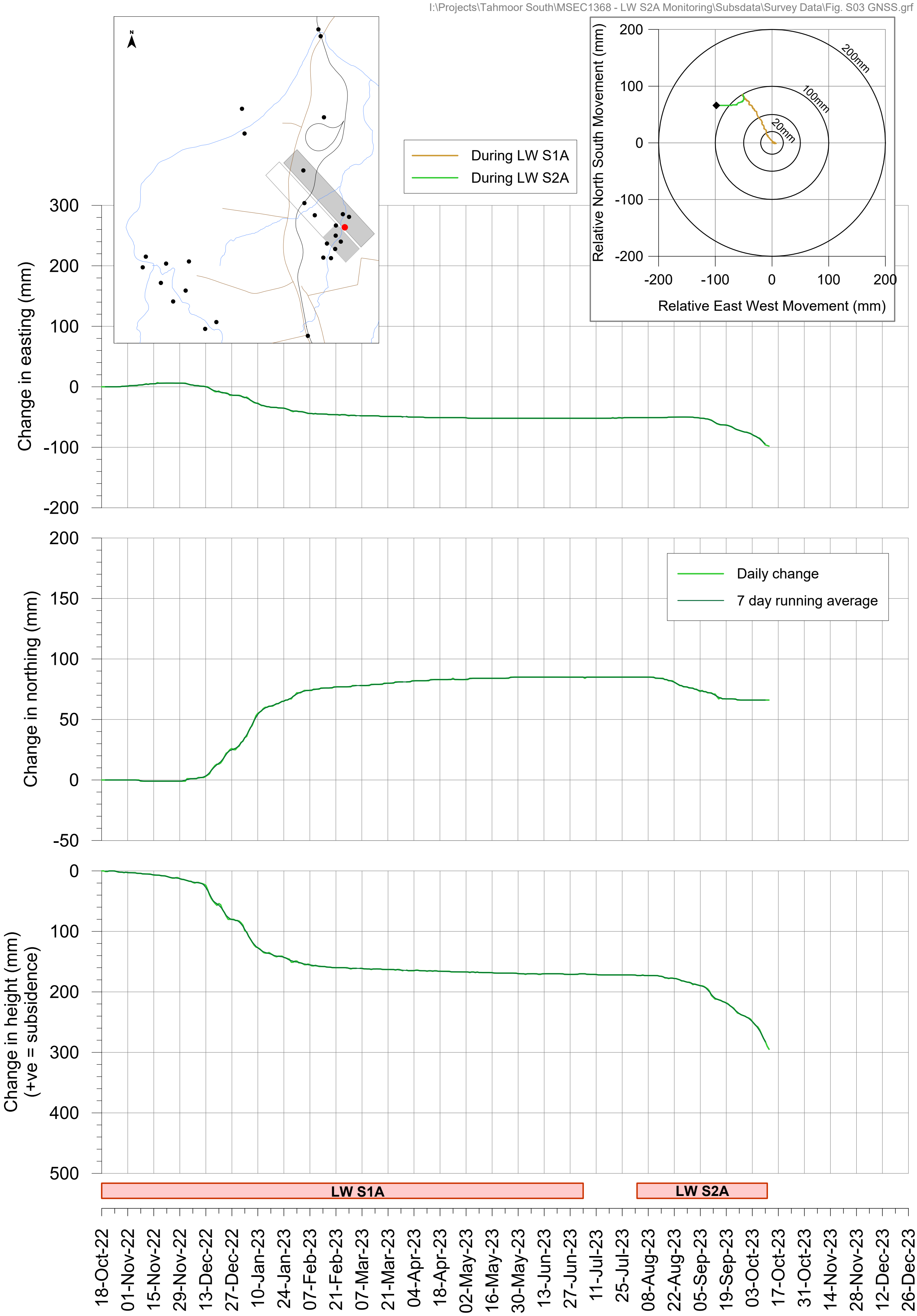

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Fig. S03-R07

Tahmoor South LW S2A - GNSS Monitoring

Site S04 above LW S2A at Teatree 3

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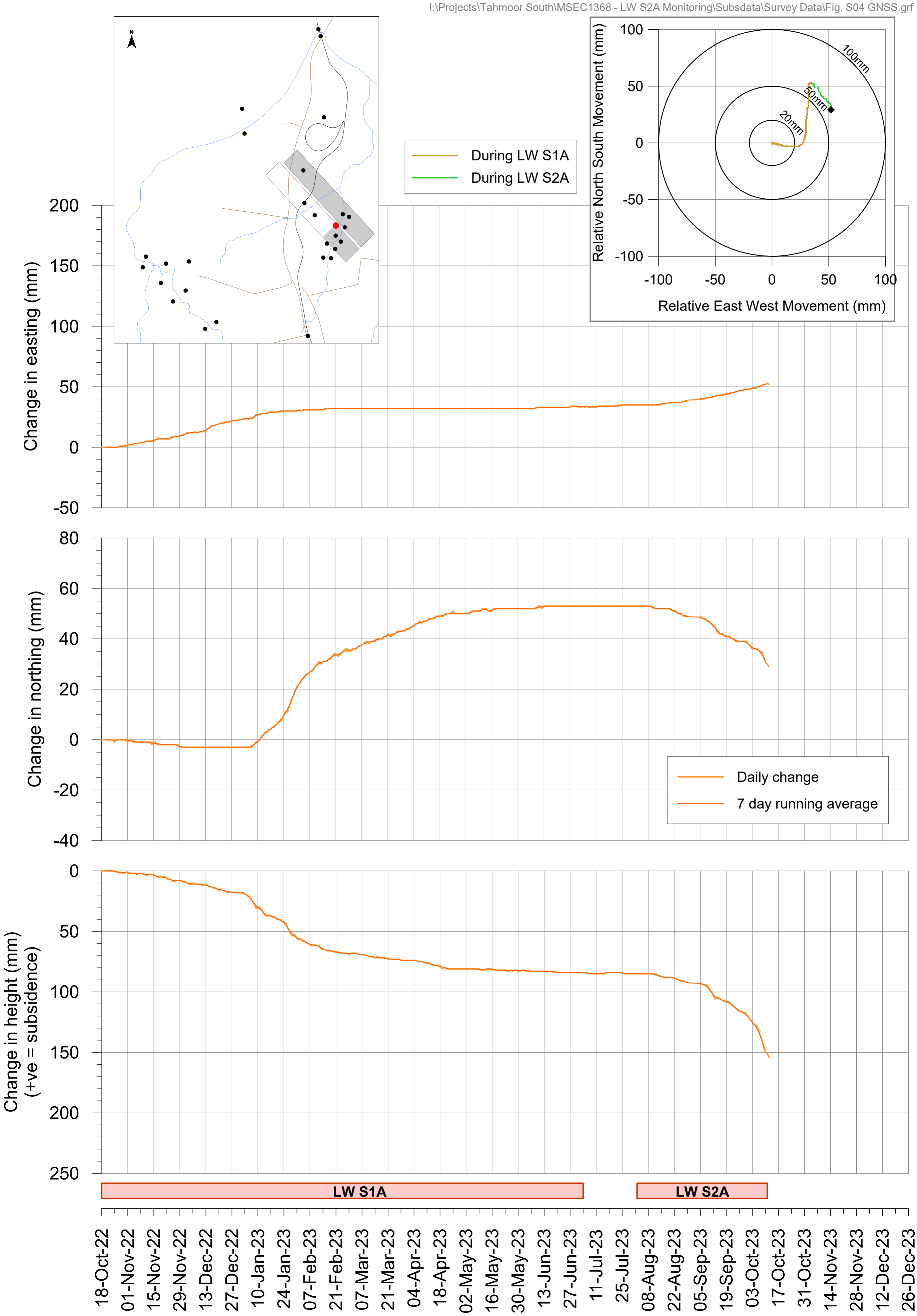
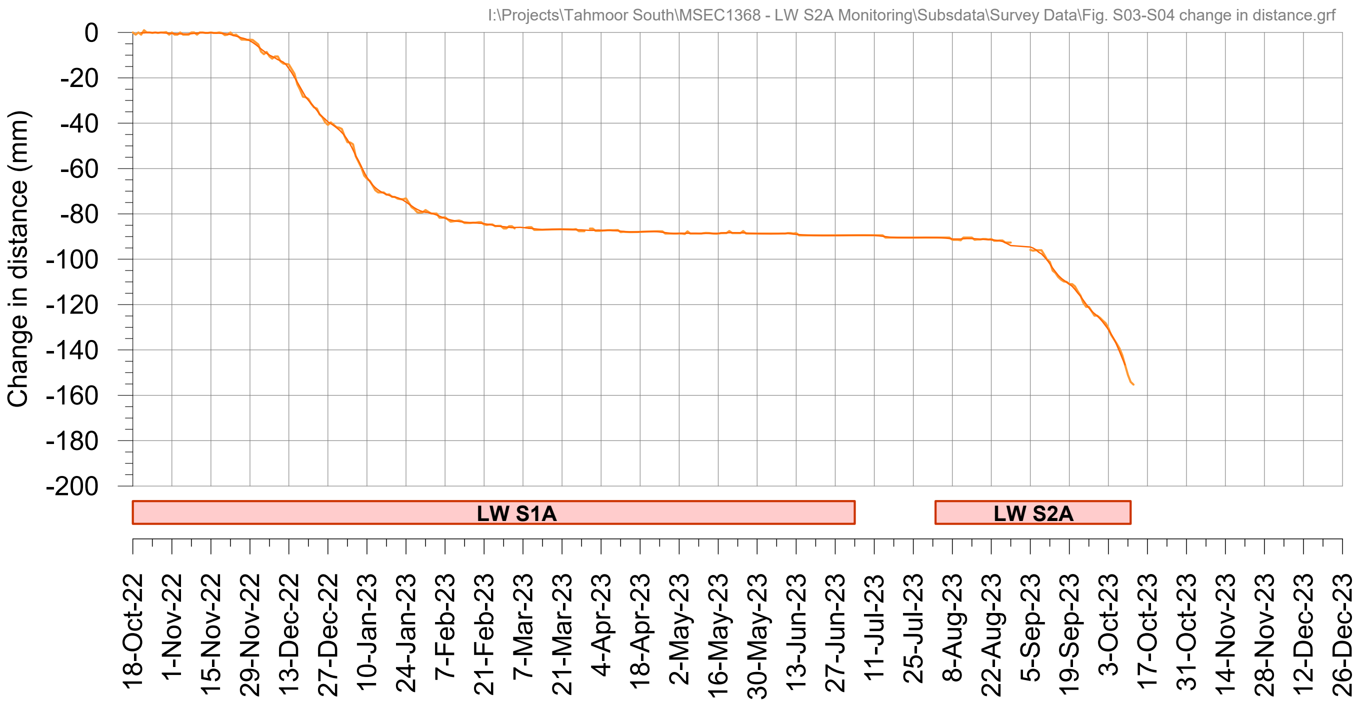


Fig. S04-R07

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



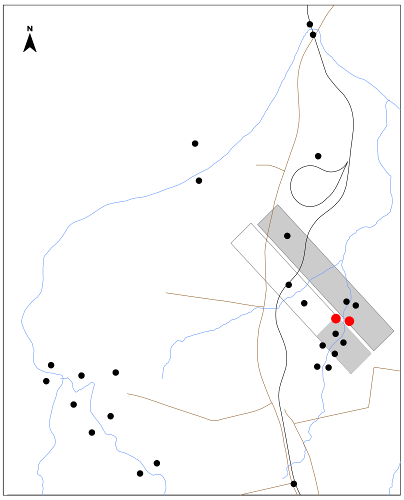


Fig. S03-S04-R07

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

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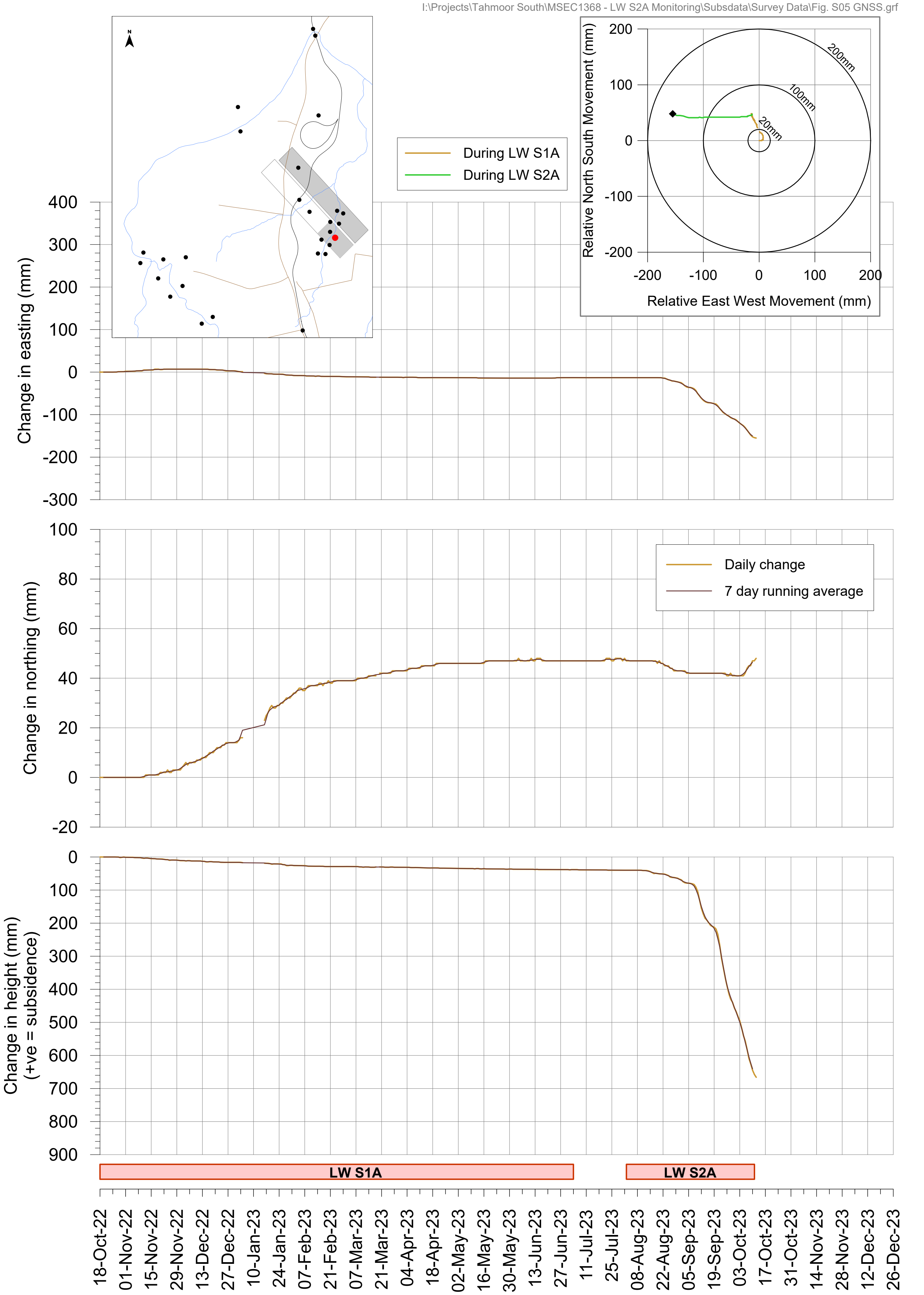

msec

Fig. S05-R07

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

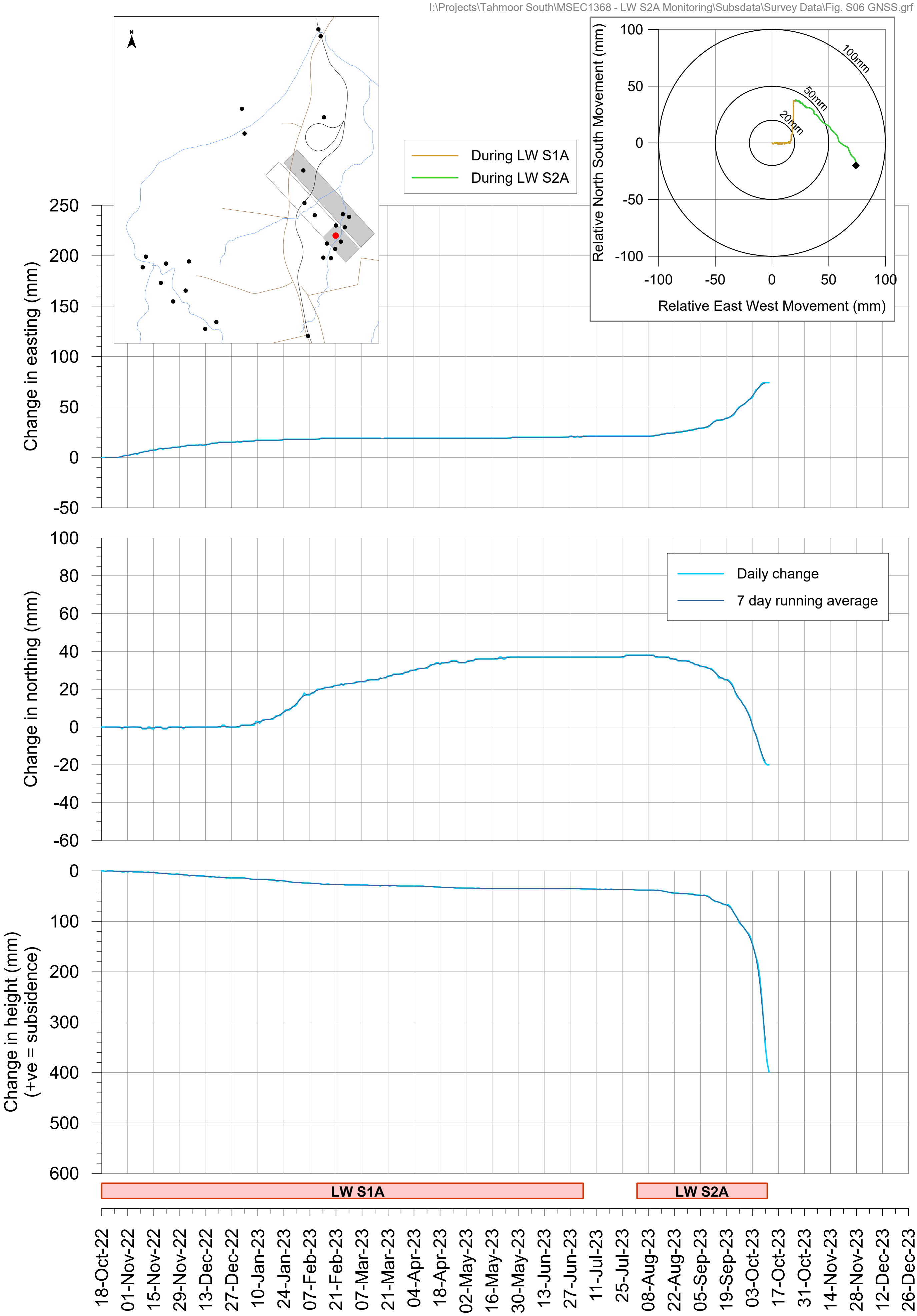

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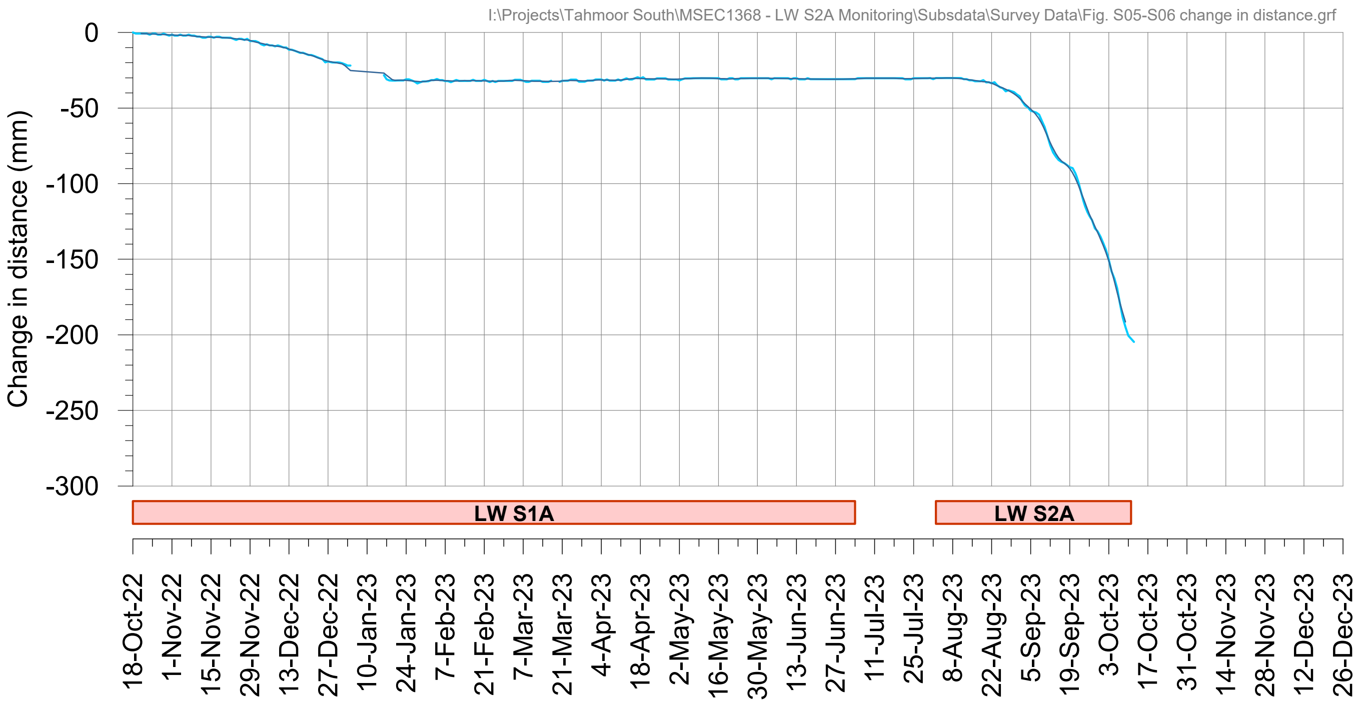
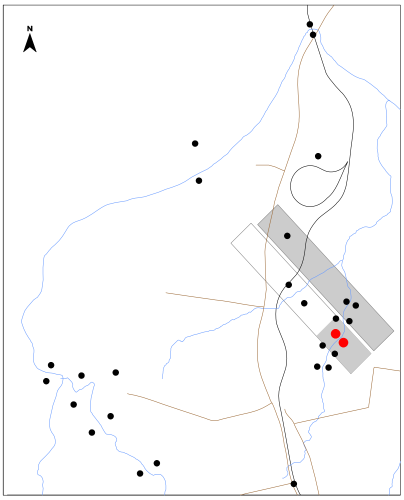
Fig. S06-R07

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





msec

Fig. S05-S06-R07

Tahmoor South LW S2A - GNSS Monitoring

Site S07 above LW S2A

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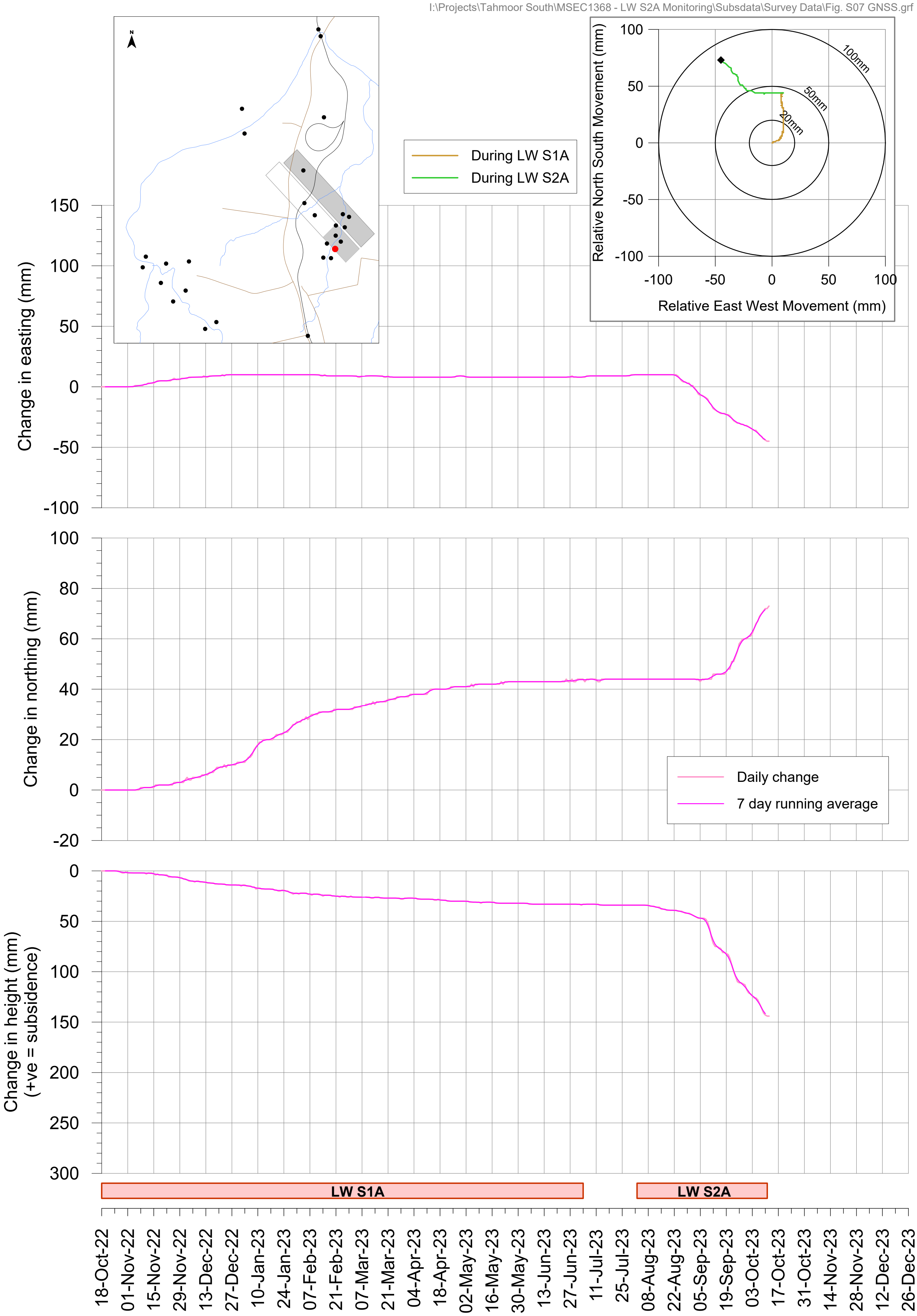

msec

Fig. S07-R07

Tahmoor South LW S2A - GNSS Monitoring
Site S08 between LW S2A and LW S3A

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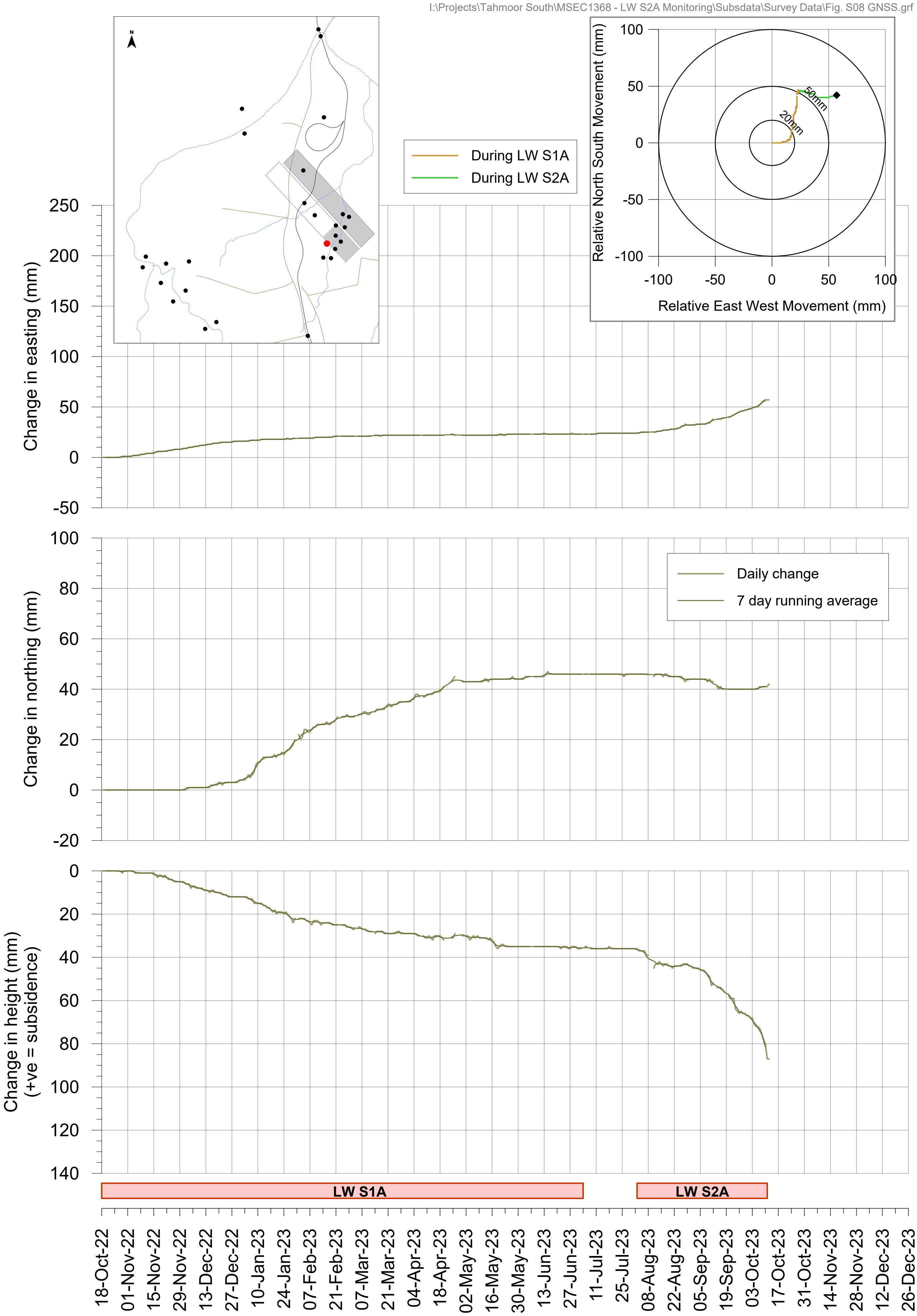

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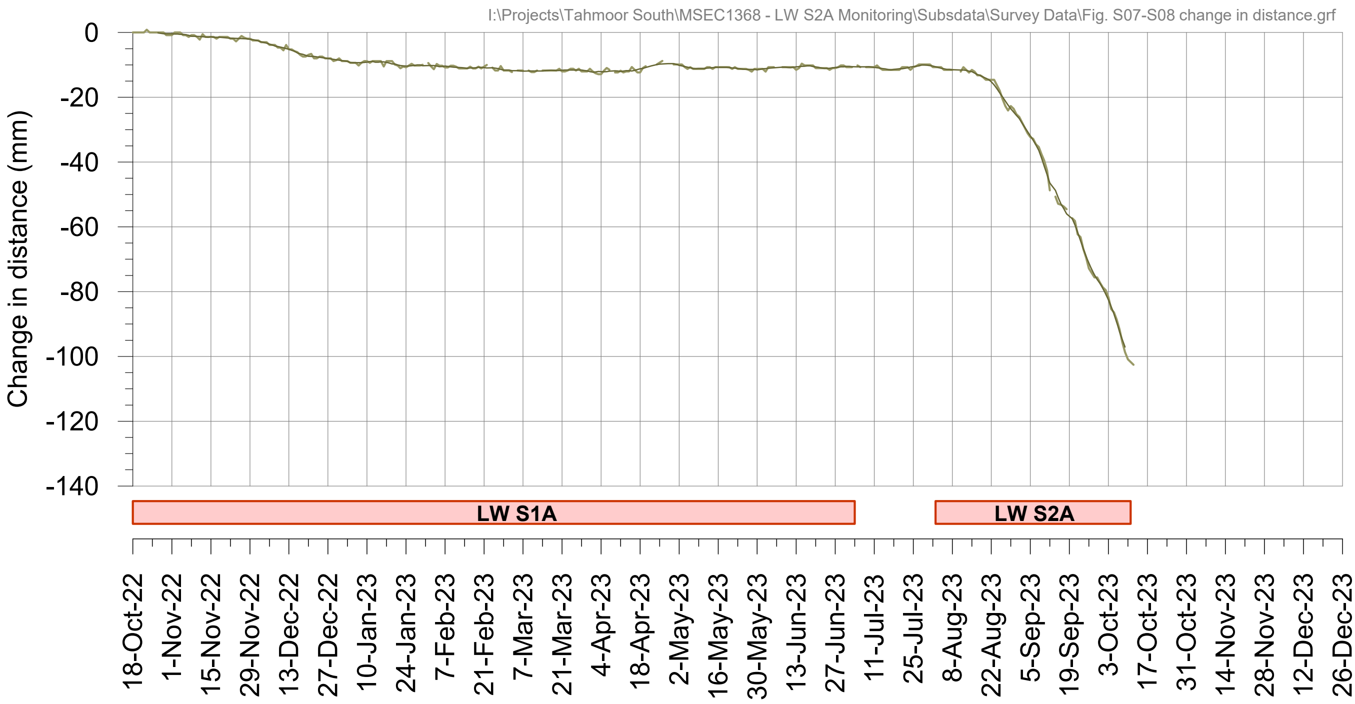
Fig. S08-R07

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



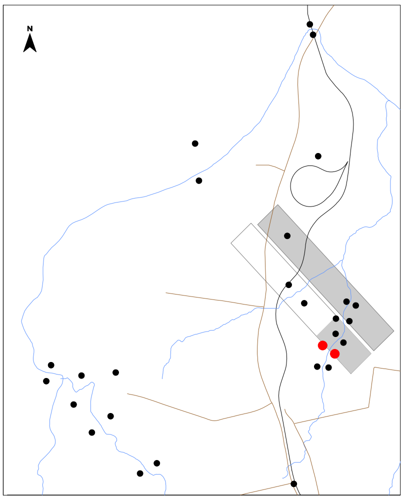


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Fig. S07-S08-R07

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

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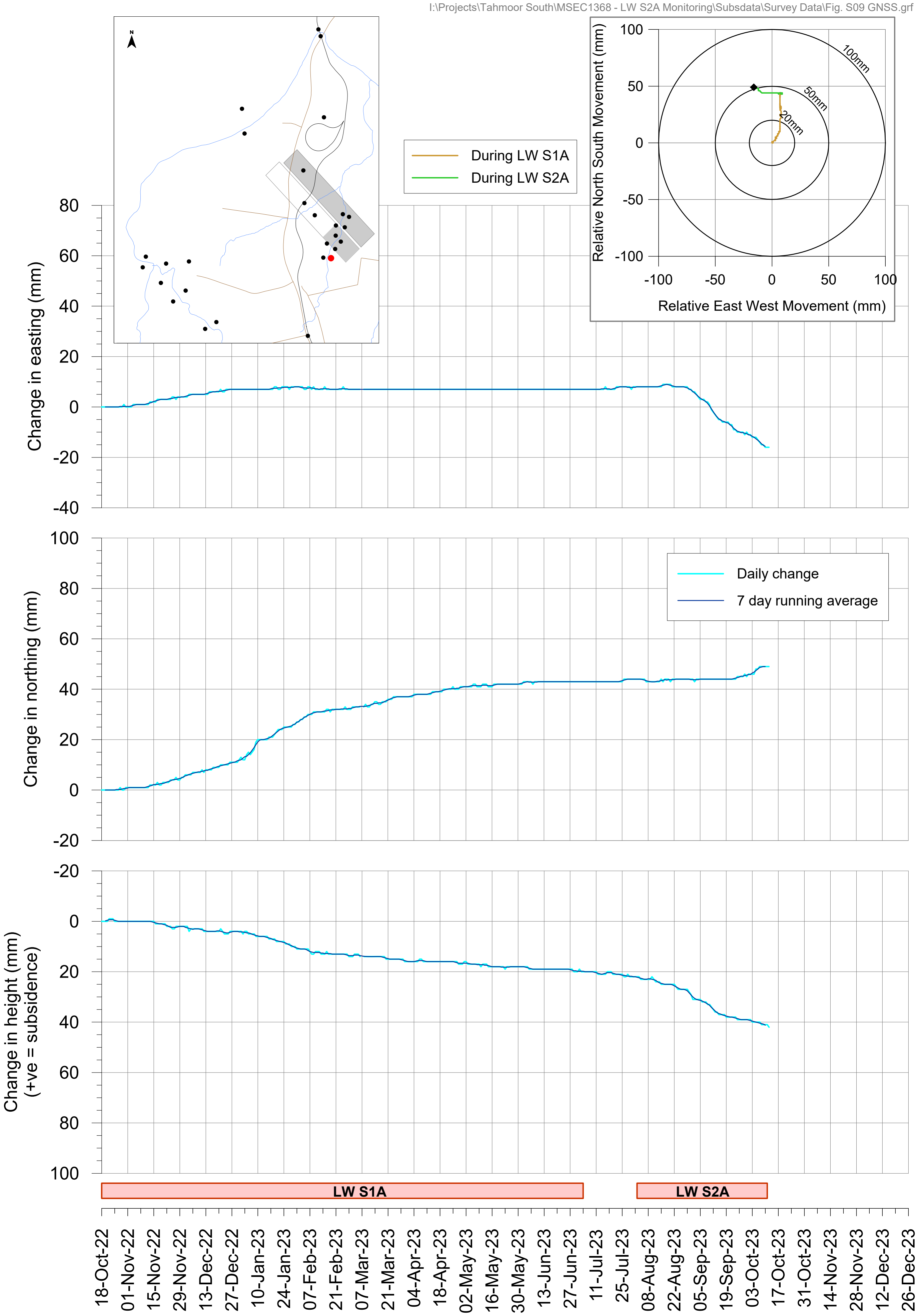

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Fig. S09-R07

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

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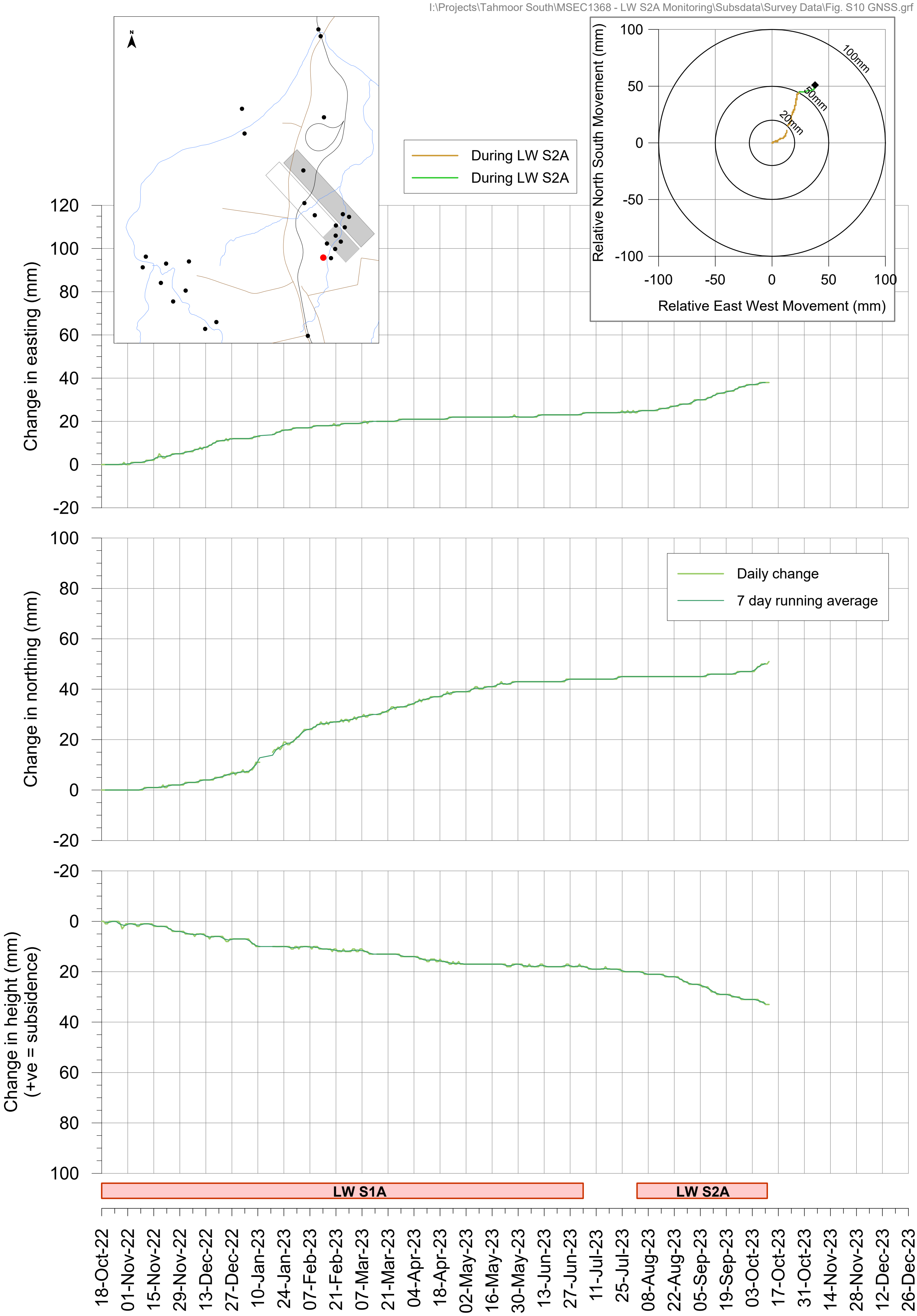
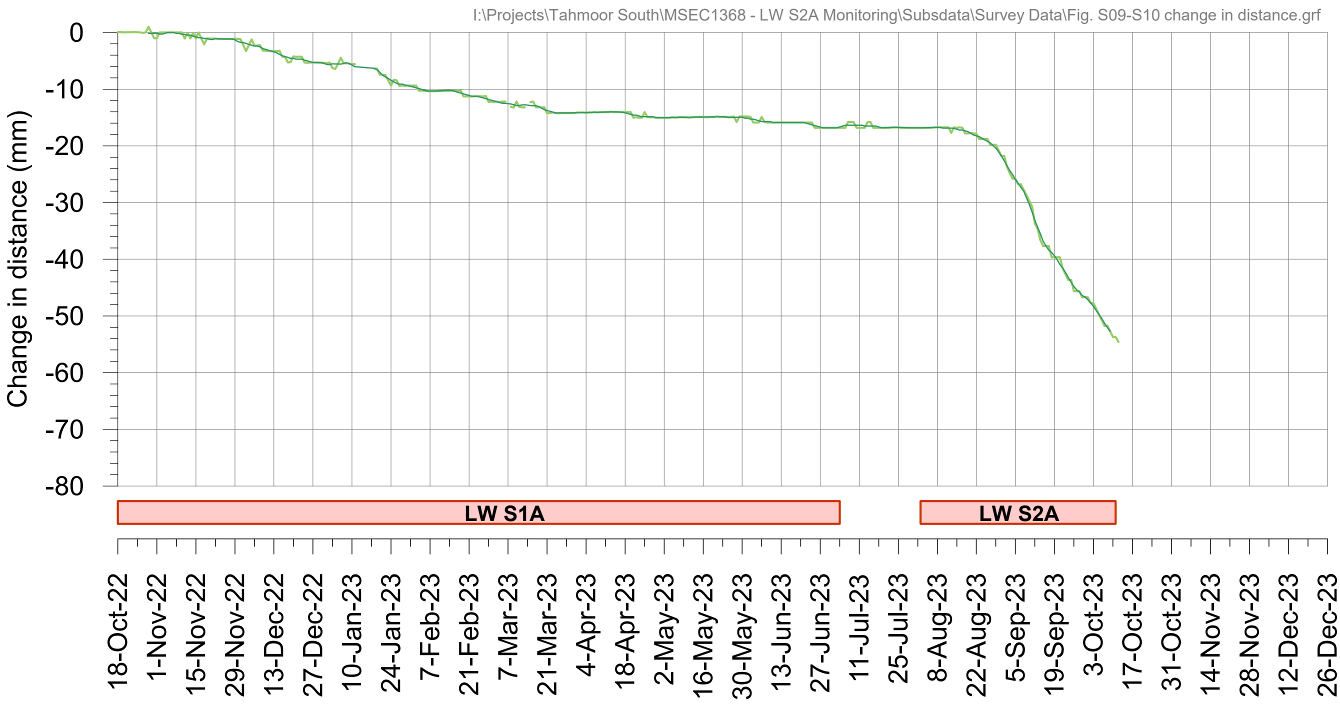


msec

Fig. S10-R07

Tahmoor South LW S2A - GNSS Monitoring

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



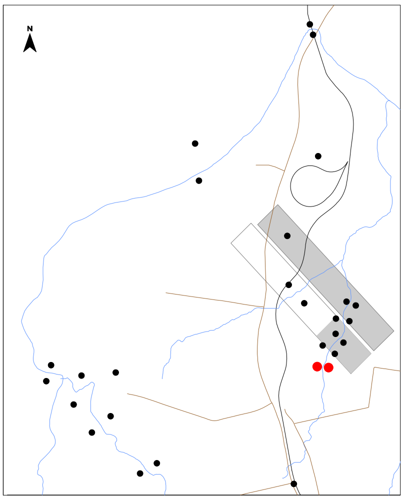


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Fig. S09-S10-R07

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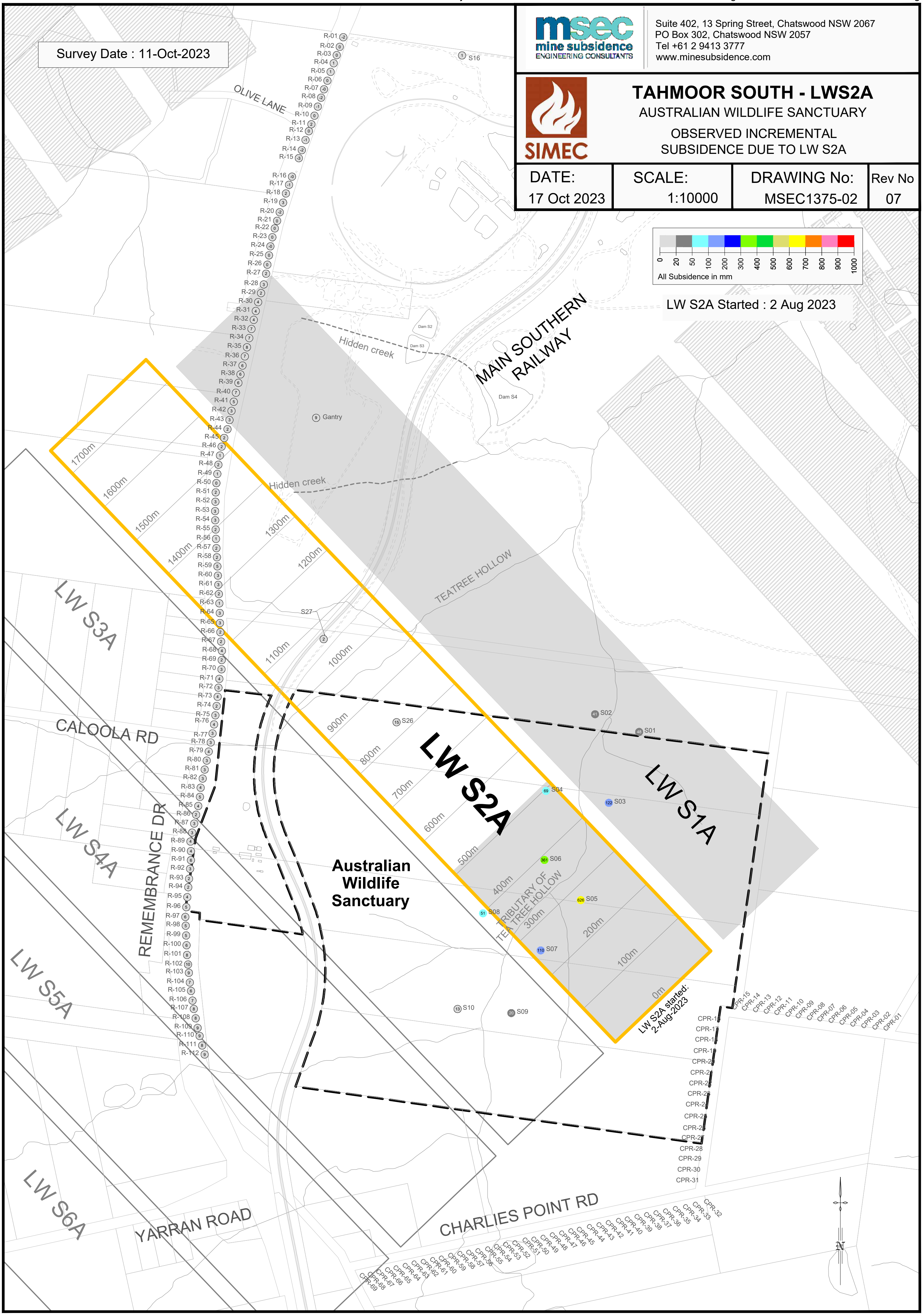

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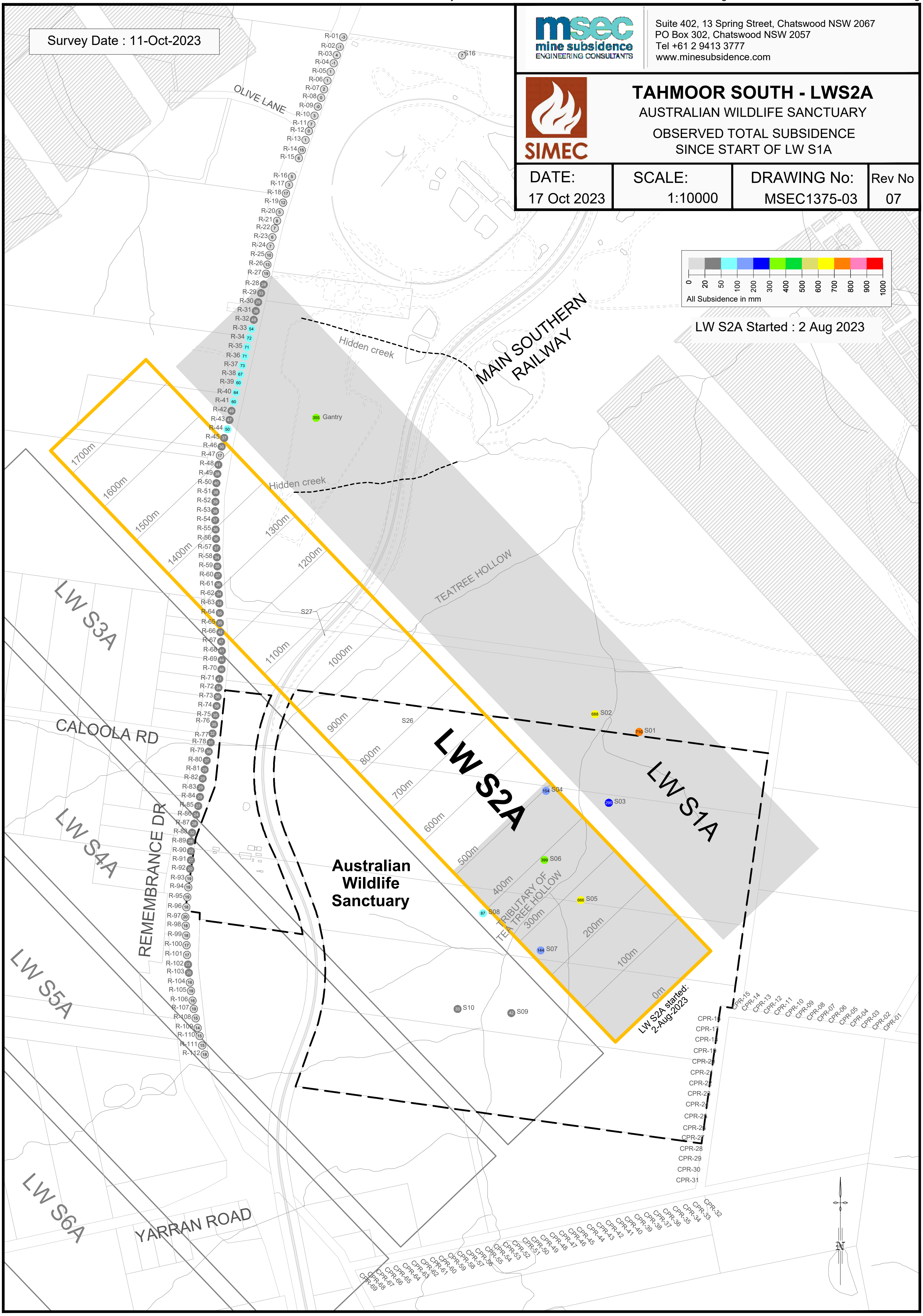

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msec mine subsidence ENGINEERING CONSULTANTS
Suite 402, 13 Spring Street, Chatswood NSW 2067
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www.minesubsidence.com

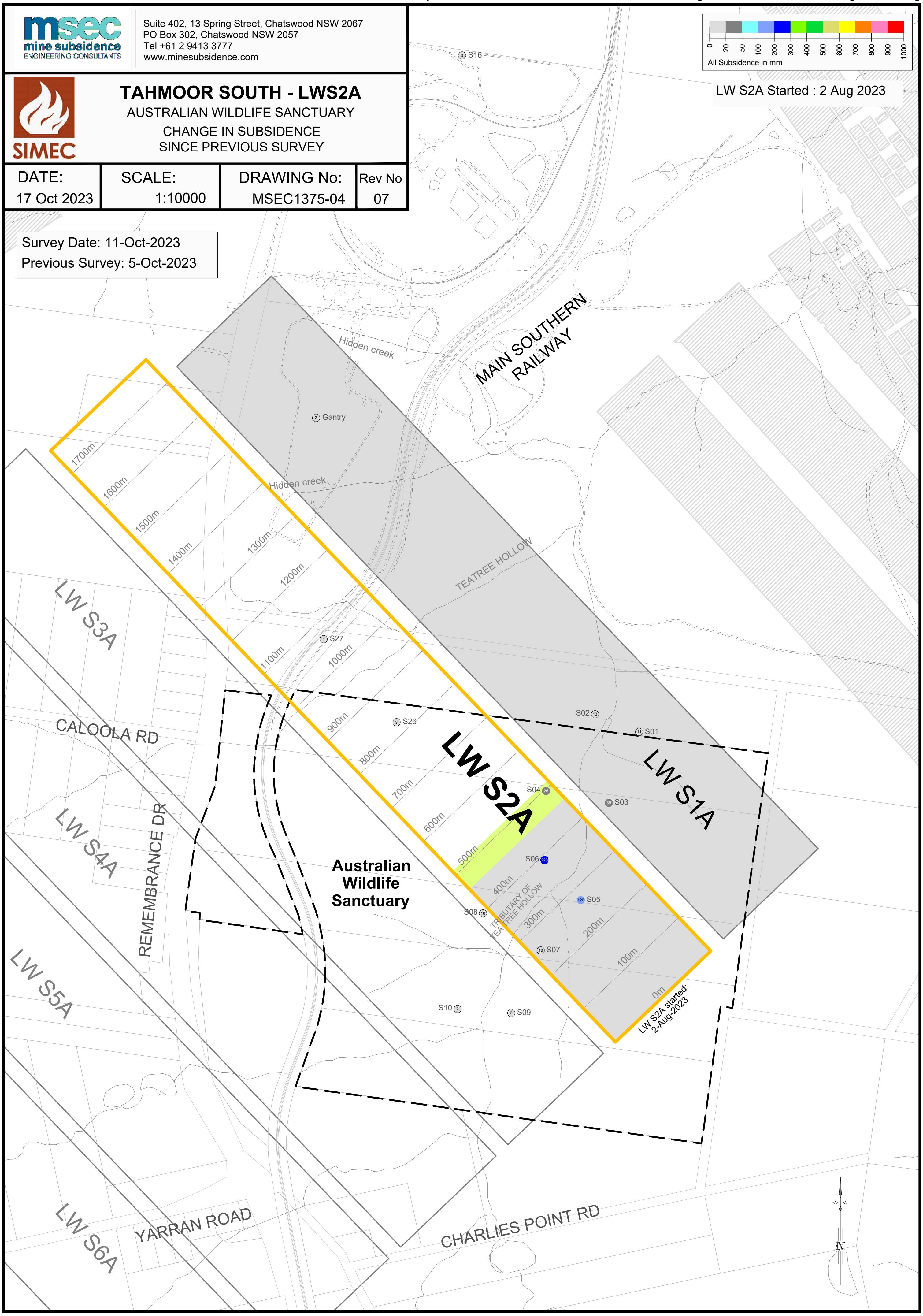
SIMEC

TAHMOOR SOUTH - LWS2A

AUSTRALIAN WILDLIFE SANCTUARY
CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
17 Oct 2023	1:10000	MSEC1375-04	07

Survey Date: 11-Oct-2023
Previous Survey: 5-Oct-2023



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SIMEC

TAHMOOR SOUTH - LW S2A
AUSTRALIAN WILDLIFE SANCTUARY

GROUND MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
17 Oct 2023	as shown	MSEC1375-05	07

Survey Date : 11-Oct-2023

mm Incremental Subsidence

Horizontal displacement of survey marks since start of LW S2A

mm Vector & magnitude of observed horizontal movement (mm)

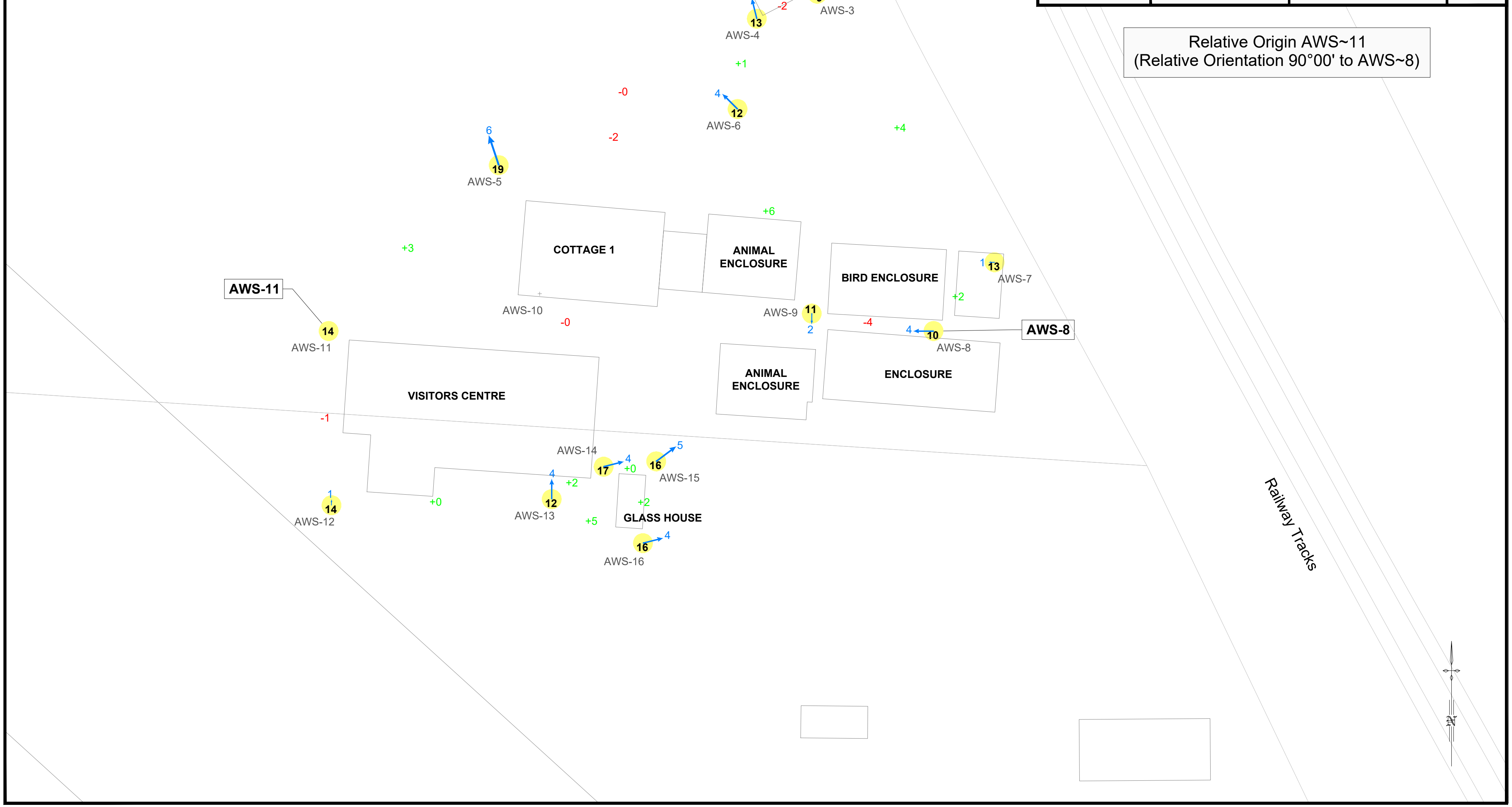
Change in horizontal distance between Survey Marks

mm Closure

mm Opening

LW S2A Started : 2 Aug 2023

Relative Origin AWS~11
(Relative Orientation 90°00' to AWS~8)



TAHMOOR COAL: Longwall S2A

Australian Wildlife Sanctuary Subsidence Status Report No. 19

SIMEC

Reporting Period	30 December 2023 to 5 January 2024	
Length of extraction of LW S2A	1147 m	On 5 January 2024 LW S2A commenced extraction on 2 August
Length of extraction remaining of LW S2A	621 m	
Distance travelled by LW since previous report	81 m	since 29 December 2023
Closest distance of LW S2A face to AWS property	70 m	LW face beyond northern property boundary and moving away
Closest distance of LW S2A face to AWS structures	380 m	to house and moving away
Maximum incremental subsidence since start of LW S2A	805 mm	GNSS Site S26 on 5 January 2024
Maximum total subsidence since start of LW S1A	841 mm	GNSS Site S06 on 5 January 2024
Maximum increase in subsidence since previous report	72 mm	GNSS Site S27 since 29 December

Summary of monitoring and inspections

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
GNSS units				
Site S01 to S10, 26 & 27	Continuous		N/A	Subsidence increasing at Site S26 above LW S2A, at reduced rate of change. Subsidence increasing at Site S27 above LW S2A. Minor changes at remaining sites this week.
Valley closure across Wirrimbirra Creek as measured by GNSS units				
Sites S01 and S02 above LW S1A	Continuous		N/A	Closure has gradually developed, up to 181 mm. Minor reduction this week.
Sites S03 and S04 at Ockenden Pool	Continuous		N/A	Closure has gradually developed, up to 194 mm. No change this week.
Sites S05 and S06 above LW S2A	Continuous		N/A	Closure has gradually developed, up to 179 mm. No change this week.
Sites S07 and S08 above LW S2A	Continuous		N/A	Approximately 125 mm closure developed. No change this week.
Sites S09 and S10 at the Big Pool	Continuous		N/A	Approximately 77 mm closure developed. Very minor increase this week.
Valley closure across Teatree Hollow as measured by GNSS units				
Sites S26 and S27 above LW S2A	Continuous		N/A	Approximately 70 mm closure developed. Valley closure gradually developing.
Tahmoor Mine Boundary Line (V-Line)				
V-Line along Tahmoor Mine property boundary	-	Monthly	N/A	Last survey 30 August. Very minor changes observed.
Main Southern Railway				
Ground surveys	2 Jan	Weekly	N/A	Small changes observed.
Local streets				
Ground survey along Charlies Point Road	-	Monthly	N/A	Last survey 27 November. Very minor subsidence observed.
Ground survey along Remembrance Drive	28 Dec	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. Small bump observed in southbound lane at this location.

Monitoring Activity	**Date**	**Current Frequency**	**Highest Trigger**	**Comments**
Local streets (continued)				
Visual inspections along local roads	3 Jan	Weekly	●	Small bump observed in southbound lane of Remembrance Drive at location of compressive strain between Pegs R47 and R48. A faint bump is visible on the edge line of the northbound lane south of Peg R46. Inspection on 27 November found that the bump had extended slightly into the shoulder. On 26 December, deterioration of the southbound pavement outside of the fog line was observed. No issues observed along Charlies Point Road on 4 December. Repair of potholes and pavement edging has been completed.
Natural features				
Ground survey across Wirrimbirra Creek	-	End of LW	N/A	Last survey 4 December. Closure and upsidence observed along TT2 line, upstream of Pool TT2. Minor changes were measured this month. Closure is also developing along TT3 line at Ockenden Pool and TT4 and TT5 lines above LW S2A.
Water level and water quality monitoring	Continuous	Download monthly	Level 4	While the observed rates of water level recession at Pool TT2 are consistent with previously observed rates and consistent with evaporation rates, surface and ground water assessments have found that the low water levels are atypical than what would be considered ‘normal’ conditions and are likely due to mining-induced reduction in groundwater baseflow into the pool.
Visual inspections of streams and small cliffs	15 Nov	Fortnightly	Level 4	Surface water flows in Wirrimbirra Creek first observed on 8 Feb to stop 120 m 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 15 Nov, no flows were observed into and out of TT1. Water observed to stop downstream of TT1. No surface water observed flowing into and out of TT2. Fracture within a surface boulder upstream of TT2 has found to have increased in size during Nov. 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. Geotechnical inspection of fracture site on 9 Nov confirmed that the boulder was once connected to the host rock on both sides of the stream but had become dislocated due to natural weathering and erosion of the underlying strata prior to mining. The boulder remained in contact with the host rock, however, such that mining-induced closure had almost immediately resulted in fracturing. Pre-mining photographs show that surface water was flowing beneath the boulder prior to mining and the fracturing has, therefore, had no effect on surface flows into Pool TT2. Flows observed to re-emerge approx. 50m upstream from TT8. While sections of Wirrimbirra Creek have been previously observed to be dry during periods of dry weather, the observations indicate that the changes are likely be mining-induced. It is noted that recent baseline monitoring in adjoining catchments are currently dry. The combination of observed increase in fracturing and pool water level assessment at Pool TT2 exceed the Level 4 trigger level in the AWS Management Plan. Tahmoor Coal will develop a CMAP in consultation with AWS as required under the Management Plan. A site inspection was conducted with National Trust and AWS at Pools TT2 and TT3 on 22 Nov. Temporary water supply continues to be maintained since installed on 25 Jul 2023. Visual inspection of rock shelter on 18 Dec found the creek bed was dry and no impacts to rock shelter.

TAHMOOR COAL: Longwall S2A

Australian Wildlife Sanctuary Subsidence Status Report No. 19

SIMEC

Monitoring Activity	Date	Current Frequency	Highest Trigger	Comments
Structures				
Local 3D surveys	3 Jan	Weekly	N/A	Minor subsidence and changes in horizontal distances between pegs observed.
Visual inspections	3 Jan	Weekly	N/A	No immediate issues of concern observed.
Asbestos air monitoring	-	Weekly	N/A	Last survey 20 December. All results are below the lowest detectable limit. The testing laboratory is closed during the holiday period until 8 Jan. Monitoring will recommence when it reopens.
Visual inspections				
Dingo Sanctuary	3 Jan	Weekly	N/A	No immediate issues of concern observed. The outer perimeter fence around the Dingo enclosure has a number of breaches that have been blocked by logs and rocks. A hole has been dug under the southwestern internal fence. Repairs will be undertaken.
Farm dam	3 Jan	Weekly	N/A	No immediate issues of concern observed.
External pavements, fences and gates	3 Jan	Weekly	N/A	No immediate issues of concern observed.
Walking trails	3 Jan	Weekly	N/A	No immediate issues of concern observed.
Management Actions				
Other management actions since previous report: ● Nil				
Any additional and/or outstanding management actions: ● Tahmoor Coal will develop a CMAP in consultation with National Trust and AWS after effects of mining				
Consultation with stakeholders since previous report: ● Weekly reports will be issued during the mining of LW S2A				
Forecast whether continued longwall mining is likely to cause impacts on the health and safety of people who may be present at the property due to the extraction of LW S2A: Based on monitoring results to date, and the controls implemented and available under the LW S2A Management Plan, no triggers under this Management Plan are expected to be exceeded in the next week.				

Certified by Tahmoor Coal	
Name	Ross Barber
Position	Project Manager
Signature	Ross Barber
Date	9 January 2024

Copy of Report to:

Gerry Hayes, General Manager Properties, National Trust of Australia (NSW)
Brad Wilson, Managing Director, Australian Wildlife Sanctuary
Luci Ellem, Managing Director, Bargo Dingo Sanctuary
Australian Native Dog Conservation Society
Clint Mason, Production Manager, Tahmoor Mine
Ray Ramage, Principal Inspector – Subsidence, Mine Safety Inspectorate, Resources Regulator

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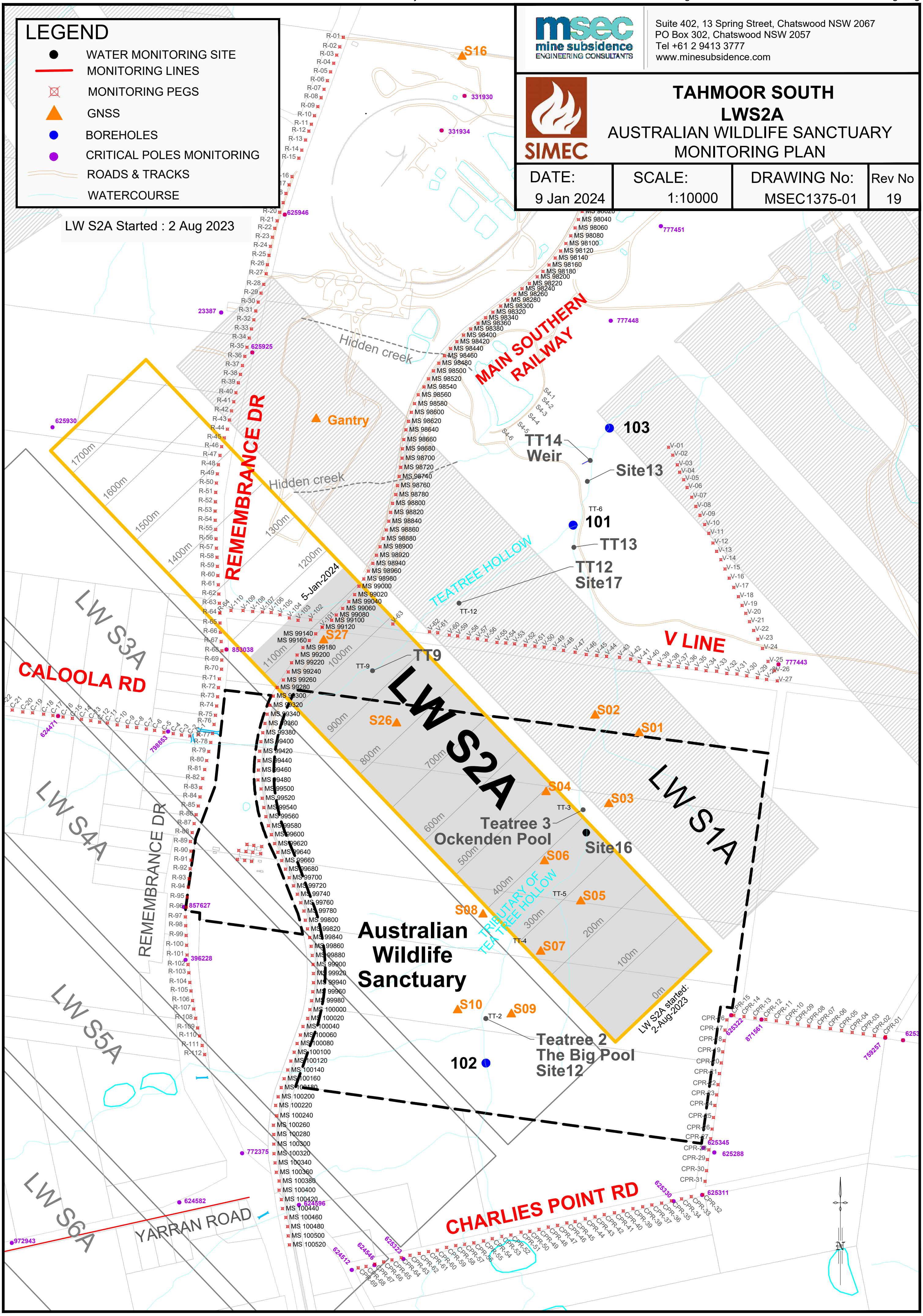

Tahmoor South LW S2A - GNSS Monitoring

Site S01 above LW S1A

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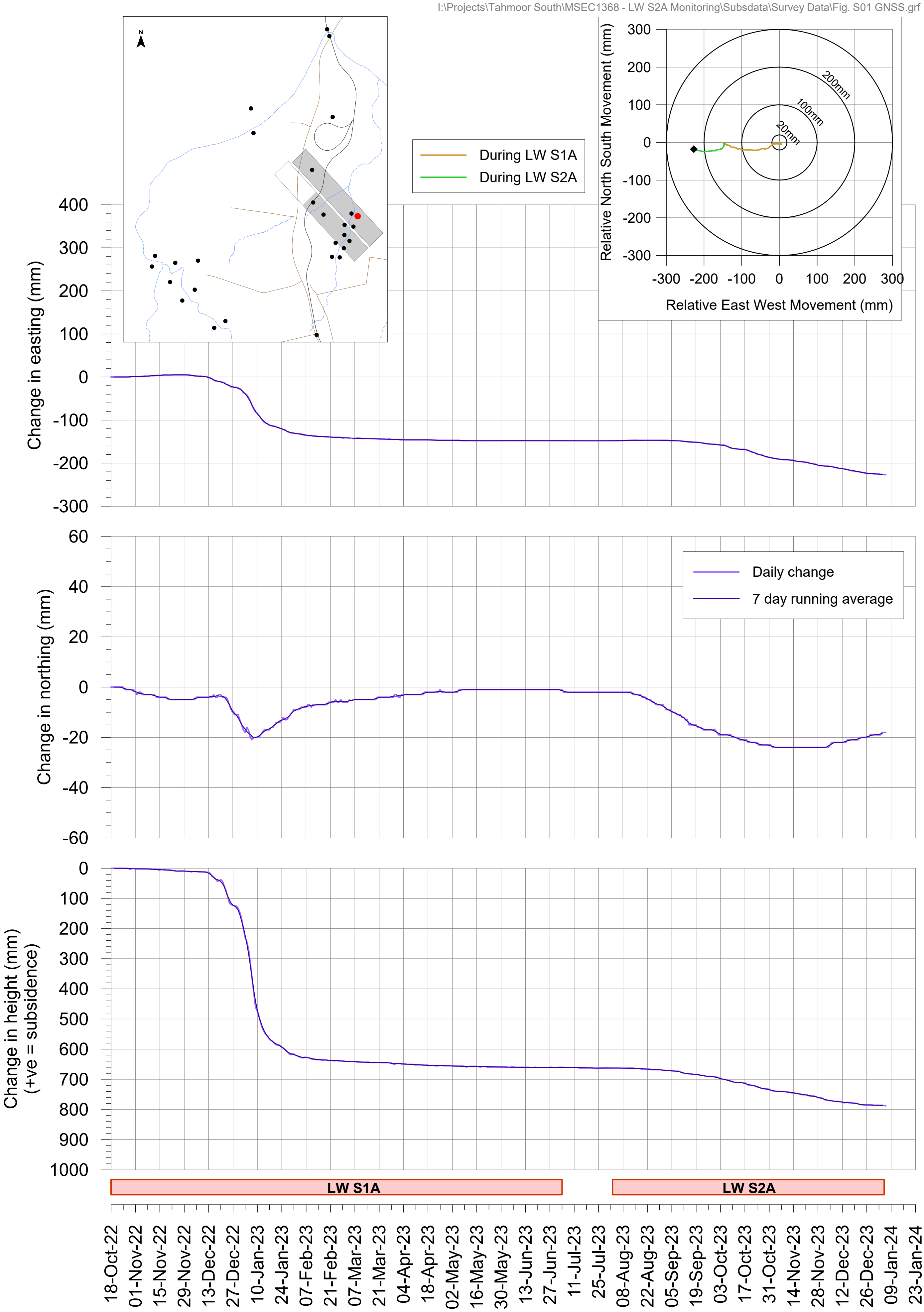

Fig. S01-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S02 above LW S1A

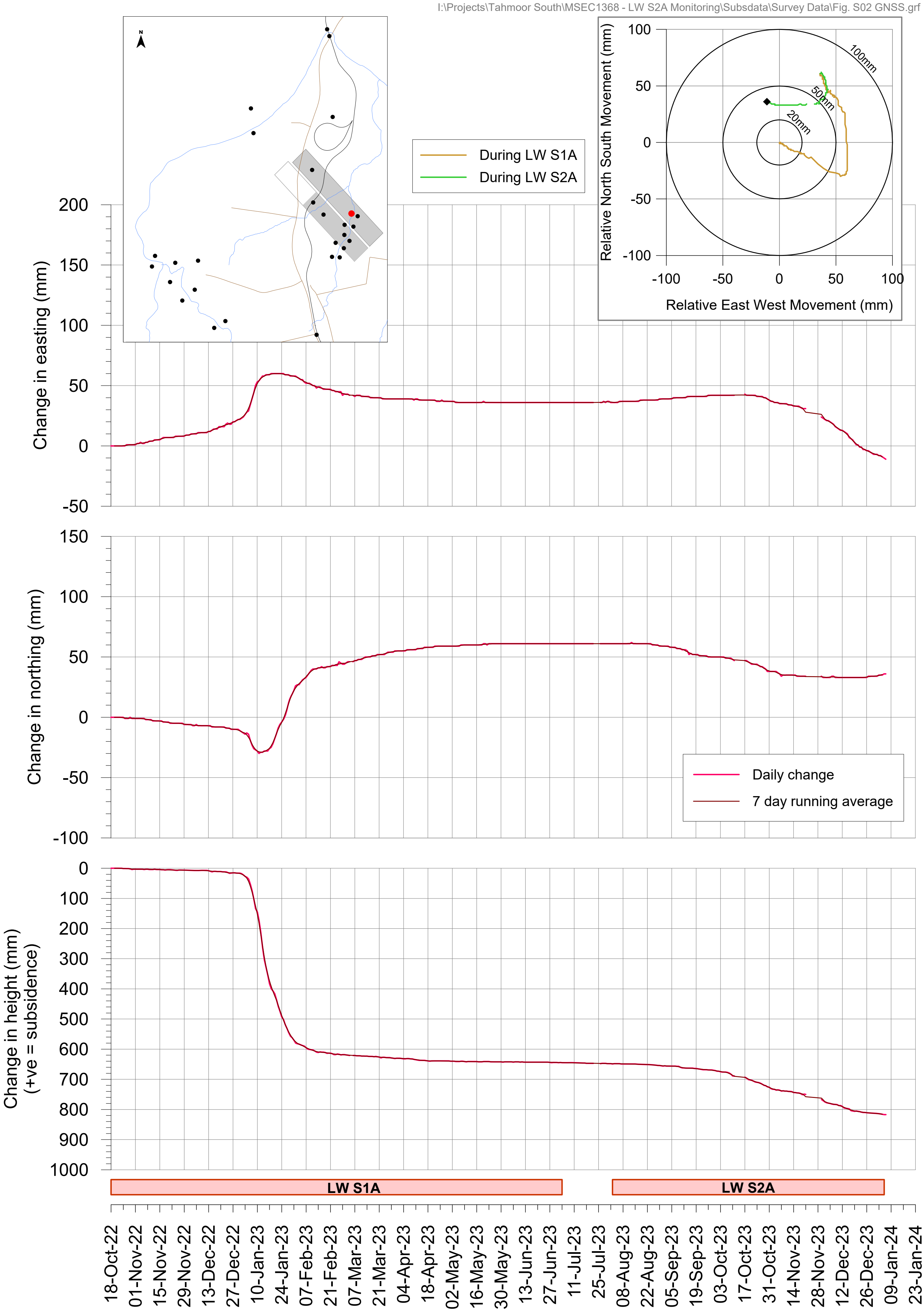

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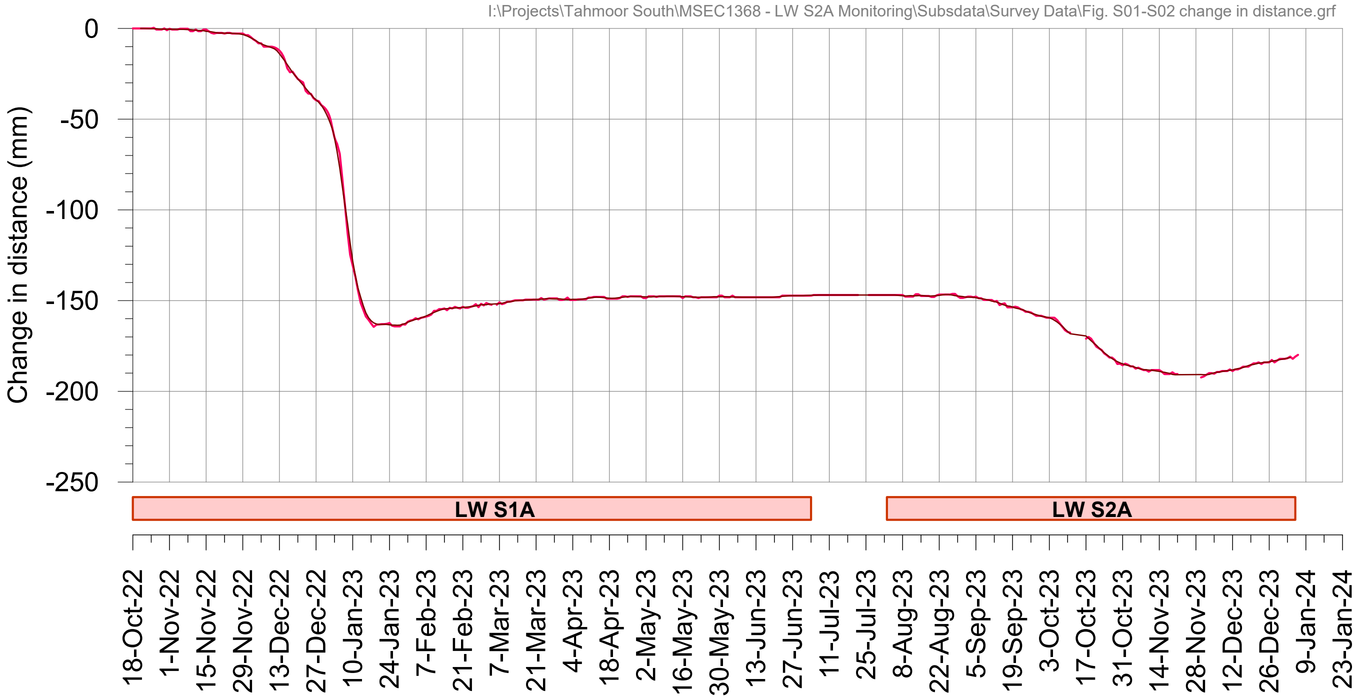
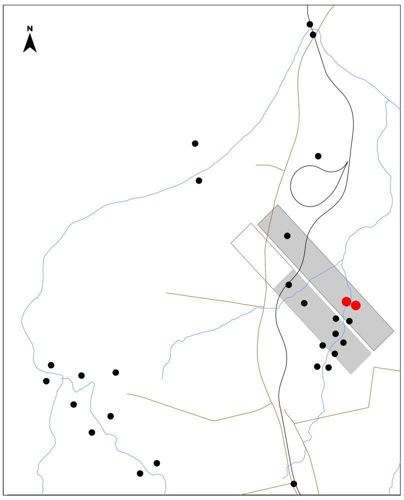
Fig. S02-R19

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





msec

Fig. S01-S02-R19

Tahmoor South LW S2A - GNSS Monitoring
Site S03 above LW S1A at Teatree 3

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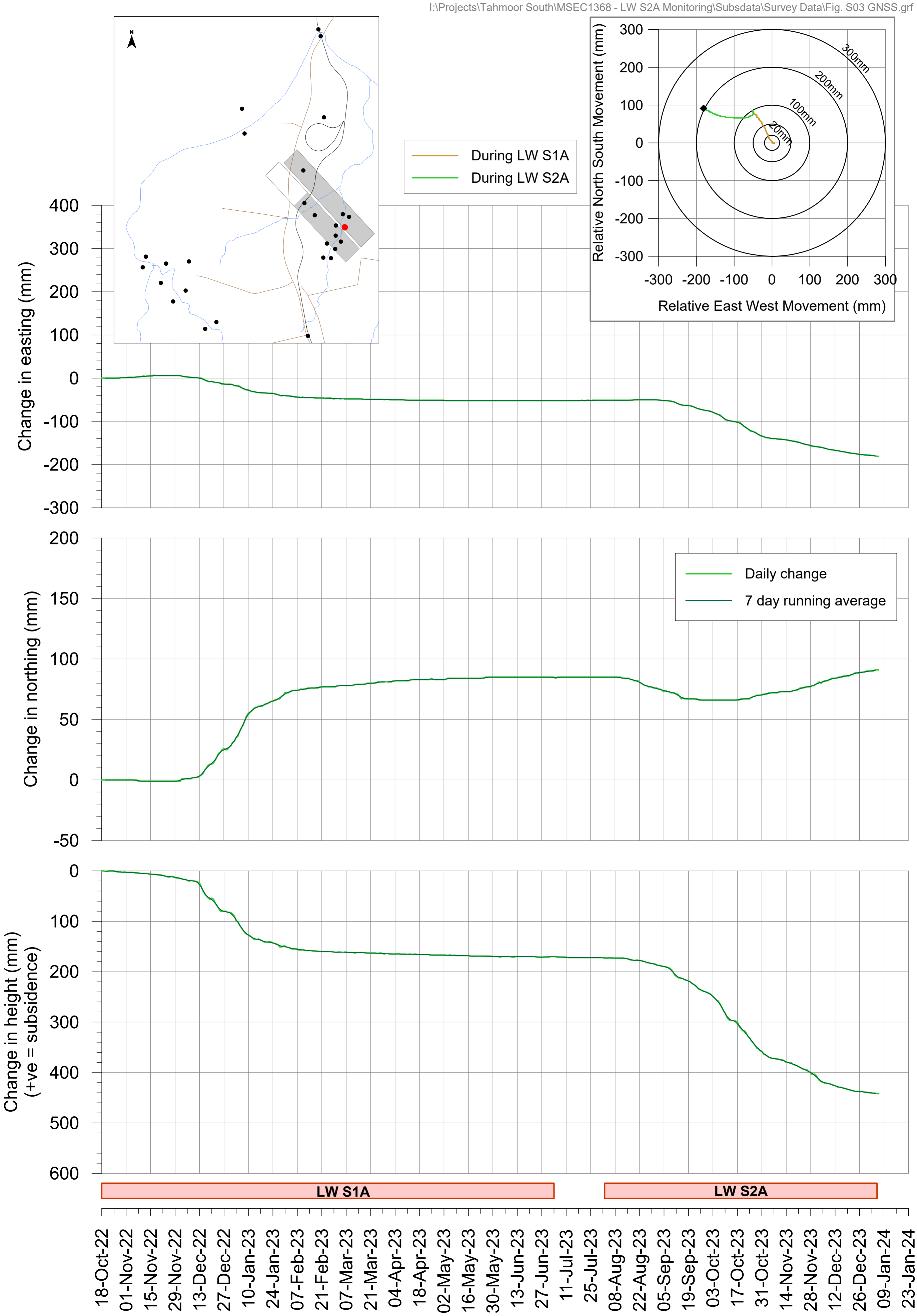

msec

Fig. S03-R19

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

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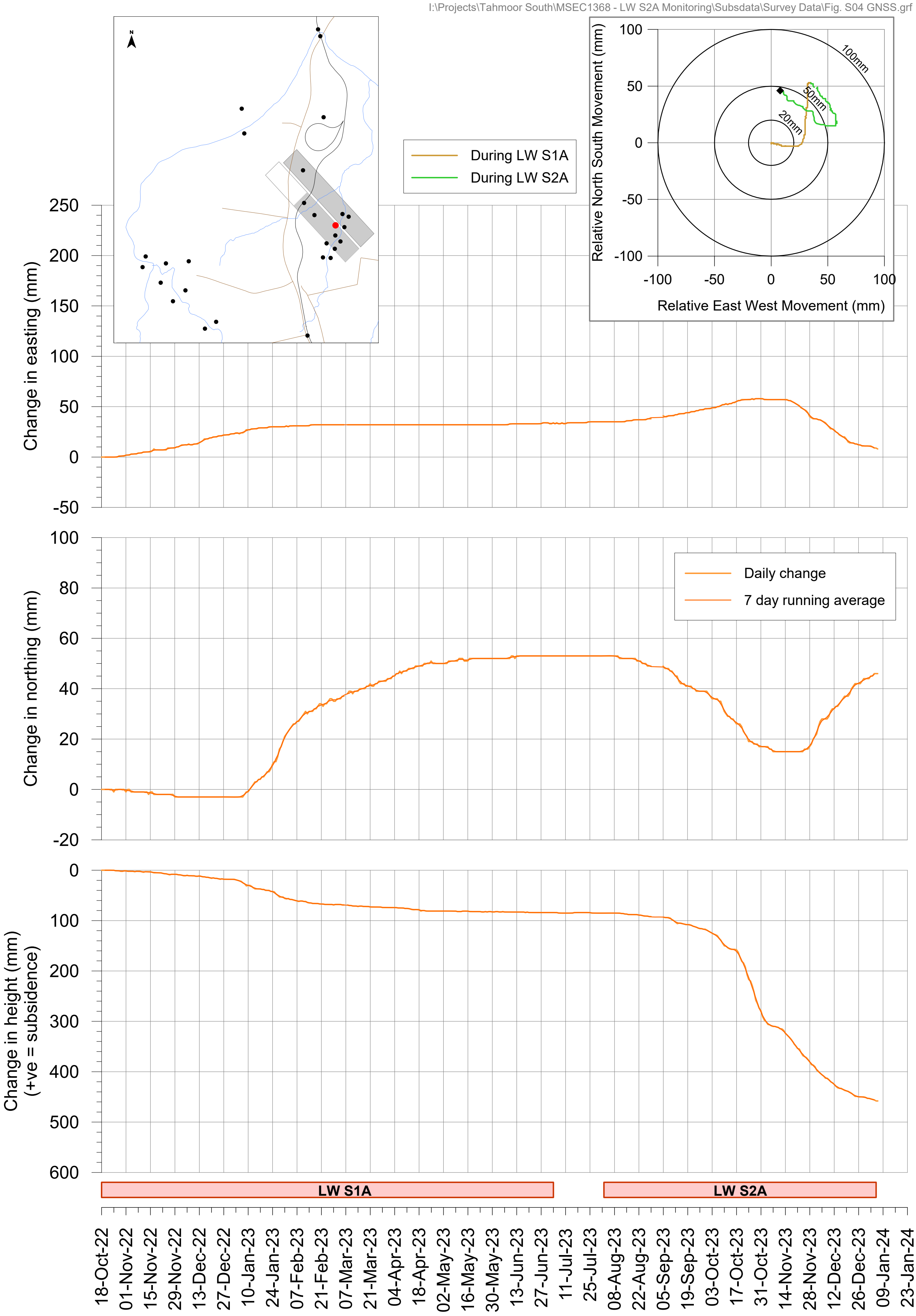
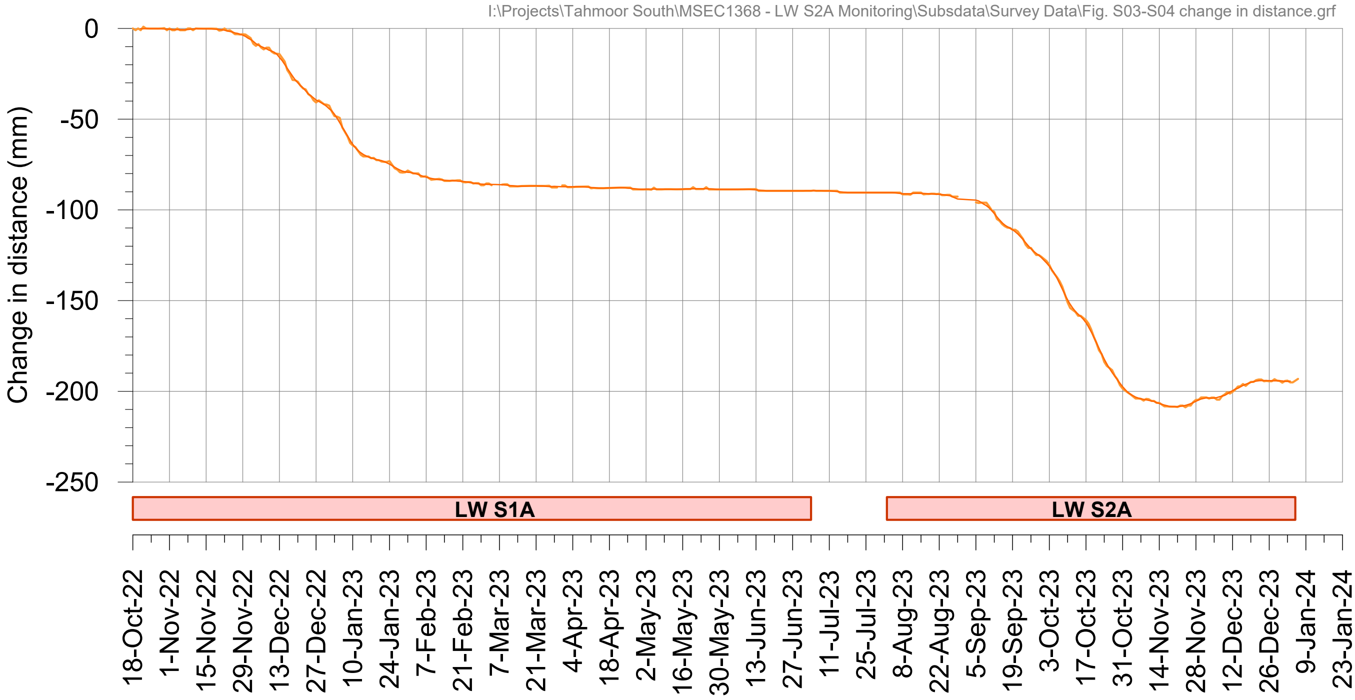


msec

Fig. S04-R19

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



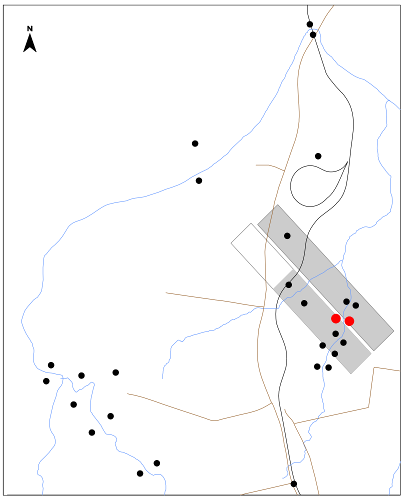


Fig. S03-S04-R19

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

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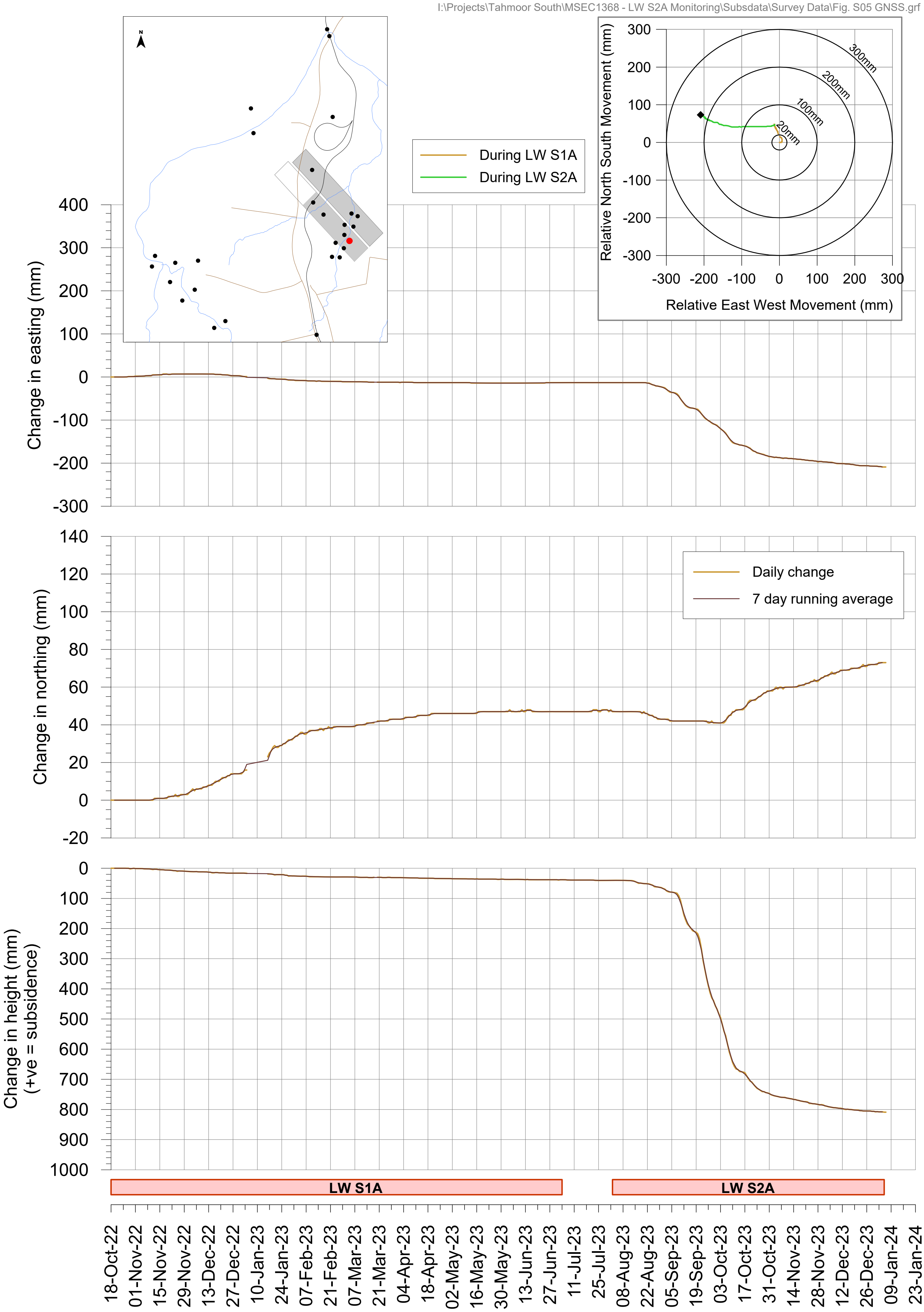

msec

Fig. S05-R19

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

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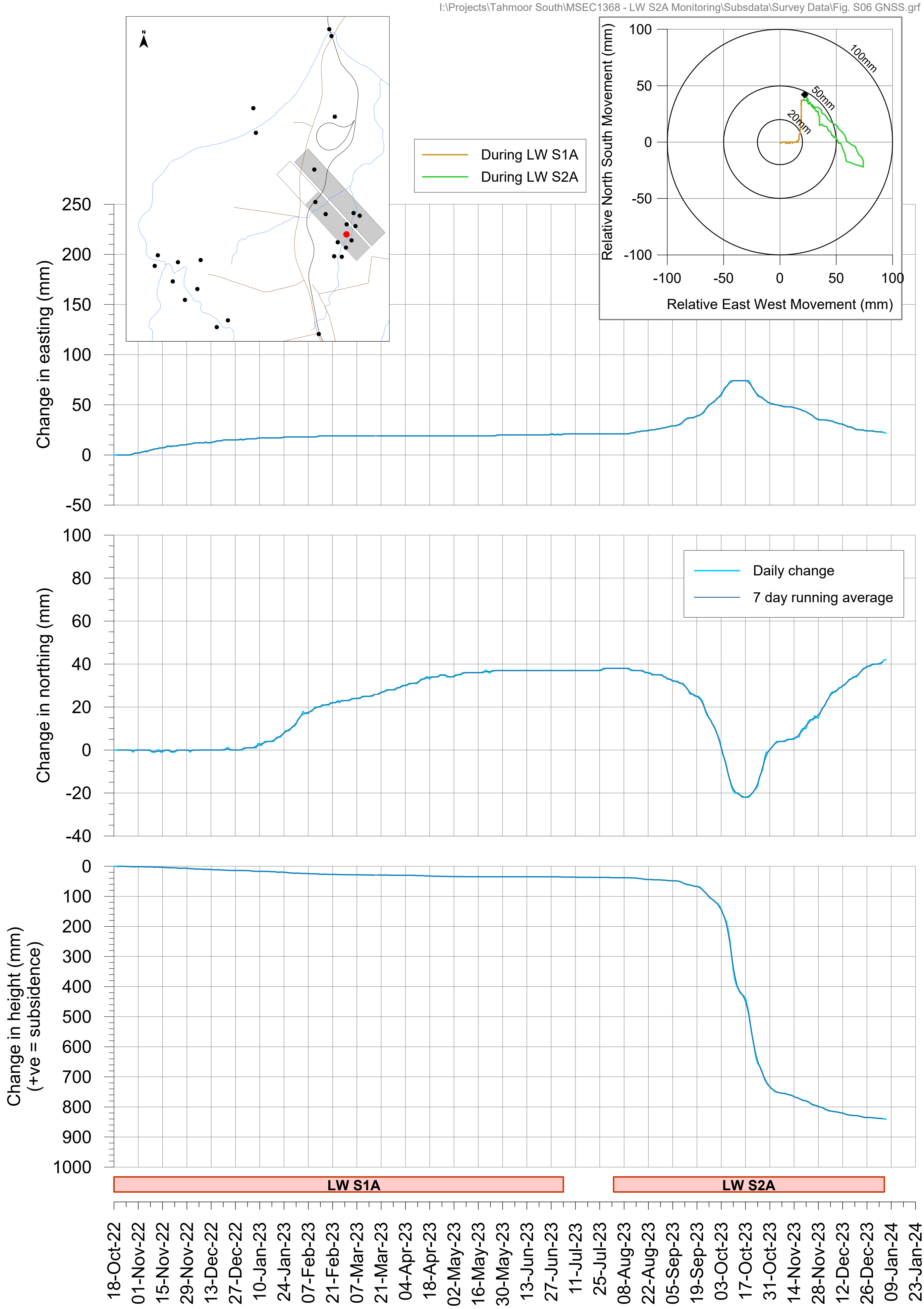
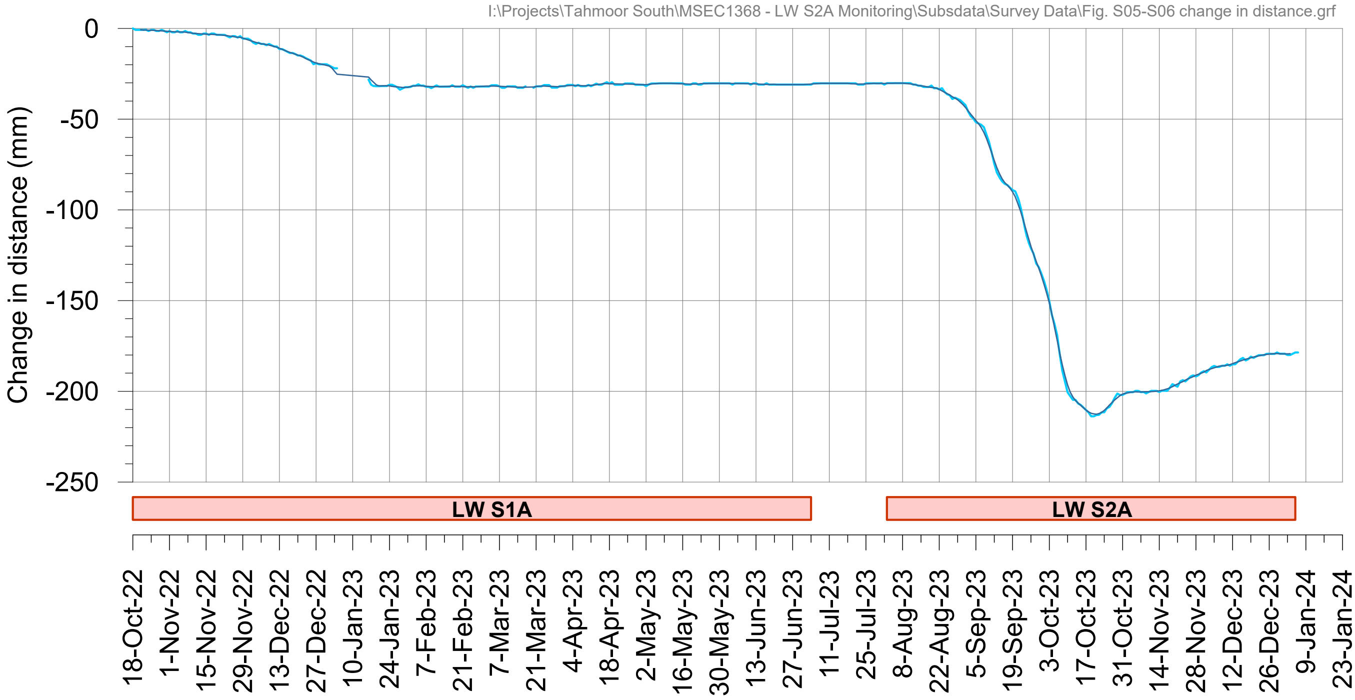


Fig. S06-R19

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



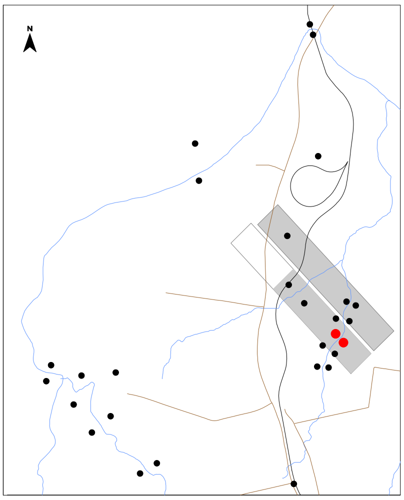
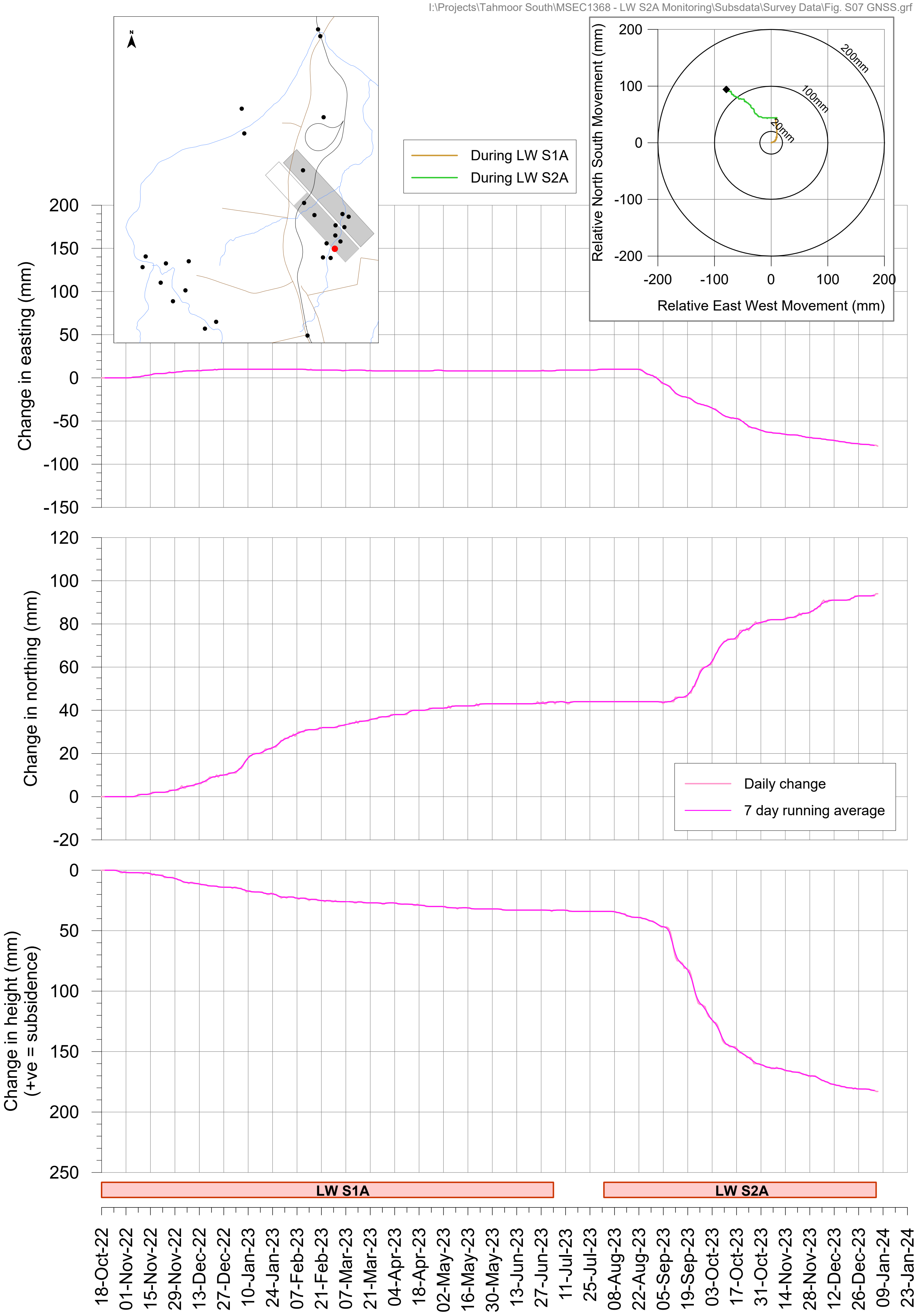


Fig. S05-S06-R19

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



msec

Fig. S07-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S08 between LW S2A and LW S3A

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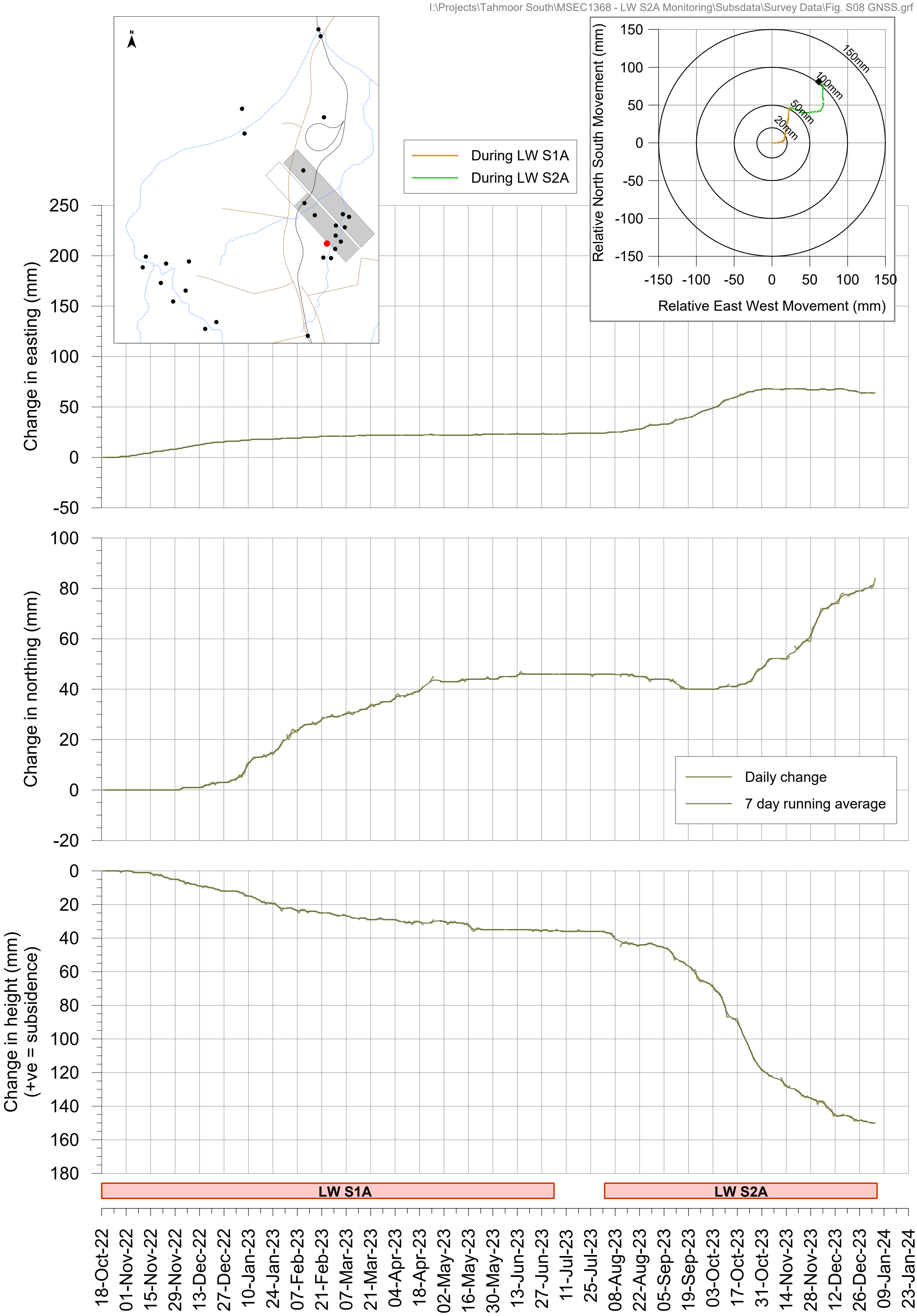
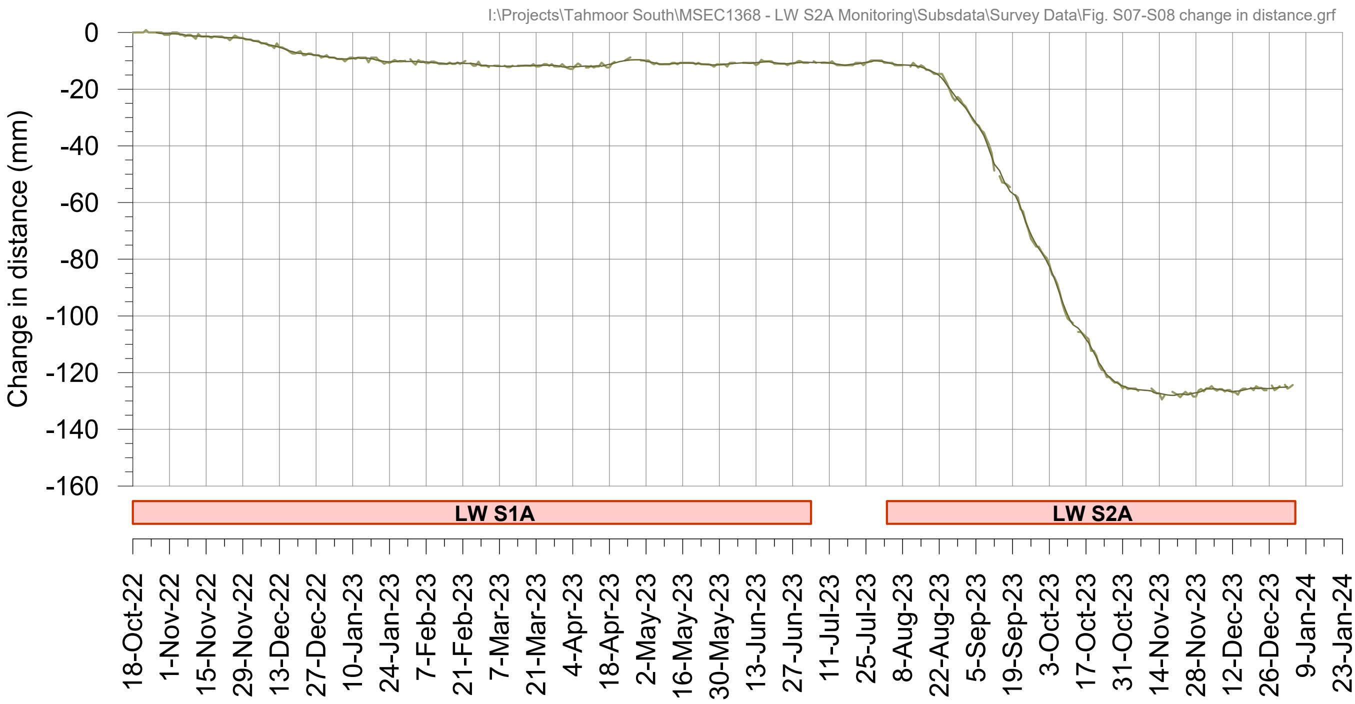


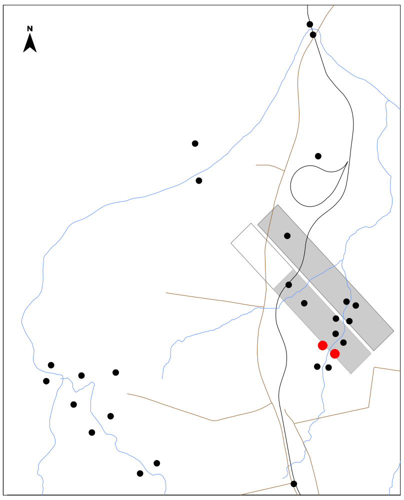
Fig. S08-R19

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





msec

Fig. S07-S08-R19

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

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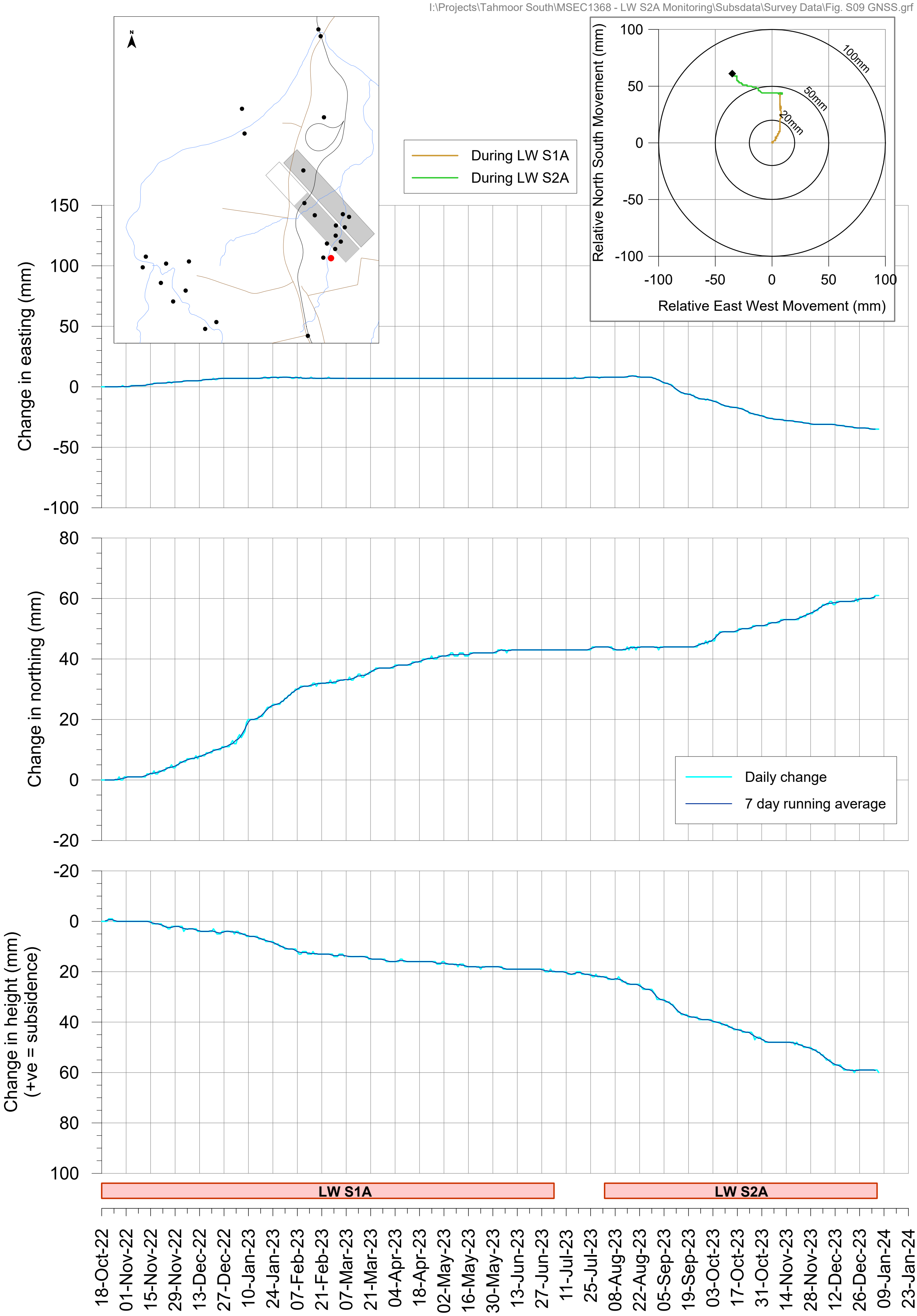

msec

Fig. S09-R19

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

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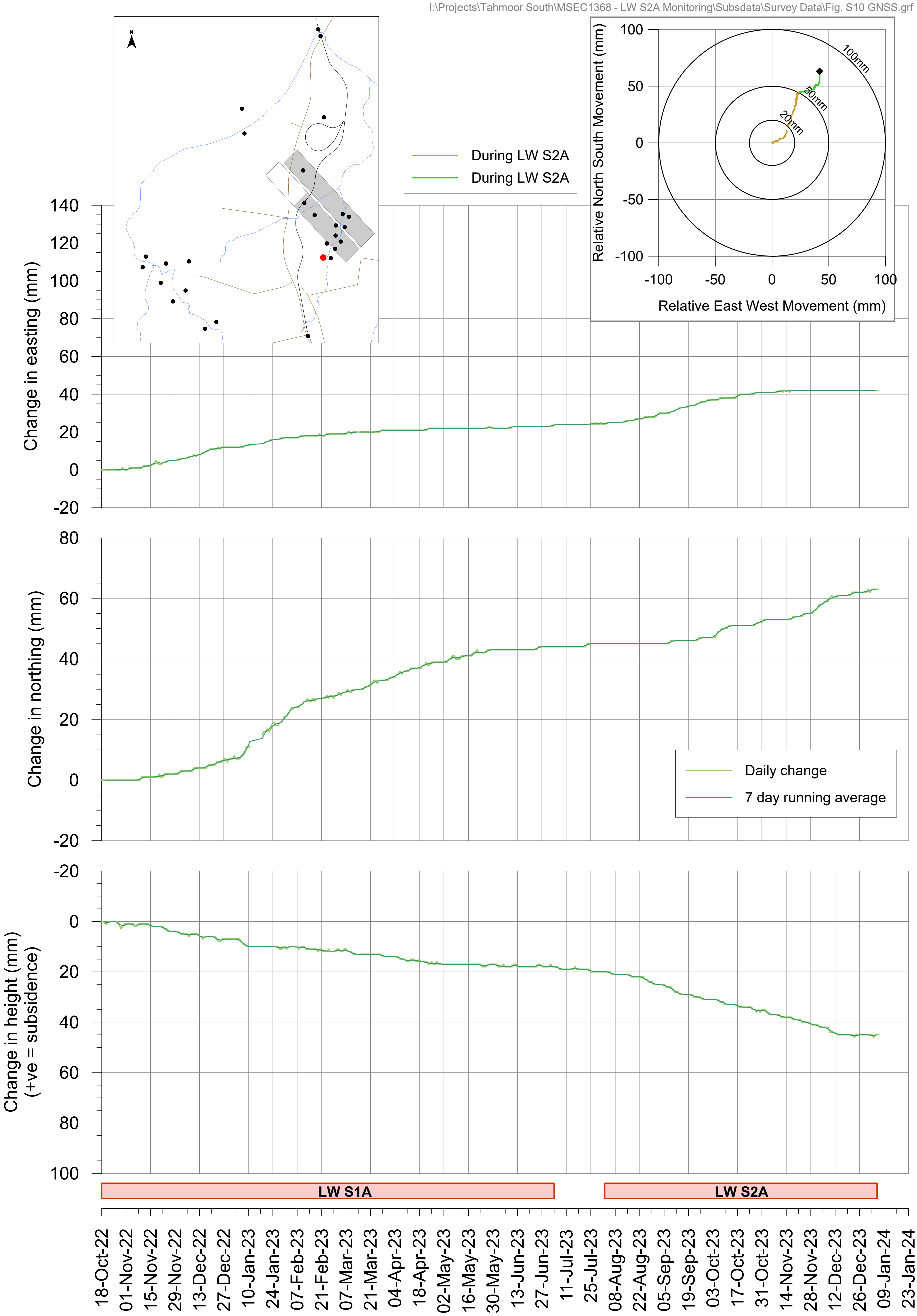
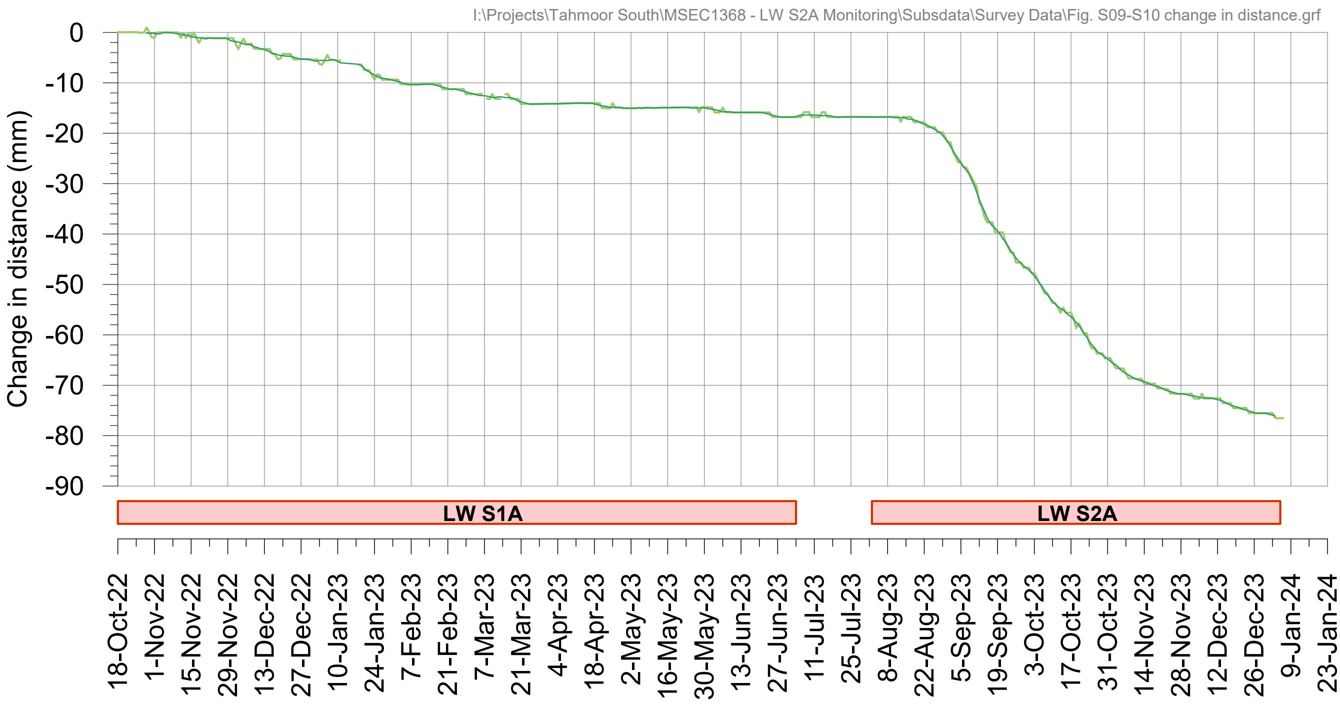


msec

Fig. S10-R19

Tahmoor South LW S2A - GNSS Monitoring
Change in distance across Wirrimbirra Creek at Teatree 2
Sites S09 and S10 above LW S3A



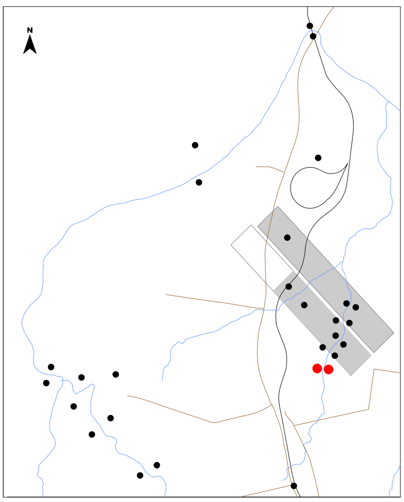
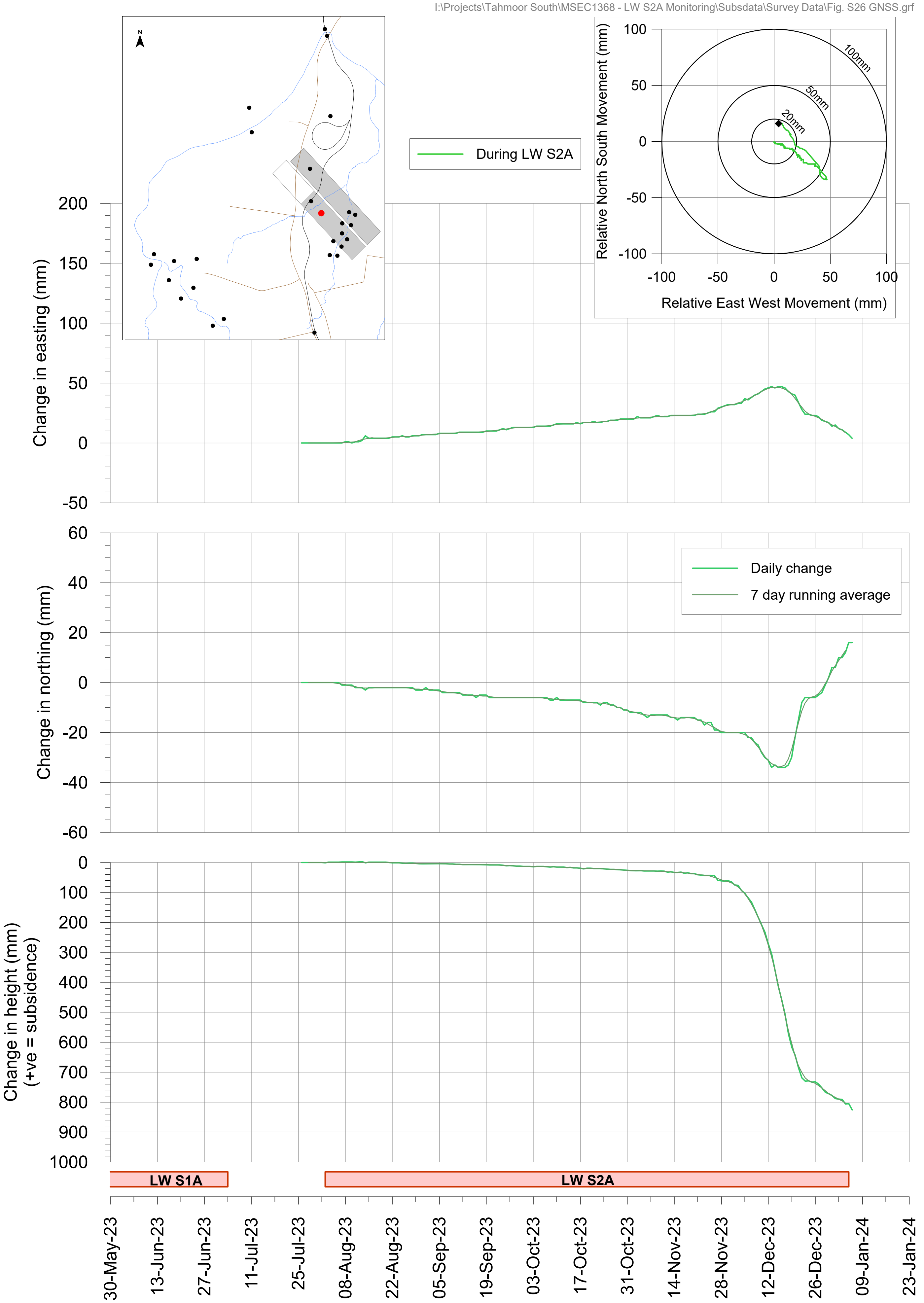


Fig. S09-S10-R19

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

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S26 GNSS.grf



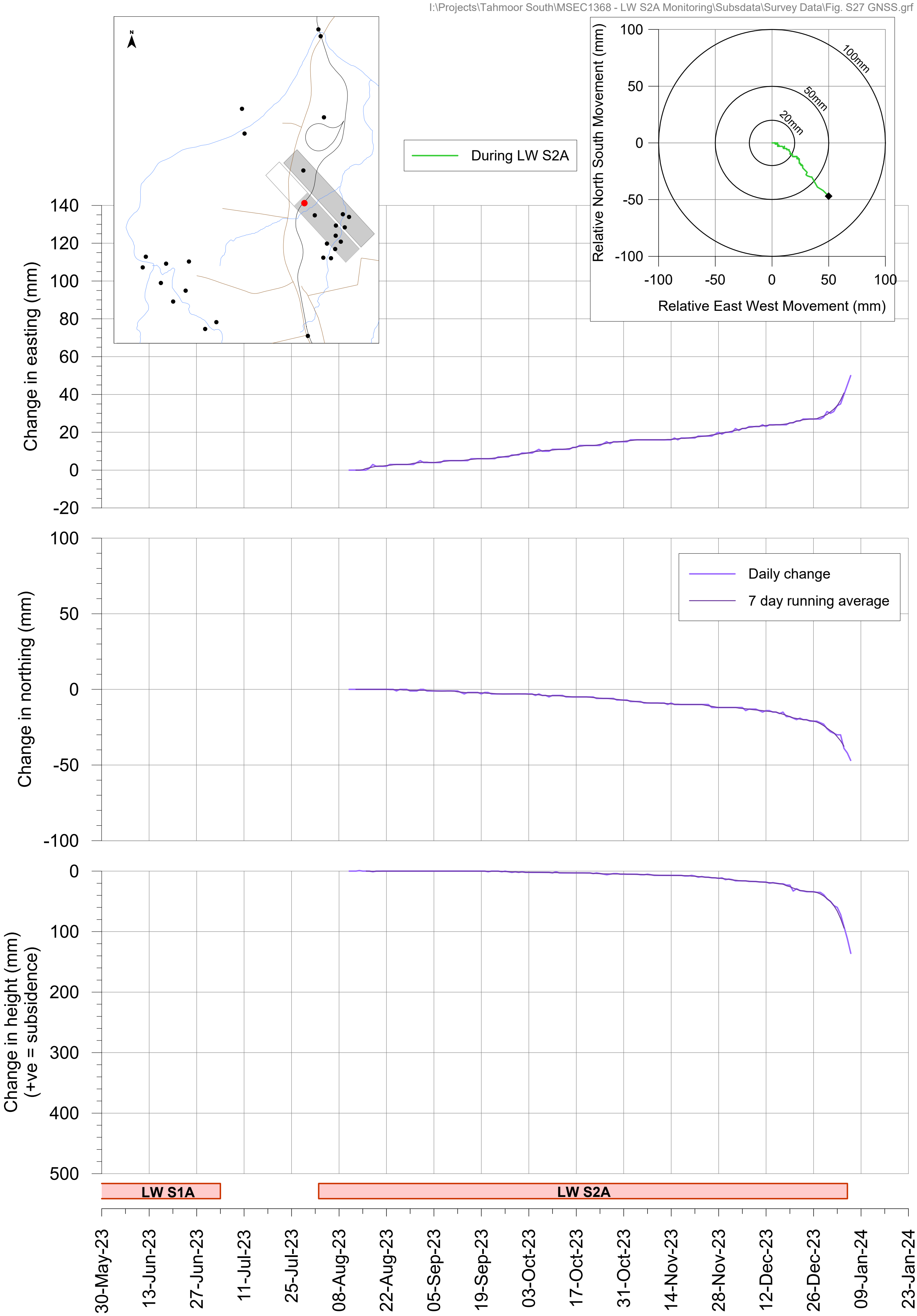
msec

Fig. S26-R19

Tahmoor South LW S2A - GNSS Monitoring

Site S27 on railway embankment above LW S2A

I:\Projects\Tahmoor South\MSEC1368 - LW S2A Monitoring\Subsdata\Survey Data\Fig. S27 GNSS.grf

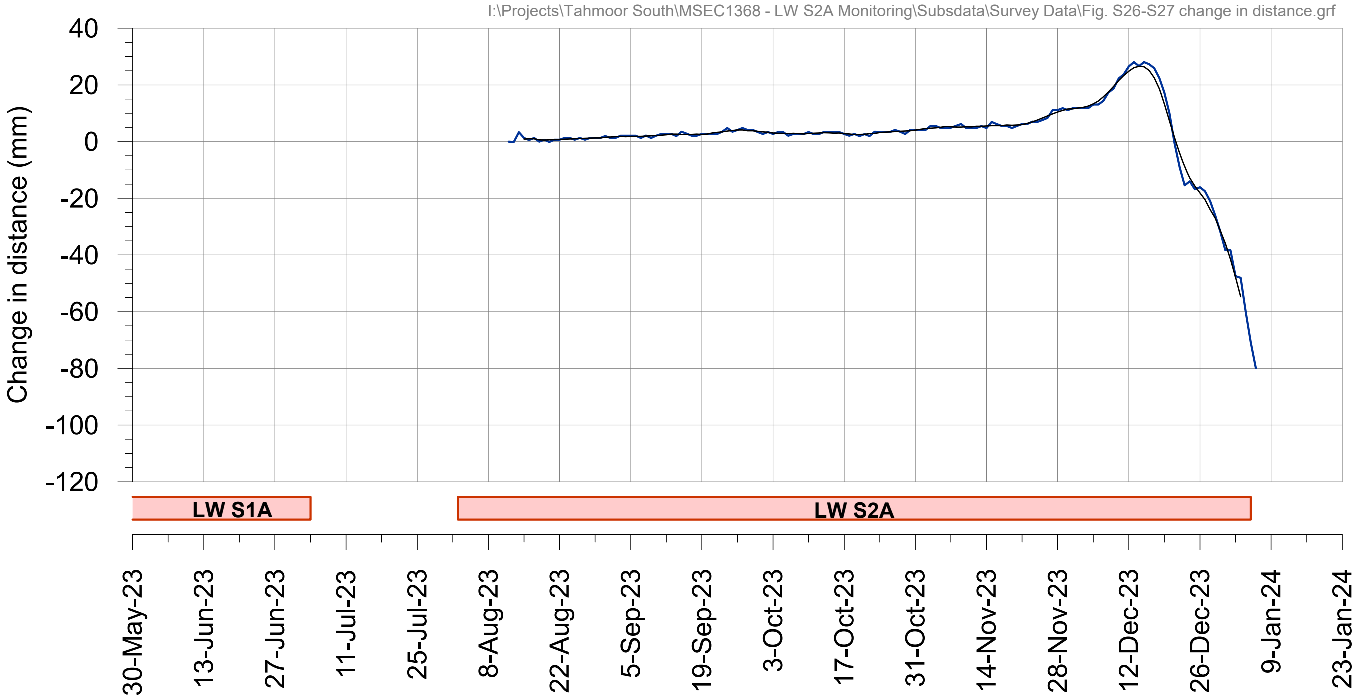


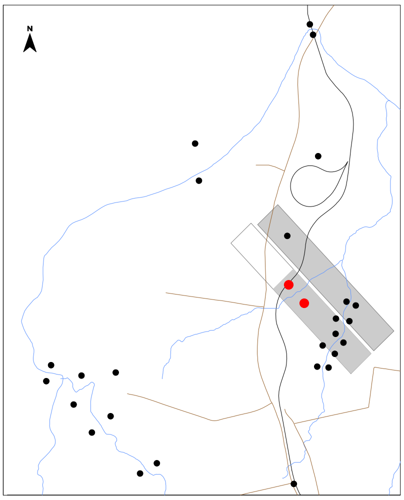
msec

Fig. S27-R19

Tahmoor South LW S2A - GNSS Monitoring

Change in distance across Teatree Hollow above LW S2A
Sites S26 and S27





msec

Fig. S26-S27-R19

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Suite 402, 13 Spring Street, Chatswood NSW 2067
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www.minesubsidence.com

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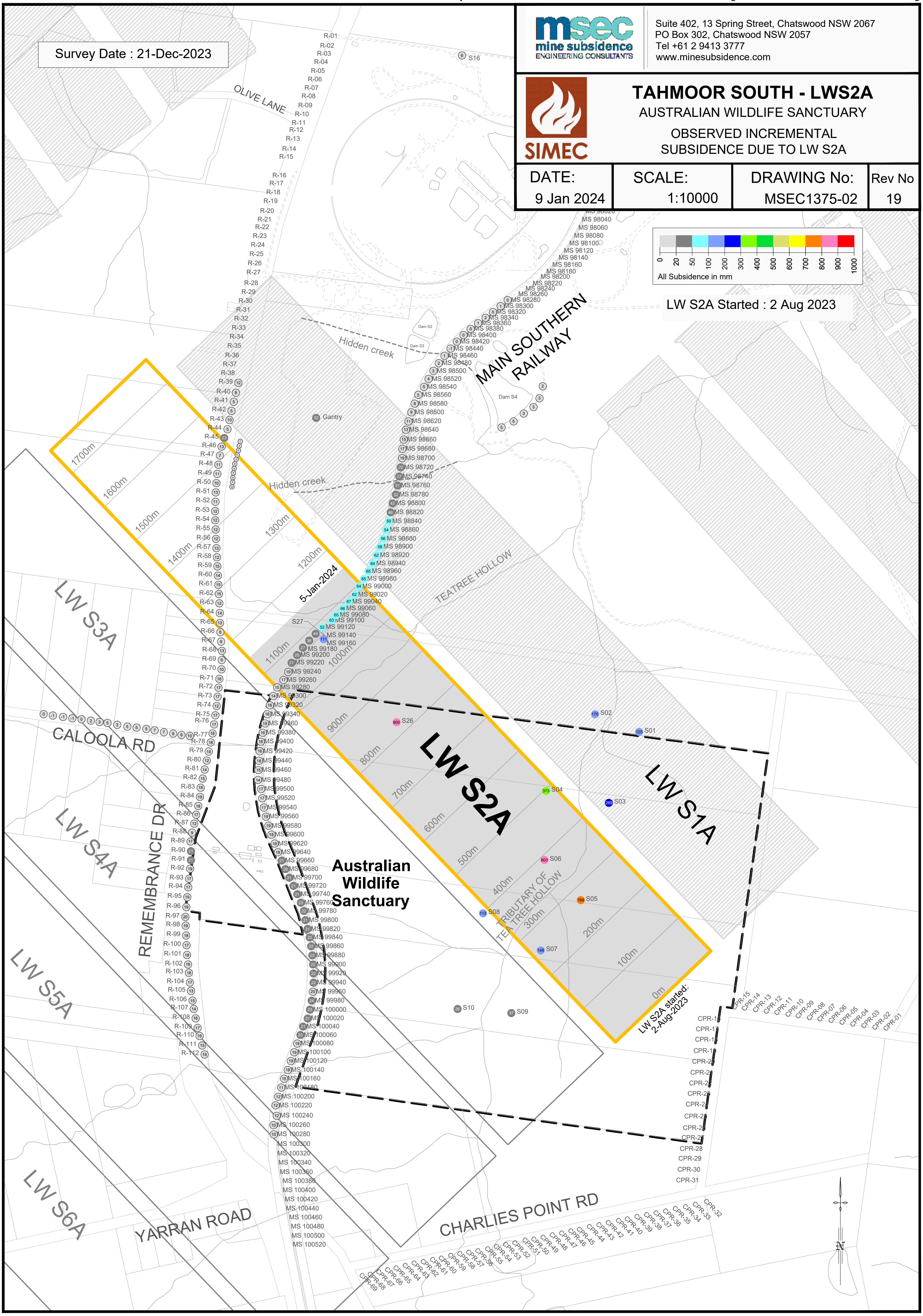
TAHMOOR SOUTH - LWS2A

AUSTRALIAN WILDLIFE SANCTUARY

OBSERVED INCREMENTAL SUBSIDENCE DUE TO LW S2A

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	1:10000	MSEC1375-02	19



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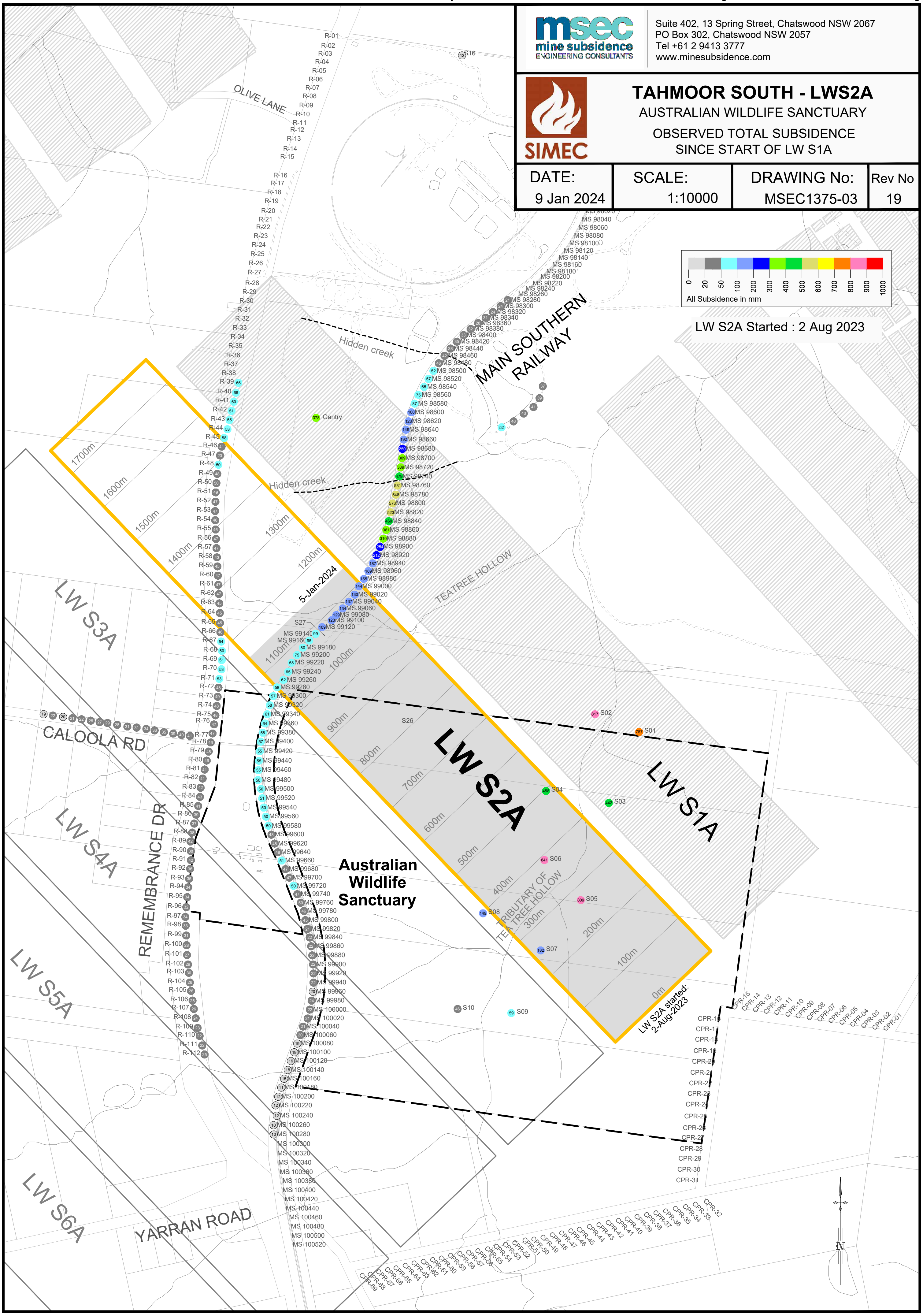

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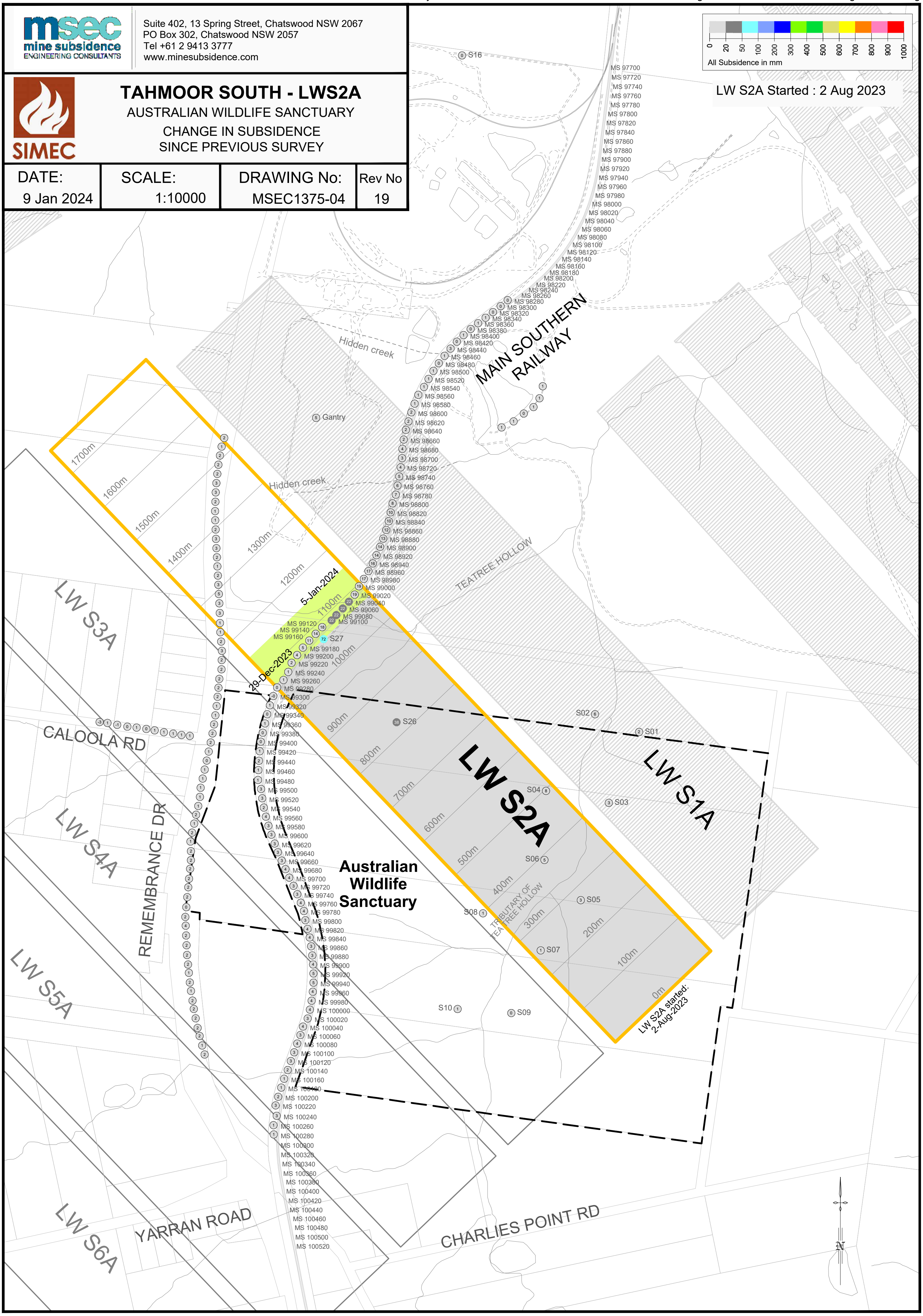
TAHMOOR SOUTH - LWS2A

AUSTRALIAN WILDLIFE SANCTUARY
CHANGE IN SUBSIDENCE
SINCE PREVIOUS SURVEY

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	1:10000	MSEC1375-04	19



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TAHMOOR SOUTH - LW S2A

AUSTRALIAN WILDLIFE SANCTUARY

GROUND MONITORING

DATE:	SCALE:	DRAWING No:	Rev No
9 Jan 2024	as shown	MSEC1375-05	19

Survey Date : 3-Jan-2024

mm Incremental Subsidence

Horizontal displacement of survey marks since start of LW S2A

mm Vector & magnitude of observed horizontal movement (mm)

Change in horizontal distance between Survey Marks

mm Closure

mm Opening

LW S2A Started : 2 Aug 2023

Relative Origin AWS~11
(Relative Orientation 90°00' to AWS~8)