Newmont™
AUSTRALIA

710-005-EN-REP-0031

CADIA 2024 ANNUAL REVIEW



FORWARD LOOKING STATEMENTS

This document contains “forward-looking statements” within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended, which are intended to be covered by the safe harbor created by such sections and other applicable laws. Where a forward-looking statement expresses or implies an expectation or belief as to future events or results, such expectation or belief is expressed in good faith and believed to have a reasonable basis. However, such statements are subject to risks, uncertainties and other factors, which could cause actual results to differ materially from future results expressed, projected or implied by the forward-looking statements.

Forward-looking statements often address our expected future business and financial performance and financial condition; and often contain words such as “anticipate,” “intend,” “plan,” “will,” “would,” “estimate,” “expect,” “believe,” "pending" or “potential.” Forward-looking statements in this Report may include, without limitation, (i) estimates of future production and sales, including production outlook, average future production and upside potential, including our Full Potential initiatives and synergies; (ii) estimates of future costs applicable to sales and all-in sustaining costs; (iii) estimates of future capital expenditures, including development and sustaining capital; (iv) expectations regarding the Cadia Block Caves projects, including, without limitation, expectations for production, milling, costs applicable to sales and all-in sustaining costs, capital costs, mine life extension, construction completion commercial production, and other timelines; (v) any share and debt repurchases; (vi) estimates of future cost reductions, synergies, including pre-tax synergies, savings and efficiencies, Full Potential and productivity improvements, and future cash flow enhancements through portfolio optimization, (vii) expectations regarding future exploration and the development, growth and potential of Newmont Corporation's ("Newmont"), project pipeline and investments; (viii) expectations regarding future investments or divestitures, including of non-core assets and assets designated as held for sale; (ix) expectations regarding free cash flow and returns to stockholders, including with respect to future dividends and future share repurchases, the dividend framework and expected payout levels; (x) expectations regarding future mineralization, including, without limitation, expectations regarding reserves and recoveries; (xi) expectations regarding organic growth in our operations; and (xii) other outlook.

Estimates or expectations of future events or results are based upon certain assumptions, which may prove to be incorrect. Such assumptions, include, but are not limited to: (i) there being no significant change to current geotechnical, metallurgical, hydrological and other physical conditions; (ii) permitting, development, operations and expansion of operations and projects being consistent with current expectations and mine plans, including, without limitation, receipt of export approvals; (iii) political developments in any jurisdiction in which the Company operates being consistent with its current expectations; (iv) certain exchange rate assumptions for the Australian dollar to U.S. dollar as well as other exchange rates being approximately consistent with current levels; (v) certain price assumptions for gold, copper, silver, zinc, lead and oil; (vi) prices for key supplies; (vii) the accuracy of current mineral reserve, mineral resource and mineralized material estimates; and (viii) other planning assumptions.

Uncertainties include those relating to general macroeconomic uncertainty and changing market conditions, changing restrictions on the mining industry in the jurisdictions in which we operate, impacts to supply chain, including price, availability of goods, ability to receive supplies and fuel, and impacts of changes in interest rates. Such uncertainties could result in operating sites being placed into care and maintenance and impact estimates, costs and timing of projects. Uncertainties in geopolitical conditions could impact certain planning assumptions, including, but not limited to commodity and currency prices, costs and supply chain availabilities.

For a more detailed discussion of such risks and other factors that might impact future looking statements, see the Company's Annual Report on Form 10-K for the year ended December 31, 2023 filed with the U.S. Securities and Exchange Commission (the "SEC") on February 29, 2024, as updated by the current report on Form 8-K, filed with the SEC on July 25, 2024, under the heading "Risk Factors", and other factors identified in the Company's reports filed with the SEC, available on the SEC website or at www.newmont.com. The Company does not undertake any obligation to release publicly revisions to any "forward-looking statement," including, without limitation, outlook, to reflect events or circumstances after the date of this news release, or to reflect the occurrence of unanticipated events, except as may be required under applicable securities laws. Investors should not assume that any lack of update to a previously issued "forward-looking statement" constitutes a reaffirmation of that statement. Continued reliance on "forward-looking statements" is at investors' own risk.

CADIA ANNUAL REVIEW 2024 – SUMMARY INFORMATION AND SIGN OFF

Name of operation	Cadia
Name of operator	Cadia Holdings Pty Limited
Development consent / project approval #	06_0295
Name of holder of development consent / project approval	Cadia Holdings Pty Limited
Mining lease #	ML1405, ML1449, ML1472, ML1481, ML1689, ML1690
Name of holder of mining lease	Cadia Holdings Pty Limited
Water licence #	28099, 31062, 31072, 36229, 32255, 32280, 31517, 31527, 31505
Name of holder of water licence	Cadia Holdings Pty Limited (28099, 31062, 36229, 32255, 32280, 31527, 31505) Cadia Holdings Pty Limited and Newcrest Operations Limited (31072) Contango Agricultural Company Pty Ltd C/O Environmental Manager Cadia Holdings Pty Limited (31517)
Annual Review start date	1 July 2023
Annual Review end date	30 June 2024

I, Tom Lukeman, certify that this report is a true and accurate record of the compliance status of Cadia for the period 1 July 2023 to 30 June 2024 and that I am authorised to make this statement on behalf of Cadia Holdings Pty Limited.

Note.
a) The Annual Review is an 'environmental audit' for the purposes of section 9.39 of the *Environmental Planning and Assessment Act 1979*. Section 9.42 provides that a person must not include information in (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.
b) The *Crimes Act 1900* contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (false or misleading applications/information/documents – maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	Tom Lukeman
Title of authorised reporting officer	General Manager, Cadia
Signature of authorised reporting officer	
Date	29/10/2024

DOCUMENT HISTORY AND STATUS

Version	Issued to	Date issued	Approved by	Date approved
1	New South Wales Department of Planning, Housing and Infrastructure	30/10/2024		

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LIST OF ACRONYMS AND ABBREVIATIONS

ACHMP	Aboriginal Cultural Heritage Management Plan	MLA	Mining Lease Area
ANSTO	Australia's Nuclear Science and Technology Organisation	MOD14	Modification 14 of the Cadia East Project Approval (06_0295)
AEMP	Aquatic Ecosystem Monitoring Project	MOD15	Modification 15 of the Cadia East Project Approval (06_0295)
AQGHGMP	Air Quality and Greenhouse Gas Management Plan	Mt	Million tonnes
AWS	Automatic Weather Station	Mtpa	Million tonnes per annum
BAM	Beta Attenuation Monitors	NAF	Non-acid forming
BCS	Biodiversity, Conservation and Science Group	NEPM	National Environment Protection Measure
BFI	Baseflow Index (the ratio of baseflow to total flow)	NIAC	Noise Impact Assessment Criteria
BCT	Biodiversity Conservation Trust	NLD	Northern Leachate Dam
BMP	Biodiversity Management Plan	NTSF	Northern Tailings Storage Facility
BOM	Bureau of Meteorology	NSW	New South Wales
BSA	Biodiversity Stewardship Agreement	NWRD	North Waste Rock Dump
Cadia	Cadia Mine	OLALC	Orange Local Aboriginal Land Council
CCC	Community Consultative Committee	PA	Project Approval
CDEP	Cadia District Enhancement Project	PAF	Potentially acid forming
CDF	Cadia Dewatering Facility	PIRMP	Pollution Incident Response Management Plan
CCOP	Cadia Continued Operations Project	$PM_{2.5}$	Particulate matter with a diameter of 2.5 micrometres or less
CHPL	Cadia Holdings Pty Limited	PM_{10}	Particulate matter with a diameter of 10 micrometres or less
CRD	Cumulative Rainfall Departure (curve)	PTSF	Pit Tailings Storage Facility
dBL	Airblast overpressure	RMP	Rehabilitation Management Plan
DDG	Dust Deposition Gauges	RR	New South Wales Resources Regulator
DPHI	New South Wales Department of Planning, Housing and Infrastructure	RW WS	Ridgeway Weather Station
EA	Environmental Assessment for Cadia East	RWY	Ridgeway

EC	Electrical Conductivity	SLB WS	Southern Lease Boundary Weather Station
EIS	Environmental Impact Statement	SLD	Southern Leachate Dam
EPA	New South Wales Environment Protection Authority	SROP	Site Runoff Pond
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*	SSGV	Site Specific Guideline Value
EPL	Environment Protection Licence	STSF	Southern Tailings Storage Facility
FY24	Financial Year 2024	SWRD	South Waste Rock Dump
GHG	Greenhouse gas	t	tonne
ha	hectare	TARP	Trigger Action Response Plan
HHMP	Historical Heritage Management Plan	TEOM	Tapered Element Oscillating Microbalance
Hi-vol	High Volume Air Samplers	TSF	Tailings Storage Facility
ICMM	International Council on Mining & Metals	TSP	Total Suspended Particulate
IEA	independent environmental audit	TSS	Total Suspended Solids
LBMP	Landscape and Biodiversity Management Plan	WAF	Water Accounting Framework
LGA	Local Government Area	WAL	Water Access Licence
mAHD	metres Australian Height Datum	WMP	Water Management Plan
MCA	Minerals Council Australia	WRD	Waste Rock Dump
ML	Mining Lease		

DEFINITIONS

For the purposes of this report the following key definitions apply.

Annual Review	The review required by Condition 2 of Schedule 5 of project approval 06_0295 (i.e. this document)
Reporting period	The reporting period relevant to this Annual Review report (1 July 2023 to 30 June 2024)
FY24	The Australian financial year ending 30 June 2024. This period is the same as the reporting period
Cadia East Project Approval (PA) 06_0295	The project approval for Cadia
Cadia Holdings Proprietary Limited (CHPL)	Owner and operator of Cadia and holder of the development consent and project approval
Cadia	Existing Cadia mining operations
EPL 5590	The Environment Protection Licence issued to Cadia by the NSW Environment Protection Authority.

1 STATEMENT OF COMPLIANCE

A summary of compliance at Cadia during the reporting period is provided in Table 1 below.

Table 1 – Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes / No
Cadia East Project Approval (PA) 06_0295	No
Environment Protection Licence (EPL) 5590	No
ML 1405	Yes
ML 1449	Yes
ML 1472	Yes
ML 1481	Yes
ML 1689	Yes
ML 1690	Yes
WAL 28099	Yes
WAL 31062	Yes
WAL 31072	Yes
WAL 31505	Yes
WAL 31517	Yes
WAL 31527	Yes
WAL 32255	Yes
WAL 32280	Yes
WAL 36229	Yes

WAL: Water Access Licence

Table 2 provides descriptions of the compliance status categories used in the classification of non-compliances during the reporting period. Incidents and non-compliances with the PA 06_0295, the Environment Protection Licence (EPL) 5590 (EPL 5590) and relevant Mining Leases (ML) (ML1405, ML1449, ML1472, ML1481, ML1689, and ML1690) during the reporting period are summarised in Table 3 and Table 4 respectively.

Table 2 – Compliance status categories

Risk Level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm

Table 3 – Incidents during the reporting period

Relevant approval and condition	Condition description (summary)	Date	Compliance status	Comment
PA 06_0295 Schedule 3, Condition 5	Traffic noise	October 2023		Unattended noise monitoring identified an exceedance of the traffic noise impact assessment criteria on 3 and 25 October 2023 at a property on Cadia Road, Springside.
EPL 5590 O3.1, U1.1	Dust lift off from STSF	15/03/2024		Unfavourable weather conditions (wind gusts and low rainfall) attributed to a dust lift off event. Community complaints were received and acknowledged. Several actions were taken including the application of dust suppressant to the area of concern.
PA 06_0295 Schedule 3, Condition 2 EPL 5590 L4.2	Noise criteria	2-10 August 2023 1-8 February 2024		Non-compliance with sleep disturbance criteria (Night) for 3 x $L_{A1,1minute}$ samples at the Hollwood monitoring location. Contributions above the noise impact assessment criteria were related to train movements.
PA 06_0295 Schedule 3, Condition 2 EPL 5590 L4.2	Noise criteria	10-18 August 2023 9-16 February 2024		Unattended noise monitoring identified non-compliance with sleep disturbance criteria (Night) for 5 x $L_{A1,1minute}$ samples and for 6 x 15 minute ($L_{Aeq,15minute}$) at 247 Newbridge Road. Contributions above the noise impact assessment criteria were related to train movements.
PA 06_0295 Schedule 3, Condition 2 EPL 5590 L4.2	Noise criteria	18-25 August 2023 14-21 March 2024		Unattended monitoring identified non-compliance with sleep disturbance criteria (Night) for 2 x $L_{A1,1minute}$ samples and for 3 x 15 minute ($L_{Aeq,15minute}$) at Athol. Contributions above the noise impact assessment criteria were related to train movements.
PA 06_0295 Schedule 3, Conditions 2 and 3 EPL 5590 L4.2	Noise criteria	Between 28 February and 21 March 2024		Attended monitoring of train noise at Athol identified non-compliance with noise impact assessment criteria levels, land acquisition criteria, and sleep disturbance criteria.
PA 06_0295 Schedule 3, Condition 2 EPL 5590 L4.1	Noise criteria	5-12 September 2023		Unattended noise monitoring identified non-compliance for 15 x 15-minute ($L_{Aeq,15minute}$) samples at Warrengong. Contributions above the noise impact assessment criteria were related to light aircraft carrying out aerial dust suppressant activities on the tailings storage facilities.
PA 06_0295 Schedule 3, Condition 2 EPL 5590 L4.1	Noise criteria	15-27 March 2024		Unattended noise monitoring identified non-compliance for 2 x 15-minute ($L_{Aeq,15minute}$) samples at Rosebank. Contributions above the noise impact assessment criteria were related to light aircraft applying dust suppressant to the tailings storage facilities.

Table 4 – Non-compliances during the reporting period

Relevant approval and condition	Condition description (summary)	Date	Compliance status	Comment
PA 06_0295 Schedule 3, Conditions 35A	Surface water sampling	11/09/2023		Some surface water samples collected during routine sampling had not been analysed for metals by the laboratory.
PA 06_0295 Schedule 3, Condition 35A EPL 5590 M2.3	Groundwater sampling	November 2023		November 2023 samples collected for groundwater quality testing at monitoring bores MB78, MB79, MB83 and MB84 were not analysed by the laboratory.
PA 06_0295 Schedule 3, Condition 20(e) EPL 5590 M2.2	Air quality monitoring	15/01/2024		Failure of the intake pump at Beta-Attenuation Monitor (BAM) site D4 resulting in temporary interruption to continuous monitoring.
PA 06_0295 Schedule 3, Condition 6	Construction hours	05/05/2024		Operation of construction equipment outside Day time, as set out in Schedule 3, Condition 6. Earthmoving machinery had commenced operation at 07:47 am outside the approved work start time of 8:00 am applicable on Sundays.
EPL 5590 M2.2	Air quality (Vent Rise 8-1 [VR8-1]) sampling frequency	Various – see comment for detail		On 30 April 2024, a sample for Type 1 and Type 2 substances wasn't collected at the same time as TSP sampling due to an equipment fault. Type 1 and Type 2 substances were sampled on the following day (1 May 2024), 15 days (rather than the required 14 days) after the previous sample was collected.
PA 06_0295 Schedule 3, Condition 35A EPL 5590 L4.1	Water Management Plan Sediment Basin Management	25 June 2024		12 on-site sediment dams identified as potentially not having sufficient storage capacity as nominated in the Water Management Plan after implementing the storage requirement changes post MOD14 approval. Further catchment surveys are required to confirm storage capacities and will be undertaken in late 2024.

2 INTRODUCTION

2.1 Overview of Cadia

Newmont Overseas Holdings Pty Corporation (Australia), a wholly owned indirect subsidiary of Newmont Corporation is the owner of Cadia Holdings Pty Limited (CHPL). CHPL is the owner and operator of Cadia Mine (herein referred to as Cadia). Cadia is one of Australia's largest gold mining operations and also produces copper, silver and molybdenum.

Cadia is located approximately 25 km south of Orange in the Central Tablelands region of New South Wales (NSW). The mining operation occurs across two local government areas (LGAs) (Blayney Shire Council and Cabonne Council). Cadia is shown in a regional context in Figure 1.

Cadia provides an important economic contribution to the region and NSW, including approximately 1,400 full time equivalent jobs. Confirmed mineable reserves have been identified to extend operations well beyond the life of the current Project Approval (PA) (06_0295) which provides for mining until 30 June 2031. Cadia has commenced planning for the continuation of mining operations and is delivering this work through the Cadia Continued Operations Project (CCOP).

PA 06_0295 issued to CHPL in January 2010 under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for the following:

- Life of mine ore production (up to 30 June 2031) of approximately 525 million tonnes (Mt) of gold/copper ore from Cadia East and approximately 96 Mt of ore from Ridgeway (RWY) underground mine.
- Processing of up to 35 Mt per annum (Mtpa)[1] of gold/copper/molybdenum ore on site to produce gold doré from a gravity circuit, a gold-rich copper concentrate from a flotation circuit (which is piped to a dewatering plant at nearby Blayney and then sent by rail to Port Kembla in NSW for export) as well as a molybdenum rich concentrate which is sent by truck to Port Kembla in NSW for export.
- Disposal of tailings through emplacement into one of three tailings storage facilities (TSFs) being the Northern TSF (NTSF), Southern TSF (STSF) and Pit TSF (PTSF).
- Significant surface infrastructure and ancillary activities to support the operation of the mine including ore processing, rock emplacements, water management, maintenance, store and staff facilities and land management practices.

PA 06_0295 has been modified 14 times since approval, with the most recent modification being Modification 14 (MOD14) approved on 13 December 2021 to provide for the repair, upgrade, and reinstatement of tailings deposition to the NTSF and STSF and increase production from 32 to 35 Mtpa.[1]

Cadia is currently progressing with a further modification to PA 06_0295 (Modification 15 [MOD15]). This was lodged with the now NSW Department of Planning, Housing and Infrastructure (DPHI) in November 2023.

Modification 15 seeks to change the existing NTSF and STSF embankment footprints, recommence mining in the Ridgeway underground mine, amongst other various minor changes or infrastructure additions to support ongoing mining activities.

The location of key features at Cadia is shown spatially in Figure 2.

[1] Subject to Schedule 2, Condition 6A of PA 06_0295

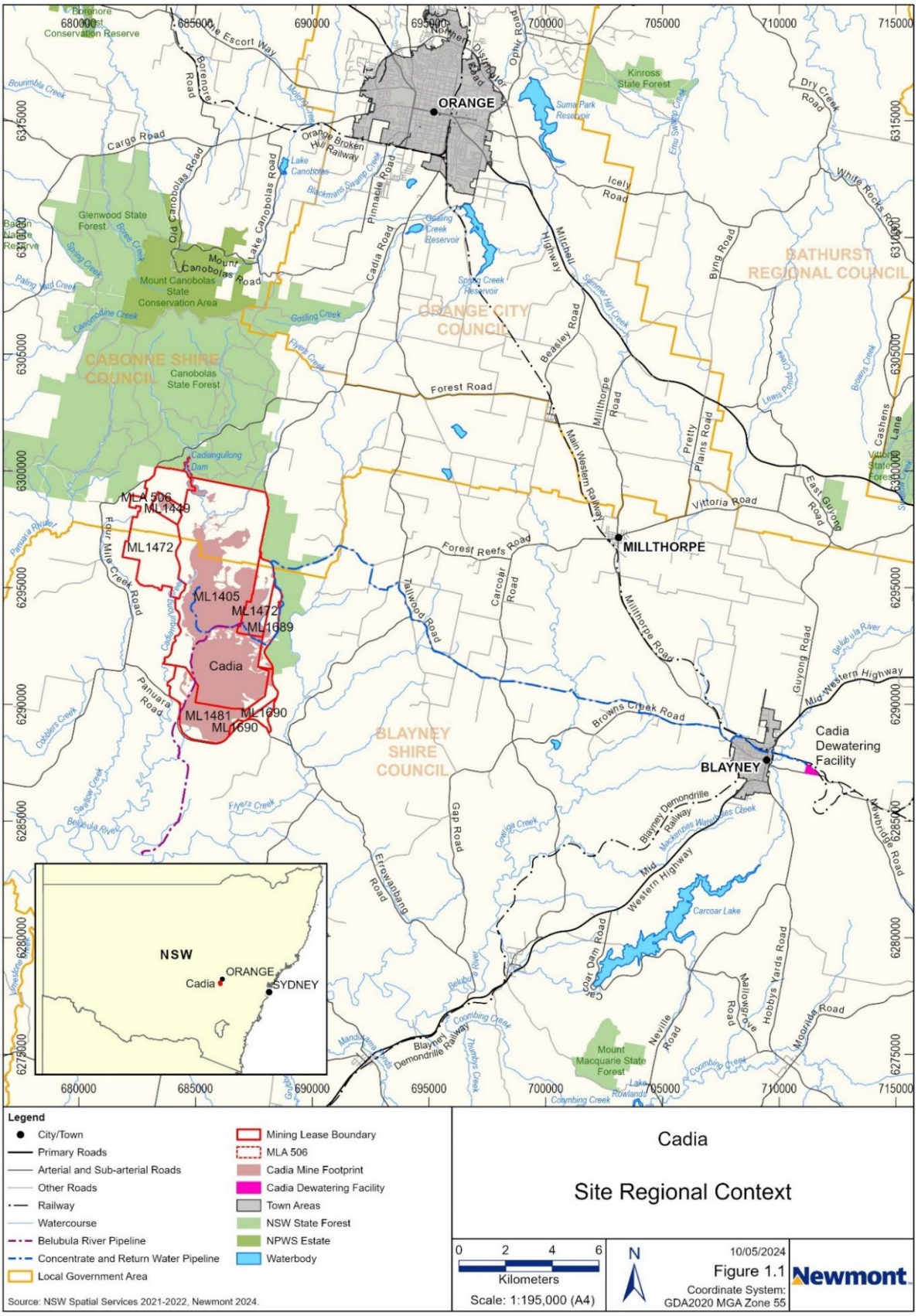


Figure 1 – Location of Cadia in a regional context

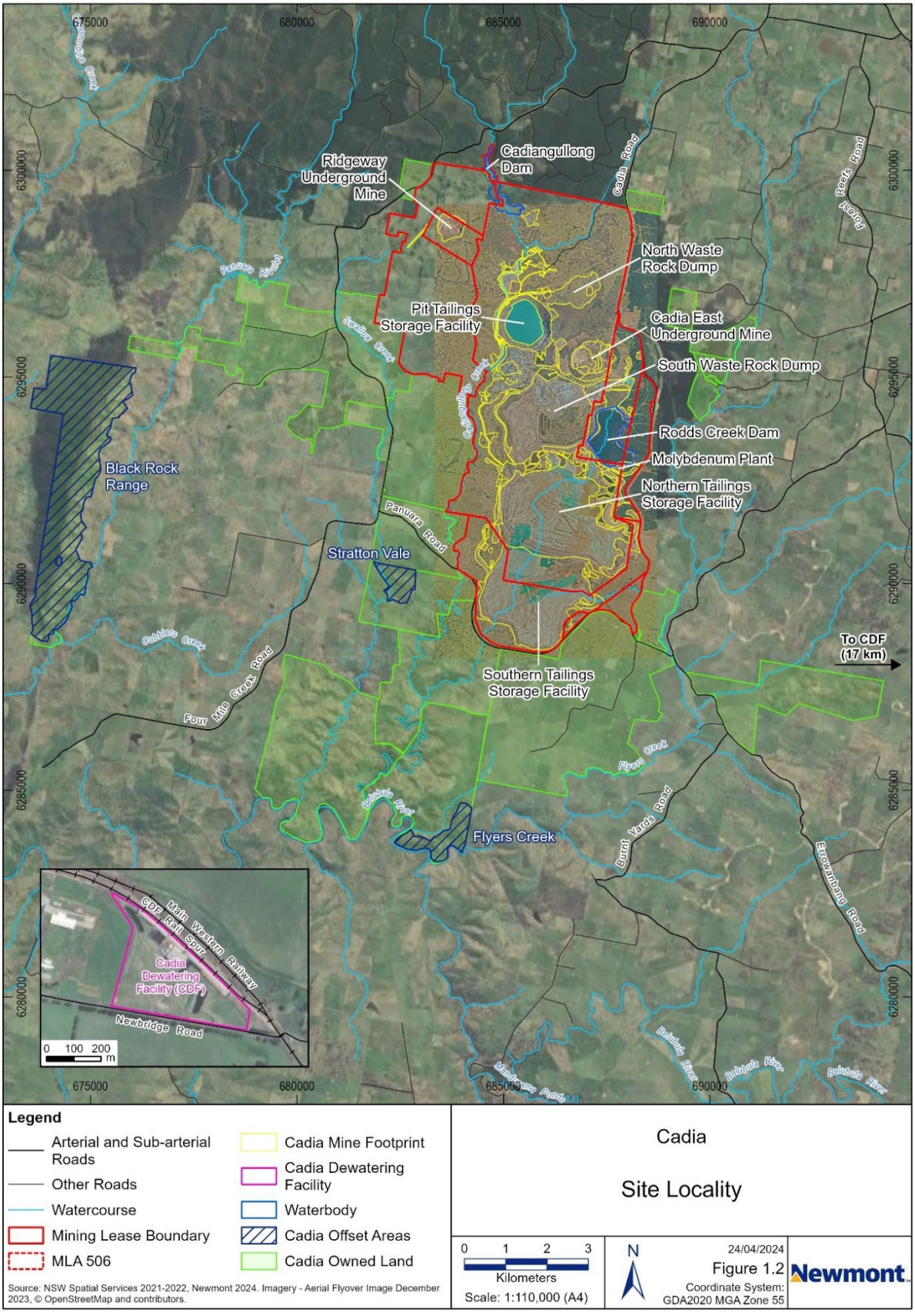


Figure 2 – Cadia and key features in a local context

2.2 Report purpose

This Annual Review document has been prepared in accordance with the following:

- Schedule 5 Condition 2 of PA 06_0295 (see Table 5)
- The New South Wales (NSW) Government Guideline, Annual Review Guideline (October 2015)
- Mining Leases (see Table 6)
- EPL 5590 (Condition R4).

This Annual Review will be submitted to DPHI for approval. Once accepted by DPHI, the Annual Review report will be made available on the Cadia website in accordance with Schedule 5 Condition 9 of PA 06_0295. In accordance with Schedule 5 Condition 2A, copies of the Annual Review report will be provided to the Council and relevant agencies and made available to the Community Consultative Committee (CCC) and any interested person upon request.

2.3 Annual review requirements

Included in Table 5 are the requirements for the Annual Review as identified in Schedule 5 Condition 2 of PA 06_0295.

Table 5 – Annual Review Requirements

Condition reference	Requirement	Report Reference
2	By the end of March in each year after the commencement of the project, or other timeframe agreed by the Secretary, a report must be submitted to the Department reviewing the environmental performance of the project, to the satisfaction of the Secretary. This review must:	-
2(a)	Describe the project (including any rehabilitation) that was carried out in the previous calendar year, and the project that is proposed to be carried out over the current calendar year;	Whole of document
2(b)	Include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, including a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria; • requirements of any plan or program required under this approval; • monitoring results of previous years; and • the relevant predictions in the EA;	Sections 6-16
2(c)	Reporting of direct and indirect water take, including water take where a water licence is required (reviewed against existing water licences) and where an exemption applies;	Section 14
2(d)	Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;	Sections 1 and 19
2(e)	Evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval;	Sections 1, 6-19
2(f)	Identify any trends in the monitoring data over the life of the project;	Sections 6-16

Condition reference	Requirement	Report Reference
2(g)	Identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	Sections 6-16
2(h)	Describe what measures will be implemented over the next year to improve the environmental performance of the project.	Section 19

2.4 Mine contact details

Contact details of the key personnel responsible for environmental management at Cadia are included in Table 6.

Table 6 – Cadia key personnel contact details

Contacts	Details
General Manager	Tom Lukeman
Manager – Environment and Social Performance	David Coe
Address	1460 Cadia Road ORANGE NSW 2800 AUSTRALIA
General Enquiries Phone Number	Access Control +61 2 6392 2422
24 Hour Community Complaints Hotline	1800 063 043
General Enquiries Email	cadia@newmont.com

3 APPROVALS

3.1 Project approval

Current approvals relevant to operations at Cadia are summarised in Table 7. Table 7 also includes commentary on whether any changes were made to approvals during the reporting period. Copies of the PA 06_0295, EPL 5590, MLs and Water Access Licences are available on the Newmont Cadia website (https://www.cadiavalley.com.au/).

Table 7 – Summary of approvals relevant to Cadia

Approval	Relevant authority	Approval date	Expiry date	Last issue date	Changes during reporting period
Cadia East PA 06_0295 (MOD14)	DPHI	06/01/2010	30/06/2031	12/12/2021	Nil
EPL 5590	EPA	16/01/2001	Not specified	26/09/2023	EPL variations were issued on 14 July 2023 and 26 September 2023
ML 1405	Resources Regulator	October 1996	05/10/2038	17/10/2022	Nil
ML 1449		June 1999	05/10/2038	17/10/2022	Nil
ML 1472		23/10/2000	22/10/2021*	23/10/2000	Nil
ML 1481		09/02/2022	07/03/2043	17/10/2022	Nil
ML 1689		11/09/2013	11/09/2034	17/10/2022	Nil
ML 1690		10/09/2013	11/09/2034	17/10/2022	Nil
Black Rock Range Subdivision (Development Consent No. 16/2010)	Blayney Shire Council	March 2010	-	-	Nil
General Monitoring / Archival Recording	Heritage Council of NSW	December 1997	-	-	Nil
Cadia Engine House - Power Poles	Heritage Council of NSW	December 2002	-	-	Nil
Cadia Engine House - Strengthening	Heritage Council of NSW	December 2002	-	-	Nil
Development Consent for a Rural Cemetery, Garden of Remembrance and Interpretive Centre	Blayney Shire Council	August 1999	-	-	Nil

Approval	Relevant authority	Approval date	Expiry date	Last issue date	Changes during reporting period
Little Cadia Excavation Permit	Heritage Council of NSW	April 2005	-	-	Nil
Big Cadia Excavation Permit	Heritage Council of NSW	April 2006	-	-	Nil
Retention of existing strengthening of Engine House, Crusher Room and Chimney	Heritage NSW (Department of Climate Change, Energy, the Environment and Water)	December 2018	30/06/2031	02/02/2024	Approval received 02/02/24 for application to modify S60 approval.
Enclosure Permit (No. 20364)	Department of Land and Water Conservation	August 1999	-	-	Nil
Resource Recovery Order and Resource Recovery Exemption - Orange treated sewage Biosolids	EPA	29/01/2021	06/11/2025	06/11/2023	Renewal application submitted 30/08/2023. Order and exemption renewed until 2025.
Prescribed Dam (Cadiangullong)^	Dam Safety NSW	August 1996	-	-	Nil
Prescribed Dam (Cadia Hill Gold Mine Tailings Storage Facility)^		June 1998	-	-	Nil
Prescribed Dam (STSF)^		July 2001	-	-	Nil
Prescribed Dam (Upper Rodds Creek Dam)^		July 2001	-	-	Nil
Water Access License (WAL) 31062 (Works Approval 70WA610474)	Water NSW	16/01/2012	15/01/2032	-	Nil
WAL 31072 (Works Approval 70WA610477)		16/01/2012	11/12/2026	-	Nil
WAL 36229 (Works Approval 70WA614787)		16/01/2012	02/11/2025	-	Nil

Approval	Relevant authority	Approval date	Expiry date	Last issue date	Changes during reporting period
WAL 28099 (Works Approval 70CA605446)		16/01/2012	05/10/2025	-	Nil
WAL 32255 (Works Approval 70WA614353)		04/10/2012	16/05/2026	-	Nil
WAL 32280 (Works Approval 70WA614341)		04/10/2012	16/05/2026	-	Nil
WAL 31517 (Works Approval 70CA610656)		14/09/2012	19/11/2025	-	Nil
WAL 31527 (Works Approval 80WA716140)		14/09/2012	11/09/2026	-	Nil
WAL 31505 (Works Approval 70WA610664)		14/09/2012	23/04/2026	-	Nil

Note:

For brevity, bore license certificates have not been included in this table. The bore licences are held by Cadia in perpetuity. No changes to bore licences occurred during the reporting period.

*A renewal application for ML 1472 was submitted more than 12 months before the expiry date. The application has been delayed and is still being proceeded. ML 1472 is still active and in full force until the renewal application is determined.

^Note that the term 'Prescribed Dam' is no longer used, but this terminology is kept in this table as it relates to the approval, which pre-dates the change in terminology to 'Declared Dam' in the Dams Safety Regulation 2019.

4 OPERATIONS SUMMARY

4.1 Mining operations

4.1.1 Production summary

The production summary for the reporting period is included in Table 8. Also included in Table 8 is a comparison against the production rates from the previous reporting period (FY23) along with forecast production values for the next reporting period (FY25).

Table 8 – Production summary

Material	Approved limit	Previous reporting period (FY2022-23) (actual)	This reporting period (FY2023-24) (actual)	Next reporting period (FY2024-25) (forecast)
Waste rock / overburden generated (t)	n/a	506,038	613,832	279,634
Waste rock / overburden transferred (t)	n/a	934,000	935,447	296,805
Ore processed (t)	32 Mtpa	29,082,463	29,105,474	
Tailings (Mt)	n/a	28.7	28.7	
Gold (oz)	n/a	596,879	517,773	
Copper (t)	n/a	98,191	91,412	
Molybdenum (t)	n/a	660	1,633	

n/a not applicable

4.1.2 Hours of operation

The approved operating hours for construction and operation activities at Cadia (see Condition 6, Schedule 3 of the PA 06_0295) are summarised in Table 9. The operating hours conditions were complied with during the reporting period except for one (1) event associated with tailings storage facility construction in May 2024 where construction equipment commenced operation at 07:47 am outside the approved work start time of 8:00 am on Sundays (see Table 4).

Table 9 – Operating hours

Activity	Day	Time
Construction		
Rodds Creek water holding dam raise; tailings storage facilities raises and embankment extensions; new pipelines; NaHS Solutioning Plant construction	Any day	Day
Cadia East underground mine development; upgrade of ore processing facilities; NTSF repair works	Any day	Any time
Dewatering facilities	Monday -Friday	7am-6pm
	Saturday	8am-1pm

Activity	Day	Time
	Sunday and Public Holidays	None
Operation		
Mine complex operations; Dewatering facilities	Any day	Any time
CVO Dewatering Facility – train loading	Any day	Day

4.1.3 Concentrate transport

As required by Condition 45, Schedule 3 of PA 06_0295, all concentrate to the Cadia Dewatering Facility (CDF) was transported by pipeline, and all concentrate from the CDF was transported by rail.

4.1.4 Operating approach

In accordance with condition O1 of EPL 5590, all licenced activities at Cadia have been carried out in a competent manner during the reporting period. Cadia has a requirement for all staff and contractors to be competent in their field.

As required by condition O2 of EPL 5590, plant and equipment at Cadia have been subject to a maintenance regime during the reporting period. Additionally, Cadia has a requirement that all plant and equipment are operated in a proper and efficient manner.

4.2 Forecast operations

The following major activities are forecast to be implemented during the next reporting period:

- Continue with the various environmental assessments required for the CCOP in preparation for the submission of the planning application and environmental impact statement.
- Continuation of the Tailings Project with buttressing of the NTSF and STSF and raising the STSF embankment wall.
- Implementation of Modification 15 works once approved by DPHI.

5 ACTIONS REQUIRED FROM 2022-23 ANNUAL REVIEW

Provided in Table 10 is a summary of actions identified in the 2022-23 Annual Review for implementation during the reporting period. The status of each action at the end of the reporting period and the relevant section reference within this document is also included in Table 10.

Table 10 – Actions required from 2022-23 Annual Review

Commitment	Timeframe	Status as at 30 June 2024
Update the Rehabilitation Management Plan.	November 2023	Updated as per the requirements of the Resources Regulator
Implement automated groundwater level loggers.	November 2023	Completed
Review traffic noise management program and create a traffic noise heatmap to identify areas for future monitoring and potential mitigation.	December 2023	Completed The traffic noise heatmap was completed. The Offsite Traffic Management Plan was updated and approved by DPHI in October 2023. Review of the traffic flow and numbers is being undertaken as part of the CCOP traffic assessment.
Investigate real time monitoring options for vent stack emissions.	December 2023	Investigation for options was completed. An option of an opacity meter was trialled during the reporting year however the results were not accurate due to high moisture content. The site is currently investigating alternative continuous monitoring options including a gas extraction system for high moisture conditions.
Implement the updated Community Consultative Committee guidelines into Cadia's Terms of Reference.	December 2023	Completed
Undertake a monitoring program of the stormwater capture at CDF and determine viability for a discharge point from the stormwater pond.	January 2024	Completed
Review the TSF dust options study and further investigate identified options to improve feasibility.	June 2024	Completed with centre pivot irrigators now operating on the NTSF.
Conduct vegetation thinning and infill planting of a minimum 20 ha on the North Waste Rock Dump (NWRD).	June 2024	The 'cut-and-paint' method was implemented to reduce acacia stem densities. Infill planting completed on 15 ha of the NWRD.
Increase wildlife habitat by relocating additional habitat features (logs, fallen trees and rocks) to both the NWRD and South Waste Rock Dump (SWRD).	June 2024	No opportunity to relocate features to the NWRD and SWRD. Habitat features were relocated to the Cadia Extended Pit as part of the rehabilitation process.
Conduct revegetation works to a minimum 10 ha on Black Rock Range.	June 2024	41 ha of revegetation undertaken at Black Rock Range (15 ha of tubestock, 26 ha direct seeded).

6 ENVIRONMENTAL PERFORMANCE

Provided in Table 11 is a brief account of the environmental performance across the 11 aspects relevant to Cadia. Additional information on environmental performance across these aspects is included in Sections 7 to 18.

A key aspect of managing environmental performance is the collection and review of environmental monitoring data. The location of Cadia's environmental monitoring sites are shown in Figure 3 (water monitoring sites) and Figure 4 (air, blast/vibration and noise monitoring sites). The monitoring sites shown in Figure 3 and Figure 4 are referenced throughout this document.

Table 11 – Environmental performance summary

Aspect	Summary of reporting period performance	Trend / key management implications	Implemented / proposed management actions
Air quality	• No non-compliances with PA or EPL criteria for deposited dust, TSP, PM_{10} and $PM_{2.5}$	• Active management of dust has resulted in low deposited dust values and particulates well below the impact assessment criteria	• Implement the measures in the revised AQGHG Management Plan
Blasting and vibration	• No non-compliances with blast and vibration criteria over the allowable exceedance	• Scheduling blast activities, where possible, to limit blasting during constrained time periods	• Ongoing geotechnical assessment of blast designs to reduce potential blast related siesmic events
Noise	• Some non-compliaces with noise criteria • Increase in noise related complaints	• Targeted noise monitoring in response to complaints	• Implement the updated Noise Management Plan when approved • Fixed point noise monitors with trigger alarms and action plans monitored by the site control centre
Biodiversity	• 41 ha of revegetation works completed at Black Rock Range and 15 ha of infill planting completed on the NWRD • Biodiversity Stewardship Agreement approved for Tunbridge Wells and Caringle • Ongoing feral pest management conducted	• Survival rates of plantings variable. Black Rock Range averaged 51% survival and NWRD plantings averaged 25% survival. All planting sites significantly impacted by herbivory	• Ensure adequate resources are assigned to planning revegetation projects • Offset site management plans approved
Heritage	• No vibration damage occurred • Highest vibration reading was 0.8mm/s, which is well below the criteria set for this heritage location	• Implement recommended remediation works to ensure structural longevity	• Formalise the Cadia Engine House inspection procedure, amongst others
Waste management	• Recycling target exceeded with 84% of waste recycled • Downward trend of waste sent to landfill continued	• Updates to non-mineral waste management plan	• Proposed to increase recycling target to align with recent historical actual performance

Aspect	Summary of reporting period performance	Trend / key management implications	Implemented / proposed management actions
Water management	• Water take was compliant with water access licence requirements • Environmental flow requirements in Cadiangullong Creek were complied with • Some exceedances of the site specific guideline value (SSGV) were observed for surface water sites, although these were not determined to be related to mining activities • 5 groundwater level and 43 groundwater quality exceedances. These were not deemed to be part of a long term trend nor was there any evidence of impact to the receiving environment • No discharge from licensed discharge points occurred	• No trends identified in the surface water or groundwater monitoring data to suggest any mining related impact to the receiving environment	• Review recommendations made in the surface water and groundwater technical review reports (see Appendix 3 and Appendix 4) and implement recommendations identified
Rehabilitation	• Annual Rehabilitation Monitoring Report (see Appendix 6) returned positive outcomes across numerous metrics. Indicators not achieved were primarily associated with mature tree population and mature tree canopy structure targets. • Annual WRD cover system field trials performance report (see Appendix 7) identified some issues for attention to improve performance outcomes.	• Revegetation of the NWRD and SWRD continue to require additional intervention to ensure rehabilitation is progressing to the desired final land use • WRD cover performance demonstrating that the WRDs are functioning as per design	• Further refinement of the rehabilitaiton materials inventory • Progress the constructed wetlands study to further understand post-closure water quality
Community	• More than $2m in community contributions. • Numerous engagement activities held in partnership with community, businesses and government stakeholders. • Key stakeholder surveys undertaken through the CCOP by Umwelt and sentiment survey by Voconiq	• Increasing trend in community complaints received • Targeted and meaningful engagement with community • Increased monitoring transparency	• Live air quality monitoring from the PM_{10} and $PM_{2.5}$ stations surrounding the site on the website. • Live noise monitoring to be implemented in FY25

*As part of Cadia's commitment to building upon its social licence to operate, there are many programs and actions planned as part of the Cadia Social Performance Plan

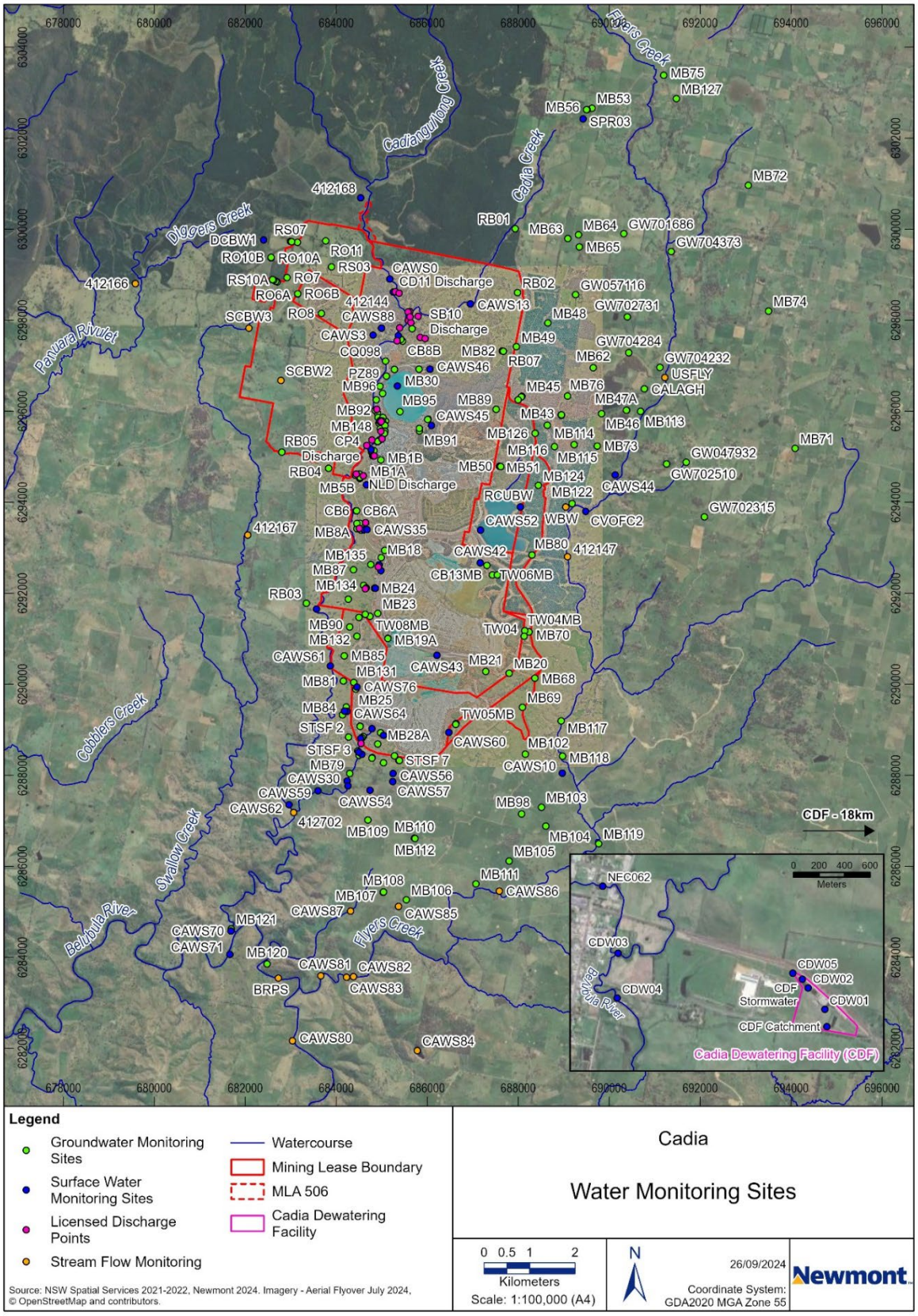


Figure 3 – Location of Cadia's water monitoring sites

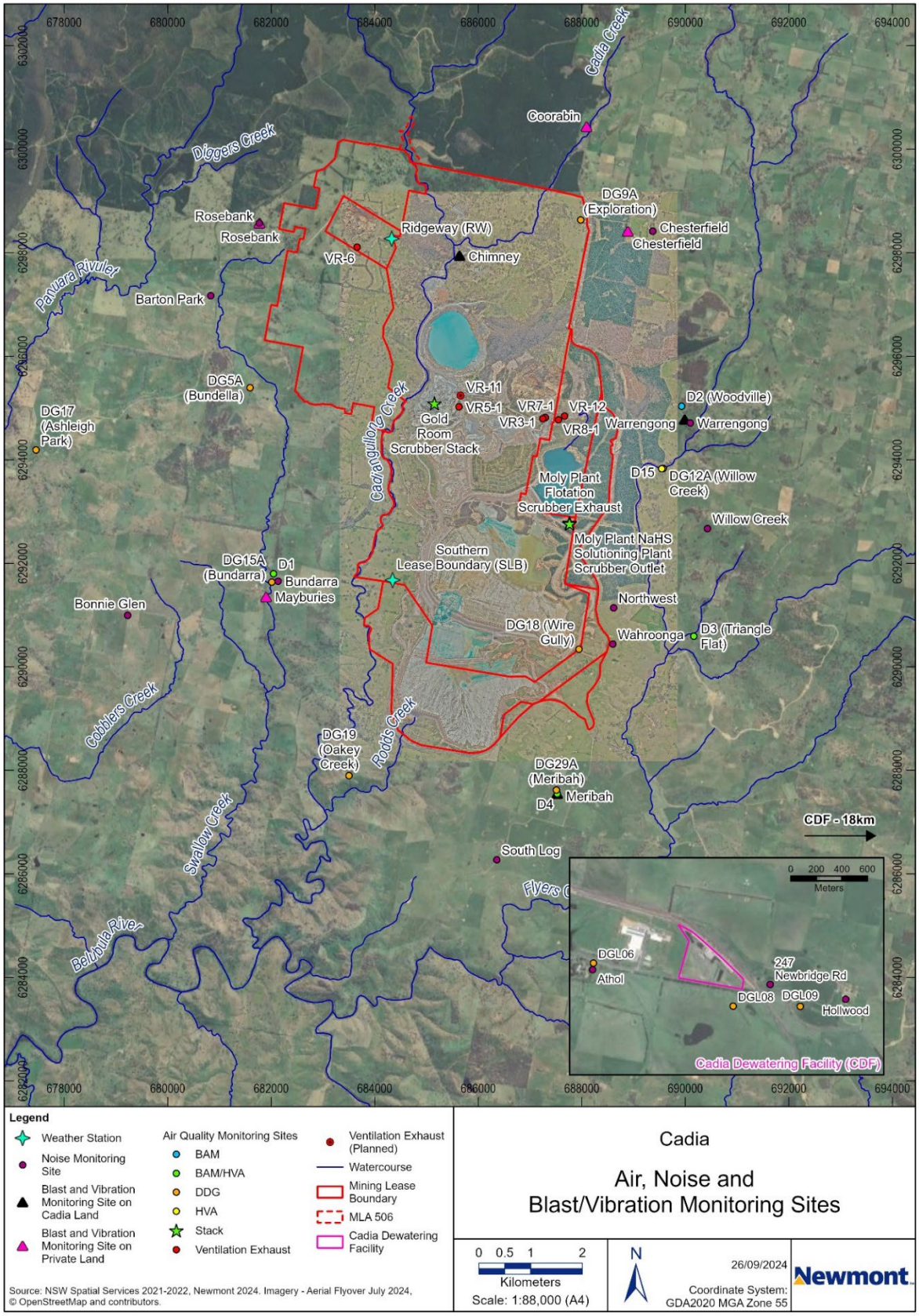


Figure 4 – Location of Cadia's weather stations, and air, blast/vibration and noise monitoring sites

7 METEOROLOGICAL

Cadia operates two weather stations (Ridgeway Weather Station [RW WS] and Southern Lease Boundary Weather Station [SLB WS]) and has access to data captured by rainfall recording stations both within and outside of the ML. The capture of meteorological data is critical as it aids in the analysis of environmental monitoring data.

The PA 06_0295, Schedule 3, Condition 21, requires that Cadia has access to a suitable meteorological station in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline. The RWY WS and SLB WS satisfy this requirement.

The RW WS and SLB WS are identified in Condition P1.1 of EPL 5590 EPL as meteorological monitoring points 17 and 18 respectively for monitoring meteorological conditions. Meteorological data captured by RW WS and SLB WS during the reporting period is available on the Cadia Valley Website (www.cadiavalley.com.au).

A summary of the meteorological data captured by RW WS and SLB WS during each month of the reporting period is provided in Table 12. Also included in Table 12 is the long-term average monthly rainfall recorded at the Bureau of Meteorology (BOM) Orange Airport Automatic Weather Station (AWS) (station number 063303) for comparison purposes against site measured data. The rainfall data included in Table 12 is presented in graphical form in Figure 5.

As shown in Figure 5, Cadia experienced monthly rainfall totals of >50mm in August 2023, from November 2023 to February 2024 inclusive, and in April and June 2024. The lowest monthly rainfall total was recorded in March 2024. The data shows that there is considerable spatial variability in rainfall at Cadia with an approximately 17% difference in the 12-month rainfall total between the RW WS and the SLB WS. The 12-month rainfall totals observed at the site weather stations (899.6 mm at RWY WS and 760.4 mm at SLB WS) were below the long-term 12-month average of 894.6 mm recorded at the Orange Airport AWS.

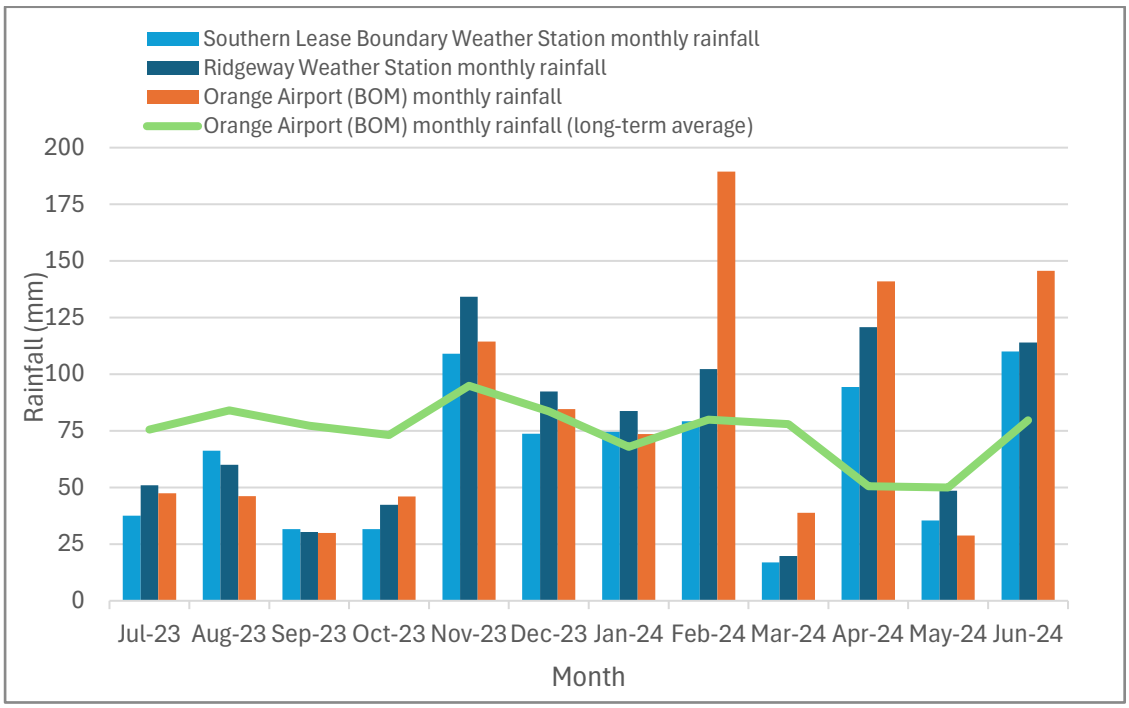


Figure 5 – Comparison of monthly rainfall at Cadia weather stations and Orange Airport BOM AWS

Table 12 – Meteorological data summary

Reporting period month	Rainfall (mm)				Average minimum temperatue (°C)		Average maximum temperature (°C)		Average wind direction (deg)		Wind direction – average standard deviation		Average wind speed (m/s)	
	RWY WS	SLB WS	OA AWS	OA AWS (long-term average)*	RWY WS	SLB WS	RWY WS	SLB WS	RWY WS	SLB WS	RWY WS	SLB WS	RWY WS	SLB WS
2023														
July	51.0	37.6	47.4	75.5	3.9	4.3	12.2	13.0	152	196	13.2	12.3	3.5	3.0
August	60.0	66.2	46.2	84.1	4.0	4.8	12.2	13.1	139	170	13.2	12.9	3.4	3.1
September	30.4	31.6	30	77.2	3.3	4.2	20.7	21.7	128	180	13.6	12.7	3.9	3.6
October	42.4	31.6	46	73.2	6.5	7.5	22.2	23.6	161	187	15.0	13.7	4.5	4.2
November	134.2	109.0	114.4	94.9	13.0	13.4	23.3	24.5	122	154	16.2	15.7	4.1	4.0
December	92.4	73.8	84.6	83.6	15.8	17.0	29.2	30.3	191	183	16.3	15.1	4.0	4.1
2024														
January	83.8	74.6	73.6	67.9	16.8	17.3	28.1	28.9	215	152	15.6	14.9	4.3	4.5
February	102.2	79.2	189.4	80.0	16.6	8.2	27.9	29.5	201	141	16.0	15.0	4.2	4.4
March	19.8	17.0	38.8	77.9	12.9	11.1	24.5	25.2	203	128	15.7	15.2	3.7	3.8
April	120.8	94.4	141.0	50.6	8.4	2.1	20.4	21.9	206	164	14.5	13.5	3.2	2.9
May	48.6	35.4	28.8	50.0	5.2	5.5	13.0	13.8	166	128	14.0	13.0	3.6	3.1
June	114.0	110.0	145.6	79.7	3.9	4.0	10.8	11.4	193	197	15.3	13.1	2.7	2.4
TOTAL	**899.6**	**760.4**	**985.8**	**894.6**	-	-	-	-	-	-	-	-	-	-

Table notes:
RWY AWS – Ridgeway Automated Weather Station
SLB WS – Southern Lease Boundary Weather Station
*OA AWS – Orange Airport Automated Weather Station (station number 063303). Values are average monthly rainfall totals recorded over the period 1996 to 2024.

8 AIR QUALITY

8.1 Overview

Cadia has a requirement to manage emissions to air to minimise potential impacts on receptors. Included in the Air Quality and Greenhouse Gas Management Plan (AQGHGMP) are the relevant air quality impact assessment criteria from Schedule 3, Conditions 17 and 18 of PA 06_0295, along with the air quality monitoring requirements set out in EPL 5590. Cadia's approach to managing these requirements is detailed in the AQGHGMP. A summary of the performance against air quality requirements during the reporting period is included in the below sections.

8.2 Management practices

The following best practice air quality management measures have been implemented during the reporting period:

- Installation of automated air quality monitoring instruments with near real-time data enabling responsive management decisions to be made.
- Frequent review of data collected from Cadia weather stations and local area weather forecasts to determine risk and response actions.
- Use of water carts on unsealed roads.
- Progressive stabilisation (i.e. seeding of stockpiles) of land disturbed.
- The application of irrigation sprinklers, hydromulch and dust suppression products on the NTSF and STSF including commercial polymer products.
- Dust extraction systems and water sprays on crushers, conveyors, and conveyor transfer points.
- Dust filter systems on vent emissions from underground.

Cadia's greenhouse gas (GHG) reduction initiatives include:

- Contribution to state grid decarbonisation through engagement in power purchase agreement with Rye Park Wind Farm.
- Optimising efficiency of existing and new plant and equipment.

The implementation of the above air quality management measures along with the practices in the AQGHGMP satisfies condition O3 in EPL 5590.

8.3 Environmental performance

8.3.1 Monitoring overview

Air quality monitoring is conducted using a combination of the following monitoring equipment:

- Beta Attenuation Monitors (BAM).
- Dust Deposition Gauges (DDG).
- High Volume Air Samplers (Hi-Vols).
- Dust Traks.
- Kunaks.
- ES405.
- Australia's Nuclear Science and Technology Organisation (ANSTO) $PM_{2.5}$ monitors.

Data from the continuous air quality monitoring network reports to a near-real time access to data through a dedicated website. The monitoring network records the following parameters:

- 60-minute PM_{10} and $PM_{2.5}$ mass concentration.
- 24-hour PM_{10} and $PM_{2.5}$ mass concentration.
- Wind direction, wind speed, temperature, humidity, and rainfall.

Continuous monitoring (BAMs) occurs at the following four locations:

- Bundarra (D1).
- Flyers Creek (D2).
- Triangle Flat (D3).
- Meribah (D4).

The locations of the air quality monitoring sites are shown in Figure 4.

8.3.2 ANSTO study

The ANSTO Cadia Valley Operations $PM_{2.5}$ Study was initiated in response to concerns raised by local residents about dust from the mine potentially affecting air quality. The study aimed to determine whether dust from Cadia was leaving the mine and affecting the surrounding community. In the reporting period the second year of monitoring and reporting was concluded.

Air quality was assessed at four locations: Panuara, Millthorpe, Mandurama and Orange. Orange was used as a background site being farthest from Cadia. Initially planned for 12 months, the study was extended for another year to expand the data set. Cadia has committed to continuing the study to ensure ongoing comprehensive analysis in the region.

From the monitoring, ANSTO was able to identify seven specific 'fingerprints' in the air: soil (a less than 10% contributor to all $PM_{2.5}$ in the airshed), smoke, salt (ocean winds), secondary sulphate (coal power generation), industrial nitrate (typically linked to industry), and auto-related particles (associated with both automobiles and heavy machinery). Secondary sulphates and auto emissions make up for more than 50% of all $PM_{2.5}$ emissions.

Key findings

Of the 823 air filters analysed over the 24 months, there were only two instances when the daily National Environment Protection Measure (NEPM) $PM_{2.5}$ standard of 25 µg/m³ was exceeded. Both instances occurred in Orange in 2022, which is the site farthest from the mine and on days when the wind direction was not from the direction of the mine, and both in winter. ANSTO's findings also revealed that Cadia did not significantly contribute to $PM_{2.5}$ levels in the region.

ANSTO's 30 years of experience in air quality studies highlights that most urban areas in Australia have $PM_{2.5}$ levels close to the NEPM annual standard of 8 µg/m³. For this study, average annual concentrations in the Cadia region were significantly lower, with Millthorpe, Mandurama, and Panuara sites recording averages between 3 and 4 µg/m³. Orange recorded a slightly higher annual average of 6.9 µg/m³, which ANSTO attributed to vehicles, woodfire heaters, and other local factors.

The results showed consistently low $PM_{2.5}$ mass concentrations at all sites, with no annual NEPM exceedances recorded, and no significant contribution from the mine to the measured $PM_{2.5}$ levels.

8.3.3 Deposited dust

8.3.3.1 Monitoring results

The long-term cumulative impact assessment criteria for deposited dust (refer to Table 10, Condition 17, Schedule 3 of PA 06_0295) is 4 g/m^2/month. The calculated monthly and annual average dust deposition results presented in Table 13 show that although some monitoring sites

returned data values >4 g/m^2/month, the annual average of monthly data was below the criteria. Further discussion of depositional dust monitoring results is included in Appendix 1.

Table 13 – Monthly and annual average dust deposition rates (insoluble solids g/m^2/month)

Month	DG5A	DG9A	DG12A	DG15A	DG17	DG18	DG19	DG29A	DGL06	DGL08	DGL09
Jul 23	0.7	0.4	0.4	1.5	0.2	2.5	0.2	0.6	^	0.4	0.3
Aug 23	0.5	^	1.9	0.9	0.4	1.3	0.4	0.7	1.9	0.6	0.5
Sep 23	1.2	^	1.4	2.4	1.3	2.1	1.4	2.5	2.0	0.8	0.9
Oct 23	*	1.3	2.9	1.5	1.4	2.6	1.5	2.6	1.3	0.7	1.0
Nov 23	2.0	^	2.7	3.0	1.3	^	1.3	1.2	1.7	1.2	2.0
Dec 23	2.9	1.6	^	2.5	1.6	^	^	1.2	1.8	1.2	1.7
Jan 24	1.6	0.6	3.7	1.0	1.7	3.8	3.2	0.7	1.6	2.3	1.6
Feb 24	^	1.2	2.4	1.7	1.9	4.5	2.4	2.5	1.7	2.2	1.7
Mar 24	1.0	0.4	1.4	1.8	2.3	1.3	0.9	0.7	0.7	0.5	1.0
Apr 24	0.4	2.6	1.8	0.7	0.3	1.1	0.5	0.9	0.5	0.7	1.2
May 24	1.3	1.0	1.2	1.0	0.7	2.3	0.8	1.0	4.2	0.5	0.7
Jun 24	0.5	0.4	0.5	0.5	0.3	1.8	0.2	0.5	2.2	0.8	0.4
Annual average	1.2	1.1	1.8	1.5	1.1	2.3	1.2	1.3	1.8	1.0	1.1

Notes:
* - Jar was broken upon visitation
^ - Not reported due sample contamination.

8.3.3.2 Comparison against Project Approval predictions

The most recently approved modification of PA 06_0295 (MOD14) contains predictions of air quality including deposited dust and particulate matter at privately-owned receptors. The air dispersion modelling predictions, published in Appendix F Air Quality Impact and Greenhouse Gas Assessment 2020 submitted with the MOD14 application, concluded that the maximum predicted deposited dust result at any privately-owned receptor for cumulative impact was 1.8 g/m^2/month. Presented in Table 14 is a comparison of monitoring results at the DDGs and the predictions in the MOD14 application submission documentation for all monitoring locations at privately owned receptors.

Except for sites DG12A and DGL06, deposited dust data collected at monitoring sites on private land aligned with MOD14 predictions. The data collected at site DG18 was higher than the MOD14 predictions, however as this site is located on the ML and not on private land, comparison with the MOD14 predictions is not warranted.

Table 14 – Annual dust gauge monitoring results and comparison against MOD14 predictions

DDG	Insoluble solids (g/m^2/month)	Meets MOD14 predictions of <1.8 g/m^2/month
DG5A	1.21	Yes

DDG	Insoluble solids (g/m²/month)	Meets MOD14 predictions of <1.8 g/m²/month
DG9A	1.06	Yes
DG12A	1.84	No. The data value of 1.84 g/m²/month is only marginally above the MOD14 prediction of <1.8 g/m²/month.
DG15A	1.54	Yes
DG17	1.12	Yes
DG19	1.17	Yes
DG29A	1.26	Yes
DGL06	1.78	Yes
DGL08	0.99	Yes
DGL09	1.08	Yes

8.3.3.3 Comparison against historical data

Historical deposited dust monitoring results from FY18 to FY24 (current reporting period) are shown in Figure 6. This data shows that annualised average monthly deposited dust values are generally variable both temporally and spatially, however, a generally declining trend is apparent from FY21 to FY24. FY19 and FY20 were greatly affected by major bushfires. This suggests that dust mitigation measures adopted at Cadia are having a measurable benefit on deposited dust outcomes. It is noted that meteorological conditions (rainfall) have also attributed to the generally lower deposited dust results over the previous four reporting periods, with annual rainfall totals higher than average on multiple occasions over this period.

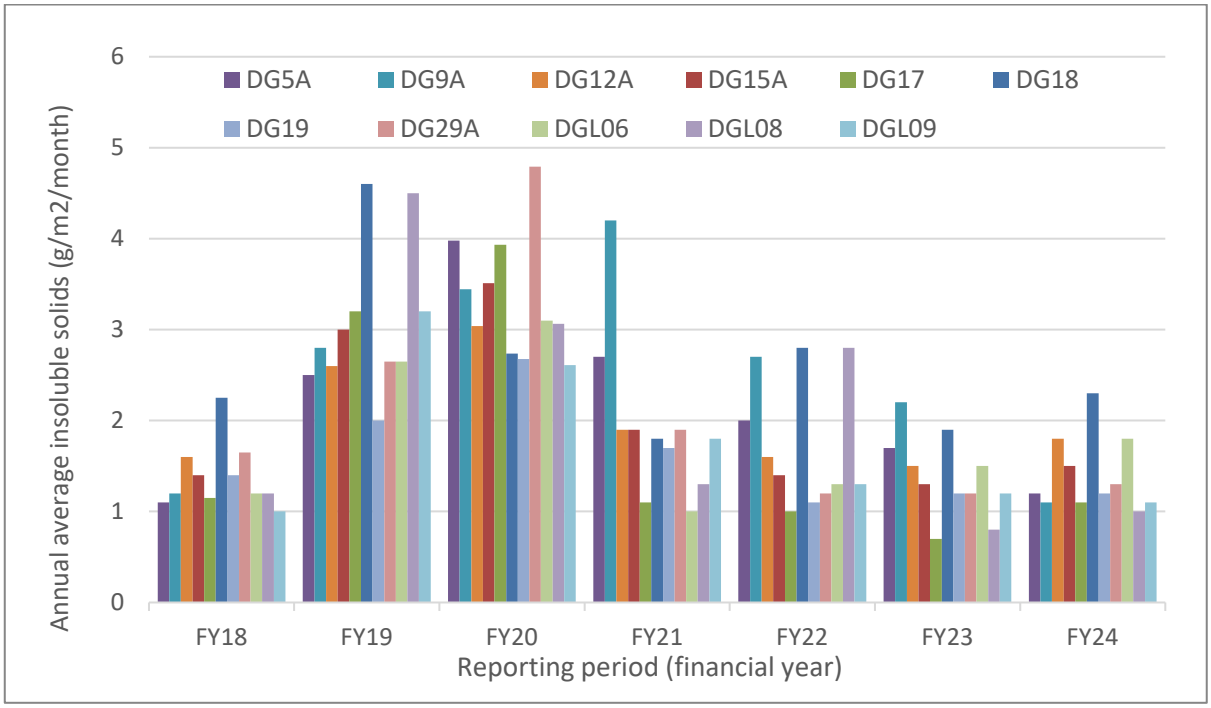


Figure 6 – Historical deposited dust monitoring results FY18-FY24

8.3.4 TSP

8.3.4.1 Monitoring results

The TSP data collected at the four BAM monitoring sites is summarised in Table 15. The TSP results at the four BAM sites were compliant with the 90 µg/m^3 criteria, with the maximum annual average value of 27 µg/m^3 well below the criteria. Appendix 1 includes further assessment of TSP monitoring results during the reporting period.

Table 15 – Assessment of TSP monitoring results against TSP criteria and MOD14 predictions

Monitoring location	Property	Annual average (µg/m^3)[a]		Compliance against criteria	Less than MOD14 predictions[c]
		Result[a]	Criteria[b]		
BAM 1 (D1)	Bundarra	27	90	Yes – compliant	Yes
BAM 2 (D2)	Woodville	22	90	Yes – compliant	Yes
BAM 3 (D3)	Triangle Flat	24	90	Yes – compliant	Yes
BAM 4 (D4)	Meribah	27	90	Yes – compliant	Yes

Notes:

[a] Annual average is rolling 365-day average calculated from available 24-hour average results between 1 July 2023 and 30 June 2024

[b] Long-term air quality impact assessment criteria from PA 06_0295 is 90 µg/m^3

[c] 47.3 µg/m^3 is the maximum predicted TSP result derived from the modelled TSP predictions published in the Air Quality Impact and Greenhouse Gas Assessment 2020

8.3.4.2 Comparison against Project Approval predictions

All BAM sites returned annual average data values less than the maximum TSP of 47.3 µg/m^3 predicted in the MOD14 air quality assessment.

8.3.4.3 Comparison against historical data

TSP data collected during the reporting period (FY24) is shown against historical TSP data in Figure 7. The TSP data values recorded during FY24 are similar to the preceding two reporting periods (FY23 and FY22), with data values at all four sites <30 µg/m^3, which is well below the long-term impact assessment criteria of 90 µg/m^3. As reported in previous annual reviews, unprecedented bushfire events and regional dust storms attributed to the higher values recorded in FY19 and FY20.

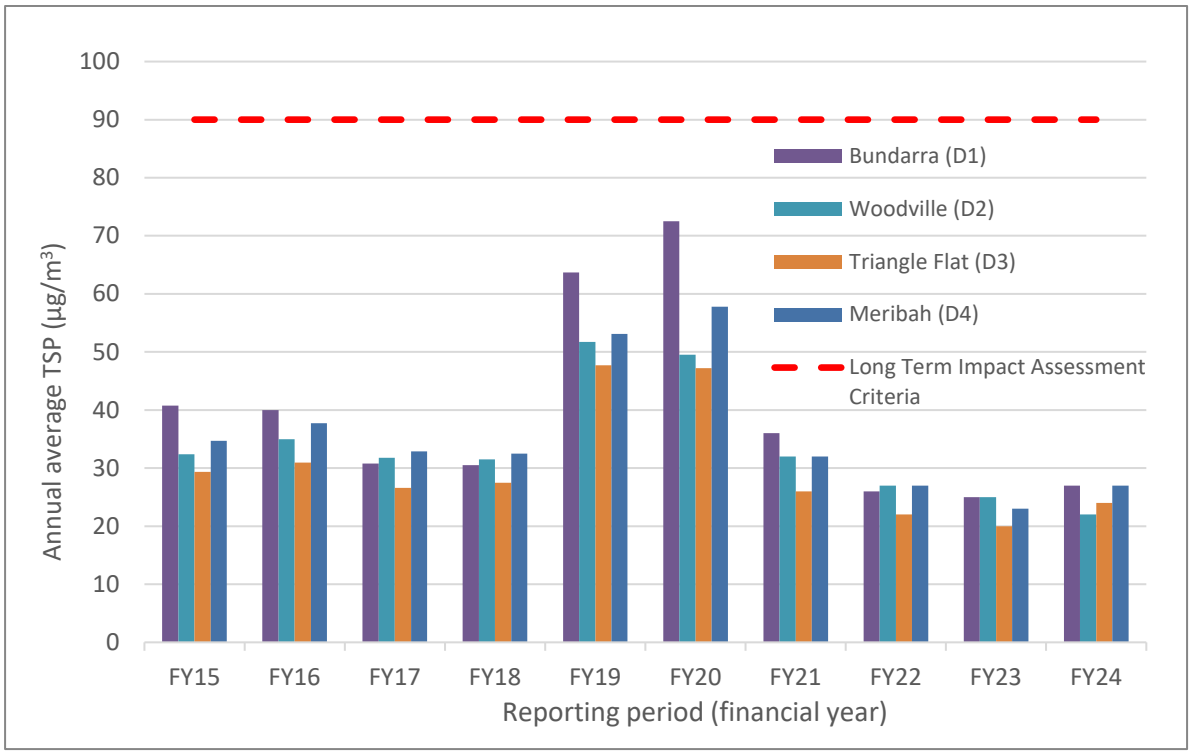


Figure 7 – Historical TSP monitoring results FY15-FY24

8.3.5 PM_{10}

8.3.5.1 Monitoring results

A summary of the PM_{10} data collected at BAM monitoring sites D1-D4 is presented in Table 16. During the reporting period the monitoring data showed that all four sites were compliant with both the annual average criteria of 25 µg/m³ and the 24-hour average criteria of 50 µg/m³. Included in Appendix 1 is further discussion on PM_{10} monitoring results captured during the reporting period.

Table 16 – Assessment of PM_{10} monitoring results against PM_{10} criteria and MOD14 predictions

Monitoring location	Property	Annual average (µg/m³)		24 hour average (µg/m³)		Compliance against criteria?	Less than MOD14 prediction?
		Result	Criteria	Result	Criteria		
BAM 1 (D1)	Bundarra	10	25	21	50	Compliant	Yes
BAM 2 (D2)	Woodville	8	25	26	50	Compliant	Yes
BAM 3 (D3)	Triangle Flat	9	25	22	50	Compliant	Yes
BAM 4 (D4)	Meribah	11	25	39	50	Compliant	Yes
Note: 16 µg/m³ was predicted as the annual average PM_{10} concentration in the MOD14 air quality assessment							

8.3.5.2 Comparison against Project Approval predictions

The annual average data captured during the reporting period was below the predicted annual average PM_{10} concentration in the MOD14 air quality assessment of 16 µg/m³.

8.3.5.3 Comparison against historical data

Historical PM_{10} monitoring results over the period FY12 to FY24 are shown in Figure 8. At all four monitoring sites, annual average PM_{10} data has been less than the long-term impact assessment

criteria over the 13-year period shown. The elevated PM_{10} results in FY19 and FY20 were influenced by bushfires. Since this time, the data is showing a general declining trend across all four sites. PM_{10} monitoring data collected since FY22 have been appreciably lower than previous reporting periods.

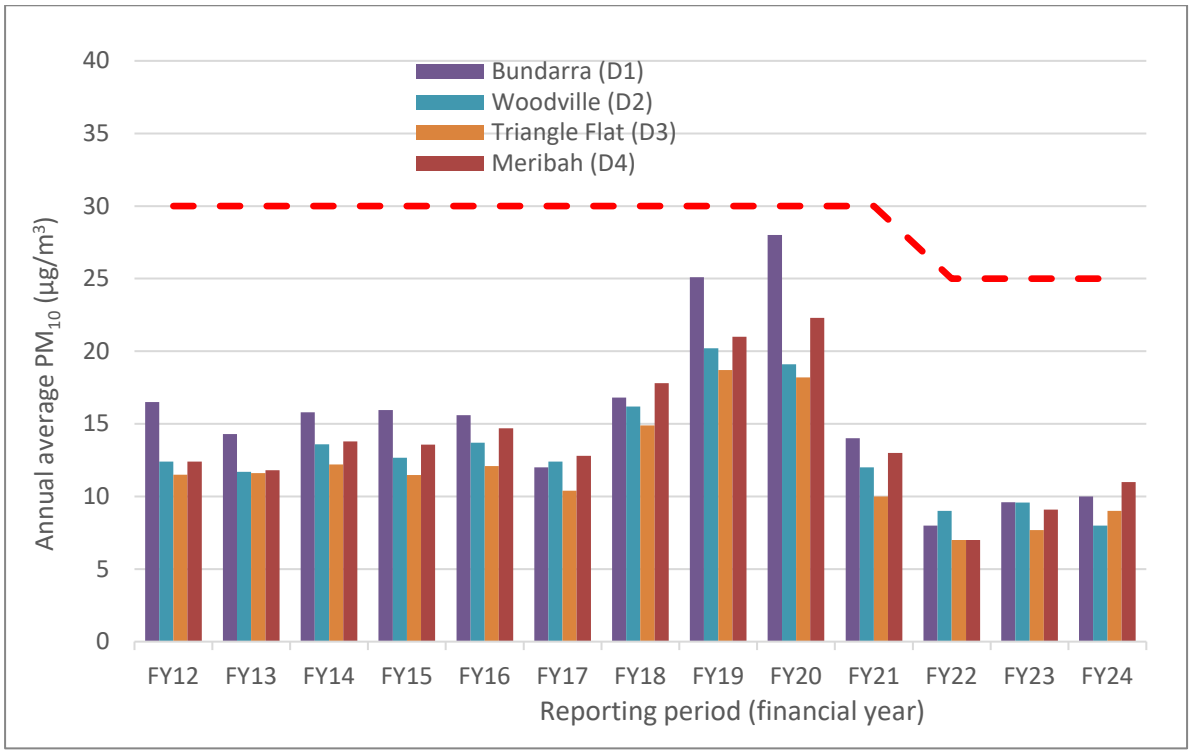


Figure 8 – Historical PM_{10} monitoring results FY12-FY24

8.3.6 PM2.5

8.3.6.1 Monitoring results

The $PM_{2.5}$ data collected at the BAM monitoring sites D1-D4 are summarised in Table 17. The monitoring data for $PM_{2.5}$ showed that all four sites were compliant with both the annual average criteria (8 µg/m^3) and the 24-hour average criteria (25 µg/m^3).

Further discussion of the $PM_{2.5}$ monitoring results is included in Appendix 1. PM2.5 data has been collected since BAMs were installed for the FY22 period.

Table 17 – Assessment of $PM_{2.5}$ monitoring results against $PM_{2.5}$ criteria and MOD14 predictions

Monitoring location	Property	Annual average (µg/m^3)		24 hour average (µg/m^3)		Compliance against criteria?	Less than MOD14 predictions?
		Result	Criteria	Result	Criteria		
BAM 1 (D1)	Bundarra	4.1	8	10.3	25	Yes – compliant	Yes
BAM 2 (D2)	Woodville	4.0	8	9.4	25	Yes – compliant	Yes
BAM 3 (D3)	Triangle Flat	3.0	8	7.8	25	Yes – compliant	Yes
BAM 4 (D4)	Meribah	3.9	8	10.5	25	Yes – compliant	Yes
Note: 6.6 µg/m^3 was predicted as the annual average $PM_{2.5}$ concentration in the MOD14 air quality assessment							

8.3.6.2 Comparison against Project Approval predictions

The data captured was also below the annual average $PM_{2.5}$ concentration of 6.6 µg/m^3 predicted in the MOD14 air quality assessment, with values ranging from 3.0 µg/m^3 at Triangle Flat (D3) to 4.1 µg/m^3 at Bundarra (D1).

8.3.6.3 Comparison against historical data

Historical $PM_{2.5}$ monitoring results over the period FY22 to FY24 is shown in Figure 9. Data recorded at all four monitoring sites during this period has remained below the long-term impact assessment criteria. There are no discernible trends in the data, however the following is noted:

- $PM_{2.5}$ at Bundarra (D1) has increased year on year, however the maximum value of 4.1 µg/m^3 in FY24 is well below the criteria.
- $PM_{2.5}$ at Woodville (D2) has decreased year on year, from 5.4 µg/m^3 in FY22 to 4.0 µg/m^3 in FY24.
- $PM_{2.5}$ at Triangle Flat (D3) and Meribah (D4) has been variable over the period FY22 to FY24.

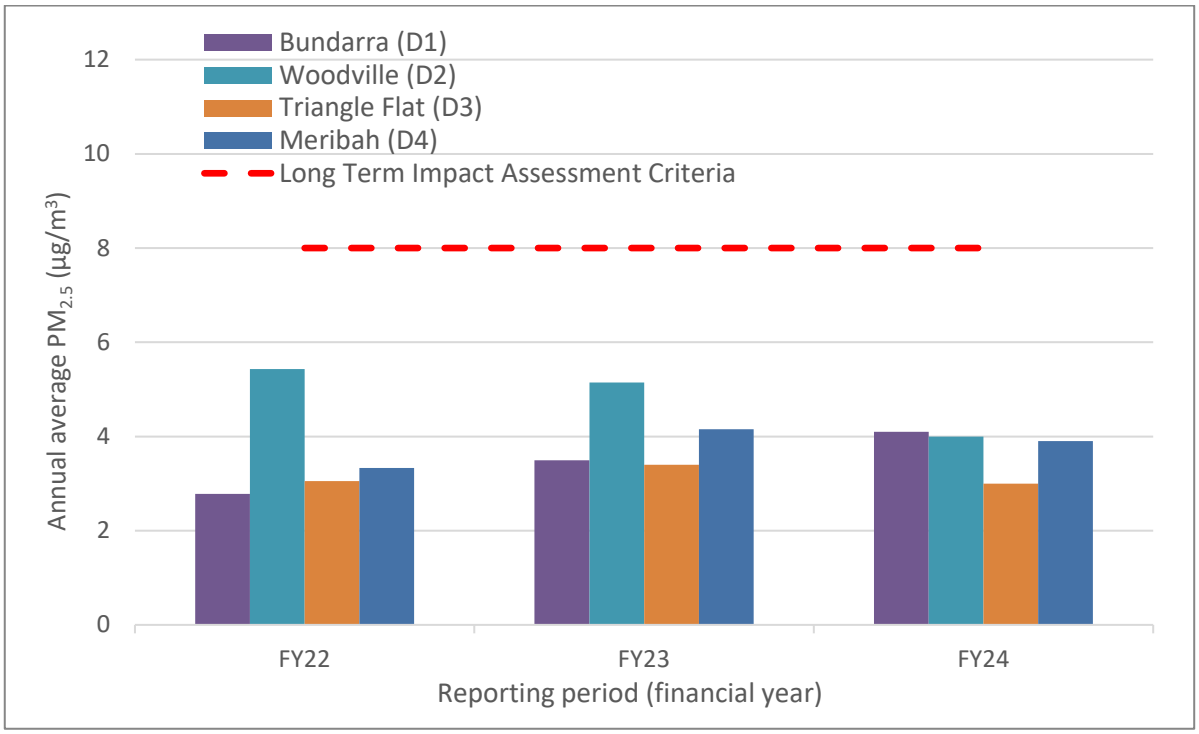


Figure 9 – Historical $PM_{2.5}$ monitoring results FY22-FY24

8.3.7 Underground ventilation exhaust emissions

Ventilation risers are used at Cadia to remove air from the underground mining area so that a safe environment is provided to underground workers. Summary results of monitoring emissions from the exit point of the ventilation shafts are included in Table 18.

It is noted that for VR8-1, the median TSP value is 17 mg/m^3, which is almost half the average presented in Table 18. There was one TSP reading recorded above the limit of 100 mg/m^3 (300 mg/m^3 on 6/12/2023). This value had a significant effect on the average value calculation.

Condition M2.2 of EPL 5590 requires the measurement of total solid particles and Type 1 and Type 2 substances every 14 days at VR8-1. There was one instance where the duration between sampling was more than 14 days (15 days between sampling in November/December 2023 due to a vent power issue on the sampling day). On 30 April 2024, a sample for Type 1 and Type 2

substances wasn't collected at the same time as TSP sampling. Type 1 and Type 2 substances were sampled on the following day (1 May 2024), 15 days after the previous sample was collected.

Table 18 – Summary monitoring results from ventilation shaft air quality sampling

Monitoring location	Site	Total Solid Particles (mg/m^3)	PM_{10} (mg/m^3)	$PM_{2.5}$ (mg/m^3)	Type 1 and 2 substances (mg/m^3)
AM060	VR8-1*	31.7[b]	26[a]	8[a]	≤0.022 to ≤0.180[c]
AM061	VR7-1	9.9[a]	n/a	n/a	≤0.027[a]
AM062	VR5-1	5.7[a]	n/a	n/a	≤0.39[a]
AM063	VR3-1	20[a]	17.5[d]	4.7[d]	n/a

Notes:

[a] data represents the results from one sampling point as the compliance monitoring frequency is annual

[b] average results from 28 data points collected over the reporting period

[c] average results from 27 data points collected over the reporting period. All data values were at the laboratory limit of reporting, which ranged from ≤0.022 to ≤0.180 mg/m^3.

[d] average results from 9 data points collected over the reporting period

* EPA identification number 38

n/a: data not available for reporting

8.3.8 Other monitoring

Other air quality compliance monitoring is undertaken at Cadia. This includes monitoring exhaust emissions from the Molybdenum Plant flotation scrubber, and emissions from the Gold Room Stack. The purpose of monitoring emissions from the Gold Room Stack is to determine compliance with the *Protection of Environment Operations (Clean Air) Regulation 2022* This is relevant to Condition O2 of EPL 5590 which requires that all plant and equipment installed at Cadia be operated and maintained in a proper and efficient condition.

Monitoring of the Molybdenum Plant flotation scrubber exhaust for hydrogen sulfide was undertaken on eight occasions during the reporting period. Six of eight sampling events returned data values below the laboratory limit of reporting of either <0.4 mg/m^3 or <0.5 mg/m^3. The two measured values for hydrogen sulfide were 0.11 mg/m^3 and 0.36 mg/m^3.

Testing of emissions from the Gold Room Scrubber Stack was undertaken on two occasions during the reporting period. The testing identified that all parameters were compliant with the emission limits set out in the *Protection of Environment Operations (Clean Air) Regulation 2022* . Thes emissions testing results are summarised in Table 19.

Table 19 – Summary monitoring results from ventilation shaft air quality sampling

Parameter	Units	POEO Group 5 emission limit*	14/09/2023 testing results	08/03/2024 testing results	Outcome
Cadmium	mg/m3	1	<0.0008	0.00067	Compliant
Mercury	mg/m3	1	0.03	0.079	Compliant
Total type 1 and 2 substances	mg/m3	5	≤0.12	≤0.14	Compliant
Nitrogen oxides	mg/m3	2,000	<4	<4	Compliant

Parameter	Units	POEO Group 5 emission limit*	14/09/2023 testing results	08/03/2024 testing results	Outcome
Total particulate matter	mg/m3	100	43	56	Compliant
Sulfur trioxide	mg/m3	100	0.11	<0.03	Compliant
Sulfur dioxide	mg/m3	2,800	0.52	0.11	Compliant

8.3.9 Community complaints

Dust related community complaints were received during the reporting period from residents in Errowanbang and Panuara (see Section 16). The complaints related to dust lift-off from the TSF, dust from the ventilation system, dust from a haul road, and dust from the coarse ore stockpile. All community complaints were investigated by Cadia and actions implemented where appropriate.

8.4 Proposed improvements

The following air quality related improvement measures are proposed to be implemented during FY25:

- Implement the approved AQGHG Management Plan (version 3), and the measures in the revised AQGHG Management Plan when approved by the DPHI.

9 BLASTING AND VIBRATION

9.1 Overview

As part of the underground mining activity at Cadia, subsurface blasting is undertaken. Cadia has a requirement to monitor and assess blast-induced seismic activity, along with seismicity induced by cave mining. PA 06_0295 and EPL 5590 contain blasting impact assessment criteria which requires monitoring of airblast overpressure and ground vibration. The Blast Monitoring Program is implemented to demonstrate compliance with the approval conditions.

This section describes the noise and vibration management practices adopted during the reporting period, the performance against approval conditions, and proposed improvements to blasting and vibration management.

9.2 Management practices

The following blasting and vibration management strategies have been implemented throughout the reporting period:

- managing the magnitude of blast events and pre-conditioning of the ore body.
- controlling the timing of blasts to minimise potential disturbance to residents.
- ongoing monitoring and publishing of results.
- ongoing reporting to the community.
- ongoing reporting and liaising with blast planning engineers regarding elevated results.

9.3 Environmental performance

9.3.1 Monitoring overview

The ground vibration and airblast overpressure monitoring sites are shown in Figure 4. The monitoring sites include the Cadia heritage site (vibration only), privately owned residences and residences owned by Cadia. Monitoring was undertaken using a SM6-4.5Hz tri-axial geophone (L, V, T parameters) and an ACO Pacific 7052 microphone (5mV/Pa sensor).

9.3.2 Blast and vibration monitoring results

Analysis of the blast overpressure and vibration monitoring data has used the blast records which includes the time of blast. This approach ensures that the monitoring data potentially attributable to blasting are assessed with other data not aligned with the timing of the blast records excluded.

There were 969 blast events during the reporting period, of which 123 occurred during the day (7am-6pm), 345 during the evening (6pm-10pm) and 501 at night (10pm-7am). There were 152 blasts on a Sunday, and 34 blasts on a public holiday (of which 5 fell on a Sunday).

The blast impact assessment criteria for residences on privately owned land includes:

- 100% of total number of blasts over a 12-month period below the airblast overpressure criteria of 120 dBL and vibration criteria of 10 mm/s
- 95% of total number of blasts over a 12-month period below the following time period criteria:
- Airblast overpressure of 115 dBL and vibration of 5 mm/s during the day
- Airblast overpressure of 105 dBL and vibration of 2 mm/s during the evening
- Airblast overpressure of 95 dBL and vibration of 1 mm/s during the night and all day on Sundays and Public Holidays

At the heritage site, a vibration criterion of 15 mm/s applies during all blasting times. Summary results from monitoring and performance against compliance criteria are presented in Table 20.

Table 20 – Compliance with blast and vibration criteria based on monitoring outcomes

Station	Time	Airblast overpressure (dBL) criteria	Ground vibration (mm/s) criteria	Compliance criteria	Number of blasts during each time period	Number above the criteria	Percentage of blasts below the criteria	Compliance with criteria
Residence on privately owned land	Any time	120	10	100% of total number of blasts over a 12-month period below the criteria	969	0	100%	**Airblast overpressure outcome: Compliant** There were no instances where the blast records aligned with airblast overpressure monitoring data values >120 dBL at private residences. **Vibration outcome: Compliant** Ground vibration did not exceed 10 mm/s at the monitoring sites at any time.
	Day (7am-6pm)	115	5	95% of total number of blasts over a 12-month period below the criteria	123	0	100%	**Airblast overpressure outcome: Compliant** There were no instances where the blast records aligned with airblast overpressure monitoring data values >115 dBL at private residences. **Vibration outcome: Compliant** Ground vibration did not exceed 5 mm/s at the monitoring sites during the day.
	Evening (6pm-10pm)	105	2	95% of total number of blasts over a 12-month period below the criteria	345	3	99.13%	**Airblast overpressure outcome: Compliant** On 15/03/2024 there were 3 instances* where airblast overpressure monitoring data was greater than 105 dBL. 114.7 dBL was recorded at Mayburies at 6:16pm. At Chesterfield, airblast overpressure data values of 108.8 dBL and 105.3 dBL were recorded at 6:16pm and 6:29pm respectively. **Vibration outcome: Compliant** Ground vibration did not exceed 2 mm/s at the monitoring sites during the evening.

Station	Time	Airblast overpressure (dBL) criteria	Ground vibration (mm/s) criteria	Compliance criteria	Number of blasts during each time period	Number above the criteria	Percentage of blasts below the criteria	Compliance with criteria
	Night (10pm-7am), and all day on Sundays and Public Holidays	95	1	95% of total number of blasts over a 12-month period below the criteria	501	14	97.21%	**Airblast overpressure outcome: Compliant** **Night** There were 14 instances* where the airblast overpressure monitoring data returned data values >95 dBL. This included: - 98.3 dBL at Chesterfield on 19/08/2023 - 96.9 dBL at Coorabin on 19/08/2023 - Values of 103.4 dBL, 100.2 dBL and 96.6 dBL at Mayburies on 18/11/2023, 06/11/2023 and 10/08/2023 respectively - Values ranging from 111.1 dBL to 96.2 dBL at Rosebank across blast activities in August, October, November and December 2023, and March and April 2024. **Sundays** No instances where blast records aligned with airblast overpressure monitoring data values >95 dBL at private residences on a Sunday. **Public holidays** No instances where the blast records aligned with airblast overpressure monitoring data values >95 dBL at private residences on a public holiday. **Vibration outcome: Compliant** No instances where the blast records aligned with ground vibration monitoring data values >1 mm/s.
Heritage sites, including Cadia Engine House and Surrounds	Any time	-	15	100% of total number of blasts over a 12-month period below the criteria	969	0	100%	**Outcome: Compliant** Ground vibration did not exceed 15 mm/s at the heritage monitoring site. The maximum vibration reading recorded at the heritage monitoring site was 2.65 mm/s.

* it is noted that these readings may be caused by external factors, and not by the underground blasts which are unlikely to result in airblast overpressure values of this magnitude at these monitoring sites.

The information presented above in Table 20 shows that 100% of blasts met the overall anytime criteria and 98.2% of blasts met the time-period criteria (i.e. criteria for day, evening and night). All blasts met the heritage sites vibration criterion.

9.3.3 Comparison against historic data

Presented in Figure 10 is a summary of annualised blast results for each reporting period from the 2011/12 to current. Blast monitoring results have remained well below the allowable 5% criteria threshold since 2011/12. Blasting in FY24 is mostly for the development of the new production cave 2-3 (PC2-3).

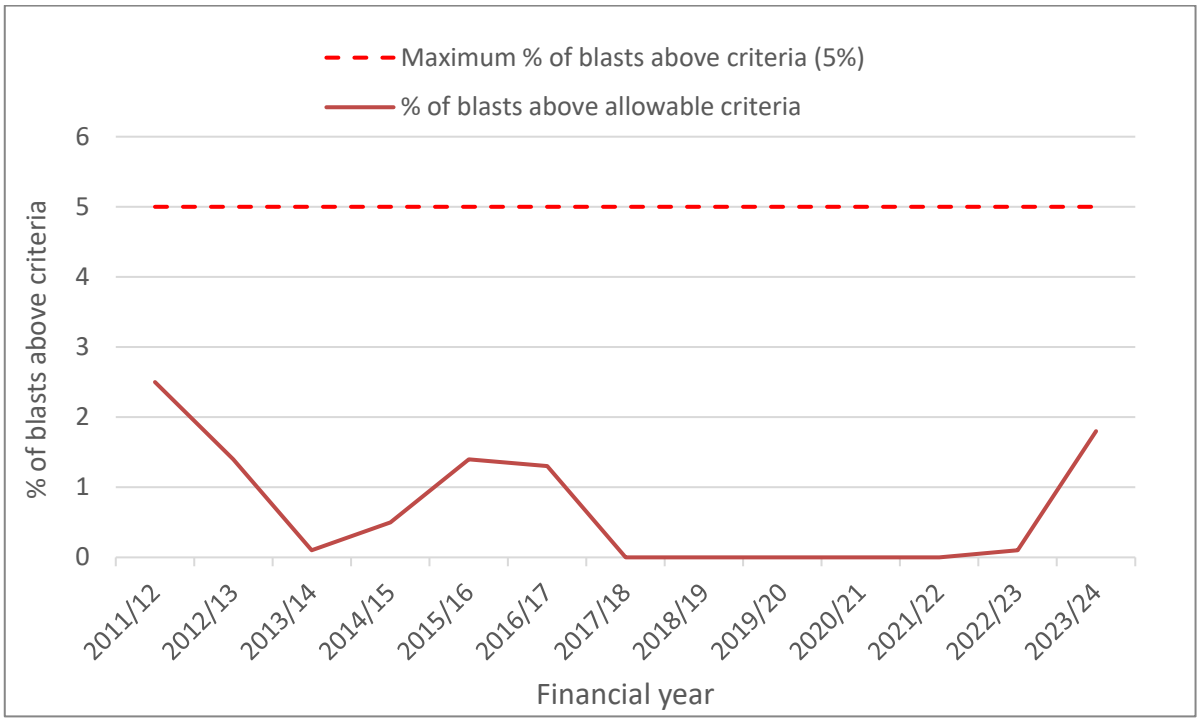


Figure 10 – Historical blast performance (2011/12 to 2023/24)

9.3.4 Comparison against Project Approval criteria

The Noise and Blasting Impact Assessment prepared for the Cadia East Environmental Assessment (EA) predicted that private residences would not experience blast vibration levels above the maximum criteria. Additionally, vibration at the heritage site was predicted to be well below the 15 mm/s criteria.

The vibration monitoring results captured during the reporting period are in line with the predictions made in the Cadia East EA. The maximum vibration readings of 2.65mm/s at private residences and 0.8 mm/s at the heritage site are well below the criteria.

9.3.5 Community complaints

There were four blasting related complaints during the reporting period (22 February, 16 March, 4 April and 9 June 2024). All four complaints came from the Forest Reefs area (east of Cadia) and were centred around experiencing tremors/vibrations at the complainant's property.

On each occasion, vibration monitoring data was within allowable limits. The actions taken to address the complaints are detailed in the Cadia Community Complaints Register available on the Cadia Valley website.

9.4 Proposed improvements

The following blast and vibration related improvements are proposed to be continued during FY25:

- Where possible, scheduling blast activities to limit blasting during night-time periods, Sundays and public holidays.
- Periodic assessment of monitoring locations to confirm that the monitoring network remains representative of potentially affected stakeholders,

10 NOISE

10.1 Overview

Cadia has a requirement to manage operational noise generated by the mining activity. The PA 06_0295 and the EPL 5590 include various conditions pertaining to noise management. This includes acquisition requirements for affected properties, compliance monitoring to enable assessment against impact assessment criteria and limits, defined operating hours for selected activities, Noise Monitoring Program implementation, competence in the carrying out noise related activities, and maintenance of plant and equipment, amongst others. Cadia's performance against the noise management requirements during this reporting period is included in this section.

10.2 Management practices

The Noise Monitoring Program details the approach taken at Cadia to ensure compliance with project approval requirements. This includes:

- Traffic noise monitoring by a qualified noise consultant at select locations.
- Directional unattended noise monitoring to assess mining operational noise, with data collected independently reviewed by a qualified consultant.
- Attended noise monitoring to assess mining operational noise, with data collected independently reviewed by a qualified consultant.
- Meteorological monitoring to assist with noise data analysis.
- Where triggered, investigation of offsite traffic noise impact assessment criteria.
- In the event of a noise exceedance, engagement with property owners to agree mitigation.
- Protocol for evaluating compliance and managing complaints.
- External reporting of noise management outcomes.

10.3 Environmental performance

The below sections summarise Cadia's performance against noise management requirements during the reporting period.

10.3.1 Monitoring results

Noise monitoring at attended and unattended monitoring locations has continued to be undertaken during the reporting period as a means of determining compliance against the noise criteria. The locations of attended and unattended noise monitoring sites are shown in Figure 4.

10.3.1.1 Attended noise monitoring

Attended noise monitoring and assessment against compliance criteria was undertaken by Advitech Pty Ltd during the reporting period.

Attended noise monitoring is required each quarter at the monitoring sites set out in Table 21, and as listed in the approved noise monitoring program. The noise assessment technical reports prepared following each monitoring event are included in Appendix 11.

Table 21 – Compliance status of attended monitoring sites during the reporting period

Area	Monitoring site	Compliance status*			
		Aug 2023	Nov 2023	Feb 2024	May 2024
Cadia Mine	Chesterfield (M1)	Compliant	Compliant	Compliant	Compliant

Area	Monitoring site	Compliance status*			
		Aug 2023	Nov 2023	Feb 2024	May 2024
	Warrengong (M2)	Compliant	Compliant	Compliant	Compliant
	Willow Creek (M3)	Compliant	Compliant	Compliant	Compliant
	South Log (M4)	Compliant	Compliant	Compliant	Compliant
	Bonnie Glen (M5)	Compliant	Compliant	Compliant	Compliant
	Rosebank (M6)	Compliant	Compliant	Compliant	Compliant
	Northwest (M7)	Compliant	Compliant	Compliant	Compliant
Cadia Dewatering Facility	84 Newbridge Road (Athol Gardens) (CDF M1)	Compliant	Compliant	Compliant	Compliant
	331 Newbridge Road (Hollwood) (CDF M2)	Compliant	Compliant	Compliant	Compliant
	247 Newbridge Road (Ewens) (CDF M3)	Compliant	Compliant	Compliant	Compliant

*compliance with both project specific and cumulative noise impact criteria listed in PA 06_0295

Table 21 shows that during each operator attended quarterly noise monitoring event, compliance with noise criteria was achieved at all ten sites for both project specific and cumulative noise impact.

10.3.1.2 Unattended noise monitoring

During the reporting period, Cadia has adopted the use of unattended real time noise monitors to assist with determining potential noise impacts on noise sensitive receptors. SentineX® units are used which allows constant directional noise monitoring with audio recording and playback capability. Near real time data is provided via a dedicated website.

Cadia has four (4) units mounted on trailers providing Cadia with the flexibility to move the monitoring units to respond to operational and community needs. Continuous noise monitoring is undertaken on a rotating roster of seven locations near to Cadia and three locations near the CDF. During the reporting period 162 days of unattended monitoring was carried out across the ten monitoring locations, resulting in more than 15,500 discrete 15-minute noise measurements. A summary of the unattended noise monitoring results is included in Table 22. Details of the unattended noise monitoring data and analysis are included in the noise technical assessment reports in Appendix 11.

Table 22 – Summary of unattended noise monitoring

Location	Monitoring duration	Assessed mining contribution >NIAC	Compliance status
South Log	16 days	Nil	Compliant
Hollwood	16 days	3 x $L_{A1,1minute}$ samples Contributions from train movements	Not compliant with the sleep disturbance criteria (Night)[1]
247 Newbridge Road	16 days	6 x 15-minute samples 5 x $L_{A1,1minute}$ samples Contributions from train movements	Not compliant with the $L_{Aeq,15minute}$ criteria and the sleep disturbance criteria (Night)[1]

Location	Monitoring duration	Assessed mining contribution >NIAC	Compliance status
Athol	16 days	3 x 15-minute samples 2 x $L_{A1,1minute}$ samples Contributions from train movements	Not compliant with the $L_{Aeq,15minute}$ criteria and the sleep disturbance criteria (Night)[1]
Warrengong	15 days	15 x 15-minute samples Contributions from light aircraft	Not compliant with $L_{Aeq,15minute}$ criteria[1]
Willow Creek	15 days	Nil	Compliant
Rosebank	20 days	2 x 15-minute samples Contributions from light aircraft	Not compliant with $L_{Aeq,15minute}$ criteria[1]
Chesterfield	15 days	Nil	Compliant
Northwest	17 days	Nil	Compliant
Bonnie Glen	15 days	Nil	Compliant
TOTAL	**162 days**	-	-

Note:
1 refer to PA 06_0295 Schedule 3 Condition 2 for noise impact assessment criteria and EPL 5590 Condition L4.1 for noise limits

The information presented in Table 22 shows that there were non-compliances with noise criteria at the three CDF monitoring locations (Hollwood, 247 Newbridge Road and Athol) and at two locations near Cadia (Warrengong and Rosebank). Monitoring at South Log, Willow Creek, Chesterfield, Northwest and Bonnie Glen confirmed compliance with noise criteria at these locations. Train movements contributed to noise exceedances at the three CDF monitoring locations, whereas light aircraft used to control dust on the TSFs was assessed as the contributor to the noise exceedances at Warrengong and Rosebank. Although some exceedances of the noise criteria were identified during the reporting period, when assessed against the period of unattended noise monitoring, compliance with noise criteria was achieved approximately 97.5% of the time.

10.3.1.3 Road traffic and train noise monitoring

Unattended and attended monitoring of road traffic and train noise was undertaken at multiple properties during the reporting period so that compliance with relevant noise criteria could be evaluated. Monitoring of train noise was limited to the Athol property opposite the CDF.

The information presented in Table 23 shows that attended monitoring was completed at three locations during the reporting period, with unattended monitoring during the reporting period occurring at Cadia Road Springside no. 1, Cadia Road Springside no. 2, Cadia Road Errowanbang no. 1 and Cadia Road Errowanbang no. 2. Although unattended monitoring was not undertaken during the reporting period at Cadia Road Springside no. 1 and Athol, the timing of the most recent unattended monitoring at these locations is included in Table 23 for information.

Table 23 – Summary of road traffic and train noise monitoring undertaken

Location	Unattended monitoring	Attended monitoirng
Cadia Road Springside no. 1	Last unattended monitoring was undertaken in October 2022	Completed in November 2023

Location	Unattended monitoring	Attended monitoirng
Cadia Road Springside no. 2	Between 25 September and 4 October 2023	Completed in November 2023
Cadia Road Errowanbang no. 1	Commenced 21 July 2023 for an approximately 10-day period	None undertaken in the reporting period
Cadia Road Errowanbang no. 2	Commenced 10 August 2023 for an approximately 10-day period	None undertaken in the reporting period
Athol (opposite CDF)	Last monitoring was undertaken in June 2023	Between 28 February and 21 March 2024

Cadia works with each landowner to create an individualised mitigation program depending on their property structure and monitoring outcome.

10.3.1.4 Comparison against noise predictions

The results of noise monitoring have been compared against the predicted noise levels at privately-owned receivers in the project approval (MOD14). Additionally, traffic noise levels from monitoring during the reporting period have been compared against predictions in the EA.

The MOD14 noise assessment (the assessment for the most recent project approval) predicted that noise levels at privately-owned receivers would comply with the impact assessment criteria. Operational noise monitoring during the reporting period generally aligned with this prediction with all attended noise monitoring compliant with noise criteria. Some noise exceedances were observed in the unattended monitoring data and traffic noise monitoring data.

The traffic noise assessment in the EA concluded that compliance with the traffic noise criteria would be achieved at Cadia Road, with exceedances of the criteria at Orchard Road, Forest Road, Woodville Road and Panuara Road in relation to the re-aligned Cadia Road (south of Woodville Road). The traffic noise monitoring conducted generally aligned with the predictions in the EA, except for the exceedance identified at Cadia Road Springside no. 2.

10.3.2 Complaints

10.3.2.1 Noise related community complaints

The number of noise related complaints recorded during the current reporting period (2023/2024) is shown in Figure A10.2 in Appendix 10 along with long term historical averages. The majority of the noise related complaints (24) were from the Errowanbang area during the period January to April 2024.

The nature of the complaints was generally related to a perceived increase at the complainant's property. Noise related complaints were also received from a Cadia landholder (1), Four Mile Creek (1), and Forest Reefs (1).

Following each complaint received, an investigation was conducted to determine the source of noise and whether compliance with noise management plan requirements, including noise assessment criteria, had been breached. This was commonly followed up with noise monitoring in the area of the complaint to gather quantitative data for use in the investigation. All investigations concluded that no noise impact criteria had been breached. Discussion on the monitoring undertaken in response to complaints is included in Section 10.3.2.2.

10.3.2.2 Monitoring in response to community complaints

Non-routine noise monitoring has been undertaken at six locations during the reporting period in response to community concerns regarding potential noise emissions from Cadia. A total of 66 days of unattended monitoring was undertaken across the six locations.

The noise monitoring undertaken in response to community complaints confirmed that although noise was detected on occasion above the NAIC, noise contributions from mine related activities were compliant with the NAIC. Local factors (e.g. agricultural activities, barking dogs, birds, insects, distant traffic and commercial aircraft) external to the mine were determined to contribute to noise levels above the NAIC.

10.4 Proposed improvements

The Noise Management Plan (replacement of the current Noise Monitoring Program) submitted to DPHI for approval (refer to Section 21.2 for details) includes an updated approach to noise management. Once approved, the Noise Management Plan which includes improvements in the approach to managing noise, will be implemented.

In addition to implementing the Noise Management Plan (once approved), the following improvements are proposed to be implemented during the next reporting period:

- Review the approach to unattended noise monitoring particularly in relation to monitoring duration and the rostering of planned monitoring activities
- Investigating the installation of fixed real-time noise monitoring at three locations around Cadia that will be accessible to the public via the Cadia website.

11 BIODIVERSITY

11.1 Overview

Management of biodiversity related aspects during the mining operation is a requirement of the project approval. Specifically, Conditions 41 and 41A of Schedule 3 of the PA 06_0295 requires that Cadia prepare and implement the approved Biodiversity Management Plan (BMP). The BMP includes the objectives, guiding principles and activities relating to the management of the mine disturbed landscape, the agricultural landscape, and the landscape of the Cadia East Offset.

It is noted that the BMP is currently being updated following review by the Biodiversity, Conservation and Science Group (BCS) of the NSW Department of Climate Change, Energy, the Environment and Water. At the time of writing, the Landscape and Biodiversity Management Plan (LBMP) is the current approved management plan for biodiversity at Cadia.

Conditions 38 to 40B of Schedule 3 of the PA 06_0295 relate to biodiversity offsets. This includes a requirement to implement the biodiversity offset strategy, lodgement of a conservation and biodiversity bond and retiring biodiversity credits, amongst others.

11.2 Management practices

The approach to managing biodiversity related aspects at Cadia is detailed in the LBMP. The LBMP includes specific management requirements for threatened species, weeds, pest animals, bushfire, remnant vegetation, mine disturbed areas, the agricultural landscape, vegetation corridors and biodiversity offset areas.

Plans for managing bushfire related risks have also been developed and are implemented at Cadia. Separate management plans exist for managing bushfire risk to Cadia assets (Bushfire Fuel Management Plan), bushfire risk within offset areas (Black Rock Range Conservation Offset Area Bushfire Management Plan), and bushfire risk to neighbouring farmland (Farmland Bushfire Fuel Management Plan).

11.3 Environmental performance

Included in the below sections are a summary of performance during the reporting period in relation to threatened flora, threatened fauna, weeds, pest animal control, bushfire management, and off-site restoration (both biodiversity offset areas and the vegetation corridor program).

11.3.1 Threatened flora

During the reporting period, no threatened flora was identified prior to disturbance activities being carried out in accordance with the Project Approval. Established protocols (Vegetation Clearance Protocol and Threatened Species Management Protocol) and management practices (Threatened Species Management Strategy) were implemented with satisfactory outcomes delivered during the reporting period.

11.3.2 Threatened fauna

Prior to any vegetation clearance activities being undertaken, there are certain requirements which must be undertaken to ensure there are no impacts to threatened fauna species. These requirements (e.g. Vegetation Clearance Protocol) which are detailed in the LBMP were implemented throughout the reporting period. As a result, there were no recorded instances of impacts to threatened fauna during the reporting period.

11.3.3 Weeds

A control program for noxious and environmental weeds was implemented during the reporting period. These contracted works involved weed control across Cadia owned land with a focus on Blackberry, St John's Wort, Patterson's Curse, Serrated Tussock, Scotch Thistle, Bathurst Burr, Sweet Briar, and Sticky Nightshade. Where relevant, the weed control measures implemented followed the requirements of the *Biosecurity Act 2015* and the local control authority management plan for the weed being controlled.

The weed control program aims to reduce seed sources, minimise spread, reduce impacts on neighbouring properties and progressively reduce the size of populations. Weed 'hot spots' are identified through regular and ad-hoc inspections by environmental staff and contractors and these problem areas are targeted by the control program.

In addition to the targeted weed control program, general herbicides were used in selected applications such as around mine related infrastructure (e.g. pipelines, buildings, substations, tanks etc.) to reduce the accumulation of grasses and broadleaf weeds.

11.3.4 Pest animal control

Throughout the reporting period, Cadia has continued to monitor the incidence of rabbits, feral cats, rodents, kangaroos, feral pigs, deer and foxes on the mine site. A process of controlling vertebrate pests has continued, with a summary of the major species control measures and outcomes presented in Table 24.

Table 24 – Vertebrate pest control program summary

Pest animal	Control measures and outcomes
Rodents	Pest control company engaged for on-going pest management services. Conducted at Cadia, Ridgeway and surrounding areas. Conducted on all Cadia owned residences. Complies with National Parks and Wildlife Service Regulations.
Kangaroos	Under the *Biodiversity Conservation Act 2016,* a total of 699 kangaroos were commercially harvested during the reporting period. This is lower than the 1,026 kangaroos commercially harvested during the previous reporting period (2022/2023) owing to reduced demand from commercial meat processors.
Feral pigs	Targeted trapping and opportunistic shooting of feral pigs was conducted on Cadia owned properties during the reporting period. This resulted in the destruction of 150 feral pigs. In addition to the targeted trapping, monitoring of feral pig activity was ongoing throughout the reporting period.
Deer	During the reporting period, a total of 15 deer were commercially harvested through a targeted shooting program. This is lower than the 28 deer harvested during the previous (2022/2023) reporting period.

11.3.5 Bushfire management

Various bushfire management measures as detailed in the bushfire management plans have been implemented during the reporting period. This has included maintenance of fire trails within Black Rock Range, targeted grazing of paddocks, slashing of high fire risk areas at Flyers Creek and vegetation management around infrastructure and buildings.

The bushfire management measures implemented and the favourable weather conditions experienced during the reporting period have contributed to zero bushfire events.

11.3.6 Performance of off-site biodiversity areas

Various rehabilitation management activities were undertaken within the conservation offset areas during the reporting period. These activities and performance against management requirements are discussed in the following sections.

11.3.6.1 Biodiversity offset areas

Black Rock Range offset area

Specific management activities undertaken within the Black Rock Range offset area during the reporting period included:

- Two campaigns of noxious weed control with an emphasis on Blackberry, St John's Wort, Patterson's Curse, Serrated Tussock, Scotch Thistle, Bathurst Burr, Sweet Briar, and Sticky Nightshade.
- Site preparation for direct seeding and tubestock planting of native species.
- Direct seeding of 26 ha.
- Planting 5275 tubestock across approximately 30 ha.
- A vertebrate pest drone survey was performed during the reporting period (May 2024).
- The drone survey identified 26 kangaroos, 8 goats and 2 feral pigs over the 809 ha offset area
- Vertebrate pest control programs undertaken during autumn and winter 2024.
- The Conservation Agreement between Cadia and Biodiversity Conservation Trust (BCT) has been formalised and signed by Cadia.

Flyers Creek offset area

Specific management activities undertaken within the Flyers Creek offset area during the reporting period included:

- Replacement of eastern boundary fence.
- Removal of top barb from all fences and replacement with plain high tensile wire.
- Two campaigns of noxious weed control with an emphasis on Blackberry, St John's Wort, Patterson's Curse, Serrated Tussock, Scotch Thistle, Bathurst Burr, Sweet Briar, and Sticky Nightshade.
- Vertebrate pest control programs.
- The Conservation Agreement between Cadia and BCT has been formalised and signed by Cadia.

Stratton Vale offset area

Specific management activities undertaken within the Stratton Vale offset area during the reporting period included:

- Replacement of the northern boundary fence.
- Removal of the top barb from all fences and replacement with plain high tensile wire.
- Two campaigns of noxious weed control with an emphasis on Blackberry, St John's Wort, Patterson's Curse, Serrated Tussock, Scotch Thistle, Bathurst Burr, Sweet Briar, and Sticky Nightshade.
- Ground preparation and planting of 1,400 tubestock targeting canopy species over 11 ha.
- Ongoing vertebrate pest control program.

- The Conservation Agreement between Cadia and BCT has been formalised and signed by Cadia.

Tunbridge Wells and Caringle Biodiversity Stewardship Site

A Biodiversity Stewardship Agreement (BSA) was approved for the Tunbridge Wells and Caringle site in April 2024. The approved BSA will now allow Cadia to retire the remaining biodiversity credits associated with Schedule 3, Clause 40B of PA 06_0295 (retirement of credits expected to be completed September 2024).

The BSA provides a framework for the active restoration, management, and conservation of habitat, which allows for biodiversity credits to be created. The Tunbridge Wells and Caringle BSA site, which is located north of Panuara and to the west of Cadia East Underground Mine, covers an area of 149 ha (on a portion of Lot 99 on deposited plan 750371 and a portion of Lot 11 on deposited plan 1292065).

The biodiversity credits associated with the BSA include the *Long-leaved Box – Red Box – Red Stringybark mixed open forest*; *Blakely's Red Gum – Yellow Box grassy tall woodland; and, White Box grassy woodland* ecosystem credits, and species credits (appropriate habitat) for Squirrel Glider (*Petaurus norfolcensis*) and Superb Parrot (*Polytelis swainsonii*).

Active restoration and management practices undertaken at the Tunbridge Wells and Caringle BSA site will be reported in the 2024/2025 Annual Review.

11.3.6.2 Retirement of credits

In accordance with Schedule 3 Conditions 40A and 40B of PA 06_0295, MOD 13 credits were retired by payment into the Biodiversity Conservation Fund. To satisfy the credit obligation for MOD14, Cadia has entered into a Stewardship Agreement to generate credits for retirement.

11.4 Proposed improvements

Since completion of the 2023 Annual Review, the BMP (revision 2) was updated and submitted to BCS for comment. BCS provided comment and recommendations in July 2024.

Cadia is currently reviewing BCS recommendations and updating the BMP. Once complete, Cadia will submit to the BCT and BCS for review and approval prior to approval from DPHI. Once the BMP has been approved by DPHI, the measures in the revised plan will be implemented.

Additionally, the following biodiversity related improvement measures have been identified for implementation during the 2024/2025 reporting period:

- Trial drone weed spraying of difficult to access areas of Black Rock Range and Flyers Creek.
- Complete 20 ha of direct seeding within the vegetation corridor areas.
- Update and implement the Bushfire Management Plan across Cadia owned land.
- Complete preparation of the Weed Management Plan and Feral Pest Management Plan.
- Increase funding to the Community Sticky Nightshade program and focus on the areas of high infestation on privately owned land within the Cadia district with a dedicated spraying resource.

12 HERITAGE

12.1 Overview

The requirements pertaining to the management of heritage matters at Cadia are detailed in Schedule 3 Conditions 42 and 43 of PA 06_0295. There are other requirements for historical heritage related matters which are included in the Section 60 works application approval.

12.2 Management practices

12.2.1 Historical Heritage

The approach to managing historical heritage related risks is detailed in the Historical Heritage Management Plan (HHMP). The HHMP has recently been reviewed and updated by Cadia, with the updated version submitted to the Major Projects Portal on 11/06/2024 for consultation with Heritage NSW.

During the reporting period, Cadia has implemented the management requirements in accordance with the approved HHMP. At a summary level, this has involved vibration monitoring and review of monitoring data, heritage structure inspections, continued use of boundary fencing, site inductions and use of Environmental Impact Permits amongst others.

12.2.2 Aboriginal Heritage

The Aboriginal Cultural Heritage Management Plan (ACHMP) includes the requirements for managing Aboriginal cultural heritage related risks. The approved ACHMP has been implemented during the reporting period by Cadia.

12.3 Performance outcomes

12.3.1 Historical Heritage

As approved in MOD14 Te Anau Homestead was demolished for the TSF buttressing. Following the partial demolition and salvage of the Te Anau cool room in August 2022, the remainder of the Te Anau Homestead was demolished in October 2023 under the supervision of an archaeologist. No unexpected items or features of interest were identified during the demolition works.

Monthly inspections of the Cadia Engine House have been completed during the reporting period. The monthly inspections confirm that no significant vibrations or damage occurred in the reporting period. The annual inspection of the Cadia Engine House was conducted by approved structural engineer Alex Been of AC Been Consulting Engineers Pty Ltd. A photo of the Cadia Engine House and Chimney from May 2024 is included as Figure 11. Key findings from the annual inspection are included below:

- There has been no significant damage since the last inspection of 16 May 2023, or since photographic recordings from 2003/2004, however, there is evidence of ongoing deterioration.
- Since vibration monitoring has indicated either no vibration, or very low levels of vibration over the preceding several years, the cracking observed in the Cadia Engine House is not deemed to be related to mining activities.
- The tarpaulin is generally intact and protecting the Cadia Engine House from rainwater ingress. Some maintenance is required given one tie rope has snapped.

Review of vibration monitoring data (refer Section 9.3.2) identified that the highest vibration reading at the Chimney monitoring station was 0.8 mm/s. This value is well below the criteria set out in the Section 60 works application approval.

Planning is underway to allow the following works to safely occur, as recommended by the structural engineer:

- Access for detailed engineering inspection to allow specification of remediation works; this is likely to involve scaffolding and/or a cherry picker.
- Localised repointing externally and internally.
- Stitching of selected cracks using remedial bed joint reinforcing.
- Continue monitoring and maintenance regime.
- Install new sandbags at window openings on north and east walls of the Cadia Engine House to better support the bracing structure.
- Mortar pack around loose stone on internal face of west and north Cadia Engine House walls.
- Install geofabric protective wrap over the Boiler House remnant brick and stone walls.



Figure 11 – Photo of Cadia Engine House and Chimney (photo taken May 2024)

12.4 Aboriginal Heritage

During November 2023, a work crew undertaking vegetation clearing works within the Cadia East subsidence zone identified a potential scar tree. Work was stopped in the area and the Orange Local Aboriginal Land Council (OLALC) was engaged to assess the tree. During a site inspection, OLALC found that the tree was not a scar tree and held no cultural significance.

12.5 Proposed improvements

The following heritage related improvements are proposed for the next reporting period:

- Formalise the inspection procedure and form for the Cadia Engine House precinct.

- Finalise update of dilapidation recording.
- Conduct detailed planning and remediation works at the Cadia Engine House.
- Once approved, implement the revised HHMP (revision number 3).
- Review the Conservation Management Plan for SHR779 and update where appropriate.

13 WASTE MANAGEMENT

13.1 Overview

Cadia has a requirement to manage waste generated from the mining operation. In addition to the legal requirements that apply to managing waste at Cadia, specific waste management requirements are set out in PA 06_0295 and EPL 5590.

Schedule 3, Condition 50 of PA 06_0295 requires Cadia to implement waste minimisation measures, ensure waste is appropriately stored, handled and disposed of, manage the on-site sewage treatment system, and report on performance.

EPL 5590 permits for waste to be received at the premises, and to be managed in accordance with certain requirements as detailed in Condition L3 Waste. General waste, wood waste, waste tyres, drilling mud and/or muddy waters, biosolids, and general or specific exempted waste are waste types permitted to be received at the premises. The Potentially Acid Forming (PAF) encapsulation cell of the SWRD can be used to dispose general solid waste, however there are limits to the amounts disposed. Additionally, Condition O1.1 of EPL 5590 requires licenced activities to be carried out in a competent manner. This applies to waste management activities at Cadia.

13.2 Management practices

The waste management practices which have been adopted at Cadia during the current reporting period are detailed in the Non-Mineral Waste Management Plan. Various types of waste are generated at Cadia from a range of activities including underground mining operations, surface operations, ore processing, mobile equipment maintenance, infrastructure construction and maintenance, shipping and packing materials and office waste.

Cadia employ a Total Waste Management contract where a third-party provider collects and disposes of selected waste streams in accordance with the requirements of their waste management licence. Waste management at Cadia follows the below key principles:

- All waste materials are to be disposed of off-site except for heavy vehicle tyres and inert materials such as timber, broken concrete, and geological samples.
- Waste materials, which cannot be either re-used or recycled, are to be sent to a licensed landfill that can accept that category of waste.
- Only transporters that are appropriately licenced by the relevant regulator will be contracted to remove waste from site.

13.3 Environmental performance

Provided in the below sections is a summary of waste management performance against EPL 5590 requirements, along with a comparison against historic data and waste generation predictions in the Cadia East EA.

13.3.1 Performance against EPL 5590 requirements

Provided in Table 25 is a summary of performance against the waste management requirements in Condition L3 of the EPL 5590. The information presented shows that waste disposal complied with EPL 5590 requirements.

Table 25 – EPL 5590 waste management requirements and commentary on performance

Waste type	Management approach	Commentary on activities during the reporting period
General solid waste (non-putrescible)	Waste disposal (application to land) as specified in resource recovery exemptions	Concrete waste disposed in waste rock dumps. Quantity aligning with historical trend.
Wood waste	Waste disposal (application to land) as timber chippings on mine site rehabilitation	Timber segregated from other waste streams for stockpiling and use on mine-site rehabilitation. Quantity aligning with historical volumes.
Waste tyres	Waste disposal (application to land) within the waste rock dumps	Heavy vehicle tyres disposed of in waste rock dumps. Reduction in disposed volume compared to last reporting period due to increased number of repair and refurbishments.
Drilling mud and/or muddy waters	Waste disposal (application to land within Cadia tailings facilities)	Drilling mud and fluids were disposed of in the Cadia Hill pit tailings storage facility.
Biosolids	Storage, processing (non-thermal treatment), composting, and waste disposal (application to land)	During the reporting period, 5,727 tonnes of biosolids were received by Cadia.

The different waste streams transported off-site from Cadia during the reporting period are summarised in Table 26.

Table 26 – Waste generated during the reporting period

Waste type	Amount of waste
Recycled material	8,176 tonnes
Waste to landfill (licenced)	1,285 tonnes
Heavy vehicle tyres	218 tonnes
Liquid waste recycled (oil, grease, coolant)	742 tonnes

13.3.2 Comparison against historic data and performance targets

The historical record of waste sent to landfill over the period 2006/2007 to the end of the current reporting period is shown in Figure 12.

This data shows that waste sent to landfill is variable, with higher rates of waste generation typically coinciding with major construction and mine expansion related activities at Cadia.

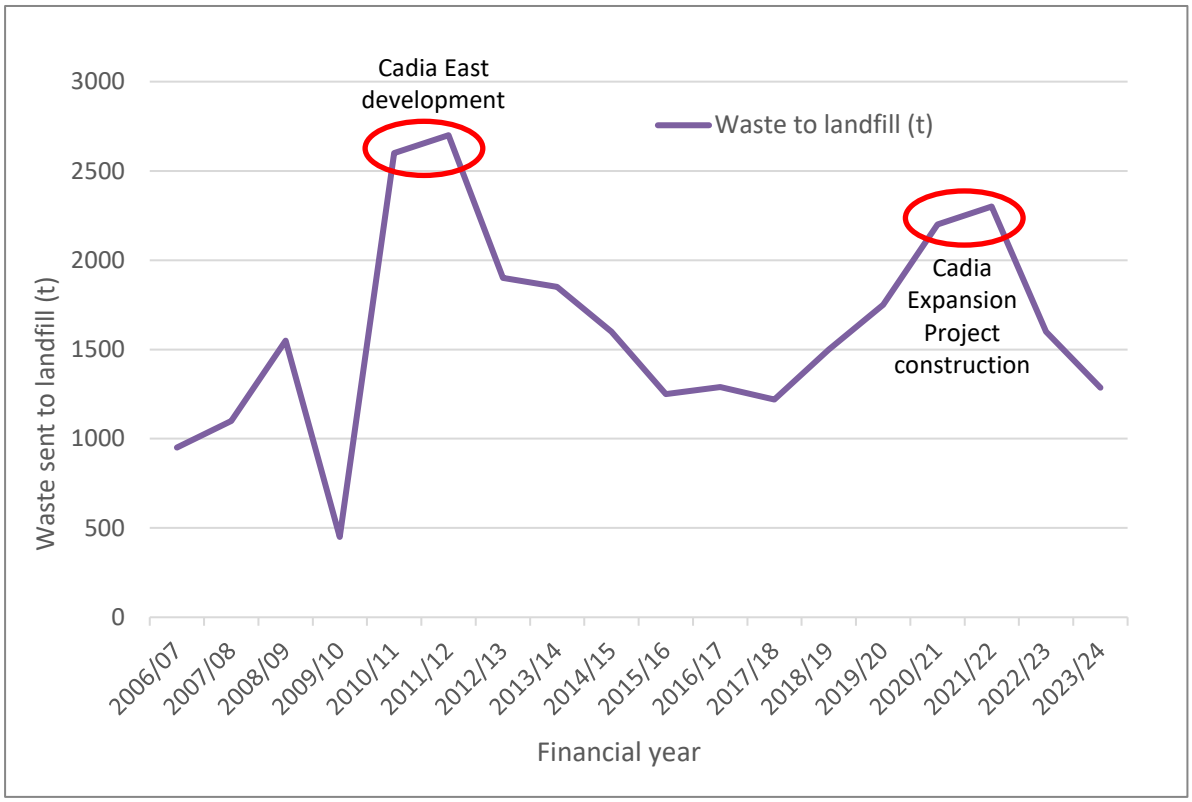


Figure 12 – Long term waste to landfill performance

Cadia has set a target to recycle a minimum of 65% of total waste (by weight) transported off-site. During the reporting period, 84% of waste was recycled, exceeding the target. Manual sorting, improved liquid separation processes and increased site awareness has led to an improved result.

Long term performance against the recycling target is shown in Figure 13 as a 12-month rolling average. The graph shows a strong trend in reducing general waste directed to landfill, linked to increased recycling efforts and segregation at site.

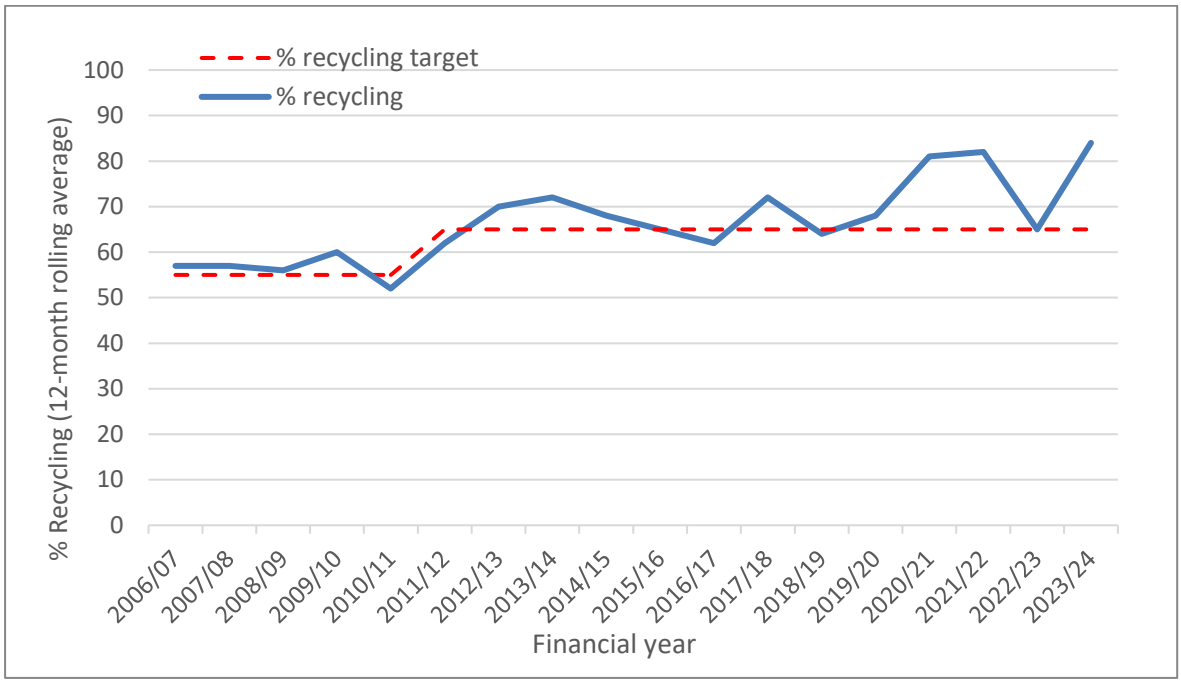


Figure 13 – Annual average recycling FY 2007-2024

13.3.3 Comparison against Cadia East EA predictions

Presented in Figure 14 is a comparison between the actual waste volumes generated during the reporting period and the waste volume predictions in the Cadia East EA. The data shows that actual volumes generated align well with predictions. Actual volumes exceeding predictions contribute to increased recycling volume.

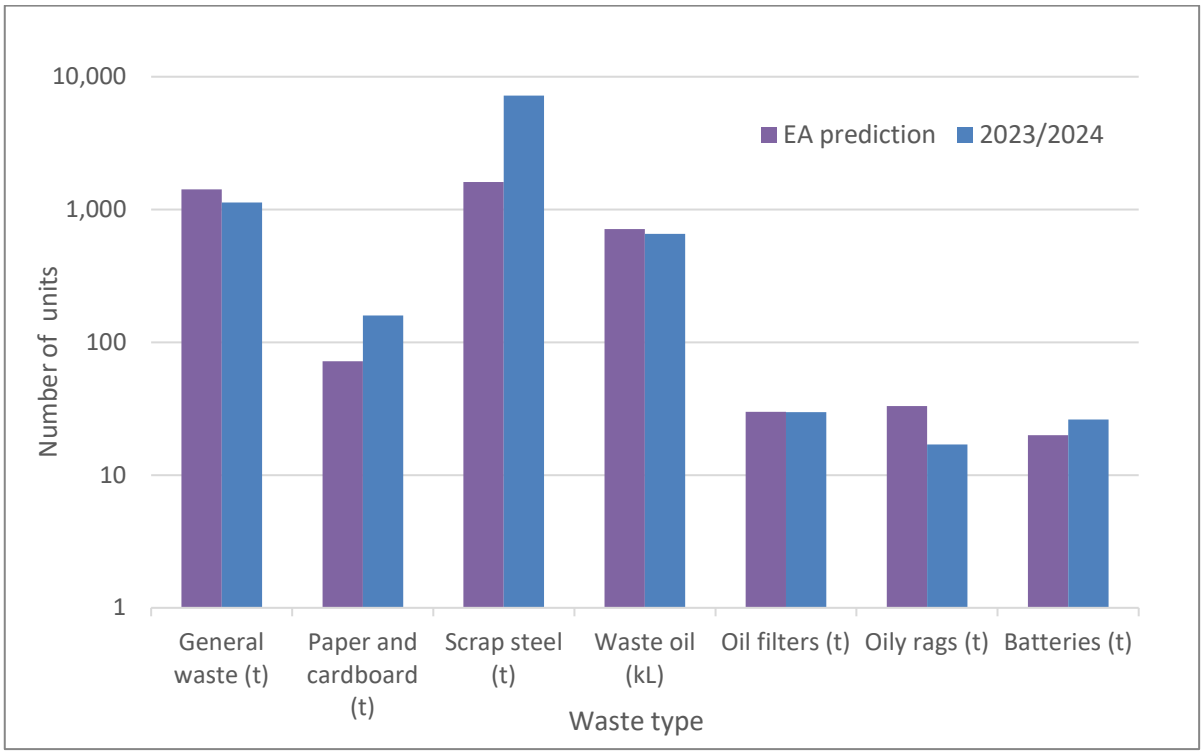


Figure 14 – Cadia East EA Waste Predictions vs FY24 Actual Waste Volumes

13.4 Proposed improvements

The following measures are proposed to be implemented during the next reporting period to improve waste management performance at Cadia:

- Recycling target to be shifted from 65% to 75% to align with recent historical actual performance. Consistent performance is expected in FY25 due the same waste contractor engaged.
- Update the Non-Mineralised Waste Management Plan to adopt a management strategy according to the waste minimisation hierarchy.
- Continue to drive waste awareness across site.
- Continue to investigate recycling and recovery pathways for hazardous and non-hazardous waste.

14 WATER MANAGEMENT

14.1 Overview

Cadia's approach to water management is documented in the Cadia Water Management Plan (WMP). The current version of the WMP is provided in Section 21.2. The WMP sets the requirements for managing all aspects of surface water and groundwater resources at and in proximity to Cadia. The management requirements respond to the relevant water related conditions in PA 06_0295, EPL 5590, and other approvals.

The project approval conditions (see Schedule 3, Condition 22 to 35 of PA 06_0295) include requirements relating to water supply, discharge limits, compensatory water supplies, baseflow offsets, site water management plan, mine water management performance measures, amongst others.

EPL 5590 includes requirements relating to pollution of waters, competence, maintenance of plant and equipment, monitoring and recording, amongst a range of other general water related conditions.

Included in the below sections is a summary of management practices, environmental performance, and proposed improvements for implementation during the next reporting period.

14.2 Management practices

The range of water management practices included in the WMP have been implemented during the reporting period. The management practices implemented include those related to:

- Site water management: ensuring water demand is met within extraction limits by forecasting water usage.
- Implementation of water capture ponds and basins to ensure run-off from operational areas does not exit site.
- Erosion and sediment control: implementation of strategies to manage soil erosion and sediment generation.

14.3 Environmental performance

14.3.1 Water accounting summary

An account of all water inputs and outputs associated with the operation at Cadia is documented in the site water balance model. The water balance model simulates the water management system at Cadia, which includes interlinked on-site storages, storage catchments, the process plant, water pumping systems, and several off-site water supply sources. The water balance model is routinely reviewed and updated, providing valuable information that assists with operational decisions at Cadia.

The water balance assessment has been undertaken in accordance with the Minerals Council of Australia (MCA) Water Accounting Framework (WAF) (Minerals Council of Australia [MCA], 2022) and the International Council on Mining & Metals (ICMM) Water Reporting Good Practice Guide (ICCM, 2021). The outputs from the water balance assessment are included in Appendix 5. Key findings from this assessment are included in the below sections.

14.3.1.1 Water balance, water consumption and efficiency

Table 27 and Table 28 present the types of water inputs, outputs, discharge and consumption during the reporting period. Note that the acronym ML used throughout the remainder of Section 14 refers to megalitre and not Mining Lease.

Table 27 – Operational and other managed water withdrawal during the reporting period

Inputs	ML	Quality*	Notes
Surface water			
Precipitation and runoff	1,703	Category 1	1
	5,706	Category 2	2
External surface water storages	384	Category 1	3
Groundwater			
Aquifer interception	501	Category 2	4
Bore Fields	58	Category 1	
Entrainment	620	Category 3	5
Third party water			
Town effluent	118	Category 1	6
Total inputs	9,089 ML		
Other managed water – Withdrawal			
Surface water	2,890	Category 1	-
Total diversion inputs	2,890 ML		

*Categories defined as per Water Accounting Framework User Guide (2022)

Category 1: Water of a high quality and may require minimal and inexpensive treatment, such as disinfection and pond settlement of solids, to raise the quality to appropriate drinking water standards

Category 2: Water of a medium quality with characteristics: TDS >1,000mg/L

Category 3: Water of low quality with characteristics: TDS >5,000mg/L

Notes:

1: Includes Cadia Creek, Copper Gully, Hoares Creek & Rodds Creek

2: Includes SWRD, TSF, NLD, SLD & SRP

3: Cadiangullong Dam

4: Combined estimate of groundwater inflow to the Cadia East and Ridgeway underground mines

5: Entrained in feed ore

6: Municipal effluent from Orange City Council

Table 28 – Operational water discharge and consumption during the reporting period

Inputs	ML	Quality	Notes
Operational water consumption			
Evaporation	2,114	Category 2	-
Entrainment	9,239	Category 3	-
Other	679	Category 3	-
Total consumption	12,032 ML		
Other managed water – discharge/consumption			

Inputs	ML	Quality	Notes
Surface water discharge	2,515	Category 1	1
Evaporation	376	Category 1	-
Total diversion outputs	2,890 ML		
Notes: 1: Environmental flow release to Cadiangullong Creek and overflow from Cadiangullong Dam spillway			

The stored water volume within Cadiangullong Dam was >90% throughout the entire reporting period. The minimum stored water volume recorded was 3,894 ML on 1 July 2023. This stored water volume represents 92.7% of the dam's total storage capacity. On this basis, Condition 28 Schedule 3, which restricts water extraction from Cadiangullong Dam to when the stored water volume within the dam is ≥10% (i.e. 420 ML), was complied with.

Included in Table 29 is a statement of operational efficiencies for the reporting period. This data has been developed in accordance with MCA (2022).

Table 29 – Statement of operational efficiencies

Operational efficiencies	Value	Notes
Total water into tasks	81,674 ML	1
Volume of worked water into tasks (water reused)	70,946 ML	1
Reuse efficiency	87%	1
Consumptive use	12,032 ML	2
Use per tonne milled	428 (L/tonne)	3
Notes: 1: Calculated based on task aggregation according to MCA (2022). 2: Represents the sum of all system losses including tailings entrainment, evaporation, and other minor losses. 3: Litres of water consumed divided by tonnes of ore milled		

14.3.1.2 Review of water take

A summary of compliance with Water Access Licence (WAL) requirements is included in Table 30 Water Access Licence compliance summary. This information shows that the water take requirements for all WALs were complied with during the reporting period.

Table 30 – Water Access Licence compliance summary

Water Access Licence (WAL)	Water source	Unit share	Reporting period water take (ML)	Compliance status
Surface water				
32280	Belubula River regulated water source[1] (Pumped extraction – Belubula River General Security)	4,080	0	Compliant
32255	Belubula River regulated water source[1]	3,125	0	Compliant

Water Access Licence (WAL)	Water source	Unit share	Reporting period water take (ML)	Compliance status
	(Pumped extraction – Belubula River Supplementary)			
31527	Belubula tributaries below Carcoar Dam water source[2] (Pumped/piped extraction for: Cadiangullong Creek, Cadia Creek, Copper Gully, Rodds Creek and Flyers Creek)	4,200	157	Compliant
31517	Belubula tributaries below Carcoar Dam water source[2] (Irrigation supply for 'Narambon' property)	6	0	Compliant
31505	Belubula tributaries below Carcoar Dam water source[2] (Stock + domestic supply for 'Stratton Vale' property)	4	0	Compliant
Groundwater				
31062	Orange Basalt groundwater source[3] (Pumped extraction 'Te Anau' bore + incidental groundwater inflow Ridgeway and Cadia East)	286	14.4	Compliant
28099	Orange Basalt groundwater source[3]	68	0	Compliant
31072	Lachlan Fold Belt Murray Darling Basin (MDB) groundwater source[3] (Pumped extraction CB3, CB6, CB8, CB9, RH641)	371	57.2	Compliant
36229	Lachlan Fold Belt MDB groundwater source[3] (Incidental groundwater inflow Ridgeway and Cadia East)	931	431.3	Compliant
Note: 1: Belubula River regulated water source 2012 2: Lachlan Unregulated River Water Sources 2012 3: NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020				

14.3.1.3 Water storage

Presented in Table 31 is a summary of stored water at Cadia at the start and end of the reporting period, along with the capacity of each storage. The change in stored water during the reporting period is represented in Figure A8.1 in Appendix 8.

Table 31 – Summary of stored water

Water type	Storage	Start of reporting period (ML)	End of reporting period (ML)	Storage capacity (ML)	Table note
Clean water	Cadiangullong Dam	3,882	4,219	4,200	
Site captured water	Hoares Creek	0	0	56	2
	Cooper Gully Dam	-	0	45	-
	Combined EPA point 1	<5	<5	103	2, 4
	Cadia Extended Pit	1,151	1,041	1,000 (estimate)	-
Mixed Water (4)	Cadia Hill Pit (decant water volume)	23,841	19,891	25,000 (estimate)	1
	Rodds Creek Dam	9,966	10,882	14,500	-
	NTSF Decant Pond	139	103	1,883	5
	STSF Decant Pond	196	244	2,068	5
	Combined EPA point 3[7]	<50	<50	217	3, 4
TOTAL		39,175	36,380[6]	-	-

Notes:
1: Deposition of tailings into the Cadia Hill Pit commenced 4/5/2018. Volume of decant water is estimated.
2: Nominal dewatered volume.
3: Stored water volume maintained below operating volumes as per Water Management Plan (2023).
4: Mixed water contains raw water and water for reuse.
5: Volume estimated. Capacity refers to the Trigger Action Response Plan (TARP) level specified in the Water Management Plan (2023).
6: excludes Combined EPA Points (i.e. volume held in sediment / seepage dams).
7: defined as SROP, NLD, SLD, ST14 and R2.

14.3.2 Stream health monitoring

The environmental monitoring program at Cadia includes biannual aquatic ecosystem surveys. The surveys focus on the assessment of macroinvertebrates, fish and aquatic habitat conditions at designated monitoring sites on waterways within and surrounding Cadia. The results of the two aquatic surveys undertaken during reporting period are included in the Aquatic Ecosystem Monitoring Project (AEMP) report included in Appendix 2. Key findings in the AEMP are:

- There was no evidence to suggest activities at Cadia have affected water quality of Cadiangullong Creek or Rodds Creek, with broader scale land-use (agricultural pollution, disturbance to riparian zone vegetation, downstream impacts of dams) likely to be impacting aquatic ecosystem health.
- Streamflow in Cadiangullong Creek and other waterways monitored reflected rainfall patterns, with flows recorded within the range of historical records.
- There was evidence of increased copper in the sediments of Cadiangullong Creek downstream of the mine, which was attributed to site mineralisation around the Cadia Hill Pit (deposition site for sediments).

- There was no evidence to indicate that activities at Cadia have affected macroinvertebrate health, and sediment was not found to be a major factor impacting macroinvertebrates.
- A relatively healthy fish community dominated by the native Mountain Galaxias (*Galaxias olidus*) was identified at several sites in different waterways, with spring recruitment of Mountain Galaxias juveniles indicating a self-sustaining population with adequate recruitment.
- eDNA monitoring for platypus indicates the distribution and presence throughout Cadiangullong Creek.

14.3.3 Streamflow and baseflow

Included in the following sections are summary results from data recorded during the reporting period at streamflow gauging stations on Cadiangullong Creek, Flyers Creek, Rodds Creek and the Belubula River. Discussion of this data against the project approval conditions and licence requirements, and the predictions in the EA are also included.

14.3.3.1 Streamflow monitoring

A summary of the streamflow monitoring data collected during the reporting period is presented in Table 32. Compliance streamflow conditions applying to Cadiangullong Creek and Flyers Creek were met during the reporting period. Hydrographs showing the streamflow data records for the gauging stations referenced in Table 32 are included in Appendix 8.

Table 32 – Summary of flow monitoring at gauging stations

Waterway	Flow gauging station	Summary of data record
Cadiangullong Creek	Forestry (GS412168)	Median daily flow rate of 4.22 ML/d (see Figure A8.2 in Appendix 8).
	Cadiangullong Dam (GS412144)	Median daily flow rate of 9.01 ML/d (see Figure A8.2 in Appendix 8). Dam level above spillway for 161 days in the reporting period.
	Southern Lease Boundary (GS412161)	Median daily flow rate of 4.96 ML/d (see Figure A8.2 in Appendix 8).
	Oaky Creek (GS412702)	Median daily flow rate of 6.38 ML/d (see Figure A8.2 in Appendix 8). Riparian release flow criteria for Cadiangullong Dam were achieved for the duration of the reporting period (see Figure A8.6 in Appendix 8). The medium flow requirement was achieved during the reporting period with 5 flow events of greater than 12 ML/d. These flow events were sustained for 4, 7, 24, 30 and 34 days.
Flyers Creek	Flyers Creek (GS412147)	Median daily flow rate of 5.5 ML/d (see Figure A8.6 in Appendix 8). No water was extracted from Flyers Creek during the reporting period.
Rodds Creek	Rodds Creek Dam Upstream (RCUBW)	Median daily flow rate of 0.01 ML/d (see Figure A8.8 in Appendix 8).
	Downstream of STSF seepage collection pond (RCDBW)	Median daily flow rate of 0.1 ML/d (see Figure A8.8 in Appendix 8).

Waterway	Flow gauging station	Summary of data record
Belubula River	The Needles (GS412056)	The median daily discharge during the reporting period was 79.2 ML/day (see Figure A8.9 in Appendix 8), which is 215 ML/day lower than the median streamflow discharge recorded during the previous reporting period. The streamflow data captured in the previous reporting period was heavily influenced by significant flood events (particularly in November 2022) which contributed to large flows in the system and a high median streamflow discharge value.

14.3.3.2 Baseflow calculations

An assessment of the streamflow monitoring data recorded during the reporting period has been undertaken to estimate the baseflow contribution. The Filter Separation Method (HYBASE – WithinKernel Filter) has been used which is consistent with previous annual review assessments. This method is based on the Lyn and Hollick algorithm and a function of the Hydstra database which records all hydrographic information from across the site.

The baseflow and total streamflow were summed on a 12-month rolling basis. The Baseflow Index (BFI) was calculated as the proportion of baseflow relative to total streamflow (expressed as a percentage). A comparison of BFI values against pre- and post-mining BFI predictions for Swallow Creek and Diggers Creek (both near Ridgeway Mine) and Flyers Creek (near Cadia Mine) is included in Appendix 8. BFI is the ratio of baseflow to total streamflow and can vary significantly due to rainfall runoff conditions.

A summary of the BFI assessment is included in Table 33.

Table 33 – Summary of baseflow index assessment

Waterway	Flow gauging station	Commentary
Swallow Creek	SCBW2	Estimated BFI of 47% to 70%. Median streamflow of 0.04 ML/d. Refer to Figure A8.11 in Appendix 8.
	GS412167	Estimated BFI of 46% to 71%. Median streamflow of 1.1 ML/d. Refer to Figure A8.12 in Appendix 8.
Diggers Creek	DCBW1	Estimated BFI of 60% to 65%. Median streamflow of 0.01ML/d. Refer to Figure A8.13 in Appendix 8.
	GS412166	Estimated BFI of 50% to 65%. Median streamflow of 0.3 ML/d. Refer to Figure A8.14 in Appendix 8.
Flyers Creek	GS412147	Estimated BFI of 57% to 80%. Median streamflow of 5.7 ML/d. Refer to Figure A8.15 in Appendix 8.

14.3.4 Spring monitoring

As described in previous annual review reports, the EA predicted that there would be no impact on the springs within the original Cadia East 1 m groundwater drawdown zone. Notwithstanding

this, data has continued to be collected at monitoring location SPR03 to determine whether there is connection between the springs and the basalt aquifer. SPR03 is not affected by local groundwater extraction or dam storage.

Daily flow at SPR03 during the reporting period is included in Figure A8.16 in Appendix 8. The long-term daily flow recorded at SPR03 (July 2012 to July 2024) and the water level time series at groundwater monitoring bore MB55 is included in Figure A8.17 in Appendix 8. To establish relationship between spring flow and rainfall, flow data captured at SPR03 is presented alongside cumulative rainfall departure (CRD) data in Figure A8.18 in Appendix 8.

The graphs in Appendix 8 indicate that daily median flow at SPR03 was 0.01ML/day and that daily flow as well as water level in MB55 generally align with CRD.

14.3.5 Surface water quality

A review of the monitoring data collected at the established surface water quality sites during the reporting period has been undertaken by Engeny (2024). This surface water assessment report is included in Appendix 4. Key findings from the assessment are included in Table 34. The monitoring sites referenced in Table 34 are shown spatially in Figure 3.

Table 34 – Surface water assessment key findings

Monitoring area	Relevant montoring sites	Key findings
Upper Cadiangullong Creek	412144, 412168, CAWS0, CAWS2, CAWS3	• Surface water monitoring results for all locations in the upper Cadiangullong Creek management zone were generally consistent with historic monitoring data. All results for antimony, arsenic, chromium, lead, mercury and silver were consistently below the limit of detection. • All results for aluminium, cadmium, cobalt, copper, iron, molybdenum, nickel and zinc were consistently low and within the historic range with no outliers observed. All results for antimony, arsenic, chromium, lead, mercury and silver were consistently below the limit of detection. • The results indicate no impacts from the mining operations to the receiving environment in this management zone.
Cadia Hill Pit	CAWS65	• Results from the Cadia Hill Pit management zone indicate no mining related impacts in the receiving environment
Ore processing areas	CAWS73, CAWS78, CAWS79	• Surface water monitoring results for all monitoring locations in the Ore Processing Area management zone were generally consistent with historic monitoring data with 3 outliers observed during FY24. • The majority of results for all dissolved metals were within the historic range, with no mining related impacts in the receiving environment observed. • Two results for molybdenum and one result for zinc exceeded the historic range at CAWS79. These concentrations are still considered to be relatively low and unlikely to pose a risk to the environment. • Results from the Ore Processing Area management zone indicate no mining related impacts in the receiving environment.
Waste rock dumps	412161, CAWS34, CAWS35, CAWS37, CAWS52	• Surface water monitoring results for all locations in the Waste Rock Dumps management zone were generally consistent with historic monitoring data during FY24 • Results from all 5 locations in the Waste Rock Dumps Management zone indicate no impact to the receiving environment from waste rock dump runoff.
TSF Eastern Zone	CAWS42, CAWS43, CAWS60	• All monitoring locations in the TSF eastern management zone are actively managed as part of the process water system. • The results indicate no impacts on the receiving environment from mining operations in the TSF Eastern Zone.

Monitoring area	Relevant montoring sites	Key findings
TSF Western Zone	CAWS61, CAWS62, CAWS64, CAWS67, CAWS68, CAWS69, CAWS72, CAWS75, CAWS76	• Surface water monitoring locations CAWS67, CAWS68, CAWS69 and CAWS72, displayed increasing trends during FY24 and higher results for several analytes. These analytes include EC, TDS, calcium, magnesium and sulphate. • All results for antimony, cadmium, chromium, mercury and silver were below the limit of detection at all monitoring locations during FY24. All results for aluminium, arsenic, cobalt, manganese and nickel were low and within the historic range. • Changes in water quality appear to be confined to the dam monitoring locations. Results for receiving environment monitoring locations (CAWS61 and CAWS62) in the management zone indicate no impact to the receiving environment from mining related activities.
TSF Southern Zone	412702, CAWS28, CAWS30, CAWS31, CAWS41, CAWS54, CAWS55, CAWS56, CAWS57, CAWS59, CAWS63	• The majority of results for the TSF Southern Zone for FY24 were consistent with historic monitoring results. • Results for most dissolved metals were below the limit of detection or within the historic range. Some higher values for molybdenum were observed at CAWS55 and CAWS56. The higher values were only slightly above the historic range and considered relatively low concentrations. The higher results do not appear to be part of a trend. Higher results were observed at CAWS31 for several dissolved metals. CAWS31 is located at seepage basin ST14. Water stored here is managed via the reclaim water system. • No long-term trends were observed in the TSF Southern Zone. The results indicate no mining related impacts to the receiving environment.
Blayney Dewatering Facility	NEC061, NEC062	• The majority of results for all analytes were within the historic range for surface water monitoring locations in the former Blayney Dewatering Facility management zone during FY24. While there were some higher values for sodium and magnesium, these values were within the historic range for the monitoring locations and are not part of any emerging or ongoing trends. • The results indicate no mining-related impacts to the receiving environment.
Cadia Dewatering Facility	CDW01, CDW02, CDW03, CDW04, CDW05	• The majority of results for monitoring locations in the CDF management zone were within the historic range during FY24. • Several dissolved metals returned results that were consistently below the limit of detection. Higher molybdenum and copper values were observed at CDW05 during FY24. The higher molybdenum values do not appear to be part of a trend. • There was one exceedance of the SSGV for copper at CDW05 during the reporting period (in October 2023). Copper at the location exhibits a long-term increasing trend. It is recommended that further investigation of increasing copper trends be undertaken and that the monitoring frequency at CDW05 be increased to monthly (currently quarterly).

Surface water monitoring locations 412702 and CDW05 have been assessed against SSGVs for the sites to determine whether there were any exceedances during the FY24 reporting period. Monitoring location 412702 is downstream of the Cadia Mine and monitoring location CDW05 is located downstream of the CDF. Key outcomes can be summarised as follows:

- There were 3 exceedances at 412702 during the reporting period, 1 for TSS and 2 for aluminium.
- There was an exceedance of 1 analyte (copper) at CDW05 in the reporting period.

For all the exceedances there were rainfall events in the days prior which appear to have contributed to increased runoff volumes and changes to analyte concentrations. At surface water monitoring location 412702, higher values of the analytes of interest (i.e., aluminium and TSS) were observed upstream of the Cadia Mine on the same day, indicating that the higher results were not caused by mining-related activities.

14.3.6 Groundwater assessment

An assessment of the groundwater monitoring data collected during the reporting period has been undertaken by AGE (2024) and is provided in Appendix 3. Presented in Table 35 are key findings from the review performed by AGE.

Table 35 – Groundwater assessment key findings

Monitoring area	Monitoring bores within area	Key findings
Cadia Hill Pit	MB30, MB91, MB92, MB93, MB94, MB96, MB97, MB99A, MB99B, MB100, MB101, PZ4, PZ5, PZ10, PZ10A, PZ89, PZ89A, PZ90, CQ098	• Some tailings deposition impacts are evident bores within the pit, MB96 and PZ90 • Risk of groundwater migrating away from the pit at present is minimal, with monitoring and numerical modelling data showing an inwards hydraulic gradient • The potential for the offsite migration of impacted groundwater is adequately monitored, with many groundwater monitoring bores installed at various depths
Ridgeway Mine	RO10A, RO10B, RO11, RO12, RS07, RS08, RO6A, RO6B, RO7, RO8, RS03	• At present, the Ridgeway Mine is conceptualised to behave as a groundwater sink • Monitoring data indicates drawdown is not laterally extensive and groundwater levels are consistent with climatic conditions • It is unlikely that there is any mining related effect on groundwater-surface water interactions
Processing Facility	MB1A, MB1B, MB2A, MB2B, MB3A, MB3B, CB14A, CB14B, CB6A, CB8A, CB8B	• Groundwater level variations are generally consistent with climate • Groundwater quality was found to align with historical records
Cadia East Mine	MB73, MB44A, MB44B, MB46, MB47A, MB47B, MB48, MB49, MB50, MB51, MB52, MB62, MB73, MB76, MB82, MB88, RB07	• Observed groundwater level decreases are generally consistent with environmental impact assessment predictions • Potential mining related declines in Silurian sediment monitoring bores RB07, MB46, and MB73 may indicate that modelled predictions underestimate drawdown and depressurisation within the Silurian sediments. Notwithstanding, no groundwater level decreases are observed within monitoring bores that are nearer and adjacent to Flyers Creek, and as such, no effects to creek baseflow are likely

Monitoring area	Monitoring bores within area	Key findings
NTSF and STSF	MB20,MB21, TW05B, MB68, MB69, MB70,MB80, MB25,MB26A, MB26B, MB27, MB28A, MB28B, MB29A, MB29B, MB77A, MB77B, MB78, MB79, MB83, MB84,MB85, MB86, MB87, MB90	• Long-term groundwater level increases have been observed adjacent to the NTSF and STSF, largely within 250m of the facilities • Water quality records indicate that some seepage is likely around the NTSF and STSF, but seepage indicators decrease with distance away from TSFs • Potential seepage is well monitored in the direction of potential receptors (Cadiangullong Creek and Rodds Creek). • No mining-related impacts are apparent in nearby or downstream sections of the Cadiangullong Creek
South Waste Rock Dump	MB4A, MB4B, MB5C, MB6A, MB6B, MB7A, MB7B, MB8A, MB8B, MB9A, MB9B, MB10A, MB10B, MB11A, MB11B	• Groundwater level variations in monitoring bores that are hydraulically down gradient of the SWRD are consistent with climate, and no increases associated with the SWRD are apparent • There is evidence of SWRD leachate influencing the groundwater chemistry of these monitoring bores, namely elevated concentrations of TDS and sulfate, as well as historical increasing trends • A review of water quality and aquatic ecosystem monitoring indicates that no mining related impacts are apparent in nearby or downstream sections of Cadiangullong Creek
Regional	MB53, MB54, MB55, MB56, MB63, MB64, MB65, RB01, RB02, MB71, MB72, MB74, MB75, MB81, RB03, RB04, RB05	• Hydrographs for regional bores, outside or on the outer edge of modelled drawdown prediction show declines over a similar period, suggesting that the declines observed are aligning with climatic conditions

Five groundwater level exceedances and 43 groundwater quality exceedances were recorded over the 2023/2024 water year. Exceedances were not deemed to be part of a long-term trend, nor was any evidence of impact to the receiving environment detected (refer to Appendix 3 for further discussion on this).

14.3.7 Groundwater model review

A review of the Cadia groundwater model was recently undertaken by Worley. The scope of the review involved an assessment of groundwater level data collected up to April 2024; review of available information related to private bores; update and review of groundwater model performance; comparison of drawdown predictions, and a review of current water level triggers.

The report concluded that:

- there were no mining-related drawdowns indicated by the data collected at monitoring bores.
- there is good agreement between the simulated groundwater levels and measured data.
- there are no landholder bores, springs or groundwater dependent ecosystems within the predicted zone of depressurisation.

14.3.8 Erosion and sediment control

Sediment control structures are employed at Cadia to manage runoff from disturbed catchments. Management of these structures has been undertaken generally in accordance with the WMP.

Commentary on compliance with the specific EPL 5590 conditions pertaining to sediment control is included in Table 36, whereas Table 37 provides a statement of compliance regarding the licenced discharge points. The storage capacity of the sediment control structures (as of June 2024) is included in Table A8.1 in Appendix 8.

Monthly summaries of sediment control performance against EPL 5590 requirements have continued to be prepared and have been uploaded to the Cadia website.

Table 36 – EPL 5590 operating conditions

Condition	Statement of compliance
O4.1	As far as practically possible, sediment dam capacity was restored in all required sediment dams within 5 days of rainfall.
O4.2	Nil uncontrolled discharges from sediment control structures occurred during the reporting period.
O4.3	As far as practically possible, dam capacity was restored in all dams identified as EPA licensed discharge point 3 within 14 days of rainfall.
O4.4	No discharges occurred from leachate, seepage, and process water collection basins identified as EPA identification licence discharge point 3.
O4.5	28 dams surveyed in reporting period; routine desilting works occurred in process water pond and site runoff pond.

Table 37 – EPL 5590 licenced discharge statement of compliance

Discharge point	Location	Statement of compliance
1	Sediment basins	No discharge occurred during the reporting period.
2	Overflow from Orange City Council effluent reuse pipeline break pressure tank to Cadiangullong Creek (CD11)	No discharge occurred during the reporting period.
3	Specific mine water storages (including seepage and leachate dams)	No discharge occurred during the reporting period.
19	SW088	No exceedances identified at this location.

14.4 Proposed improvements

The following improvements to water management are proposed:

- Review recommendations made in the Annual Groundwater Monitoring Review (Appendix 3) and the Annual Surface Water Assessment (Appendix 4) and implement recommendations identified.
- Review of site sediment basins and leachate dams following catchment surveys.
- Major works for sediment management in Site Runoff Pond (SROP).

15 REHABILITATION

15.1 Overview

Requirements for rehabilitation at Cadia are set out in PA 06_0295, specifically Conditions 36, 37, 41, and 41B in Schedule 3. In accordance with project approval requirements, Cadia has developed a Rehabilitation Strategy and a Rehabilitation Management Plan (RMP). Together these documents set the objectives for rehabilitation at Cadia, including achieving the final landform and land use, along with the measures to be implemented to monitor performance against objectives.

In addition to the rehabilitation related conditions in the project approval, the Cadia Mine Leases include rehabilitation conditions. The approach to satisfying these requirements is included in Cadia rehabilitation documents. The rehabilitation aim at Cadia is to generate safe, stable, non-polluting and self-sustainable landforms at the mine site and on Cadia owned land.

Commentary on the status of the rehabilitation documents including revision number and Secretary approval status where relevant is included in Section 21.2.

15.2 Management practices

The Rehabilitation Strategy and RMP detail the objectives and management measures to be implemented at Cadia. The overall rehabilitation approach and the post mining land use objectives for Cadia are broadly based on the pre-existing land uses within the Cadiangullong Creek Valley, which includes grassy woodland and agricultural activities. Rehabilitated landforms will aim to blend in with the surrounding topography by adopting characteristics consistent with undulating hills which are common in the region.

Management practices included in the rehabilitation and biodiversity management documents have been implemented throughout the reporting period. Specifically, this has included:

- Various quality assurance processes such as stored topsoil volumes, biosolids volumes, native seed store quantities, waste rock volumes, weed control and pest management (see the RMP for details) to validate that rehabilitation has been undertaken in accordance with the approved plan.
- Rehabilitation monitoring program (refer to the 2023/2024 report included as Appendix 6) to determine whether early intervention is required to assist with meeting final land use objectives and completion criteria, and to refine revegetation techniques to ultimately meet completion criteria.
- Other inspection and monitoring as detailed in the RMP such as fencing inspection, targeted water quality sampling of backfilled void water and leachate ponds, and inspections of sediment dams.
- Cover system performance monitoring program (refer to the 2023/2024 report included as Appendix 7).
- Various rehabilitation research, modelling and trials (see the RMP for details).
- Inspection of tubestock success/seedling density.
- Native seed collection program.

15.3 Environmental performance

A summary of actual rehabilitation performance both on-site and off-site is included in Table 38. Data is included for the current reporting period (2023/2024) and for the two most recent reporting periods (2021/2022 and 2022/2023) to enable comparison with historical data. Also

included in Table 38 is the forecast rehabilitation performance for the next reporting period (2024/2025).

The rehabilitation performance data shows that whilst there were no opportunities to undertake progressive rehabilitation on the mine site, Cadia increased revegetation efforts in offset areas substantially over the previous reporting period.

Table 38 – Summary of actual (2021-2024) and forecast rehabilitation performance (2024-2025)

Area type	2021/2022 reporting period (actual)	2022/2023 reporting period (actual)	2023/2024 reporting period (actual)	2024/2025 reporting period (forecast)
Total mine footprint (ha)	2,077[3]	2,254[3]	2,550	2,684
Total active disturbance (ha)	1,567[3]	1,926[3]	2,298	2,432
Land being prepared for rehabilitation (ha)[1]	1.6	9.2	0	0
Biodiversity offset areas (ha)	5	14.5	79.5	124
Completed rehabilitation (ha)[2]	0	0	0	0

Notes:

[1] Preparation refers to landform establishment and development of growth medium

[2] Denotes land that has been signed off by the Resources Regulator as completed rehabilitation

[3] Significant variations from 2021/2022 associated with updated spatial mapping and calculations used, including the addition of the NTSF containment bund, Upper Rodds Creek Dam and Cadiangullong Dam, as well as new disturbance during the reporting period.

The below sections provide discussion on the on-site performance against rehabilitation requirements during the reporting period, along with commentary on forward program predictions, rehabilitation monitoring, trials and research, and key issues affecting rehabilitation.

15.3.1 Rehabilitation performance on-site

On-site rehabilitation activities have been undertaken during the reporting period in accordance with the approved RMP. Detailed performance outcomes of the rehabilitation work undertaken at Cadia are included in Appendix 6, with a summary provided below:

- Holistically, the NWRD is not trending towards the proposed rehabilitation objectives and completion criteria due to issues associated with the species mix without additional intervention. Cadia is systematically addressing this through actions including additional infill planting and re-seeding with target vegetation species.
- The SWRD is experiencing similar issues, although there were some areas that were exhibiting characteristics of target vegetation.
- Erosion and drainage issues are present on both the NRWD and SWRD, with rectification works planned to commence in November 2024 to repair these issues.

15.3.2 Comparison with forward program predictions

Discussion on rehabilitation performance against predictions in the forward program is included in the following sections.

15.3.2.1 Performance against rehabilitation forecasts

Cadia operated in line with the rehabilitation forecast included in three-year Forward Program applicable to the reporting period (i.e., 1 July 2023 to 30 June 2026). Performance against the rehabilitation predictions for the reporting period is summarised in Table 39 and Table 40.

Table 39 – Summary of three-yearly forecast cumulative disturbance and rehabilitation progression

Aspect	Year 1 2023/2024 (forecast)	Year 1 2023/2024 (actual)	Year 2 2024/2025 (forecast)	Year 3 2025/2026 (forecast)
Total surface disturbance footprint (ha)	2,510	2,424	2,559	2.597
Total active disturbance (ha)	2,182	2,172	2,306	2,344
Total new area of land proposed for active rehabilitation (ha)	0	0	0	0

An inventory of bulk materials commonly used during on-site rehabilitation works is provided in Table 40. The data presented highlights that the site holds sufficient stocks of topsoil, clay and benign rock (NAF) for use in future rehabilitation and construction works.

Table 40 – Materials inventory summary

Material	Currently stored as at June 2024 (m^3)	Forecast material balance 2024/2025 (m^3)	Total required until June 2031 (m^3)	Surplus (+) or deficit (-) (m^3)
Topsoil[1]	4,286,921	4,690,133	4,596,000	(+) 94,133
Clay[2]	0	n/a	7,252,666	n/a
Non-acid forming (NAF) rock[3]	60,150,780	6,851,632	43,833,052	+ 16,317,727

Notes:

[1] topsoil required for 0.2 m thickness coverage of disturbed area (2298 ha)

[2] Clay available to be harvested from in-situ during stripping. HDPE liner available as alternate very low permeability layer for the cell comprised of potentially acid forming (PAF) rock.

[3] NAF required for 2 m thick layer of PAF cell 5,200,000 m^3. TSF decant cover 1,000,000 m^3, other areas 1,720,420 m^3 and material for tailings dam wall construction and buttressing works 36,000,000 m^3.

15.3.2.2 Performance against rehabilitation completion criteria

The performance of on-site rehabilitation areas against the rehabilitation completion performance criteria is detailed in the Rehabilitation Monitoring Report included in Appendix 6, and is summarised below:

- Ongoing improvement in ground covers observed and becoming ecologically stable across most monitoring sites.
- Some areas are showing successful establishment of a high diversity of native vegetation trending toward the desired final land use.
- All rehabilitation monitoring sites met ground cover targets (although many dominated by exotic pasture species).
- With some exceptions, all monitoring sites had similar native cover abundance and diversity to reference woodland sites.

- Tree and mature shrubs were recorded in all rehabilitation sites, although overall eucalyptus densities were low.
- There was a high variability of shrubs and/or juvenile trees with a declining trend in shrub densities (mostly associated with natural senescence).

The majority of performance indicators that were not achieved were primarily associated with the lack of a mature tree population and targets associated with a mature tree canopy structure.

15.3.3 Rehabilitation performance enhancement

The approach to rehabilitation at Cadia is continually being refined through the collection of ecological monitoring data, together with enhancement programs and research. Recent programs undertaken include monitoring waste rock dump cover performance, vegetation trials on the NWRD, and research into using constructed wetlands to manage water runoff from tailings storage facilities. A summary of rehabilitation enhancement programs conducted during the reporting period is included in the below sections.

15.3.3.1 Waste rock dump cover performance monitoring outcomes

During the reporting period, soil temperature profiles within the cover system remained controlled by ambient conditions. This suggests an absence of heat generation at depth and no evidence of oxidation of the stored waste material which is an indicator to the overall success of the cover system. Despite below average rainfall, the majority of monitoring stations remained within the optimal range for soil plant available water capacity with some sites remaining above the field capacity. Elevated water storage implies a risk of net percolation and waterlogging conditions that may adversely affect plant growth. However, evapotranspiration remains the primary factor affecting water movement through the cover system compared to runoff and percolations as evidenced by validation of the Waste Rock Dump water balance.

15.3.3.2 NWRD vegetation trial outcomes

The revegetation trials on the NWRD consisted of trialling various tubestock guards and surface preparation techniques. The 2023 trials suffered significant damage, with the 2024 trial results ongoing. The following summary of results shows:

Herbivory management:

- Various tubestock guards were trialled, ranging from cardboard guards with basic stakes to large coreflute guards with large stakes and pins. The trial that commenced in 2023 has shown basic cardboard guards do not protect against herbivory animals (likely kangaroos), with 2024 planting efforts utilising larger corflute guards.
- These larger guards have shown better success, although are still affected by herbivory animals (likely feral pigs). Cadia subsequently increased feral pest management measures to reduce the herbivory pressure within the NWRD trials.
- Other possible issues associated with herbivory animals are the use of water crystals or started fertilisers which may attract feral pigs.

Compaction and planting techniques:

- The 2023 trial indicated that planting that did not include sufficient ‘loosening’ of the growth medium (i.e. using push tubes to plant the seedlings) prior to planting appears to have restricted root establishment.
- The 2024 trial involved more rigorous planting preparation to de-compact the soil surface prior to planting (such as use of a mattock to loosen the growth medium).

- The results for the 2024 planting efforts will be presented in the next Annual Review (FY25).

15.3.4 Key issues affecting rehabilitation

The previous annual review for Cadia (Newcrest Mining Limited, 2023) identified several potential issues which have affected rehabilitation success at Cadia. The issues previously identified include:

- Animal grazing.
- Active erosion.
- Function of the water management structures on the NWRD and SWRD.
- Changes to soil chemical and physical properties.
- Declining shrub densities.
- Low abundance of eucalypt within rehabilitation areas.
- Weed presence.

The monitoring data and information gathered during the reporting period aligns with the key issues previously reported and are continuing to be addressed through existing and new management plans and the proposed improvements in Section 15.4.

15.4 Proposed improvements

Key improvements identified for the FY25 reporting period include:

- Further refining of the Rehabilitation Materials Inventory to incorporate clay and native seed resources.
- Progress the constructed wetlands study to further understand post-closure water quality.
- Increased and on-going pest management within rehabilitation and mine operation areas.
- Increased and on-going weed management, including the implementation of formalised, site-wide biosecurity protocols.
- Remediation works to address water management structures on the NWRD and SWRD.
- Where scheduling and conditions permit, undertake continued revegetation works on the NWRD and SWRD potentially including:
- infill tubestock planting within areas that have prior successful tubestock planting or areas that are missing structural or species composition elements
- direct seeding in areas where target vegetation communities have largely failed to establish.

16 COMMUNITY

16.1 Overview

Cadia's community engagement focus is on proactive, transparent engagement with local community members, and stakeholders. Cadia's engagement schedule is robust, and focuses on varying types of communication, information and engagement activities.

The summary below focusses on business-as-usual aspects of the site. The CCOP is not in relation to the current Project Approval and is for a future approval. As such, CCOP engagement outcomes are not reported in this document.

16.2 Community consultation/engagement

Cadia continues to be an active member of the local community and has conducted numerous community consultation and relationship-building activities during the reporting period. Cadia continues to focus on building upon its social licence to operate, including but not limited to, the stakeholder engagement activities included in Table 41.

16.3 Cadia Community initiatives and contributions

Included in Table 42 is a summary of Cadia's contributions to community initiatives during the reporting period. More than $2M was contributed to the community during the reporting period.

16.4 Community Complaints

Cadia operates a 24-hour Community Complaints Hotline number to enable the community to register complaints and enquire about site operations. The Complaints Hotline Number is 1800 063 043.

Complaints received by Cadia during the reporting period are summarised in Figures A10.1 and A10.2 in Appendix 10. Note, Newcrest was acquired by Newmont in November 2023. Newmont's corporate reporting is per calendar year, therefore all reporting has transitioned accordingly. The data included in the figures in Appendix 10 is presented in two 6-month reporting periods to align with Newmont's calendar year reporting as well as the financial year time period of the reporting period.

Table 41 – Summary of community engagement during the reporting period

Engagement activity	Dates undertaken / frequency	Summary
Modification 15 consultation activities	• November 2023 – one-to-one meetings with near neighbours • November 2023 – Information Sheet #3 distributed • December 2023 – Modification 15 community drop in session • May 2024 – Communication advising Modification 15 lodged • May 2024 – Information Sheet #4 distributed • Regular updates in all external communication (operational updates and Cadia Newsletter) • Regular updates in all community meetings (CCC, Cadia District Resident's Meetings)	Modification 15 progress updates and lodgement.
Local Council Chief Executive Officer and General Manager Meetings	• Monthly	Operational and project updates.
Cadia newsletter	• July 2023 • December 2023 • April 2024	Quarterly newsletter with expansive communication on operations at Cadia.
Cadia Community Consultative Committee (CCC)	• 21 August 2023 • 20 November 2023 • 19 February 2024 • 20 May 2024	Local stakeholder and Council updates of operational and project updates at Cadia.
Fortnightly smart communications	• Fortnightly	A fortnightly smart communication is a regular part of our communications strategy to provide consistent and transparent information. The email communication is sent out every two weeks and includes links to all updated website content/reports, along with other general information relevant to the community.

Engagement activity	Dates undertaken / frequency	Summary
Operational updates	• August 2023 • February 2024	Operational updates are distributed to the Cadia District community, with a summary of operations, environment, social performance and tailings management, including updates on dust mitigation. Operational updates are part of a full suite of communications designed to provide consistent and transparent information to the community.
Cadia District Enhancement Project (CDEP)	• 7 September 2023 (Annual General Meeting) • 23 November 2023 • 7 March 2024 • 6 June 2024	The CDEP program works with community members to deliver on environmental and community benefits for the Cadia District, with the aim of making it a more desirable place to live and work and enhancing the value of the area as an agricultural, mining, and lifestyle choice.
Cadia District Residents' Meeting	• 5 July 2023 (ANSTO special guest to discuss results from air quality project) • 18 July 2023 (community drinking water) • 29 August 2023 • 4 September 2023 (SAGE Environmental special guest to discuss human health risk assessment conducted) • 5 November 2023 • 27 February 2024 • 28 May 2024	Cadia District stakeholder and landholder meeting to provide operational and project updates to the community.
Cadia District Consultation Meetings	• One-to-one meetings • Exploration land access meetings • Introductory meetings – community engagement • 20 September 2023 – SAGE Envirnmental community drop in session • Groundwater Working Group meeting	Consultation meetings with local community members focussing on specific projects or approvals. A series of meetings occurred relating to topics of interest – specifically the community drinking water/air quality concerns, elevated noise levels and alleged groundwater seepage.
Cadia District Residents' Christmas Party	• 1 December 2023	Annual Cadia District Residents' Christmas party for the local community. This is an informal opportunity for Cadia to engage with members of the local community.

Engagement activity	Dates undertaken / frequency	Summary
Cadia Open Day	• 21 October 2023	Held every 2-3 years, the Cadia Open Day is a whole of site event where more than 2,500 members of the public visit the site to gain an understanding of mining.
Indigenous Relations	• Monthly OLALC and Cadia update meetings • National Aborigines and Islanders Day Observance Committee (NAIDOC) week celebrations • Reconciliation Week celebrations • 25 year site celebrations with Indigenous focus	Ongoing consultation and engagement activities with the local Indigenous community.
Local Elected Officials	• Various written communications	• Ongoing consultation and engagement activities • Monthly Government Update distributed
General stakeholder meetings and correspondence	• Belubula Landholders Association • Orange Aboriginal Medical Centre • Housing Plus • Orange360 • Environmental Concerned Citizens of Orange (ECCO) • NSW Health • Central Tablelands Local Land Services • NSW Farmers Association • NSW Department of Primary Industries • Central NSW Business HQ Orange Business Chamber • Millthorpe Village Committee	• Ongoing consultation and engagement activities • Quarterly stakeholder updates distributed • Updates on Modification 15 • Cadia Newsletter distribution

Table 42 – Summary of financial contributions to community during the reporting period

Initiative	Cadia contribution (AUD)*
Community Partnership Program Some key programs supported through the Program include: • Support of the Orange Aboriginal Medical Service Hydrotherapy Pool (multi-year commitment with total funding of $590,000 over three years) • $124,899 to support The Cumnock General Store to establish a commercial kitchen • $100,000 to support the Canobolas Clontarf Foundation, a program for young Indigenous males • Support of the Orange Regional Conservatorium (multi-year commitment with total funding of $250,000 over three years) • $72,000 to disability support services provider Wangarang Industries for the Orange Bulk Return and Earn Facility • $70,000 to the Millthorpe Museum for upgrades to their kitchen facilities	$1,052,144.37
Newcrest Sustainability Fund • $300,000 to Rural Aid to continue assistance with flood recovery in the Central West • $282,036 towards the Sticky Nightshade Community Research Project	$582,036.00
Community Contributions • Workforce engagement projects including: ○ Eugowra Schoolyard Blitz ○ Spring Terrace Schoolyard Blitz ○ Dinner in a Dash at Ronald McDonald House Charities Central West ○ Meal Cooking at Cancer Care Western NSW ○ Clean-up of Cadia Road ○ Landscaping at The Orchard To celebrate 25-years of operation, Cadia commissioned one-ounce gold coins which were auctioned off to local charities, raising $130,250. Two gold coins are still to be auctioned in the next reporting period.	$181,168.92 $130,250.00
Cadia District Enhancement Project Some key program highlights include: • CDEP Educational Grants – 10 residents approved at a total of $20,443.50 • CDEP Agronomy Program – 16 landholders participated in the program at a total of $18,409.09 • Good Onya Program – 22 residents volunteered more than 25 hours of their time to raise funds for organisations at a total of $5,500 • Innovation and Technology Solar Program – 7 subsidies have been allocated to the CDEP community at a total of $19,721.82.	$216,172.51
Scholarships and Tertiary Support	$45,000.00
TOTAL	**$2,206,771.80**

* As only major contributions are shown in this table for brevity, the sum of the contributions does not match the values reported in this column.

17 INDEPENDENT AUDIT

17.1 Independent compliance audit

An independent environmental compliance audit was undertaken at Cadia during the reporting period. This audit was conducted by James Bailey & Associates, with support from independent technical specialists in the fields of air quality, noise, and water.

The audit objectives were to assess activities at Cadia during the audit period (defined as 13 November 2020 to 14 December 2023) and compliance with PA 06_0295 (including management plans, strategies, and programs), and ML 1405.

A summary of key findings from the audit is included in Table 43. In relation to PA 06_0295, the audit identified 39 compliant items and 21 non-compliant items. A total of 22 items were not triggered. No non-compliances were identified for ML 1405. The non-compliances identified for PA 06_0295 are presented in Appendix 9 along with commentary on status as of 30 June 2024.

The independent environmental audit (IEA) report and Cadia's response to the audit findings are available on the Newmont Cadia website (https://www.cadiavalley.com.au/). These documents provide detail on the audit outcomes and identify proposed actions and timing in response to the observed non-compliances. The next independent environmental audit is due to be undertaken in 2026.

Table 43 – Summary of compliance

Document	Compliance	Non-compliance	Not triggered
PA 06_0295	39	21	22
ML 1405	1	0	3

18 INCIDENTS, NON-COMPLIANCES AND REGULATORY ACTIONS DURING THE REPORTING PERIOD

18.1 Incidents

Included in Table 44 is a summary of incidents reported during FY24.

Table 44 – Reporting period incidents

Incident	Date / location	Cause	Action plan	Status
Traffic noise exceedance	October 2023 Cadia Road Springside no. 2	Traffic on Cadia Road resulting in exceedances of noise impact assessment criteria.	Attended noise monitoring and reporting was undertaken. Meeting held with the landholder to discuss and agree mitigation.	Mitigation option agreed but is yet to be actioned
Dust	15/03/2024 TSF	Unfavourable weather conditions (wind gusts and low rainfall)	Prompt mobilisation of specialist machinery to apply dust suppressant. Re-treatment of areas with application of polymer and hydromulch. Aerial dust suppression campaigns.	Closed
Noise exceedance	2-10 August 2023 and 1-8 February 2024 Hollwood	Train movements contributed to exceedances of sleep disturbance criterion.	Discussion held with the landholder and mitigation option agreed. Mitigation has been installed.	Closed
Noise exceedance	10-18 August 2023 and 9-16 February 2024 247 Newbridge Road	Train movements contributed to exceedances of sleep disturbance criterion.	Cadia completed an investigation into train noise and identified changes to several operational practices.	Completed
Noise exceedance	Between 28 February and 21 March 2024 Athol	Train movements contributed to exceedances of the criteria for noise impact assessment, land acquisition, and sleep disturbance.	Initial discussion held with owner regarding mitigation or a negotiated agreement. Previous mitigation had been installed at the property. Voluntary Negotiated Agreement is being drafted.	Ongoing
Noise exceedance	18-25 August 2023 and 14-21 March 2024 Athol	Train movements contributed to exceedances of the sleep disturbance criterion.	Initial discussion held with owner regarding mitigation or a negotiated agreement. Previous mitigation had been installed at the property. Voluntary Negotiated Agreement is being drafted.	Ongoing

Incident	Date / location	Cause	Action plan	Status
Noise exceedance	5-12 September 2023 Warrengong	Light aircraft associated with TSF aerial dust suppression activities contributed to exceedances of the noise impact assessment criteria.	Investigation undertaken. Aircraft to travel at a higher altitude (1,000 ft). Monitoring to occur during future spraying campaigns to assess effectiveness of higher altitude flying.	Completed
Noise exceedance	15-27 March 2024 Rosebank	Light aircraft associated with TSF aerial dust suppression activities contributed to noise levels above the impact assessment criteria.	Aircraft operations at take-off were reviewed as this was identified as the primary reason for noise non-compliance. This review identified that engine speed could be managed such that lower noise levels are generated, without materially affecting aircraft performance (and safety).	Completed

18.2 Non-compliances

A summary of environment related non-compliances recorded during the reporting period is provided in Table 45.

Table 45 – Reporting period non-compliances, actions and status

Relevant approval	Date	Summary of non-compliance	Action plan	Status
PA 06_0295 Schedule 3, Conditions 30, 33 and 34	11/09/2023	Some surface water samples collected during routine sampling had not been analysed for metals by the laboratory.	A thorough review was undertaken, and it was identified that the analytical suites were missing from Cadia's automated chain of custody (COC) forms for a combination of reasons. The forms were recreated in EQUIS to ensure that correct analysis is completed. Additionally, sample containers have been updated to make them unique on the COC forms. These actions were implemented in September 2023.	Closed
PA 06_0295 Schedule 3, Condition 35A EPL 5590 M2.3	November 2023	November 2023 samples collected for groundwater quality testing at monitoring bores MB78, MB79, MB83 and MB84 were not analysed by the laboratory.	The software used to generate electronic COC forms was updated and laboratory procedures were reviewed to ensure all unaccounted samples received are escalated. A review of processes to improve verification checks of data completeness was also undertaken. Additionally, Cadia enquired how to integrate the laboratory barcode system into the site software.	Closed

Relevant approval	Date	Summary of non-compliance	Action plan	Status
PA 06_0295 Schedule 3, Condition 20(e) EPL 5590 M2.2	15/01/2024	Failure of the intake pump at Beta-Attenuation Monitor (BAM) site D4 resulting in temporary interruption to continuous monitoring.	Implementation of a maintenance and calibration schedule for air quality monitoring instrumentation. Back up air quality monitoring units (Dust Master Pro) at compliance monitoring locations which were actively operating during the period in question.	Closed
PA 06_0295 Schedule 3, Condition 6	05/05/2024	Operation of construction equipment outside Day time, as set out in Schedule 3, Condition 6. Earthmoving machinery had commenced operation at 07:47 am, outside the approved work start time of 8:00 am.	An independent noise specialist conducted a review of the noise data at the time of operation and the operating equipment was not audible. Cadia did not receive any noise or other complaints at the time of operation of the equipment. Cadia has discussed the operation of equipment outside of construction hours with the construction team in pre-start meetings and have reinforced the hours of work in the project approval. A general broadcast is now made on the two-way system that engines may start to ensure that construction operations occur during permitted times. Cadia will periodically review proximity detection data to ensure compliance with construction hours.	Closed
EPL 5590 M2.2	Various – see comment for detail	The duration between sampling was more than 14 days for both TSP and Type 1 and Type 2 substances. This occurred due to equipment failure (Fan 2). On 30 April 2024, a sample for Type 1 and Type 2 substances wasn't collected at the same time as TSP sampling.	The fixed plant manager was notified to investigate and fix Fan 2 which was inactive. The environment team instructed the contractors to perform the monitoring the day after the scheduled monitoring. In response to the Type 1 and Type 2 substances which weren't sampled on 30 April 2024 due to equipment failure, sampling of these parameters was undertaken on the following day (one day after the 14-day sample collection window).	Closed

Relevant approval	Date	Summary of non-compliance	Action plan	Status
PA 06_0295 Schedule 3, Condition 35A EPL 5590 L4.1	Water Management Plan Sediment Basin Management	12 on-site sediment dams identified as potentially not having sufficient storage capacity as nominated in the Water Management Plan after implementing the storage requirement changes post MOD14 approval.	Further catchment surveys are required to confirm storage capacities and will be undertaken in late 2024.	Ongoing

18.3 Regulatory actions

One formal warning in relation to Condition M2.3 of EPL 5590 and the groundwater testing non-compliance in November 2023 was received from the EPA on 22 January 2024.

Two prosecution proceedings were bought against Cadia by NSW EPA in the reporting period.

- In August and October 2023, the EPA commenced three prosecutions against Cadia alleging that Cadia committed offences against section 128(1)(b) of the *Protection of the Environment Operations Act 1997* (NSW) by causing emission of air impurities from a point source in excess of the standard of concentration prescribed in the *Protection of the Environment Operations (Clean Air) Regulations* in relation to monitoring results for particulate matter from a ventilation rise in November 2021, March 2022 and May 2023. Cadia pleaded guilty to these charges and is awaiting sentencing.
- In October 2023, the EPA commenced two prosecutions against Cadia alleging offences against section 126(1) of the *Protection of Environment Operation Act 1997* (NSW) because it failed to deal with stored tailings in the STSF and NTSF in a proper and efficient manner causing air pollution from the premises on 13 and 31 October 2022. Cadia is yet to plead to these two charges.

No other formal warnings, official cautions, penalty notices or prosecution proceedings were received by any regulatory agency during the reporting period.

19 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

19.1 Summary of activities for completion in FY2024-25

Provided in Table 46 is a summary of proposed actions identified from the review of environmental and social performance data and information collected during the reporting period. These actions have been identified for completion in the next reporting period (FY25).

Table 46 – Actions identified for completion in FY25

Commitment
Air quality
Implement the revised AQGHG Management Plan (version 3).
Blasting and vibration
Where possible, scheduling blast activities to limit blasting during night-time periods, Sundays and public holidays
Periodic assessment of monitoring locations to confirm that the monitoring network remains representative of potentially affected stakeholders
Noise
Review the approach to unattended noise monitoring particularly in relation to monitoring duration and the rostering of planned monitoring activities
Installation of fixed real-time noise monitoring at three locations around Cadia and making the data publicly available via the Cadia website.
Biodiversity
Trial drone weed spraying of difficult to access areas of Black Rock Range and Flyers Creek.
Complete 20 ha of direct seeding within the vegetation corridor areas.
Update and implement the Bushfire Management Plan across Cadia owned land.
Complete preparation of the Weed Management Plan and Feral Pest Management Plan
Increase funding to the Community Sticky Nightshade program and focus on the areas of high infestation on privately owned land within the Cadia district with a dedicated spraying resource.
Heritage
Formalise the inspection procedure and form for the Cadia Engine House precinct
Finalise update of dilapidation recording
Conduct detailed planning and remediation works at the Cadia Engine House
Once approved, implement the revised HHMP (revision number 3).
Review the Conservation Management Plan for SHR779 and update where appropriate.
Waste management
Recycling target to be shifted from 65% to 75% to align with recent historical actual performance. Consistent performance is expected in FY25 due the same waste contractor engaged

Commitment
Update the non-mineralised waste management plan to adopt a management strategy according to the waste minimisation hierarchy
Continue to drive waste awareness across site
Continue to investigate recycling and recovery pathways for hazardous and non-hazardous waste
Water management
Review recommendations made in the Annual Groundwater Monitoring Review (Appendix 3) and the Surface Water Assessment (Appendix 4) and implement recommendations identified
Review of site sediment basins following catchment surveys
Major works for sediment management in Site Runoff Pond.
Rehabilitation
Further refining of the rehabilitation materials inventory to incorporate clay and native seed resources
Progress the constructed wetlands study to further understand post-closure water quality
Increased and ongoing pest management within rehabilitation and mine operation areas
Increased and ongoing weed management, including the implementation of formalised, site-wide biosecurity protocols
Remediation works to address water management structures on the NWRD and SWRD
Where scheduling and conditions permit, undertake continued revegetation works on the NWRD and SWRD potentially including infill tubestock planting within areas that have prior successful tubestock planting or areas that are missing structural or species composition elements; and direct seeding in areas where target vegetation communities have largely failed to establish.

19.2 Review of monitoring programs, strategy, and environmental management plans

Schedule 5, Condition 3 of the PA 06_0295 requires that the strategies, plans and programs used to manage environmental and social aspects at Cadia are kept up to date. Reviews of relevant documents have been undertaken as part of the independent audit, the acquisition of Cadia by Newmont, and this Annual Review process. These reviews have triggered the update of all key management documents. Included in Table 47 is a summary of the status of these key management documents.

Table 47 – Summary of management plan document reviews

Document	Summary of material changes and document status
Aboriginal Cultural Heritage Management Plan	Review completed and no changes required. Revision 2 dated 23/06/2022 approved by the Secretary on 04/07/2022.
Air Quality and Greenhouse Gas Management Plan	Various changes following review. Version 3 submitted to the DPHI on 11/06/24 for approval.
Biodiversity Management Plan	Revision 2 yet to be approved, updates to be made after DPHI provide comments on current revision. Further consultation requested by DPHI.
Blast Monitoring Program	Review completed and no changes required.

Document	Summary of material changes and document status
	Version 4 is current.
Environmental Management Strategy	Version 5.1 dated 23/09/2024 approved by the Secretary, DPHI.
Historical Heritage Management Plan	Various changes following review. Version 3 submitted to the Portal on 11/06/24 for consultation with Heritage NSW.
Noise Management Plan	Various changes following review. Version 3.3 submitted to DPHI on 4/10/24 for approval.
Rehabilitation Management Plan*	Various changes following review. Version 1.2 submitted to the Portal on 13/06/24.
Rehabilitation Strategy	Revised document submitted 08/03/24 with feedback received 20/06/24. Updates are in progress, with submission of the revised document expected by end of October 2024.
(Offsite) Traffic Management Plan	Review completed and no changes required. Revision 2.3 dated 04/10/2023 approved by the Secretary on 13/10/2023.
Water Management Plan	Various changes following review. Version 9 submitted to the DPHI for approval on 13/06/24.
*Note that the Rehabilitation Management Plan does not require approval by a regulatory body.	

20 REFERENCES

Newcrest Mining Limited (2023). Cadia Valley Operations Annual Review FY23, 31 October 2023.

Minerals Council of Australia (MCA) (2022). Water Accounting Framework for the Minerals Industry.

International Council on Mining and Metals (ICCM) (2021). Water Reporting good practice guide 2nd edition.

NSW Government (2015). Annual Review Guideline Post-approval requirements for State significant mining developments. October 2015.

APPENDIX 1 AIR QUALITY REVIEW 2023-24

CADIA MINE

Air Quality Review 2023-24

Final | Revision 0

28 August 2024

Project: 22021

Cadia Mine

Project number	22021
Title	Cadia Mine
Subject	Air Quality Review 2023-24
Version	Final
Revision	Revision 0
Date	28 August 2024
Client	Cadia Holdings Pty Ltd
Project manager	Shane Lakmaker
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D1R0	14/08/24	Draft report	SL	NL
Final	28/08/24	Final report	SL	NL, CHPL

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Acronyms and definitions

Abbreviation	Definition
BAM	Beta Attenuation Monitor
CHPL	Cadia Holdings Pty Ltd
CO	Carbon monoxide
DPHI	Department of Planning, Housing and Infrastructure
EPA	NSW Environment Protection Authority
MLs	Mining Leases
NEPM	National Environment Protection Measure
NEPC	National Environment Protection Council of Australia
NSW	New South Wales
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
OEH	Office of Environment and Heritage, now part of the Department of Planning and Environment as Environment, Energy and Science
PAX	Potassium Amyl Xanthate
$PM_{2.5}$	Particulate matter with equivalent aerodynamic diameters less than 2.5 microns
PM_{10}	Particulate matter with equivalent aerodynamic diameters less than 10 microns
Planning Approval	Planning approval (06_0295), as modified most recently by Modification 14 in December 2021
SLB	Southern Lease Boundary
SO_2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
TSF	Tailings Storage Facility
TSP	Total suspended particulate matter

1 Introduction

1.1 Background

Newmont Corporation (Australia) (Newmont) is the owner of Cadia Holdings Pty Limited (Cadia) which in turn is the owner and operator of the Cadia Mine. Cadia Mine is located approximately 25 kilometres (km) southwest of Orange, in the Central Tablelands of NSW and is one of Australia's largest gold mining operations.

The Planning Approval for Cadia Mine (PA 06_0295) was granted by the NSW Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 6 January 2010 and includes all of the integrated operations and components of the approved Cadia Mine including:

- the Cadia East Underground Mine;
- the Cadia Hill Open Cut Mine;
- the Ridgeway Underground Mine;
- Blayney and Cadia Mine Dewatering Facilities; and
- a range of ancillary and support infrastructure.

Cadia, as the proponent of Cadia Mine, is authorised by Schedule 2 Condition 5 of the Planning Approval to carry out mining operations at Cadia Mine until 30 June 2031.

This report has been prepared by Airen Consulting. It provides a review of relevant air quality monitoring data collected by Cadia in the period from 1 July 2023 to 30 June 2024, to inform the 2023-24 Annual Review.

1.2 Project Approval Criteria

Schedule 3, Condition 17 of the Planning Approval requires Cadia to "ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not cause exceedances of the criteria listed in Tables 8, 9 and 10 at any residence on privately owned land, or on more than 25% of any privately-owned land". Table 1 shows the air quality criteria from the Planning Approval. Schedule 3, Condition 19(c) of the Planning Approval also requires Cadia "implement all reasonable and feasible measures to minimise off-site odour and fume emissions generated by the project". Cadia has a network of air quality and meteorological monitoring equipment around the Cadia Mine which is designed to meet relevant conditions of the Planning Approval.

Table 1 Air quality criteria from the Cadia Mine Planning Approval

Air quality indicator	Averaging time	[d] Air quality criteria from Planning Approval
Particulate matter (PM_{10})	24-hour	[b] 50 µg/m³
	Annual	[a] 25 µg/m³
Particulate matter ($PM_{2.5}$)	24-hour	[b] 25 µg/m³
	Annual	[a] 8 µg/m³
Particulate matter (TSP)	Annual	[a] 90 µg/m³
Deposited dust [c]	Annual (maximum increase)	[b] 2 g/m²/month
	Annual (maximum total)	[a] 4 g/m²/month

[a] *Cumulative impact (i.e. increase in concentrations due to the project plus background concentrations due to all other sources).*
[b] *Incremental impact (i.e. increase in concentrations due to the project on its own), with up to five allowable exceedances of the criteria over the life of the project.*
[c] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.*
[d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.*

2 Monitoring Results

Cadia operates a local air quality and meteorological monitoring network (Figure 1) to assist with evaluating performance against the air quality criteria in the Planning Approval. This network includes various technologies (by approved methods) to measure PM_{10}, $PM_{2.5}$, TSP and deposited dust. The air quality monitoring data represent the contributions from all sources of particulate matter that have at some stage been upwind of each monitor. In the case of PM_{10} for example, a measurement may contain contributions from many sources such as from construction works, bushfires, agricultural activities, industry, vehicles, roads, wind-blown dust from nearby and remote areas, pollens and moulds.

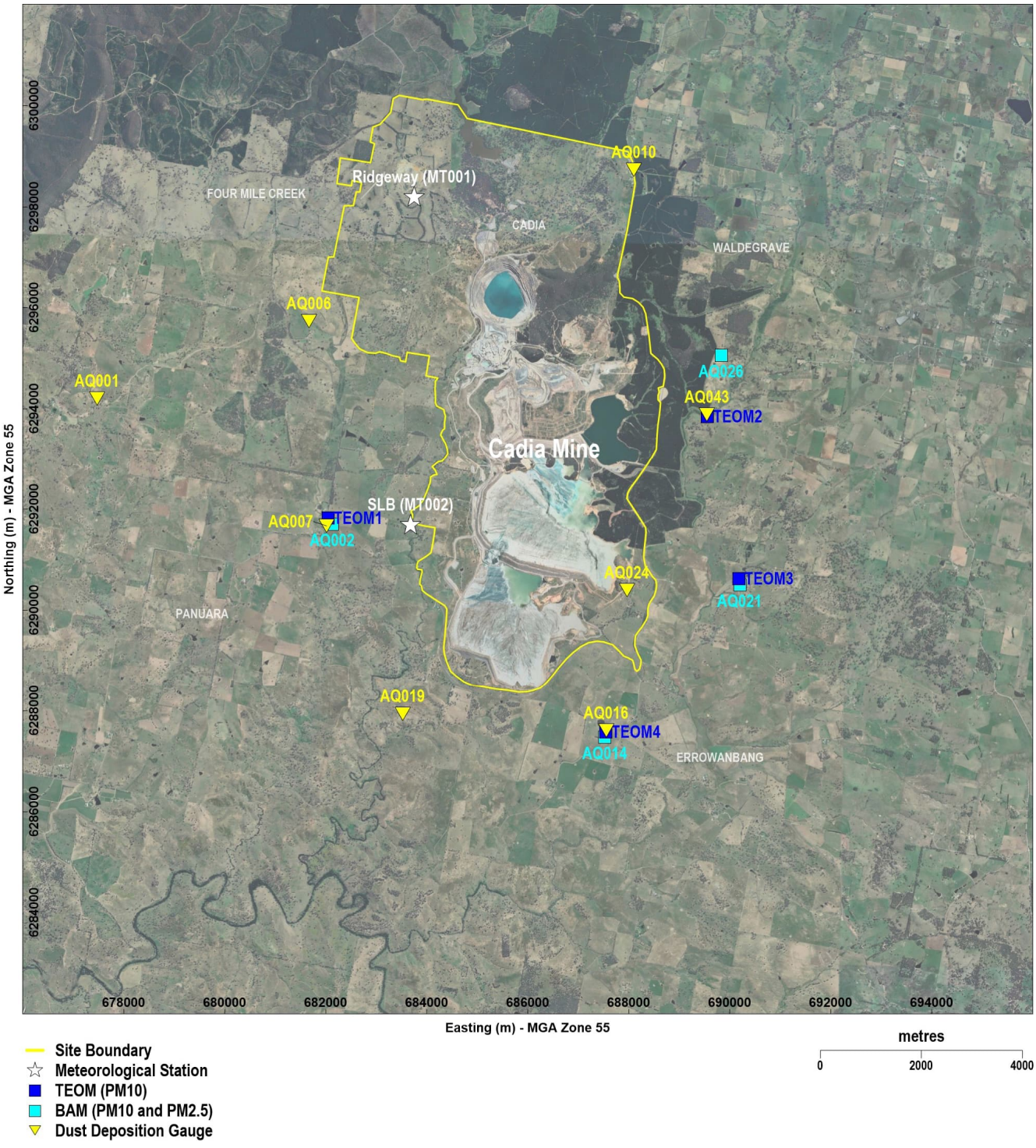


Figure 1 Location of air quality and meteorological monitors

2.1 Meteorology

Meteorological conditions are important for determining the transport and dispersion of emissions from the source to receptors locations, and the potential influences on air quality. Rainfall can influence air quality conditions, particularly dust levels. Cadia operates two site-specific meteorological stations, referred to as Ridgeway and Southern Lease Boundary (SLB) (see Figure 1 for locations). The monitoring includes the measurement of rainfall, among other parameters. Figure 2 shows the annual rainfall between 2015-16 and 2023-24. The drought conditions were evident in the 2017-18 to 2019-20 data with annual rainfall well below the long-term average as measured at Orange Airport by the Bureau of Meteorology (based on 27 years of records).

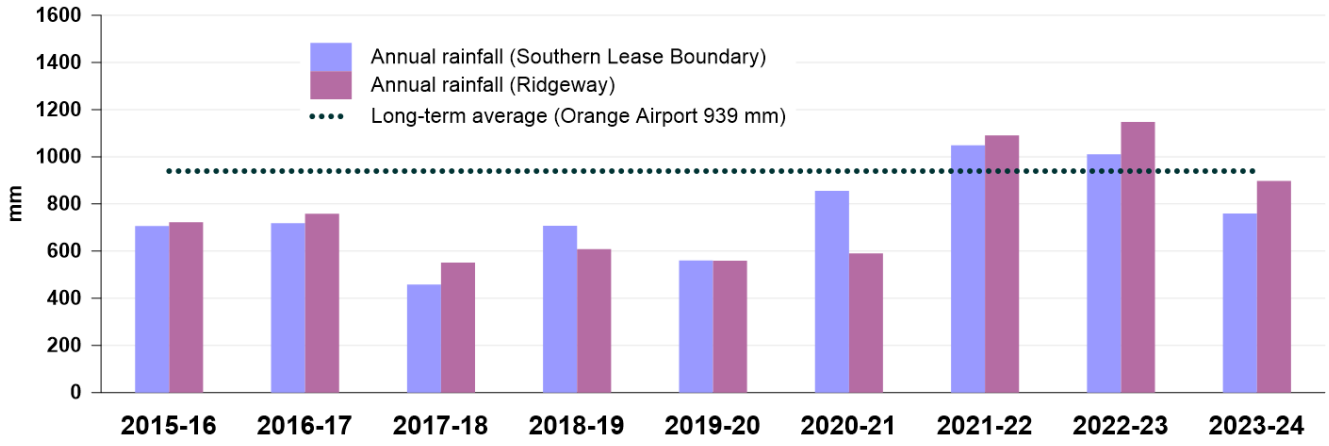


Figure 2 Annual rainfall

The monitoring at the Ridgeway and SLB stations is carried out to understand the local meteorological conditions, assist with operational decisions, and to inform air quality studies. Wind-roses have been prepared from the 2023-24 data (Figure 3 and Figure 4). The wind-roses show the frequency of wind speeds and wind directions based on hourly records. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

Figure 3 shows the wind-roses from data collected at the Ridgeway meteorological station. It can be seen from these wind-roses that winds at the Ridgeway meteorological station are predominantly from the north to northeast or west to southwest. This pattern of winds is evident in all seasons, to various degrees. Figure 4 shows the wind-roses from data collected at the SLB meteorological station. These wind-roses show similar patterns to those measured at Ridgeway with the prevailing winds from the north to northeast and west to southwest.

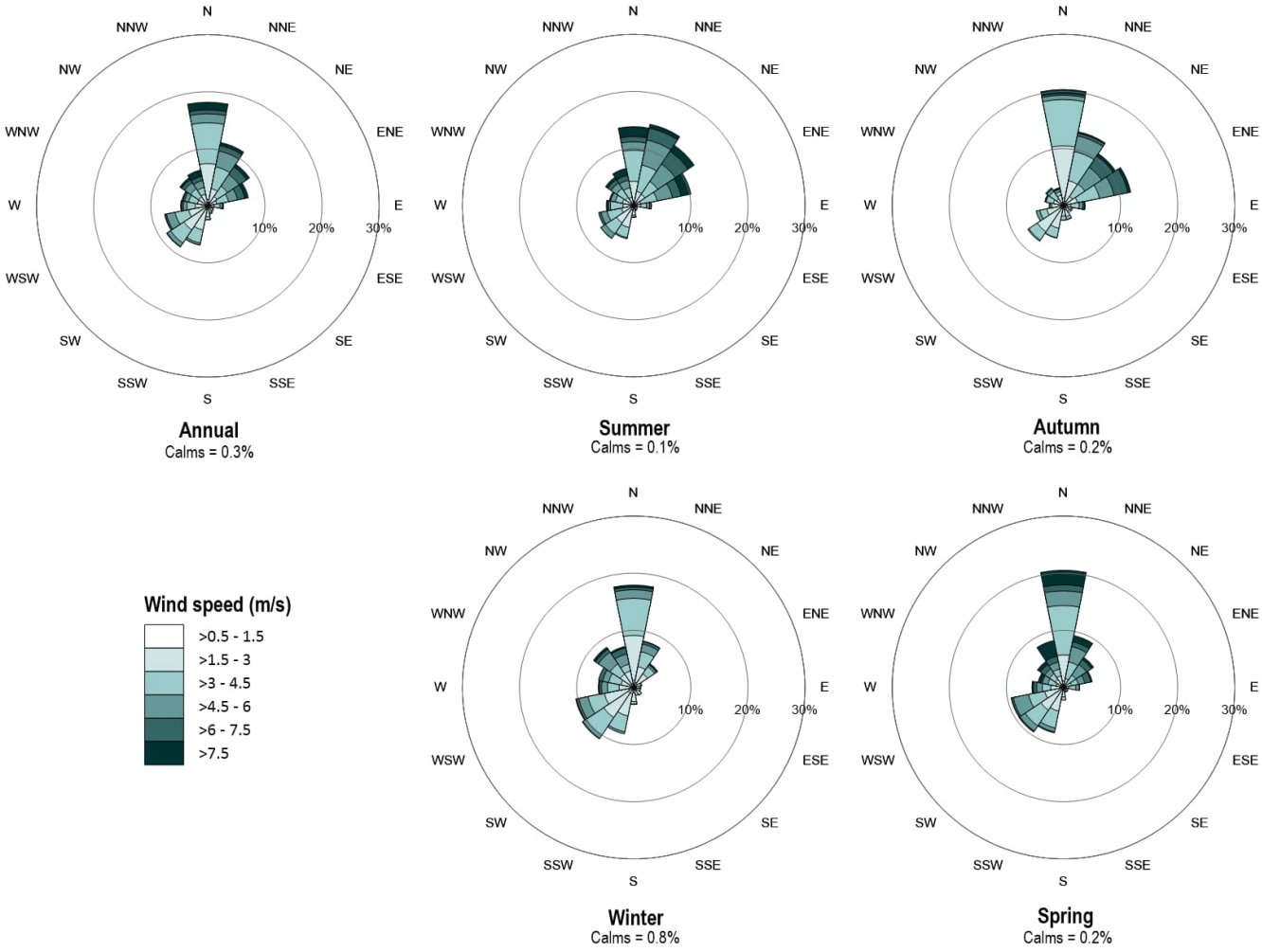


Figure 3 Wind-roses from data collected at the Ridgeway meteorological station in 2023-24

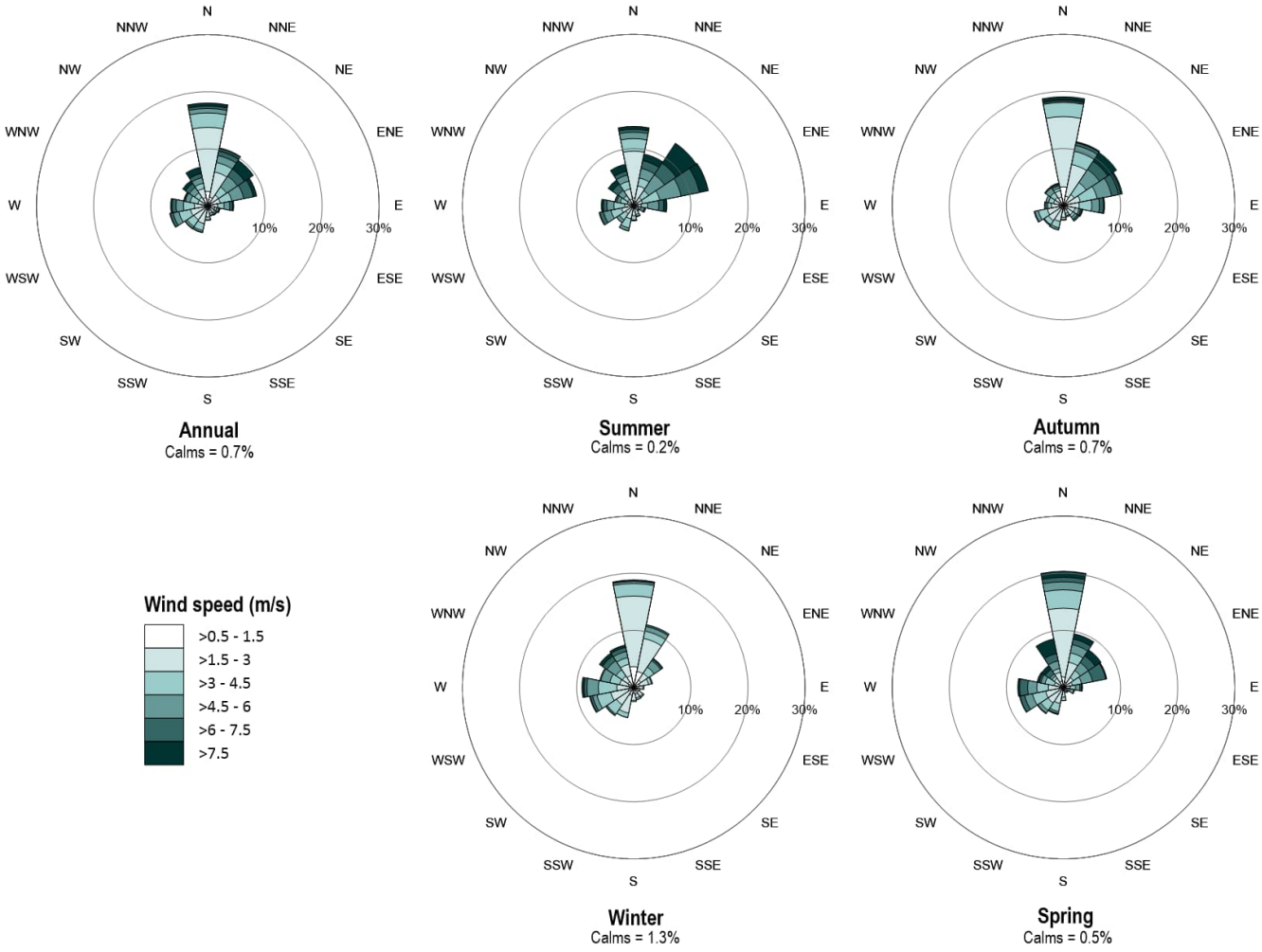


Figure 4 Wind-roses from data collected at the Southern Lease Boundary meteorological station in 2023-24

2.2 Particulate Matter (as PM_{10})

Cadia monitors PM_{10} at four locations (Figure 1) with the method of measurement changing from Tapered Element Oscillating Microbalance (TEOMs) to Beta Attenuation Monitor (BAMs) between April and June 2022. Compliance is currently evaluated by Cadia at AQ002, AQ026, AQ021 and AQ014.

The measured 24-hour average PM_{10} concentrations in 2023-24 have been evaluated against the Project Approval criteria. Contributions from the direction of Cadia Mine to each monitoring location have been calculated as the 24-hour average PM_{10} criterion from the Project Approval relates to an "incremental impact". There is no standard prescribed methodology for determining contributions to air quality from mining operations. The methodology described below is based on the use of concurrent hourly meteorological and air quality monitoring data from suitably located monitoring stations around the mine site to estimate the potential contribution from the direction of the mining operations. This method is referred to as an "upwind / downwind" calculation approach. In this context, "upwind" is a location that collects data representative of background conditions, not influenced by the source of interest, and does not necessarily need to be upwind of the source of interest.

The maximum contributions from the direction of Cadia Mine to each measured hourly average result was calculated by first determining the wind direction ranges which represented a wind from the direction of Cadia Mine towards the monitor. Table 2 shows the wind direction ranges that represented the direction to Cadia Mine from each monitor.

Table 2 Wind directions to Cadia Mine for PM_{10} contribution calculations

Monitor	Direction to Cadia Mine
AQ002 (formerly BAM 1, Bundarra, D5)	Between 30 and 135 degrees true north
AQ026 (formerly BAM 2, Woodville, D7)	Between 200 and 300 degrees true north
AQ021 (formerly BAM 3, Flyers Creek, D9)	Between 240 and 340 degrees true north
AQ014 (formerly BAM 4, Meribah, D11)	Between 390 and 360 degrees true north

The potential contribution from the direction of Cadia Mine to each monitor was calculated for every 1-hour average record for every day based on the concurrent wind direction and from a "monitor" concentration minus "background" concentration calculation. Table 3 shows the data representing "monitor" and "background" conditions for each monitoring site. The "monitor" concentration minus "background" concentration result was only calculated for hours with wind speeds greater than 0 m/s.

Table 3 Data for monitor and background PM_{10} calculations

Monitor	Data representing "background" conditions
AQ002 (formerly BAM 1, Bundarra, D5)	Average of AQ026 and AQ021
AQ026 (formerly BAM 2, Woodville, D7)	Average of AQ002 and AQ014
AQ021 (formerly BAM 3, Flyers Creek, D9)	Average of AQ002 and AQ026
AQ014 (formerly BAM 4, Meribah, D11)	Average of AQ002 and AQ026

The potential contribution to each monitor was then calculated as 24-hour and annual averages (not including negative values) from the 8,784 hourly records in the 2023-24 period.

Figure 5 shows the measured 24-hour average PM_{10} concentrations in 2023-24 from data collected at each monitor. These results include the calculated contributions from the direction of Cadia Mine, as per the methodology described above.

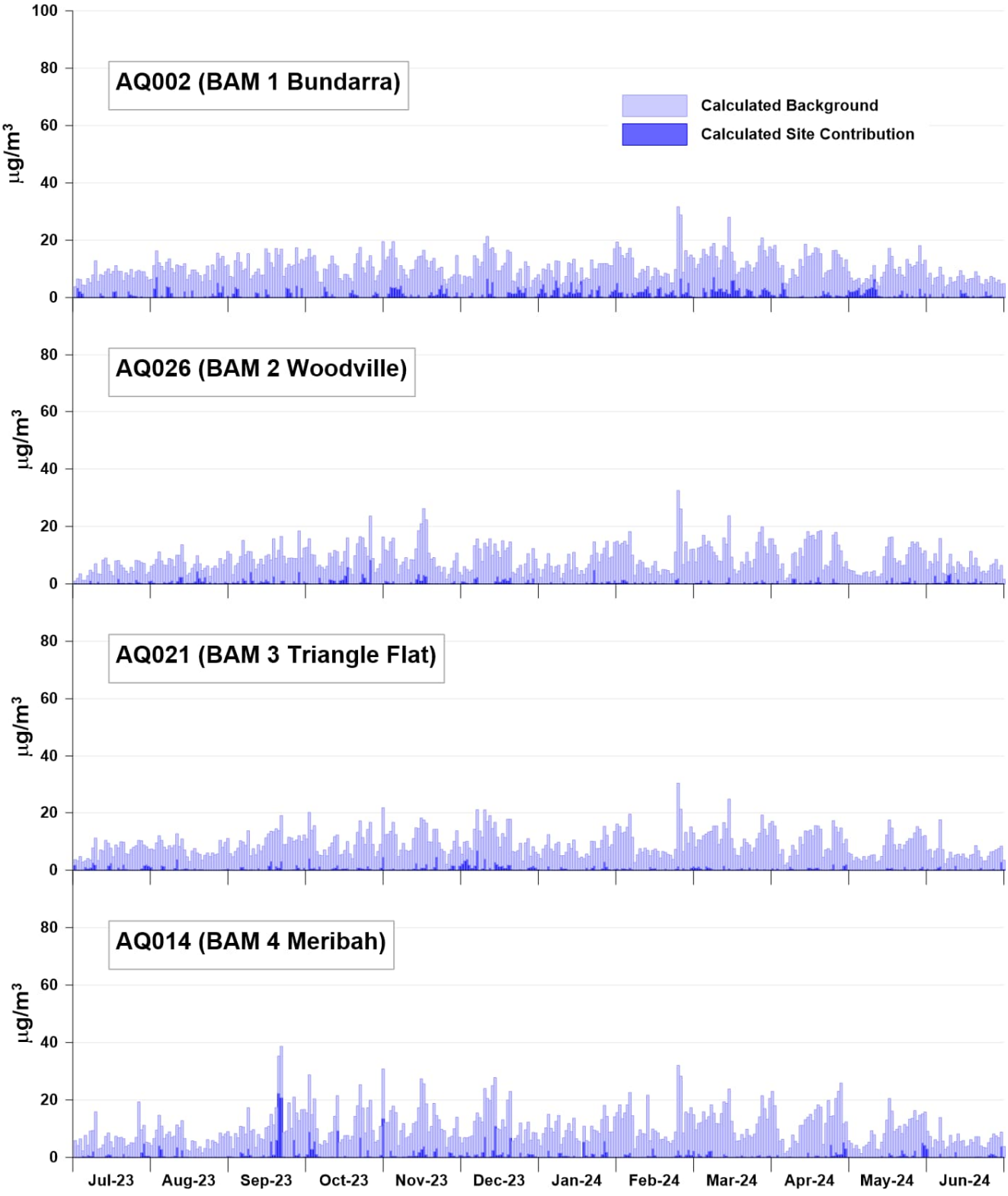


Figure 5 Measured 24-hour average PM_{10} concentrations at Cadia monitors in 2023-24

Table 4 provides a summary of the measured PM_{10} data. The results have been calculated without extraordinary events (although it is noted that no extraordinary events were identified in 2023-24). The data show that the PM_{10} concentrations at all four monitors were below the 24-hour and annual average criteria. Consequently, the monitoring demonstrates compliance with the Project Approval in terms of particulate matter as PM_{10}.

Table 4 Summary of measured PM_{10} concentrations around Cadia Mine in 2023-24

Statistic	AQ002 / BAM 1 (Bundarra)	AQ026 / BAM 2 (Woodville)	AQ021 / BAM 3 (Triangle Flat)	AQ014 / BAM 4 (Meribah)	Criteria
Measured maximum 24-hour average due to all sources (µg/m³)	21	26	22	39	NA
Calculated maximum 24-hour average due to Cadia Mine (µg/m³)	7.1	8.2	6.9	22.3	50
Measured annual average due to all sources (µg/m³)	10	8	9	11	25
Calculated annual average due to Cadia Mine (µg/m³)	1.2	0.5	0.6	0.9	NA

The trends in PM_{10} concentrations have also been examined. Figure 6 to Figure 8 show the historical data at each monitoring location. These data show that PM_{10} concentrations increased significantly between 2017-18 and 2019-20, coinciding with drought conditions, lower than average rainfall, and widespread bushfires. The DPHI noted these as extraordinary events (DPE, 2020) and not typical air quality conditions. The increases in PM_{10} concentrations were observed across many locations in NSW and were not unique to the Central Tablelands. Concentrations decreased from mid-2020 as rainfall returned to more typical levels.

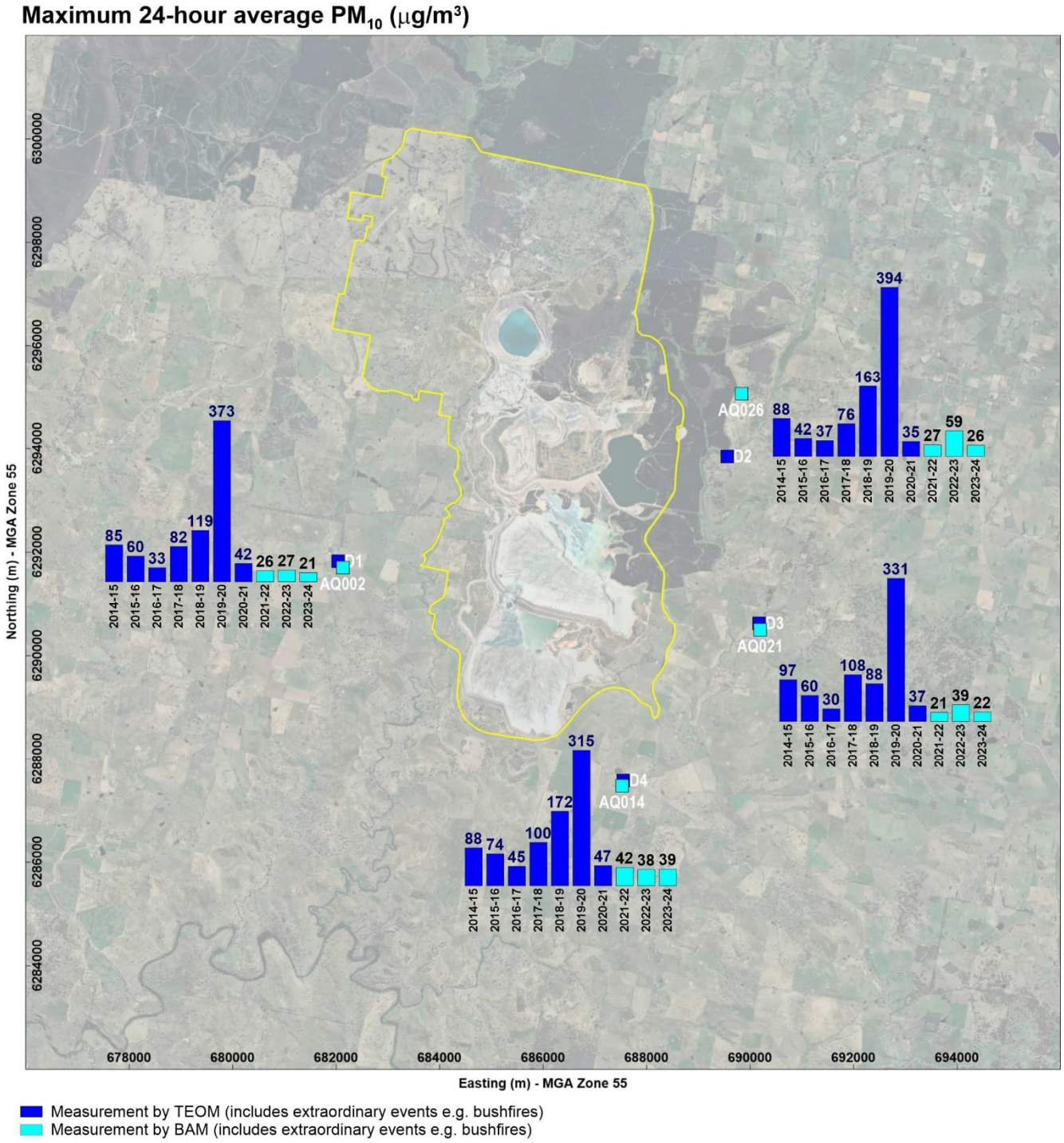


Figure 6 Historical trend in maximum 24-hour average PM_{10} concentrations at Cadia monitors

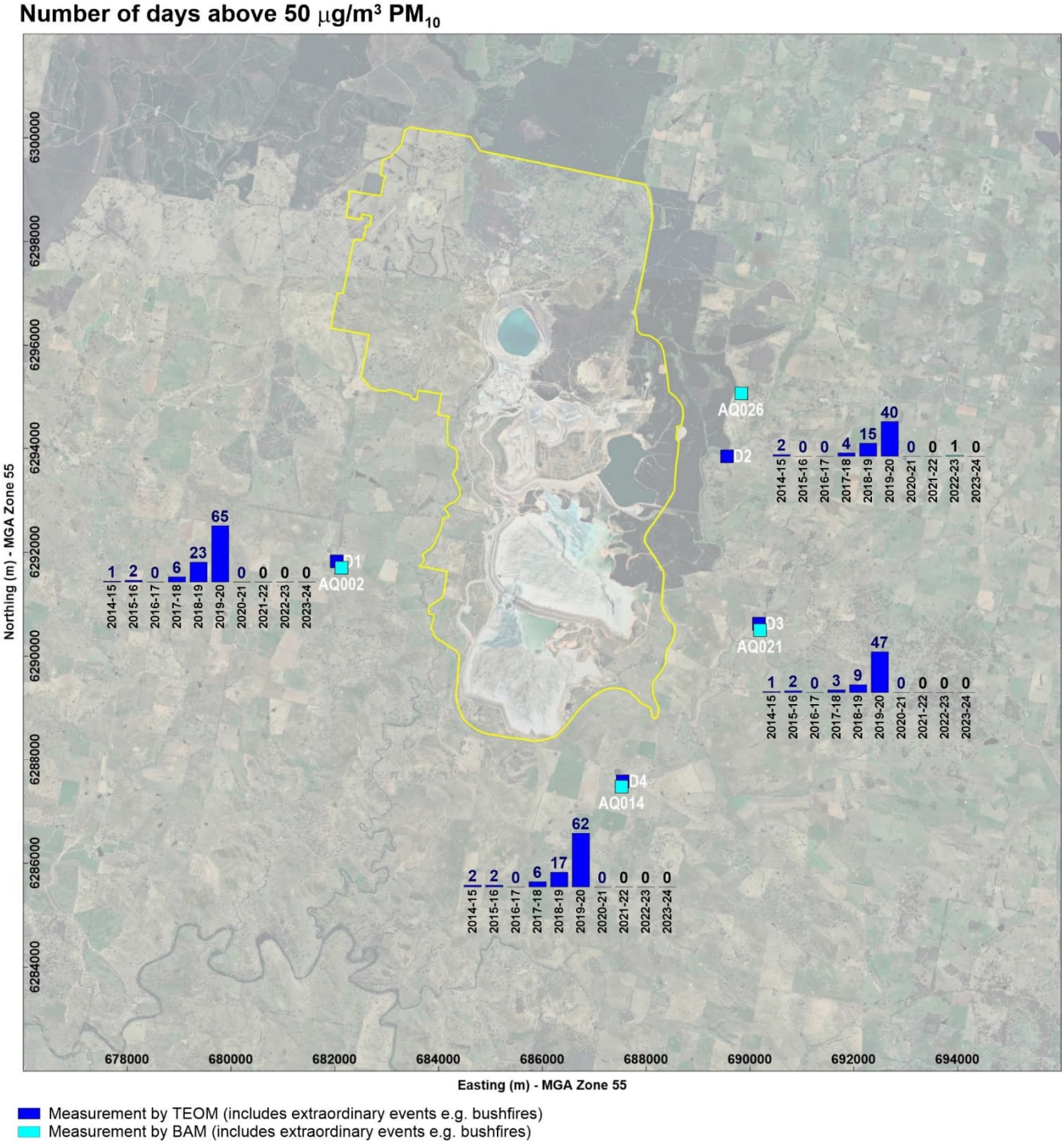


Figure 7 Historical trend in the number of days above 50 µg/m³ PM_{10} at Cadia monitors

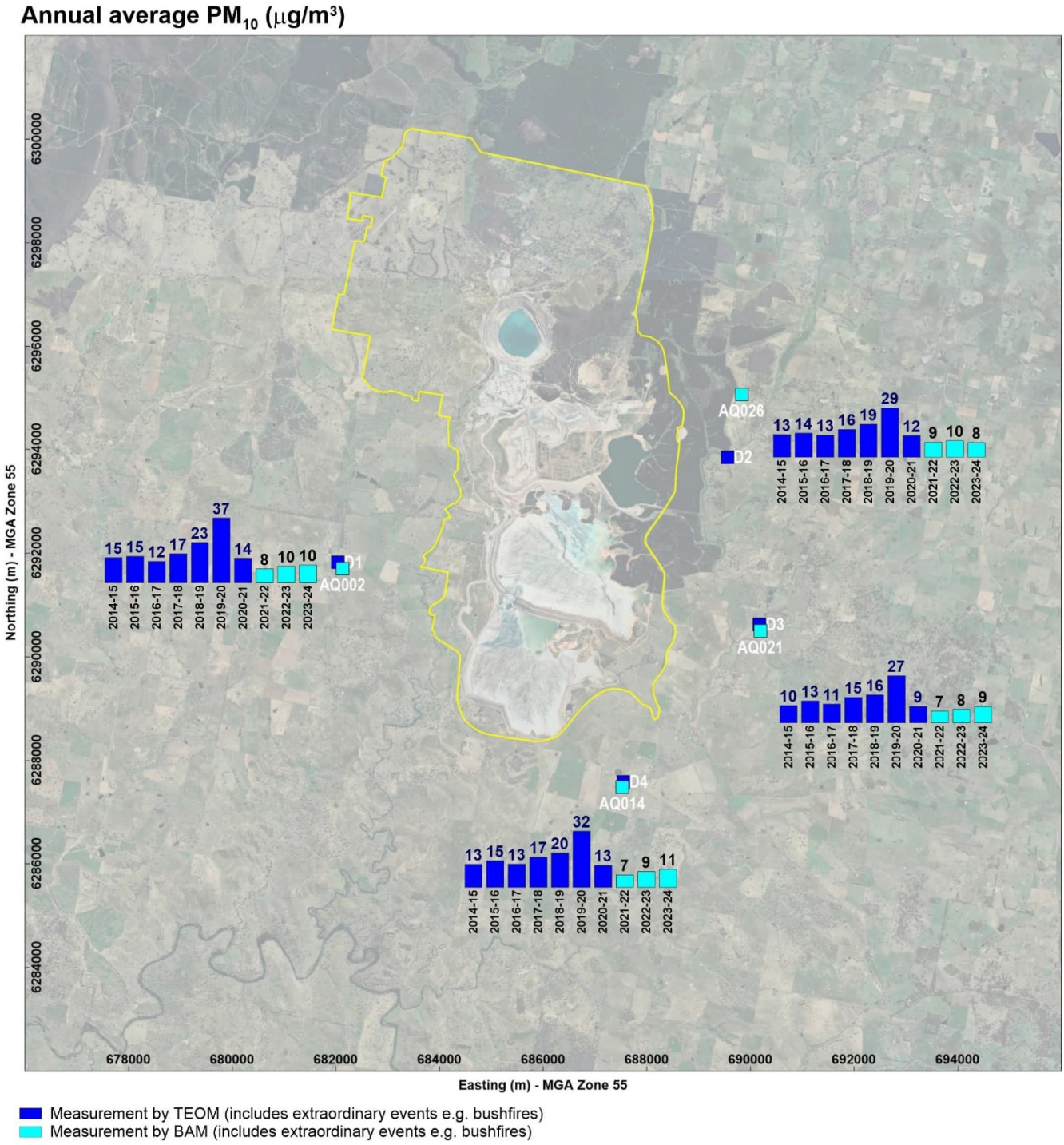


Figure 8 Historical trend in annual average PM_{10} concentrations at Cadia monitors

2.3 Particulate Matter (as $PM_{2.5}$)

Monitoring of $PM_{2.5}$ around Cadia Mine commenced in 2022 at four locations (Figure 1). Compliance is currently evaluated by Cadia at AQ002, AQ026, AQ021 and AQ014.

The measured 24-hour average $PM_{2.5}$ concentrations in 2023-24 have been evaluated against the Project Approval criteria. As for PM_{10}, contributions from the direction of Cadia Mine to each monitoring location have been calculated and reported as the 24-hour average $PM_{2.5}$ criterion from the Project Approval relates to an "incremental impact". An "upwind / downwind" calculation approach has been adopted, as per the approach for PM_{10}. The maximum contributions from the direction of Cadia Mine to each measured hourly average result was calculated by first determining the wind direction ranges which represented a wind from the direction of Cadia Mine towards the monitor. Table 5 shows the wind direction ranges that represented the direction to Cadia Mine from each monitor.

Table 5 Wind directions to Cadia Mine for $PM_{2.5}$ contribution calculations

Monitor	Direction to Cadia Mine
AQ002 (formerly BAM 1, Bundarra, D6)	Between 30 and 135 degrees true north
AQ026 (formerly BAM 2, Woodville, D8)	Between 200 and 300 degrees true north
AQ021 (formerly BAM 3, Flyers Creek, D10)	Between 240 and 340 degrees true north
AQ014 (formerly BAM 4, Meribah, D12)	Between 390 and 360 degrees true north

The potential contribution from the direction of Cadia Mine to each monitor was calculated for every 1-hour average record for every day based on the concurrent wind direction and from a "monitor" concentration minus "background" concentration calculation. Table 6 shows the data representing "monitor" and "background" conditions for each monitoring site. The "monitor" concentration minus "background" concentration result was only calculated for hours with wind speeds greater than 0 m/s.

Table 6 Data for monitor and background $PM_{2.5}$ calculations

Monitor	Data representing "background" conditions
AQ002 (formerly BAM 1, Bundarra, D6)	Average of AQ026 and AQ021
AQ026 (formerly BAM 2, Woodville, D8)	Average of AQ002 and AQ014
AQ021 (formerly BAM 3, Flyers Creek, D10)	Average of AQ002 and AQ026
AQ014 (formerly BAM 4, Meribah, D12)	Average of AQ002 and AQ026

The potential contribution to each monitor was then calculated as 24-hour and annual averages (not including negative values) from the 8,784 hourly records in the 2023-24 period.

Figure 9 shows the measured 24-hour average $PM_{2.5}$ concentrations in 2023-24 from data collected at each monitor including the calculation contributions from the direction of Cadia Mine, as per the methodology described above.

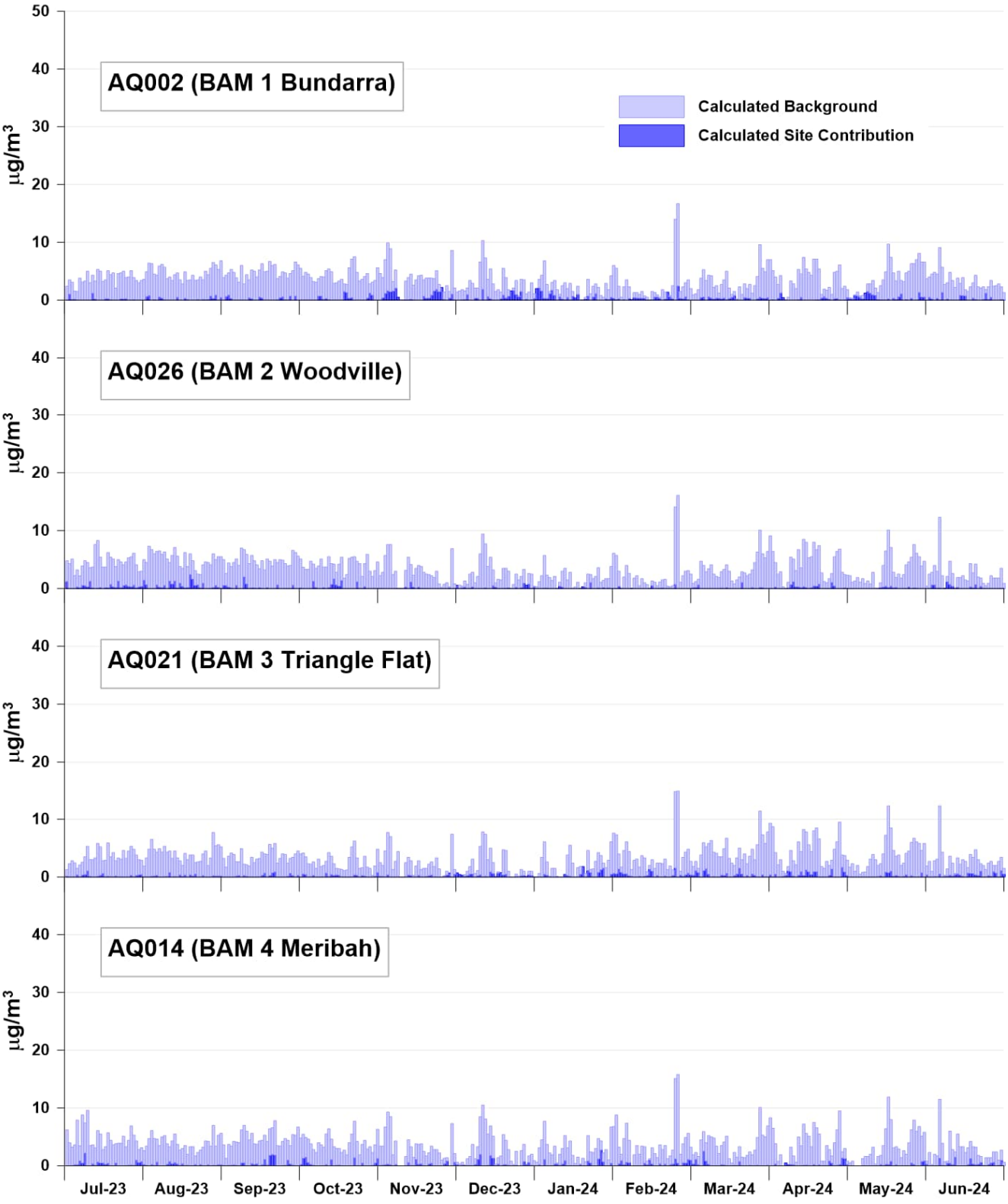


Figure 9 Measured 24-hour average $PM_{2.5}$ concentrations at Cadia monitors in 2023-24

Table 7 provides a summary of the measured $PM_{2.5}$ data. The results have been calculated without extraordinary events (although it is noted that no extraordinary events were identified in 2023-24). The data show that the $PM_{2.5}$ concentrations at all four monitors were below the 24-hour and annual average criteria. Consequently, the monitoring demonstrates compliance with the Project Approval in terms of particulate matter as $PM_{2.5}$.

Table 7 Summary of measured $PM_{2.5}$ concentrations around Cadia Mine in 2023-24

Statistic	AQ002 / BAM 1 (Bundarra)	AQ026 / BAM 2 (Woodville)	AQ021 / BAM 3 (Triangle Flat)	AQ014 / BAM 4 (Meribah)	Criteria
Measured maximum 24-hour average due to all sources (µg/m³)	10.3	9.4	7.8	10.5	NA
Calculated maximum 24-hour average due to Cadia Mine (µg/m³)	2.4	2.4	1.8	2.7	25
Measured annual average due to all sources (µg/m³)	4.1	4.0	3.0	3.9	8
Calculated annual average due to Cadia Mine (µg/m³)	0.3	0.2	0.3	0.3	NA

The trends in $PM_{2.5}$ concentrations have also been examined. Figure 10 and Figure 11 show the historical data at each monitoring location. There have not been any days above 25 µg/m³ since monitoring began in mid-2022.

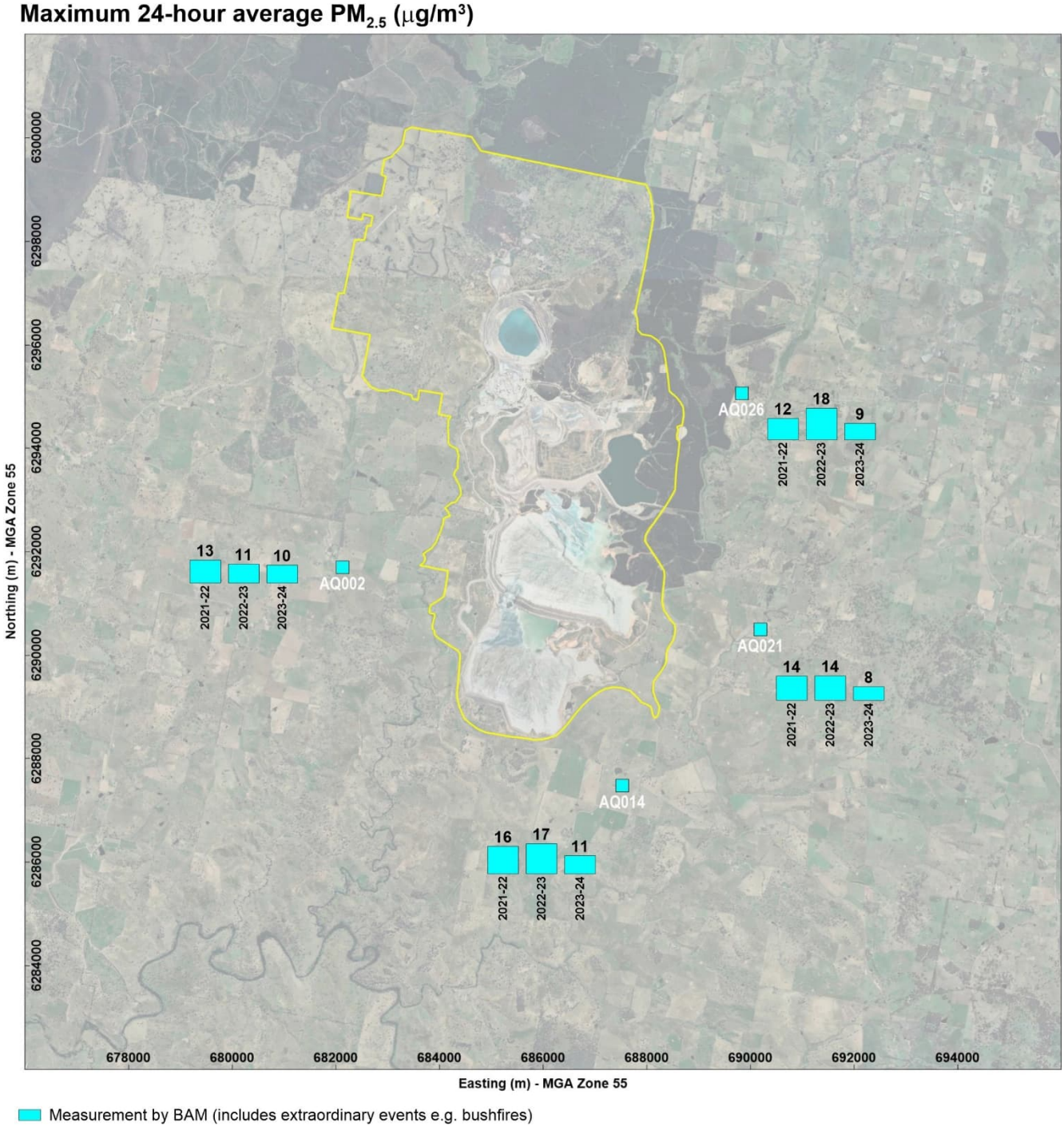


Figure 10 Historical trend in maximum 24-hour average $PM_{2.5}$ concentrations at Cadia monitors

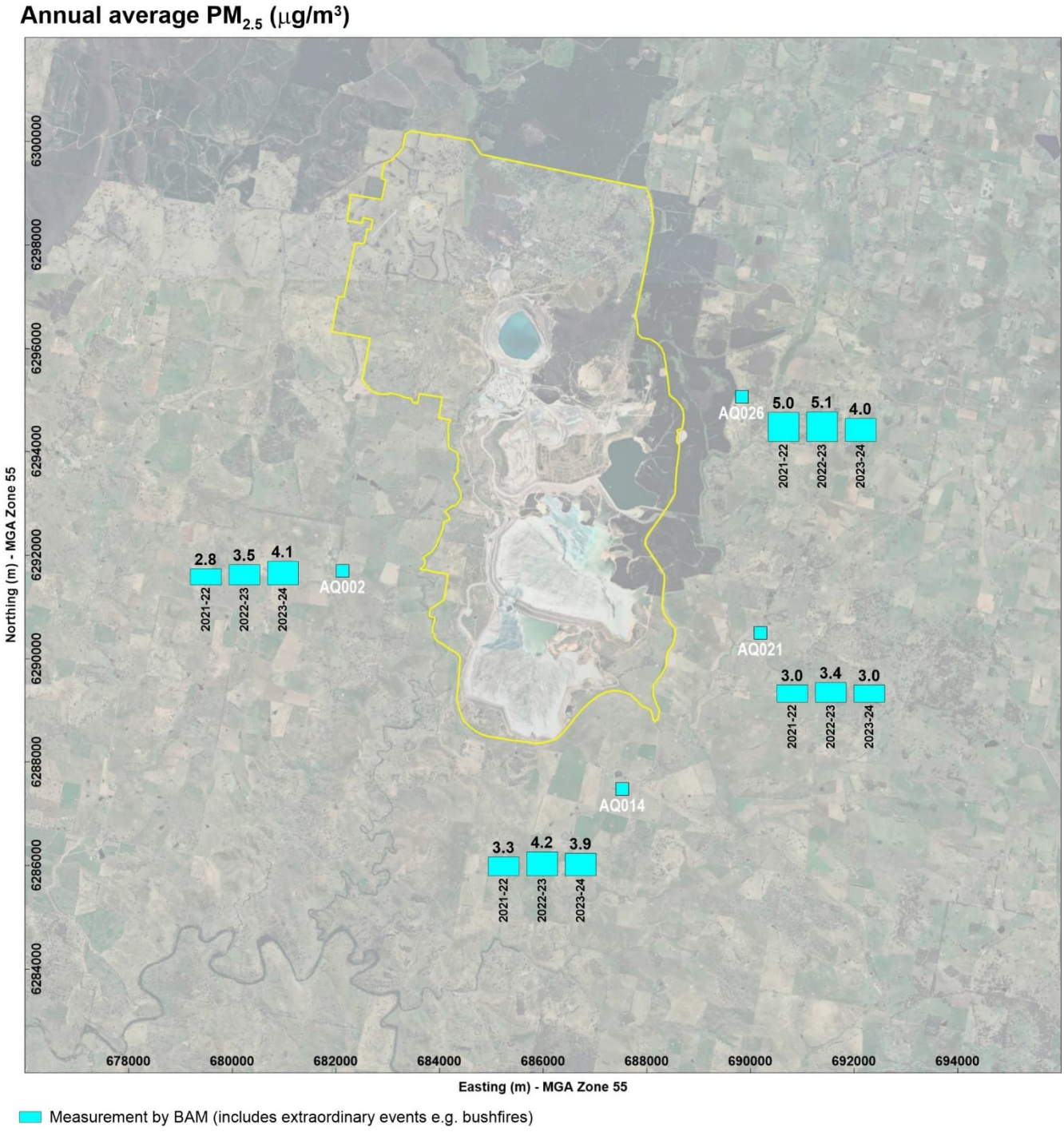


Figure 11 Historical trend in annual average PM_{10} concentrations at Cadia monitors

2.4 Particulate Matter (as TSP)

Cadia commenced the direct monitoring of TSP in March 2024. The historical reporting by Cadia (2022) has estimated TSP from the PM_{10} results by assuming 39% of the TSP is PM_{10}. This assumption is similar to that derived by the NSW Minerals Council (2000) which estimated that, for rural environments in NSW, the average PM_{10} concentrations are typically 40% of the TSP concentrations. For this review it has been assumed, conservatively, that PM_{10} concentrations would be 39% of the TSP concentrations. Table 8 shows the estimated annual average TSP concentrations at the PM_{10} monitoring locations from data collected in 2023-24. Estimated annual average TSP concentrations are unlikely to have exceeded the criteria contained in the Planning Approval, with the estimates given in Table 8 all well below the annual average criterion of 90 µg/m^3. The monitoring demonstrates compliance with the Project Approval in terms of particulate matter as TSP. Data from the recently commenced TSP monitoring program will be reported in future reviews.

Table 8 Summary of estimated TSP concentrations around Cadia Mine in 2023-24

Statistic	AQ002 / BAM 1 (Bundarra)	AQ026 / BAM 2 (Woodville)	AQ021 / BAM 3 (Triangle Flat)	AQ014 / BAM 4 (Meribah)	Criteria
Estimated annual average due to all sources (µg/m^3)	27	22	24	27	90

2.5 Deposited Dust

Deposited dust is monitored at eight locations around Cadia Mine (Figure 1). Table 9 shows the measured annual average deposited dust levels from data collected in 2023-24. The annual average deposited dust levels have not exceeded the cumulative criterion from the Project Approval (4 g/m^2/month).

In accordance with AS 5380.10-1, there is only one measurement of dust deposition each month, from each monitor. Consequently, it is not possible to determine whether a monthly measurement was being influenced by a single source over a few days, multiple sources over the entire month, or some other combination. The potential site contribution to each monitor was calculated by multiplying the annual average dust deposition by the percentage of time that winds were in the direction of that monitor. This calculation assumes that Cadia Mine was contributing to the measurements at all times when the wind was in the direction of the monitor, which may not necessarily be the case. The annual average deposited dust levels have not exceeded the incremental criterion from the Project Approval (2 g/m^2/month).

Table 9 Summary of measured deposited dust around Cadia Mine in 2023-24

Statistic	AQ006	AQ010	AQ043	AQ007	AQ001	AQ024	AQ019	AQ016	Criteria
Measured annual due to all sources (g/m^2/month)	1.8	3.6	2.2	1.5	1.1	2.9	2.6	1.3	4
Percentage of time that wind was from Cadia Mine towards monitor (%)	17%	12%	27%	27%	14%	42%	30%	21%	-
Calculated contribution from the direction of Cadia Mine to annual average deposited dust (g/m^2/month)	0.3	0.4	0.6	0.4	0.2	1.2	0.8	0.3	2

The trends in deposited dust levels have also been examined (Figure 12). Some elevated levels (above 4 g/m^2/month) were observed around 2018-19 to 2019-20, coinciding with drought conditions. The deposited dust levels have not exceeded 4 g/m^2/month at any location in the three most recent reporting periods.

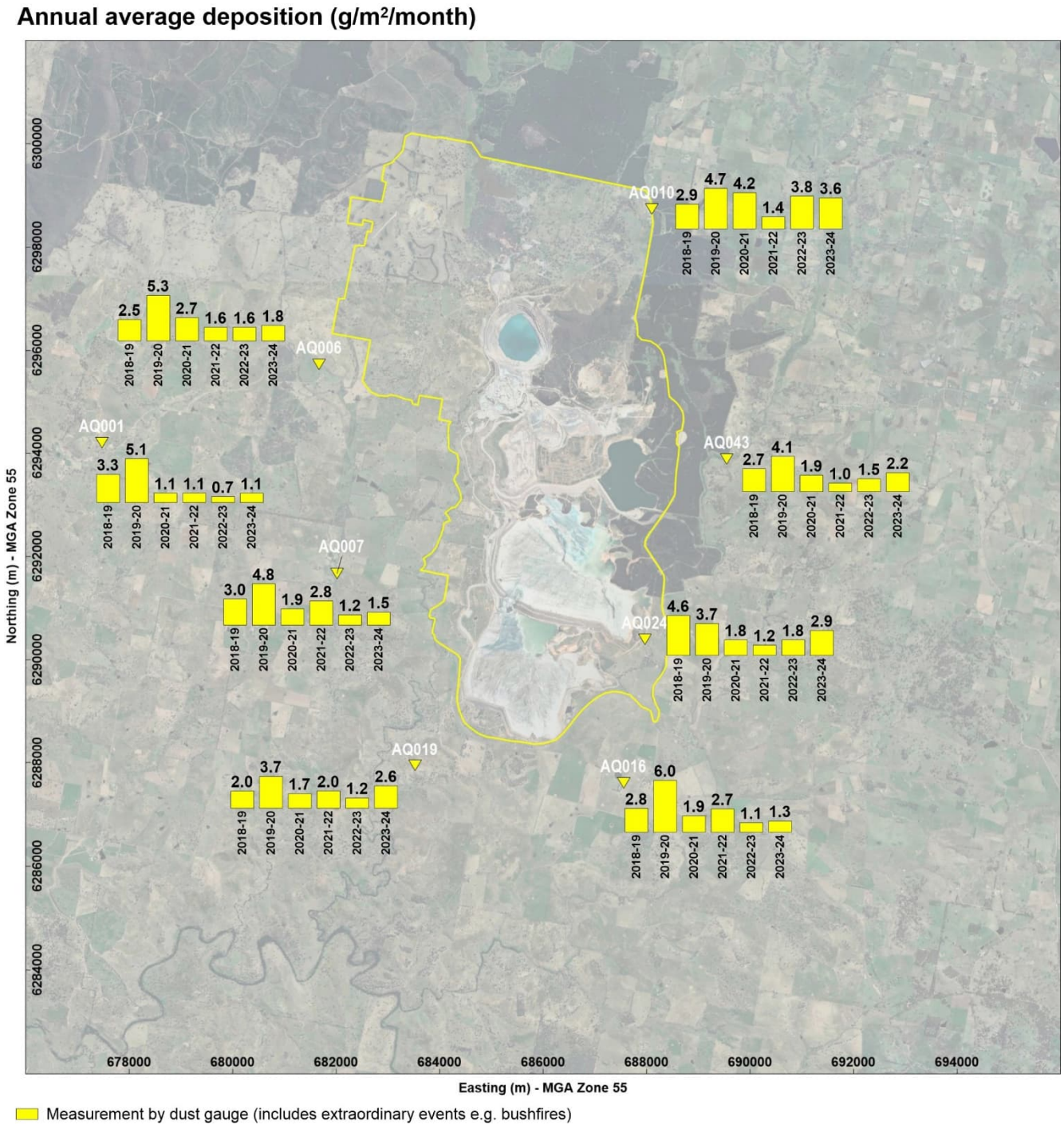


Figure 12 Historical trend in annual average deposited dust at Cadia monitors

3 Conclusions

The air quality monitoring data collected in 2023-24 around Cadia Mine have been reviewed. It has been concluded that Cadia was in compliance with its Project Approval for the Cadia Mine in terms of all relevant air quality indicators for data collected in 2023-24.

4 References

DPE (2020) “Annual Air Quality Statement 2019”. Available from https://www.environment.nsw.gov.au/

NSW Minerals Council (2000) “Particulate matter and mining”.

APPENDIX 2 AQUATIC ECOSYSTEM MONITORING PROJECT ANNUAL REPORT 2023-2024

Newmont Corporation, Cadia Mine - AEMP

Annual Report 2023 - 2024

Cadia Holdings Pty Limited

23 September 2024

→ **The Power of Commitment**



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Executive Summary

The Cadia environmental monitoring program includes an Aquatic Ecosystem Monitoring Project (AEMP) implemented biannually since spring 2006. The AEMP focusses on the assessment of macroinvertebrates, fish, and aquatic habitat condition potentially impacted by mine operations, within and surrounding the Cadia mine lease area (MLA). This report presents data collected during the spring 2023 and autumn 2024 monitoring periods and includes additional eDNA monitoring for platypus. Major findings in this report are:

– Flow in Cadiangullong Creek and the other waterways monitored reflected the pattern in rainfall with higher flows following rainfall events, but monitoring did not occur during a flow peak that would influence the results.
– Broader scale land-use are likely to be impacting on aquatic ecosystem health independent of mining activities in the catchment. These include elevated salinity or nutrient levels, agricultural pollution, disturbance to riparian zone vegetation and the downstream impacts of dams.
– There was no evidence that mining activities have impacted the *in situ* water quality of Cadiangullong Creek or Rodds Creek. The *in situ* water quality of sites on these waterways downstream of mining activities were not notably different to reference sites or upstream sites.
– As found in previous monitoring periods, there was evidence of increased copper in the sediments of Cadiangullong Creek downstream of the mine at site CC2. Due to the geomorphology of CC2, the pool at this site appears to act as a deposition site for sediments containing elevated copper concentrations.
– Despite elevated concentrations in the sediments at CC2, copper concentrations were lower further downstream at CC4, although they remained higher than upstream of the mine. The high copper concentrations in Cadiangullong Creek are not surprising given it flows through Cadia Hill that has naturally high copper mineralisation.
– There was no evidence that mining operations impact macroinvertebrate health. It is likely habitat conditions are more influential on macroinvertebrate community health than water or sediment quality.
– Sediment analytes were not found to be a major factor impacting the macroinvertebrate community. This includes the relatively high copper concentrations at CC2.
– A relatively healthy fish community dominated by the native Mountain Galaxias (*Galaxias olidus*) remains distributed throughout Cadiangullong Creek, along with Flyers Creek, Swallow Creek, Diggers Creek and Panuara Rivulet. Spring recruitment of juveniles indicates a self-sustaining population with adequate recruitment.
– eDNA monitoring for platypus suggest they remain distributed throughout Cadiangullong Creek, although they have rarely been detected at the most downstream sites at Oaky Station (CC4).

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.1 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

Newmont Overseas Holdings Pty Corporation (Australia), a wholly owned indirect subsidiary of Newmont Corporation, is the owner of Cadia Holdings Pty Limited (CHPL). CHPL is the owner and operator of Cadia Mine (Cadia). Cadia is one of Australia's largest gold mining operations.

Commencing in 1998 and operating continuously since, Cadia is located approximately 25 km south of Orange in the Central Tablelands region of New South Wales (NSW). The mining operation occurs across two local government areas (LGAs) (Blayney Shire Council and Cabonne Council).

Cadia provides an important economic contribution to the region and NSW and is a major regional employer providing approximately 1,400 full time equivalent jobs. Confirmed mineable resources have been identified to extend operations well beyond the life of the current Project Approval (PA) 06_0295 which provides for mining until 30 June 2031. Cadia has commenced planning for the continuation of mining operations and is delivering this work through the Cadia Continued Operations Project (CCOP).

PA 06_295 issued to CHPL in January 2010 under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for the following:

– Life of mine ore production (up to 30 June 2031) of approximately 525 million tonnes (Mt) of gold/copper ore from Cadia East and approximately 96 Mt of ore from Ridgeway underground mine.
– Processing of up to 35 Mt per annum (Mtpa) of gold/copper/molybdenum ore on site to produce gold doré from a gravity circuit, a gold-rich copper concentrate from a flotation circuit (which is piped to a dewatering plant at nearby Blayney and then sent by rail to Port Kembla in NSW for export) as well as a molybdenum rich concentrate which is sent by truck to Port Kembla in NSW for export.
– Disposal of tailings through emplacement into one of three tailings storage facilities (TSFs) being the Northern TSF (NTSF), Southern TSF (STSF) and Pit TSF (PTSF).
– Significant surface infrastructure and ancillary activities to support the operation of the mine including ore processing, rock emplacements, water management, maintenance, store and staff facilities and land management practices.

PA 06_0295 has been modified 14 times since issue, with the most recent modification approved on 13 December 2021 to provide for the repair, upgrade, and reinstatement of tailings deposition to the NTSF and STSF and increase production from 32 to 35 Mtpa.

Cadia is currently progressing with a further modification to PA 06_0295 (Modification 15). This was lodged with the now NSW Department of Planning, Housing and Infrastructure (DPHI) in November 2023. Modification 15 seeks to change the existing NTSF and STSF embankment footprints, recommence mining in the Ridgeway underground mine, amongst other various minor changes or infrastructure additions to support ongoing mining activities. CHPL also hold other environmental licences and mining approvals and authorities related to Cadia.

As part of the Cadia Environmental Monitoring Program, an Aquatic Ecosystem Monitoring Project (AEMP) is implemented on a biannual basis in spring and autumn. Commencing in spring 2006 the AEMP has focused on the assessment of aquatic macroinvertebrates, fish, and habitat conditions in waterways potentially impacted by mine operations within and surrounding the Cadia MLA. GHD Pty Ltd (GHD) was commissioned to undertake the most recent monitoring for the AEMP from 23 to 27 October 2023 (spring) and 17 to 21 April 2024 (autumn).

1.1 Scope and limitations

This report details the AEMP and documents the field monitoring undertaken by GHD in spring 2023 and autumn 2024. It describes the methodology, results for the various components of the monitoring program, and discusses these in relation to various assessment criteria (where applicable) and in the context of mining operations.

This report has been prepared by GHD for Cadia Holdings Pty Ltd (CHPL) and may only be used and relied on by CHPL for the purpose agreed between GHD and CHPL. GHD otherwise disclaims responsibility to any person other than CHPL arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and monitoring undertaken at or in connection with specific monitoring points, and on conditions encountered and information reviewed at the date of preparation of the report. Site conditions at other parts of the mine may be different from the site conditions found at the specific monitoring points. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

Investigations undertaken in respect of this report are constrained by the particular site conditions. As a result, not all relevant site features and conditions may have been identified in this report. Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.2 Rationale for using biological indicators

Aquatic macroinvertebrates are widely accepted and used for the biological assessment of rivers and streams. The use of macroinvertebrates in ecosystem disturbance studies stems from their high abundance and diversity, sensitivity to changes in water quality, flow regime and habitat conditions, ease of sampling, a good understanding of their taxonomy and ecological requirements, and an ability to detect long-term impacts (DNR 2001). The successful application of macroinvertebrates for biological assessment in the mining industry has been demonstrated both within Australia and overseas (Brycroft et al. 1982; Dudka and Adriano 1997; Faith et al. 1995; Humphrey et al. 1995; Norris et al. 1982). Traditionally, biological indices such as diversity and pollution indices have been used to determine the level of impact (Garcia-Criado et al. 1999).

Fish have been widely used as indicators of water quality throughout the world and were the basis for the North American Index of Biological Integrity (IBI), which has been modified for use in temporary streams and Australian inland rivers. The quantitative monitoring of fish has been applied successfully to the assessment of water quality impacts in temporary waters in Australia.

Previous studies of fish populations within streams in the Cadia area (e.g., Bauer 1995; Goldney 2000; GHD 2022: GHD 2023) have recorded the occurrence of five species only one of which, Mountain Galaxias (*Galaxias olidus*), is native to the region. The other four exotic species recorded in these past studies include Redfin Perch (*Perca fluviatilis*), Eastern Gambusia (*Gambusia holbrooki*), Rainbow Trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta*).

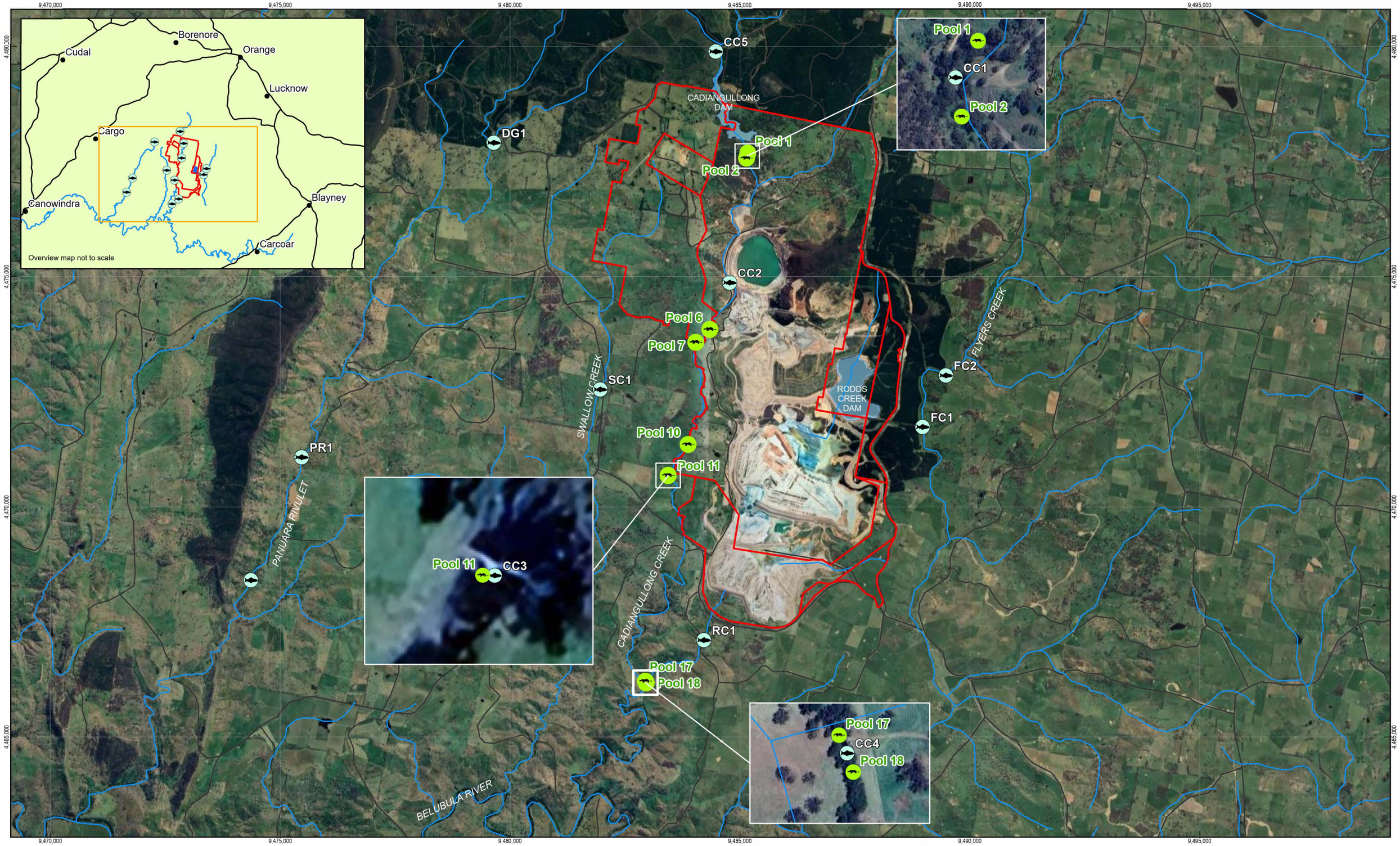
1.3 Study area

Cadiangullong Creek is the main focus of the AEMP as it runs in a southerly direction directly through the MLA and is therefore susceptible to impacts from mining operations (Plate 1; Figure 1.1). Cadiangullong Dam, a key water supply for mining facilities and environmental flow releases (termed ‘riparian releases’), is located upstream of the main Cadia mining facilities. A 2.4 km diversion, excavated from igneous rock, was created around open cut mining operations to allow for continuation of water supply to downstream reaches of Cadiangullong Creek via the riparian releases.

Cadiangullong Creek flows south into the Belubula River, approximately 14 km downstream of the Cadia southern lease boundary. Flyers Creek, Swallow Creek, Diggers Creek, Panuara Rivulet and Rodds Creek also flow into the Belubula River and are monitored in the AEMP.



Plate 1 ***Cadiangullong Creek***



Paper Size A3

0 0.5 1 2 3

Kilometers

Map Projection: Lambert Conformal Conic
Horizontal Datum: GDA 1994
Grid: GDA 1994 NSW Lambert

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LEGEND

- **Aquatic Monitoring Sites**
- **Platypus Monitoring Sites**
- Cadia Valley Operations MLA
- Water Storage/Reservoir
- Roads
- River/Creek

Cadia Holdings Pty Ltd
Cadia Aquatic Ecosystem Monitoring Project

Job Number 12620903
Revision C
Date 22 Sep 2024

Aquatic Ecosystem Monitoring Sites Surface Water Features

Figure 1.1

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1.4 Monitoring sites

During spring 2023 and autumn 2024 there were 12 sites monitored as part of the AEMP with site locations enabling comparisons of different treatments (Table 1.1; Figure 1.1). Five sites were located on Cadiangullong Creek (CC1 to CC5), the main waterway flowing through the Cadia MLA (Plate 2). One site was located on Swallow Creek (SC1) and two sites on Panuara Rivulet (PR1 and PR2) to the west of the MLA (Plate 3). One site was also located on Rodds Creek (RC1) and Diggers Creek (DG1) (Plate 2). Two sites were located on Flyers Creek (FC1 and FC2) to the east of Cadia (Plate 4).

Table 1.1 Monitoring site locations

Waterway	Site code	Site treatment
Cadiangullong Creek	CC5	Upstream
	CC1	Upstream
	CC2	On-site
	CC3	Downstream
	CC4	Downstream
Flyers Creek	FC2	Reference
	FC1	Reference
Panuara Rivulet	PR1	Reference
	PR2	Reference
Swallow Creek	SC1	Reference
Rodds Creek	RC1	On-site (downstream tailings dam)
Diggers Creek	DG1	Upstream

In addition to the standard AEMP monitoring components, monitoring of platypus (*Ornithorhynchus anatinus*) was also undertaken during spring 2023 and autumn 2024 (Figure 1.1). The aims of the program were to determine the current distribution of platypus in Cadiangullong Creek, predict changes during a cease-to-flow period, and identify potential management actions to mitigate against potential impacts.

The monitoring of platypus and associated water quality and habitat conditions (generally monthly) was initially carried out between March 2019 and July 2020 with environmental DNA (eDNA) sampling used to determine platypus presence (GHD 2020). The overall findings from the monitoring were that platypus persisted in Cadiangullong Creek, even during the cessation of the riparian releases, and continued to persist once releases were reinstated. The requirement to complete a monthly monitoring program ceased in July 2020 although Cadia decided to include the eDNA component in the AEMP to continue tracking platypus distribution (between spring 2020 and autumn 2024).

CC5	CC5
	
CC1	**CC1**
	
CC2	**CC2**
	
CC3	**CC3**
	
CC4	**CC4**
	

Plate 2 ***Cadiangullong Creek site photographs in spring 2023 (left) and autumn 2024 (right)***

RC1	**RC1**
	
SC1	**SC1**
	
DG1	**DG1**
	
PR1	**PR1**
	
PR2	**PR2**
	

Plate 3 ***Site photographs in spring 2023 (left) and autumn 2024 (right)***

FC2	FC2
	
FC1	**FC1**
	

Plate 4 ***Flyers Creek site photographs in spring 2023 (left) and autumn 2024 (right)***

2. Methodology

2.1 Permits and licences

GHD conduct macroinvertebrate and fish monitoring in NSW rivers and streams under a NSW Department of Primary Industries (DPI) Fisheries permit, issued under section 37 of the *Fisheries Management Act 1994* (Permit No: FP23/125, expiry date 22 March 2029). GHD also has an internal Animal Ethics Committee that operates in accordance with the requirements of the *Australian Code of Practice for the Care and Use of Animals for Scientific Purpose* (8th edition 2013).

2.2 Aquatic habitat

The aquatic habitat assessment was undertaken following methods described in the NSW AUSRIVAS Manual (Turak et al. 2004) that includes a range of physical habitat measurements and the Visual Assessment of Disturbance Related to Human Activities (VisAssess). This visual assessment method is an evidence-based approach of grading the degree of anthropogenic impacts at a monitoring site based on four assessment categories:

- **Water Quality:** odour, water clarity, disruption of the natural hydrology, presence of foam from detergents, oil
- **Instream:** change in substrate (e.g., rock piles or sedimentation from road construction or other development pipes), rubbish, filamentous algae, alien fish species, invasion by exotic aquatic plants
- **Riparian Zone:** de-vegetation, exotic plant invasion, bank degradation, point sources
- **Catchment:** mine, sewage treatment plant, landfill, dam, industry, logging, agriculture, clearing, salinity, grazing, urban development

A ranking of 0 to 4 and an associated description is assigned for each category with a higher score indicating a higher level of anthropogenic impact (Table 2.1). The total score is the sum of these rankings for each site, which provides an overall assessment of anthropogenic impacts ranging from 0 to 16.

Table 2.1 NSW AUSRIVAS VisAssess ranking categories, descriptions and total scores

Ranking	Description	Total visual assessment score
0	No evidence of disturbance	0 – 2
1	Little disturbance	3 – 5
2	Moderate disturbance	6 – 8
3	High disturbance	9 – 12
4	Extreme disturbance	13 – 16

2.3 Water quality

In situ water quality recordings were made from the surface at each site for the following physico-chemical parameters:

- Temperature (°C)
- pH (pH units)
- Electrical conductivity (µS/cm)
- Dissolved oxygen (% saturation and mg/L)
- Turbidity (NTU)
- Alkalinity (mg/L $CaCO_3$)

Temperature, pH, EC and dissolved oxygen (DO) were recorded at each site using a multi-parameter water quality meter. Alkalinity was measured using a Hach Alkalinity Titration kit and turbidity using a Hach 2100Q portable turbidimeter. All equipment is maintained and calibrated in accordance with manufacturer specifications. The water quality results were compared to ANZG (2018) default guideline values for slightly disturbed upland rivers of south-eastern Australia (previously known as ANZECC 2000).

2.4 Sediment quality

2.4.1 Sampling

Sediment quality has been included in the monitoring program since autumn 2018 to fill a knowledge gap identified following a review of the water quality, environmental and biological data for Cadia (GHD 2018). One of the key recommendations from the review was to include sediment monitoring to assess its relationship with benthic macroinvertebrate communities. There was some evidence of a relationship between macroinvertebrate communities and sediment in autumn 2018, so monitoring has continued to determine whether there was evidence of seasonal variation in sediment quality.

From a minimum of five locations at each site, sediment was collected and consolidated into a single composite sample. Sediment from multiple locations encapsulates variation associated with different habitats and hydrological units and allows for a more standardised procedure for comparing sediments amongst sites. The sediment samples were analysed for a suite of total metals (Table 2.2).

Table 2.2 Analytes – sediment samples

Laboratory analyses	Analytes
Total metals	Aluminium (Al), Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn)

2.4.2 Data analyses

Heavy metals concentrations in sediments were compared to default guideline values (DGVs) published in ANZG (2018). The sediment DGVs provide concentrations below which there is a low risk of unacceptable effects occurring in aquatic ecosystems (ANZG 2018). Upper guideline values are also published to provide an indication of concentrations at which toxicity-related adverse effects may be expected (ANZG 2018). The sediment concentrations in this report have been compared to both the DGVs and upper DGVs.

Note that the major toxic effect of metals on macroinvertebrate communities is due to the dissolved form of metals in an ecosystem (ANZG 2018). As such, the total metal concentrations assessed in this monitoring program over-estimate the fraction that is bioavailable.

Relationships in sediment quality amongst sites were examined using a Principal Components Analysis (PCA), which reduces a large set of variables into a small set that retains most information associated with the large set. In this case, the suite of metals listed in Table 2.2 were reduced to two principal components (PC1 and PC2). These principal components were used as axes in PCA ordinations to graphically represent sites in ordinal space. Principal component scores explain the percentage of variation in the sediment quality contributed by each axis and linear coefficients define the contribution of each analyte to each axis (plotted as vectors on the PCA ordination to superimpose environmental gradients). Prior to performing the PCA, the data was normalised to ensure scale independence. PCA analyses were conducted using PRIMER Version 7 (Clarke and Warwick 2001).

Note that where sediment results were presented as below laboratory limits of resolution (LOR), these values were halved (i.e., $<0.5 \div 2 = 0.25$ and $<1 \div 2 = 0.5$ respectively) and retained in the analysis. This is an accepted method for treating values that are below LOR (ANZG 2018). Antimony, beryllium, molybdenum, selenium and silver were removed from analyses as all, or most values were below laboratory detection limits and provided no information about variation.

2.5 Macroinvertebrates

2.5.1 Sampling

Macroinvertebrates were sampled in accordance with the NSW AUSRIVAS Sampling and Processing Manual (Turak et al. 2004). At each site, the littoral or edge habitat was sampled by sweeping the collecting net along the edge of the stream in areas of little or no current. Where present, riffles were sampled using a kick sampling method. For each sample the collected material was placed into a sorting tray and macroinvertebrates were 'live picked' for a minimum of 40 minutes. Live picked macroinvertebrates were preserved in 70% ethanol and labelled with information including site code, site location, habitat, sampling method, date, sampler and picker.

2.5.2 Laboratory processing

Macroinvertebrate samples were transported to the GHD ecology laboratory and sorted using stereo-dissection microscopes. The freshwater macroinvertebrates were identified using published taxonomic keys (see Hawking 2000), unpublished working keys and an extensive specimen reference collection maintained by GHD. Based on standard conventions for NSW AUSRIVAS models (Turak et al. 2004) macroinvertebrates were identified to family-level with the following exceptions:

– Chironomidae (Diptera) were identified to Sub-family (e.g., Orthocladiinae, Chironominae and Tanypodinae)
– Groups such as Nematoda, Oligochaeta and Acarina were identified to Class or Order
– Microcrustacea, Ostracoda, Copepoda and Cladocera were identified to the Order

Upon completion of identifications, all samples were returned to 100% ethanol for long-term archiving. This process allows samples to be re-examined if required. This may be important, particularly if taxonomy changes significantly in the future under a long-term monitoring program or for QA/QC purposes. Reference specimens remain the property of GHD.

2.5.3 Data analysis

The data analyses in this AEMP are designed to achieve the key objective of developing an understanding of macroinvertebrate communities as an indicator of aquatic ecosystem health. This has been done using a combination of univariate and multivariate analyses.

2.5.3.1 Univariate analyses - biological indices

The biological indices calculated from the macroinvertebrate data include:

– Taxa richness
– EPT taxa richness
– SIGNAL-2 scores
– NSW AUSRIVAS models: spring, autumn, and combined season edge and riffle where applicable

Taxa richness - Refers to the number of different taxa (identified to taxonomic levels outlined in Section 2.5.2) contained in a sample. Taxa richness can reasonably indicate ecological health, with healthy waterways generally having more taxa.

EPT Taxa Richness - Refers to the number of key macroinvertebrate taxa (identified to family level) belonging to the taxonomic Orders Ephemeroptera, Plecoptera and Trichoptera. These Orders are generally considered to contain pollution–sensitive insects and a loss of families usually indicates some level of disturbance (Plafkin et al. 1989).

SIGNAL-2 scores - SIGNAL-2 (Stream Invertebrate Grade Number Average Level) is a scoring system for macroinvertebrates in Australian rivers (see Chessman 2003). SIGNAL-2 is a biotic index based on pollution sensitivity values (grade numbers) assigned to aquatic macroinvertebrate taxa at the Order and Family taxonomic levels. These grades have been derived from published and unpublished information on taxa tolerance to pollutants such as sewage and nitrification (Chessman 1995). Each taxon is assigned a grade from 1 (tolerant) to 10 (sensitive) based on ecotoxicity assessment data.

Not all macroinvertebrate families have been assigned a SIGNAL-2 grade and those without are removed from SIGNAL-2 calculations, which is the average of the grades within a sample. SIGNAL-2 scores only use the presence of taxa and are not weighted with regard to abundance. For easier interpretation, SIGNAL-2 scores and the number of macroinvertebrate taxa are graphed using a bi-plot. The resulting bi-plot is placed into context using a quadrant diagram, which divides the results into four general realms. Each realm indicates various factors of site condition that may explain the macroinvertebrate community SIGNAL-2 scores (Figure 2.1).

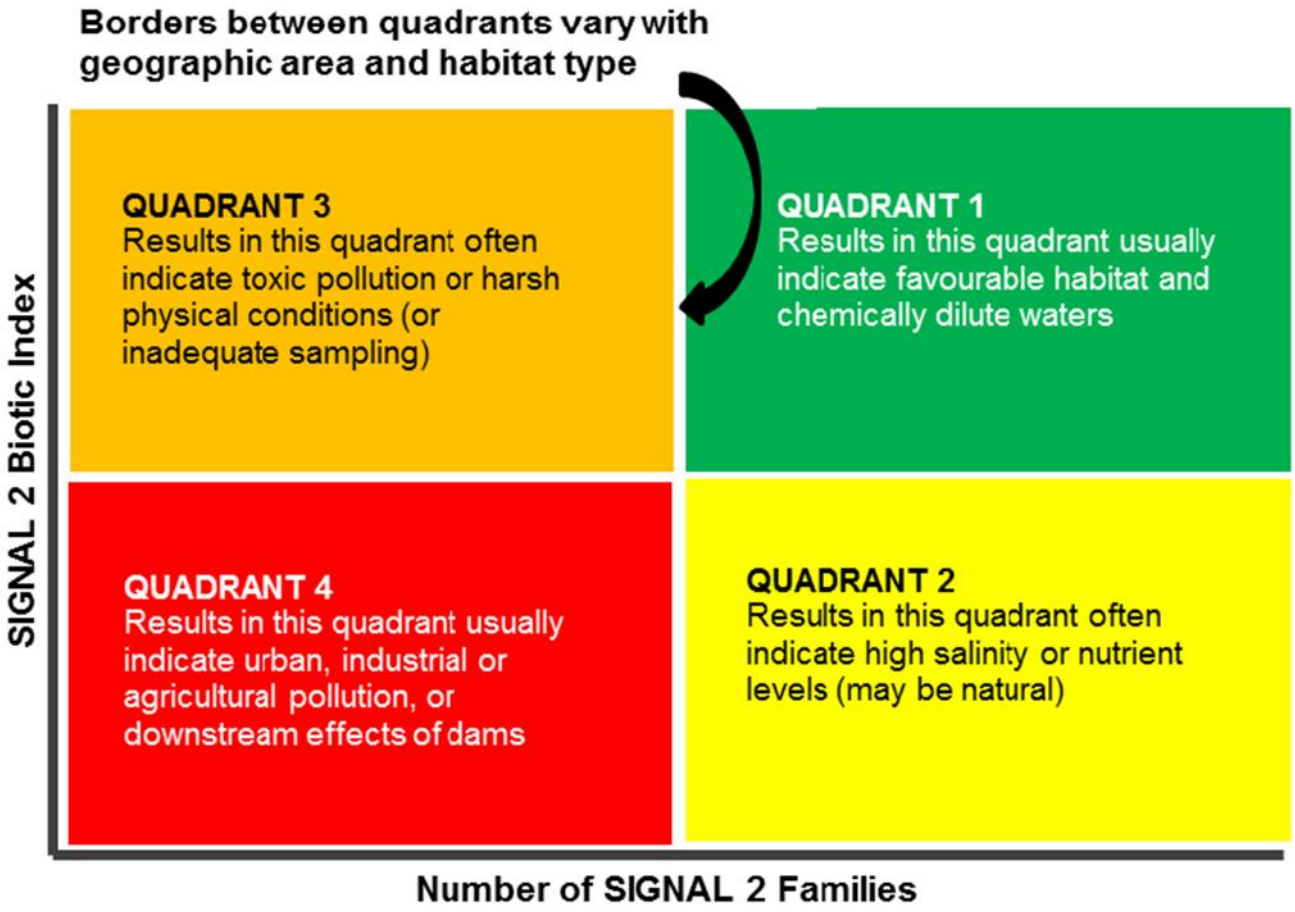


Figure 2.1 SIGNAL-2 bi-plot displaying the four quadrants and explanation of what each quadrant indicates

The SIGNAL-2 quadrant boundaries have been set according to the NSW interim boundaries suggested for sites within the Murray-Darling Basin above 400 m elevation (Chessman 2001). These are:

– A SIGNAL-2 score of 5 and 19.5 for number of families in edge habitats
– A SIGNAL-2 score of 6 and 17.5 for number of families in riffle habitats

NSW AUSRIVAS Model - All macroinvertebrate data, water quality parameters and habitat variables required by the AUSRIVAS models were collected according to the NSW AUSRIVAS manual (Turak et al. 2004) and ANZG (2018) water quality guidelines for aquatic ecosystems in south-eastern Australia. NSW AUSRIVAS models and accompanying scores and bandings have been used to detect changes in observed and expected macroinvertebrate communities for sites associated with the AEMP and include:

– NSW - Spring Riffle
– NSW - Spring Edge
– NSW - Autumn Riffle
– NSW - Autumn Edge
– NSW - Combined Seasons Edge
– NSW - Combined Seasons Riffle

AUSRIVAS generates site-specific predictions of the macroinvertebrate fauna expected to be present in the absence of environmental stress. The expected fauna from reference sites with a similar set of physical and chemical characteristics are compared to the observed fauna, and the ratio derived is used to indicate the extent of the impact. This ratio can range from 0, when none of the expected taxa are found at a site, to approximately 1, when all the expected taxa are present. The value can also be greater than 1 when more families are found at a site than predicted by the model. The ratio scores are placed in bands, which indicate whether the site is richer than reference, reference quality, significantly impaired, severely impaired or extremely impaired. Examples of outputs from the AUSRIVAS models (i.e., O/E 50 upper limits and band descriptions) are demonstrated for the combined season edge and riffle models in Table 2.3.

Table 2.3 AUSRIVAS bands, O/E50 upper limits, and band names and descriptions for the NSW combined seasons models

Band label	O/E50 upper limit for edge habitats	O/E50 upper limit for riffle habitats	Band name	Band description
Band X	>1.17	>1.14	More biologically diverse than reference sites	More taxa found than expected. Potential biodiversity hot spot. Possible mild organic enrichment.
Band A	1.17	1.14	Reference condition	Most/all of the expected families found. Water quality and/or habitat condition roughly equivalent to reference sites. Impact on water quality and habitat condition does not result in a loss of macroinvertebrate diversity.
Band B	0.82	0.85	Significantly impaired	Fewer families than expected. Potential impact, either on water quality or habitat quality or both, resulting in loss of taxa.
Band C	0.48	0.57	Severely impaired	Many fewer families than expected. Loss of macroinvertebrate biodiversity due to substantial impacts on water and/or habitat quality.
Band D	0.14	0.29	Extremely impaired	Few of the expected families remain. Extremely poor water and/or habitat quality. Highly degraded.

2.5.3.2 Multivariate analyses – macroinvertebrate communities

Multivariate analyses were performed on the macroinvertebrate data for both spring and autumn separately as strong seasonal differences have previously been identified by the AEMP. Edge and riffle habitats were also analysed separately due to differences in the communities associated with these habitats. The multivariate analyses were utilised to determine if significant differences in the macroinvertebrate community existed spatially. That is, are there significant differences between sites associated with each treatment type (i.e., upstream, on-site, downstream and reference). All multivariate analyses were performed using the PRIMER V7 software package (Clarke and Gorley 2015).

Initially, the macroinvertebrate data was transformed to presence/absence data as the macroinvertebrate sampling protocol is a semi-quantitative technique. Furthermore, transformation of the macroinvertebrate data increases the influence of rare taxa and decreases potential sample variability based on the inherent variation associated with different sample collectors. A similarity matrix was subsequently calculated between all samples based on the Bray-Curtis similarity measure. Non-metric multidimensional scaling (nMDS) was then used to produce an ordination plot as a graphical representation of key spatial and temporal trends in the macroinvertebrate assemblages. The stress value associated with the nMDS ordination was examined to identify the accuracy of the ordination. A stress value <0.2 indicates a potential useful 2-dimensional ordination (Clarke and Warwick 2001).

To test if there were statistically significant differences in the macroinvertebrate communities between each treatment type (see Table 1.1), permutation-based analyses of variance (ANOSIMs) were used using 999 permutations. If significant differences were detected or the composition of the community warranted further examination, taxa analysis was conducted using the similarity percentages (SIMPER) routine to identify the taxa that best discriminate between the treatments. SIMPER quantifies the contribution of each taxon to the average dissimilarity between the two groups of samples, and to the average similarity within a group (Clarke and Warwick 2001).

A key focus of the sediment monitoring was to assess if there was an association between sediment quality and macroinvertebrate communities. To investigate this, the study design allowed for the RELATE, BEST and DISTLM procedures in the PRIMER V7 software package to be used (see Clarke and Gorley 2015). Initially, the RELATE procedure was used to test if there was a correlation between sediment quality and macroinvertebrate communities. That is, to explore if the patterns on the sediment PCA show some correlation to the macroinvertebrate nMDS. Using 999 permutations, RELATE calculates the rank correlation (q) and if the null hypothesis was accepted (significance level $P > 0.05$) no relationship between two data sets is assumed. If the RELATE procedure identified a relationship between sediment analytes and the macroinvertebrate community, additional tests would be completed.

The sediment analytes that best explained relationships would be identified using the BEST procedure. BEST identifies which analytes are most strongly correlated with the macroinvertebrate communities and was carried out by generating a resemblance matrix (based on Euclidean distance) of normalised sediment analytes and matching it, using a Spearman rank correlation, to the macroinvertebrate data. The limitation of the BEST procedure is it gives an indication of correlation between sediment analytes and macroinvertebrate communities but does not identify how much of the variation in macroinvertebrates communities is explained by each analyte. This would be determined using the distanced based linear modelling (DISTLM) procedure to test if there was a significant correlation, using 999 permutations, between each sediment analyte and the macroinvertebrate communities. DISTLM can then identify the percentage variation in the macroinvertebrate community explained by the analytes[1].

2.6 Fish

2.6.1 Sampling

Electrofishing was conducted in accordance with the Australian Code of Electrofishing Practice (SCFFA 1997) and GHD's Fauna Survey Standard Operating Procedure to ensure all safety requirements were met prior to commencing work. At each site, the total reach surveyed was defined as 10 x bank-full width. Electrofishing was undertaken using an E-fish 500 W Backpack System in areas where the depth, instream habitat, and water quality was suitable for safe operation.

There were two sites where electrofishing could not be undertaken – for safety reasons at CC5 where the water depth exceeded 1.5 m, and at SC1 where excessive macrophyte growth meant there was little open water areas where fish could be netted. At these sites, eight baitfish traps (250 mm x 250 mm x 450 mm; 5 mm mesh) were set using a stratified approach to cover all habitat types within the reach. Traps were baited with dry cat biscuits and left overnight for approximately 12 hours. Fish surveys are not conducted at Rodds Creek (RC1) or Diggers Creek (DG1) as part of the AEMP.

2.6.2 Identification and processing

At each site fish collected were identified to species using published keys (e.g., Allen et al. 2002; Lintermans 2023; Kuiter 2013) and the total length (TL) of Mountain Galaxias to the nearest millimetre (mm) recorded. Native species were returned unharmed to the stream. Non-native species (e.g., Gambusia – *Gambusia holbrooki*) were euthanised and disposed of in accordance with ethics permit requirements. All by-catch fauna (e.g., Yabbies - *Cherax* sp.) were noted and immediately returned to the waterways.

[1] Note that in the current AEMP program for spring 2023 and autumn 2024 there was no significant correlation determined by the RELATE procedure so BEST and DISTLM were not used.

2.7 Platypus

2.7.1 Sampling

Platypus were monitored using environmental DNA (eDNA) sampling to determine presence. At each site, samples were collected in duplicate by passing up to 5 L of water through a 0.22 µm filter (Sterivex) using a battery powered Smith-root eDNA pump. Filters were transported to the EnviroDNA laboratory for processing. Note that from March 2019 to December 2021 hand-held syringes were used to collected eDNA samples, with the standard volume filtered approximately 200 mL. This lower volume was due to the clogging of the filters with sediment as water was filtered. The use of the pump and greater volume of water samples would be expected to increase the chances of detecting Platypus DNA, if present. However, the results from March 2019 to December 2021 do provide evidence supporting the distribution of Platypus in Cadiangullong Creek.

2.7.2 Laboratory processing

DNA was extracted from the filters using a commercially available DNA extraction kit (Qiagen DNeasy Blood and Tissue Kit). Real-time quantitative Polymerase Chain Reaction (qPCR) assays were used to amplify the target DNA, using a species-specific marker targeting a small region of the mitochondrial DNA, previously developed and assessed for specificity and sensitivity by EnviroDNA (Weeks et al. 2015; Lugg et al. 2018). Assays were performed in triplicate on each sample. Negative controls were included for the DNA extraction and qPCR steps. At least two positive PCR's (out of 6 assays performed for each site) were required to classify the site as positive for the presence of platypus.

3. Results

3.1 Rainfall and hydrology

Table 3.1 includes 12 months of rainfall and temperature data for the Orange region from June 2023 to May 2024. From June to October 2023 total monthly rainfall in the region was lower than the long-term average, including during the spring monitoring in October 2023. Total monthly rainfall during April when the autumn 2024 monitoring occurred was almost three times the long-term average. Furthermore, from November to April the total monthly rainfall exceeded the long-term average, except for March 2024. The mean maximum air temperatures during both the spring and autumn monitoring were close to the long-term averages.

Table 3.1 ***Monthly rainfall and temperature recorded at Orange Airport (63303) from June 2023 to May 2024 and long-term means from 1996 to 2024 (sourced from BOM 2024). Red highlights indicate monitoring months***

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Total rainfall (mm)	56.6	47.4	46.2	30.0	46.0	114.4	84.6	73.6	189.4	38.8	141.0	28.8
Long-term mean rainfall (mm)	77.4	75.0	85.2	78.8	73.2	94.9	83.6	67.9	80.0	77.9	50.6	50.0
Mean maximum temperature (ºC)	10.7	12.0	13.6	17.8	19.1	22.8	26.4	26.9	27.0	24.2	17.8	15.0
Long-term mean maximum temperature (ºC)	10.8	9.9	11.3	14.9	18.3	21.7	24.8	27.4	26.0	23.0	18.6	13.9

The hydrograph for Cadiangullong Creek upstream of Cadiangullong Dam (CC5) reflected the seasonal patterns in rainfall (Figure 3.1).

At CC5 there was an increase in mean daily flow during early October, while further downstream of Cadiangullong Dam, at CC1, a similar but larger increase in flow occurred – likely due to a combination of runoff and releases from the dam. Increases in flow were also observed further downstream at CC3 and CC4 during October, with flow in Cadiangullong Creek generally increasing with distance downstream. This is likely due to the further contribution of runoff to the creek – either as overland flow, or tributary and groundwater inputs.

The high April rainfall resulted in a peak flow event prior to the autumn monitoring at all Cadiangullong Creek sites. However, this increase was small at CC1, which may be due to the capture of water in the dam.

In Flyers Creek and Swallow Creek there were also noticeable increases in flow in October, although they were only minor in Swallow Creek. Similar to Cadiangullong Creek, there were peak flow events prior to the autumn monitoring in April 2024. There were also peak flow events prior to the spring monitoring in October, although this was only minor in Swallow Creek.

Overall, the rainfall and hydrology in the region demonstrate that the spring and autumn monitoring was undertaken during relatively low and steady flows in the waterways as shown in Figure 3.1. The monitoring did not occur during a flow peak that would influence the results.

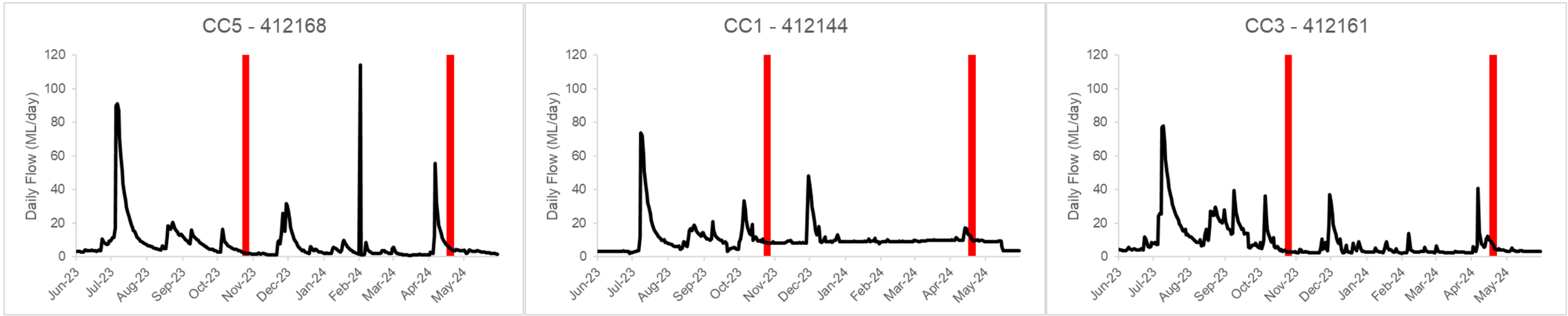


Figure 3.1 ***Hydrographs from Swallow Creek (SC), Flyers Creek (FC) and Cadiangullong Creek (CC) showing average daily flow for the period 1 June 2023 to 31 May 2024 with red lines indicating spring and autumn monitoring periods. The six digit numbers refer to the stream gauge identification numbers***

3.2 Aquatic habitat

The NSW AUSRIVAS Visual Assessment of Disturbance Related to Human Activities determined most sites on Cadiangullong Creek are subject to 'high disturbance' (Table 3.2). Site CC1 upstream of the mine was categorised as 'moderate disturbance' given it had better quality riparian vegetation than other sites. Site CC2, located onsite at Cadia, was categorised as 'extreme disturbance', with water quality being the only criteria that did not score the maximum value. In previous seasons reference sites on Panuara Rivulet have at times also been categorised as 'extreme disturbance'. This was the case for PR1 during spring 2023 due to the presence of excessive filamentous algae (Plate 3). Filamentous algae was also present at PR2, but the better quality riparian vegetation at this site resulted in the site remaining within the 'high disturbance' category. The algae had cleared in autumn 2024 and both Panuara Rivulet sites were categorised as 'high disturbance'.

In general, most sites on the Cadiangullong Creek, Swallow Creek, Flyers Creek, Panuara Rivulet and Rodds Creek were categorised as 'high disturbance' due to the impacts to riparian zone vegetation and broader catchment scale land-use which is heavily influenced by grazing in the mid to lower catchment areas, and pine plantations in the upper catchment.

Common disturbance of the waterways unrelated to mining activities includes erosion and sedimentation that contributes to increased turbidity in Cadiangullong Creek, excessive algal growth in Panuara Rivulet due in part to agricultural land use and nutrients inputs, and the presence of exotic fish species.

Table 3.2 Results of the NSW AUSRIVAS visual assessment of disturbance

Site	Season	Water quality	Instream	Riparian zone	Catchment	Total score	Category
CC5	Spring	2	2	3	2	9	High disturbance
	Autumn	2	2	3	2	9	High disturbance
CC1	Spring	2	2	2	2	8	Moderate disturbance
	Autumn	2	2	2	2	8	Moderate disturbance
CC2	Spring	2	4	4	4	14	Extreme disturbance
CC3	Spring	2	2	3	3	10	High disturbance
	Autumn	2	2	3	3	10	High disturbance
CC4	Spring	2	2	3	3	10	High disturbance
	Autumn	2	2	3	3	10	High disturbance
FC2	Spring	2	2	3	3	10	High disturbance
	Autumn	2	2	3	3	10	High disturbance
FC1	Spring	2	2	4	3	11	High disturbance
	Autumn	2	2	4	3	11	High disturbance
PR1	Spring	2	4	4	3	13	Extreme disturbance
	Autumn	2	2	4	3	11	High disturbance
PR2	Spring	2	4	3	3	12	High disturbance
	Autumn	2	2	3	3	10	High disturbance
SC1	Spring	2	2	4	2	10	High disturbance
	Autumn	2	2	4	2	10	High disturbance
RC1	Spring	2	2	4	4	12	High disturbance
	Autumn	2	2	4	4	12	High disturbance
DG1	Spring	2	2	4	3	11	High disturbance
	Autumn	2	2	4	3	11	High disturbance

3.3 Water quality

Results for the *in-situ* water quality recorded in spring 2023 and autumn 2024 are presented in Table 3.3 and are compared to the relevant ANZG (2018) DGVs, where available. The results are also displayed in graphs in Figure 3.2, which allows for visual comparison of trends between seasons and sites.

Table 3.3 ***Results of in-situ water quality for the Cadia aquatic ecosystems sites monitored in spring 2023 and autumn 2024. Red values exceed ANZG (2018) DGVs***

Site	Season	Temp. (ºC)	DO (mg/L)	DO (%Sat.)	EC (µS/cm)	pH (Units)	Turbidity (NTU)	Alkalinity (mg/L)
ANZG (2018) DGVs[2]		NA	NA	90-110	350	6.8-8.0	25	NA
CC5 (Upstream)	Spring	12.5	9.6	90.1	62	7.2	10	45
	Autumn	11.7	9.3	85.5	76	7.1	11	35
CC1 (Upstream)	Spring	11.8	10.6	97.9	84	7.8	11	40
	Autumn	14.8	8.9	87.4	104	7.5	8	50
CC2 (On-site)	Spring	17.7	9.3	97.7	182	7.8	7	75
	Autumn	15.5	8.1	80.8	195	8.0	4	55
CC3 (Downstream)	Spring	12.1	10.8	100.6	360	7.8	6	95
	Autumn	11.7	9.9	91.8	336	8.0	4	75
CC4 (Downstream)	Spring	13.6	9.7	93.5	581	8.0	9	280
	Autumn	12.6	10.2	96.0	526	8.4	4	200
DG1 (Upstream)	Spring	11.2	7.1	64.9	825	7.4	6	240
	Autumn	13.9	8.2	79.9	974	7.8	5	240
FC2 (Reference)	Spring	15.5	9.7	97.4	319	8.3	5	200
	Autumn	14.8	8.3	81.4	457	8.5	4	260
FC1 (Reference)	Spring	12.2	11.2	104.5	297	8.0	5	160
	Autumn	11.6	9.8	89.7	472	8.2	3	320
PR1 (Reference)	Spring	12.8	12.9	122.2	687	8.4	7	360
	Autumn	13.6	10.3	99.1	991	8.6	3	260
PR2 (Reference)	Spring	17.4	12.1	126.6	781	8.4	3	300
	Autumn	14.8	10.6	105.0	986	8.7	4	260
RC1 (On-site)	Spring	10.2	8.3	74.3	1372	8.0	8	160
	Autumn	13.3	8.4	80.7	713	8.2	4	480
SC1 (Reference)	Spring	12.5	9.9	93.4	1320	7.5	6	340
	Autumn	11.5	7.4	68.5	1789	7.8	3	440

Discussion of seasonal or spatial trends are provided below:

Temperature – There was no clear seasonal pattern in surface water temperature, with some sites having higher temperature in spring than in autumn, and *vice versa*. This is likely due to the climatic conditions experienced during monitoring and the time of day that each site was monitored. In Cadiangullong Creek CC2 had higher temperatures than other sites on this waterway which is likely due to the slow flowing conditions at this site allowing the water to warm up. Slow flowing conditions at FC2 and PR2 also likely contributed to higher temperatures at these two sites. There is no ANZG (2018) DGV for temperature.

[2] ANZG (2018) default guideline values (DGVs) are for upland rivers in south-eastern Australia

Dissolved oxygen – During both spring and autumn a number of sites had DO less than the ANZG (2018) DGV. In general, higher DO was recorded during spring than autumn, although this was not consistent at all sites. In both seasons, oxygen was generally lower at DG1, RC1 and SC1.Higher DO concentrations were recorded at the two Panuara Rivulet sites (PR1 and PR2) during spring, which was likely due to the excessive filamentous algae growth that contributed to higher rates of photosynthesis (Plate 3).

Electrical conductivity – There was no consistent pattern in EC between seasons, with higher values at some sites during spring, and at others during autumn. In Cadiangullong Creek there was a consistent EC gradient, with levels increasing downstream in both seasons, and with site CC3 exceeding the ANZG (2018) DGV in spring and site CC4 exceeding the DGV in both seasons. Flyers Creek remained below the DGV during spring but exceeded the DGV during autumn, which is likely due to the lower flows in autumn leading to increased salt concentration. Panuara Rivulet, Rodds Creek and Swallow Creek exceeded the DGV in both seasons.

pH – With the exception of sites CC5 and CC1 there was slightly higher pH at all sites during autumn compared to spring. Sites DG1 and SC1 were within the DGV range of 6.5 to 8.0 in both seasons. There were some exceedances of the upper DGV value of 8.0 at sites on Flyers Creek, Panuara Rivulet and Rodds Creek. Cadiangullong Creek was generally within the DGV range, with the exception of CC4 during autumn that exceed pH 8.

Turbidity – Turbidity remained below the ANZG (2018) DGV of 25 NTU at all sites in both seasons. The highest turbidity value was 11 NTU at sites CC5 and CC1, but this was well below the DGV.

Alkalinity – Alkalinity is water's capacity to resist acidification and is influenced by the soil and bedrock through which it passes as well as by rainfall. Alkalinity can also be influenced by acids from mining runoff, which may decrease alkalinity. No pattern was observed between seasons - with some sites higher during spring and others during autumn. There is no ANZG (2018) DGV for alkalinity. Cadiangullong Creek generally had lower alkalinity than the other waterways, with the exception of the most downstream site CC4.

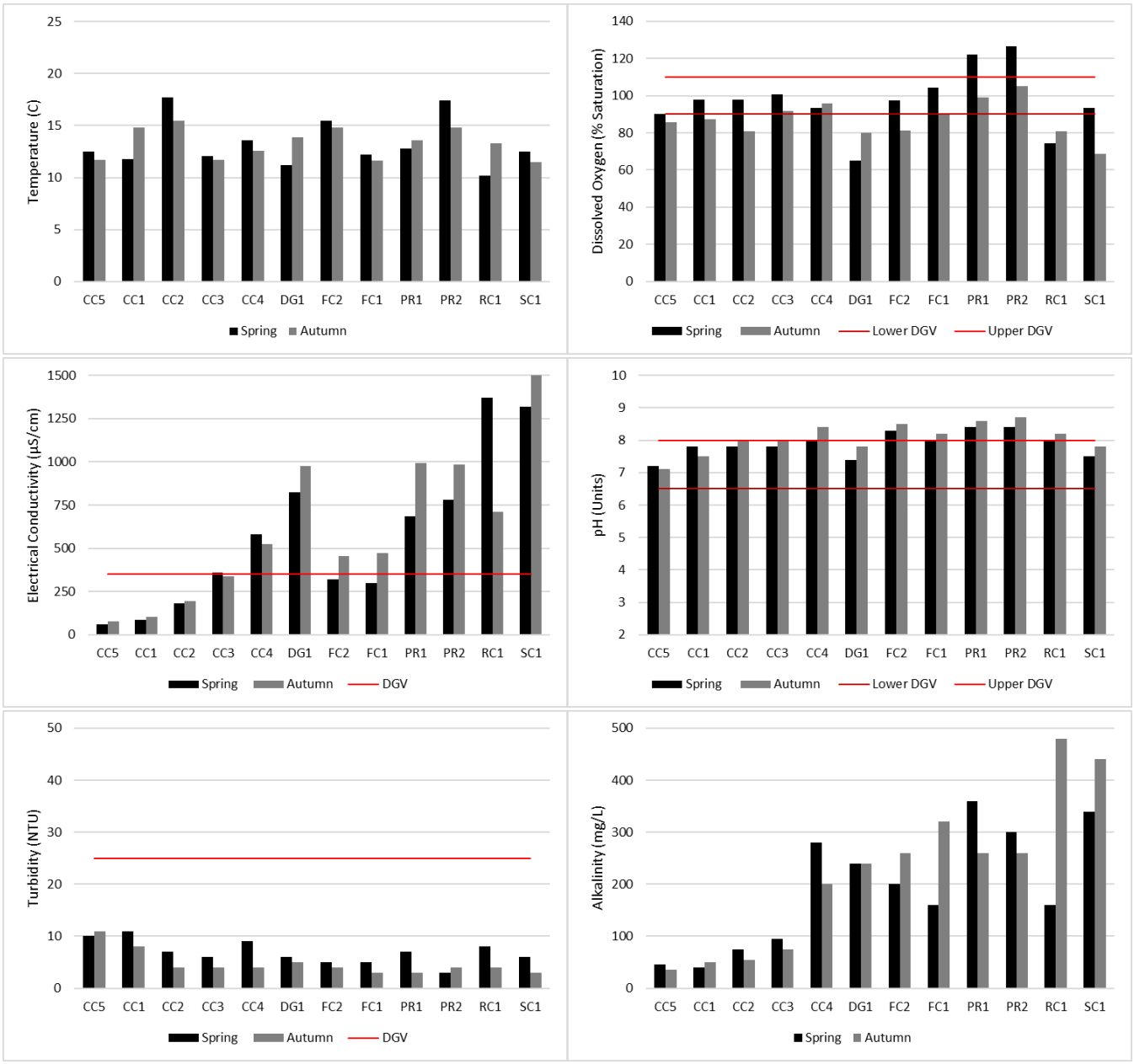


Figure 3.2 ***In situ water quality for Cadia sites monitored spring 2023 and autumn 2024. Red lines are ANZG (2018) default guideline values (DGV)***

3.4 Sediment quality

3.4.1 Comparison to guideline values

Comparisons of total metal concentrations in sediments against the ANZG (2018) DGVs are shown in Table 3.4. Copper exceeded the upper DGV at most sites in both seasons in Cadiangullong Creek, apart from the two most upstream sites – CC5 and CC1. The only other metal that exceed the upper DGV was arsenic in Diggers Creek during spring.

Several sites also exceeded the DGV for arsenic, chromium, copper, lead, mercury, nickel and zinc but overall, there was no consistent pattern indicating that sites regularly exceeded the DGV for these metals in both seasons. The exception was at both Flyers Creek sites, where the DGV for nickel was exceeded in both seasons.

Concentrations of antimony and silver were below laboratory limits of reporting (LOR) at all sites in both seasons, as were most results for beryllium, cadmium, molybdenum and selenium. However, there were no consistent patterns suggesting these metals were of concern.

Table 3.4 Comparisons of total metals (mg/kg) against the ANZG (2018) DGVs for sediment. Orange values exceeded the DGV and red the upper DGV. Bold values exceed the DGV when value is halved (due to limit of laboratory resolution exceeding the DGV)

		Aluminium	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
DGVs		**NA**	**2**	**20**	**NA**	**NA**	**1.5**	**80**	**NA**	**65**	**NA**	**50**	**NA**	**0.15**	**NA**	**21**	**NA**	**1**	**200**
Upper DGVs		**NA**	**25**	**70**	**NA**	**NA**	**10**	**370**	**NA**	**270**	**NA**	**220**	**NA**	**1**	**NA**	**52**	**NA**	**4**	**410**
CC5	Spring	21000	**< 5**	7	240	< 5	< 0.2	45	29	44	71000	17	1400	< 0.05	< 5	19	< 3	**< 5**	120
	Autumn	37000	**< 5**	9	92	5	< 0.2	51	32	260	77000	22	1600	0.07	< 5	27	3	**< 5**	200
CC1	Spring	15000	**< 5**	< 5	77	< 5	< 0.2	48	19	59	45000	5	700	< 0.05	< 5	14	< 3	**< 5**	65
	Autumn	30000	**< 5**	10	110	< 5	< 0.2	82	39	190	67000	11	1700	0.08	< 5	30	< 3	**< 5**	94
CC2	Spring	25000	**< 5**	7	210	< 5	0.8	26	100	1400	36000	21	2800	0.09	< 5	20	< 3	**< 5**	310
	Autumn	22000	**< 5**	17	55	< 5	< 0.2	38	33	730	49000	21	750	0.09	9	20	< 3	**< 5**	110
CC3	Spring	11000	**< 5**	9	120	< 5	< 0.2	37	19	160	36000	12	970	< 0.05	< 5	13	< 3	**< 5**	57
	Autumn	16000	**< 5**	7	56	< 5	< 0.2	25	18	370	26000	11	1200	0.06	< 5	14	< 3	**< 5**	67
CC4	Spring	19000	**< 5**	8	140	< 5	0.2	25	17	330	32000	12	1400	0.05	< 5	14	< 3	**< 5**	85
	Autumn	36000	**< 5**	15	150	< 5	0.3	47	28	580	56000	16	3400	0.11	< 5	25	4	**< 5**	150
DG1	Spring	12000	**< 5**	77	160	< 5	0.6	36	16	57	70000	60	720	0.06	< 5	20	< 3	**< 5**	160
	Autumn	22000	**< 5**	49	110	< 5	1.1	31	22	72	42000	45	780	0.13	< 5	29	< 3	**< 5**	220
FC2	Spring	25000	**< 5**	< 5	78	< 5	< 0.2	93	13	48	27000	22	240	< 0.05	< 5	23	3	**< 5**	110
	Autumn	20000	**< 5**	19	84	< 5	< 0.2	69	22	53	41000	19	2200	0.18	< 5	23	< 3	**< 5**	98
FC1	Spring	18000	**< 5**	33	150	< 5	< 0.2	97	26	63	71000	24	1700	0.12	< 5	28	< 3	**< 5**	98
	Autumn	19000	**< 5**	19	95	< 5	< 0.2	56	21	48	42000	15	1900	0.11	< 5	22	< 3	**< 5**	86
PR1	Spring	14000	**< 5**	8	180	< 5	< 0.2	23	12	25	30000	18	680	< 0.05	< 5	14	< 3	**< 5**	65
	Autumn	12000	**< 5**	9	79	< 5	< 0.2	22	10	18	29000	17	670	< 0.05	< 5	15	< 3	**< 5**	60
PR2	Spring	11000	**< 5**	5	160	< 5	< 0.2	17	8	19	18000	14	620	< 0.05	< 5	11	< 3	**< 5**	44
	Autumn	16000	**< 5**	8	130	< 5	< 0.2	19	8	21	20000	13	660	< 0.05	< 5	12	< 3	**< 5**	54
RC1	Spring	23000	**< 5**	8	170	< 5	< 0.2	29	15	82	33000	9	1900	0.12	< 5	16	< 3	**< 5**	85
	Autumn	36000	**< 5**	10	120	< 5	< 0.2	70	27	91	55000	9	1300	< 0.05	< 5	26	< 3	**< 5**	78
SC1	Spring	16000	**< 5**	28	180	< 5	< 0.2	31	18	62	32000	14	880	< 0.05	< 5	17	< 3	**< 5**	65
	Autumn	24000	**< 5**	28	42	< 5	< 0.2	48	12	65	38000	13	260	< 0.05	< 5	16	< 3	**< 5**	57

3.4.2 Multivariate analysis

To further investigate patterns amongst sites, PCA ordinations based on the sediment quality was carried out for two sets of sites:

– All monitoring sites to identify major differences in sediment quality between the waterways
– Cadiangullong Creek sites only, to identify site differences within Cadiangullong Creek.

For the PCA ordinations of all monitoring sites during spring and autumn, the two principal components accounted for 69% and 70% of the variation in sediment metal concentrations respectively (Figure 3.3). For the PCA ordination of the Cadiangullong Creek sites only, the two principal components accounted for over 96% of the variation in sediment metal concentrations during spring, and over 82% during autumn (Figure 3.4). Clarke and Warwick (2001) suggest that an empirical rule-of-thumb for a PCA is that the two principal components should account for at least 70% of the variation. As such, the PCA ordinations are a good representation of patterns in the sediment metal concentrations amongst waterways and sites.

The main aim of the PCA ordinations that include all waterways is to determine if there is evidence of differences amongst the treatments. That is, do mining activities result in an increase in metals at sites that are on-site at the mine compared to upstream and reference sites, and if there is evidence of a residual influence of any increases at downstream sites.

Comparison between all sites

During spring, most sites were grouped together indicating they had relatively similar metals concentrations. However, the separation of Diggers Creek (DG1) on the PCA ordinations for both seasons suggest it consistently had different concentrations of metals compared to the other waterways (Figure 3.3). In spring DG1 had relatively higher concentrations of arsenic, lead, iron and chromium. In autumn DG1 had relatively higher concentrations of cadmium, lead, arsenic, zinc and mercury. One of the Flyers Creek sites (FC1) also had higher concentrations of arsenic, lead, iron and chromium during spring, but there were fewer differences during autumn. One of the sites on Cadiangullong Creek (CC2) had relatively higher concentrations of several metals including copper, cobalt, barium and manganese. During autumn the differences in the metal concentrations at site CC2 were not as distinct as observed during spring. Although copper was still higher at CC2 compared to other sites, the concentrations of other metals including cobalt, barium and manganese were more comparable. In fact, aluminium, iron, chromium and manganese were lower at CC2 than most other Cadiangullong Creek sites. Although there is only one site on Diggers Creek, the results suggest that this waterway had higher concentrations of many metals relative to other waterways. Given it is an upstream site, this is not related to mining activities. There was no consistent pattern that suggests the on-site or downstream sites had higher metal concentrations than upstream or reference sites.

Comparison between Cadiangullong Creek sites

The PCA ordination for the Cadiangullong Creek sites indicates that during spring site CC2, located on-site at the mine, was separated from all other sites (Figure 3.4). This was primarily due to relatively higher concentrations of copper, cobalt, zinc, cadmium and manganese compared to other Cadiangullong Creek sites. The upstream site CC5 was also separated from other sites during spring due to higher concentrations of barium and iron. During autumn site CC2 was not as different to the other sites. In fact, there is some pattern of change moving downstream in Cadiangullong Creek. The two upstream sites (CC5 and CC1) had relatively higher concentrations of iron, nickel and chromium. Downstream at the on-site CC2 there were still higher concentrations of copper, but not to the degree observed in autumn. At CC4 the metal concentrations generally returned to be more similar to the upstream sites, although there were relatively higher concentrations of manganese, barium and aluminium. Overall, the main driver of the differences amongst the sites was copper at CC2, particularly in spring.

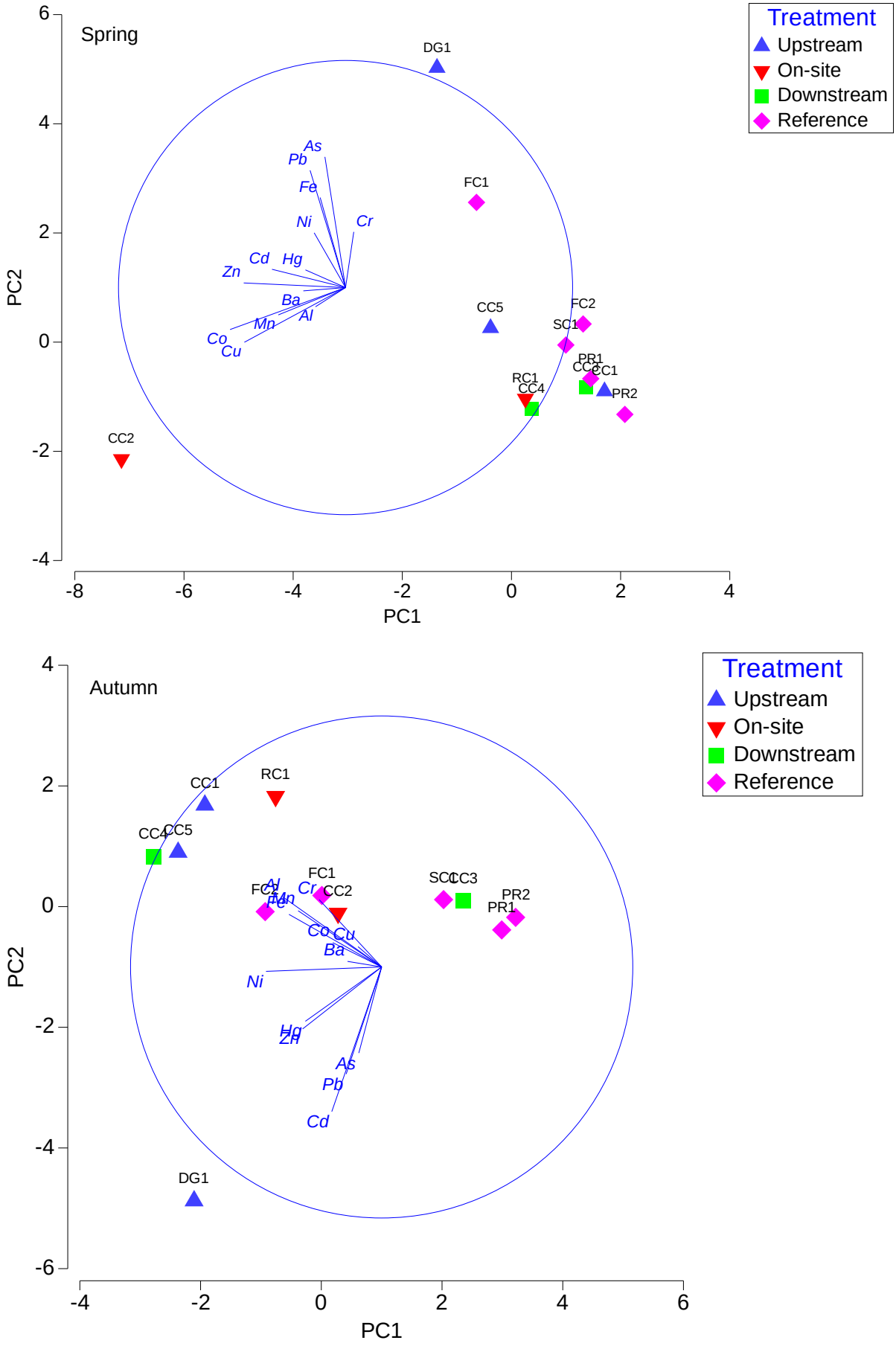


Figure 3.3 *PCA ordination showing relationship between sediment concentrations and monitoring sites for all sites*

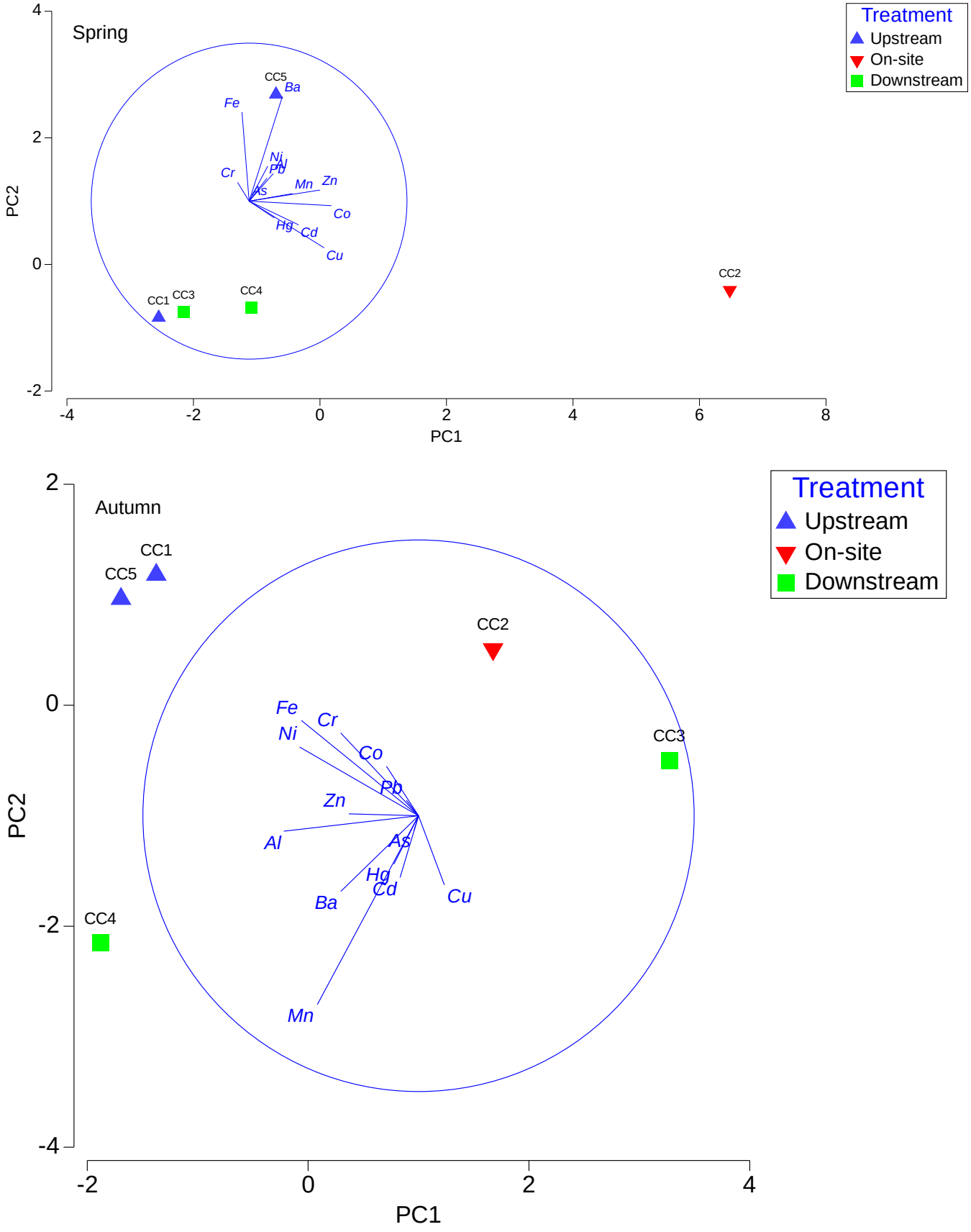


Figure 3.4 ***PCA ordination showing the relationship between sediment concentrations and monitoring sites for Cadiangullong Creek only***

3.5 Macroinvertebrates

A summary of the macroinvertebrate biological indices is presented in Table 3.5 for edge habitats, and in Table 3.6 for riffle habitats. AUSRIVAS results are coloured according to the banding scheme presented in Table 2.3. Combined season AUSRIVAS model bands are included in the final column of the tables. The biological indices have also been plotted as charts to illustrate patterns amongst sites (Figure 3.5 and Figure 3.6).

3.5.1 Taxa richness and EPT taxa richness

In Cadiangullong Creek, there were no consistent patterns in taxa richness to suggest the on-site CC2 or downstream sites were in less healthy conditions compared to upstream sites for both edge and riffle habitats. For example, in spring edge habitats at CC2 had the lowest taxa richness with the downstream sites CC3 and CC4 comparable to the upstream sites CC5 and CC1. However, during autumn CC2 had a higher taxa richness in edge habitats than all other sites on Cadiangullong Creek, except for CC5. There were no riffle samples collected from CC2 in either season due to a lack of habitat. In both seasons the downstream sites CC3 and CC4 had lower taxa richness in riffle samples compared to the upstream site CC1. However, CC3 and CC4 tended to have similar or higher taxa richness than reference sites on Flyers Creek and Panuara Rivulet. This suggests there was no major impacts that reduced diversity compared to natural variation amongst waterways in the region.

In addition, taxa richness at the on-site RC1 on Rodds Creek did not indicate there was an impact from mining activities – with no reduced diversity compared to other sites. During autumn, taxa richness at RC1 was higher than those recorded at most reference sites on Flyers Creek and Panuara Rivulet.

EPT taxa richness also varied between sites and in both seasons the on-site CC2 had the lowest number of EPT taxa when compared to the other Cadiangullong Creek sites. But in both seasons, there was an increase in EPT taxa moving downstream at sites CC3 and CC4. As such, if there was a loss of EPT taxa due to mining activities, this was localised and restricted to CC2 only.

The number of EPT taxa at the on-site RC1 on Rodds Creek also had low numbers of EPT taxa. However, for both RC1 and CC2 there were more EPT taxa than one of the reference sites on Flyers Creek during spring.

Overall, the results did not indicate that there were any impacts from mining activities that resulted in consistently lower taxa richness or EPT taxa richness. Although CC2 often had lower diversity and EPT taxa, this was localised with sites further downstream comparable to reference sites.

3.5.2 SIGNAL-2 scores

There was no consistent pattern to suggest the on-site CC2 had lower SIGNAL-2 scores, and therefore a loss of taxa sensitive to pollution, when compared to other sites on Cadiangullong Creek. In both seasons SIGNAL-2 scores at CC2 were comparable to other Cadiangullong Creek sites and were higher at CC2 than upstream at CC1 in spring. There were no riffle samples collected from CC2 but the other downstream sites CC3 and CC4 were comparable to, or even higher than the upstream site CC1 in both seasons.

At the on-site RC1 on Rodds Creek SIGNAL-2 scores were comparable to or even greater than other reference sites on Flyers Creek, Panuara Rivulet and Swallow Creek. Overall, there was no indication the reference sites on Flyers Creek, Panuara Rivulet or Swallow Creek had higher SIGNAL-2 scores than the on-site or downstream sites.

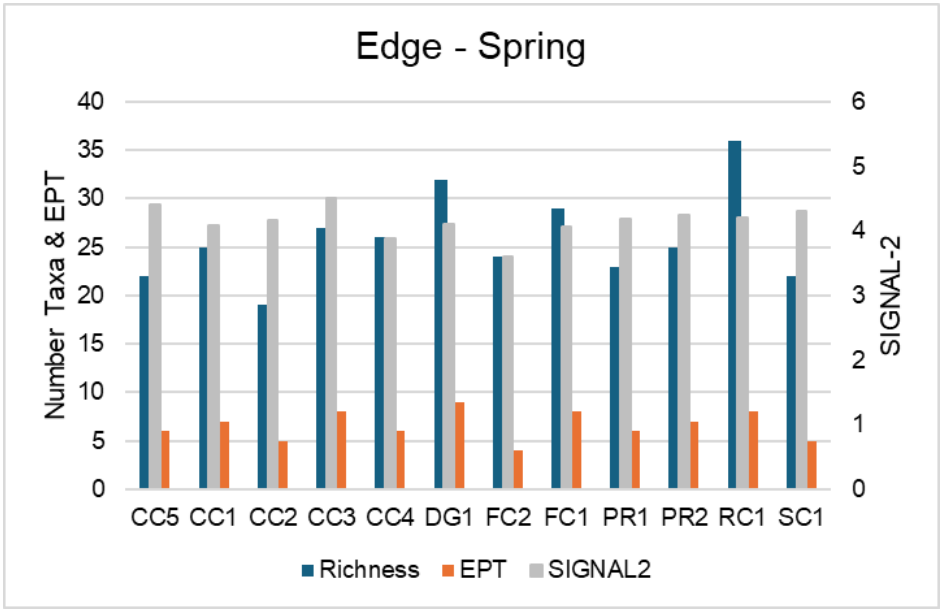
For both edge and riffle habitats, most sites were in quadrant 2 of the SIGNAL-2 biplot (Figure 3.7). Sites in this quadrant are often indicative of high salinity or nutrients, and in some cases this may be natural. Should there be cumulative impacts due to the mine and downstream effects of the dams on Cadiangullong Creek and Rodds Creek, then the on-site sites would likely be located in quadrant 4 – which can indicate urban, industrial or agricultural pollution, or downstream effects of dams (Chessman 2001). However, this was not the case with a spread of samples from all treatments in both quadrant 2 and quadrant 4. In fact, for riffle habitats the only sites in quadrant 4 were reference sites. As such, the SIGNAL-2 biplot did not provide any consistent evidence that mining activities or effects due to the dams were impacting the macroinvertebrate community health beyond other broad-scale land use disturbances.

Table 3.5 Summary of macroinvertebrate biological indices for edge habitats

Site	Season	Taxa Richness	EPT Richness	SIGNAL-2 Score	AUSRIVAS		
					OE50	Band	Combined Seasons Band
CC5	Spring	22	6	4.4	1.03	A	A
	Autumn	30	6	4.3	0.98	A	
CC1	Spring	25	7	4.1	0.94	A	A
	Autumn	25	6	4.4	OEX	OEX	
CC2	Spring	19	5	4.2	0.57	B	A
	Autumn	26	2	3.8	0.81	B	
CC3	Spring	27	8	4.5	1.13	A	A
	Autumn	22	6	4.0	0.79	B	
CC4	Spring	26	6	3.9	1.27	X	A
	Autumn	23	4	3.5	1.05	A	
DG1	Spring	32	9	4.1	1.09	A	OEX
	Autumn	30	7	4.4	0.99	A	
FC2	Spring	24	4	3.6	OEX	OEX	A
	Autumn	23	6	3.9	0.97	A	
FC1	Spring	29	8	4.1	1.18	X	A
	Autumn	22	6	3.9	0.87	A	
PR1	Spring	23	6	4.2	0.82	B	A
	Autumn	25	6	4.0	0.87	A	
PR2	Spring	25	7	4.3	0.91	A	A
	Autumn	34	6	3.9	1.13	A	
RC1	Spring	36	8	4.2	1.18	X	OEX
	Autumn	31	6	4.1	1.13	A	
SC1	Spring	22	5	4.3	OEX	OEX	A
	Autumn	24	4	3.6	OEX	OEX	

Table 3.6 Summary of macroinvertebrate biological indices for riffle habitats

Site	Season	Taxa Richness	EPT Richness	SIGNAL-2 Score	AUSRIVAS		
					OE50	Band	Combined Seasons Band
CC1	Spring	20	7	4.8	0.85	A	A
	Autumn	23	12	5.3	0.97	A	
CC3	Spring	18	8	5.2	0.77	B	A
	Autumn	19	6	4.9	0.90	A	
CC4	Spring	18	6	5.1	0.89	A	B
	Autumn	19	7	5.1	0.82	B	
FC2	Spring	19	7	4.9	0.89	A	A
	Autumn	16	7	5.6	0.90	A	
FC1	Spring	16	5	5.2	0.85	A	B
	Autumn	18	6	4.7	0.82	B	
PR1	Spring	18	6	4.9	0.85	A	B
	Autumn	20	6	4.8	0.82	B	
PR2	Spring	17	6	4.7	0.85	A	NA
	Autumn	No riffle present					



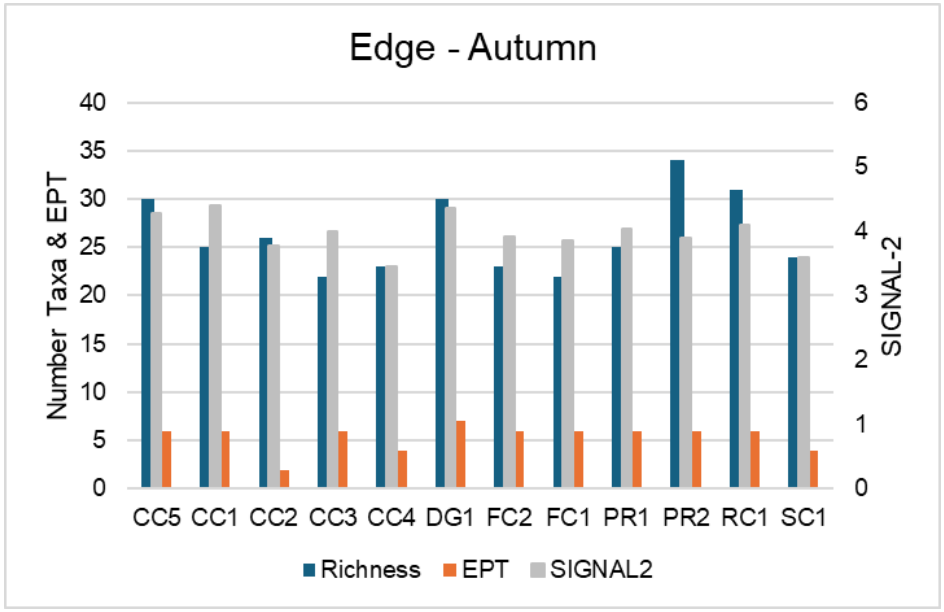
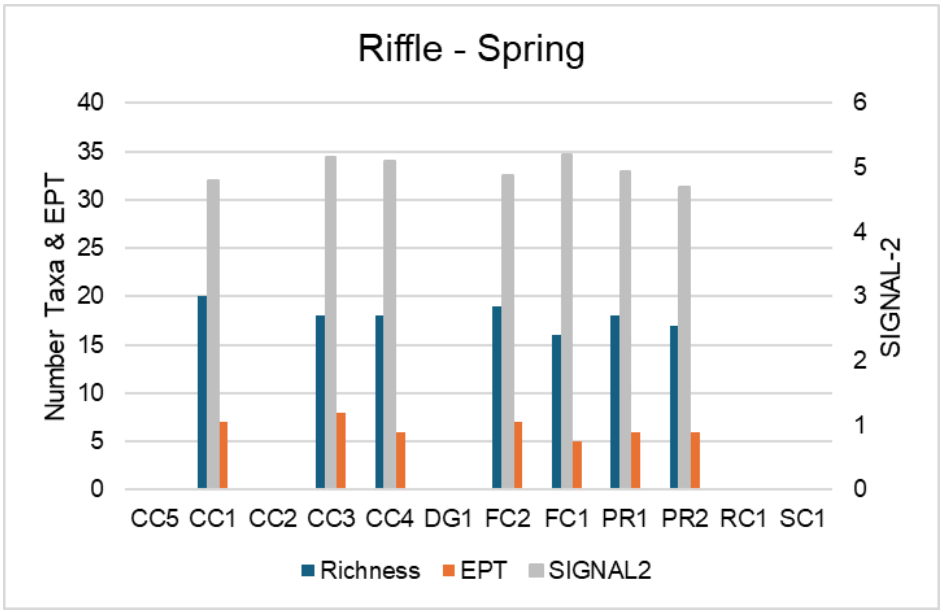


Figure 3.5 Taxa richness, EPT richness and SIGNAL-2 scores during spring 2023 and autumn 2024 for each site for edge habitats



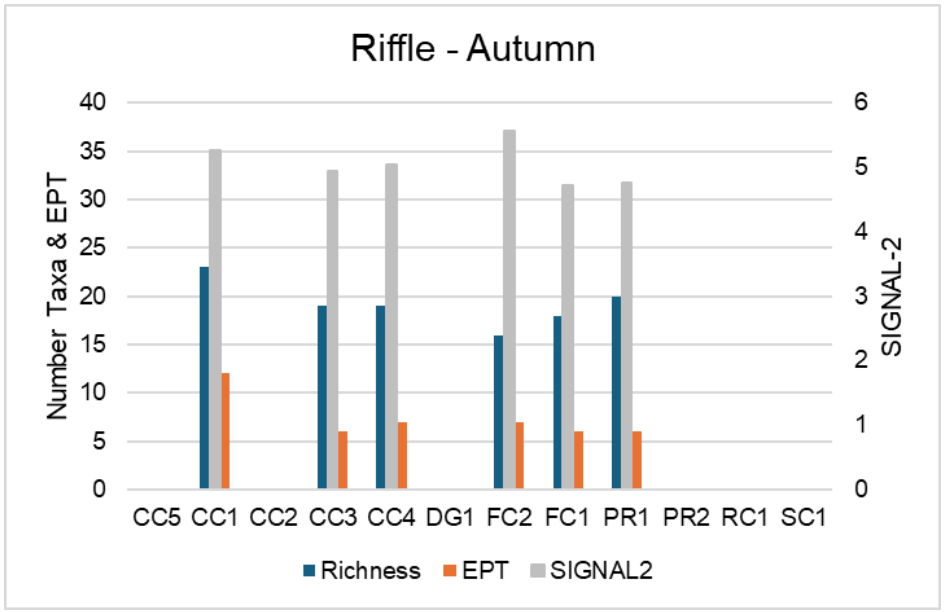


Figure 3.6 Taxa richness, EPT richness and SIGNAL-2 scores during spring 2023 and autumn 2024 for each site for riffle habitats

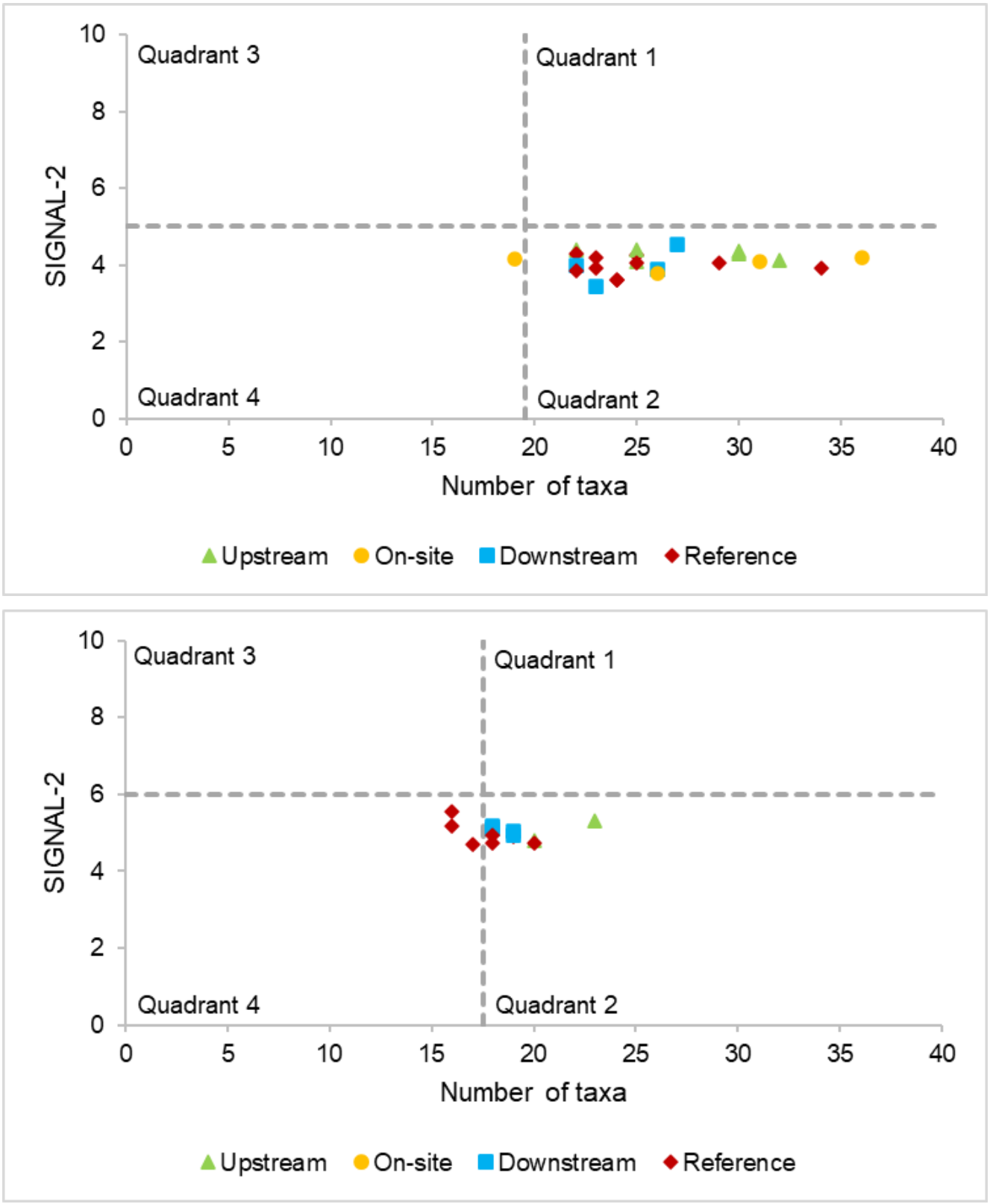


Figure 3.7 ***SIGNAL-2 bi-plot for edge samples (top) and riffle habitats (bottom) with dashed lines indicating the NSW interim quadrant boundaries***

3.5.3 AUSRIVAS

For edge habitats, most sites in both seasons were allocated to Band A[3]. Sites allocated to Band A have most/all of the expected families found, with water quality and/or habitat condition roughly equivalent to reference sites and no loss of macroinvertebrate diversity due to impacts on water quality and habitat conditions (see Table 2.3). However, for Cadiangullong Creek, the on-site CC2 was allocated to Band B in both seasons which is indicative of fewer families than expected due to potential impacts either on water quality or habitat quality or both, resulting in loss of taxa. Despite this, there was a general improvement at sites further downstream in Cadiangullong Creek, at sites CC3 and CC4. Interestingly, CC4 at Oakey Station was allocated to Band X during spring. Sites allocated to Band X have more taxa than expected, potentially represent a biodiversity hotspot, and may be prone to mild organic enrichment. Importantly, the combined seasons banding, which gives an indication of waterway health across both seasons, suggests all sites in Cadiangullong Creek were roughly equivalent to reference conditions. A similar pattern was observed for riffle habitats with most Cadiangullong Creek sites allocated to Band A in both seasons, although the most downstream site CC4 was allocated to Band B for the combined seasons.

Based on edge habitats, AUSRIVAS determined that there were no major impacts to the health of Rodds Creek (site RC1). During spring the creek was allocated to Band X and to Band A during autumn. There was no riffle habitat present in both seasons.

The single season results for the reference sites on Flyers Creek, Panuara Rivulet and Swallow Creek varied in the bands they were allocated to. However, there was no indication of impacts at these sites, with the combined seasons results allocating all sites to Band A. A similar pattern was observed for riffle habitats, although the combined season results were often allocated to Band B.

Overall, the AUSRIVAS results do not suggest any consistent patterns between the different site treatments that indicate mining activities at the on-site and downstream sites were more impacted compared to the upstream and reference sites.

3.5.4 Multivariate analyses

The nMDS ordination for both spring and autumn edge habitats did not find clear patterns to suggest that there were differences in the macroinvertebrate community composition amongst upstream, reference and downstream sites (Figure 3.8). That is, these three site treatments overlapped on the ordination indicating their community compositions were relatively similar. In both seasons the two sites located on-site (CC2 and RC1) did not overlap with the other three treatments, and this may suggest that these sites had a different community composition. However, the one-way ANOSIM for each comparing the treatments within each season did not detect significant differences in the macroinvertebrate community composition (Global R range 0.101 to 0.174; $P > 0.05$).

The ability to detect significant differences using ANOSIM is limited due to the low sample sizes (i.e., only two on-site samples within each season). Clarke and Warwick (2001) state that the R statistic itself is a very useful comparative measure of the degree of separation of sites, and its value is at least as important as its statistical significance, and arguably more so. Large R values (close to one) are indicative of complete separation of the sites, while small values (close to zero) imply little or no separation. Furthermore, if the MDS is of sufficiently low stress (i.e., <0.2) then the relative separations will also be evident in the ordination (Clarke and Warwick 2001). Based on the low R values generated in the ANOSIMs, the location of the samples on the MDS is the best indication of differences amongst the treatments.

Further examination of the nMDS ordinations does highlight some other patterns of note. For example, although the on-site RC1 did not overlap with the reference sites during spring, it was located closer on the ordination to the reference site PR2 than it was to CC2. As such, this indicates that RC1 had a macroinvertebrate composition that was more similar to the reference site than on-site CC2. Similarly, in autumn RC1 was more similar to the upstream site on Diggers Creek DG1 than CC2. In both seasons, CC2 appeared to have a more distinct community than all other sites. However, SIMPER analyses determined that CC2 did contain most of the taxa observed at all other sites. The exceptions were an absence of some taxa including of Mayflies (Caenidae and Leptophlebiidae), Small Water Striders (Veliidae), and Meniscus Midges (Dixidae).

[3] Some sites were outside the experience of the model (i.e., OEX) as AUSRIVAS could not identify a suitable reference site for comparisons.

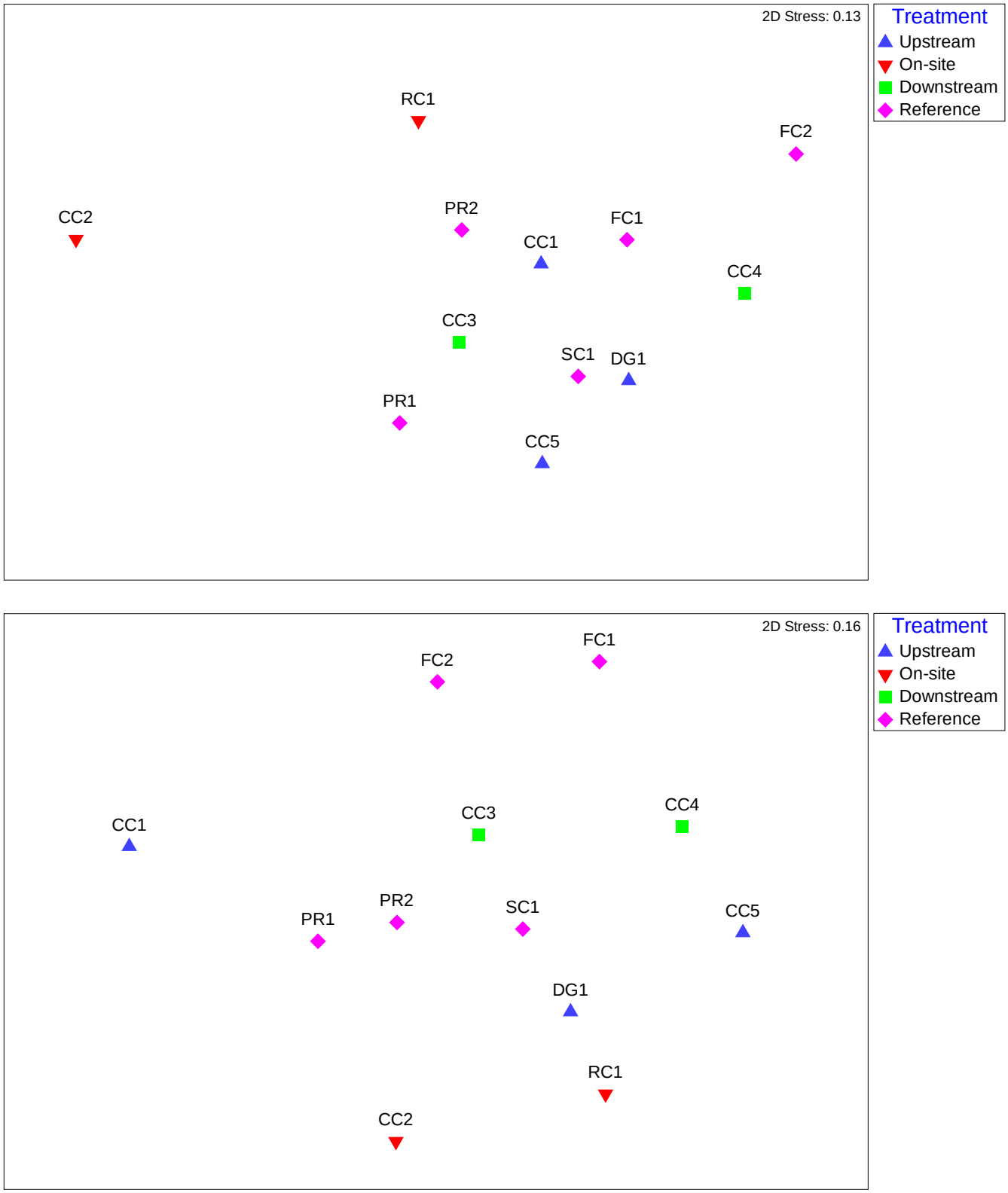


Figure 3.8 ***nMDS ordination of edge samples displaying the relative similarities in macroinvertebrate communities between the different site treatments during spring (top) and autumn (bottom)***

3.6 Sediment/macroinvertebrate relationship

The RELATE procedure determined that there was no significant correlation between patterns in the sediment quality and macroinvertebrate communities for edge or riffle samples in either spring or autumn (Rho range -0.052 to 0.045; P > 0.05). This suggests that the sediment quality was not a major influence on the macroinvertebrate community composition. Due to this, the BEST and DISTLM procedures were not undertaken.

3.7 Fish

Three species of fish were collected across all sites during the two monitoring seasons: the native Mountain Galaxias (*Galaxias olidus*), Rainbow Trout (*Oncorhynchus mykiss*) and Eastern Gambusia (*Gambusia holbrooki*) (Table 3.7). Mountain Galaxias were by far the numerically dominant species, with only a single Rainbow Trout and Eastern Gambusia collected across the two seasons. In both seasons, Mountain Galaxias were collected from all sites on Cadiangullong Creek, except for CC5 during spring. Mountain Galaxias were also collected from all sites on Flyers Creek, Swallow Creek in both seasons, Panuara Rivulet in spring and Diggers Creek in autumn.

Table 3.7 Total fish numbers caught or observed during the Cadia AEMP

Site	Season	Mountain Galaxias	Rainbow Trout	Eastern Gambusia
CC5	Spring	0	1	0
	Autumn	1	0	0
CC1	Spring	62	0	0
	Autumn	82	0	0
CC2	Spring	17	0	0
	Autumn	4	0	0
CC3	Spring	75	0	0
	Autumn	80	0	0
CC4	Spring	64	0	0
	Autumn	82	0	0
FC2	Spring	120	0	0
	Autumn	12[4]	0	1
FC1	Spring	100	0	0
	Autumn	100	0	0
SC1	Spring	16	0	0
	Autumn	51	0	0
PR1	Spring	3	0	0
	Autumn	0	0	0
PR2	Spring	1	0	0
	Autumn	0	0	0
DG1	Spring	6	0	0
	Autumn	1	0	0

Field observations determined that in Cadiangullong Creek there were lower abundances of Mountain Galaxias at CC5 and CC2, and this has also been observed in previous years (e.g., GHD 2022; GHD 2023). Relatively high abundances have been recorded at Flyers Creek and Swallow Creek, while the species is rare in Panuara Rivulet with no fish captured during autumn 2024.

[4] A new fence installed at FC2 prior to the autumn 2024 monitoring meant that electrofishing could not be carried out due to restricted access. The results for autumn at this site are based on fish captured during netting for macroinvertebrates.

It should be noted that no fish surveys are undertaken at the upstream treatment site on Diggers Creek (DG1) or the on-site treatment site on Rodds Creek (RC1) downstream of the tailings dam as excessive macrophyte coverage makes fish surveys ineffective. However, Mountain Galaxias were captured at Diggers Creek while netting for macroinvertebrates, and the species was observed in Rodds Creek during spring 2023.

Histograms of the length distribution of Mountain Galaxias show that all site treatments had a wide range of fish lengths that varied between seasons (Figure 3.9). The Gaussian kernel curves indicate that during spring, a larger proportion of smaller Mountain Galaxias were collected. For example, the upstream sites had fish lengths ranging from less than 20 to 130 mm during spring, with lengths ranging from 40 to 70 mm in autumn.

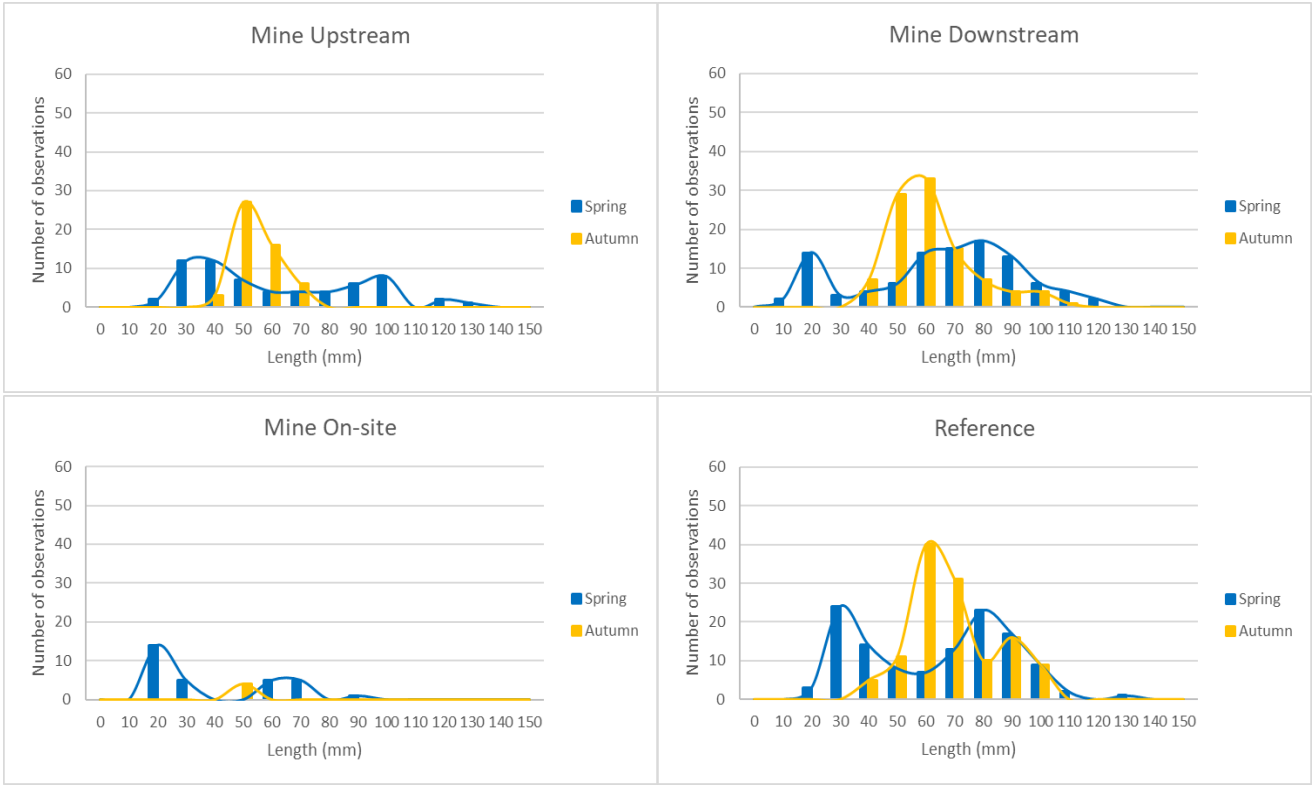


Figure 3.9 ***Histograms of total length (mm) of Mountain Galaxias for each site treatment. The upstream sites are CC5, CC1 and DG1; the downstream sites are CC3 and CC4; the on-site sites areCC2 and RC1; the reference sites are FC2, FC1, PR1, PR2 and SC1***

3.8 Platypus

The eDNA monitoring for platypus determined that they have been regularly present in upper reaches of Cadiangullong Creek in Pools 1 and 2, and in Pools 6 or 7 approximately 1 km downstream of site CC2, since March 2019 (Table 3.8). Following the trial environmental flow release, which concluded on 29 July 2019, platypus were detected in Pool 10. Although, they were not recorded in Pool 10 again until April 2020, they have regularly been detected since then. It is possible that improved flows in April 2020 have allowed platypus to recolonise these pools from upstream locations. The presence of platypus in Pools 17 and 18 has been rare, although they were detected in March 2019 and November 2022, and as equivocal results in June 2020 and Dec 2021.

The October 2023 (spring) and April 2024 (autumn) eDNA results demonstrate platypus are present throughout Cadiangullong Creek, although they appear to remain absent at the downstream pool at site CC4.

Table 3.8 ***Summary of platypus results; green cells indicate presence based on eDNA; green cells with sighted or photography indicate presence confirmed by chance visual observations or images captured on field deployed cameras; orange cells indicate equivocal eDNA results; red cells indicate absence based on eDNA***

	Pool 1	Pool 2	Pool 6/7	Pool 9/10/11	Pool 17/18
Mar 2019					
May 2019					
Jun 2019	Sighted				
Jul 2019					
Jul 2019	Not sampled	Photography	Not sampled	Not sampled	Not sampled
Jul 2019		Photography		Photography	
Aug 2019	Photography	Photography	Photography		
Sep 2019					
Nov 2019	Photography				
Dec 2019	Not sampled	Photography	Not sampled	Not sampled	Not sampled
Jan 2020					
Feb 2020					
Apr 2020					
May 2020					
Jun 2020					
Dec 2020					
May 2021					
Dec 2021					
May 2022					
Nov 2022					
May 2023					
Oct 2023					
Apr 2024					

Note: Table 3.8 refers to Pools 9 and 11. These sites were used in previous surveys but were replaced by Pool 10.

4. Discussion

4.1 Rainfall and hydrology

This report presents the results from the spring 2023 and autumn 2024 monitoring for the Cadia AEMP and there were differences in rainfall prior to the two monitoring events. The spring monitoring followed a period when rainfall was much lower than the long-term average. Alternatively, the autumn monitoring occurred following a period of substantial rainfall in the catchments surrounding Cadia. Despite this, in both seasons the monitoring occurred during relatively normal flow conditions in all waterways.

Riparian releases from Cadiangullong Dam are made in accordance with Condition 27 of the Project Approval PA06_0295 to meet the criteria listed in Table 4.1. The Cadia riparian releases are approximately 2.8 ML/day and are aimed at achieving 0.9 ML/day at Oaky Creek (site CC4) although this varies depending on storage levels in the dam and inflows upstream of the dam at gauge 412168 (site CC5).

Table 4.1 Cadiangullong flow criteria

Cadiangullong Dam			Inflow	Downstream minimum	Other conditions
Reduced Level (m asl)	**Volume (ML)**	**Capacity (%)**	**ML/day @ GS412168**	**ML/day @ GS412702**	
>778.8	420 to 4200	10 to 100	0 to 0.4	0.4	Nil
			0.4 to 3.4	Inflow	Nil
			>3.4	3.4	Nil
773 – 778.8	170 to 420	4 to 10	0 to 0.4	0.4	No water to be extracted
			0.4 to 3.4	Inflow	
			>3.4	3.4	
762.8 - 773	5 to 170	0.1 to 4	0 to 0.4	Inflow*	
			>0.4	0.4*	
<762.8	5	0.1		No release required	

*Measured at the Dam GS412144

Overall, from 1 June 2023 to 30 May 2024 average flow at gauge 412702 (site CC4) was 10.5 ML/day with a minimum of 2.4 ML/day and a maximum of 99.0 ML/day. As such, a flow of at least 0.9 ML/day was achieved at site CC4 throughout this period as per the aims of the riparian releases. A flow duration curve for site CC4 indicates that flows exceeded 20 ML/day 11% of the time, 10 ML/day 25% of the time, and 5 ML/day 58% of the time (Figure 4.1).

For the period from 1 June 2023 to 30 May 2024 the riparian releases contributed a maximum of 37% to the flows at site CC4. Importantly, for around 85% of the time the riparian releases contributed to more than 25% of the total flow at CC4. As such, the riparian releases were an important flow component of Cadiangullong Creek during the current monitoring period.

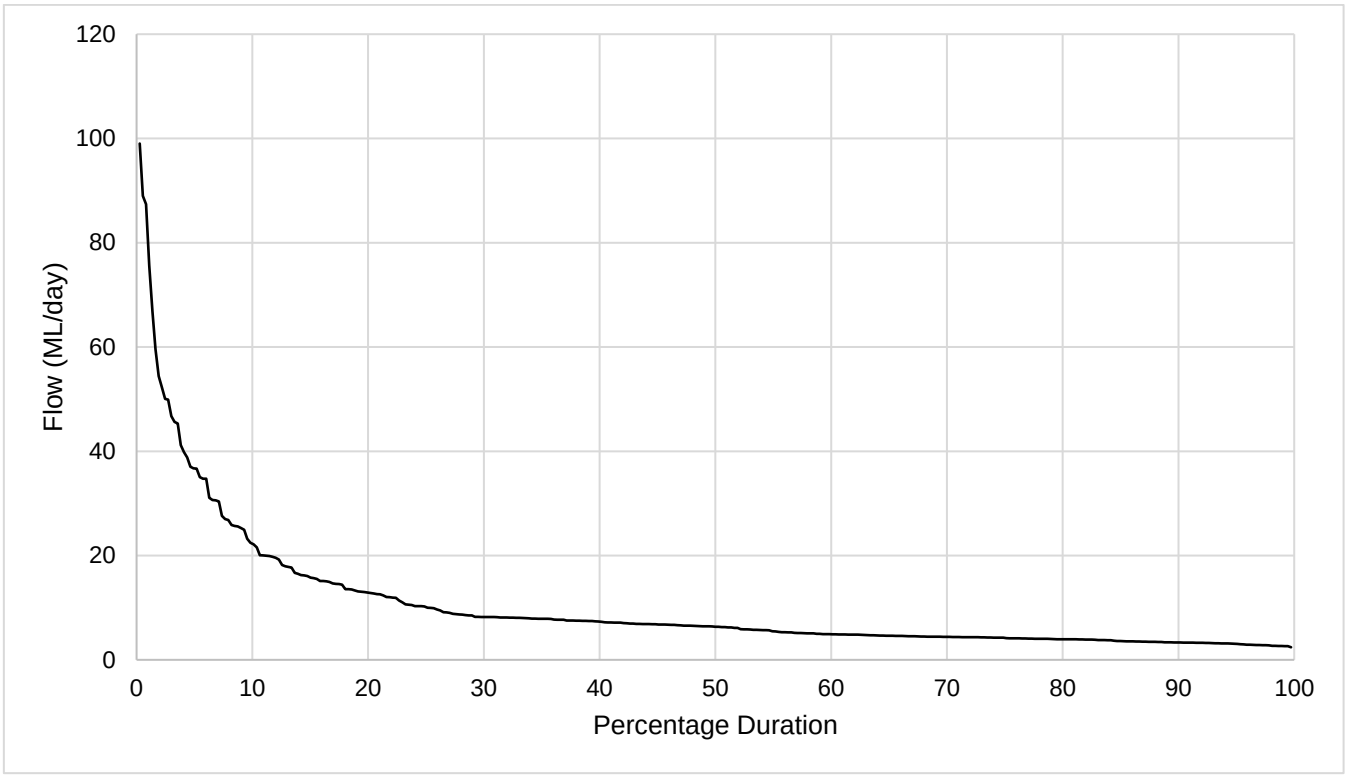


Figure 4.1 *Flow duration curve for Cadiangullong Creek at Oaky Gauging Station from 1 June 2023 to 30 May 2024*

4.2 Aquatic habitat

All waterways assessed as part of the AEMP are subject to disturbance from different land use activities. This includes changes to Cadiangullong Creek due to activities within the Cadia MLA, and agricultural uses further downstream. The upstream reference site (CC5) is also located in a modified landscape surrounded by pine plantations.

Habitat conditions during spring 2023 and autumn 2024 were consistent with those found in previous years (e.g., GHD 2020a; 2021; 2022; 2023). The current levels of disturbance at all waterways suggest that there are regional scale issues impacting waterway health. As such, the ability to detect impacts within the mine (i.e., on-site treatment) will require those impacts to be greater than what currently occurs at upstream and reference sites outside the mine. That is, the effect of any mining activities on water quality, sediment quality, and biological communities will need to be more detrimental compared to other land use activities. Common disturbances of the waterways unrelated to mining activities include erosion and sedimentation that contributes to increased turbidity in Cadiangullong Creek, excessive algal growth in Panuara Rivulet due in part to agricultural land use and nutrients inputs, and the presence of exotic fish species (Plate 5).



Plate 5 *Increased turbidity in Cadiangullong Creek following high rainfall in spring 2021, filamentous algal growth in Panuara Rivulet in spring 2020, and Redfin Perch in Cadiangullong Creek autumn 2023*

4.3 Water quality

There was no evidence that mining activities negatively influenced the water quality of sites located on-site of the mine. Temperature varied in no predictable way amongst sites and was likely influenced by climatic conditions and the time that monitoring occurred. Slow flowing conditions at some sites also provided opportunities for the surface water to heat up more than those sites with faster flows.

There were low dissolved oxygen (DO) levels (less than the ANZG (2018) DGV) at a number of sites, particularly in spring. Low levels of DO can cause stress and even death to fish and other aquatic fauna which rely on oxygen in the water to breathe. The critical minimum DO threshold varies with different species and different physical conditions, but as a general guide for native fish DO less than 4 mg/L is considered detrimental and below 2 mg/L leads to altered behaviour and often results in fish kills (McNeil and Closs 2007; King et al. 2012). However, the minimum concentration recorded was 7.1 mg/L and fish and other aquatic fauna are reported to be able to survive in these conditions (Borzog-Haddad et al. 2021). The high DO at sites on Panuara Rivulet during spring was likely due to high algal growth often observed at these sites that can increase DO through photosynthesis (see Plate 3).

In Cadiangullong Creek, the longitudinal increase in electrical conductivity (EC) was consistent with monitoring in previous years (GHD 2020a; 2021; 2022; 2023) and is likely due to groundwater inputs to the waterway. Most Cadiangullong Creek sites remained relatively fresh in both seasons while EC further downstream at CC4 regularly exceeded the ANZG (2018) DGV. High EC in Diggers Creek, Flyers Creek, Panuara Rivulet, Rodds Creek, and Swallow Creek have also been observed during monitoring in previous years. There is a general acceptance that freshwater ecosystems undergo little ecological stress when subjected to salinities up to 1000 mg/L (or 1,500 µS/cm) and that flora and fauna are adversely impacted as salinity exceeds this level (Hart et al. 1991; Nielson et al. 2003). Generally, as salinity and electrical conductivity increases the growth of freshwater flora and fauna is reduced, and species richness declines (Hart et al. 1991). Changes in salinity can affect biota in freshwater directly or indirectly. Direct effects may occur as increasing salinity leads to physiological changes, while indirect effects can occur where increasing salinity modifies community structure and function by removing (or adding) taxa that provide refuge, food or modify predation pressure (Nielson et al. 2003). In addition, other factors such as waterlogging or loss of habitat may interact with salinity or have a more immediate impact on species richness (Clunie et al. 2002). Impacts due to salinity also differ for different components of an ecosystem. Most adult native and introduced fish and macroinvertebrates are tolerant of increasing salinity while freshwater algae, aquatic plants, and micro-invertebrates (e.g., Copepoda, Ostracoda and Cladocera) appear to be less tolerant (Hart et al. 1991). The EC observed during the monitoring remained below the 1,500 µS/cm that would be expected to result in an impact to flora and fauna. The exception was at Swallow Creek (SC1) during autumn. However, given this is a reference site, the EC was not influenced by mining activities and reflects natural conditions in the region.

There were no patterns to suggest mining activities influenced pH in Cadiangullong Creek. Most sites, except CC4 during autumn, were within the ANZG (2018) range. The high pH at reference sites on Flyers Creek, Panuara Rivulet and Swallow Creek are also unrelated to mining activities. There was also a high pH recording of 8.2 at the on-site RC1 on Rodds Creek, but this was during autumn only and was within the range observed at other reference sites. The high pH levels may be related to algal growth. During daytime hours photosynthesis by algae can lead to increased DO in the water. During the night this reduces DO and increases the proportion of carbon dioxide. Carbon dioxide (CO_2) is acidic and the sequestration of CO_2 in photosynthesis increases the pH of water which is carried over to daytime. However, the increased pH may also be related to changing land use between sites, or a combination of this and photosynthesis. The relatively high alkalinity at many sites would also act as a buffer against changes in pH and potentially mitigate against pH fluctuations.

Turbidity remained below the ANZG (2018) DGV of 25 NTU at all sites in both seasons. In previous seasons high turbidity has been observed following high rainfall events. Given the monitoring occurred following rainfall and peak flow events, it appears turbidity had returned to a ‘normal’ range during monitoring.

Overall, the results do not suggest that Cadia had a detectable influence on the surface water quality during the spring 2023 and autumn 2024 monitoring. Although there was some variation amongst sites, there was no consistent pattern to indicate water quality was deteriorated downstream of the Cadia MLA. The tailings dam appears to have negligible impact on water quality in Rodds Creek (RC1) based on comparisons with the previous monitoring periods and other waterways.

4.4 Sediment quality

Of the metals that have DGVs published, arsenic, chromium, copper, mercury, lead, nickel, and zinc were exceeded in the waterways monitored as part of the AEMP. Of these, only copper and arsenic exceeded the ANZG (2018) upper DGVs. Copper exceeded the upper DGV in Cadiangullong Creek at CC2 and at sites further downstream in this waterway. This is to be expected given Cadiangullong Creek flows through Cadia Hill which naturally contains mineralised copper. Arsenic was exceeded in Diggers Creek, but this waterway is upstream of Cadia and as such, the increase in arsenic is unrelated to mining activities.

Given copper exceeded the upper DGV in Cadiangullong Creek, ANZG (2018) suggest that toxicity-related adverse effects may be expected. Increased copper concentrations levels in Cadiangullong Creek downstream of the mine at CC2, and a gradual decrease in copper moving further downstream has been observed in previous years of monitoring. Due to the geomorphology of CC2, the pool at this site appears to act as a sink for copper and other metals. The pool acts as a settlement pond due to dense stands of Cumbungi (*Typha* spp.) that limits downstream sediment movement during low flows. Sediment transport may occur during higher flow events and the risk of contamination downstream appears to be dependent on a) the connectivity between CC2 and downstream reaches, b) the frequency and size of the high flow events, and c) the size of the sediment particles. There was some evidence to suggest that the elevated copper at CC2 was transported further downstream in both seasons. However, there was reduced copper during autumn 2024.

Other than some increases in copper which is to be expected given the mineralised copper in the area, there was no evidence to suggest that mining activities are contributing to elevated metals throughout Cadiangullong Creek. Although the ANZG (2018) DGV for chromium and nickel were exceeded, this was at sites upstream from Cadia. Zinc also exceeded the DGV at CC2, but zinc concentrations at the downstream sites had returned to levels comparable to upstream.

At the on-site RC1 on Rodds Creek there were also exceedances of the ANZG (2018) DGV for copper and nickel, but these concentrations were similar to those observed at upstream sites on Cadiangullong Creek and Diggers Creek, and at reference sites on Flyers Creek, which indicate that there are sources of metals to the waterways other than Cadia mining activities.

4.5 Macroinvertebrates

In Cadiangullong Creek there was no consistent evidence of reduced macroinvertebrate diversity or health due to mining activities for both edge and riffle habitats. Although in spring the on-site CC2 had the lowest number of taxa, in autumn this site had the highest number of taxa than all other Cadiangullong Creek sites. There were low numbers of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa at CC2 in both seasons, but if this was due to mining activities it was localised as there were increases at the downstream sites.

The on-site RC1 on Rodds Creek had diversity and the number of EPT taxa similar to reference streams on Flyers Creek and Panuara Rivulet.

In both seasons SIGNAL-2 scores at CC2 were comparable to other Cadiangullong Creek sites and were higher at CC2 than upstream at CC1 in spring. At the on-site RC1 on Rodds Creek SIGNAL-2 scores were comparable to or even greater than other reference sites on Flyers Creek, Panuara Rivulet and Swallow Creek.

Most sites were allocated to AUSRIVAS Band A and had most/all of the expected families found, with water quality and/or habitat condition roughly equivalent to reference sites and no loss of macroinvertebrate diversity due to impacts on water quality and habitat conditions. The on-site CC2 was allocated to Band B in both seasons which is indicative of fewer families than expected due to potential impacts either on water quality or habitat quality or both, resulting in loss of taxa. Despite this, there was a general improvement at sites further downstream in Cadiangullong Creek at CC3 and CC4 so any impacts at CC2 were again localised. The on-site RC1 on Rodds Creek was determined to be similar to, or even healthier than many reference sites.

In general, SIGNAL-2 has been found to be more sensitive to impacts of pollution while AUSRIVAS is relatively more sensitive to impacts on habitat (Barmuta et al. 1998). Consequently, given that SIGNAL-2 scores at CC2 where similar to other sites, it is likely that habitat conditions are more influential on the macroinvertebrate community health in the waterways than water or sediment quality impacts due to mining activities. This is also reflected by the multivariate analyses that did not detect any differences amongst treatments. The SIGNAL-2 results suggest that all waterways monitored may be subject to multiple disturbances irrespective of mine operations including high salinity or nutrient levels, agricultural pollution, or the downstream impacts of dams.

4.6 Sediment/macroinvertebrate relationship

The RELATE procedure determined that there was no significant correlation between patterns in the sediment quality and macroinvertebrate communities in either spring or autumn. This suggests that the sediment quality was not a major influence on the macroinvertebrate community composition. As mentioned above, it is likely that habitat conditions are more influential on the macroinvertebrate community health in the waterways than water or sediment quality.

4.7 Fish

Overall, the results from the 2023-24 fish monitoring indicate a relatively healthy community dominated by the native Mountain Galaxias (*Galaxias olidus*). The species remains distributed throughout Cadiangullong Creek, along with Flyers Creek and Swallow Creek. Field observations also noted the species was present in Panuara Rivulet and Diggers Creek.

The low numbers of fish collected at CC5 on Cadiangullong Creek, SC1 on Swallow Creek and Panuara Rivulet is consistent with previous surveys. It may be due to predatory Rainbow Trout in Cadiangullong Creek, and the small size of Swallow Creek. It is reported that the presence of Trout has reduced the abundance of Mountain Galaxias in lowland streams and completely eliminated them in some upland streams (Lintermans 2023). The barrier effect of Cadiangullong Dam may also prevent recruitment and recolonisation of upstream reaches. However, it should be noted electrofishing was not possible at CC5 and SC1 and this may have biased the results. Although there were Rainbow Trout captured at the most upstream site on Cadiangullong Creek (CC5), Mountain Galaxias were still present.

For all treatments (i.e. upstream, on-site, downstream and reference) there was a range of size classes in the fish populations. Furthermore, there was an overall increase in length during autumn compared to spring. In southern NSW Mountain Galaxias spawn from May to September and in northern NSW from August to October (Lintermans 2023). The larvae are around 10 mm long after hatching and juveniles reach around 35-40 mm in their first year (Lintermans 2023). The smaller fish during spring are likely the new recruits from spawning prior to the spring 2023 monitoring. Importantly, given there are multiple size classes, the results suggest there are self-sustaining populations with adequate recruitment levels for all treatments. On current evidence, the mine does not appear to be negatively impacting populations of Mountain Galaxias and that all site treatments are maintaining self-sustaining populations with breeding and subsequent recruitment occurring.

4.8 Platypus

The eDNA monitoring for platypus determined they have regularly been present in upper reaches of Cadiangullong Creek in Pools 1 and 2 since March 2019, and in Pool 7 approximately 1 km downstream of site CC2. Since April 2020, platypus have also regularly been detected in downstream Pool 10. Importantly, the spring 2023 and autumn 2024 eDNA results demonstrate platypus are present throughout Cadiangullong Creek. Although they were absent at the most downstream site at Oaky Station (Pools 17/18), they have regularly been absent from this site.

5. Conclusions

- Flow in Cadiangullong Creek and the other waterways monitored reflected the pattern in rainfall with higher flows following rainfall events, but monitoring did not occur during a flow peak that would influence the results.
- The riparian releases played an important role and contributed to flow throughout Cadiangullong Creek during the spring 2023 and autumn 2024 monitoring events.
- Disturbances to riparian zone vegetation and broader catchment scale land-use outside of the Cadia MLA are likely to be impacting on aquatic ecosystem health. Aside from mining and associated operations, disturbance of riparian zone vegetation is heavily influenced by grazing in the mid to lower catchment areas and pine plantations in the upper catchments.
- Overall, the water quality results do not suggest that Cadia had a detectable influence on the surface water quality during the spring 2023 and autumn 2024 monitoring. Although there was some variation amongst sites, there was no consistent pattern to indicate water quality was deteriorated downstream of the Cadia MLA. Although there was low dissolved oxygen and high electrical conductivity at many sites, this included upstream and reference sites and was not related to mining activities. The tailings dam appears to have negligible impact on water quality in Rodds Creek (RC1) based on comparisons with the previous monitoring periods and other waterways.
- There was evidence of increased copper in the sediments of Cadiangullong Creek downstream of the mine and the pool at CC2 appears to act as a sink for copper and other metals. This is to be expected given the creek flows through Cadia Hill which naturally contains mineralised copper. Sediment transport may occur during high flow events thereby increasing the risk of contamination further downstream. However, as found in previous years, copper dissipated further downstream. Furthermore, there were lower copper concentrations in autumn 2024 compared to spring 2023.
- There was no consistent evidence that macroinvertebrate communities have been impacted by mining operations. It is likely that habitat conditions are more influential on the macroinvertebrate community than water or sediment quality.
- Macroinvertebrate results suggest that all waterways monitored may be subject to multiple disturbances irrespective of mine operations including high salinity or nutrient levels, agricultural pollution, or the downstream impacts of dams.
- A relatively healthy fish community dominated by the native Mountain Galaxias remains distributed throughout Cadiangullong Creek, along with Flyers Creek, Swallow Creek, Diggers Creek and Panuara Rivulet. There was a range of size classes in the fish community and an increase in length during autumn compared to spring. This may indicate the recruitment of juveniles during spring that had matured by the following autumn, indicating a reasonably healthy self-sustaining community with adequate recruitment.
- Platypus remain distributed throughout Cadiangullong Creek, except at the most downstream site CC4 at Oaky Station.

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Appendices

Appendix A

Site location details for the Cadia AEMP

Site Code	Site Name	Position Relative to Potential Impacts and Cadia	Latitude	Longitude	Catchment Area (km^2)
CC5	Cadiangullong Creek at Forestry gauging station	Downstream of Canobolas State Forest (pine plantation); upstream of Cadia	-33.41563	148.98528	33.44
CC1	Cadiangullong Creek 200 m downstream of Cadiangullong Dam	Downstream of Cadiangullong Dam; upstream of Cadia mining facilities	-33.43592	148.99287	40.28
CC2	Cadiangullong Creek at South Portal Road (lower cutting)	Downstream of Cadiangullong Dam; downstream of Cadiangullong Creek diversion; adjacent to Cadia pit (now in care and maintenance phase)	-33.46092	148.98957	58.16
CC3	Cadiangullong Creek at Southern Lease Boundary	Downstream of Cadia facilities; upstream of tailings dams; grazing in surrounding lands	-33.49894	148.97604	72.71
CC4	Cadiangullong Creek at Oaky Creek Gauging Station	Downstream of Cadia facilities; downstream of tailings dams; grazing in surrounding lands	-33.53951	148.97173	107.36
FC2	Flyers Creek at Extraction Weir	Catchment east and adjacent to Cadiangullong Creek catchment; grazing and pine plantation in surrounding lands; upstream of Flyers Creek Extraction Weir	-33.47829	149.04060	52.36
FC1	Flyers Creek at Martin Road Gauging Station	Catchment east and adjacent to Cadiangullong Creek catchment; grazing and pine plantation in surrounding lands; downstream of Flyers Creek Extraction Weir	-33.48849	149.03539	56.16
SC1	Swallow Creek at Gauging Station No. 412167	Catchment west and adjacent to Cadiangullong Creek catchment; grazing in surrounding lands; downstream of Ridgeway underground mine sinkhole	-33.48234	148.95974	17.97
PR1	Panuara Rivulet upstream of Revegetation Area	Catchment west of Cadia; located on leased sheep grazing property; upstream of proposed revegetation area	-33.49671	148.89010	54.04
PR2	Panuara Rivulet downstream of Revegetation Area	Catchment west of Cadia; located on leased sheep grazing property; downstream of proposed revegetation area	-33.52097	148.87873	58.72
RC1	Rodds Creek upstream of Cadiangullong Creek	Downstream of tailing dams on Rodds Creek; upstream of confluence with Cadiangullong Creek	-33.53107	148.98513	21.14
DG1	Diggers Creek at Diggers Weir Station No. 412166	Upstream of Panuara Rivulet, catchment adjacent to, but not influenced by mining operations.	-33.43434	148.93373	5.29

Appendix B

Field sheets summarising habitat conditions

	Site	CC5	CC1	CC2	CC3	CC4	FC1	FC2	PR1	PR2	SC1	RC1	DG1
Site Attributes	Topography	Broad Valley	Steep Valley	Steep Valley	Broad Valley	Steep Valley	Steep Valley	Broad Valley	Broad Valley	Broad Valley	Broad Valley	Steep Valley	Broad Valley
	Water Level	Low	Moderate	Low	Low	Low	Low	Moderate	NF	NF	Low	Low	Low
	Shading of River	Moderate	High	Low	Moderate	Moderate	None	Low	Low	Low	None	None	Low
	Trees >10 m	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present	Present
	Trees <10 m	60	10	15	15	45	5	5	1	5	15	2	5
	Shrubs / Vines / Rushes	30	30	5	5	10	5	3	0	30	5	5	0
	Grasses / Herbs / Ferns	40	90	40	80	3	80	95	30	15	90	90	90
	Stream Width - Min	1	1	1	0.5	3	0.5	2	0	0	51	1	1
	Stream Width - Max	5	6	5	2	7	2	12	4	3	2	2	1
	Stream Width - Mode	3	3	1.5	1	4	1.5	5	0.5	1.5	1	1	1
Land Use	Left Bank	Forestry	Exotic Grassland (no grazing)	Mining (Open Cut)	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
	Right Bank	Forestry	Exotic Grassland (no grazing)	Exotic Grassland (no grazing)	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Riffle	Bedrock	/	10	/	5	0	5	15	30	/	/	/	/
	Boulder	/	20	/	20	2	10	10	40	0	/	/	/
	Cobble	/	40	/	40	30	45	20	20	/	/	/	/
	Pebble	/	5	/	10	35	15	20	5	/	/	/	/
	Gravel	/	5	/	10	20	10	10	1	/	/	/	/
	Sand	/	10	/	5	5	10	10	0	/	/	/	/
	Silt	/	10	/	10	4	5	10	2	/	/	/	/
	Clay	/	0	/	0	4	0	5	2	/	/	/	/

	Site	CC5	CC1	CC2	CC3	CC4	FC1	FC2	PR1	PR2	SC1	RC1	DG1
	Depth - Mode	/	4	12	10	15	9	14	0	/	/	/	/
Edge	Bedrock	15	0	10	0	0	0	0	40	15	0	0	20
	Boulder	10	0	30	0	5	0	0	5	0	0	0	10
	Cobble	10	0	20	30	30	0	0	30	10	15	20	5
	Pebble	20	15	2	0	30	15	5	15	2	10	10	5
	Gravel	15	10	2	0	15	15	5	5	3	10	10	10
	Sand	15	20	1	10	5	40	5	0	5	15	40	20
	Silt	20	50	30	50	8	20	70	3	60	35	10	25
	Clay	5	5	5	10	7	10	15	2	5	15	10	5
	Detritus Cover	30	60	30	60	15	25	65	20	30	40	30	15
	Bank Overhang	20	30	5	40	25	15	5	5	10	20	10	40
	Total Macrophytes	60	80	80	70	20	70	20	0	60	90	80	70
Site Assessment	Water Quality	2	2	2	2	2	2	3	3	2	2	2	2
	Instream	2	2	4	3	3	2	3	4	2	3	2	2
	Riparian Zone	3	1	3	2	3	4	3	4	3	4	4	3
	Catchment Assessment	2	2	3	3	3	3	3	3	3	4	3	3
	Total	9	7	12	10	11	11	12	14	10	13	11	10

Appendix C

Sediment quality results spring 2023 and autumn 2024

CERTIFICATE OF ANALYSIS

Batch No: **23-66723**
Final Report **131724**

Client: **GHD Pty Ltd**
Contact: **MR. Peter Lind**
Address: Level 8
180 Lonsdale Street
MELBOURNE
VIC
3000
AUSTRALIA

Laboratory Scoresby Laboratory
Address Caribbean Business Park,
22 Dalmore Drive,
Scoresby,
VIC 3179
Phone 03 8756 8000
Fax 03 9763 1862
Contact: Brad Snibson
Client Manager
Brad.Snibson@alsglobal.com

PO No: **Not Available**
Sampler Name: **Peter Lind**
ALS Program Ref: **GHD**
Program Description: **GHD**
Client Ref: **12620903**

Date Sampled: **23-Oct-2023 - 27-Oct-2023**
Date Samples Received: **10-Nov-2023**
Date Issued: **17-Nov-2023**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis	*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
MS Total Metals	WG020B	Scoresby			

Signatories

Name	*Title*	*Name*	*Title*
Alan Chung	**Team Leader Metals**		

Samples not collected by ALS and are tested as received.
Calculated results are based on raw data.

Soil

Samples are tested within holding time unless otherwise stated.

Results contained within this report relate only to the samples tested.
The report shall not be reproduced, except in full and results relate only to the items tested.

Batch No: **23-66723**
Report Number: **131724**
Client: **GHD Pty Ltd**
ALS Program Ref: **GHD**
Program Description: **GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9205576	NONE	1. CC1	SOIL	25/10/23
9205577	NONE	2. CC2	SOIL	25/10/23
9205578	NONE	3. CC3	SOIL	26/10/23

Analysis - Analyte	*Sample No. Site Code Units*	9205576 NONE	9205577 NONE	9205578 NONE
MS Total Metals - Aluminium	mg/kg	15000	25000	11000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	<5	7	9
MS Total Metals - Barium	mg/kg	77	210	120
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	<0.2	0.8	<0.2
MS Total Metals - Chromium	mg/kg	48	26	37
MS Total Metals - Cobalt	mg/kg	19	100	19
MS Total Metals - Copper	mg/kg	59	1400	160
MS Total Metals - Iron	mg/kg	45000	36000	36000
MS Total Metals - Lead	mg/kg	5	21	12
MS Total Metals - Manganese	mg/kg	700	2800	970
MS Total Metals - Mercury	mg/kg	<0.05	0.09	<0.05
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	14	20	13
MS Total Metals - Selenium	mg/kg	<3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	32	22	28
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	1100	430	440
MS Total Metals - Vanadium	mg/kg	120	55	76
MS Total Metals - Zinc	mg/kg	65	310	57

Batch No: **23-66723**
Report Number: **131724**
Client: **GHD Pty Ltd**
ALS Program Ref: **GHD**
Program Description: **GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9205579	NONE	4. CC4	SOIL	24/10/23
9205580	NONE	5. CC5	SOIL	23/10/23
9205581	NONE	6. FC1	SOIL	26/10/23

Analysis - Analyte	*Sample No. Site Code Units*	9205579 NONE	9205580 NONE	9205581 NONE
MS Total Metals - Aluminium	mg/kg	19000	21000	18000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	8	7	33
MS Total Metals - Barium	mg/kg	140	240	150
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	0.2	<0.2	<0.2
MS Total Metals - Chromium	mg/kg	25	45	97
MS Total Metals - Cobalt	mg/kg	17	29	26
MS Total Metals - Copper	mg/kg	330	44	63
MS Total Metals - Iron	mg/kg	32000	71000	71000
MS Total Metals - Lead	mg/kg	12	17	24
MS Total Metals - Manganese	mg/kg	1400	1400	1700
MS Total Metals - Mercury	mg/kg	0.05	<0.05	0.12
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	14	19	28
MS Total Metals - Selenium	mg/kg	<3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	35	15	32
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	330	690	170
MS Total Metals - Vanadium	mg/kg	51	92	100
MS Total Metals - Zinc	mg/kg	85	120	98

Batch No:	**23-66723**
Report Number:	**131724**
Client:	**GHD Pty Ltd**
ALS Program Ref:	**GHD**
Program Description:	**GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9205582	NONE	7. FC2	SOIL	26/10/23
9205583	NONE	8. PR1	SOIL	27/10/23
9205584	NONE	9. PR2	SOIL	27/10/23

Analysis - Analyte	*Sample No. Site Code Units*	**9205582 NONE**	**9205583 NONE**	**9205584 NONE**
MS Total Metals - Aluminium	mg/kg	25000	14000	11000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	<5	8	5
MS Total Metals - Barium	mg/kg	78	180	160
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	<0.2	<0.2	<0.2
MS Total Metals - Chromium	mg/kg	93	23	17
MS Total Metals - Cobalt	mg/kg	13	12	8
MS Total Metals - Copper	mg/kg	48	25	19
MS Total Metals - Iron	mg/kg	27000	30000	18000
MS Total Metals - Lead	mg/kg	22	18	14
MS Total Metals - Manganese	mg/kg	240	680	620
MS Total Metals - Mercury	mg/kg	<0.05	<0.05	<0.05
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	23	14	11
MS Total Metals - Selenium	mg/kg	3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	35	38	82
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	170	280	140
MS Total Metals - Vanadium	mg/kg	81	51	31
MS Total Metals - Zinc	mg/kg	110	65	44

Batch No: **23-66723**
Report Number: **131724**
Client: **GHD Pty Ltd**
ALS Program Ref: **GHD**
Program Description: **GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9205585	NONE	10. DG1	SOIL	23/10/23
9205586	NONE	11. RC1	SOIL	24/10/23
9205587	NONE	12. SC1	SOIL	23/10/23

Analysis - Analyte	*Sample No. Site Code Units*	9205585 NONE	9205586 NONE	9205587 NONE
MS Total Metals - Aluminium	mg/kg	12000	23000	16000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	77	8	28
MS Total Metals - Barium	mg/kg	160	170	180
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	0.6	<0.2	<0.2
MS Total Metals - Chromium	mg/kg	36	29	31
MS Total Metals - Cobalt	mg/kg	16	15	18
MS Total Metals - Copper	mg/kg	57	82	62
MS Total Metals - Iron	mg/kg	70000	33000	32000
MS Total Metals - Lead	mg/kg	60	9	14
MS Total Metals - Manganese	mg/kg	720	1900	880
MS Total Metals - Mercury	mg/kg	0.06	0.12	<0.05
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	20	16	17
MS Total Metals - Selenium	mg/kg	<3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	33	110	51
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	150	480	300
MS Total Metals - Vanadium	mg/kg	77	55	75
MS Total Metals - Zinc	mg/kg	160	85	65

A blank space indicates no test performed.

CERTIFICATE OF ANALYSIS

Batch No: **24-27698**
Final Report **177541**

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ALS Program Ref: **GHD**
Program Description: **GHD**
Client Ref: **12620903**

Date Sampled: **17-Apr-2024 - 21-Apr-2024**
Date Samples Received: **22-Apr-2024**
Date Issued: **01-May-2024**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis	*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
MS Total Metals	WG020B	Scoresby			

Signatories

Name	*Title*	*Name*	*Title*
Alan Chung	**Team Leader Metals**		

Samples not collected by ALS and are tested as received.
Calculated results are based on raw data.

Soil microb

Samples are tested within holding time unless otherwise stated.

Results contained within this report relate only to the samples tested.
The report shall not be reproduced, except in full and results relate only to the items tested.

Batch No:	**24-27698**
Report Number:	**177541**
Client:	**GHD Pty Ltd**
ALS Program Ref:	**GHD**
Program Description:	**GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9778275	NONE	CC5	SEDIMENT	17/04/24
9778276	NONE	DG1	SEDIMENT	17/04/24
9778277	NONE	CC1	SEDIMENT	18/04/24

Analysis - Analyte	*Sample No. Site Code Units*	9778275 NONE	9778276 NONE	9778277 NONE
MS Total Metals - Aluminium	mg/kg	37000	22000	30000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	9	49	10
MS Total Metals - Barium	mg/kg	92	110	110
MS Total Metals - Beryllium	mg/kg	5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	<0.2	1.1	<0.2
MS Total Metals - Chromium	mg/kg	51	31	82
MS Total Metals - Cobalt	mg/kg	32	22	39
MS Total Metals - Copper	mg/kg	260	72	190
MS Total Metals - Iron	mg/kg	77000	42000	67000
MS Total Metals - Lead	mg/kg	22	45	11
MS Total Metals - Manganese	mg/kg	1600	780	1700
MS Total Metals - Mercury	mg/kg	0.07	0.13	0.08
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	27	29	30
MS Total Metals - Selenium	mg/kg	3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	32	61	72
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Thorium	mg/kg	10	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	1200	190	1800
MS Total Metals - Uranium	mg/kg	<5	<5	<5
MS Total Metals - Vanadium	mg/kg	110	72	160
MS Total Metals - Zinc	mg/kg	200	220	94
MS Total Metals - Lanthanum	mg/kg	30	16	11

Batch No:	**24-27698**
Report Number:	**177541**
Client:	**GHD Pty Ltd**
ALS Program Ref:	**GHD**
Program Description:	**GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9778278	NONE	CC2	SEDIMENT	18/04/24
9778279	NONE	CC3	SEDIMENT	19/04/24
9778280	NONE	CC4	SEDIMENT	19/04/24

Analysis - Analyte	*Sample No. Site Code Units*	9778278 NONE	9778279 NONE	9778280 NONE
MS Total Metals - Aluminium	mg/kg	22000	16000	36000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	17	7	15
MS Total Metals - Barium	mg/kg	55	56	150
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	<0.2	<0.2	0.3
MS Total Metals - Chromium	mg/kg	38	25	47
MS Total Metals - Cobalt	mg/kg	33	18	28
MS Total Metals - Copper	mg/kg	730	370	580
MS Total Metals - Iron	mg/kg	49000	26000	56000
MS Total Metals - Lead	mg/kg	21	11	16
MS Total Metals - Manganese	mg/kg	750	1200	3400
MS Total Metals - Mercury	mg/kg	0.09	0.06	0.11
MS Total Metals - Molybdenum	mg/kg	9	<5	<5
MS Total Metals - Nickel	mg/kg	20	14	25
MS Total Metals - Selenium	mg/kg	<3	<3	4
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	55	31	110
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Thorium	mg/kg	5	<5	5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	1200	330	940
MS Total Metals - Uranium	mg/kg	<5	<5	<5
MS Total Metals - Vanadium	mg/kg	98	50	87
MS Total Metals - Zinc	mg/kg	110	67	150
MS Total Metals - Lanthanum	mg/kg	14	16	23

Batch No: **24-27698**
Report Number: **177541**
Client: **GHD Pty Ltd**
ALS Program Ref: **GHD**
Program Description: **GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9778281	NONE	RC1	SEDIMENT	19/04/24
9778282	NONE	SC1	SEDIMENT	20/04/24
9778283	NONE	PR1	SEDIMENT	20/04/24

Analysis - Analyte	*Sample No. Site Code Units*	9778281 NONE	9778282 NONE	9778283 NONE
MS Total Metals - Aluminium	mg/kg	36000	24000	12000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	10	28	9
MS Total Metals - Barium	mg/kg	120	42	79
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	10
MS Total Metals - Cadmium	mg/kg	<0.2	<0.2	<0.2
MS Total Metals - Chromium	mg/kg	70	48	22
MS Total Metals - Cobalt	mg/kg	27	12	10
MS Total Metals - Copper	mg/kg	91	65	18
MS Total Metals - Iron	mg/kg	55000	38000	29000
MS Total Metals - Lead	mg/kg	9	13	17
MS Total Metals - Manganese	mg/kg	1300	260	670
MS Total Metals - Mercury	mg/kg	<0.05	<0.05	<0.05
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	26	16	15
MS Total Metals - Selenium	mg/kg	<3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	100	35	67
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Thorium	mg/kg	<5	<5	7
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	1200	240	290
MS Total Metals - Uranium	mg/kg	<5	<5	<5
MS Total Metals - Vanadium	mg/kg	130	90	43
MS Total Metals - Zinc	mg/kg	78	57	60
MS Total Metals - Lanthanum	mg/kg	11	12	12

Batch No: **24-27698**
Report Number: **177541**
Client: **GHD Pty Ltd**
ALS Program Ref: **GHD**
Program Description: **GHD**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
9778284	NONE	PR2	SEDIMENT	20/04/24
9778285	NONE	FC2	SEDIMENT	20/04/24
9778286	NONE	FC1	SEDIMENT	21/04/24

Analysis - Analyte	*Sample No. Site Code Units*	9778284 NONE	9778285 NONE	9778286 NONE
MS Total Metals - Aluminium	mg/kg	16000	20000	19000
MS Total Metals - Antimony	mg/kg	<5	<5	<5
MS Total Metals - Arsenic	mg/kg	8	19	19
MS Total Metals - Barium	mg/kg	130	84	95
MS Total Metals - Beryllium	mg/kg	<5	<5	<5
MS Total Metals - Boron	mg/kg	<10	<10	<10
MS Total Metals - Cadmium	mg/kg	<0.2	<0.2	<0.2
MS Total Metals - Chromium	mg/kg	19	69	56
MS Total Metals - Cobalt	mg/kg	8	22	21
MS Total Metals - Copper	mg/kg	21	53	48
MS Total Metals - Iron	mg/kg	20000	41000	42000
MS Total Metals - Lead	mg/kg	13	19	15
MS Total Metals - Manganese	mg/kg	660	2200	1900
MS Total Metals - Mercury	mg/kg	<0.05	0.18	0.11
MS Total Metals - Molybdenum	mg/kg	<5	<5	<5
MS Total Metals - Nickel	mg/kg	12	23	22
MS Total Metals - Selenium	mg/kg	<3	<3	<3
MS Total Metals - Silver	mg/kg	<5	<5	<5
MS Total Metals - Strontium	mg/kg	150	54	53
MS Total Metals - Thallium	mg/kg	<5	<5	<5
MS Total Metals - Thorium	mg/kg	6	<5	<5
MS Total Metals - Tin	mg/kg	<5	<5	<5
MS Total Metals - Titanium	mg/kg	260	270	320
MS Total Metals - Uranium	mg/kg	<5	<5	<5
MS Total Metals - Vanadium	mg/kg	34	74	62
MS Total Metals - Zinc	mg/kg	54	98	86
MS Total Metals - Lanthanum	mg/kg	15	11	14

A blank space indicates no test performed.

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The Power of Commitment

APPENDIX 3 CADIA ANNUAL GROUNDWATER MONITORING REVIEW – 2023/2024 WATER YEAR

Australasian Groundwater & Environmental Consultants

Report on

Cadia Annual Groundwater Monitoring Review 2023/2024 Water Year

Prepared for
Cadia Holdings Proprietary Limited

Project No. CAD5020.001
October 2024

ageconsultants.com.au

ABN 64 080 238 642

Document details and history

Document details

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Document title	Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year
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Document status and review

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Cadia Annual Groundwater Monitoring Review 2023/2024 Water Year

Executive summary

Hydrogeological setting *(Section 4.4)*

Geological units that have the ability to store and transmit groundwater within the Cadia area and the surrounding region include the Tertiary basalt, Silurian sediments, and Ordovician rock (primarily volcaniclastics and intrusive volcanics). Groundwater use in the region is largely from the Tertiary basalt, which can form a productive aquifer in some areas. The Silurian and Ordovician groundwater systems generally form low permeability aquitards (i.e. the geology inhibits the movement of groundwater), Permeability can be enhanced in areas of fracturing; however, hydraulic tests indicate that these fracture networks are not laterally extensive and form localised flow features. Cadia's operation is largely located to the south of the main basalt sequence.

Some groundwater level drawdown and depressurisation is predicted and observed to occur in association with current and historical mining activities (Cadia Hill Pit, Ridgeway, and Cadia East), although the extent of this is not significant, particularly within the more productive Tertiary basalt.

The direction of groundwater flow is predominately to the southwest, which is consistent with pre-mining interpretations and the terrain. Decreases of groundwater levels and pressures around Cadia Hill Pit, Ridgeway, and Cadia East have resulted in localised inwards flow directions at these locations. With respect to potential contaminant sources including the Southern Waste Rock Dump (SWRD), Northern Tailings Storage Facility (NTSF), and Southern Tailings Storage Facility (STSF), groundwater flow is to the southwest in the direction of Cadiangullong Creek and/or Rodds Creek.

Groundwater monitoring and modelling *(Section 2.2 and Section 4.4.6)*

Groundwater monitoring is undertaken as per the site Water Management Plan (WMP), which is in line with project approval conditions. The WMP describes groundwater level and quality monitoring requirements for 121 monitoring bores both across the site and in the broader Cadia region. Monitoring bores are categorised based on the geology that a bore's screened interval intersects.

The site WMP also defines impact assessment criteria for groundwater levels and quality. Based on the WMP defined Trigger Action Response Plan (TARP), impact assessment criteria exceedances can lead to more detailed internal and/or specialist investigations, as well as the implementation of management and mitigation measures, if required.

A regional groundwater flow model has been developed and is regularly updated to predict potential impacts associated with mining and tailings storage activities at Cadia. Modelled impacts were originally considered as part of the project approval, and these predictions are regularly compared to observations collected from the groundwater monitoring program.

Cadia Hill Pit *(Section 5.3)*

Continued tailings deposition over the 2023/2024 reporting period resulted in the pit lake reaching an approximate elevation of 653 mAHD in June 2024.

Assessment of potential impacts

Increasing groundwater levels that correlate to the elevation of the pit lake have been observed historically in Ordovician monitoring bores MB94 and MB95 (now decommissioned). Similar increases have been observed more recently in Ordovician monitoring bores MB96 and PZ90. Influences of tailings deposition is also observed in the water quality of these monitoring bores, with increasing concentrations of Total Dissolved Solids (TDS), sulfate, sodium, arsenic, copper, and molybdenum. All affected bores are located within the pit walls and screened at an elevation that is lower than the level of the pit lake in June 2024.

The risk of this groundwater flowing away from the pit is minimal, given that monitoring data and numerical modelling both show and predict an inwards hydraulic gradient. The extent of potential impacts are well monitored in the direction of the potential down gradient receptor, Cadiangullong Creek. A review of water quality and aquatic ecosystem monitoring indicates that no mining related impacts are apparent in nearby or downstream sections of Cadiangullong Creek.

Ridgeway Mine *(Section 5.4)*

The Ridgeway Mine underwent a testing program over the 2023/2024 reporting period, which involved further dewatering of the underground workings.

Assessment of potential impacts

Historical groundwater level declines after the 2002 surface breakthrough were observed in many nearby monitoring bores, although these declines are consistent with environmental impact assessment predictions. Drawdown and depressurisation is well delineated and monitored to the west of Ridgeway Mine. It is unlikely that there is any mining related effect on groundwater-surface water interactions, with no reductions in baseflow evident in upstream or downstream monitoring of Swallow Creek.

Cadia East Mine *(Section 5.5)*

Cave mining at Cadia East remained active over the 2023/2024 reporting period.

Assessment of potential impacts

Monitoring indicates that mining and dewatering activities have resulted in drawdown and depressurisation of the surrounding Ordovician/Silurian systems, as well as the Tertiary basalt, although to a lesser extent relative to other systems. Observed groundwater level decreases are generally consistent with environmental impact assessment predictions. Groundwater level decreases observed in Tertiary basalt monitoring bores RB02, MB42, and MB44B are not consistent with modelled impacts. However, decreases in monitoring bores RB02 and MB42 precede mining, and influences from forestry and agricultural activities are also possible. Additionally, groundwater level declines in monitoring bore MB44B, may be associated with a structural feature further propagating impacts.

Potential mining related declines in Silurian sediment monitoring bores RB07, MB46, and MB73 may indicate that modelled predictions underestimate drawdown and depressurisation within the Silurian sediments. Notwithstanding, no groundwater level decreases are observed within monitoring bores that are nearer and adjacent to Flyers Creek, and as such, no effects to creek baseflow are likely.

Northern Tailings Storage Facility and Southern Tailings Storage Facility *(Section 5.6)*

The NTSF and STSF have remained inactive over the 2023/2024 reporting period, following the March 2018 internal embankment slump.

Assessment of potential impacts

Long-term groundwater level increases have been observed adjacent to NTSF and the STSF, largely within 250 m of the facilities, and wholly within 500 m. These increases are likely associated with a combination of seepage and poroelastic responses (i.e. compression from the mass of tailings), although total seepage volumes are conceptualised and modelled to be relatively minor. Water quality records also indicate that some seepage is likely, with historical periods of increasing TDS and sulfate concentrations observed in some monitoring bores. Elevated sulfate-chloride mass ratios, which are used as a proxy for seepage identification, are also observed in monitoring bores around the NTSF and STSF. However, these ratios generally decrease with distance away from TSFs and are notably lower in hydraulically down gradient Cadia Continued Operations Project (CCOP) monitoring bores.

Potential seepage related effects are well monitored in the direction of down gradient receptors, Cadiangullong Creek and Rodds Creek. Concentrations of sulfate within the surrounding monitoring bore network are generally below the stock water guideline value. Where concentrations do exceed the guideline value, hydraulically down gradient bores delineate the affected area. Additionally, a review of water quality and aquatic ecosystem monitoring indicates that no mining related impacts are detected in nearby or downstream sections of Cadiangullong Creek. Similarly, affected surface water quality in the Rodds Creek drainage feature is limited to the ST14 dam that is adjacent to the southern end of the STSF, with no downstream impacts observed.

Southern Waste Rock Dump *(Section 5.7)*

The SWRD remained active over the 2023/2024 reporting period.

Assessment of potential impacts

Groundwater level variations in monitoring bores that are hydraulically down gradient of the SWRD are consistent with climate, and no increases associated with the SWRD are apparent. There is evidence of SWRD leachate influencing the groundwater chemistry of these monitoring bores, namely elevated concentrations of TDS and sulfate, as well as historical increasing trends. A review of water quality and aquatic ecosystem monitoring indicates that no mining related impacts are apparent in nearby or downstream sections of Cadiangullong Creek.

Summary of groundwater risk

Operations at Cadia have the potential to effect groundwater through two overarching mechanisms: (1) drawdown and depressurisation that is associated with mining activities; and (2) a change of groundwater chemistry and quality that is associated with waste material including tailings storages and waste rock.

With respect to drawdown and depressurisation, monitoring indicates that this has occurred within the areas surrounding the Cadia Hill Pit, the Ridgeway Mine, and the Cadia East Mine. However, observed effects are largely consistent with impact predictions that were originally considered as part of the project approval. There may be some evidence of groundwater depressurisation within the Tertiary Basalt and Silurian sediments extending slightly further to the north/east of the Cadia East Mine than is modelled. Notwithstanding, monitoring that is further afield indicates that impacts to Flyers Creek baseflow and groundwater users of the Orange Basalt Groundwater Source have not been detected.

Some changes of groundwater chemistry were observed in areas surrounding the PTSF, the NTSF/STSF, the SWRD, and the ore processing area. The potential for effected groundwater to impact hydraulically down gradient receptors was considered as part of this investigation. A review of water quality and aquatic ecosystem monitoring indicates that no mining related impacts are apparent within Cadiangullong Creek. Similarly, affected surface water quality in the Rodds Creek drainage feature is limited to the ST14 dam that is adjacent to the southern end of the STSF.

Potential effects to hydraulically down gradient groundwater users (i.e. to the south and southeast of operations) are also considered to be unlikely. While some deterioration of groundwater quality is observed in bores that are close to the STSF, these effects are absent within groundwater monitoring bores that are further hydraulically down gradient. Persistent exceedances of stock watering guideline values are also absent in these same monitoring bores, meaning there has been no detectable change in the beneficial use category of the groundwater. Additionally, the low bulk permeability of hydraulically down gradient geological units reduces the potential for offsite migration of contaminants, which is reflected in the impact modelling that has been completed to date, as well as the approximations of groundwater travel times that were calculated in this report for context (0.3 m per year to 3.1 m per year).

Elevated pH levels have been observed within some CCOP monitoring bores. However, these atypical levels are attributed to effects from defective grouting and/or remnant drilling fluids.

1 Introduction

Cadia Holdings Proprietary Limited (CHPL), a subsidiary of Newmont, own and operate the gold/copper Cadia Mine (Cadia). Cadia comprises two underground mines, a completed open cut pit, and also tailings and water storage dams. The operations are located approximately 25 km southwest of the city of Orange in central west New South Wales (NSW) and about 250 km west of Sydney.

CHPL has engaged Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to undertake an assessment of groundwater levels and quality at Cadia to meet internal and annual reporting requirements for the 2023/2024 water year[1] as part of project approvals (06_0295) and EPL licence requirements (licence no. 5590). This report presents a review of groundwater monitoring data from the existing groundwater monitoring network to assess for potential impacts to the environment and stakeholders. Historical data collected prior to the reporting period is also reviewed to identify long-term trends. AGE has prepared this report on the basis of information provided by CHPL.

As Cadia has multiple activities occurring onsite, which have different influences on the groundwater regime, the site has been separated into different operational areas for assessment. These areas include the:

- Cadia Hill Pit, which is currently used for tailings storage (PTSF) ;
- Ridgeway Mine, which has been in care and maintenance since March 2016;
- Cadia East Mine, which is currently operating and approved to extract up to 32 million tonnes per annum (Mtpa) until June 2031;
- northern and southern tailings storage facilities (NTSF and STSF, respectively);
- southern waste rock dump (SWRD); and
- other areas, which include the ore processing area and regional monitoring.

[1] Representing the period of 1 July 2023 to 30 June 2044; also referred to as the ‘reporting period’.

2 Statutory requirements

The annual groundwater monitoring review is a requirement of the Project Approval (PA) (application no. 06_0295), the Environment Protection Licence (EPL) (no. 5590), and is specified within Cadia's Water Management Plan (WMP) (Newcrest, 2023). Relevant conditions, commitments, and details for each of these are discussed in the following sections.

2.1 Project Approval

Applicable conditions within PA 06_0295 are:

- Condition 34 of Schedule 2 requires implementation of a groundwater monitoring program within the site water management plan, as well as reporting of the monitoring program results (Condition 34(e)).
- Condition 2 of Schedule 5 requires the annual groundwater monitoring review forms part of the annual review produced by Cadia.

Condition 34 of Schedule 2 states the following:

- *'The Groundwater Monitoring Program must include:*
  - *a) detailed baseline data, based on sound statistical analysis, to benchmark the pre-mining natural variation in groundwater levels, yield and quality (including privately-owned bores within the maximum predicted 1 metre groundwater drawdown contour, as indicated on the plans in Appendix 5);*
  - *b) groundwater impact assessment criteria (including for monitoring bores and privately-owned bores);*
  - c) *a program to monitor:*
    - *impacts on the groundwater supply of potentially affected landowners;*
    - *impacts on springs and groundwater dependent ecosystems;*
    - *the volume of groundwater seeping into open pit and underground mine workings;*
    - *regional groundwater levels and quality in all potentially affected aquifers;*
    - *potential acid rock drainage;*
    - *the hydraulic gradient and groundwater quality around the base of the Cadia Hill pit;*
  - *d) a program for the ongoing verification and refinement of the groundwater model; and*
  - *e) reporting procedures for the results of the monitoring program and model verification.'*

Cadia's groundwater monitoring program is described in the site WMP, which is discussed in Section 2.2.

Condition 2 of Schedule 5 states the following:

- *'By the end of March in each year after the commencement of the project, or other timeframe agreed by the Secretary, a report must be submitted to the Department reviewing the environmental performance of the project, to the satisfaction of the Secretary. This review must::*
  - *a) describe the project (including any rehabilitation) that was carried out in the previous calendar year, and the project that is proposed to be carried out over the current calendar year;*
  - *b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, including a comparison of these results against the:*
    - *relevant statutory requirements, limits or performance measures/criteria;*
    - *requirements of any plan or program required under this approval;*
    - *monitoring results of previous years; and*
    - *relevant predictions in the EA;*
  - *c) reporting of direct and indirect water take, including water take where a water licence is required (reviewed against existing water licences) and where an exemption applies*

d) *identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;*

e) *evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval;*

f) *identify any trends in the monitoring data over the life of the project;*

g) *identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and*

h) *describe what measures will be implemented over the next year to improve the environmental performance of the project.*

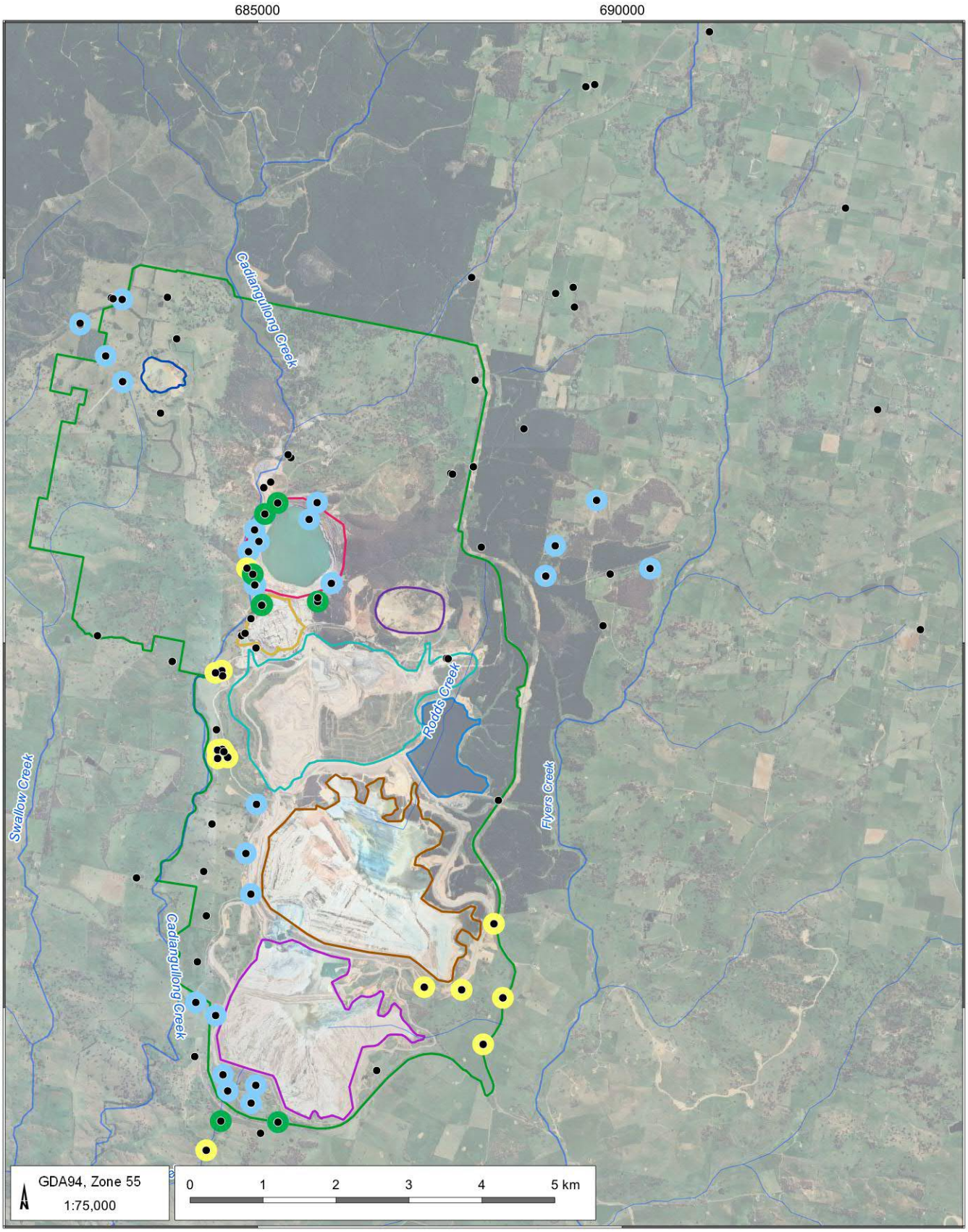
Schedule 5 Conditions 2 (b), (d), (e), (f), and (g) are discussed in this report.

2.2 Water management plan

2.2.1 Groundwater monitoring network and sampling

Cadia's WMP describes monitoring requirements for 121 monitoring bores, 74 of which require groundwater level and quality monitoring, while 47 require groundwater level monitoring only (Figure 2.1). The frequency of monitoring ranges from a monthly cadence to an annual cadence (Newcrest, 2023; Table 17). Additionally, the WMP defines Site Specific Guideline Values (SSGVs) for 55 monitoring bores (Figure 2.1), which are used to assess potential impacts to groundwater (Section 2.2.2). Note that the WMP defined monitoring network is not the entire groundwater monitoring network that is active at Cadia. The groundwater monitoring network in its entirety is discussed and shown in Section 4.4.3.

Groundwater level gauging and groundwater quality sampling is conducted by Cadia personnel as per Cadia's groundwater sampling procedure (Newcrest, 2022). It is understood that most monitoring bores are sampled via the low-flow sampling technique using dedicated in-situ bladder pumps. Purging using bailers is adopted as a backup methodology for monitoring bores where the bladder pump is not available or suitable. A high level review of both the sampling procedure and the sampling fieldsheets for the most recent groundwater sampling round was undertaken by AGE. Sampling is largely undertaken in accordance with Cadia's groundwater sampling procedure (including associated industry guidelines); however some improvements are suggested in Section 7 of this report. These suggested improvements and considerations are not expected to have had a material influence on compromising any of the monitoring data that are reviewed for this assessment.



LEGEND

- WMP defined groundwater monitoring location

Monitoring locations with defined SSGVs

- Level & quality SSGV
- Quality SSGV
- Level SSGV

Drainage

- Major drainage
- Minor drainage

- Mining Lease

Infrastructure

- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

WMP defined monitoring network is not the entire monitoring network that is active at Cadia

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

WMP defined groundwater monitoring network

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FIGURE No. **2.1**

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Source: GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
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2.2.2 WMP impact assessment criteria and TARP

Impact assessment criteria are used to identify changes in groundwater quality and level, which may indicate adverse impacts on the environment because of mining operations. Impact assessment criteria are implemented as SSGVs, with SSGVs for groundwater levels and groundwater quality reproduced from Newcrest (2023) in Table 2.1 and Table 2.2, respectively. AGE note that the current WMP presents all water quality triggers as SSGVs, although in reality, water quality triggers are SSGVs only in part (where triggers are based on the 95th percentile of historical data). Most of the water quality triggers presented are based on guideline water quality values.

Should groundwater level or groundwater quality observations exceed a SSGV, the WMP includes a Trigger Action Response Plan (TARP), which if required, may trigger further investigations and the implementation of management and mitigation measures. Generally, there are two levels of investigation. Firstly a Level 1 investigation, where data are reviewed internally by Cadia personnel. If exceedances are considered likely to be related to mining influences, a Level 2 investigation is implemented, where an independent specialist undertakes further review and provides recommendations around management and mitigation strategies. The specific TARPs for groundwater level and groundwater quality exceedances are provided in Table 2.3 and Table 2.4, respectively.

Table 2.1 Groundwater level SSGVs (Newcrest, 2023)

Bore ID	Level (mAHD)
Cadia Hill Pit:	
MB30	Change in direction of hydraulic gradient
MB91	“ ”
MB92	“ ”
MB93	“ ”
MB94	“ ”
MB96	“ ”
MB97A	“ ”
MB97B	“ ”
MB97C	“ ”
MB99A	“ ”
MB99B	“ ”
MB100	“ ”
PZ89	“ ”
PZ4	“ ”
PZ5	“ ”
PZ89	“ ”
PZ89A	“ ”
PZ90	“ ”
Ridgeway Mine:	
RO6A	866
RO6B	832
RO7	865
RO10A	882

Bore ID	Level (mAHD)
RO10B	870
RO12	893
Cadia East Mine:	
MB43	Groundwater drawdown of greater than 3 m from that considered normal climatic variation
MB44B	“ ”
MB47A	“ ”
MB47B	“ ”
MB62	“ ”
MB76	“ ”
NTSF:	
MB18	707
MB23	699
MB24	691
STSF:	
MB25	665
MB26B	648
MB27	594
MB28B	645
MB29B	635
MB77A	658
MB77B	658
MB78	585
MB81	656

Note: mAHD – metres with respect to the Australian Height Datum.

Table 2.2 Groundwater quality SSGVs (Newcrest, 2023)

Bore ID	pH (pH units)	TDS (mg/L)	Sulfate (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Zinc (mg/L)	Nitrite as N (mg/L)	Nitrate as N (mg/L)
Cadia Hill Pit:													
MB91	6 - 8.5	4000	1000	5	0.1	0.2	0.01	0.3	0.002	0.2	2	30	400
MB92	6 - 8.5	4000	1000	5	0.1	0.2	0.01	0.7	0.002	0.2	2	30	400
MB93	6 - 8.5	4000	1000	5	0.1	0.2	0.01	1.1	0.002	0.2	2	30	400
MB99A	6 - 8.5	4000	1000	5	0.1	0.2	0.01	0.6	0.002	0.2	2	30	400
MB99B	6 - 8.5	4000	2060	5	0.1	0.2	0.01	0.3	0.002	0.2	2	30	400
MB100	6 - 8.5	4000	1000	5	0.1	0.2	0.01	0.1	0.002	0.2	2	30	400
NTSF and STSF:													
MB20	6 - 8.5	7330	3530	13.6	0.01	0.2	0.01	29.7	0.003	0.2	2	30	400
MB21	6 - 8.5	4000	1000	5	0.01	0.2	0.01	0.5	0.001	0.2	2	30	400
MB68	6 - 8.5	4000	1000	5	0.01	0.2	0.01	0.5	0.001	0.2	2	30	400
MB69	6 - 8.5	4000	1000	5	0.01	0.2	0.01	1.3	0.001	0.2	2	30	400
MB70	6 - 8.5	4000	1000	5	0.01	0.2	0.01	0.5	0.001	0.2	2	30	400
MB77B	6 - 8.5	4000	1220	5	0.01	0.2	0.01	1.9	0.0008	0.2	2	30	400
MB78	6 - 8.5	4000	1000	5	0.01	0.2	0.01	0.5	0.001	0.2	2	30	400
MB79	6 - 8.5	4000	1000	5	0.01	0.2	0.01	0.5	0.001	0.2	2	30	400
Southern Waste Rock Dump:													
MB4A	6 - 8.5	4000	1327	5	0.1	0.2	0.1	4.4	0.002	0.2	2	30	400
MB6A	6 - 8.5	4000	1473	5	0.1	0.2	0.1	0.9	0.002	0.2	2	30	400
MB7A	6 - 8.5	4000	2076	5	0.1	0.2	0.1	0.8	0.002	0.2	2	30	400
MB8A	6 - 8.5	4000	2147	5	0.1	0.2	0.1	1	0.002	0.2	2	30	400
MB9A	6 - 8.5	4000	2281	5	0.1	0.2	0.1	2.1	0.002	0.2	2	30	400
MB10A	6 - 8.5	4000	2190	5	0.1	0.2	0.1	1.5	0.002	0.2	2	30	400
MB11A	6 - 8.5	4000	2124	5	0.1	0.2	0.1	0.7	0.002	0.2	2	30	400

Note: Comparison against dissolved constituent of metals/metalloids.

Table 2.3 Groundwater level TARP (Newcrest, 2023)

Trigger	Action	Response
Level 1		
Groundwater level declines below the assessment criterion at a given monitoring site	Cadia personnel to: • validate the data collected (quality control/quality assurance) • assess the results in relation to climatic conditions or other external factors • identify if the assessment criteria were exceeded during the baseline monitoring period • compare results to reference site levels to assess if effects are catchment wide (i.e. unrelated to mining activities)	Cadia personnel to: • record findings • if the exceedance is considered likely related to mining influences, initiate Level 2 investigation
Level 2		
Groundwater level declines below the assessment criterion at a given monitoring site and the Level 1 investigation indicates a potential mining related effect	Independent specialist to: • validate the data collected (quality control/quality assurance) • review groundwater level data for nearby monitoring bores to identify extent of drawdown • assess potential impact to high value receptors and private water supply sources • provide recommendations of management and mitigation measures • report on material limitations of the monitoring program and document potential improvements	Independent specialist to: • submit investigation report to Cadia Cadia personnel to: • submit investigation report to relevant government agencies and stakeholders • initiate further investigation as required (i.e. baseflow reduction assessment) • implement management and mitigation measures • monitor and report on the effectiveness of management and mitigation measures

Table 2.4 Groundwater quality TARP (Newcrest, 2023)

Trigger	Action	Response
Level 1		
Groundwater quality exceeds the SSGV at a given monitoring site	Cadia personnel to: • validate the data collected (quality control/quality assurance) • assess the results in relation to climatic conditions or other external factors • identify if the SSGV was exceeded during the baseline monitoring period • compare results to reference site values to assess if effects are catchment wide (i.e. unrelated to mining activities)	Cadia personnel to: • record findings • if the exceedance is considered likely related to mining influences, initiate Level 2 investigation • report to DPE if a Level 2 investigation has commenced
Level 2		
Groundwater quality exceeds the SSGV at a given monitoring site and the Level 1 investigation indicates a potential mining related effect	Independent specialist to: • validate the data collected (quality control/quality assurance) • review groundwater and surface water quality at compliance points as defined in EPL 5590 • identify potential exceedance of relevant compliance criteria as defined in EPL 5590 • assess potential impact to high value receptors and private water supply sources • provide recommendations of management and mitigation measures • report on material limitations of the monitoring program and document potential improvements	Independent specialist to: • submit investigation report to Cadia Cadia personnel to: • submit investigation report to relevant government agencies and stakeholders • implement management and mitigation measures • monitor and report on the effectiveness of management and mitigation measures

2.3 EPL conditions

Cadia holds an Environment Protection Licence (licence no. 5590), which is regulated by the NSW Environment Protection Authority (EPA). Groundwater specific licence conditions relate to monitoring requirements that define the analytes to be sampled and the sampling frequency (Condition M2.3) for monitoring bores MB27, MB78, MB79, MB83, and MB84 (Condition P1.3). No limit conditions are defined for groundwater; however, monitoring bores MB27, MB78, and MB79 have assessment criteria defined under the Cadia WMP (Section 2.2.2).

3 Site setting

3.1 Mining and tailings deposition

Cadia operations consist of one open cut mine (the Cadia Hill Pit) and two underground mines (the Ridgeway and Cadia East mines). Mining commenced at the Cadia Hill Pit in 1998, with the pit closing in mid-2012. The Ridgeway Mine opened in 2001 using the sub-level caving (SLC) mining method and operated until 2010. The Ridgeway Deeps Mine commenced in 2009 using cave mining and was placed in care and maintenance in 2016. Dewatering of the underground workings has continued since 2016 as part of care and maintenance.

Construction of the NTSF and the STSF was completed in May 1998 and November 2001 respectively, while tailings emplacement in the Cadia Hill Pit commenced in May 2018 (PTSF). All three of the tailing storage facilities are still active, with both the NTSF and STSF having a number of embankment raises since their initial construction. The use of the NTSF and STSF for tailings deposition is currently discontinued after an internal embankment failure in 2018.

Over the current reporting period, mining operations and tailings deposition were exclusive to Cadia East Mine and the PTSF, respectively

The SWRD is active and receives low grade ore and mineralised waste in accessible areas (approved disturbance area of 450 ha, extending to ~ 100 m above natural surface). Deposition of waste rock into the North Waste Rock Dump has ceased (disturbance area of 60 ha, extending to ~ 30 m above natural surface).

A summary of mining and tailings deposition dates are presented below in Table 3.1, with the locations of various infrastructure shown in Figure 3.1.

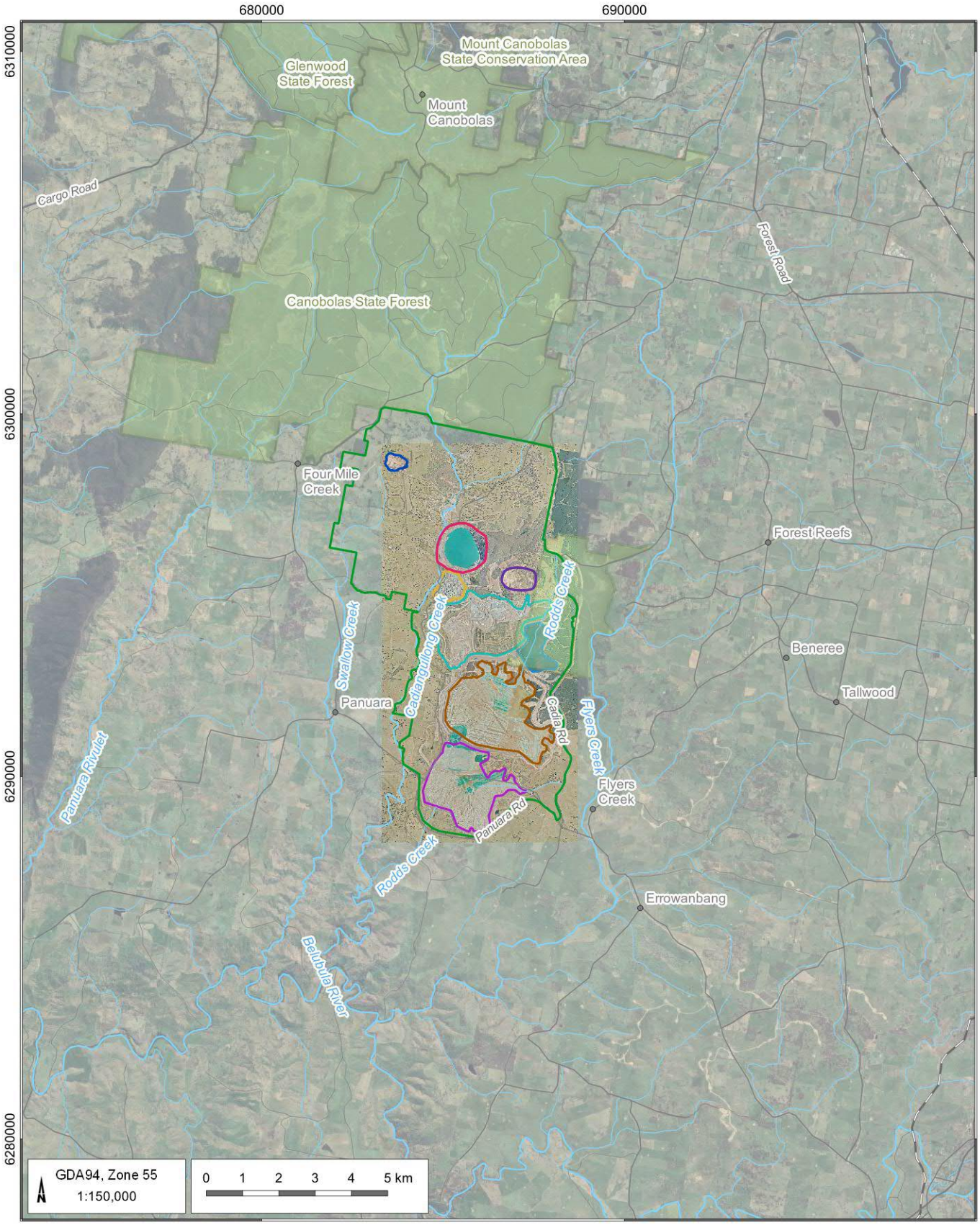
Table 3.1 Mining and tailings deposition summary

Mine/TSF	Start date	End date	Mining method
Cadia Hill	1998	2012	Open cut
Cadia Hill Extended	2003	2004	Open cut
Ridgeway	2001	2010	Sub-level caving
Ridgeway Deeps	2009	2016	Cave mining (with continuous dewatering)
Cadia East	2012	Ongoing	Cave mining (with continuous dewatering)
NTSF	1998	2018 [a]	-
STSF	2002	2018 [a]	-
PTSF	2018	Ongoing	-

Note: (a) The use of the NTSF and STSF is currently discontinued after an embankment failure in 2018.

3.2 Surrounding land use

The Cadia Valley is characterised by cleared open grassland, scattered remnant native vegetation and State Forest Monterey Pine (Pinus radiata) plantations (Figure 3.1). Land use in the vicinity of the Cadia Valley is dominated by sheep and cattle grazing in flat areas, and private and state forestry operations on poorer soil and steeper slopes. The Canobolas State Forest is located to the east and north of the mine. Within the mining leases, the main land use is mining and associated activities (e.g. ore processing, waste rock management, and tailings deposition). The Forestry Corporation of NSW conducts forestry operations at the Canobolas State Forest with periodic harvesting/thinning campaigns likely to continue over the life of mining activities. Pine plantations are typical within the Canobolas State Forest and are predominately comprised of Radiata Pine trees.



LEGEND

- Place name
- Major road
- Minor Road
- Rail
- Major drainage
- Minor drainage
- Mining lease
- Reserve

Infrastructure

- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

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Site setting

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FIGURE No. **3.1**

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4 Environmental setting

4.1 Climate

The climate is temperate, with warm to hot summers and cold winters. There are occasional snowfalls, particularly at Mount Canobolas that rises to around 1,400 mAHD. Rainfall is distributed fairly evenly throughout the seasons averaging approximately 880 mm/year. Rainfall totals are influenced by topography and generally reduce as the land elevation decreases to the south towards the Belubula River. The average annual evaporation rate is approximately 1,340 mm/year. The total rainfall recorded during the annual reporting period was 888.5 mm, which is consistent with average conditions.

The cumulative rainfall departure (CRD) from the monthly mean is a useful qualitative tool to graphically illustrate periods that are wetter or dryer than long-term averages. A rising slope in the CRD indicates periods of above average rainfall, while a falling slope indicates below average rainfall. Natural variations in groundwater level are typically consistent with the CRD.

Monthly patched point Scientific Information for Land Owners (SILO) rainfall data that is adjacent to the site (longitude 149.0°, latitude -33.45°) were obtained from the Long Paddock website (DES, 2024) to calculate the CRD. SILO uses mathematical interpolation techniques between available weather stations to construct spatial grids and infill gaps in time series datasets.

After a period of drought between 2017 and 2020, much higher than average rainfall was recorded until April 2023 (Figure 4.1). Following these distinctive periods, rainfall has been approximate to long-term averages over the 2023/2024 reporting period (Figure 4.1).

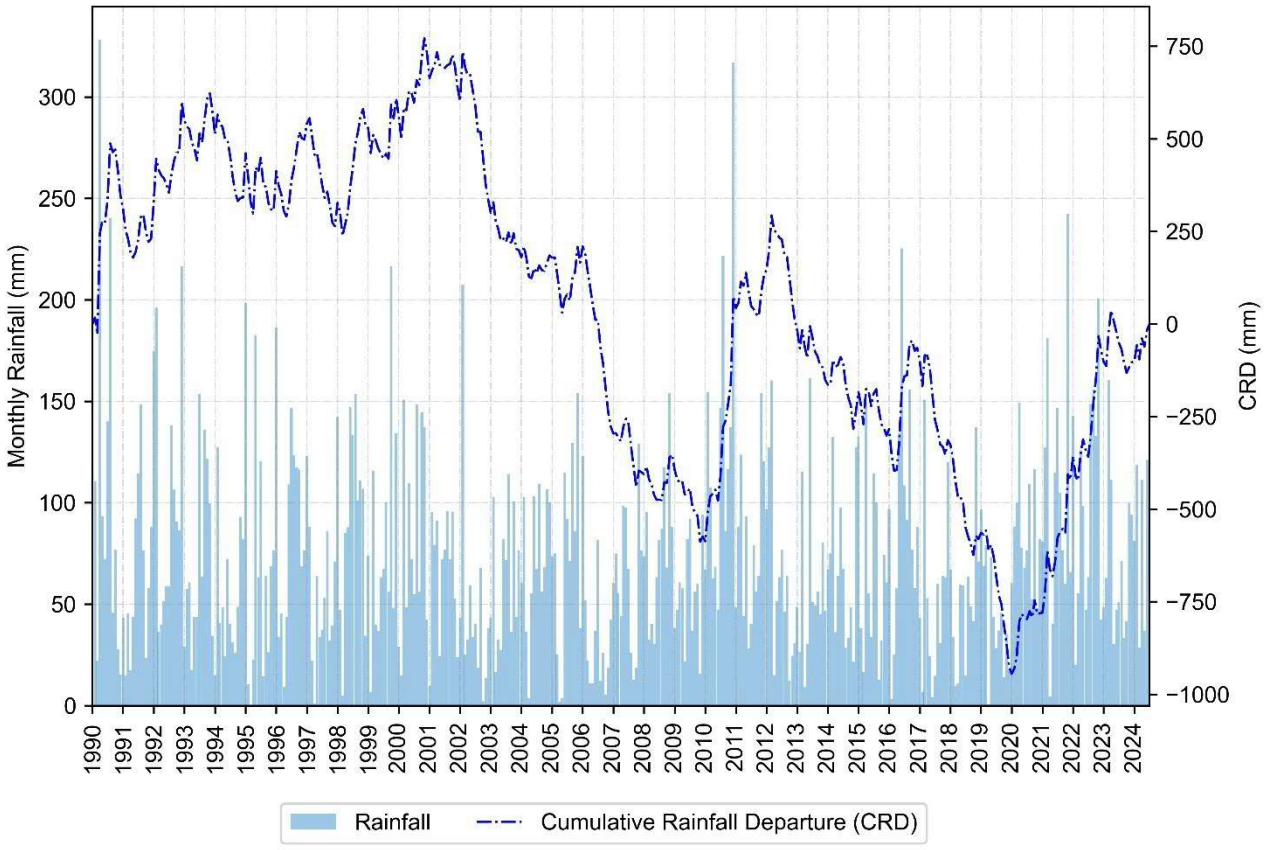


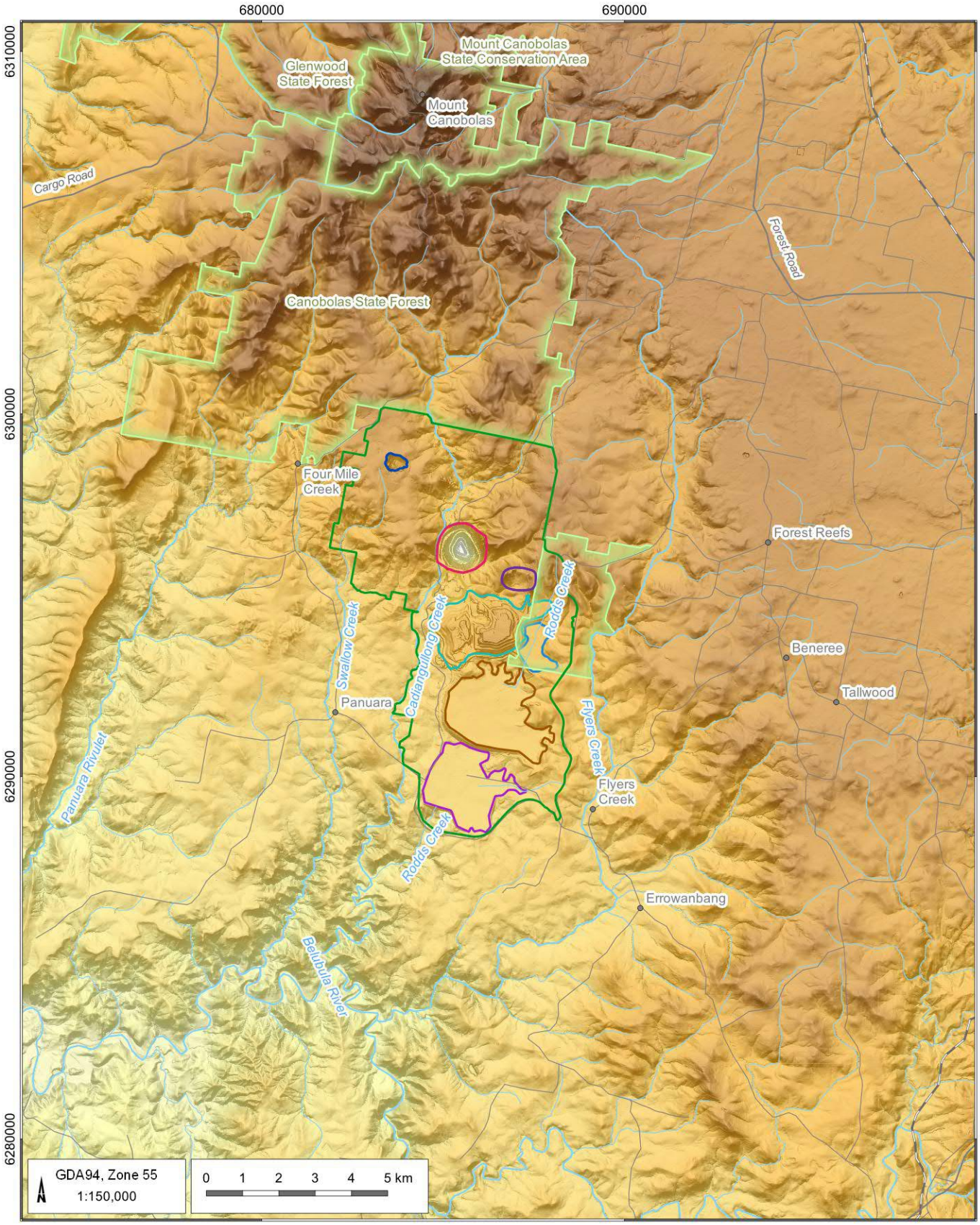
Figure 4.1 Cumulative rainfall departure and annual rainfall (source SILO; longitude 149°, latitude -33.45°)

4.2 Terrain and drainage

The most significant natural topographic feature in the area is the Cadia Valley, which runs in a north-south orientation, between a series of rolling hills that form ridgelines to the east and west of Cadiangullong Creek (Figure 4.2). The local terrain within the Cadia mining leases falls from approximately 1,000 mAHD at the northern boundary, down to approximately 600 mAHD on the southern boundary. Further to the south, the Cadia Valley opens out forming a gently undulating landscape (Figure 4.2).

Cadiangullong Creek is the major watercourse in the Cadia Valley. Local tributaries of Cadiangullong Creek include Cadia Creek, Hoares Creek, Copper Gully Creek, and Rodds Creek. Other watercourses near CVO include Swallow Creek and Flyers Creek, which are located to the west and east of mining operations, respectively. Cadiangullong Creek, Swallow Creek and Flyers Creek flow generally north to south, before joining the Belubula River.

Many of these creeks and their tributaries are naturally ephemeral and show no measurable flow during extended dry periods. The exception is Flyers Creek, which is largely perennial downstream of Long Swamp Road due to baseflow contributions from groundwater fed springs. Flows in Cadiangullong Creek are maintained by Cadia via a low-flow release protocol from the Cadiangullong Dam as per Condition 27 of the Project Approval.



LEGEND

- Place name
- Major road
- Minor Road
- Rail
- Major drainage
- Minor drainage
- Mining lease
- Reserve

Infrastructure

- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

Elevation (mAHD)

- 200
- 500
- 800
- 1000
- 1200
- 1400

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Terrain and drainage

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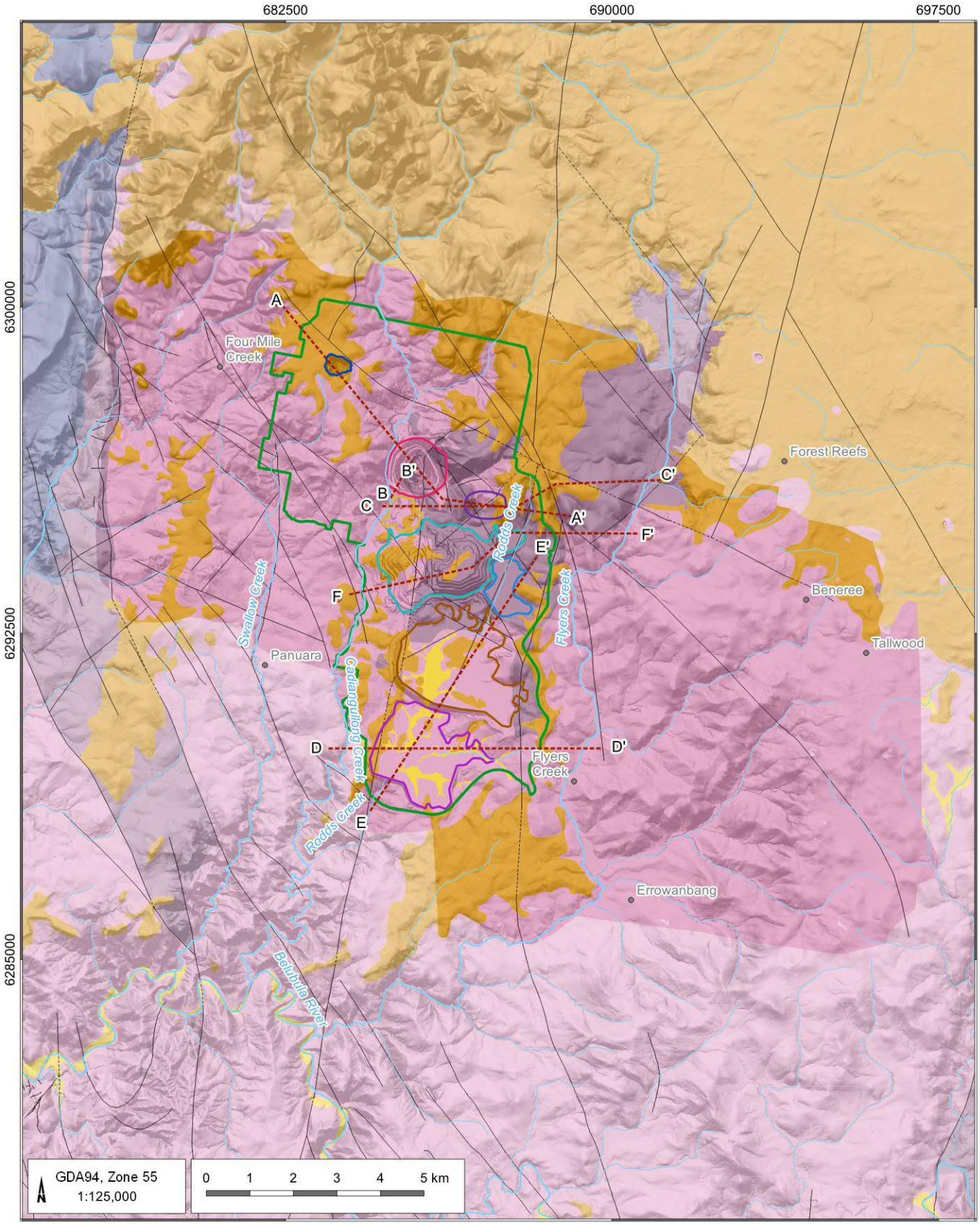
FIGURE No. 4.2

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4.3 Geology

Cadia is located within the eastern Lachlan Fold Belt, where northerly trending volcanic and sedimentary belts have experienced several episodes of intrusive volcanism. Regional mapping (Figure 4.3) shows that surface geology of the local area is primarily comprised of sedimentary turbidites and volcanic/volcaniclastic units, which are Ordovician, Silurian or Devonian in age. These geological units are overlain by younger Tertiary basalt flows, largely to the north of CVO, and more recent Quaternary alluvium which occurs along some drainage features. The gold/copper porphyry deposit at Cadia is associated with monzonite intrusions within the Ordovician volcaniclastic host rocks, accompanied by low grade alteration.

Within the Lachlan Fold Belt, the dominant regional structure consists of a series of roughly north striking faults and splays. These faults were caused by several tectonic events that occurred between the Ordovician and the Carboniferous Periods, with deformation generally driven by east-west crustal shortening (Section 4.3.2) (Washburn, 2008).



LEGEND

- Place name
- Drainage
- Fault lineaments
- Fault lineaments beneath Tertiary cover
- Hydrogeology section lines
  - X = cross section start (A to F)
  - X' = cross section end (A' to F')
- Mining lease

Surface geological age

- Quaternary
- Tertiary
- Devonian
- Silurian
- Ordovician

Infrastructure

- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

Note: Darker colours represent the extent of Cadia surface geological mapping

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Regional geology

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FIGURE No. 4.3

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Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
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4.3.1 Geological units

4.3.1.1 Quaternary alluvium

Alluvial deposits are present along and adjacent to some watercourses in the region, in particular in association with the Belubula River. Alluvium is generally less than 5 m thick and comprises clays, sands and some gravels deposited by meandering fluvial systems. Watercourses are commonly incised into the bedrock, with alluvium largely absent. This absence is notably apparent along watercourses nearest to mining activities, although Cadia geological mapping does indicate some deposits beneath the NTSF and STSF (Figure 4.3).

4.3.1.2 Tertiary basalt

The Tertiary basalt originated from numerous extrusive episodes from Mount Canobolas and surrounding volcanic vents, covering an area of about 530 km^2. The nature of the basalt varies from relatively massive to vesicular (scoriaceous). Ash or clay layers may be present between successive basalt layers, which reflect periods of dormancy between flow events. The Tertiary basalt thickness is dependent on the topography of the underlying land surface, with the basalt being thickest along paleochannels. Pogson and Watkins (1998) indicate that the thickness of the Tertiary basalt varies from a few metres to over 150 m. In the Cadia area, the Tertiary basalt cover is predominantly to the north/northeast of the Cadia mine, but also outcrops along elevated ridgelines adjacent to both the NTSF and the STSF (Figure 4.3).

4.3.1.3 Silurian sediments

The Silurian sediments proximal to CVO are low energy shallow to deep water sediments that were deposited in the early Silurian period (430 to 400 million years ago). In the Cadia mining lease, the Silurian aged Waugoola Group is present, which is predominantly comprised of siltstones and sandstones, with minor conglomerate and calcirudite (limestone) layers at the base (Figure 4.3). The unit represents fluctuating transgressive/regressive marine depositional conditions. The Waugoola Group unconformably overlies the deeper Ordovician rocks. The southern and western extent of the Silurian sediments is marked by a faulted contact with Ordovician volcanics and has been well defined by exploration drilling. Exploration drilling above the Cadia East orebody has typically intersected between 100 m and 300 m of Silurian sediments, with an average thickness of approximately 100 m.

Further to the north and east, the Silurian sediments are overlain by the Tertiary basalt. The extent of the formation in this area is not well known as limited exploration drilling has been undertaken in this area. A single exploration drill hole (NC599) intersected about 1,000 m of Silurian sediments, indicating a basin of substantial thickness northeast of the Cadia East Mine. To the east of the mining lease, the Cobblers Creek Limestone of the Waugoola Group subcrops at Flyers Creek.

4.3.1.4 Late Ordovician intrusives

The Cadia Intrusive Complex intruded the Weemalla Formation and the Forest Reefs Volcanics during the late Ordovician. The intrusions range in composition from monzodiorite, diorite, and minor gabbro, to quartz monzonite (Washburn, 2008).

4.3.1.5 Ordovician volcaniclastics and other sedimentary units

The Forest Reef Volcanics conformably overly the Weemalla Formation. These Ordovician rocks are generally exposed at surface around Cadia, except where there are overlying Silurian sediments and/or Tertiary basalt. The Forest Reefs Volcanics are prevalent in the area. The Forest Reef Volcanics are dominated by volcaniclastic lithologies, which comprise lithic conglomerates, breccias, sandstones, and lesser siliceous siltstone. Exploration drilling works have investigated the Forest Reefs Volcanics to a vertical depth of approximately 1,800 m, although the total thickness of the sequence is not known.

The Weemalla Formation comprises turbidite sediments that consist of fine grained and thinly laminated, carbonaceous to volcanic siltstones, with minor arenaceous volcanic beds, including pillow basalts. The Weemalla Formation extends from the western side of the South Waste Rock Dump to the east across Cadiangullong Creek and south of Ridgeway Mine.

4.3.2 Geological structure

Within the Lachlan Fold Belt, the dominant regional structures are a series of roughly north striking reverse faults and related splays. These reverse faults are moderately to steeply dipping to the west, curviplanar, and commonly have a strike slip component. These faults were caused by several tectonic events that occurred between the Ordovician and the Carboniferous Periods, with deformation generally driven by east-west crustal shortening (Washburn, 2008).

Major regional faults include the north striking Werribee Fault (known as the Cadiangullong Fault in the Cadia area) and the Warrengong Fault, which is located approximately 1 km east of the Cadia East Mine. The north to north-northeast trending Cadiangullong Fault is inferred to underly the western margin of the STSF and slightly to the west of the NTSF, within the Forest Reef volcanoclastic rocks. The Cadiangullong Fault extends north between the SWRD and Cadiangullong Creek within the Weemalla Formation, before skirting the western side of the Cadia Hill Pit. The fault has a westerly dipping thrust with a strike-slip component and truncates several north-northwest trending faults. The structure has a damage zone noted up to 200 m to 400 m wide, with a vertical offset of about 300 m (KCB, 2019).

Mapping of faults to the north of the Cadia East workings shows a series of carbonate faults which appear to be of late Devonian age and are related to the Gibb Fault. The faults are dipping to the southwest and intersect the Cadia East workings.

4.4 Hydrogeology

4.4.1 Conceptual groundwater model

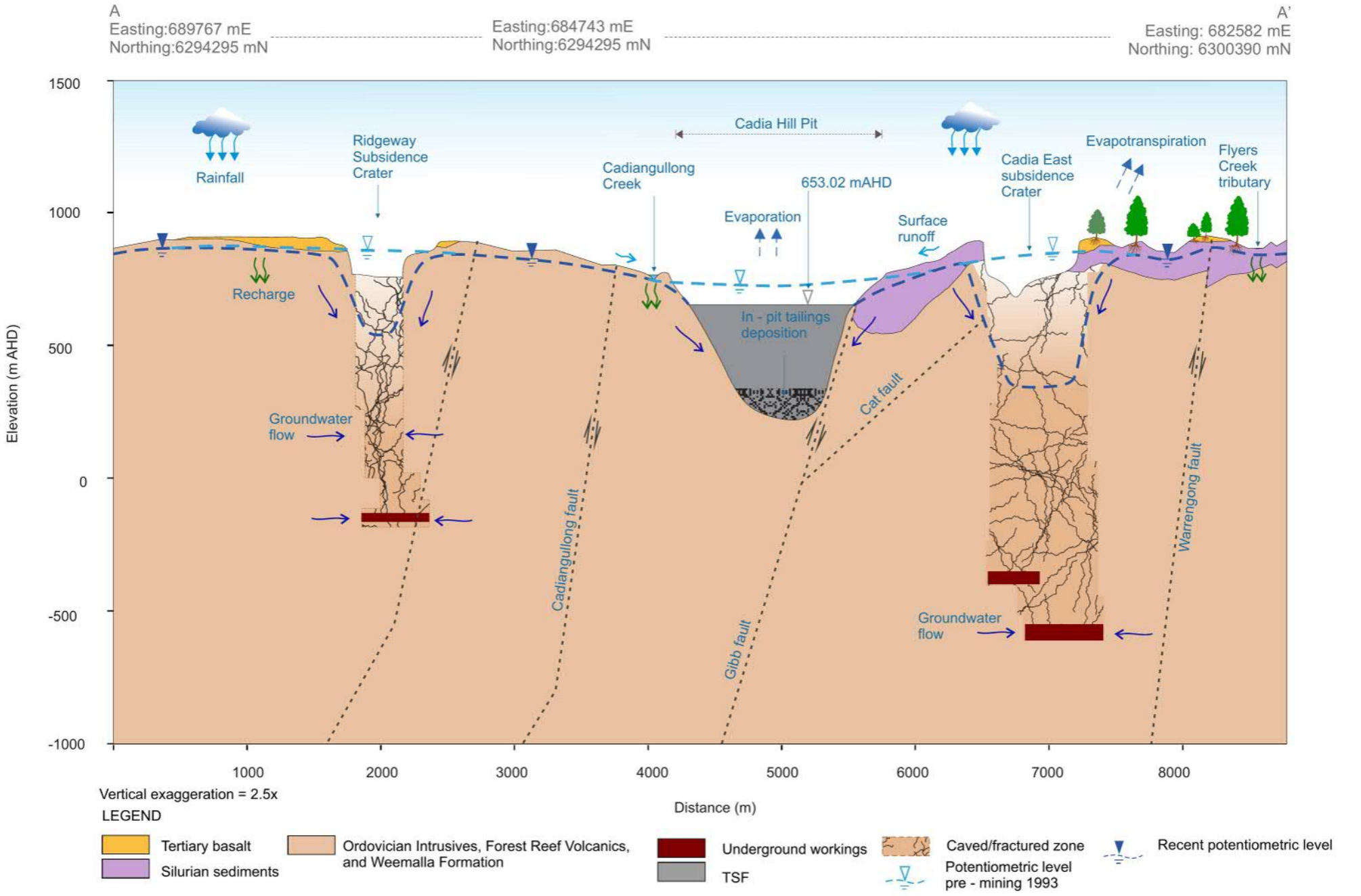
The geological units described previously can be grouped into the following hydrostratigraphic units based on their ability to store and transmit groundwater:

- **Regolith** - locally considered to represent a low permeability unit where saturated on account of silt and clay dominant lithologies; alluvial features are generally limited to major drainage lines away from the Cadia area;
- **Tertiary basalt flows** - variable permeability unit that may form fractured aquifer systems;
- **Silurian sediments** - generally fine grained and forms low permeability aquitards, except in localised zones of fracturing or karstic conditions where permeability is enhanced; and
- **Ordovician rocks** - rock matrix has inherently low permeability and forms competent aquitards, except in zones of fracturing where permeability is enhanced.

The main aquifers in the Cadia region are within fractured systems of the Tertiary basalt and structural zones in the underlying Silurian and Ordovician rocks. The extent of the fractured aquifer system is dependent on the connectivity of fracture networks, as well as the occurrence of chemical precipitates or clay infill restricting groundwater flow. The transmission of groundwater within these fractured systems may be enhanced in the weathered zone and restricted at depth, due to a combination of rock mass loading (which reduces fracture apertures) and an absence of weathering. Several pumping test investigations have been undertaken within fractured Silurian and Ordovician units, with findings indicating that fractured networks are only relatively localised features and not laterally extensive.

Perched groundwater systems may form at the interface between weathered and fractured units (including Silurian/Ordovician rocks and Tertiary basalt), which overly fresh massive rock. These systems will drain downslope and emanate as surface seepage typically within creek lines or topographic breaks of slope.

The hydrogeological conceptualisation is supported by hydrogeological cross section A – A’ (Figure 4.4) and cross-sections provided in Section 5. Cross section A – A’ extends from west of the Ridgeway Mine to the southeast/east through Cadia Hill Pit, Cadia East Mine, and to Flyers Creek. Cross section alignments are shown on Figure 4.3.



Cadia conceptual cross section (A – A')

Figure - 4.4

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

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4.4.2 Hydrostratigraphic units description

4.4.2.1 Regolith

The regolith cover within Cadia is generally thin and is predominately comprised of weathered residual soils and colluvium, where silt and clay lithologies are dominant. This cover sequence is generally above the water table, although the regolith is saturated in some areas. Due to the fine grain size of the regolith, it is likely to represent a low permeability feature.

Geological mapping indicates that the presence of Quaternary alluvium within Cadia is limited (Figure 4.3). Where Quaternary alluvium is present in the region, it is generally present above the water table on account of its limited thickness (typically less than 5 m along creeks). Alluvium may be temporarily saturated in places, especially during wetter periods. The nearest alluvial system of significance is associated with the Belubula River, which is located to the south of Cadia.

4.4.2.2 Tertiary basalt

The Tertiary basalt hosts the Orange Basalt fractured rock aquifer. The nature of the basalt varies spatially from relatively massive and low yielding, to vesicular (scoriaceous) and highly transmissive. The presence of fracturing that is associated with magma cooling is highly variable. Contacts between lava flows may form preferential groundwater flow paths, due to weathering and the presence of porous paleo-sediments. The basalt aquifers are generally unconfined at shallow depths, although may be semi-confined at deeper depths because of poor vertical connectivity between layers of low permeability (e.g. massive basalt, clay, or ash). Vertical connectivity with underlying Silurian/Ordovician units is generally limited due to the low permeability of these units (see discussion below). As such, the effect of mining induced depressurisation in the lower units is dampened in the overlying basalt, particularly when accounting for the higher rate of recharge in the basalt relative to the Silurian/Ordovician units. However, vertical connectivity is likely enhanced where the Tertiary basalt overlies fractured or weathered Silurian/Ordovician units, due to locally enhanced permeability.

4.4.2.3 Silurian sediments

The Silurian sediments are largely fine-grained rocks that were formed in a low energy environment. The rock mass is inherently of low permeability and of very low primary porosity, which generally forms an effective aquitard. Groundwater flow within the Silurian sediments is primarily due to secondary porosity induced by fracturing and weathering.

In zones of fracturing and within karstic zones of the basal limestone unit, the permeability and effective porosity of the Silurian sediments can be enhanced locally. Karstic conditions may be associated with geological structures such as faults, although these features are not pervasive throughout the limestone. In areas of massive limestone, the permeability is generally low. Where karstic conditions have been intercepted during mine development, high initial inflows have been recorded, but typically wane afterwards indicating limited storage. Three multi-day pumping test investigations have been undertaken in this unit where the permeability is enhanced due to fracturing (Woodward-Clyde, 1995; AGE 2009). After continuous abstraction, all test results show the influence of multiple boundary conditions, indicating that the fractured network is only a relatively localised feature and is not laterally extensive.

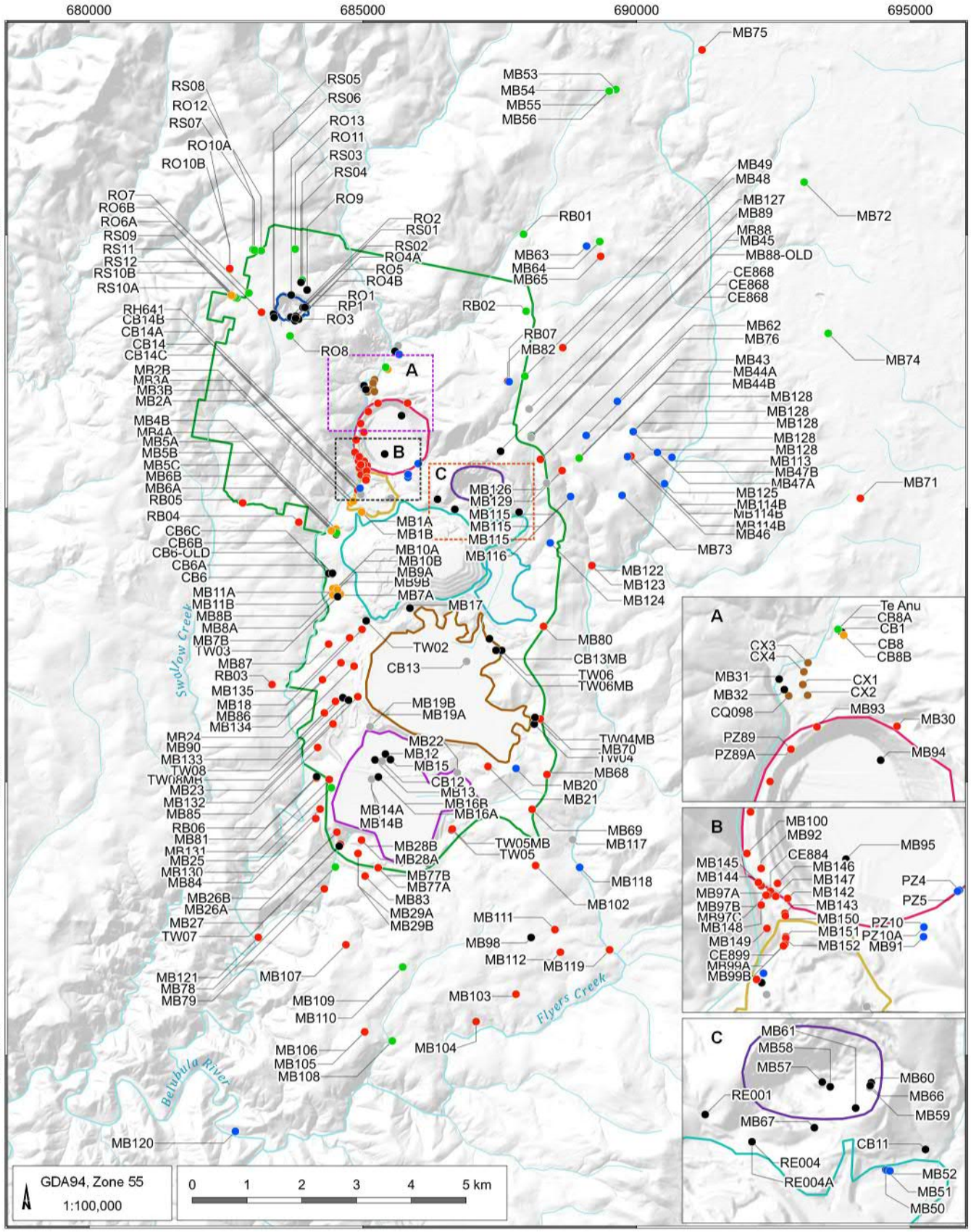
4.4.2.4 Ordovician units

Like the Silurian sediments, the Ordovician rock mass is inherently of low permeability and of very low primary porosity. In general, the unit therefore forms a competent aquitard. Groundwater flow is primarily due to secondary porosity that is induced by fracturing and weathering. In zones of fracturing the permeability and effective porosity is enhanced. Eight multi-day pumping test investigations have been undertaken in this unit where the permeability is enhanced due to fracturing (Woodward-Clyde, 1995; Kalf & Associates, 2000; AGE, 2020; AGE 2023c). After continuous abstraction, all test results show the influence of multiple boundary conditions, indicating that the fractured network is only a relatively localised feature and is not laterally extensive.

4.4.3 Groundwater monitoring network

The Cadia monitoring bore network has continuously expanded over time. Currently there are 182 active groundwater monitoring bores and vibrating wire piezometers (VWPs) (Figure 4.5), with 69 sites that are now decommissioned, abandoned, or placed into care and maintenance for a variety of reasons. Monitoring bores that do not explicitly require monitoring under the WMP (Section 2.2) are typically related to other Cadia groundwater investigations, although this additional monitoring data may also be considered to support or further investigate findings from the WMP monitoring network. Monitoring sites are further categorised based on the geology that a bore's screened interval intersects, or the geology that the VWP sensor is installed into (Figure 4.5). Simplified geological groupings include backfill, regolith, Tertiary basalt, Silurian (sediments), and Ordovician (extrusive/intrusive volcanics, volcaniclastics, and sediments). Note that the groupings presented in this report differ from internal Cadia records and are based on the combined recommendations of previous AGE and Umwelt investigations. There is still uncertainty around the appropriate geological grouping for some monitoring bores, particularly those that are older with missing installation records. Appendix A highlights where there are discrepancies in classification between internal records and AGE/Umwelt revisions.

The active monitoring network in its entirety is larger than the WMP defined monitoring network. These additional monitoring sites are often associated with specific investigations, but observations can be collected or referenced if required to support the WMP monitoring program.



LEGEND

- Drainage
- Mining lease
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

Cadia monitoring network

- Ordovician
- Silurian
- Regolith
- Tertiary basalt
- Backfill
- Inactive
- Unknown

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Cadia groundwater monitoring network

AGE

DATE 08/10/2024

FIGURE No: **4.5**

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4.4.4 Groundwater levels and flow

The pre-mining characteristics of the groundwater system in the Cadia Valley were described in the Cadia Hill Pit environmental impact statement (Newcrest, 1995) as follows:

- the water table generally mimics the topography of the valley;
- groundwater flows are generally toward the southwest;
- a significantly elevated groundwater table (> 915 mAHD) is present under the Cadia Hill and Canobolas State Forest areas;
- steep hydraulic gradients exist in the north and east, becoming gentler towards the south and west (reflecting topographic contrast); and
- the groundwater flow patterns are strongly controlled by the major catchments in the Cadia Valley area, particularly Cadiangullong Creek and to a lesser extent Rodds Creek/Cadia Creek.

Groundwater level data collected in June 2024 was used to estimate water table elevation contours, with consideration of major watercourse elevations, the PTSF level, and estimates of the floor levels of the Ridgeway/Cadia East mines (Figure 4.6)[2]. At a regional scale, the piezometric surface has been relatively stable over time, with the exception of the steep zone of depressurisation that has developed around the Cadia Hill Pit and the Ridgeway/Cadia East mines. There is also some localised groundwater level increases that are observed adjacent to parts of the NTSF and STSF. A comparison of interpreted water table elevations against the elevations of watercourses adjacent to Cadia indicates that most watercourses are likely to be groundwater gaining, with the exception of sections of Cadiangullong Creek that are adjacent to the Cadia Hill Pit.

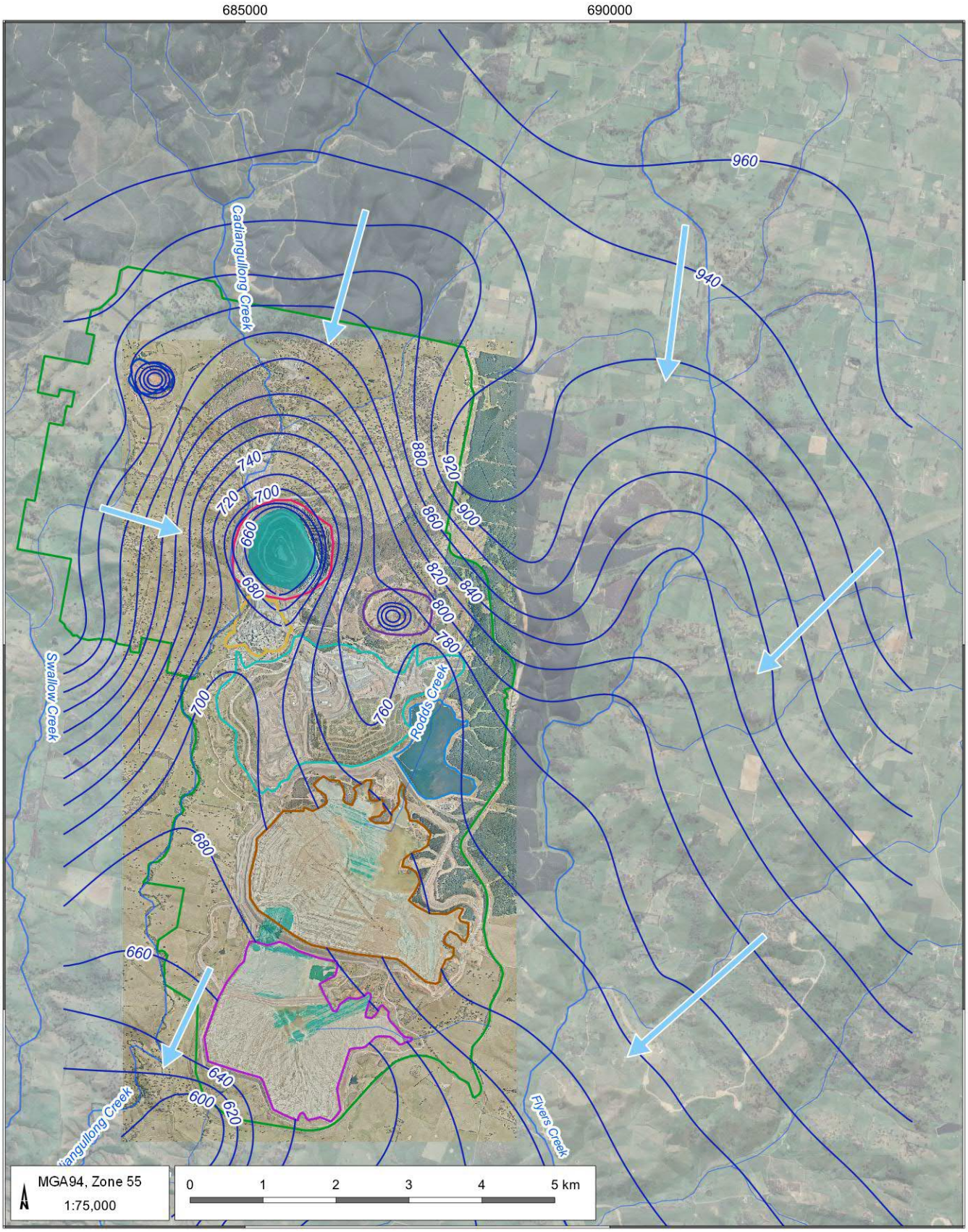
Relative to potential sources of groundwater contaminants such as the TSFs and WRDs, hydraulically down gradient geological units largely consist of Ordovician aged volcaniclastics and sediments (Section 4.3.1.5). To convey the potential rates of offsite groundwater migration, the linear velocity was approximated under the assumption of Darcian conditions, as shown below.

$$v = \frac{Ki}{n_e}$$

$where$:
$v = linear\ velocity$;
$K = hydraulic\ conductivity$ [0.001 to 0.1 m/day adopted after AGE (2019)];
$i = hydraulic\ gradient$ [0.026 estimated from Figure 4.6]; and
$n_e = effective\ porosity$ [3% after Attwell (1976)].

Linear velocity was approximated to range between 0.3 m per year to 3.1 m per year, highlighting the slow rates of migration through the Ordovician rocks mass. Rates of migration would be greater where fracture networks are present; however, these fracture networks have been demonstrated through pumping tests to be relatively localised features. Groundwater migration through the Tertiary basalt may again be greater, but this unit is not a persistent feature in the hydraulically down gradient area.

[2] Regional approximation of water table elevations only. Interpretation based on observations from various groundwater systems, some of which are at depth, where observations may slightly differ from the true water table elevation.



LEGEND

- Drainage
- Mining lease

Infrastructure

- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF

- Approximate groundwater flow direction
- Groundwater level contours (mAHD)

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Interpreted June 2024 water table contours

AGE

DATE 30/09/2024

FIGURE No. **4.6**

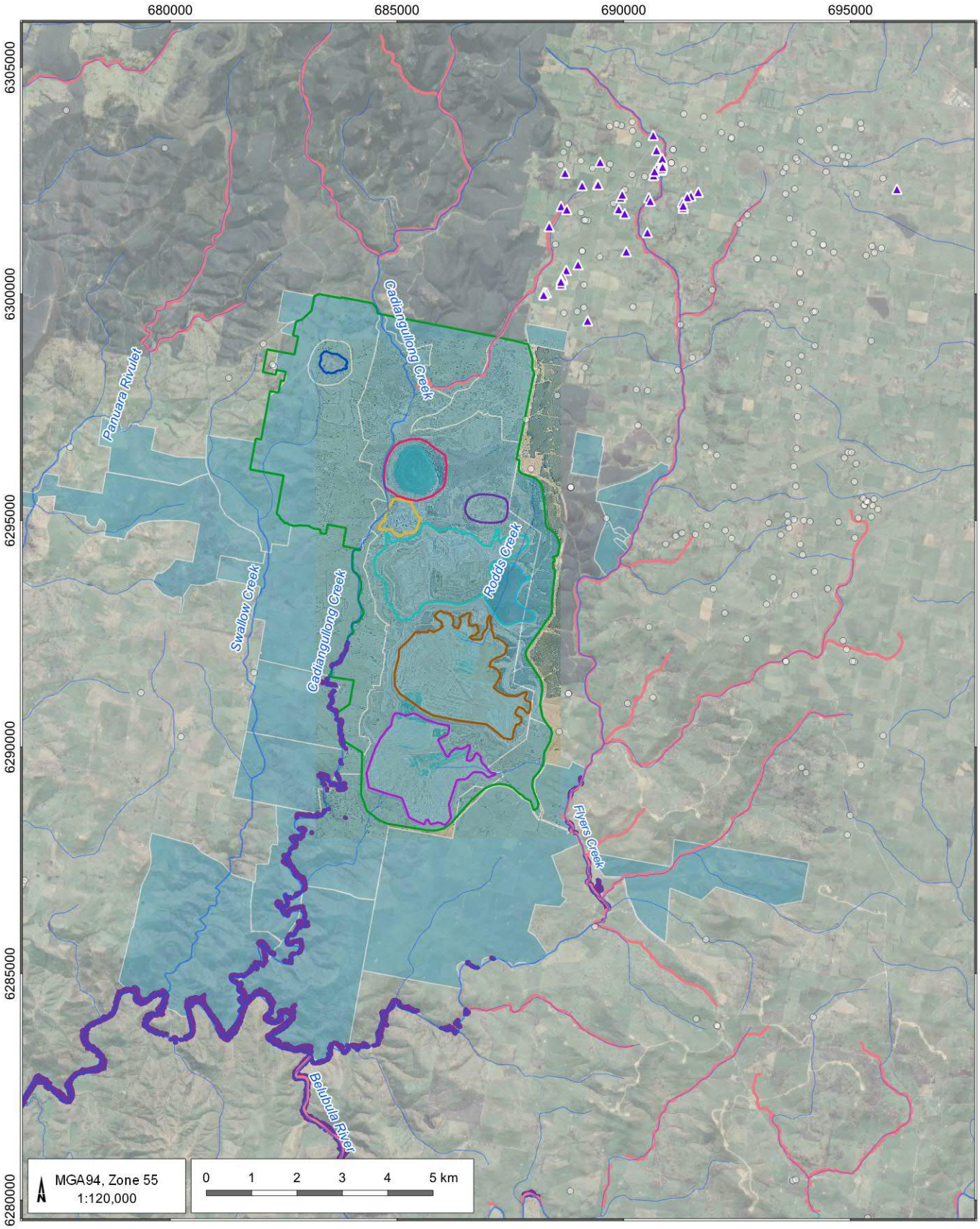
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4.4.5 Groundwater dependent assets

Surrounding groundwater dependant assets include private water supply bores, as well as springs and watercourses that rely on groundwater baseflow and can form groundwater dependant ecosystems (Figure 4.7). There are over 250 private bores within 10 km of Cadia, with the majority of the bores present to the east/northeast and screened within the Tertiary basalt (Figure 4.7).

Springs are present in the headwaters of Cadia Creek and Flyers Creek (Figure 4.7), and typically emanate as discharge from the Tertiary basalt, Tertiary paleochannel sediments, or fractured Silurian sediments. These springs may provide a source of water for surrounding landholders, with spring water diverted into storage dams. Baseflow in Flyers Creek, which is largely perennial, is partially maintained by an area of springs approximately 1.2 km downstream of Long Swamp Road. Adjacent to the Cadia owned Woodville property, discharge from Silurian sediments is conceptualised to occur and is likely influenced by local fracture networks.

High potential aquatic groundwater dependent ecosystems (GDEs), as defined by the BoM (2019) GDE Atlas, are mapped in the upper reaches of Cadiangullong Creek and the Panuara Rivulet, in Flyers Creek and its tributaries to the east of CVO, and in some tributaries of the Belubula River to the south of mining operations (Figure 4.7). The GDE Atlas also identifies a high potential for terrestrial GDEs that comprise River Oak and River Red Gum trees in small areas adjacent to Flyers Creek (to the east and southeast of the STSF), adjacent to Cadiangullong Creek (to the west and southwest of the NTSF/STSF), and along the Belubula River (Figure 4.7). These high potential terrestrial GDE's are consistent with the High Ecological Value Aquatic Ecosystems (HEVAE) framework (Dabovic et al., 2019), which in turn constitute high priority GDEs under the Water Sharing Plan (WSP) for the NSW Murray Darling Basin Fractured Rock Groundwater Sources.



LEGEND

- Private landholder bore
- Springs
- Drainage
- Mining Lease
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF
- CVO owned property

Aquatic GDEs - national assessment
- High potential GDE

Terrestrial GDE national assessment
- High potential GDE

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Groundwater dependent assets

AGE

DATE 29/08/2024

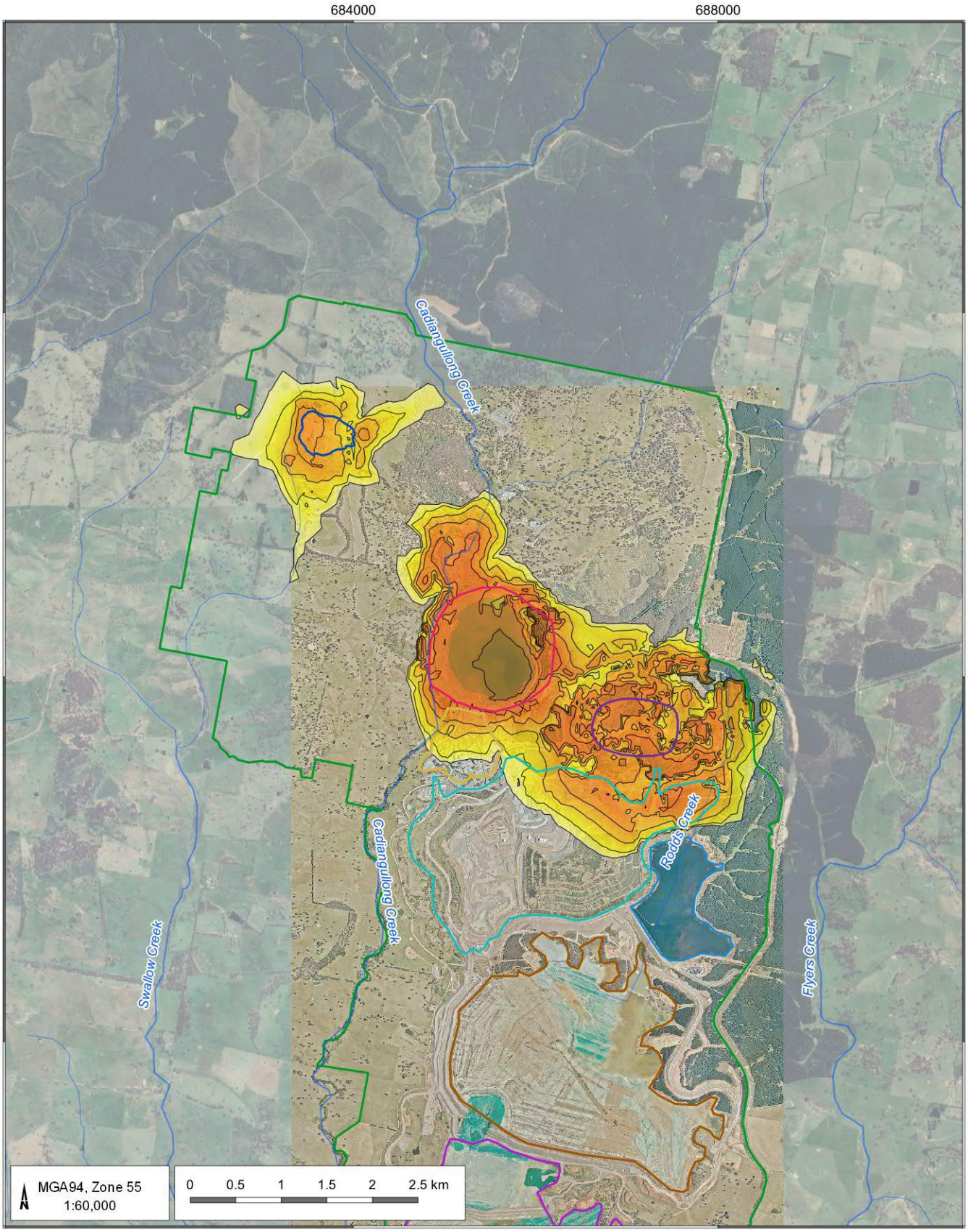
FIGURE No. **4.7**

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4.4.6 Numerical groundwater modelling

A regional numerical groundwater flow model has been developed to predict impacts from mining and tailings storage at Cadia. The initial model in 2009 was developed to assess the impact of the Cadia East Mine on the groundwater regime. This model has been modified, refined, and improved to replicate site conditions and prediction capacity through subsequent updates in 2013, 2016, and 2021. To support the Modification 15 application, the model was again updated in 2023 (Advisian, 2023) and verified against additional monitoring data in 2024 (Worley, 2024). However, given that Modification 15 is still going through the approval process and because neither Advisian (2023) or Worley (2024) explicitly present predictions for 'approved mining', the prior AGE (2021) modelling is still used to evaluate impacts in this report. Notwithstanding, Advisian (2023) do note that the updated modelling has very similar predictions to the AGE (2021) modelling.

Current predictions of maximum water table drawdown though to the end of approved mining are provided in Figure 4.8. Predicted drawdown of the water table is constrained due to the low permeability of the rock mass that is intersected by mining activities, with average calibrated values of horizontal hydraulic conductivity of 0.003 m/day, 0.005 m/day, and 0.002 m/day for the Tertiary basalt, Silurian rock mass, and Ordovician rock mass, respectively (AGE, 2021). Note that elsewhere in this report, maximum depressurisation extents are presented for each modelled geological unit (Tertiary basalt, Silurian sediments, and Ordovician aged rocks) to better present impacts that may be apparent in confined systems at depth as mining proceeds.



LEGEND

- Contour line
- Major drainage
- Minor drainage
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Ridgeway
- Rodds Creek Dam
- South Waste Rock Dump
- STSF
- Mining Lease

Drawdown (m)

- 0
- 1
- 2
- 5
- 10
- 20
- 50
- 100
- 200
- 500

Cadia AGMR 2021/2022 (CAD5005.001)

Maximum water table drawdown to end of approved mining as modelled in AGE (2021)

AGE

DATE 30/09/2024

FIGURE No. **4.8**

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4.5 Consideration of potential TSF seepage indicators

Previous investigations have identified that the water quality of the TSF decant water can often have similar characteristics to native groundwater (AGE, 2023b). To support this review, potential seepage indicators were evaluated by statistically comparing the water quality of the various TSF decant water to that of either upgradient or background groundwater. Summary statistics for all analytes are presented as box plots (visual representation of data median, quartiles, and range) in Appendix B for:

- the PTSF decant water (CAWS65) and upgradient monitoring bores that are considered to be unimpacted by mining activities (MB91, MB92, MB93, MB97A, MB97B, MB97C); and
- the NTSF/STSF decant water (CAWS42/CAWS43) and an upgradient/unimpacted monitoring bore (MB70), as well as grouped pre-mining data from 1994 to 1995 in the area of the NTSF/STSF[3]

The most notable differences of TSF decant water relative to the assessed groundwater results are elevated dissolved molybdenum concentrations and salinity (Figure 4.9), although the salinity of groundwater is highly variable. Other notable differences in major ion concentrations include elevated potassium, sodium, and sulfate, with lower concentrations of total alkalinity (Appendix B). Dissolved aluminium, antimony, cadmium, and selenium concentrations are also relatively elevated in the decant water, although concentrations are still low (Appendix B).

[3] Data sourced from Woodward-Clyde (1995), largely for sterilisation boreholes. The method of sampling is unknown and the total depth of the sterilisation boreholes is usually quite deep (up to 200 mbgl); however, the standing water level of these holes is generally near surface. Data still considered to be suitable for consideration , although uncertainty needs to be considered.

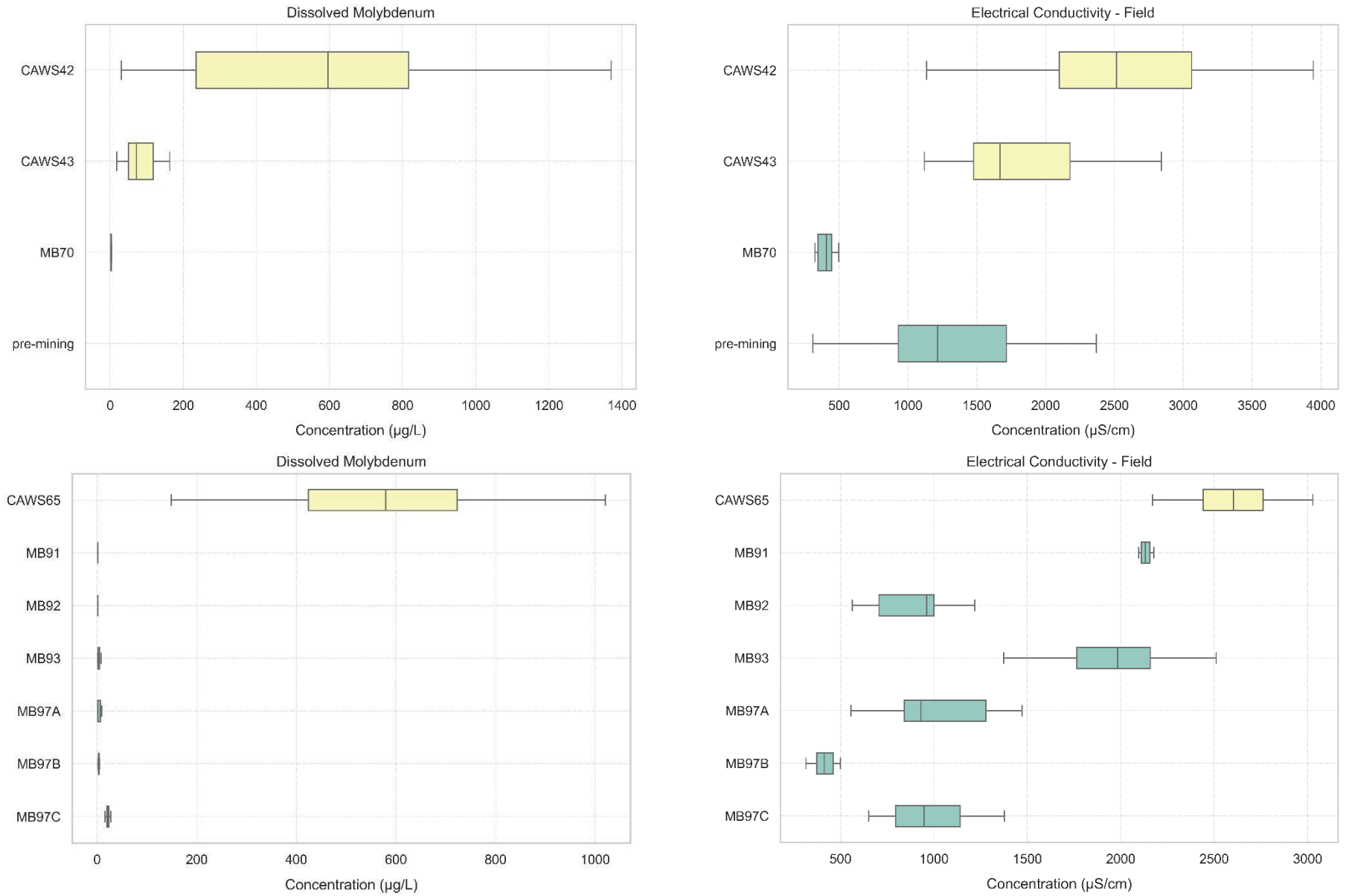


Figure 4.9 Notable differences of TSF decant water quality versus upgradient/background groundwater quality

5 Review of operational area monitoring data

The review of the 2023/2024 groundwater monitoring data is divided into the following operational areas:

- Cadia Hill Pit (Section 5.3);
- Ridgeway Mine (Section 5.4);
- Cadia East Mine (Section 5.5);
- NTSF and STSF (Section 5.6);
- Southern Waste Rock Dump (SWRD) (Section 5.7); and
- other areas, including the ore processing area, regional monitoring sites, and landholder monitoring sites (Section 5.8).

For each of these operational areas, a conceptualisation of the local hydrogeology is first presented, which was informed by monitoring data and groundwater investigations completed to date, maps of the monitoring network, surrounding groundwater dependent assets, and modelled drawdown predictions. These modelled predictions are the maximum values of drawdown at any stage of mining and at any depth and were extracted from the groundwater model completed in 2021.

This conceptualisation and presentation of model predictions is compared with the monitoring data for the 2023/2024 water year, which is used to assess any potential impacts that may be associated with each of these operational areas.

5.1 Data assessment notes

Groundwater level and groundwater quality data is reviewed in the following sections through several means. These include:

- comparison to WMP defined assessment criteria;
- comparison to relevant guideline values; and
- qualitative and quantitative review of temporal trends.

Groundwater quality guideline values for applicable analytes are considered in addition to the WMP defined assessment criteria to provide another level assessment that is appropriate to the potential Environmental Value (EV) of the groundwater. Given the surrounding land use (Section 3.2) and nearby groundwater dependent assets (Section 4.4.5), groundwater quality results are compared against stock watering (ANZECC & ARMCANZ, 2000)[4] and aquatic ecosystem (ANZG, 2018; 95% level of protection) guideline values. Many of the WMP defined assessment criteria are already equivalent to these guideline values. An exceedance of these guideline values is not an explicit measure of impacted groundwater, but rather an indicator to undertake more detailed analysis.

Composite plots of historical groundwater level and groundwater quality data for the entire monitoring network are provided in Appendix C. These plots were prepared to inform the review that is presented in this report and were also created for the benefit of readers. Plots were designed to portray a large amount of relevant data in a single place and feature:

- key monitoring bore information (ID, screened geology, screened interval depth);
- a map that highlights the location of the monitoring bores in relation to various Cadia operations/ surrounding watercourses and the surrounding monitoring bore network;
- a groundwater level hydrograph, which includes the CRD for reference (Section 4.1); and
- groundwater quality time series plots for all WMP defined analytes and additional analytes of interest (Section 4.5)

[4] Guideline values compared against the dissolved constituent of metal/metalloids.

For the benefit of the reader, an annotated example plot is provided below (Figure 5.1).

Tabulated groundwater quality results for all data from the WMP defined monitoring network that were collected over the 2023/2024 water year are provided in Appendix D.

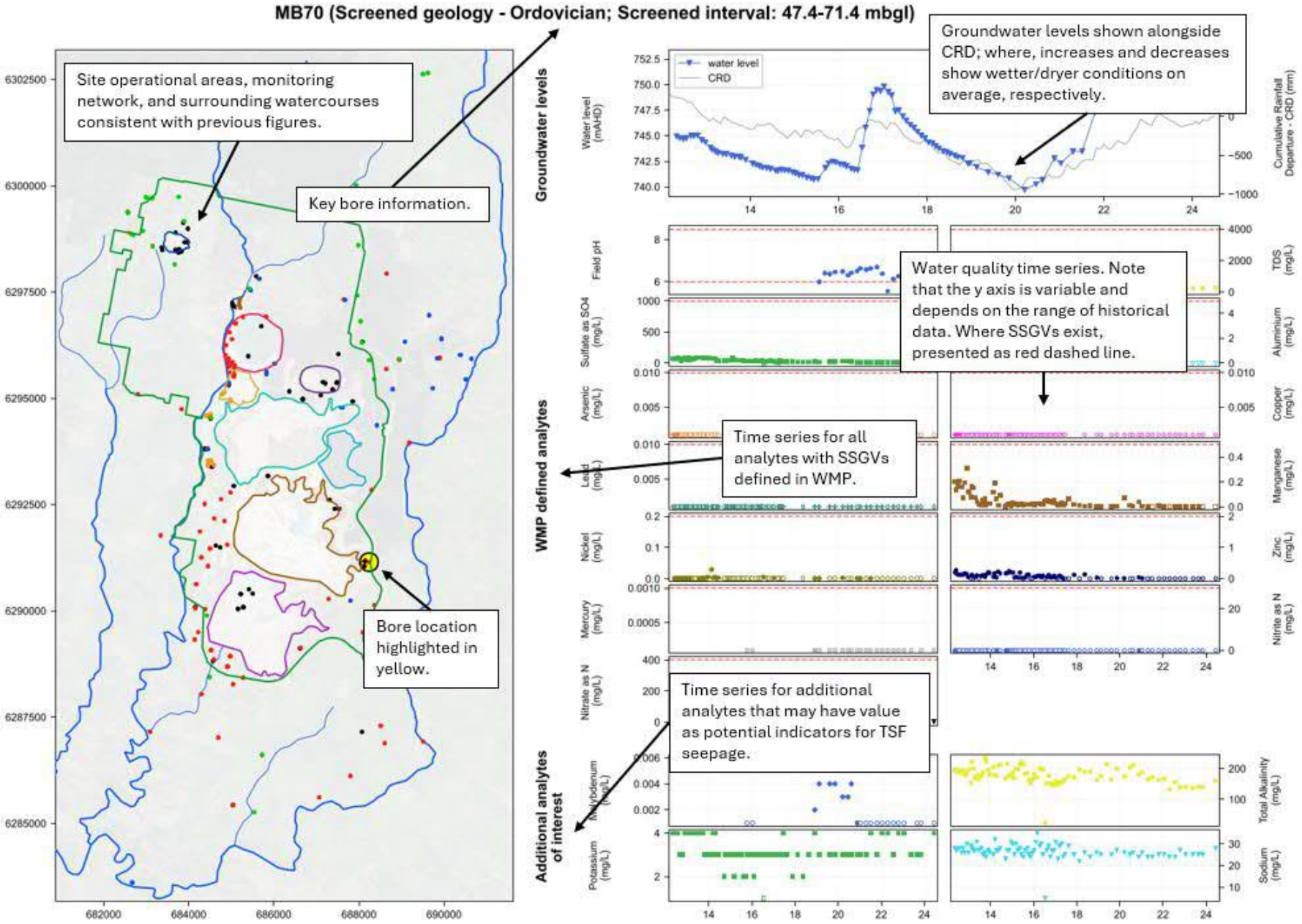


Figure 5.1 Annotated example of appended composite groundwater level/groundwater quality plots

5.2 Summary of trigger/guideline exceedances

5.2.1 WMP defined assessment criteria

The monitoring data for the 2023/2024 water year was assessed against the groundwater level and groundwater quality assessment criteria stipulated within the WMP (Section 2.2.2). A summary of groundwater level and groundwater quality exceedances are presented below (Table 5.1) and are also highlighted in the composite plots provided in Appendix C.

Five groundwater level exceedances and 43 groundwater quality exceedances were recorded over the 2023/2024 water year. Further consideration of these exceedances, including potential impacts to groundwater dependent assets, is discussed with reference to specific operational areas in Section 5.3 through to Section 5.8. As per the TARP defined in the WMP (Section 2.2.2), Cadia personnel carried out Level 1 investigations internally, with the status of 29 groundwater quality exceedances 'open' at the time of this review. All exceedances over the 2023/2024 water year were considered as part of this review.

Table 5.1 2023/2024 water year exceedances of groundwater level and groundwater quality assessment criteria

Bore ID	Nearest operational area	Exceedance type	Months an exceedance occurred
MB92	Cadia Hill Pit	Mercury	Mar-24
		Zinc	Jul-23, Aug-23, Sep-23, Oct-23, Jan-24
MB96	Cadia Hill Pit	Level [a]	post Oct-23
MB99A	Cadia Hill Pit	Manganese	Sep-23, Oct-23, Nov-23, Jan-24, Feb-24, Mar-24, Apr-24, May-24, Jun-24
		Zinc	Aug-23, Sep-23, Oct-23
		Sulfate	Dec-23
MB99B	Cadia Hill Pit	Manganese	Dec-23, Apr-24, May-24, Jun-24
		Zinc	Aug-23, Dec-23
MB43	Cadia East Mine	Level [b]	-
MB44B	Cadia East Mine	Level [b]	-
MB18	NTSF/STSF	Level [c]	-
MB20	NTSF/STSF	pH	Aug-23, Oct-23, Feb-24, May-24
MB24	NTSF/STSF	Level [c]	-
MB68	NTSF/STSF	Mercury	Jun-24
MB11A	SWRD	Manganese	Jul-23, Oct-23, Jan-24, May-24
		Sulfate	May-24
MB6A	SWRD	Sulfate	Oct-23, Apr-24
MB8A	SWRD	Manganese	Jan-24
		Sulfate	Jul-23, Oct-23, May-24
MB9A	SWRD	Sulfate	Jul-23, May-24

Notes: (a) outwards hydraulic gradient observed; however, overarching gradient still indicates pit is strongly behaving as a groundwater sink;

(b) long-term trend as evaluated through transfer function noise (TFN) modelling; and

(c) bores not monitored over 2023/2024 water year, but exceeded assessment criteria prior to this.

5.2.2 Reference guideline values

Sulfate and TDS concentrations exceeded stock watering guideline values at a number of locations over the 2023/2024 water year (Appendix D). Several monitoring bores exceed both stock watering guideline values and WMP defined assessment criteria (MB6A, MB8A, MB9A, MB11A, MB99A). Sulfate concentrations exceed stock watering guideline values within monitoring bores to the west of the SWRD and the ore processing area within monitoring bores screened within both the shallow regolith and underlying rock (MB1 to MB11 series). Based on the information presented in the surface water assessment, there is no evidence of groundwater altering the water quality of Cadiangullong Creek (Engeny, 2024).

Sporadic exceedances of stock watering guideline values are also present hydraulically down gradient of the NTSF/STSF (MB77B, MB86, MB90); however, these elevated values are not widespread within the down gradient monitoring network. Comparisons between the dissolved constituents of metals against stock watering guideline values also indicate several exceedances (Appendix D); although these are discussed below while comparing against aquatic ecosystem guideline values.

Dissolved metal concentrations exceeded aquatic ecosystem guideline values at a number of locations over the 2023/2024 water year (Appendix D). Several of these exceedances are consistent with exceedances of the WMP defined assessment criteria for mercury (MB68 and MB92) and zinc (MB99A and MB99B). On further review, exceedances are not ubiquitous in monitoring bores that are down gradient of potential contaminant sources, but generally only occur sporadically. Additionally, exceedances of aluminium, copper, and zinc are regionally prevalent and also occur in monitoring bores that are upgradient of site activities. Notable observations that stem from a review of these exceedances include the following.

- Monitoring bore MB20, which is located near the southeast corner of the NTSF, is atypically elevated in concentrations of aluminium, cadmium, cobalt, manganese, and nickel. The cause of these elevated metal concentrations, as well as the low pH and elevated TDS/sulfate concentrations, is not known, but similarly elevated concentrations are not observed in surrounding monitoring bores.
- Dissolved zinc concentrations in monitoring bores to the west and the southwest of the PTSF (MB92, MB97A, MB97B, MB99A, and MN99B) spiked to concentrations greater than ecosystem guideline values in July/August 2023, although concentrations have since been significantly decreasing.
- Mercury concentrations in two monitoring bores to the southwest of the STSF have exceeded ecosystem guideline values since the onset of monitoring in 2019 (MB26B) and consistently since August 2023 (MB27). Elevated concentrations of mercury are not present at monitoring sites hydraulically down gradient of the exceeding monitoring bores (MB78), or in other monitoring bores to the south of the STSF (MB26B, MB29B, MB77B, MB78, MB83). The source of mercury is not known, although it is noted that mercury is below the limit of detection in TSF decant water (Appendix B) and in tailings leach extraction results (MESH, 2009).
- Relative to ecosystem guideline values, elevated metals concentrations have been observed adjacent to the PTSF (As, Mo, Se), to the west of the SWRD (Al, Cd, Cr, Ni, Se), and to the west/southwest of the NTSF/STSF (Cr, Hg, Mo). However, these elevated metal concentrations are not ubiquitous in the monitoring network, nor does monitoring indicate that they are altering the Cadiangullong Creek water quality (Engeny, 2024).

5.3 Cadia Hill Pit

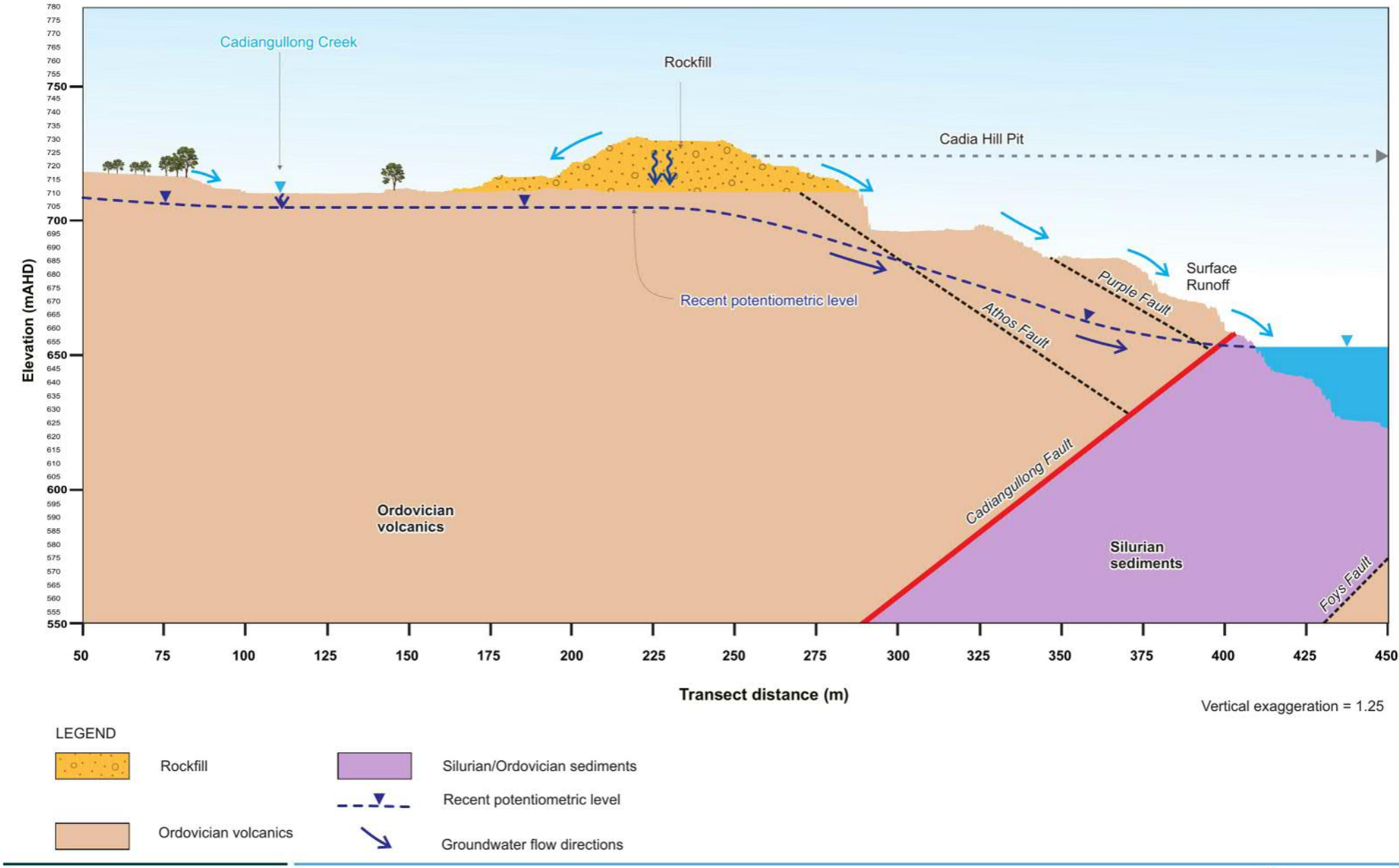
5.3.1 Overview and hydrogeological conceptualisation

The Cadia Hill Pit has two distinct operational periods, namely open cut mining between 1998 and 2012 and in pit tailings deposition since 2018. Recent bathymetry surveys (Spectrum, 2024) indicate that there is on average 37.6 m of free standing water above the tailings level, with the pit lake measured to be at an elevation of 653.02 mAHD in June 2024.

At present, the Cadia Hill Pit is conceptualised to behave as a groundwater sink, with mining having resulted in drawdown and depressurisation of the surrounding Ordovician and Silurian aged groundwater systems (Figure 5.2). Drawdown is not laterally extensive, primarily due to the low permeability of the Ordovician and Silurian bulk rock mass. The volume of groundwater intercepted is therefore conceptualised and modelled to be low. Tailings are also confined to the pit, with inwards hydraulic gradients preventing tailings impacted water from migrating away from the pit. If increases in the height of the emplaced tailings exceeds the rate at which the surrounding groundwater units are able to equilibrate, there is some potential for localised tailings/groundwater mixing. However, groundwater movement is still constrained by the overarching inwards hydraulic gradients.

The Cadia Hill Pit is predicted to remain a groundwater sink until tailings deposition approaches the approved pre-consolidation elevation of 713 mAHD. At this point, the tailings level will be slightly above the invert of Cadiangullong Creek to the southwest of the pit (Figure 5.3). Investigations are ongoing to assess these potential impacts and to evaluate the performance of potential mitigation measures. Following consolidation of the tailings, the long-term behaviour of the pit is predicted to revert back to that of a groundwater sink (Golder, 2018; HEC, 2019).

The monitoring bore network that surrounds the Cadia Hill Pit is largely screened within the Ordovician aged Intrusive Complex and the Forest Reef Volcanics, with an emphasis on monitoring to the west and southwest of the pit, where Cadiangullong Creek is in close proximity to the pit (Figure 5.4). Active monitoring bores are screened at depths ranging from near surface to 170 mbgl. As per the WMP, groundwater levels and quality at select monitoring bores (Figure 2.1) adjacent to the pit are monitored on either a monthly or quarterly basis. Monitoring bores MB95 and MB94 are no longer active and were inundated by tailings in May 2020 and February 2022, respectively.



Cadia Hill Pit conceptual cross section (B - B')

Figure - 5.2

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

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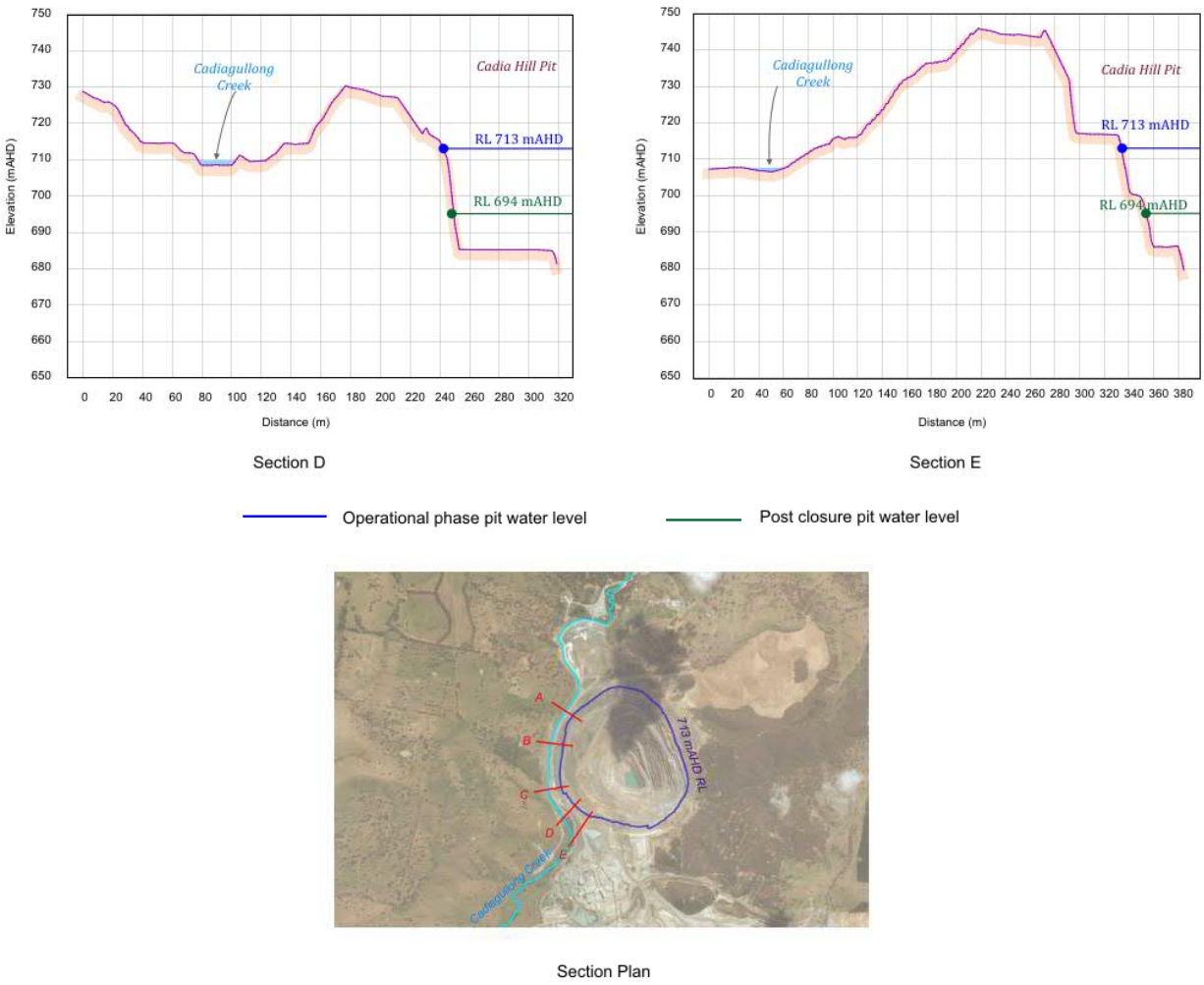
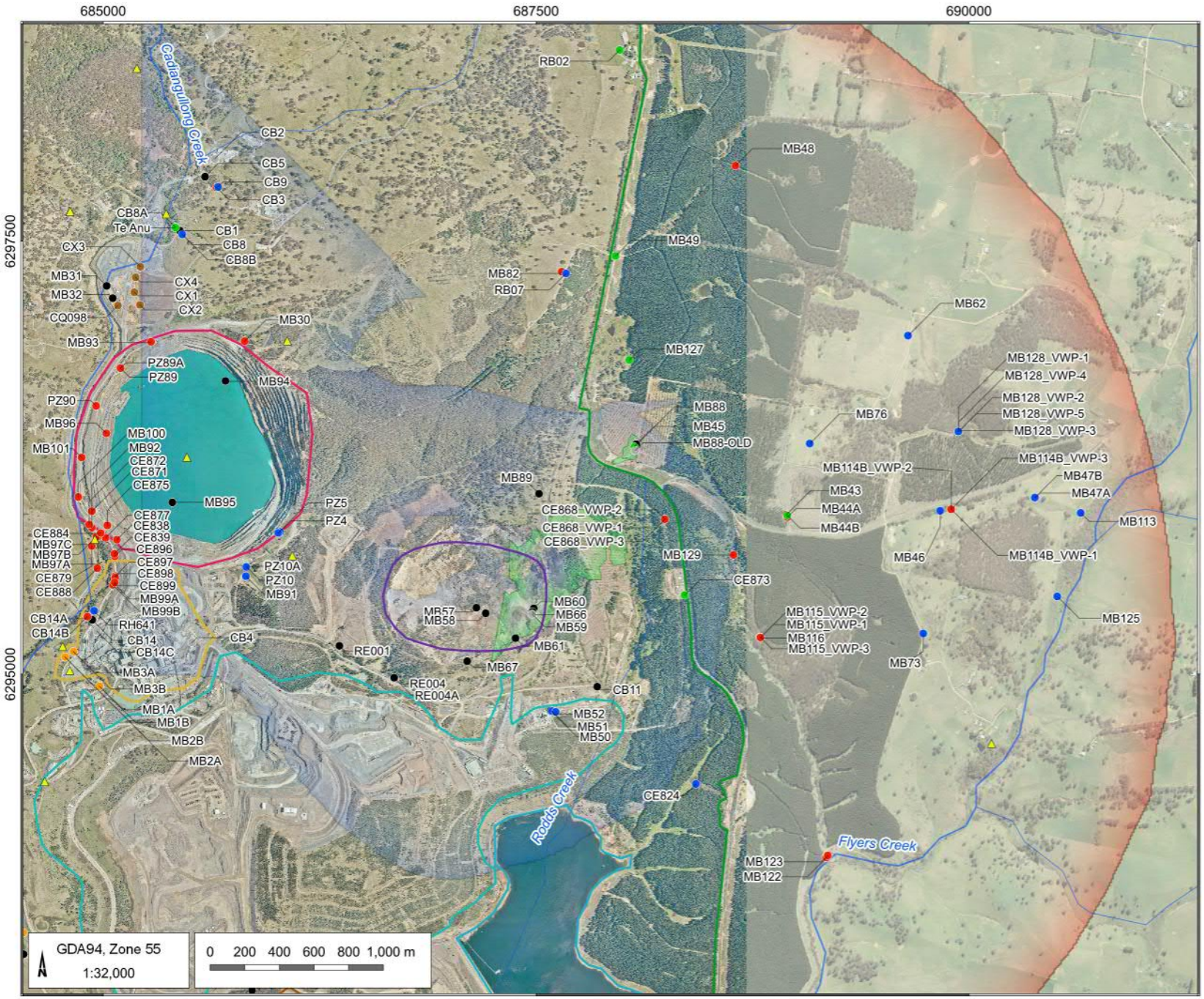


Figure 5.3 MOD13 maximum tailings emplacement height and Cadiangullong Creek invert (AGE, 2019)



LEGEND

- Surface water monitoring sites

Monitoring bore network

- Ordovician
- Silurian
- Regolith
- Tertiary basalt
- Backfill
- Inactive
- Unknown

- Drainage
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Rodds Creek Dam
- South Waste Rock Dump
- Mining lease
- Modelled maximum extent of basalt drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Silurian drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Ordovician drawdown/depressurisation that exceeds 3 m

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Cadia Hill Pit and Cadia East Mine – surrounding monitoring bores and maximum modelled drawdown

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5.3.2 Groundwater monitoring data

5.3.2.1 Groundwater levels

The WMP defines groundwater level triggers for select monitoring bores (Table 2.1) that are adjacent to the PTSF based on a change in the direction of the hydraulic gradient (i.e. groundwater flow away from the pit would be a trigger exceedance under the WMP). Over the 2023/2024 water year, a review of groundwater levels relative to the PTSF pit lake elevation (Table 5.2) indicates that the pit is still behaving as a groundwater sink. Generally, groundwater elevations in monitoring bores that are adjacent to Cadia Hill Pit are well above the current elevation of the PTSF pit lake, with more than 40 m of vertical separation at most monitoring sites (Table 5.2; Figure 5.5). This demonstrates that the Cadia Hill Pit is still strongly behaving as a groundwater sink, with inwards hydraulic gradients.

Observations from several monitoring bores demonstrate that tailings deposition in the PTSF is affecting some groundwater level in monitoring bores that are screened at depths greater than the PTSF pit lake elevation. This occurrence has been seen historically in monitoring bores within the open pit (MB95 and MB94) that are now decommissioned on account of the PTSF increasing to a level above their headworks (Figure 5.5). Groundwater levels in these monitoring bores were approximately equal to increasing pit lake levels (Figure 5.6a and Figure 5.6b, respectively). Over the 2023/2024 water year, a similar trend has been observed in monitoring bores MB96 and PZ90 (Figure 5.6c and Figure 5.6d respectively). While groundwater levels observed in monitoring bore MB96 over the 2023/2024 water year trigger the WMP defined water assessment criteria, the head difference relative to the PTSF is minimal (Table 5.2). It is also likely to be a localised and temporary trend that is associated with the rate of tailings emplacement exceeding the rate at which groundwater levels are able to equilibrate.

Not all monitoring bores that are screened at depths greater than the PTSF pit lake elevation have their groundwater levels affected by the PTSF pit lake elevation (PZ89, MB91, MB92, MB142, and MB143) (Figure 5.5). There are likely several controls on connectivity, including the presence and connectivity of fractured rock, as well as the lateral distance from the PTSF pit lake. Previous investigations (AGE, 2023c) have also indicated that the major local fault (the Cadiangullong Fault) may behave as a barrier to flow on account of the fault zone being comprised of clay gouge. As such, potential impacts to western monitoring bores would be more likely to be present once the PTSF water levels reach an elevation above the hanging wall of the Cadiangullong Fault (i.e. the western side of the fault in this instance) (Figure 5.5).

Groundwater levels in monitoring bore MB30 have remained stable across the 2023/2024 water year after experiencing an increase of more than 23 m between July 2021 and December 2021 (Appendix C). The PTSF is not considered to be an influencing factor, given that this monitoring bore was and still is screened above the PTSF pit lake elevation and groundwater levels are significantly greater than the PTSF pit lake elevation (Table 5.2). Uncertainty remains around the exact cause of the groundwater level increases; however, one plausible scenario is the surface seal being damaged and the subsequent ingress of rainfall. This is consistent with both the very high groundwater elevation (~ 4 mbgl) and the sharp drop in salinity observed (Appendix C).

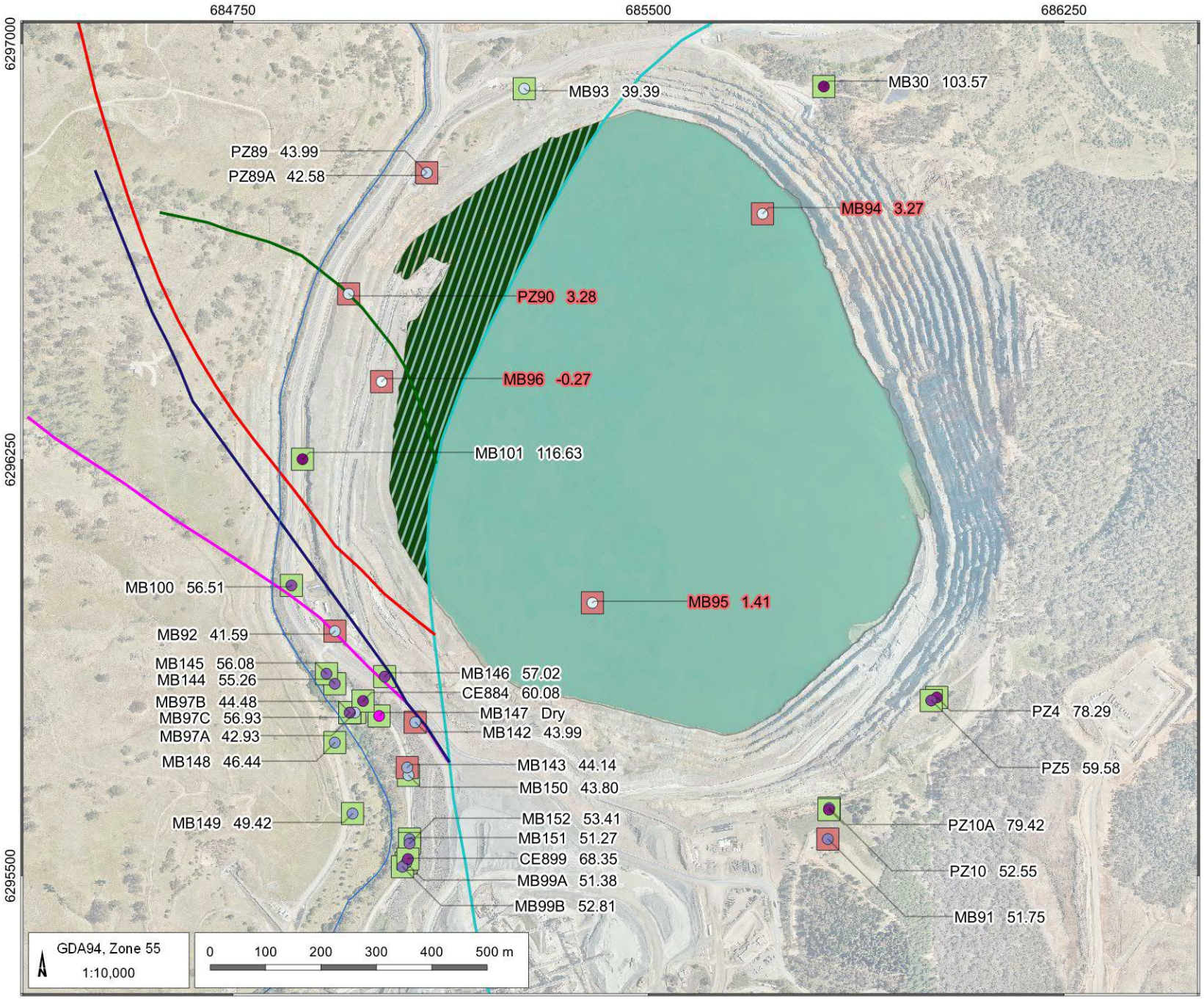
Historically, large groundwater level fluctuations are observed in some of the Cadia Hill Pit monitoring bores (e.g. PZ89, PZ89A, MB92, and MB93; Appendix C), which may indicate that these monitoring bores intersect fractured networks of limited storage.

Table 5.2 Hydraulic gradient assessment for monitoring bores adjacent to Cadia Hill Pit

Bore ID	Status	Screen interval (mbgl)	Screened geology [a]	Recent groundwater level (mAHD)	Nearest PTSF level (mAHD)	Difference between screen base and nearest PTSF level (m) [b]	Difference between groundwater level and nearest PTSF level (m) [c]
Bores screened below the June 2024 PTSF water level:							
MB95	Decommissioned	146-186	Ordovician; Cadia Intrusive Complex	477.31 (May-20)	475.9 (May-20)	-145.14	1.41
MB94 WMP	Decommissioned	114-140	Ordovician; Cadia Intrusive Complex	586.27 (Jan-22)	583 (Jan-22)	-105.96	3.27
PZ90 WMP	Active	155-170	Ordovician; Cadia Intrusive Complex	655.72 (Jun-24)	652.44 (Jun-24)	-75.49	3.28
MB96 WMP	Active	80-110	Ordovician; Cadia Intrusive Complex	652.17 (Jun-24)	652.44 (Jun-24)	-62.74	-0.27
PZ89 WMP	Active	138-150	Ordovician; Cadia Intrusive Complex	696.43 (Jun-24)	652.44 (Jun-24)	-57.78	43.99
MB142	Active	123-144	Ordovician; Cadia Intrusive Complex	696.86 (Jun-24)	652.87 (Jun-24)	-40.84	43.99
MB92 WMP	Active	102-120	Ordovician; Forest Reefs Volcanics	694.03 (Jun-24)	652.44 (Jun-24)	-32.70	41.59
MB143	Active	82-91	Ordovician; Cadia Intrusive Complex	697.03 (Jun-24)	652.89 (Jun-24)	-16.02	44.14
MB91 WMP	Active	138-150	Silurian; Cadia Coach Shale	704.19 (Jun-24)	652.44 (Jun-24)	-3.56	51.75
Bores screened above the June 2024 PTSF water level:							
MB93 WMP	Active	72-120	Ordovician; Cadia Intrusive Complex	691.83 (Jun-24)	652.44 (Jun-24)	8.30	39.39
MB97A WMP	Active	48.4-60.4	Ordovician; Cadia Intrusive Complex	695.37 (Jun-24)	652.44 (Jun-24)	10.19	42.93
MB145	Active	55-64	Ordovician; Weemalla Formation	708.97 (Jun-24)	652.89 (Jun-24)	11.95	56.08
PZ5 WMP	Active	83-95	Silurian; Cadia Coach Shale	712.02 (Jun-24)	652.44 (Jun-24)	12.21	59.58
MB151	Active	44-53	Ordovician; Cadia Intrusive Complex	704.16 (Jun-24)	652.89 (Jun-24)	18.05	51.27
PZ89A WMP	Active	52-60	Ordovician; Cadia Intrusive Complex	695.02 (Jun-24)	652.44 (Jun-24)	28.22	42.58
MB99A WMP	Active	27-48	Ordovician; Cadia Intrusive Complex	703.83 (Jun-24)	652.44 (Jun-24)	34.45	51.39
MB148	Active	24-45	Ordovician; Cadia Intrusive Complex	699.33 (Jun-24)	652.89 (Jun-24)	37.13	46.44
MB97B WMP	Active	15.5-18.5	Ordovician; Cadia Intrusive Complex	696.92 (Jun-24)	652.44 (Jun-24)	43.18	44.48
PZ10 WMP	Active	75-85	Silurian; Cadia Coach Shale	704.99 (Jun-24)	652.44 (Jun-24)	45.12	52.55
MB150	Active	18-24	Ordovician; Cadia Intrusive Complex	696.69 (Jun-24)	652.89 (Jun-24)	46.97	43.80

Bore ID	Status	Screen interval (mbgl)	Screened geology [a]	Recent groundwater level (mAHD)	Nearest PTSF level (mAHD)	Difference between screen base and nearest PTSF level (m) [b]	Difference between groundwater level and nearest PTSF level (m) [c]
CE884	Active	30.8-62	Ordovician; Cadia Intrusive Complex	696.58 (Jun-23)	636.5 (Jun-23)	47.26	60.08
MB144	Active	16-22	Ordovician; Cadia Intrusive Complex	708.15 (Jun-24)	652.89 (Jun-24)	48.25	55.26
MB99B [WMP]	Active	12.3-15.3	Ordovician; Cadia Intrusive Complex	705.25 (Jun-24)	652.44 (Jun-24)	48.79	52.81
CE899	Active	25.5-53	Ordovician; Cadia Intrusive Complex	704.85 (Jun-23)	636.5 (Jun-23)	52.03	68.35
MB147	Active	9-15	Ordovician; Cadia Intrusive Complex	Dry (Jun-23)	652.89 (Jun-24)	53.72	n/a
MB100 [WMP]	Active	12-24	Ordovician; Forest Reefs Volcanics	708.95 (Jun-24)	652.44 (Jun-24)	54.76	56.51
MB146	Active	19.3-28.3	Ordovician; Cadia Intrusive Complex	709.91 (Jun-24)	652.89 (Jun-24)	54.83	57.02
MB152	Active	7.0-10	Ordovician; Cadia Intrusive Complex	706.28 (Jun-24)	652.87 (Jun-24)	54.95	53.41
MB149	Active	9-18	Ordovician; Cadia Intrusive Complex	702.31 (Jun-24)	652.89 (Jun-24)	56.56	49.42
MB97C [WMP]	Active	2-4	Ordovician; Cadia Intrusive Complex	709.37 (Jun-24)	652.44 (Jun-24)	56.67	56.93
PZ4 [WMP]	Active	36-45	Silurian; Cadia Coach Shale	730.73 (Jun-24)	652.44 (Jun-24)	60.53	78.29
PZ10A [WMP]	Active	30-54	Silurian; Cadia Coach Shale	731.86 (Jun-24)	652.44 (Jun-24)	90.12	79.42
MB30 [WMP]	Active	4-76	Ordovician; Cadia Intrusive Complex	756.01 (Jun-24)	652.44 (Jun-24)	101.99	103.57
MB101 [WMP]	Active	14-20.1	Ordovician; Cadia Intrusive Complex	699.63 (Jan-22)	583 (Jan-22)	122.88	116.63

Notes: underlined entries indicates monitoring bores where groundwater level increases have been strongly correlated to PTSF water level increases;
(a) geological Formations largely inferred based on Cadia surface geological mapping;
(b) negative value indicates that base of screen is below the PTSF water level;
(c) negative value indicates that groundwater level is greater than the PTSF water level; and
(WMP) monitoring bore is part of the WMP defined monitoring network.



LEGEND

- Cadiangullong Creek
- Mining lease
- June 2023 PTSF elevation (653 mAHD)
- Area where PTSF water level reaches the Cadiangullong Fault hanging wall

Screen elevation

- Base of screen below PTSF water level
- Base of screen above PTSF water level

Bore id
groundwater level
PTSF elevation difference (m)

- Cadia Hill Pit monitoring bores - groundwater level PTSF elevation difference (m)

Dry Low High

Approximate surface traces of Cadiagullong Fault hanging wall splays:

- Violet
- Rahrah
- Purple
- Cadiangullong
- Athos

Bores where water level rises correlate with PTSF deposition

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Cadia Hill Pit hydraulic gradient assessment

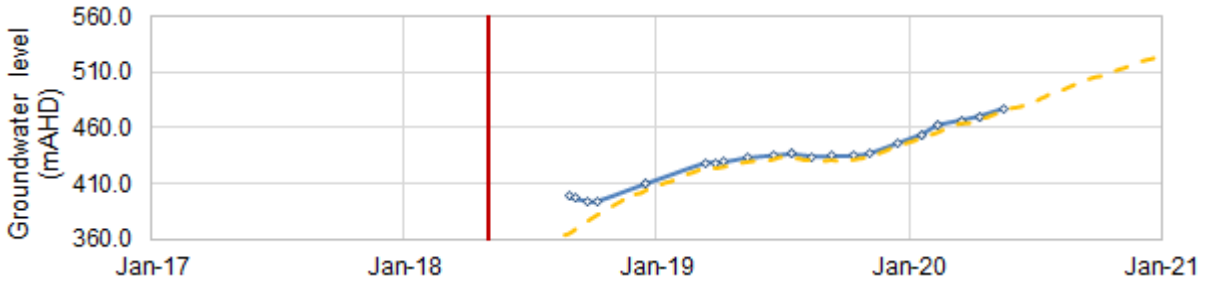
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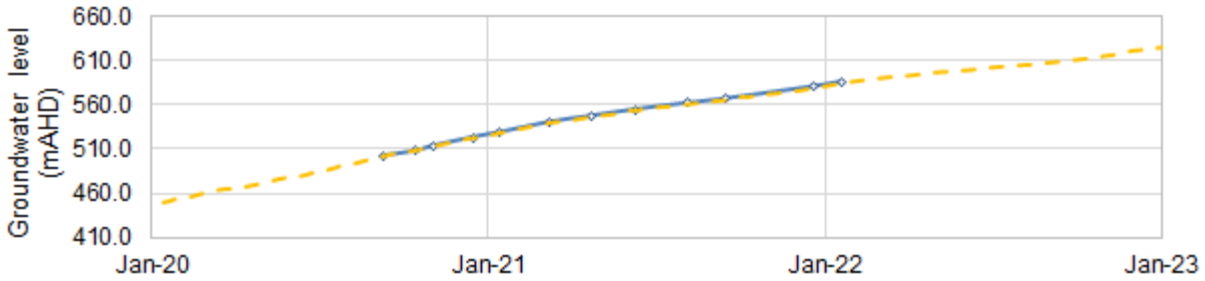
©2024 Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) - www.ageconsultants.com.au; Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006

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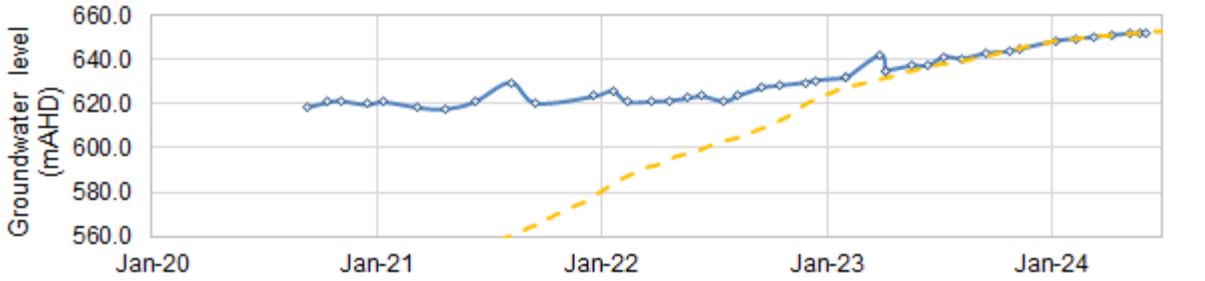
(a) MB95



(b) MB94



(c) MB96



(d) PZ90

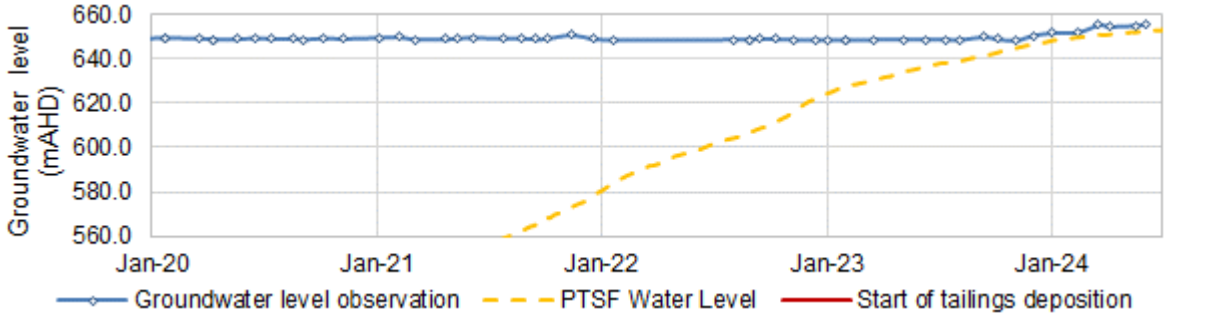


Figure 5.6 Cadia Hill Pit monitoring bores with rising groundwater levels correlating to PTSF pit lake elevation

5.3.2.2 Groundwater quality

Over the 2023/2024 water year, groundwater quality trigger exceedances were recorded in Ordovician monitoring bores MB92 (mercury and zinc), MB99A (sulfate, manganese, and zinc), and MB99B (manganese, and zinc), which are further discussed below.

- Dissolved zinc concentrations spiked in several monitoring bores in July/August 2023 (see Section 5.2.2), potentially in association with the pumping tests (AGE, 2023c) that were undertaken in the area. Increases may have been associated with the oxidation of dewatered rock. Concentrations have since fallen to well below WMP defined assessment criteria (and reference ecosystem protection guideline values).
- Elevated mercury concentrations in monitoring bore MB92 were a one off occurrence in March 2024, with June 2024 concentrations having returned to below the limit of detection (< 0.0001 mg/L), which is consistent with the historical dataset.
- Concentrations of dissolved manganese are highly variable in monitoring bores throughout the Cadia Hill Pit area (Appendix B; Appendix C). Groundwater quality triggers for manganese are determined based on the 95th percentile of the historical dataset (Newcrest, 2023) and it is noted that exceedances in monitoring bores MB99A and MB99B are only marginally above respective assessment criteria. Manganese concentrations in both monitoring bores are well below reference guideline for ecosystem protection (1.9 mg/L), and stock watering guidelines deem manganese to be insufficiently toxic to warrant development of a guideline value.

A review of long-term trends for select analytes (pH, TDS, sulfate, aluminium, arsenic, copper, lead, manganese, nickel, zinc, mercury, nitrite/nitrate, molybdenum, alkalinity, potassium, and sodium) was undertaken, with time series plots provided in Appendix C. Concentrations of these analytes at monitoring bores adjacent to the Cadia Hill Pit have generally remained stable over the period of monitoring, with notable trends including:

- Monitoring Bore MB94, where groundwater levels were affected by tailings prior to be the monitoring bore being decommissioned, had increasing concentrations of TDS, sulfate, sodium, arsenic, copper, and molybdenum. A similar but less pronounced trend for TDS, sulfate, and sodium is observed in monitoring bore MB96, where groundwater levels are also recently correlated with the PTSF pit lake elevation.
- Post 2023 water quality trends in monitoring bore MB97A are similar to the trends previously observed in MB96, with increasing concentrations of TDS, sulfate, sodium, arsenic, copper, molybdenum, and zinc. This monitoring bore has lower absolute values of these analytes and is screened well above the PTSF pit lake. As such, observed changes are unlikely to be associated with tailings deposition. However, trends should be closely monitored in the future.
- Monitoring bore MB93, where post 2021 increases in the concentrations of sodium, arsenic, and copper, correlate with increasing groundwater levels that are independent of levels in the PTSF.
- Monitoring bore MB30, where recent (post July 2021) and sharp decreases in salinity that correlate with the spike in groundwater levels may be related to the ingress of rainfall from surface.
- Consistently decreasing concentrations of sulfate in monitoring bores MB99A and MB99B.

Groundwater quality was compared to reference guideline values for stock watering and freshwater ecosystem protection, with notable 2023/2024 water year observations discussed in Section 5.2.2.

Total recoverable hydrocarbons (TRH) and benzene, toluene, ethylbenzene, xylenes, and naphthalene (BTEXN) samples from select monitoring bores that are adjacent to Cadiangullong Creek or Rodds Creek were collected over the 2023/2024 water year, with no detection of any TRH fractions or BTEXN compounds recorded (Appendix D; MB92, MB93, MB97A, MB97B, MB97C, MB99A, MB99B, and MB96).

5.3.3 Assessment of potential impacts

A review of groundwater monitoring data suggests that the decommissioned Ordovician monitoring bores MB94 and MB95 were previously impacted by tailings deposition, with similar impacts now observed in Ordovician monitoring bores MB96 and PZ90. These historical and current impacts are evident through clear increases in groundwater levels that correlate with the elevations of the Cadia Hill Pit lake, as well as increasing concentrations of TDS, sulfate, sodium, arsenic, copper, and molybdenum.

The risk of groundwater migrating away from the pit at present is minimal, given that monitoring data and numerical modelling (AGE, 2021) both show and predict an inwards hydraulic gradient, with the Cadia Hill Pit acting as a groundwater sink. The potential for the offsite migration of impacted groundwater is adequately monitored, with a large number of groundwater monitoring bores installed at various depths. These monitoring bores are largely located to the west and southwest of the pit in the direction of Cadiangullong Creek, which is the nearest environmental receptor. Additionally, over the same reporting period, the surface water assessment (Engeny, 2024) concludes that no mining related impacts are evident in the downstream Cadiangullong Creek receiving environment (CAWS79 and CAWS78). Similarly, no mining related impact is evident in any macroinvertebrate, fish, or platypus communities of Cadiangullong Creek based on aquatic ecosystem monitoring (GHD, 2024).

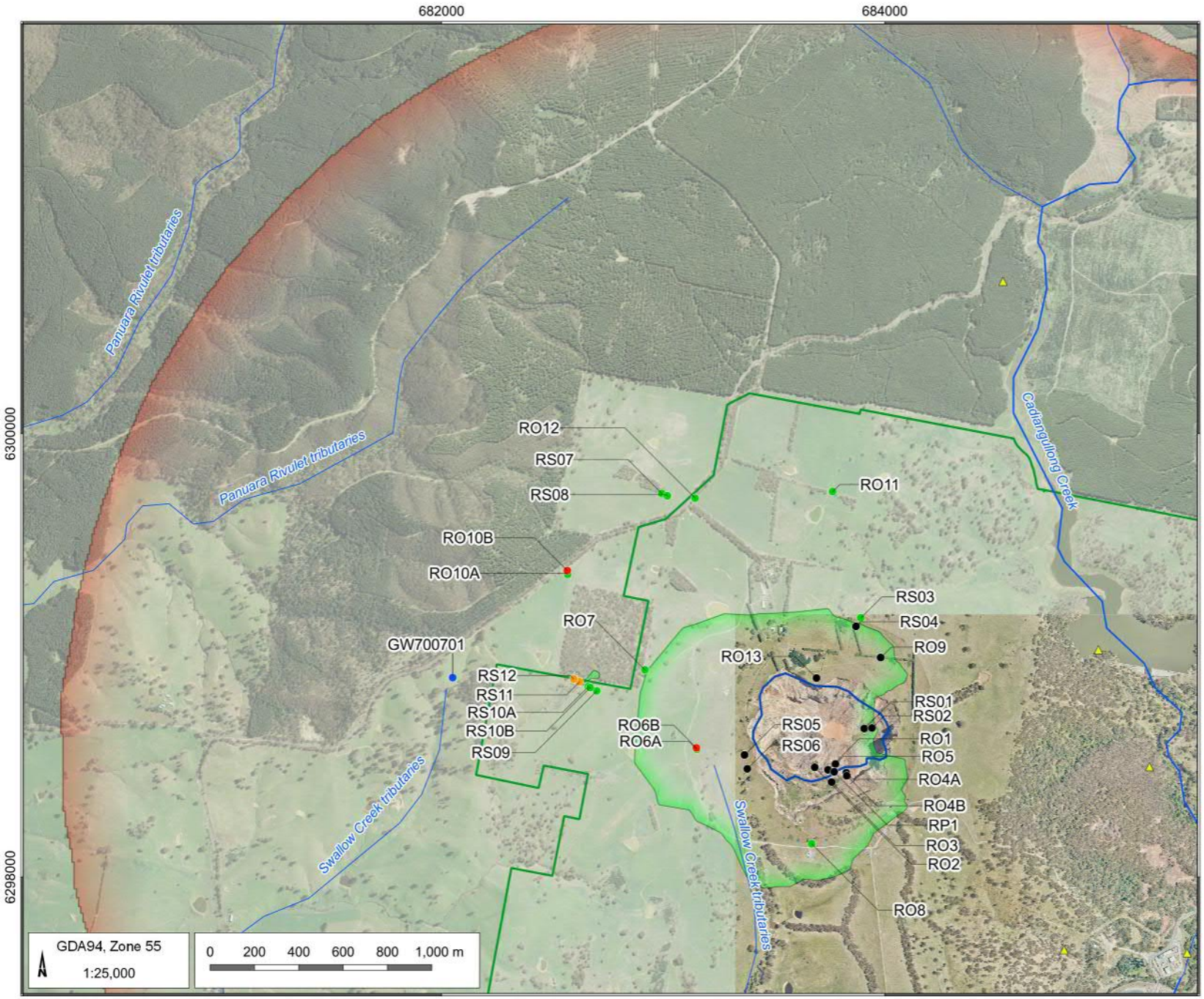
5.4 Ridgeway Mine

5.4.1 Overview and hydrogeological conceptualisation

Mining at the Ridgeway Mine took place between 1998 and 2016, with the more recent ‘Ridgeway Deeps’ being mined from 2009 to 2016. Although the Ridgeway Mine is no longer actively mined, it is understood that the underground workings are still dewatered. At present, the Ridgeway Mine is conceptualised to behave as a groundwater sink, with test mining and continued dewatering during the care and maintenance period creating drawdown in groundwater systems in surrounding Ordovician units, as well as the Tertiary basalt (Figure 4.4). Monitoring data indicates drawdown is not laterally extensive, primarily due to the low permeability of the Ordovician rock mass, which the Ridgeway Mine is constructed within.

The monitoring network that surrounds the Ridgeway Mine is comprised of the ‘RO’ and ‘RS’ series of bores, with a total of 30 monitoring bores surrounding the mining area, 16 of which are still in use (Figure 5.7). Of the active monitoring bores, there are eight shallow (< 12 mbgl) monitoring bores installed into either regolith or the Tertiary basalt, six deeper Tertiary basalt monitoring bores (< 62 mbgl), and two Ordovician monitoring bores that are screened to 136 mbgl. As per the WMP, groundwater levels at select monitoring bores around the Ridgeway Mine (Figure 2.1) are monitored on a quarterly basis. There are no requirements to collect groundwater quality samples from these monitoring bores, although there are some historical records (Appendix C).

Nearby potential groundwater receptors include Cadiangullong Creek to the east (~ 1.2 km), Swallow Creek to the south-southwest, and a registered supply bore to the west (~ 1.4 km). The registered bore is located on privately owned and installed within the Ordovician volcanics (GW700701) (Figure 5.7).



LEGEND

- Surface water monitoring sites
- Private registered bore

Monitoring bore network

- Ordovician
- Regolith
- Tertiary basalt
- Inactive
- Drainage
- Mining lease
- Ridgeway
- Modelled maximum extent of basalt drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Ordovician drawdown/depressurisation that exceeds 3 m

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Ridgeway Mine – surrounding monitoring bores and maximum modelled drawdown

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5.4.2 Groundwater monitoring data

5.4.2.1 Groundwater levels

There were no exceedances of WMP defined groundwater level assessment criteria in any Ridgeway Mine monitoring bore over the 2023/2024 water year.

Historical observations illustrate that groundwater levels fell rapidly in a number of monitoring bores after the Ridgeway Mine broke through to land surface in August 2002 (Figure 5.8 and Figure 5.9). These monitoring bores are largely situated adjacent to the mine, although 2002 groundwater level declines are also observed in monitoring bores RO11 and RO12, which are located more than 800 m north of the mine (Figure 5.7).

To the west and northwest, monitoring bores were largely unaffected by mining with historical water levels responding to climatic conditions (Figure 5.10). Groundwater level variations in recent years (2018 to the present) generally correlate with climatic conditions.

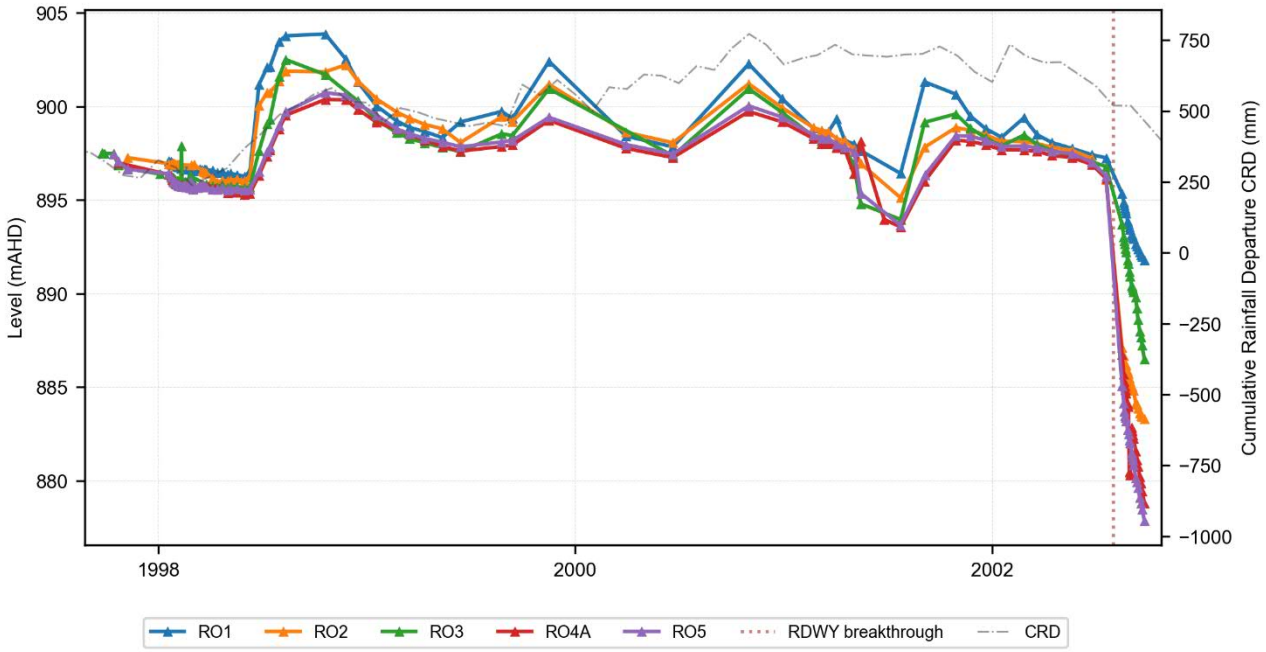


Figure 5.8 Ridgeway Mine monitoring bores with declines after 2002 breakthrough (1 of 2)

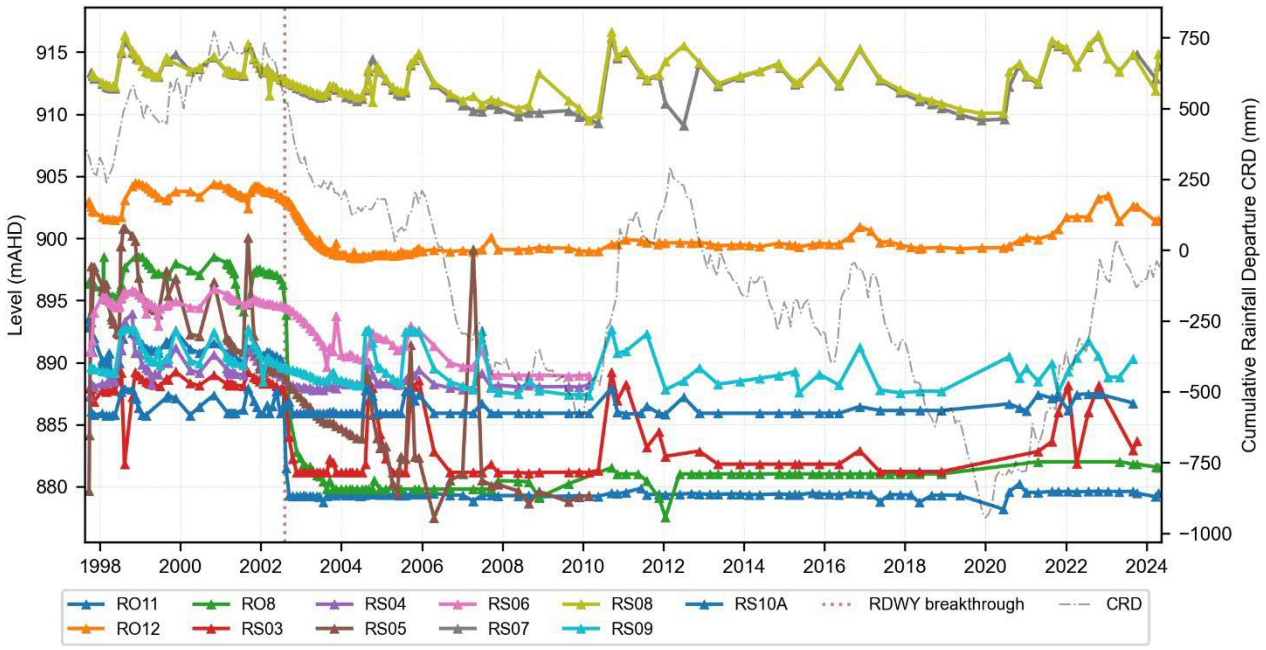


Figure 5.9 Ridgeway Mine monitoring bores with declines after 2002 breakthrough (2 of 2)

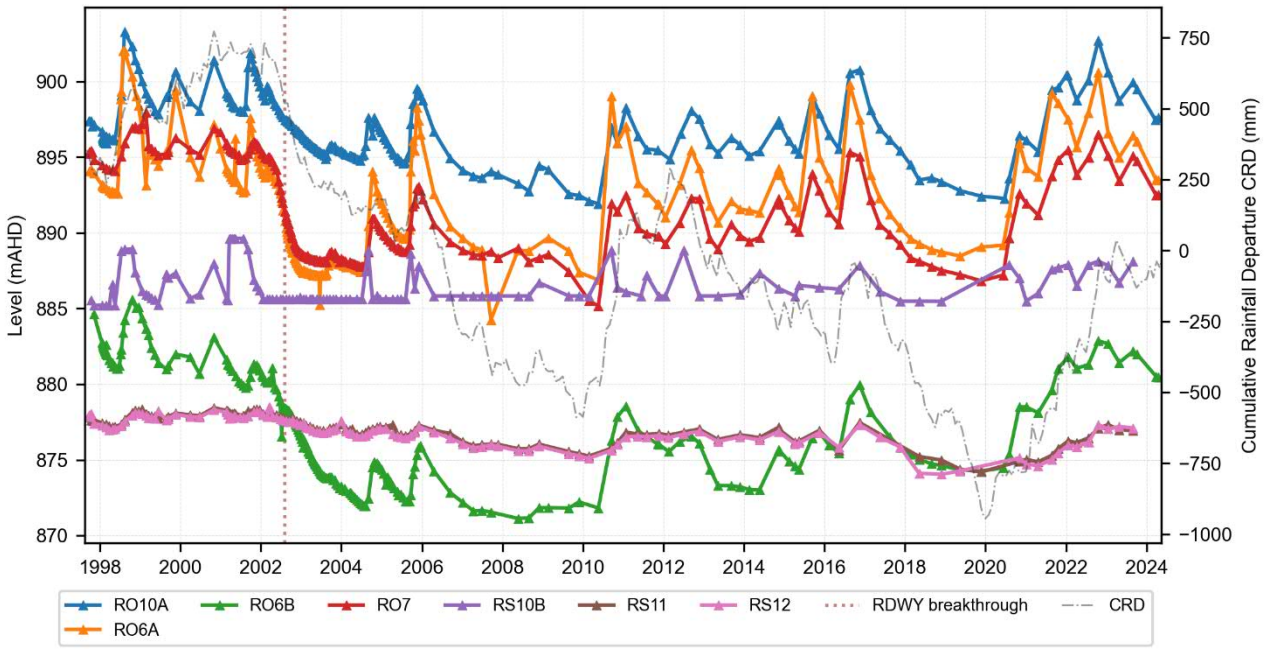


Figure 5.10 Ridgeway Mine monitoring bores with typical climatic responses

5.4.2.2 Groundwater quality

Where available, historical data for select analytes (pH, TDS, sulfate, aluminium, arsenic, copper, lead, manganese, nickel, zinc, mercury, nitrite/nitrate, molybdenum, alkalinity, potassium, and sodium) are presented in Appendix C. As per the WMP, there are no requirements to collect groundwater quality samples from these monitoring bores.

5.4.3 Assessment of potential impacts

Drawdown of the groundwater systems that are associated with the shallow regolith and the Tertiary basalt is consistent with impacts predicted for the Cadia East environmental assessment (AGE, 2009) and is well delineated to the west of Ridgeway Mine. There are a large number of active monitoring bores installed in this area, many of which have historical groundwater levels that are consistent with climatic conditions.

Groundwater monitoring data collected around the Ridgeway Mine confirms the zone of drawdown and depressurisation is limited. It is unlikely that there is any mining related effect on groundwater-surface water interactions, with no reductions in baseflow evident in upstream or downstream monitoring of Swallow Creek (Newmont, 2024).

5.5 Cadia East Mine

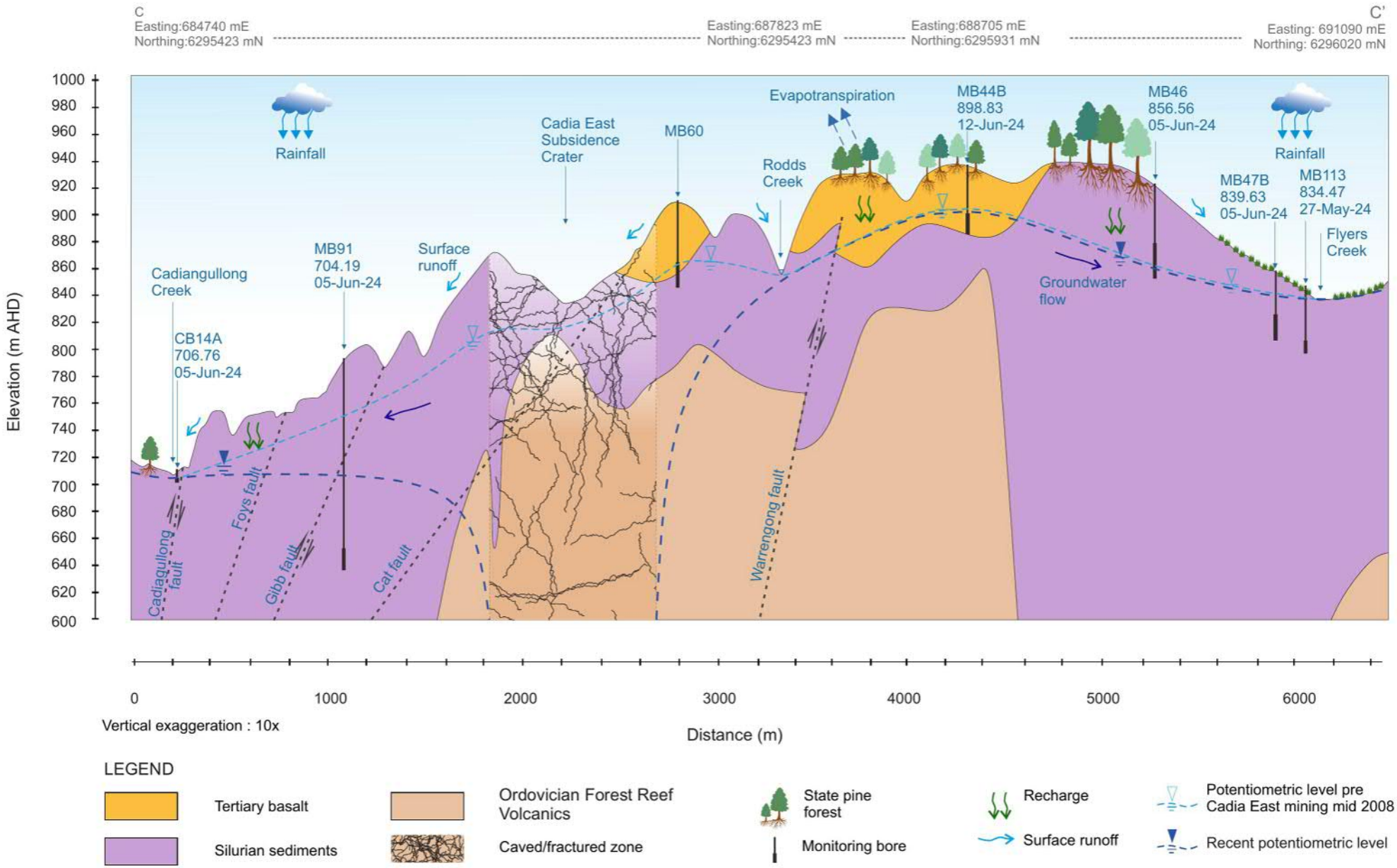
5.5.1 Overview and hydrogeological conceptualisation

Cave mining at the Cadia East Mine is ongoing, with works beginning in 2012 and cave breakthrough at ground surface occurring in October 2014. At present, the Cadia East Mine is conceptualised to behave as a groundwater sink, with mining/dewatering resulting in the drawdown of groundwater systems in surrounding Ordovician/Silurian units, as well as the Tertiary basalt, although to a lesser extent (Figure 5.11). Groundwater drawdown is not modelled to be laterally extensive (AGE, 2021), primarily due to the low permeability of the Ordovician/Silurian rock mass, which the Cadia East Mine largely intercepts. A number of faults are known to intersect the underground workings and these faults may increase the range of drawdown if permeability is enhanced around these features relative to the bulk rock mass.

The groundwater monitoring network that surrounds the Cadia East Mine is comprised of monitoring bores and VWPs installed into the Tertiary basalt (depth of monitoring ranging from 24 mbgl to 99 mbgl), Silurian sediments (depth of monitoring ranging from 8 mbgl to 182 mbgl), and Ordovician aged rocks (depth of monitoring ranging from 9 mbgl to 175 mbgl) (Figure 5.12). As per the WMP, groundwater levels at select monitoring bores around the Cadia East Mine (Figure 2.1) are monitored on a monthly or quarterly basis, while groundwater quality is monitored on a quarterly or annual basis.

Nearby potential groundwater receptors include Cadiangullong Creek to the west (~ 1.7 km), Flyers Creek to the east/southeast (~ 3 km/~ 2 km), a large number of registered supply bores to the northeast/east/southeast (nearest ~ 1.5 km to the northeast), and a number of mapped springs to the north-northeast (> 4 km) (Figure 4.7).

In July 2022 through to August 2022, there was an uncontrolled groundwater flow into the new VR14-1 vent shaft during drilling at Cadia East from the underground mine to the surface (referred to as the VR14-1 shaft incident). Groundwater ingress into the shaft was predominantly from the Tertiary basalt aquifer. The shaft was backfilled with non-potential acid forming waste rock. To constrain groundwater inflow into the shaft a grout curtain was installed into the basalt and the top part of underlying Silurian sediments by grout injection in an array of boreholes around the shaft in September 2022 (AGE, 2023a). Several standalone and incident specific groundwater investigations have been undertaken to date, which focus on impacts observed in basalt monitoring bore MB88 and surrounding basalt monitoring bores.



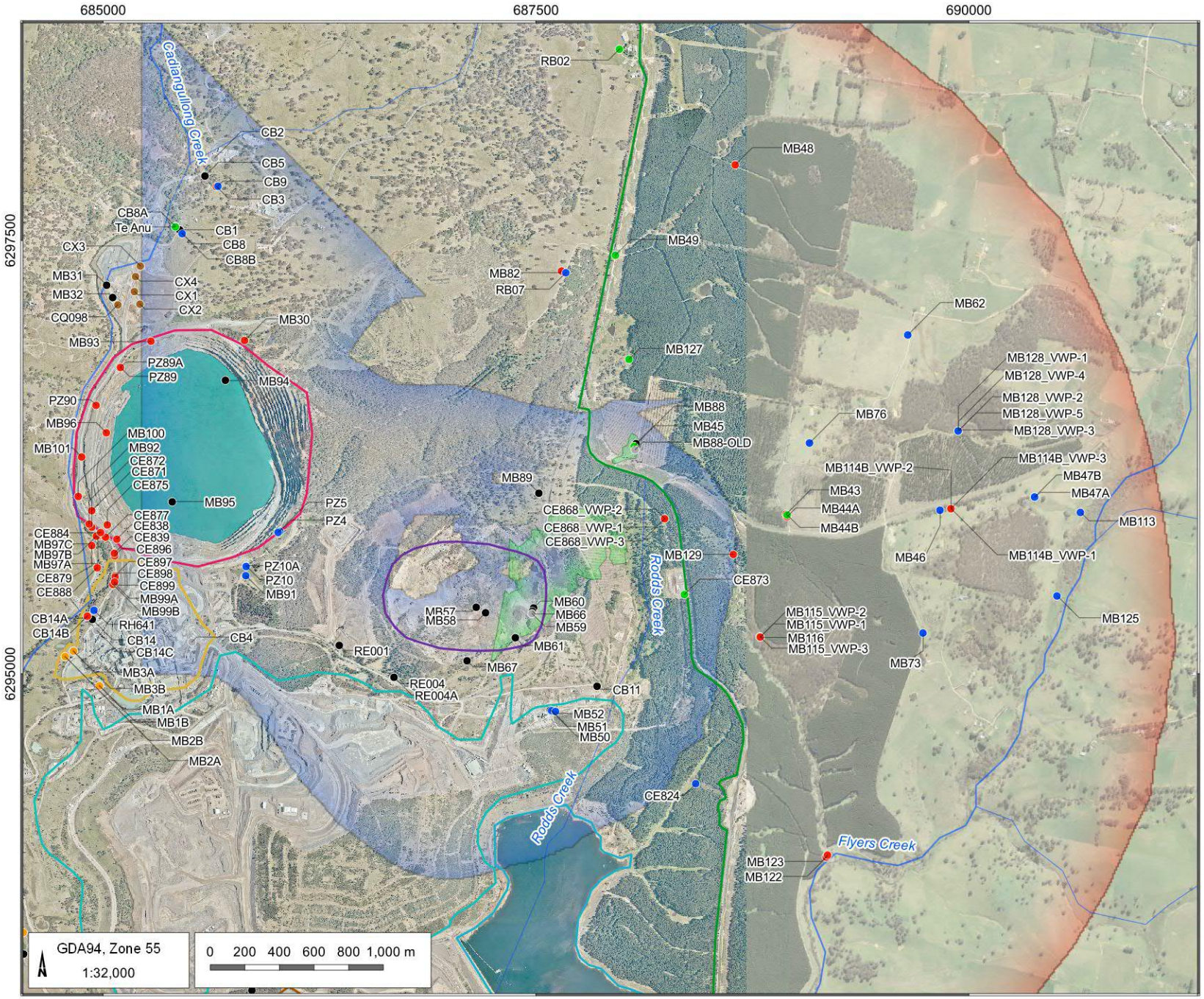
Cadia East Mine conceptual cross section (C - C')

Figure - 5.11

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

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LEGEND

Monitoring bore network

- Ordovician
- Silurian
- Regolith
- Tertiary basalt
- Backfill
- Inactive
- Unknown

- Drainage
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Rodds Creek Dam
- South Waste Rock Dump
- Mining lease
- Modelled maximum extent of basalt drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Silurian drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Ordovician drawdown/depressurisation that exceeds 3 m

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Cadia Hill Pit and Cadia East Mine – surrounding monitoring bores and maximum modelled drawdown

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5.5.2 Groundwater monitoring data

5.5.2.1 Groundwater levels

Exceedances of the WMP defined groundwater guidelines were estimated to be present in assessable monitoring bores MB43 (screened in Ordovician volcanics) and MB44B (screened in Tertiary basalt). No mining related impacts were evident in other WMP assessable monitoring bores (MB47A, MB47B, MB62, and MB76).

As per the WMP defined assessment criteria, 'groundwater drawdown of greater than 3 m from that considered normal climatic variation' was assessed via both the qualitative review of hydrographs and transfer function noise (TFN) modelling; where CRD trends are compared to groundwater level variations with the aim of quantifying any non-climatic variations (Appendix E). TFN models assume that multiple time series can be modelled by linearly transforming the data, with the transformation in this case being driven by historical groundwater level observations and rainfall derived CRD trends. While the absolute departure of groundwater levels from 'typical' climatic variations should not be solely relied upon, it is still a useful line of evidence.

TFN modelling indicates approximately 5 m and 6 m of non-climatic drawdown for exceeding monitoring bores MB43 and MB44B, which is largely associated with decreases that have been observed in each bore since late 2016. Groundwater level decreases in monitoring bore MB43 are consistent with modelled predictions, noting that the attributed screened geology in this review differs from the WMP attribution, based on the geological model used for AGE (2021) modelling. If monitoring bore MB43 is indeed screened within Silurian sediments, numerical modelling may be underpredicting impacts at this location. Observed groundwater level declines in Tertiary basalt monitoring bore MB44B, which is outside the zone of predicted impacts (Figure 5.12), may be associated a structural feature further propagating impacts.

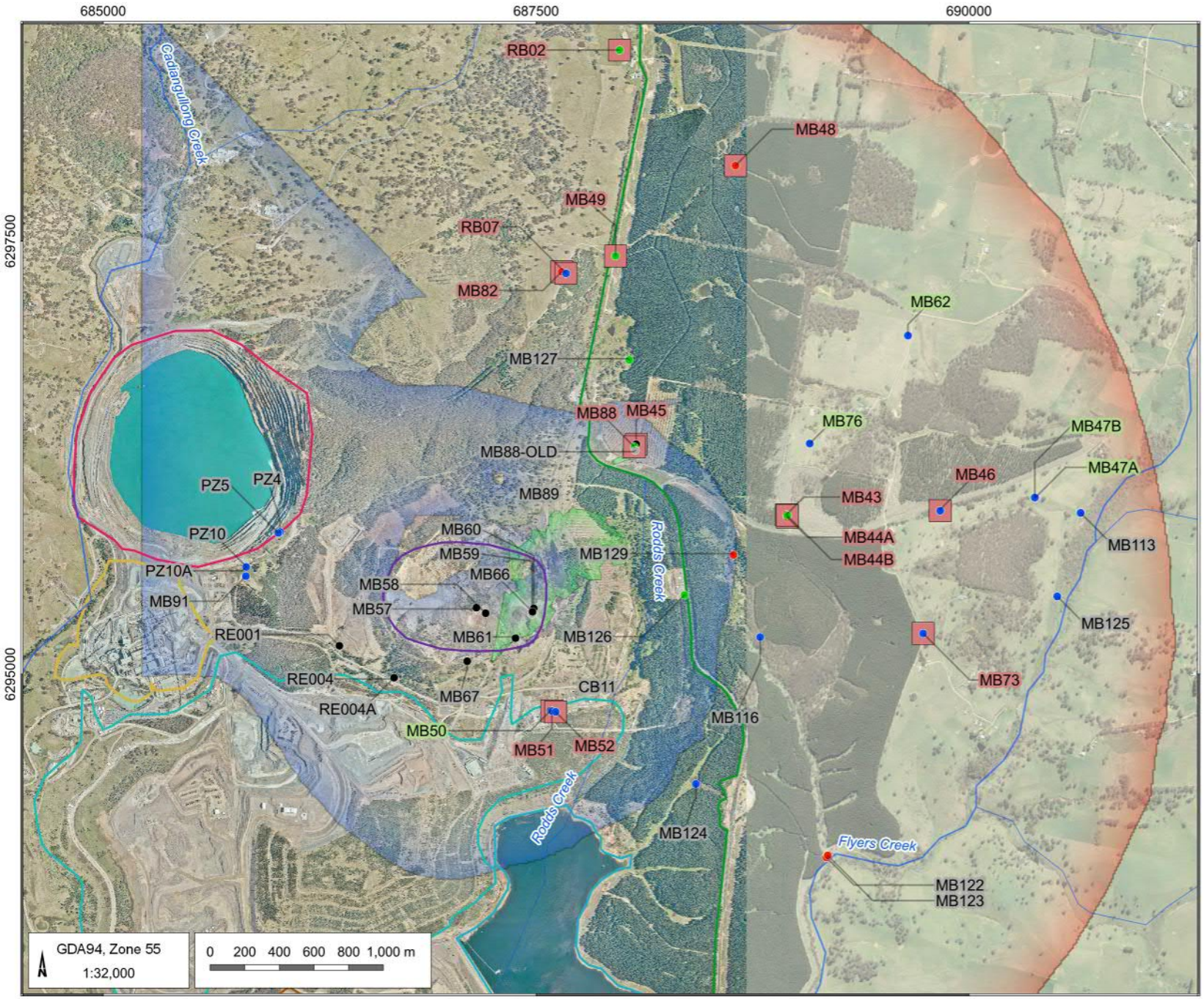
In addition to the WMP defined monitoring bores that are discussed above, a review of TFN modelling results may indicate non-climatic impacts at other monitoring sites (Figure 5.13). These monitoring bores where non-climatic drawdown may be evident can be further categorised as follows:

- drawdown consistent with modelled impacts;
  - Tertiary basalt monitoring bores MB45 and MB88[5];
  - Silurian sediment monitoring bores MB51 and MB52;
  - Ordovician monitoring bores MB43[6], MB44A, MB48, and MB82;
- drawdown not consistent with modelled impacts, but impact precedes mining at Cadia East;
  - Tertiary basalt monitoring bores RB02 and MB49;
- drawdown not consistent with modelled impacts;
  - Tertiary basalt monitoring bore MB44B; and
  - Silurian sediment monitoring bores RB07, MB46, and MB73.

An interpretation of non-climatic drawdown does not explicitly mean that drawdown is associated with mining activities and other potential local stresses may include impacts from groundwater abstraction (particularly in the Tertiary basalt), as well as the influence of pine plantations. Notwithstanding, an assessment of long-term drawdown trends indicates that modelled predictions may underestimate Silurian sediment impacts in part. Groundwater level monitoring indicates that these impacts are unlikely to affect Flyers Creek given that no drawdown is evident in monitoring bores MB47A or MB47B and because of high absolute groundwater elevations in the recently installed monitoring bores adjacent to Flyers Creek (MB113 and MB125) (Figure 5.14).

The potential for declines to be associated with pine plantations was also considered. Aerial imagery shows that these plantations near the Cadia East Mine were well established by year 2000 to the east/southeast and by year 2011 to the northeast, which generally precedes observed groundwater level declines.

[5] Groundwater levels in monitoring bore MB88 were impacted by the VR14-1 shaft incident.
[6] Only a single measurement at this monitoring bore was collected between December 2018 and May 2023, which was approximately 4 m below the preceding measurement. The reason for the absence of data is unknown, but unlikely to be dry conditions given that lowest measurement (891.45 mAHD, November 2019) still represents an approximate water column thickness of 133 m.



LEGEND

- Drainage
- Cadia East
- Cadia Hill Pit
- NTSF
- Ore Processing Facilities
- Rodds Creek Dam
- South Waste Rock Dump
- Mining lease
- Modelled maximum extent of basalt drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Silurian drawdown/depressurisation that exceeds 3 m
- Modelled maximum extent of Ordovician drawdown/depressurisation that exceeds 3 m

Cadia East monitoring bores

- Ordovician
- Silurian
- Tertiary basalt
- Inactive
- Unknown

Bore were non-climatic drawdown may be evident

- Non-climatic drawdown may be evident

Label buffer colour indicates:
red - Non-climatic drawdown may be evident,
green - Non-climatic drawdown not evident,
grey - Insufficient data or Cadia Hill Pit bore

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Cadia East Mine – assessment of long term drawdown

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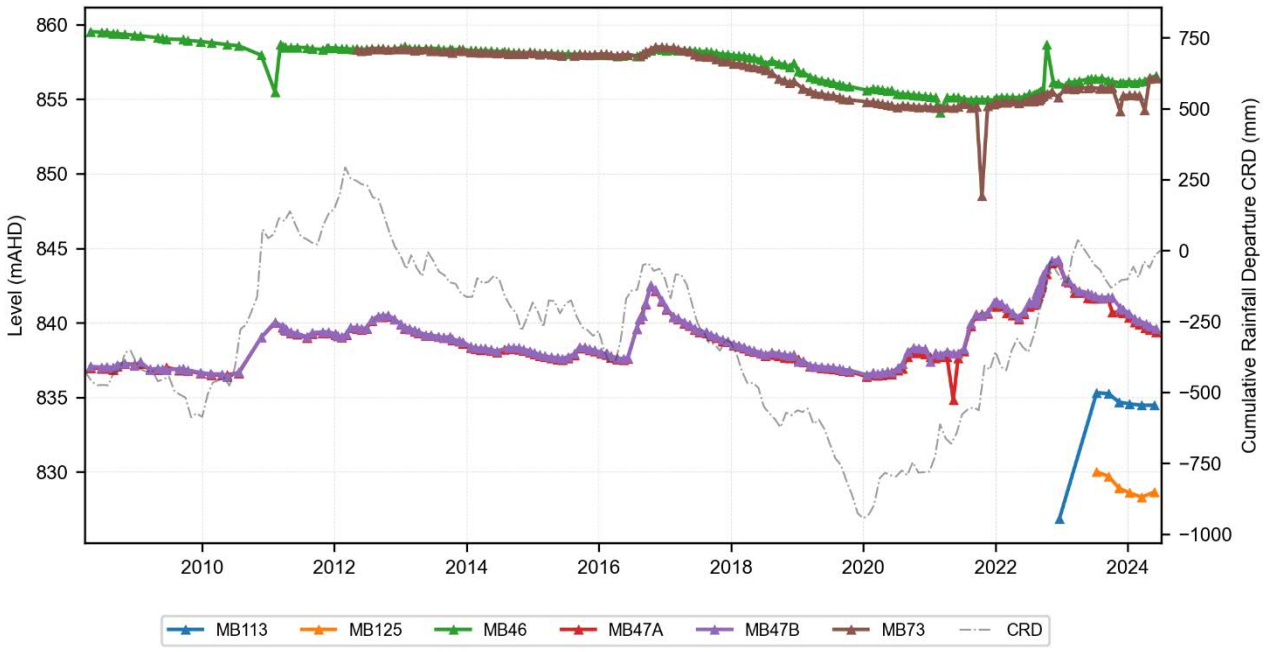


Figure 5.14 Groundwater level responses in Silurian sediment monitoring bores between the Cadia East Mine and Flyers Creek

5.5.2.2 Groundwater quality

As per the WMP, there are no groundwater quality assessment criteria defined for the Cadia East Mine monitoring bores. Where available, historical data for select analytes (pH, TDS, sulfate, aluminium, arsenic, copper, lead, manganese, nickel, zinc, mercury, nitrite/nitrate, molybdenum, alkalinity, potassium, and sodium) are presented in Appendix C. Notable historical trends include:

- Monitoring bore MB88, where there was a distinct change in water chemistry post the VR14-1 shaft incident, with increases to the concentrations of sulfate and nitrate, as well as dissolved nickel and zinc. Zinc concentrations have returned to a level consistent with long-term averages, although the other analytes still remain elevated. Previous investigations attribute this changed water quality to geochemical processes that are driven by the changed conditions; specifically, the lowered groundwater levels observed.

Groundwater quality was compared to reference guideline values for stock watering and freshwater ecosystem protection, with notable 2023/2024 water year observations discussed in Section 5.2.2.

Given that the potential impacts from mining at the Cadia East Mine are drawdown of the surrounding groundwater systems, any water quality variations that can be attributed to mining would therefore be linked to a changed flow regime. There is no explicit source of potential contaminants for this activity, which is dissimilar to other operational areas where tailings or surface water storages are present.

5.5.3 Assessment of potential impacts

Long-term drawdown/depressurisation that is consistent with modelled impact predictions is observed in several monitoring bores within the surrounding Tertiary basalt, Silurian sediment and Ordovician groundwater systems. Groundwater level decreases observed in Tertiary basalt monitoring bores RB02, MB42, and MB44B are not consistent with modelled impacts. However, impacts in monitoring bores RB02 and MB42 precede operations at the Cadia East Mine and impacts from forestry and agricultural activities are also feasible. Observed groundwater level declines in monitoring bore MB44B, may be associated with a structural feature further propagating impacts, similar to what is observed and explicitly modelled in monitoring bore MB88. Potential mining related declines in Silurian sediment monitoring bores RB07, MB46, and MB73 may indicate that modelled predictions in part underestimate drawdown and depressurisation within the Silurian sediments.

Given that parts of Flyers Creek are conceptualised to be gaining from the Silurian groundwater system, it is important to assess the implications of the declining levels that are apparent in monitoring bores MB46 and MB73 to the east of the Cadia East Mine. While some groundwater level declines are evident, it is noted that: (a) absolute declines are not substantial (approximately 3 m and 2 m in monitoring bore MB46 and MB73, respectively); and (b) groundwater levels have partially recovered during the wetter than average conditions since 2021. Additionally, impacts to creek baseflow are unlikely given that no drawdown is observed in monitoring bores nearer to Flyers Creek (MB47A and MB47B), nor are groundwater elevations in the recently installed monitoring bores adjacent to Flyers Creek indicative of impacts.

Several registered supply bores on privately owned land (Figure 4.7) are located within the zone of drawdown that is predicted to occur within the Ordovician volcanics. It is expected that most of these bores will be installed into the more productive Tertiary basalt, although a review of screened stratigraphies and groundwater use should be undertaken.

5.6 NTSF and STSF

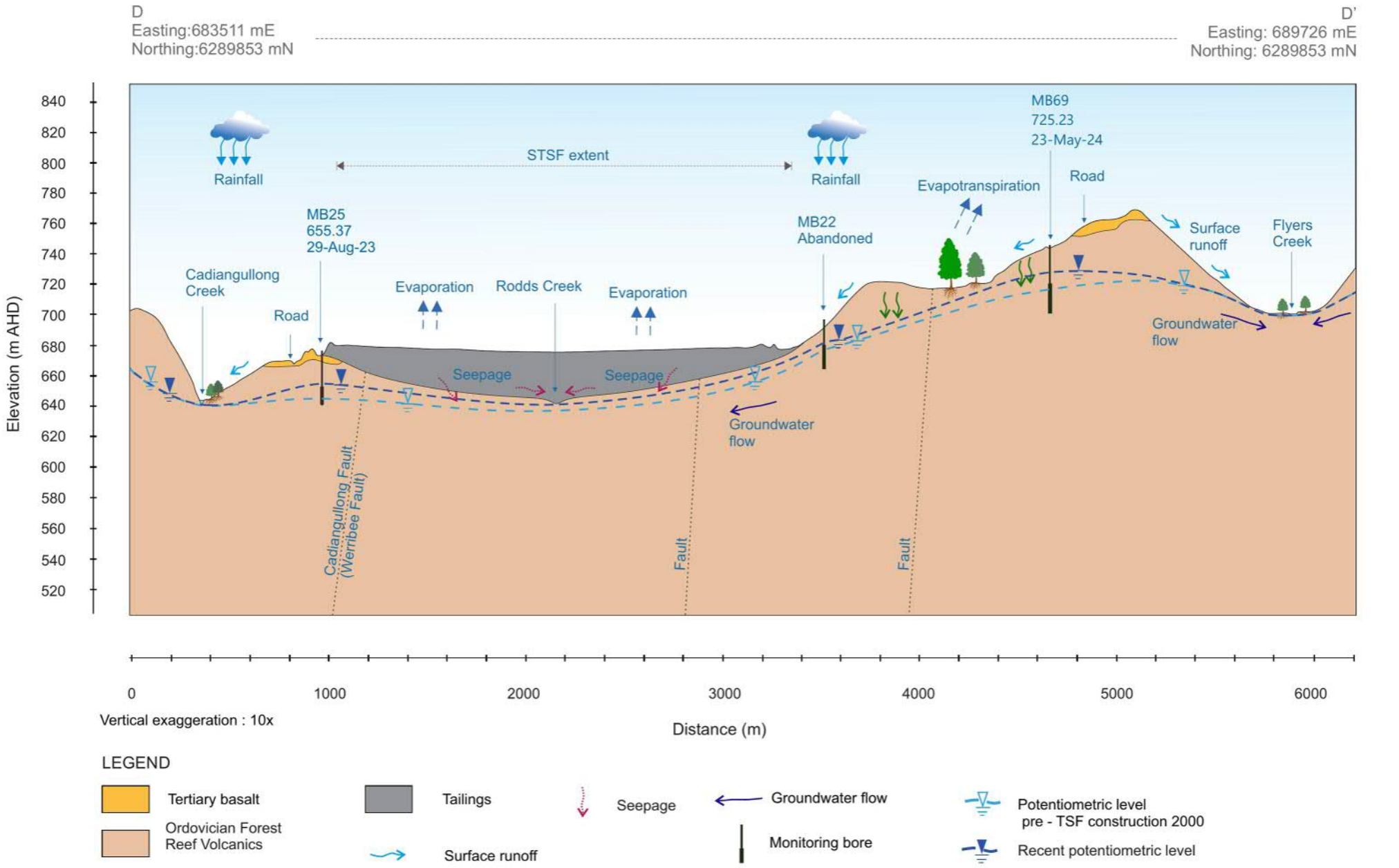
5.6.1 Overview and hydrogeological conceptualisation

Tailings deposition in the NTSF and the STSF has been taking place respectively since 1998 and 2002, although no deposition has taken place since an embankment slump in March 2018. Long-term groundwater level increases have been observed in monitoring bores that are adjacent to the TSFs, likely from a combination of seepage and poroelastic responses associated with the mass of tailings compressing the underlying rock mass (Figure 5.15 and Figure 5.16).

Some seepage from the TSFs is likely, although impact modelling predicts relatively small fluxes, largely due to the bulk rock mass being of low permeability (0.4 ML/day and 0.2 ML/day from the NTSF/STSF, respectively; AGE, 2021). Additionally, engineering controls are in place in areas where permeability may be higher, for example the clay seal blanket that covers parts of the old Rodds Creek drainage line (KCB, 2019), as well as seepage interception and containment in the ST14 dam. A conceptualised groundwater divide on the western edge of the STSF (GHD, 2018) reduces the likelihood of seepage migrating directly to the west, with preferential flow towards the centre of the TSF, where Rodds Creek previously resided (Figure 5.15). To the south of the STSF some groundwater is expected to discharge into topographic low points, which includes the Rodds Creek drainage line and associated dams (Figure 5.16).

There is an extensive monitoring network that surrounds the NTSF/STSF (Figure 5.17), with most monitoring bores installed hydraulically down gradient of the TSFs, either between Cadiangullong Creek and the TSFs, or to the south of the STSF around the Rodds Creek drainage feature. Several monitoring bores are also installed hydraulically upgradient of the TSFs (Figure 5.17). The majority of the monitoring bore network is screened within Ordovician aged rocks, although some monitoring of the Tertiary basalt and Silurian sediments is also undertaken where these units are present (Figure 5.17). Many of the monitoring bores to the west of the TSFs are screened at relatively shallow depths (< 20 mbgl) to ensure that the shallow groundwater system, which may interact with Cadiangullong Creek, is actively monitored. As per the WMP, groundwater level and groundwater quality data is largely collected at either a monthly or quarterly cadence for select monitoring bores around the NTSF/STSF (Figure 2.1).

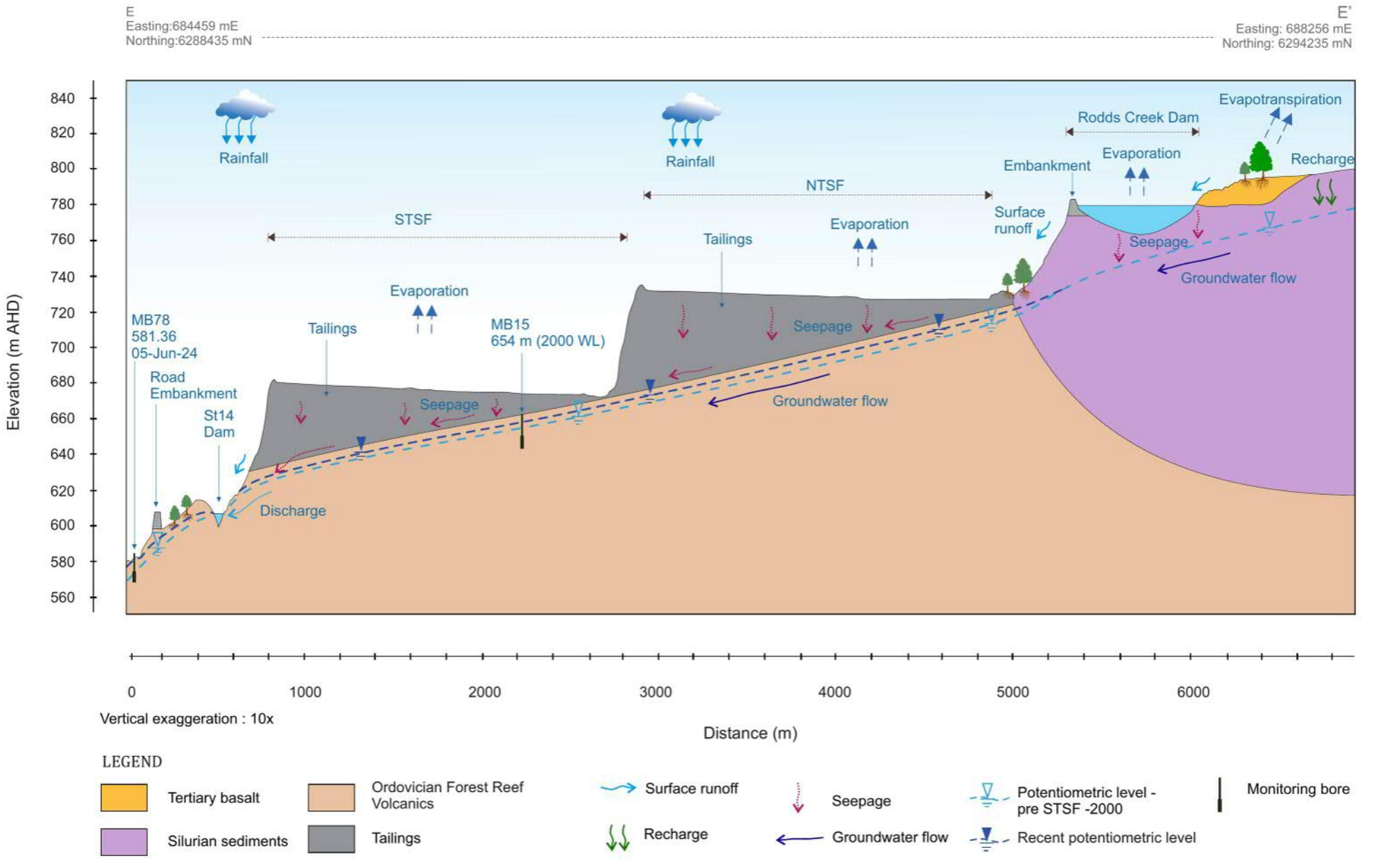
Nearby potential groundwater receptors include Rodds Creek to the south of the STSF and Cadiangullong Creek, which is at its closest, approximately 1 km from the NTSF and 0.6 km from the STSF. It should be noted that nearby portions of Cadiangullong Creek constitute high priority GDEs under the Water Sharing Plan (WSP) for the NSW Murray Darling Basin Fractured Rock Groundwater Sources (Figure 4.7).



STSF conceptual cross section (D - D')

Figure - 5.15

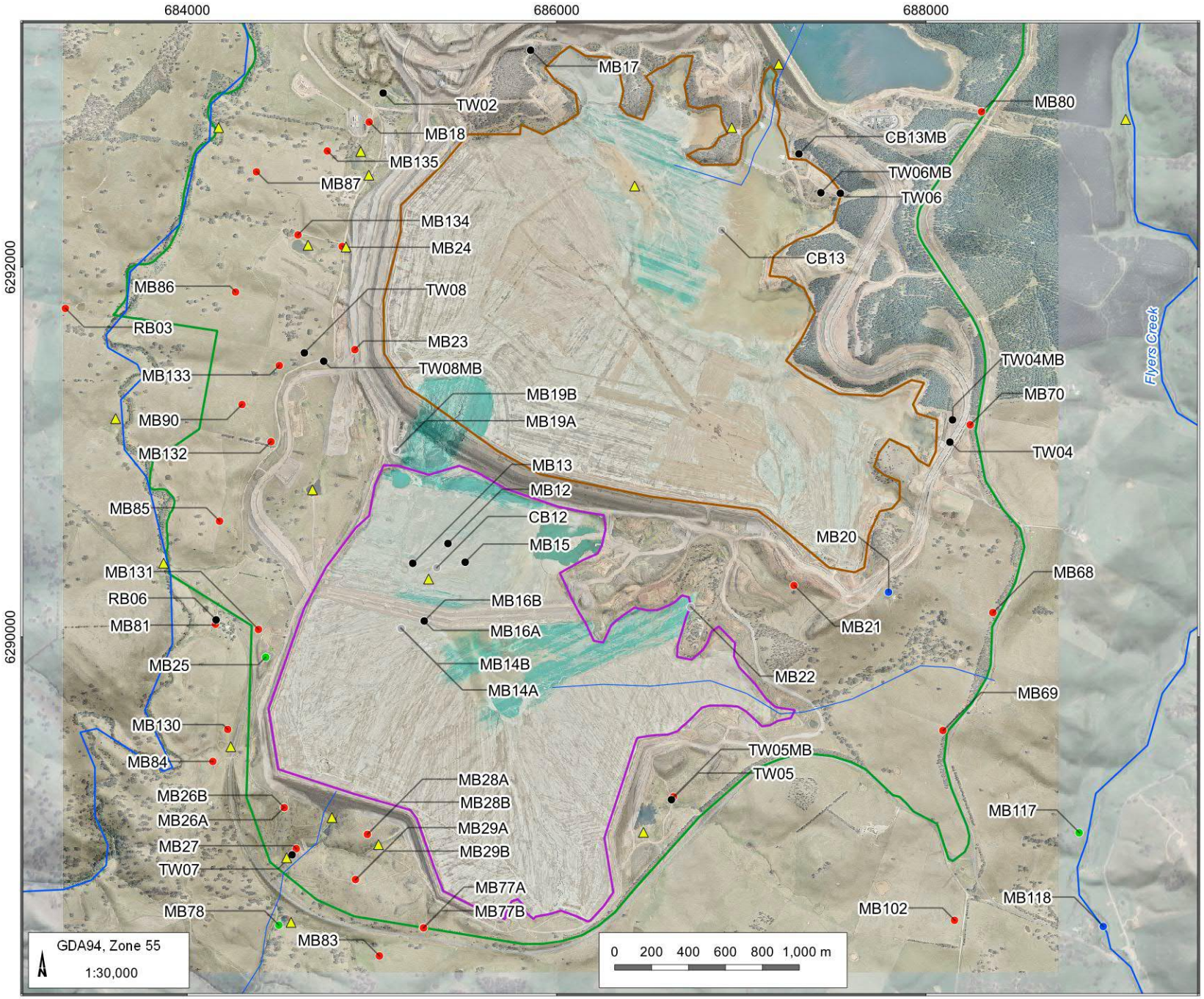
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STSF/NTSF conceptual cross section (E - E')

Figure - 5.16

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)



LEGEND

- Surface water monitoring sites

Monitoring bore network

- Ordovician
- Silurian
- Tertiary basalt
- Inactive
- Unknown
- Drainage
- Mining lease
- NTSF
- STSF

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

NTSF/STSF – surrounding monitoring bores

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5.6.2 Groundwater monitoring data

5.6.2.1 Groundwater levels

Exceedances of the WMP defined groundwater guidelines were estimated to be present in assessable Ordovician monitoring bores MB18 and MB24, both of which were decommissioned by July 2023[7] on account of buttressing works. Due to the date of decommissioning, these exceedances are assumed based on groundwater levels already exceeding over the previous 2022/2023 water year (Appendix C). The WMP should be amended to stipulate suitable groundwater level assessment criteria for the replacement monitoring bores that remain active and are hydraulically down gradient of the TSFs.

Groundwater level increases that can be attributed to the TSF were identified in 15 monitoring bores, six surrounding the NTSF and nine surrounding the STSF. Only six of these monitoring bores are still active and are all located to the south of the STSF. The maximum groundwater level increase measured in each of these monitoring bores is provided below in Table 5.3, with hydrographs provided in Figure 5.18 and Figure 5.19. Most of these monitoring bores are within 250 m of the TSF embankment crest, with the exception of MB18 (~ 440 m from NTSF), MB27 (~ 370 m from NTSF), and MB29A/B (~ 440 m from STSF). Monitoring bores where groundwater level increases have been observed are largely located hydraulically downgradient of the TSFs. However, groundwater levels in monitoring bores that are further downgradient are responding in a manner that is generally either consistent with climatic conditions, or stable with minimal variation (MB77A, MB77B, MB78, MB81, MB83, MB84, MB85, MB86, MB87, and MB90).

Groundwater levels in monitoring bore MB79 have varied significantly in the past (~25 m) in a manner that is not consistent with either climate or tailings deposition (Appendix C; also note low salinity, sulfate, and dissolved metals). The cause of this variance is unknown, but given the monitoring bores location they may be related to flows or water storage in Rodds Creek. It is noted that groundwater levels at this monitoring bore have remained relatively stable since 2021.

[7] Monitoring bores MB23 and MB25 were also decommissioned.

Table 5.3 Summary of groundwater level increases around NTSF/STSF

NTSF/STSF	ID	Initial groundwater level (mAHD)	Latest groundwater level (mAHD)	Maximum groundwater level (mAHD)	Maximum individual rise (m)	WMP guideline level (mAHD)
NTSF	MB15 [a]	650.06 Feb-1998	654.84 May-2004	654.93 Sep-2000	4.87	-
NTSF	MB16A [a]	641.33 Feb-1998	644.01 Aug-2002	644.72 Sep-2000	3.39	-
NTSF	MB16B [a]	641.14 Feb-1998	645.28 Feb-2003	645.28 Feb-2003	4.14	-
NTSF	MB18 [a]	698.2 Mar-1999	707.28 Apr-2023	707.46 Jan-2023	7.73	707
NTSF	MB23 [a]	668.56 Mar-1999	680.59 Jun-2022	680.59 Jun-2022	12.03	699
NTSF	MB24 [a]	680.99 Mar-1999	692.12 May-2023	692.4 Jan-2023	9.72	691
STSF	MB19A [a]	648.6 Mar-1999	678.20 May-2018	679.55 Nov-2017	30.95	-
STSF	MB22 [a]	673.32 Mar-1999	683.71 Nov-2014	683.71 Nov-2014	10.39	-
STSF	MB25 [a]	649.99 Aug-2001	653.99 May-2023	658.46 Aug-2016	8.47	665
STSF	MB26A	642.48 Aug-2001	644.14 May-2024	648.32 Aug-2016	5.84	-
STSF	MB26B	631.36 Aug-2001	643.73 May-2024	646.5 Nov-2016	15.14	648
STSF	MB27	590.87 Aug-2001	592.49 Jun-2024	592.98 Dec-2021	2.11	594
STSF	MB28B	630.33 Aug-2001	634.50 May-2024	635.28 Aug-2016	4.95	645
STSF	MB29A	638.68 May-2000	640.92 May-2024	642.03 Feb-2024	2.24	-
STSF	MB29B	625.02 Aug-2001	628.78 May-2024	633.16 Oct-2022	8.14	635

Note: (a) monitoring bores are now decommissioned or inactive.

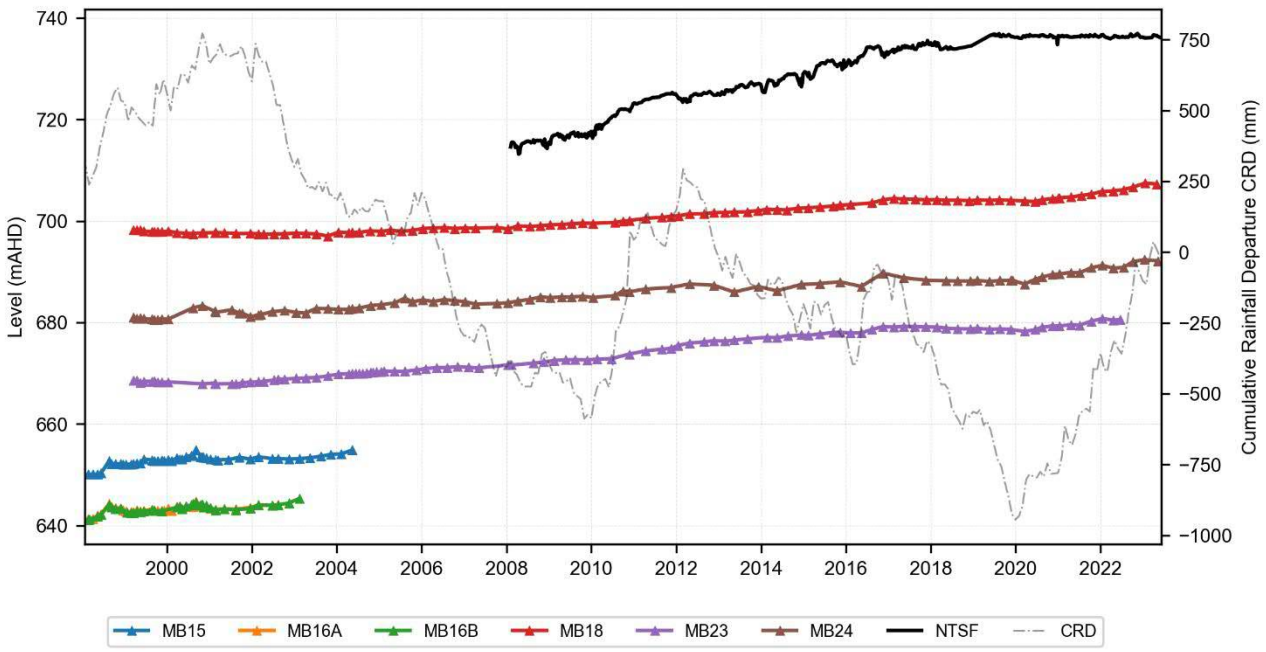


Figure 5.18 NTSF monitoring bores with increasing groundwater levels

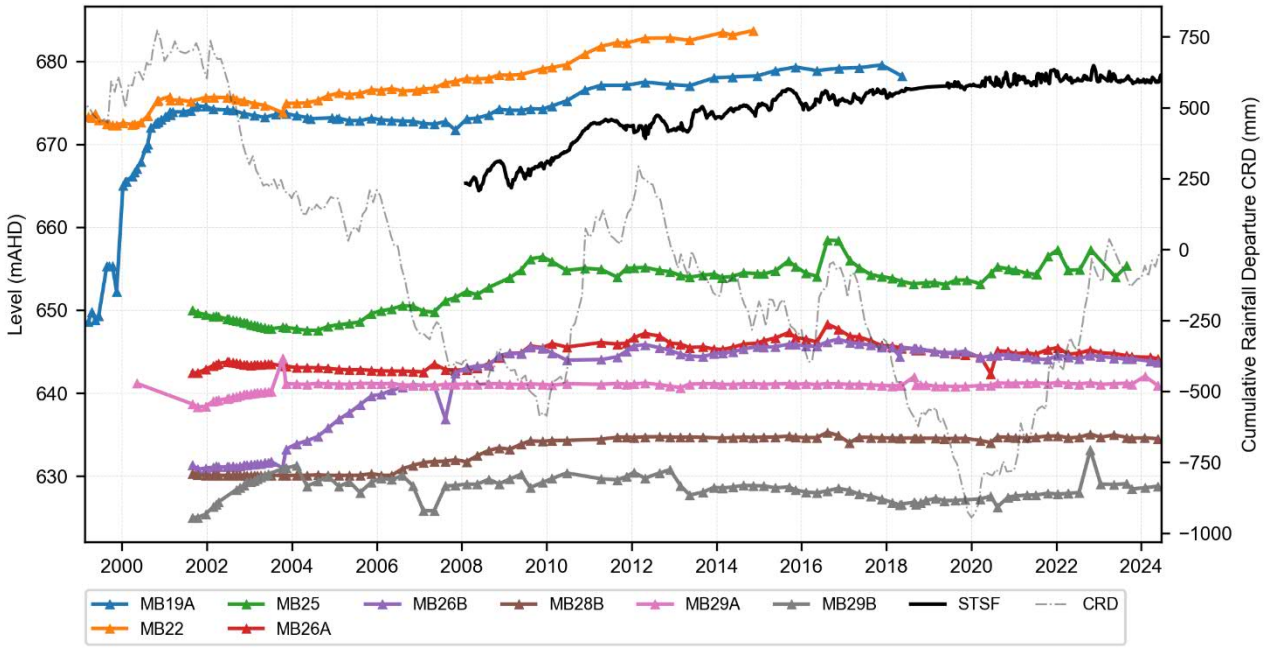


Figure 5.19 STSF monitoring bores with increasing groundwater levels

5.6.2.2 Groundwater quality

Over the 2023/2024 water year, groundwater quality trigger exceedances were recorded in Silurian sediment monitoring bore MB20 (pH) and Ordovician monitoring bore MB68 (mercury), which are further discussed below.

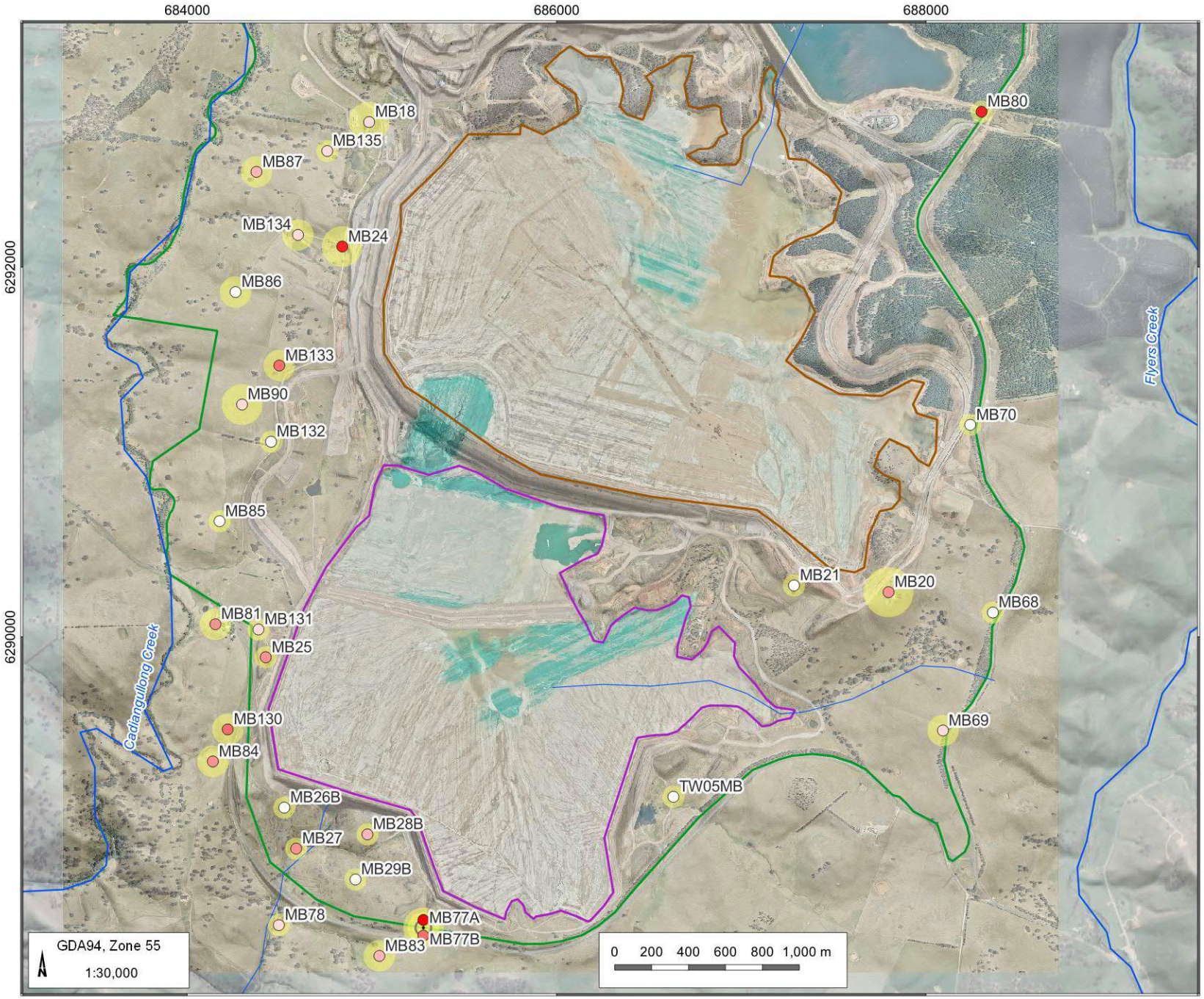
- The cause of the low pH in monitoring bore MB20 is unknown, as are the atypically high concentrations of TDS/sulfate and some dissolved metals (see Section 5.2.2). However, it is noted that the low pH is consistent with the historical dataset and that similar water quality characteristics are not observed in the surrounding monitoring bores.
- Mercury concentrations in monitoring bore MB68 first exceeded the WMP defined assessment criteria in the June 2024 sampling round, but concentrations had previously been increasing since April 2022. Given that this monitoring bore is hydraulically cross gradient of the NTSF and upgradient of the STSF, a TSF related impact is considered unlikely. The source of elevated mercury in this monitoring bore remains unknown and should continue to be monitored.

A review of long-term trends for select analytes (pH, TDS, sulfate, aluminium, arsenic, copper, lead, manganese, nickel, zinc, mercury, nitrite/nitrate, molybdenum, alkalinity, potassium, and sodium) was undertaken, with time series plots provided in Appendix C. Notably, periods of increasing TDS and sulfate concentrations have historically been observed in monitoring bores that have experienced groundwater level increases (MB24, MB25, and MB27), as well as in some monitoring bores where no obvious groundwater level increases are apparent (MB21, MB69, MB78, MB81, MB83, MB84, and MB90). Previous investigations (GHD, 2018) have used increasing sulfate concentrations as an indicator of potential seepage impacts.

Chloride exhibits chemically conservative behaviour and has few sources except for meteoric deposition and mixing with higher chloride end-member waters. A common method in hydrochemistry is to normalise the concentrations of other major ions/elements to the concentration of chloride to identify the potential for source/sink mechanisms. Median sulfate-chloride mass ratios and sulfate concentrations for the 2022/2023 and 2023/2024 water year (i.e. July 2022 to June 2024) are shown in Figure 5.20. Spatial review of this data shows that the sulfate-chloride mass ratio is lower hydraulically upgradient of the TSFs, with the notable exceptions of monitoring bores MB20 (NTSF adjacent) and MB80 (potential Rodds Creek Dam impact). Additionally, the median sulfate-chloride mass ratio generally decreases with distance away from TSFs in hydraulically down gradient locations.

Groundwater quality was compared to reference guideline values for stock watering and freshwater ecosystem protection, with notable 2023/2024 water year observations discussed in Section 5.2.2.

TRH/BTEXN samples from select monitoring bores that are adjacent to Cadiangullong Creek or Rodds Creek were collected over the 2023/2024 water year, with no detection of any TRH fractions or BTEXN compounds recorded (Appendix D; MB26B, MB27, MB28B, MB29A, MB77B, MB78, MB79, MB81, MB83, MB84, MB85, MB86, MB87, MB90, MB130, MB131, MB132, MB133, MB134, and MB135).



LEGEND

- Drainage
- Mining lease
- NTSF
- STSF

NTSF/STSF monitoring bores - median sulfate-chloride mass ratio

- 0.1 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 6 - 7
- 7 - 7.9

Median sulfate concentration

- 10 - 500
- 500 - 1000
- 1000 - 1500
- 1500 - 1530

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Median sulfate-chloride mass ratios and sulfate concentrations in NTSF/ STSF monitoring bores (2022/2023 and 2023/2024 water year)

DATE
29/08/2024

AGE

FIGURE No:
5.20

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5.6.3 Assessment of potential impacts

Beneath and adjacent to the NTSF and the STSF, the rise in groundwater levels are likely due a combination of seepage and poroelastic responses associated with the mass of tailings compressing the underlying rock mass. The extent of these groundwater level increases is largely within 250 m of the facilities (wholly within 500 m) and is well constrained and monitored in the direction of Cadiangullong Creek to the west, and along the Rodds Creek drainage system to the south. TSF related groundwater level increases are similarly well constrained and monitored up hydraulic gradient of the TSFs.

Seepage from the TSF is conceptualised and modelled to be a relatively small flux, with predictions from the AGE (2021) numerical model providing an average of 0.4 ML/day and 0.2 ML/day from the NTSF/STSF, respectively. These predictions are also consistent with the findings of other seepage investigations (KCB, 2019; GHD, 2018). Notwithstanding, historical periods of increasing TDS and sulfate concentrations may indicate that seepage influences have been observed in monitoring bores that are further hydraulically downgradient of the monitoring bores with affected groundwater levels (albeit, still generally at concentrations below reference guideline values for stock watering). Additionally, concentrations of dissolved chromium, mercury, and molybdenum are elevated at some hydraulically down gradient monitoring bores with respect to reference guideline values for freshwater ecosystem protection. In hydraulically down gradient locations, sulfate-chloride mass ratios, which are used as a proxy for the identification of seepage effects, generally decrease with distance away from TSFs. The identification of seepage affected groundwater can be difficult given that water quality of the TSF decant water has similarities with the native groundwater and is of comparable salinity and has low concentrations of most dissolved metals.

With respect to the nearby and hydraulically down gradient potential groundwater receptors of Cadiangullong Creek and Rodds Creek, both the Engeny (2024) surface water assessment and GHD (2024) aquatic ecosystem assessment conclude no mining related impacts are evident. No seepage related surface water impacts are evident in Cadiangullong Creek to the west of the TSFs, while surface water impacts to the south of the STSF are only evident in the ST14 dam that is adjacent to the southern end of the STSF, with no downstream impacts observed (Engeny, 2024). Similarly, no mining related impact is evident in any macroinvertebrate, fish, or platypus communities of Cadiangullong Creek based on aquatic ecosystem monitoring (GHD, 2024).

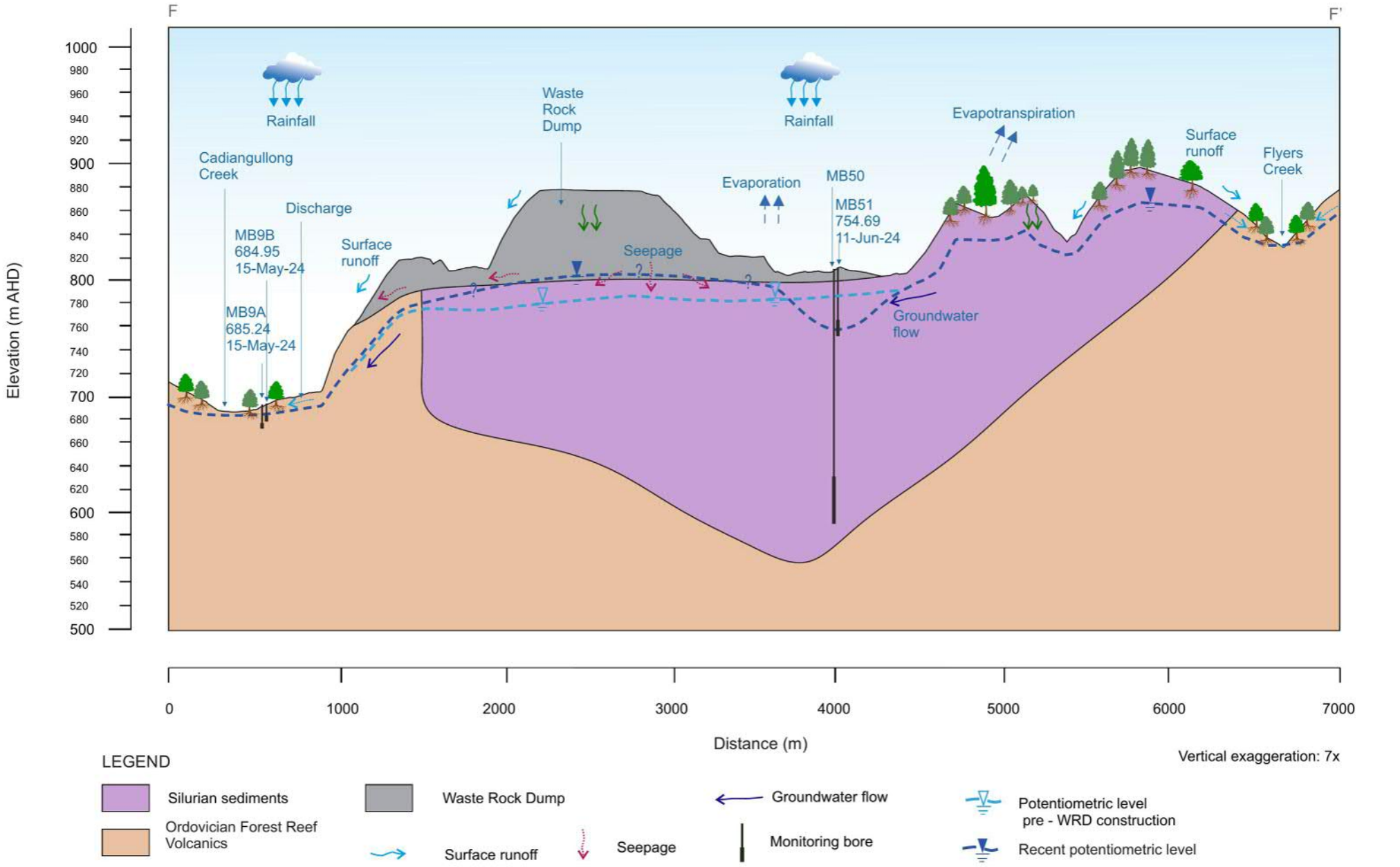
5.7 Southern Waste Rock Dump

5.7.1 Overview and hydrogeological conceptualisation

The SWRD has been in use since mining at the Cadia Hill Pit began in 1998, and it is still in use to support development activities at the Cadia East Mine. Although not observed in the current monitoring network, groundwater levels beneath the SWRD are expected to be elevated relative to natural conditions on account of: (a) enhanced recharge through what is inferred to be more permeable waste material relative to the natural geology; (b) the SWRDs proximity to Rodds Creek Dam; and (c) poroelastic responses associated with the mass of the waste material (Figure 5.21). Groundwater flow beneath the SWRD is inferred to be largely from the east-northeast to the west-southwest, in the direction of Cadiangullong Creek (Figure 4.6). There are two leachate collection dams on the western side of the SWRD and Rodds Creek Dam is located on the eastern side of the SWRD.

The active groundwater monitoring network that surrounds the SWRD is comprised of two deeper Silurian sediment monitoring bores (< 55 mbgl) that are located hydraulically up gradient (although notably close to the Cadia East Mine), as well as 17 monitoring bores that are located hydraulically down gradient (generally shallow, < 23 mbgl) (Figure 5.22). A production bore CB6 is also present adjacent to monitoring bore CB6A, although it is understood to not be consistently active. As per the WMP, groundwater level and groundwater quality data is collected from select shallow monitoring bores that are hydraulically down gradient of the SWRD (Figure 2.1) at either a quarterly or biannual basis.

The nearest potential groundwater receptor is Cadiangullong Creek, which is located approximately 500 m from the toe of the SWRD.



Southern Waste Rock Dump conceptual cross section (F - F')

Figure - 5.21

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

AGE



LEGEND

- Surface water monitoring sites
- Drainage

Monitoring bore network

- Ordovician
- Silurian
- Regolith
- Tertiary basalt
- Inactive
- Unknown

- Mining lease
- Cadia East
- NTSF
- Ore Processing Facilities
- Rodds Creek Dam
- South Waste Rock Dump

Cadia Annual Groundwater Monitoring Review – 2023/2024 Water Year (CAD5020.001)

Southern Waste Rock Dump – surrounding monitoring bores

DATE
29/08/2024

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FIGURE No:
5.22

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5.7.2 Groundwater monitoring data

5.7.2.1 Groundwater levels

As per the WMP, there are no groundwater level assessment criteria defined for the SWRD monitoring bores. Notable historical and 2023/2024 water year trend are detailed below, with hydrographs provided in Appendix C.

- Groundwater level variations in the MB4 to MB11 series of hydraulically down gradient shallow monitoring bores are all consistent with climatic conditions and variations strongly correlate with the CRD.
- Monitoring bore CB6A has clearly been influenced by abstraction from the adjacent production bore CB6 in the past, although levels have remained relatively stable over the 2023/2024 water year.
- No historical groundwater levels that could be associated with the SWRD are apparent at hydraulically upgradient locations (monitoring bores MB50, MB51, and MB52). These monitoring bores are located near raised bores VR81 and VR71, which was drilled in early 2011. The groundwater elevation of monitoring bore MB50 is much lower than the groundwater elevations of monitoring bores MB51 and MB52, which may be due to the draining of groundwater from a water bearing structure during the drilling of raised bore VR71. Groundwater elevations have remained relatively stable over the 2023/2024 water year.

5.7.2.2 Groundwater quality

Over the 2023/2024 water year, groundwater quality trigger exceedances were recorded in Ordovician monitoring bores MB6A (sulfate), MB8A (sulfate and manganese), MB9A (sulfate), and MB11A (sulfate and manganese), which are further discussed below.

- Sulfate concentrations (and salinity) at all four exceeding monitoring bores have been increasing since the onset of monitoring and current concentrations are all greater than stock watering guideline values (1,000 mg/L). Similarly high concentrations are also seen through recently implemented monitoring at adjacent monitoring bores that are installed into the shallow regolith (MB6B, MB8B, and MB9B). Elevated salinity and sulfate concentrations are also observed in SWRD leachate collection dams CAWS34 and CAWS35 (Engeny, 2024). However, no effects of this are evident in downstream monitoring (site 412161) of Cadiangullong Creek (Engeny, 2024)
- WMP defined assessment criteria for manganese were determined based on the 95th percentile of historical observations, and as such intermittent exceedances are not unexpected. Additionally, manganese concentrations are well below reference guideline for ecosystem protection (1.9 mg/L), and stock watering guidelines deem manganese to be insufficiently toxic to warrant development of a guideline value.

A review of long-term trends for select analytes (pH, TDS, sulfate, aluminium, arsenic, copper, lead, manganese, nickel, zinc, mercury, nitrite/nitrate, molybdenum, alkalinity, potassium, and sodium) was undertaken, with time series plots provided in Appendix C. Notably, elevated and increasing TDS and sulfate concentrations are observed in all MB4 to MB11 series monitoring bores, which are hydraulically down gradient of the SWRD and its leachate interception dams. Similarly, metals concentrations (Al, Cd, Cr, Ni, Se) at some monitoring bores are intermittently elevated relative to ecosystem guideline values. No impacts on surface water quality are evident in downstream monitoring of Cadiangullong Creek (Engeny, 2024).

TRH/BTEXN samples from select monitoring bores that are adjacent to Cadiangullong Creek or Rodds Creek were collected over the 2023/2024 water year, with no detection of any TRH fractions or BTEXN compounds recorded (Appendix D; CB6A, MB10A, MB11A, MB4A, MB51, MB5C, MB6A, and MB8A).

5.7.3 Assessment of potential impacts

Groundwater level variations in monitoring bores that are hydraulically down gradient of the SWRD are consistent with climate, and no increases associated with the SWRD are apparent. There is evidence of SWRD leachate influencing the groundwater quality of these monitoring bores, namely elevated concentrations of TDS/sulfate, as well as historical increasing trends observed in monitoring bores MB4A, MB5C, MB6A, MB7A, MB8A, MB9A, MB10A, MB11A. The recent implementation of water quality monitoring in shallow regolith monitoring bores also indicates similarly elevated TDS/sulfate concentrations at most locations.

No effects of this impacted groundwater are evident in downstream monitoring of Cadiangullong Creek (Engeny, 2024). This suggests that the section of Cadiangullong Creek hydraulically down gradient of the SWRD are either not groundwater gaining, or the flux of effected groundwater is not significant enough to alter water chemistry in the creek.

5.8 Other areas

5.8.1 Ore processing area

The groundwater monitoring network that surrounds the ore processing area is comprised of three paired monitoring sites, each of which have a shallow monitoring bore (< 7 mbgl) installed into regolith (MB1B, MB2B, and MB3B) and a deeper monitoring bore that is installed into Ordovician units (MB1A, MB2A, and MB3A) (Figure 4.5). There are also two Ordovician monitoring bores that are adjacent to the now decommissioned production bore CB14 (CB14A and CB14B).

Groundwater level variations are generally consistent with climate, noting that more than a 15 m decline was observed in monitoring bore MB1A between 2005 and 2008, and a steep decline in monitoring bore CB14B was also observed in 2007/2008, likely due to abstraction from production bore CB14 (Appendix C). Groundwater levels have since recovered at these locations.

Over the 2023/2024 water year, groundwater levels at these locations are consistent with climatic conditions and where available (MB1A, MB2A, and MB3A), groundwater quality records are consistent with historical records (Appendix C). EC concentrations in these Ordovician monitoring bores remain elevated over the reporting period, with approximate June 2024 concentrations of 3,500 µS/cm, 3,400 µS/cm, and 4,200 µS/cm in monitoring bores MB1A, MB2A, and MB3A, respectively. Given the range of pre-mining EC that is presented in Woodward-Clyde (1995)[8], effects from the ore processing area since the onset of monitoring in 1998 are likely, with the site runoff pond a potential source. A single sampling event in 2015 of adjacent shallow regolith bores (MB2B and MB3B), suggests that the near surface groundwater is not effected to the same degree.

TRH/BTEXN samples from select monitoring bores that are adjacent to Cadiangullong Creek or Rodds Creek were collected over the 2023/2024 water year, with no detection of any TRH fractions or BTEXN compounds recorded (Appendix D; MB1A, MB2A, and MB3A).

5.8.2 Regional monitoring

Regular landholder bore groundwater level monitoring data was available for WMP stipulated bores (GW704284, GW702315, GW704373, GW701686, GW702510, GW057116, and SS_B1), plus additional non stipulated bores (GW255 and GW267). These bores are largely screened in the Tertiary basalt, although GW704373 and GW704284 are reported to be installed withing limestone and sandstone strata, respectively. All monitored landholder bores are located to the east and northeast of the Cadia East Mine (Figure 5.23).

Monthly monitoring data for these landholder bores is generally available between October 2022 and May 2023 (Figure 5.24 and Figure 5.25), which was collected as a response to the VR14-1 shaft incident (Section 5.5.1). AGE were advised by CHPL that the landowner bore monitoring program as defined in the WMP is yet to be initiated as approval for long term land access needs to be negotiated. As such, this review does not include comparison to the WMP defined triggers (i.e. the Aquifer Interference Policy minimal impact considerations).

Other 'regional' [9] bores that are monitored by Cadia, are located further to the north and east of the Cadia East Mine, outside, or on the outer edge of modelled drawdown/depressurisation predictions (bores MB53, MB54, MB55, MB56, MB63, MB64, MB65, MB71, MB72, MB74, MB75, RB01). Hydrographs for several of these bores (Appendix C) show historical groundwater level variations that are likely indicative of private abstraction from nearby supply bores.

[8] 95th percentile of 63 samples equal to approximately 2,500 µS/cm.
[9] Defined in this investigation as a bore that is more than 2 km distant from any of the previously defined operational areas.

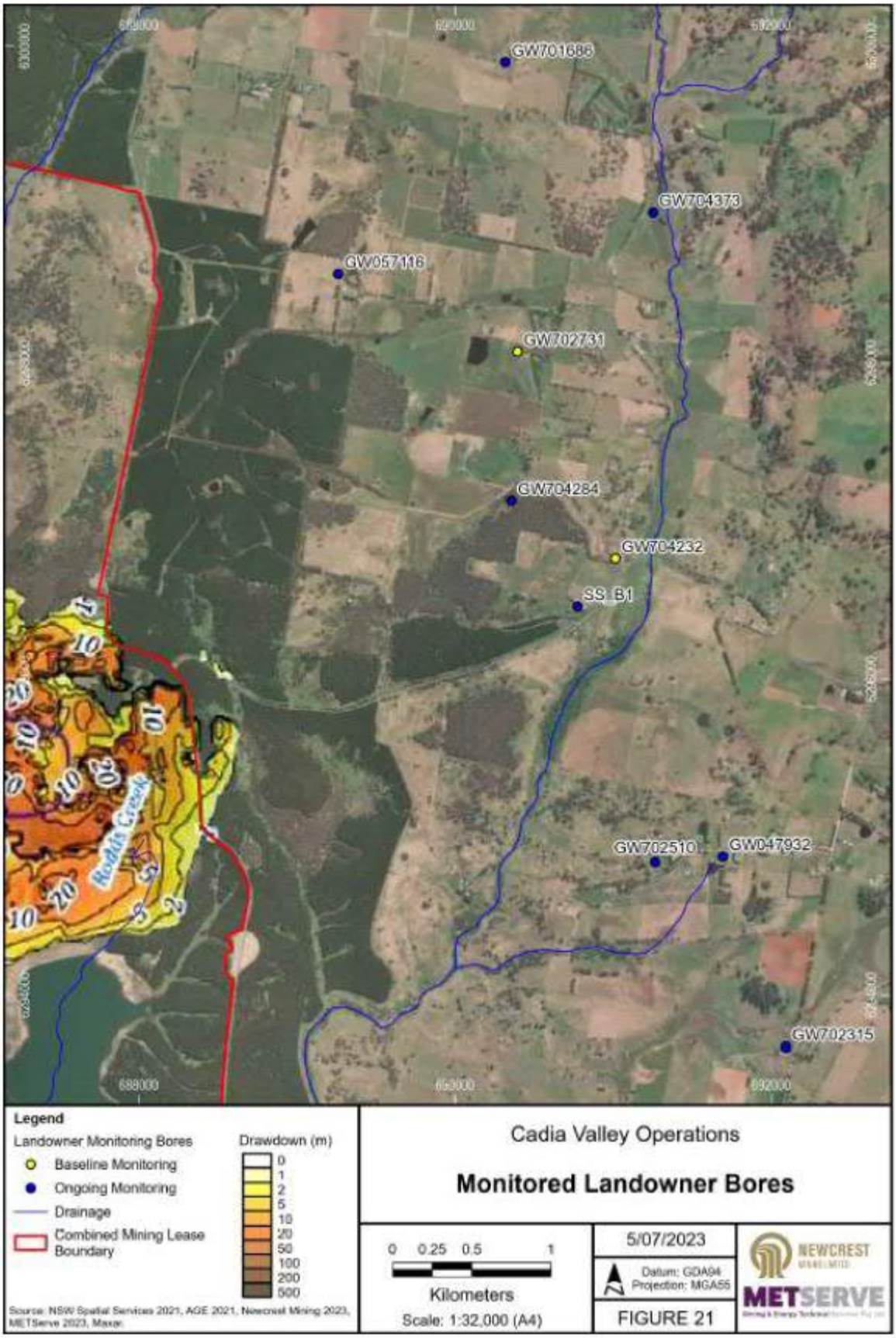


Figure 5.23 Monitored landholder bores after Newcrest (2023)

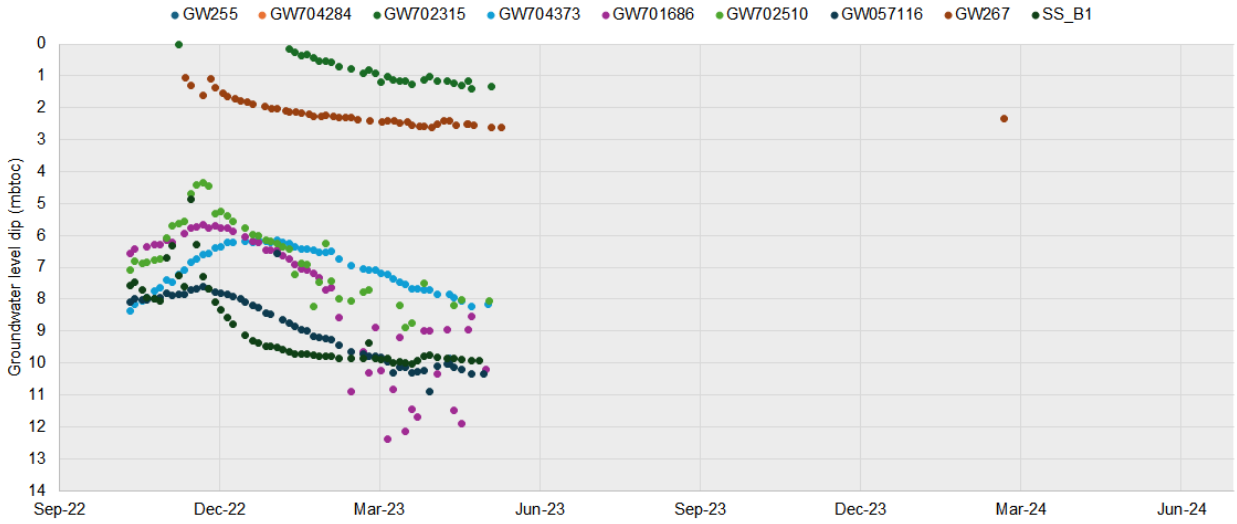


Figure 5.24 Landholder bore groundwater levels (1 of 2)

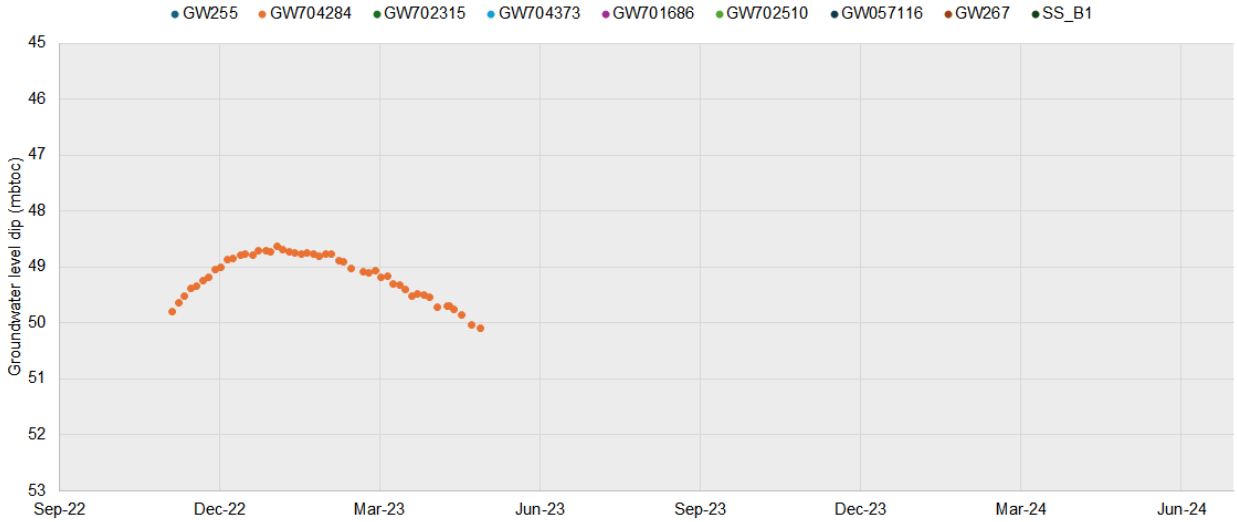


Figure 5.25 Landholder bore groundwater levels (2 of 2)

5.8.3 CCOP monitoring bores

Additional groundwater monitoring bores have been installed to support groundwater assessments for the Cadia Continued Operations Project (CCOP). While these monitoring bores are not part of the WMP defined monitoring network, groundwater level and groundwater quality data are still regularly collected. These monitoring bores are either located:

- to the south of the STSF in association with the proposed South Tailings Storage Facility (STSFX) (monitoring bores MB102 to MB112); or
- to the east of the Cadia East Mine (monitoring bores MB122 to MB129; plus MB113 and MB116); or
- adjacent to surrounding watercourses (monitoring bores MB122 to MB129).

Groundwater level and groundwater quality trends for these monitoring bores are presented as time series plots in Appendix C. Additionally, water quality data over the 2023/2024 water year are also tabulated in Appendix D, which includes a comparison against the reference guideline values discussed in Section 5.2.2.

Over the 2023/2024 water year, the monitoring bores did not exceed stock watering guideline values, with the exception of a single sulfate exceedance in monitoring bore MB111 (Appendix D). TDS and sulfate concentrations within CCOP monitoring bores to the south of the STSF (monitoring bores MB102 to MB112) are notably lower than the concentrations observed in monitoring bore proximal to the STSF that are likely to be affected by seepage (Section 5.6.2). There were some exceedances of aquatic ecosystem guideline values for dissolved metals (Appendix D); however these occurrences are generally sporadic, and in the case of aluminium, copper, and zinc are regionally prevalent and also occur in monitoring bores that are upgradient of site activities.

Elevated pH levels have been observed within several of the CCOP monitoring bores, with the following trends identified.

- Monitoring bores where pH is typically greater than 10 for the majority of the monitoring record (MB105, MB106, MB124). The elevated pH levels that are observed within these bores are likely to be associated with grout related installation issues, either through fractures within the grout seal and/or grout penetrating into the filter pack. In addition to the atypically high pH, monitoring bores MB106 and MB124 also have relatively elevated alkalinity and calcium concentrations, as well as high calcium-chloride mass ratios, which are also indicators of grout effects.
- pH is consistently elevated (~ 9 to 10) in monitoring bore MB127, but decreasing with time. The elevated pH levels in this bore may be associated with inadequate bore development and remnant impacts from drilling fluids (note the high sodium-chloride mass ratios), which is improving with time as the monitoring bore is purged each sampling round.
- Monitoring bores where pH was elevated at the onset of monitoring, with levels now being more consistent with other surrounding monitoring bores (MB102, MB103, MB104, MB111, MB121, and MB125). Again, these historically elevated pH levels may be associated with inadequate bore development and remnant impacts from drilling fluids, which then improved with time as each monitoring bore continued to be purged.

In all cases, the elevated pH levels that have been observed within CCOP monitoring bores are not associated with seepage from mine water storages. The aforementioned bores are either, not hydraulically down gradient of any potential sources (i.e. MB124, MB125, and MB127), while in the case of the monitoring bores that may be hydraulically down gradient of the NTSF/STSF and associated water storages (i.e. MB102, MB103, MB104, MB105, MB106, MB111, and MB121), elevated pH levels are not seen nearer to the potential sources and the pH of the potential source water itself is circumneutral to slightly alkaline (Section 4.5). Recommendations relating to the either further development or the replacement of these bores are provided in Section 7.

6 Statement of compliance

Groundwater monitoring over the 2023/2024 water year was largely compliant with the prescribed sampling locations and frequency listed the WMP. With respect to the data that was provided to AGE, some discrepancies were identified; however, these are unlikely to impact the findings of this investigation. These discrepancies are outlined below.

- No groundwater level or quality data was collected from NTSF/STSF monitoring bores MB18, MB23, MB24, and MB25. It is understood that these monitoring bore were decommissioned as part of upcoming changes to the TSF footprint and have been replaced by the MB130 to MB135 series of monitoring bores. The WMP needs to be amended to reflect this.
- No groundwater level or quality data was collected from PTSF monitoring bore MB94. This bore has been decommissioned on account of rising PTSF level and the WMP needs to be amended accordingly.
- No groundwater quality data for monitoring bore MB100 was collected over the 2023/2024 water year; however it is understood that there was an insufficient water column within the monitoring bore to sample.
- Insufficient hydrocarbon sampling frequency for monitoring bores MB1A, MB2A, and MB3A (2 of 4). It is noted that oil and grease in water was sampled, but not TRH/BTEXN.

7 Recommendations

Based on this annual groundwater monitoring review, AGE recommend the following.

WMP amendments

Amend WMP to replace decommissioned NTSF/STSF monitoring bores

It is understood that monitoring bores MB18, MB23, MB24, and MB25 were decommissioned as part of upcoming changes to the NTSF/STSF footprint and have been replaced by the MB130 to MB135 series of monitoring bores. The WMP needs to be amended to reflect this.

Revise water quality triggers in monitoring bores that are hydraulically down gradient of potential contaminant sources (i.e. PTSF, NTSF, STSF, and SWRD) in consultation with an independent hydrogeologist.

The current WMP presents all water quality triggers as SSGVs, although in reality, water quality triggers are SSGVs only in part (where triggers are based on the 95th percentile of historical data). Most of the water quality triggers presented are based on guideline water quality values. Additionally, it appears that the SSGV approach has generally only been adopted for monitoring bores where concentrations exceed guideline values. This is particularly true for TDS and sulfate, which are analytes that have previously been used to identify impacts. Given that the purpose of an SSGV is to detect changing conditions, SSGVs should be adopted even when concentrations are lower than guideline values, particularly for analytes that are non-toxicants[10] such as TDS and sulfate.

An alternate two tiered approach to water quality compliance is recommended, which would better identify changing conditions and potential impacts. At a high level this approach may consist of:

1. **Observation bores** – For monitoring bores adjacent to potential contaminant sources (some of which may already be effected) derive SSGVs for non-toxicants only.
2. **Compliance bores** – For monitoring bores that are further hydraulically down gradient of the observation bores, but still between potential contaminant sources and receptors, derive SSGVS for non-toxicants in addition to a comparison against suitable guideline values for toxicants. If sufficient baseline monitoring data is available, and toxicant concentrations exceed suitable guideline values, toxicant SSGVs should be derived.

Adopt water quality triggers for dissolved molybdenum

Dissolved molybdenum may serve as a useful seepage indicator given the high concentrations within TSF decant water relative to groundwater.

Data review

Where there are discrepancies in the attribution of a monitoring bores screened geology, undertake a detailed review

An assessment of potential groundwater impacts can be highly sensitive to differences in screened geology. As such, the discrepancies that are highlighted in Appendix A should be investigated. This review should be primarily based on bore logs, which should also be collated during this review. Where bore logs are not available, the screened geology should be inferred based on the most contemporary site geological model in combination with surrounding exploration bore hole logs. Local surface geological mapping should be used as a last resort.

[10] Definition of a 'toxicant' for this investigation is based on ANZG (2018) definitions. In the context of the Cadia groundwater sampling suite, toxicants are dissolved metals/metalloids, nutrients, and TRH/BTEXN, while non-toxicants are pH, measures of salinity, and major ions.

Additional monitoring

Implement landowner bore monitoring program as per the WMP

Landowner bore monitoring program as defined in the WMP is yet to be initiated as approval for long term land access needs to be negotiated. This should be initiated as soon as is feasible to ensure consistency with the WMP. Once implemented, a quarterly groundwater gauging frequency is recommended. If bores are actively abstracted from, it is recommended that water level data loggers be installed to collect high frequency data.

Install additional shallow monitoring bores adjacent to Cadiangullong Creek to the west of effected SWRD monitoring bores

There is evidence of SWRD leachate influencing the groundwater quality within hydraulically down gradient monitoring bores. Given that Cadiangullong Creek is the nearest potential receptor, it is recommended that additional monitoring bores are installed adjacent to the creek, within the shallow regolith (if saturated). These bores would have the added benefit of being appropriate for use as compliance bores as per the two tiered trigger approach that is described above.

Conduct quarterly groundwater quality monitoring within shallow series of ore processing monitoring bores

Ordovician monitoring bores in the ore processing appear to be effected by mining activities (MB1A, MB2A, and MB3A). However, there is no ongoing water quality monitoring in shallower co-located regolith monitoring bores (MB1B, MB2B, and MB3B).

Undertake groundwater quality sampling at additional monitoring bores that are hydraulically downgradient of the STSF

For more widespread monitoring down hydraulic gradient of the STSF (likely baseline conditions), it is recommended that quarterly groundwater quality sampling be undertaken in monitoring bores that are further hydraulically down gradient and deemed suitable (e.g. MB107, MB109, MB110, and MB121).

Increase frequency of groundwater quality sampling in monitoring bore MB68 from annually to quarterly

Currently, groundwater levels in this monitoring bore are collected on a quarterly basis, while water quality samples are collected annually. Given the atypical mercury concentrations, it is recommended that the frequency of water quality sampling be increased to a quarterly frequency.

Bore function

Investigate efficacy of surface seal for monitoring bore MB30

Groundwater level and groundwater quality variations in monitoring bore MB30 may indicate that the surface seal of this bore is damaged. It is recommended that CHPL investigate the integrity of this bore and repair or redrill as required.

Rehabilitation of CCOP monitoring bores with atypical pH levels

It is recommended that monitoring bores MB105, MB106, and MB124, which exhibit the effects of grout impacts, are decommissioned and reinstalled at a nearby location. These monitoring bores are still suitable for groundwater level monitoring purposes in the interim.

Additional development of other bores where pH levels may be influenced by inadequate development/residual drilling fluids is recommended. This is required for monitoring bore MB127, but is also likely to be beneficial for monitoring bores MB102, MB103, MB104, MB111, MB121, and MB125.

Groundwater sampling methodology

General groundwater sampling improvements

Majority of groundwater sampling is undertaken via low flow purging methods. As such, consistent records of purged volumes and drawdown should be kept to demonstrate that the method is being implemented correctly.

Although sampling with bailers is limited, no explicit procedure was provided as part of this review and field records indicate that bailers are being used to remove a single ‘slug’ of water, rather than being used to purge the bore. It is understood that CHPL have already implemented these changes within an updated version of the procedure.

8 References

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Appendix A

Groundwater system attribution discrepancies

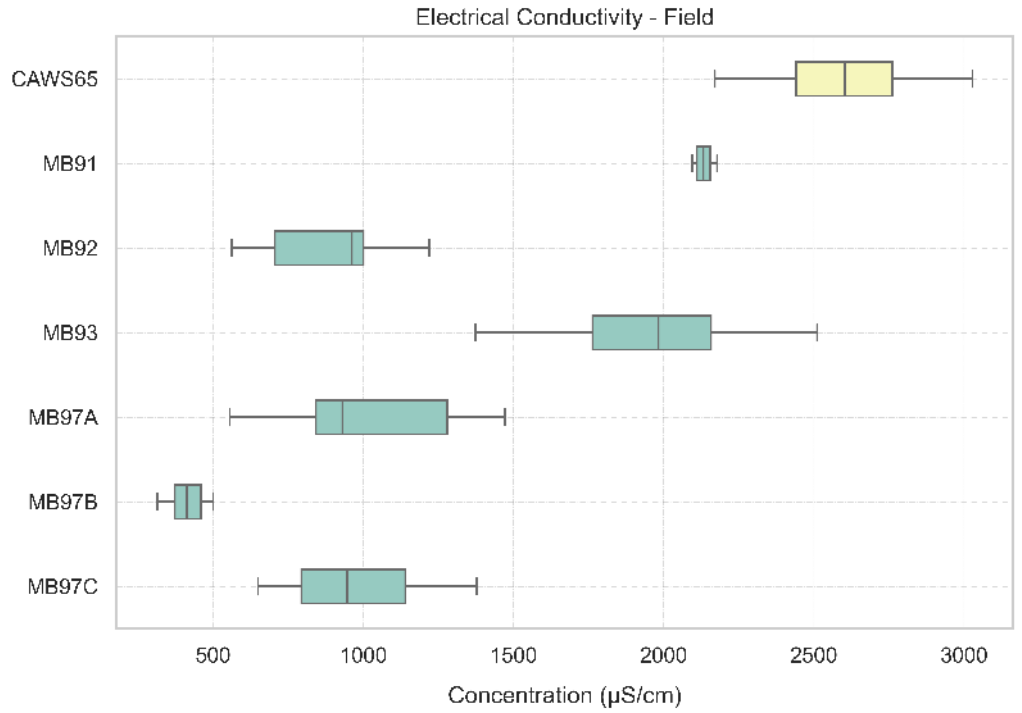
ID	Screened interval (mbgl)	Aquifer attribution		
		This report [a]	Umwelt [b c]	Cadia database [b c]
CB14	48-92	Ordovician	-	**Silurian**
CB14A	6.3-12.3	Ordovician	Ordovician	**Silurian**
CB14B	31.5-37.5	Ordovician	Ordovician	**Silurian**
CB3	0-52	Ordovician	-	**Silurian**
CB5	0.3-82	Ordovician	-	**Silurian**
CB6A	0.5-38	Ordovician	Ordovician	**Silurian**
MB10A	12.0-18	Ordovician	Ordovician	**Silurian**
MB11A	12.0-18	Ordovician	Ordovician	**Silurian**
MB18	17.6-29.6	Ordovician	Ordovician	**Silurian**
MB1A	28.5 - 34.5	Ordovician	Ordovician	**Silurian**
MB25	18.5-30.5	Tertiary basalt	Tertiary basalt	**Ordovician**
MB3A	10.0-16	Ordovician	Ordovician	**Silurian**
MB43	75-175	Ordovician	**Silurian**	**Silurian**
MB44A	82-142	Ordovician	**Silurian**	**Silurian**
MB48	26-69	Ordovician	**Silurian**	**Silurian**
MB65	26-62	Ordovician	**Tertiary basalt**	**Silurian**
MB77A	6.0-12	Ordovician	Ordovician	**Silurian**
MB77B	23-29	Ordovician	Ordovician	**Silurian**
MB79	34-40	Ordovician	Ordovician	**Silurian**
MB7A	12.0-18	Ordovician	Ordovician	**Silurian**
MB80	54-64	Ordovician	**Silurian**	**Silurian**
MB81	14-19	Ordovician	Ordovician	**Silurian**
MB82	91-103	Ordovician	**Tertiary basalt**	**Silurian**
MB84	10.97-13.97	Ordovician	**Tertiary basalt**	**Silurian**
MB85	25.84-22.84	Ordovician	Ordovician	**Silurian**
MB89	114-126	Silurian	-	**Ordovician**
MB8A	11.5-17.5	Ordovician	Ordovician	**Silurian**
MB91	138-150	Silurian	**Ordovician**	**Ordovician**
PZ10	75-85	Silurian	Silurian	**Ordovician**
PZ10A	30-54	Silurian	Silurian	**Ordovician**
PZ4	36-45	Silurian	**Ordovician**	**Ordovician**
PZ5	83-95	Silurian	**Ordovician**	**Ordovician**
RS03	6.5-8.0	Tertiary basalt	Tertiary basalt	**Regolith**

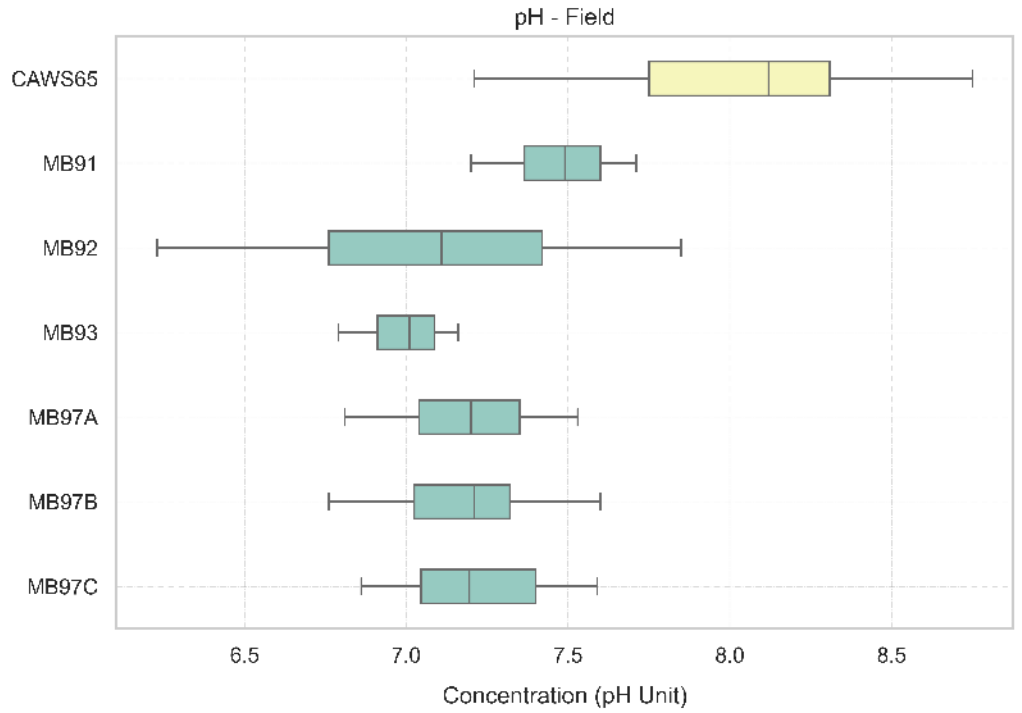
ID	Screened interval (mbgl)	Aquifer attribution		
		This report [a]	Umwelt [b c]	Cadia database [b c]
RS07	10.0-11.5	Tertiary basalt	Tertiary basalt	**Regolith**
RS08	8.5-10.0	Tertiary basalt	Tertiary basalt	**Regolith**
RS09	4.3-5.8	Tertiary basalt	Tertiary basalt	**Regolith**
RS10A	2.4-2.9	Tertiary basalt	Tertiary basalt	**Regolith**
RS10B	2.5-4.0	Tertiary basalt	Tertiary basalt	**Regolith**
RB04	Unknown	Ordovician	Ordovician	**Silurian**
RB05	6.0-21	Ordovician	**Tertiary basalt**	**Silurian**

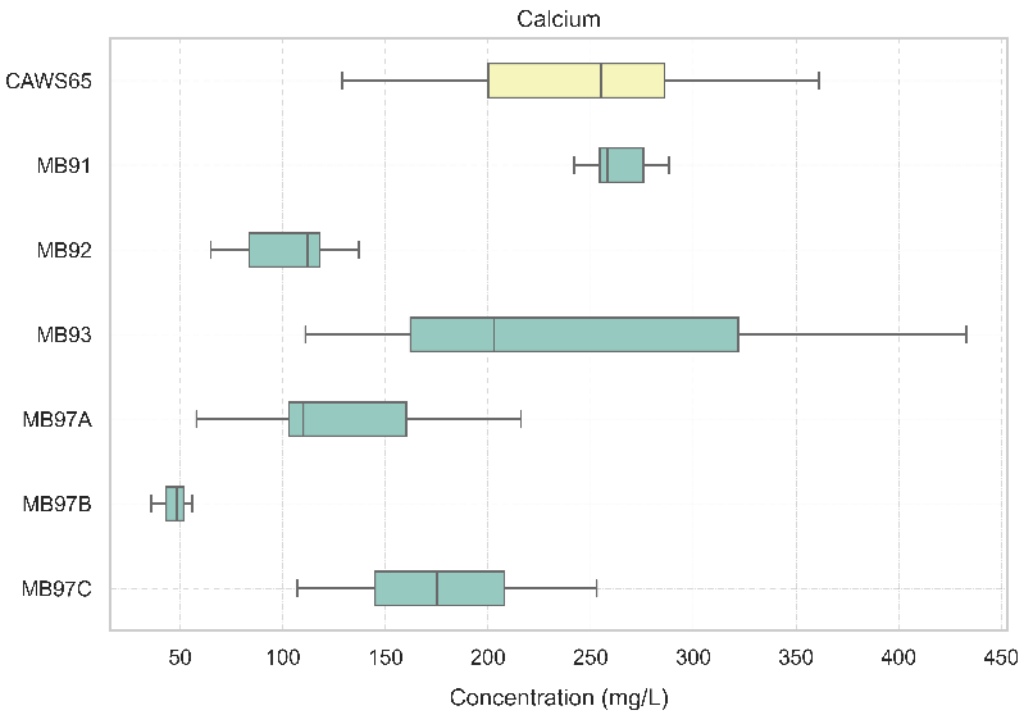
Note: (a) Difference to Cadia database largely based on AGE (2021) geological model;
(b) Classification simplified for easy comparison between sources; and
(c) Sourced from Cadia provided '*REG-Groundwater Bore Details and Water Levels.xlsm*'.

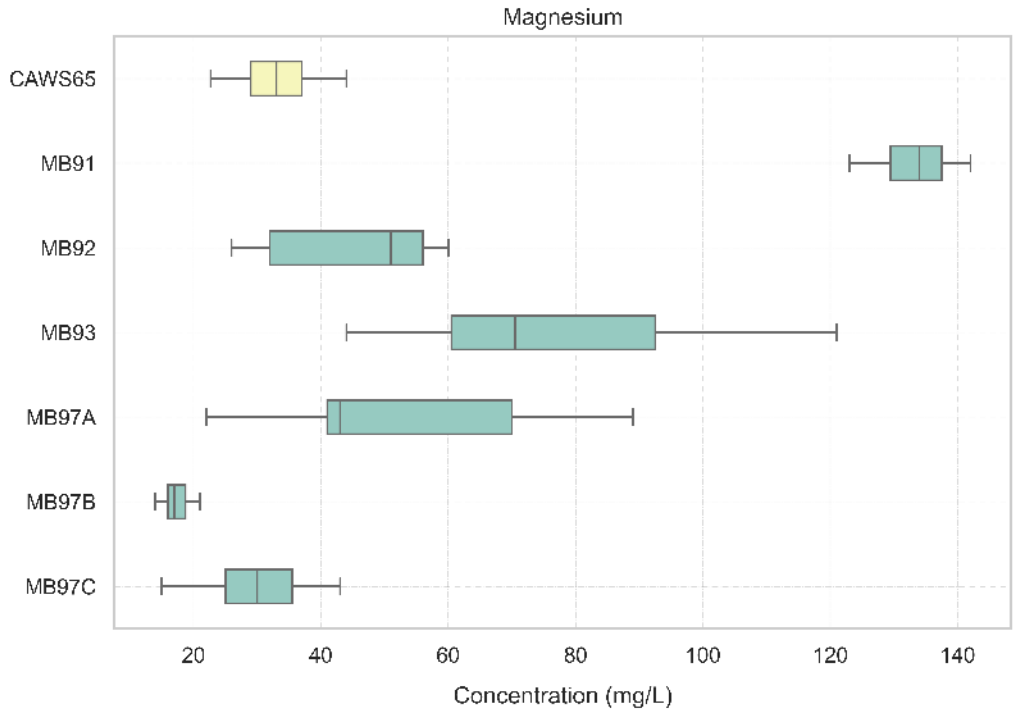
Appendix B

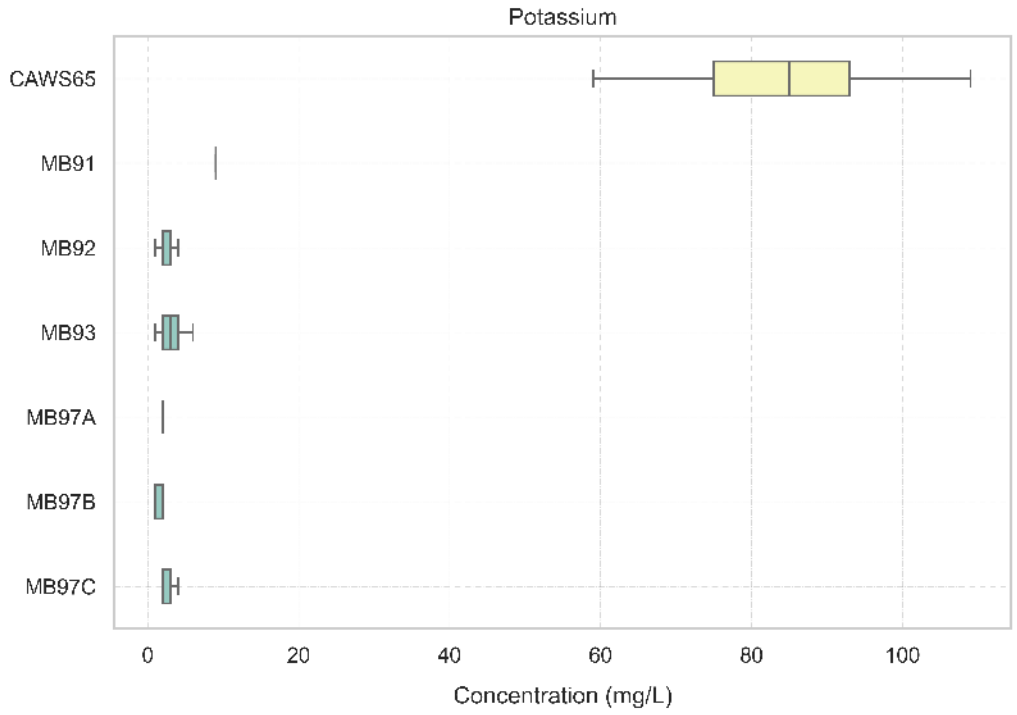
TSF water quality box plots

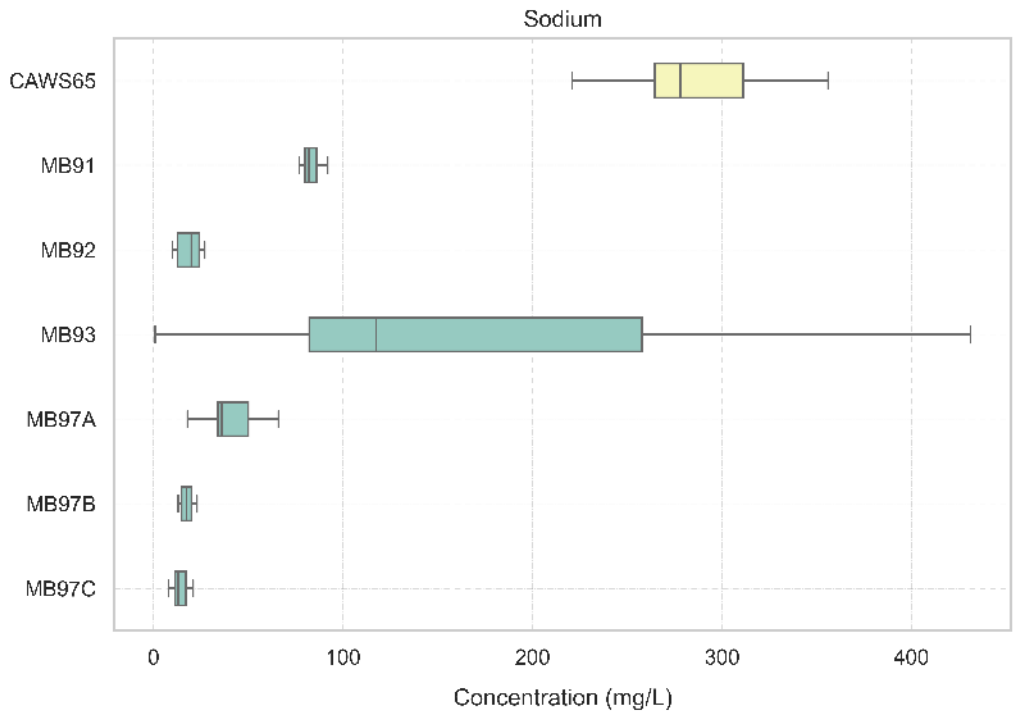

Electrical Conductivity - Field
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
500
1000
1500
2000
2500
3000
Concentration (µS/cm)

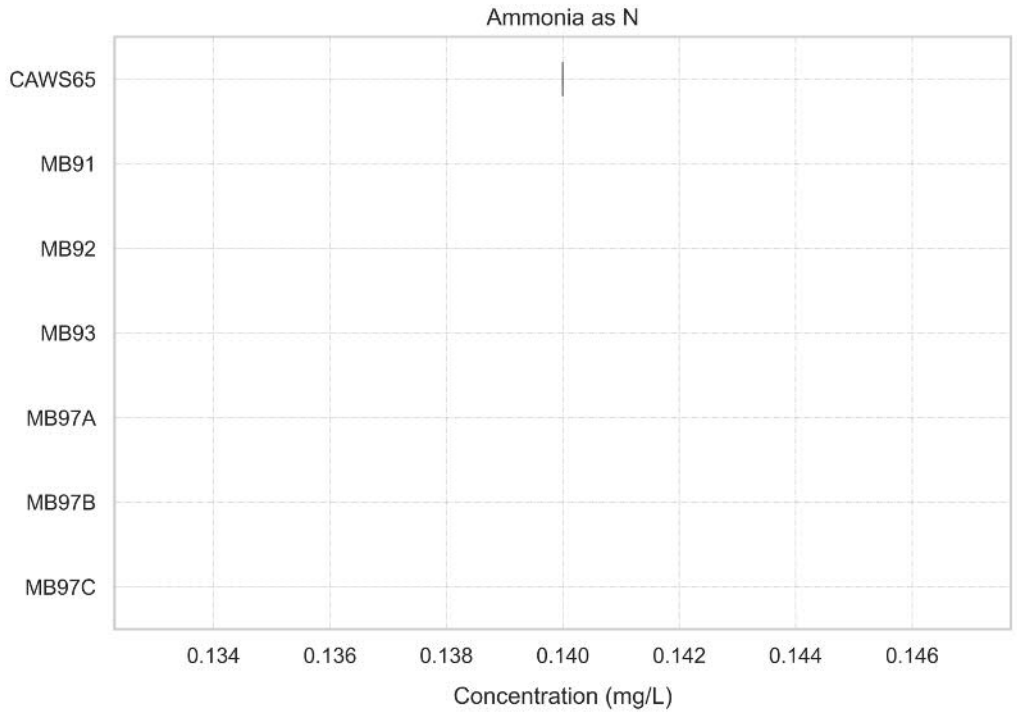

pH - Field
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
6.5
7.0
7.5
8.0
8.5
Concentration (pH Unit)

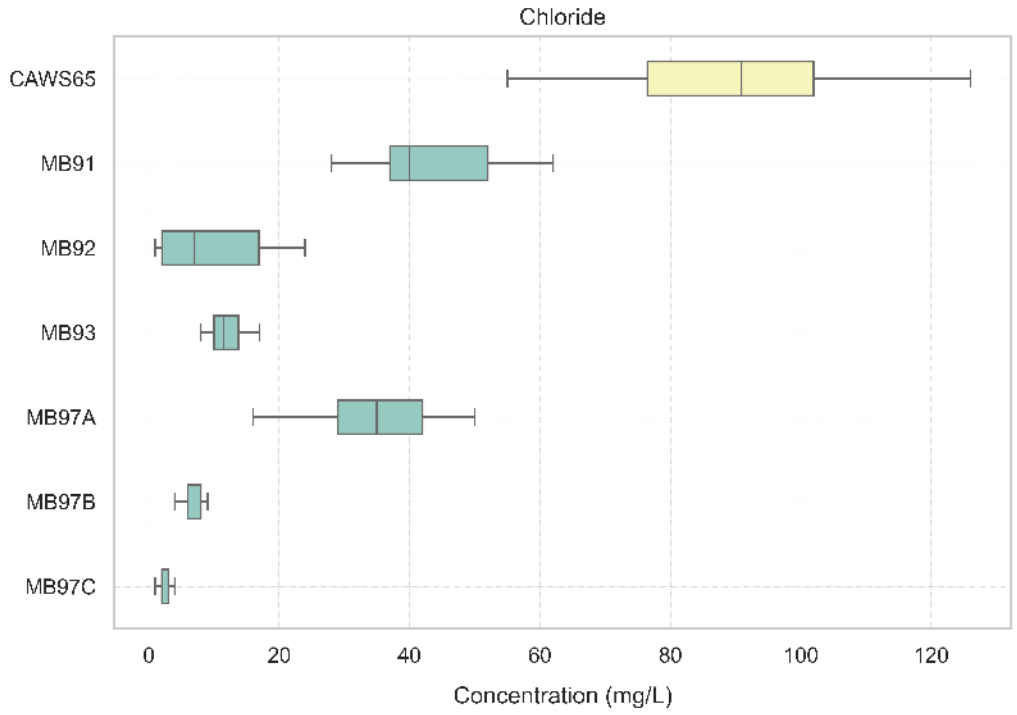

Calcium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
50
100
150
200
250
300
350
400
450
Concentration (mg/L)

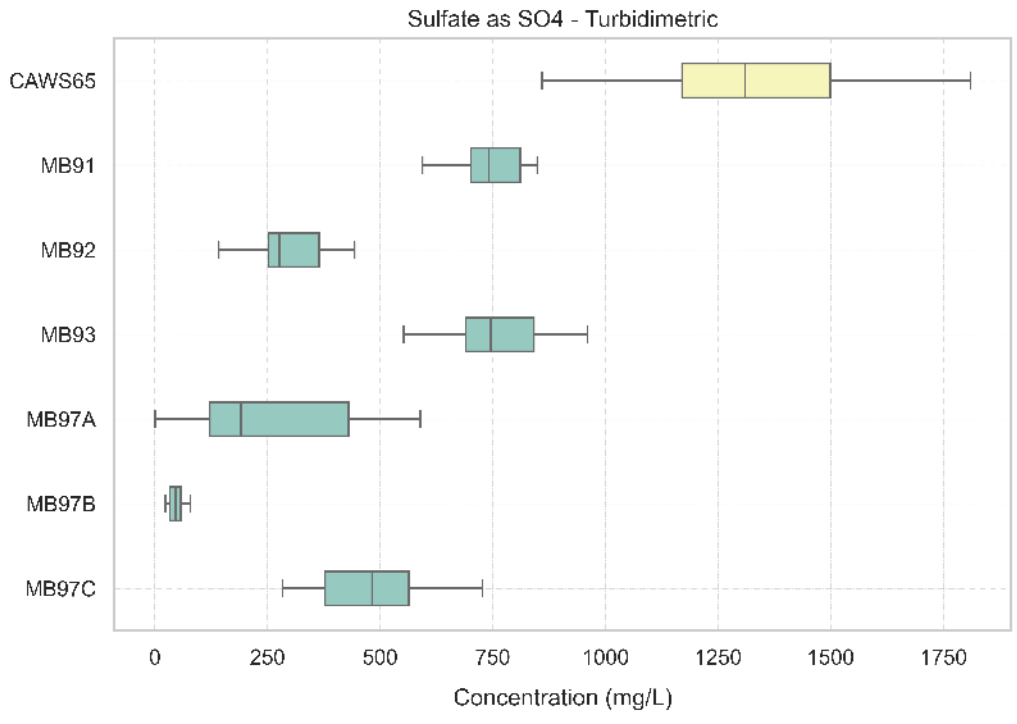

Magnesium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
20
40
60
80
100
120
140
Concentration (mg/L)

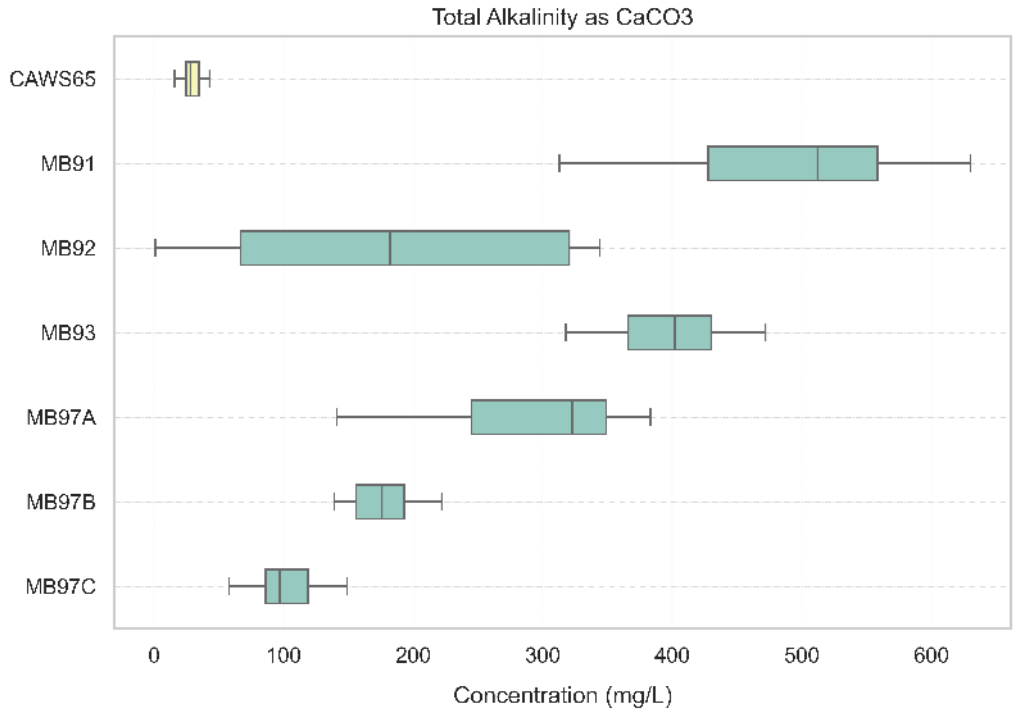

Potassium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
20
40
60
80
100
Concentration (mg/L)

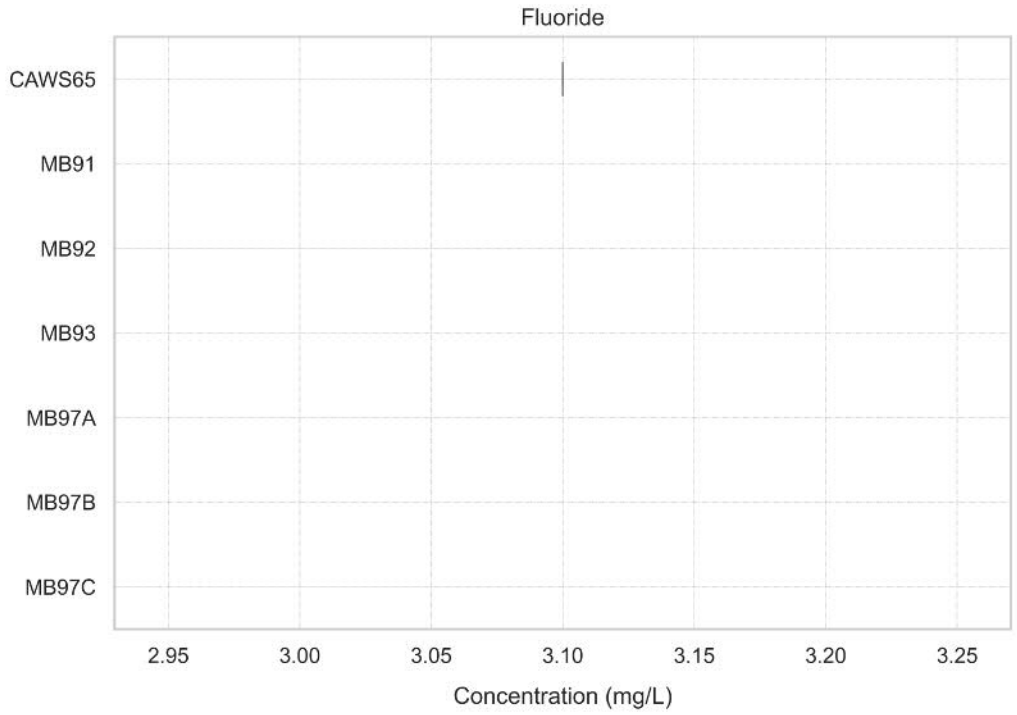

Sodium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
100
200
300
400
Concentration (mg/L)

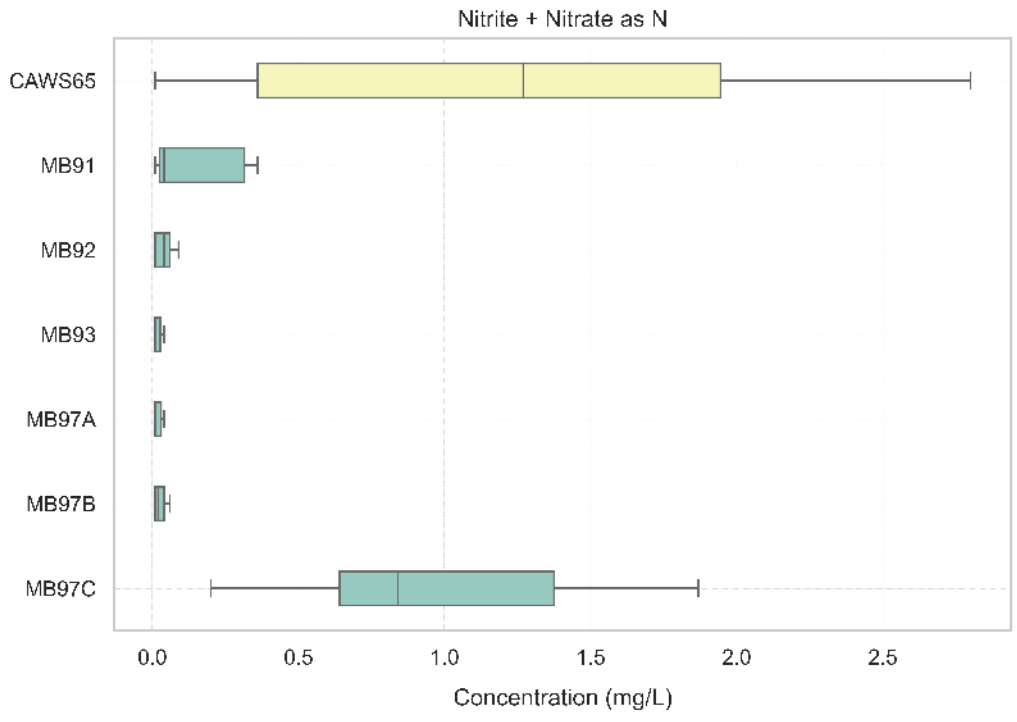

Ammonia as N
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.134
0.136
0.138
0.140
0.142
0.144
0.146
Concentration (mg/L)

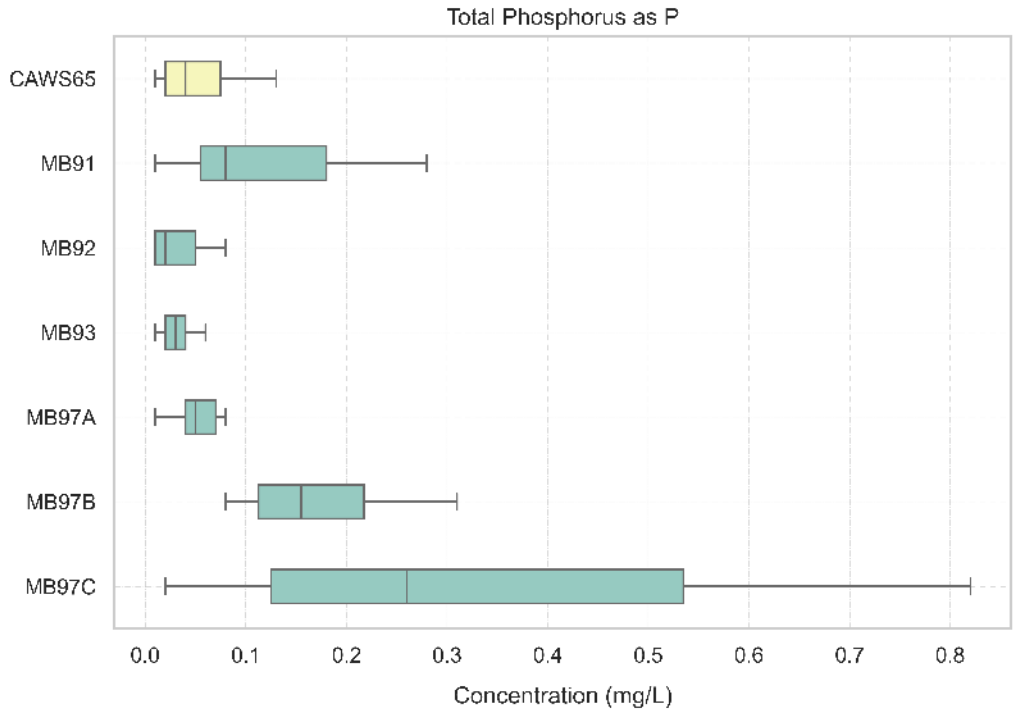

Chloride
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
20
40
60
80
100
120
Concentration (mg/L)

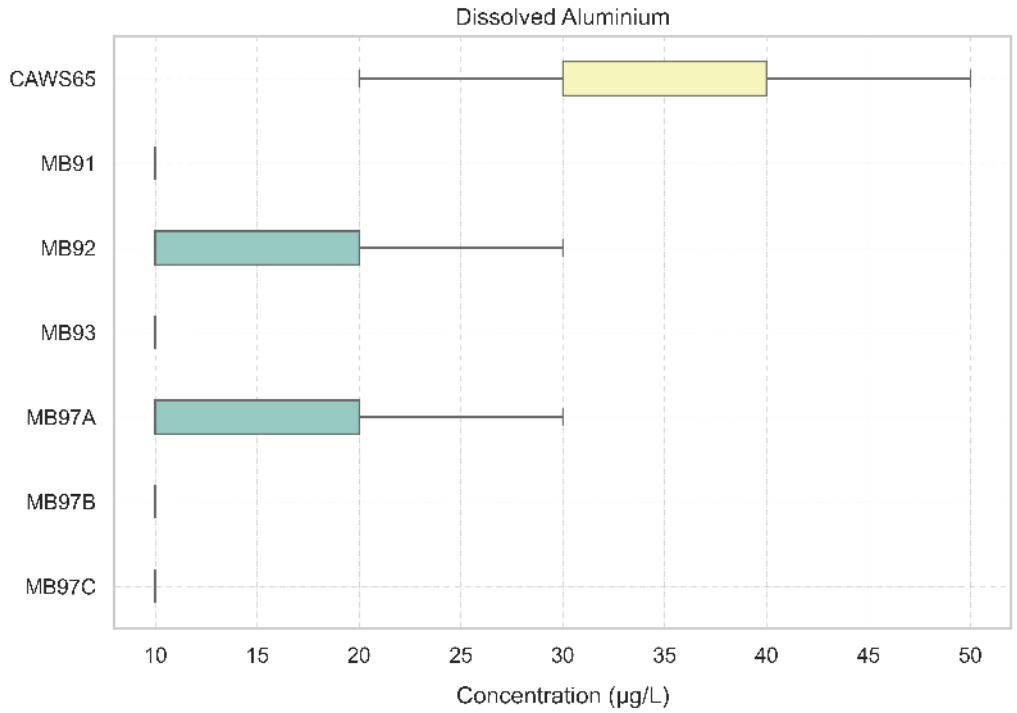

Sulfate as SO4 - Turbidimetric
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
250
500
750
1000
1250
1500
1750
Concentration (mg/L)

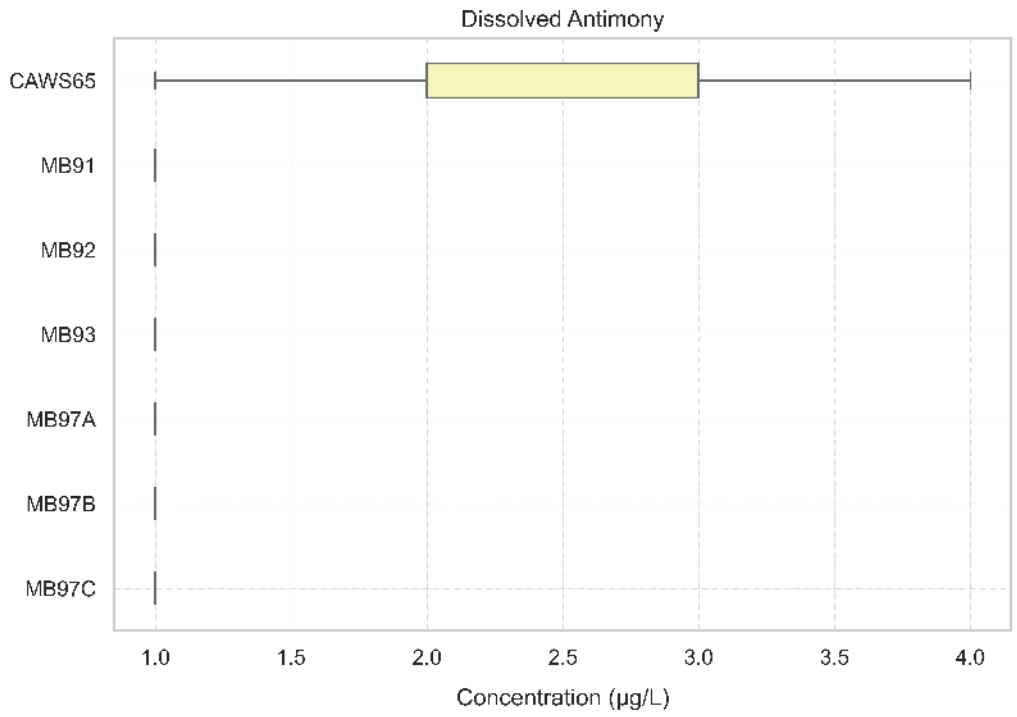

Total Alkalinity as CaCO3
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
100
200
300
400
500
600
Concentration (mg/L)

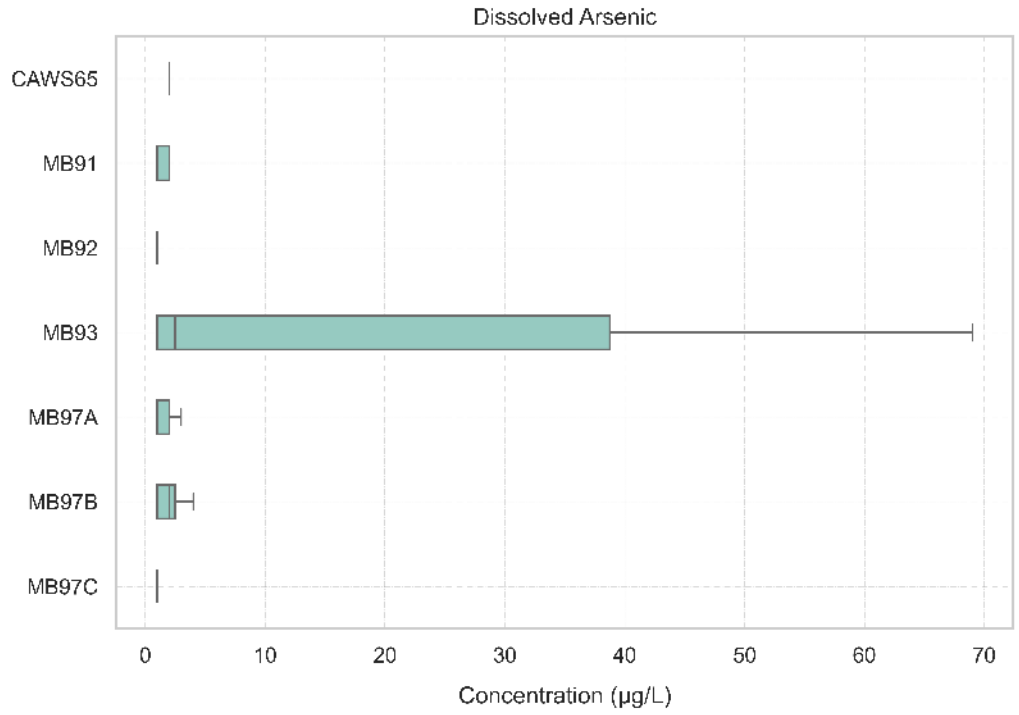

Fluoride
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
2.95
3.00
3.05
3.10
3.15
3.20
3.25
Concentration (mg/L)

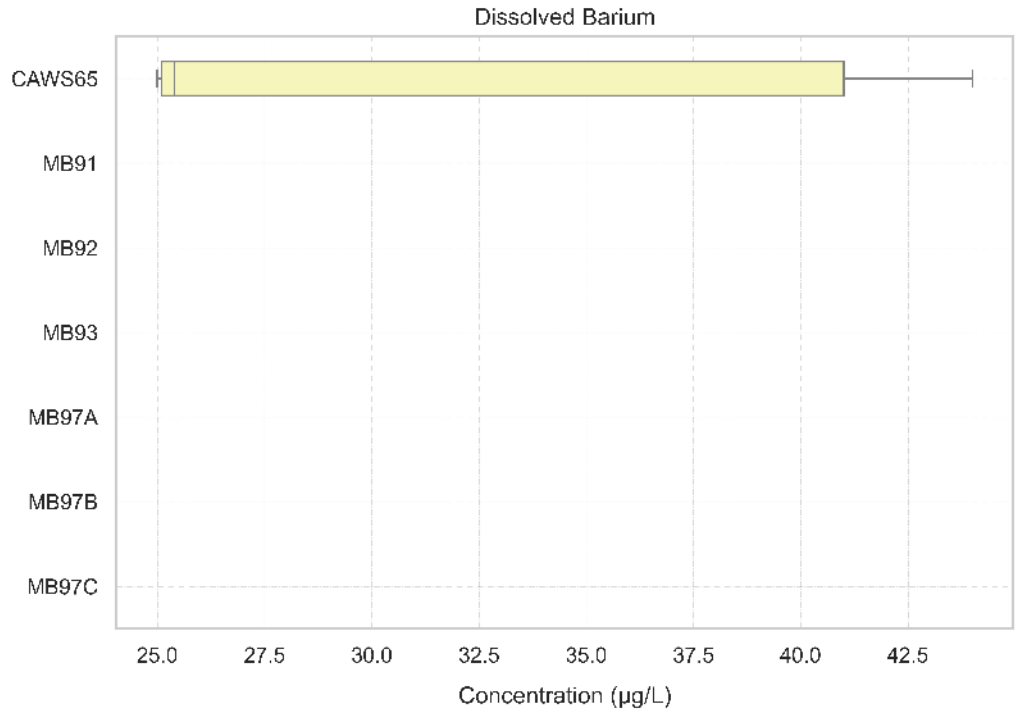

Nitrite + Nitrate as N
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.0
0.5
1.0
1.5
2.0
2.5
Concentration (mg/L)

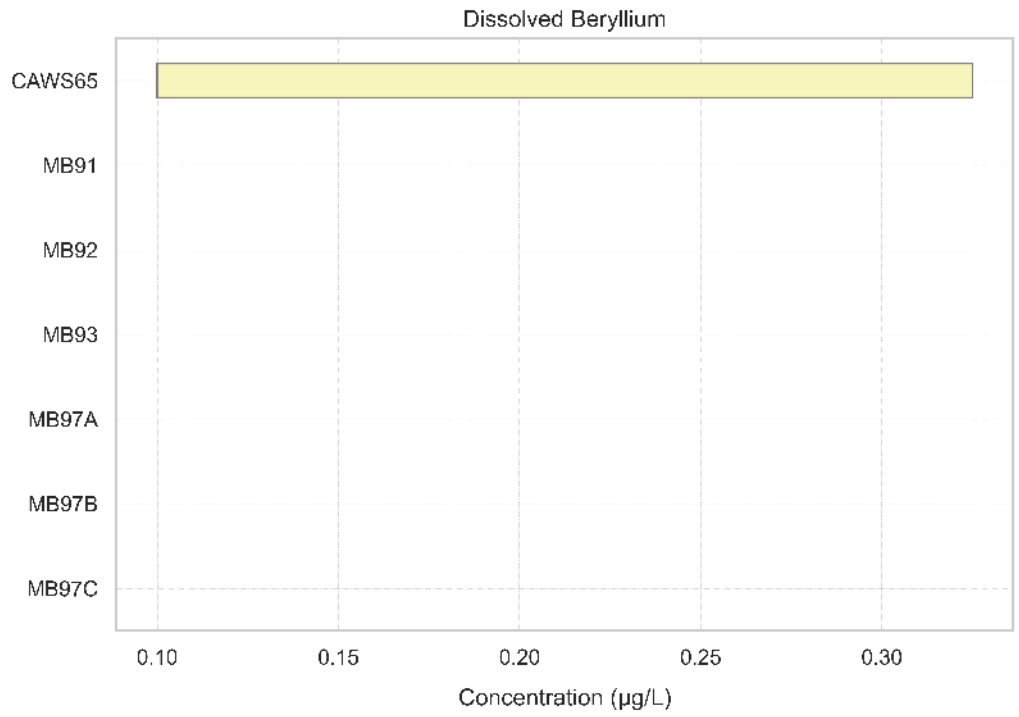

Total Phosphorus as P
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Concentration (mg/L)

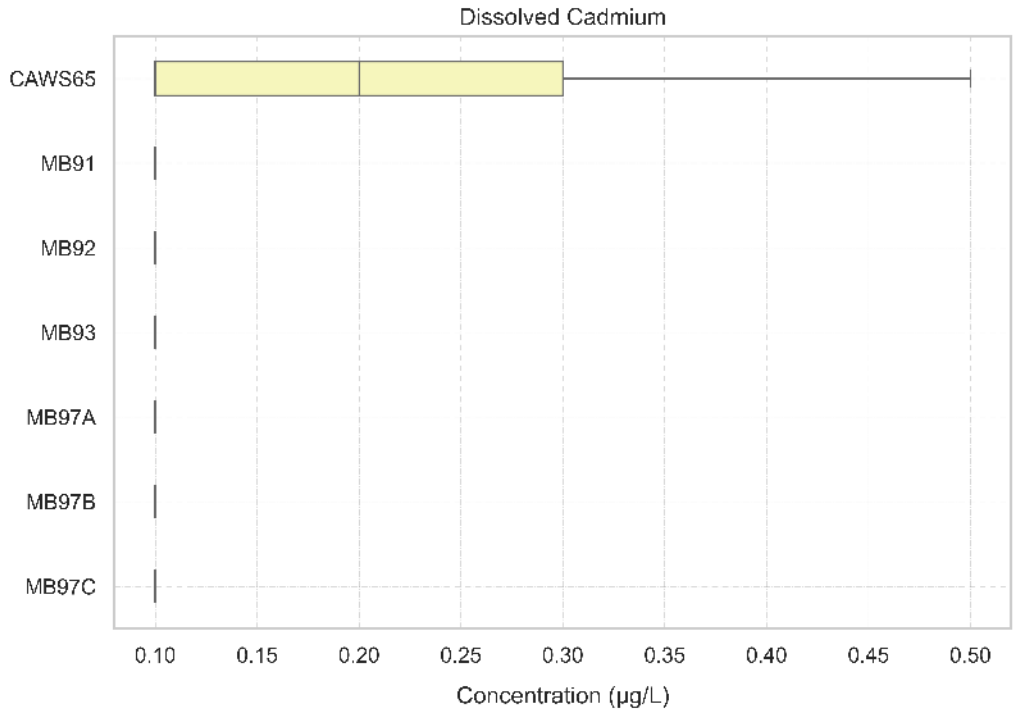

Dissolved Aluminium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
10
15
20
25
30
35
40
45
50
Concentration (µg/L)

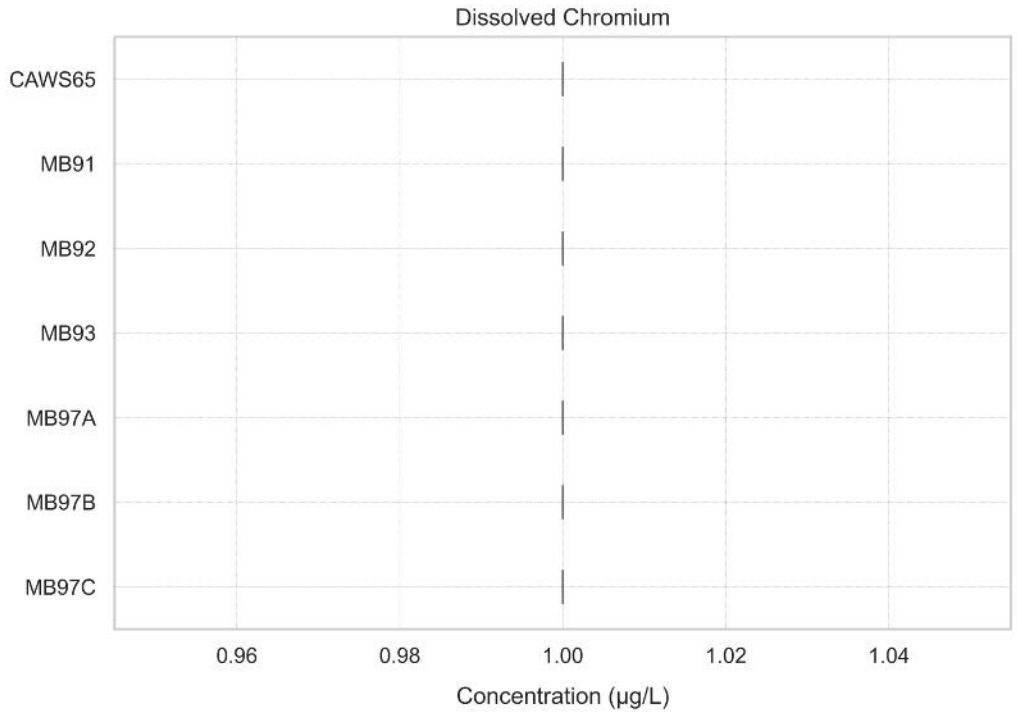

Dissolved Antimony
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Concentration (µg/L)

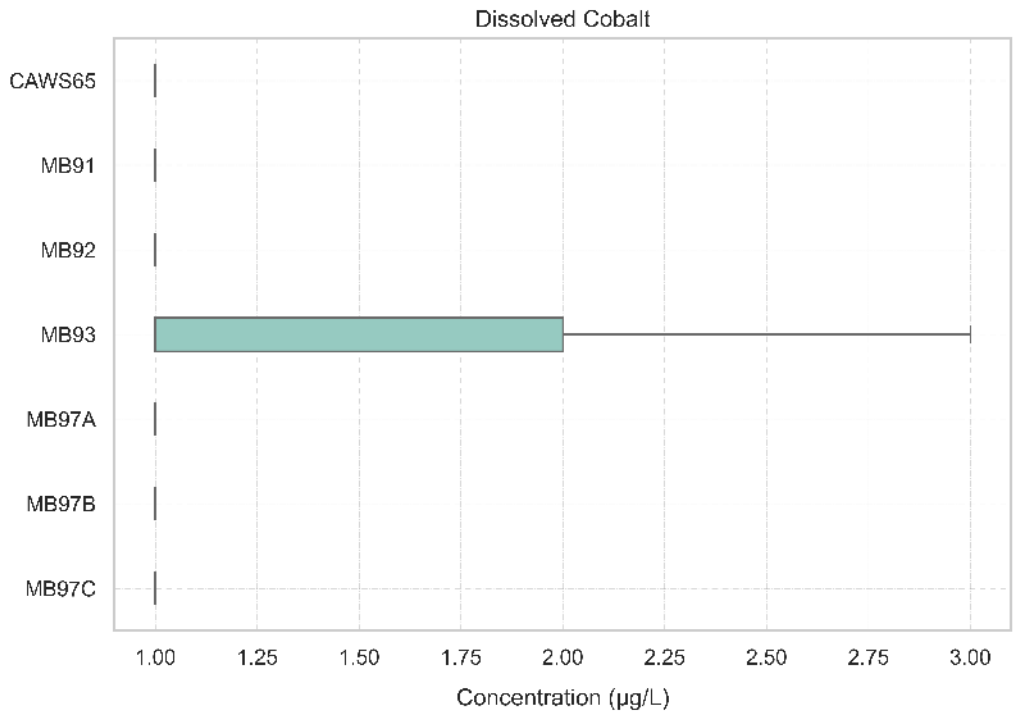

Dissolved Arsenic
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
10
20
30
40
50
60
70
Concentration (µg/L)

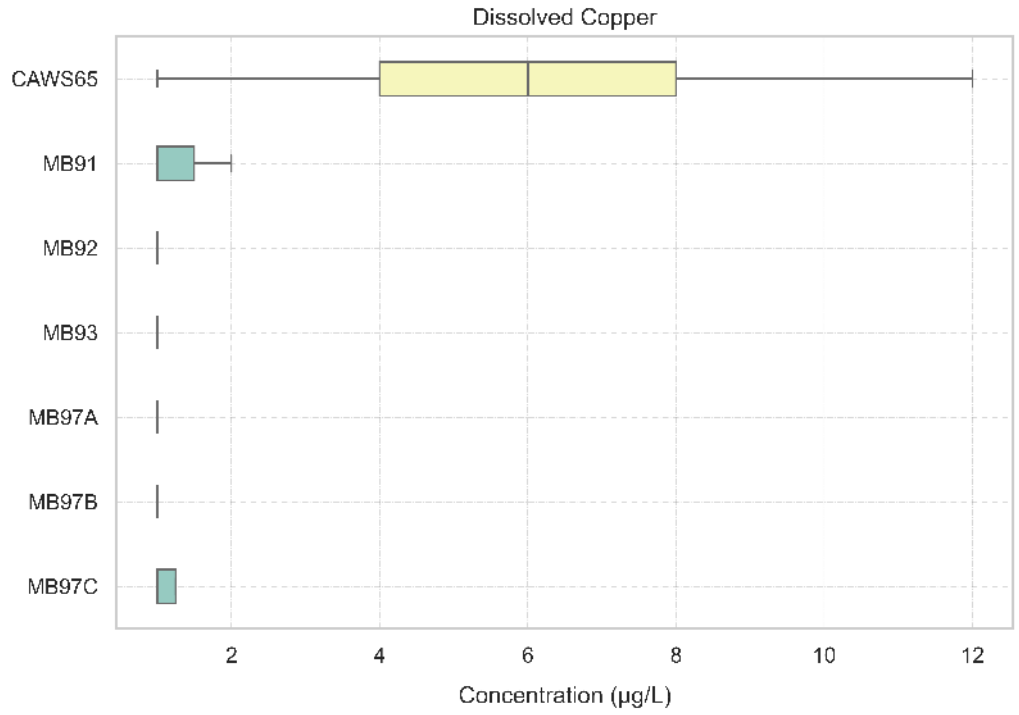

Dissolved Barium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
25.0
27.5
30.0
32.5
35.0
37.5
40.0
42.5
Concentration (µg/L)

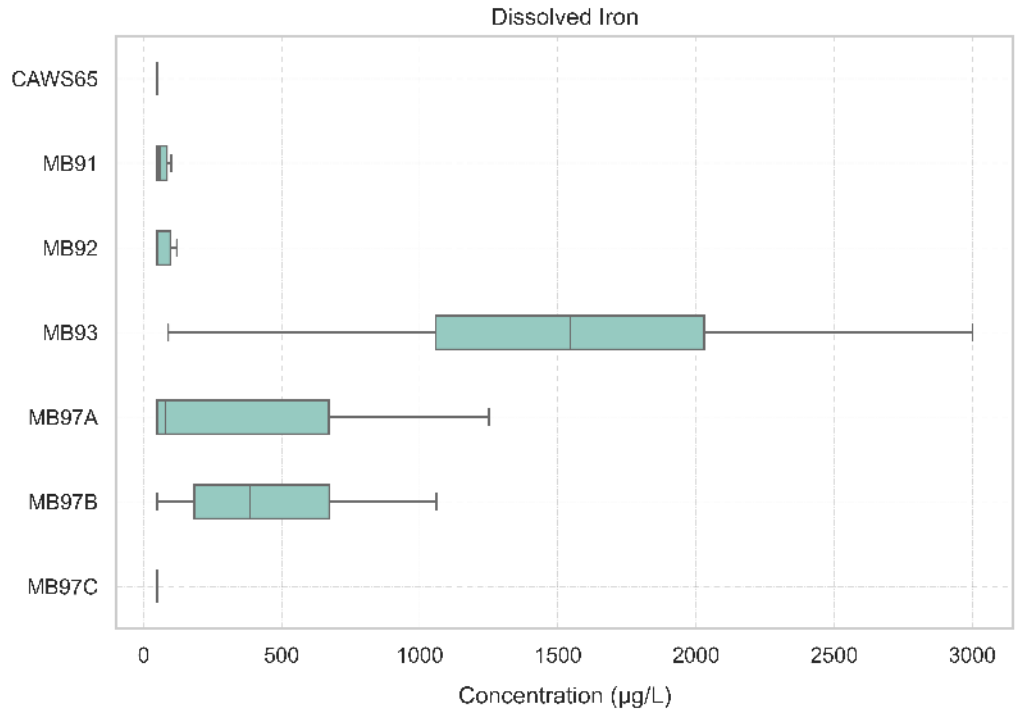

Dissolved Beryllium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.10
0.15
0.20
0.25
0.30
Concentration (µg/L)

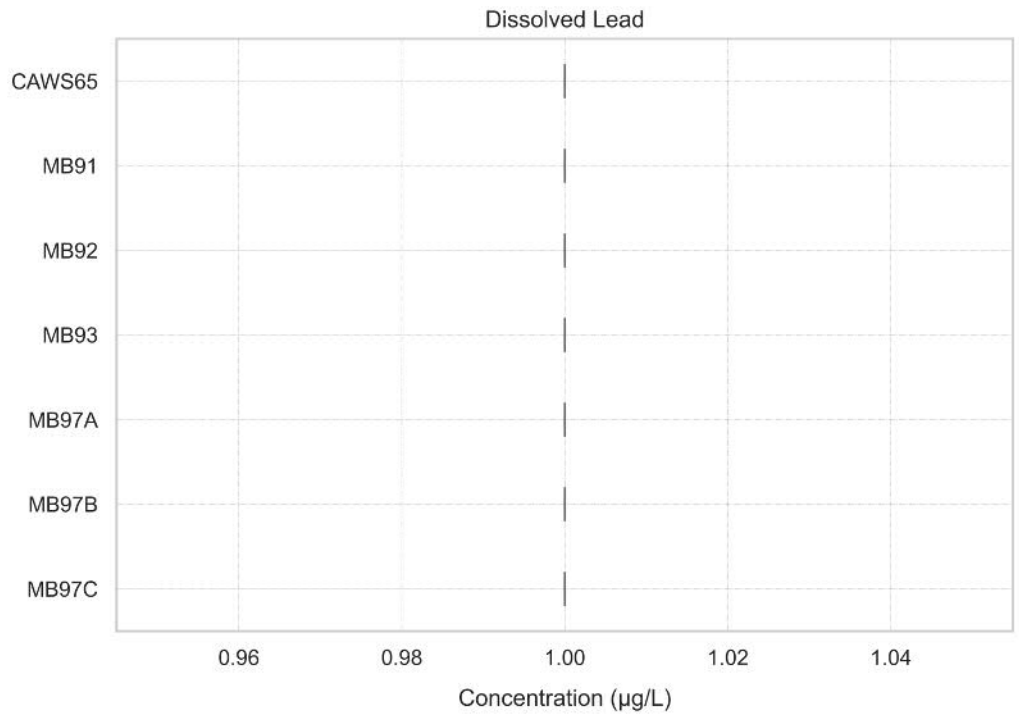

Dissolved Cadmium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Concentration (µg/L)

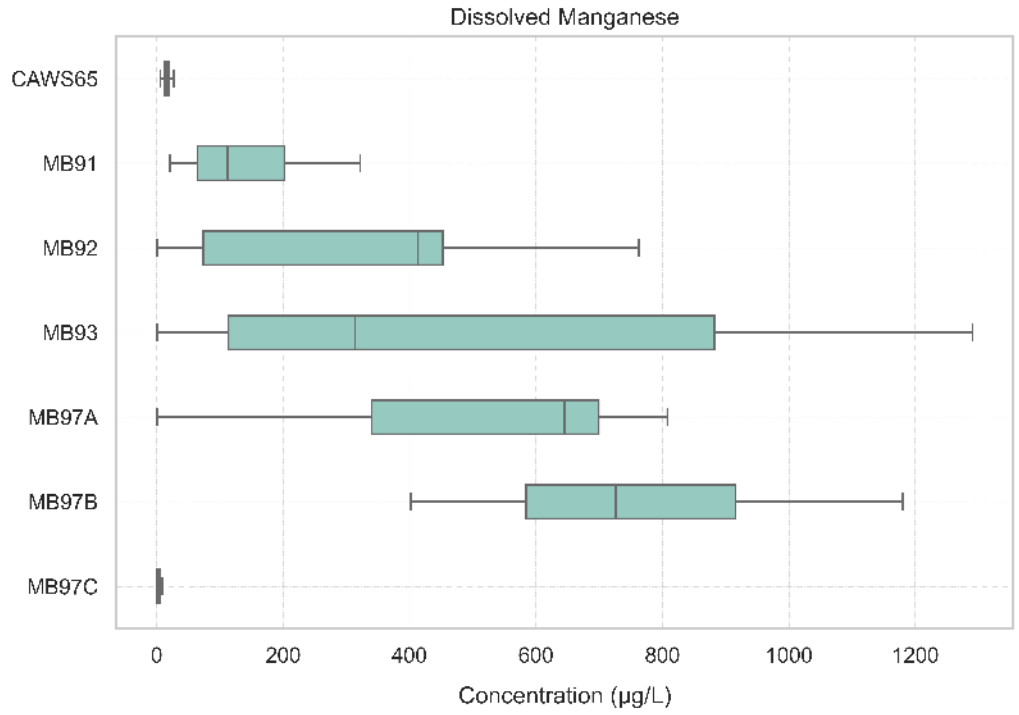

Dissolved Chromium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)

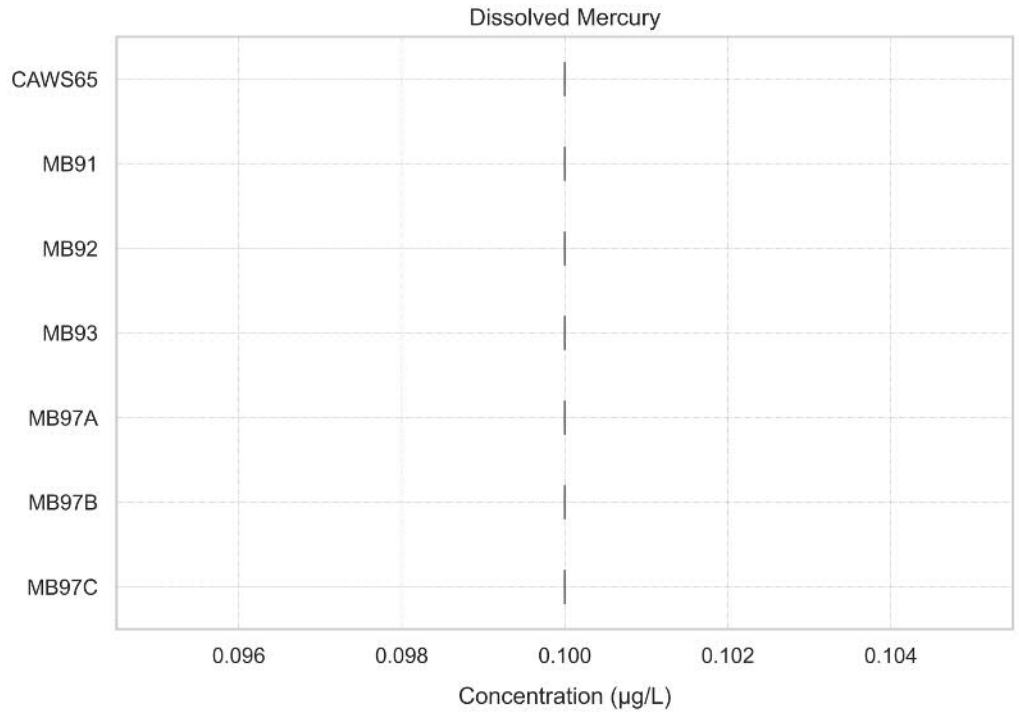

Dissolved Cobalt
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
Concentration (µg/L)

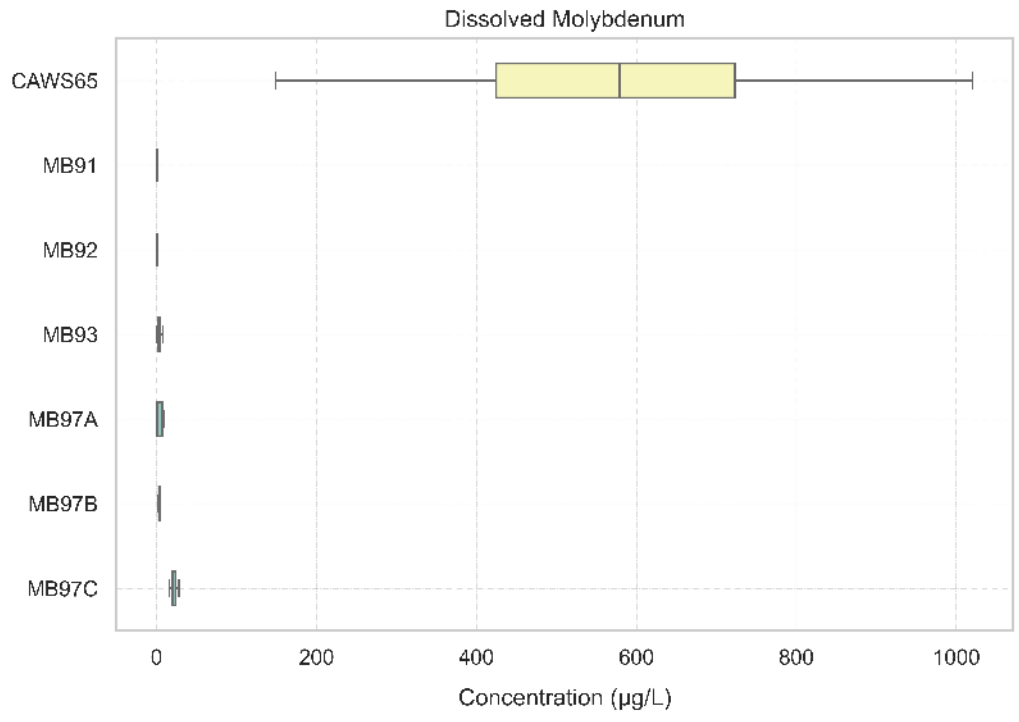

Dissolved Copper
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
2
4
6
8
10
12
Concentration (µg/L)

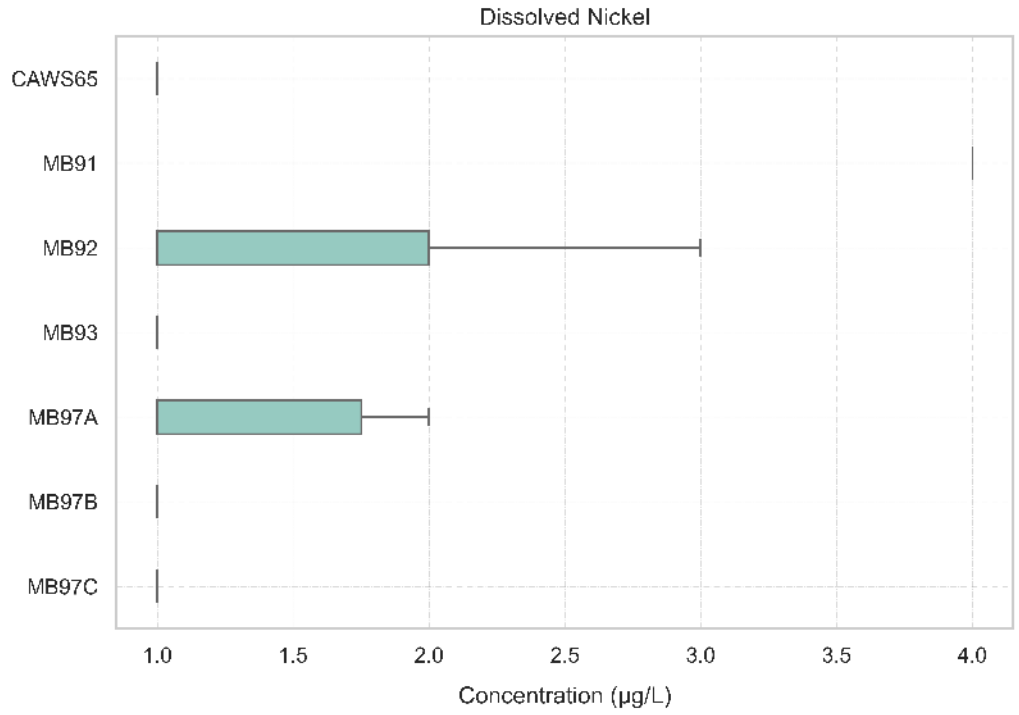

Dissolved Iron
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
500
1000
1500
2000
2500
3000
Concentration (µg/L)

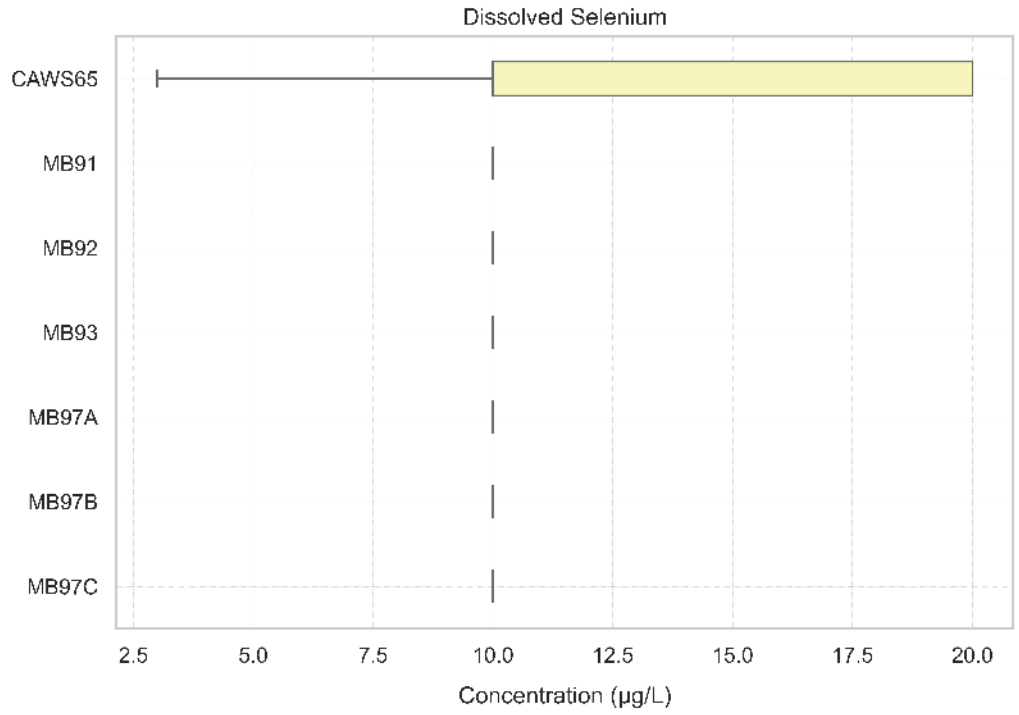

Dissolved Lead
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)

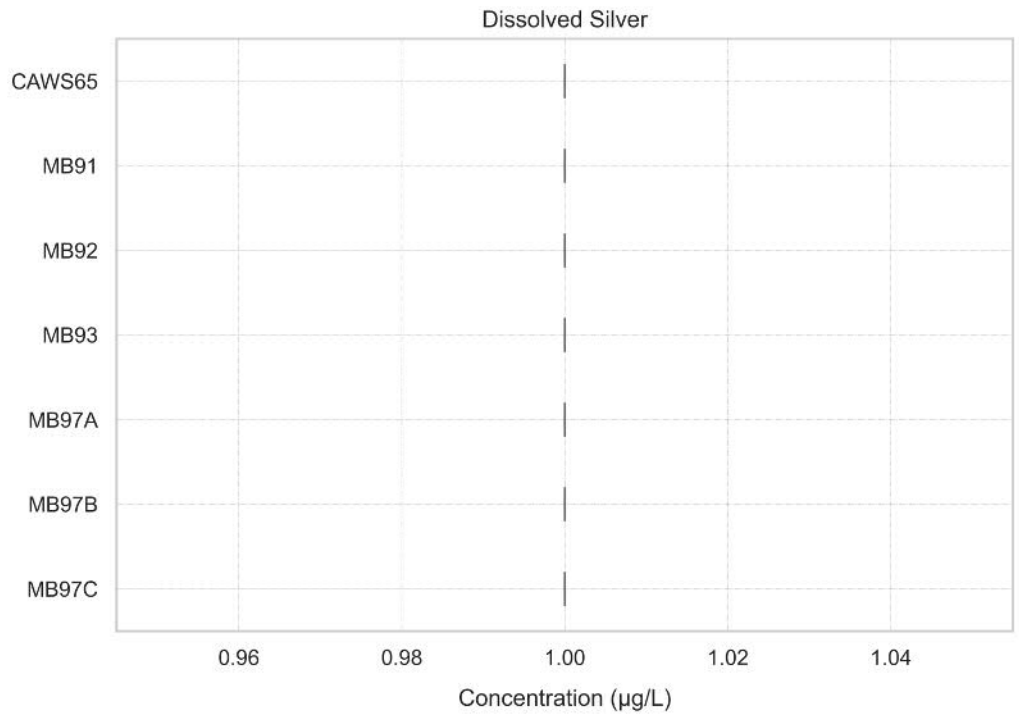

Dissolved Manganese
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
200
400
600
800
1000
1200
Concentration (µg/L)

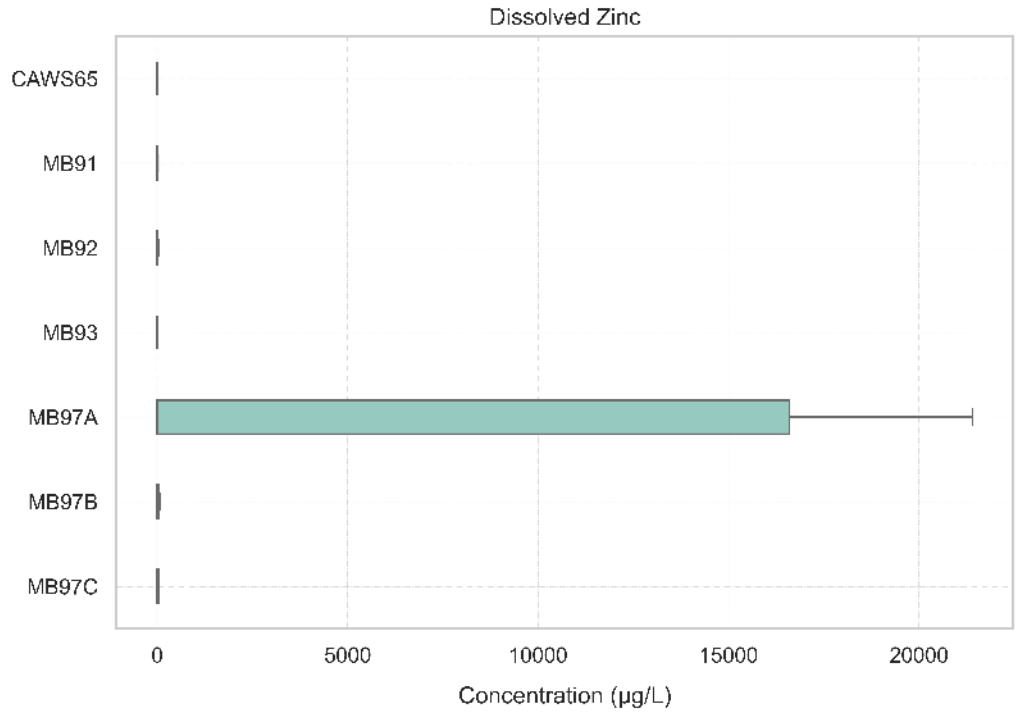

Dissolved Mercury
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.096
0.098
0.100
0.102
0.104
Concentration (µg/L)

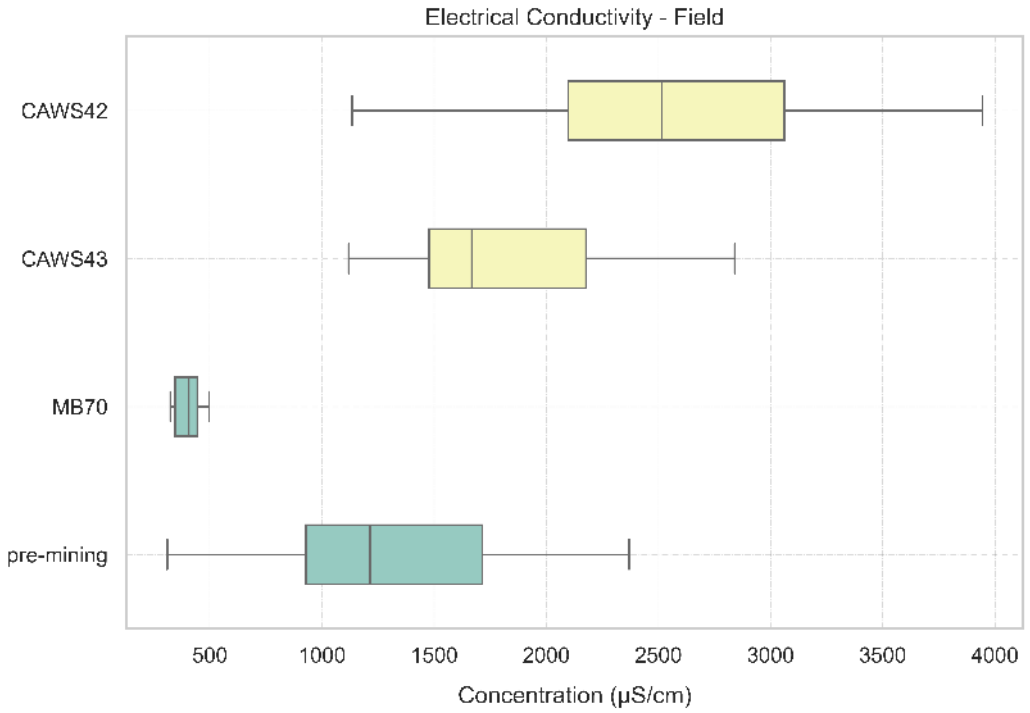

Dissolved Molybdenum
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
200
400
600
800
1000
Concentration (µg/L)

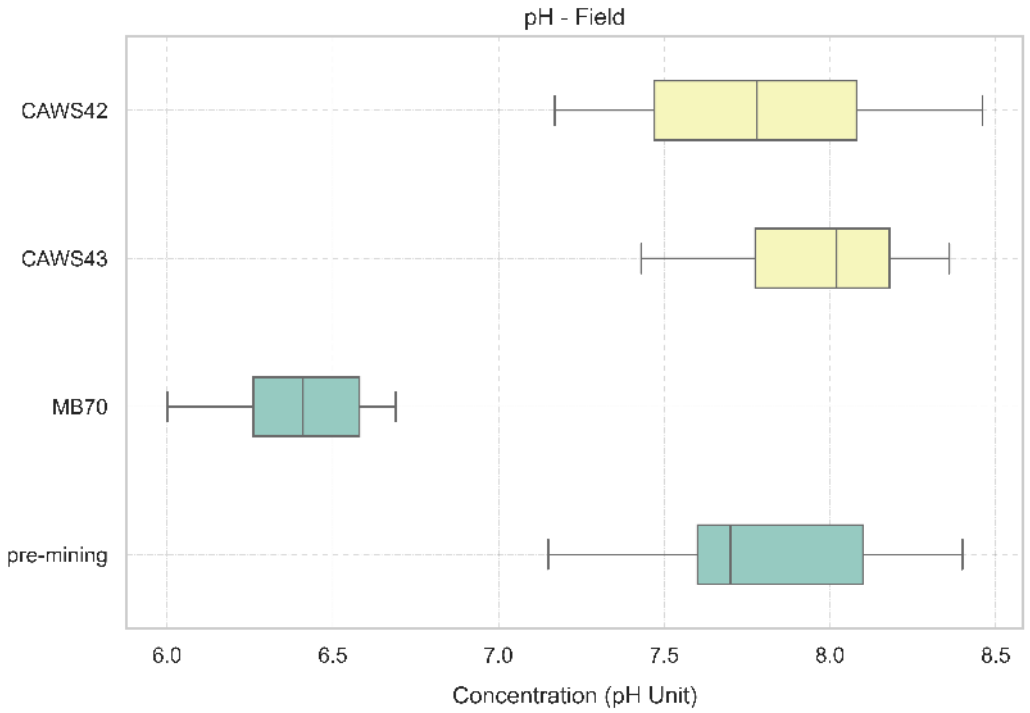

Dissolved Nickel
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Concentration (µg/L)

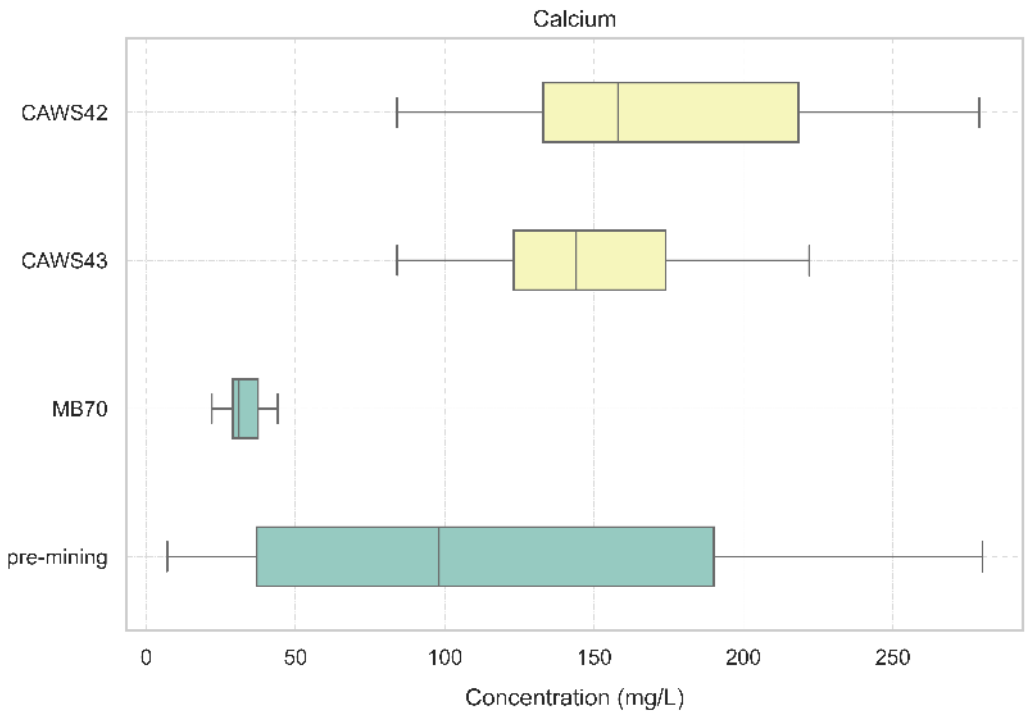

Dissolved Selenium
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Concentration (µg/L)

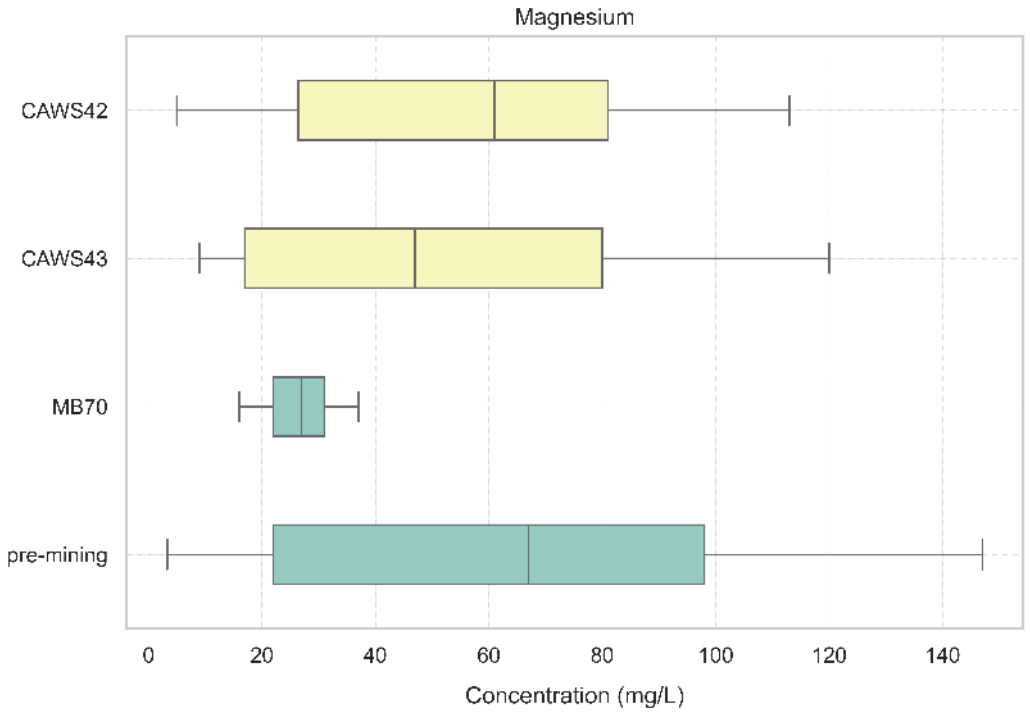

Dissolved Silver
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)

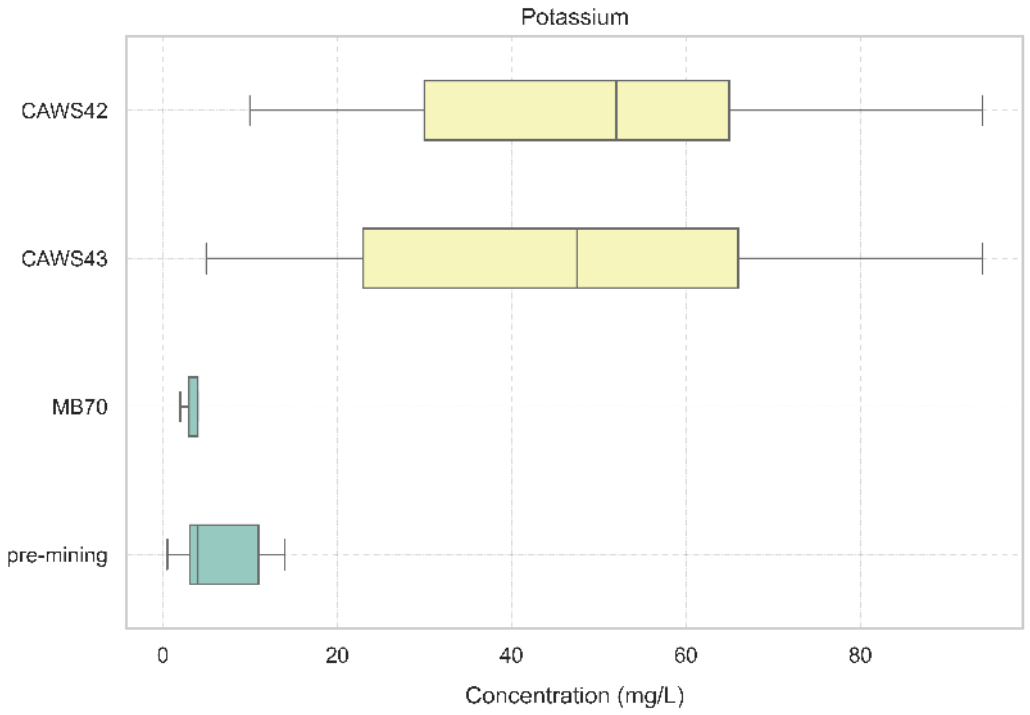

Dissolved Zinc
CAWS65
MB91
MB92
MB93
MB97A
MB97B
MB97C
0
5000
10000
15000
20000
Concentration (µg/L)

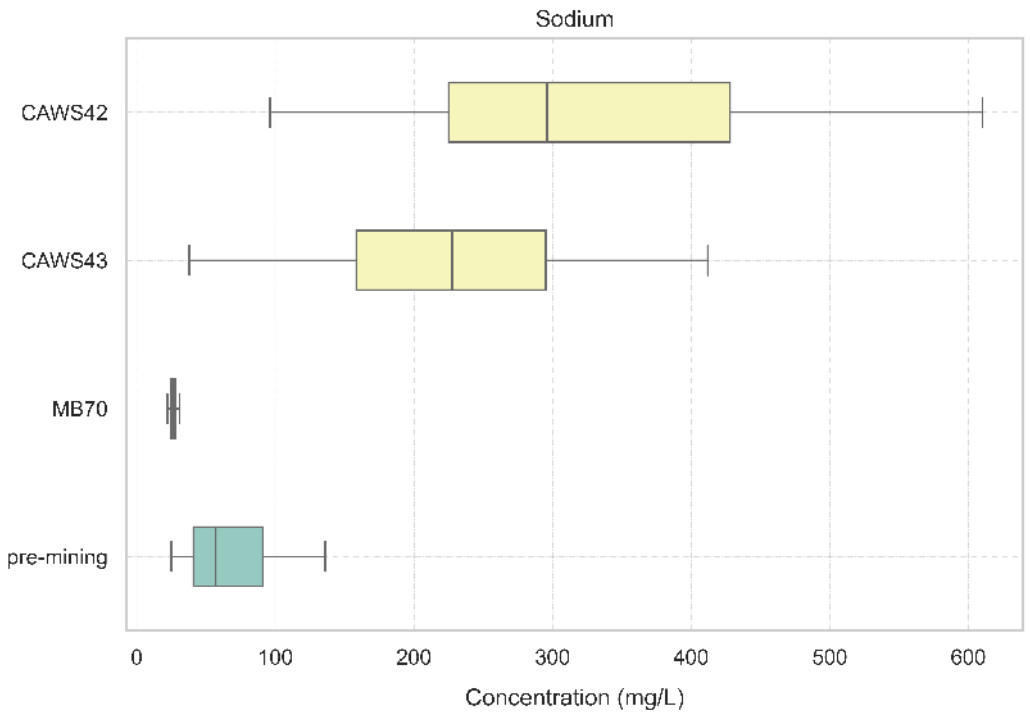

Electrical Conductivity - Field
CAWS42
CAWS43
MB70
pre-mining
500
1000
1500
2000
2500
3000
3500
4000
Concentration (µS/cm)

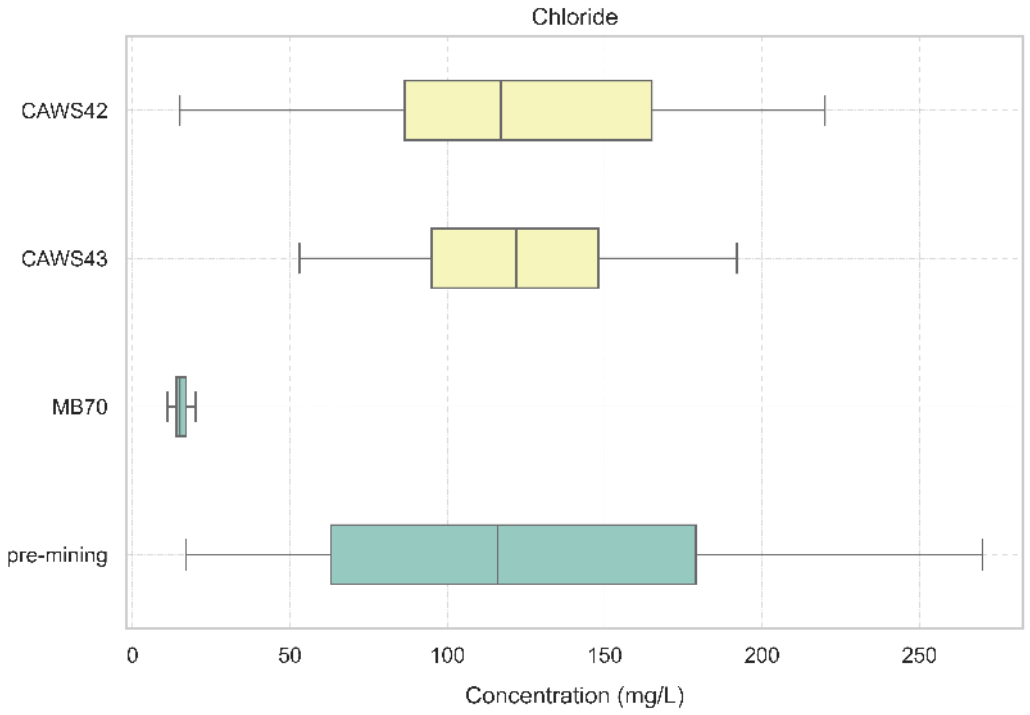

pH - Field
CAWS42
CAWS43
MB70
pre-mining
6.0
6.5
7.0
7.5
8.0
8.5
Concentration (pH Unit)

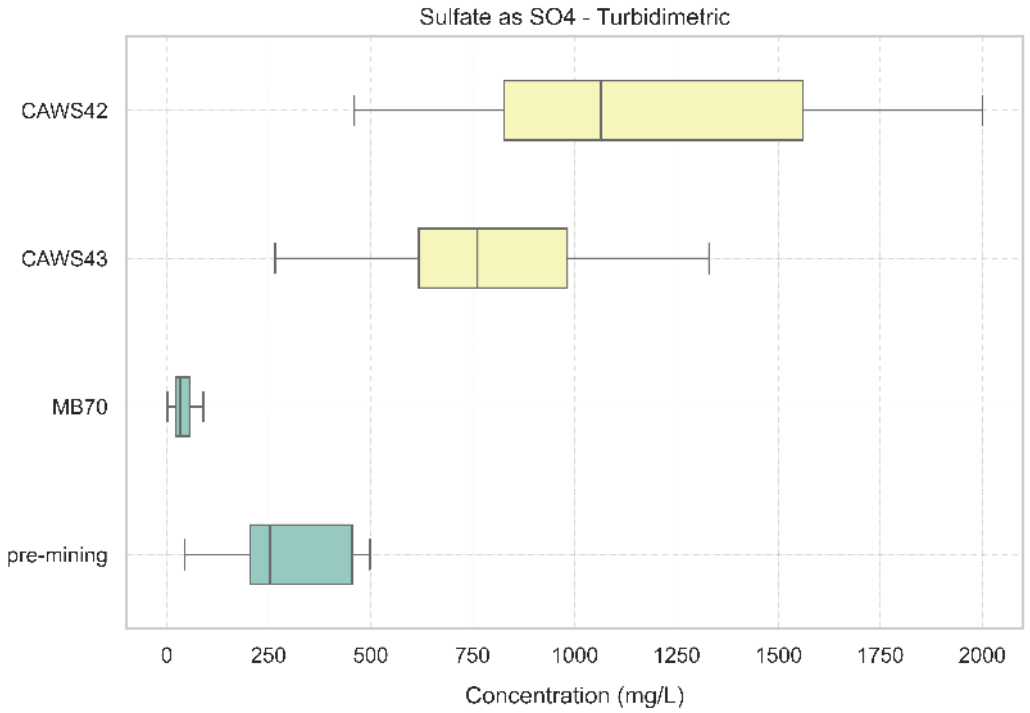

Calcium
CAWS42
CAWS43
MB70
pre-mining
0
50
100
150
200
250
Concentration (mg/L)

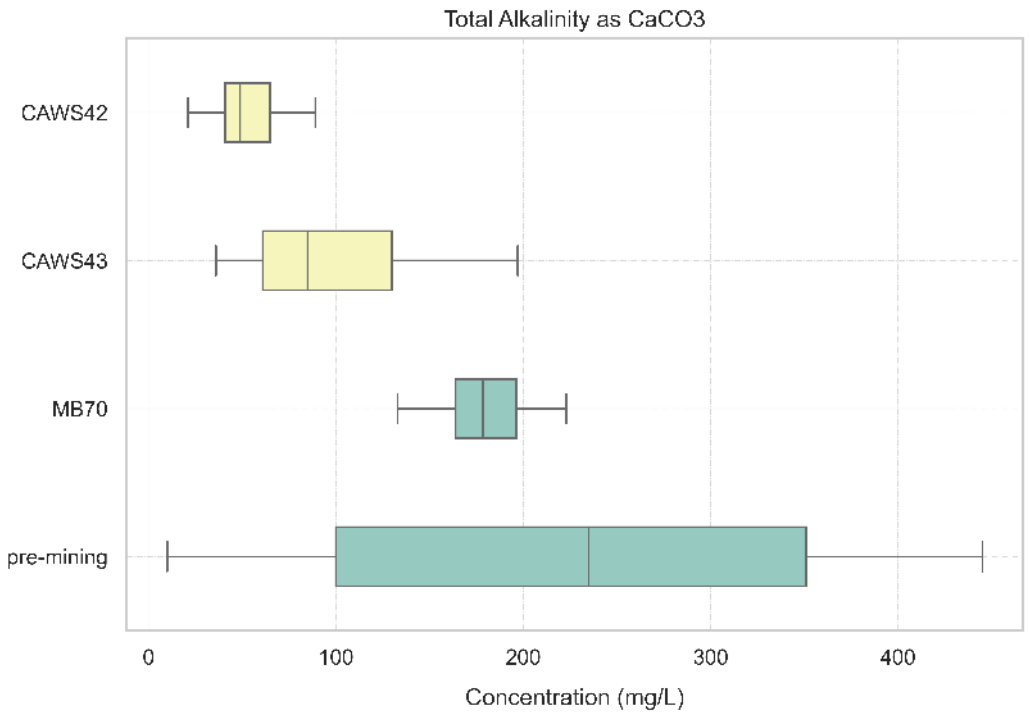

Magnesium
CAWS42
CAWS43
MB70
pre-mining
0
20
40
60
80
100
120
140
Concentration (mg/L)

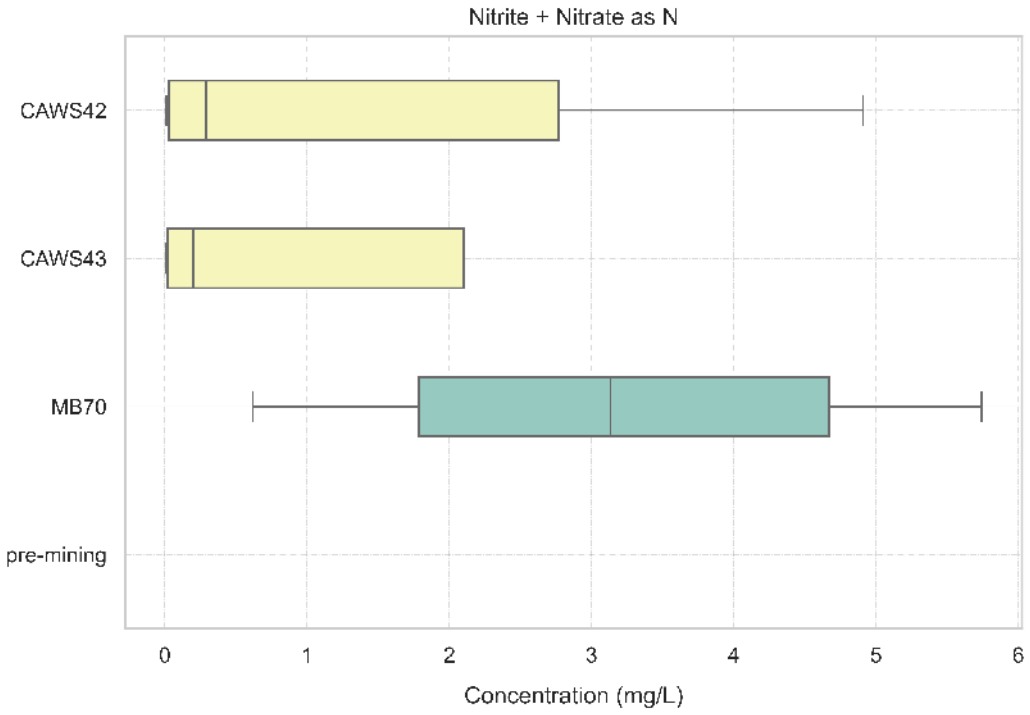

Potassium
CAWS42
CAWS43
MB70
pre-mining
0
20
40
60
80
Concentration (mg/L)

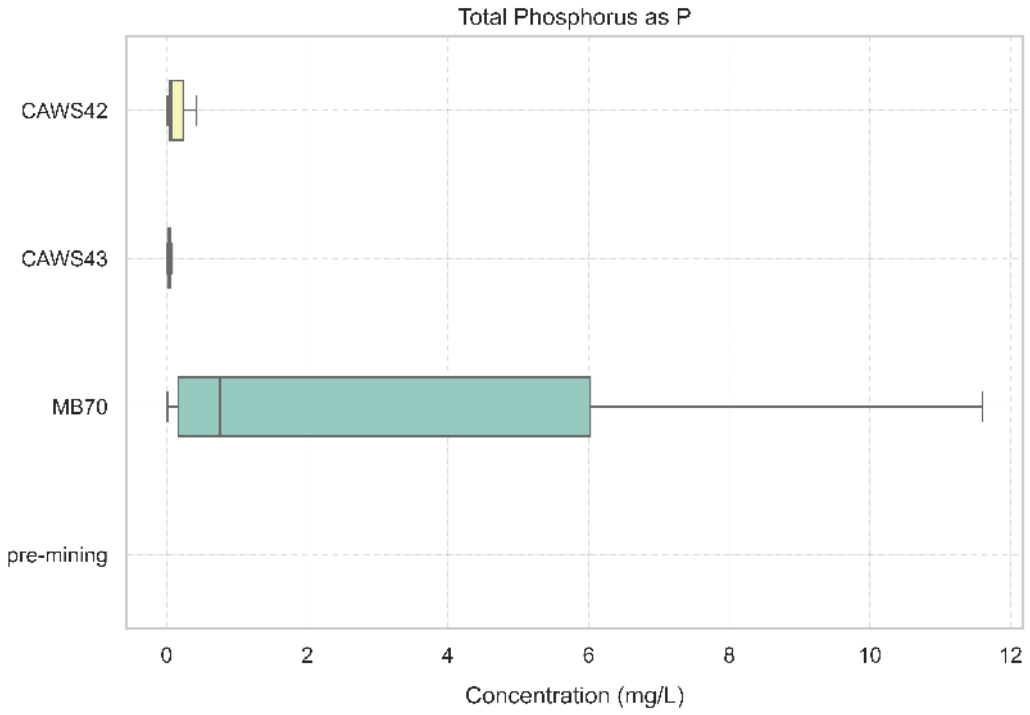

Sodium
CAWS42
CAWS43
MB70
pre-mining
0
100
200
300
400
500
600
Concentration (mg/L)

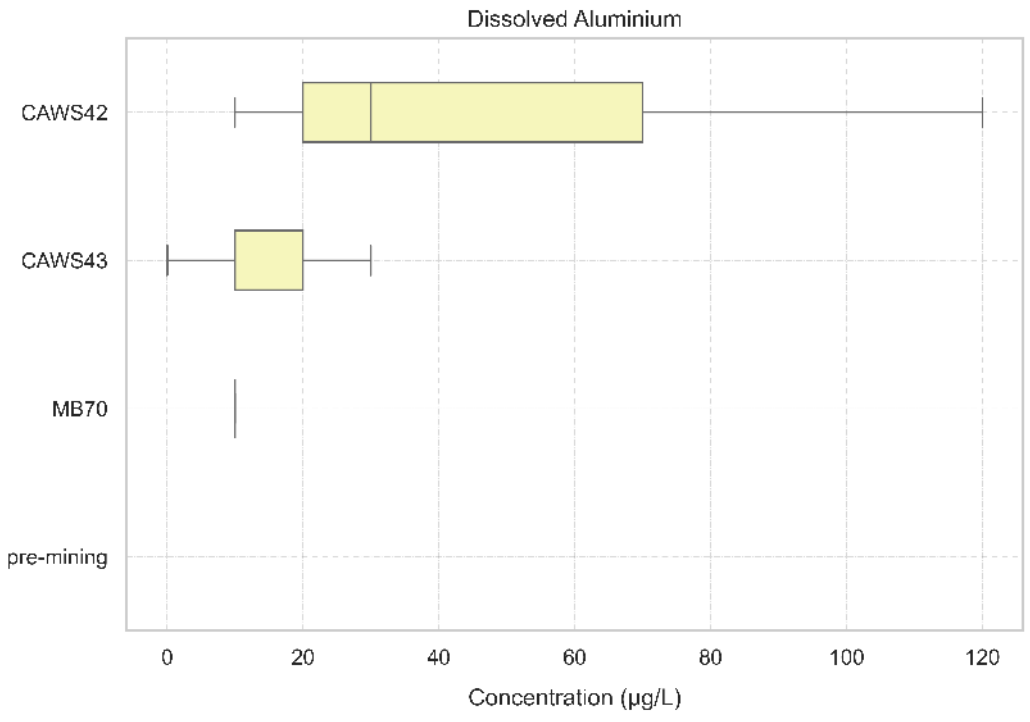

Chloride
CAWS42
CAWS43
MB70
pre-mining
0
50
100
150
200
250
Concentration (mg/L)

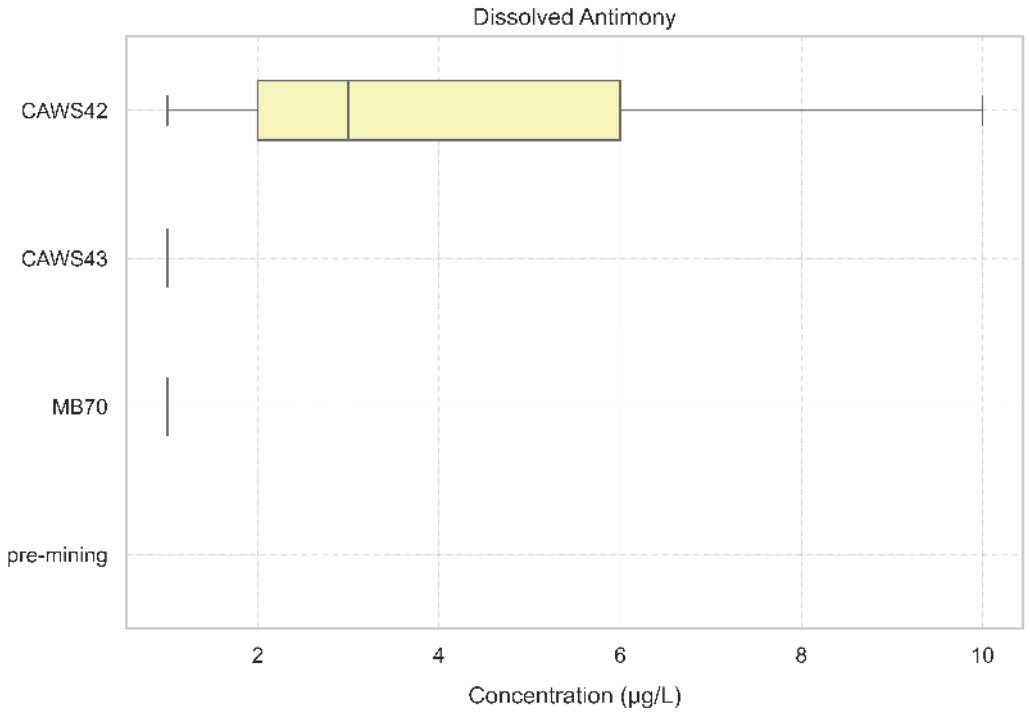

Sulfate as SO4 - Turbidimetric
CAWS42
CAWS43
MB70
pre-mining
0
250
500
750
1000
1250
1500
1750
2000
Concentration (mg/L)

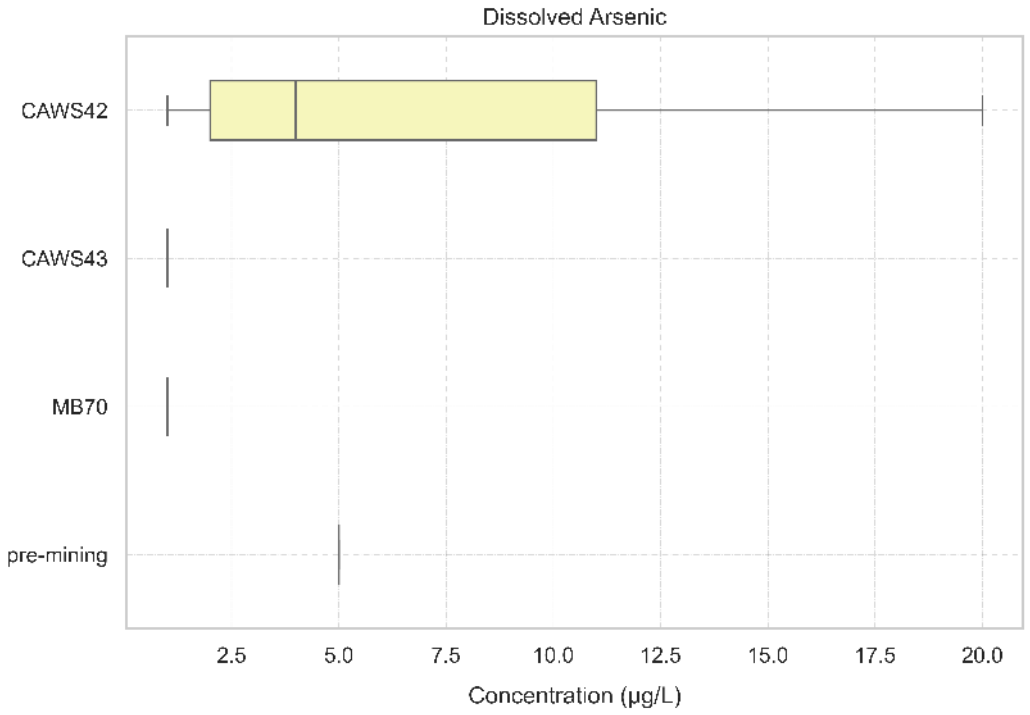

Total Alkalinity as CaCO3
CAWS42
CAWS43
MB70
pre-mining
0
100
200
300
400
Concentration (mg/L)

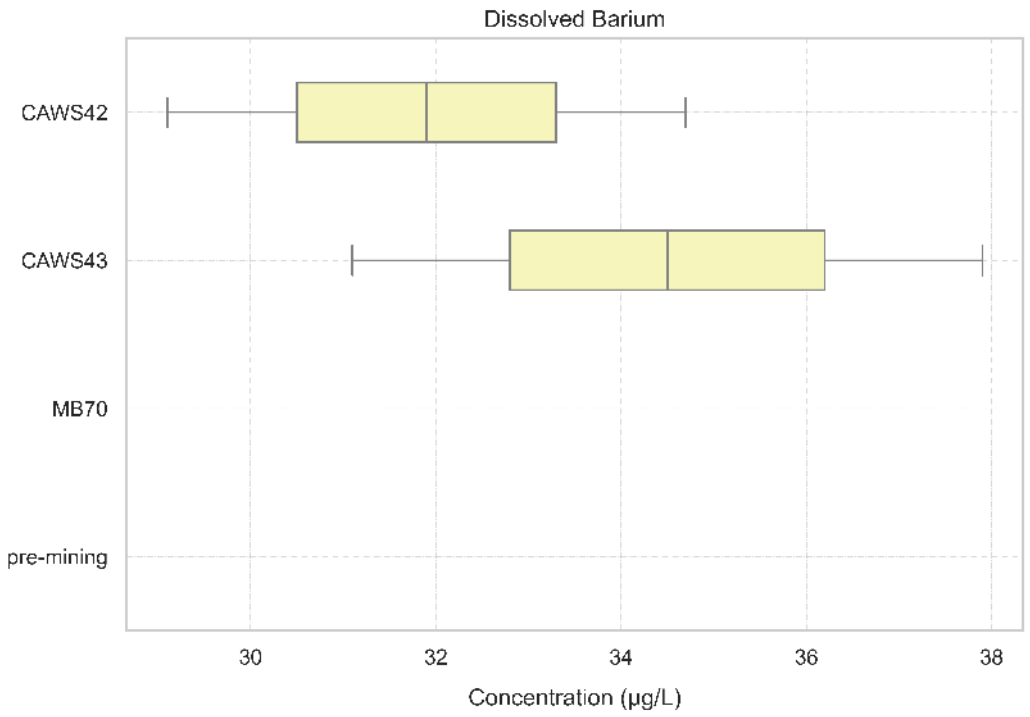

Nitrite + Nitrate as N
CAWS42
CAWS43
MB70
pre-mining
0
1
2
3
4
5
6
Concentration (mg/L)

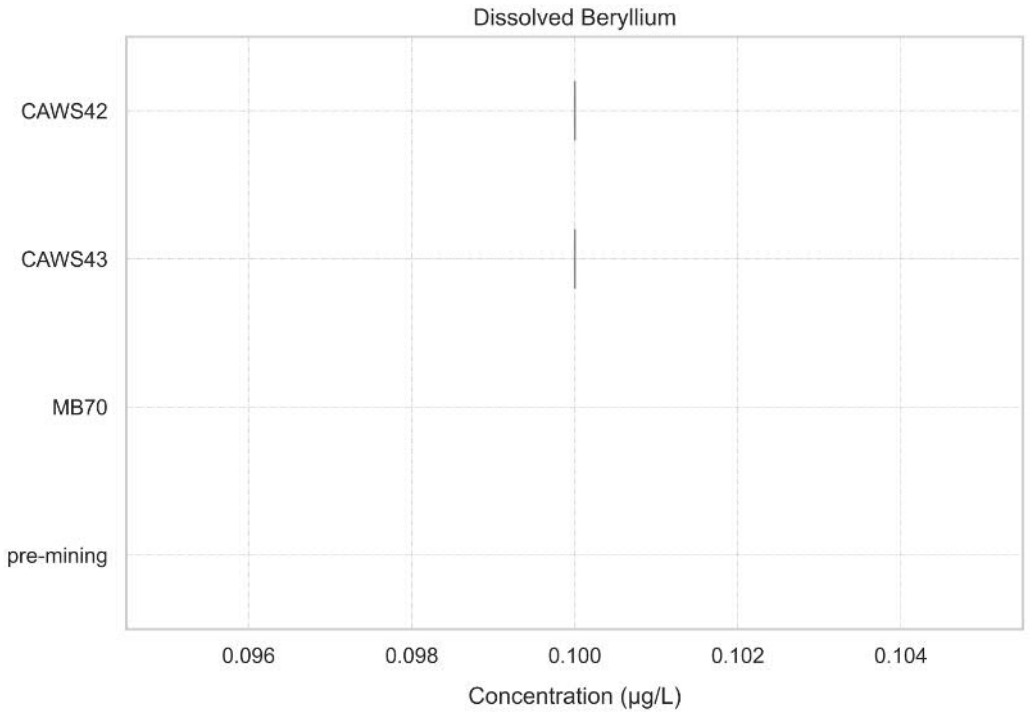

Total Phosphorus as P
CAWS42
CAWS43
MB70
pre-mining
0
2
4
6
8
10
12
Concentration (mg/L)

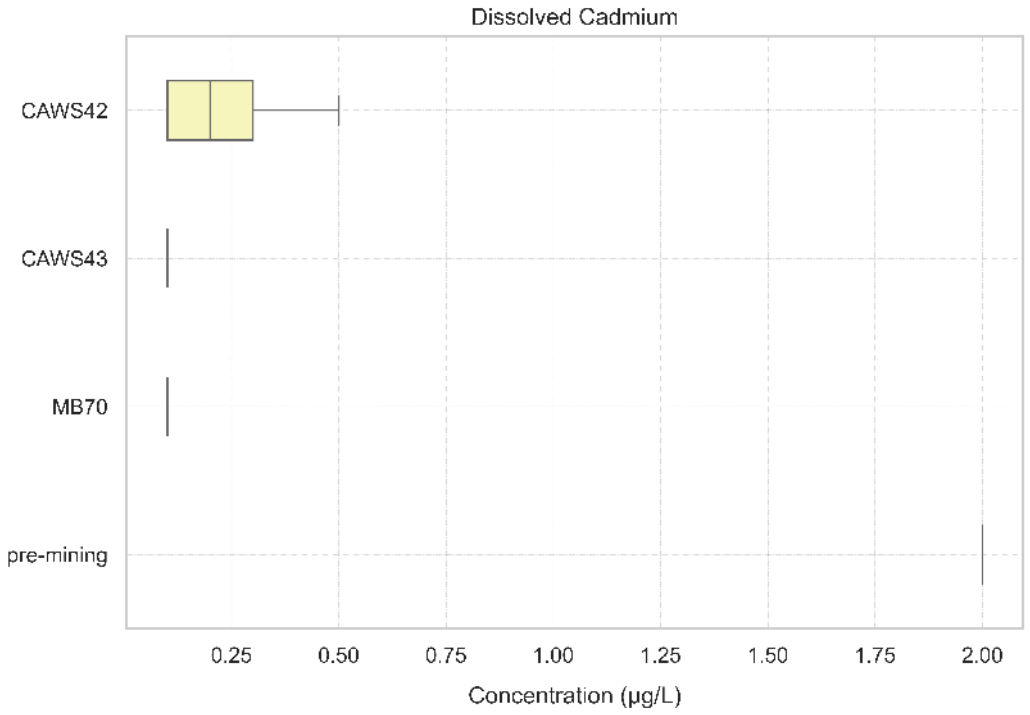

Dissolved Aluminium
CAWS42
CAWS43
MB70
pre-mining
0
20
40
60
80
100
120
Concentration (µg/L)

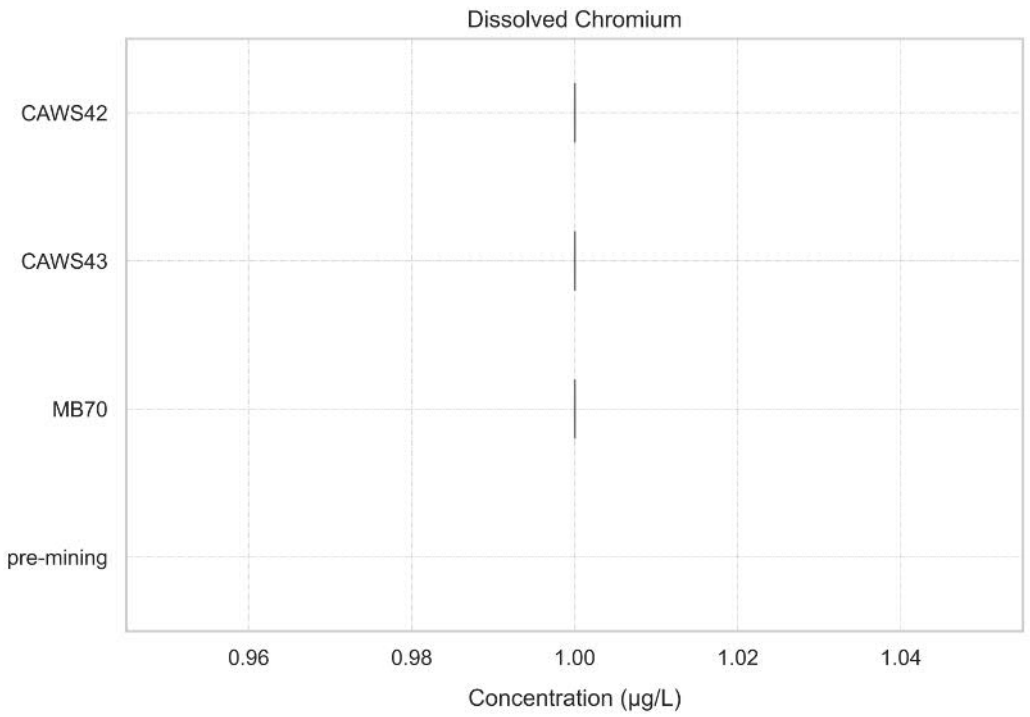

Dissolved Antimony
CAWS42
CAWS43
MB70
pre-mining
2
4
6
8
10
Concentration (µg/L)

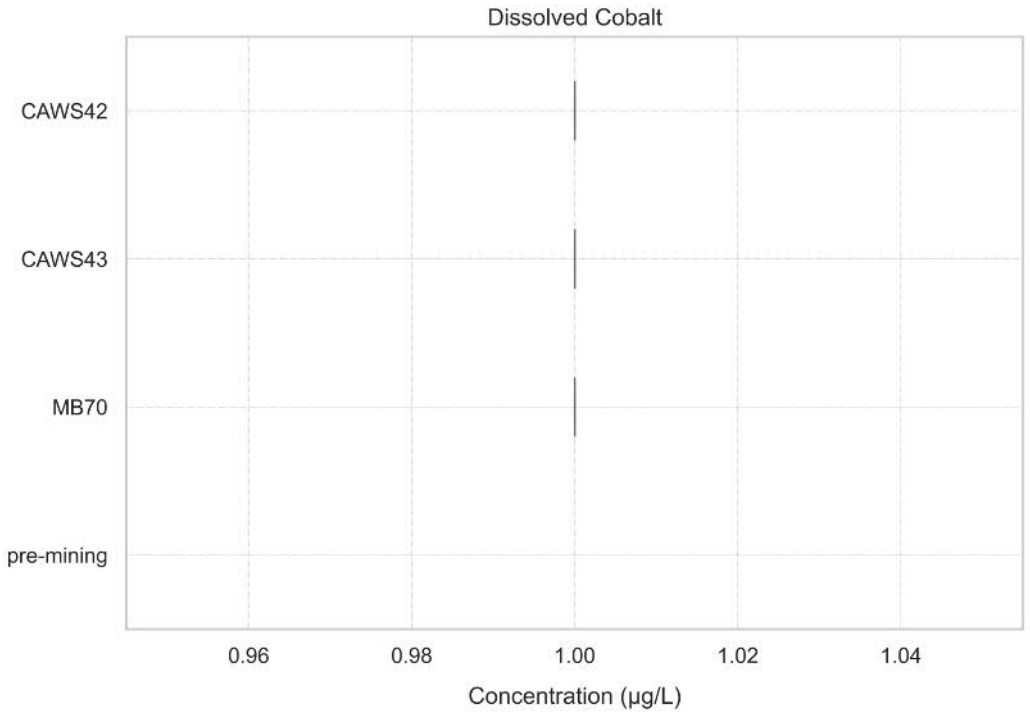

Dissolved Arsenic
CAWS42
CAWS43
MB70
pre-mining
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Concentration (µg/L)

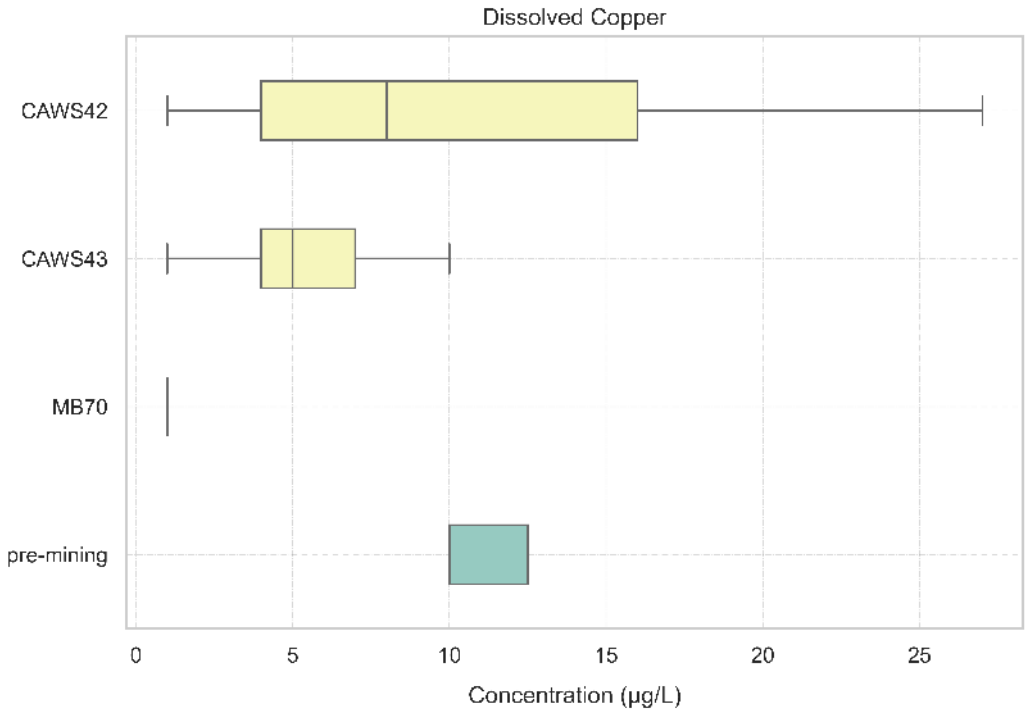

Dissolved Barium
CAWS42
CAWS43
MB70
pre-mining
30
32
34
36
38
Concentration (µg/L)

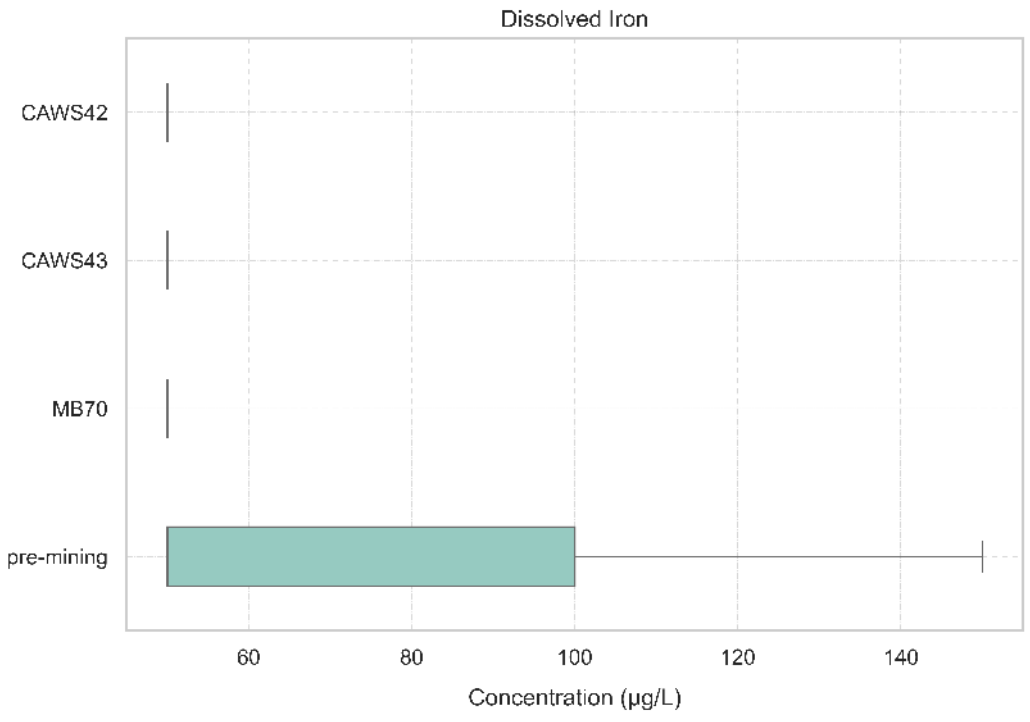

Dissolved Beryllium
CAWS42
CAWS43
MB70
pre-mining
0.096
0.098
0.100
0.102
0.104
Concentration (µg/L)

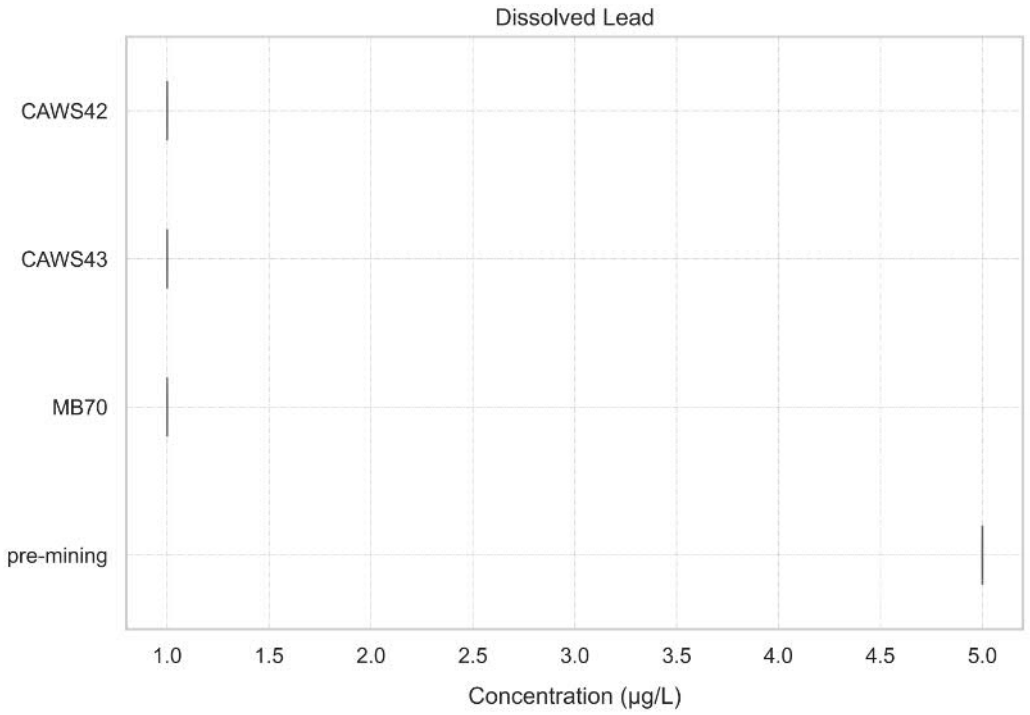

Dissolved Cadmium
CAWS42
CAWS43
MB70
pre-mining
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
Concentration (µg/L)

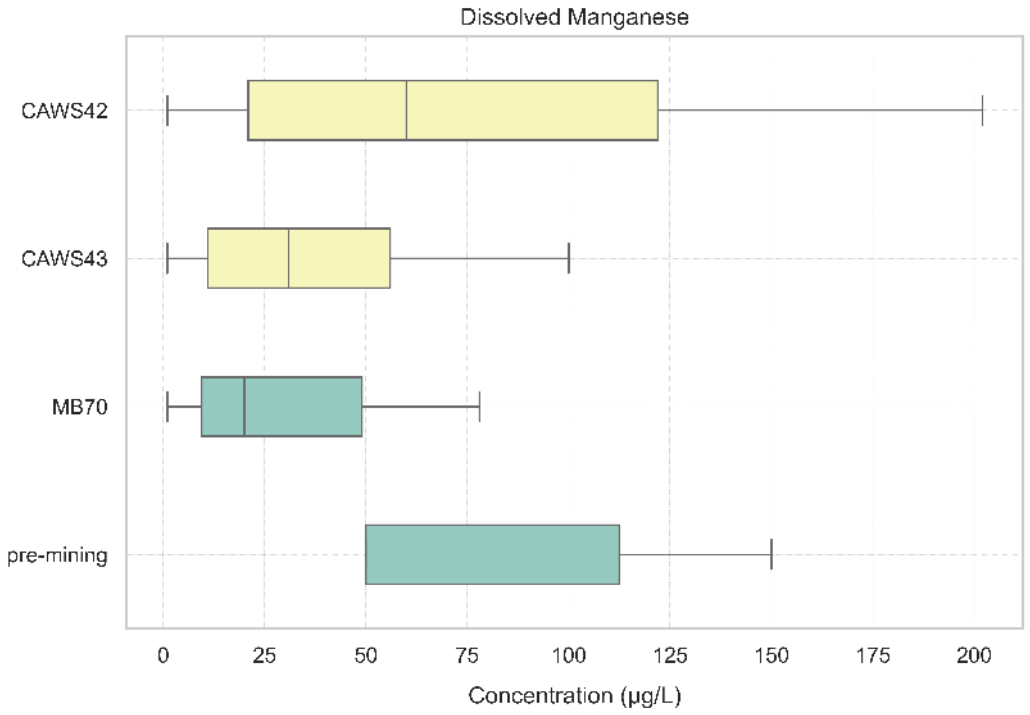

Dissolved Chromium
CAWS42
CAWS43
MB70
pre-mining
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)

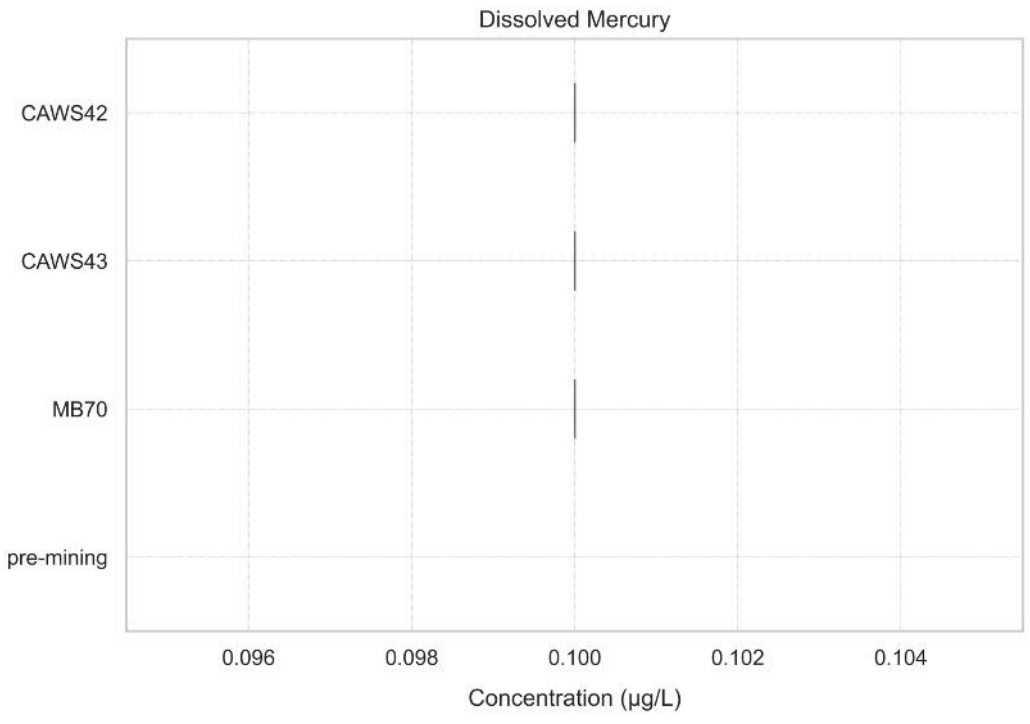

Dissolved Cobalt
CAWS42
CAWS43
MB70
pre-mining
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)

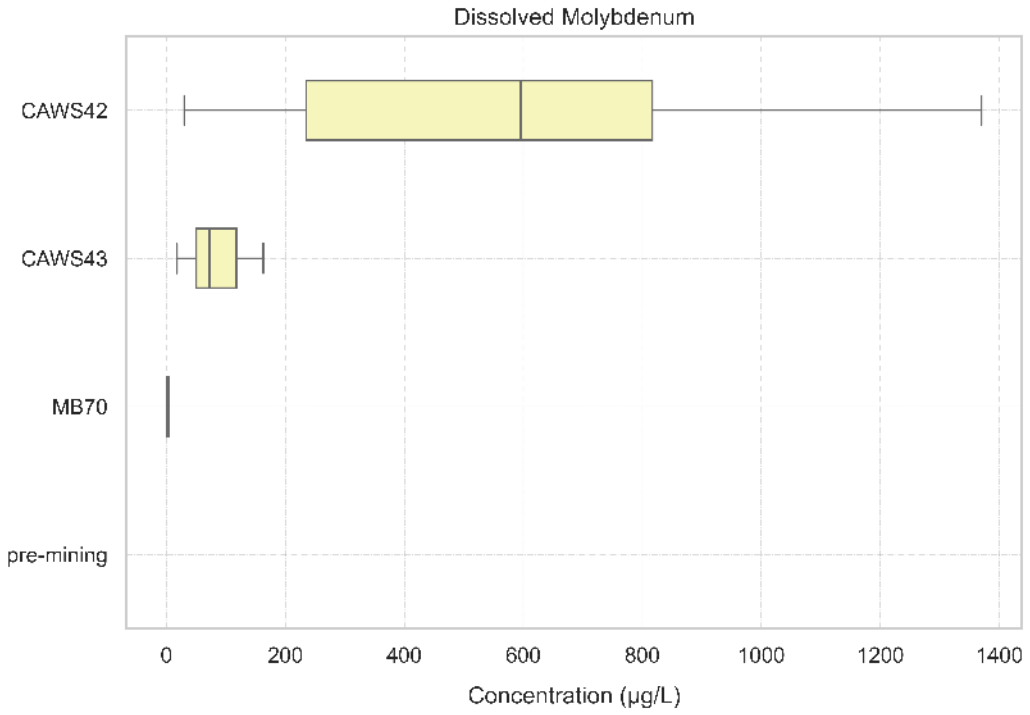

Dissolved Copper
CAWS42
CAWS43
MB70
pre-mining
0
5
10
15
20
25
Concentration (µg/L)

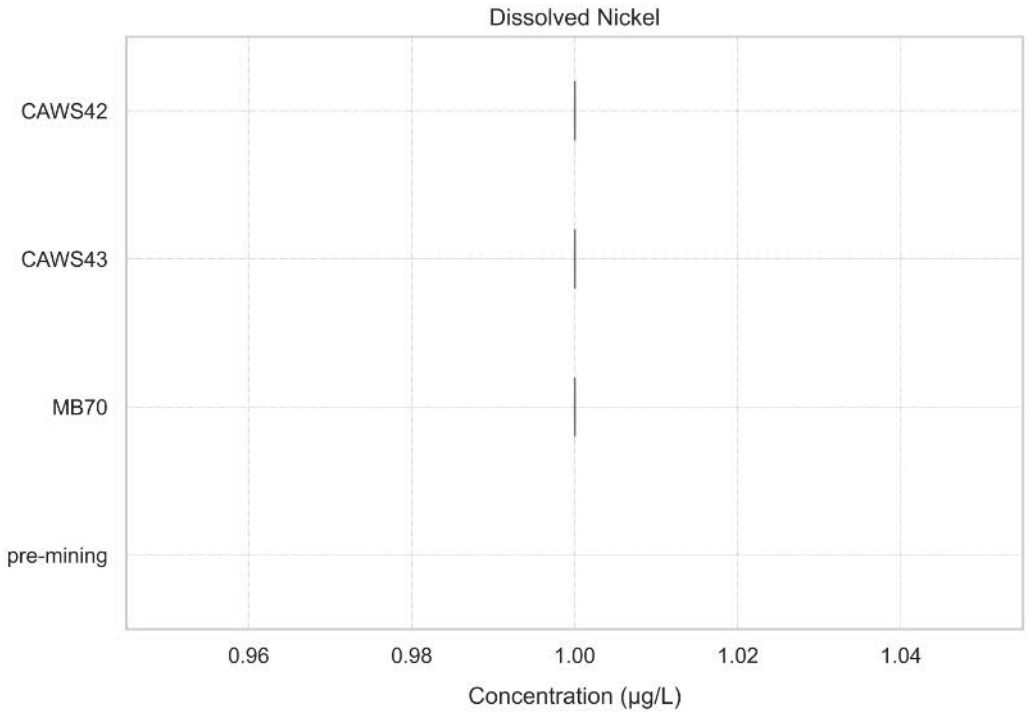

Dissolved Iron
CAWS42
CAWS43
MB70
pre-mining
60
80
100
120
140
Concentration (µg/L)

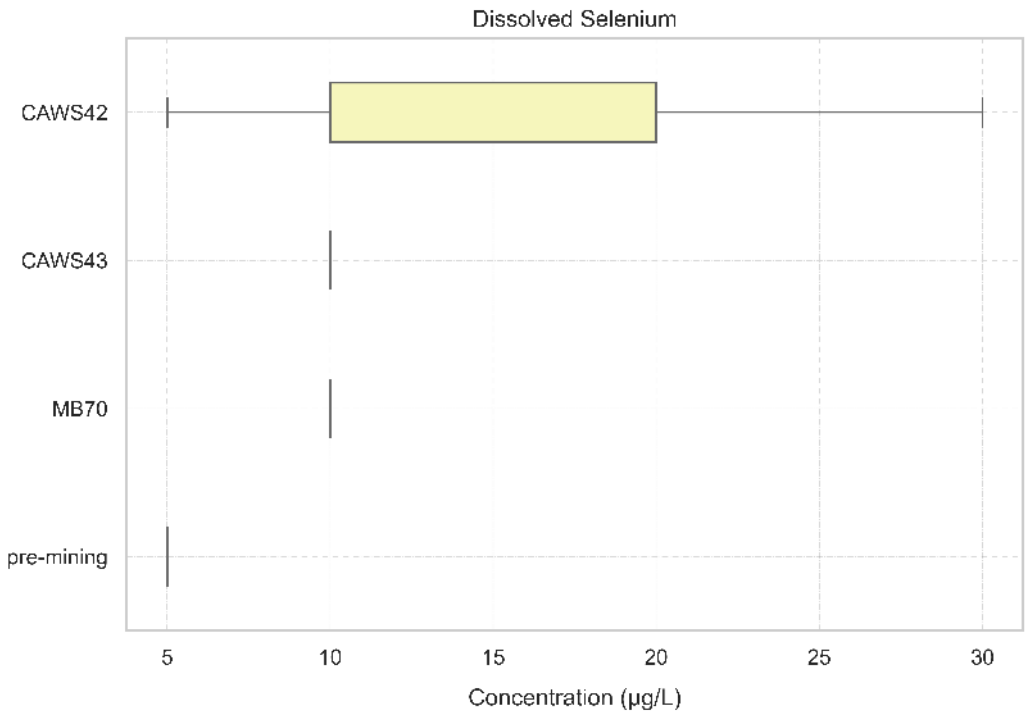

Dissolved Lead
CAWS42
CAWS43
MB70
pre-mining
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Concentration (µg/L)

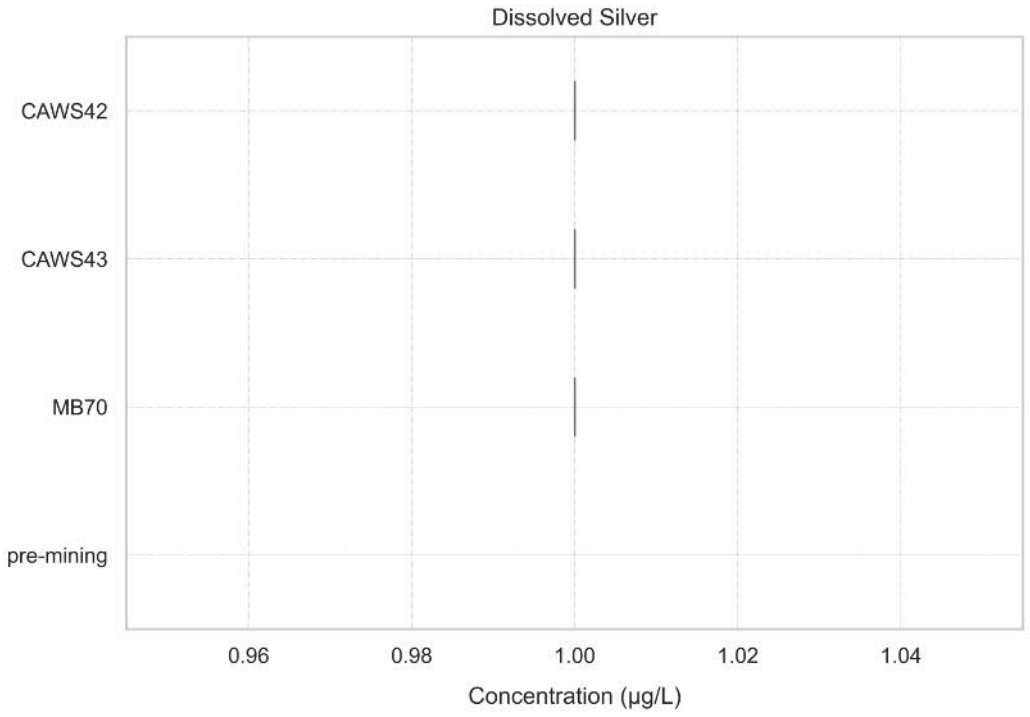

Dissolved Manganese
CAWS42
CAWS43
MB70
pre-mining
0
25
50
75
100
125
150
175
200
Concentration (µg/L)

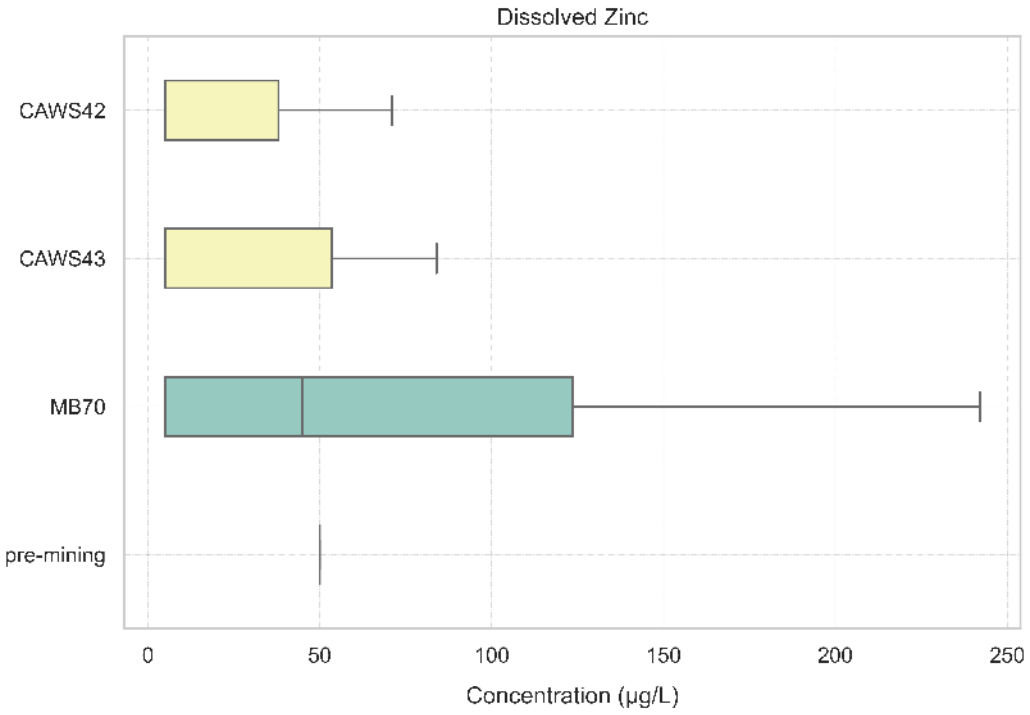

Dissolved Mercury
CAWS42
CAWS43
MB70
pre-mining
0.096
0.098
0.100
0.102
0.104
Concentration (µg/L)


Dissolved Molybdenum
CAWS42
CAWS43
MB70
pre-mining
0
200
400
600
800
1000
1200
1400
Concentration (µg/L)


Dissolved Nickel
CAWS42
CAWS43
MB70
pre-mining
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)


Dissolved Selenium
CAWS42
CAWS43
MB70
pre-mining
5
10
15
20
25
30
Concentration (µg/L)

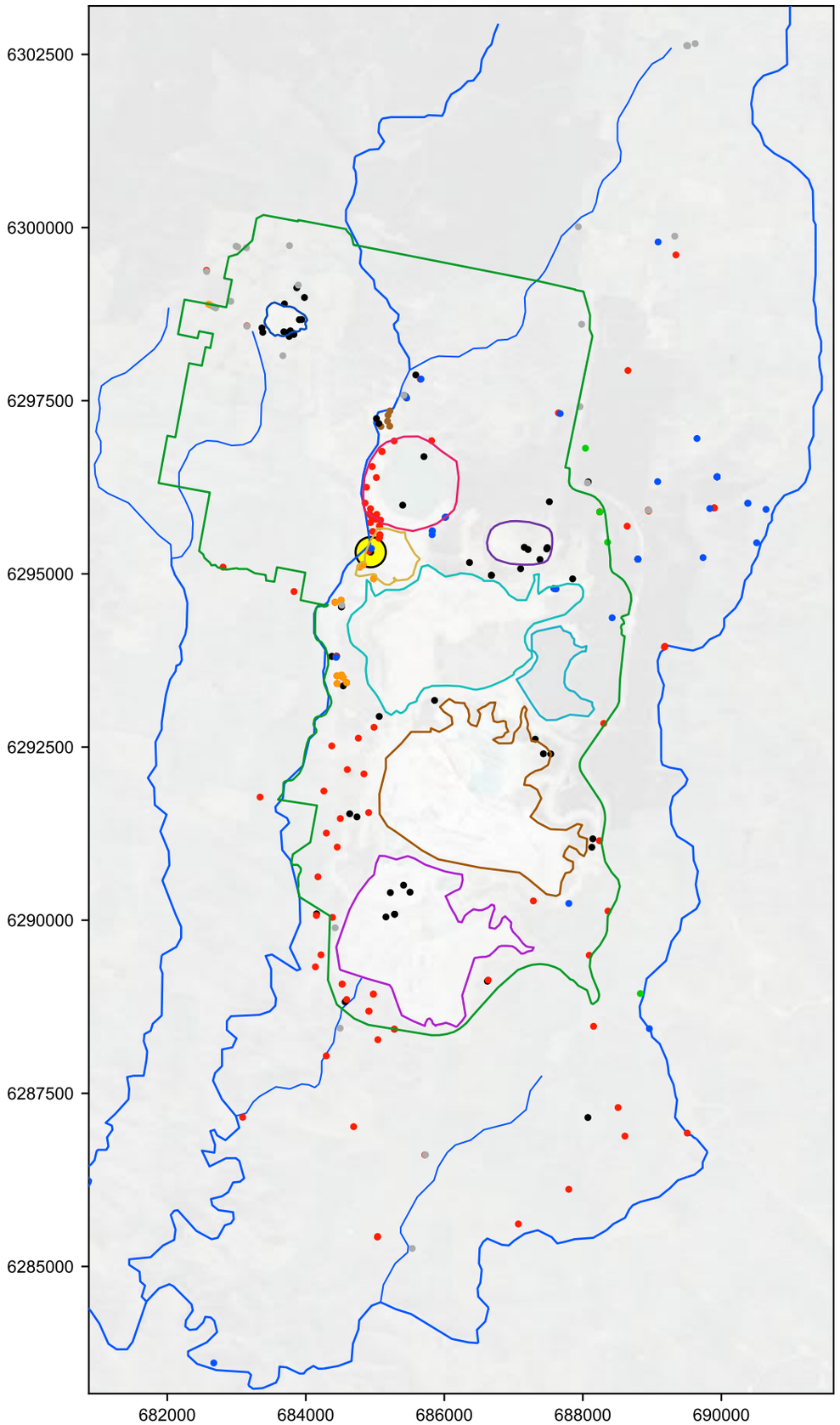

Dissolved Silver
CAWS42
CAWS43
MB70
pre-mining
0.96
0.98
1.00
1.02
1.04
Concentration (µg/L)


Dissolved Zinc
CAWS42
CAWS43
MB70
pre-mining
0
50
100
150
200
250
Concentration (µg/L)

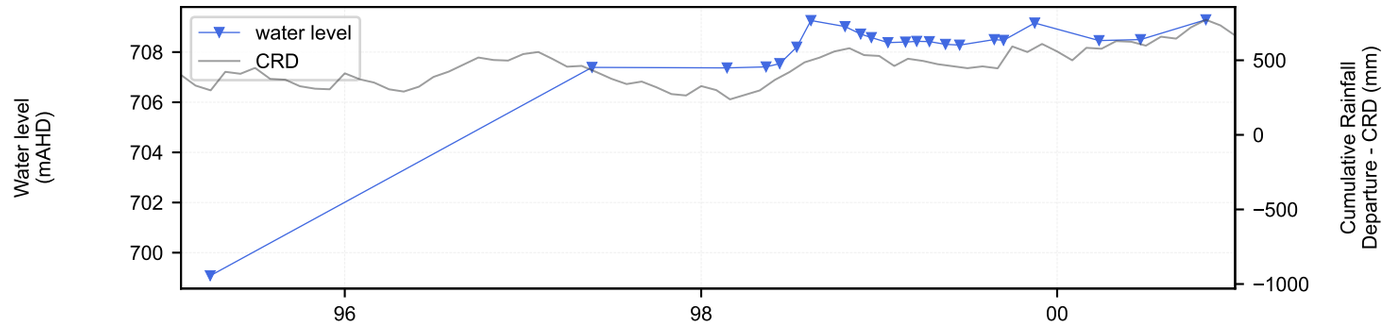
Appendix C

Groundwater level and quality composite plots

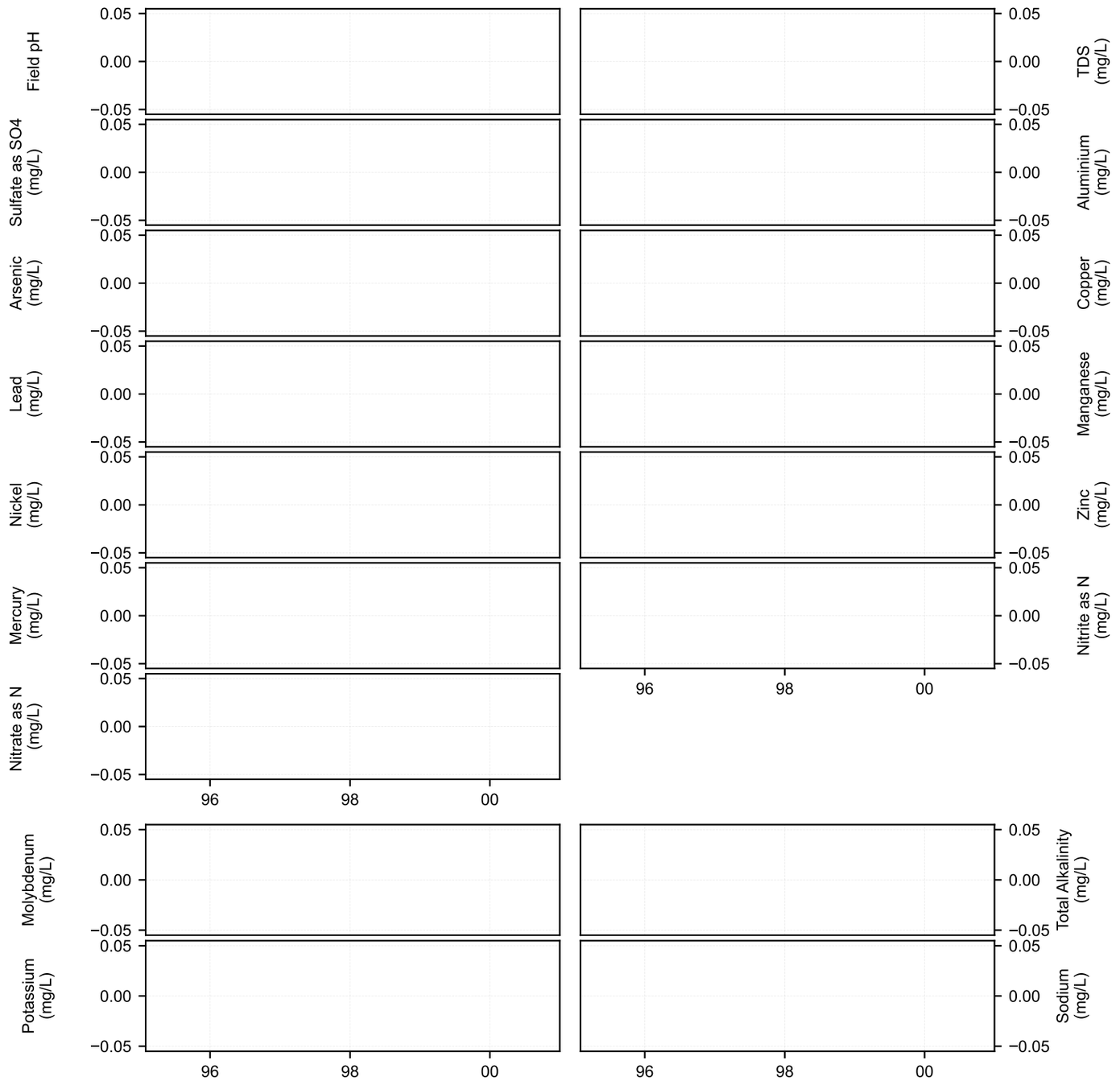
CB14 (Screened geology - Inactive; Screened interval: 48-92 mbgl)



Groundwater levels



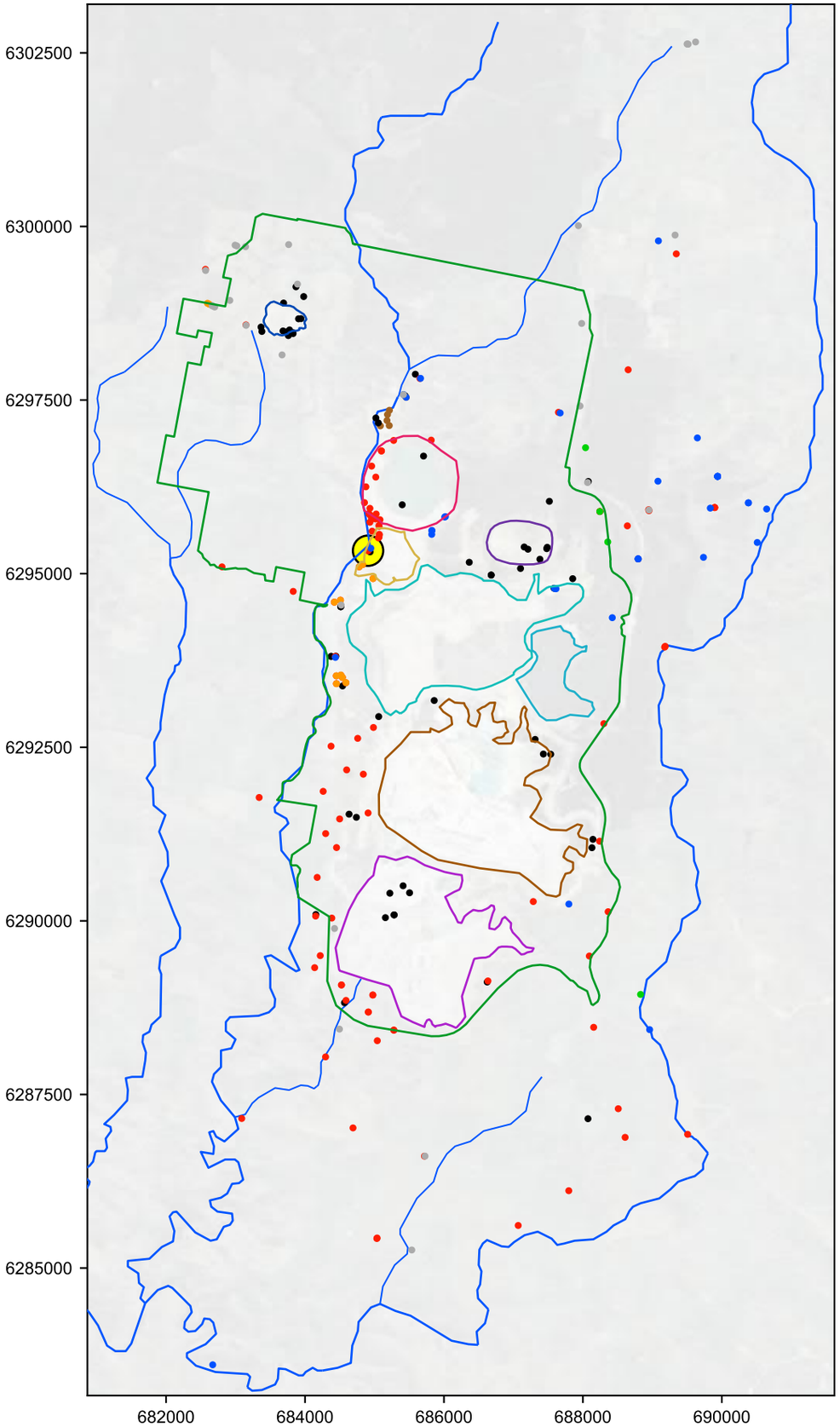
WMP defined analytes



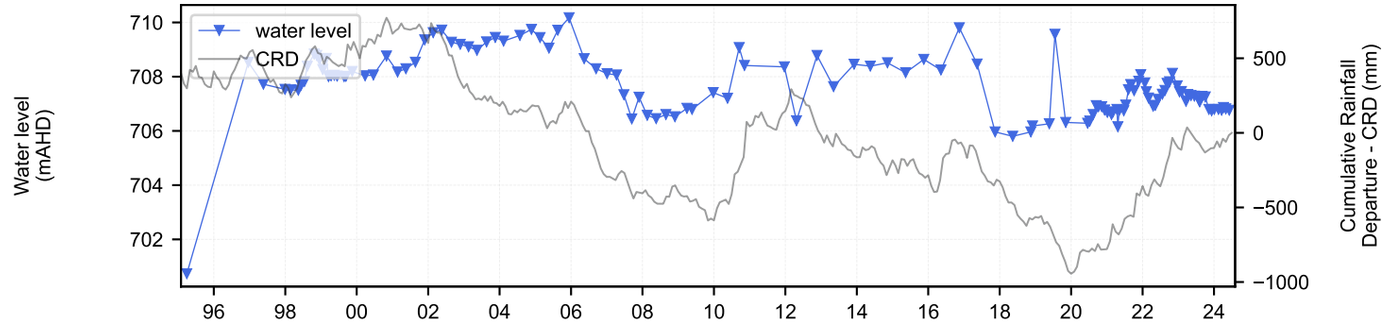
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

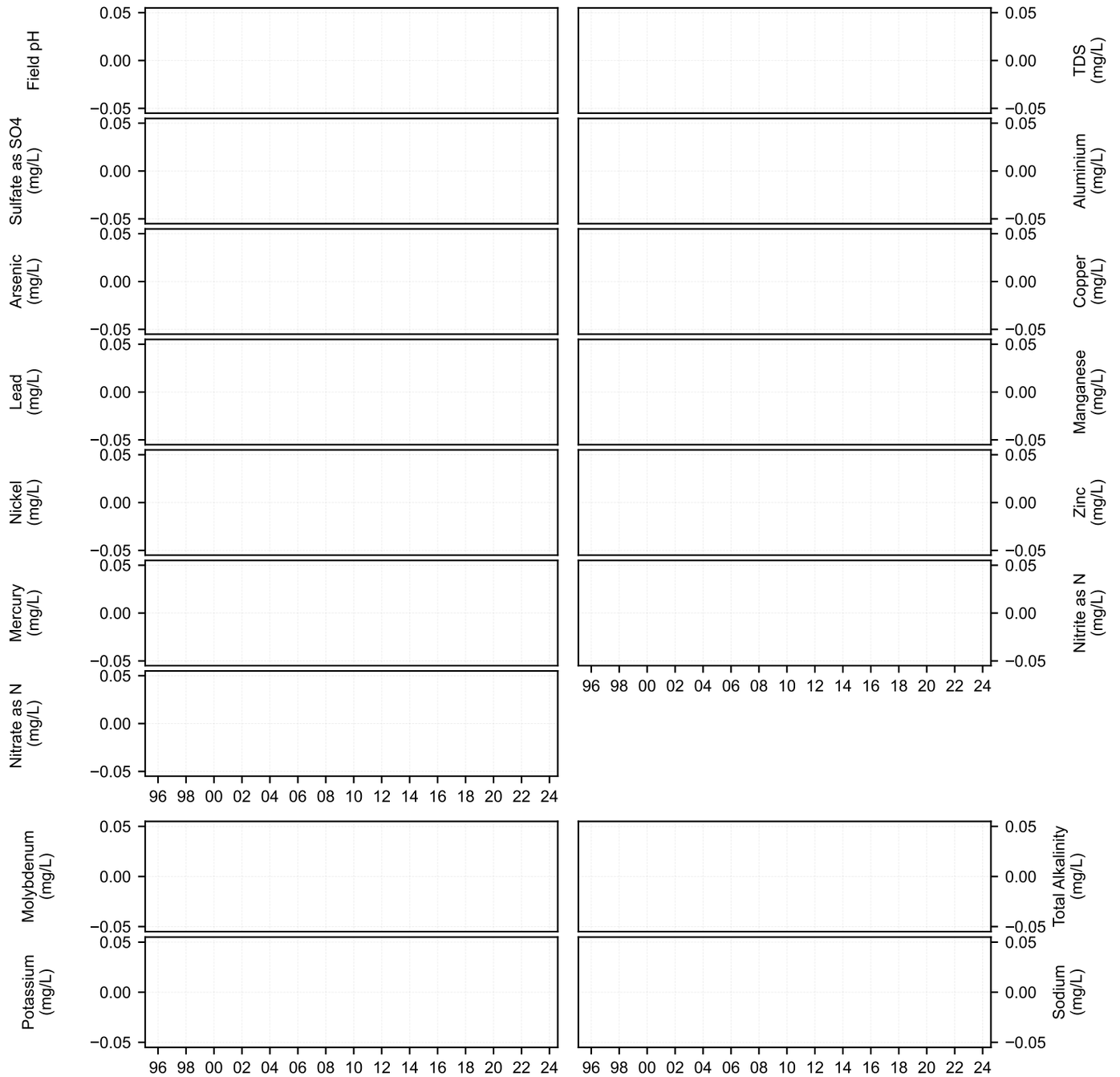
CB14A (Screened geology - Ordovician; Screened interval: 6.3-12.3 mbgl)



Groundwater levels



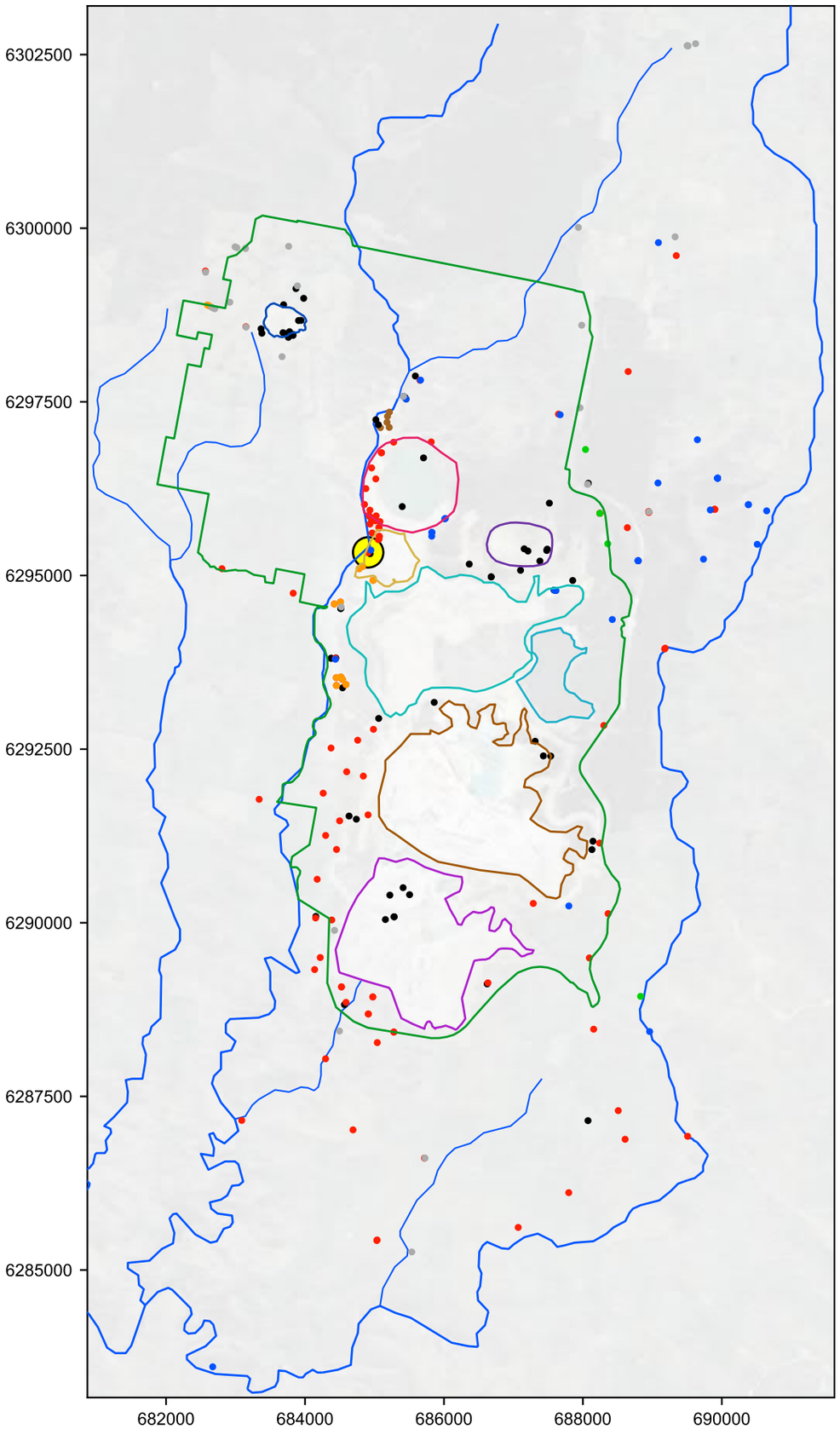
WMP defined analytes



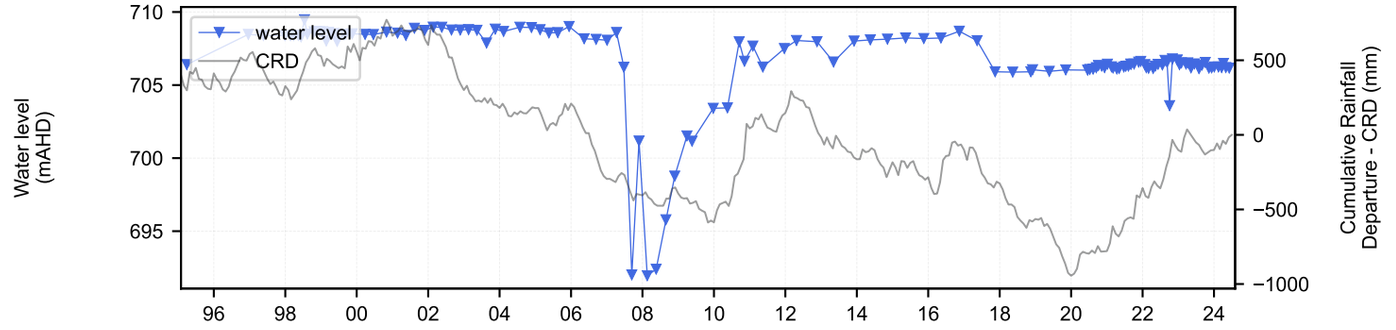
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

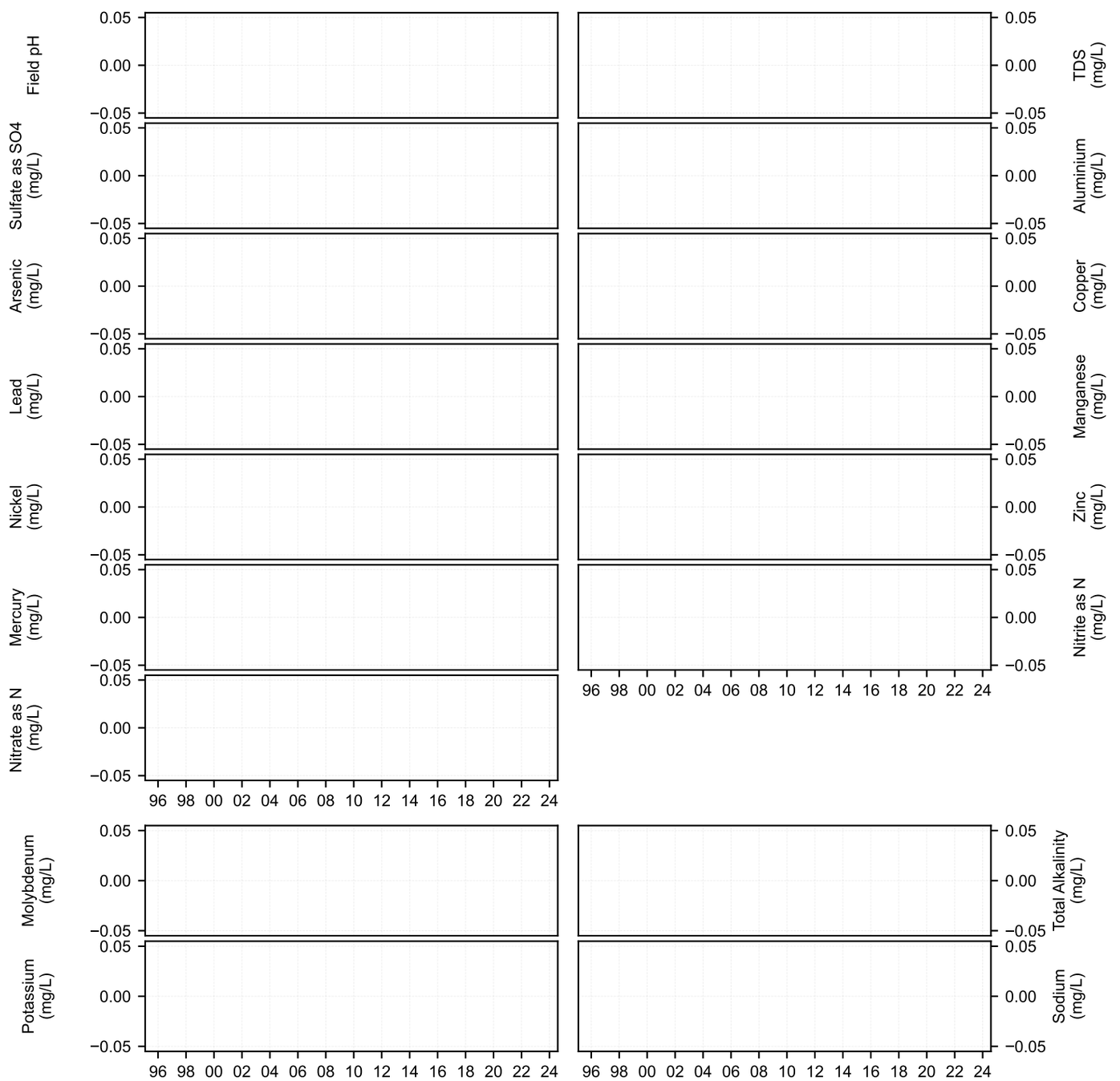
CB14B (Screened geology - Ordovician; Screened interval: 31.5-37.5 mbgl)



Groundwater levels



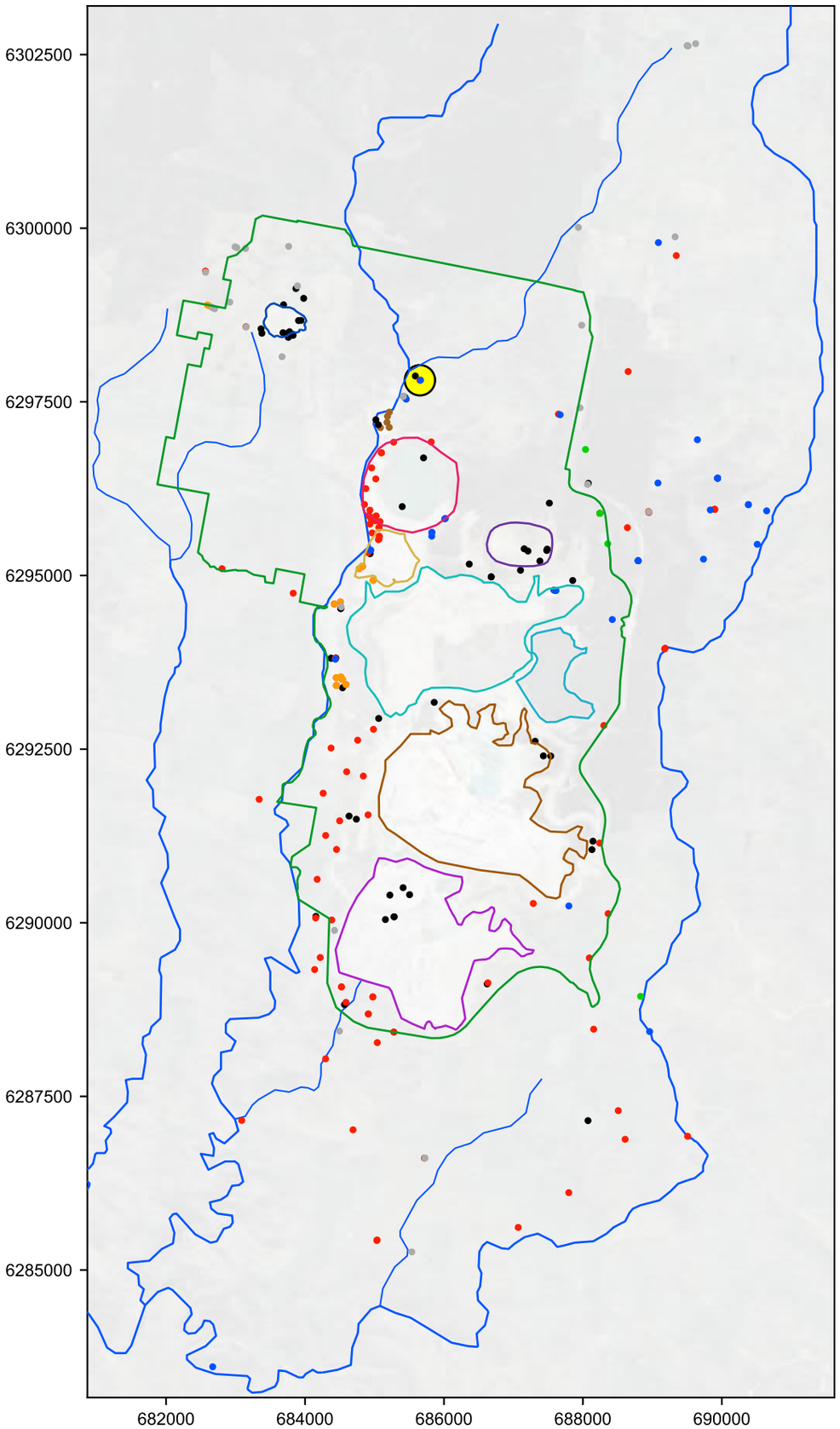
WMP defined analytes



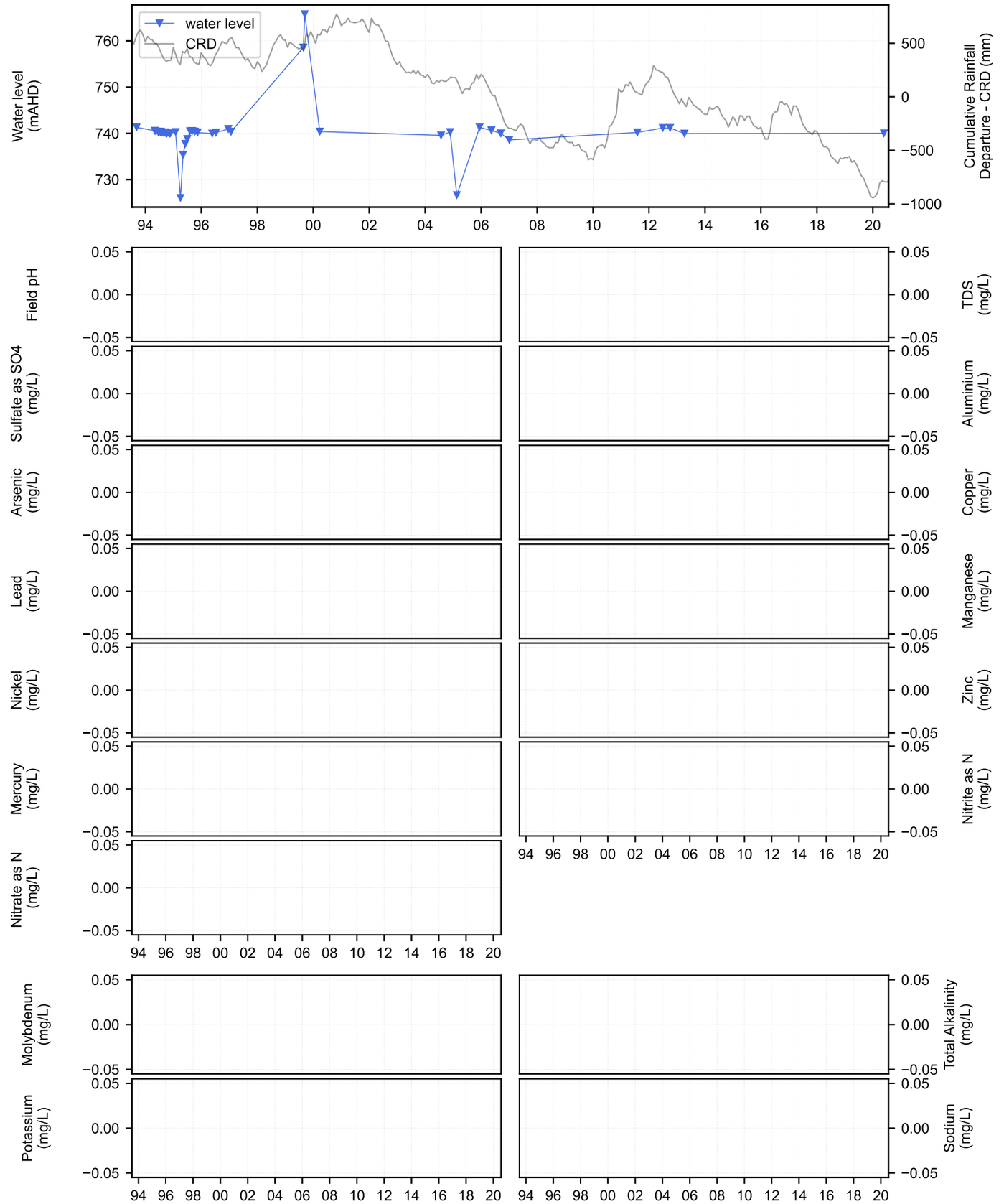
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

CB3 (Screened geology - Ordovician; Screened interval: 0-52 mbgl)



Groundwater levels

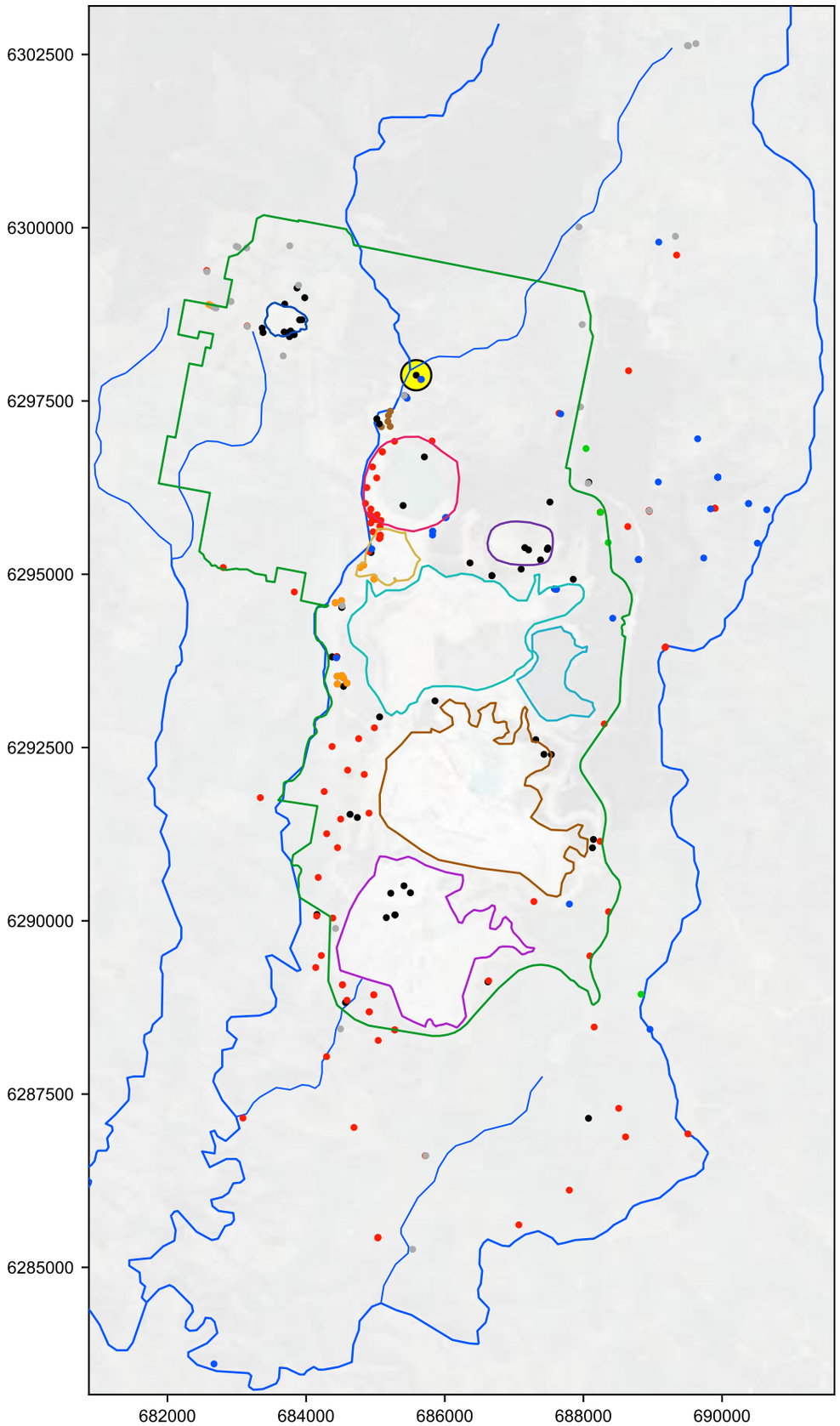


WMP defined analytes

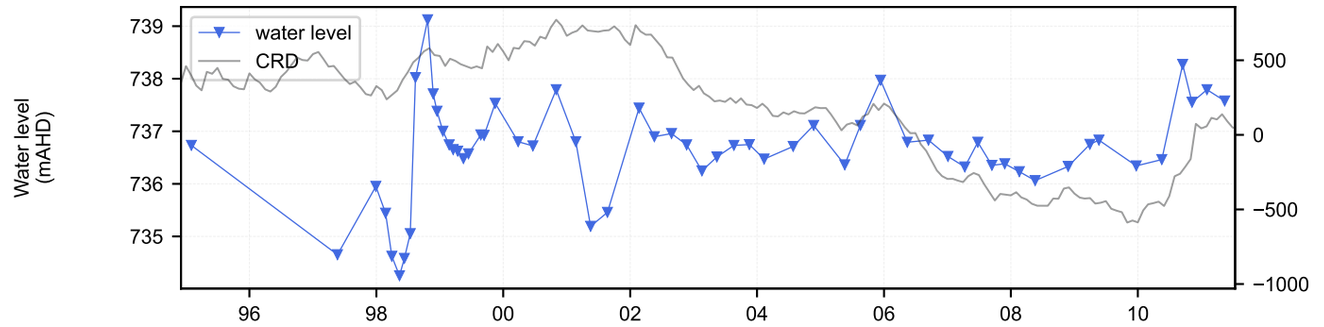
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

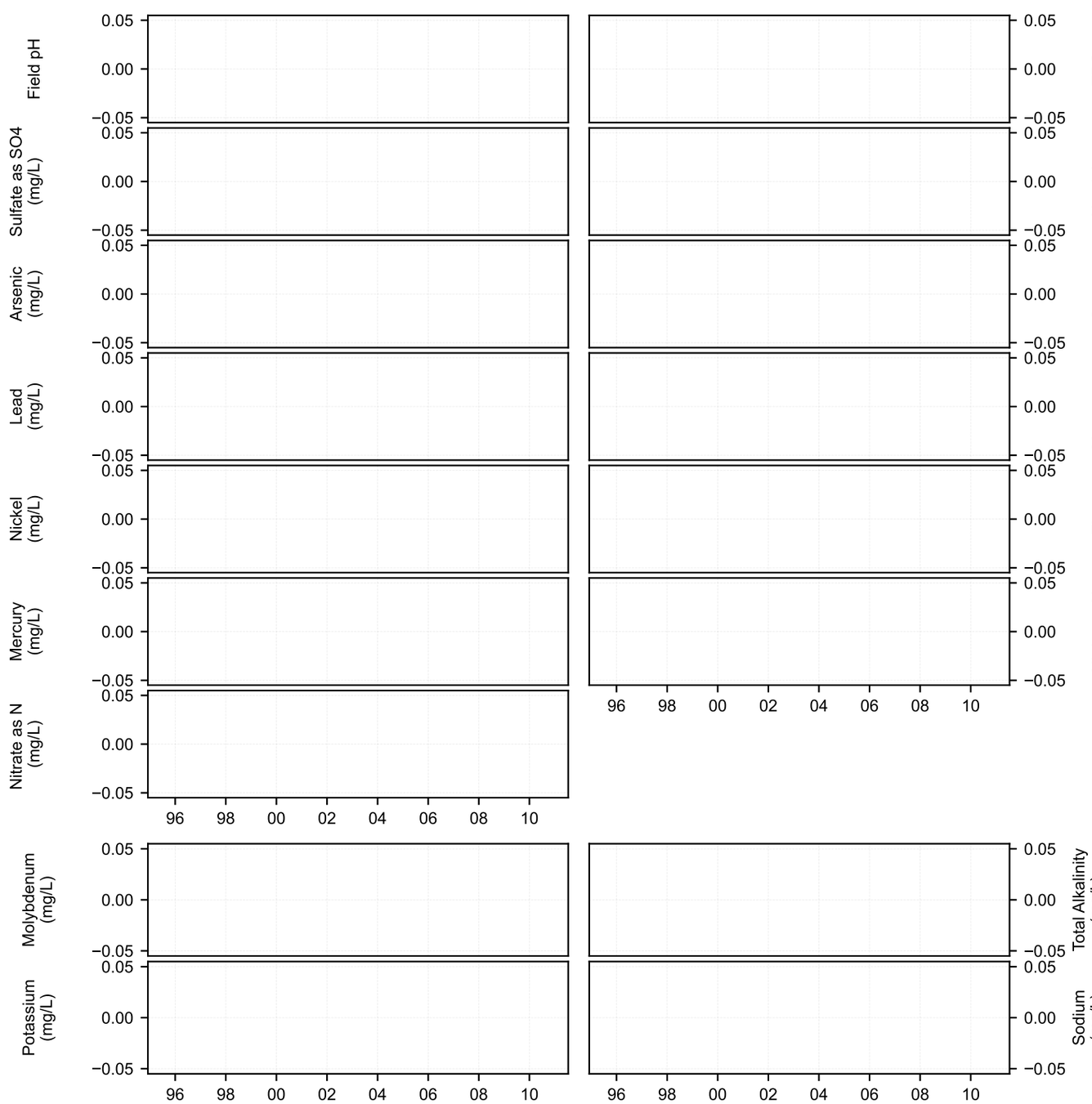
CB5 (Screened geology - Inactive; Screened interval: 0.3-82 mbgl)



Groundwater levels



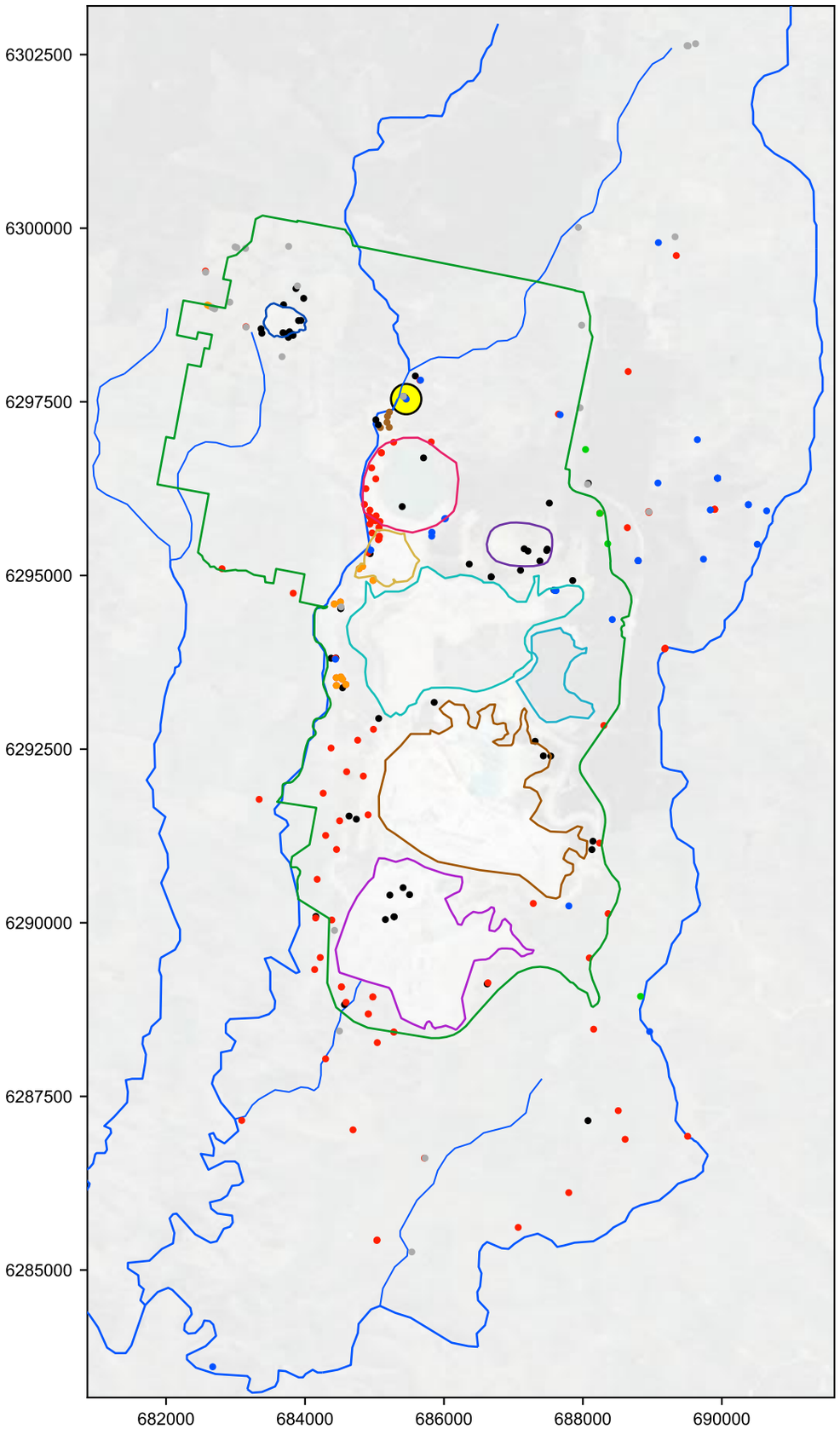
WMP defined analytes



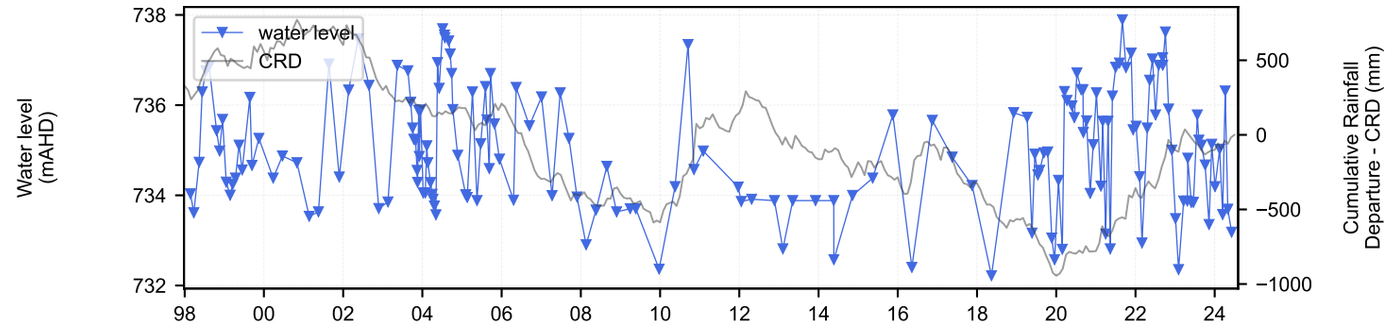
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

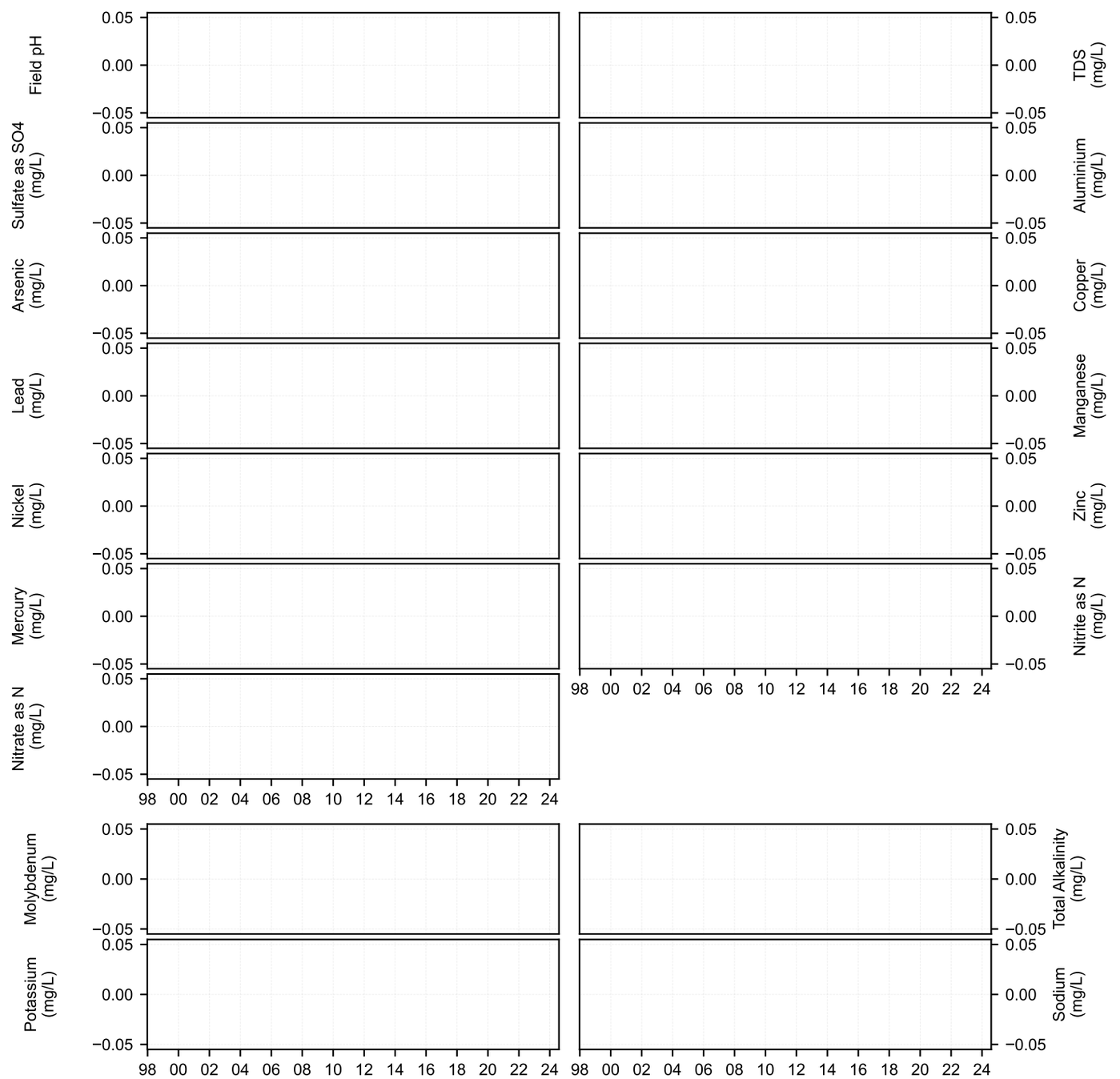
CB8B (Screened geology - Regolith; Screened interval: 0.3-6 mbgl)



Groundwater levels



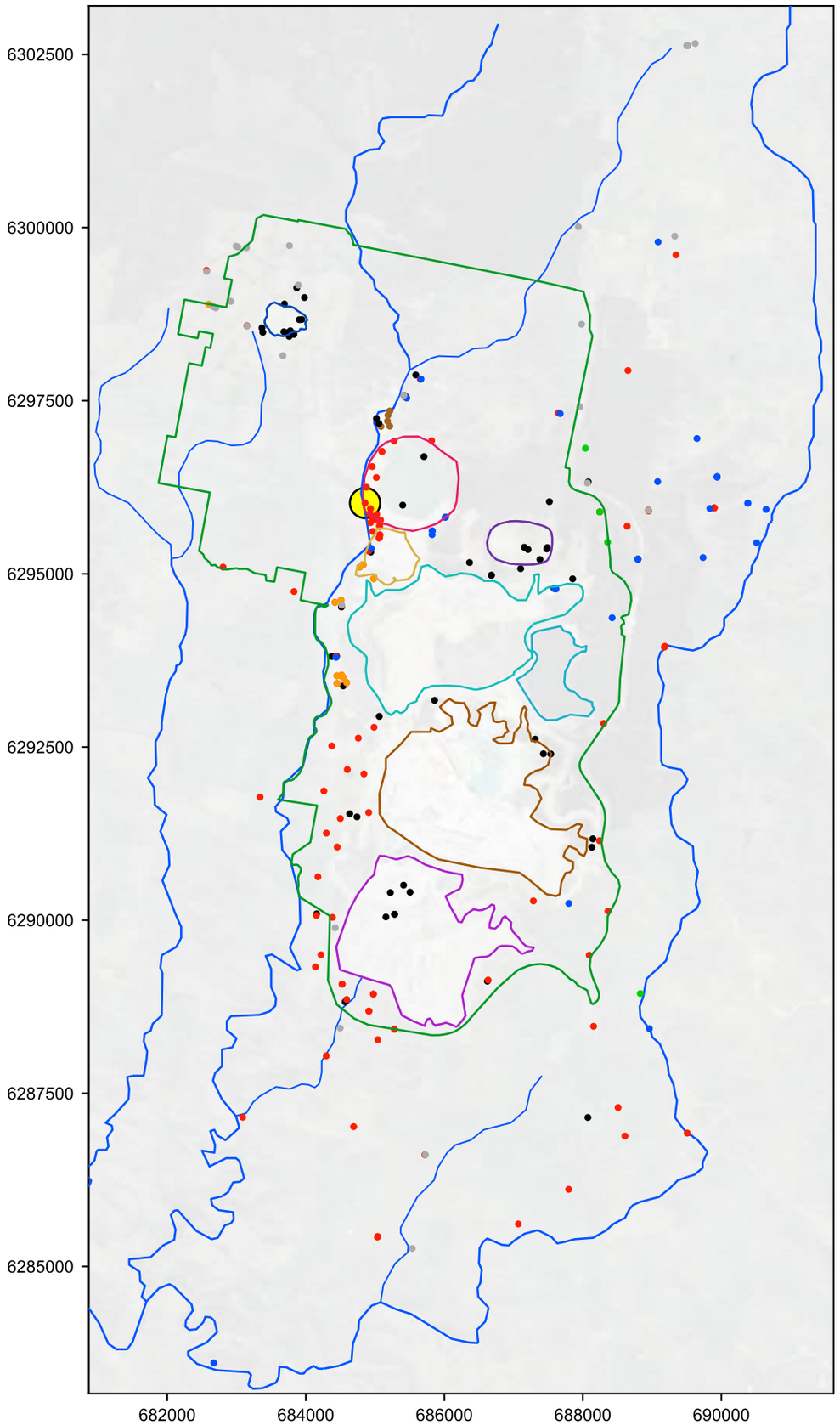
WMP defined analytes



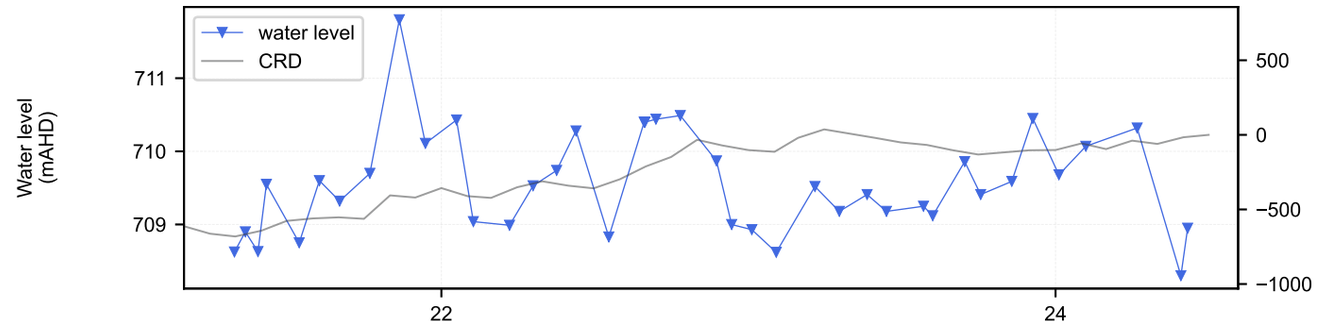
Additional analytes of interest

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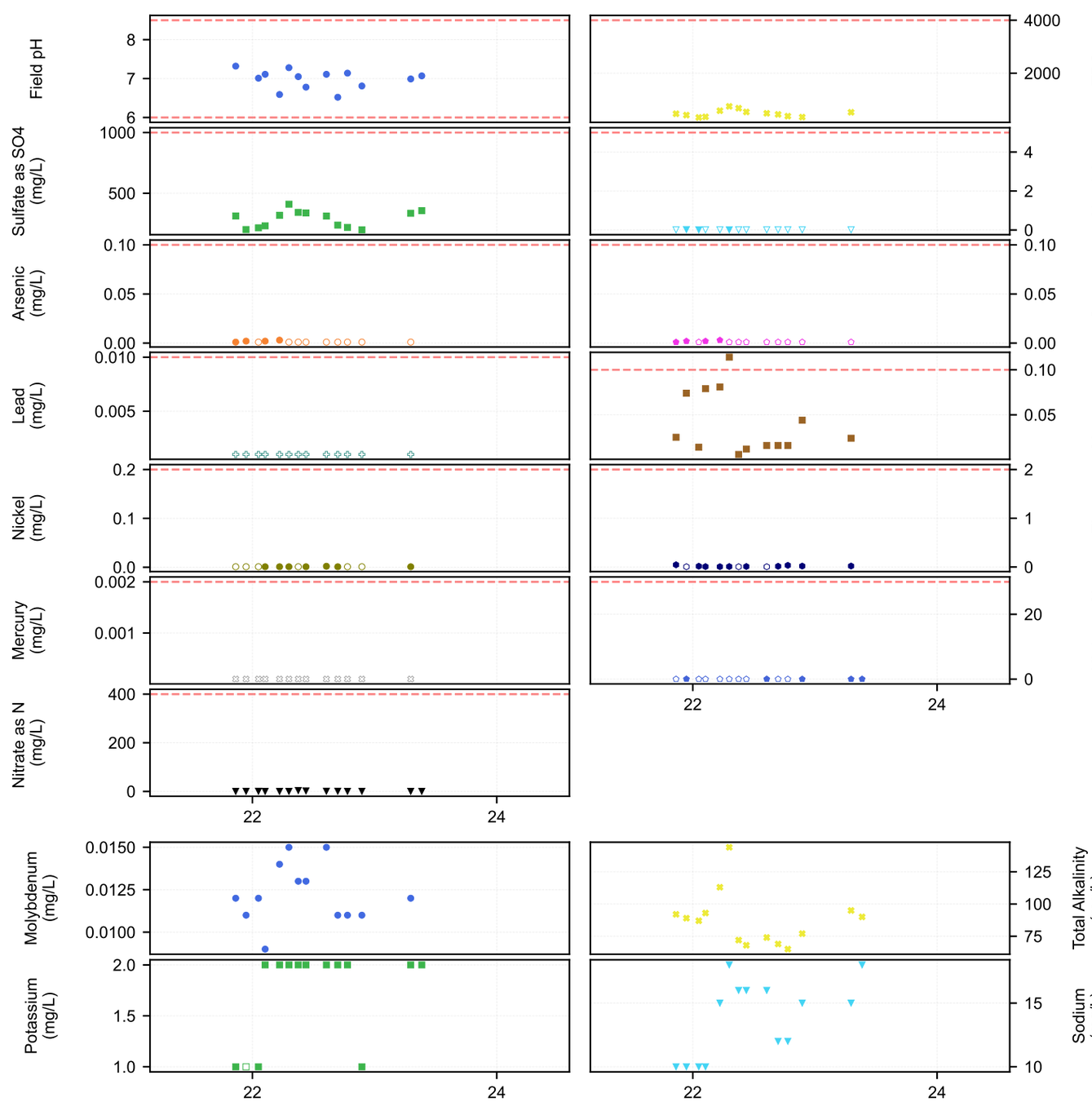
MB100 (Screened geology - Ordovician; Screened interval: 9-12 mbgl)



Groundwater levels



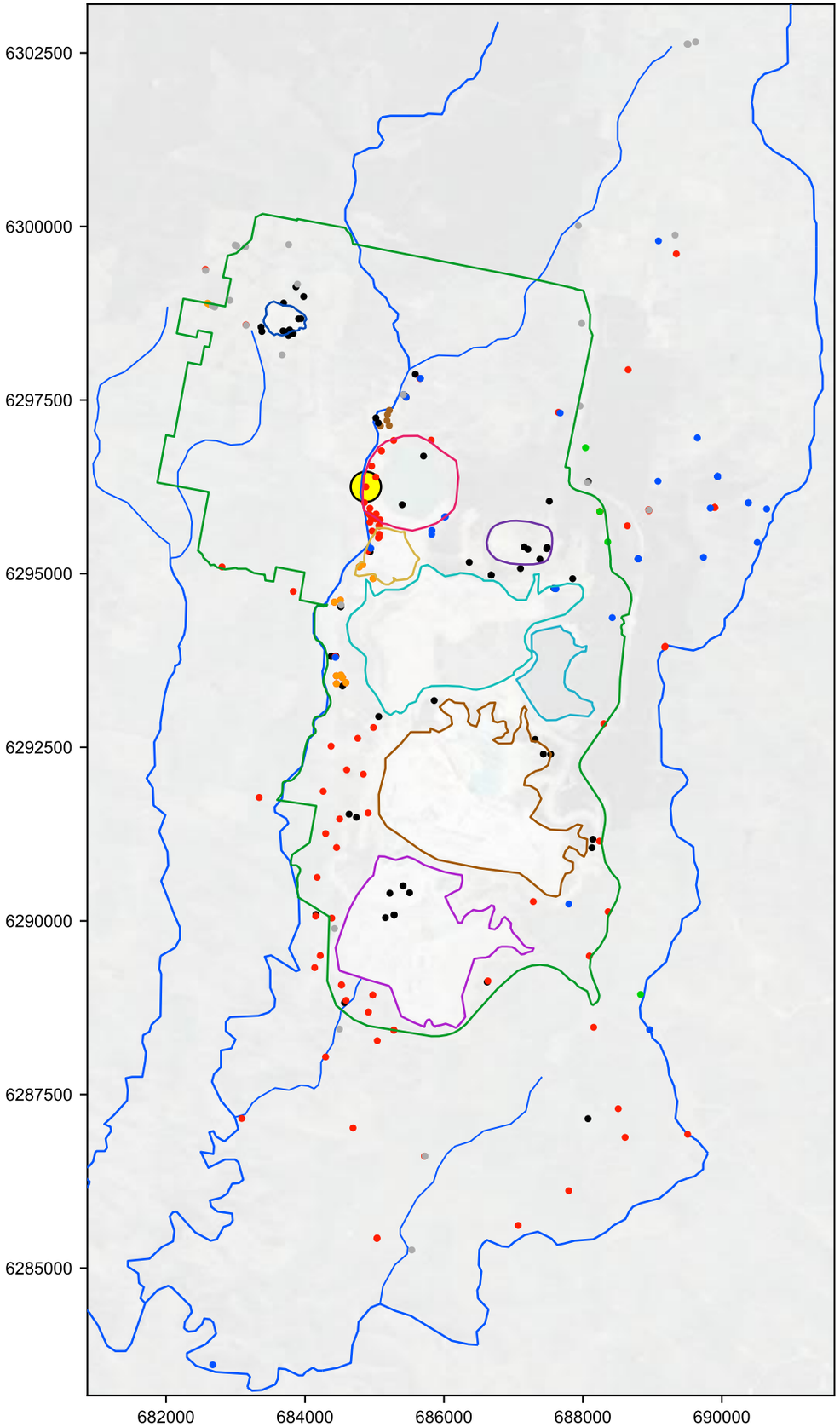
WMP defined analytes



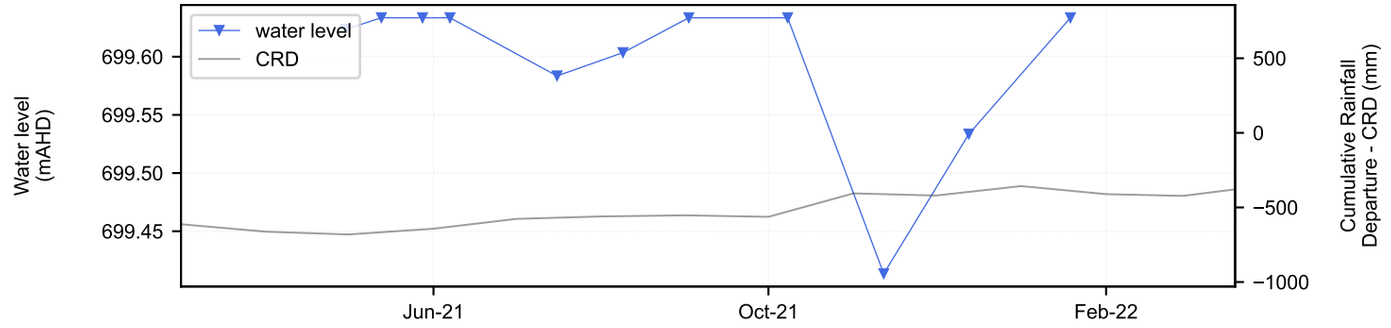
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

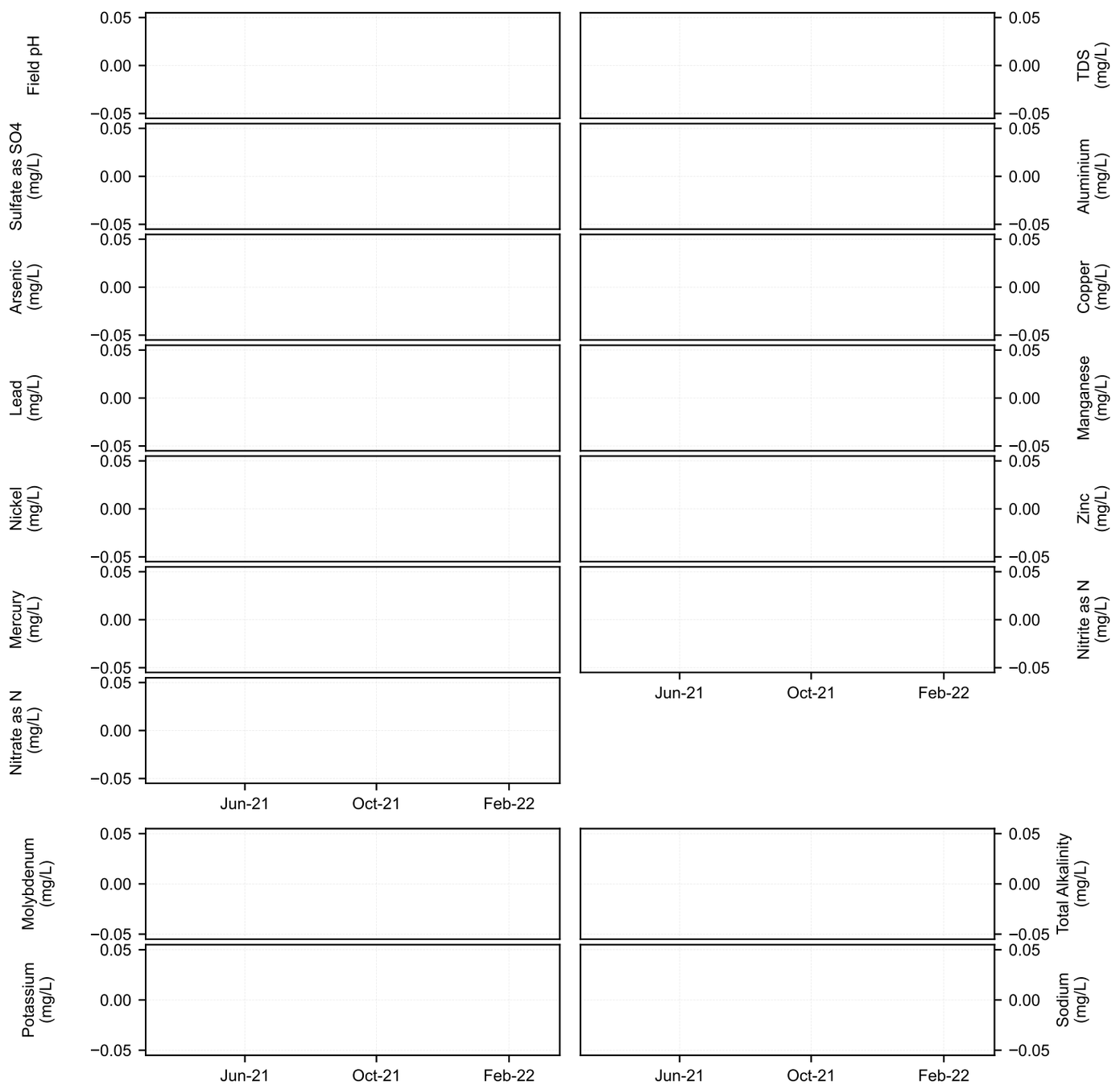
MB101 (Screened geology - Ordovician; Screened interval: 14-20.1 mbgl)



Groundwater levels



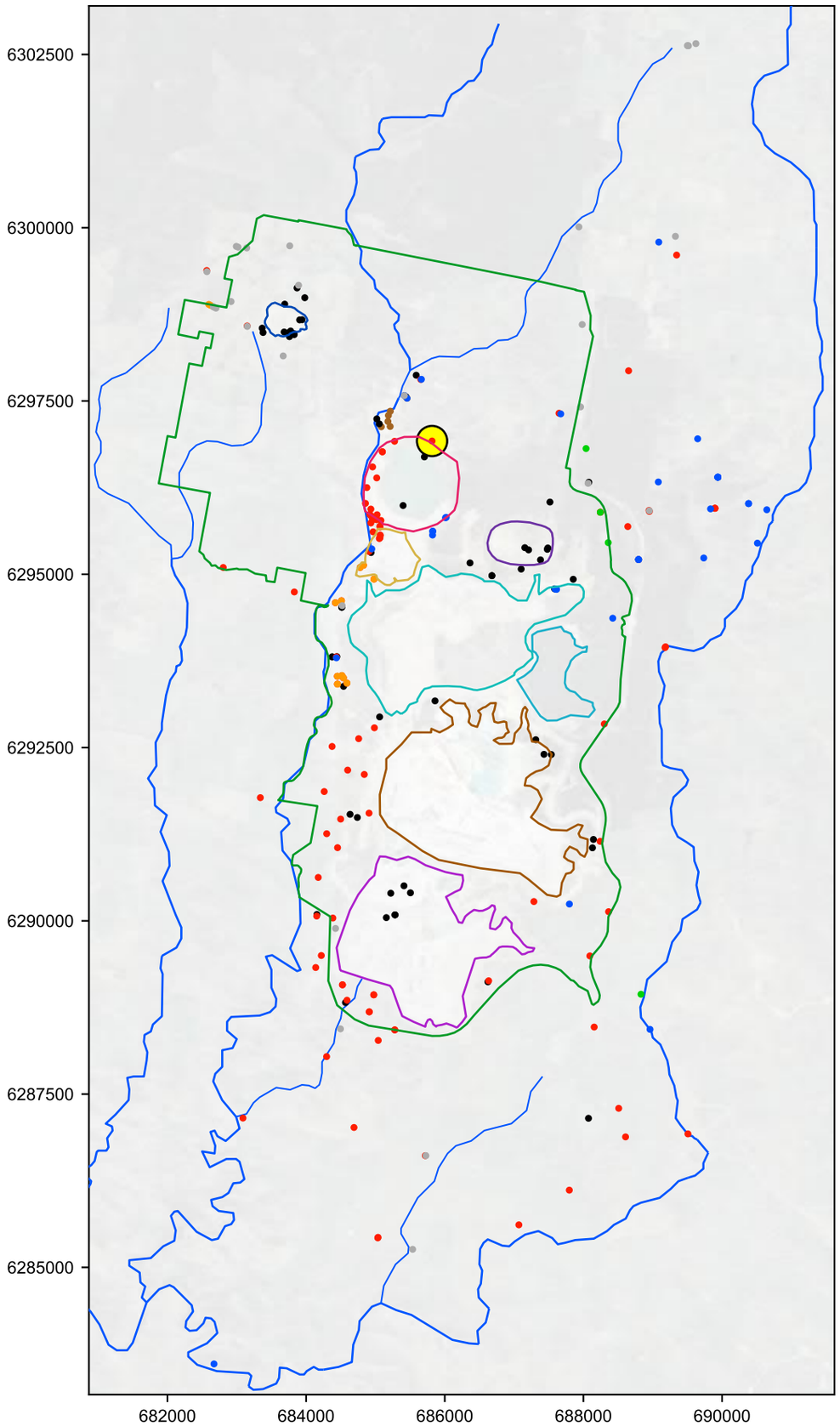
WMP defined analytes



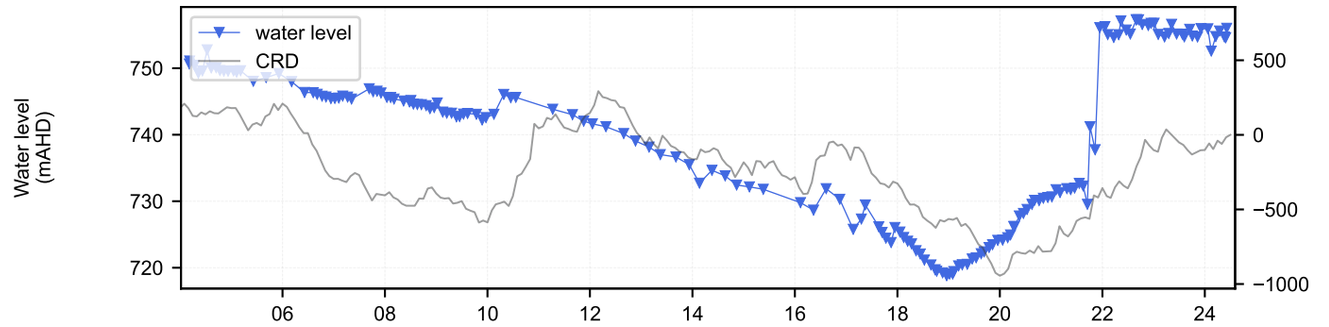
Additional analytes of interest

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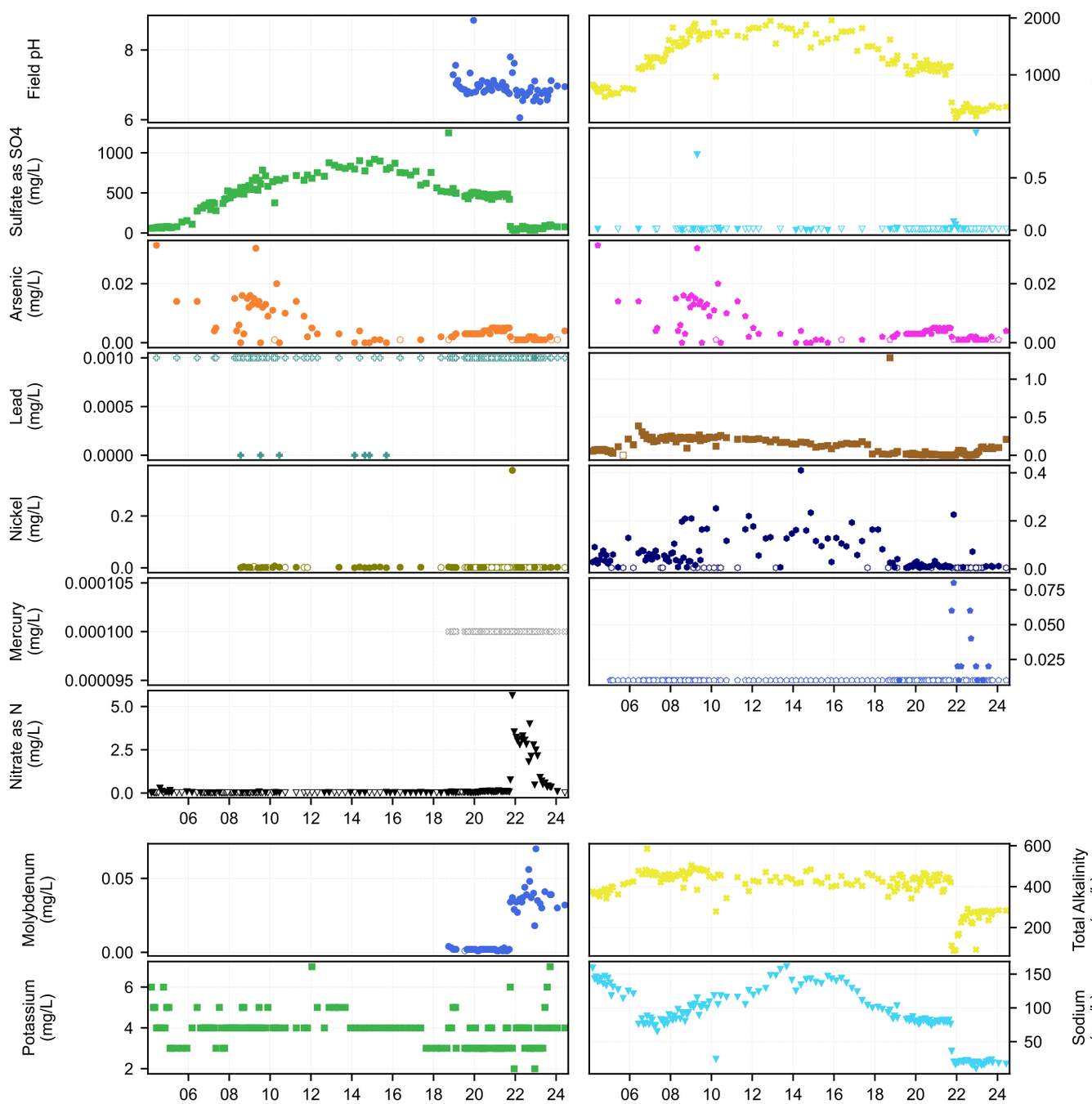
MB30 (Screened geology - Ordovician; Screened interval: 4-76 mbgl)



Groundwater levels



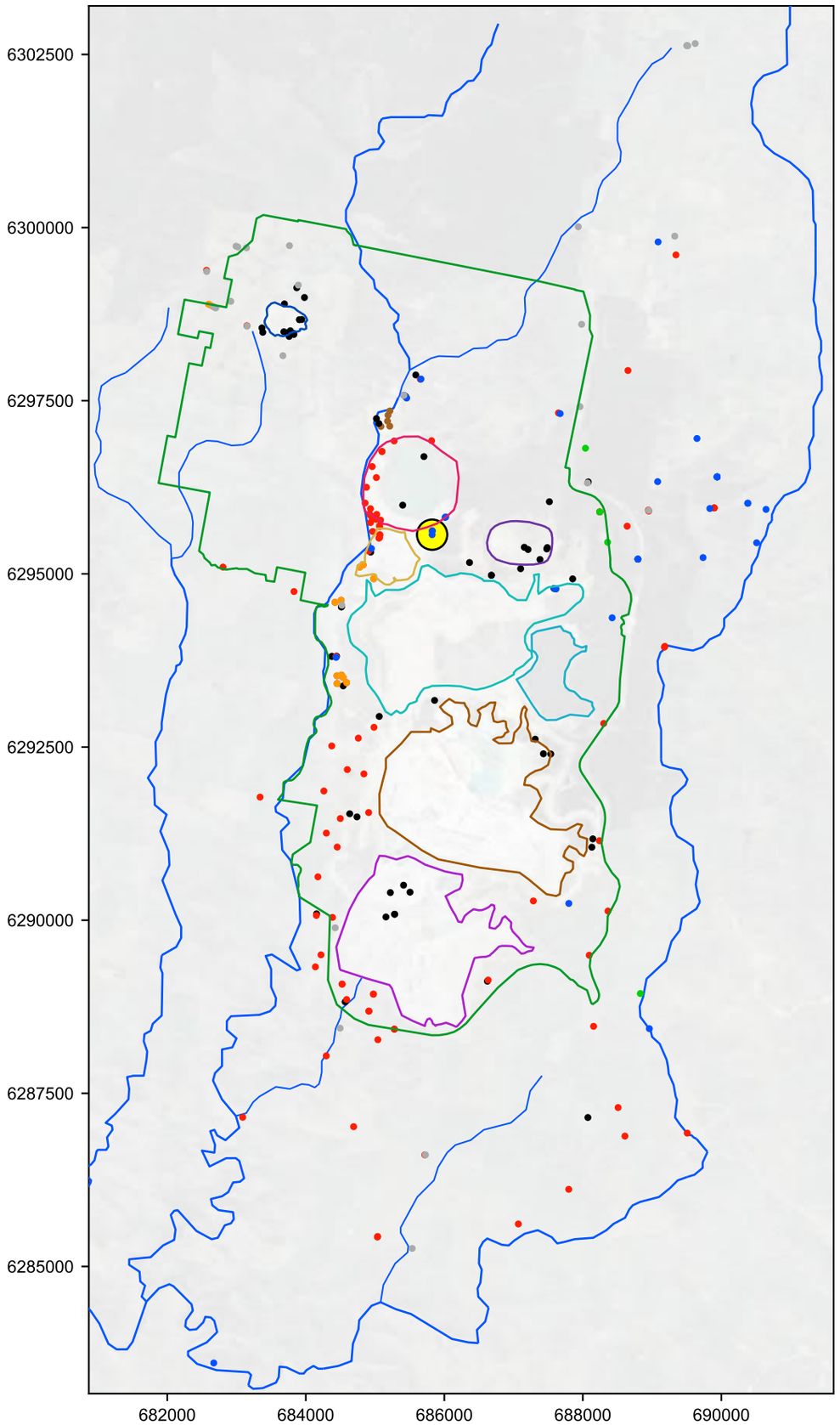
WMP defined analytes



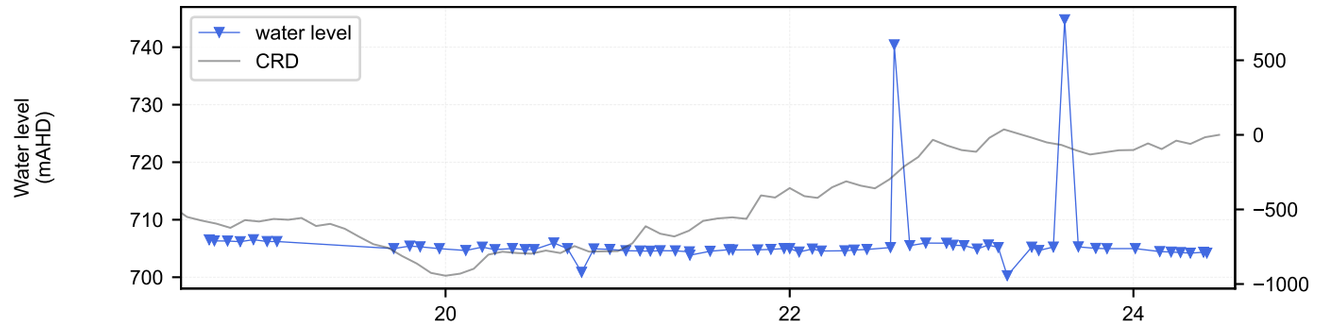
Additional analytes of interest

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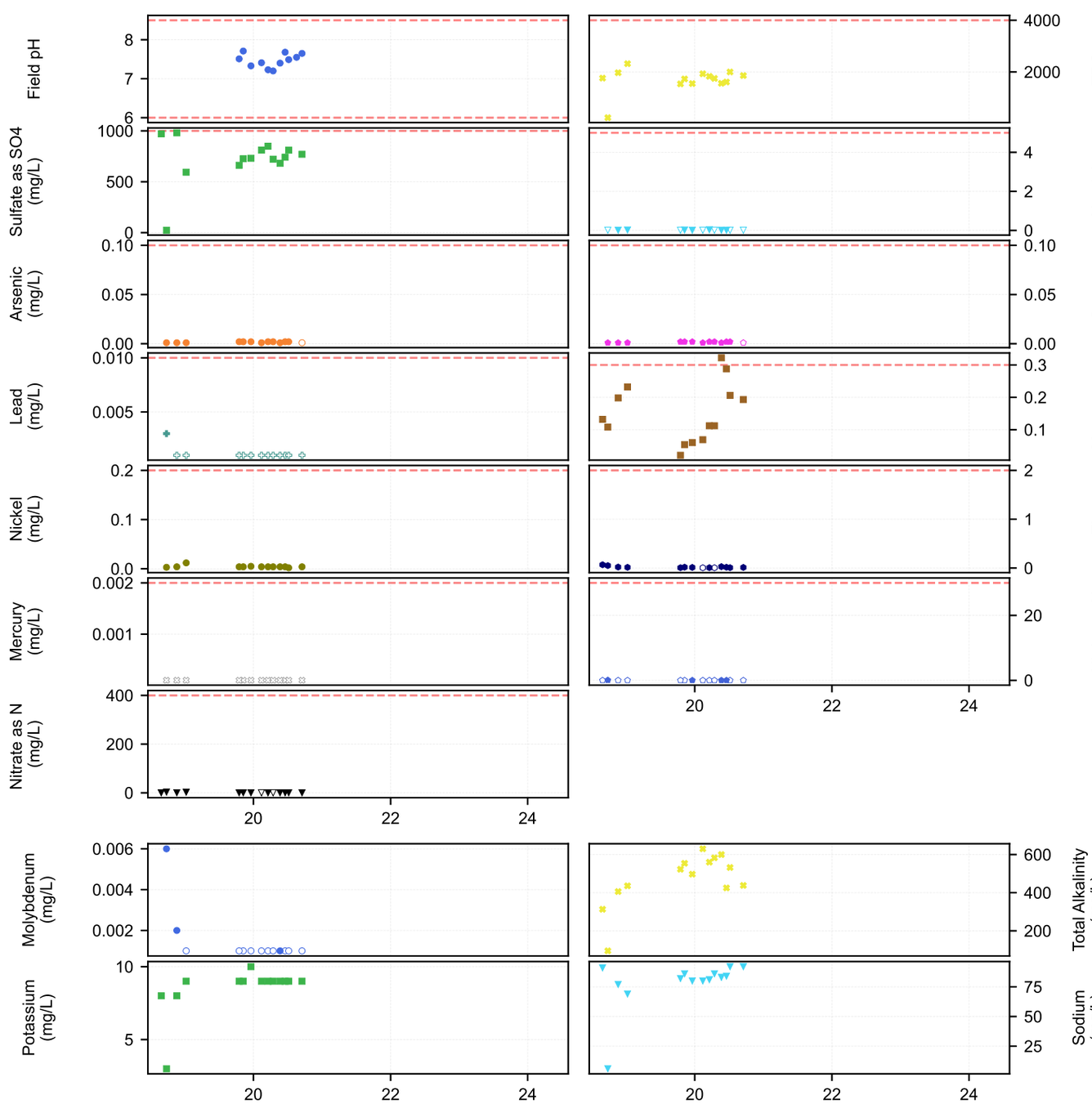
MB91 (Screened geology - Silurian; Screened interval: 138-150 mbgl)



Groundwater levels



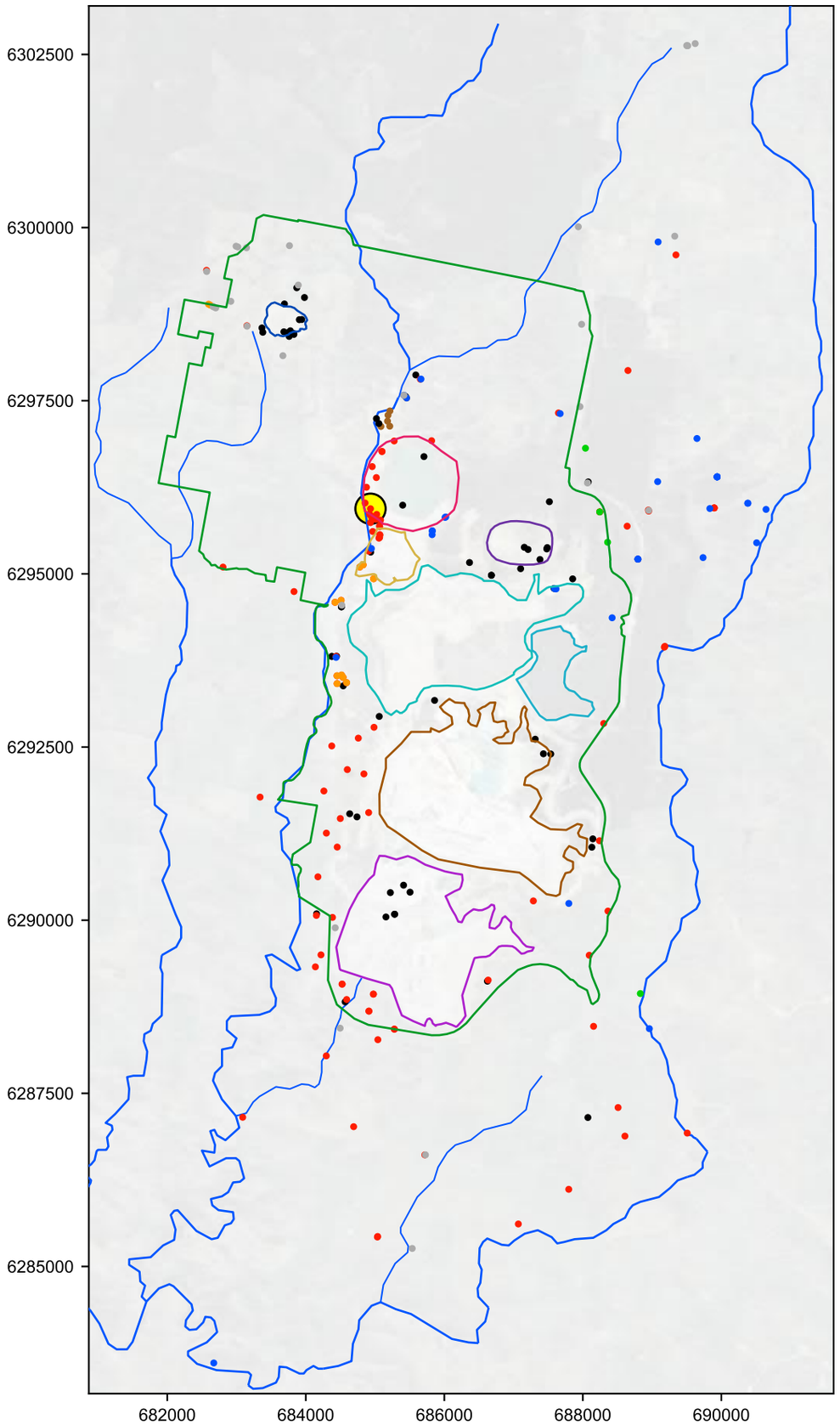
WMP defined analytes



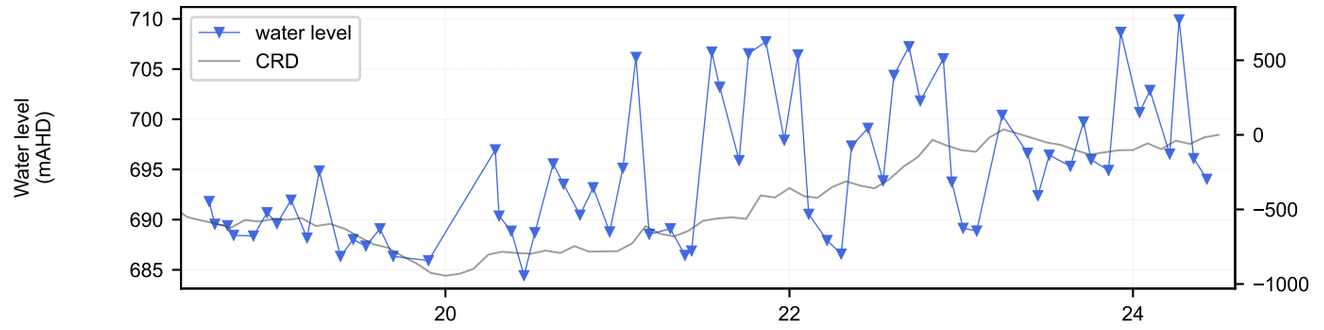
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

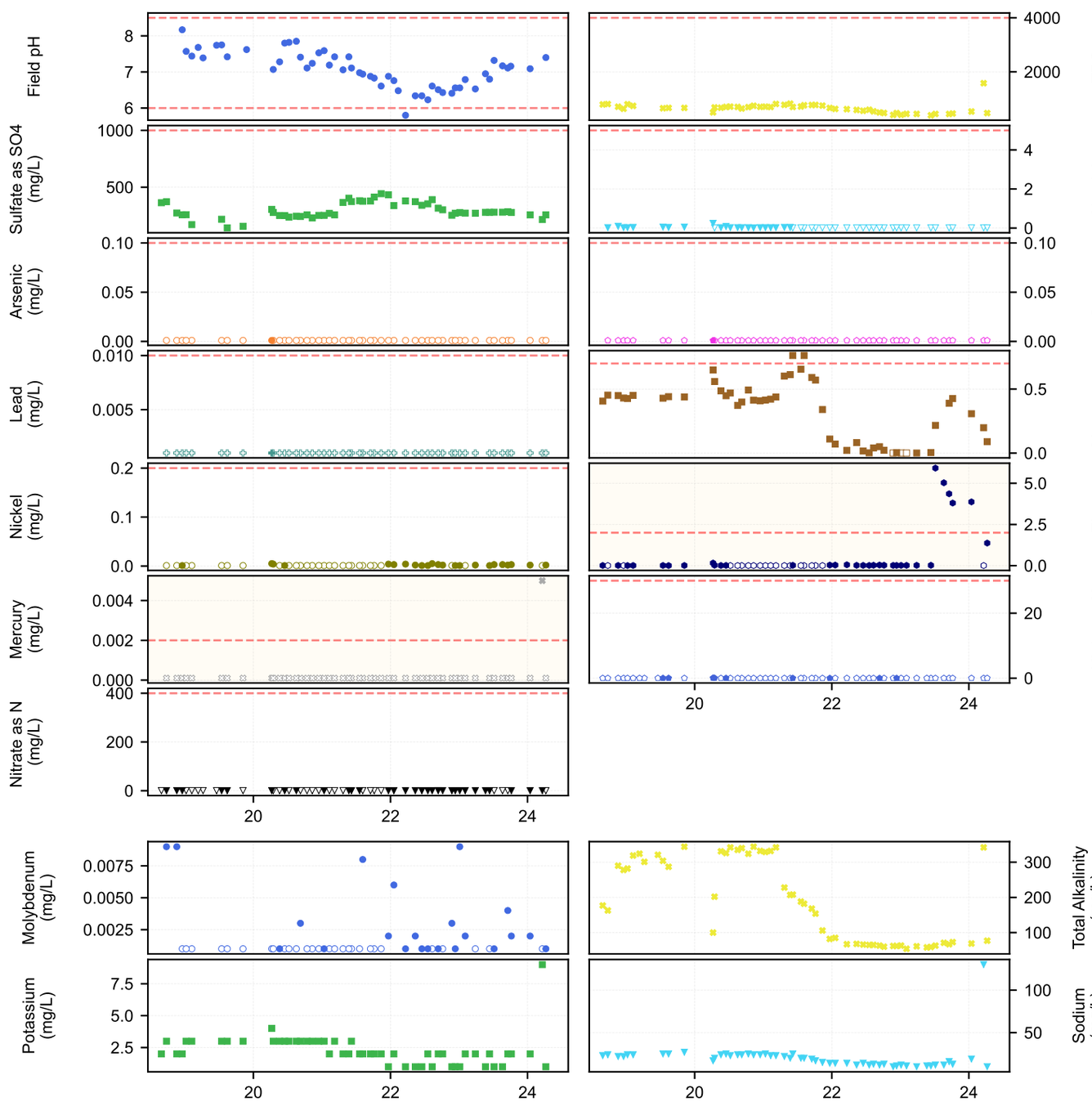
MB92 (Screened geology - Ordovician; Screened interval: 102-120 mbgl)



Groundwater levels



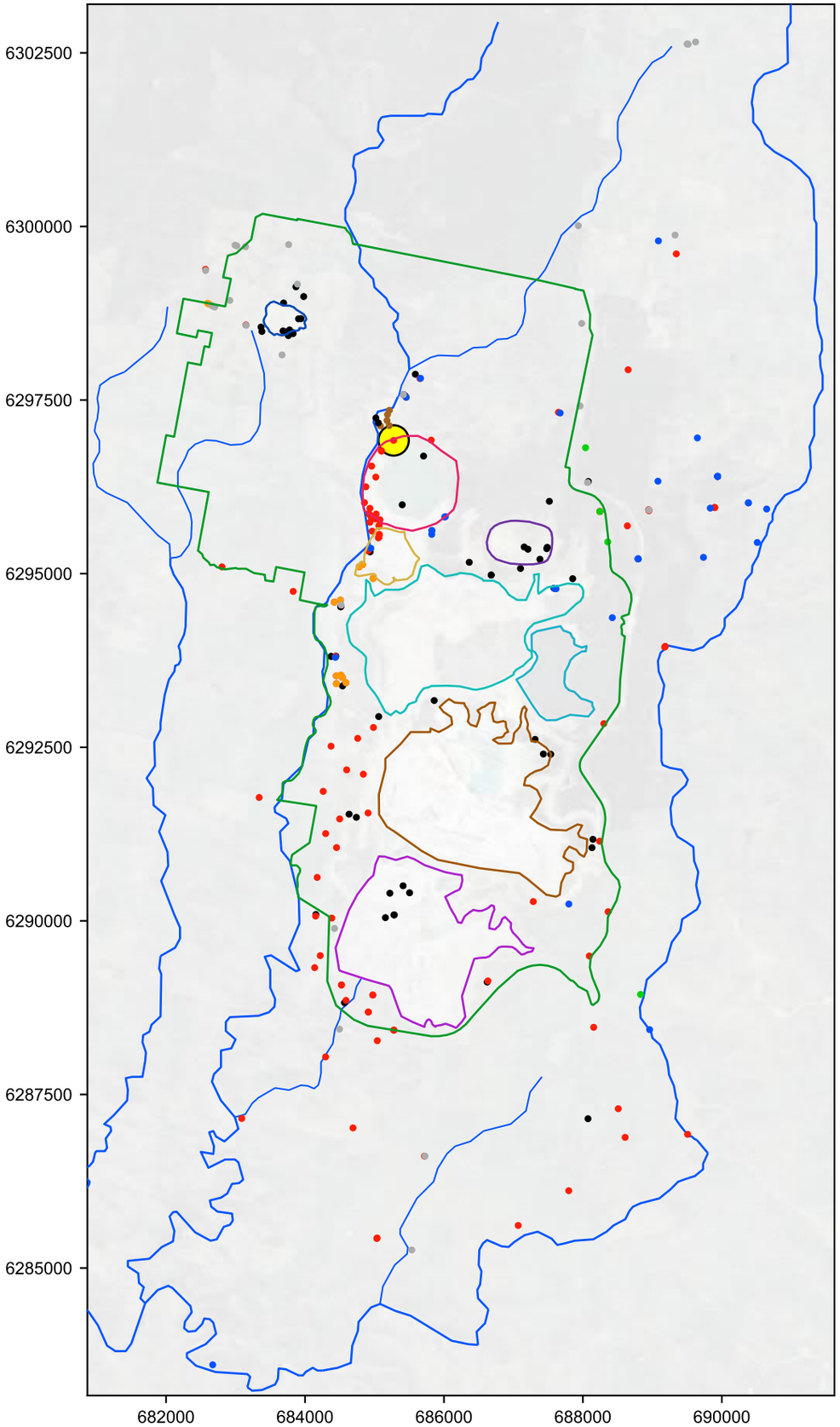
WMP defined analytes



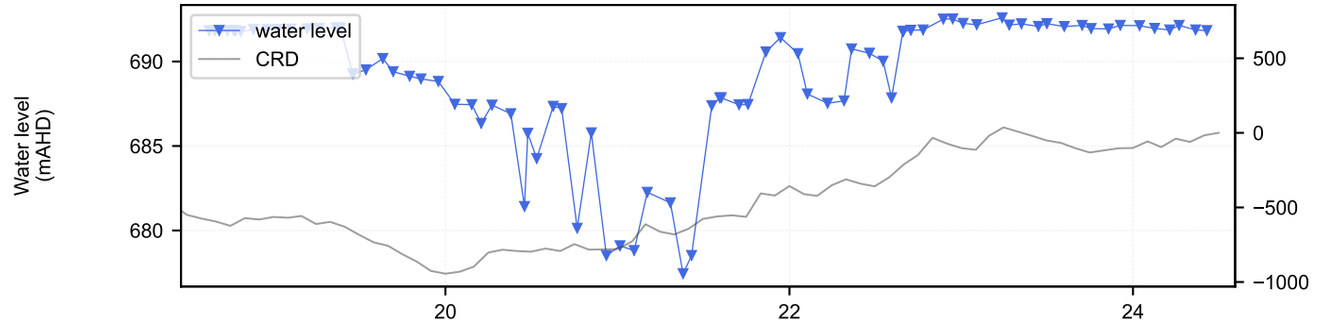
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

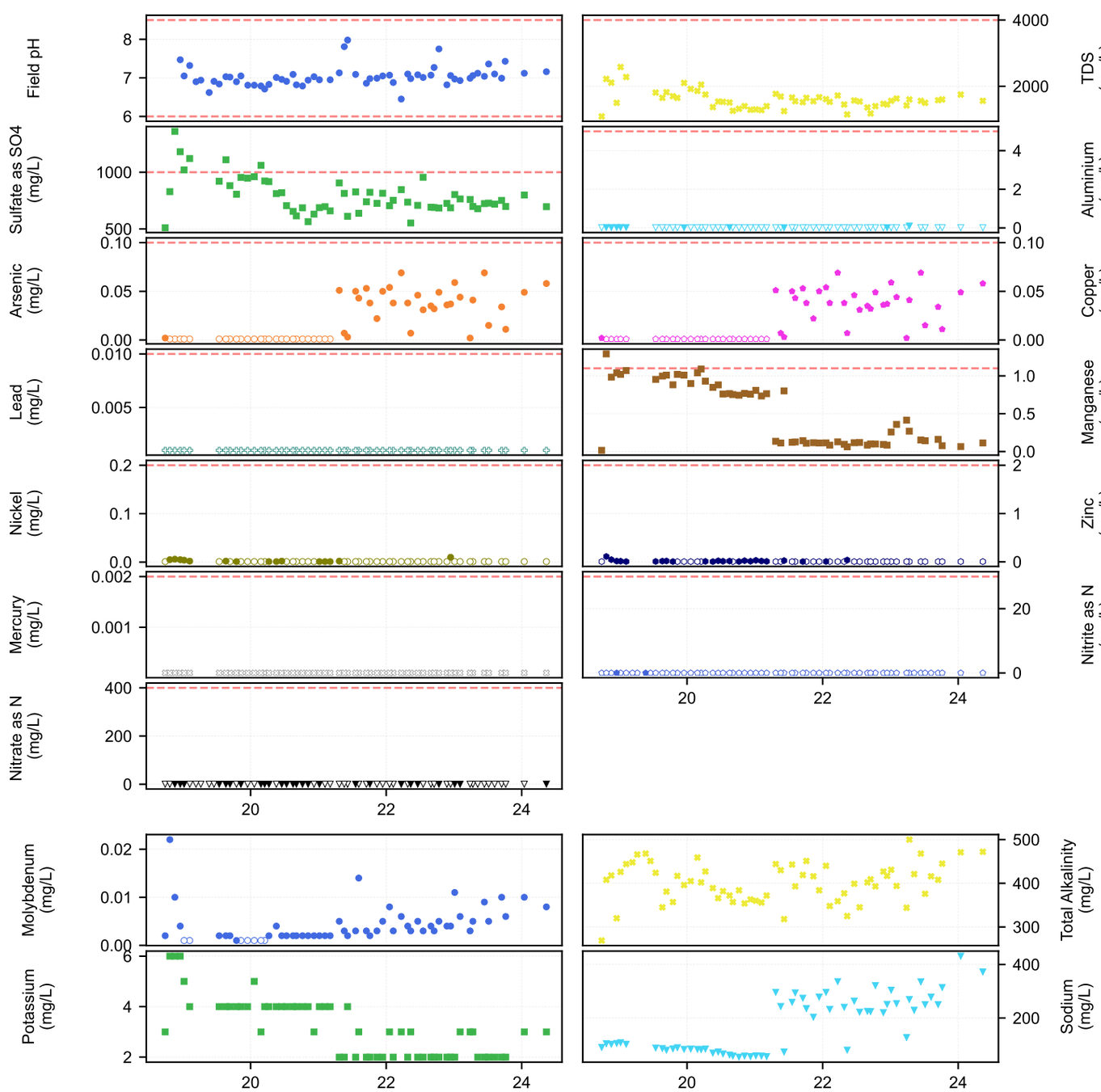
MB93 (Screened geology - Ordovician; Screened interval: 72-120 mbgl)



Groundwater levels



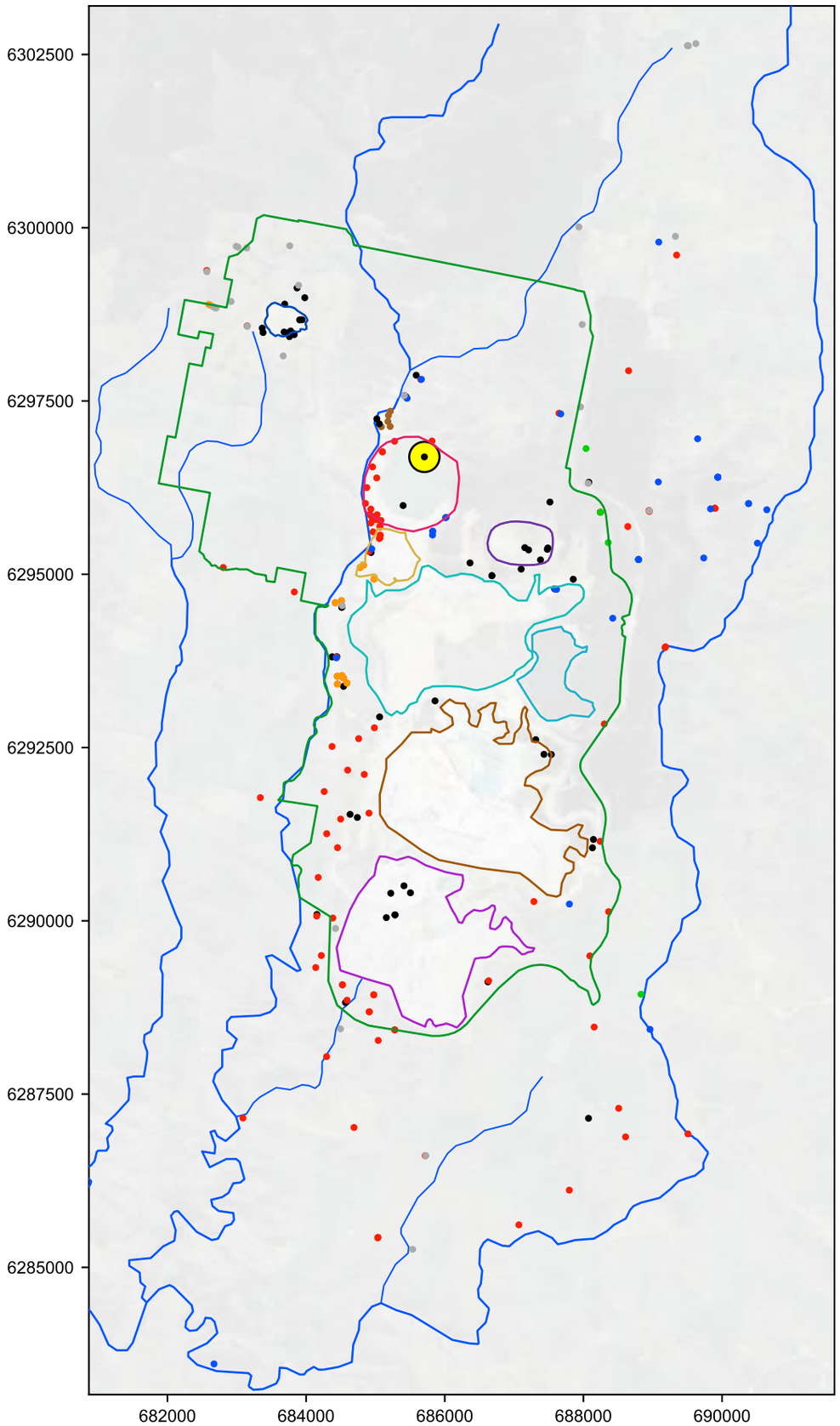
WMP defined analytes



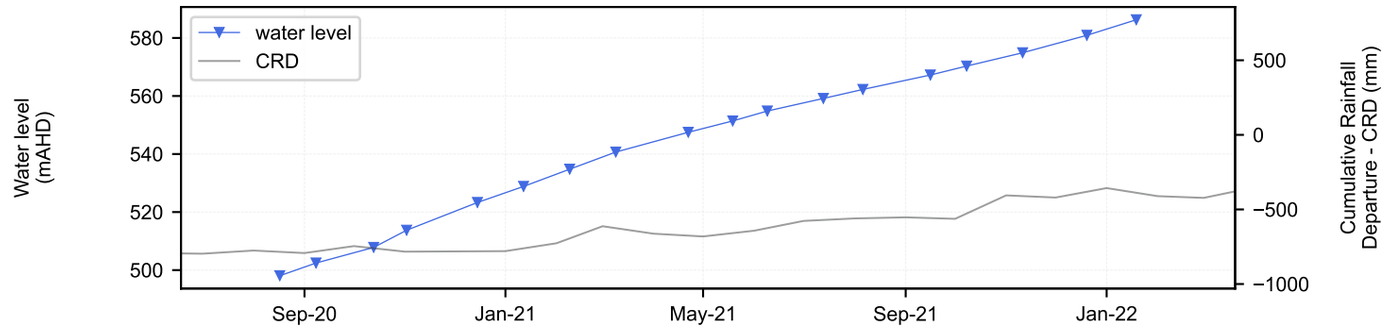
Additional analytes of interest

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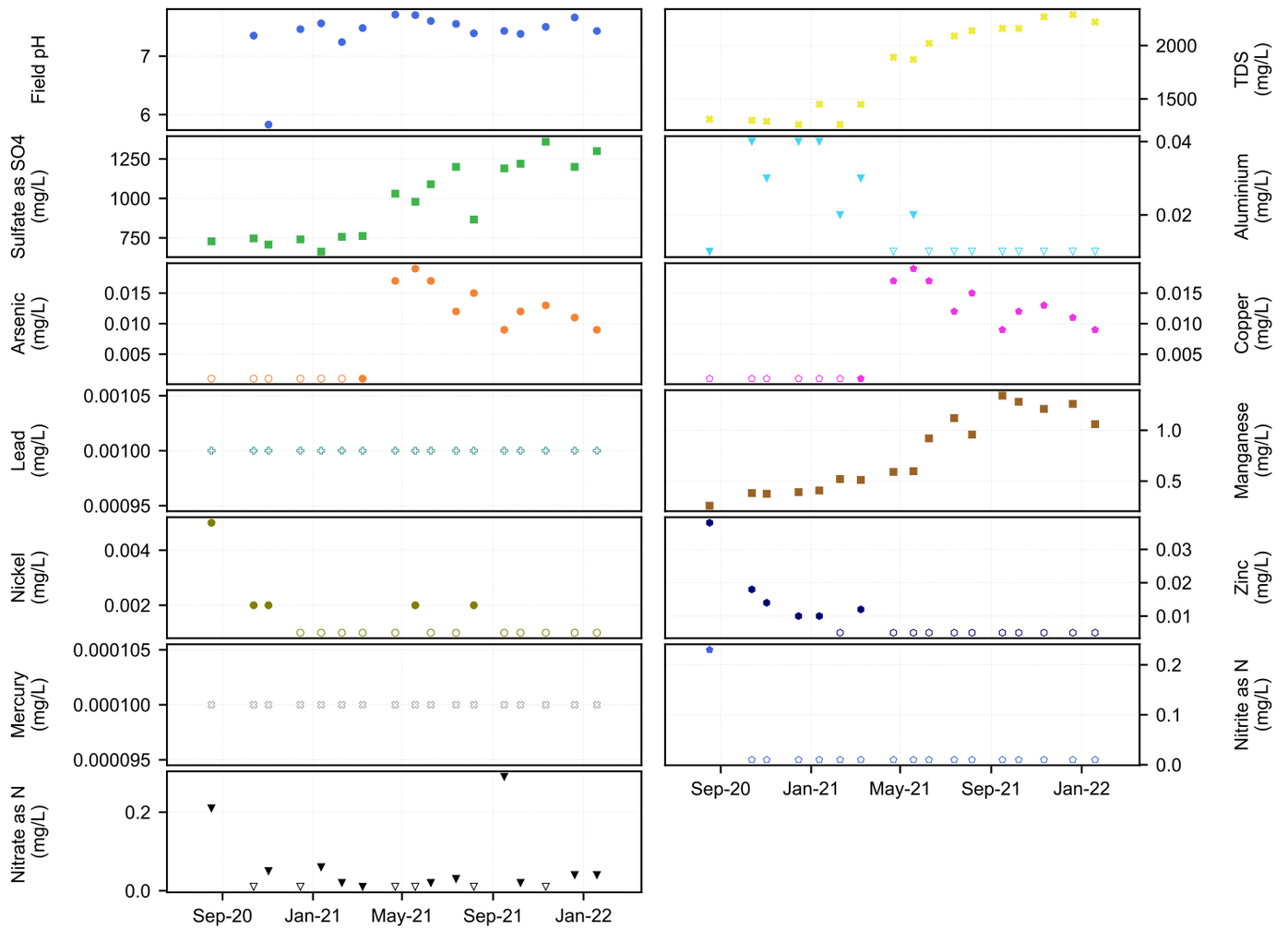
MB94 (Screened geology - Inactive; Screened interval: 114-140 mbgl)



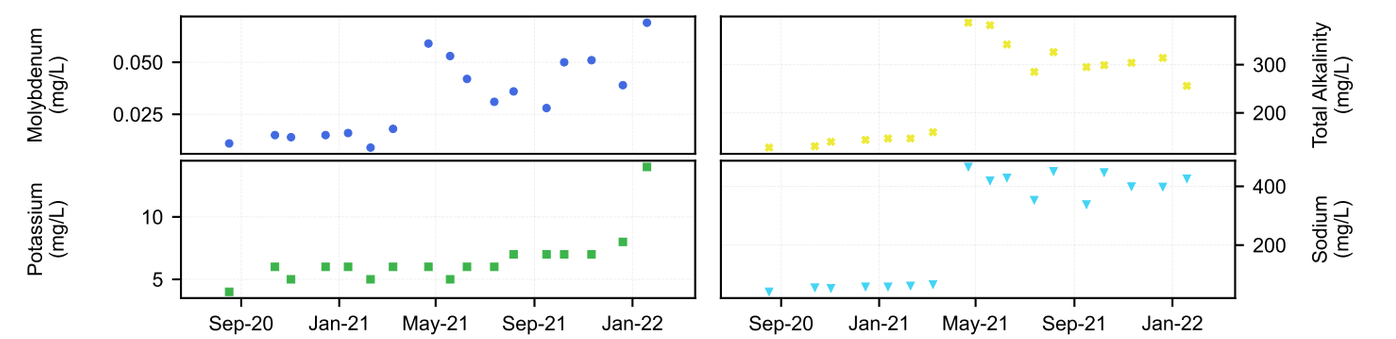
Groundwater levels



WMP defined analytes

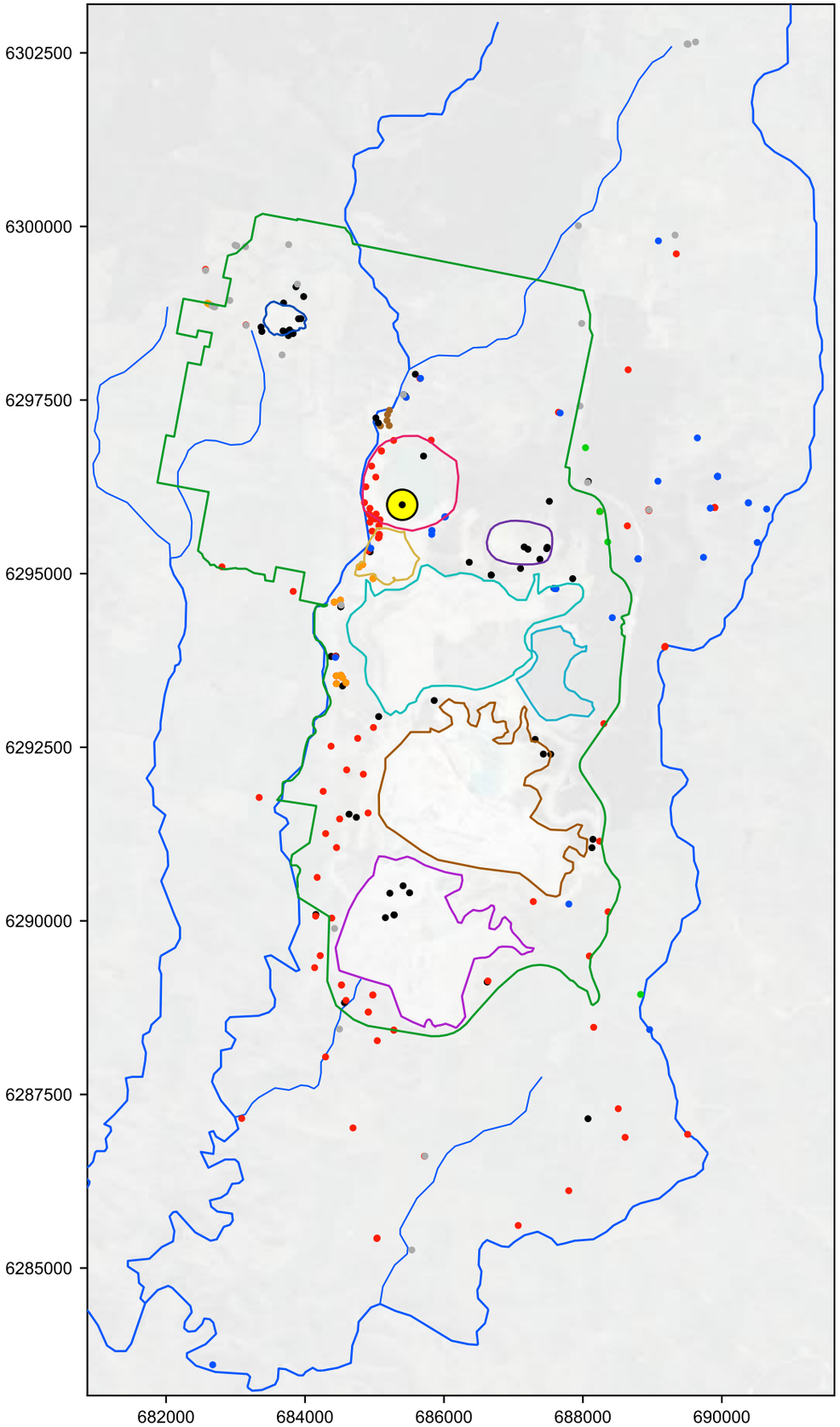


Additional analytes of interest

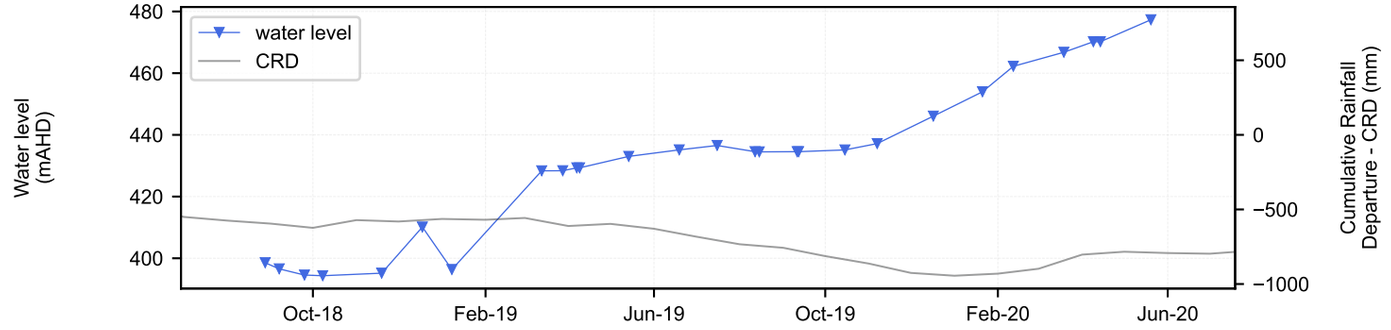


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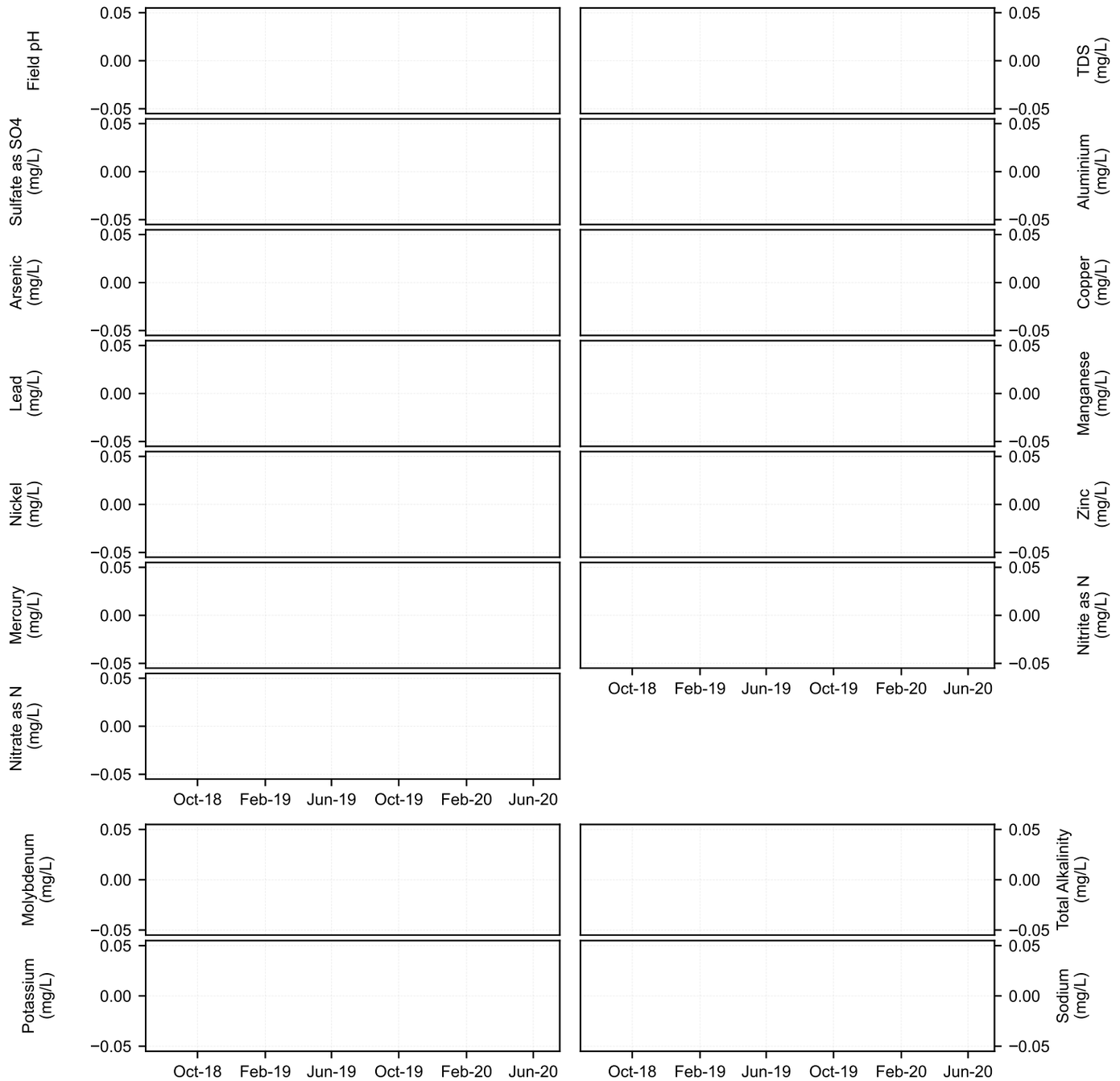
MB95 (Screened geology - Inactive; Screened interval: 146-186 mbgl)



Groundwater levels



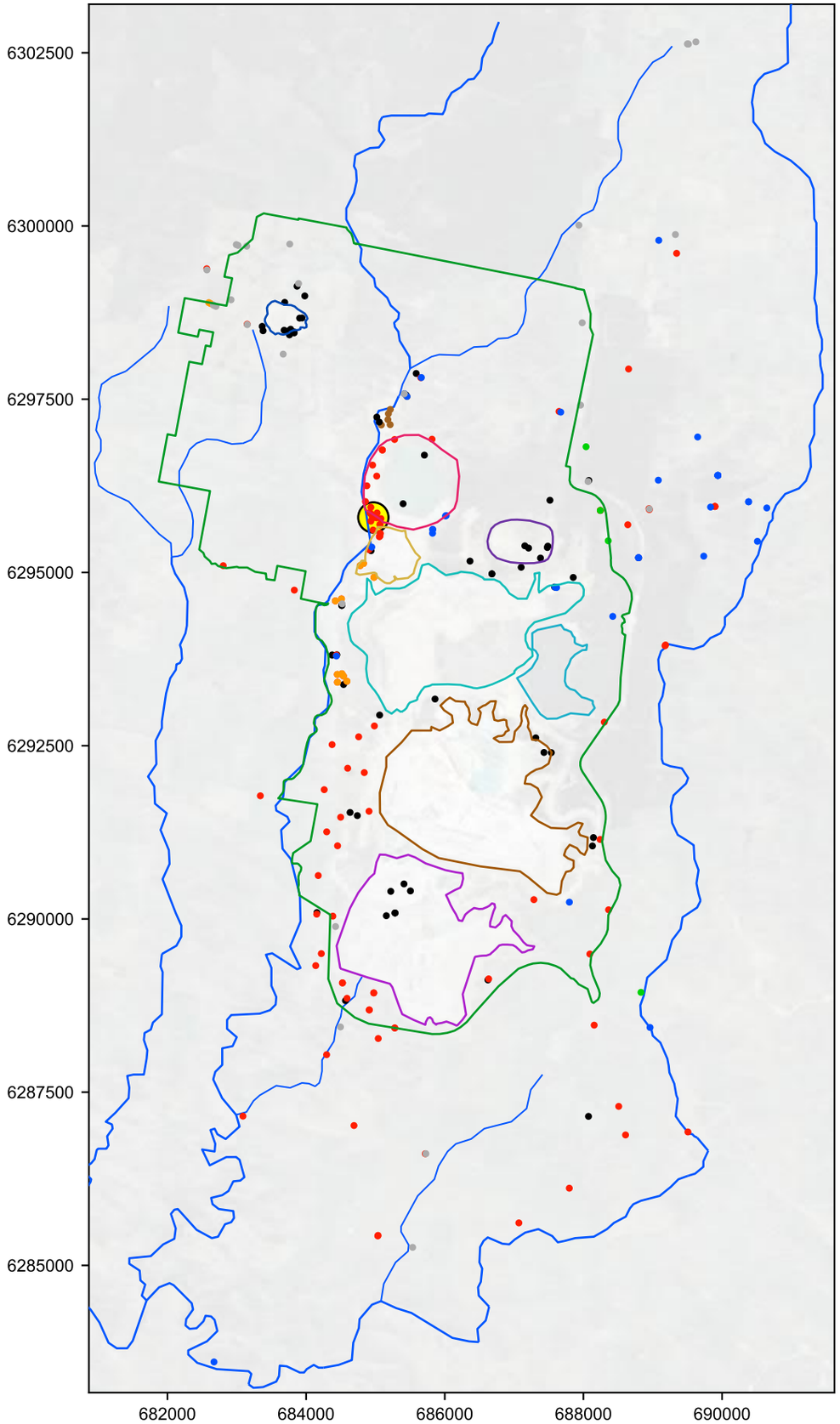
WMP defined analytes



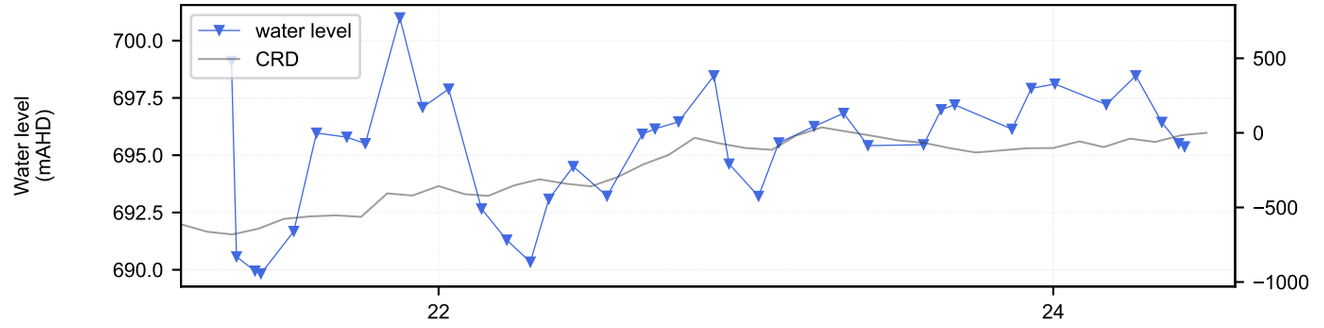
Additional analytes of interest

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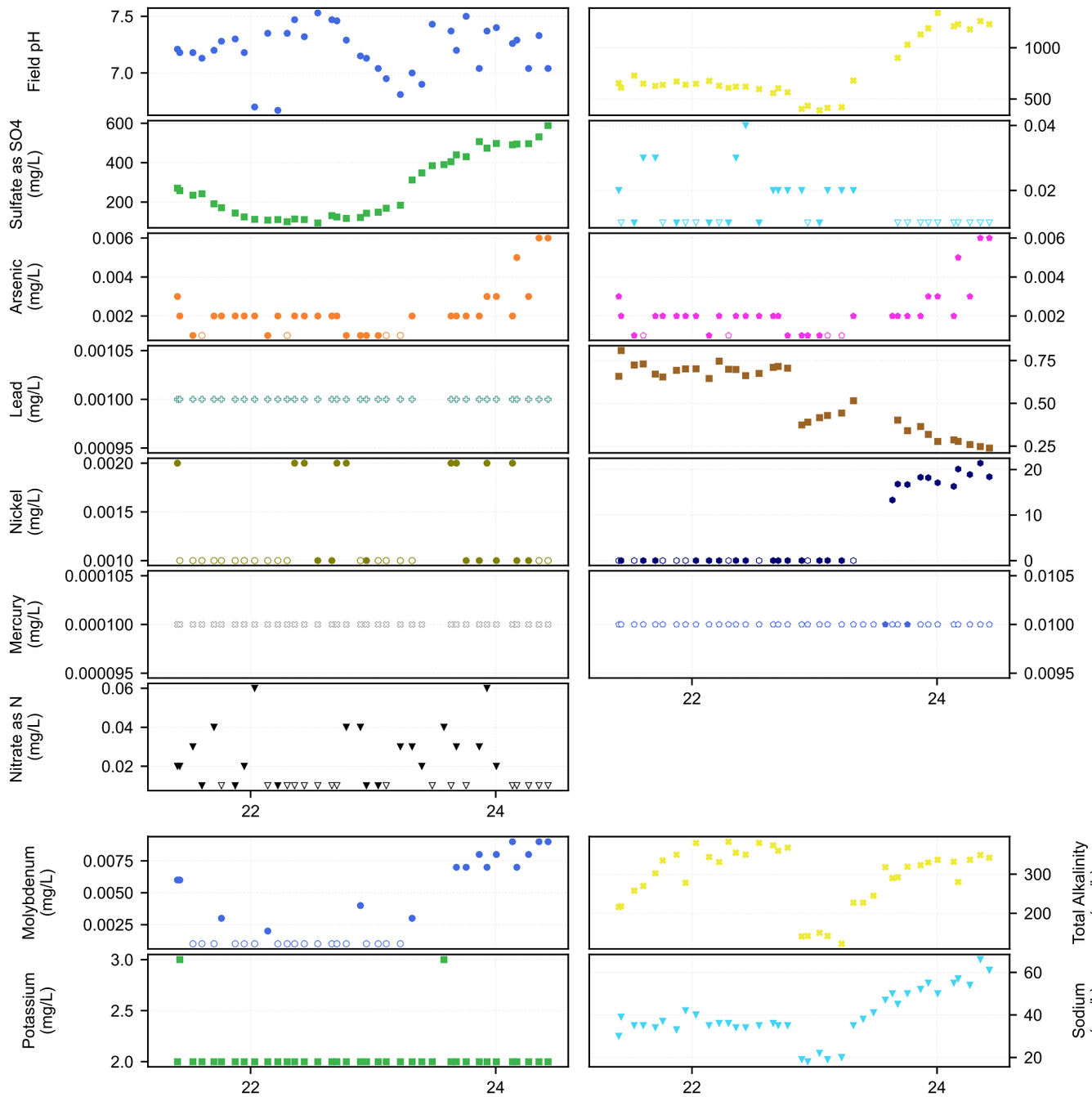
MB97A (Screened geology - Ordovician; Screened interval: 48.4-60.4 mbgl)



Groundwater levels



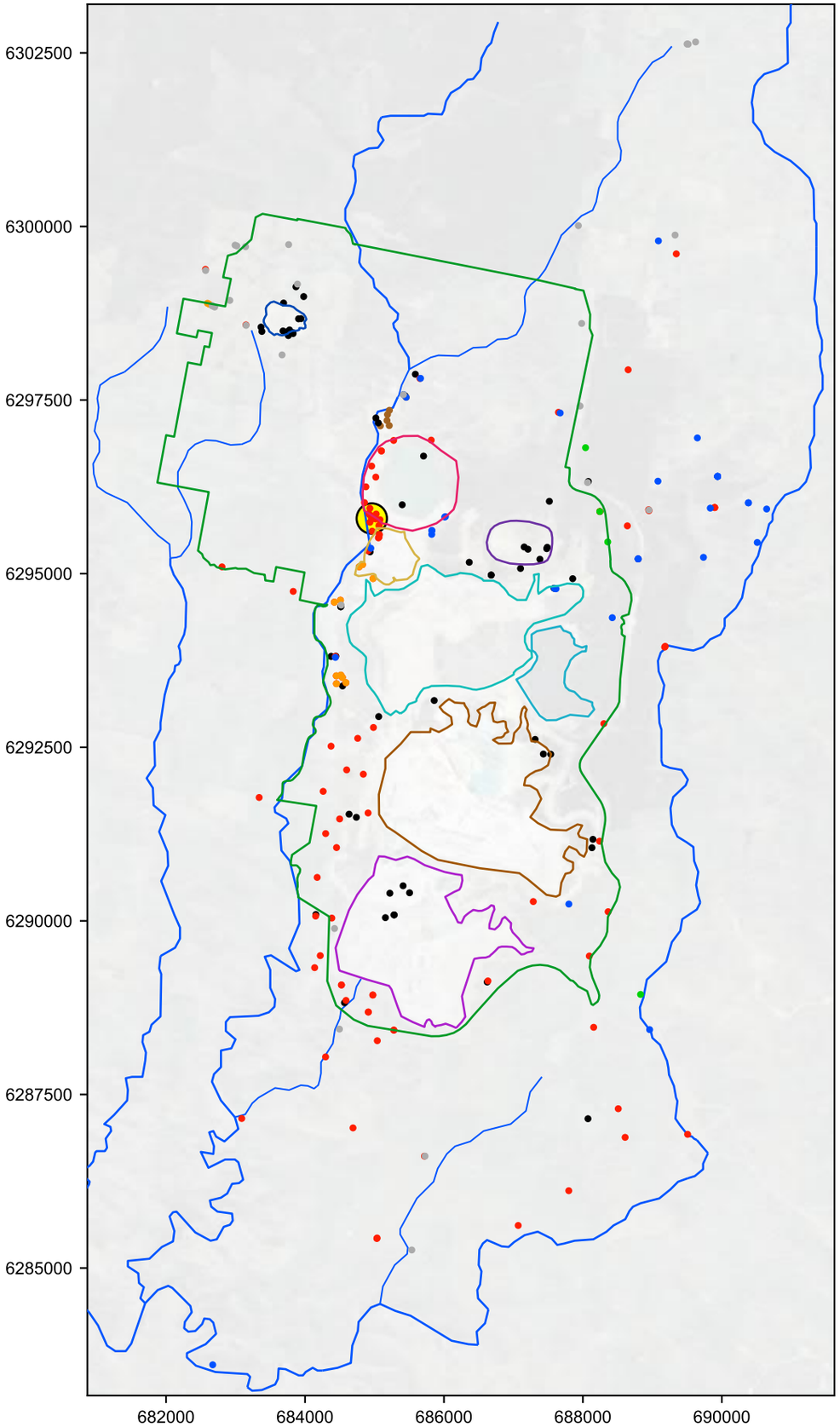
WMP defined analytes



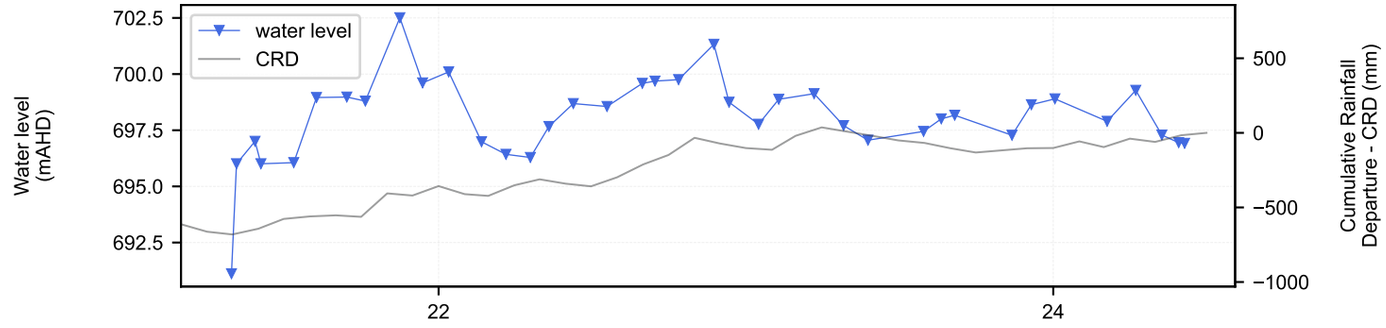
Additional analytes of interest

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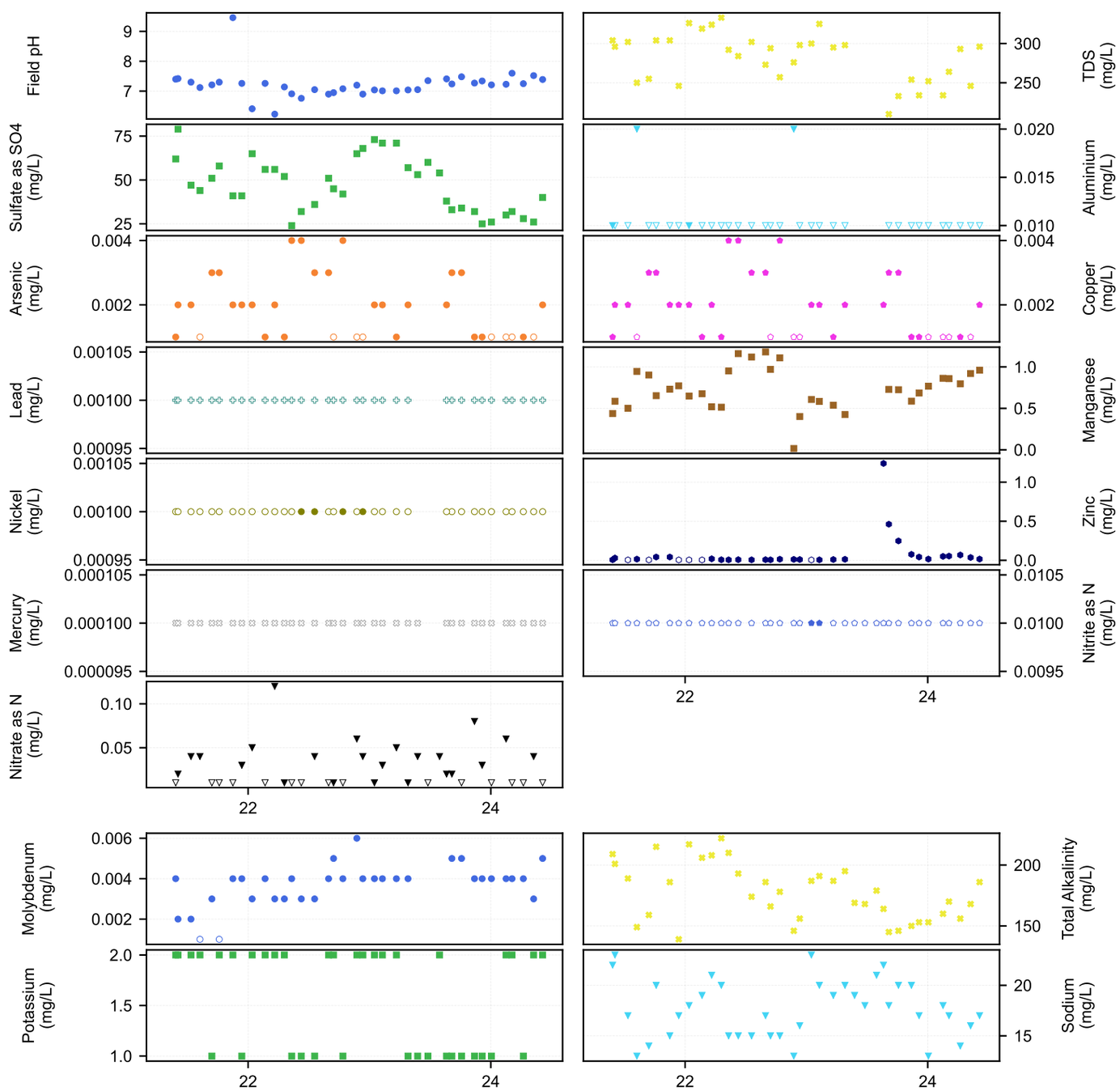
MB97B (Screened geology - Ordovician; Screened interval: 15.5-18.5 mbgl)



Groundwater levels



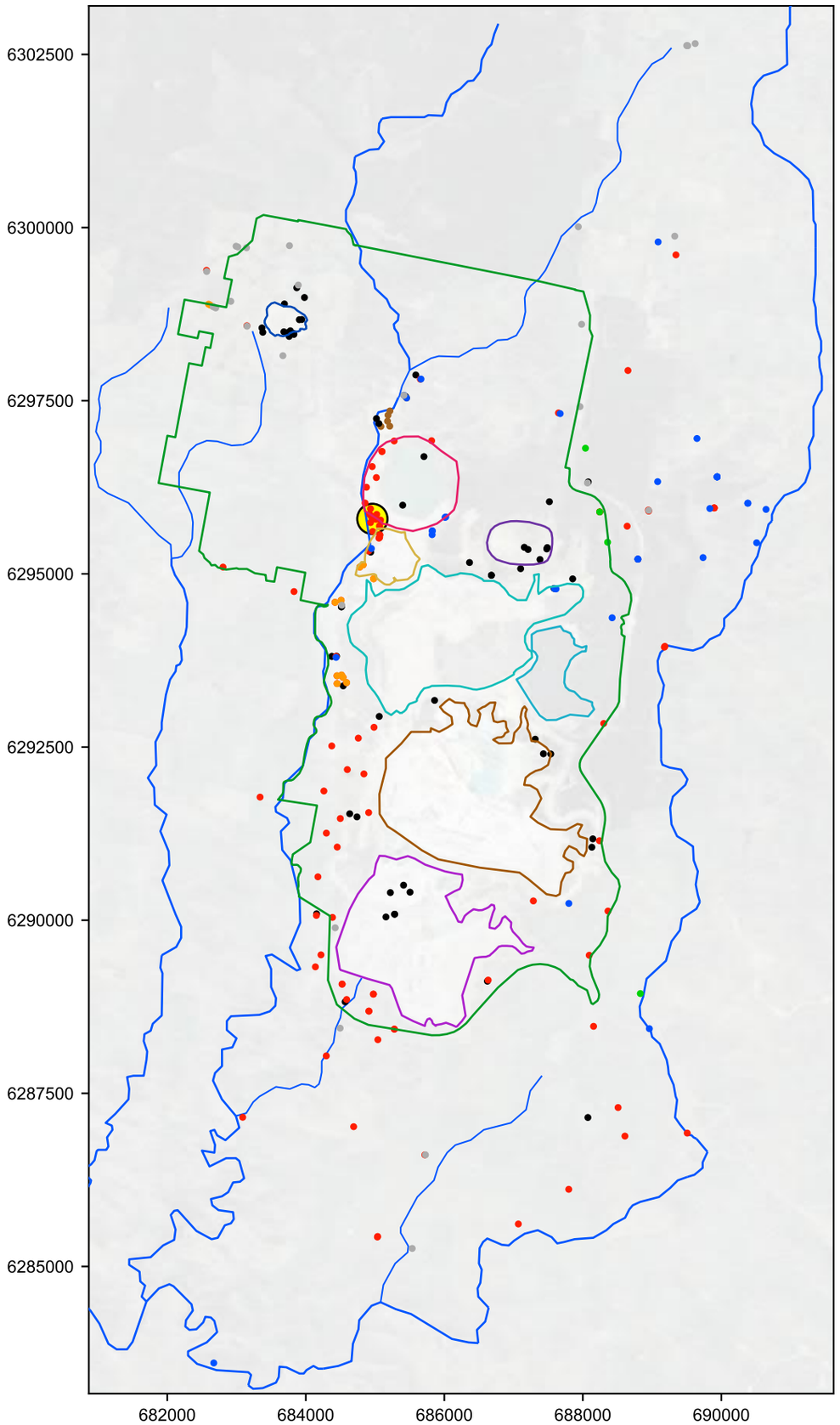
WMP defined analytes



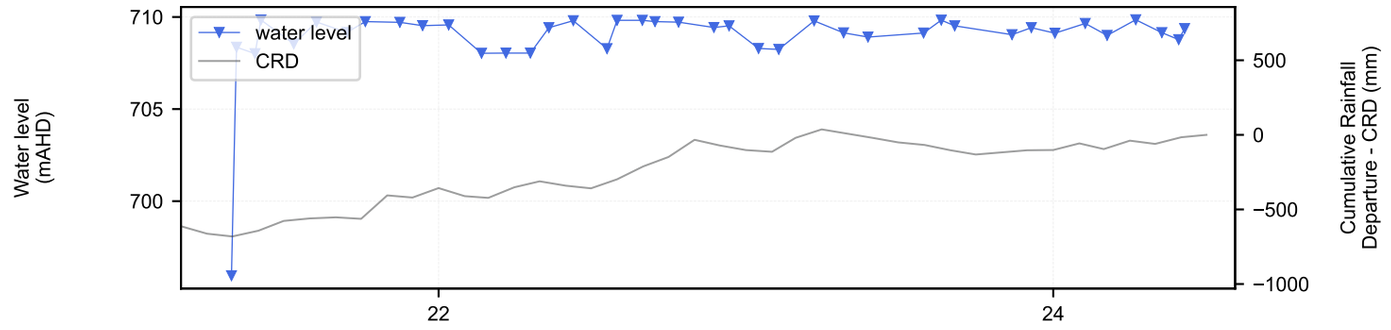
Additional analytes of interest

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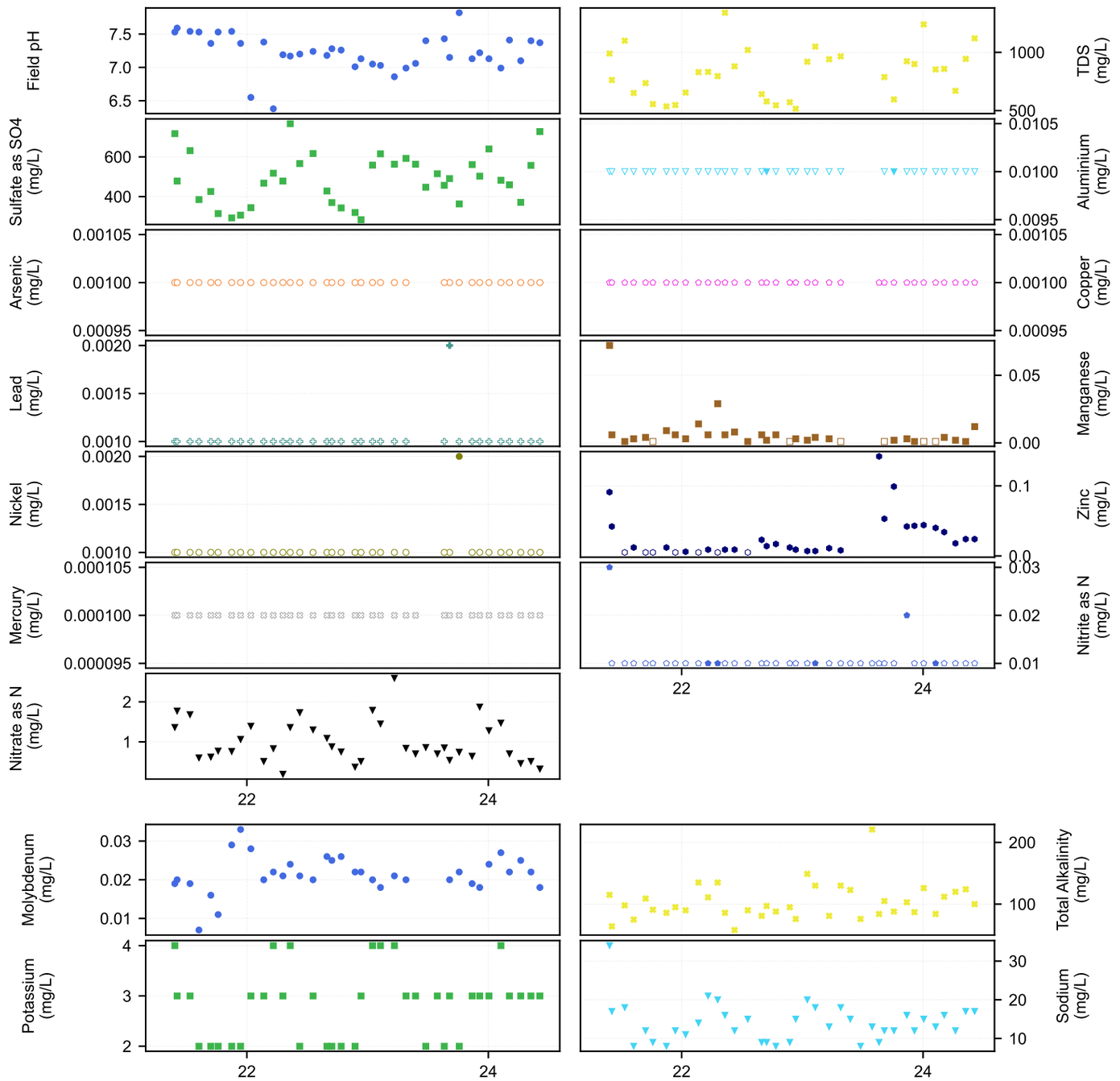
MB97C (Screened geology - Ordovician; Screened interval: 2.0-4.0 mbgl)



Groundwater levels



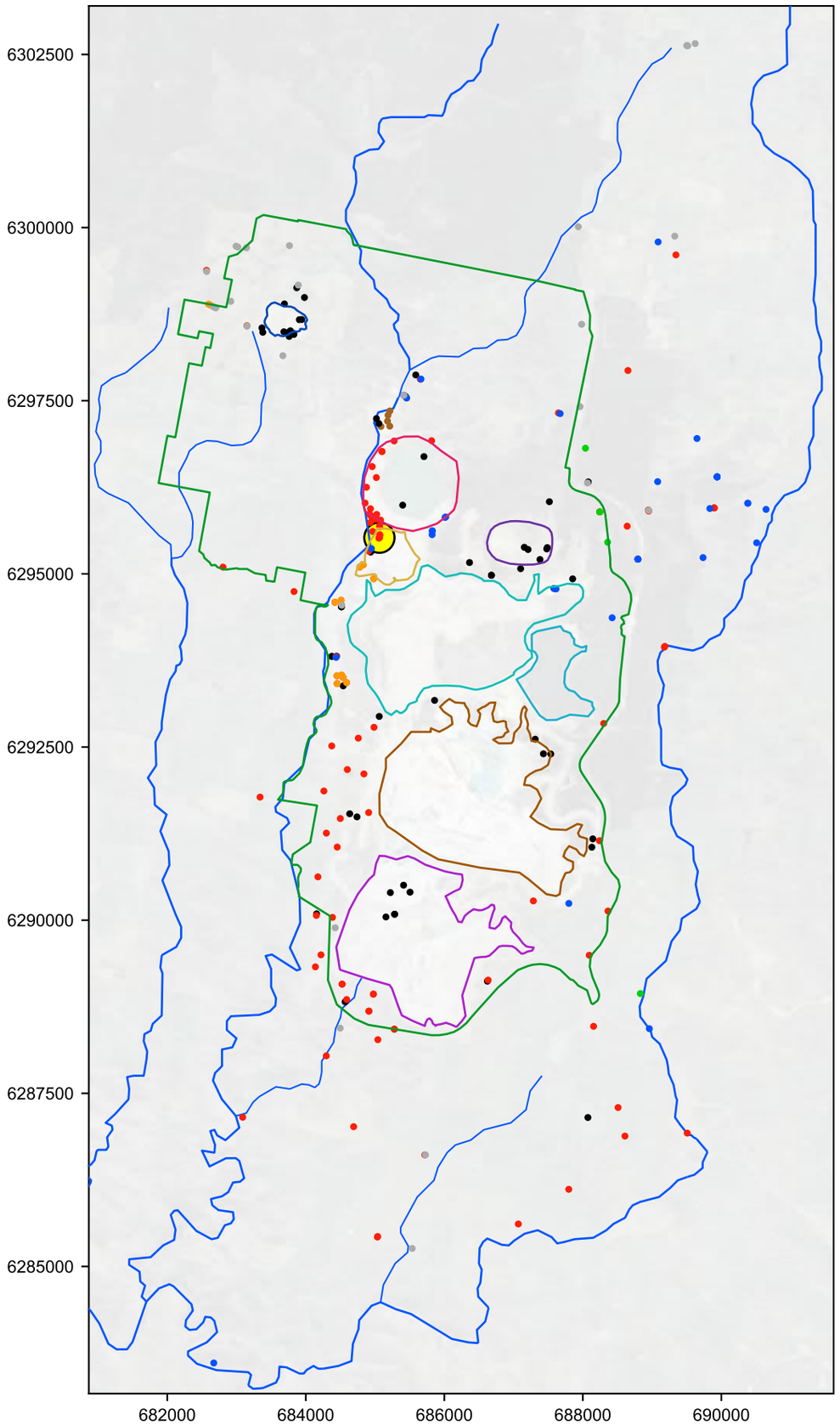
WMP defined analytes



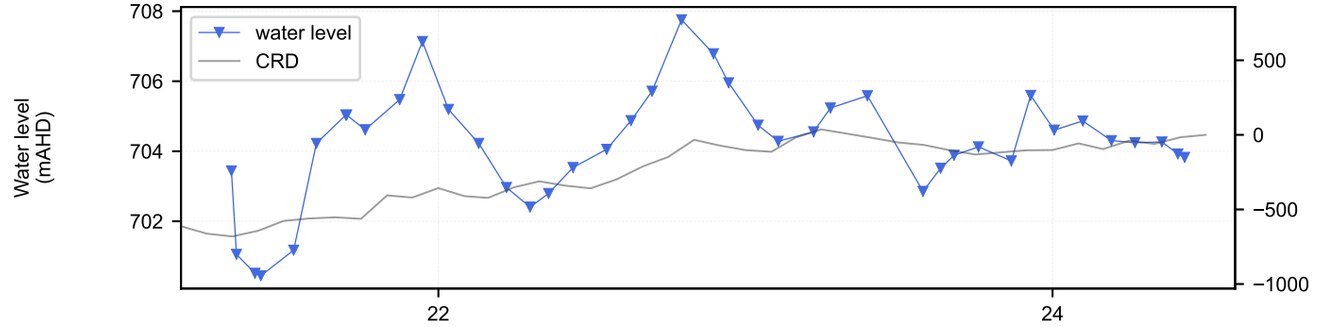
Additional analytes of interest

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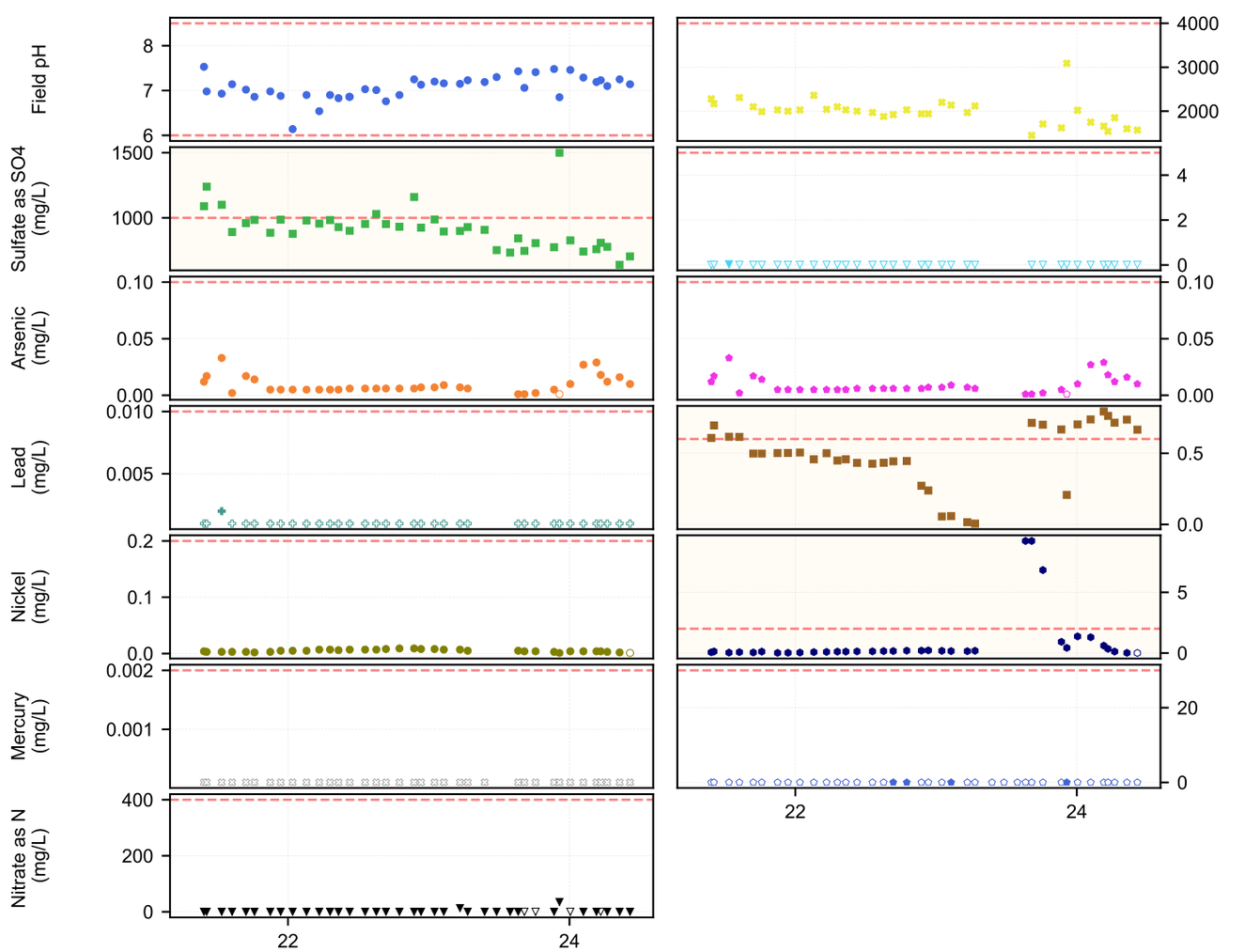
MB99A (Screened geology - Ordovician; Screened interval: 27-48 mbgl)



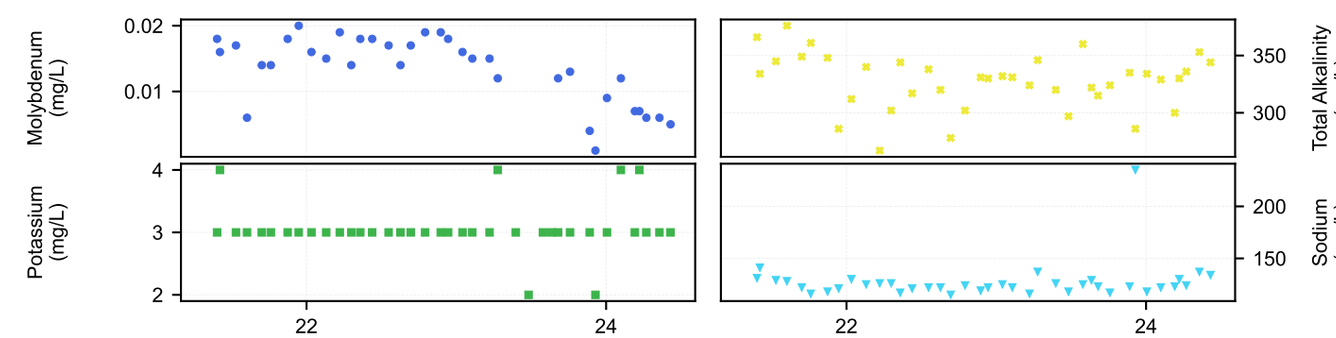
Groundwater levels



WMP defined analytes

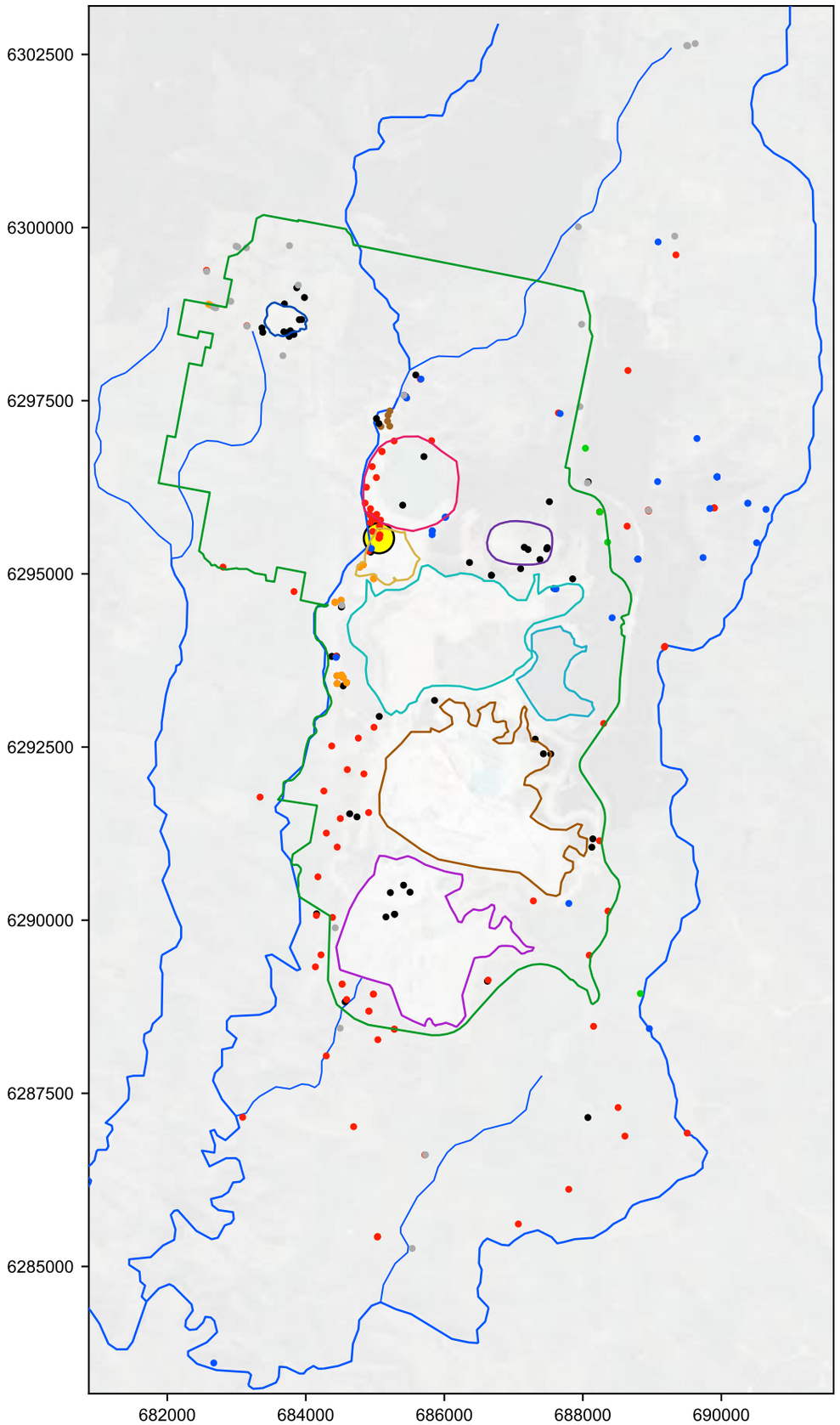


Additional analytes of interest

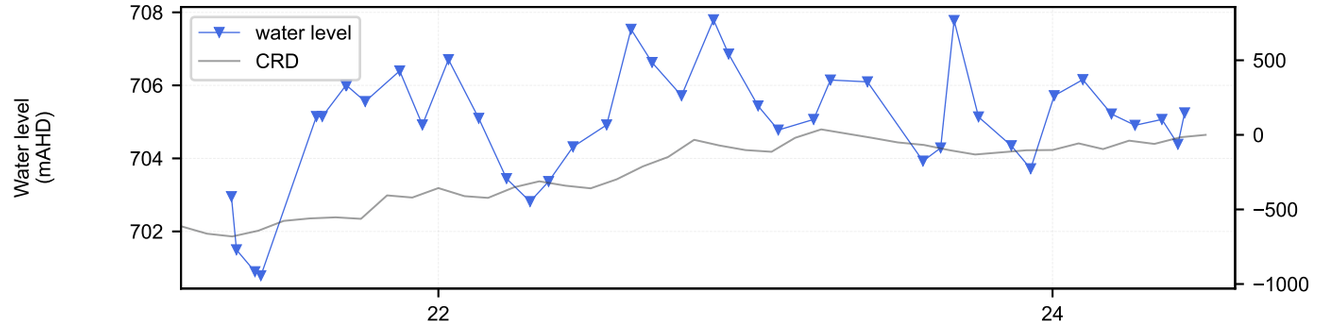


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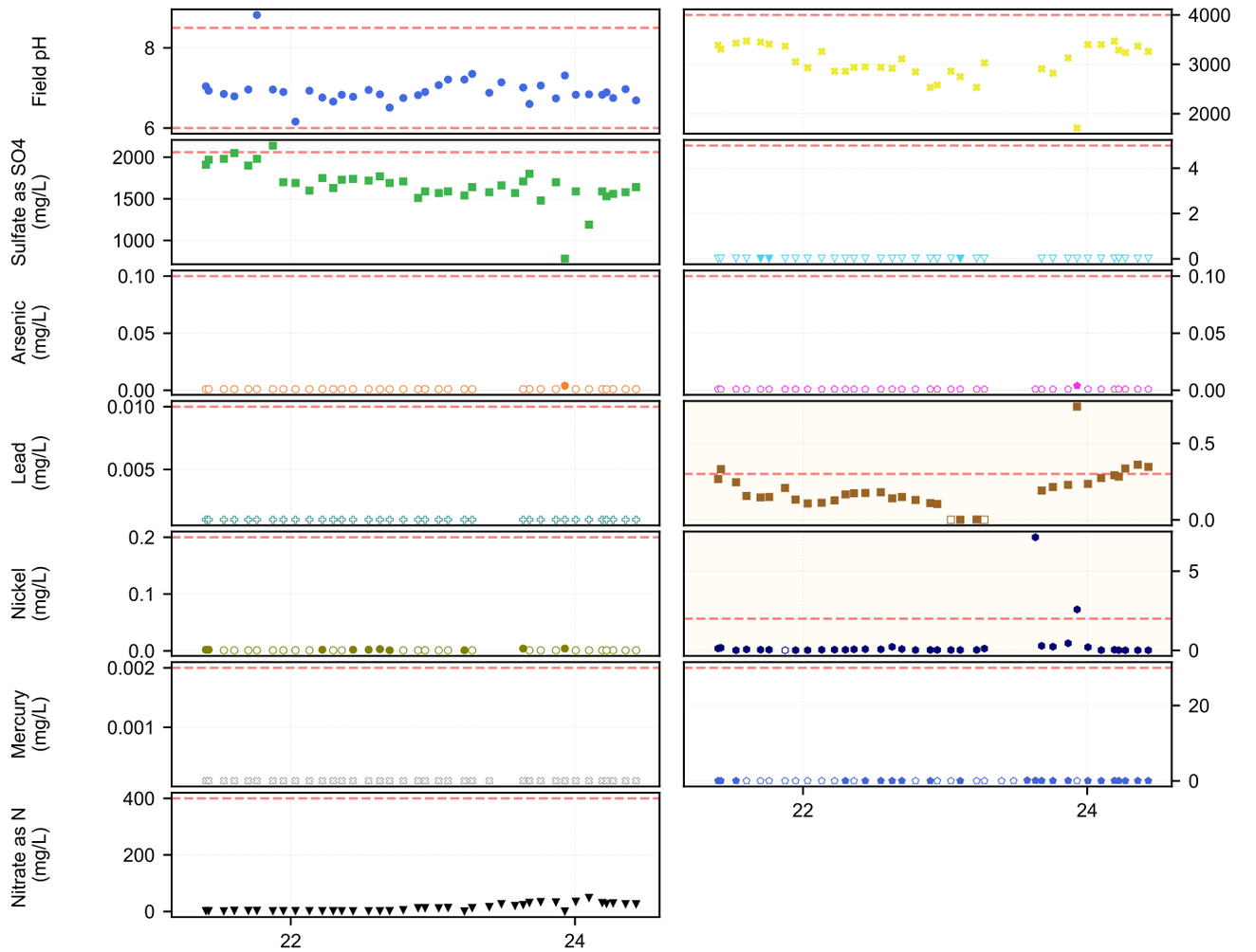
MB99B (Screened geology - Ordovician; Screened interval: 12.3-15.3 mbgl)



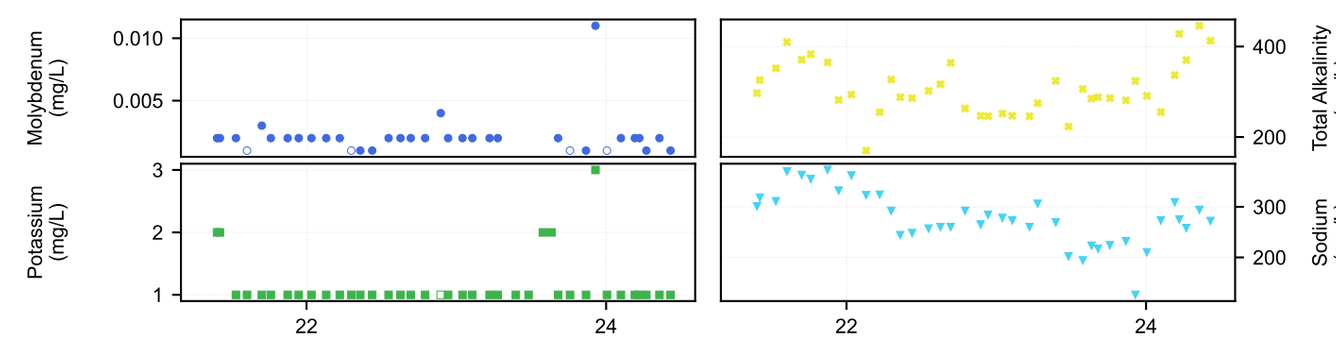
Groundwater levels



WMP defined analytes

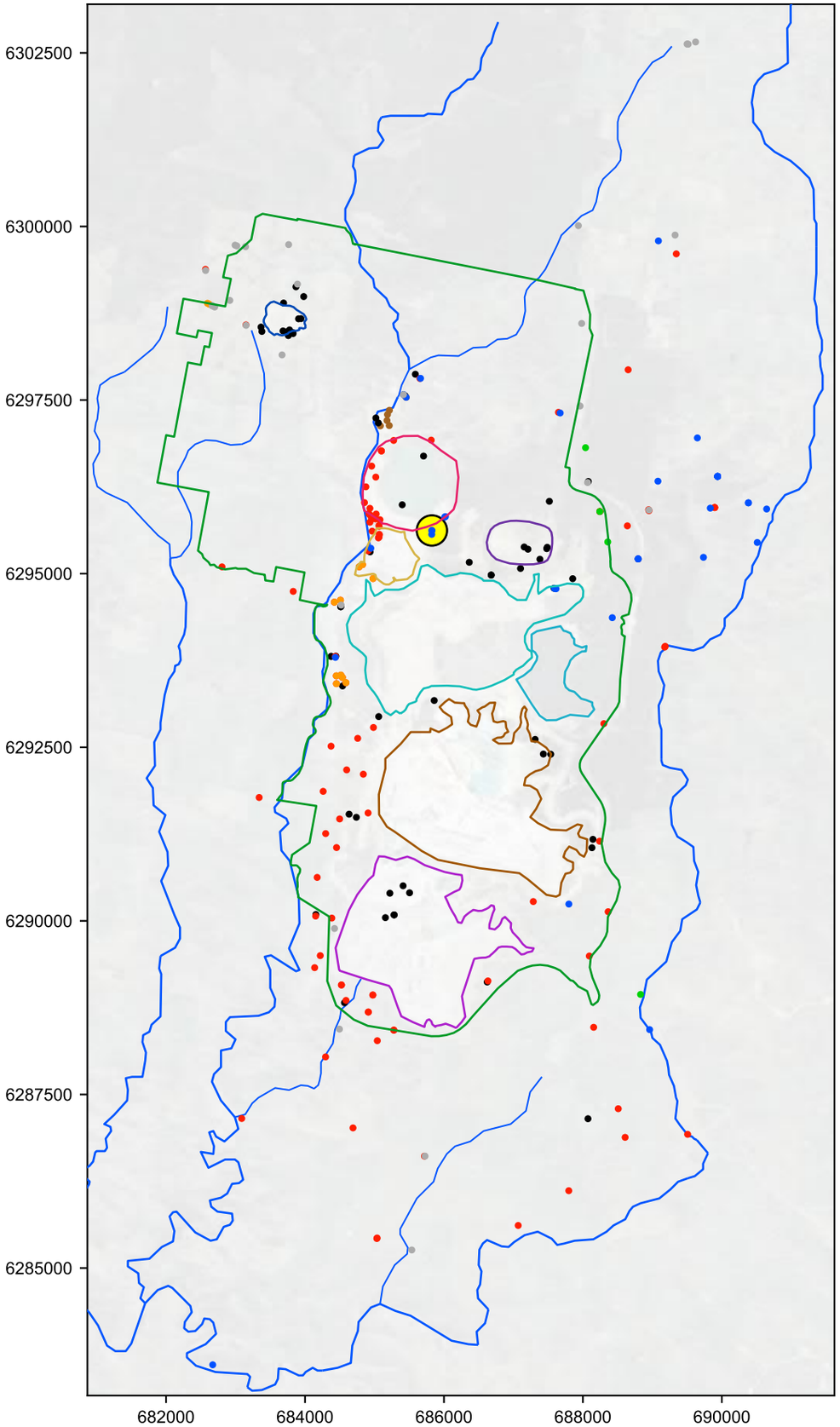


Additional analytes of interest

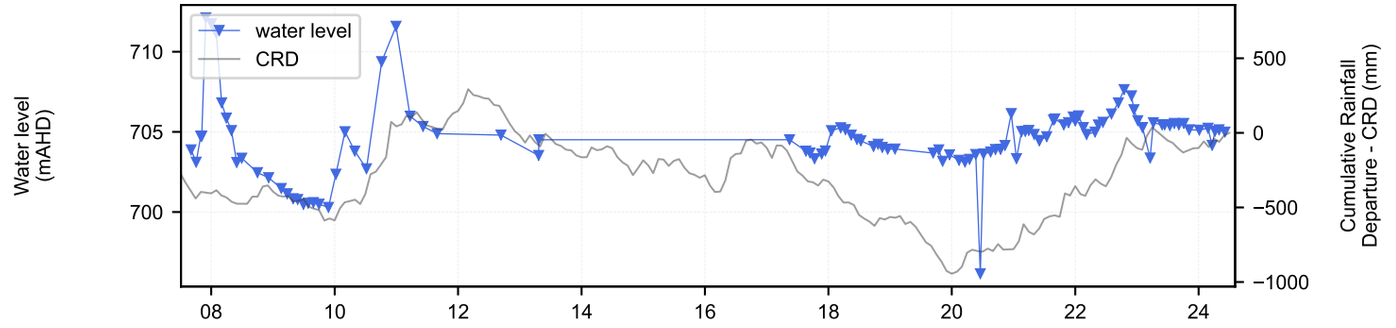


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

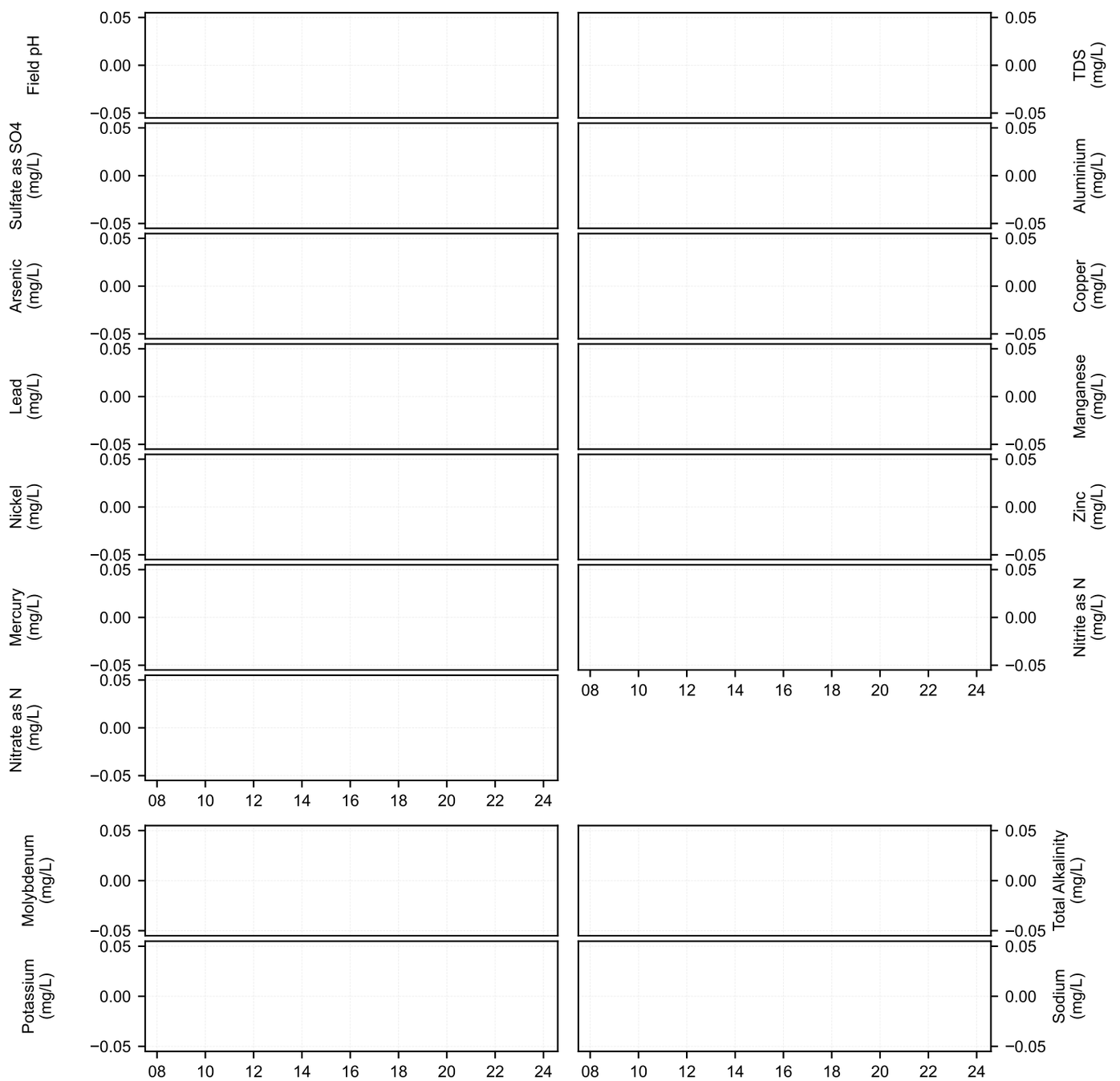
PZ10 (Screened geology - Silurian; Screened interval: 75-85 mbgl)



Groundwater levels



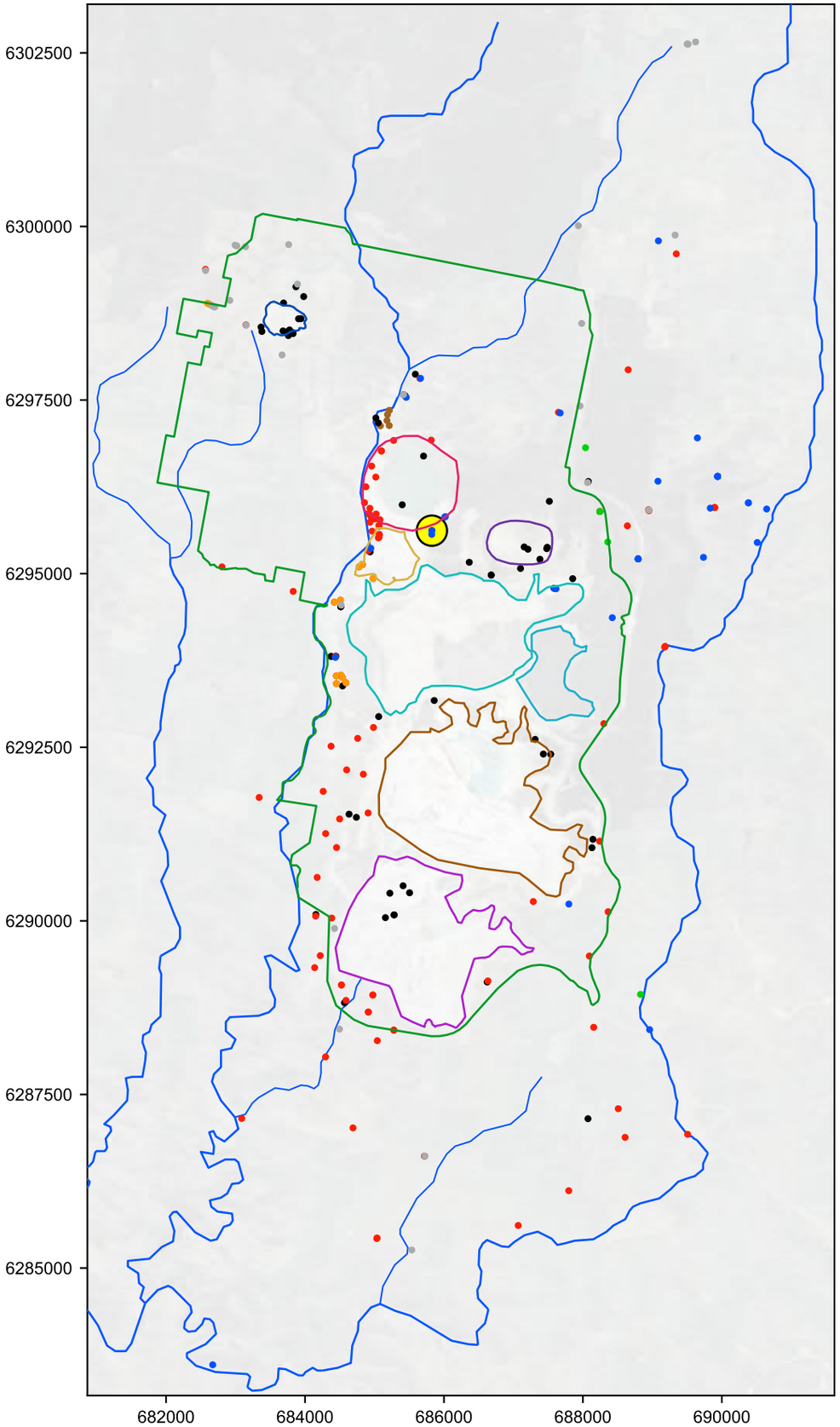
WMP defined analytes



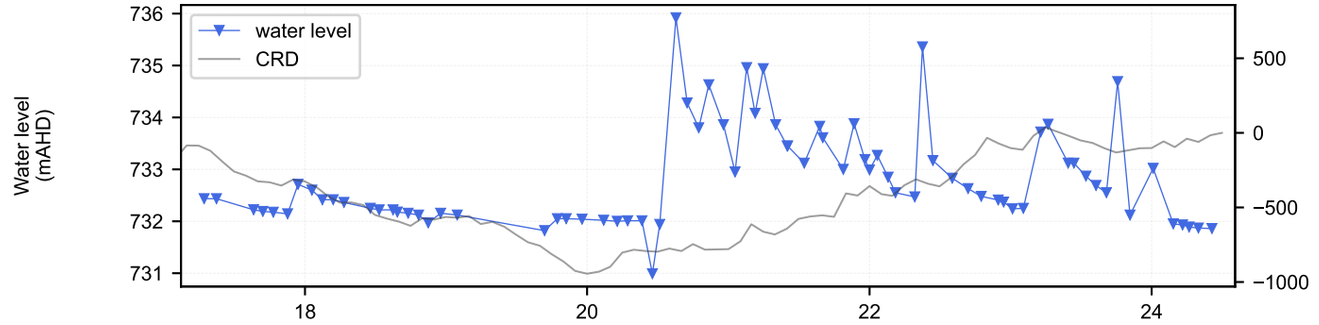
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

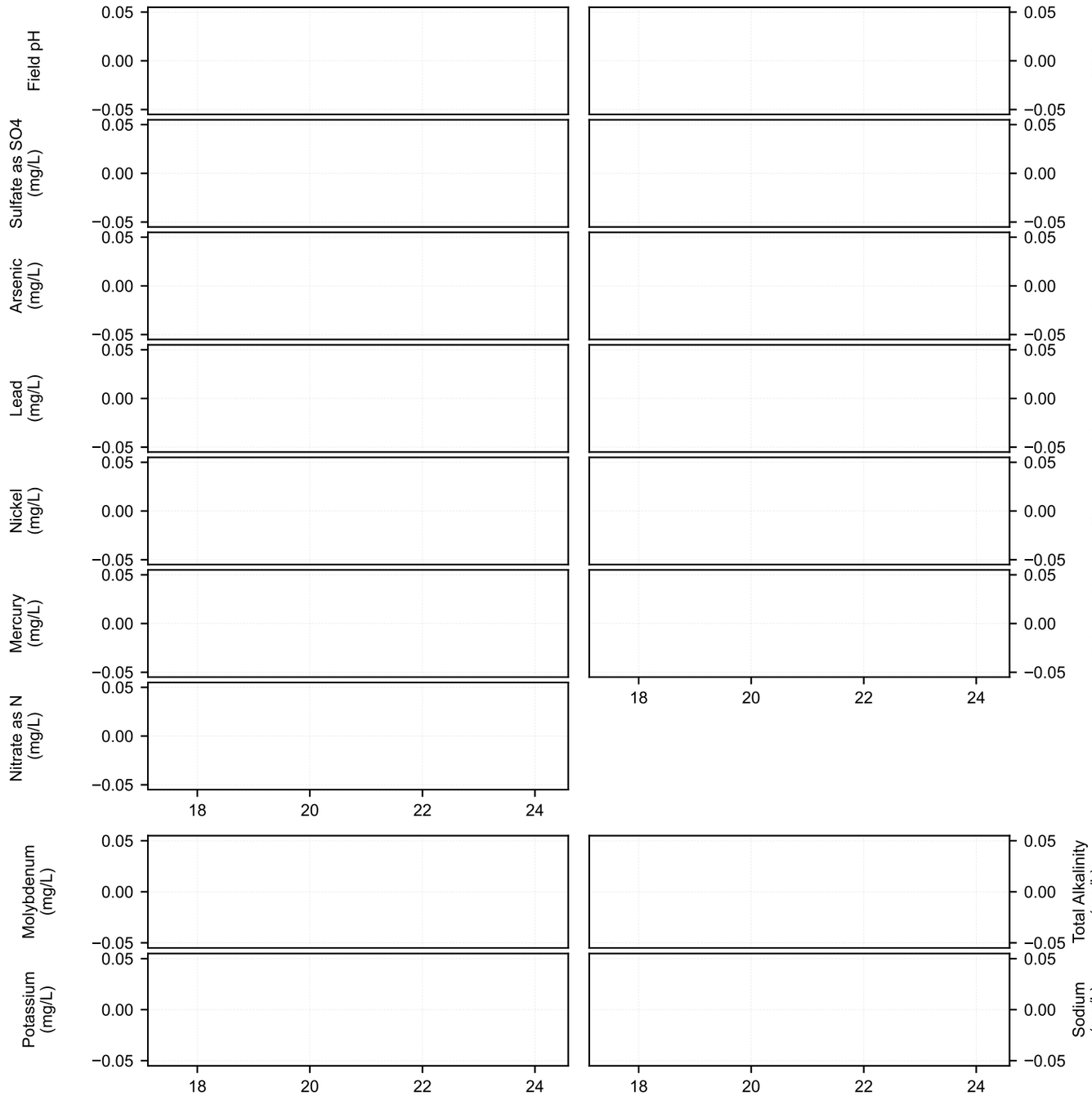
PZ10A (Screened geology - Silurian; Screened interval: 30-54 mbgl)



Groundwater levels



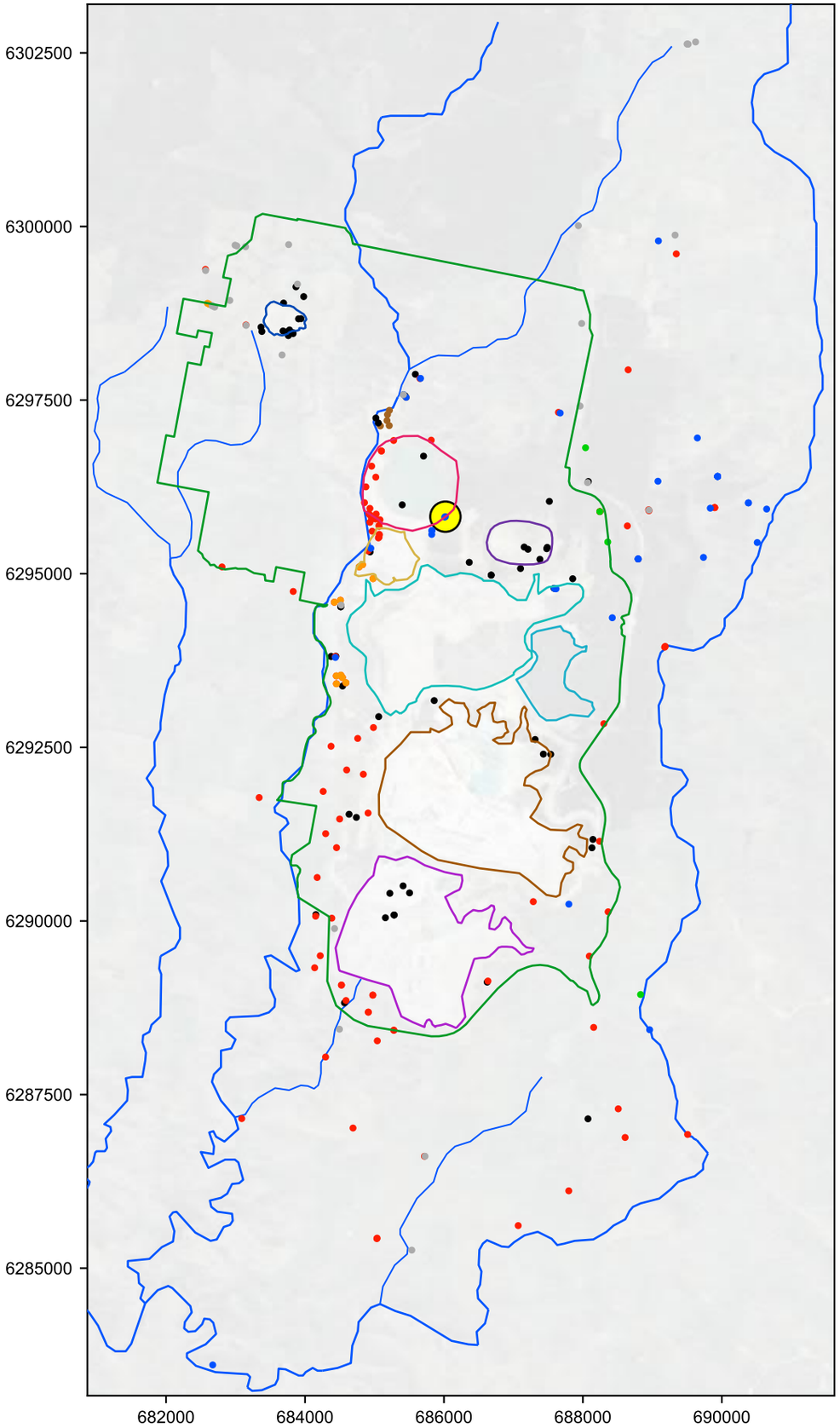
WMP defined analytes



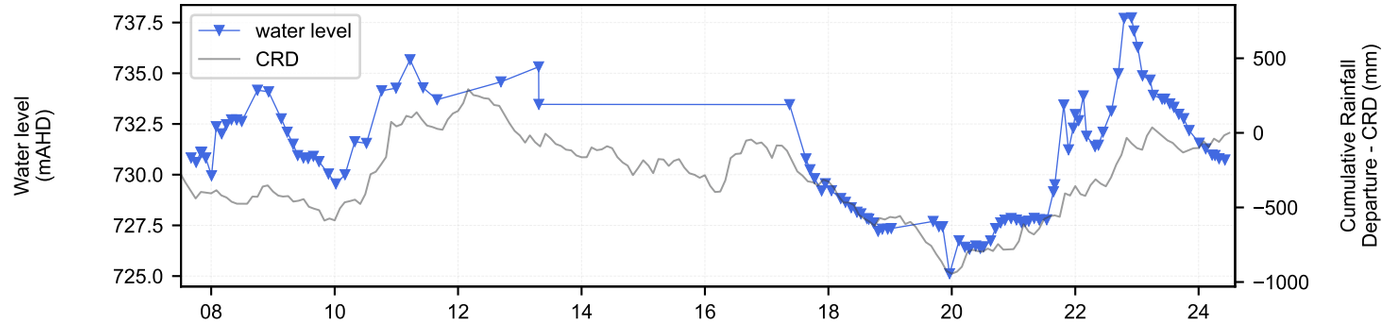
Additional analytes of interest

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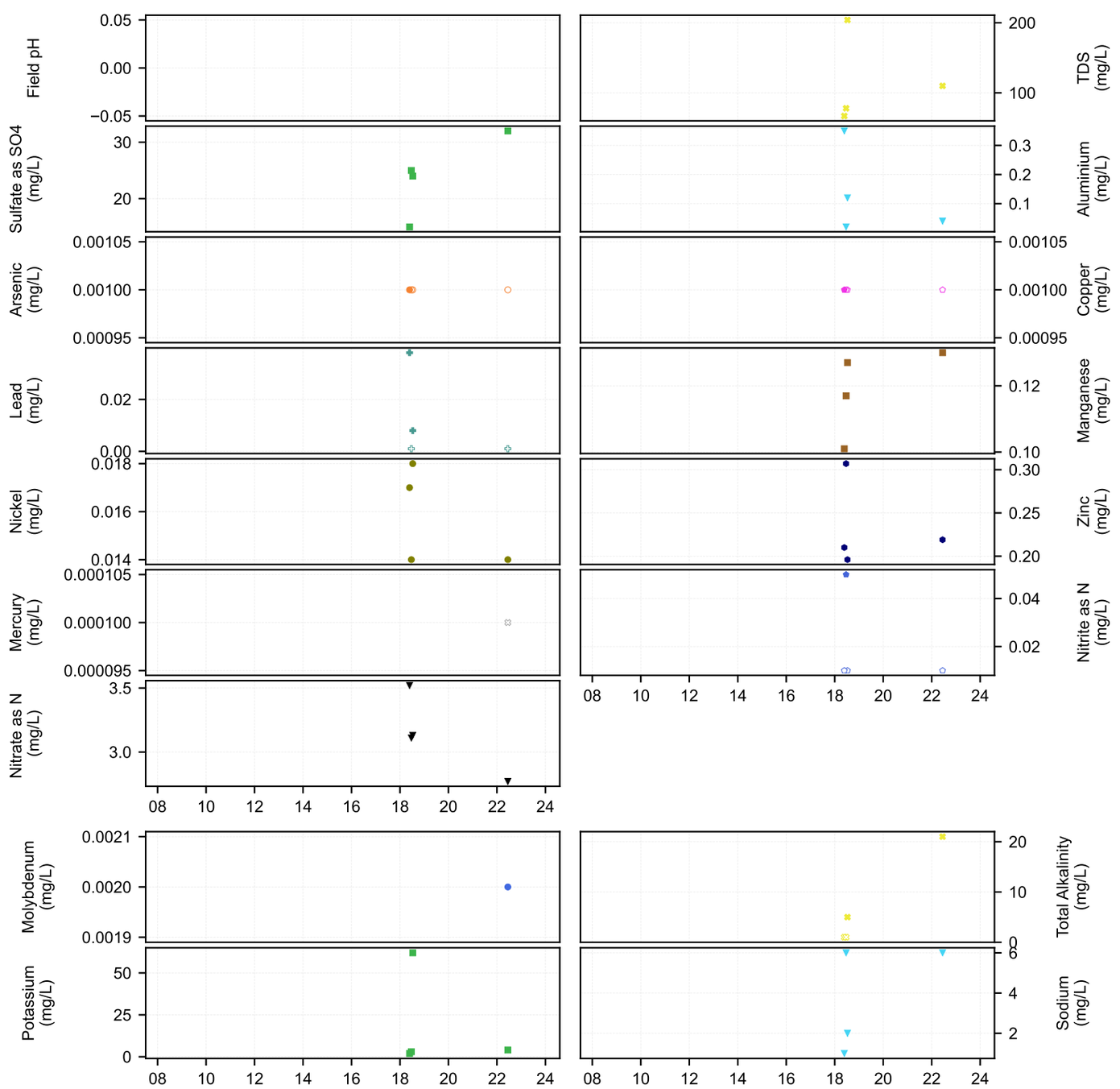
PZ4 (Screened geology - Silurian; Screened interval: 36-45 mbgl)



Groundwater levels



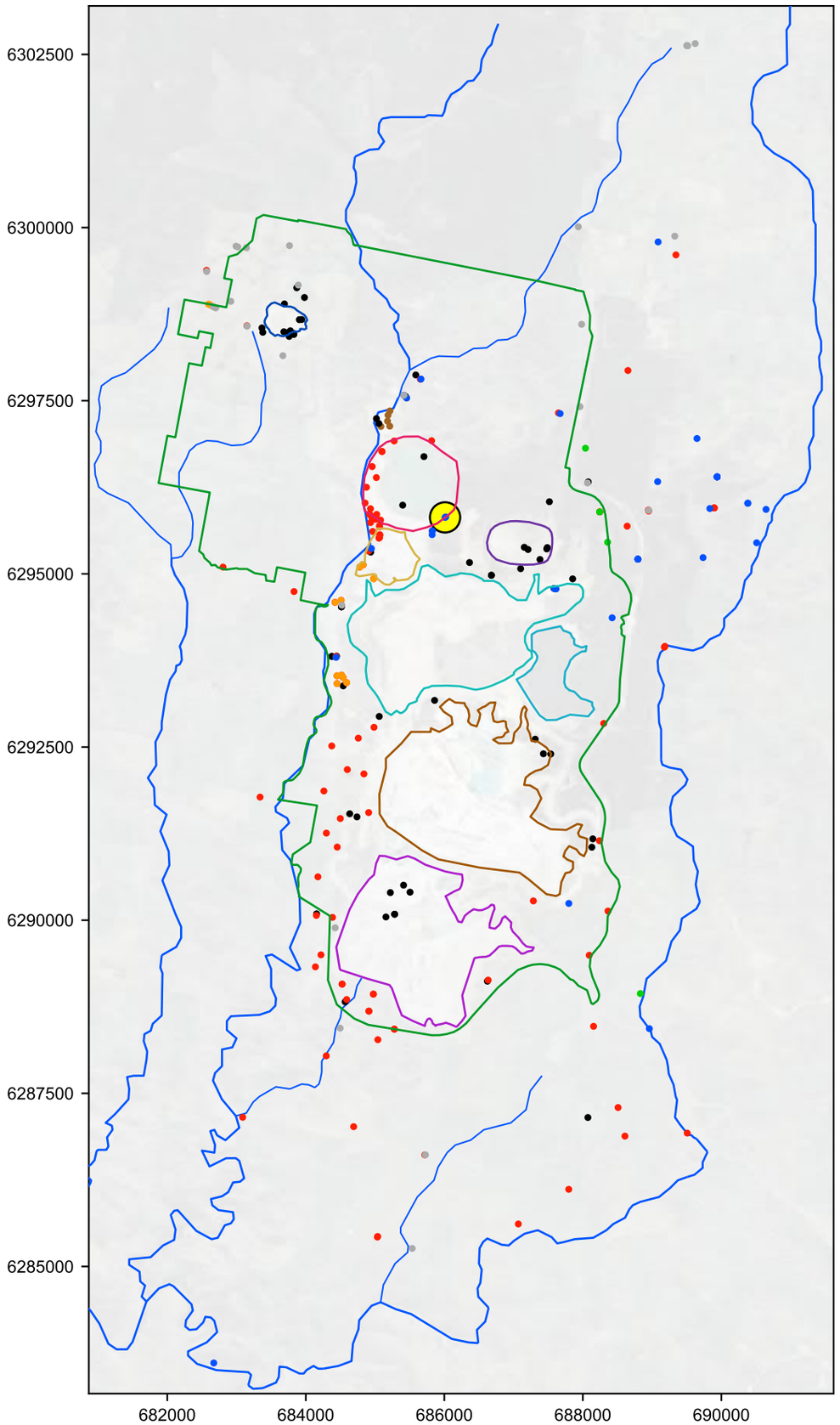
WMP defined analytes



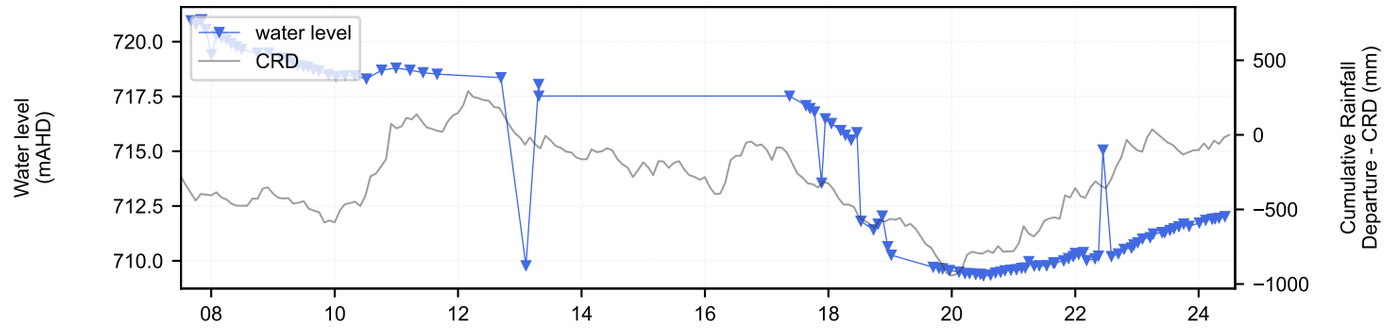
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

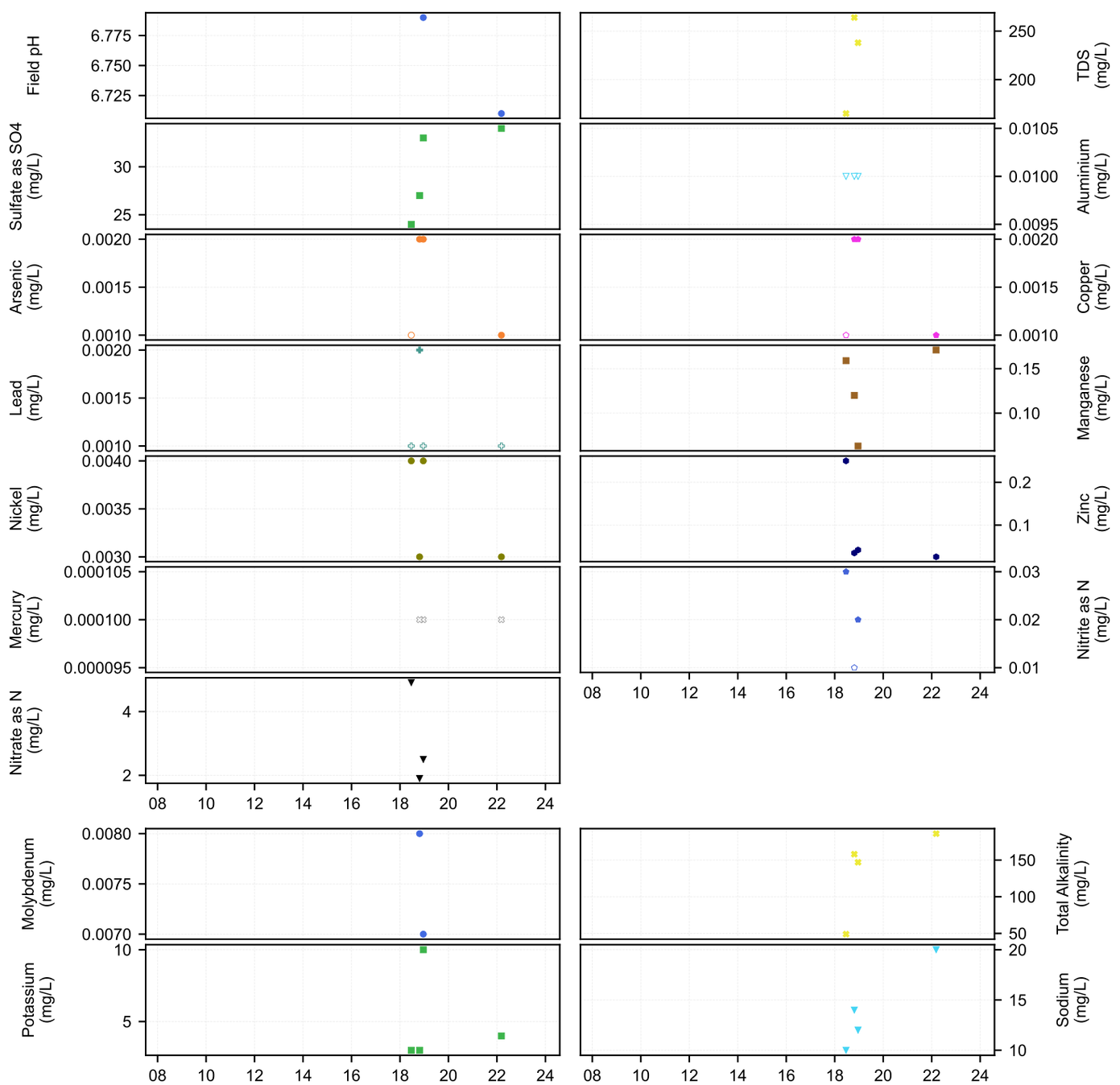
PZ5 (Screened geology - Silurian; Screened interval: 83-95 mbgl)



Groundwater levels



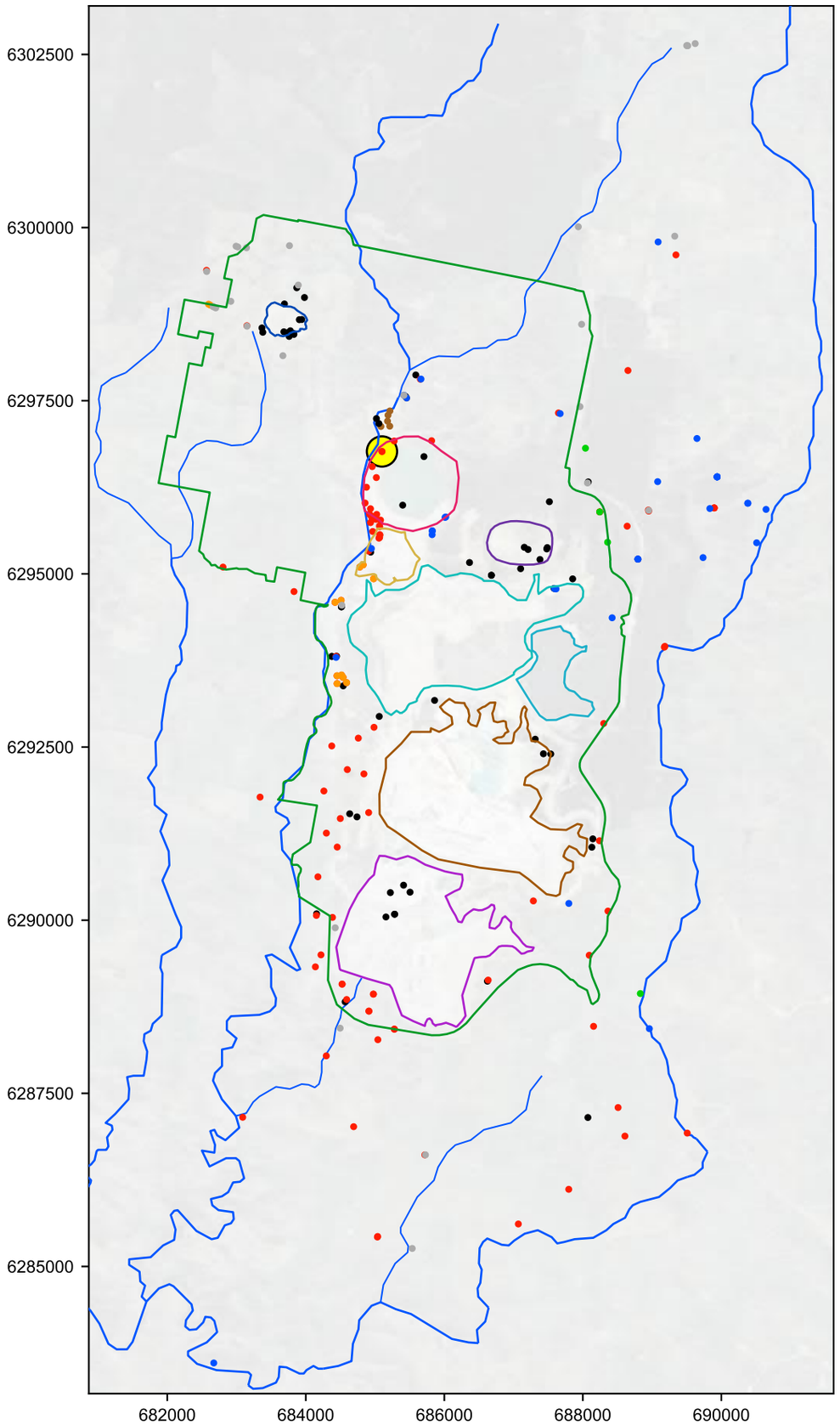
WMP defined analytes



Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

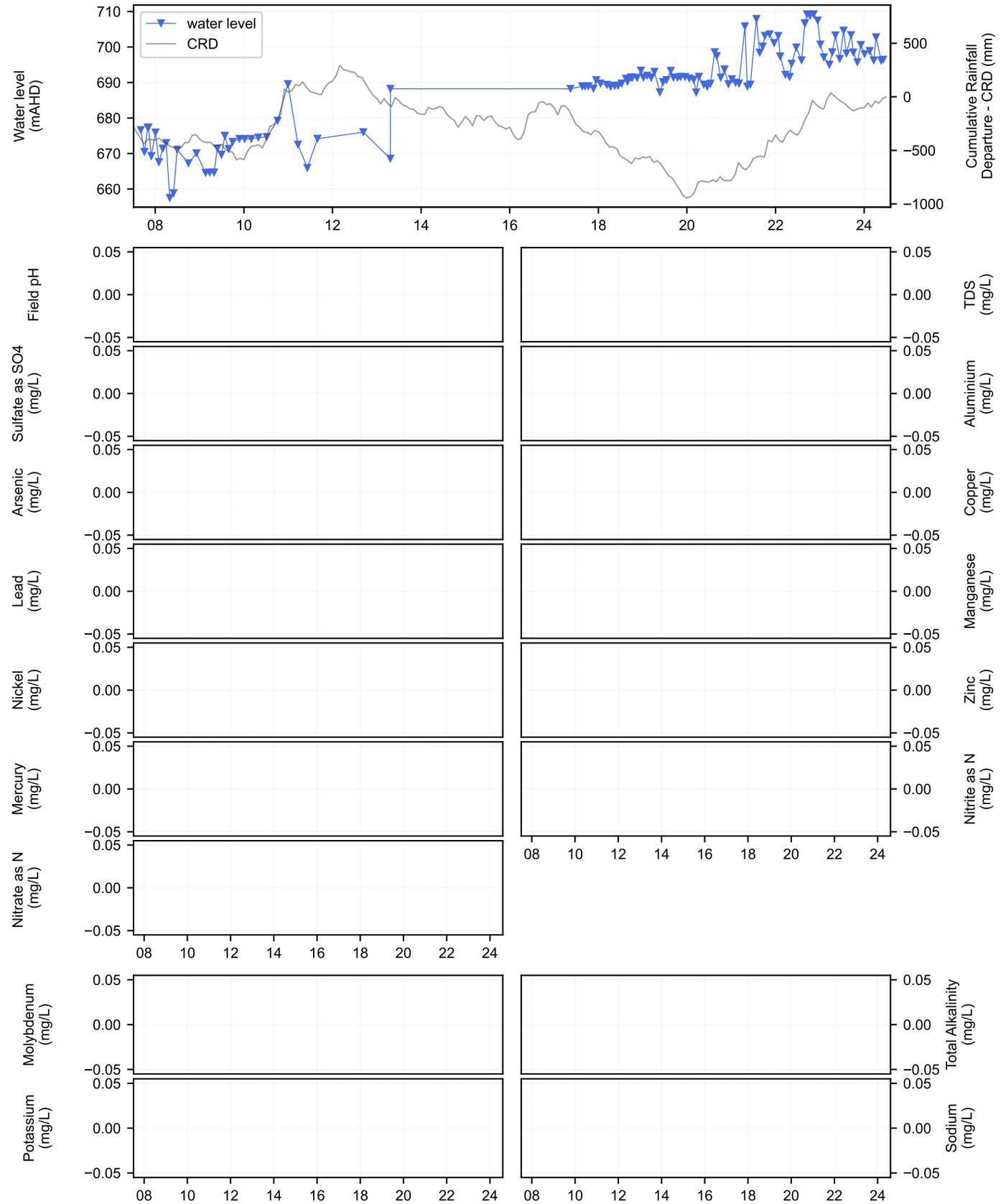
PZ89 (Screened geology - Ordovician; Screened interval: 138-150 mbgl)



Groundwater levels

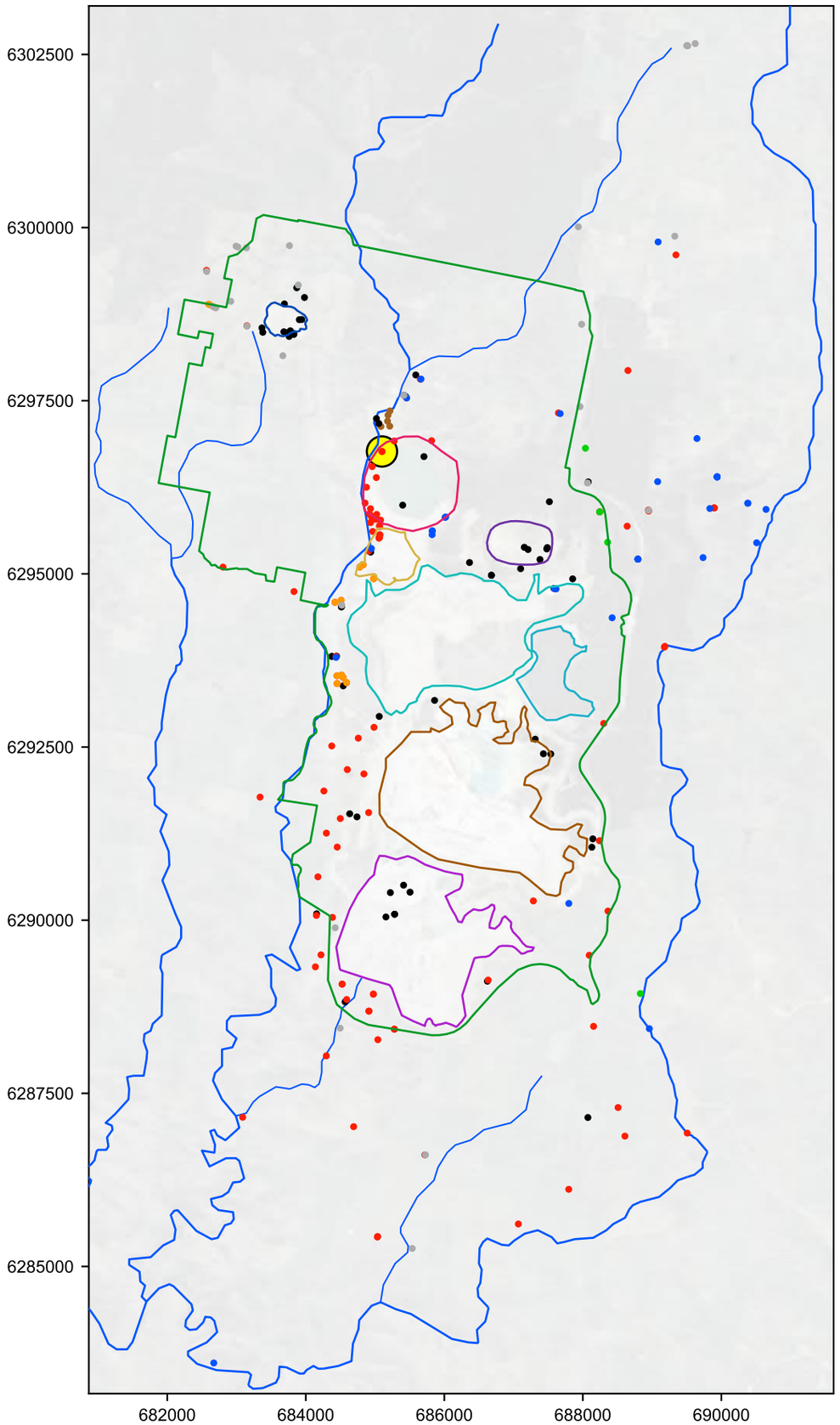
WMP defined analytes

Additional analytes of interest

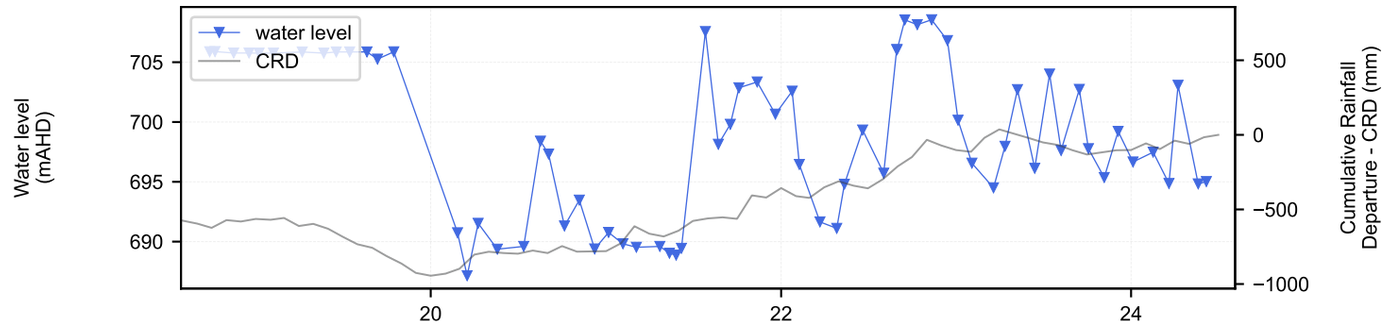


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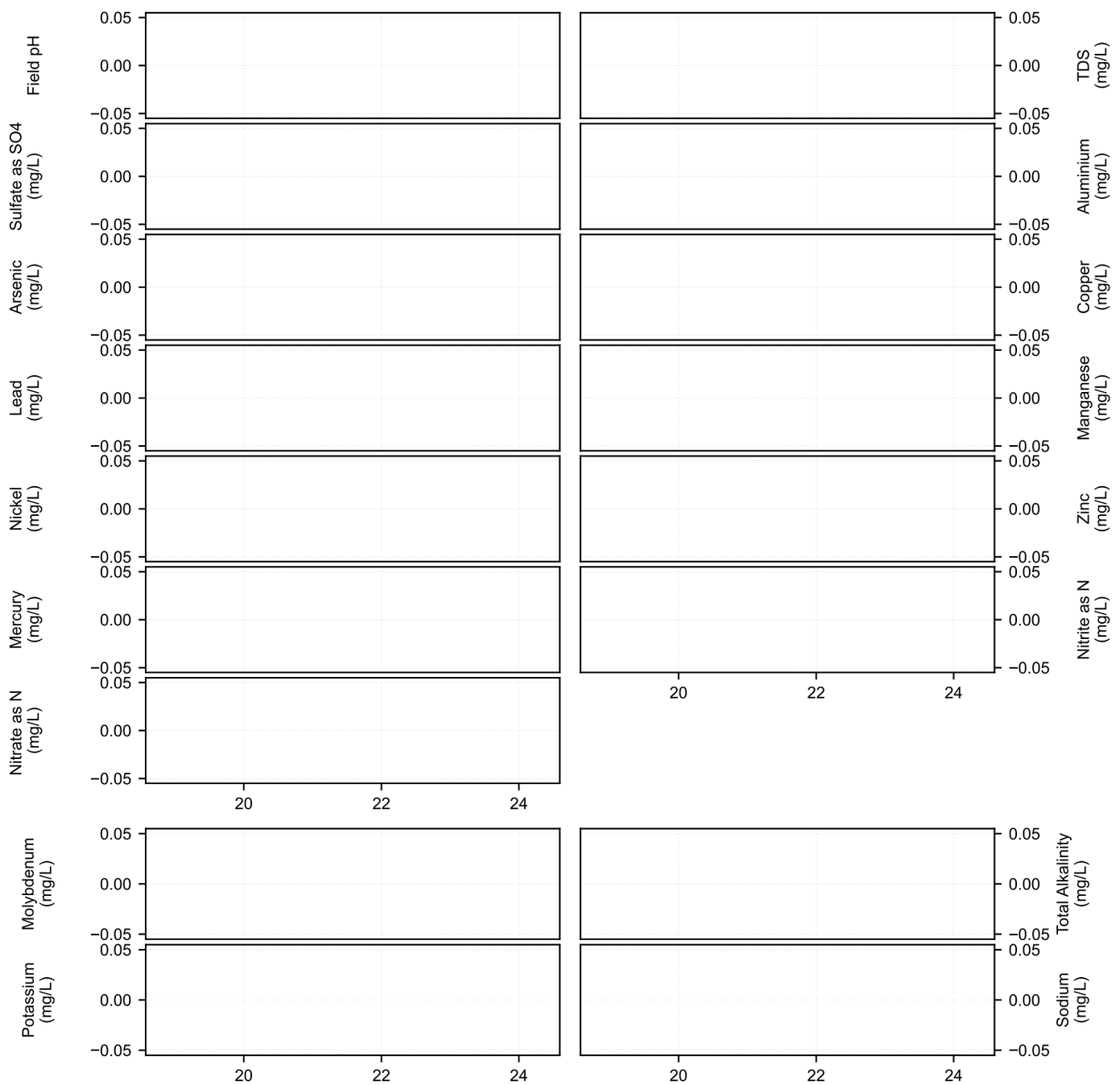
PZ89A (Screened geology - Ordovician; Screened interval: 52-60 mbgl)



Groundwater levels



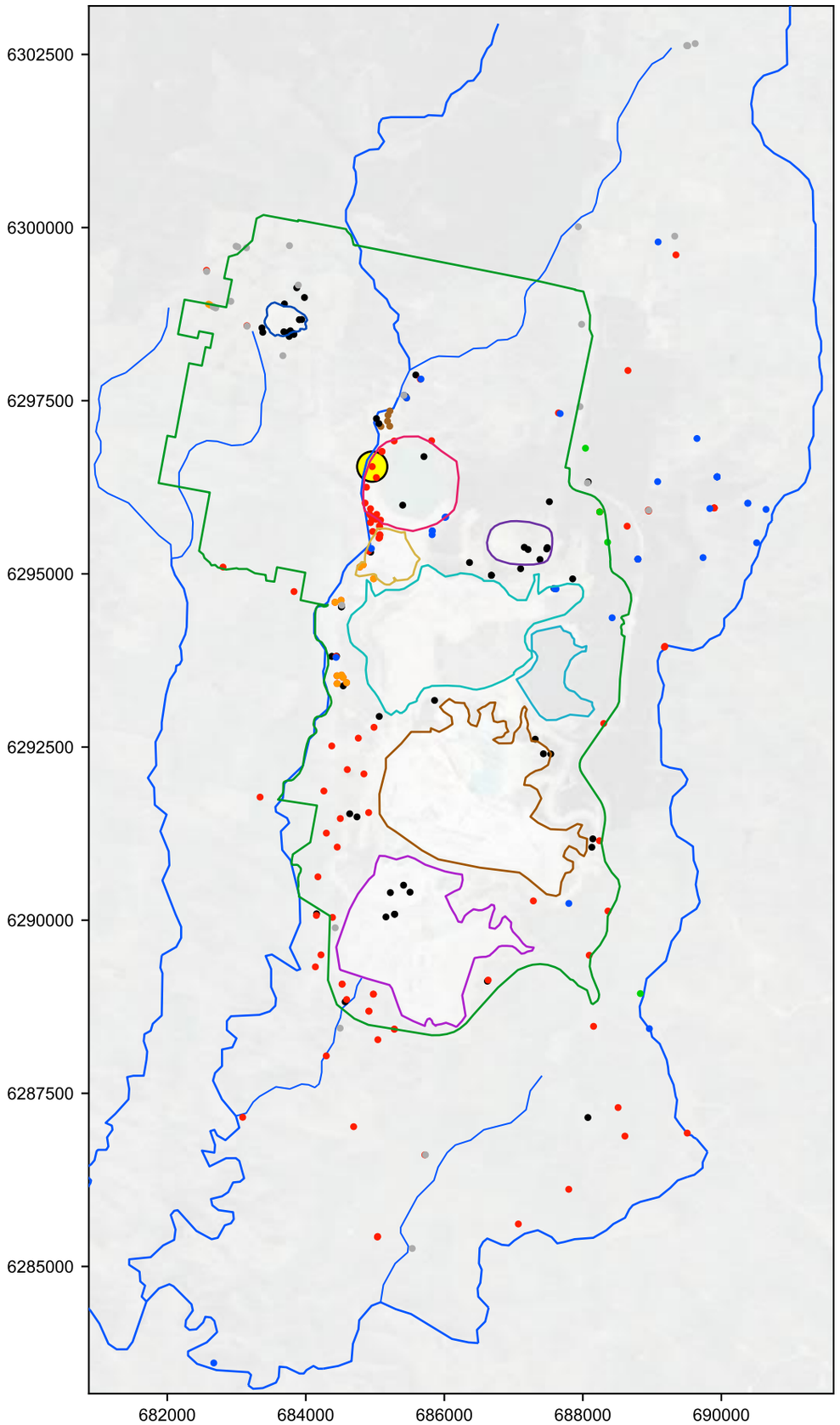
WMP defined analytes



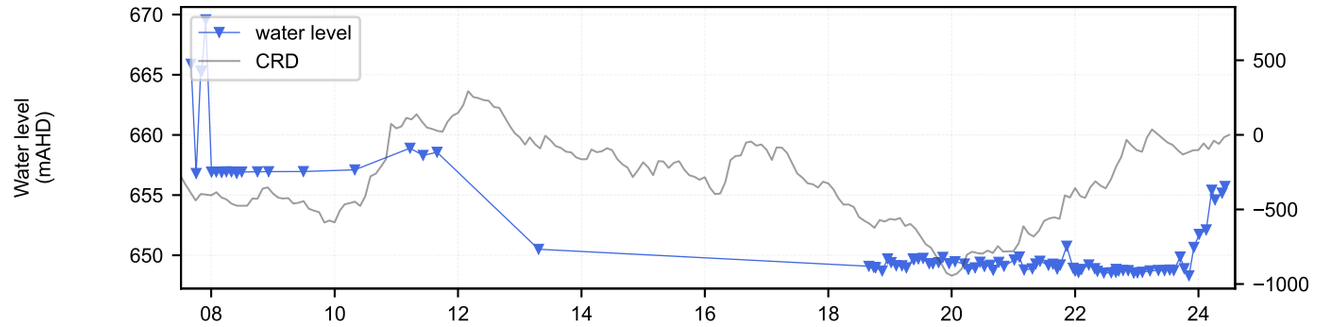
Additional analytes of interest

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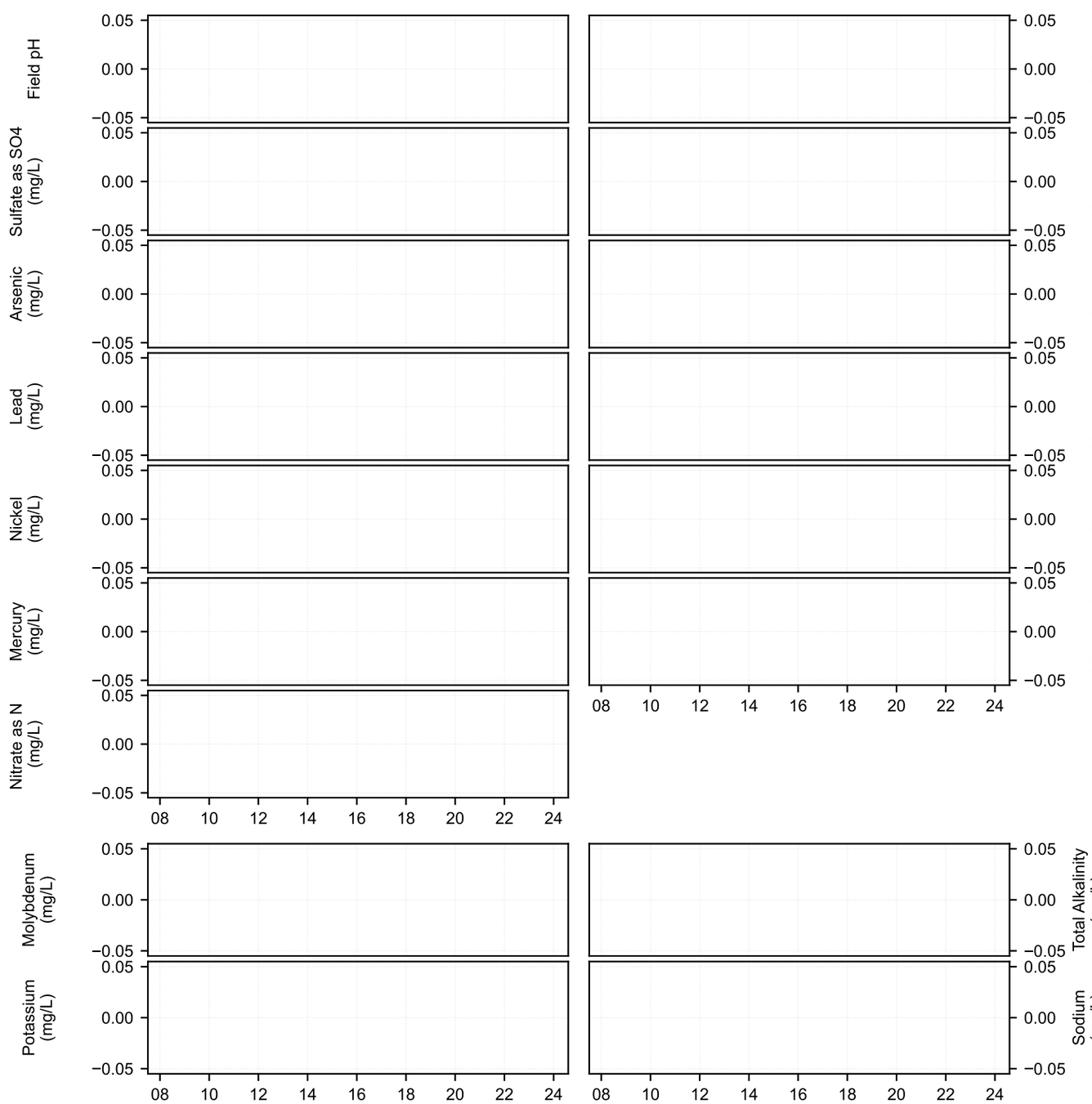
PZ90 (Screened geology - Ordovician; Screened interval: 155-170 mbgl)



Groundwater levels



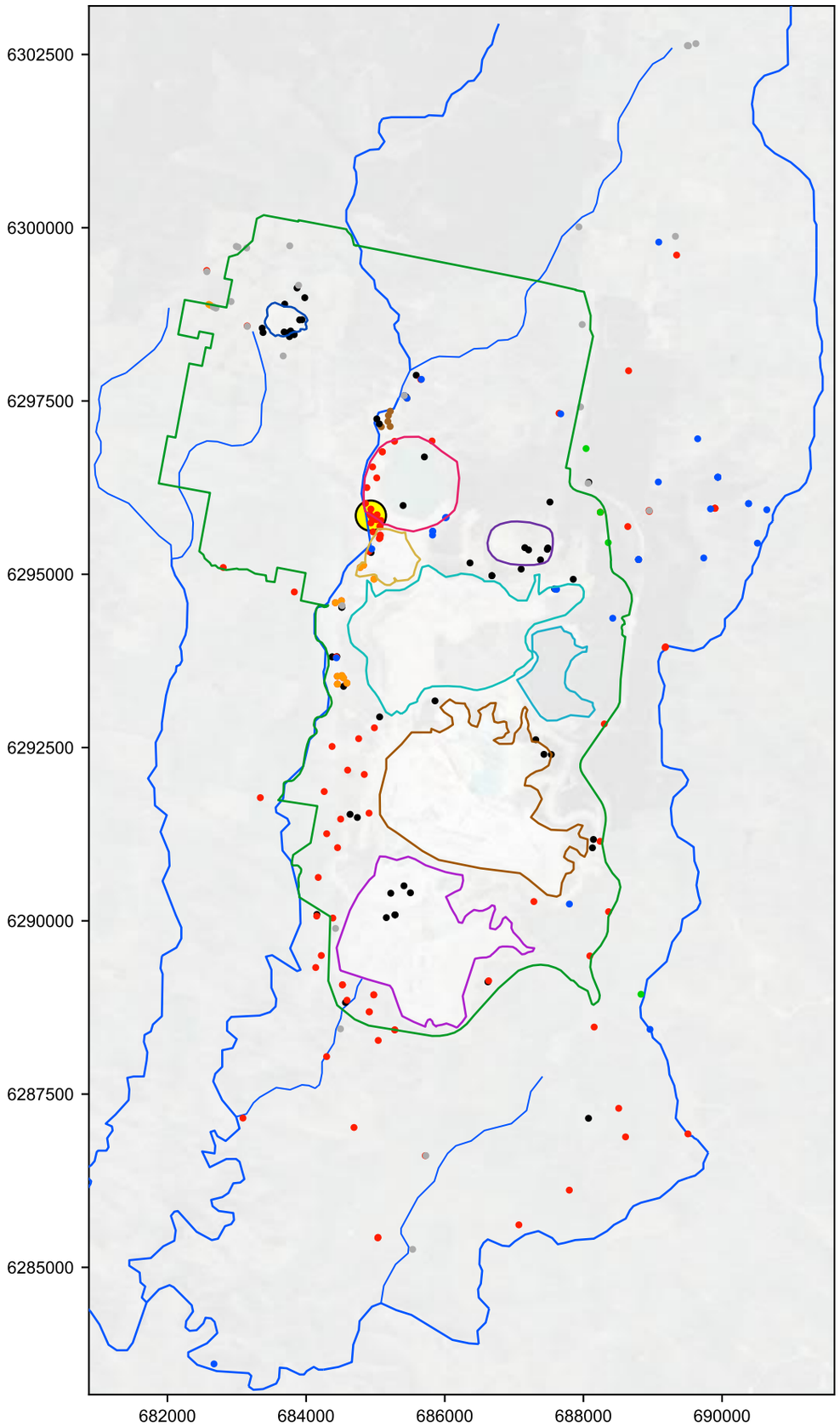
WMP defined analytes



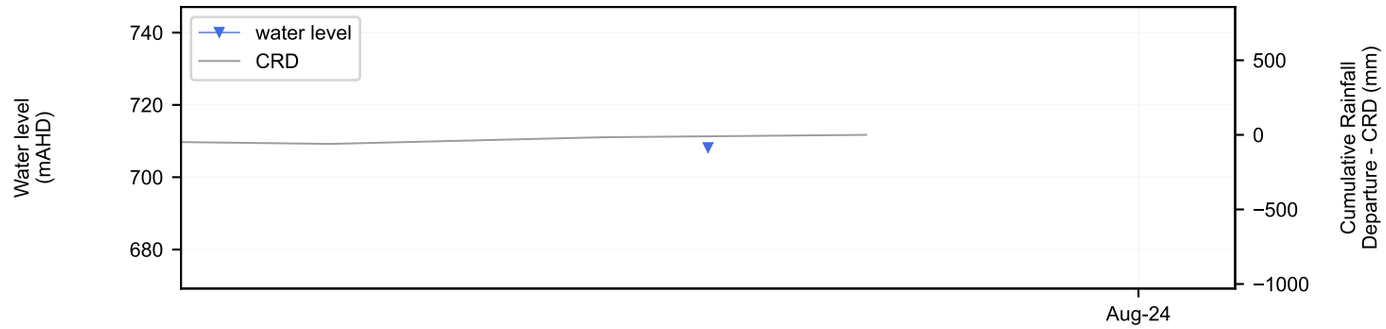
Additional analytes of interest

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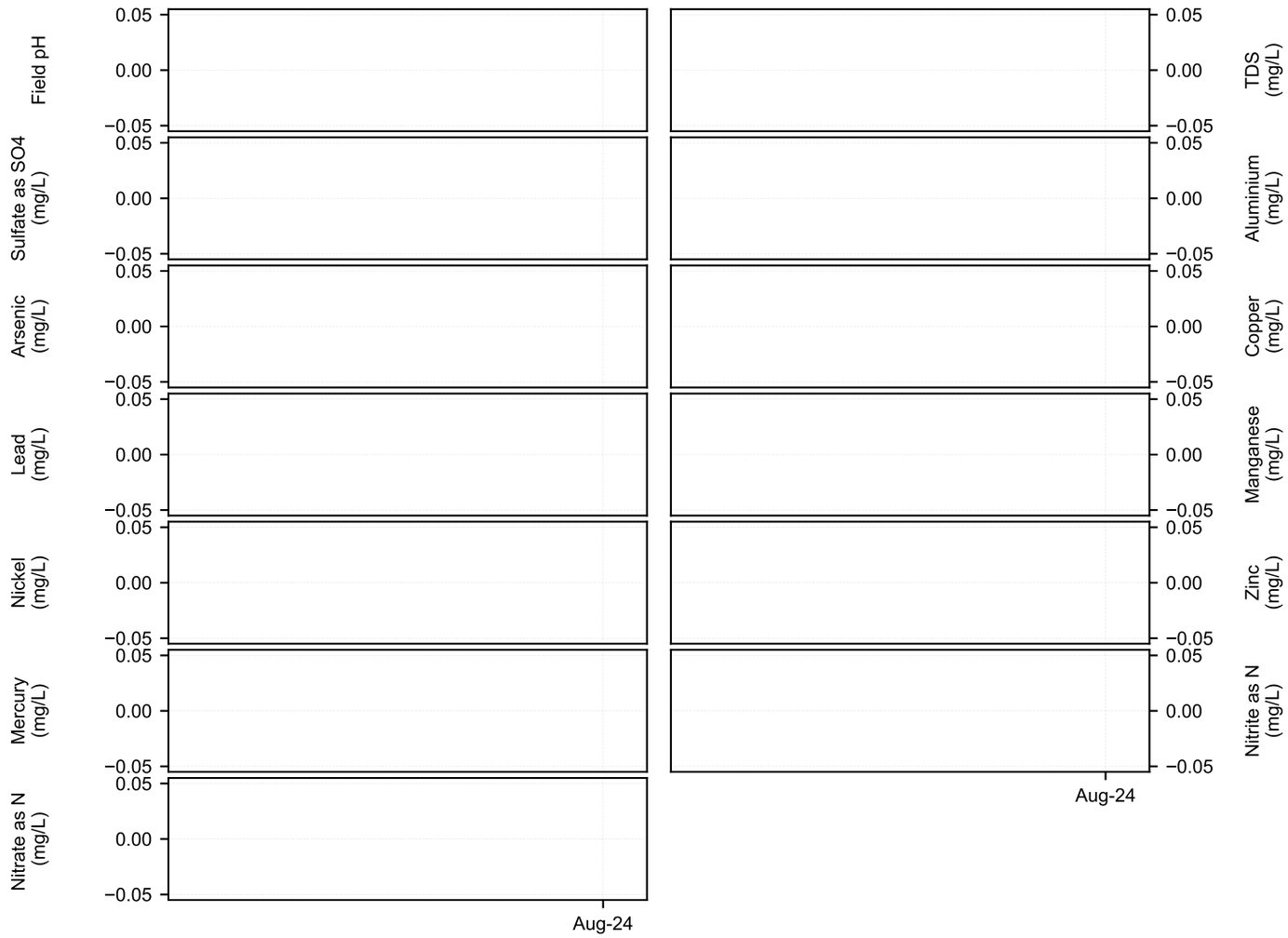
MB144 (Screened geology - Ordovician; Screened interval: 16-22 mbgl)



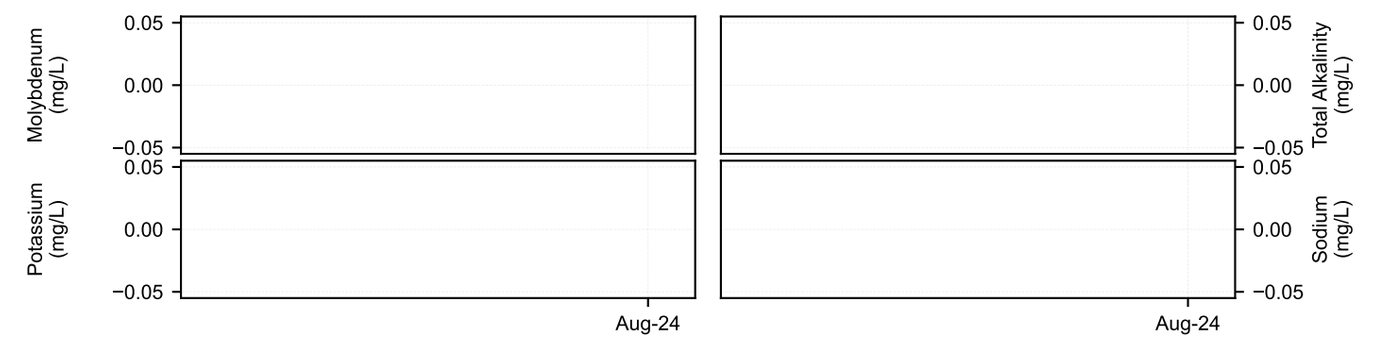
Groundwater levels



WMP defined analytes

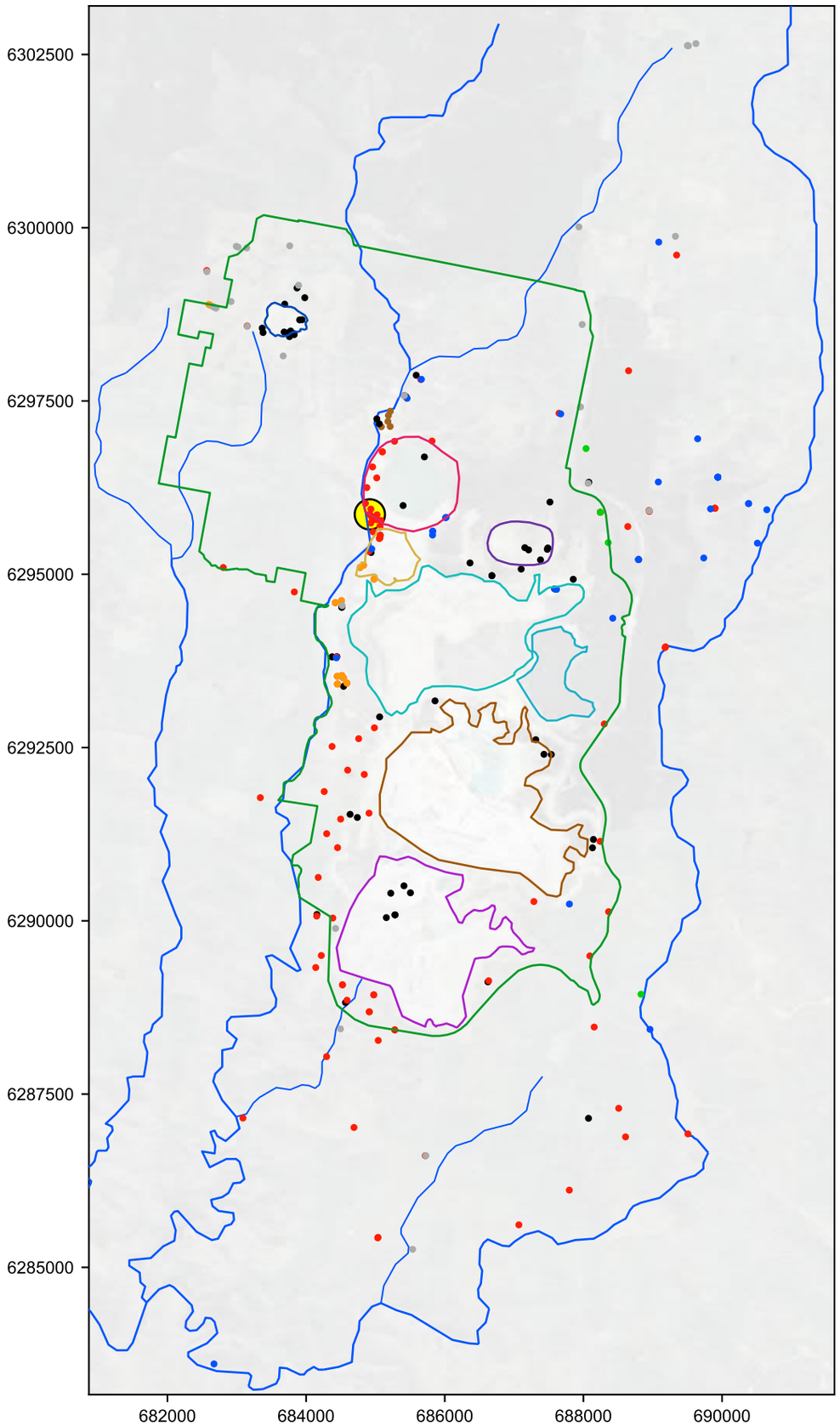


Additional analytes of interest

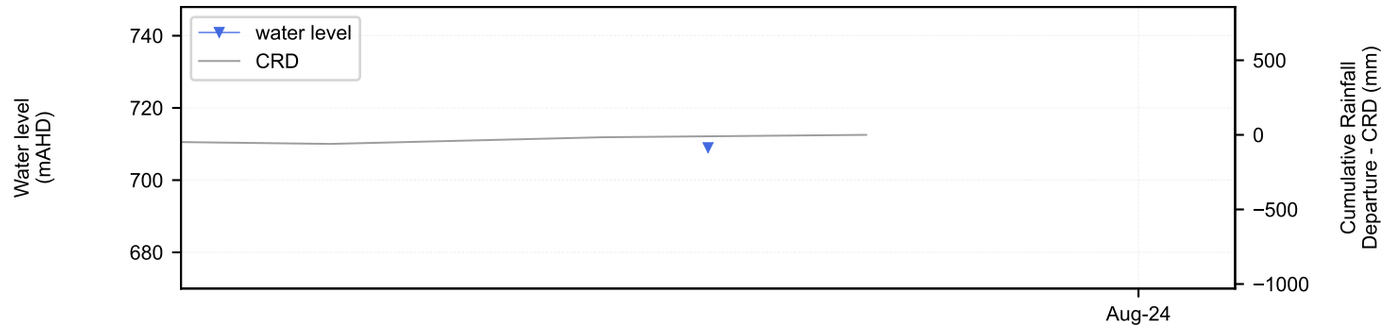


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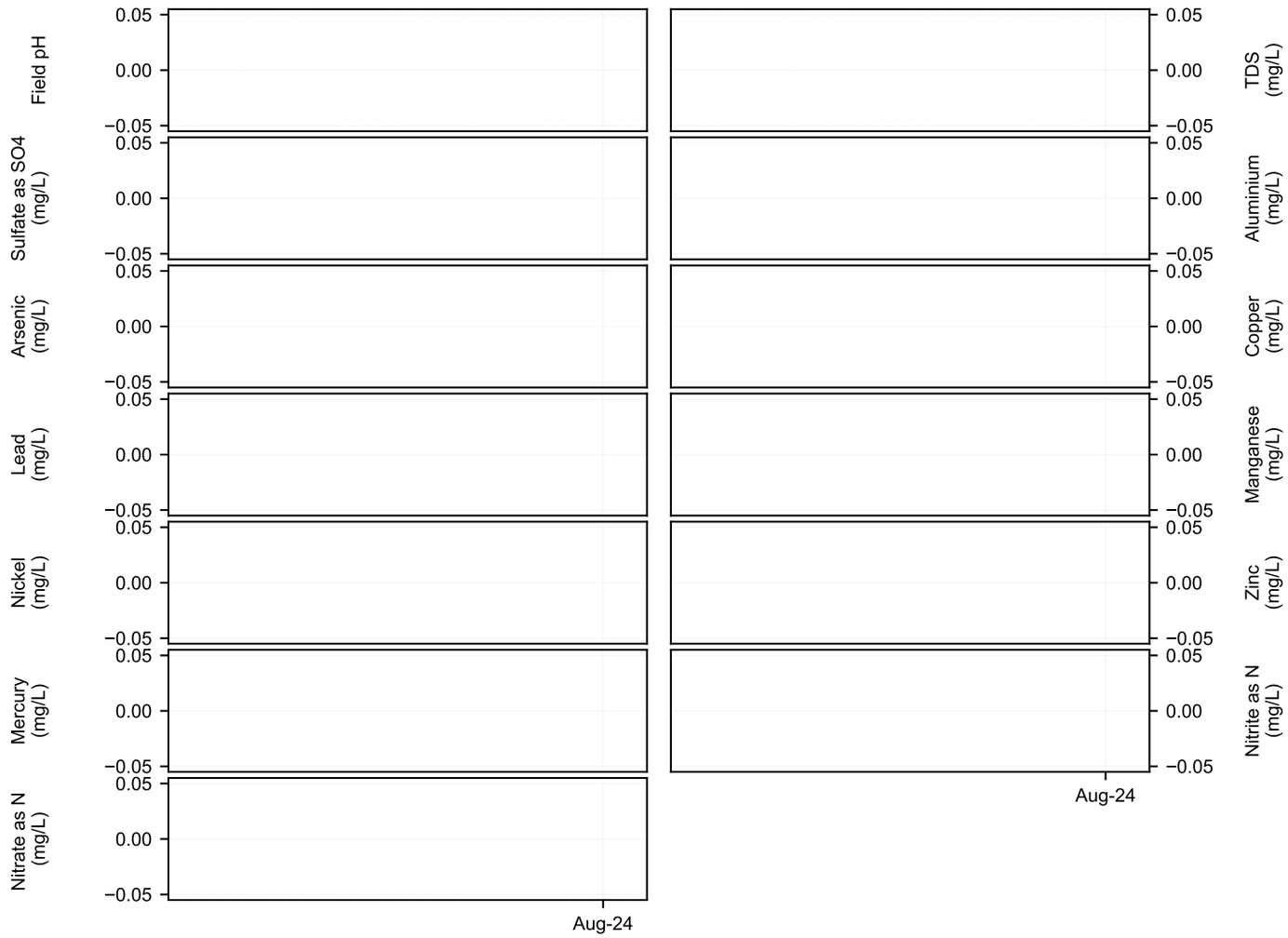
MB145 (Screened geology - Ordovician; Screened interval: 55-64 mbgl)



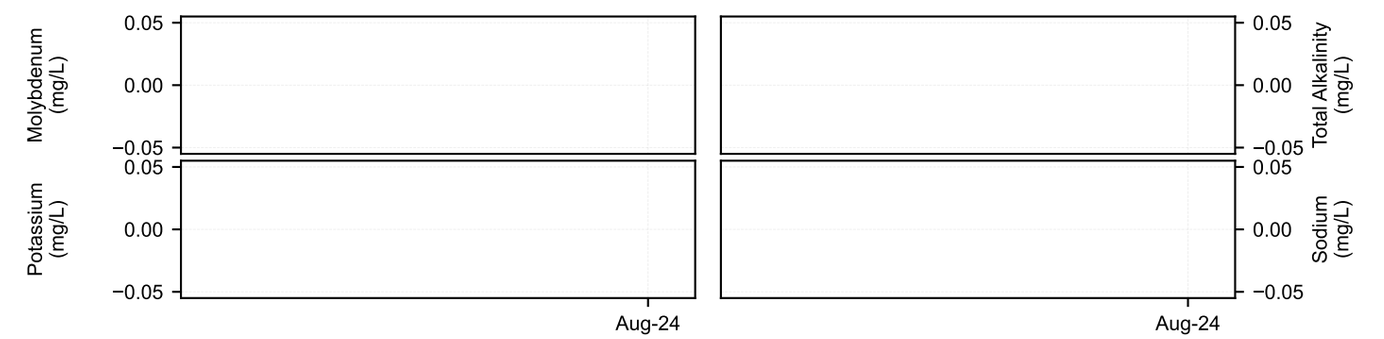
Groundwater levels



WMP defined analytes

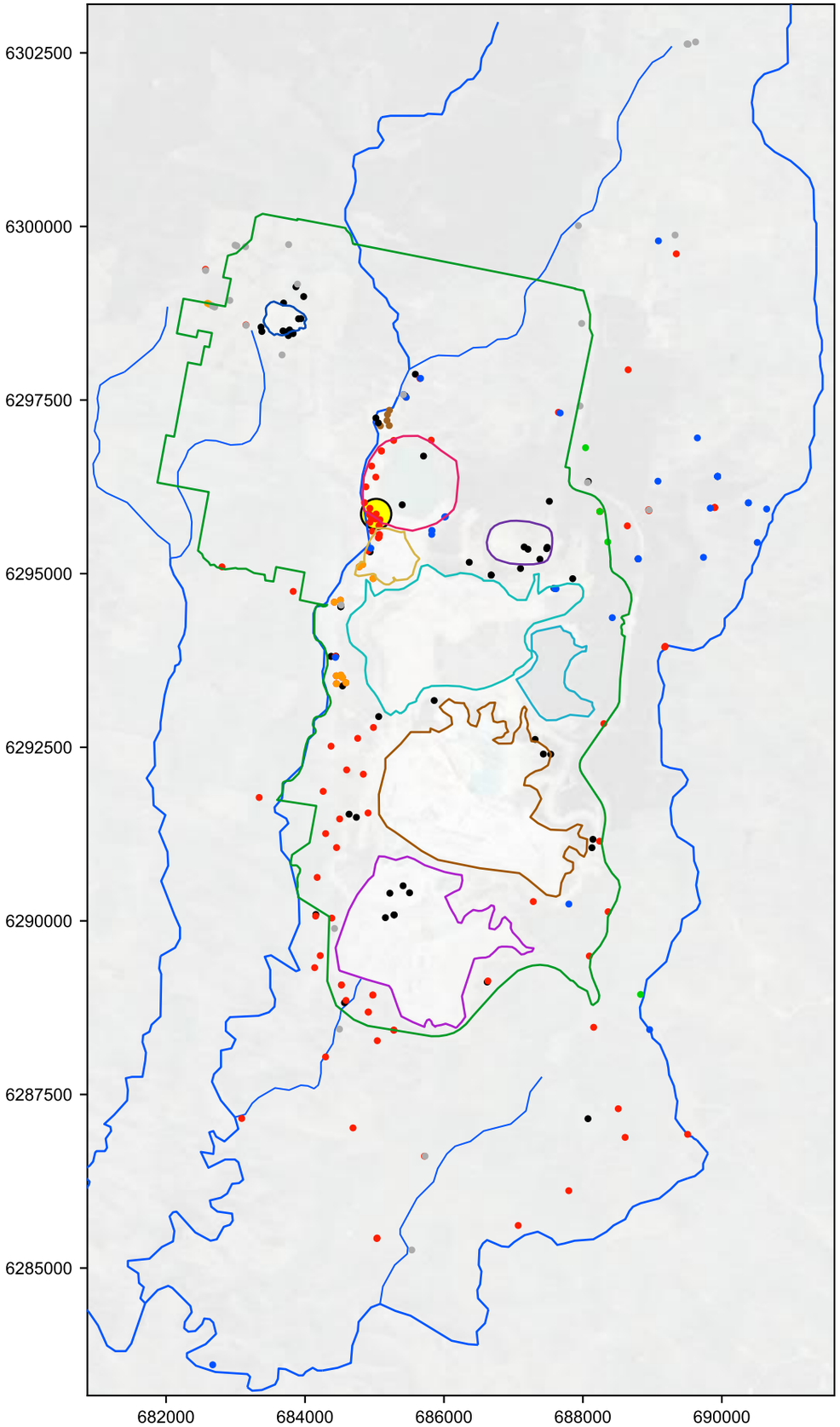


Additional analytes of interest

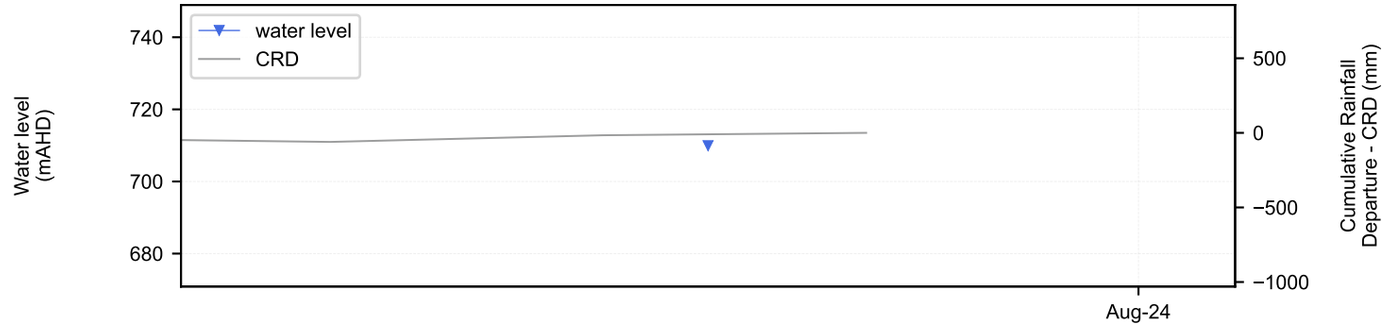


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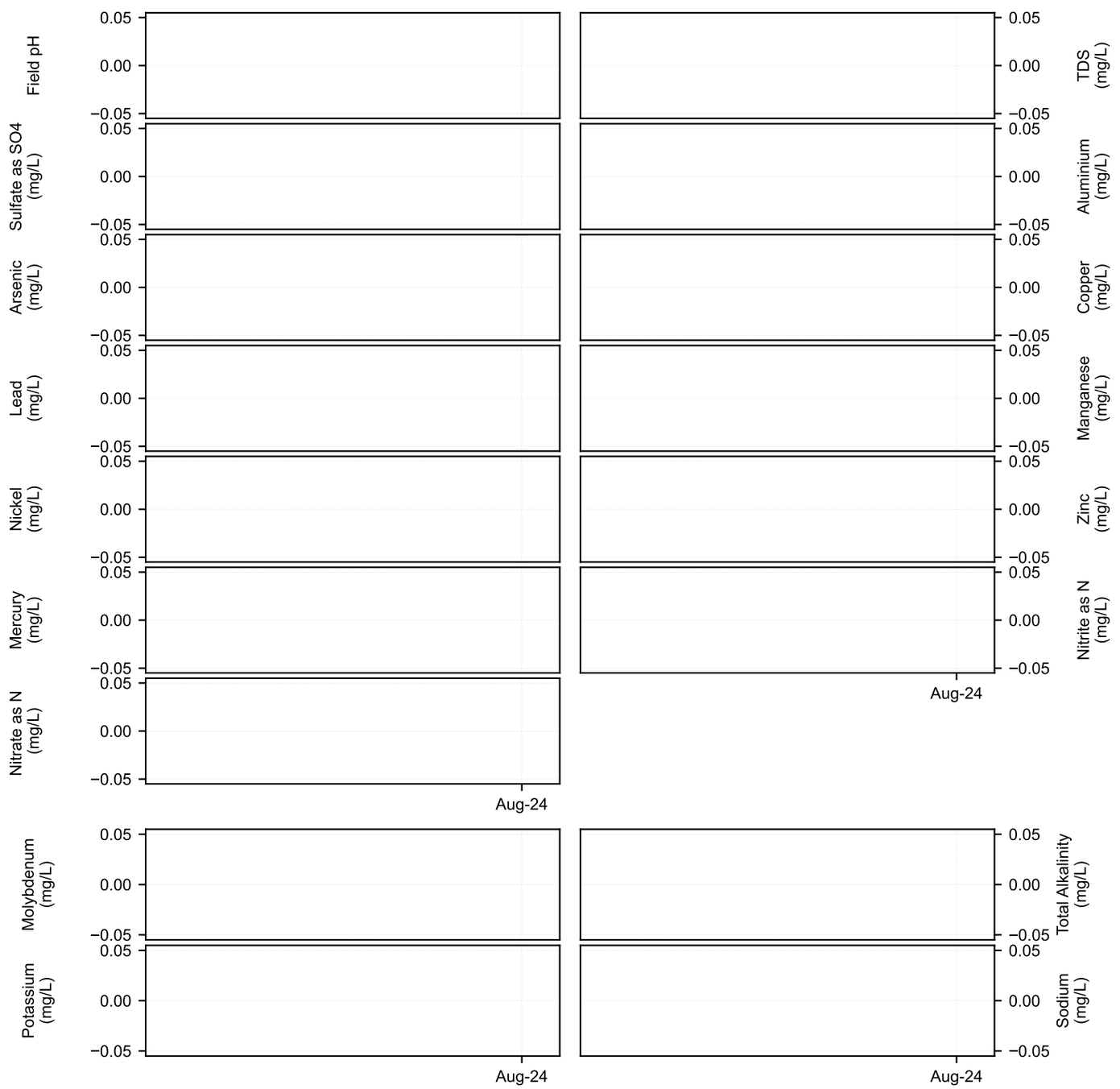
MB146 (Screened geology - Ordovician; Screened interval: 19.3-28.3 mbgl)



Groundwater levels



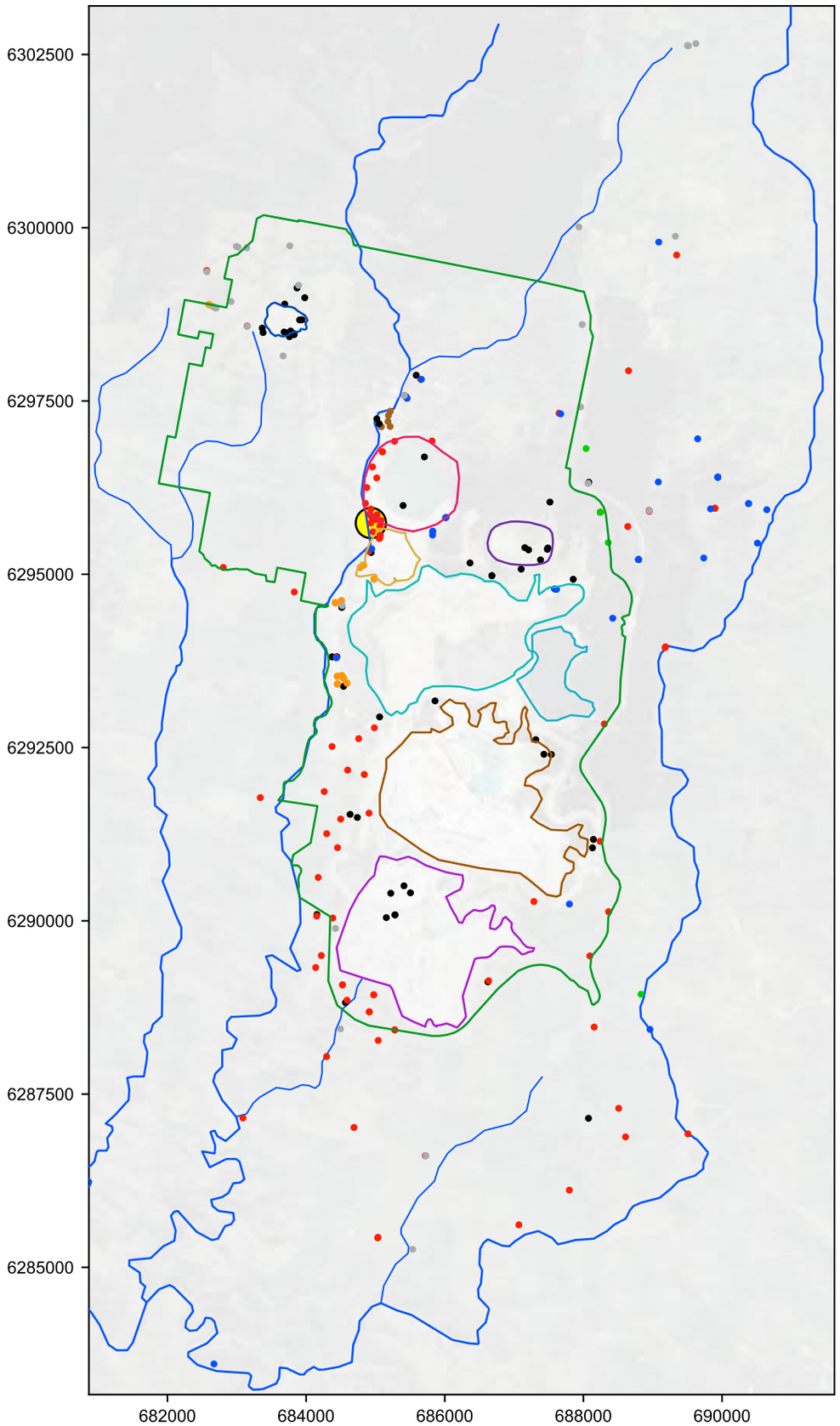
WMP defined analytes



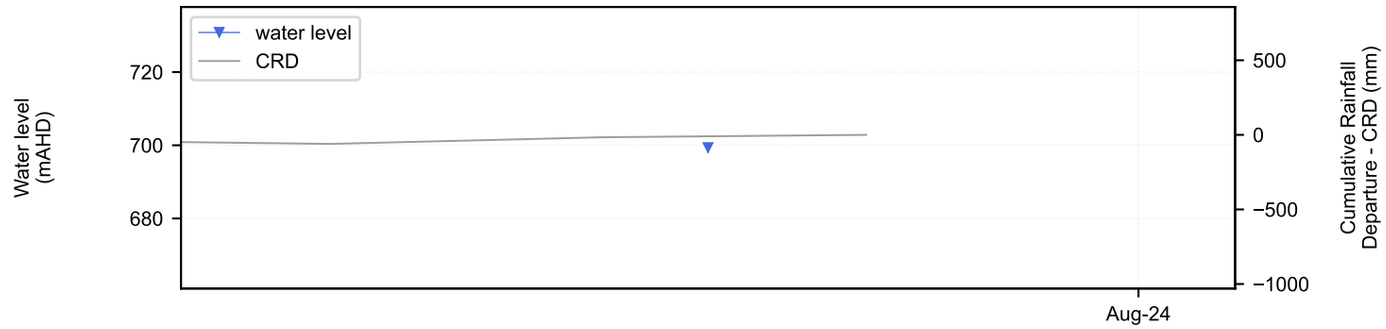
Additional analytes of interest

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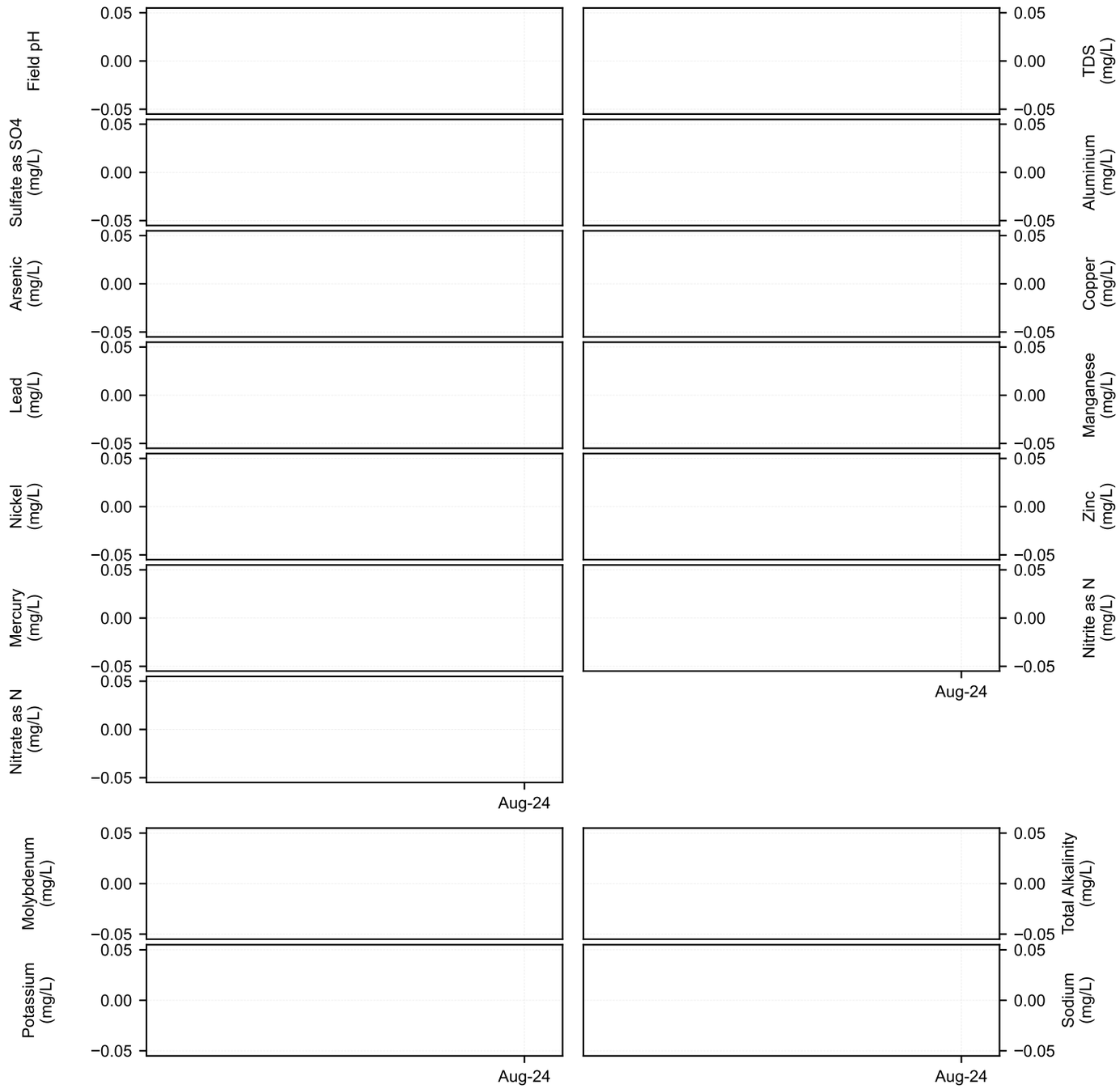
MB148 (Screened geology - Ordovician; Screened interval: 24-45 mbgl)



Groundwater levels



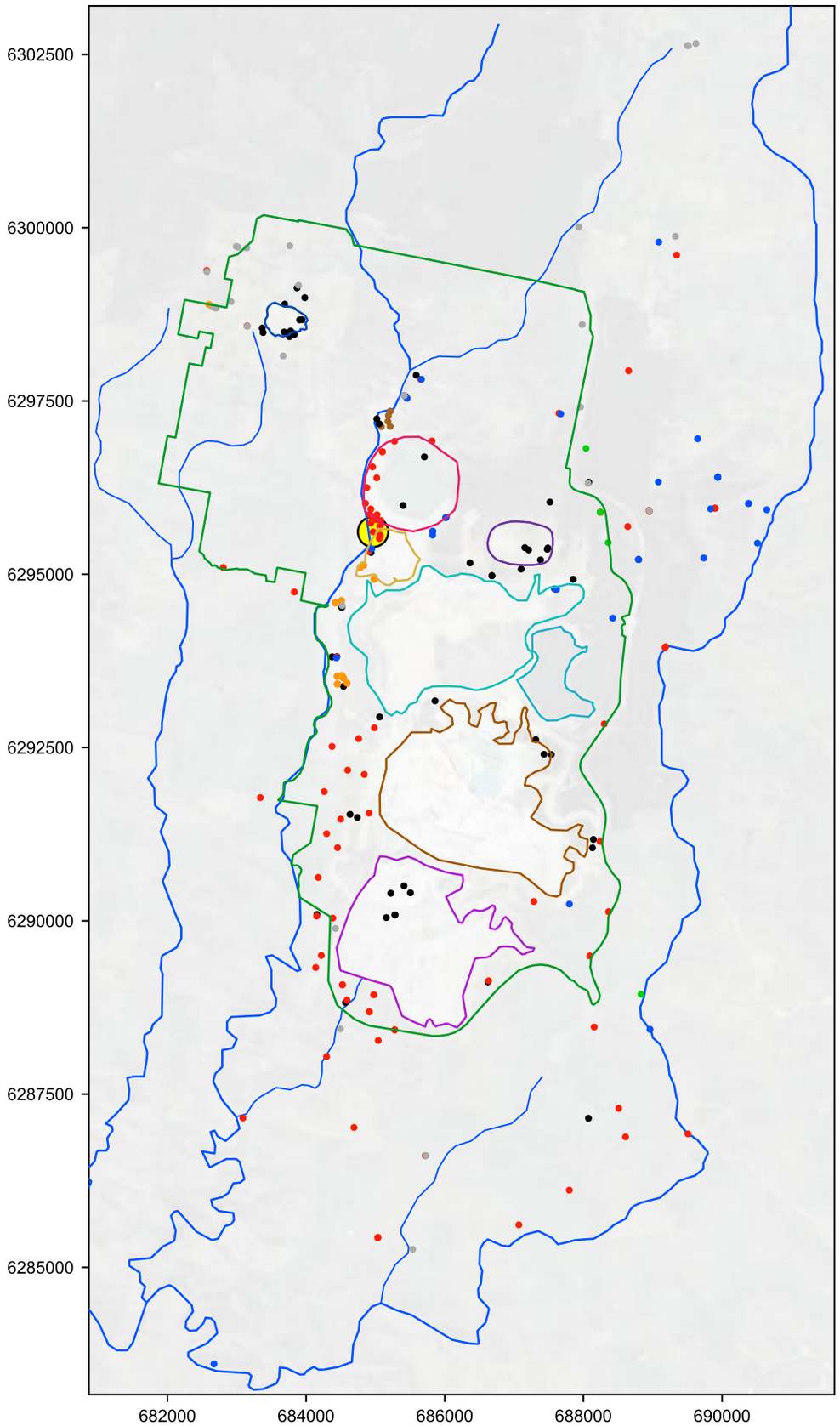
WMP defined analytes



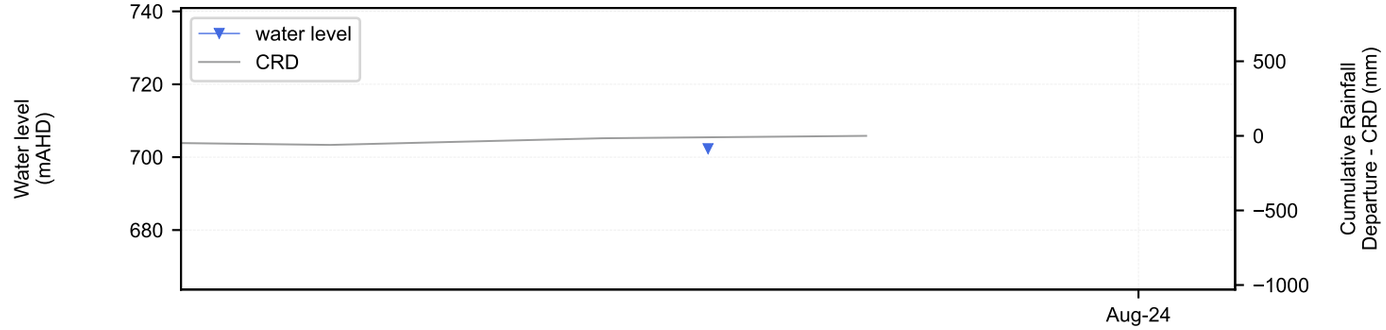
Additional analytes of interest

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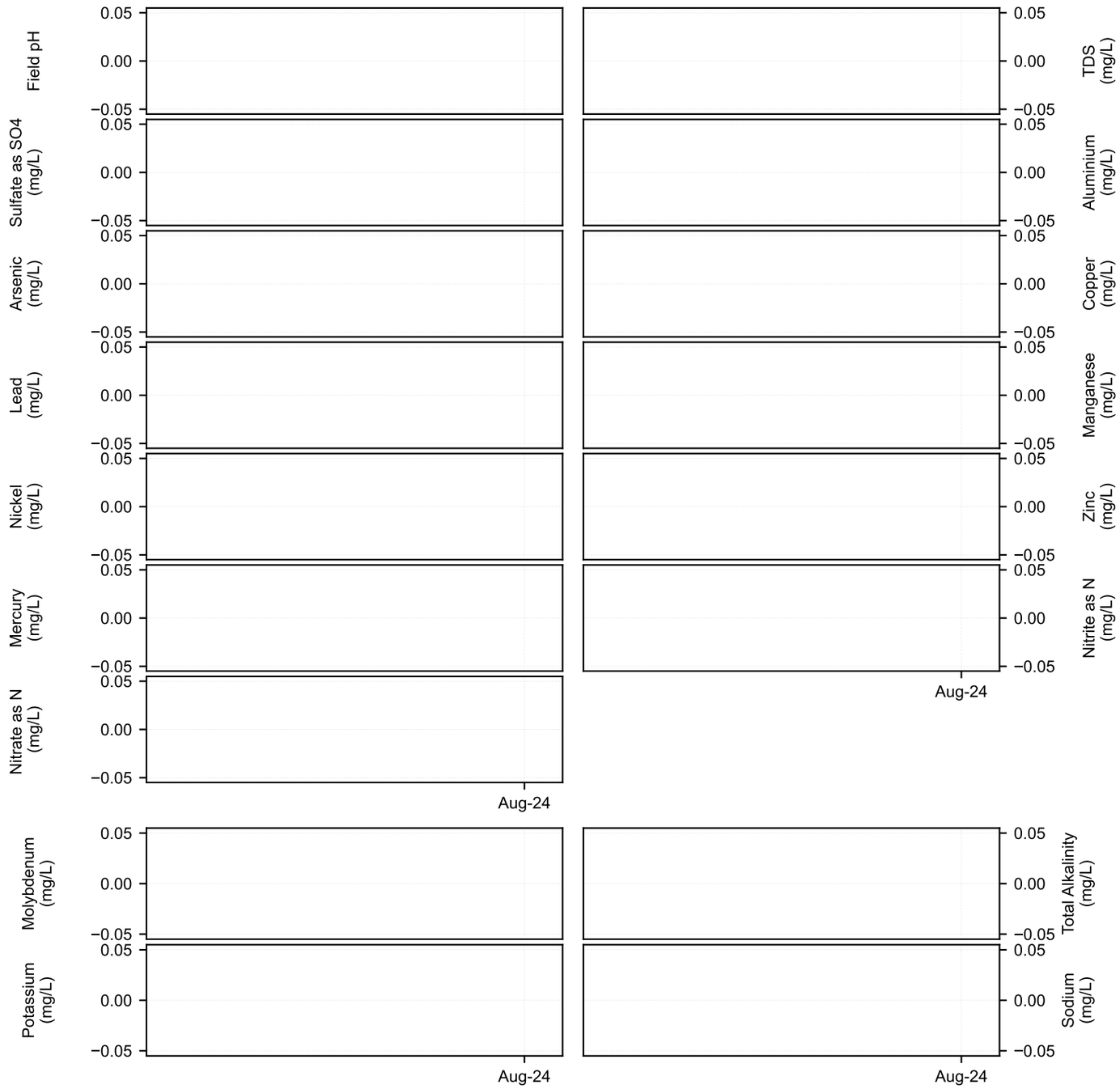
MB149 (Screened geology - Ordovician; Screened interval: 9-18 mbgl)



Groundwater levels



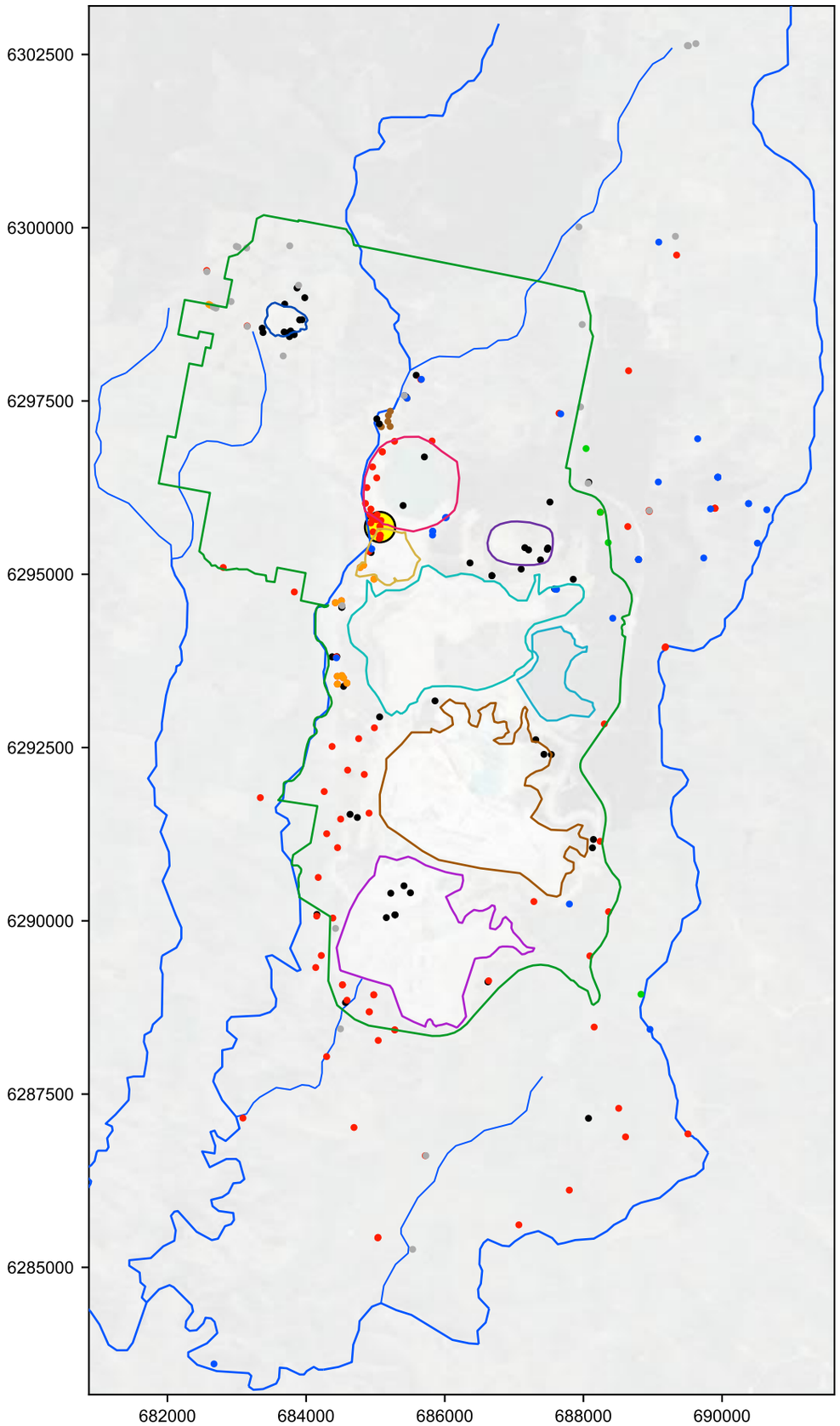
WMP defined analytes



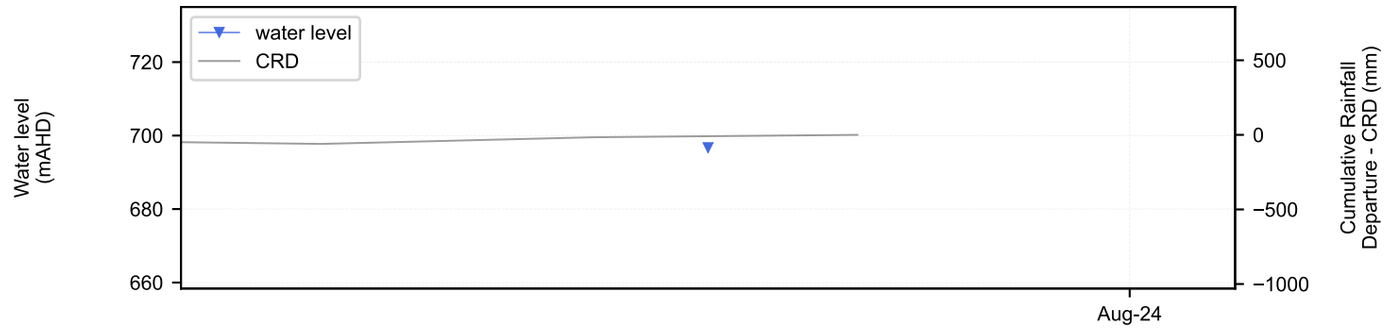
Additional analytes of interest

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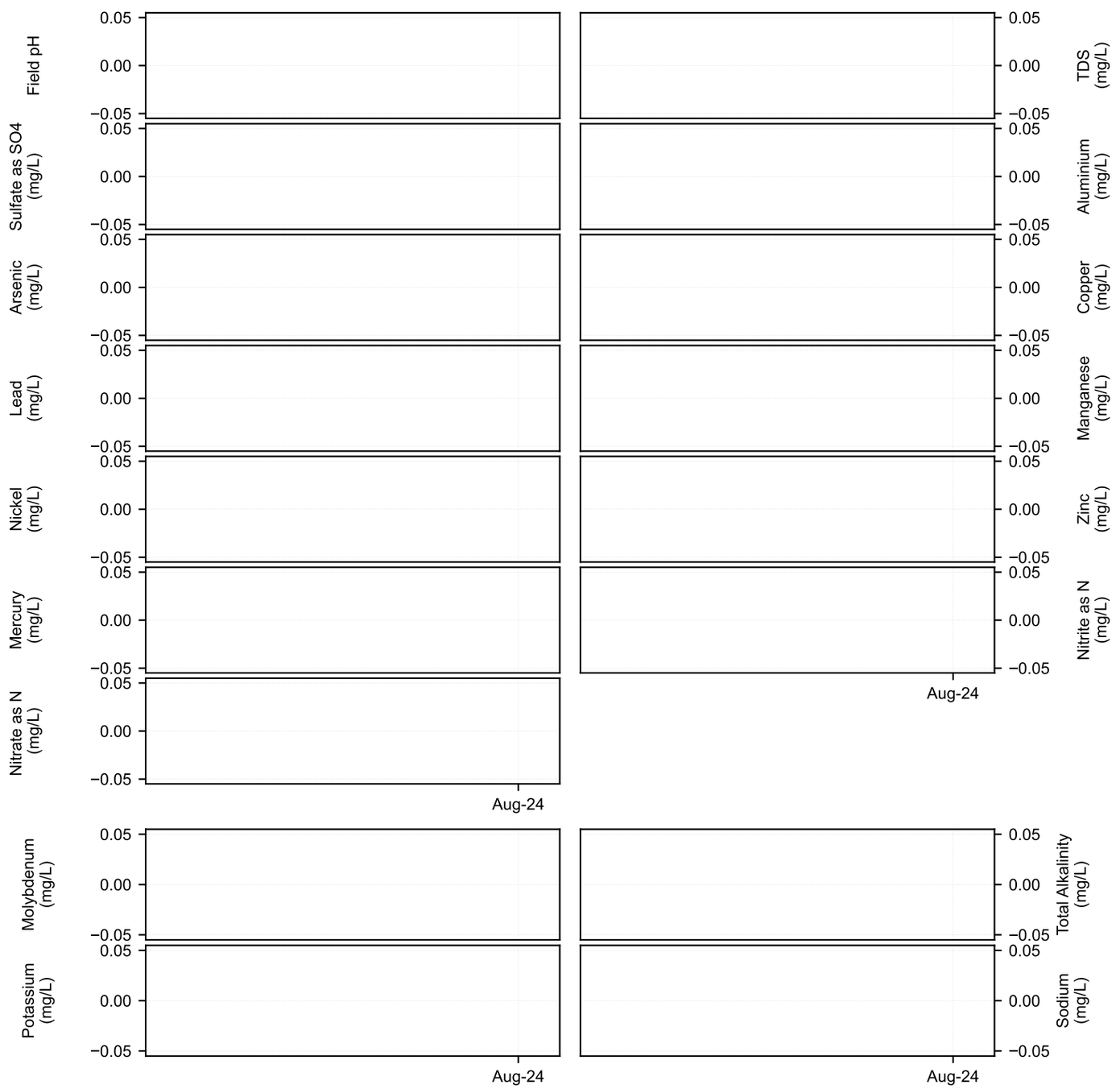
MB150 (Screened geology - Ordovician; Screened interval: 18-24 mbgl)



Groundwater levels



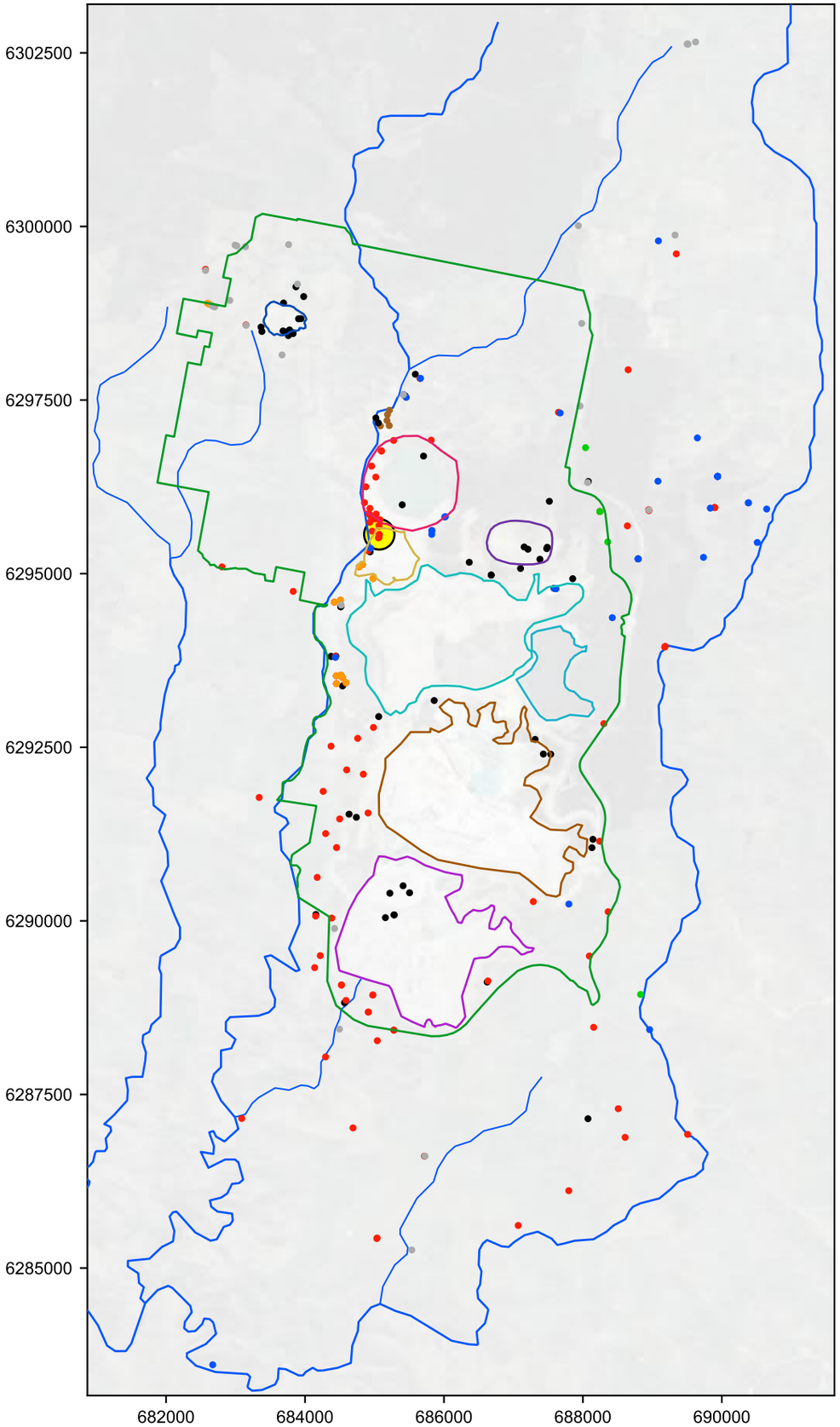
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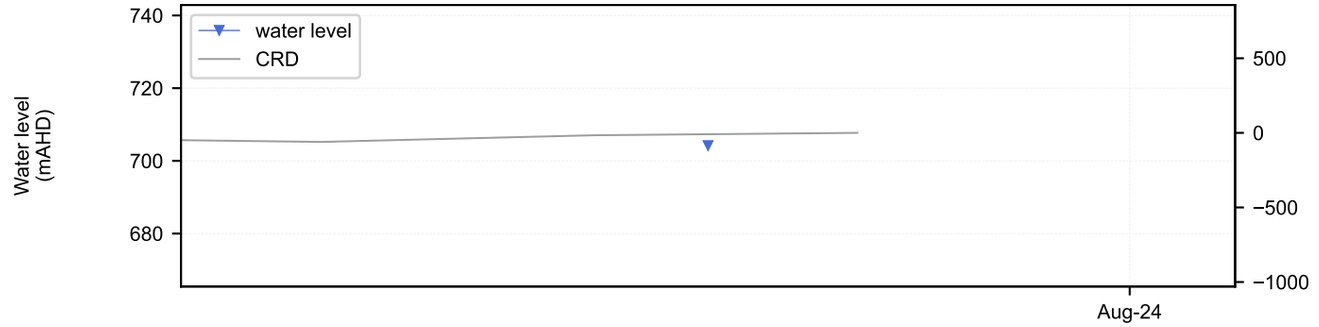
Additional analytes of interest

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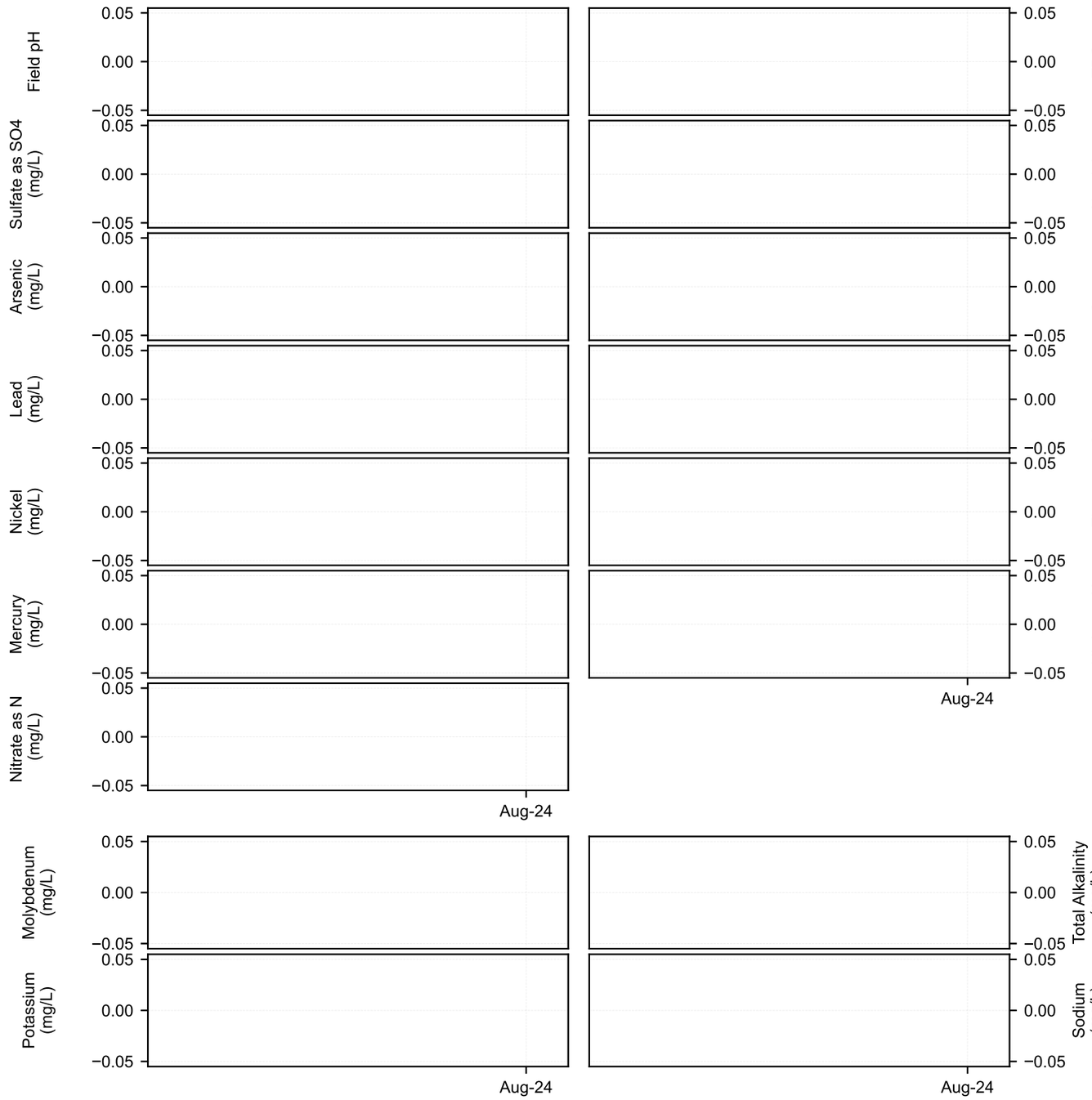
MB151 (Screened geology - Ordovician; Screened interval: 44-53 mbgl)



Groundwater levels



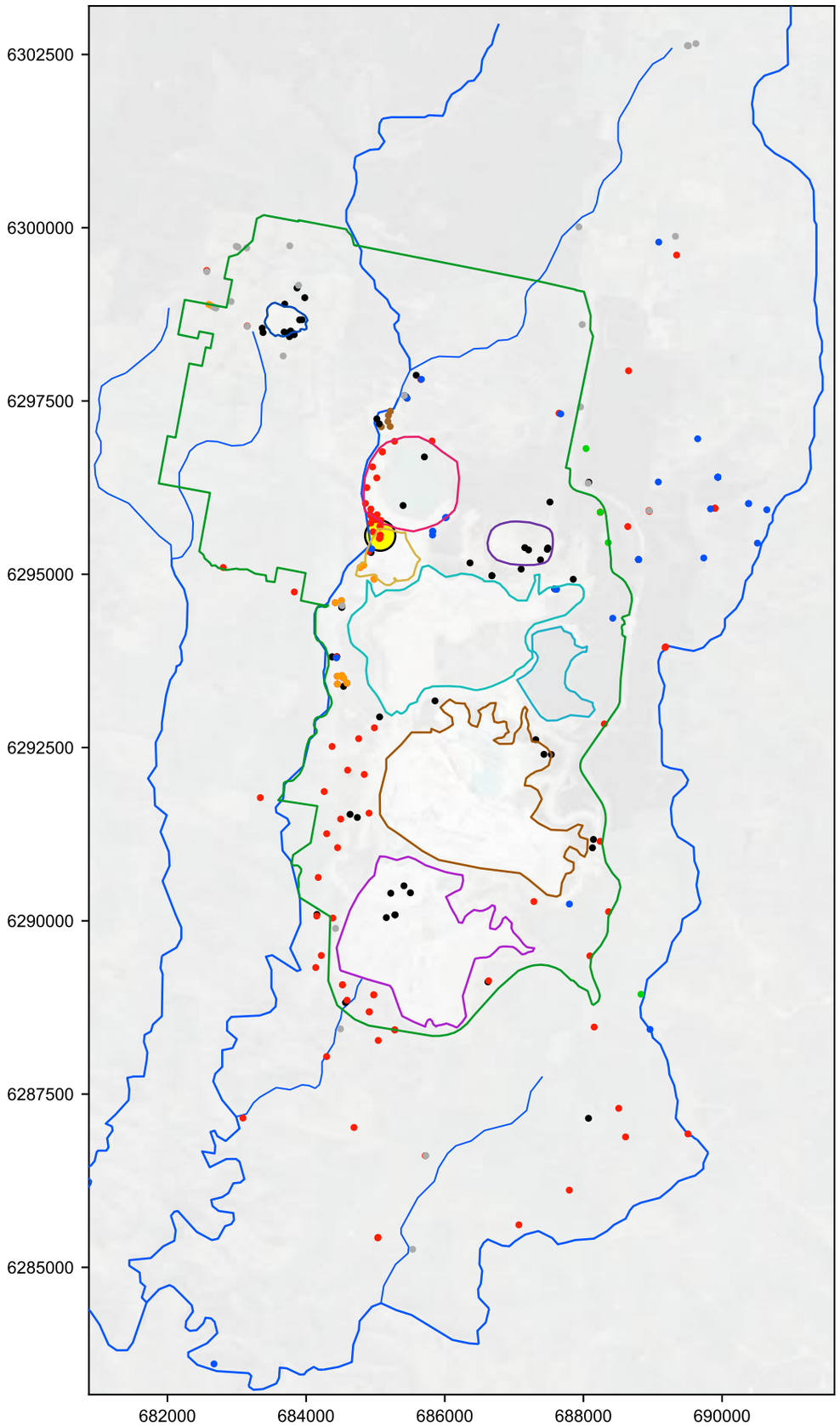
WMP defined analytes



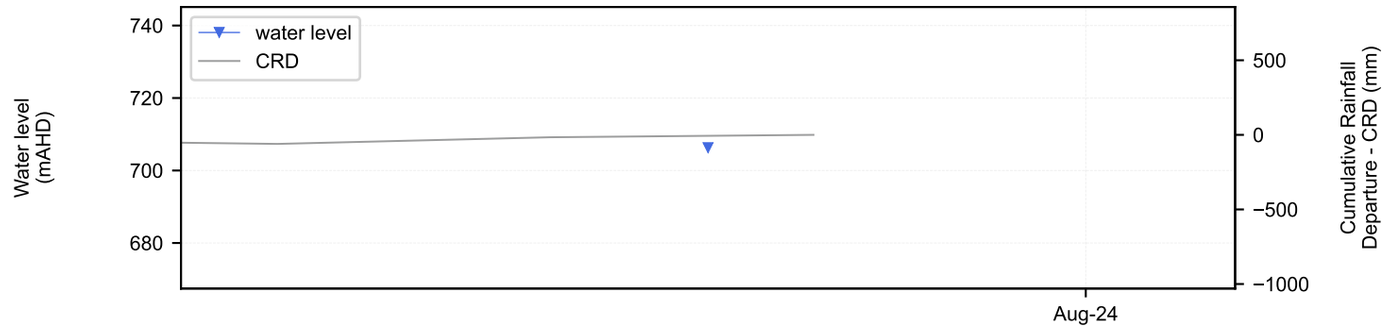
Additional analytes of interest

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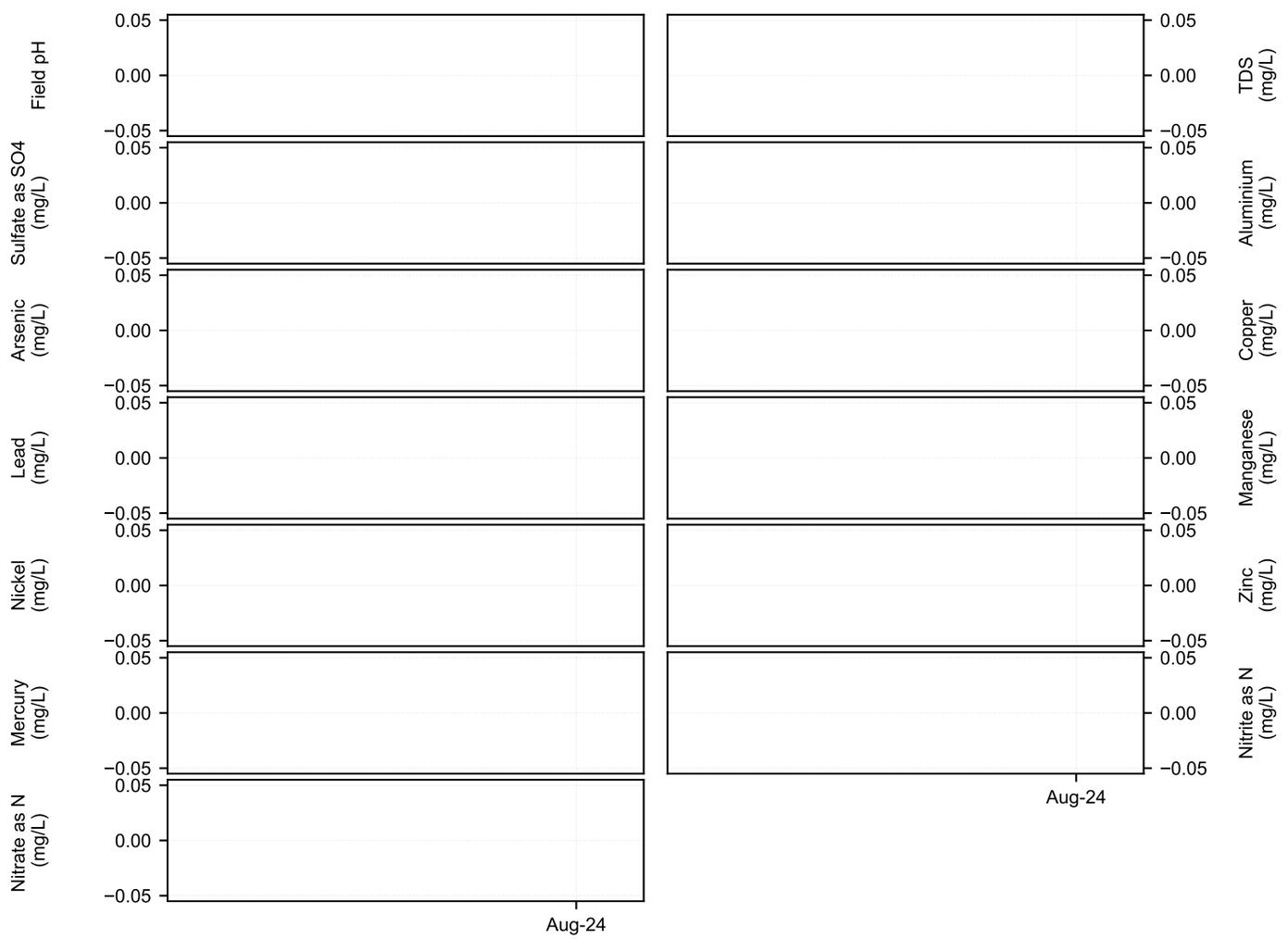
MB152 (Screened geology - Ordovician; Screened interval: 7-10 mbgl)



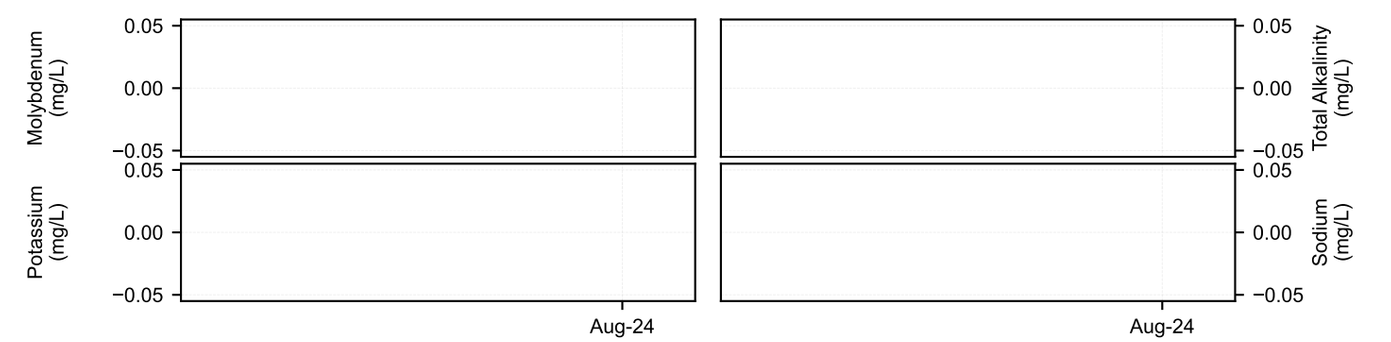
Groundwater levels



WMP defined analytes

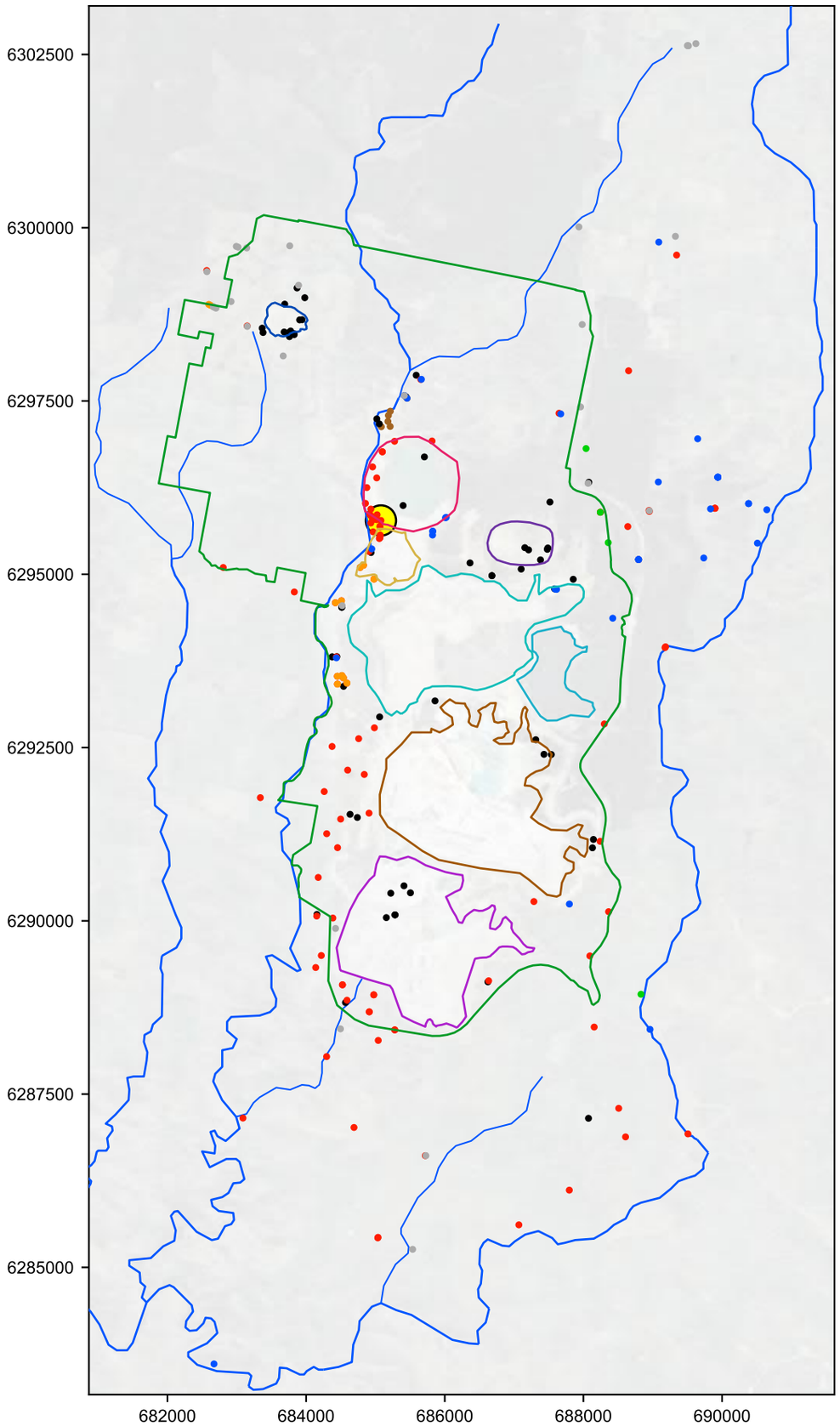


Additional analytes of interest

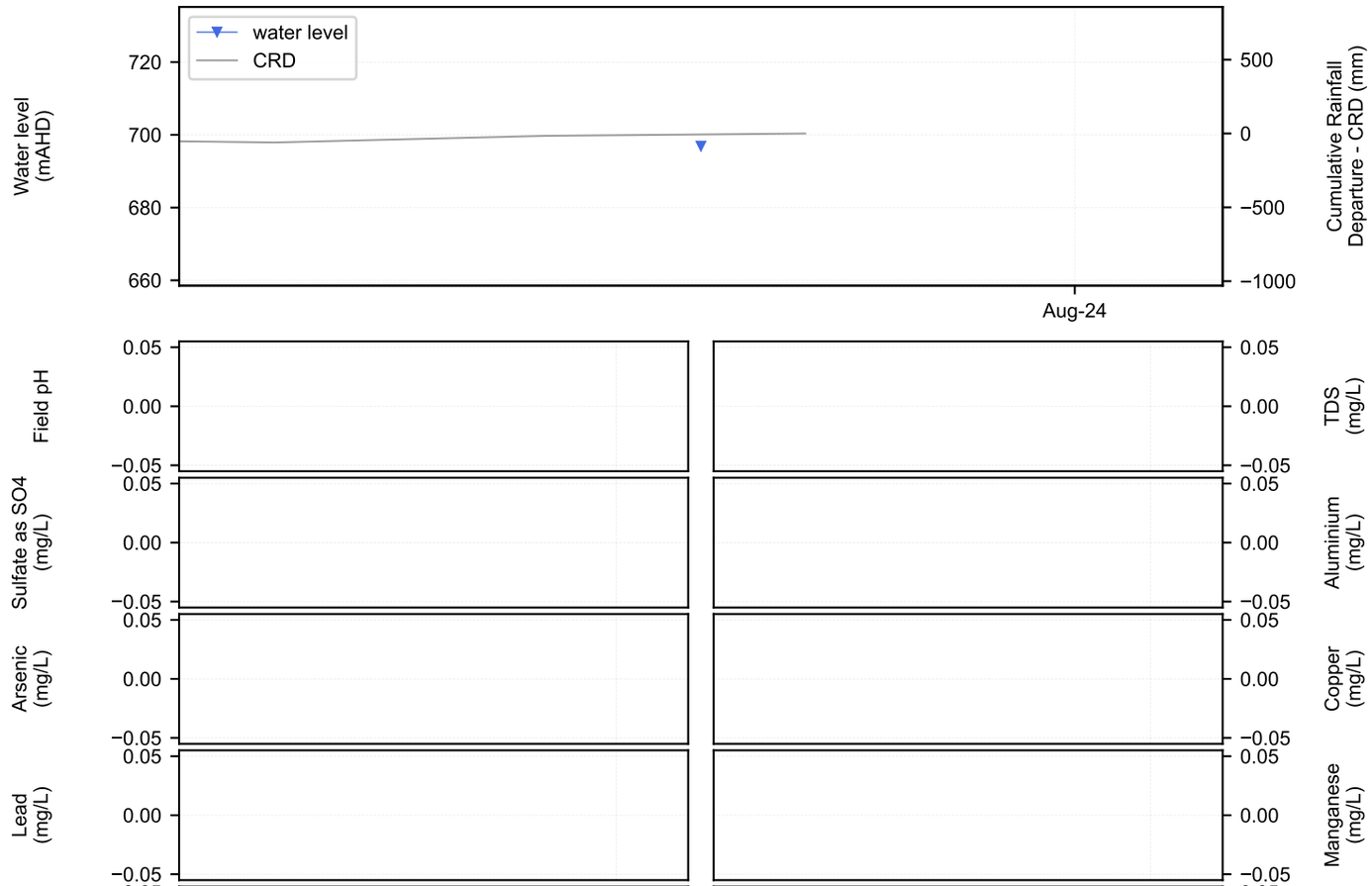


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MB142 (Screened geology - Ordovician; Screened interval: 123-144 mbgl)

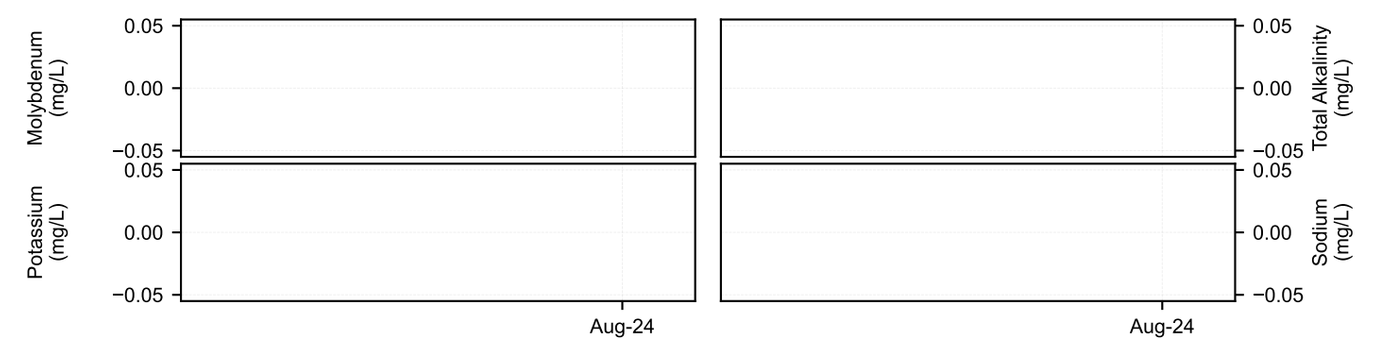


Groundwater levels



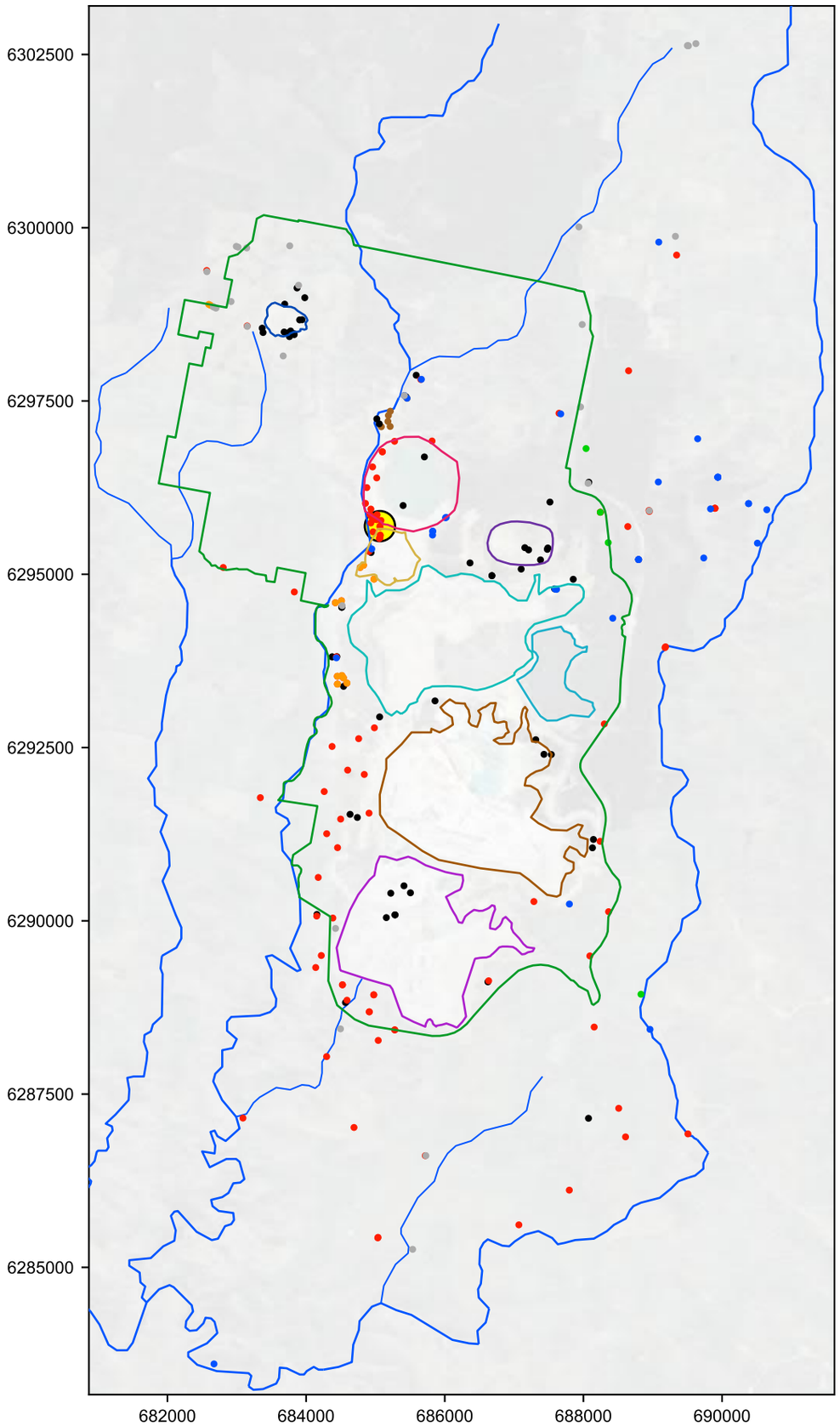
WMP defined analytes

Additional analytes of interest

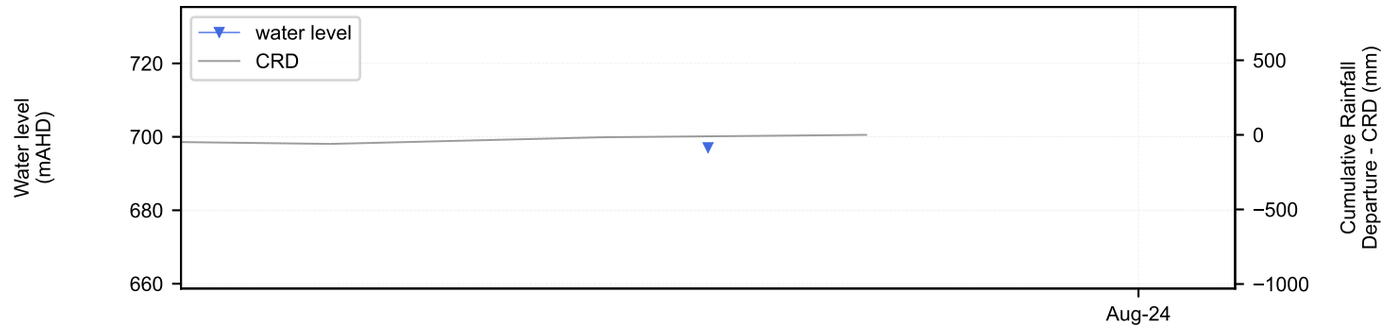


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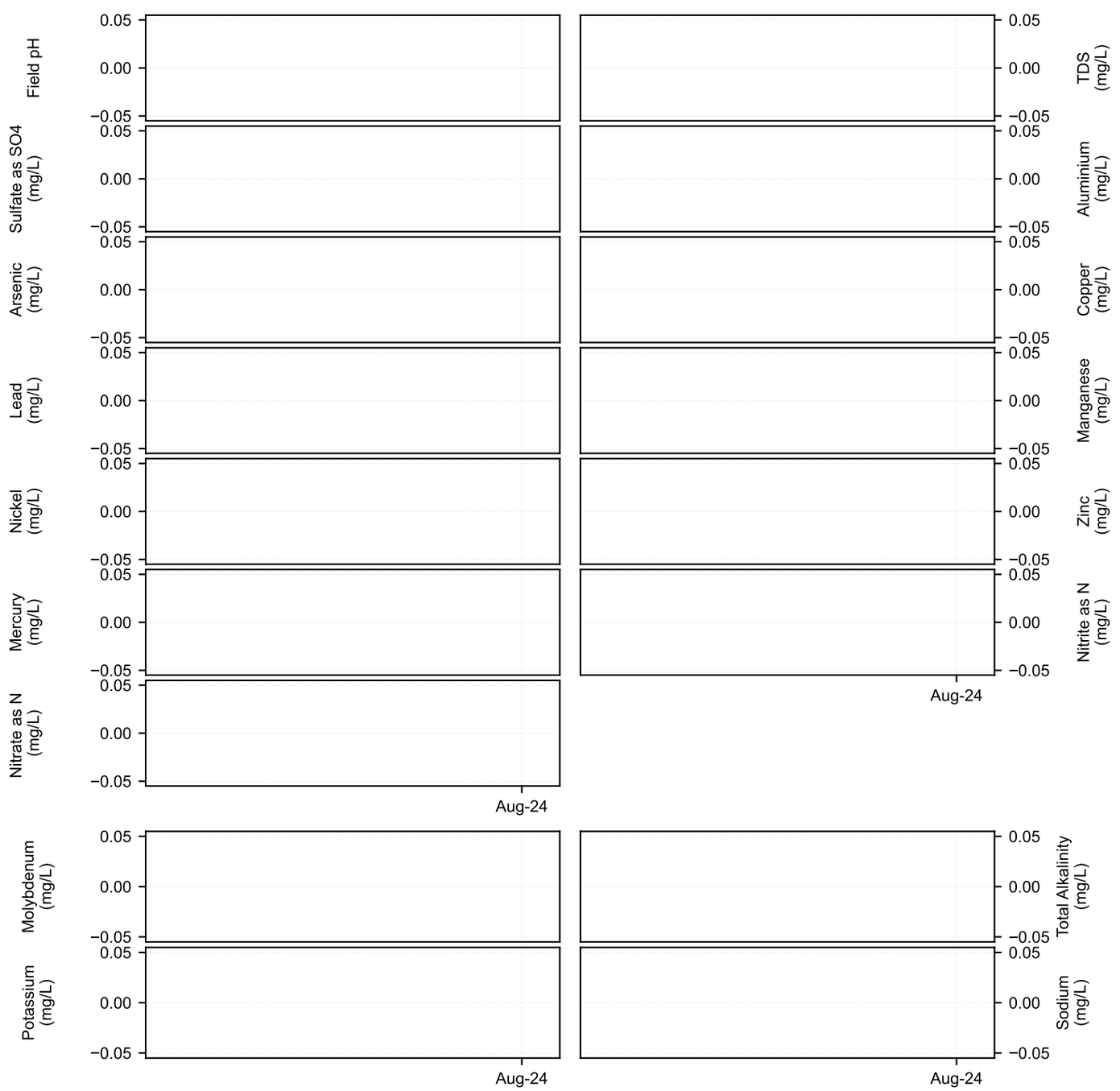
MB143 (Screened geology - Ordovician; Screened interval: 82-91 mbgl)



Groundwater levels



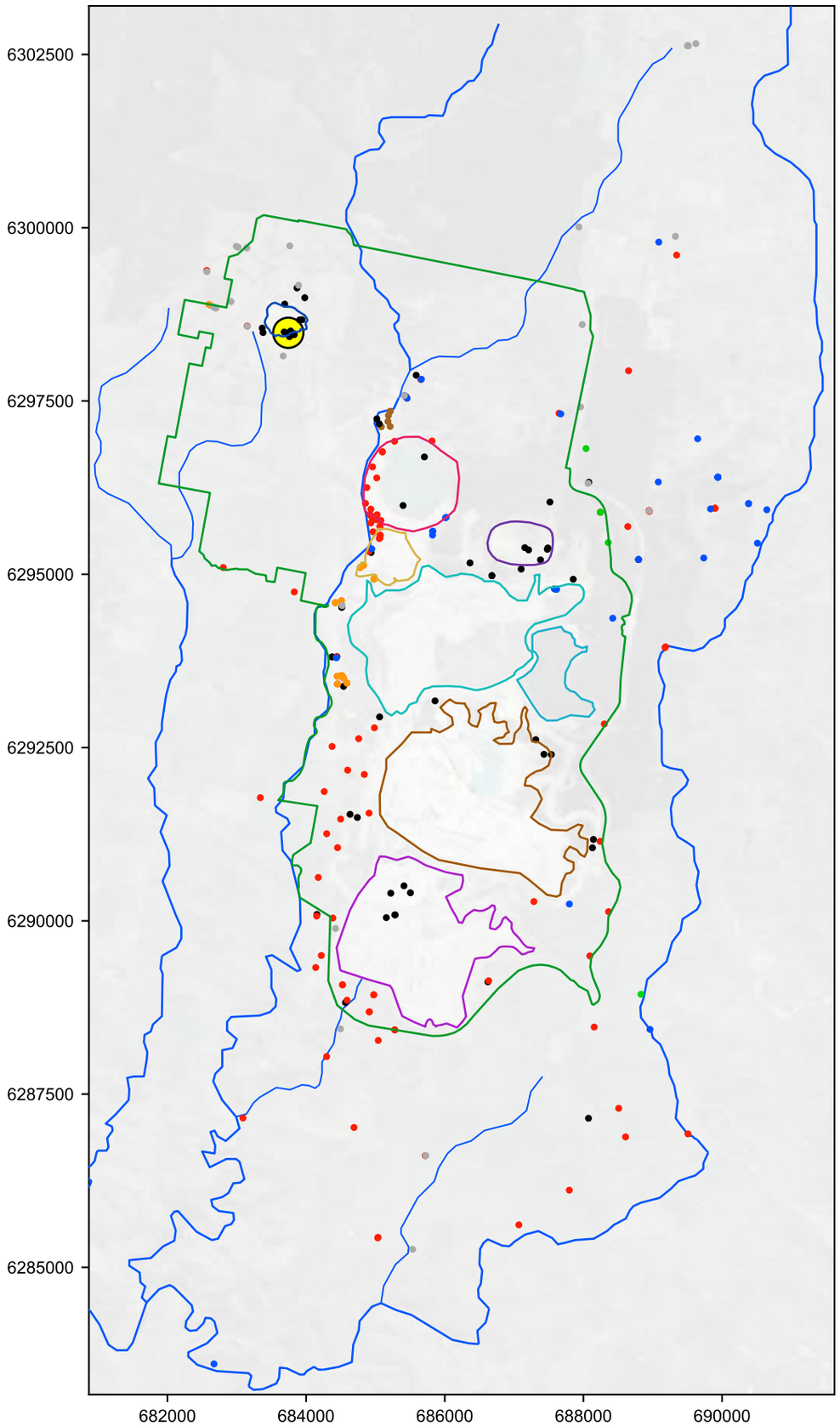
WMP defined analytes



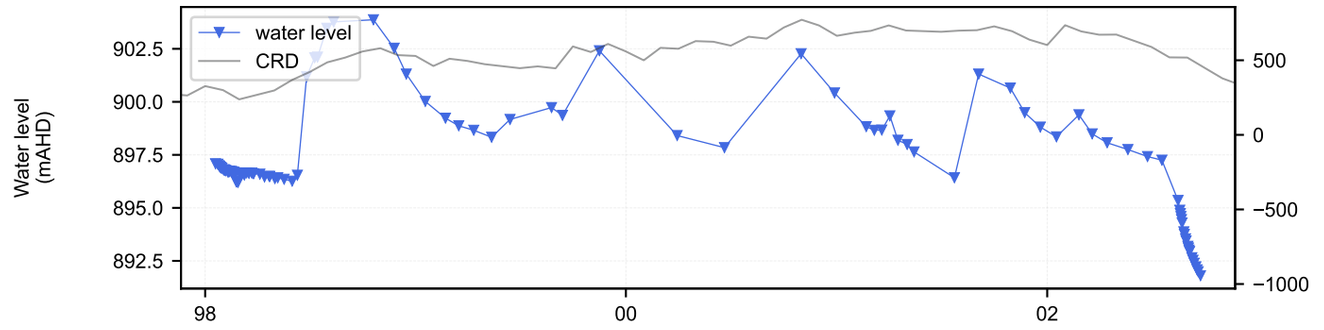
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

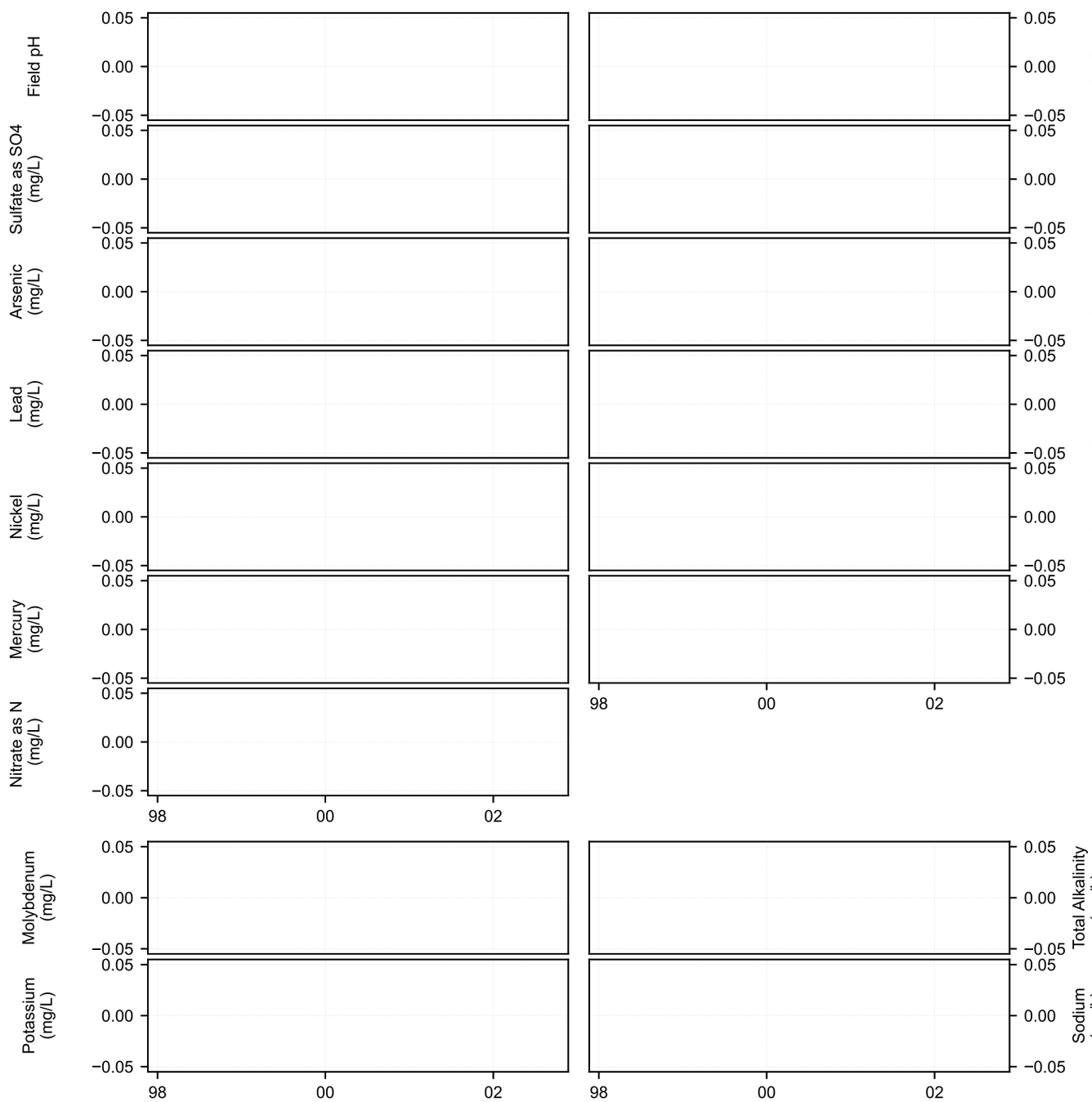
RO1 (Screened geology - Inactive; Screened interval: 29.3-35.3 mbgl)



Groundwater levels



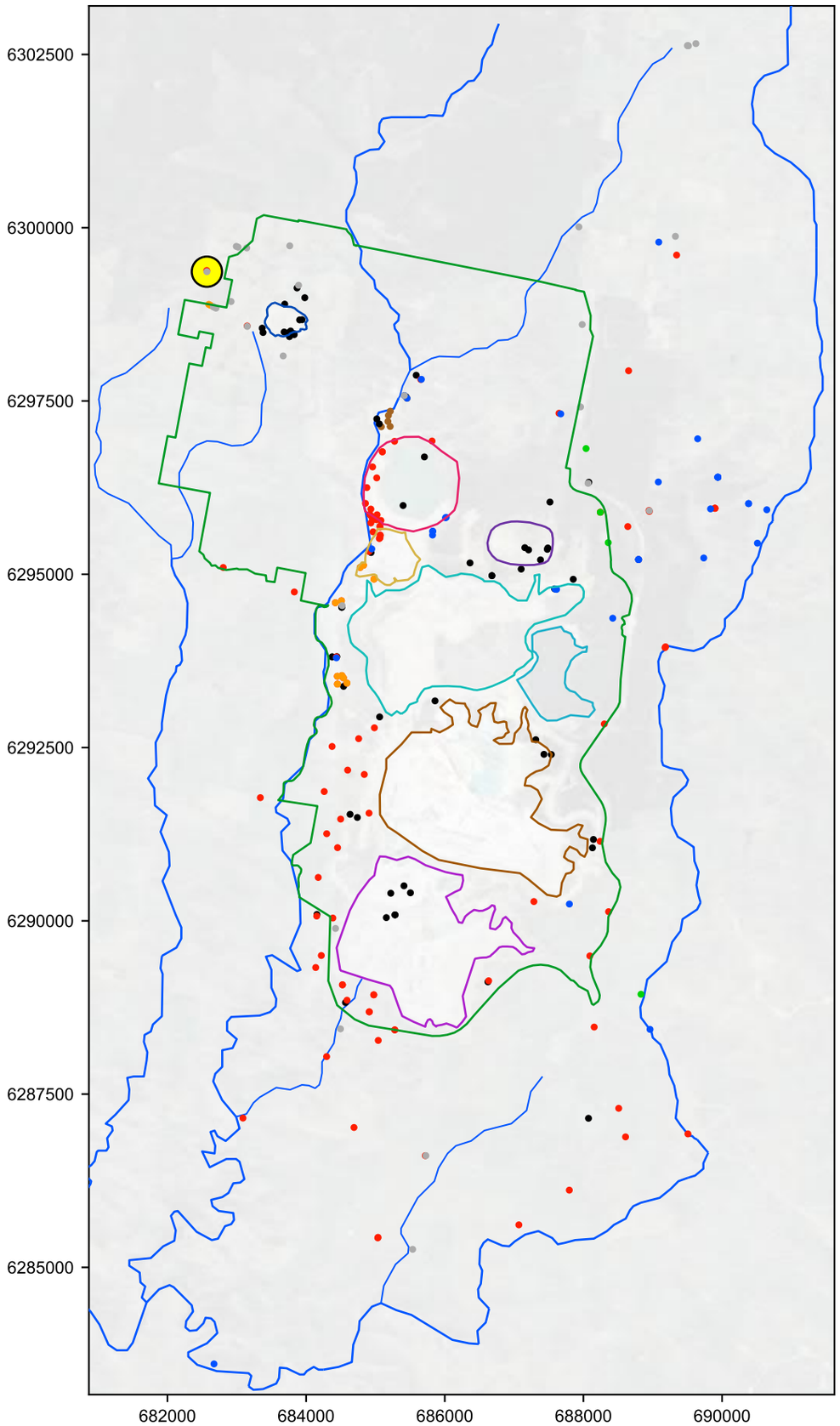
WMP defined analytes



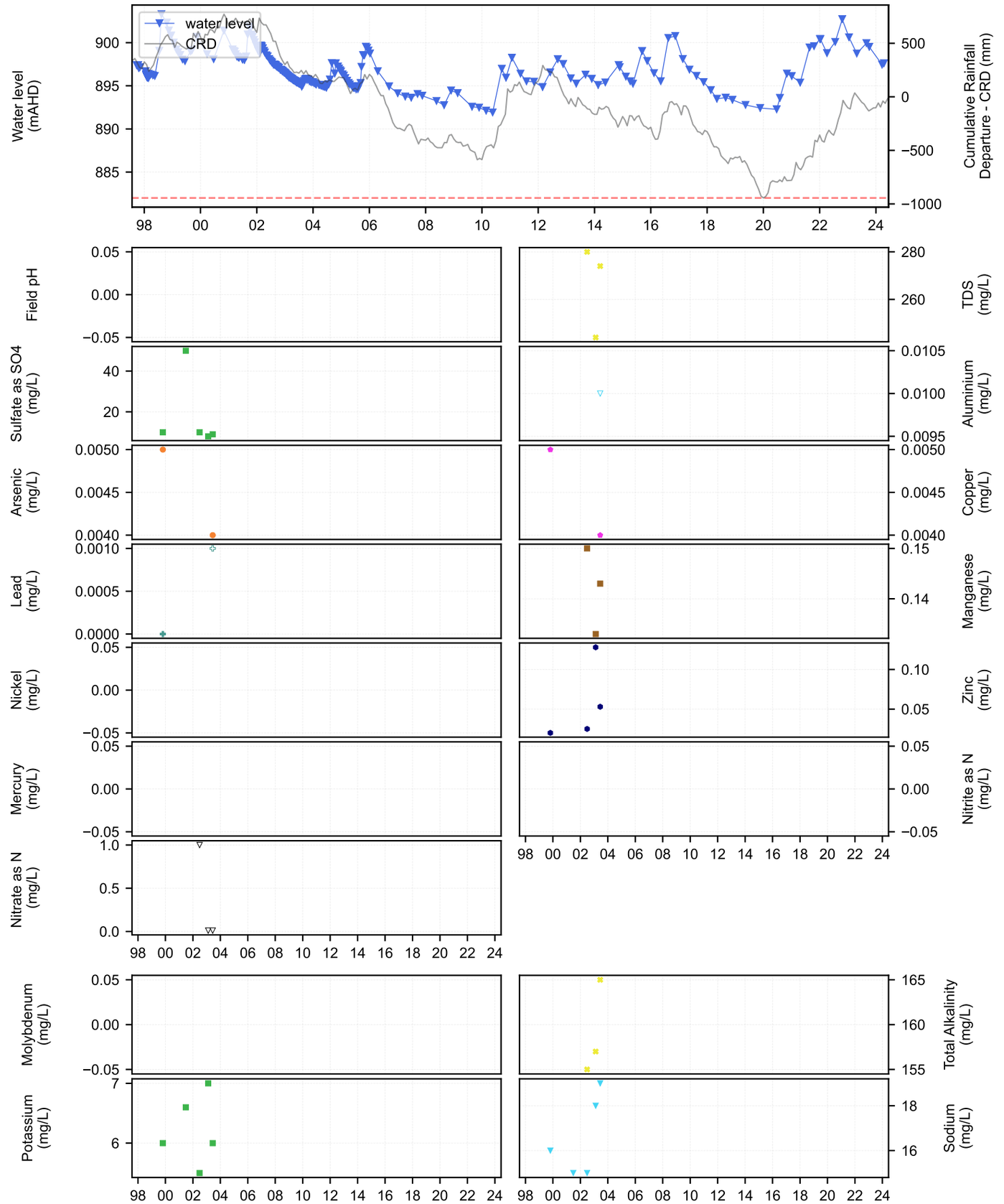
Additional analytes of interest

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RO10A (Screened geology - Tertiary basalt; Screened interval: 39-44 mbgl)



Groundwater levels

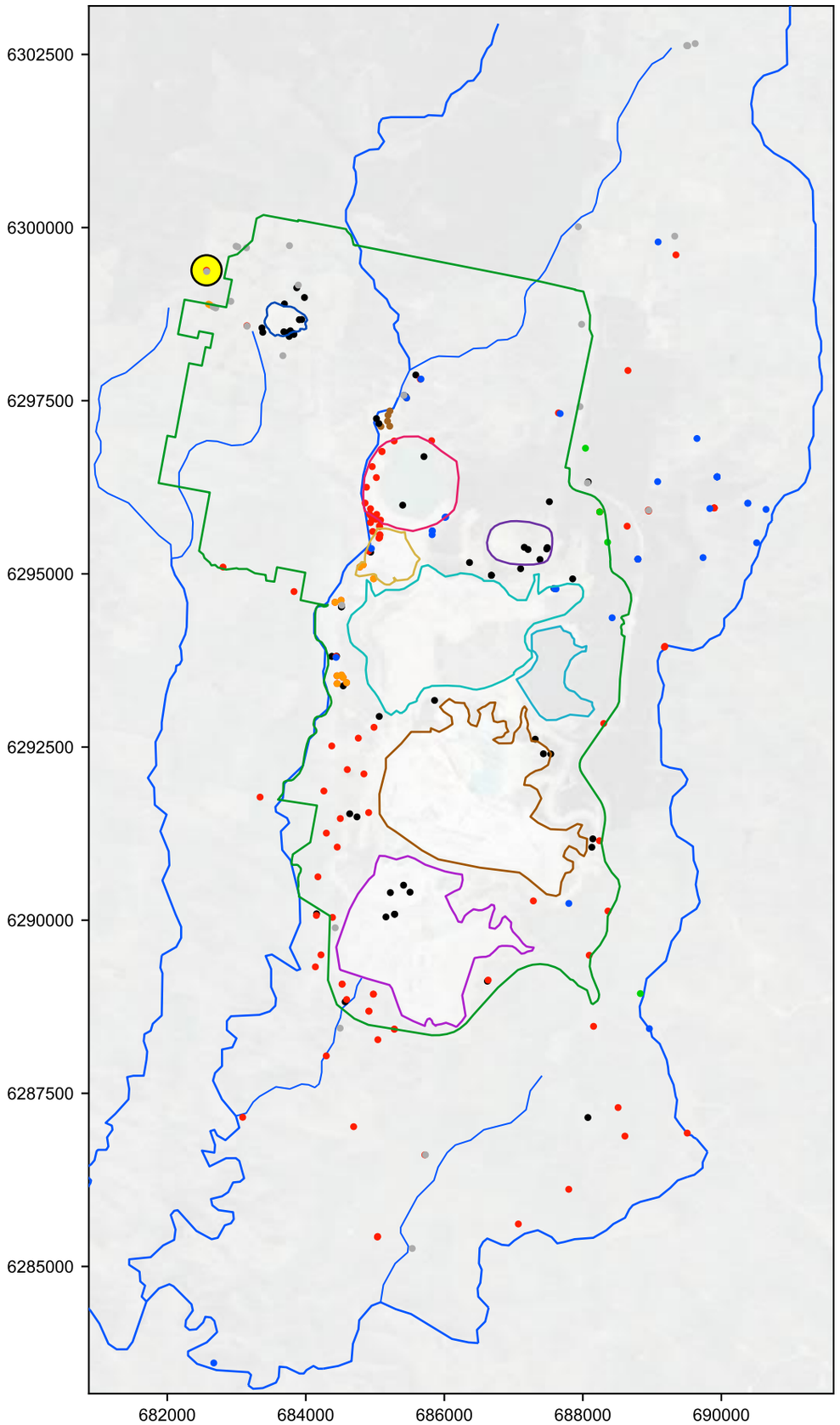


WMP defined analytes

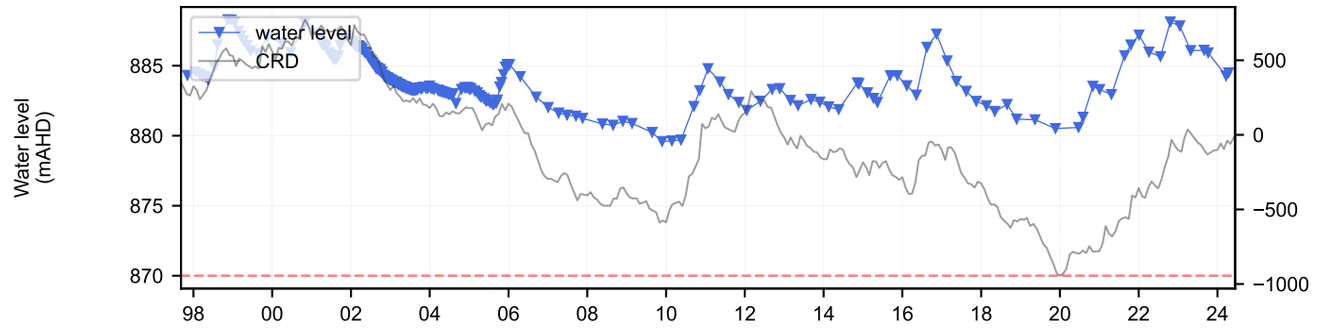
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

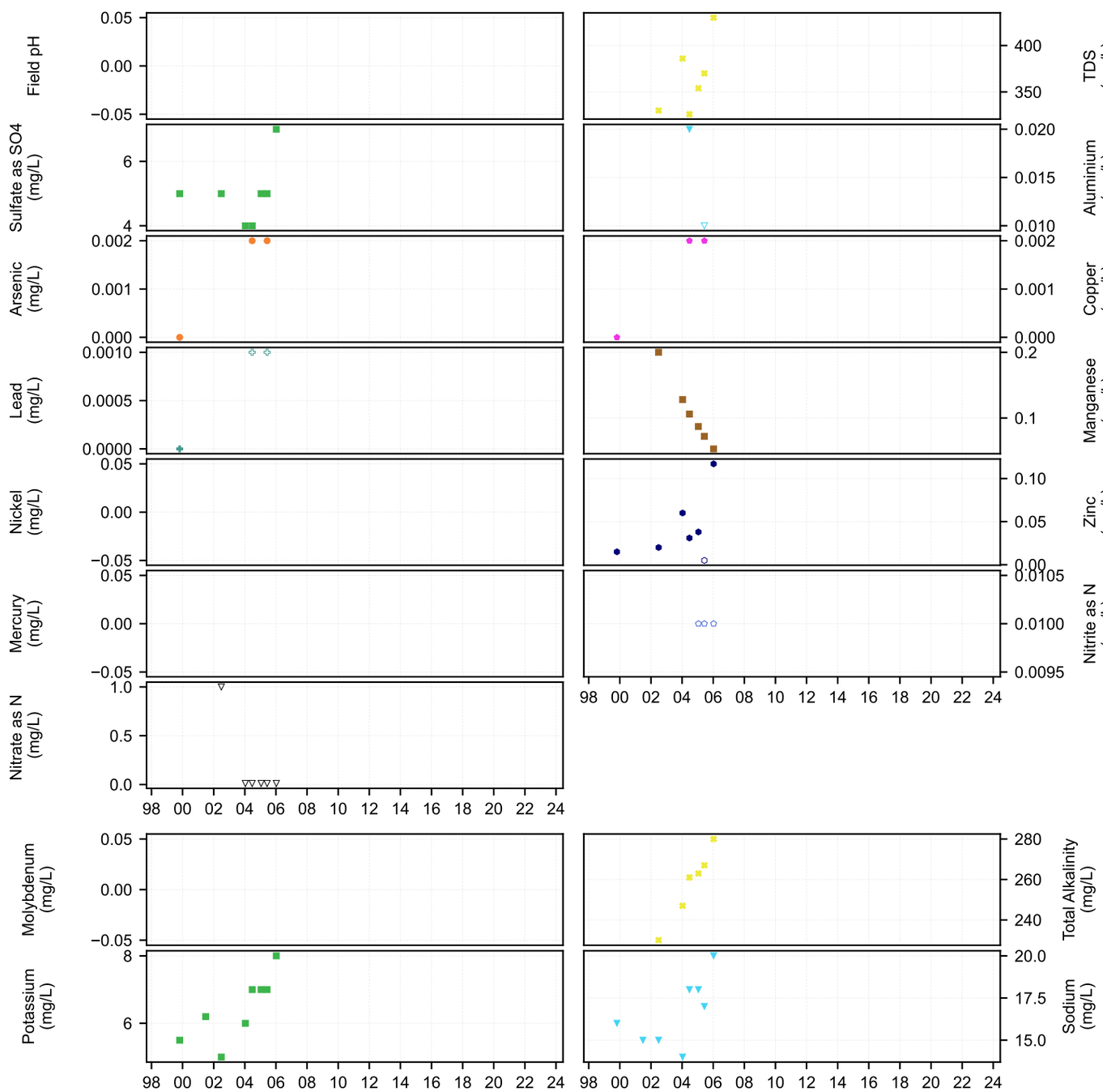
RO10B (Screened geology - Ordovician; Screened interval: 89-136 mbgl)



Groundwater levels



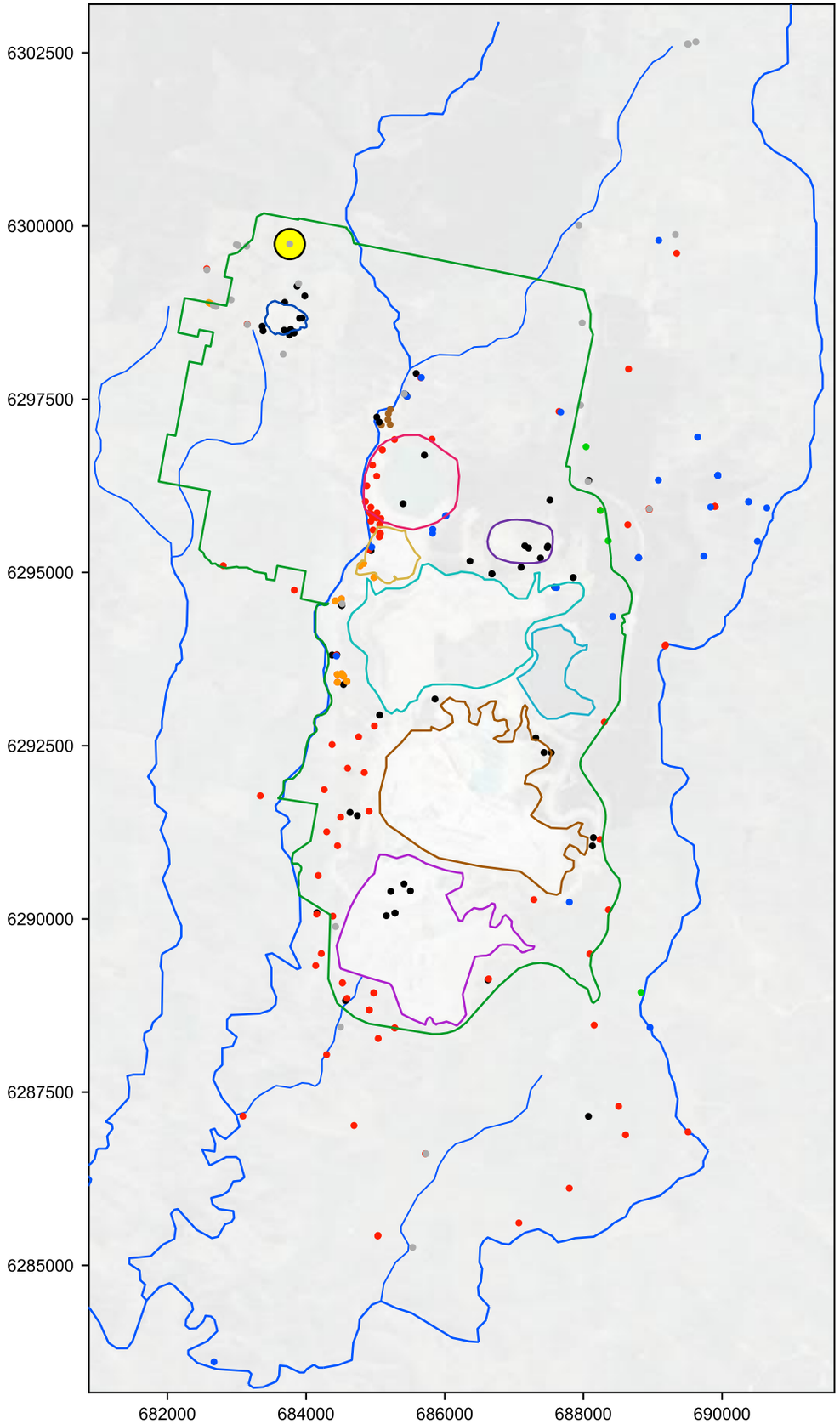
WMP defined analytes



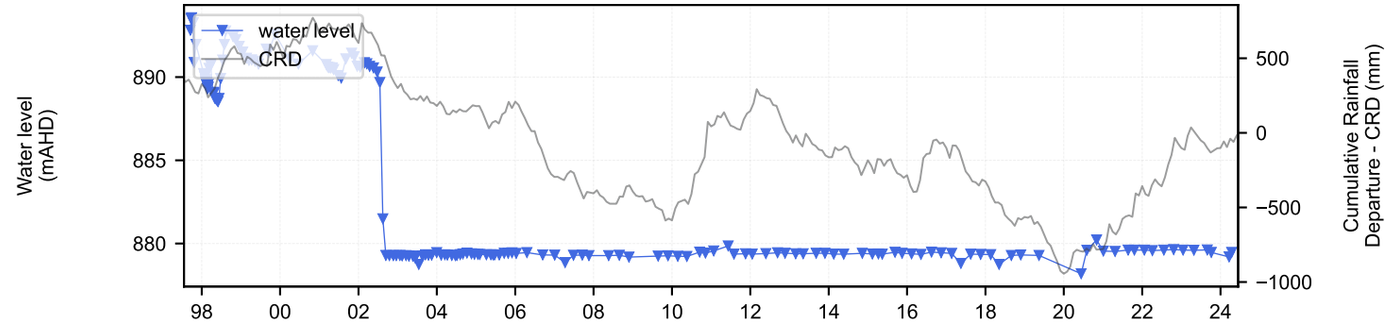
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

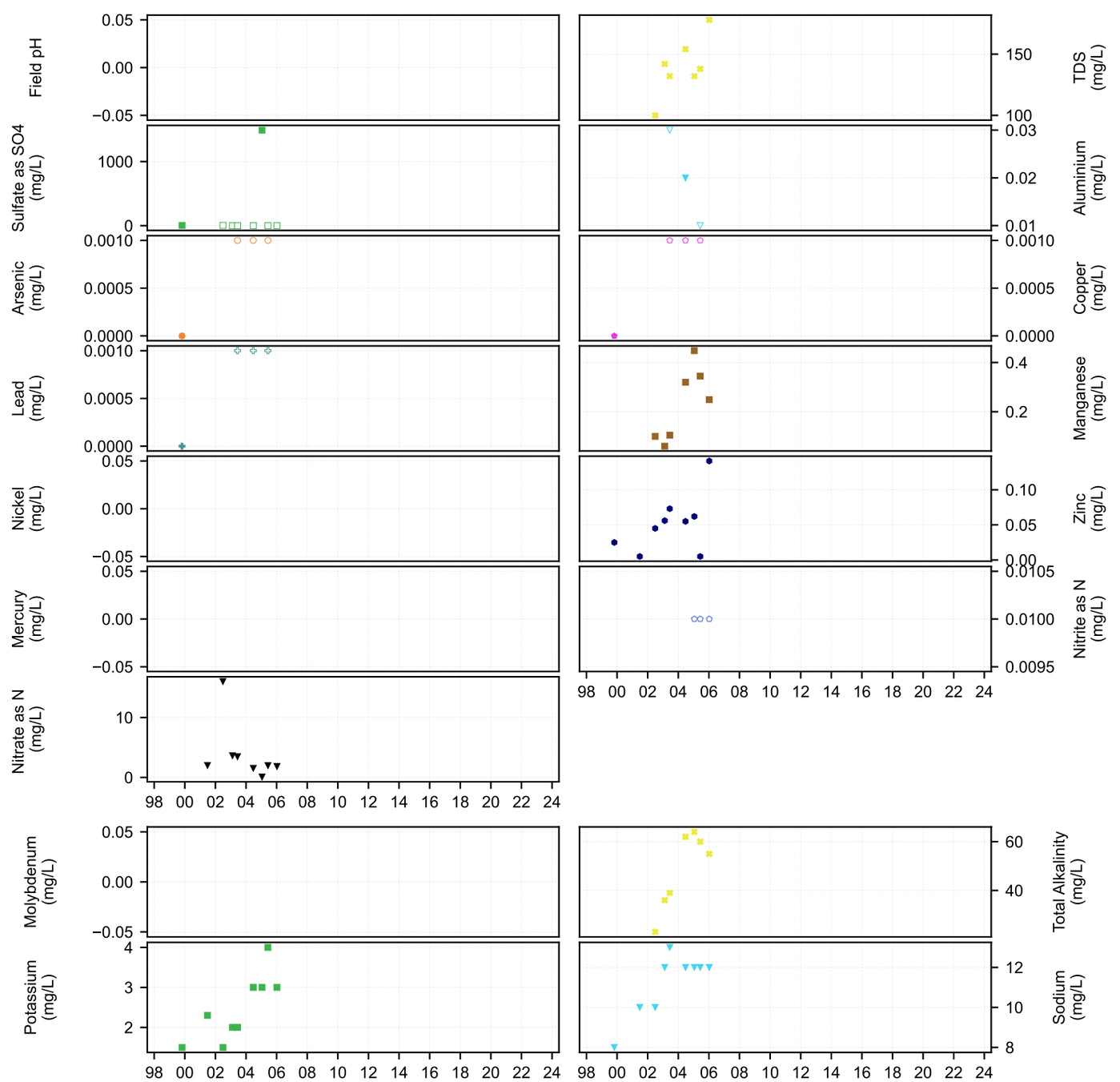
RO11 (Screened geology - Tertiary basalt; Screened interval: 24-36 mbgl)



Groundwater levels



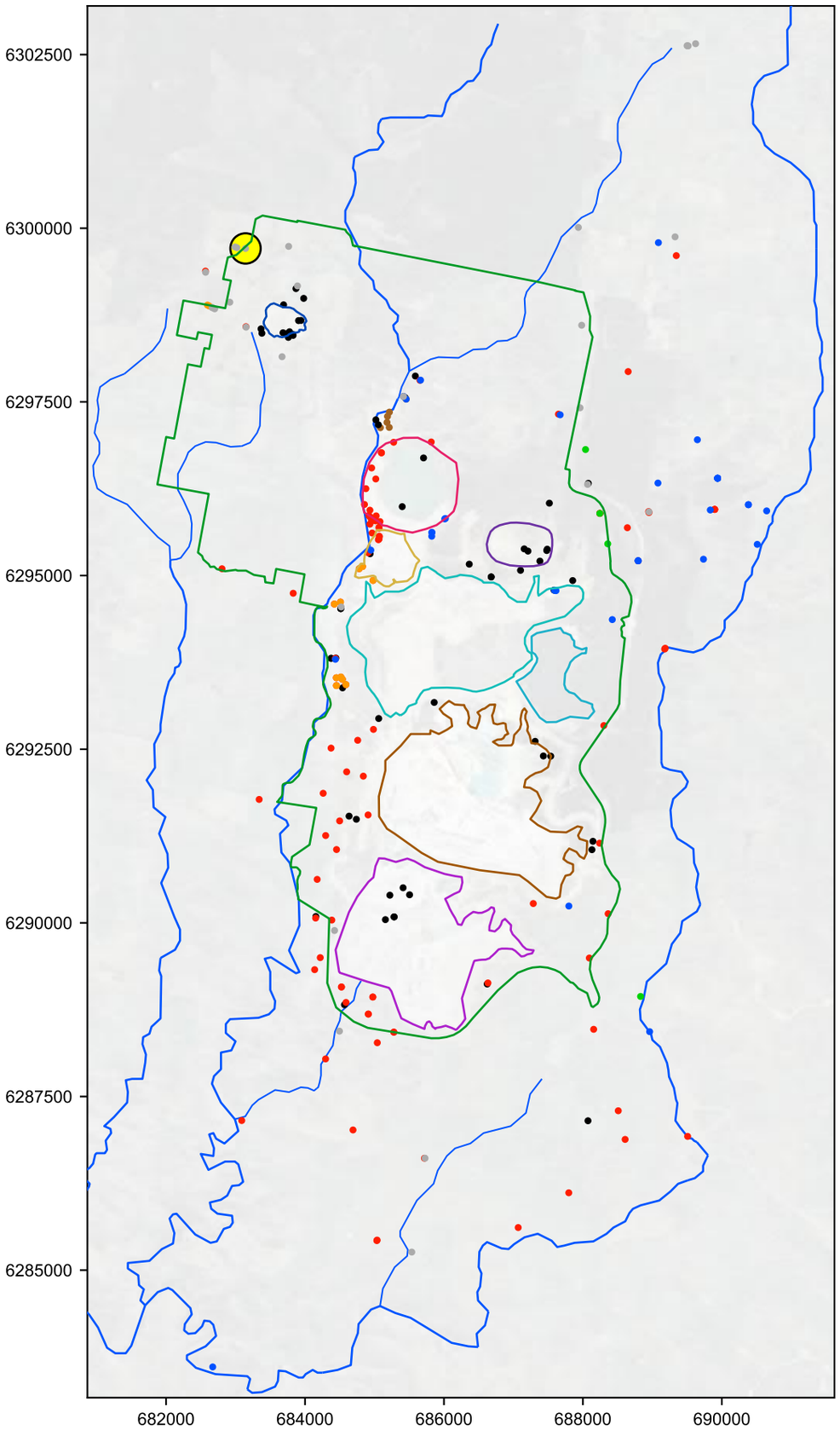
WMP defined analytes



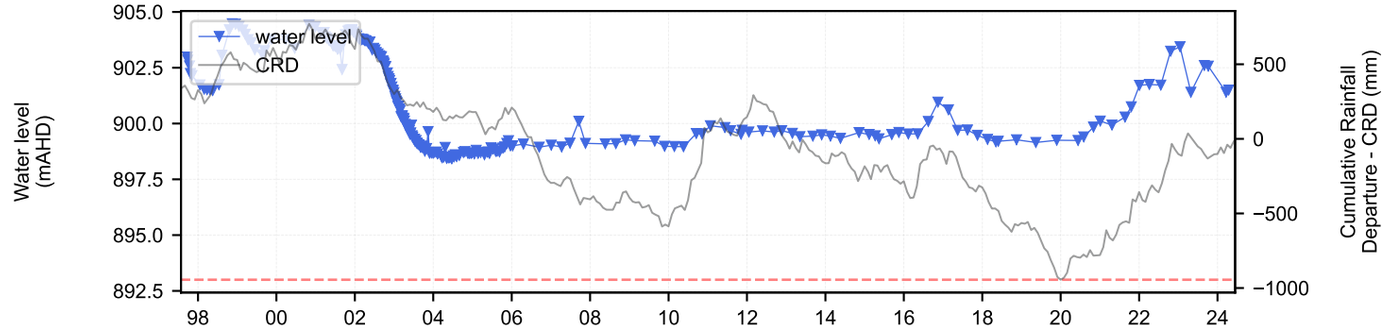
Additional analytes of interest

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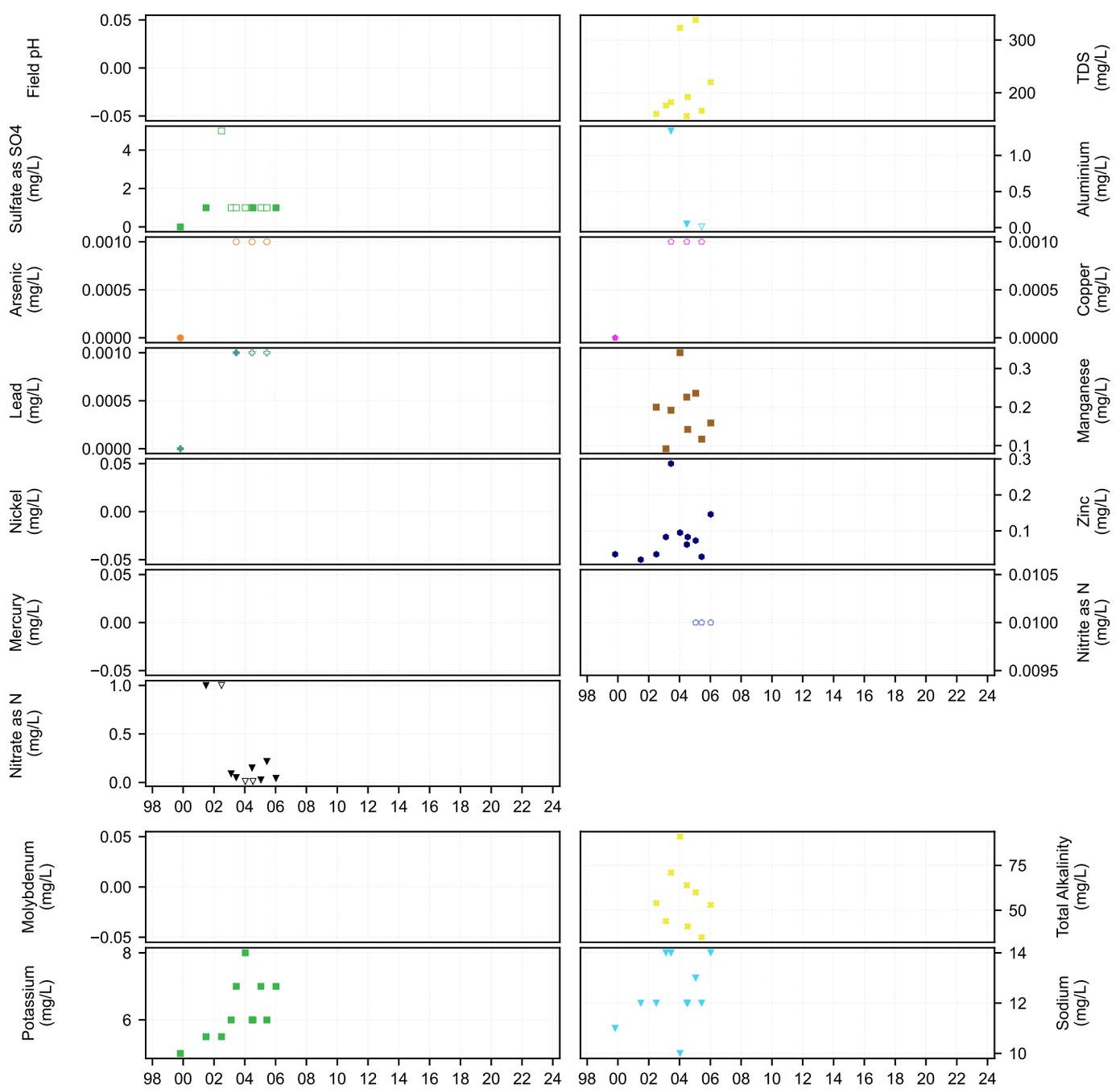
RO12 (Screened geology - Tertiary basalt; Screened interval: 25.4-31.4 mbgl)



Groundwater levels



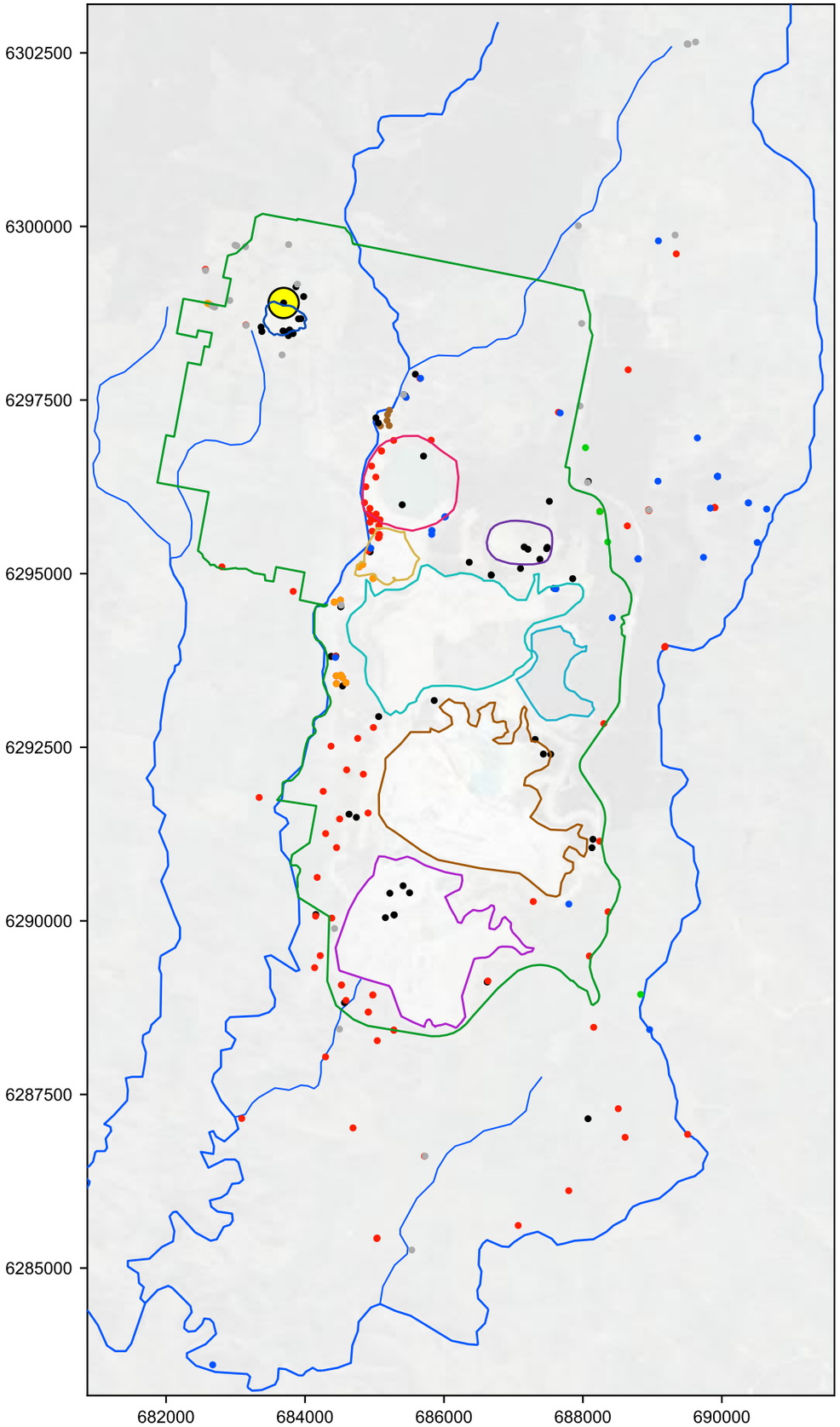
WMP defined analytes



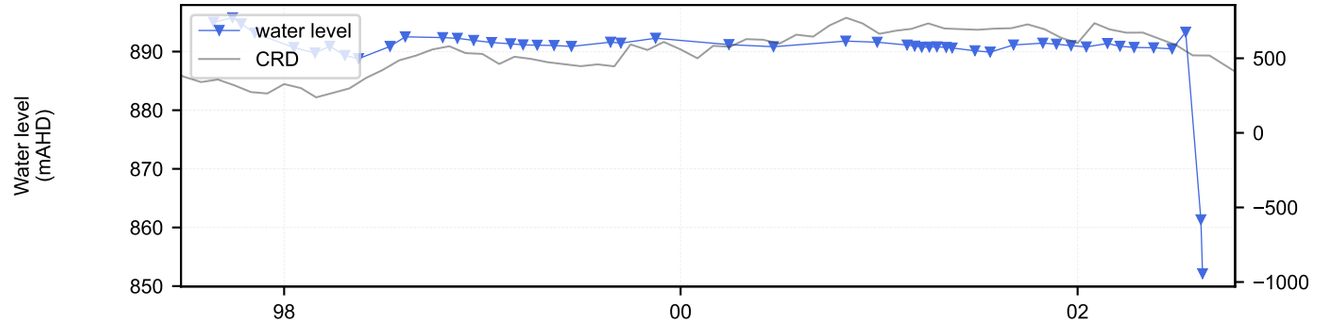
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

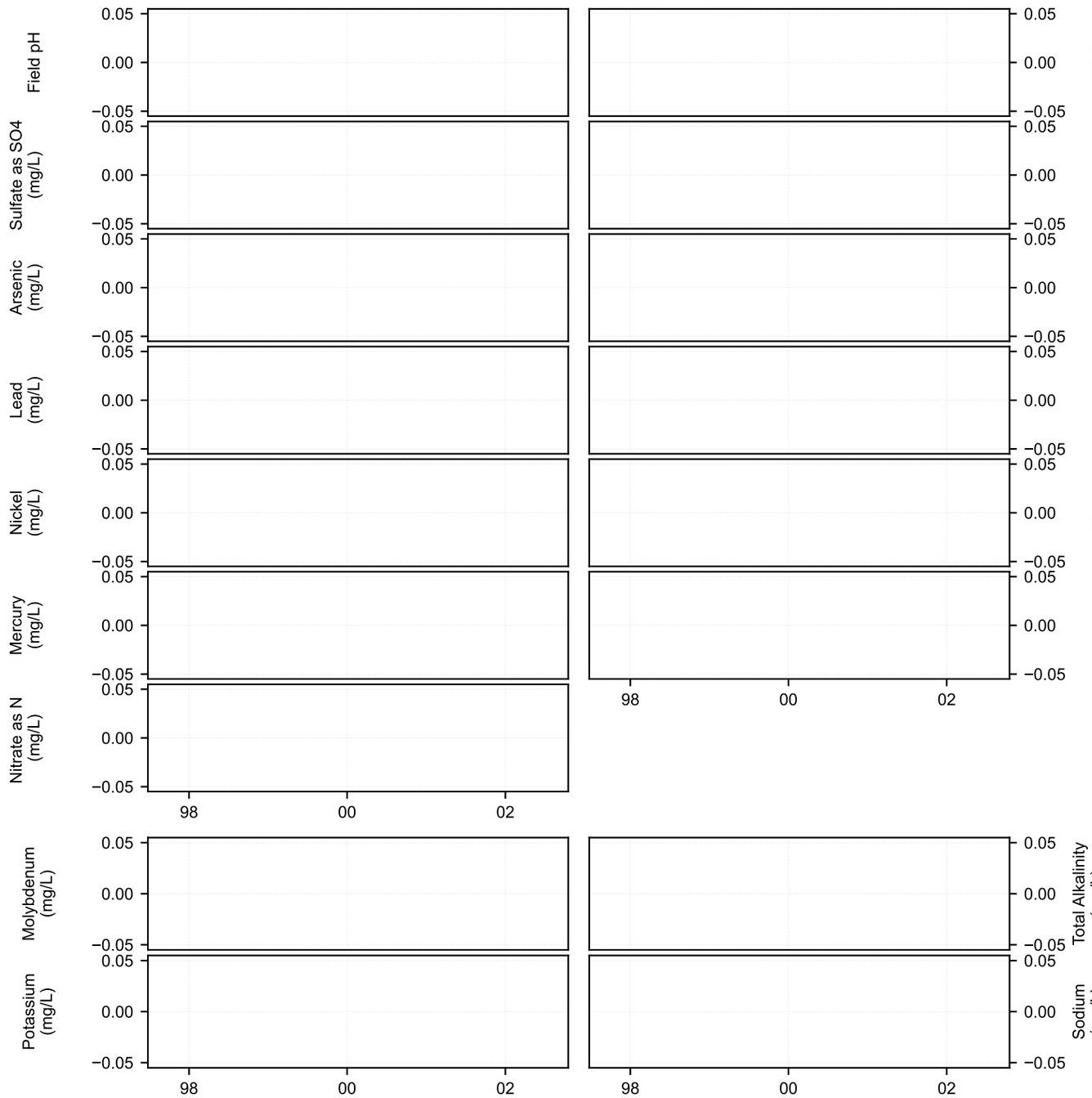
RO13 (Screened geology - Inactive; Screened interval: 52.5-65.5 mbgl)



Groundwater levels



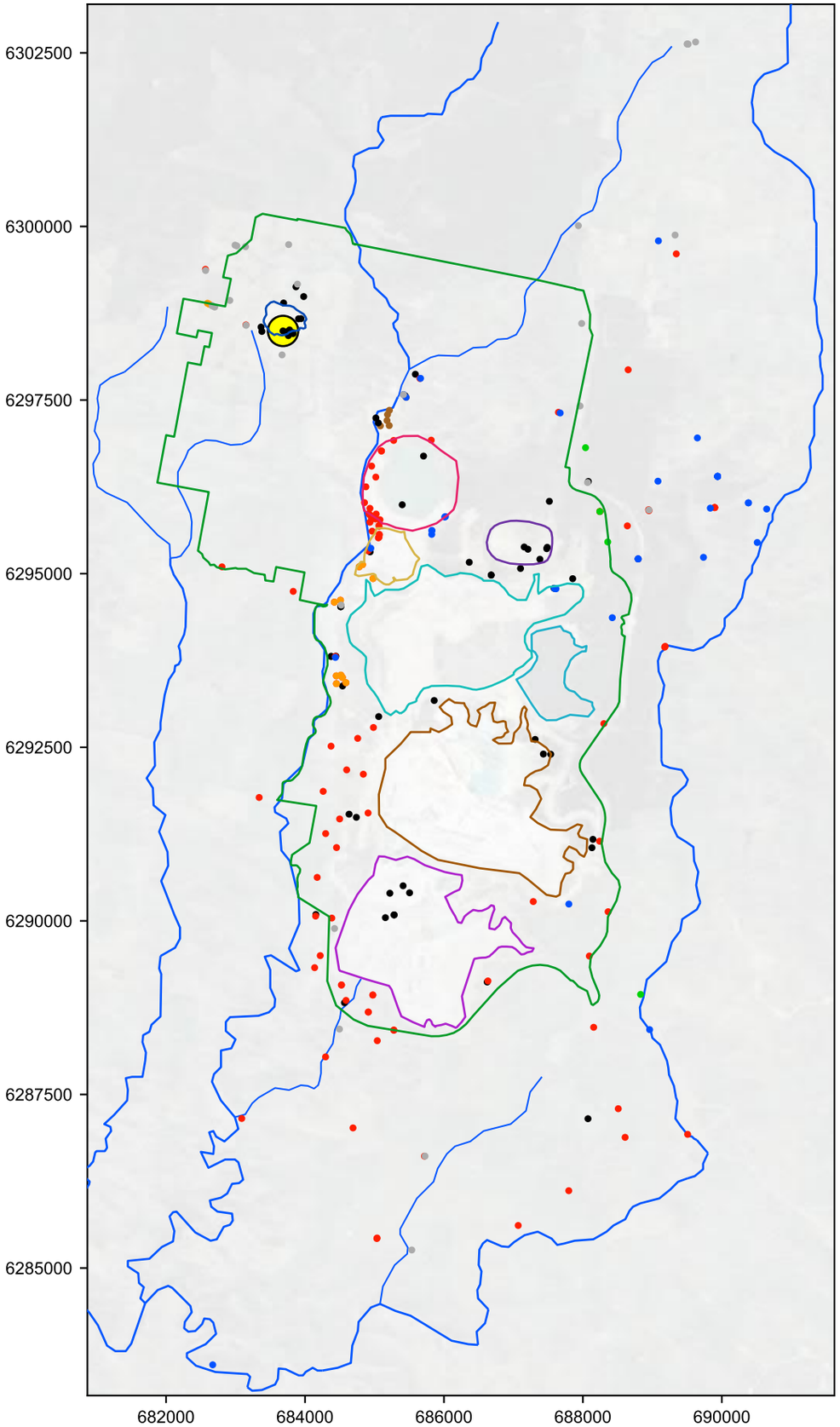
WMP defined analytes



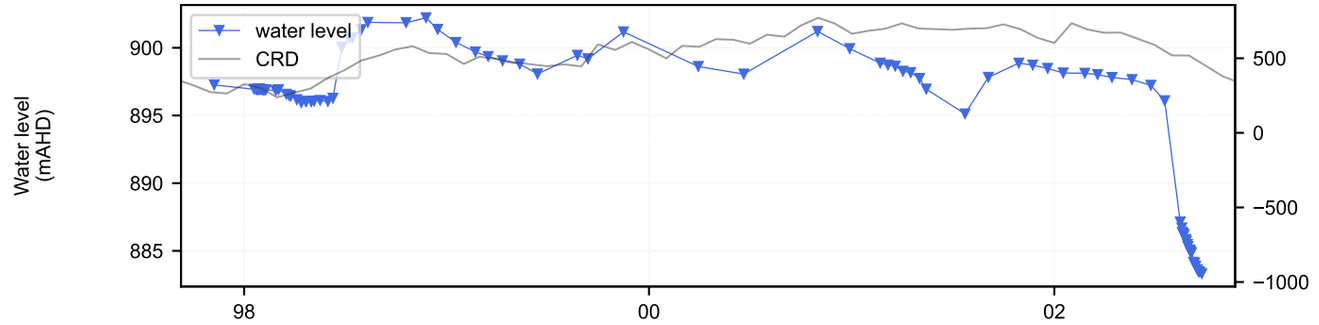
Additional analytes of interest

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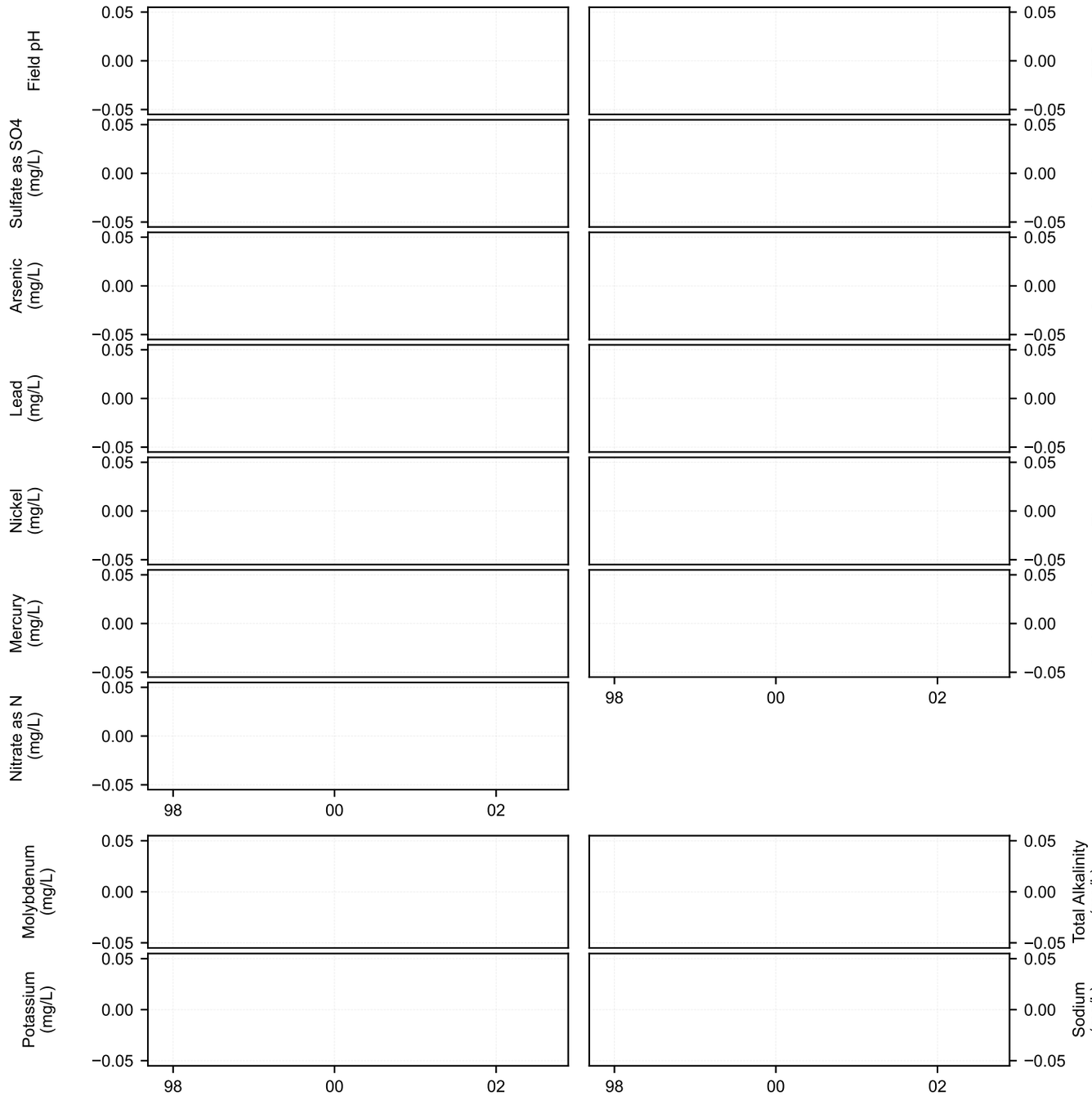
RO2 (Screened geology - Inactive; Screened interval: 26.5-32.5 mbgl)



Groundwater levels



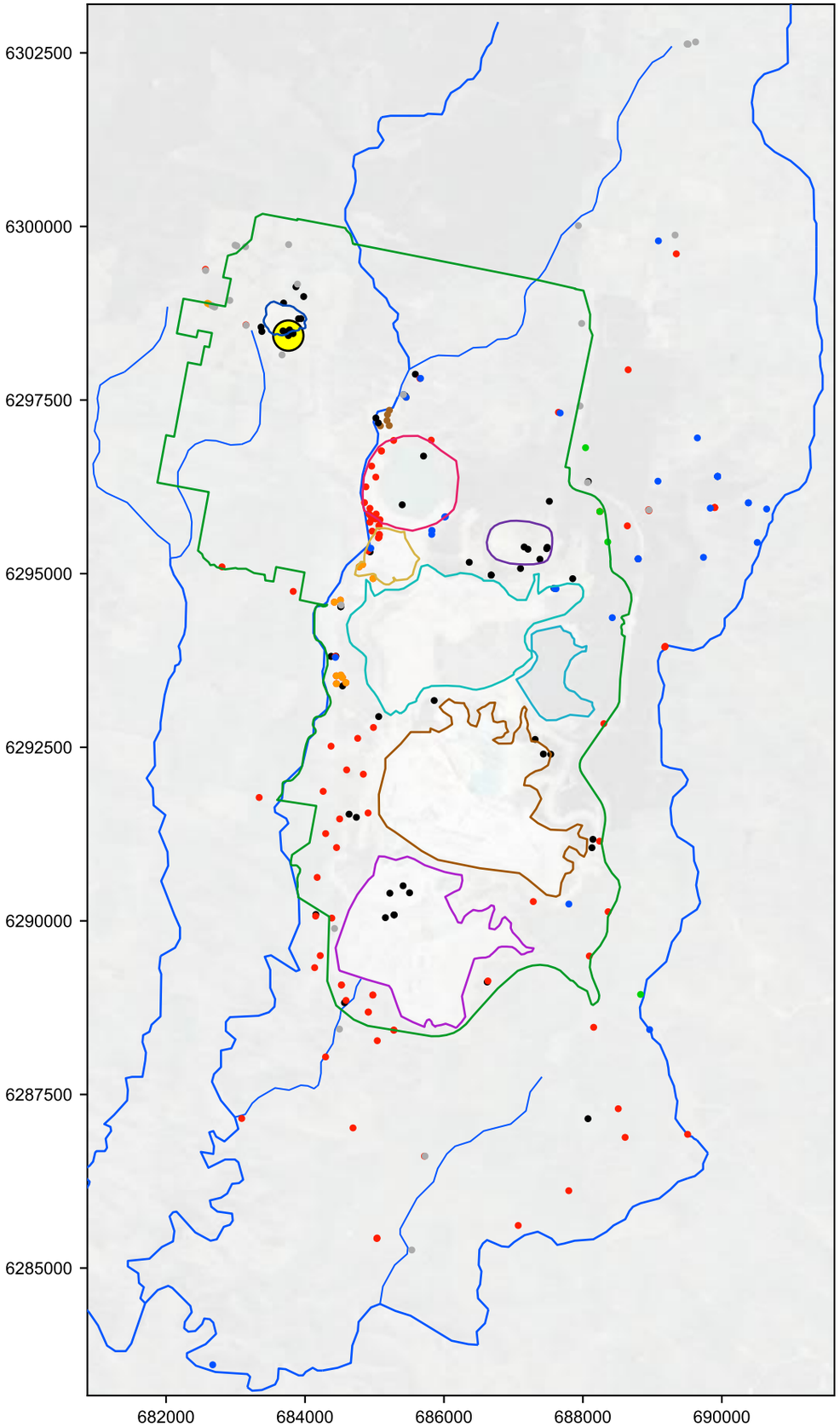
WMP defined analytes



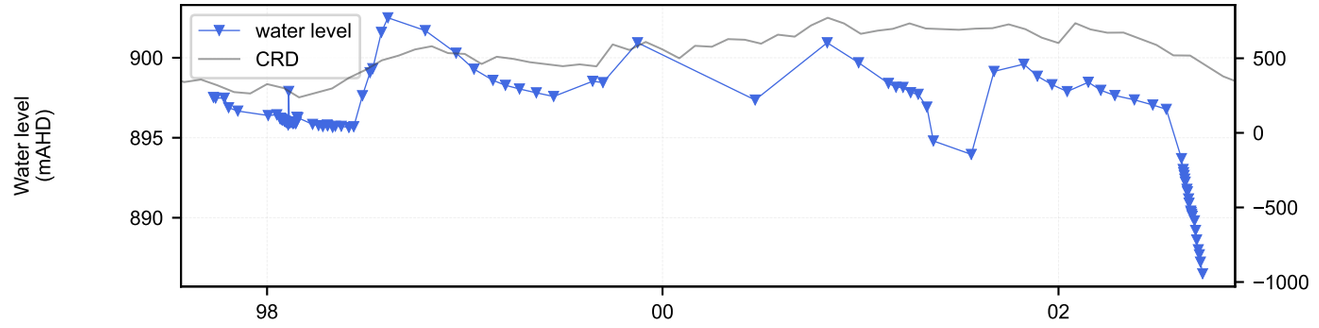
Additional analytes of interest

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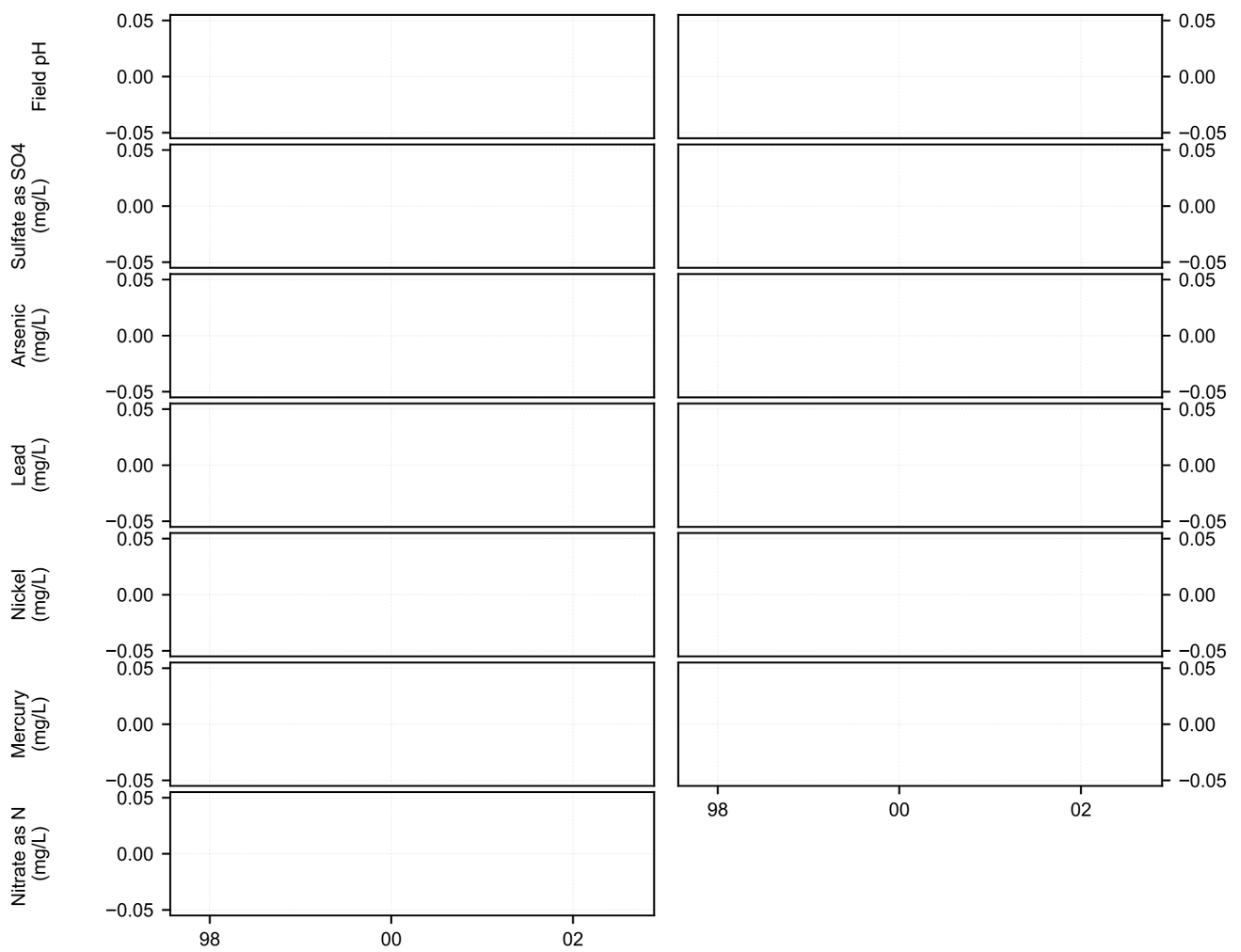
RO3 (Screened geology - Inactive; Screened interval: 24-30 mbgl)



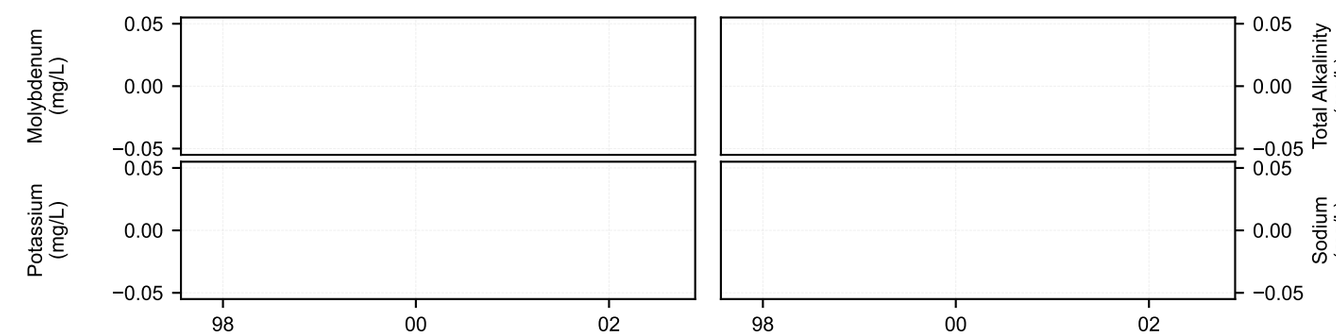
Groundwater levels



WMP defined analytes

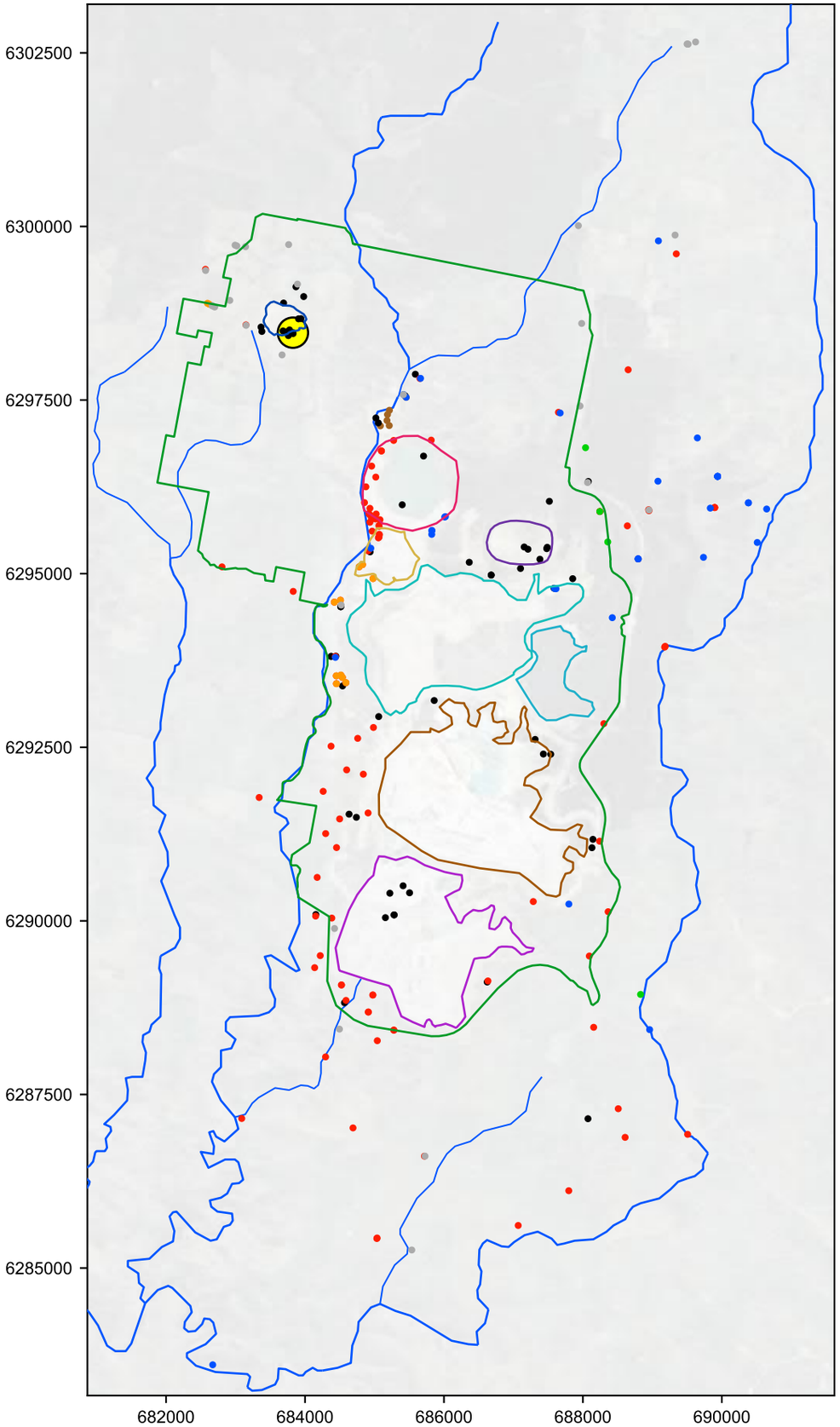


Additional analytes of interest

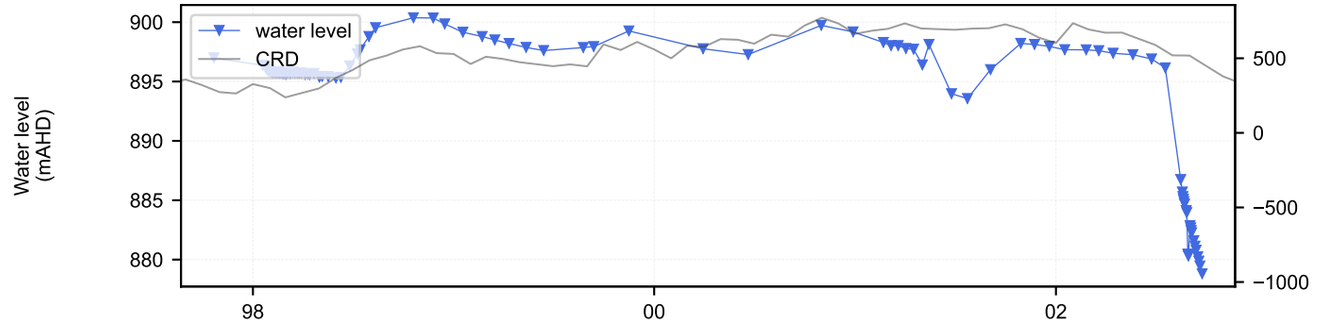


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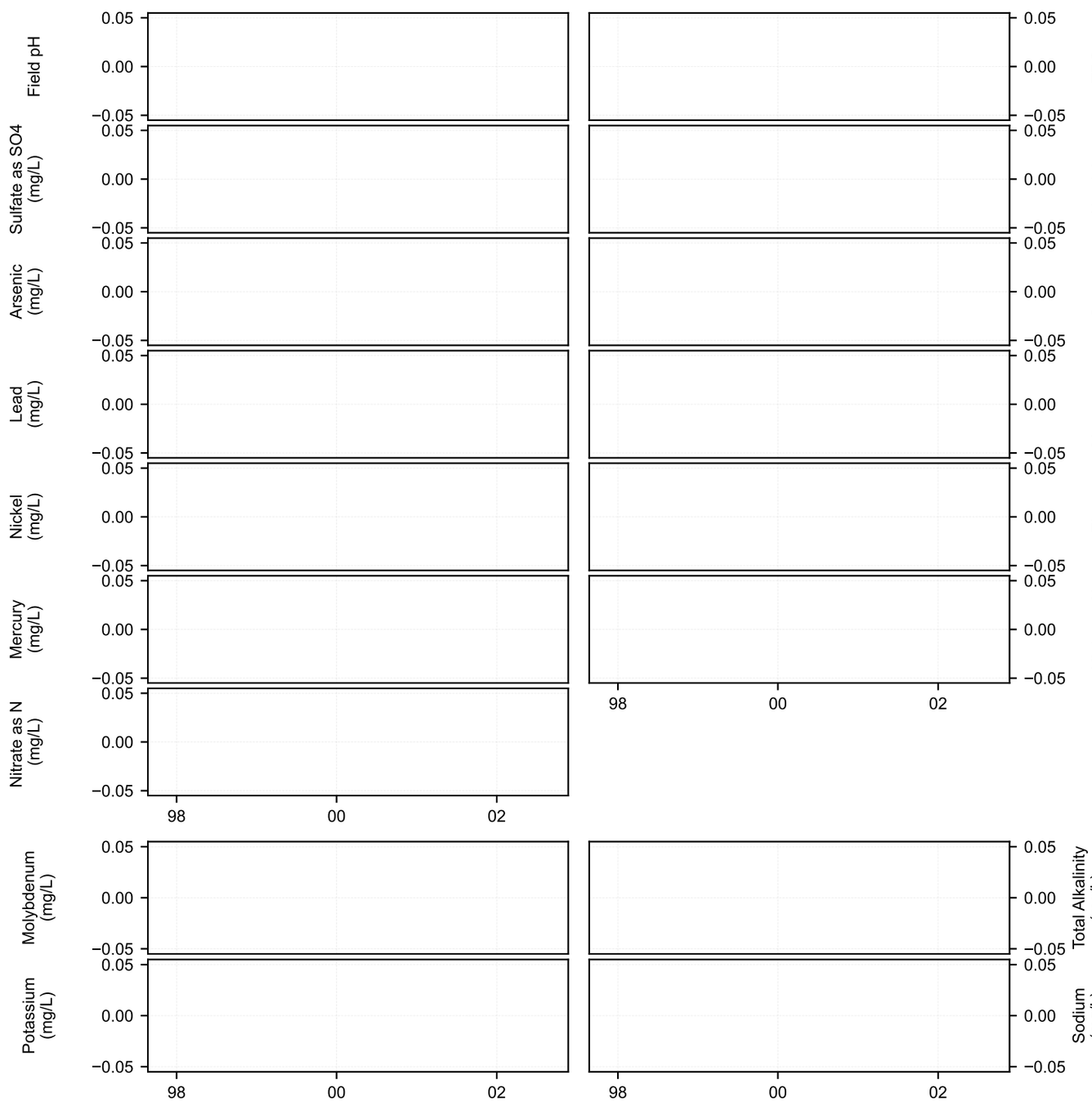
RO4A (Screened geology - Inactive; Screened interval: 29.5-41.5 mbgl)



Groundwater levels



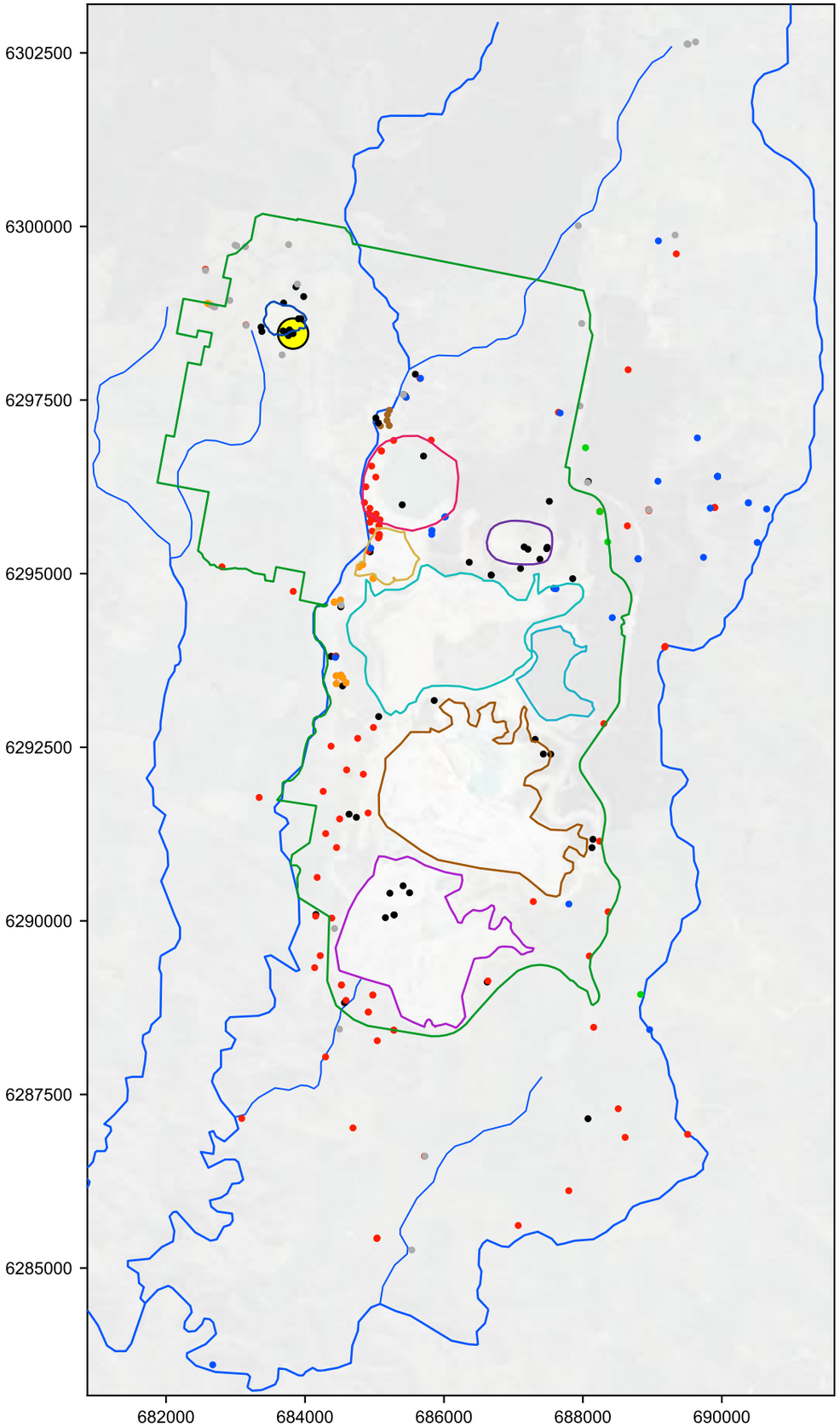
WMP defined analytes



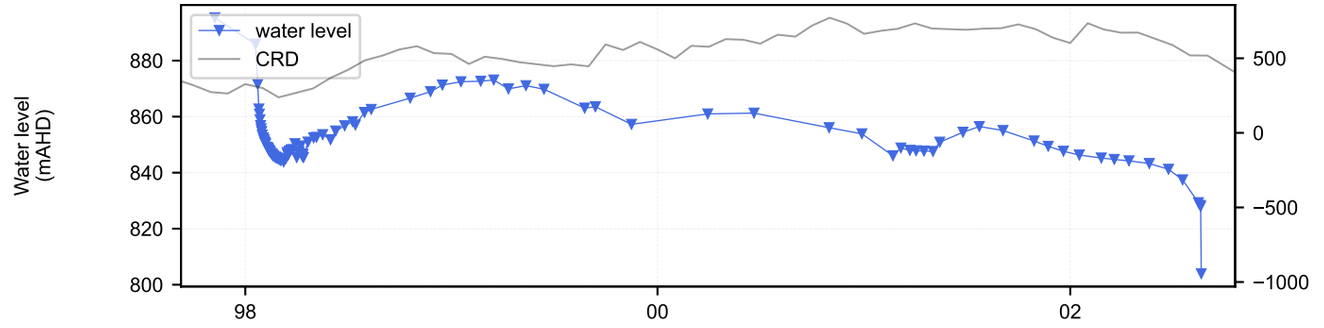
Additional analytes of interest

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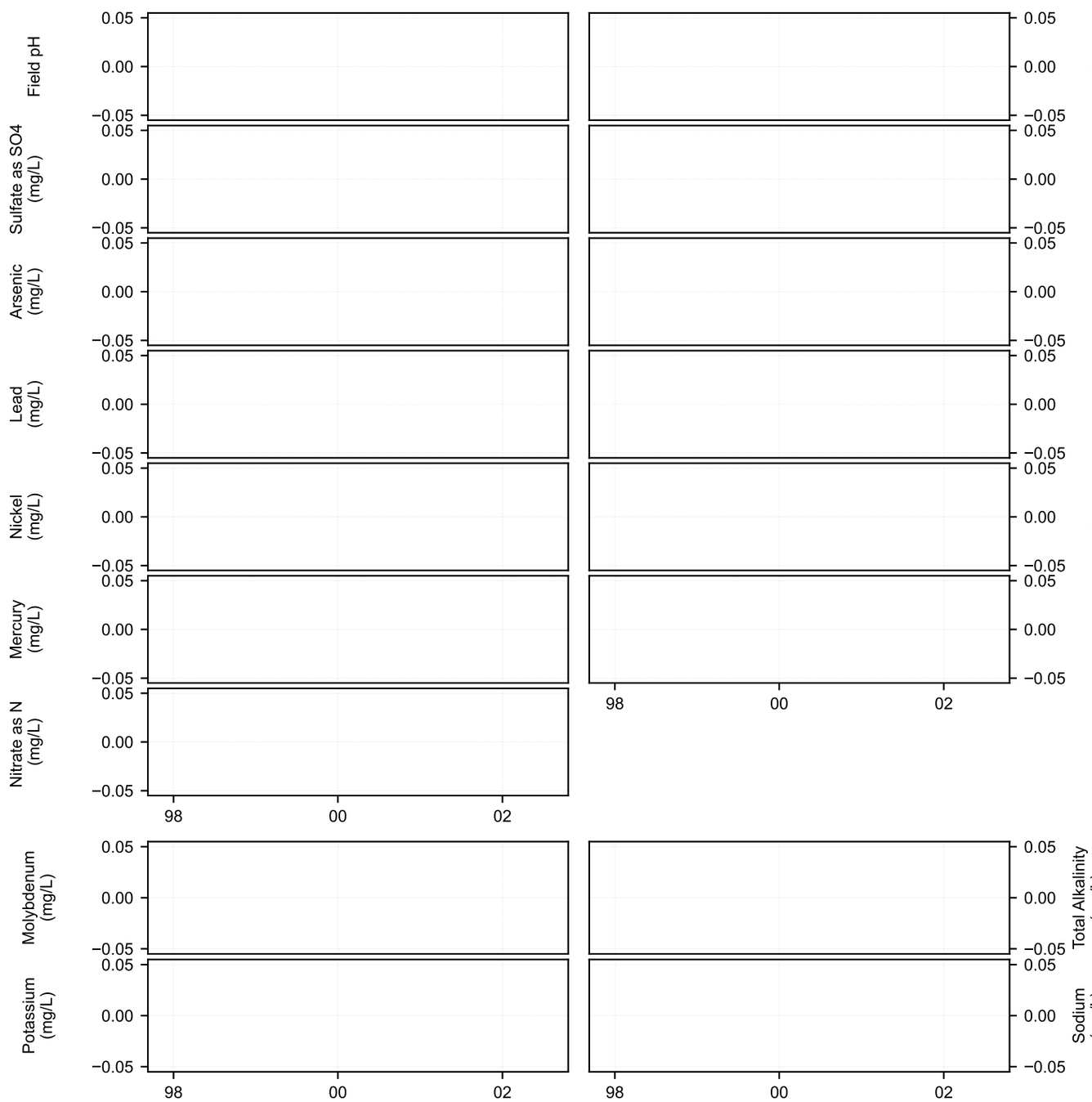
RO4B (Screened geology - Inactive; Screened interval: 99.7-129.7 mbgl)



Groundwater levels



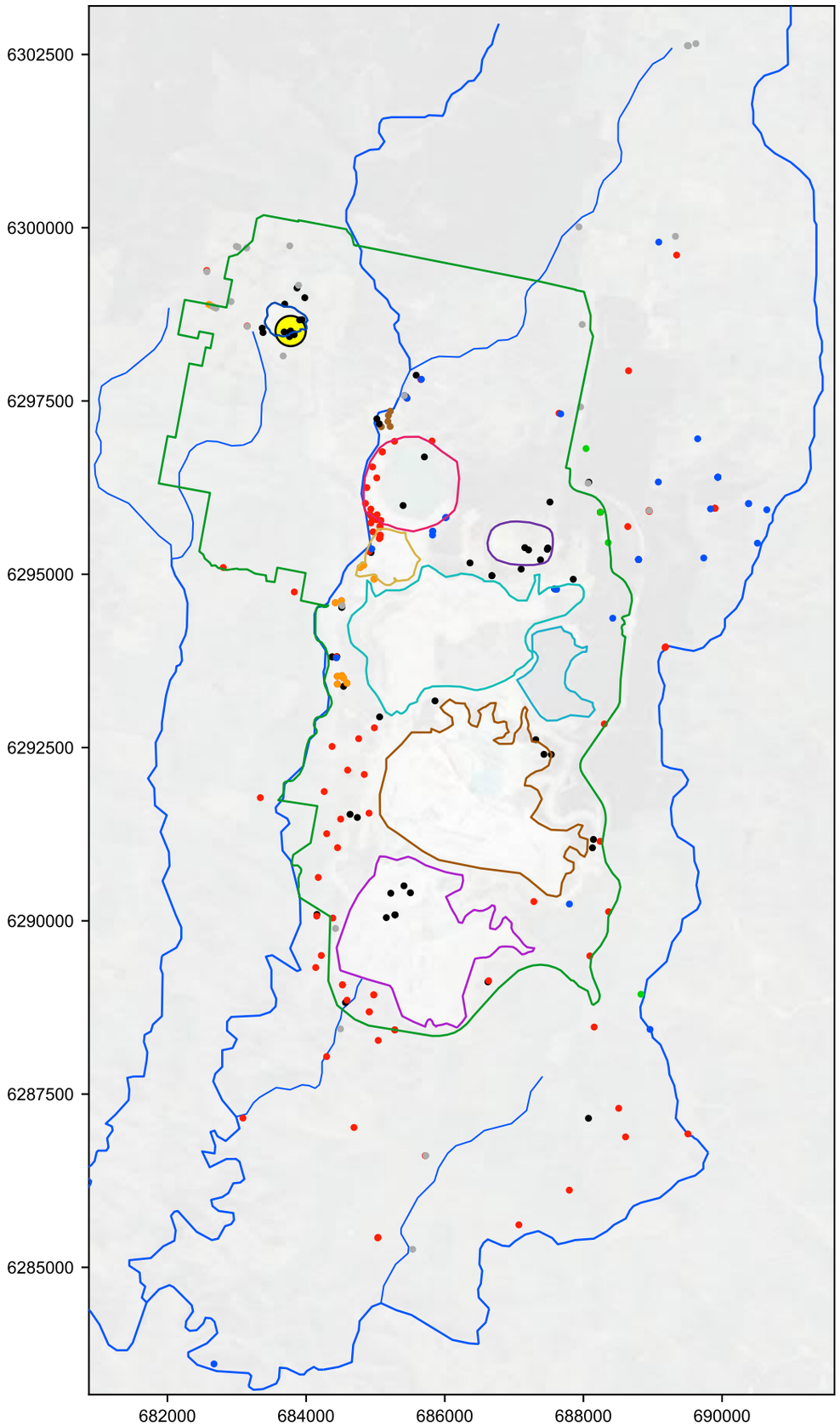
WMP defined analytes



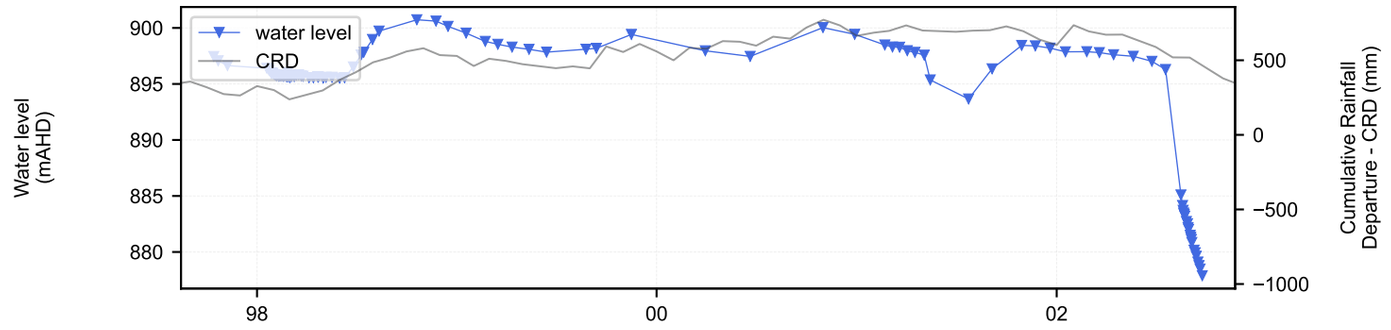
Additional analytes of interest

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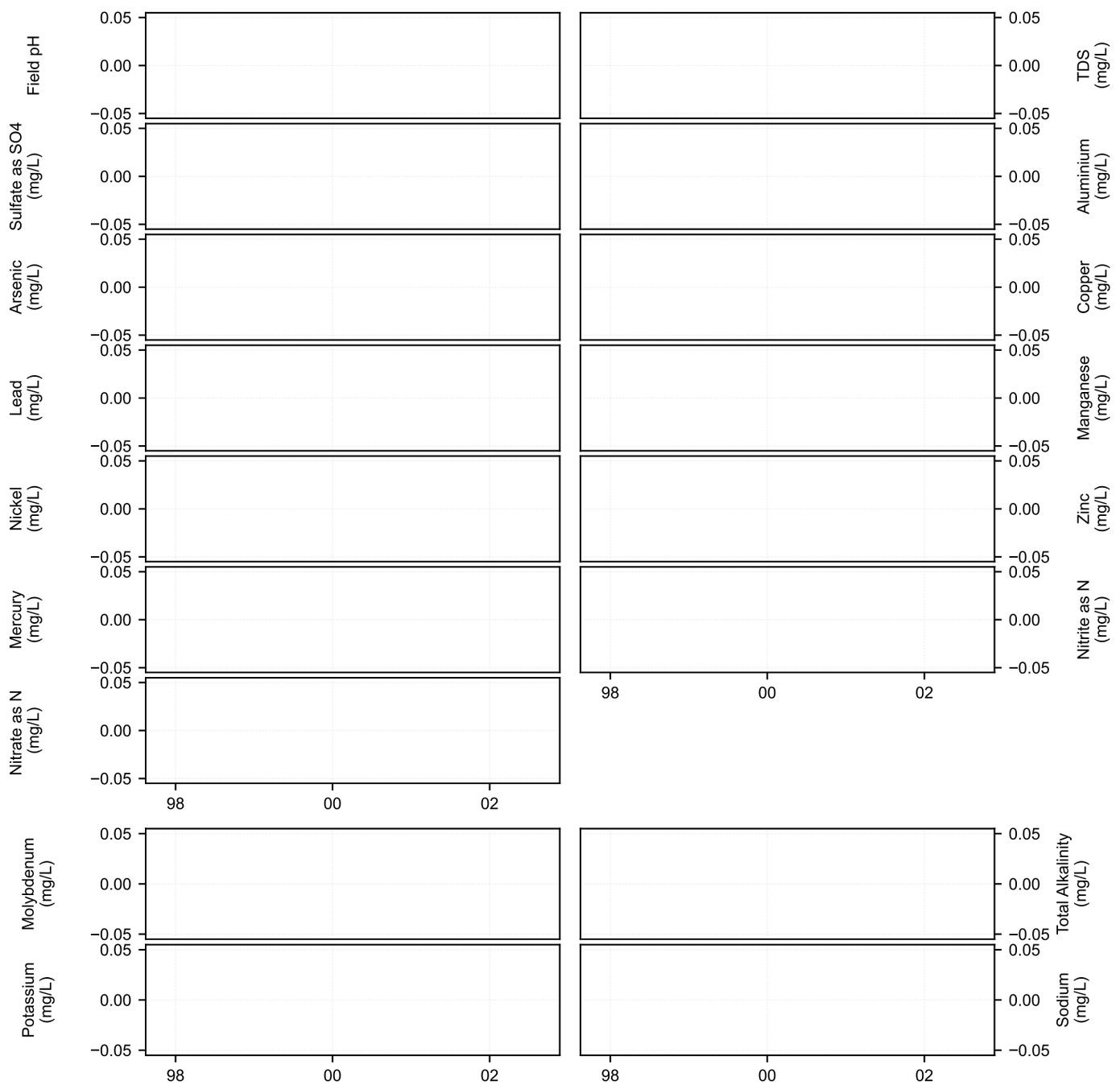
RO5 (Screened geology - Inactive; Screened interval: 41.2-47.2 mbgl)



Groundwater levels



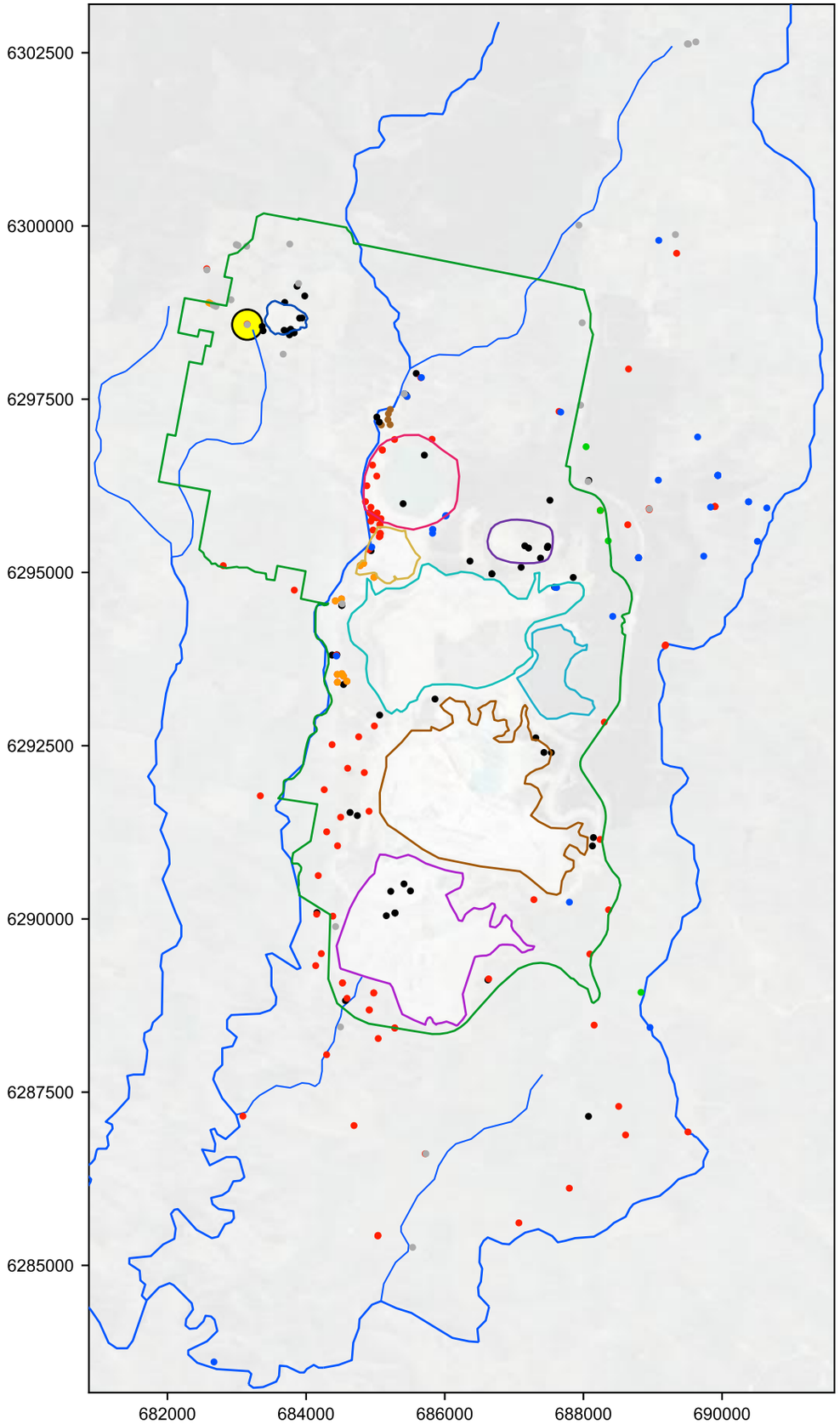
WMP defined analytes



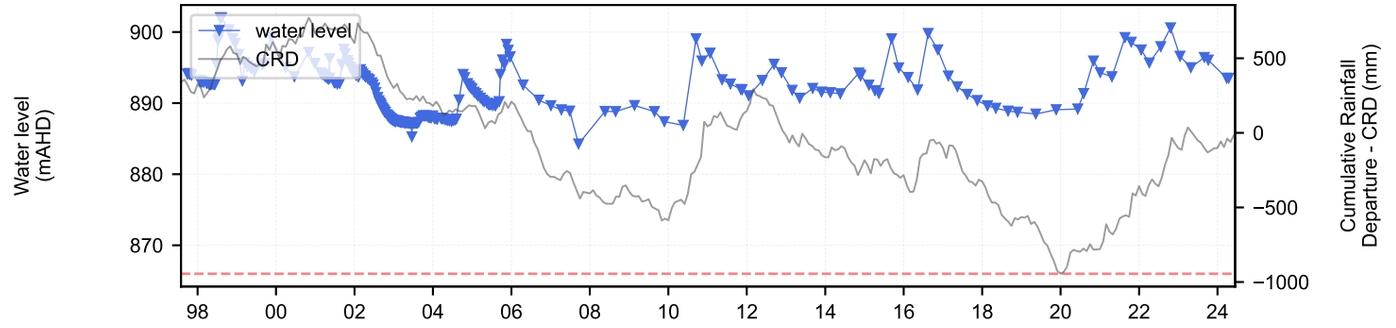
Additional analytes of interest

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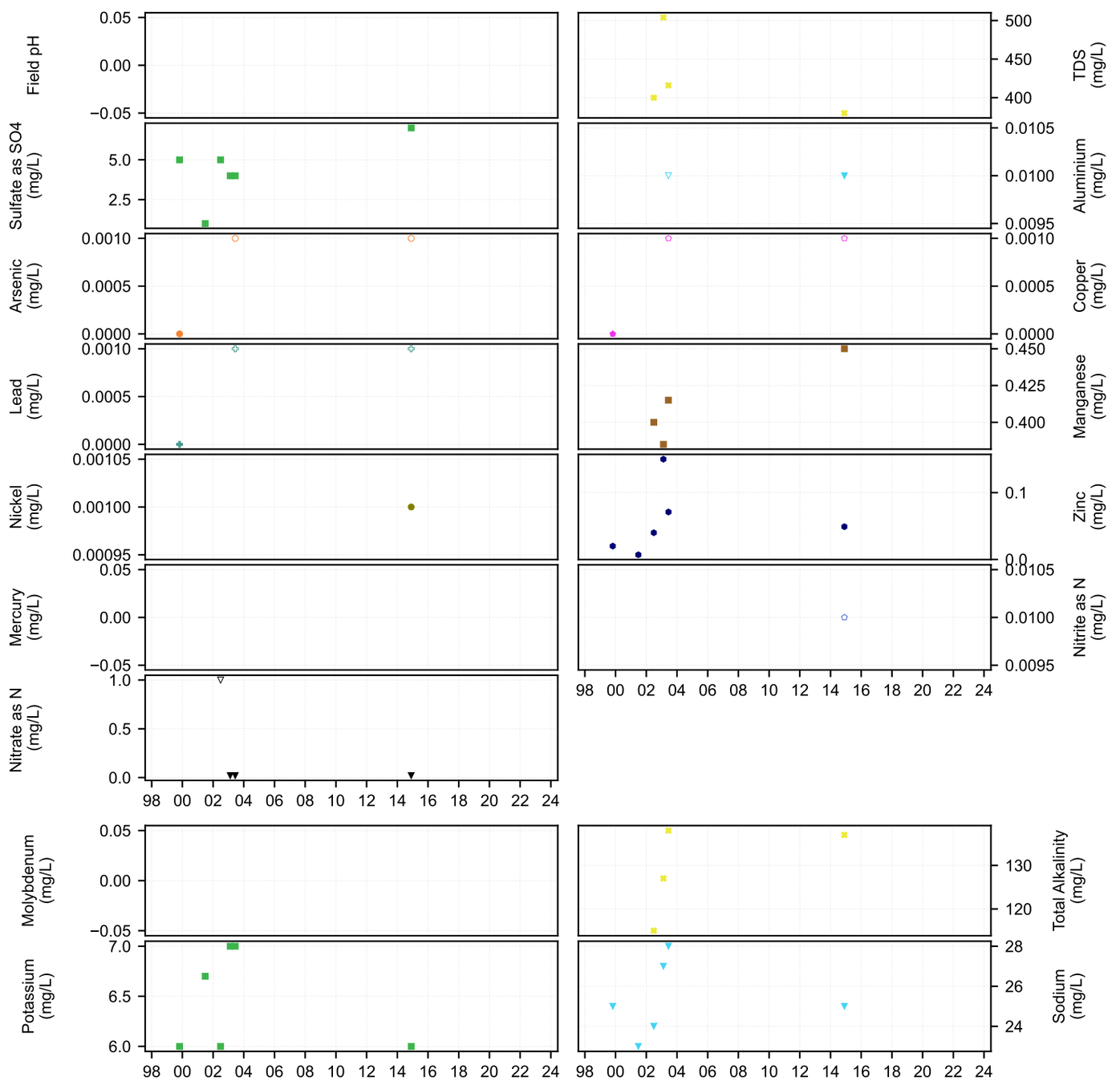
RO6A (Screened geology - Tertiary basalt; Screened interval: 31-37 mbgl)



Groundwater levels



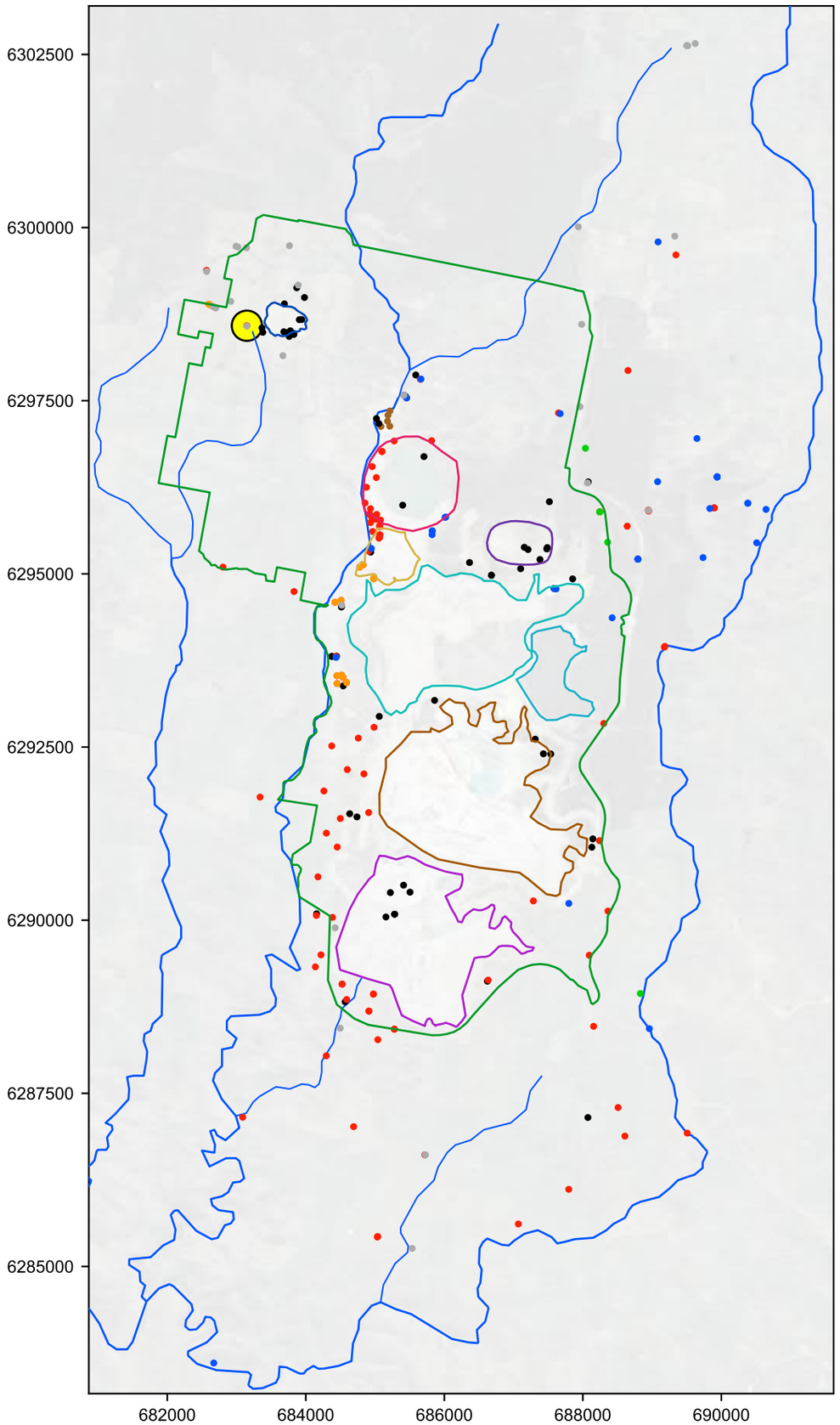
WMP defined analytes



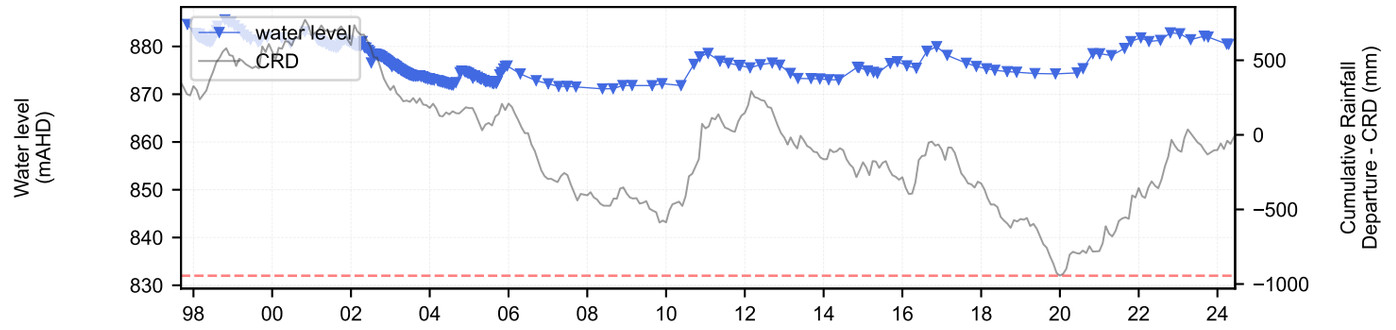
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

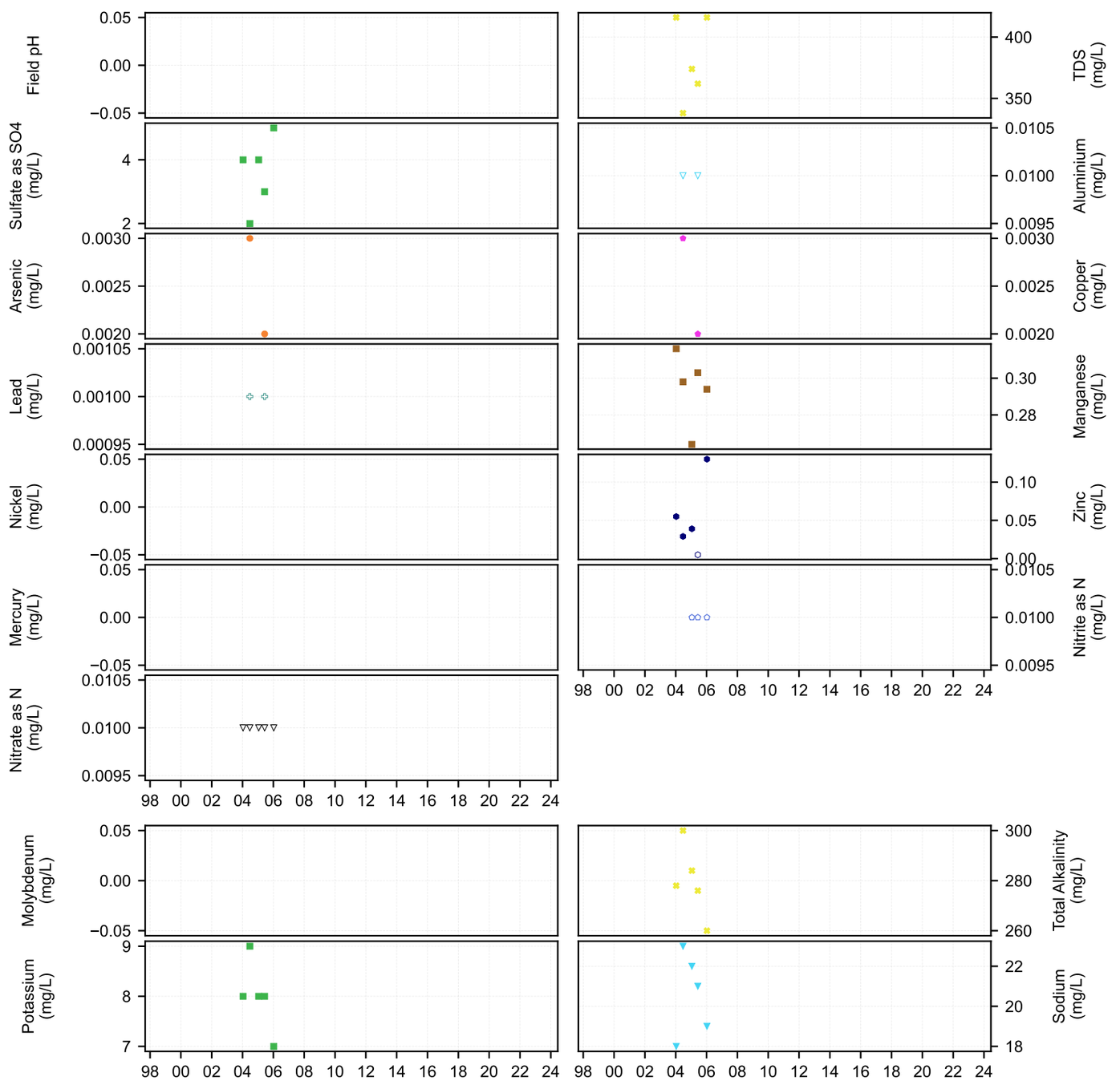
RO6B (Screened geology - Ordovician; Screened interval: 52-136 mbgl)



Groundwater levels



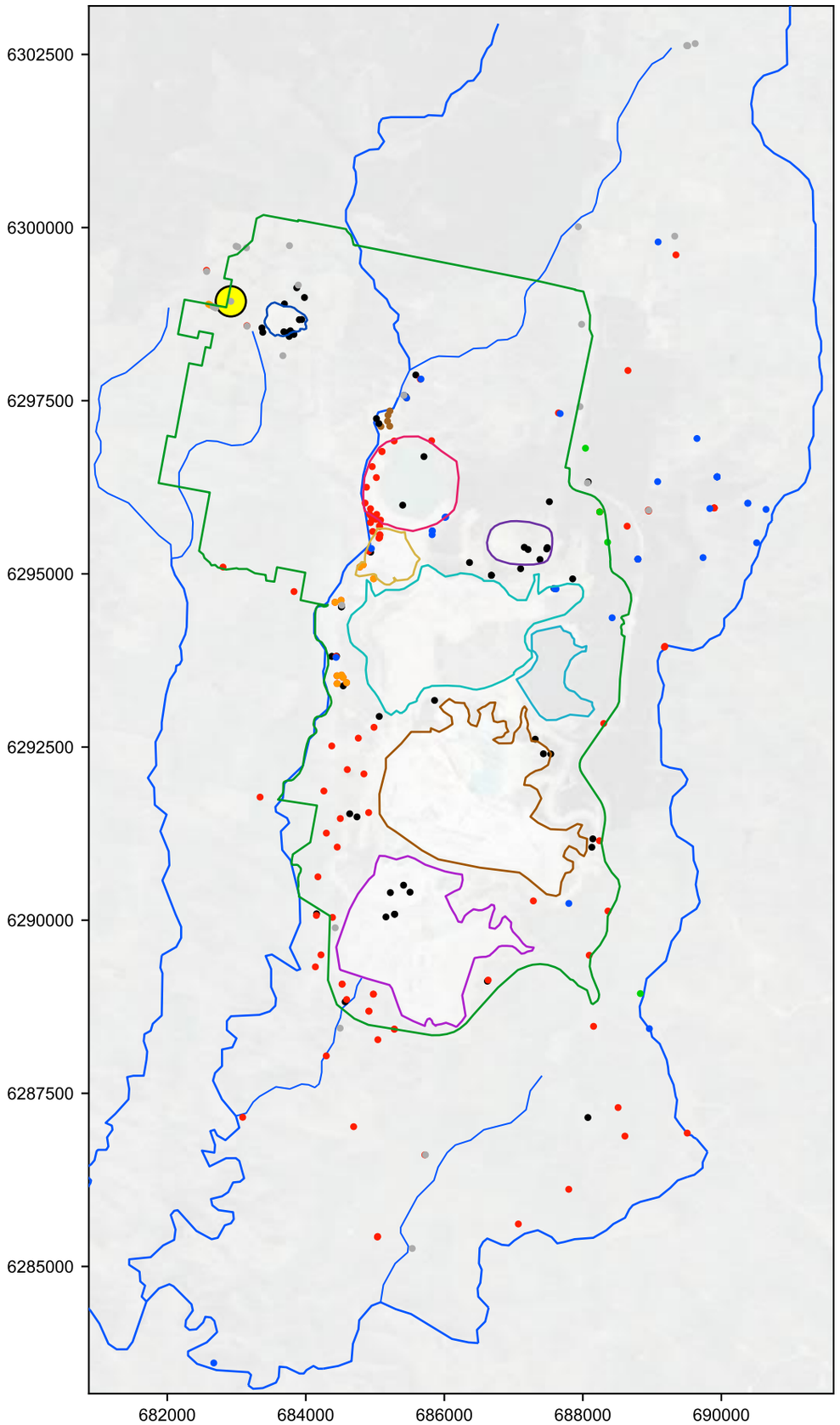
WMP defined analytes



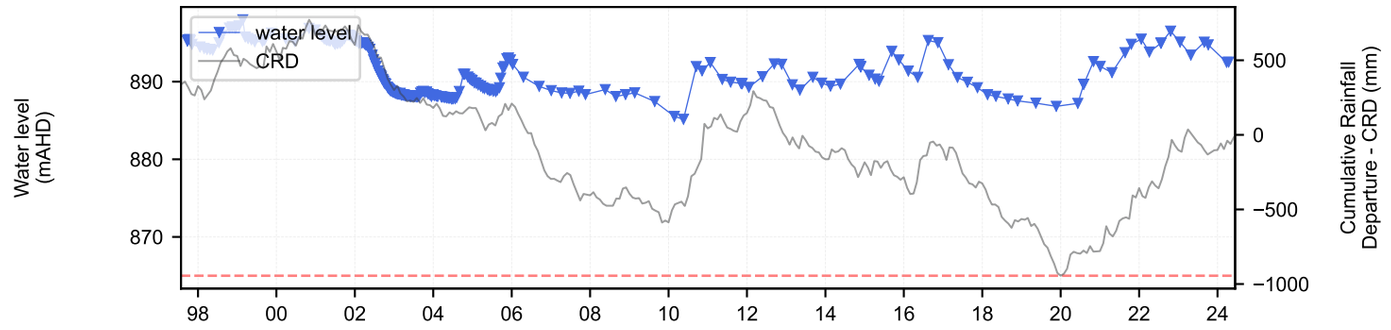
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

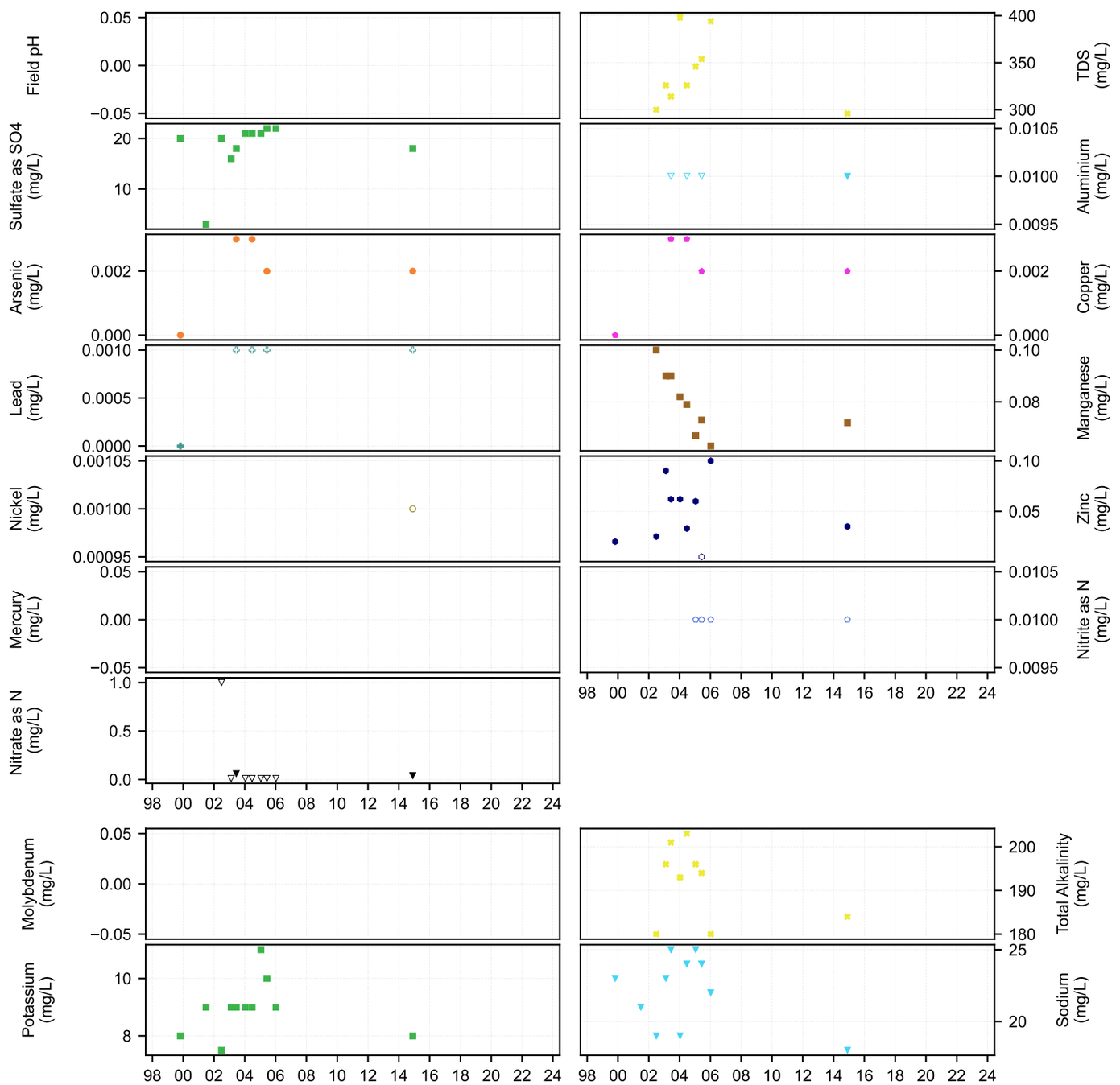
RO7 (Screened geology - Tertiary basalt; Screened interval: 50-62 mbgl)



Groundwater levels



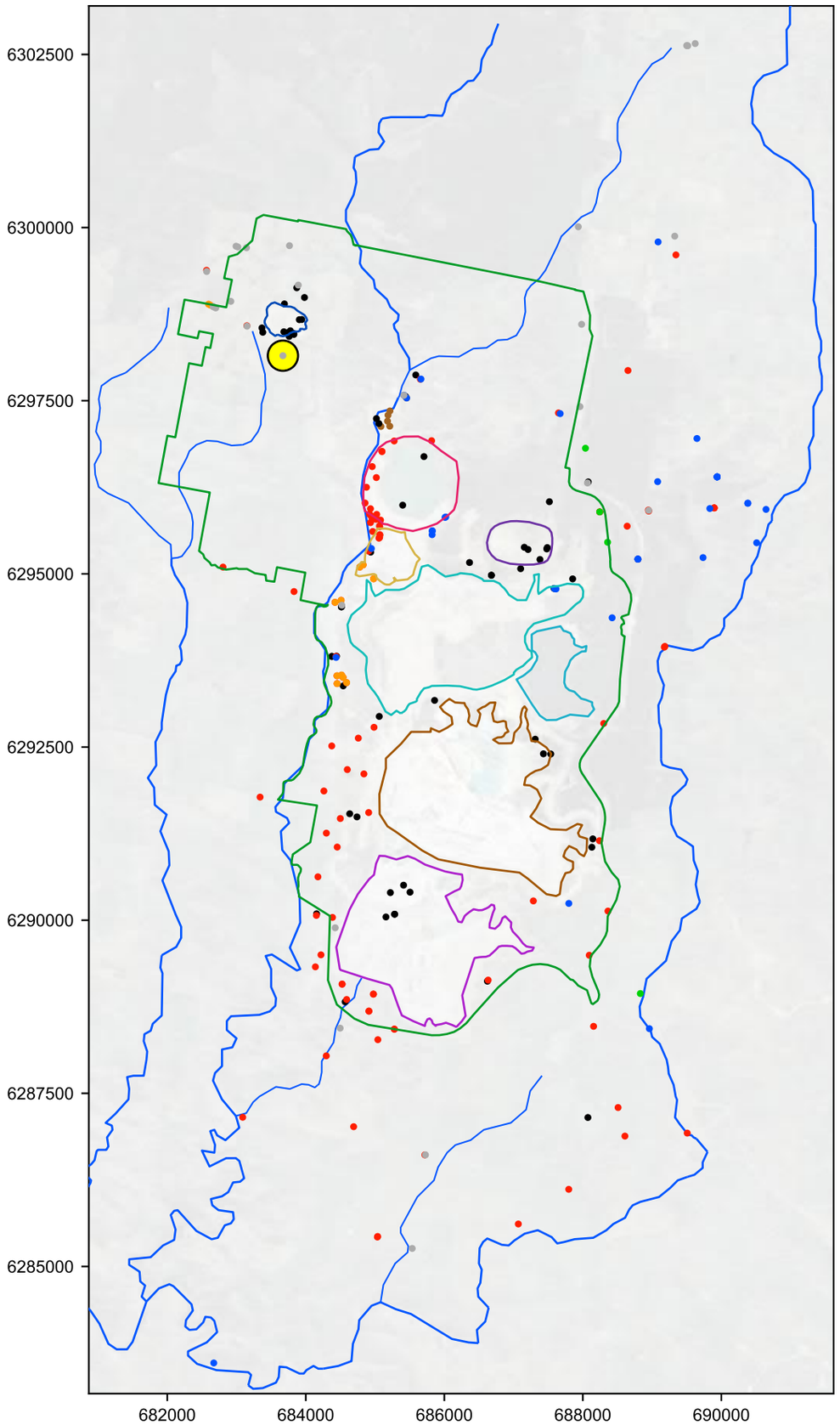
WMP defined analytes



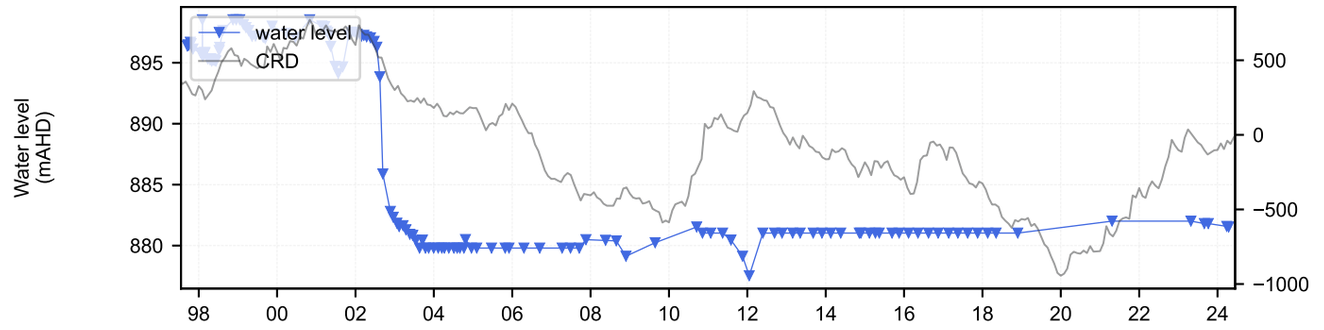
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

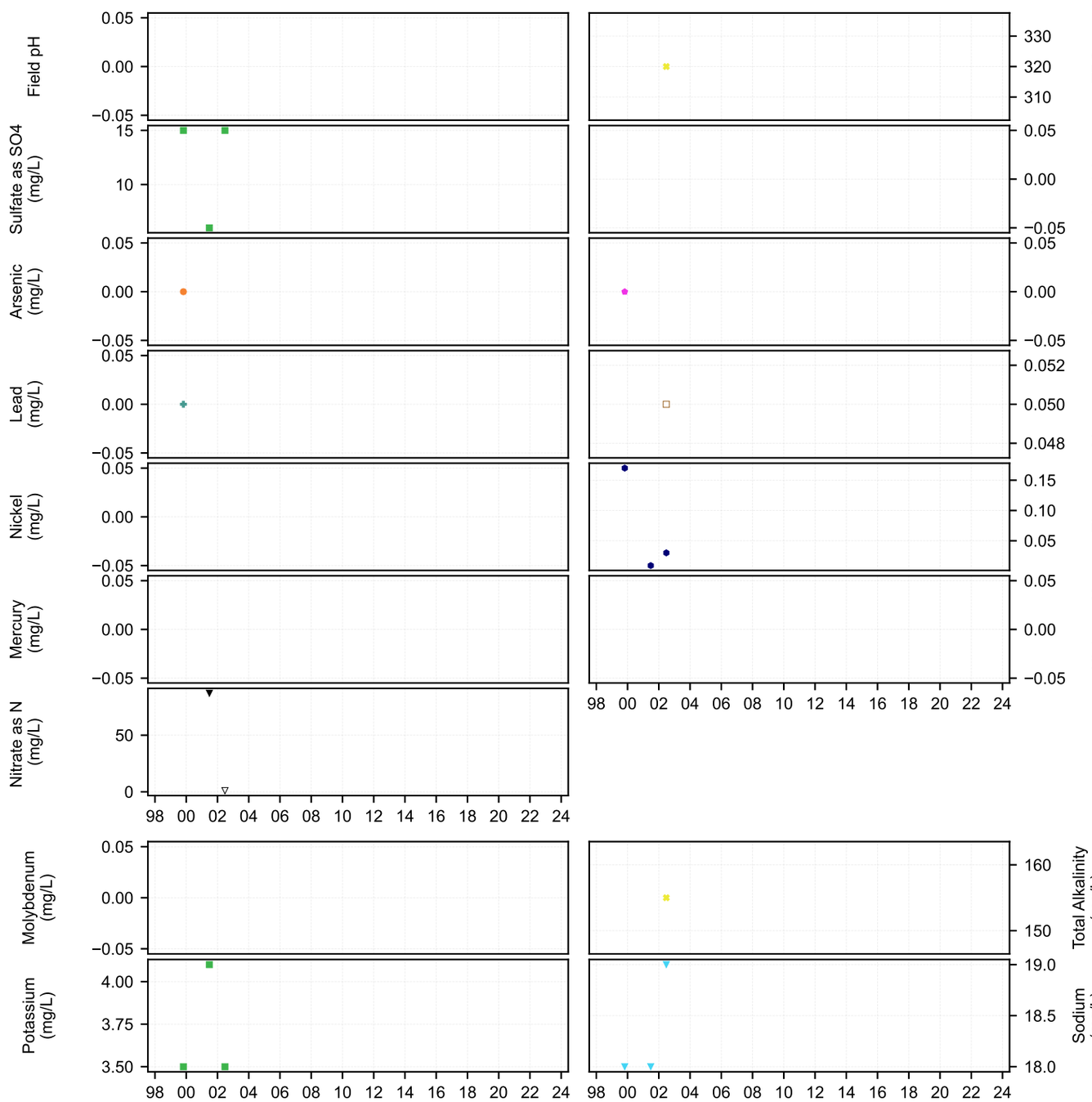
RO8 (Screened geology - Tertiary basalt; Screened interval: 11.5-17.5 mbgl)



Groundwater levels



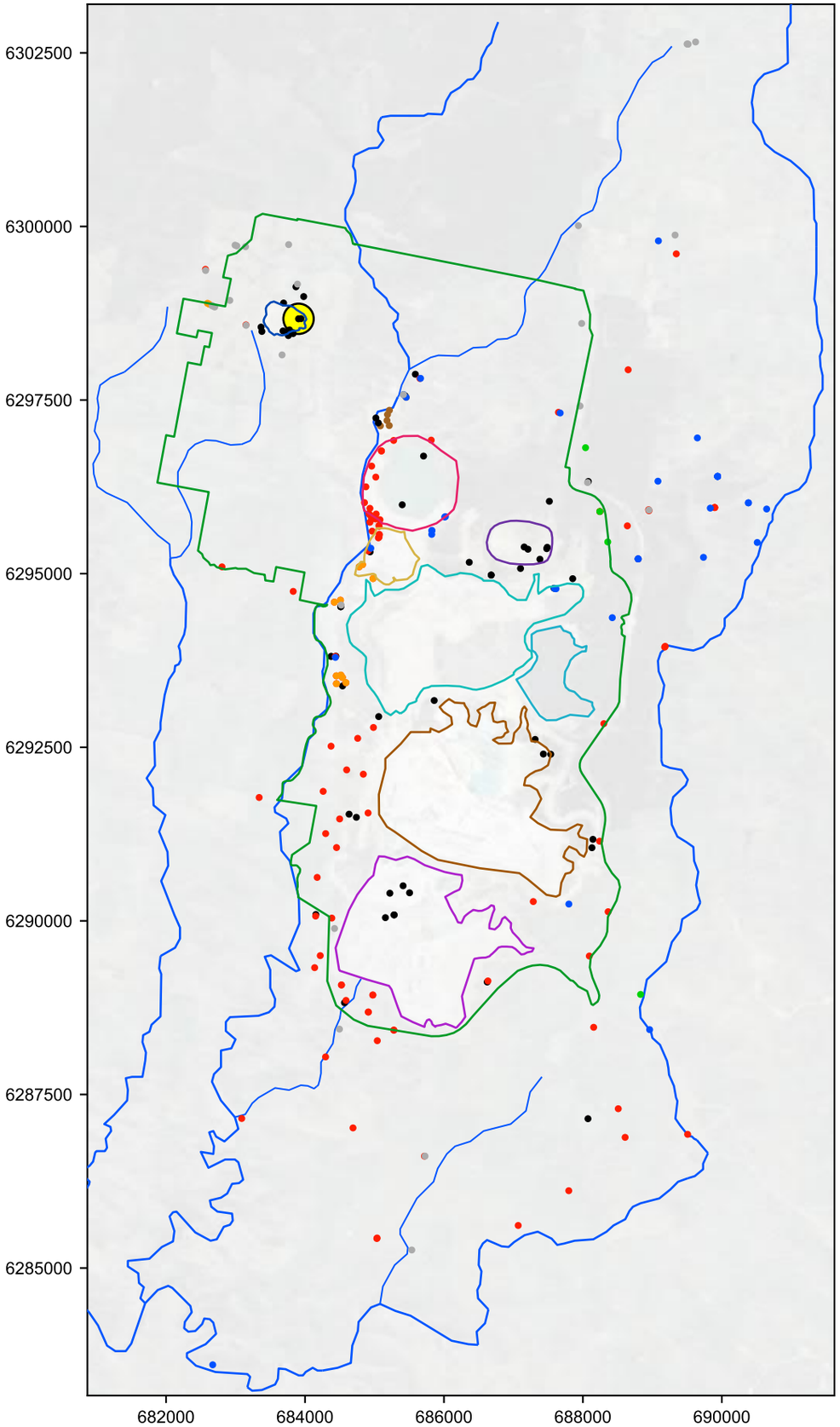
WMP defined analytes



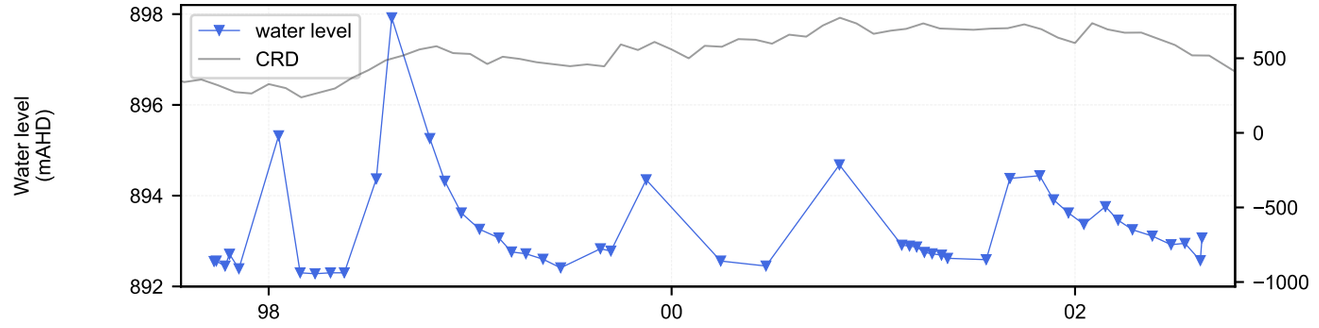
Additional analytes of interest

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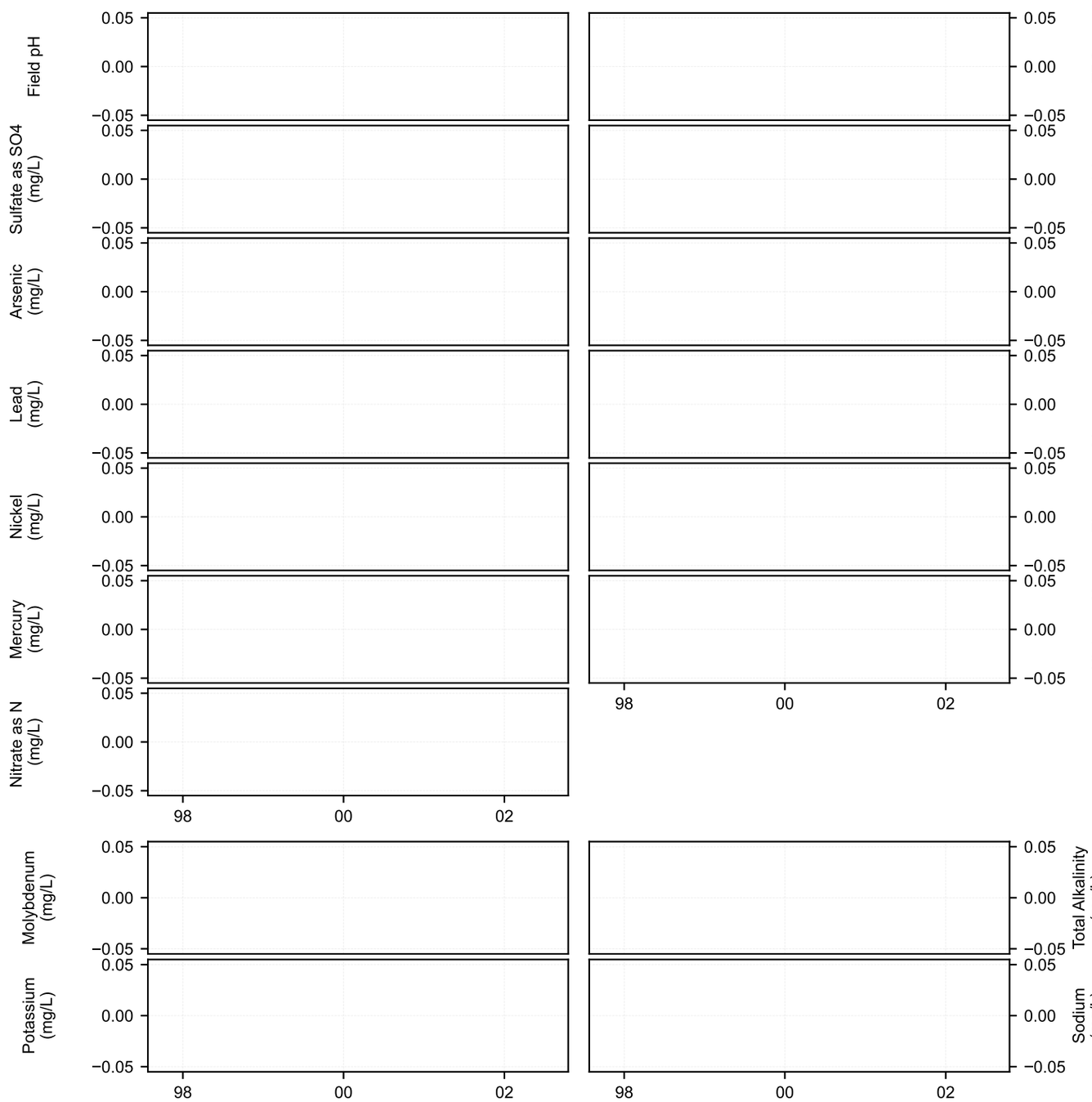
RS01 (Screened geology - Inactive; Screened interval: 6.5-8.0 mbgl)



Groundwater levels



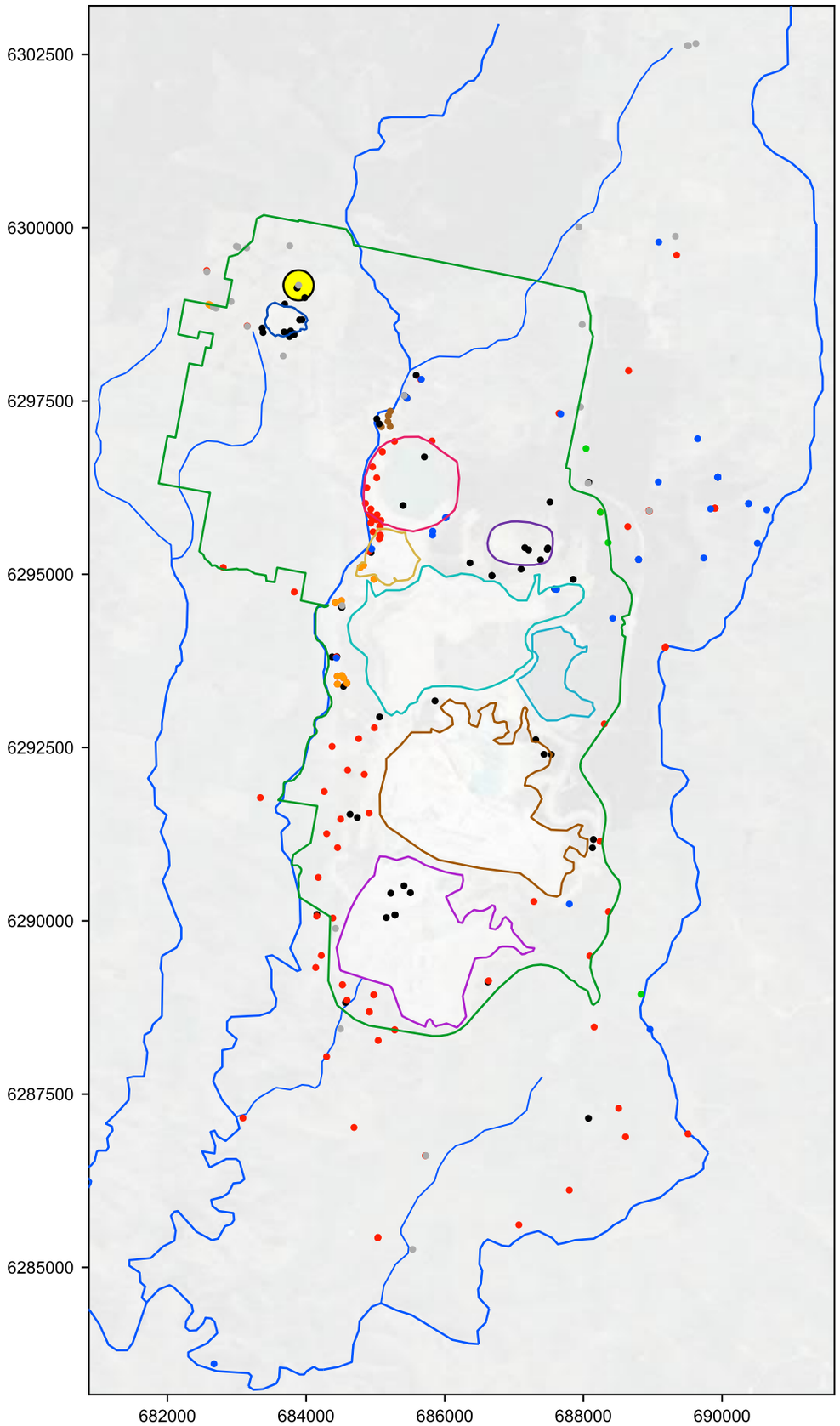
WMP defined analytes



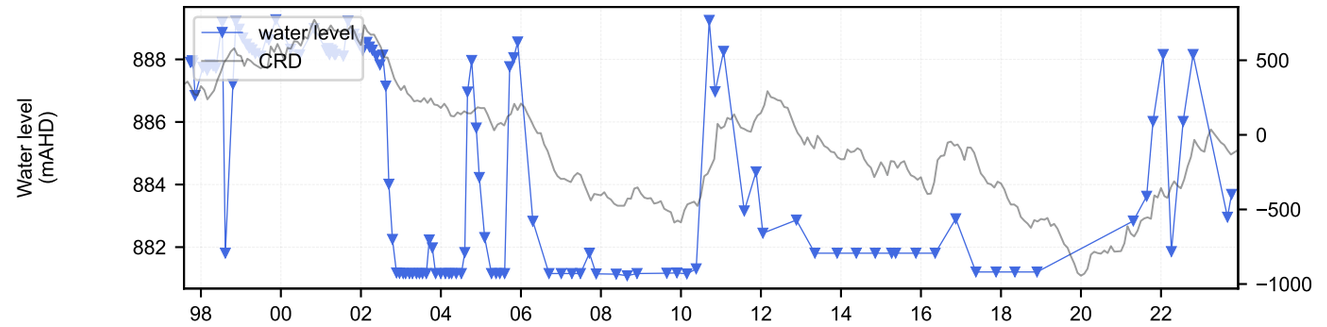
Additional analytes of interest

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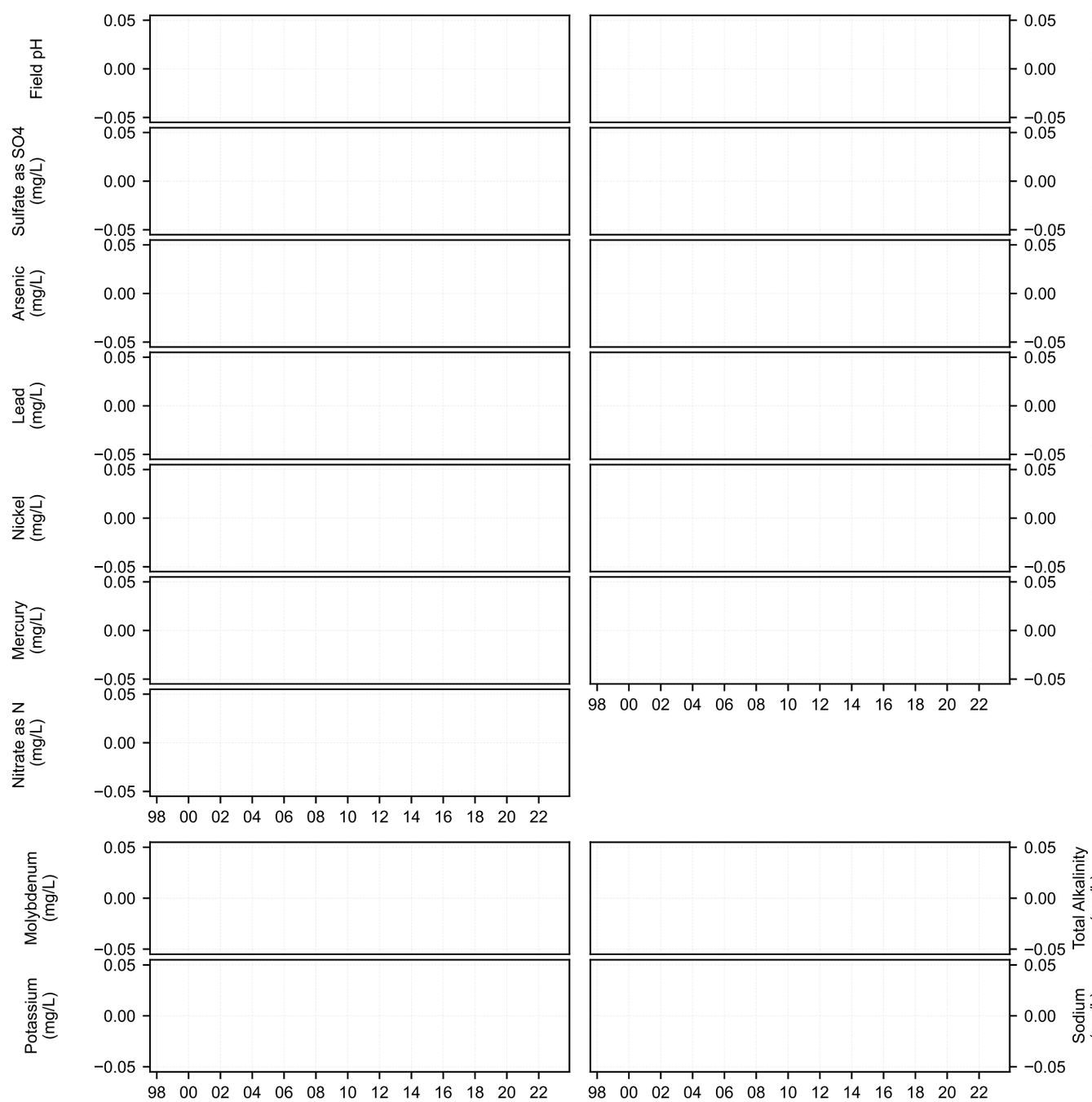
RS03 (Screened geology - Tertiary basalt; Screened interval: 6.5-8.0 mbgl)



Groundwater levels



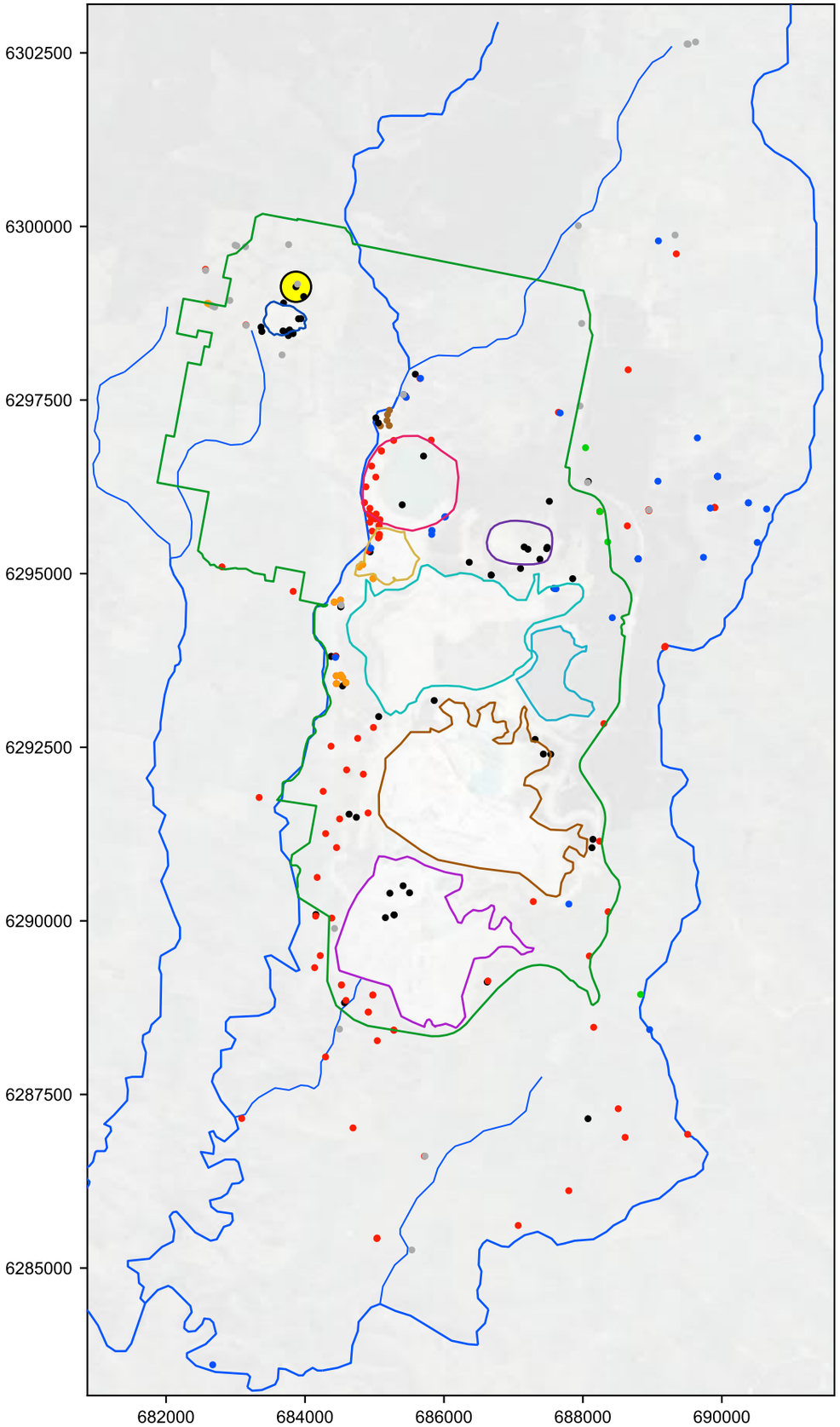
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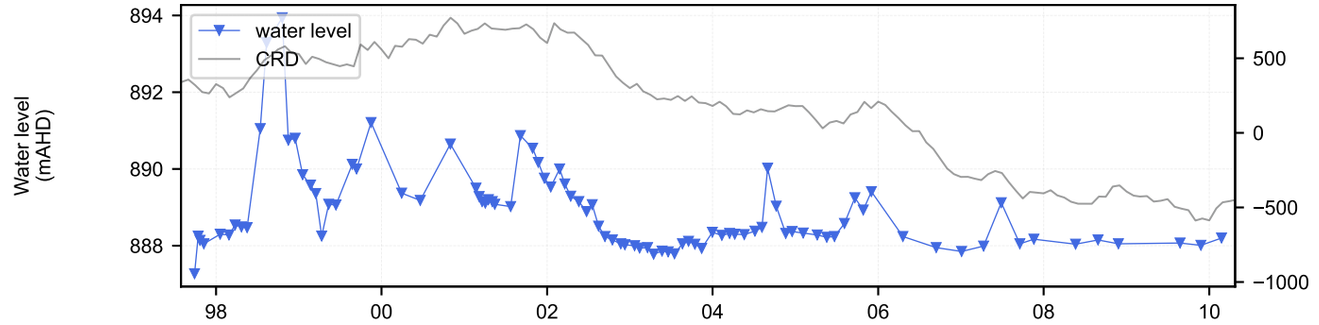
Additional analytes of interest

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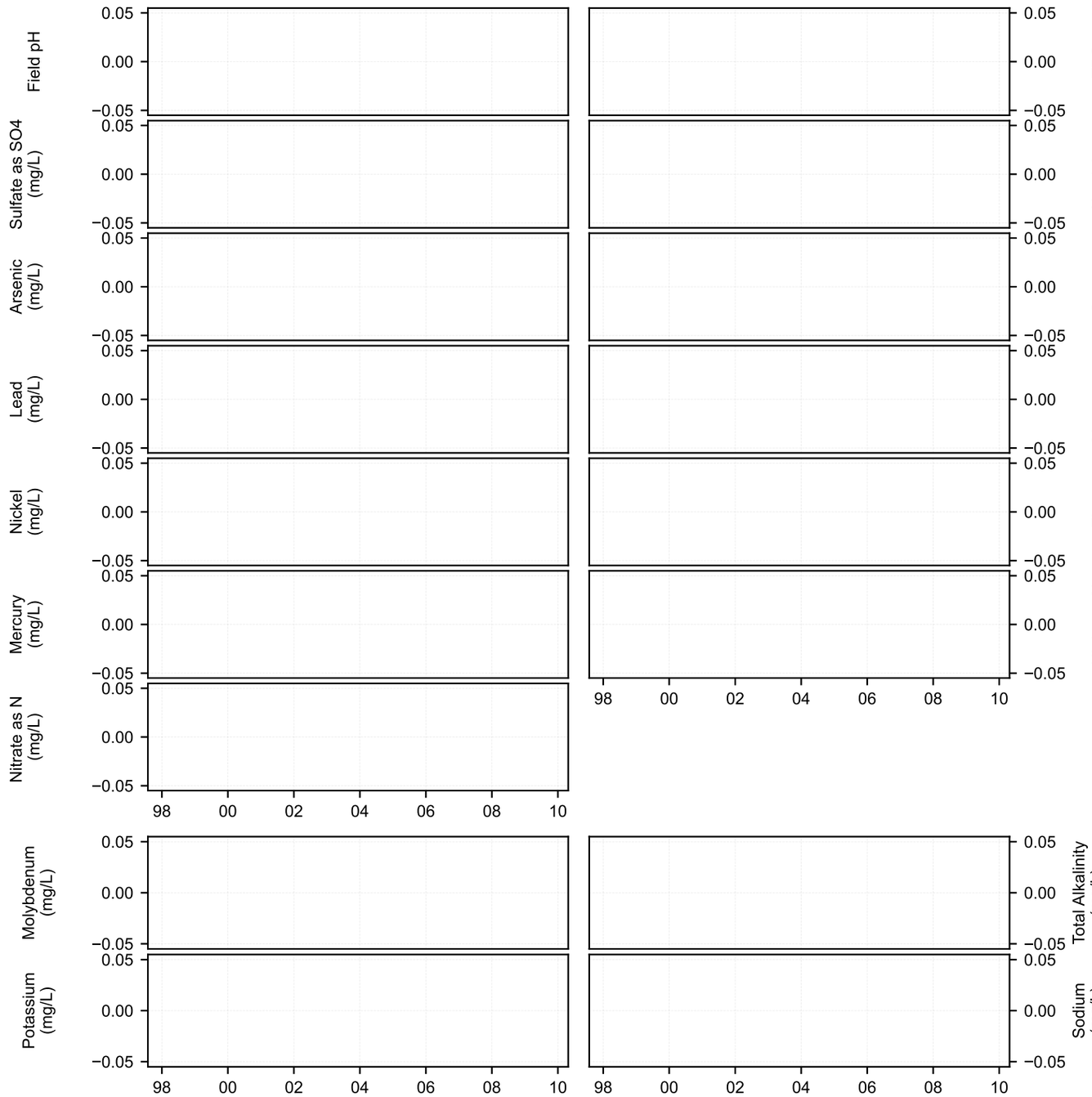
RS04 (Screened geology - Inactive; Screened interval: 6.0-7.0 mbgl)



Groundwater levels



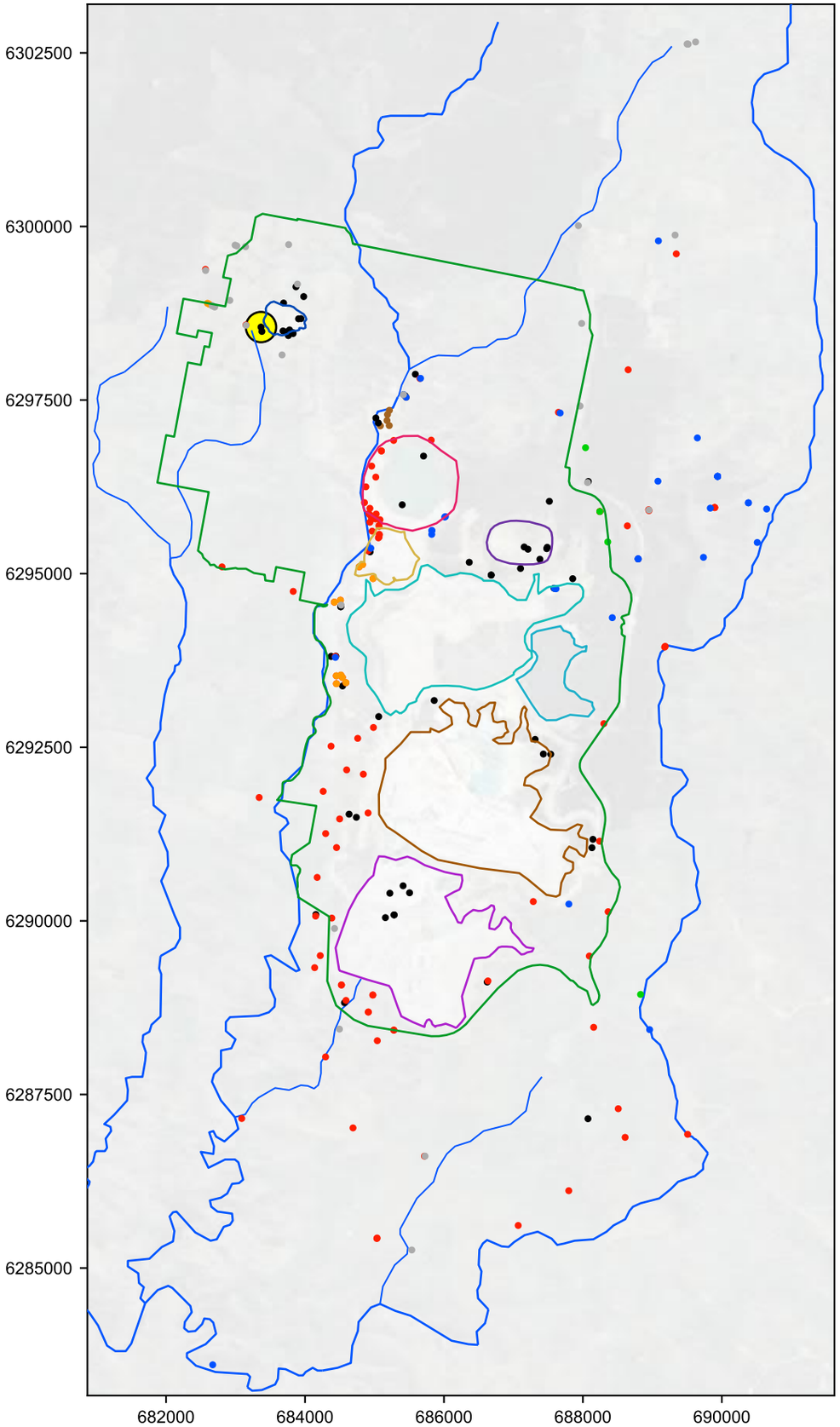
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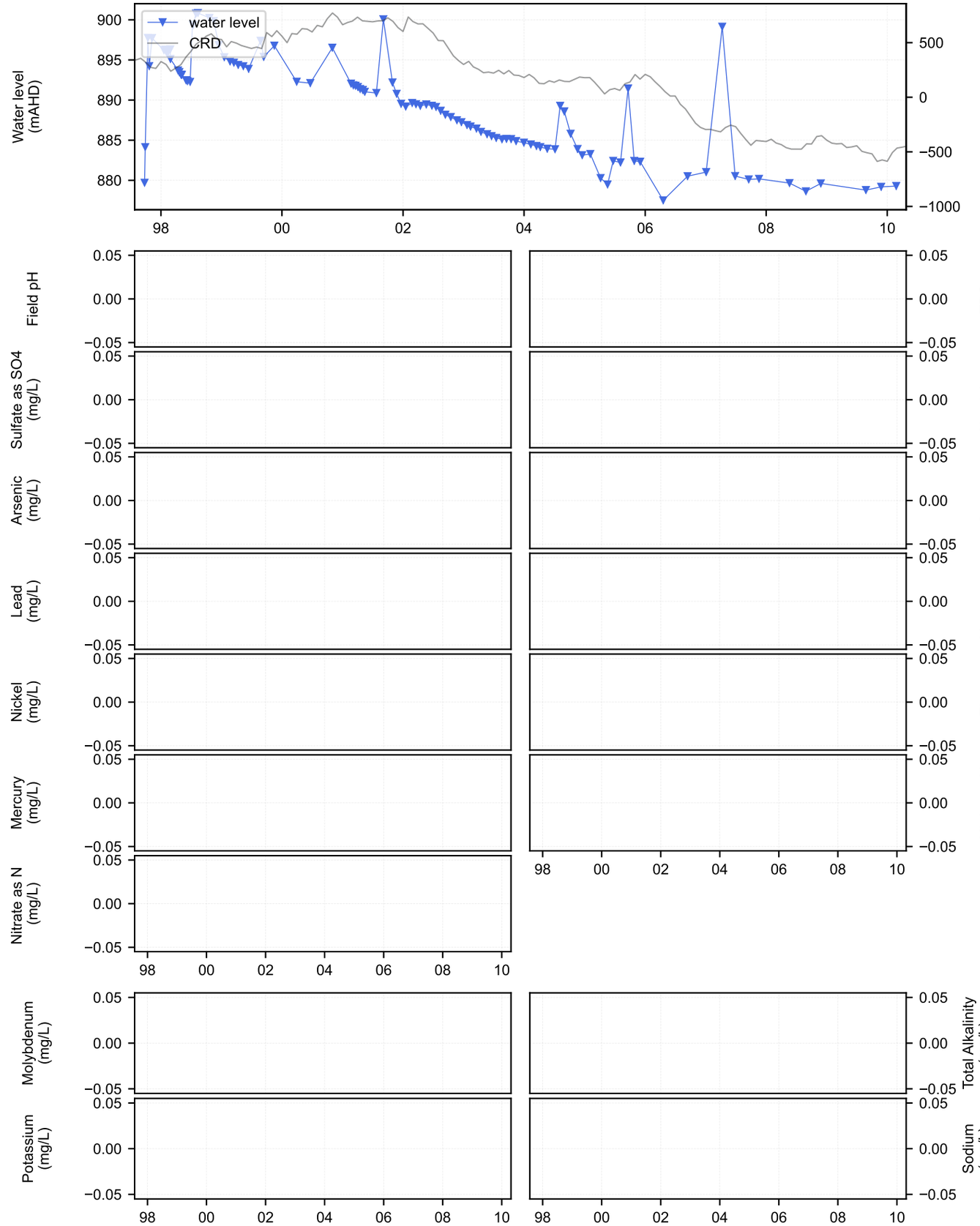
Additional analytes of interest

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RS05 (Screened geology - Inactive; Screened interval: 21.8-23.3 mbgl)



Groundwater levels

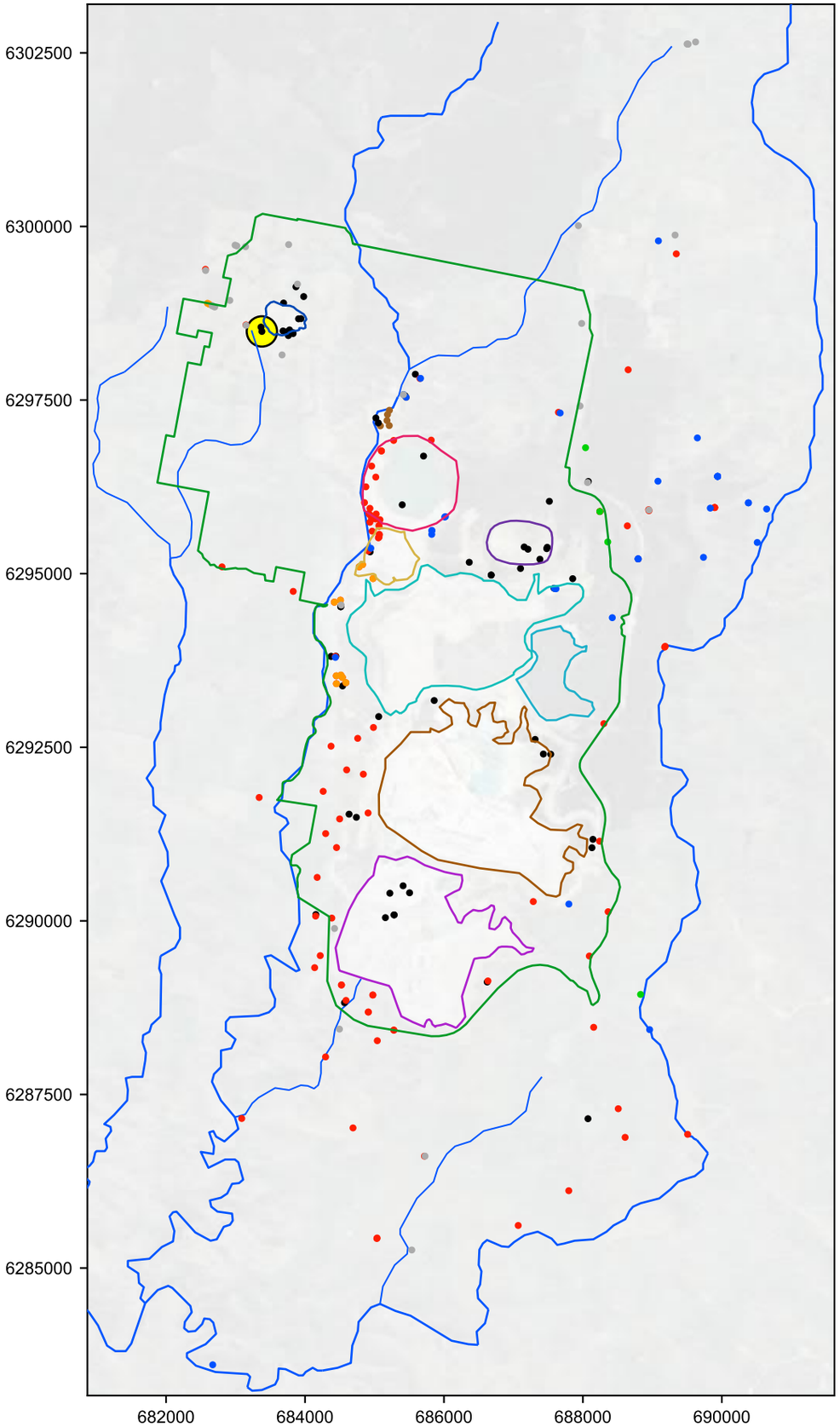


WMP defined analytes

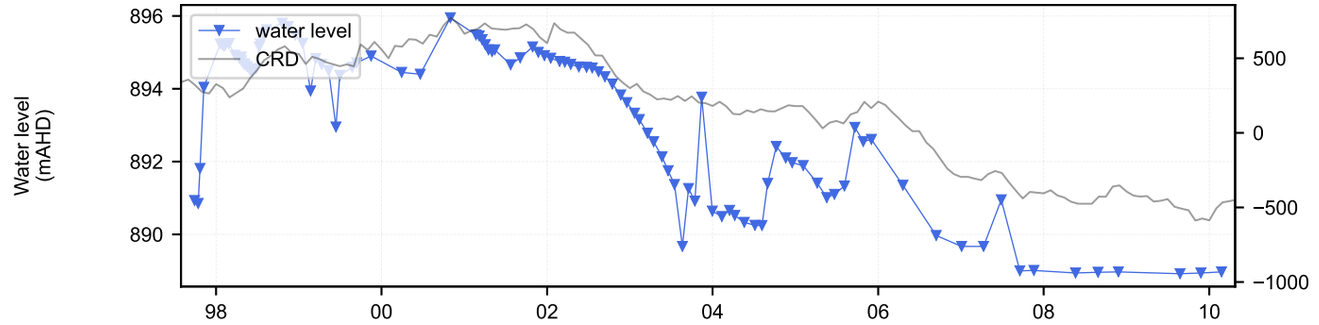
Additional analytes of interest

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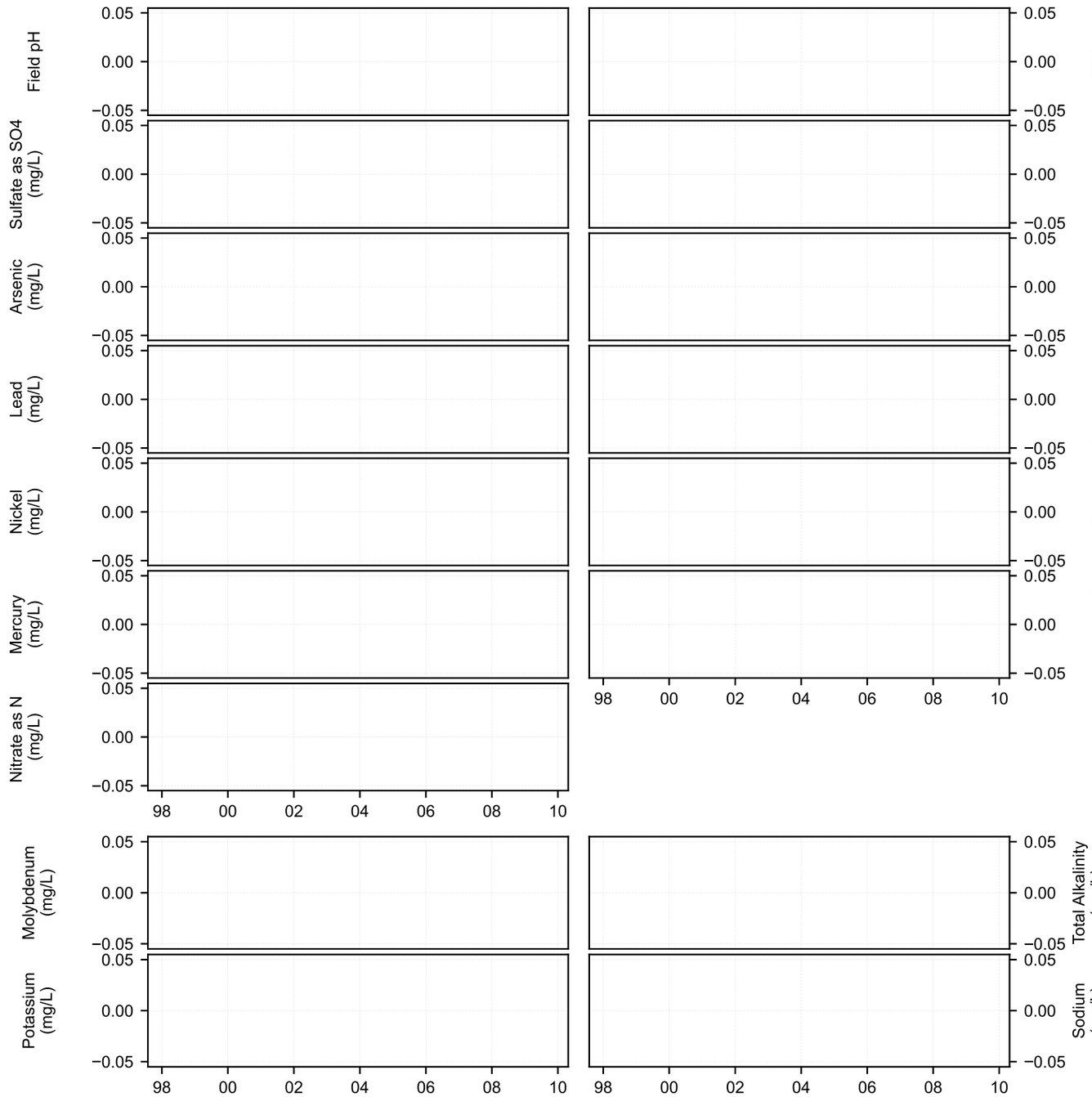
RS06 (Screened geology - Inactive; Screened interval: 8.5-10.0 mbgl)



Groundwater levels



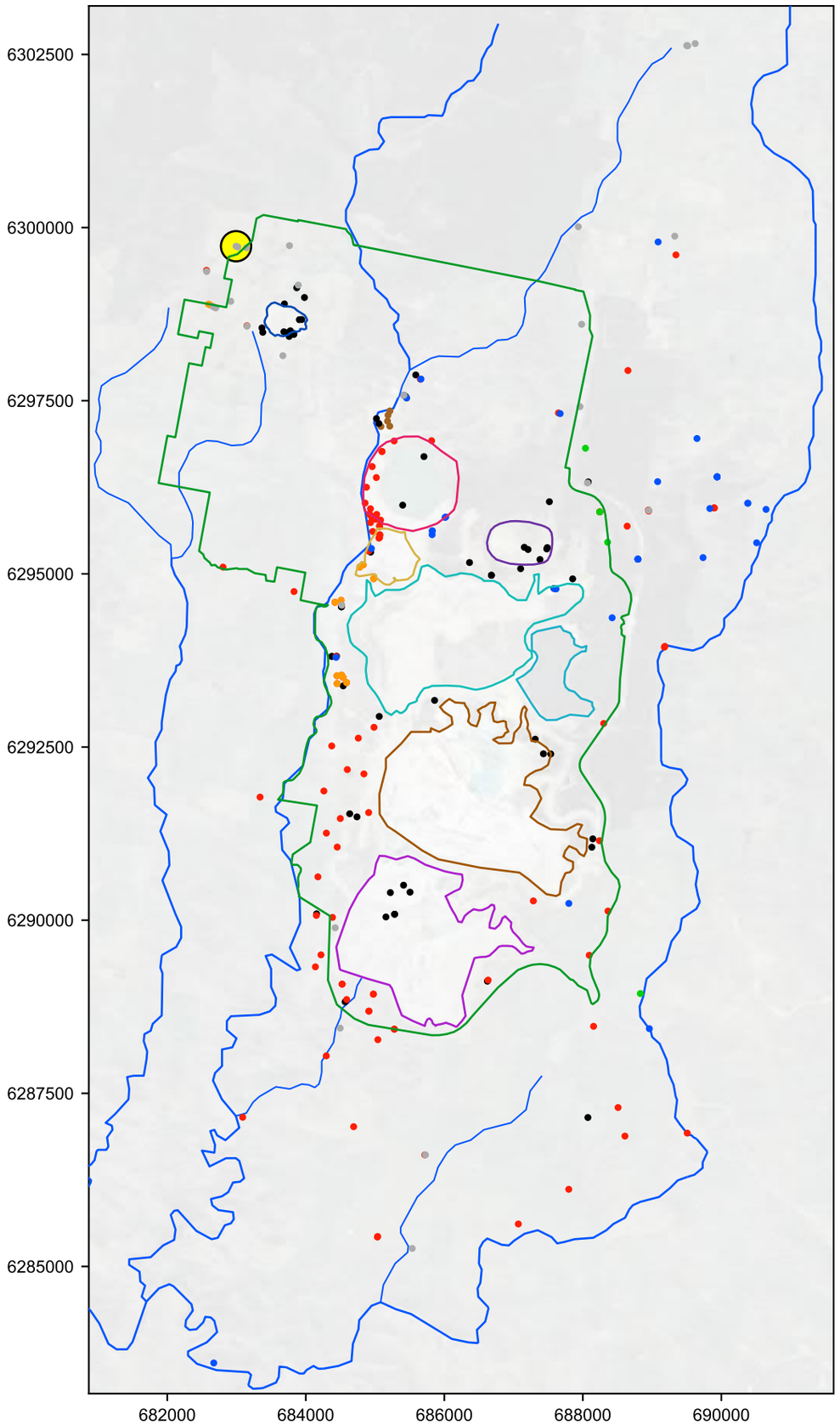
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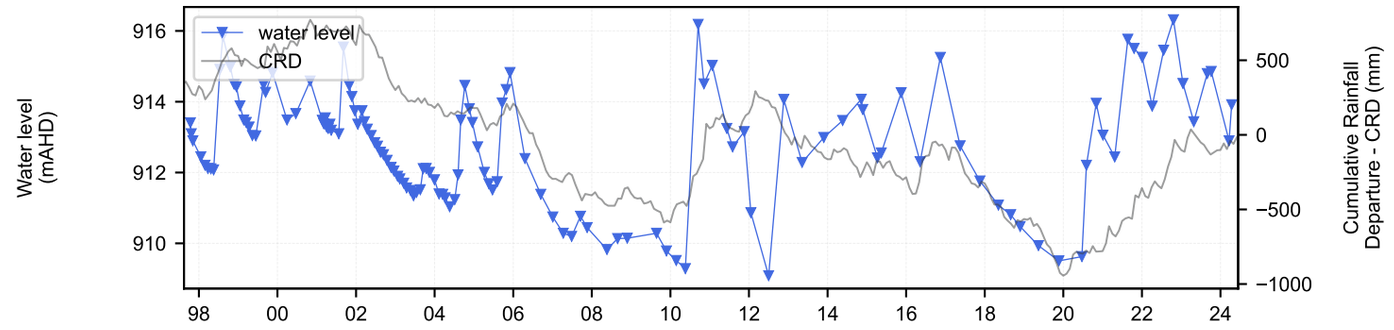
Additional analytes of interest

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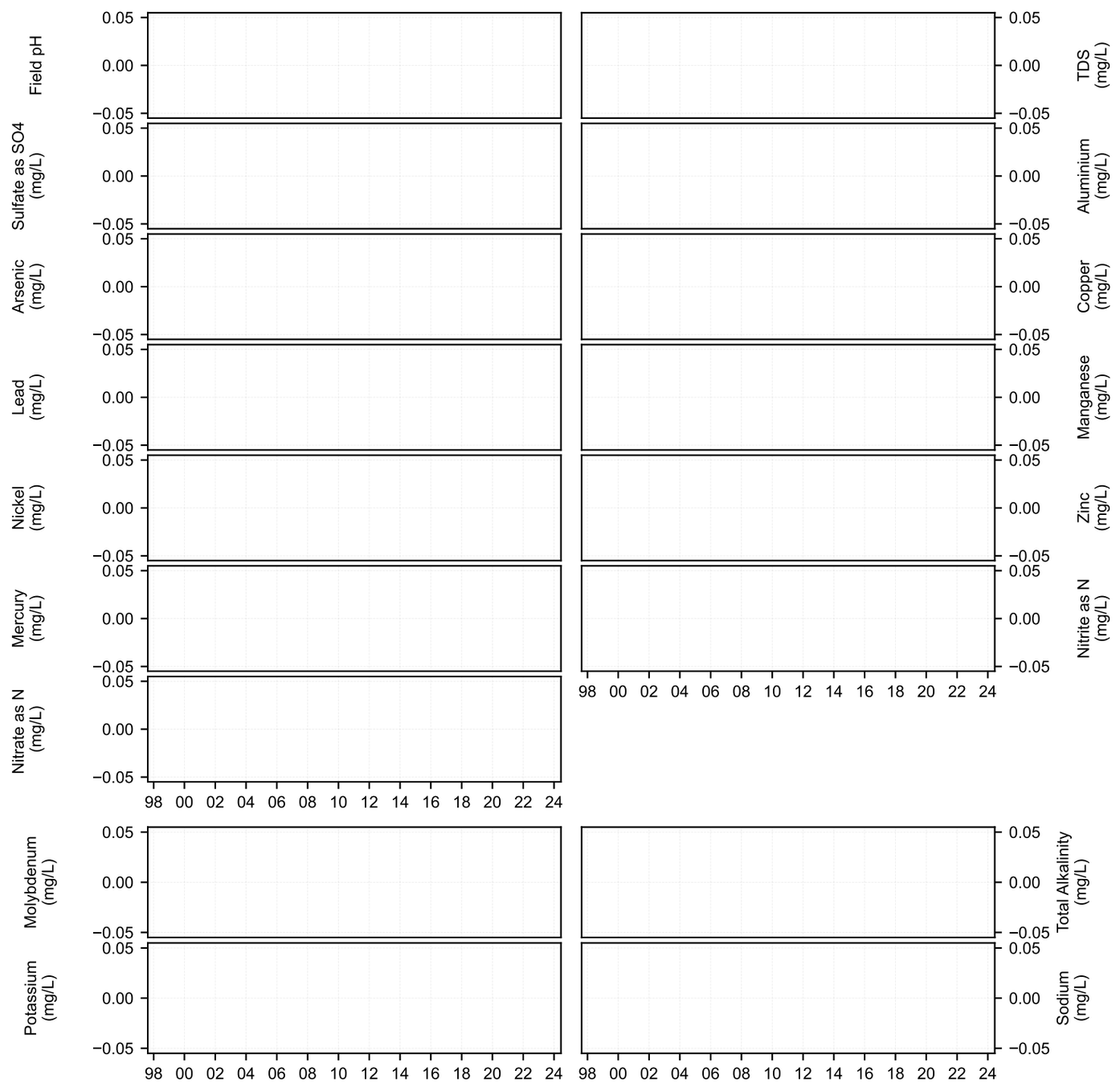
RS07 (Screened geology - Tertiary basalt; Screened interval: 10.0-11.5 mbgl)



Groundwater levels



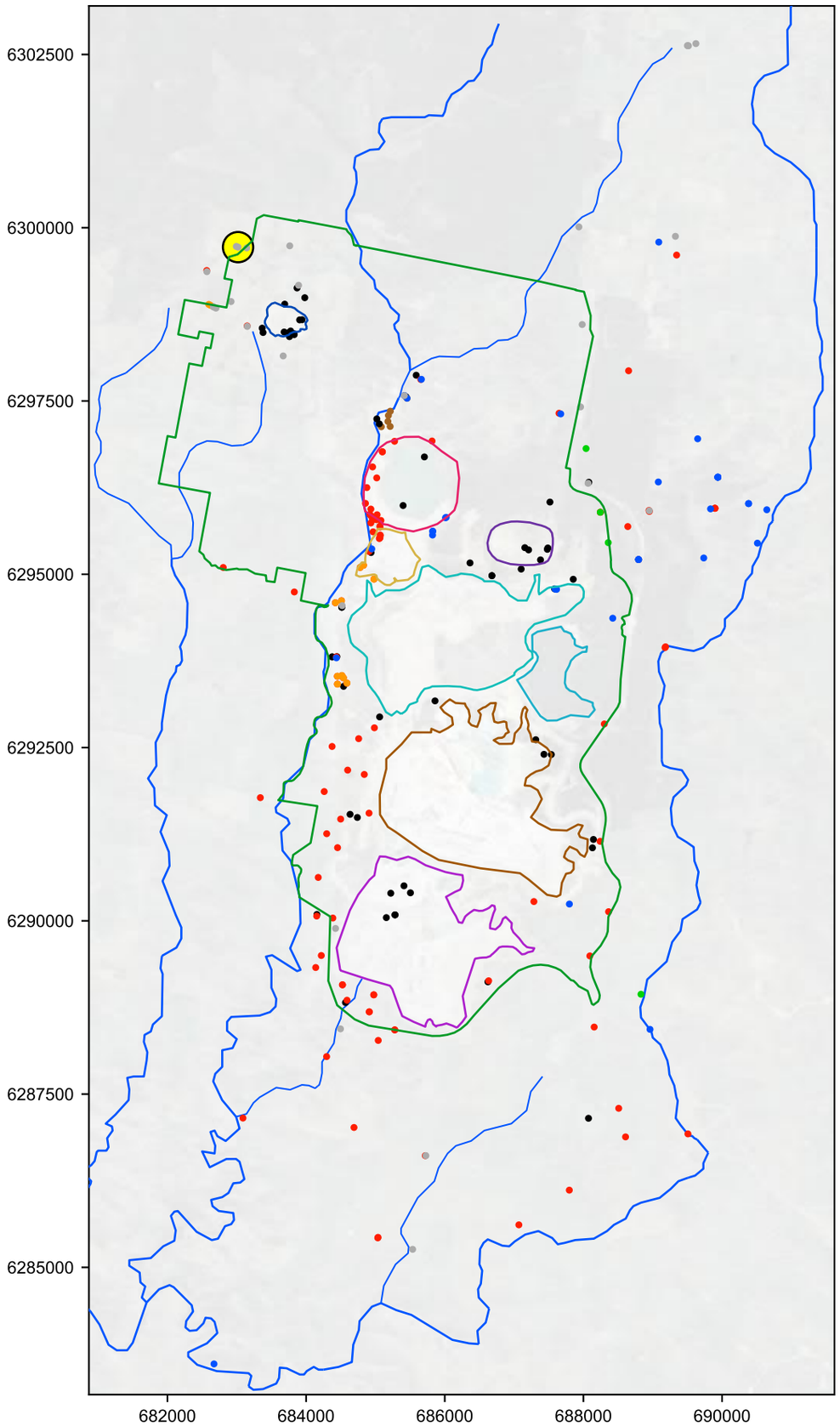
WMP defined analytes



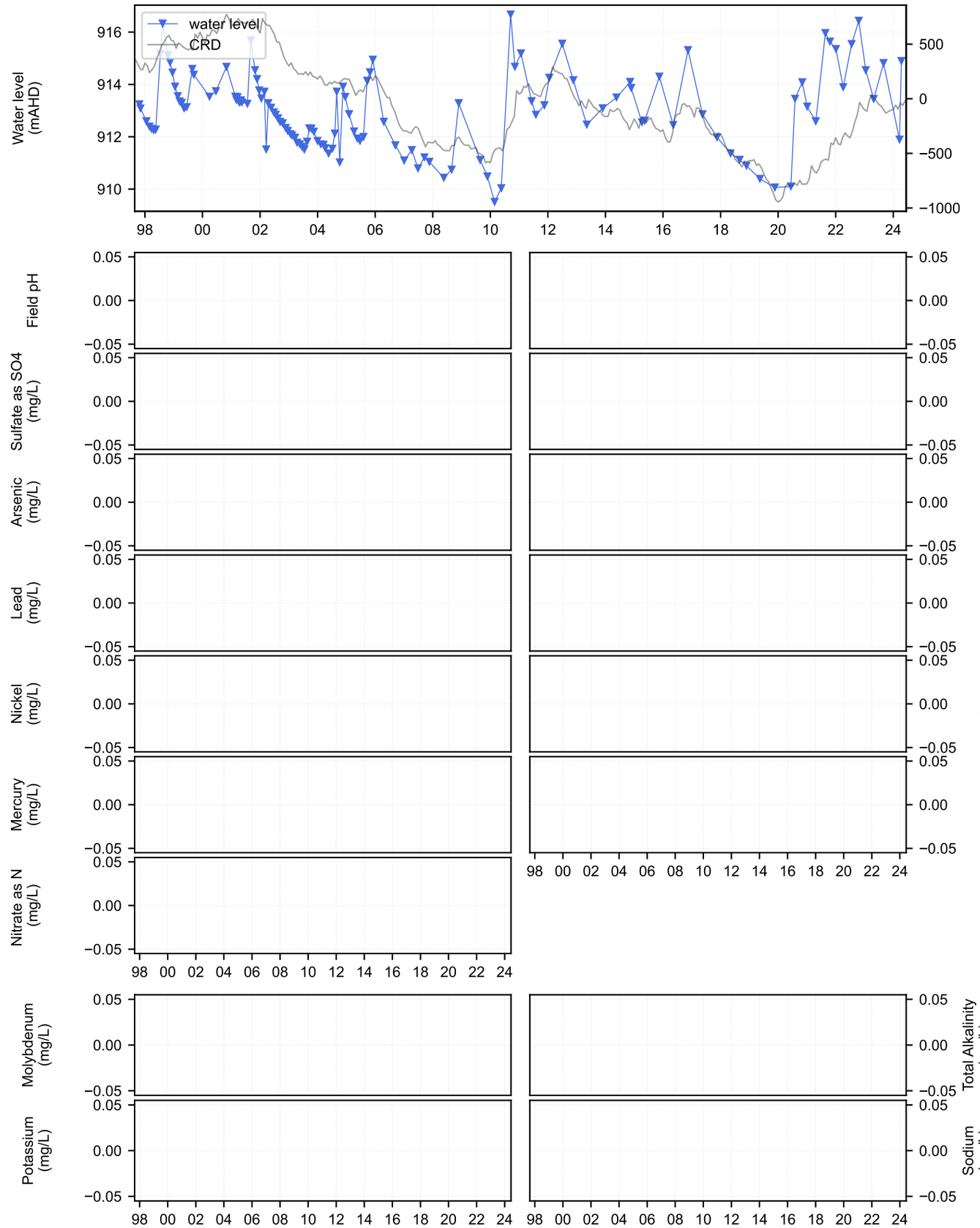
Additional analytes of interest

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RS08 (Screened geology - Tertiary basalt; Screened interval: 8.5-10.0 mbgl)



Groundwater levels

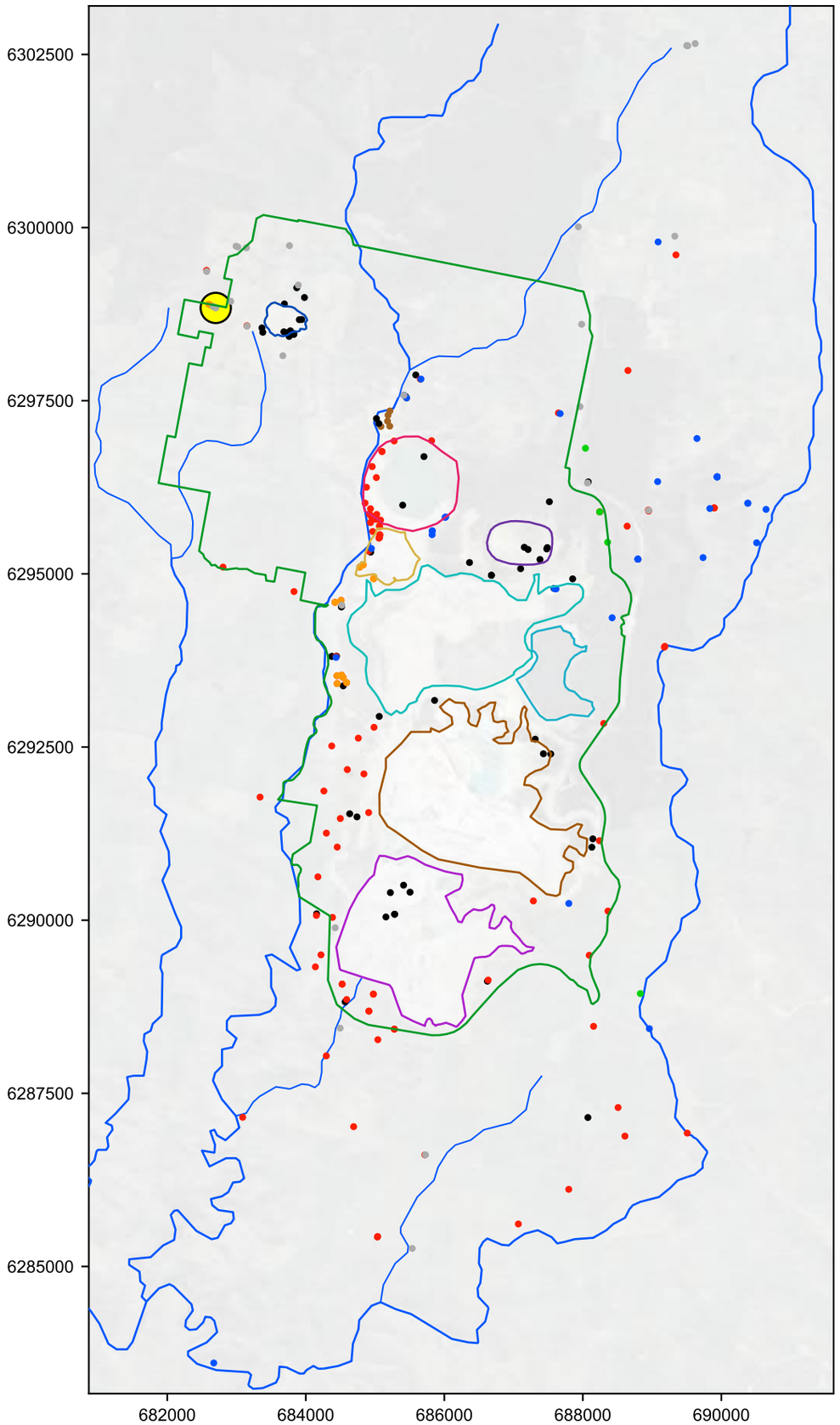


WMP defined analytes

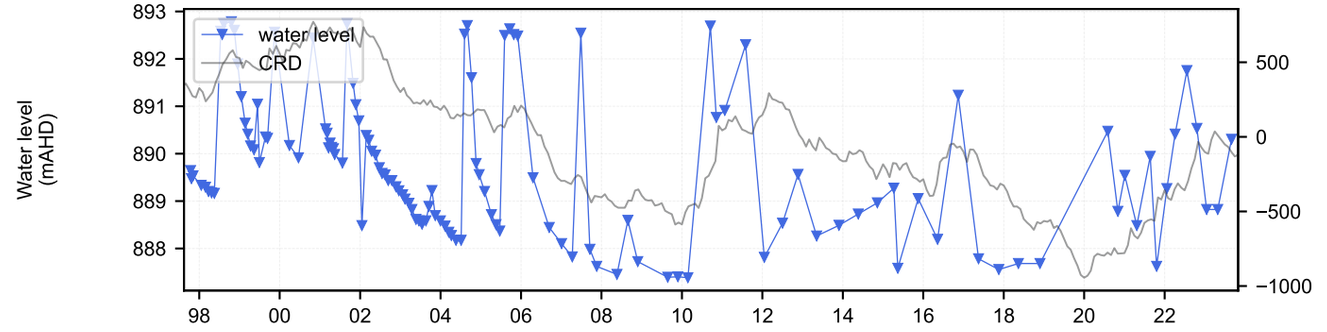
Additional analytes of interest

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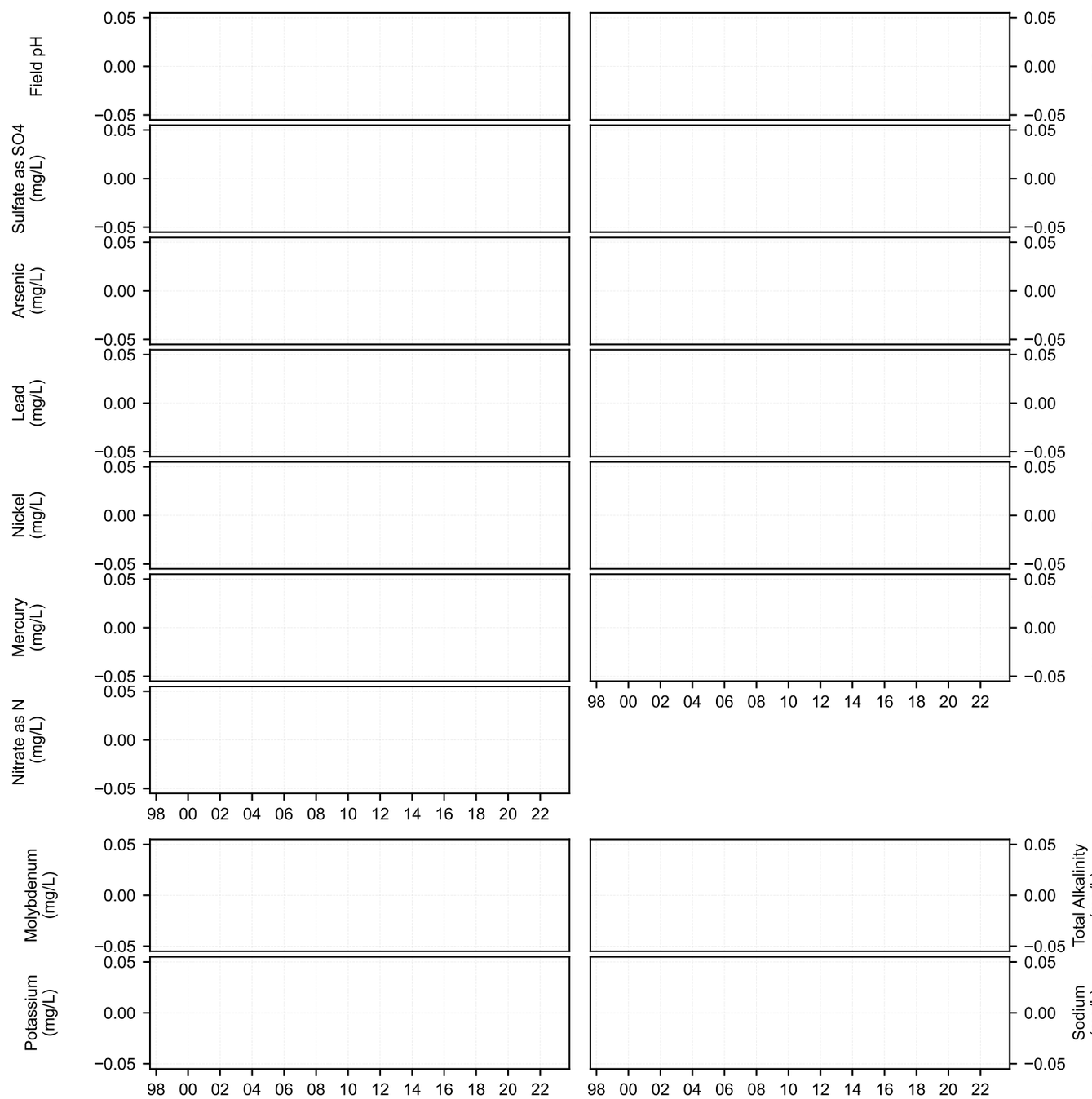
RS09 (Screened geology - Tertiary basalt; Screened interval: 4.3-5.8 mbgl)



Groundwater levels



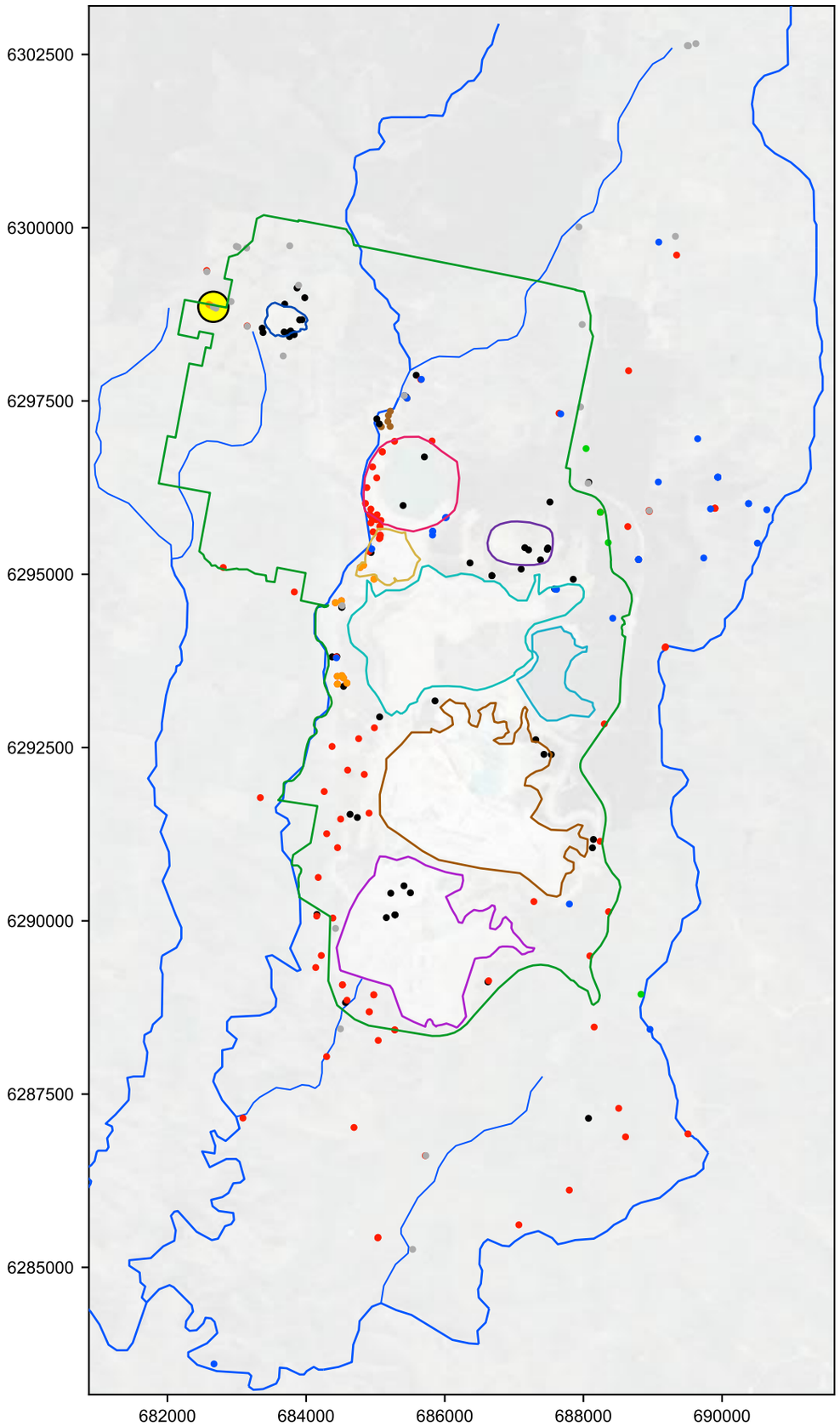
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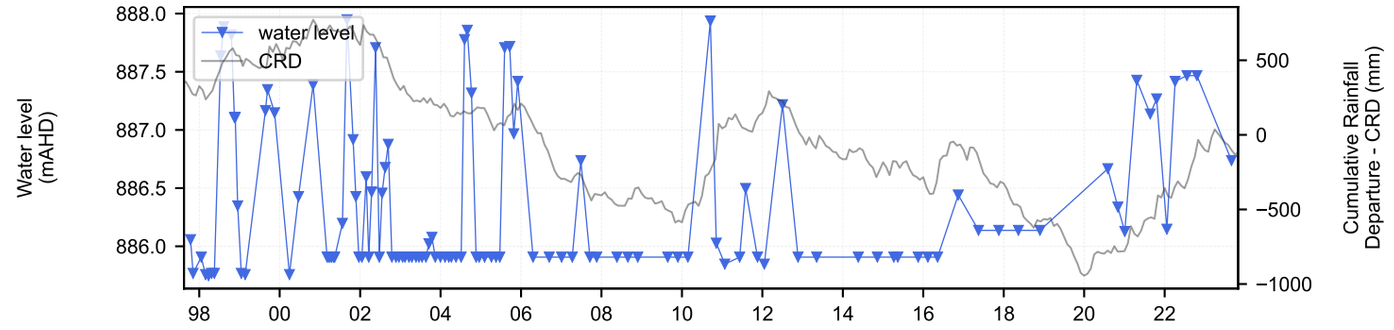
Additional analytes of interest

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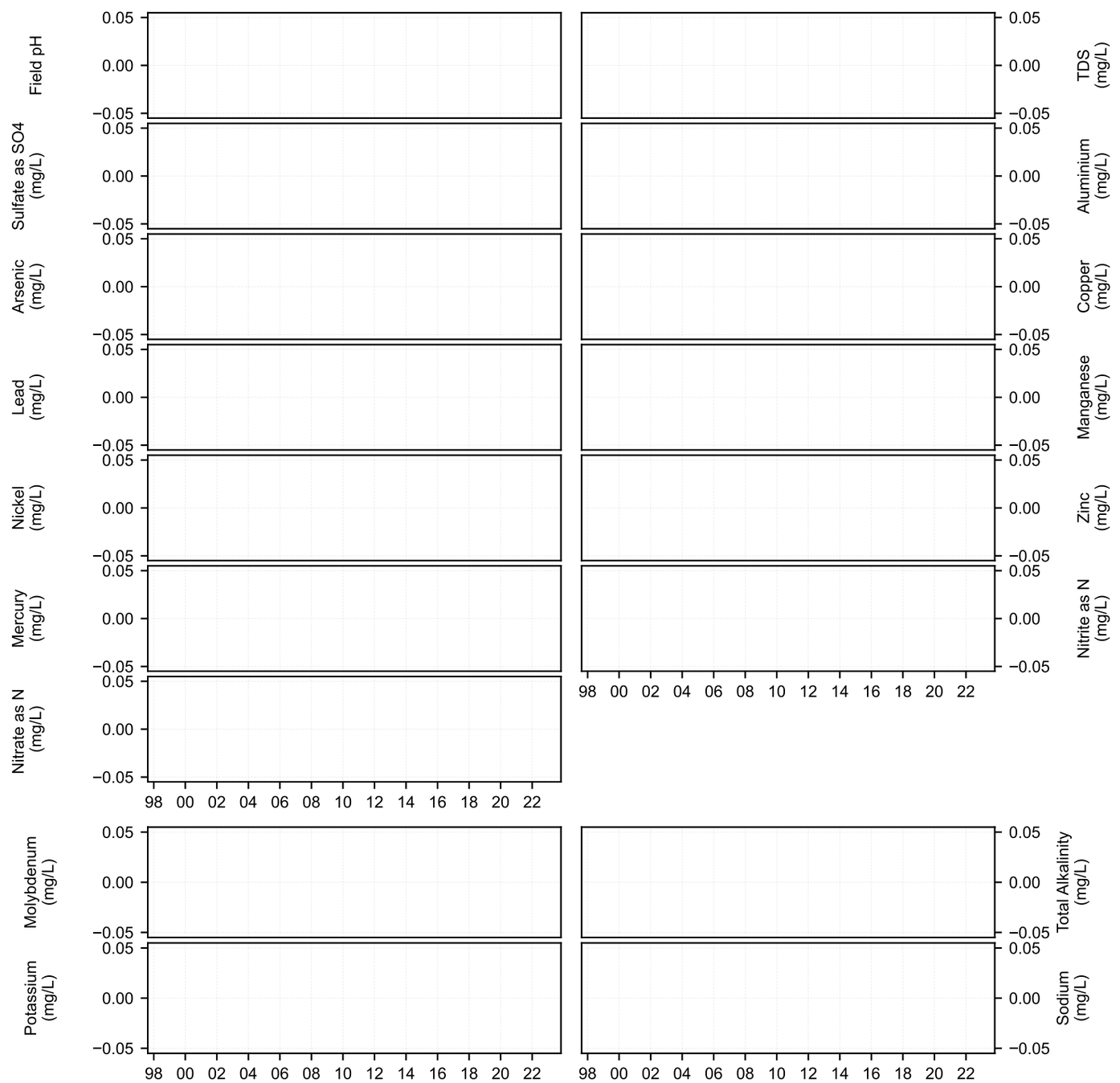
RS10A (Screened geology - Tertiary basalt; Screened interval: 2.4-2.9 mbgl)



Groundwater levels



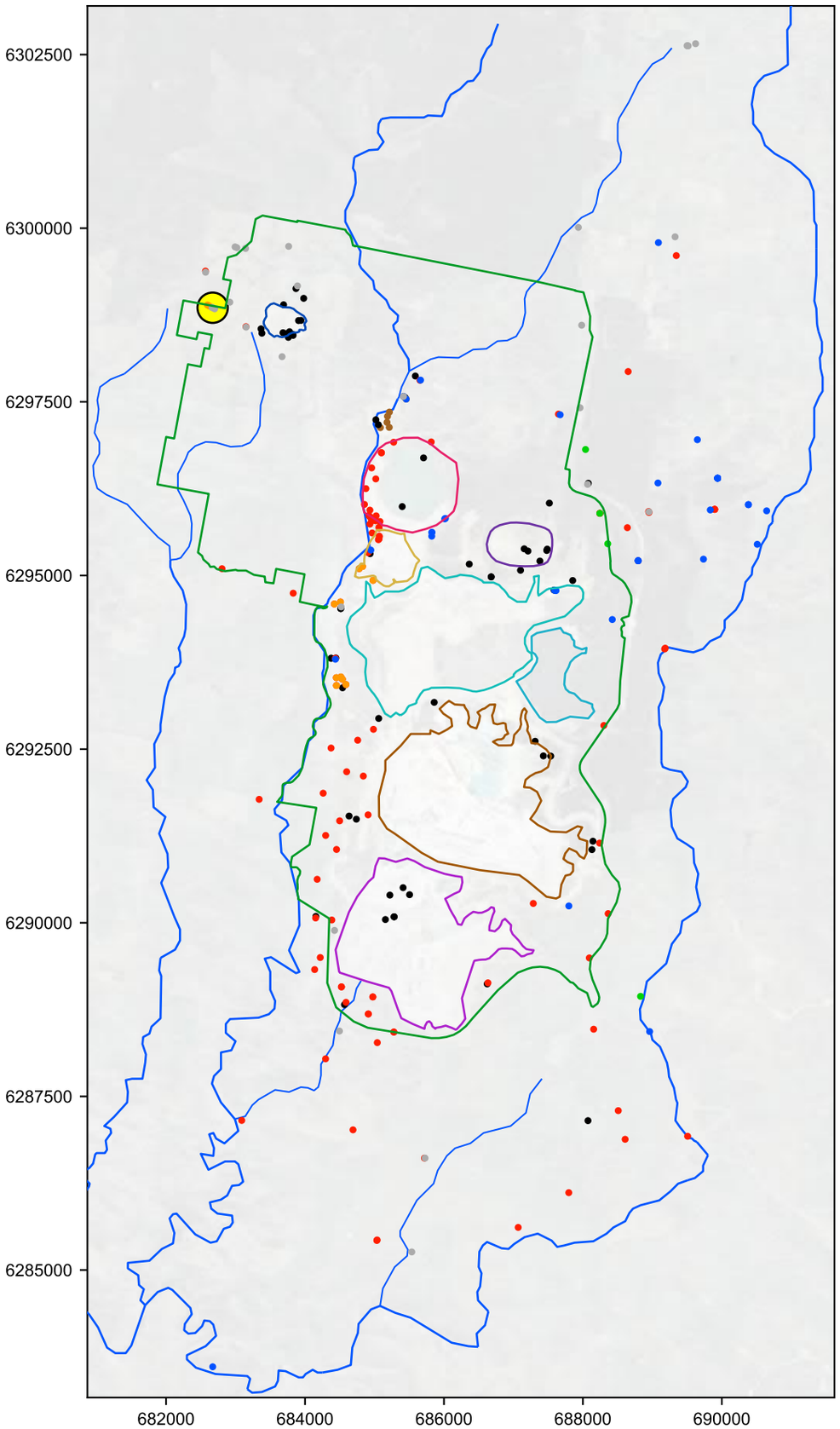
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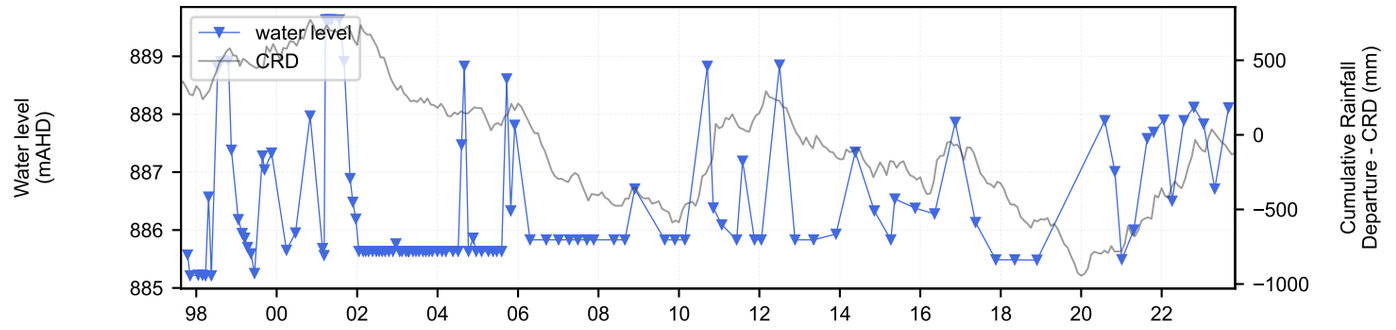
Additional analytes of interest

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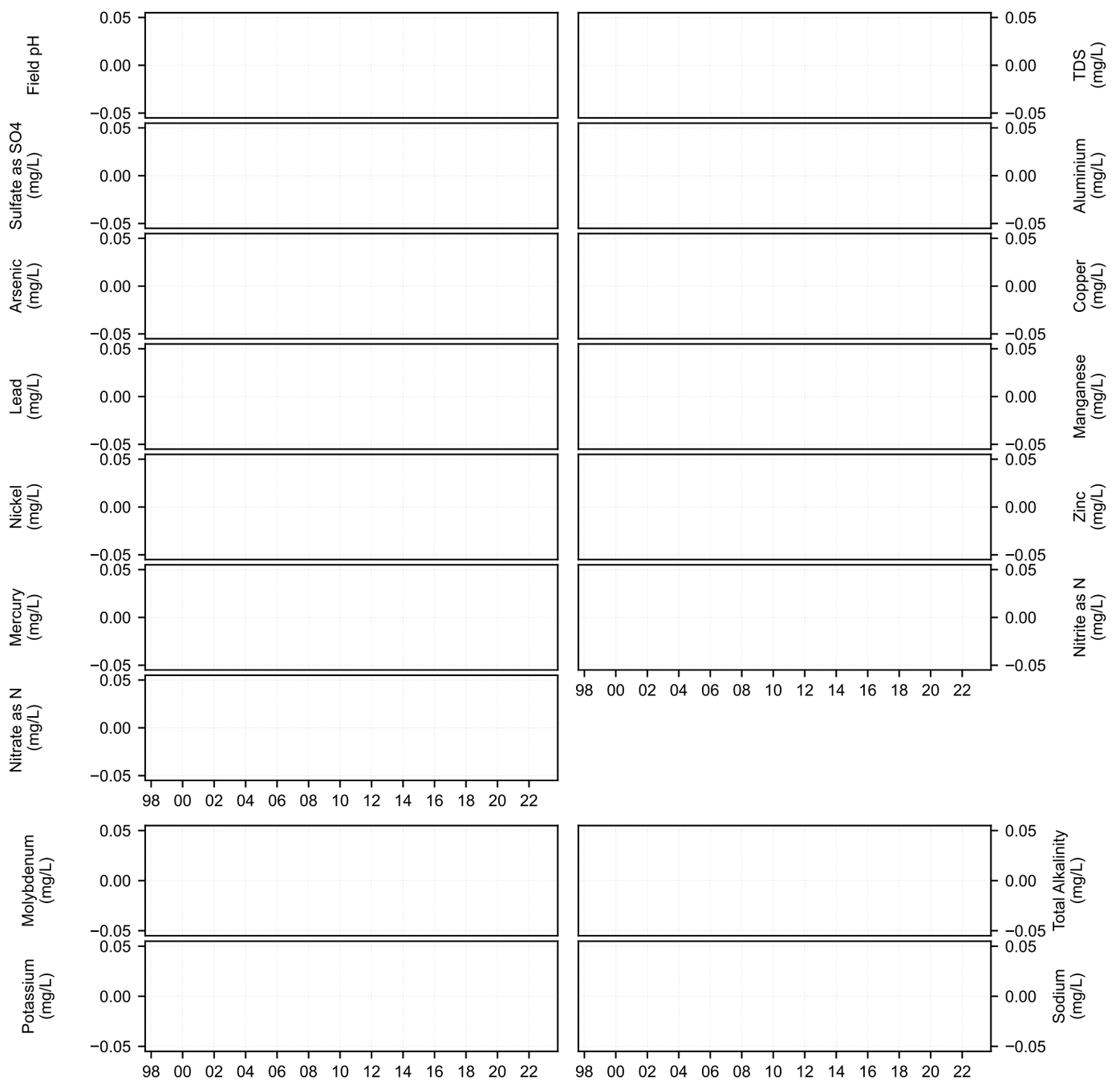
RS10B (Screened geology - Tertiary basalt; Screened interval: 2.5-4.0 mbgl)



Groundwater levels



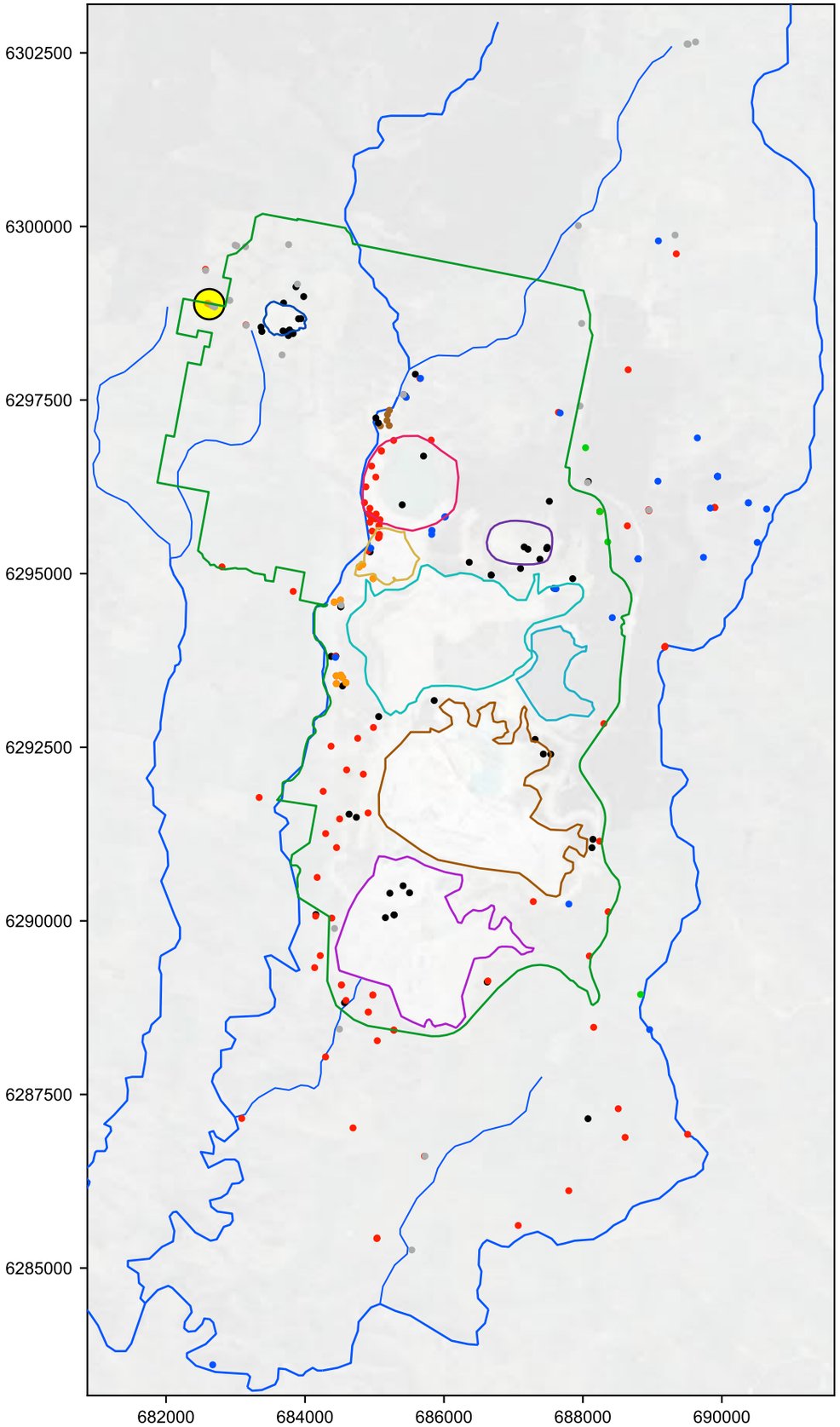
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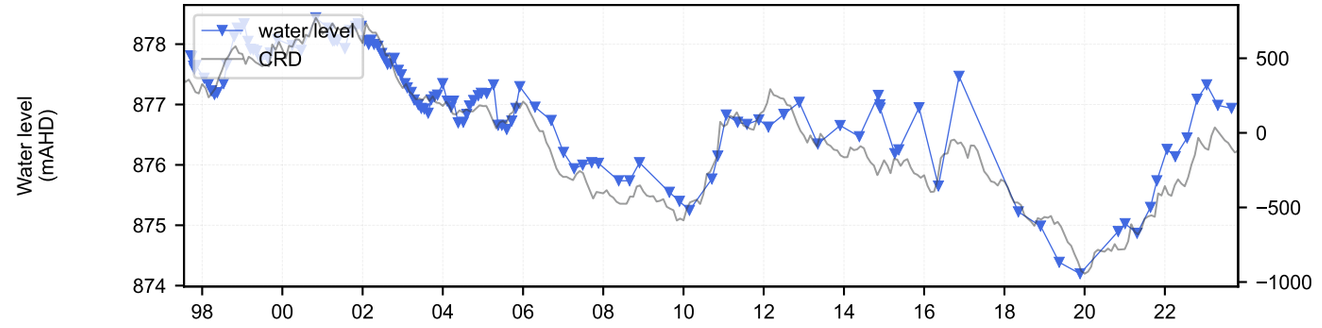
Additional analytes of interest

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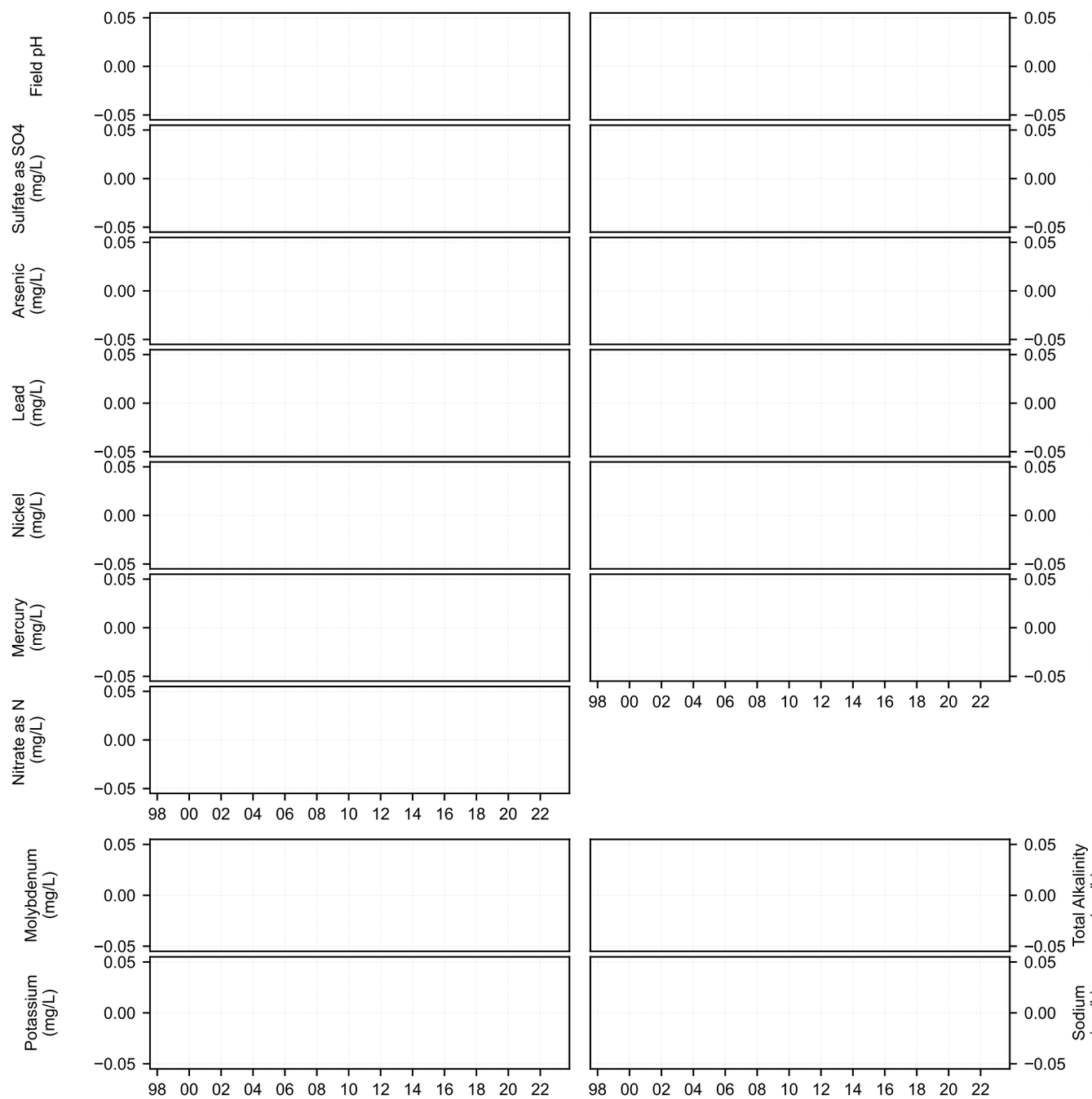
RS11 (Screened geology - Regolith; Screened interval: 9.0-10.5 mbgl)



Groundwater levels



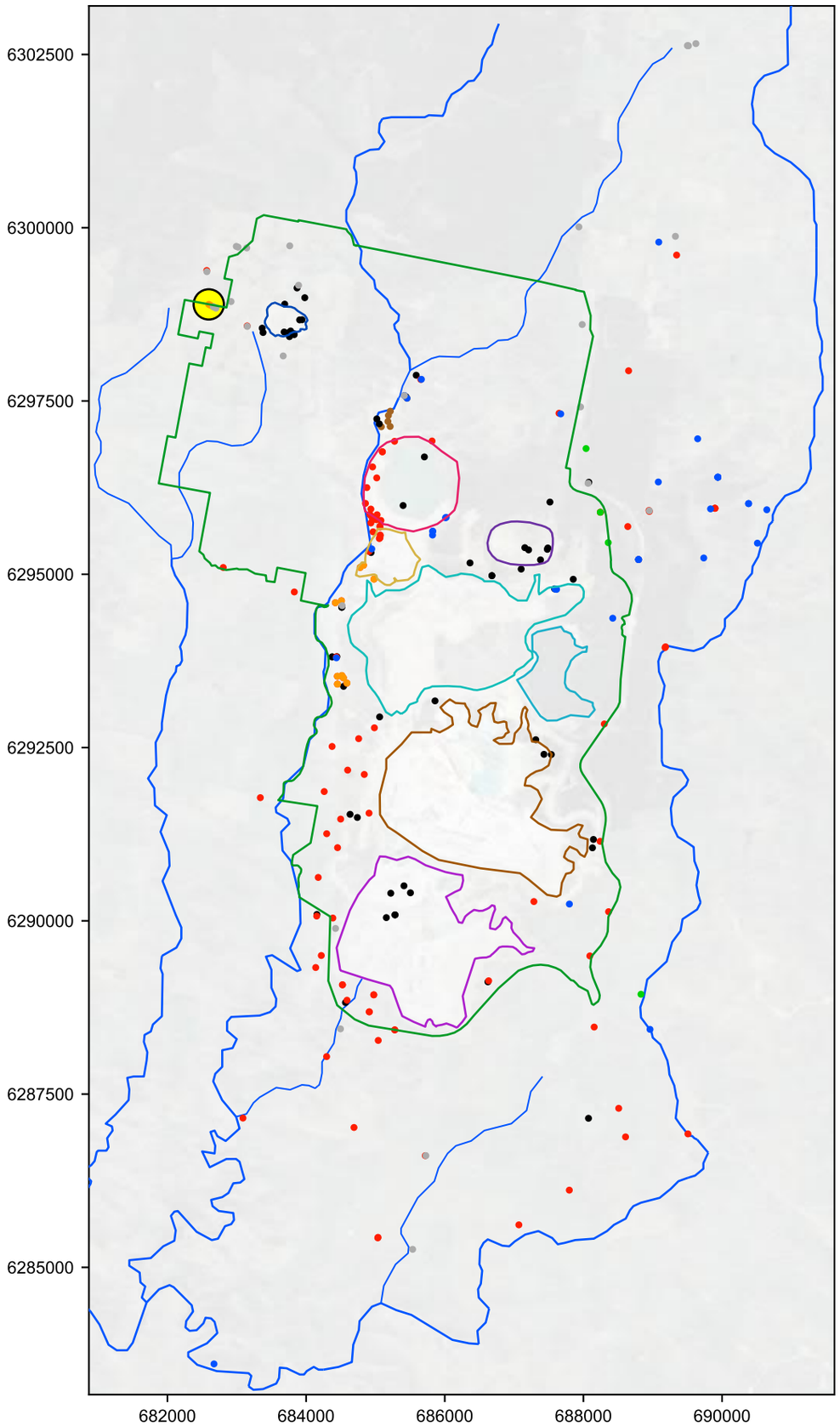
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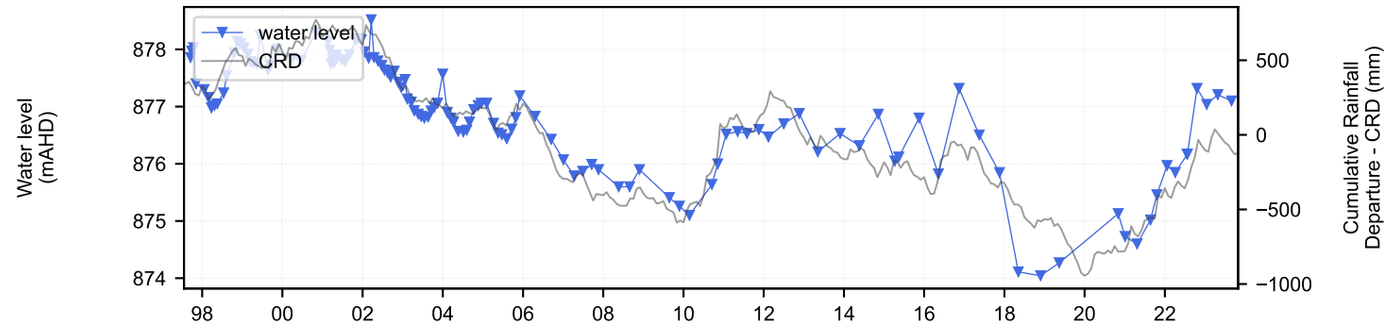
Additional analytes of interest

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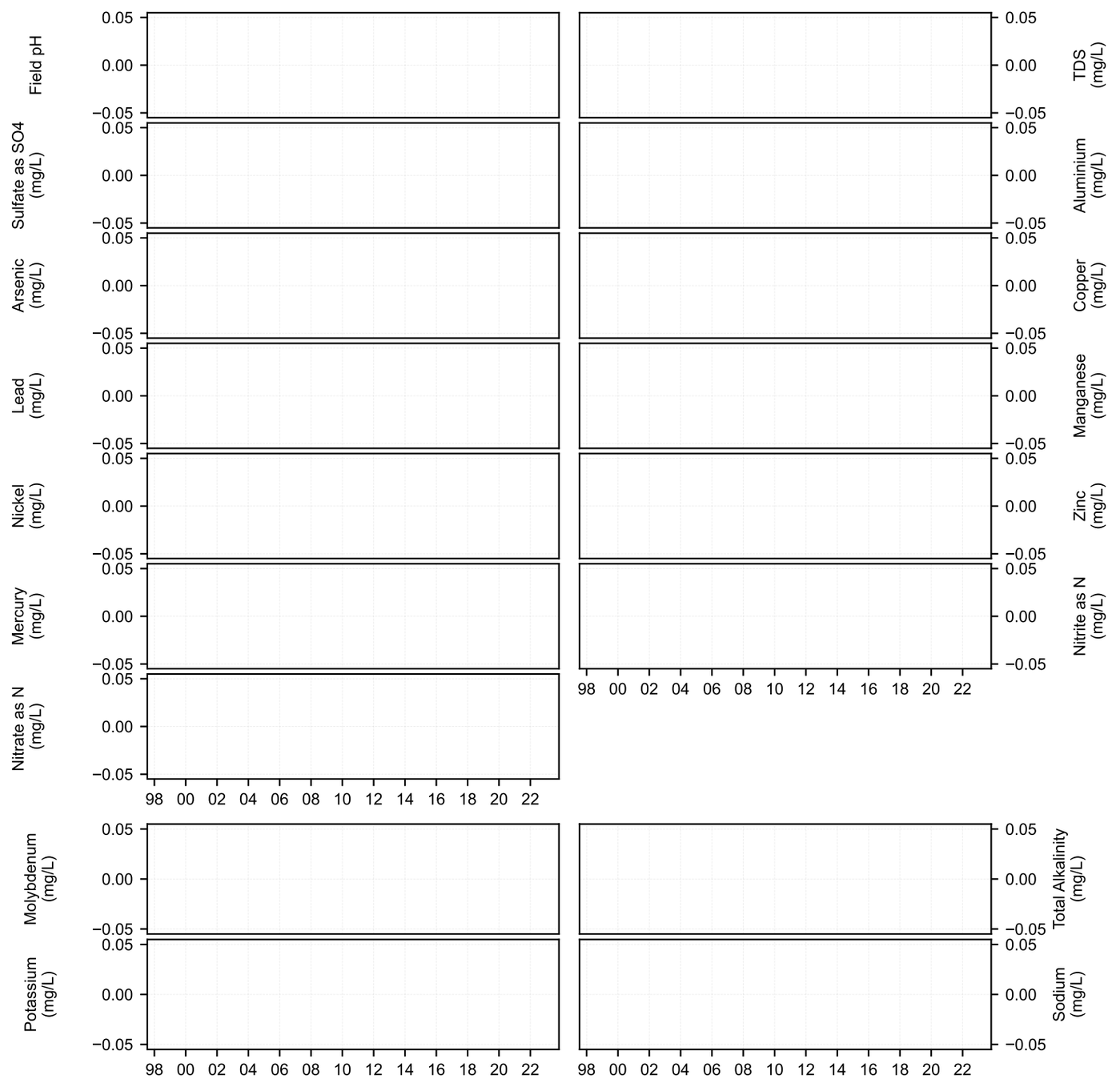
RS12 (Screened geology - Regolith; Screened interval: 5.0-8.0 mbgl)



Groundwater levels



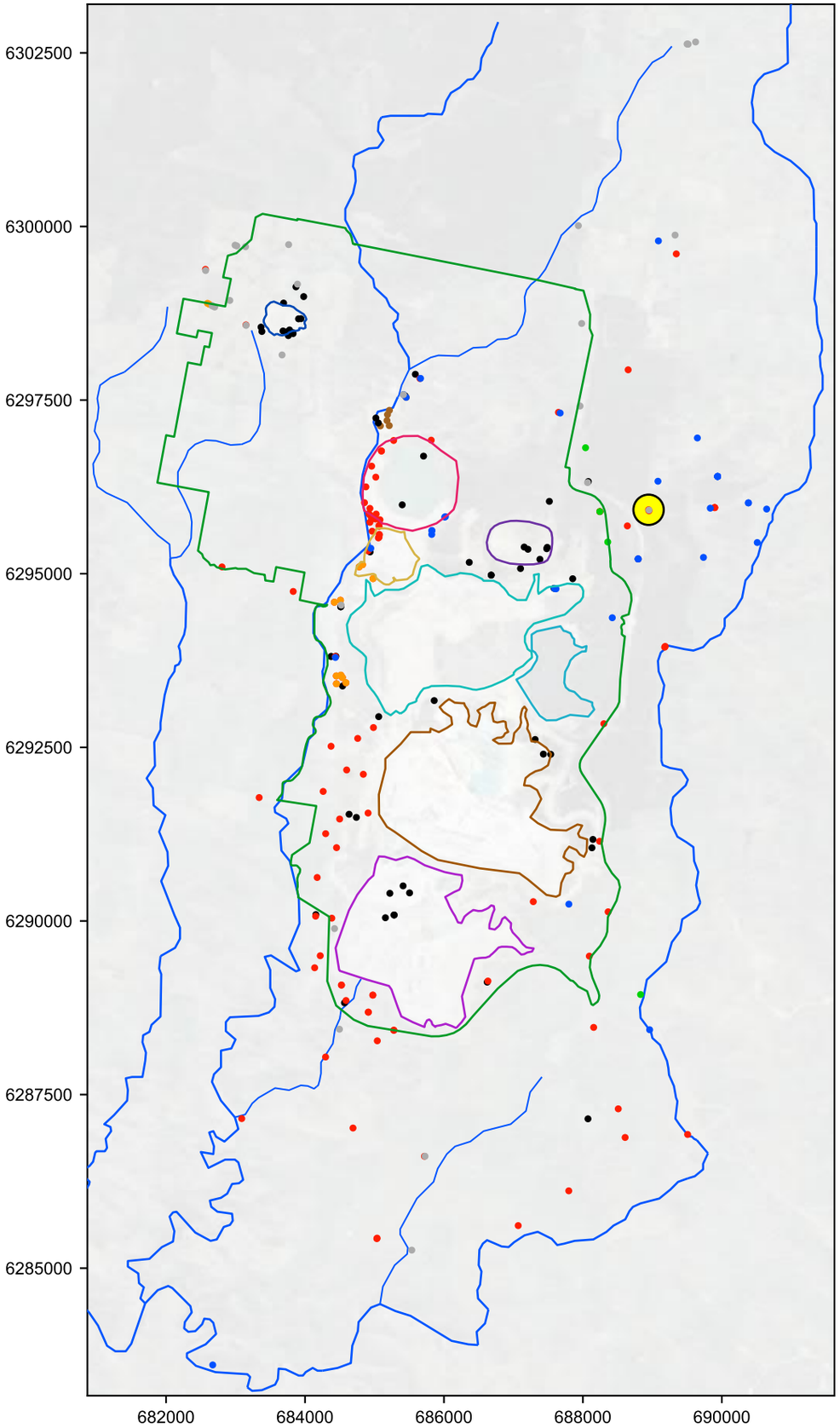
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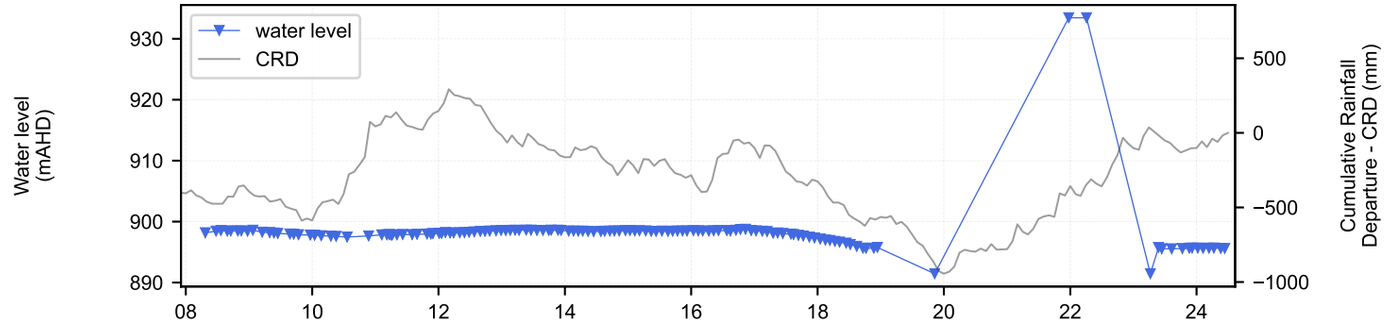
Additional analytes of interest

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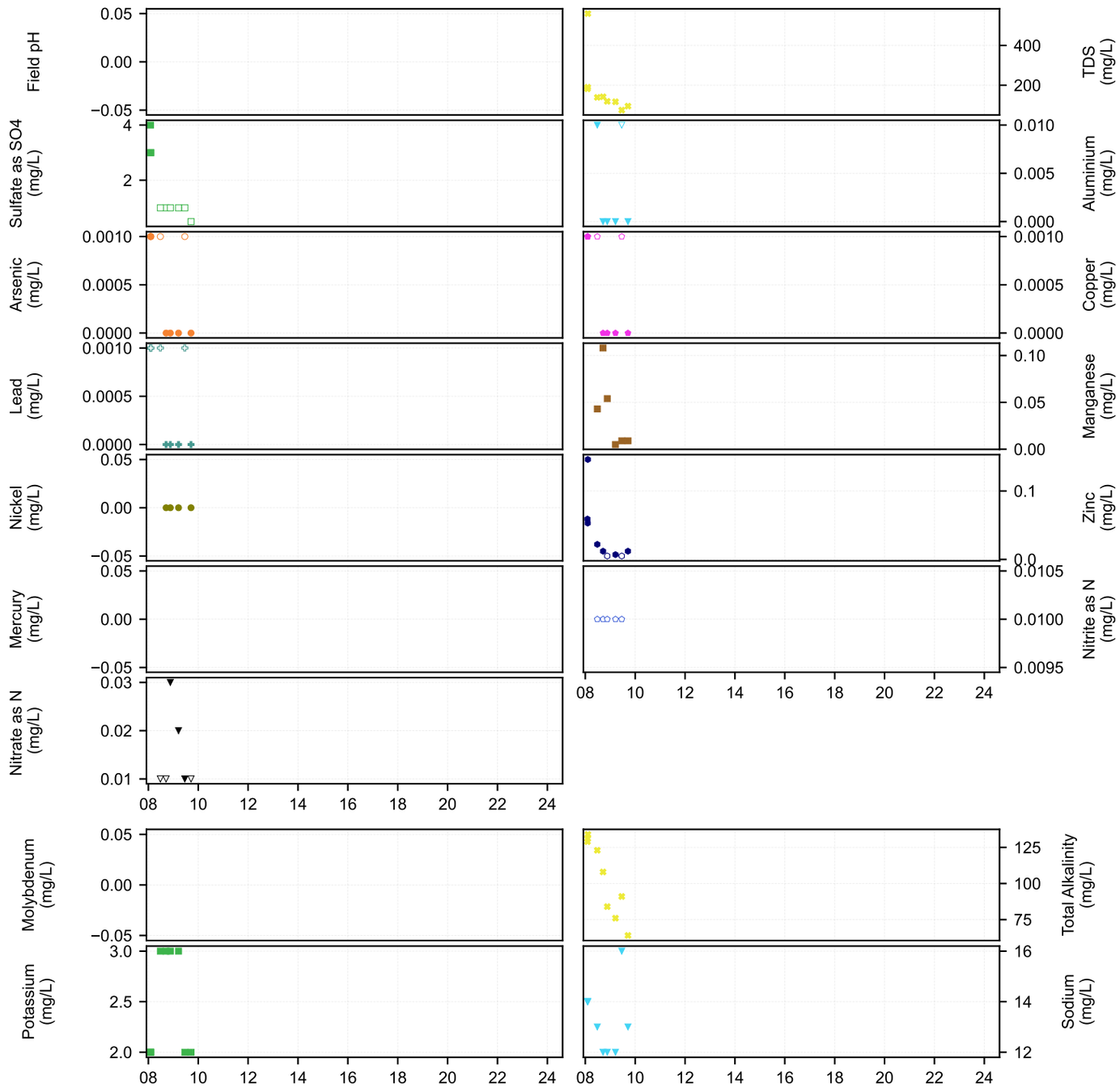
MB43 (Screened geology - Ordovician; Screened interval: 75-175 mbgl)



Groundwater levels



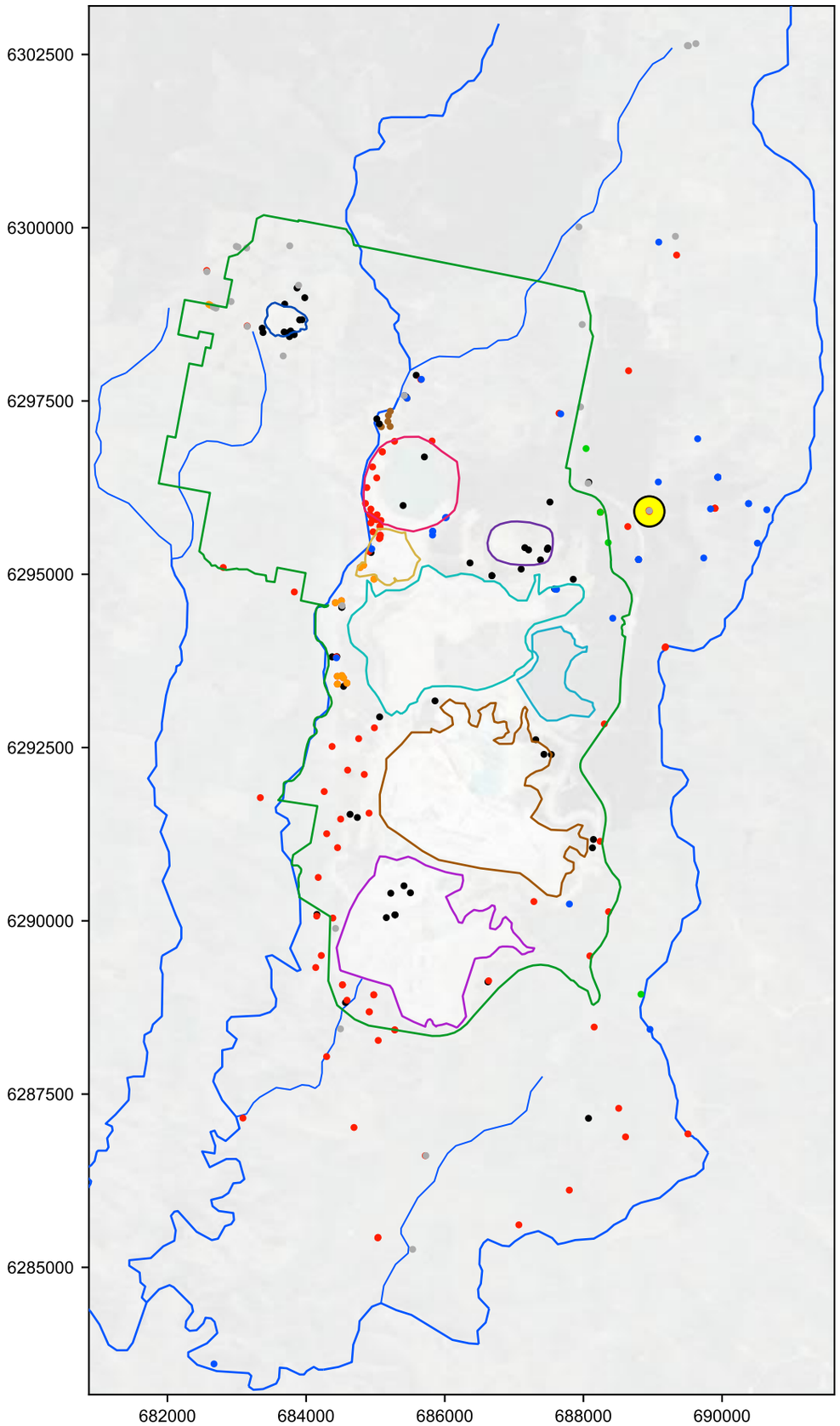
WMP defined analytes



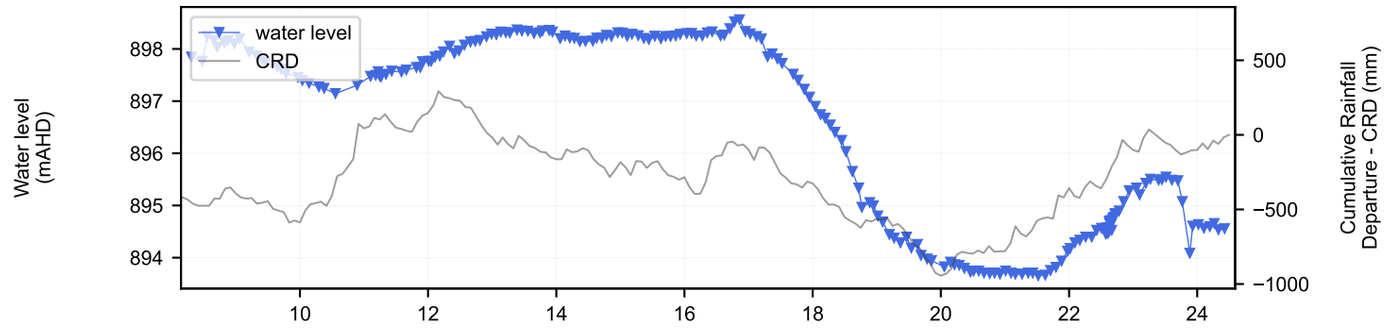
Additional analytes of interest

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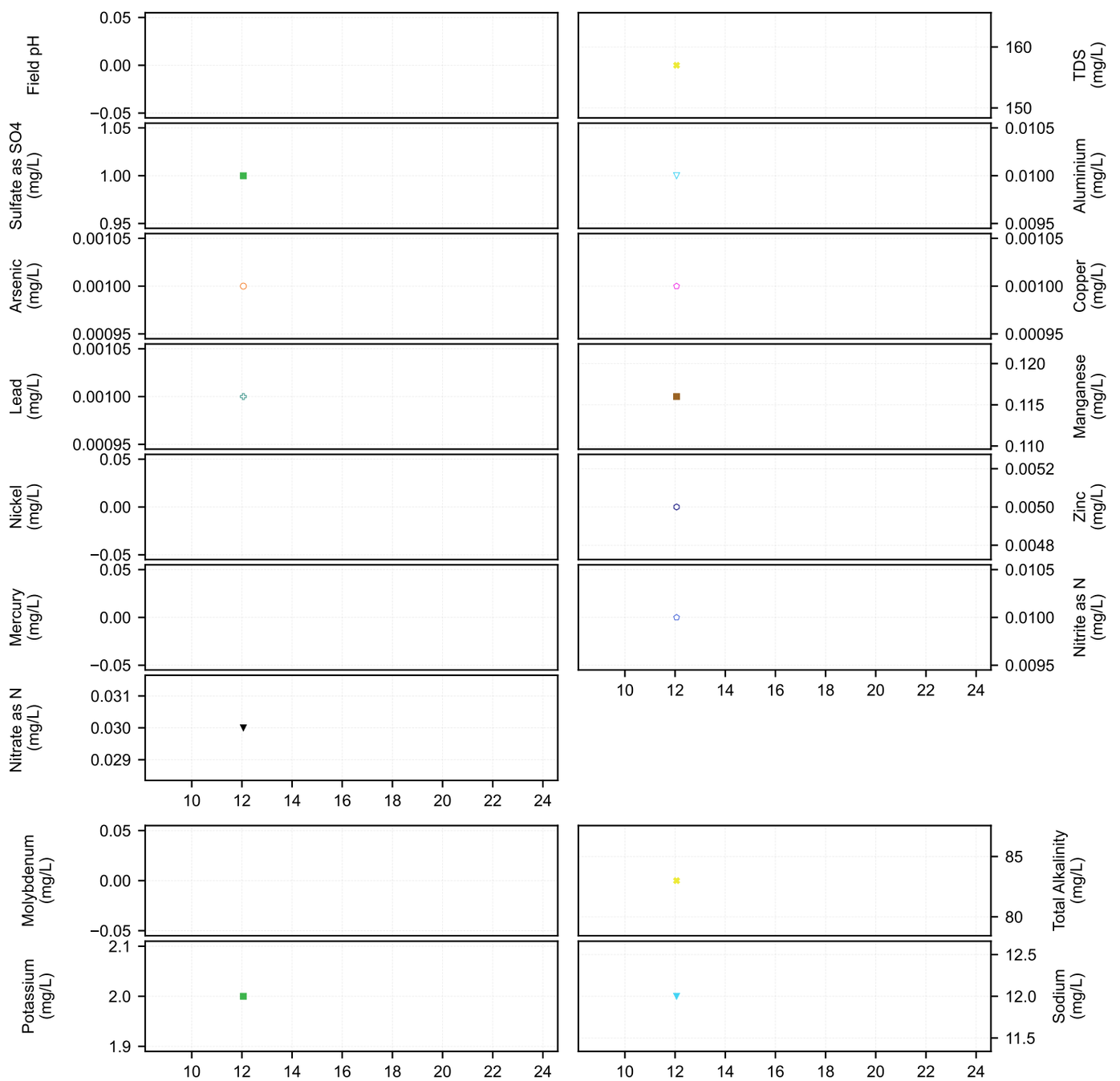
MB44A (Screened geology - Ordovician; Screened interval: 82-142 mbgl)



Groundwater levels



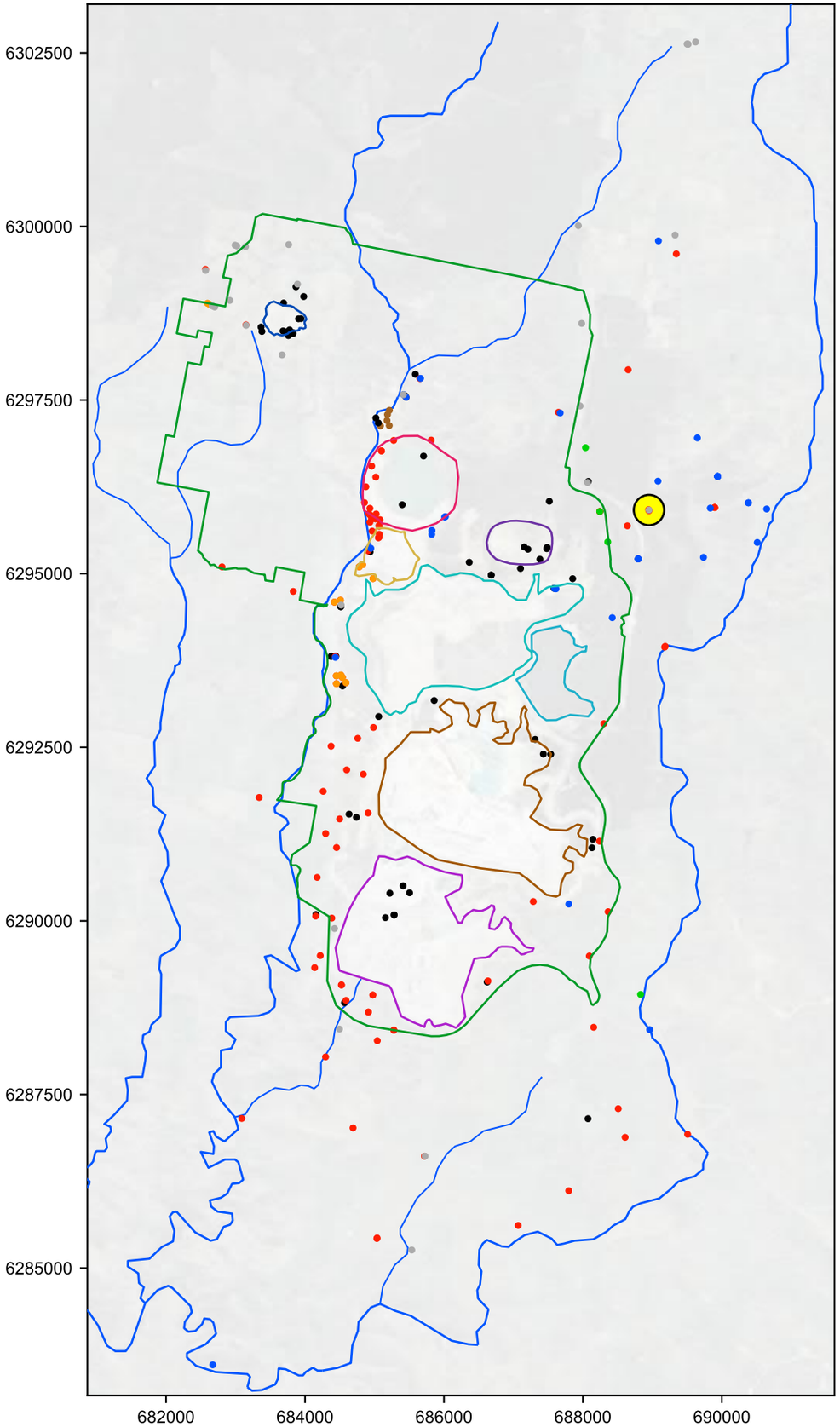
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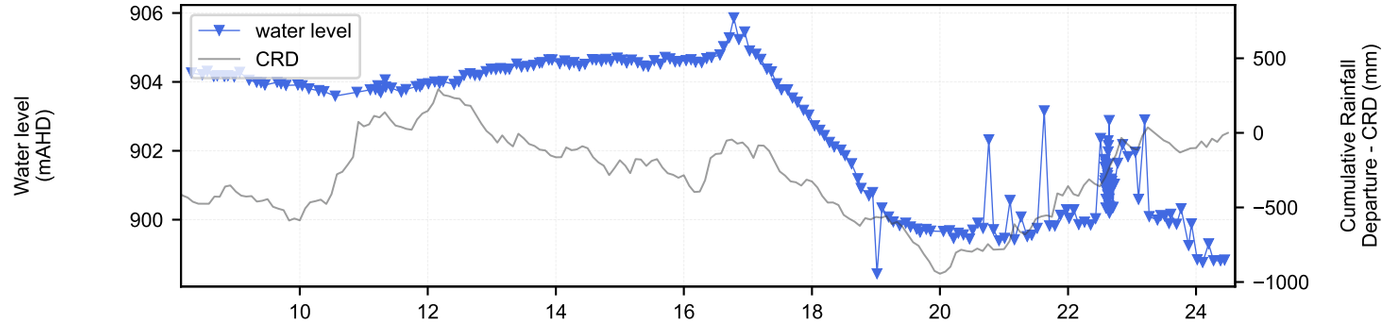
Additional analytes of interest

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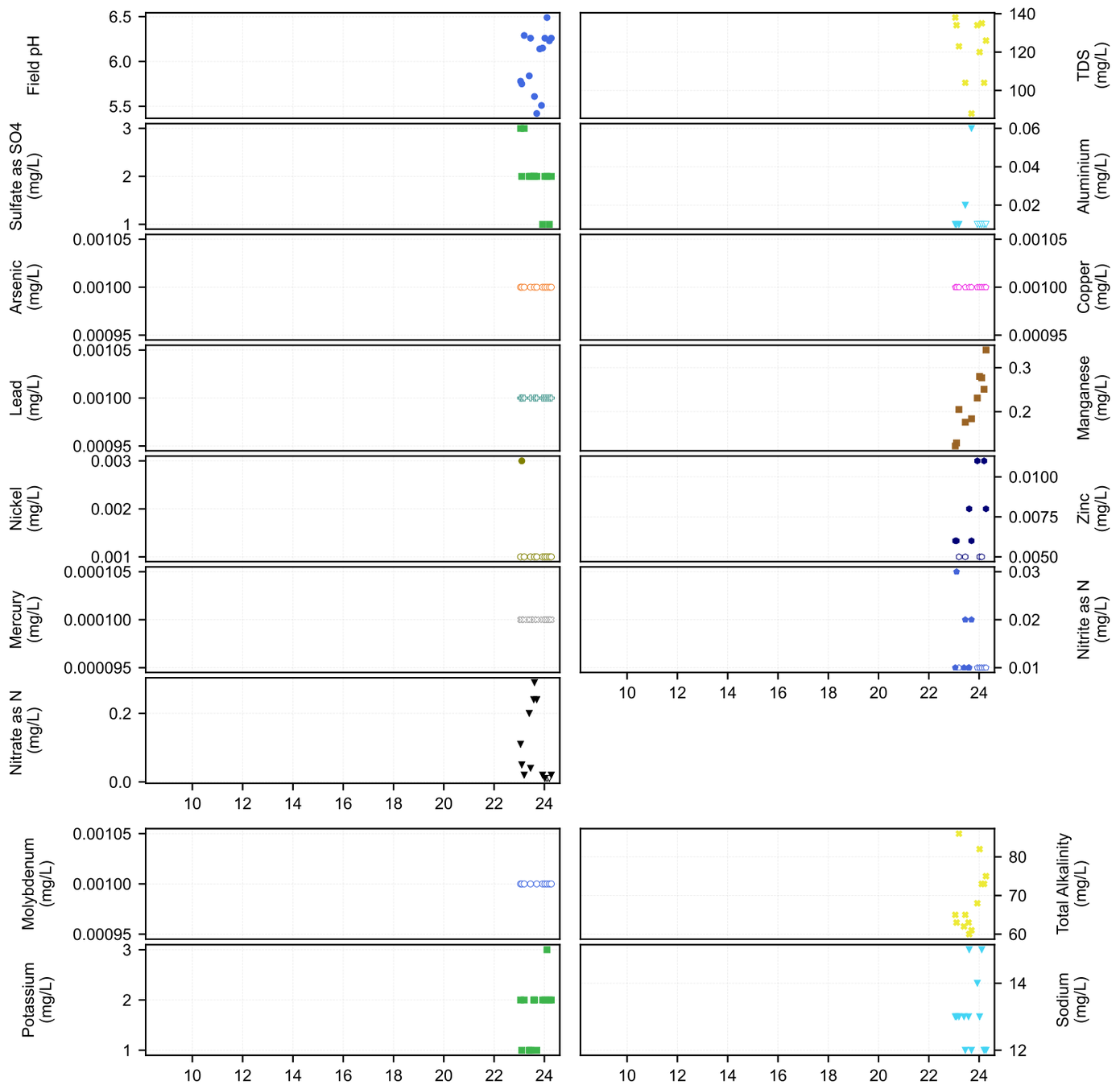
MB44B (Screened geology - Tertiary basalt; Screened interval: 26-47 mbgl)



Groundwater levels



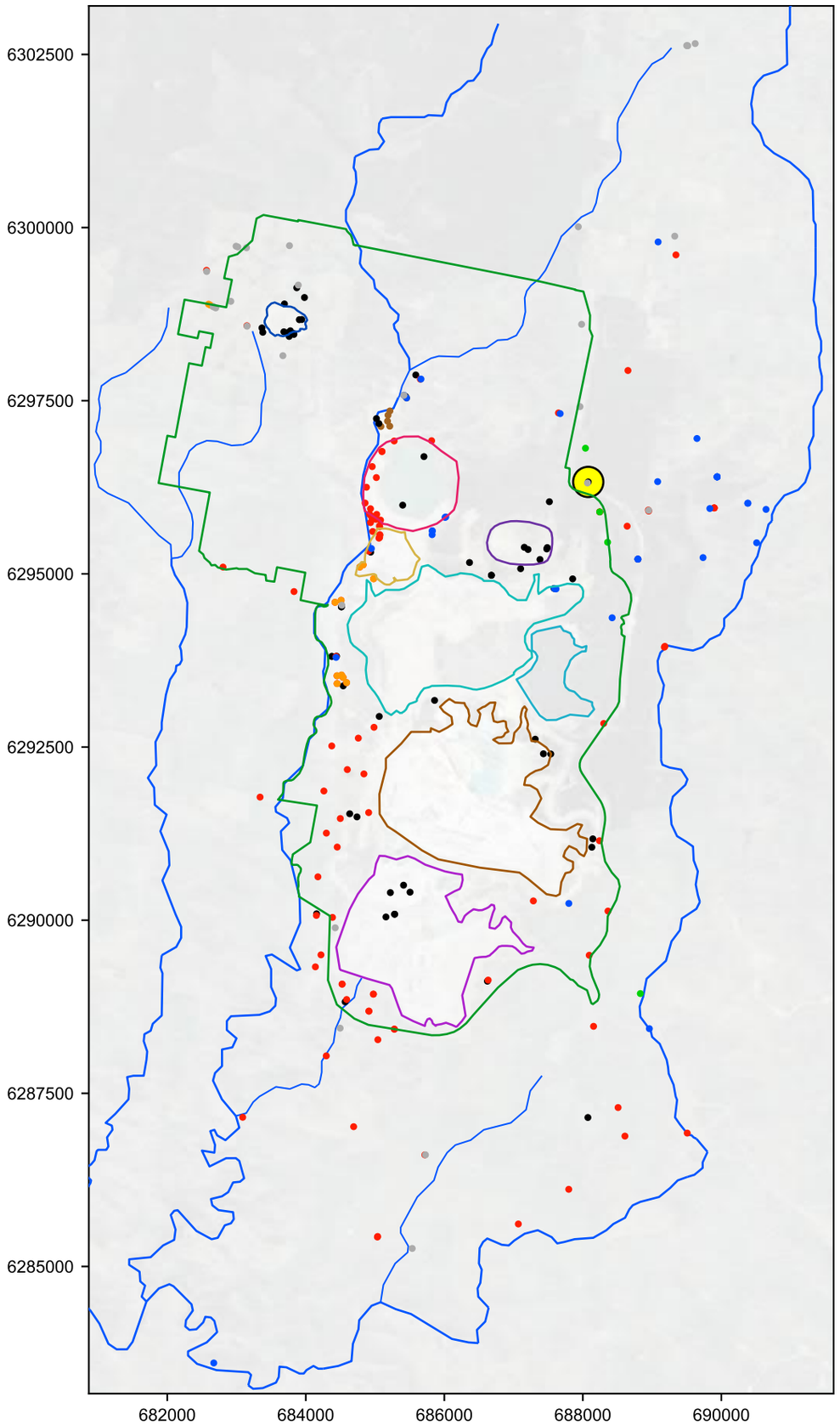
WMP defined analytes



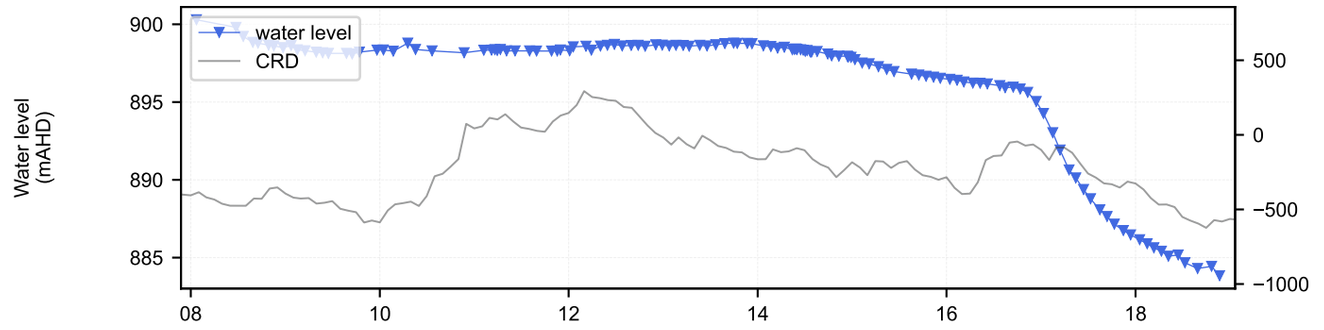
Additional analytes of interest

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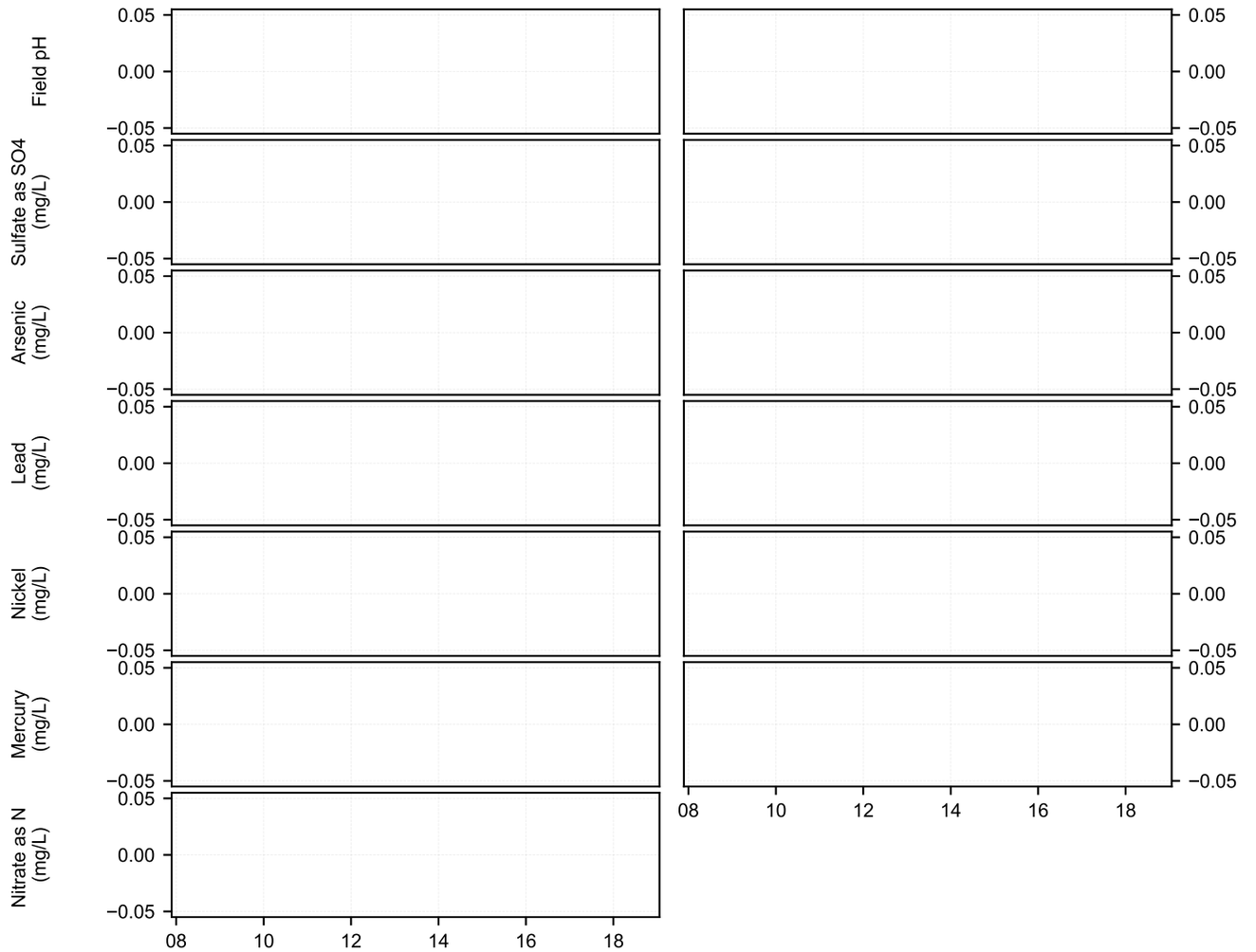
MB45 (Screened geology - Inactive; Screened interval: 84-90 mbgl)



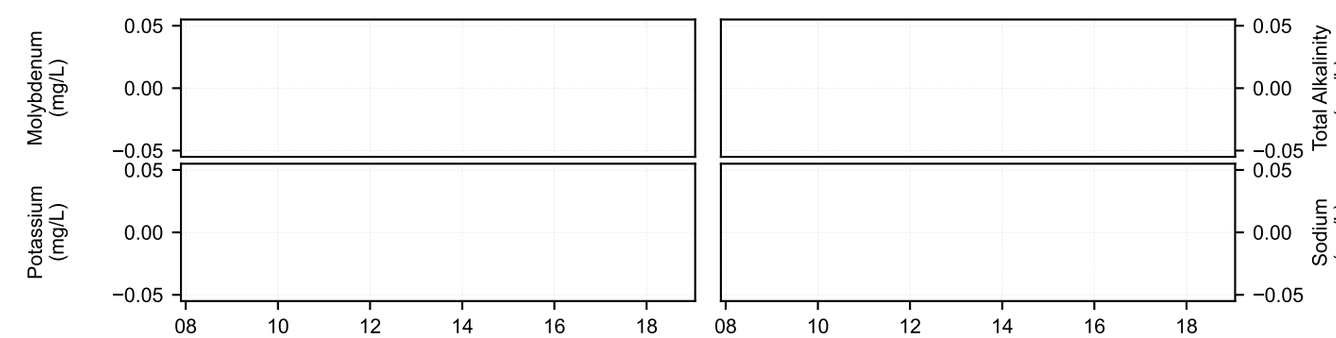
Groundwater levels



WMP defined analytes

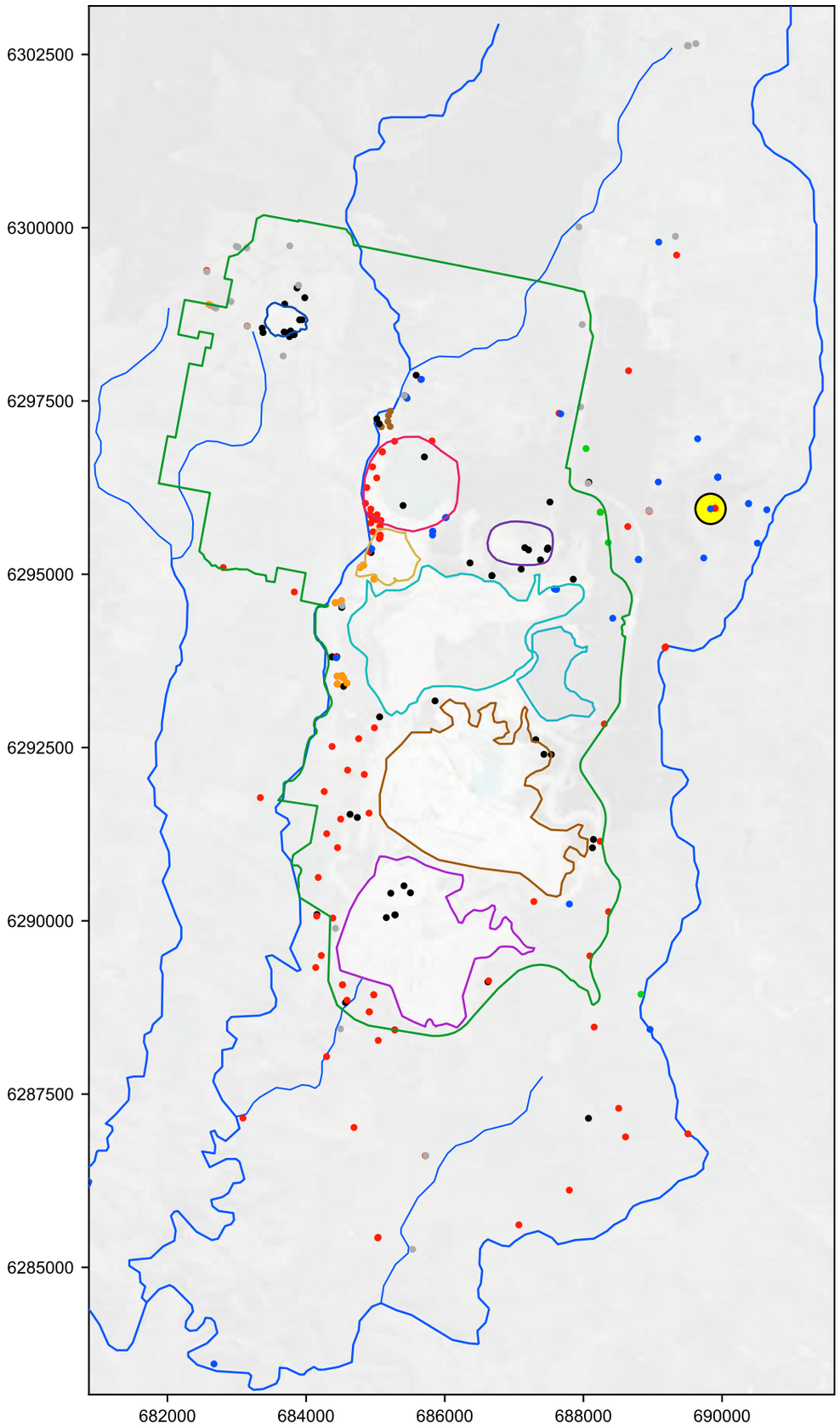


Additional analytes of interest

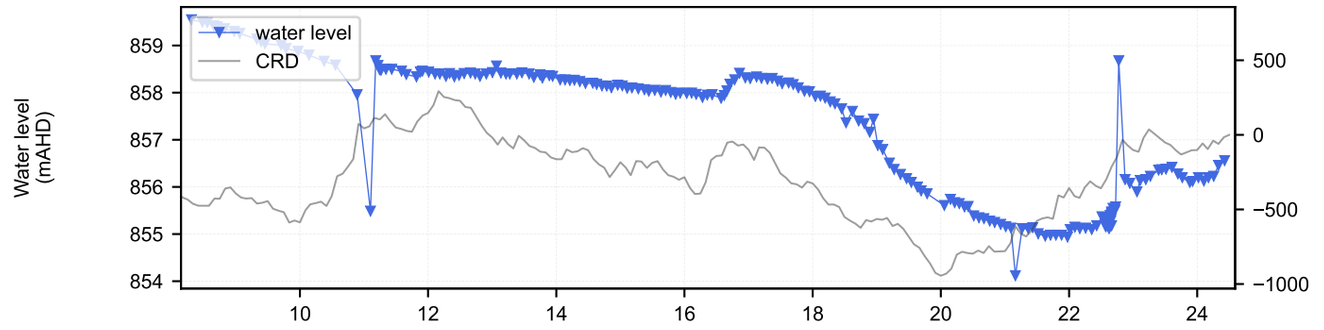


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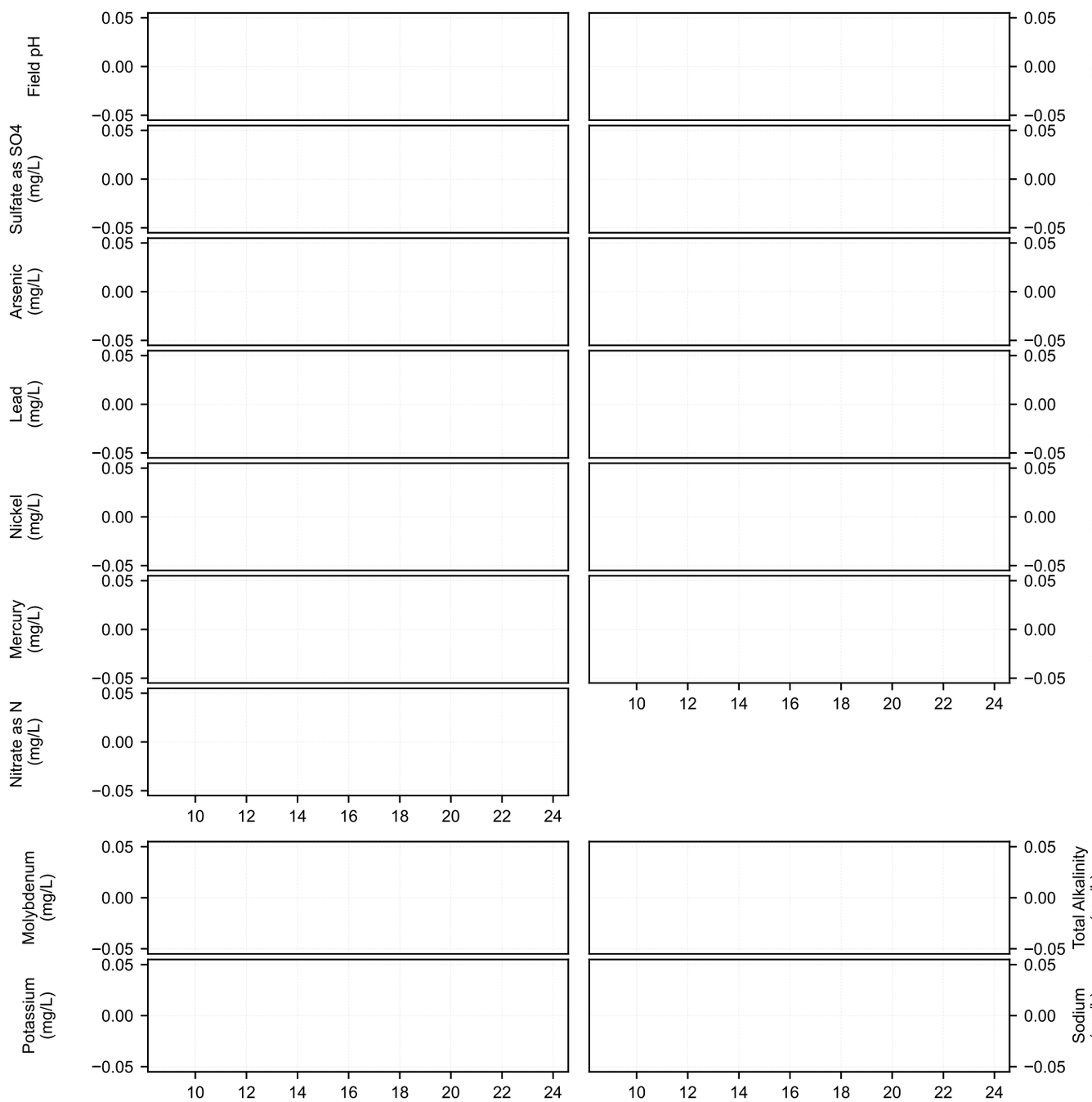
MB46 (Screened geology - Silurian; Screened interval: 55-88 mbgl)



Groundwater levels



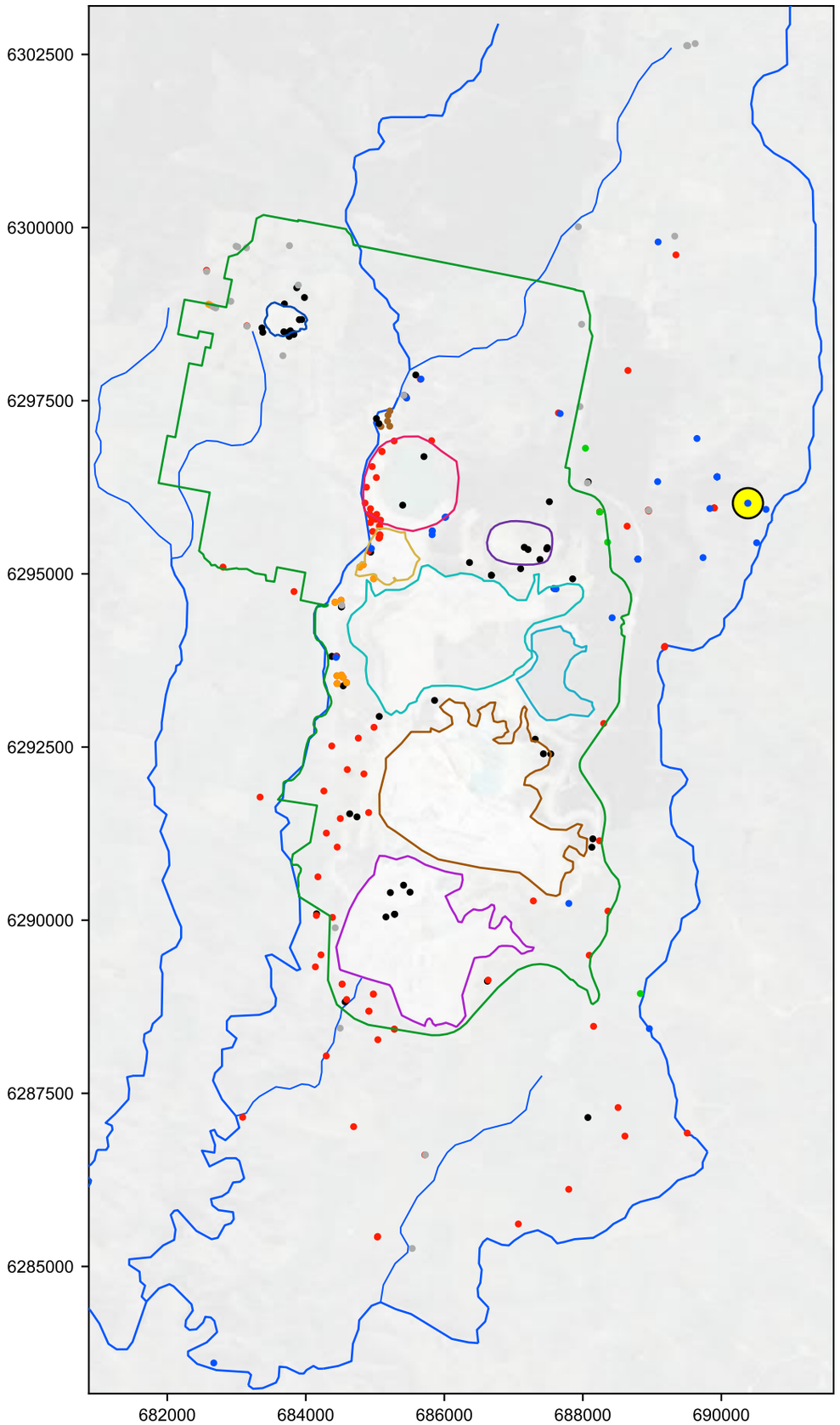
WMP defined analytes



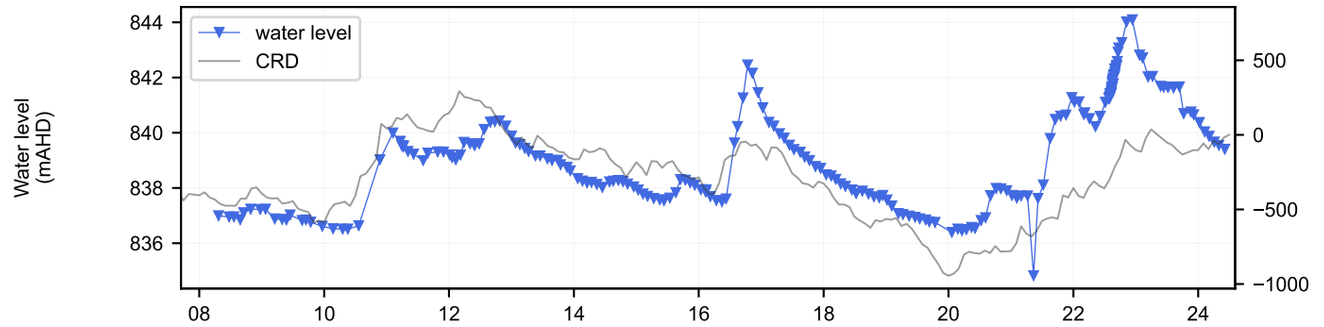
Additional analytes of interest

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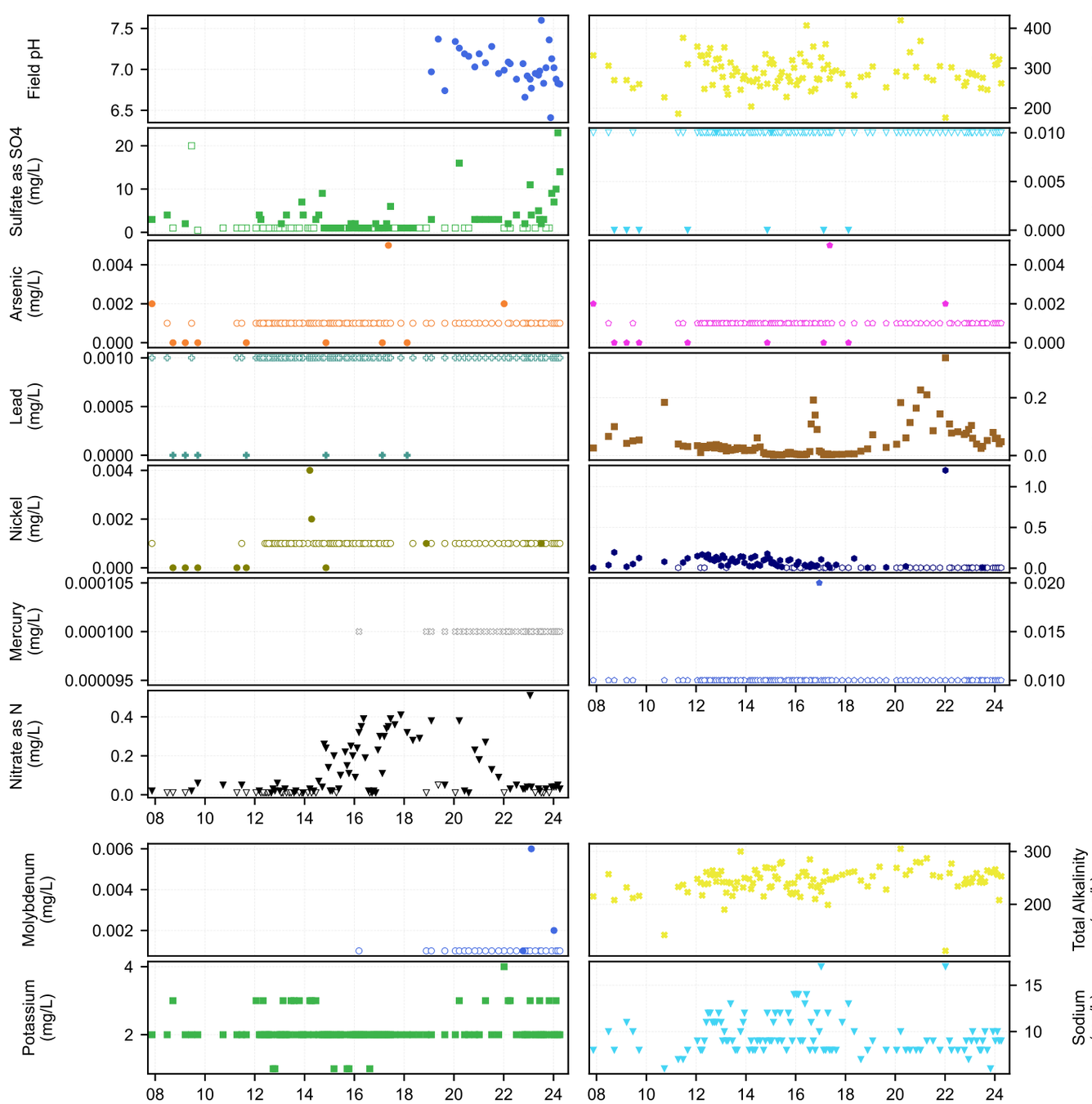
MB47A (Screened geology - Silurian; Screened interval: 152-182 mbgl)



Groundwater levels



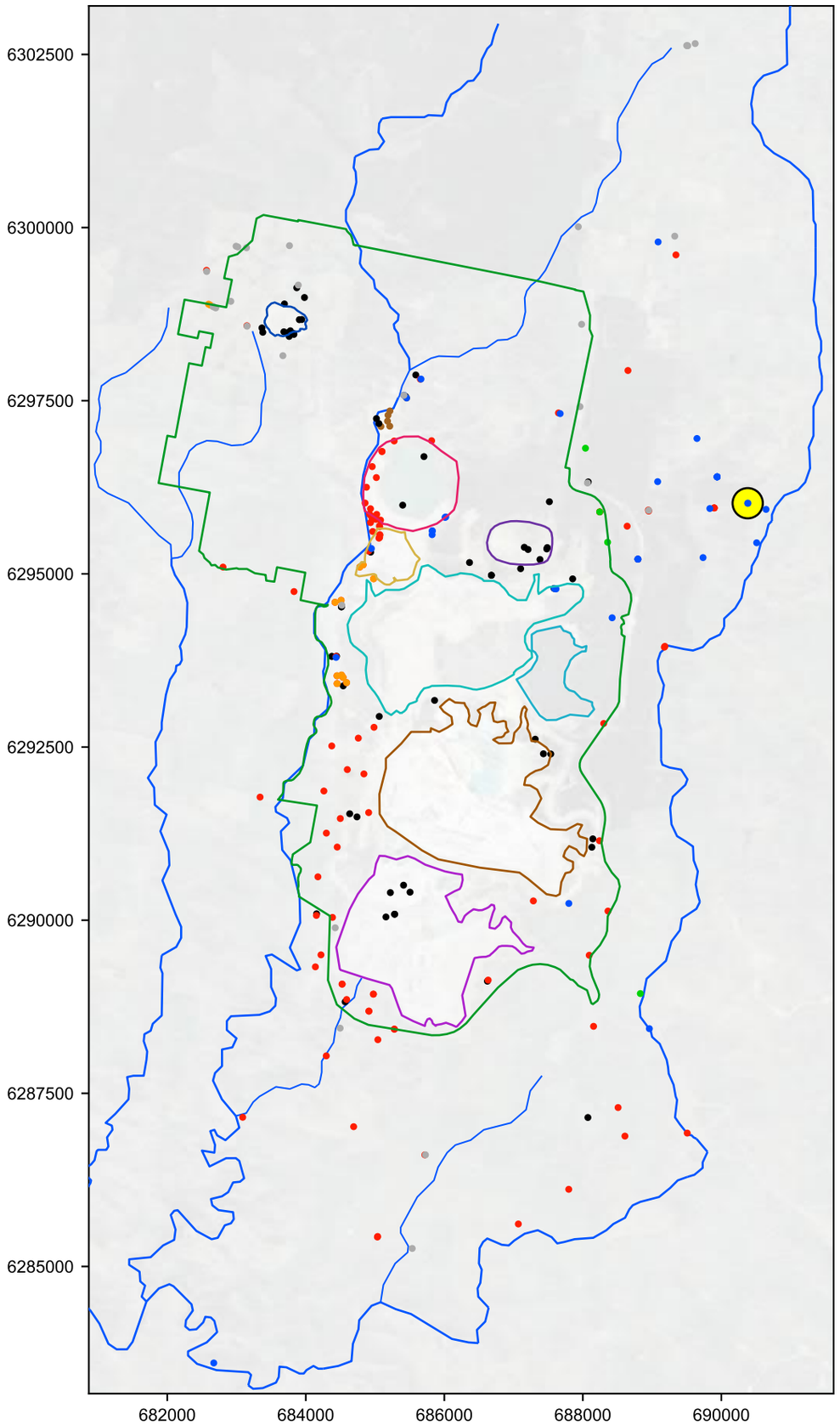
WMP defined analytes



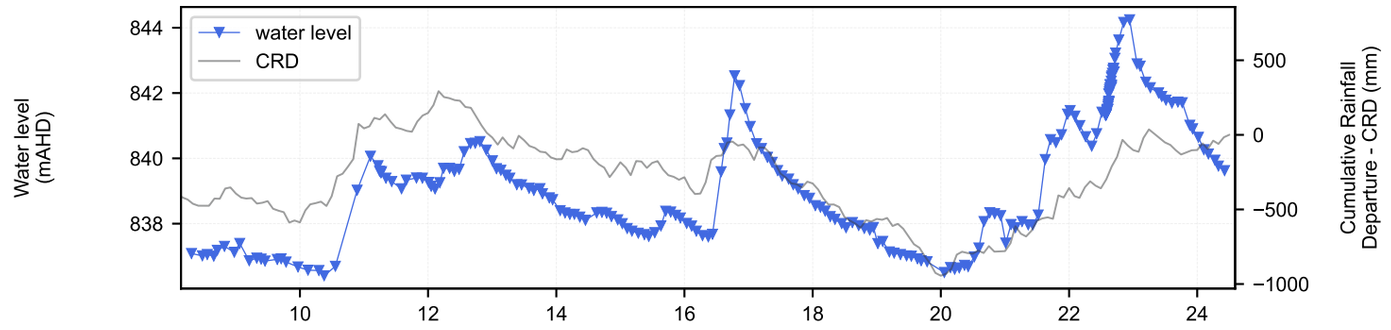
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

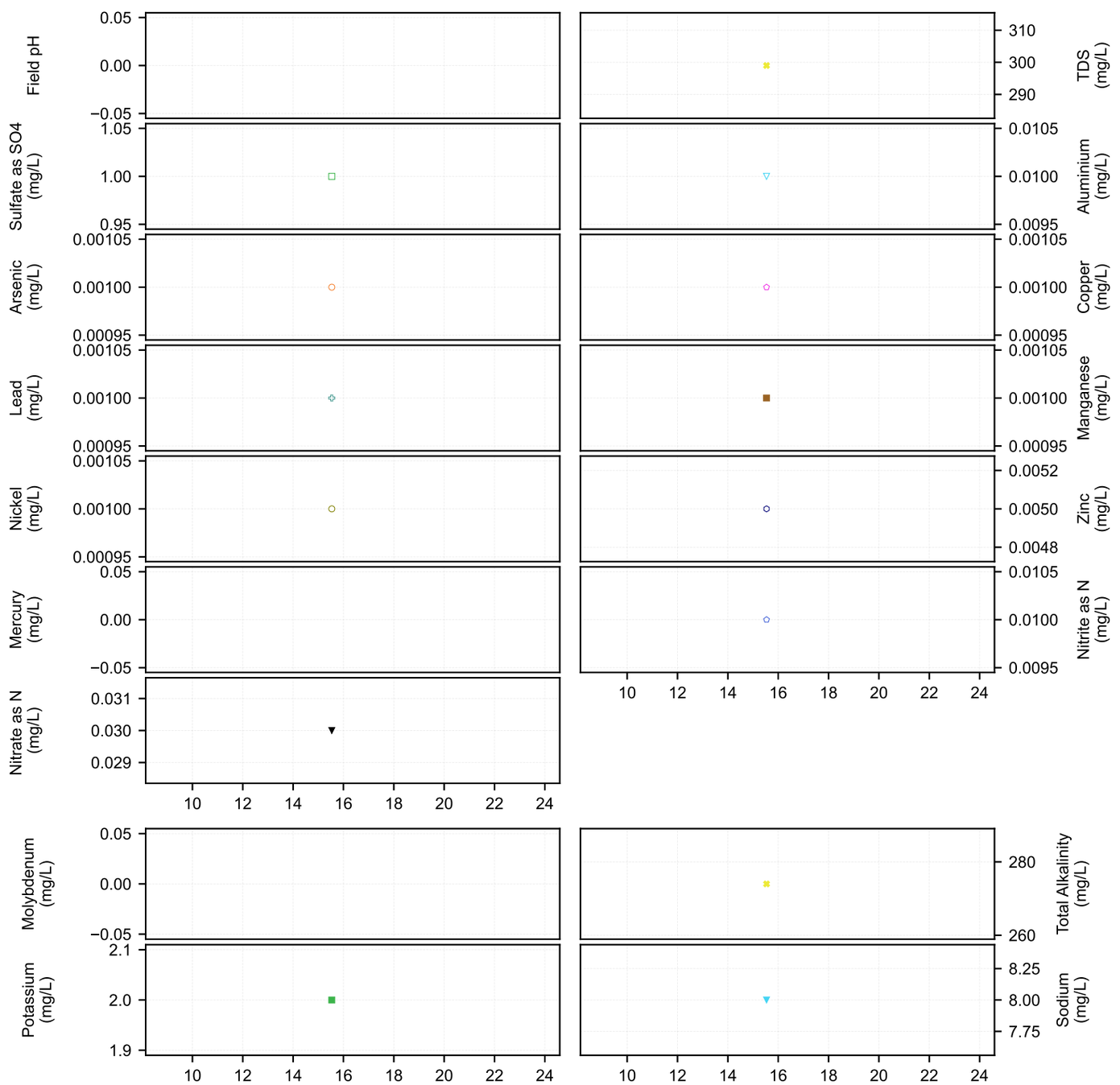
MB47B (Screened geology - Silurian; Screened interval: 40-72 mbgl)



Groundwater levels



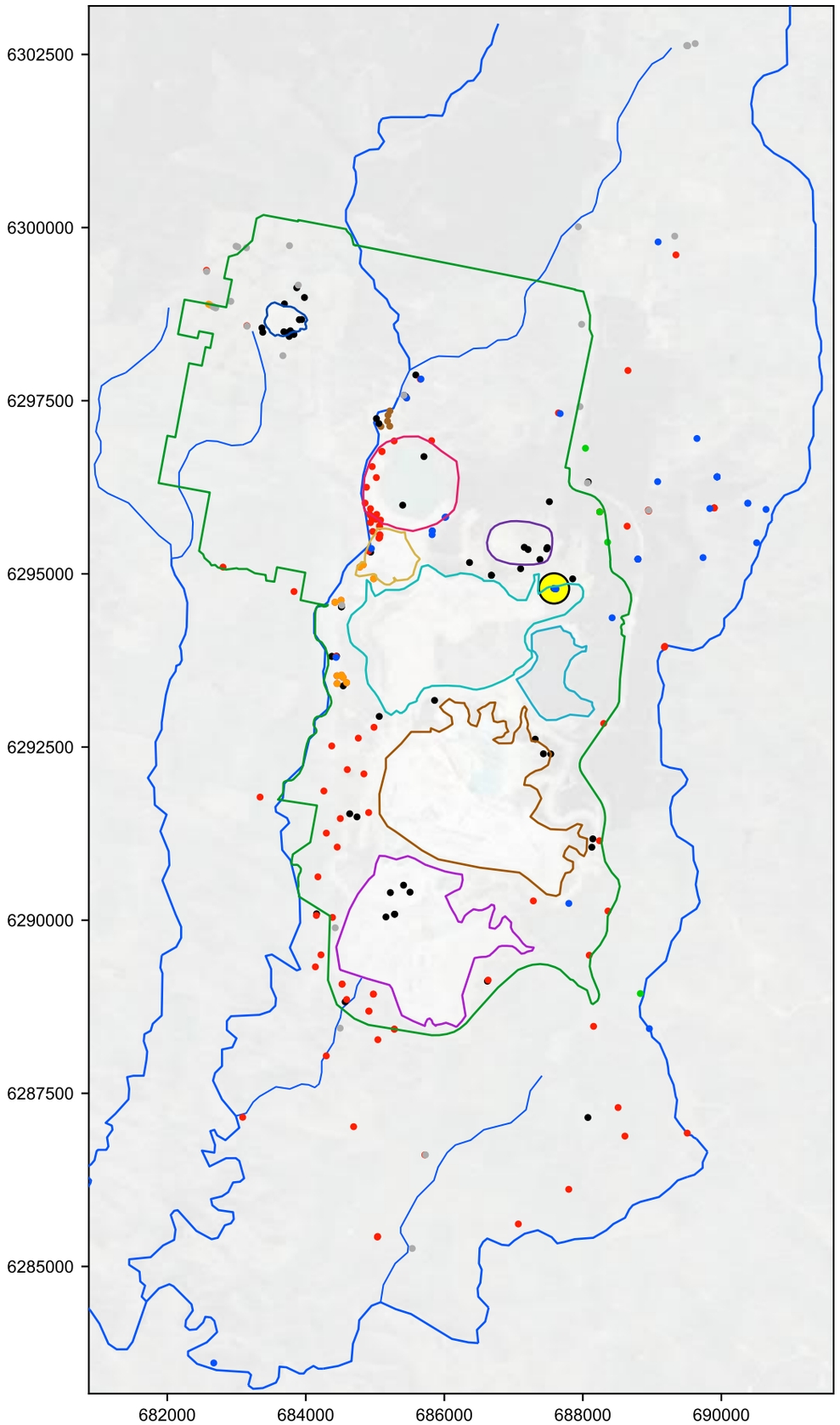
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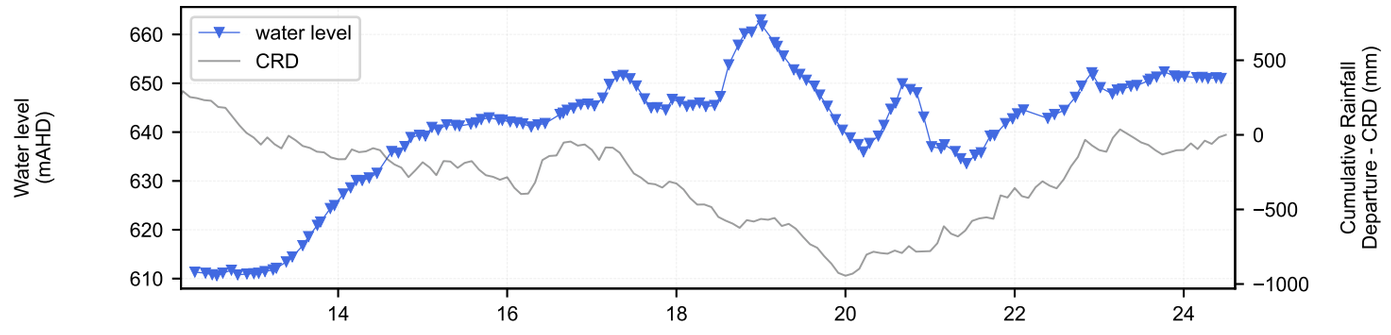
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

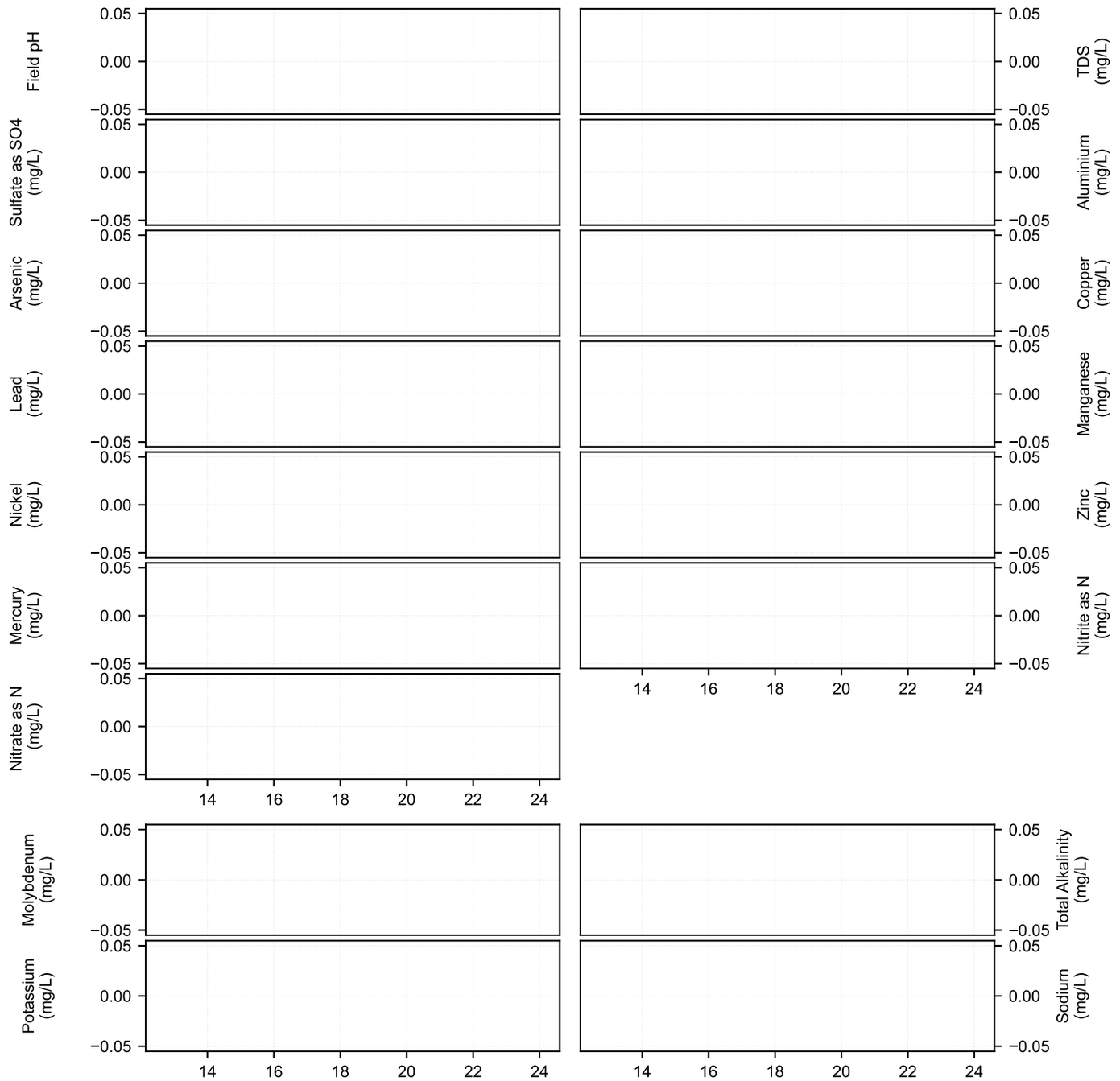
MB50 (Screened geology - Inactive; Screened interval: 197-217 mbgl)



Groundwater levels



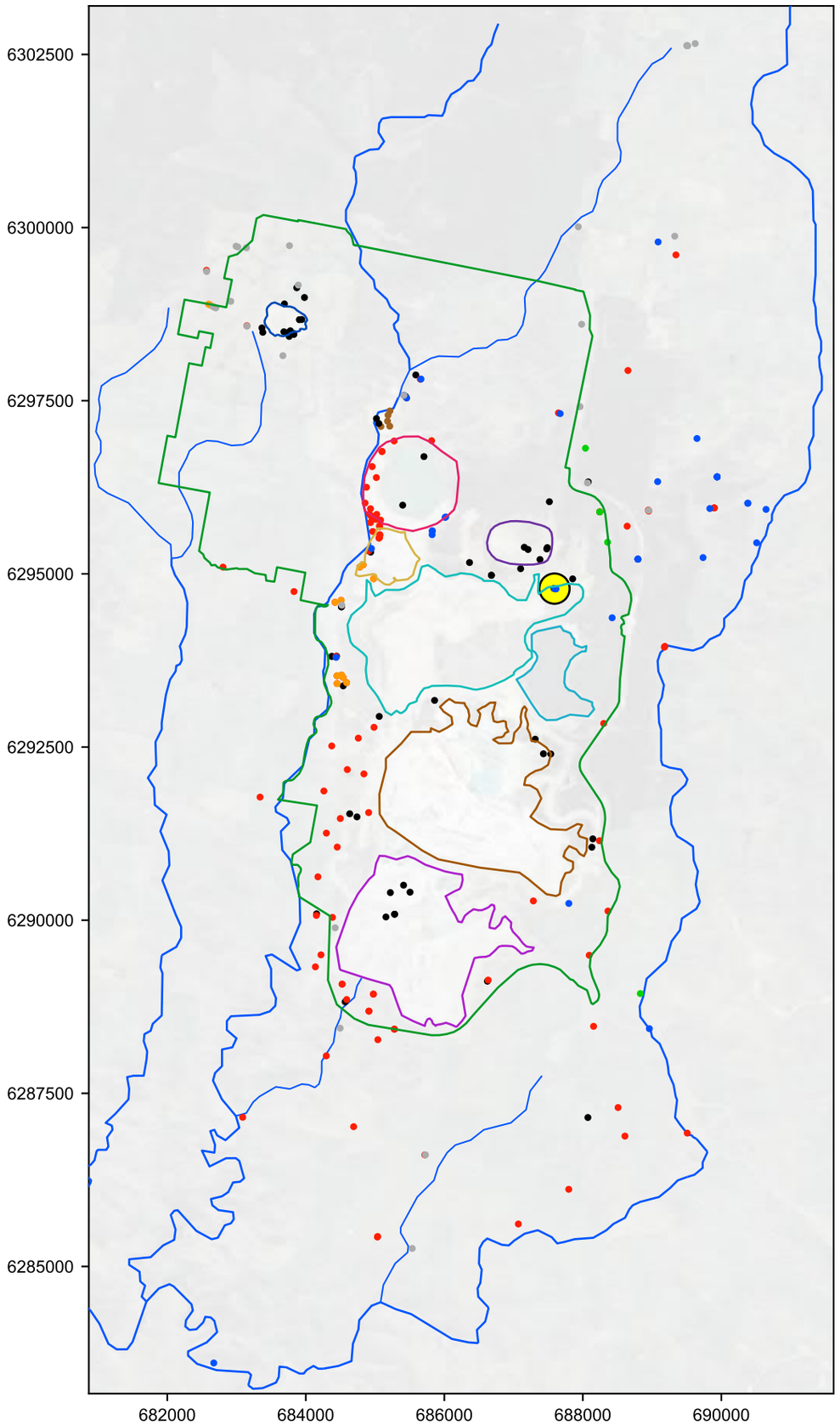
WMP defined analytes



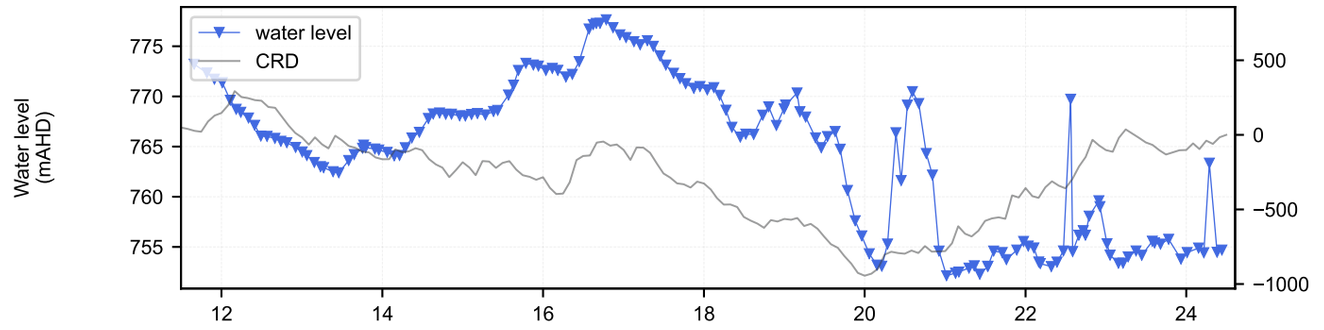
Additional analytes of interest

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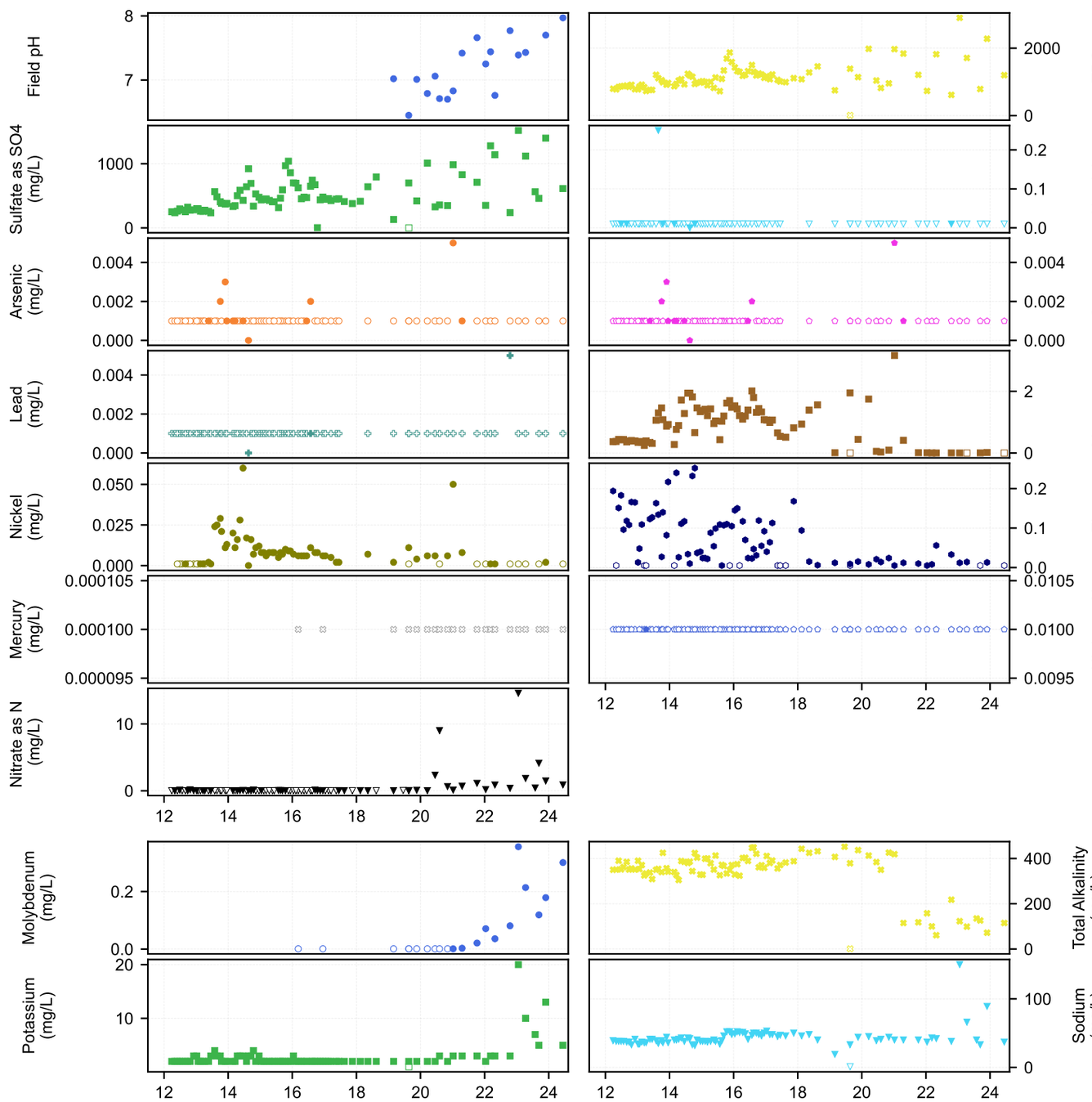
MB51 (Screened geology - Silurian; Screened interval: 42-54 mbgl)



Groundwater levels



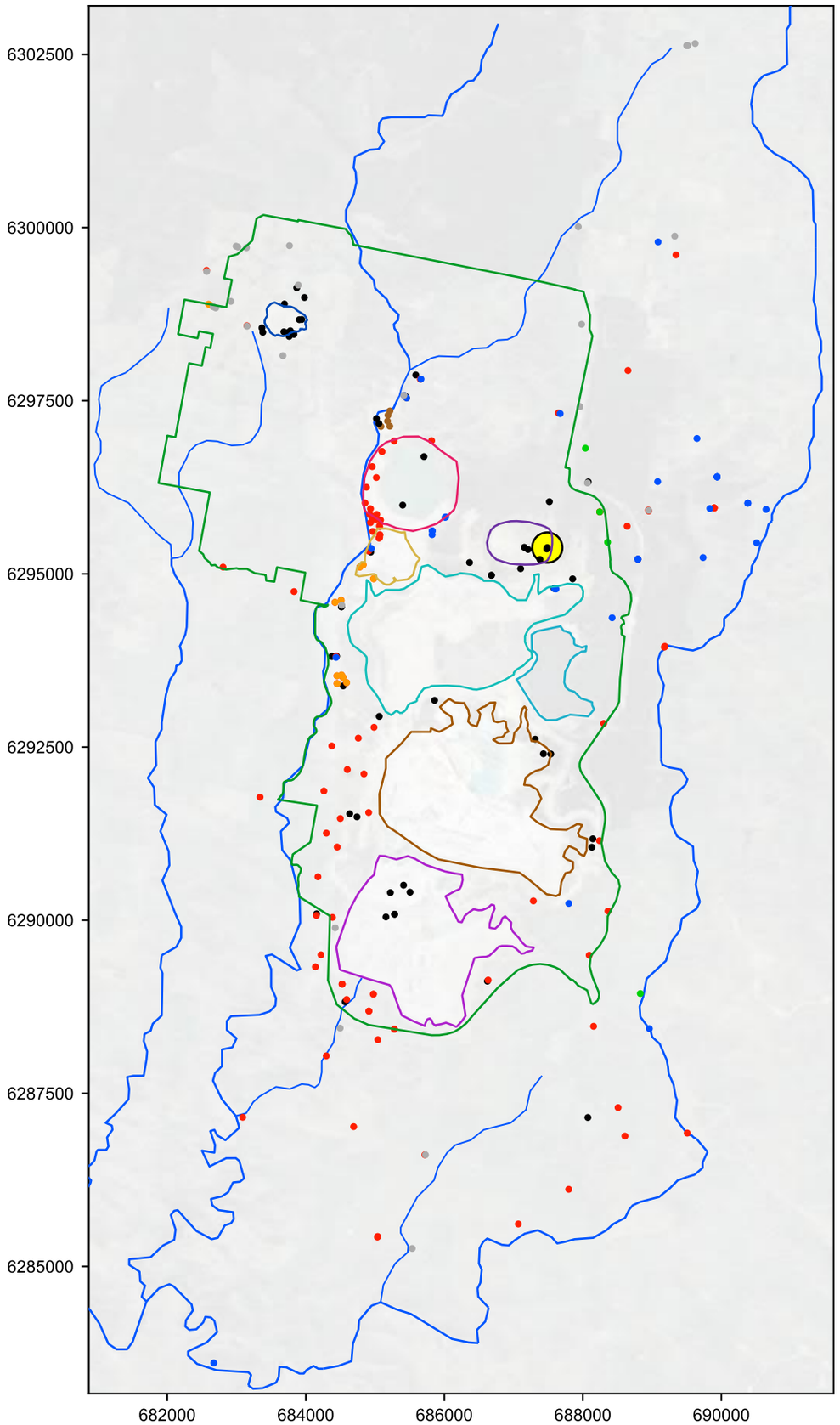
WMP defined analytes



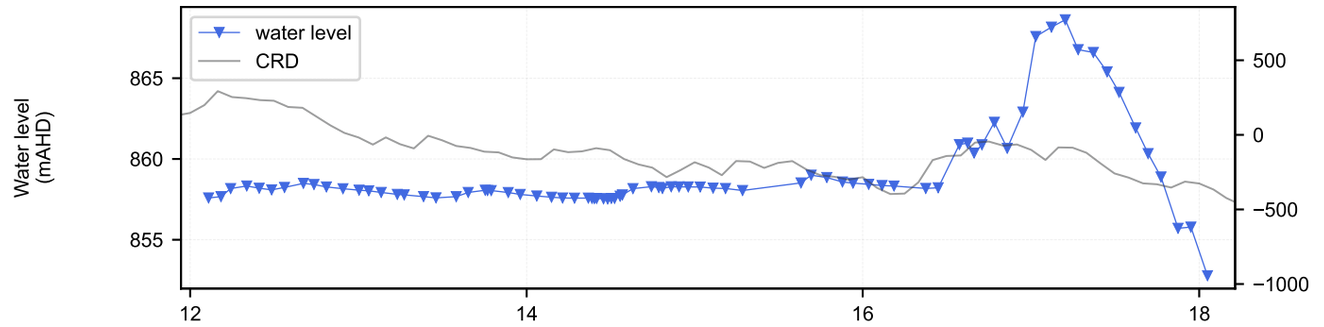
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

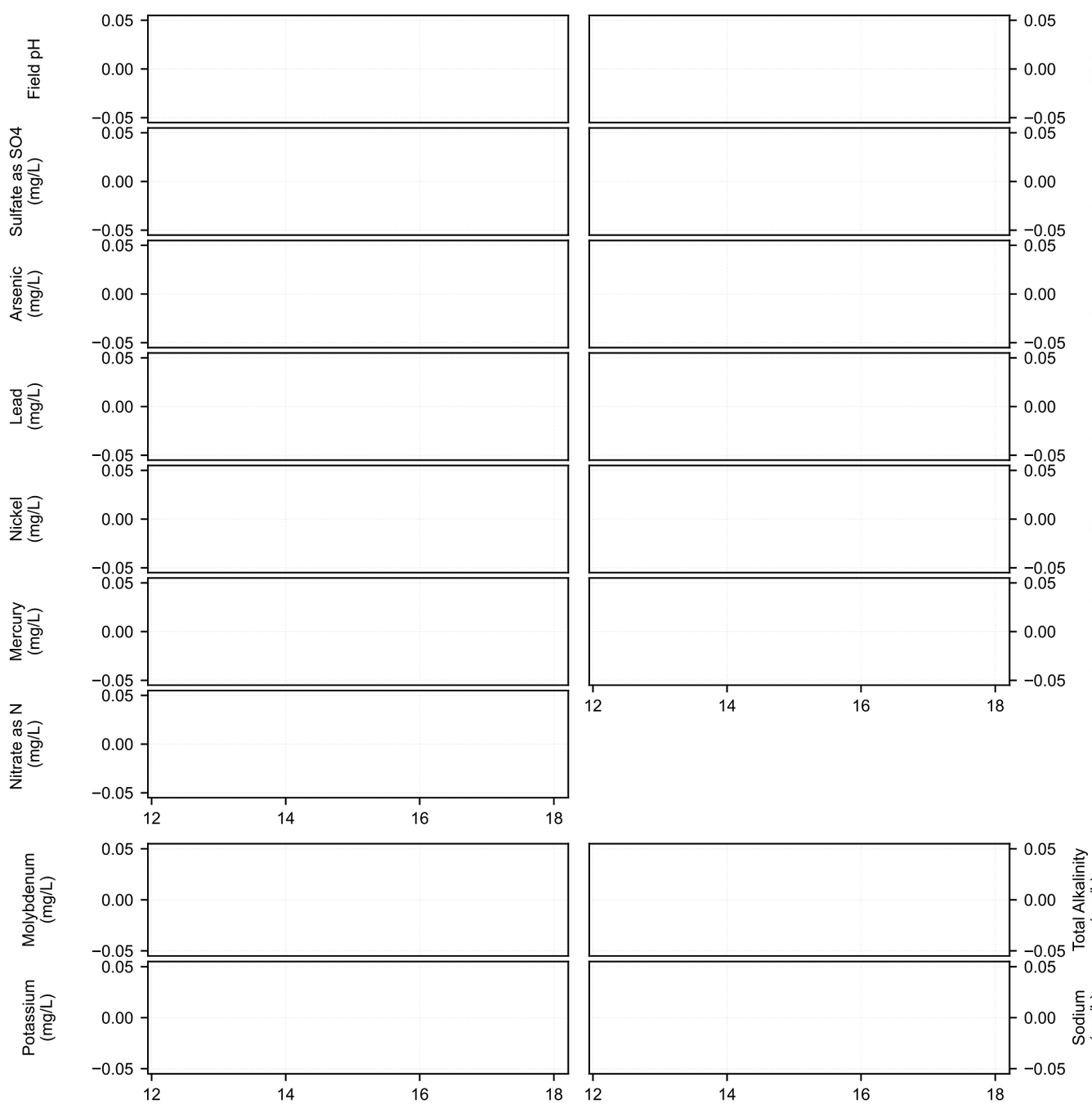
MB60 (Screened geology - Inactive; Screened interval: 44-56 mbgl)



Groundwater levels



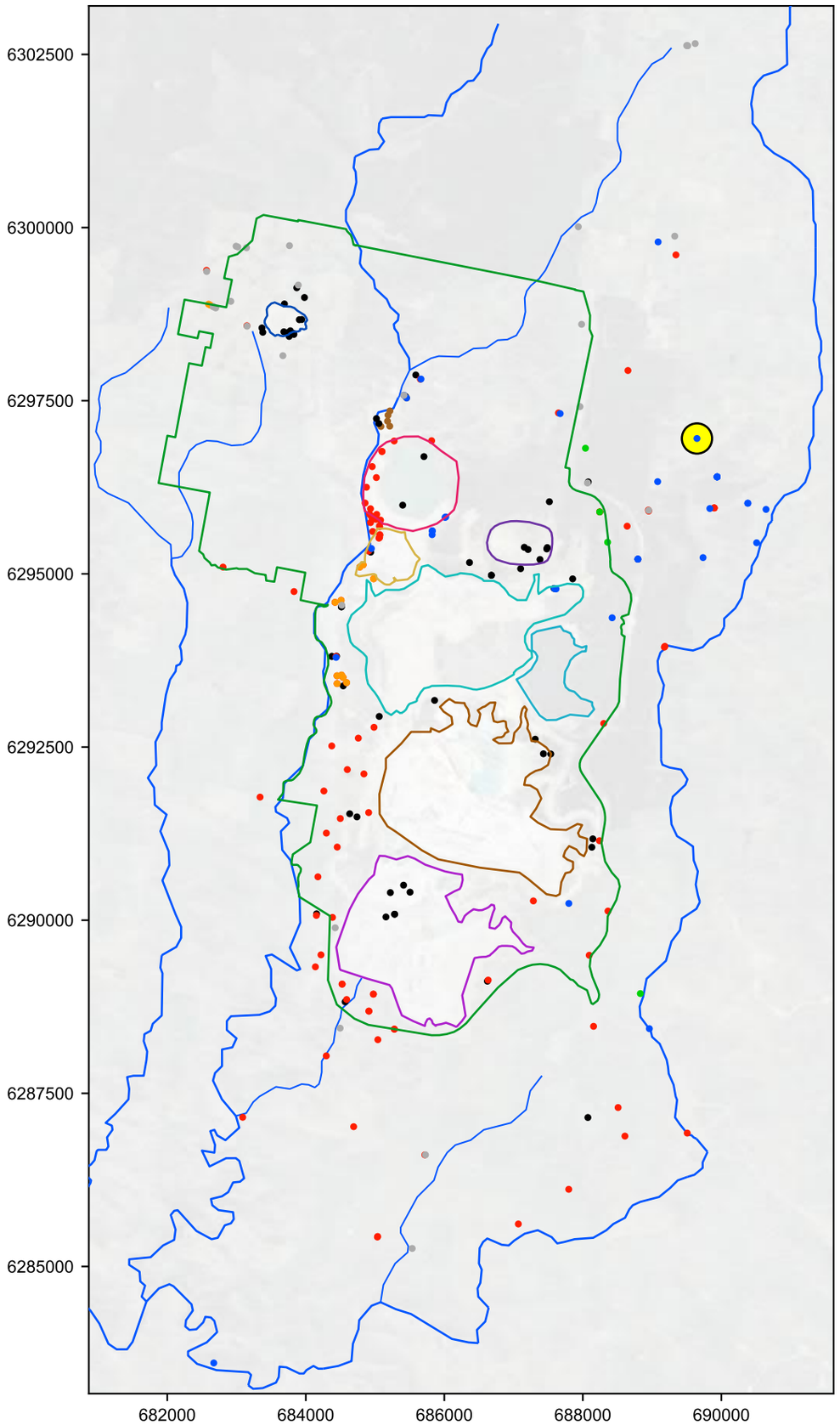
WMP defined analytes



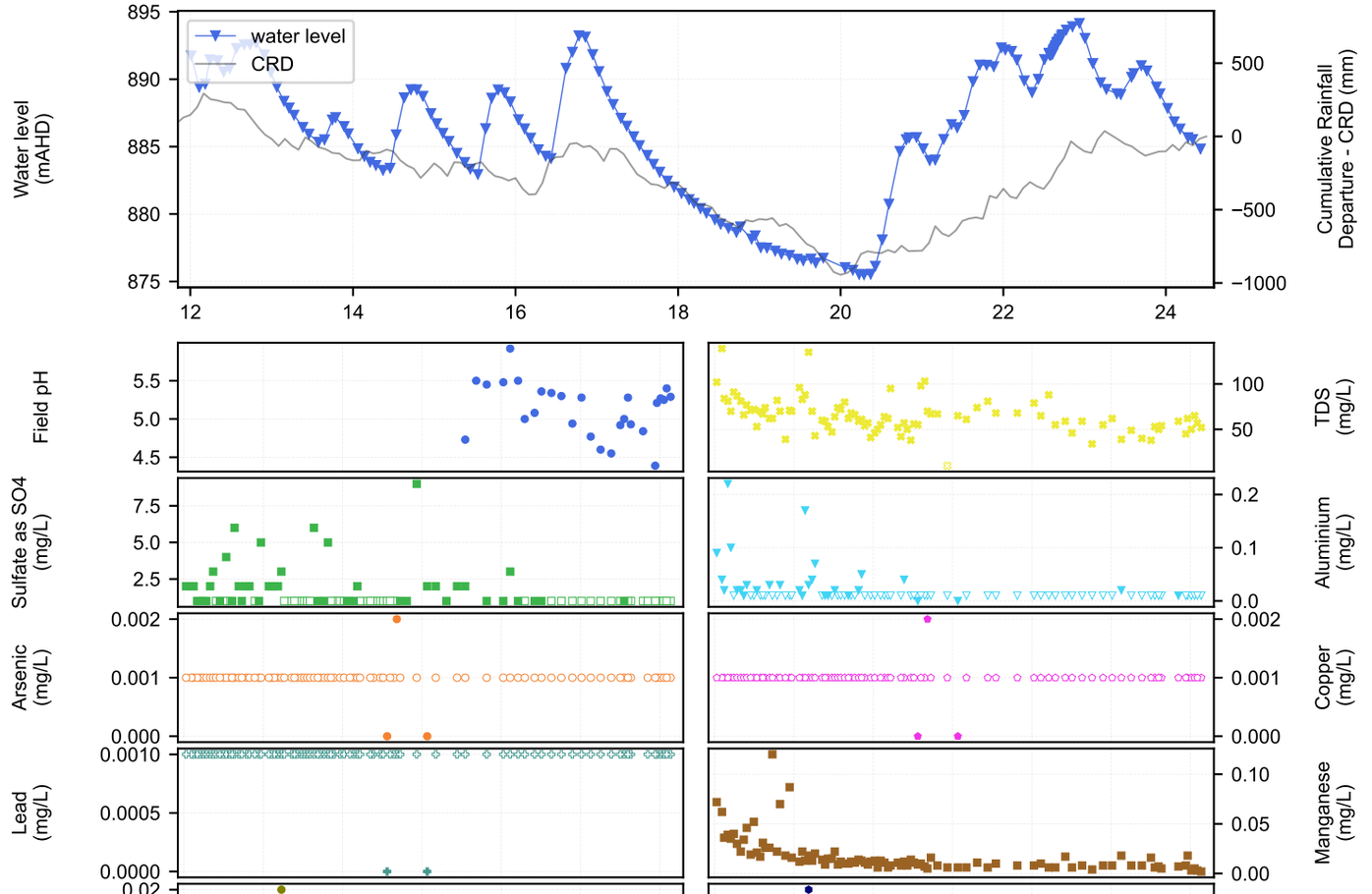
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

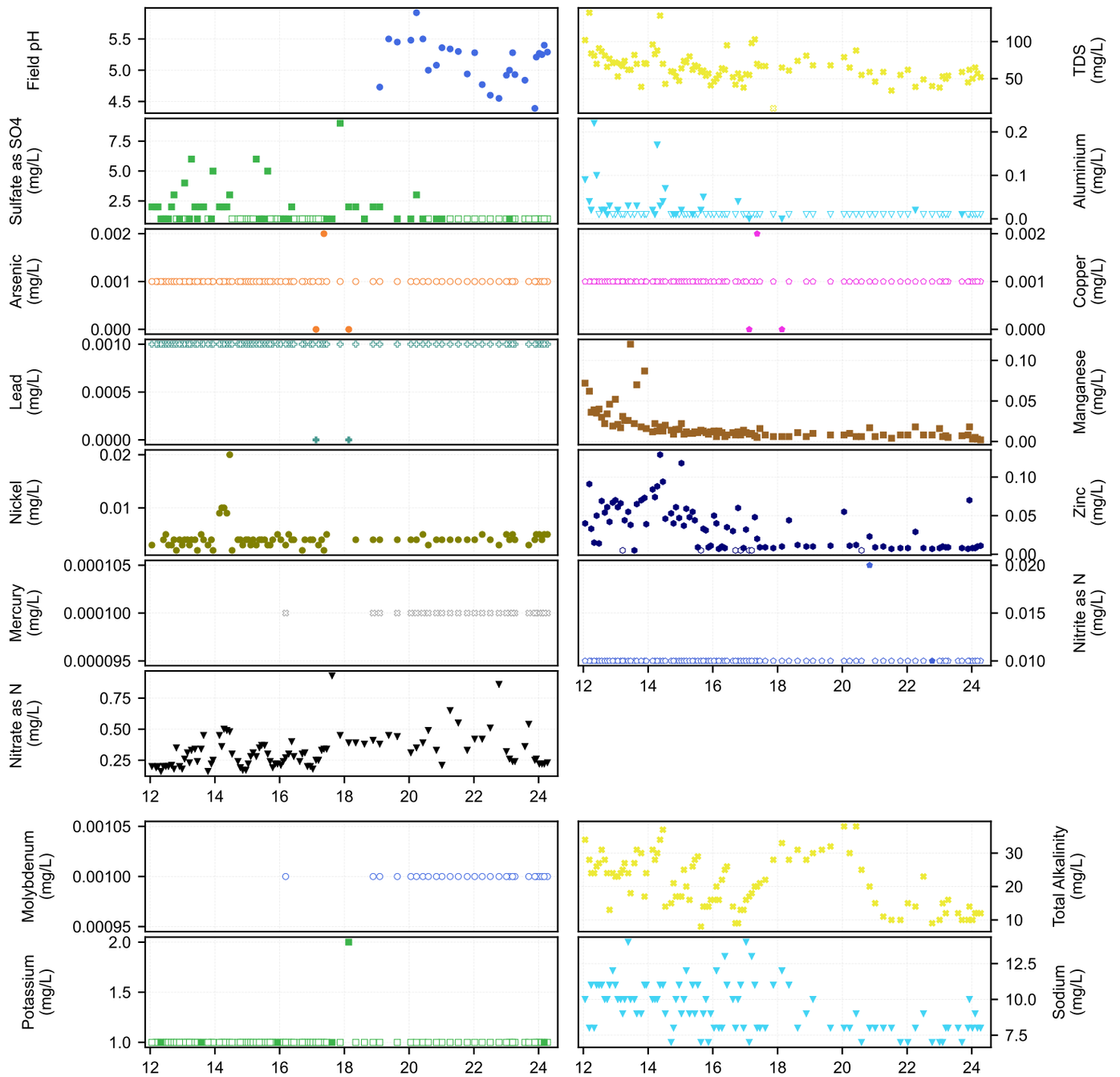
MB62 (Screened geology - Silurian; Screened interval: 39-63 mbgl)



Groundwater levels



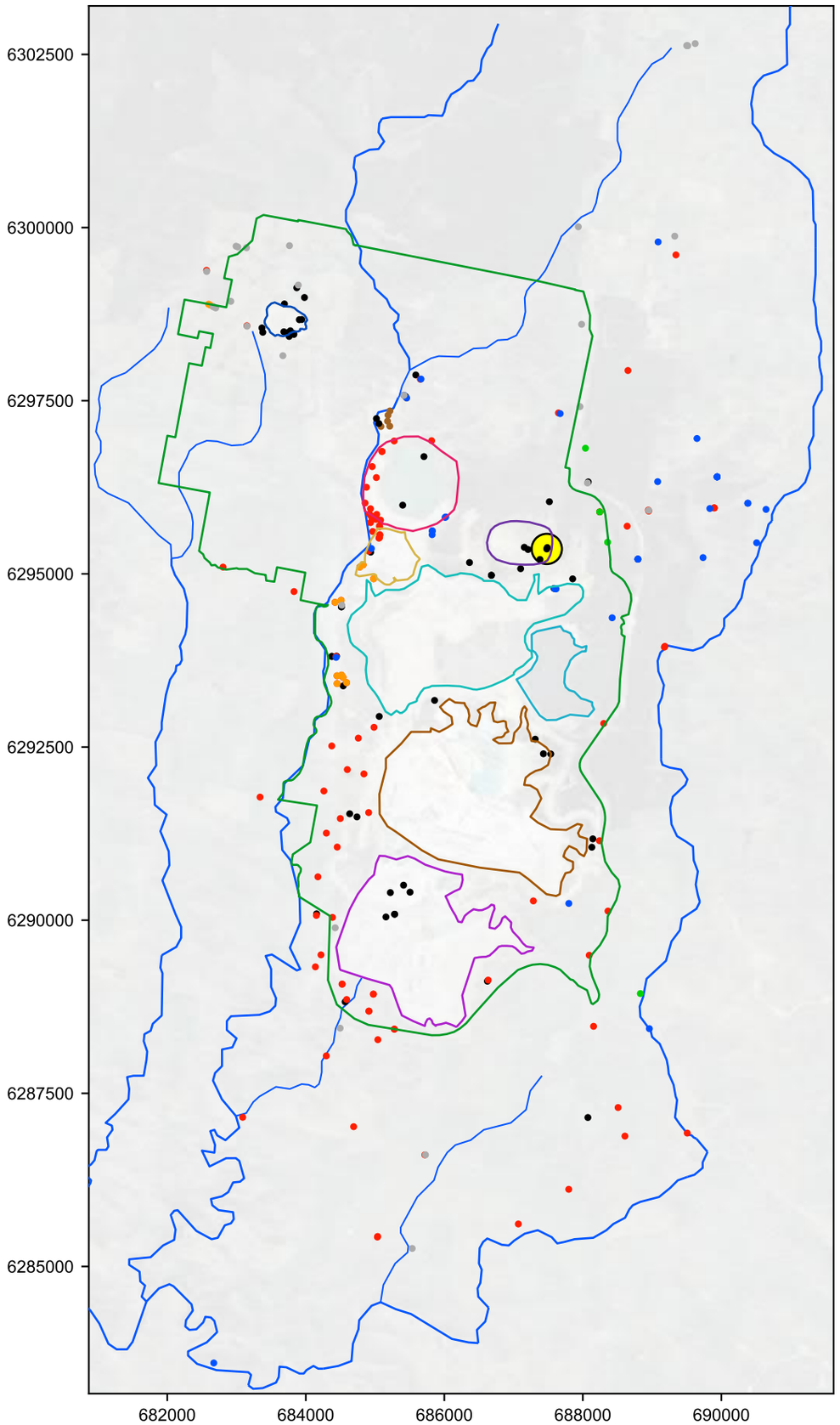
WMP defined analytes



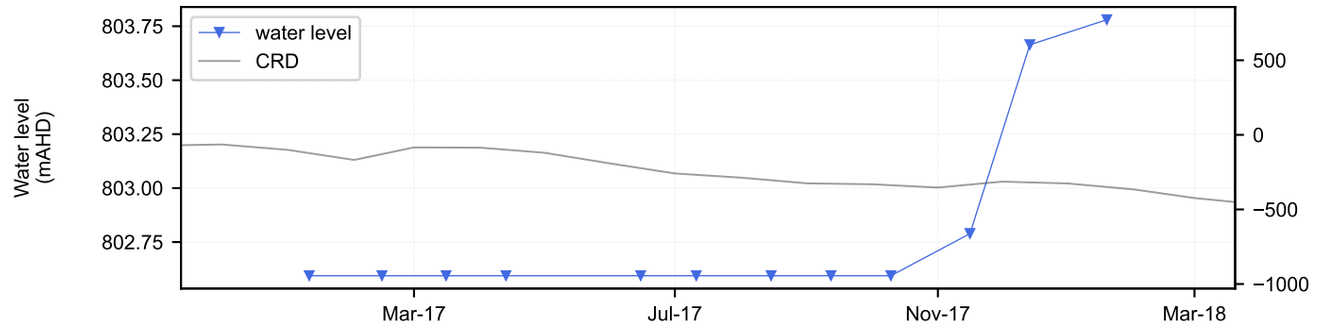
Additional analytes of interest

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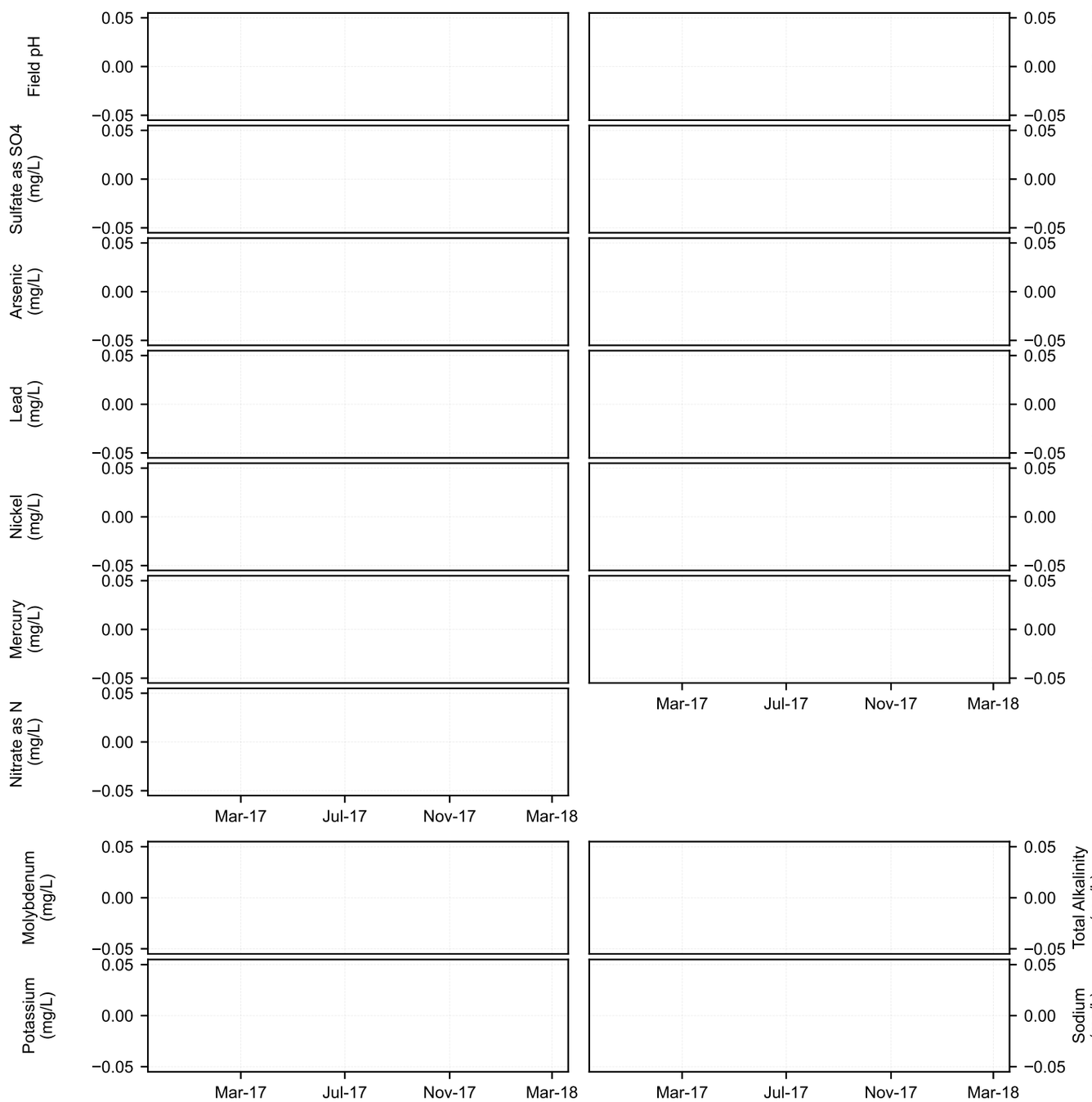
MB66 (Screened geology - Inactive; Screened interval: 65-96 mbgl)



Groundwater levels



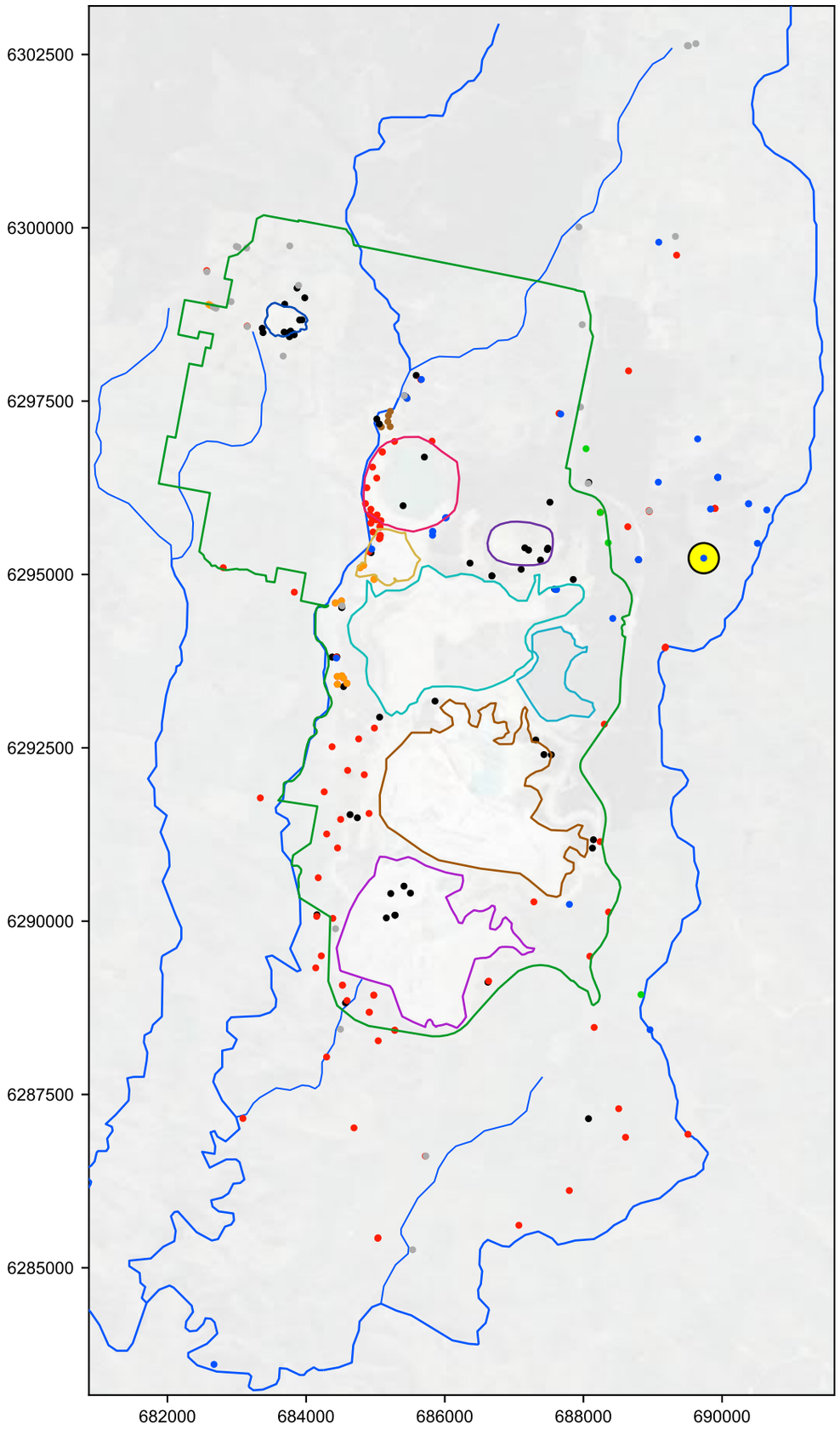
WMP defined analytes



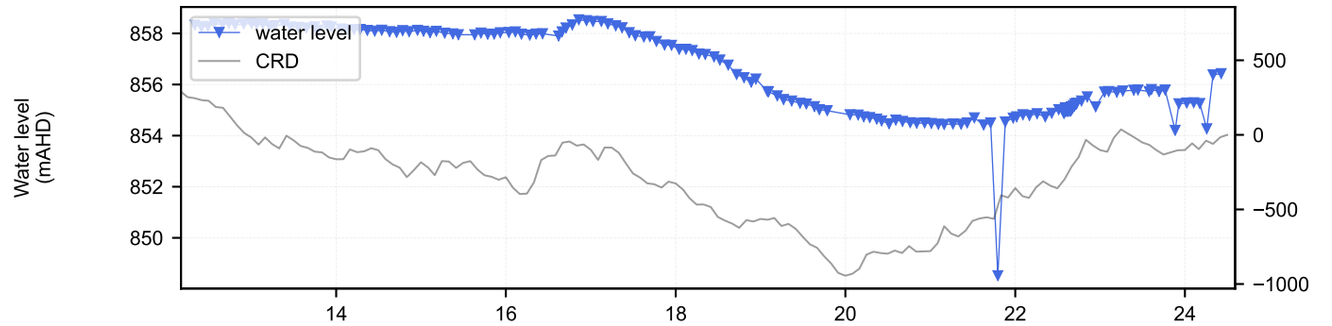
Additional analytes of interest

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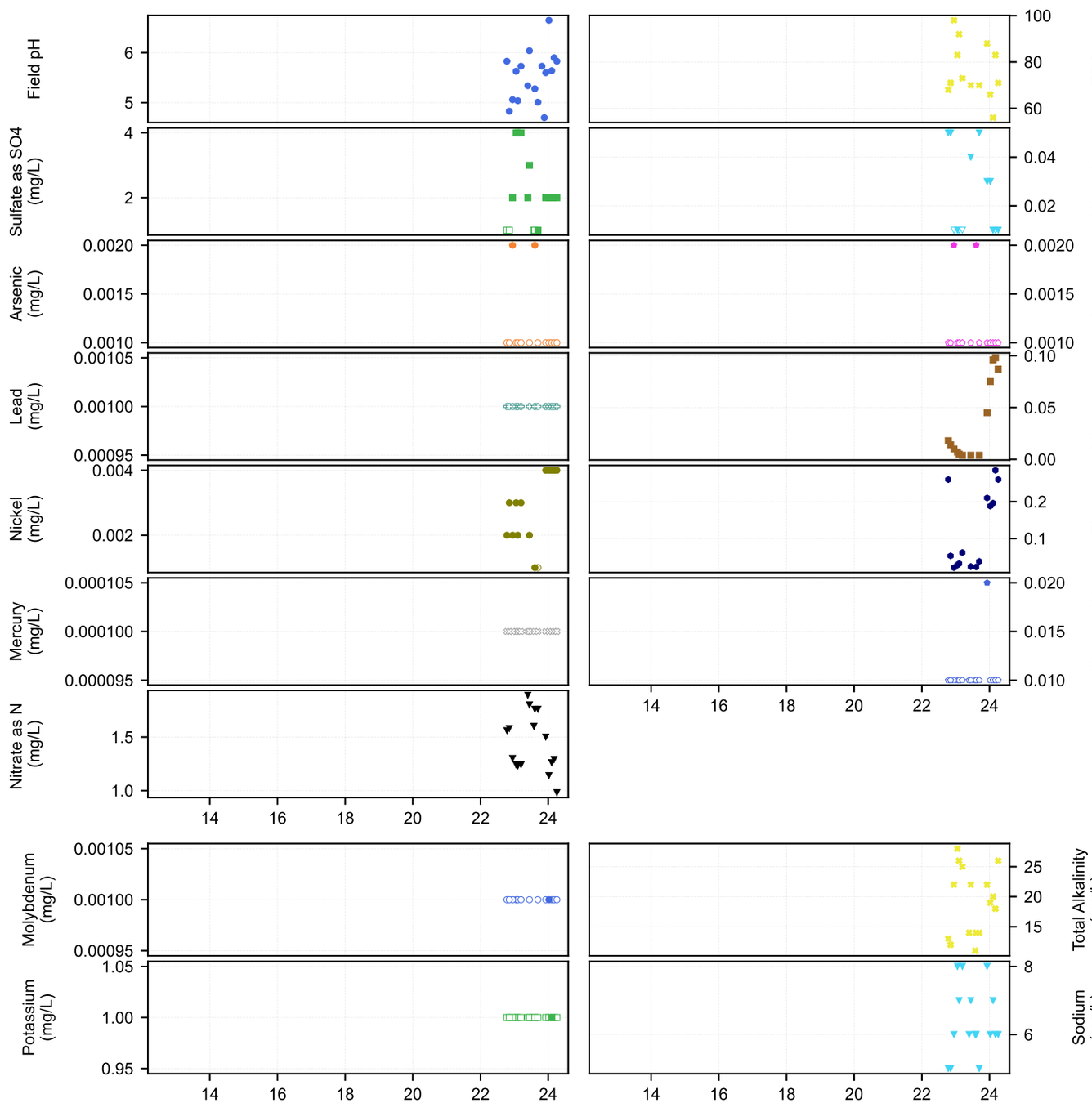
MB73 (Screened geology - Silurian; Screened interval: 75.35-94.35 mbgl)



Groundwater levels



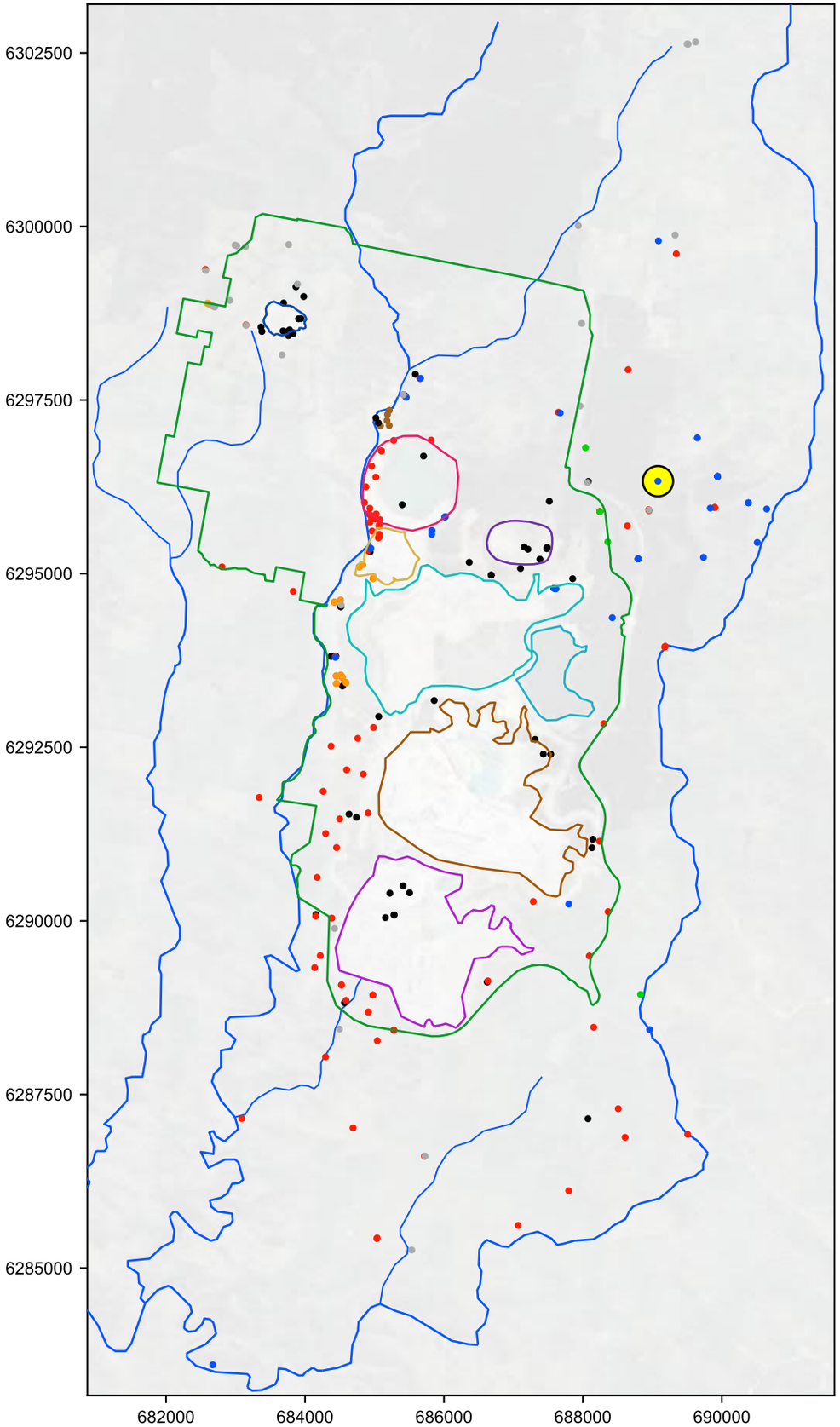
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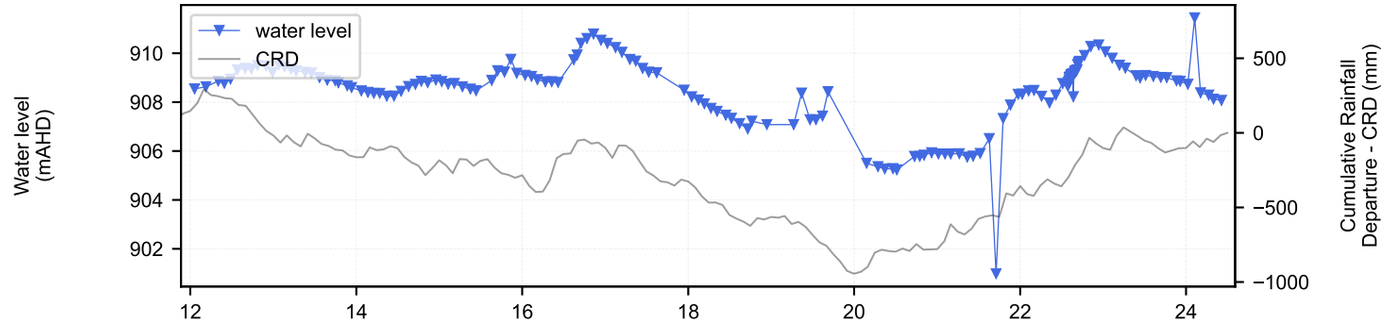
Additional analytes of interest

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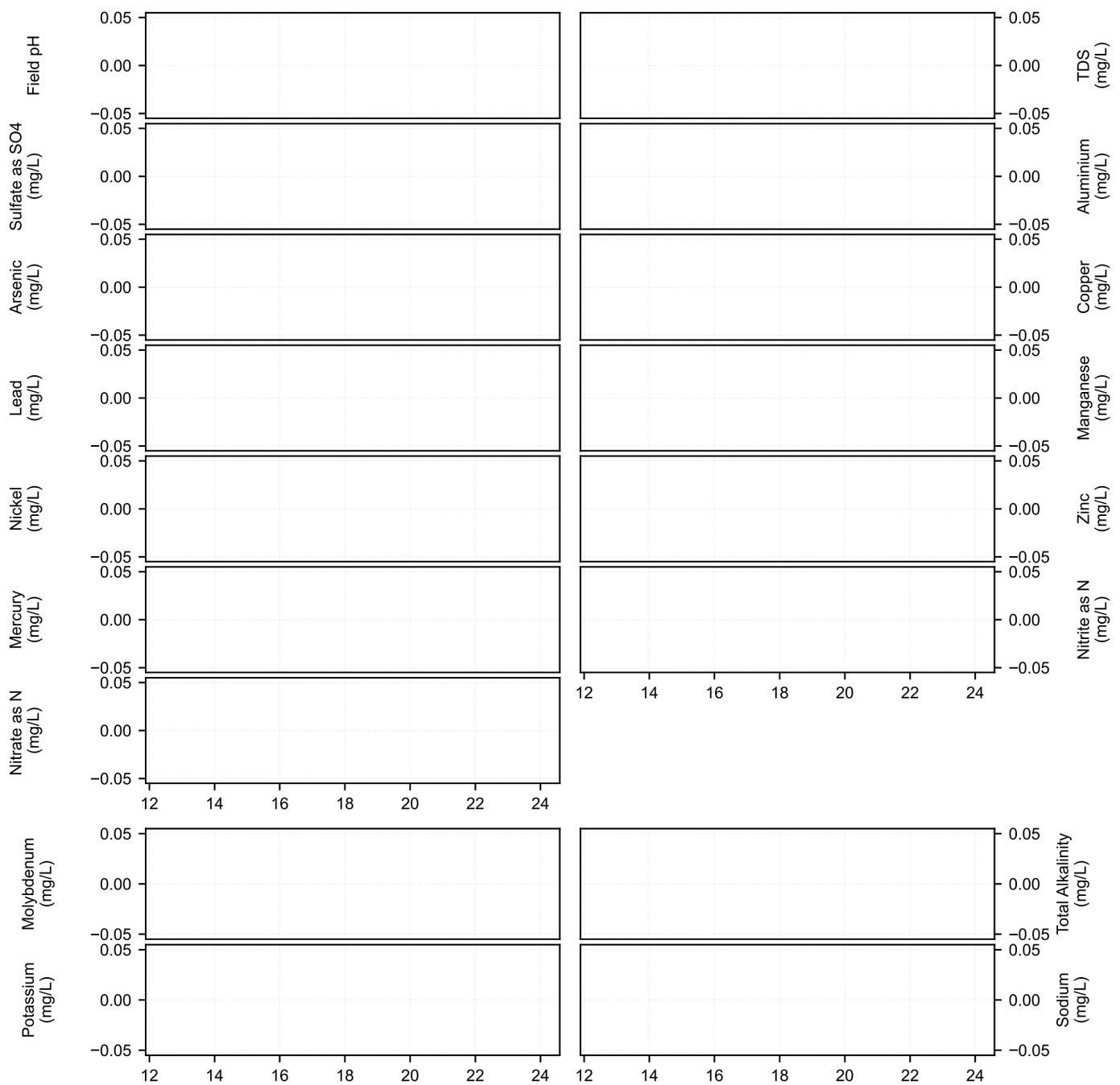
MB76 (Screened geology - Silurian; Screened interval: 25-26 mbgl)



Groundwater levels



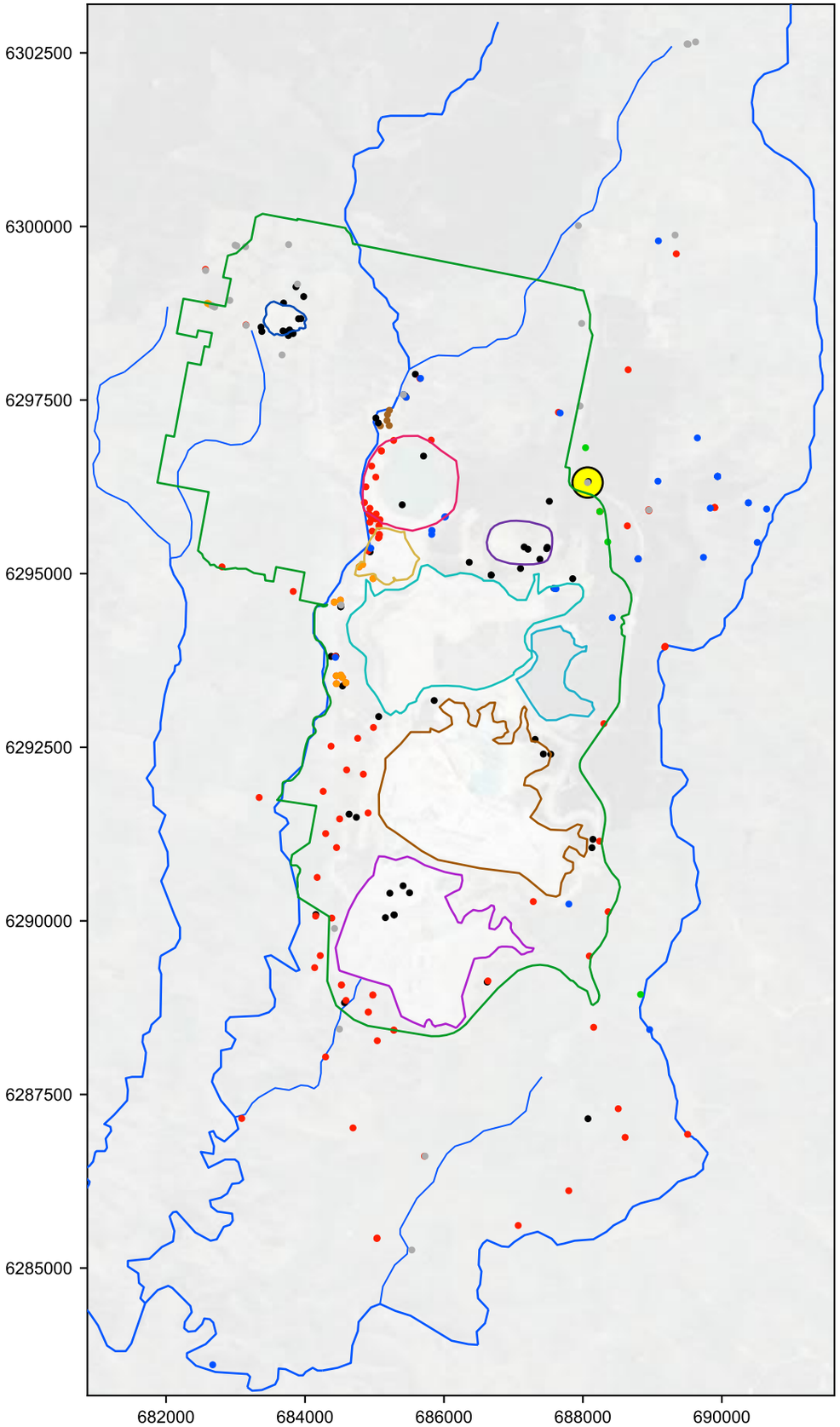
WMP defined analytes



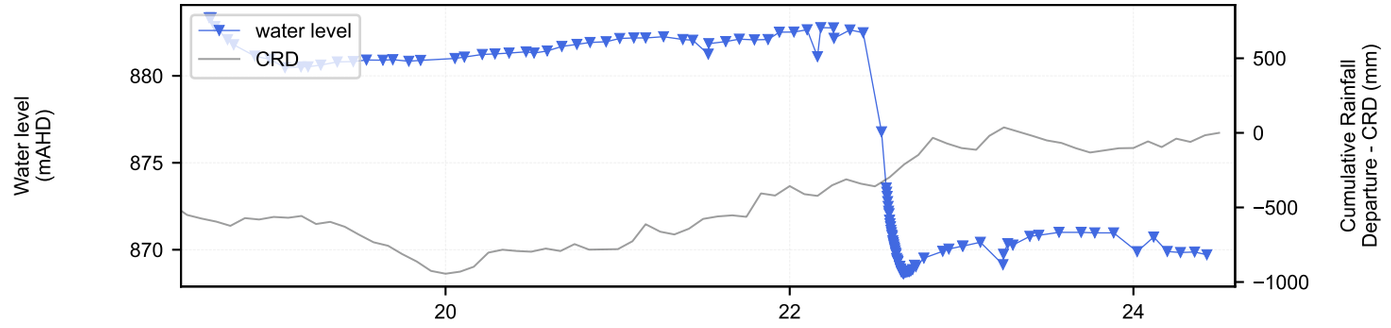
Additional analytes of interest

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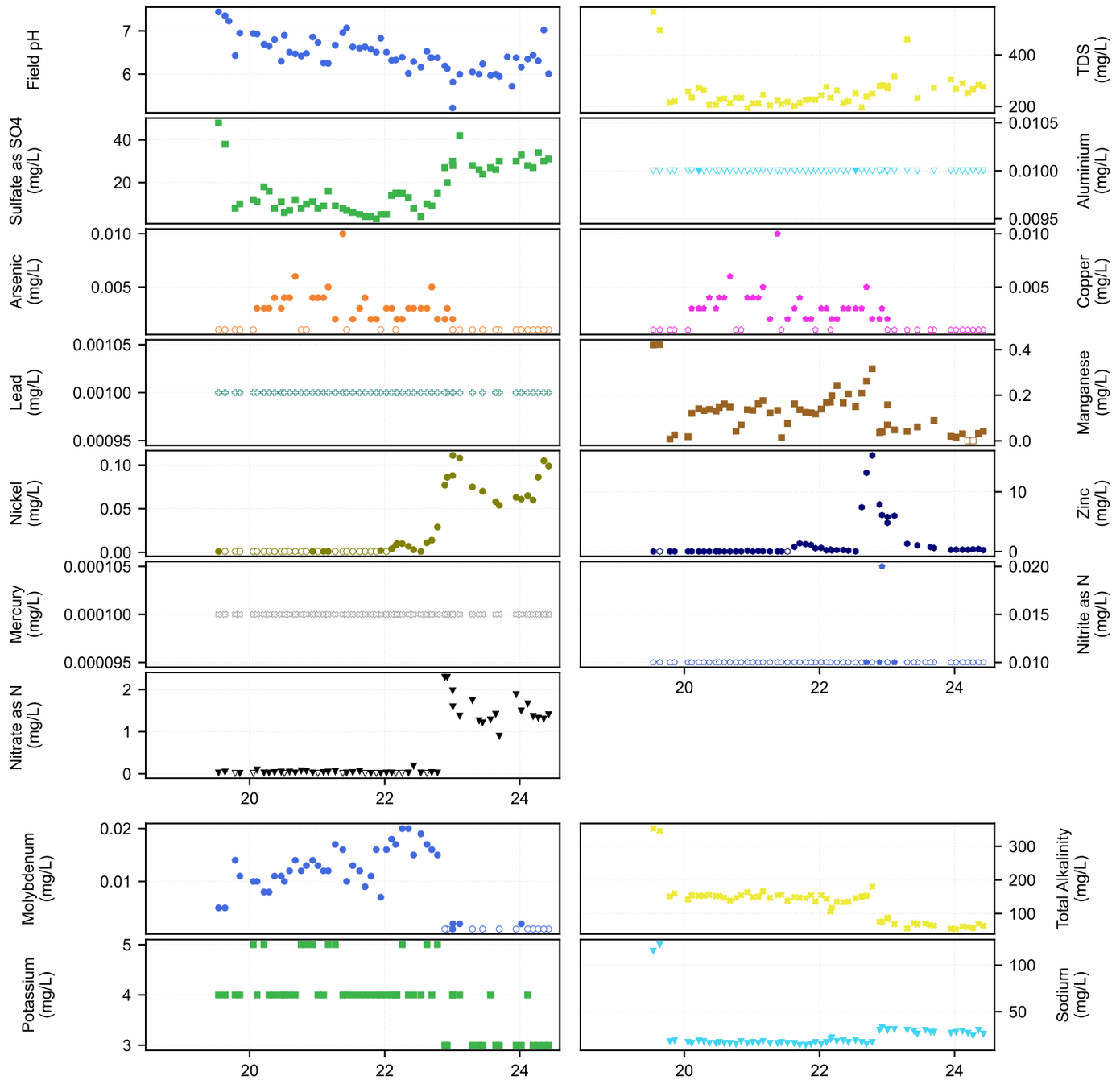
MB88 (Screened geology - Tertiary basalt; Screened interval: 78-90 mbgl)



Groundwater levels



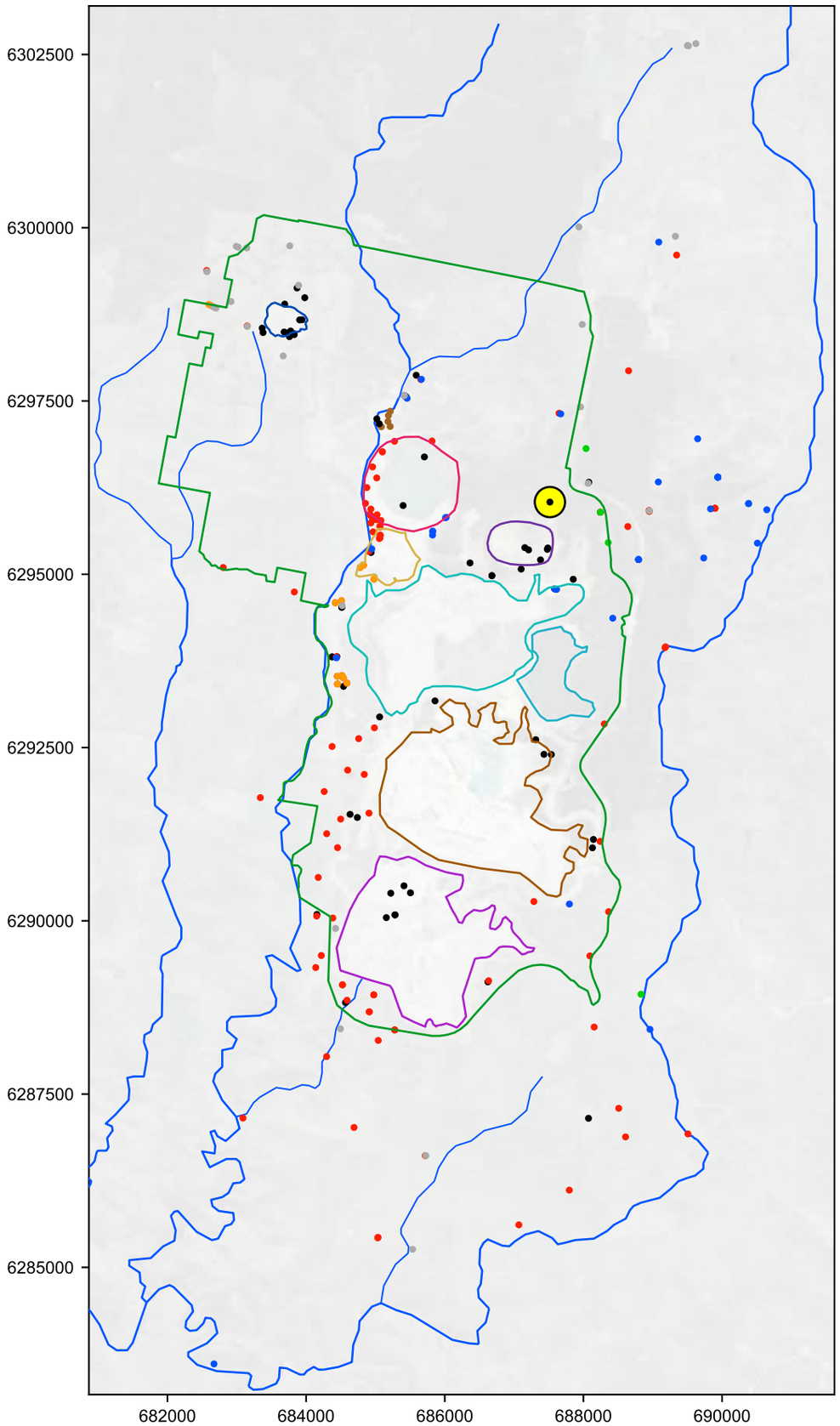
WMP defined analytes



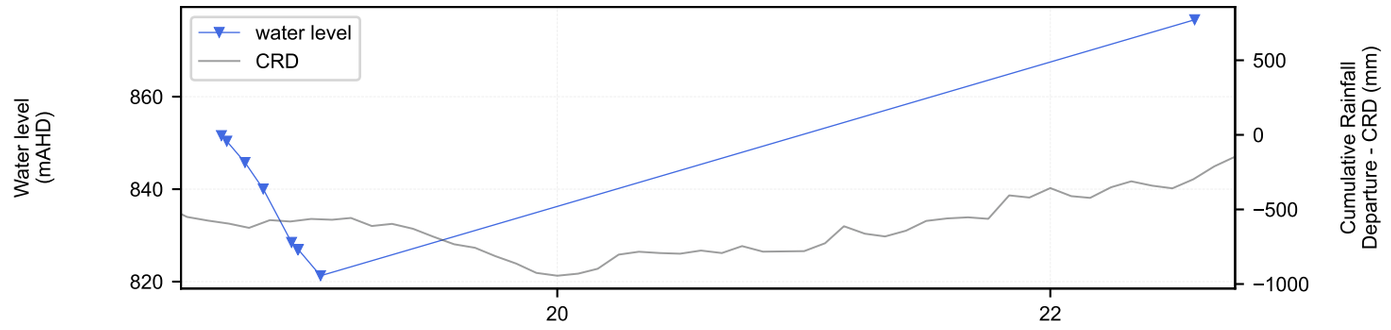
Additional analytes of interest

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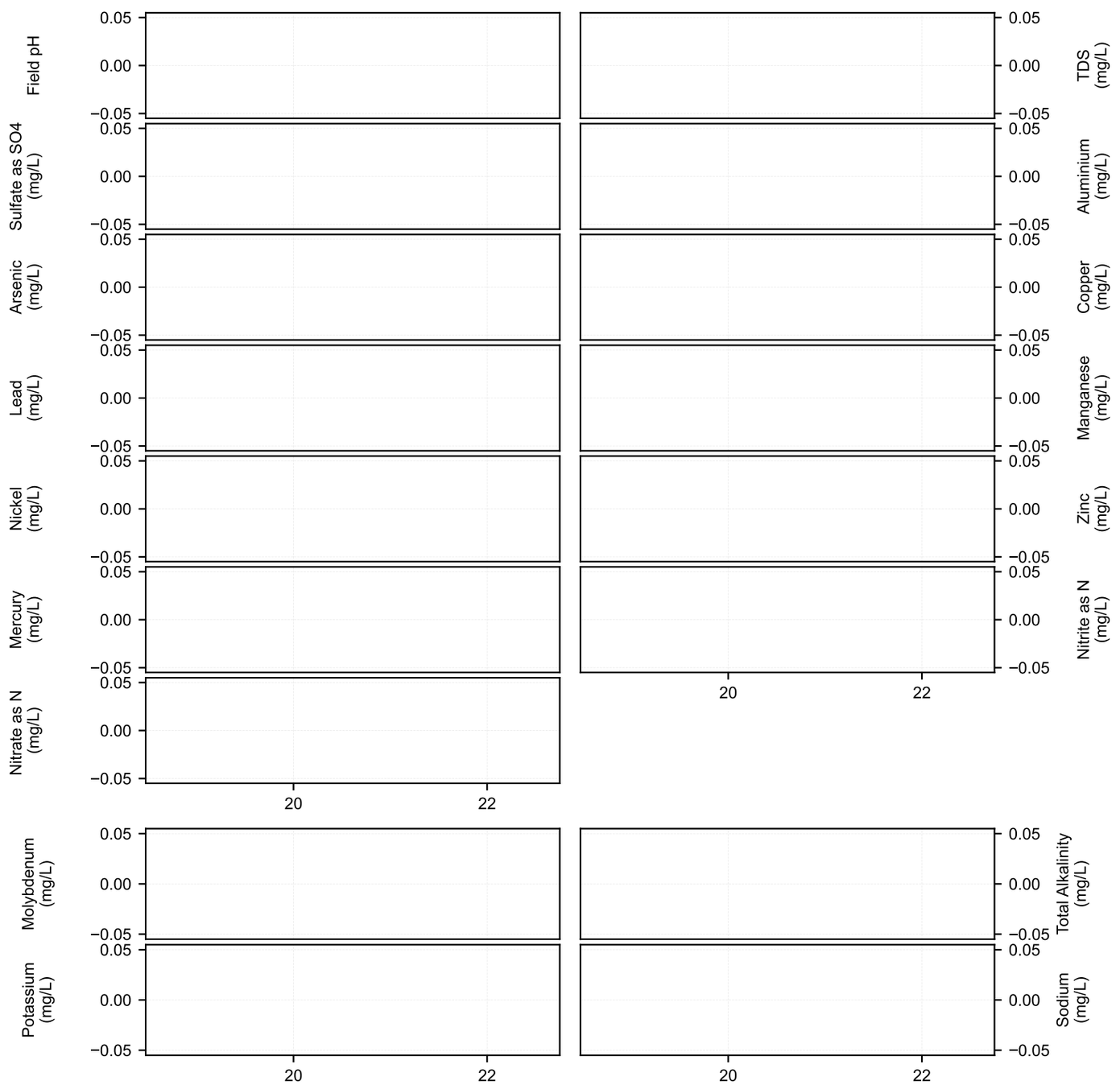
MB89 (Screened geology - Inactive; Screened interval: 114-126 mbgl)



Groundwater levels



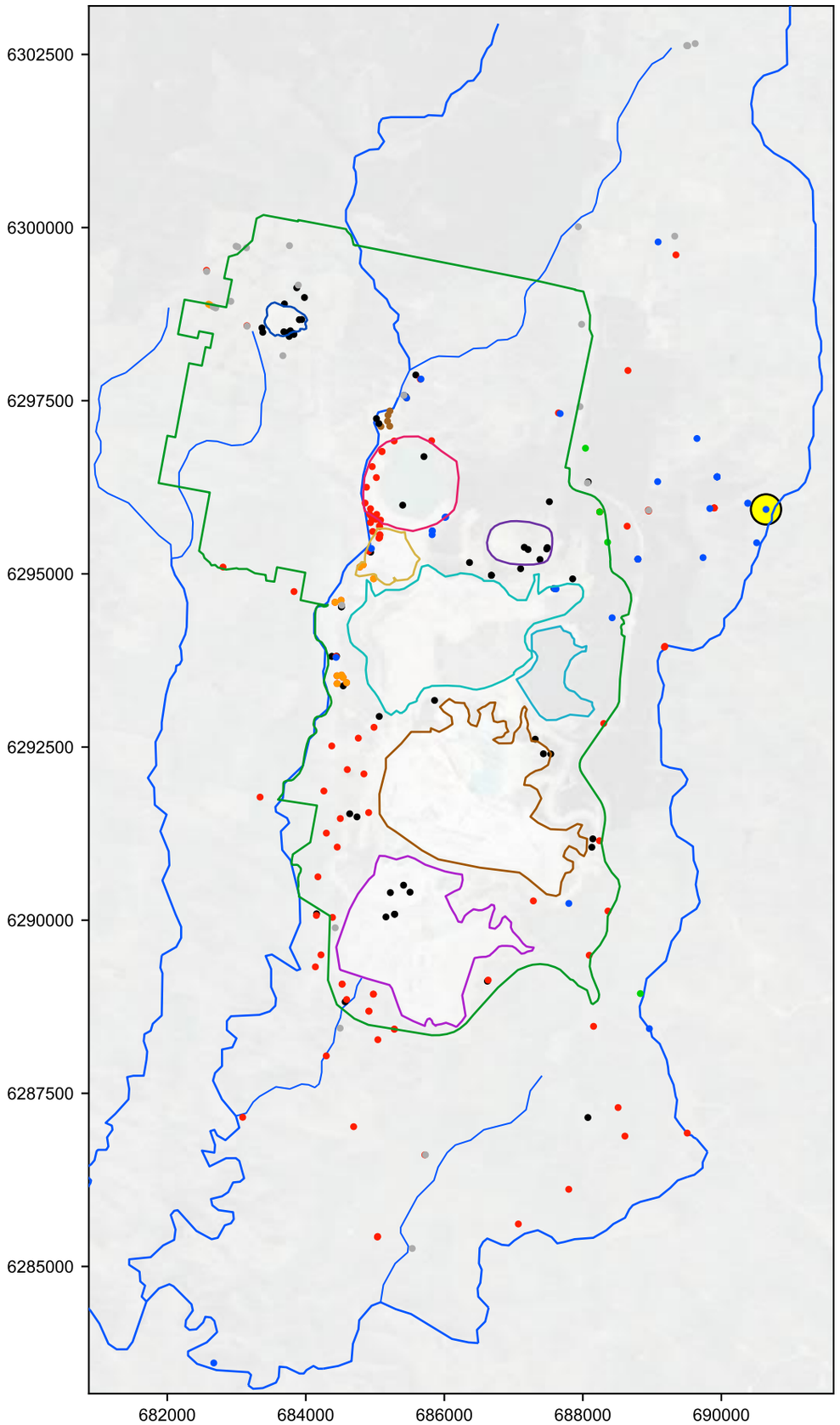
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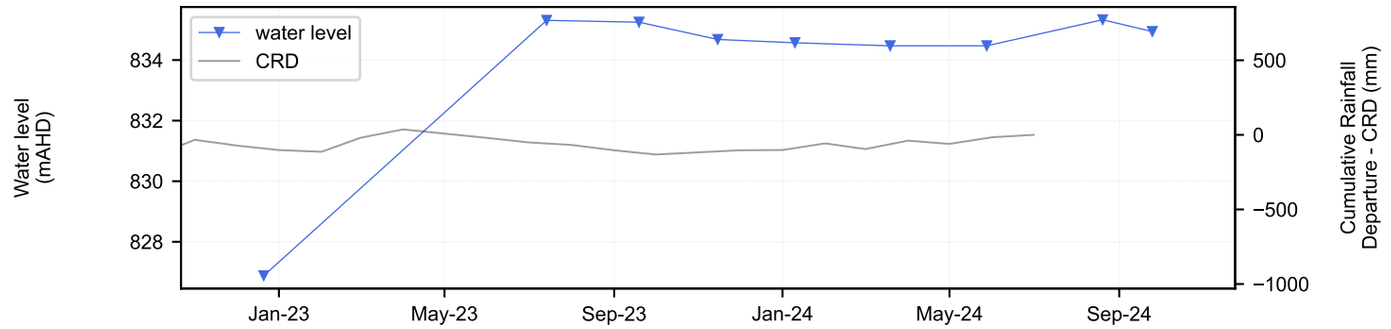
Additional analytes of interest

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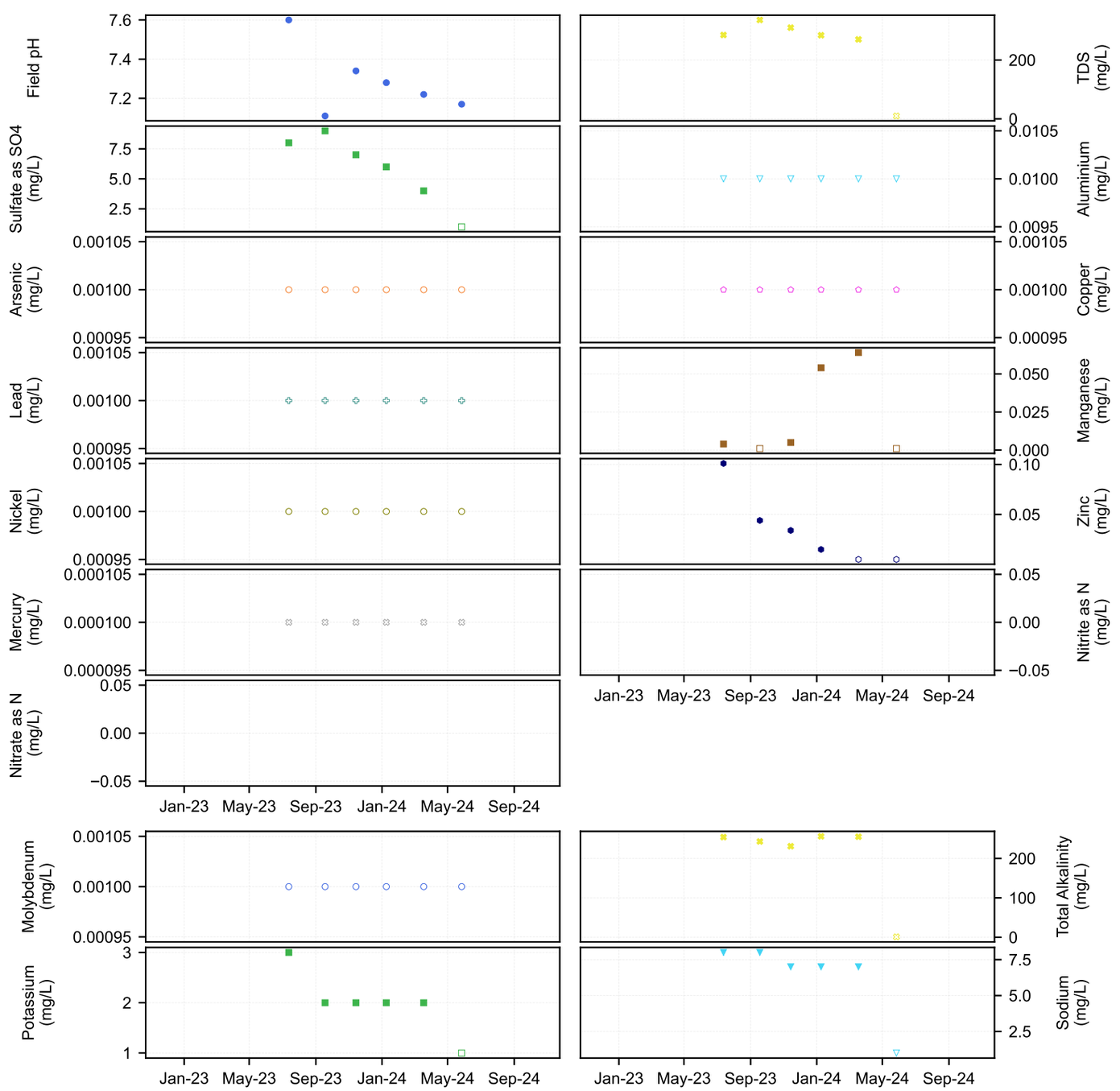
MB113 (Screened geology - Silurian; Screened interval: 33-39 mbgl)



Groundwater levels



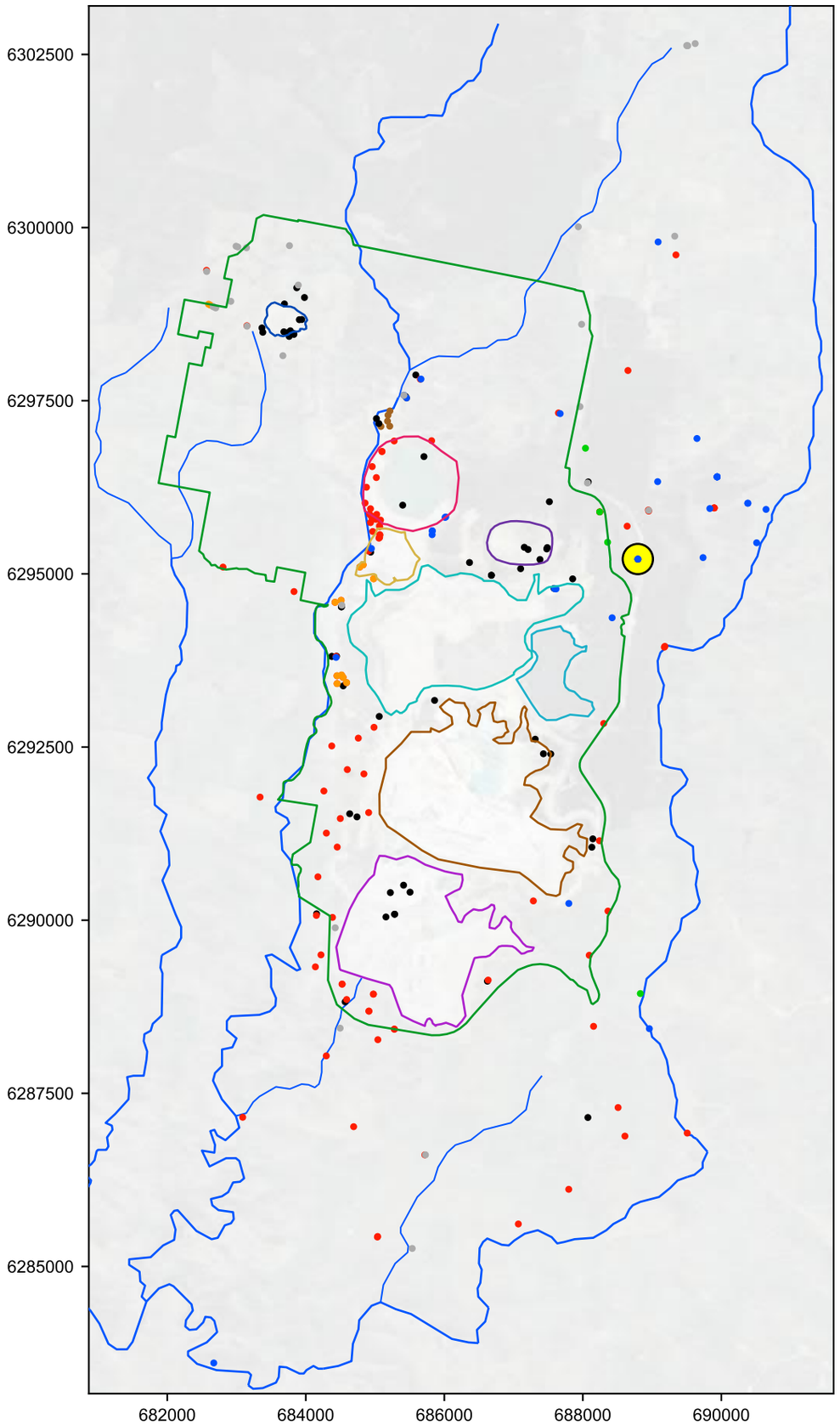
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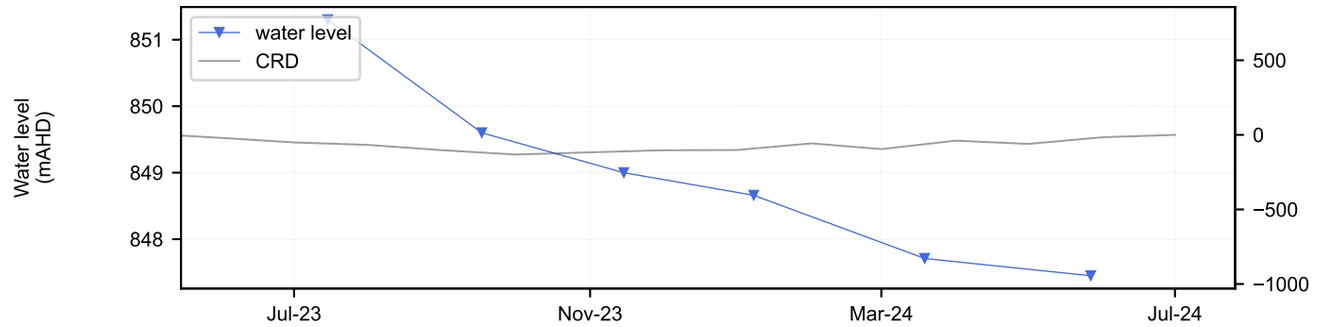
Additional analytes of interest

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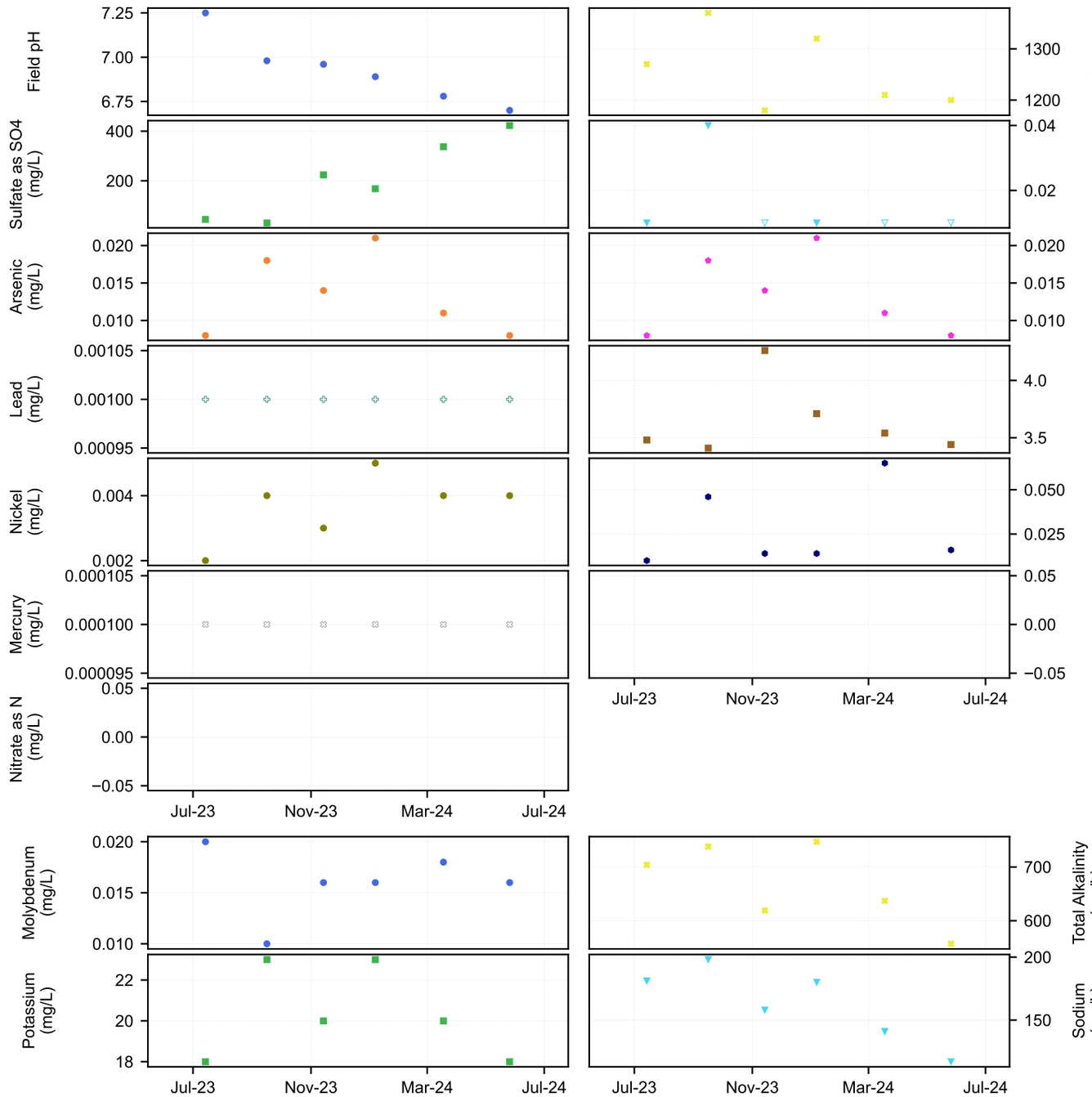
MB116 (Screened geology - Silurian; Screened interval: 9.0-18 mbgl)



Groundwater levels



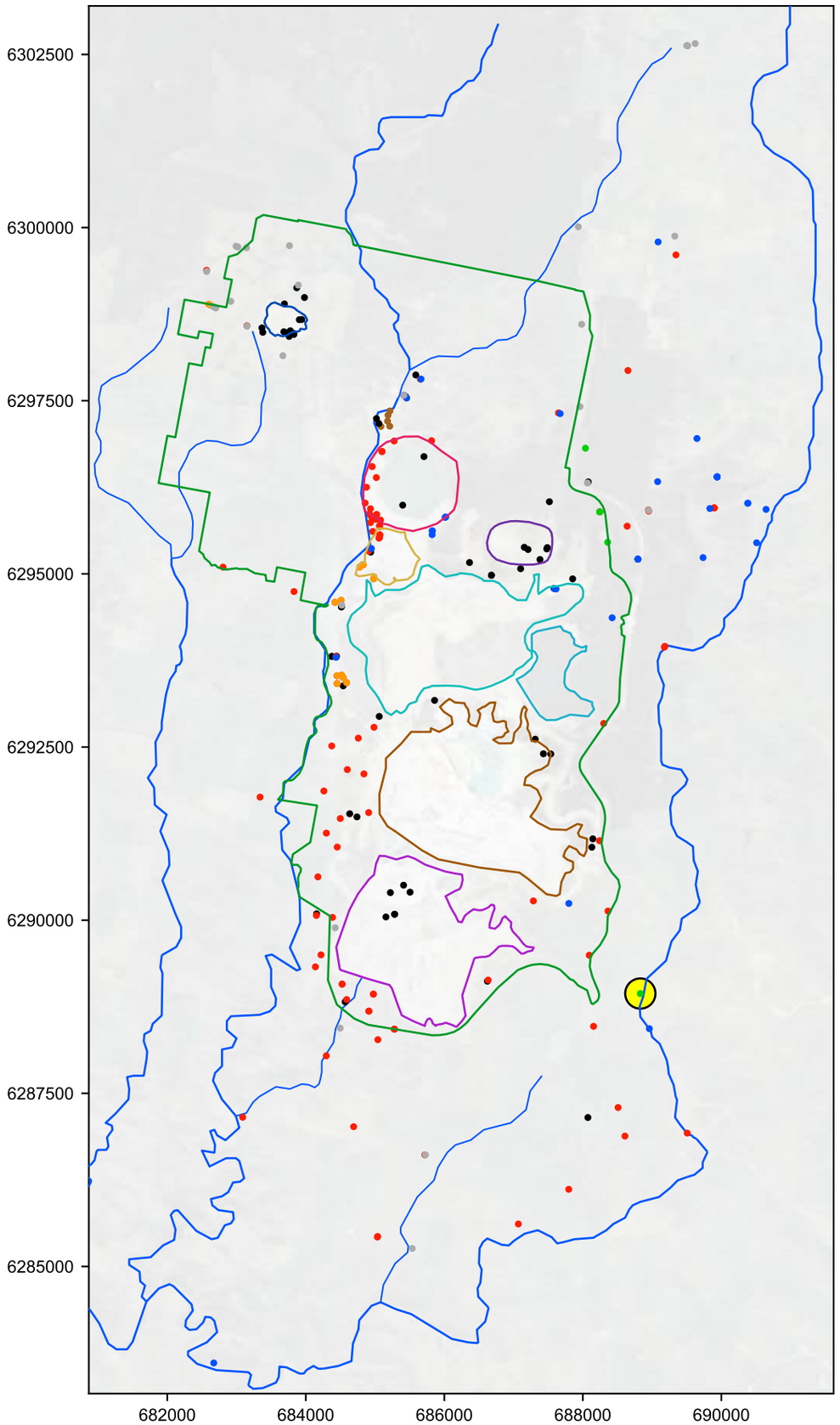
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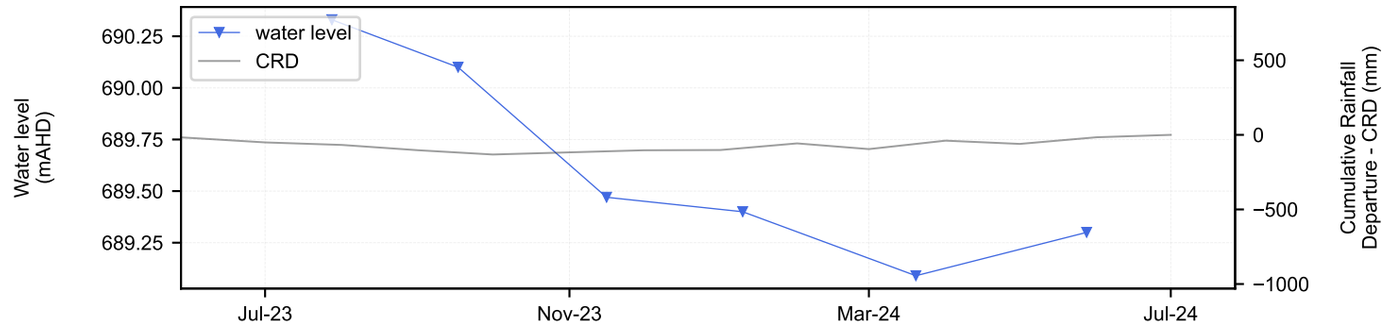
Additional analytes of interest

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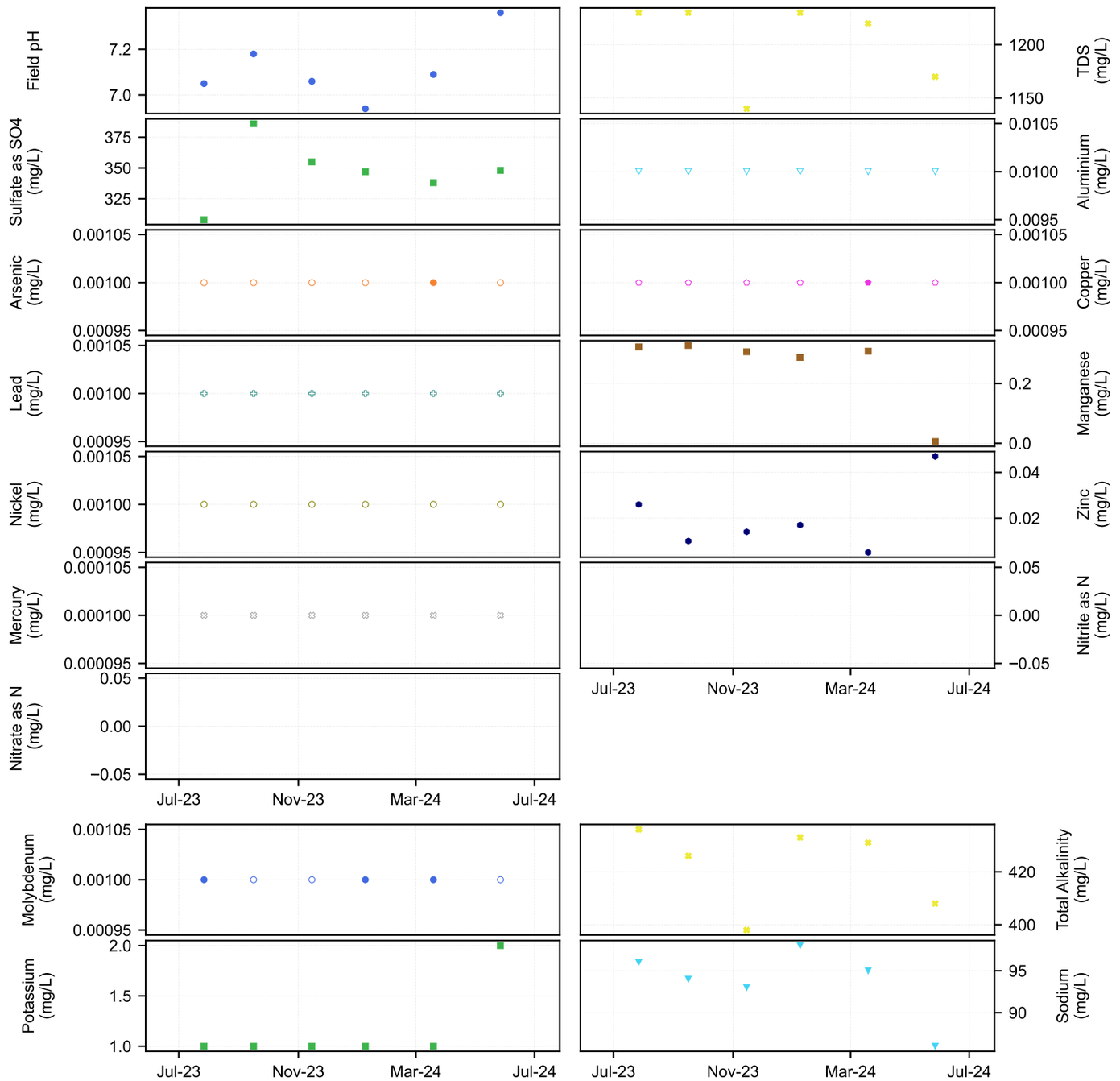
MB117 (Screened geology - Tertiary Basalt; Screened interval: 4.5-7.5 mbgl)



Groundwater levels



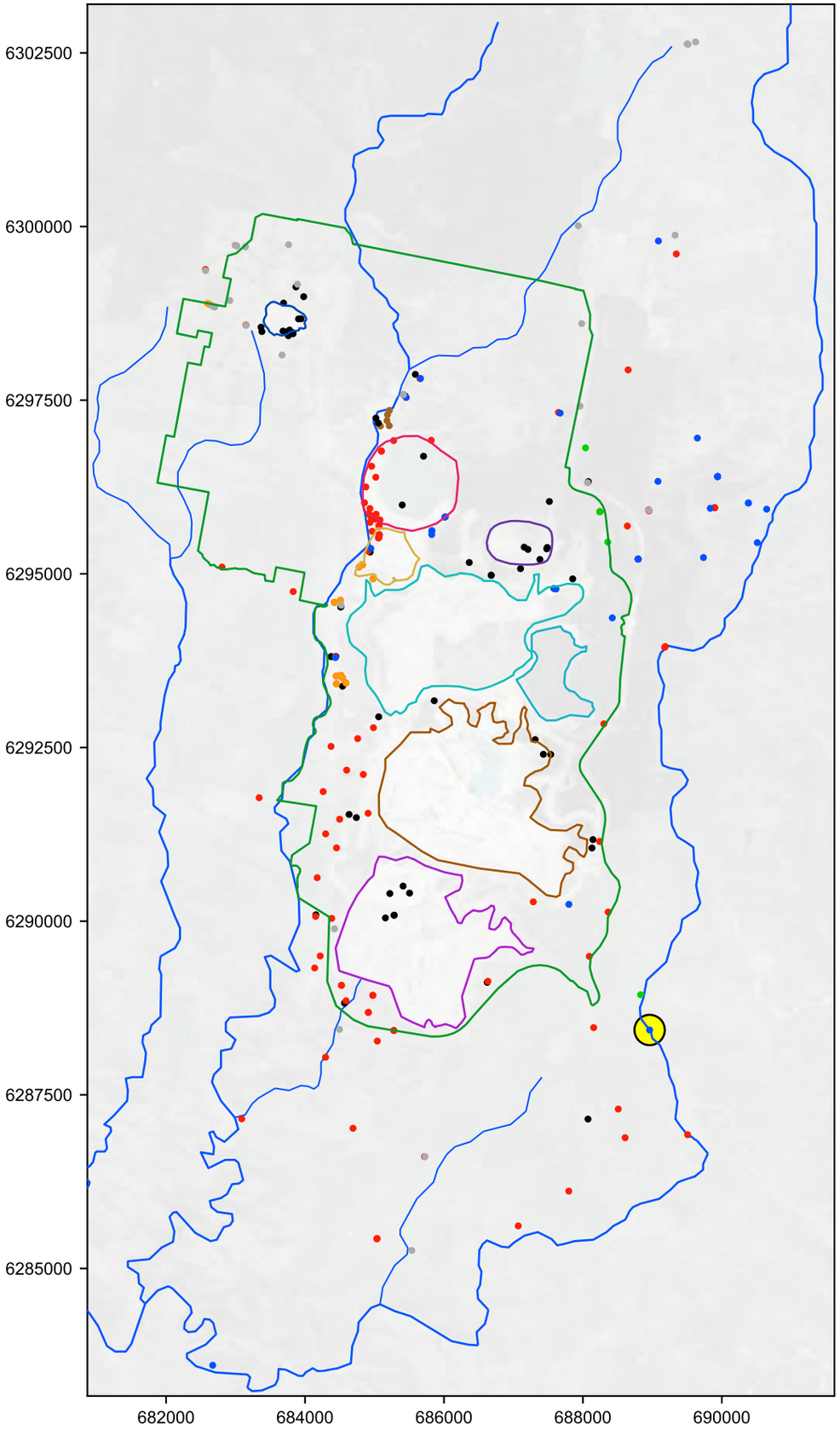
WMP defined analytes



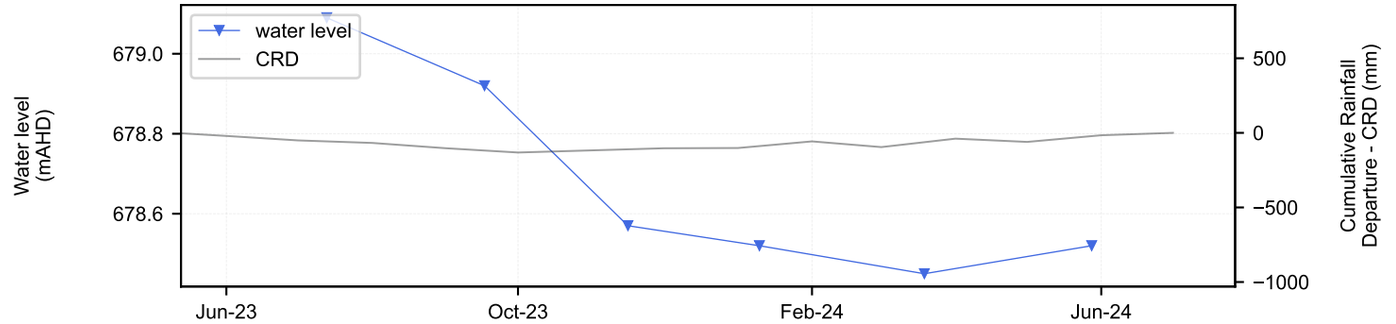
Additional analytes of interest

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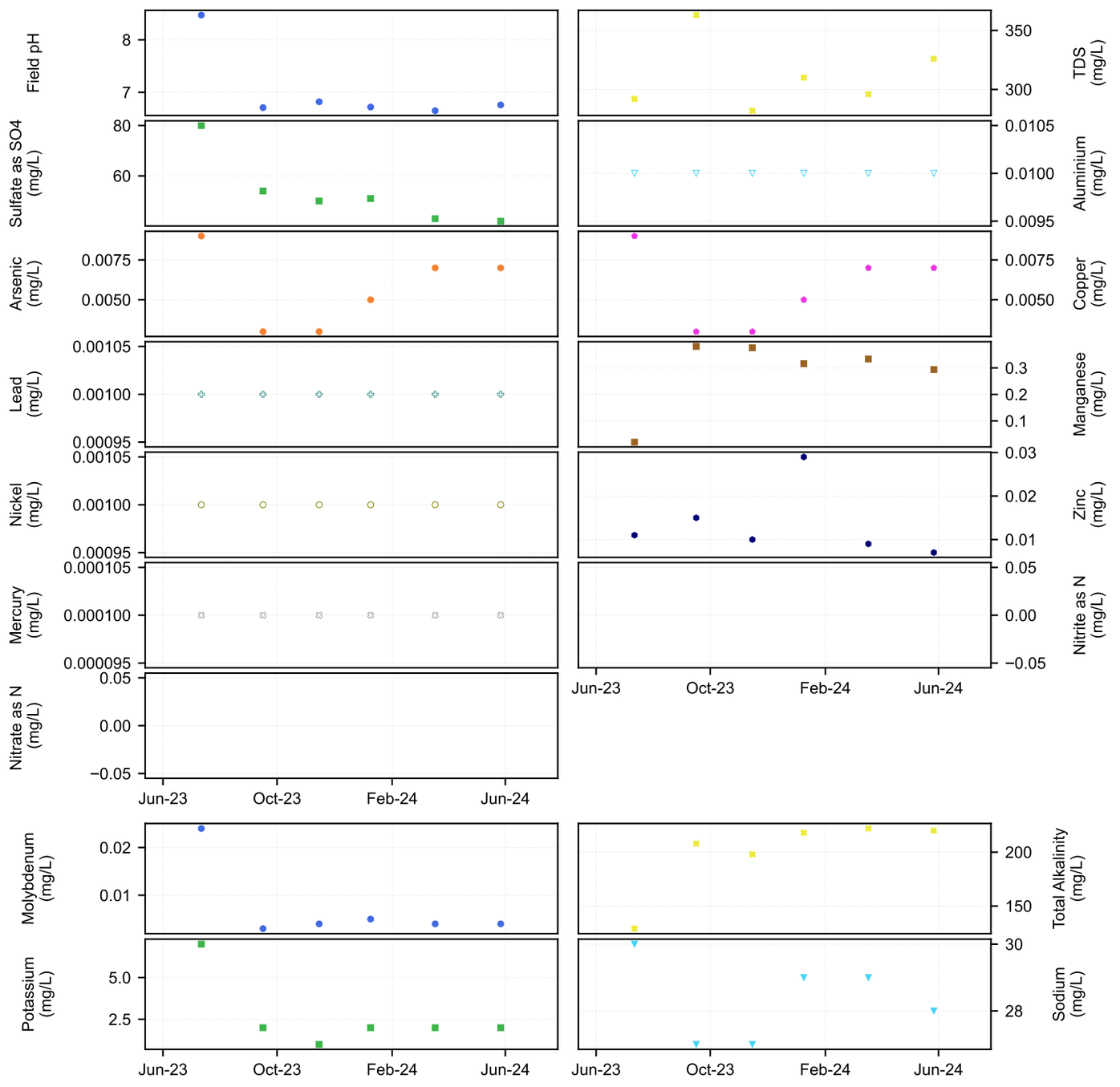
MB118 (Screened geology - Silurian; Screened interval: 3.2-6.2 mbgl)



Groundwater levels



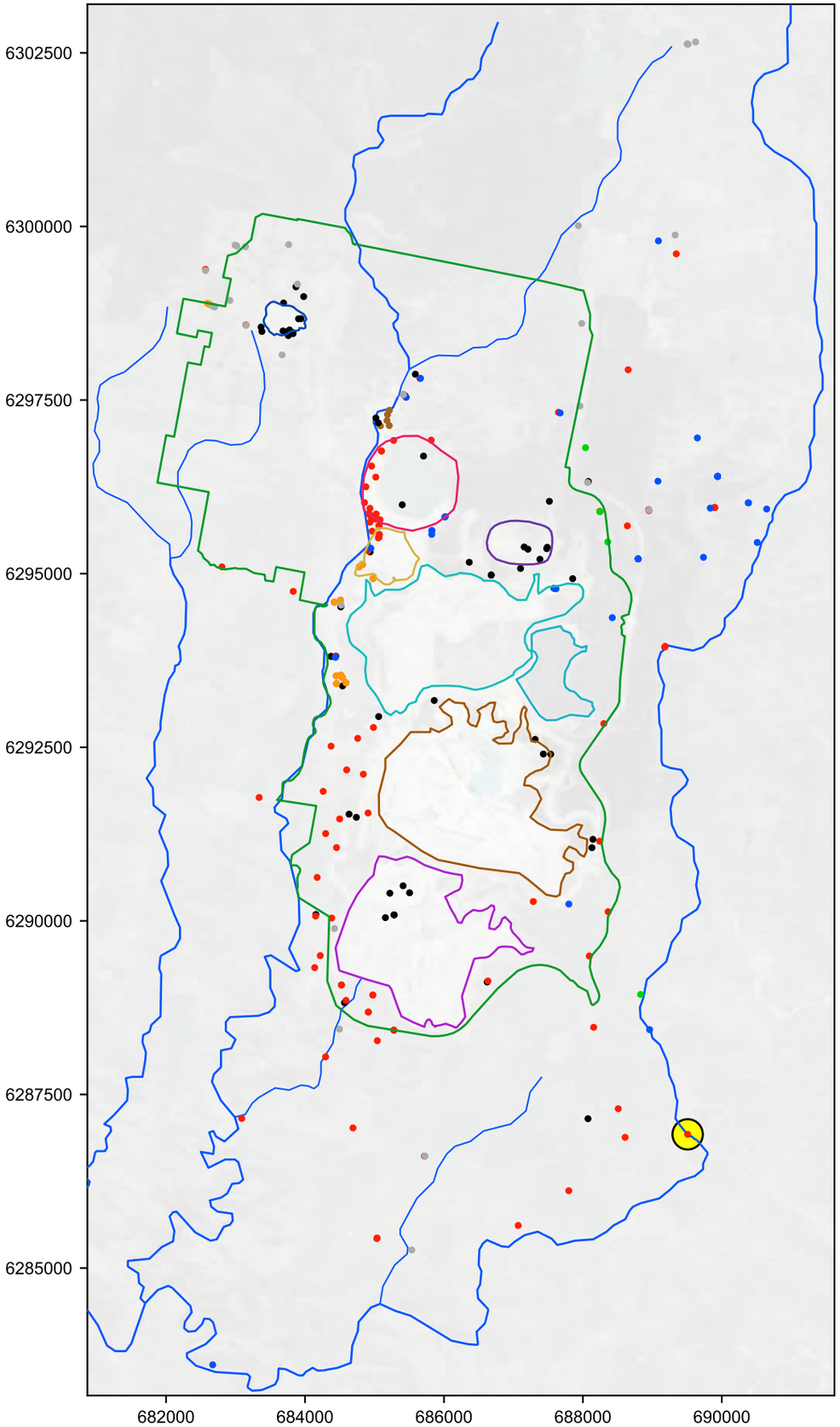
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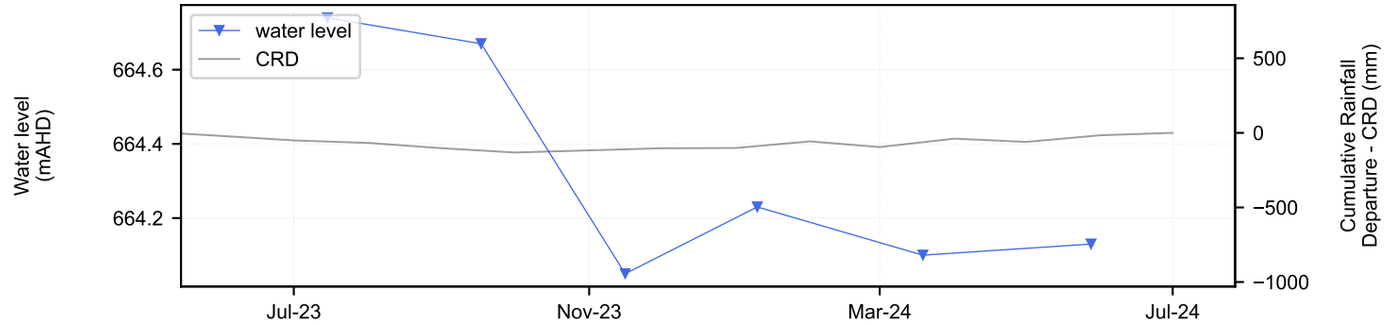
Additional analytes of interest

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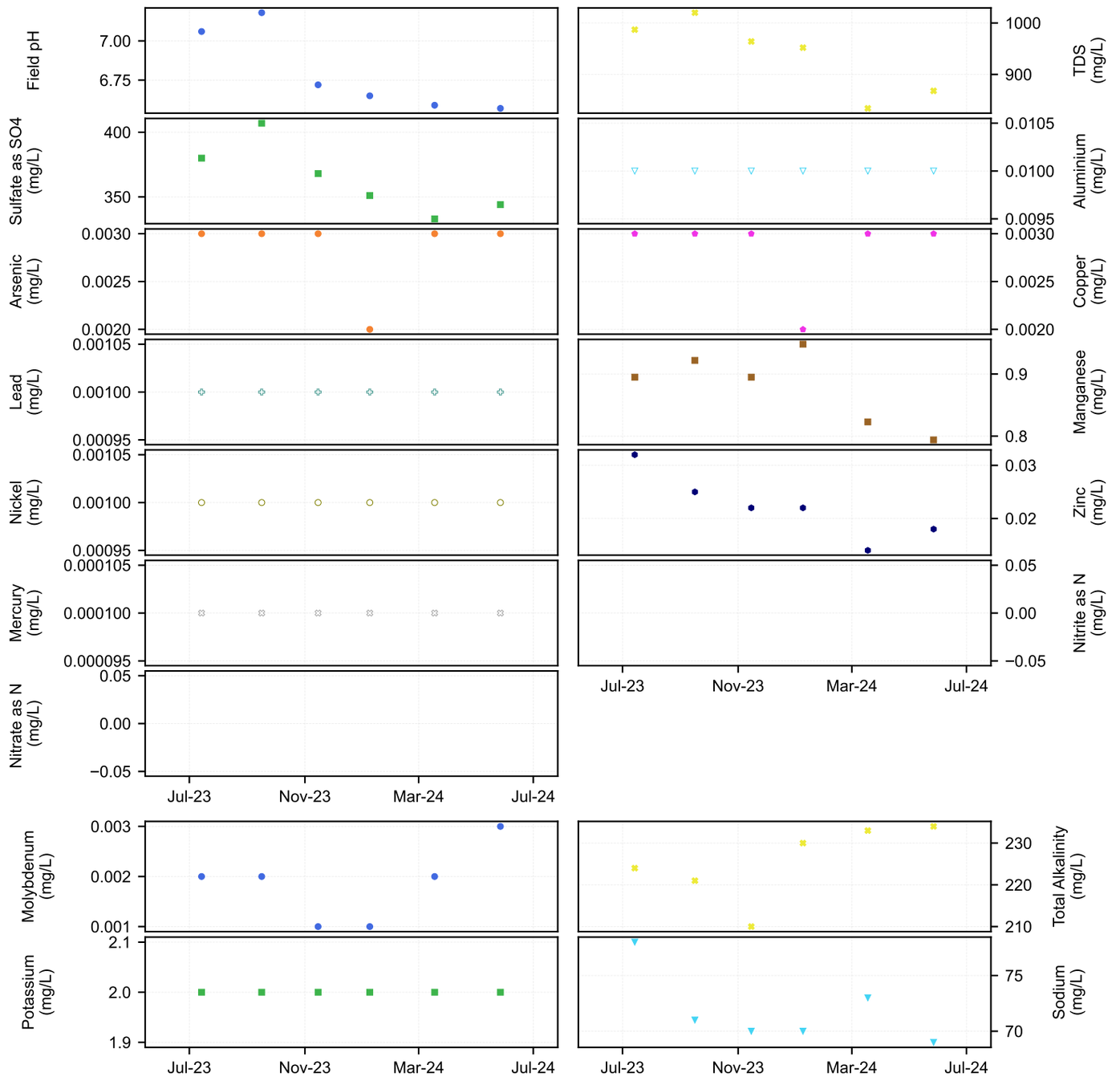
MB119 (Screened geology - Ordovician; Screened interval: 3.2-6.2 mbgl)



Groundwater levels



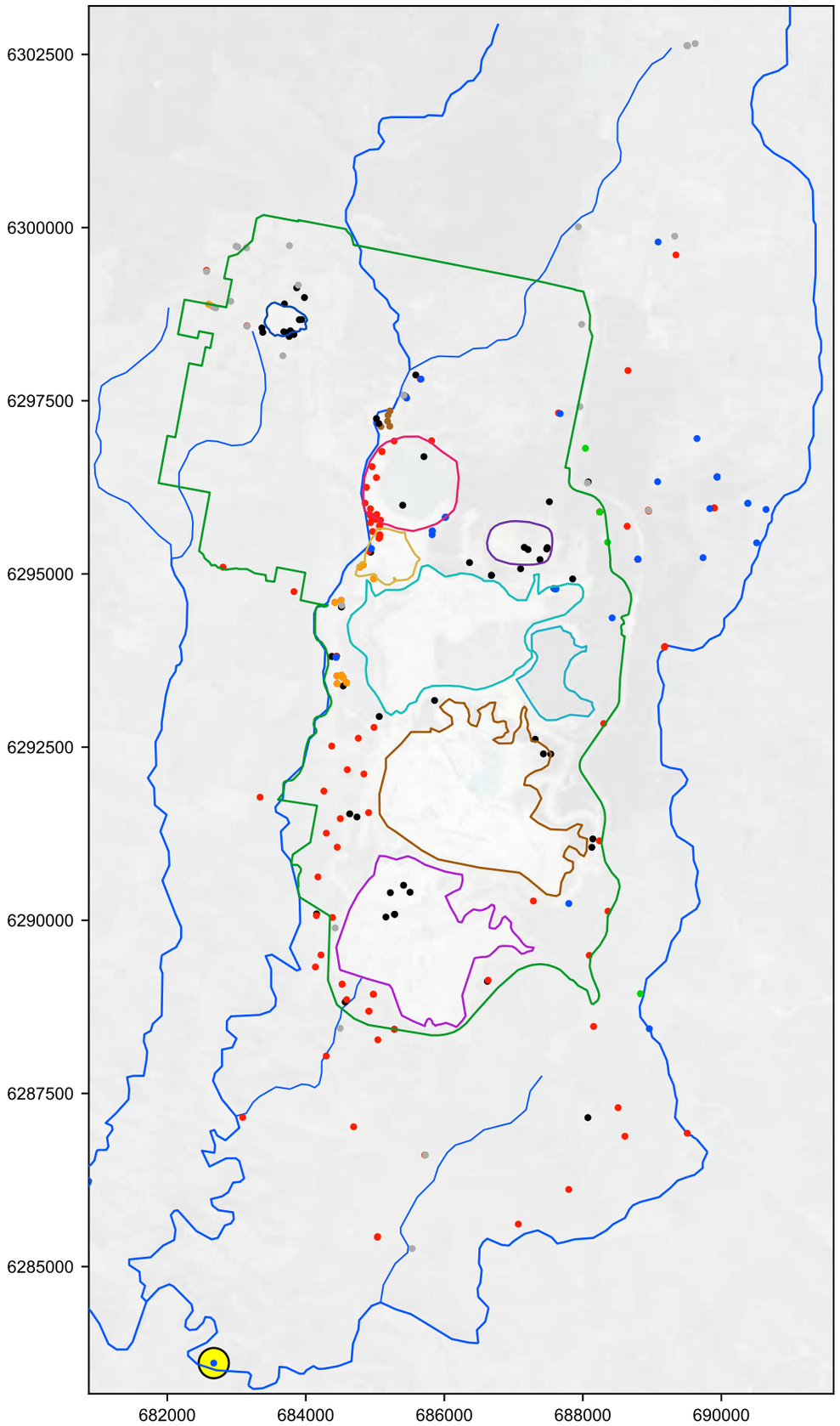
WMP defined analytes



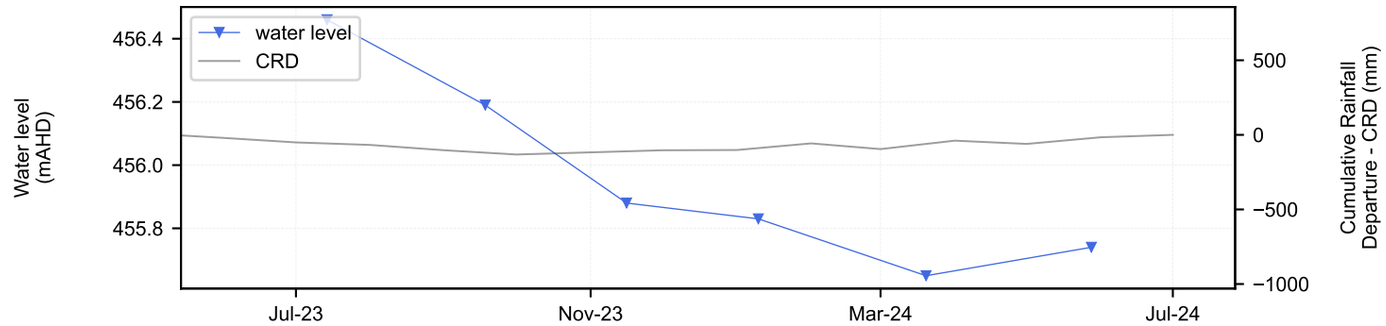
Additional analytes of interest

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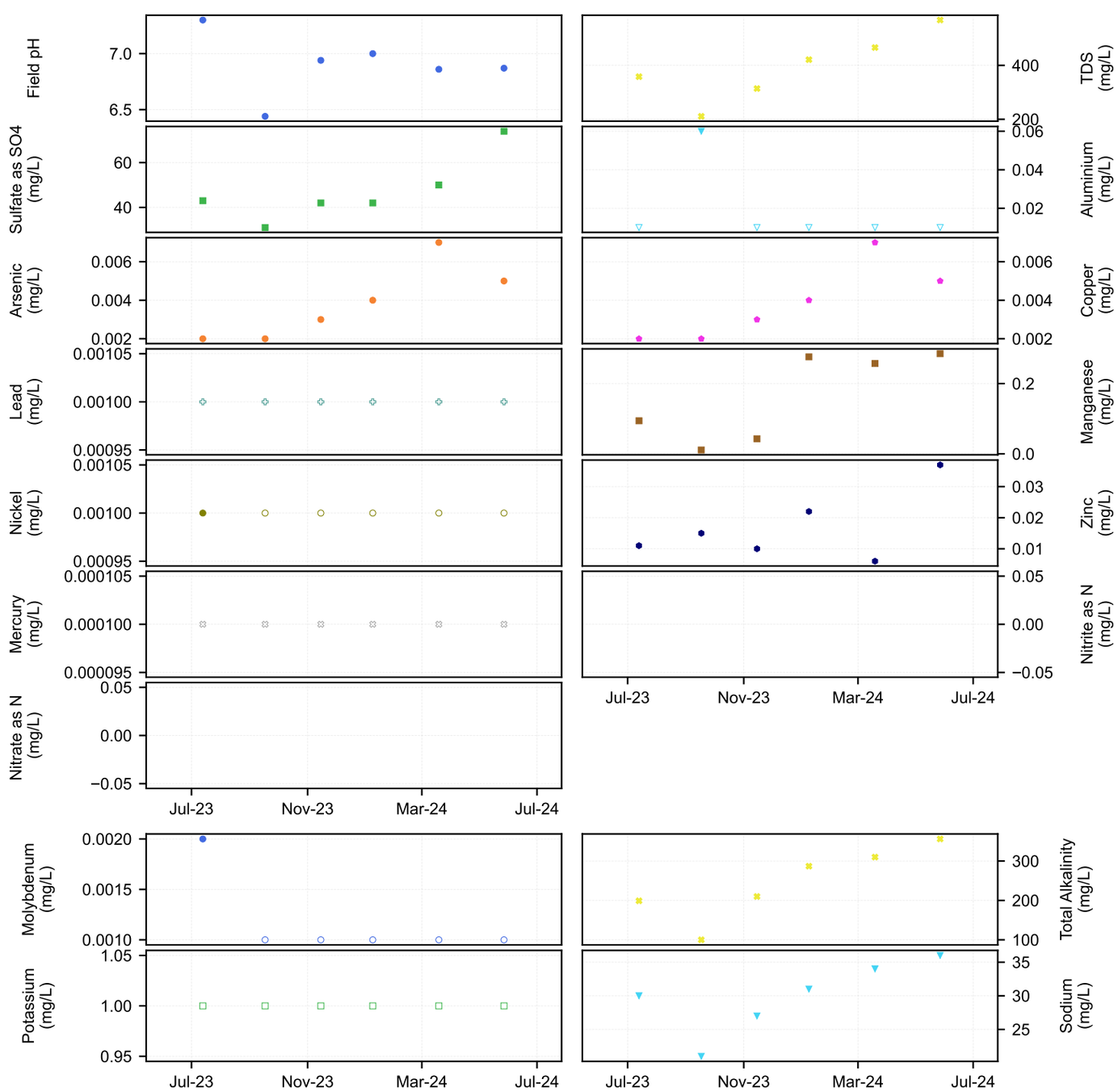
MB120 (Screened geology - Silurian; Screened interval: 9.0-15 mbgl)



Groundwater levels



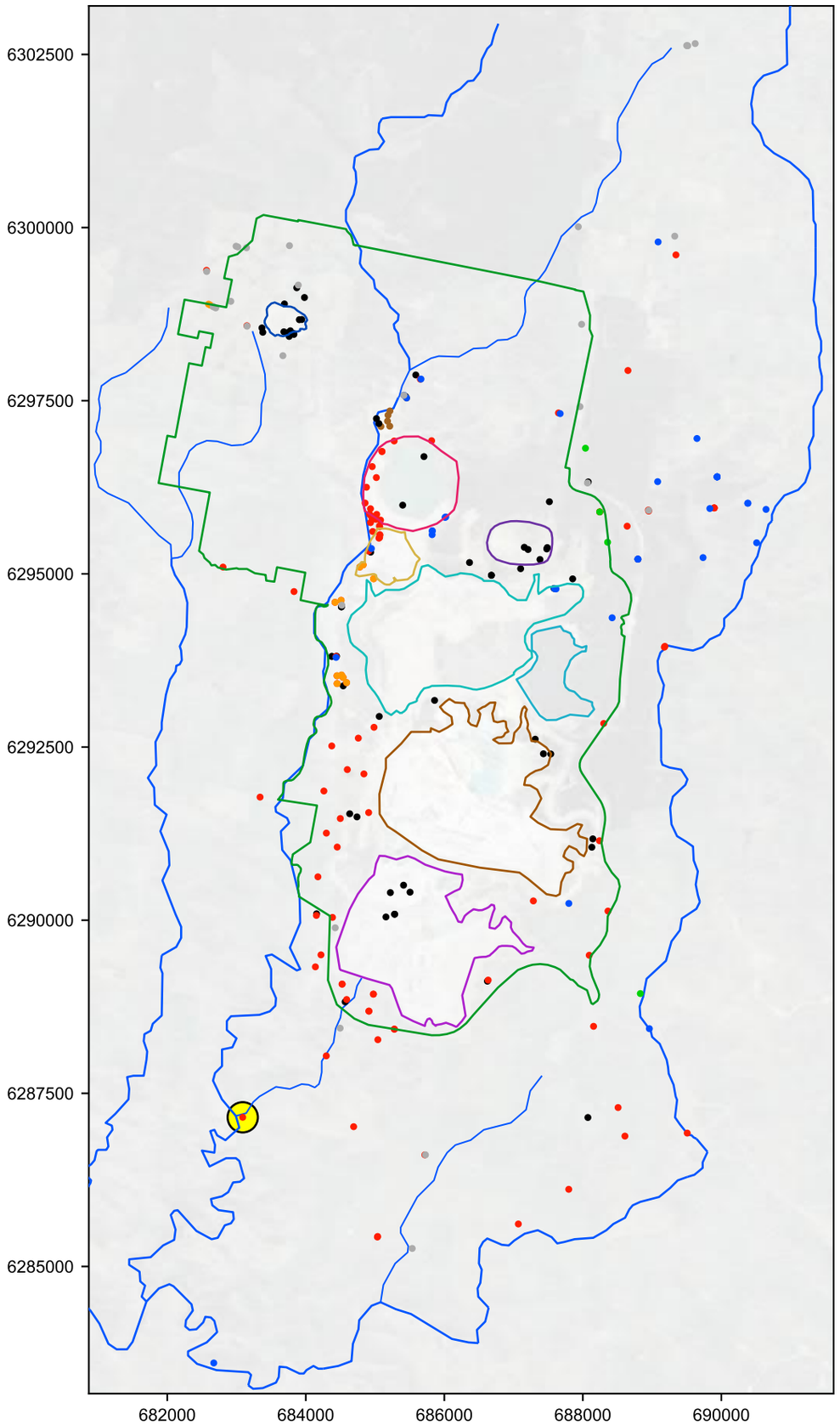
WMP defined analytes



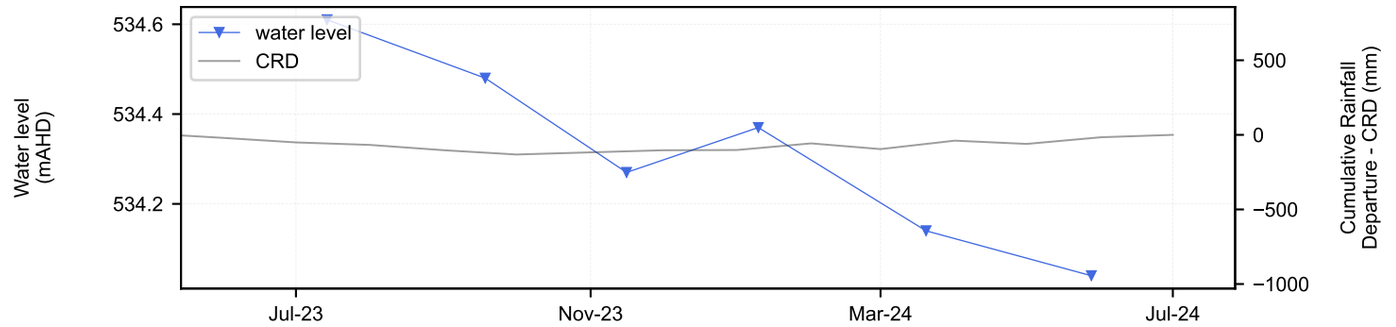
Additional analytes of interest

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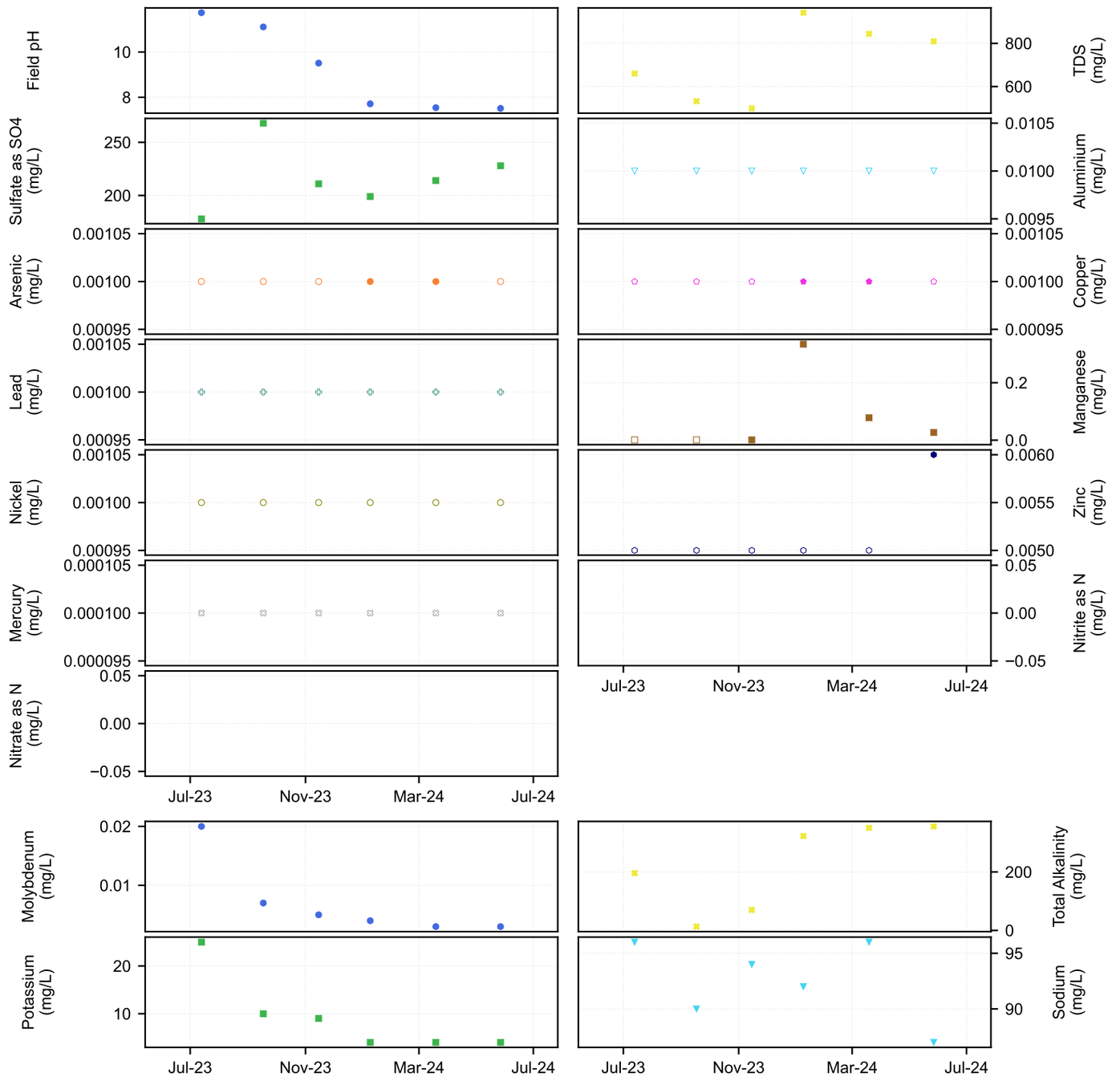
MB121 (Screened geology - Ordovician; Screened interval: 7.0-13 mbgl)



Groundwater levels



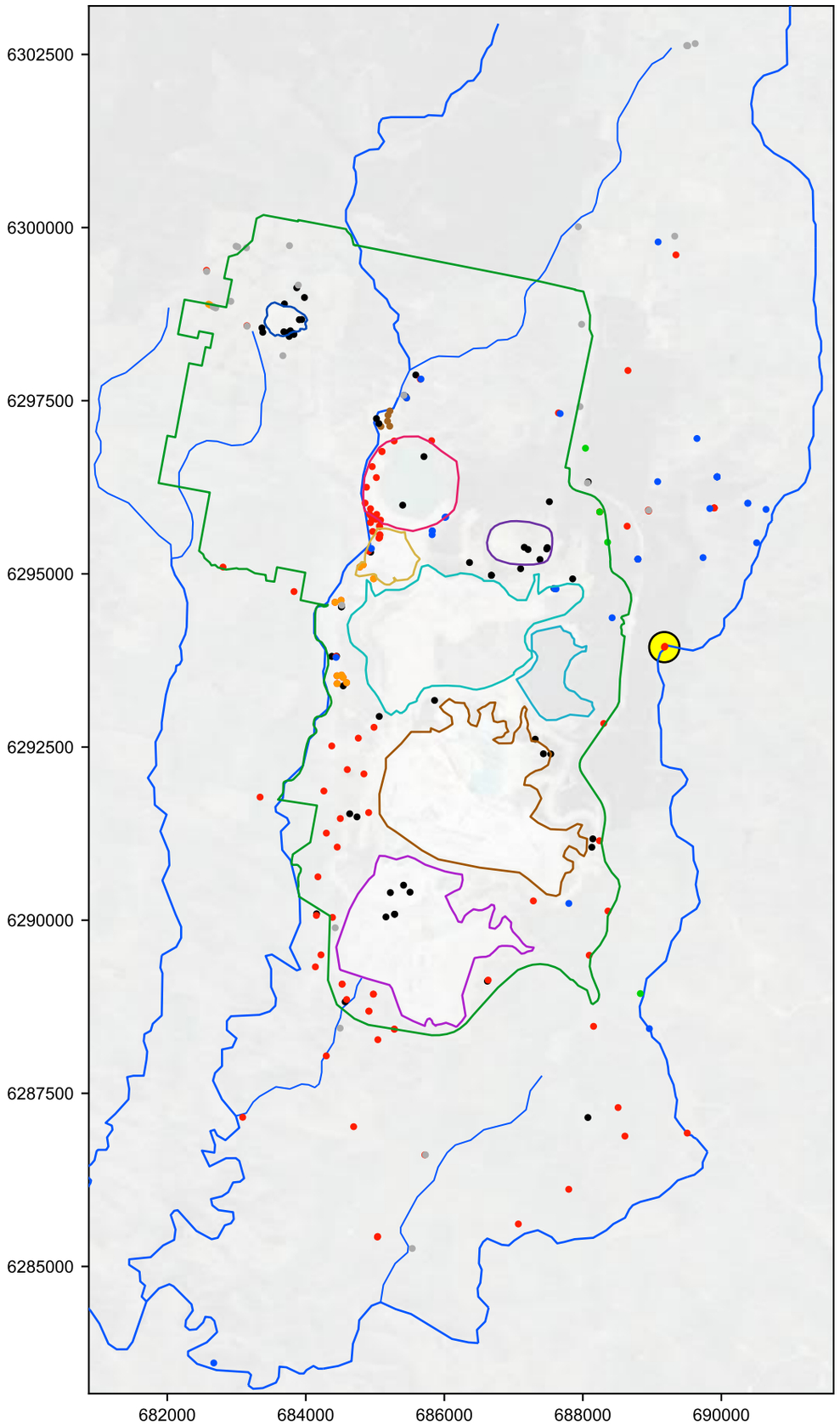
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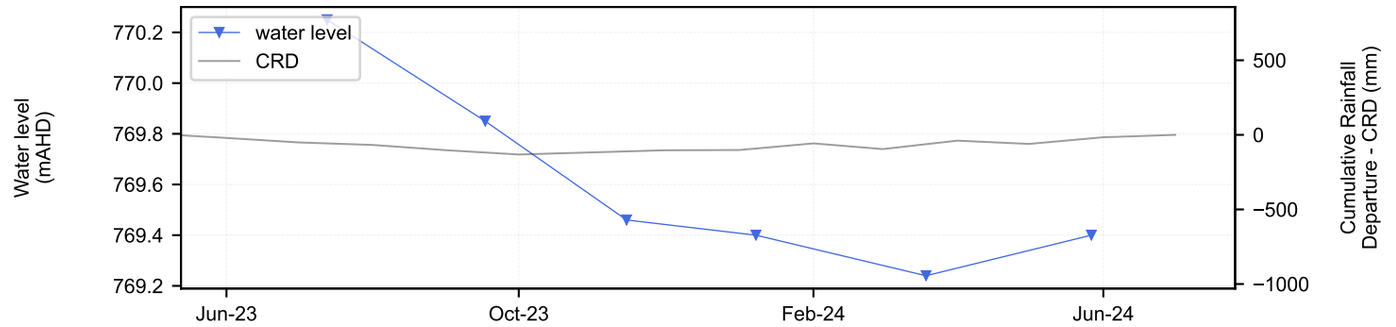
Additional analytes of interest

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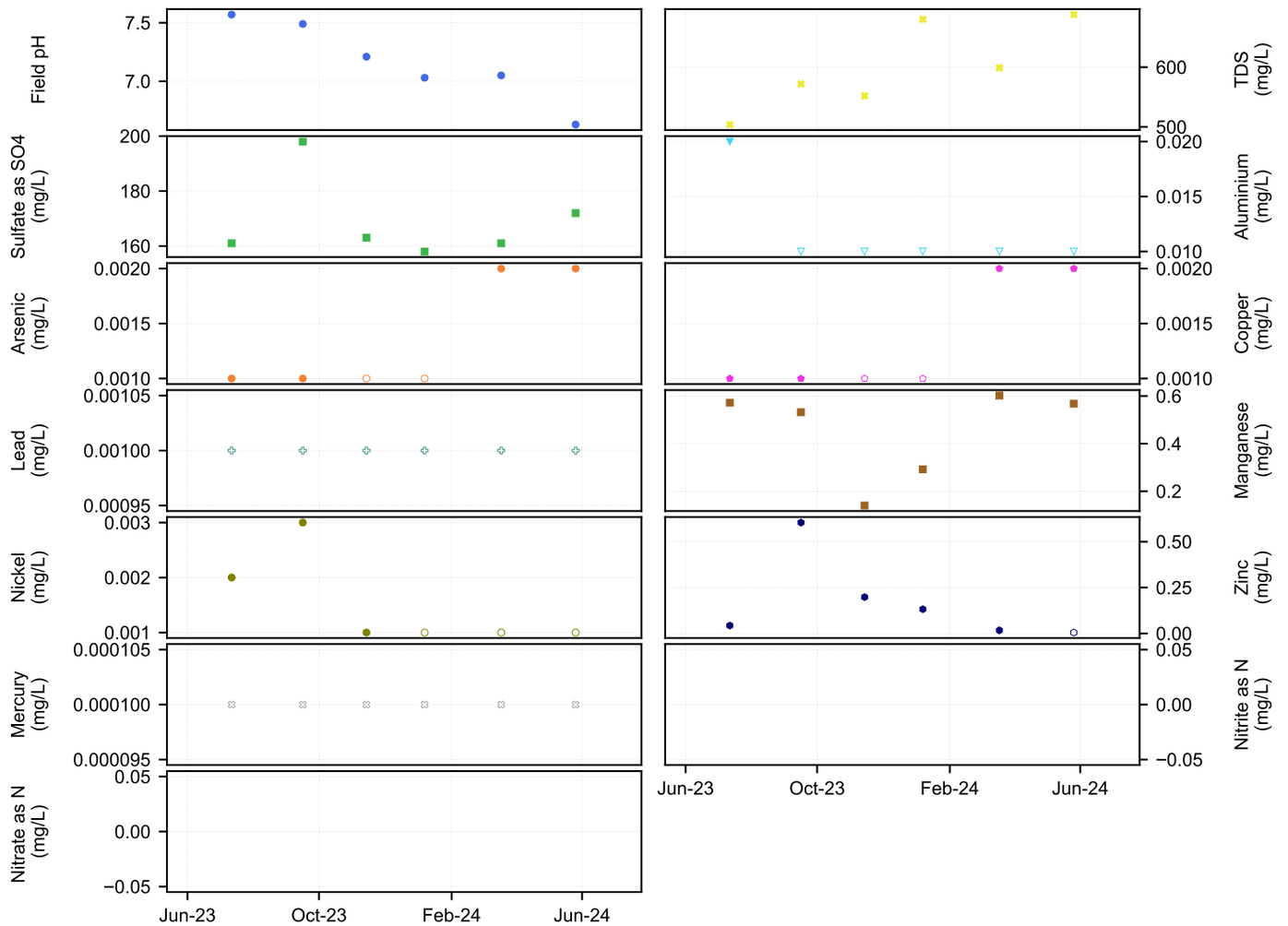
MB122 (Screened geology - Ordovician; Screened interval: 13-19 mbgl)



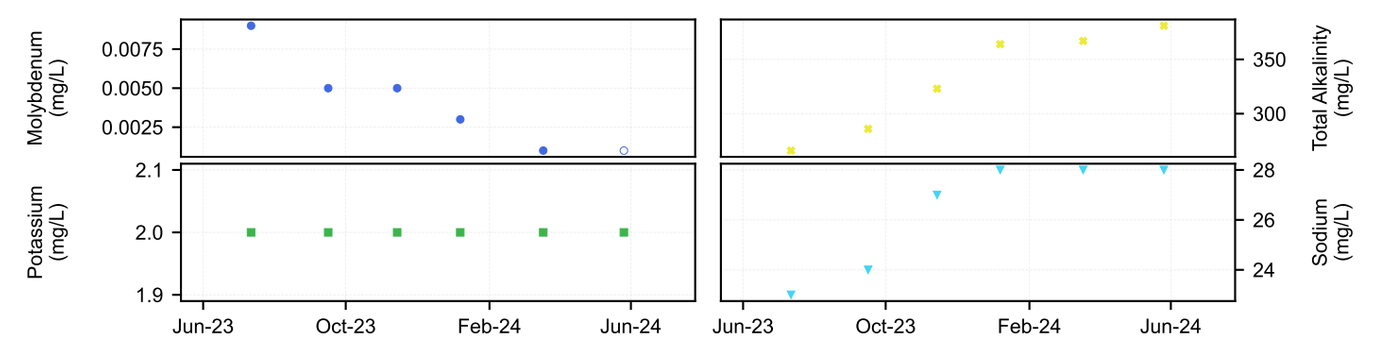
Groundwater levels



WMP defined analytes

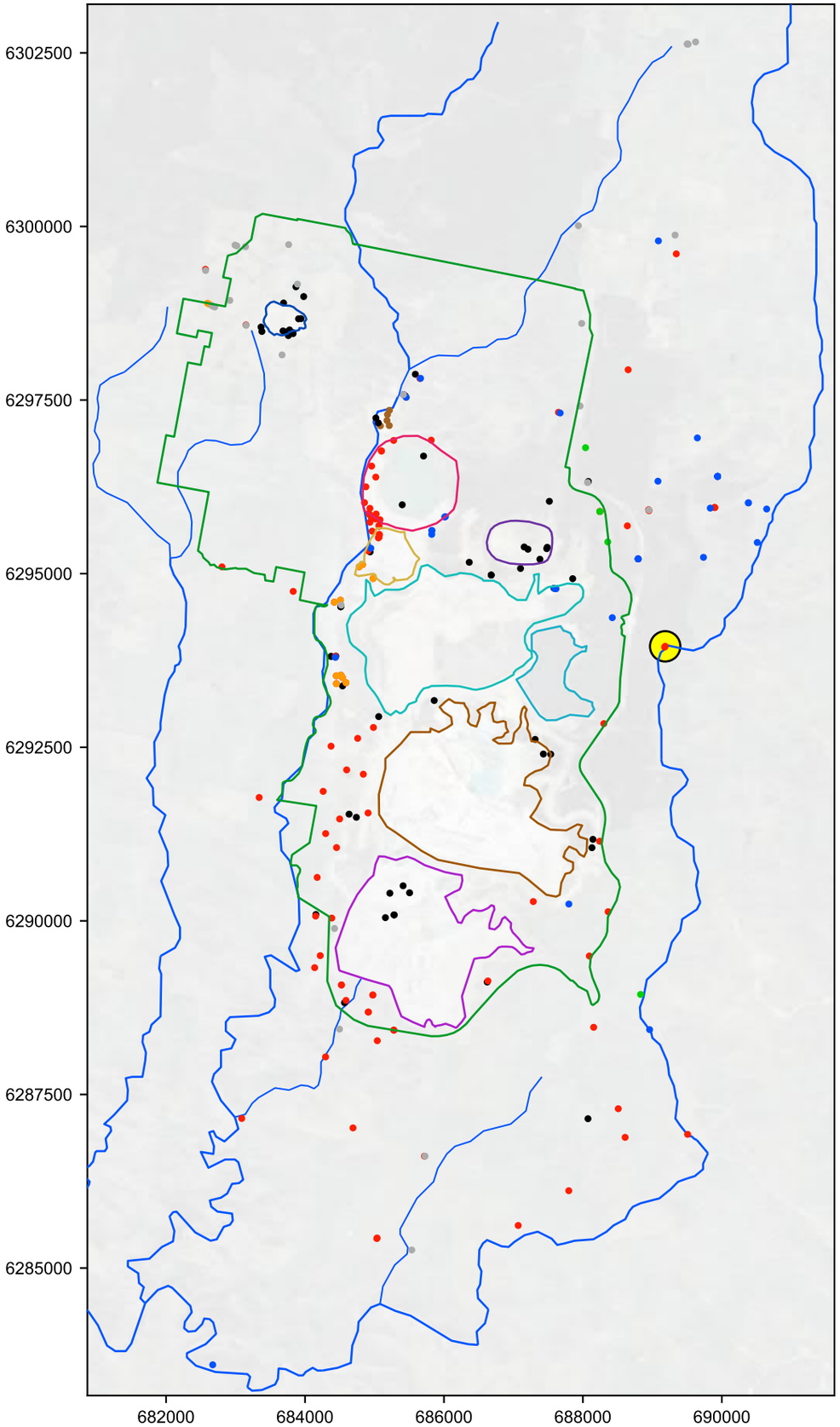


Additional analytes of interest

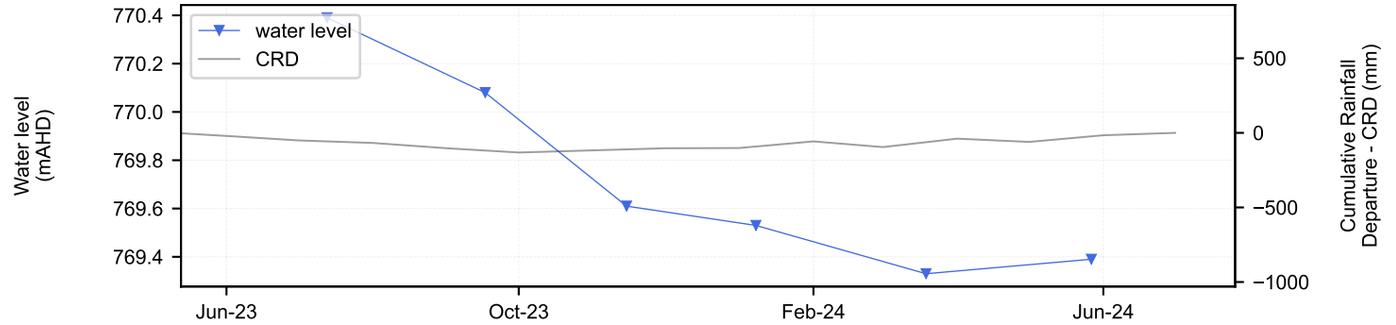


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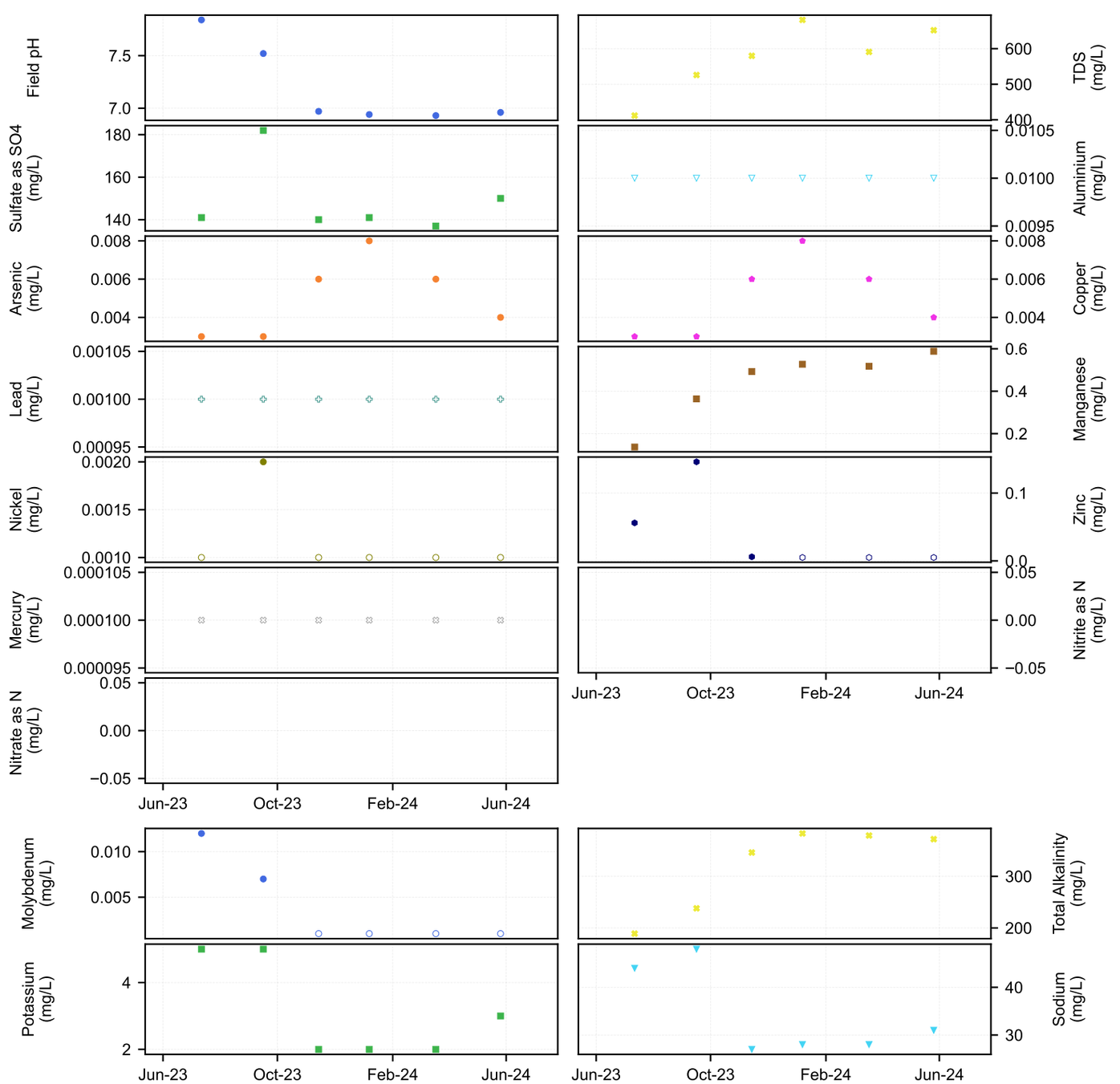
MB123 (Screened geology - Ordovician; Screened interval: 9.0-15 mbgl)



Groundwater levels



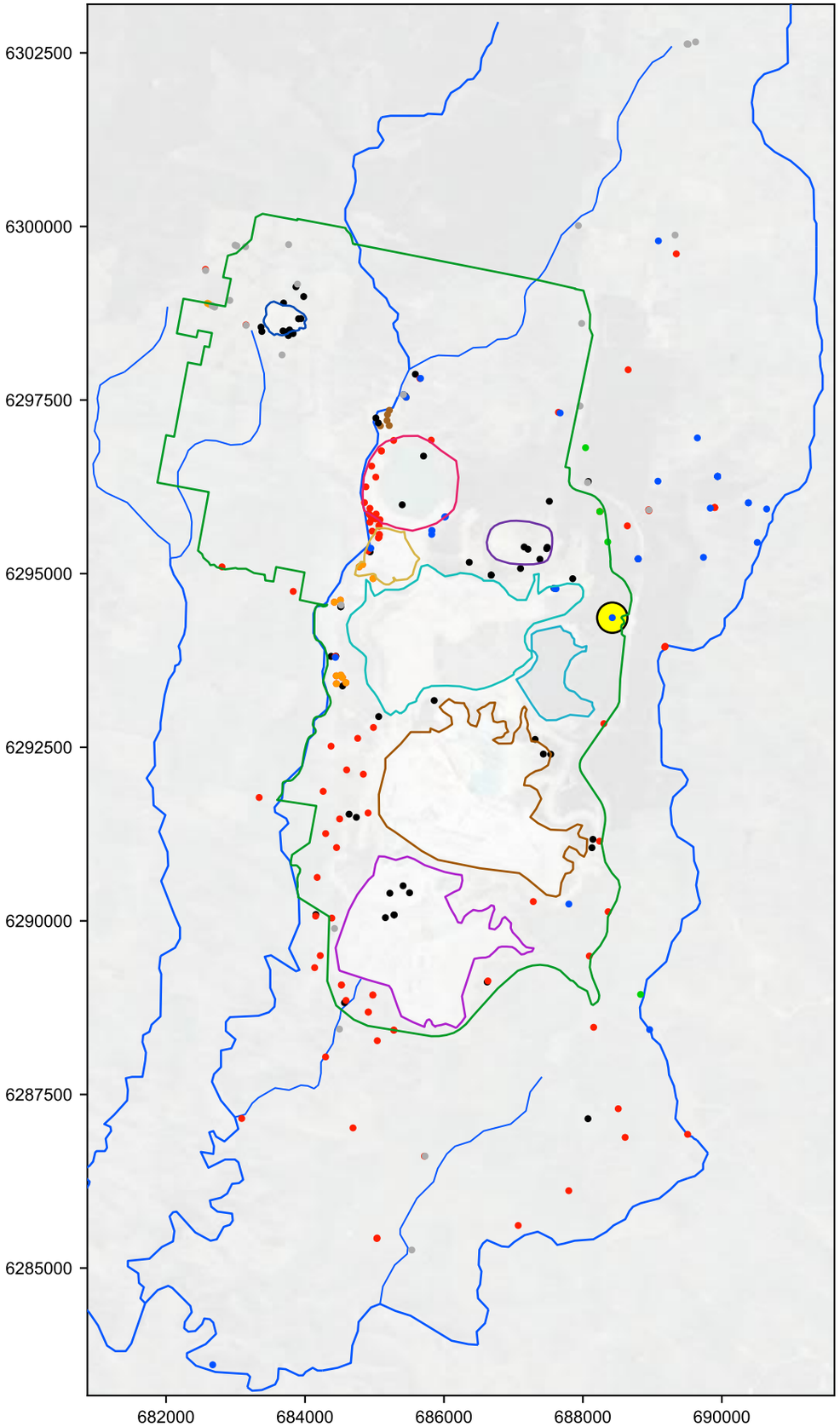
WMP defined analytes



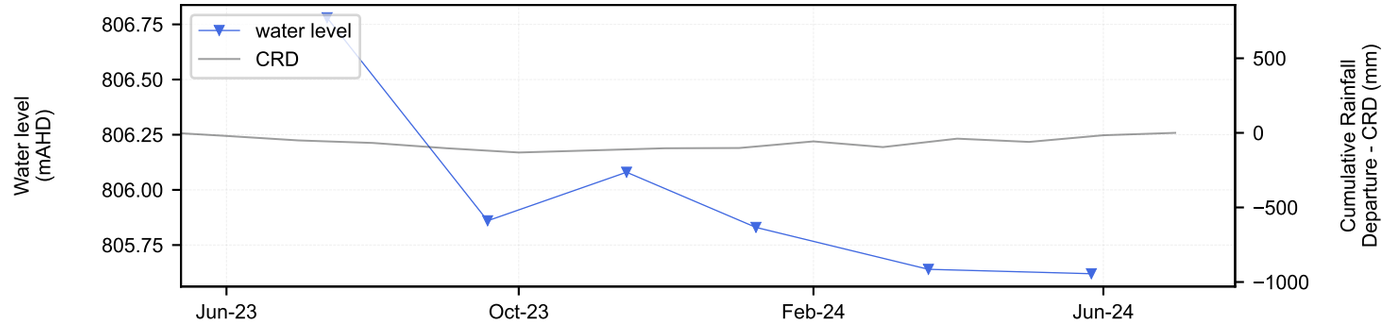
Additional analytes of interest

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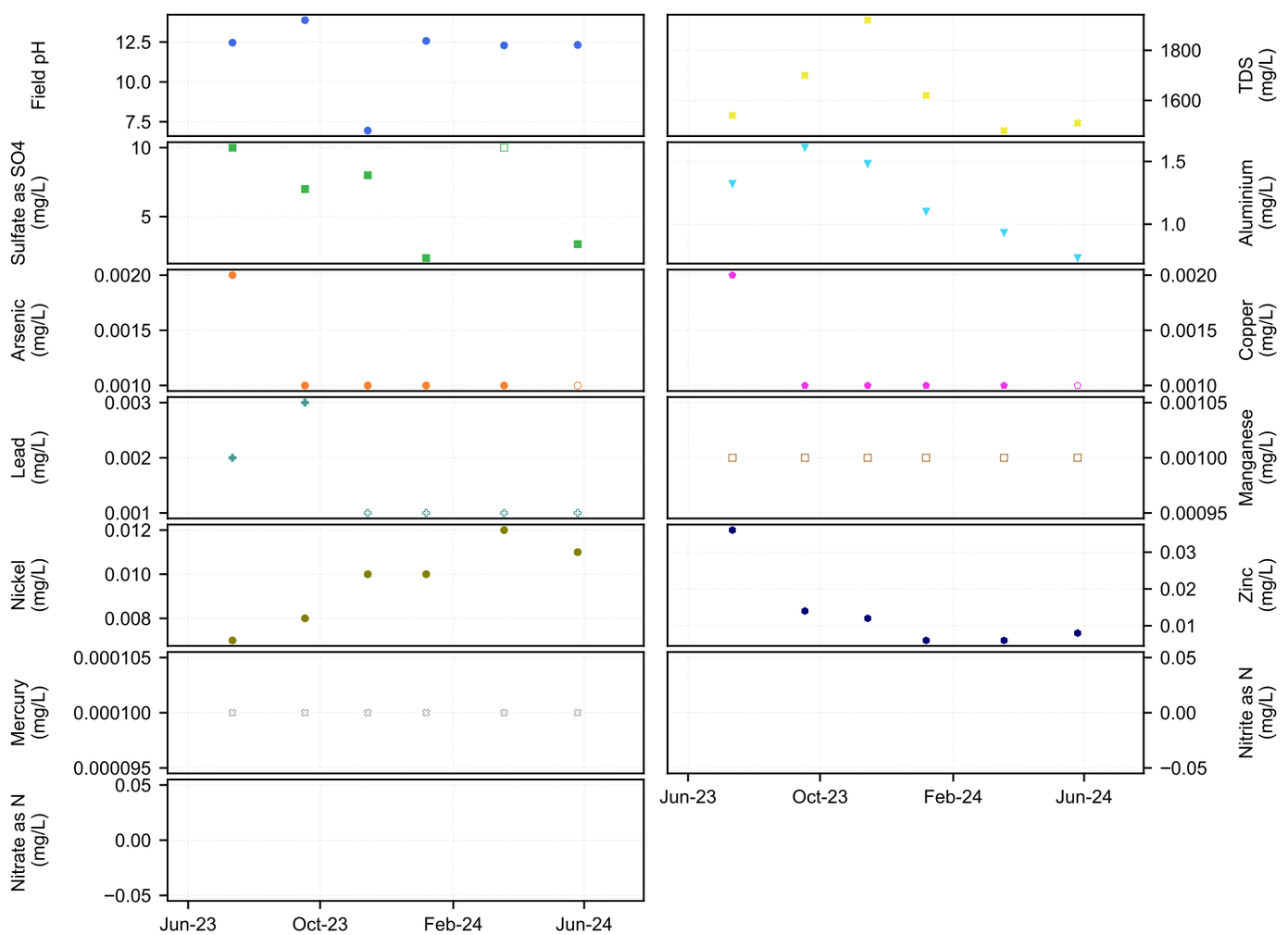
MB124 (Screened geology - Silurian; Screened interval: 64-70 mbgl)



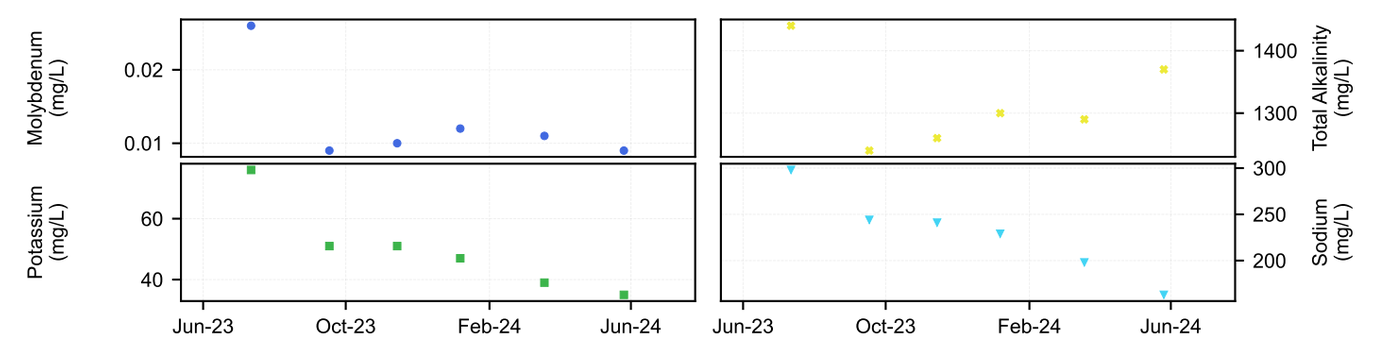
Groundwater levels



WMP defined analytes

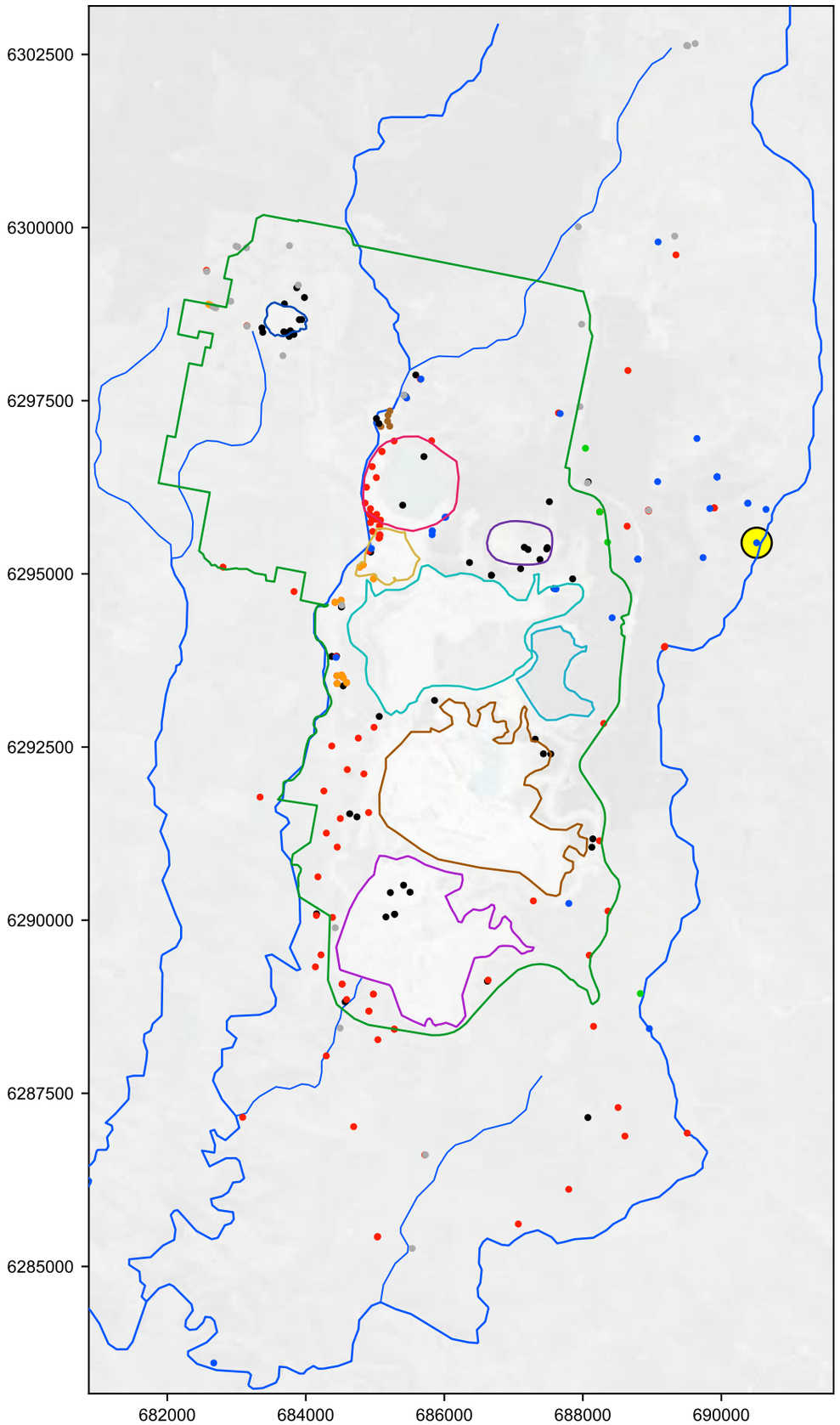


Additional analytes of interest

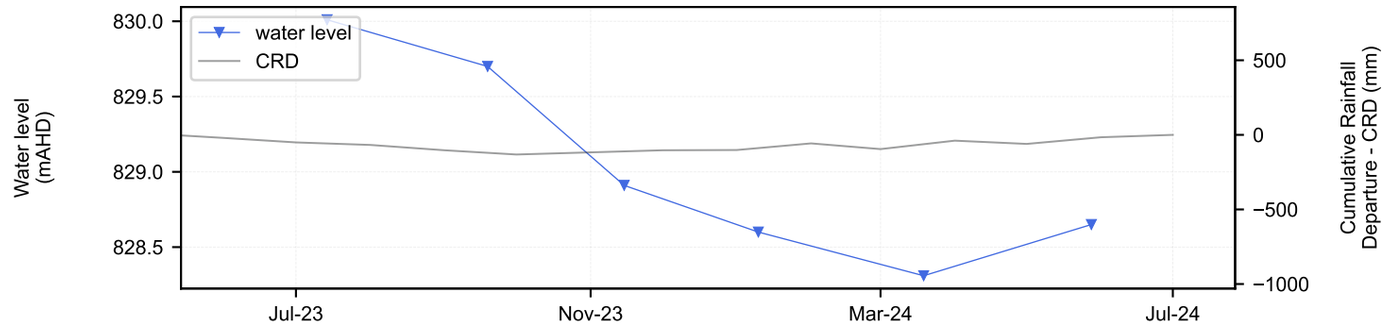


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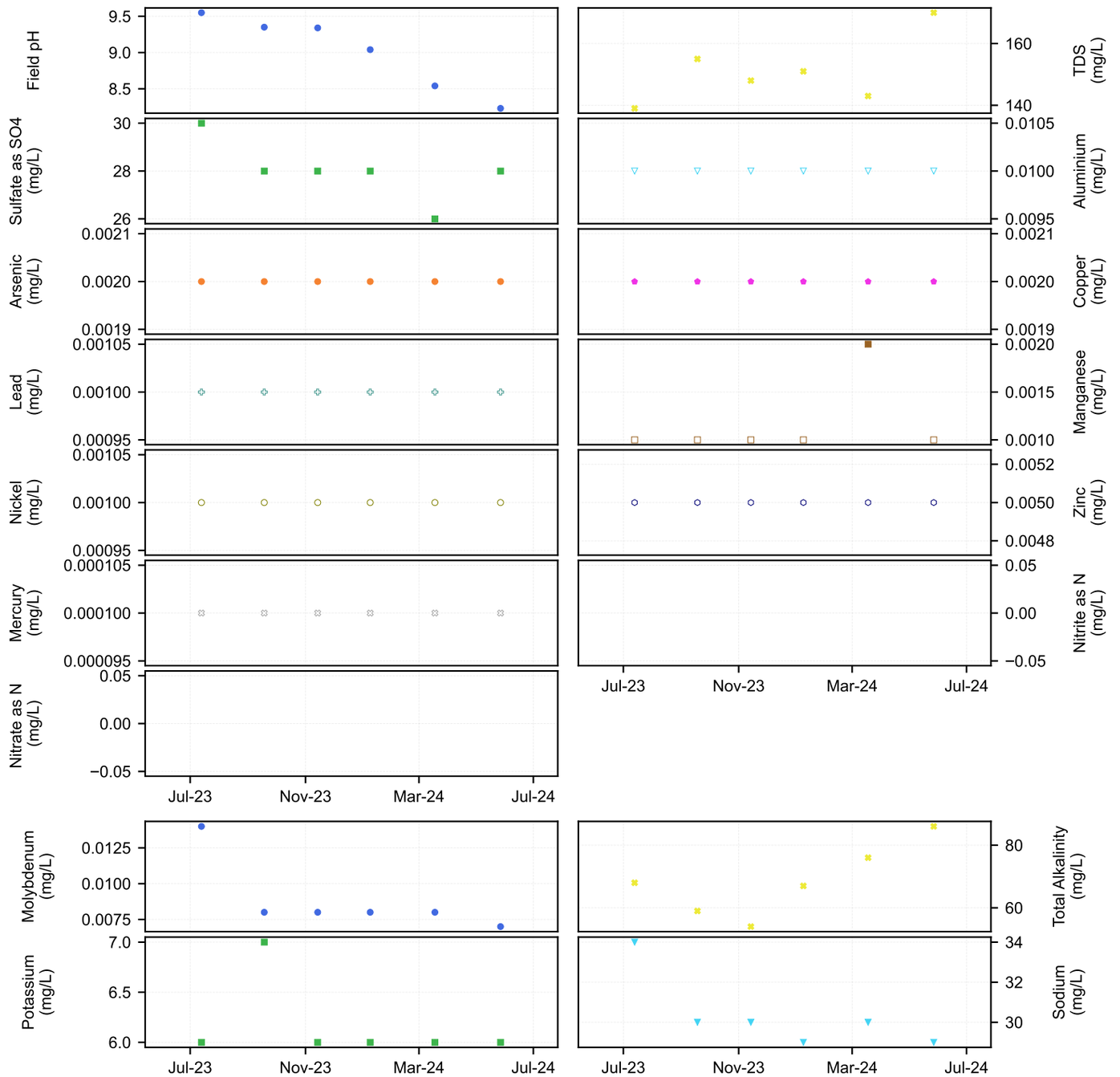
MB125 (Screened geology - Silurian; Screened interval: 12.5-27.5 mbgl)



Groundwater levels



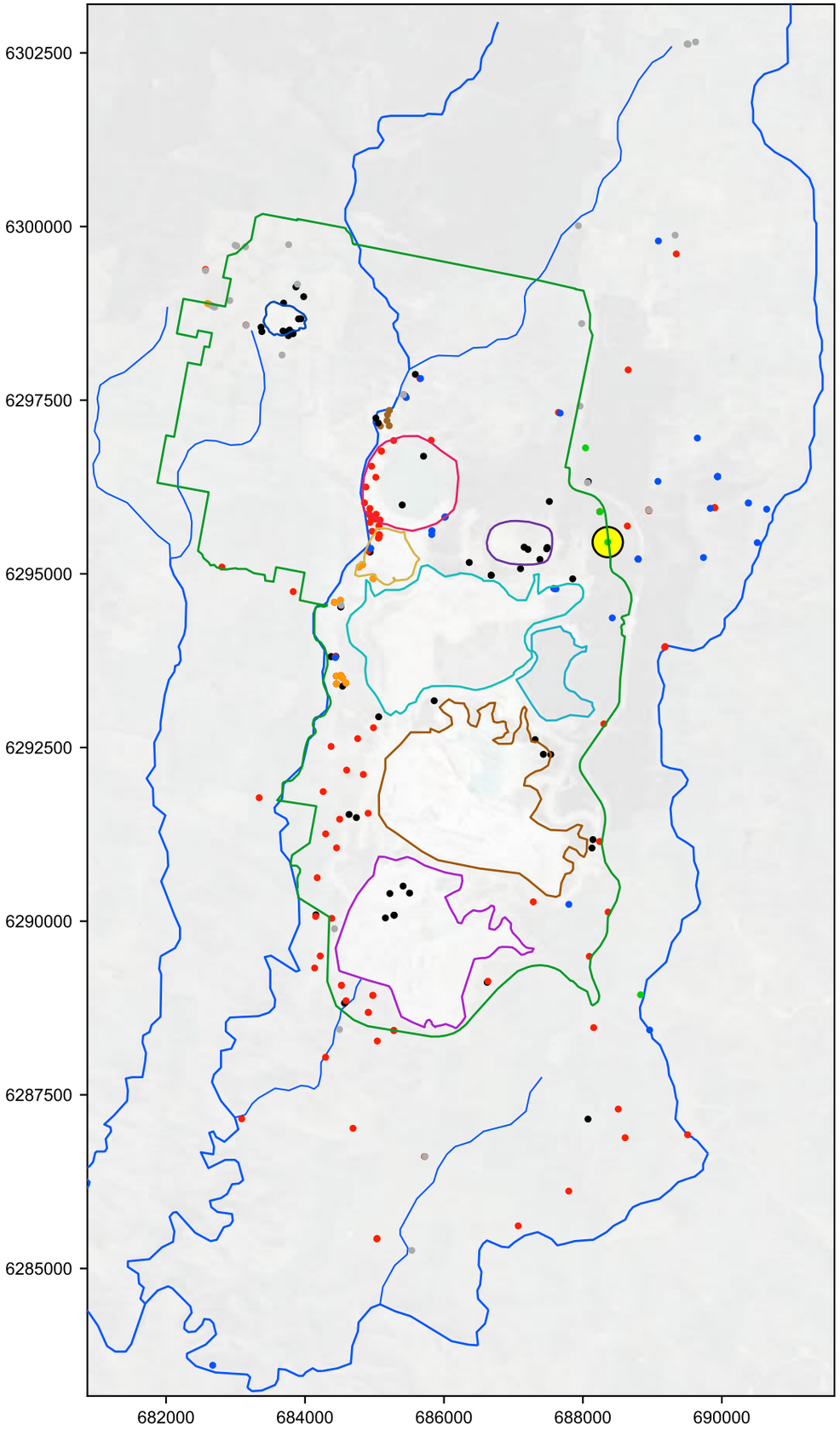
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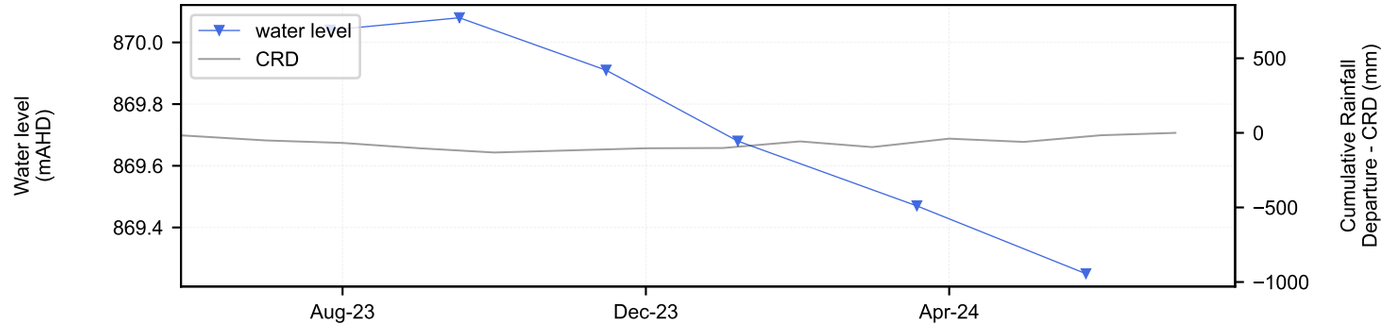
Additional analytes of interest

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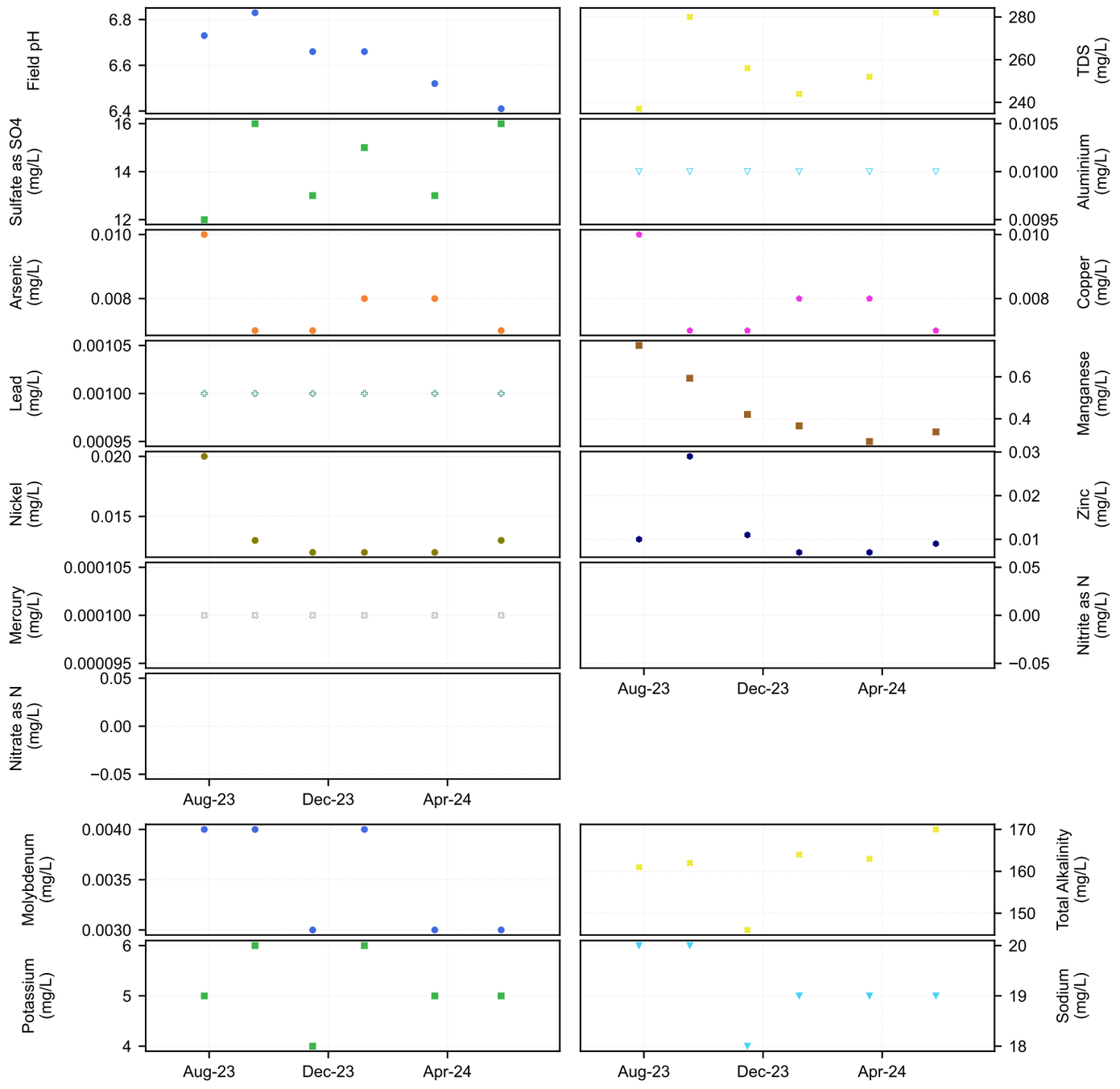
MB126 (Screened geology - Tertiary Basalt; Screened interval: 34-55 mbgl)



Groundwater levels



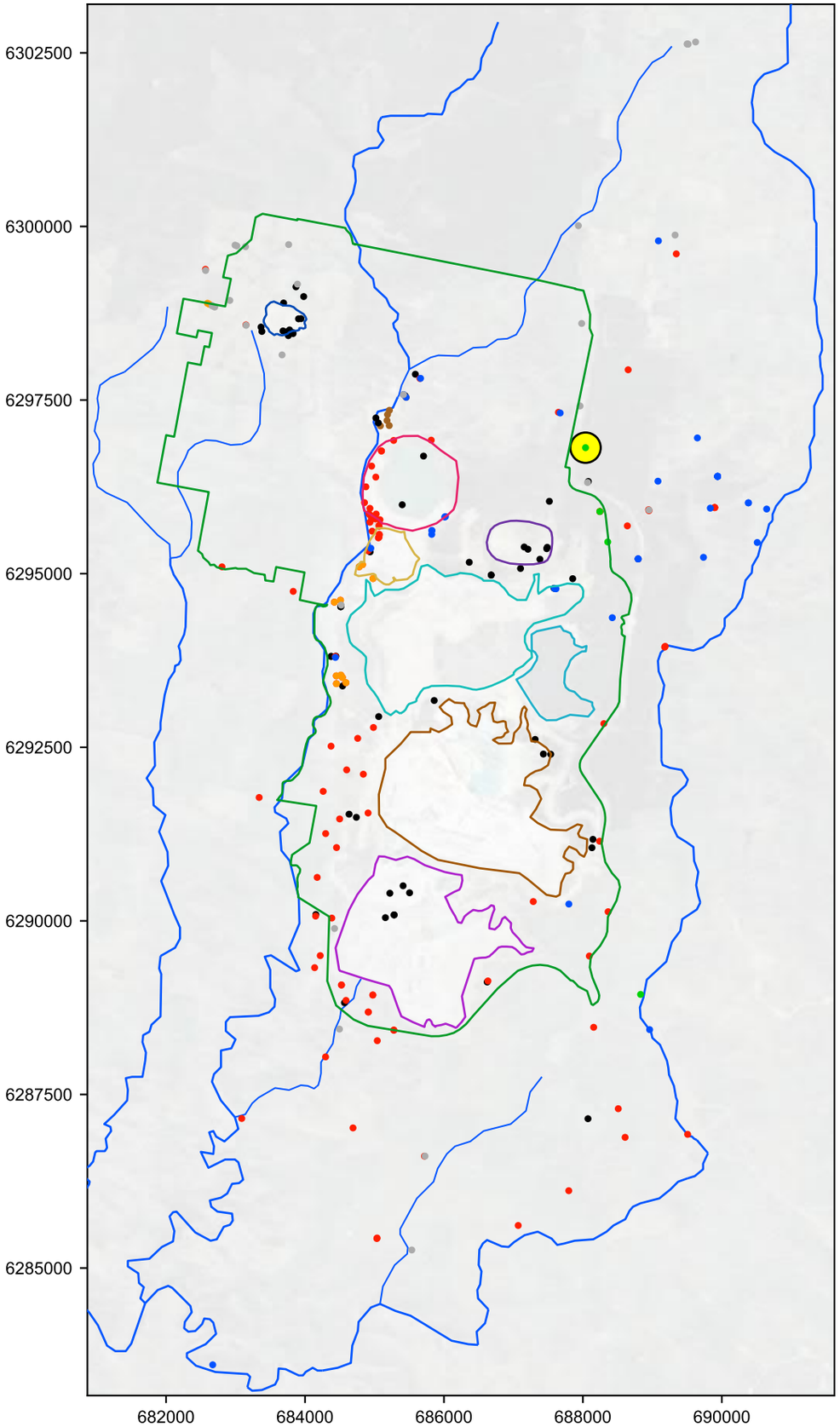
WMP defined analytes



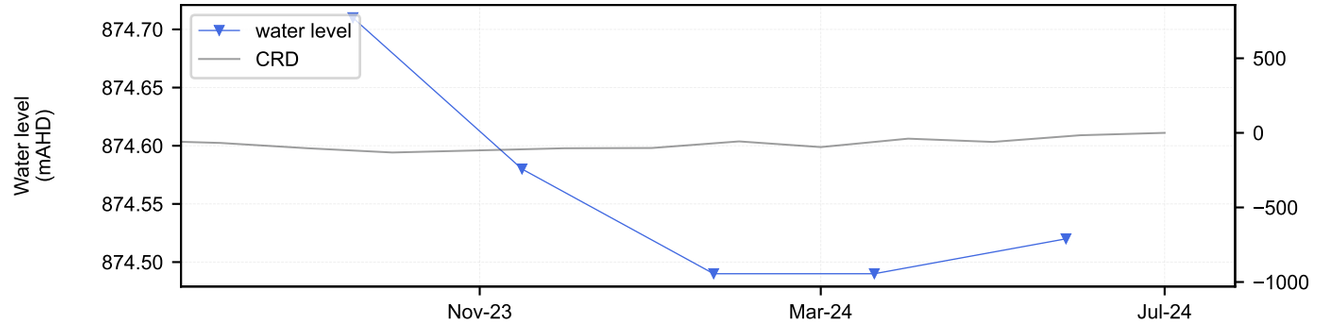
Additional analytes of interest

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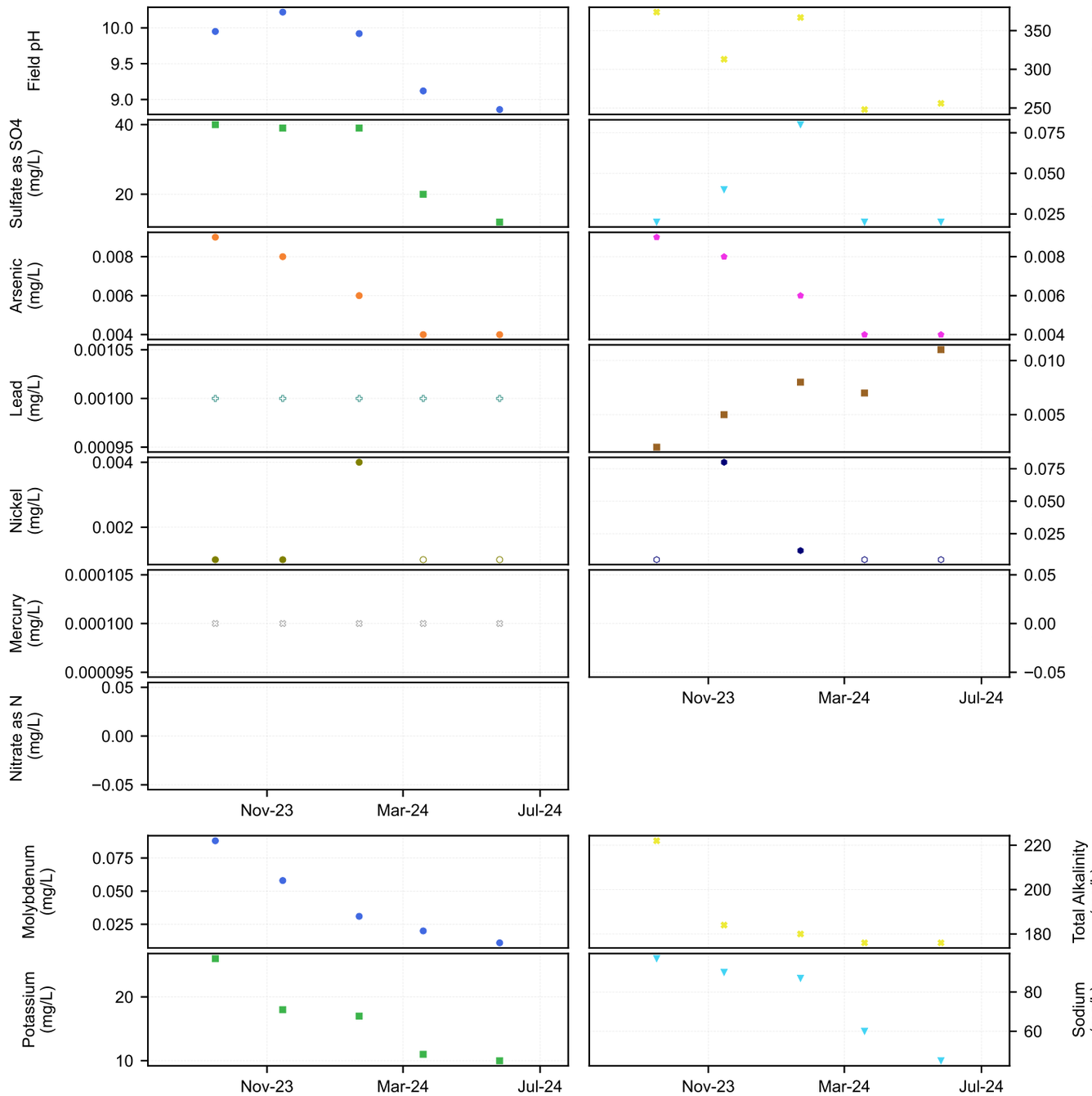
MB127 (Screened geology - Tertiary Basalt; Screened interval: 87-99 mbgl)



Groundwater levels



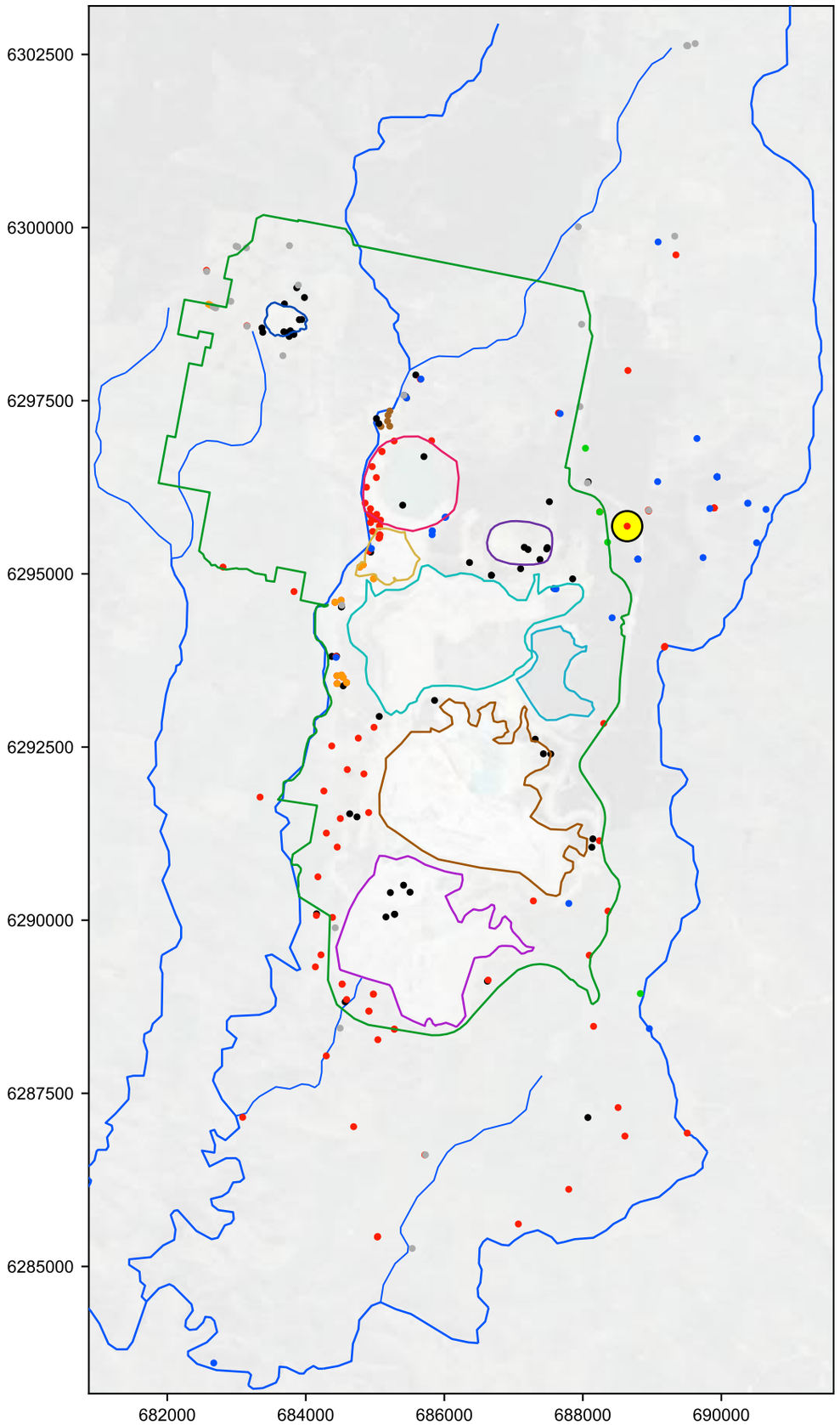
WMP defined analytes



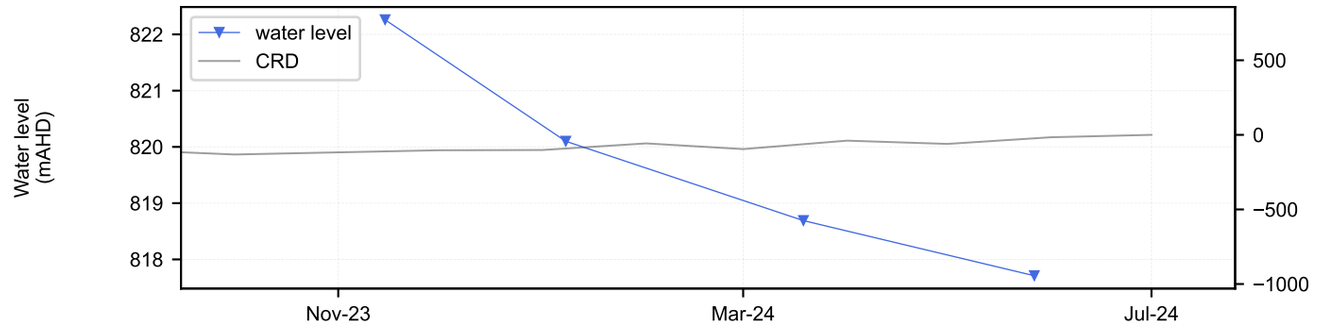
Additional analytes of interest

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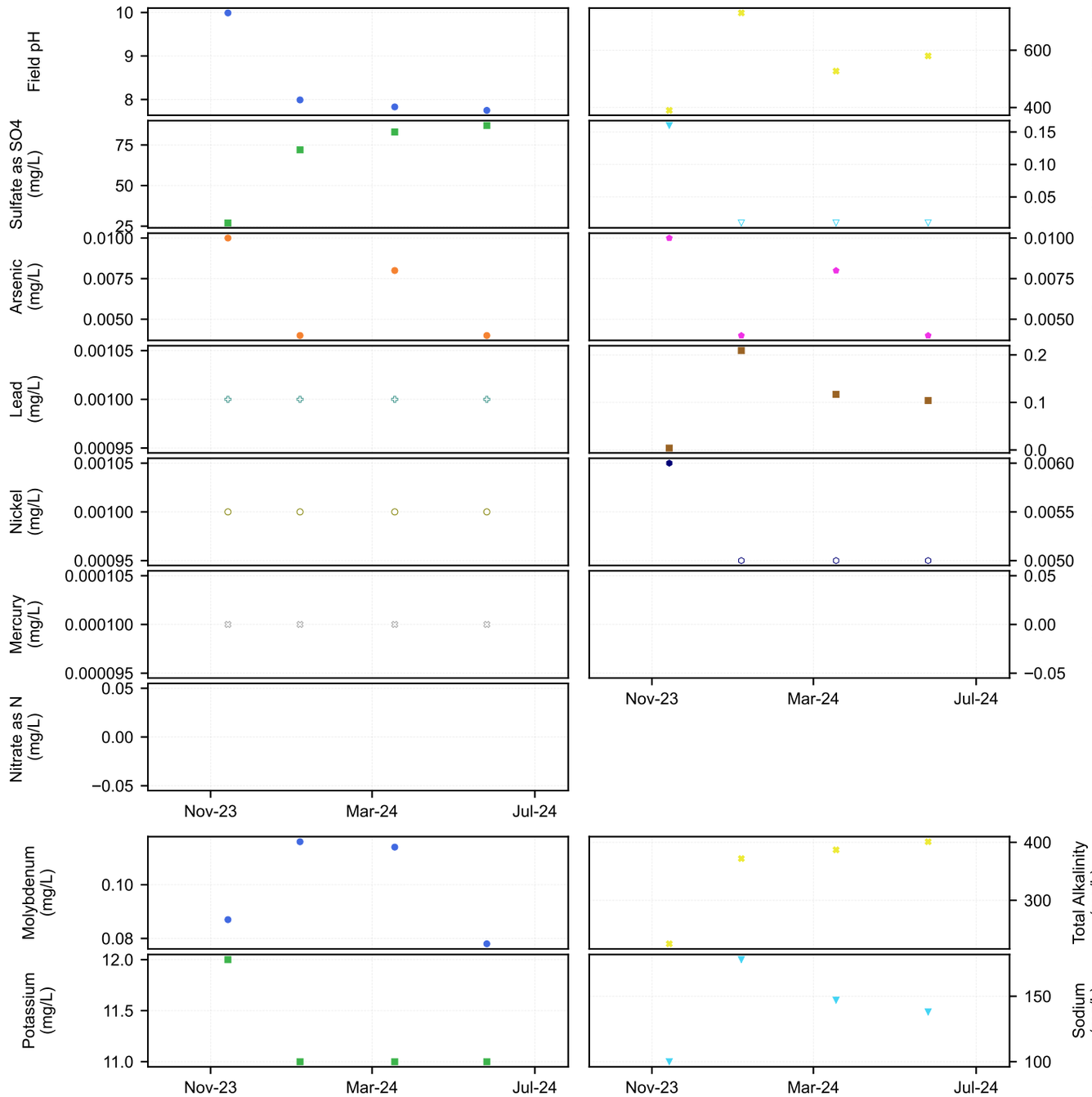
MB129 (Screened geology - Ordovician; Screened interval: 65-74 mbgl)



Groundwater levels



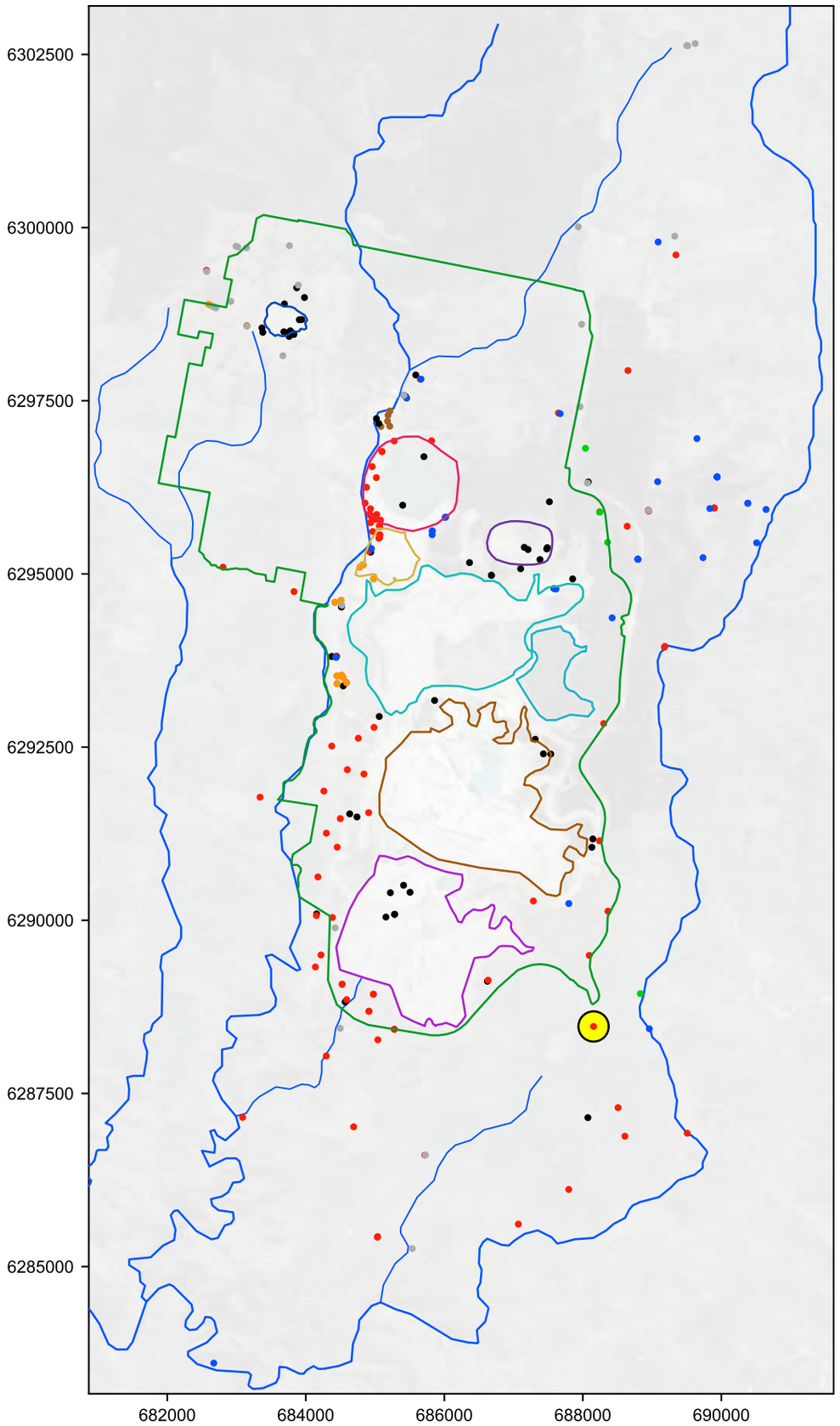
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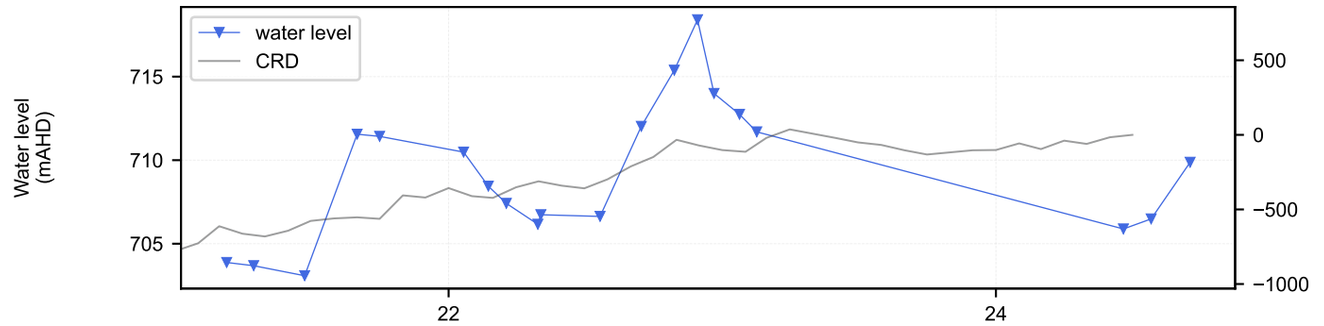
Additional analytes of interest

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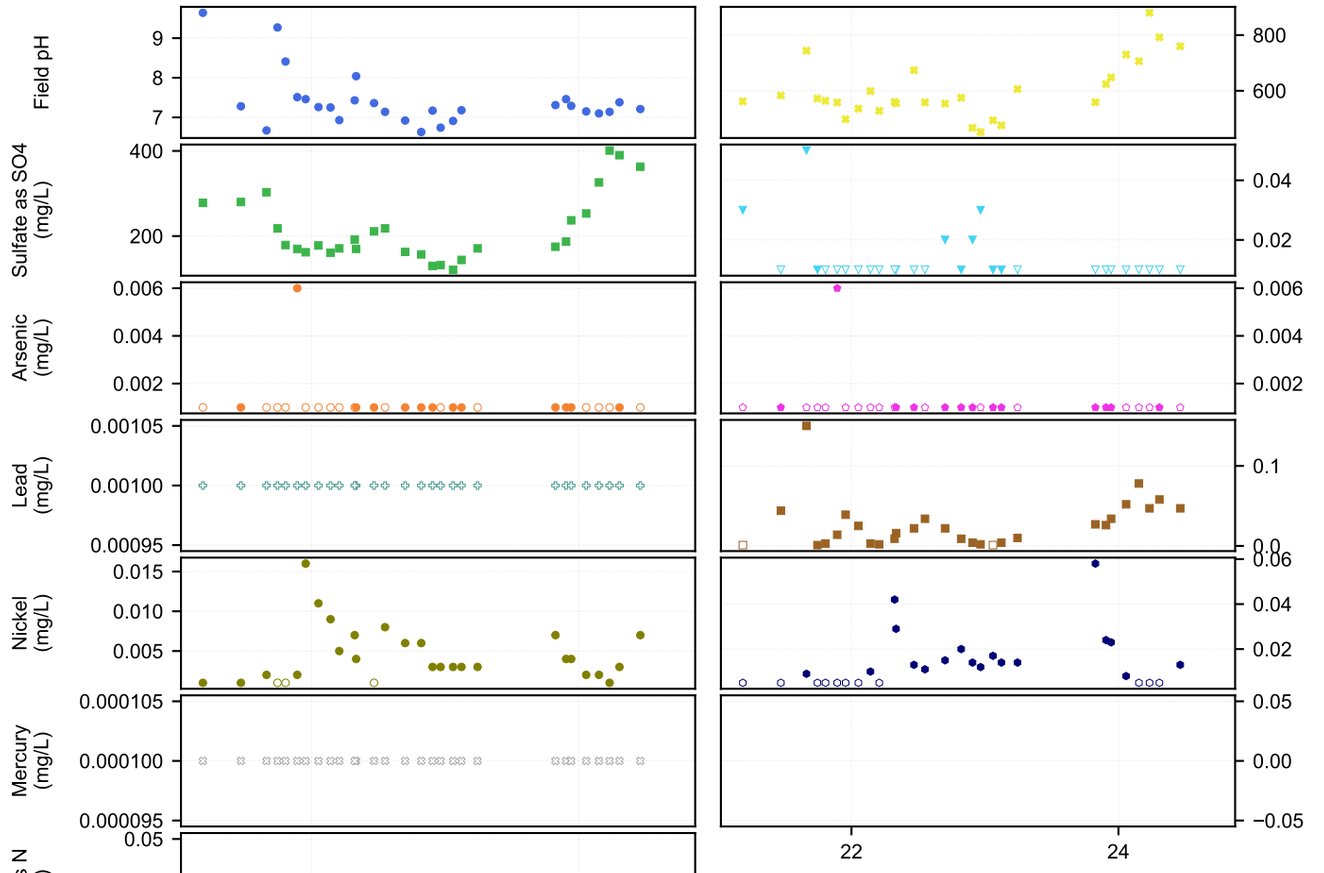
MB102 (Screened geology - Ordovician; Screened interval: 23-32 mbgl)



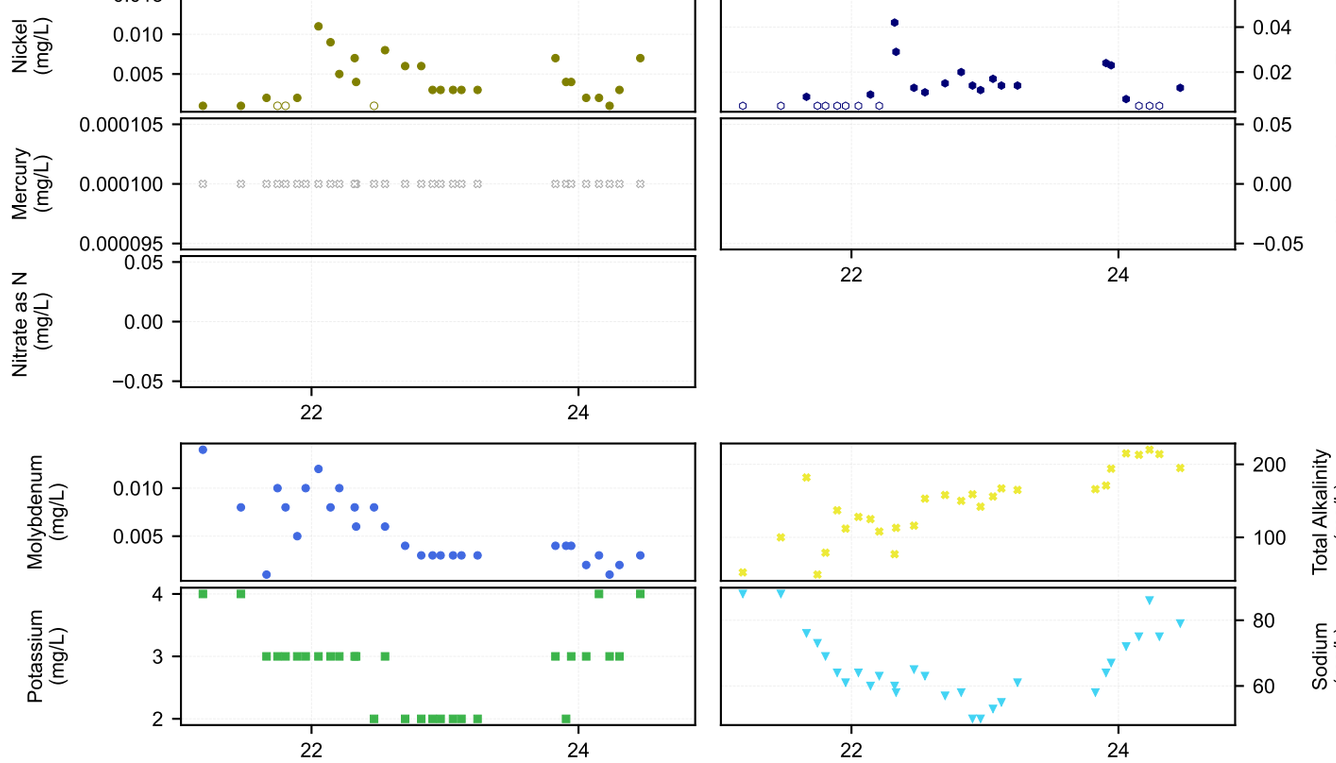
Groundwater levels



WMP defined analytes

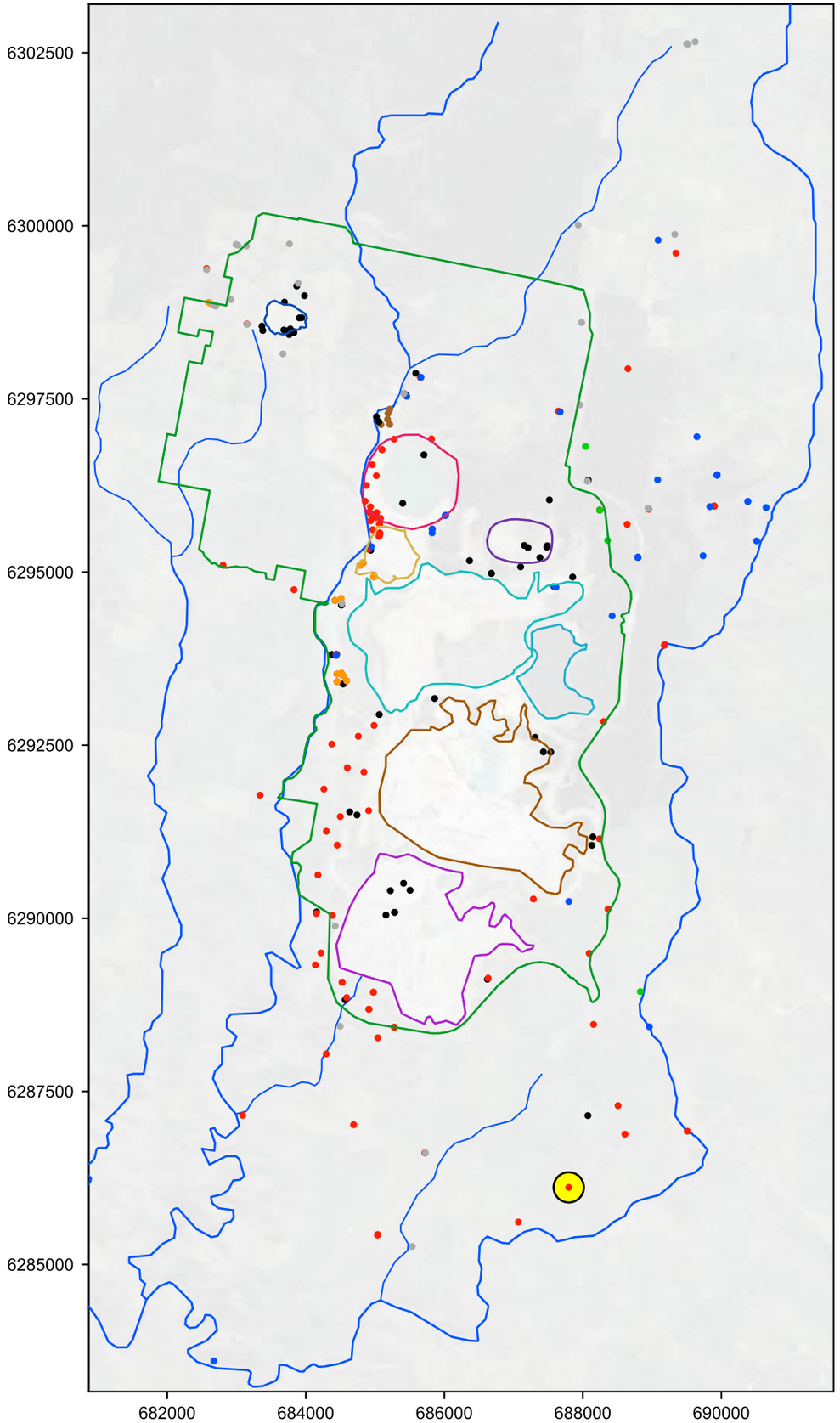


Additional analytes of interest

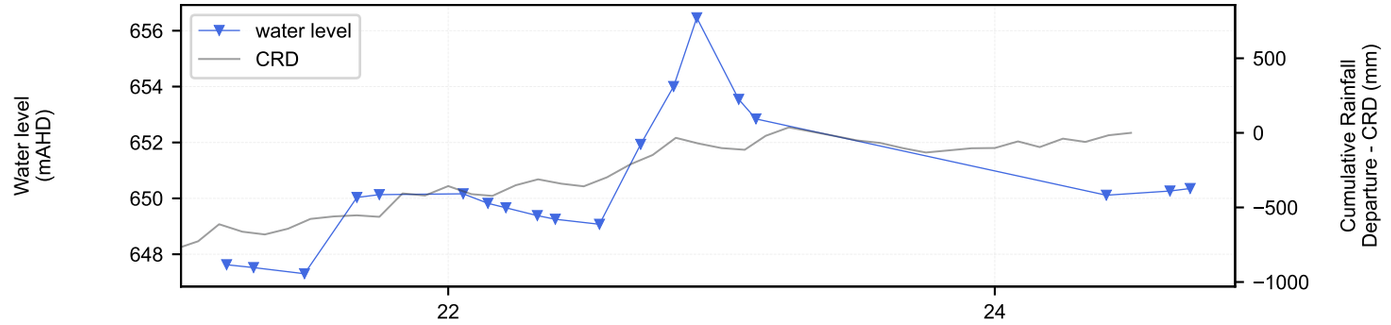


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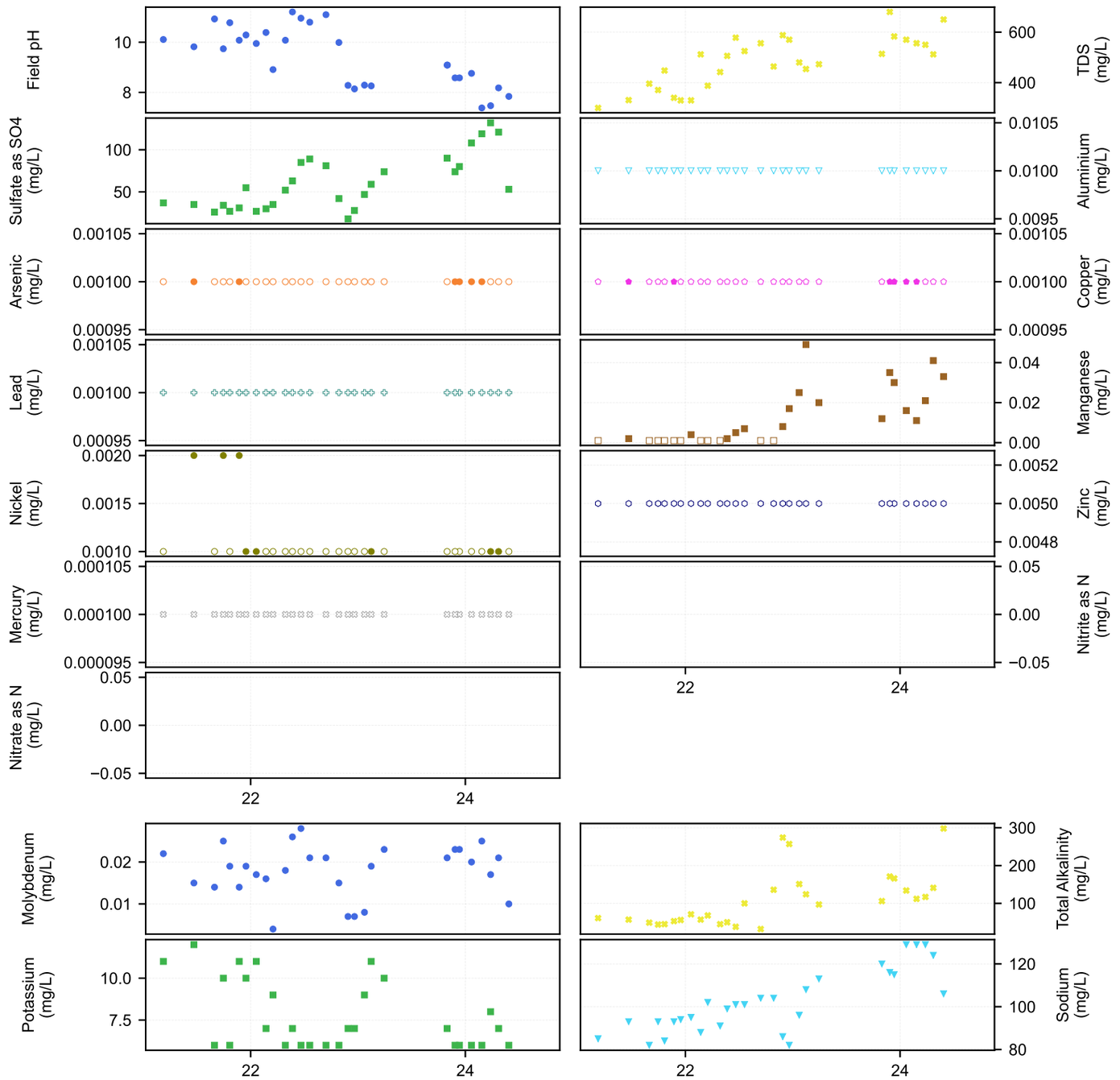
MB103 (Screened geology - Ordovician; Screened interval: 42-48 mbgl)



Groundwater levels



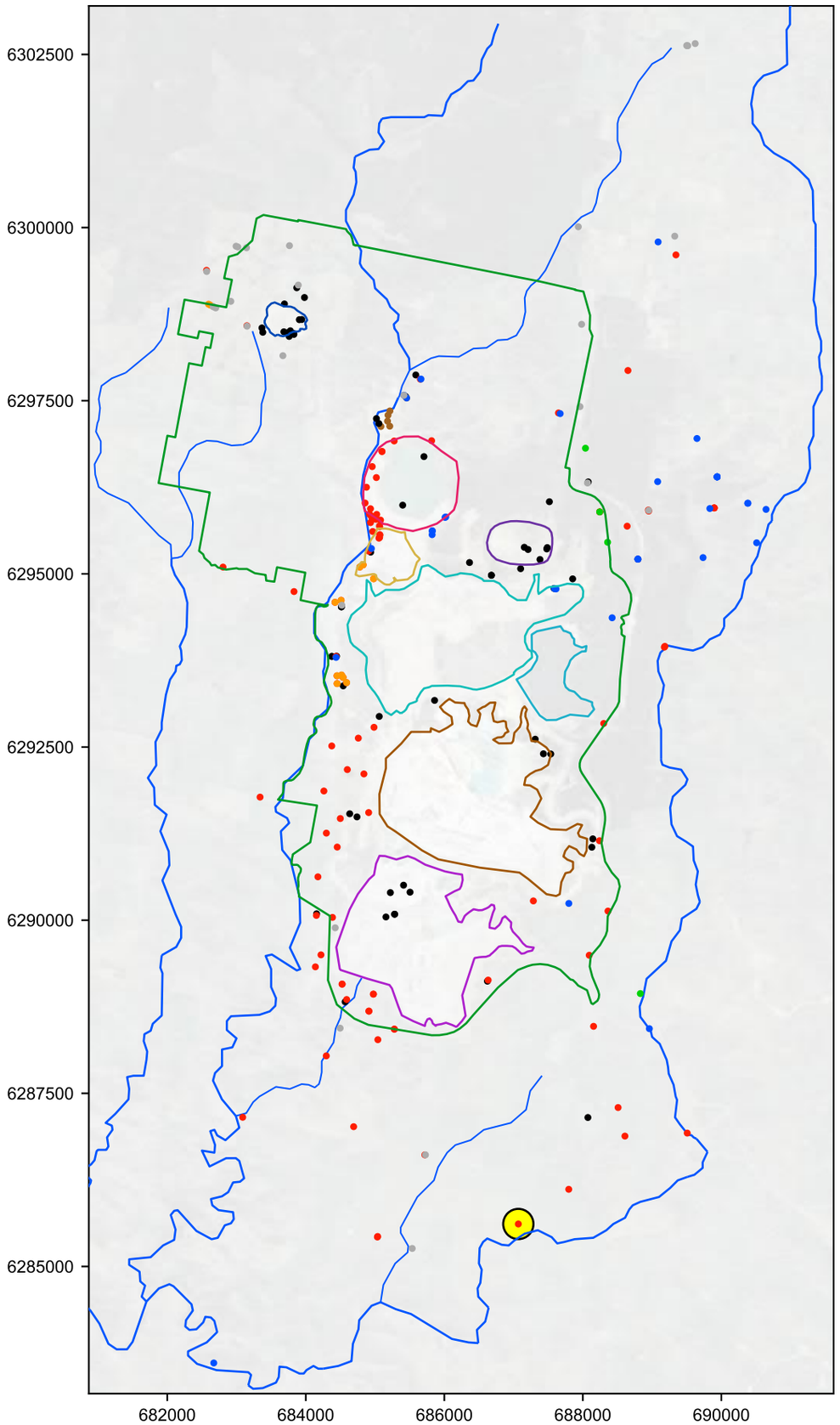
WMP defined analytes



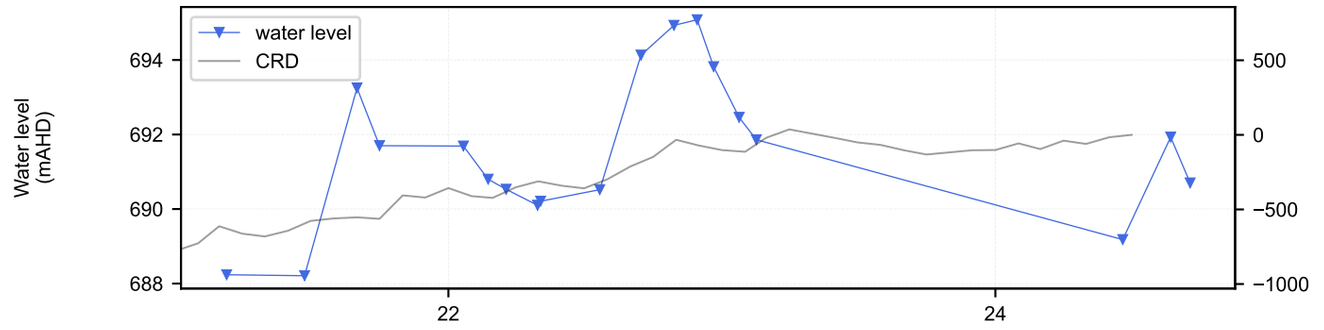
Additional analytes of interest

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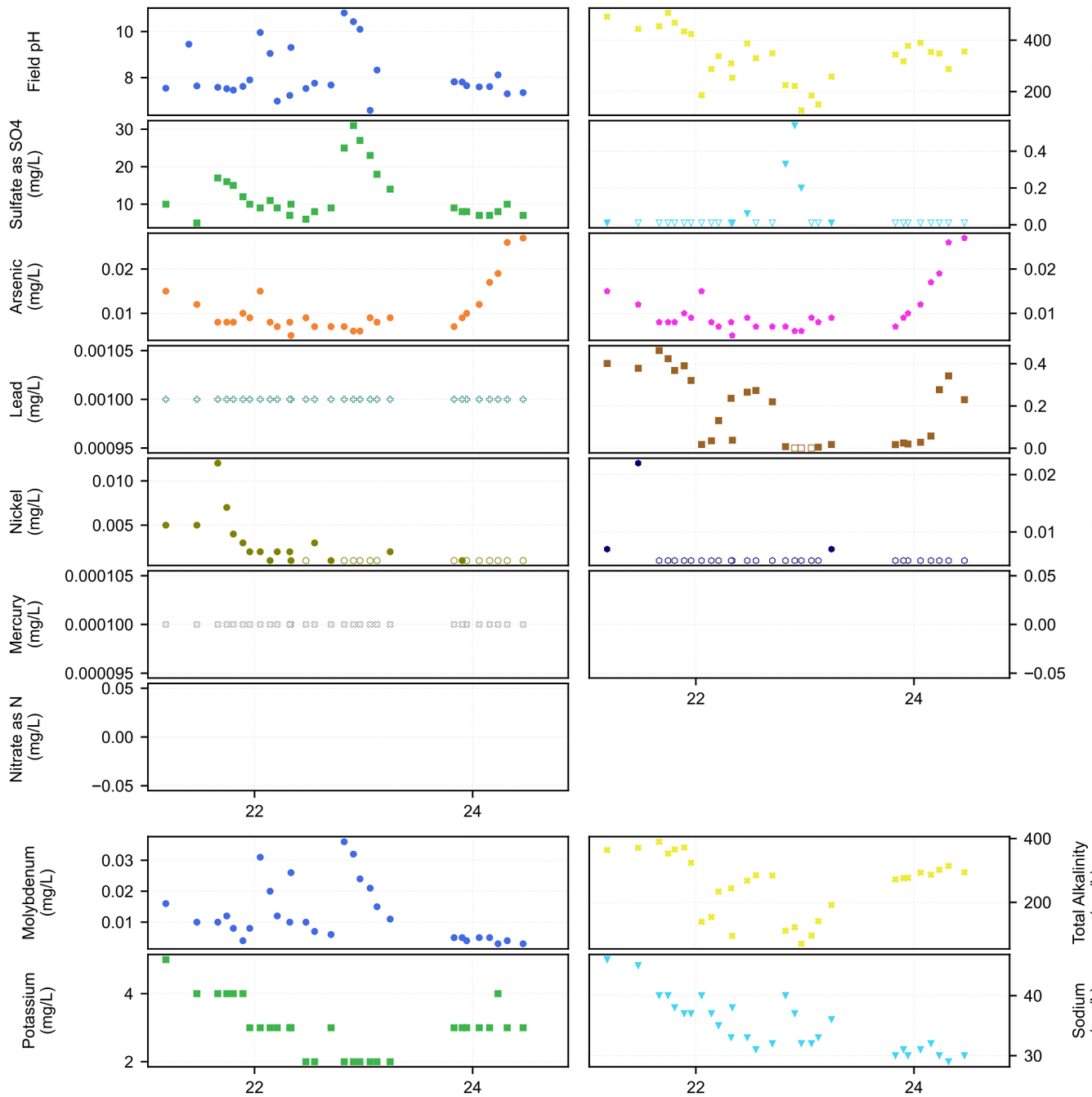
MB104 (Screened geology - Ordovician; Screened interval: 30-36 mbgl)



Groundwater levels



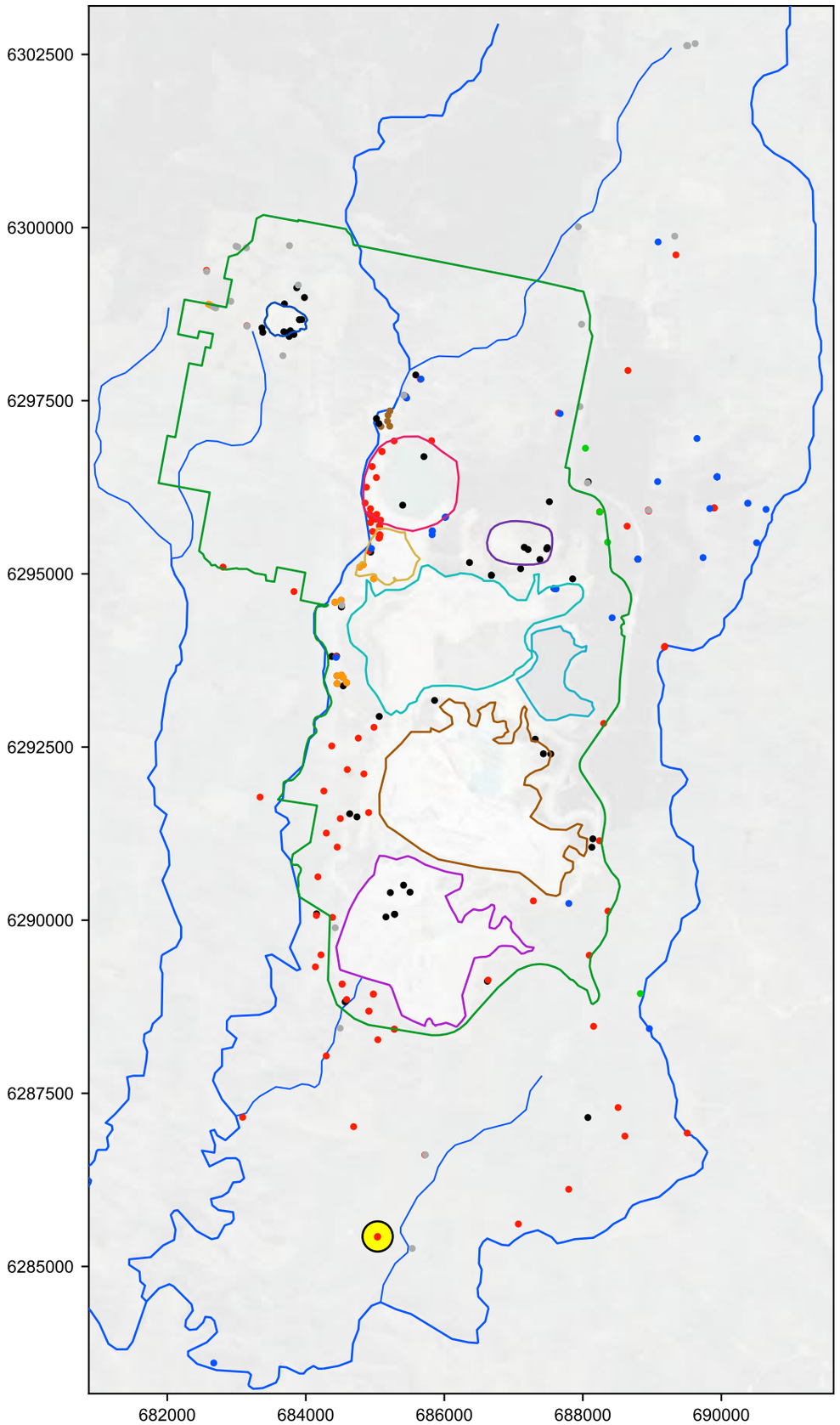
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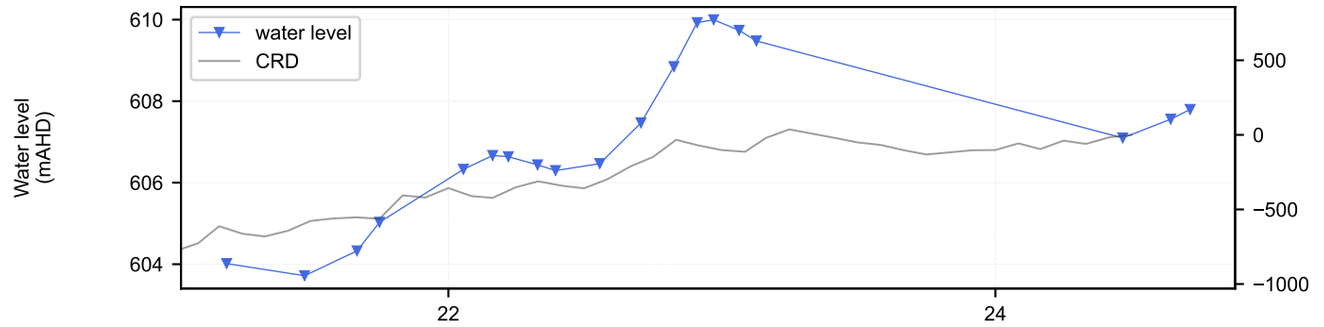
Additional analytes of interest

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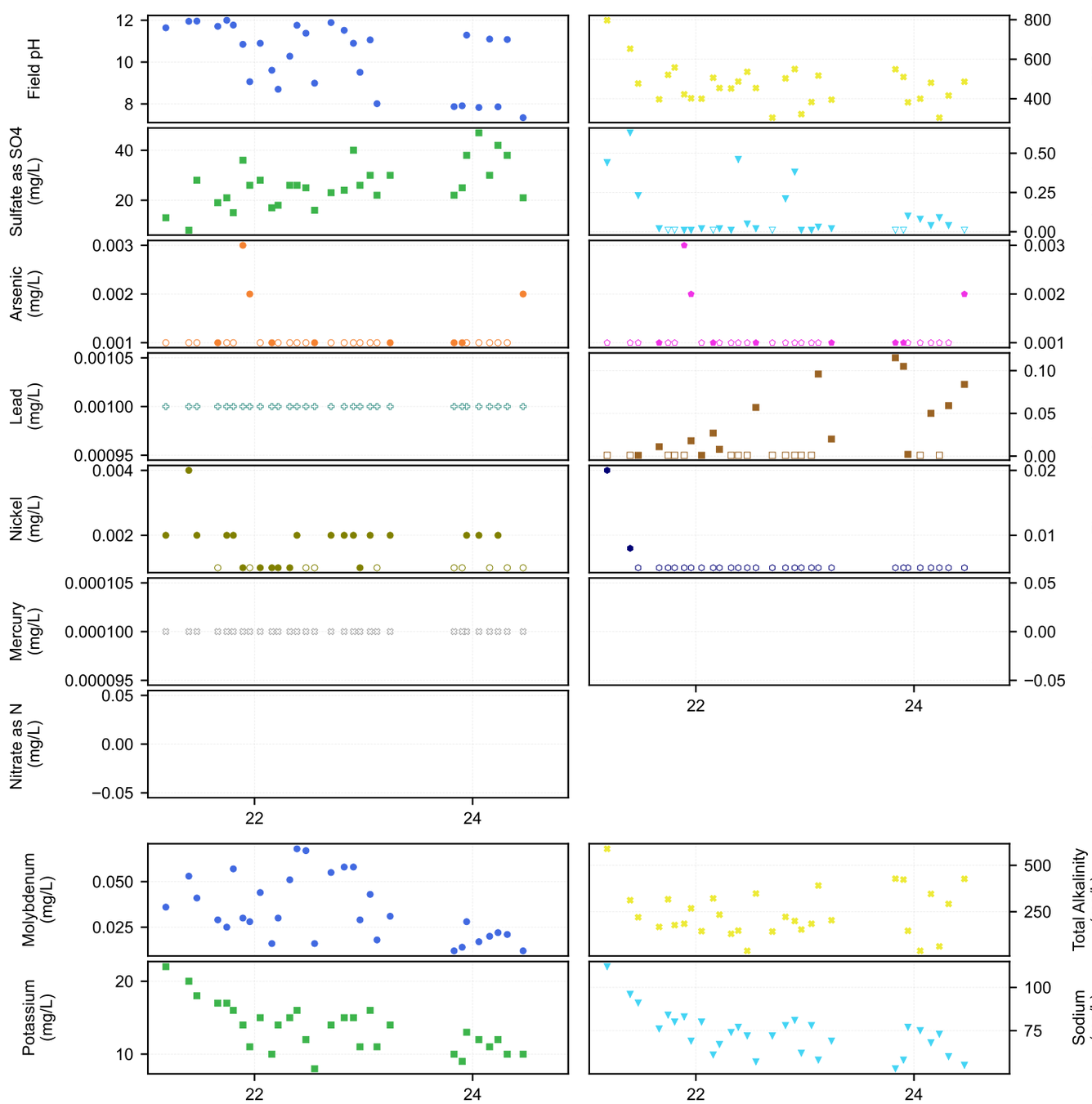
MB105 (Screened geology - Ordovician; Screened interval: 10.5-16.5 mbgl)



Groundwater levels



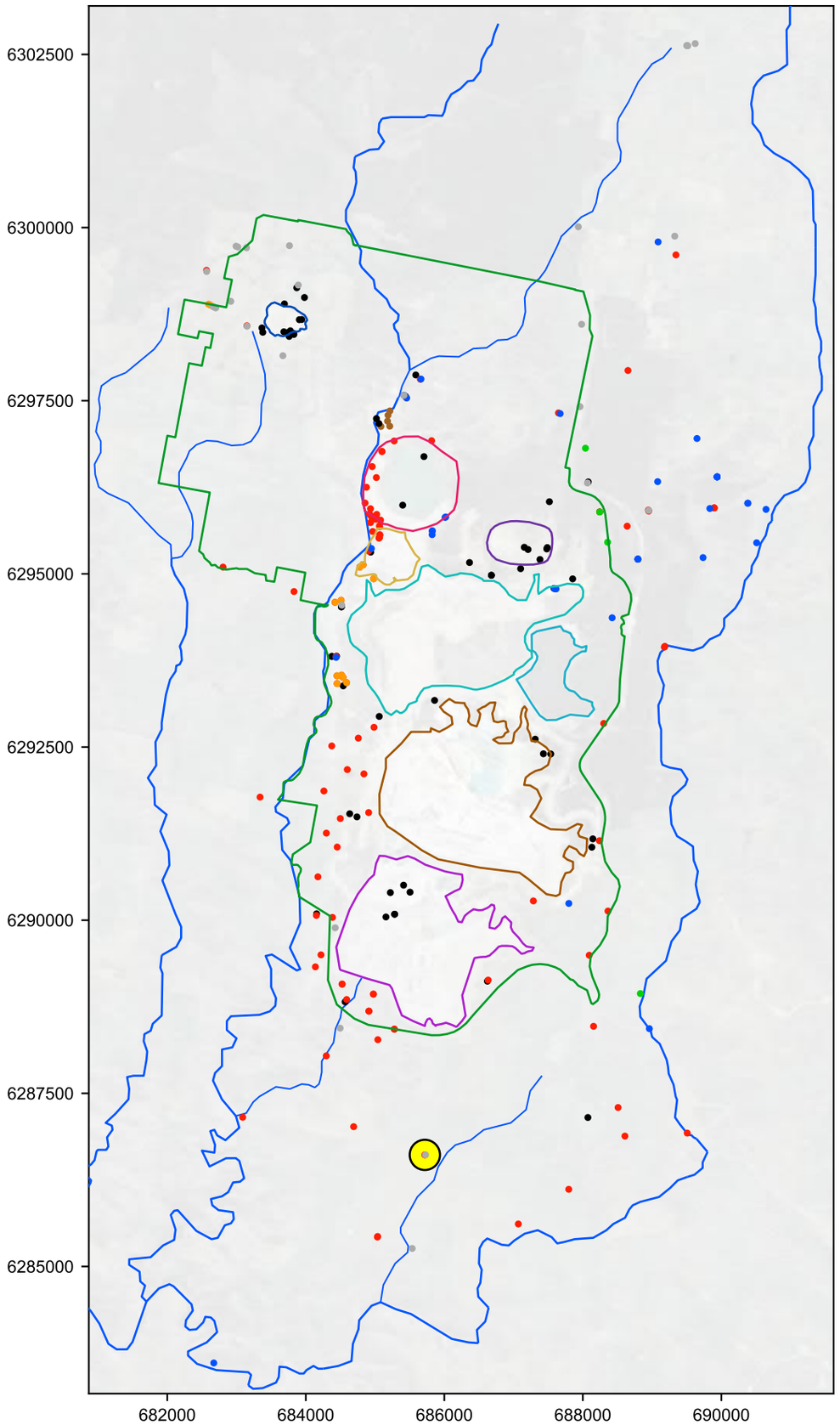
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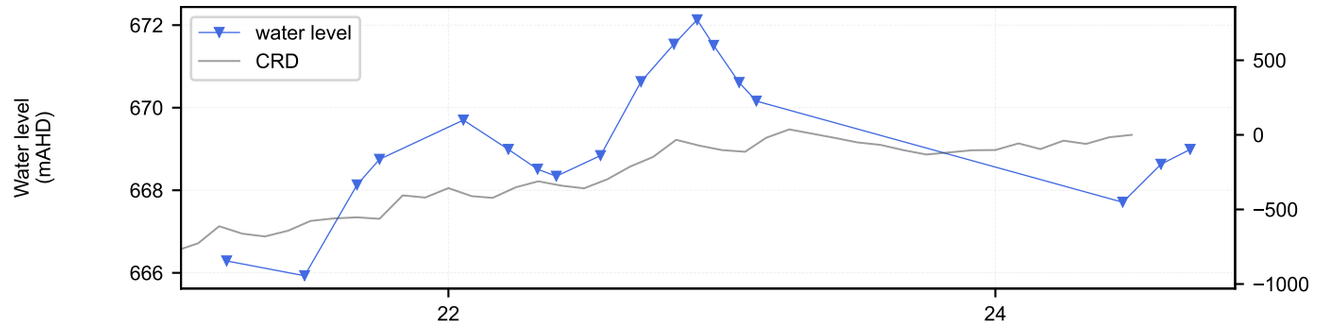
Additional analytes of interest

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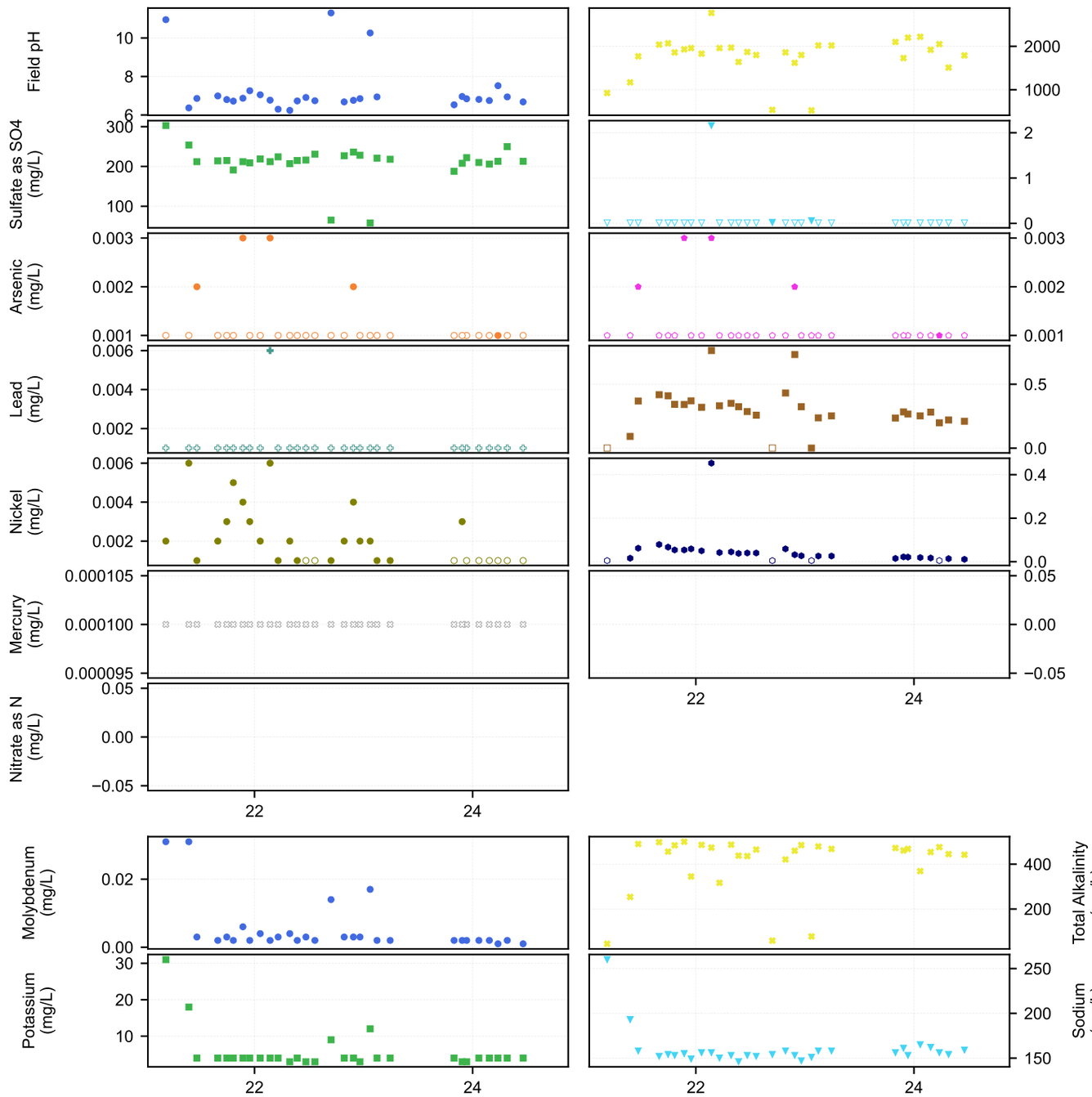
MB109 (Screened geology - Ordovician; Screened interval: 18-24 mbgl)



Groundwater levels



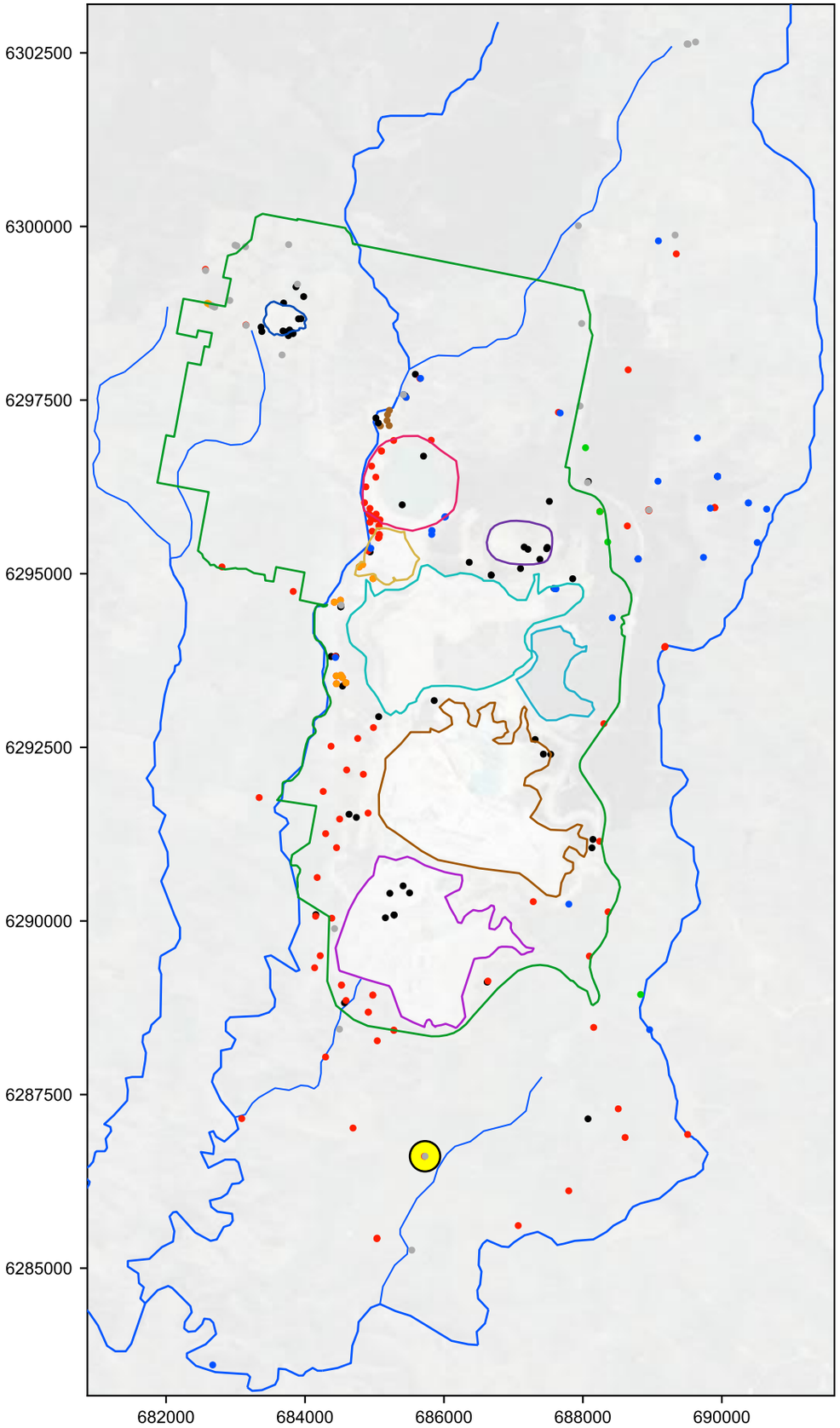
WMP defined analytes



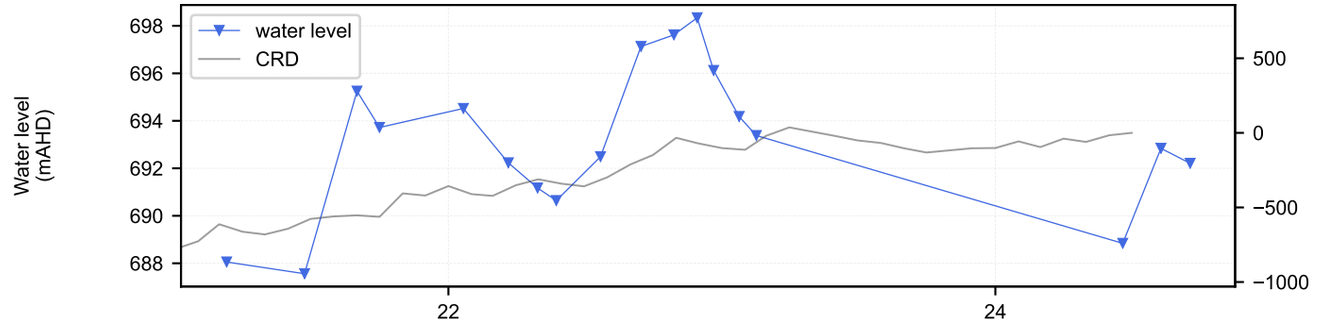
Additional analytes of interest

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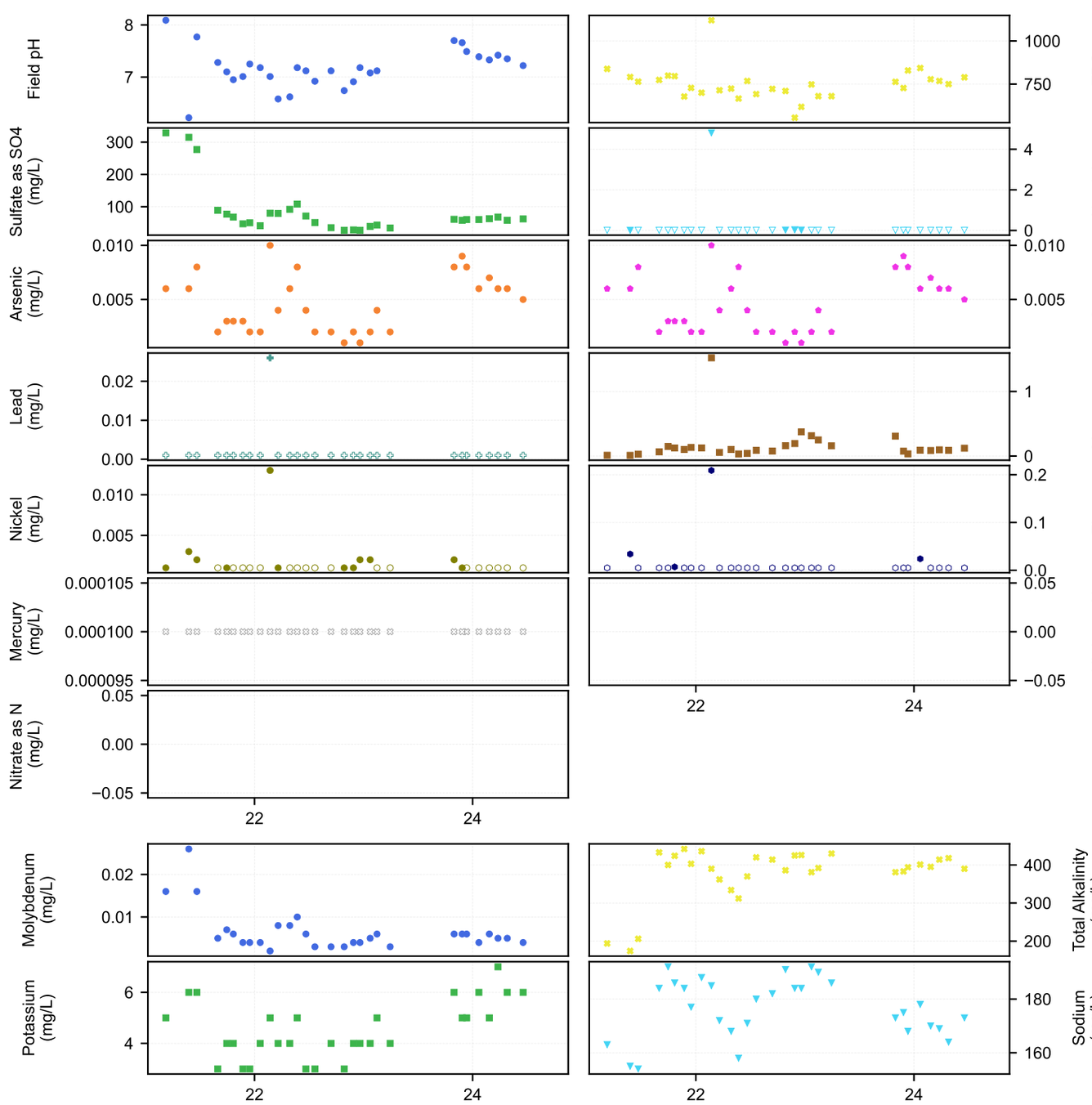
MB110 (Screened geology - Tertiary basalt; Screened interval: 22-28 mbgl)



Groundwater levels



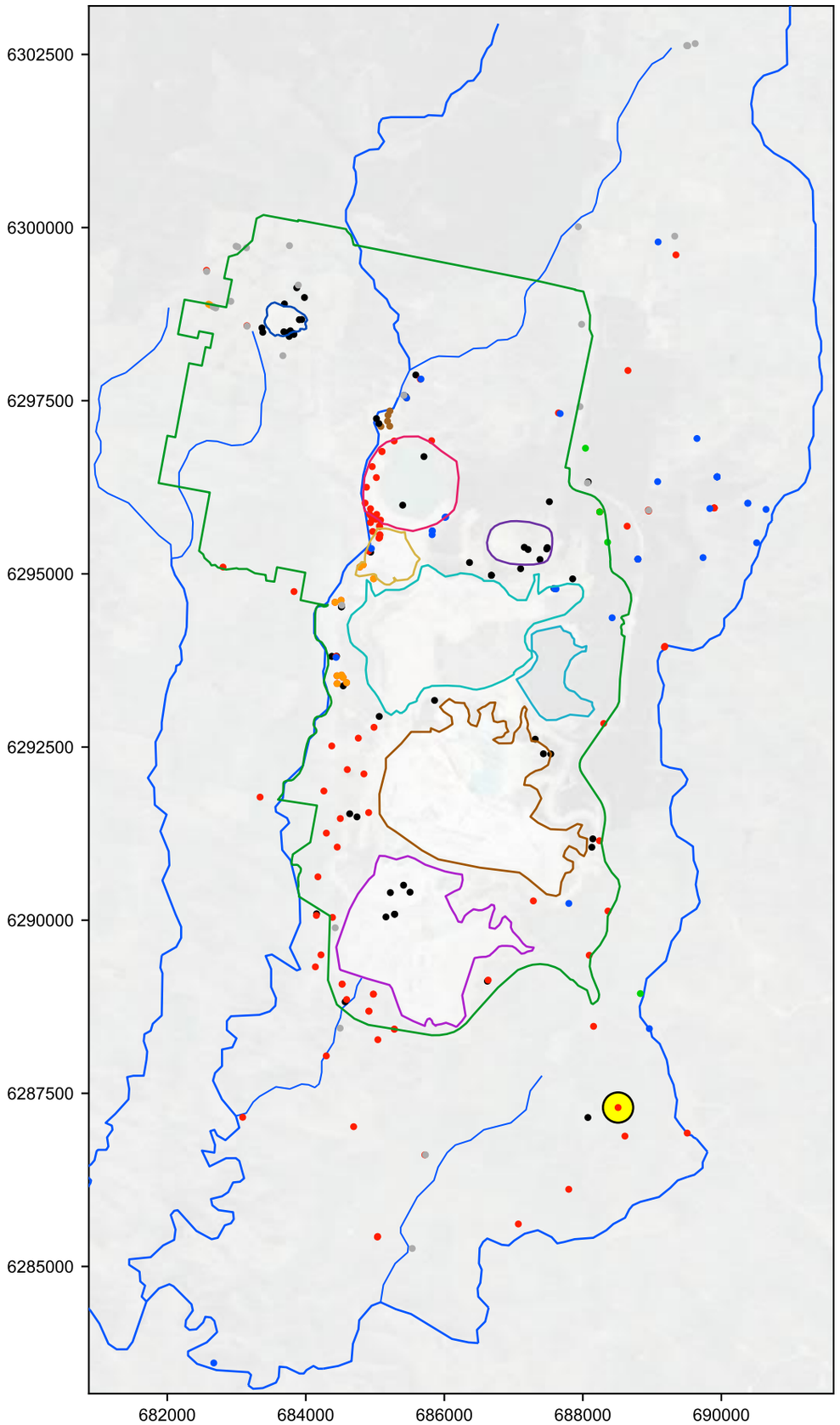
WMP defined analytes



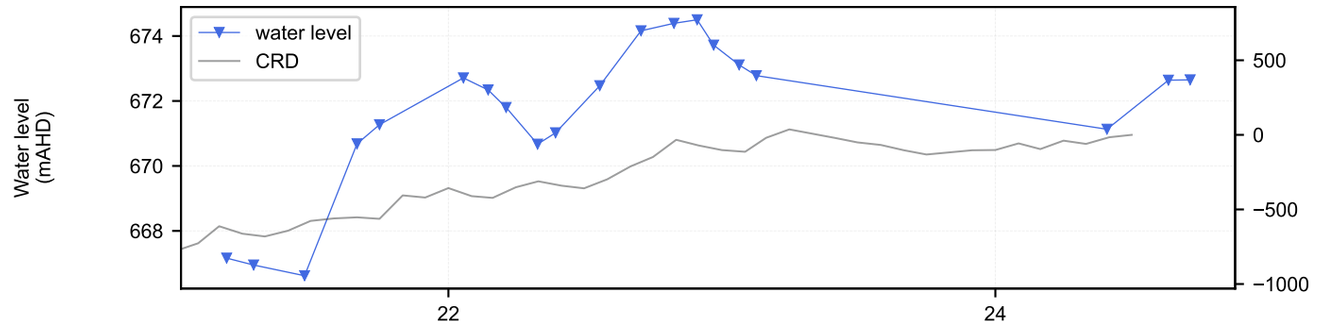
Additional analytes of interest

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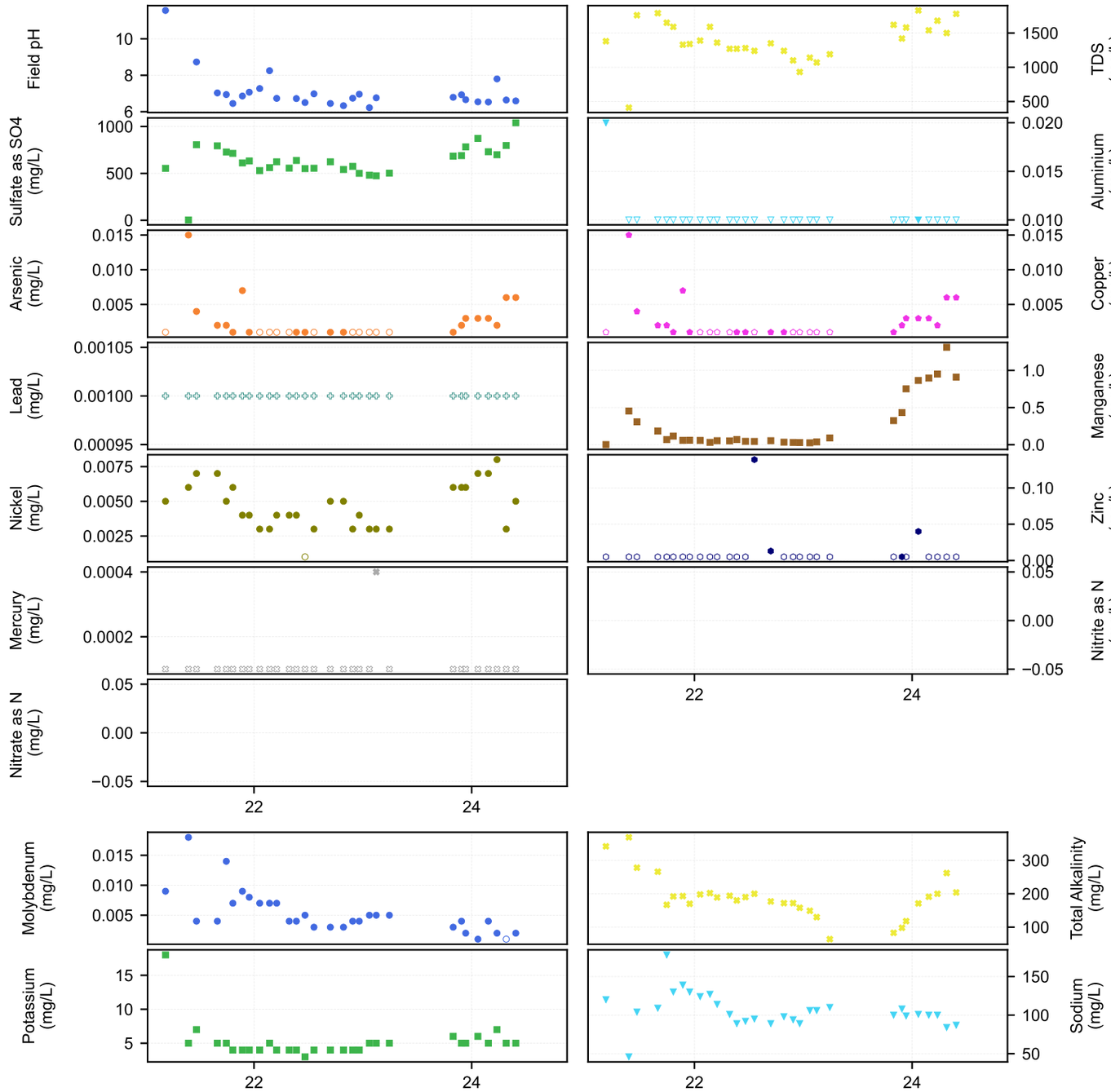
MB111 (Screened geology - Ordovician; Screened interval: 34-40 mbgl)



Groundwater levels



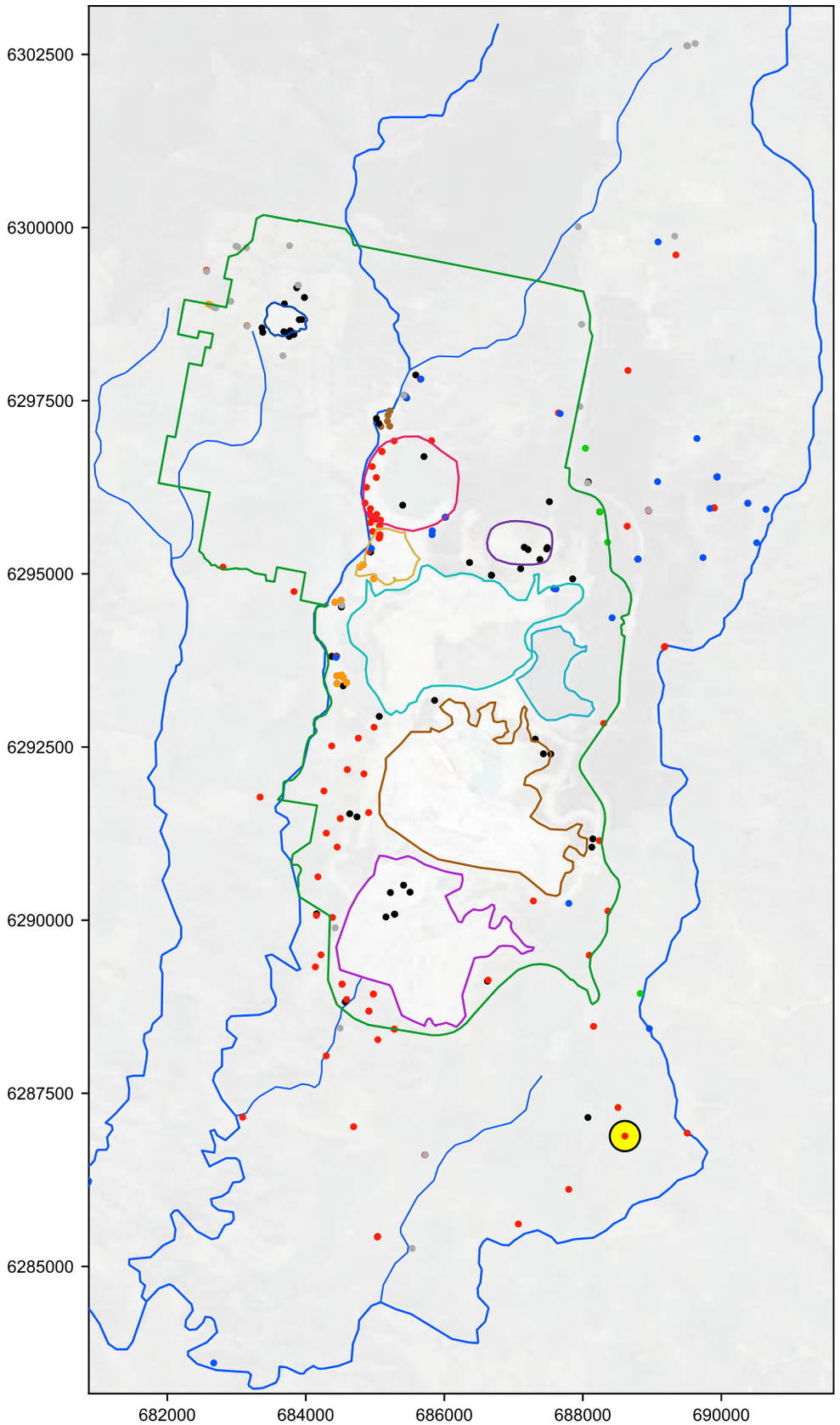
WMP defined analytes



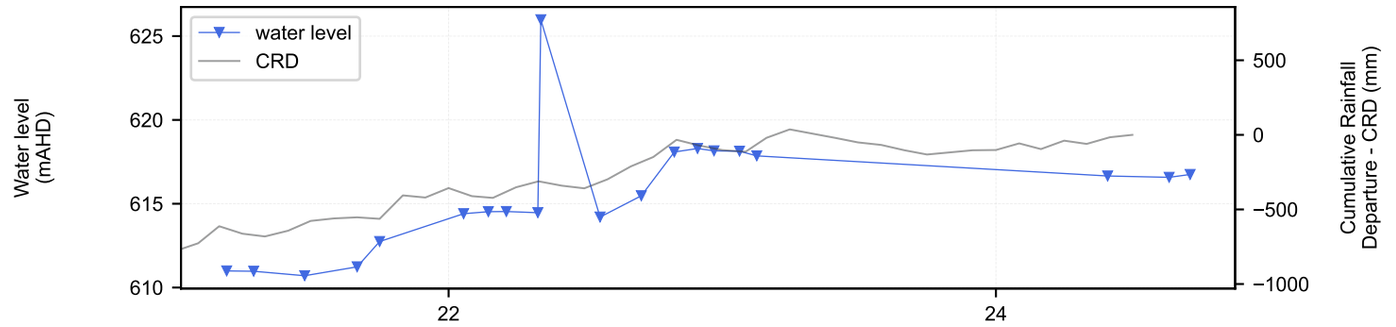
Additional analytes of interest

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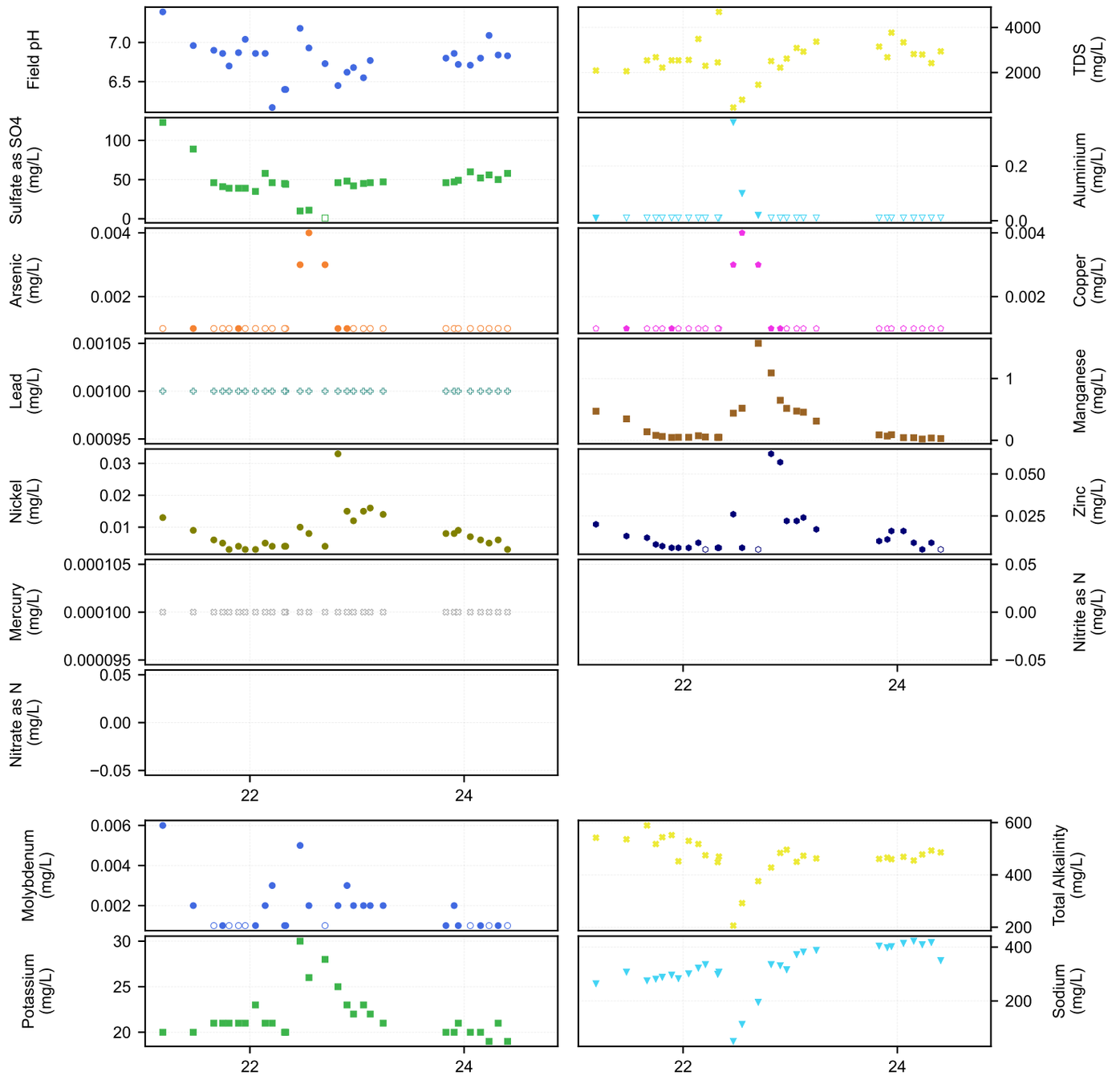
MB112 (Screened geology - Ordovician; Screened interval: 8-14 mbgl)



Groundwater levels



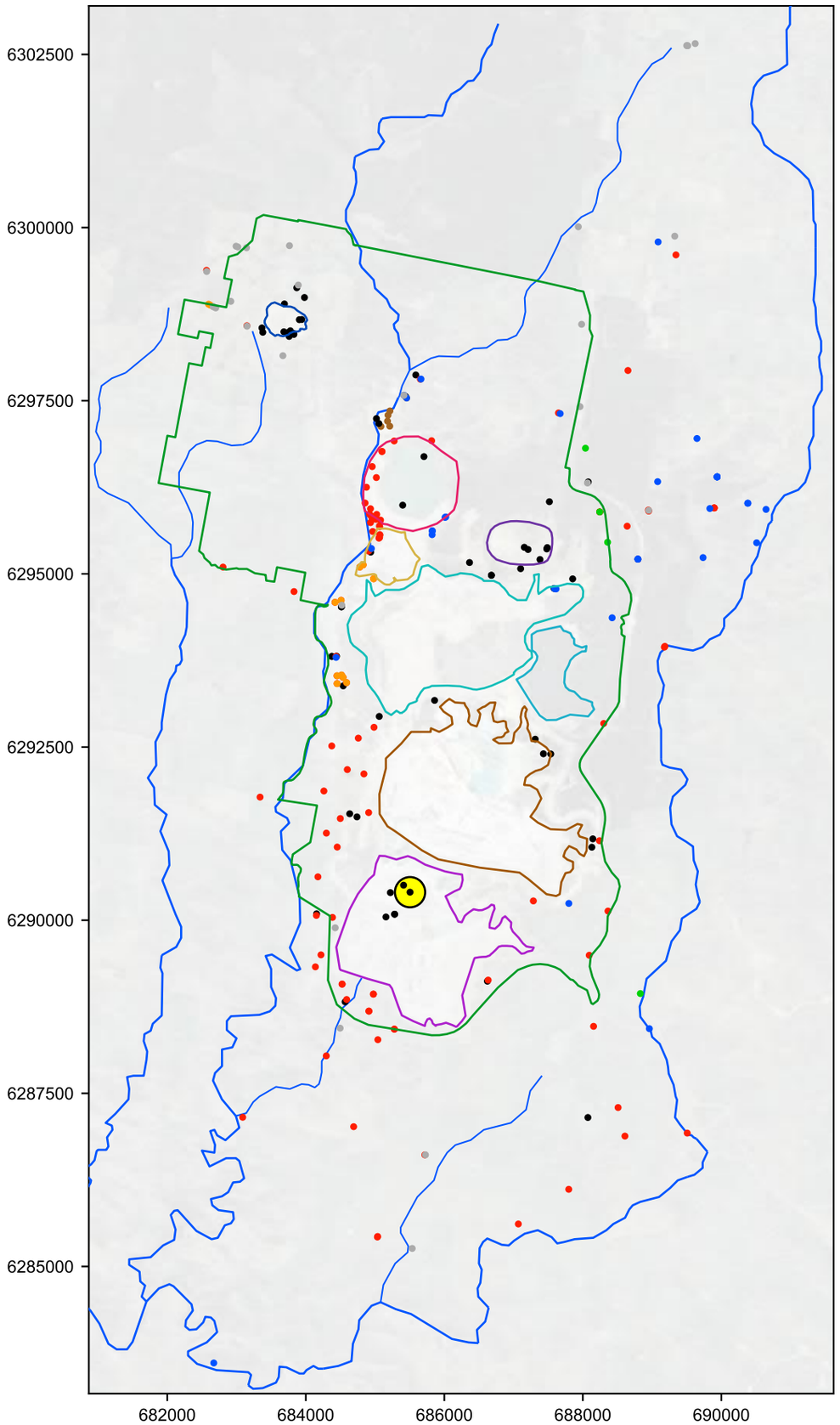
WMP defined analytes



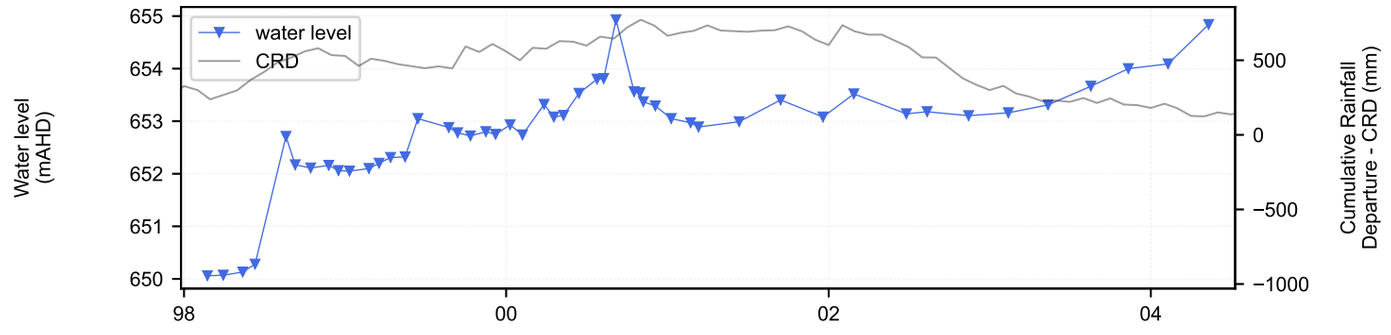
Additional analytes of interest

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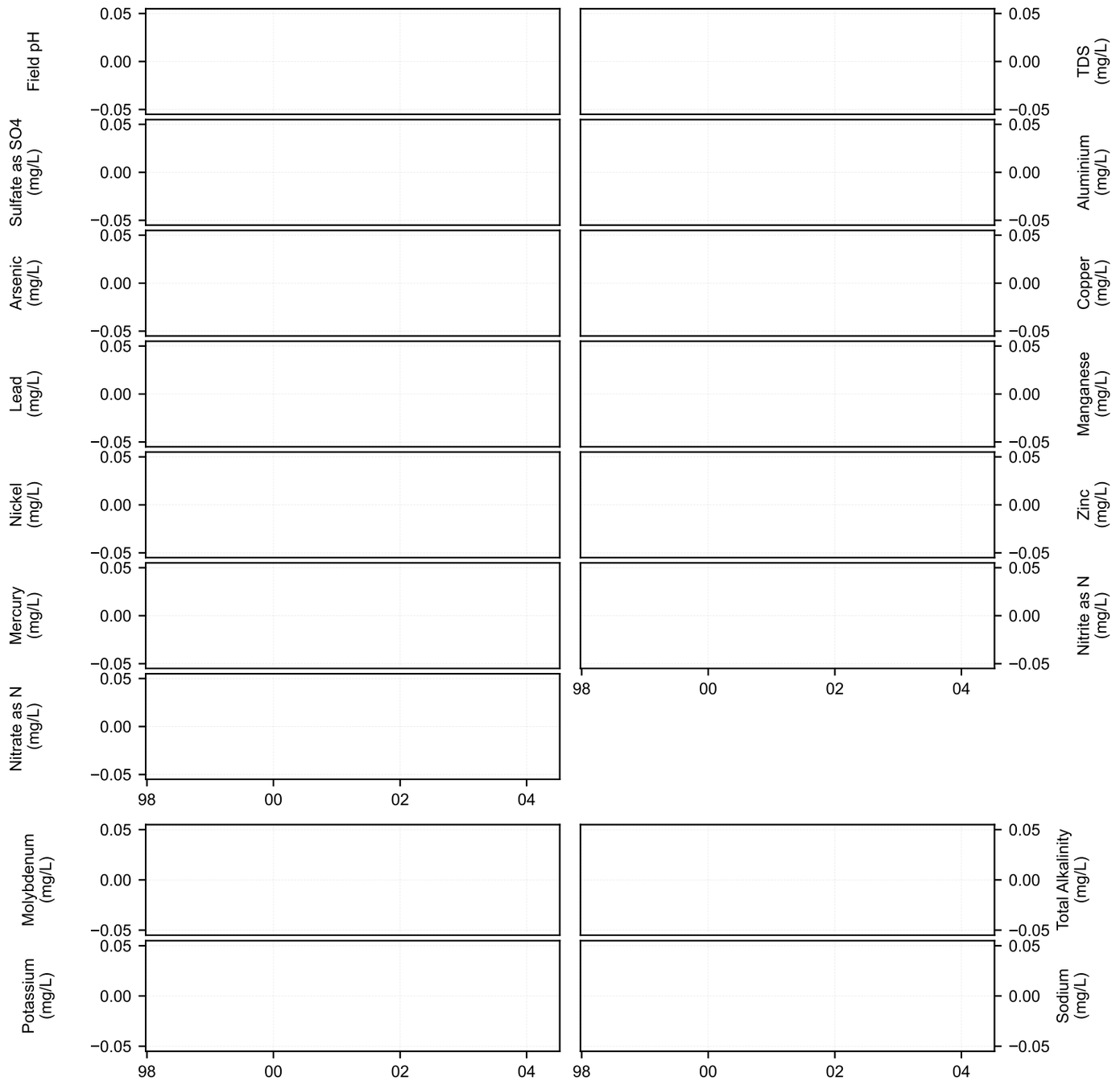
MB15 (Screened geology - Inactive; Screened interval: 12-18 mbgl)



Groundwater levels



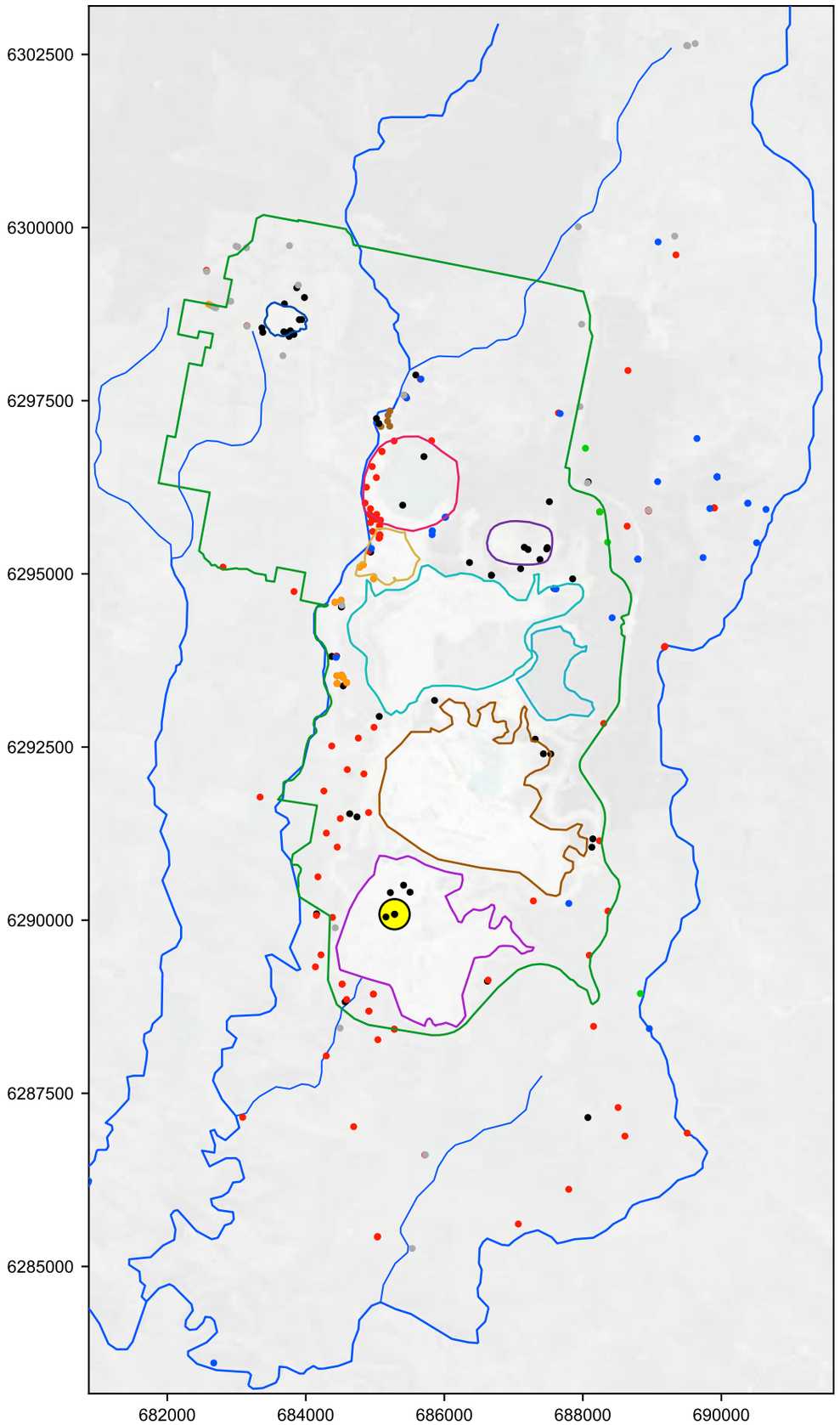
WMP defined analytes



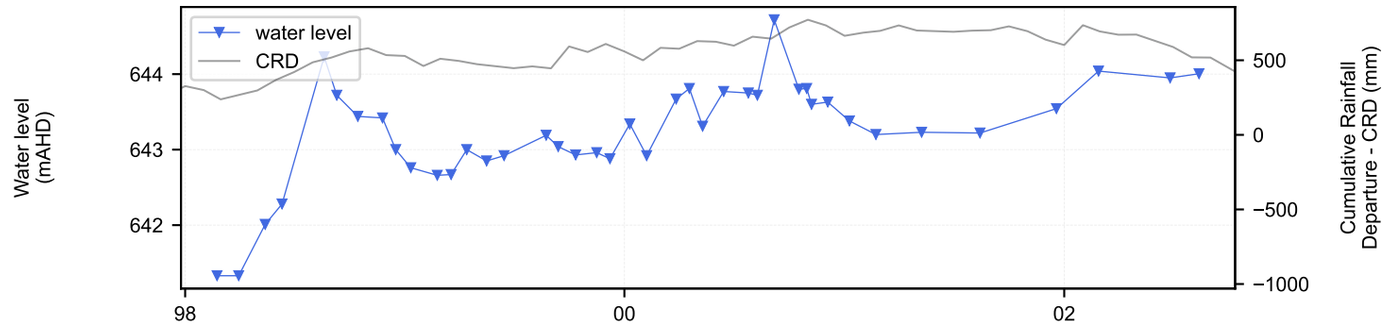
Additional analytes of interest

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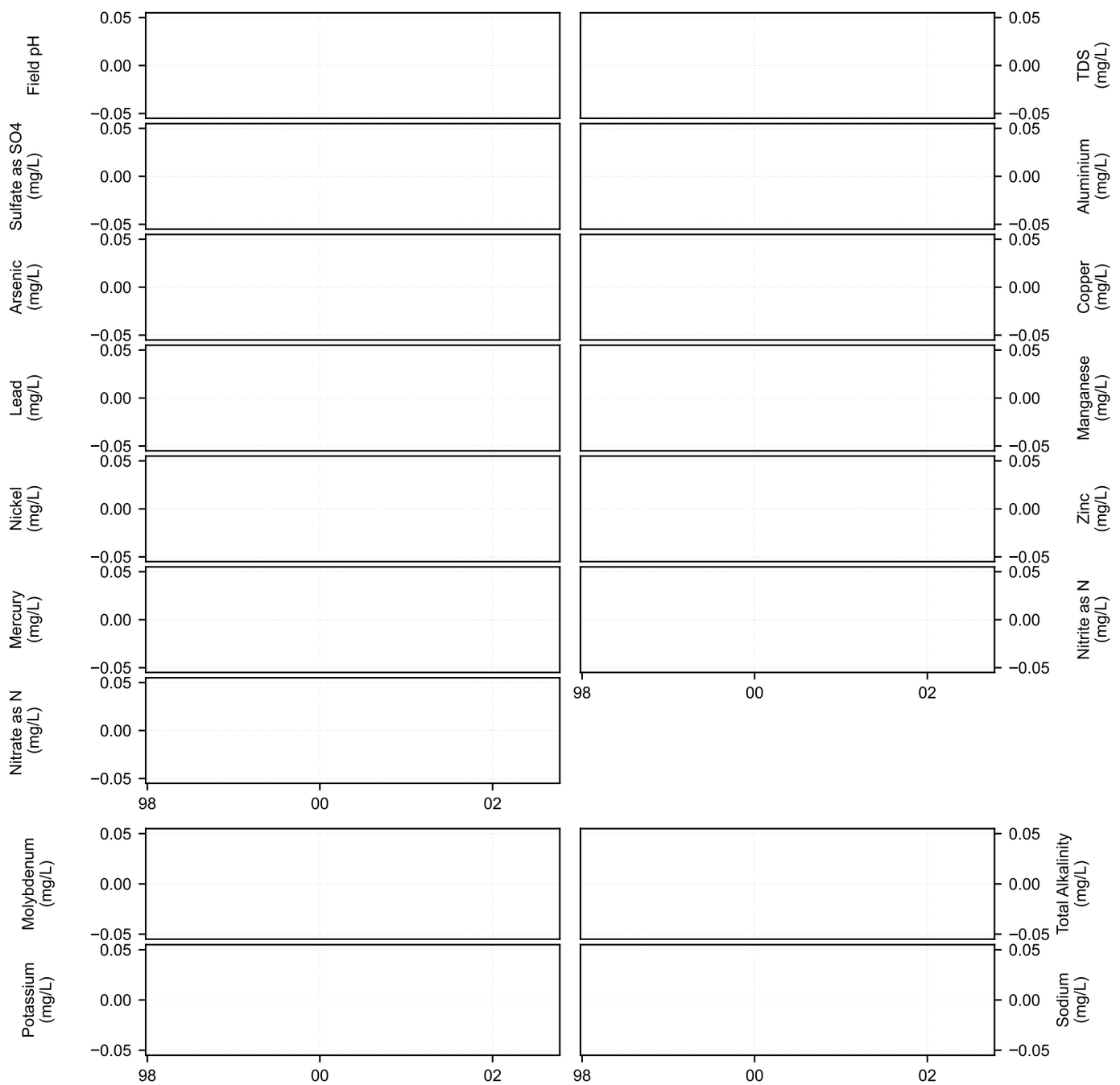
MB16A (Screened geology - Inactive; Screened interval: 12-18 mbgl)



Groundwater levels



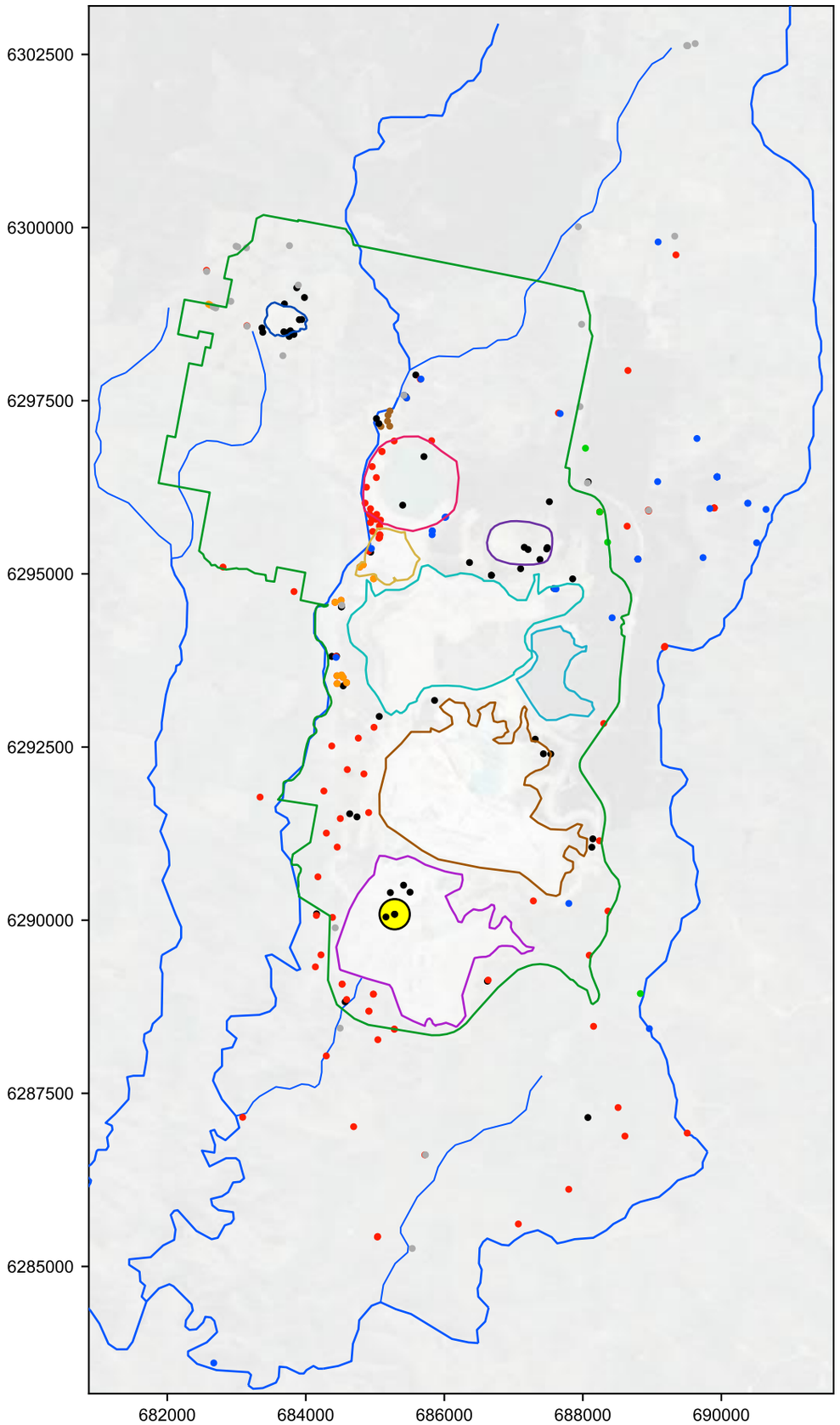
WMP defined analytes



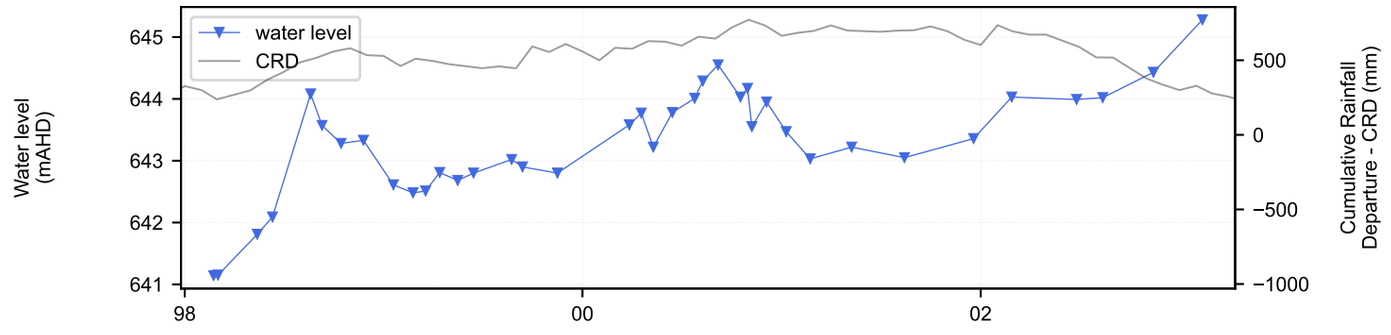
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

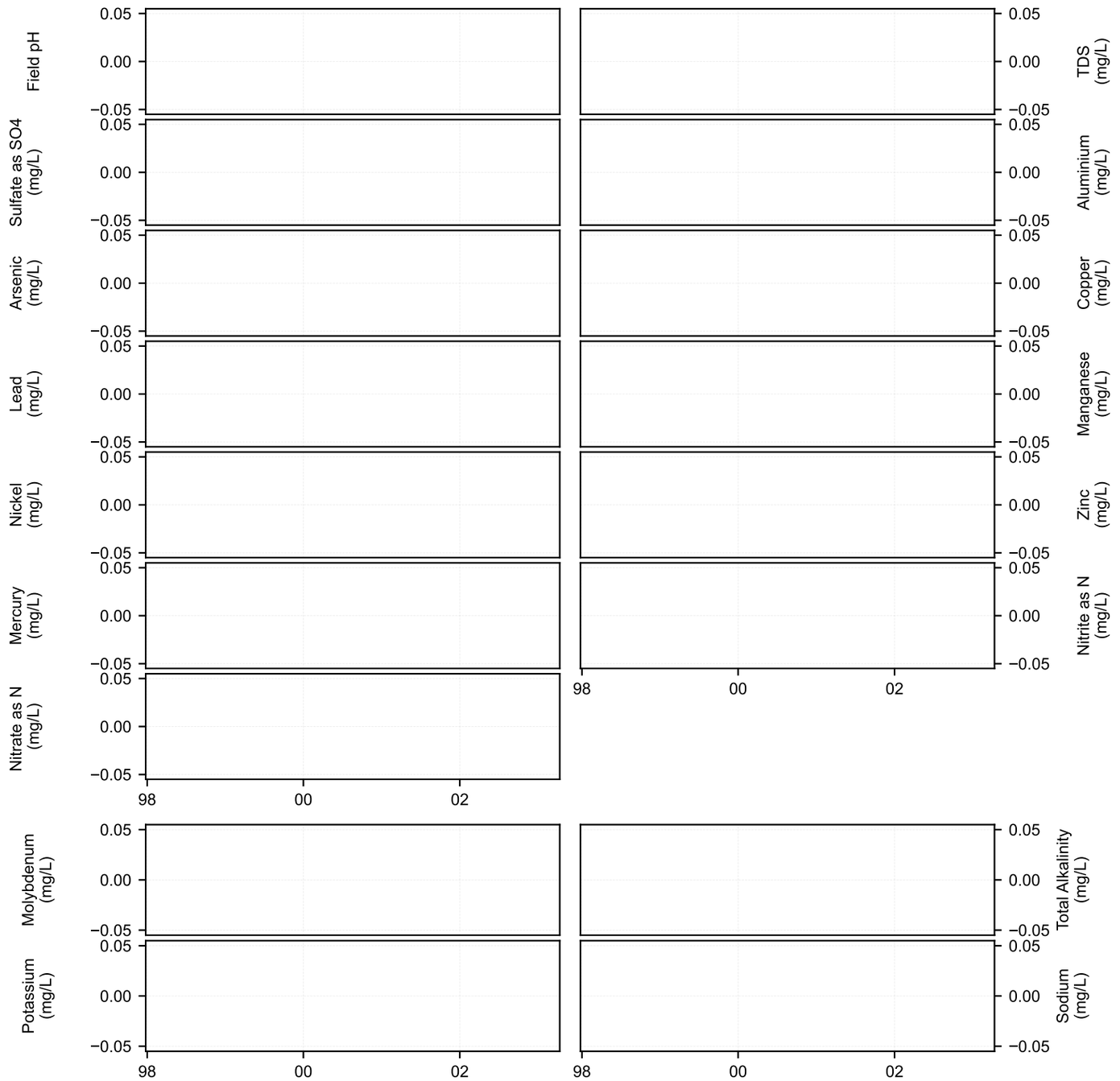
MB16B (Screened geology - Inactive; Screened interval: 2.9-5.7 mbgl)



Groundwater levels



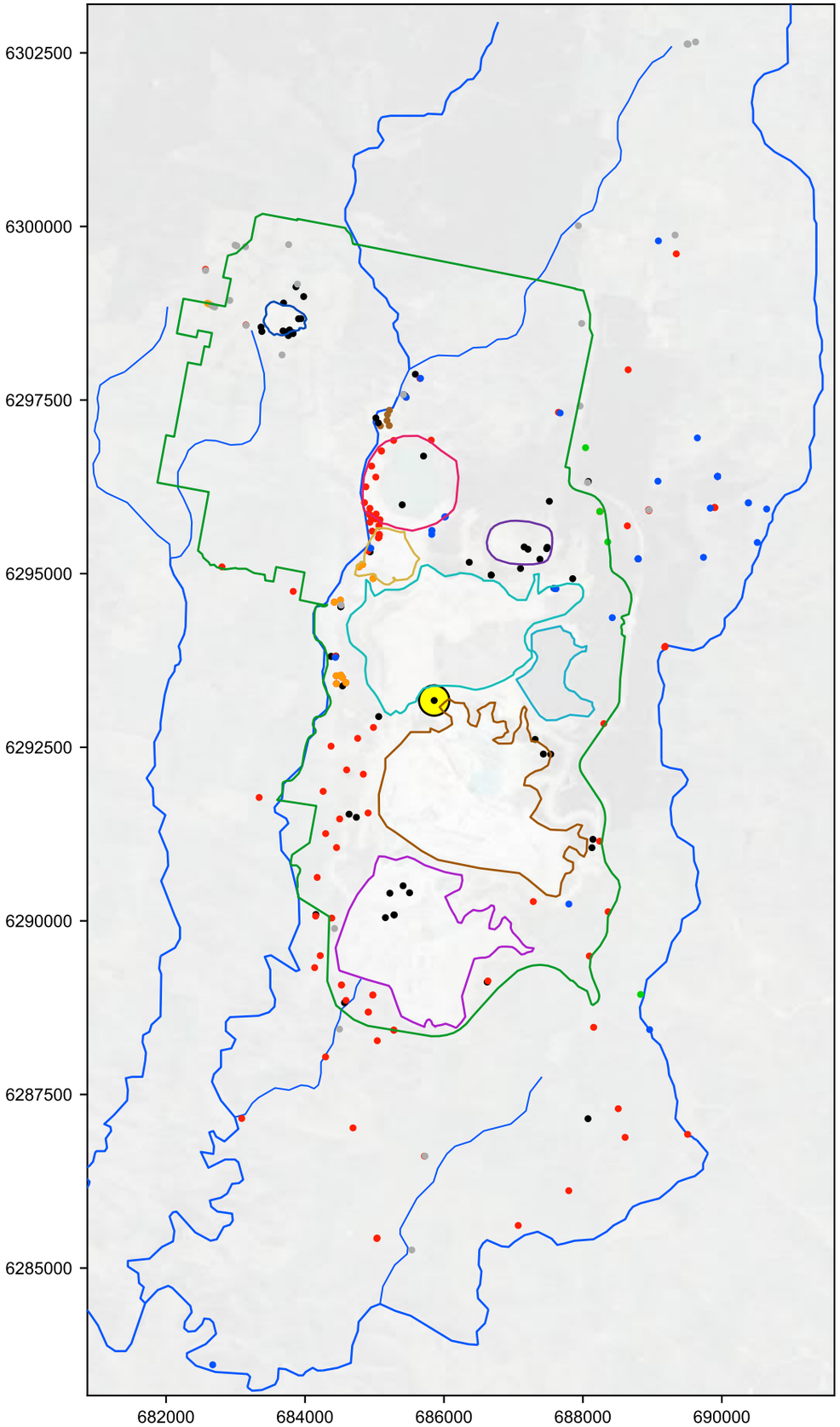
WMP defined analytes



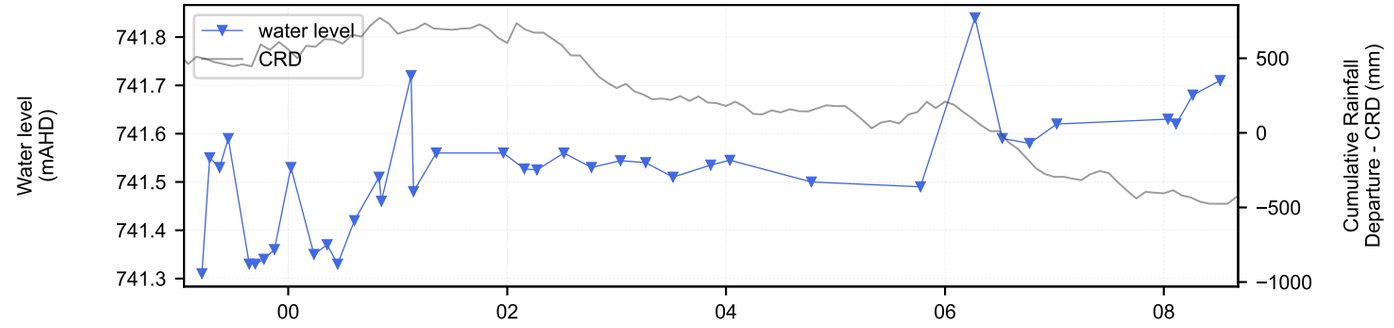
Additional analytes of interest

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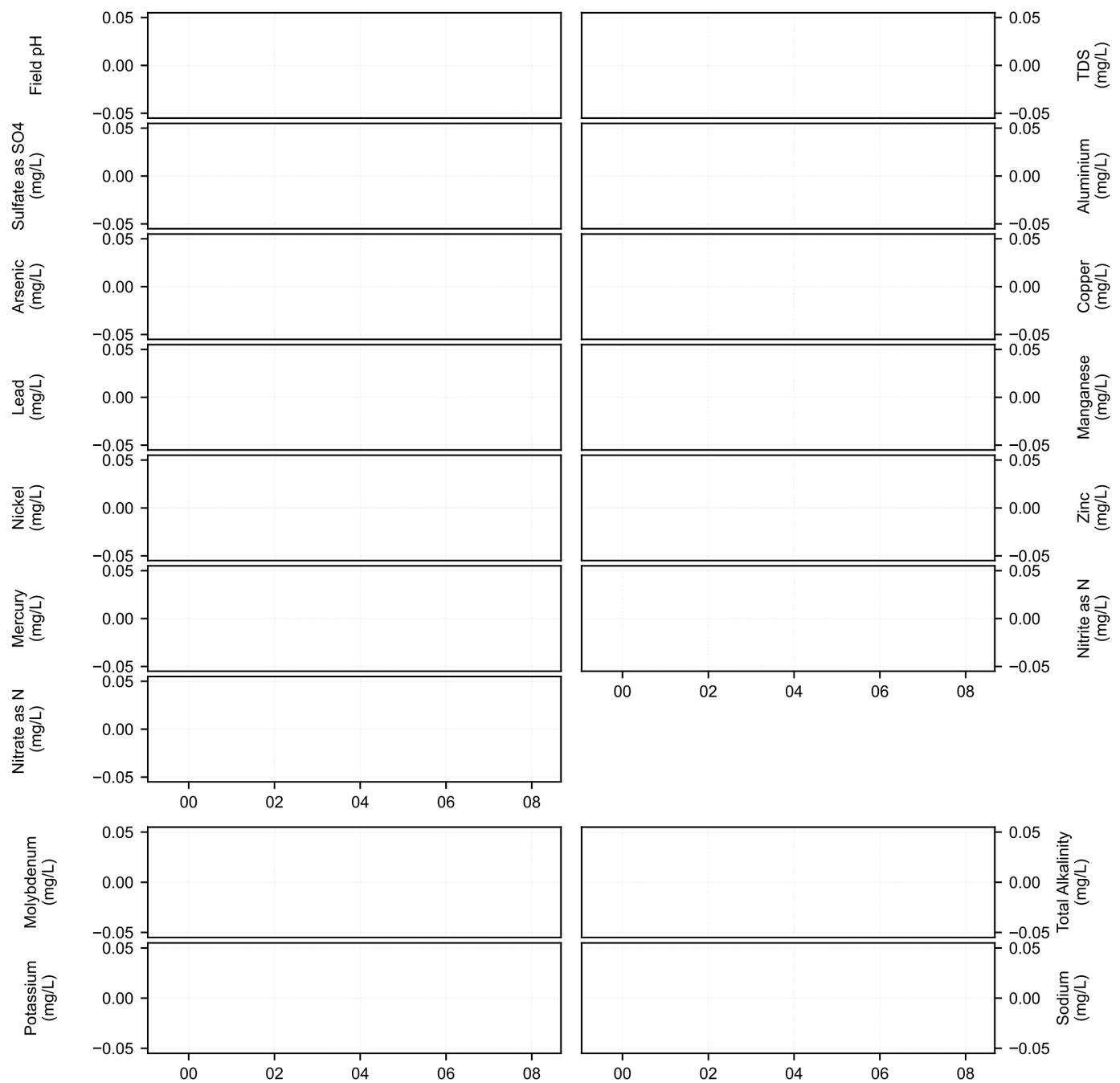
MB17 (Screened geology - Inactive; Screened interval: 15.9-33.9 mbgl)



Groundwater levels



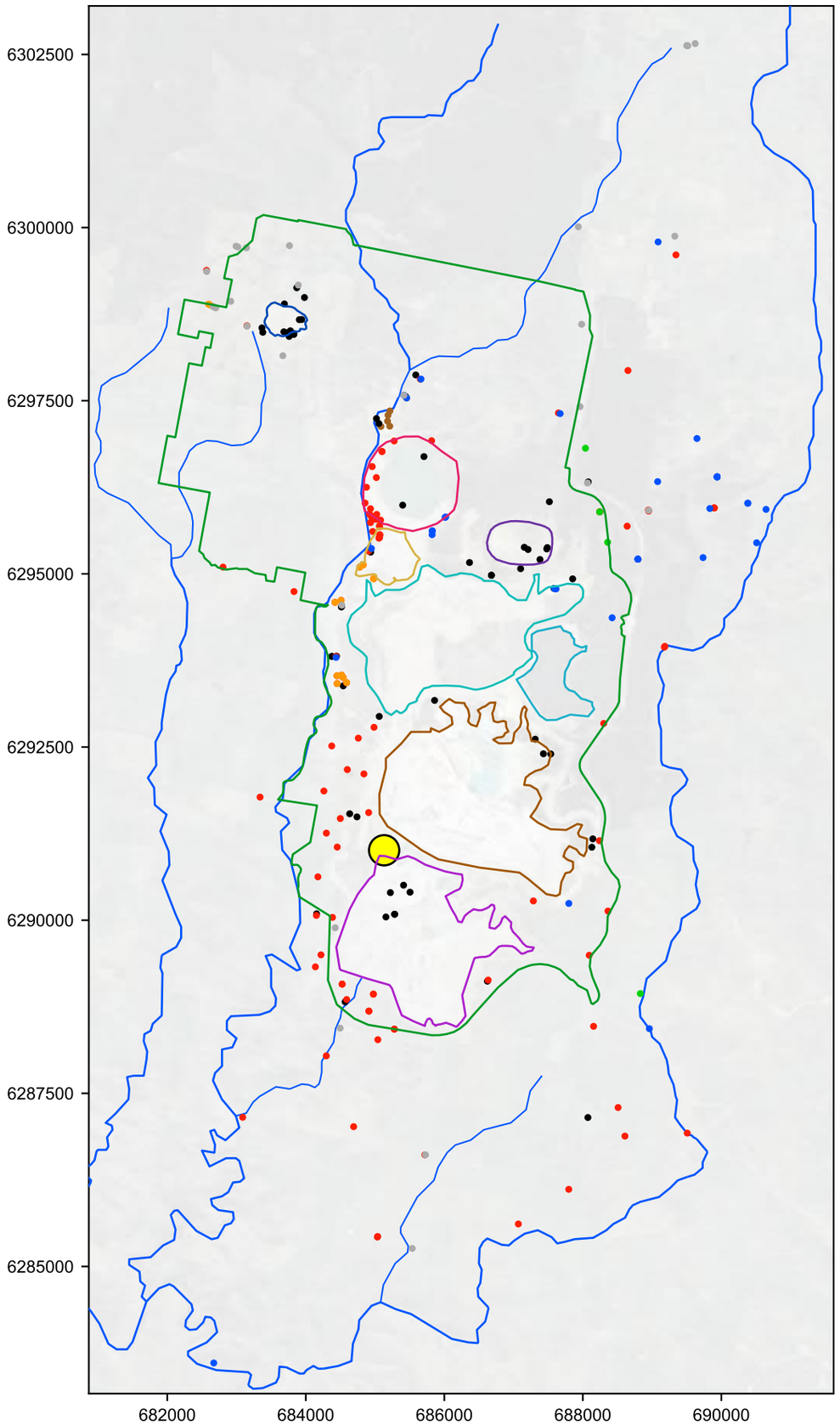
WMP defined analytes



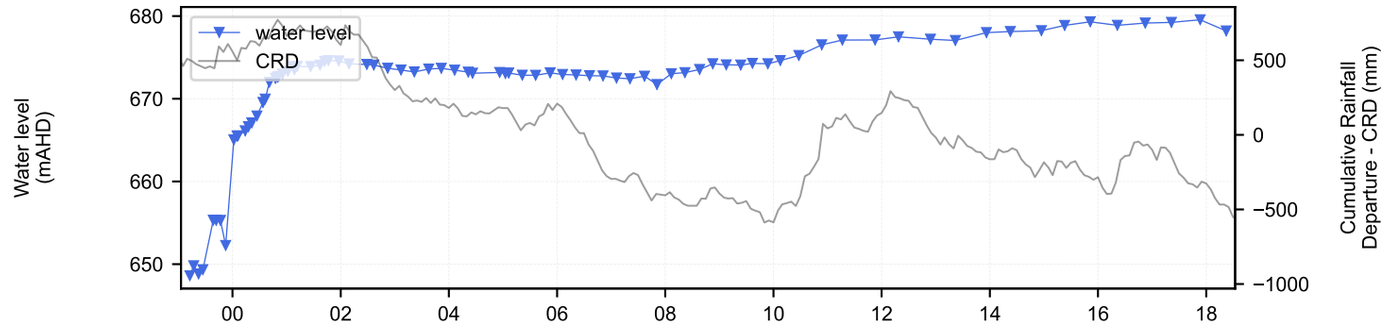
Additional analytes of interest

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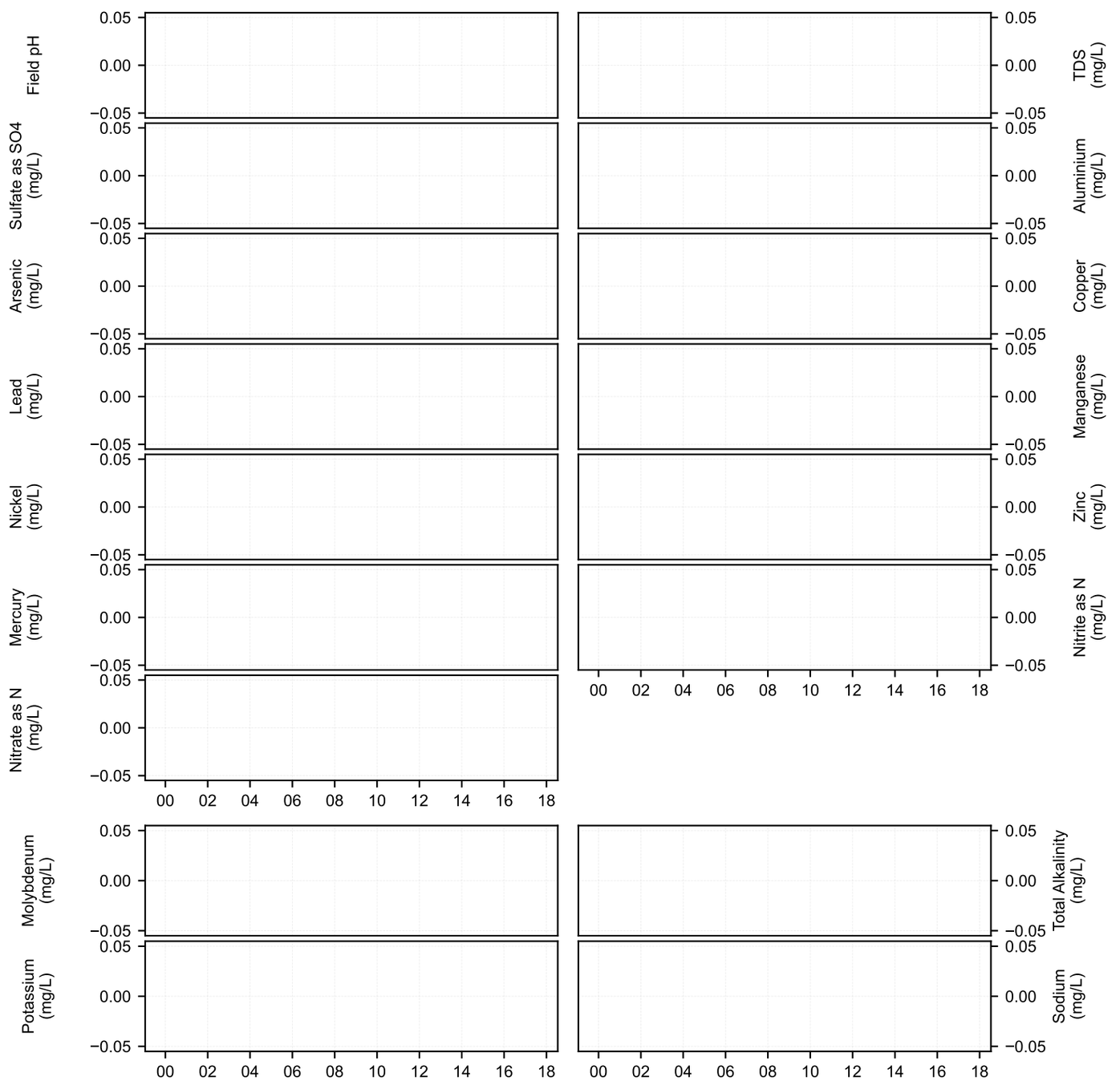
MB19A (Screened geology - None; Screened interval: 15.7-39.7 mbgl)



Groundwater levels



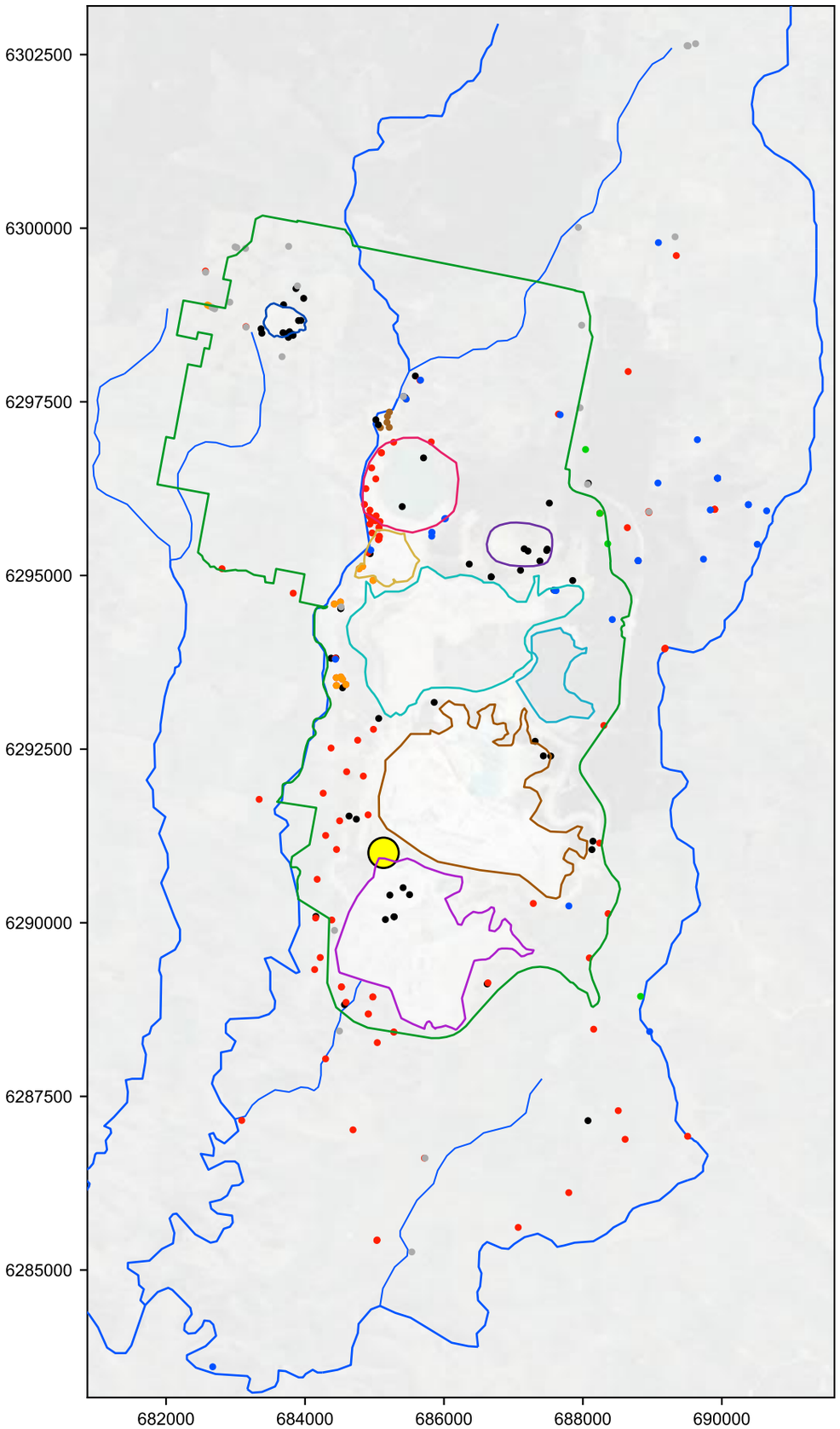
WMP defined analytes



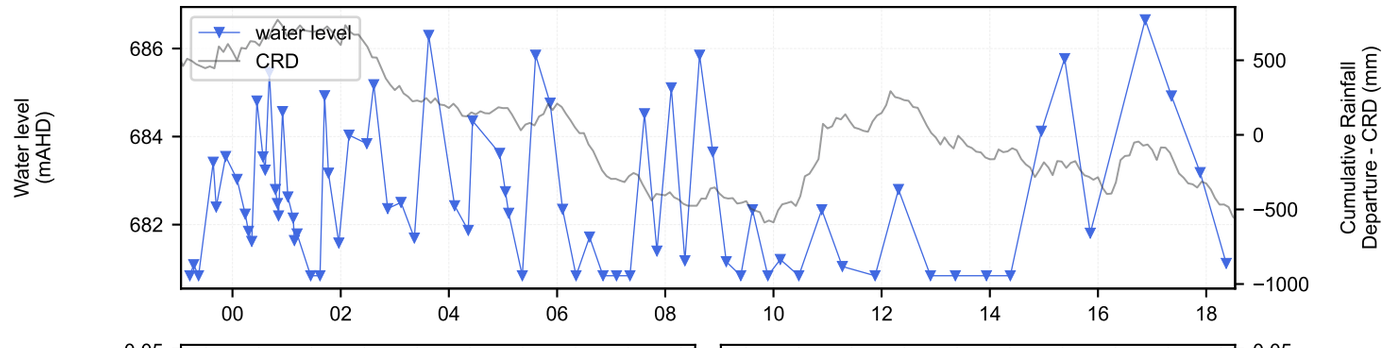
Additional analytes of interest

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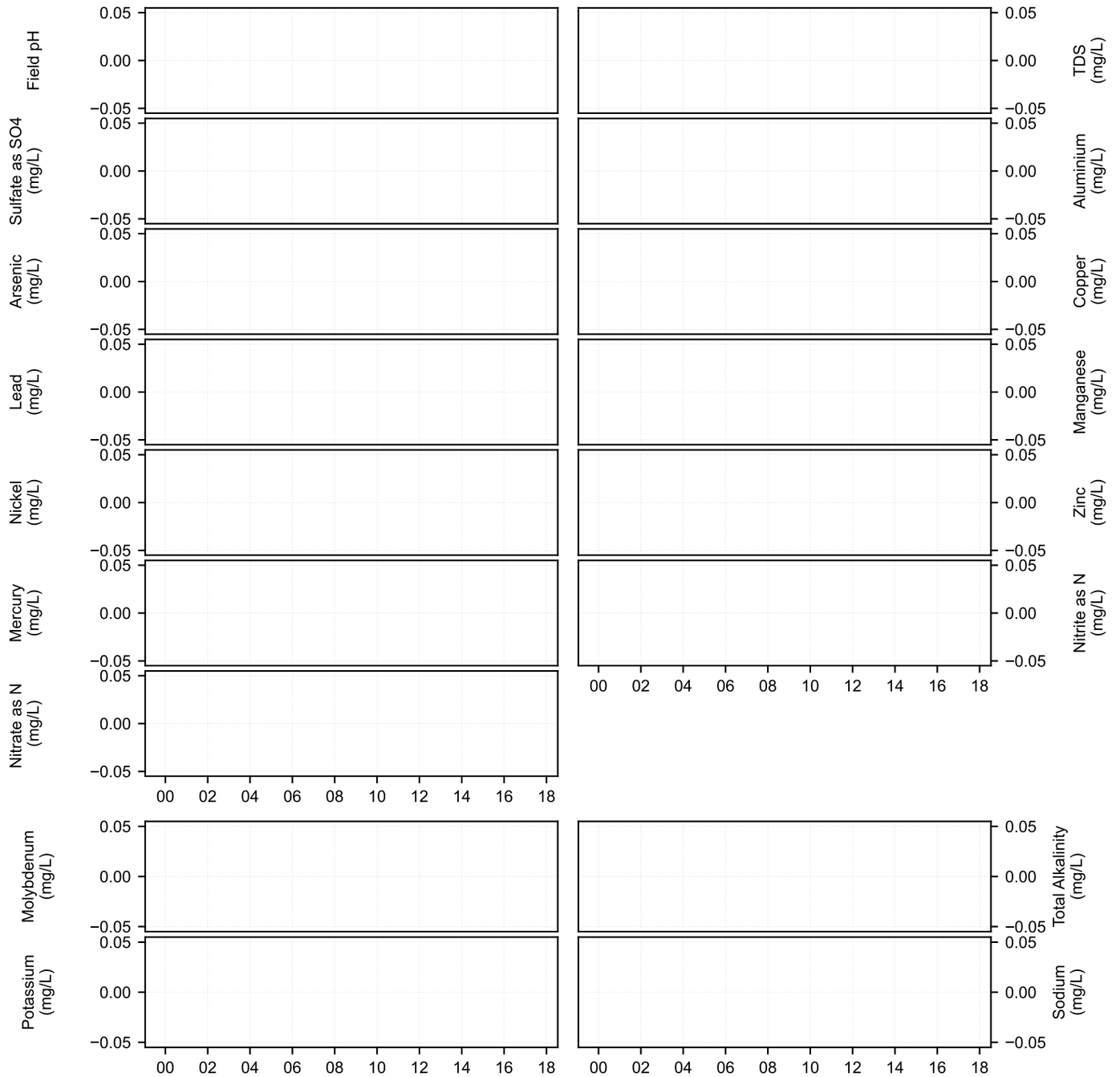
MB19B (Screened geology - None; Screened interval: 1.64-7.64 mbgl)



Groundwater levels



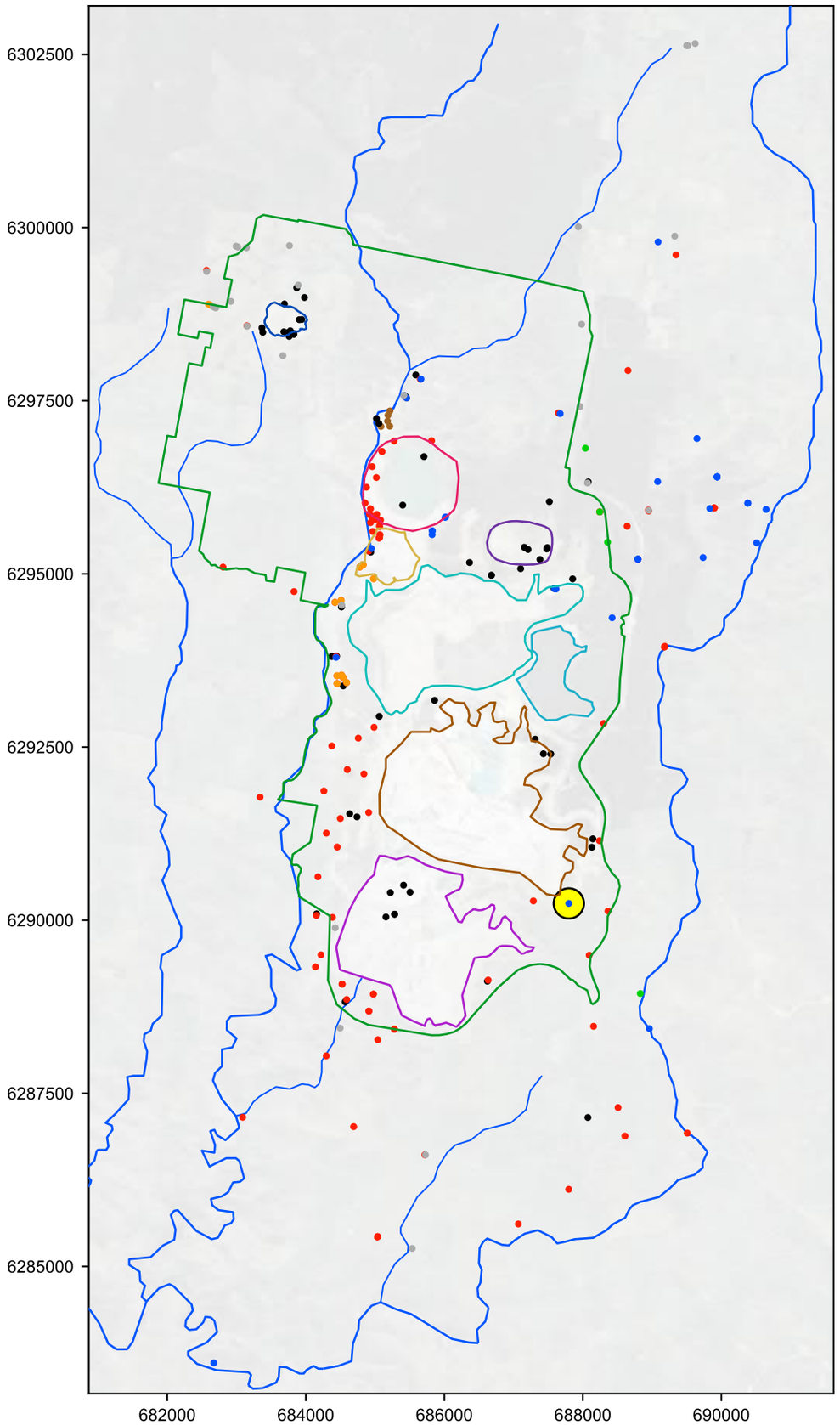
WMP defined analytes



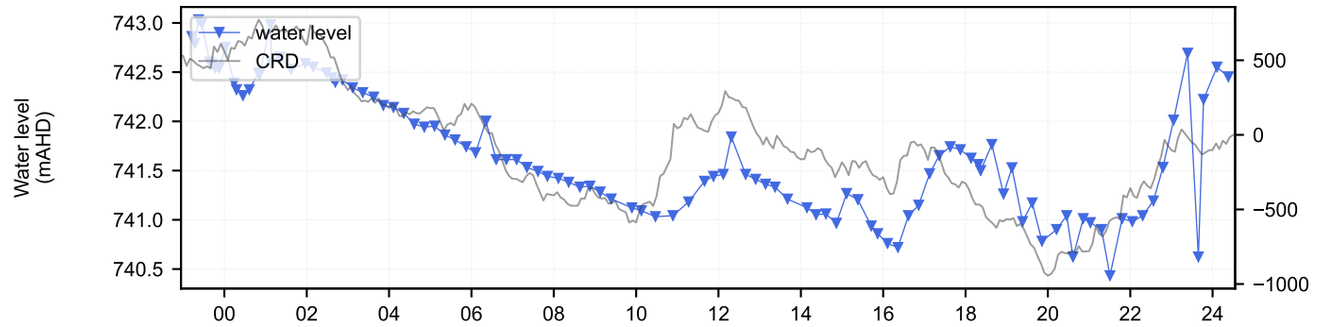
Additional analytes of interest

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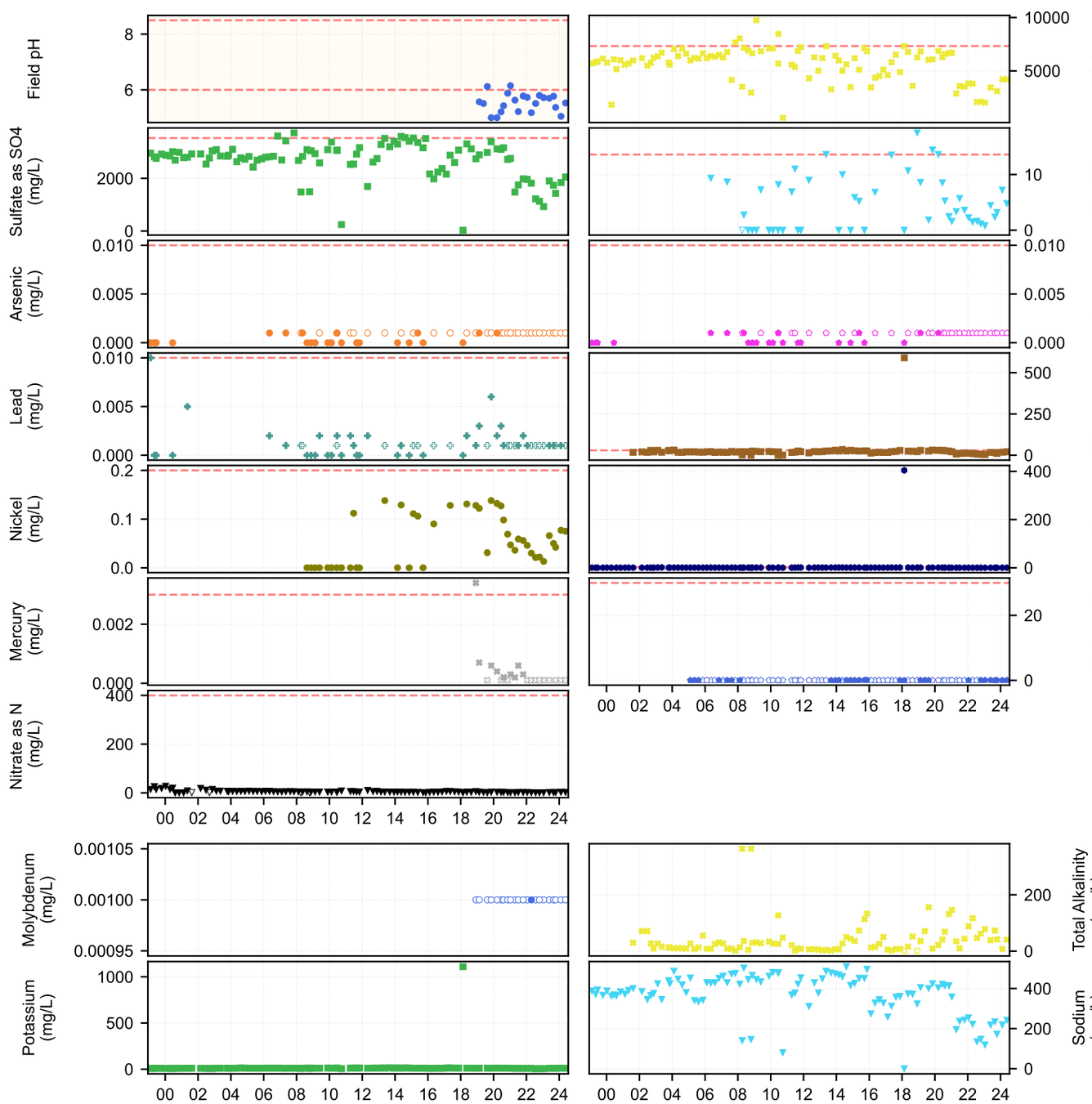
MB20 (Screened geology - Silurian; Screened interval: 9.9-39.9 mbgl)



Groundwater levels



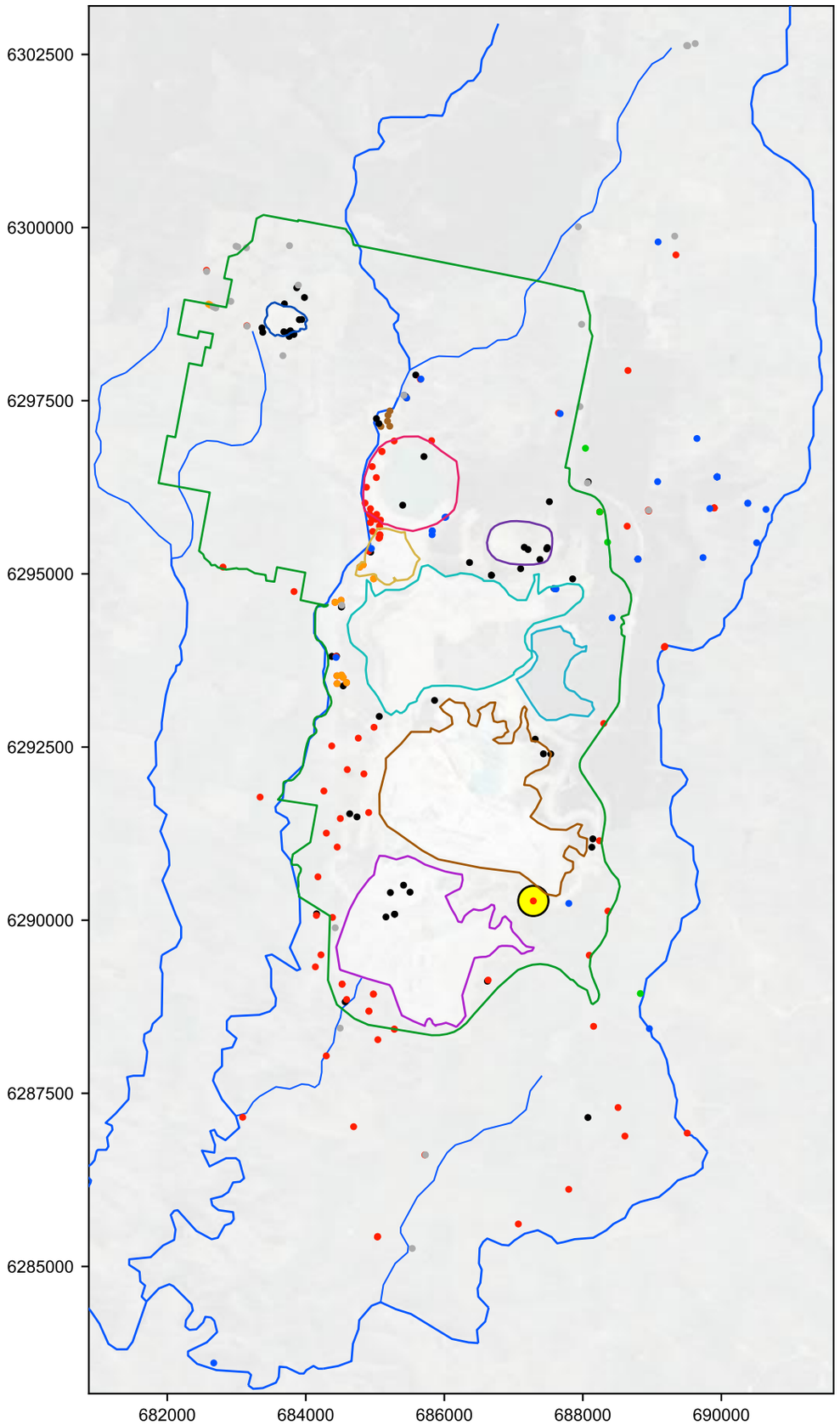
WMP defined analytes



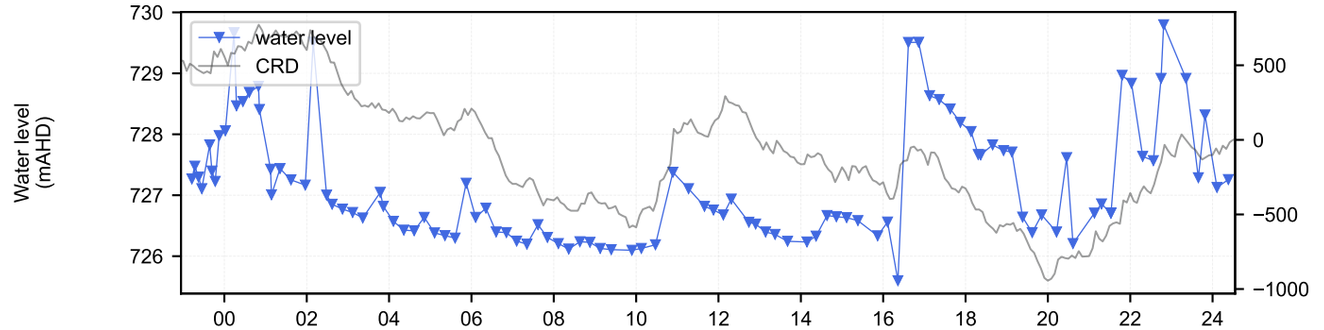
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

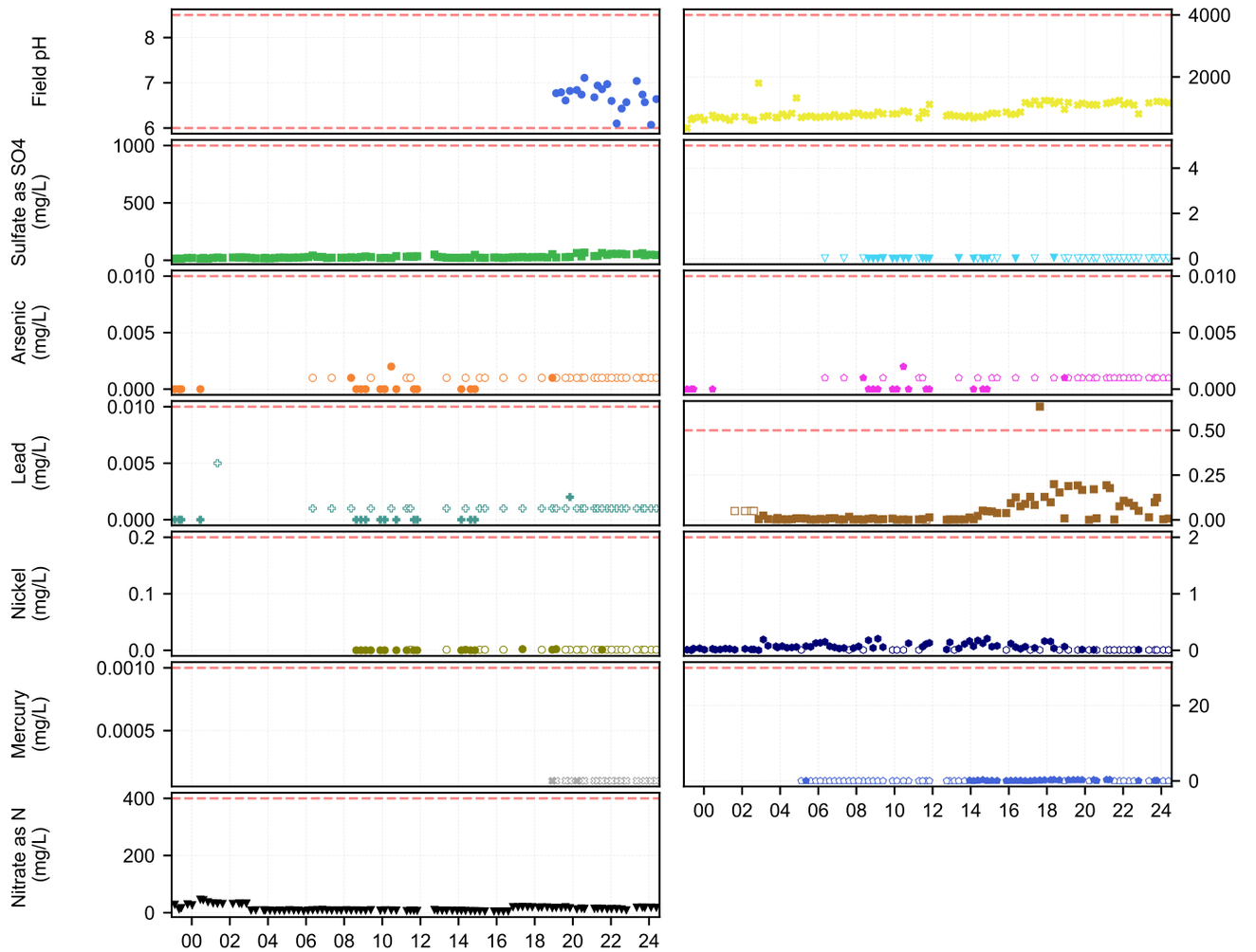
MB21 (Screened geology - Ordovician; Screened interval: 11.9-29.9 mbgl)



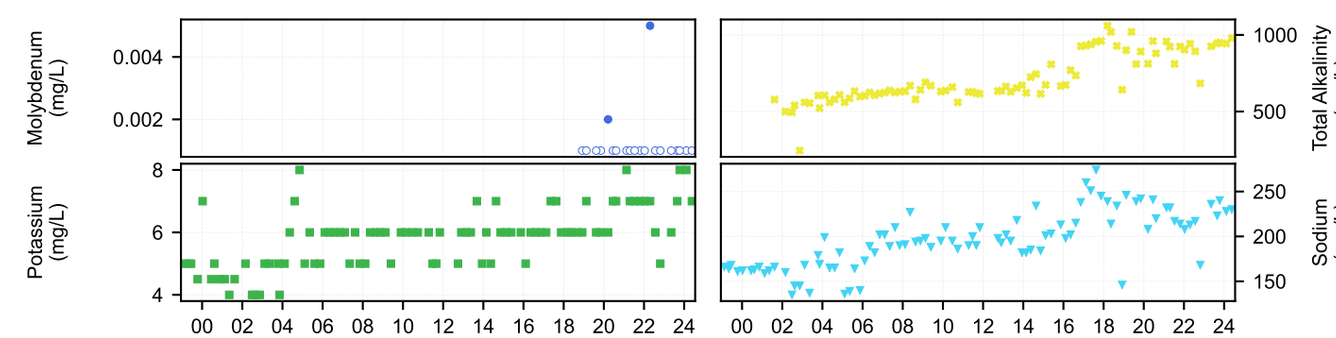
Groundwater levels



WMP defined analytes

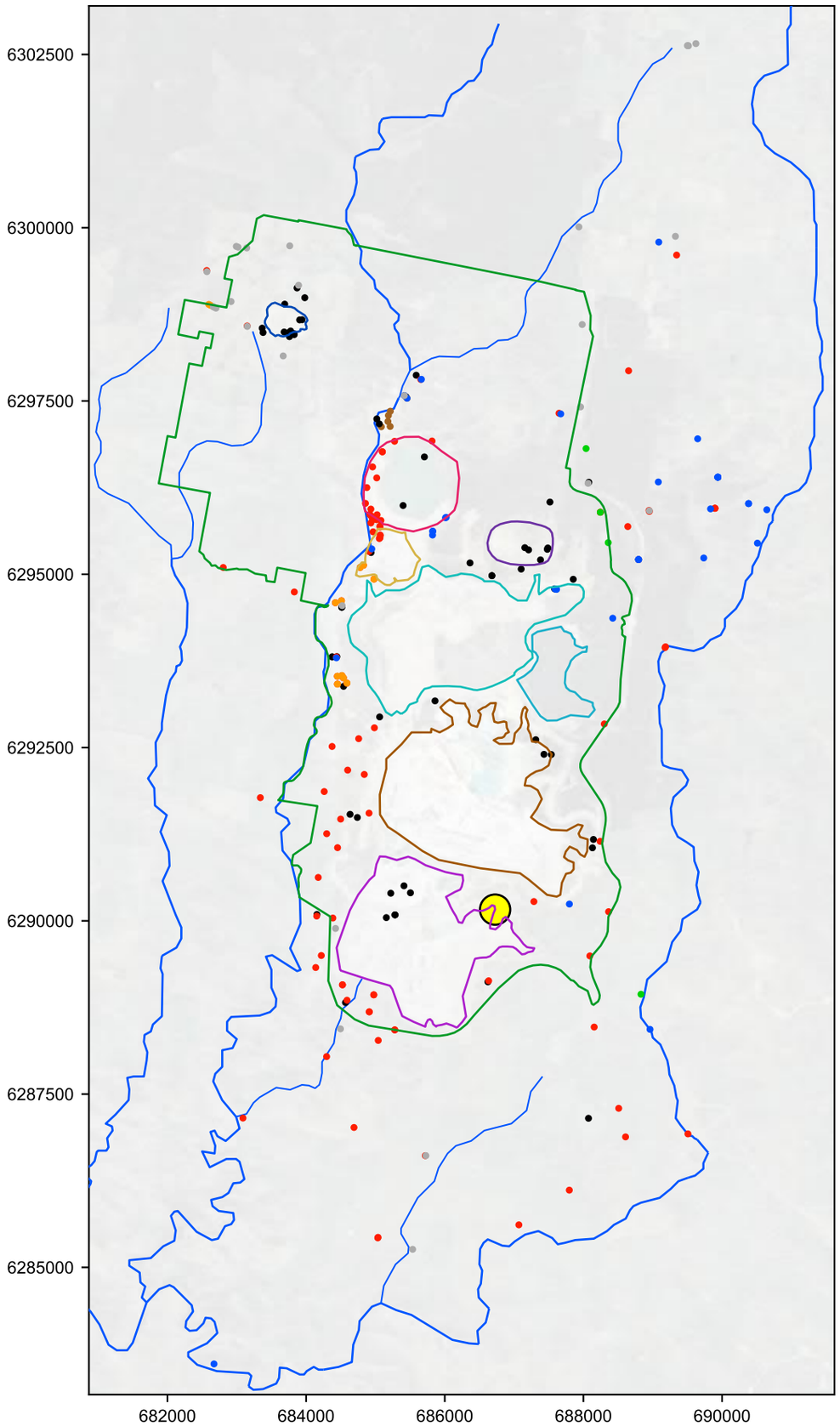


Additional analytes of interest

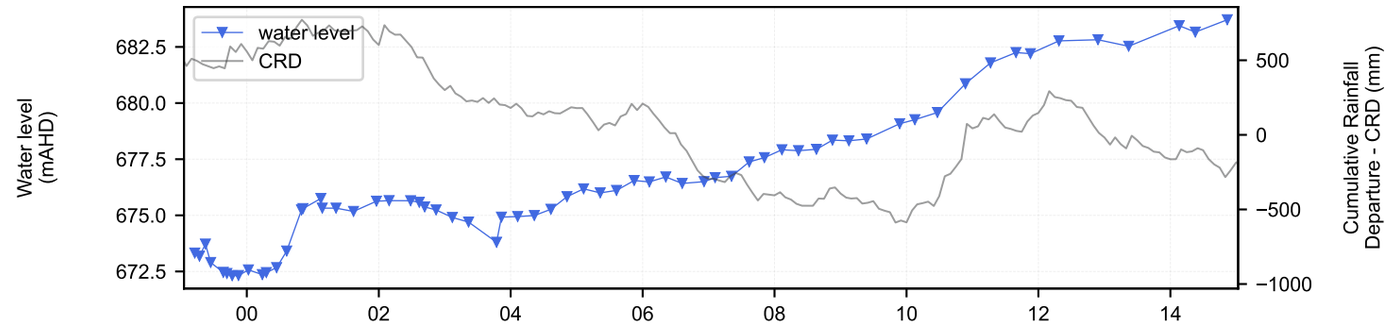


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

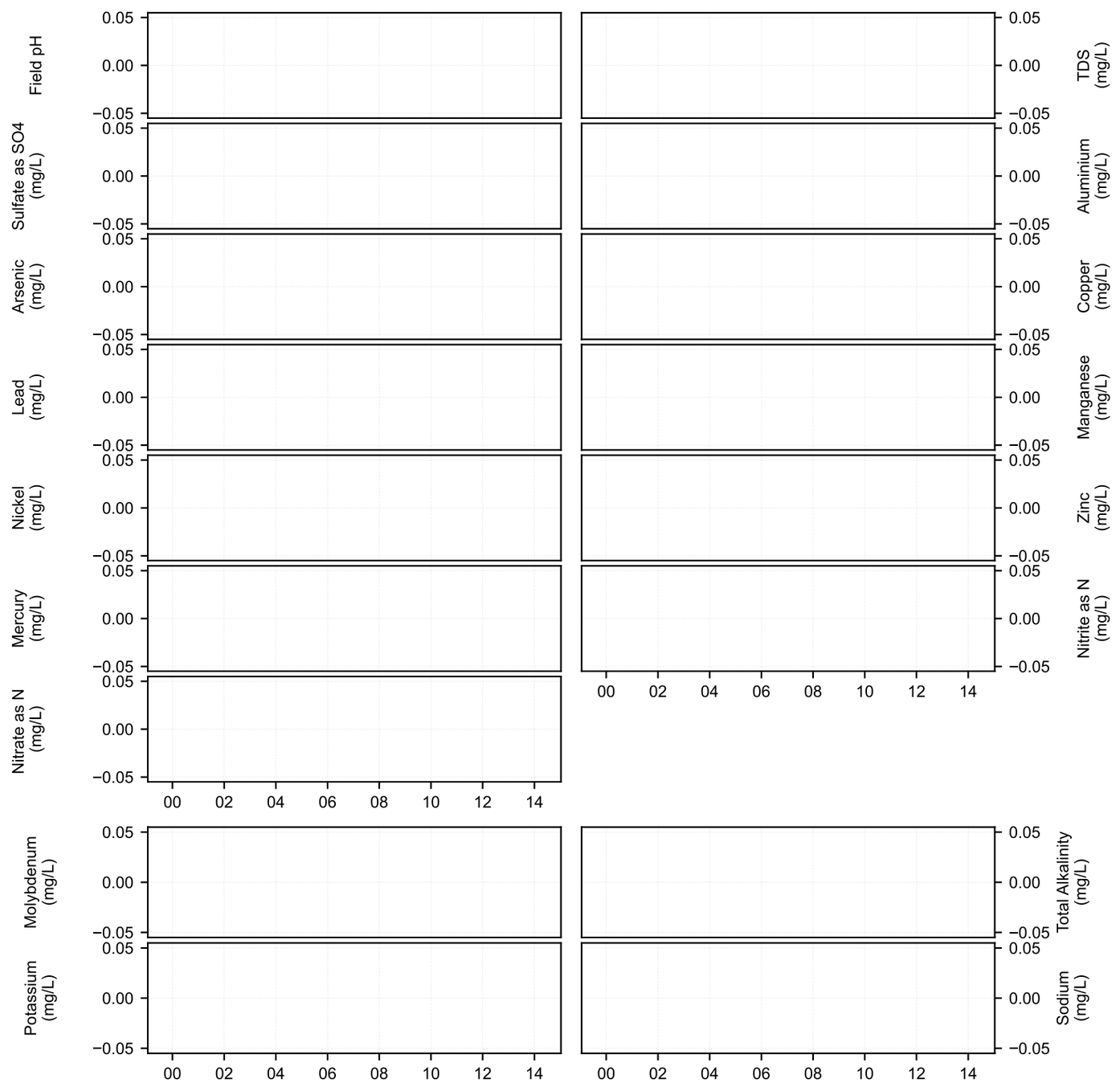
MB22 (Screened geology - None; Screened interval: 11.66-29.66 mbgl)



Groundwater levels



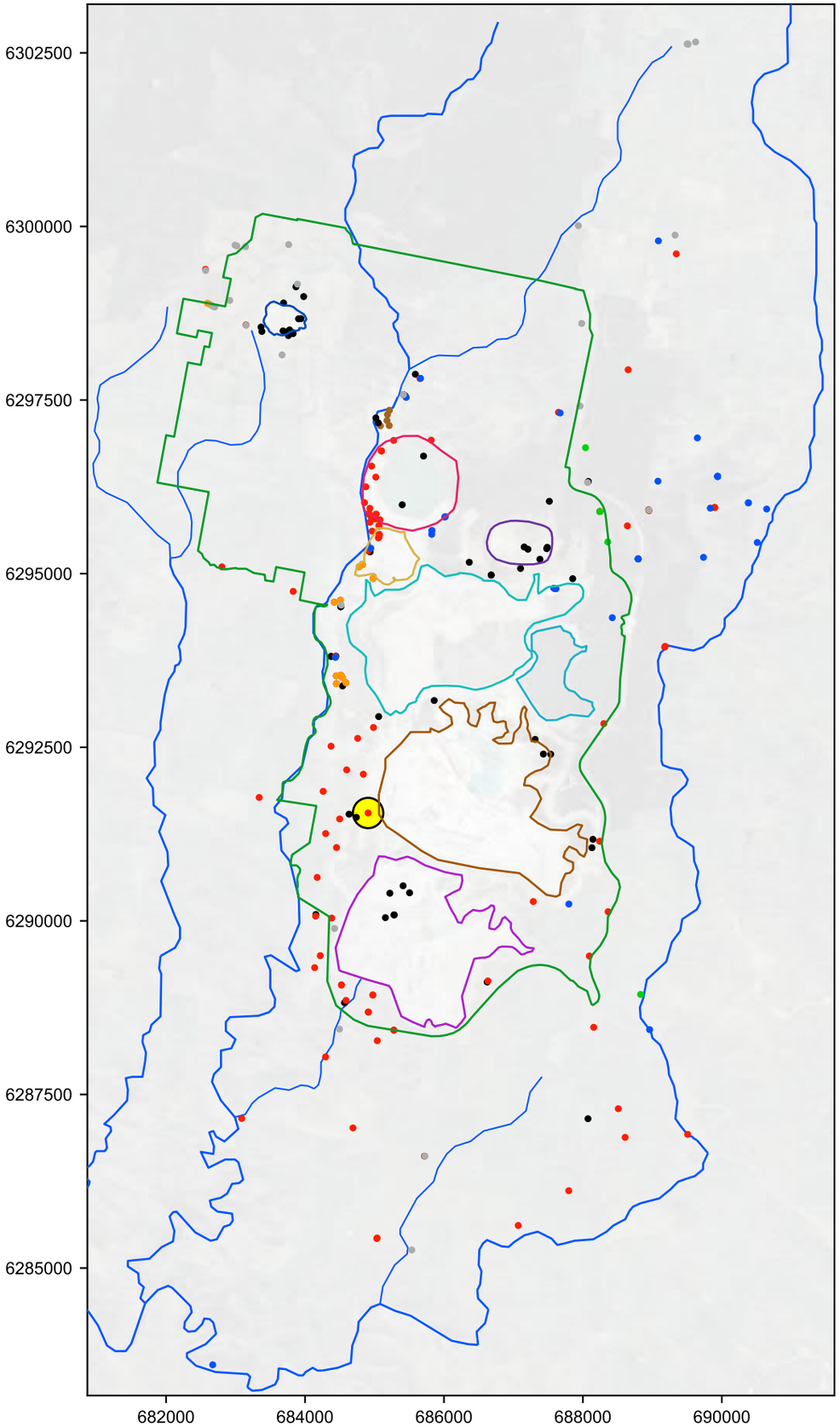
WMP defined analytes



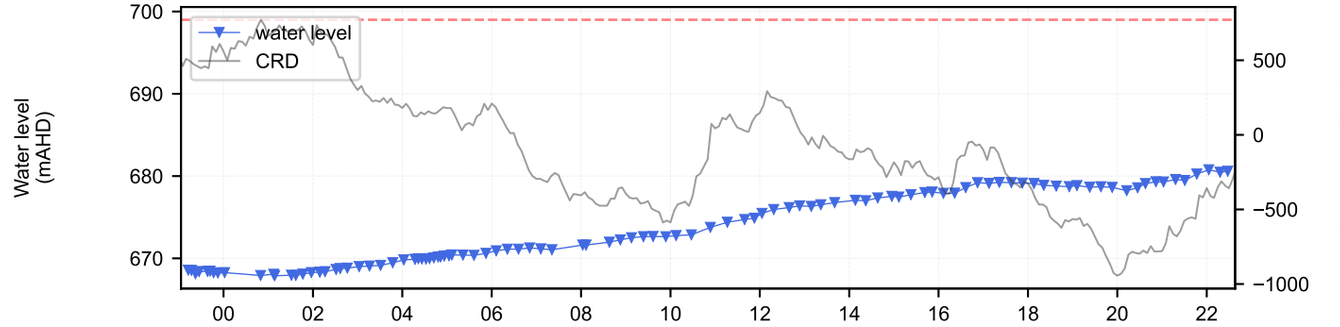
Additional analytes of interest

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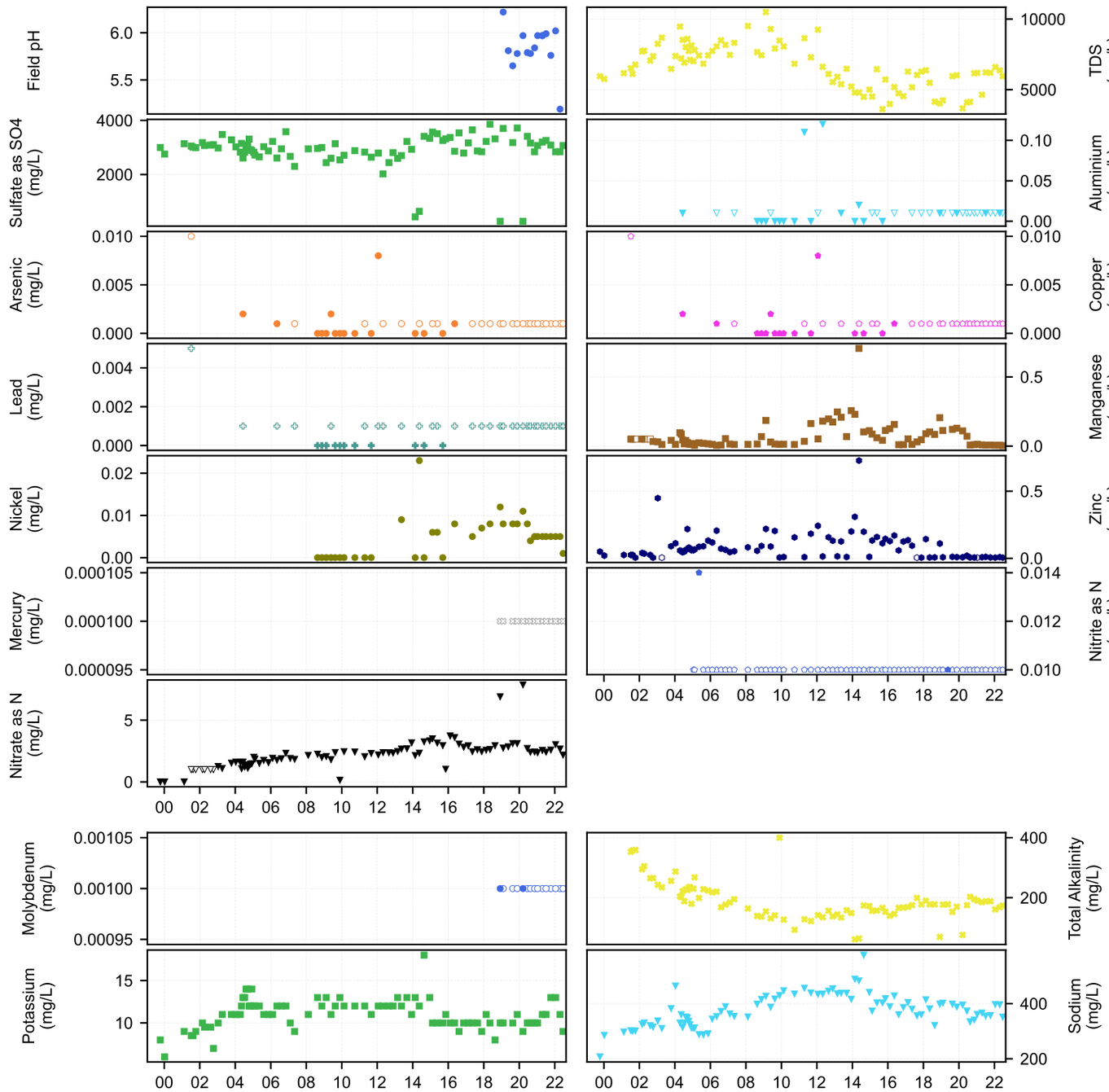
MB23 (Screened geology - Ordovician; Screened interval: 11.37-41.37 mbgl)



Groundwater levels



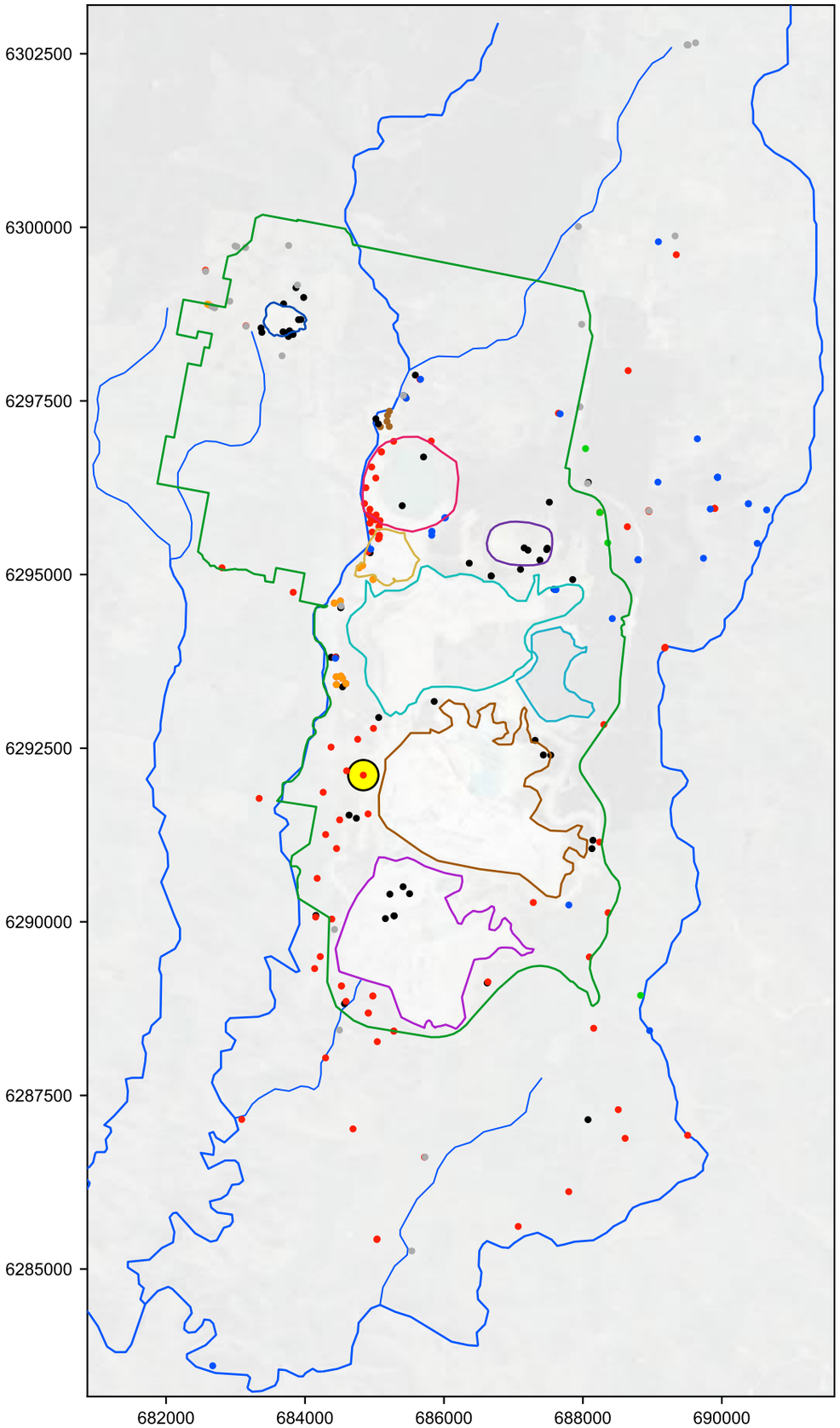
WMP defined analytes



Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

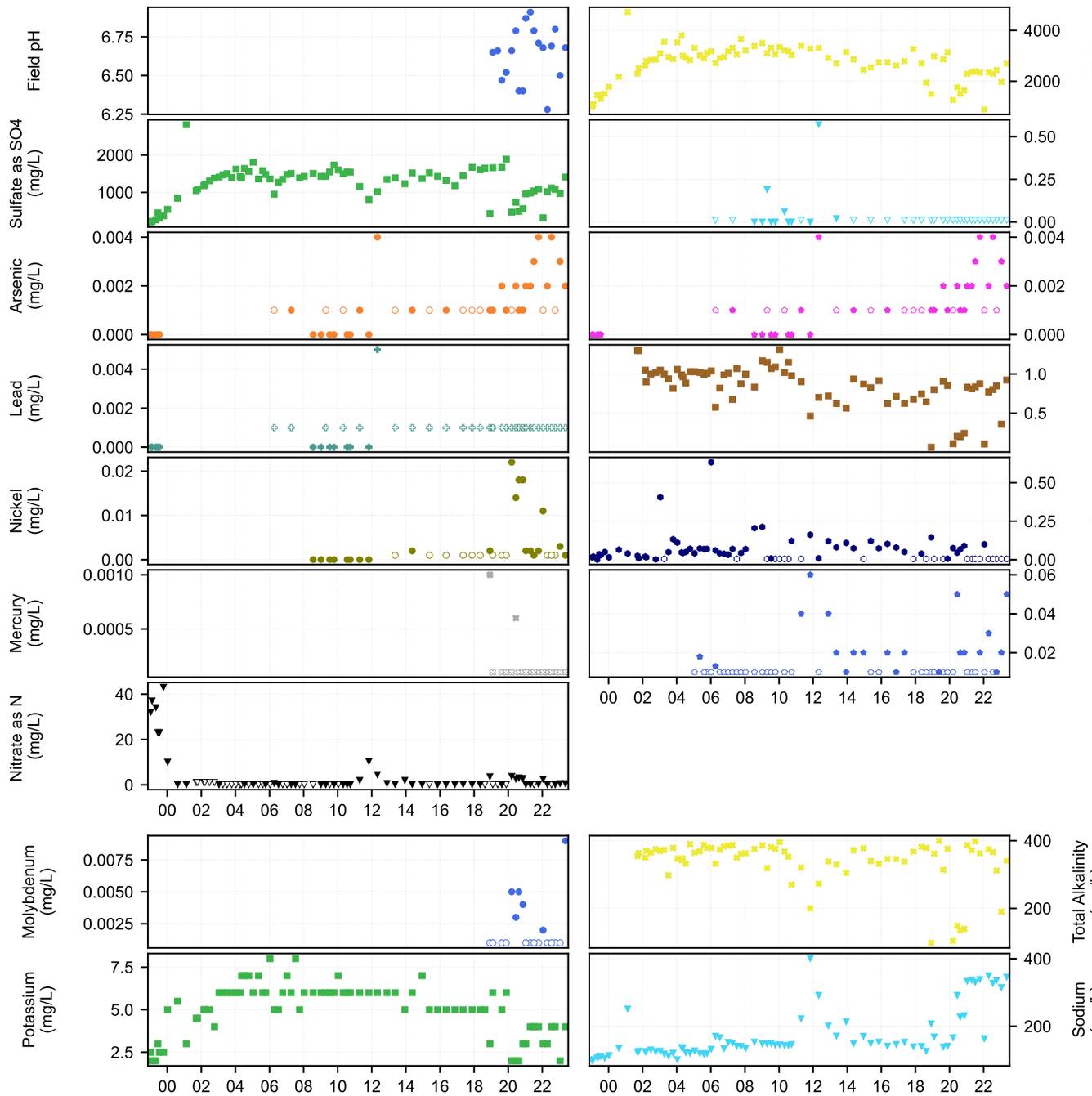
MB24 (Screened geology - Ordovician; Screened interval: 12.98-30.98 mbgl)



Groundwater levels



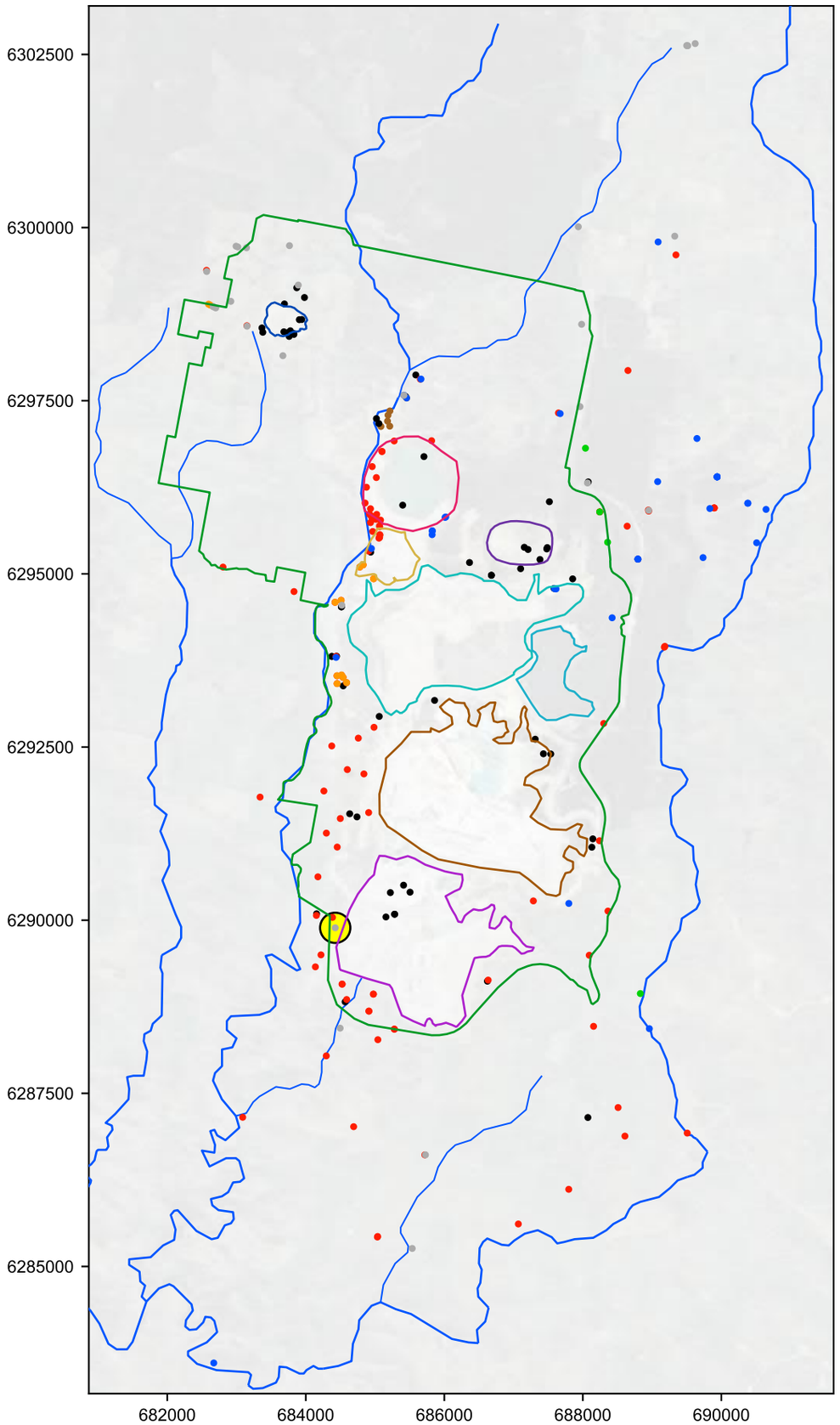
WMP defined analytes



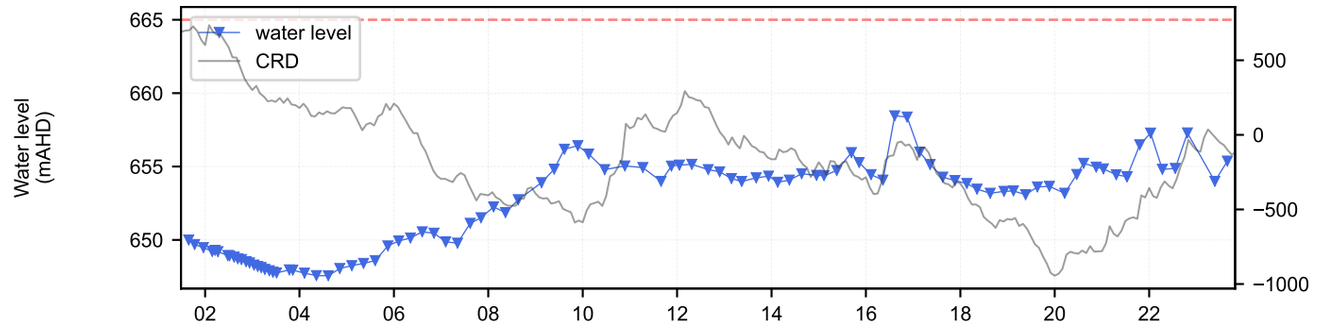
Additional analytes of interest

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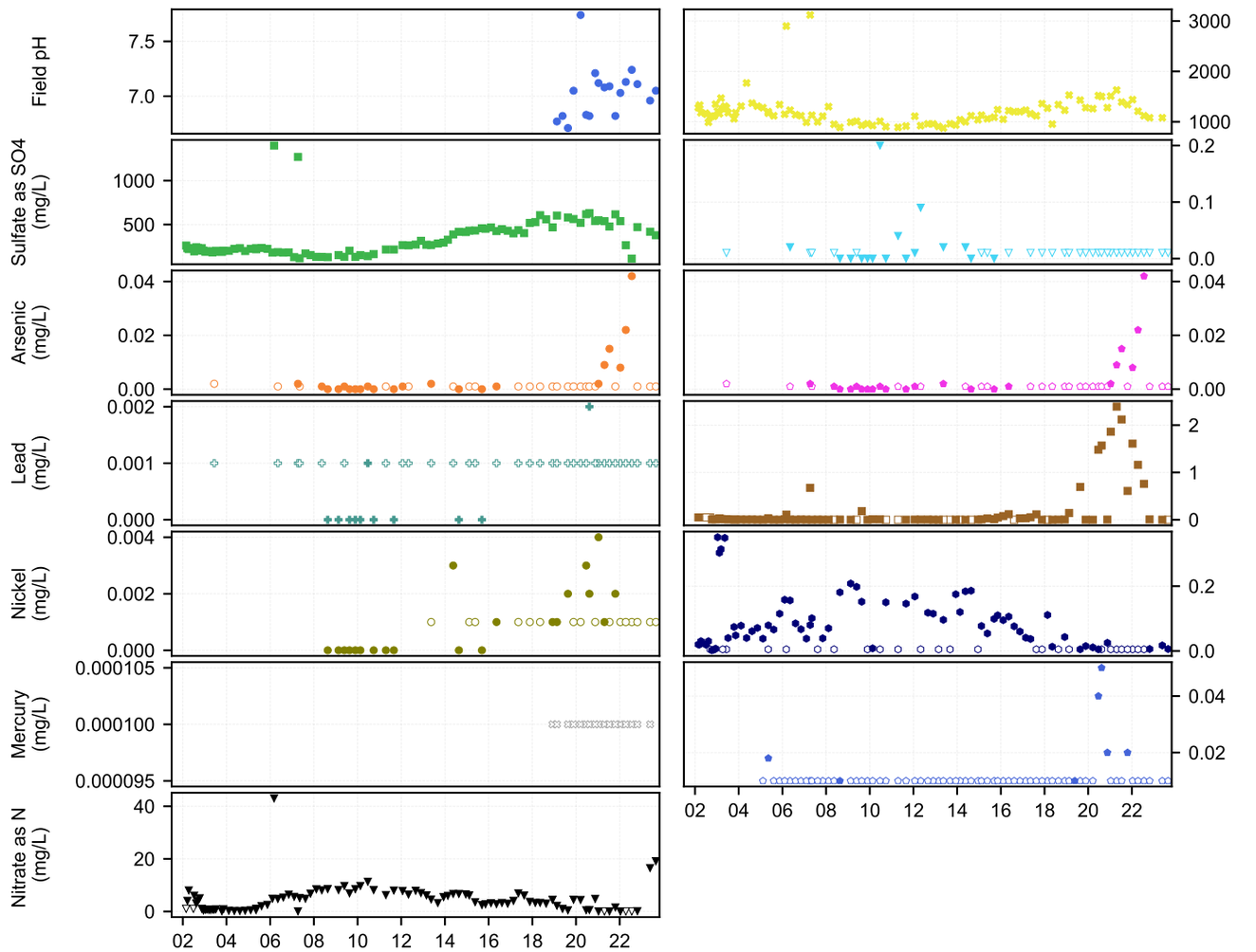
MB25 (Screened geology - Tertiary basalt; Screened interval: 18.5-30.5 mbgl)



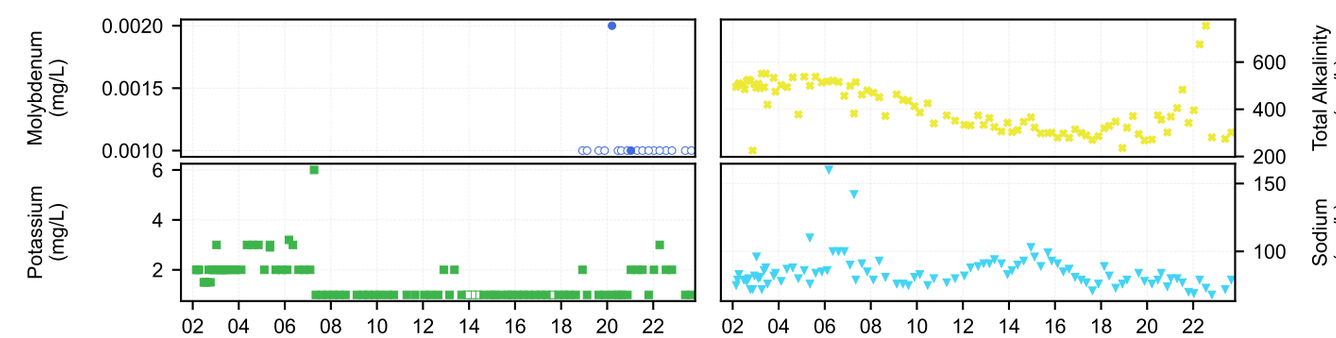
Groundwater levels



WMP defined analytes

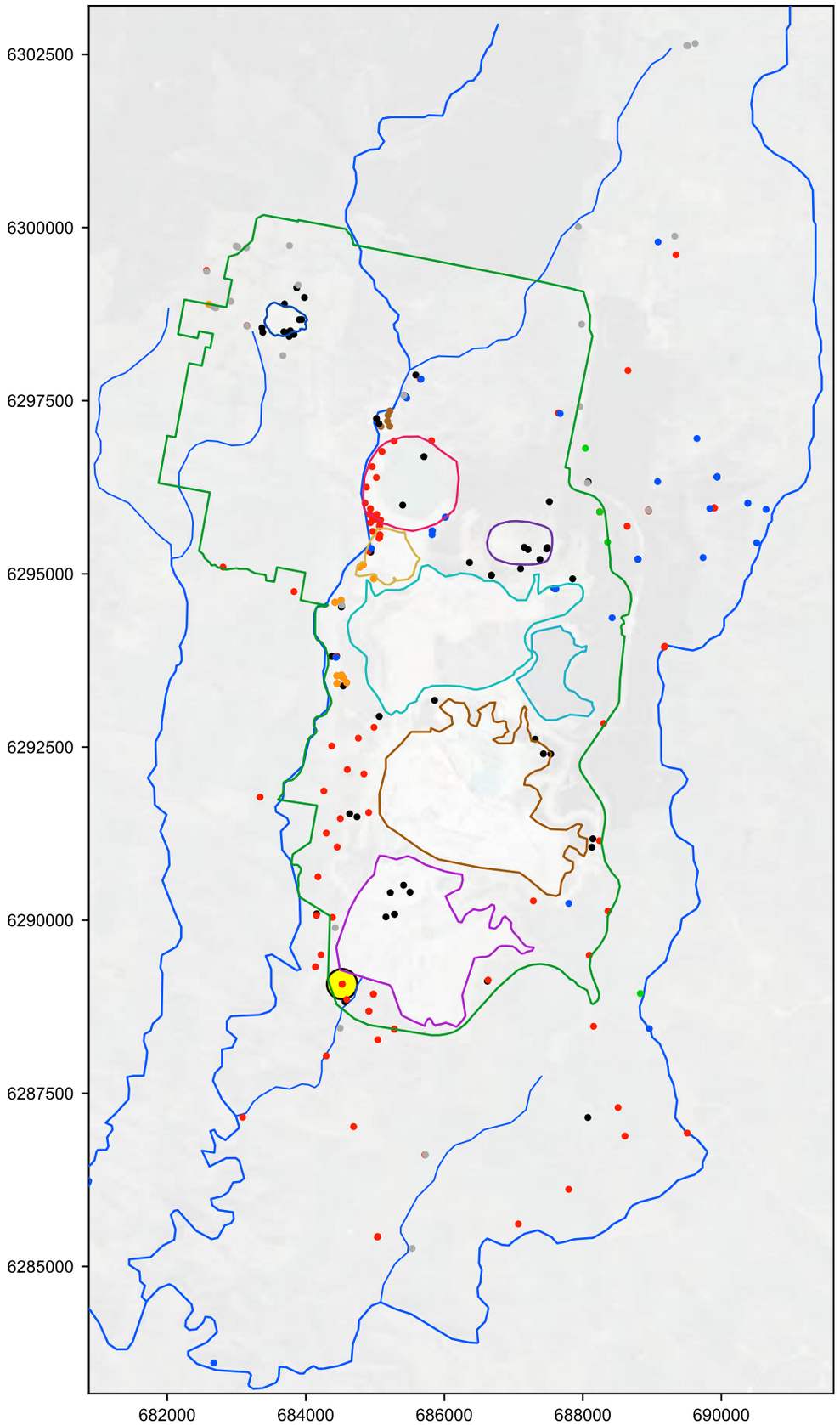


Additional analytes of interest

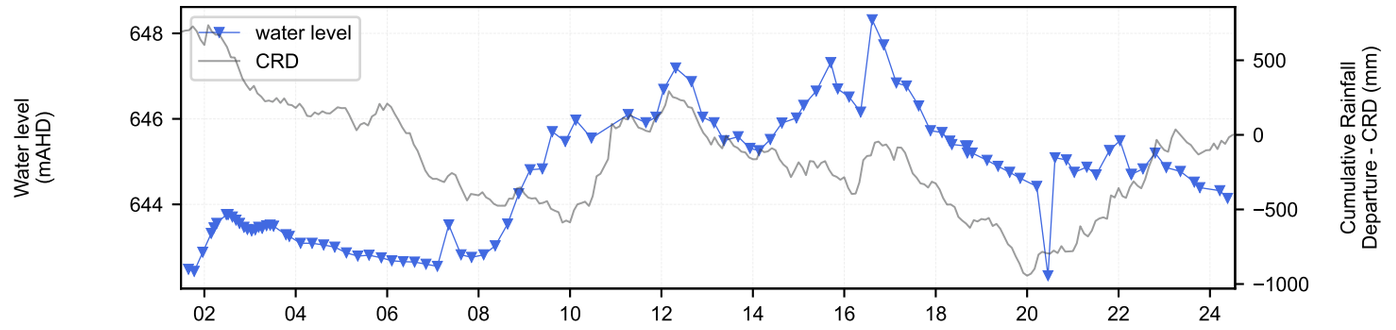


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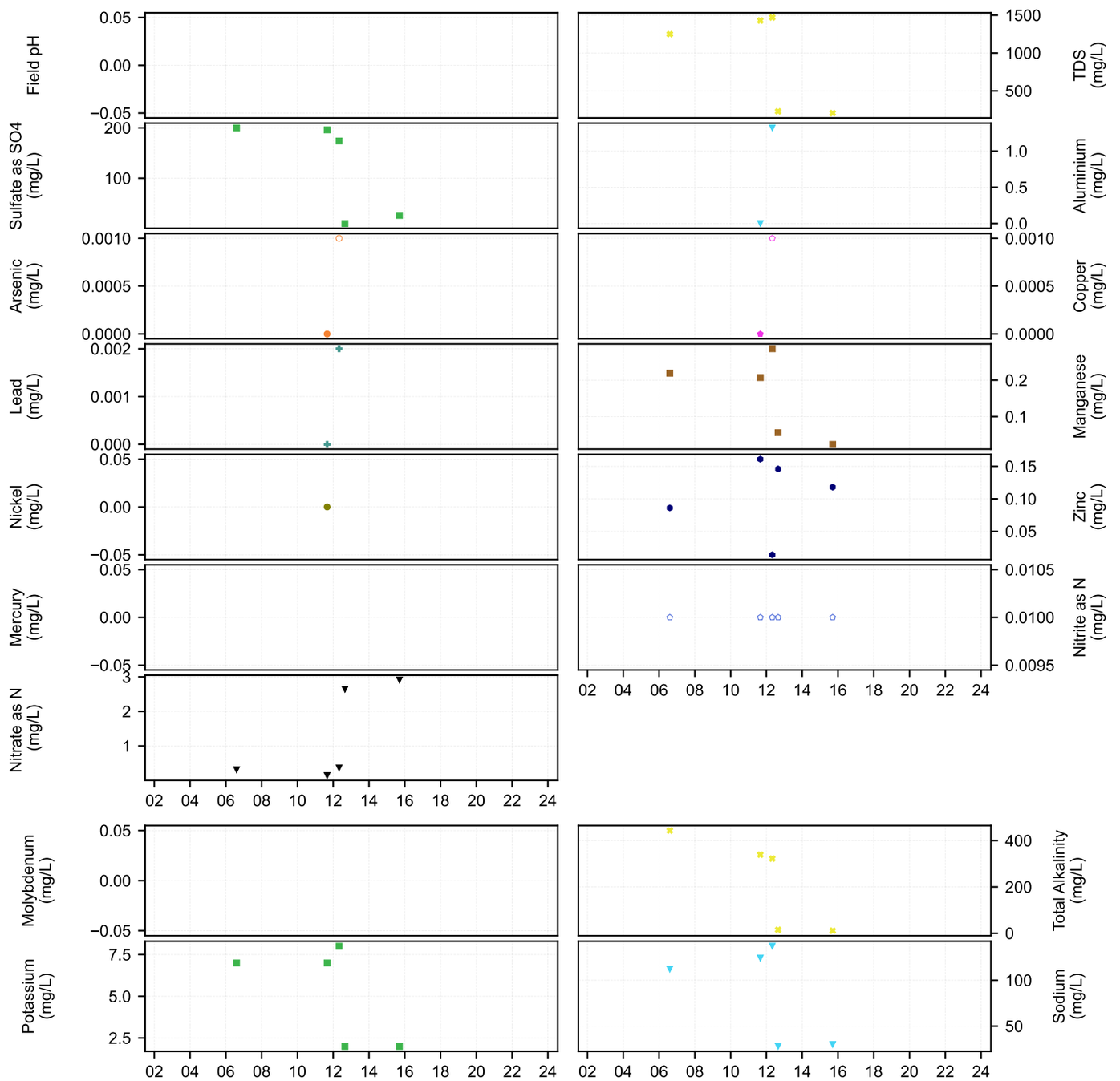
MB26A (Screened geology - Ordovician; Screened interval: 4.5-10.5 mbgl)



Groundwater levels



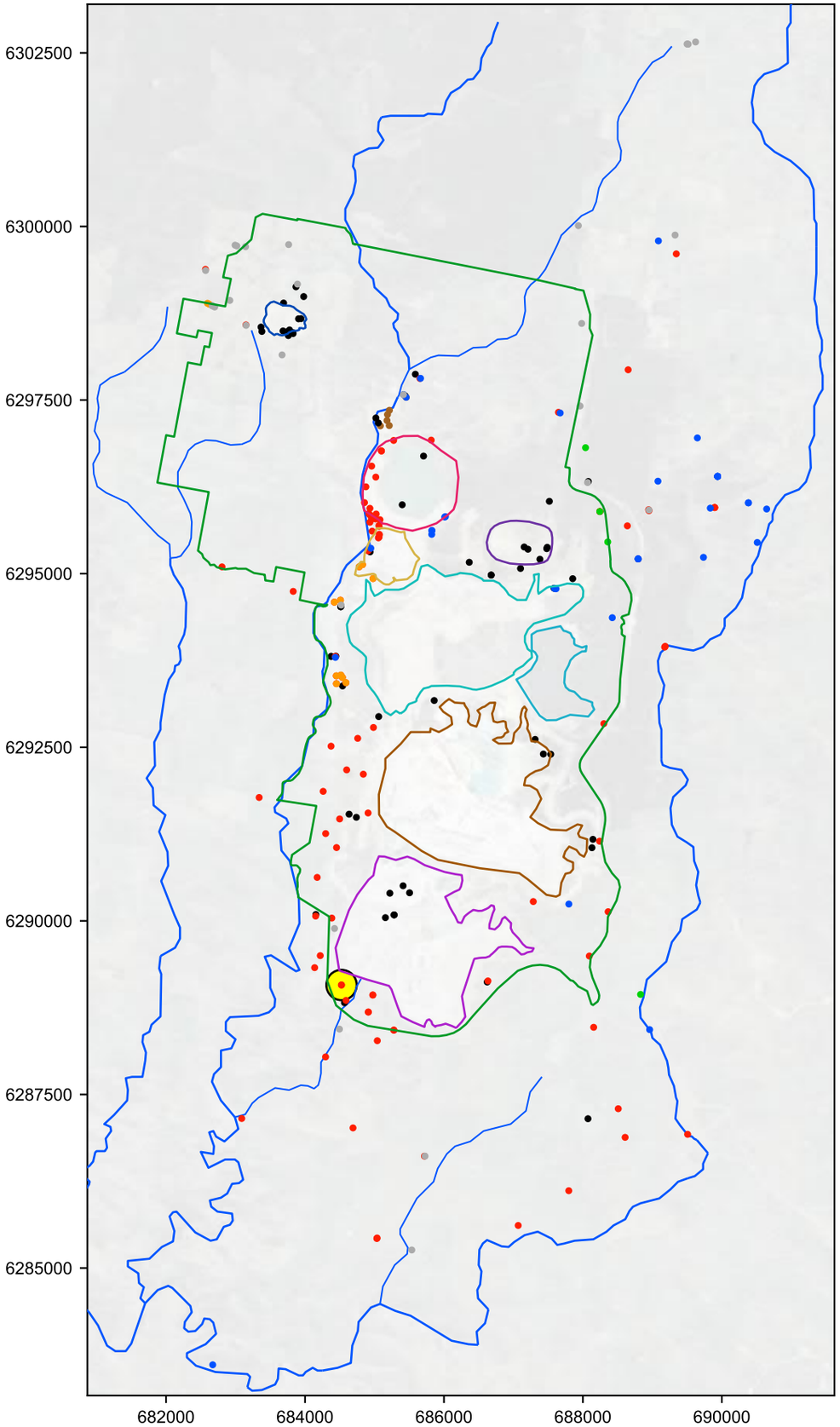
WMP defined analytes



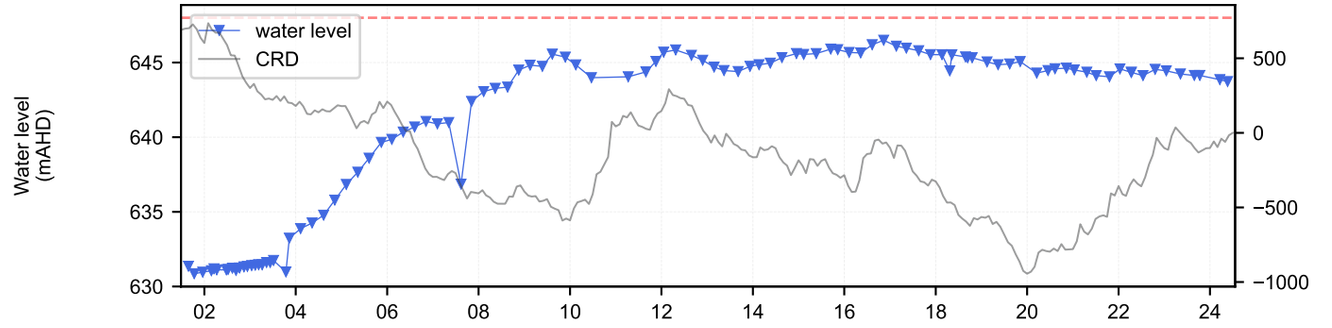
Additional analytes of interest

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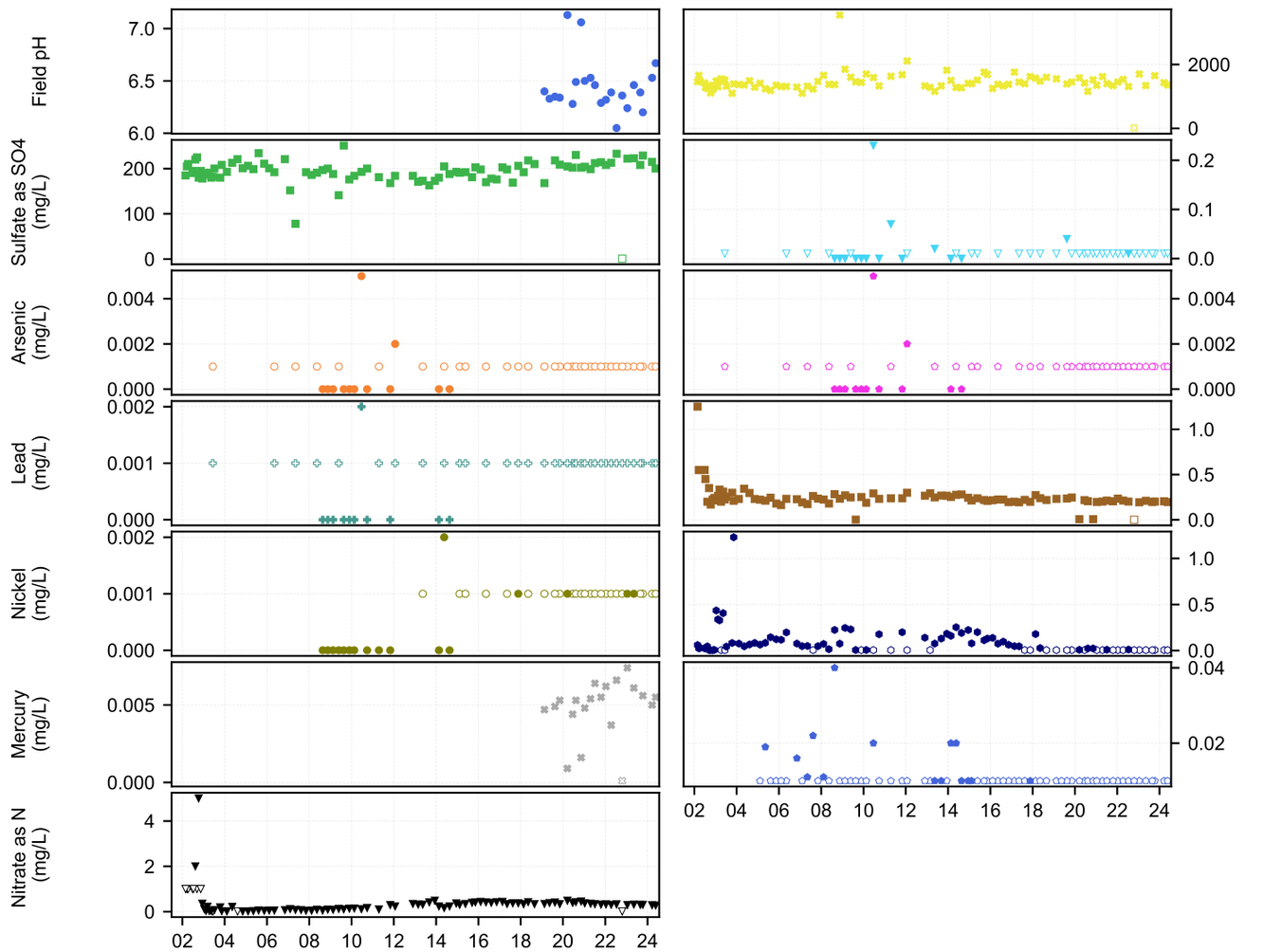
MB26B (Screened geology - Ordovician; Screened interval: 19.0-30.0 mbgl)



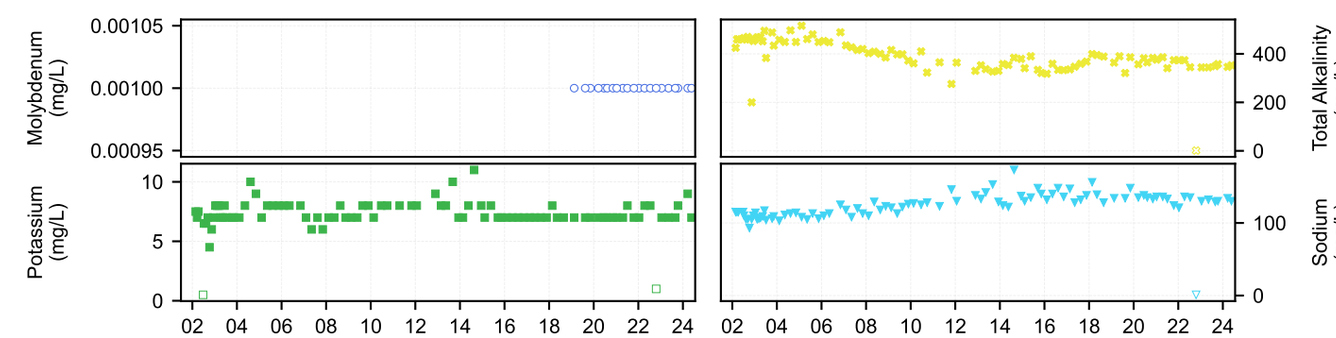
Groundwater levels



WMP defined analytes

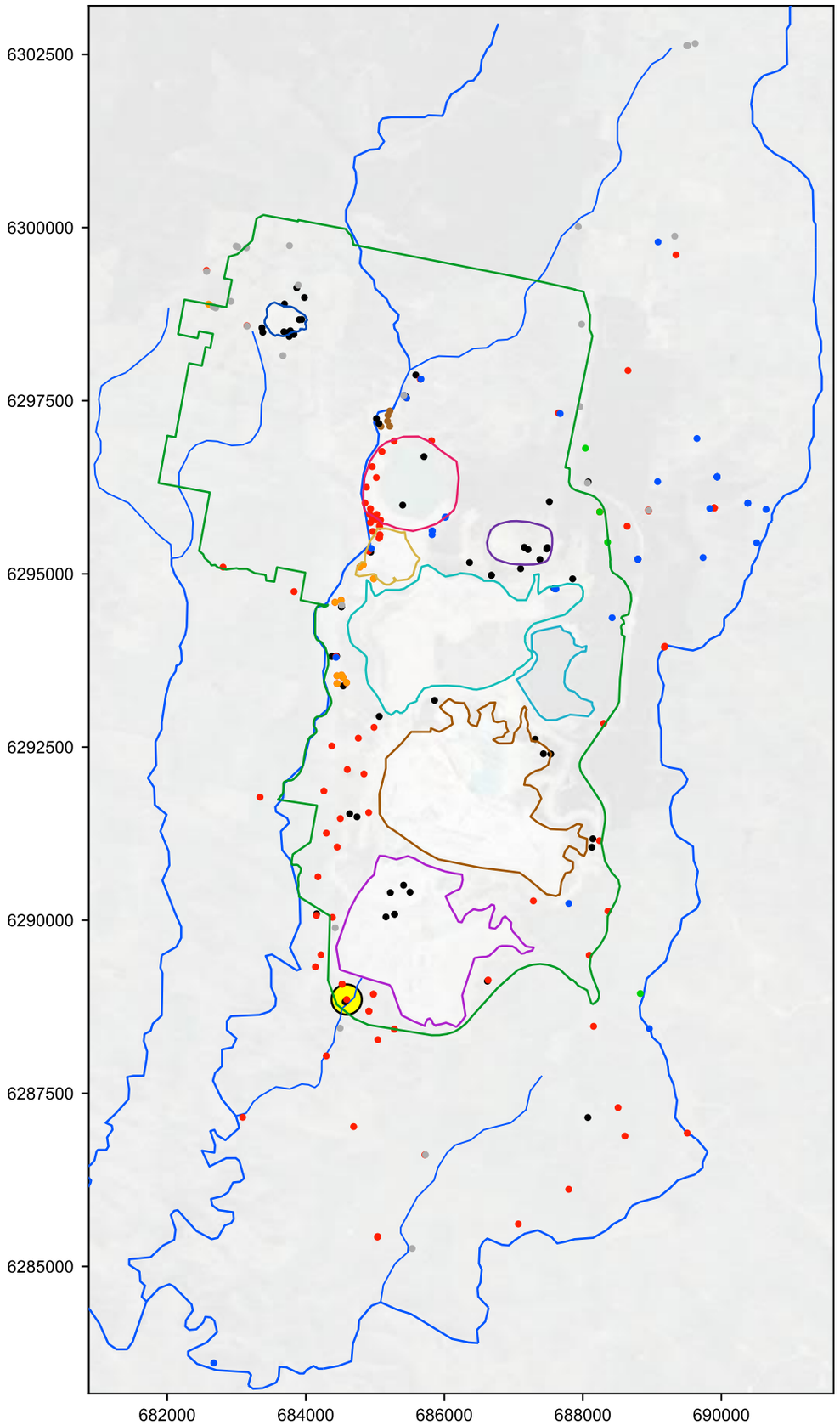


Additional analytes of interest

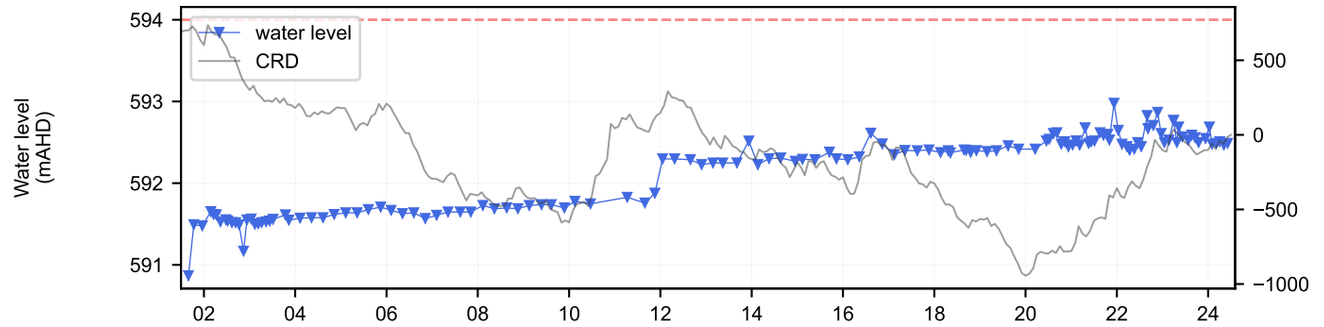


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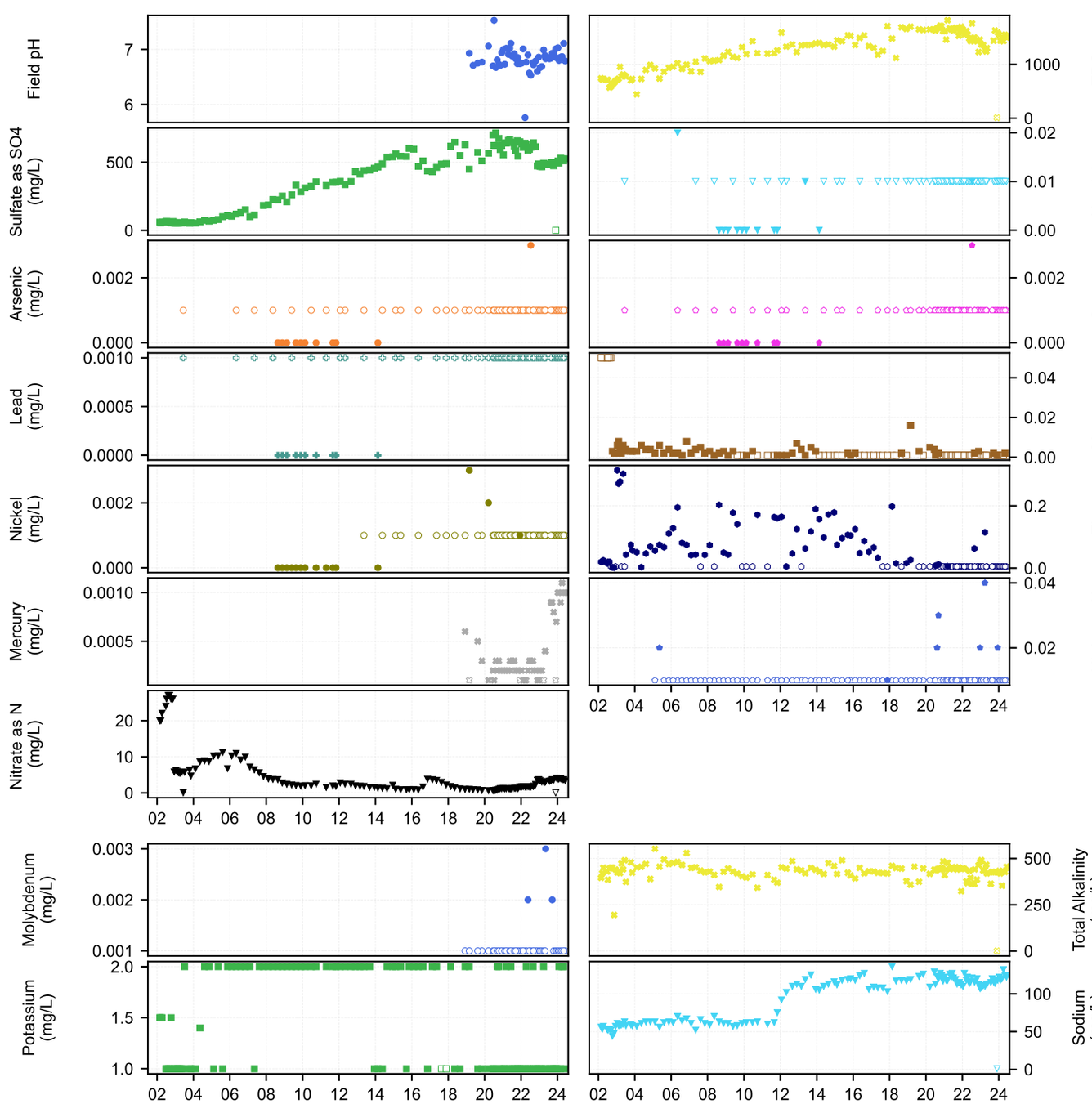
MB27 (Screened geology - Ordovician; Screened interval: 4.0-11.5 mbgl)



Groundwater levels



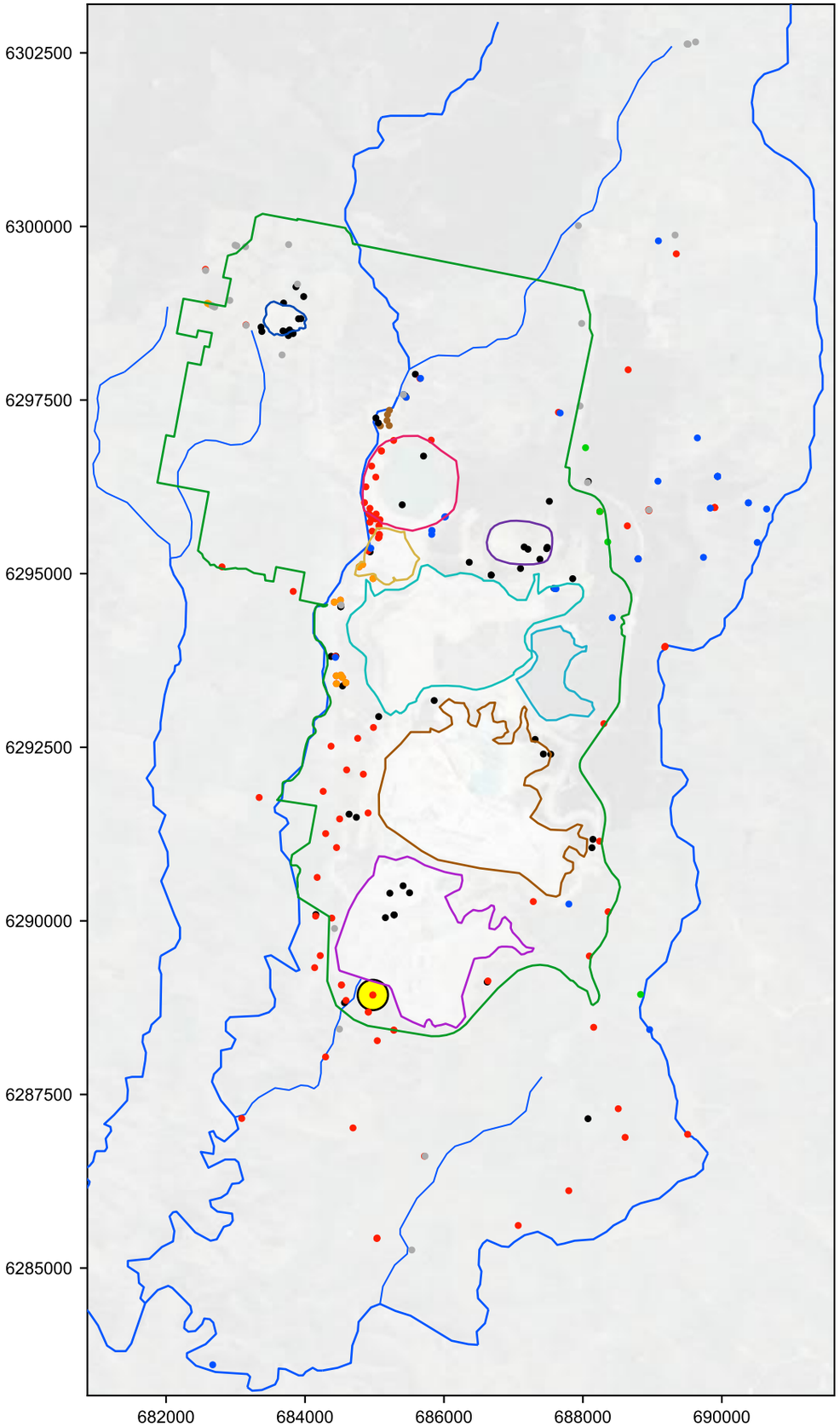
WMP defined analytes



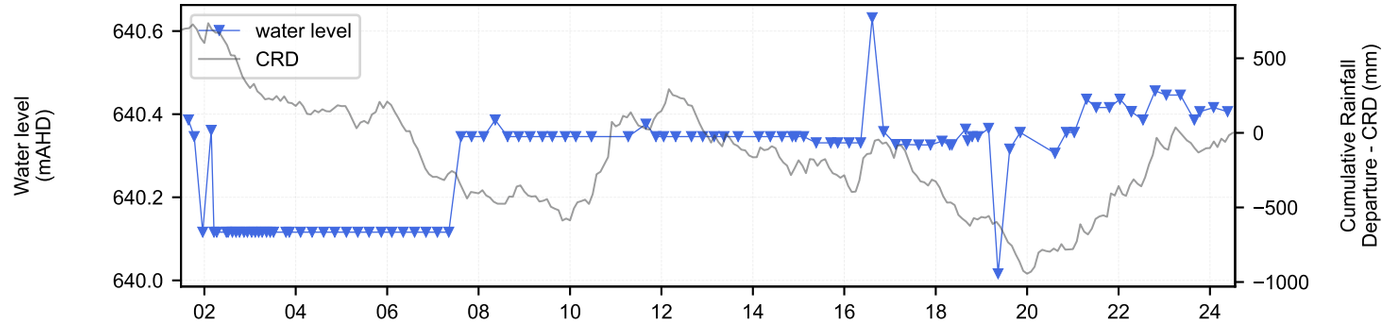
Additional analytes of interest

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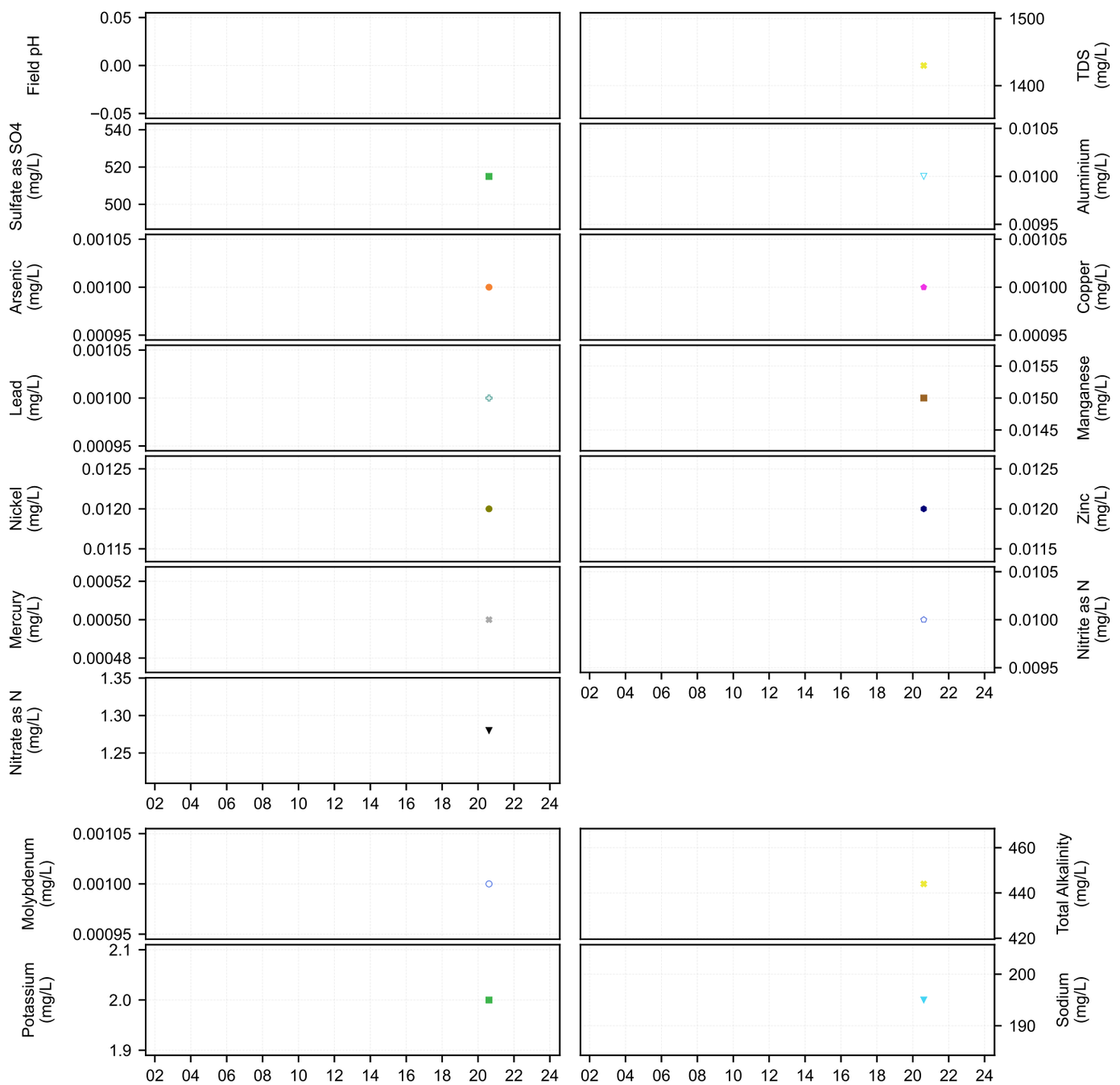
MB28A (Screened geology - Ordovician; Screened interval: 4.5-10.6 mbgl)



Groundwater levels



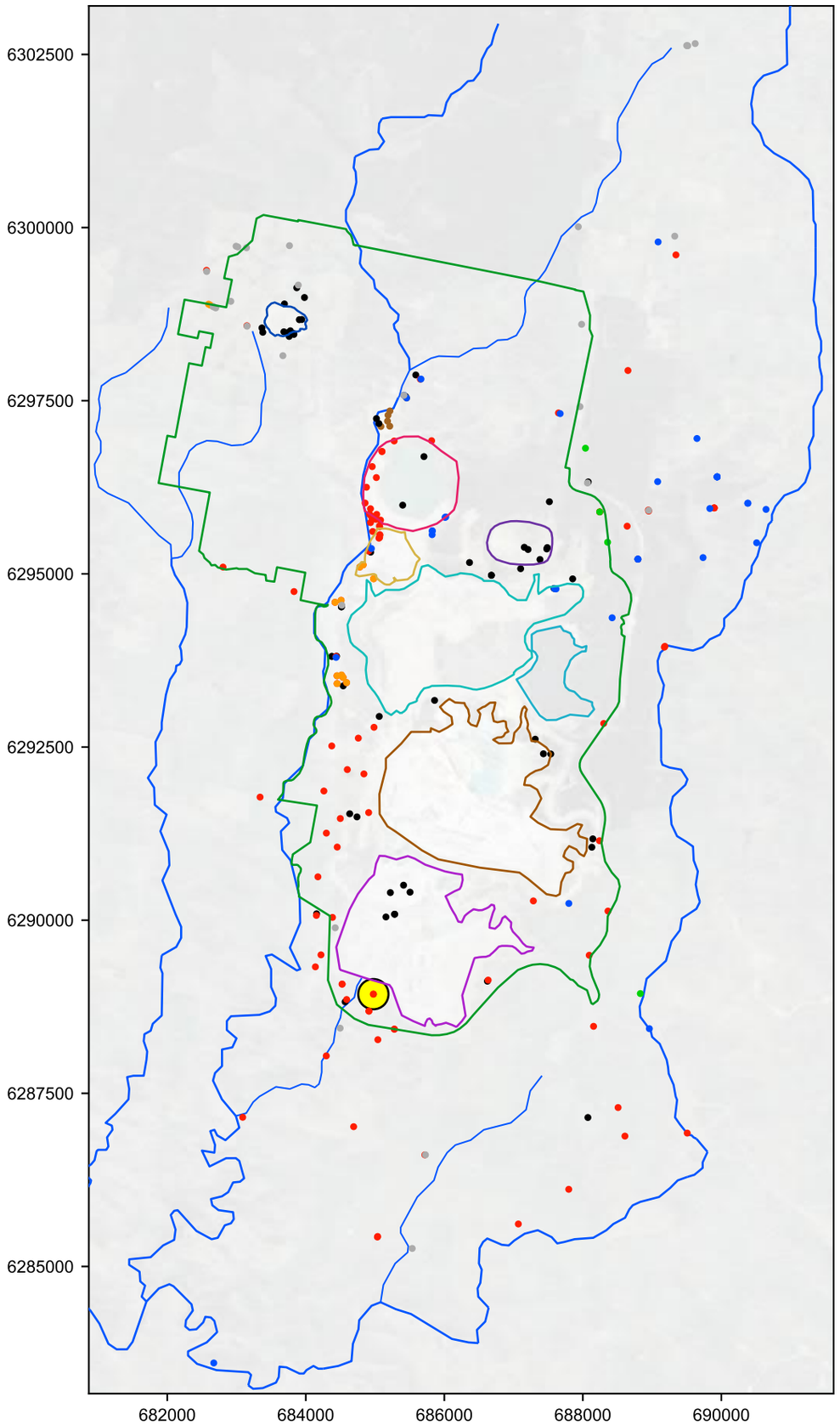
WMP defined analytes



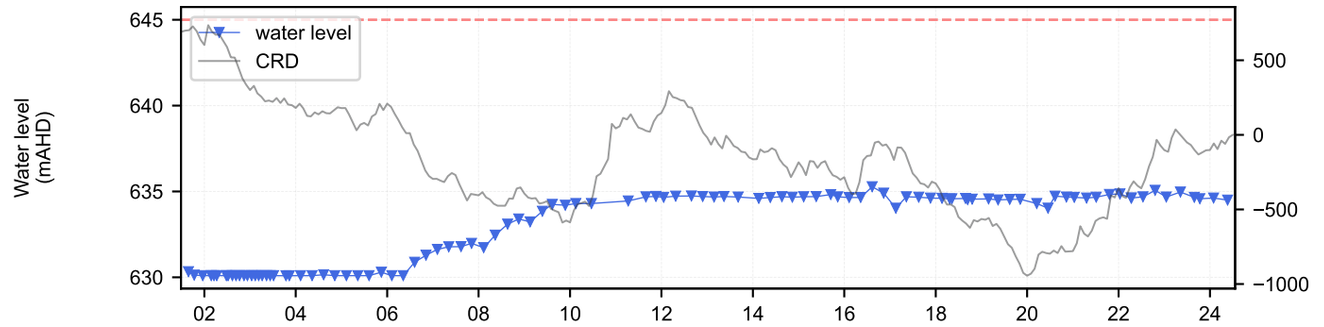
Additional analytes of interest

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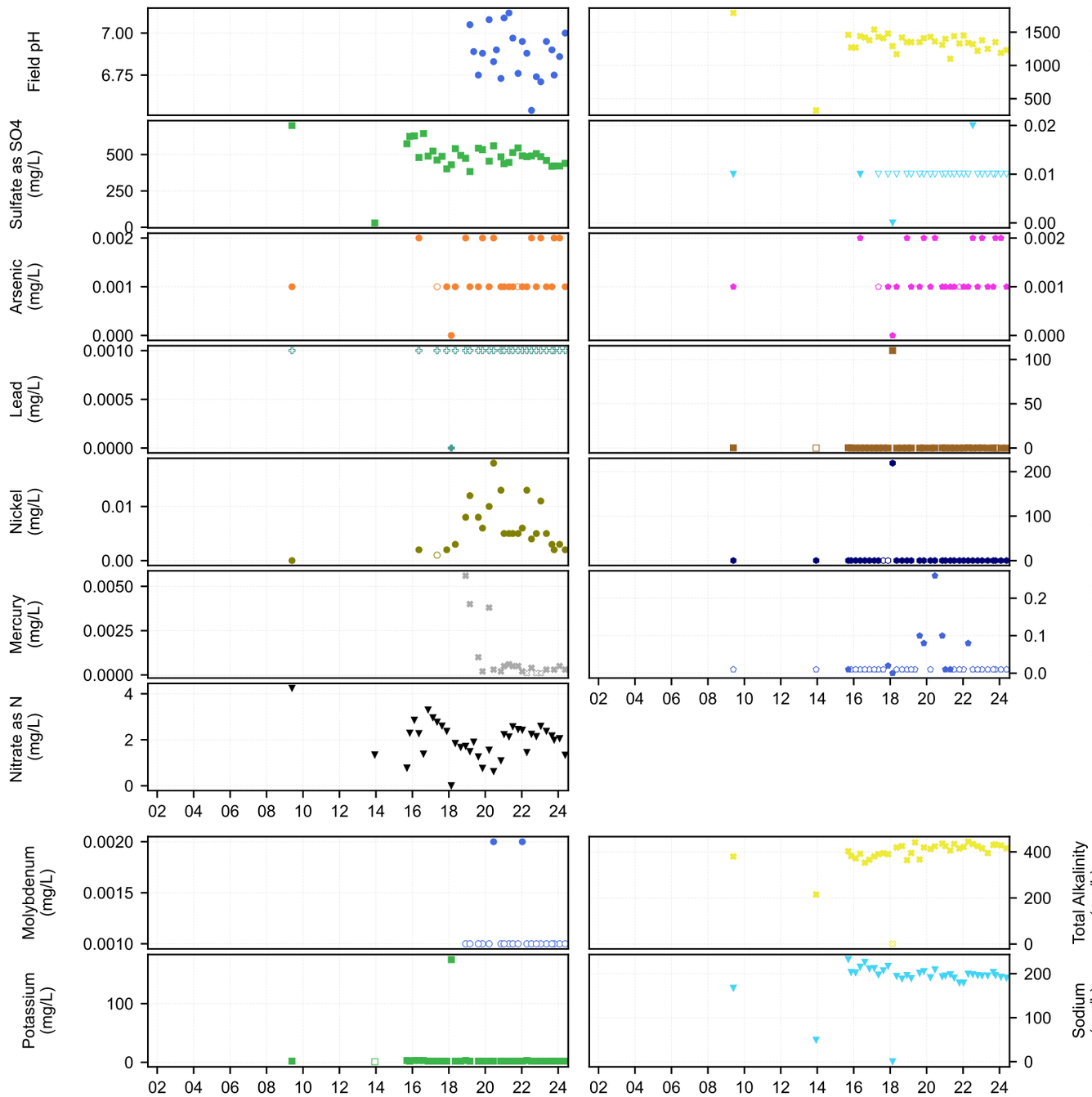
MB28B (Screened geology - Ordovician; Screened interval: 14.0-20.5 mbgl)



Groundwater levels



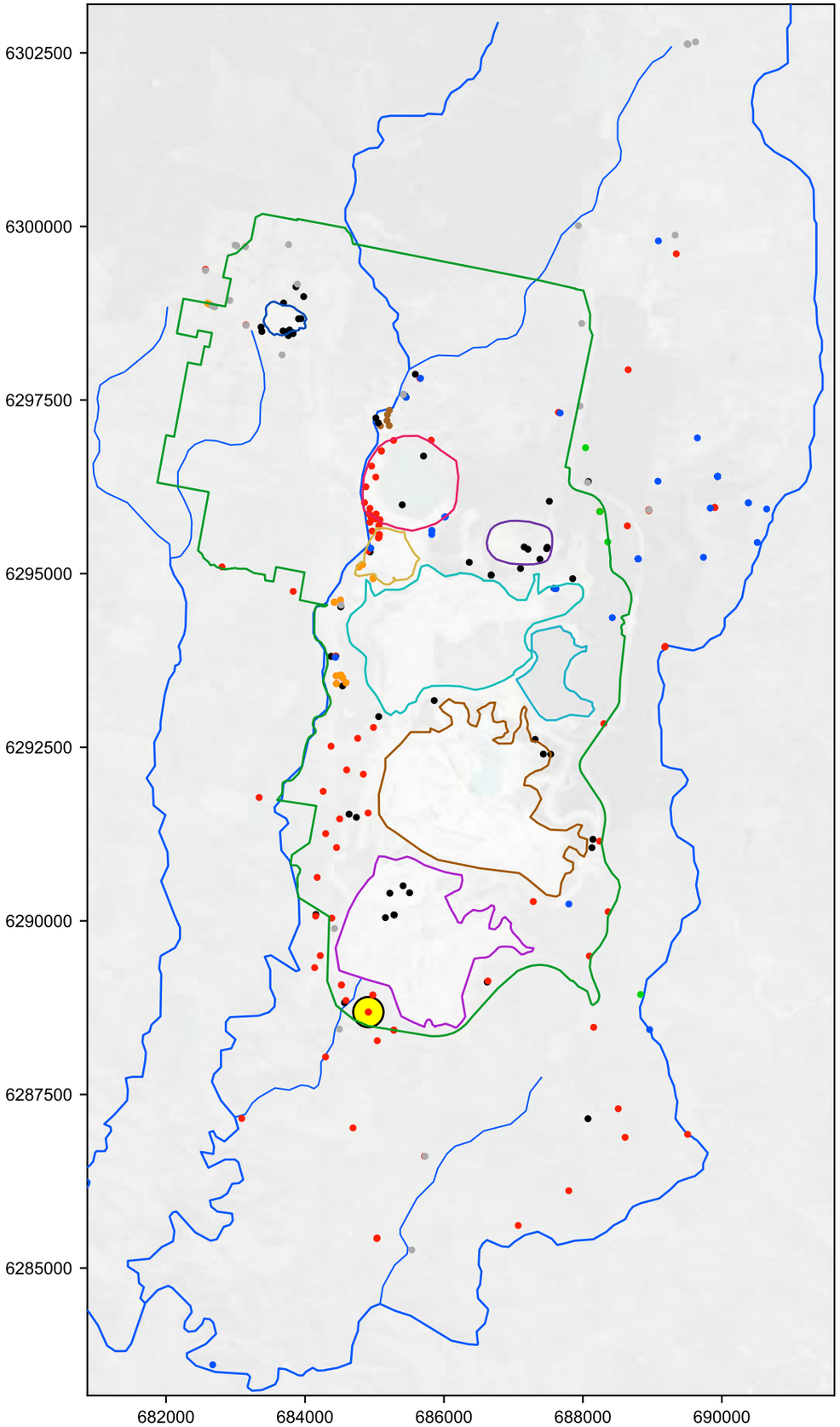
WMP defined analytes



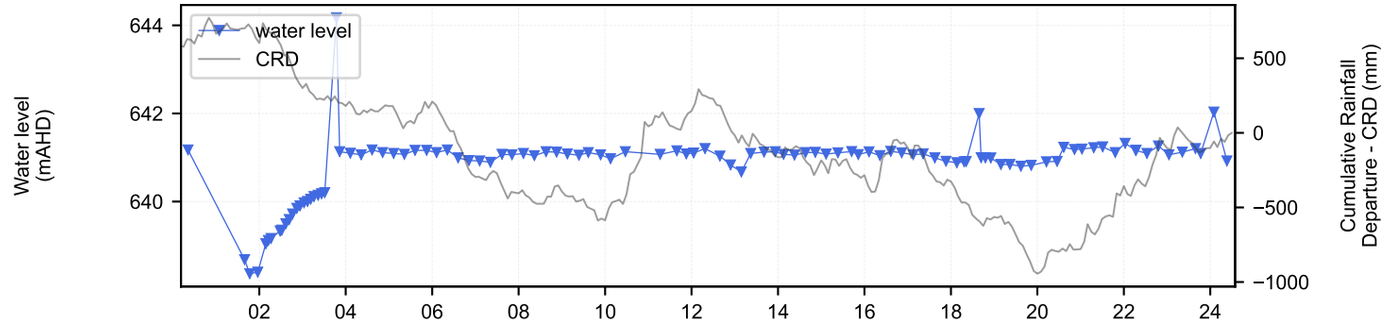
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

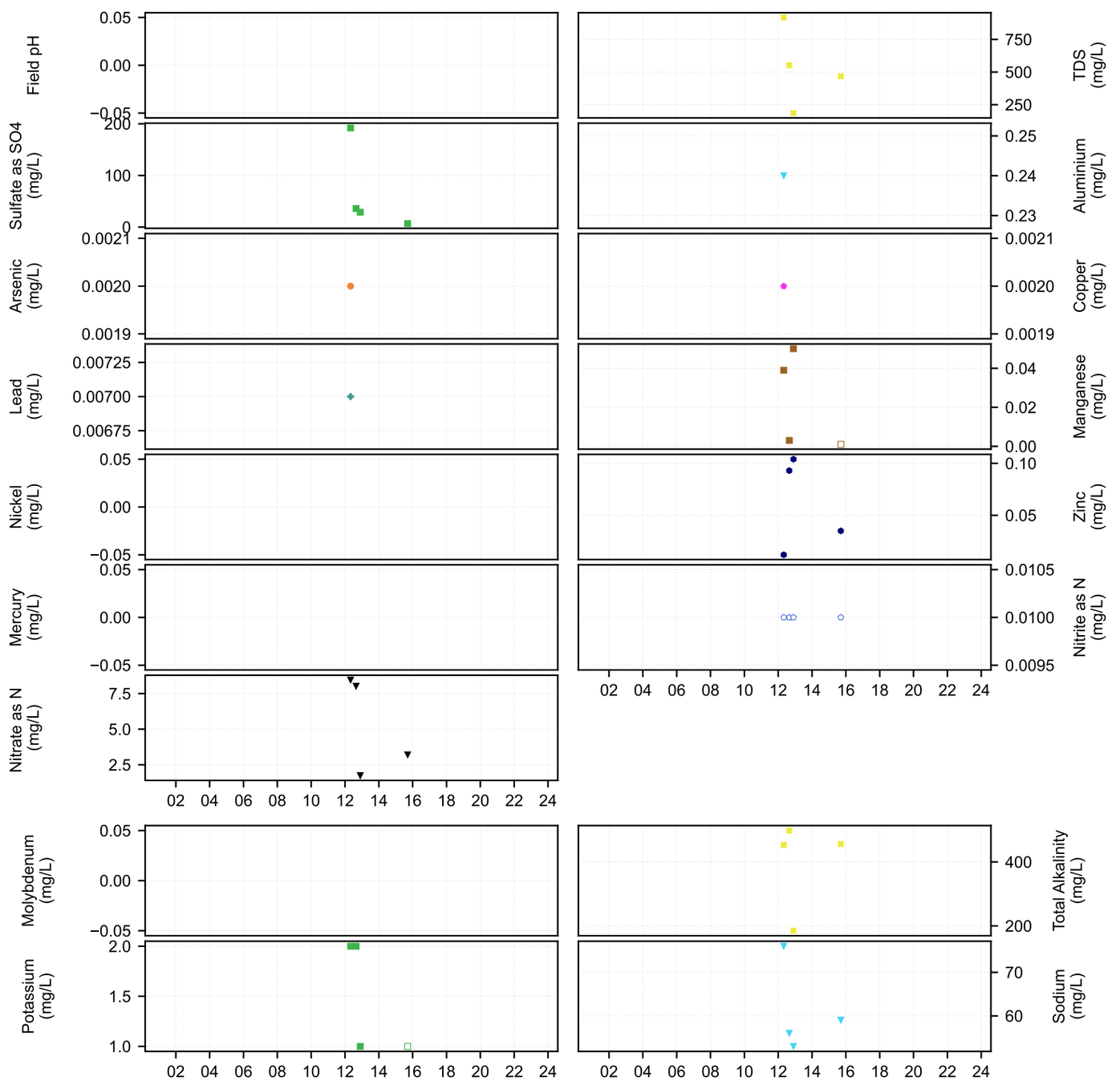
MB29A (Screened geology - Ordovician; Screened interval: 3.5-10.5 mbgl)



Groundwater levels



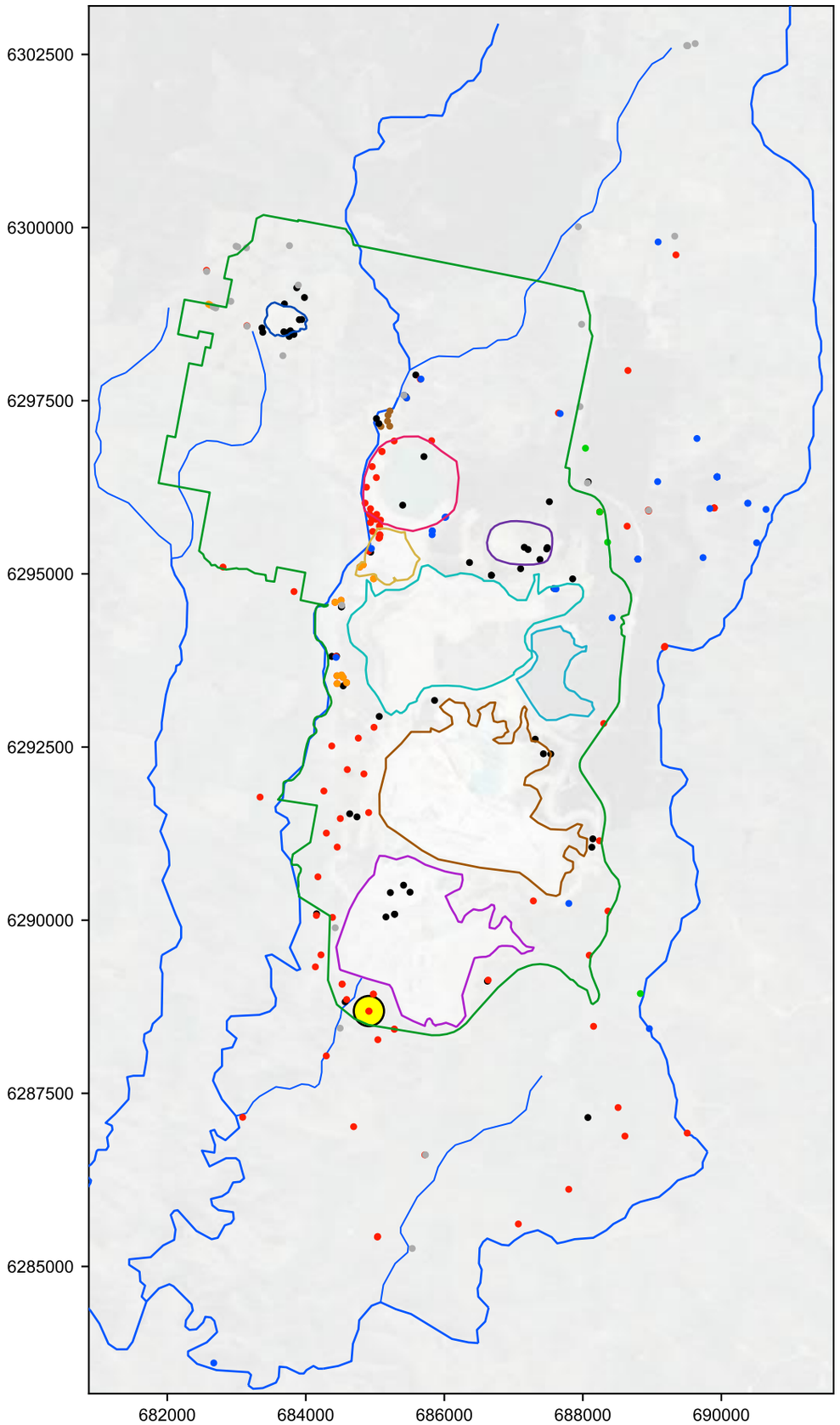
WMP defined analytes



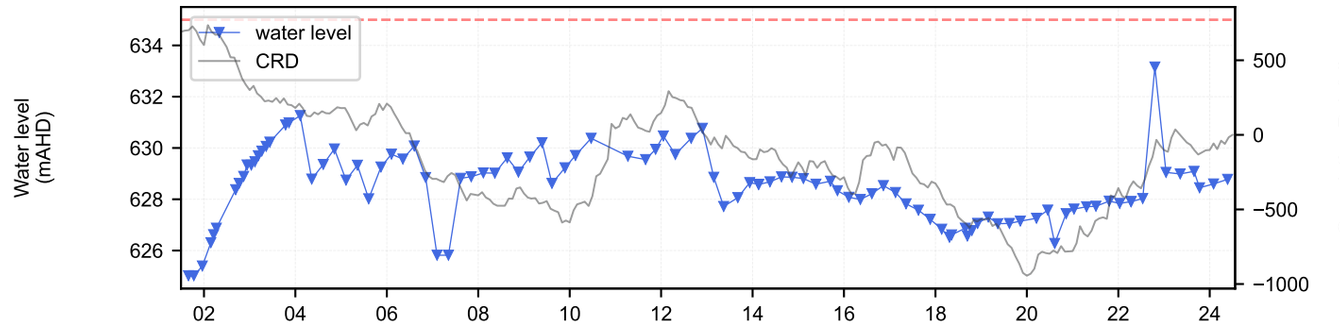
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

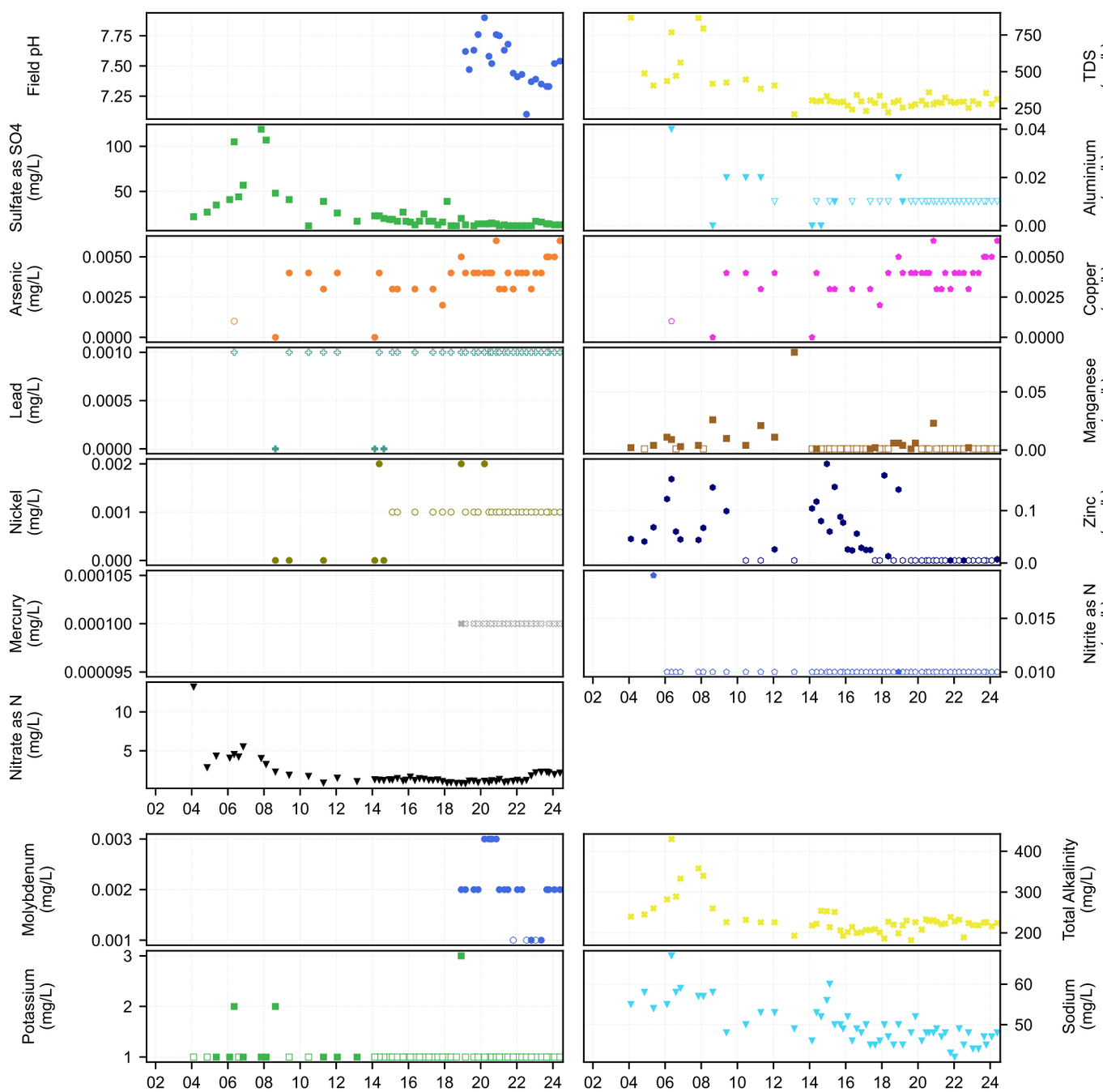
MB29B (Screened geology - Ordovician; Screened interval: 11.2-24.0 mbgl)



Groundwater levels



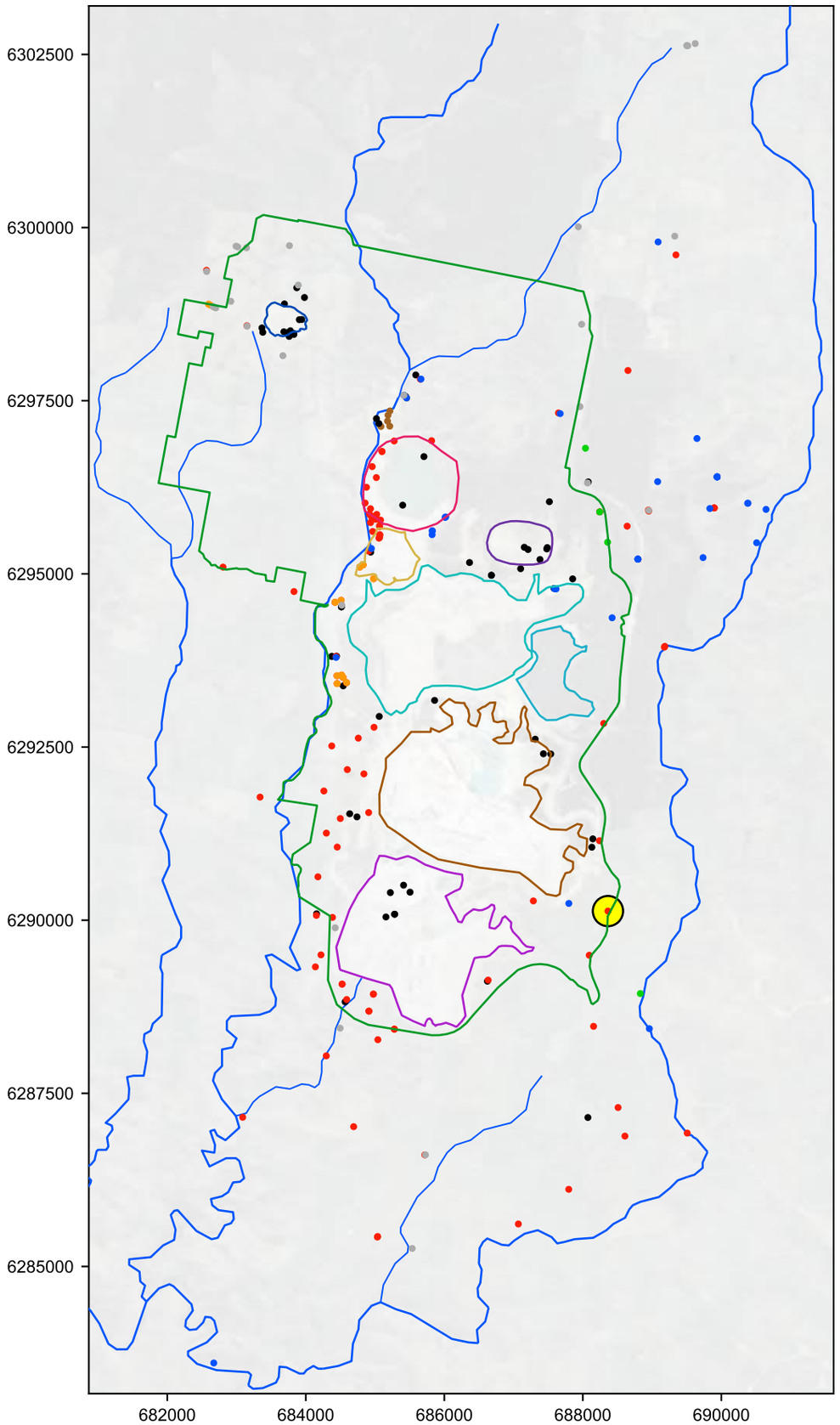
WMP defined analytes



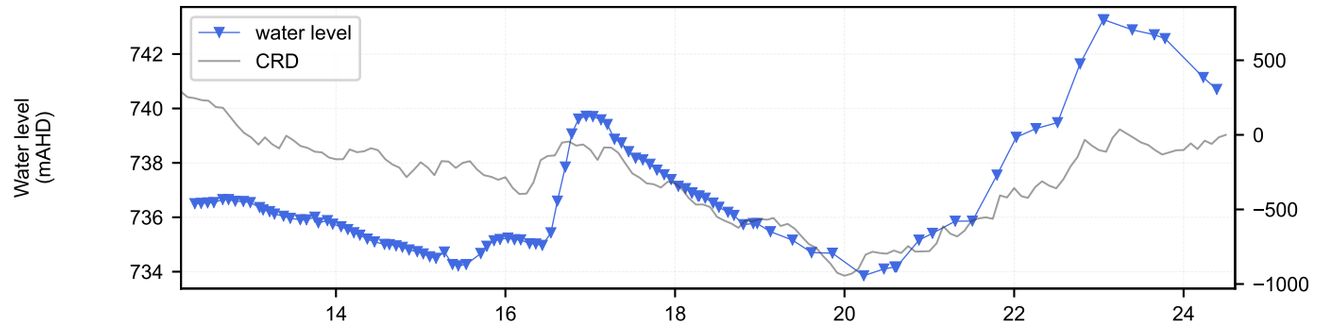
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

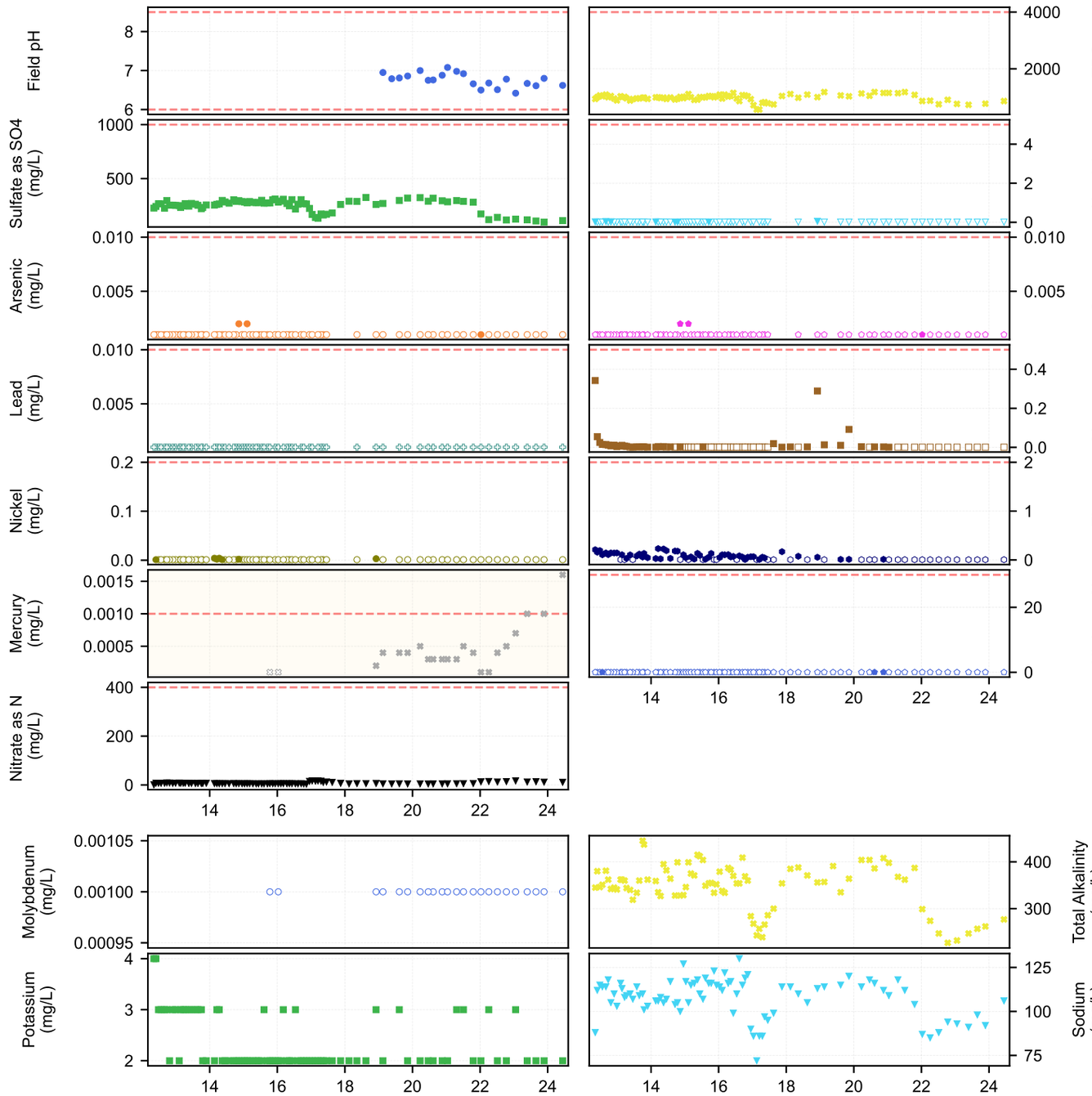
MB68 (Screened geology - Ordovician; Screened interval: 64-78 mbgl)



Groundwater levels



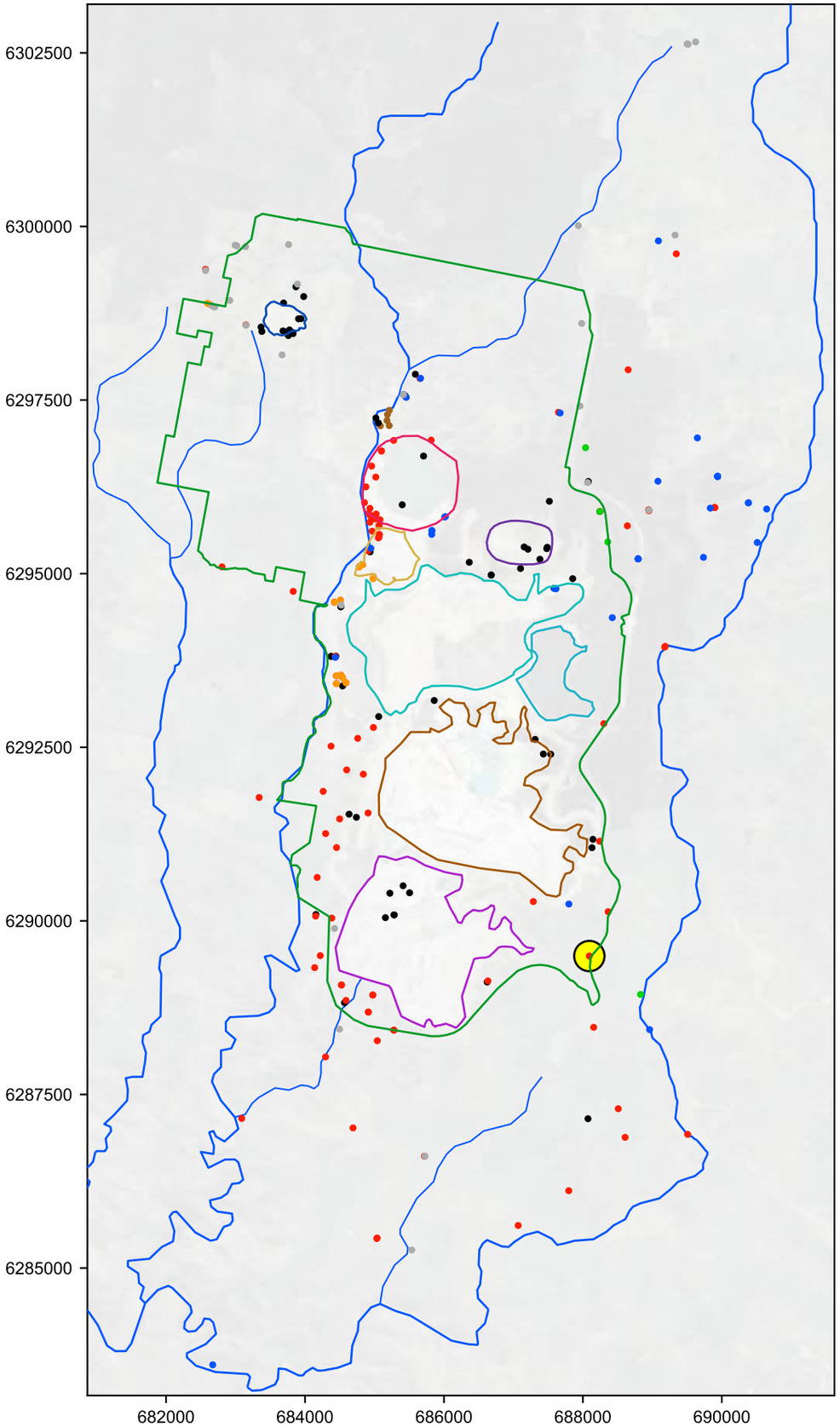
WMP defined analytes



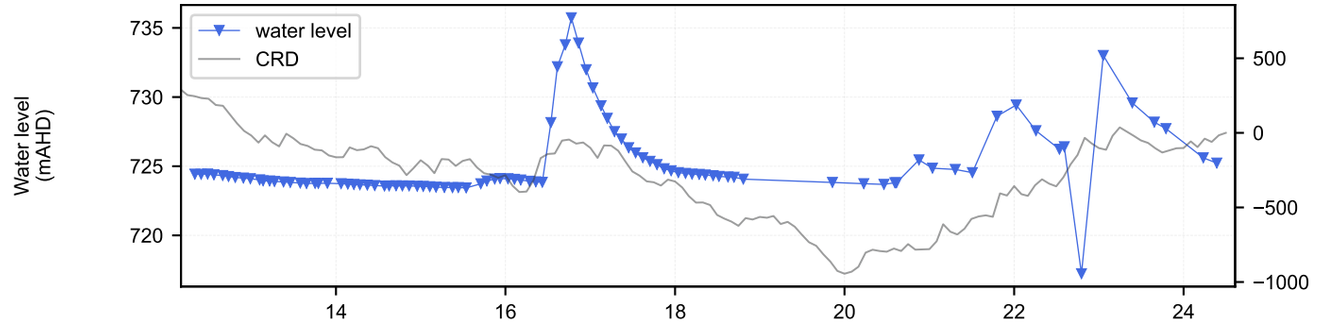
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

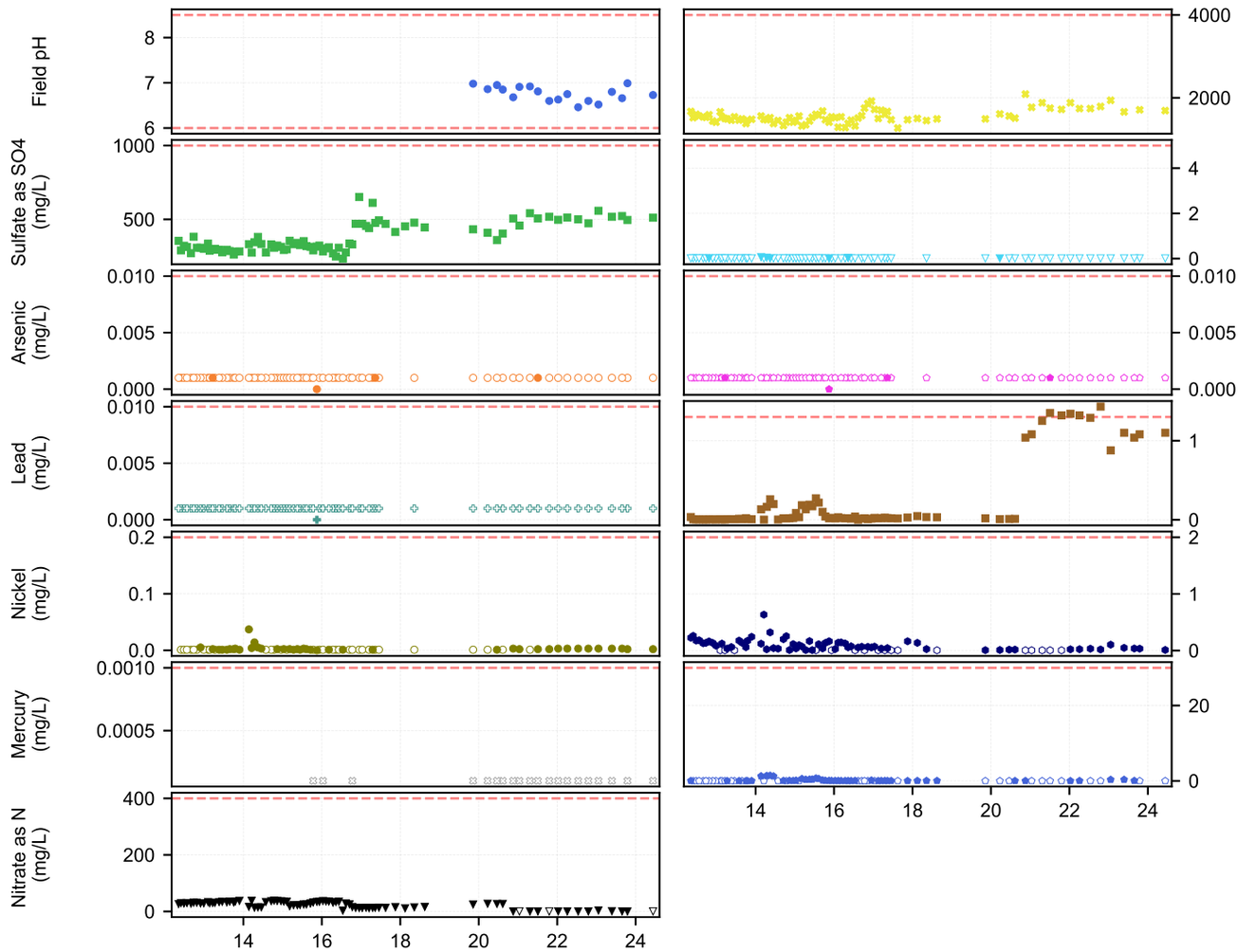
MB69 (Screened geology - Ordovician; Screened interval: 26.4-62.4 mbgl)



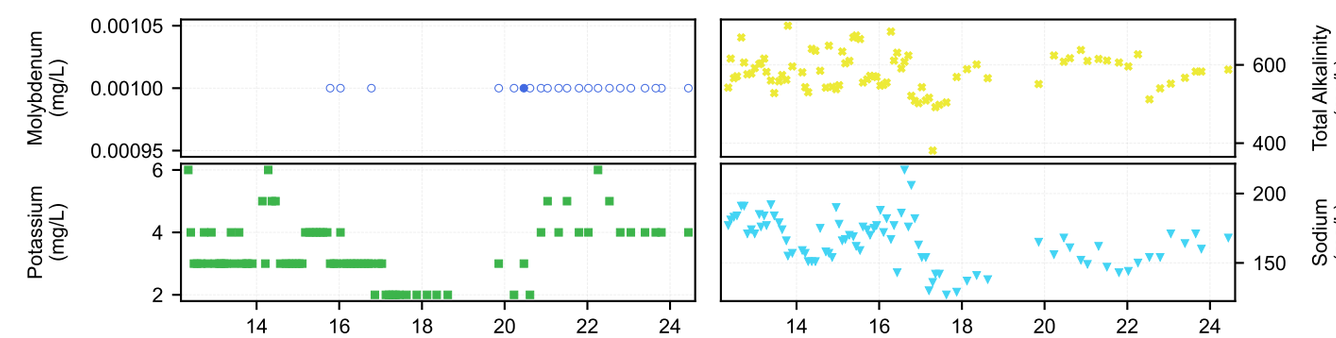
Groundwater levels



WMP defined analytes

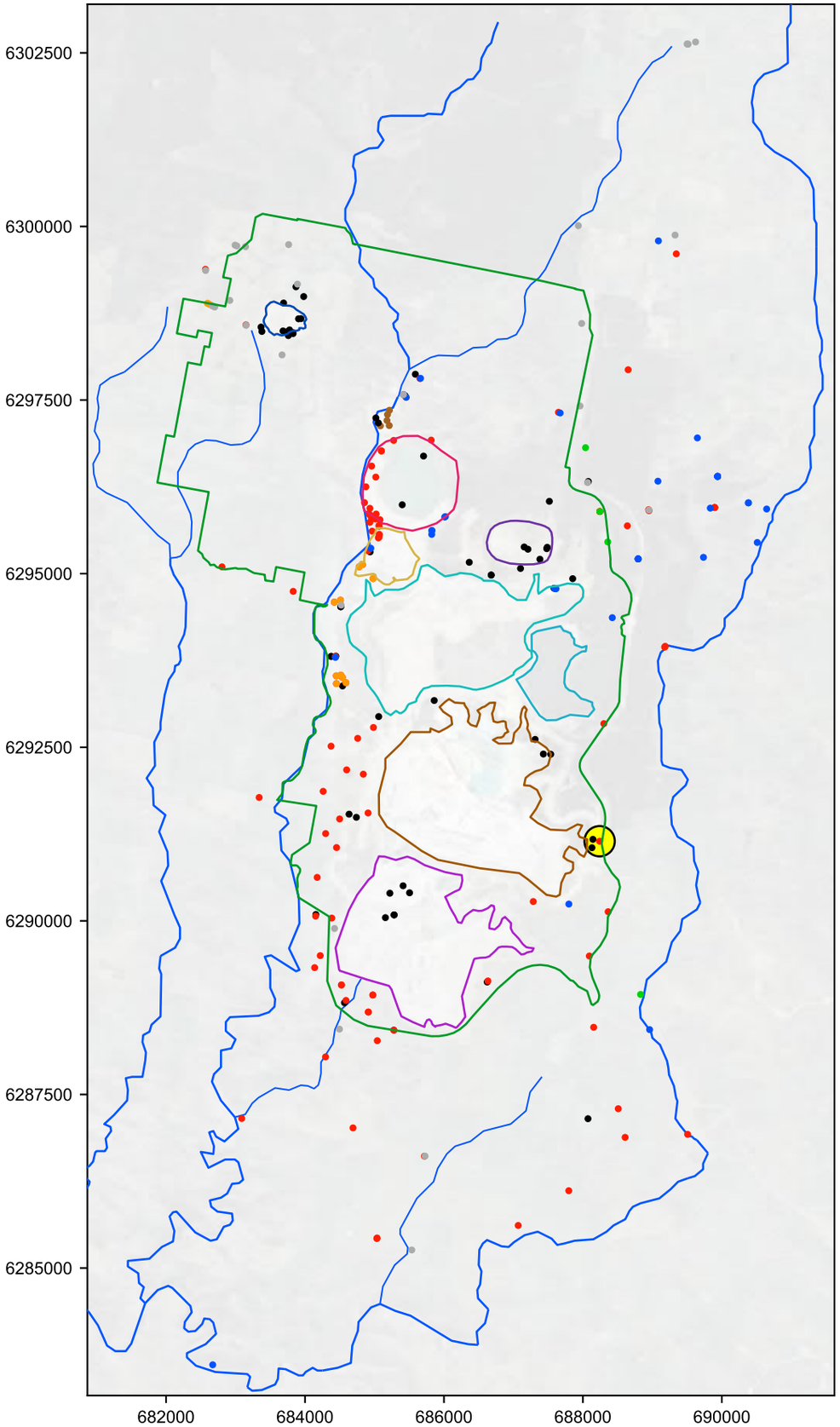


Additional analytes of interest

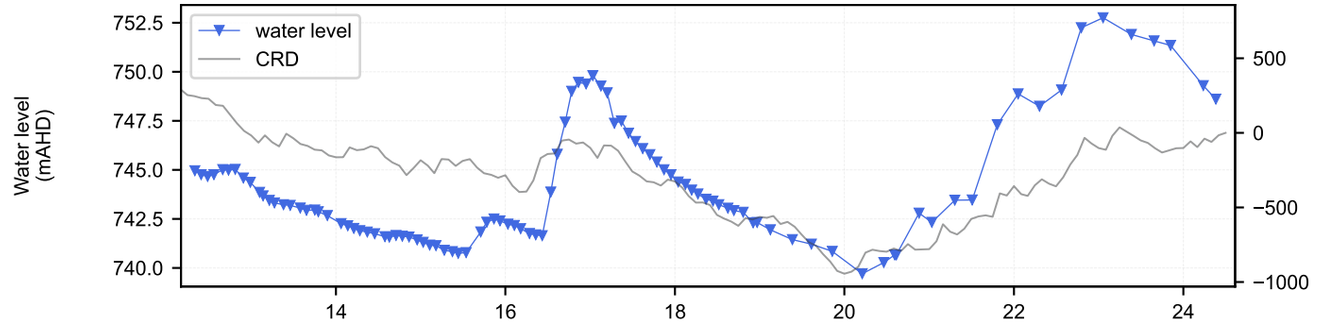


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

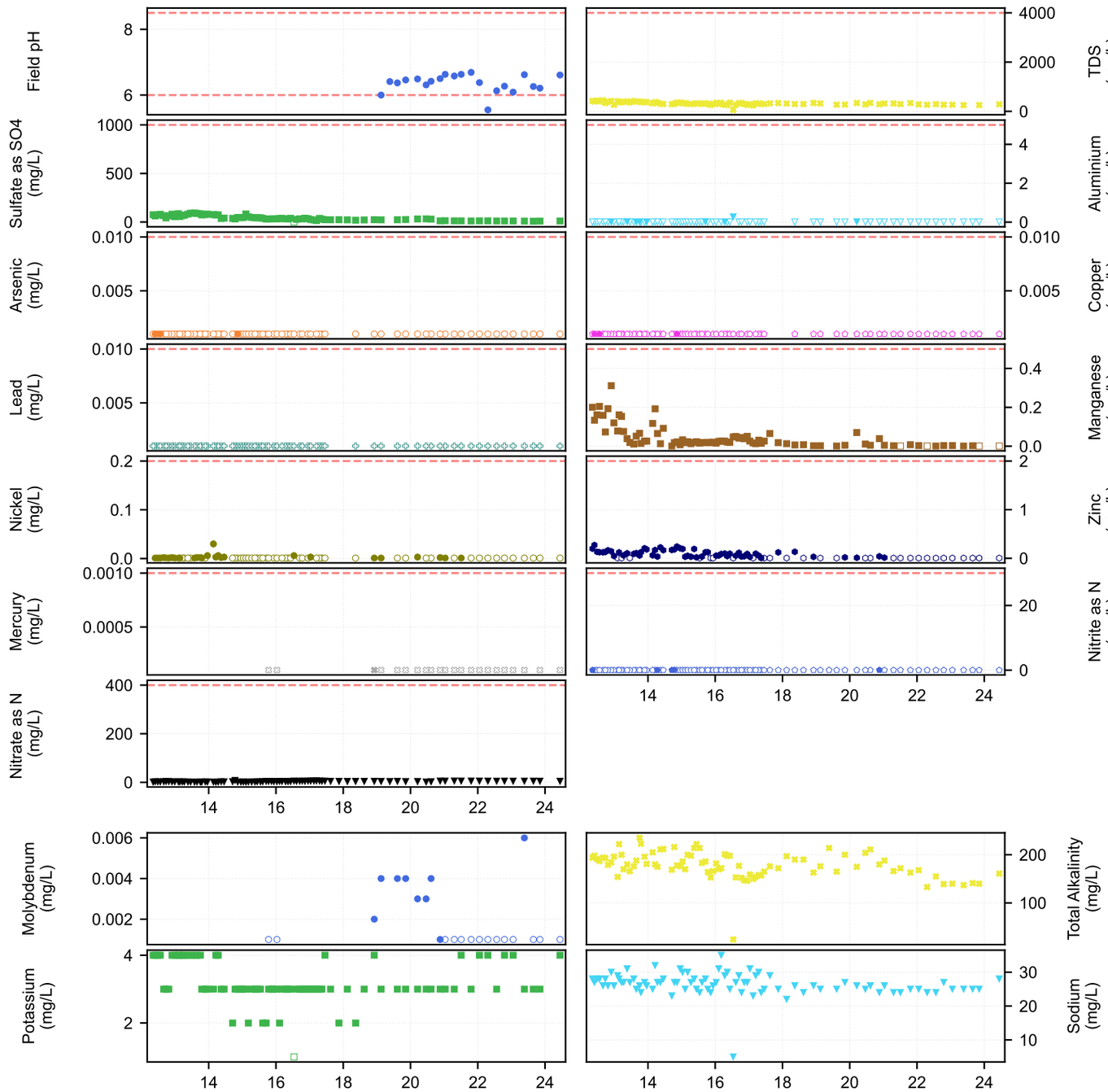
MB70 (Screened geology - Ordovician; Screened interval: 47.4-71.4 mbgl)



Groundwater levels



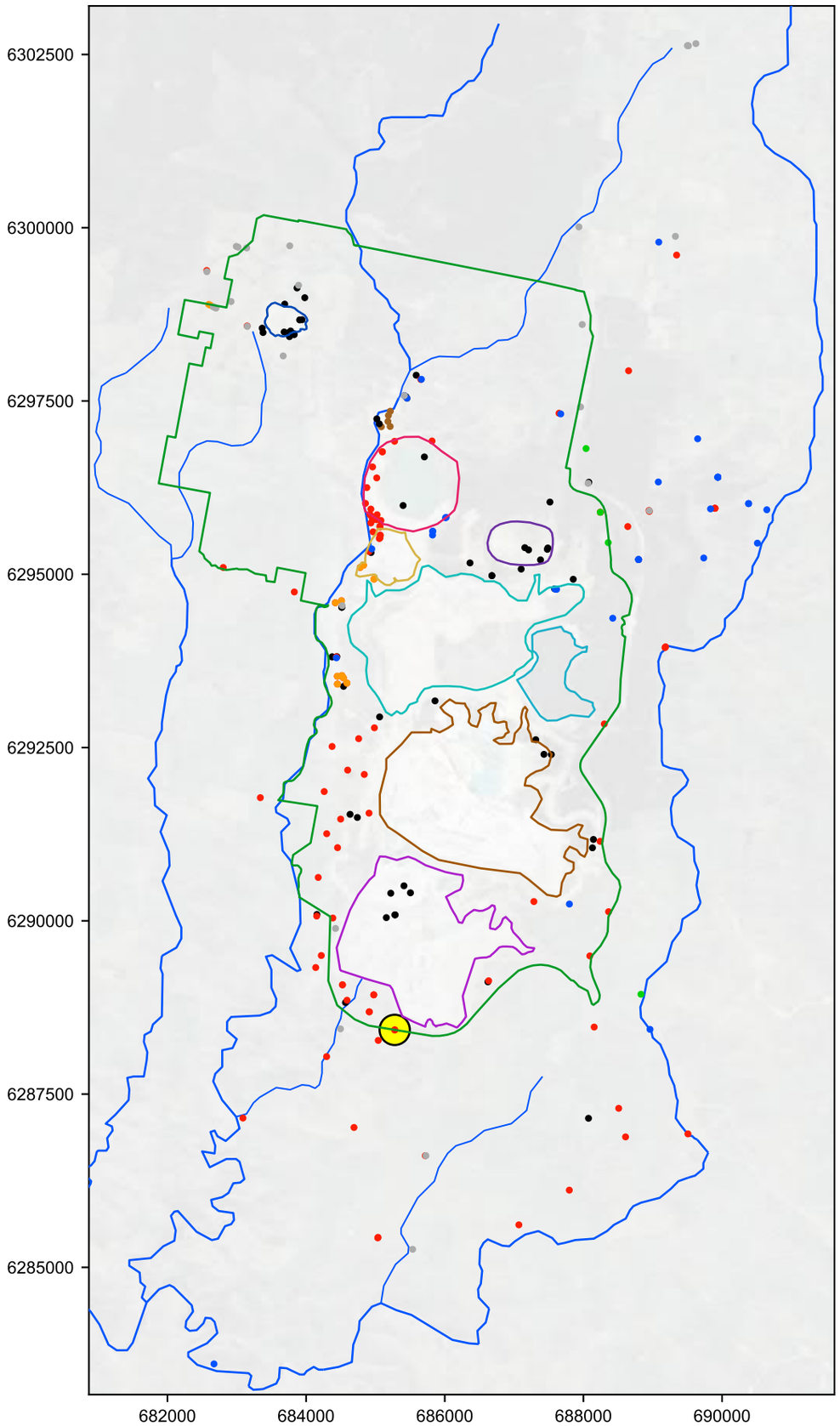
WMP defined analytes



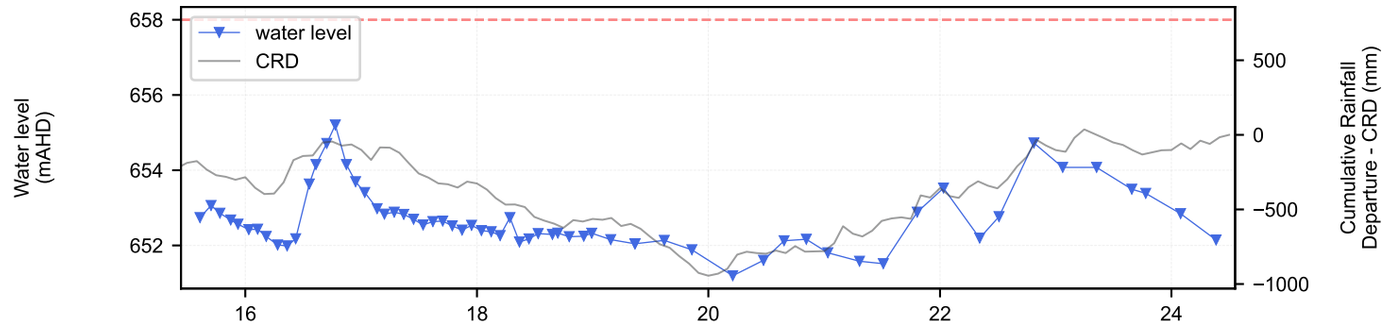
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

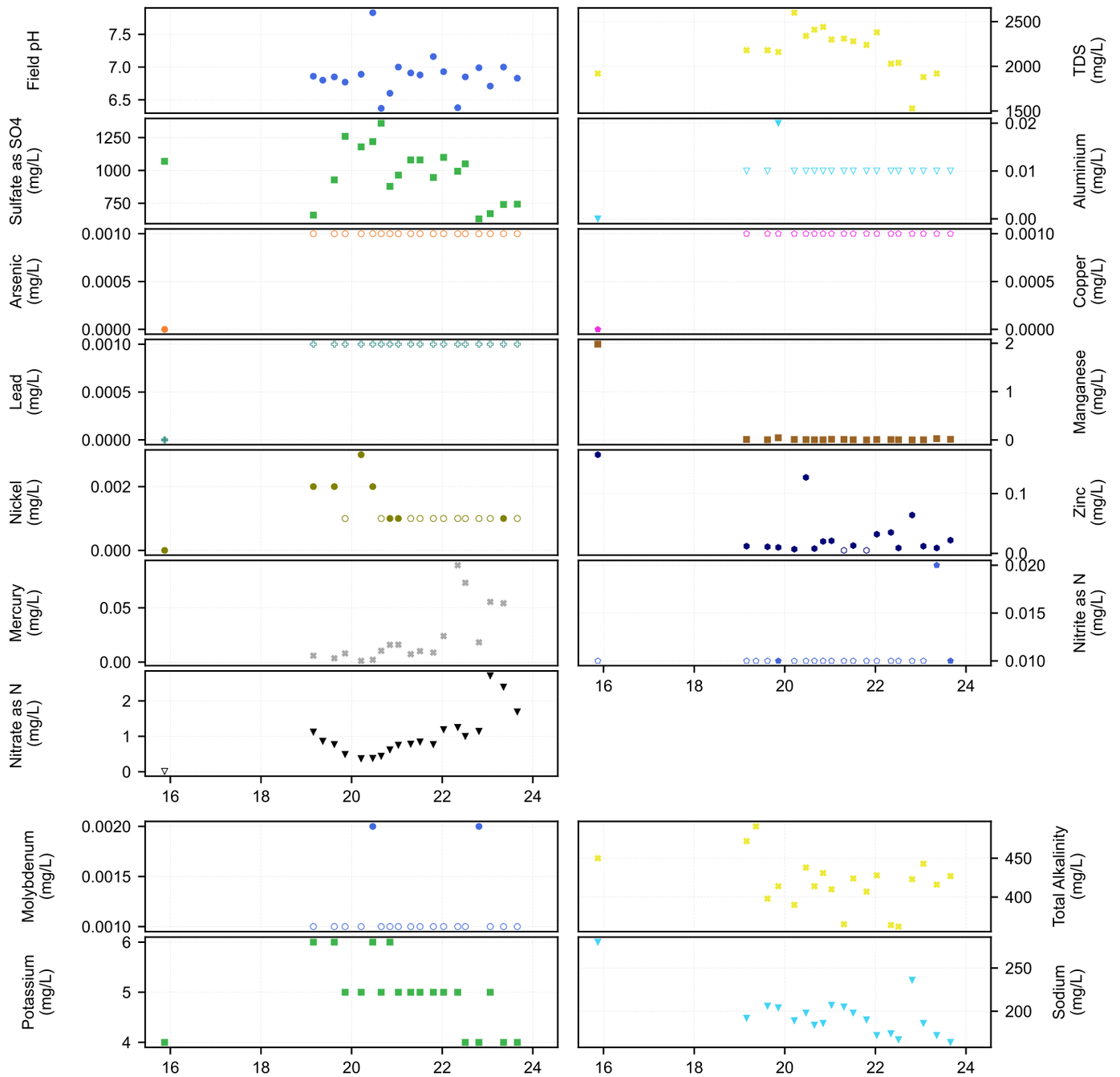
MB77A (Screened geology - Ordovician; Screened interval: 6-12 mbgl)



Groundwater levels



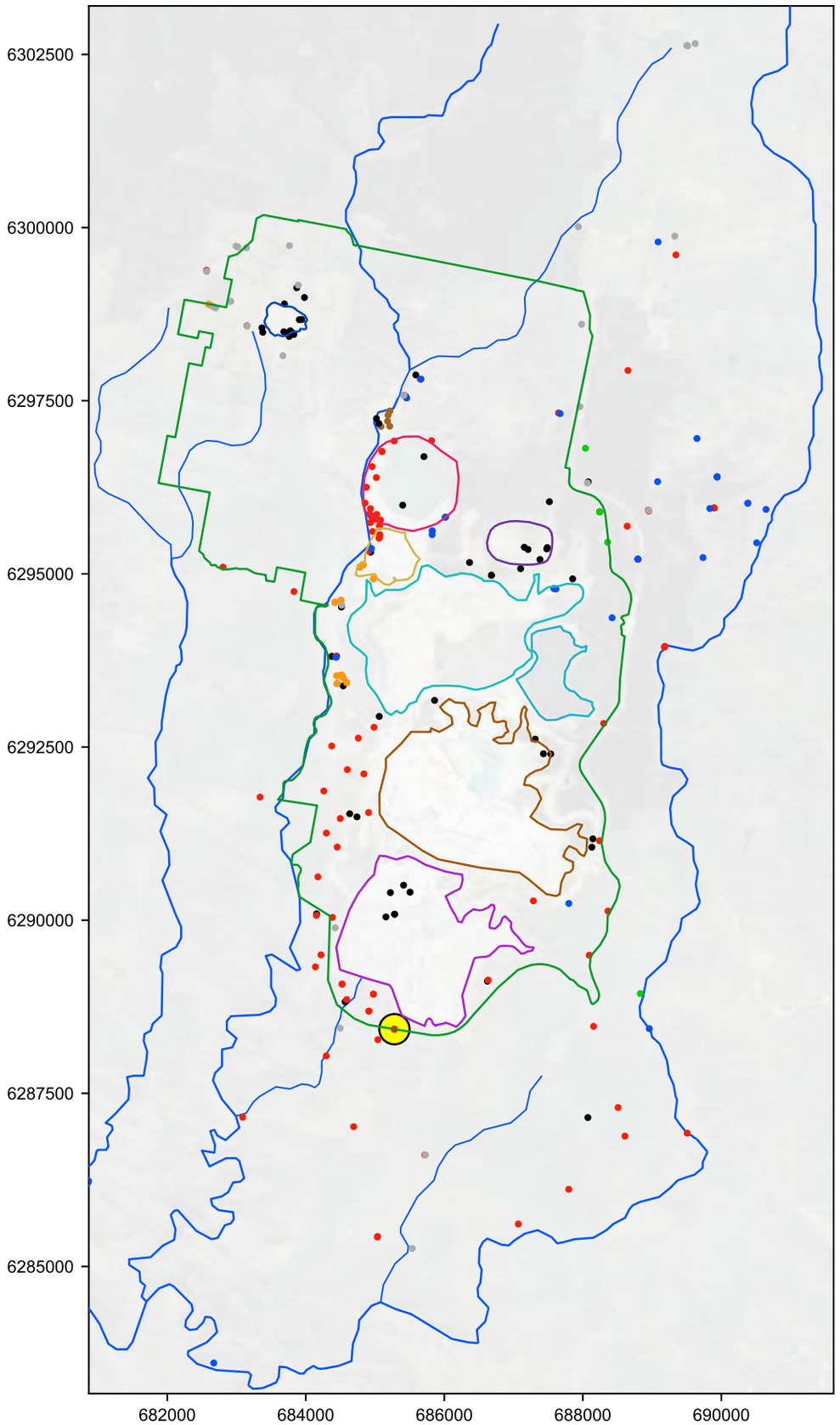
WMP defined analytes



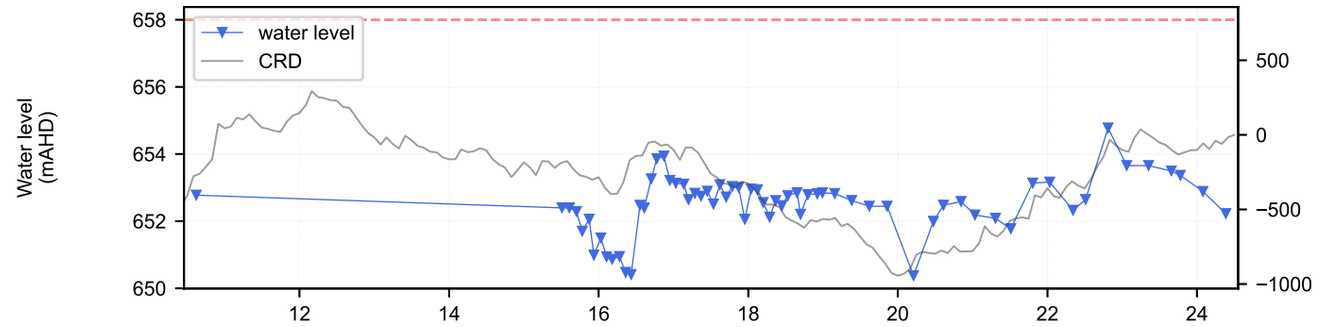
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

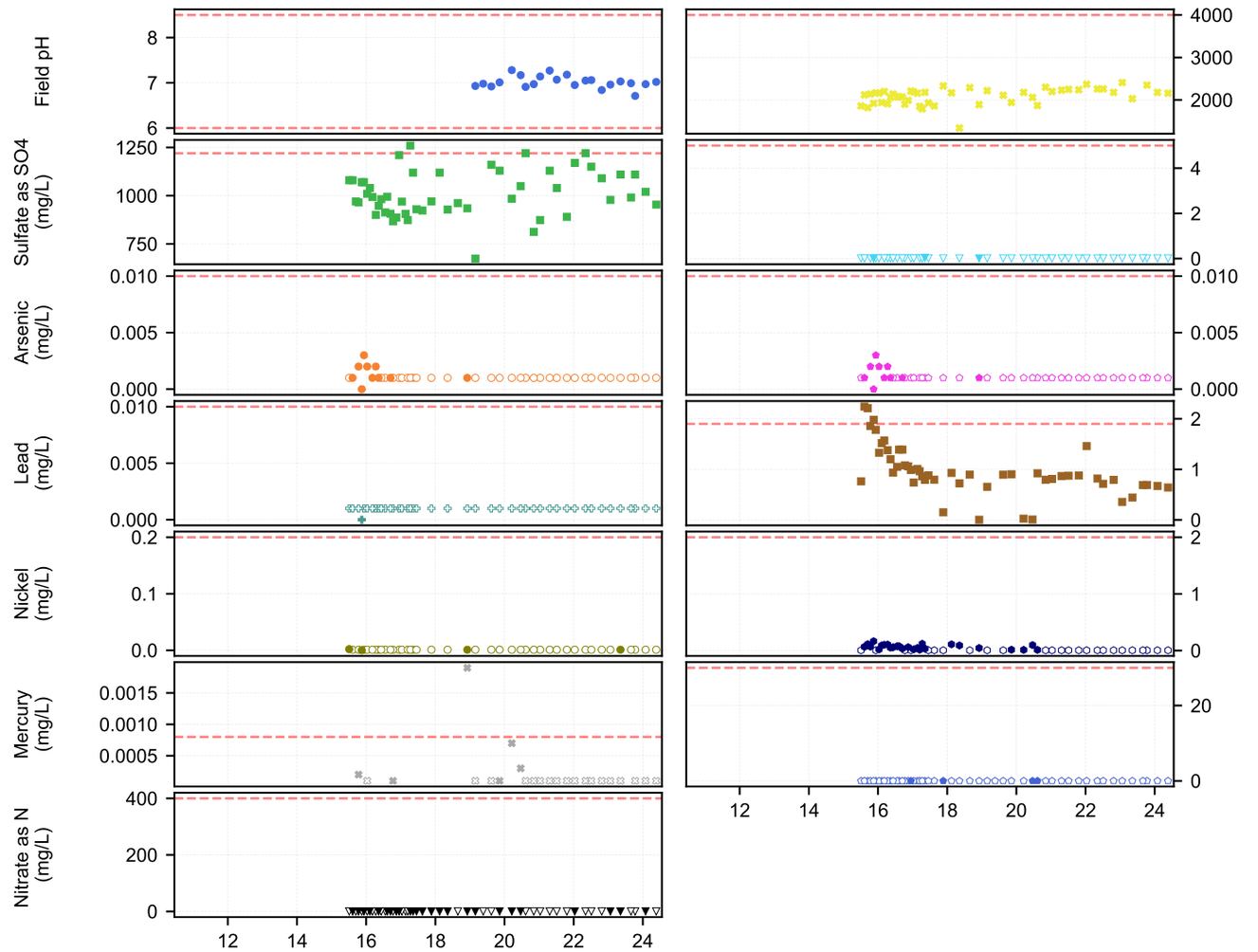
MB77B (Screened geology - Ordovician; Screened interval: 23-29 mbgl)



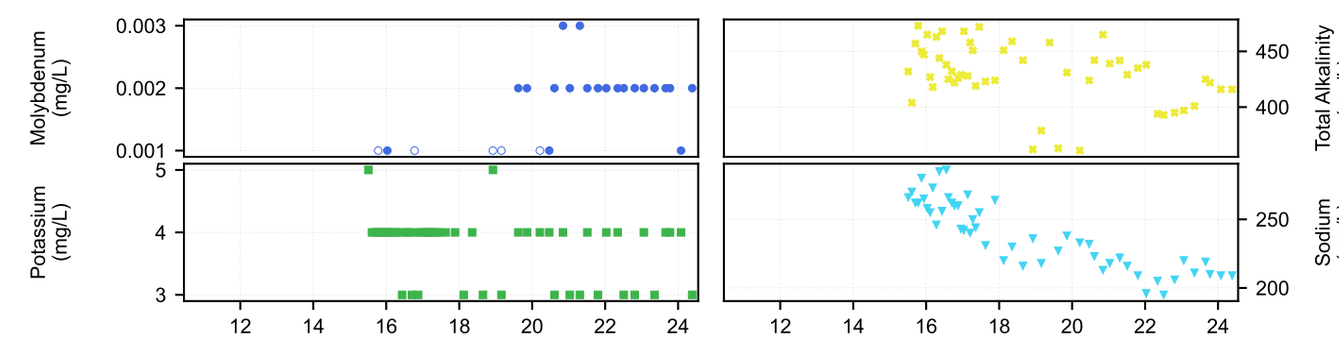
Groundwater levels



WMP defined analytes

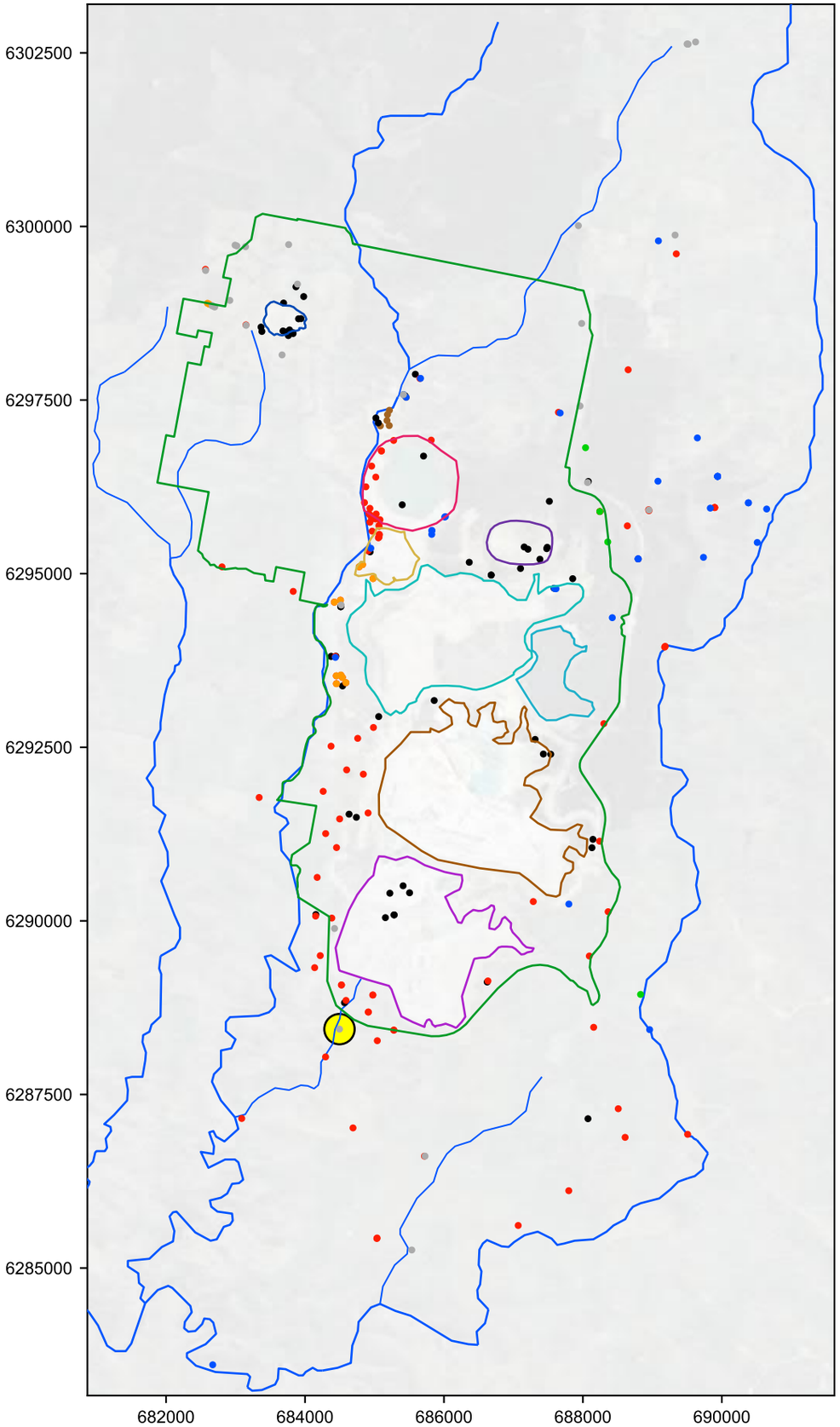


Additional analytes of interest

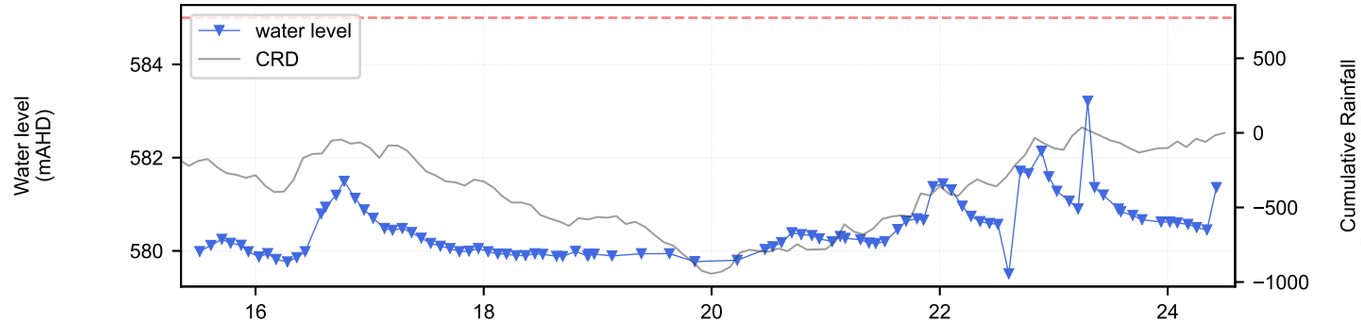


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

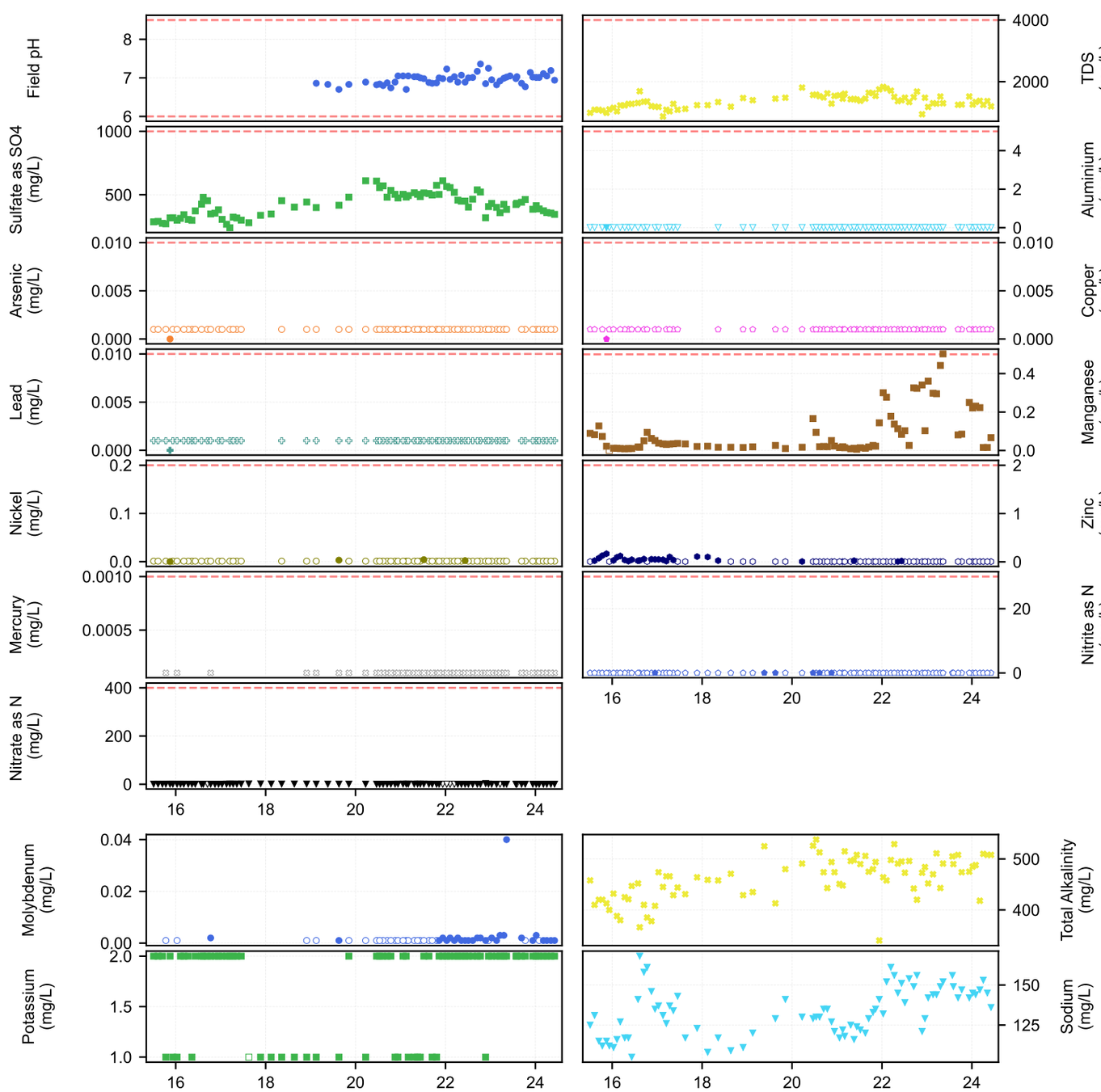
MB78 (Screened geology - Tertiary basalt; Screened interval: 6-12.5 mbgl)



Groundwater levels



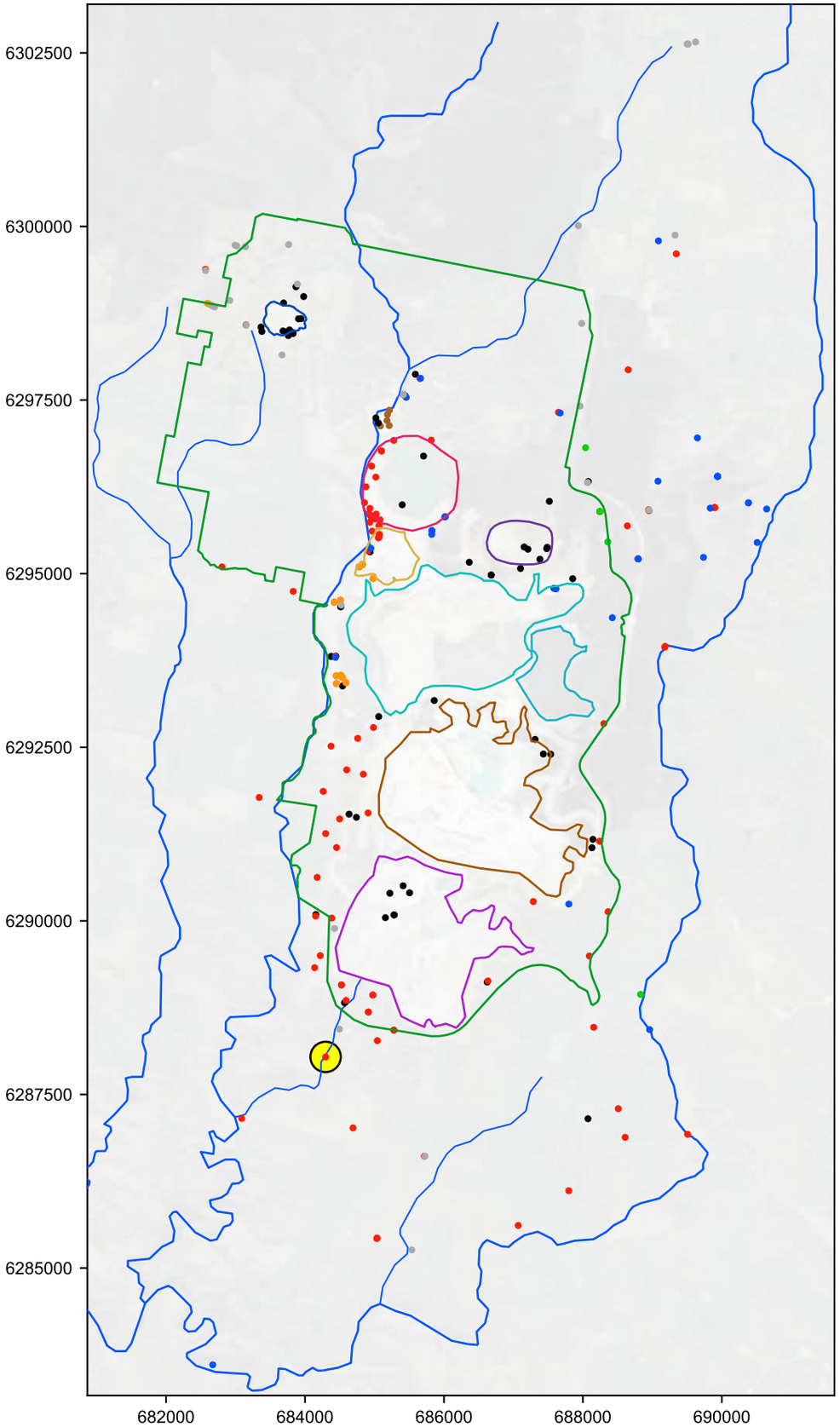
WMP defined analytes



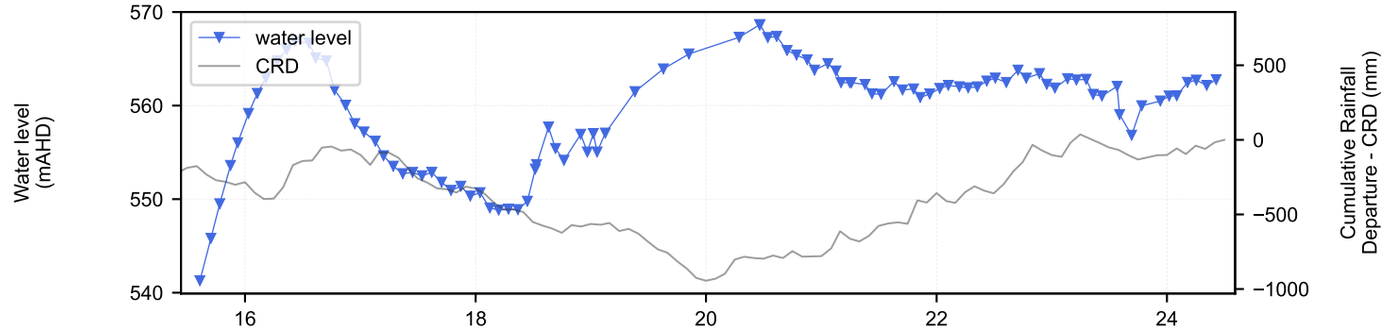
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

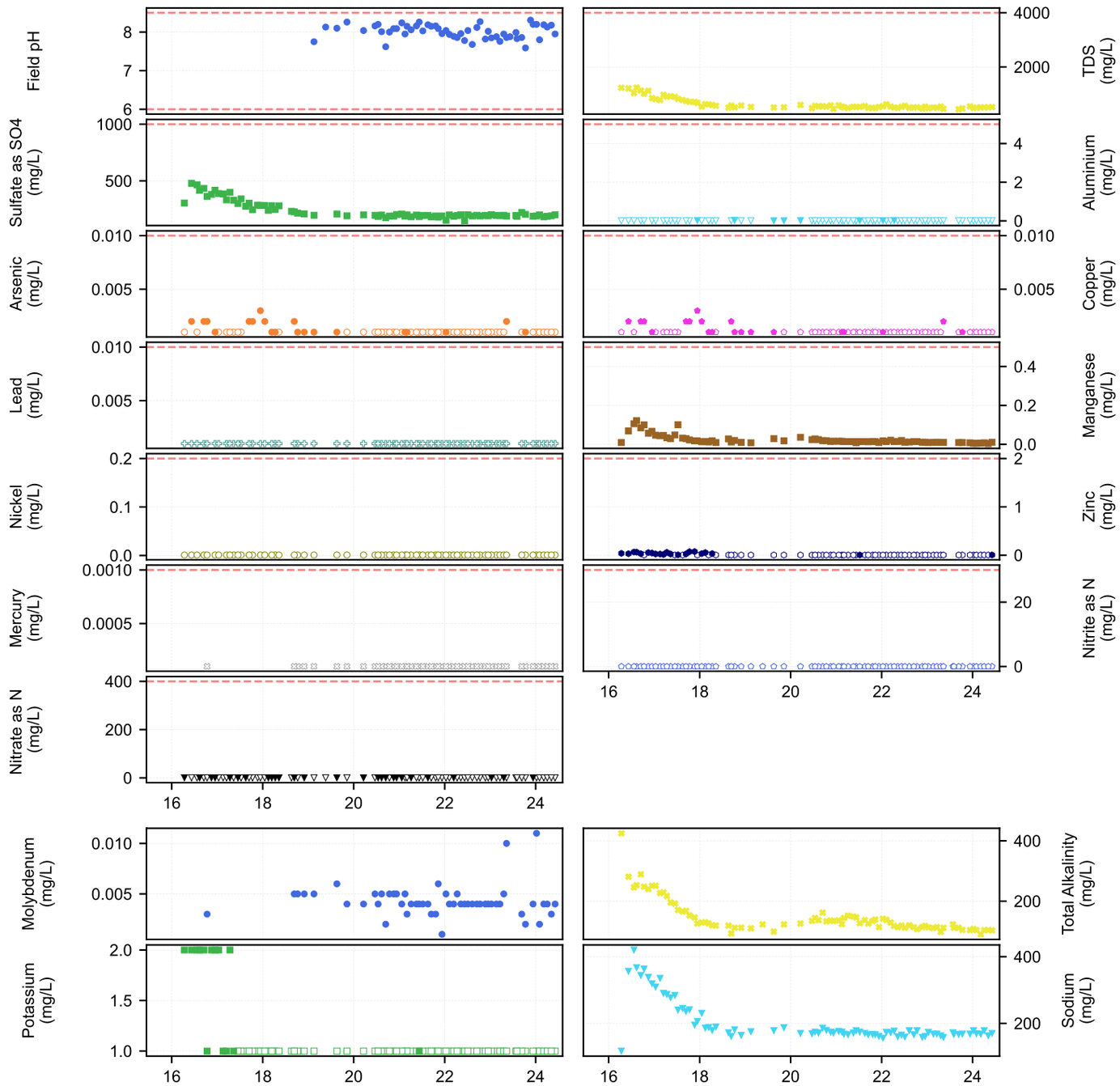
MB79 (Screened geology - Ordovician; Screened interval: 34-40 mbgl)



Groundwater levels



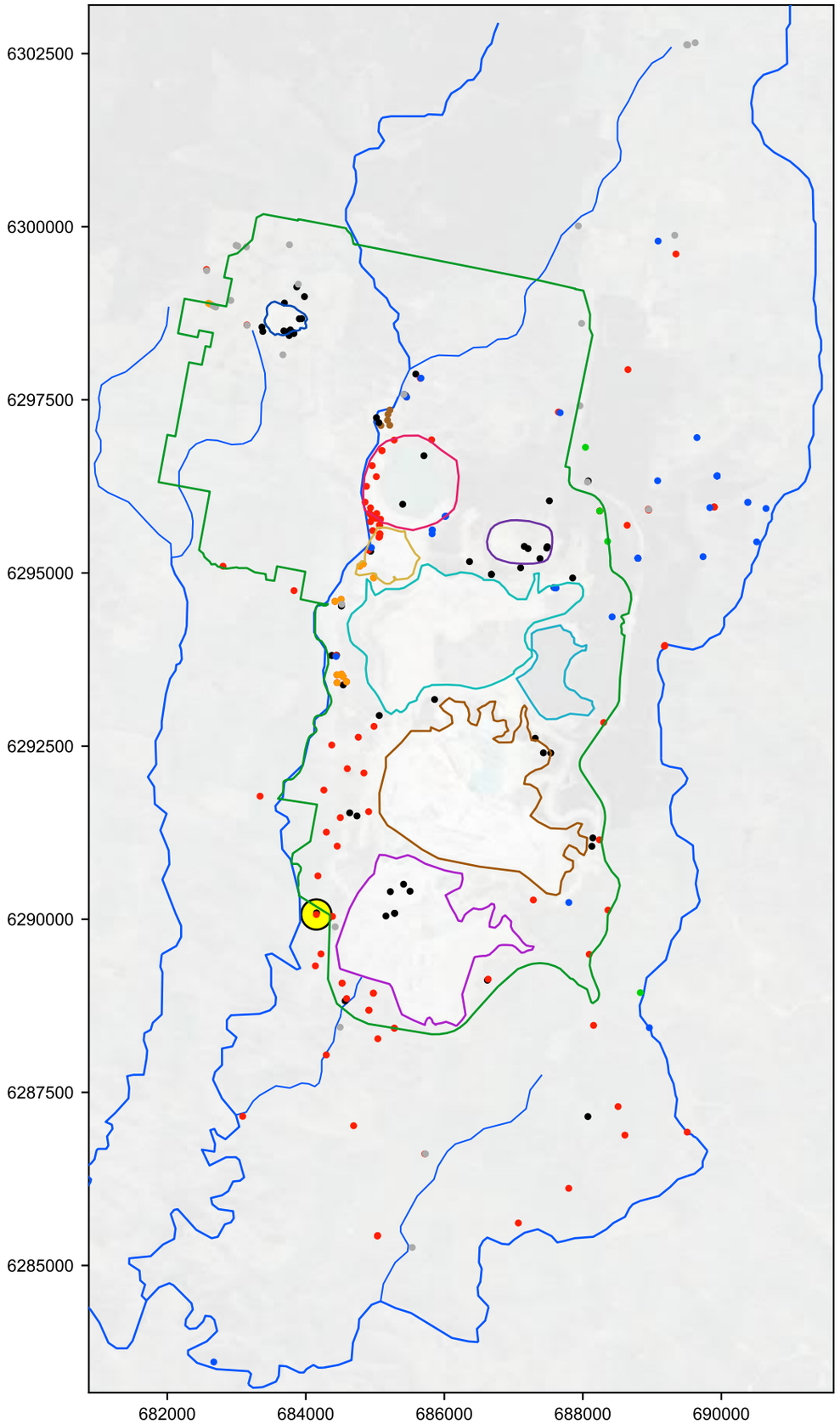
WMP defined analytes



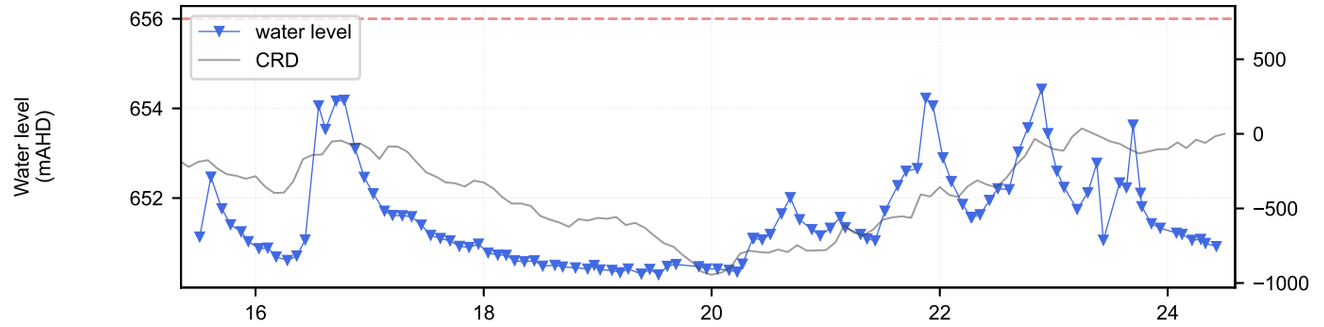
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

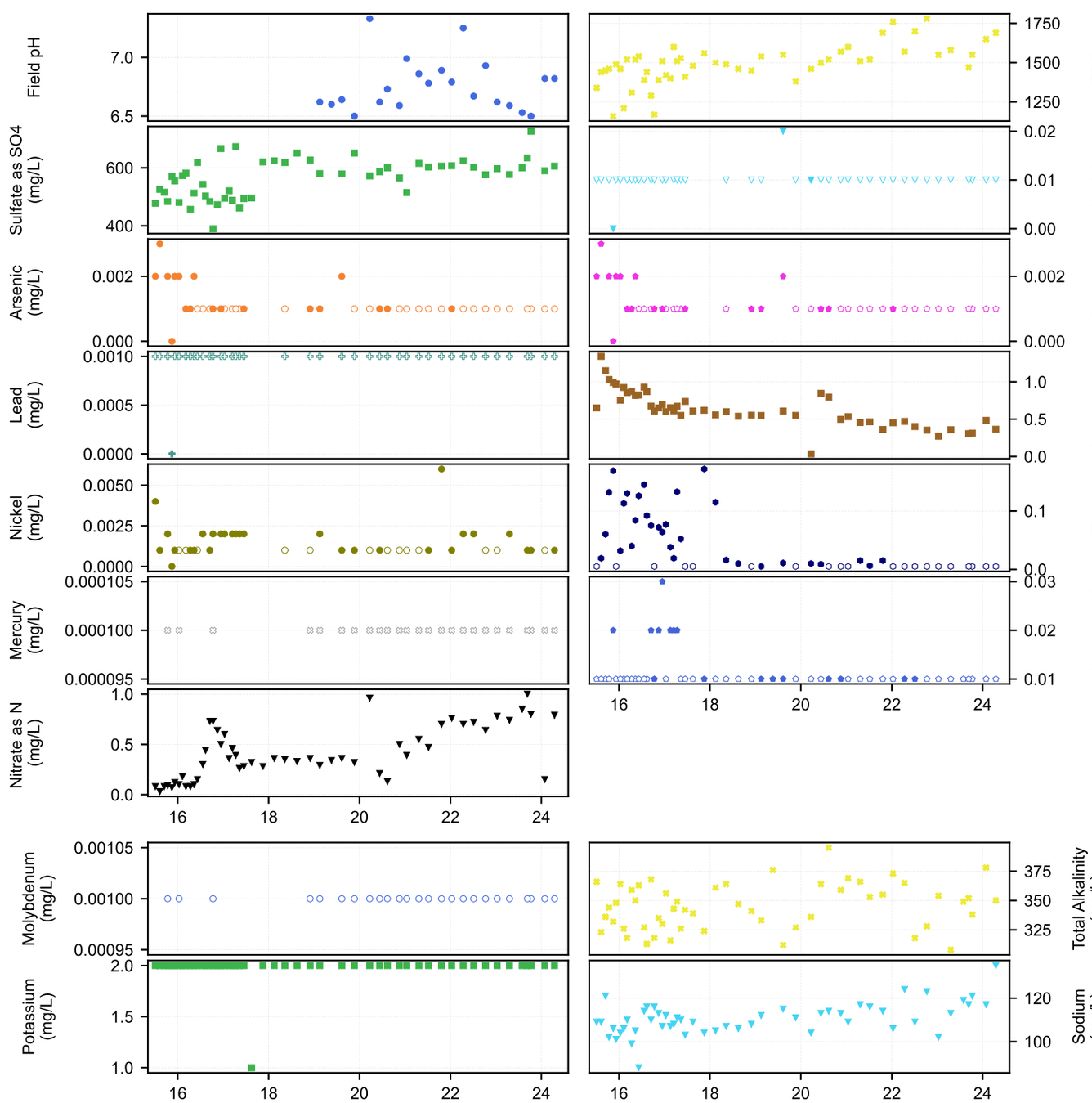
MB81 (Screened geology - Ordovician; Screened interval: 14-19 mbgl)



Groundwater levels



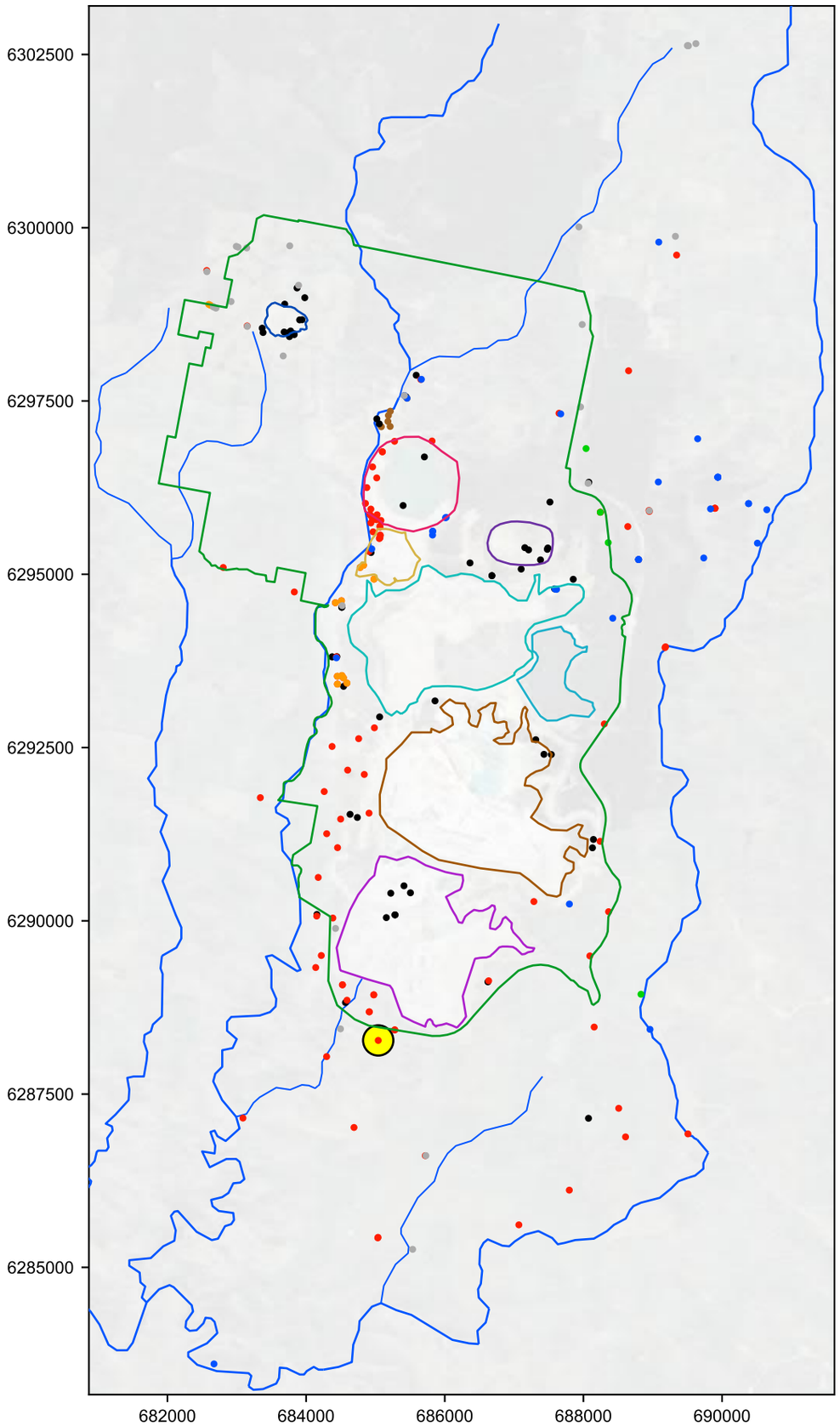
WMP defined analytes



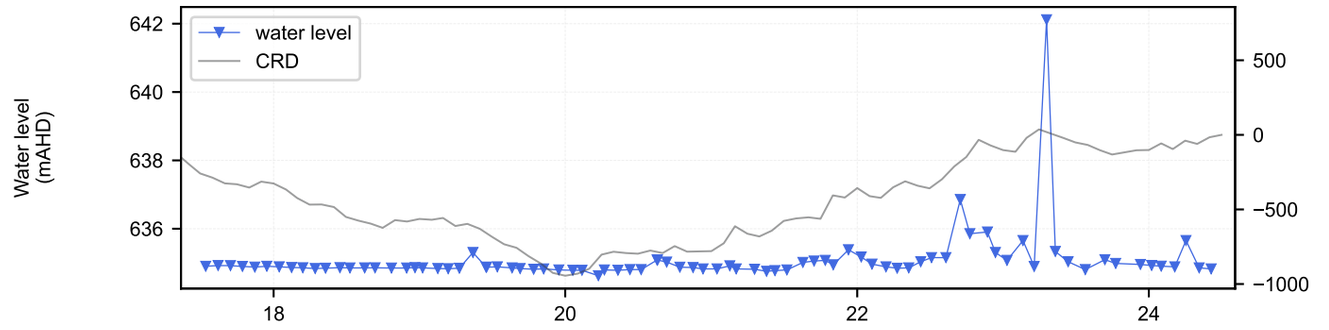
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

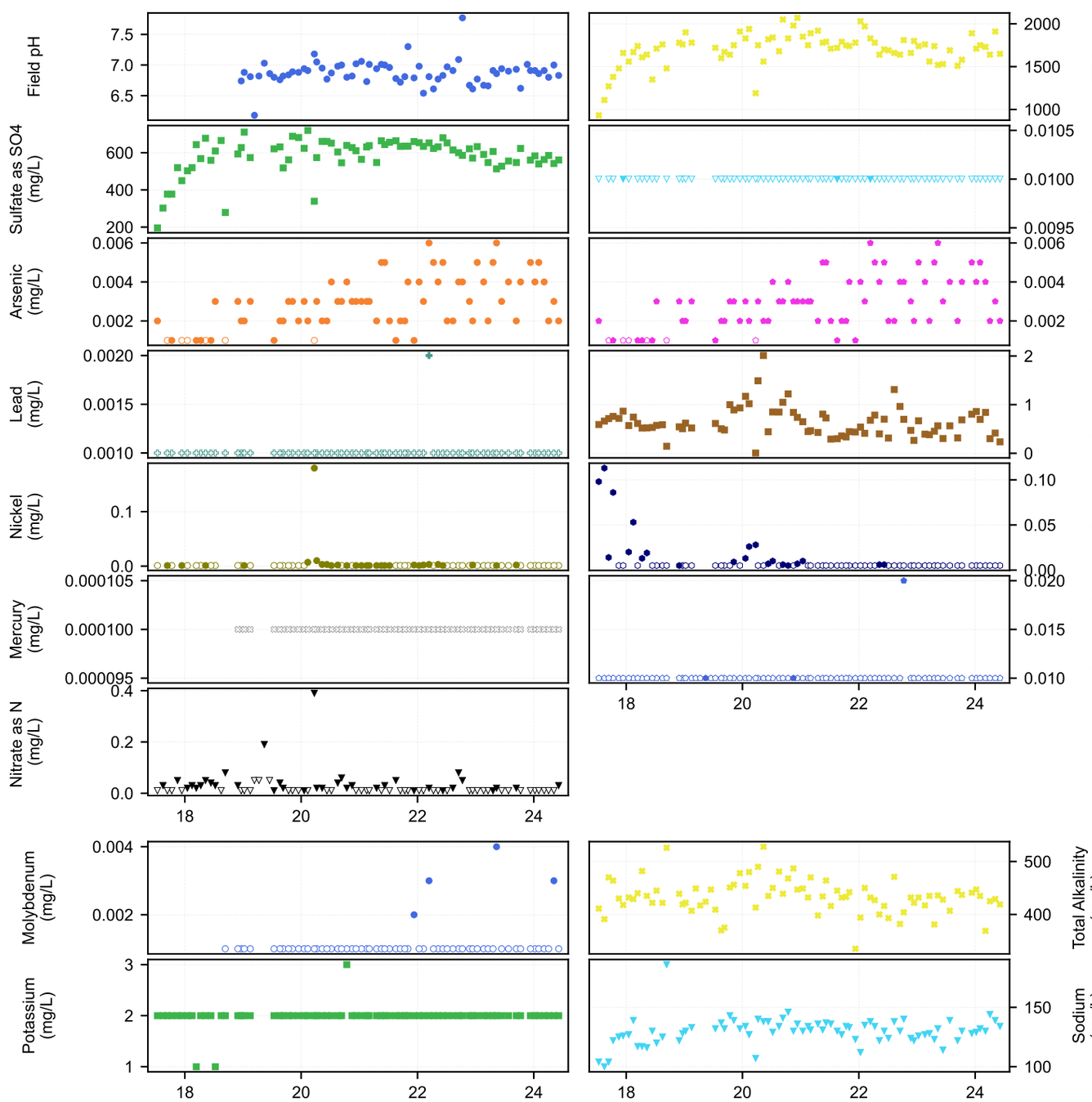
MB83 (Screened geology - Ordovician; Screened interval: 37.2-40.2 mbgl)



Groundwater levels



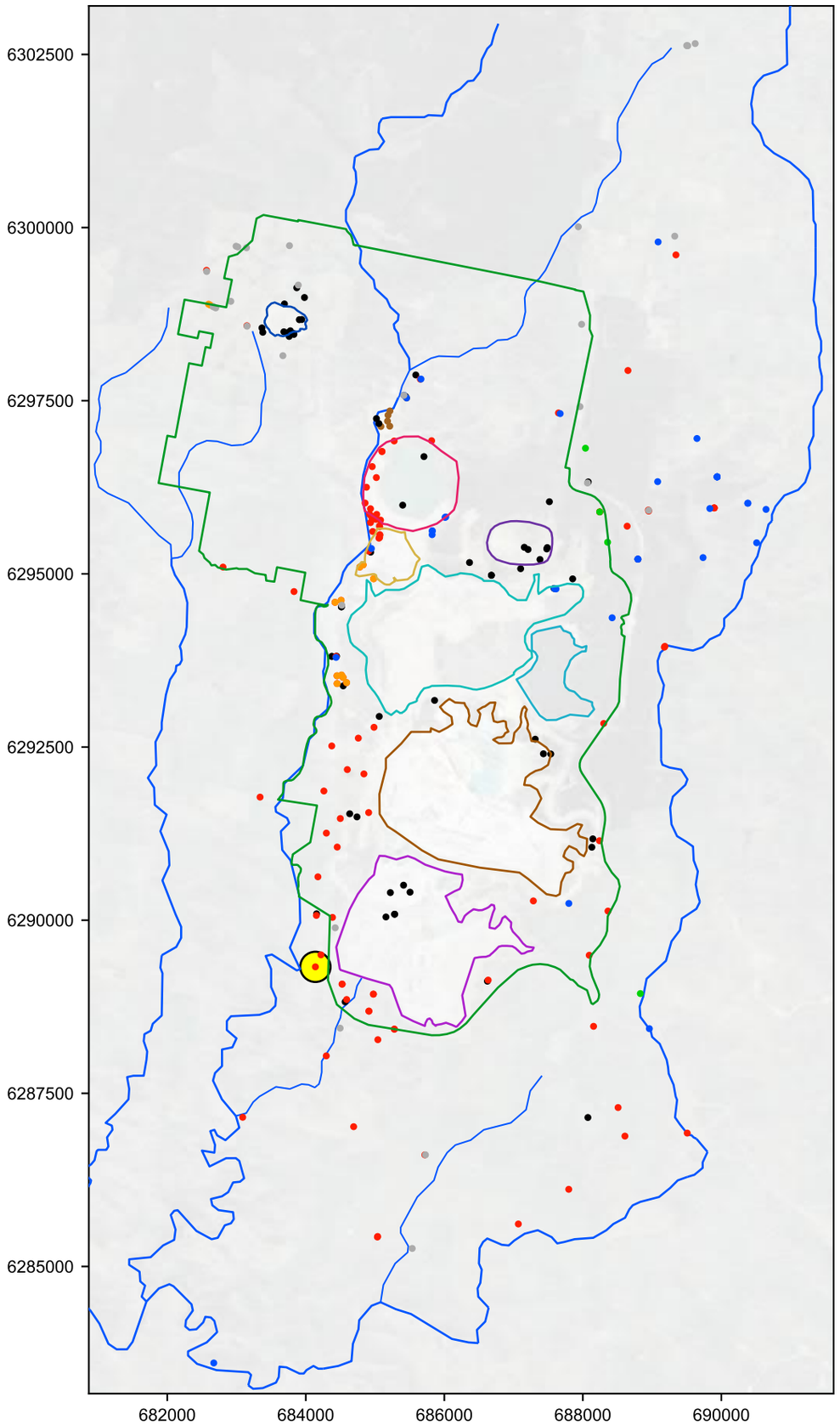
WMP defined analytes



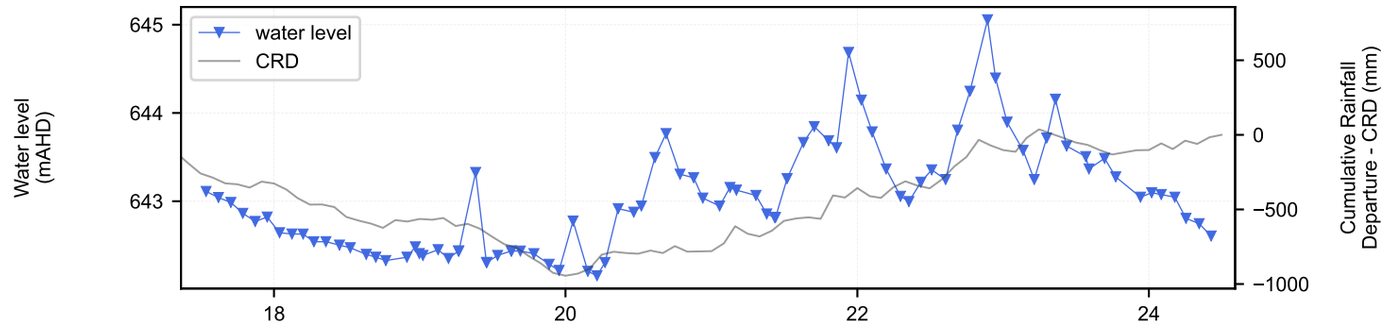
Additional analytes of interest

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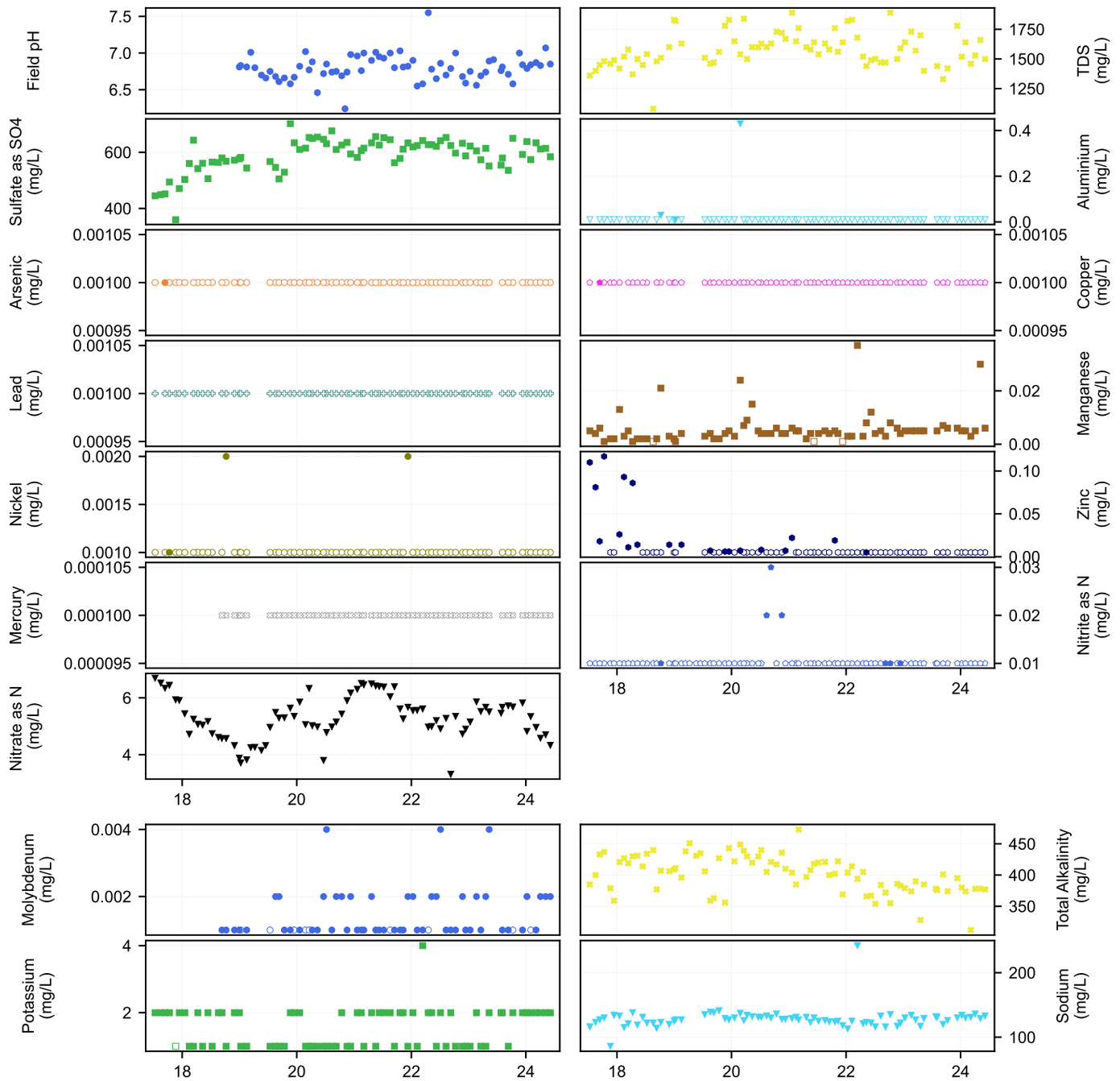
MB84 (Screened geology - Ordovician; Screened interval: 10.97-13.97 mbgl)



Groundwater levels



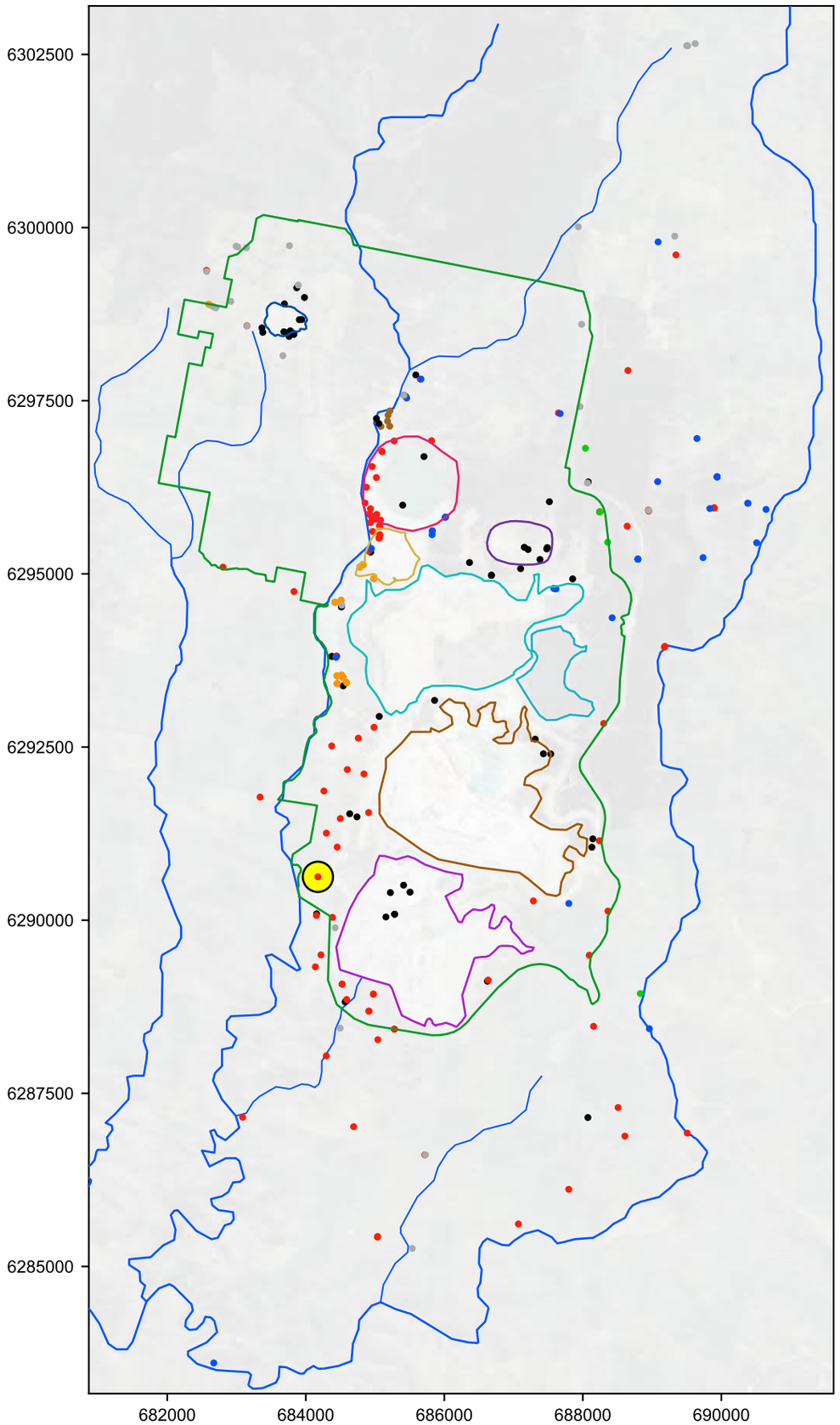
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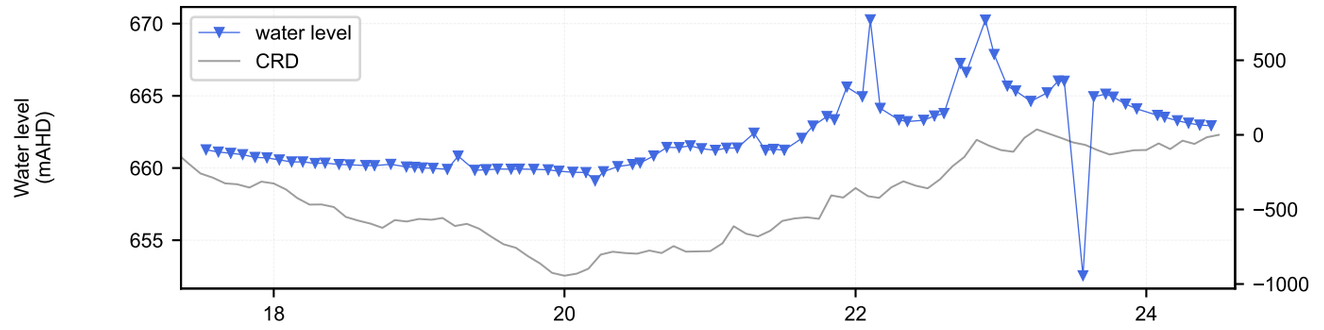
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

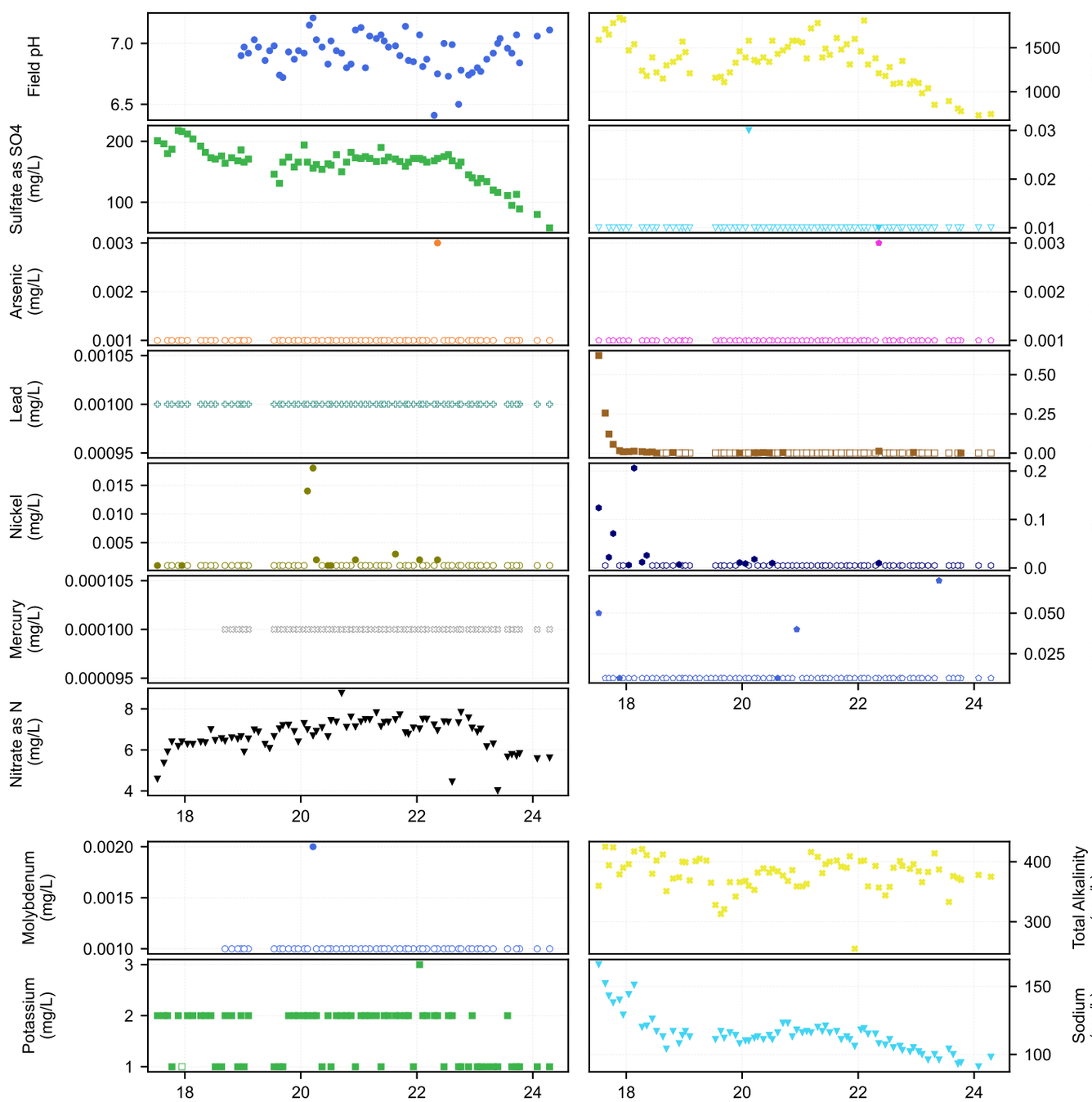
MB85 (Screened geology - Ordovician; Screened interval: 25.84-22.84 mbgl)



Groundwater levels



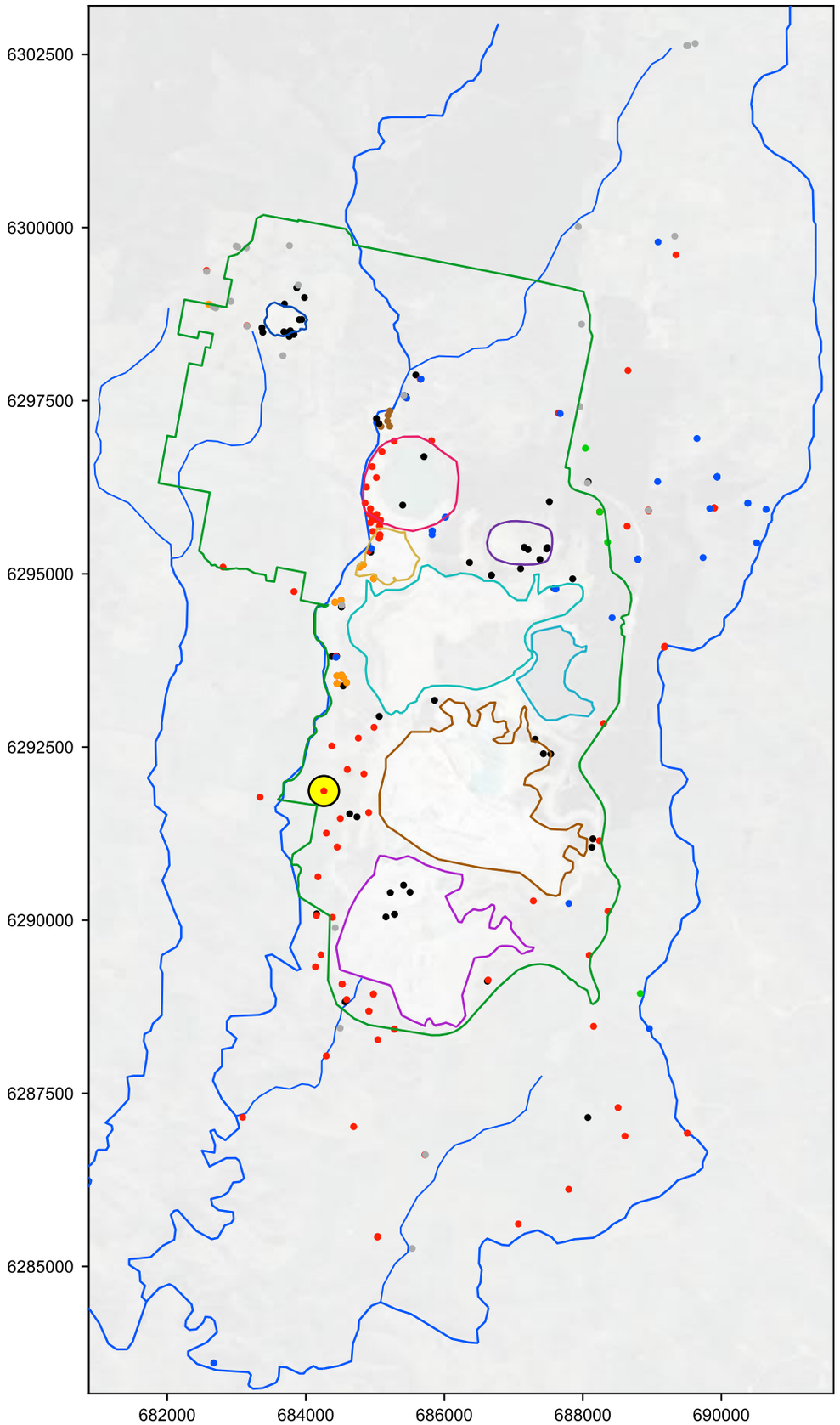
WMP defined analytes



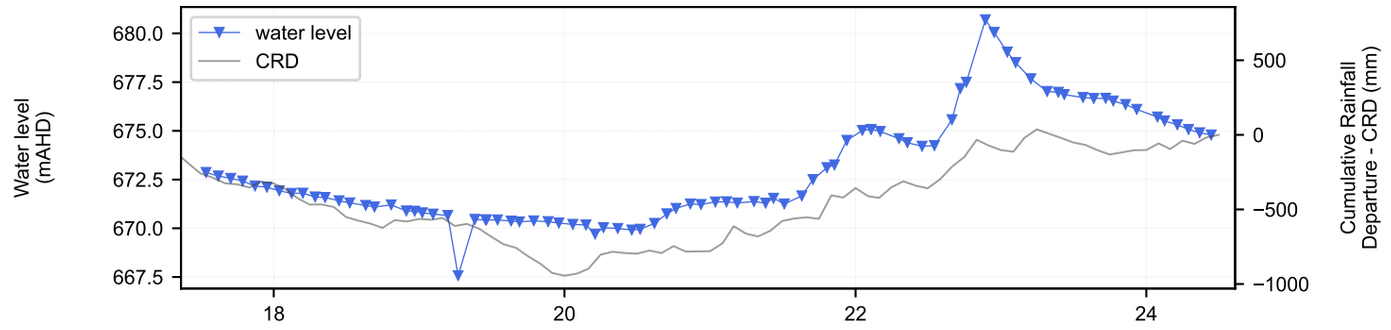
Additional analytes of interest

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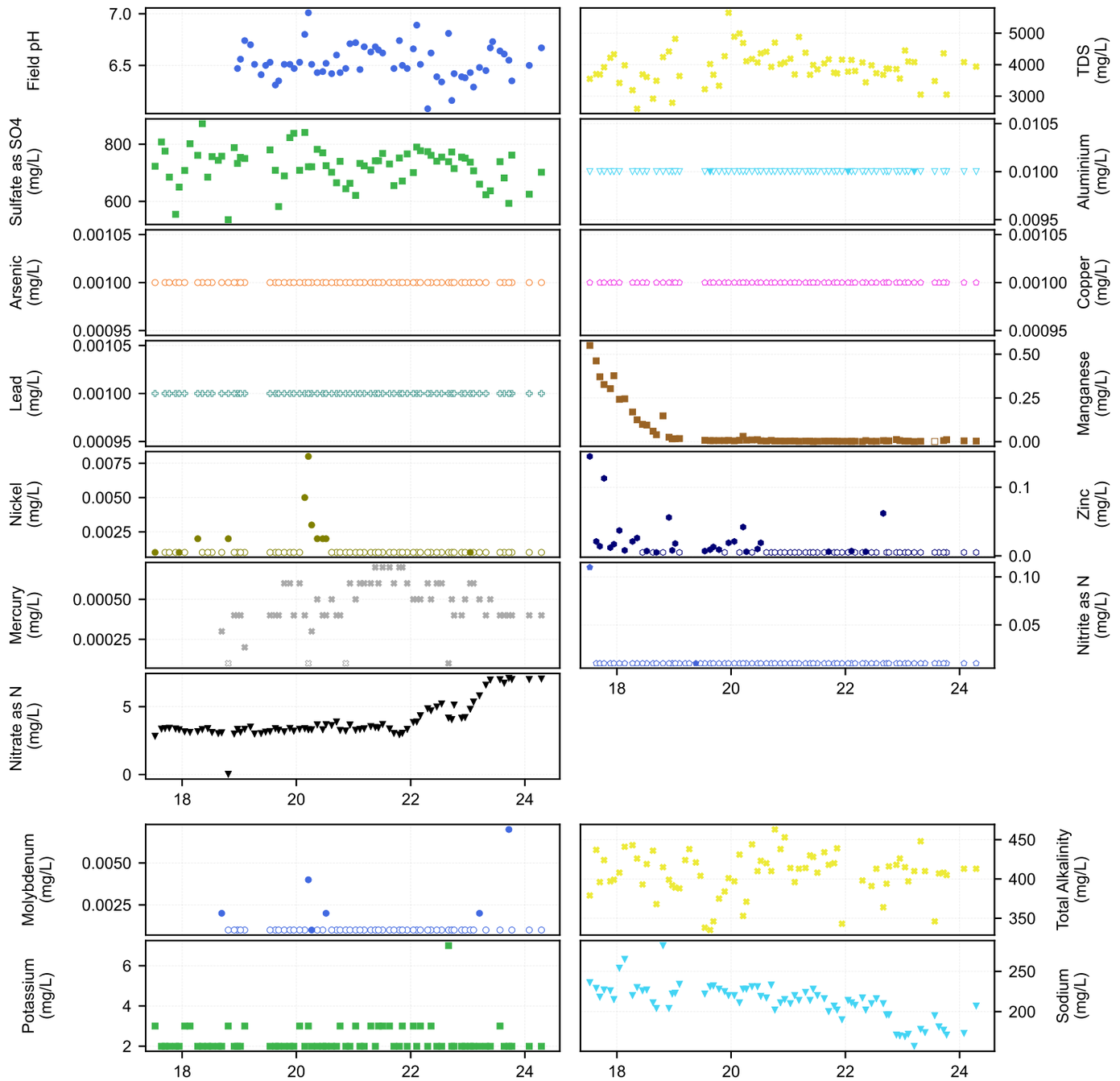
MB86 (Screened geology - Ordovician; Screened interval: 18.45-21.45 mbgl)



Groundwater levels



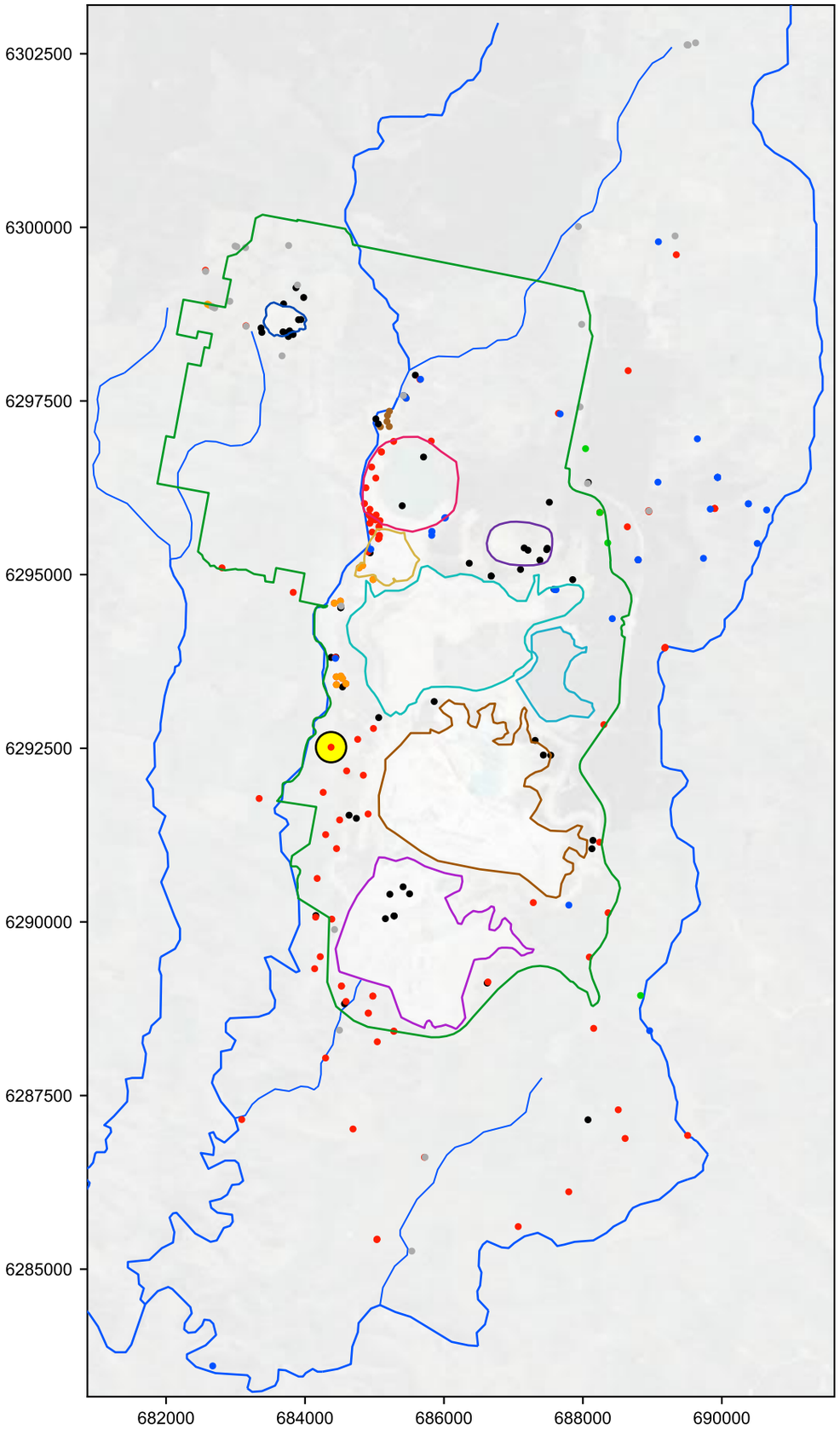
WMP defined analytes



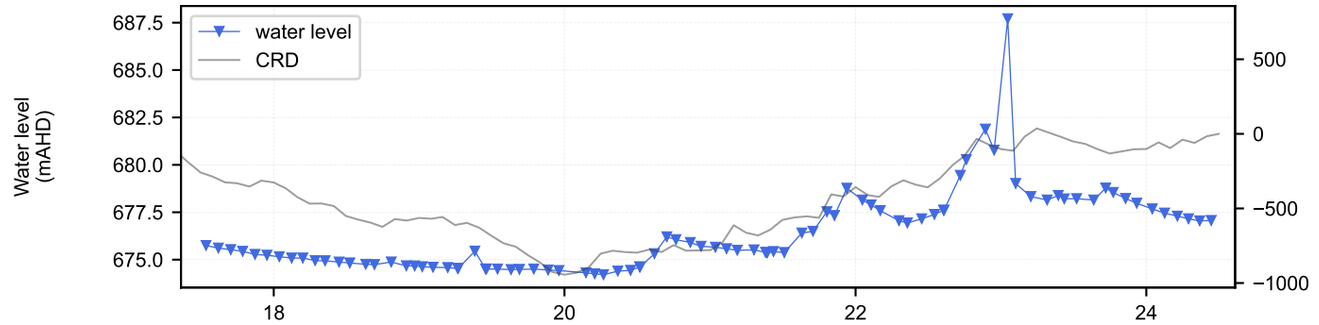
Additional analytes of interest

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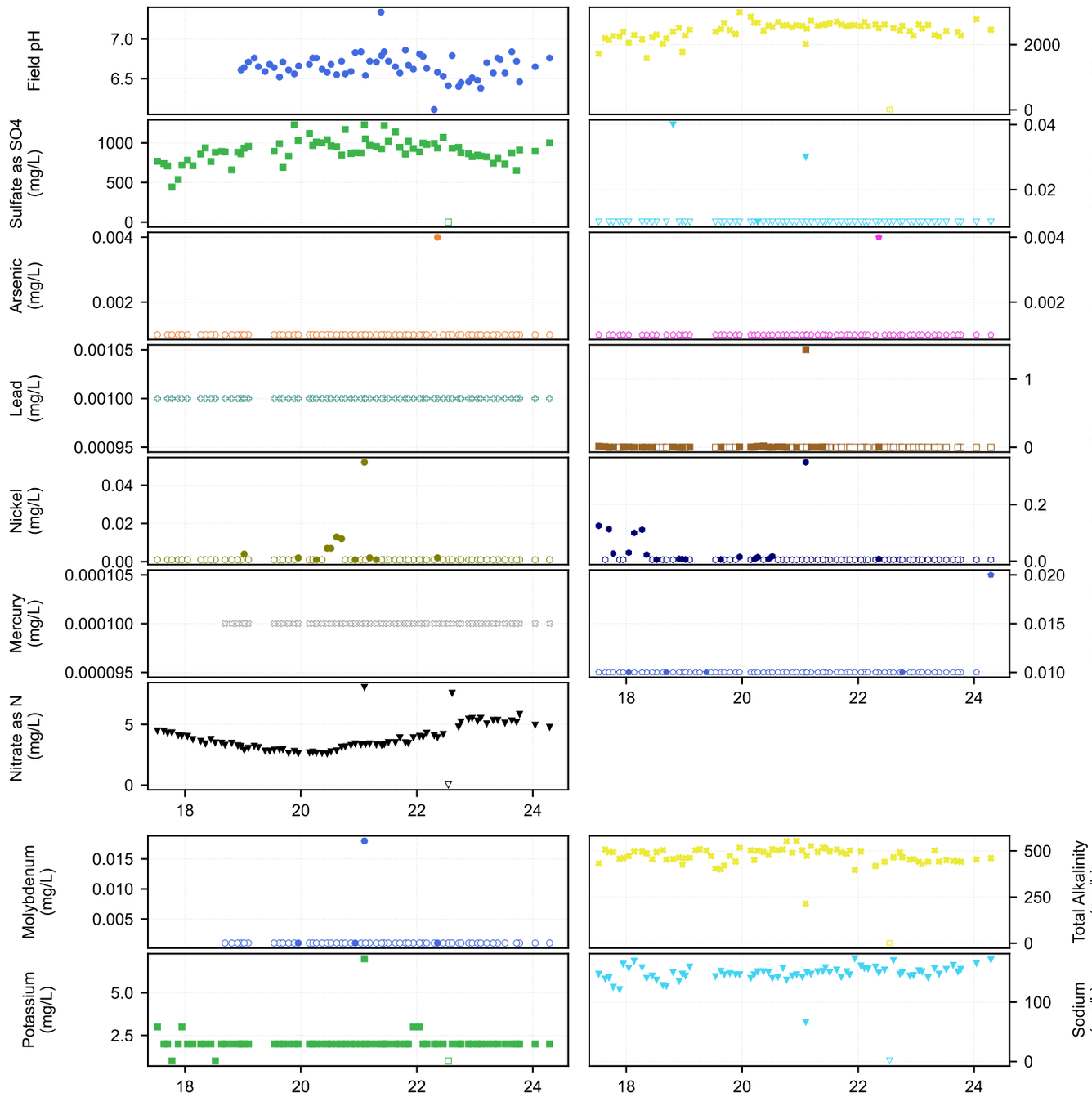
MB87 (Screened geology - Ordovician; Screened interval: 18.4-21.4 mbgl)



Groundwater levels



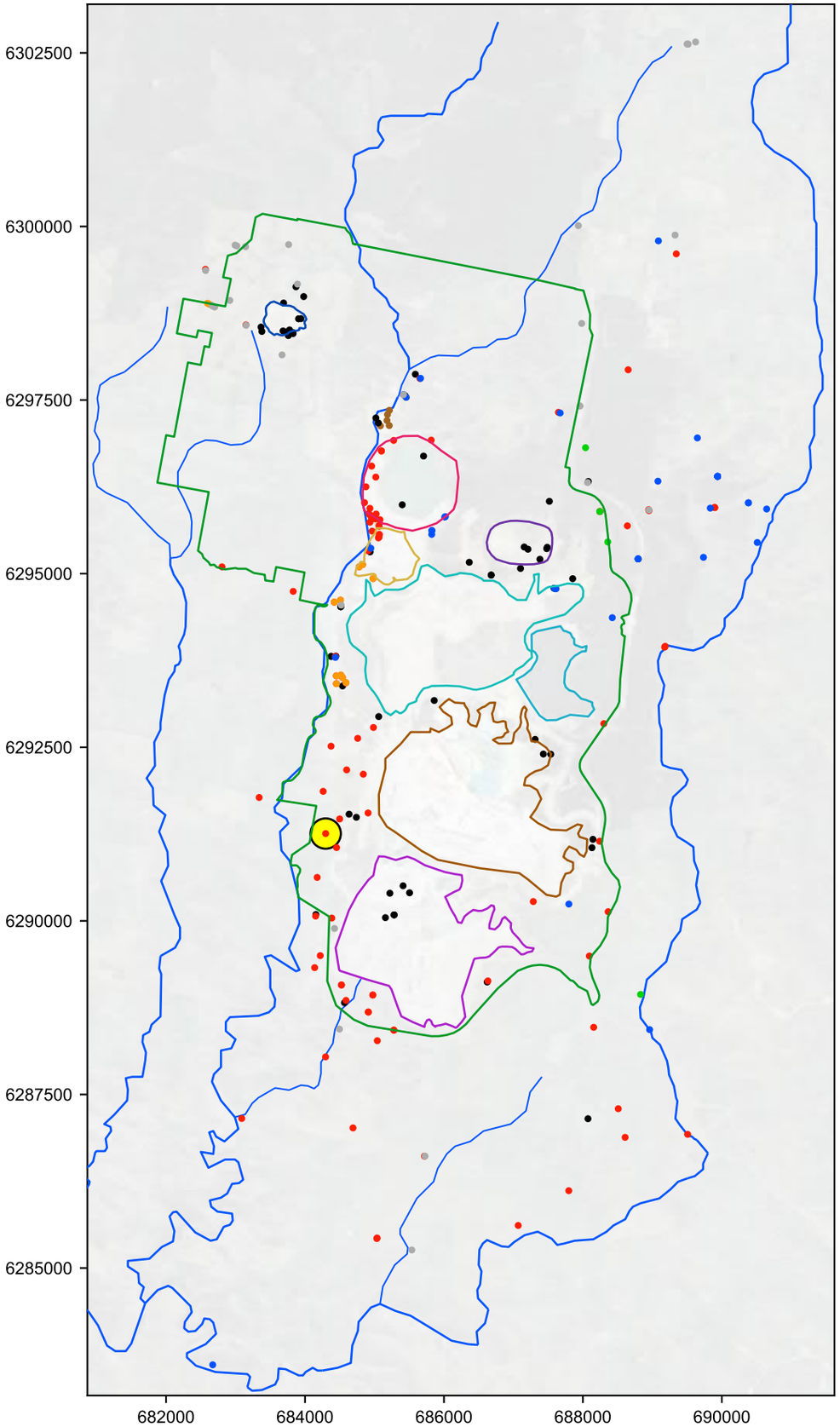
WMP defined analytes



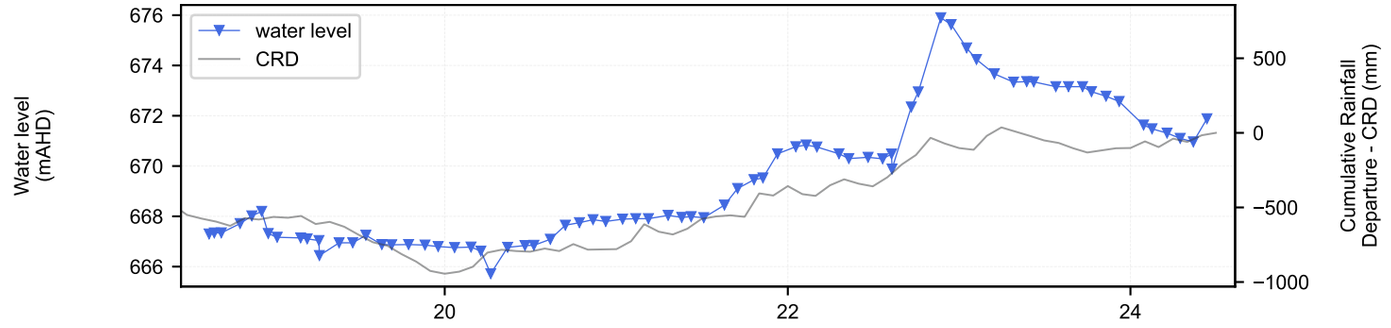
Additional analytes of interest

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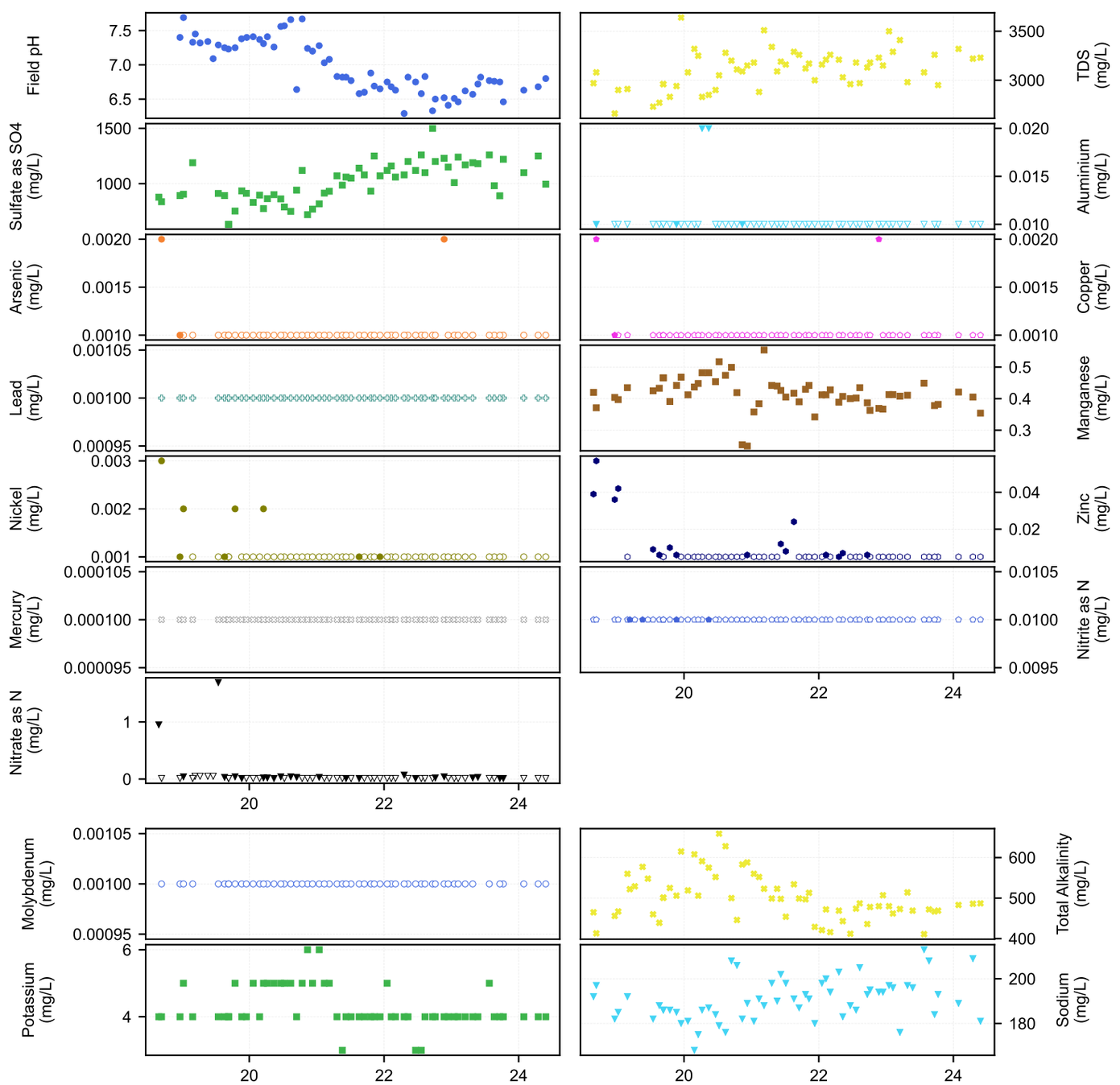
MB90 (Screened geology - Ordovician; Screened interval: 48-60 mbgl)



Groundwater levels



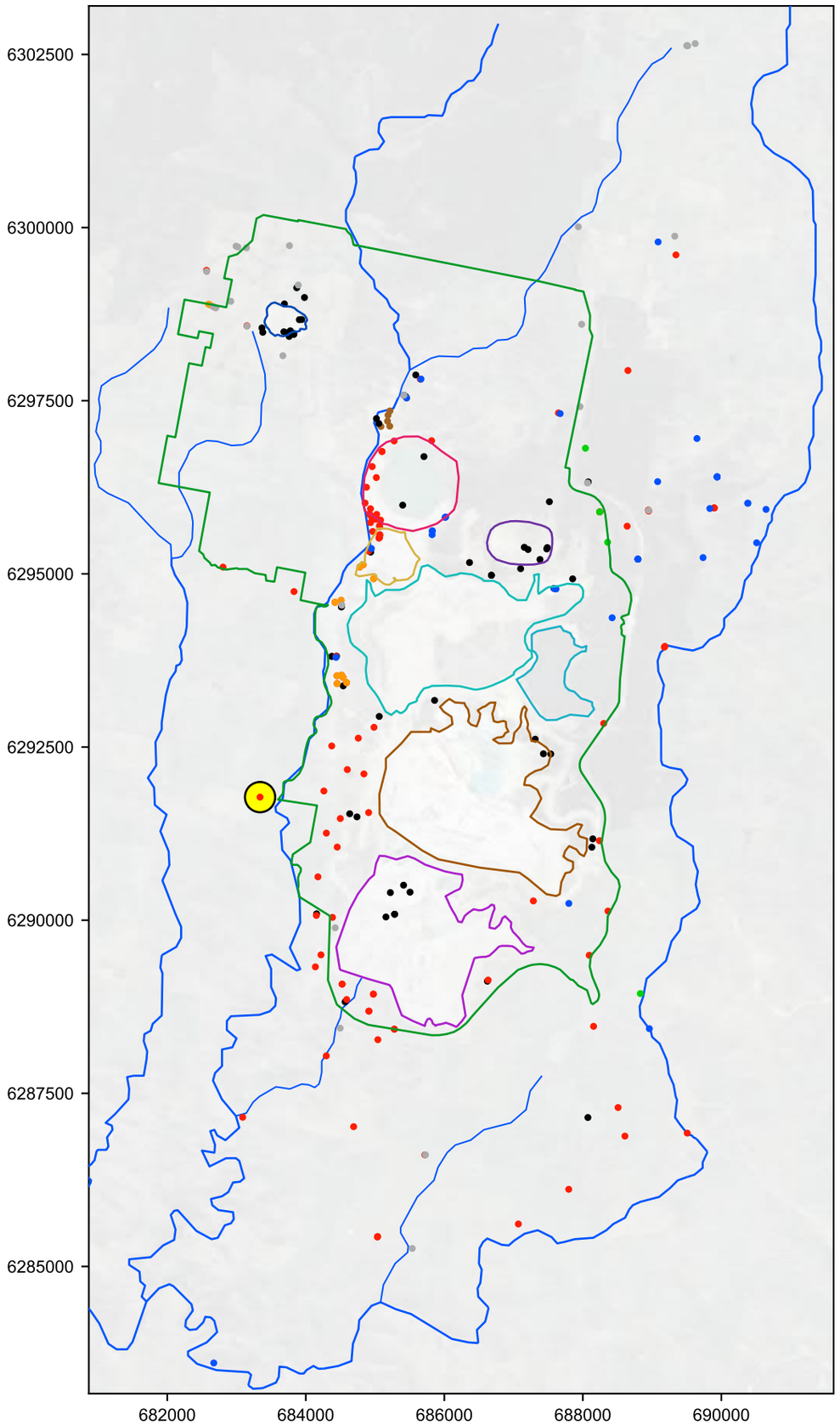
WMP defined analytes



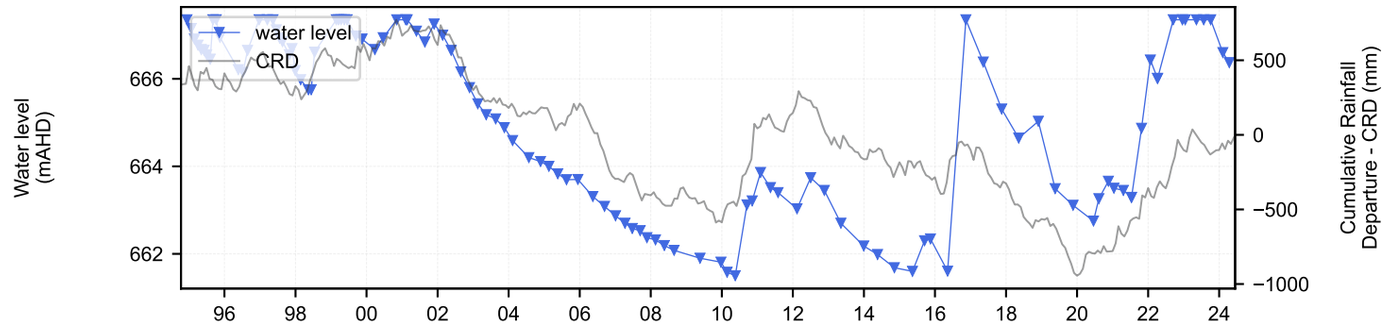
Additional analytes of interest

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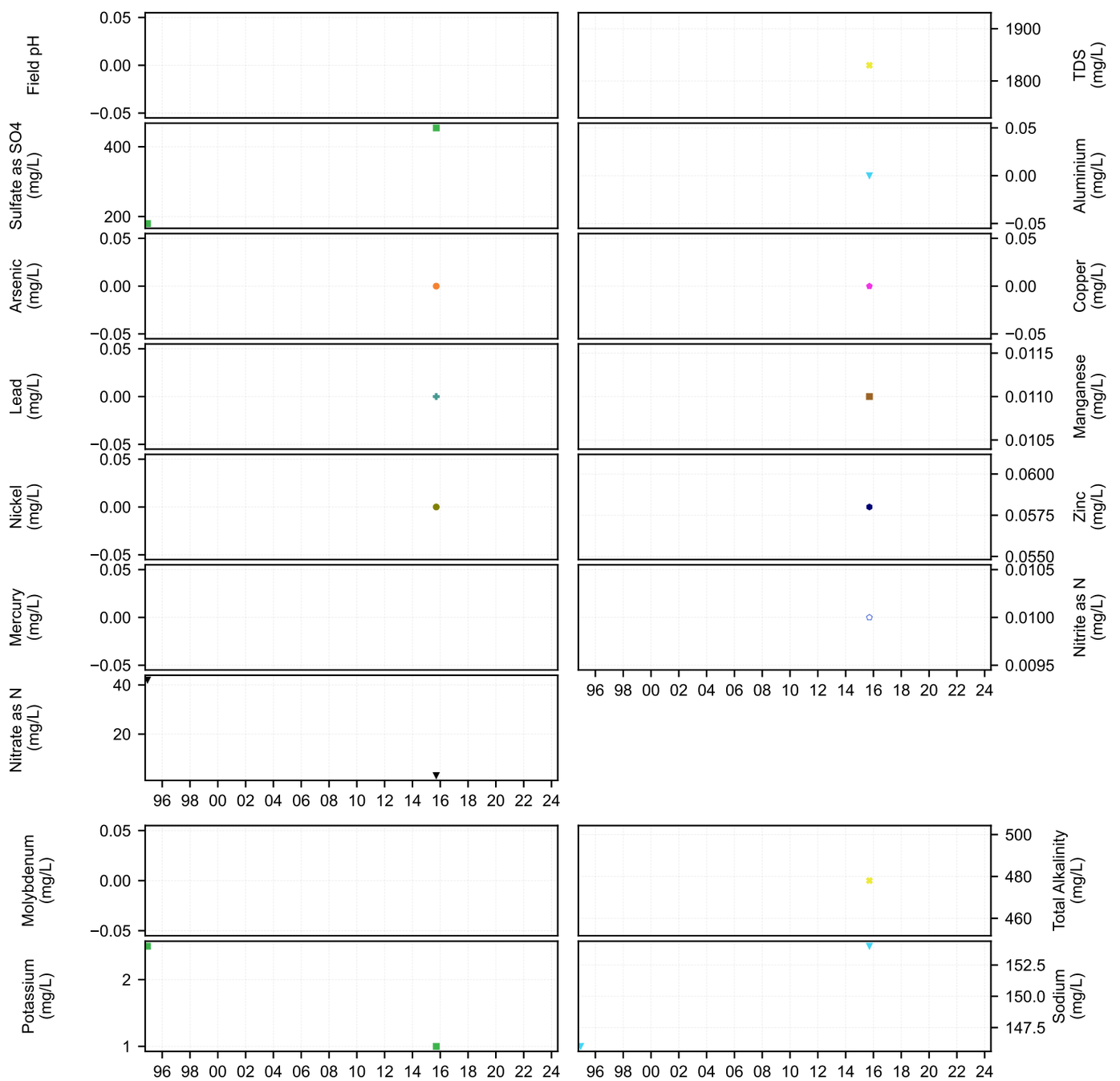
RB03 (Screened geology - Ordovician; Screened interval: 8-22 mbgl)



Groundwater levels



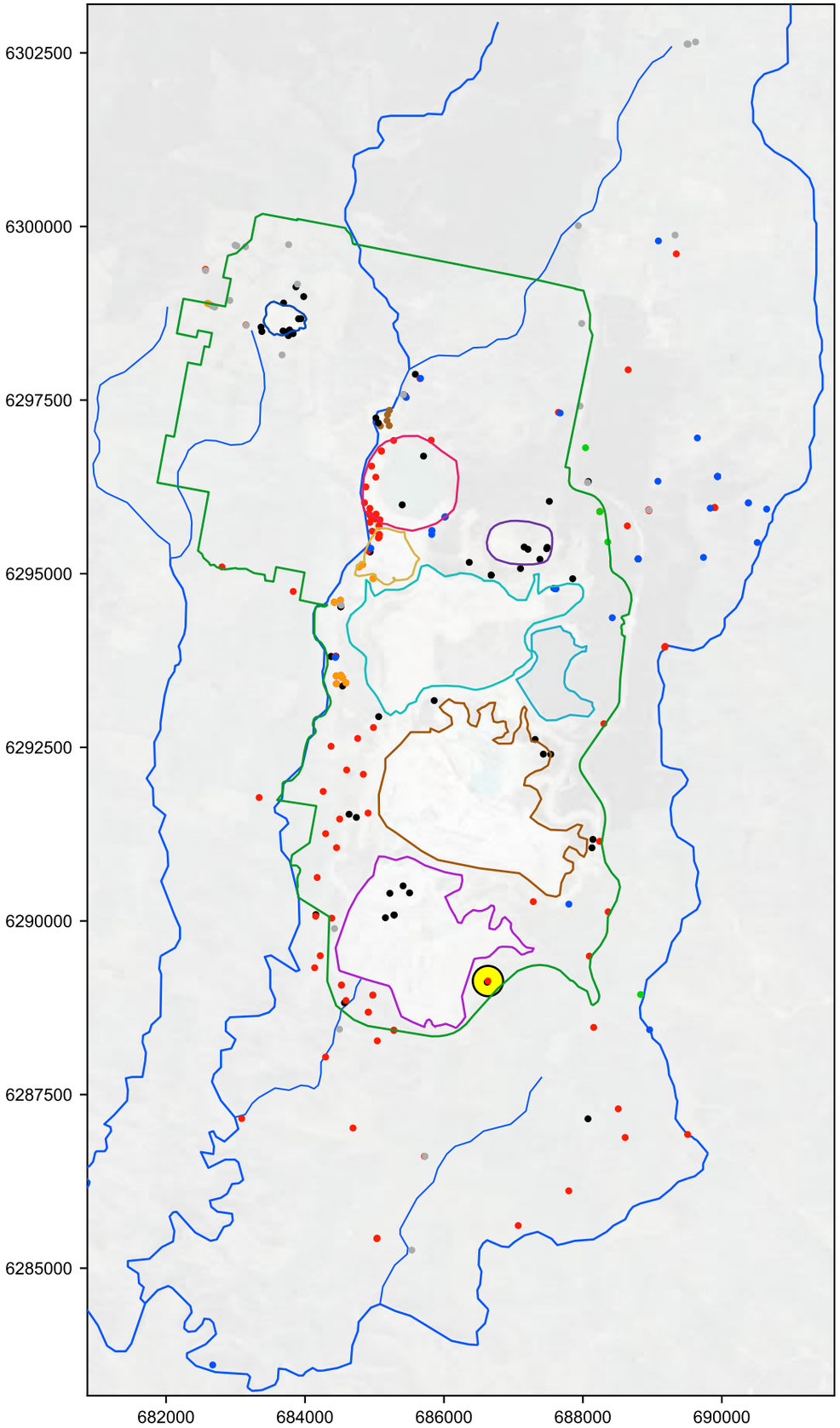
WMP defined analytes



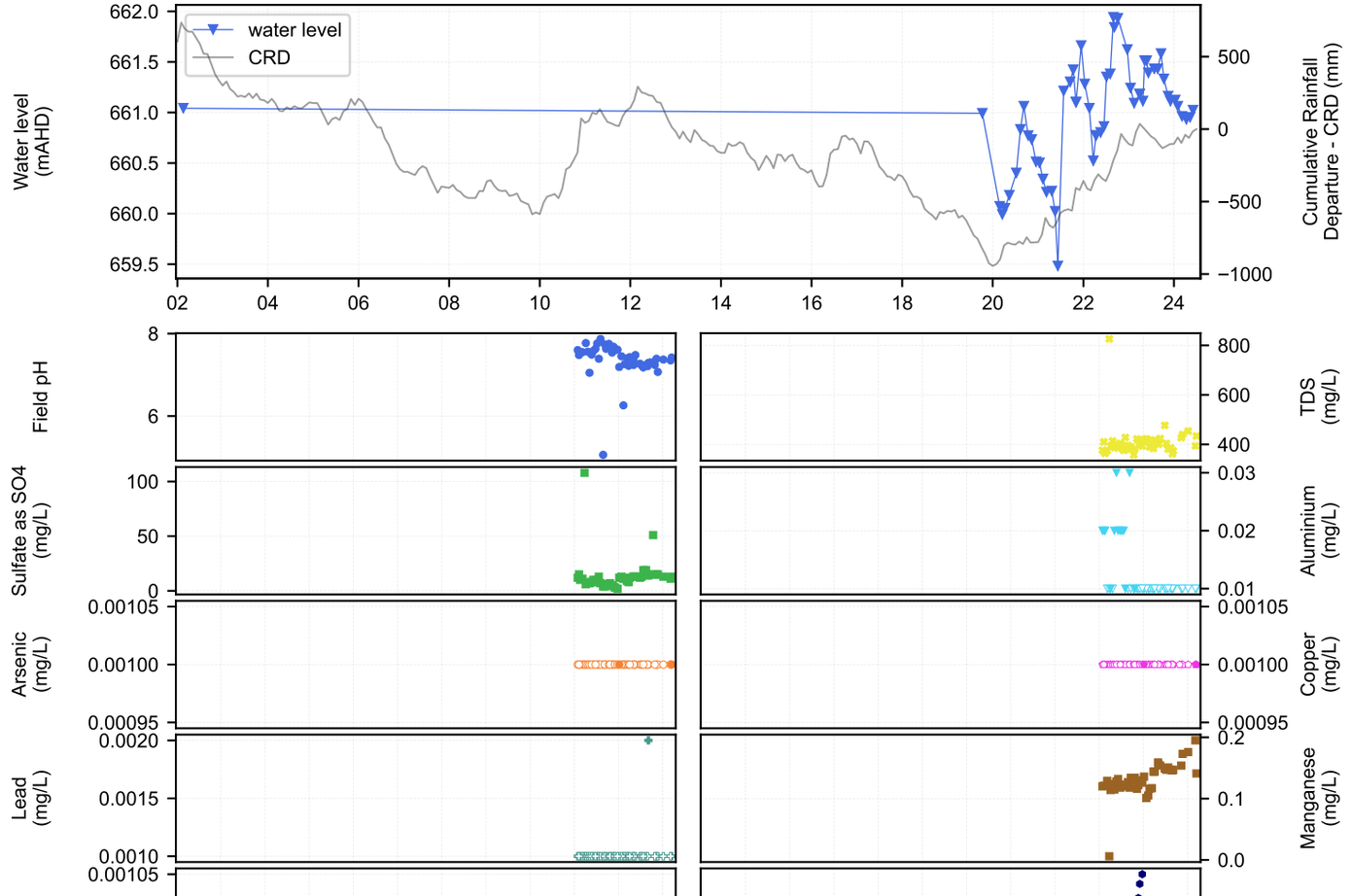
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

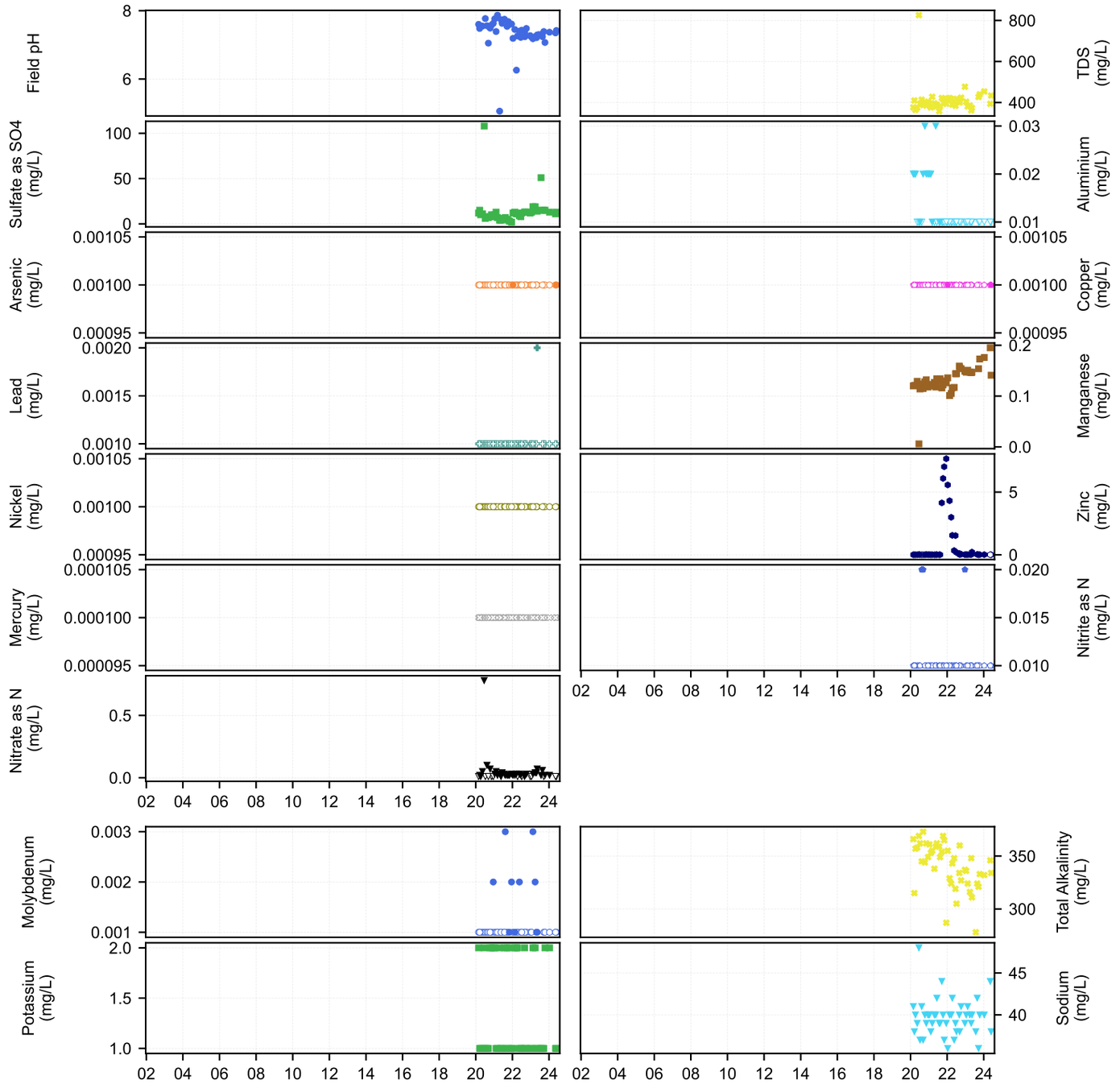
TW05MB (Screened geology - Ordovician; Screened interval: 30-60 mbgl)



Groundwater levels



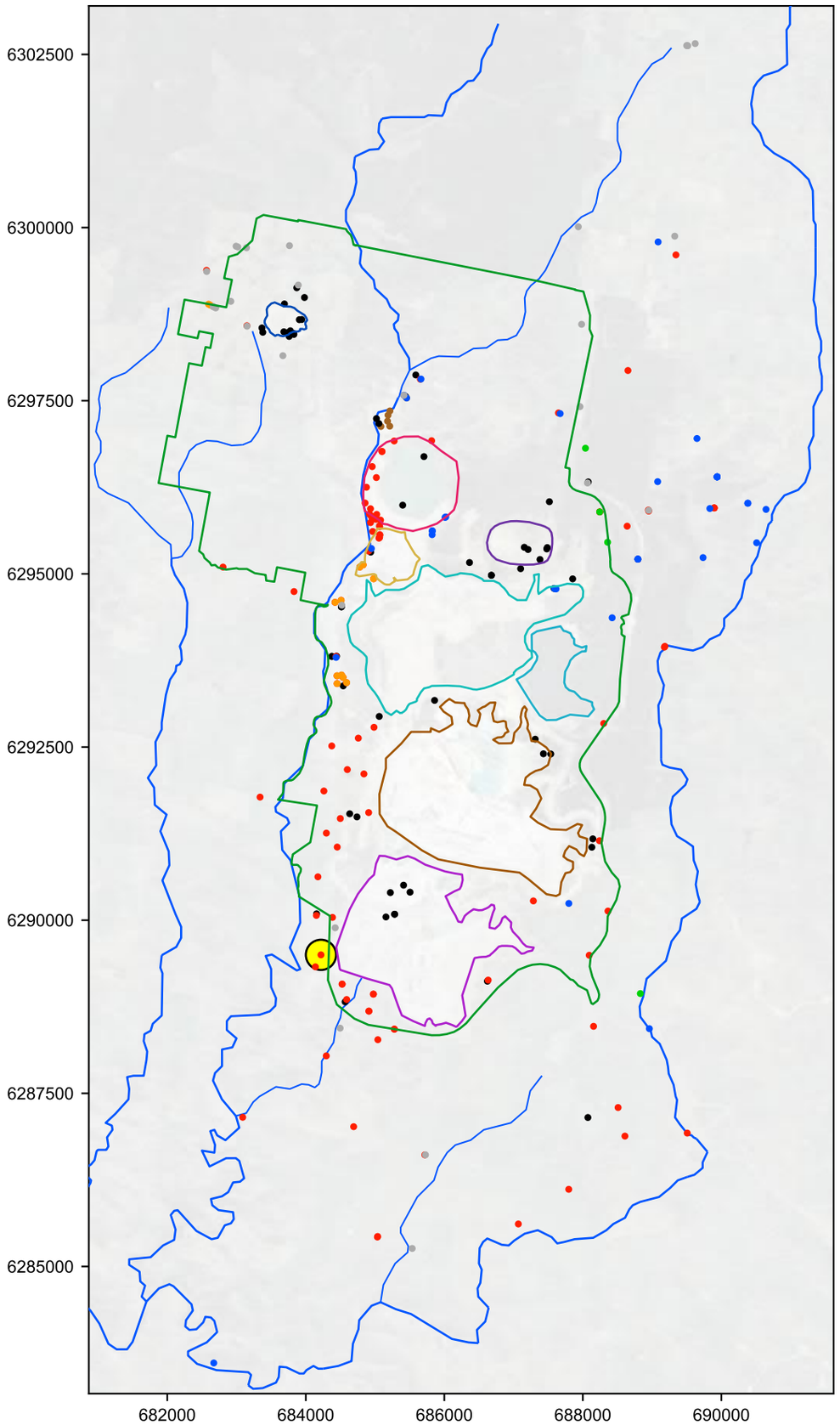
WMP defined analytes



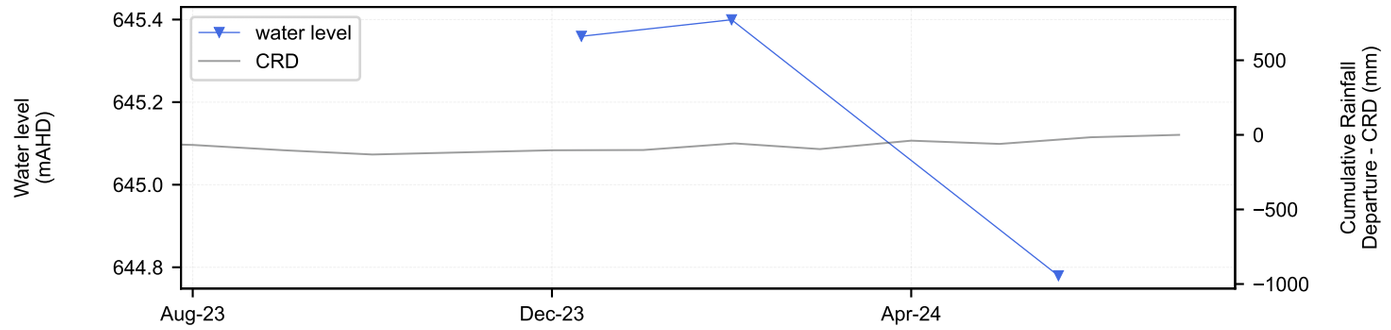
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

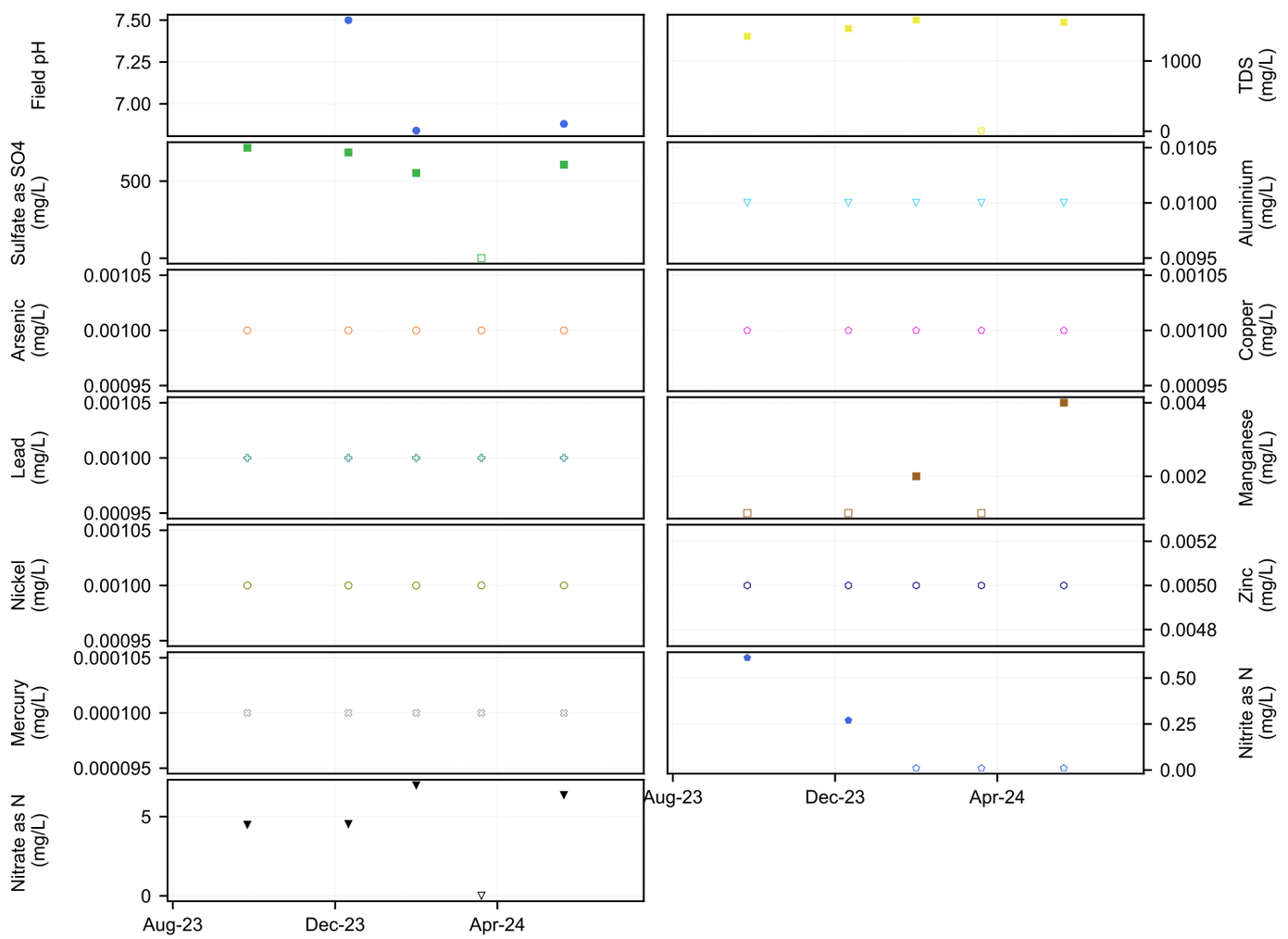
MB130 (Screened geology - Ordovician; Screened interval: 13.0-16.0 mbgl)



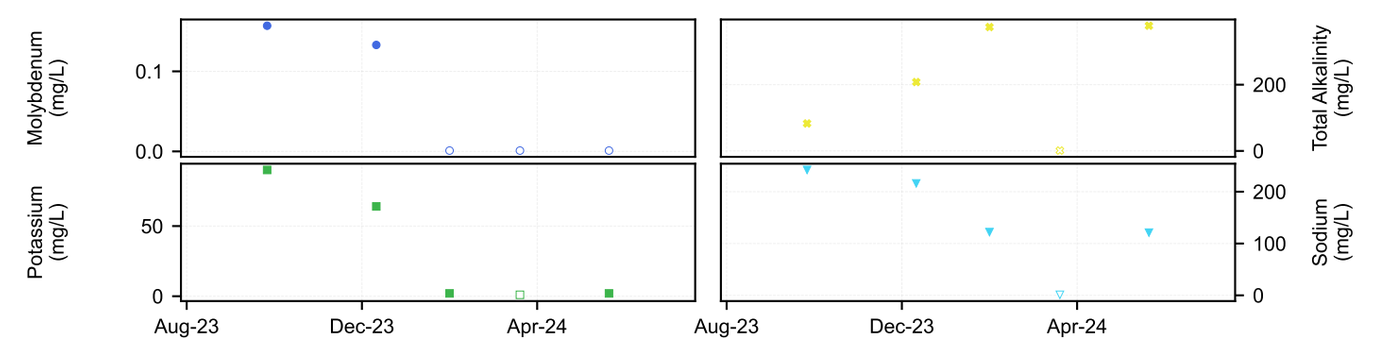
Groundwater levels



WMP defined analytes

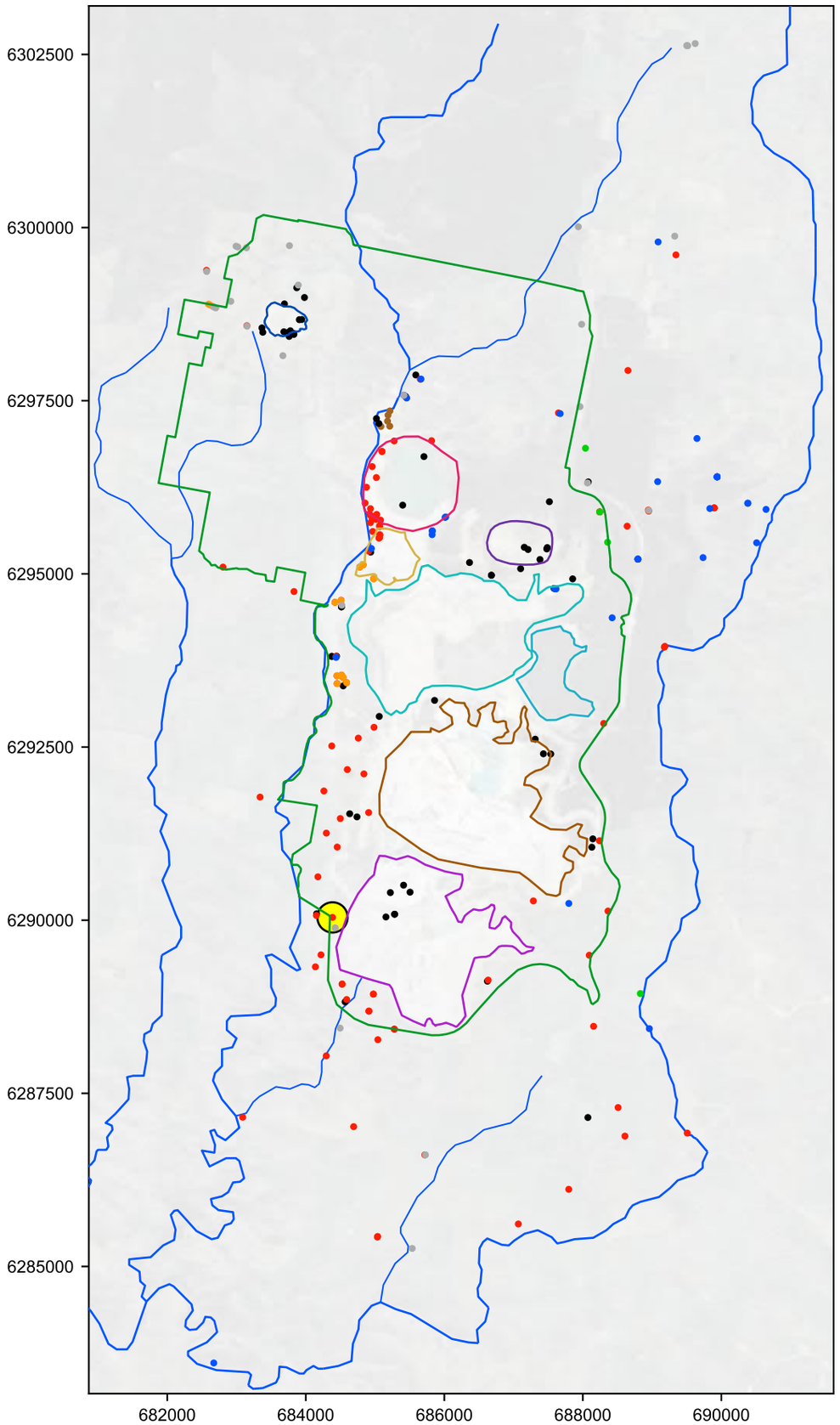


Additional analytes of interest

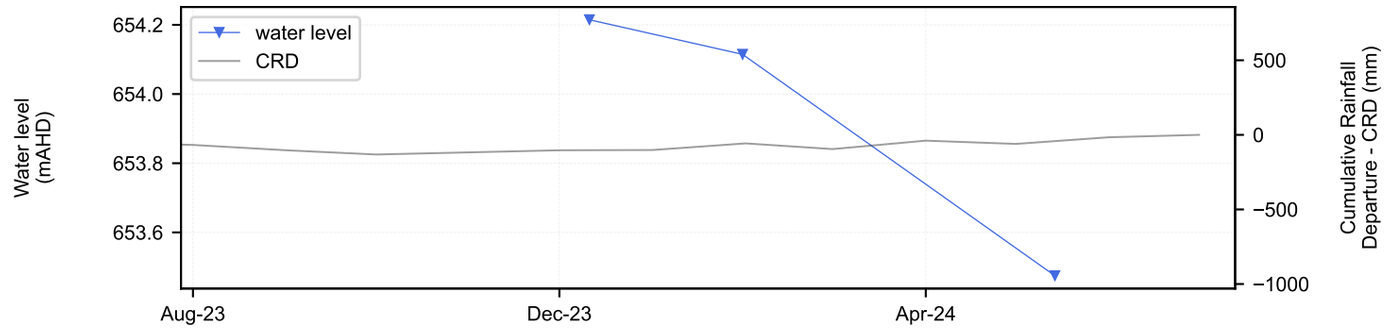


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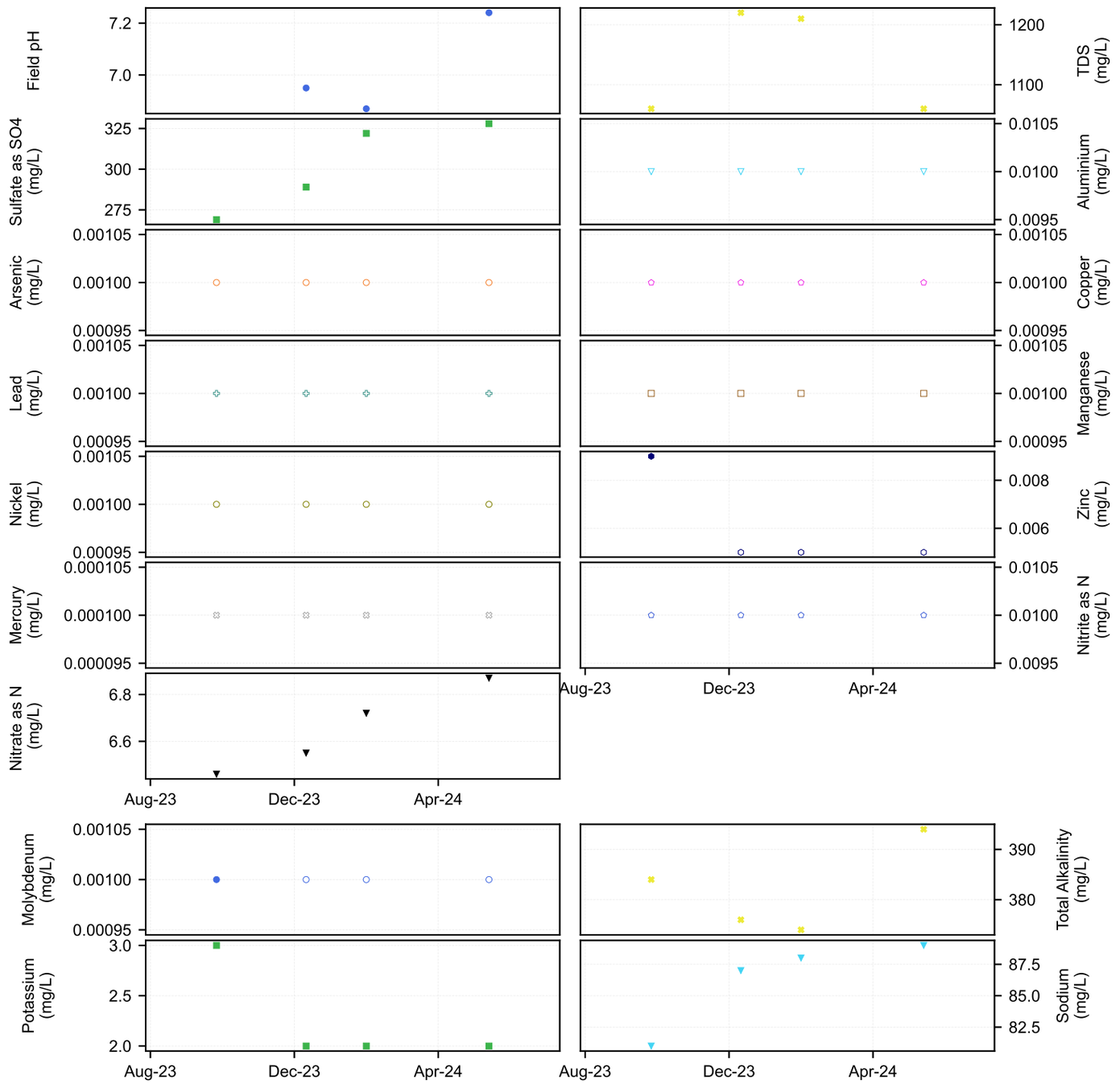
MB131 (Screened geology - Ordovician; Screened interval: 14.0-20.0 mbgl)



Groundwater levels



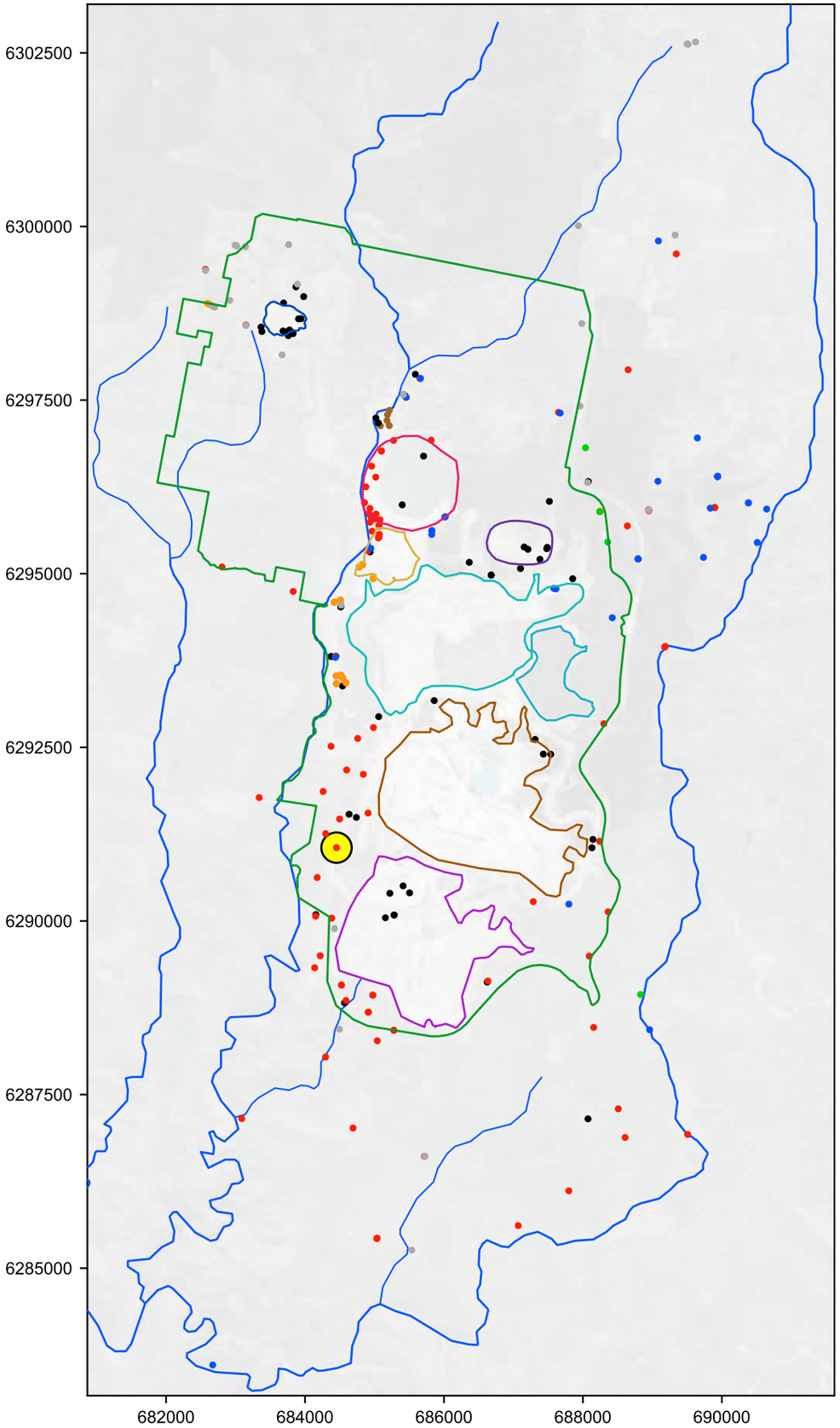
WMP defined analytes



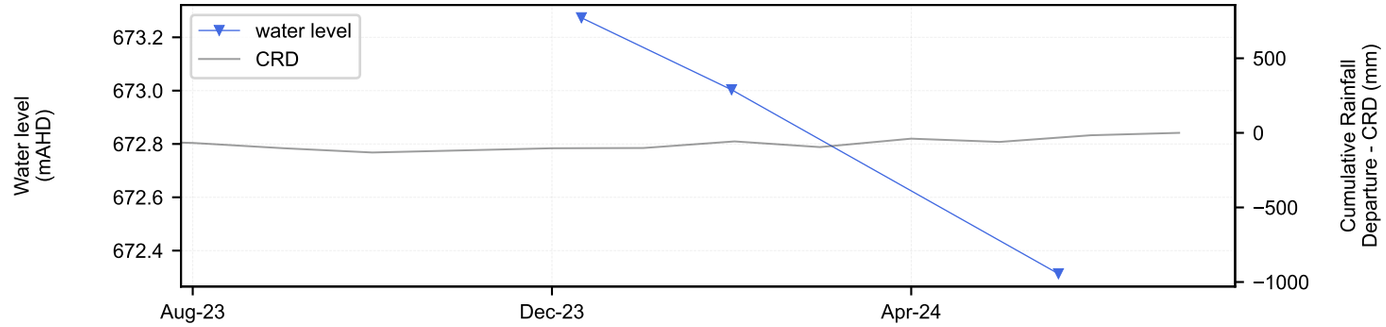
Additional analytes of interest

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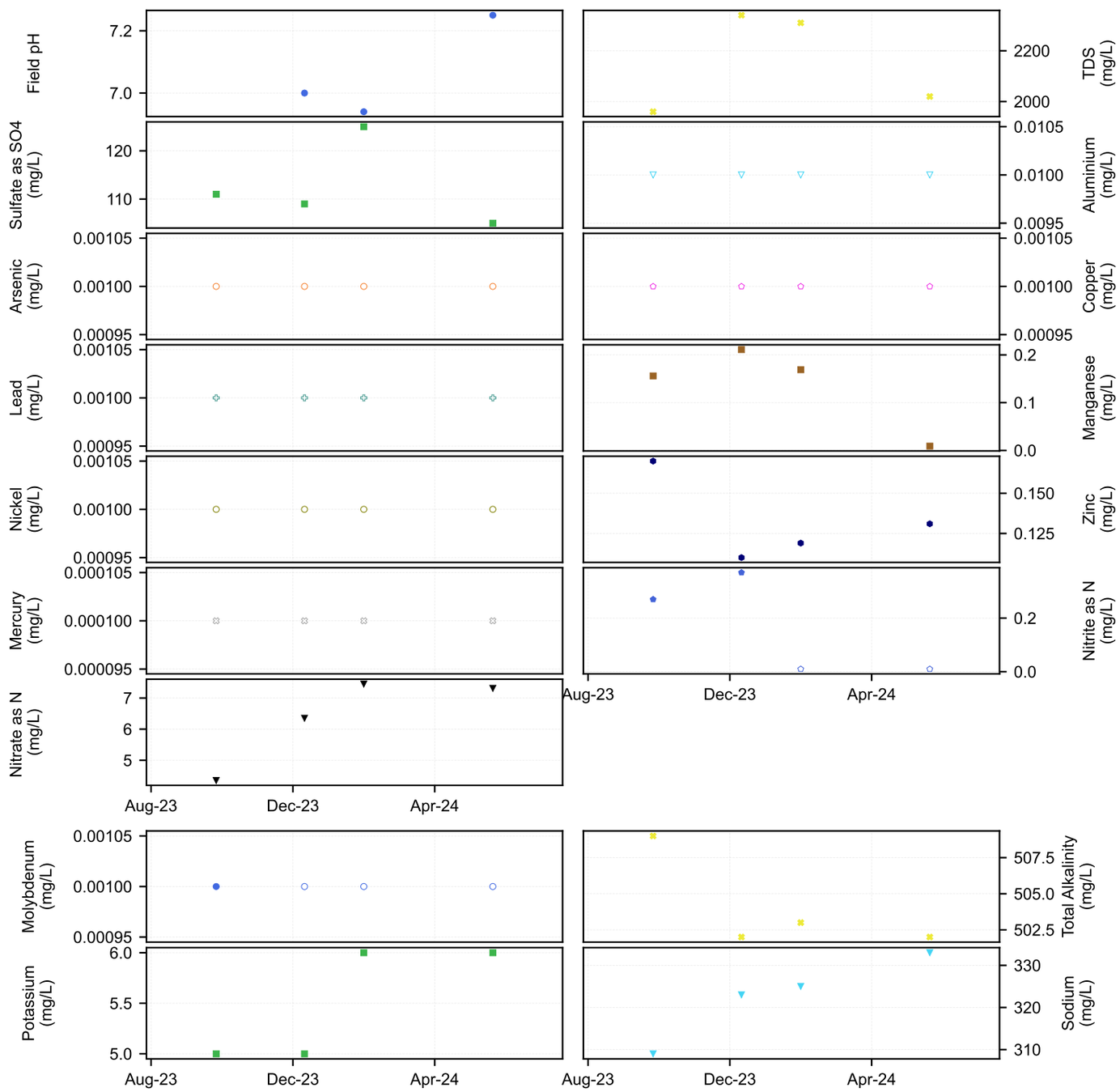
MB132 (Screened geology - Ordovician; Screened interval: 21.5-27.5 mbgl)



Groundwater levels



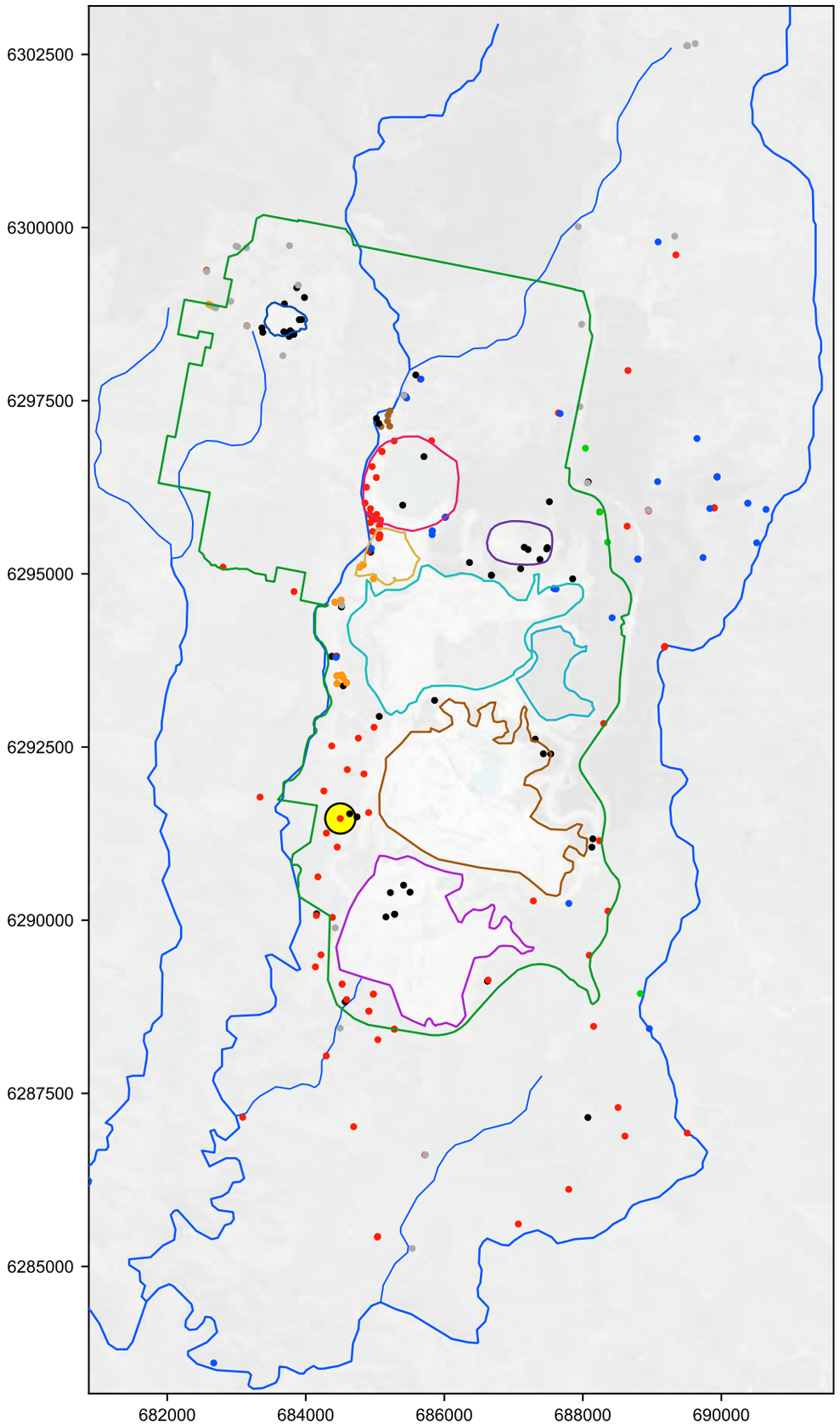
WMP defined analytes



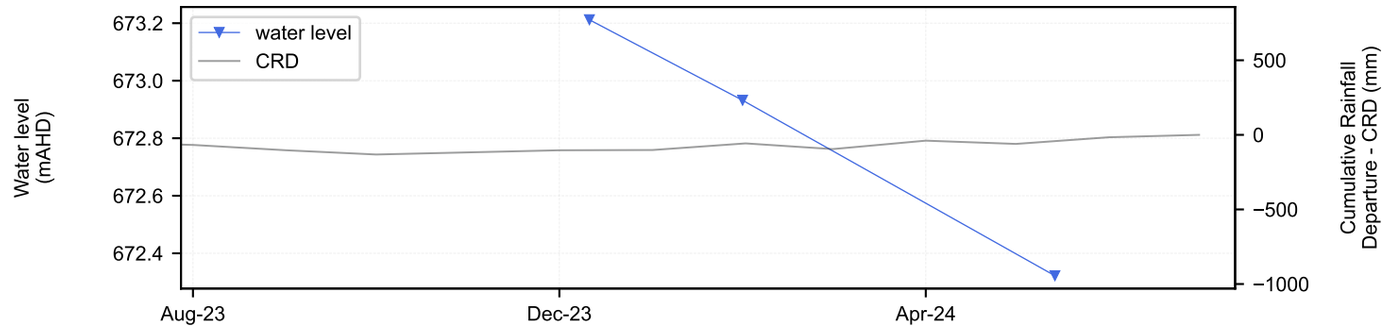
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

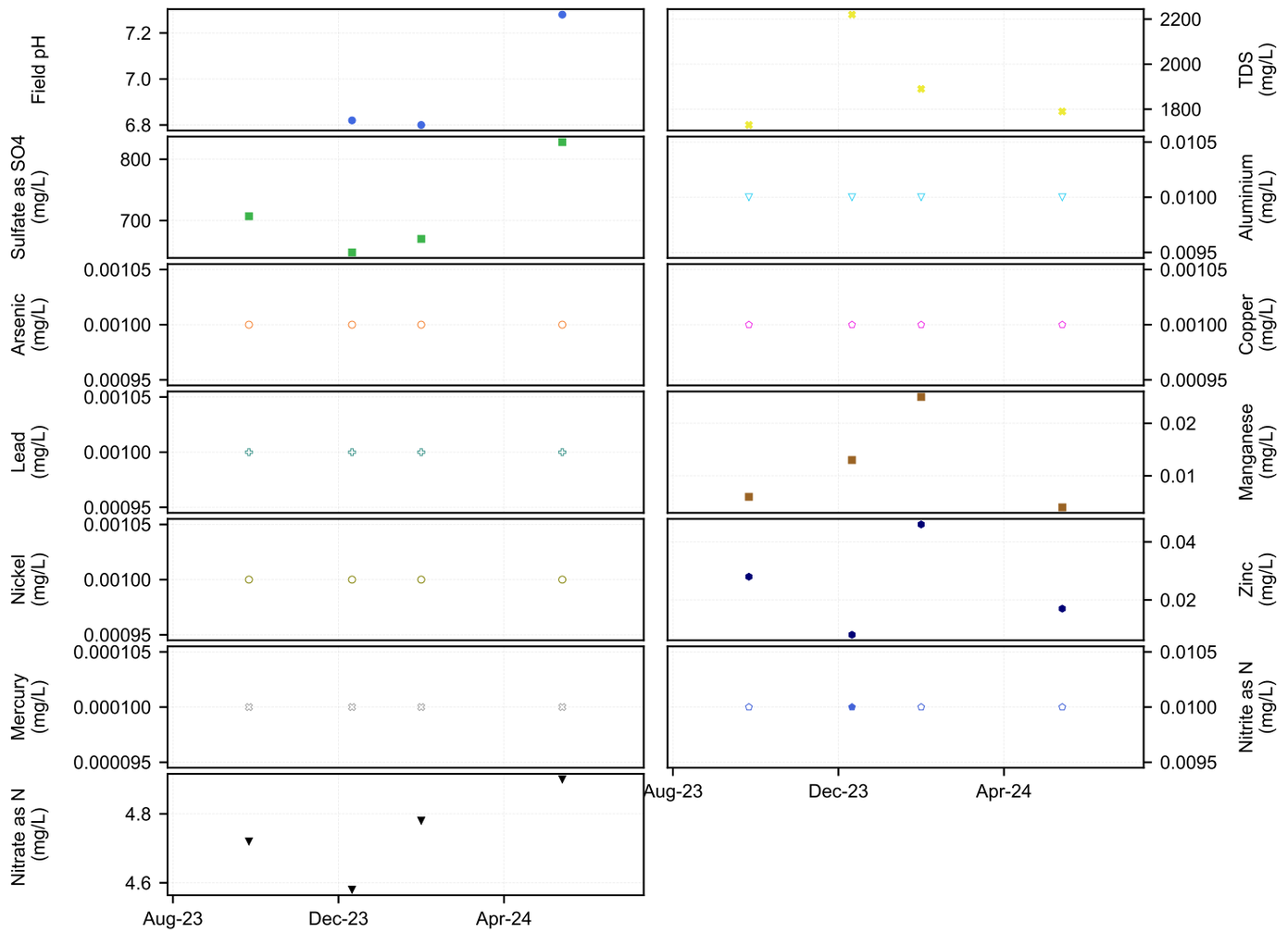
MB133 (Screened geology - Ordovician; Screened interval: 21.5-24.5 mbgl)



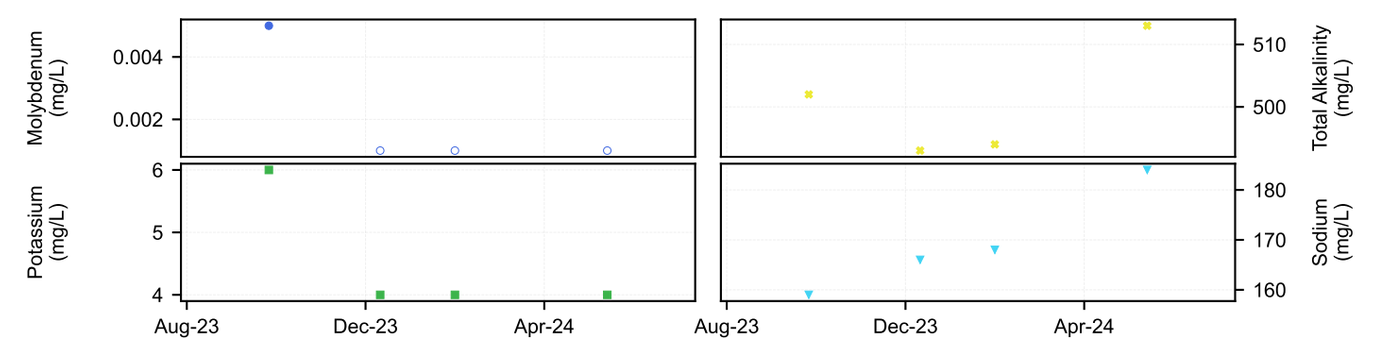
Groundwater levels



WMP defined analytes

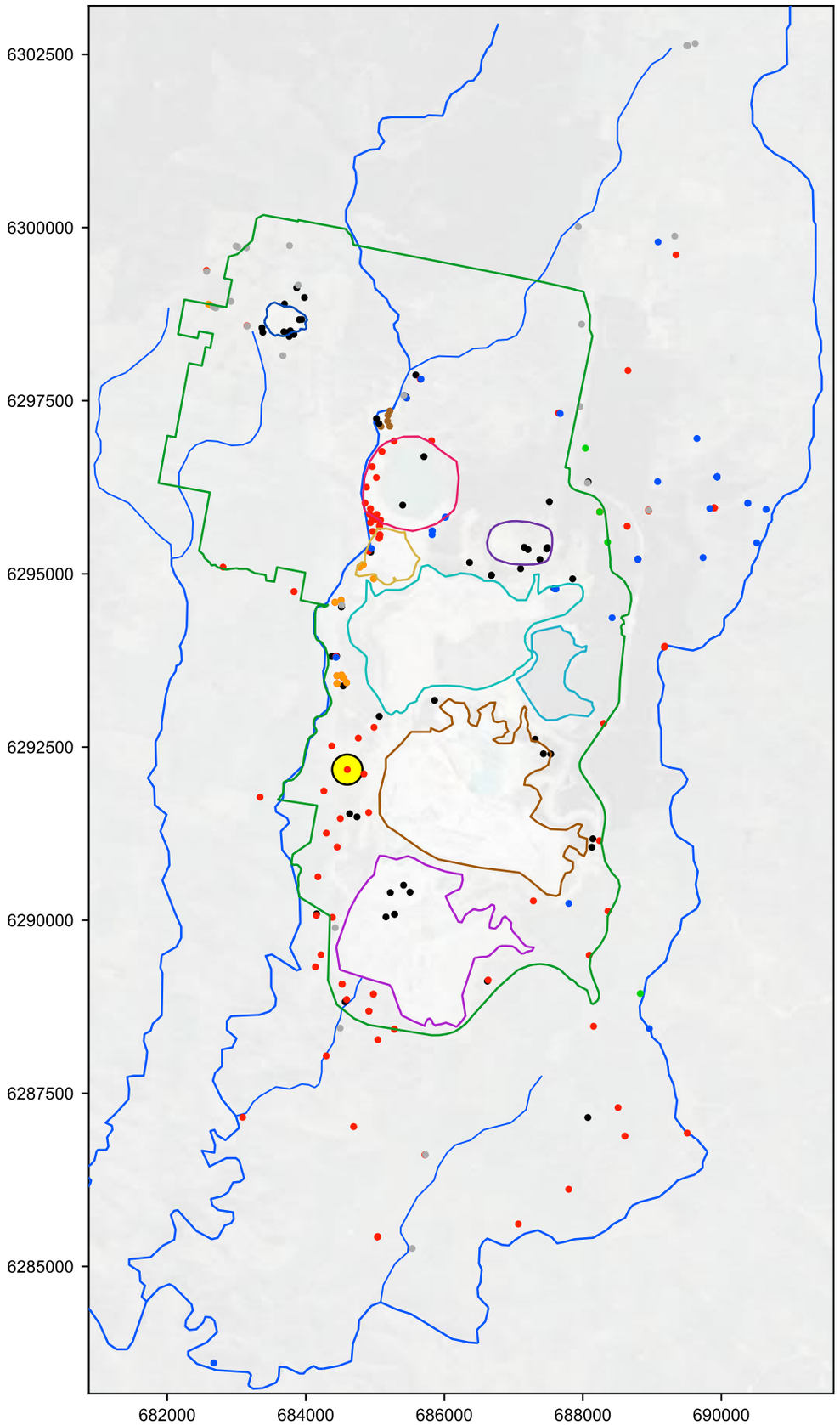


Additional analytes of interest

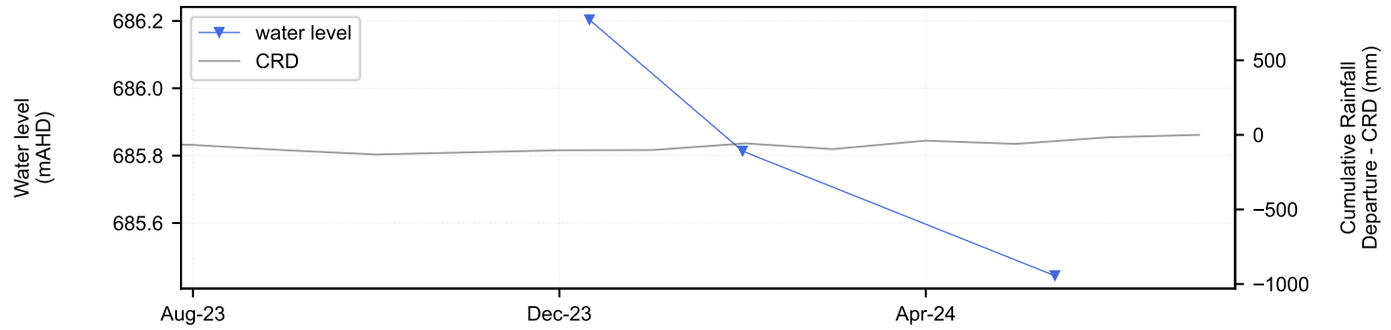


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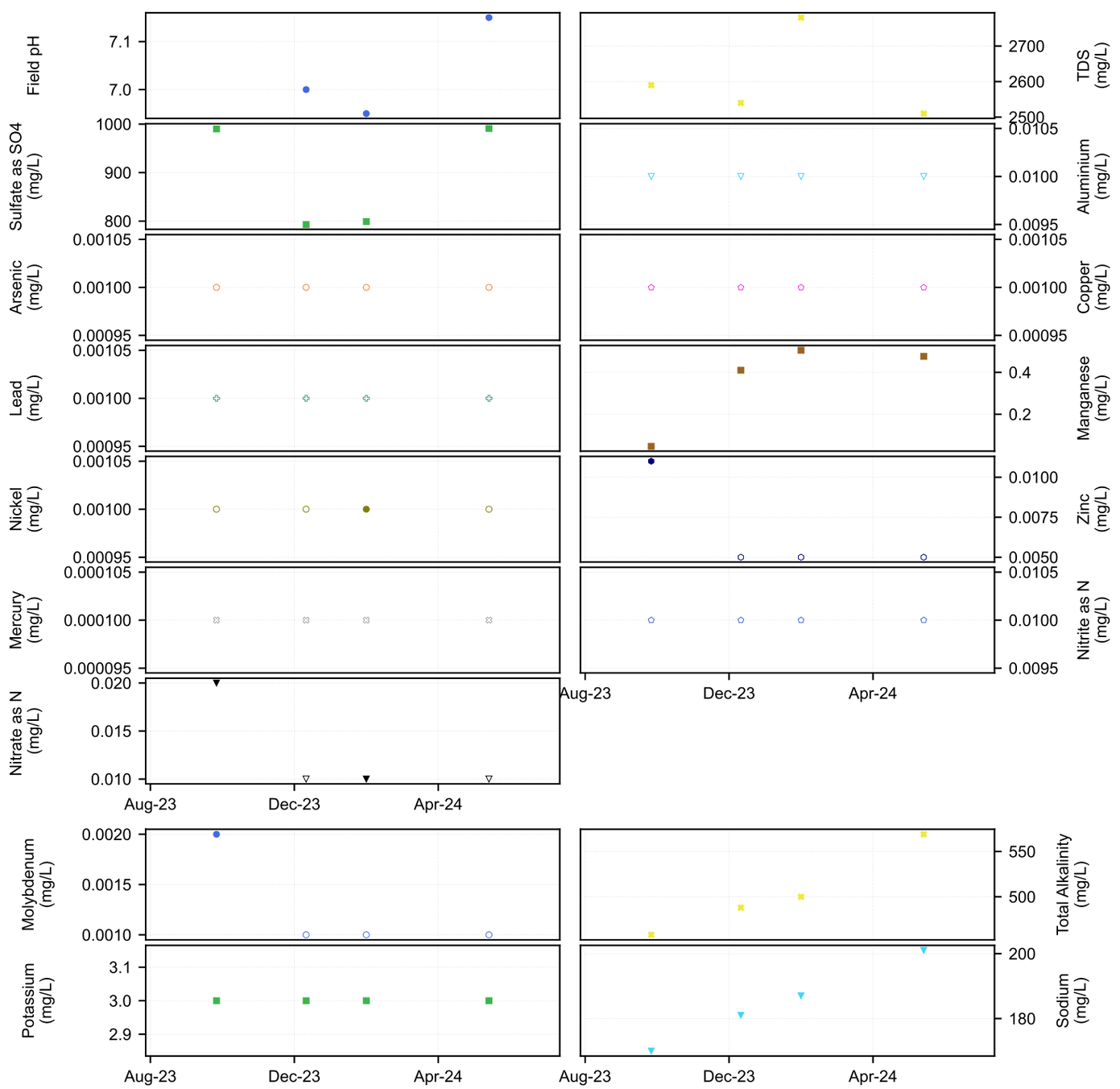
MB134 (Screened geology - Ordovician; Screened interval: 21.5-27.5 mbgl)



Groundwater levels



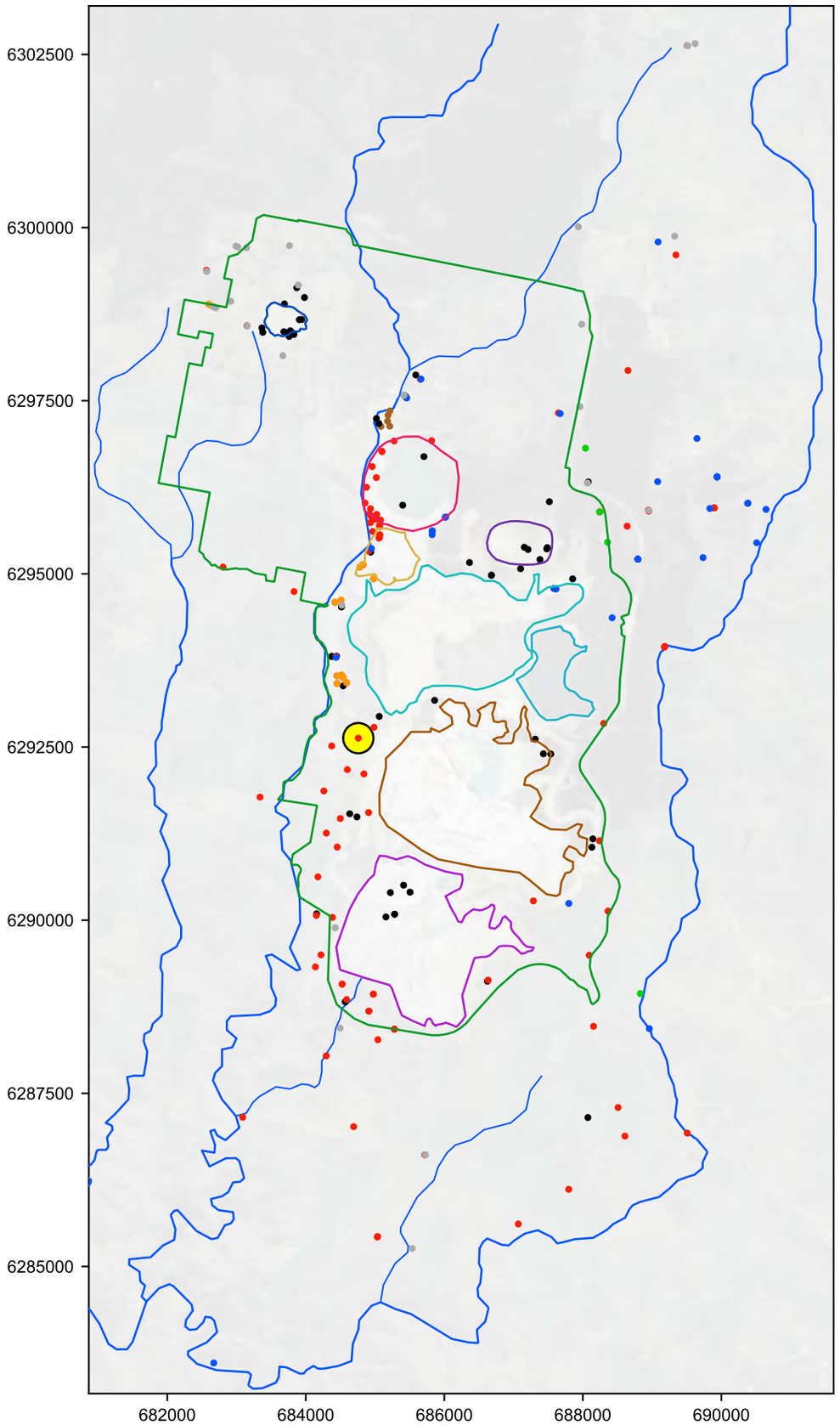
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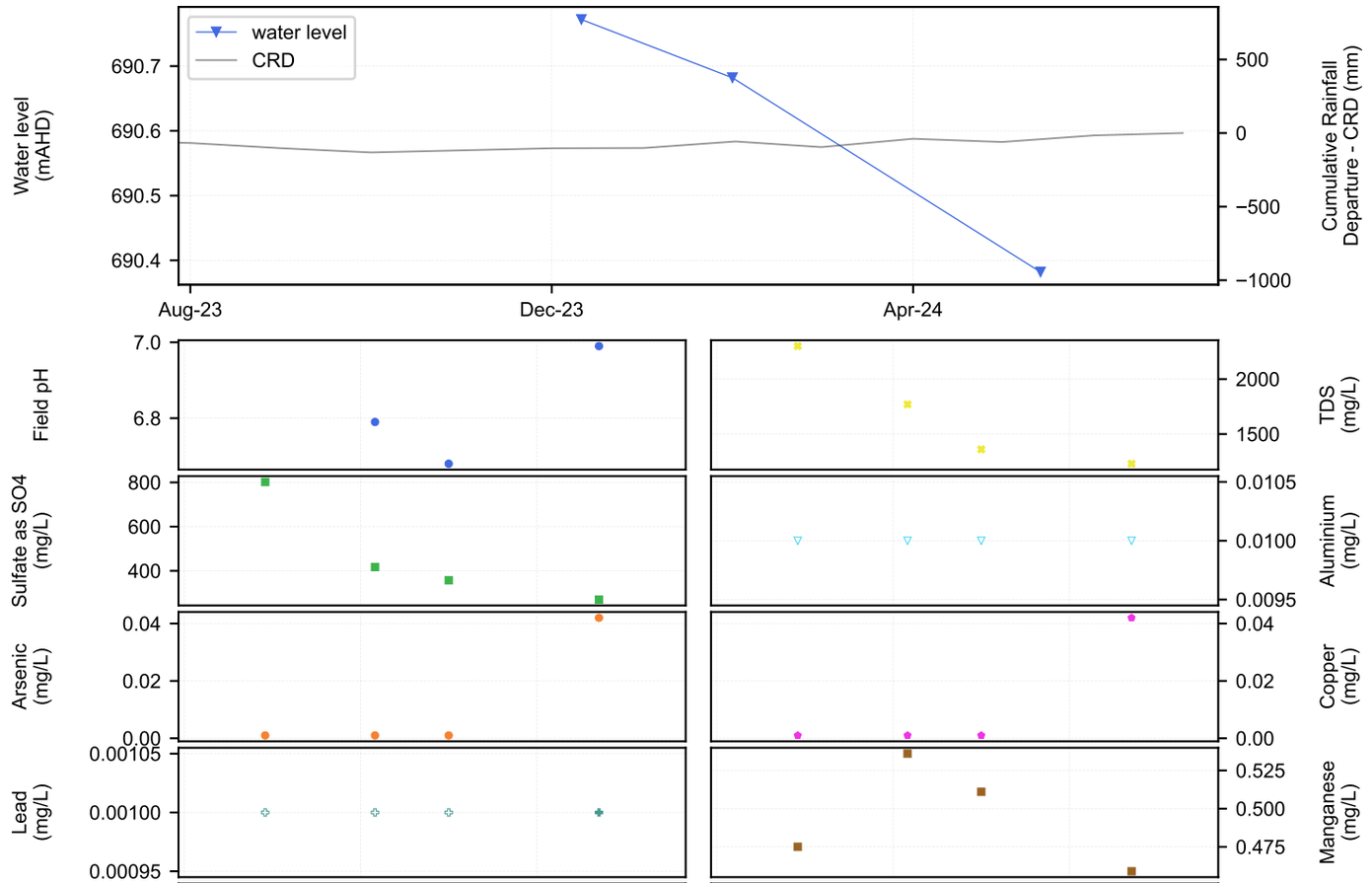
Additional analytes of interest

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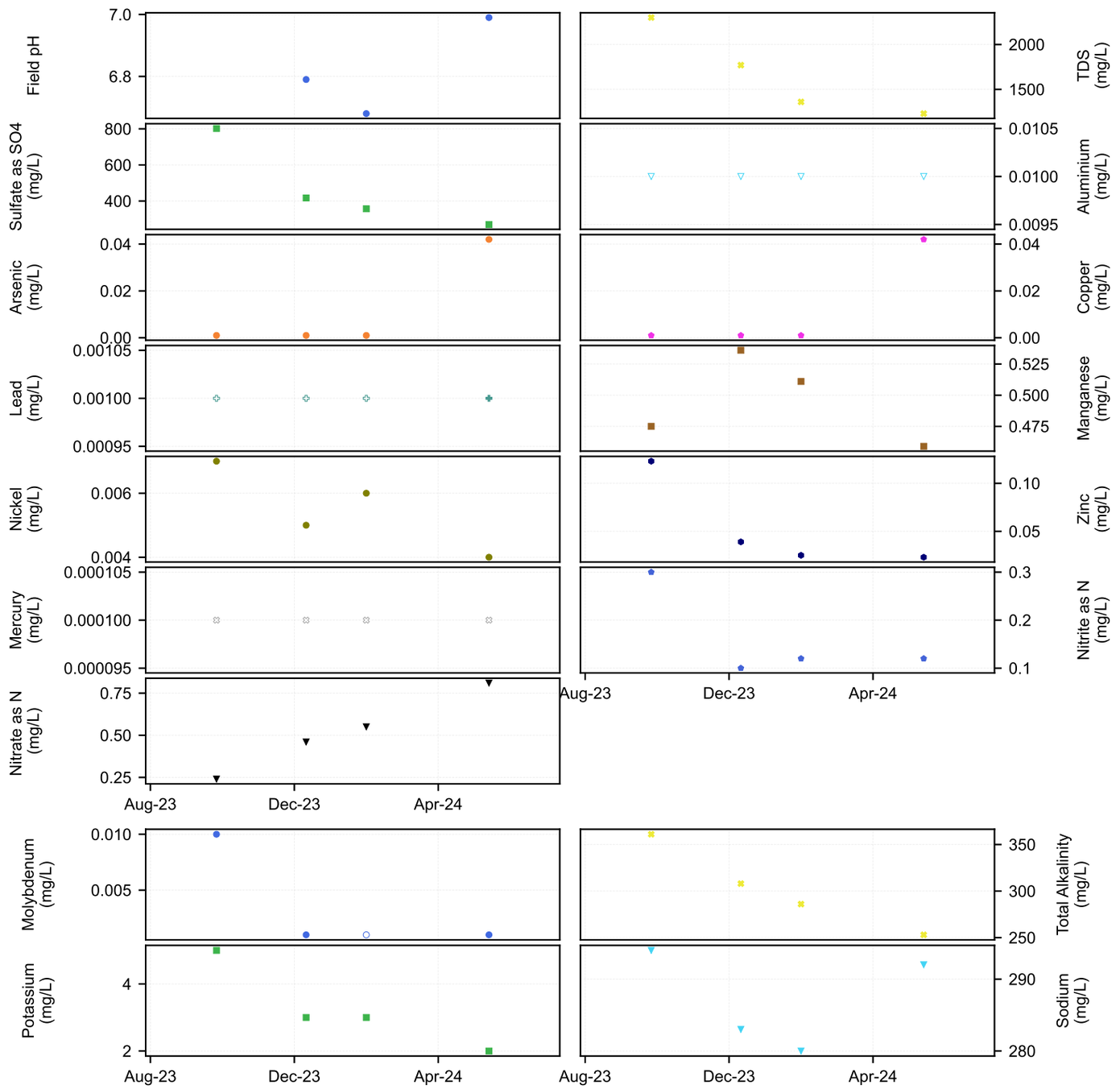
MB135 (Screened geology - Ordovician; Screened interval: 17.0-20.0 mbgl)



Groundwater levels



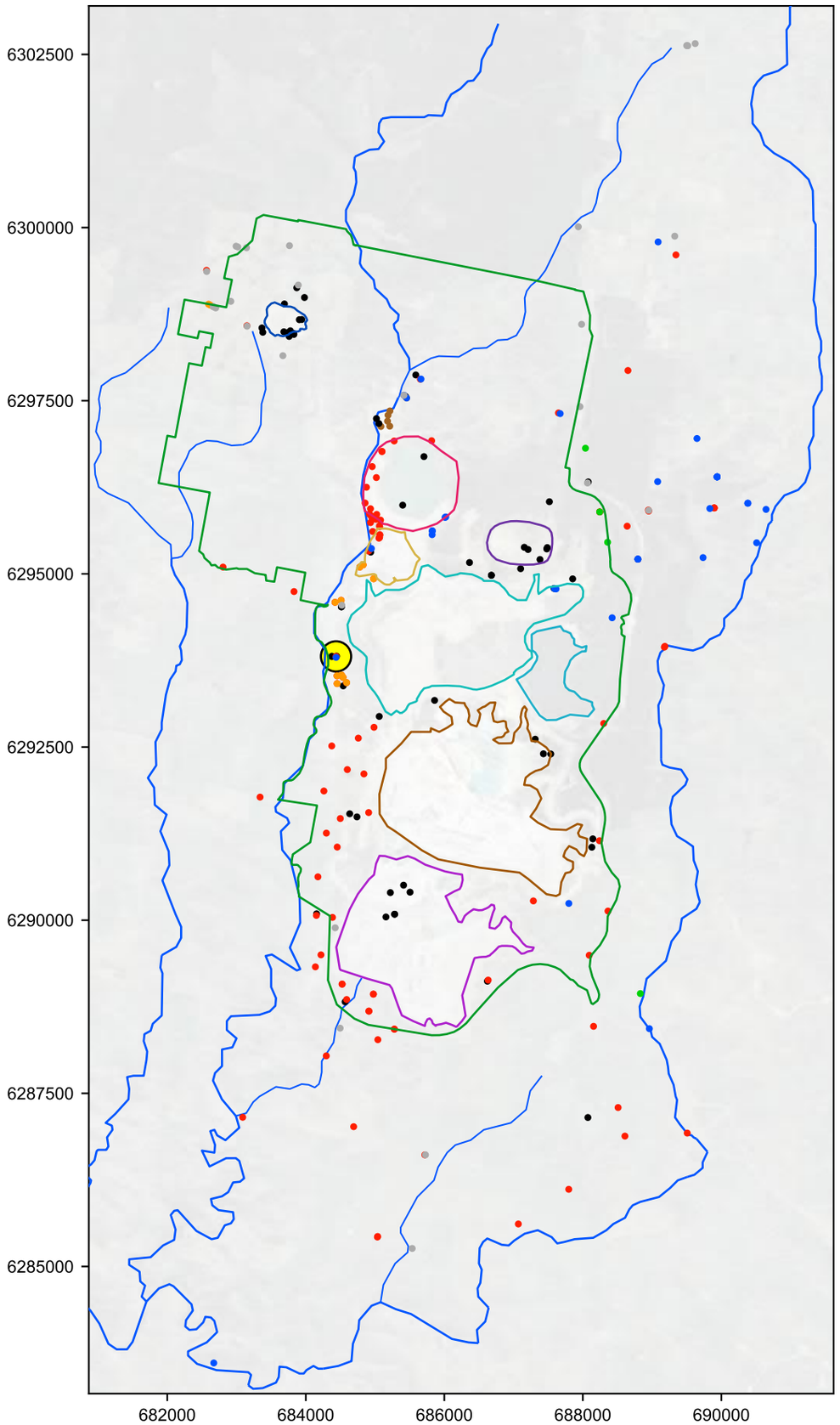
WMP defined analytes



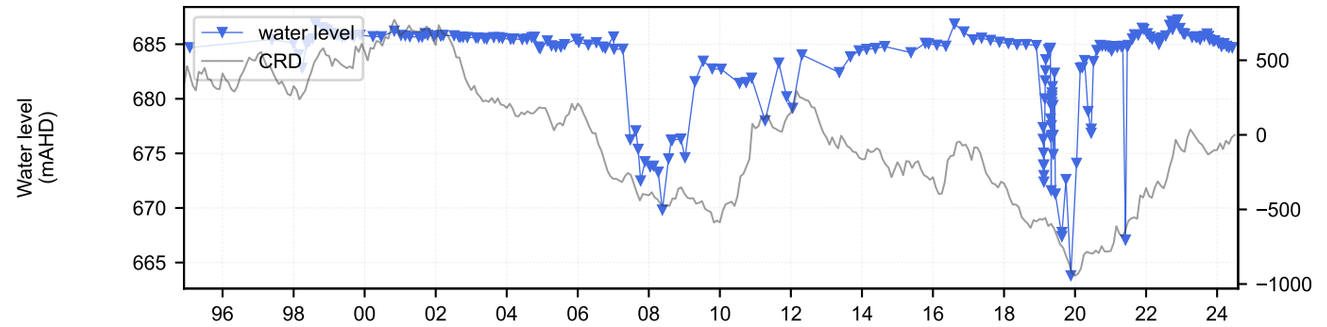
Additional analytes of interest

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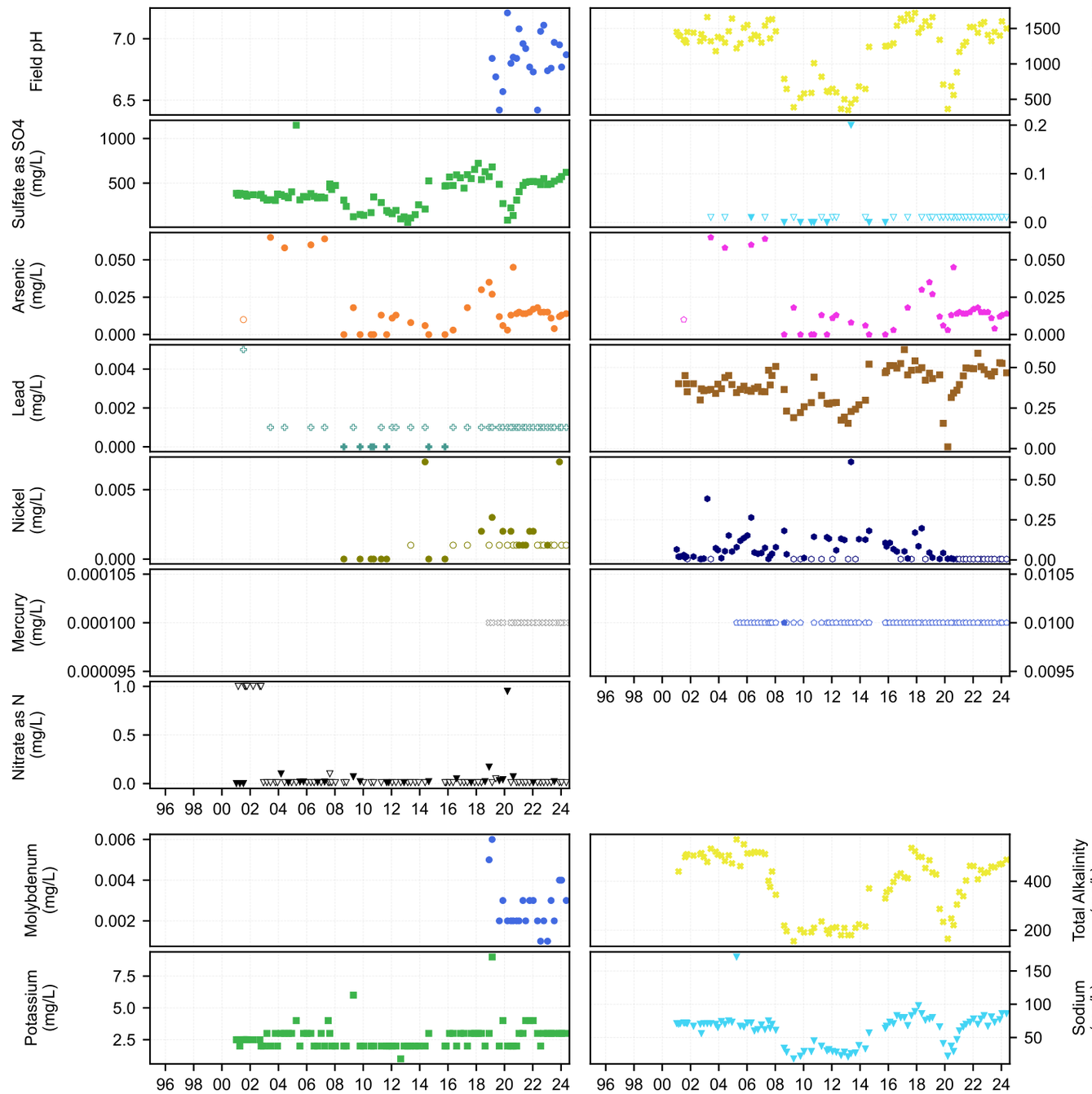
CB6A (Screened geology - Ordovician; Screened interval: 0.5-38 mbgl)



Groundwater levels



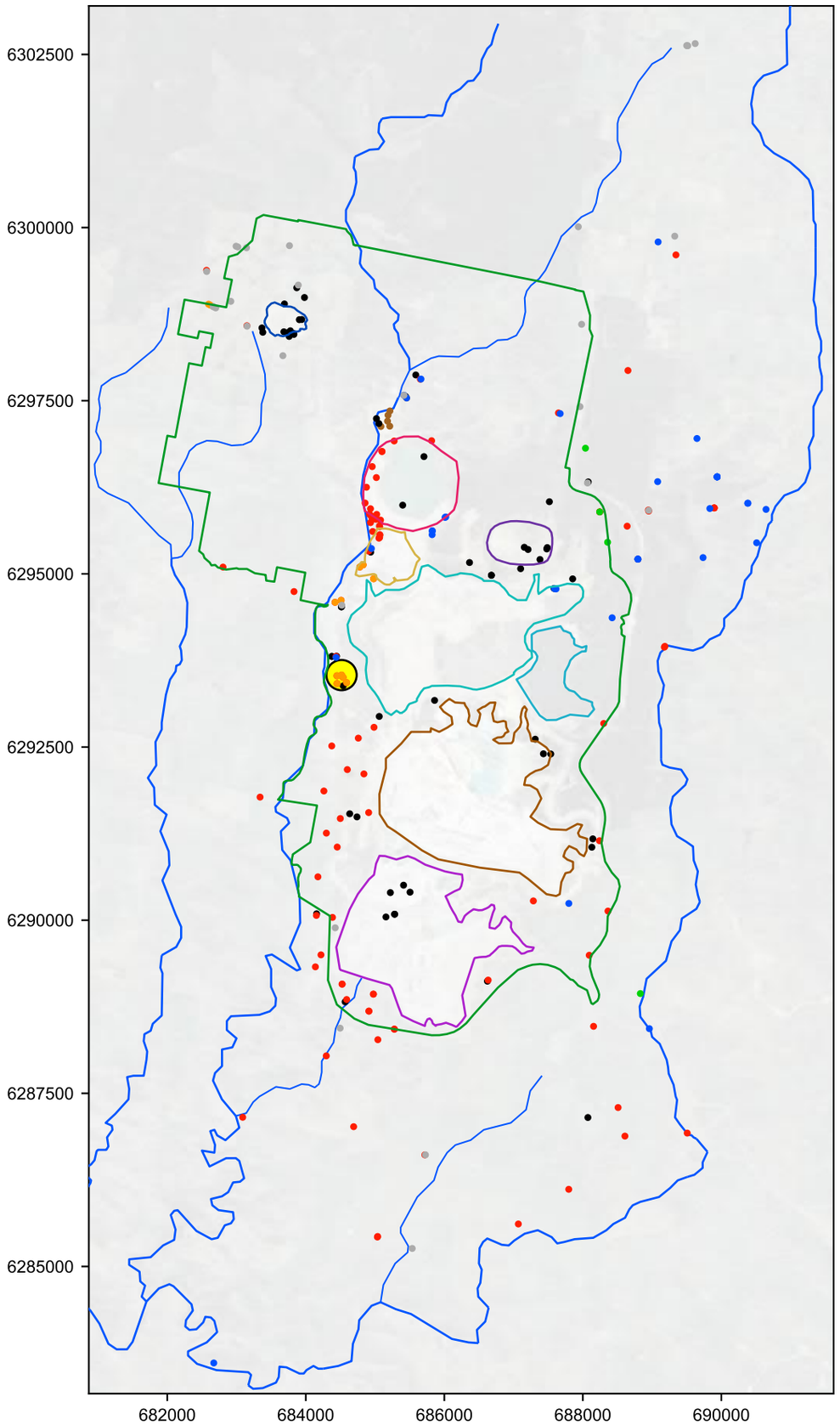
WMP defined analytes



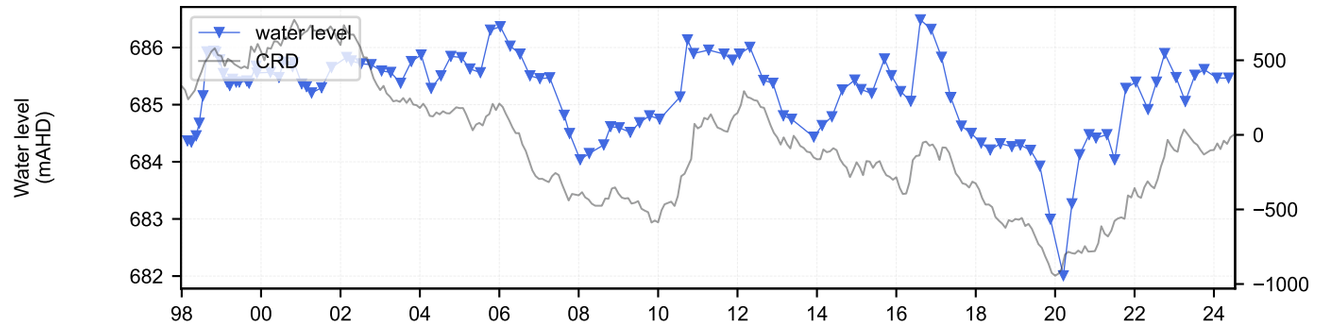
Additional analytes of interest

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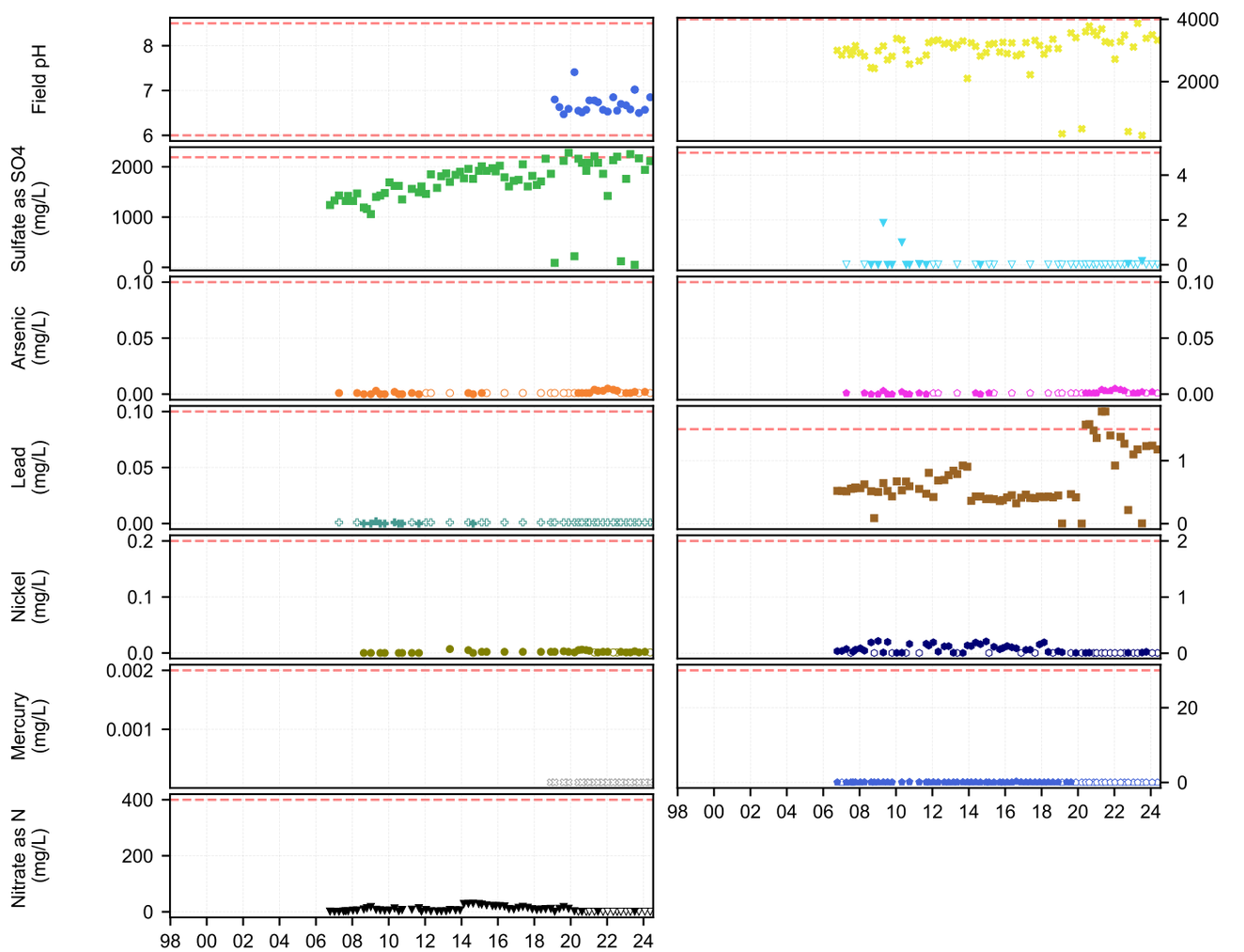
MB10A (Screened geology - Ordovician; Screened interval: 12-18 mbgl)



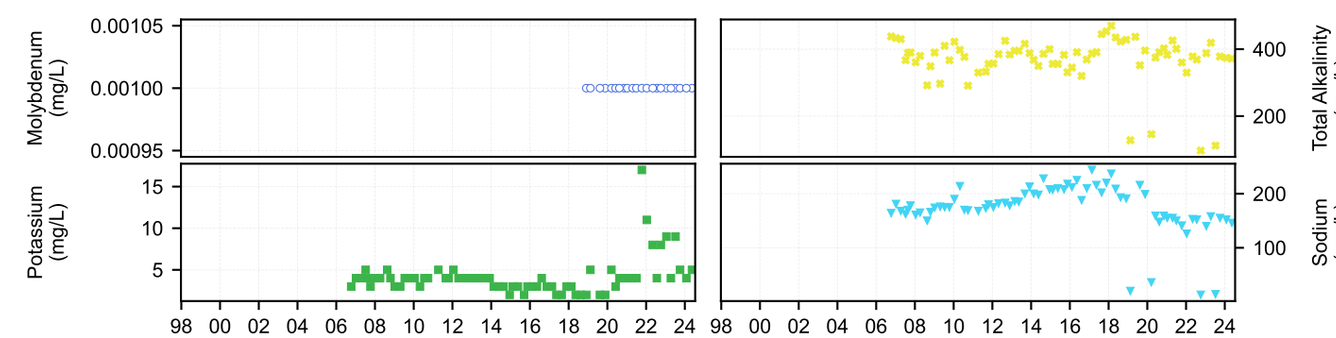
Groundwater levels



WMP defined analytes

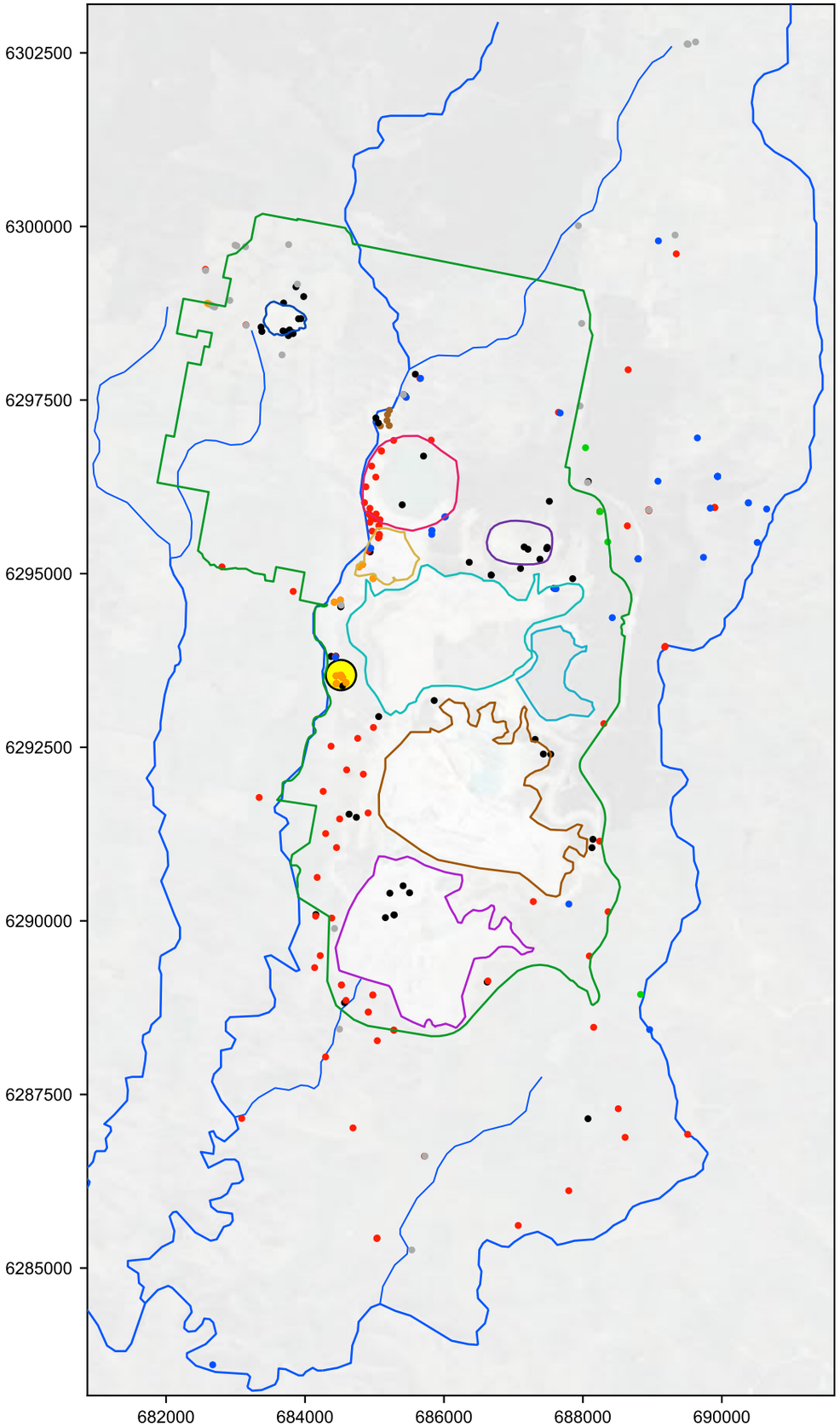


Additional analytes of interest

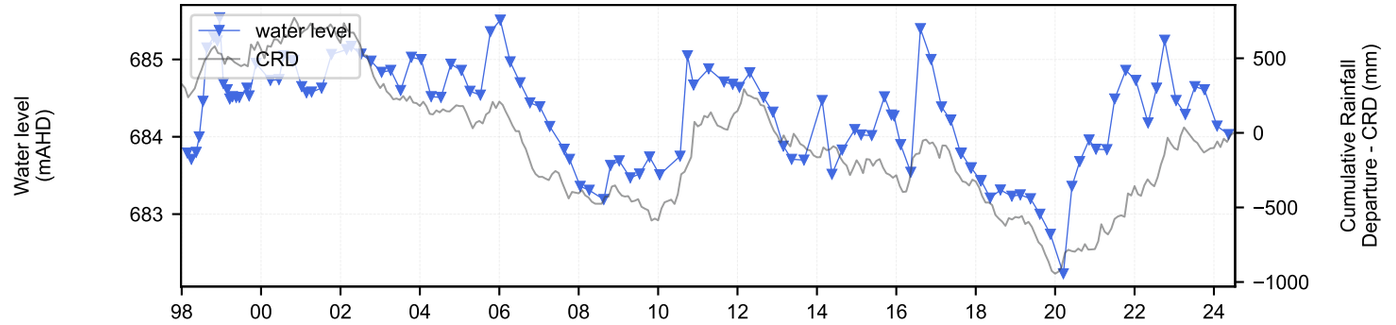


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

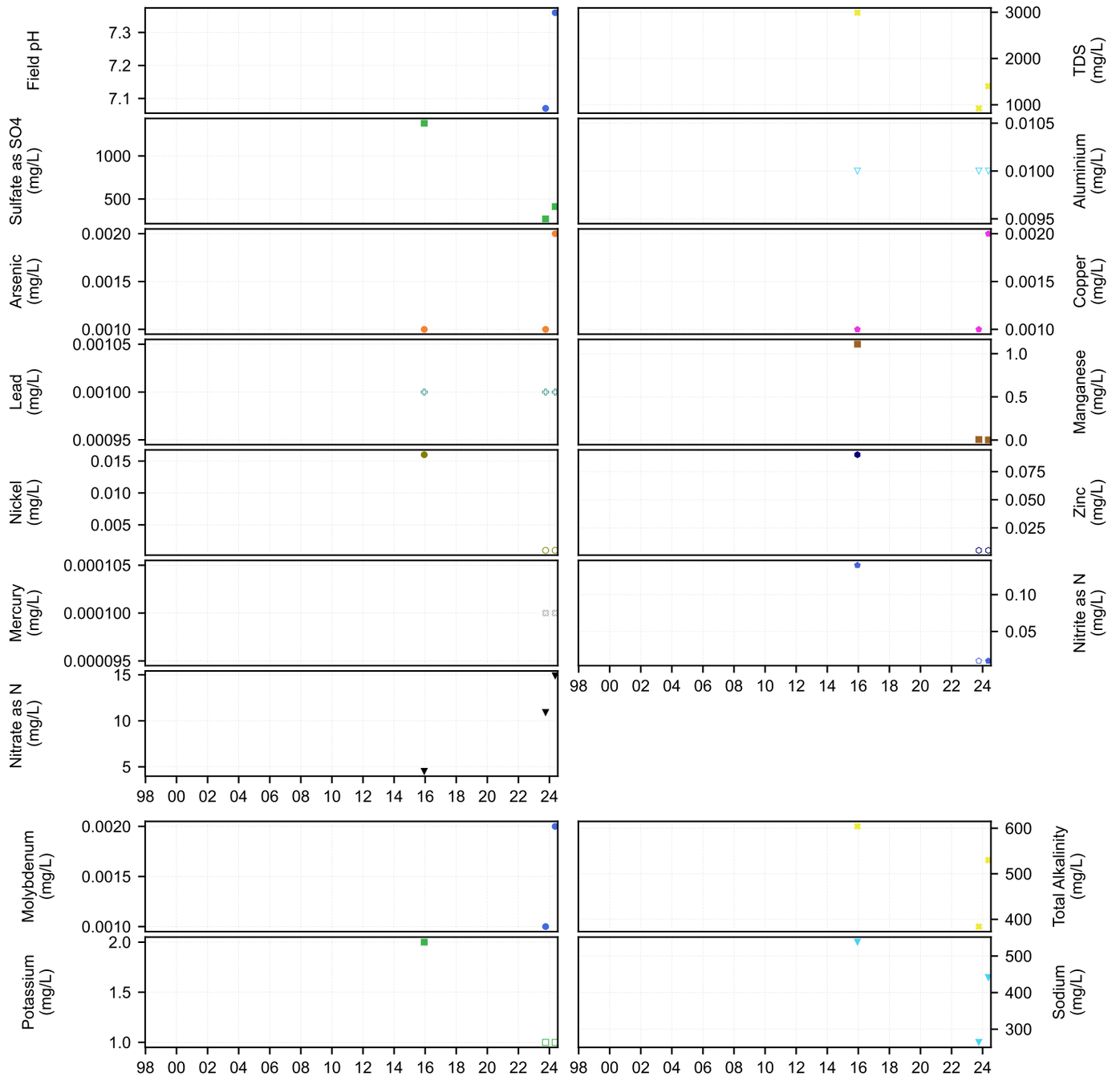
MB10B (Screened geology - Regolith; Screened interval: 0.7-6.7 mbgl)



Groundwater levels



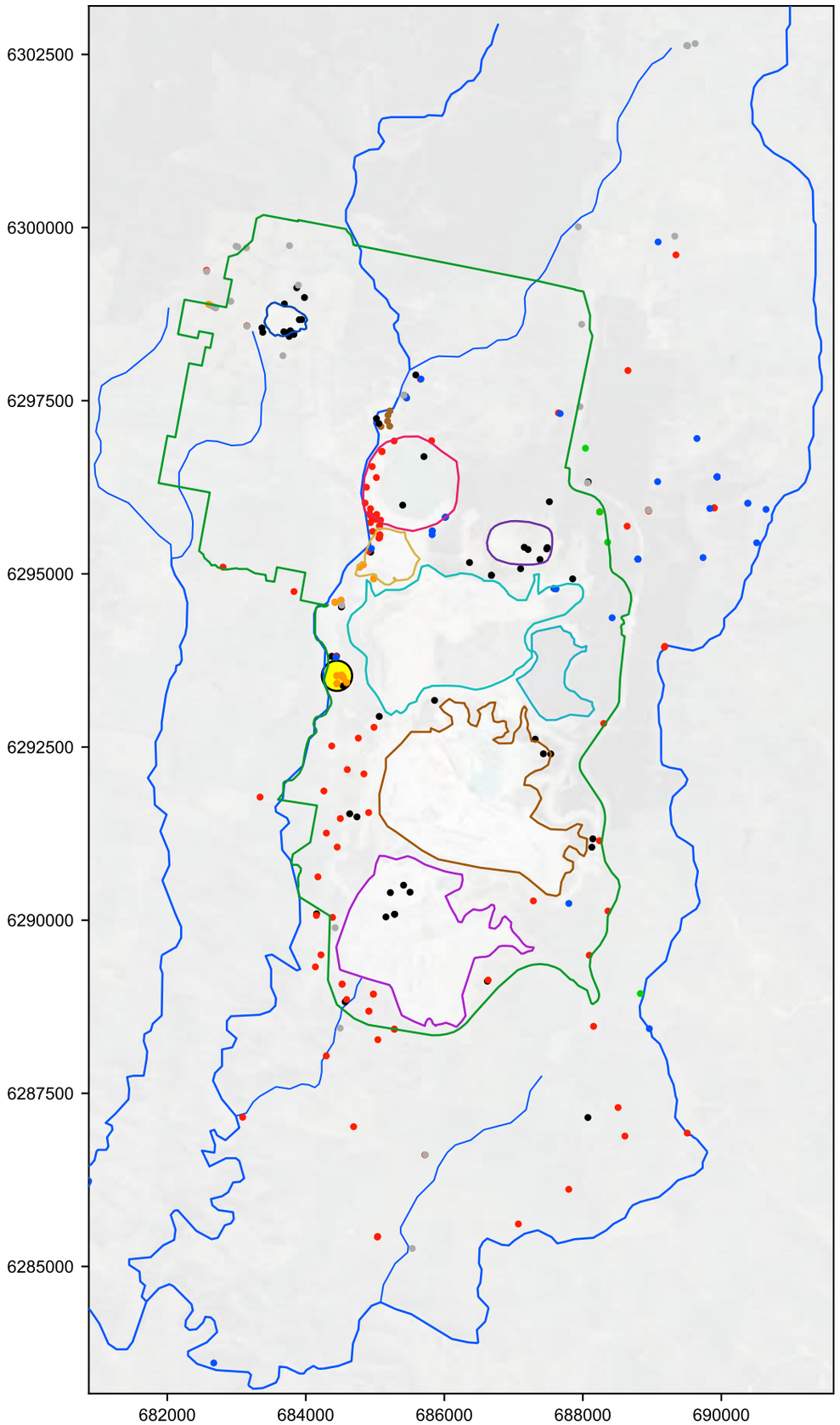
WMP defined analytes



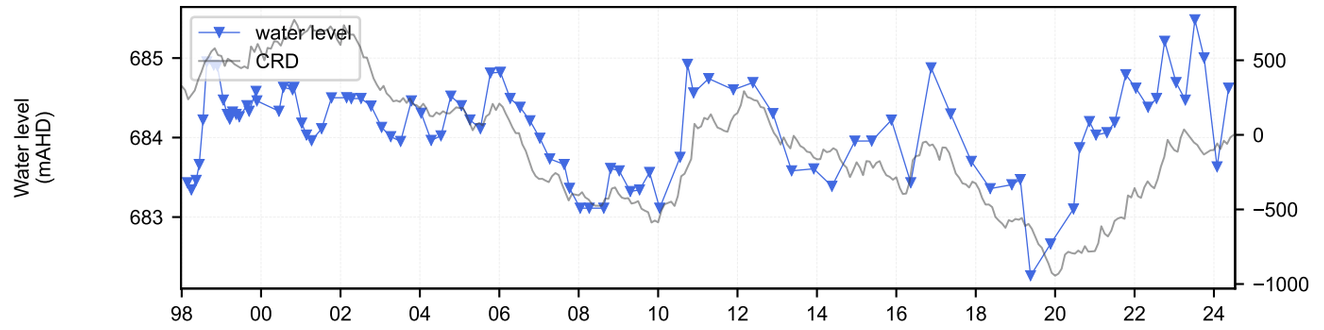
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

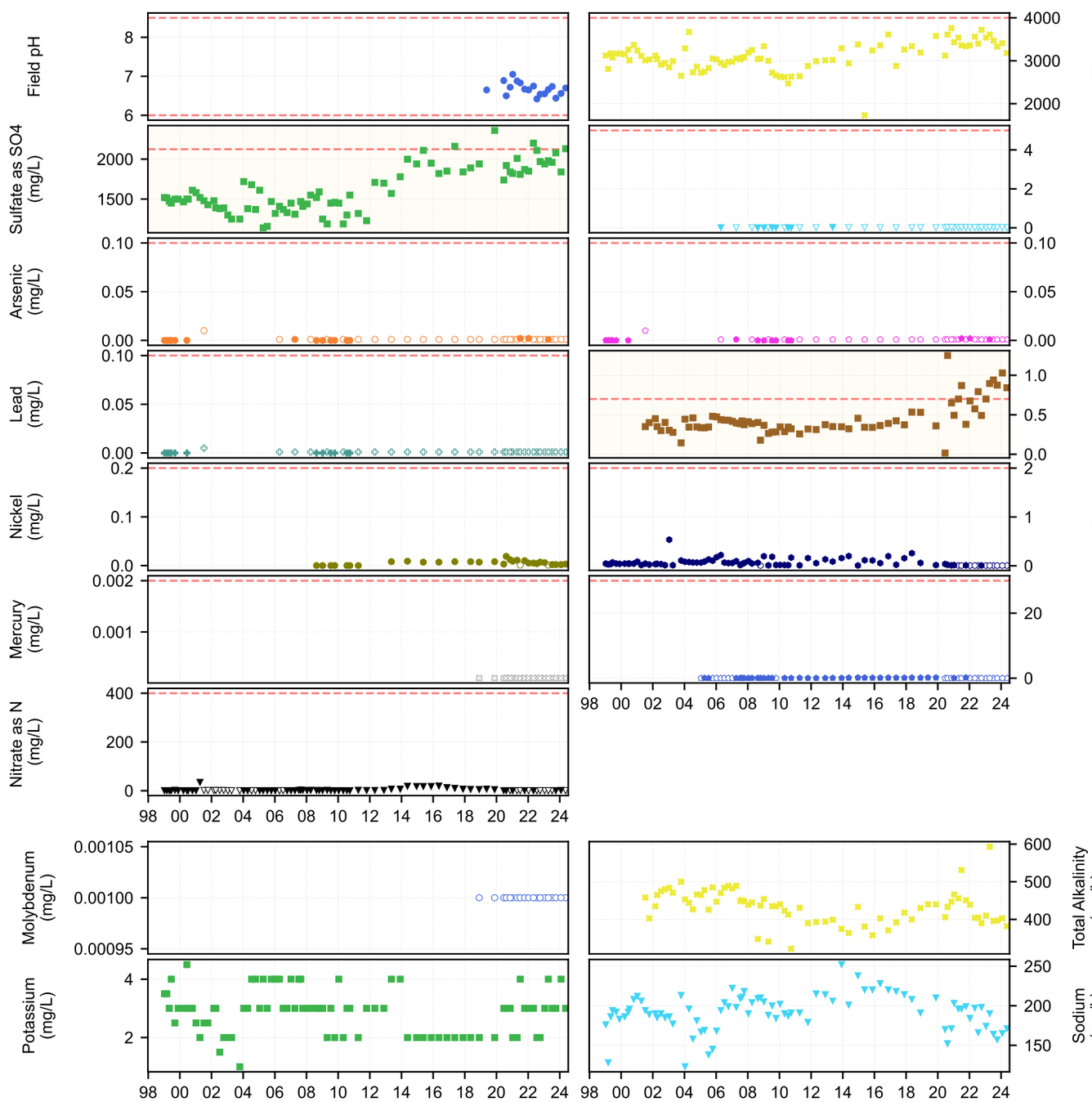
MB11A (Screened geology - Ordovician; Screened interval: 12-18 mbgl)



Groundwater levels



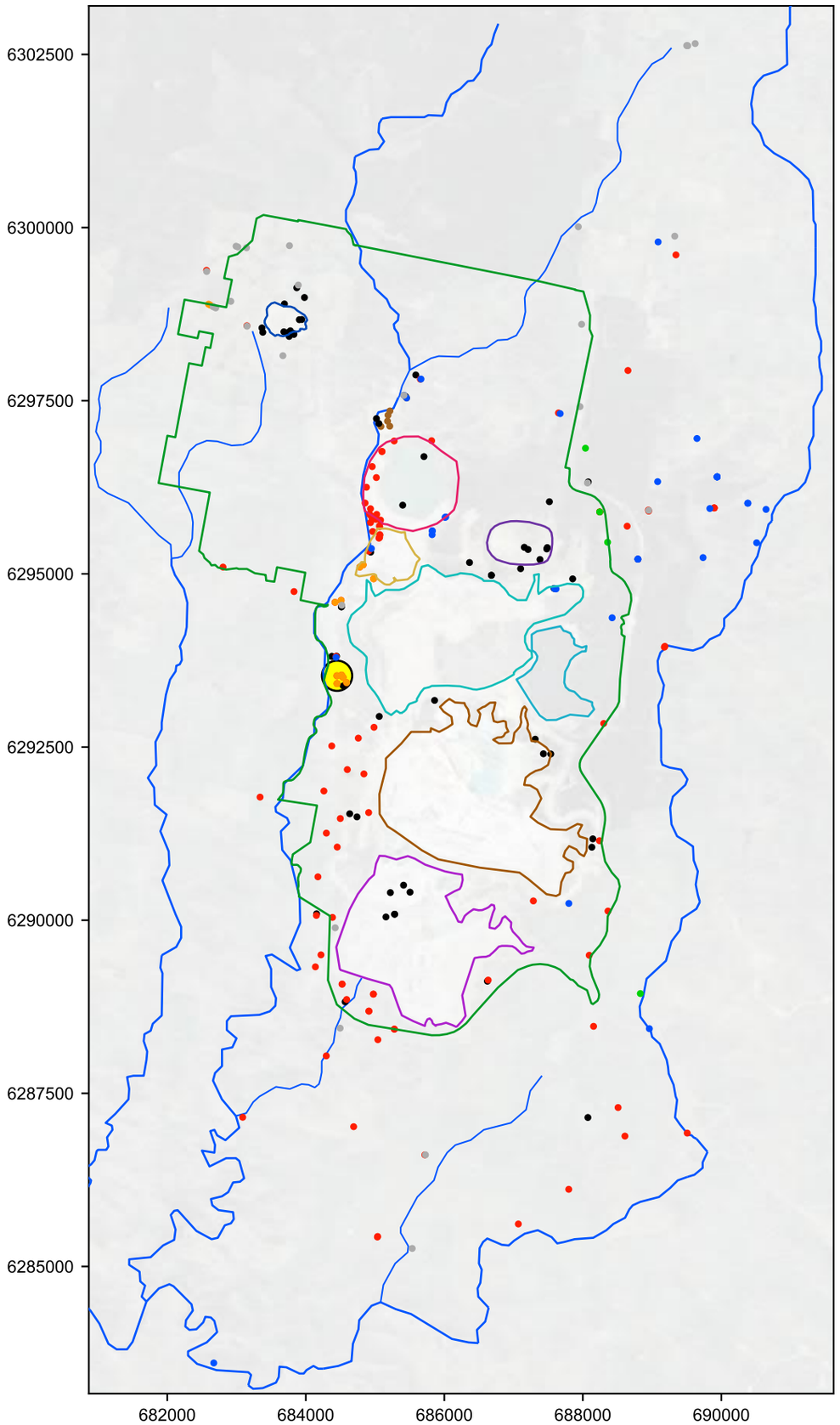
WMP defined analytes



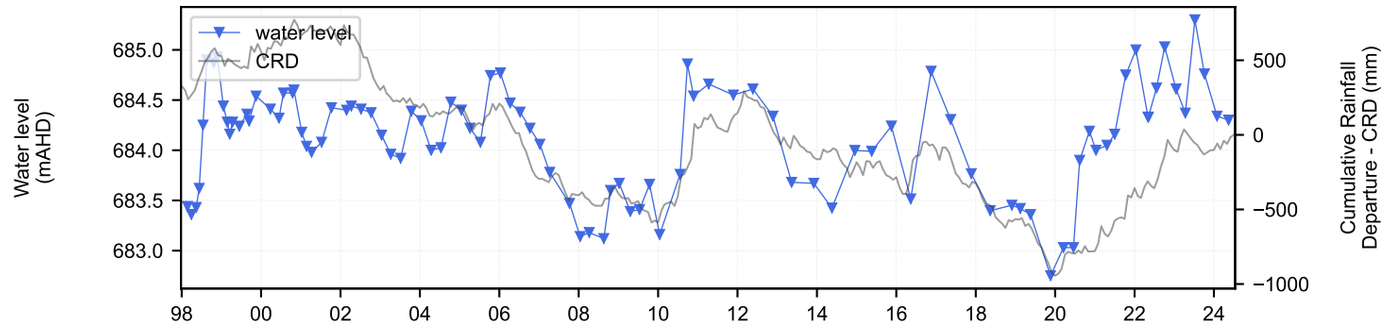
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

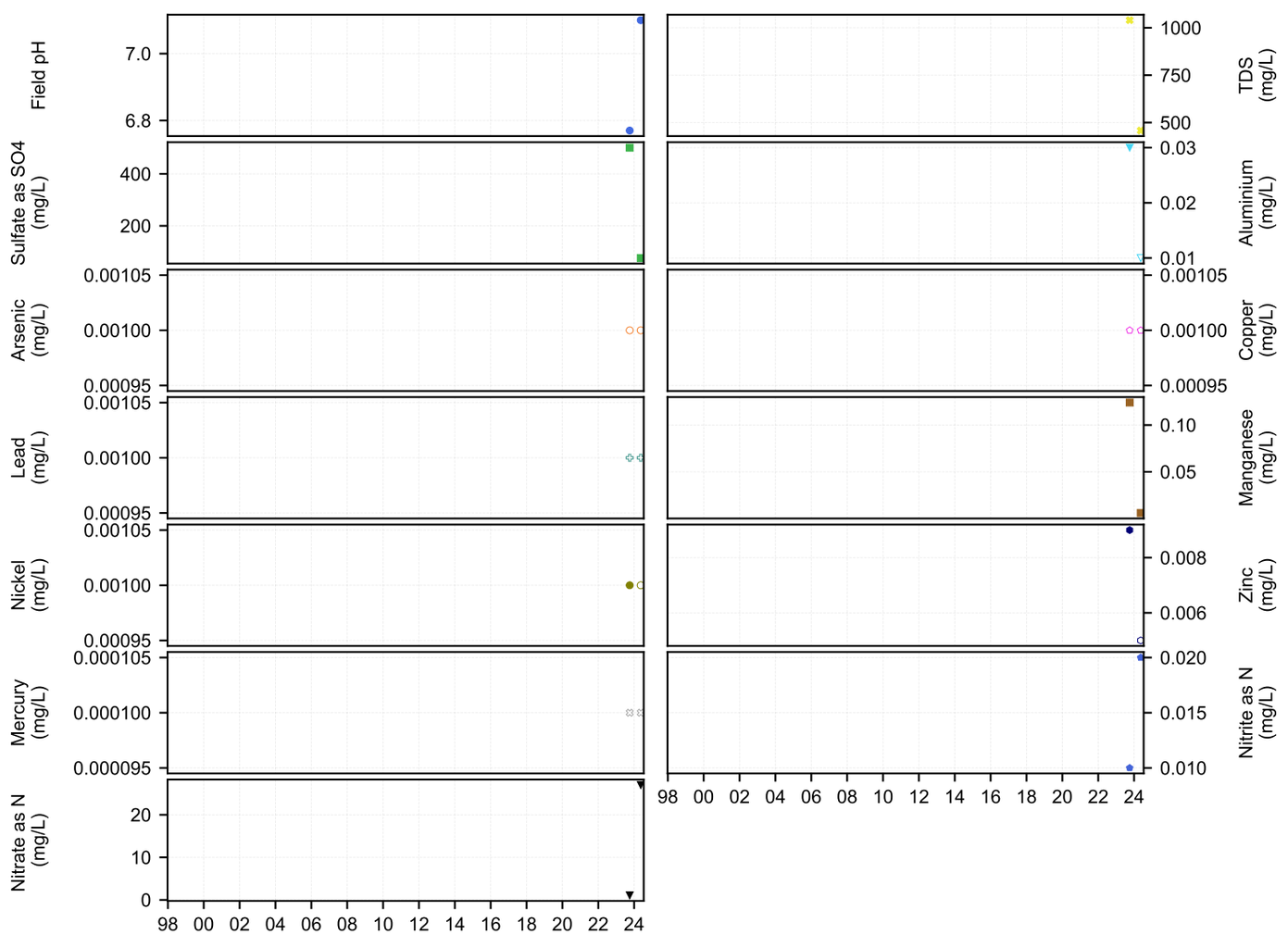
MB11B (Screened geology - Regolith; Screened interval: 3.2-5.0 mbgl)



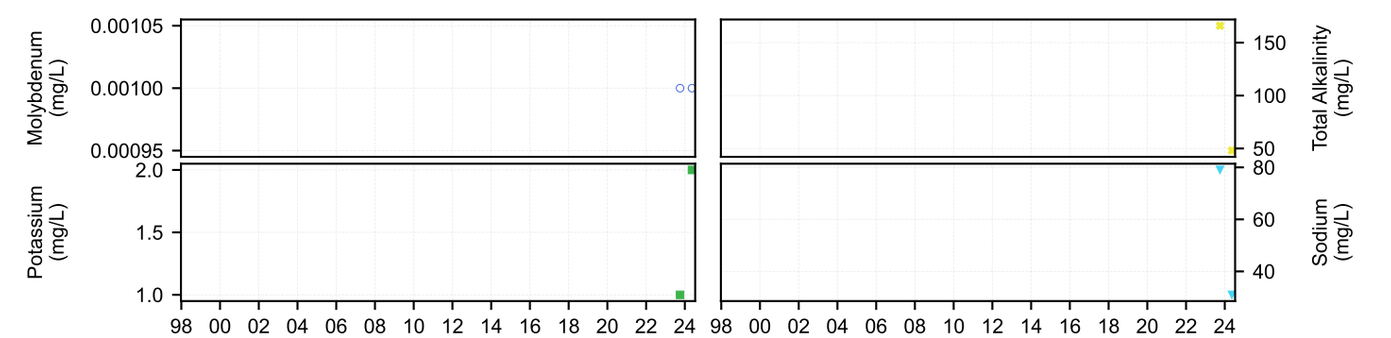
Groundwater levels



WMP defined analytes

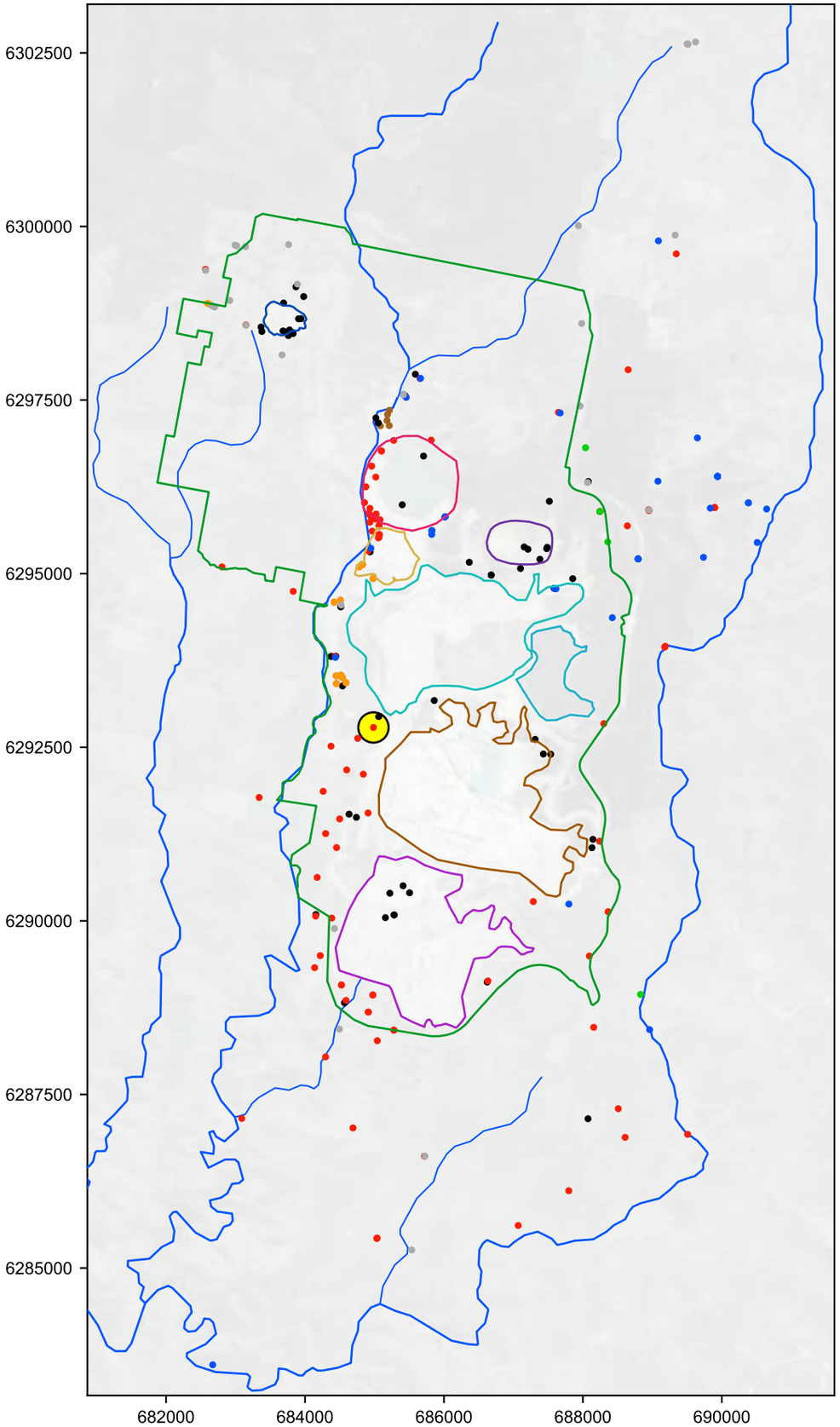


Additional analytes of interest

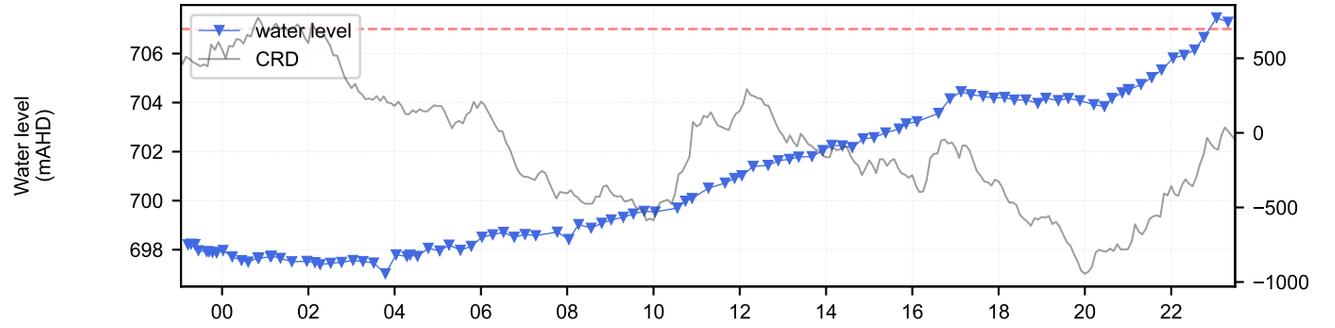


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

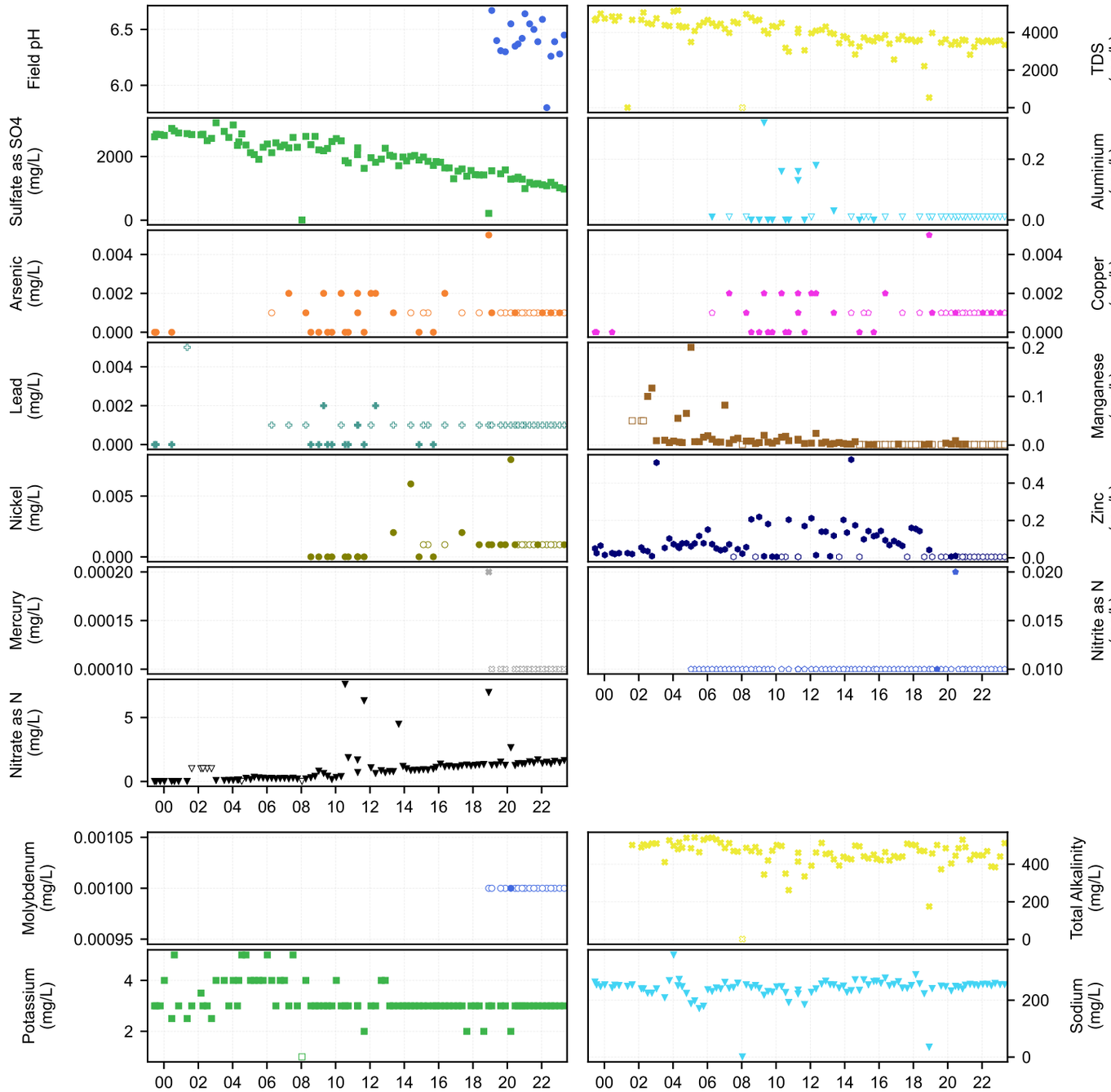
MB18 (Screened geology - Ordovician; Screened interval: 17.6-29.6 mbgl)



Groundwater levels



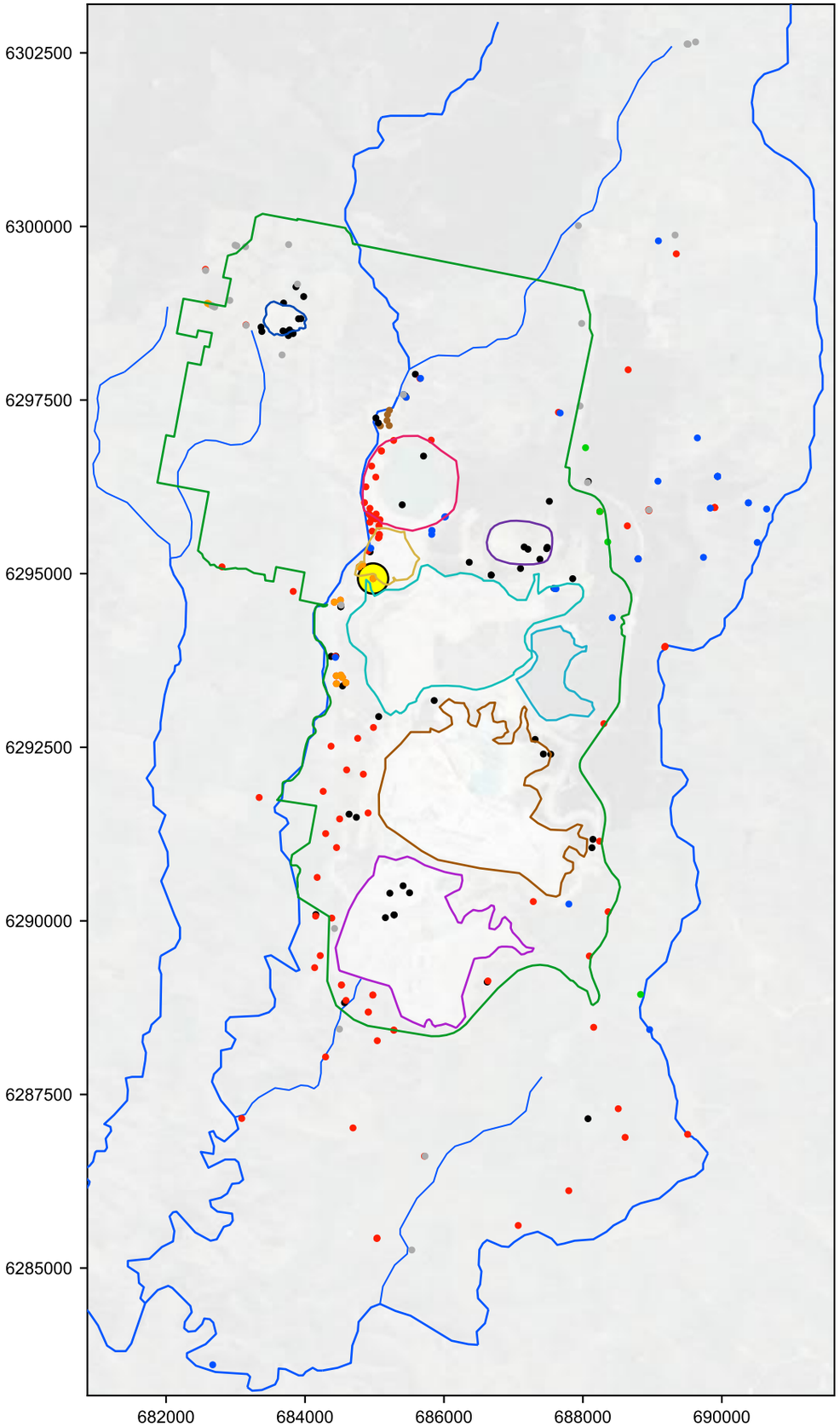
WMP defined analytes



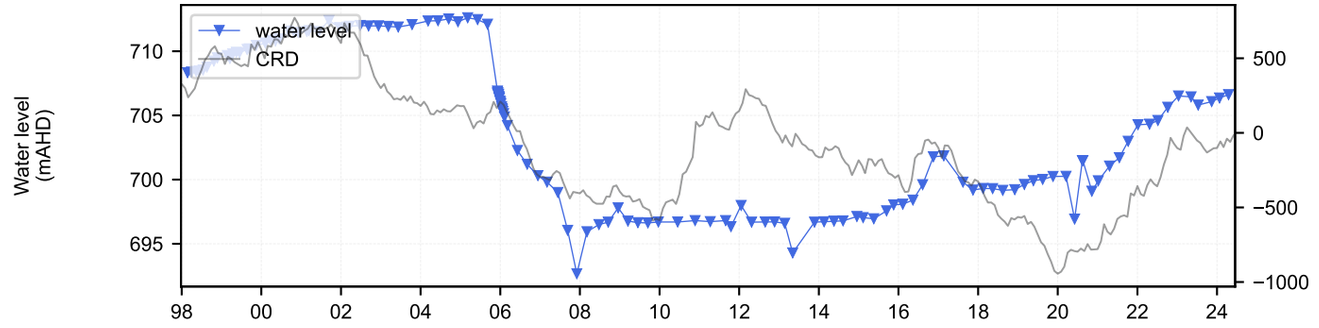
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

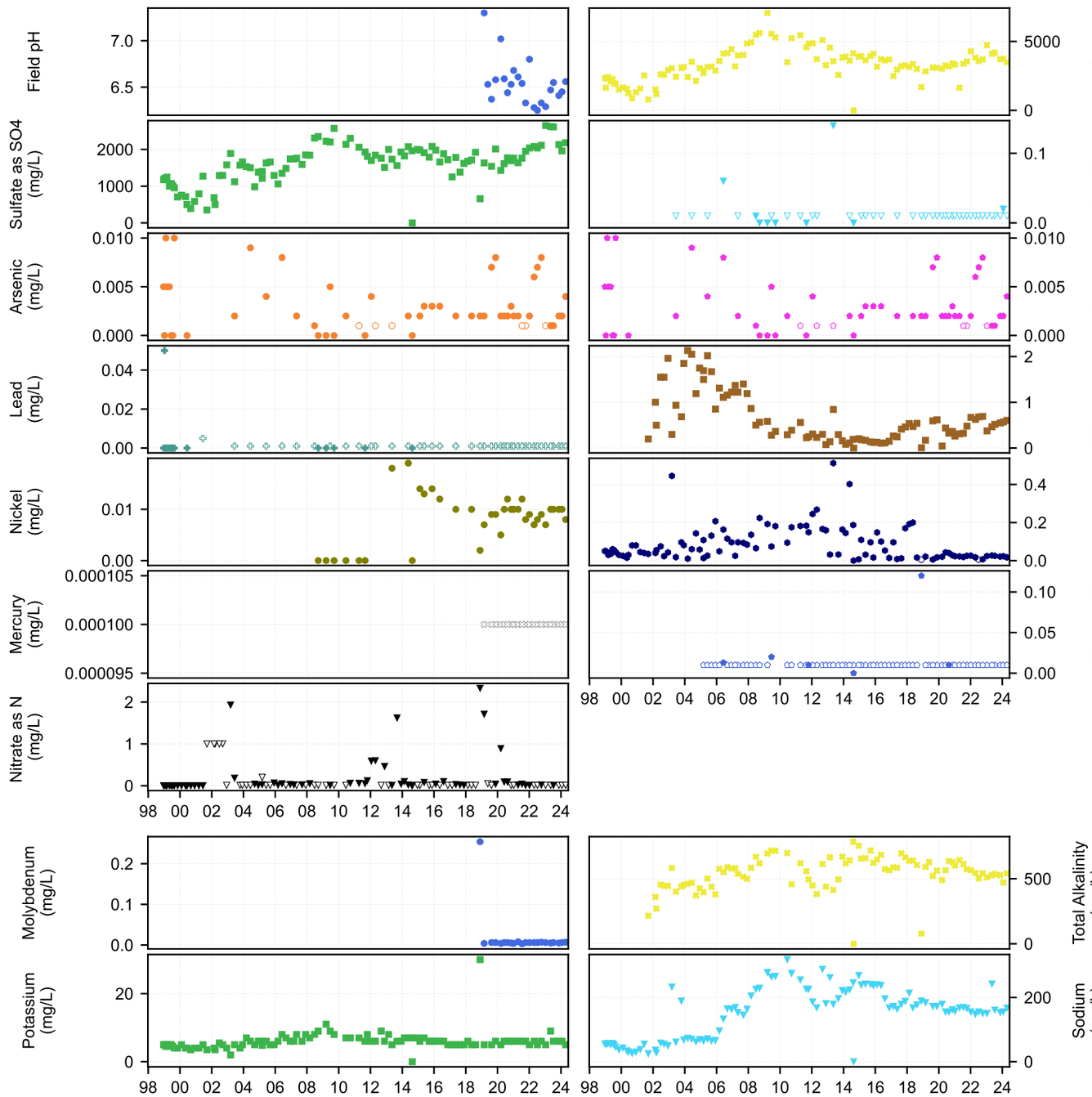
MB1A (Screened geology - Ordovician; Screened interval: 28.5-34.5 mbgl)



Groundwater levels



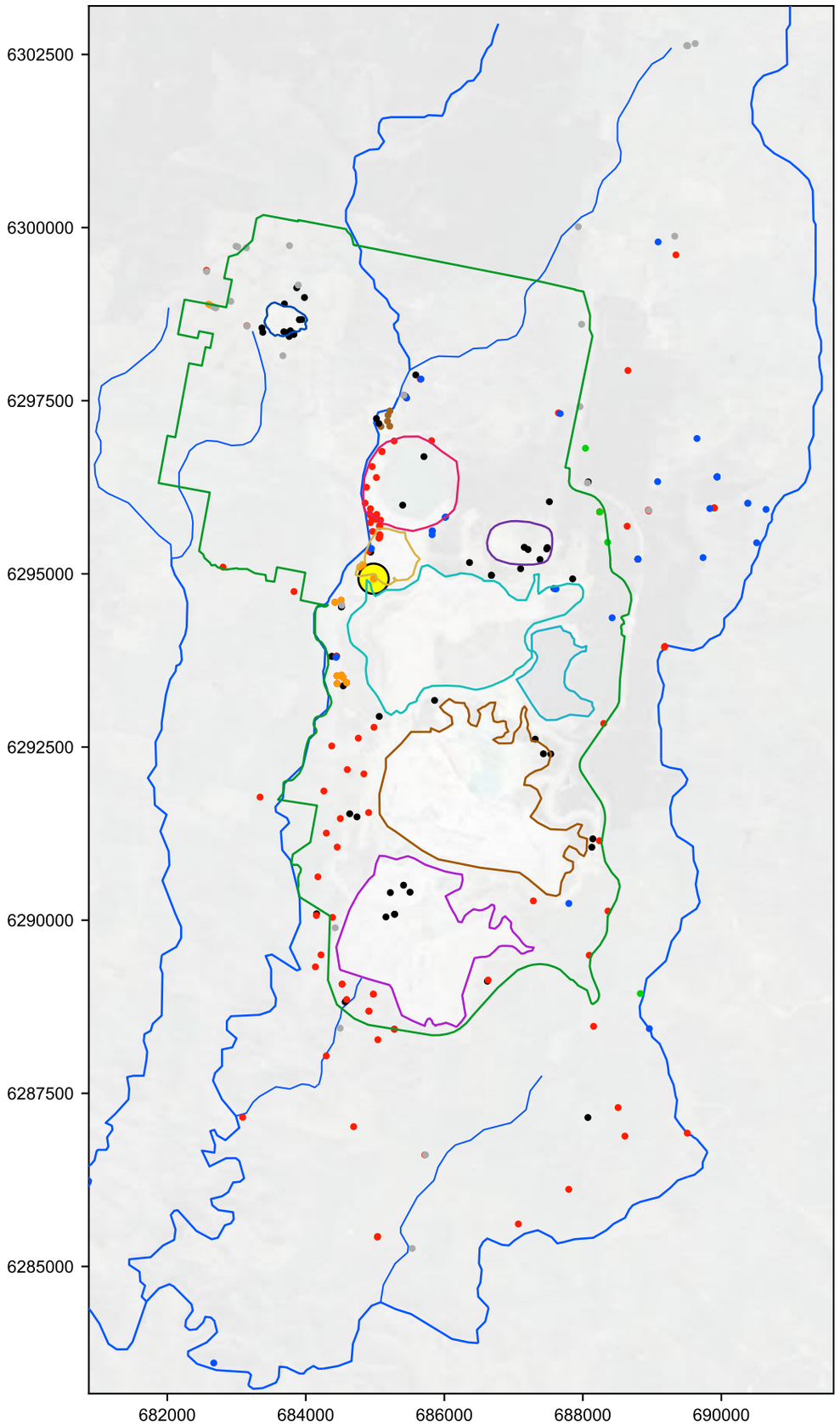
WMP defined analytes



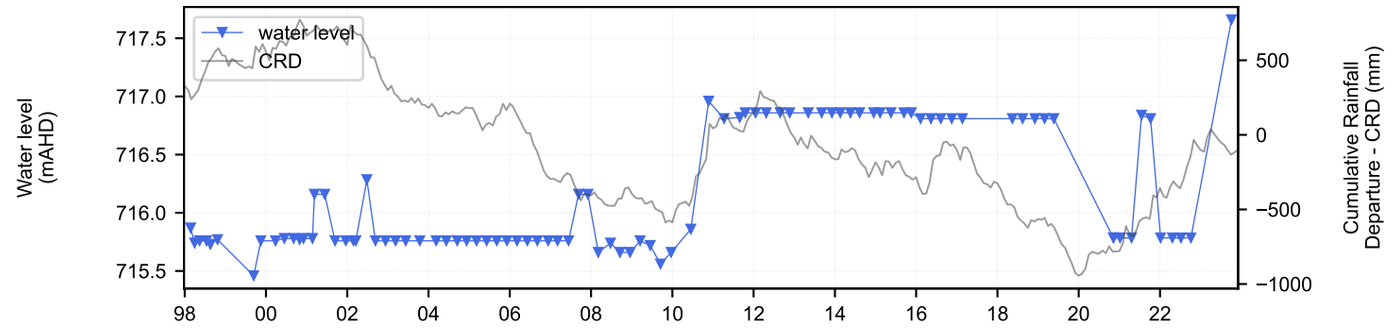
Additional analytes of interest

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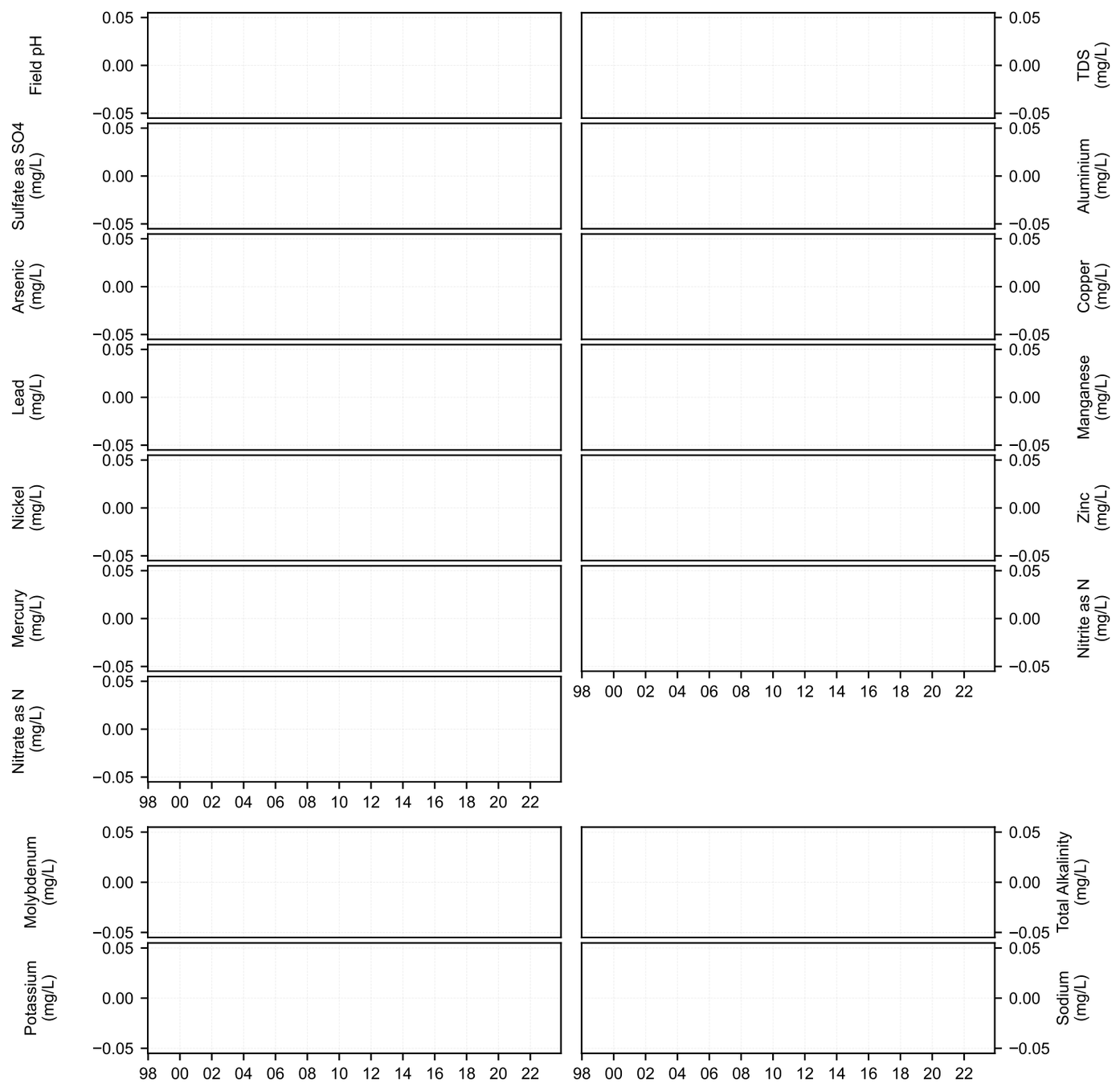
MB1B (Screened geology - Regolith; Screened interval: 0.3-6.3 mbgl)



Groundwater levels



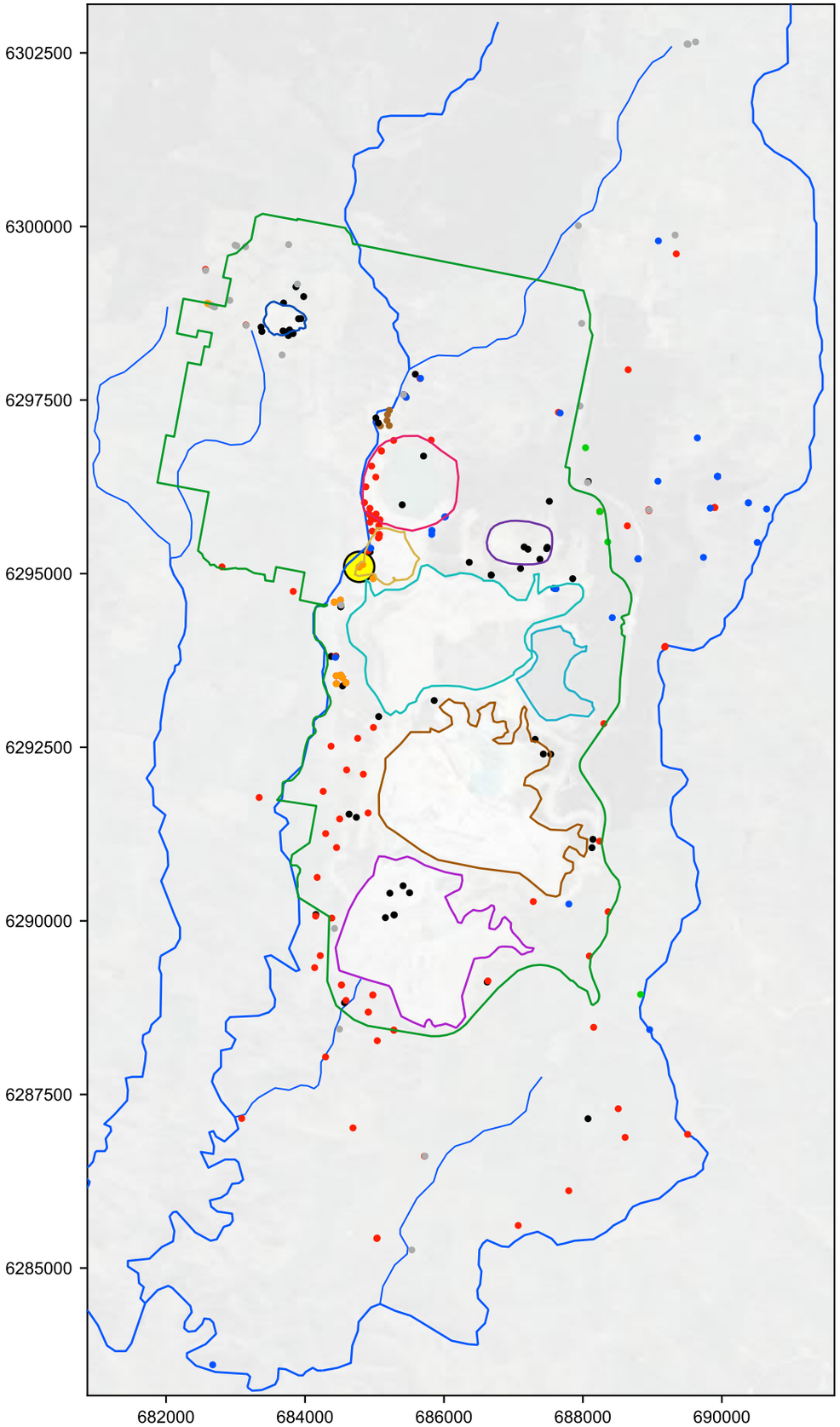
WMP defined analytes



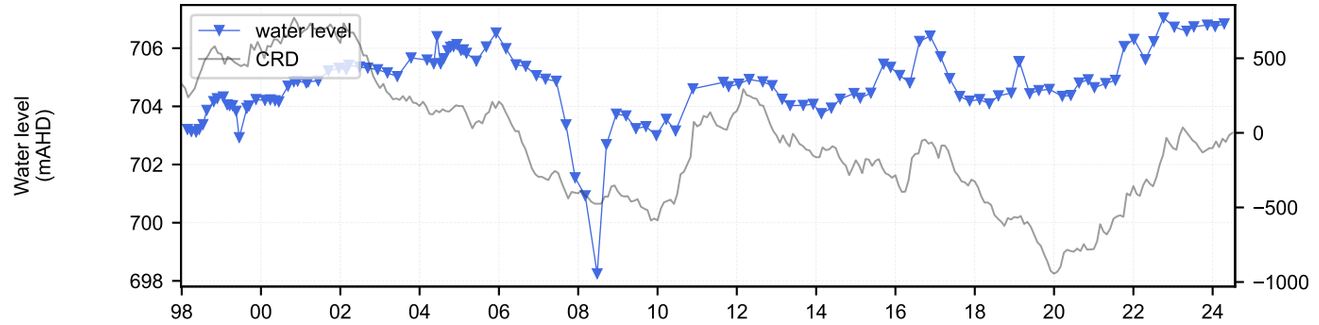
Additional analytes of interest

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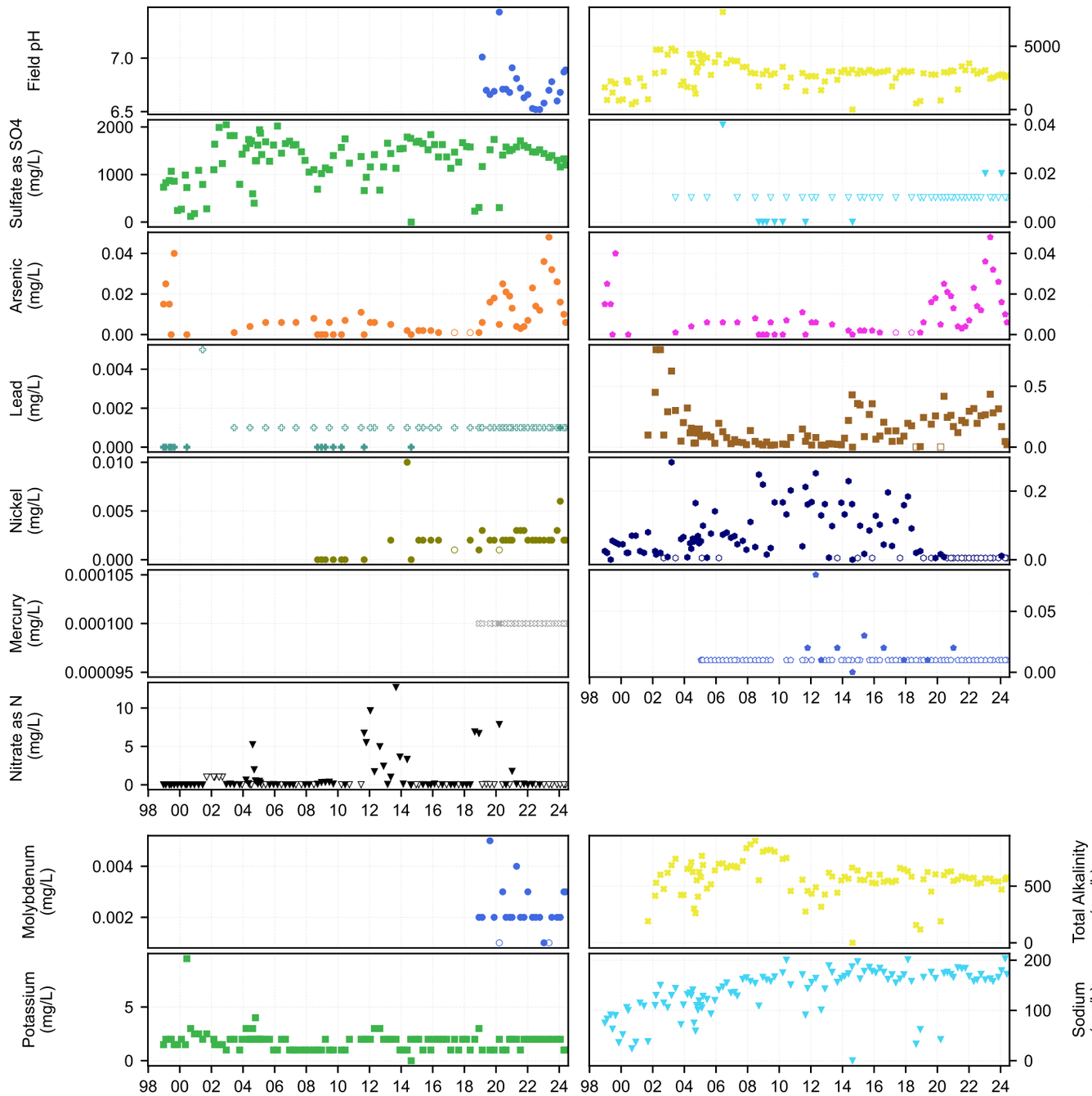
MB2A (Screened geology - Ordovician; Screened interval: 11.65-17.65 mbgl)



Groundwater levels



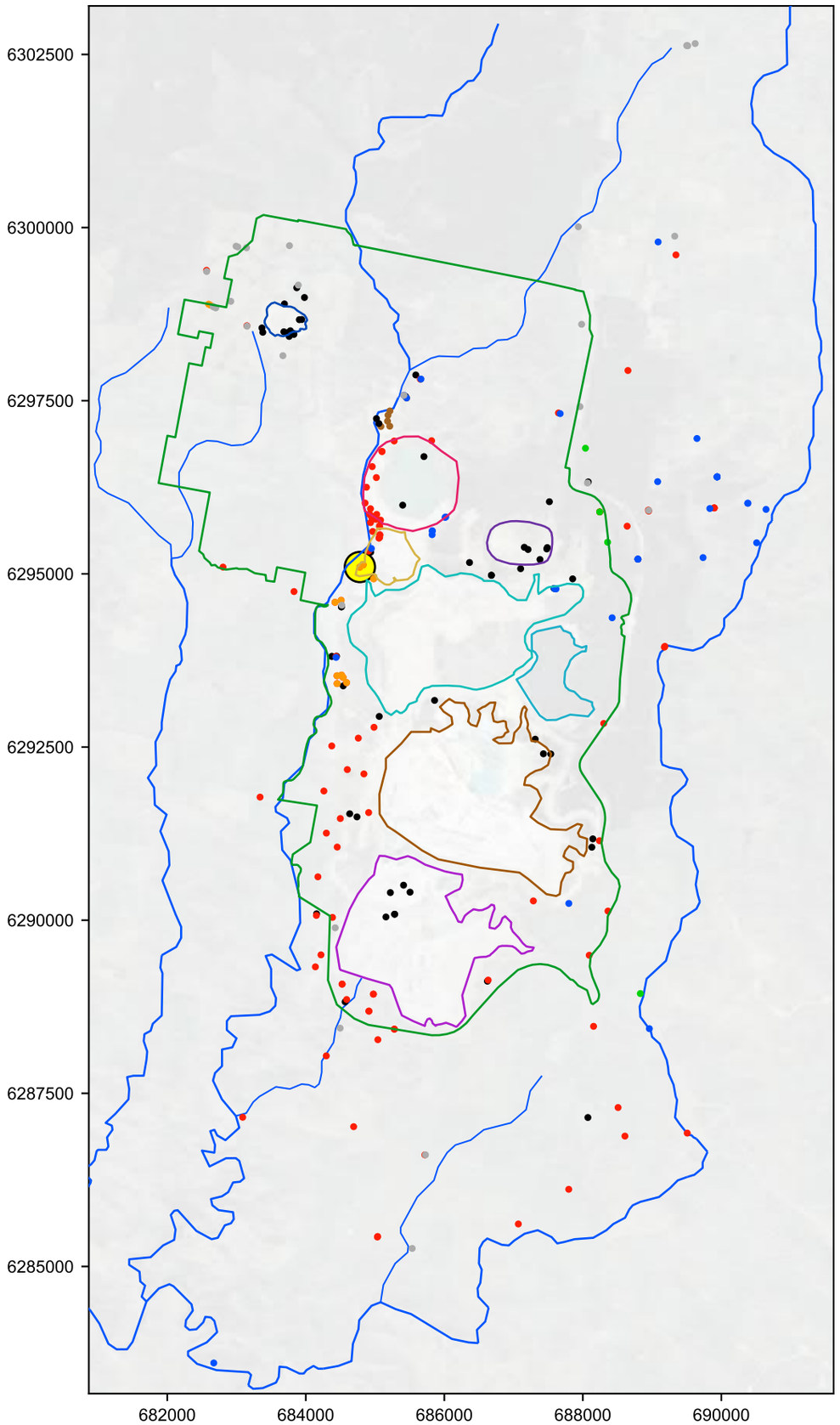
WMP defined analytes



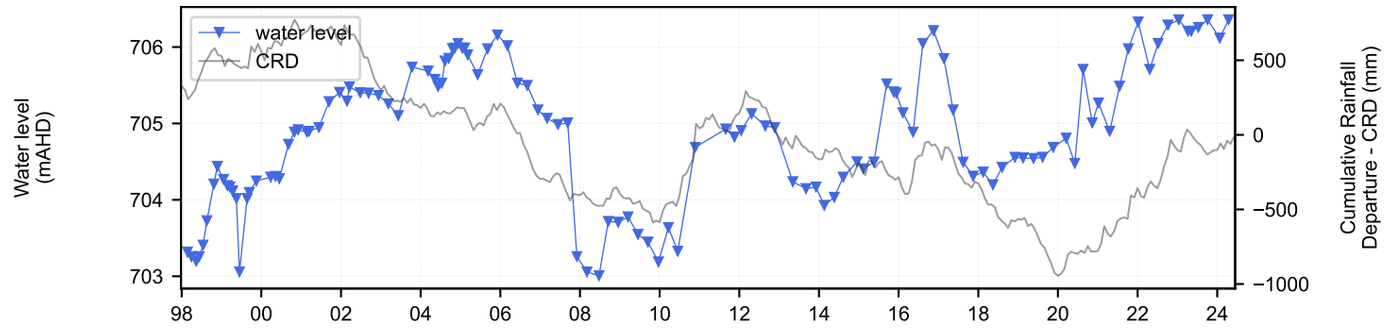
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

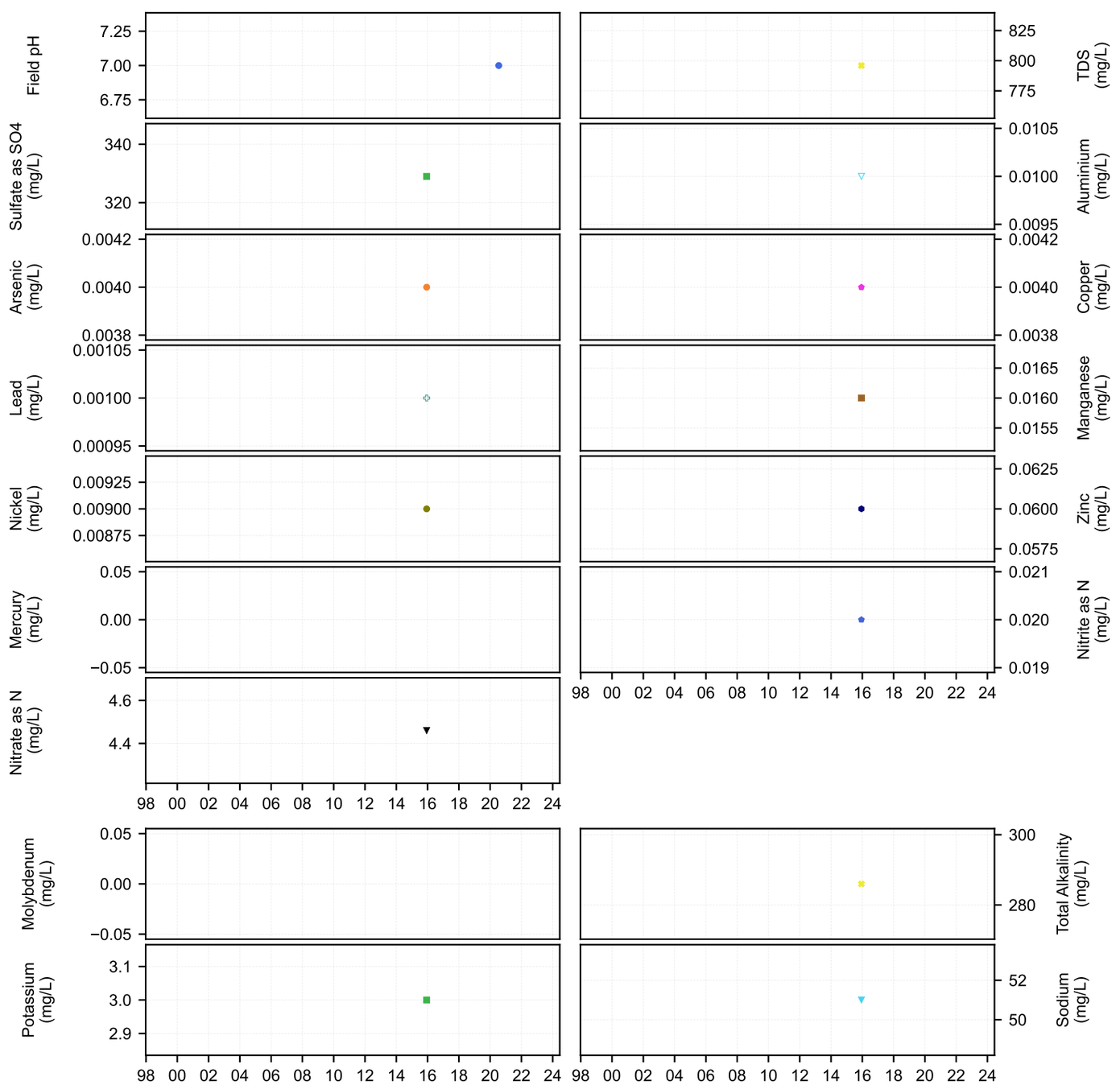
MB2B (Screened geology - Regolith; Screened interval: 0.5-6.5 mbgl)



Groundwater levels



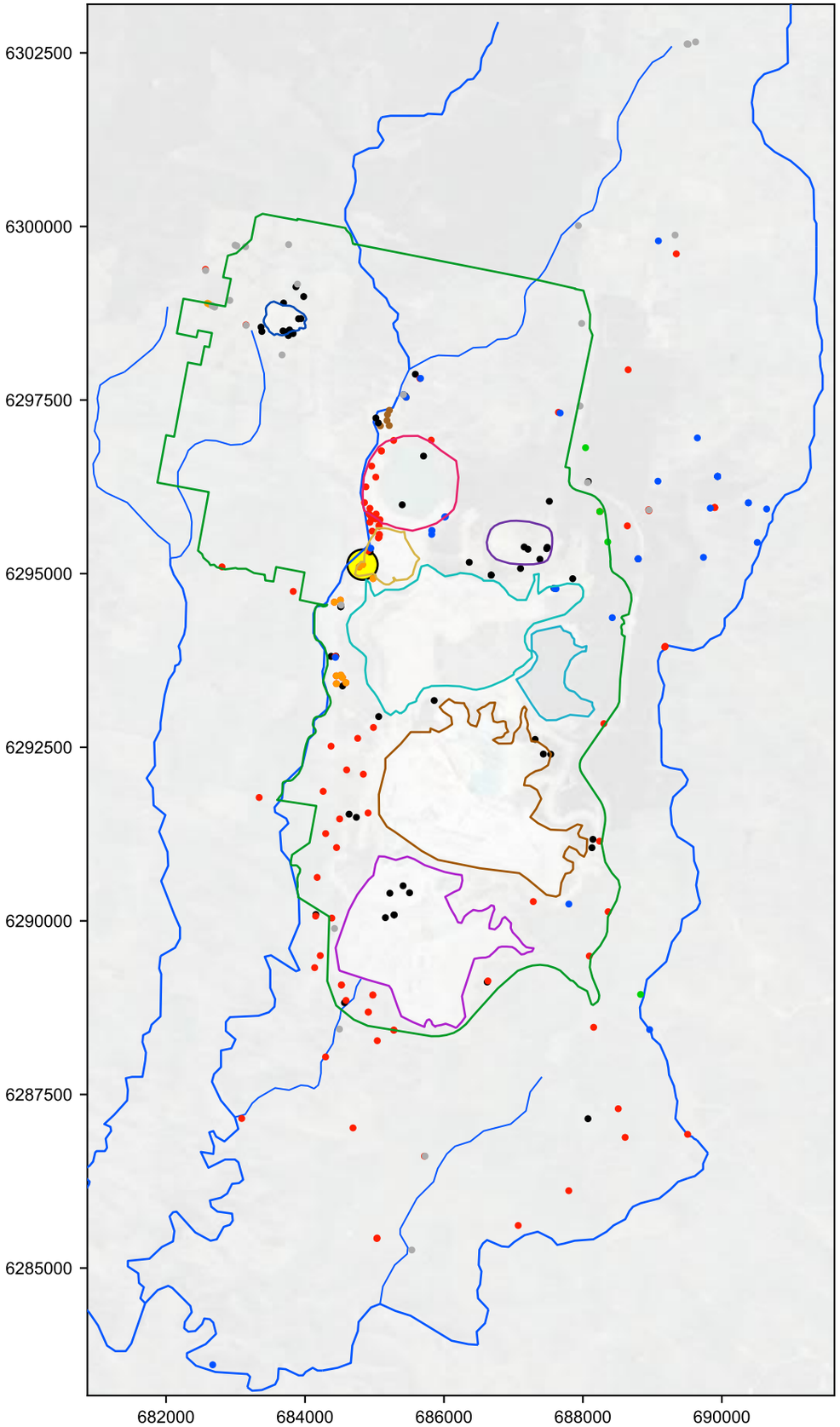
WMP defined analytes



Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

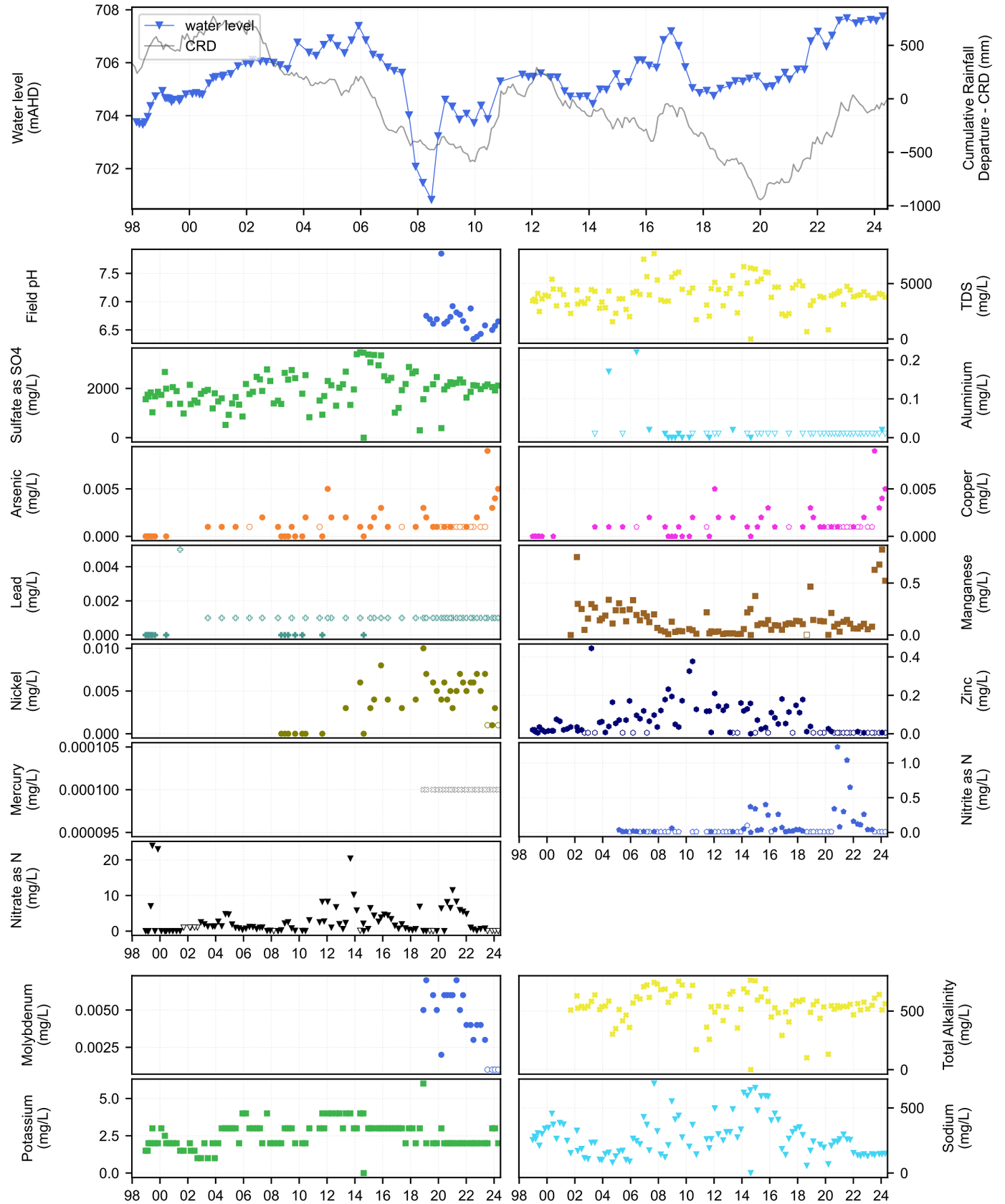
MB3A (Screened geology - Ordovician; Screened interval: 10-16 mbgl)



Groundwater levels

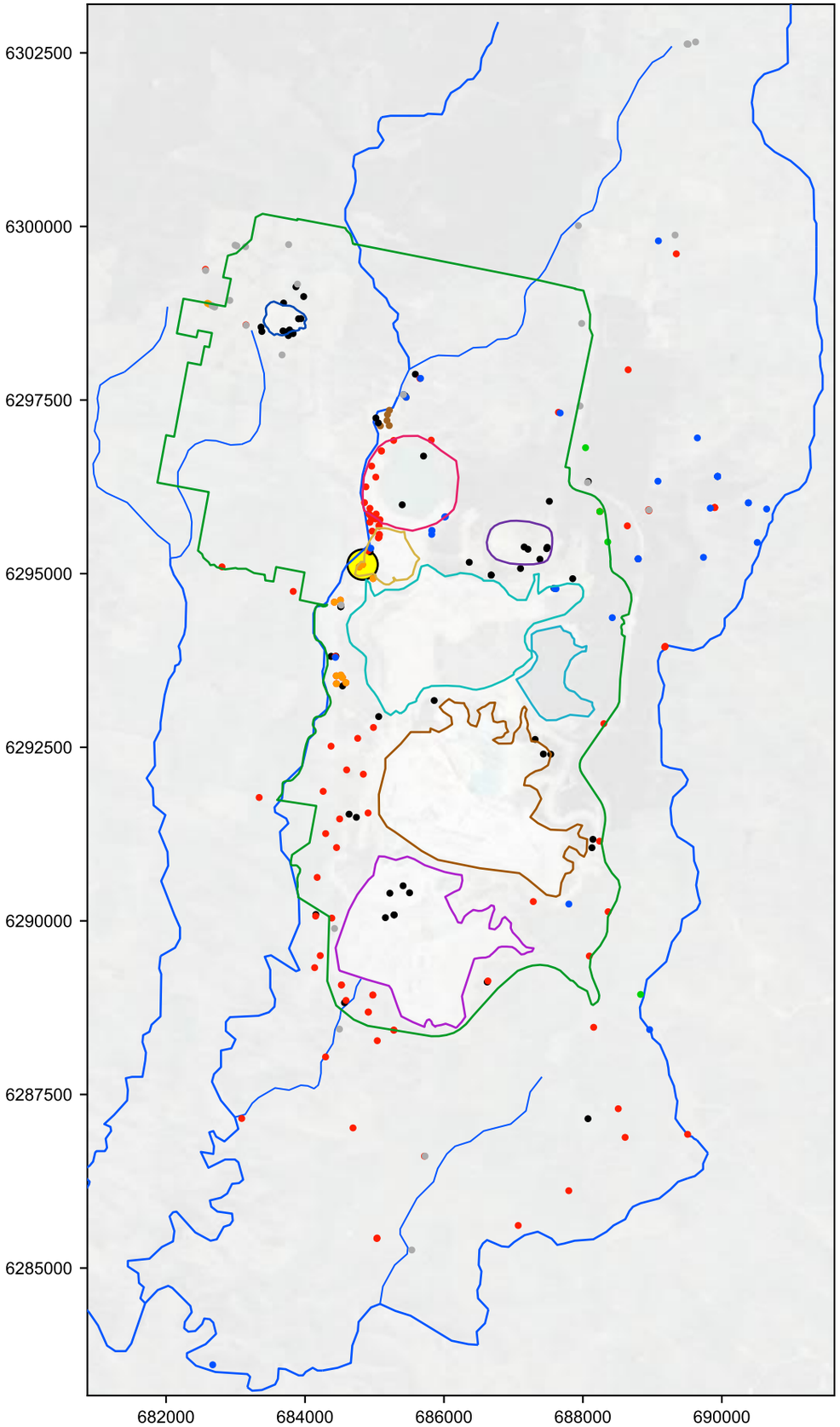
WMP defined analytes

Additional analytes of interest

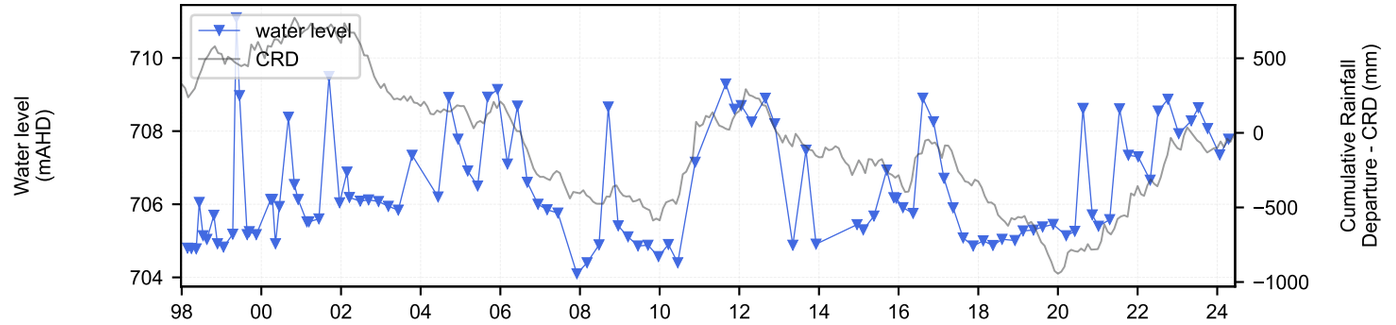


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

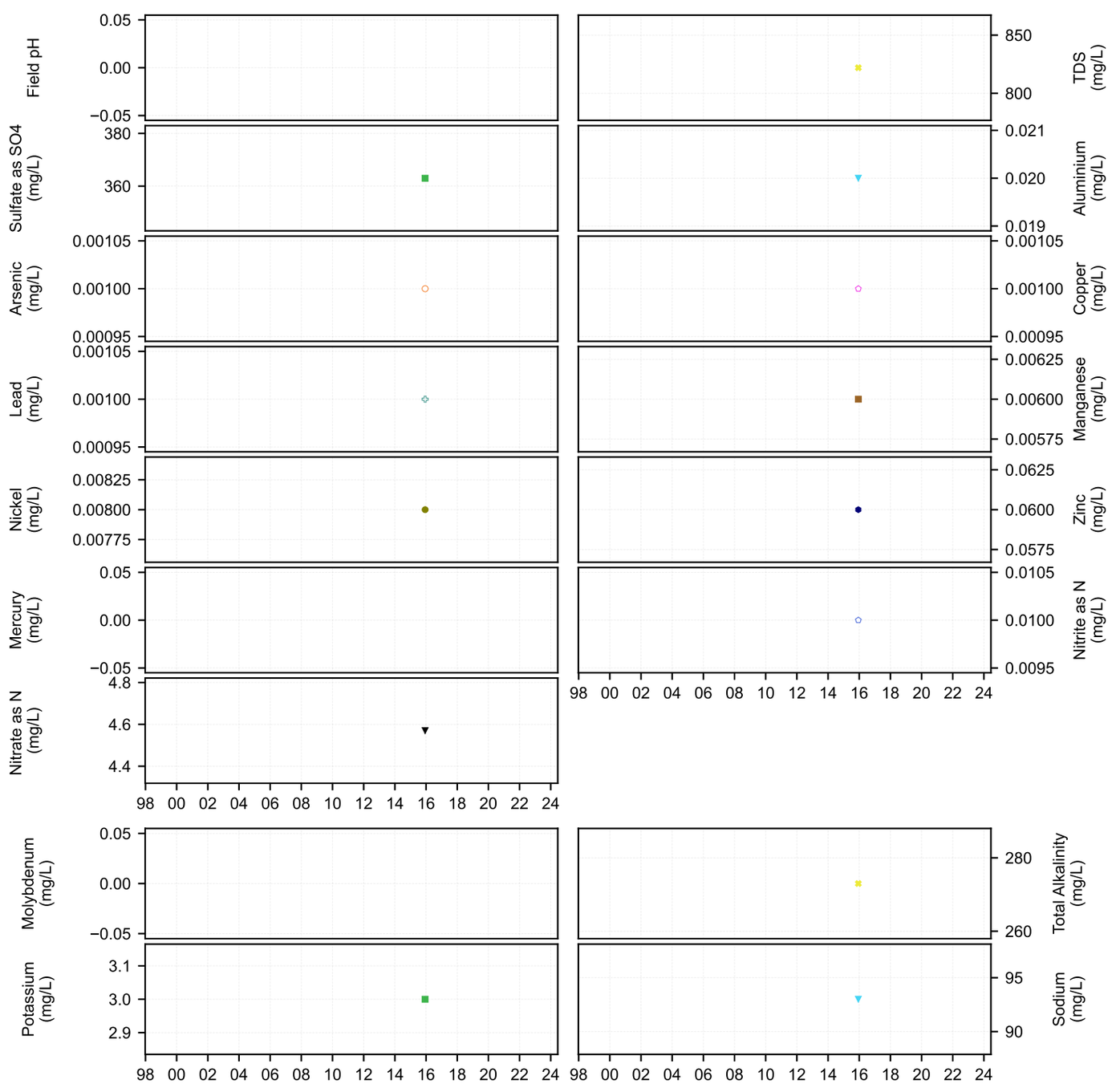
MB3B (Screened geology - Regolith; Screened interval: 0.45-6.45 mbgl)



Groundwater levels



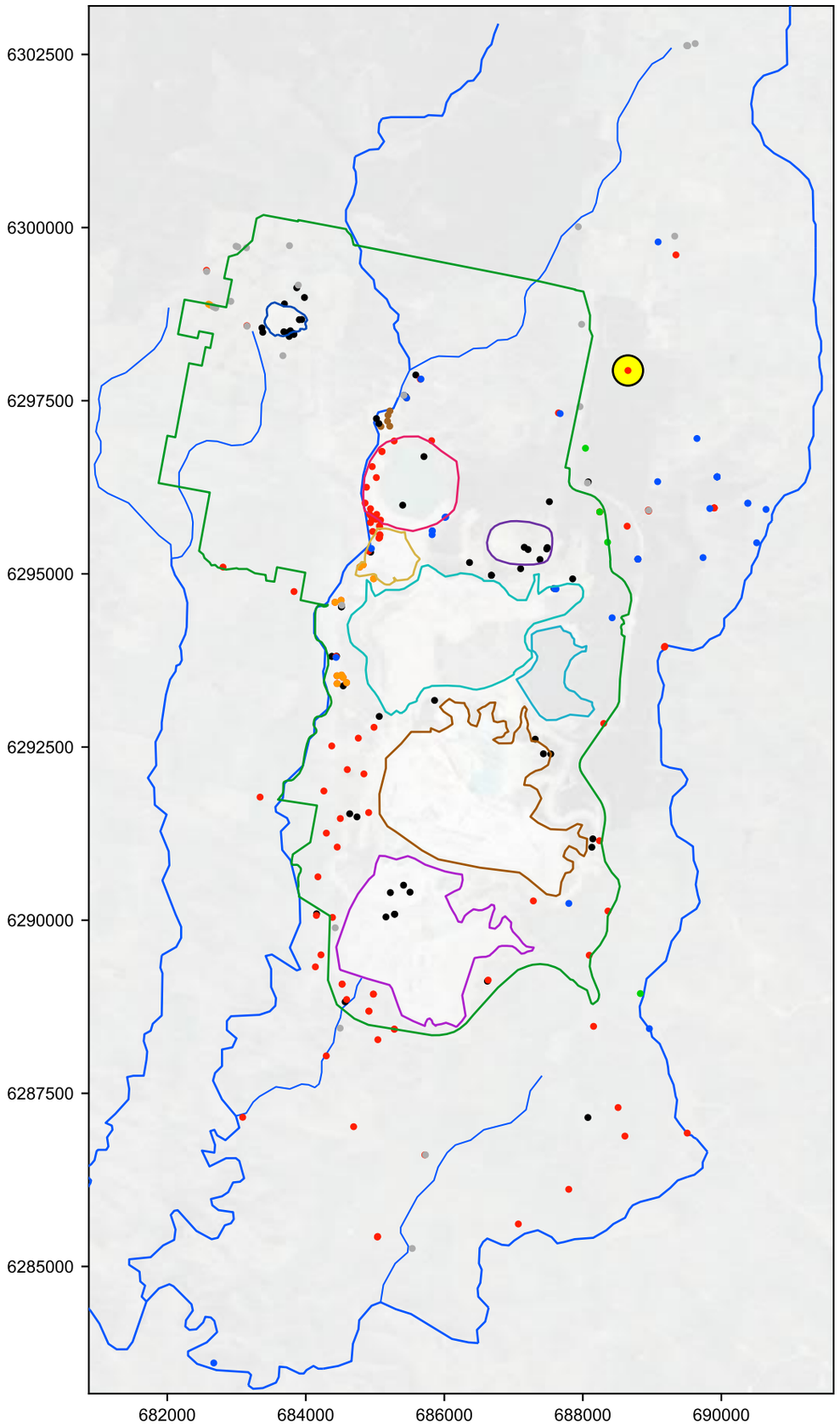
WMP defined analytes



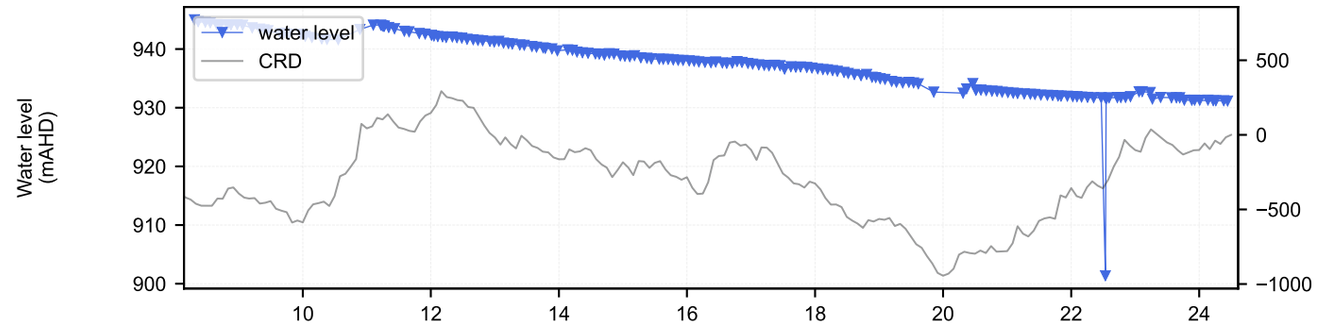
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

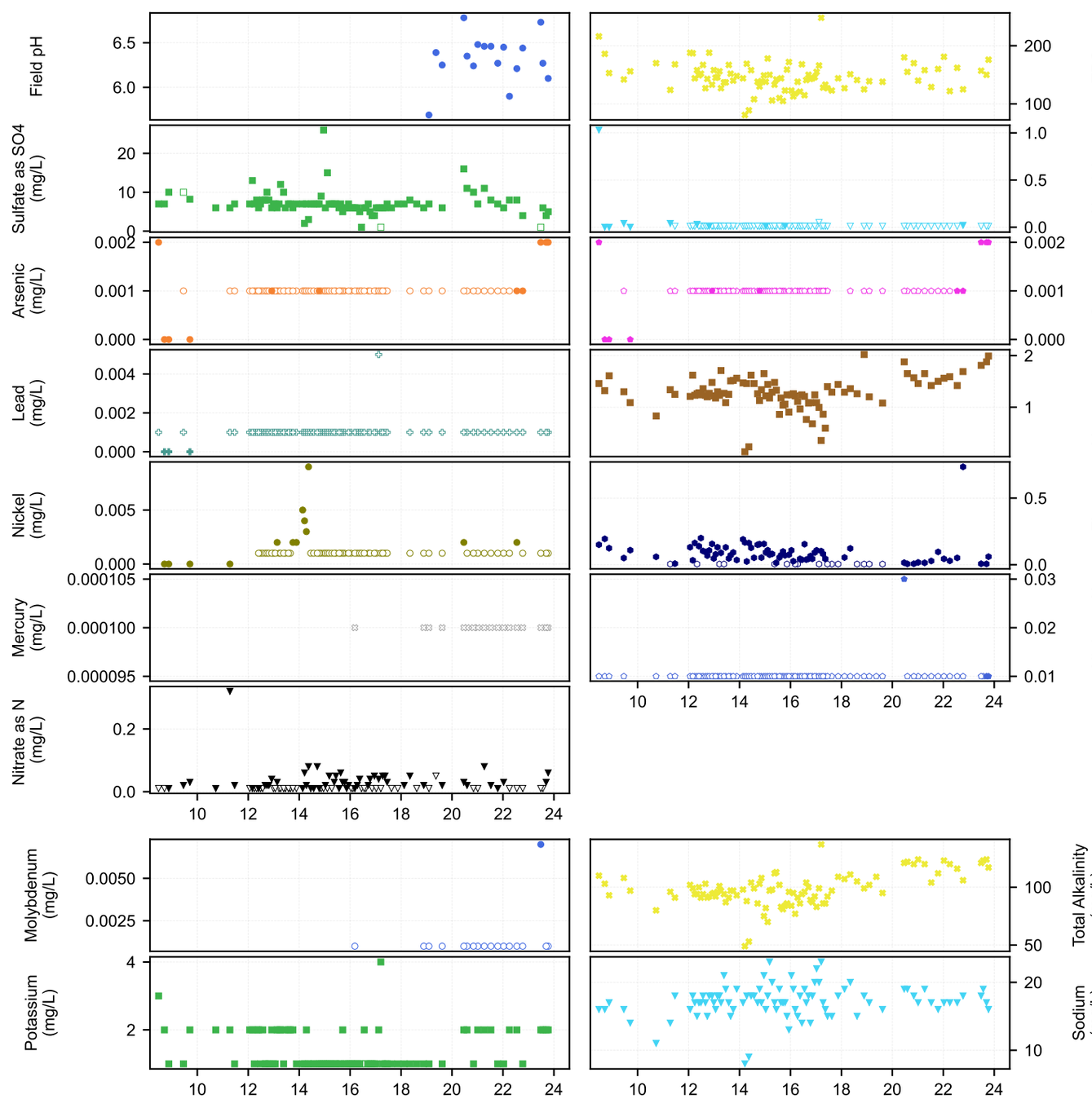
MB48 (Screened geology - Ordovician; Screened interval: 26-69 mbgl)



Groundwater levels



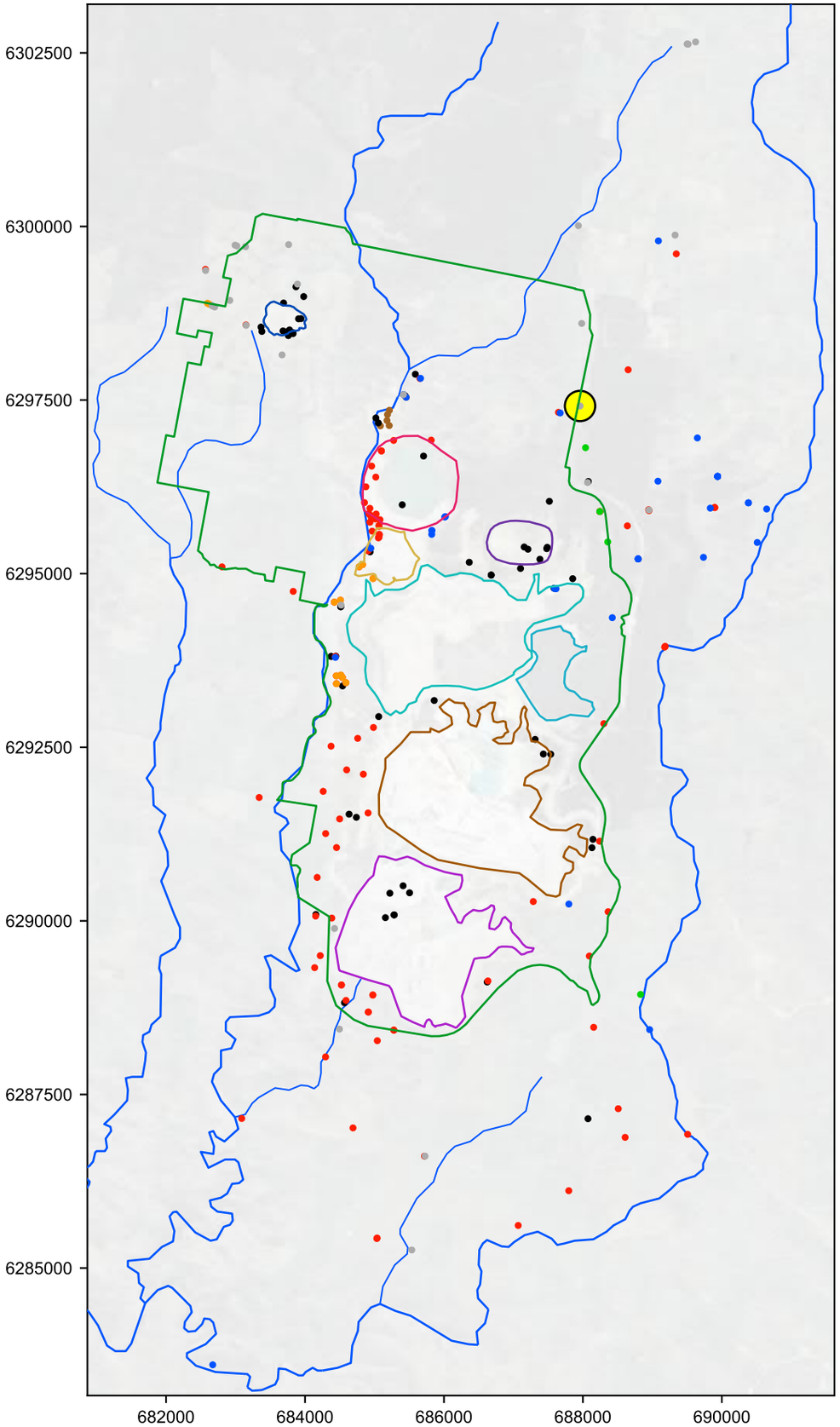
WMP defined analytes



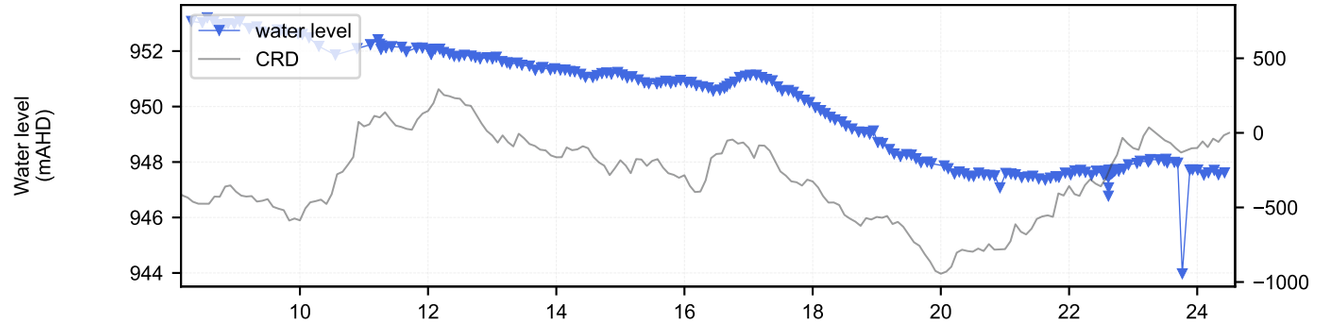
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

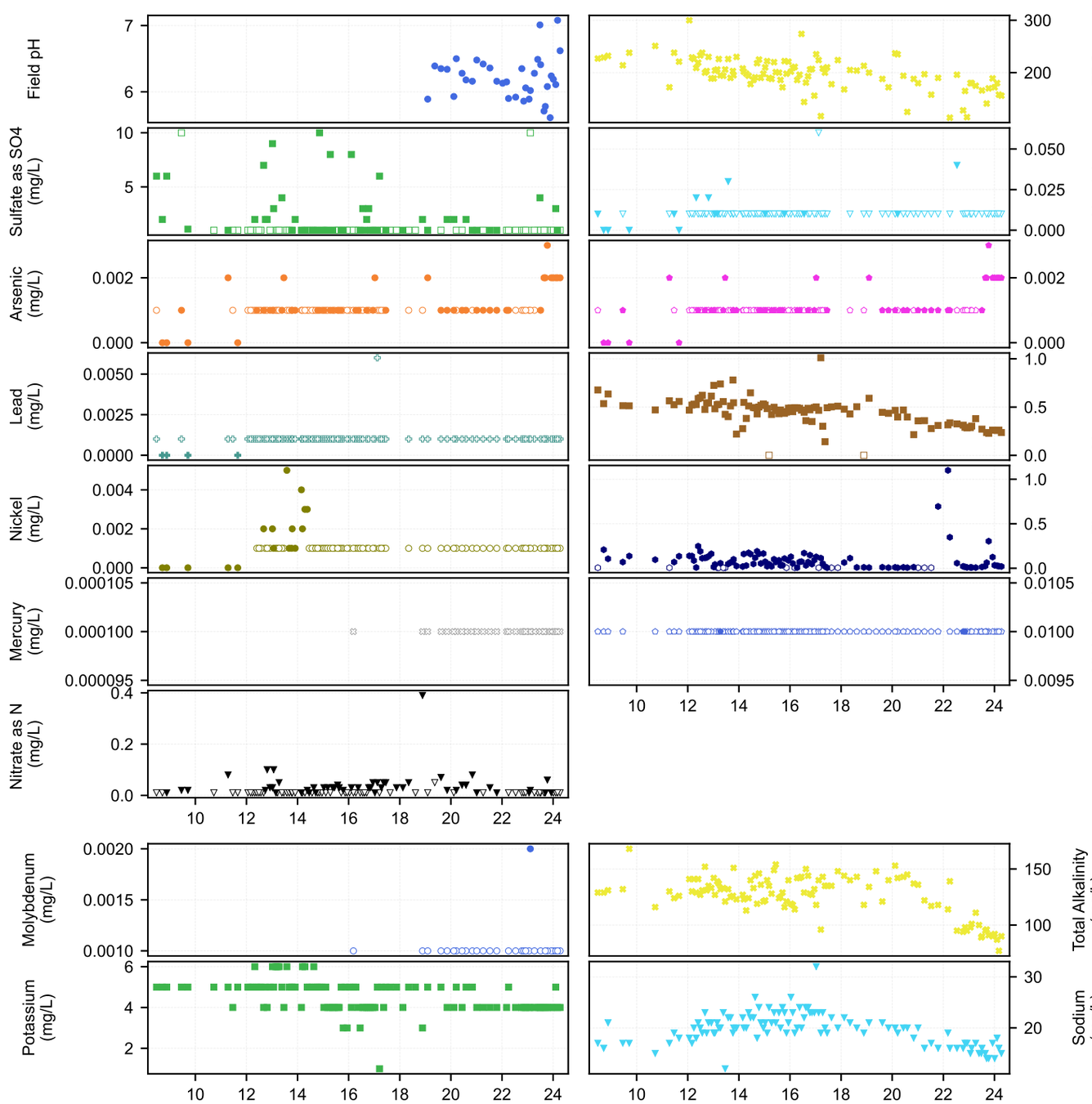
MB49 (Screened geology - Tertiary basalt; Screened interval: 20-39 mbgl)



Groundwater levels



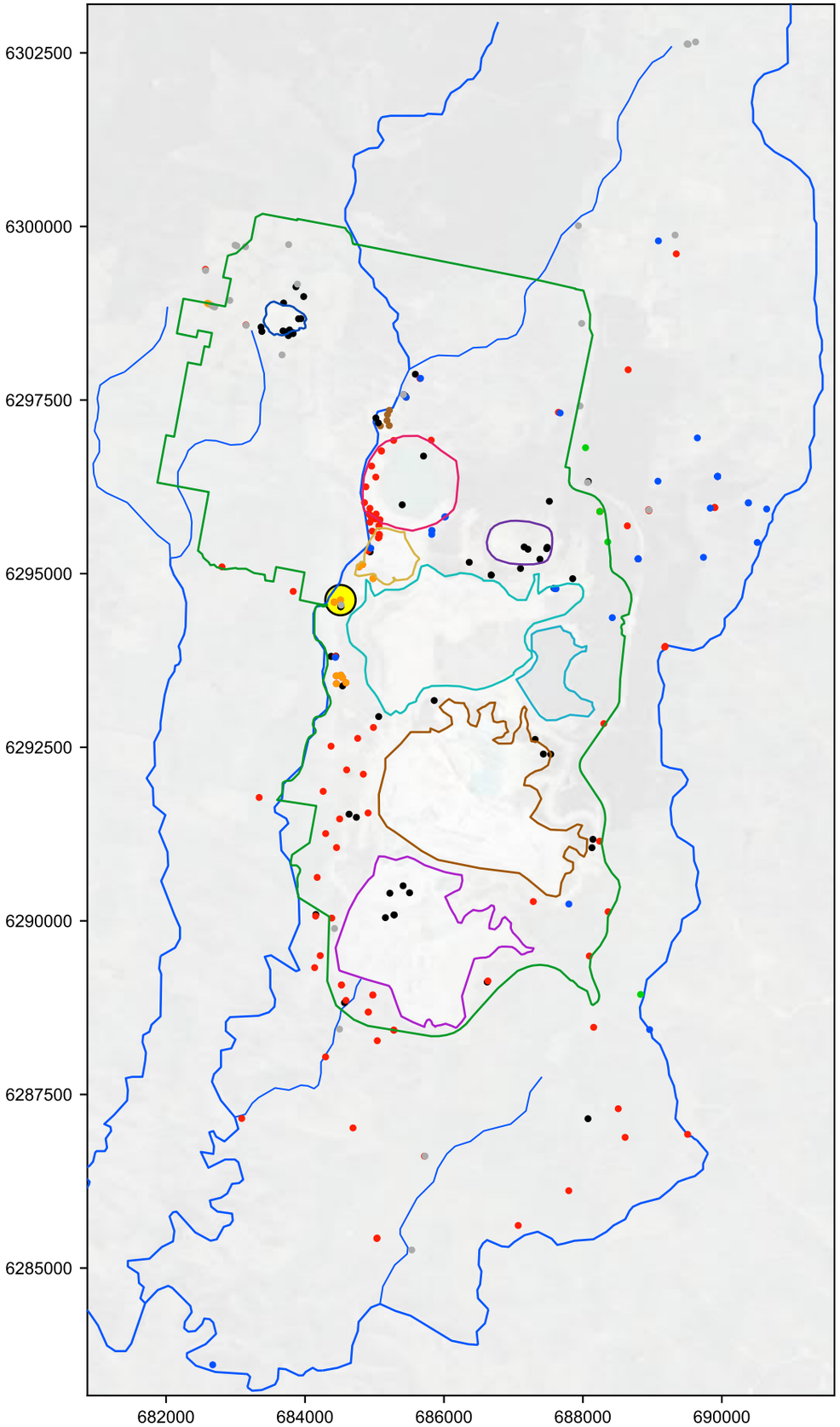
WMP defined analytes



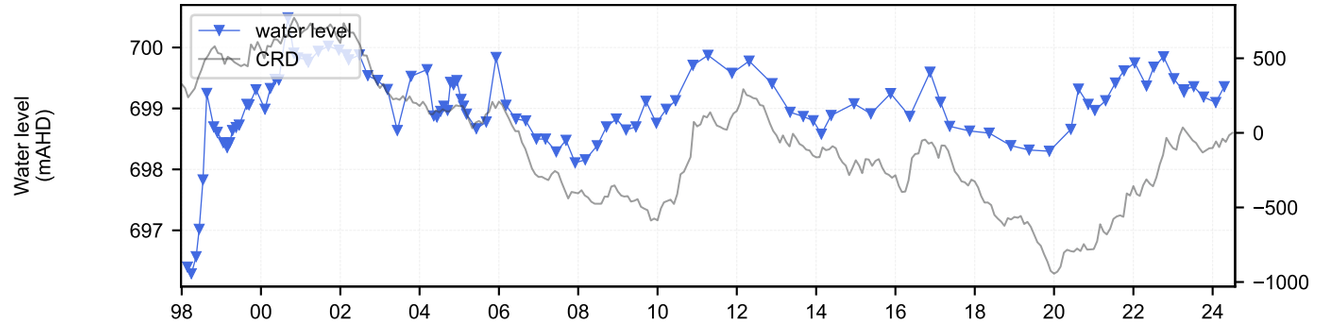
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

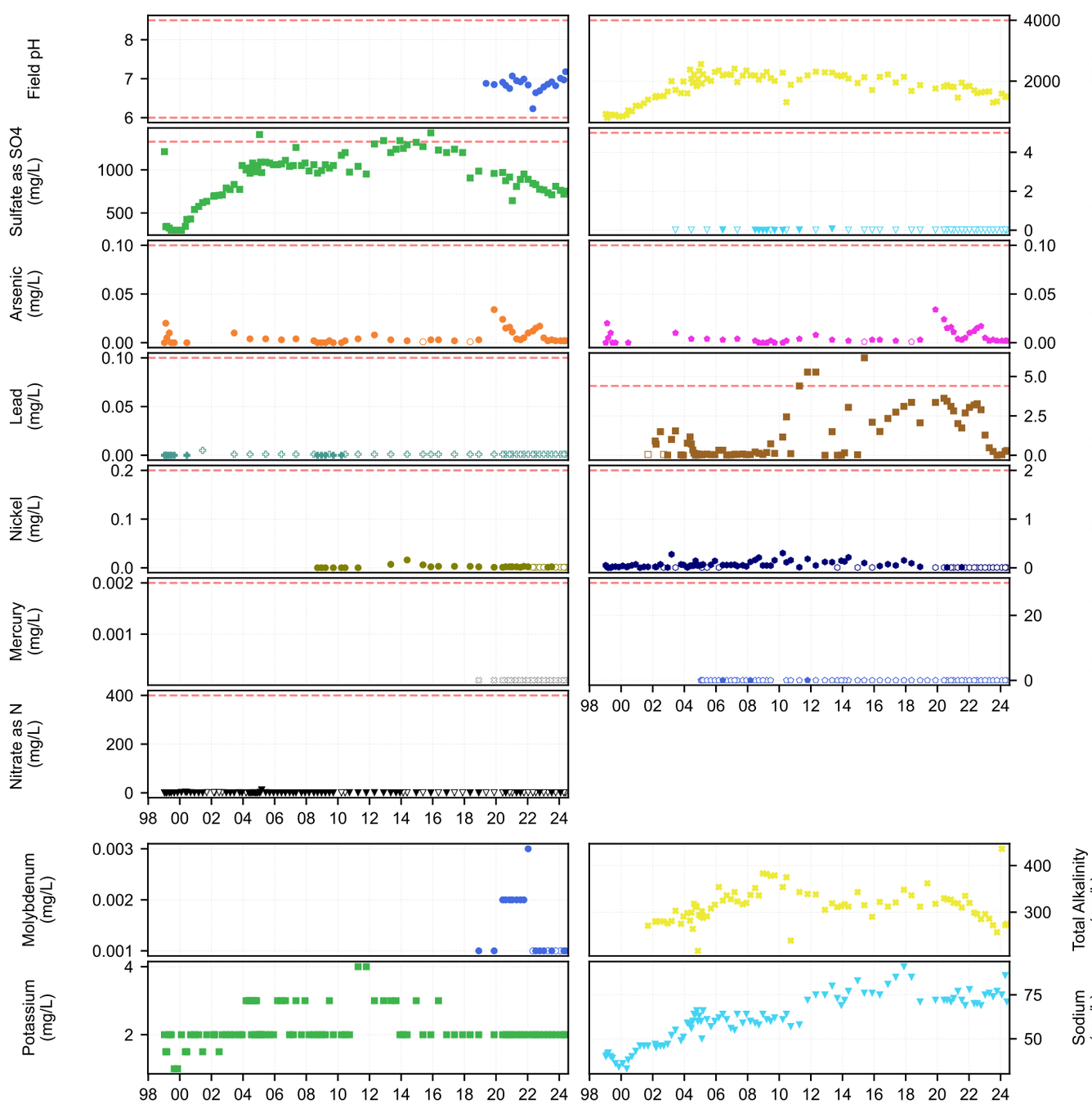
MB4A (Screened geology - Ordovician; Screened interval: 17.1-23.1 mbgl)



Groundwater levels



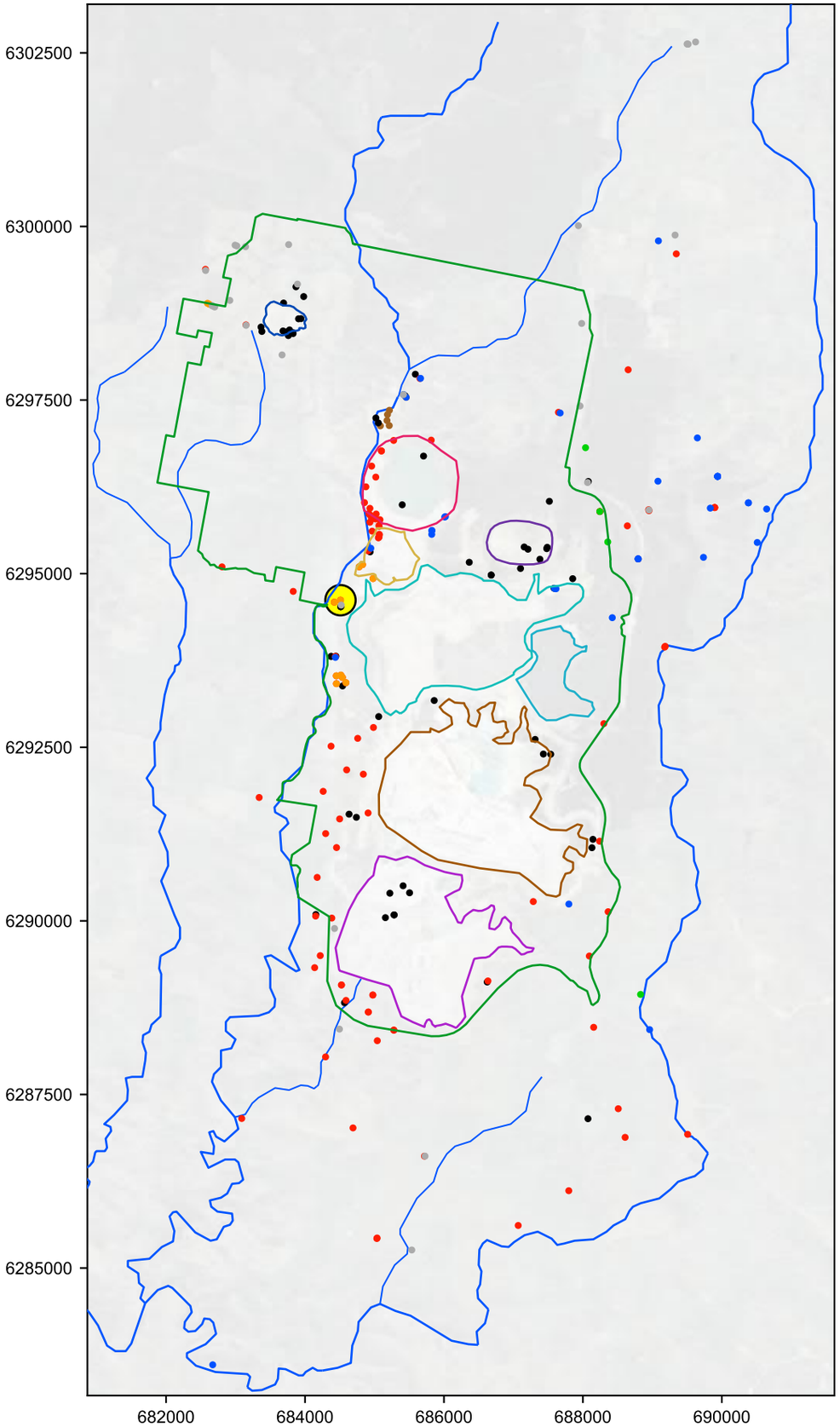
WMP defined analytes



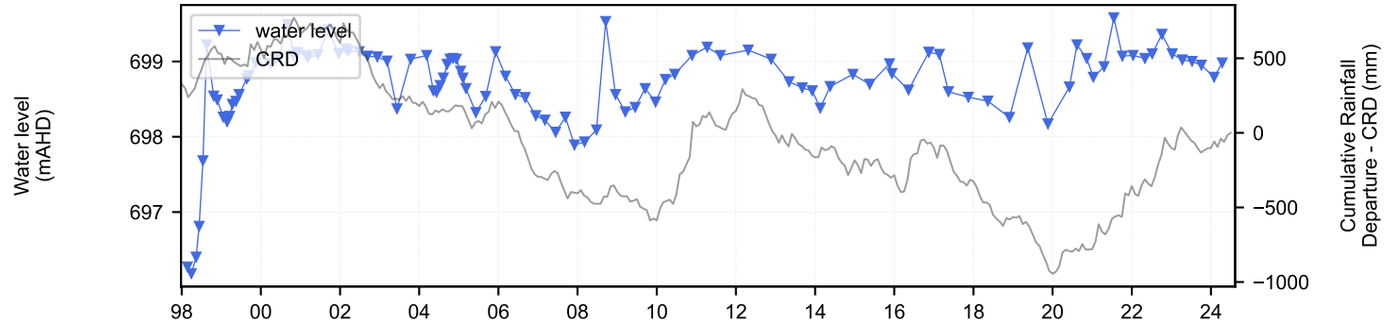
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023

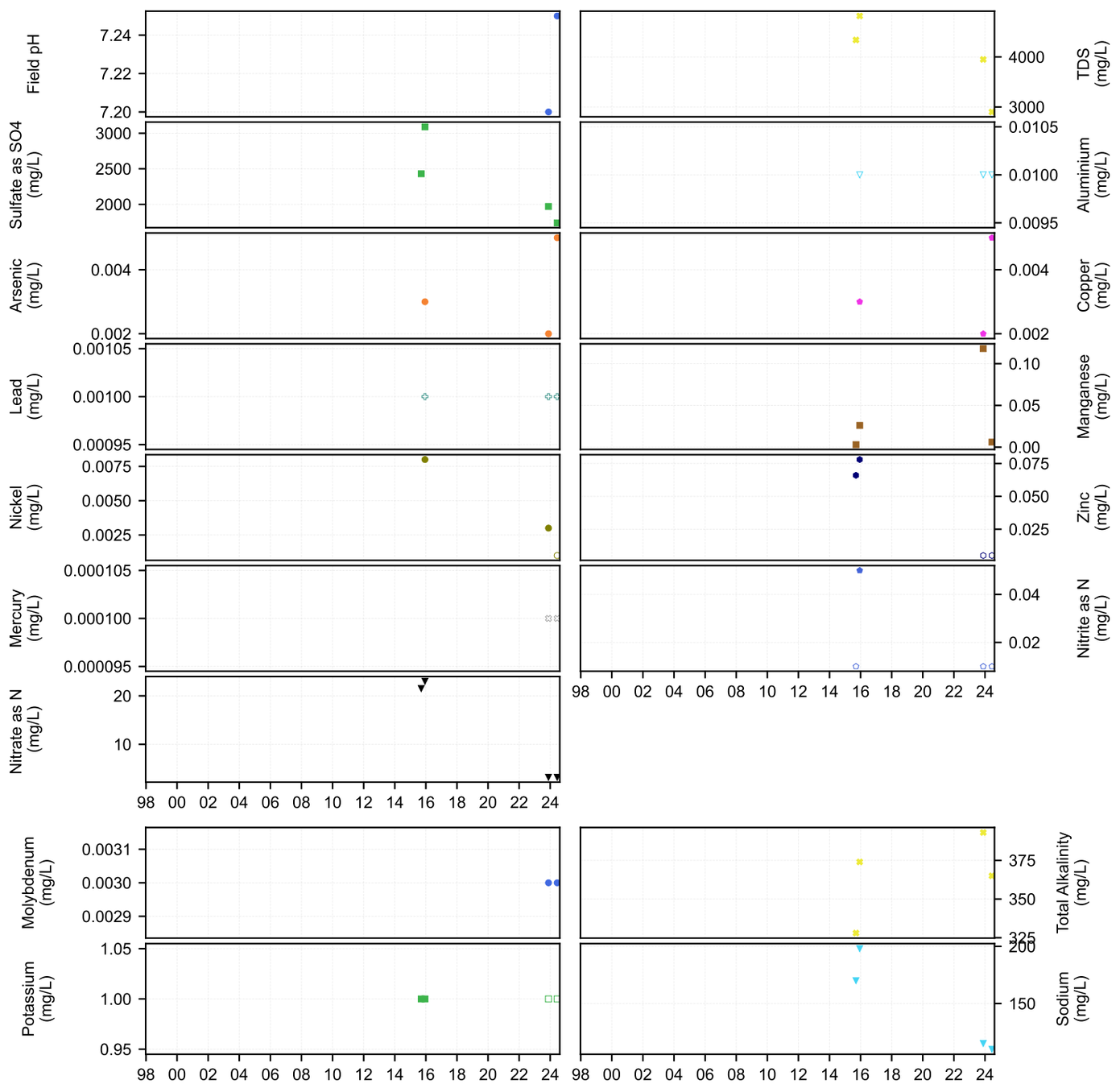
MB4B (Screened geology - Regolith; Screened interval: 0.3-6.3 mbgl)



Groundwater levels



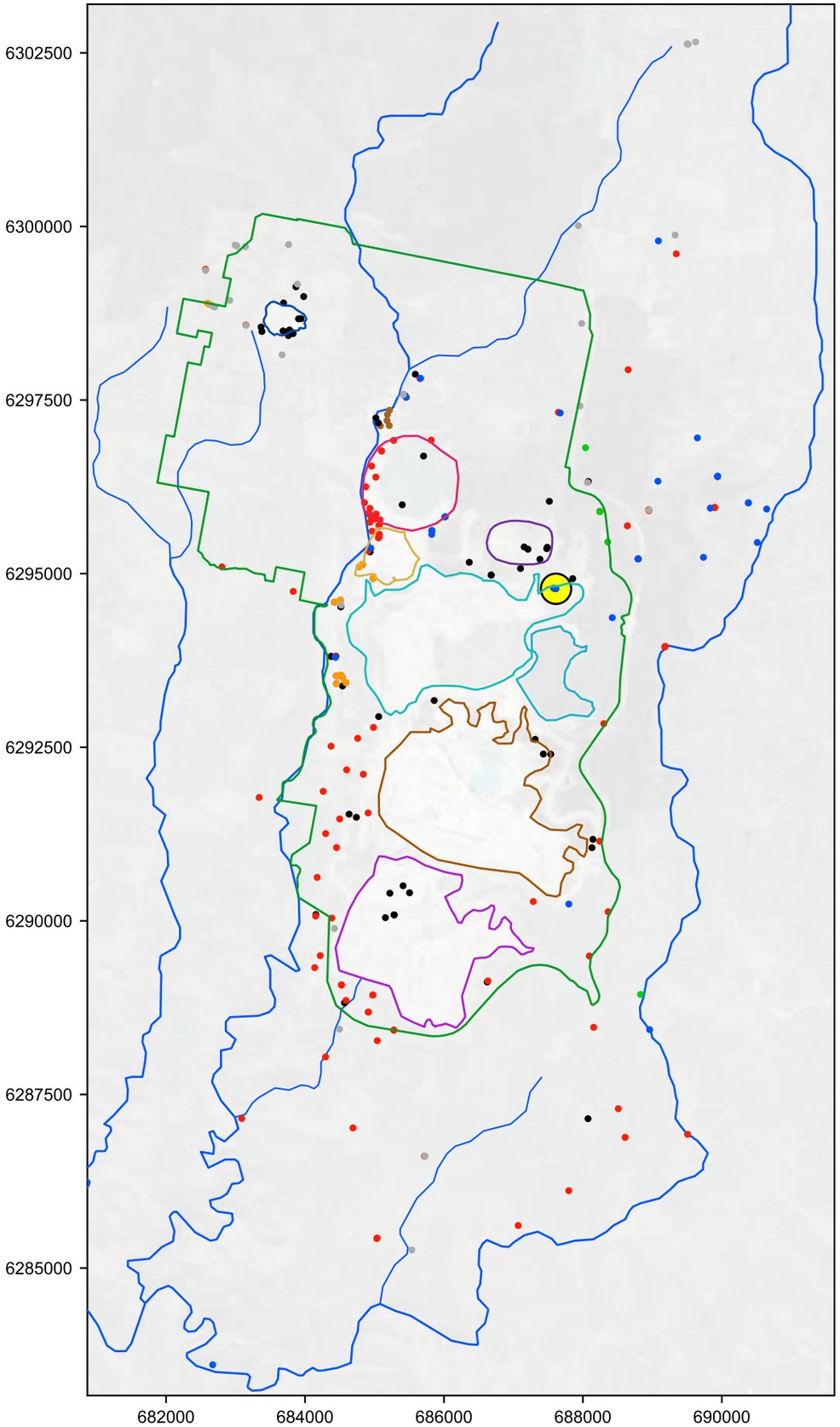
WMP defined analytes



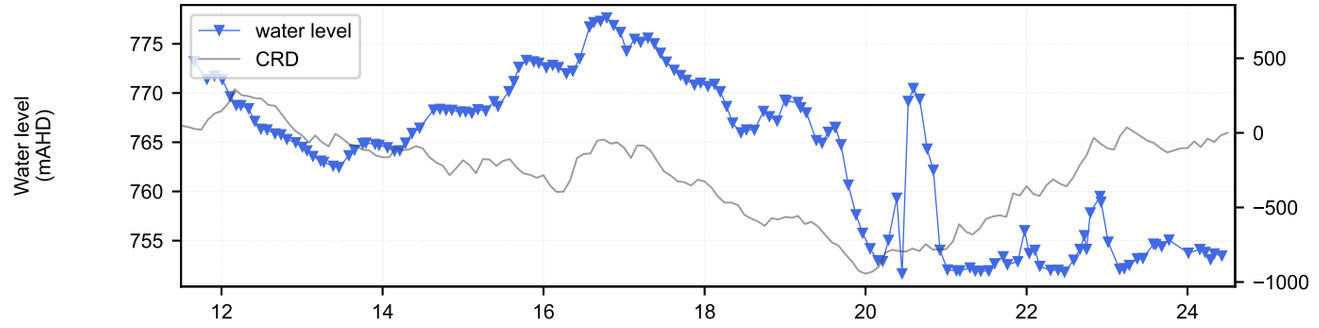
Additional analytes of interest

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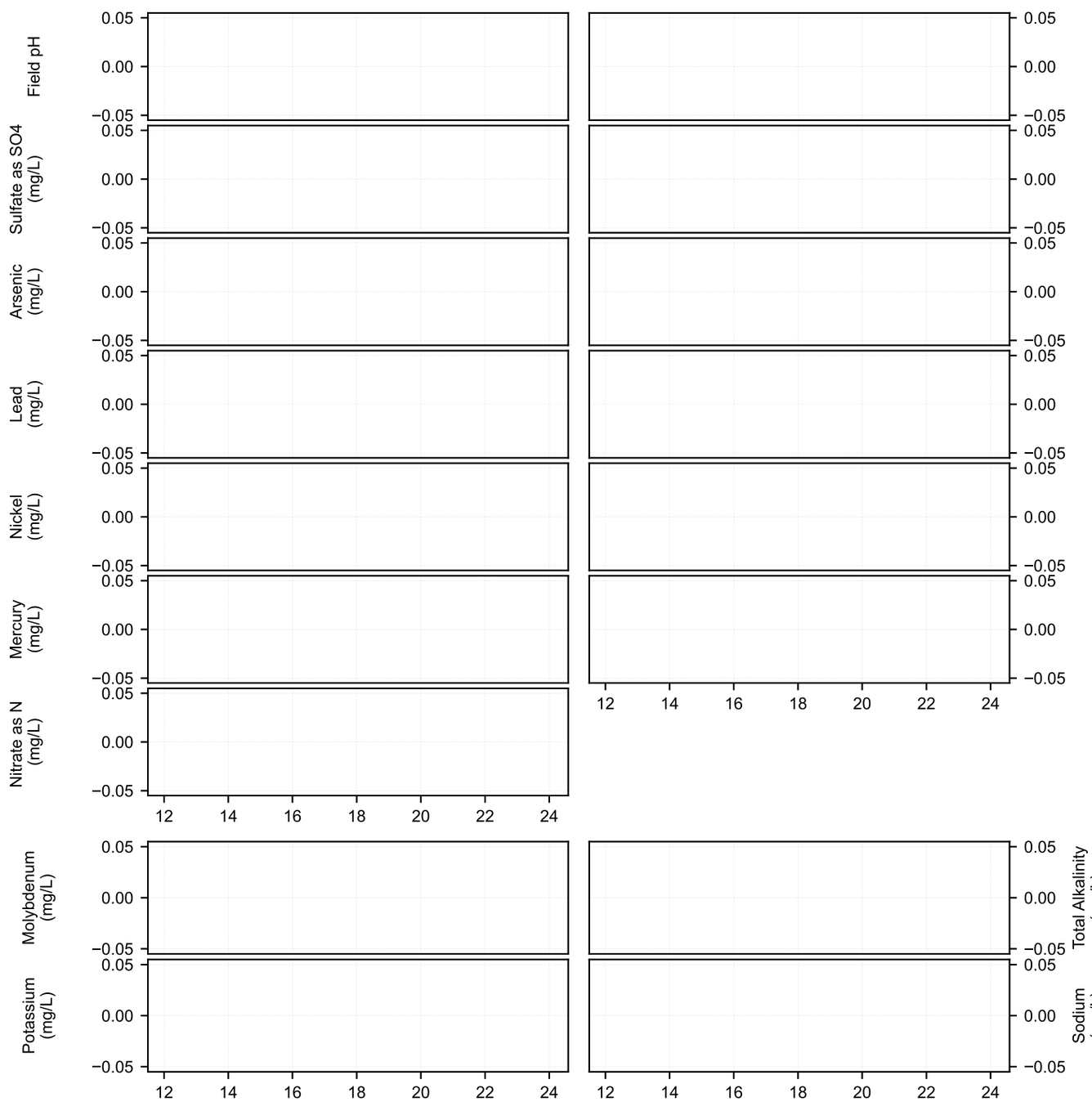
MB52 (Screened geology - Silurian; Screened interval: 35-55 mbgl)



Groundwater levels



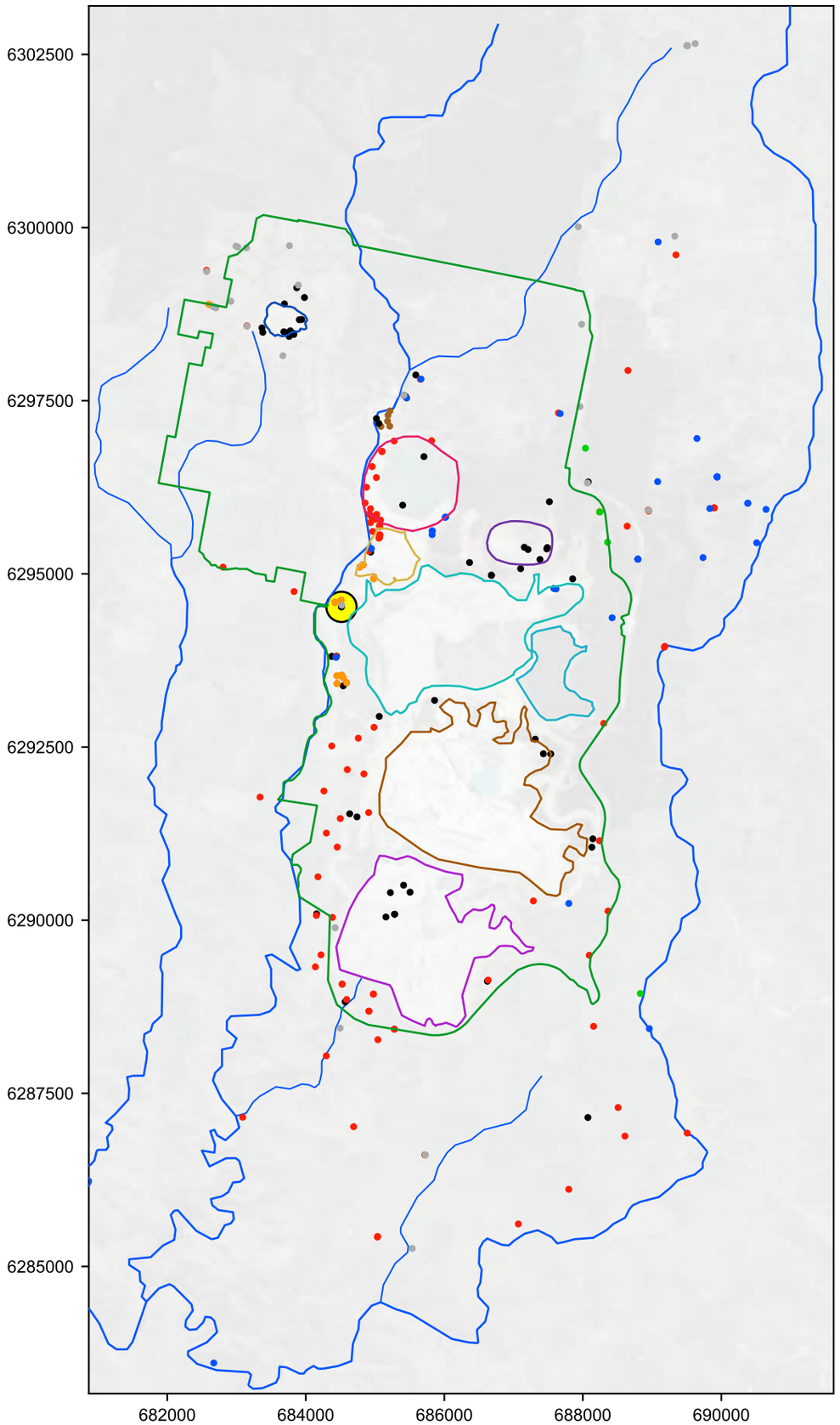
WMP defined analytes



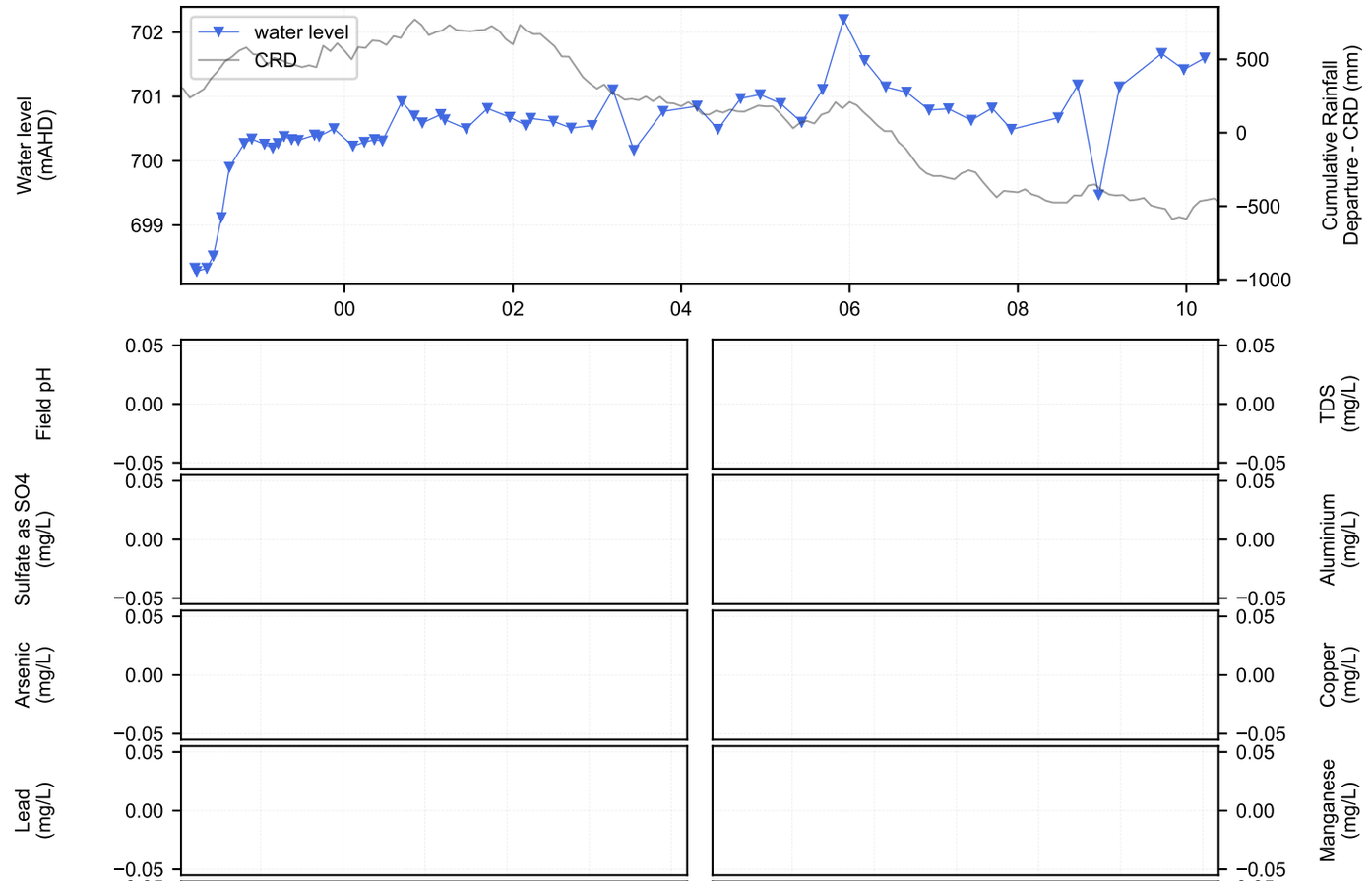
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

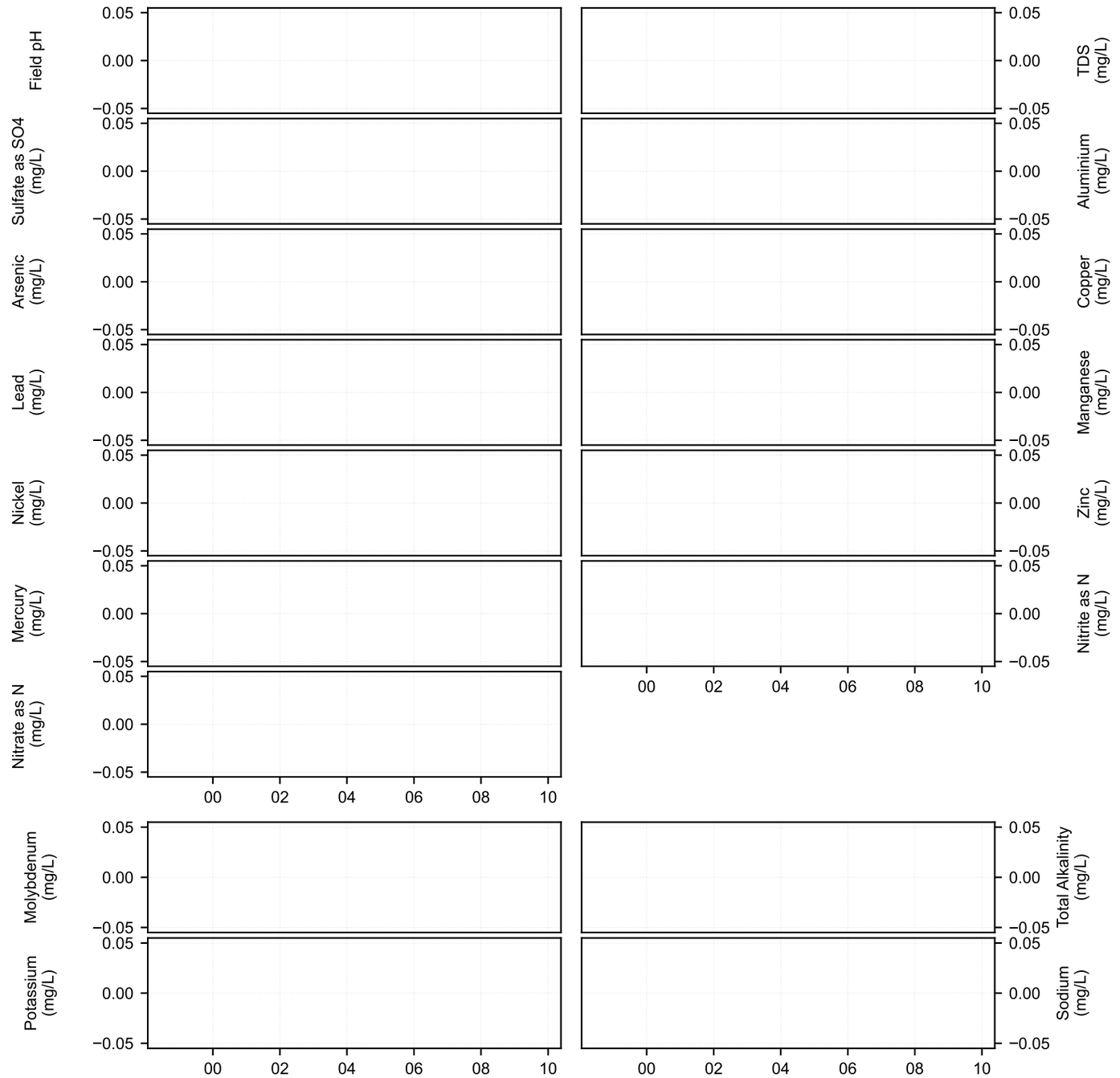
MB5A (Screened geology - Inactive; Screened interval: 24-30 mbgl)



Groundwater levels



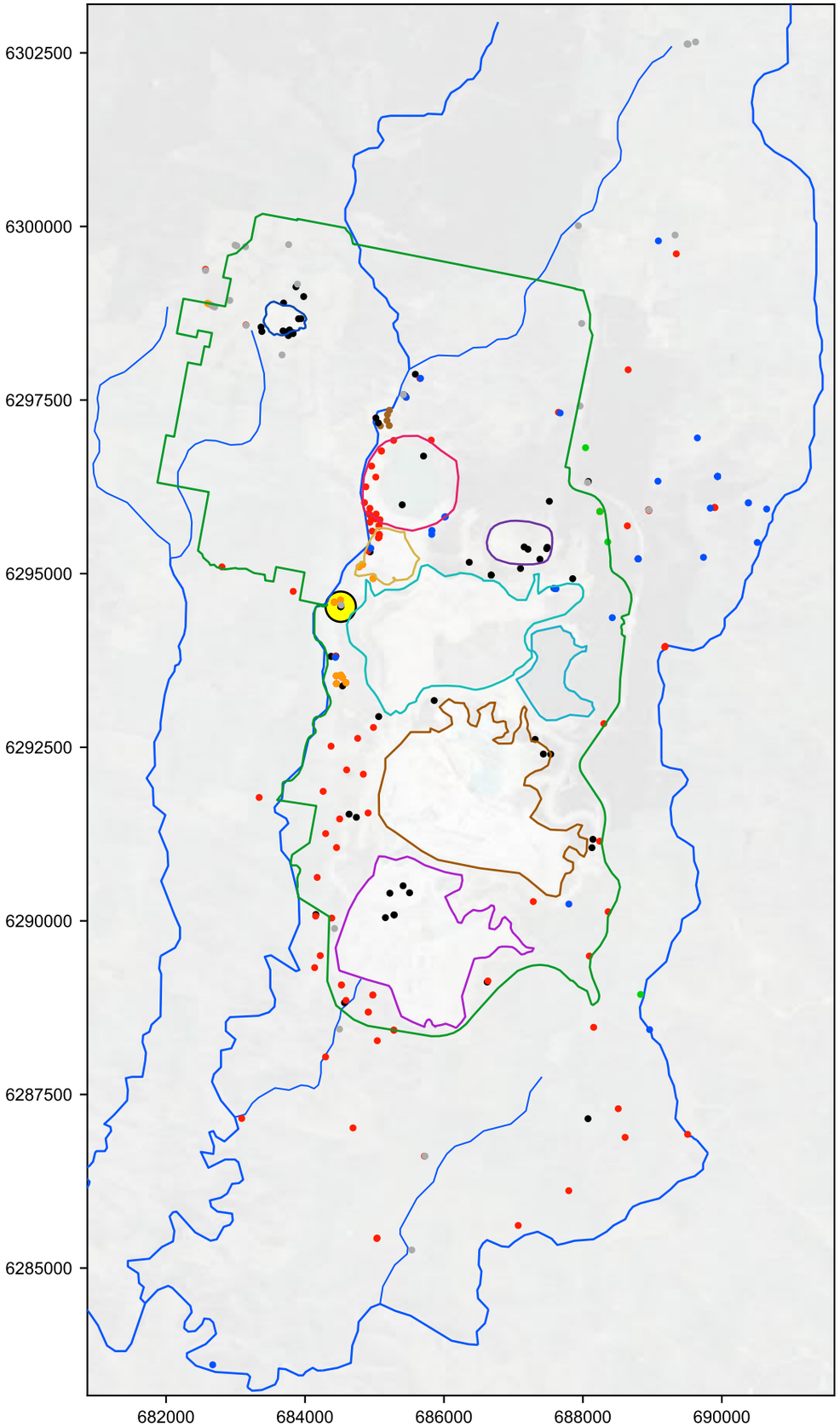
WMP defined analytes



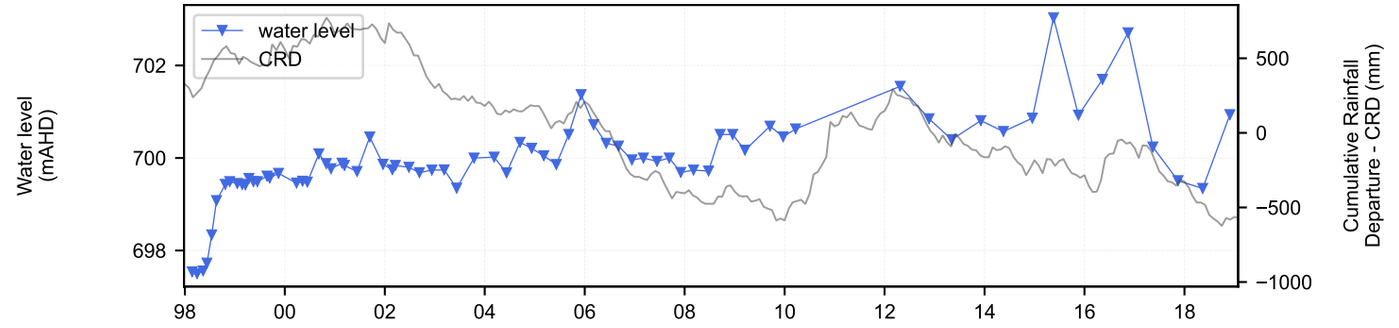
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

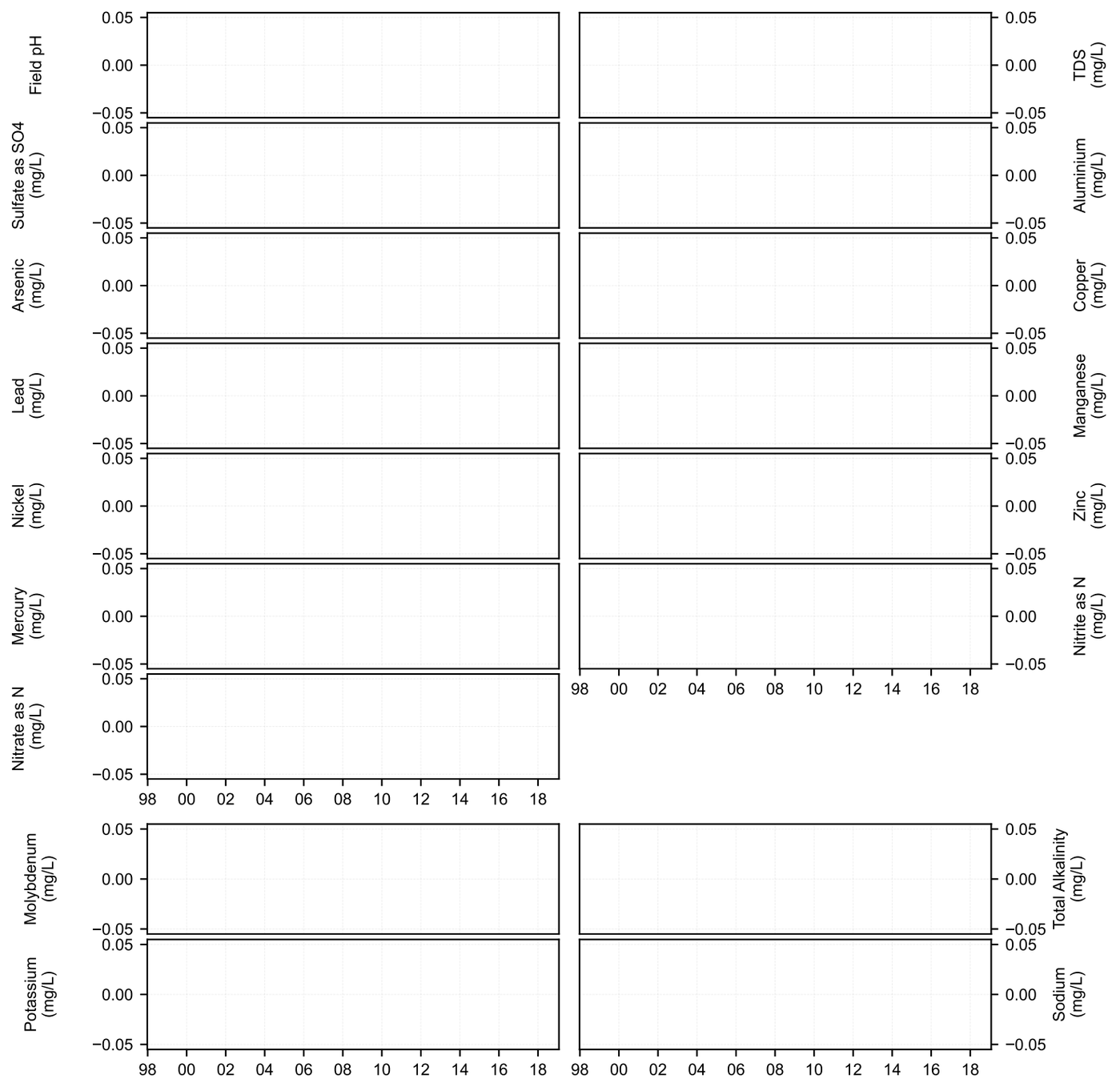
MB5B (Screened geology - Inactive; Screened interval: 2.2-8.2 mbgl)



Groundwater levels



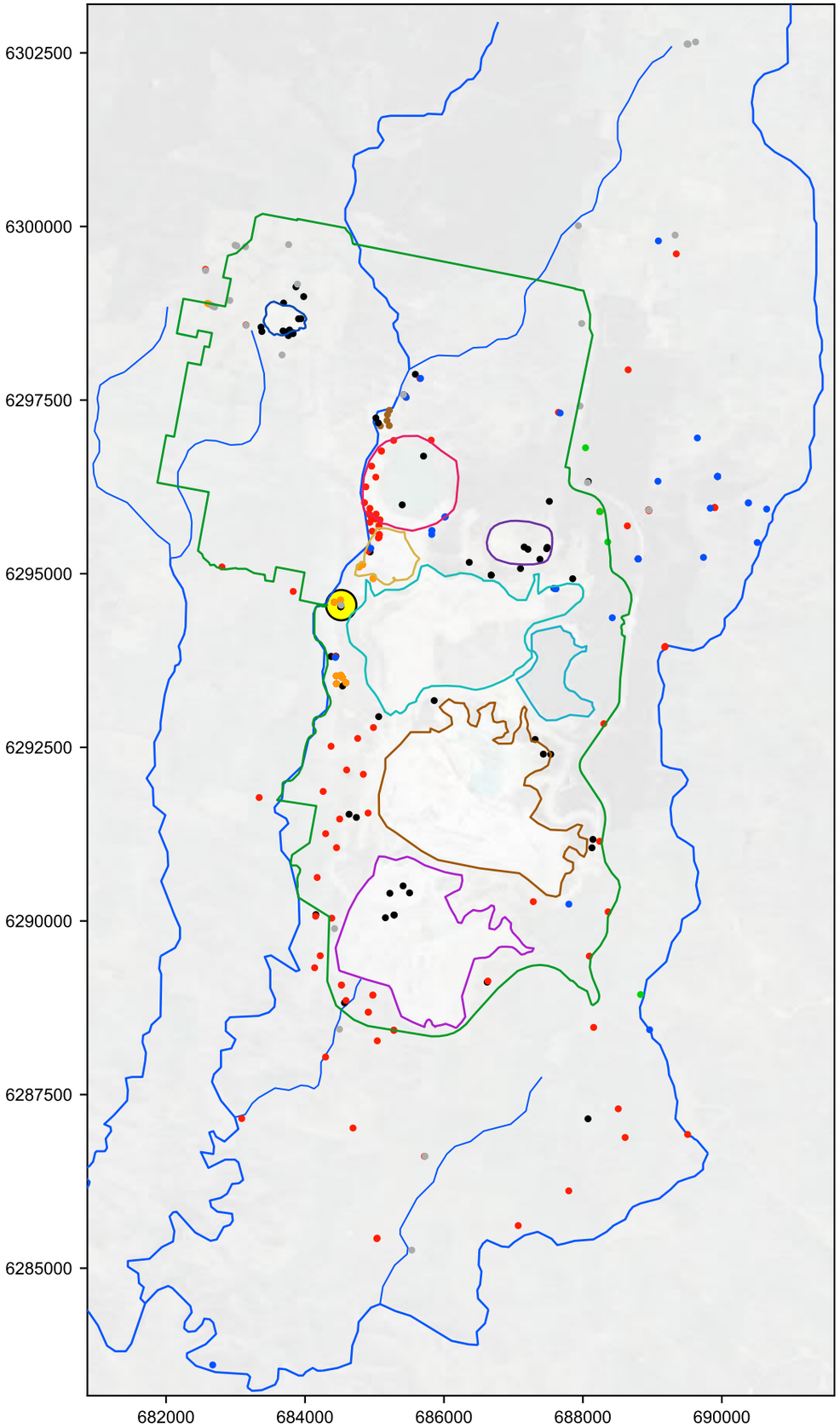
WMP defined analytes



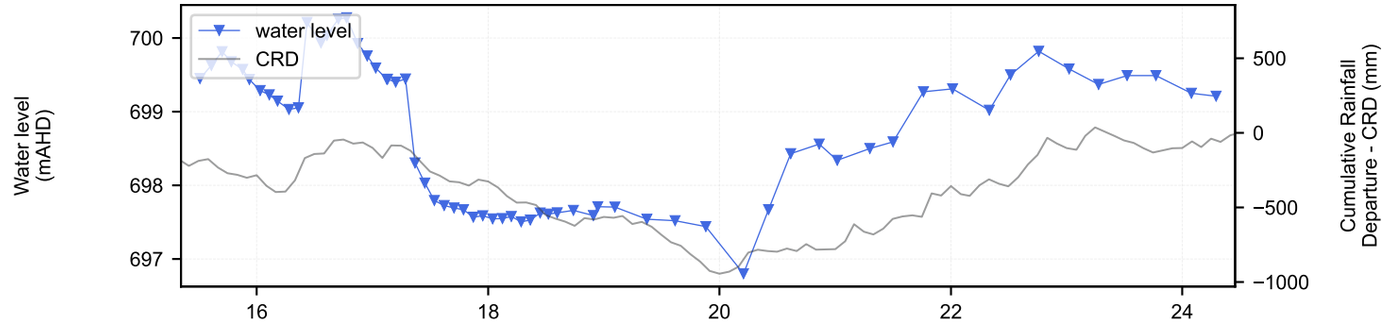
Additional analytes of interest

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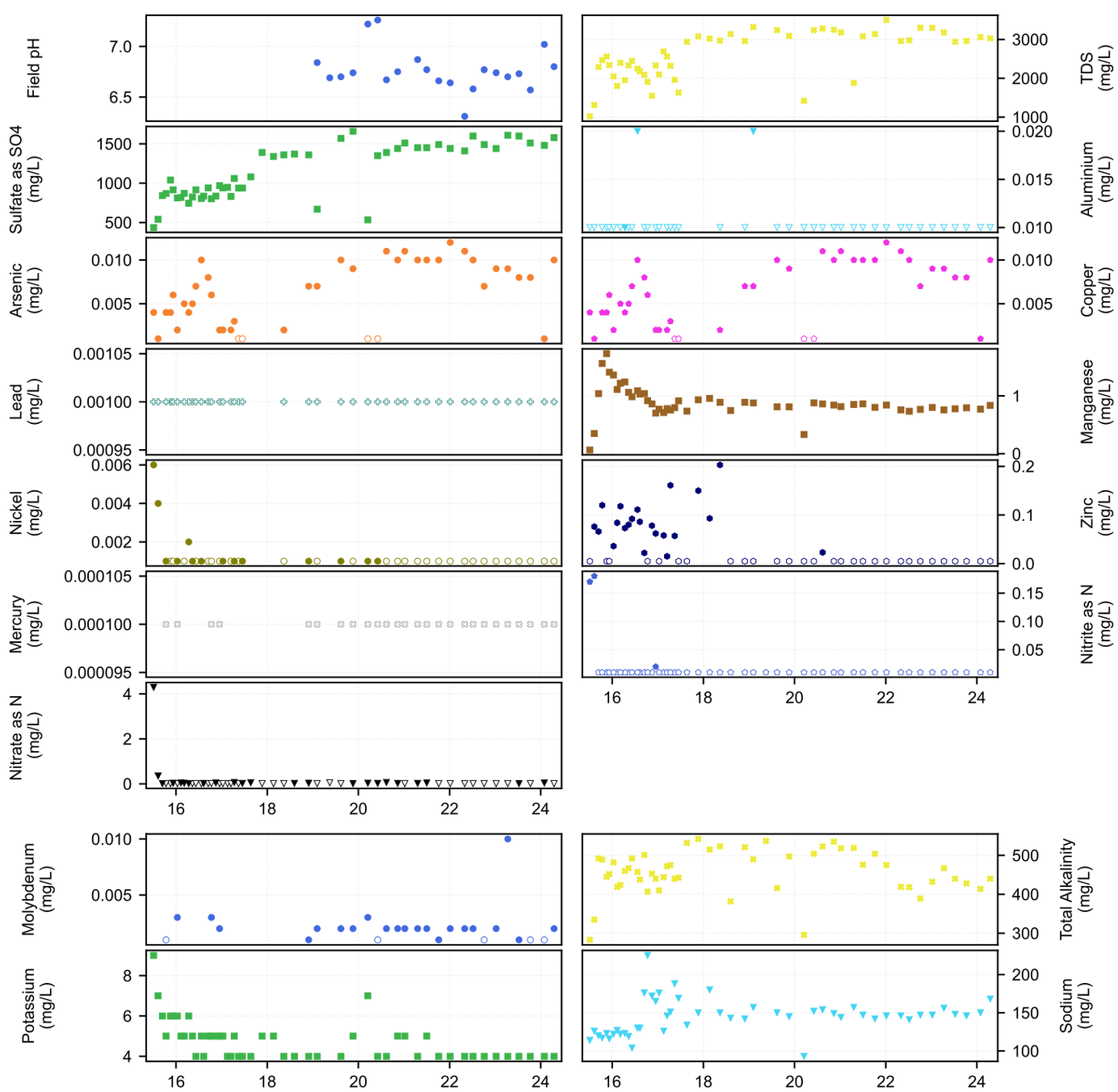
MB5C (Screened geology - Tertiary basalt; Screened interval: 43-55 mbgl)



Groundwater levels



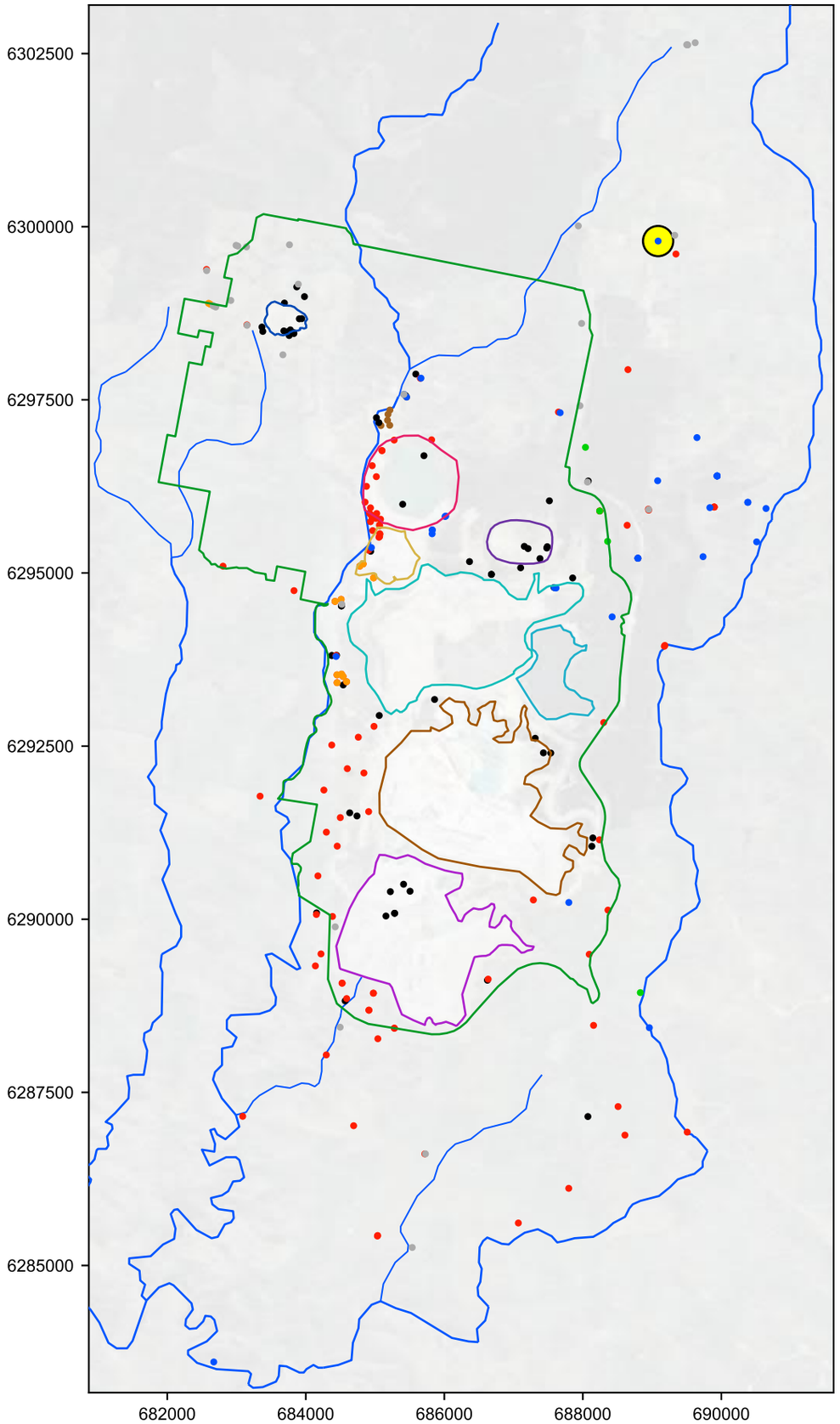
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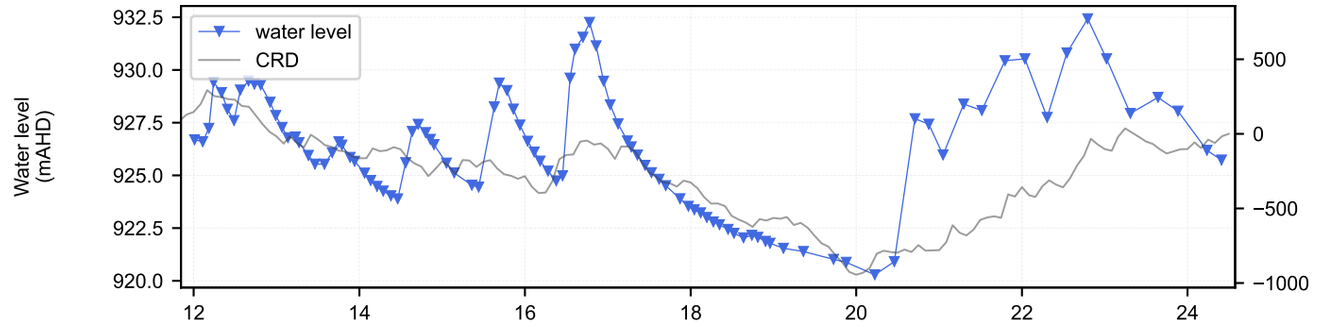
Additional analytes of interest

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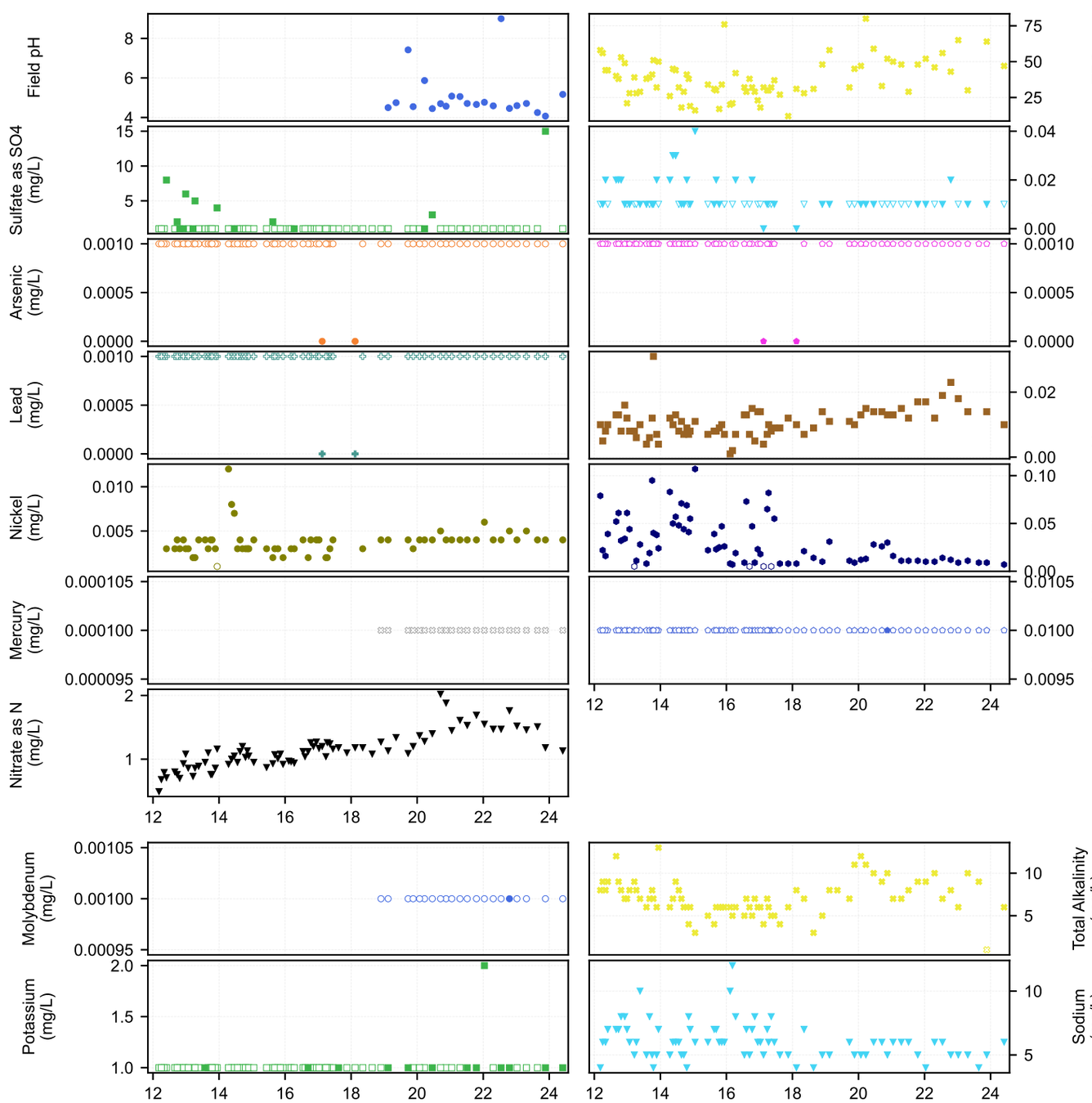
MB63 (Screened geology - Silurian; Screened interval: 10-16 mbgl)



Groundwater levels



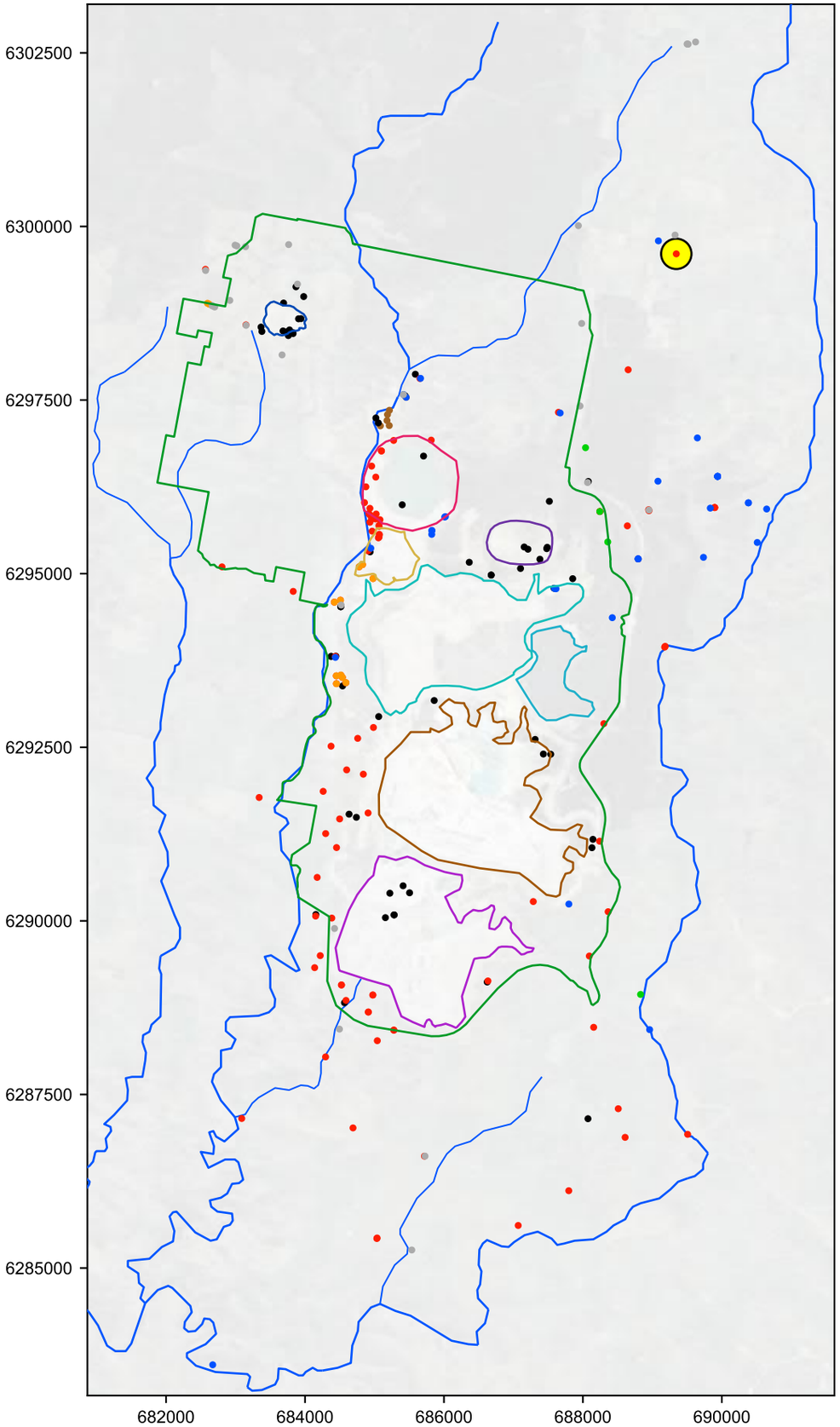
WMP defined analytes



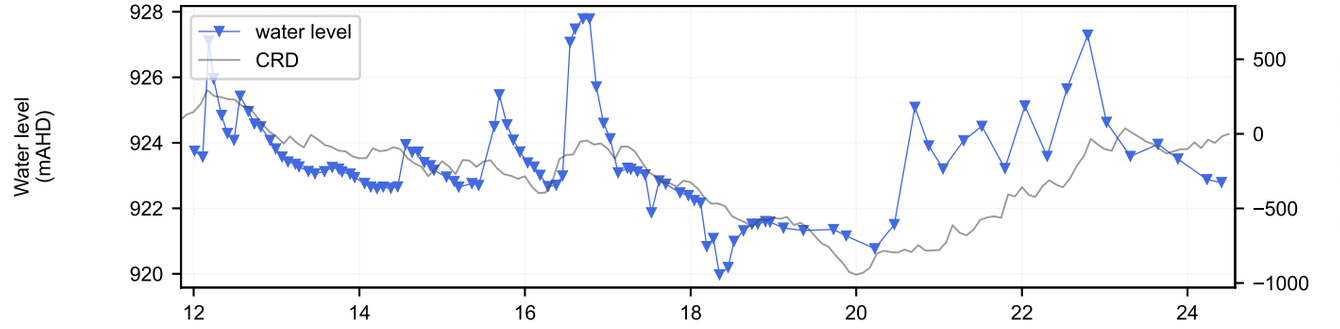
Additional analytes of interest

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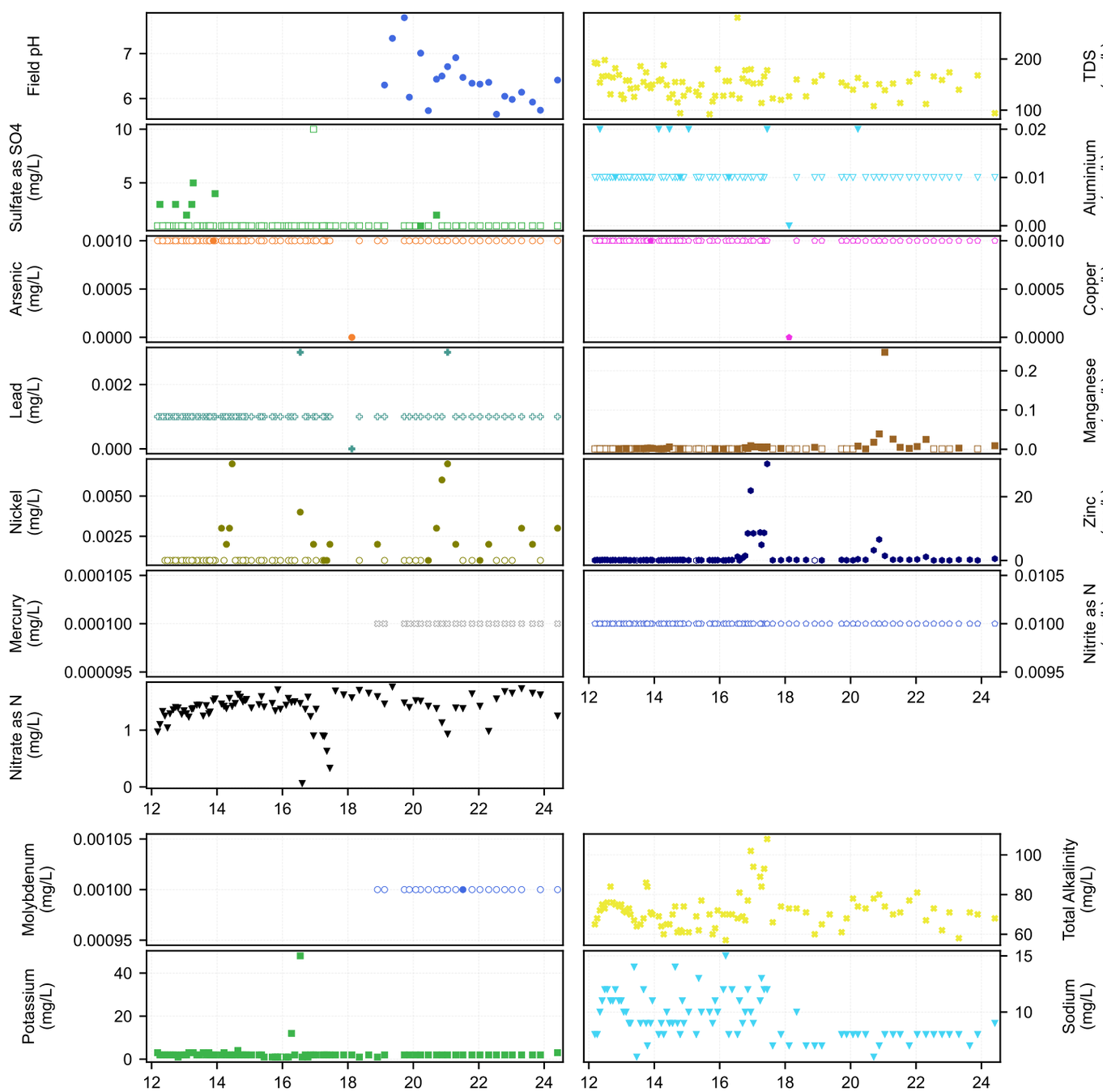
MB65 (Screened geology - Ordovician; Screened interval: 26-62 mbgl)



Groundwater levels



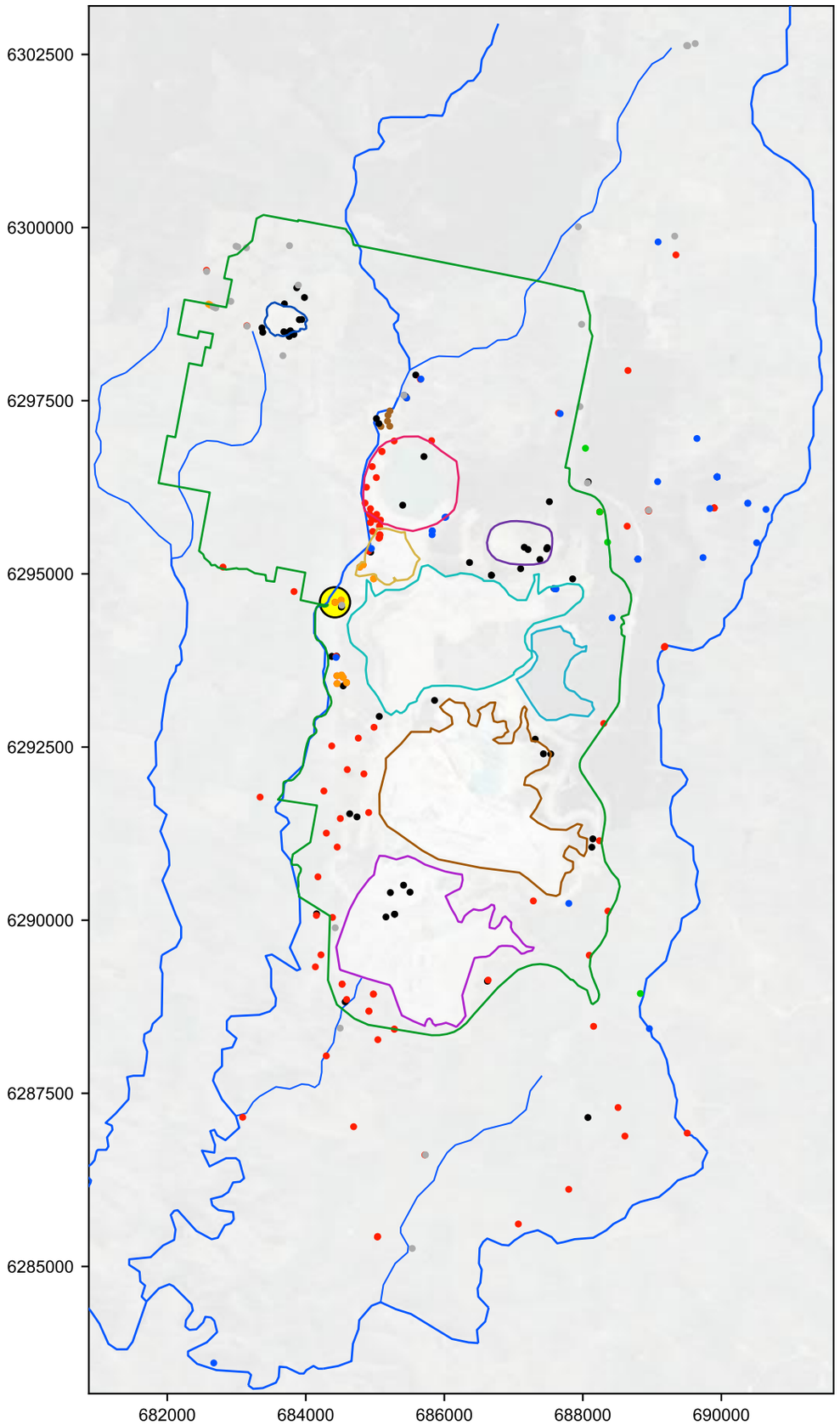
WMP defined analytes



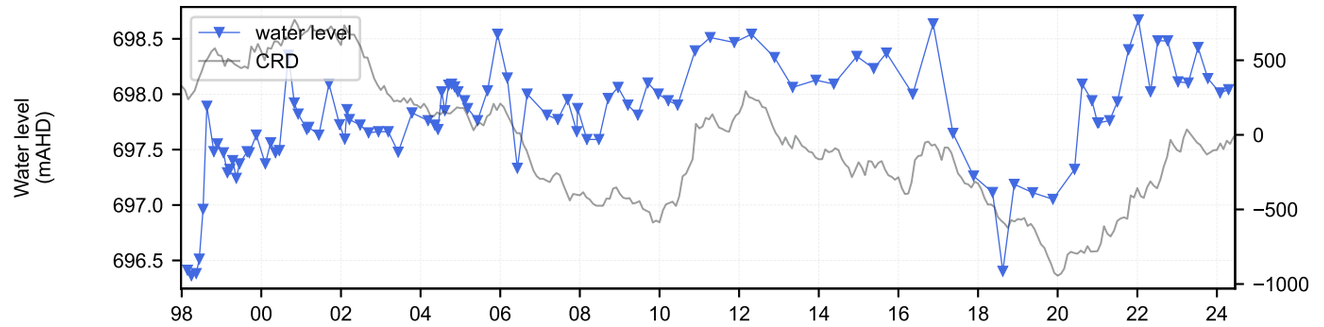
Additional analytes of interest

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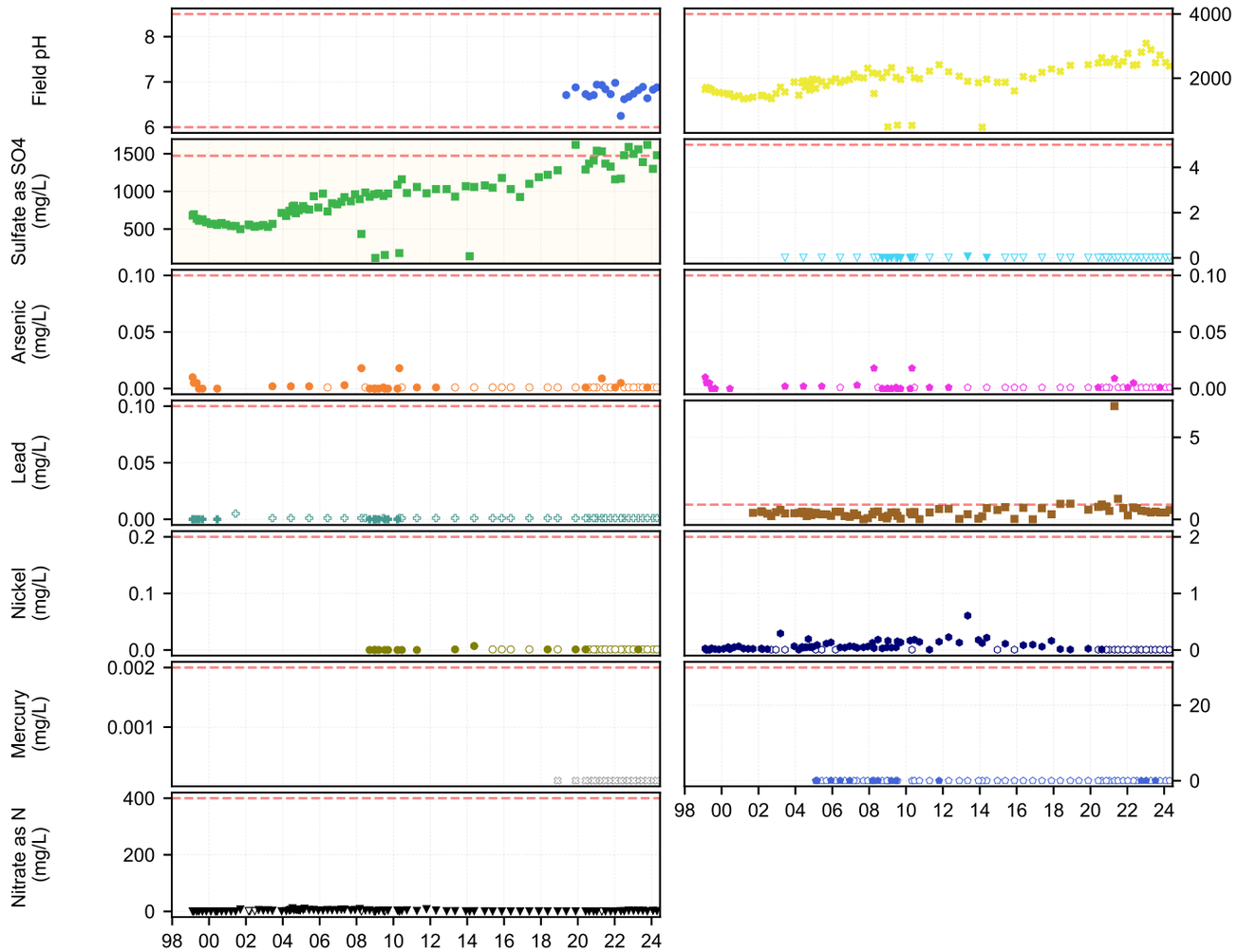
MB6A (Screened geology - Ordovician; Screened interval: 11.59-17.59 mbgl)



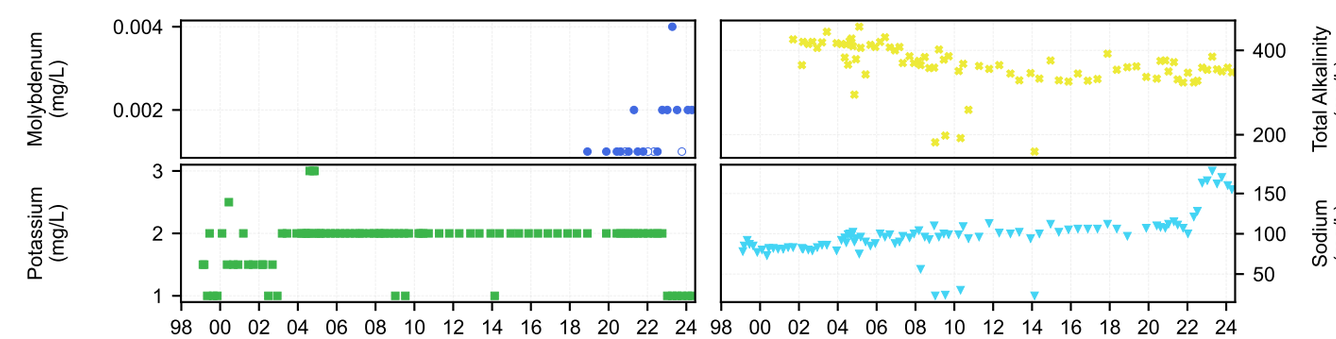
Groundwater levels



WMP defined analytes

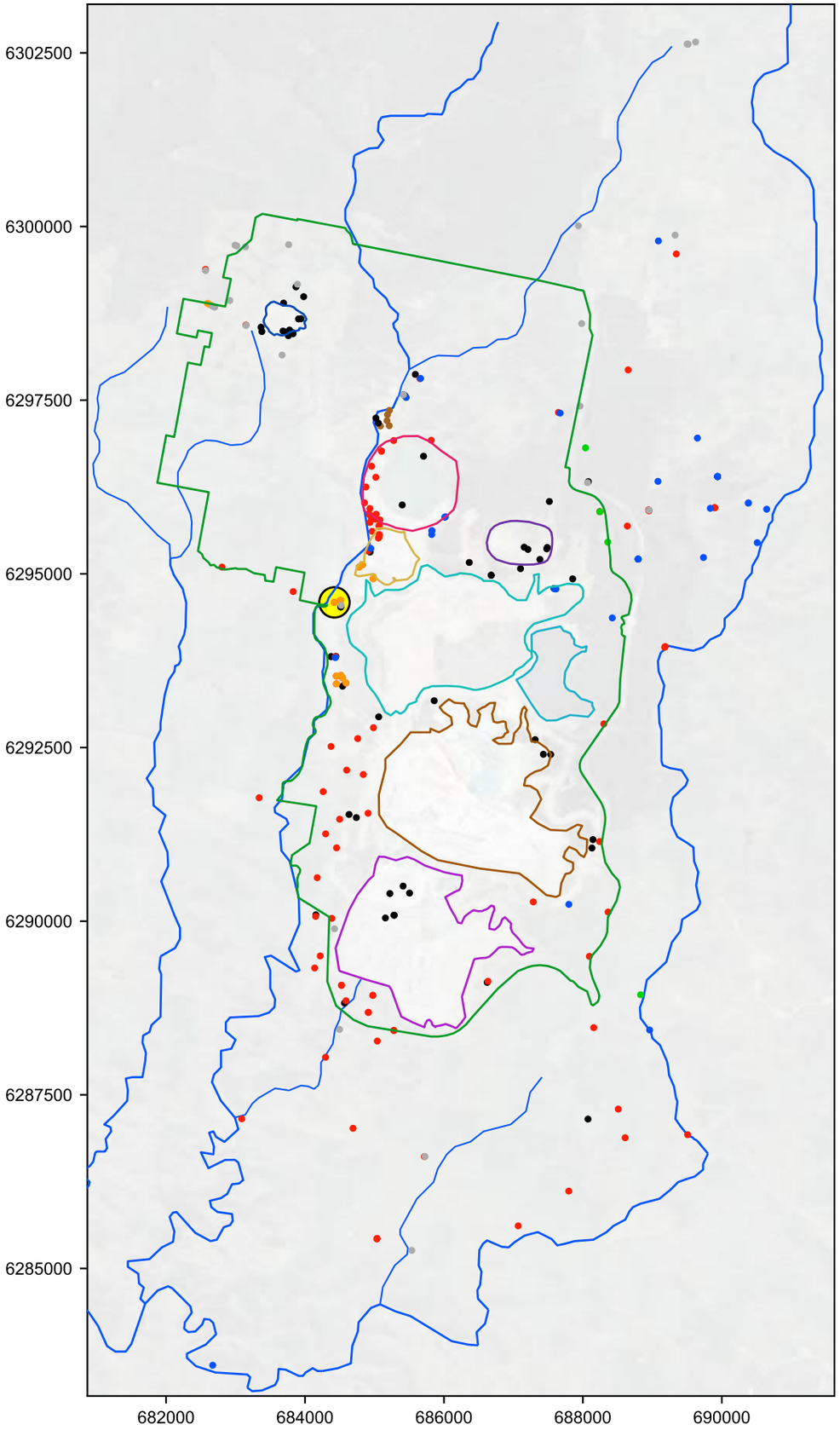


Additional analytes of interest

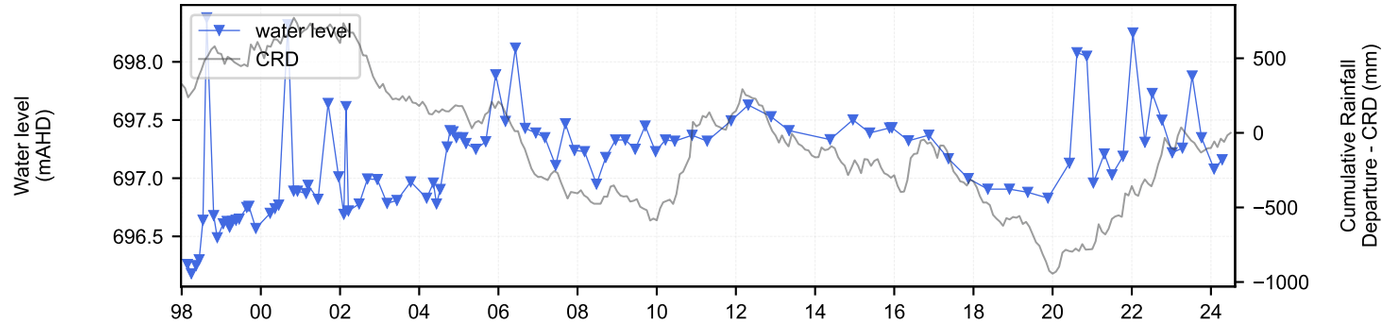


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

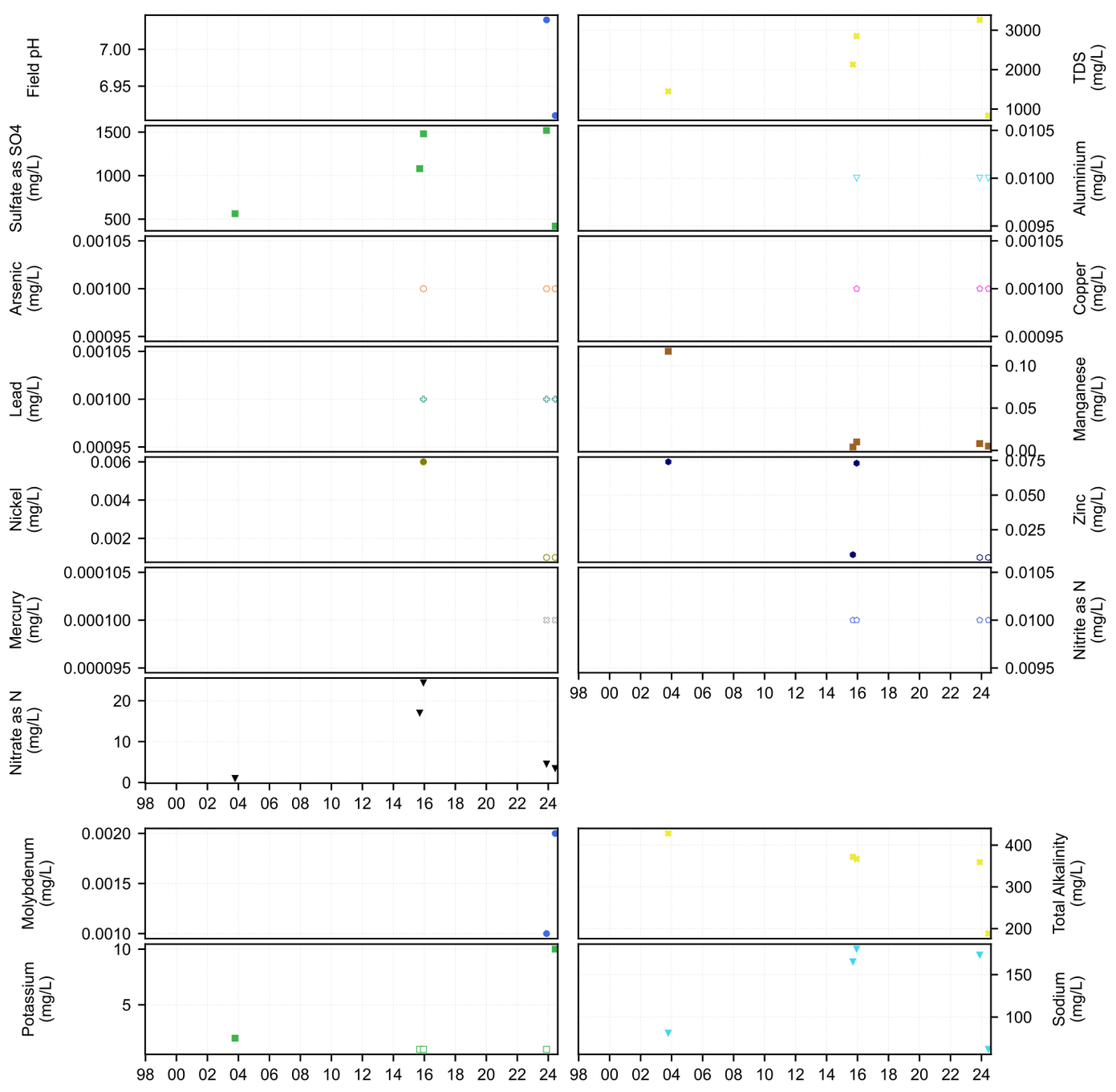
MB6B (Screened geology - Regolith; Screened interval: 0.5-6.5 mbgl)



Groundwater levels



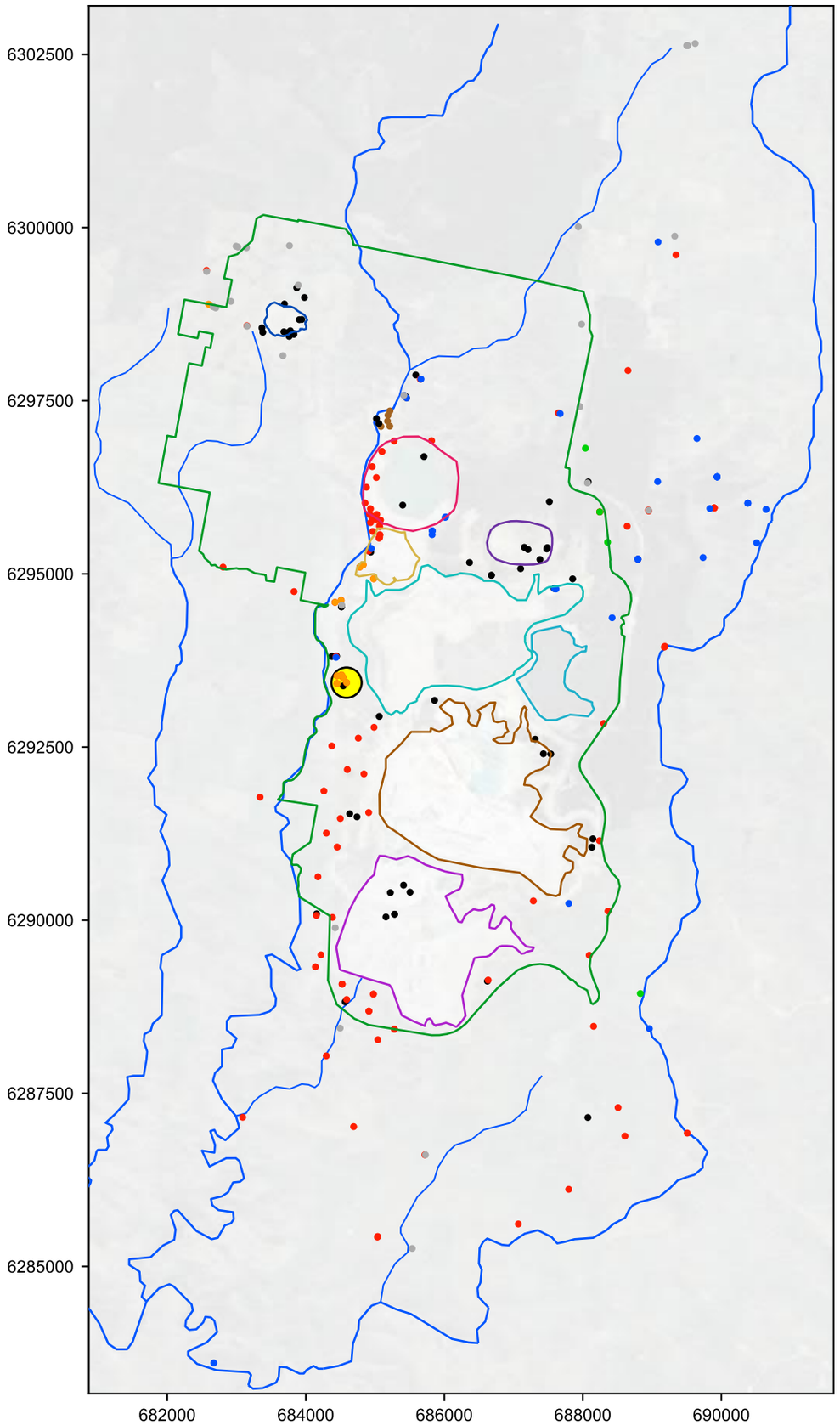
WMP defined analytes



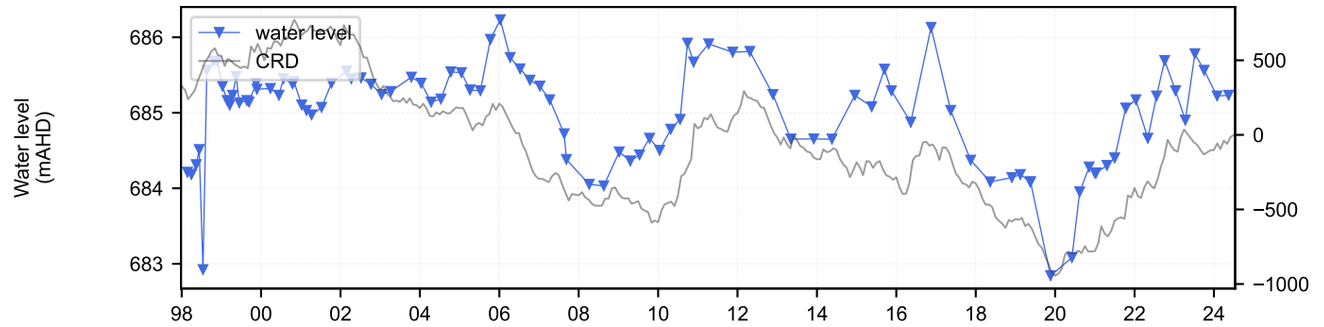
Additional analytes of interest

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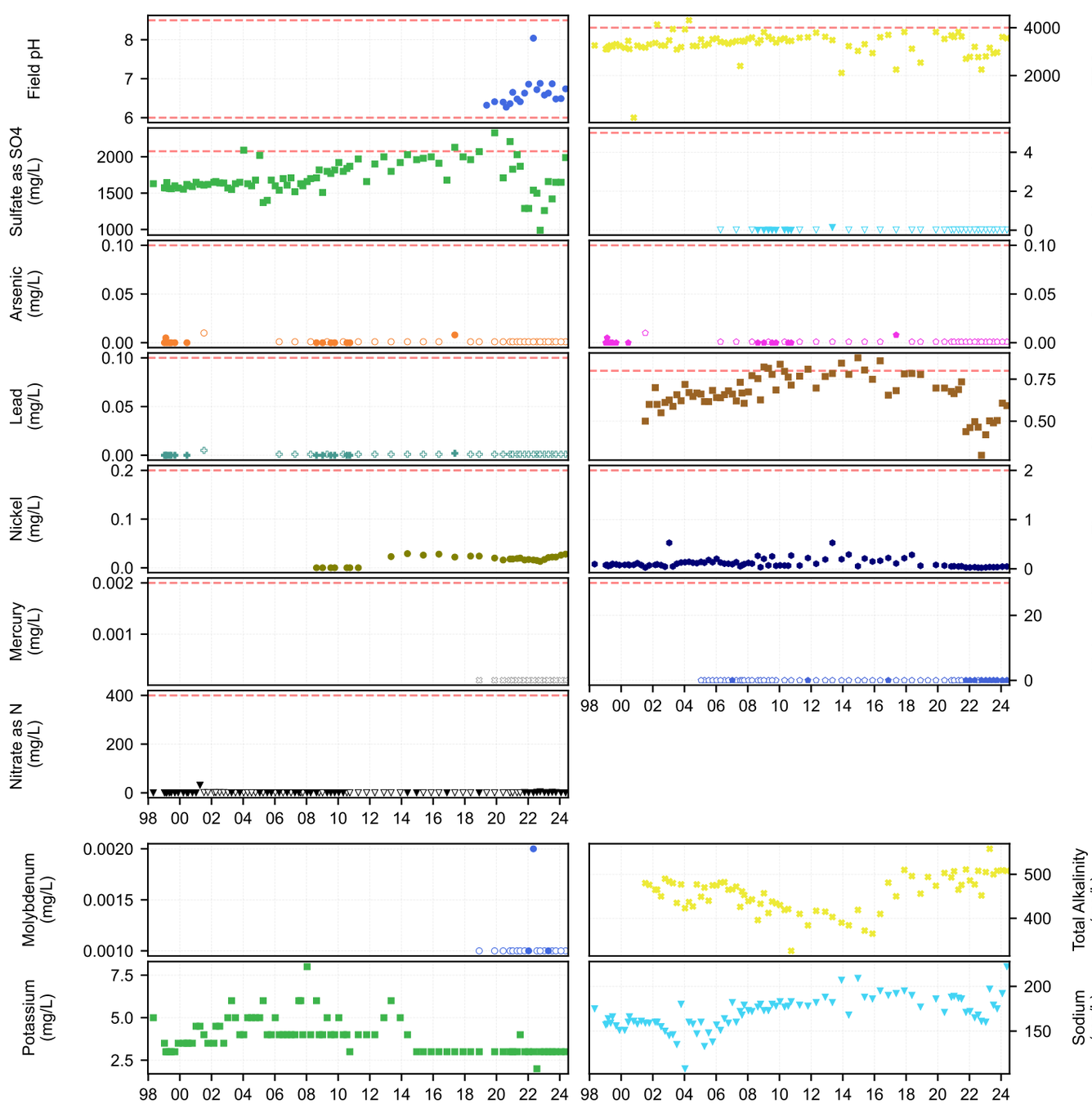
MB7A (Screened geology - Ordovician; Screened interval: 12-18 mbgl)



Groundwater levels



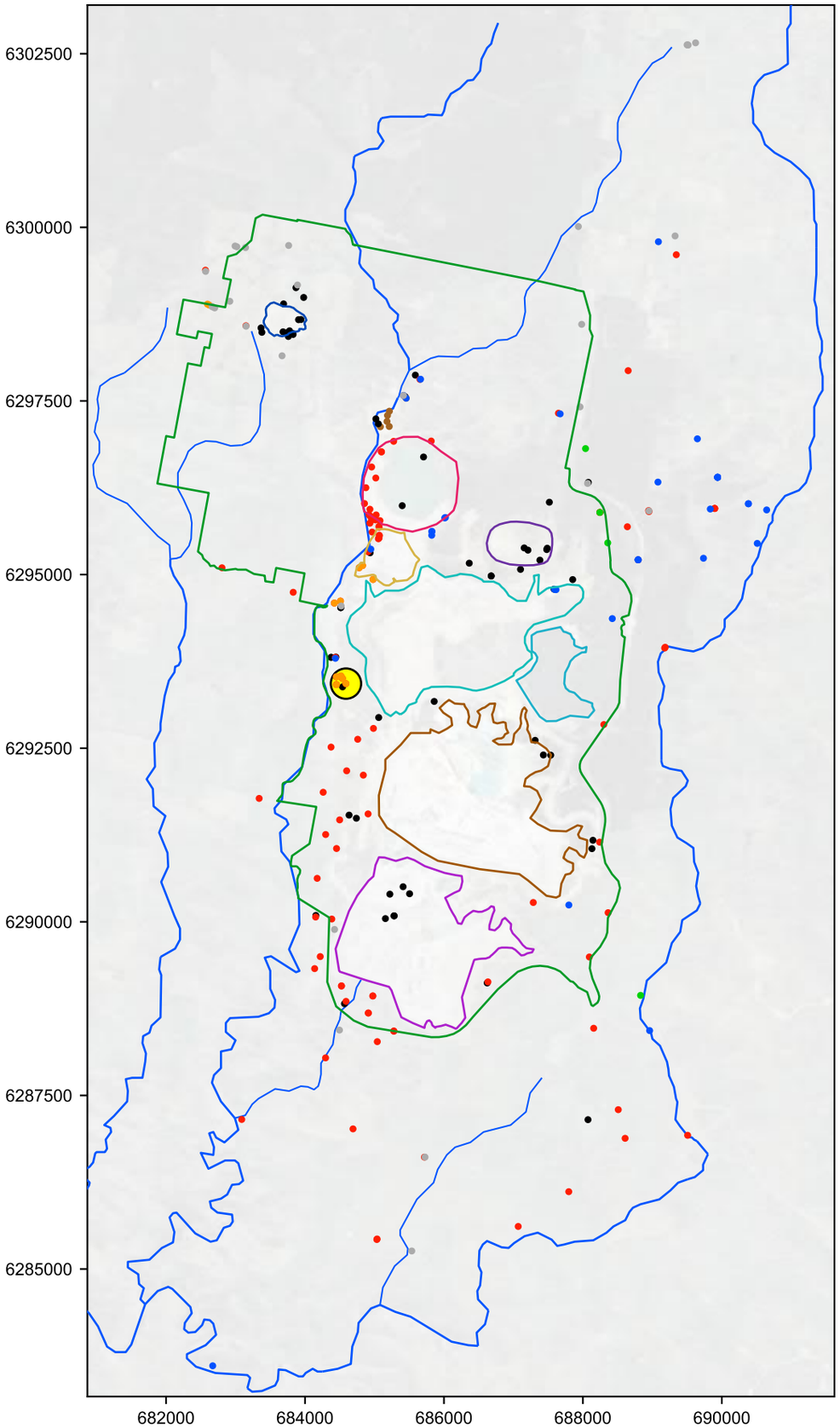
WMP defined analytes



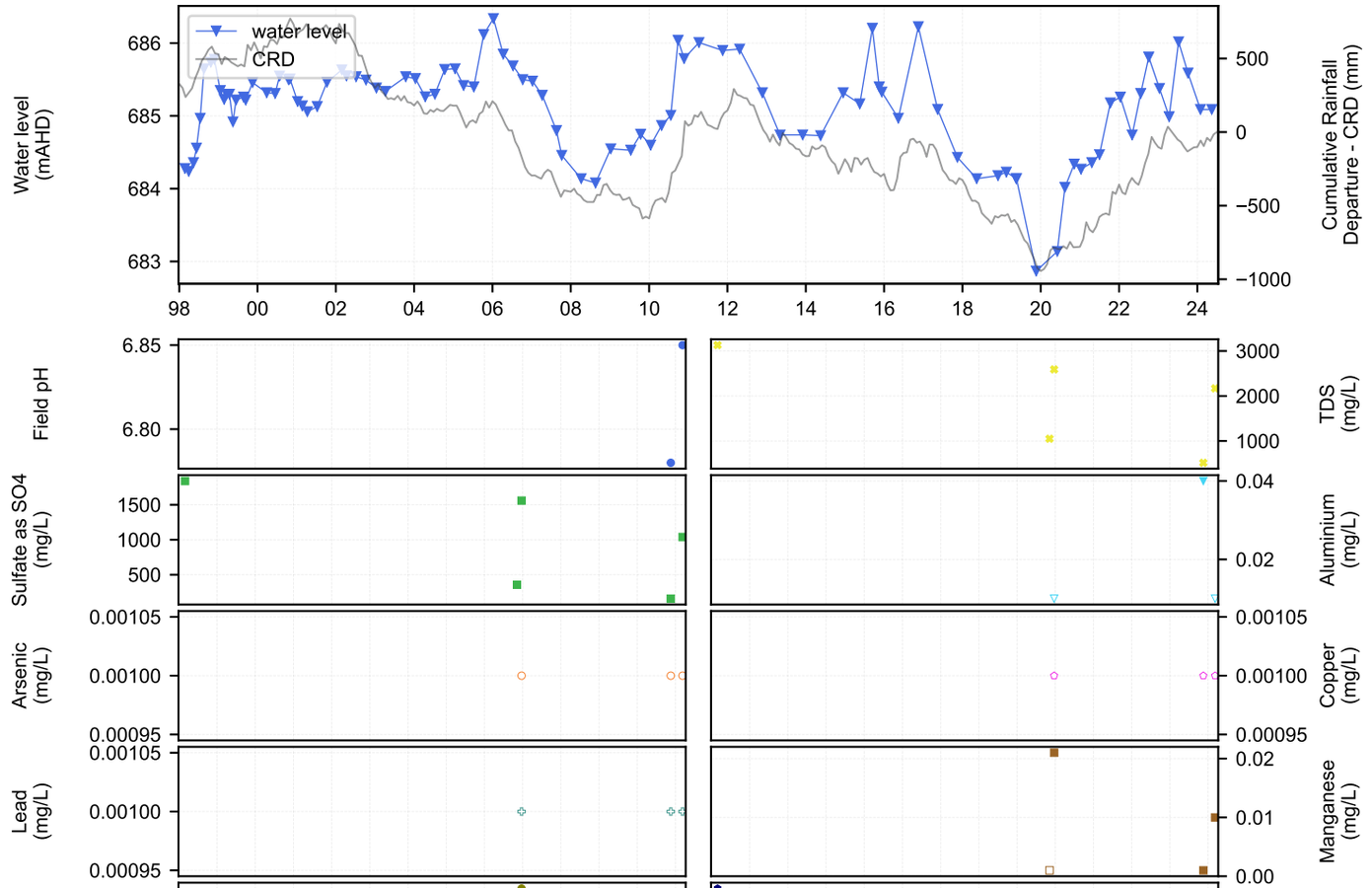
Additional analytes of interest

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Red dashed lines are trigger levels from WMP 2023

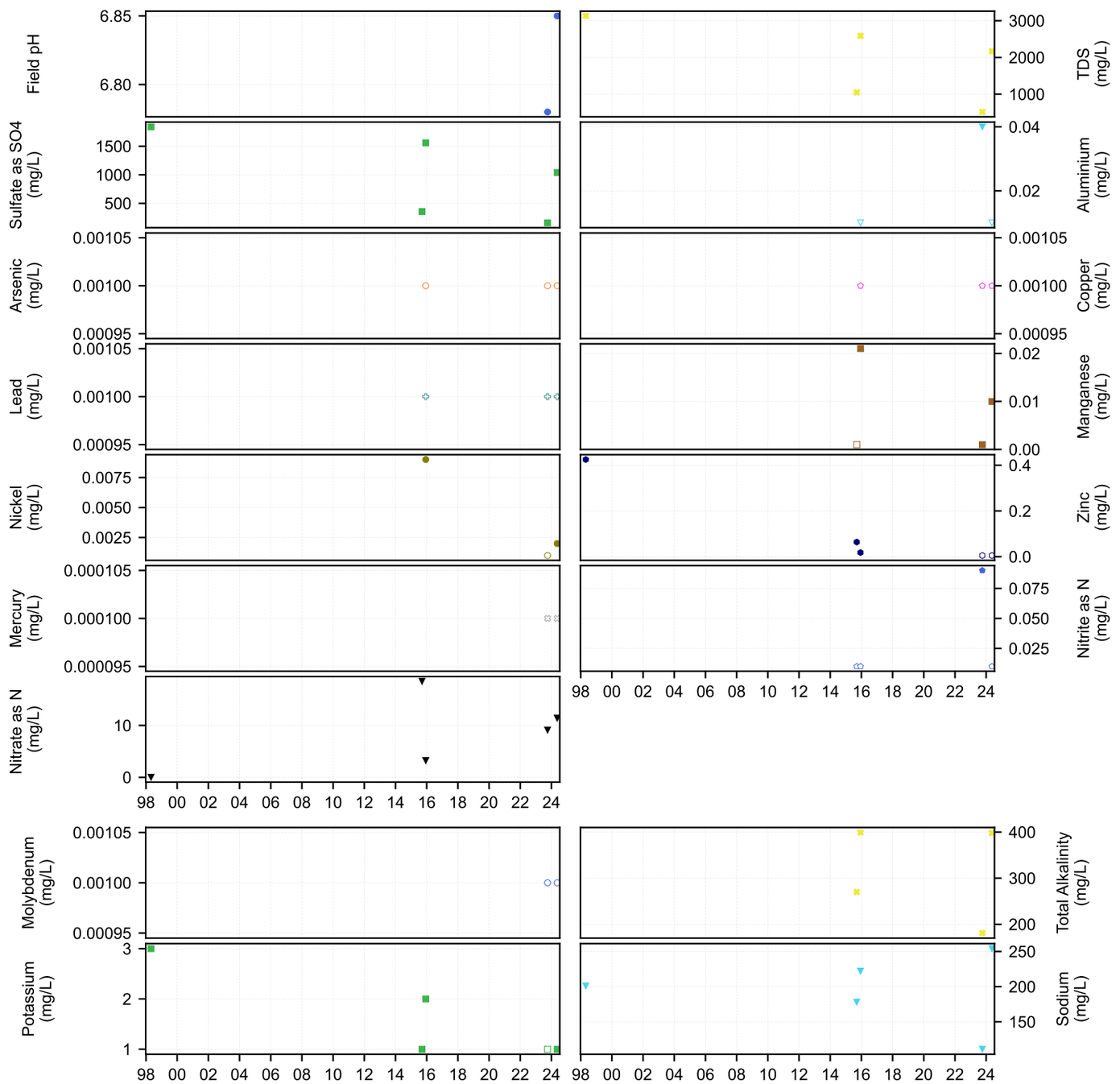
MB7B (Screened geology - Regolith; Screened interval: 0.45-6.45 mbgl)



Groundwater levels



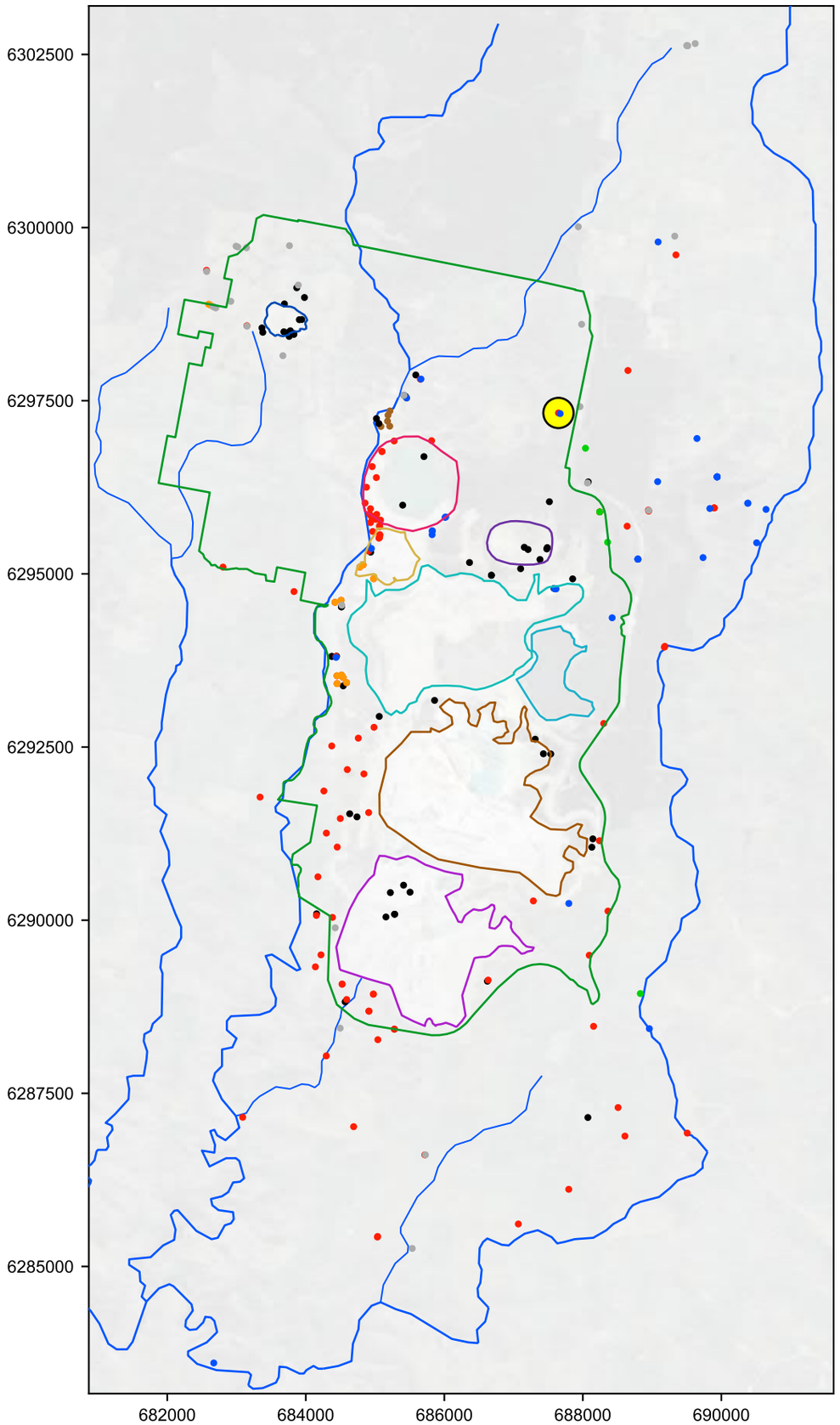
WMP defined analytes



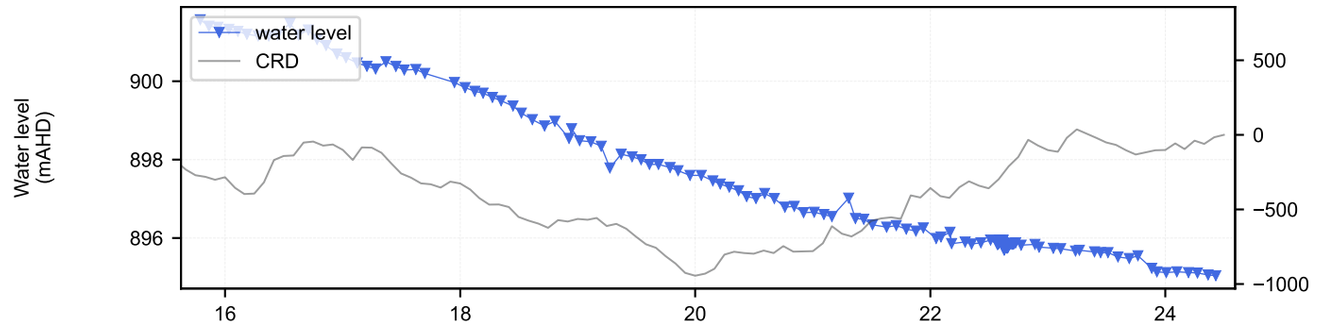
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

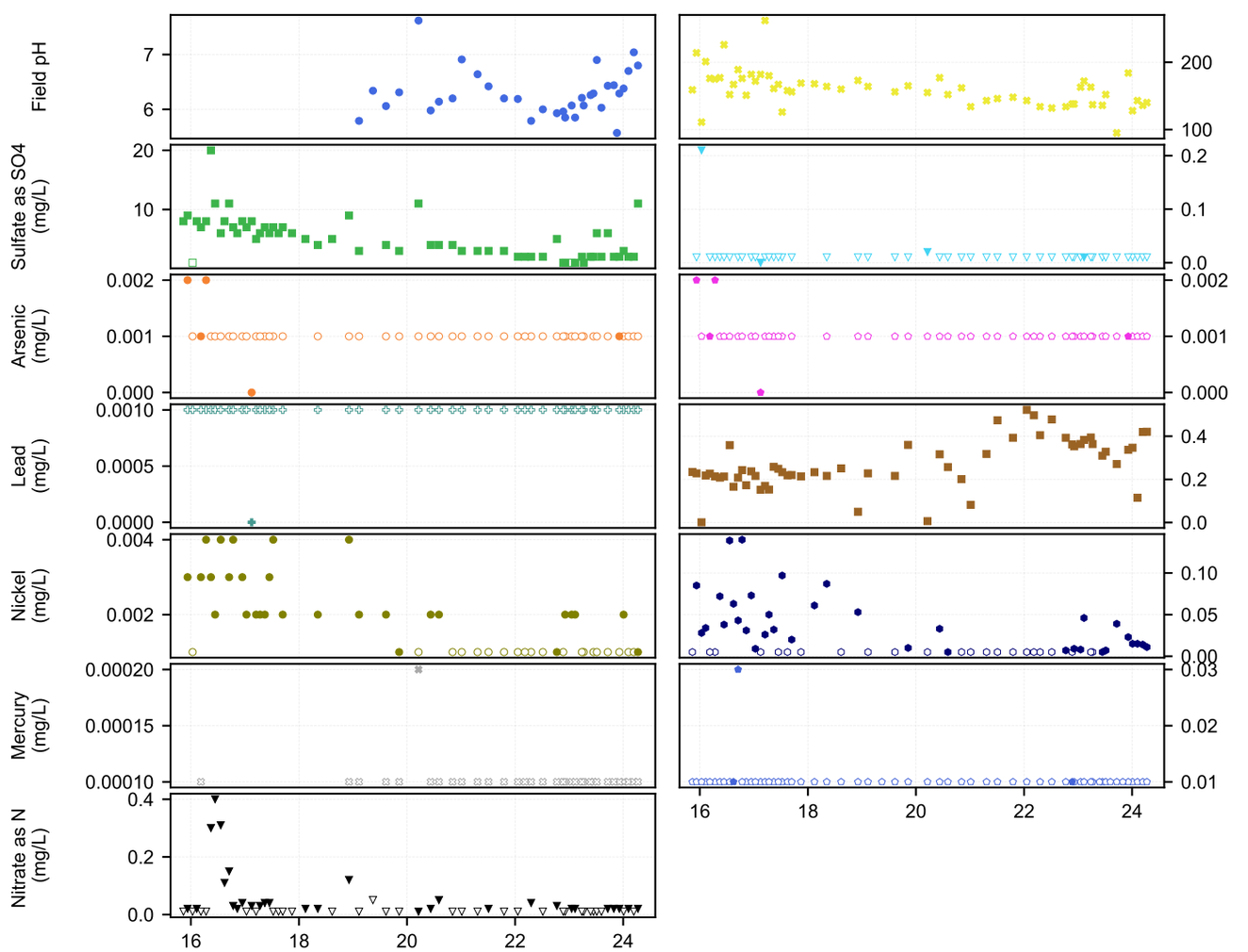
MB82 (Screened geology - Ordovician; Screened interval: 91-103 mbgl)



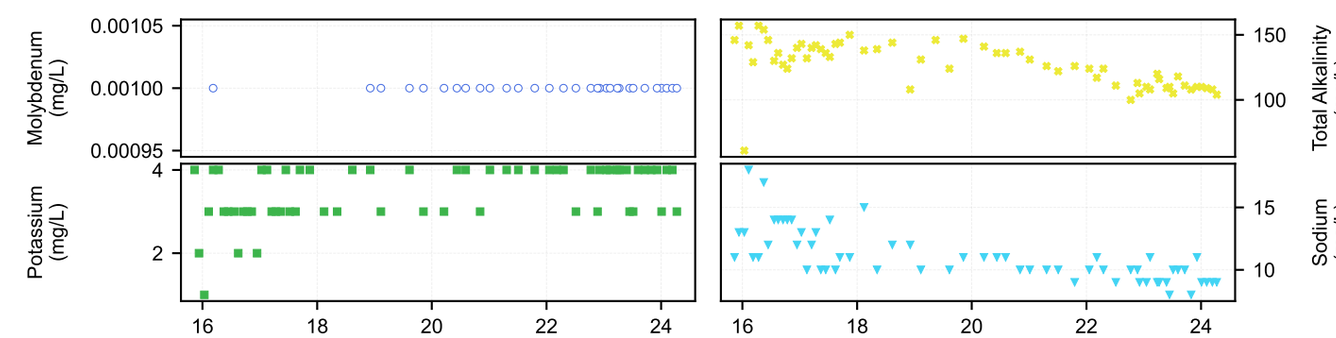
Groundwater levels



WMP defined analytes

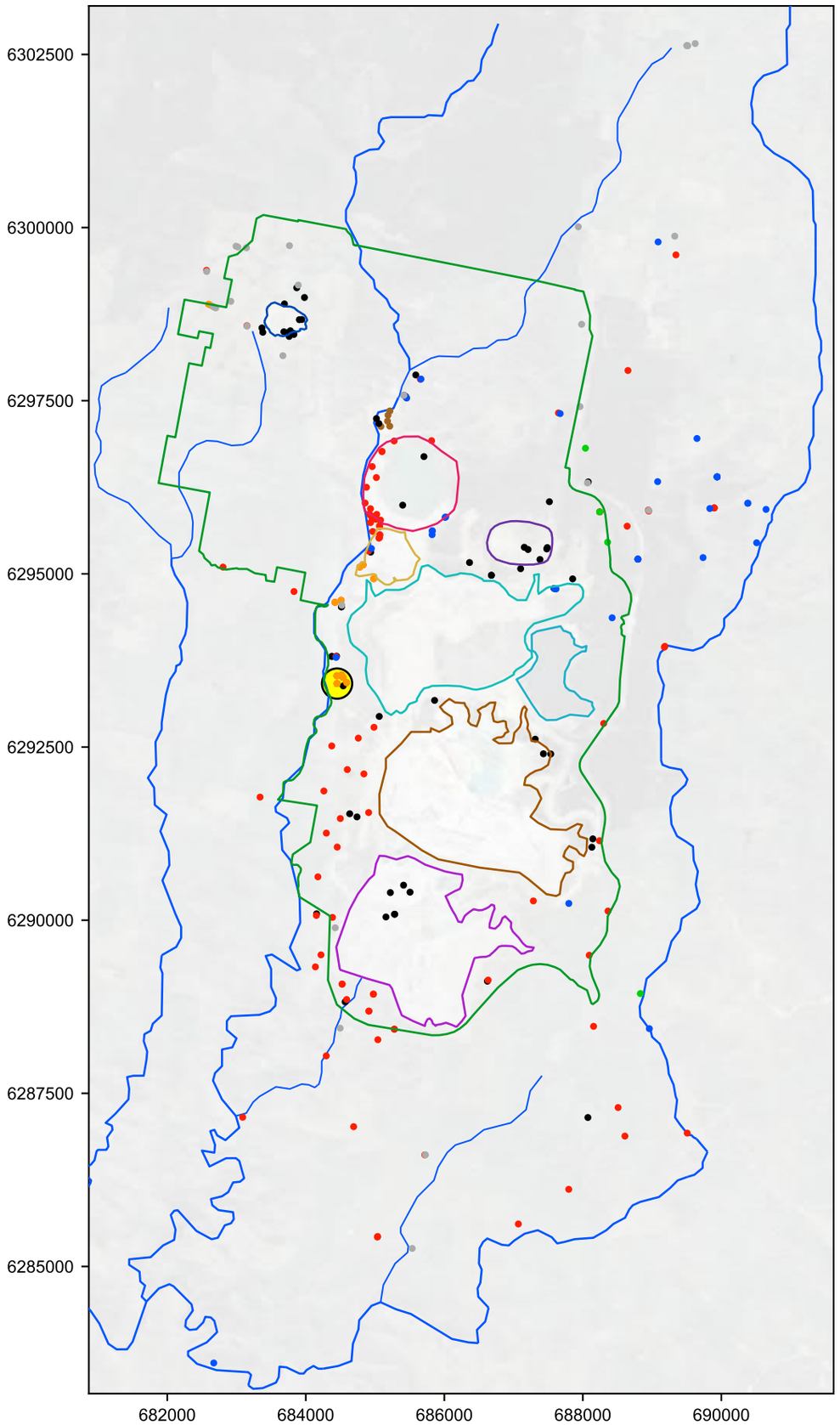


Additional analytes of interest

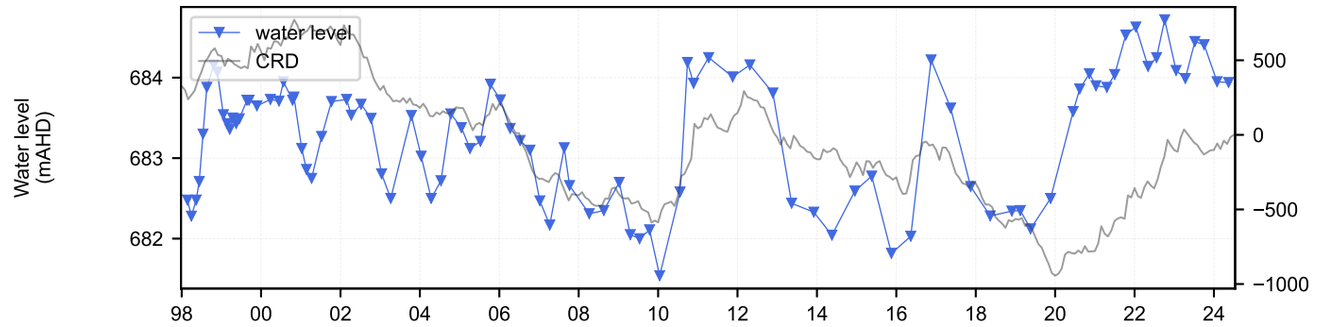


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

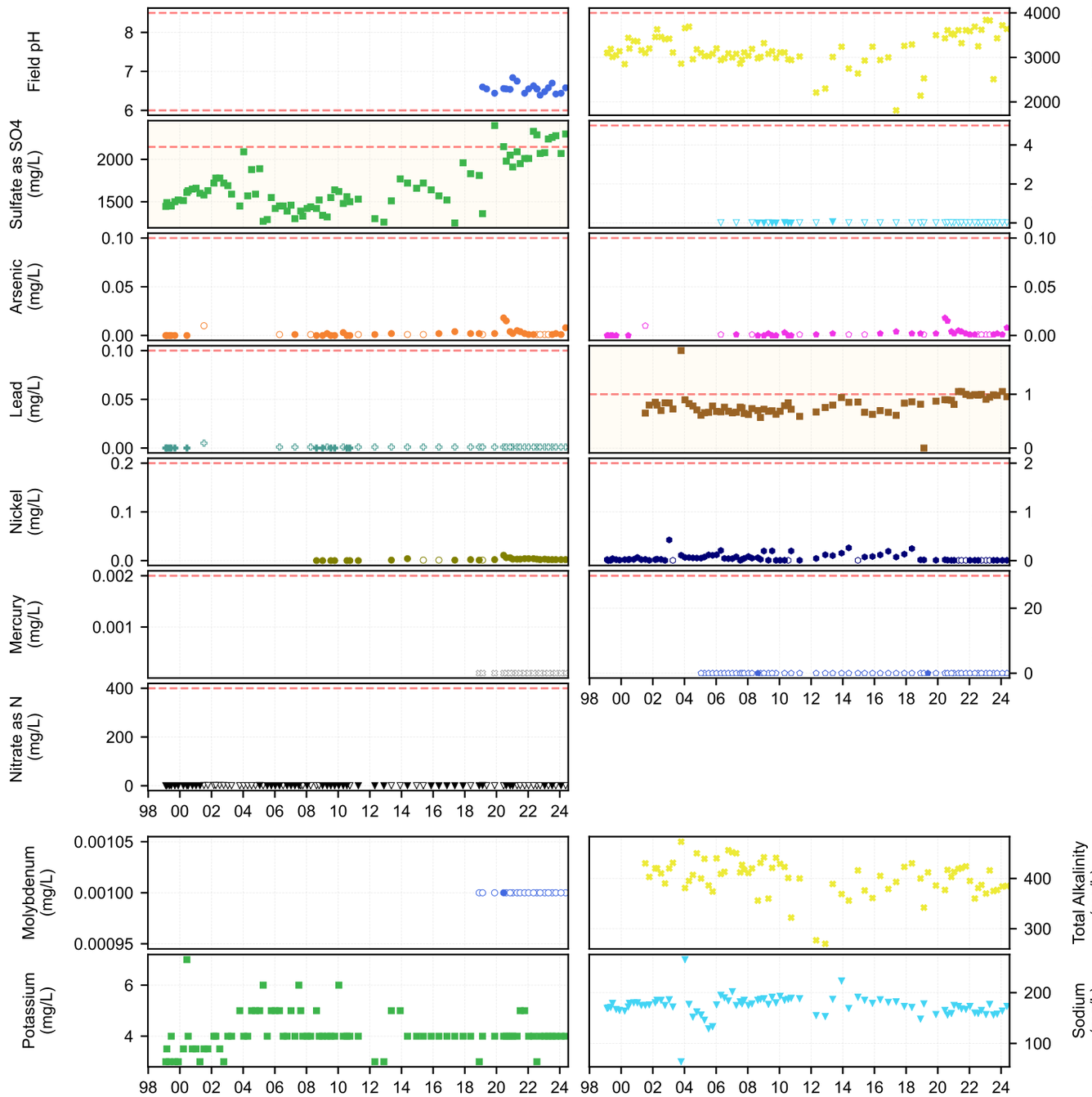
MB8A (Screened geology - Ordovician; Screened interval: 11.5-17.5 mbgl)



Groundwater levels



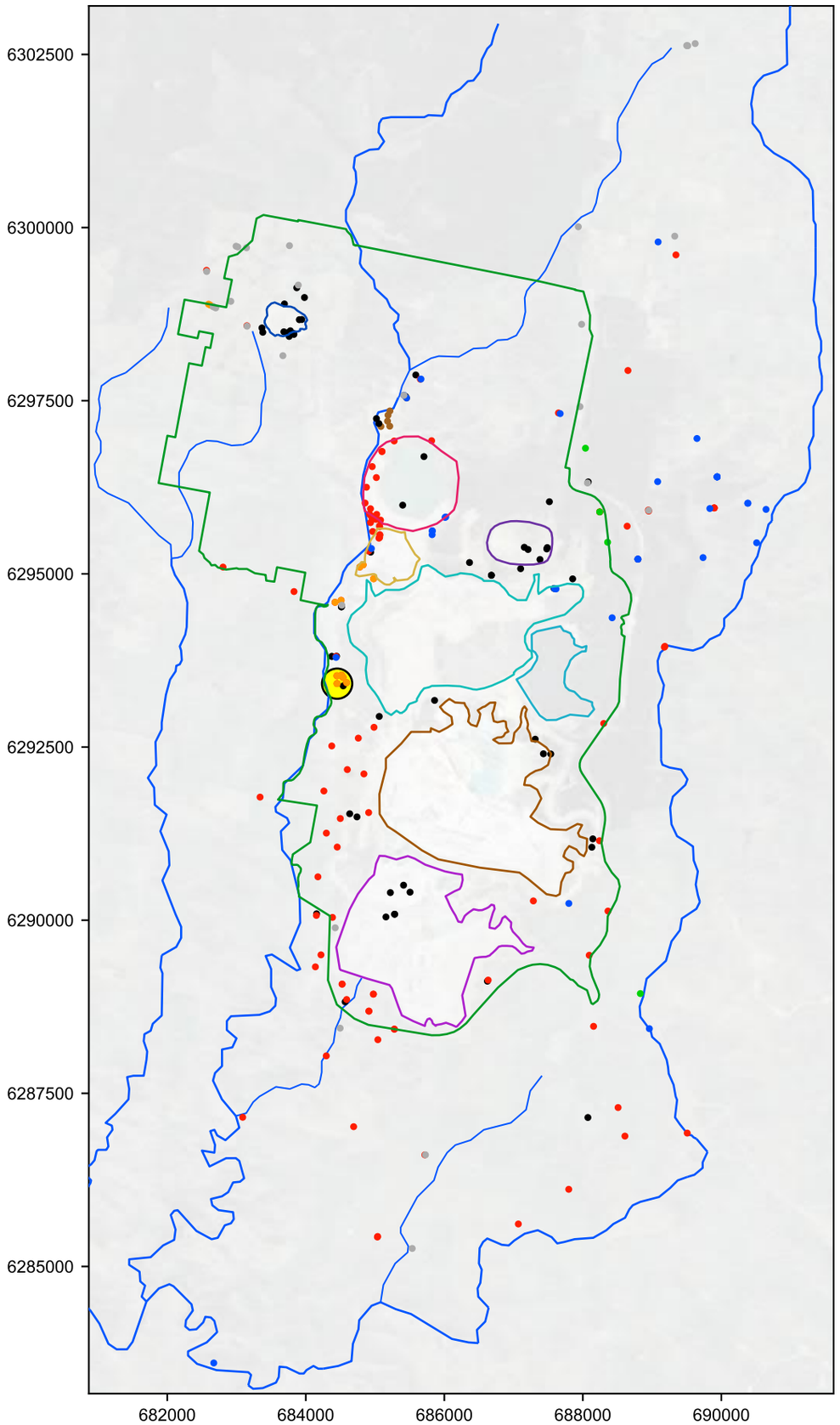
WMP defined analytes



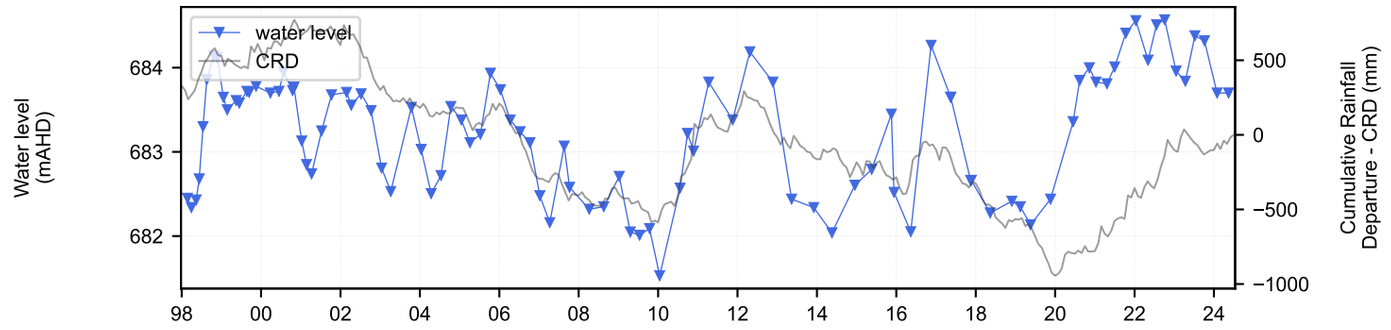
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

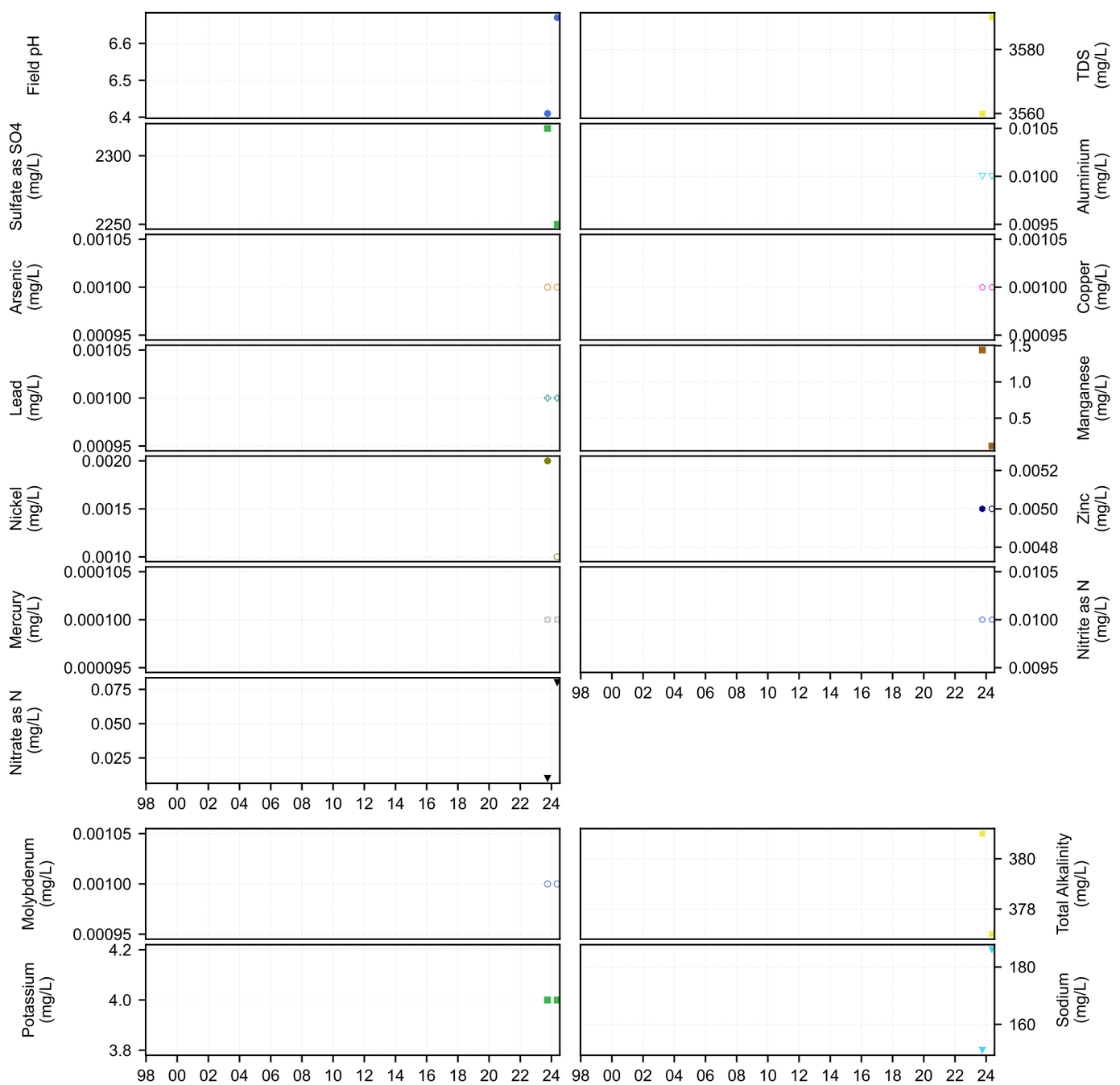
MB8B (Screened geology - Regolith; Screened interval: 0.4-4.4 mbgl)



Groundwater levels



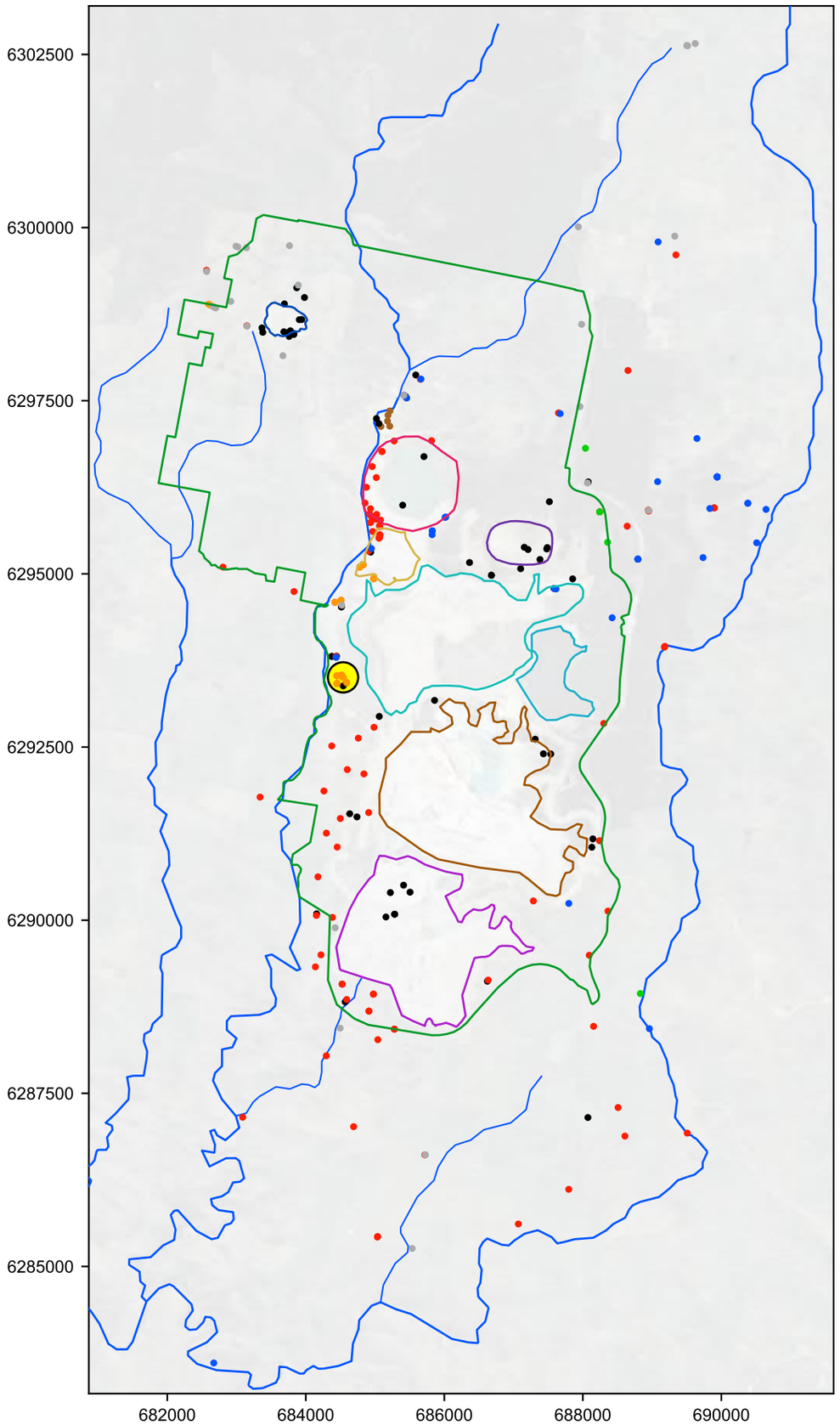
WMP defined analytes



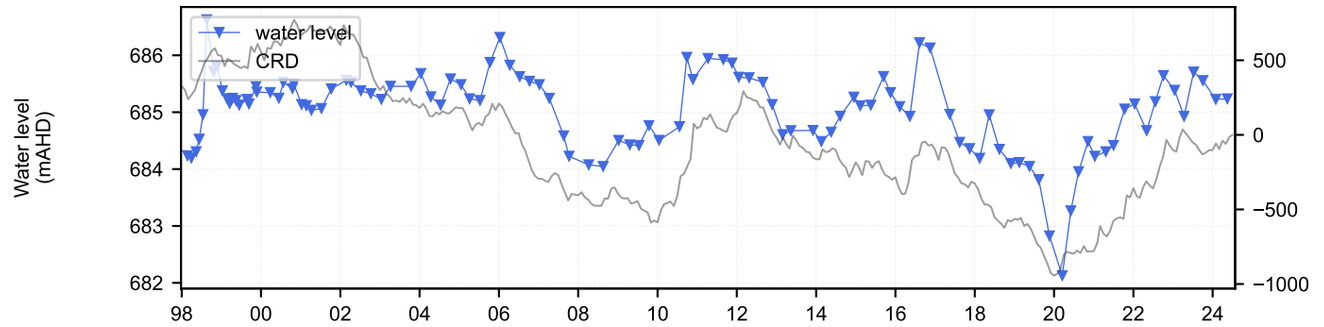
Additional analytes of interest

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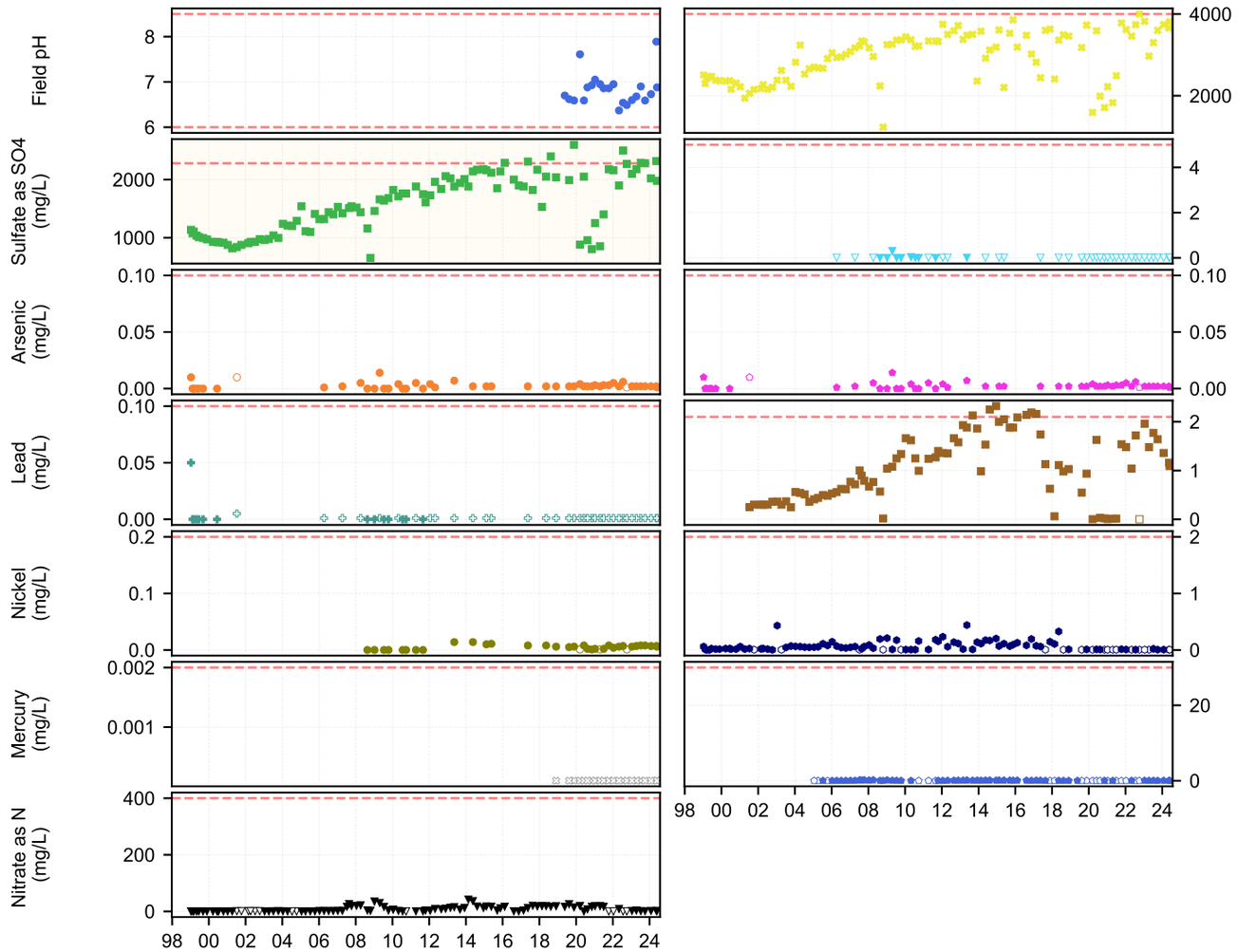
MB9A (Screened geology - Ordovician; Screened interval: 10.5-16.5 mbgl)



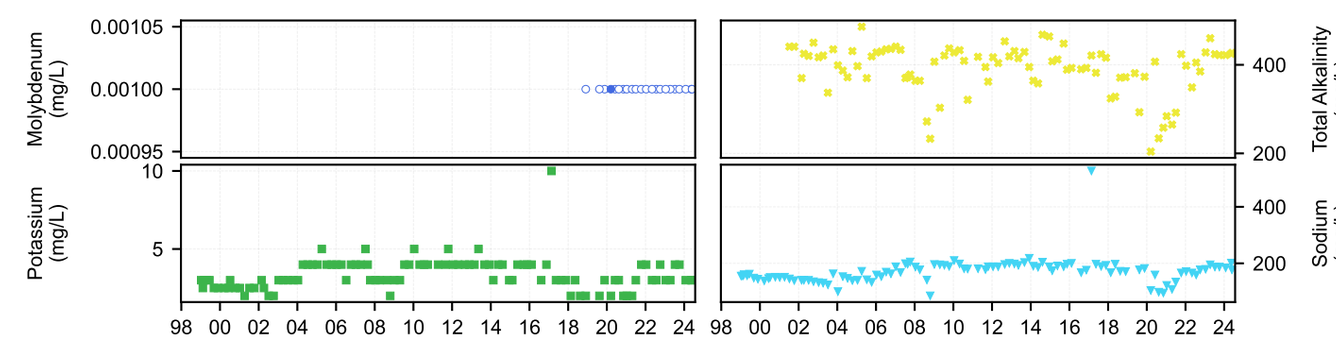
Groundwater levels



WMP defined analytes

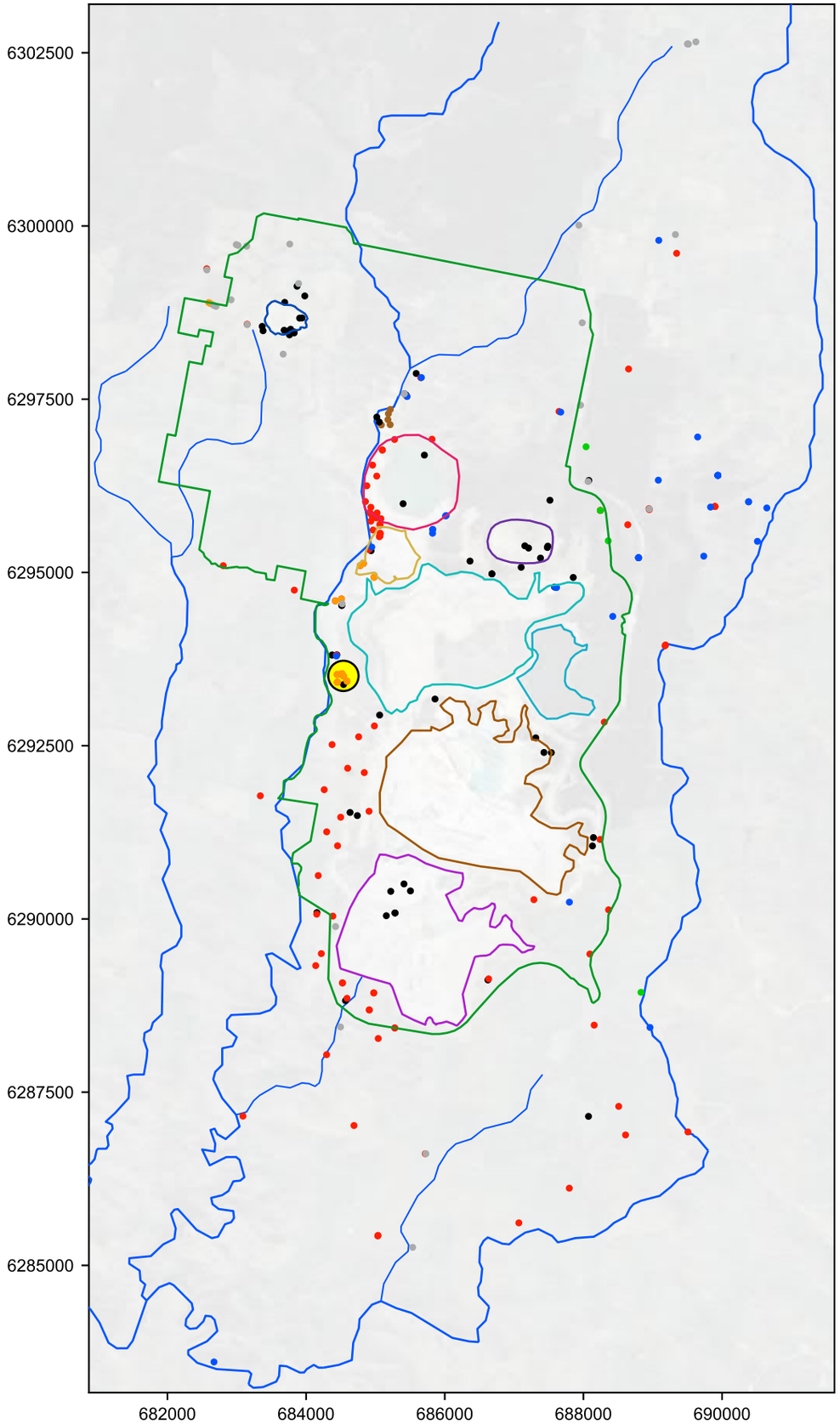


Additional analytes of interest

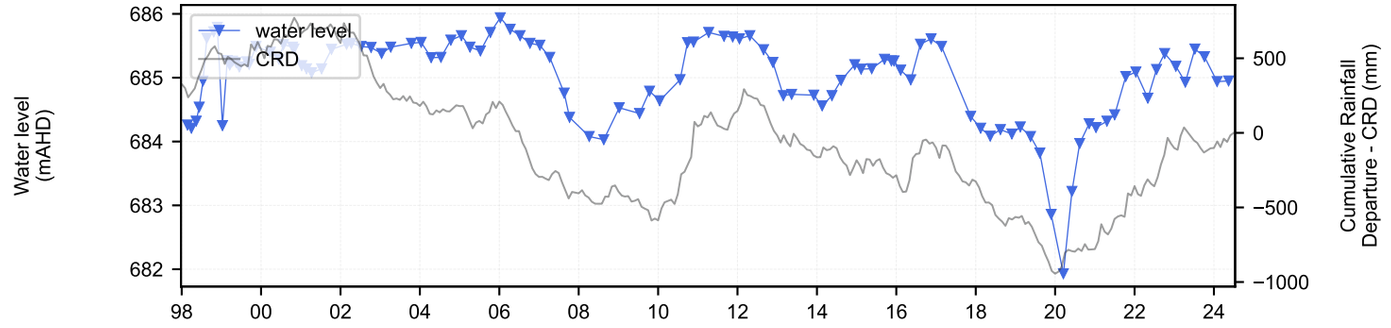


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting
Red dashed lines are trigger levels from WMP 2023; Plots shaded to highlight Water Year 23-24 exceedance

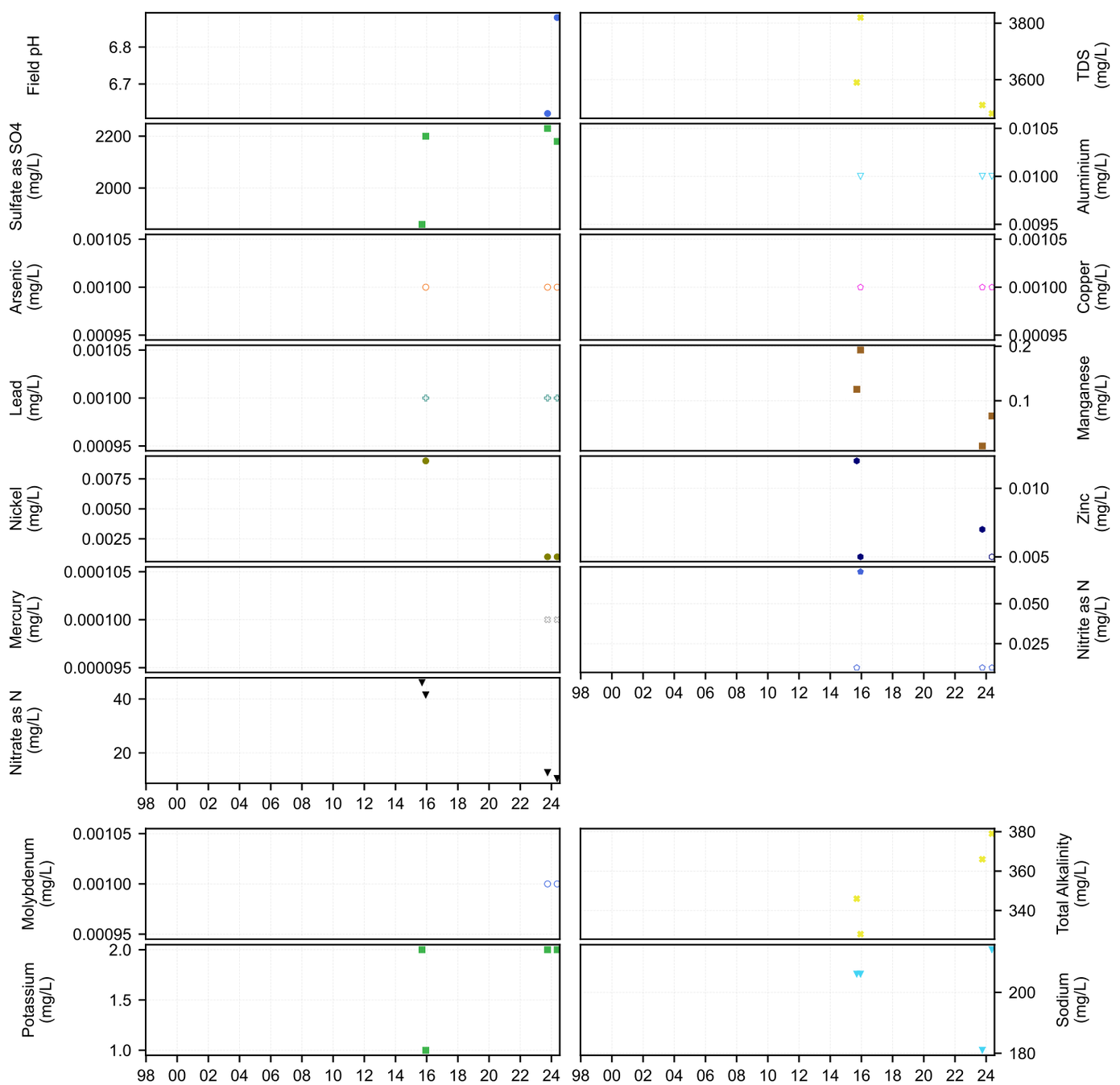
MB9B (Screened geology - Regolith; Screened interval: 0.2-6.2 mbgl)



Groundwater levels



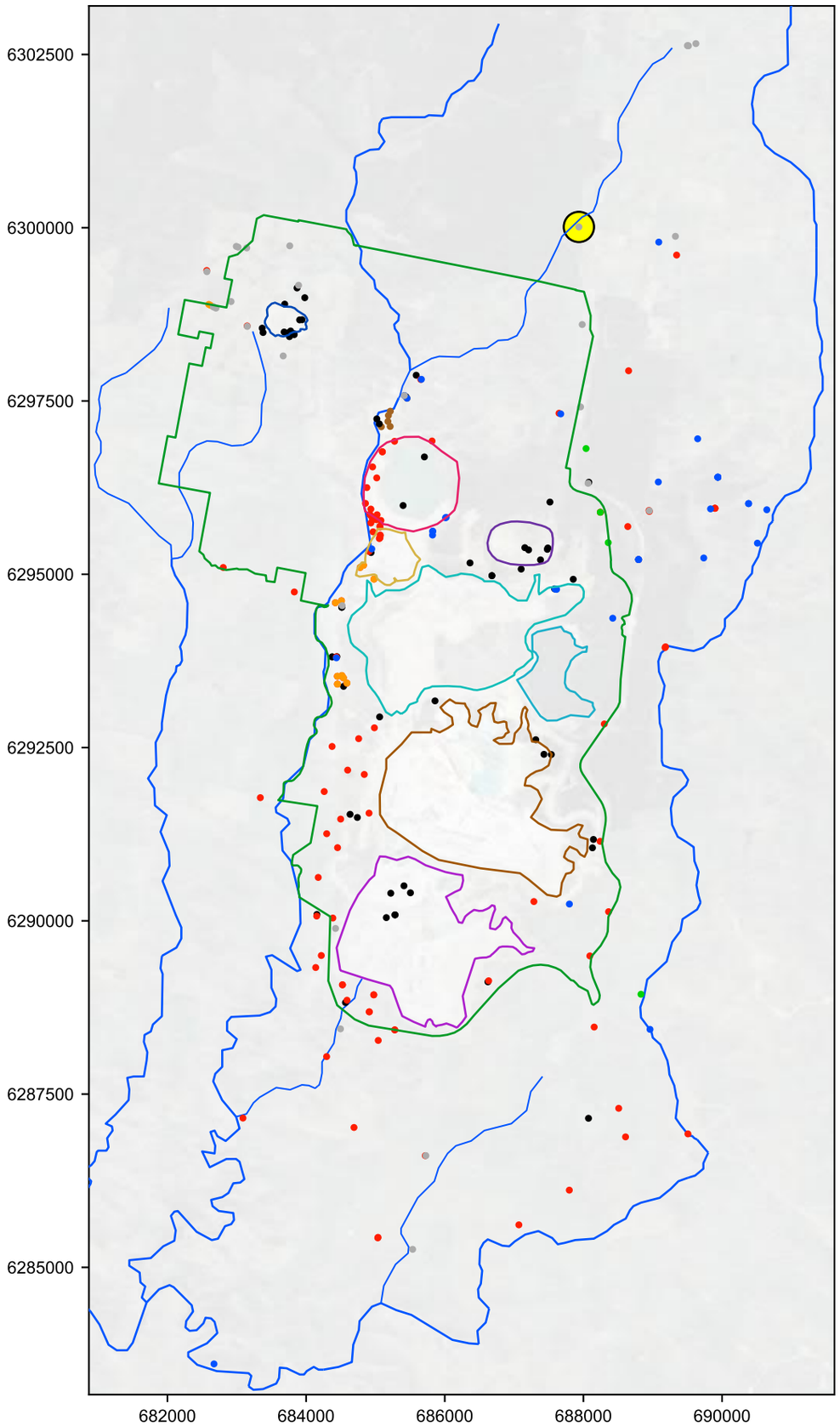
WMP defined analytes



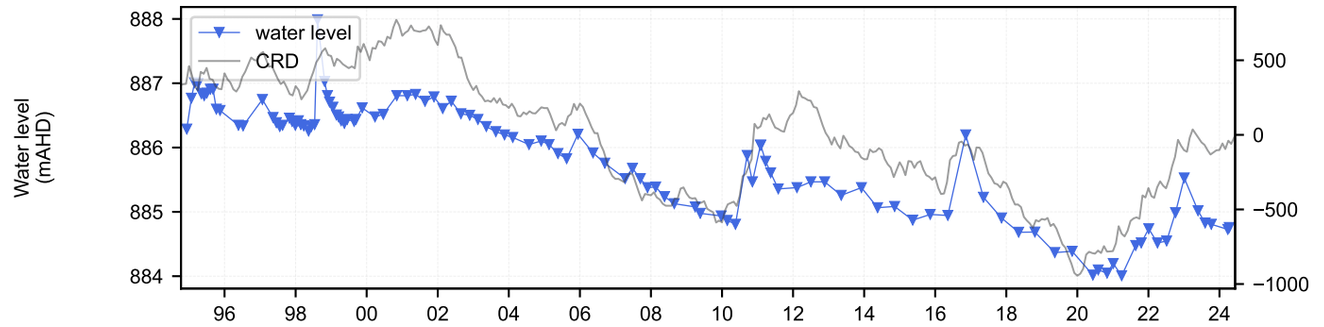
Additional analytes of interest

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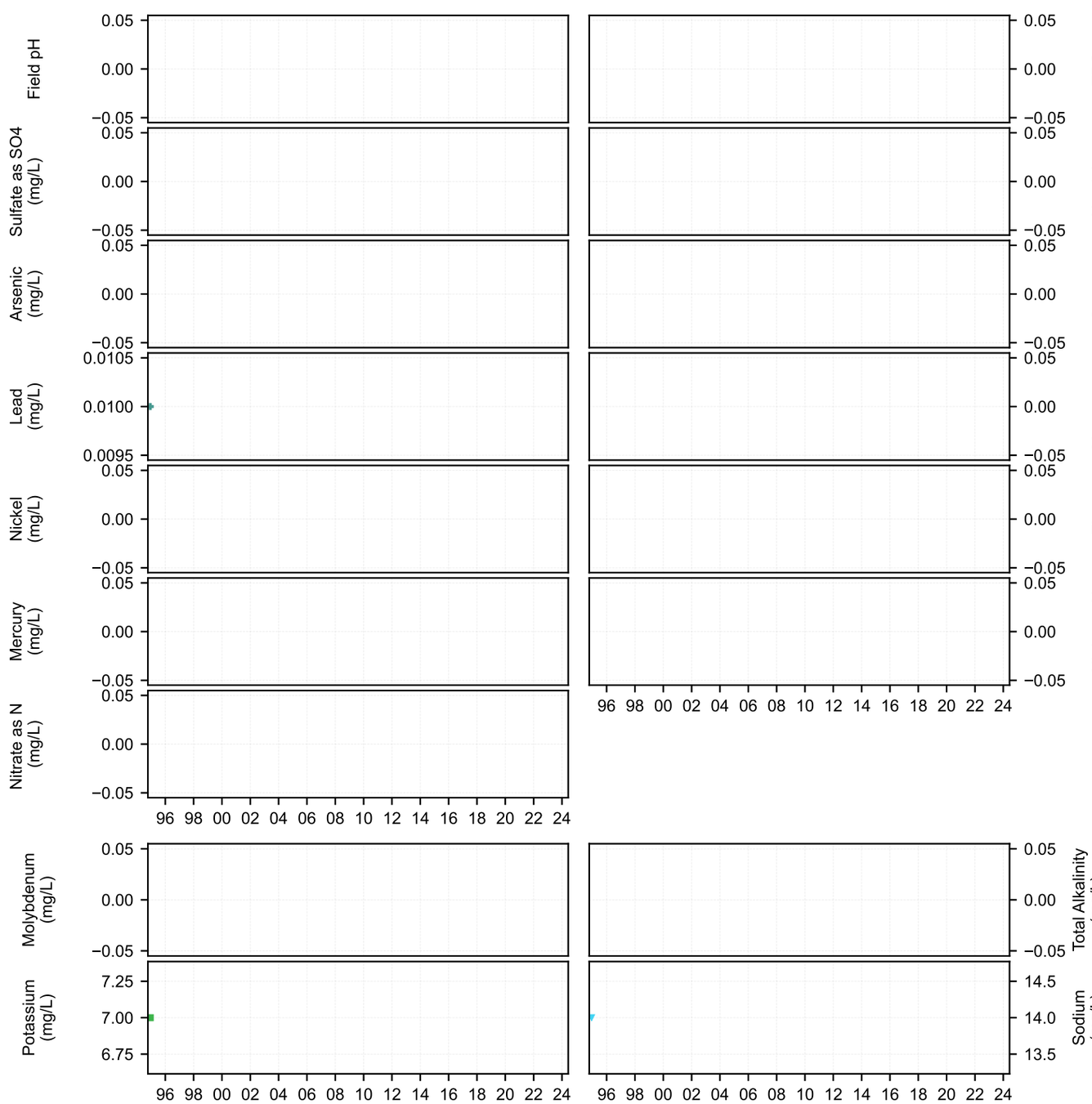
RB01 (Screened geology - Tertiary basalt; Screened interval: 14-50 mbgl)



Groundwater levels



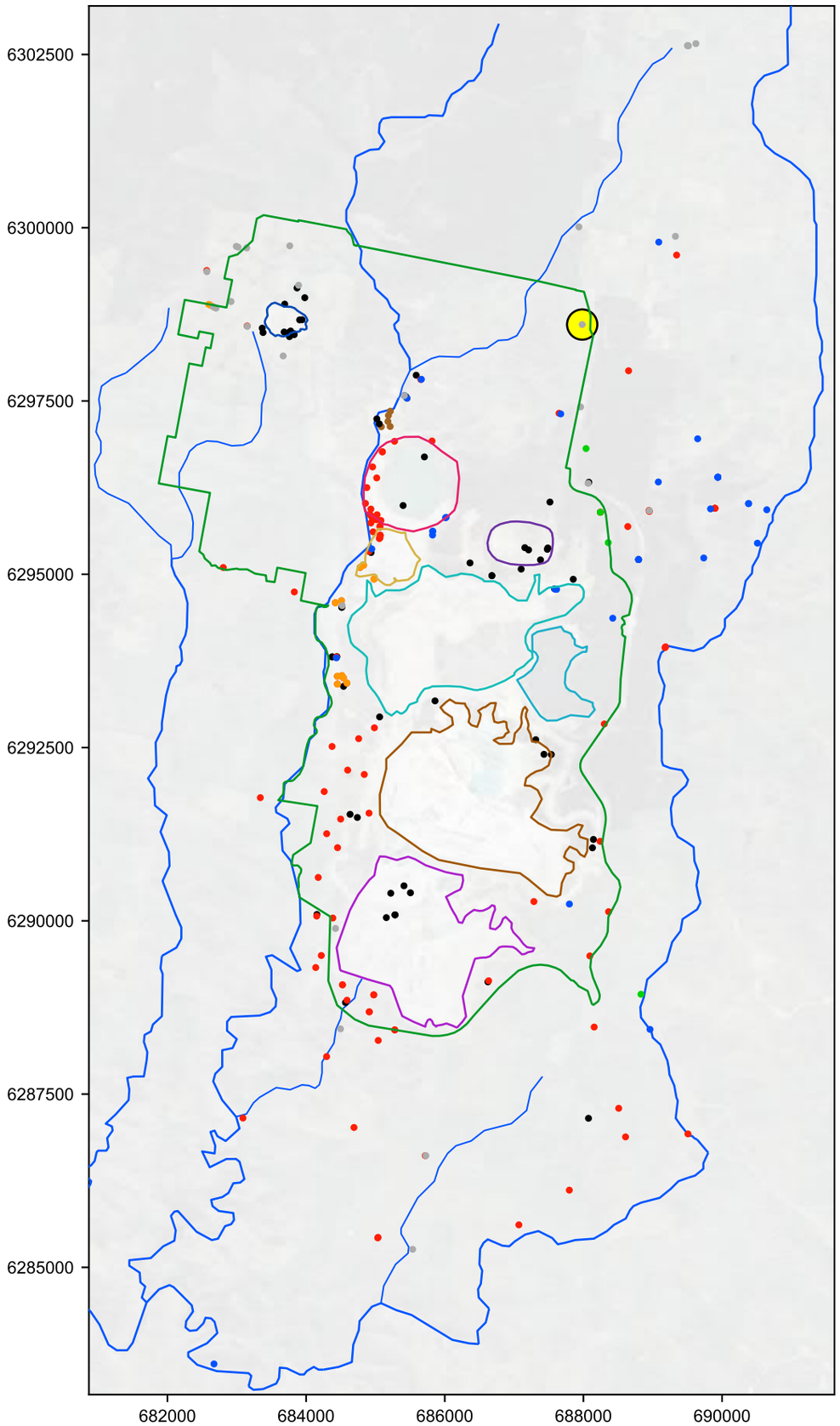
WMP defined analytes



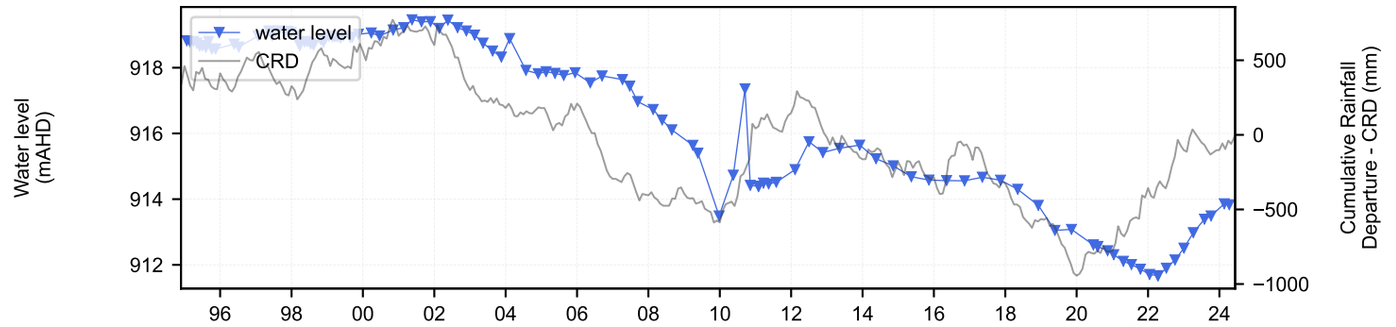
Additional analytes of interest

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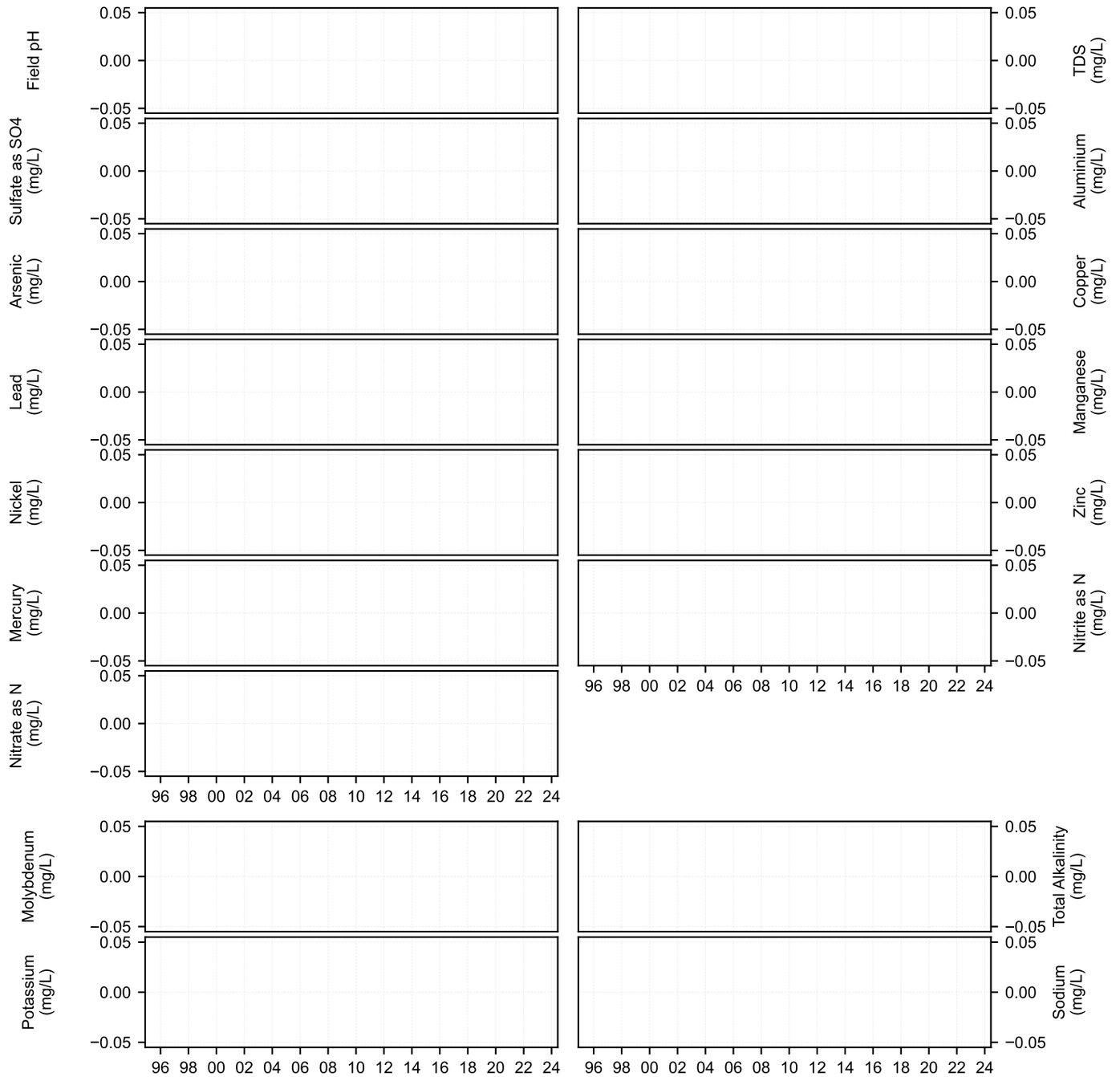
RB02 (Screened geology - Tertiary basalt; Screened interval: 24-60 mbgl)



Groundwater levels



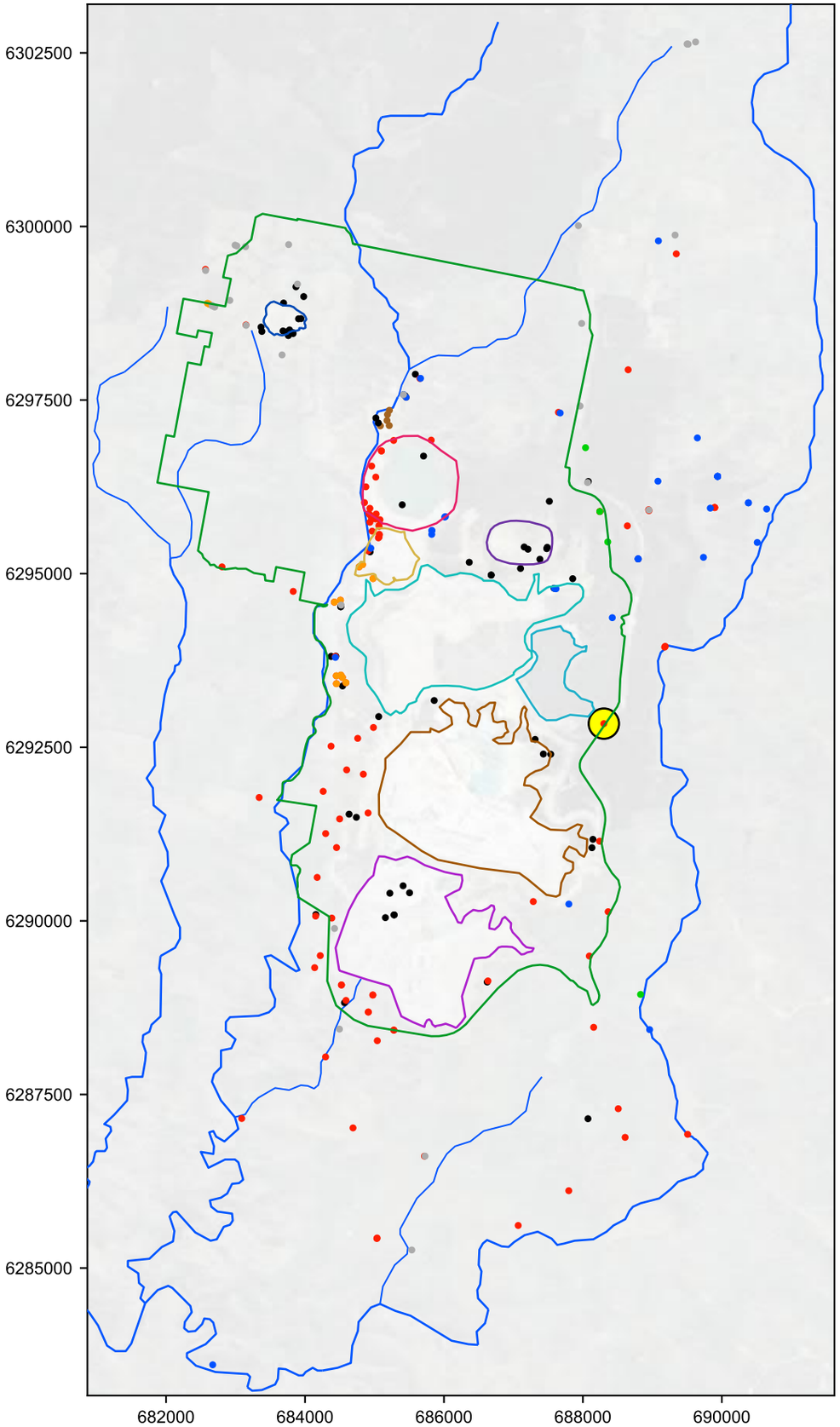
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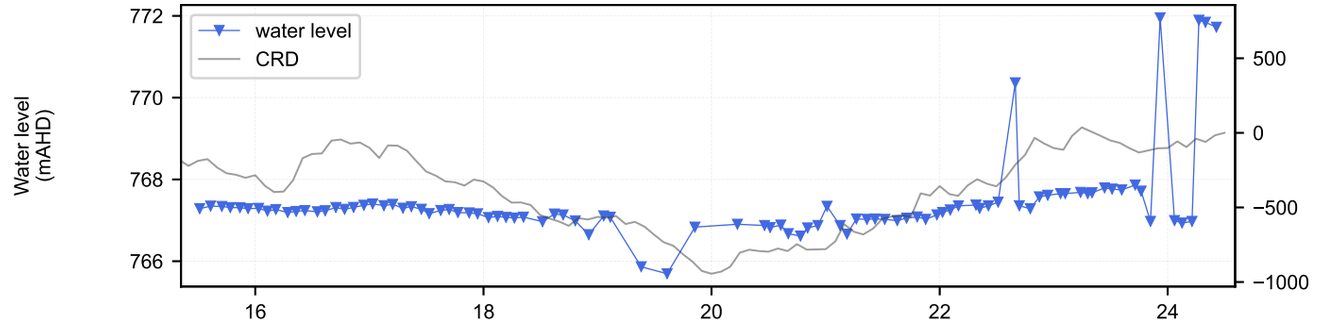
Additional analytes of interest

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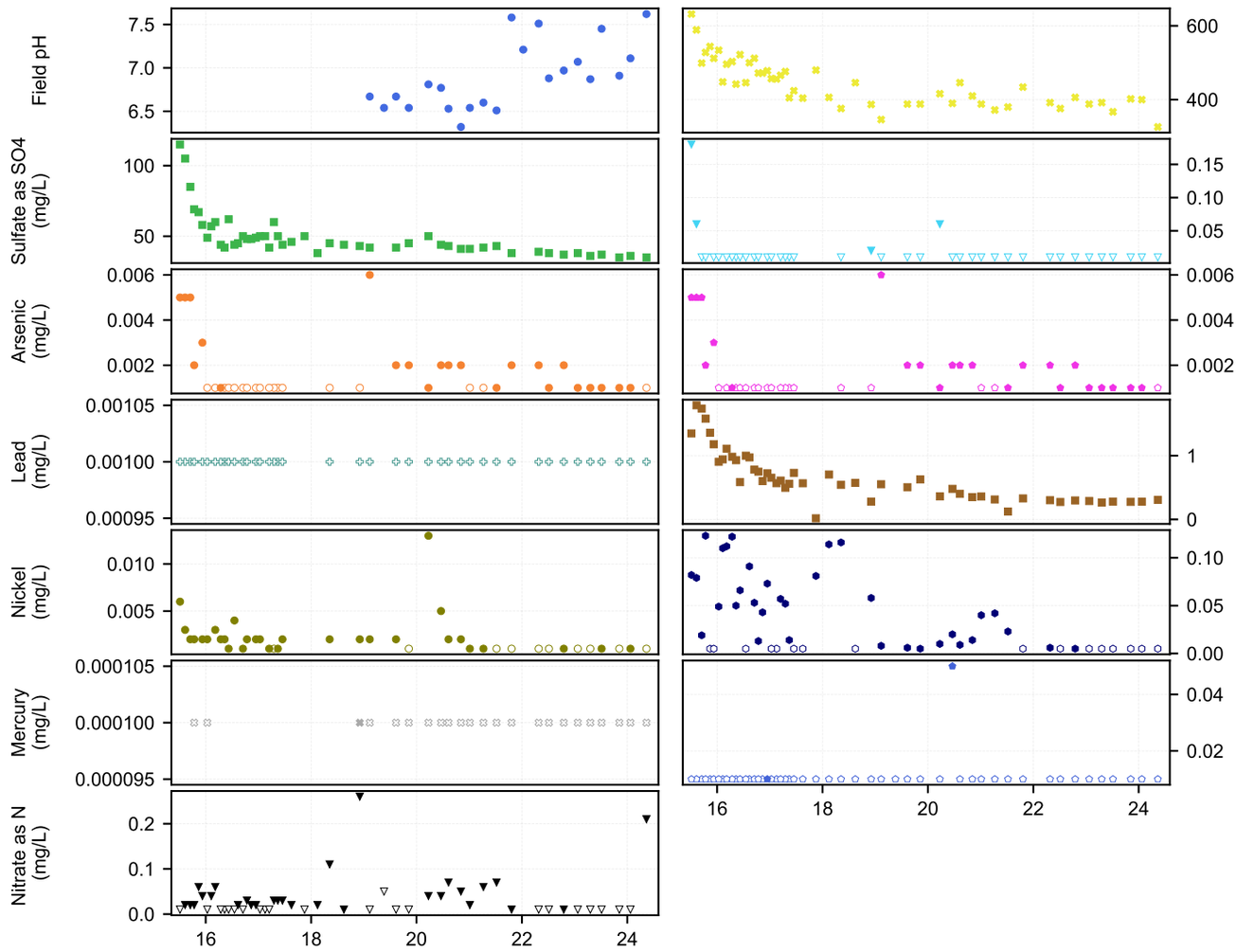
MB80 (Screened geology - Ordovician; Screened interval: 54-64 mbgl)



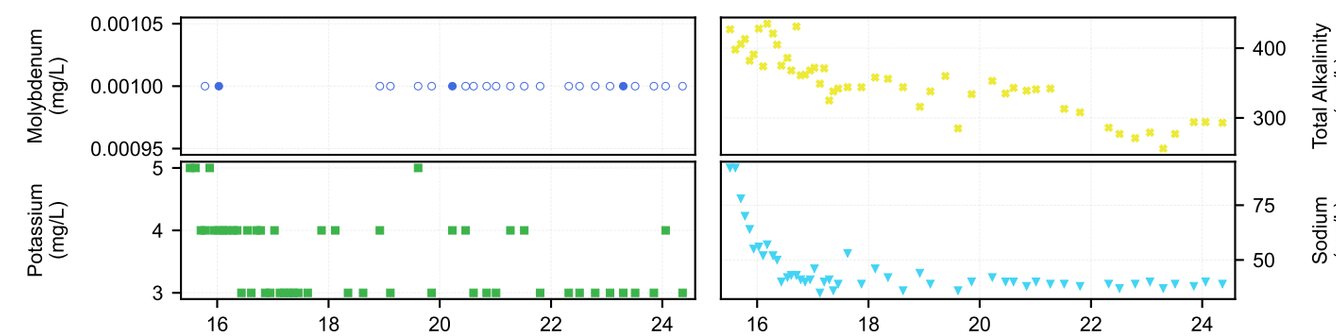
Groundwater levels



WMP defined analytes

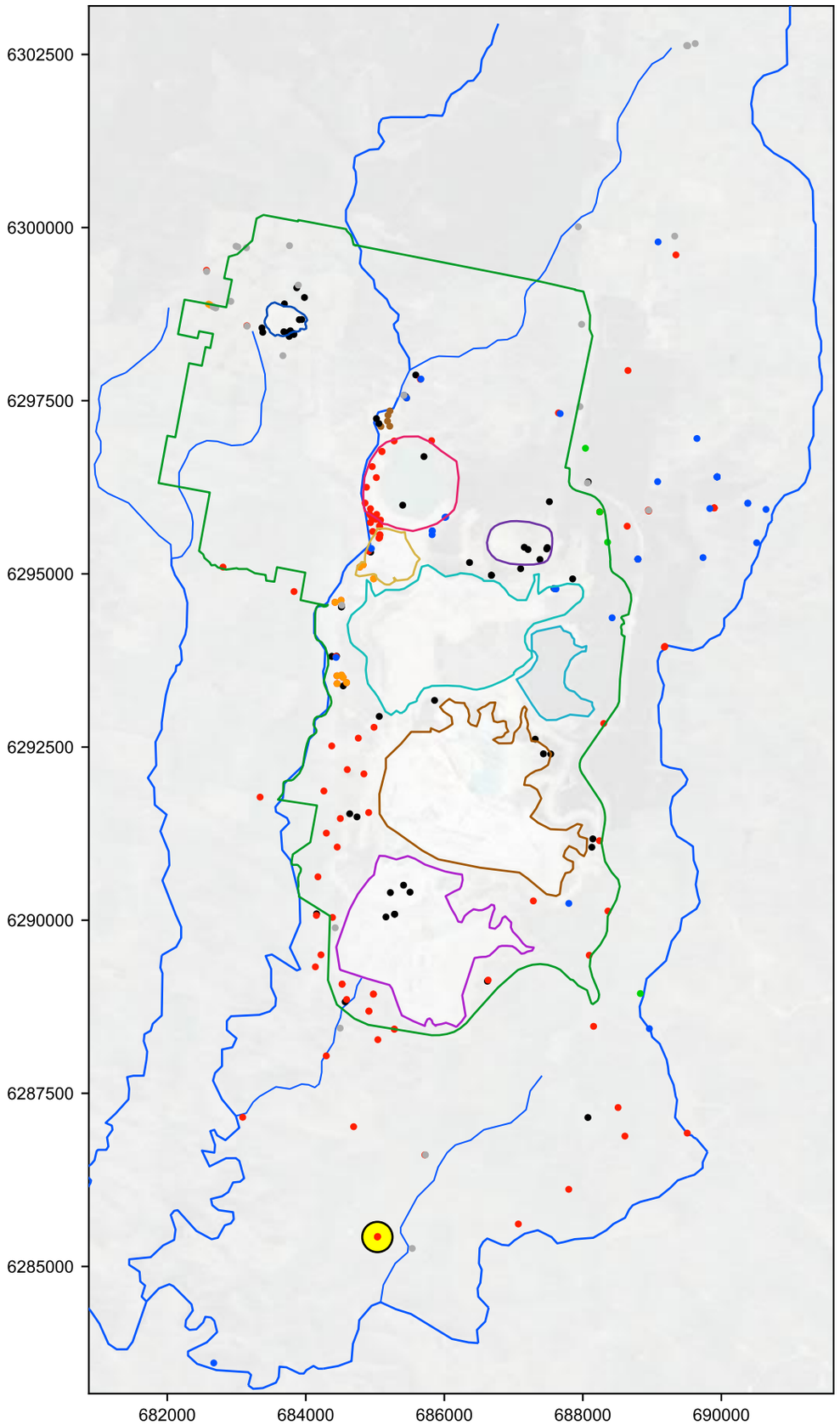


Additional analytes of interest

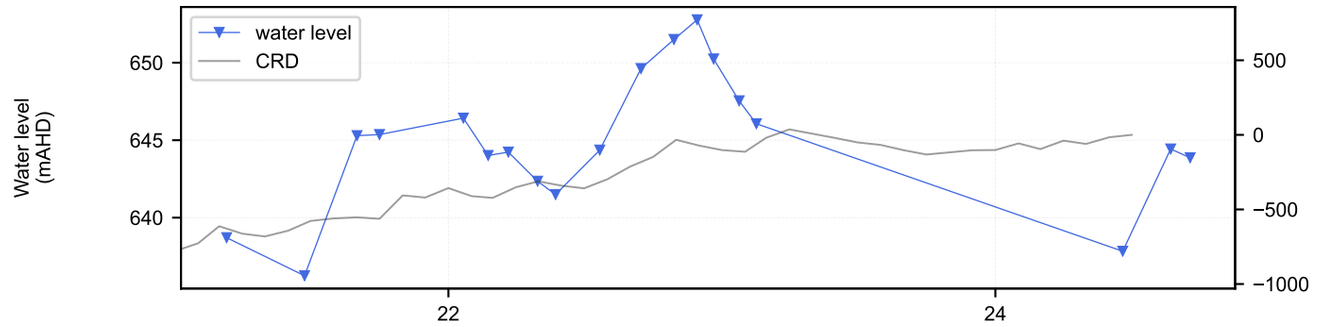


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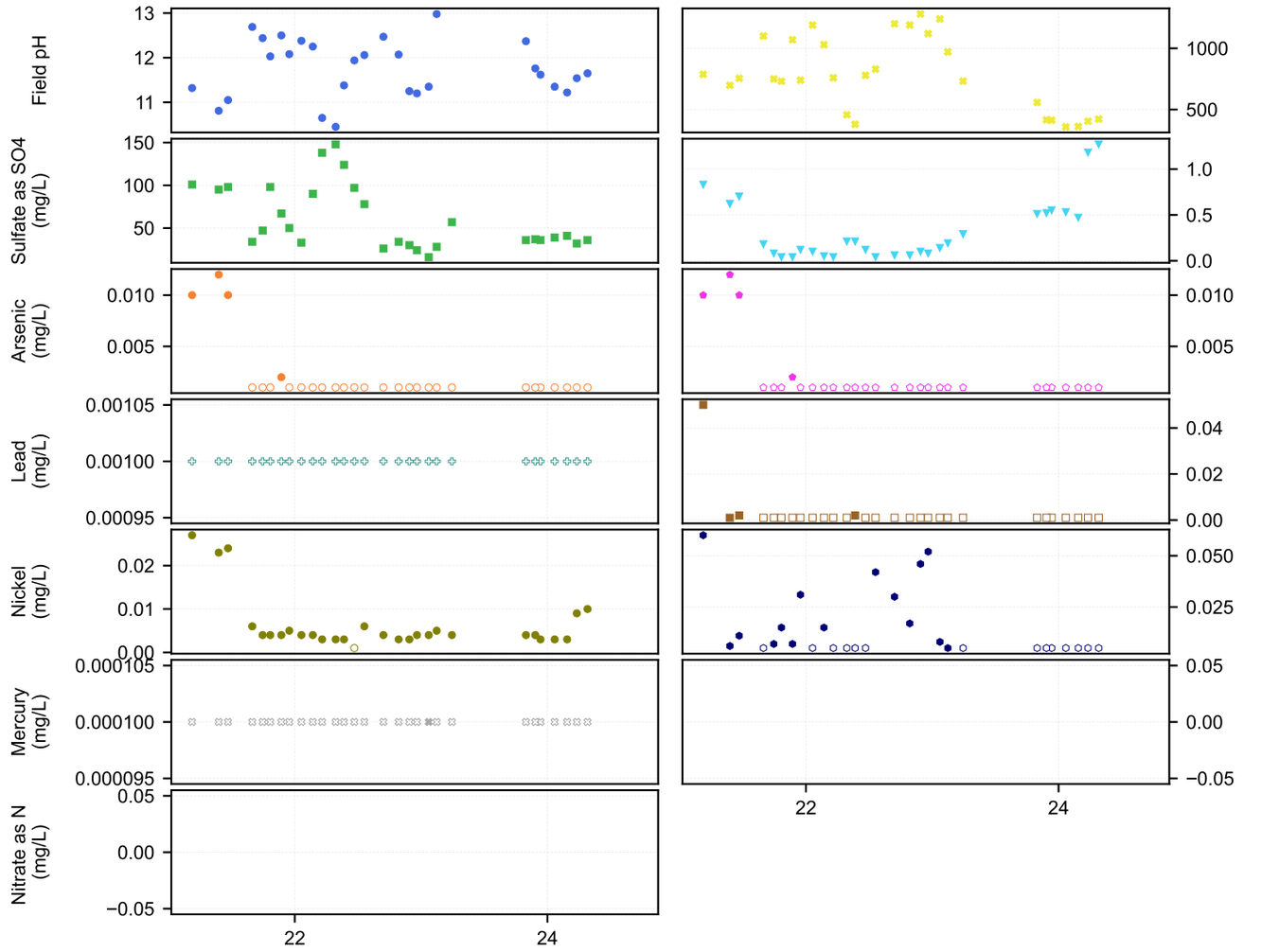
MB106 (Screened geology - Ordovician; Screened interval: 21-30 mbgl)



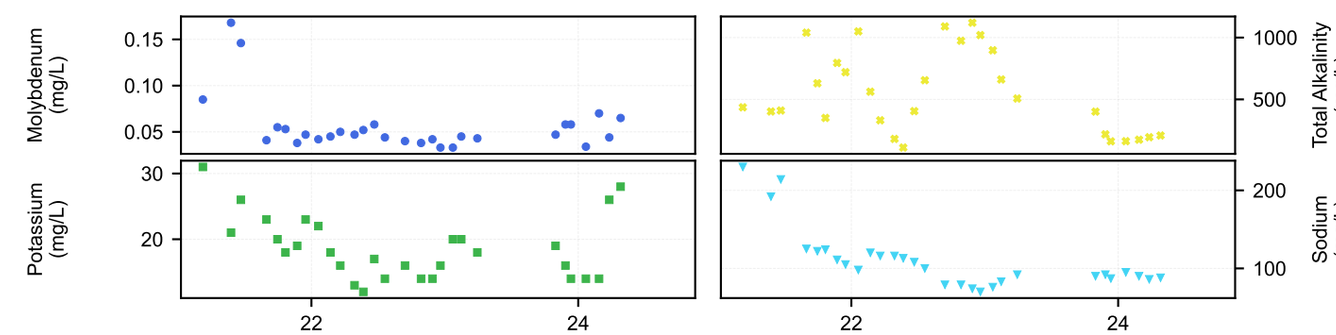
Groundwater levels



WMP defined analytes

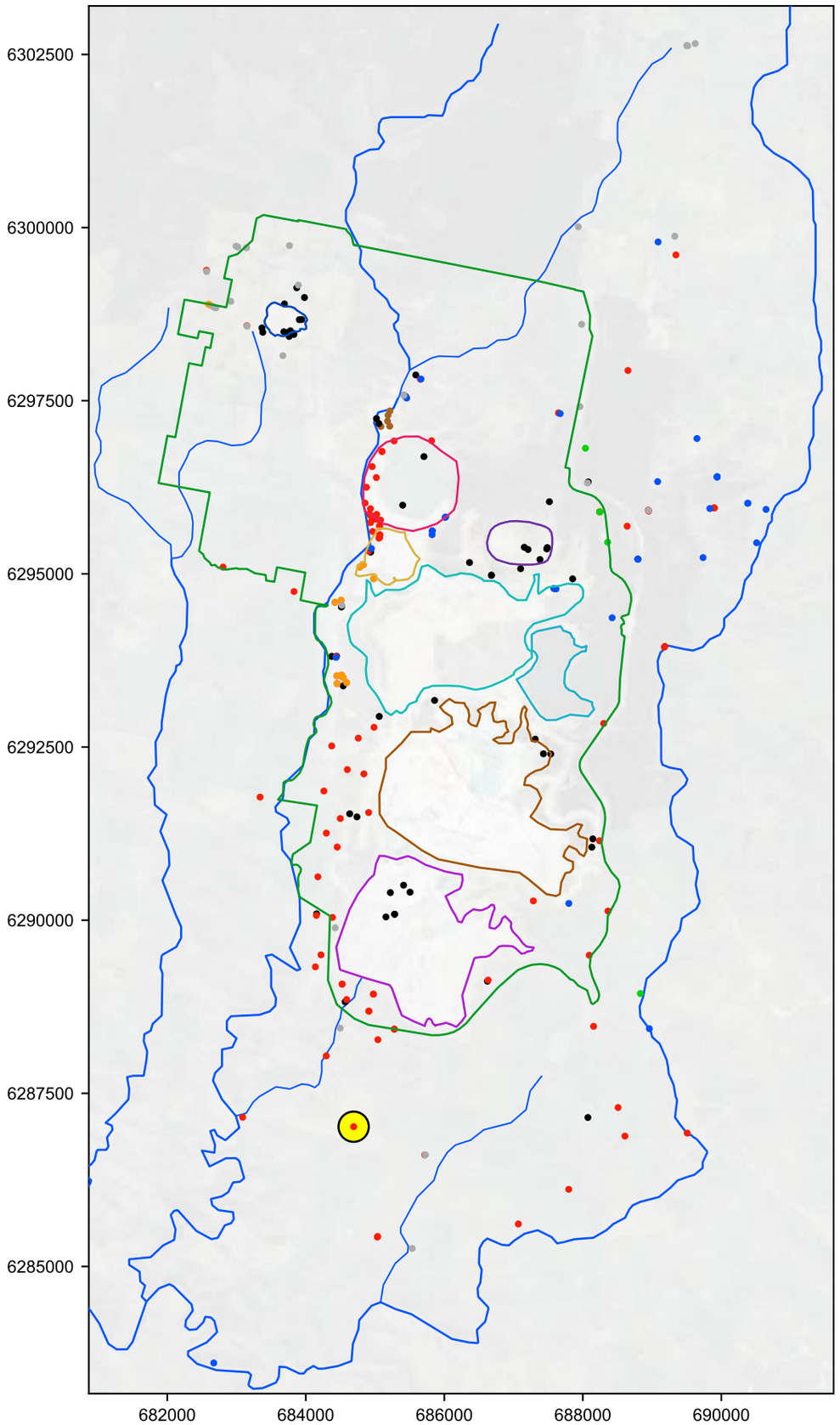


Additional analytes of interest

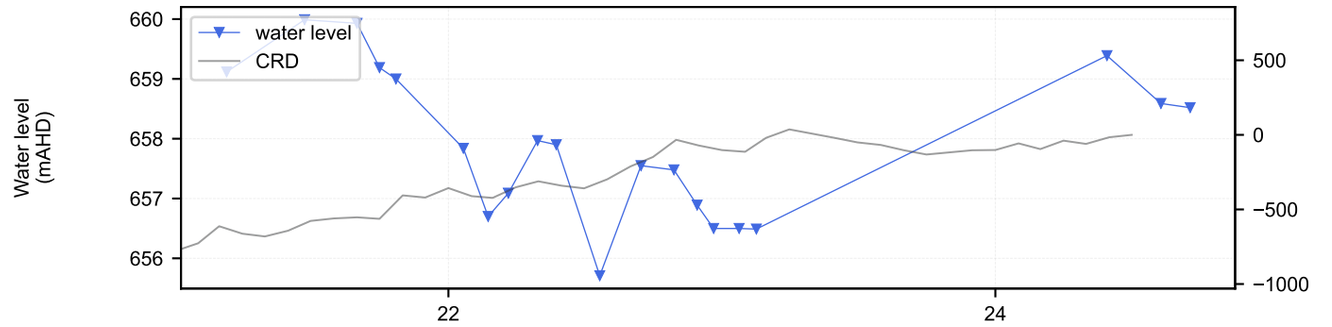


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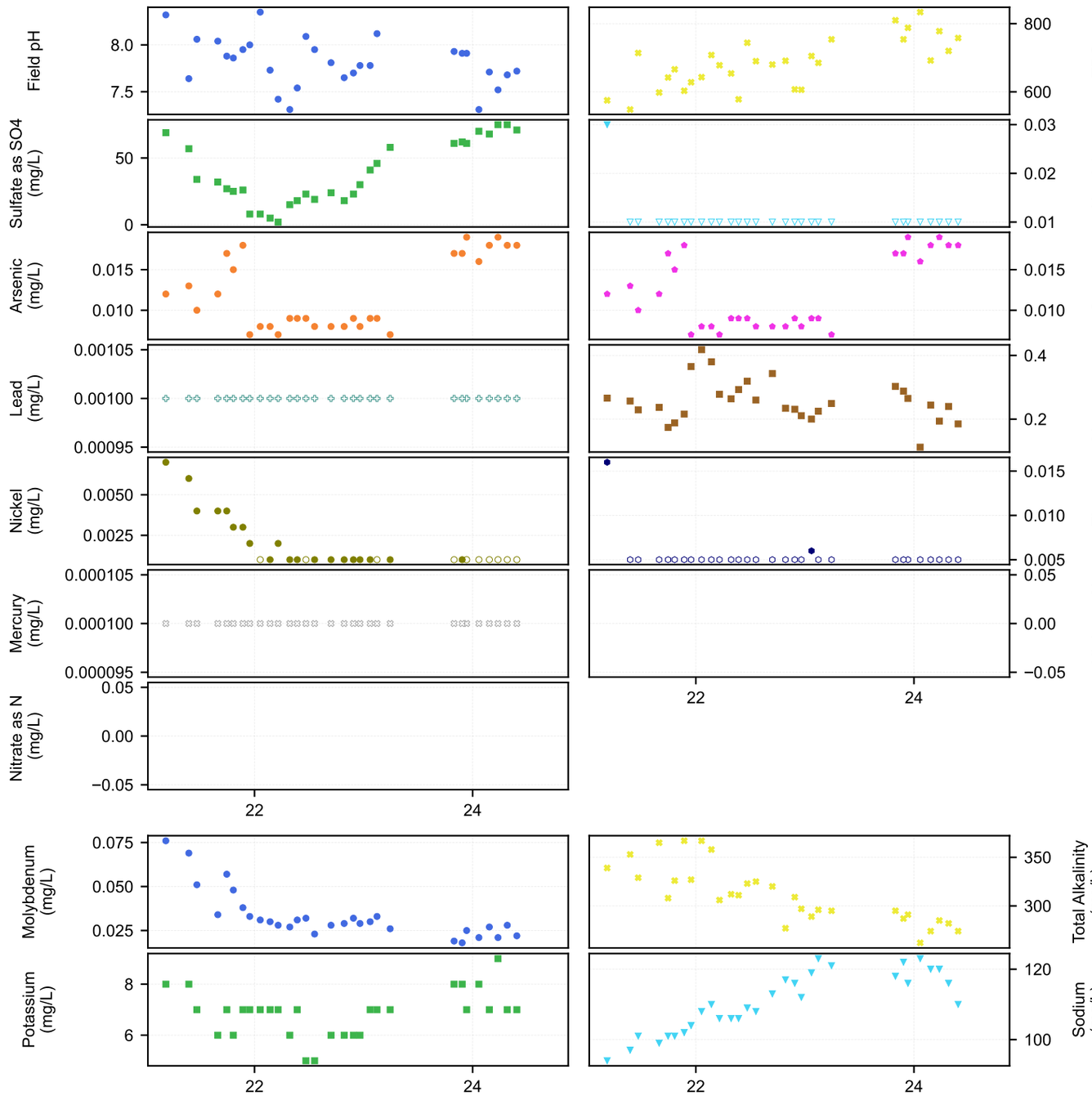
MB107 (Screened geology - Ordovician; Screened interval: 42.5-54.5 mbgl)



Groundwater levels



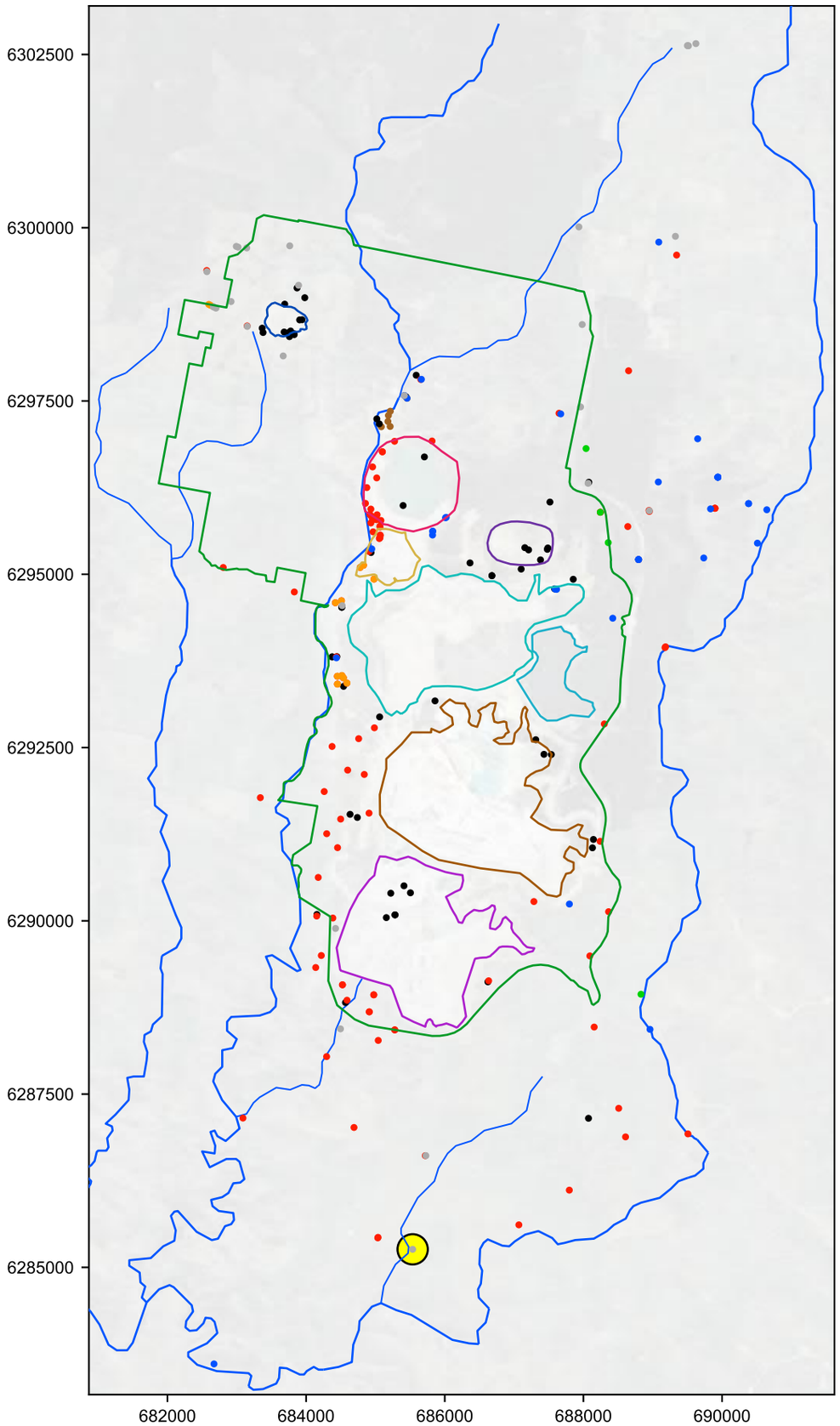
WMP defined analytes



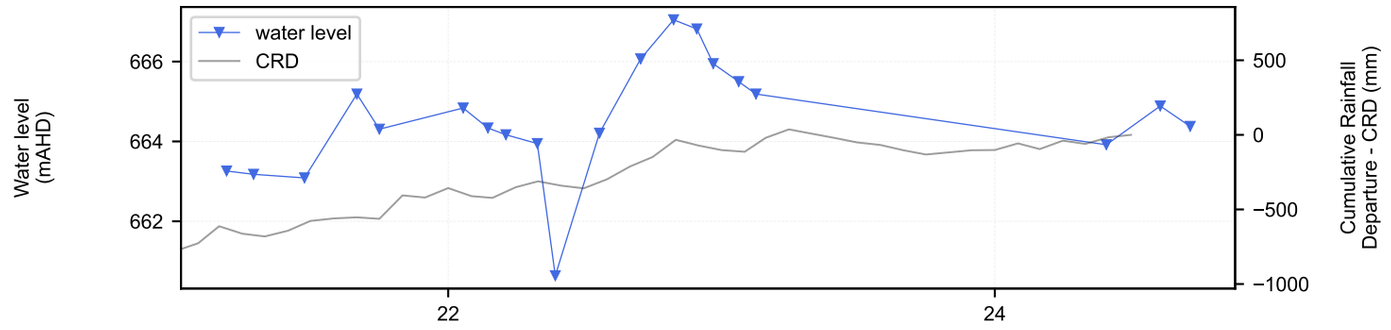
Additional analytes of interest

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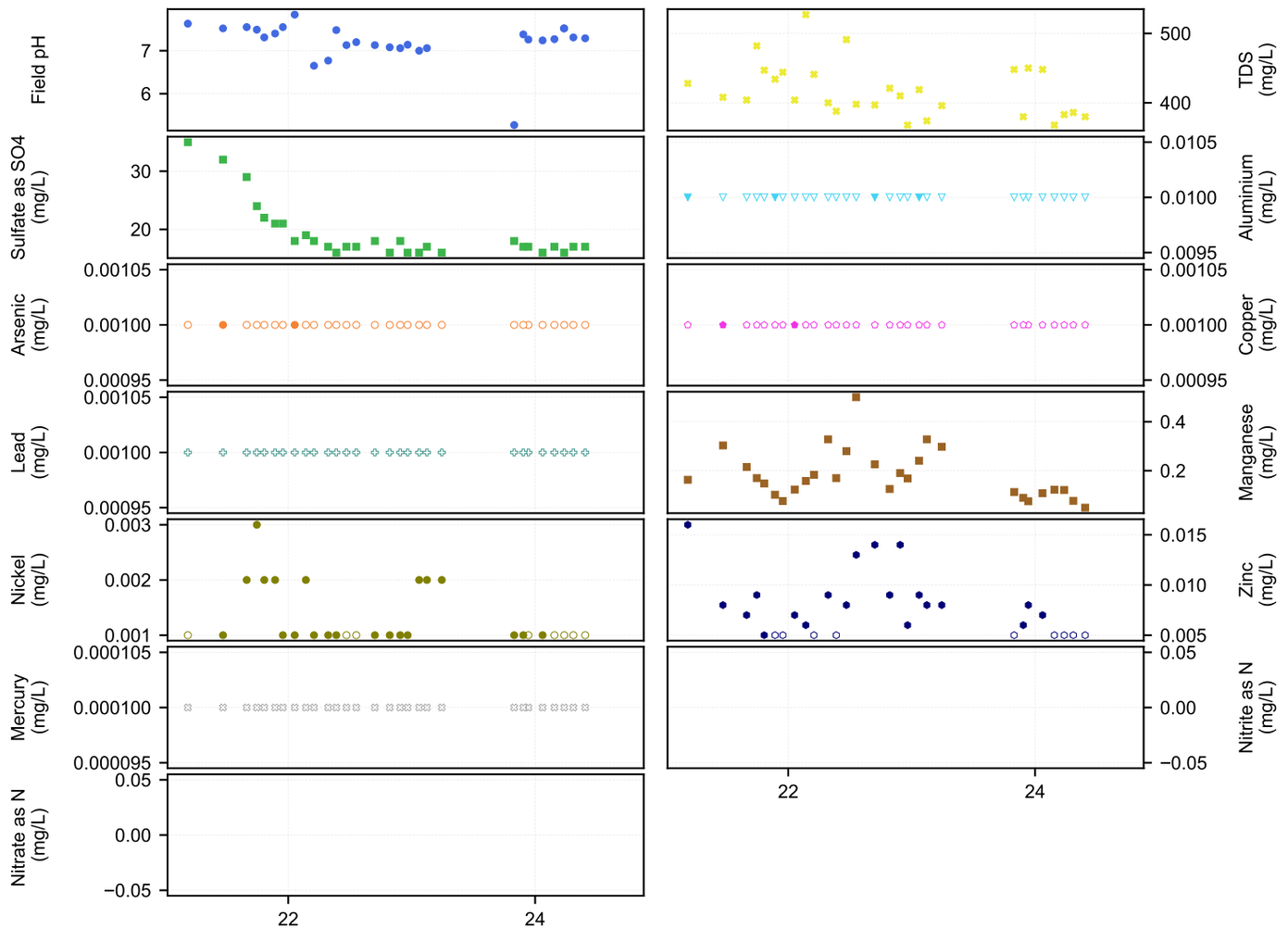
MB108 (Screened geology - Tertiary basalt; Screened interval: 17-21 mbgl)



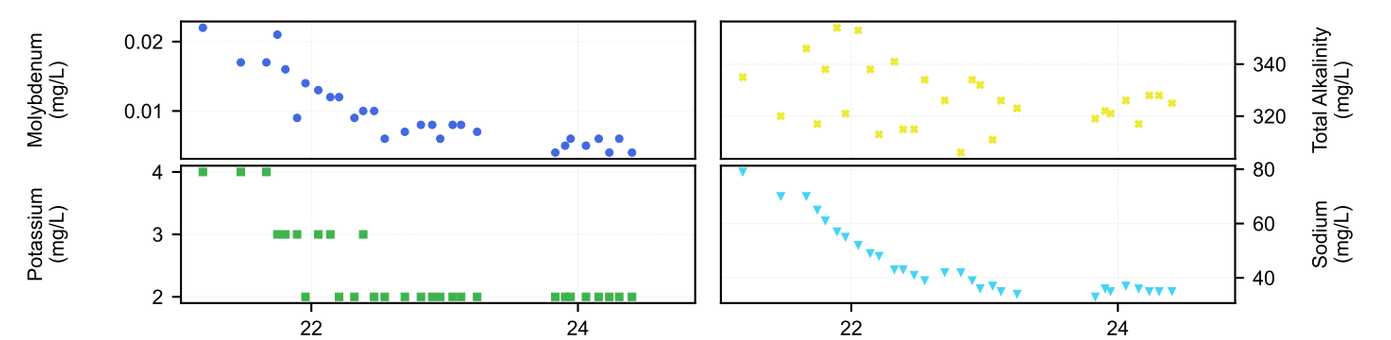
Groundwater levels



WMP defined analytes

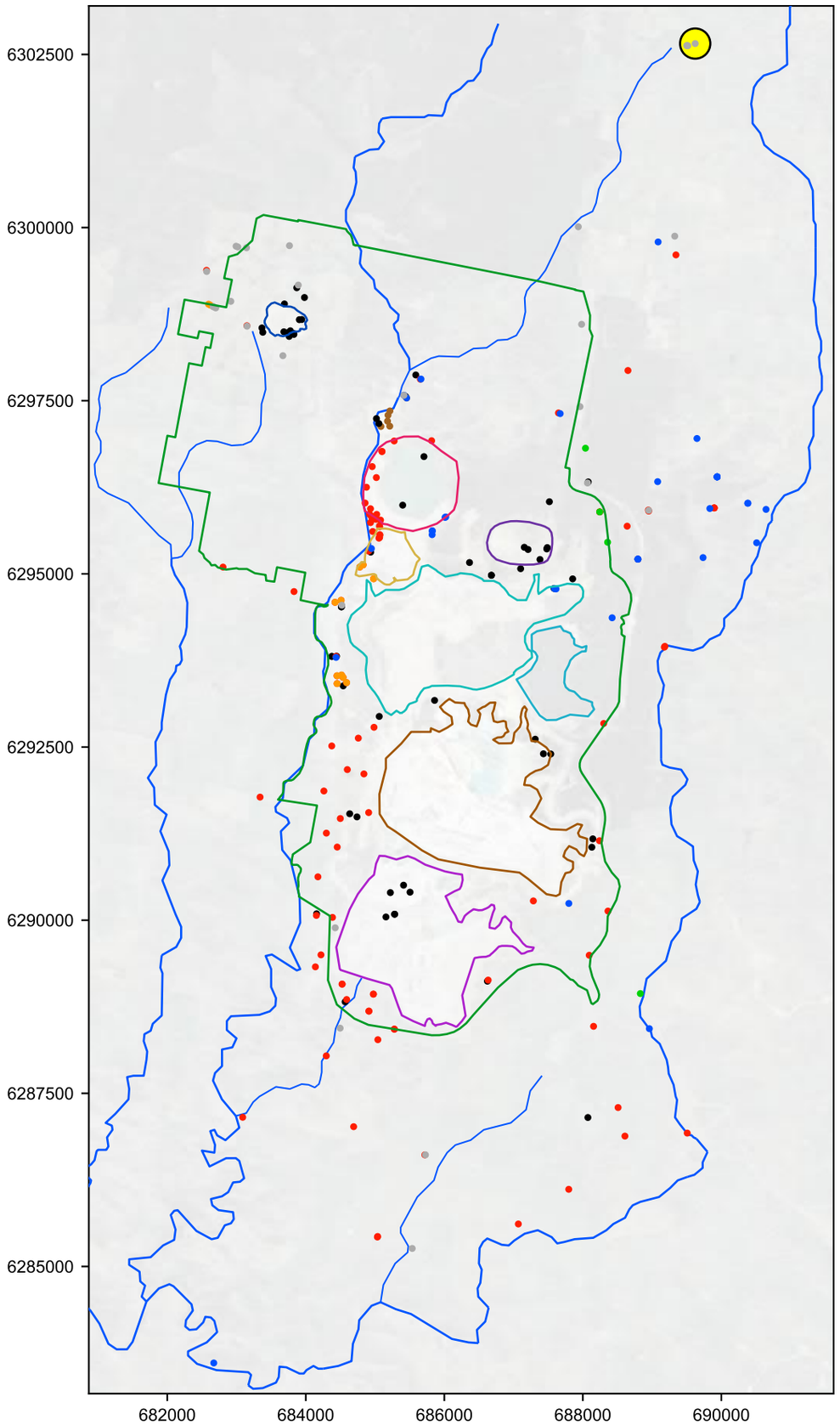


Additional analytes of interest

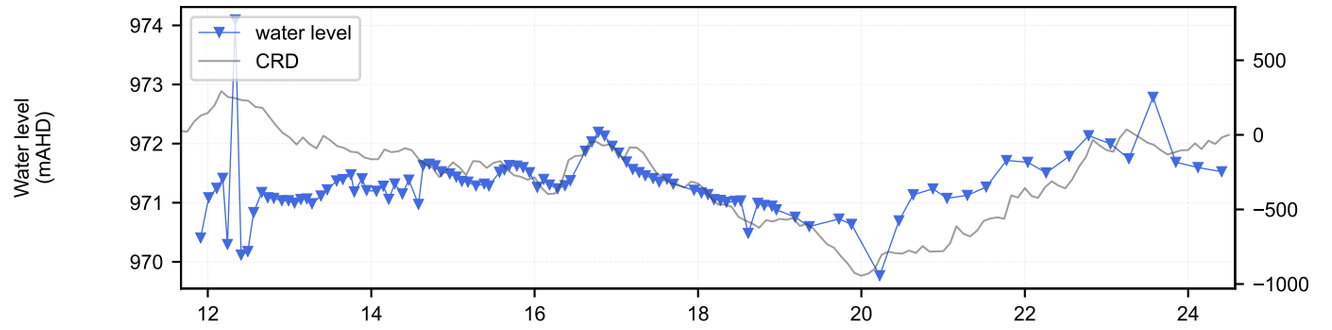


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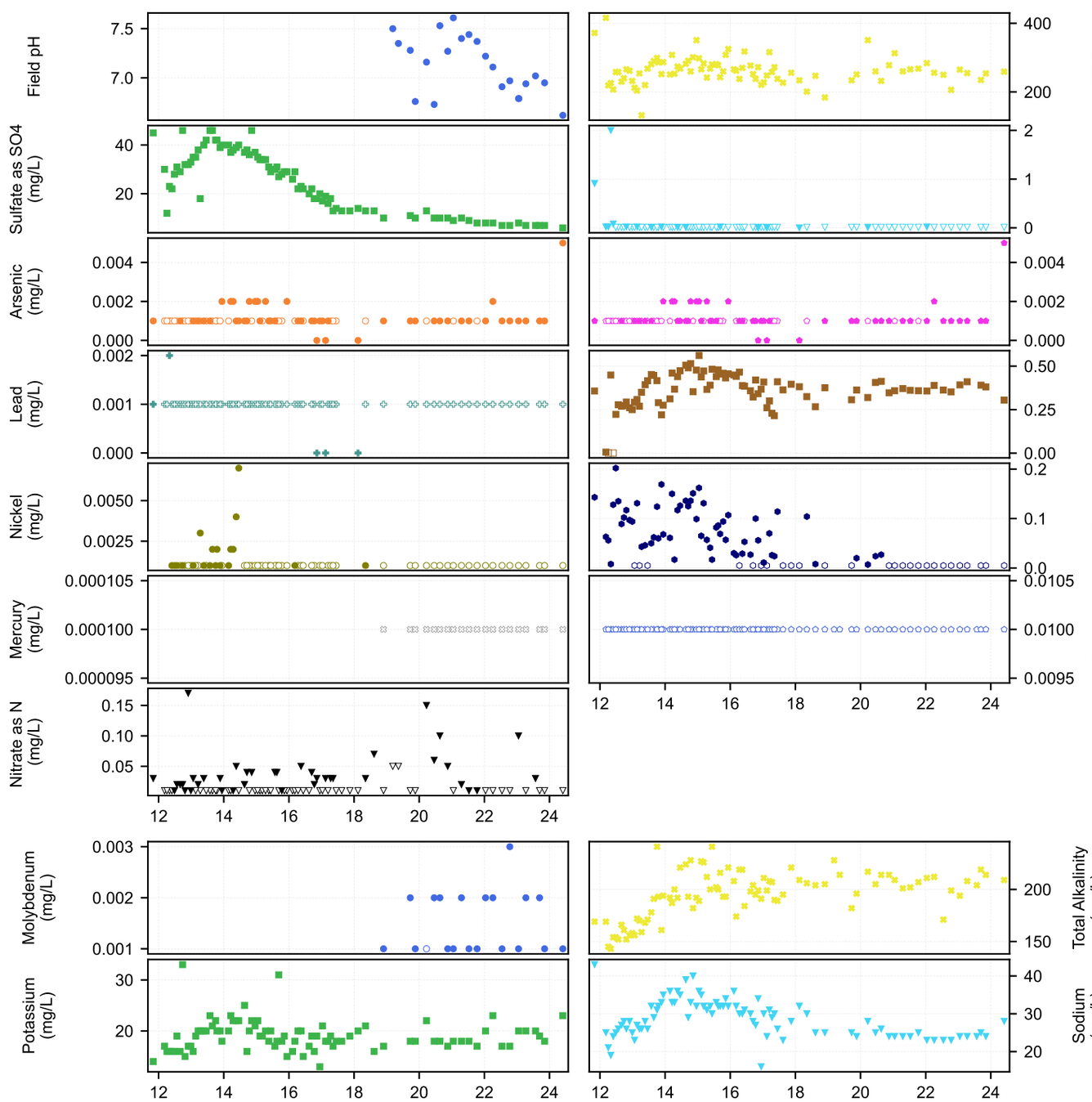
MB53 (Screened geology - Tertiary basalt; Screened interval: 27-45 mbgl)



Groundwater levels



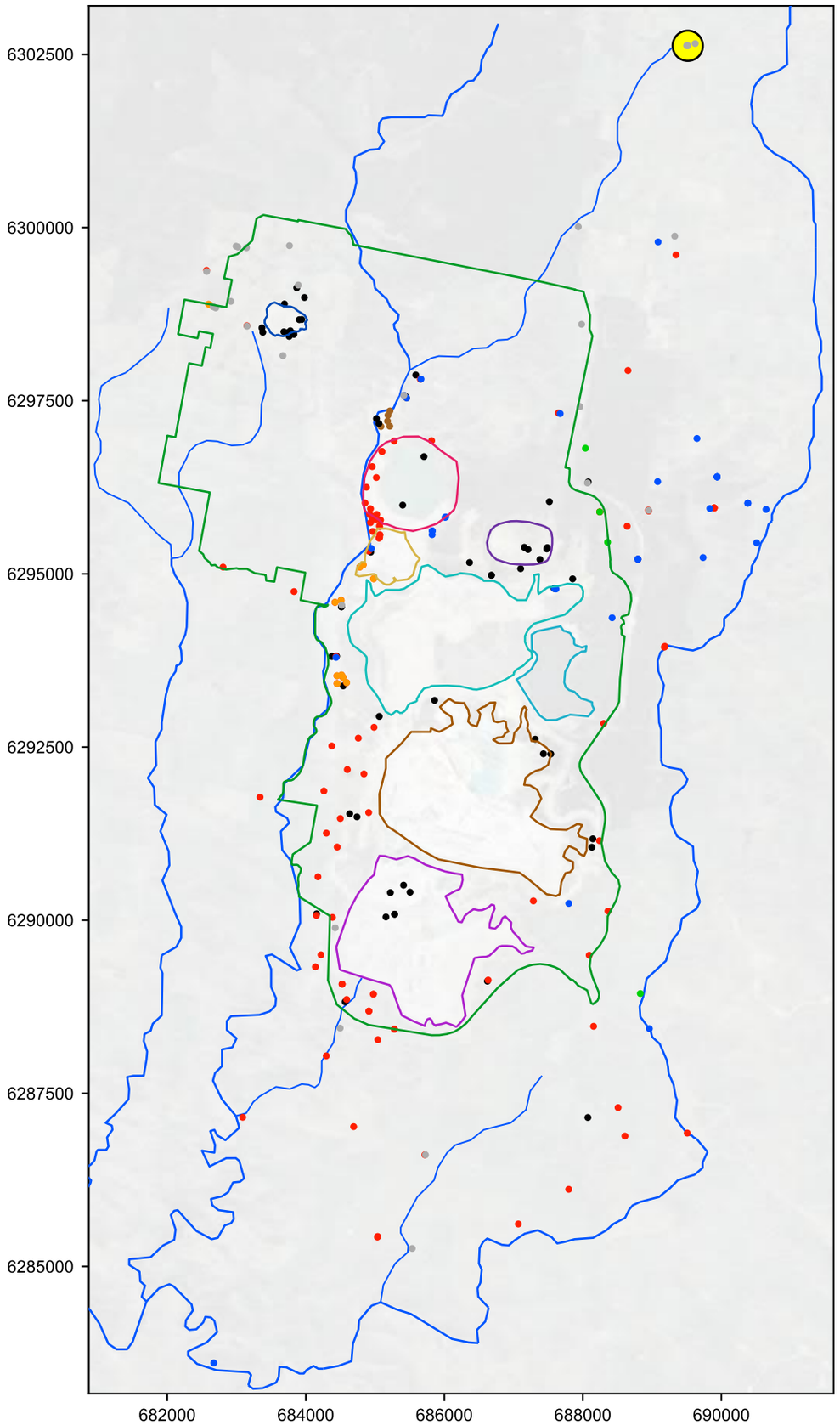
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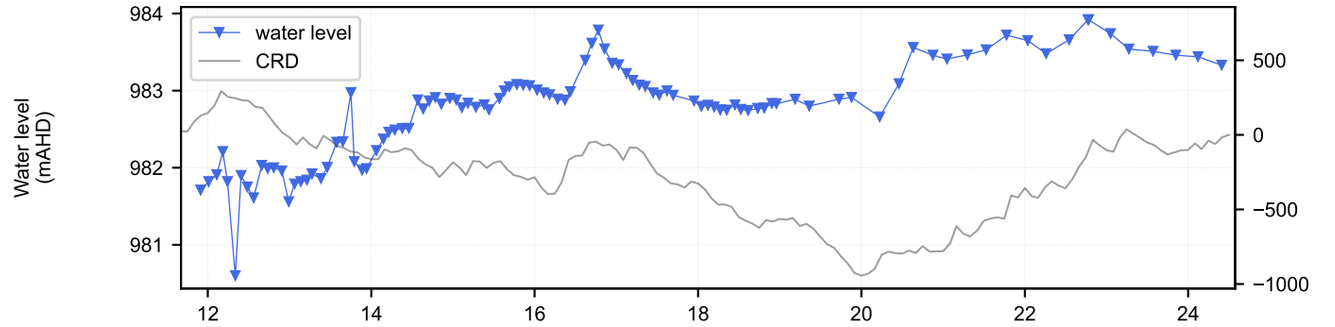
Additional analytes of interest

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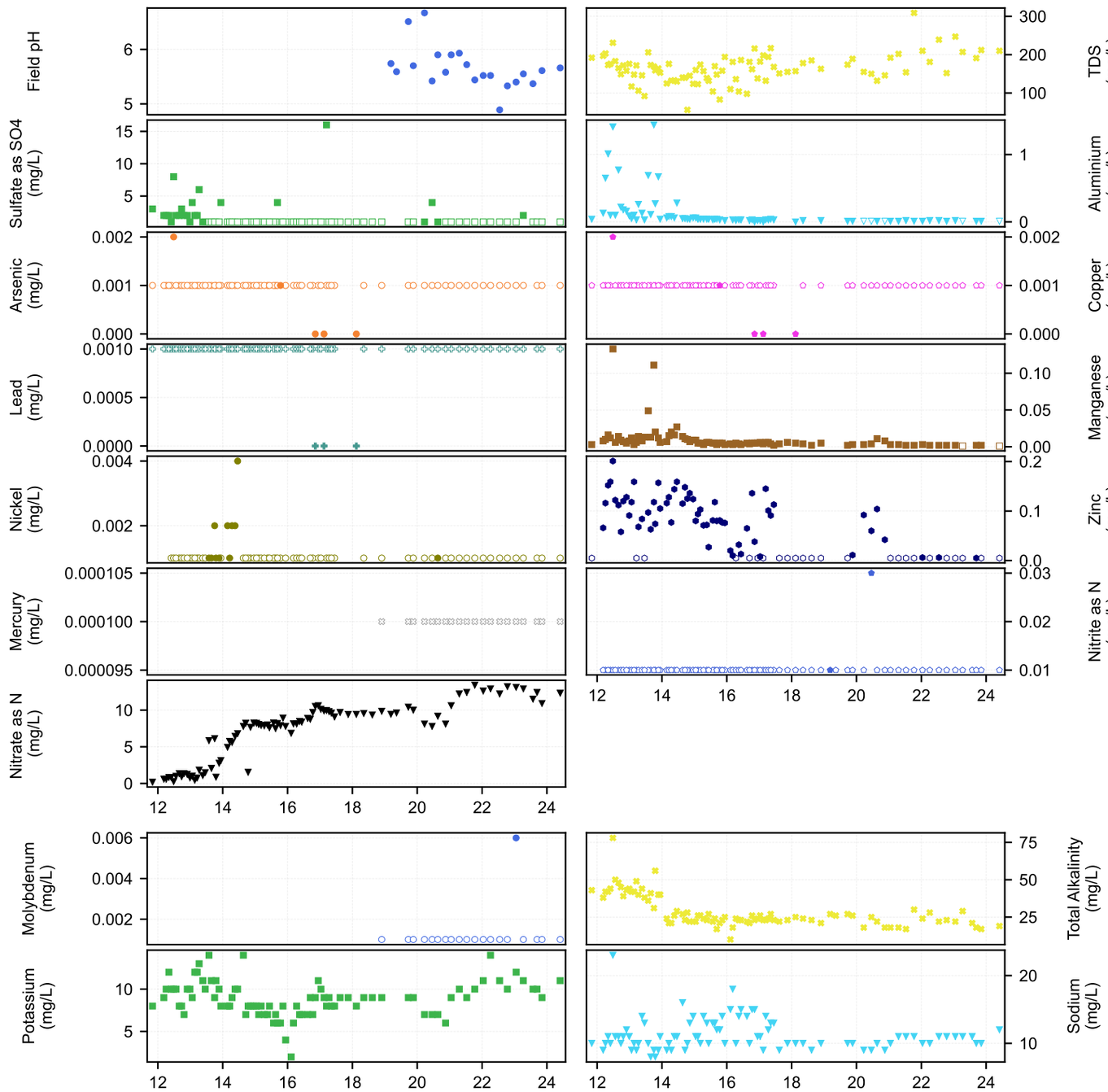
MB54 (Screened geology - Tertiary basalt; Screened interval: 15-21 mbgl)



Groundwater levels



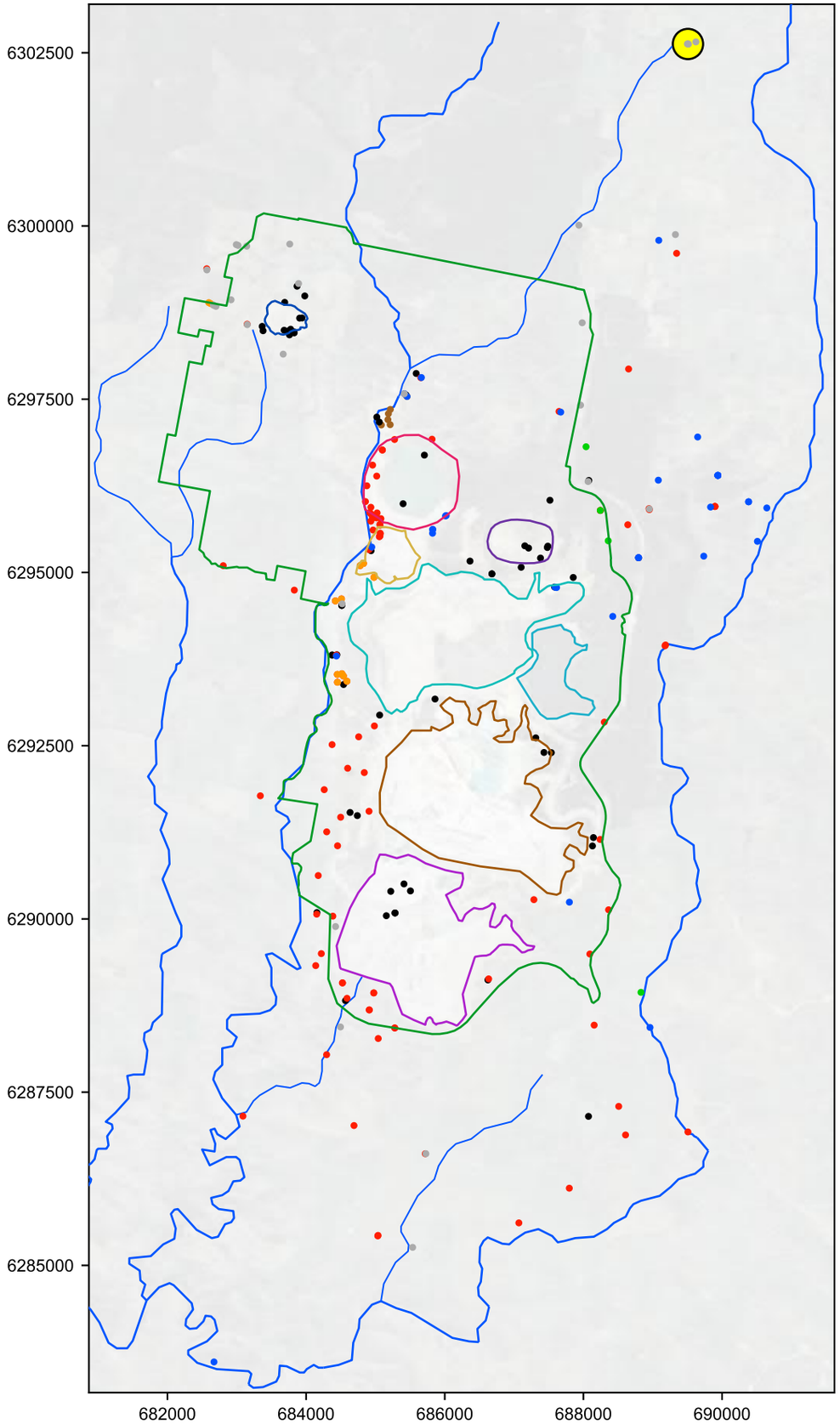
WMP defined analytes



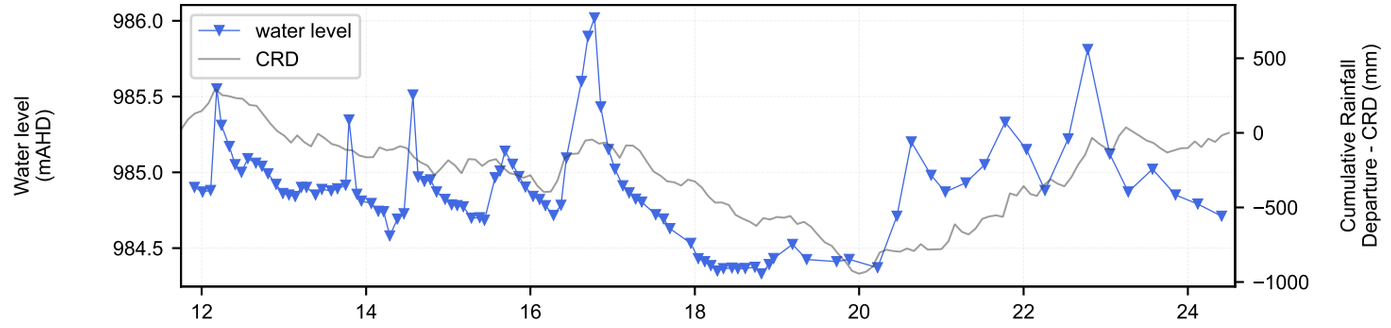
Additional analytes of interest

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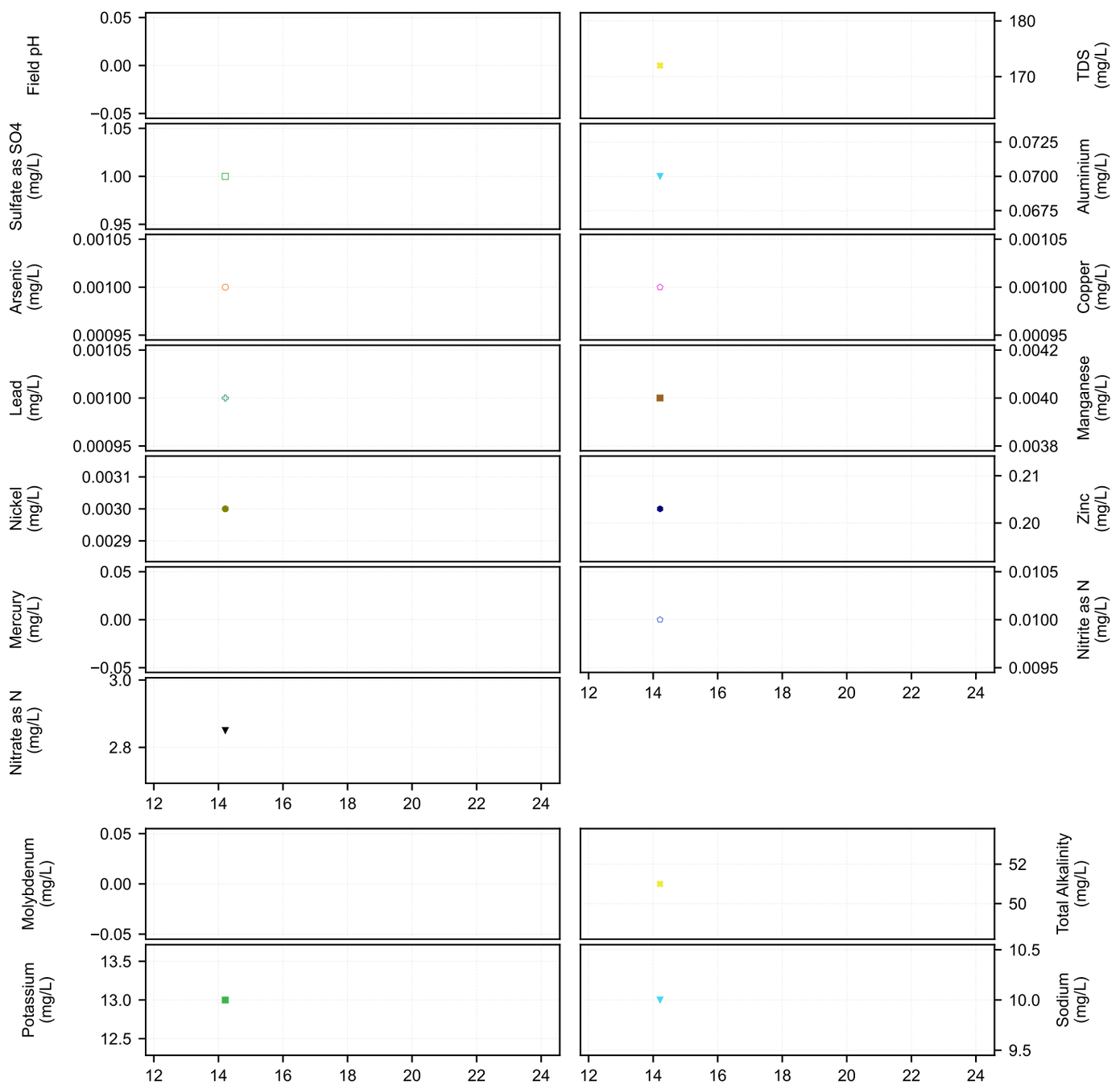
MB55 (Screened geology - Tertiary basalt; Screened interval: 6-9 mbgl)



Groundwater levels



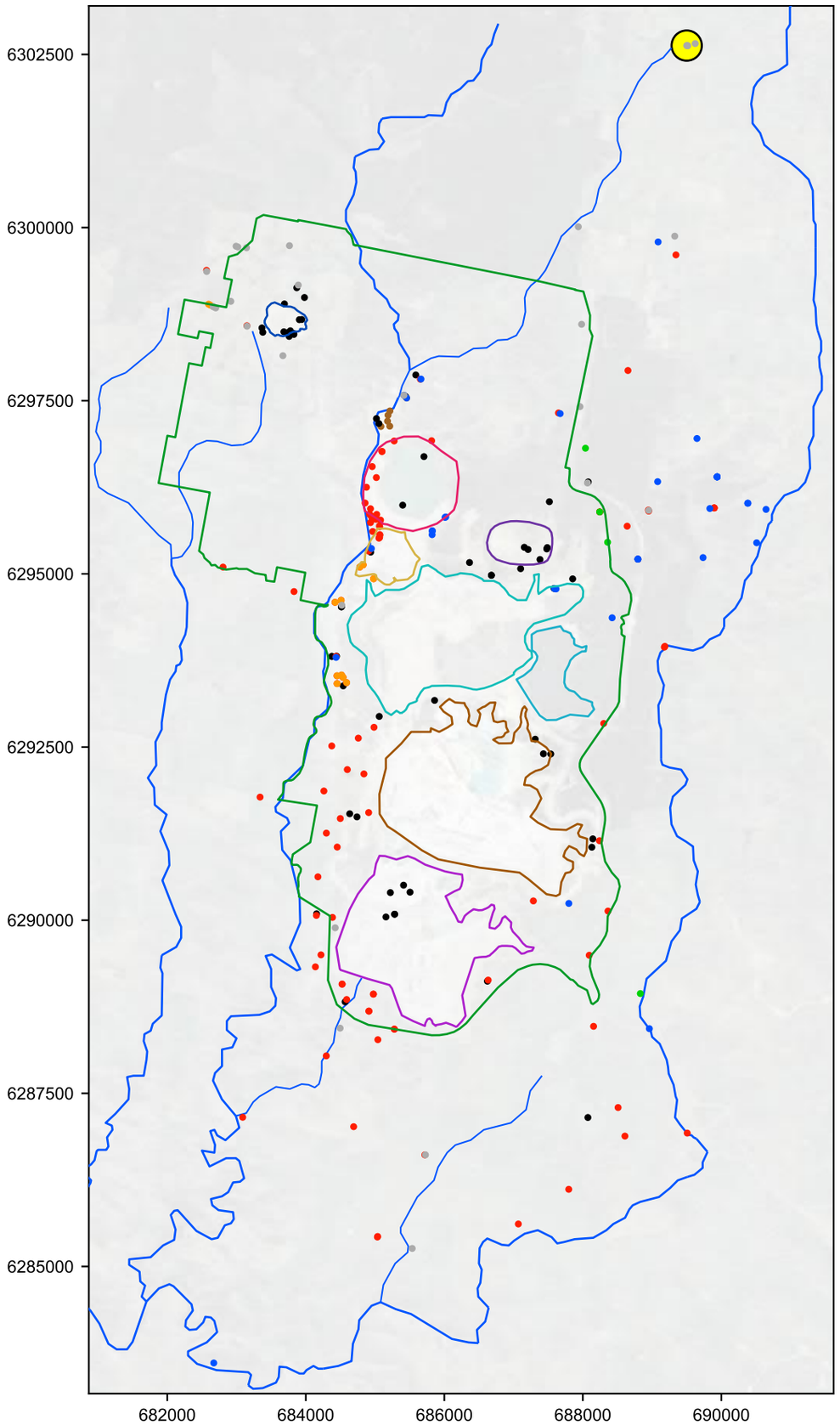
WMP defined analytes



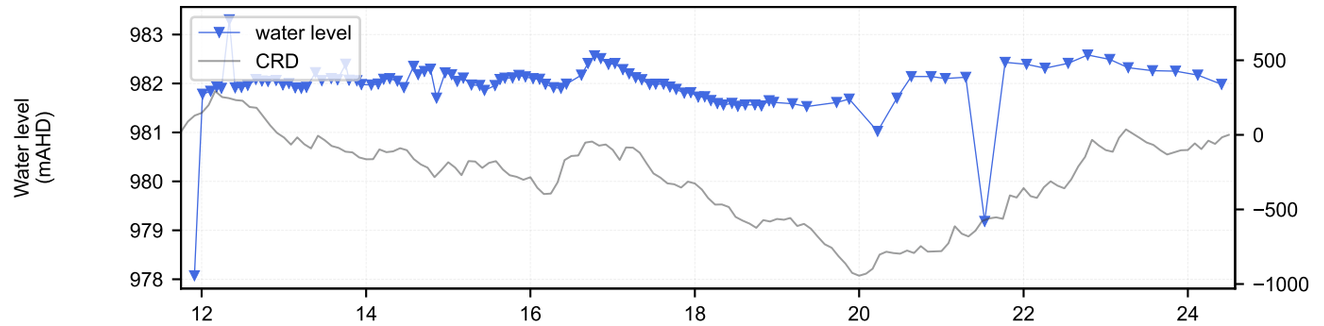
Additional analytes of interest

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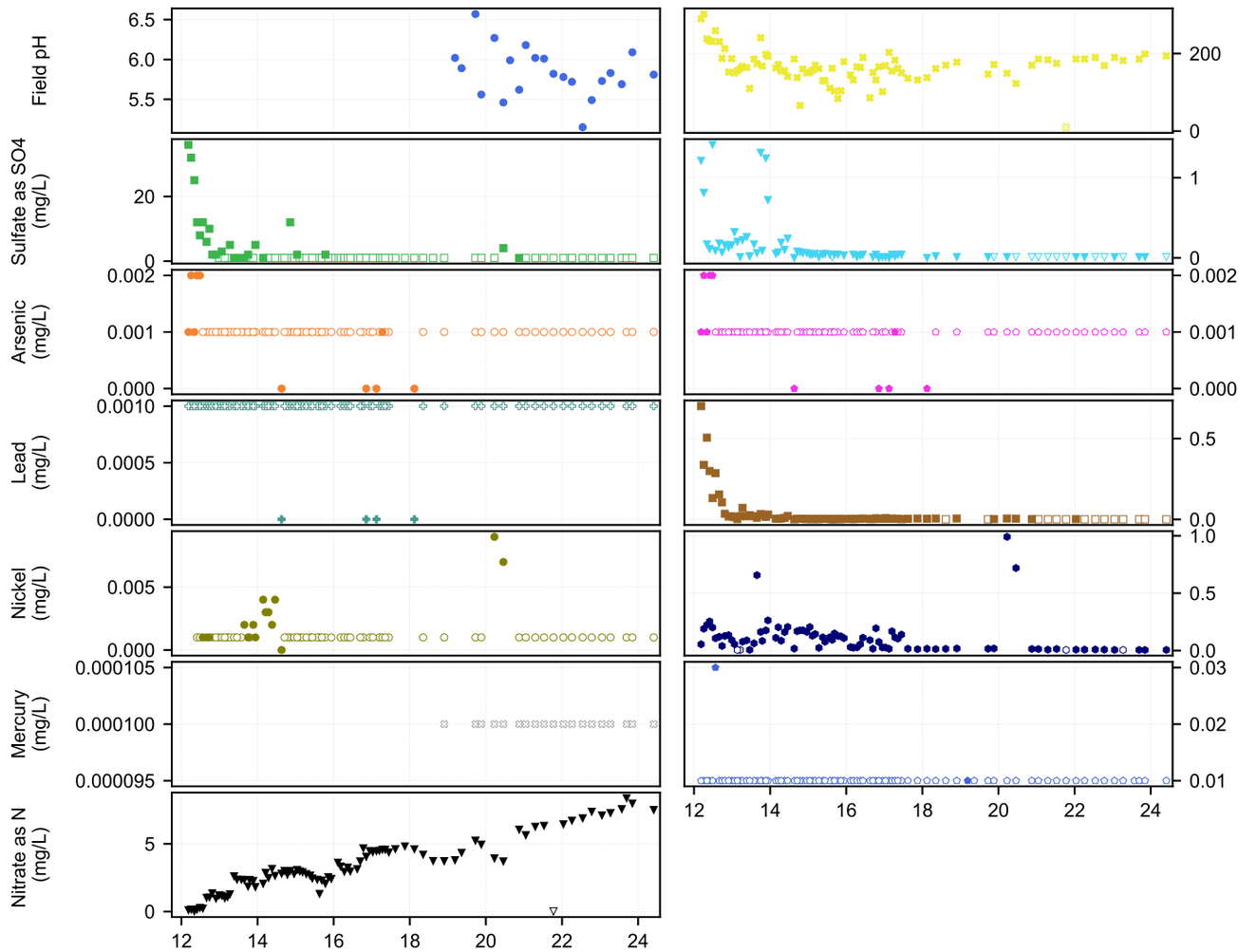
MB56 (Screened geology - Tertiary basalt; Screened interval: 23-30 mbgl)



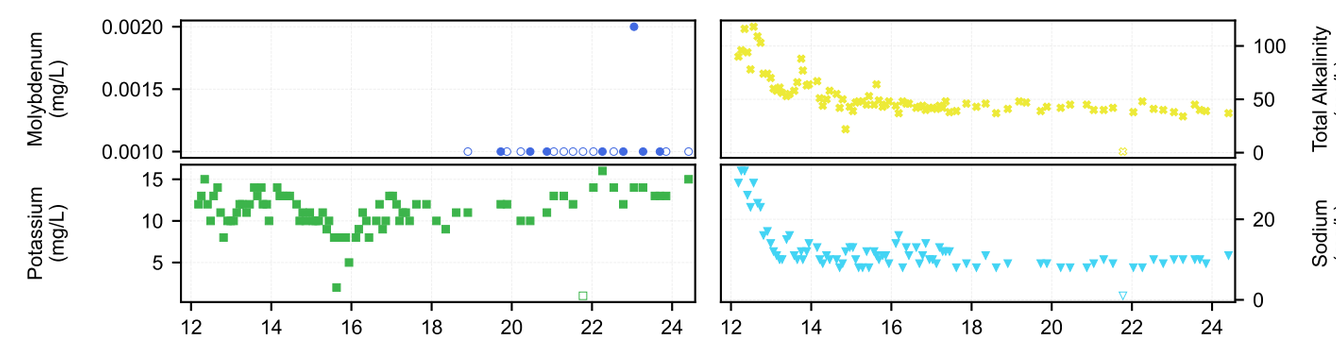
Groundwater levels



WMP defined analytes

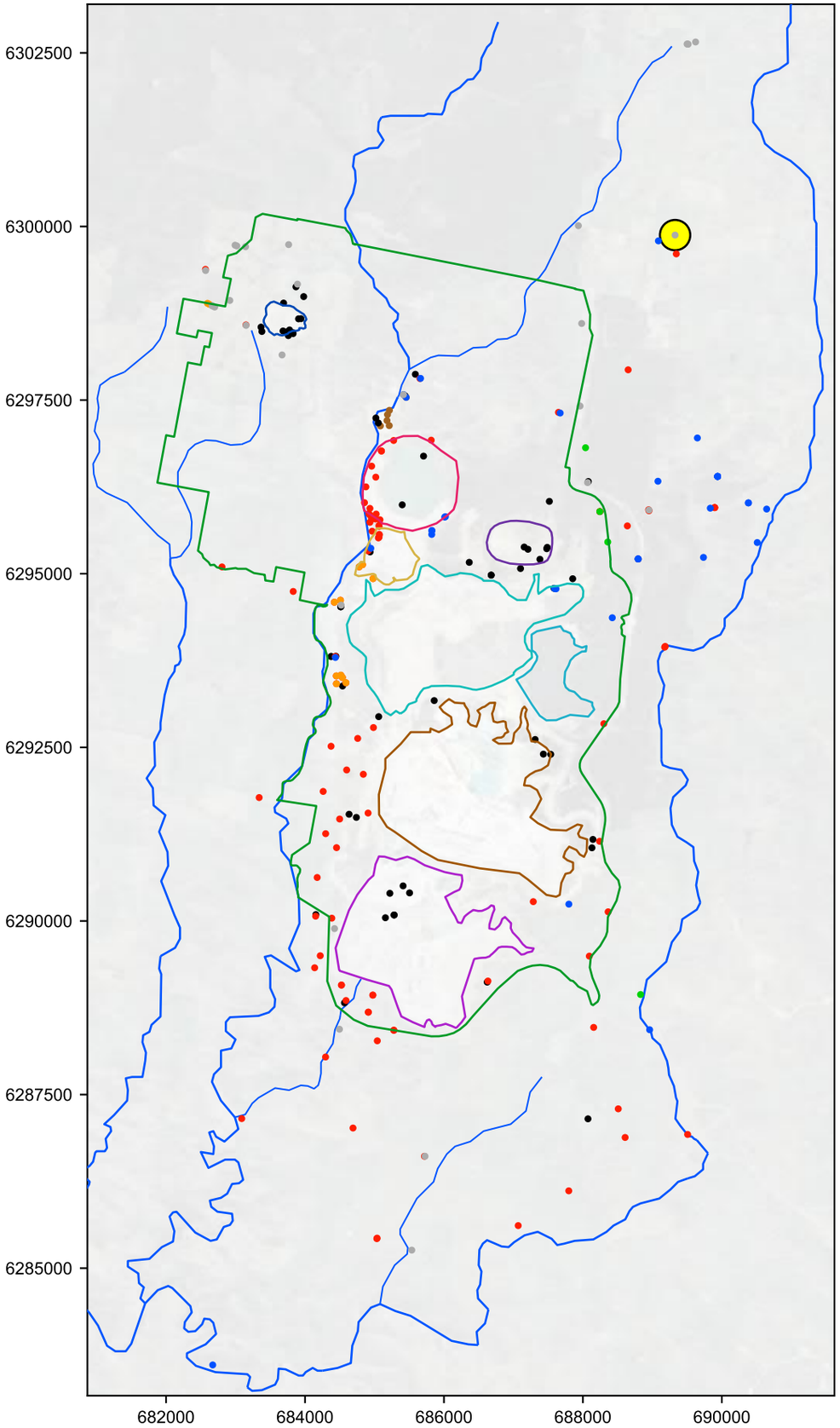


Additional analytes of interest

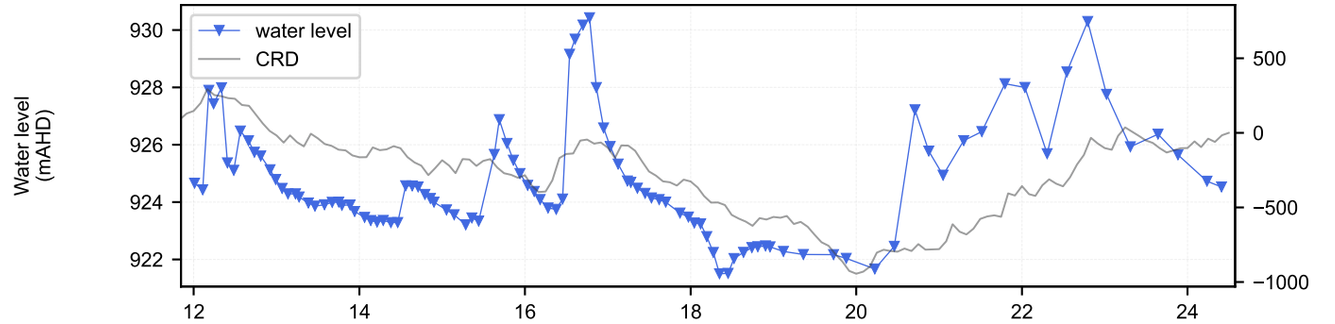


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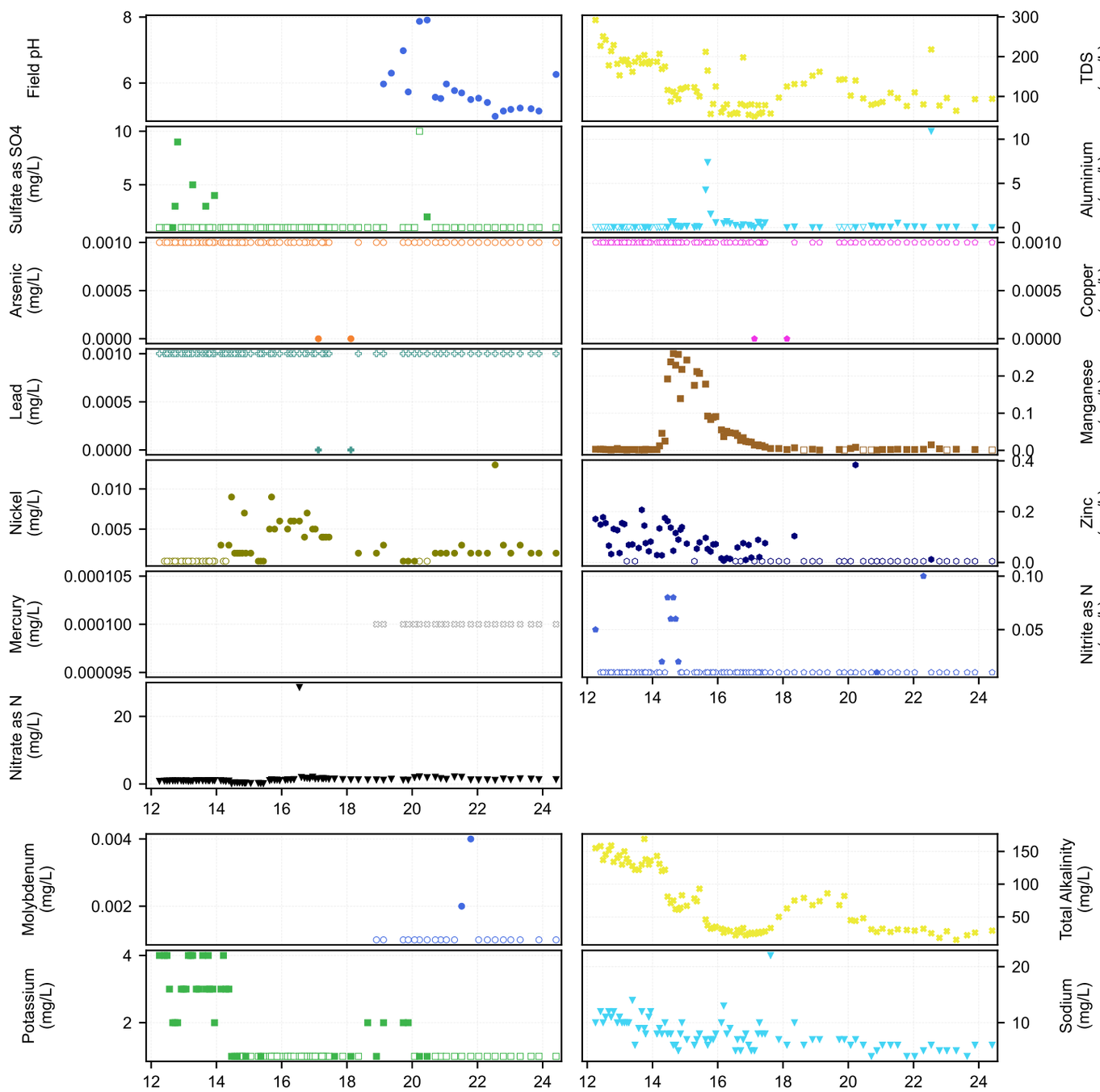
MB64 (Screened geology - Tertiary basalt; Screened interval: 25-62 mbgl)



Groundwater levels



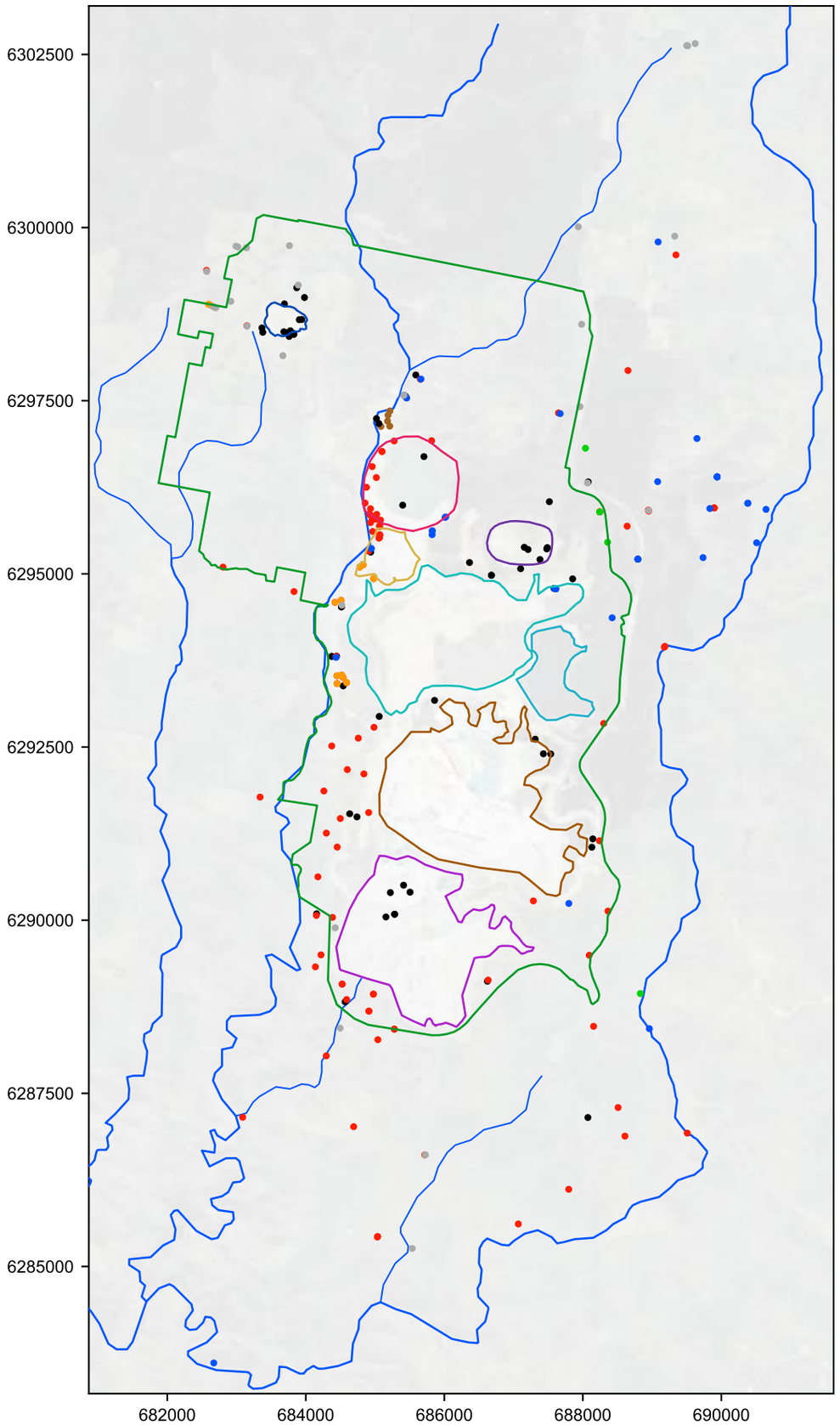
WMP defined analytes



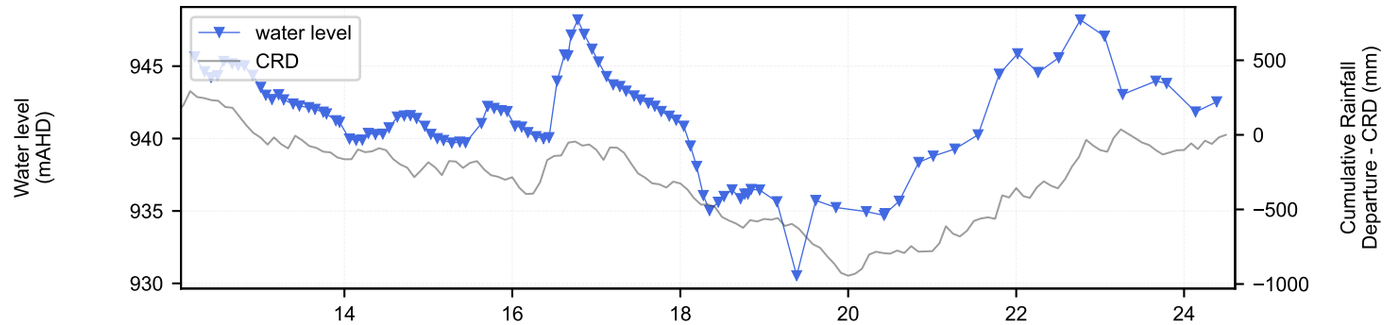
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

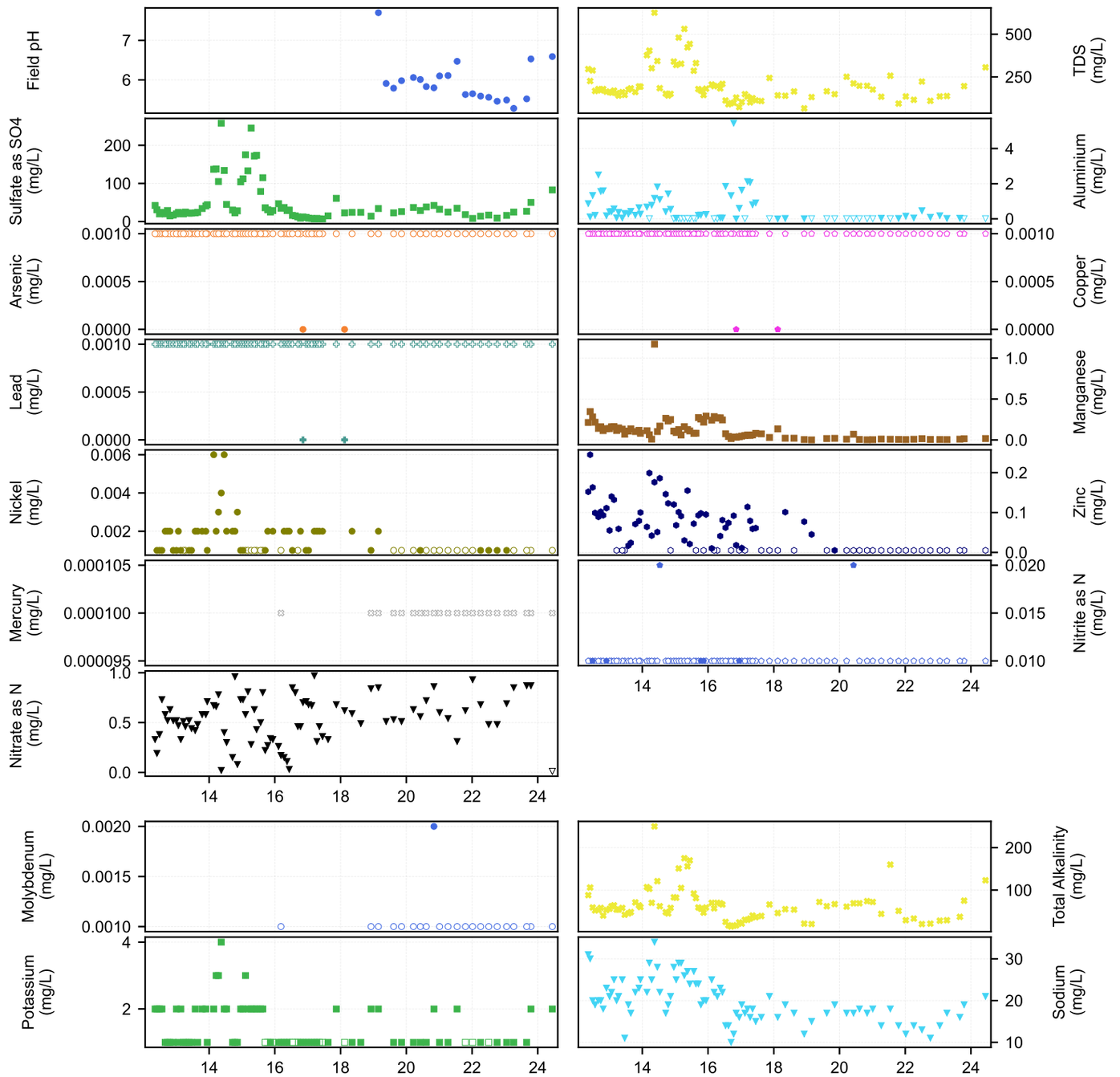
MB71 (Screened geology - Ordovician; Screened interval: 21.8-33.8 mbgl)



Groundwater levels



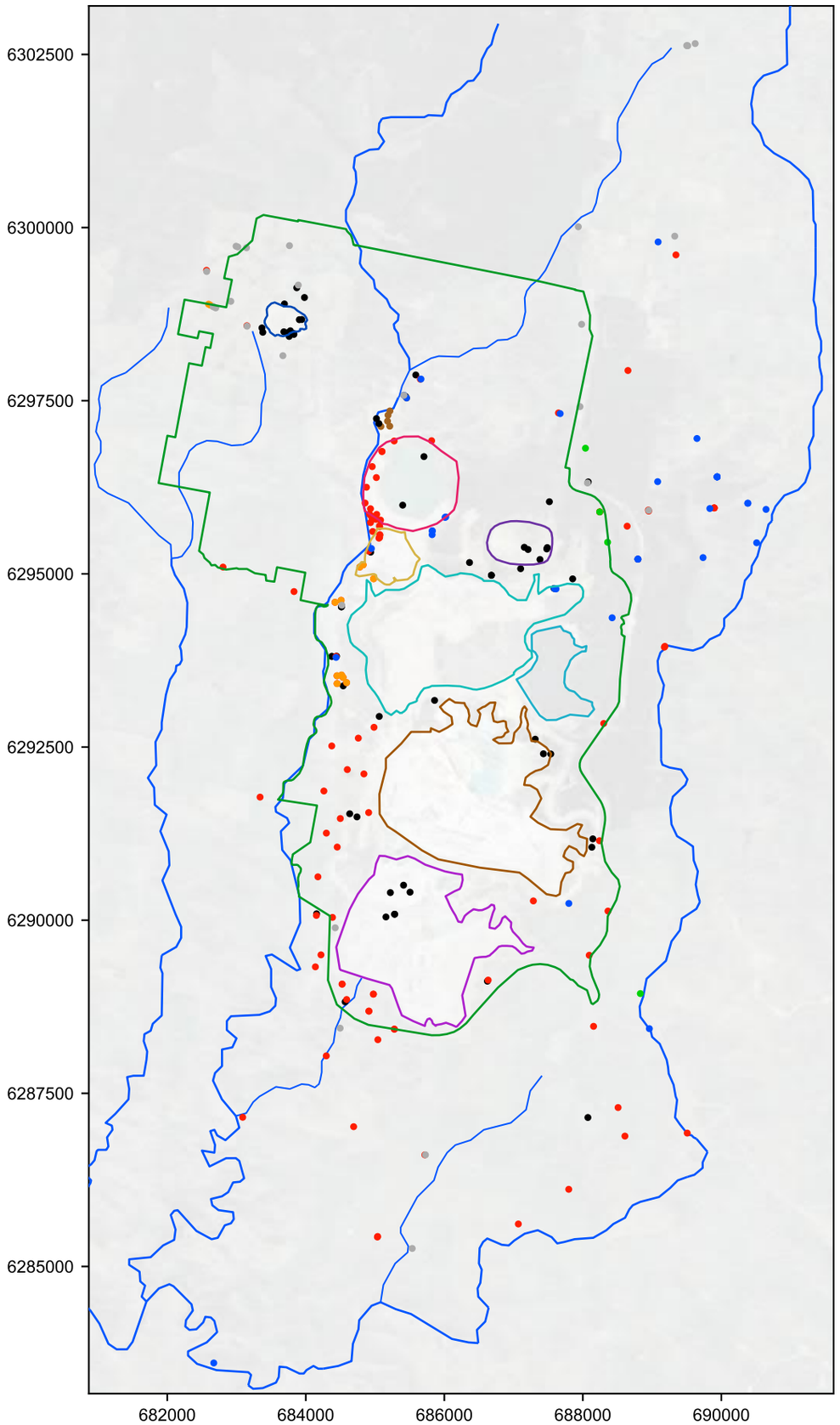
WMP defined analytes



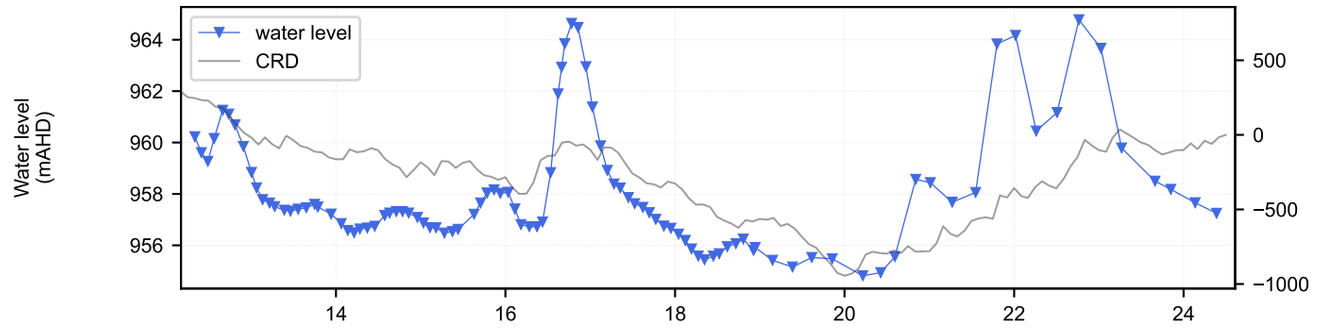
Additional analytes of interest

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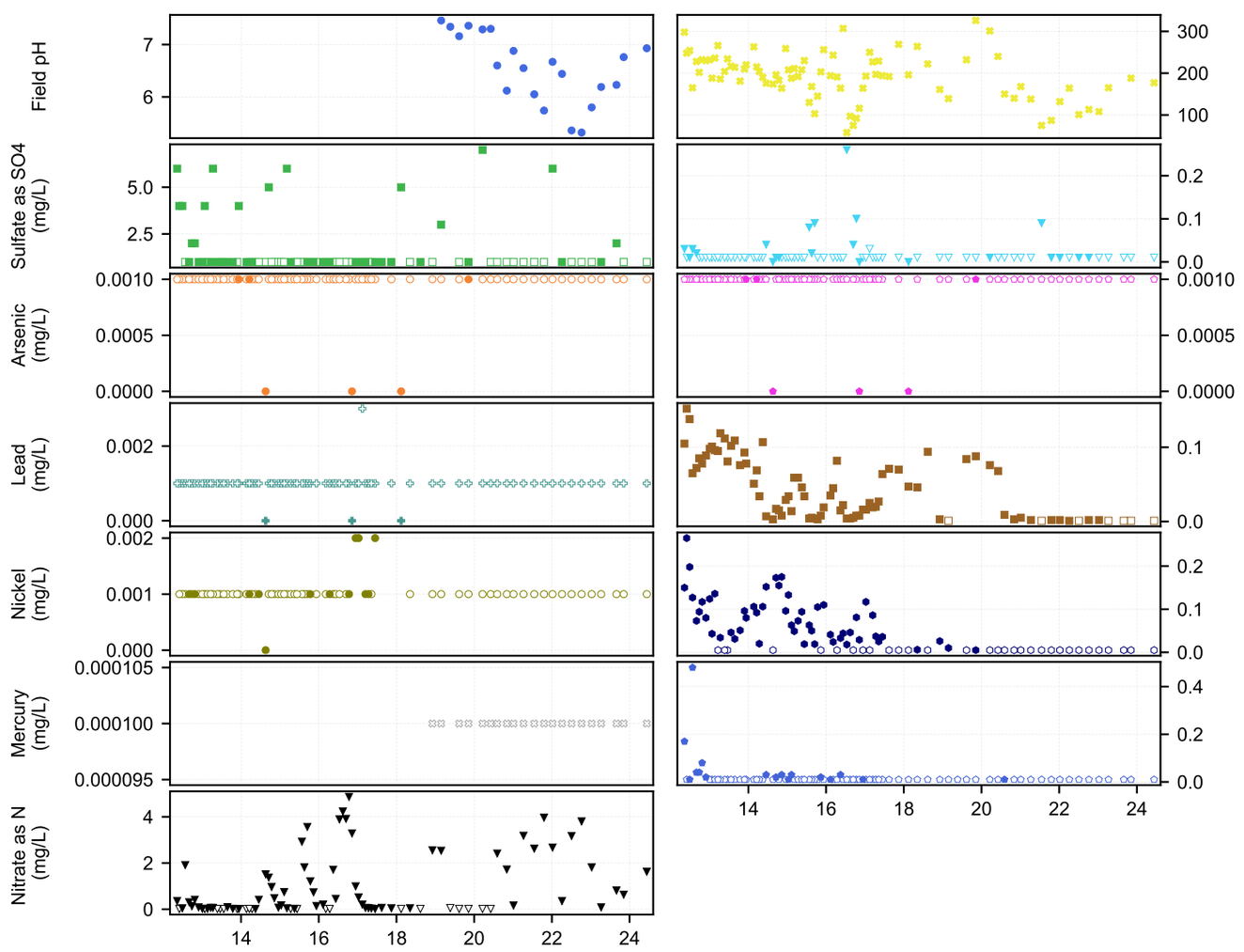
MB72 (Screened geology - Tertiary basalt; Screened interval: 29.2-41.2 mbgl)



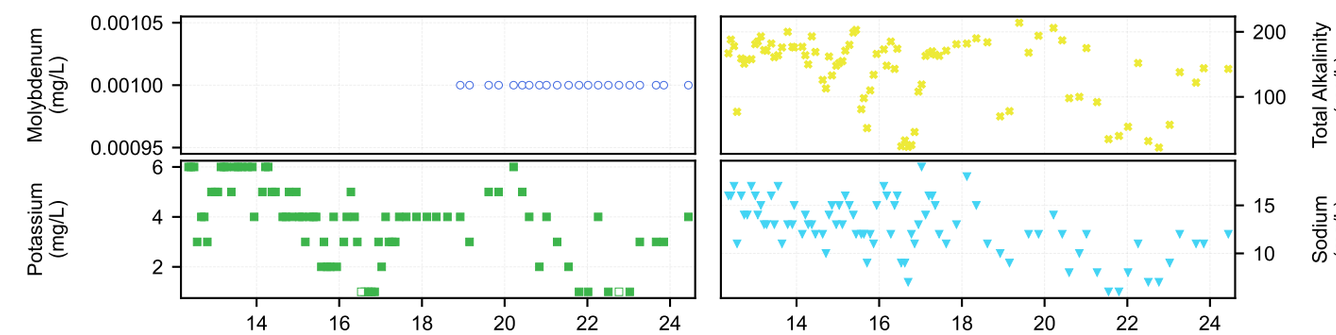
Groundwater levels



WMP defined analytes

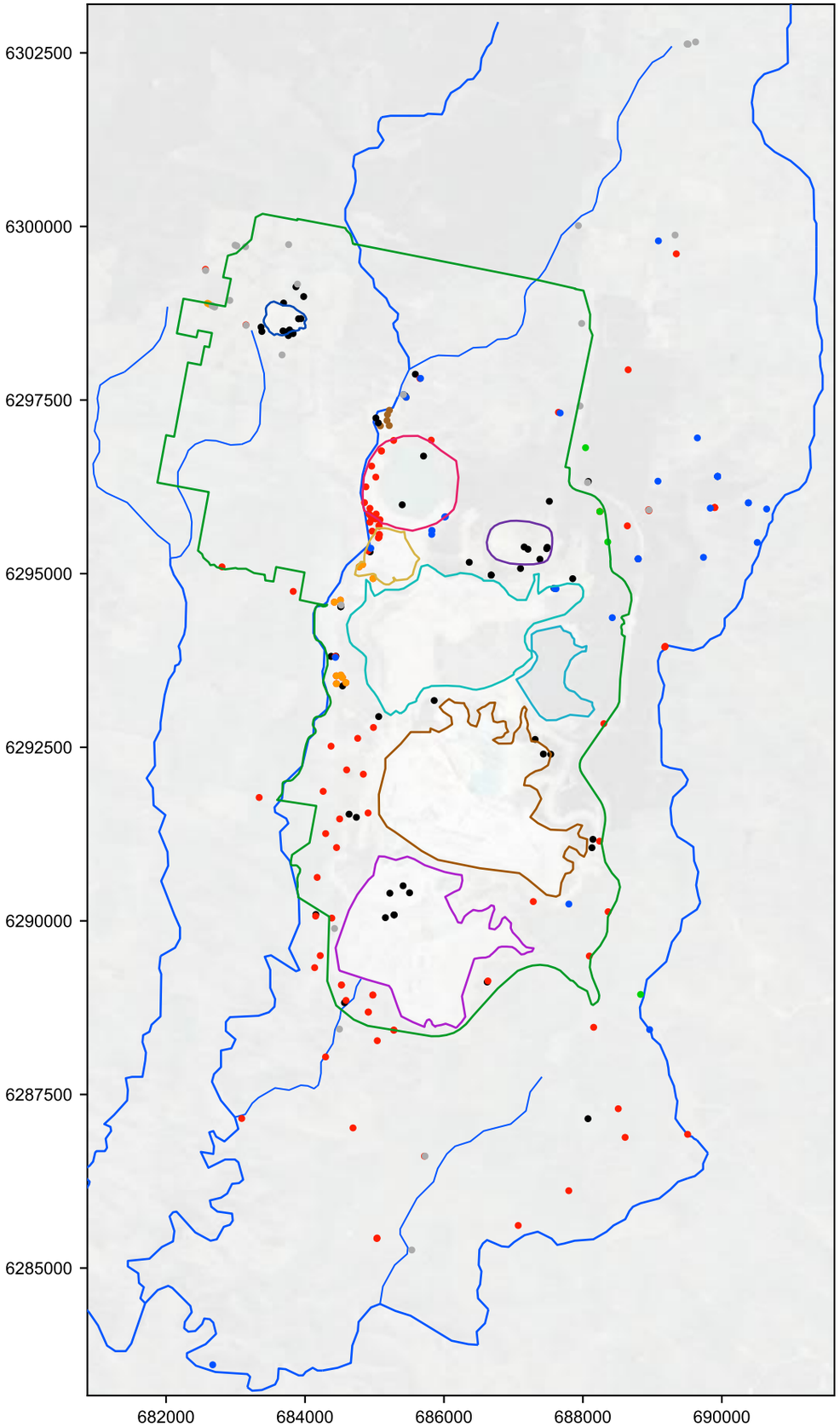


Additional analytes of interest

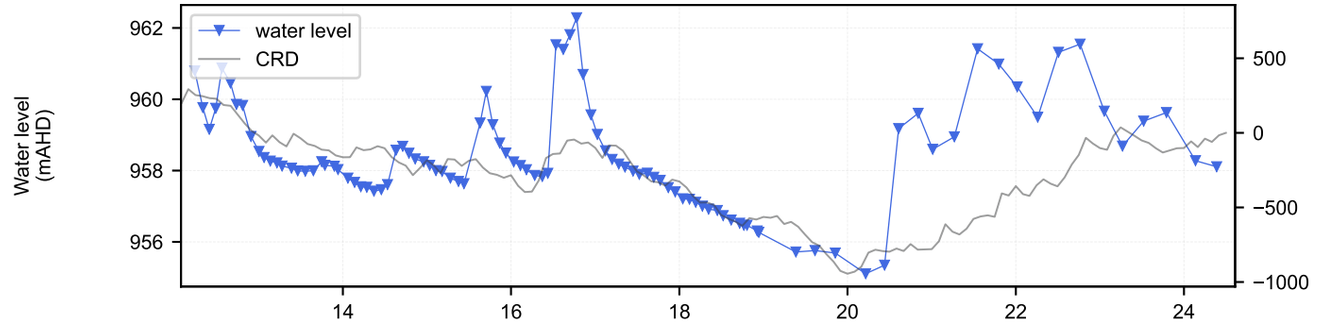


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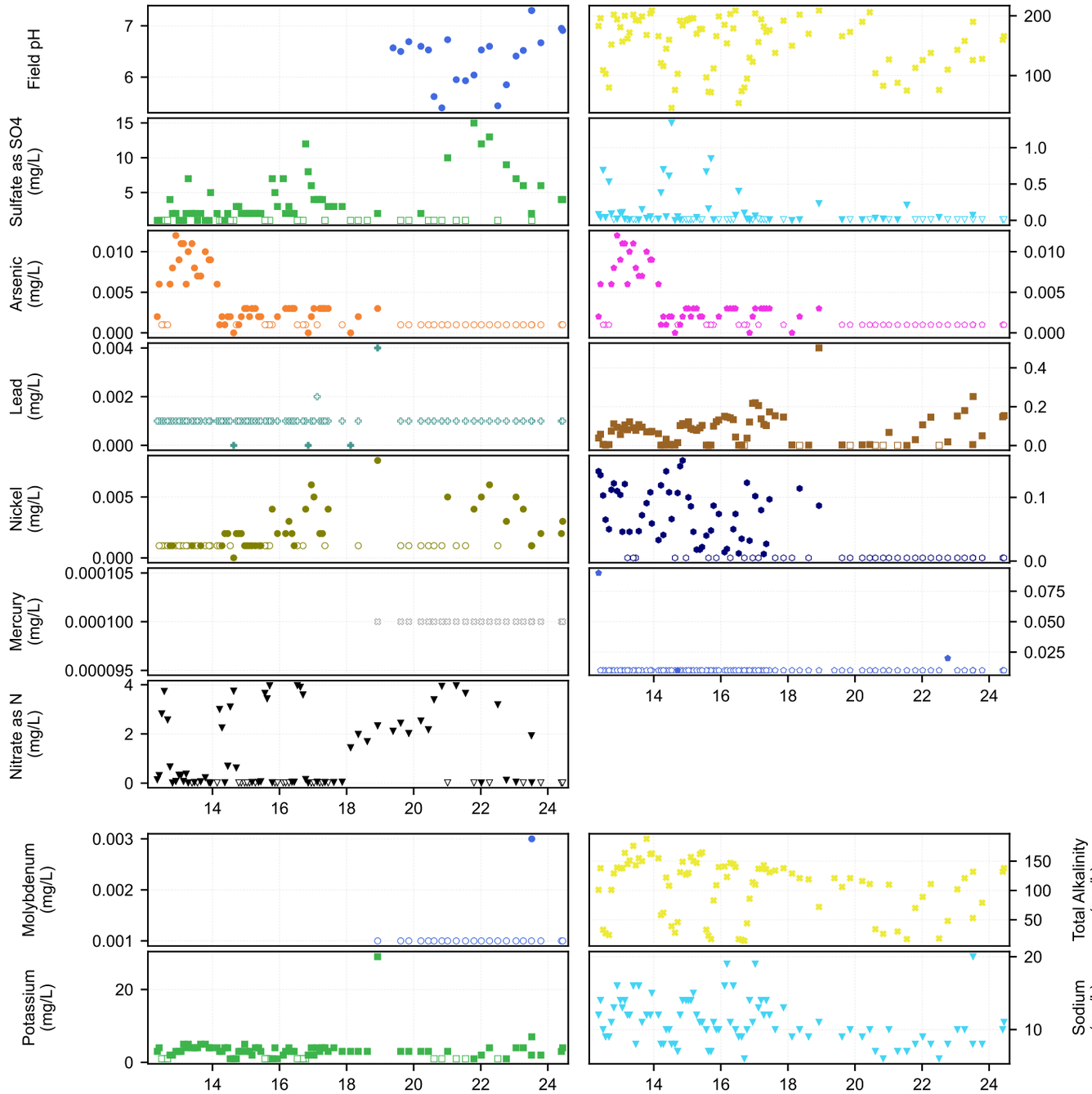
MB74 (Screened geology - Tertiary basalt; Screened interval: 6.6-24.6 mbgl)



Groundwater levels



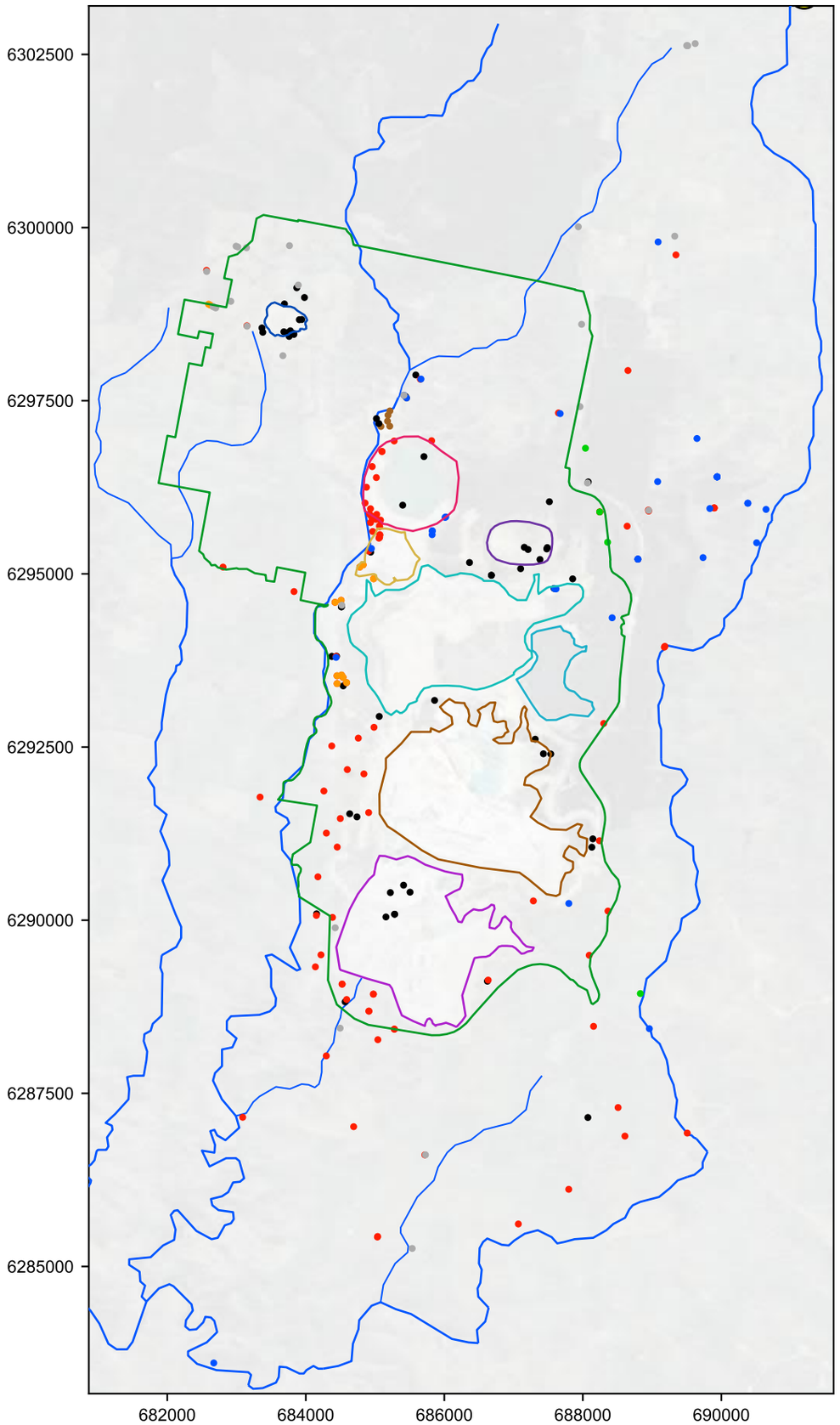
WMP defined analytes



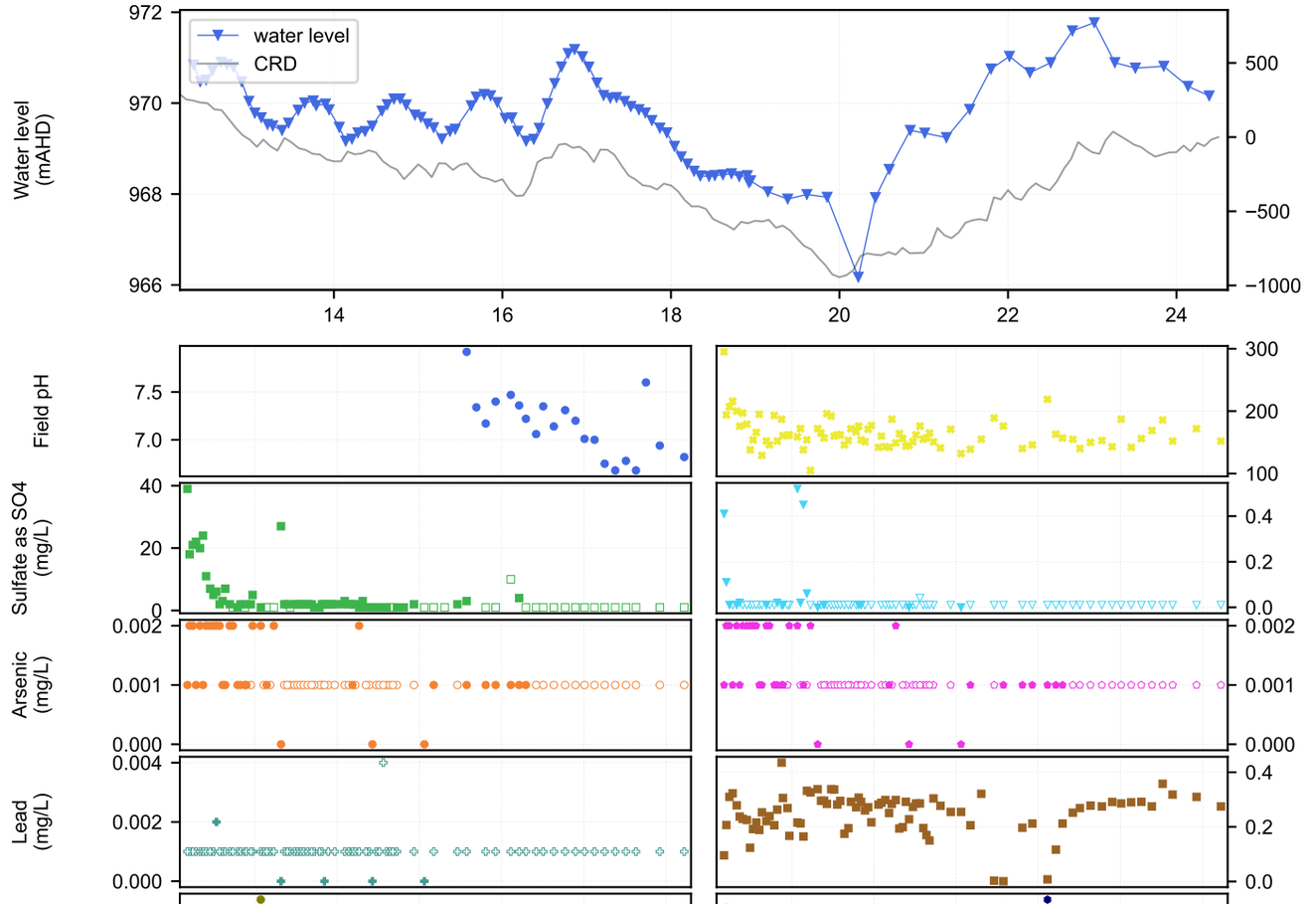
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

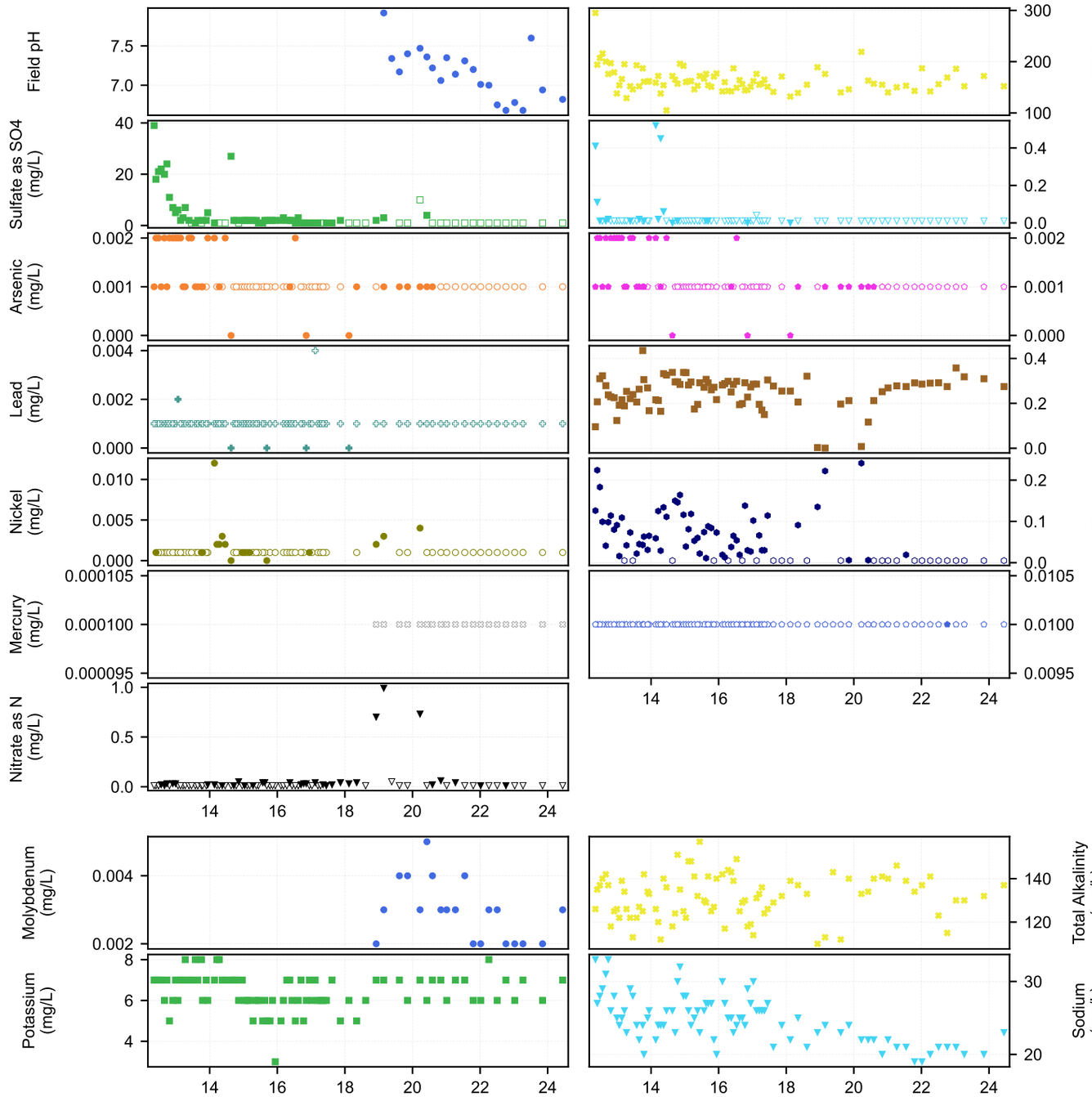
MB75 (Screened geology - Ordovician; Screened interval: 43.9-58.9 mbgl)



Groundwater levels



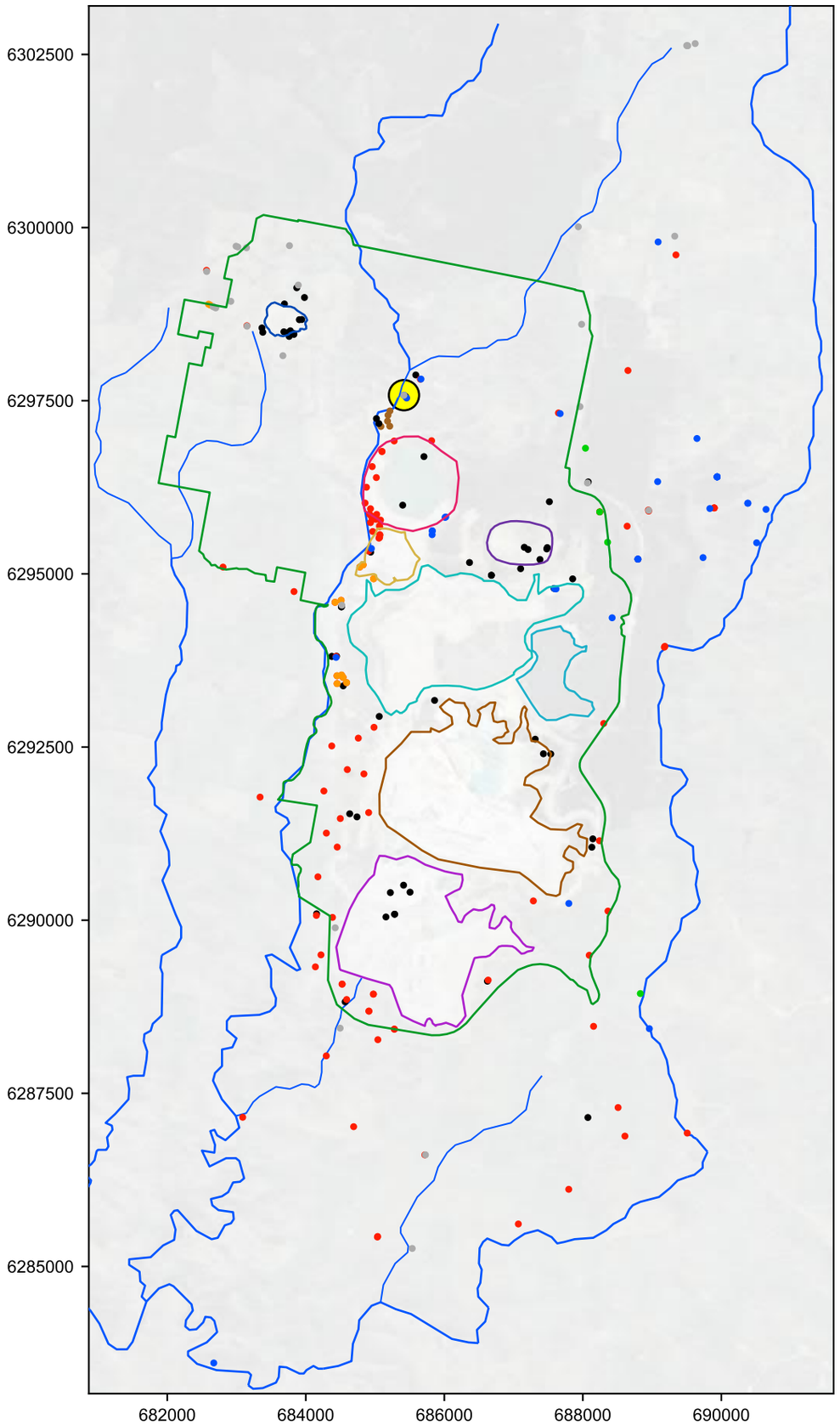
WMP defined analytes



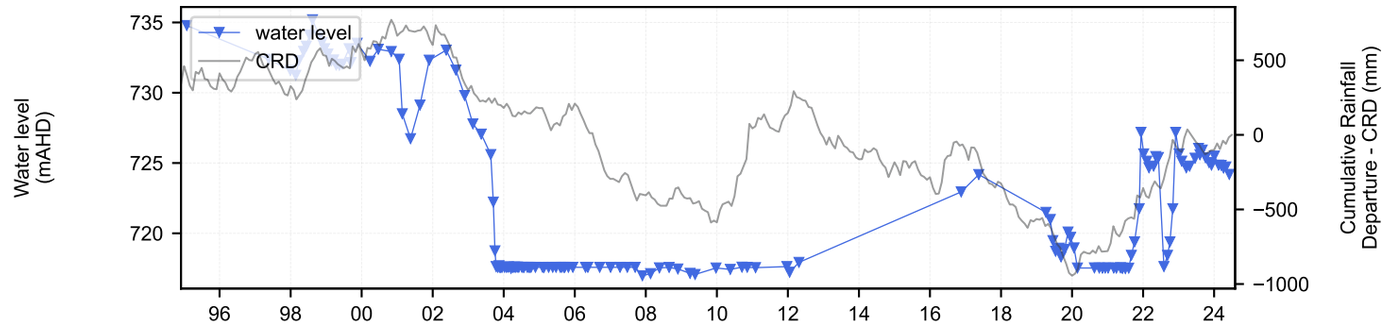
Additional analytes of interest

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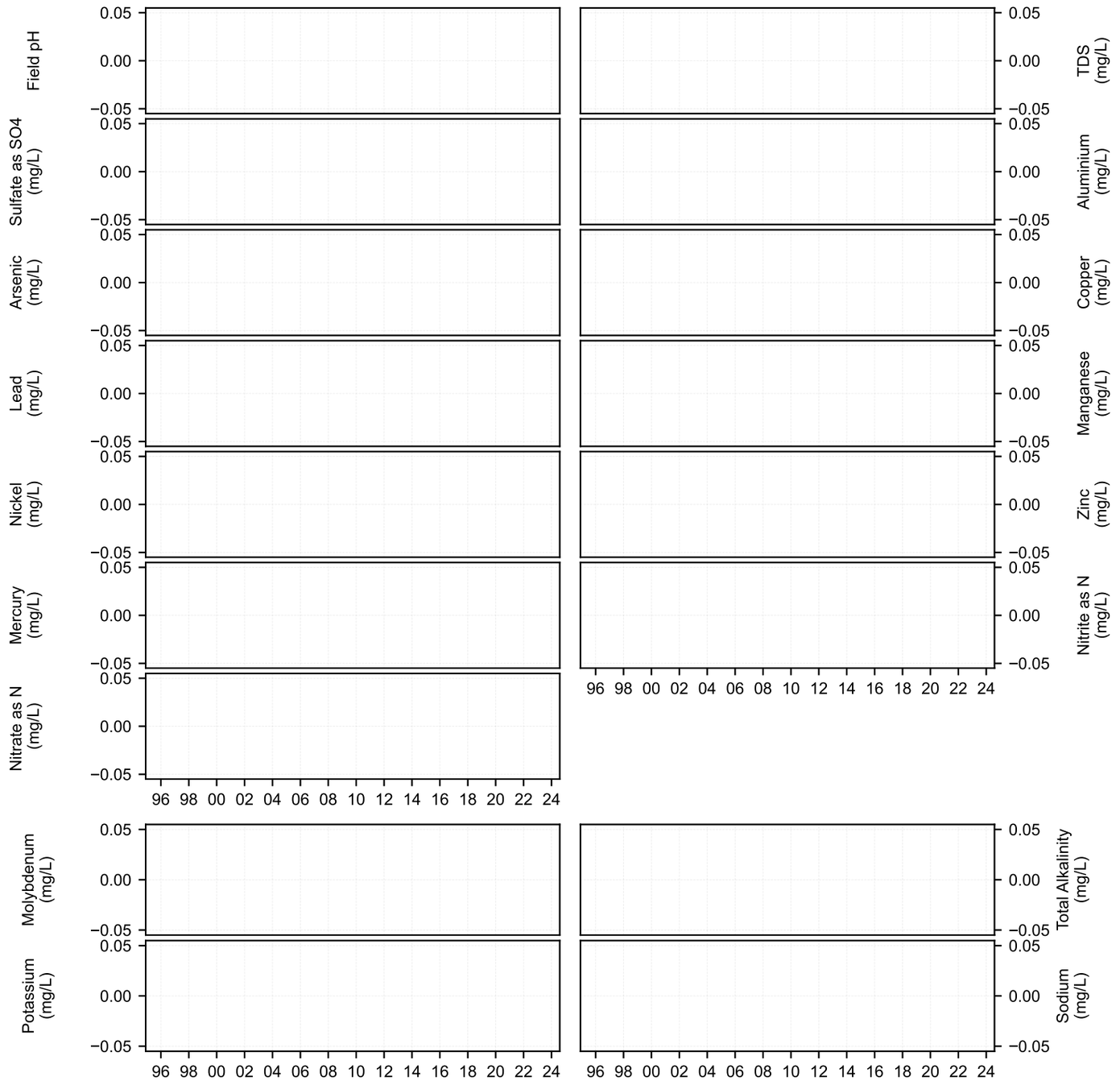
CB8A (Screened geology - Silurian; Screened interval: Unknown)



Groundwater levels



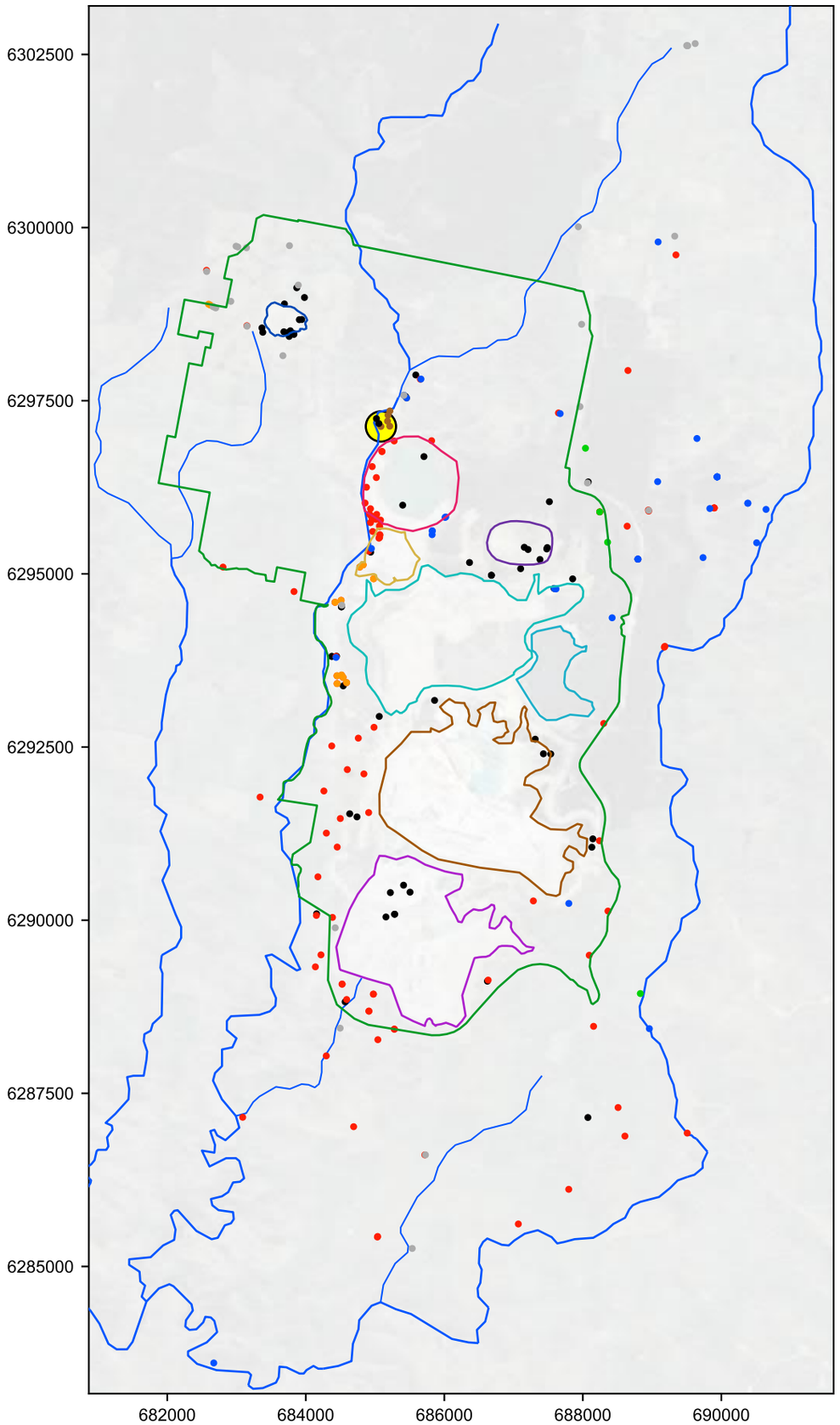
WMP defined analytes



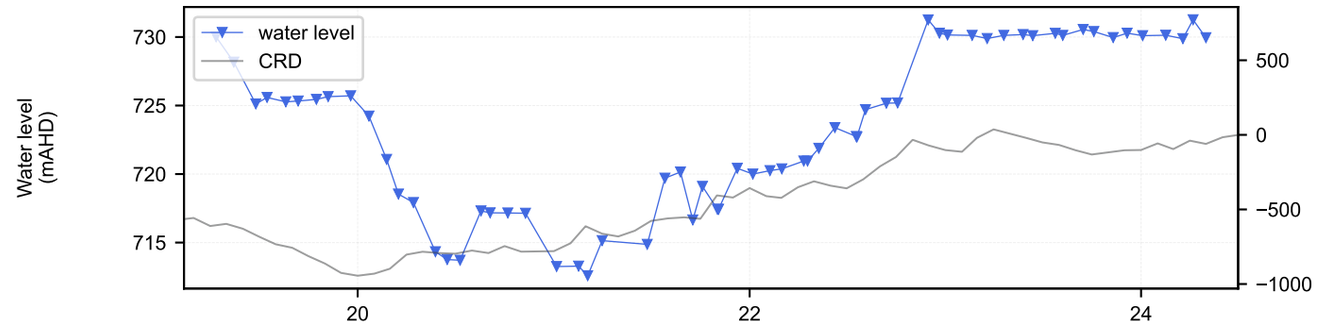
Additional analytes of interest

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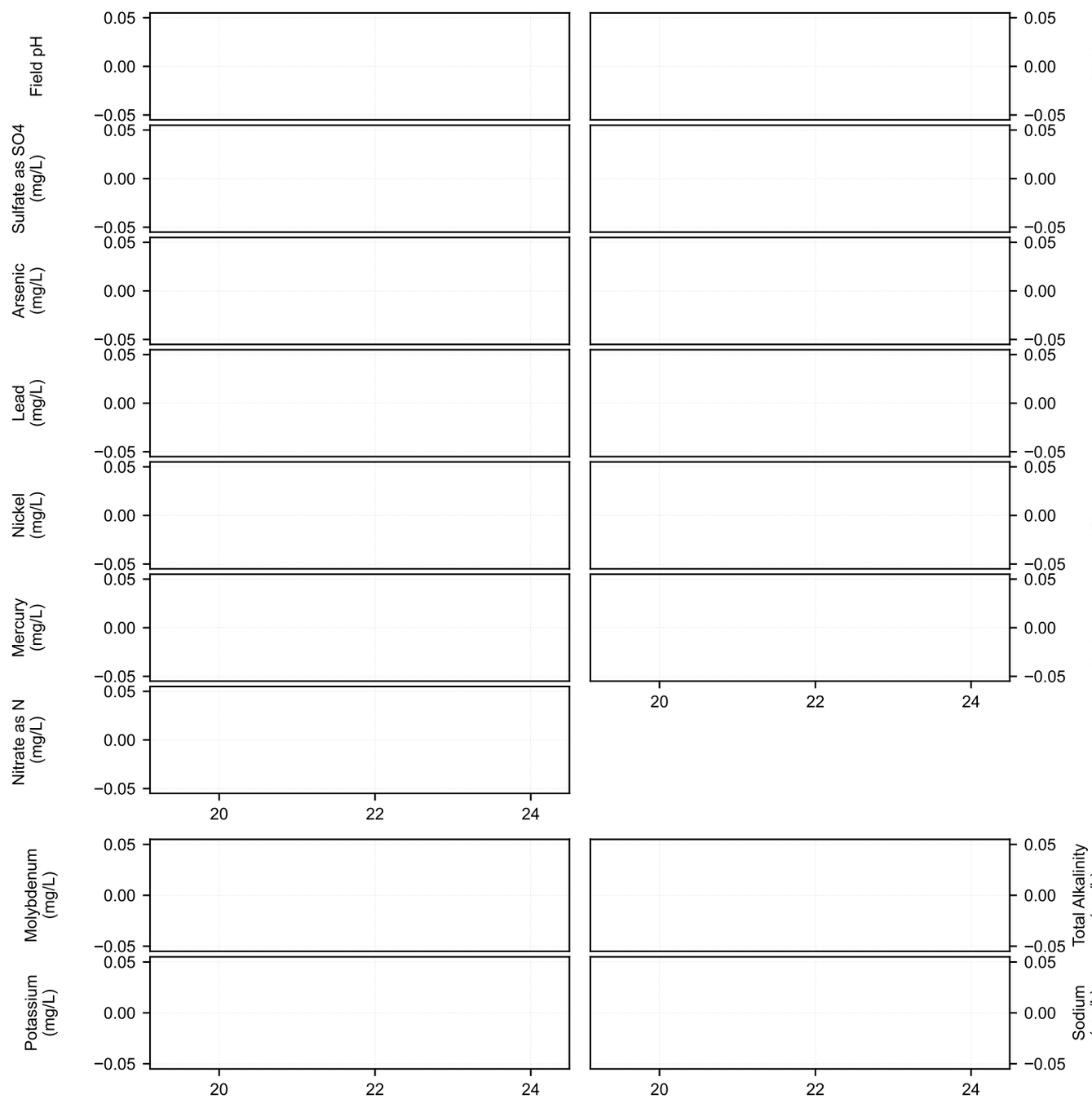
CQ098 (Screened geology - Backfill; Screened interval: openhole mbgl)



Groundwater levels



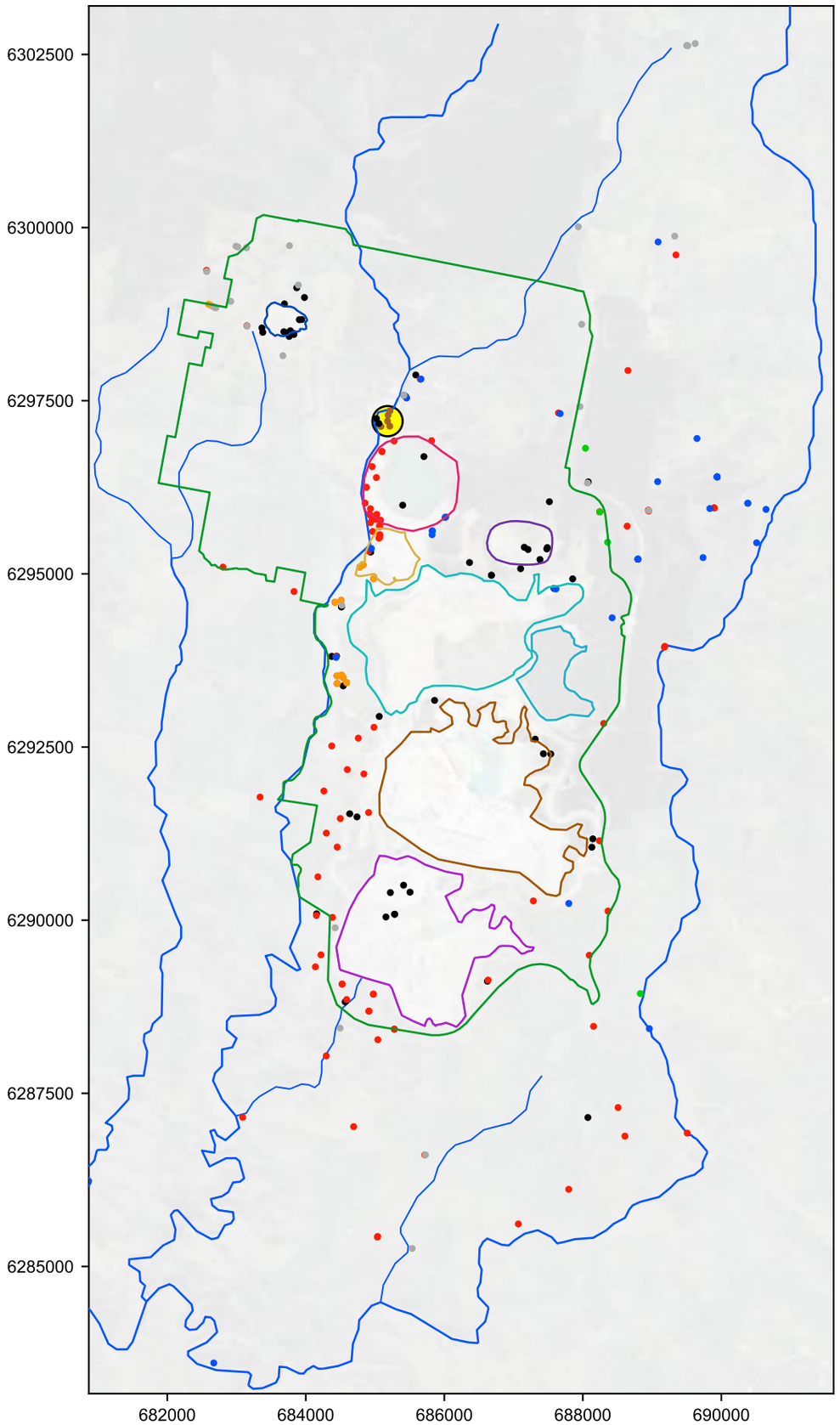
WMP defined analytes



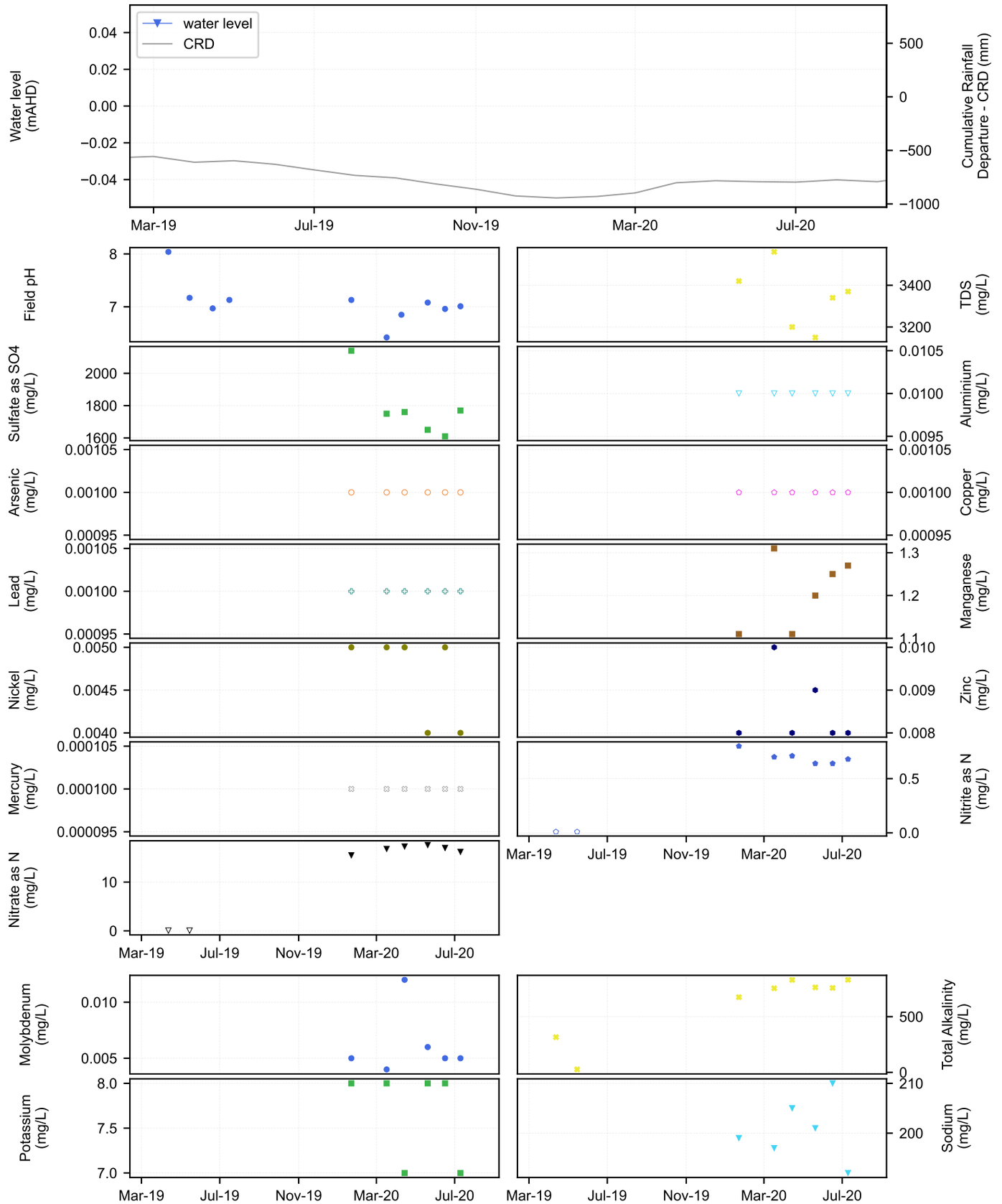
Additional analytes of interest

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CX1 (Screened geology - Backfill; Screened interval: 60-100 mbgl)



Groundwater levels

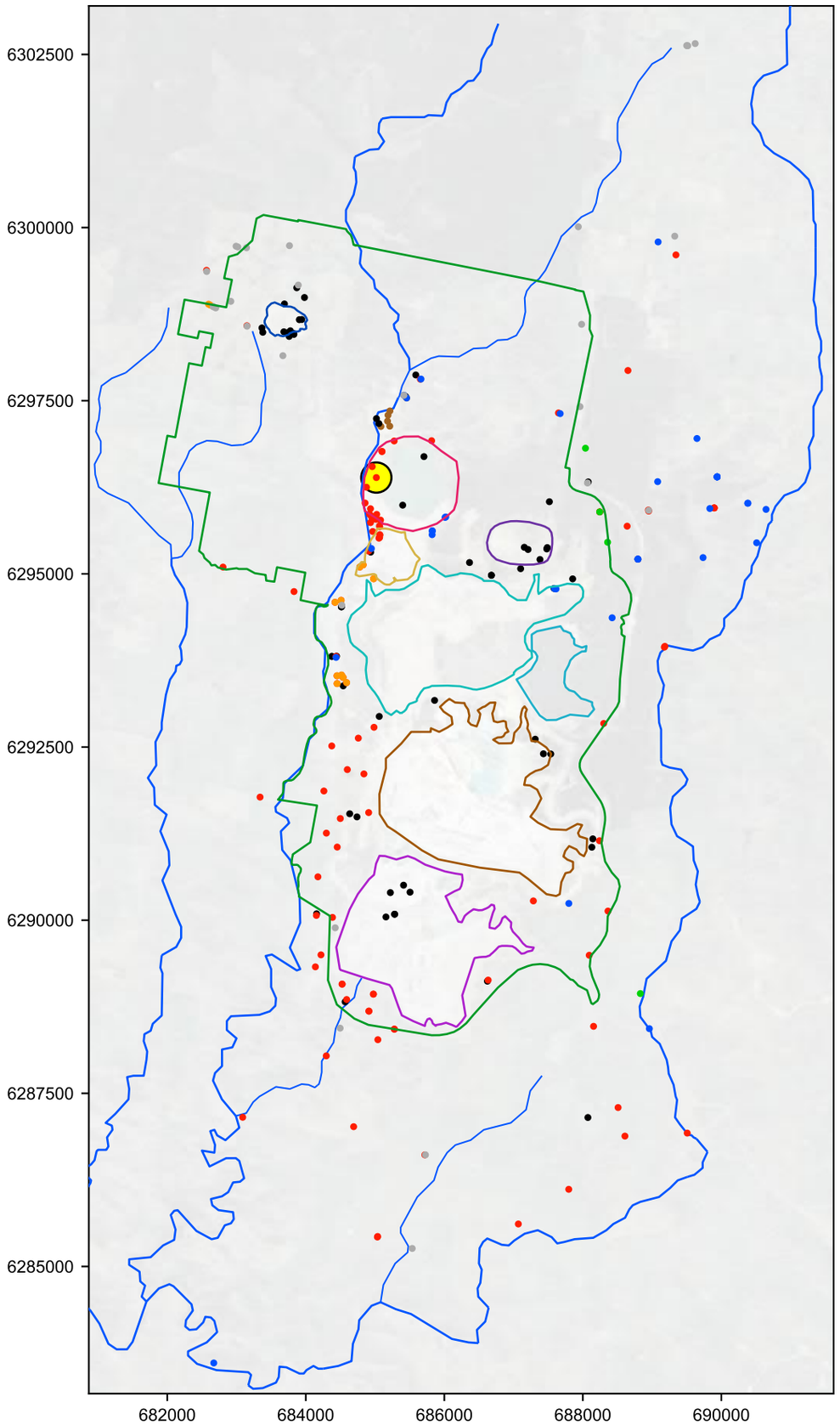


WMP defined analytes

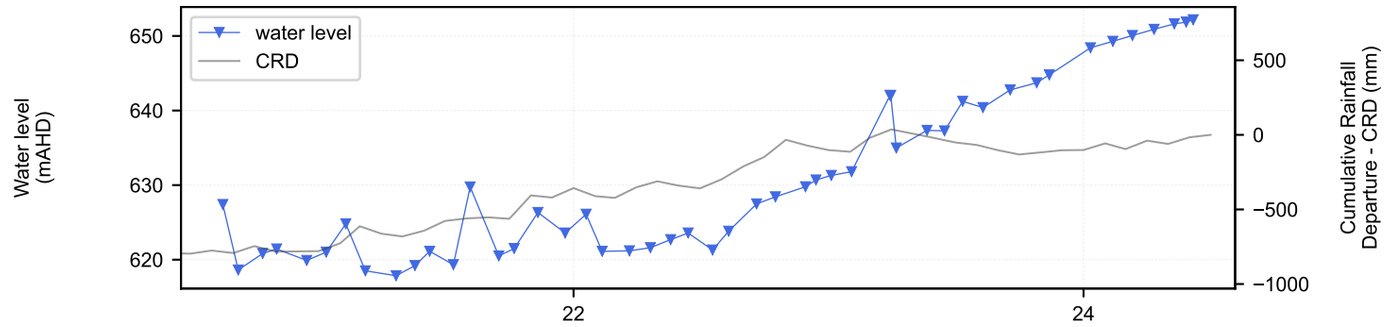
Additional analytes of interest

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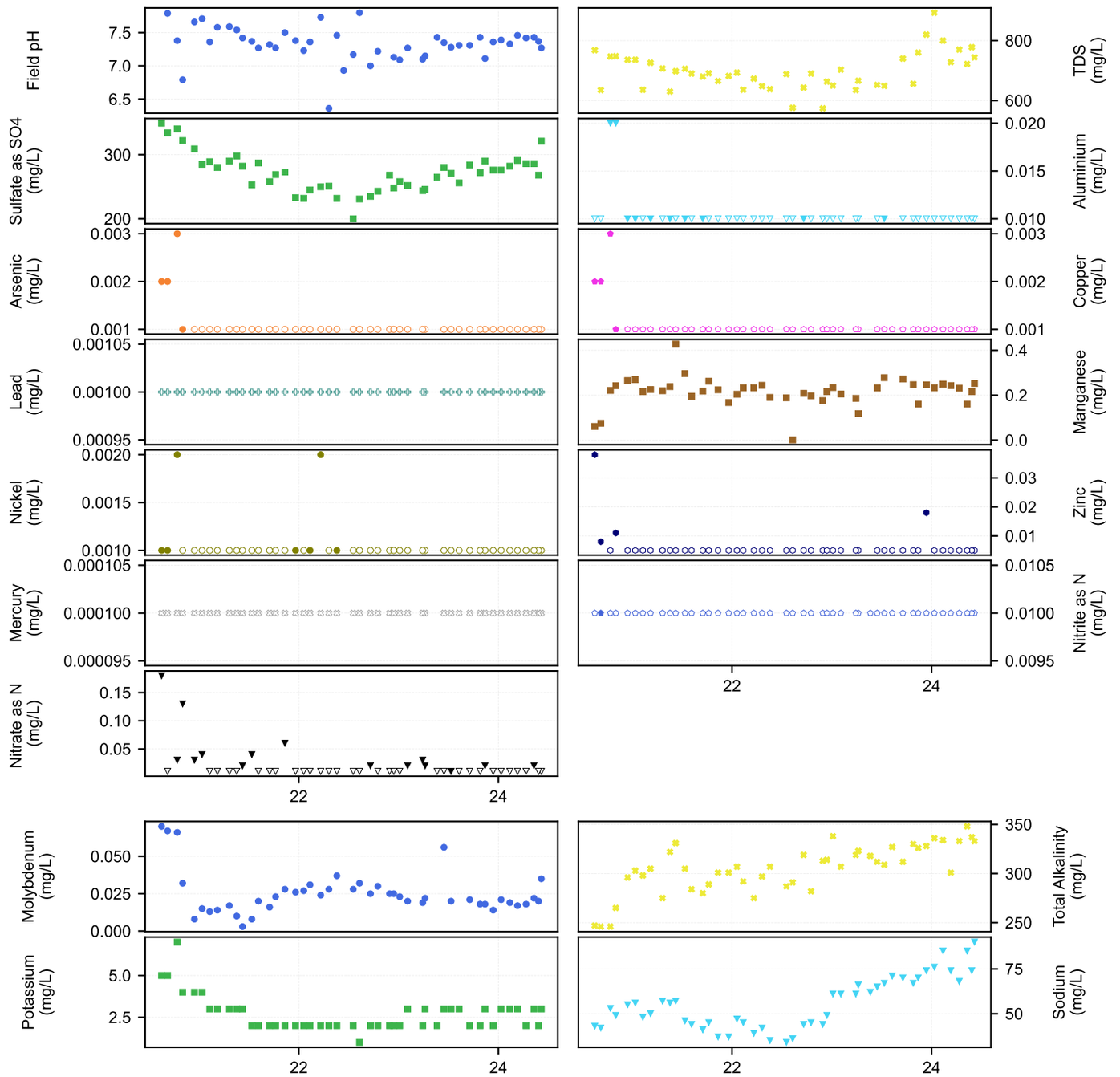
MB96 (Screened geology - Ordovician; Screened interval: 80-110 mbgl)



Groundwater levels



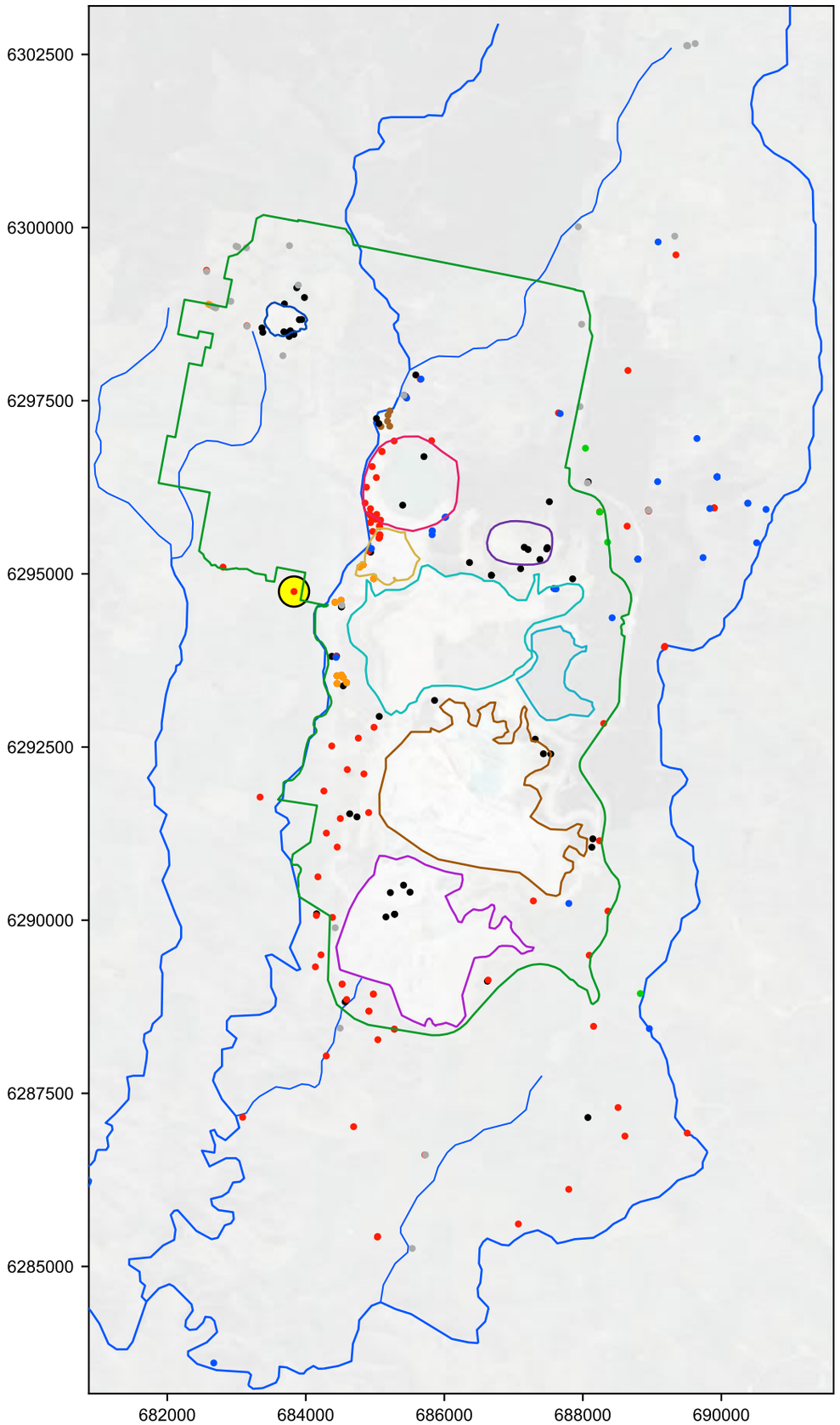
WMP defined analytes



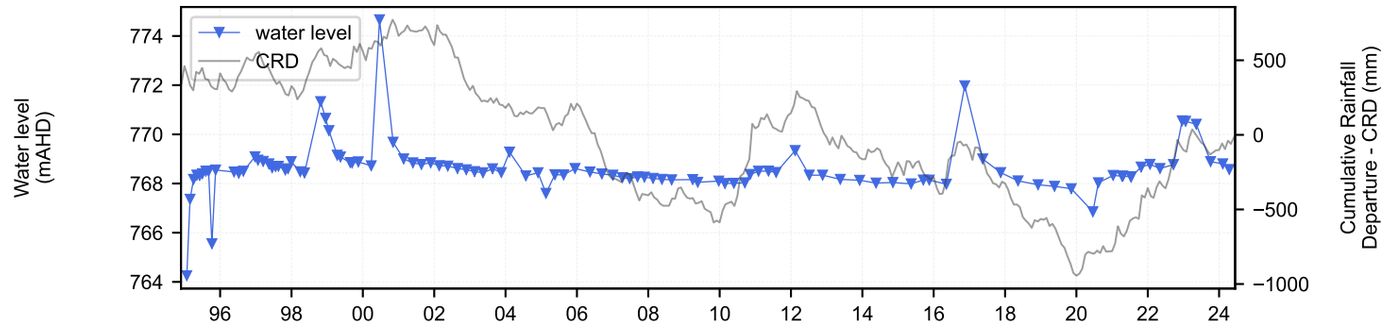
Additional analytes of interest

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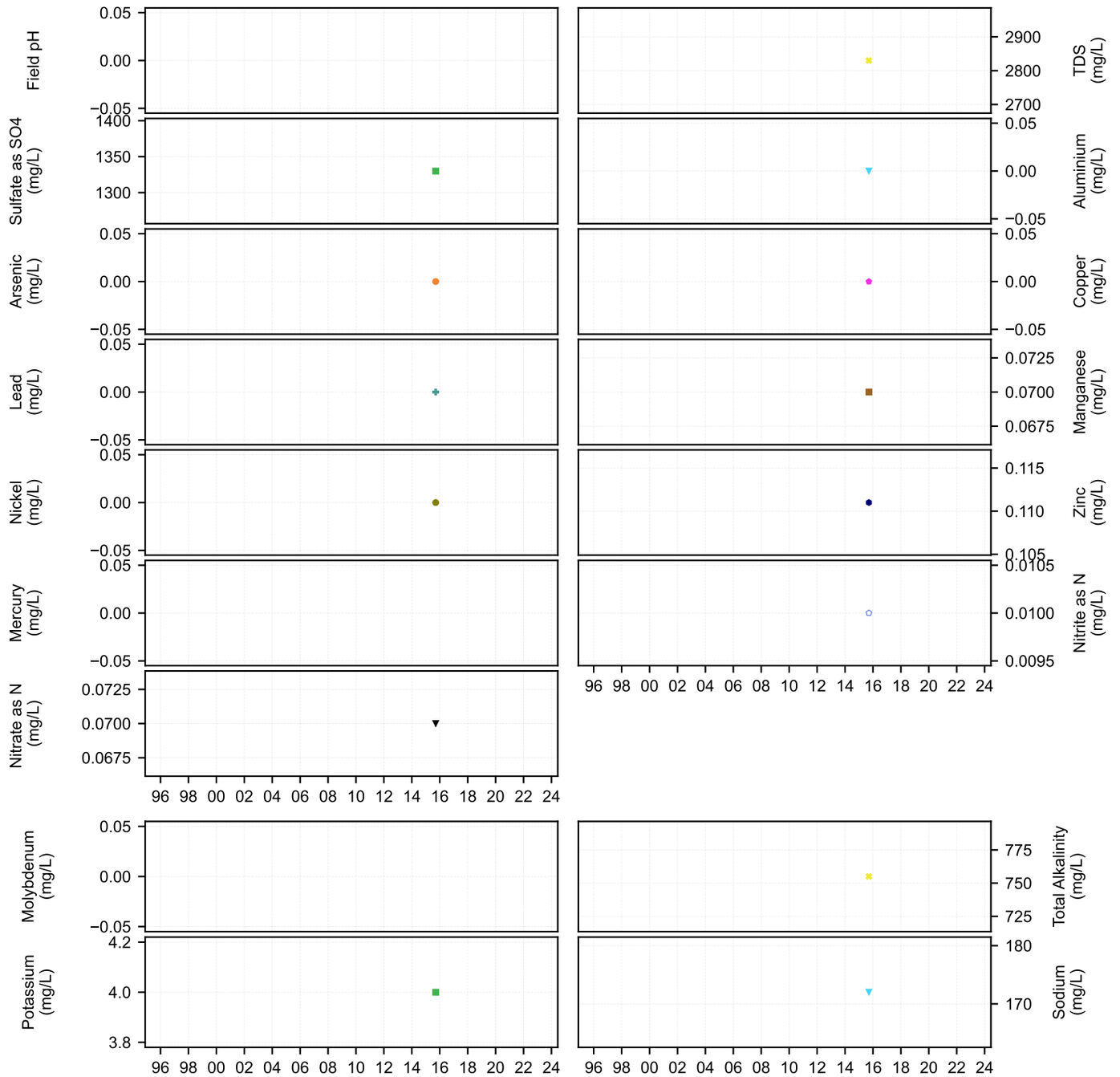
RB04 (Screened geology - Ordovician; Screened interval: Unknown)



Groundwater levels



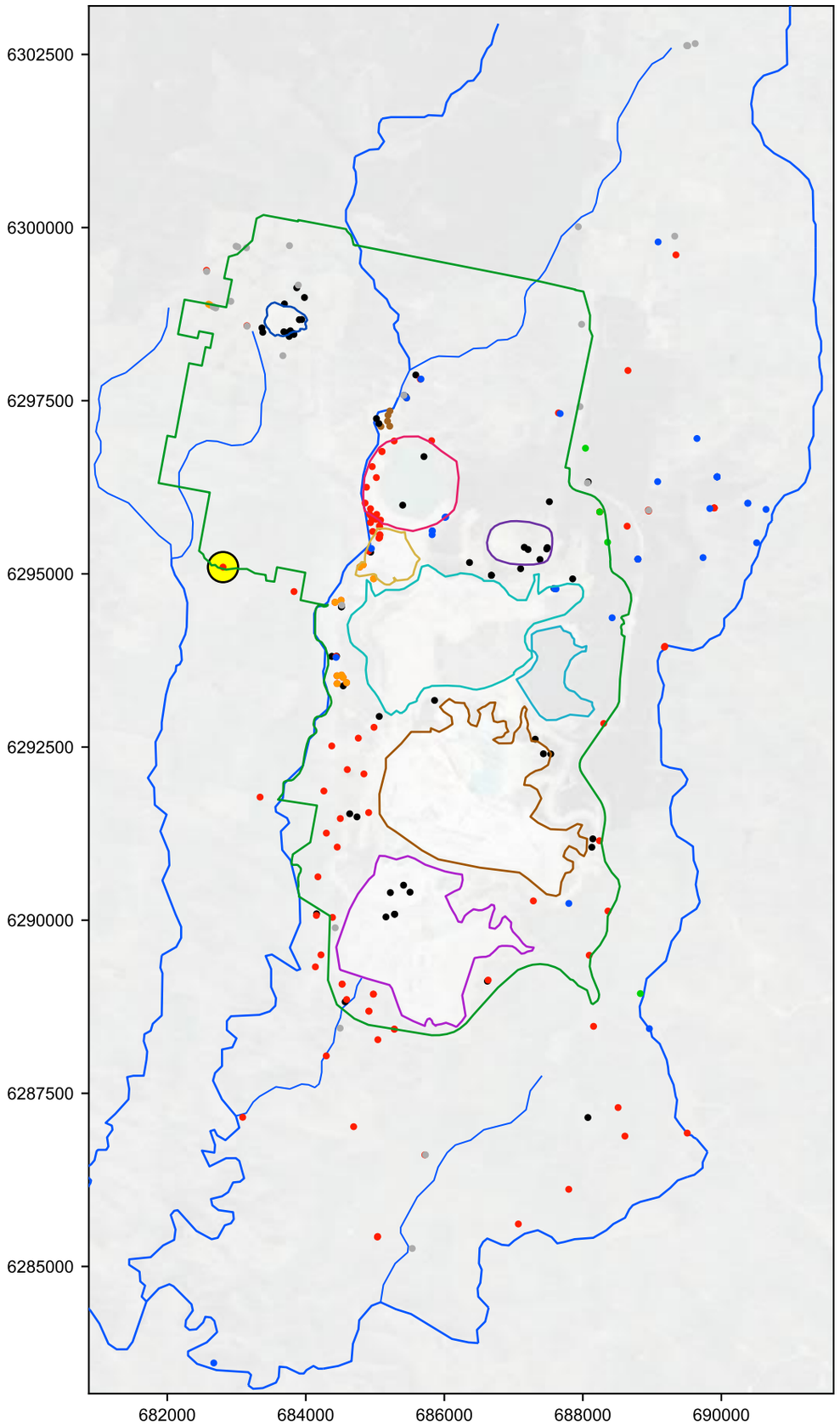
WMP defined analytes



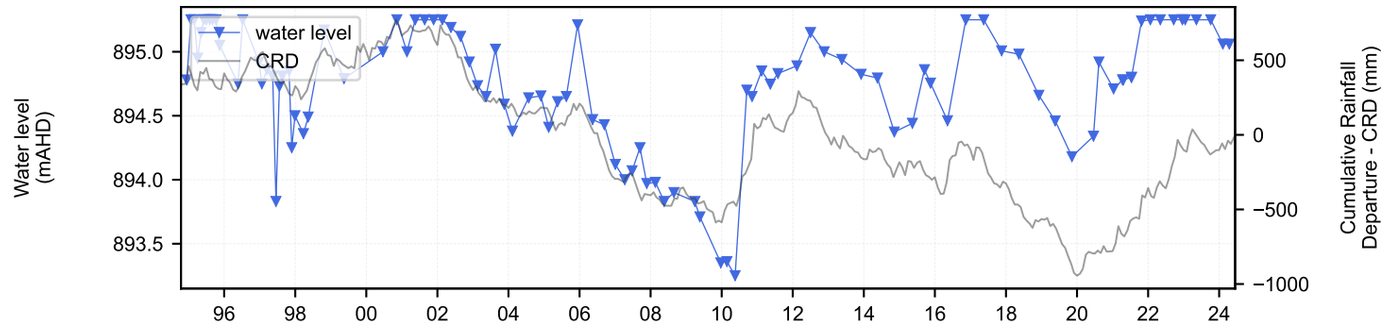
Additional analytes of interest

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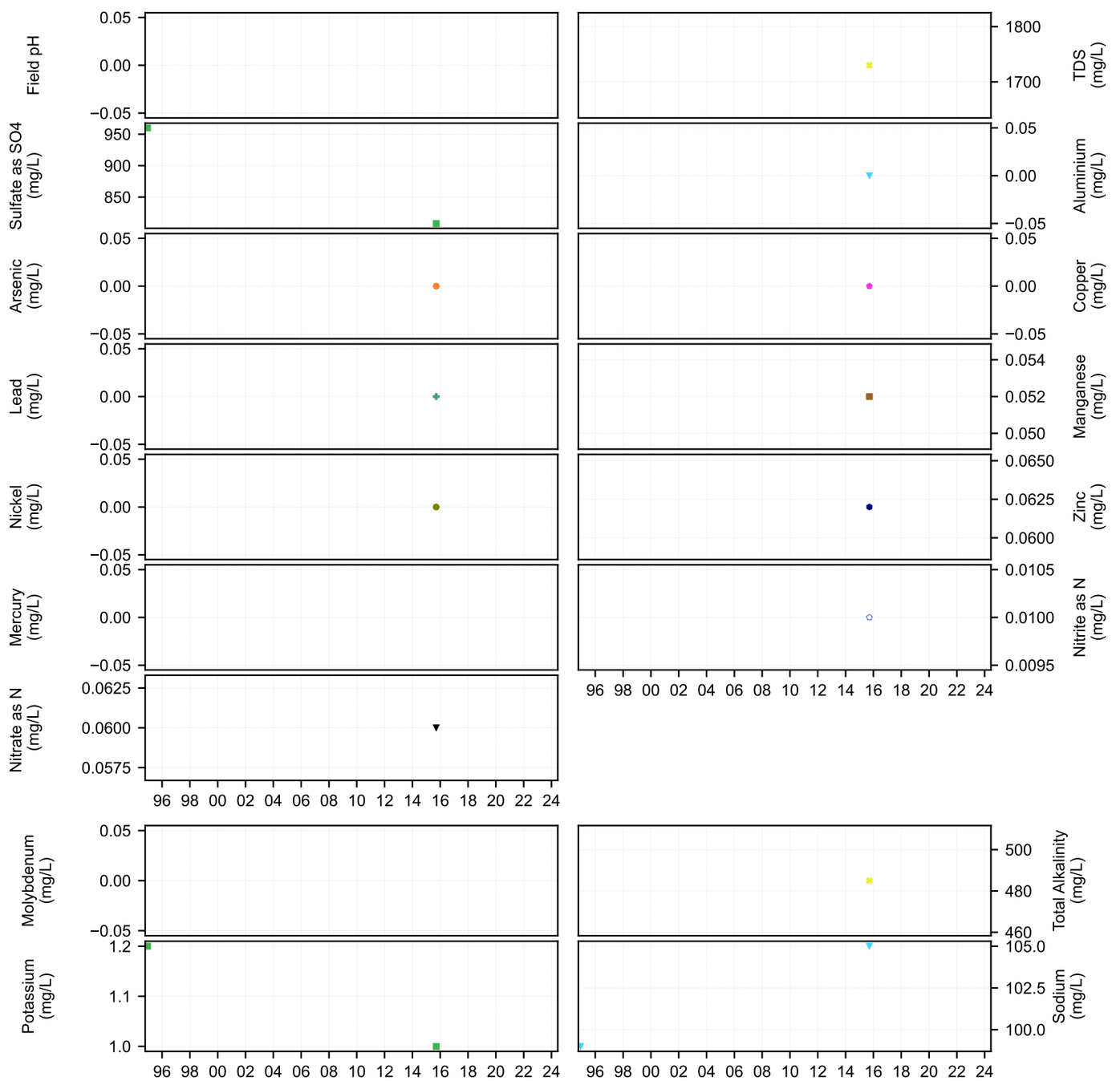
RB05 (Screened geology - Ordovician; Screened interval: 6.0-21 mbgl)



Groundwater levels



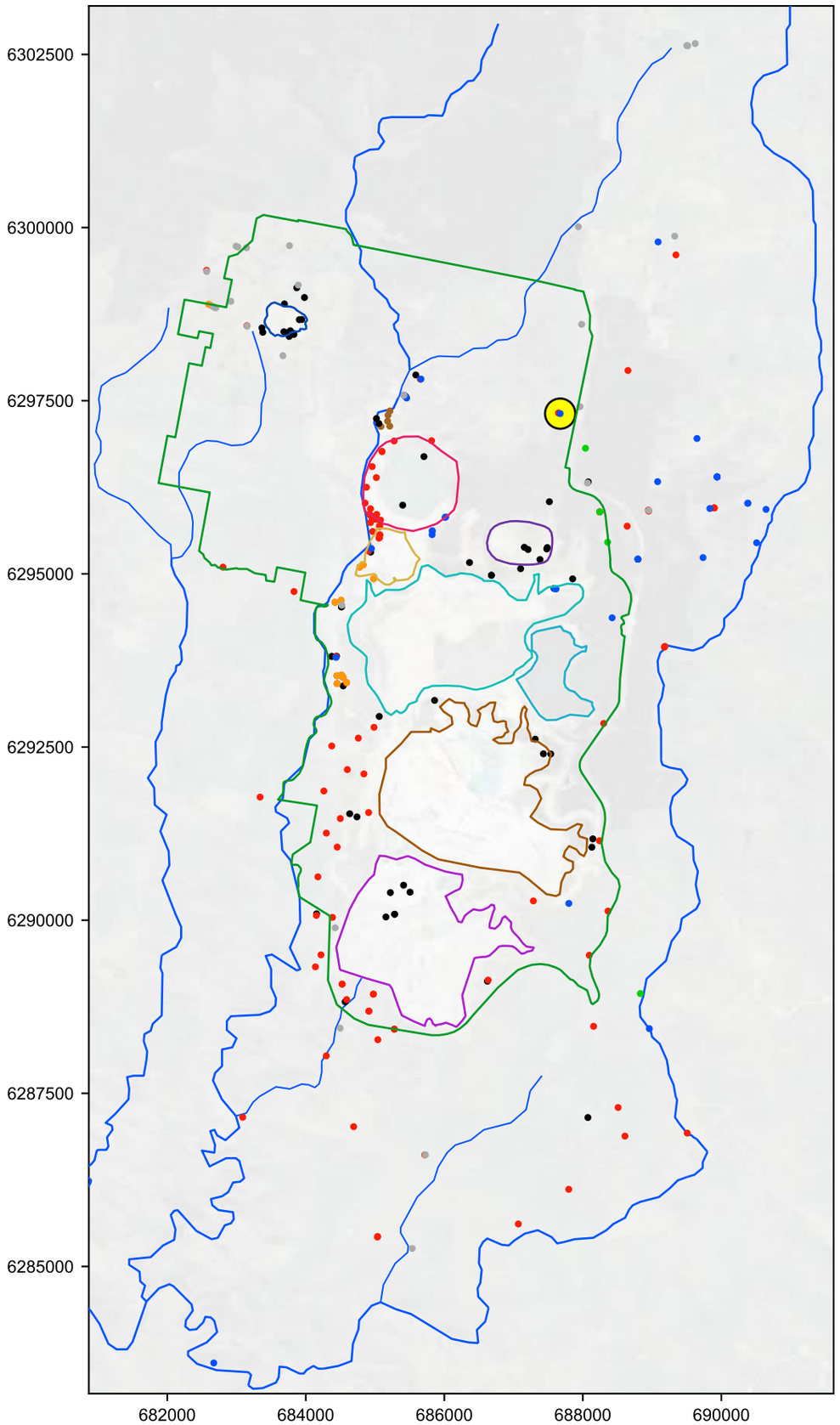
WMP defined analytes



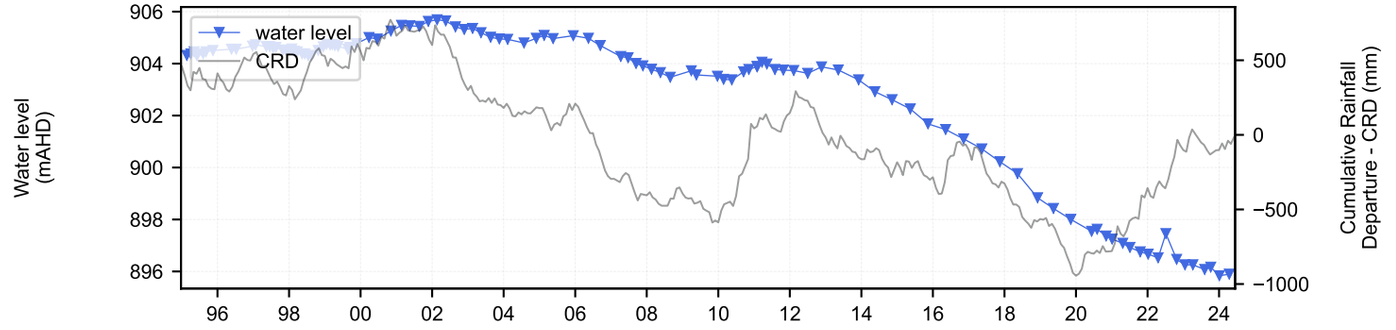
Additional analytes of interest

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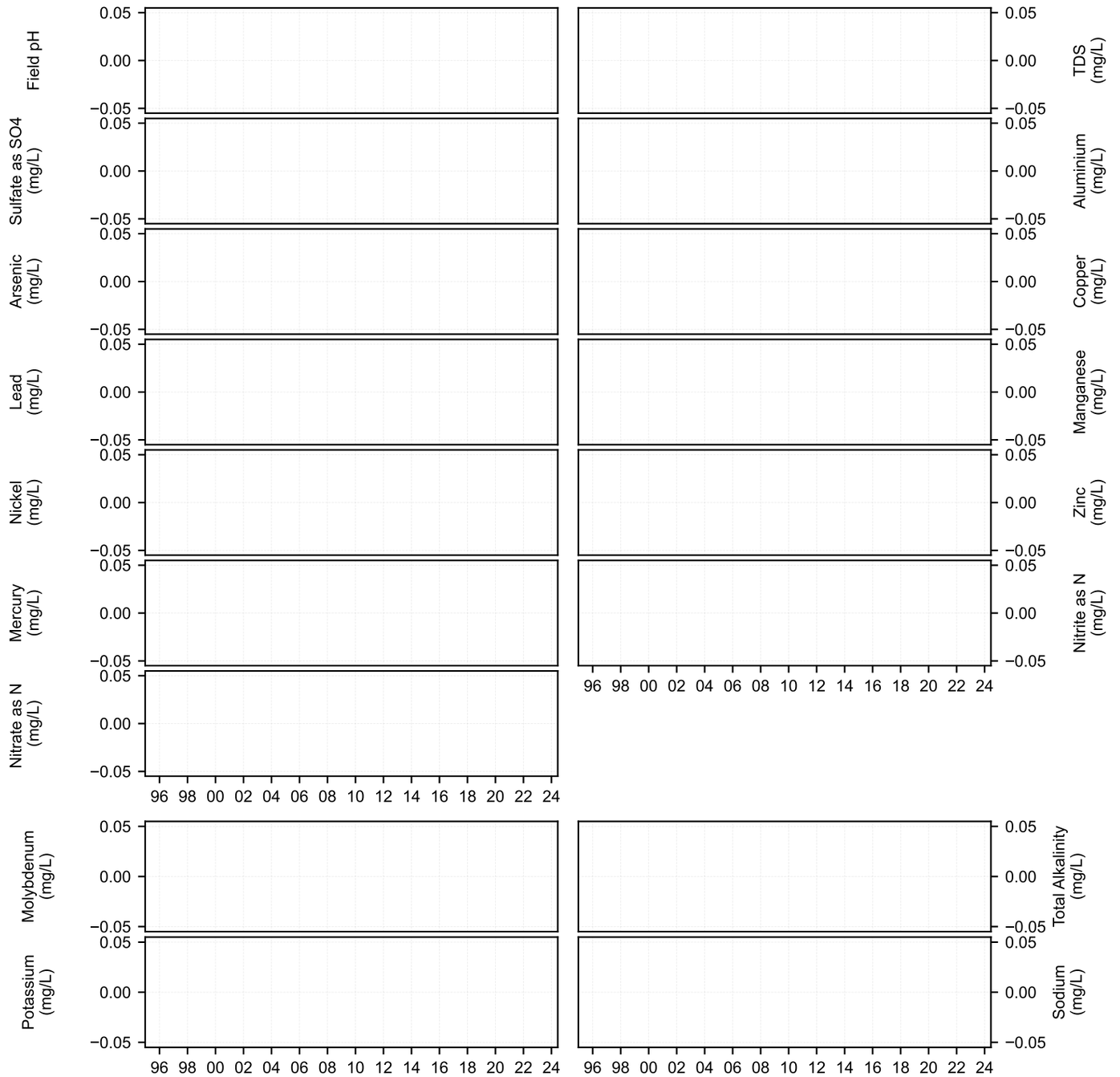
RB07 (Screened geology - Silurian; Screened interval: Unknown)



Groundwater levels



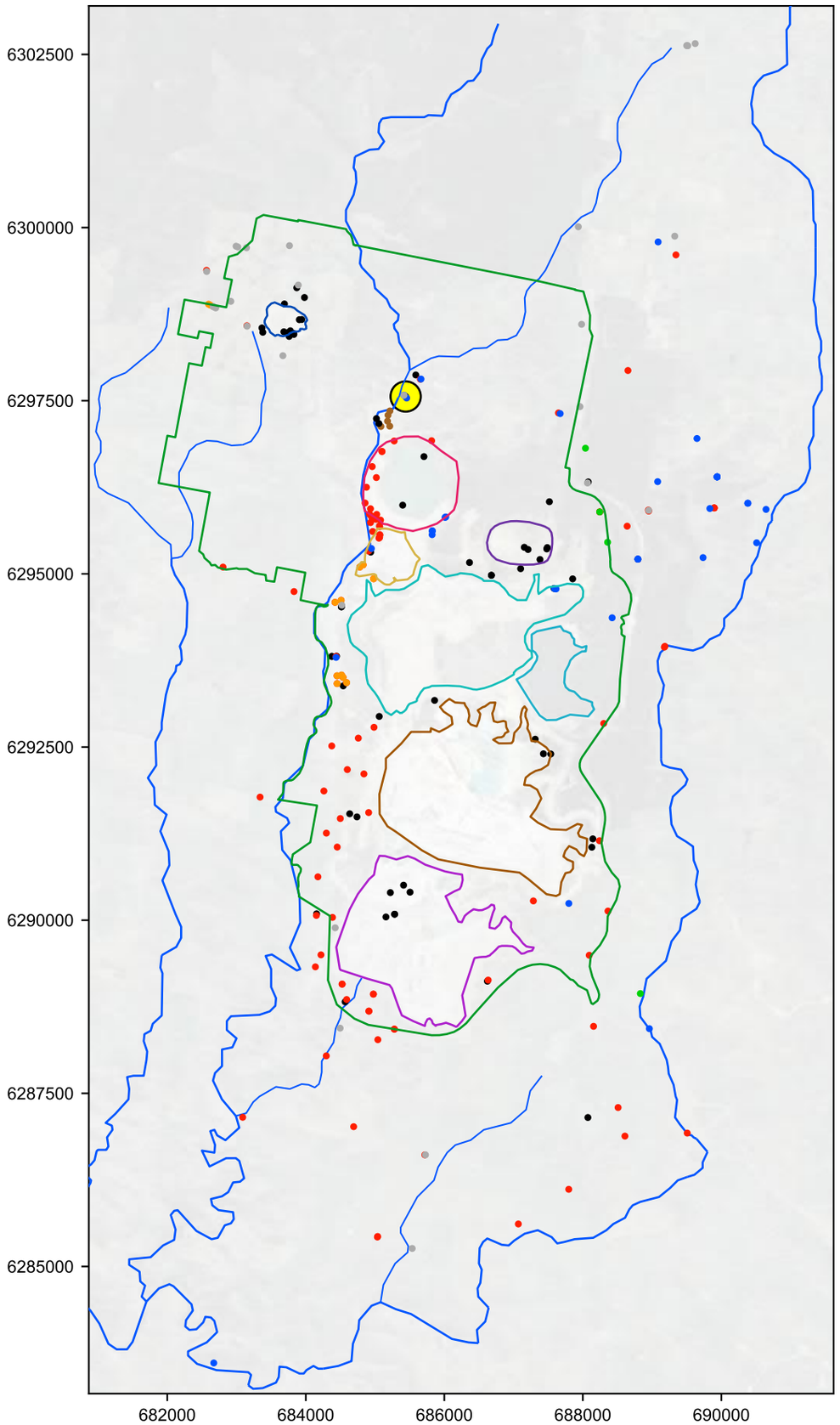
WMP defined analytes



Additional analytes of interest

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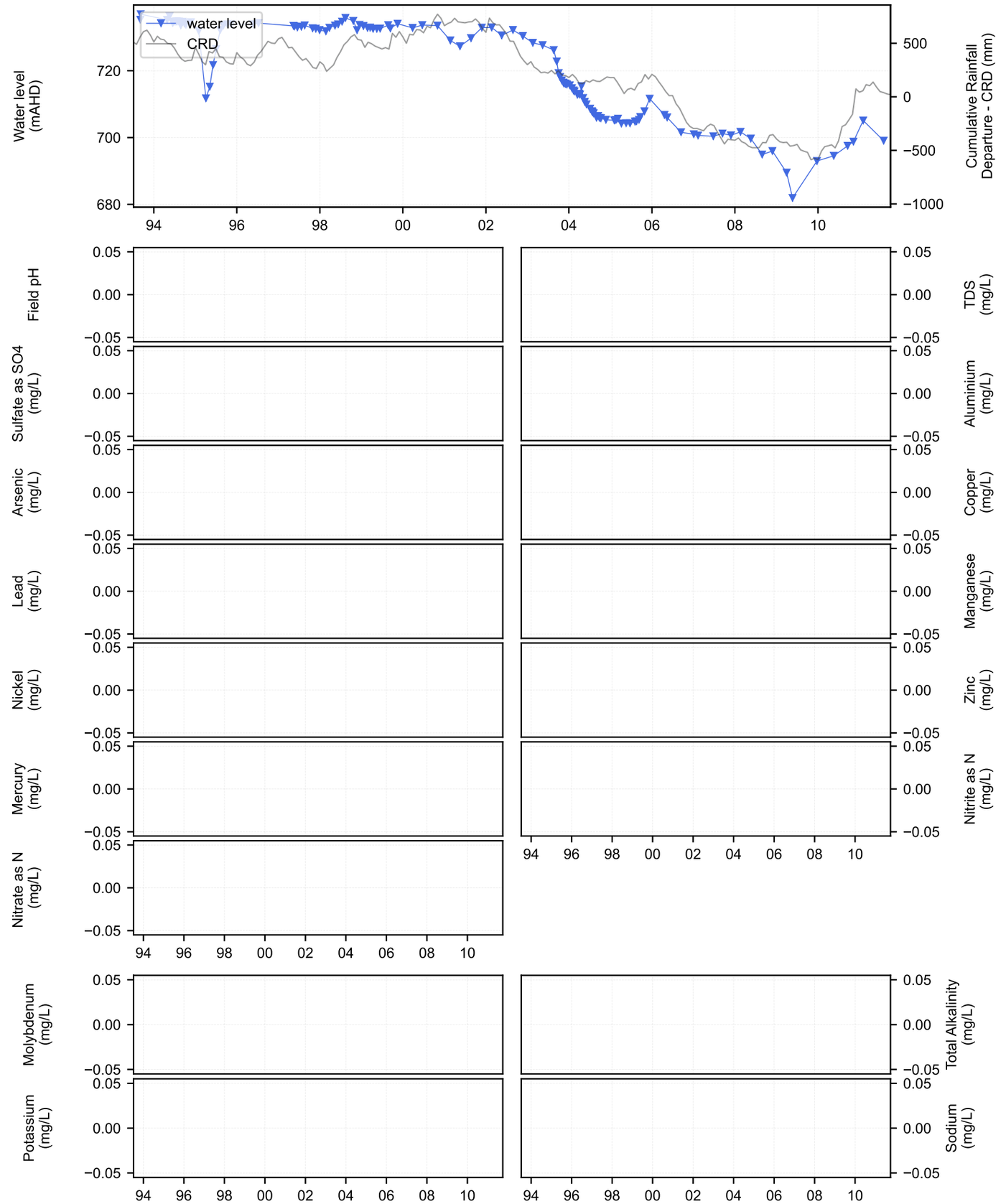
CB1 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels

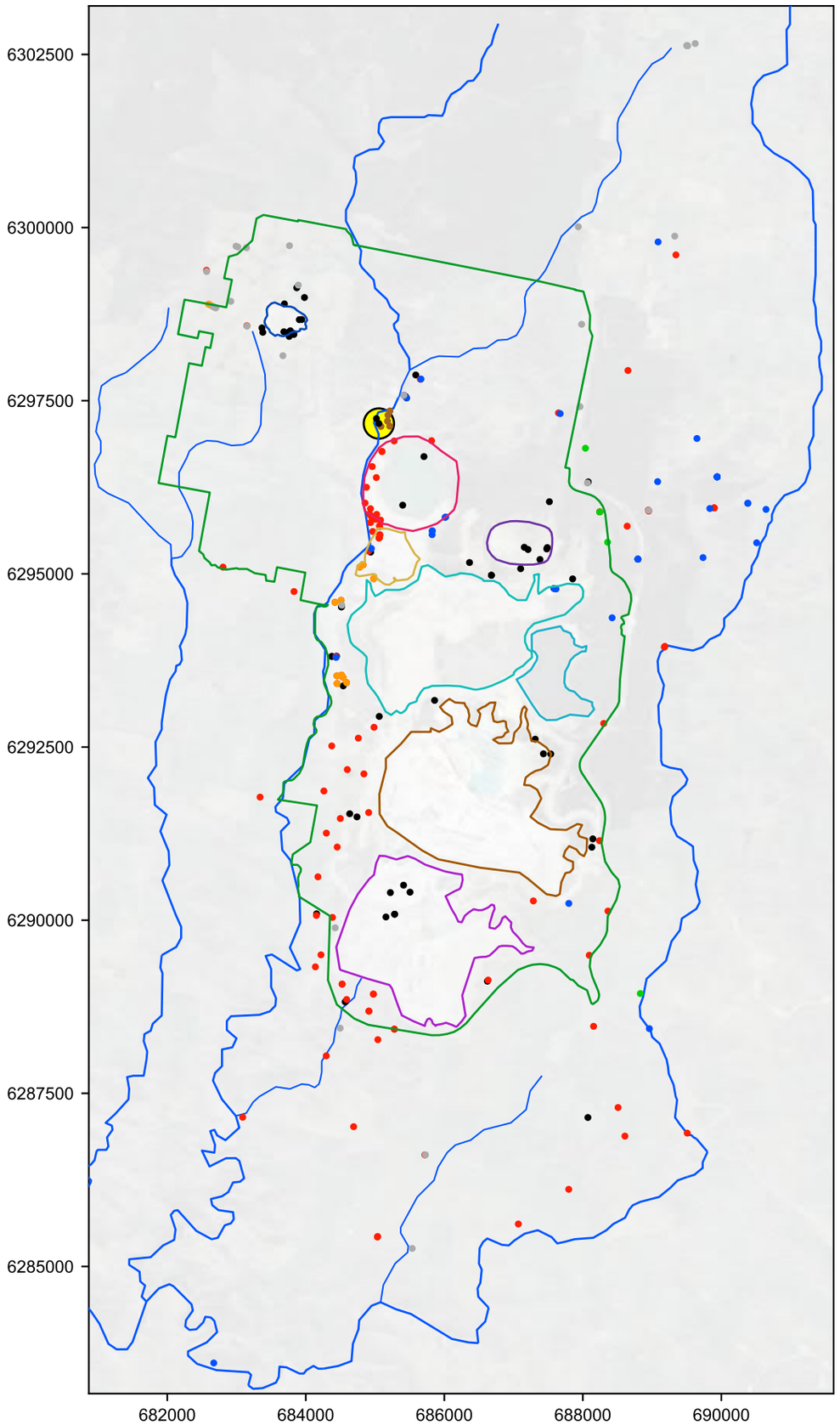
WMP defined analytes

Additional analytes of interest

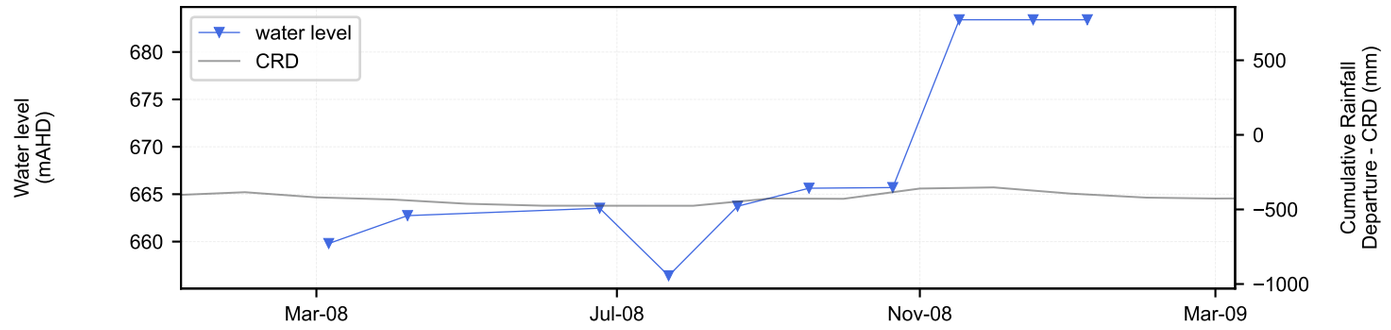


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

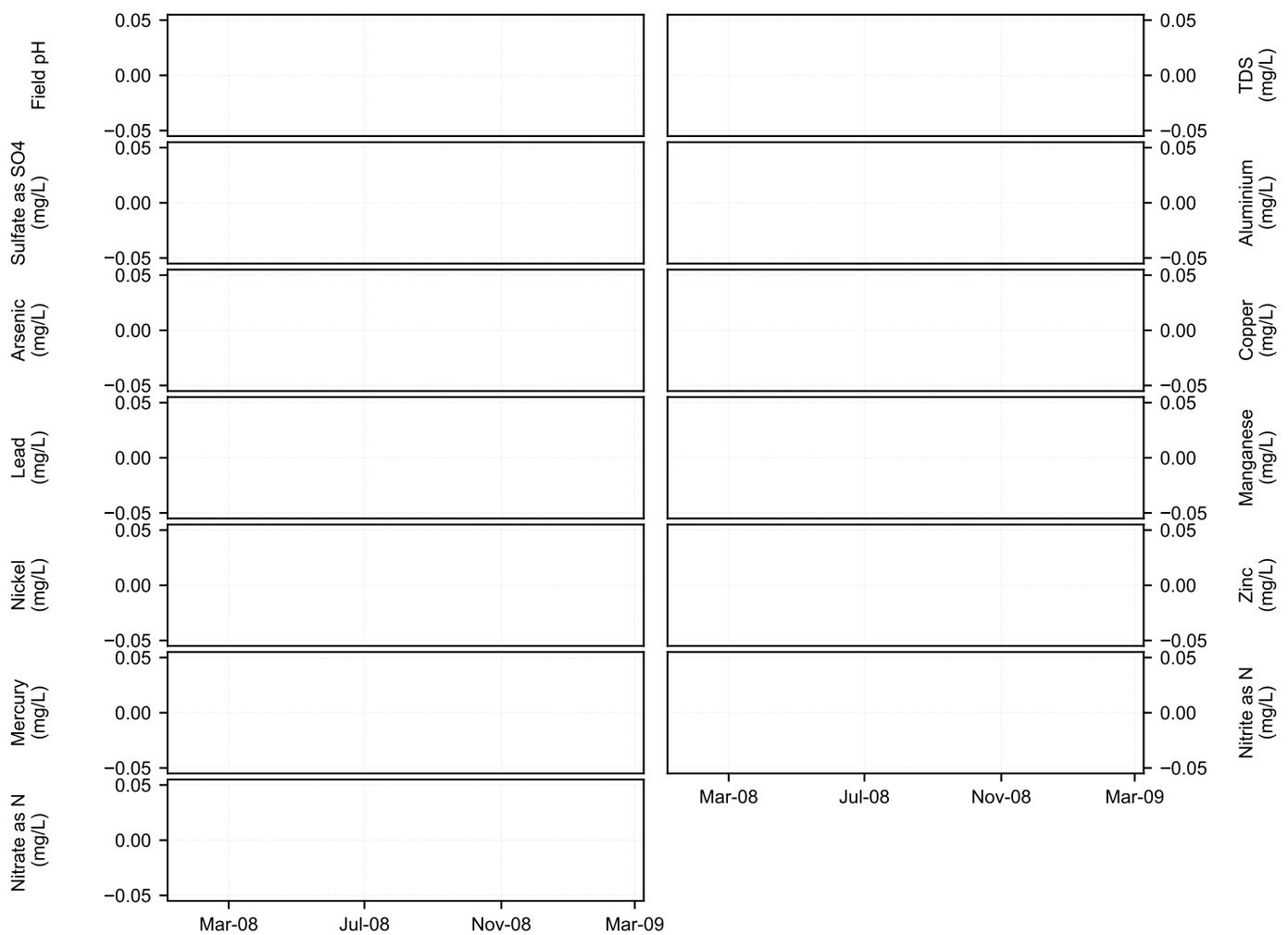
MB32 (Screened geology - Inactive; Screened interval: Unknown)



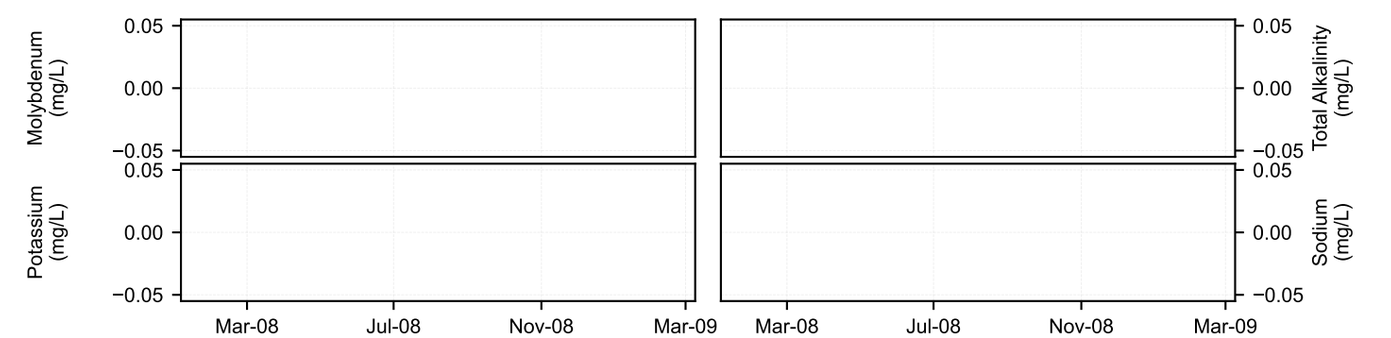
Groundwater levels



WMP defined analytes

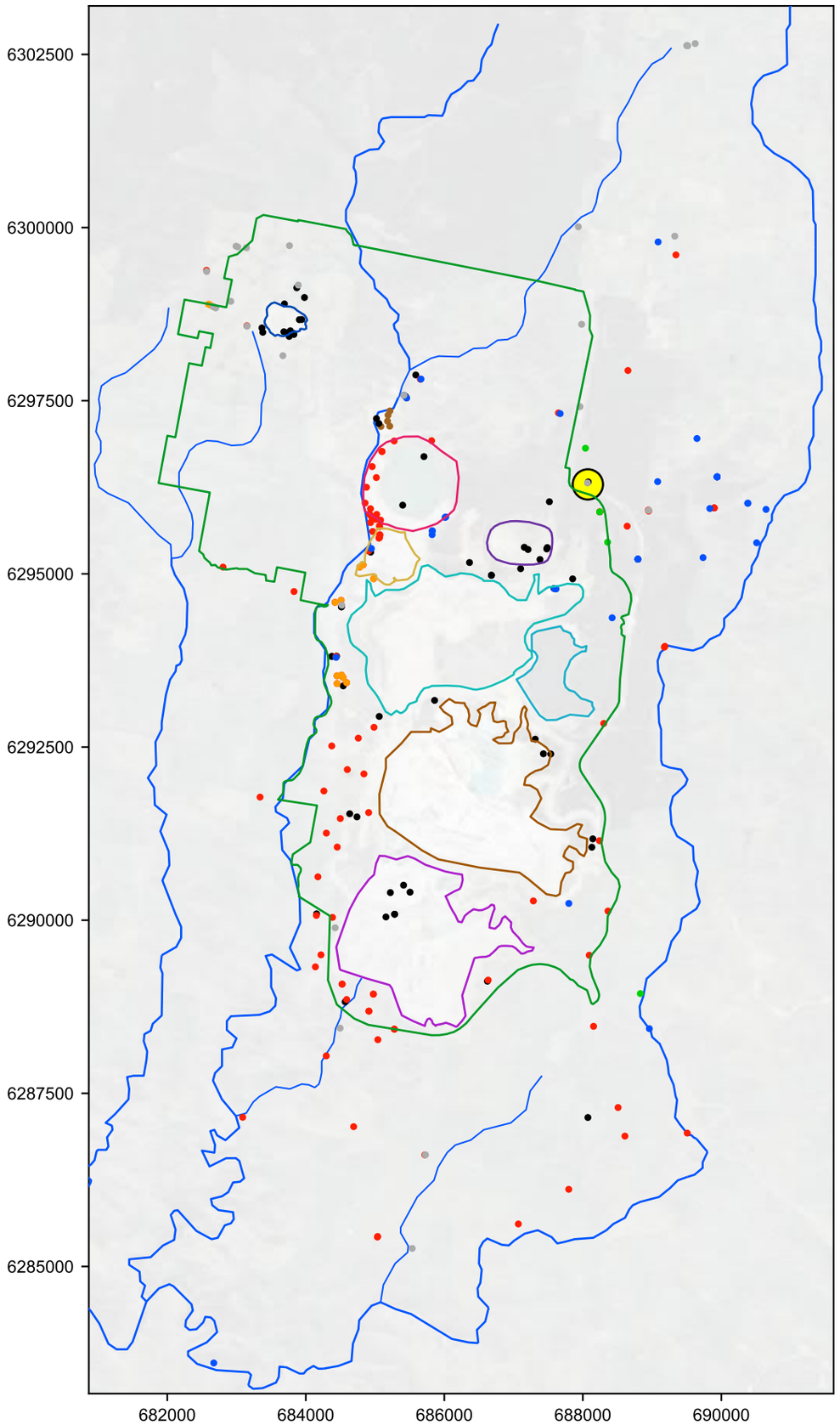


Additional analytes of interest

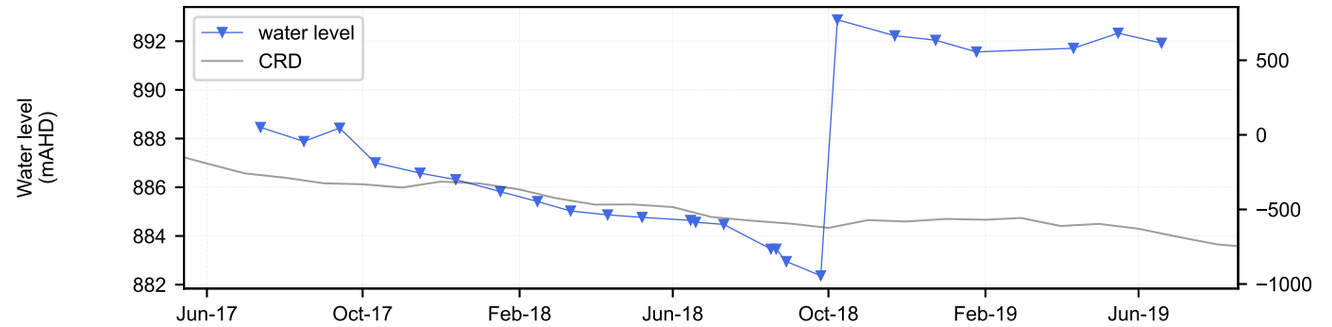


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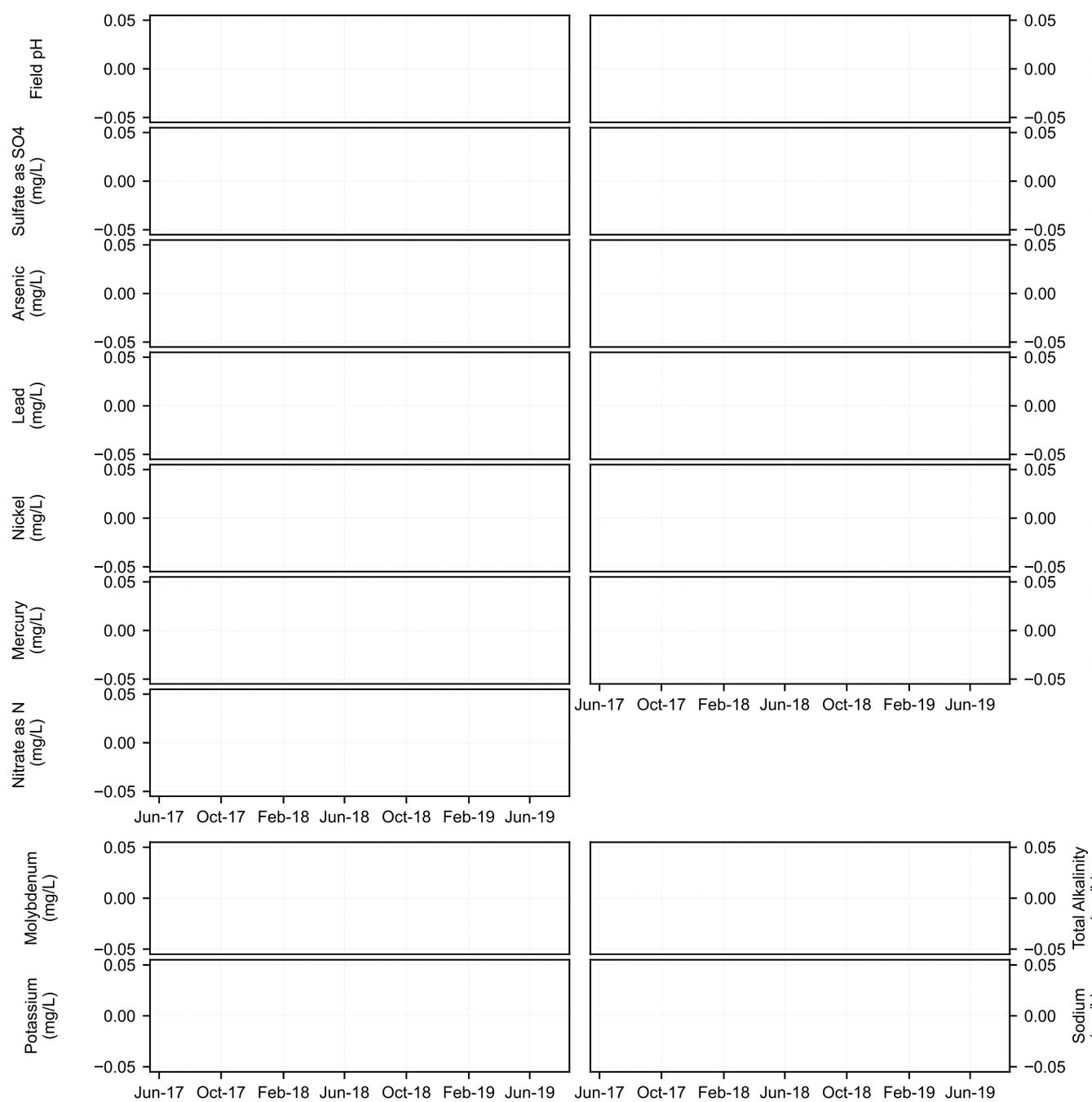
MB88-OLD (Screened geology - None; Screened interval: Unknown)



Groundwater levels



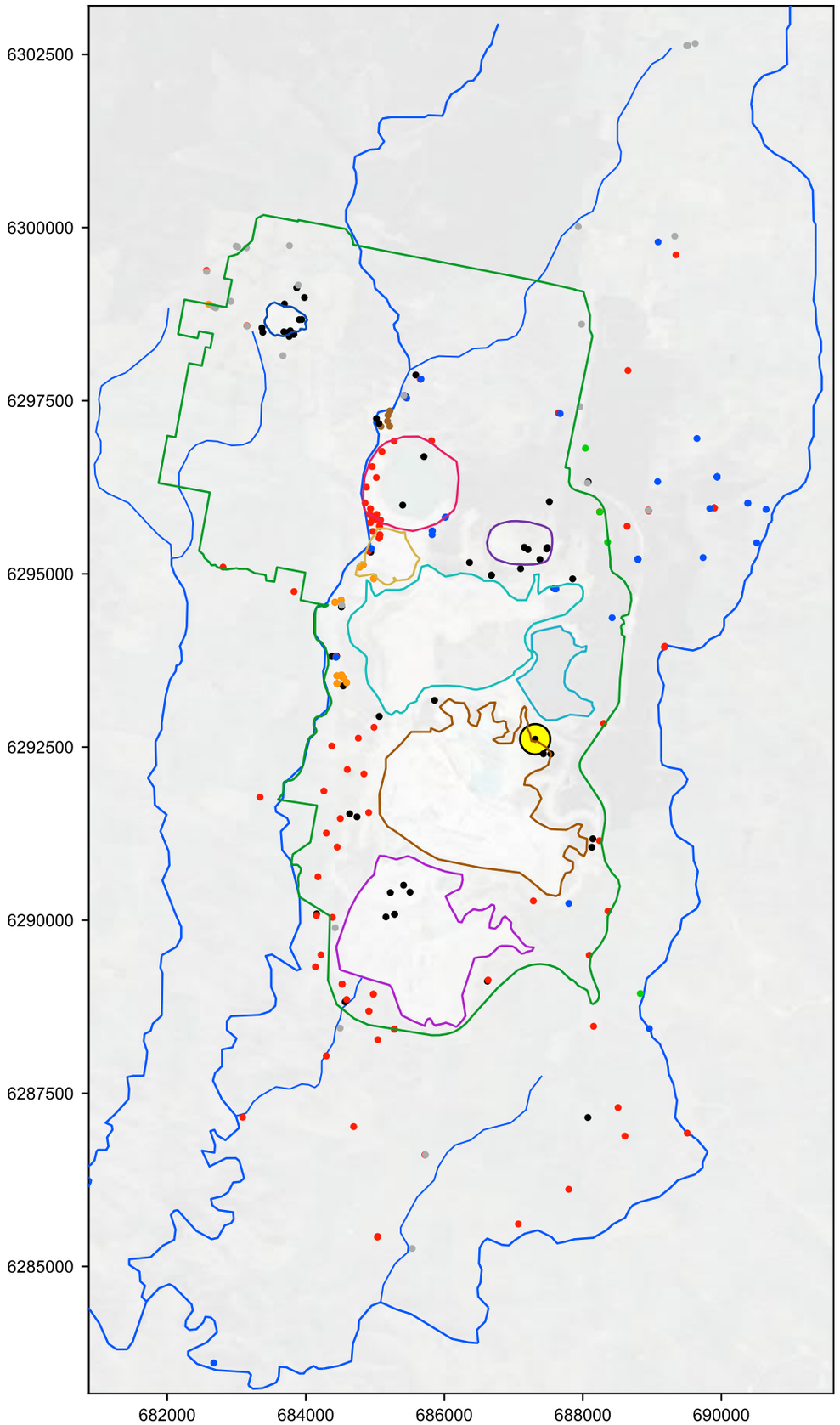
WMP defined analytes



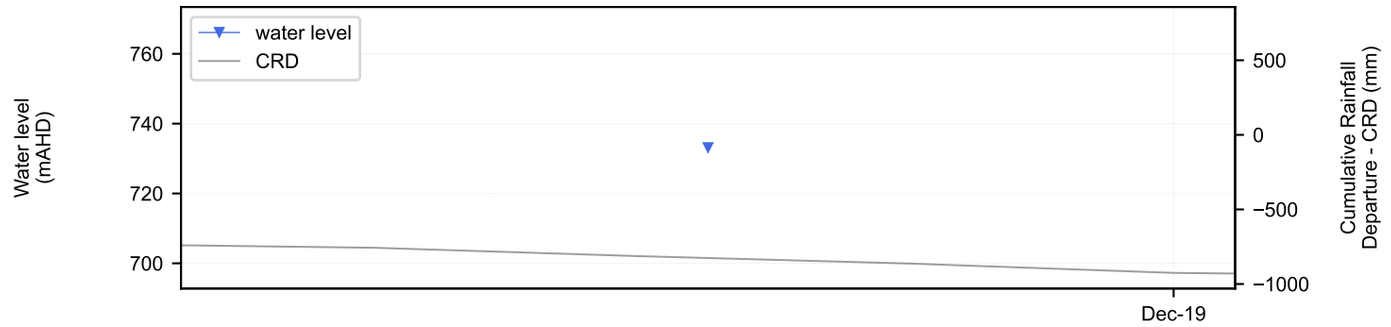
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

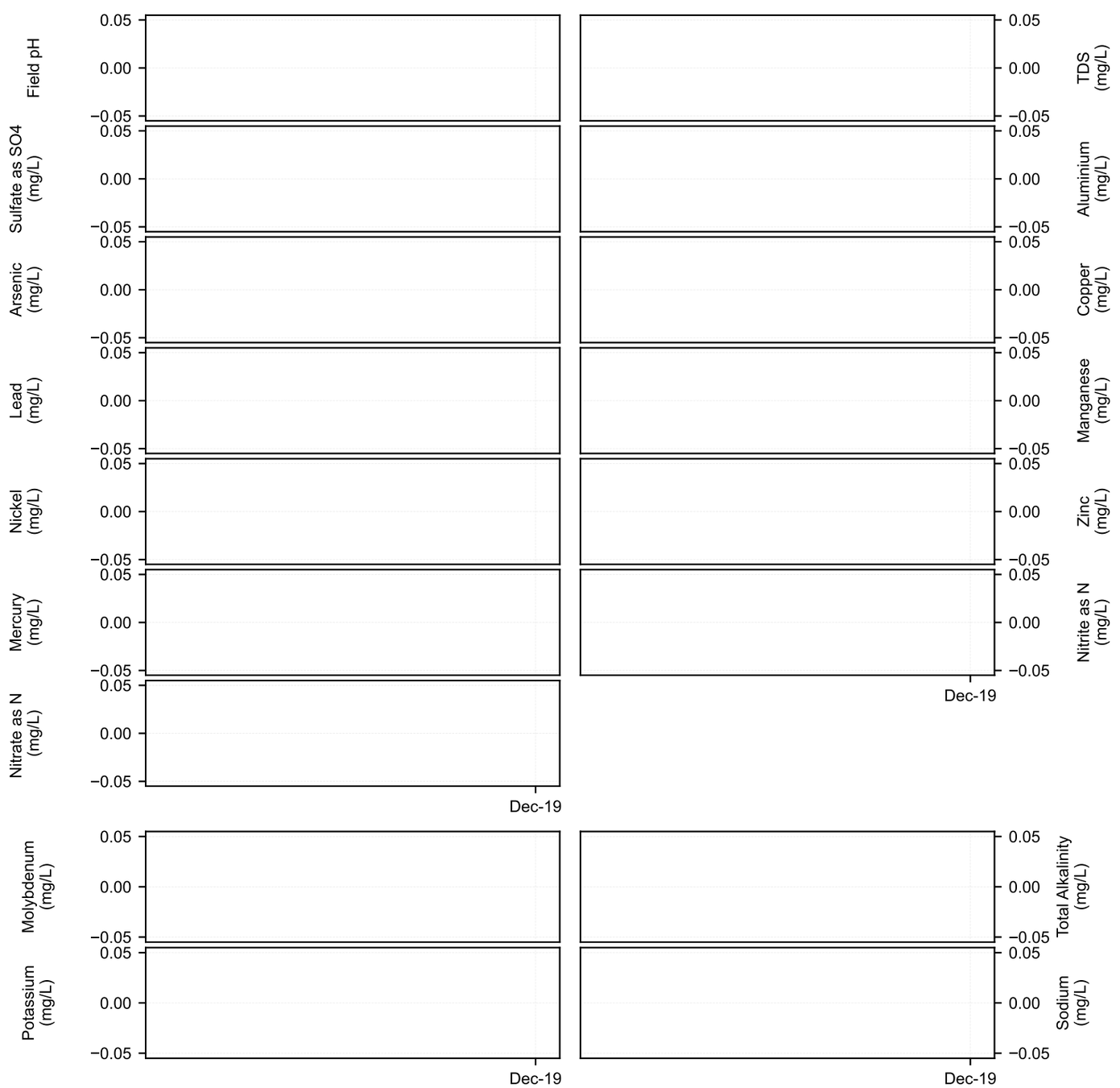
CB13MB (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



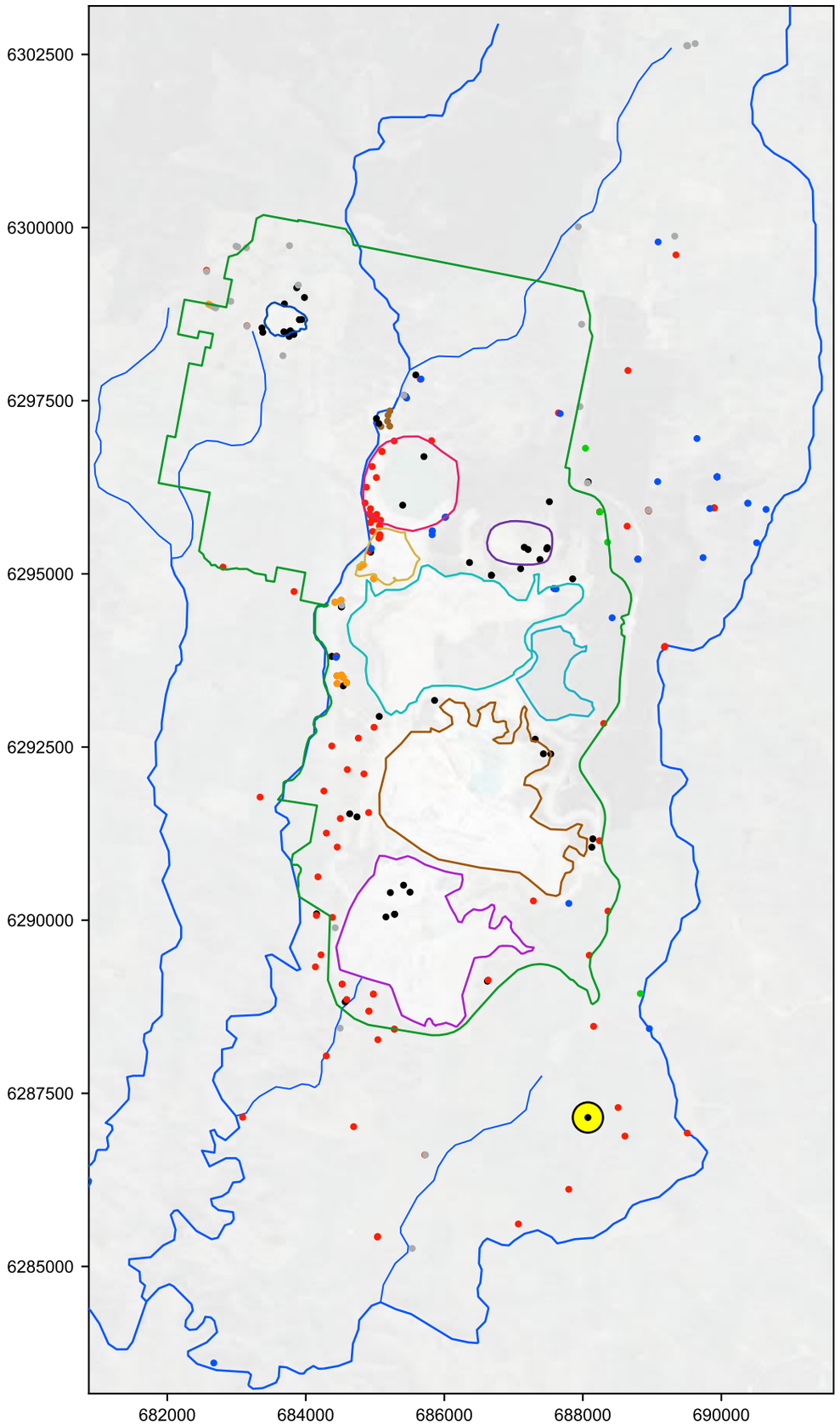
WMP defined analytes



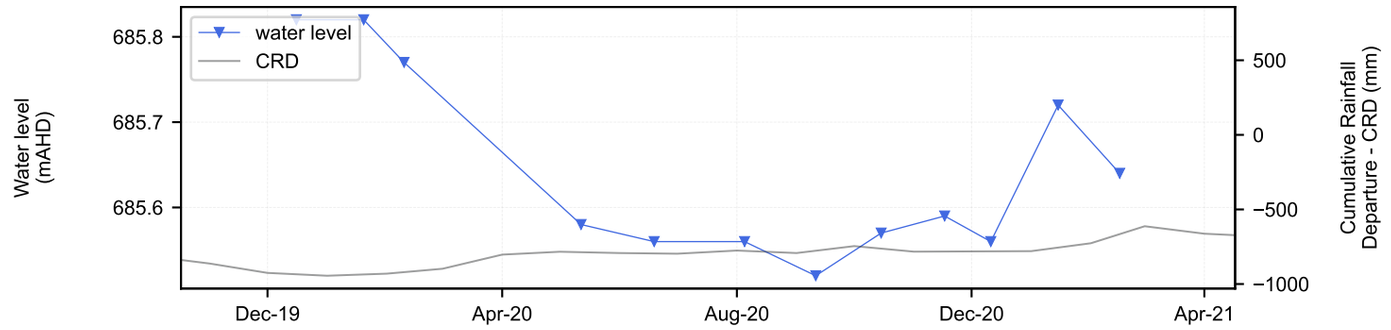
Additional analytes of interest

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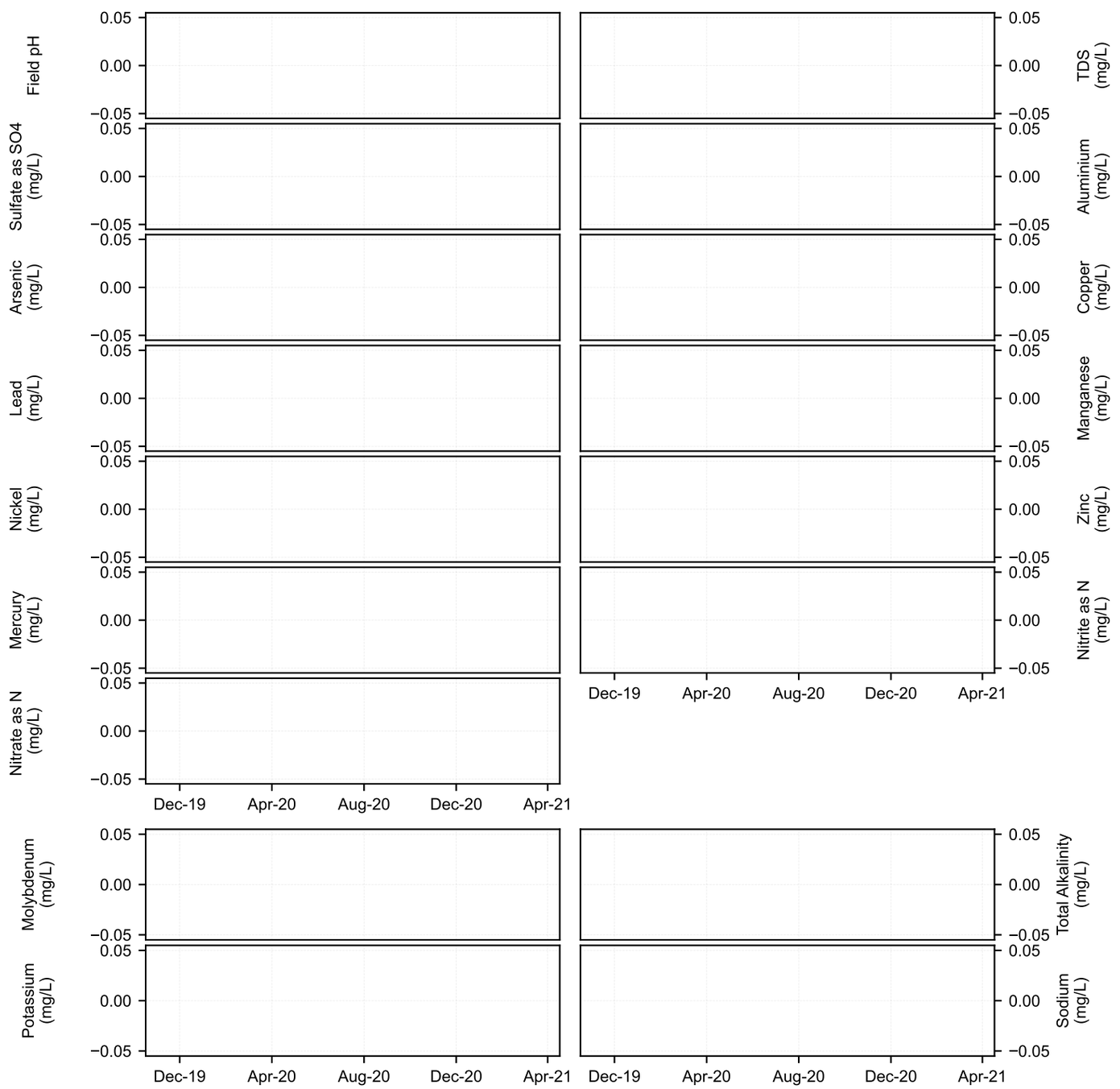
MB98 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



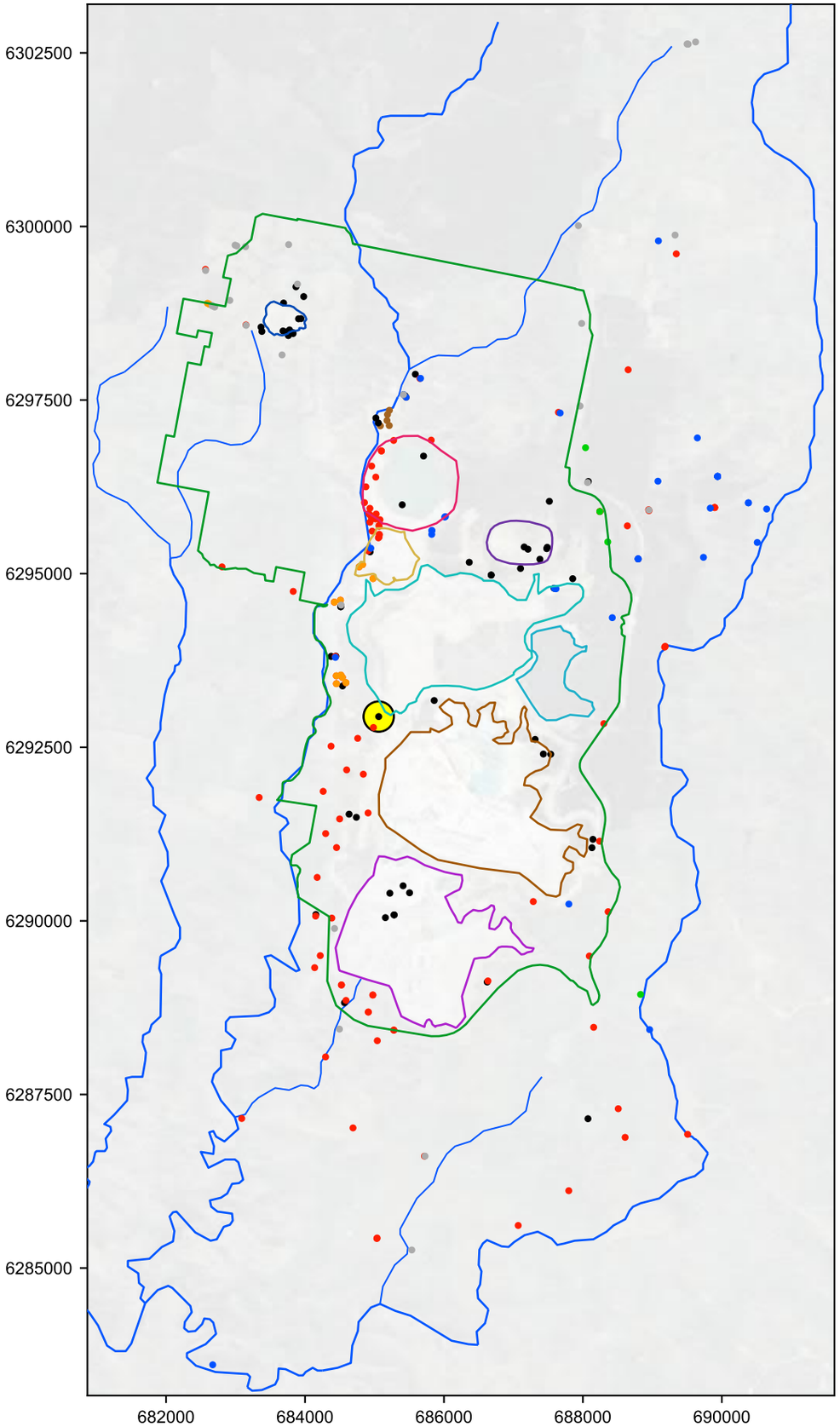
WMP defined analytes



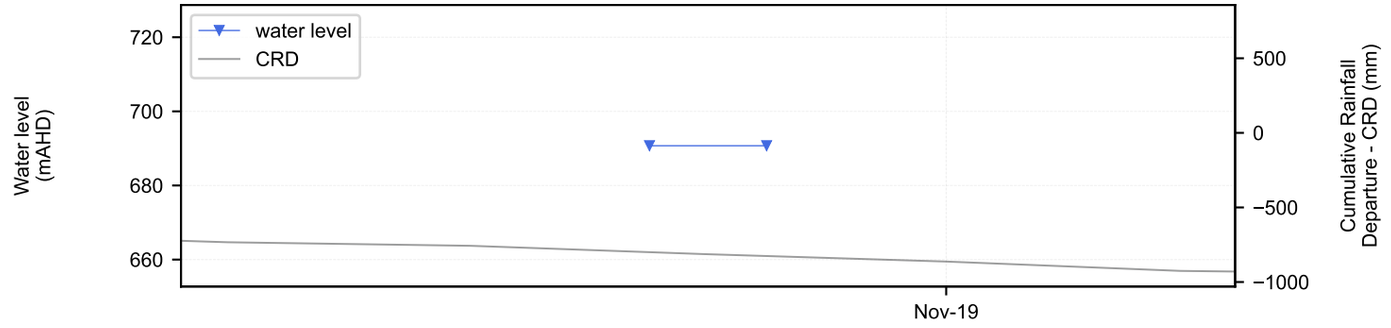
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

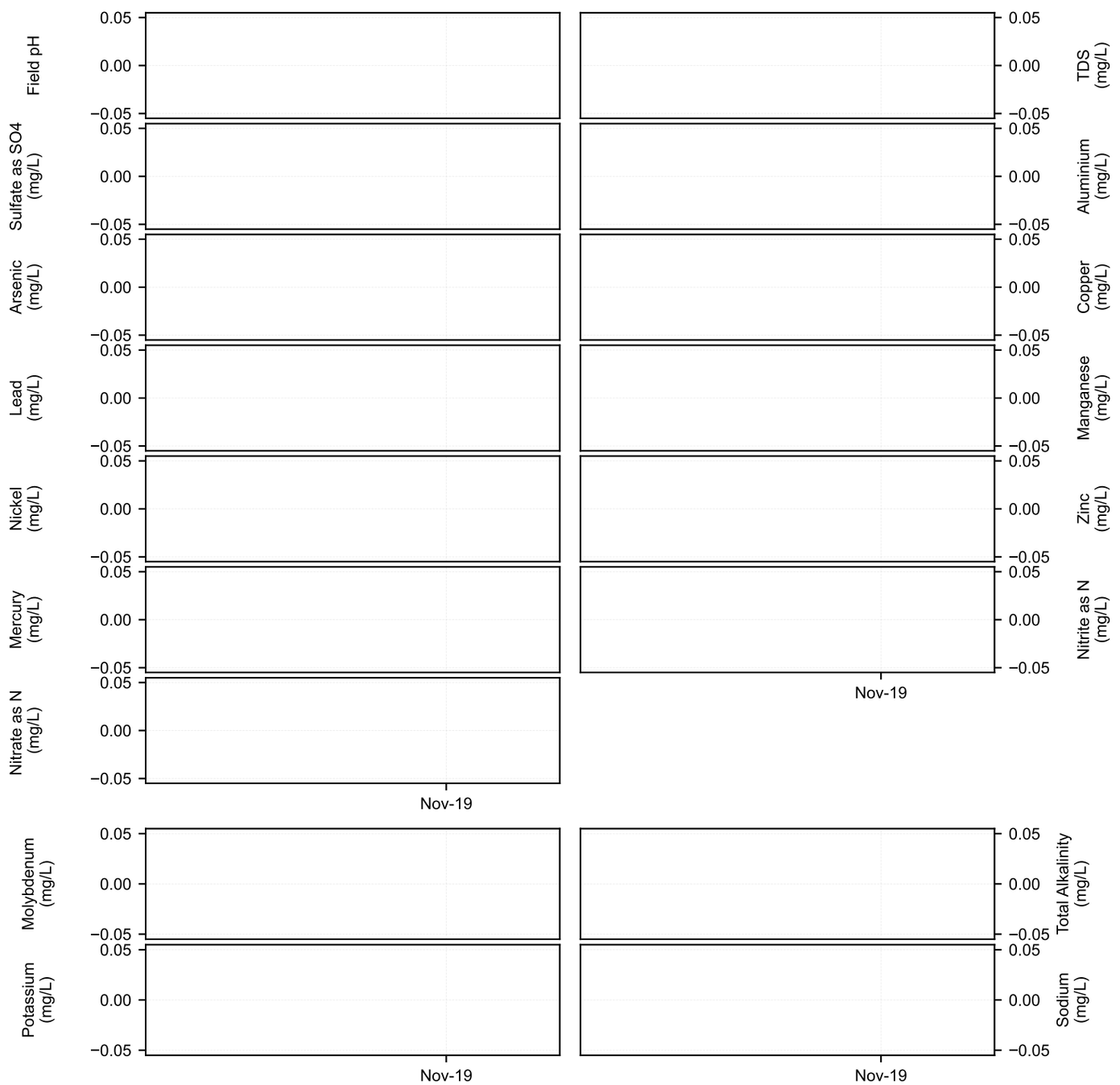
TW02 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



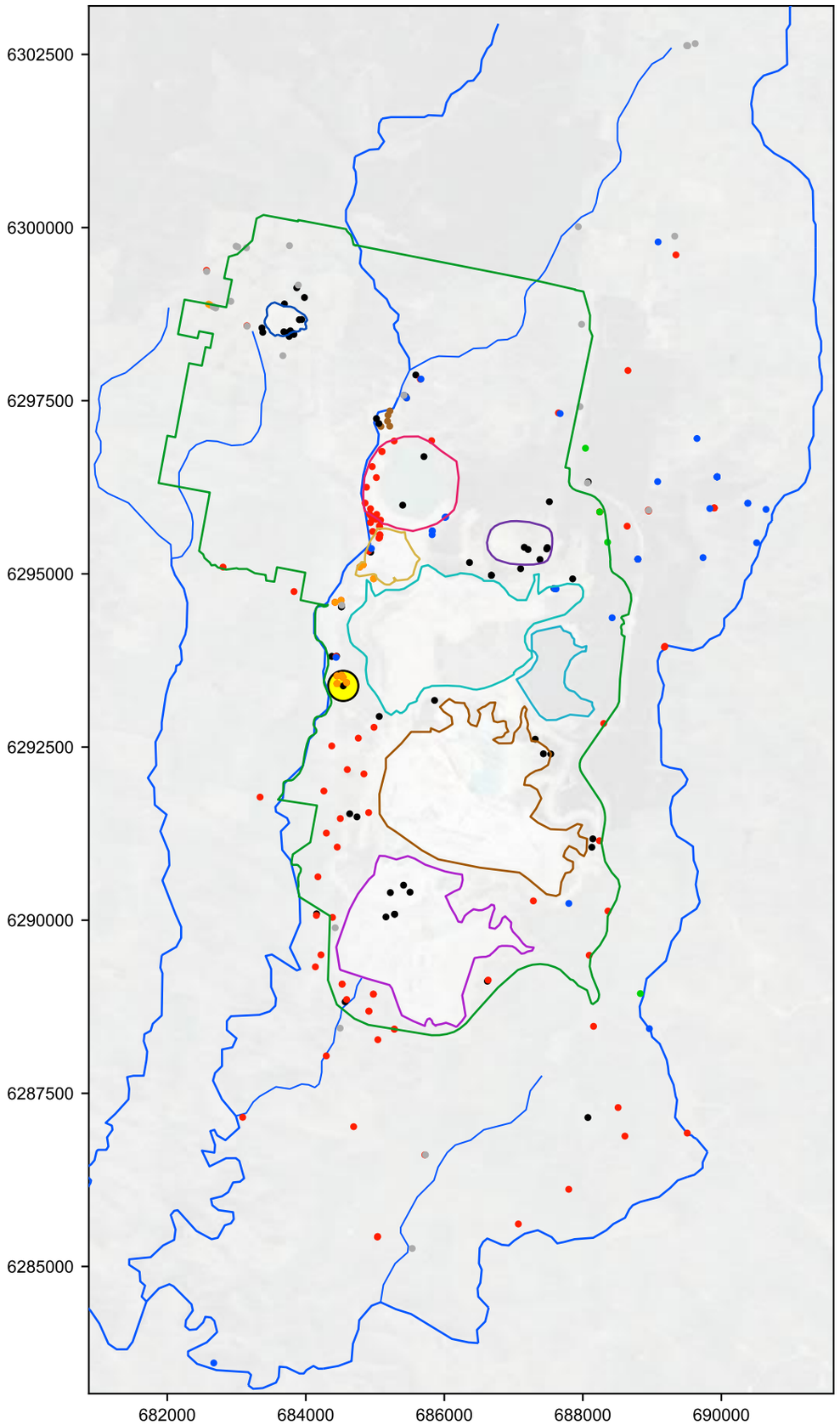
WMP defined analytes



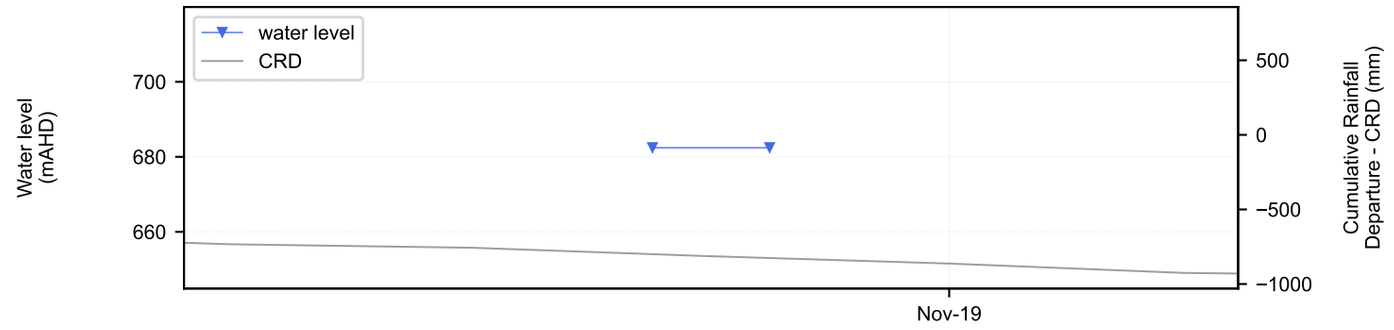
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

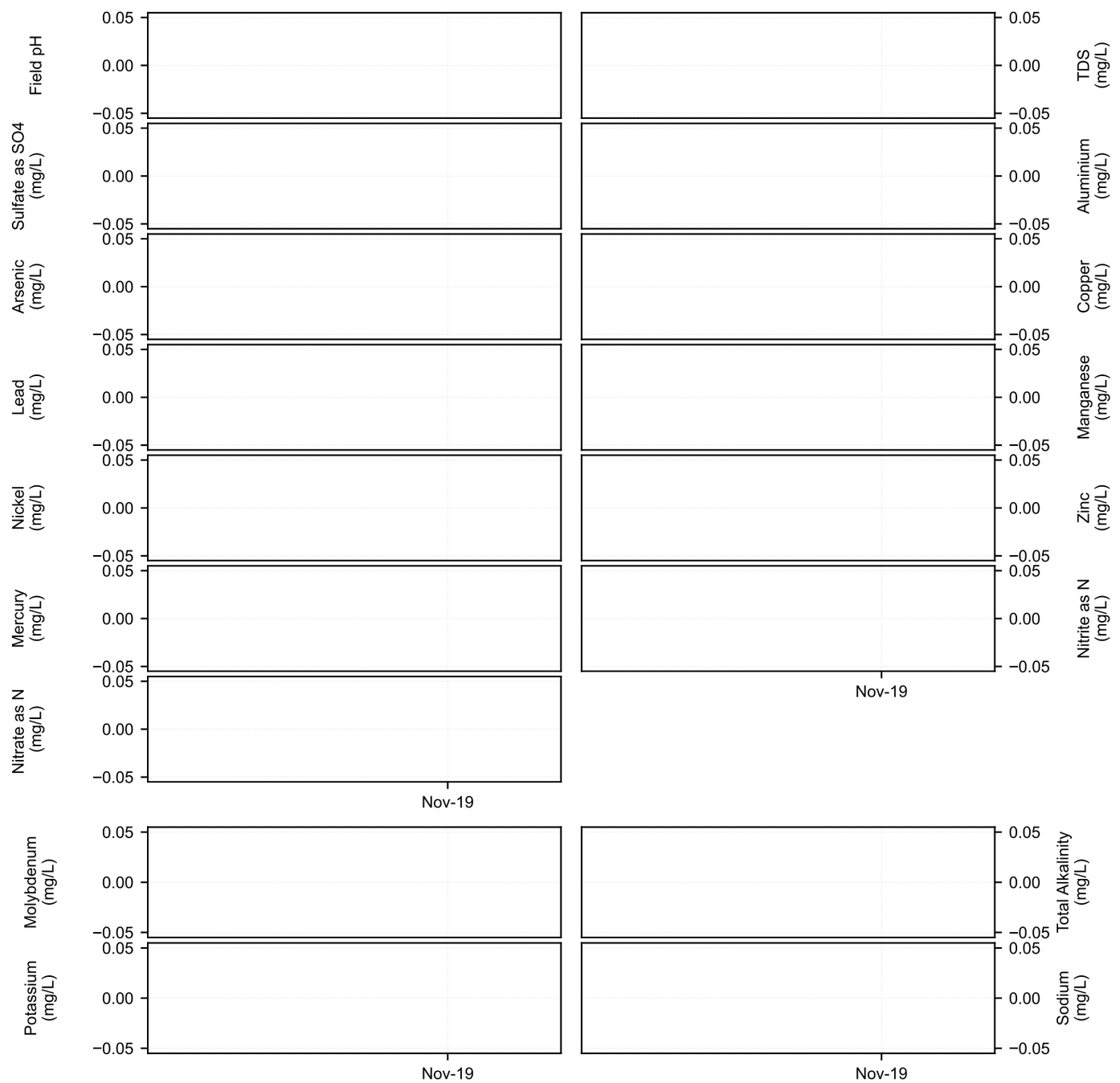
TW03 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



WMP defined analytes

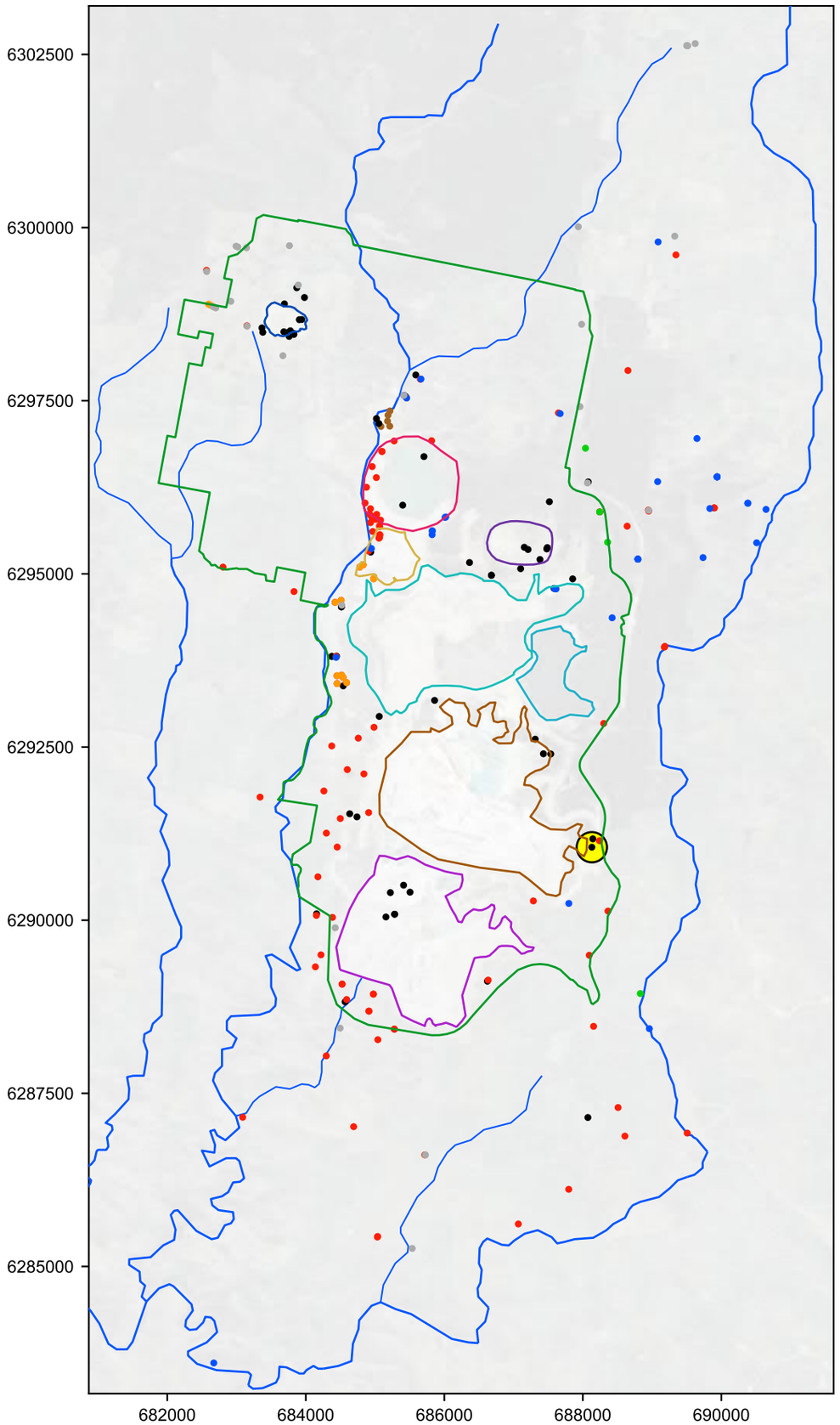


Additional analytes of interest

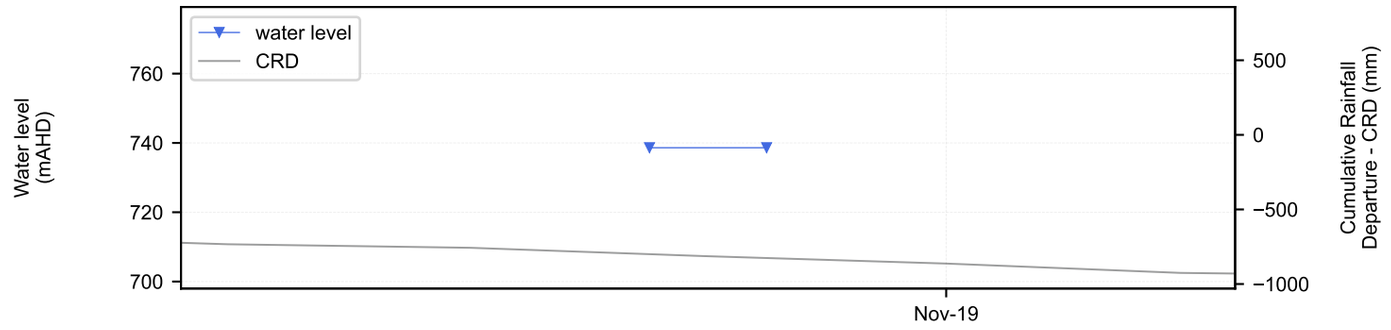


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

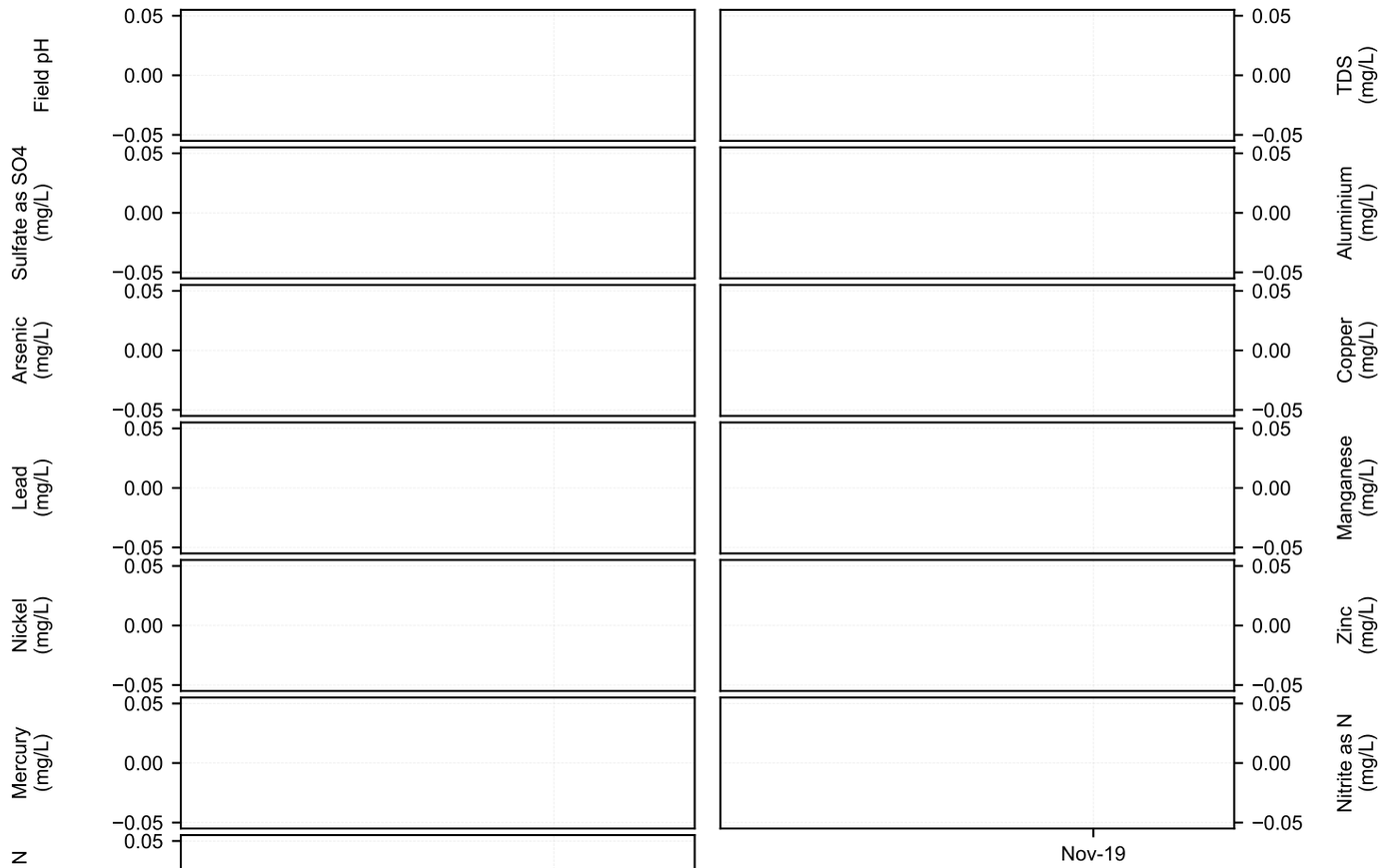
TW04 (Screened geology - Inactive; Screened interval: Unknown)



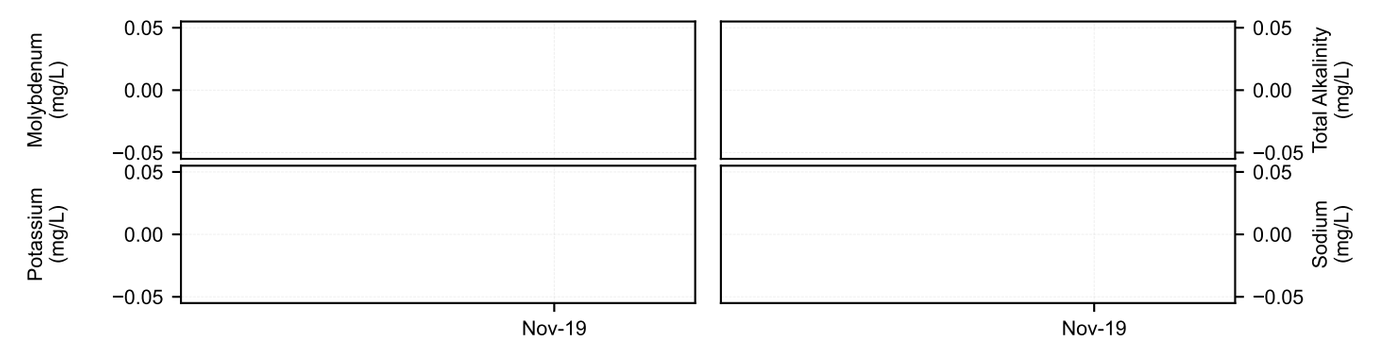
Groundwater levels



WMP defined analytes

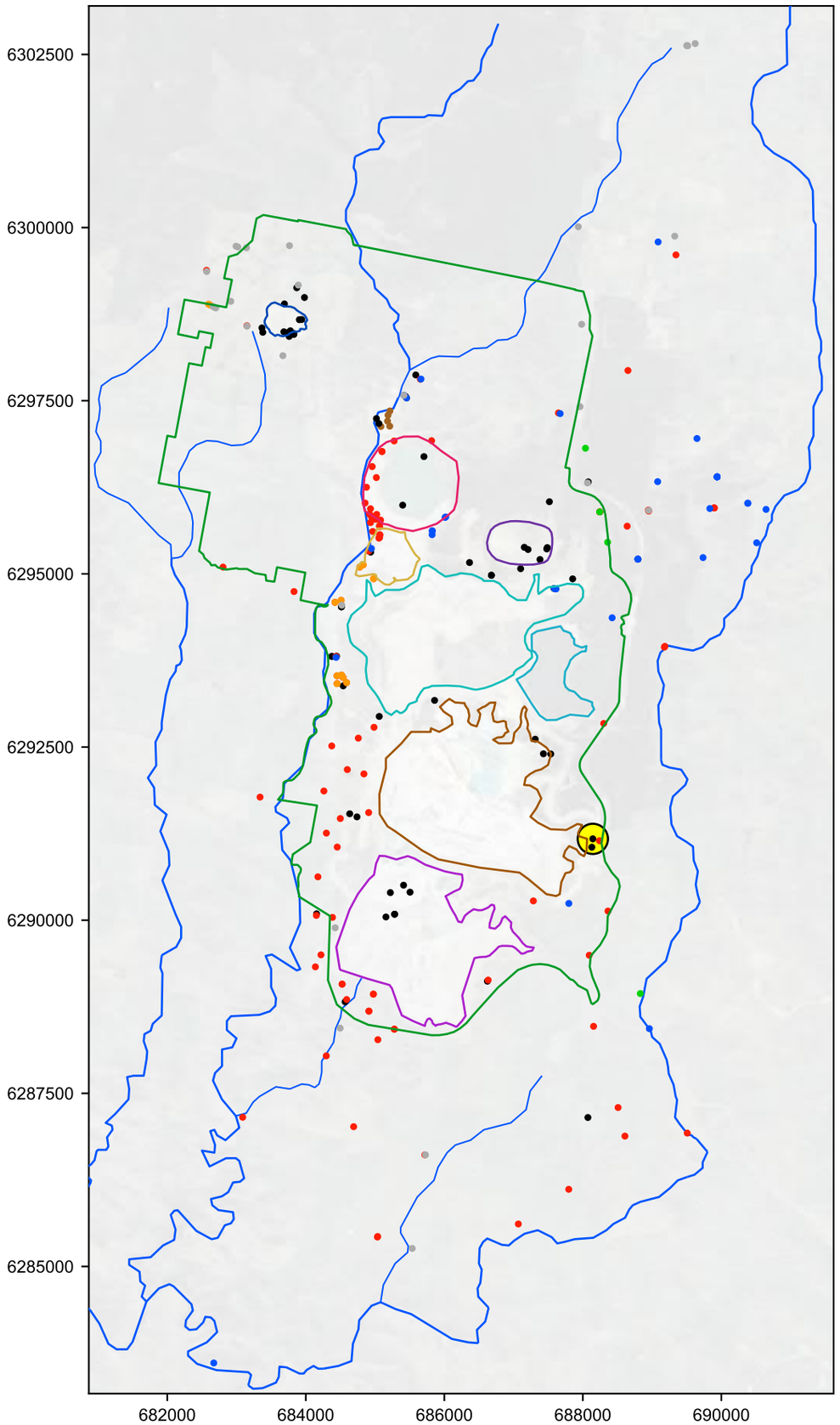


Additional analytes of interest

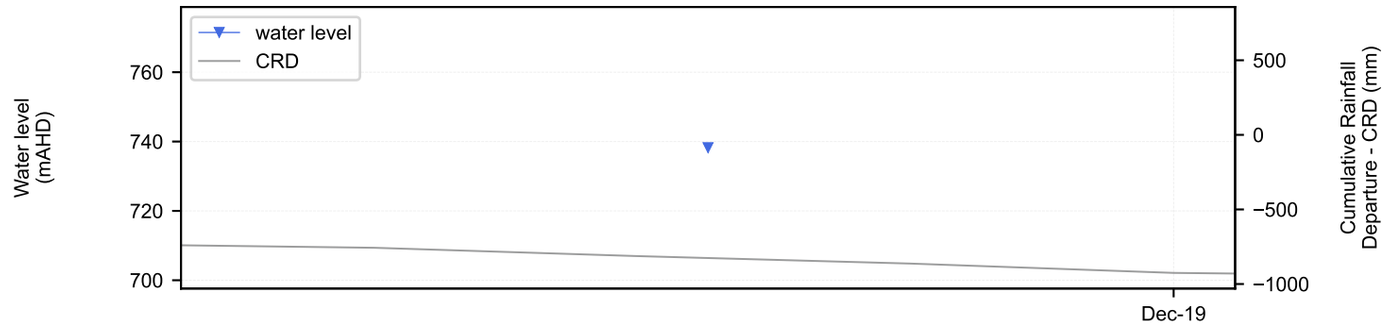


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

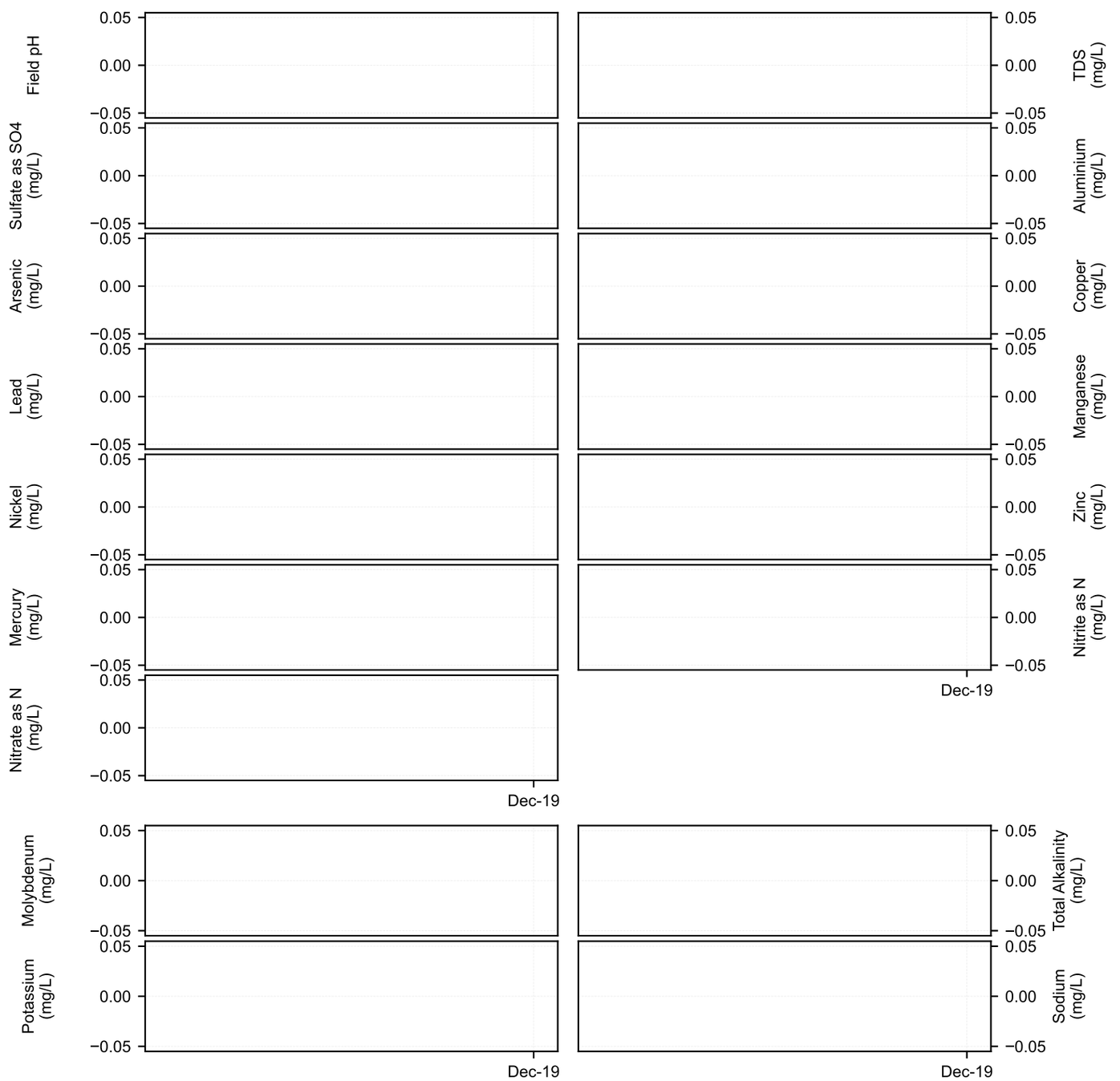
TW04MB (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



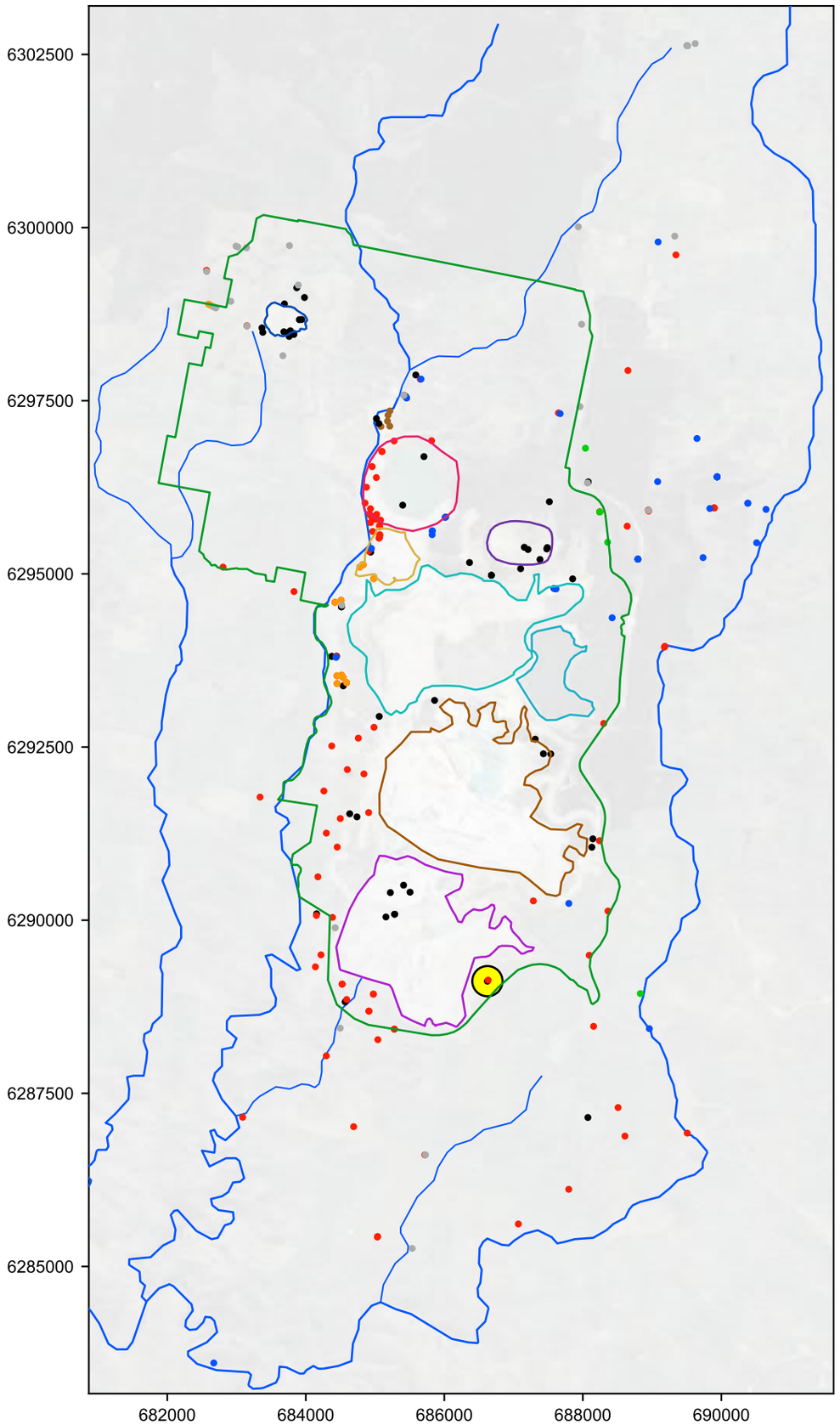
WMP defined analytes



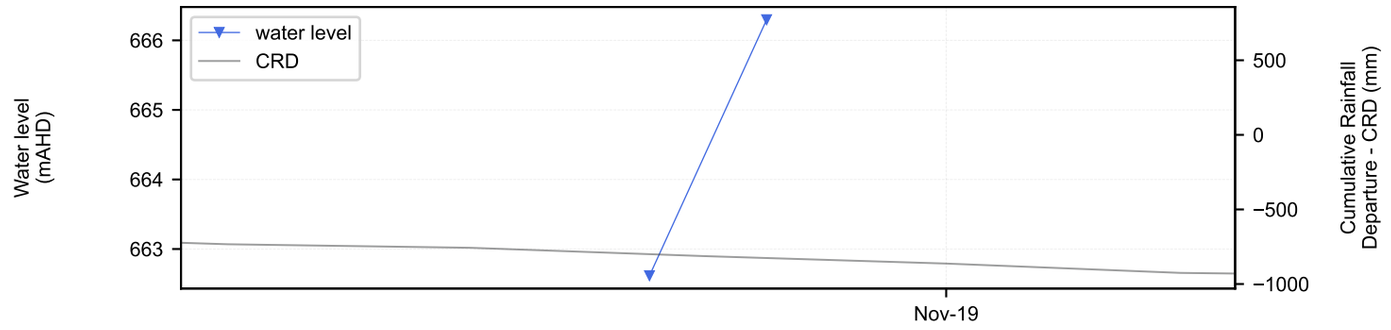
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

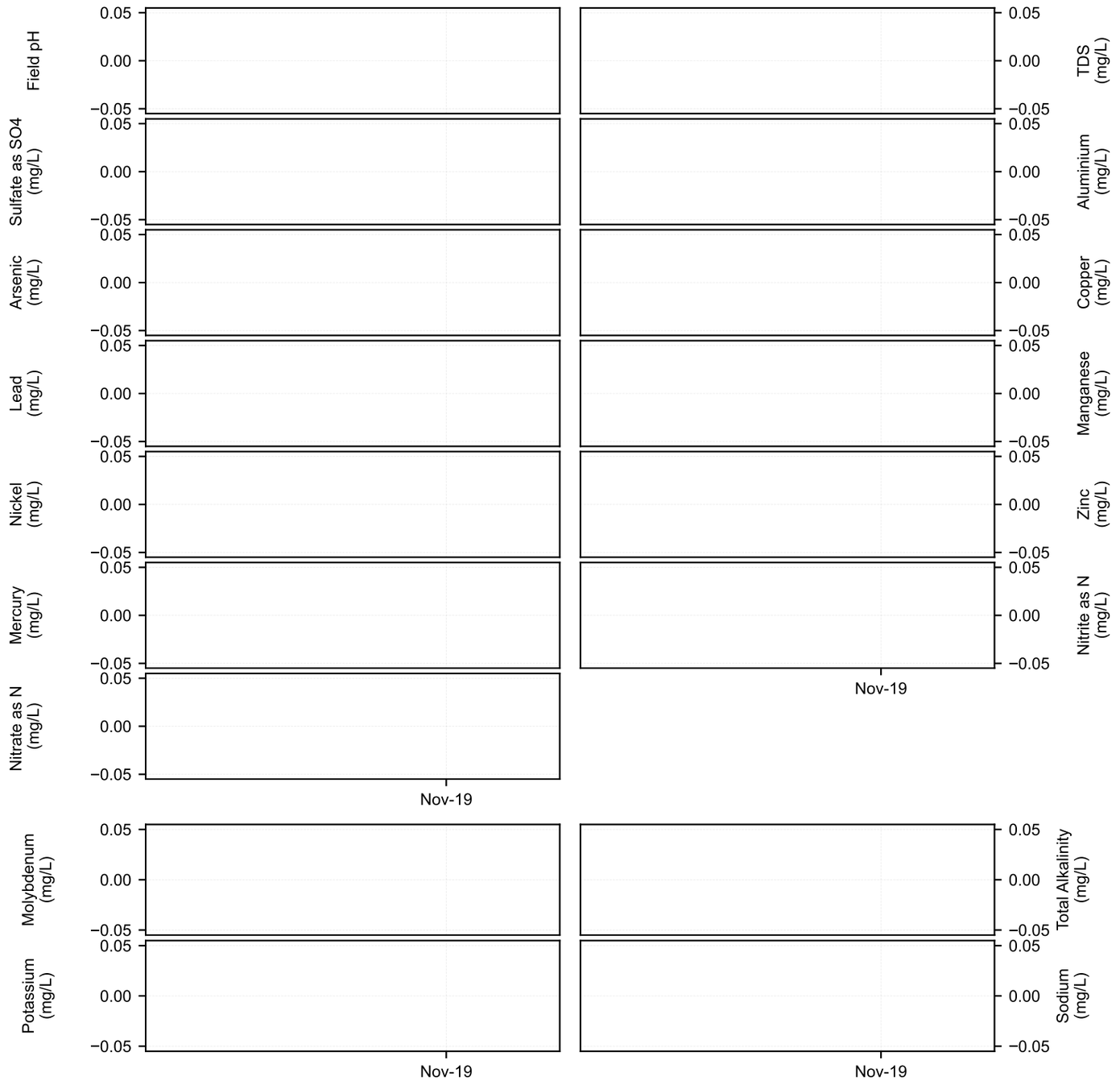
TW05 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



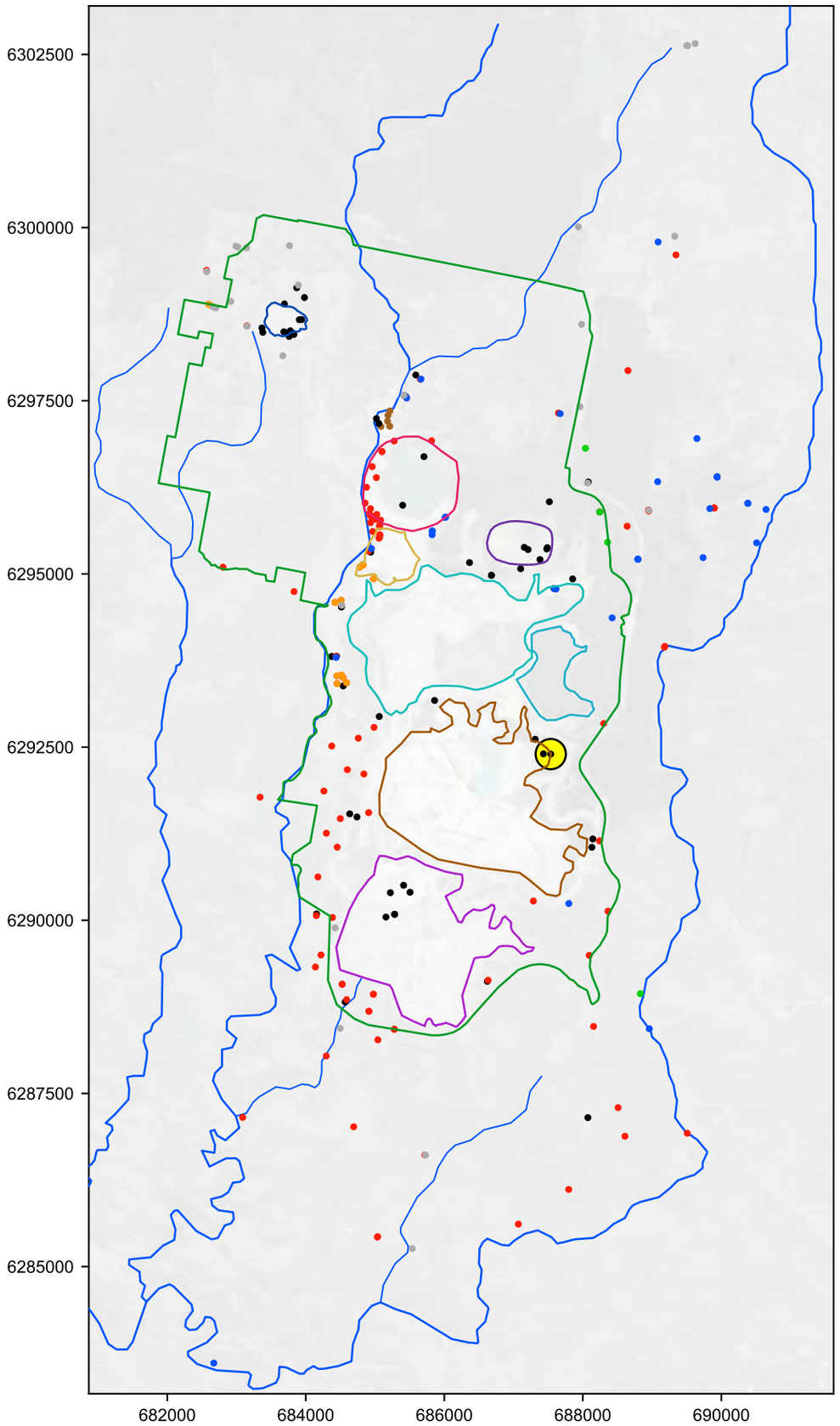
WMP defined analytes



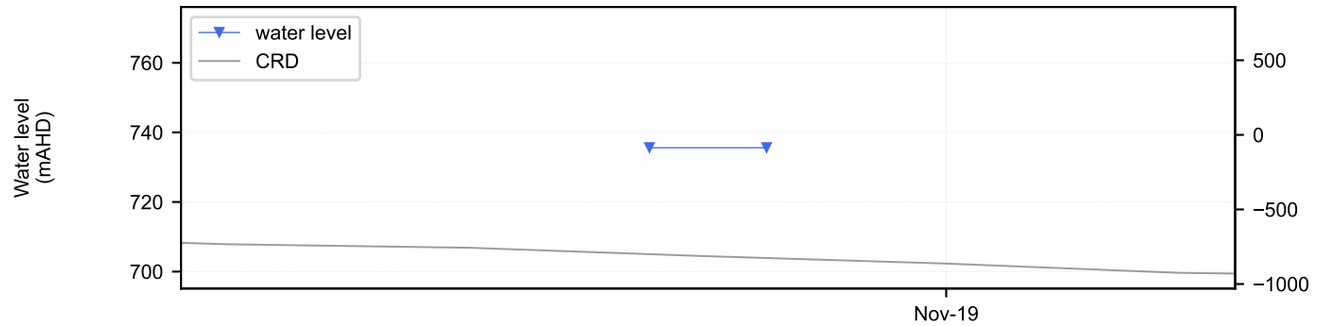
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

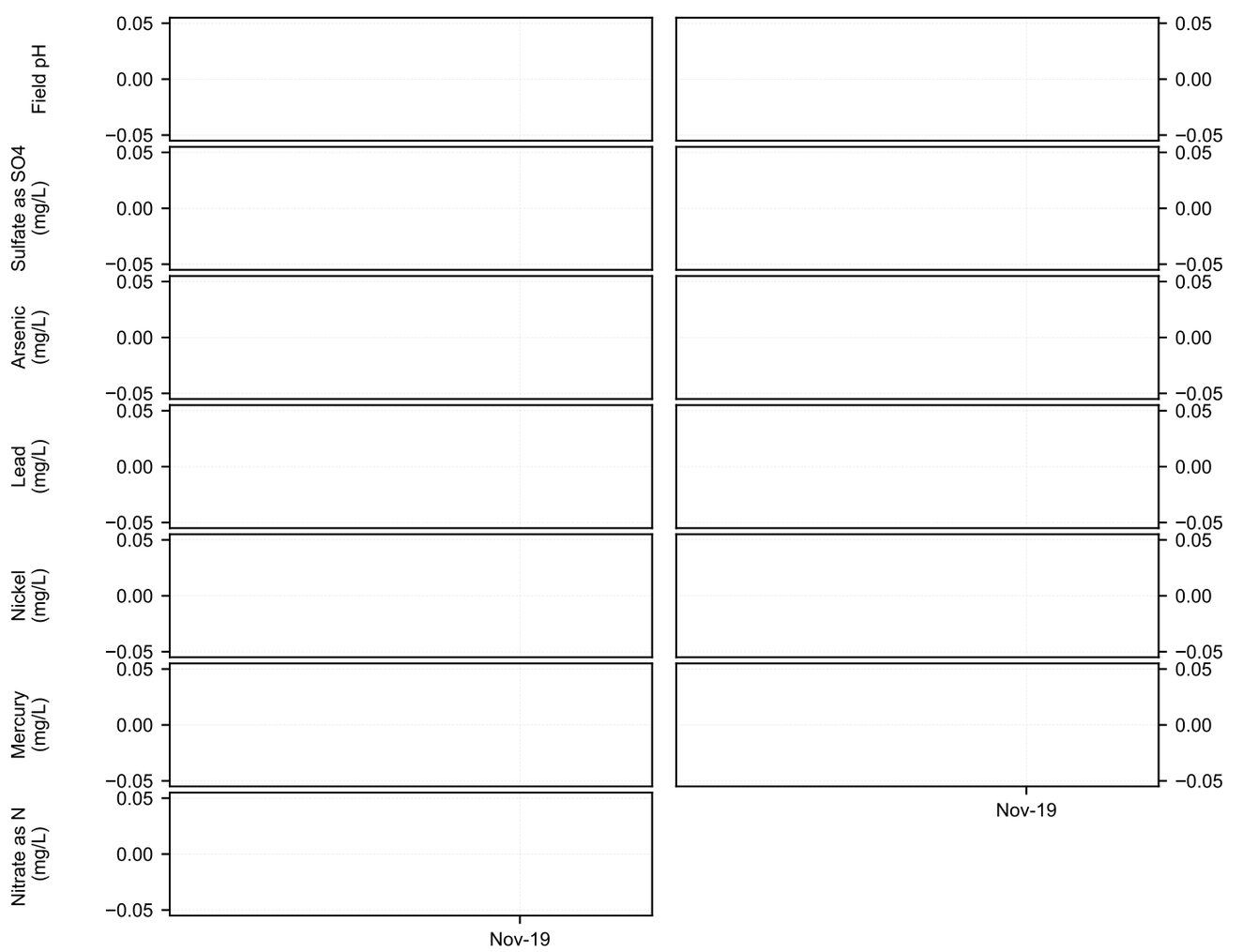
TW06 (Screened geology - Inactive; Screened interval: Unknown)



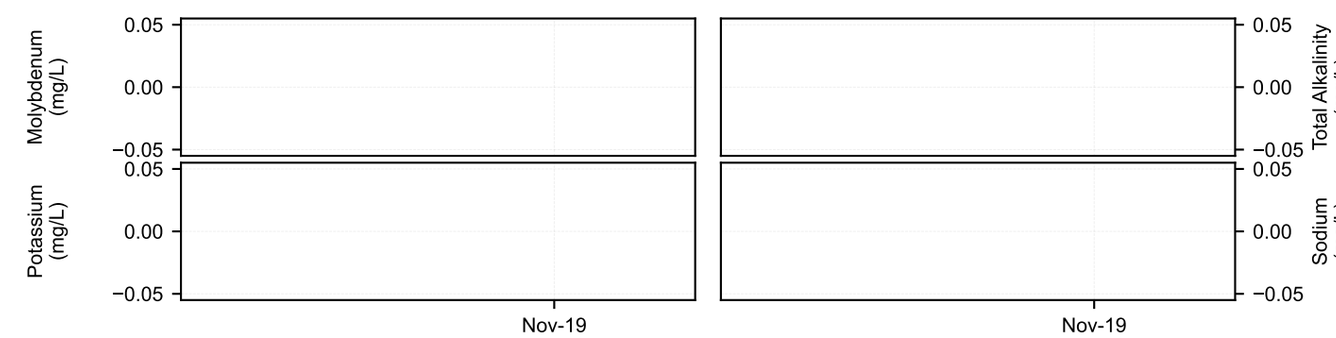
Groundwater levels



WMP defined analytes

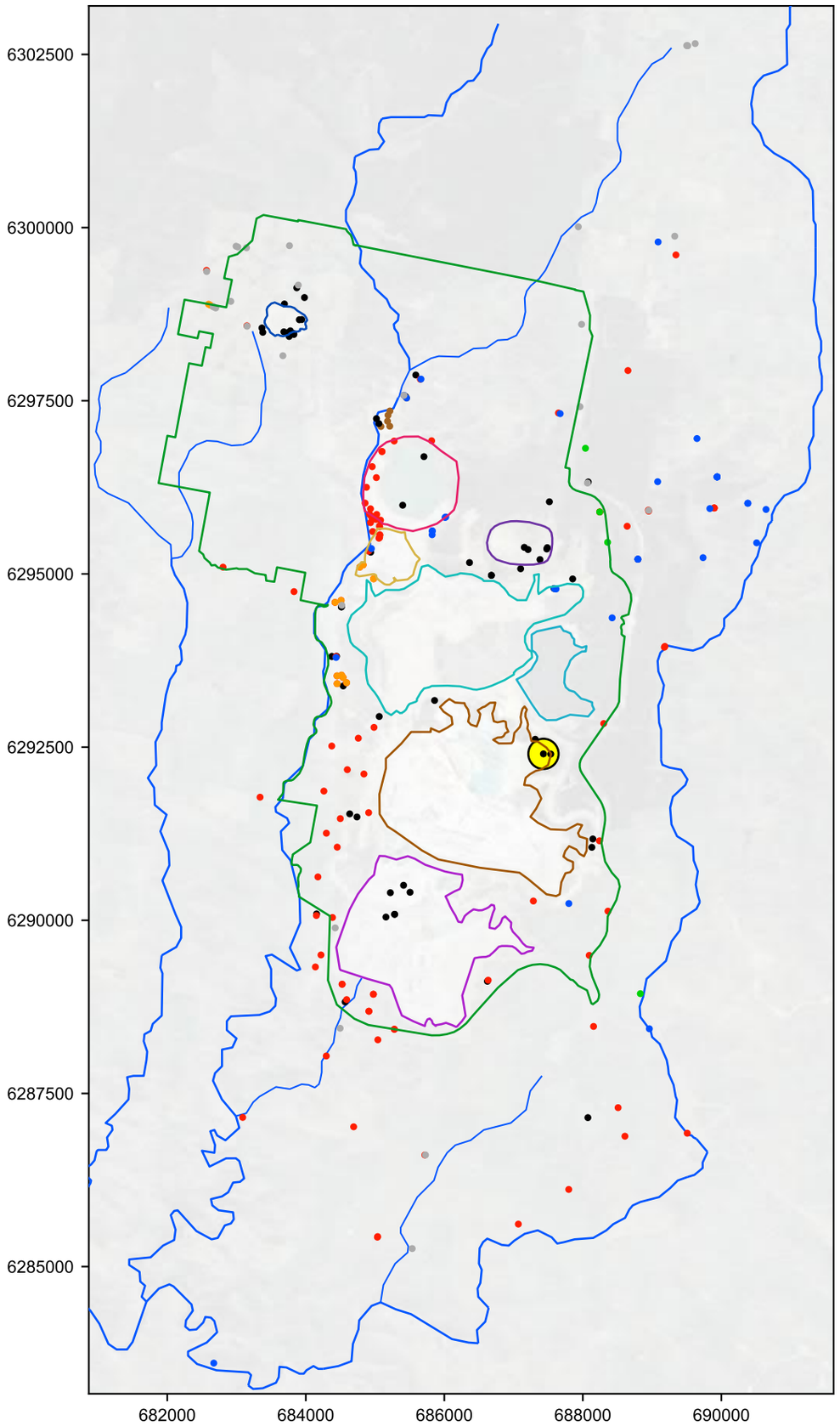


Additional analytes of interest

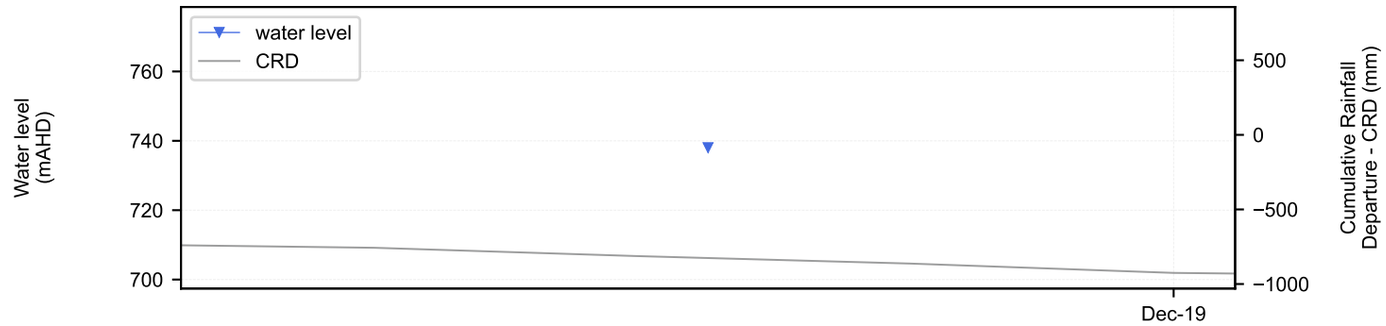


Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

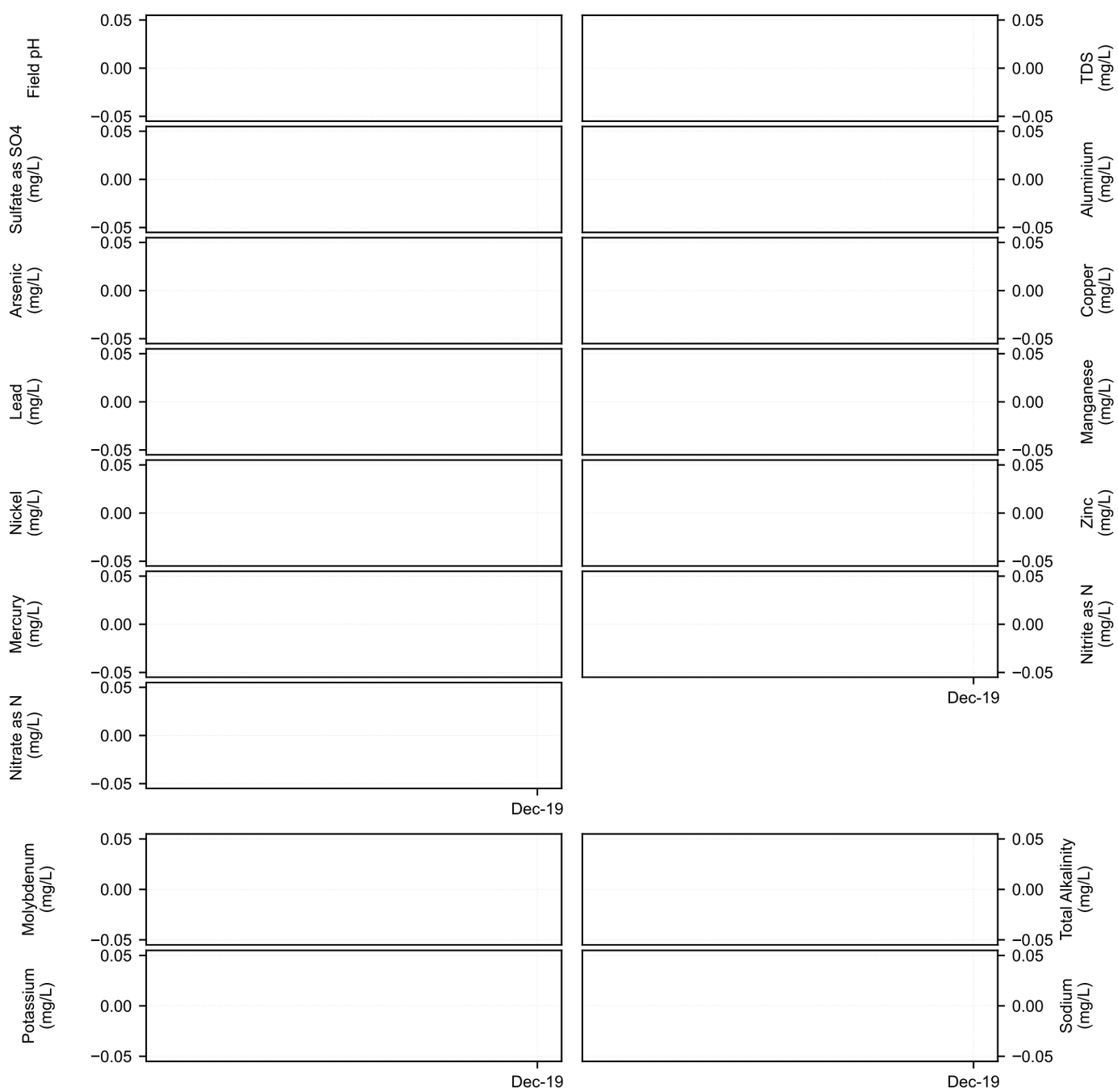
TW06MB (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



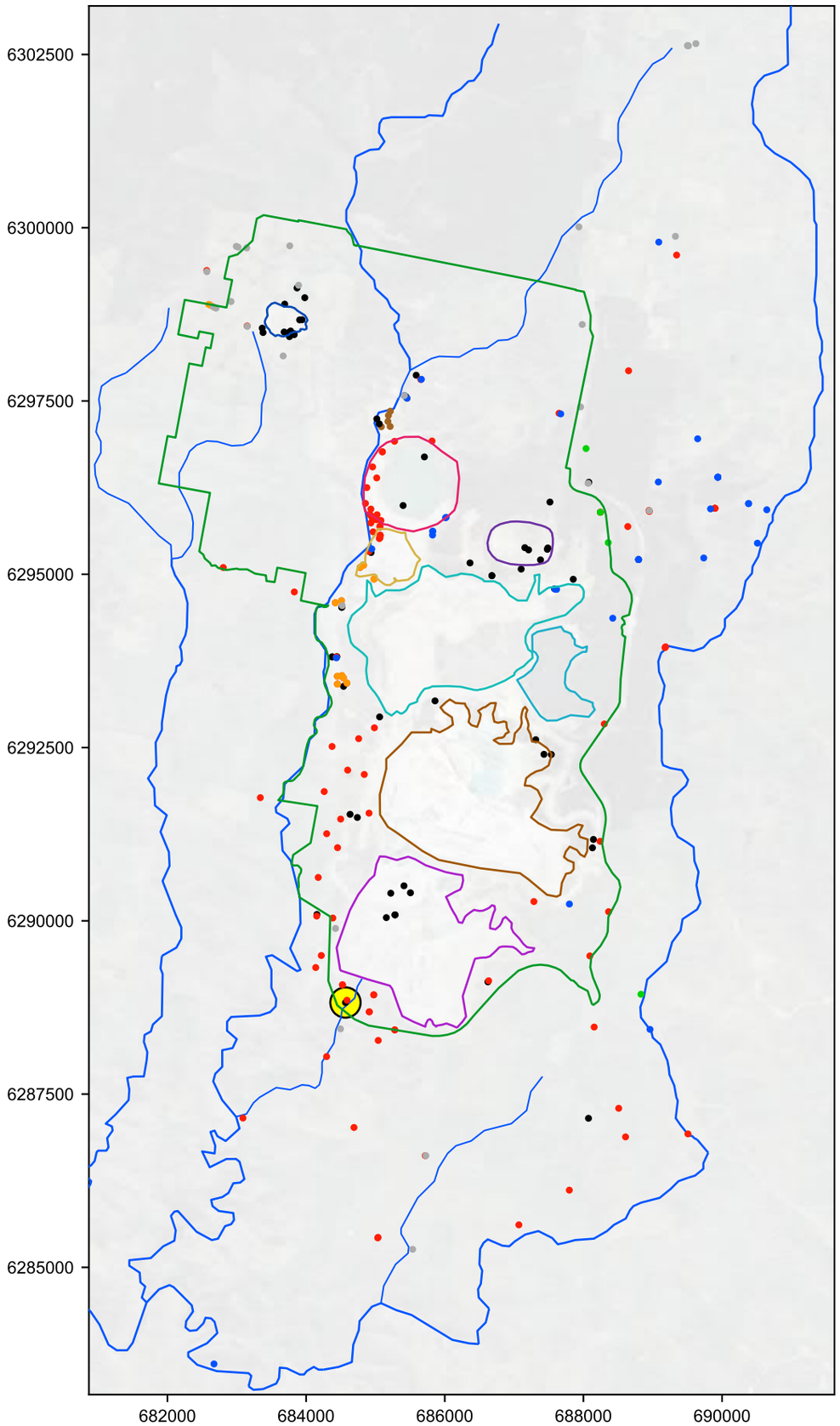
WMP defined analytes



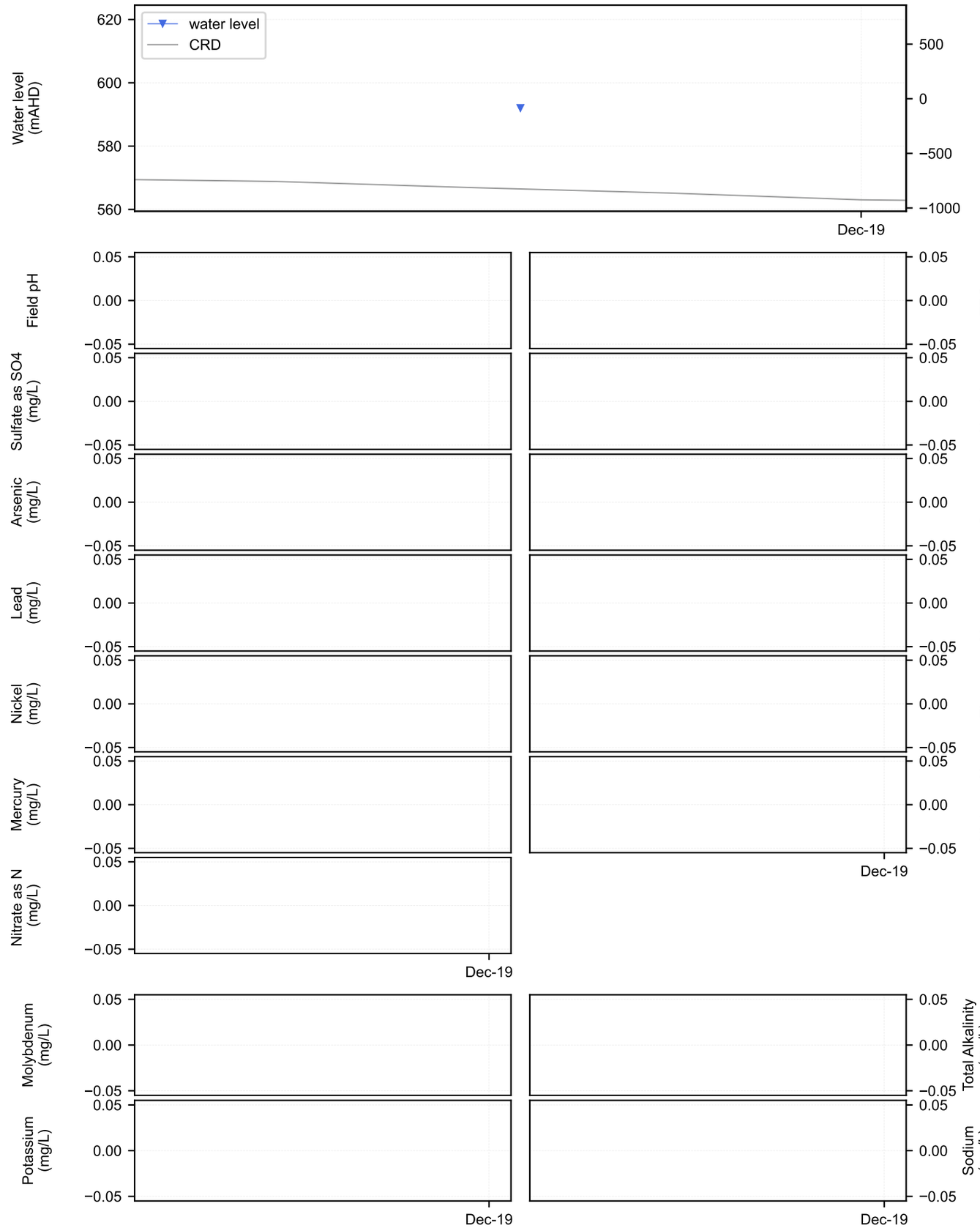
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

TW07 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels

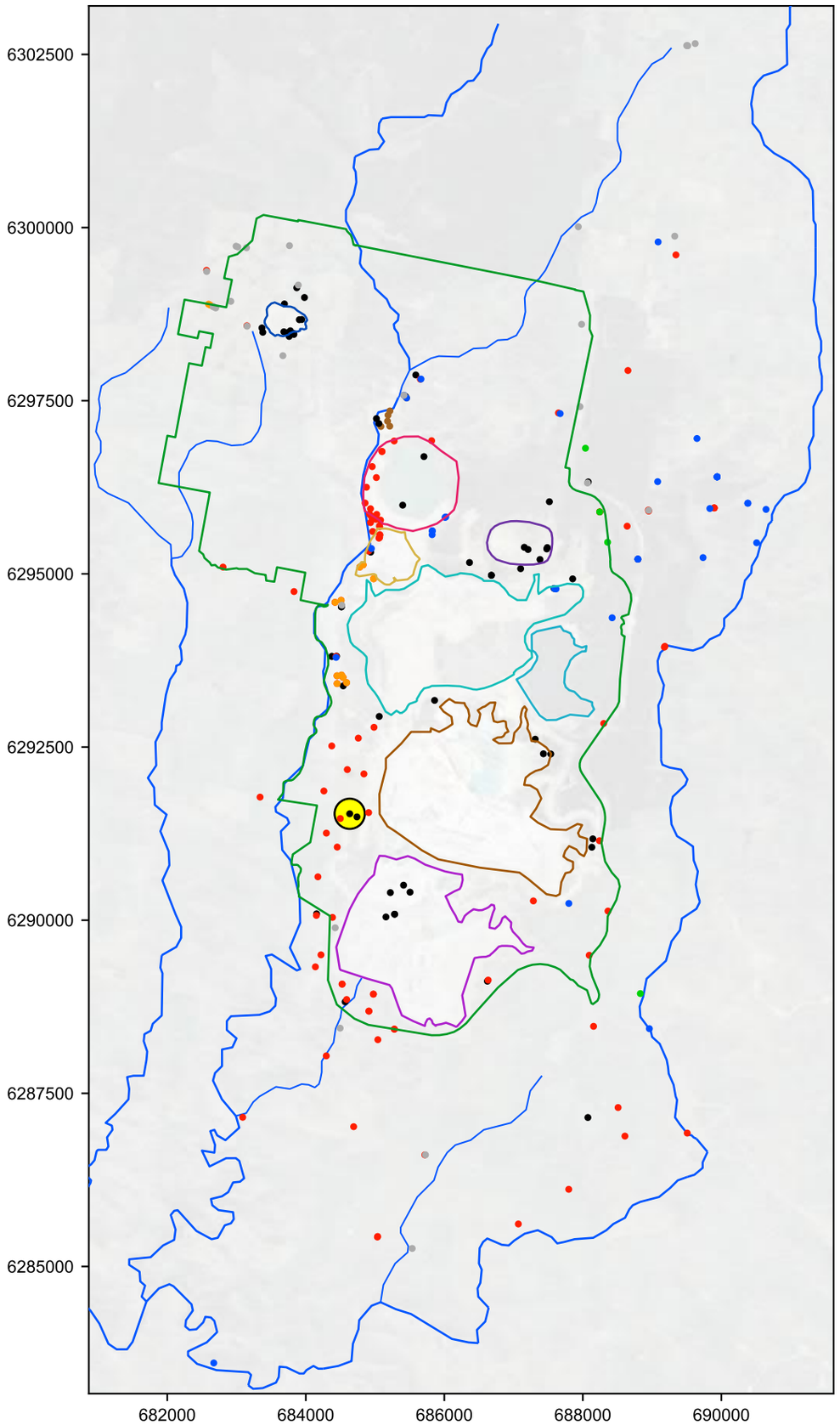


WMP defined analytes

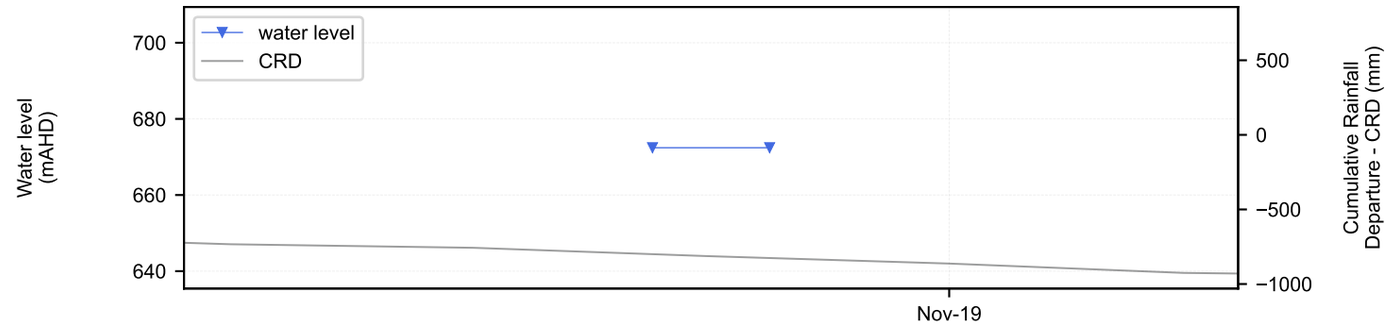
Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

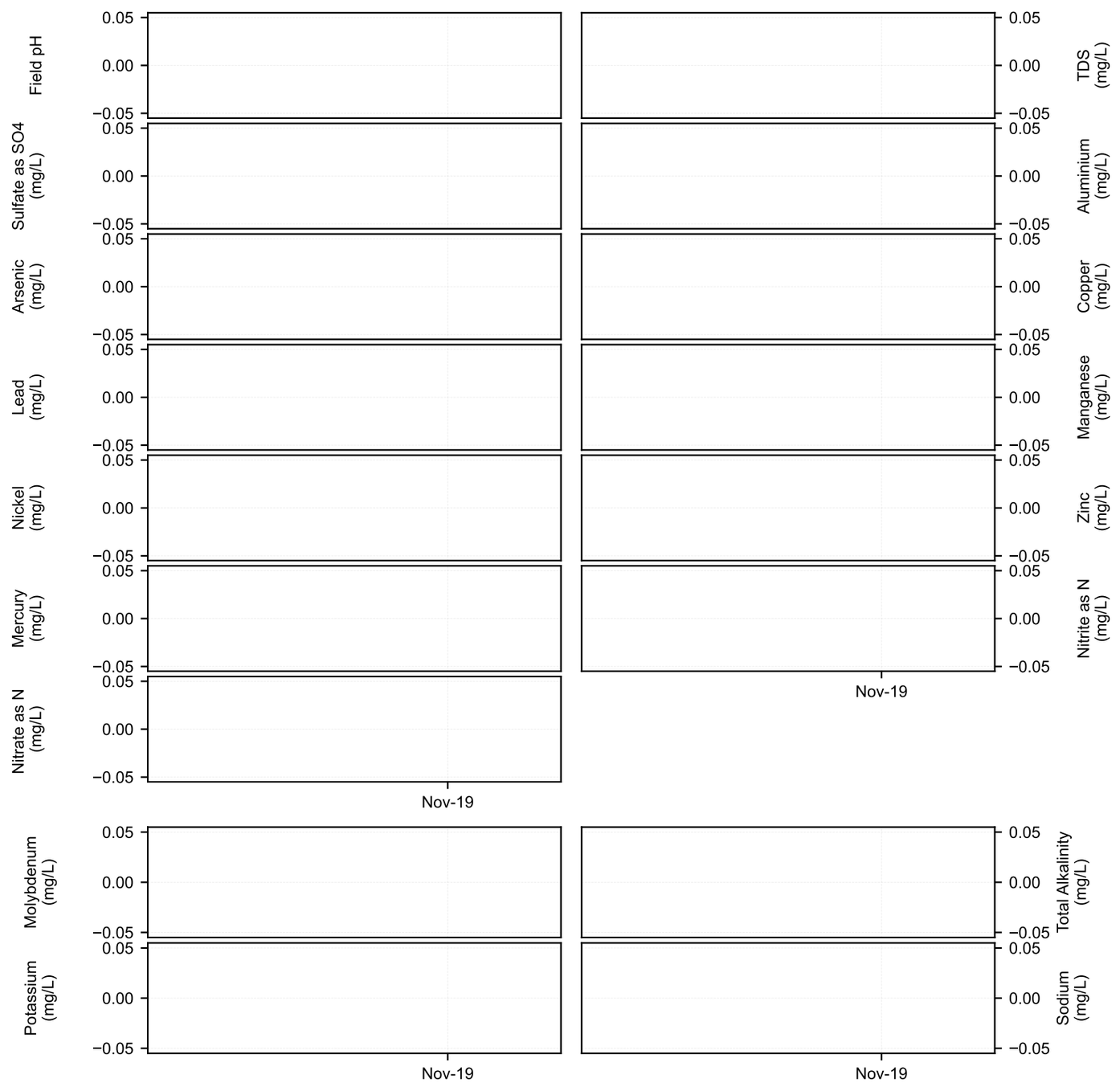
TW08 (Screened geology - Inactive; Screened interval: Unknown)



Groundwater levels



WMP defined analytes



Additional analytes of interest

Filled markers indicates above limit of reporting, empty markers indicates below limit of reporting

Appendix D

Tabulated water quality data - WMP bores - 2023/2024 water year

AGE

CAD5020.001 Groundwater quality data

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Sample Location		**CB6A**	**CB6A**	**CB6A**	**CB6A**	**MB10A**	**MB10A**	**MB10A**	**MB10A**	**MB10A**	**MB10B**	**MB10B**	**MB11A**	**MB11A**	**MB11A**	**MB11A**	**MB11B**	**MB11B**	**MB1A**
Date Sampled		10/07/2023	22/11/2023	16/01/2024	15/05/2024	10/07/2023	11/07/2023	3/10/2023	30/01/2024	15/05/2024	3/10/2023	15/05/2024	10/07/2023	3/10/2023	30/01/2024	15/05/2024	3/10/2023	15/05/2024	12/07/2023
Field Parameters	**Units**																		
Field pH	pH units	6.97	6.95	6.77	6.87	7.02	7.02	6.5	6.57	6.85	7.07	7.36	6.74	6.44	6.56	6.7	6.77	7.1	6.55
Field Electrical Conductivity (EC)	µS/cm	1728	1691	1766	1824	3190	3190	3194	3387	3207	1187	1823	3317	3177	3331	3305	1038	471.1	3822
Field Temperature	deg c	15.6	16.2	16	16.3	15.6	15.6	16	16.3	16.2	14.1	17.3	15.2	15.7	16	15.9	14	17.4	16.7
Physical Parameters																			
Electrical conductivity	µS/cm	1840	1790	1890	1910	338	-	3480	3630	3480	1380	2010	3590	3510	3580	3550	1290	540	3910
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	457	469	472	488	112	-	378	374	372	384	530	396	397	403	382	166	48	537
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	457	469	472	488	112	-	378	374	372	384	530	396	397	403	382	166	48	537
Suspended Solids (SS)	mg/L	16	14	13	9	27	-	32	37	50	347	267	10	< 5	10	8	100	26	< 5
Total Dissolved Solids @180°C	mg/L	1450	1400	1600	1500	274	-	3390	3500	3330	922	1400	3470	3330	3410	3180	1040	458	4190
Redox Potential	mV	93	-78	-81	-8	77	77	183	-33	-24	192	6	134	277	-44	-16	283	52	185
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	522	541	574	622	52	-	2170	1940	2110	270	413	1960	2080	1840	2130	501	76	2610
Chloride	mg/L	118	128	136	133	8	-	74	62	58	66	102	106	98	123	72	36	21	91
Calcium	mg/L	214	220	237	226	41	-	579	610	551	30	36	603	571	626	608	194	50	581
Magnesium	mg/L	100	108	122	122	9	-	174	184	193	28	35	165	147	161	171	51	18	330
Sodium	mg/L	73	77	86	86	14	-	155	152	146	264	441	164	157	165	171	79	31	161
Potassium	mg/L	3	3	3	3	9	-	5	4	5	< 1	< 1	3	3	4	3	1	2	6
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.02	< 0.01
Nitrate as N	mg/L	0.02	< 0.01	< 0.01	< 0.01	0.26	-	< 0.01	< 0.01	< 0.01	10.9	14.9	< 0.01	0.02	1.37	< 0.01	1.06	27	0.01
Nitrite + Nitrate as N	mg/L	0.02	< 0.01	< 0.01	< 0.01	0.26	-	< 0.01	< 0.01	< 0.01	10.9	14.9	< 0.01	0.02	1.37	< 0.01	1.07	27	0.01
Total Kjeldahl Nitrogen as N	mg/L	0.8	0.2	0.1	< 0.1	1.1	-	0.6	0.4	1.1	3.1	< 1.0	0.4	0.3	0.7	0.4	1.9	1.4	0.2
Total Nitrogen as N	mg/L	0.8	0.2	0.1	< 0.1	1.4	-	0.6	0.4	1.1	14	14.9	0.4	0.3	2.1	0.4	3	28.4	0.2
Total Phosphorus as P	mg/L	0.34	0.12	0.09	0.05	0.18	-	0.26	0.12	0.21	0.31	< 0.10	0.12	0.06	0.1	0.02	0.29	0.05	0.07
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	**0.17**	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.004	0.012	0.013	**0.014**	0.002	-	< 0.001	0.002	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	0.003	< 0.001	< 0.001	0.001	-	0.002	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004
Copper	mg/L	< 0.001	**0.008**	< 0.001	< 0.001	**0.017**	-	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.006**	**0.004**	< 0.001
Iron	mg/L	2.09	4.36	5.44	5.01	0.2	-	5.58	5.61	2.8	< 0.05	< 0.05	1.94	2.58	1.45	1.5	0.18	< 0.05	0.29
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.474	0.529	0.525	0.467	0.004	-	1.23	1.24	1.18	0.005	0.002	0.94	0.876	1.03	0.843	0.124	0.006	0.519
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.002	0.004	0.004	0.003	< 0.001	-	< 0.001	< 0.001	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.006
Nickel	mg/L	< 0.001	0.007	< 0.001	< 0.001	0.003	-	0.001	0.002	< 0.001	< 0.001	< 0.001	0.002	0.002	0.002	0.003	0.001	< 0.001	0.01
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	0.01	**0.02**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	**0.012**	-	**0.025**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	**0.009**	< 0.005	**0.025**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	< 100	-	-	-	-	< 100	-	-	-	-	-	< 100	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	< 100	-	-	-	-	< 100	-	-	-	-	-	< 100	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	< 100	-	-	-	-	< 100	-	-	-	-	-	< 100	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	< 100	-	-	-	-	< 100	-	-	-	-	-	< 100	-	-	-
Benzene	µg/L	-	-	-	< 1	-	-	-	-	< 1	-	-	-	-	-	< 1	-	-	-
Ethylbenzene	µg/L	-	-	-	< 2	-	-	-	-	< 2	-	-	-	-	-	< 2	-	-	-
Naphthalene	µg/L	-	-	-	< 5	-	-	-	-	< 5	-	-	-	-	-	< 5	-	-	-
ortho-Xylene	µg/L	-	-	-	< 2	-	-	-	-	< 2	-	-	-	-	-	< 2	-	-	-
Toluene	µg/L	-	-	-	< 2	-	-	-	-	< 2	-	-	-	-	-	< 2	-	-	-
Total Xylenes	µg/L	-	-	-	< 2	-	-	-	-	< 2	-	-	-	-	-	< 2	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Sample Location		**MB1A**	**MB1A**	**MB1A**	**MB20**	**MB20**	**MB20**	**MB20**	**MB21**	**MB21**	**MB21**	**MB21**	**MB25**	**MB26B**	**MB26B**	**MB26B**	**MB26B**	**MB27**	**MB27**
Date Sampled		13/11/2023	24/01/2024	16/04/2024	28/08/2023	13/10/2023	9/02/2024	20/05/2024	28/08/2023	12/10/2023	9/02/2024	20/05/2024	29/08/2023	29/08/2023	12/10/2023	20/03/2024	21/05/2024	26/07/2023	23/08/2023
Field Parameters	**Units**																		
Field pH	pH units	6.41	6.45	6.56	5.77	5.37	5.05	5.53	6.74	6.57	6.07	6.64	7.05	6.39	6.2	6.53	6.67	6.83	6.84
Field Electrical Conductivity (EC)	µS/cm	3333	3286	3357	3790	3000	3935	4308	1707	1849	1746	1686	1398	255	2127	1989	1923	1691	1739
Field Temperature	deg c	17.3	17.2	17.1	16.1	16	16.8	16	15.8	16.1	16.5	15.6	16.8	16.5	16.7	16.9	16.7	17	16.6
Physical Parameters																			
Electrical conductivity	µS/cm	3720	3630	3800	-	3150	4260	4810	-	1890	1860	1830	-	-	2160	2150	2070	-	-
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	527	471	540	73	42	8	41	945	949	944	980	302	349	358	346	353	363	428
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	527	471	540	73	42	8	41	945	949	944	980	302	349	358	346	353	363	428
Suspended Solids (SS)	mg/L	< 5	< 5	< 5	-	11	< 5	< 5	-	< 5	< 5	5	-	-	< 5	< 5	< 5	-	-
Total Dissolved Solids @180°C	mg/L	3710	3750	3500	-	3110	4210	4230	-	1210	1190	1160	-	-	1650	1430	1360	-	-
Redox Potential	mV	194	96	106	245	306	223	330	232	292	1746	273	214	255	265	286	227	209	100
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	2130	1960	2180	1740	1430	1840	2050	62	43	49	46	379	208	229	215	200	481	498
Chloride	mg/L	97	61	64	654	463	575	639	77	52	52	46	130	526	494	449	417	136	132
Calcium	mg/L	487	439	517	390	311	336	412	102	122	105	113	140	99	115	121	106	204	184
Magnesium	mg/L	276	275	280	310	218	306	363	77	84	91	83	95	136	140	141	143	106	106
Sodium	mg/L	153	155	167	234	172	219	242	223	240	228	230	79	129	130	134	130	115	120
Potassium	mg/L	6	6	5	10	9	11	10	7	8	8	7	1	7	8	9	7	1	1
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	0.01	0.02	0.01	0.03	0.06	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	< 0.01	< 0.01	1.19	1.34	2.29	1.98	18.2	17.6	18	17.6	19.1	0.3	0.3	0.28	0.27	3.25	3.39
Nitrite + Nitrate as N	mg/L	< 0.01	< 0.01	< 0.01	1.2	1.36	2.3	2.01	18.3	17.7	18	17.6	19.1	0.3	0.3	0.28	0.27	3.25	3.39
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.1	0.2	0.6	0.7	0.7	0.5	1.3	2.4	2.4	2.9	1.2	0.1	< 0.1	0.1	< 0.1	0.5	0.5
Total Nitrogen as N	mg/L	0.2	0.1	0.2	1.8	2.1	3	2.5	19.6	20.1	20.4	20.5	20.3	0.4	0.3	0.4	0.3	3.8	3.9
Total Phosphorus as P	mg/L	0.17	0.03	0.08	0.02	0.04	0.02	< 0.01	0.02	0.01	0.01	< 0.01	0.04	0.04	0.05	0.04	0.04	0.04	0.04
Dissolved Metals																			
Aluminium	mg/L	< 0.01	0.02	< 0.01	**2.36**	**3.16**	**7.22**	**4.78**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-
Arsenic	mg/L	0.002	0.002	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	**0.0017**	**0.0015**	**0.003**	**0.0024**	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Cobalt	mg/L	0.004	0.004	0.004	**0.161**	**0.138**	**0.259**	**0.253**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-
Copper	mg/L	< 0.001	**0.002**	< 0.001	**0.011**	**0.014**	**0.029**	**0.016**	**0.006**	**0.006**	**0.002**	**0.003**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Iron	mg/L	0.42	0.82	1.09	< 0.05	< 0.05	0.07	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-
Lead	mg/L	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Manganese	mg/L	0.546	0.571	0.606	**16.1**	**11.2**	**18.6**	**20.6**	0.098	0.123	0.003	0.007	< 0.001	0.198	0.201	0.205	0.197	-	-
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	-	**0.0056**	**0.005**	**0.0055**	-	**0.0009**
Molybdenum	mg/L	0.005	0.006	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-
Nickel	mg/L	0.01	0.01	0.008	**0.05**	**0.042**	**0.077**	**0.075**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-
Zinc	mg/L	**0.021**	**0.023**	**0.017**	**0.181**	**0.167**	**0.357**	**0.305**	< 0.005	< 0.005	< 0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005	-	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C16 - C34 Fraction	µg/L	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C34 - C40 Fraction	µg/L	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C10 - C40 Fraction (sum)	µg/L	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
Benzene	µg/L	-	< 1	< 1	-	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-
Ethylbenzene	µg/L	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Naphthalene	µg/L	-	< 5	< 5	-	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-
ortho-Xylene	µg/L	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Toluene	µg/L	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Total Xylenes	µg/L	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Sample Location		**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB27**	**MB28B**	**MB28B**	**MB28B**	**MB28B**	**MB29A**	**MB29B**	**MB29B**	**MB29B**
Date Sampled		19/09/2023	17/10/2023	27/11/2023	11/12/2023	11/01/2024	1/02/2024	6/03/2024	3/04/2024	6/05/2024	5/06/2024	29/08/2023	12/10/2023	30/01/2024	21/05/2024	30/05/2024	29/08/2023	12/10/2023	1/02/2024
Field Parameters	**Units**																		
Field pH	pH units	6.93	6.93	7.01	6.85	7.03	6.8	6.86	6.87	7.11	6.79	6.9	6.75	6.86	7	-	7.33	7.33	7.52
Field Electrical Conductivity (EC)	µS/cm	1724	1689	1729	1746	1758	1822	1794	1833	1845	1797	1705	1852	1758	1682	-	438.4	471.5	444.1
Field Temperature	deg c	17.3	16.9	16.9	17.4	17	17.4	17.2	17.2	17	16.9	16.2	16.4	16.6	16.2	-	16.8	17	17.5
Physical Parameters																			
Electrical conductivity	µS/cm	1940	1980	< 1	1860	1930	2040	2010	1990	1920	2000	-	1890	1900	1810	-	-	474	492
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	426	426	< 1	426	433	419	353	430	427	456	430	432	428	416	-	225	226	216
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	426	426	< 1	426	433	419	353	430	427	456	430	432	428	416	-	225	226	216
Suspended Solids (SS)	mg/L	9	24	< 5	5	< 5	18	< 5	< 5	< 5	< 5	-	< 5	< 5	< 5	-	-	< 5	< 5
Total Dissolved Solids @180°C	mg/L	1440	1630	< 10	1590	1550	1440	1510	1430	1550	1500	-	1350	1190	1230	-	-	354	280
Redox Potential	mV	257	290	177	146	151	182	183	254	272	319	139	320	38	123	-	214	300	184
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	484	474	< 1	499	509	494	530	523	511	525	419	422	421	440	-	14	14	13
Chloride	mg/L	133	167	< 1	147	139	143	140	154	154	154	202	186	192	160	-	12	13	14
Calcium	mg/L	184	187	< 1	190	195	182	196	215	197	200	112	121	111	109	-	50	52	51
Magnesium	mg/L	106	105	< 1	111	113	111	114	120	115	108	96	95	94	93	-	11	12	11
Sodium	mg/L	116	114	< 1	118	122	118	120	132	124	122	203	196	192	190	-	47	45	47
Potassium	mg/L	1	1	< 1	1	1	2	1	2	2	1	2	2	2	2	-	< 1	< 1	< 1
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	3.62	3.53	< 0.01	4.09	3.84	3.85	3.94	3.5	3.66	3.36	2.17	1.99	2.05	1.33	-	2.27	2.16	1.95
Nitrite + Nitrate as N	mg/L	3.62	3.53	< 0.01	4.11	3.84	3.85	3.94	3.5	3.66	3.36	2.17	1.99	2.05	1.33	-	2.27	2.16	1.95
Total Kjeldahl Nitrogen as N	mg/L	0.5	0.6	< 0.1	0.5	0.5	0.5	0.8	0.6	0.5	0.4	0.4	0.4	0.3	0.3	-	0.2	0.2	< 0.1
Total Nitrogen as N	mg/L	4.1	4.1	< 0.1	4.6	4.3	4.4	4.7	4.1	4.2	3.8	2.6	2.4	2.4	1.6	-	2.5	2.4	2
Total Phosphorus as P	mg/L	0.04	0.05	< 0.01	0.04	< 0.01	0.05	0.04	0.02	0.04	0.06	0.06	0.06	0.07	0.04	-	0.06	0.06	0.06
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.002	0.002	0.001	-	0.005	0.005	0.005
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	**0.002**	**0.002**	0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.002	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.001	< 0.001	0.002	0.001	-	< 0.001	< 0.001	< 0.001
Mercury	mg/L	**0.0009**	**0.0008**	< 0.0001	**0.0007**	**0.001**	**0.001**	**0.0009**	**0.0011**	**0.001**	**0.001**	-	0.0003	0.0005	0.0003	-	-	< 0.0001	< 0.0001
Molybdenum	mg/L	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.002	0.002	0.002
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	0.002	0.003	0.002	-	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	0.006	**0.009**	0.008	-	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	< 100	-	-	-	-	-	< 100	< 100	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	< 100	-	-	-	-	-	< 100	< 100	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	< 100	-	-	-	-	-	< 100	< 100	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	< 100	-	-	-	-	-	< 100	< 100	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	< 1	-	-	-	-	-	< 1	< 1	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	< 2	-	-	-	-	-	< 2	< 2	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	< 5	-	-	-	-	-	< 5	< 5	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	< 2	-	-	-	-	-	< 2	< 2	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	< 2	-	-	-	-	-	< 2	< 2	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	< 2	-	-	-	-	-	< 2	< 2	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Sample Location		**MB29B**	**MB2A**	**MB2A**	**MB2A**	**MB2A**	**MB2A**	**MB30**	**MB30**	**MB30**	**MB30**	**MB30**	**MB30**	**MB30**	**MB3A**	**MB3A**	**MB3A**	**MB3A**	**MB44B**
Date Sampled		23/05/2024	12/07/2023	13/11/2023	24/01/2024	17/04/2024	27/05/2024	25/07/2023	8/08/2023	15/09/2023	4/10/2023	7/10/2023	23/01/2024	5/06/2024	12/07/2023	13/11/2023	24/01/2024	17/04/2024	31/07/2023
Field Parameters	**Units**																		
Field pH	pH units	7.54	6.78	6.6	6.68	6.87	6.89	6.57	6.69	6.85	7.12	-	6.97	6.95	-	6.5	6.57	6.65	-
Field Electrical Conductivity (EC)	µS/cm	434.3	2674	2685	2651	2727	2725	610.7	621.1	606.7	601.4	-	585.2	581.6	-	3705	3657	3623	-
Field Temperature	deg c	16.9	15.8	16.6	16.2	16.4	126	15.7	15.7	15.4	15.4	-	16.1	15.9	-	15.8	16	16.2	-
Physical Parameters																			
Electrical conductivity	µS/cm	474	2880	2940	2820	3060	3080	-	-	680	-	670	663	660	4050	4130	4000	4070	-
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	224	541	541	470	559	577	236	280	264	-	280	278	283	610	641	510	562	63
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	7	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	224	541	541	470	559	577	236	280	264	-	280	285	283	610	641	510	562	63
Suspended Solids (SS)	mg/L	< 5	18	16	7	< 5	< 5	-	-	7	-	10	20	32	18	10	13	16	-
Total Dissolved Solids @180°C	mg/L	312	2540	2690	2780	2570	2700	-	-	446	-	456	422	437	3720	4100	4000	3780	-
Redox Potential	mV	260	39	80	-38	35	16	254	179	309	242	-	120	4	-	38	-54	-28	-
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	13	1400	1300	1160	1330	1200	86	82	101	-	89	77	77	2160	2060	1920	2120	2
Chloride	mg/L	14	104	118	74	104	70	7	7	6	-	7	5	4	249	246	214	188	6
Calcium	mg/L	50	350	355	303	357	322	100	100	106	-	94	104	108	560	568	508	561	7
Magnesium	mg/L	11	185	195	189	194	175	19	20	20	-	19	20	18	290	302	306	290	6
Sodium	mg/L	48	158	166	179	203	172	21	22	23	-	19	18	17	139	146	145	148	13
Potassium	mg/L	< 1	2	2	2	1	1	6	4	7	-	4	4	4	2	3	3	2	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Nitrate as N	mg/L	2.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.35	0.41	0.35	-	0.34	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.24
Nitrite + Nitrate as N	mg/L	2.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.37	0.41	0.35	-	0.34	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.25
Total Kjeldahl Nitrogen as N	mg/L	0.4	0.4	0.5	0.3	0.2	0.2	0.2	0.3	0.3	-	0.2	0.3	0.2	1.9	1.8	1.4	0.7	0.6
Total Nitrogen as N	mg/L	2.5	0.4	0.5	0.3	0.2	0.2	0.6	0.7	0.6	-	0.5	0.4	0.2	1.9	1.8	1.4	0.7	0.8
Total Phosphorus as P	mg/L	0.1	0.25	0.24	0.1	0.08	0.05	0.03	0.03	0.02	-	0.04	0.04	0.07	0.83	1.06	0.8	0.32	0.51
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	-	-	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	-
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-
Arsenic	mg/L	0.006	**0.032**	**0.026**	**0.016**	0.01	0.006	-	-	0.002	-	< 0.001	< 0.001	0.004	0.009	0.003	0.004	0.005	-
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	**0.0004**	< 0.0001	< 0.0001	-	-	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	-
Chromium	mg/L	< 0.001	< 0.001	< 0.001	**0.002**	< 0.001	< 0.001	-	-	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-
Cobalt	mg/L	< 0.001	0.006	0.005	0.004	< 0.001	< 0.001	-	-	< 0.001	-	< 0.001	0.001	0.006	< 0.001	< 0.001	< 0.001	< 0.001	-
Copper	mg/L	**0.002**	< 0.001	< 0.001	**0.004**	< 0.001	< 0.001	-	-	**0.013**	-	**0.012**	**0.01**	0.001	< 0.001	< 0.001	**0.002**	< 0.001	-
Iron	mg/L	< 0.05	5.64	5.1	2.35	0.77	0.35	-	-	< 0.05	-	< 0.05	< 0.05	1.36	5.51	1.99	5.16	7.13	-
Lead	mg/L	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	-	-	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-
Manganese	mg/L	< 0.001	0.281	0.315	0.169	0.046	0.02	-	-	0.112	-	0.088	0.102	0.21	0.627	0.678	0.822	0.522	-
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	-	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-
Molybdenum	mg/L	0.002	0.002	0.002	0.002	0.003	0.003	-	-	**0.039**	-	**0.039**	0.03	0.032	< 0.001	< 0.001	< 0.001	< 0.001	-
Nickel	mg/L	< 0.001	0.002	0.003	0.006	0.002	0.002	-	-	0.001	-	0.001	0.002	< 0.001	< 0.001	0.001	0.003	< 0.001	-
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-
Zinc	mg/L	0.007	< 0.005	< 0.005	**0.011**	< 0.005	< 0.005	-	-	**0.012**	-	**0.009**	**0.012**	< 0.005	< 0.005	< 0.005	0.006	< 0.005	-
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	< 100	< 100	-
>C16 - C34 Fraction	µg/L	-	-	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	< 100	< 100	-
>C34 - C40 Fraction	µg/L	-	-	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	< 100	< 100	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	< 100	< 100	-	-	-	-	-	-	-	-	-	-	< 100	< 100	-
Benzene	µg/L	< 1	-	-	< 1	< 1	-	-	-	-	-	-	-	-	-	-	< 1	< 1	-
Ethylbenzene	µg/L	< 2	-	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	< 2	< 2	-
Naphthalene	µg/L	< 5	-	-	< 5	< 5	-	-	-	-	-	-	-	-	-	-	< 5	< 5	-
ortho-Xylene	µg/L	< 2	-	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	< 2	< 2	-
Toluene	µg/L	< 2	-	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	< 2	< 2	-
Total Xylenes	µg/L	< 2	-	-	< 2	< 2	-	-	-	-	-	-	-	-	-	-	< 2	< 2	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
Sample Location		**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB44B**	**MB47A**	**MB47A**	**MB47A**	**MB47A**	**MB47A**	**MB47A**	**MB47A**	**MB47A**	**MB47A**
Date Sampled		10/08/2023	12/09/2023	26/10/2023	20/11/2023	6/12/2023	8/01/2024	8/02/2024	13/03/2024	10/04/2024	7/07/2023	10/08/2023	13/09/2023	30/10/2023	20/11/2023	6/12/2023	8/01/2024	8/02/2024	5/03/2024
Field Parameters	**Units**																		
Field pH	pH units	5.61	5.42	6.14	5.51	6.15	6.26	6.49	6.23	6.26	7.6	6.83	7.02	7.36	6.41	7.13	7.02	6.88	6.83
Field Electrical Conductivity (EC)	µS/cm	1352	152.7	147.9	147.8	170.8	209.7	234.9	189.1	226.3	460.3	47.99	464.4	4.4	471.4	446.1	472.8	486.3	457
Field Temperature	deg c	14.2	14.1	14.1	14.6	15.5	14.7	15.3	14.7	14.3	13.5	16.4	16.1	16.6	17	18	16.9	17	16.8
Physical Parameters																			
Electrical conductivity	µS/cm	-	130	-	-	158	176	162	162	167	453	-	457	-	-	479	474	469	504
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	60	61	-	-	68	82	73	73	75	241	243	264	261	-	260	266	256	208
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	60	61	-	-	68	82	73	73	75	241	243	264	261	-	260	266	256	208
Suspended Solids (SS)	mg/L	-	164	-	-	40	102	102	56	419	20	-	97	-	-	778	952	864	726
Total Dissolved Solids @180°C	mg/L	-	88	-	-	134	120	135	104	126	276	-	246	-	-	329	308	311	322
Redox Potential	mV	199	286	57	318	-33	-52	-83	-19	-18	101	-42	-87	-156	207	-119	-130	-93	77
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	2	2	-	-	1	2	2	1	2	2	3	< 1	< 1	-	9	7	10	23
Chloride	mg/L	6	5	-	-	7	8	8	8	10	3	4	4	4	-	4	4	4	4
Calcium	mg/L	8	8	-	-	8	9	9	8	8	82	84	78	90	-	84	88	82	92
Magnesium	mg/L	5	5	-	-	6	7	7	6	6	8	8	8	9	-	8	9	9	9
Sodium	mg/L	15	12	-	-	14	13	15	12	12	9	10	8	6	-	10	9	10	9
Potassium	mg/L	2	1	-	-	2	2	3	2	2	2	2	2	3	-	2	2	3	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	0.02	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.29	0.24	-	-	0.02	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	0.03	< 0.01	-	0.04	0.04	0.04	0.05
Nitrite + Nitrate as N	mg/L	0.29	0.26	-	-	0.02	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	0.03	< 0.01	-	0.04	0.04	0.04	0.05
Total Kjeldahl Nitrogen as N	mg/L	0.6	0.5	-	-	< 0.1	0.3	0.3	< 0.1	0.5	< 0.1	0.2	0.2	0.1	-	0.4	< 1.0	0.7	0.7
Total Nitrogen as N	mg/L	0.9	0.8	-	-	< 0.1	0.3	0.3	< 0.1	0.5	< 0.1	0.2	0.2	0.1	-	0.4	< 1.0	0.7	0.8
Total Phosphorus as P	mg/L	0.62	0.84	-	-	0.18	0.13	0.26	< 0.01	0.24	0.03	0.01	0.05	0.02	-	0.46	0.33	0.33	0.3
Dissolved Metals																			
Aluminium	mg/L	-	**0.06**	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	-	5.52	-	-	12.9	22.1	26.9	17.1	24.5	8.73	-	11.7	-	-	4.71	6.71	7.78	5.14
Lead	mg/L	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	-	0.184	-	-	0.231	0.28	0.277	0.251	0.34	0.032	-	0.052	-	-	0.08	0.059	0.06	0.041
Mercury	mg/L	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	-	< 0.001	0.002	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	-	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	0.008	0.006	-	-	**0.011**	< 0.005	< 0.005	**0.011**	0.008	0.007	< 0.005	< 0.005	-	-	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107
Sample Location		MB47A	MB48	MB48	MB48	MB49	MB49	MB49	MB49	MB49	MB49	MB49	MB49	MB49	MB49	MB4A	MB4A	MB4A	MB4A
Date Sampled		4/04/2024	27/07/2023	12/09/2023	11/10/2023	7/07/2023	24/08/2023	12/09/2023	11/10/2023	20/11/2023	6/12/2023	4/01/2024	8/02/2024	5/03/2024	10/04/2024	11/07/2023	10/10/2023	30/01/2024	17/04/2024
Field Parameters	**Units**																		
Field pH	pH units	6.82	6.27	-	6.1	6.41	5.71	5.78	6.08	5.61	6.24	6.19	6.11	7.08	6.62	6.92	6.82	7.01	6.97
Field Electrical Conductivity (EC)	µS/cm	496.6	264.4	-	262.8	193.6	189.8	200.9	203.4	181.5	179.5	182.1	186.6	181.3	184.7	1625	1735	1636	1631
Field Temperature	deg c	17.1	12.8	-	13.2	13.5	14.6	14.6	14.6	14.9	15	15	14.9	14.9	14.3	15.5	15.3	16.1	15.9
Physical Parameters																			
Electrical conductivity	µS/cm	488	-	256	260	198	-	196	201	-	205	203	195	201	194	1750	1810	3350	1790
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	253	123	124	117	90	95	96	91	-	90	92	87	77	90	272	257	436	272
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	253	123	124	117	90	95	96	91	-	90	92	87	77	90	272	257	436	272
Suspended Solids (SS)	mg/L	500	-	34	51	13	-	6	9	-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total Dissolved Solids @180°C	mg/L	262	-	150	176	166	-	141	170	-	189	172	180	158	156	1300	1330	1590	1490
Redox Potential	mV	-43	27	-	201	293	165	307	309	322	8	15	177	53	83	159	123	28	25
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	14	6	4	5	< 1	< 1	< 1	< 1	-	< 1	< 1	3	1	< 1	712	809	762	718
Chloride	mg/L	4	10	10	11	8	8	8	9	-	9	9	9	9	9	36	38	34	36
Calcium	mg/L	91	8	8	7	15	16	14	13	-	14	14	14	15	13	267	255	261	270
Magnesium	mg/L	8	19	17	17	7	6	6	6	-	7	6	7	7	6	73	73	72	78
Sodium	mg/L	9	19	17	16	16	15	14	14	-	17	14	18	16	15	74	77	75	86
Potassium	mg/L	2	2	2	2	4	4	4	4	-	4	4	5	4	4	2	2	2	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.03	< 0.01	0.03	0.06	< 0.01	< 0.01	0.01	0.06	-	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	0.01	< 0.01
Nitrite + Nitrate as N	mg/L	0.03	< 0.01	0.04	0.07	< 0.01	< 0.01	0.01	0.06	-	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01	0.01	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	0.2	1.7	1	0.8	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	0.1	< 0.1	0.1	0.2	< 0.1	< 0.1	0.2
Total Nitrogen as N	mg/L	0.2	1.7	1	0.9	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	0.1	< 0.1	0.1	0.3	< 0.1	< 0.1	0.2
Total Phosphorus as P	mg/L	0.1	0.74	0.56	0.4	0.21	0.18	0.24	0.19	-	0.22	0.18	0.19	0.21	0.2	0.09	0.02	0.04	0.04
Dissolved Metals																			
Aluminium	mg/L	< 0.01	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	-	0.002	0.002	0.001	0.002	0.002	0.003	-	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002
Cadmium	mg/L	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	-	0.001	0.002	0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	8.68	-	6.93	3.42	2.31	-	1.6	2.01	-	1.43	1.89	1.52	1.21	1.38	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.048	-	1.88	**1.99**	0.272	-	0.236	0.228	-	0.262	0.26	0.258	0.262	0.236	0.244	0.005	0.04	0.249
Mercury	mg/L	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.001
Nickel	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	-	0.006	**0.06**	**0.014**	**0.025**	**0.062**	**0.304**	-	**0.125**	**0.033**	**0.028**	**0.023**	**0.02**	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 1
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 5
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
Sample Location		**MB4A**	**MB4B**	**MB4B**	**MB51**	**MB51**	**MB51**	**MB51**	**MB53**	**MB53**	**MB53**	**MB53**	**MB54**	**MB54**	**MB54**	**MB54**	**MB56**	**MB56**	**MB56**
Date Sampled		27/05/2024	21/11/2023	12/06/2024	31/07/2023	11/09/2023	28/11/2023	11/06/2024	28/07/2023	12/09/2023	7/11/2023	30/05/2024	28/07/2023	12/09/2023	7/11/2023	30/05/2024	28/07/2023	12/09/2023	7/11/2023
Field Parameters	**Units**																		
Field pH	pH units	7.18	7.2	7.25	-	-	7.7	7.97	7.02	-	6.95	6.62	5.37	-	5.61	5.66	5.69	-	6.09
Field Electrical Conductivity (EC)	µS/cm	1595	3075	2764	-	-	2184	1157	373.1	-	386.5	357.9	145.9	-	145.9	154.2	144.8	-	152.4
Field Temperature	deg c	16	15.1	15.4	-	-	16.1	15.6	14.2	-	14.6	14.3	13.9	-	14.5	14	13.9	-	14.3
Physical Parameters																			
Electrical conductivity	µS/cm	1740	3400	3170	-	1070	2450	1360	-	399	401	408	-	156	152	168	-	159	159
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	275	393	365	135	126	72	115	204	219	214	209	21	18	17	19	45	40	39
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	275	393	365	135	126	72	115	204	219	214	209	21	18	17	19	45	40	39
Suspended Solids (SS)	mg/L	< 5	45	22	-	291	175	194	-	< 5	< 5	< 5	-	< 5	< 5	< 5	-	< 5	< 5
Total Dissolved Solids @180°C	mg/L	1490	3950	2900	-	788	2280	1200	-	235	254	259	-	191	212	210	-	186	199
Redox Potential	mV	181	138	308	-	-	262	238	156	-	313	277	224	-	339	283	200	-	327
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	752	1970	1740	563	461	1400	614	7	7	7	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloride	mg/L	33	63	39	16	13	32	16	4	4	4	3	5	5	5	5	5	5	5
Calcium	mg/L	244	378	317	196	141	409	208	30	29	28	30	9	8	8	9	9	9	8
Magnesium	mg/L	70	316	275	51	40	93	45	18	17	16	17	4	3	3	4	3	3	3
Sodium	mg/L	71	115	110	40	33	89	37	24	25	24	28	11	10	10	12	10	10	9
Potassium	mg/L	2	< 1	< 1	7	5	13	5	20	19	18	23	10	10	9	11	13	13	13
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	3.19	3.19	0.42	4.12	1.47	0.88	0.03	< 0.01	< 0.01	< 0.01	11.5	12.4	10.9	12.3	7.56	8.37	7.98
Nitrite + Nitrate as N	mg/L	< 0.01	3.19	3.19	0.42	4.12	1.47	0.88	0.03	< 0.01	< 0.01	< 0.01	11.5	12.4	10.9	12.3	7.56	8.37	7.98
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.8	0.9	0.1	0.7	0.5	0.4	< 0.1	< 0.1	< 0.1	< 0.1	1.4	1.3	0.9	0.9	0.5	0.6	0.6
Total Nitrogen as N	mg/L	0.2	4	4.1	0.5	4.8	2	1.3	< 0.1	< 0.1	< 0.1	< 0.1	12.9	13.7	11.8	13.2	8.1	9	8.6
Total Phosphorus as P	mg/L	0.04	0.14	0.21	0.15	0.43	0.22	0.26	0.12	0.12	0.1	0.1	0.05	0.09	0.08	0.04	0.15	0.16	0.13
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	-	0.01	0.01	< 0.01	-	0.01	0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	-	< 0.001	0.002	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Arsenic	mg/L	0.002	0.002	0.005	-	< 0.001	< 0.001	< 0.001	-	0.001	0.001	0.005	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	0.0001	< 0.0001	-	< 0.0001	0.0001	< 0.0001	-	< 0.0001	< 0.0001	0.0002	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	**0.003**	-	**0.002**	**0.021**	**0.01**	-	< 0.001	< 0.001	0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Manganese	mg/L	0.302	0.118	0.006	-	0.004	0.019	< 0.001	-	0.391	0.381	0.305	-	0.002	0.002	< 0.001	-	< 0.001	< 0.001
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001
Molybdenum	mg/L	0.001	0.003	0.003	-	**0.119**	**0.179**	**0.301**	-	0.002	0.001	0.001	-	< 0.001	< 0.001	< 0.001	-	0.001	< 0.001
Nickel	mg/L	< 0.001	0.003	< 0.001	-	< 0.001	0.002	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	-	< 0.01	0.01	0.01	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	-	< 0.005	**0.013**	< 0.005	-	< 0.005	< 0.005	< 0.005	-	0.005	< 0.005	< 0.005	-	0.006	0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	< 1	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	< 5	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
Sample Location		**MB56**	**MB5C**	**MB5C**	**MB5C**	**MB5C**	**MB62**	**MB62**	**MB62**	**MB62**	**MB62**	**MB62**	**MB62**	**MB62**	**MB63**	**MB63**	**MB63**	**MB64**	**MB64**
Date Sampled		30/05/2024	11/07/2023	10/10/2023	30/01/2024	17/04/2024	31/07/2023	12/09/2023	20/11/2023	6/12/2023	9/01/2024	8/02/2024	5/03/2024	10/04/2024	24/08/2023	20/11/2023	30/05/2024	24/08/2023	20/11/2023
Field Parameters	**Units**																		
Field pH	pH units	5.81	6.73	6.57	7.02	6.8	4.84	-	4.39	5.21	5.27	5.25	5.4	5.29	4.25	4.07	5.17	5.22	5.15
Field Electrical Conductivity (EC)	µS/cm	145.8	3044	3316	3079	3116	67.39	-	68.15	68.15	69.58	72.68	72.9	75.18	42.62	39.97	39.3	59.07	65.3
Field Temperature	deg c	14	16.1	16	16.9	16.9	15	-	15.5	15.9	15.6	15.7	15.7	15.2	14.6	14.9	14.8	14.3	14.4
Physical Parameters																			
Electrical conductivity	µS/cm	159	3230	3330	4440	3400	-	68	72	80	74	75	80	79	-	56	41	-	66
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	37	440	428	414	440	12	10	10	14	10	12	12	12	9	< 1	6	22	26
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	37	440	428	414	440	12	10	10	14	10	12	12	12	9	< 1	6	22	26
Suspended Solids (SS)	mg/L	< 5	19	29	23	24	-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	-	< 5	< 5	-	< 5
Total Dissolved Solids @180°C	mg/L	194	2940	2960	3060	3030	-	59	45	62	50	65	57	52	-	64	47	-	93
Redox Potential	mV	279	139	203	-90	-30	222	-	294	218	222	167	219	169	276	391	257	239	349
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	< 1	1600	1510	1480	1580	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	15	< 1	< 1	< 1
Chloride	mg/L	4	225	227	218	195	16	12	14	14	14	15	15	15	4	5	4	2	3
Calcium	mg/L	9	418	427	420	450	1	< 1	1	1	1	1	1	1	< 1	< 1	< 1	3	4
Magnesium	mg/L	4	208	220	205	229	3	2	3	3	3	4	4	3	< 1	< 1	1	3	3
Sodium	mg/L	11	148	146	150	168	8	7	8	10	8	9	8	8	4	5	6	4	6
Potassium	mg/L	15	4	4	4	4	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	1	1	< 1	< 1
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	7.5	0.01	< 0.01	0.04	< 0.01	0.36	0.54	0.25	0.26	0.22	0.22	0.22	0.23	1.51	1.18	1.13	1.43	1.3
Nitrite + Nitrate as N	mg/L	7.5	0.01	< 0.01	0.04	< 0.01	0.36	0.54	0.25	0.26	0.22	0.22	0.22	0.23	1.51	1.18	1.13	1.43	1.3
Total Kjeldahl Nitrogen as N	mg/L	0.9	0.3	0.2	0.2	0.4	< 0.1	< 0.1	0.4	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.2	0.2	0.2	0.5	0.2
Total Nitrogen as N	mg/L	8.4	0.3	0.2	0.2	0.4	0.4	0.5	0.6	0.3	0.2	0.2	0.2	0.3	1.7	1.4	1.3	1.9	1.5
Total Phosphorus as P	mg/L	0.12	0.14	0.08	0.08	0.15	0.01	0.02	0.01	0.02	0.02	0.03	0.02	0.03	0.01	0.02	< 0.01	0.13	0.05
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	0.01	< 0.01	-	0.03
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001
Arsenic	mg/L	< 0.001	0.008	0.008	0.001	0.01	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.002	0.002	-	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	4.52	5.45	2.33	5.81	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	-	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	< 0.001	0.777	0.793	0.771	0.834	-	0.007	0.008	0.018	0.003	0.005	0.003	0.002	-	0.014	0.01	-	0.002
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	0.001	< 0.001	< 0.001	0.002	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.003	0.004	0.005	0.005	0.004	0.005	0.005	0.004	0.004	0.004	0.002	0.002
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	-	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	< 0.001
Zinc	mg/L	0.006	< 0.005	< 0.005	< 0.005	< 0.005	-	0.008	0.007	**0.07**	0.008	0.008	**0.01**	**0.011**	**0.009**	**0.009**	0.007	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	< 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	< 5	-	-	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161
Sample Location		**MB64**	**MB65**	**MB65**	**MB65**	**MB68**	**MB68**	**MB68**	**MB69**	**MB69**	**MB69**	**MB6A**	**MB6A**	**MB6A**	**MB6A**	**MB6B**	**MB6B**	**MB70**	**MB70**
Date Sampled		30/05/2024	24/08/2023	20/11/2023	30/05/2024	28/08/2023	23/11/2023	11/06/2024	28/08/2023	17/10/2023	11/06/2024	12/07/2023	10/10/2023	30/01/2024	17/04/2024	21/11/2023	12/06/2024	28/08/2023	7/11/2023
Field Parameters	**Units**																		
Field pH	pH units	6.26	5.92	5.74	6.41	6.61	6.8	6.62	6.66	6.99	6.73	6.89	6.64	6.83	6.88	7.04	6.91	6.26	6.21
Field Electrical Conductivity (EC)	µS/cm	74.9	157	152.1	151	1119	1113	1247	2182	2160	2189	2629	2925	2581	2483	2651	655.6	325.3	338.5
Field Temperature	deg c	14.4	12.5	15.6	11.7	16.4	16.2	16.2	15.8	15.9	15.7	15.5	15.1	15.9	15.9	15.1	14.5	15.6	15.8
Physical Parameters																			
Electrical conductivity	µS/cm	82	-	158	165	-	1180	1300	-	2420	2460	2750	2990	2810	2800	2920	1090	-	352
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	29	71	70	68	257	262	277	583	583	588	355	350	359	348	359	188	141	140
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	29	71	70	68	257	262	277	583	583	588	355	350	359	348	359	188	141	140
Suspended Solids (SS)	mg/L	< 5	-	< 5	11	-	< 5	< 5	-	76	< 5	30	6	7	8	374	336	-	< 5
Total Dissolved Solids @180°C	mg/L	94	-	168	94	-	770	862	-	1710	1690	2480	2720	2490	2380	3260	836	-	254
Redox Potential	mV	222	229	340	249	229	208	310	229	314	185	53	181	150	125	156	290	229	282
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	< 1	< 1	< 1	< 1	107	97	111	522	496	511	1390	1620	1300	1480	1520	421	8	10
Chloride	mg/L	3	8	9	9	206	153	229	302	294	265	70	78	53	56	57	24	16	16
Calcium	mg/L	5	13	14	13	86	84	96	235	229	227	374	360	348	353	339	97	22	22
Magnesium	mg/L	4	8	8	10	56	54	61	134	128	126	167	178	161	149	179	52	17	16
Sodium	mg/L	6	7	8	9	98	92	106	171	160	168	162	170	160	155	173	62	25	25
Potassium	mg/L	< 1	2	2	3	2	2	2	4	4	4	1	1	1	1	< 1	10	3	3
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	1.3	1.65	1.62	1.25	13.2	11.4	10.9	0.12	0.02	< 0.01	2.46	0.5	2.25	1.33	4.53	3.45	4.91	4.62
Nitrite + Nitrate as N	mg/L	1.3	1.65	1.62	1.25	13.2	11.4	10.9	0.17	0.02	< 0.01	2.47	0.5	2.25	1.33	4.53	3.45	4.91	4.62
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.2	0.1	0.2	2.3	2.4	1.1	0.1	0.3	0.2	0.5	0.5	0.5	0.3	0.9	2.4	0.7	0.9
Total Nitrogen as N	mg/L	1.5	1.8	1.7	1.4	15.5	13.8	12	0.3	0.3	0.2	3	1	2.8	1.6	5.4	5.8	5.6	5.5
Total Phosphorus as P	mg/L	0.03	0.12	0.13	0.08	0.08	0.09	0.06	0.09	0.38	0.08	0.05	< 0.01	< 0.01	0.03	0.14	0.63	0.17	0.16
Dissolved Metals																			
Aluminium	mg/L	0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	**0.004**	**0.003**	**0.003**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.004	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	**0.004**	0.001	**0.002**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.001	**0.017**	< 0.001	< 0.001
Iron	mg/L	< 0.05	-	< 0.05	0.22	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.38	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	< 0.001	-	< 0.001	0.009	< 0.001	< 0.001	< 0.001	1.04	1.08	1.1	0.479	0.421	0.42	0.57	0.008	0.005	0.002	< 0.001
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	**0.001**	**0.0016**	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001
Molybdenum	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.002	0.002	0.001	0.002	< 0.001	< 0.001
Nickel	mg/L	0.002	0.002	< 0.001	0.003	< 0.001	< 0.001	< 0.001	0.003	0.002	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	**0.225**	**0.031**	**0.533**	< 0.005	< 0.005	< 0.005	**0.037**	**0.034**	**0.011**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179
Sample Location		**MB70**	**MB71**	**MB71**	**MB71**	**MB72**	**MB72**	**MB72**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB73**	**MB74**
Date Sampled		12/06/2024	31/08/2023	17/10/2023	11/06/2024	31/08/2023	7/11/2023	11/06/2024	31/07/2023	10/08/2023	12/09/2023	26/10/2023	20/11/2023	6/12/2023	9/01/2024	8/02/2024	5/03/2024	4/04/2024	7/07/2023
Field Parameters	**Units**																		
Field pH	pH units	6.61	5.52	6.53	6.59	6.23	6.76	6.93	-	5.28	5.01	5.73	4.7	5.6	6.65	5.64	5.9	5.83	7.3
Field Electrical Conductivity (EC)	µS/cm	354	170.8	298.1	464.2	228.2	254	242.9	-	49.57	68.69	66.26	62.47	66.86	68.46	74.37	79.21	77.03	130.1
Field Temperature	deg c	15.1	14.8	14.9	14.7	14	14.1	13.9	-	15.1	15.2	14.5	15.7	16.5	16	15.6	15.7	15.2	13.6
Physical Parameters																			
Electrical conductivity	µS/cm	384	-	325	434	-	265	262	-	-	58	-	-	85	74	76	82	84	143
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	-	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	161	37	75	123	122	144	143	11	14	14	-	-	22	19	20	18	26	53
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	-	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	161	37	75	123	122	144	143	11	14	14	-	-	22	19	20	18	26	53
Suspended Solids (SS)	mg/L	< 5	-	< 5	< 5	-	< 5	< 5	-	-	35	-	-	79	20	8	26	19	19
Total Dissolved Solids @180°C	mg/L	288	-	196	306	-	188	177	-	-	70	-	-	88	66	56	83	71	126
Redox Potential	mV	319	228	305	247	210	302	185	-	219	263	214	310	205	181	95	219	271	233
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	11	27	50	83	2	< 1	< 1	< 1	< 1	1	-	-	2	2	2	2	2	2
Chloride	mg/L	17	13	18	19	2	3	3	4	4	4	-	-	6	5	6	6	6	3
Calcium	mg/L	26	11	26	51	23	25	27	2	2	2	-	-	4	4	4	6	5	10
Magnesium	mg/L	20	6	12	16	12	12	14	2	2	2	-	-	2	2	3	3	2	6
Sodium	mg/L	28	16	19	21	11	11	12	6	6	5	-	-	8	6	7	6	6	8
Potassium	mg/L	4	1	2	2	3	3	4	< 1	< 1	< 1	-	-	< 1	< 1	1	< 1	< 1	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	4.35	0.87	0.87	< 0.01	0.81	0.63	1.62	1.6	1.76	1.76	-	-	1.5	1.14	1.26	1.29	0.98	1.93
Nitrite + Nitrate as N	mg/L	4.35	0.87	0.87	< 0.01	0.81	0.63	1.62	1.6	1.76	1.76	-	-	1.52	1.14	1.26	1.29	0.98	1.93
Total Kjeldahl Nitrogen as N	mg/L	0.7	< 0.1	0.2	1.2	< 0.1	< 0.1	0.2	0.2	0.2	0.4	-	-	0.6	0.2	0.3	0.4	0.3	0.3
Total Nitrogen as N	mg/L	5	0.9	1.1	1.2	0.8	0.6	1.8	1.8	2	2.2	-	-	2.1	1.3	1.6	1.7	1.3	2.2
Total Phosphorus as P	mg/L	0.14	0.06	0.1	0.07	0.09	0.1	0.09	0.17	0.15	0.19	-	-	0.18	0.12	0.08	0.11	0.07	0.09
Dissolved Metals																			
Aluminium	mg/L	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	0.05	-	-	0.03	0.03	0.01	< 0.01	0.01	0.07
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.002	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	-	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	**0.007**	< 0.001	< 0.001	< 0.001	-	**0.002**	**0.002**	-	-	**0.01**	**0.005**	**0.006**	**0.005**	**0.007**	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	< 0.001	0.01	0.014	0.018	< 0.001	< 0.001	< 0.001	-	-	0.004	-	-	0.045	0.075	0.096	0.098	0.087	0.005
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	-	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.001	< 0.001	-	-	0.004	0.004	0.004	0.004	0.004	0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	-	**0.023**	**0.038**	-	-	**0.21**	**0.188**	**0.196**	**0.285**	**0.26**	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197
Sample Location		**MB74**	**MB74**	**MB74**	**MB74**	**MB75**	**MB75**	**MB75**	**MB77A**	**MB77B**	**MB77B**	**MB77B**	**MB77B**	**MB78**	**MB78**	**MB78**	**MB78**	**MB78**	**MB78**
Date Sampled		10/07/2023	17/10/2023	28/05/2024	11/06/2024	7/07/2023	7/11/2023	11/06/2024	29/08/2023	29/08/2023	12/10/2023	30/01/2024	21/05/2024	27/07/2023	4/08/2023	11/09/2023	11/10/2023	21/11/2023	11/12/2023
Field Parameters	**Units**																		
Field pH	pH units	7.3	6.67	6.95	6.91	7.6	6.94	6.82	6.83	6.99	6.71	6.97	7.02	6.98	7.03	6.86	6.77	7.14	7.02
Field Electrical Conductivity (EC)	µS/cm	130.1	152.8	232.3	231.6	227.1	234.5	224.8	2139	2412	2654	2490	2410	1880	1876	1876	2001	1747	1748
Field Temperature	deg c	13.6	14.2	14.7	14.3	13.9	14.5	14.3	15.8	16.1	16.2	16.6	16.1	15.8	15.8	15.9	16	16.1	17.8
Physical Parameters																			
Electrical conductivity	µS/cm	244	178	257	250	-	244	239	-	-	2610	2680	2580	-	-	1990	2040	-	1870
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	132	79	132	138	-	132	137	427	425	422	416	416	505	490	508	474	-	475
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1
Total Alkalinity as $CaCO_3$	mg/L	132	79	132	138	-	132	137	427	425	422	416	416	505	490	508	474	-	475
Suspended Solids (SS)	mg/L	< 5	< 5	179	12	-	< 5	< 5	-	-	< 5	< 5	6	-	-	< 5	< 5	-	< 5
Total Dissolved Solids @180°C	mg/L	190	128	160	166	-	172	152	-	-	2350	2180	2160	-	-	1250	1260	-	1520
Redox Potential	mV	233	308	270	229	222	300	171	175	173	245	-69	212	32	219	299	122	-75	-42
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	< 1	6	4	4	-	< 1	< 1	743	991	1110	1020	954	423	433	441	463	-	386
Chloride	mg/L	3	4	4	4	-	2	2	199	162	138	154	138	222	203	197	254	-	197
Calcium	mg/L	18	15	23	24	-	18	19	208	292	310	283	285	165	164	153	160	-	155
Magnesium	mg/L	9	9	13	13	-	8	8	116	137	134	132	134	119	117	108	110	-	112
Sodium	mg/L	20	8	10	11	-	20	23	164	219	210	209	209	156	149	142	147	-	142
Potassium	mg/L	7	2	3	4	-	6	7	4	4	4	4	3	2	2	2	2	-	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01
Nitrate as N	mg/L	0.02	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	1.69	< 0.01	< 0.01	0.53	< 0.01	0.03	< 0.01	0.03	0.02	-	0.04
Nitrite + Nitrate as N	mg/L	0.02	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	1.7	< 0.01	< 0.01	0.53	< 0.01	0.03	< 0.01	0.03	0.02	-	0.04
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.1	0.5	0.1	-	< 0.1	0.1	0.5	0.2	0.2	0.2	0.3	0.2	0.3	0.1	0.1	-	0.1
Total Nitrogen as N	mg/L	0.2	0.1	0.5	0.1	-	< 0.1	0.1	2.2	0.2	0.2	0.7	0.3	0.2	0.3	0.1	0.1	-	0.1
Total Phosphorus as P	mg/L	0.18	0.03	0.08	< 0.01	-	0.14	0.11	0.07	0.09	0.1	0.09	0.06	0.07	0.07	0.06	0.04	-	0.09
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	-	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	**0.004**	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Iron	mg/L	0.11	< 0.05	< 0.05	< 0.05	-	0.13	0.1	< 0.05	1.29	1.54	1.76	1.8	-	-	< 0.05	< 0.05	-	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Manganese	mg/L	0.252	0.05	0.148	0.154	-	0.31	0.275	0.014	0.691	0.692	0.673	0.642	-	-	0.081	0.085	-	0.25
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001
Molybdenum	mg/L	0.003	< 0.001	< 0.001	< 0.001	-	0.002	0.003	< 0.001	0.002	0.002	0.001	0.002	-	-	0.002	< 0.001	-	0.001
Nickel	mg/L	< 0.001	0.002	0.002	0.003	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	-	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	-	< 0.005	< 0.005	**0.022**	< 0.005	< 0.005	< 0.005	< 0.005	-	-	< 0.005	< 0.005	-	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215
Sample Location		MB78	MB78	MB78	MB78	MB78	MB78	MB79	MB79	MB79	MB79	MB79	MB79	MB79	MB79	MB79	MB79	MB79	MB79
Date Sampled		8/01/2024	1/02/2024	6/03/2024	3/04/2024	6/05/2024	5/06/2024	27/07/2023	4/08/2023	11/09/2023	11/10/2023	21/11/2023	11/12/2023	8/01/2024	1/02/2024	6/03/2024	3/04/2024	6/05/2024	5/06/2024
Field Parameters	**Units**																		
Field pH	pH units	7.01	7.01	7.11	7.05	7.19	6.94	7.99	7.83	7.86	7.59	8.31	8.2	8.2	7.8	8.19	8.13	8.18	7.95
Field Electrical Conductivity (EC)	µS/cm	1795	1844	1773	1786	1784	1683	765.9	765.1	753.6	833.4	749.6	751.3	757.2	781.1	259.1	769.8	769.3	750.1
Field Temperature	deg c	15.8	16.3	16.1	16.1	16	15.8	17	16.8	17	17.1	17.4	17.8	17.2	17.5	17.5	17.3	17	16.4
Physical Parameters																			
Electrical conductivity	µS/cm	1930	2070	1990	1880	1840	1860	-	-	825	850	-	805	808	874	858	845	820	829
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	485	488	418	510	508	508	123	112	112	105	-	104	108	104	90	104	104	103
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	485	488	418	510	508	508	123	112	112	105	-	104	108	104	90	104	104	103
Suspended Solids (SS)	mg/L	6	< 5	< 5	< 5	< 5	< 5	-	-	< 5	< 5	-	< 5	6	< 5	< 5	< 5	< 5	< 5
Total Dissolved Solids @180°C	mg/L	1260	1340	1380	1250	1370	1200	-	-	440	470	-	545	490	498	511	506	514	519
Redox Potential	mV	-49	53	80	79	113	119	32	228	299	130	-152	-112	-103	223	165	123	183	29
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	414	388	374	359	356	345	195	187	221	205	-	188	191	200	184	187	192	201
Chloride	mg/L	203	196	174	176	187	174	83	65	63	63	-	63	62	67	64	66	61	58
Calcium	mg/L	156	169	158	171	166	153	12	12	12	12	-	13	10	13	11	13	8	13
Magnesium	mg/L	112	111	113	116	113	99	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sodium	mg/L	145	144	147	153	145	136	172	167	167	168	-	168	178	169	168	178	163	170
Potassium	mg/L	2	2	2	2	2	2	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.05	0.07	0.16	0.16	0.08	0.34	< 0.01	< 0.01	< 0.01	< 0.01	-	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrite + Nitrate as N	mg/L	0.05	0.07	0.16	0.16	0.08	0.34	< 0.01	< 0.01	< 0.01	< 0.01	-	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	0.1	0.1	0.2	< 0.1	0.2	0.3	0.2	0.2	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.2	< 0.1
Total Nitrogen as N	mg/L	0.2	0.2	0.4	0.2	0.3	0.6	0.2	0.2	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.2	< 0.1
Total Phosphorus as P	mg/L	0.06	0.06	0.07	0.04	0.06	0.04	0.1	0.15	0.09	0.08	-	0.12	0.1	0.1	0.1	0.09	0.08	0.09
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.221	0.231	0.223	0.016	0.016	0.067	-	-	0.009	0.009	-	0.008	0.005	0.005	0.006	0.008	0.004	0.011
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.003	< 0.001	0.001	0.001	0.001	0.001	-	-	0.003	0.002	-	0.004	0.011	0.002	0.004	0.004	0.003	0.004
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	-	-	< 0.005	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.006
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C16 - C34 Fraction	µg/L	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C34 - C40 Fraction	µg/L	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
Benzene	µg/L	-	-	-	< 1	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-
Ethylbenzene	µg/L	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Naphthalene	µg/L	-	-	-	< 5	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-
ortho-Xylene	µg/L	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Toluene	µg/L	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Total Xylenes	µg/L	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233
Sample Location		**MB7A**	**MB7A**	**MB7A**	**MB7A**	**MB7B**	**MB7B**	**MB80**	**MB80**	**MB80**	**MB80**	**MB81**	**MB81**	**MB81**	**MB81**	**MB81**	**MB82**	**MB82**	**MB82**
Date Sampled		10/07/2023	3/10/2023	30/01/2024	15/05/2024	3/10/2023	15/05/2024	7/07/2023	7/11/2023	23/01/2024	13/05/2024	31/07/2023	11/09/2023	10/10/2023	29/01/2024	16/04/2024	7/07/2023	7/08/2023	19/09/2023
Field Parameters	**Units**																		
Field pH	pH units	6.87	6.48	6.49	6.74	6.78	6.85	7.45	6.91	7.11	7.62	6.53	-	6.5	6.82	6.82	6.9	6.03	6.43
Field Electrical Conductivity (EC)	µS/cm	3043	3017	3504	3603	627.8	2407	557.9	564.3	533.6	548.8	1850	-	2028	1882	1916	244.8	239.2	238.1
Field Temperature	deg c	15	15.3	15.8	16.2	13.2	16.9	13.3	16.5	16.8	16.4	16.6	-	16.7	17.1	17.1	10.6	15.4	15.5
Physical Parameters																			
Electrical conductivity	µS/cm	3040	3360	3780	3880	737	2650	583	580	606	584	-	1990	2060	2130	2150	245	-	260
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	500	508	509	508	181	398	277	294	280	293	349	352	338	378	350	105	118	111
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	14	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	500	508	509	508	181	398	277	294	294	293	349	352	338	378	350	105	118	111
Suspended Solids (SS)	mg/L	< 5	< 5	< 5	6	255	119	< 5	< 5	< 5	< 5	-	< 5	5	< 5	< 5	13	-	73
Total Dissolved Solids @180°C	mg/L	2930	2970	3610	3560	516	2170	367	402	400	326	-	1470	1550	1650	1690	152	-	95
Redox Potential	mV	241	280	196	266	267	221	195	247	-25	59	239	-	264	160	245	257	16	295
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	1420	1650	1650	1990	158	1040	37	35	36	35	600	634	726	590	606	6	2	6
Chloride	mg/L	169	192	241	243	21	127	5	6	6	5	186	177	220	184	177	13	14	13
Calcium	mg/L	396	407	497	482	28	236	48	47	51	50	187	177	187	208	211	13	14	15
Magnesium	mg/L	190	186	225	256	26	162	32	30	33	34	118	114	118	114	127	17	18	18
Sodium	mg/L	179	175	192	222	111	254	39	38	40	39	119	117	121	117	135	10	10	10
Potassium	mg/L	3	3	3	3	< 1	1	3	3	4	3	2	2	2	2	2	3	4	4
Nutrients																			
Nitrite as N	mg/L	0.04	0.03	0.02	0.03	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	2.26	1.31	0.43	0.16	9.1	11.4	< 0.01	< 0.01	< 0.01	0.21	0.85	1	0.8	0.15	0.79	< 0.01	< 0.01	0.02
Nitrite + Nitrate as N	mg/L	2.3	1.34	0.45	0.19	9.19	11.4	< 0.01	< 0.01	< 0.01	0.21	0.85	1	0.8	0.15	0.79	< 0.01	< 0.01	0.02
Total Kjeldahl Nitrogen as N	mg/L	0.6	0.4	0.2	< 0.1	4.9	1.4	0.1	< 0.1	< 0.1	0.2	0.2	0.2	0.2	< 0.1	0.3	< 0.1	0.2	< 0.1
Total Nitrogen as N	mg/L	2.9	1.7	0.6	0.2	14.1	12.8	0.1	< 0.1	< 0.1	0.4	1	1.2	1	0.2	1.1	< 0.1	0.2	< 0.1
Total Phosphorus as P	mg/L	0.05	< 0.01	< 0.01	0.05	0.33	0.07	0.14	0.14	0.12	0.12	0.01	0.02	0.02	0.02	0.05	0.16	0.17	0.16
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Cadmium	mg/L	**0.0007**	**0.0006**	**0.0008**	**0.0008**	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Cobalt	mg/L	0.011	0.012	**0.015**	**0.016**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Copper	mg/L	< 0.001	< 0.001	0.001	< 0.001	**0.003**	0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	0.87	0.78	0.84	0.99	-	< 0.05	< 0.05	< 0.05	< 0.05	4.34	-	2.91
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Manganese	mg/L	0.49	0.504	0.607	0.592	0.001	0.01	0.28	0.275	0.278	0.306	-	0.306	0.313	0.483	0.365	0.328	-	0.271
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001
Molybdenum	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Nickel	mg/L	**0.022**	**0.022**	**0.026**	**0.028**	< 0.001	0.002	0.001	< 0.001	0.001	< 0.001	-	0.001	0.001	< 0.001	0.001	< 0.001	-	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Zinc	mg/L	**0.033**	**0.035**	**0.045**	**0.047**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	0.007	-	**0.039**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251
Sample Location		**MB82**	**MB82**	**MB82**	**MB82**	**MB82**	**MB82**	**MB82**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**	**MB83**
Date Sampled		30/10/2023	20/11/2023	6/12/2023	4/01/2024	6/02/2024	13/03/2024	10/04/2024	26/07/2023	13/09/2023	10/10/2023	21/11/2023	11/12/2023	8/01/2024	1/02/2024	6/03/2024	3/04/2024	6/05/2024	5/06/2024
Field Parameters	**Units**																		
Field pH	pH units	6.44	5.57	6.29	6.38	6.7	7.04	6.8	6.9	6.93	6.62	7.01	6.91	6.91	6.86	6.91	6.8	7	6.83
Field Electrical Conductivity (EC)	µS/cm	244.9	227.8	233	231.2	229.3	227.2	226.9	2052	2016	2248	2029	2044	2072	2131	2079	2093	2097	2033
Field Temperature	deg c	16.8	15.7	16.5	17.4	16.6	15.8	13.9	17	17.1	17.3	17.4	17.6	17.4	17.7	17.8	17.4	14.7	17
Physical Parameters																			
Electrical conductivity	µS/cm	-	-	259	250	241	247	247	2280	2220	2250	-	2210	2260	2300	2230	2220	2220	2330
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	108	-	110	110	109	108	104	407	444	437	-	441	447	435	369	425	429	419
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	108	-	110	110	109	108	104	407	444	437	-	441	447	435	369	425	429	419
Suspended Solids (SS)	mg/L	-	-	16	118	37	6	11	10	16	15	-	20	20	12	12	7	12	7
Total Dissolved Solids @180°C	mg/L	-	-	184	128	143	136	140	1690	1510	1580	-	1890	1710	1750	1730	1640	1910	1650
Redox Potential	mV	167	334	-38	3	165	207	172	113	163	216	-86	-97	-80	-69	-8	9	-10	-30
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	2	-	2	3	2	2	11	555	547	623	-	560	583	540	563	585	542	561
Chloride	mg/L	13	-	14	14	14	15	14	233	230	285	-	238	233	235	224	230	237	234
Calcium	mg/L	15	-	15	13	15	14	12	259	212	228	-	236	231	254	235	264	252	244
Magnesium	mg/L	17	-	17	16	17	17	15	125	111	117	-	120	115	119	120	129	123	112
Sodium	mg/L	8	-	11	9	9	9	9	139	122	130	-	128	129	132	130	144	139	134
Potassium	mg/L	4	-	4	3	4	4	3	2	2	2	-	2	2	2	2	2	2	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.02	-	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Nitrite + Nitrate as N	mg/L	0.02	-	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Total Kjeldahl Nitrogen as N	mg/L	0.2	-	0.2	< 0.1	< 0.1	0.2	< 0.1	0.4	0.3	0.5	-	1	0.5	0.4	0.5	0.1	0.3	0.2
Total Nitrogen as N	mg/L	0.2	-	0.2	< 0.1	< 0.1	0.2	< 0.1	0.4	0.3	0.5	-	1	0.5	0.4	0.5	0.1	0.3	0.2
Total Phosphorus as P	mg/L	0.03	-	0.1	0.14	0.07	0.07	0.01	0.06	0.06	0.06	-	0.1	0.06	0.05	0.05	0.04	0.06	0.05
Dissolved Metals																			
Aluminium	mg/L	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	-	-	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004	0.002	0.004	-	0.005	0.004	0.005	0.004	0.002	0.003	0.002
Cadmium	mg/L	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	0.002	0.003	-	0.003	0.003	0.003	0.003	0.002	0.002	0.001
Copper	mg/L	-	-	< 0.001	< 0.001	< 0.001	**0.003**	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	-	-	2.78	3.12	0.74	< 0.05	< 0.05	4.8	2.86	4.82	-	5.03	5.07	4.83	5.17	2.22	3.9	2.13
Lead	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	-	-	0.337	0.347	0.115	0.42	0.421	0.564	0.315	0.688	-	0.803	0.86	0.696	0.842	0.3	0.417	0.234
Mercury	mg/L	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001
Nickel	mg/L	-	-	< 0.001	0.002	< 0.001	< 0.001	0.001	< 0.001	0.002	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	-	-	**0.023**	**0.015**	**0.015**	**0.014**	**0.011**	< 0.005	< 0.005	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269
Sample Location		MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB84	MB85	MB85	MB85	MB85	MB85
Date Sampled		27/07/2023	4/08/2023	4/08/2023	11/09/2023	10/10/2023	21/11/2023	11/12/2023	8/01/2024	1/02/2024	6/03/2024	3/04/2024	6/05/2024	5/06/2024	26/07/2024	22/08/2023	21/09/2023	10/10/2023	29/01/2024
Field Parameters	**Units**																		
Field pH	pH units	6.76	6.81	-	6.71	6.58	7	6.84	6.79	6.84	6.87	6.83	7.07	6.85	6.96	6.92	7.07	6.84	7.06
Field Electrical Conductivity (EC)	µS/cm	1840	1841	-	1804	1998	1816	1834	1866	1927	1871	1896	1874	1807	1214	1214	1182	1261	1110
Field Temperature	deg c	16.8	16.7	-	16.6	16.8	17	17.4	16.8	16.9	17	16.9	16.7	16.7	16.5	16.4	16.4	16.6	17
Physical Parameters																			
Electrical conductivity	µS/cm	-	-	1980	1990	2070	-	2000	2000	2080	2050	2050	1950	2040	1320	-	1290	1290	1260
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	378	376	372	401	374	-	395	380	374	312	378	378	377	333	376	373	370	378
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	378	376	372	401	374	-	395	380	374	312	378	378	377	333	376	373	370	378
Suspended Solids (SS)	mg/L	-	-	< 5	115	14	-	6	9	10	< 5	< 5	< 5	6	< 5	-	6	< 5	6
Total Dissolved Solids @180°C	mg/L	-	-	1440	1330	1420	-	1780	1520	1640	1460	1530	1660	1500	894	-	810	780	733
Redox Potential	mV	117	266	-	298	258	108	45	34	256	74	96	101	83	162	132	173	203	252
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	554	580	575	536	650	-	592	638	574	634	612	614	584	111	95	113	89	80
Chloride	mg/L	170	157	146	155	187	-	158	156	150	145	143	135	133	177	160	154	180	144
Calcium	mg/L	185	181	149	172	188	-	189	197	204	195	210	201	193	114	104	98	98	96
Magnesium	mg/L	116	118	119	109	115	-	118	120	116	122	127	121	111	68	65	60	59	57
Sodium	mg/L	132	131	130	120	126	-	130	134	130	131	136	129	133	104	100	93	94	91
Potassium	mg/L	2	2	1	1	2	-	2	2	2	2	2	2	2	2	1	1	1	1
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	5.46	5.67	5.65	5.72	5.68	-	5.82	4.82	5.34	4.96	4.58	4.7	4.33	5.65	5.77	5.7	5.82	5.57
Nitrite + Nitrate as N	mg/L	5.46	5.67	5.65	5.72	5.68	-	5.82	4.82	5.34	4.96	4.58	4.7	4.33	5.65	5.77	5.7	5.82	5.57
Total Kjeldahl Nitrogen as N	mg/L	1.1	0.7	0.7	0.8	0.6	-	0.5	0.7	0.6	1	0.6	0.7	0.6	1.3	1.1	0.5	0.6	0.8
Total Nitrogen as N	mg/L	6.6	6.4	6.4	6.5	6.3	-	6.3	5.5	5.9	6	5.2	5.4	4.9	7	6.9	6.2	6.4	6.4
Total Phosphorus as P	mg/L	0.04	0.04	0.04	0.22	0.05	-	0.06	0.05	0.08	0.06	0.04	0.05	0.05	0.07	0.08	0.07	0.05	0.08
Dissolved Metals																			
Aluminium	mg/L	-	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Antimony	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	-	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Copper	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	-	-	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.26	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05
Lead	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	-	-	0.005	0.007	0.006	-	0.006	0.005	0.005	0.003	0.005	0.03	0.006	< 0.001	-	< 0.001	0.001	< 0.001
Mercury	mg/L	-	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	-	-	0.001	0.001	< 0.001	-	0.001	0.002	< 0.001	0.001	0.002	0.002	0.002	< 0.001	-	< 0.001	< 0.001	< 0.001
Nickel	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	-	-	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Silver	mg/L	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001
Zinc	mg/L	-	-	< 0.005	< 0.005	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
Sample Location		**MB85**	**MB86**	**MB86**	**MB86**	**MB86**	**MB86**	**MB86**	**MB87**	**MB87**	**MB87**	**MB87**	**MB87**	**MB87**	**MB87**	**MB88**	**MB88**	**MB88**	**MB88**
Date Sampled		16/04/2024	26/07/2023	22/08/2023	21/09/2023	10/10/2023	29/01/2024	16/04/2024	10/07/2023	22/08/2023	22/08/2023	21/09/2023	10/10/2023	16/01/2024	16/04/2024	27/07/2023	24/08/2023	12/09/2023	26/10/2023
Field Parameters	**Units**																		
Field pH	pH units	7.11	6.64	6.61	6.55	6.35	6.5	6.67	6.57	6.84	-	6.72	6.46	6.65	6.76	5.97	6	5.95	6.4
Field Electrical Conductivity (EC)	µS/cm	1113	3847	3939	3870	4226	3910	4100	2834	2795	-	2759	2291	2788	2840	356.1	363.2	400.7	388.9
Field Temperature	deg c	16.7	16.3	16.2	16.3	16.4	16.9	16.8	15.9	16.1	-	16.1	16.2	16.4	16.6	13.6	14	13.9	13
Physical Parameters																			
Electrical conductivity	µS/cm	1220	4290	-	4380	4360	4440	4670	3030	-	-	3100	3080	3060	3220	-	-	394	-
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-
Carbonate Alkalinity as $CaCO_3$	mg/L	375	346	407	408	405	413	413	450	445	443	444	441	453	461	70	66	64	-
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-
Total Alkalinity as $CaCO_3$	mg/L	375	346	407	408	405	413	413	450	445	443	444	441	453	461	70	66	64	-
Suspended Solids (SS)	mg/L	< 5	< 5	-	< 5	< 5	< 5	8	5	-	-	6	< 5	< 5	< 5	-	-	146	-
Total Dissolved Solids @180°C	mg/L	747	3480	-	4360	3050	4080	3940	2420	-	-	2380	2280	2780	2460	-	-	272	-
Redox Potential	mV	230	257	212	215	248	114	130	250	213	-	322	322	72	187	119	133	179	154
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	58	739	682	593	762	625	702	735	873	811	653	910	894	1000	27	26	30	-
Chloride	mg/L	144	916	894	888	1110	995	922	381	370	360	357	433	385	357	73	65	60	-
Calcium	mg/L	96	464	478	466	457	478	509	347	341	343	334	330	351	361	24	25	23	-
Magnesium	mg/L	56	234	228	217	219	214	239	170	176	180	169	171	184	183	17	13	13	-
Sodium	mg/L	98	195	181	177	171	173	207	155	162	164	151	155	165	171	30	28	28	-
Potassium	mg/L	1	3	2	2	2	2	2	2	2	2	2	2	2	2	4	3	3	-
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	-
Nitrate as N	mg/L	5.61	6.99	6.73	7.09	7	7	7.04	5.11	5.29	5.28	5.19	5.83	4.94	4.76	1.28	1.41	0.89	-
Nitrite + Nitrate as N	mg/L	5.61	6.99	6.73	7.09	7	7	7.04	5.11	5.29	5.28	5.19	5.83	4.94	4.78	1.28	1.41	0.89	-
Total Kjeldahl Nitrogen as N	mg/L	0.7	0.9	1.6	1.1	1.2	1.1	0.7	0.6	1.1	1.1	0.5	0.7	0.6	0.5	0.4	0.4	0.6	-
Total Nitrogen as N	mg/L	6.3	7.9	8.3	8.2	8.2	8.1	7.7	5.7	6.4	6.4	5.7	6.5	5.5	5.3	1.7	1.8	1.5	-
Total Phosphorus as P	mg/L	0.07	0.02	0.03	0.05	< 0.01	0.08	0.04	0.06	0.03	0.03	0.03	0.02	0.03	0.03	0.07	0.07	0.17	-
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	-
Antimony	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Cobalt	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	-	-	0.003	-
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	**0.003**	< 0.001	-
Iron	mg/L	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.05	-
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Manganese	mg/L	< 0.001	< 0.001	-	0.006	0.011	0.005	0.003	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	-	-	0.089	-
Mercury	mg/L	< 0.0001	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-
Molybdenum	mg/L	< 0.001	< 0.001	-	0.007	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	**0.058**	**0.054**	-
Selenium	mg/L	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	-
Silver	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	-
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	-	**0.75**	**0.588**	-
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	< 100	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100	-	-	-	-
>C16 - C34 Fraction	µg/L	< 100	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100	-	-	-	-
>C34 - C40 Fraction	µg/L	< 100	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	< 100	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100	-	-	-	-
Benzene	µg/L	< 1	-	-	-	-	-	< 1	-	-	-	-	-	-	< 1	-	-	-	-
Ethylbenzene	µg/L	< 2	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2	-	-	-	-
Naphthalene	µg/L	< 5	-	-	-	-	-	< 5	-	-	-	-	-	-	< 5	-	-	-	-
ortho-Xylene	µg/L	< 2	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2	-	-	-	-
Toluene	µg/L	< 2	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2	-	-	-	-
Total Xylenes	µg/L	< 2	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305
Sample Location		**MB88**	**MB88**	**MB88**	**MB88**	**MB88**	**MB88**	**MB88**	**MB88**	**MB8A**	**MB8A**	**MB8A**	**MB8A**	**MB8B**	**MB8B**	**MB90**	**MB90**	**MB90**	**MB90**
Date Sampled		20/11/2023	12/12/2023	9/01/2024	13/02/2024	13/03/2024	10/04/2024	10/05/2024	5/06/2024	10/07/2023	3/10/2023	30/01/2024	15/05/2024	3/10/2023	15/05/2024	26/07/2023	22/08/2023	21/09/2023	10/10/2023
Field Parameters	**Units**																		
Field pH	pH units	5.72	6.38	6.16	6.35	6.44	6.31	7.02	6.01	6.7	6.42	6.44	6.58	6.41	6.67	6.77	6.76	6.75	6.46
Field Electrical Conductivity (EC)	µS/cm	345.5	332	336	336.2	337.2	341.3	352.3	325.9	3470	3356	3539	3500	3342	3502	3494	3578	3522	3821
Field Temperature	deg c	17.4	20.5	19.7	21.5	18.4	11.9	15.6	12.3	15.5	15.9	16.4	16.2	14.4	16.7	16.7	16.4	16.6	16.5
Physical Parameters																			
Electrical conductivity	µS/cm	-	363	367	364	365	375	376	373	3600	3690	3820	3720	3680	3760	3960	-	3980	3980
Hydroxide Alkalinity as $CaCO_3$	mg/L	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	-	55	54	62	60	57	70	64	375	377	384	385	381	377	411	472	467	469
Bicarbonate Alkalinity as $CaCO_3$	mg/L	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	-	55	54	62	60	57	70	64	375	377	384	385	381	377	411	472	467	469
Suspended Solids (SS)	mg/L	-	66	36	42	22	95	42	13	26	12	10	10	16	45	6	-	6	6
Total Dissolved Solids @180°C	mg/L	-	305	268	290	252	267	284	277	2510	3430	3720	3640	3560	3590	3080	-	3260	2950
Redox Potential	mV	294	137	188	198	254	232	211	291	80	176	-32	66	207	36	218	199	181	242
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	-	30	33	28	27	34	30	31	2260	2280	2070	2300	2320	2250	1260	981	890	1220
Chloride	mg/L	-	54	52	54	55	55	49	45	116	102	124	114	123	121	550	557	543	662
Calcium	mg/L	-	23	24	27	24	22	26	25	579	594	620	592	571	595	403	406	388	388
Magnesium	mg/L	-	12	13	13	12	11	14	12	200	194	207	218	188	230	266	260	234	244
Sodium	mg/L	-	27	28	29	27	24	30	26	156	158	164	173	151	186	213	208	184	193
Potassium	mg/L	-	3	3	4	3	3	3	3	4	4	4	4	4	4	5	4	4	4
Nutrients																			
Nitrite as N	mg/L	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	-	1.88	1.49	1.66	1.36	1.32	1.3	1.4	0.03	< 0.01	0.53	< 0.01	0.01	0.08	< 0.01	< 0.01	0.01	0.01
Nitrite + Nitrate as N	mg/L	-	1.88	1.49	1.66	1.36	1.32	1.3	1.4	0.03	< 0.01	0.53	< 0.01	0.01	0.08	< 0.01	< 0.01	0.01	0.01
Total Kjeldahl Nitrogen as N	mg/L	-	0.3	0.2	1	0.2	0.5	0.2	0.3	0.2	0.1	0.2	0.2	0.1	0.1	< 0.1	0.1	< 0.1	< 0.1
Total Nitrogen as N	mg/L	-	2.2	1.7	2.7	1.6	1.8	1.5	1.7	0.2	0.1	0.7	0.2	0.1	0.2	< 0.1	0.1	< 0.1	< 0.1
Total Phosphorus as P	mg/L	-	0.23	0.09	0.17	0.02	0.13	0.14	0.06	0.12	0.06	0.03	0.03	0.08	0.07	0.03	0.04	0.04	0.01
Dissolved Metals																			
Aluminium	mg/L	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01
Antimony	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Arsenic	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.002	0.001	0.008	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002
Cobalt	mg/L	-	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.002	0.003	0.001	0.001	0.001	0.001	0.002	< 0.001	< 0.001	-	0.001	0.001
Copper	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	-	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	5.46	5.08	5.46	5.44	0.48	< 0.05	1.79	-	1.72	1.6
Lead	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	-	0.02	0.016	0.031	< 0.001	< 0.001	0.033	0.042	0.99	0.978	1.05	0.954	1.44	0.115	0.449	-	0.378	0.382
Mercury	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	-	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Nickel	mg/L	-	**0.063**	**0.061**	**0.065**	**0.06**	**0.086**	**0.105**	**0.099**	0.002	0.002	0.002	0.002	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01
Silver	mg/L	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001
Zinc	mg/L	-	**0.274**	**0.314**	**0.301**	**0.296**	**0.386**	**0.422**	**0.236**	0.006	0.006	0.006	0.006	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323
Sample Location		**MB90**	**MB90**	**MB90**	**MB92**	**MB92**	**MB92**	**MB92**	**MB92**	**MB92**	**MB92**	**MB92**	**MB93**	**MB93**	**MB93**	**MB93**	**MB93**	**MB93**	**MB93**
Date Sampled		29/01/2024	16/04/2024	27/05/2024	7/07/2023	21/08/2023	18/09/2023	4/10/2023	7/10/2023	15/01/2024	20/03/2024	8/04/2024	7/07/2023	8/08/2023	15/09/2023	4/10/2023	7/10/2023	15/01/2024	13/05/2024
Field Parameters	**Units**																		
Field pH	pH units	6.63	6.68	6.8	7.32	7.17	7.11	7.16	-	7.09	-	7.4	7.36	7.1	6.99	7.43	-	7.12	7.16
Field Electrical Conductivity (EC)	µS/cm	3485	3572	3508	856.2	603.7	594.5	566.7	-	570.7	-	573	1870	196.2	1811	2043	-	2108	1988
Field Temperature	deg c	17	16.9	16.9	13.2	16.4	16.7	16.3	-	17.7	-	17.5	15.3	16.1	16.2	16.1	-	16.8	16.4
Physical Parameters																			
Electrical conductivity	µS/cm	3940	4070	3910	612	-	621	-	631	618	2160	620	1960	-	2060	-	2130	2260	2210
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	483	486	487	63	71	67	-	73	69	342	77	376	416	408	-	445	471	472
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	483	486	487	63	71	67	-	73	69	342	77	376	416	408	-	445	471	472
Suspended Solids (SS)	mg/L	< 5	5	< 5	< 5	-	14	-	< 5	10	< 5	16	< 5	-	< 5	-	< 5	< 5	< 5
Total Dissolved Solids @180°C	mg/L	3320	3220	3230	442	-	442	-	456	532	1580	473	1500	-	1580	-	1600	1750	1560
Redox Potential	mV	98	119	65	235	-49	-57	291	-	120	-	192	112	150	306	274	-	-67	100
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	1100	1250	995	280	280	284	-	278	256	215	256	728	719	751	-	698	799	696
Chloride	mg/L	594	525	538	1	2	1	-	1	20	449	< 1	9	10	9	-	10	36	9
Calcium	mg/L	404	406	378	72	77	86	-	70	78	119	75	178	164	198	-	127	111	132
Magnesium	mg/L	242	253	232	29	30	34	-	30	32	137	26	67	72	70	-	53	52	53
Sodium	mg/L	189	209	181	12	12	16	-	13	19	130	10	250	278	250	-	314	431	372
Potassium	mg/L	4	4	4	1	1	2	-	2	2	9	1	2	2	2	-	2	3	3
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	0.02	0.06	0.28	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	0.64
Nitrite + Nitrate as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	0.02	0.06	0.28	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	0.64
Total Kjeldahl Nitrogen as N	mg/L	< 0.1	0.1	0.1	0.1	0.1	< 0.1	-	0.1	< 0.1	0.2	0.1	0.1	0.1	< 0.1	-	< 0.1	< 0.1	0.3
Total Nitrogen as N	mg/L	< 0.1	0.1	0.1	0.1	0.1	< 0.1	-	0.1	< 0.1	0.5	0.1	0.1	0.1	< 0.1	-	< 0.1	< 0.1	0.9
Total Phosphorus as P	mg/L	0.03	0.04	0.03	0.03	0.05	< 0.01	-	0.02	0.04	0.04	0.02	0.04	0.05	0.02	-	0.01	0.03	0.04
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	**0.015**	-	**0.034**	-	0.011	**0.049**	**0.058**
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	-	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.001	0.001	< 0.001	**0.02**	-	**0.016**	-	**0.023**	0.008	< 0.001	0.002	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Iron	mg/L	1.45	1.88	1.71	0.06	-	6.28	-	< 0.05	< 0.05	< 0.05	< 0.05	0.72	-	1.53	-	0.35	1.51	1.54
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.421	0.405	0.354	0.217	-	0.389	-	0.426	0.308	0.199	0.09	0.143	-	0.16	-	0.077	0.066	0.114
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	**0.005**	< 0.0001	< 0.0001	-	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	< 0.001	< 0.001	0.001	-	0.004	-	0.002	0.002	< 0.001	0.001	0.005	-	0.01	-	0.006	0.01	0.008
Nickel	mg/L	< 0.001	< 0.001	< 0.001	0.003	0.003	0.002	-	0.003	0.002	< 0.001	0.002	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	-	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	-	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	**5.92**	**5.03**	**4.36**	-	**3.8**	**3.87**	< 0.005	**1.37**	< 0.005	-	< 0.005	-	< 0.005	< 0.005	< 0.005
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	< 100	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100
>C16 - C34 Fraction	µg/L	-	< 100	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100
>C34 - C40 Fraction	µg/L	-	< 100	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100
>C10 - C40 Fraction (sum)	µg/L	-	< 100	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	< 100
Benzene	µg/L	-	< 1	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-	< 1
Ethylbenzene	µg/L	-	< 2	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2
Naphthalene	µg/L	-	< 5	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-	< 5
ortho-Xylene	µg/L	-	< 2	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2
Toluene	µg/L	-	< 2	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2
Total Xylenes	µg/L	-	< 2	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	< 2

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341
Sample Location		**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB96**	**MB97A**	**MB97A**	**MB97A**	**MB97A**	**MB97A**
Date Sampled		12/07/2023	10/08/2023	18/09/2023	26/10/2023	13/11/2023	13/12/2023	11/01/2024	12/02/2024	11/03/2024	11/04/2024	10/05/2024	27/05/2024	6/06/2024	31/07/2023	21/08/2023	6/09/2023	5/10/2023	13/11/2023
Field Parameters	**Units**																		
Field pH	pH units	7.28	7.31	7.31	7.43	7.11	7.36	7.39	7.33	7.46	7.42	7.43	7.37	7.27	-	7.37	7.2	7.5	7.04
Field Electrical Conductivity (EC)	µS/cm	944.6	979.6	968.9	1057	968.1	960.1	971.9	1011	979.7	1001	1014	1027	1155	-	1187	1192	1216	1272
Field Temperature	deg c	17.1	17.2	17.8	17.2	18.4	18.4	18.6	18	18.2	17.8	17.5	17.3	14.7	-	15.2	15.3	15	15.7
Physical Parameters																			
Electrical conductivity	µS/cm	1020	-	1040	992	1030	1040	1070	1070	1100	1090	1070	1100	1100	-	-	1320	1290	1390
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	309	327	312	330	326	328	336	334	301	333	348	337	333	318	290	292	319	323
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	309	327	312	330	326	328	336	334	301	333	348	337	333	318	290	292	319	323
Suspended Solids (SS)	mg/L	< 5	-	< 5	< 5	< 5	5	< 5	< 5	< 5	< 5	6	< 5	< 5	-	-	26	22	13
Total Dissolved Solids @180°C	mg/L	649	-	740	656	760	820	893	800	728	770	722	778	744	-	-	902	1030	1130
Redox Potential	mV	203	166	207	-187	270	-98	-106	65	109	74	37	-13	-14	-	-50	68	244	109
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	271	256	284	272	290	276	276	282	291	286	286	268	321	390	405	440	430	507
Chloride	mg/L	15	15	14	14	13	14	14	15	14	15	13	14	15	36	35	39	36	66
Calcium	mg/L	88	104	105	85	87	94	90	87	81	75	103	98	104	149	156	164	160	172
Magnesium	mg/L	65	68	67	64	69	71	71	74	68	56	69	66	70	67	70	68	70	74
Sodium	mg/L	67	71	70	67	70	74	76	85	74	68	85	74	90	47	50	45	50	52
Potassium	mg/L	3	3	2	2	3	2	3	3	3	2	3	2	3	3	2	2	2	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.01	< 0.01
Nitrate as N	mg/L	0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	0.04	< 0.01	0.03	< 0.01	0.03
Nitrite + Nitrate as N	mg/L	0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	0.05	< 0.01	0.03	0.01	0.03
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.1	0.1	0.1	0.1	< 0.1	0.2	0.4	0.1	0.2	0.1	0.2	0.2	0.4	0.4	0.3	0.1	0.2
Total Nitrogen as N	mg/L	0.2	0.1	0.1	0.1	0.1	< 0.1	0.2	0.4	0.1	0.2	0.1	0.2	0.2	0.4	0.4	0.3	0.1	0.2
Total Phosphorus as P	mg/L	0.05	< 0.01	0.01	0.01	0.02	0.04	< 0.01	0.02	0.02	0.02	0.03	0.02	0.04	0.03	0.06	0.06	0.03	0.04
Dissolved Metals																			
Aluminium	mg/L	0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	0.002	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.002	0.002	0.002	0.002
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.001	0.001	< 0.001	< 0.001
Iron	mg/L	0.26	-	0.31	0.23	0.26	0.24	0.21	0.24	0.25	0.18	< 0.05	0.3	0.3	-	-	0.08	0.34	1.21
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.278	-	0.272	0.247	0.16	0.246	0.233	0.249	0.243	0.231	0.16	0.216	0.252	-	-	0.402	0.34	0.365
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.02	-	0.021	0.018	0.018	0.014	0.021	0.019	0.017	0.018	0.022	0.02	**0.035**	-	-	0.007	0.007	0.008
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.002	0.002	0.001	0.001
Selenium	mg/L	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	**0.018**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	-	**13.3**	**16.8**	**16.7**	**18.3**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359
Sample Location		**MB97A**	**MB97A**	**MB97A**	**MB97A**	**MB97A**	**MB97A**	**MB97A**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**	**MB97B**
Date Sampled		6/12/2023	3/01/2024	20/02/2024	4/03/2024	8/04/2024	9/05/2024	5/06/2024	31/07/2023	21/08/2023	6/09/2023	5/10/2023	13/11/2023	6/12/2023	3/01/2024	16/02/2024	5/03/2024	8/04/2024	9/05/2024
Field Parameters	**Units**																		
Field pH	pH units	7.37	7.4	7.26	7.29	7.04	7.33	7.04	-	7.41	7.24	7.48	7.27	7.34	7.21	7.23	7.6	7.25	7.52
Field Electrical Conductivity (EC)	µS/cm	1285	1346	1327	1351	1365	1448	1471	-	384.5	340.1	314.2	333.5	314.9	322.7	330.6	351.3	367	338.7
Field Temperature	deg c	16.4	15.7	15.2	15.4	16.5	17.2	14.5	-	15.4	15.2	14.9	15.2	15.5	15.7	15.5	14.9	15.8	15.3
Physical Parameters																			
Electrical conductivity	µS/cm	1470	1460	1460	1510	1500	1590	1670	-	-	363	327	355	362	350	372	390	360	366
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	330	337	332	280	337	349	342	179	164	145	146	150	153	153	160	170	156	168
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	330	337	332	280	337	349	342	179	164	145	146	150	153	153	160	170	156	168
Suspended Solids (SS)	mg/L	13	16	26	7	6	91	16	-	-	94	28	154	14	6	19	41	9	34
Total Dissolved Solids @180°C	mg/L	1190	1340	1210	1230	1180	1260	1230	-	-	210	233	254	234	252	234	264	293	246
Redox Potential	mV	-102	-129	130	-71	56	-27	-93	-	-49	102	199	110	-87	-94	24	-5	-33	-3
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	474	498	491	495	496	531	589	54	38	33	34	32	25	26	30	32	28	26
Chloride	mg/L	42	43	42	43	44	45	45	7	7	7	6	6	6	6	9	6	5	6
Calcium	mg/L	171	161	180	185	181	210	216	44	44	41	36	37	39	37	43	46	42	46
Magnesium	mg/L	76	71	77	82	74	89	89	17	17	16	16	15	15	14	17	18	14	16
Sodium	mg/L	55	50	55	57	54	66	61	21	22	18	20	20	17	13	18	17	14	16
Potassium	mg/L	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2	1	2
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.06	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.02	0.02	< 0.01	0.08	0.03	< 0.01	0.06	< 0.01	< 0.01	0.04
Nitrite + Nitrate as N	mg/L	0.06	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.02	0.02	< 0.01	0.08	0.03	< 0.01	0.06	< 0.01	< 0.01	0.04
Total Kjeldahl Nitrogen as N	mg/L	0.5	1	0.5	0.3	0.3	0.4	0.1	0.3	0.4	6.1	0.2	0.3	0.2	0.2	0.5	0.5	0.3	0.4
Total Nitrogen as N	mg/L	0.6	1	0.5	0.3	0.3	0.4	0.1	0.3	0.4	6.1	0.2	0.4	0.2	0.2	0.6	0.5	0.3	0.4
Total Phosphorus as P	mg/L	0.05	0.07	0.04	0.05	0.01	0.16	0.02	0.08	0.21	0.21	0.18	0.22	0.14	0.11	0.17	0.31	0.1	0.15
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.003	0.003	0.002	0.005	0.003	0.006	0.006	-	0.002	0.003	0.003	0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	**0.004**	**0.002**	**0.002**	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.003**	< 0.001	< 0.001	< 0.001
Iron	mg/L	1.16	1.25	0.67	1.62	0.6	1.36	1.13	-	-	0.4	0.9	0.51	0.37	1.01	1.06	0.69	0.49	0.47
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.319	0.277	0.287	0.278	0.259	0.248	0.239	-	-	0.728	0.725	0.587	0.686	0.767	0.863	0.858	0.797	0.92
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.007	0.008	0.009	0.007	0.008	0.009	0.009	-	-	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.003
Nickel	mg/L	0.002	0.001	0.002	0.001	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**18.2**	**17.1**	**16.3**	**20.1**	**18.9**	**21.4**	**18.4**	-	**1.24**	**0.462**	**0.248**	**0.076**	**0.042**	**0.016**	**0.05**	**0.054**	**0.068**	**0.036**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-
>C16 - C34 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-
>C34 - C40 Fraction	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	< 100	-
Benzene	µg/L	-	-	-	-	< 1	-	-	-	-	-	-	-	-	-	-	-	< 1	-
Ethylbenzene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-
Naphthalene	µg/L	-	-	-	-	< 5	-	-	-	-	-	-	-	-	-	-	-	< 5	-
ortho-Xylene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-
Toluene	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-
Total Xylenes	µg/L	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	< 2	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377
Sample Location		**MB97B**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB97C**	**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99A**
Date Sampled		5/06/2024	31/07/2023	21/08/2023	6/09/2023	5/10/2023	13/11/2023	6/12/2023	3/01/2024	8/02/2024	5/03/2024	8/04/2024	9/05/2024	5/06/2024	31/07/2023	21/08/2023	6/09/2023	5/10/2023	22/11/2023
Field Parameters	**Units**																		
Field pH	pH units	7.39	-	7.43	7.15	7.82	7.13	7.22	7.13	6.99	7.41	7.1	7.4	7.37	-	7.43	7.06	7.41	7.48
Field Electrical Conductivity (EC)	µS/cm	380.3	-	906.9	982	730.1	952.9	923.5	1147	914.5	934.2	770	1089	1184	-	1840	1830	1820	1845
Field Temperature	deg c	15	-	12.9	12.9	14.9	17	19.1	20.5	22.9	21.7	21.3	18.7	16.2	-	15.4	15.3	14.9	15.5
Physical Parameters																			
Electrical conductivity	µS/cm	432	-	-	1060	789	1070	1110	1260	1000	1060	871	1160	1330	-	-	1990	1920	1910
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	186	221	84	105	88	103	87	126	84	112	120	124	100	360	322	315	324	335
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	186	221	84	105	88	103	87	126	84	112	120	124	100	360	322	315	324	335
Suspended Solids (SS)	mg/L	54	-	-	390	126	412	133	100	22	115	< 5	92	265	-	-	54	39	59
Total Dissolved Solids @180°C	mg/L	296	-	-	788	596	923	900	1240	854	858	670	944	1120	-	-	1450	1710	1620
Redox Potential	mV	-1	-	-10	160	187	148	25	49	143	124	134	138	133	-	-93	-45	0	-167
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	40	515	457	491	363	561	503	640	482	459	371	557	727	733	842	746	806	774
Chloride	mg/L	6	4	2	3	1	2	2	3	< 1	4	4	3	2	74	81	72	68	60
Calcium	mg/L	51	203	175	201	136	177	192	207	173	176	164	224	241	205	207	216	198	212
Magnesium	mg/L	17	34	29	30	29	38	28	34	30	38	29	41	43	116	118	114	110	114
Sodium	mg/L	17	13	9	12	12	16	12	15	13	16	12	17	17	125	129	123	117	123
Potassium	mg/L	2	3	2	3	2	3	3	3	4	3	3	3	3	3	3	3	3	3
Nutrients																			
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	0.7	0.85	0.54	0.74	0.64	1.87	1.28	1.47	0.7	0.46	0.51	0.32	0.05	0.05	< 0.01	< 0.01	0.02
Nitrite + Nitrate as N	mg/L	< 0.01	0.7	0.85	0.54	0.74	0.66	1.87	1.28	1.48	0.7	0.46	0.51	0.32	0.05	0.05	< 0.01	< 0.01	0.02
Total Kjeldahl Nitrogen as N	mg/L	0.3	0.5	0.3	0.5	0.3	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2
Total Nitrogen as N	mg/L	0.3	1.2	1.2	1	1	0.8	2.2	1.4	1.8	0.8	0.7	0.6	0.5	0.2	0.4	0.2	0.2	0.2
Total Phosphorus as P	mg/L	0.17	0.38	0.15	2.24	0.38	0.2	0.35	0.3	0.03	0.08	0.06	0.15	0.37	0.02	0.04	0.06	0.04	0.02
Dissolved Metals																			
Aluminium	mg/L	< 0.01	-	-	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.002	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.001	0.001	0.002	0.005
Cadmium	mg/L	< 0.0001	-	< 0.0001	0.0001	< 0.0001	0.0001	< 0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	0.003	0.003	0.001
Copper	mg/L	< 0.001	-	0.001	**0.002**	**0.007**	< 0.001	< 0.001	**0.003**	**0.003**	< 0.001	0.001	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	**0.002**
Iron	mg/L	0.61	-	-	< 0.05	< 0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	8.48	5.05	16.6
Lead	mg/L	< 0.001	-	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.96	-	-	< 0.001	0.002	0.003	0.001	< 0.001	< 0.001	0.004	0.002	0.001	0.012	-	-	0.713	0.7	0.667
Mercury	mg/L	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.005	-	-	0.02	0.022	0.019	0.018	0.024	0.027	0.022	0.025	0.022	0.018	-	-	0.012	0.013	0.004
Nickel	mg/L	< 0.001	-	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	0.005	0.004	0.004	0.003
Selenium	mg/L	< 0.01	-	-	0.01	0.01	0.01	**0.02**	0.01	**0.02**	0.01	**0.02**	0.01	**0.02**	-	-	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.016**	-	**0.142**	**0.053**	**0.099**	**0.042**	**0.043**	**0.044**	**0.04**	**0.034**	**0.018**	**0.024**	**0.024**	-	**9.23**	**9.23**	**6.83**	**0.923**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	-	-	-	-	-	< 100	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	-	-	-	-	-	< 1	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	-	-	-	-	-	< 5	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	-	-	-	-	-	< 2	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395
Sample Location		**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99A**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**	**MB99B**
Date Sampled		6/12/2023	3/01/2024	6/02/2024	11/03/2024	22/03/2024	8/04/2024	10/05/2024	6/06/2024	31/07/2023	21/08/2023	6/09/2023	5/10/2023	13/11/2023	6/12/2023	3/01/2024	6/02/2024	11/03/2024	22/03/2024
Field Parameters	**Units**																		
Field pH	pH units	6.85	7.46	7.29	7.19	7.23	7.1	7.25	7.14	-	7.01	6.6	7.06	6.74	7.31	6.83	6.84	6.83	6.89
Field Electrical Conductivity (EC)	µS/cm	3055	1930	1932	1904	1918	1730	1942	2106	-	298.3	3021	3051	3087	1836	3197	3143	3581	3787
Field Temperature	deg c	16.6	15.9	15.4	15.7	15.3	15.5	15.1	15.1	-	15.6	15.5	15	15.6	16.2	16	15.6	16.7	15.4
Physical Parameters																			
Electrical conductivity	µS/cm	3470	2030	1980	2050	2020	2040	2040	1960	-	-	3420	3320	3420	2060	3580	3360	3990	3960
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	286	334	329	300	330	336	353	344	306	285	288	286	281	324	291	255	337	428
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	286	334	329	300	330	336	353	344	306	285	288	286	281	324	291	255	337	428
Suspended Solids (SS)	mg/L	8	52	53	54	46	65	54	61	-	-	15	6	56	40	43	23	124	9
Total Dissolved Solids @180°C	mg/L	3090	2020	1750	1660	1540	1850	1600	1570	-	-	2910	2820	3130	1710	3400	3400	3470	3290
Redox Potential	mV	132	-173	-100	-139	-131	-30	-107	-115	-	-99	-22	178	239	-120	43	67	165	156
Major Ions																			
Sulfate as SO_4 - Turbidimetric	mg/L	1500	827	742	759	808	778	640	704	1570	1710	1800	1480	1700	782	1590	1190	1590	1530
Chloride	mg/L	163	63	57	62	65	64	61	66	160	175	194	156	179	64	204	109	254	312
Calcium	mg/L	316	194	202	203	212	209	224	215	292	336	372	313	332	205	316	271	323	340
Magnesium	mg/L	214	111	116	118	120	111	117	118	196	224	225	209	218	115	214	208	250	254
Sodium	mg/L	235	118	122	123	130	124	137	134	194	223	217	224	232	126	210	273	309	275
Potassium	mg/L	2	3	4	3	4	3	3	3	2	2	1	1	1	3	1	1	1	1
Nutrients																			
Nitrite as N	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.16	0.09	0.04	0.04	0.06	< 0.01	0.02	0.02	0.06	0.03
Nitrate as N	mg/L	34.8	< 0.01	0.03	0.04	< 0.01	0.13	0.03	0.03	19.9	23.1	30.6	33.5	32.4	0.1	34.2	48.1	30.1	26.9
Nitrite + Nitrate as N	mg/L	34.8	< 0.01	0.03	0.04	< 0.01	0.13	0.03	0.03	20.1	23.2	30.6	33.5	32.5	0.1	34.2	48.1	30.2	26.9
Total Kjeldahl Nitrogen as N	mg/L	5.4	0.3	0.7	0.6	0.6	1.8	0.9	0.7	3.1	4.4	3.5	3.2	1.6	0.7	8.4	1.7	4.8	3.6
Total Nitrogen as N	mg/L	40.2	0.3	0.7	0.6	0.6	1.9	0.9	0.7	23.2	27.6	34.1	36.7	34.1	0.8	42.6	49.8	35	30.5
Total Phosphorus as P	mg/L	0.03	0.02	0.05	0.03	0.04	0.08	0.04	0.04	0.07	0.08	0.04	0.04	0.05	0.05	0.03	0.08	0.2	0.02
Dissolved Metals																			
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	0.01	**0.027**	**0.029**	**0.018**	0.012	**0.016**	0.01	-	< 0.001	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	-	0.0001	0.0002	< 0.0001	0.0001	< 0.0001	0.0001	0.0001	0.0001	0.0002
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	0.002	0.002	0.002	0.002	0.001	0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.001	**0.002**	**0.002**	< 0.001	**0.002**	**0.002**	< 0.001	< 0.001	-	**0.002**	< 0.001	< 0.001	**0.002**	0.001	**0.004**	< 0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	10.6	9.18	12.2	8.37	10.2	16.8	16.3	-	-	< 0.05	< 0.05	< 0.05	5.42	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.207	0.703	0.737	0.793	0.762	0.715	0.736	0.666	-	-	0.192	0.214	0.229	0.739	0.235	0.274	0.292	0.282
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.001	0.009	0.012	0.007	0.007	0.006	0.006	0.005	-	-	0.002	< 0.001	0.001	0.011	< 0.001	0.002	0.002	0.002
Nickel	mg/L	0.001	0.004	0.004	0.004	0.004	0.003	0.002	< 0.001	-	0.004	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	0.01	< 0.01	< 0.01	< 0.01	**0.03**	< 0.01	< 0.01	< 0.01	-	-	0.01	0.01	0.01	< 0.01	0.01	**0.02**	0.01	0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.427**	**1.37**	**1.3**	**0.606**	**0.344**	**0.124**	**0.014**	< 0.005	-	**7.14**	**0.284**	**0.233**	**0.448**	**2.58**	**0.202**	0.014	**0.039**	**0.009**
Hydrocarbons																			
>C10 - C16 Fraction	µg/L	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	-	-	-	-	-	< 100	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	-	-	-	-	-	< 1	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	-	-	-	-	-	< 5	-	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	-	-	-	-	-	< 2	-	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412
Sample Location		**MB99B**	**MB99B**	**MB99B**	**MB9A**	**MB9A**	**MB9A**	**MB9A**	**MB9A**	**MB9B**	**MB9B**	**TW05MB**	**TW05MB**	**TW05MB**	**TW05MB**	**TW05MB**	**TW05MB**	**TW05MB**
Date Sampled		8/04/2024	10/05/2024	6/06/2024	10/07/2023	3/10/2023	30/01/2024	15/05/2024	27/05/2024	3/10/2023	15/05/2024	26/07/2023	23/08/2023	19/09/2023	12/10/2023	11/01/2024	10/05/2024	27/05/2024
Field Parameters	**Units**																	
Field pH	pH units	6.75	6.97	6.69	6.9	6.59	6.73	7.89	6.88	6.62	6.88	7.3	7.24	7.39	7.07	7.37	7.35	7.42
Field Electrical Conductivity (EC)	µS/cm	3686	3719	3992	3434	3333	3512	3518	3446	3218	3367	658	677.1	667.4	716.4	645.3	663.7	649.4
Field Temperature	deg c	15.3	15.2	15	15.4	16.1	16.3	16.4	16.4	14.8	17.4	14.5	13.7	14.5	15	16	16.4	15.8
Physical Parameters																		
Electrical conductivity	µS/cm	3680	3900	3940	3540	3690	3800	3810	3860	3510	3640	-	-	685	700	695	691	689
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	370	446	413	424	422	422	425	427	366	379	278	324	321	333	332	346	334
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity as $CaCO_3$	mg/L	370	446	413	424	422	422	425	427	366	379	278	324	321	333	332	346	334
Suspended Solids (SS)	mg/L	< 5	< 5	< 5	22	12	11	30	5	137	56	-	-	70	40	61	58	14
Total Dissolved Solids @180°C	mg/L	3240	3370	3260	3300	3600	3740	3660	3810	3510	3480	-	-	427	440	454	394	434
Redox Potential	mV	273	311	296	244	187	200	242	180	282	168	-69	-66	-95	-41	-156	-147	-86
Major Ions																		
Sulfate as SO_4 - Turbidimetric	mg/L	1560	1580	1640	2290	2280	2020	2320	1980	2230	2180	51	15	15	15	13	11	13
Chloride	mg/L	296	351	308	78	57	55	57	56	65	49	36	34	34	36	35	34	34
Calcium	mg/L	381	413	390	524	530	533	509	503	504	495	59	61	52	66	64	63	56
Magnesium	mg/L	237	261	239	236	230	238	259	233	218	245	38	40	35	39	38	39	38
Sodium	mg/L	258	294	272	187	187	184	201	177	181	214	38	42	36	40	40	44	38
Potassium	mg/L	1	1	1	4	4	3	3	3	2	2	1	1	1	2	2	1	1
Nutrients																		
Nitrite as N	mg/L	0.01	0.04	0.03	0.04	0.02	0.04	0.04	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	29	25.9	25.4	1.02	0.7	1.62	1.27	1.23	12.7	10.5	0.02	0.06	< 0.01	0.02	0.02	< 0.01	< 0.01
Nitrite + Nitrate as N	mg/L	29	25.9	25.4	1.06	0.72	1.66	1.31	1.26	12.7	10.5	0.02	0.06	< 0.01	0.02	0.02	< 0.01	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	3.8	6.6	1.2	0.3	0.3	0.4	0.5	0.5	4.2	1.3	0.3	0.2	< 0.1	< 0.1	0.2	< 0.1	0.2
Total Nitrogen as N	mg/L	32.8	32.5	26.6	1.4	1	2.1	1.8	1.8	16.9	11.8	0.3	0.3	< 0.1	< 0.1	0.2	< 0.1	0.2
Total Phosphorus as P	mg/L	0.01	< 0.01	0.02	0.06	0.02	0.03	0.03	< 0.01	0.18	0.06	0.07	0.06	0.04	0.02	< 0.01	0.08	0.01
Dissolved Metals																		
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	< 0.001	0.002	0.002	0.002	0.002	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Cadmium	mg/L	0.0002	0.0002	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	0.008	0.007	0.007	0.006	0.005	< 0.001	< 0.001	-	-	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.002**	< 0.001	-	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	6.98	7.25	8.39	10.3	3.3
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.335	0.36	0.346	1.77	1.64	1.36	1.16	1.09	0.017	0.072	-	-	0.154	0.173	0.176	0.195	0.141
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.001	0.002	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	0.008	0.008	0.007	0.007	0.006	0.001	0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	0.005	0.006	0.006	**0.021**	0.005	0.006	< 0.005	< 0.005	0.007	< 0.005	-	**0.032**	0.005	**0.012**	**0.014**	< 0.005	< 0.005
Hydrocarbons																		
>C10 - C16 Fraction	µg/L	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C16 - C34 Fraction	µg/L	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C34 - C40 Fraction	µg/L	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>C10 - C40 Fraction (sum)	µg/L	< 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	µg/L	< 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	µg/L	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	< 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ortho-Xylene	µg/L	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	µg/L	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Xylenes	µg/L	< 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

Analytes with trigger (WMP)
Exceeding trigger (WMP)
Exceeding limits (Eco-95)
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sample Location		**MB102**	**MB102**	**MB102**	**MB102**	**MB102**	**MB102**	**MB102**	**MB102**	**MB103**	**MB103**	**MB103**	**MB103**	**MB103**	**MB103**	**MB103**	**MB103**
Date Sampled		30/10/2023	28/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024	22/04/2024	18/06/2024	31/10/2023	1/11/2023	27/11/2023	12/12/2023	22/01/2024	26/02/2024	27/03/2024	23/04/2024
Field Parameters	**Units**																
Field pH	pH units	7.31	7.46	7.29	7.15	7.1	7.14	7.38	7.21	**9.09**	**9.09**	**8.58**	**8.58**	**8.76**	7.38	7.47	8.18
Field Electrical Conductivity (EC)	µS/cm	780.3	780.3	839.1	906.7	1126	1174	1062	1039	883.1	883.1	869.5	868	851.1	863.5	889.4	905
Field Temperature	deg c	16.7	16.5	-	16.9	16.9	16.5	16.8	15.9	16.1	16.1	17.8	16.9	17	16.8	16.3	16.2
Physical Parameters																	
Electrical conductivity	µS/cm	759	785	886	1040	1090	1220	1060	1070	865	-	942	923	1010	969	943	928
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	10	-	7	6	< 1	14	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	166	171	194	215	213	220	214	195	97	-	165	161	134	98	117	141
Total Alkalinity as $CaCO_3$	mg/L	166	171	194	215	213	220	214	195	106	-	171	166	134	112	117	141
Suspended Solids (SS)	mg/L	7	7	< 5	6	< 5	< 5	< 5	5	< 5	-	12	10	32	17	36	< 5
Total Dissolved Solids @180°C	mg/L	559	624	648	730	706	880	792	760	514	-	680	583	570	556	550	512
Redox Potential	mV	138	198	53	-115	-65	281	41	217	-	-	131	-90	-140	83	274	22
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	175	187	237	253	326	401	390	363	90	-	74	80	108	119	132	121
Chloride	mg/L	25	23	24	24	25	24	24	22	102	-	175	167	166	154	139	159
Calcium	mg/L	75	69	76	87	97	108	94	105	24	-	35	35	32	33	40	37
Magnesium	mg/L	26	32	35	45	44	71	52	51	16	-	36	31	25	22	20	19
Sodium	mg/L	58	64	67	72	75	86	75	79	120	-	116	115	129	129	129	124
Potassium	mg/L	3	2	3	3	4	3	3	4	7	-	6	6	6	6	8	7
Nutrients																	
Nitrite as N	mg/L	0.02	0.03	0.11	2.9	0.09	0.04	< 0.01	0.03	0.21	-	0.5	0.32	0.25	0.05	0.35	< 0.01
Nitrate as N	mg/L	8.6	9.3	6.21	1.08	3.03	5.76	2.56	2.29	1.57	-	2.76	2.4	1.37	1.1	0.84	< 0.01
Nitrite + Nitrate as N	mg/L	8.62	9.33	6.32	3.98	3.12	5.8	2.56	2.32	1.78	-	3.26	2.72	1.62	1.15	1.19	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	1	0.8	1.8	2.7	3	1.3	2.8	2.8	2.2	-	0.5	0.7	1.1	0.4	0.5	3.4
Total Nitrogen as N	mg/L	9.6	10.1	8.1	6.7	6.1	7.1	5.4	5.1	4	-	3.8	3.4	2.7	1.6	1.7	3.4
Total Phosphorus as P	mg/L	0.46	0.42	0.55	0.55	0.59	0.35	0.52	0.45	0.08	-	0.15	0.2	0.24	0.18	0.15	0.44
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.001	0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	-	0.001	0.001	0.001	0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	**0.002**	< 0.001	**0.001**	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	0.06	0.11	< 0.05	0.14	0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.027	0.026	0.034	0.052	0.078	0.047	0.058	0.047	0.012	-	0.035	0.03	0.016	0.011	0.021	0.041
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.004	0.004	0.004	0.002	0.003	0.001	0.002	0.003	0.021	-	0.023	0.023	0.02	0.025	0.017	0.021
Nickel	mg/L	0.007	0.004	0.004	0.002	0.002	0.001	0.003	0.007	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.058**	**0.024**	**0.023**	**0.008**	< 0.005	< 0.005	< 0.005	**0.013**	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sample Location		MB103	MB104	MB104	MB104	MB104	MB104	MB104	MB104	MB104	MB104	MB105	MB105	MB105	MB105	MB105	MB105
Date Sampled		28/05/2024	31/10/2023	1/11/2023	27/11/2023	12/12/2023	23/01/2024	27/02/2024	26/03/2024	26/04/2024	18/06/2024	31/10/2023	27/11/2023	12/12/2023	22/01/2024	27/02/2024	26/03/2024
Field Parameters	**Units**																
Field pH	pH units	7.84	7.82	7.82	7.81	7.65	7.6	7.61	8.12	7.3	7.35	7.87	7.91	**11.29**	7.83	**11.1**	7.86
Field Electrical Conductivity (EC)	µS/cm	908.5	526.1	526.1	476	484.1	497.2	518.4	535.4	547.6	561.7	946.3	828.1	807.4	775.9	736.7	801.8
Field Temperature	deg c	16.8	15.7	15.7	15.7	16	16	16.2	15.8	15.7	15.4	16.9	17.8	17.5	17.7	17.8	17.2
Physical Parameters																	
Electrical conductivity	µS/cm	1090	512	-	508	514	563	576	570	565	570	920	895	565	555	912	541
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	-	< 1	< 1	23	< 1	< 1	9	< 1	< 1	< 1	29	6	< 1	32
Bicarbonate Alkalinity as $CaCO_3$	mg/L	298	272	-	276	277	270	287	302	304	294	428	423	118	33	346	31
Total Alkalinity as $CaCO_3$	mg/L	298	272	-	276	277	293	287	302	314	294	428	423	147	39	346	63
Suspended Solids (SS)	mg/L	< 5	< 5	-	< 5	6	< 5	< 5	< 5	< 5	< 5	154	261	200	146	12	80
Total Dissolved Solids @180°C	mg/L	650	344	-	318	378	390	354	348	288	356	549	510	382	400	481	304
Redox Potential	mV	-224	-	-	-12	24	-59	2	-74	-154	28	-134	-133	7	-60	101	115
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	53	9	-	8	8	7	7	8	10	7	22	25	38	47	30	42
Chloride	mg/L	170	10	-	10	12	13	15	16	17	17	61	59	101	109	74	90
Calcium	mg/L	47	63	-	59	62	65	70	72	74	77	60	54	38	34	51	8
Magnesium	mg/L	48	20	-	20	19	22	22	22	22	24	66	62	10	< 1	43	9
Sodium	mg/L	106	30	-	31	30	31	32	30	29	30	53	58	77	75	68	73
Potassium	mg/L	6	3	-	3	3	3	3	4	3	3	10	9	13	12	11	12
Nutrients																	
Nitrite as N	mg/L	0.03	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.6	0.9	2.55	2.9	1.1	2.18
Nitrate as N	mg/L	2.02	0.02	-	0.06	0.08	0.03	< 0.01	0.1	0.07	< 0.01	0.28	0.45	2.21	2.28	1.68	1.49
Nitrite + Nitrate as N	mg/L	2.05	0.02	-	0.06	0.08	0.03	< 0.01	0.1	0.07	< 0.01	0.88	1.35	4.76	5.18	2.78	3.67
Total Kjeldahl Nitrogen as N	mg/L	1.7	0.1	-	< 0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.5	1.2	1.6	2.2	1.1	1
Total Nitrogen as N	mg/L	3.8	0.1	-	< 0.1	0.2	0.1	0.1	0.3	0.3	0.2	1.4	2.6	6.4	7.4	3.9	4.7
Total Phosphorus as P	mg/L	0.17	0.16	-	0.2	0.22	0.18	0.16	0.16	0.14	0.17	0.11	0.25	0.14	0.16	0.05	0.06
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.1**	**0.08**	0.04	**0.09**
Antimony	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	0.007	-	0.009	0.01	0.012	**0.017**	**0.019**	**0.026**	**0.027**	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.001**	< 0.001	**0.001**
Cobalt	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	0.07	0.06	0.19	0.16	0.55	0.23	< 0.05	< 0.05	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.033	0.017	-	0.025	0.02	0.028	0.058	0.277	0.342	0.23	0.115	0.105	0.002	< 0.001	0.05	< 0.001
Mercury	mg/L	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.01	0.005	-	0.005	0.004	0.005	0.005	0.003	0.004	0.003	0.012	0.014	0.028	0.017	0.02	0.022
Nickel	mg/L	< 0.001	< 0.001	-	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.002	< 0.001	0.002
Selenium	mg/L	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

CAD5020.001 Groundwater quality data

		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Sample Location		**MB105**	**MB105**	**MB106**	**MB106**	**MB106**	**MB106**	**MB106**	**MB106**	**MB106**	**MB107**	**MB107**	**MB107**	**MB107**	**MB107**	**MB107**	**MB107**
Date Sampled		26/04/2024	18/06/2024	31/10/2023	27/11/2023	12/12/2023	22/01/2024	27/02/2024	26/03/2024	26/04/2024	31/10/2023	27/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024	26/04/2024
Field Parameters	**Units**																
Field pH	pH units	**11.08**	7.34	**12.37**	**11.76**	**11.62**	**11.35**	**11.22**	**11.54**	**11.65**	7.93	7.91	7.91	7.31	7.71	7.52	7.68
Field Electrical Conductivity (EC)	µS/cm	738.5	903.5	1320	1244	937	726.1	614.6	1028	1199	1223	1092	1096	1097	1109	1125	1128
Field Temperature	deg c	17.1	16.5	16.3	17.3	17.6	17.5	18.1	17.2	16.7	17	17.3	17.3	17.7	17.5	17.2	17
Physical Parameters																	
Electrical conductivity	µS/cm	778	930	1570	949	587	483	697	799	868	1210	1170	1190	1240	1250	1220	1170
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	243	122	39	< 1	86	101	136	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	7	< 1	158	94	122	88	87	93	72	< 1	< 1	< 1	< 1	< 1	< 1	10
Bicarbonate Alkalinity as $CaCO_3$	mg/L	284	427	< 1	< 1	< 1	74	< 1	< 1	< 1	295	287	291	262	274	285	273
Total Alkalinity as $CaCO_3$	mg/L	292	427	401	217	161	162	174	194	208	295	287	291	262	274	285	282
Suspended Solids (SS)	mg/L	12	17	206	55	72	198	156	76	48	56	114	78	581	21	21	10
Total Dissolved Solids @180°C	mg/L	416	486	558	416	413	359	362	405	422	810	754	788	834	692	778	720
Redox Potential	mV	-29	-57	-62	-20	-32	-84	39	34	-59	75	-101	-87	-55	-68	173	-60
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	38	21	36	37	36	39	41	32	36	61	62	61	70	68	75	75
Chloride	mg/L	75	53	34	31	34	31	37	41	41	139	212	213	203	207	182	188
Calcium	mg/L	49	56	118	48	24	18	18	53	55	111	99	102	104	111	111	111
Magnesium	mg/L	35	77	< 1	< 1	< 1	< 1	< 1	< 1	< 1	28	27	24	27	26	26	25
Sodium	mg/L	60	55	90	92	87	95	90	86	88	118	122	116	123	120	120	116
Potassium	mg/L	10	10	19	16	14	14	14	26	28	8	8	7	8	7	9	7
Nutrients																	
Nitrite as N	mg/L	1.09	0.02	0.07	0.05	0.05	0.07	0.08	< 0.01	0.02	< 0.01	< 0.01	< 0.01	0.04	0.02	< 0.01	0.02
Nitrate as N	mg/L	3.32	0.01	0.41	0.22	0.23	0.2	0.15	0.18	< 0.01	< 0.01	< 0.01	< 0.01	0.4	0.02	0.49	< 0.01
Nitrite + Nitrate as N	mg/L	4.41	0.03	0.48	0.27	0.28	0.27	0.23	0.18	< 0.01	< 0.01	< 0.01	< 0.01	0.44	0.04	0.49	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	1.4	0.3	2.9	2	1.5	2.1	1.7	3.1	2.9	0.9	1	0.9	0.6	0.9	0.7	0.8
Total Nitrogen as N	mg/L	5.8	0.3	3.4	2.3	1.8	2.4	1.9	3.3	2.9	0.9	1	0.9	1	0.9	1.2	0.8
Total Phosphorus as P	mg/L	0.02	0.07	0.33	0.09	0.1	0.11	0.07	0.05	0.04	0.12	0.23	0.22	0.17	0.14	0.13	0.11
Dissolved Metals																	
Aluminium	mg/L	0.04	< 0.01	**0.51**	**0.52**	**0.55**	**0.53**	**0.47**	**1.18**	**1.27**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.017**	**0.017**	**0.019**	**0.016**	**0.018**	**0.019**	**0.018**
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	**0.004**	**0.003**	**0.001**	**0.001**	**0.001**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	**0.009**	**0.012**	**0.008**	**0.005**	**0.008**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	**0.002**	< 0.001	< 0.001
Iron	mg/L	0.08	0.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	0.07	< 0.05	< 0.05	0.09	0.06	0.08
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.059	0.084	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.303	0.288	0.265	0.112	0.244	0.194	0.24
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.021	0.012	**0.047**	**0.058**	**0.058**	**0.034**	**0.07**	**0.044**	**0.065**	0.019	0.018	0.025	0.021	0.027	0.021	0.028
Nickel	mg/L	< 0.001	< 0.001	0.004	0.004	0.003	0.003	0.003	0.009	0.01	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Sample Location		**MB107**	**MB108**	**MB108**	**MB108**	**MB108**	**MB108**	**MB108**	**MB108**	**MB108**	**MB108**	**MB109**	**MB109**	**MB109**	**MB109**	**MB109**	**MB109**
Date Sampled		28/05/2024	31/10/2023	27/11/2023	12/12/2023	23/01/2024	27/02/2024	26/03/2024	27/03/2024	23/04/2024	28/05/2024	31/10/2023	27/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024
Field Parameters	**Units**																
Field pH	pH units	7.72	**5.27**	7.38	7.26	7.24	7.27	7.52	7.52	7.31	7.29	6.53	6.96	6.84	6.81	6.75	7.52
Field Electrical Conductivity (EC)	µS/cm	1090	662	587.1	587.6	583.7	588.8	2243	599.5	599.1	576.9	2672	2374	2387	2387	2430	2243
Field Temperature	deg c	17.4	16.6	17.3	17.2	17.5	17.9	17.5	17.5	11.2	17.6	16.8	17.3	18.1	18.4	17.7	17.5
Physical Parameters																	
Electrical conductivity	µS/cm	1160	641	633	629	655	667	-	634	616	614	2640	2670	2610	2570	2600	2670
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	16	< 1	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	274	319	322	321	310	317	-	328	328	325	472	461	468	369	454	476
Total Alkalinity as $CaCO_3$	mg/L	274	319	322	321	326	317	-	328	328	325	472	461	468	369	454	476
Suspended Solids (SS)	mg/L	174	< 5	< 5	< 5	< 5	7	-	< 5	< 5	< 5	99	174	38	101	32	24
Total Dissolved Solids @180°C	mg/L	758	448	380	450	448	368	-	383	386	380	2100	1730	2200	2220	1920	2050
Redox Potential	mV	3	118	96	69	111	147	122	122	144	14	75	140	128	53	-34	122
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	71	18	17	17	16	17	-	16	17	17	188	208	222	210	206	213
Chloride	mg/L	230	19	18	19	18	19	-	20	17	17	486	532	527	542	570	538
Calcium	mg/L	102	74	66	69	70	70	-	69	64	65	210	201	208	194	221	192
Magnesium	mg/L	25	30	30	28	31	29	-	28	30	30	143	145	143	147	138	137
Sodium	mg/L	110	33	36	35	37	36	-	35	35	35	156	161	153	165	162	156
Potassium	mg/L	7	2	2	2	2	2	-	2	2	2	4	3	3	4	4	4
Nutrients																	
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	0.14	0.1	0.08	0.08	0.04	< 0.01
Nitrate as N	mg/L	0.02	0.86	0.81	0.83	0.59	0.47	-	0.32	0.27	0.32	0.36	0.29	0.25	0.23	0.2	< 0.01
Nitrite + Nitrate as N	mg/L	0.02	0.86	0.81	0.83	0.59	0.47	-	0.32	0.27	0.32	0.5	0.39	0.33	0.31	0.24	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	0.7	0.2	0.1	0.1	0.2	0.1	-	0.2	0.3	0.1	0.1	< 0.1	0.1	0.1	< 0.1	0.1
Total Nitrogen as N	mg/L	0.7	1.1	0.9	0.9	0.8	0.6	-	0.5	0.6	0.4	0.6	0.4	0.4	0.4	0.2	0.1
Total Phosphorus as P	mg/L	0.25	< 0.01	0.02	0.04	0.02	0.02	-	0.02	< 0.01	0.03	0.06	0.08	0.06	0.12	0.06	0.04
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	**0.018**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	**0.001**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	0.004	0.004	0.004	0.004	0.004	0.003
Copper	mg/L	< 0.001	0.001	**0.003**	**0.004**	**0.003**	**0.003**	-	< 0.001	**0.002**	**0.002**	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.17	0.17
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.185	0.113	0.089	0.075	0.108	0.122	-	0.121	0.077	0.049	0.236	0.284	0.267	0.253	0.282	0.199
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.022	0.004	0.005	0.006	0.005	0.006	-	0.004	0.006	0.004	0.002	0.002	0.002	0.002	0.002	0.001
Nickel	mg/L	< 0.001	0.001	0.001	< 0.001	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	0.006	**0.008**	0.007	< 0.005	-	< 0.005	< 0.005	< 0.005	**0.015**	**0.022**	**0.021**	**0.019**	**0.017**	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
Sample Location		**MB109**	**MB109**	**MB110**	**MB110**	**MB110**	**MB110**	**MB110**	**MB110**	**MB110**	**MB110**	**MB111**	**MB111**	**MB111**	**MB111**	**MB111**	**MB111**
Date Sampled		26/04/2024	18/06/2024	31/10/2023	27/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024	26/04/2024	18/06/2024	31/10/2023	28/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024
Field Parameters	**Units**																
Field pH	pH units	6.94	6.68	7.7	7.66	7.49	7.39	7.33	7.42	7.35	7.22	6.79	6.93	6.66	6.54	6.53	7.8
Field Electrical Conductivity (EC)	µS/cm	2467	2452	1172	1053	1065	1091	1124	1162	1170	1180	1834	1616	1776	1829	1871	1586
Field Temperature	deg c	17	16.4	16.8	16.9	17.2	17.4	17.3	17	16.8	16.5	16.1	16.4	16.5	17.1	17	16.5
Physical Parameters																	
Electrical conductivity	µS/cm	2520	2730	1160	1130	1150	1240	1270	1230	1210	1200	1800	1750	1880	2070	1970	2060
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	25	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	445	442	381	383	394	376	395	414	418	390	83	98	118	171	191	200
Total Alkalinity as $CaCO_3$	mg/L	445	442	381	383	394	401	395	414	418	390	83	98	118	171	191	200
Suspended Solids (SS)	mg/L	54	61	21	60	34	57	12	27	46	< 5	< 5	< 5	< 5	38	40	21
Total Dissolved Solids @180°C	mg/L	1510	1790	763	727	829	843	778	768	750	789	1620	1420	1580	1830	1540	1680
Redox Potential	mV	16	174	62	70	66	-2	-29	118	-6	180	99	159	-8	-38	-38	48
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	250	213	61	58	60	60	63	68	58	62	684	689	783	873	730	698
Chloride	mg/L	514	556	74	137	140	148	150	132	138	152	107	163	172	161	135	118
Calcium	mg/L	223	220	66	60	65	72	77	80	81	84	193	176	188	186	198	205
Magnesium	mg/L	133	141	23	24	23	28	27	28	28	32	96	94	116	136	121	132
Sodium	mg/L	154	159	173	175	168	178	170	169	164	173	100	108	99	101	100	100
Potassium	mg/L	4	4	6	5	5	6	5	7	6	6	6	5	5	6	5	7
Nutrients																	
Nitrite as N	mg/L	0.04	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.53	0.75	0.27	< 0.01	0.37	0.05
Nitrate as N	mg/L	0.2	0.17	< 0.01	0.03	0.05	0.02	0.02	0.01	0.03	0.02	0.23	0.08	< 0.01	< 0.01	< 0.01	0.78
Nitrite + Nitrate as N	mg/L	0.24	0.22	< 0.01	0.03	0.05	0.02	0.02	0.01	0.03	0.02	0.76	0.83	0.1	< 0.01	0.08	0.83
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.1	0.1	0.1	< 0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.5	0.2	0.4	1.2	1.5
Total Nitrogen as N	mg/L	0.4	0.3	0.1	0.1	< 0.1	0.2	0.1	0.1	0.2	0.2	1.1	1.3	0.3	0.4	1.3	2.3
Total Phosphorus as P	mg/L	0.03	0.06	0.47	0.44	0.44	0.6	0.45	0.46	0.44	0.25	< 0.01	0.03	0.11	0.13	0.2	0.06
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	< 0.001	< 0.001	0.008	0.009	0.008	0.006	0.007	0.006	0.006	0.005	0.001	0.002	0.003	0.003	0.003	0.002
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.003	0.003	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004	0.004	**0.016**	0.013	0.013	0.011
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.002**	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.003**	< 0.001	< 0.001
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.11	0.53	0.92	0.51
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.22	0.211	0.309	0.075	0.034	0.091	0.085	0.096	0.088	0.121	0.324	0.432	0.751	0.864	0.896	0.95
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.002	0.001	0.006	0.006	0.006	0.004	0.006	0.005	0.005	0.004	0.003	0.004	0.002	0.001	0.004	0.002
Nickel	mg/L	< 0.001	< 0.001	0.002	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.006	0.006	0.006	0.007	0.007	0.008
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.014**	**0.011**	< 0.005	< 0.005	< 0.005	**0.024**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005	< 0.005	**0.04**	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

CAD5020.001 Groundwater quality data

		80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Sample Location		**MB111**	**MB111**	**MB112**	**MB112**	**MB112**	**MB112**	**MB112**	**MB112**	**MB112**	**MB112**	**MB113**	**MB113**	**MB113**	**MB113**	**MB113**	**MB113**
Date Sampled		26/04/2024	28/05/2024	31/10/2023	28/11/2023	12/12/2023	22/01/2024	26/02/2024	26/03/2024	26/04/2024	28/05/2024	13/07/2023	18/09/2023	14/11/2023	9/01/2024	18/03/2024	27/05/2024
Field Parameters	**Units**																
Field pH	pH units	6.64	6.59	6.8	6.86	6.72	6.71	6.8	7.09	6.84	6.83	7.6	7.11	7.34	7.28	7.22	7.17
Field Electrical Conductivity (EC)	µS/cm	1994	1881	4173	3703	3765	3752	3827	3930	3957	3835	465	511.2	514.9	516.4	459.9	472.1
Field Temperature	deg c	16.3	16.6	16.1	16.5	17	17.5	17.4	16.5	16.4	16.7	13.2	15.1	14.8	14.7	17.4	15.7
Physical Parameters																	
Electrical conductivity	µS/cm	1990	2080	4130	4150	4090	4310	4180	4240	4120	4110	472	471	456	490	462	< 1
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	262	204	461	466	460	464	455	478	493	486	254	243	231	256	255	< 1
Total Alkalinity as $CaCO_3$	mg/L	262	204	461	466	460	469	455	478	493	486	254	243	231	256	255	< 1
Suspended Solids (SS)	mg/L	17	< 5	72	5	15	48	5	13	7	< 5	12	10	< 5	9	5	< 5
Total Dissolved Solids @180°C	mg/L	1500	1780	3150	2680	3770	3340	2820	2800	2420	2940	285	336	310	284	270	< 10
Redox Potential	mV	-82	18	42	237	187	-22	166	230	312	136	-	-	-	-	-	-
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	797	1040	46	47	49	60	52	56	50	58	8	9	7	6	4	< 1
Chloride	mg/L	130	146	1050	1010	1040	1050	1140	1090	1120	1150	6	5	6	6	6	< 1
Calcium	mg/L	193	190	145	123	138	137	149	143	153	118	86	96	91	94	84	< 1
Magnesium	mg/L	135	147	215	218	218	215	210	209	220	191	4	5	4	5	4	< 1
Sodium	mg/L	84	87	404	398	402	414	422	409	417	350	8	8	7	7	7	< 1
Potassium	mg/L	5	5	20	20	21	20	20	19	21	19	3	2	2	2	2	< 1
Nutrients																	
Nitrite as N	mg/L	0.11	0.17	0.05	0.03	0.08	0.07	0.07	0.13	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	< 0.01	7.38	8.13	7.76	7.47	6.98	7.48	7.01	7.9	0.09	0.18	0.06	0.05	0.03	< 0.01
Nitrite + Nitrate as N	mg/L	< 0.01	0.04	7.43	8.16	7.84	7.54	7.05	7.61	7.03	7.9	0.09	0.18	0.06	0.05	0.03	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	3.6	0.6	1.4	1	1.3	1.6	0.8	1.6	1.8	0.8	0.1	< 0.1	0.1	< 0.1	0.3	< 0.1
Total Nitrogen as N	mg/L	3.6	0.6	8.8	9.2	9.1	9.1	7.8	9.2	8.8	8.7	0.2	0.2	0.2	< 0.1	0.3	< 0.1
Total Phosphorus as P	mg/L	0.45	0.12	0.32	0.25	0.26	0.31	0.28	0.31	0.24	0.29	0.09	0.03	0.03	0.02	0.04	< 0.01
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	**0.011**	0.006	0.002	< 0.001
Arsenic	mg/L	0.006	0.006	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.007	0.006	0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	**0.003**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	2.45	0.91	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	1.31	0.91	0.087	0.069	0.091	0.044	0.043	0.021	0.036	0.027	0.004	< 0.001	0.005	0.054	0.064	< 0.001
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	0.002	0.001	0.002	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	0.003	0.005	0.008	0.008	0.009	0.007	0.006	0.005	0.006	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	**0.01**	**0.011**	**0.016**	**0.016**	**0.009**	0.005	**0.009**	< 0.005	**0.101**	**0.044**	**0.034**	**0.015**	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
Sample Location		**MB116**	**MB116**	**MB116**	**MB116**	**MB116**	**MB116**	**MB117**	**MB117**	**MB117**	**MB117**	**MB117**	**MB117**	**MB118**	**MB118**	**MB118**	**MB118**
Date Sampled		14/07/2023	16/09/2023	14/11/2023	7/01/2024	18/03/2024	26/05/2024	27/07/2023	16/09/2023	15/11/2023	9/01/2024	19/03/2024	27/05/2024	12/07/2023	16/09/2023	15/11/2023	9/01/2024
Field Parameters	**Units**																
Field pH	pH units	7.25	6.98	6.96	6.89	6.78	6.7	7.05	7.18	7.06	6.94	7.09	7.36	8.47	6.71	6.82	6.72
Field Electrical Conductivity (EC)	µS/cm	1406	1543	1750	1770	1674	1697	1741	174.7	1866	1890	1629	1735	421.2	494.3	528.4	540.2
Field Temperature	deg c	13.2	14.9	15.5	15	14.1	13.7	15.7	16.1	16	18.5	22.2	15.6	16.3	16.6	15.8	16.2
Physical Parameters																	
Electrical conductivity	µS/cm	1410	1560	1560	1670	1670	1700	1820	1790	1670	1790	1730	1720	417	492	467	510
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	704	738	619	747	637	557	436	426	398	433	431	408	129	208	198	218
Total Alkalinity as $CaCO_3$	mg/L	704	738	619	747	637	557	436	426	398	433	431	408	129	208	198	218
Suspended Solids (SS)	mg/L	90	210	68	724	23	91	30	42	81	50	8	6	5	16	18	24
Total Dissolved Solids @180°C	mg/L	1270	1370	1180	1320	1210	1200	1230	1230	1140	1230	1220	1170	292	363	282	310
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	44	30	224	168	337	423	308	386	355	347	338	348	80	54	50	51
Chloride	mg/L	98	96	78	58	52	38	193	211	208	198	189	200	5	4	4	4
Calcium	mg/L	101	147	160	178	194	205	133	141	129	135	123	121	34	48	46	48
Magnesium	mg/L	36	40	43	47	47	49	129	126	121	133	126	115	13	24	22	25
Sodium	mg/L	181	198	158	180	141	117	96	94	93	98	95	86	30	27	27	29
Potassium	mg/L	18	23	20	23	20	18	1	1	1	1	1	2	7	2	1	2
Nutrients																	
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.03	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.38	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.05	0.03	0.22	0.12	1.45	1.13	0.01	< 0.01	0.05	0.05	< 0.01	4.03	0.18	0.01	0.01	0.02
Nitrite + Nitrate as N	mg/L	0.05	0.03	0.22	0.12	1.48	1.15	0.01	< 0.01	0.05	0.05	0.38	4.03	0.18	0.01	0.01	0.02
Total Kjeldahl Nitrogen as N	mg/L	4.2	< 1.0	6	7.8	4.3	2.8	0.2	< 0.1	0.2	< 0.1	1.5	0.9	0.2	< 0.1	< 0.1	< 0.1
Total Nitrogen as N	mg/L	4.2	< 1.0	6.2	7.9	5.8	4	0.2	< 0.1	0.2	< 0.1	1.9	4.9	0.4	< 0.1	< 0.1	< 0.1
Total Phosphorus as P	mg/L	0.78	< 0.10	0.64	1.22	0.68	0.36	0.11	0.14	0.28	0.09	0.15	0.3	0.04	0.14	0.59	0.45
Dissolved Metals																	
Aluminium	mg/L	0.01	0.04	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	0.001	< 0.001	0.001	0.002	< 0.001	< 0.001	< 0.001	0.001	0.001	0.004	0.008	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.008	**0.018**	**0.014**	**0.021**	0.011	0.008	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.009	0.003	0.003	0.005
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	**0.002**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.001**	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.002	0.003	0.002	0.005	0.004	0.006	0.002	0.002	0.002	0.002	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	3.62	10.6	13.3	14.1	13.9	15.9	< 0.05	< 0.05	1.06	1.12	1.71	< 0.05	< 0.05	0.23	0.18	0.44
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	**3.48**	**3.41**	**4.26**	**3.71**	**3.54**	**3.44**	0.322	0.327	0.306	0.287	0.308	0.006	0.02	0.381	0.376	0.316
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.02	0.01	0.016	0.016	0.018	0.016	0.001	< 0.001	< 0.001	0.001	0.001	< 0.001	0.024	0.003	0.004	0.005
Nickel	mg/L	0.002	0.004	0.003	0.005	0.004	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.01**	**0.046**	**0.014**	**0.014**	**0.065**	**0.016**	**0.026**	**0.01**	**0.014**	**0.017**	0.005	**0.047**	**0.011**	**0.015**	**0.01**	**0.029**

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

CAD5020.001 Groundwater quality data

		112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
Sample Location		**MB118**	**MB118**	**MB119**	**MB119**	**MB119**	**MB119**	**MB119**	**MB119**	**MB120**	**MB120**	**MB120**	**MB120**	**MB120**	**MB120**	**MB121**	**MB121**
Date Sampled		18/03/2024	27/05/2024	14/07/2023	16/09/2023	15/11/2023	9/01/2024	18/03/2024	27/05/2024	13/07/2023	17/09/2023	15/11/2023	9/01/2024	19/03/2024	27/05/2024	13/07/2023	17/09/2023
Field Parameters	**Units**																
Field pH	pH units	6.65	6.76	7.06	7.18	6.72	6.65	6.59	6.57	7.3	6.44	6.94	7	6.86	6.87	**11.74**	**11.11**
Field Electrical Conductivity (EC)	µS/cm	483	505.2	1406	1326	1388	1365	1218	1234	571	303.7	598.8	729.1	702	842.9	1740	870.8
Field Temperature	deg c	17.6	16.6	15.6	16	14.7	16	16.9	16.2	15.6	15.9	15.3	16.3	16	17.2	17.1	14.2
Physical Parameters																	
Electrical conductivity	µS/cm	490	486	1390	1350	1250	1320	1240	1240	553	297	543	716	738	891	1290	778
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	121	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	75	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	222	220	224	221	210	230	233	234	199	100	210	287	310	356	< 1	13
Total Alkalinity as $CaCO_3$	mg/L	222	220	224	221	210	230	233	234	199	100	210	287	310	356	196	13
Suspended Solids (SS)	mg/L	8	13	244	1100	4170	1780	979	707	308	8	12	46	19	29	160	42
Total Dissolved Solids @180°C	mg/L	296	326	987	1020	964	952	834	868	358	211	314	421	466	568	660	532
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	43	42	380	407	368	351	333	344	43	31	42	42	50	74	178	268
Chloride	mg/L	5	4	122	125	119	109	107	74	36	11	24	31	40	52	116	100
Calcium	mg/L	44	44	127	130	121	122	109	110	67	30	75	99	100	122	128	63
Magnesium	mg/L	23	24	68	71	67	65	63	63	15	8	14	20	20	27	< 1	8
Sodium	mg/L	29	28	78	71	70	70	73	69	30	21	27	31	34	36	96	90
Potassium	mg/L	2	2	2	2	2	2	2	2	< 1	< 1	< 1	< 1	< 1	< 1	25	10
Nutrients																	
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.03
Nitrate as N	mg/L	< 0.01	0.1	4.34	4.42	4.6	4.64	5.22	4.96	0.09	0.1	0.02	< 0.01	0.02	0.17	0.02	< 0.01
Nitrite + Nitrate as N	mg/L	< 0.01	0.1	4.34	4.42	4.6	4.65	5.22	4.96	0.09	0.1	0.02	< 0.01	0.02	0.18	0.02	0.03
Total Kjeldahl Nitrogen as N	mg/L	0.2	< 0.1	0.6	2	2.2	1.2	1.1	1.3	0.9	0.2	0.2	0.4	0.4	0.6	0.3	0.3
Total Nitrogen as N	mg/L	0.2	0.1	4.9	6.4	6.8	5.8	6.3	6.3	1	0.3	0.2	0.4	0.4	0.8	0.3	0.3
Total Phosphorus as P	mg/L	0.2	0.18	0.4	< 0.20	3.43	2.55	1.05	0.66	0.4	0.04	0.05	0.08	0.11	0.12	0.05	0.02
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	**0.06**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.002	0.001	0.003	< 0.001	0.005
Arsenic	mg/L	0.007	0.007	0.003	0.003	0.003	0.002	0.003	0.003	0.002	0.002	0.003	0.004	0.007	0.005	< 0.001	< 0.001
Cadmium	mg/L	< 0.0001	< 0.0001	0.0001	**0.0002**	**0.0002**	**0.0002**	**0.0003**	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.038**	**0.007**
Cobalt	mg/L	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	0.004	0.004	0.002	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	**0.002**	**0.003**	**0.002**	< 0.001	< 0.001	< 0.001	**0.002**	**0.002**
Iron	mg/L	0.85	0.86	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	0.4	0.18	< 0.05	< 0.05
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.334	0.294	0.895	0.922	0.895	0.948	0.823	0.794	0.094	0.011	0.043	0.276	0.257	0.285	< 0.001	< 0.001
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.004	0.004	0.002	0.002	0.001	0.001	0.002	0.003	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.02	0.007
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.009**	0.007	**0.032**	**0.025**	**0.022**	**0.022**	**0.014**	**0.018**	**0.011**	**0.015**	**0.01**	**0.022**	0.006	**0.037**	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

AGE

CAD5020.001 Groundwater quality data

		128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
Sample Location		**MB121**	**MB121**	**MB121**	**MB121**	**MB122**	**MB122**	**MB122**	**MB122**	**MB122**	**MB122**	**MB123**	**MB123**	**MB123**	**MB123**	**MB123**	**MB123**
Date Sampled		15/11/2023	9/01/2024	19/03/2024	27/05/2024	12/07/2023	16/09/2023	14/11/2023	7/01/2024	18/03/2024	26/05/2024	12/07/2023	16/09/2023	14/11/2023	7/01/2024	18/03/2024	26/05/2024
Field Parameters	**Units**																
Field pH	pH units	**9.51**	7.71	7.54	7.51	7.57	7.49	7.21	7.03	7.05	6.63	7.84	7.52	6.97	6.94	6.93	6.96
Field Electrical Conductivity (EC)	µS/cm	821.6	1305	1213	1264	802	831.2	978.2	1012	924	991	644	729.3	977.7	1014	929.9	940.1
Field Temperature	deg c	14.1	14.7	18.2	17.6	14.2	12.2	13	13.8	15.5	14.6	13.4	11.5	12.7	12.8	14	14.5
Physical Parameters																	
Electrical conductivity	µS/cm	732	1220	1260	1260	782	851	892	965	922	970	631	753	882	966	920	921
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	25	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	44	323	351	356	266	286	323	364	367	381	189	238	346	383	379	372
Total Alkalinity as $CaCO_3$	mg/L	70	323	351	356	266	286	323	364	367	381	189	238	346	383	379	372
Suspended Solids (SS)	mg/L	< 5	26	10	9	< 5	< 5	7	12	< 5	< 5	18	8	18	22	9	12
Total Dissolved Solids @180°C	mg/L	499	942	844	809	504	572	552	680	599	688	412	526	580	681	591	652
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	211	199	214	228	161	198	163	158	161	172	141	182	140	141	137	150
Chloride	mg/L	78	103	117	118	24	24	22	21	24	21	18	19	19	20	26	19
Calcium	mg/L	13	95	94	90	113	125	131	145	137	143	83	98	141	148	142	143
Magnesium	mg/L	30	61	69	69	29	31	32	35	33	36	16	20	29	32	30	29
Sodium	mg/L	94	92	96	87	23	24	27	28	28	28	44	48	27	28	28	31
Potassium	mg/L	9	4	4	4	2	2	2	2	2	2	5	5	2	2	2	3
Nutrients																	
Nitrite as N	mg/L	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.07	0.02
Nitrate as N	mg/L	0.02	< 0.01	0.03	0.09	0.04	0.04	0.09	0.01	0.02	0.04	0.07	0.16	0.02	< 0.01	< 0.01	0.24
Nitrite + Nitrate as N	mg/L	0.02	0.01	0.03	0.09	0.04	0.04	0.09	0.01	0.02	0.04	0.07	0.16	0.02	< 0.01	0.05	0.26
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.3	0.3	0.3	0.3	0.4	0.1	< 0.1	0.2	0.2	0.2	0.4	< 0.1	3.2	1.4	1.6
Total Nitrogen as N	mg/L	0.2	0.3	0.3	0.4	0.3	0.4	0.2	< 0.1	0.2	0.2	0.3	0.6	< 0.1	3.2	1.4	1.9
Total Phosphorus as P	mg/L	0.02	0.04	0.05	0.05	0.03	< 0.01	0.01	< 0.01	0.03	0.03	0.04	0.02	0.09	0.27	0.19	0.18
Dissolved Metals																	
Aluminium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	0.004	0.006	0.002	**0.012**	< 0.001	0.001	**0.011**	0.006	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001
Arsenic	mg/L	< 0.001	0.001	0.001	< 0.001	0.001	0.001	< 0.001	< 0.001	0.002	0.002	0.003	0.003	0.006	0.008	0.006	0.004
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.001**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.006**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	< 0.05	0.28	0.22	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.63	1.07	< 0.05	< 0.05	0.52	1.12	0.9	0.96
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.001	0.334	0.078	0.027	0.572	0.532	0.14	0.292	0.602	0.568	0.137	0.364	0.493	0.527	0.518	0.588
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.005	0.004	0.003	0.003	0.009	0.005	0.005	0.003	0.001	< 0.001	0.012	0.007	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.003	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	< 0.005	< 0.005	< 0.005	0.006	**0.043**	**0.604**	**0.198**	**0.132**	**0.017**	< 0.005	**0.056**	**0.146**	0.006	< 0.005	< 0.005	< 0.005

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

CAD5020.001 Groundwater quality data

		144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
Sample Location		**MB124**	**MB124**	**MB124**	**MB124**	**MB124**	**MB124**	**MB125**	**MB125**	**MB125**	**MB125**	**MB125**	**MB125**	**MB126**	**MB126**	**MB126**	**MB126**
Date Sampled		12/07/2023	17/09/2023	14/11/2023	7/01/2024	19/03/2024	26/05/2024	13/07/2023	18/09/2023	14/11/2023	9/01/2024	18/03/2024	27/05/2024	27/07/2023	17/09/2023	15/11/2023	7/01/2024
Field Parameters	**Units**																
Field pH	pH units	**12.46**	**13.87**	6.95	**12.57**	**12.29**	**12.32**	**9.55**	**9.35**	**9.34**	**9.04**	**8.54**	8.23	6.73	6.83	6.66	6.66
Field Electrical Conductivity (EC)	µS/cm	7.01	7.35	6.92	7.12	7.33	7.08	2123.3	220	210.5	223.2	219.9	249.6	365.1	374.3	370.9	394
Field Temperature	deg c	15.5	15.5	15	16.5	18.7	16	15.5	13.8	14.2	14.5	17	16.2	15.1	17	16.6	16
Physical Parameters																	
Electrical conductivity	µS/cm	6060	5430	5950	5580	5280	5950	223	204	189	216	223	241	374	383	330	367
Hydroxide Alkalinity as $CaCO_3$	mg/L	1330	1130	1180	1210	1200	1300	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	106	103	75	89	83	69	39	24	18	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	29	36	36	67	76	86	161	162	146	164
Total Alkalinity as $CaCO_3$	mg/L	1440	1240	1260	1300	1290	1370	68	59	54	67	76	86	161	162	146	164
Suspended Solids (SS)	mg/L	12	13	< 5	10	6	28	101	8	< 5	21	9	< 5	82	87	240	23
Total Dissolved Solids @180°C	mg/L	1540	1700	1920	1620	1480	1510	139	155	148	151	143	170	237	280	256	244
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																	
Sulfate as SO_4 - Turbidimetric	mg/L	10	7	8	2	< 10	3	30	28	28	28	26	28	12	16	13	15
Chloride	mg/L	25	31	55	42	47	45	6	5	6	5	6	6	14	14	13	13
Calcium	mg/L	317	358	391	412	416	430	5	6	6	9	11	15	28	29	27	29
Magnesium	mg/L	< 1	2	< 1	< 1	< 1	< 1	2	2	2	3	3	4	19	19	17	19
Sodium	mg/L	298	244	241	229	198	163	34	30	30	29	30	29	20	20	18	19
Potassium	mg/L	76	51	51	47	39	35	6	7	6	6	6	6	5	6	4	6
Nutrients																	
Nitrite as N	mg/L	0.03	0.02	0.02	0.02	0.04	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	0.01	0.02	0.01	0.01	0.05	< 0.01	0.02	0.14	0.13	0.06	0.01	0.1	0.04	0.02	< 0.01	< 0.01
Nitrite + Nitrate as N	mg/L	0.04	0.04	0.03	0.03	0.09	0.03	0.02	0.14	0.13	0.06	0.01	0.1	0.04	0.02	< 0.01	< 0.01
Total Kjeldahl Nitrogen as N	mg/L	1.8	2.2	2	2.2	1.8	2.2	0.4	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	< 0.1
Total Nitrogen as N	mg/L	1.8	2.2	2	2.2	1.9	2.2	0.4	0.2	0.2	0.3	0.2	0.3	0.2	0.1	0.2	< 0.1
Total Phosphorus as P	mg/L	0.04	0.02	0.03	< 0.01	0.03	0.03	0.2	0.02	0.05	0.04	0.04	0.04	0.2	0.17	0.41	0.11
Dissolved Metals																	
Aluminium	mg/L	**1.32**	**1.61**	**1.48**	**1.1**	**0.93**	**0.73**	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	**0.029**	**0.027**	**0.024**	**0.03**	< 0.001	0.001	**0.011**	**0.013**	0.003	**0.012**	< 0.001	0.002	< 0.001	< 0.001
Arsenic	mg/L	0.002	0.001	0.001	0.001	0.001	< 0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.01	0.007	0.007	0.008
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	**0.012**	**0.012**	**0.004**	**0.002**	**0.001**	< 0.001	**0.003**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.002	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.013	0.008	0.008	0.008
Copper	mg/L	**0.012**	**0.013**	**0.008**	**0.006**	**0.002**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	0.11	0.15	0.16	0.15	0.14	0.11	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.16	1.04	1.52	1.73
Lead	mg/L	0.002	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.749	0.593	0.421	0.366
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.026	0.009	0.01	0.012	0.011	0.009	0.014	0.008	0.008	0.008	0.008	0.007	0.004	0.004	0.003	0.004
Nickel	mg/L	0.007	0.008	0.01	0.01	**0.012**	**0.011**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	**0.02**	**0.013**	**0.012**	**0.012**
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	**0.036**	**0.014**	**0.012**	0.006	0.006	**0.008**	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	**0.01**	**0.029**	**0.011**	0.007

Notes

Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

CAD5020.001 Groundwater quality data

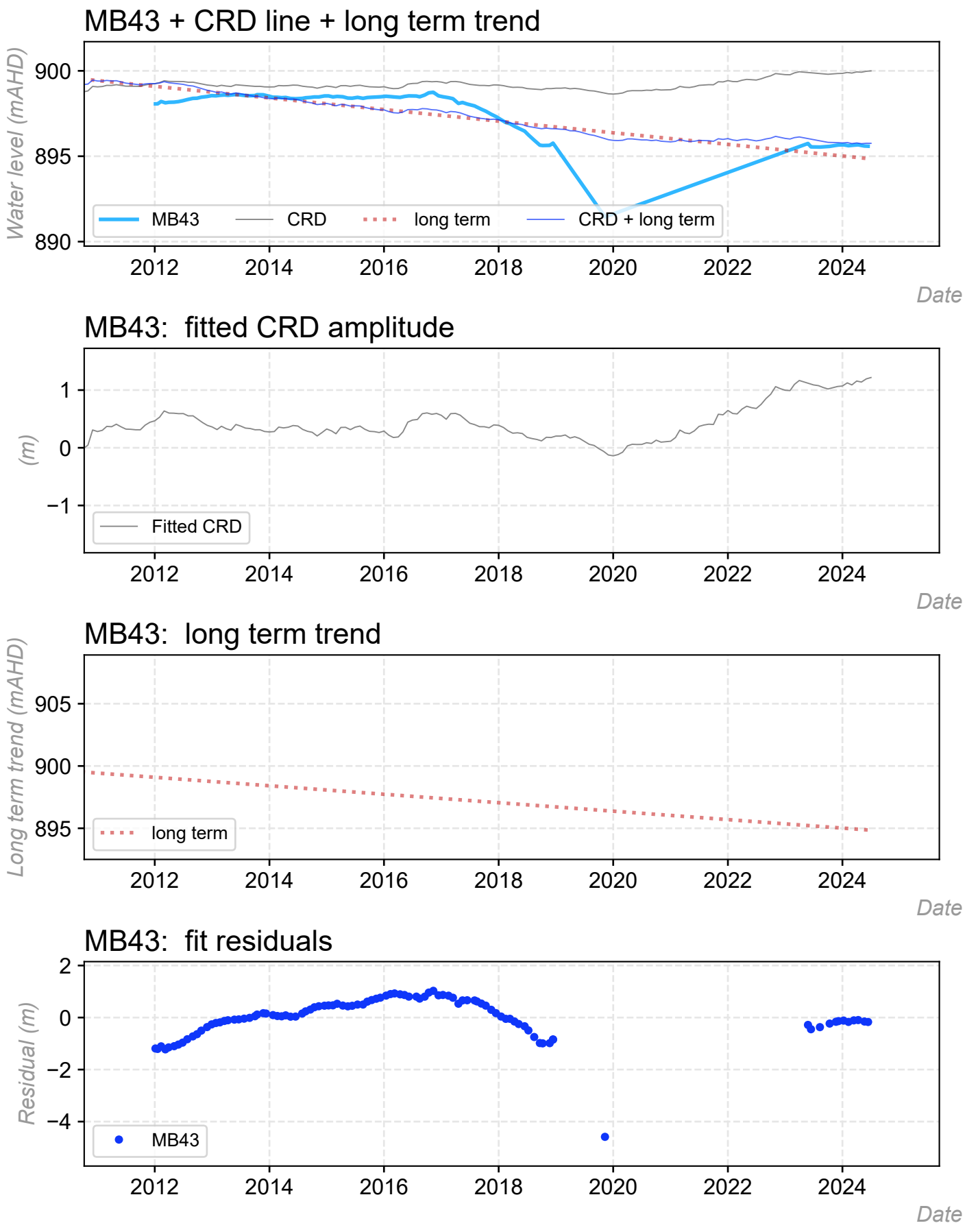
		160	161	162	163	164	165	166	167	168	169	170
Sample Location		**MB126**	**MB126**	**MB127**	**MB127**	**MB127**	**MB127**	**MB127**	**MB129**	**MB129**	**MB129**	**MB129**
Date Sampled		19/03/2024	26/05/2024	16/09/2023	15/11/2023	22/01/2024	19/03/2024	26/05/2024	14/11/2023	7/01/2024	18/03/2024	26/05/2024
Field Parameters	**Units**											
Field pH	pH units	6.52	6.41	**9.95**	**10.22**	**9.92**	**9.12**	**8.86**	**9.99**	7.99	7.83	7.75
Field Electrical Conductivity (EC)	µS/cm	358.2	374.9	571.2	596.3	485.1	379.8	372.5	571	809.7	875.3	943.5
Field Temperature	deg c	17.4	15.7	17.1	17.3	17.2	17.9	16.5	17.1	16.3	15.5	15.1
Physical Parameters												
Electrical conductivity	µS/cm	358	368	572	477	493	387	354	492	864	858	872
Hydroxide Alkalinity as $CaCO_3$	mg/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbonate Alkalinity as $CaCO_3$	mg/L	< 1	< 1	152	112	31	22	32	102	< 1	13	< 1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	163	170	70	72	149	155	144	123	372	373	401
Total Alkalinity as $CaCO_3$	mg/L	163	170	222	184	180	176	176	225	372	387	401
Suspended Solids (SS)	mg/L	57	28	98	45	97	48	48	612	119	55	73
Total Dissolved Solids @180°C	mg/L	252	282	374	313	367	248	256	390	730	527	580
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-
Major Ions												
Sulfate as SO_4 - Turbidimetric	mg/L	13	16	40	39	39	20	12	27	72	83	87
Chloride	mg/L	14	12	10	10	10	10	8	13	14	14	12
Calcium	mg/L	26	28	8	8	10	14	16	9	30	39	42
Magnesium	mg/L	18	19	7	5	6	8	10	3	11	14	15
Sodium	mg/L	19	19	97	90	87	60	45	100	178	147	138
Potassium	mg/L	5	5	26	18	17	11	10	12	11	11	11
Nutrients												
Nitrite as N	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg/L	< 0.01	< 0.01	0.03	0.01	0.06	0.02	0.01	0.01	0.02	0.09	0.12
Nitrite + Nitrate as N	mg/L	< 0.01	< 0.01	0.03	0.01	0.06	0.02	0.02	0.01	0.02	0.09	0.12
Total Kjeldahl Nitrogen as N	mg/L	0.2	0.3	0.7	1.1	1.3	0.8	0.6	0.6	0.8	0.7	1.2
Total Nitrogen as N	mg/L	0.2	0.3	0.7	1.1	1.4	0.8	0.6	0.6	0.8	0.8	1.3
Total Phosphorus as P	mg/L	0.21	0.22	0.19	0.48	0.25	0.27	0.2	1.92	0.21	0.13	0.16
Dissolved Metals												
Aluminium	mg/L	< 0.01	< 0.01	0.02	0.04	**0.08**	0.02	0.02	**0.16**	< 0.01	< 0.01	< 0.01
Antimony	mg/L	< 0.001	< 0.001	< 0.001	**0.011**	**0.048**	**0.018**	**0.021**	0.005	< 0.001	< 0.001	0.002
Arsenic	mg/L	0.008	0.007	0.009	0.008	0.006	0.004	0.004	0.01	0.004	0.008	0.004
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium	mg/L	< 0.001	< 0.001	**0.003**	**0.002**	**0.002**	< 0.001	< 0.001	**0.001**	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.008	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	< 0.001	< 0.001	0.001	**0.002**	**0.005**	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iron	mg/L	2.11	2.17	0.13	0.11	0.06	< 0.05	0.08	0.12	0.52	0.26	0.22
Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	mg/L	0.292	0.338	0.002	0.005	0.008	0.007	0.011	0.004	0.209	0.117	0.104
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	0.003	0.003	**0.088**	**0.058**	0.031	0.02	0.011	**0.087**	**0.116**	**0.114**	**0.078**
Nickel	mg/L	**0.012**	**0.013**	0.001	0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	mg/L	0.007	**0.009**	< 0.005	**0.08**	**0.012**	< 0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005

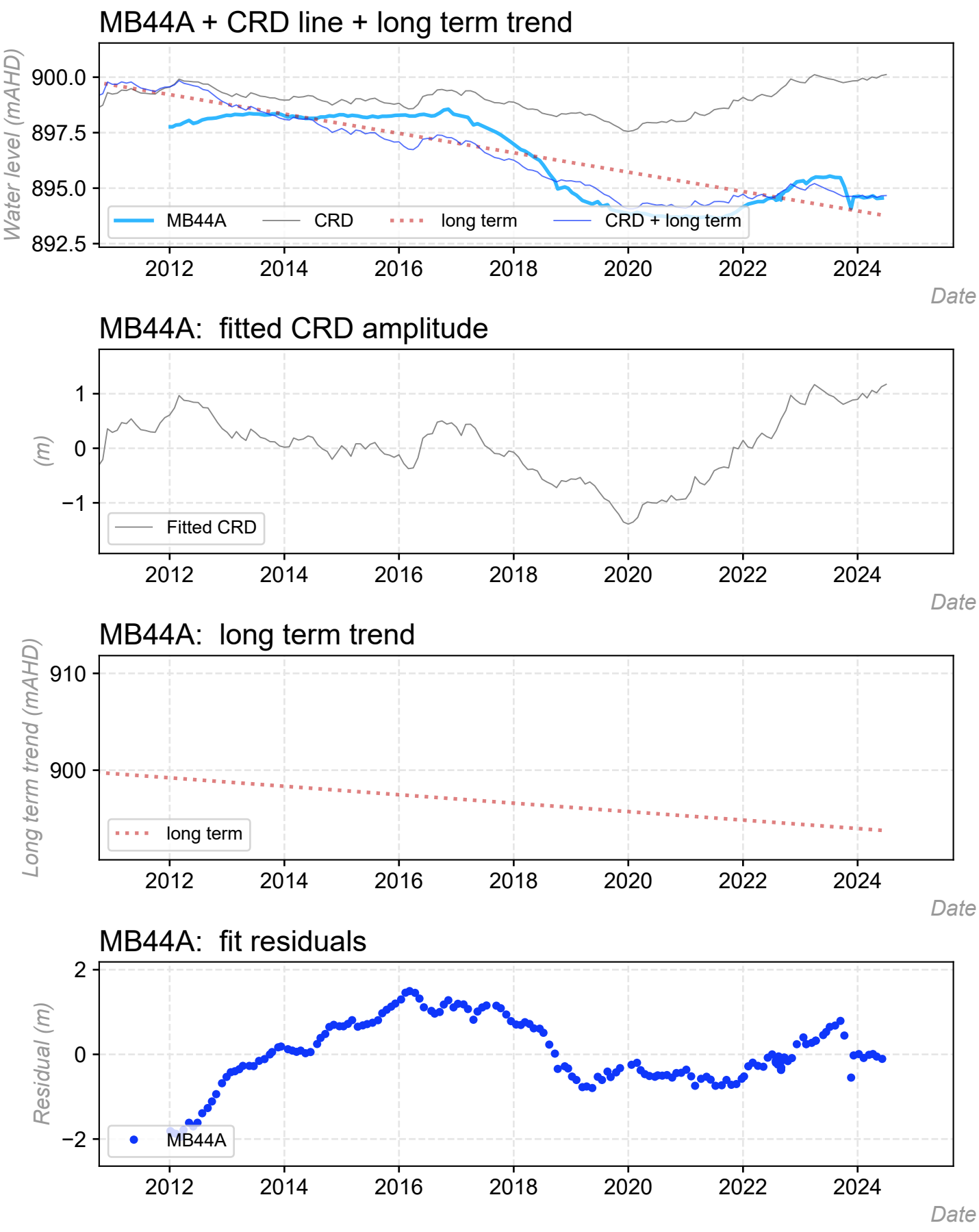
Notes

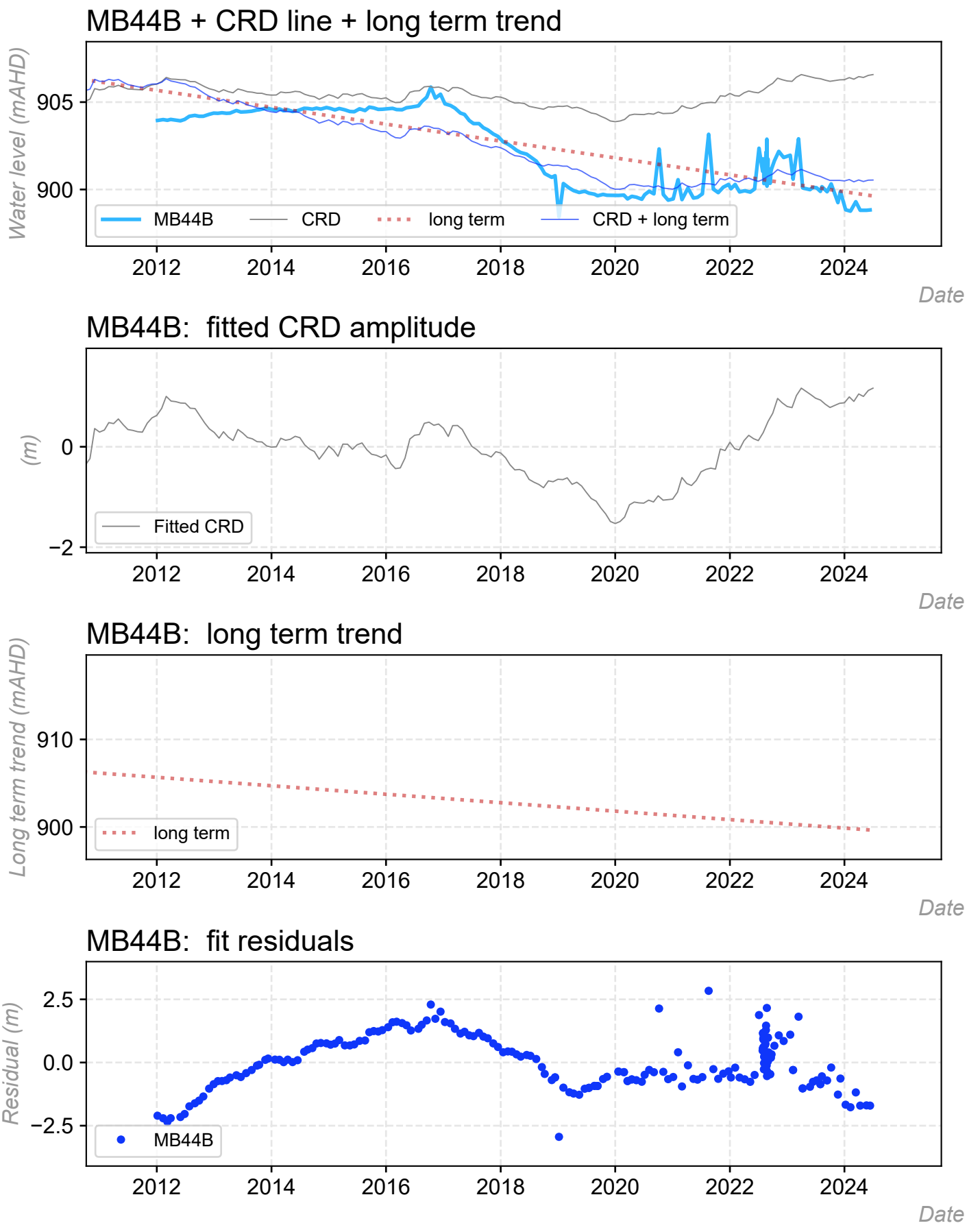
Exceeding limits (Eco-95) **[WMP values applied to pH]**
Exceeding limits (Stock)

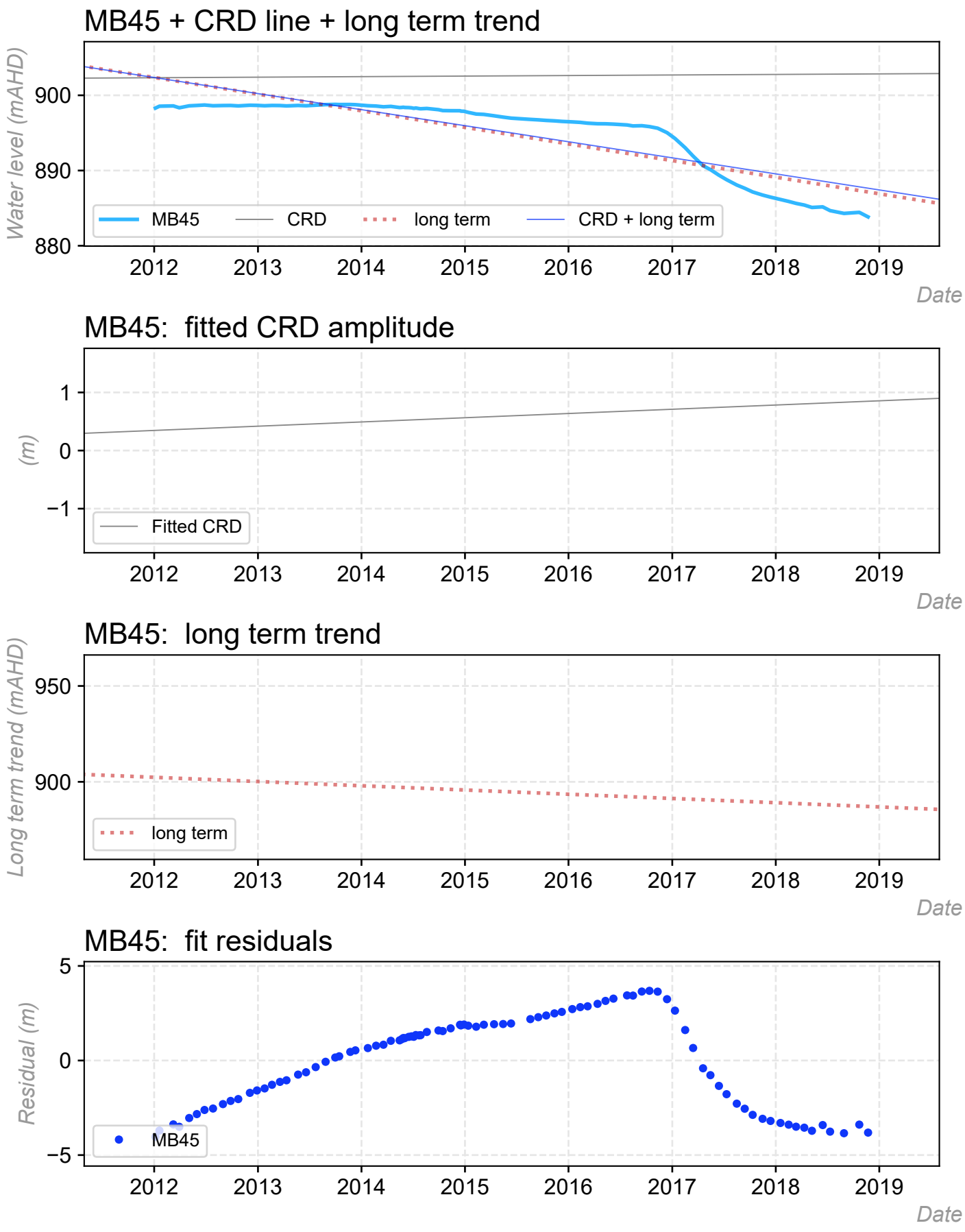
Appendix E

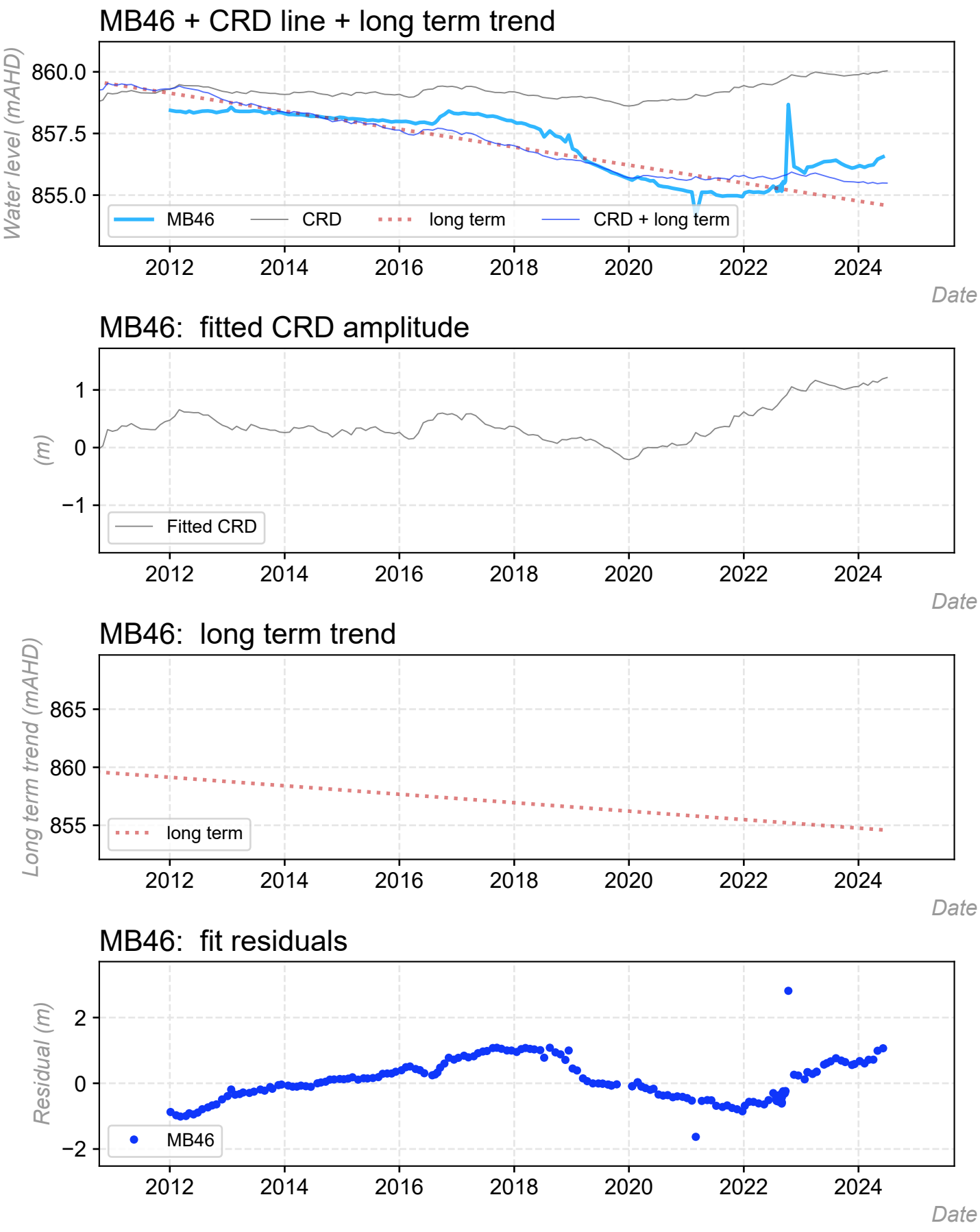
TFN modelling

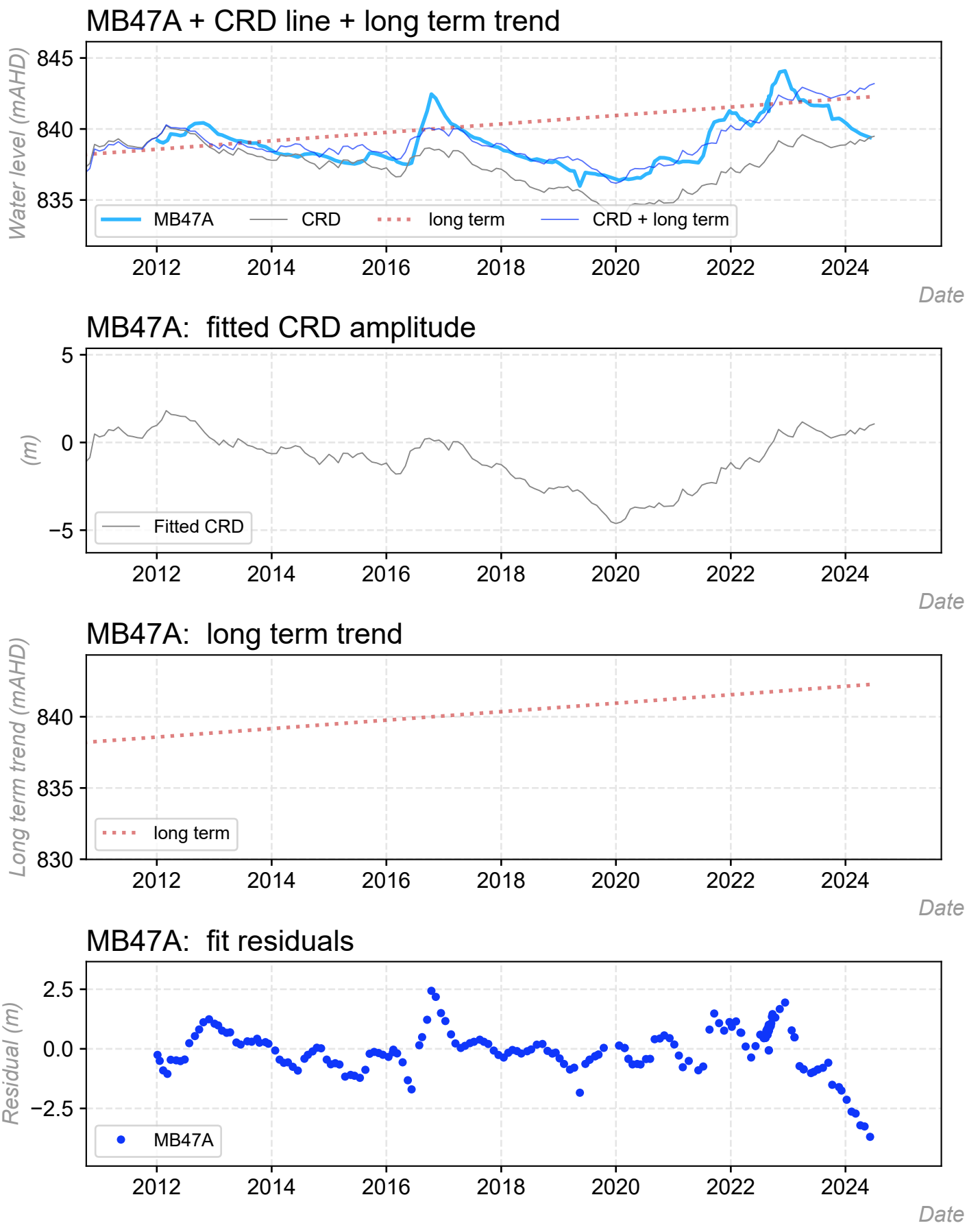

MB43 + CRD line + long term trend
Water level (mAHD)
900
895
890
MB43
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB43: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB43: long term trend
Long term trend (mAHD)
905
900
895
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB43: fit residuals
Residual (m)
2
0
−2
−4
MB43
2012
2014
2016
2018
2020
2022
2024
Date

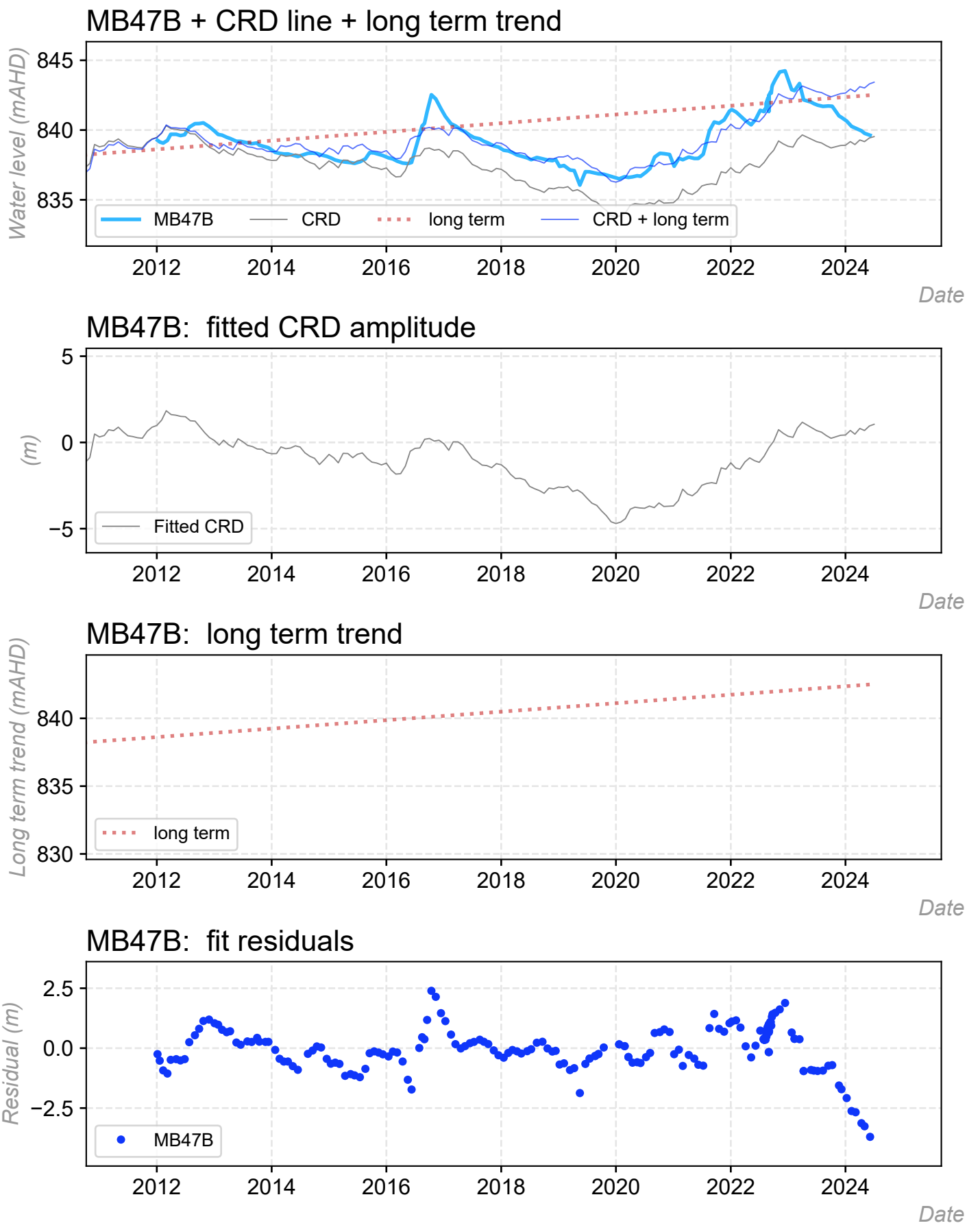

MB44A + CRD line + long term trend
Water level (mAHD)
900.0
897.5
895.0
892.5
MB44A
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB44A: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB44A: long term trend
Long term trend (mAHD)
910
900
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB44A: fit residuals
Residual (m)
2
0
−2
MB44A
2012
2014
2016
2018
2020
2022
2024
Date

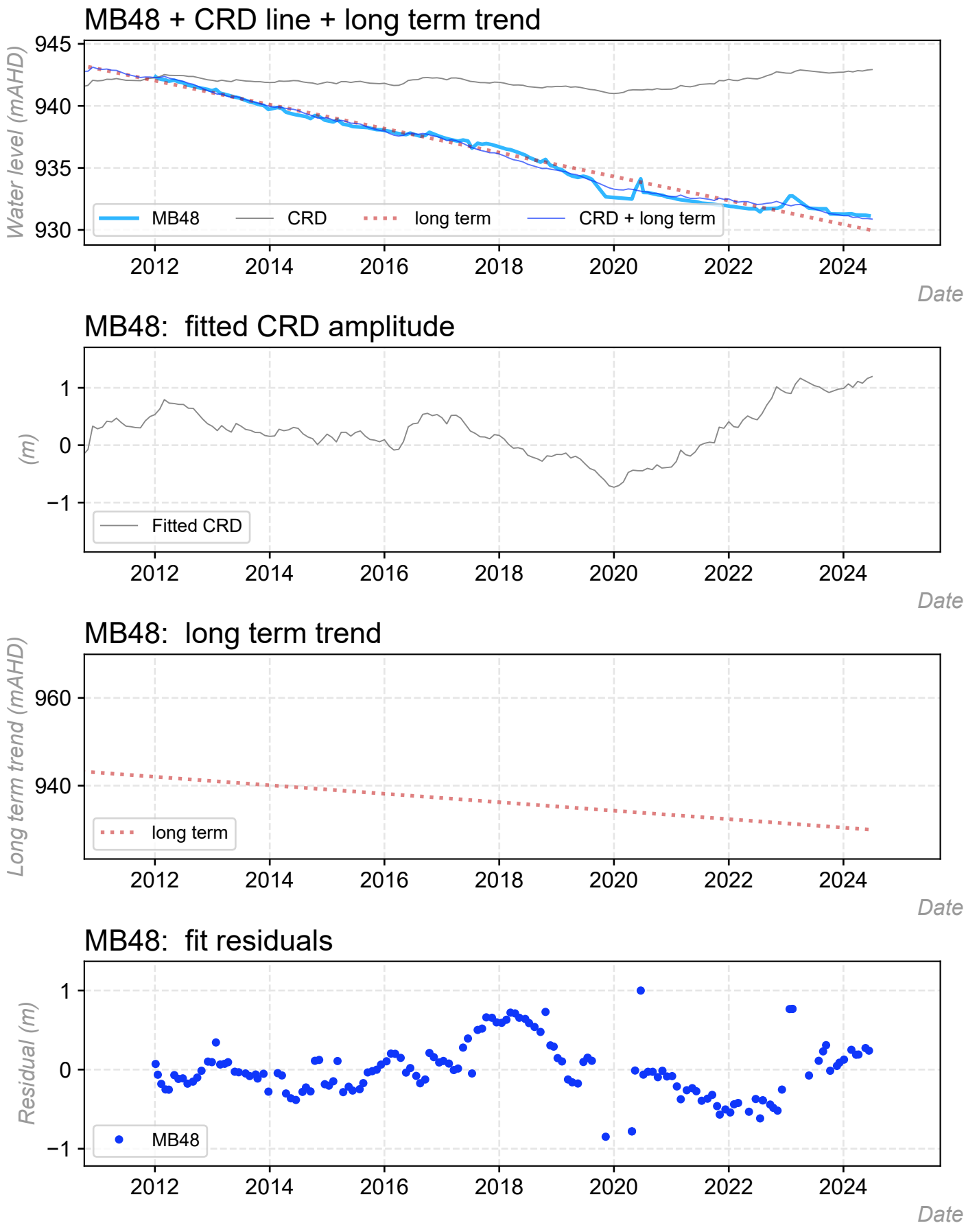

MB44B + CRD line + long term trend
Water level (mAHD)
905
900
MB44B
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB44B: fitted CRD amplitude
(m)
0
−2
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB44B: long term trend
Long term trend (mAHD)
910
900
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB44B: fit residuals
Residual (m)
2.5
0.0
−2.5
MB44B
2012
2014
2016
2018
2020
2022
2024
Date

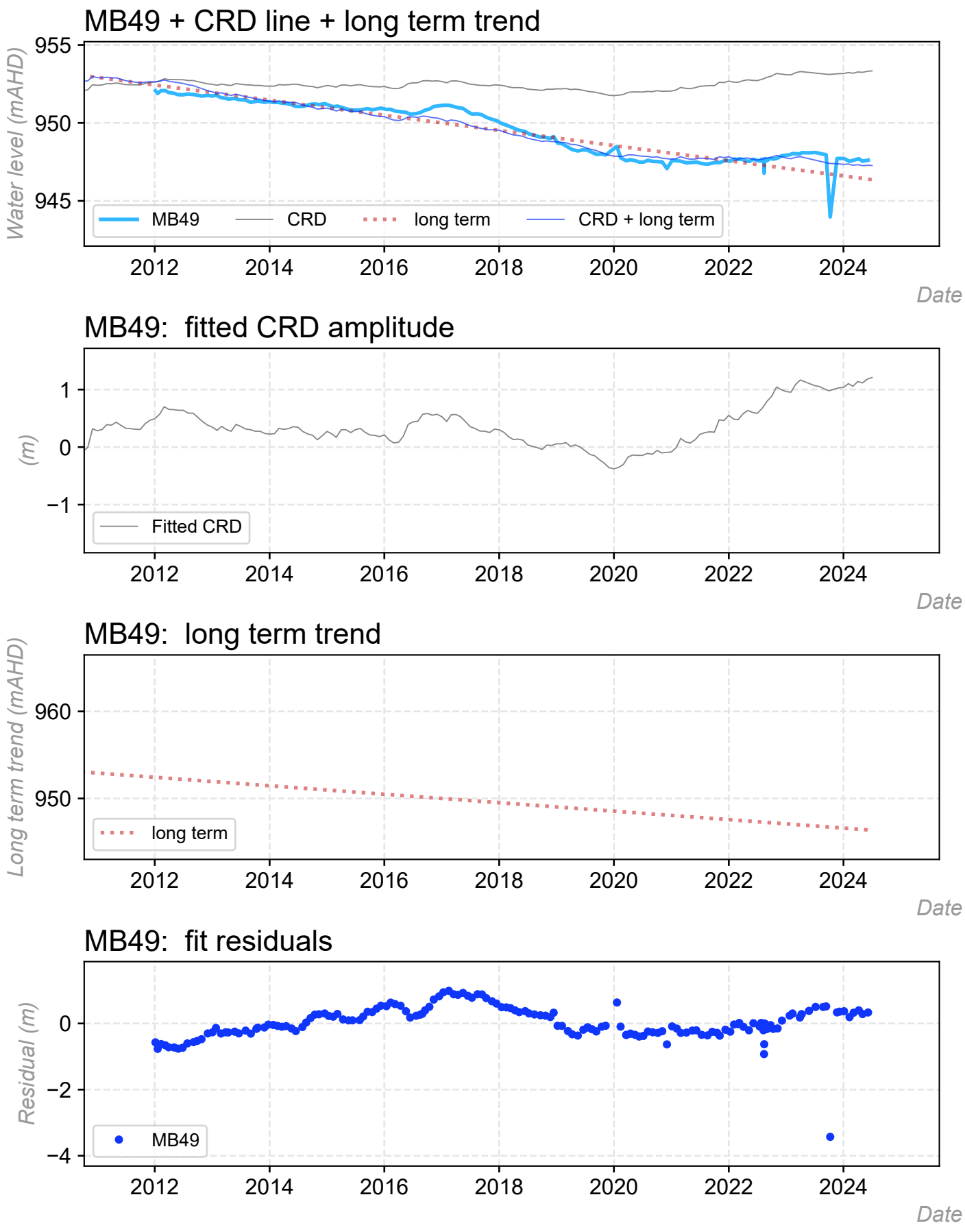

MB45 + CRD line + long term trend
Water level (mAHD)
900
890
880
MB45
CRD
long term
CRD + long term
2012
2013
2014
2015
2016
2017
2018
2019
Date
MB45: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2013
2014
2015
2016
2017
2018
2019
Date
MB45: long term trend
Long term trend (mAHD)
950
900
long term
2012
2013
2014
2015
2016
2017
2018
2019
Date
MB45: fit residuals
Residual (m)
5
0
−5
MB45
2012
2013
2014
2015
2016
2017
2018
2019
Date

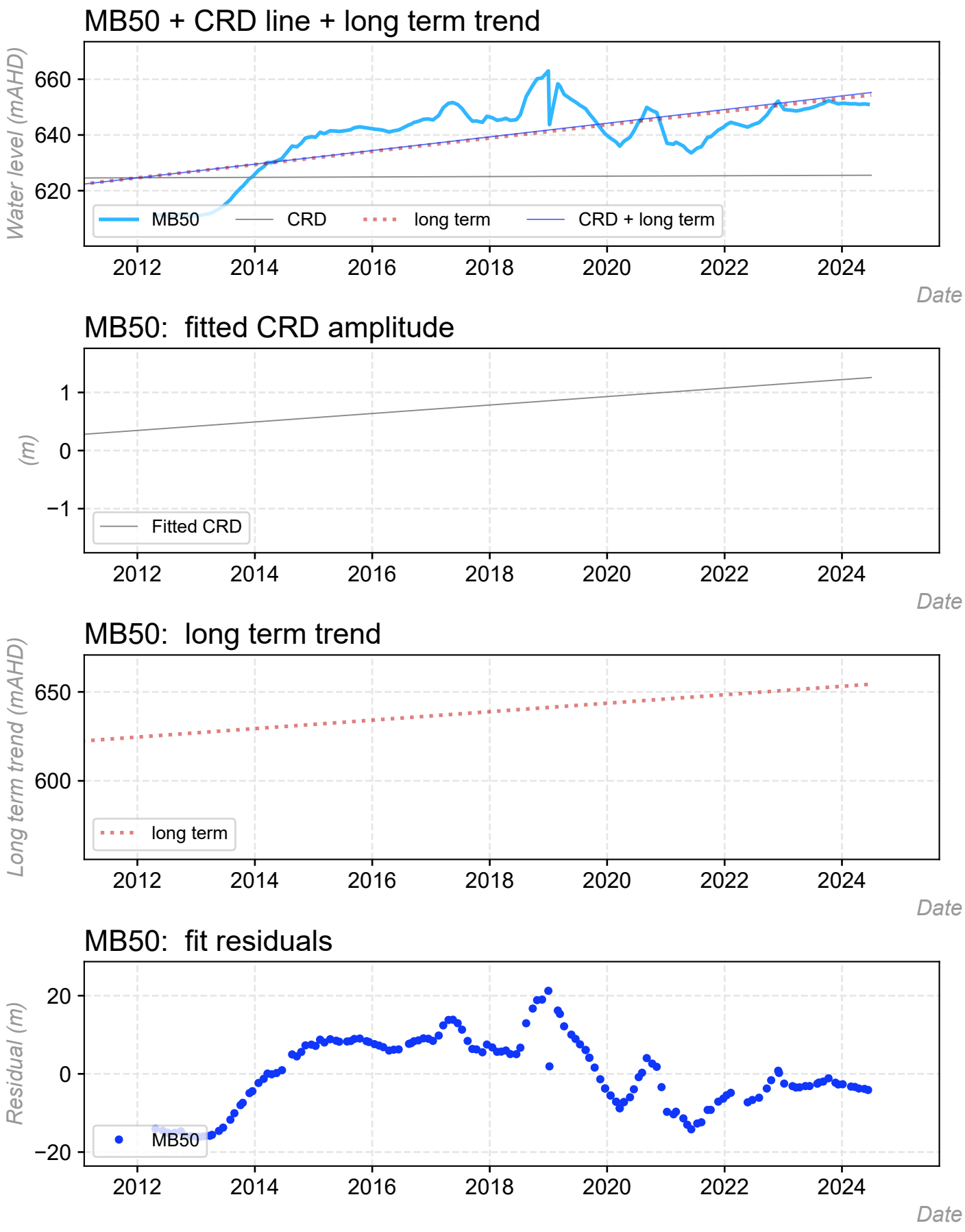

MB46 + CRD line + long term trend
Water level (mAHD)
860.0
857.5
855.0
MB46
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB46: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
Date
MB46: long term trend
Long term trend (mAHD)
865
860
855
long term
Date
MB46: fit residuals
Residual (m)
2
0
−2
MB46
Date

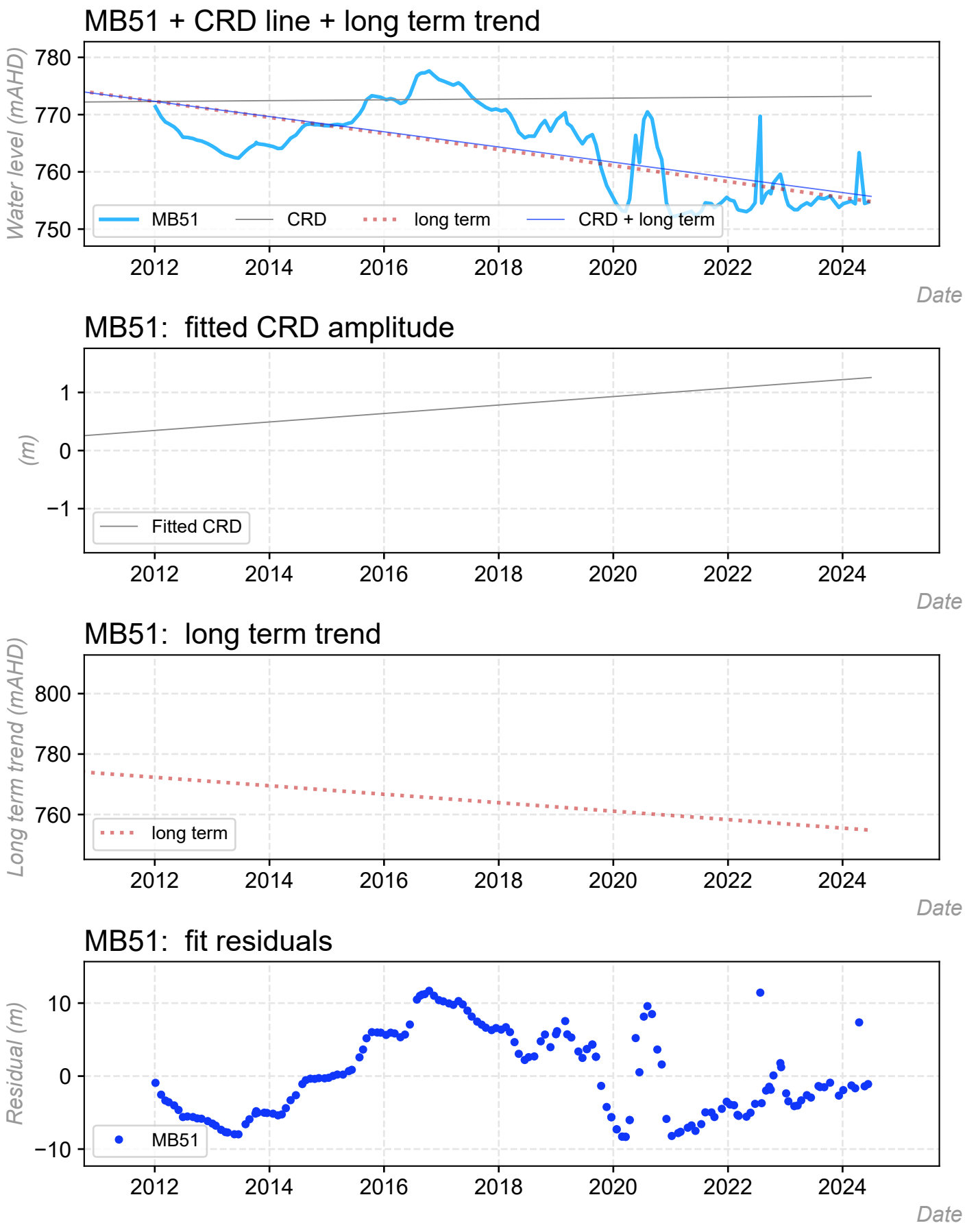

MB47A + CRD line + long term trend
Water level (mAHD)
845
840
835
MB47A
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB47A: fitted CRD amplitude
(m)
5
0
−5
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB47A: long term trend
Long term trend (mAHD)
840
835
830
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB47A: fit residuals
Residual (m)
2.5
0.0
−2.5
MB47A
2012
2014
2016
2018
2020
2022
2024
Date

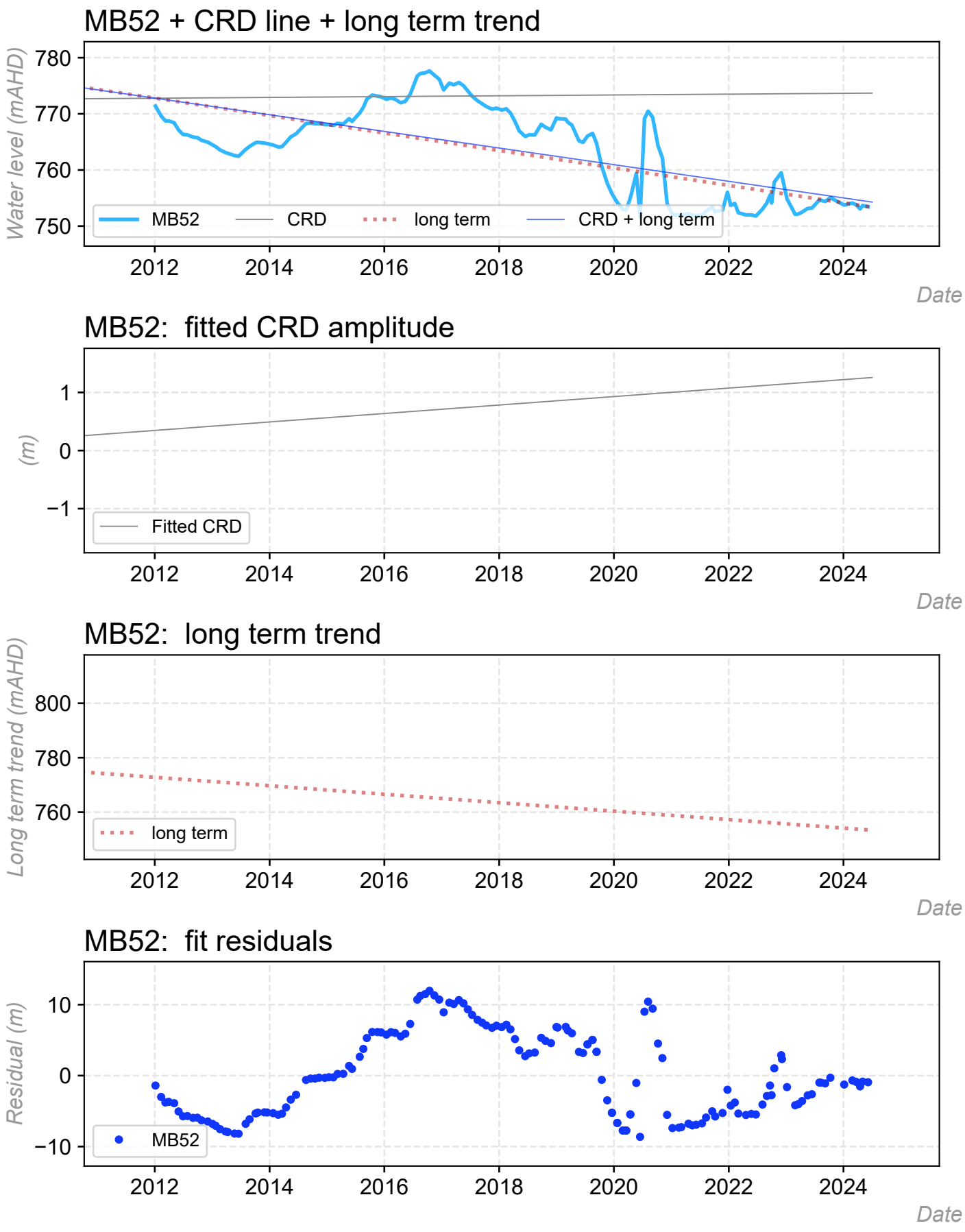

MB47B + CRD line + long term trend
Water level (mAHD)
845
840
835
MB47B
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB47B: fitted CRD amplitude
(m)
5
0
−5
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB47B: long term trend
Long term trend (mAHD)
840
835
830
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB47B: fit residuals
Residual (m)
2.5
0.0
−2.5
MB47B
2012
2014
2016
2018
2020
2022
2024
Date

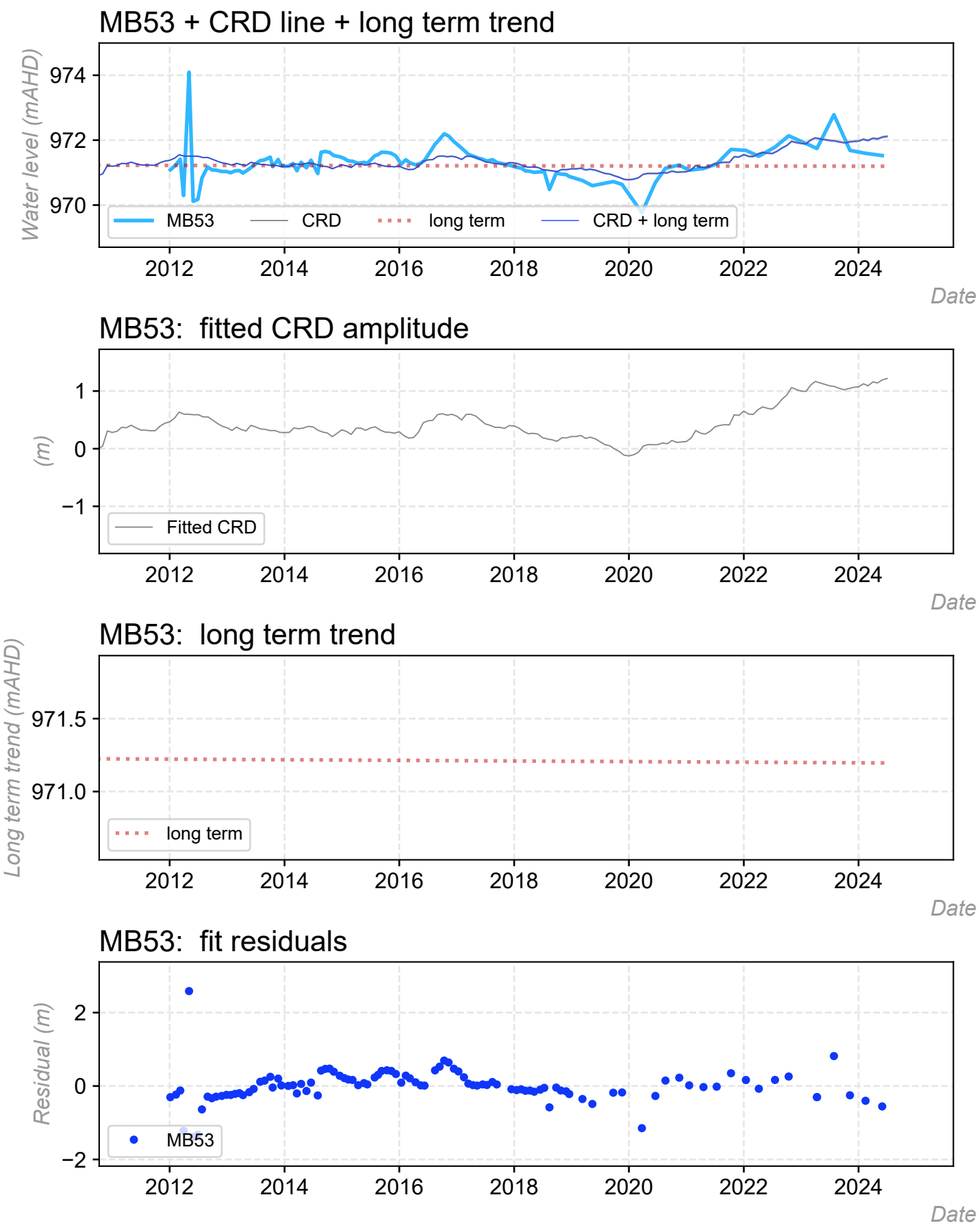

MB48 + CRD line + long term trend
Water level (mAHD)
945
940
935
930
MB48
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB48: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB48: long term trend
Long term trend (mAHD)
960
940
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB48: fit residuals
Residual (m)
1
0
−1
MB48
2012
2014
2016
2018
2020
2022
2024
Date

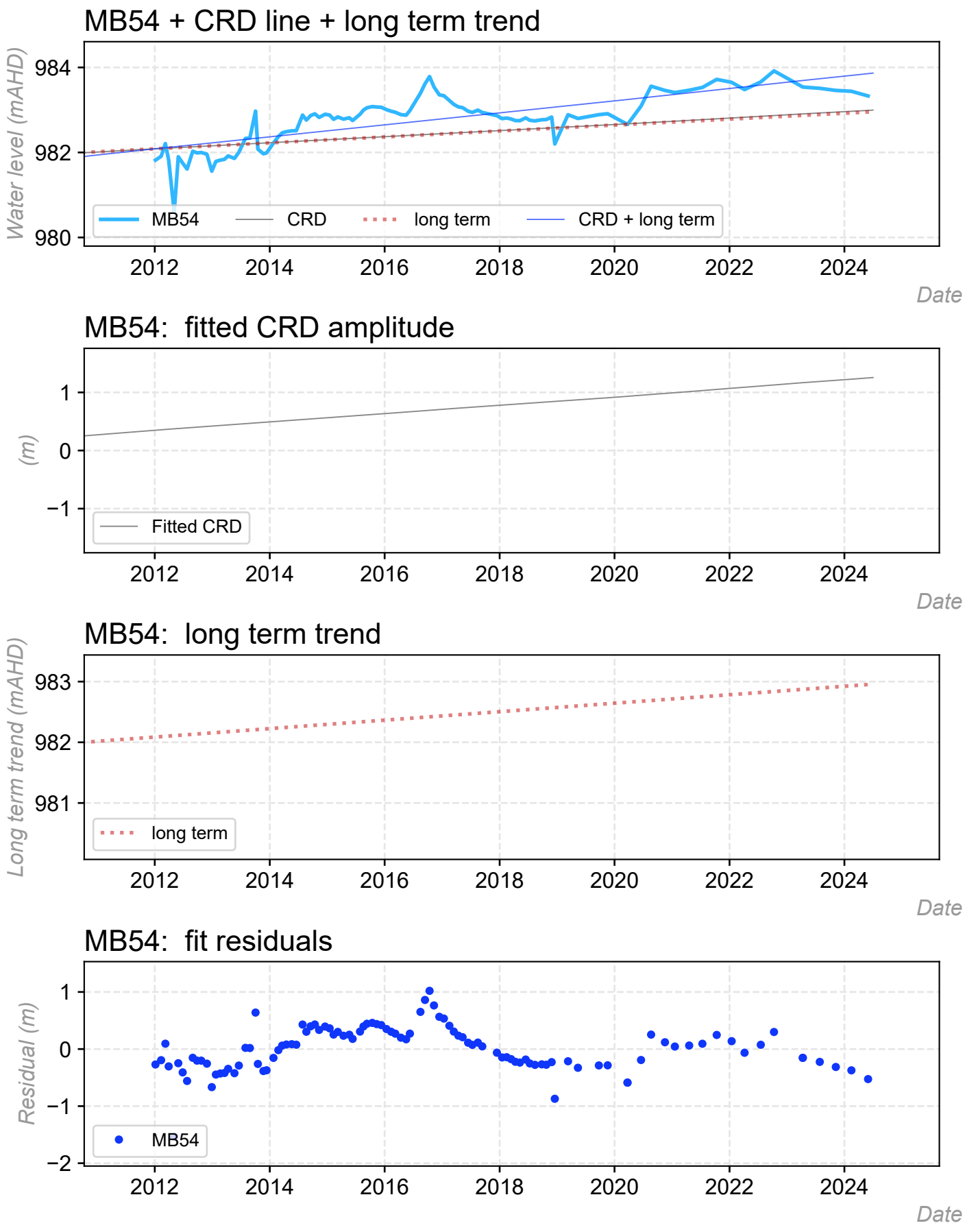

MB49 + CRD line + long term trend
Water level (mAHD)
955
950
945
MB49
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB49: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB49: long term trend
Long term trend (mAHD)
960
950
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB49: fit residuals
Residual (m)
0
−2
−4
MB49
2012
2014
2016
2018
2020
2022
2024
Date

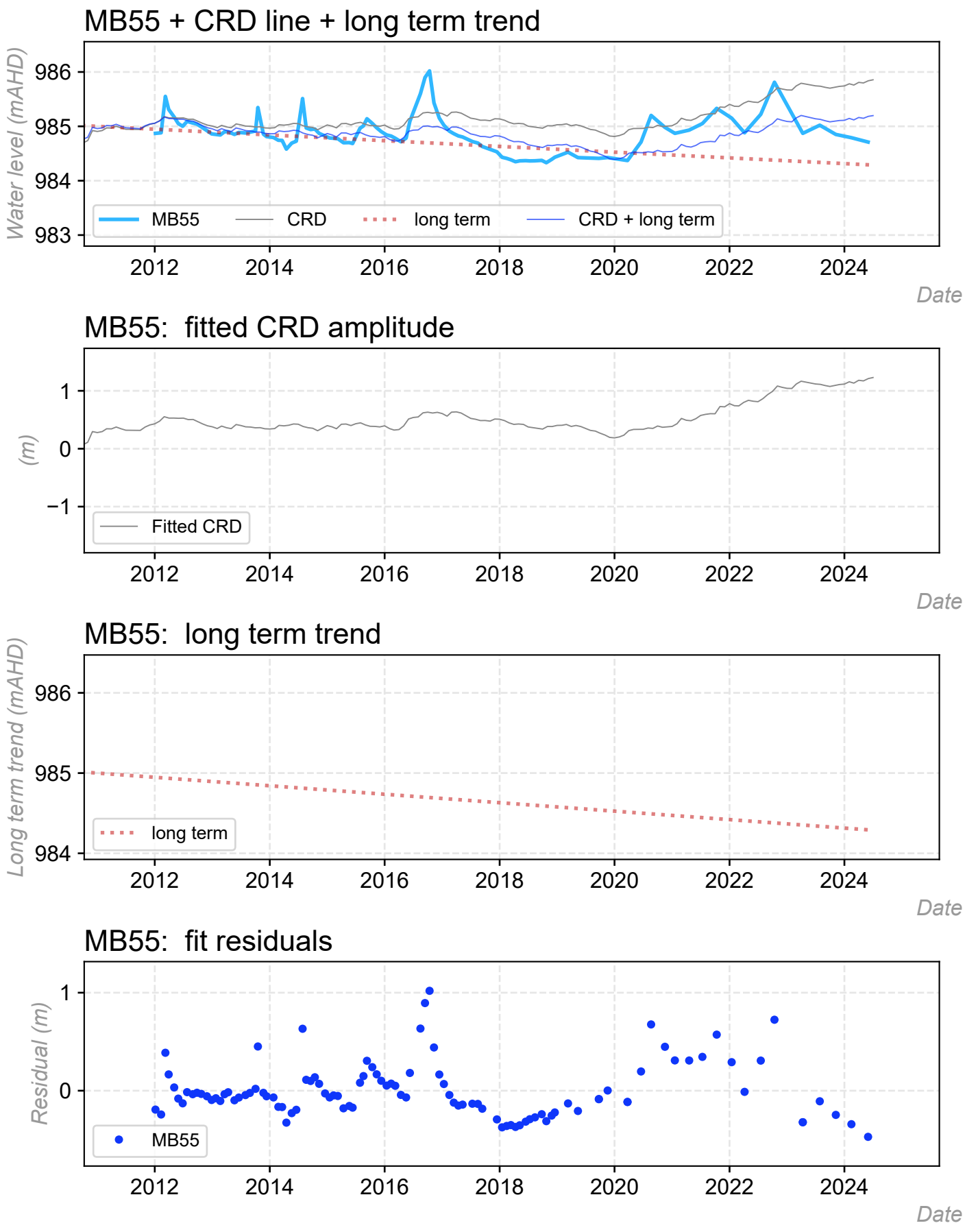

MB50 + CRD line + long term trend
Water level (mAHD)
660
640
620
MB50
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB50: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB50: long term trend
Long term trend (mAHD)
650
600
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB50: fit residuals
Residual (m)
20
0
−20
MB50
2012
2014
2016
2018
2020
2022
2024
Date

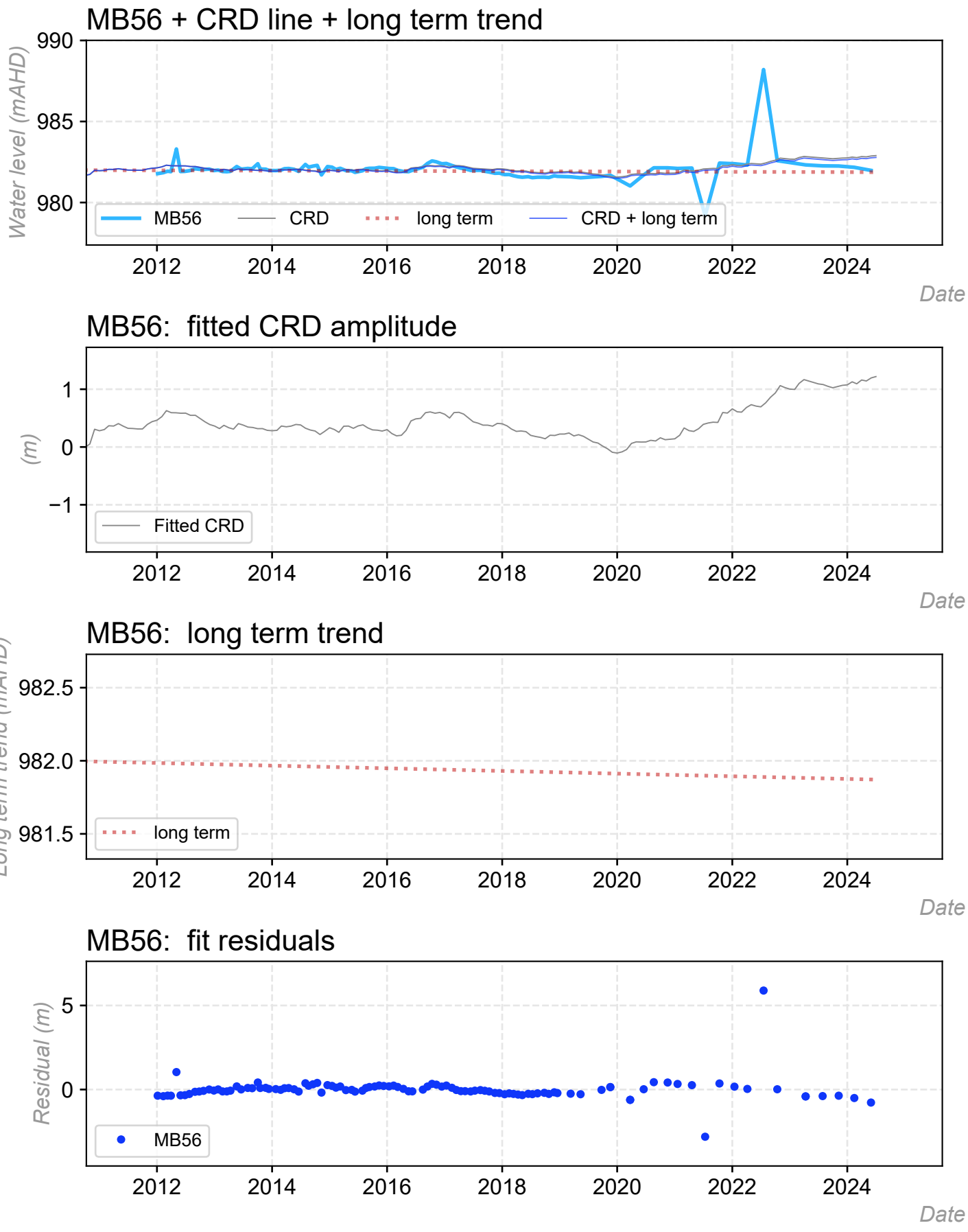

MB51 + CRD line + long term trend
Water level (mAHD)
780
770
760
750
MB51
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB51: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB51: long term trend
Long term trend (mAHD)
800
780
760
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB51: fit residuals
Residual (m)
10
0
−10
MB51
2012
2014
2016
2018
2020
2022
2024
Date

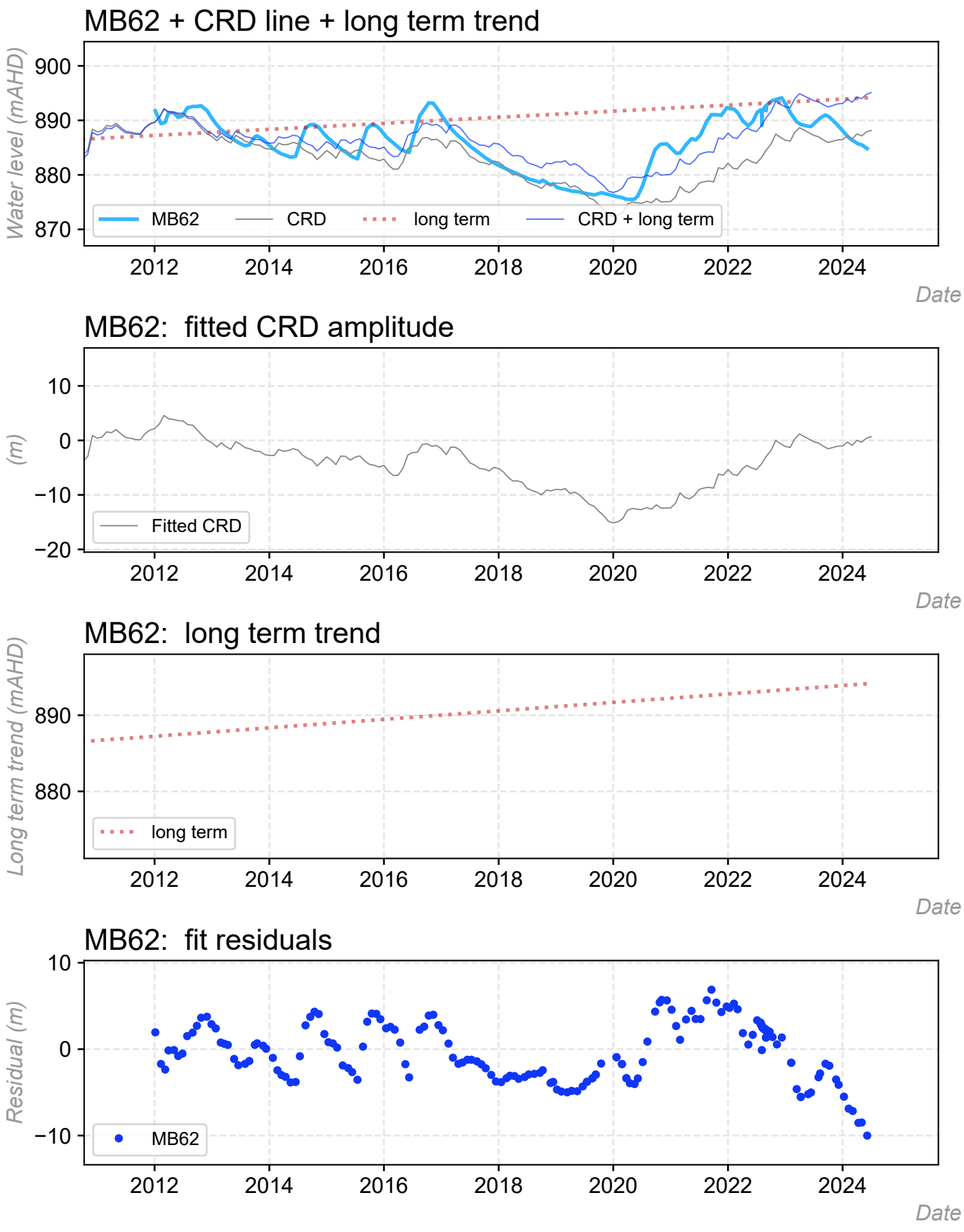

MB52 + CRD line + long term trend
Water level (mAHD)
780
770
760
750
MB52
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB52: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB52: long term trend
Long term trend (mAHD)
800
780
760
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB52: fit residuals
Residual (m)
10
0
−10
MB52
2012
2014
2016
2018
2020
2022
2024
Date

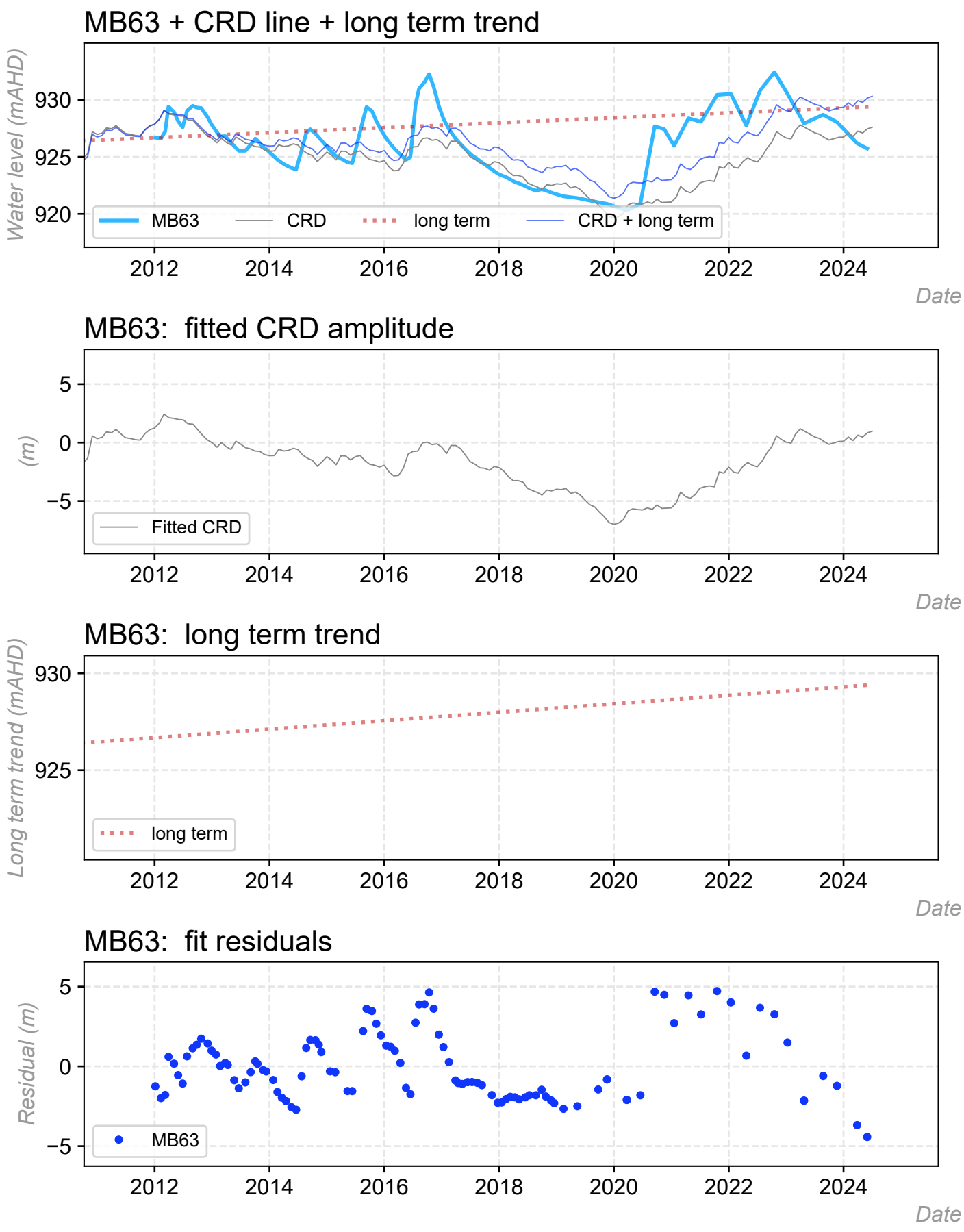

MB53 + CRD line + long term trend
Water level (mAHD)
974
972
970
MB53
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB53: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB53: long term trend
Long term trend (mAHD)
971.5
971.0
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB53: fit residuals
Residual (m)
2
0
−2
MB53
2012
2014
2016
2018
2020
2022
2024
Date

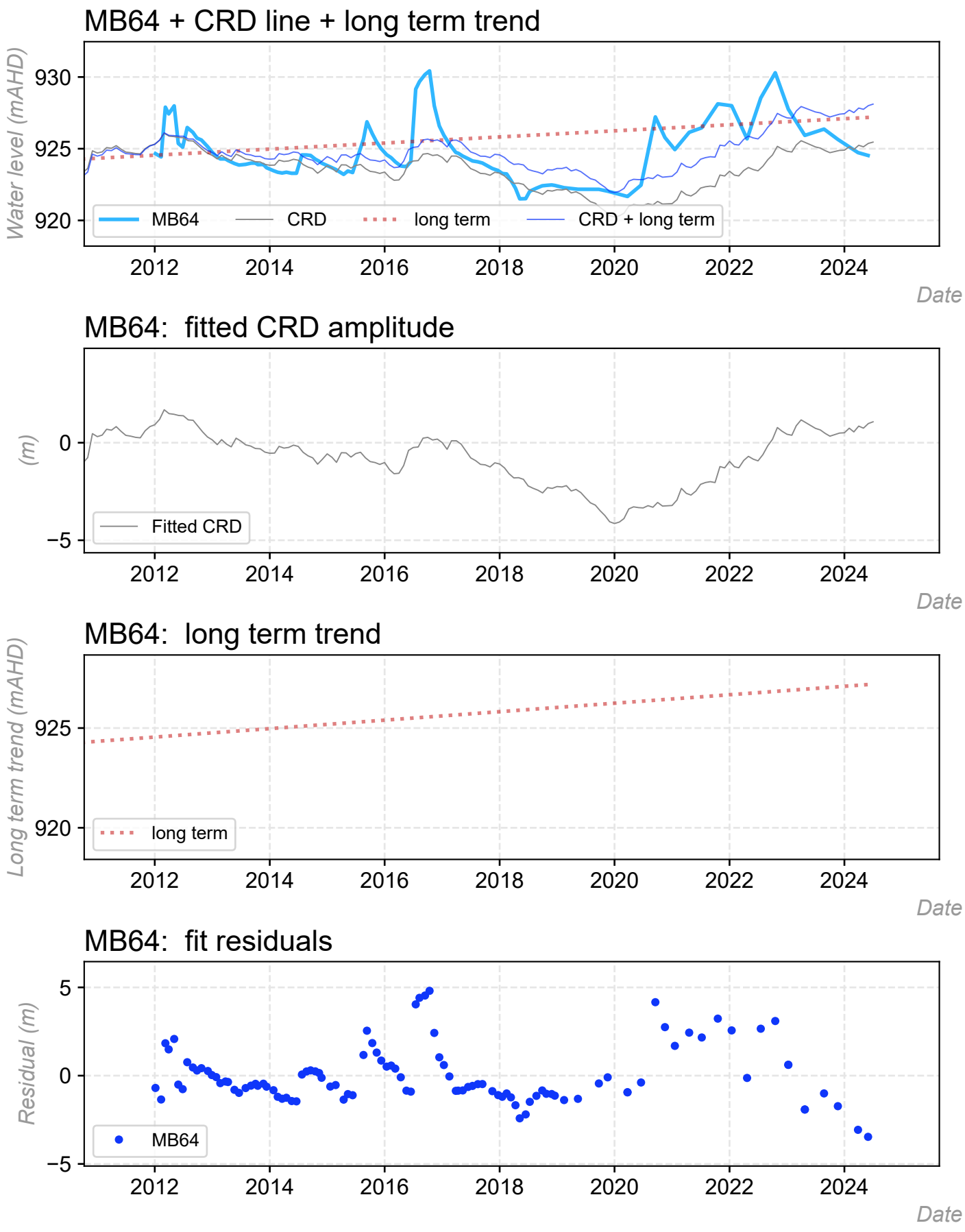

MB54 + CRD line + long term trend
Water level (mAHD)
984
982
980
MB54
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB54: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB54: long term trend
Long term trend (mAHD)
983
982
981
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB54: fit residuals
Residual (m)
1
0
−1
−2
MB54
2012
2014
2016
2018
2020
2022
2024
Date

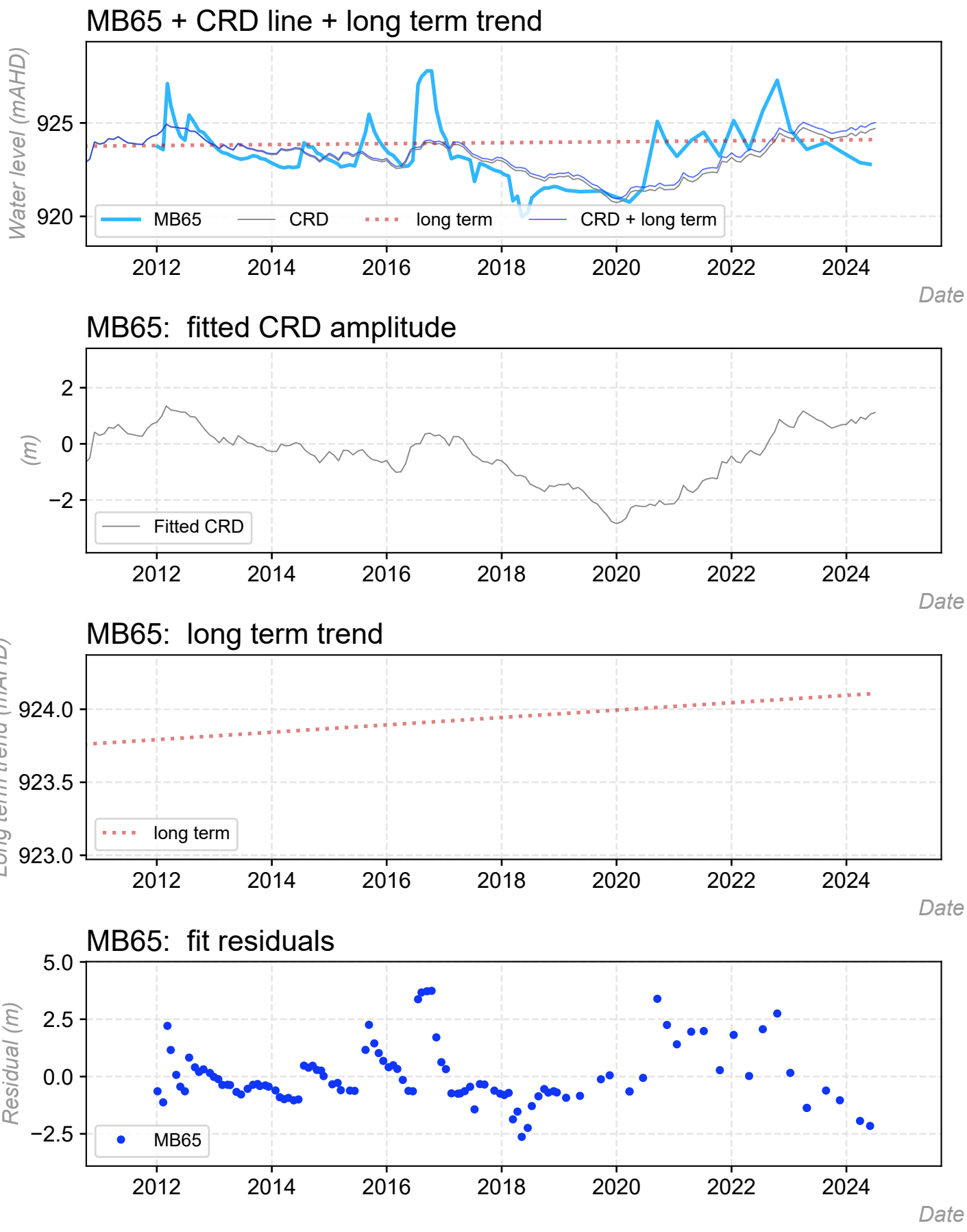

MB55 + CRD line + long term trend
Water level (mAHD)
986
985
984
983
MB55
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB55: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB55: long term trend
Long term trend (mAHD)
986
985
984
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB55: fit residuals
Residual (m)
1
0
MB55
2012
2014
2016
2018
2020
2022
2024
Date

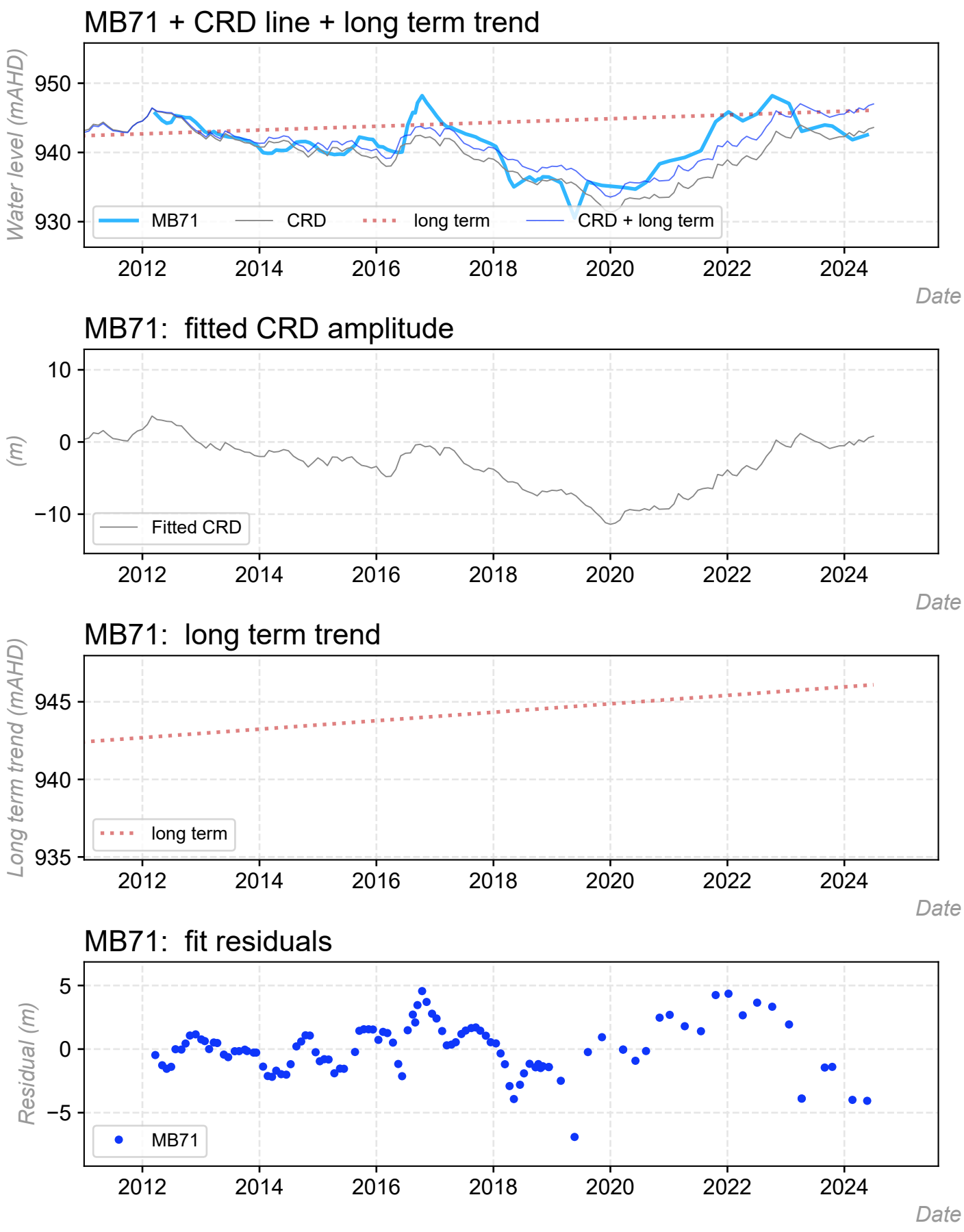

MB56 + CRD line + long term trend
Water level (mAHD)
990
985
980
MB56
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB56: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB56: long term trend
Long term trend (mAHD)
982.5
982.0
981.5
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB56: fit residuals
Residual (m)
5
0
MB56
2012
2014
2016
2018
2020
2022
2024
Date

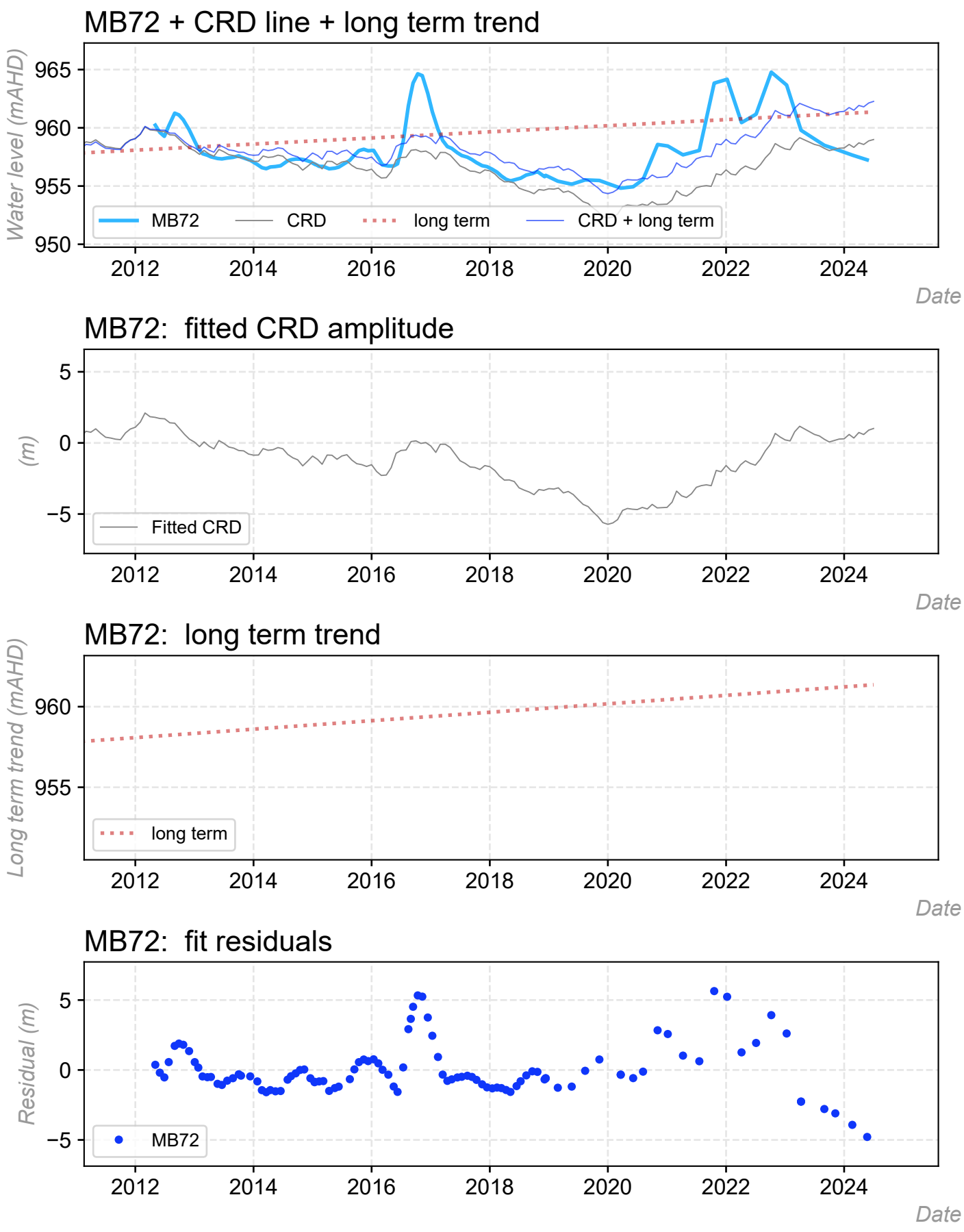

MB62 + CRD line + long term trend
Water level (mAHD)
900
890
880
870
MB62
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB62: fitted CRD amplitude
(m)
10
0
−10
−20
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB62: long term trend
Long term trend (mAHD)
890
880
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB62: fit residuals
Residual (m)
10
0
−10
MB62
2012
2014
2016
2018
2020
2022
2024
Date

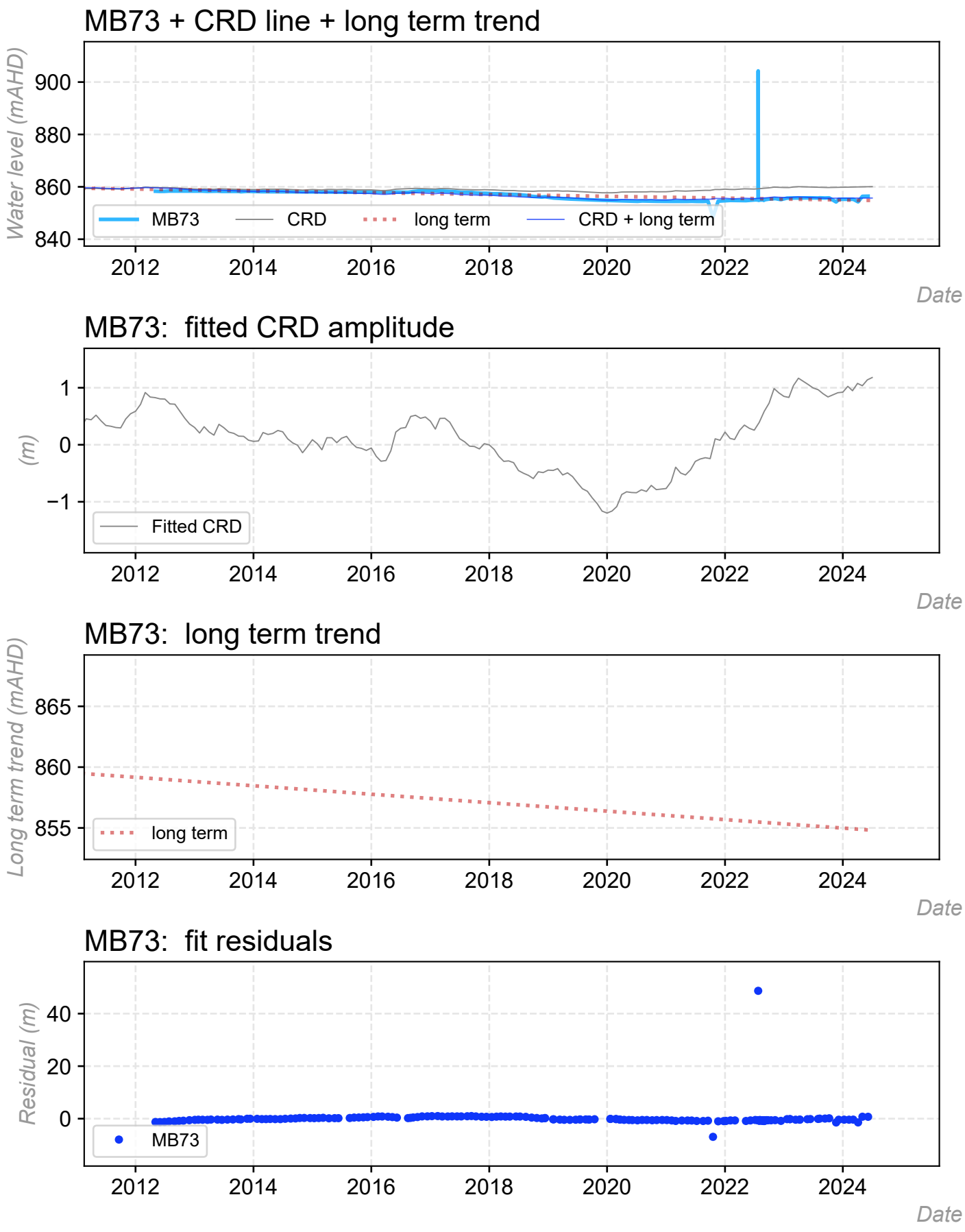

MB63 + CRD line + long term trend
Water level (mAHD)
930
925
920
MB63
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB63: fitted CRD amplitude
(m)
5
0
−5
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB63: long term trend
Long term trend (mAHD)
930
925
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB63: fit residuals
Residual (m)
5
0
−5
MB63
2012
2014
2016
2018
2020
2022
2024
Date

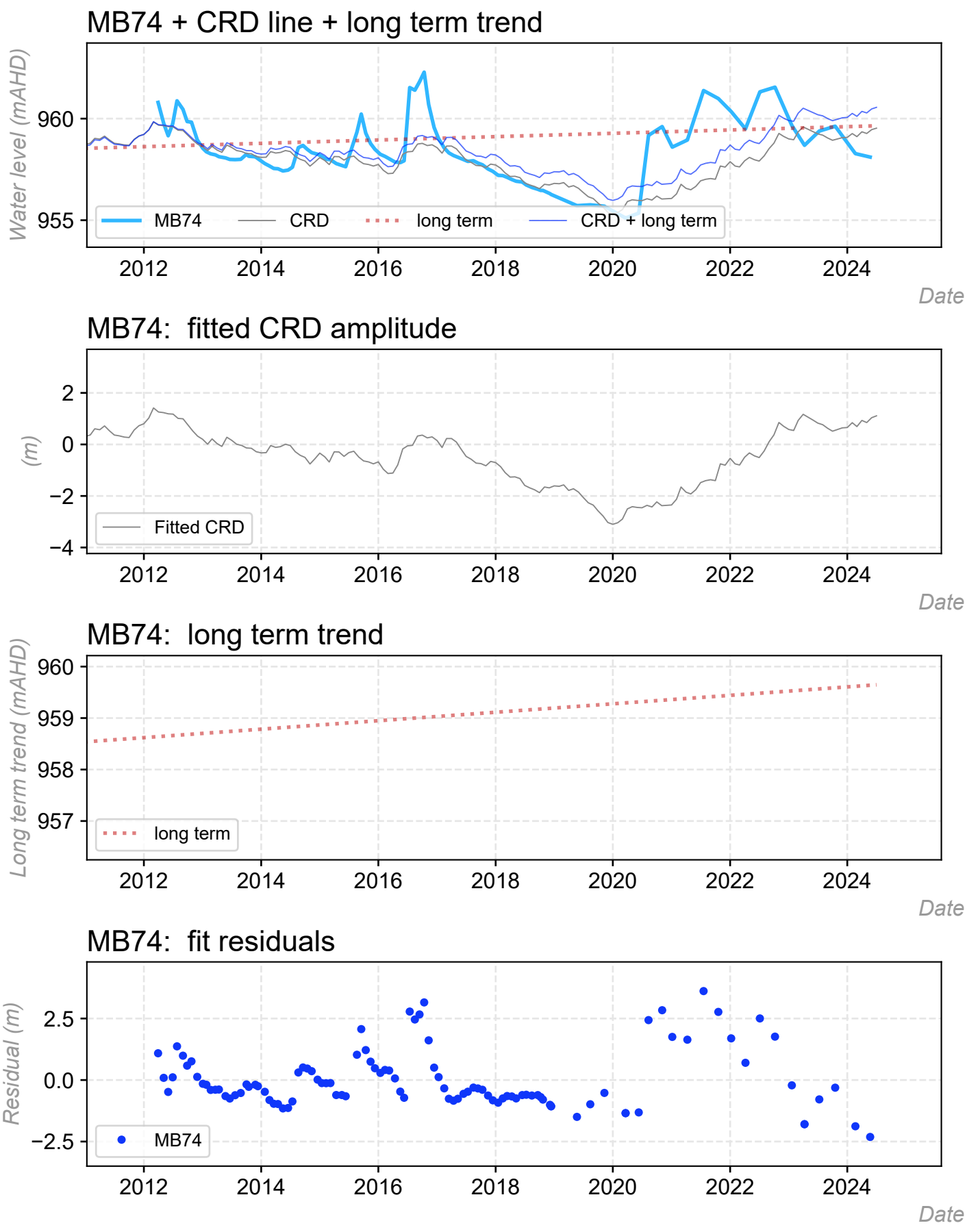

MB64 + CRD line + long term trend
Water level (mAHD)
930
925
920
MB64
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB64: fitted CRD amplitude
(m)
0
−5
Fitted CRD
Date
MB64: long term trend
Long term trend (mAHD)
925
920
long term
Date
MB64: fit residuals
Residual (m)
5
0
−5
MB64
Date

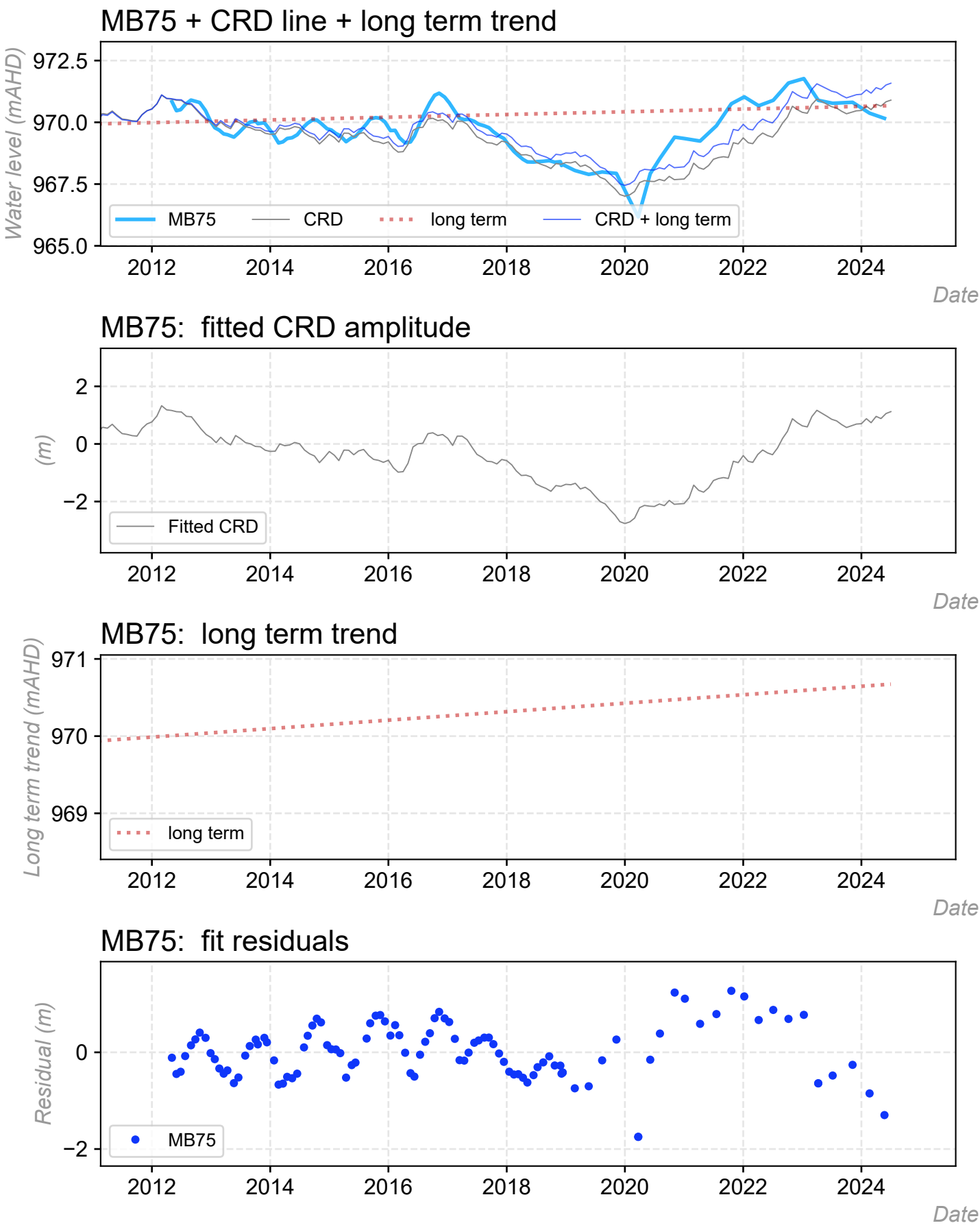

MB65 + CRD line + long term trend
Water level (mAHD)
925
920
MB65
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB65: fitted CRD amplitude
(m)
2
0
−2
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB65: long term trend
Long term trend (mAHD)
924.0
923.5
923.0
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB65: fit residuals
Residual (m)
5.0
2.5
0.0
−2.5
MB65
2012
2014
2016
2018
2020
2022
2024
Date

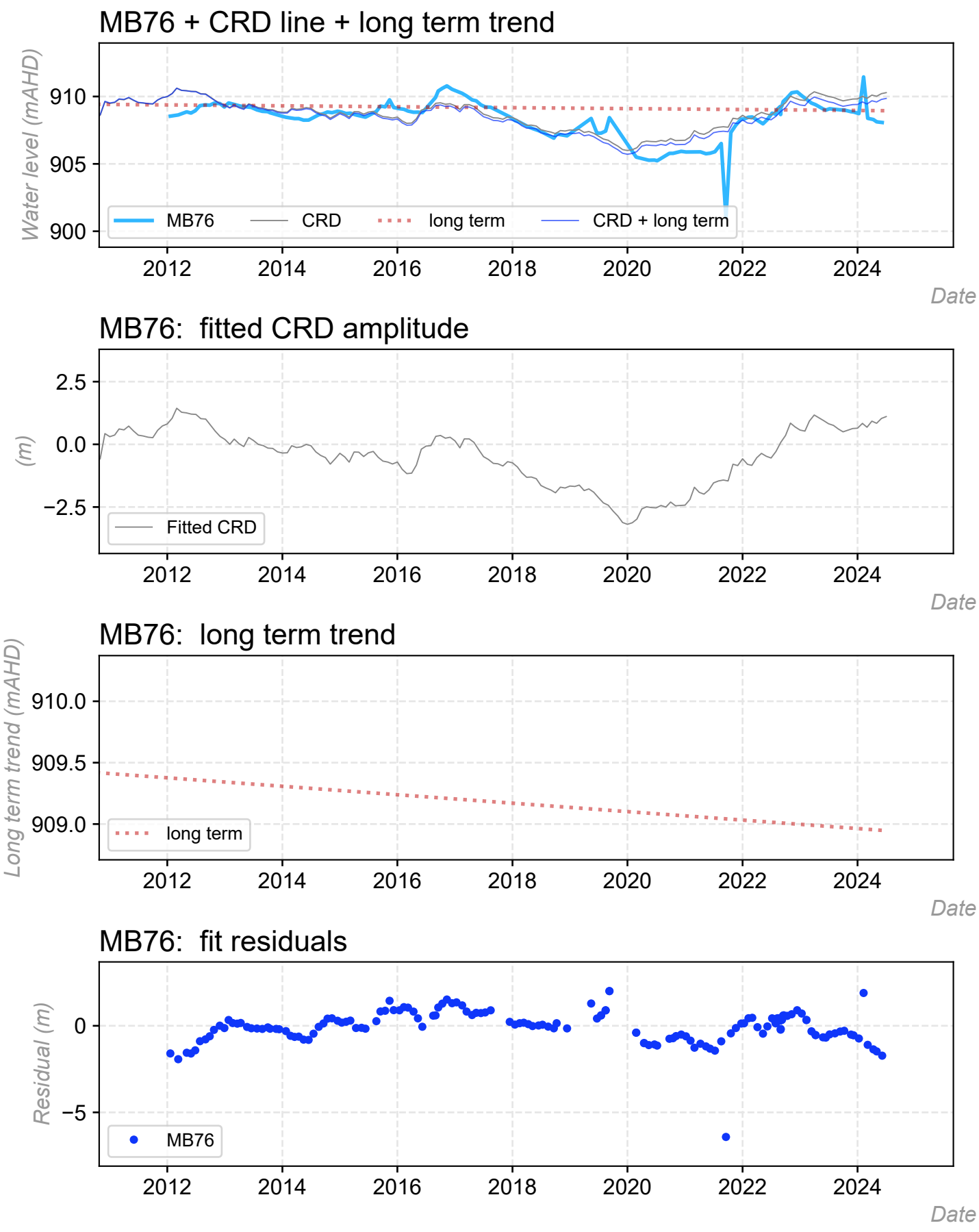

MB71 + CRD line + long term trend
Water level (mAHD)
950
940
930
MB71
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB71: fitted CRD amplitude
(m)
10
0
−10
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB71: long term trend
Long term trend (mAHD)
945
940
935
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB71: fit residuals
Residual (m)
5
0
−5
MB71
2012
2014
2016
2018
2020
2022
2024
Date

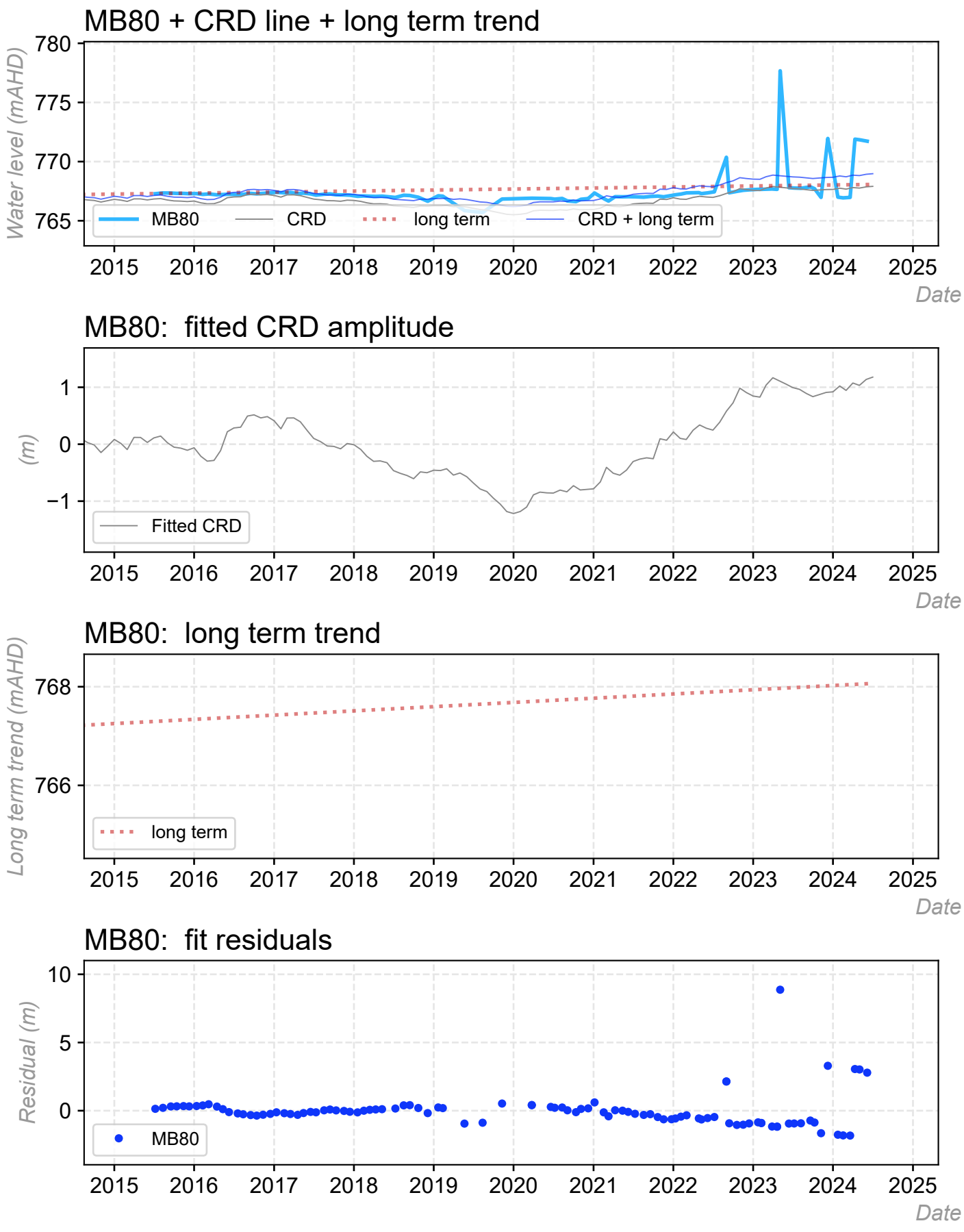

MB72 + CRD line + long term trend
Water level (mAHD)
965
960
955
950
MB72
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB72: fitted CRD amplitude
(m)
5
0
−5
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB72: long term trend
Long term trend (mAHD)
960
955
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB72: fit residuals
Residual (m)
5
0
−5
MB72
2012
2014
2016
2018
2020
2022
2024
Date

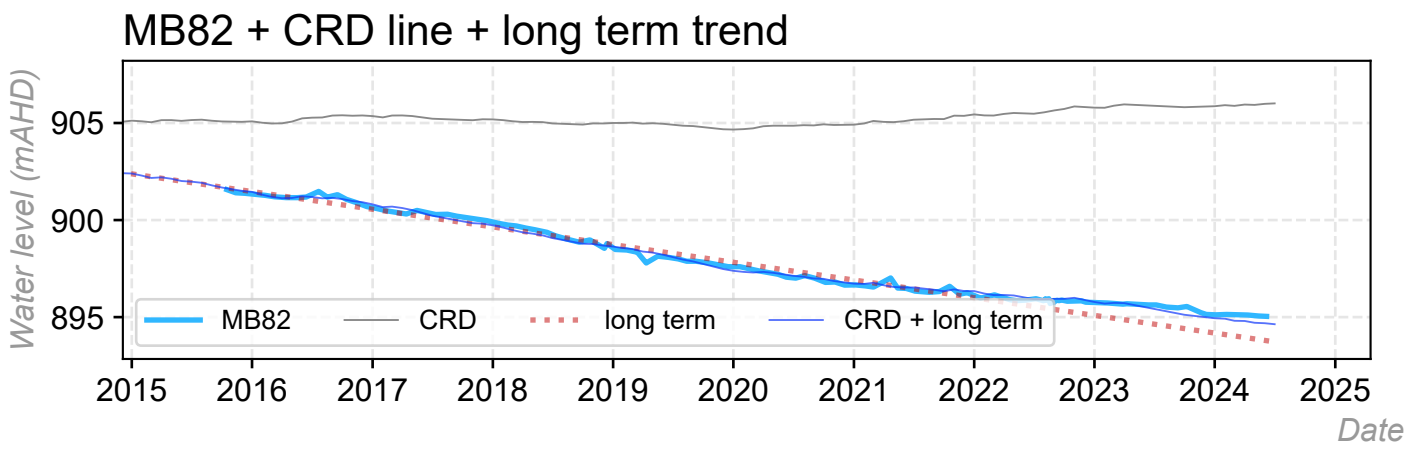

MB73 + CRD line + long term trend
Water level (mAHD)
900
880
860
840
MB73
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB73: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB73: long term trend
Long term trend (mAHD)
865
860
855
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB73: fit residuals
Residual (m)
40
20
0
MB73
2012
2014
2016
2018
2020
2022
2024
Date

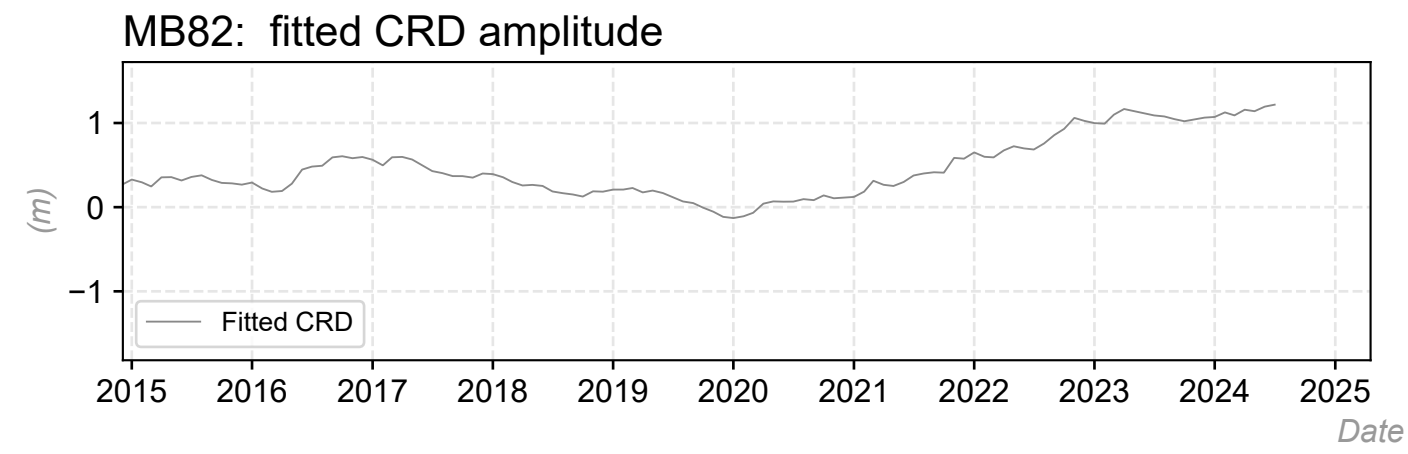

MB74 + CRD line + long term trend
Water level (mAHD)
960
955
MB74
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB74: fitted CRD amplitude
(m)
2
0
−2
−4
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB74: long term trend
Long term trend (mAHD)
960
959
958
957
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB74: fit residuals
Residual (m)
2.5
0.0
−2.5
MB74
2012
2014
2016
2018
2020
2022
2024
Date

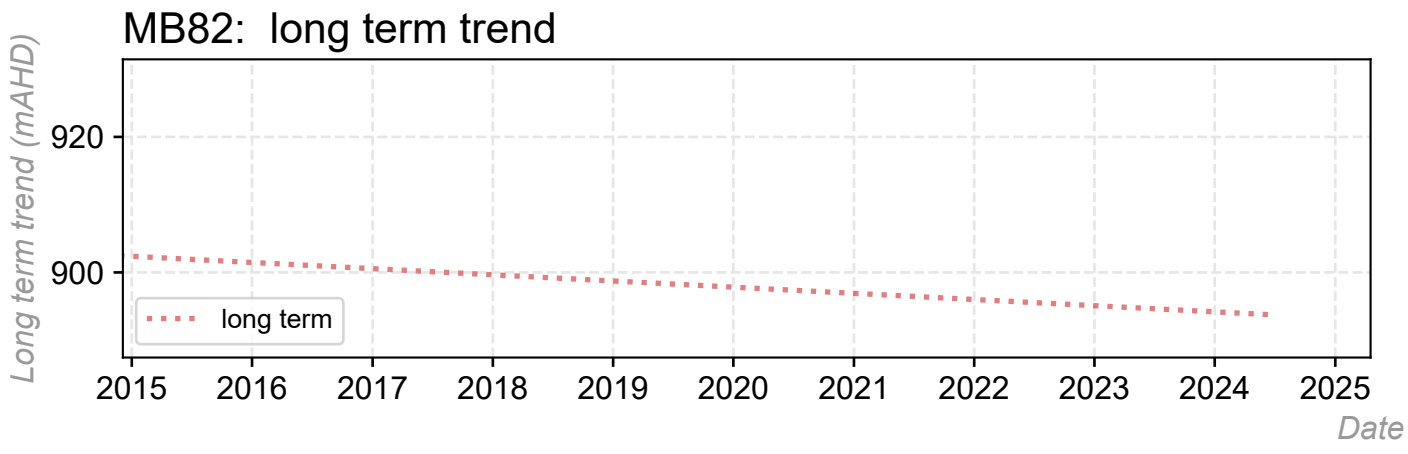

MB75 + CRD line + long term trend
Water level (mAHD)
972.5
970.0
967.5
965.0
MB75
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB75: fitted CRD amplitude
(m)
2
0
−2
Fitted CRD
Date
MB75: long term trend
Long term trend (mAHD)
971
970
969
long term
Date
MB75: fit residuals
Residual (m)
0
−2
MB75
Date

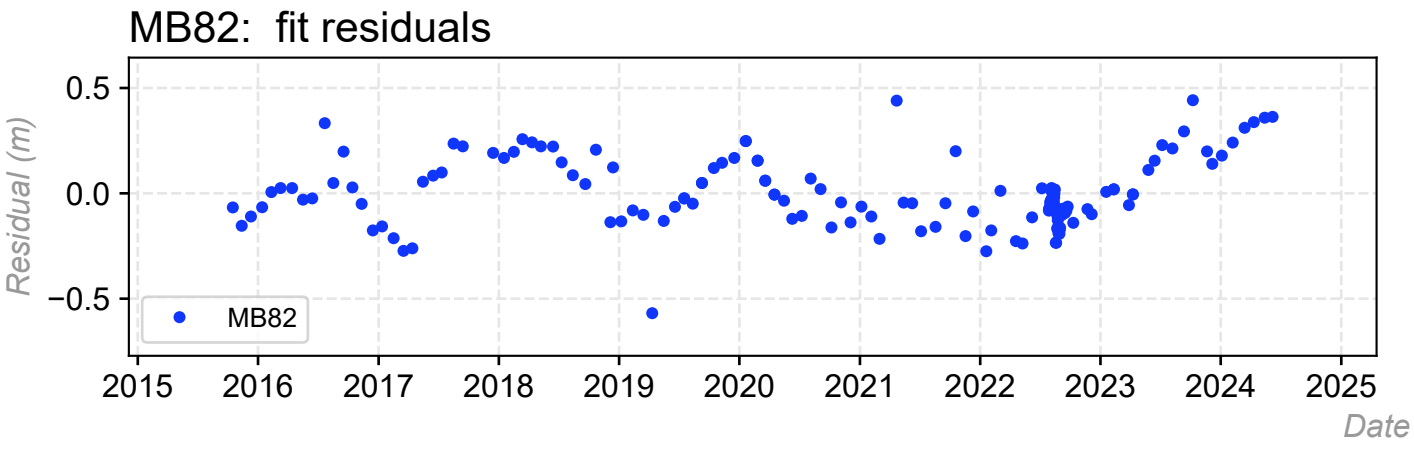

MB76 + CRD line + long term trend
Water level (mAHD)
910
905
900
MB76
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
MB76: fitted CRD amplitude
(m)
2.5
0.0
−2.5
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
MB76: long term trend
Long term trend (mAHD)
910.0
909.5
909.0
long term
2012
2014
2016
2018
2020
2022
2024
Date
MB76: fit residuals
Residual (m)
0
−5
MB76
2012
2014
2016
2018
2020
2022
2024
Date

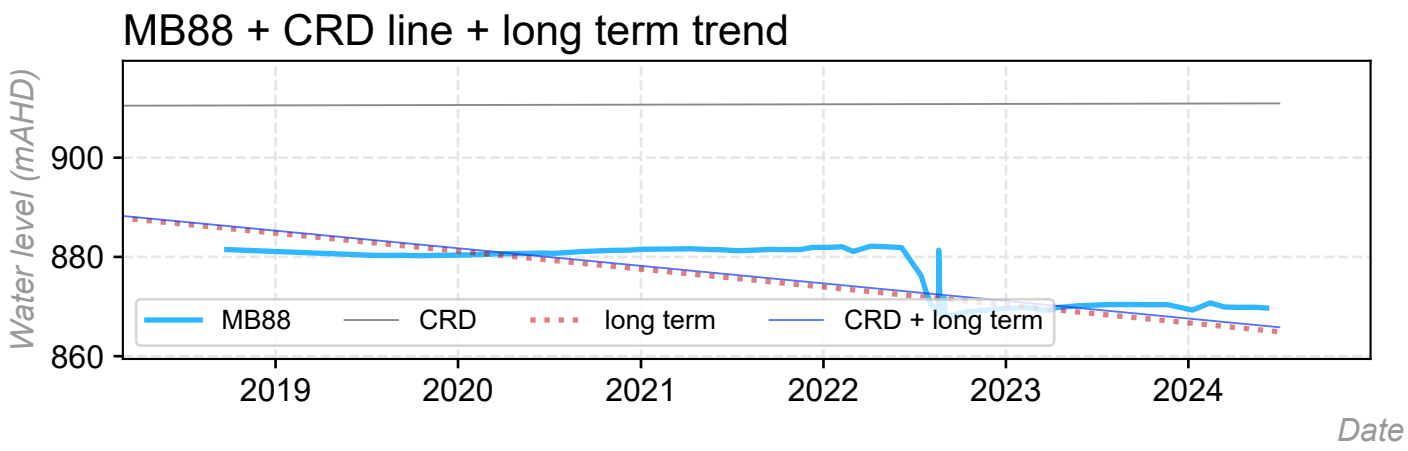

MB80 + CRD line + long term trend
Water level (mAHD)
780
775
770
765
MB80
CRD
long term
CRD + long term
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
MB80: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
Date
MB80: long term trend
Long term trend (mAHD)
768
766
long term
Date
MB80: fit residuals
Residual (m)
10
5
0
MB80
Date

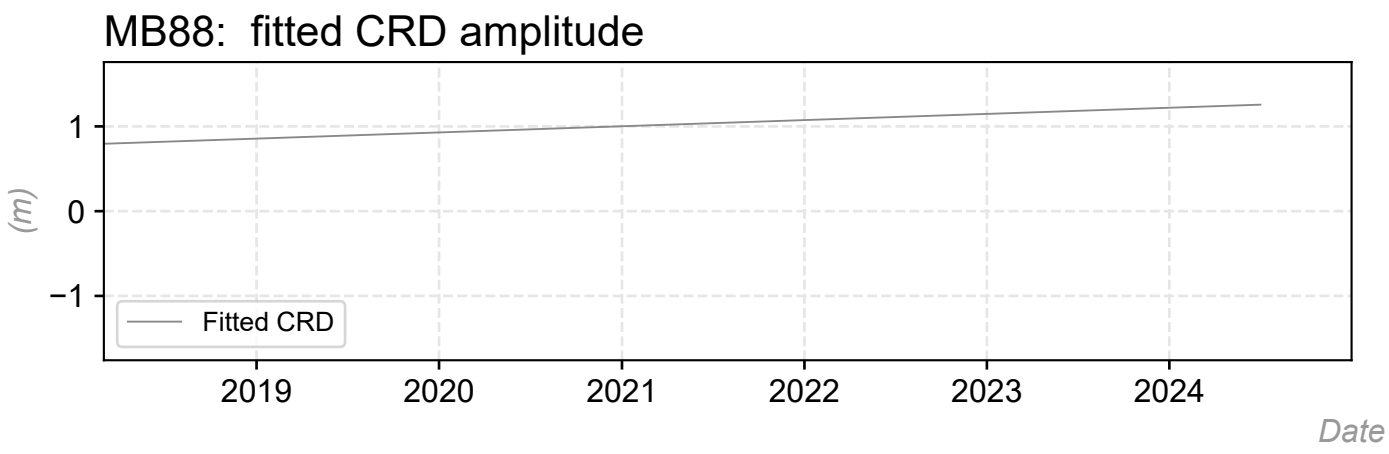

MB82 + CRD line + long term trend
Water level (mAHD)
905
900
895
MB82
CRD
long term
CRD + long term
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date

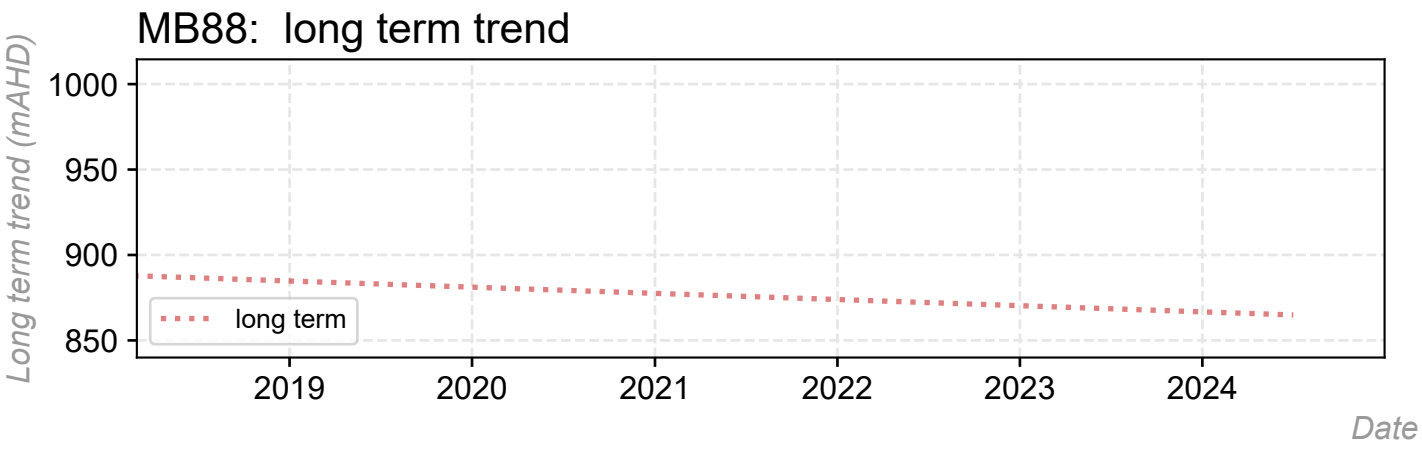

MB82: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date

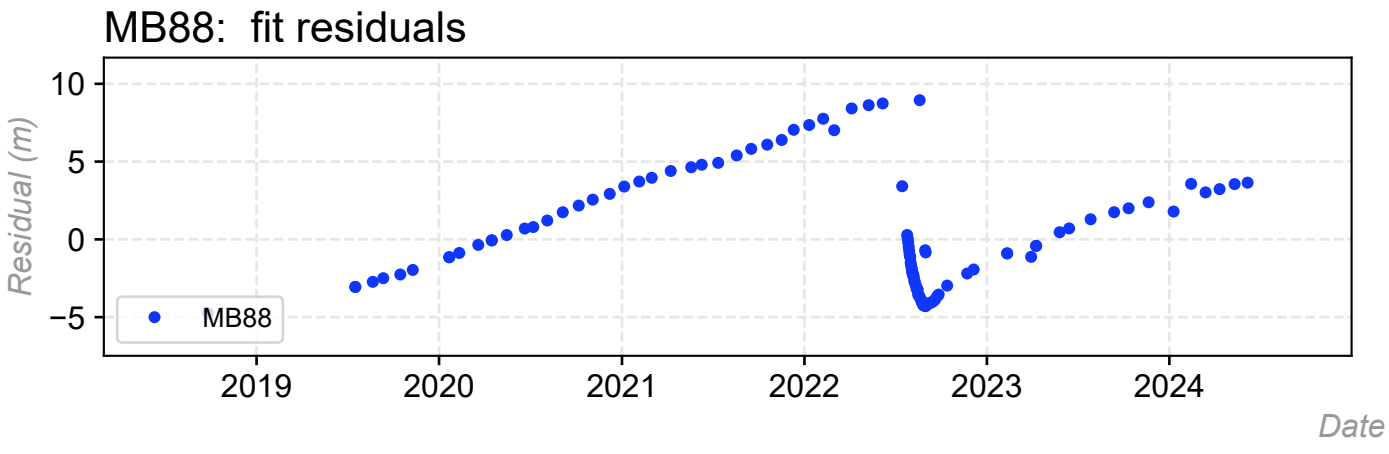

MB82: long term trend
Long term trend (mAHD)
920
900
long term
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date

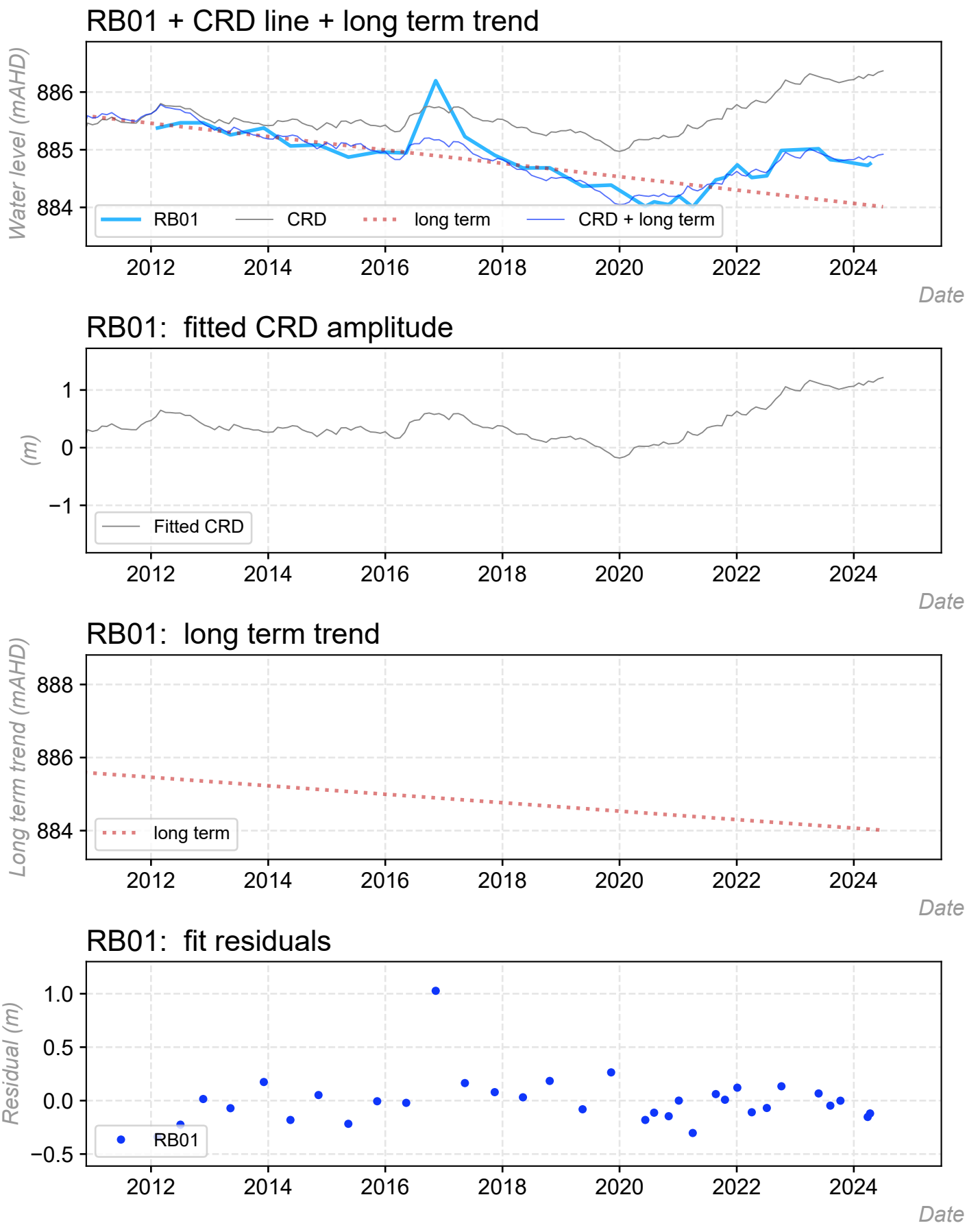

MB82: fit residuals
Residual (m)
0.5
0.0
−0.5
MB82
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date

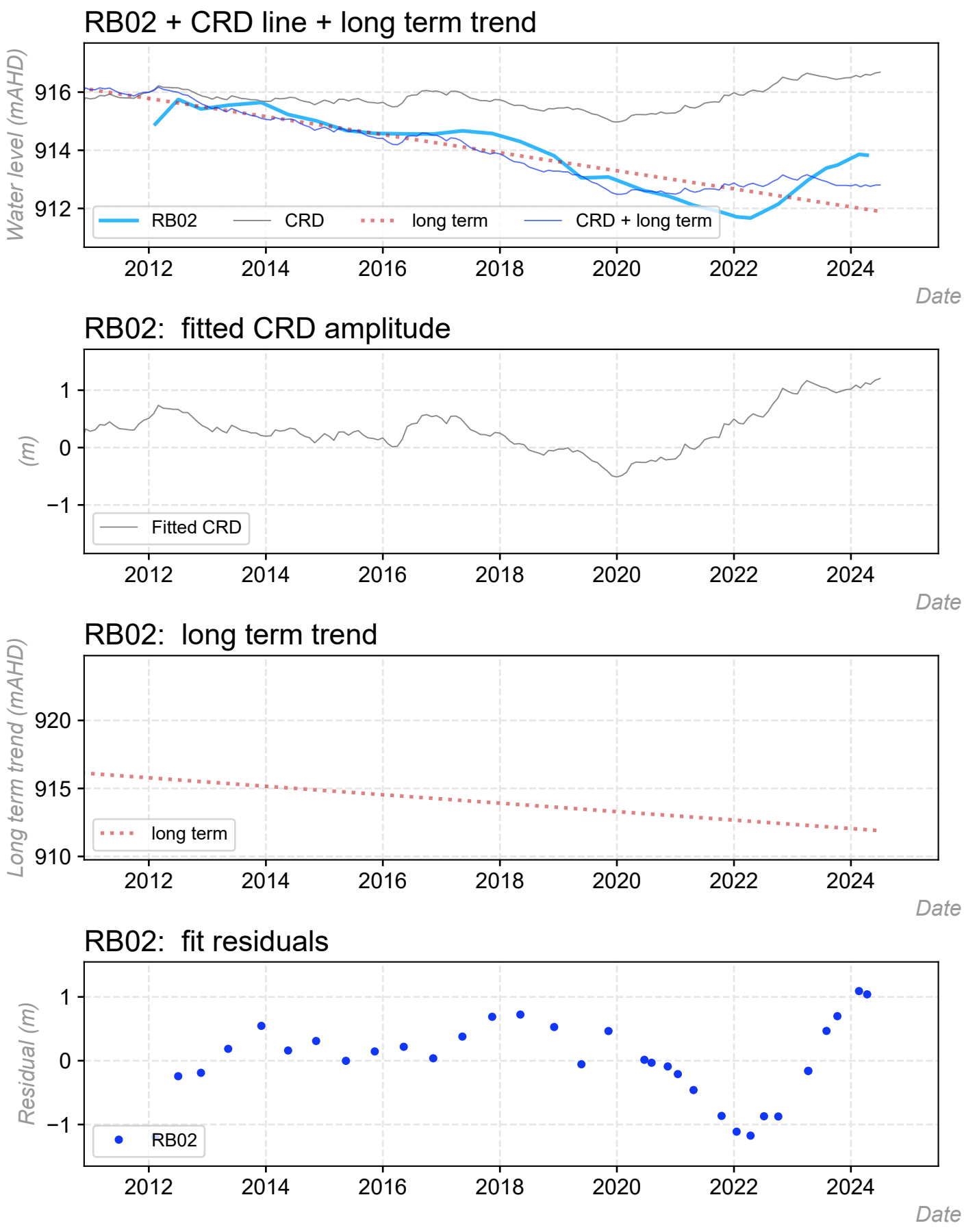

MB88 + CRD line + long term trend
Water level (mAHD)
900
880
860
MB88
CRD
long term
CRD + long term
2019
2020
2021
2022
2023
2024
Date

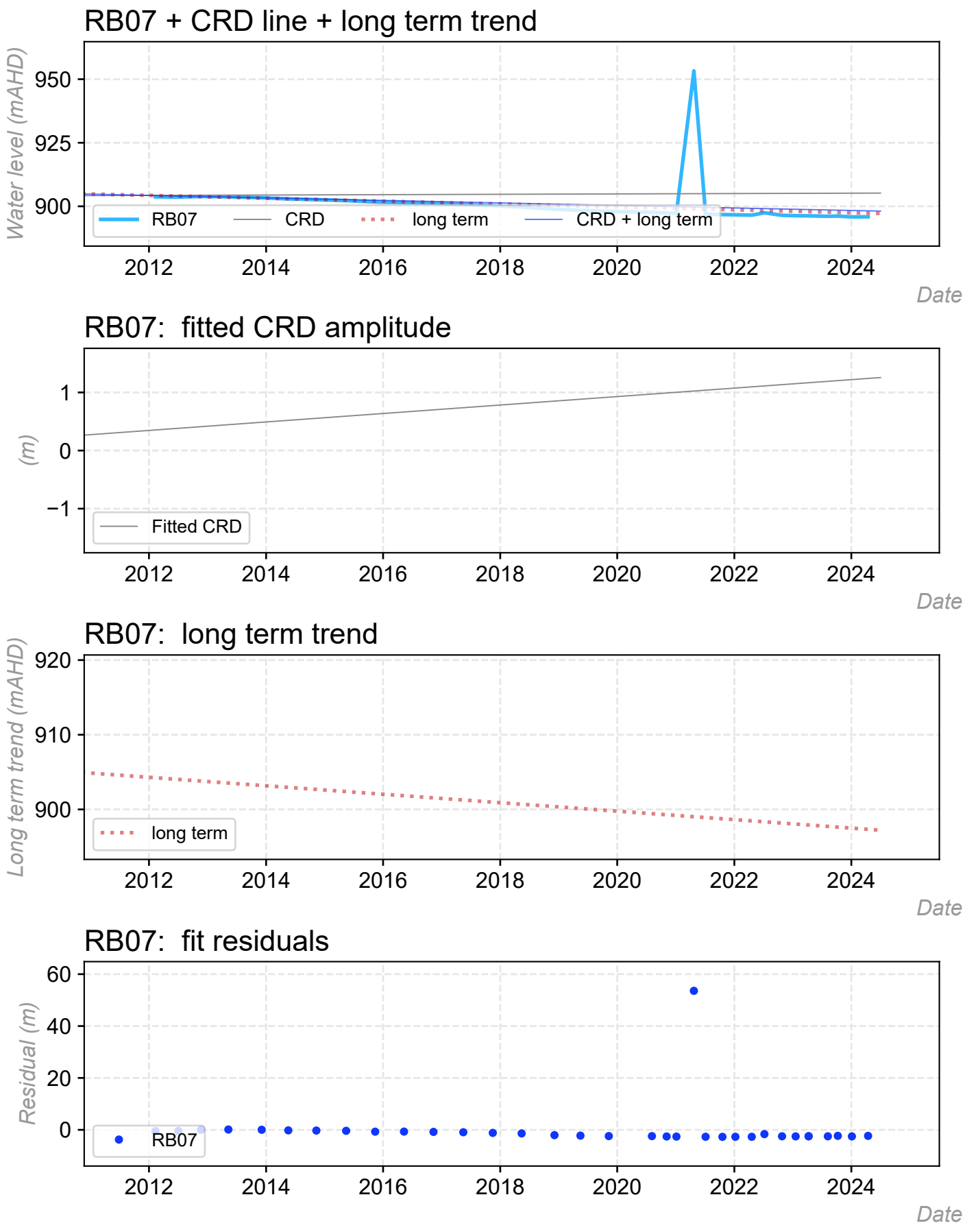

MB88: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2019
2020
2021
2022
2023
2024
Date


MB88: long term trend
Long term trend (mAHD)
1000
950
900
850
long term
2019
2020
2021
2022
2023
2024
Date


MB88: fit residuals
Residual (m)
10
5
0
−5
MB88
2019
2020
2021
2022
2023
2024
Date


RB01 + CRD line + long term trend
Water level (mAHD)
886
885
884
RB01
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
RB01: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
RB01: long term trend
Long term trend (mAHD)
888
886
884
long term
2012
2014
2016
2018
2020
2022
2024
Date
RB01: fit residuals
Residual (m)
1.0
0.5
0.0
−0.5
RB01
2012
2014
2016
2018
2020
2022
2024
Date


RB02 + CRD line + long term trend
Water level (mAHD)
916
914
912
RB02
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
RB02: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
RB02: long term trend
Long term trend (mAHD)
920
915
910
long term
2012
2014
2016
2018
2020
2022
2024
Date
RB02: fit residuals
Residual (m)
1
0
−1
RB02
2012
2014
2016
2018
2020
2022
2024
Date


RB07 + CRD line + long term trend
Water level (mAHD)
950
925
900
RB07
CRD
long term
CRD + long term
2012
2014
2016
2018
2020
2022
2024
Date
RB07: fitted CRD amplitude
(m)
1
0
−1
Fitted CRD
2012
2014
2016
2018
2020
2022
2024
Date
RB07: long term trend
Long term trend (mAHD)
920
910
900
long term
2012
2014
2016
2018
2020
2022
2024
Date
RB07: fit residuals
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APPENDIX 4 FY24 ANNUAL SURFACE WATER ASSESSMENT

ENGENY

NEWMONT CORPORATION PTY LTD

Cadia Valley Operations

FY24 Annual Surface Water Assessment

BNTL00383_0008-REP-001-2

24 SEPTEMBER 2024

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	1/08/2024	Draft for Client Comment	Sarah Green Goldberg and Annabell Hanthorn	Susan Shield	Sarah Green Goldberg	Susan Shield
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EXECUTIVE SUMMARY

Cadia Holdings Pty Limited (CHPL), which is owned by Newmont Corporation (Newmont), own and operate the Cadia Mine (Cadia). Schedule 5 Condition 2 of the Cadia Project Approval (PA06_0295) specifies that the site is required to complete an Annual Review each year that details the performance of the operation. All aspects of the operation must be included in the review, including surface water.

Engeny Australia Pty Ltd (Engeny) has been engaged to complete a surface water assessment that details the performance of the operation for the 2023 to 2024 financial year (FY24) (herein referred to as the reporting period). The purpose of this assessment is to provide a detailed review of the performance of the Cadia surface water management system (WMS) for FY24. The performance of the surface WMS is benchmarked against requirements outlined in the *Cadia Water Management Plan Revision 8.2* (Newcrest Mining Limited, 2023). The assessment included a review of water quality monitoring data for FY24 and the long-term data to determine whether there are any adverse water quality trends, exceedances of site-specific guideline values (SSGVs) and whether there is any evidence of contamination/connection to receiving surface waters in the vicinity of the operation. Key outcomes of the assessment are summarised below.

FY24 Surface Water Performance Snapshot by Management Zone

Due to the scale of the operation, the Cadia surface water management system (WMS) is separated into discrete management zones for reporting purposes, as shown in Figure 2 and Figure 1. Summaries of the FY24 surface water performance for each of the management zone are provided below.

Upper Cadiangullong Creek

The upper Cadiangullong Creek management zone includes 6 surface water monitoring locations, as follows:

- **412168** – A reference monitoring location that is located upstream of Cadiangullong Dam and the areas disturbed by the mining operation.
- **412144** – Monitoring location immediately downstream of Cadiangullong Dam and upstream of mining operations. Used to assess water quality of flow volumes from Cadiangullong Dam.
- **CAWS0** – Cadiangullong Dam. Data is used to assess quality of raw water to be imported to Cadia Mine for processing operations.
- **CAWS2** and **CAWS3** – Used to monitor for impacts to Cadiangullong Creek from historical mining activities. CAWS3 is the location of a historic mine adit and receives seepage from historic mining operations. The CAWS3 location is a bunded area (i.e., not on the watercourse) and water collected here is dewatered to the process water system. There is no direct connection between CAWS3 and Cadiangullong Creek.
- **CAWS13** – Located on Cadia Creek at Cadia Creek weir. Used to monitor water quality at Cadia Creek prior to its confluence with Cadiangullong Creek.

Surface water monitoring results for all locations in the upper Cadiangullong Creek management zone were generally consistent with historic monitoring data. Higher values that exceeded the historic range were observed for manganese (1 result at CAWS0 and CAWS13), ORP (1 result at 412168 and 412144), and TSS (1 result at CAWS2). These results can generally be attributed to increased runoff during/following high rainfall events. Most monitoring locations where higher values were observed (CAWS0, CAWS13, 412168 and 412144) are upstream of the areas disturbed by mining related activities and the likelihood of the higher values being caused by Cadia operations is minimal. Values for all of the aforementioned analytes at these monitoring locations returned to the historic range following the occurrence of the higher values.

All results for antimony, arsenic chromium, lead, mercury and silver were consistently below the limit of detection. All results for aluminium, cadmium, cobalt, copper, iron, molybdenum, nickel and zinc were consistently low and within the historic range with no outliers observed.

During FY23 (the previous reporting period), increases in several metals (including cadmium, cobalt, copper, manganese, molybdenum, nickel and zinc) were observed at CAWS3. CAWS3 is the location of a historic mine adit and receives seepage flows from the historic operation. The seepage flows are contained in a bunded area and managed via transfers to the process water system. It was concluded in the FY23 Cadia surface water assessment that these higher values could be attributed to seepage flows and that there were no clear impacts at downstream Cadiangullong Creek monitoring locations (GHD, 2023). Concentrations of the aforementioned metals, EC and TDS exhibited decreasing trends during FY24. These decreasing dissolved metal trends were coincident with slightly increasing trends for alkalinity, chloride and ORP indicating an overall improvement in water quality since the values observed in FY23.

The results indicate no mining related impacts to the receiving environment.

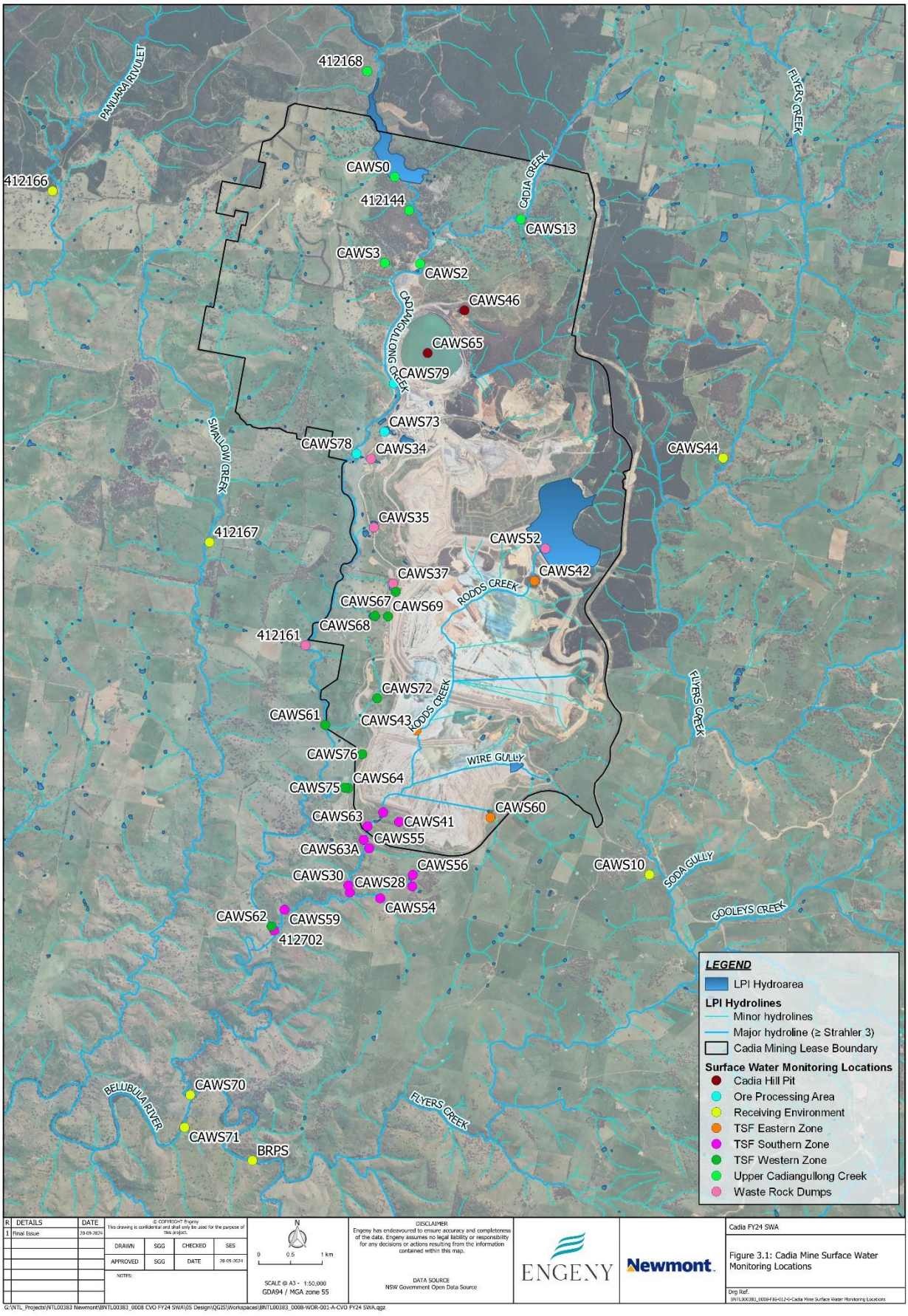


FIGURE 1: CADIA SURFACE WATER QUALITY MONITORING LOCATIONS

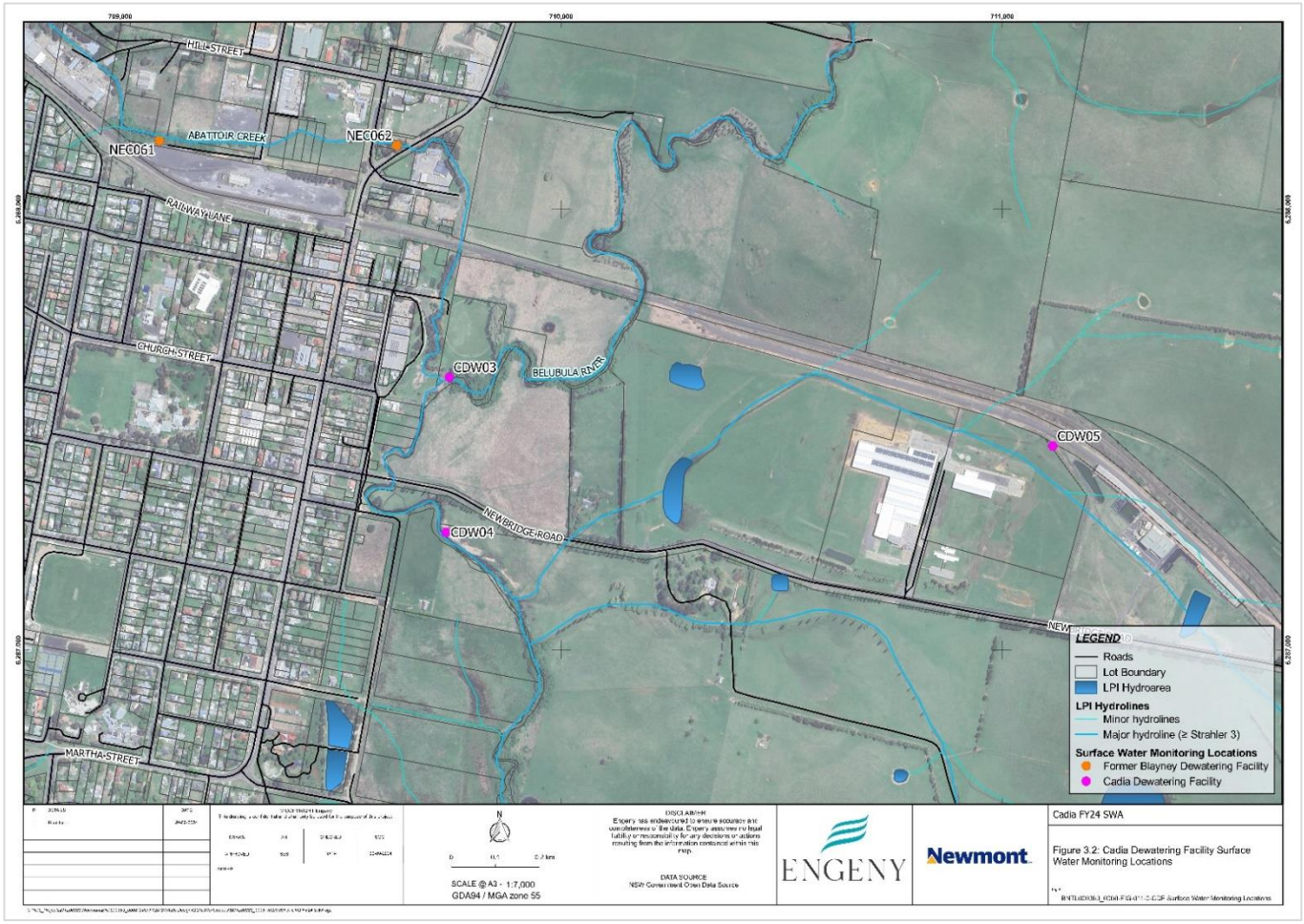


FIGURE 2: CADIA DEWATERING FACILITY SURFACE WATER QUALITY MONITORING LOCATIONS

Cadia Hill Pit

The Cadia Hill Pit management zone includes 2 surface water monitoring locations that are both located within the mine WMS, as follows:

- **CAWS65** – Used to monitor water quality in the Pit TSF (PTSF).
- **CAWS46** – Used to monitor water quality in Hoares Creek Dam.

The majority of results at both monitoring locations in the Cadia Hill Pit management zone were within the historic range. The only result returned during FY24 that was not within the historic range was a result for alkalinity (12 mg/L) at CAWS46 which is the lowest in the historic dataset. This low alkalinity value may be attributed to dilution due to rainfall inflows.

Results for several analytes appeared to exhibit a weak increasing trend throughout FY24 at CAWS46. These analytes include cobalt, copper, manganese, nickel and zinc. It should be noted that these increases appear to be the result of cyclic changes in water quality at the monitoring location over the long-term in which peaks and troughs are observed. Variation in the concentrations of these dissolved metals is minimal (both for FY24 and the long-term) and all results for these analytes are within the historic range and not considered to be indicative of mining related impacts.

Increases were observed during FY24 for EC, TDS, chloride, potassium, sodium and sulphate at CAWS65 (refer to Figure 4.4). These increases appear to be a continuation of a trend that began at the start of 2022. Variation at CAWS65 (located inside the PTSF) is expected due to natural variation in the tailings materials deposited. Water in the PTSF is reclaimed for use in Ore Processing and as such these increases, at this stage, do not require further investigation.

Ore Processing Area

The Ore Processing Area management zone has 3 monitoring locations, as follows:

- **CAWS73** – Used to monitor changes in water quality for the Site Runoff Pond. Water captured by the Site Runoff Pond is contained for reuse in the process water system.
- **CAWS78** – Used to assess potential impacts on Cadiangullong Creek from the Ore Processing Area. Located downstream of the Site Runoff Pond
- **CAWS79** – Used to assess potential impacts on Cadiangullong Creek from the Ore Processing Area. Located upstream of the Site Runoff Pond.

Surface water monitoring results for all monitoring locations in the Ore Processing Area management zone were generally consistent with historic monitoring data with only 3 outliers observed during FY24. The majority of results for all dissolved metals were within the historic range.

One result for molybdenum and 1 result for zinc slightly exceeded the historic range at CAWS79. These concentrations are still considered to be relatively low and unlikely to pose a risk to the environment. The CAWS79 monitoring location is located upstream of the Ore Processing Area and it is considered that these increases are not the result of mining related impacts. Subsequent results were more consistent with historic averages for the monitoring locations.

One result for molybdenum at CAWS73 exceeded the historic range. This higher value appears to be part of an increasing trend observed at CAWS73 since January 2016.

Long-term trends are also evident for alkalinity, total phosphorus, calcium, chloride, EC, nickel, magnesium, manganese, sodium and sulphate at CAWS73. The CAWS73 monitoring location is located at the Site Runoff Pond. The Site Runoff Pond captures water that is reused during processing. The upstream catchment reporting to the Site Runoff Pond is an active waste rock dump. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek. Results from the Ore Processing Area management zone indicate no mining related impacts in the receiving environment.

Waste Rock Dumps

The Waste Rock Dumps management zone is inclusive of 5 surface water monitoring locations, as follows:

- **412161** – Used to assess water quality on Cadiangullong Creek and monitor for potential impacts from the mining operation
- **CAWS34** – Used to monitor changes in water quality in the Northern Leachate Dam
- **CAWS35** – Used to monitor changes in water quality in the Southern Leachate Dam
- **CAWS37** – Used to monitor changes in water quality at H19 sediment dam
- **CAWS52** – Used to monitor changes in water quality in Rodds Creek Dam.

Surface water monitoring results for all locations in the Waste Rock Dumps management zone were generally consistent with historic monitoring data during FY24 and only 1 outlier was observed.

A higher value for molybdenum was observed at CAWS52 which is highest value for the monitoring location in the historic monitoring period and the only value for all monitoring locations in the Waste Rock Dumps management zone that did not fall within the historic range for FY24. This result is part of a continuing increasing trend at CAWS52 that has been prevalent since the end of 2021. Increasing trends have also been observed for the same period for EC, TDS, calcium, chloride, potassium, sodium and sulphate. Rodds Creek Dam (i.e., CAWS52) receives transferred inflows from the NTSF and STSF decant ponds. These inflows increase in both frequency and volume during periods of high rainfall (such as the past few years). Increased transfer inflows from the TSFs, other site storages and runoff from the upstream catchment are likely to have attributed to these increasing trends. Due to the size and location of Rodds Creek Dam (upslope of the NTSF), it is considered that these changes in water quality are unlikely to impact the downstream receiving environment.

Long-term water quality trends at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24 for several analytes including nitrate, total nitrogen, cadmium, copper, manganese, zinc, cobalt and nickel.

Changes in water quality at CAWS37 (H19) were within the historic range for the monitoring location. Minor increases were observed for some analytes during FY24 which appear to be reflective of cyclic changes in water quality at the monitoring location due to the active upstream waste rock dump catchment.

No increasing trends or higher values were observed at monitoring location 412161 during FY24. Results during FY24 (and over the long-term) at monitoring location 412161 do not reflect the trends observed at other monitoring locations in the management zone and no mining related impacts are evident. Results from all 5 locations in the Waste Rock Dumps Management zone indicate no impact to the receiving environment from waste rock dump runoff.

TSF Eastern Zone

The TSF Eastern management zone includes 3 surface water monitoring locations, as follows:

- **CAWS42** – Used to monitor changes in NTSF decant water quality. Located at the Cadia Molybdenum Plant outflow point.
- **CAWS43** – Used to monitor changes in STSF decant water quality.
- **CAWS60** – Used to monitor changes in water quality in the Eastern Dyke Storage, located adjacent to the eastern wall of the STSF.

Results recorded for TSS at CAWS42 (NTSF) and CAWS43 (STSF) on 23 October 2023 were the highest on record. Results prior to and following these higher results were within the historic ranges for the monitoring locations. Somewhat consistent rainfall throughout October 2023 could have caused increased sediment suspension in the decant ponds.

Several analytes at CAWS42 returned results that were the highest in the historic monitoring period or above the 95th percentile of historic results during FY24. These analytes include total phosphorus, chloride, sodium, antimony, arsenic and copper. Four results for molybdenum were above the 90th percentile of the historic range at CAWS42 during FY24. CAWS42 exhibits long-term increasing trends for the aforementioned analytes. Higher values at CAWS42 for these analytes have become more consistent since July 2022 when the NTSF decant pond began receiving inflows from the Molybdenum Plant outflow point. Comparatively, other monitoring locations in the management zone (CAWS43 and CAWS60 (Eastern Dyke storage) that are downstream of CAWS42 generally exhibit stable or decreasing trends. This indicates that changes in water quality in the management zone are confined to the NTSF decant pond (CAWS42).

Copper is the only analyte at CAWS60 that appears to exhibit a trend that reflects that of the CAWS42. This trend is also reflected at CAWS43. The majority of water quality results at CAWS60 were low or below the limit of detection, including dissolved metals. Results for copper at CAWS60 are also considered low. Water captured in the Eastern Dyke storage is managed via transfers to the process water system. It should be noted that the Eastern Dyke storage has a significant upstream catchment comprised of agricultural land and receives the majority of rainfall runoff inflows from this area as opposed to the TSFs. Changes in analyte concentrations could be attributed to upstream agricultural sources, however, it is not possible to make this conclusion due to lack of upstream monitoring locations.

All of the monitoring locations in the TSF eastern management zone are actively managed as part of the process water system. The results indicate no impacts from the mining operations to the receiving environment in the TSF Eastern management zone.

TSF Western Zone

The TSF western management zone includes 9 surface water monitoring locations, as follows:

- **CAWS61** and **CAWS62** – Water quality monitoring results at these monitoring locations are used to assess potential effects of mining, processing and waste rock emplacements. These monitoring locations are both on Cadiangullong Creek (i.e., the receiving environment).
- **CAWS64, CAWS67**, **CAWS68, CAWS69**, **CAWS72**, **CAWS75** and **CAWS76** – These surface water monitoring locations are used to monitor for potential for seepage impacts on the western side of the NTSF and STSF. These surface water monitoring locations are dams.

Some surface water monitoring locations, particularly CAWS67, CAWS68, CAWS69 and CAWS72, displayed increasing trends during FY24 and higher results for several analytes. These analytes include EC, TDS, calcium, magnesium and sulphate. These increases appear to be the continuation of a trend that began at the start of 2022. Dissimilarity between TSF decant water and the water quality at these monitoring locations indicate that increasing trends and higher results are not due to seepage related impacts. These monitoring locations are intended to capture rainfall runoff from disturbed areas on site that are quite dynamic and as a result, can cause changes to water quality due to variation in analytes captured by runoff volumes.

All results for antimony, cadmium, chromium, mercury and silver were below the limit of detection at all monitoring locations during FY24. All results for aluminium, arsenic, cobalt, manganese and nickel were low and within the historic range.

Multiple analytes returned results that were the highest in the historic range during FY24. These analytes include chloride (at CAWS68), nitrate (at CAWS67), iron (at CAWS67 and CAWS68), magnesium (at CAWS69), molybdenum (at CAWS75), lead (CAWS67) and zinc (at CAWS64 and CAWS75).

Changes in water quality appear to be confined to the dam monitoring locations (CAWS64, CAWS67, CAWS68 CAWS69, CAWS72, CAWS75 and CAWS76). Results for receiving environment monitoring locations (CAWS61 and CAWS62) in the management zone indicate no impact to the receiving environment from mining related activities.

TSF Southern Zone

The TSF southern management zone includes 11 surface water monitoring locations, as follows:

- **412702** – This surface water monitoring location is used to assess potential effects of the entire Cadia Mine area. It is the most downstream monitoring location and is located immediately downstream of the confluence of Cadiangullong Creek and Rodds Creek.
- **CAWS28**, **CAWS55**, **CAWS59**, **CAWS30**, **CAWS63** and **CAWS63a** – Surface water monitoring locations used to assess potential effects of the TSFs on surface water quality in Rodds Creek. These monitoring locations are on watercourses.
- **CAWS31**, **CAWS54**, **CAWS56** and **CAWS57 –** Surface water monitoring locations used to assess potential effects of the TSFs on surface water quality in Rodds Creek. These monitoring locations are surface water storages.

The majority of results for the TSF southern management zone for FY24 were consistent with historic monitoring results. All results for major ions were within the historic range.

Higher values for TSS, total phosphorus and total nitrogen were observed at CAWS54 and CAWS57. These higher concentrations are not part of emerging trends. Values prior to and following the higher results were consistent with the historic range for the monitoring locations. These surface water monitoring locations are surface water storages (farm dams) for which the upstream reporting catchment is entirely agricultural and increases in phosphorus and nitrogen are consistent with expectations from farming practices.

Results for most dissolved metals were below the limit of detection or within the historic range. Some higher values for molybdenum were observed at CAWS55 and CAWS56. The higher values were only slightly above the historic range and considered relatively low concentrations. The higher results do not appear to be part of a trend. Higher results were observed at CAWS31 for several dissolved metals. CAWS31 is located at seepage basin ST14. Water stored here is managed via the reclaim water system.

There were 3 exceedances of SSGVs values at surface water monitoring location 412702, 1 for TSS and 2 for aluminium. All monitoring results at 412702 were within the historic range for the monitoring location and no emerging trends or outliers are evident for the FY24 period. Monitoring at 412702 is undertaken monthly while monitoring at 412168 (the upstream reference monitoring location) is undertaken quarterly. It is recommended that either monitoring at 412168 be undertaken monthly, or the upstream reference monitoring location be changed to another location upstream of the mining area that is monitored monthly so that comparisons can be made when exceedances occur. It is understood that this change has been captured in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.

No long-term trends were observed in the TSF southern management zone. The results indicate no mining related impacts to the receiving environment.

Cadia Dewatering Facility

The CDF management zone includes 3 surface water monitoring locations, as follows:

- **CDW03** – This monitoring location is used to characterise water quality upstream of the CDF. CDW03 is located on the Belubula River upstream of the confluence of the Belubula River and the unnamed creek to the south of the CDF.
- **CDW04** – As per the Cadia Water Management Plan, CDW04 is intended to characterise water quality downstream of the CDF (Newcrest, 2023). It is noted however that this monitoring location is actually upstream of the CDF (upstream of the confluence of the Belubula River and the unnamed creek to the south of the CDF). Cadia is aware of this and have noted the relocation of this monitoring location in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.
- **CDW05 –** The CDW05 monitoring location is used to assess water quality immediately downstream of the CDF.

The majority of results for monitoring locations in the CDF management zone were within the historic range during FY24. All results for physiochemical parameters, nutrients and major ions were within the historic range with no outliers observed. A slight increasing trend for sodium at all monitoring locations that commenced in early 2021 is evident. These trends appear to have somewhat stabilised during FY24.

The majority of dissolved metal concentrations were within the historic monitoring range for the monitoring locations in the CDF management zone. Several dissolved metals returned results that were consistently below the limit of detection. Higher molybdenum and copper values were observed at CDW05 during FY24. The higher molybdenum values do not appear to be part of a trend.

There was one exceedance of the SSGV for copper at CDW05 during the reporting period (in October 2023). Copper at the location exhibits a long-term increasing trend. It is recommended that further investigation of increasing copper trends be undertaken and that the monitoring frequency at CDW05 be increased to monthly (currently quarterly) to monitor these values which is consistent with the proposed monitoring frequency included in the updated WMP (currently with the relevant government agencies for review).

Former Blayney Dewatering Facility

The former BDF management zone includes 2 surface water monitoring locations, as follows:

- **NEC061** – This surface water monitoring location is used to characterise water quality upstream of the Former BDF.
- **NEC062** – This surface water monitoring location is used to characterise water quality downstream of the Former Blayney Dewatering Facility.

The majority of results for all analytes were within the historic range for surface water monitoring locations in the Former BDF management zone during FY24. While there were some higher values for sodium and magnesium, these values were within the historic range for the monitoring locations and are not part of any emerging or ongoing trends.

The majority of dissolved metal concentrations were within the historic monitoring range for the monitoring locations in the Former BDF management zone. Several dissolved metals returned results that were consistently below the limit of detection. One higher result for copper at NEC061 (0.009 mg/L) was observed on 3 June 2024. This monitoring location is upstream of the Former BDF. The downstream site, NEC062, recorded a result below the limit of detection (<0.001 mg/L) on the same day, indicating that the higher copper concentration at NEC061 could be caused by a point source or a source upstream of NEC061.

The results indicate no mining related impacts to the receiving environment.

Receiving Environment

The receiving environment management zone includes 7 surface water monitoring locations, as follows:

- **412166** – This monitoring location is used to monitor surface water quality in Diggers Creek
- **412167** – This monitoring location is used to monitor surface water quality in Swallow Creek
- **CAWS44** – This monitoring location is intended to be used as an upstream reference site on Flyers Creek. The monitoring location is upstream of areas disturbed by mining activities.
- **CAWS10** – This monitoring location is used to monitor surface water quality in Flyers Creek downstream of the Cadia Mine and identify any potential mining related impacts
- **BRPS** – This monitoring location is intended to be used as an upstream reference site on the Belubula River. The monitoring location is upstream of the confluence of Cadiangullong Creek and the Belubula River.
- **CAWS70** - This monitoring location is used to monitor water quality in Cadiangullong Creek immediately prior to the confluence of Cadiangullong Creek and the Belubula River. In addition to being used to monitor water quality in Cadiangullong Creek, this location is intended to be used as a reference site upstream of CAWS71 for comparison purposes.
- **CAWS71** – This monitoring location is used to monitor water quality in the Belubula River downstream of the confluence of Cadiangullong Creek and the Belubula River. Water quality at this location is used to identify any potential mining related impacts.

The majority of water quality results in the receiving environment management zone were within the historic range during FY24. Some slight increasing trends were observed for chloride (at 412167 and CAWS10), magnesium (at 412167, CAWS10 and CAWS44) and sodium (412167). It should be noted that all results for these analytes were within the historic range and there were no outliers. Increased concentrations of these analytes during FY24 could be the result of increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations).

Results for several analytes (chloride, magnesium, sodium, sulphate, arsenic, chromium and copper) at BRPS (upstream of the Cadia Mine on the Belubula River) were the highest on record during the reporting period. This location is upstream of the Cadia Mine and it is considered that these higher results were not caused by mining related activities.

The results indicate no mining related impacts to the receiving environment.

FY24 Performance Against Site Specific Guideline Values

Surface water monitoring locations 412702 and CDW05 have been assessed against SSGVs for the sites to determine whether there were any exceedances during the FY24 reporting period. Monitoring location 412702 is downstream of the Cadia Mine and monitoring location CDW05 is located downstream of the CDF. Key outcomes can be summarised as follows:

- Of the 12 analytes for which there are SSGVs for 412702, there were exceedances for aluminium and TSS.
- There were 3 exceedances at 412702 in total during FY24, 1 for TSS and 2 for aluminium.

- Of the 11 analytes for which there are SSGVs for CDW05, there was an exceedance of 1 analyte (copper).

For all the exceedances there were rainfall events in the days prior which appear to have contributed to increased runoff volumes and changes to analyte concentrations. At surface water monitoring location 412702, higher values observed for aluminium were coincidentally observed upstream of Cadia (monitoring locations CAWS0 and 412144 in the Upper Cadiangullong Creek management zone) on the same day, indicating that the higher results were not caused by mining-related activities. In addition, the higher value for TSS observed at 412702 was coincident with higher values observed at upstream locations CAWS56, CAWS57 and CAWS59 which have a predominantly agricultural upstream catchment.

It is recommended that SSGVs be reviewed to determine the suitability of the values and whether additional SSGVs are required.

FY24 Performance Against ANZECC (2000) Livestock and Irrigation Guideline Values

Cadia has requested that the downstream Cadiangullong Creek monitoring locations (412702 and CAWS70), monitoring locations for Flyers Creek (CAWS10 and CAWS44) and monitoring locations on the Belubula River (BRPS and CAWS71) be reviewed against ANZECC (2000) livestock drinking water guidelines and ANZECC (2000) irrigation and general use guidelines. These guidelines were selected as the land in the vicinity of Cadia is primarily used for agricultural purposes. Key outcomes can be summarised as follows:

- Two values for iron and 2 values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location 412702.
- Three values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value at monitoring location CAWS70.
- One value for iron and 3 values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS10.
- One value for iron and 1 value for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS44.
- One value for iron and 1 value for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location BRPS.
- One value for iron, 4 values for total phosphorus and 1 value for molybdenum were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS71.

The majority of the results were within the historic range for the sites with the exception of total phosphorus at BRPS and molybdenum at CAWS71. The higher results are not considered the be associated with emerging trends. All values are below the ANZECC (2000) short-term (20 years) guideline values for iron (10 mg/L), total phosphorus (0.8 to 12 mg/L) and molybdenum (0.05 mg/L).

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1. INTRODUCTION

Cadia Holdings Pty Limited (CHPL), which is owned by Newmont Corporation (Newmont), own and operate the Cadia Mine (Cadia). Cadia operates under Project Approval PA06_0295 and Environment Protection Licence (EPL) 5590. Schedule 5 Condition 2 of the Cadia Project Approval specifies that the site is required to complete an Annual Review each year that details the performance of the operation. The Annual Review should include a comprehensive review of monitoring results for the previous year and a comparison of these results against the:

- Relevant statutory requirements, limits or performance measures/criteria.
- Requirements of any plan or program required under this approval.
- Monitoring results of previous years.
- Relevant predictions in the Environmental Assessment.
- Trends in monitoring data over the life of the project.

All aspects of the operation must be included in the review, including surface water. Engeny Australia Pty Ltd (Engeny) has been engaged to complete a surface water assessment that details the performance of the operation for the 2023 to 2024 financial year (FY24) (herein referred to as the reporting period). This assessment is detailed in subsequent sections of the report and is intended to inform the Cadia FY24 Annual Review.

1.1 Purpose

The purpose of this assessment is to provide a detailed review of the performance of the Cadia surface water management system (WMS) for FY24. The performance of the surface WMS is benchmarked against requirements outlined in the *Cadia Water Management Plan Revision 8.2* (Newcrest Mining Limited, 2023) (refer to Section 3). The assessment is intended to:

- Provide a detailed and transparent review of surface water monitoring data gathered during the reporting period that is easy to read and interpret.
- Highlight any adverse water quality trends for the reporting period and over the longer term.
- Establish whether there were any exceedances of site specific guideline values during the reporting period and assess the potential impact of the exceedance.
- Determine whether there is any evidence of contamination/connection to receiving surface waters in the vicinity of the operation.
- Review receiving environment water quality and assess against water quality criteria (such as Australia and New Zealand Environment and Conservation Council (ANZECC) guidelines) that is relevant to surrounding water users (refer to Section 3.4).
- Address agency and community concerns by providing detailed commentary on all surface water monitoring analytes of interest with particular focus on receiving environment surface water monitoring locations.
- Provide recommendations for any changes to the monitoring programs required to facilitate more robust future assessments or to further investigate the sources or impacts relating to surface water quality.

1.2 Site Context

Commencing in 1998 and operating continuously since, Cadia is located approximately 25 km south of Orange in the Central Tablelands region of New South Wales (NSW). The mining operation occurs across 2 local government areas (LGAs) (Blayney Shire Council and Cabonne Council).

Cadia provides an important economic contribution to the region and NSW and is a major regional employer providing approximately 1,400 full time equivalent jobs. Confirmed mineable resources have been identified to extend operations well beyond the life of the current Project Approval (PA) 06_0295 which provides for mining until 30 June 2031. CHPL has commenced planning for the continuation of mining operations and is delivering this work through the Cadia Continued Operations Project (CCOP).

PA 06_295 issued in January 2010 under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for the following:

- Life of mine ore production (up to 30 June 2031) of approximately 525 million tonnes (Mt) of gold/copper ore from Cadia East and approximately 96 Mt of ore from Ridgeway underground mine.

- Processing of up to 35 Mt per annum (Mtpa) of gold/copper/molybdenum ore (subject to approval conditions) on site to produce gold ore from a gravity circuit, a gold-rich copper concentrate from a flotation circuit (which is piped to a dewatering plant at nearby Blayney and then sent by rail to Port Kembla in NSW for export) as well as a molybdenum rich concentrate which is sent by truck to Port Kembla in NSW for export.
- Disposal of tailings through emplacement into 1 of 3 tailings storage facilities (TSFs) being the Northern TSF (NTSF), Southern TSF (STSF) and Pit TSF (PTSF).
- Significant surface infrastructure and ancillary activities to support the operation of the mine including ore processing, rock emplacements, water management, maintenance, store and staff facilities and land management practices.

PA 06_0295 has been modified 14 times since issue, with the most recent modification approved on 13 December 2021 to provide for the repair, upgrade, and reinstatement of tailings deposition to the NTSF and STSF and increase production from 32 to 35 Mtpa.

CHPL is currently progressing with a further modification to PA 06_0295 (Modification 15). This was lodged with the now NSW Department of Planning, Housing and Infrastructure (DPHI) in November 2023. Modification 15 seeks to change the existing NTSF and STSF embankment footprints, recommence mining in the Ridgeway underground mine, amongst other various minor changes or infrastructure additions to support ongoing mining activities. CHPL also hold other environmental licences and mining approvals and authorities related to Cadia.

The Cadia site regional context and site locality is shown in Figure 1.1 and Figure 1.2.

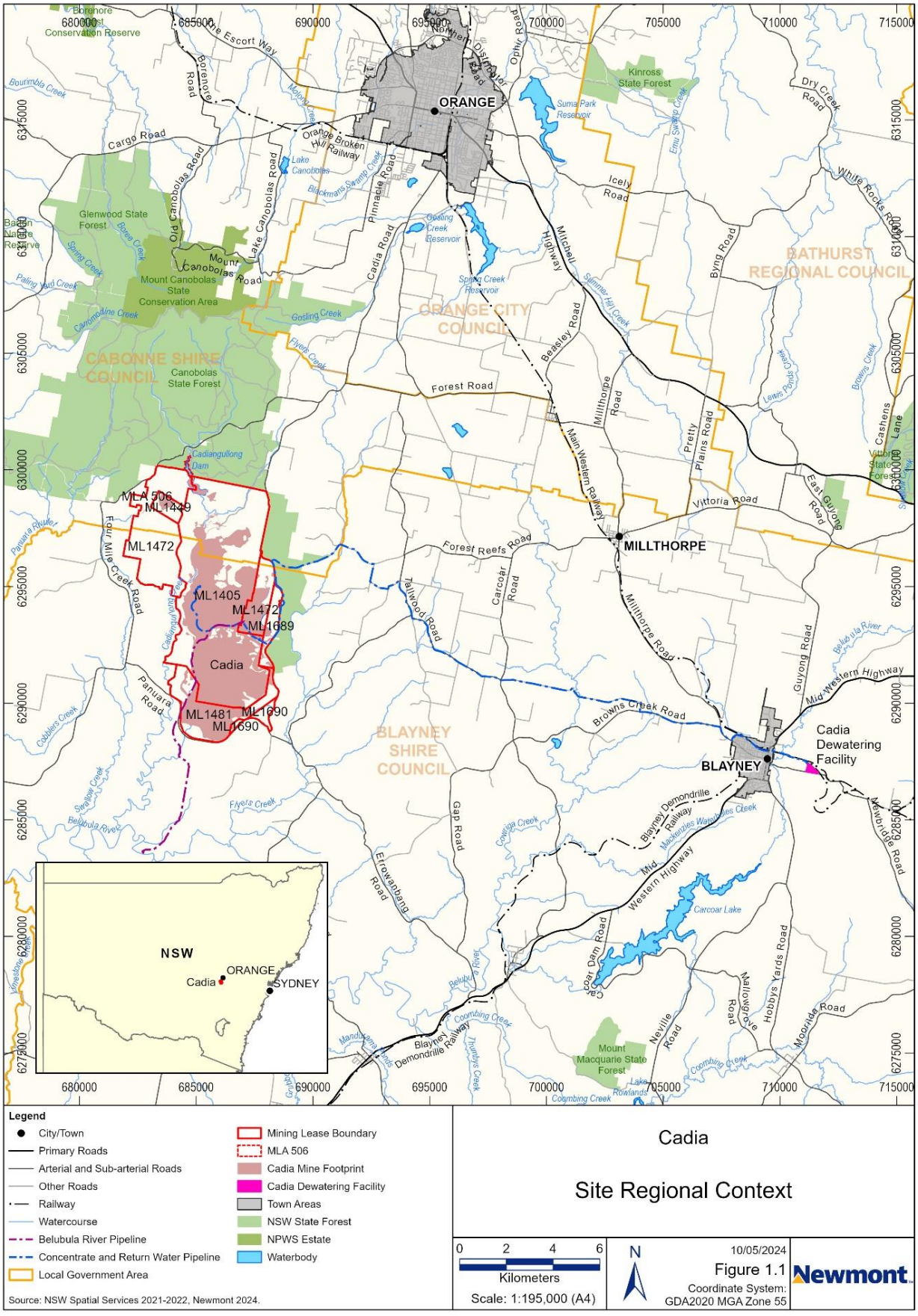


FIGURE 1.1: SITE REGIONAL CONTEXT

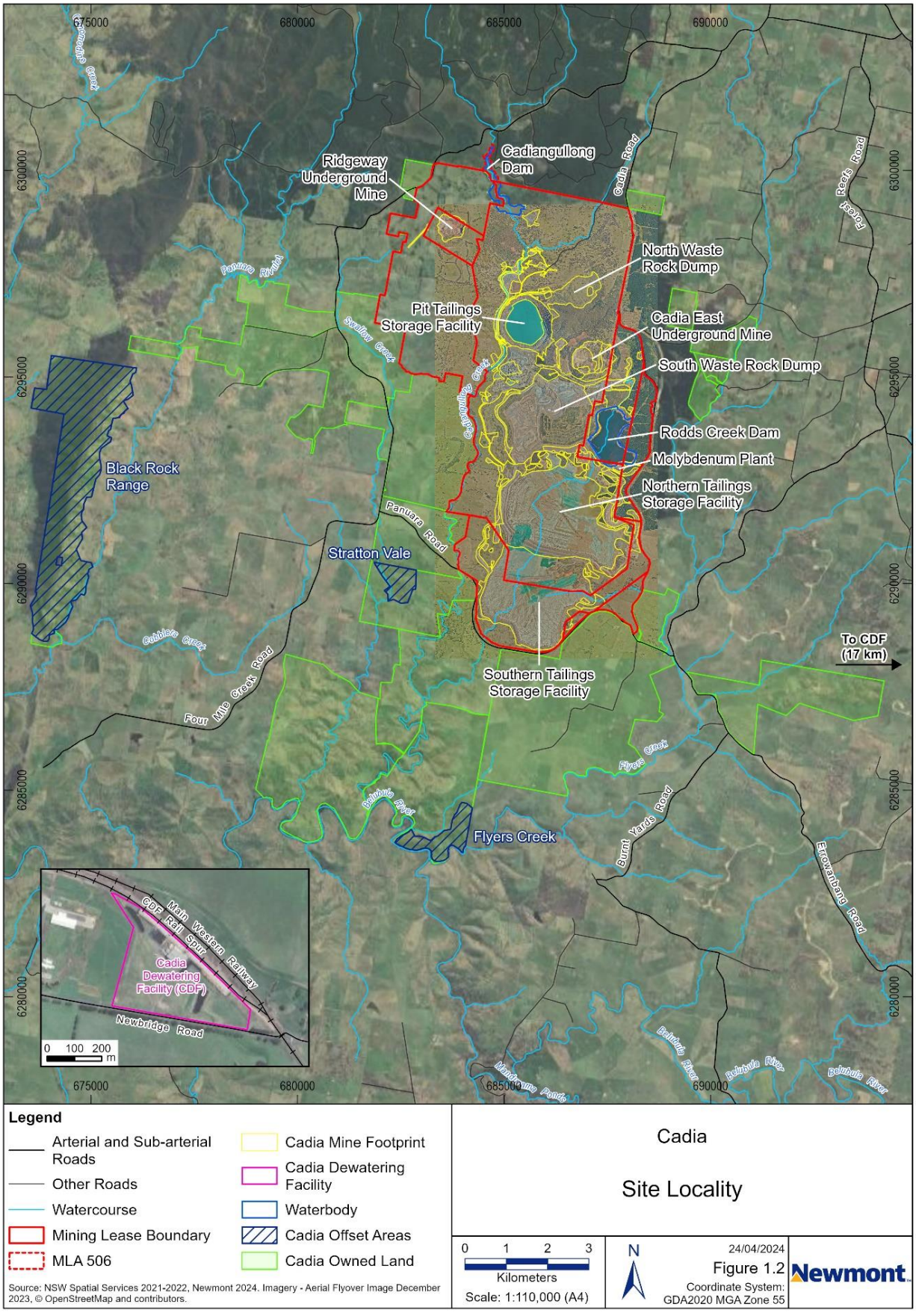


FIGURE 1.2: SITE LOCALITY

1.3 Surface Water Context

1.3.1 Regional Surface Water Context

The Cadia operational areas lies within the upper reaches of the Lachlan River catchment which covers and approximate area of around 84,700 km^2. The closest major watercourse to the site is the Belubula River. At its closest point, the Belubula River is around 4.5 km south of the Cadia Mine and around 1 km west of the Cadia Dewatering Facility (CDF). The Belubula River flows to the west before meeting the Lachlan River around 50 km from the Cadia Mine. Other major surface water features in the vicinity of the site include the Carcoar Dam (around 5 km southwest of the CDF) and the Panuara River (around 10 km west of the Cadia Mine).

Water sharing plans relevant to Cadia include the Lachlan Unregulated River Water Source 2012 and the Belubula Regulated River Water Source 2012. CHPL holds several water access licenses for these water sharing plans that allow for the extraction of water that is used to supply operational demands.

1.3.2 Local Surface Water Context

Local watercourses near the Cadia Mine include Flyers Creek, Cadia Creek, Cadiangullong Creek, Swallow Creek and Rodds Creek. These watercourses all flow in a southerly direction toward the Belubula River. The land surrounding these creek systems is primarily agricultural with smaller areas of state forest. Water quality in these creeks is monitored at several locations (refer to Figure 3.1 and Figure 3.2). CHPL manages weirs and dams (i.e., Cadiangullong Dam, Cadia Creek weir and Flyers Creek weir) on some of these watercourses for extraction purposes.

There are 2 unnamed watercourses immediately to the east and southeast of the CDF that come to a confluence before flowing in a westerly direction to meet the Belubula River around 1.5 km west of the CDF. The former Blayney Dewatering Facility is located around 2.5 km northwest of the CDF and is directly adjacent to Abattoir Creek. Abbatoir Creek flows in the southeasterly direction before meeting the Belubula River. The Carcoar Dam is around 5 km southwest of the CDF.

Features relevant to the Cadia local surface water context are shown in Figure 1.3 and Figure 1.4.

1.3.3 Cadia Surface Water Management System

The Cadia surface WMS is used to contain runoff from disturbed areas on site and prevent contamination of waterways using drains, bunds and water storages. Different types of water storages that make up the Cadia surface WMS include sediment dams, mine affected water dams, clean water dams and tailings storage facilities (TSFs). Major water storages at the site (refer to Figure 1.4) include:

- Rodds Creek Dam (mine affected water storage that captures clean water runoff and stores mine affected water),
- The Process Water Pond, Site Runoff Pond, Northern Leachate Dam and Southern Leachate Dam (mine affected dams), and
- The Northern TSF, Southern TSF and Pit TSF.

Due to the scale of the operation, the Cadia surface WMS is separated into discrete management zones for reporting purposes. The different management zones have specific potential pollution sources that are considered at the receiving waterway downstream of the zone to monitor for potential impacts. The performance of each of the water managements zones for the reporting period is summarised in Section 4 with detailed analyses provided in Appendix A.

TABLE 1.1: CADIA WATER MANAGEMENT ZONES

Cadia Water Management Zone	Location / Description
Upper Cadiangullong Creek	Surface water monitoring locations in the vicinity of Cadiangullong Creek upstream of the mining area.
Cadia Hill Pit	Pit TSF (PTSF) and the adjacent Hoares creek Dam.
Ore Processing Area	Surface water monitoring locations in the vicinity of the mine infrastructure area (MIA) and ore processing plant.
Waste Rock Dumps	Dams adjacent to the waste rock dumps that receive runoff from these areas.

Cadia Water Management Zone	Location / Description
TSF Eastern Zone	Surface water monitoring locations in the vicinity of the TSFs. Water monitoring data collected at locations in these zones is used to monitor for potential seepage impacts.
TSF Western Zone	
TSF Southern Zone	
Cadia Dewatering Facility	Surface water monitoring locations in the vicinity of the CDF that are used to monitor for potential impacts related to the operation.
Blayney Dewatering Facility	Surface water monitoring locations in the vicinity of the former Blayney Dewatering Facility that are used to determine whether there are remnant water quality impacts from the former operation.
Receiving Environment	Surface water monitoring locations in various creeks and watercourses (i.e., Flyers Creek, Diggers Creek, Swallow Creek and the Belubula River) near Cadia that are used to monitor water quality of the receiving environment for potential impacts from the operation.

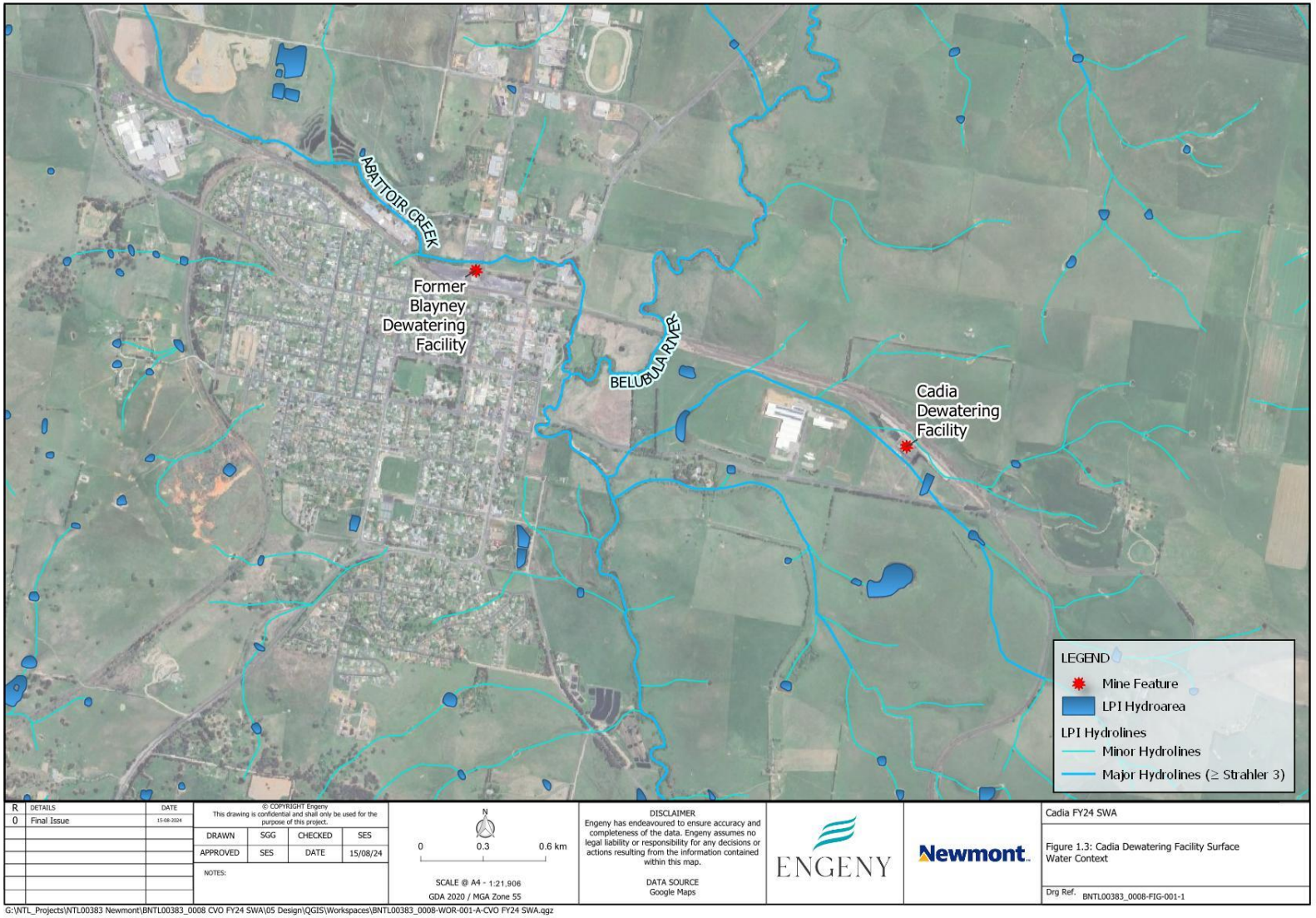


FIGURE 1.3: CADIA DEWATERING FACILITY SURFACE WATER CONTEXT

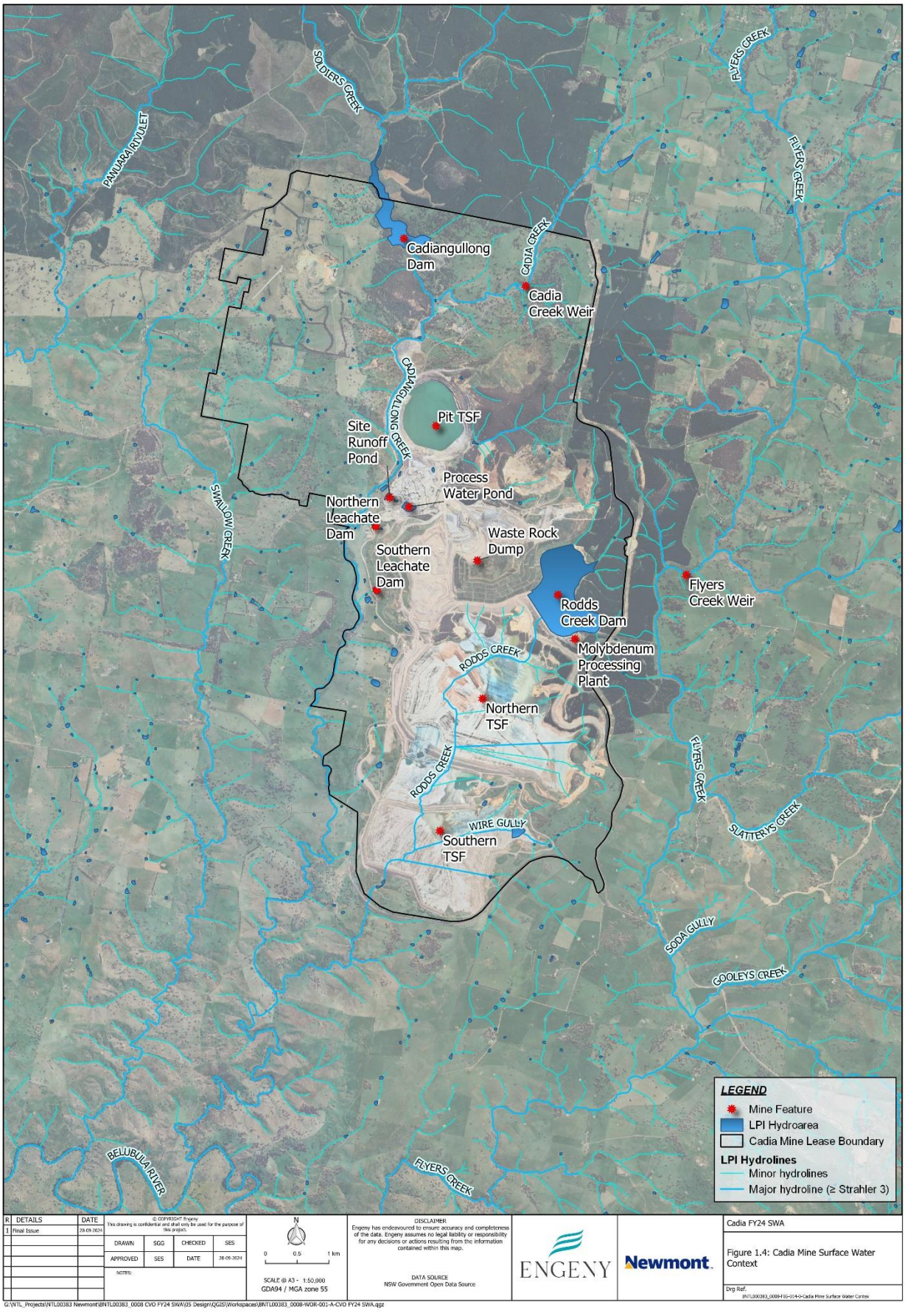


FIGURE 1.4: CADIA MINE SURFACE WATER CONTEXT

2. CLIMATE CHARACTERISTICS

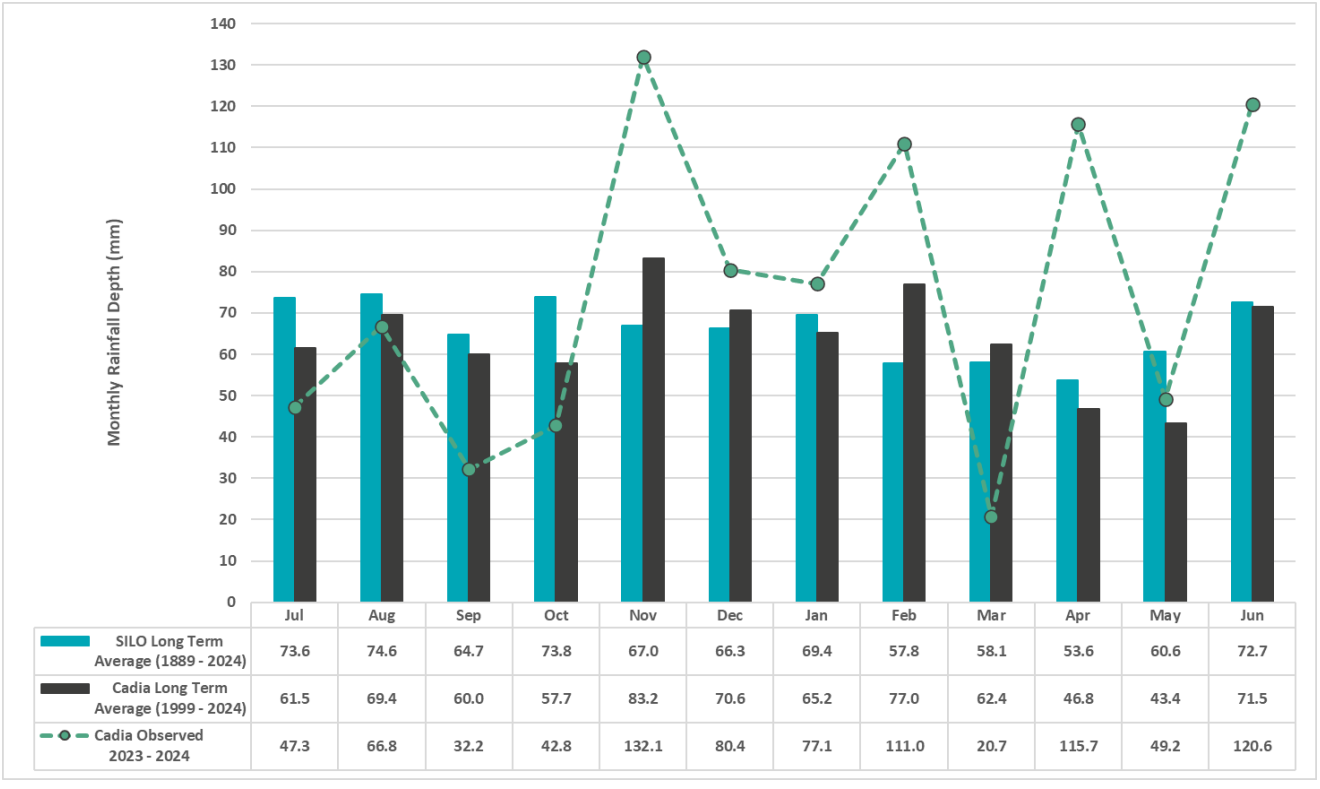
Cadia is located in the Central Tablelands region around 220 km west of the NSW coast. The area has a temperate climate with 4 distinct seasons. Winters are characterised by low temperatures and summers are typically hot with higher rainfall. An overview of key climate variables (i.e., rainfall and evaporation) that most impact the Cadia surface WMS are provided in Sections 2.1 and 2.2.

2.1 Rainfall

CHPL manages several rainfall gauges in various areas across the site and have a historic climate data series that spans 25 years (1999 to 2024). Daily averages from the various gauges were used to derive cumulative daily rainfall for the year, long-term monthly rainfall totals and rainfall totals (start July to end June) for the site. This data is presented in Figure 2.1, Figure 2.2, and Figure 2.3. Figure 2.1. also includes long-term monthly rainfall averages derived from daily rainfall data sourced from the Queensland Government Synthetic Information for Land Owners (SILO) Database (grid point -33.5, 149.00).

Rainfall data for the reporting period and long-term can be summarised as follows:

- Long-term monthly rainfall averages indicates that rainfall is slightly higher in spring and summer months and lower in autumn and winter months. Seasonal variation between monthly rainfall totals is minor indicating that the site does not experience distinct wet and dry seasons.
- The total observed rainfall for the reporting period at the site was 896 mm. This is greater than both the median (742 mm) and average (766 mm) rainfall depths indicating wetter than normal conditions.
- For 6 months (November, December, January, February, April and June) of FY24, the observed monthly rainfall total exceeded both the long-term SILO and site monthly averages. The highest monthly rainfall occurred in November 2023 where the observed rainfall was around 1.5 times greater than the long-term site average, and 1.9 times greater than the long-term average for November from SILO records. The total monthly rainfall for April (116 mm) was also uncharacteristically high (more than 2 times greater than the long-term site and SILO averages for the month).
- The largest daily rainfall (56.1 mm) for the reporting period was observed on 5 April 2024. Rain events also occurred on the days prior and following with a total of 104.5 mm observed between 2 and 7 of April 2024. The aforementioned events and other singular high rainfall events observed in late February 2024 contributed significantly to increased averages for those months.



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
SILO Long Term Average (1889 - 2024)	73.6	74.6	64.7	73.8	67.0	66.3	69.4	57.8	58.1	53.6	60.6	72.7
Cadia Long Term Average (1999 - 2024)	61.5	69.4	60.0	57.7	83.2	70.6	65.2	77.0	62.4	46.8	43.4	71.5
Cadia Observed 2023 - 2024	47.3	66.8	32.2	42.8	132.1	80.4	77.1	111.0	20.7	115.7	49.2	120.6

FIGURE 2.1: COMPARISON OF FY24 CADIA RAINFALL DATA TO LONG-TERM SITE AND SILO AVERAGES

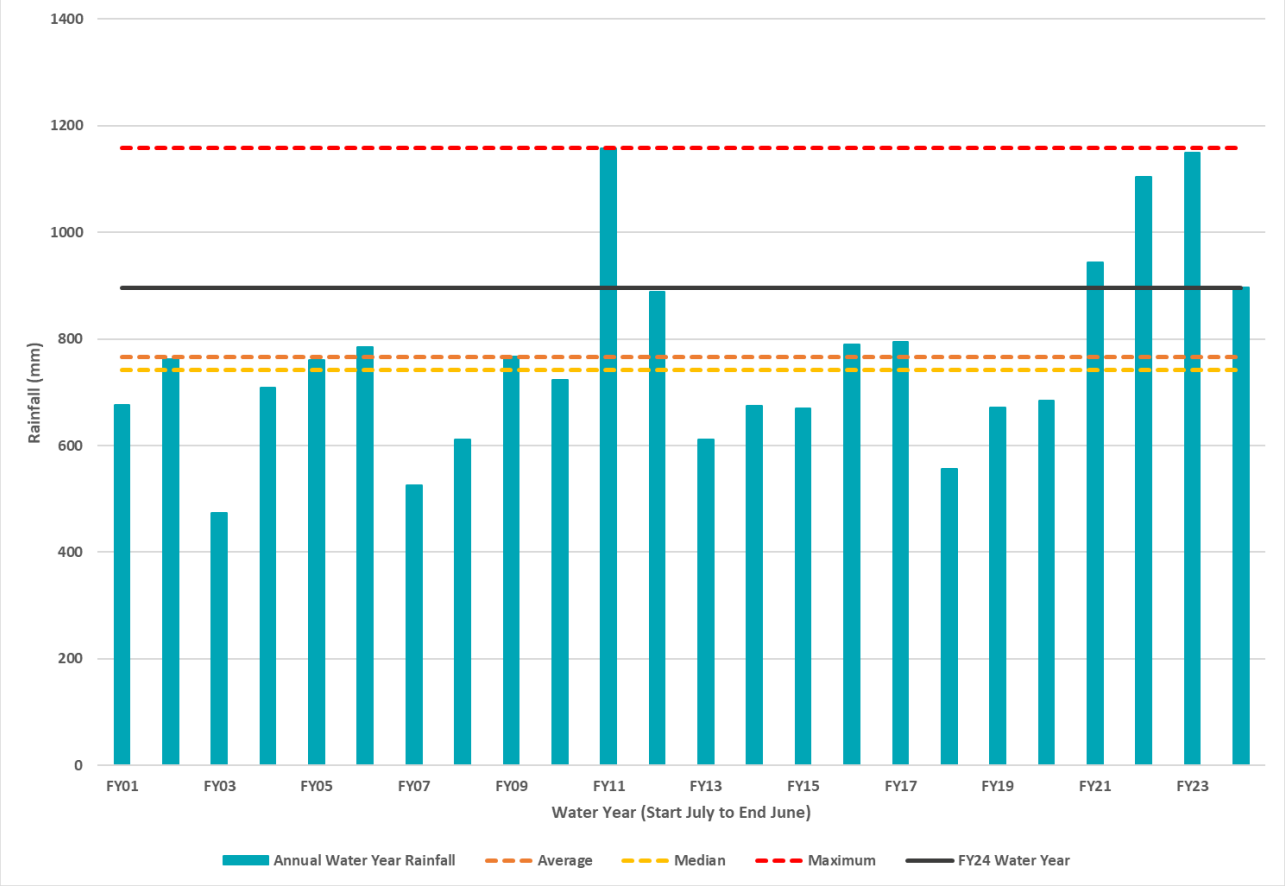


FIGURE 2.2: CADIA YEARLY RAINFALL DEPTHS

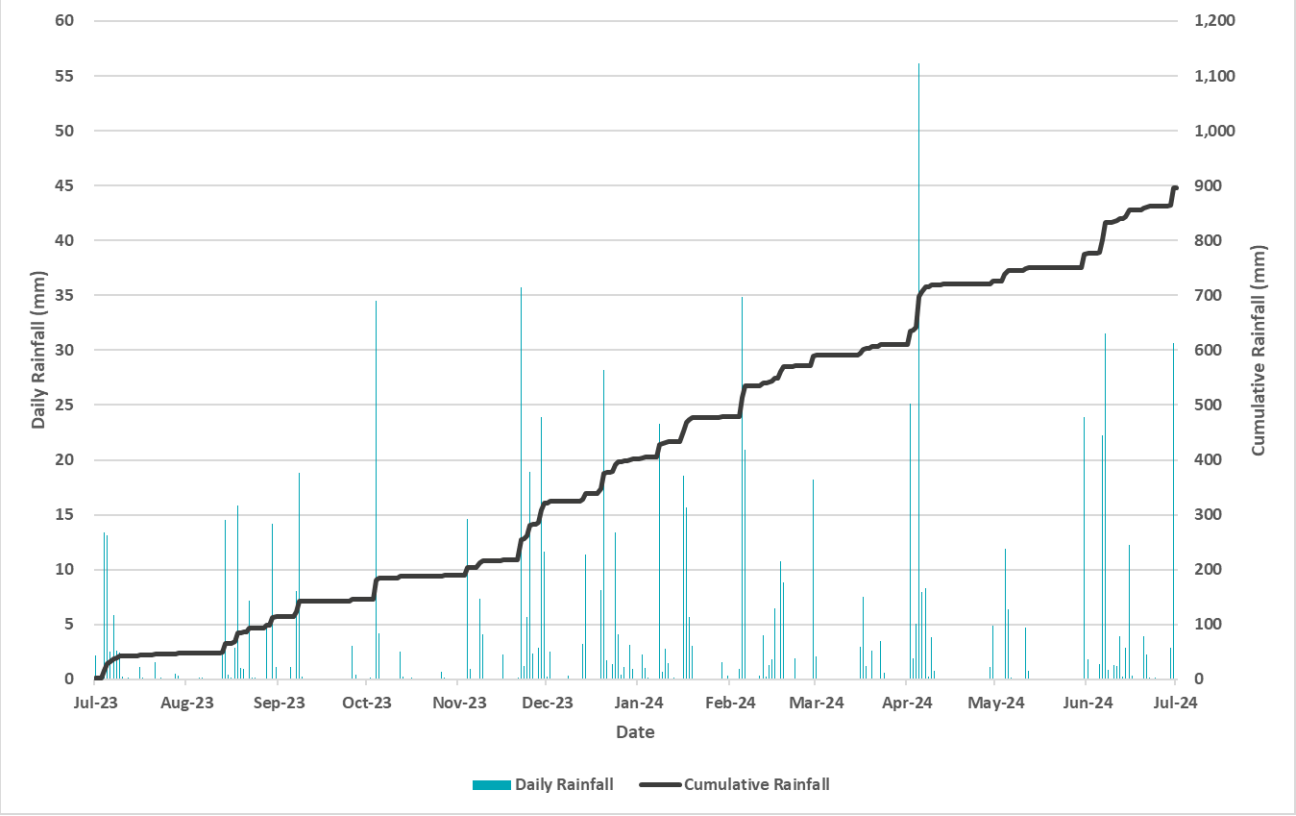
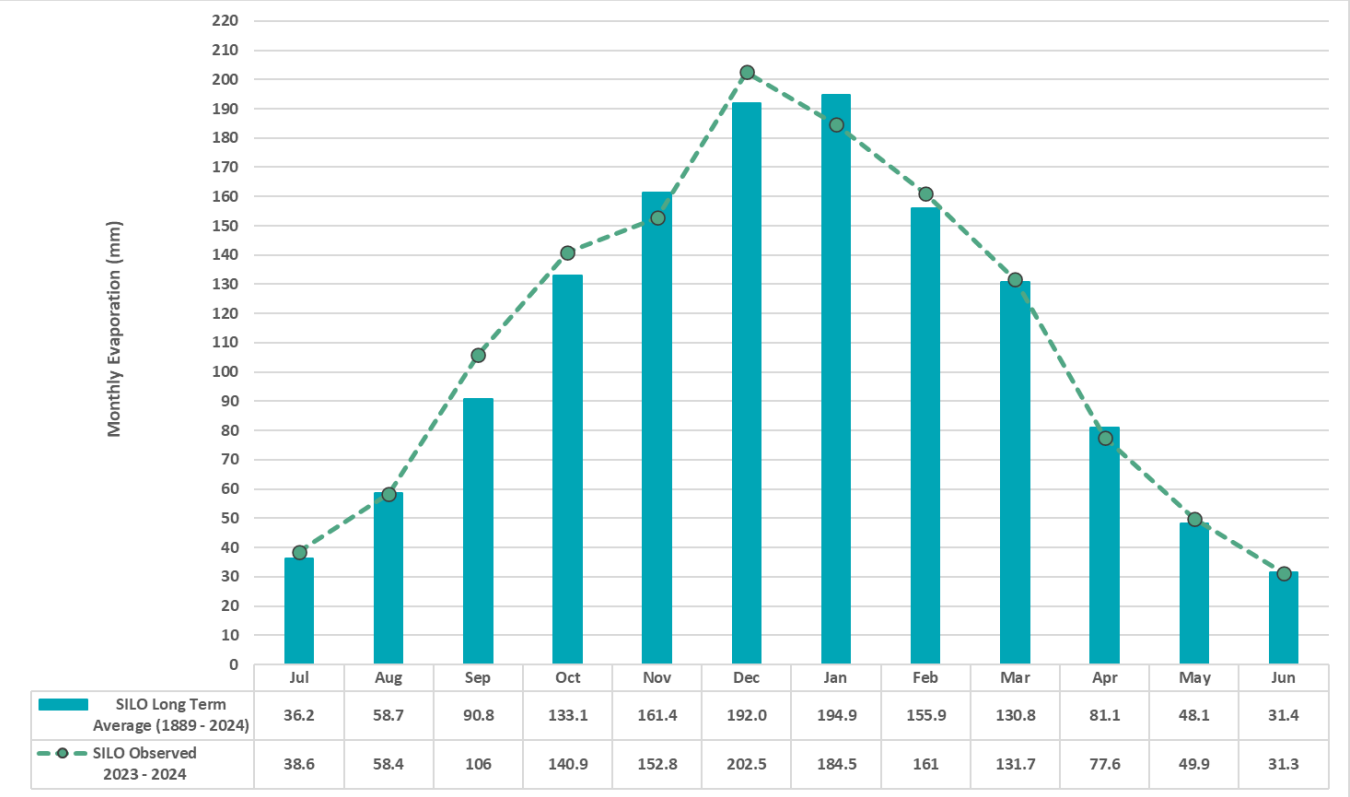


FIGURE 2.3: FY24 CADIA DAILY AND CUMULATIVE RAINFALL

2.2 Evaporation

Evaporation data (Mortons potential lake evaporation) was sourced from the Queensland Government SILO Database (grid point -33.5, 149.00) for the purpose of the assessment. A comparison of long-term monthly averages to monthly averages observed during FY24 are provided in Figure 2.4. Evaporation data for the reporting period and longer term can be summarised as follows:

- Long-term evaporation data indicated that evaporation is greatest in summer months when the temperatures are higher, and lowest in cooler months.
- Monthly totals for FY24 were similar to long-term monthly averages.



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
SILO Long Term Average (1889 - 2024)	36.2	58.7	90.8	133.1	161.4	192.0	194.9	155.9	130.8	81.1	48.1	31.4
SILO Observed 2023 - 2024	38.6	58.4	106	140.9	152.8	202.5	184.5	161	131.7	77.6	49.9	31.3

FIGURE 2.4: COMPARISON OF FY24 EVAPORATION DATA TO LONG-TERM AVERAGES

3. SURFACE WATER MONITORING REQUIREMENTS

3.1 Introduction

Cadia's surface water monitoring requirements are specified in the *Cadia Water Management Plan Revision 8.2* (Newcrest Mining Limited, 2023), which is the current approved version. Requirements specified in the Water Management Plan (WMP) have been developed to be consistent with requirements specified in the Cadia Project Approval (PA06_0295) and the site's Environment Protection Licence (EPL 5590). The WMP has been approved by NSW DPE Water (now the Department of Climate Change, Energy, the Environment and Water (DCCEEW)), with review by the NSW Environment Protection Authority (EPA) and the NSW Department of Planning, Housing and Infrastructure (DPHI).

Section 8.5.1 of the WMP states that the objectives of the surface water quality monitoring program are to:

- Characterise water quality within Cadia operational areas and adjacent watercourses.
- Assess the site performance in relation to prevention of pollution.
- Identify and quantify any potential impacts associated with mining activities.
- Monitor the effectiveness of remediation and rehabilitation measures.

Surface water quality data gathered in accordance with the surface water quality monitoring program (detailed in Section 8.1 of the WMP) has been used to assess the performance of the Cadia surface WMS these objectives for the purpose of the assessment.

3.2 Surface Water Quality Monitoring Locations and Analytes

Water quality monitoring is completed for the analytes listed in Table 3.1 for the monitoring locations shown in Figure 3.1 and Figure 3.2. Monitoring occurs either monthly or quarterly depending on the purpose of the monitoring location. The purpose of each of the monitoring locations are further detailed in Appendix A.

TABLE 3.1: SURFACE WATER QUALITY MONITORING SUITES (ADAPTED FROM TABLE 14 OF THE CADIA WMP (NEWCREST, 2023))

Suite Name	Suite Code	Analytes
Physical parameters (field measurement)	FP	pH, electrical conductivity (EC), temperature, oxidation reduction potential (ORP)
Surface Water Quality	SWQ	• EC, total suspended solids (TSS), total dissolved solids (TDS), alkalinity • Major ions: calcium, magnesium, sodium, potassium, chloride, sulphate • Nutrients: nitrite, nitrate, total nitrogen, total phosphorus • Dissolved metals: aluminium, arsenic, cadmium, copper, iron, lead, manganese, molybdenum, zinc, antimony, cobalt, chromium, mercury, nickel, silver
Oil and Grease	O&G	Oil and grease
Dam	ALG	Blue green algae (counts)

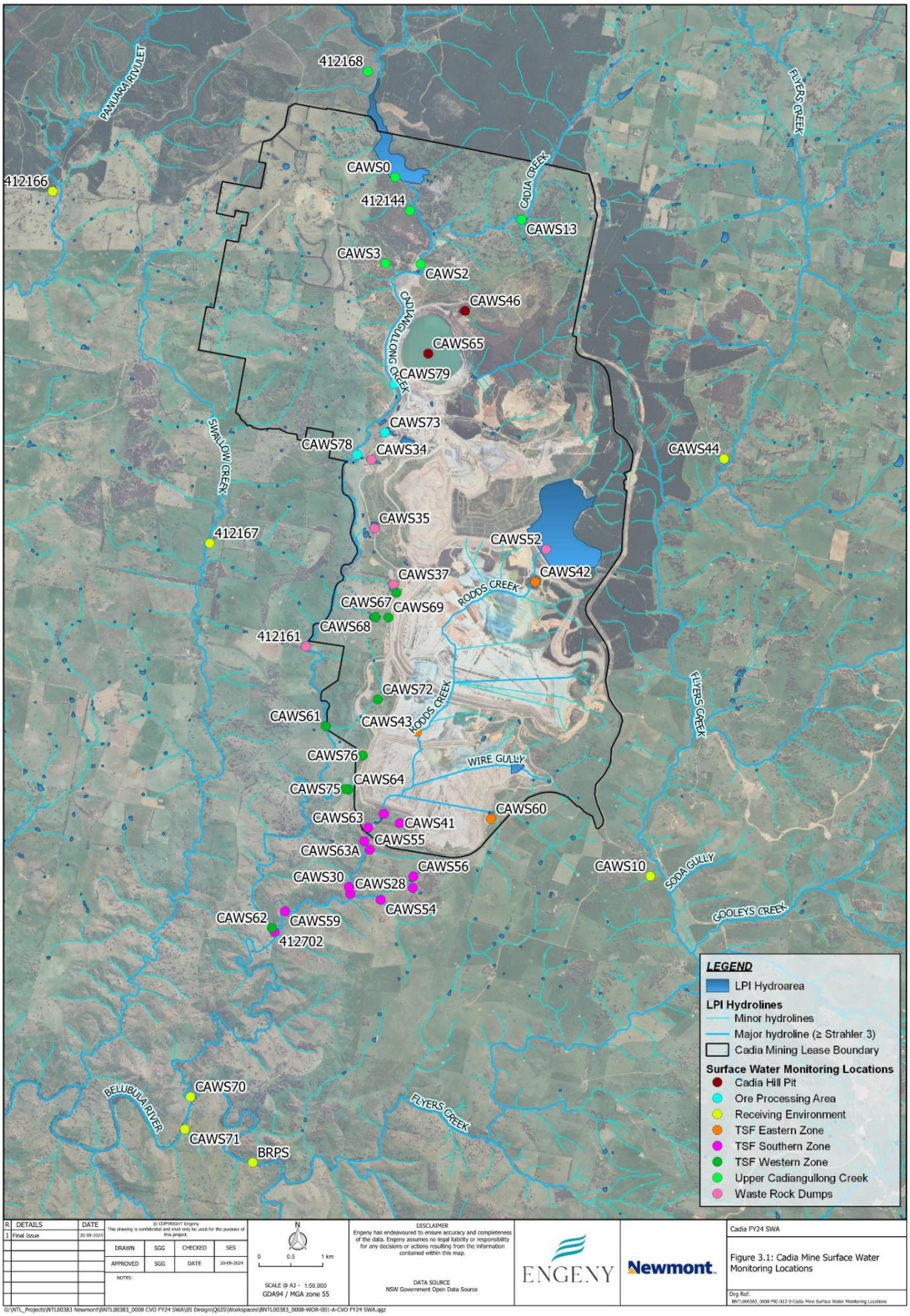


FIGURE 3.1: CADIA SURFACE WATER QUALITY MONITORING LOCATIONS

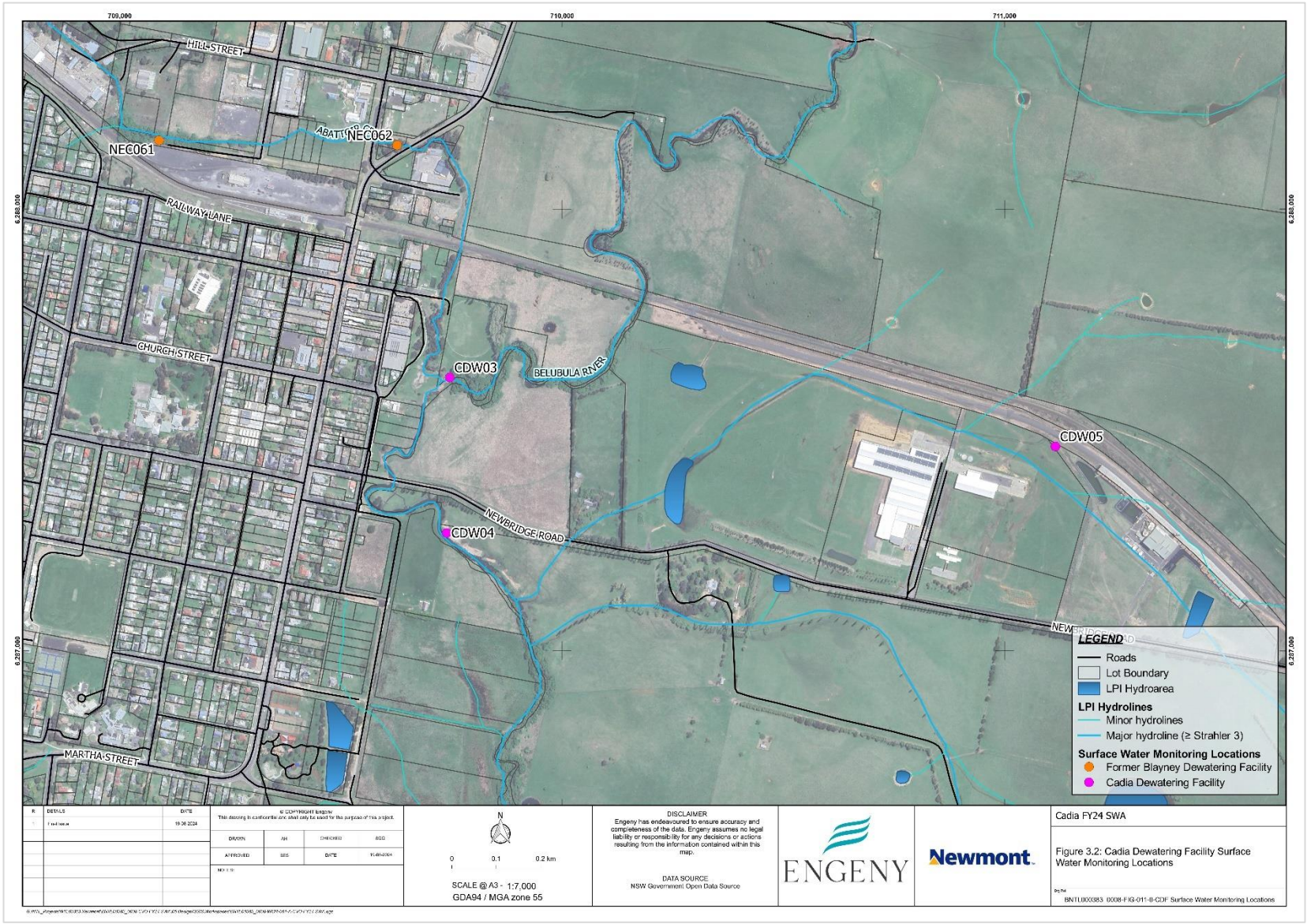


FIGURE 3.2: BLAYNEY SURFACE WATER QUALITY MONITORING LOCATIONS

3.3 Site Specific Guideline Values

Site specific guideline values (SSGVs) have been developed for 2 receiving environment surface water monitoring locations (Oaky Creek Gauging Station and CDW05 at the Cadia Dewatering Facility) in the vicinity of the Cadia operational areas. Exceedances of the SSGVs at these sites indicate potential changes in water quality characteristics and warrant further investigation to determine whether an impact to the receiving environment has occurred. The SSGVs are tabulated in Table 3.2 and have been used to assess the performance of the Cadia WMS for the purpose of the assessment. The Cadia WMP (Newcrest Mining Limited, 2023) should be consulted for additional details relating to how these values were derived.

TABLE 3.2: SURFACE WATER GUIDELINE VALUES (ADAPTED FROM TABLE 20 OF THE CADIA WMP (NEWCREST MINING LIMITED, 2023))

Parameter	Unit	GS412702 (Oaky Creek Gauging Station)	Cadia Dewatering Facility (CDW05)
Physiochemical			
pH	pH	6.5 – 8.5	6.5 – 8.5
EC	µS/cm	1,535	640
TSS	mg/L	50	-
Dissolved Metals			
Aluminium	mg/L	0.055	0.055
Arsenic	mg/L	0.013	0.013
Cadmium	mg/L	0.0002	0.0002
Copper	mg/L	0.009	0.006
Iron	mg/L	0.8	0.2
Lead	mg/L	0.0034	0.0034
Manganese	mg/L	1.9	1.9
Molybdenum	mg/L	0.034	0.034
Zinc	mg/L	0.08	0.05

3.4 ANZECC (2000) Livestock and Irrigation Guideline Values

While not specifically required as per the Cadia WMP (Newcrest Mining Limited, 2023), CHPL has requested that the ANZECC (2000) guideline values for livestock drinking water, and irrigation and general water use be used to assess water quality for specific receiving environment monitoring locations. These ANZECC guideline values are considered relevant to the Cadia receiving environment as the land in the surrounding area is predominantly used for agricultural purposes.

It should be noted that long-term (> 100 years) and short-term trigger (up to 20 years) are provided for irrigation and general water use guideline values. Long-term trigger values represent the maximum concentration of contaminants in the irrigation water which can be tolerated for 100 years. The short-term trigger values represent the maximum concentration in irrigation water that can be tolerated for a shorter period (i.e., 20 years). Where a value was recognised as higher than the long-term trigger, the value has also been compared to short-term triggers for analysis purposes.

TABLE 3.3: ANZECC (2000) LIVESTOCK AND IRRIGATION GUIDELINES VALUES

Parameter	Unit	ANZECC Livestock Drinking Water Guideline Values	ANZECC Irrigation and General Water Use Long-term (>100 years) Guideline Values	ANZECC Irrigation and General Water Use Short-term (up to 20 years) Guideline Values
Physiochemical Parameters, Major Ions and Nutrients				
TDS	mg/L	Beef cattle 0 – 4000 Dairy cattle 0 – 2500 Sheep 0 – 5000 Horses 0 – 4000 Pigs 0 – 4000 Poultry 0 – 4000	-	-
Sulphate	mg/L	1000	-	-
Calcium	mg/L	1000	-	-
Nitrate	mg/L	1500	-	-
Nitrite	mg/L	30	-	-
Total Nitrogen	mg/L	-	5	25-125
Total Phosphorus	mg/L	-	0.05	0.8-12
Dissolved Metals				
Aluminium	mg/L	5	5	20
Arsenic	mg/L	0.5 up to 5	0.1	2.0
Cadmium	mg/L	0.01	0.01	0.05
Chromium	mg/L	1	0.1	1
Cobalt	mg/L	1	0.05	0.1
Copper	mg/L	0.4 (sheep) 1 (cattle) 5 (pigs) 5 (poultry)	0.2	0.5
Iron	mg/L	Not sufficiently toxic	0.2	10
Lead	mg/L	0.1	2	5
Mercury	mg/L	0.002	0.002	0.002
Manganese	mg/L	Not sufficiently toxic	0.2	10
Molybdenum	mg/L	0.15	0.01	0.05
Nickel	mg/L	1	0.2	2
Zinc	mg/L	20	2	5

4. SURFACE WATER ASSESSMENT

4.1 Introduction

This section of the report is intended to provide a summary of the key surface water assessment outcomes including consideration of:

- Elevated analyte values observed during FY24
- Emerging trends from the FY24 period
- Long-term trends that extend beyond FY24
- Seepage related impacts
- Performance of relevant monitoring locations against SSGVs
- Performance of relevant monitoring locations for the receiving environment against ANZECC (2000) guideline values for livestock drinking water, and ANZECC (2000) guideline values for irrigation and general water use
- Whether the water quality data indicates any contamination of the receiving environment.

Outcomes of the assessment are detailed in subsequent sections. A detailed analysis of all analytes for each management zone is provided in Appendix A and graphs for all analytes of interest are provided in Appendix B.

4.2 FY24 Surface Water Performance Snapshot by Management Zone

The FY24 surface water performance for each of the management zones (refer to Figure 3.1 and Figure 3.2) is summarised in Sections 4.2.1 to 4.2.10. It should be noted that where graphical representations of trends for multiple analytes at specific surface water monitoring locations are provided, analytes with similar concentrations have been selected to allow the trend to be displayed clearly. The phrase *highest in the historic monitoring period* is used to highlight results that are the highest on record for the relevant locations.

4.2.1 Upper Cadiangullong Creek

The upper Cadiangullong Creek management zone includes 6 surface water monitoring locations, as follows:

- **412168** – A reference monitoring location that is located upstream of Cadiangullong Dam and the areas disturbed by the mining operation.
- **412144** – Monitoring location immediately downstream of Cadiangullong Dam and upstream of mining operations. Used to assess water quality of flow volumes from Cadiangullong Dam.
- **CAWS0** – Cadiangullong Dam. Data is used to assess quality of raw water to be imported to Cadia Mine for processing operations.
- **CAWS2** and **CAWS3** – Used to monitor for impacts to Cadiangullong Creek from historical mining activities. CAWS3 is the location of a historic mine adit and receives seepage from historic mining operations. The CAWS3 location is a bunded area (i.e., not on the watercourse) and water collected here is dewatered to the process water system. There is no direct connection between CAWS3 and Cadiangullong Creek.
- **CAWS13** – Located on Cadia Creek at Cadia Creek weir. Used to monitor water quality at Cadia Creek prior to its confluence with Cadiangullong Creek.

These monitoring locations are shown in Figure 4.1.

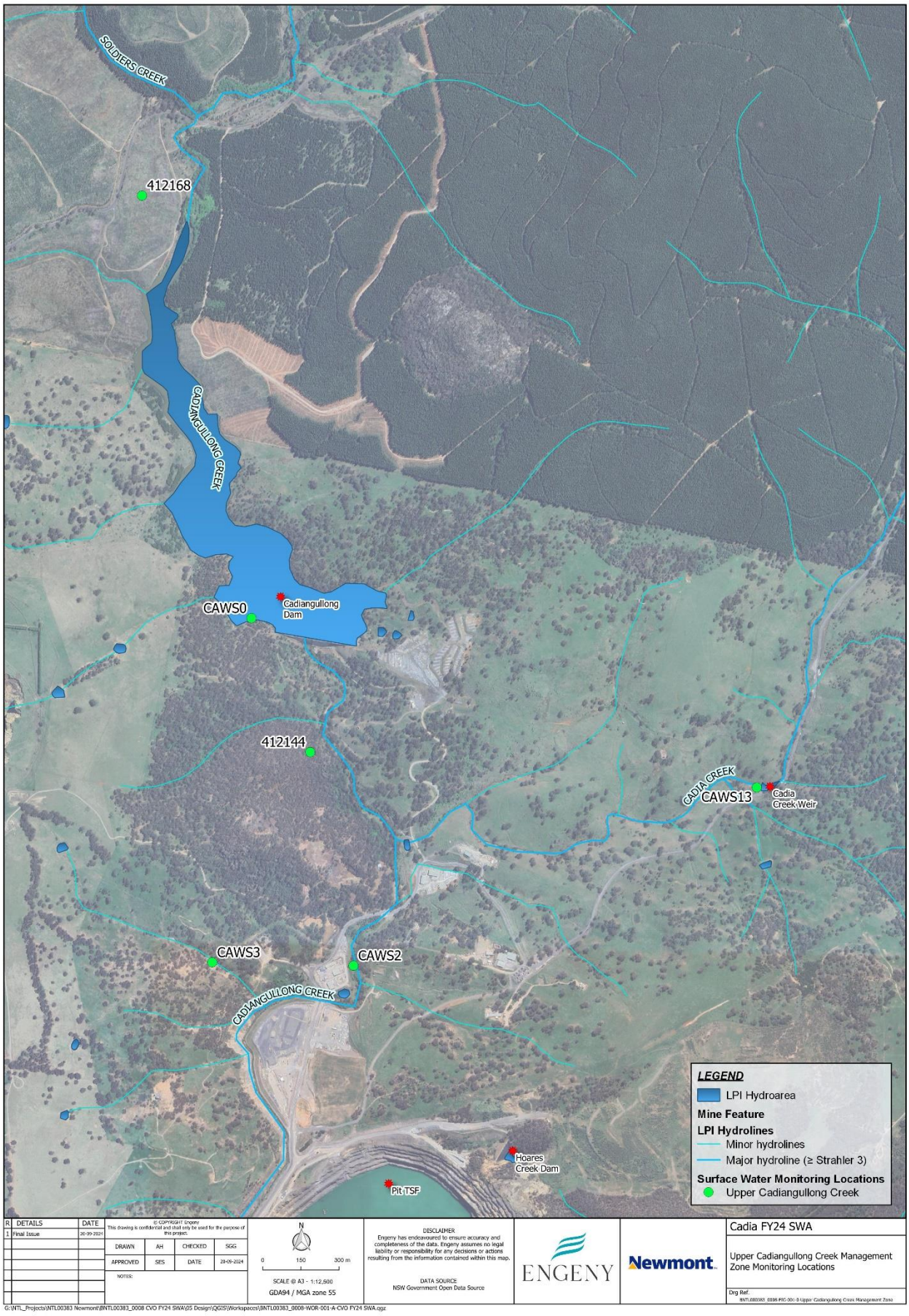


FIGURE 4.1: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE MONITORING LOCATIONS

4.2.1.1 Physiochemical Parameters

Surface water monitoring results for all locations in the upper Cadiangullong Creek management zone were generally consistent with historic monitoring data. Higher values that exceeded the historic range were observed for ORP (1 result each at 412168 and 412144), and TSS (1 result at CAWS2). Higher results from the reporting period that are not typical of the historic range at the relevant monitoring location can generally be attributed to increased runoff during/following high rainfall events. Values for the aforementioned analytes at these monitoring locations returned to the historic range following the occurrence of the higher values.

4.2.1.2 Nutrients

All values for nitrate, nitrate, total nitrogen and total phosphorus were within the historic range during FY24. There were some slightly higher results observed for total phosphorus at CAWS13 during the latter half of the reporting period. For all the dates where a higher result was returned, rainfall events had occurred during the preceding days. Increased runoff volumes from the predominantly agricultural catchment upstream are considered likely the cause of these higher total phosphorus results.

4.2.1.3 Major Ions

Results for all major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24.

4.2.1.4 Dissolved Metals

All results for antimony, arsenic chromium, lead, mercury and silver were consistently below the limit of detection. All results for aluminium, cadmium, cobalt, copper, iron, molybdenum, nickel and zinc were consistently low and within the historic range with no outliers observed.

Higher values that exceeded the historic range were observed for manganese (1 result each for CAWS0 and CAWS13). Higher results from the reporting period that are not typical of the historic range at the relevant monitoring location can generally be attributed to increased runoff during/following high rainfall events. Values for manganese at these monitoring locations subsequently returned to be within the historic range.

During FY23 (the previous reporting period), increases in several metals (including cadmium, cobalt, copper, manganese, molybdenum, nickel and zinc) were observed at CAWS3. CAWS3 is the location of a historic mine adit and receives seepage flows from the historic operation. These seepage flows are captured via bunding and transferred to the process water system. It was concluded in the FY23 Cadia surface water assessment that these higher values could be attributed to increased seepage flows as a result of higher than average rainfall and that there were no clear impacts at downstream Cadiangullong Creek monitoring locations (GHD, 2023). During FY24, concentrations of the aforementioned metals, as well as EC and TDS exhibited decreasing trends. An example of these decreasing trends for selected analytes is shown in Figure 4.2. These decreasing dissolved metal trends were coincident with slightly increasing trends for alkalinity, chloride and ORP indicating an overall improvement in water quality since the values observed during FY23.

4.2.1.5 Biological Indicators

One slightly higher value for ALG (13,200 cells/mL on 8 April 2024) was observed at CAWS0 (Cadiangullong Dam) during the reporting period. This increase is likely the result of high temperatures and low rainfall in the weeks prior to sampling (only 20.5 mm of rainfall occurred in March 2024), and minimal mixing of water in the dam due to lack of inflows. While slightly higher, this value is still within the historic range for the monitoring location.

4.2.1.6 Summary

Surface water monitoring results for all locations in the upper Cadiangullong Creek management zone were generally consistent with historic monitoring data. Most monitoring locations where higher values were observed (CAWS0, CAWS13, 412168 and 412144) are upstream of the areas disturbed by mining related activities and the likelihood of the higher values being caused by Cadia operations is negligible. Concentrations of dissolved metals at CAWS3 decreased during FY24.

The results indicate no mining related impacts to the receiving environment.

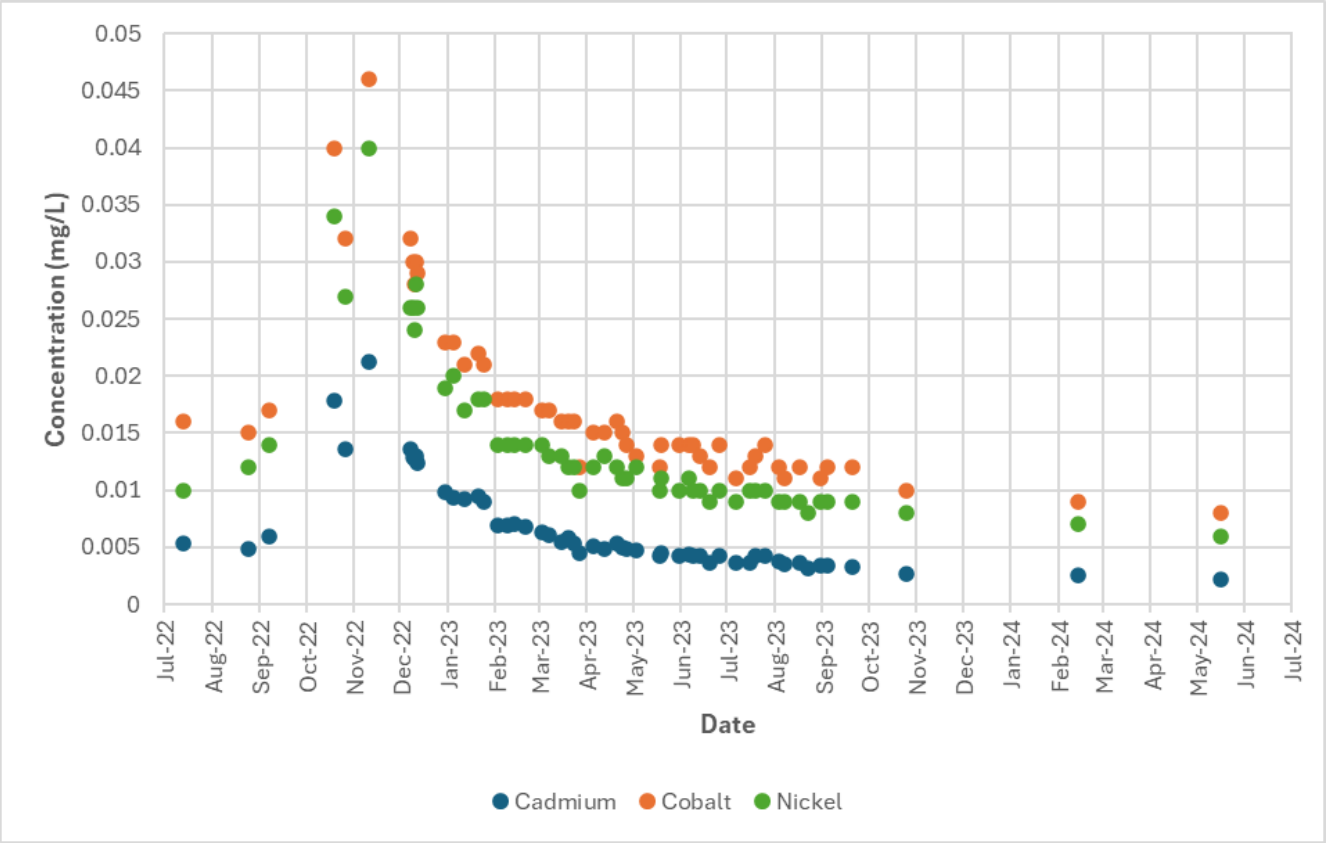


FIGURE 4.2: FY24 TRENDS AT CAWS3

4.2.2 Cadia Hill Pit

The Cadia Hill Pit management zone includes 2 surface water monitoring locations that are both located within the WMS, as follows:

- **CAWS65** – Used to monitor water quality in the Pit TSF (PTSF).
- **CAWS46** – Used to monitor water quality in Hoares Creek Dam.

It should be noted that these monitoring locations are in the same management zone due to their geographical location, however, interaction between the 2 locations is minimal (if any). These monitoring locations are shown in Figure 4.3.

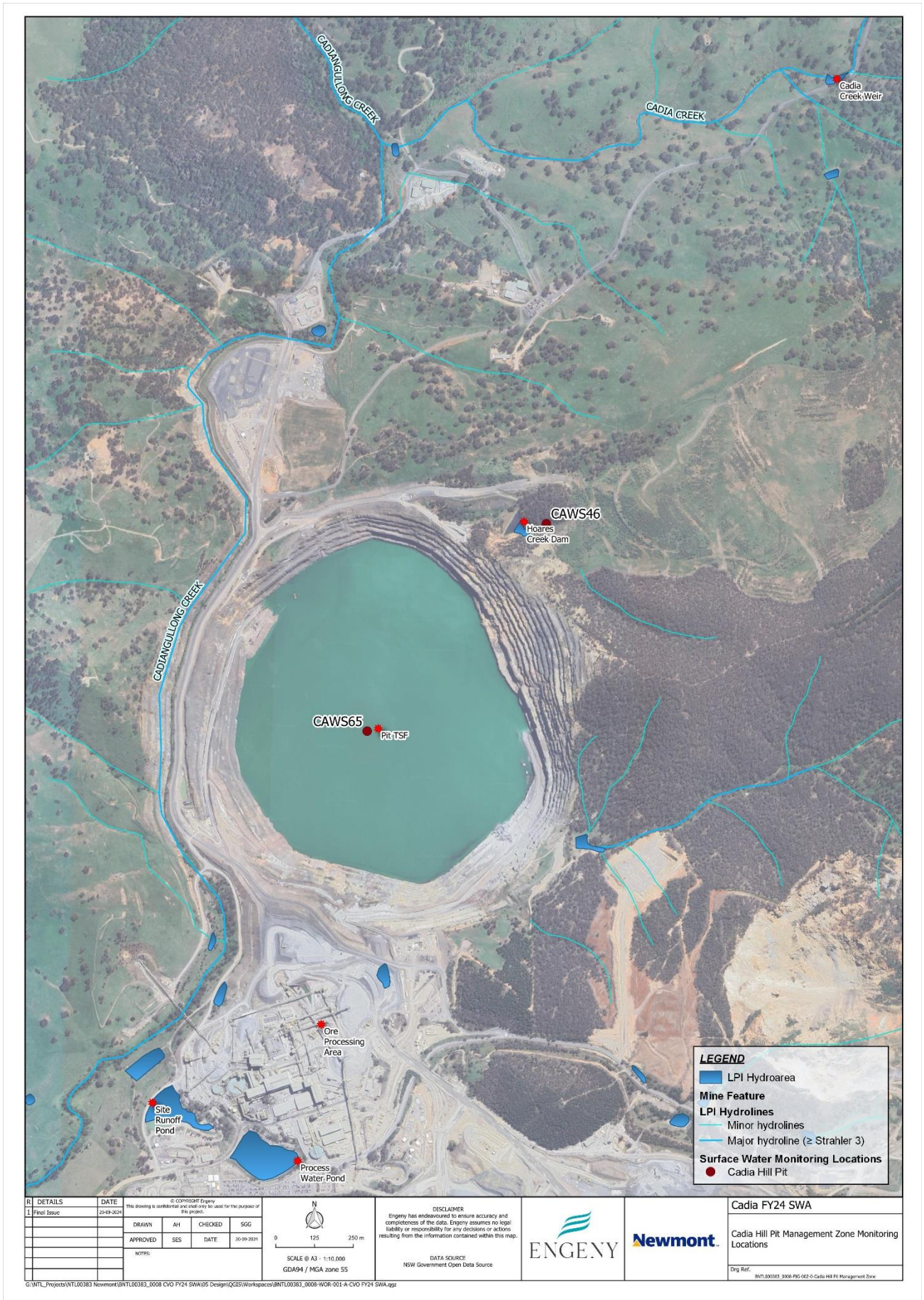


FIGURE 4.3: CADIA HILL PIT MANAGEMENT ZONE MONITORING LOCATIONS

4.2.2.1 Physiochemical Parameters

Increases were observed during FY24 for EC and TDS at CAWS65 (refer to Figure 4.4). These increases appear to be a continuation of a trend that began at the start of 2022. Variation at CAWS65 (located inside the PTSF), is expected due to natural variation in the tailings materials deposited. Water in the PTSF is reclaimed for use in ore processing.

The only results returned during FY24 that were not within the historic range was a result for alkalinity (12 mg/L) at CAWS46 which is the lowest in the historic dataset. This low alkalinity value may be attributed to dilution due to rainfall inflows.

4.2.2.2 Nutrients

All values for nitrate, nitrate, total nitrogen and total phosphorus were within the historic range during FY24.

4.2.2.3 Major Ions

Increases were observed during FY24 for chloride, potassium, sodium and sulphate at CAWS65 (refer to Figure 4.4). These increases appear to be a continuation of a trend that began at the start of 2022. Variation at CAWS65 (located inside the PTSF), is expected due to natural variation in the tailings materials deposited. Water in the PTSF is reclaimed for use in ore processing.

4.2.2.4 Dissolved Metals

All values for chromium, iron, lead, mercury and silver were consistently below the limit of detection for both monitoring locations. At CAWS46, all results for antimony and arsenic were also below the limit of detection. Values for all dissolved metal analytes at both monitoring locations are within the historic range.

Results for several dissolved metals appeared to exhibit a weak increasing trend throughout FY24 at CAWS46. These analytes include antimony, cobalt, copper, manganese, nickel and zinc. It should be noted that these increases appear to be the result of cyclic changes in water quality at the monitoring location over the long-term in which peaks and troughs are observed. Variation in the concentrations of these dissolved metals is minimal (both for FY24 and the long-term) and all results for these analytes are within the historic range and are considered to not be due to mining related impacts.

4.2.2.5 Summary

The majority of results at both monitoring locations in the Cadia Hill Pit management zone were within the historic range. It is considered that no results from the management zone warrant the need for further investigation.

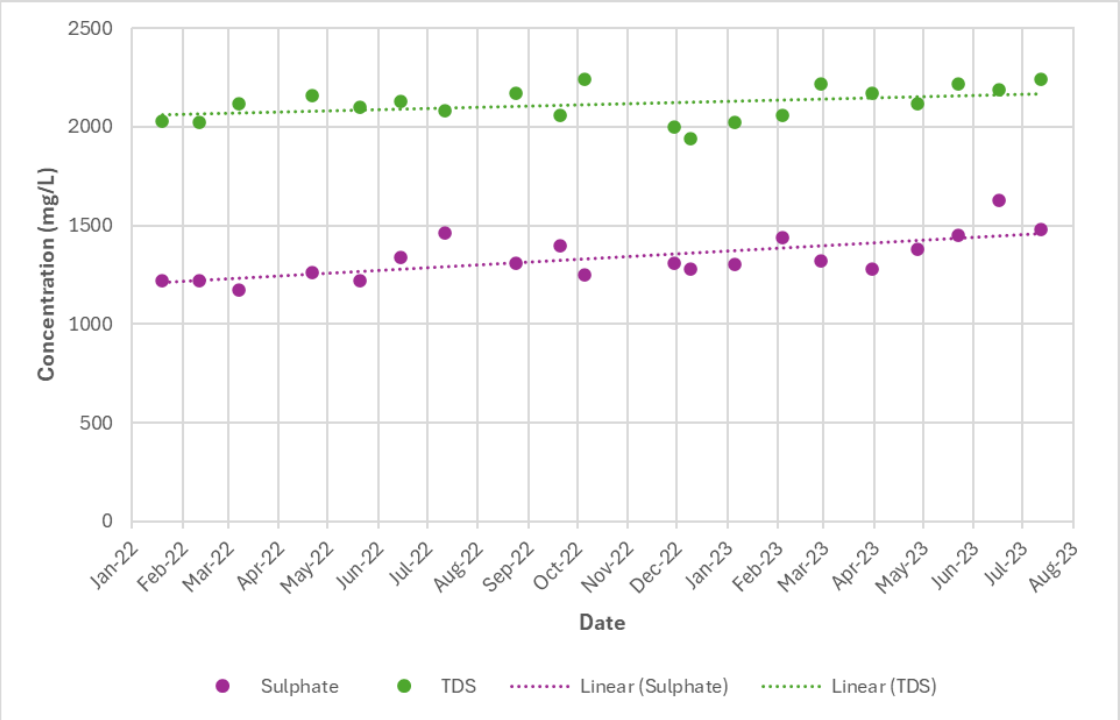


FIGURE 4.4: LONG-TERM TRENDS AT CAWS65

4.2.3 Ore Processing Area

The Ore Processing Area management zone has 3 monitoring locations, as follows:

- **CAWS73** – Used to monitor changes in water quality for the Site Runoff Pond. Water captured by the Site Runoff Pond is contained for reuse in the process water system.
- **CAWS78** – Used to assess potential impacts on Cadiangullong Creek from the Ore Processing Area. Located downstream of the Site Runoff Pond
- **CAWS79** – Used to assess potential impacts on Cadiangullong Creek from the Ore Processing Area. Located upstream of the Site Runoff Pond.

These surface water monitoring locations are shown in Figure 4.5.

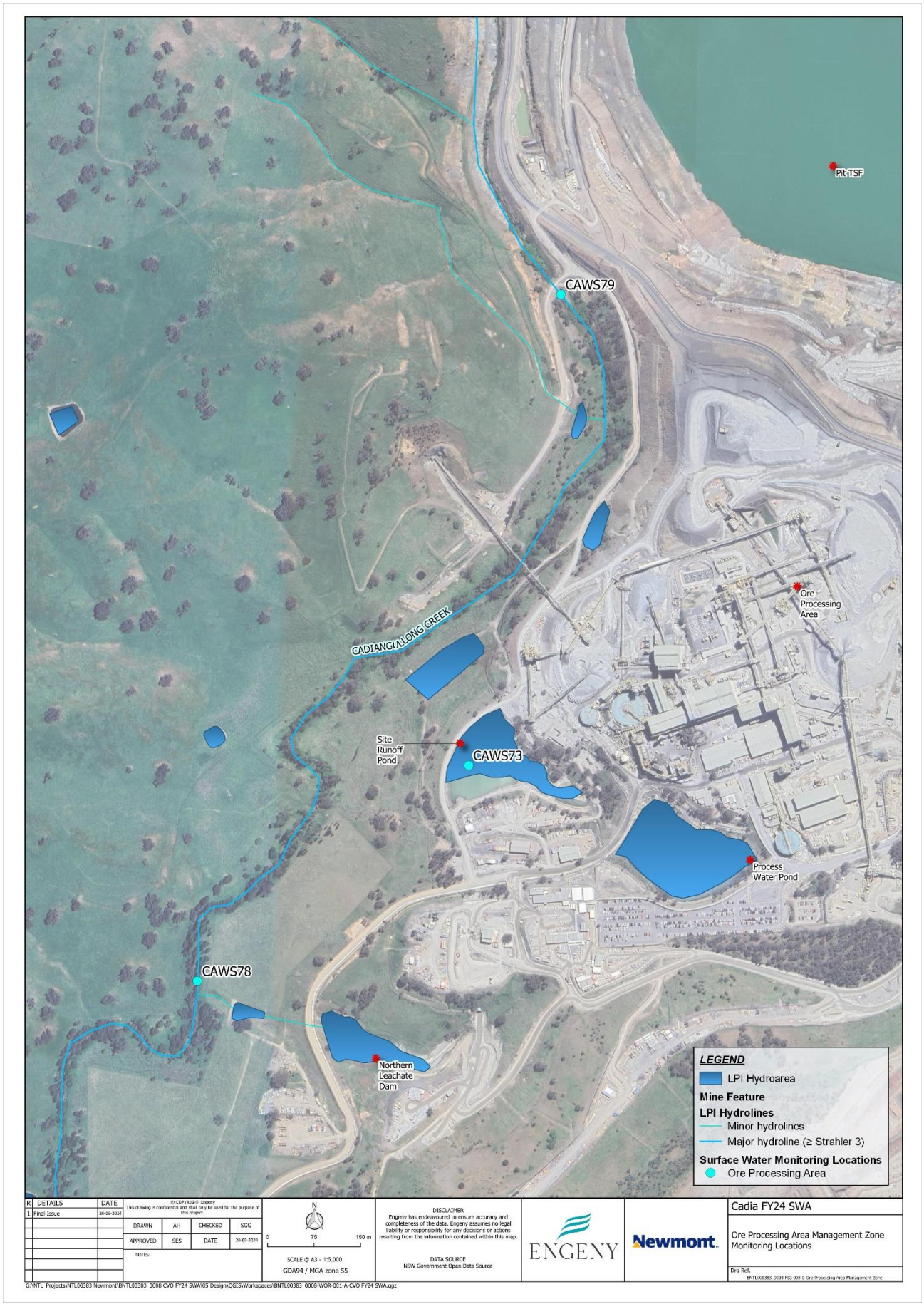


FIGURE 4.5: ORE PROCESSING AREA SURFACE WATER MONITORING LOCATIONS

4.2.3.1 Physiochemical Parameters

All results TSS and TDS during FY24 were within the historic range for all locations. Peak pH values were observed during FY24 for CAWS73 on 14 November 2023 (9.66), for CAWS79 on 27 October 2023 (8.3), and for CAWS78 on 30 October 2023 (8.45). These results are only slightly above the historic range. Following these occurrences all sites returned results that were more in line with the historic averages for the sites.

Long-term trends (since July 2020) are evident for EC and alkalinity at CAWS73 (refer to Figure 4.6 and Appendix B.3). The CAWS73 monitoring location is located at the Site Runoff Pond. The Site Runoff Pond captures water that is reused during processing. The upstream catchment reporting to the Site Runoff Pond is an active waste rock dump. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek.

4.2.3.2 Nutrients

All results for nitrate, nitrate, total nitrogen and total phosphorus were within the historic range for all monitoring location in the ore processing area management zone during FY24. A long-term trend is evident for total phosphorus at CAWS73. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek.

4.2.3.3 Major Ions

Results for all major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24. Long-term trends (since July 2020) are evident for calcium, chloride, magnesium, sodium and sulphate at CAWS73 (refer to Figure 4.6). Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek.

4.2.3.4 Dissolved Metals

All results for chromium, cobalt, lead, mercury, nickel and silver were consistently below the limit of detection for all sites during FY24. At CAWS78 and CAWS79 (on Cadiangullong Creek), all results for antimony, arsenic and cadmium were also below the limit of detection. The majority of results for dissolved metals were within the historic range during FY24.

One result for molybdenum (0.01 mg/L on 5 February 2024) and 1 result for zinc (0.099 mg/L on 27 October 2023) slightly exceeded the historic range at CAWS79. These concentrations are still considered to be relatively low and unlikely to pose a risk to the environment. The CAWS79 monitoring location is located upstream of the Ore Processing Area and it is considered that these increases are not the result of mining related impacts. Subsequent results these higher results were more consistent with historic averages for the monitoring locations.

One result for molybdenum at CAWS73 (0.921 mg/L on 16 May 2024) exceeded the historic range. This higher value appears to be part of an increasing trend observed at CAWS73 and appear to be part of an increasing trend since January 2016.

Long-term trends are evident for nickel and manganese at CAWS73. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek.

4.2.3.5 Summary

Surface water monitoring results for all monitoring locations in the Ore Processing Area management zone were generally consistent with historic monitoring data with only 6 outliers observed during FY24. The majority of results for all dissolved metals were within the historic range. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek. Therefore, results from the Ore Processing Area management zone indicate no mining related impacts in the receiving environment.

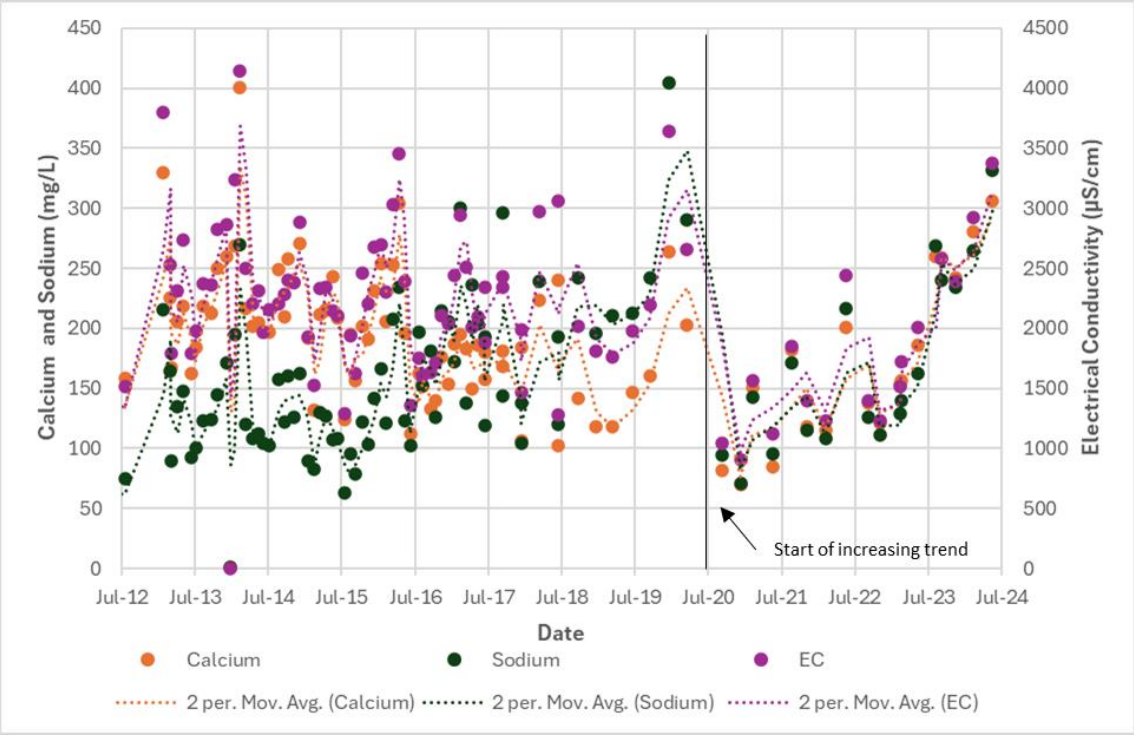


FIGURE 4.6: LONG-TERM TRENDS AT CAWS73

4.2.4 Waste Rock Dumps

The Waste Rock Dumps management zone is inclusive of 5 surface water monitoring locations, as follows:

- **412161** – Used to assess water quality on Cadiangullong Creek and monitor for potential impacts from the mining operation
- **CAWS34** – Used to monitor changes in water quality in the Northern Leachate Dam
- **CAWS35** – Used to monitor changes in water quality in the Southern Leachate Dam
- **CAWS37** – Used to monitor changes in water quality at H19 sediment dam
- **CAWS52** – Used to monitor changes in water quality in Rodds Creek Dam.

These surface water monitoring locations are shown in Figure 4.7.

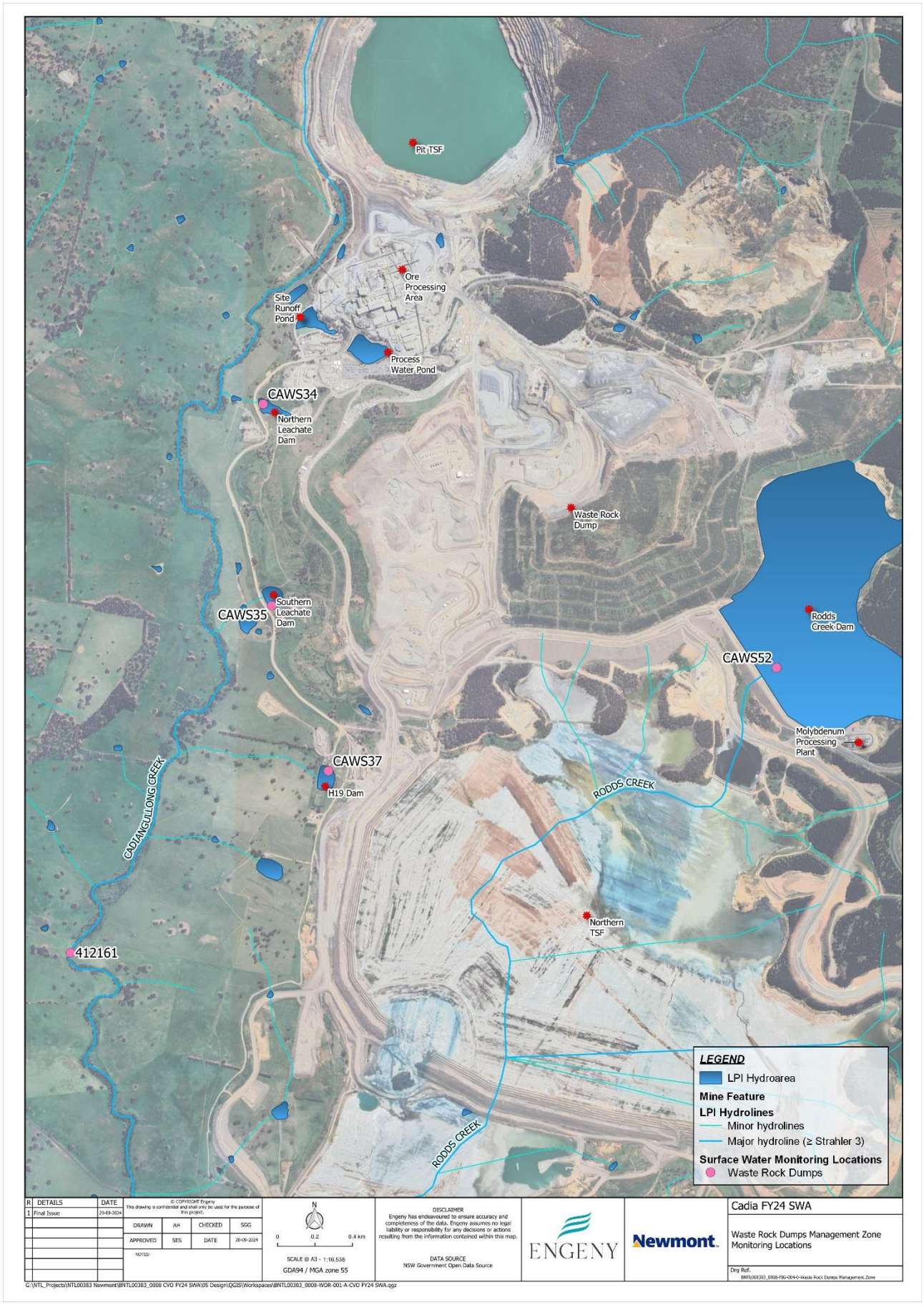


FIGURE 4.7: WASTE ROCK DUMP MANAGEMENT ZONE MONITORING LOCATIONS

4.2.4.1 Physiochemical Parameters

All results for pH, EC, TSS, TDS and alkalinity were within the historic range. Long-term increasing trends for EC and TDS were observed at CAWS52 (refer to Section 4.2.4.4).

4.2.4.2 Nutrients

All values for nitrate, nitrite, total nitrogen and total phosphorus for all monitoring locations were within the historic range during FY24. Long-term water quality trends for nitrate and total nitrogen at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24.

4.2.4.3 Major Ions

All results for calcium, chloride, magnesium, potassium, sodium and sulphate for all monitoring locations were within the historic range during FY24. Long-term increasing trends were observed at CAWS52 for calcium, chloride, potassium, sodium and sulphate (refer to Section 4.2.4.4).

4.2.4.4 Dissolved Metals

All results for chromium, lead and silver were below the limit of detection at all monitoring locations during FY24. All results for aluminium, antimony, arsenic, cadmium, cobalt, copper, iron, manganese, nickel and zinc were low and within the historic range for all locations.

A higher value for molybdenum was observed at CAWS52 (0.701 mg/L) on 7 March 2024. This is the highest value for the monitoring location in the historic monitoring period and the only value for all monitoring locations in the Waste Rock Dumps management zone that did not fall within the historic range for FY24. This result is part of a continuing increasing trend at CAWS52 that has been prevalent since the end of 2021. Increasing trends have also been observed for the same period for EC, TDS, calcium, chloride, potassium, sodium and sulphate (refer to Figure 4.8).

Rodds Creek Dam (i.e., CAWS52) receives transferred inflows from the NTSF and STSF decant ponds. These inflows increase in both frequency and volume during periods of high rainfall (such as the past few years). Increased transfer inflows from the TSFs, other site storages and runoff from the upstream catchment are likely to have attributed to these increasing trends. Due to the size and location of Rodds Creek Dam (upslope of the NTSF), and the freeboard maintained in the dam for stormwater runoff, Rodds Creek Dam is considered to be isolated from the downstream receiving environment.

Long-term water quality trends at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24 for several analytes including cadmium, copper, manganese, zinc, cobalt and nickel.

4.2.4.5 Biological Indicators

Blue green algae (ALG) is required to be monitored at Rodds Creek Dam (CAWS52) monthly between October and April. All values for ALG at CAWS52 were historic range during FY24.

4.2.4.6 Summary

Surface water monitoring results for all locations in the Waste Rock Dumps management zone were generally consistent with historic monitoring data during FY24 and only 1 outlier was observed.

Long-term water quality trends at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24 for several analytes including nitrate, total nitrogen, cadmium, copper, manganese, zinc, cobalt and nickel. Changes in water quality at CAWS37 (H19) were within the historic range for the monitoring location.

Continuing increasing trends at CAWS52 (Rodds Creek Dam) were observed for several analytes including, molybdenum, EC, TDS, calcium, chloride, potassium, sodium and sulphate. This increases are likely attributed to increased transferred inflows from the NTSF and STSF decant ponds in recent years due to periods of above average rainfall.

Minor increases observed for some analytes during FY24 appear to be reflective of cyclic changes in water quality at the monitoring location due to the upstream active waste rock dump. No increasing trends or higher values were observed at monitoring location 412161 during FY24. Results during FY24 (and over the long-term) at monitoring location 412161 do not reflect the trends observed at other monitoring locations in the management zone and no mining related impacts are evident. Results from all 5 locations in the waste rock dumps management zone indicate no impact to the receiving environment from waste rock dump runoff.

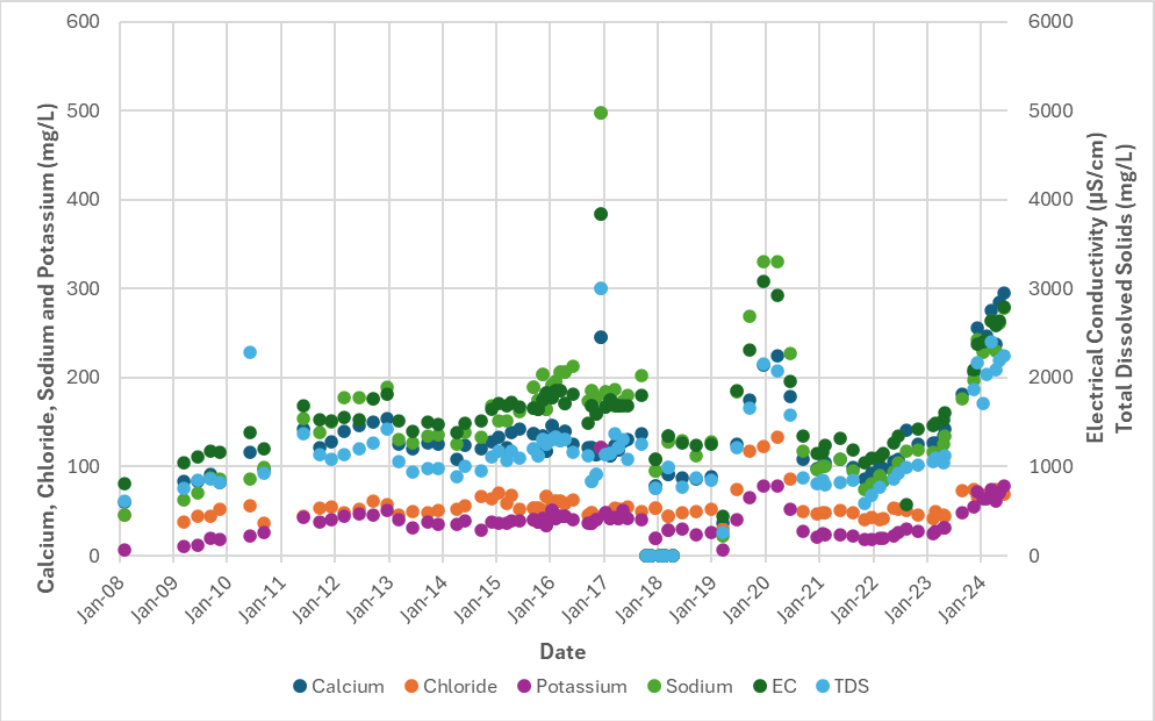


FIGURE 4.8: LONG-TERM TRENDS AT CAWS52

4.2.5 TSF Eastern Zone

The TSF Eastern management zone includes 3 surface water monitoring locations, as follows:

- **CAWS42** – Used to monitor changes in NTSF decant water quality. Located at the Cadia Molybdenum Plant outflow point.
- **CAWS43** – Used to monitor changes in STSF decant water quality.
- **CAWS60** – Used to monitor changes in water quality in the Eastern Dyke Storage, located adjacent to the eastern wall of the STSF.

These monitoring locations are shown in Figure 4.9. Water at CAWS42, CAWS43 and CAWS60 is reclaimed for use in the process water system and there is no direct connection between these monitoring locations and the receiving environment.

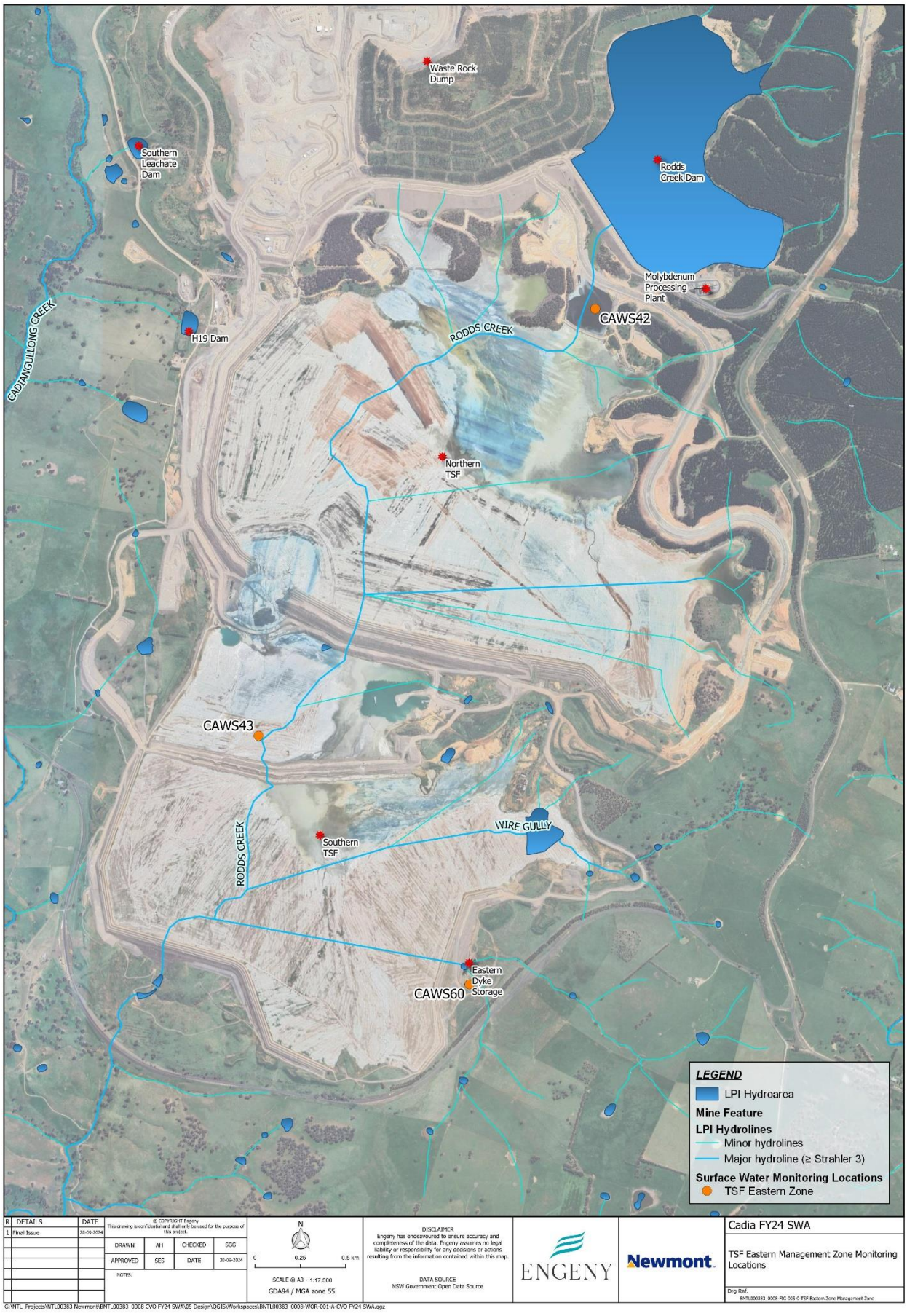


FIGURE 4.9: TSF EASTERN MANAGEMENT ZONE MONITORING LOCATIONS

4.2.5.1 Physiochemical Parameters

All results for pH, EC, TDS and alkalinity were within the historic range at all monitoring locations during FY24.

Results recorded for TSS at CAWS42 and CAWS43 on 23 October 2023 were the highest on record. Results prior to and following these higher results were within the historic ranges for the monitoring locations. Somewhat consistent rainfall throughout October 2023 could have caused increased sediment suspension in the decant ponds. All other result for TSS were within the historic range with around half being below the limit of detection.

4.2.5.2 Nutrients

All results for nitrate, nitrite and total nitrogen were within the historic range at all monitoring locations during FY24. All results for total phosphorus at CAWS43 and CAWS60 were within the historic range for the sites. The highest result for total phosphorus on record at CAWS42 was recorded on 23 October 2023 (0.67 mg/L). Four other results for total phosphorus at CAWS42 during FY24 were equal to or greater than the 95th percentile of the historic range. This trend is discussed further in Section 4.2.5.5.

4.2.5.3 Major Ions

All results for calcium, magnesium, potassium, and sulphate were within the historic range at all monitoring locations during FY24. All results for chloride and sodium at CAWS43 and CAWS60 were also within the historic range for the sites.

The highest result for chloride on record at CAWS42 was recorded on 7 August 2023 (569 mg/L). Four other results for chloride at CAWS42 during FY24 were equal to or greater than the 95th percentile of the historic range. The highest result for sodium on record at CAWS42 was recorded on 17 August 2023 (925 mg/L). One other result for sodium at CAWS42 during FY24 was greater than the 95th percentile of the historic range. The higher results for these analytes at CAWS42 began at the start of 2023 and have continued trending upwards in the time since. This trend is discussed further in Section 4.2.5.5.

4.2.5.4 Dissolved Metals

All results for chromium, cobalt, lead, nickel and silver were below the limit of detection during FY24 for all monitoring locations. All results for aluminium, antimony, cadmium, iron, manganese, mercury, molybdenum and zinc at all locations were within the historic range. All dissolved metal results at CAWS60 and CAWS43 were within the historic range.

The majority of dissolved metal results at CAWS42 (NTSF) were within the historic range, however, several results were the highest on records or above the 90th percentile of historic results during FY24. Four results for antimony at CAWS42 during the period were equal to or greater than the 95th percentile of the historic data. The highest result for the historic monitoring period at CAWS42 for copper was recorded on 19 July 2023 (0.07 mg/L). One other result for copper at CAWS42 during FY24 was greater than the 95th percentile of the historic range. Four results for molybdenum were greater than the historic 90th percentile for the site. These results are discussed further in Section 4.2.5.5.

4.2.5.5 Summary

Several analytes at CAWS42 returned results that were the highest in the historic monitoring period or above the 95th percentile of historic results during FY24. These analytes include total phosphorus, chloride, sodium, antimony, arsenic and copper. Four results for molybdenum were above the 90th percentile of the historic range at CAWS42 during FY24. CAWS42 exhibits long-term increasing trends for the aforementioned analytes. Higher values at CAWS42 for these analytes have become more consistent since July 2022 (refer to Figure 4.10) which is when discharges from the Molybdenum Plant outflow to the NSTS decant pond (CAWS42) began. Comparatively, other monitoring locations in the management zone (CAWS43 and CAWS60) that are downstream of CAWS42 generally exhibit stable or decreasing trends. This indicates that changes in water quality in the management zone are confined to the NTSF decant pond (CAWS42). Changes to the tailings decant water quality are likely attributed to additional inflows to the NTSF from the Molybdenum Plant discharge point and changes in the tailings characteristics. Changes to tailings decant water quality can occur for several reasons including mining in different veins/locations which can influence chemical reactions, and leaching of metals in the tailings, as well as dilution and concentration of decant water due to changing weather conditions.

Copper is the only analyte at CAWS60 that appears to exhibit a trend that reflects that of the CAWS42 (NTSF). This trend is also reflected at CAWS43 (STSF) (refer to Figure 4.11). At CAWS60 (Eastern Dyke storage) the majority of results for water quality analytes (including dissolved metals) were low or below the limit of detection. Results for copper at CAWS60 are also considered low. Water captured in the Eastern Dyke storage is managed via transfers to the process water system. It should be noted that the Eastern Dyke storage has a significant upstream catchment comprised of agricultural land and receives the majority of rainfall runoff inflows from this area as opposed to the TSFs. Changes in analyte concentrations could be attributed to upstream agricultural sources, however, it is not possible to make this conclusion due to lack of upstream monitoring locations.

All of the monitoring locations in the TSF Eastern management zone are actively managed as part of the process water system. The results indicate no impacts from the mining operations to the receiving environment.

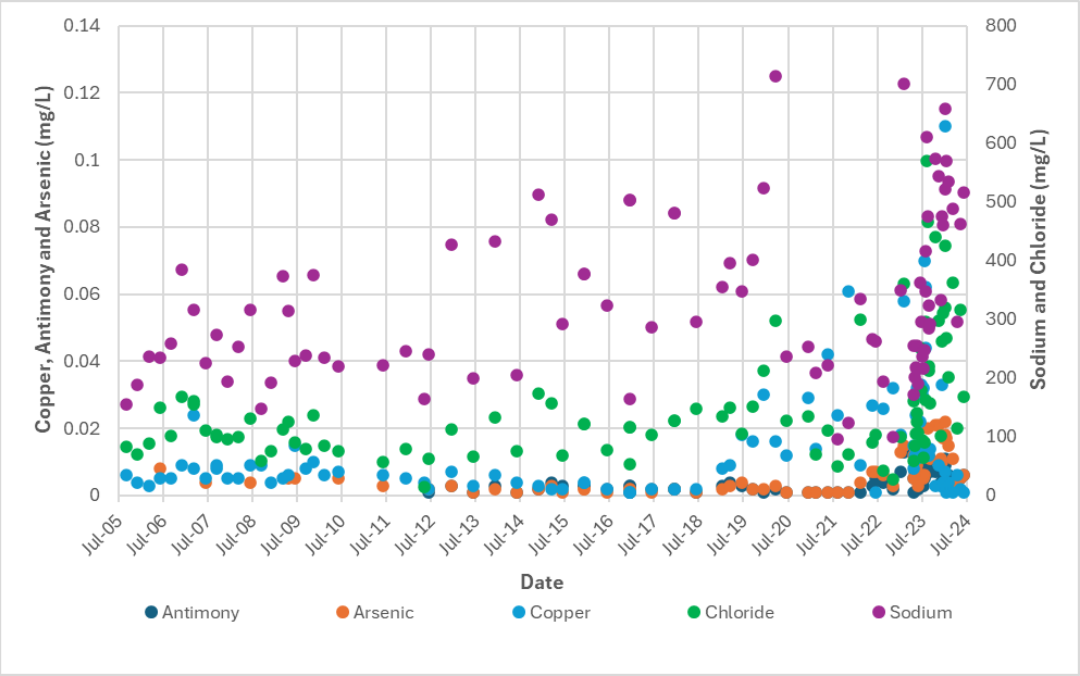


FIGURE 4.10: LONG-TERM TRENDS AT CAWS42

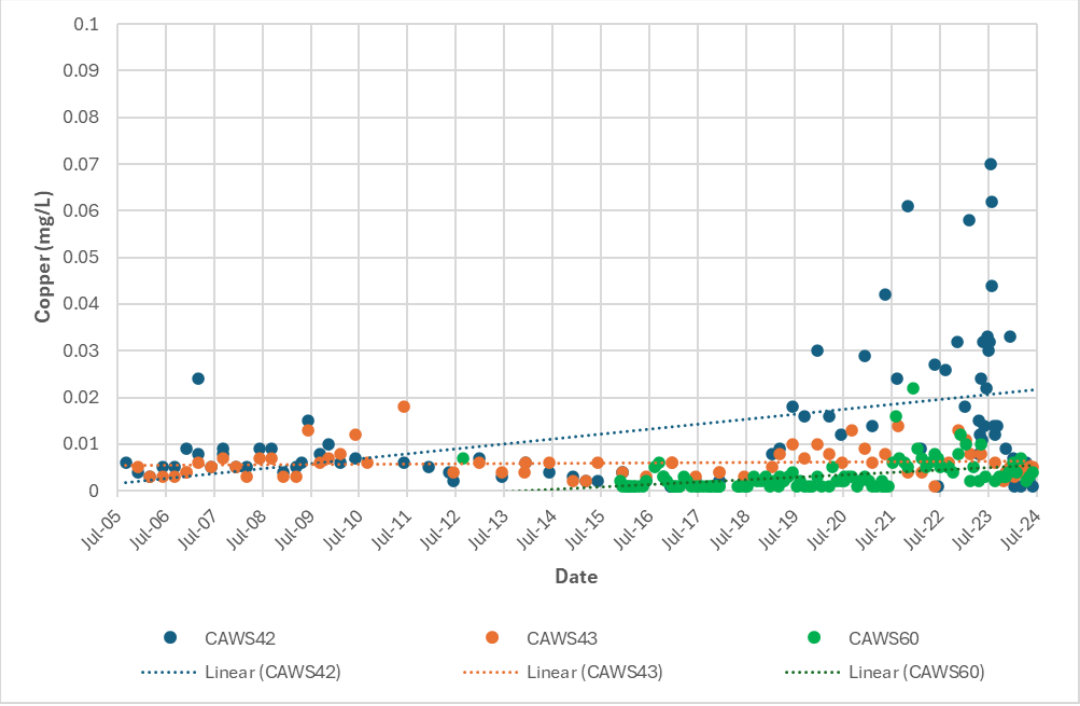


FIGURE 4.11: TSF EASTERN MANAGEMENT ZONE LONG-TERM COPPER

4.2.6 TSF Western Zone

The TSF western management zone includes 9 surface water monitoring locations, as follows:

- **CAWS61** and **CAWS62** – Water quality monitoring results at these monitoring locations are used to assess potential effects of mining, processing and waste rock emplacements. These monitoring locations are both on Cadiangullong Creek (i.e., the receiving environment).

- **CAWS64, CAWS67**, **CAWS68, CAWS69**, **CAWS72**, **CAWS75** and **CAWS76** – These surface water monitoring locations are used to monitor for potential for seepage impacts on the western side of the NTSF and STSF. These surface water monitoring locations are dams.

These monitoring locations are shown in Figure 4.12.

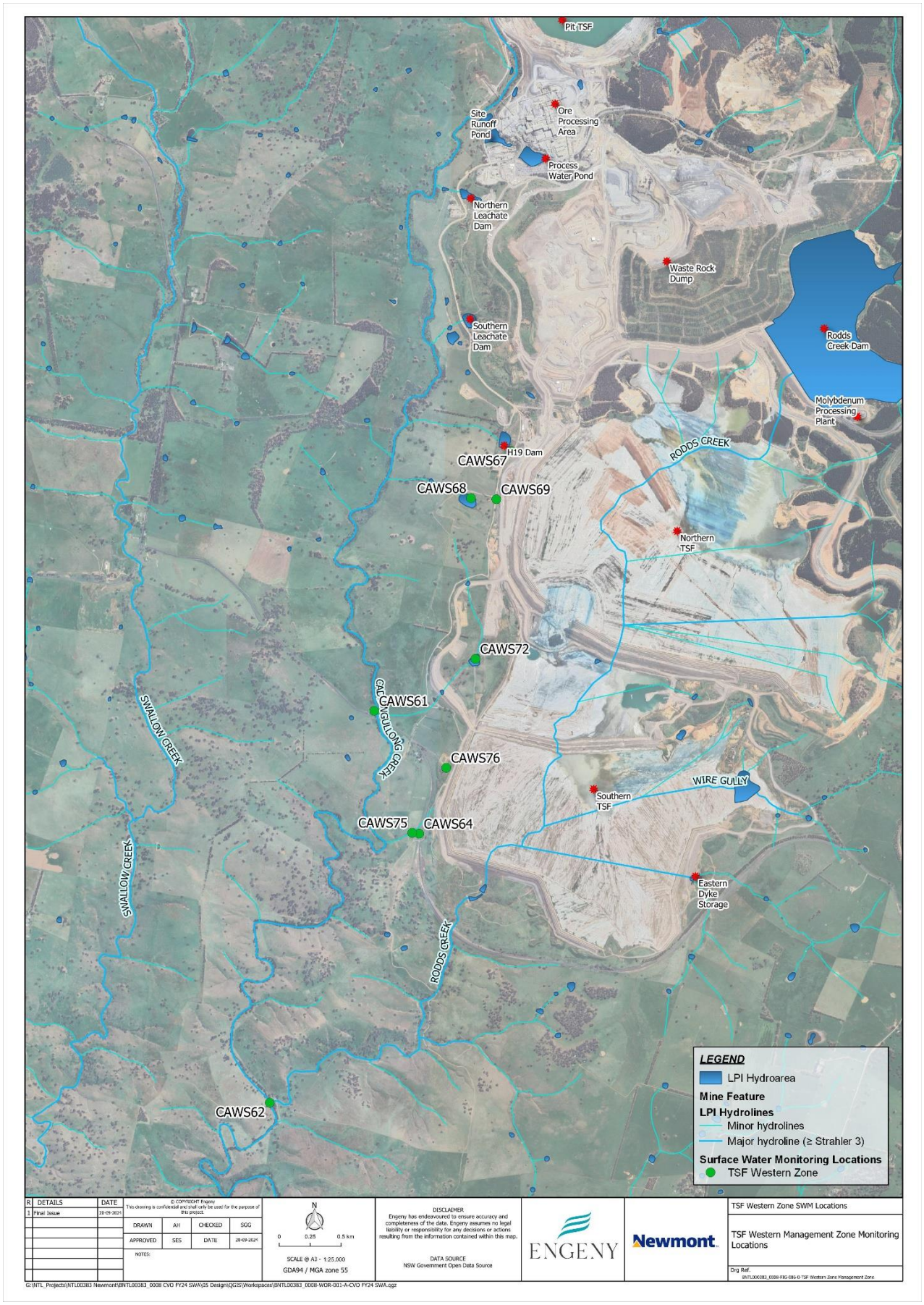


FIGURE 4.12: TSF WESTERN MANAGEMENT ZONE MONITORING LOCATIONS

4.2.6.1 Physiochemical Parameters

All results for pH, EC, TSS, TDS and alkalinity at all monitoring locations were within the historic range during FY24. Increasing EC and TDS trends were observed at CAWS67, CAWS68, CAWS69 and CAWS72. These trends appear to have begun at the start of 2022. These trends are further detailed in Section 4.2.6.5.

4.2.6.2 Nutrients

All values for nitrate, nitrite, total nitrogen and total phosphorus were within the historic range for all monitoring locations during FY24. Two higher nitrate values were observed at CAWS67 during the reporting period (1.59 mg/L on 21 February 2024 and 2.09 mg/L on 16 May 2024). The value observed at CAWS67 on 16 May 2024 was greater the 95th percentile of historic results for the site. Increased nitrate concentrations may be attributed to increased inflows from rainfall runoff. Rainfall events observed in the days and weeks prior to these higher results indicate that there could be some association between these inflows and the higher results.

4.2.6.3 Major Ions

All results for calcium, potassium, sodium and sulphate at all monitoring locations were within the historic range during FY24. Increasing calcium, magnesium and sulphate trends were observed at CAWS67, CAWS68, CAWS69 and CAWS72. These trends appear to have begun at the start of 2022. These trends are further detailed in Section 4.2.6.5.

All results for magnesium were within the historic range for the individual monitoring locations except for 1 value for magnesium at CAWS69 on 16 May 2024 (233 mg/L) which is the highest on record. All results for chloride were within the historic range for the individual locations with the exception of a value for chloride at CAWS68 on 23 August 2023 (228 mg/L) which is the highest observed in the historic monitoring period. Both of these results are considered part of the aforementioned trends (refer to Section 4.2.6.5).

4.2.6.4 Dissolved Metals

All results for antimony, cadmium, chromium, mercury and silver were below the limit of detection at all monitoring locations during FY24. All results for aluminium, arsenic, cobalt, manganese and nickel were low and within the historic range.

Multiple dissolved metals returned results that were the highest in the historic range during FY24. These dissolved metals include iron (at CAWS67 and CAWS68), molybdenum (at CAWS75), lead (CAWS67) and zinc (at CAWS64 and CAWS75).

4.2.6.5 Summary

Some surface water monitoring locations, particularly CAWS67, CAWS68, CAWS69 and CAWS72, displayed increasing trends during FY24 and higher results for several analytes. These analytes include EC, TDS, calcium, magnesium and sulphate (refer to Figure 4.13). These increases appear to be the continuation of a trend that began at the start of 2022. Dissimilarity between TSF decant water and the water quality at these monitoring locations indicate that increasing trends and higher results are not due to seepage related impacts. These monitoring locations are intended to capture rainfall runoff from disturbed areas on site that are quite dynamic and as a result, can cause changes to water quality due to variation in analytes captured by runoff volumes.

Multiple analytes returned results that were the highest in the historic range during FY24. These analytes include chloride (at CAWS68), nitrate (at CAWS67), iron (at CAWS67 and CAWS68), molybdenum (at CAWS75), lead (CAWS67) and zinc (at CAWS64 and CAWS75).

Changes in water quality appear to be confined to the dam monitoring locations (CAWS64, CAWS67, CAWS68 CAWS69, CAWS72, CAWS75 and CAWS76). Results for receiving environment monitoring locations (CAWS61 and CAWS62) in the management zone do not indicate an impact to the receiving environment from mining related activities or seepage.

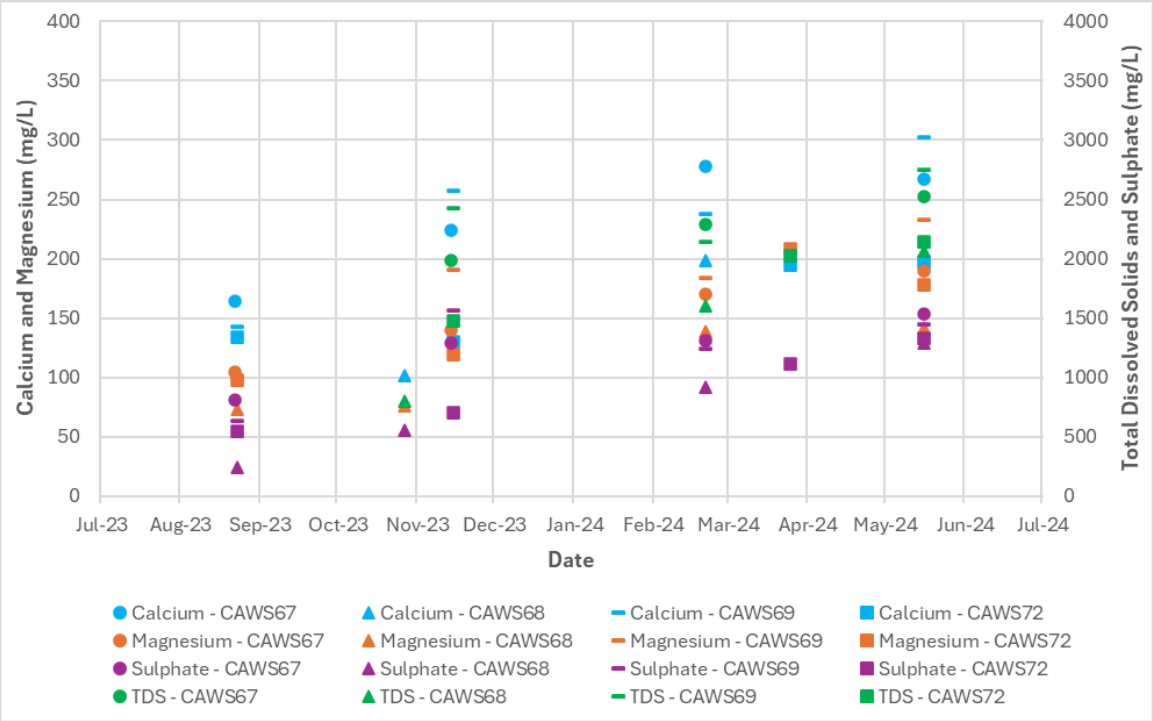


FIGURE 4.13: INCREASING TRENDS AT CAWS67, CAWS68, CAWS69 AND CAWS72 IN FY24

4.2.7 TSF Southern Zone

The TSF southern management zone includes 11 surface water monitoring locations, as follows:

- **412702** – This surface water monitoring location is used to assess potential effects of the entire Cadia Mine area. It is the most downstream monitoring location and is located immediately downstream of the confluence of Cadiangullong Creek and Rodds Creek. It should be noted that 412702 has associated SSGVs that are used to indicate water quality impacts from the Cadia mining areas. A full summary of these SGGVs is provided in Section 3.3. The FY24 performance against these SSGVs is detailed in Section 4.3 and Section A.7.4.
- **CAWS28**, **CAWS55**, **CAWS59**, **CAWS30**, **CAWS63** and **CAWS63a** – Surface water monitoring locations used to assess potential effects of the TSFs on surface water quality in Rodds Creek. These monitoring locations are on watercourses.
- **CAWS31**, **CAWS54**, **CAWS56** and **CAWS57 –** Surface water monitoring locations used to assess potential effects of the TSFs on surface water quality in Rodds Creek. These monitoring locations are surface water storages.

These monitoring locations are shown in Figure 4.14.

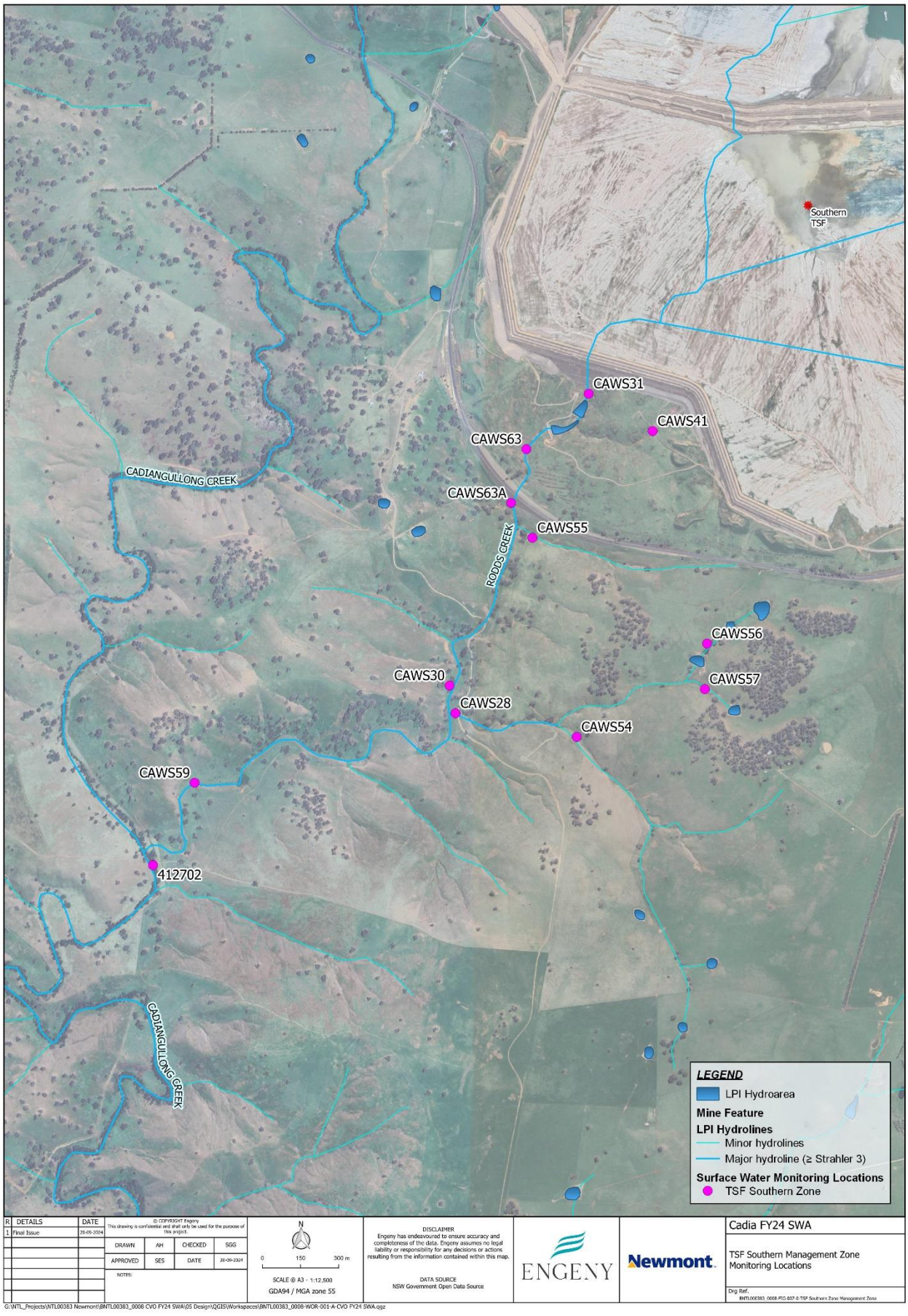


FIGURE 4.14: TSF SOUTHERN MANAGEMENT ZONE MONITORING LOCATIONS

4.2.7.1 Physiochemical Parameters

All results for pH, EC, TDS and alkalinity were within the historic range at all monitoring locations during FY24.

A higher value for TSS (the highest in the historic range for the site) was observed at CAWS54 on 15 February 2024. A higher value for TSS was also observed at CAWS57 on 15 November 2023. This higher value at CAWS57 was coincident with higher results for total phosphorus and total nitrogen on the same day which is expected due to higher TSS concentrations. None of these higher concentrations demonstrate an emerging trend. Values prior to and following the higher results were consistent with the historic range for the monitoring locations. These surface water monitoring locations are surface water storages (farm dams) for which the upstream reporting catchment is entirely agricultural. All other values for TSS were within the historic range during FY24.

There was 1 exceedance of the SSGV for TSS at monitoring location 412702 during FY24. This exceedance is detailed in Section 4.3.

4.2.7.2 Nutrients

All values for nitrate and nitrite were within the historic range at all monitoring locations during FY24. Higher values for total nitrogen and total phosphorus at CAWS54 and CAWS57 were observed during the reporting period (as discussed in Section 4.2.7.1. All other values for total nitrogen and total phosphorus were within the historic range.

4.2.7.3 Major Ions

Results for all major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24.

4.2.7.4 Dissolved Metals

All values for antimony, mercury and silver were below the limit of detection at all monitoring locations during FY24. Results were either below the limit of detection or within the historic range for all other dissolved metals at all monitoring locations except where explicitly noted below.

Molybdenum values at CAWS55 (0.01 mg/L) and CAWS56 (0.004 mg/L) during FY24 are the highest in historic range. These results are the highest observed at each of the monitoring location in the historic monitoring period. Values prior to and following these higher results were below the limit of detection indicating that the values are not part of a continuing or emerging trend. While slightly higher for the locations, these molybdenum values are considered relatively low and only slightly above the historic range for the monitoring locations. Continued monitoring at these locations at the frequency specified in the Cadia WMP (Newmont, 2023) is considered sufficient to monitor molybdenum concentrations without the need for additional investigations.

The CAWS31 surface water monitoring location is used to monitor water quality at seepage basin ST14. Higher dissolved metal concentrations for multiple analytes (aluminium, arsenic, cadmium, chromium, cobalt, lead and nickel) were observed at CAWS31 during the monitoring period. Although higher dissolved metals were detected, the higher values are confined to seepage basin ST14 and were not observed downstream. Water stored in seepage basin ST14 is managed via the reclaim water system.

There were 2 exceedances of the SSGV for aluminium at monitoring location 412702 during FY24. These exceedances are detailed in Section 4.3.

4.2.7.5 Summary

The majority of results for the TSF southern management zone for FY24 were consistent with historic monitoring results. All results for major ions were within the historic range.

Higher values for TSS, total phosphorus and total nitrogen were observed at CAWS54 and CAWS57. These higher concentrations are not part of emerging trends. Values prior to and following the higher results were consistent with the historic range for the monitoring locations. These surface water monitoring locations are surface water storages (farm dams) for which the upstream reporting catchment is entirely agricultural.

Results for most dissolved metals were below the limit of detection or within the historic range. Some higher values for molybdenum were observed at CAWS55 and CAWS56. The higher values were only slightly above the historic range and considered relatively low concentrations. The higher results do not appear to be part of a trend. Higher results were observed at CAWS31 for several dissolved metals. CAWS31 is located at seepage basin ST14. Water stored here is managed via the reclaim water system.

There were 3 exceedances of SSGVs values at surface water monitoring location 412702, 1 for TSS and 2 for aluminium. These exceedances are detailed in Section 4.3. All monitoring results at 412702 were within the historic range for the monitoring location and no emerging trends or outliers are evident for the FY24 period.

No long-term trends were observed in the TSF southern management zone. The results indicate no mining related impacts to the receiving environment.

4.2.8 Cadia Dewatering Facility

The CDF management zone includes 3 surface water monitoring locations, as follows:

- **CDW03** – This monitoring location is used to characterise water quality upstream of the CDF. CDW03 is located on the Belubula River upstream of the confluence of the Belubula River and the unnamed creek to the south of the CDF.
- **CDW04** – As per the Cadia Water Management Plan, CDW04 is intended to characterise water quality downstream of the CDF (Newcrest, 2023). It is noted however that this monitoring location is actually upstream of the CDF (upstream of the confluence of the Belubula River and the unnamed creek to the south of the CDF). CHPL is aware of this and have noted the relocation of this monitoring location in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.
- **CDW05 –** The CDW05 monitoring location is used to assess water quality immediately downstream of the CDF. It should be noted that CDW05 has associated SSGVs that are used to indicate water quality impacts from the CDF. A full summary of these SGGVs is provided in Section 3.3. The FY24 performance against these SSGVs is detailed in Section 4.3 and Section A.8.3.

These surface water monitoring locations are shown in Figure 4.15.

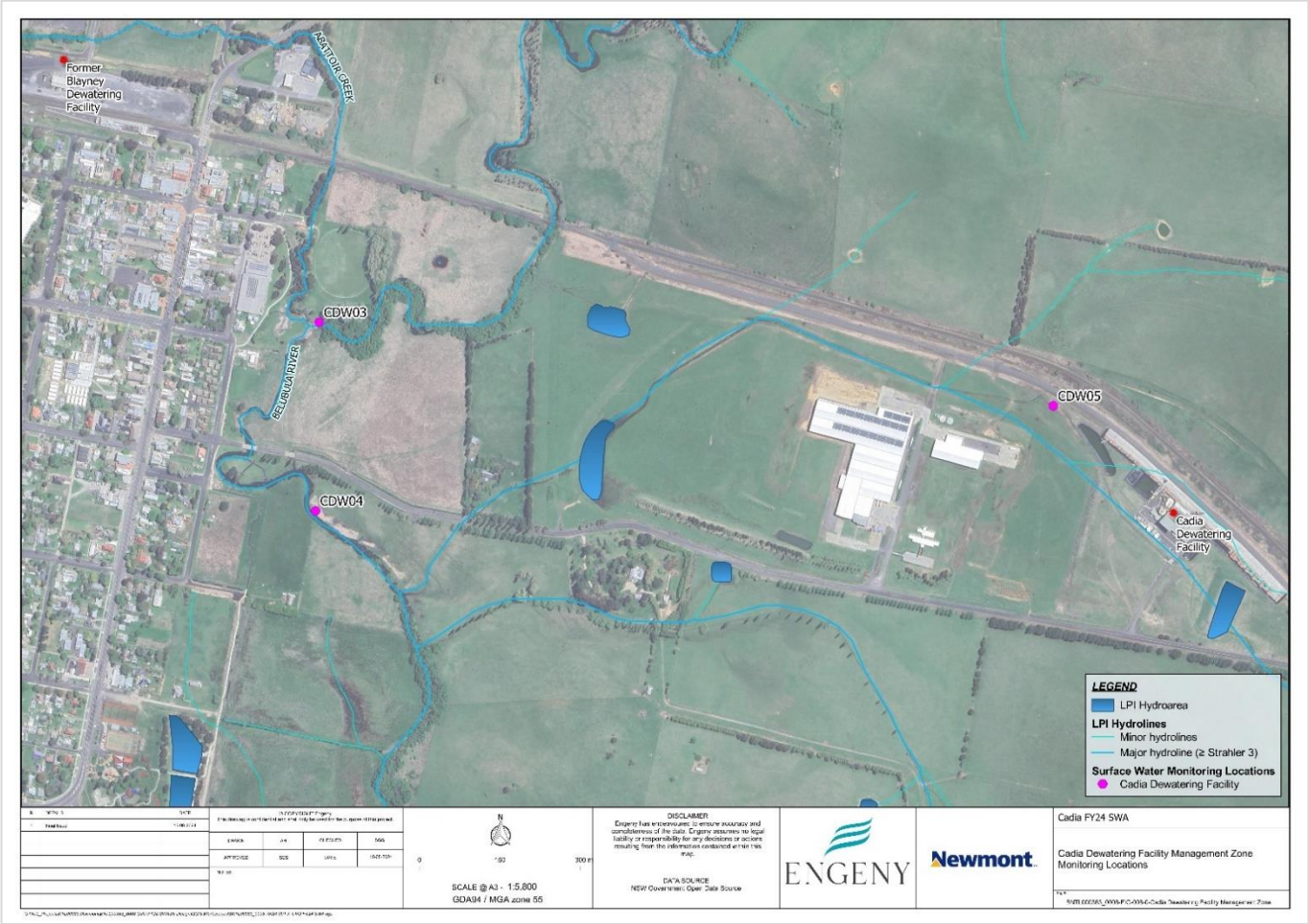


FIGURE 4.15: CADIA DEWATERING FACILITY MANAGEMENT ZONE MONITORING LOCATIONS

4.2.8.1 Physiochemical Parameters

All results for pH, EC, TSS, TDS and alkalinity were within the historic range during FY24 with no emerging trends or outliers observed.

4.2.8.2 Nutrients

All results for nitrate, nitrite, total nitrogen and total phosphorus for all monitoring locations were within the historic range during FY24.

4.2.8.3 Major Ions

Results for all major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24. While no outliers are evident, there is a slight increasing trend for sodium at all monitoring locations that commenced in early 2021. These trends appear to have somewhat stabilised during FY24 (refer to Figure 4.16).

4.2.8.4 Dissolved Metals

All values for antimony, chromium, cobalt, lead, mercury, silver and zinc were below the limit of detection at all monitoring locations during FY24. All results for aluminium, iron, manganese and nickel concentrations were low and consistent with the historic range for the sites. Results were either below the limit of detection or within the historic range for all other dissolved metals at all monitoring locations except where explicitly noted below.

Analyte concentrations were typically within the historic range for CDW03 and CDW04 with the exception of one higher value for cadmium at CDW03 (0.0007 mg/L) on 5 September 2023 and one higher value for arsenic at CDW04 on 9 February 2024 (0.04 mg/L). These are the highest values for these analytes in the historic range for the respective sites. For the dates on which these higher values were observed, concentrations of the analytes were below the limit of detection at CDW05 indicating that the higher results are not associated with the CDF.

Two results for molybdenum were above the limit of detection at CDW05 during the reporting period, one on 27 October 2023 (0.024 mg/L) and one on 9 February 2024 (0.011 mg/L) (refer to Figure 4.17). While these results are the highest on record for the location, they are below the SSGV for the location (0.034 mg/L) and do not demonstrate an emerging trend. All other results for molybdenum were within the historic range and the majority were below the limit of detection.

Results for copper at CDW05 during the first 6 months of FY24 exhibited a continuing upward trend from the FY23 reporting period. In the latter half of the FY24 reporting period, copper concentrations at CDW05 reduced slightly. There was 1 exceedance of the copper SSGV (0.0006 mg/L) at CDW05 on 27 October 2023. This was the only SSGV exceedance at this monitoring location. This potential cause and impact of this higher copper value are detailed in Section 4.3. There is a long-term increasing trend for copper at CDW05, immediately downstream of the CDF. This long-term increasing trend is not evident at locations upstream of the CDF (CDW03 and CDW04) (refer to Figure 4.18). It should be noted that these values for copper are below the ANZECC (2000) livestock and irrigation guideline values for copper (0.009 mg/L and 0.006 mg/L respectively).

4.2.8.5 Summary

The majority of results for monitoring locations in the CDF management zone were within the historic range during FY24. All results for physiochemical parameters, nutrients and major ions were within the historic range with no outliers observed. A slight increasing trend for sodium at all monitoring locations that commenced in early 2021 is evident. These trends appear to have somewhat stabilised during FY24 (refer to Figure 4.16).

The majority of dissolved metal concentrations were within the historic monitoring range for the monitoring locations in the CDF management zone. Several dissolved metals returned results that were consistently below the limit of detection. Higher molybdenum and copper values were observed at CDW05 during FY24. The higher molybdenum values do not appear to be part of a trend.

There was 1 exceedance of the SSGV for copper at CDW05 during FY24. Copper at the location exhibits a long-term increasing trend. It is recommended that the monitoring frequency at CDW05 be increased to monthly (currently quarterly) to monitor these values.

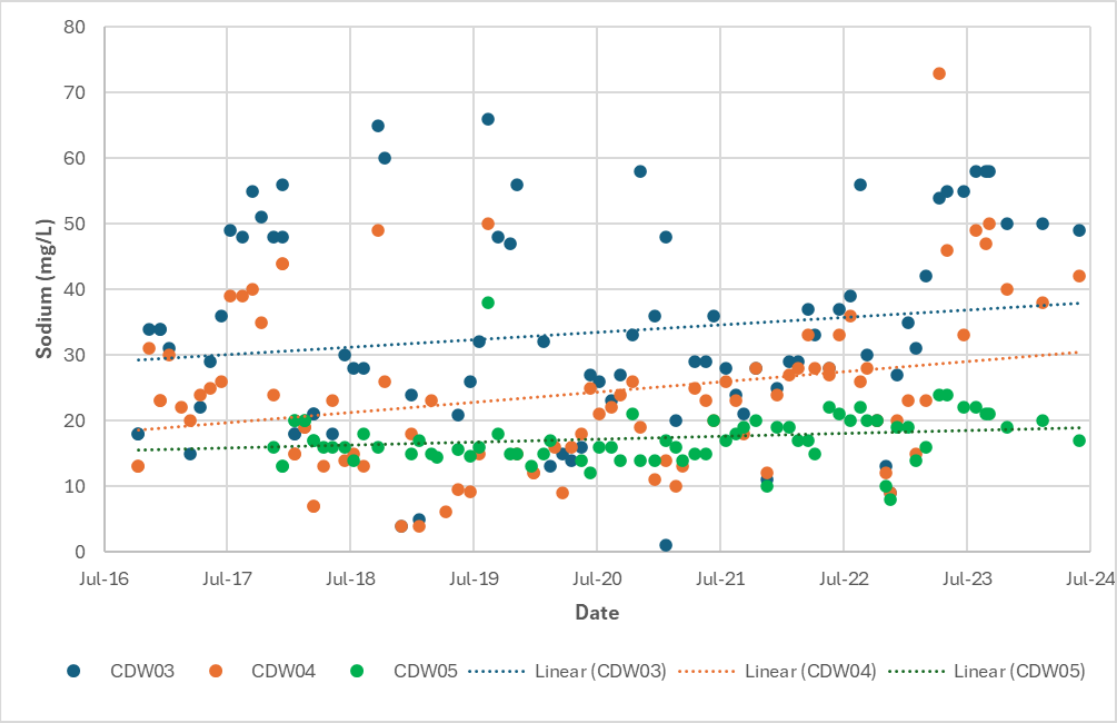


FIGURE 4.16: CDF MANAGEMENT ZONE LONG-TERM SODIUM

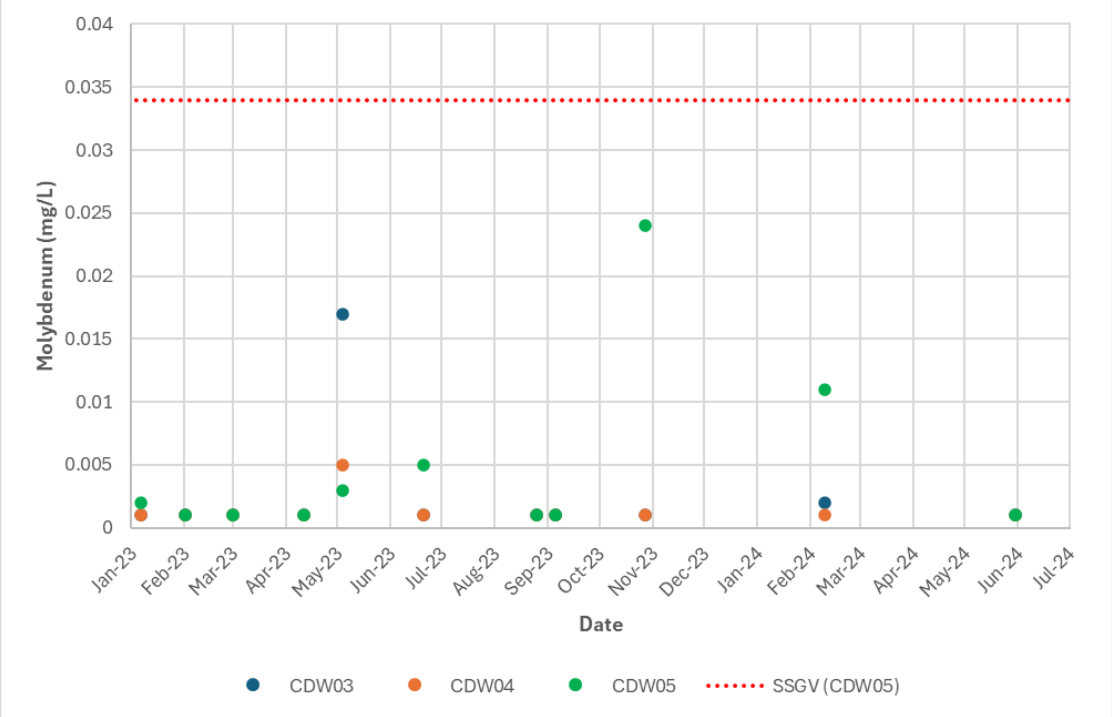


FIGURE 4.17: CDF MANAGEMENT ZONE FY24 MOLYBDENUM

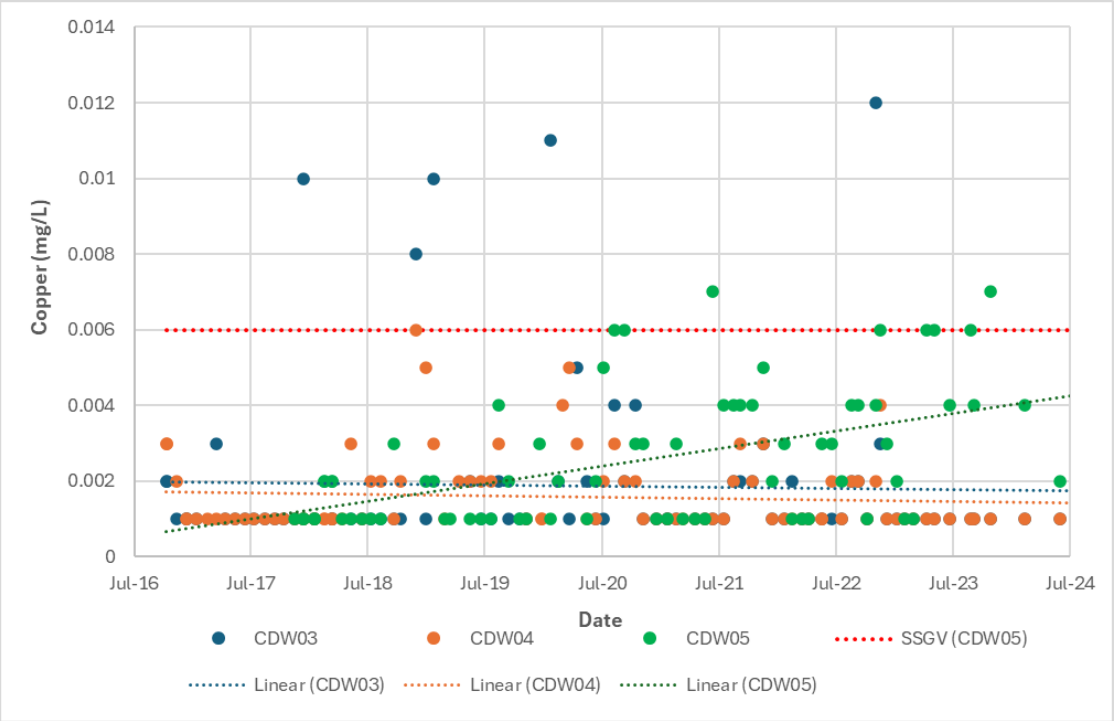


FIGURE 4.18: CDF MANAGEMENT ZONE LONG-TERM COPPER

4.2.9 Former Blayney Dewatering Facility

The former BDF management zone includes 2 surface water monitoring locations, as follows:

- **NEC061** – This surface water monitoring location is used to characterise water quality upstream of the Former BDF.
- **NEC062** – This surface water monitoring location is used to characterise water quality downstream of the Former Blayney Dewatering Facility.

These surface water monitoring locations are shown in Figure 4.19.

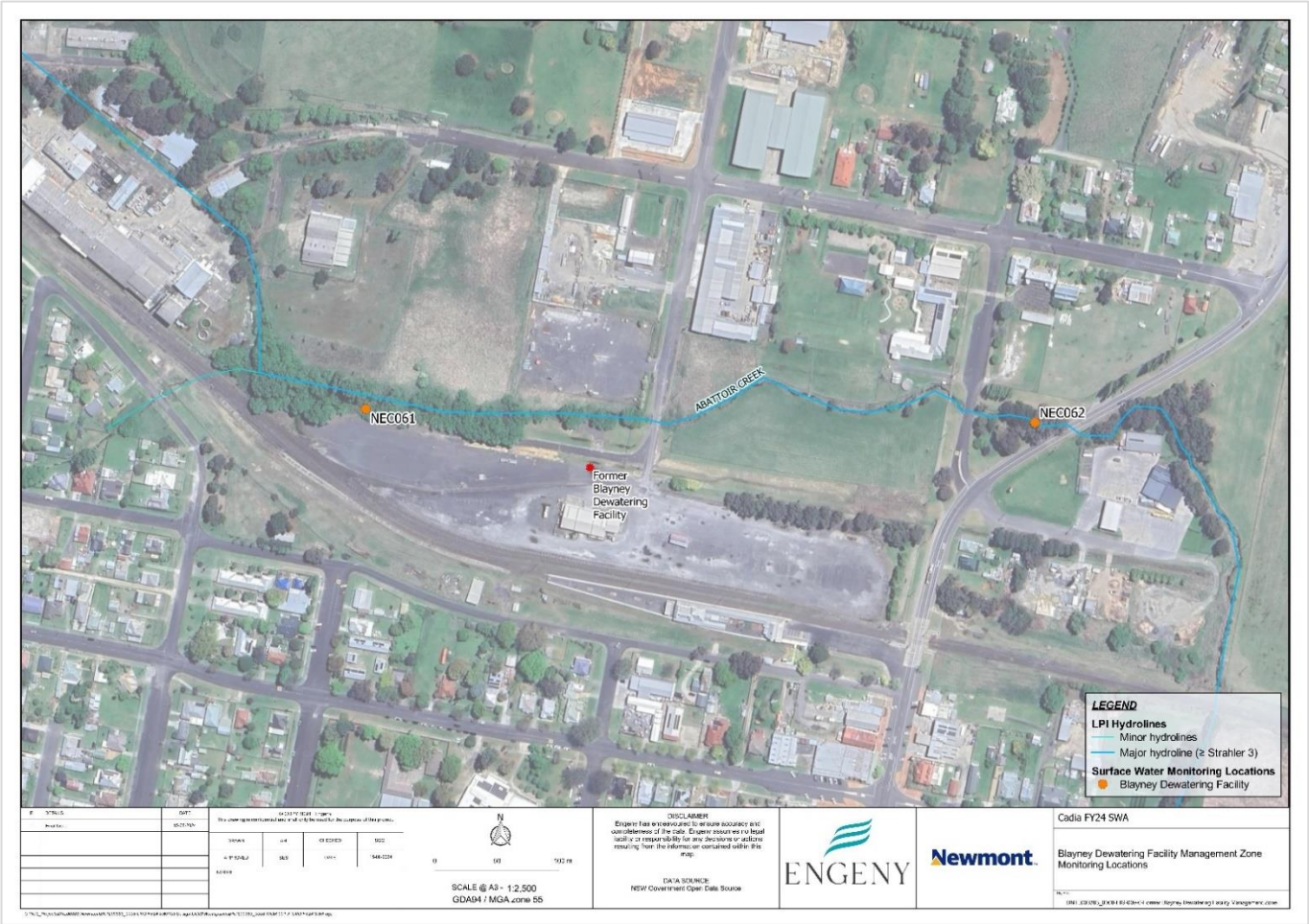


FIGURE 4.19: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE MONITORING LOCATIONS

4.2.9.1 Physiochemical Parameters

All results for pH, EC, TDS and alkalinity during FY24 for monitoring locations in the Former BDF management zone were consistent with historic monitoring results.

Around half the results for TSS at both NEC061 and NEC062 were below the limit of detection (<5 mg/L). While there was one higher result at NEC061 recorded on 5 December 2023 (40 mg/L), this result is still within the historic range. Results before and after this higher reading were more in line with the historic average. A result recorded at NEC062 on 5 September 2024 is the highest in the historic monitoring period (35 mg/L). The next highest result (26 mg/L) was recorded in July 2021. Results prior to and following the higher result are within the historic range for the site. This appears to be an isolated event that could be due to sampling technique.

4.2.9.2 Nutrients

All results for nitrate, nitrite, total nitrogen and total phosphorus for all monitoring locations were within the historic range during FY24.

4.2.9.3 Major Ions

Results for all major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24. While there were some higher values for sodium and magnesium, these values were within the historic range for the monitoring locations and are not part of any emerging or ongoing trends.

4.2.9.4 Dissolved Metals

All results for cadmium, chromium, cobalt, lead, mercury and silver during FY24 were below the limit of detection. All results for aluminium, antimony, arsenic, iron, manganese, nickel and zinc were clow and consistent with historic monitoring results. One higher result for copper at NEC061 (0.009 mg/L) was observed on 3 June 2024 (refer to Figure 4.20). This monitoring location is upstream of the former BDF. The downstream site, NEC062, recorded a result below the limit of detection (<0.001 mg/L) on the same day, indicating that the higher copper concentration at NEC061 could be caused by a point source or a source upstream of NEC061.

4.2.9.5 Summary

The majority of results for all analytes were within the historic range for surface water monitoring locations in the Former BDF management zone during FY24. While there were some higher values for sodium and magnesium, these values were within the historic range for the monitoring locations and are not part of any emerging or ongoing trends.

The majority of dissolved metal concentrations were within the historic monitoring range for the monitoring locations in the Former BDF management zone. Several dissolved metals returned results that were consistently below the limit of detection. One higher result for copper at NEC061 (0.009 mg/L) was observed on 3 June 2024 (refer to Figure 4.20). This monitoring location is upstream of the Former BDF. The downstream site, NEC062, recorded a result below the limit of detection (<0.001 mg/L) on the same day, indicating that the higher copper concentration at NEC061 could be caused by a point source or a source upstream of NEC061.

The results indicate no mining related impacts to the receiving environment.

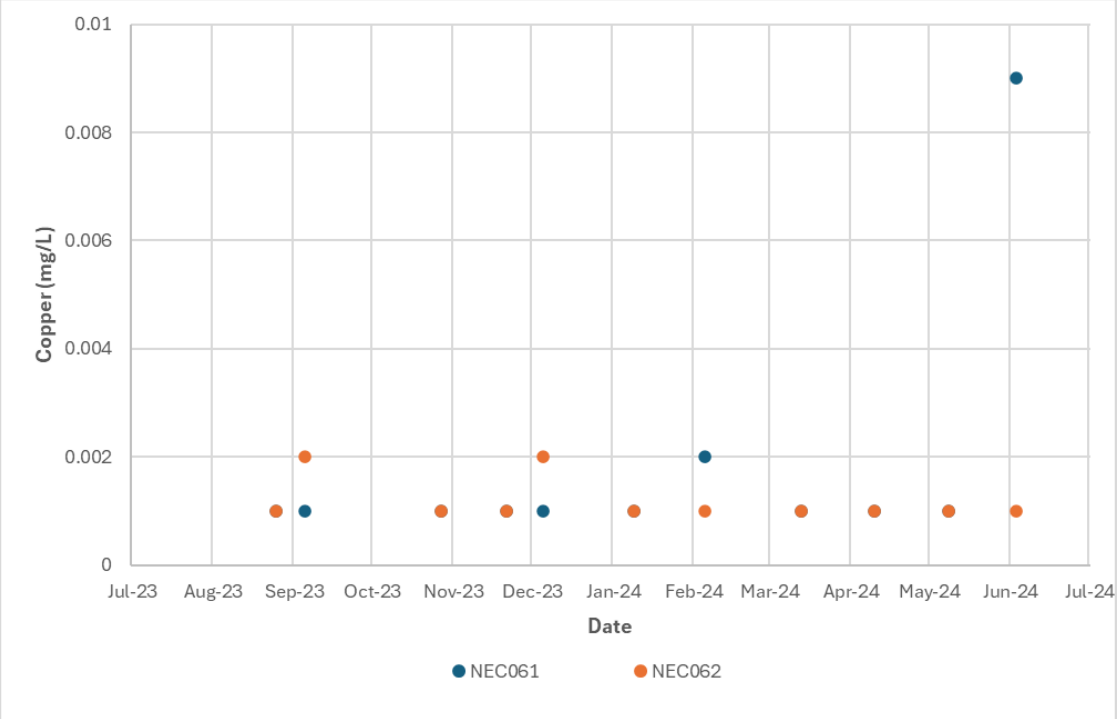


FIGURE 4.20: FORMER BDF MANAGEMENT ZONE FY24 COPPER

4.2.10 Receiving Environment

The receiving environment management zone includes 7 surface water monitoring locations, as follows:

- **412166** – This monitoring location is used to monitor surface water quality in Diggers Creek
- **412167** – This monitoring location is used to monitor surface water quality in Swallow Creek
- **CAWS44** – This monitoring location is intended to be used as an upstream reference site on Flyers Creek. The monitoring location is upstream of areas disturbed by mining activities.
- **CAWS10** – This monitoring location is used to monitor surface water quality in Flyers Creek downstream of the Cadia Mine and identify any potential mining related impacts

- **BRPS** – This monitoring location is intended to be used as an upstream reference site on the Belubula River. The monitoring location is upstream of the confluence of Cadiangullong Creek and the Belubula River.
- **CAWS70** - This monitoring location is used to monitor water quality in Cadiangullong Creek immediately prior to the confluence of Cadiangullong Creek and the Belubula River. In addition to being used to monitor water quality in Cadiangullong Creek, this location is intended to be used as a reference site upstream of CAWS71 for comparison purposes.
- **CAWS71** – This monitoring location is used to monitor water quality in the Belubula River downstream of the confluence of Cadiangullong Creek and the Belubula River. Water quality at this location is used to identify any potential mining related impacts.

These surface water monitoring locations are shown in Figure 4.21.

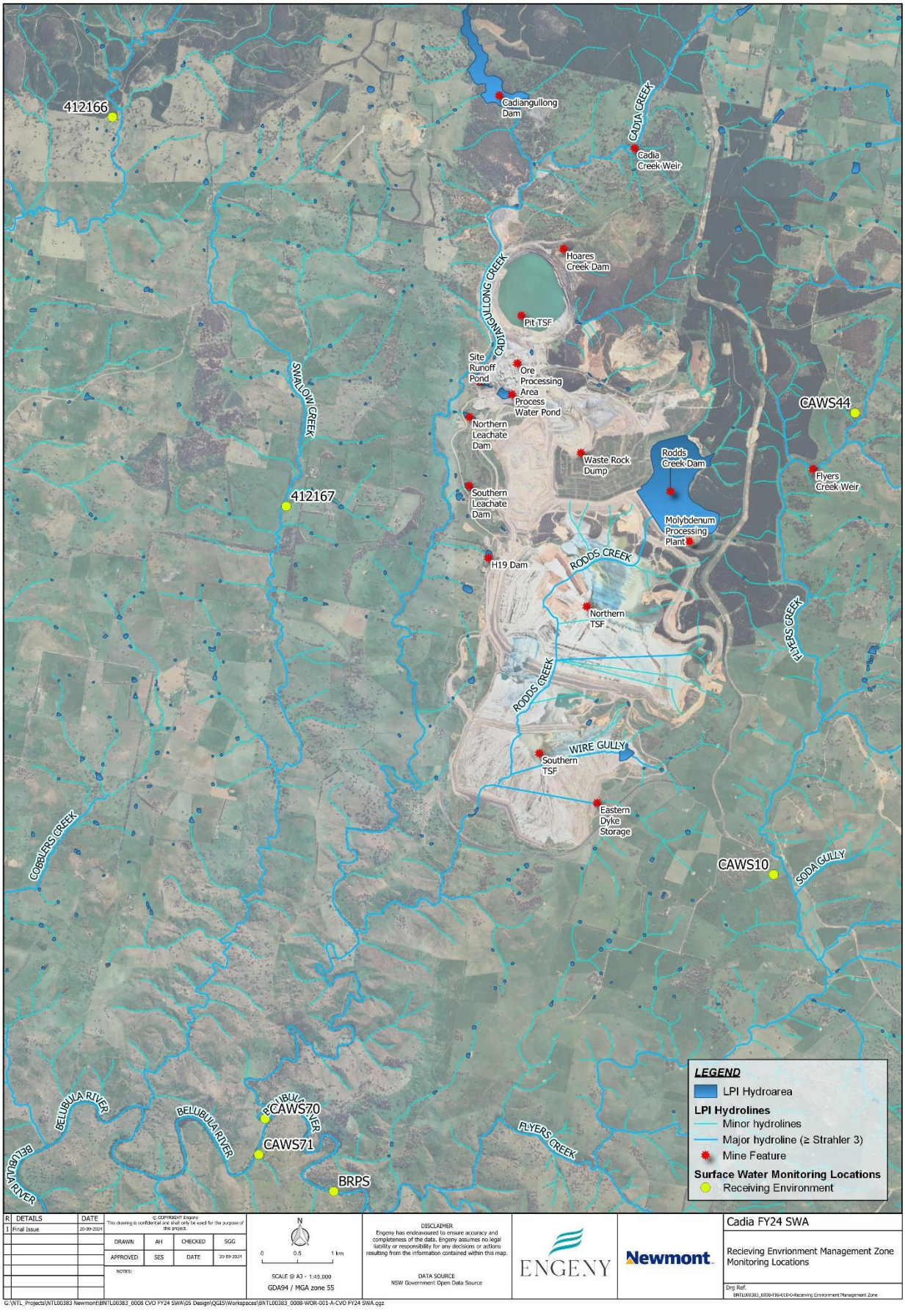


FIGURE 4.21: RECEIVING ENVIRONMENT MANAGEMENT ZONE MONITORING LOCATIONS

4.2.10.1 Physiochemical Parameters

All results for pH, EC and alkalinity were within the historic range during FY24 with no emerging trends or outliers observed. A higher result for TDS was observed at BRPS and a higher TSS result was observed at CAWS44. The higher results are the highest on record for the locations. Both locations are upstream of the Cadia Mine and it is considered that the higher results were not associated with mining related activities. All other results for TSS and TDS were within the historic range. No emerging trends were observed.

4.2.10.2 Nutrients

All results for nitrate, nitrite, and total phosphorus for all monitoring locations were within the historic range during FY24. Values for total nitrogen were consistently low and within the historical range for monitoring locations in the management zone with the exception of one higher total nitrogen value at CAWS71. This higher result is not reflected at CAWS70 (between CAWS71 and the Cadia Mine), thus, it is considered that this higher result was not caused by mining related impacts.

4.2.10.3 Major Ions

The majority of results for major ions analysed (calcium, chloride, magnesium, potassium, sodium and sulphate) were consistent with historic monitoring results during FY24. Some slight increasing trends were observed for chloride (at 412167 and CAWS10), magnesium (at 412167, CAWS10 and CAWS44) and sodium (412167). Increased concentrations of these analytes during FY24 could be the result of increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations). Increased runoff was observed during FY24 as a result of above average rainfall throughout the year. Higher values for chloride, magnesium, sodium and sulphate were observed at BRPS, however, this location is upstream of the Cadia Mine and it is considered that these higher results were not caused by mining related activities.

4.2.10.4 Dissolved Metals

All results at all monitoring locations were below the limit of detection for antimony, cadmium, lead, mercury and silver. All results for aluminium, cobalt, iron, manganese and zinc were consistent with historic monitoring data for all monitoring locations. Results were either below the limit of detection or within the historic range for all other dissolved metals at all monitoring locations except where explicitly noted below.

One set of results for 3 dissolved metals (arsenic, chromium and copper) at BRPS were the highest on record for the site. This location is upstream of the Cadia Mine and it is considered that these higher results were not caused by mining related activities. One result for arsenic at CAWS71 and one result for molybdenum at CAWS71 were the highest on record for the site. A coinciding higher result for arsenic was not observed at CAWS70 (between CAWS71 and the Cadia Mine), thus, it is considered that the higher result was not caused by mining related impacts. Molybdenum was not monitored at CAWS70 on the same day as the high results was returned at CAWS71, however, results at monitoring location 412702 (between CAWS71 and the Cadia Mine) returned a result below the limit of detection on the day prior indicating that the higher result was not caused by mining related impacts.

4.2.10.5 Summary

The water quality in the receiving environment management zone appears unaffected by mining related activities as the majority of results were within the historic range during FY24. Some slight increasing trends were observed for chloride (at 412167 and CAWS10), magnesium (at 412167, CAWS10 and CAWS44) and sodium (412167). It should be noted that all results for these analytes were within the historic range and there were no outliers. Increased concentrations of these analytes during FY24 could be the result of increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations).

Results for several analytes (chloride, magnesium, sodium, sulphate, arsenic, chromium and copper) at BRPS (upstream of the Cadia Mine on the Belubula River) were the highest on record during the reporting period. This location is upstream of the Cadia Mine and it is considered that these higher results were not caused by mining related activities.

The results indicate no mining related impacts to the receiving environment.

4.3 FY24 Performance Against SSGVs

Surface water monitoring locations 412702 and CDW05 have been assessed against SSGVs for the sites to determine whether there were any exceedances during the FY24 reporting period. Monitoring location 412702 is downstream of the Cadia Mine and monitoring location CDW05 is located downstream of the CDF. Exceedances of the SSGVs at these locations are intended to act as an early warning system that prompts further internal investigation of the cause and potential impact of the exceedance. A summary of exceedances for each of the monitoring locations are provided in Table 4.1. Key outcomes can be summarised as follows:

- Of the 12 analytes for which there are SSGVs for 412702, there were exceedances for aluminium and TSS.
- There were 3 exceedances at 412702 in total during FY24, 1 for TSS and 2 for aluminium.
- Of the 11 analytes for which there are SSGVs for CDW05, there was an exceedance of 1 analyte (copper).

The exceedances for TSS at 412702 and copper at CDW05 are described in detail in Section 5. This section is inclusive of a detailed review of internal exceedance investigations undertaken by CHPL during FY24 and provides commentary on the potential cause of the exceedance, the potential impact, and whether the exceedance is related to a long-term trend. Recommendations regarding whether further investigations of the exceedances are required are also provided.

No internal exceedance investigations for the aluminium exceedances at 412702 were undertaken by CHPL. Detailed analyses of these exceedances are provided in Section A.7.4 and can be summarised as follows:

- The exceedances occurred on 13 September 2023 (0.15 mg/L) and 4 December 2023 (0.12 mg/L).
- Similar results for aluminium were observed at several monitoring locations upstream of 412702 on Cadiangullong Creek (including sites CAWS0 and 412144 in the Upper Cadiangullong Creek management zone that are upstream of the mine) on both of these dates.
- All values for aluminium (except the exceedances at 412702) were below the limit of detection (<0.01 mg/L) for upstream sites in the TSF southern management zone on the days on which the exceedances occurred.
- Rainfall occurrence in the days prior to the September 2023 exceedance of approximately 28 mm over 8 to 9 September 2023 is likely to have caused increase flows at the 412702 monitoring location. The consistency of the higher values throughout the various management zones along Cadiangullong Creek at the time indicate that increased aluminium could be caused by influences upstream of the mine site.
- Similarly, there were also rainfall events in the weeks prior to the 4 December 2023 exceedance where 105.4 mm of rainfall fell between 21 November 2023 and 3 December 2023. The consistency of the higher values throughout the various management zones along Cadiangullong Creek at this time warrant the same conclusion; increased aluminium could be caused by influences upstream of the mine site.

No further investigation of these exceedances is recommended.

TABLE 4.1: REVIEW OF FY24 SSGV EXCEEDANCES

Parameter	Unit	Monitoring Location 412702		Monitoring Location CDW05	
		SSGV	Were there exceedances of the SSGV in FY24?	SSGV	Were there exceedances of the SSGV in FY24?
Physiochemical					
pH	pH	6.5 – 8.5	No	6.5 – 8.5	No
EC	µS/cm	1,535	No	640	No
TSS	mg/L	50	Yes	N/A – there is no SSGV for TSS at CDW05	N/A
Dissolved Metals					
Aluminium	mg/L	0.055	Yes	0.055	No
Arsenic	mg/L	0.013	No	0.013	No
Cadmium	mg/L	0.0002	No	0.0002	No
Copper	mg/L	0.009	No	0.006	Yes
Iron	mg/L	0.8	No	0.2	No
Lead	mg/L	0.0034	No	0.0034	No
Manganese	mg/L	1.9	No	1.9	No

Parameter	Unit	Monitoring Location 412702		Monitoring Location CDW05	
		SSGV	Were there exceedances of the SSGV in FY24?	SSGV	Were there exceedances of the SSGV in FY24?
Molybdenum	mg/L	0.034	No	0.034	No
Zinc	mg/L	0.08	No	0.05	No

4.4 FY24 Performance Against ANZECC (2000) Livestock and Irrigation Guideline Values

CHPL has requested that the downstream Cadiangullong Creek monitoring locations (412702 and CAWS70), monitoring locations for Flyers Creek (CAWS10 and CAWS44) and monitoring locations on the Belubula River (BRPS and CAWS71) be reviewed against ANZECC (2000) livestock drinking water guidelines and ANZECC (2000) irrigation and general use guidelines. These guidelines were selected as the land in the vicinity of Cadia is primarily used for agricultural purposes.

A comparison of water quality results from 412702, CAWS70, CAWS10, CAWS44, BRPS and CAWS71 to the ANZECC guideline values is provided in Table 4.2. Detailed comparisons are provided in Sections A.7.5 and A.10.3. Key outcomes can be summarised as follows:

- Two values for iron and 2 values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location 412702.
- Three values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value at monitoring location CAWS70.
- One value for iron and 3 values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS10.
- One value for iron and 1 value for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS44.
- One value for iron and 1 value for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location BRPS.
- One value for iron, 4 values for total phosphorus and 1 value for molybdenum were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline values at monitoring location CAWS71.

The aforementioned results are shown in Figure 4.22, Figure 4.23 and Figure 4.24. The majority of the results were within the historic range for the sites with the exception of total phosphorus at BRPS and molybdenum at CAWS71. The higher results are not considered the be associated with emerging trends. All values are below the ANZECC (2000) short-term (20 years) guideline values for iron (10 mg/L), total phosphorus (0.8 – 12 mg/L) and molybdenum (0.05 mg/L).

TABLE 4.2: REVIEW OF FY24 PERFORMANCE AGAINST ANZECC (2000) LIVESTOCK AND IRRIGATION GUIDELINE VALUES

Parameter	Unit	ANZECC Livestock Drinking Water Guideline Values	ANZECC Irrigation and General Water Use Short-Term (up to 20 years) Guideline Values	ANZECC Irrigation and General Water Use Long-Term (>100 years) Guideline Values	Any Results Greater Than the ANZECC Guideline Values Observed?		
					Flyers Creek (CAWS10 and CAWS44)	Cadiangullong Creek (412702 and CAWS70)	Belubula River (CAWS71 and BRPS)
Physiochemical Parameters, Major Ions and Nutrients							
TDS	mg/L	Beef cattle 0 – 4000 Dairy cattle 0 – 2500 Sheep 0 – 5000 Horses 0 – 4000 Pigs 0 – 4000 Poultry 0 – 4000	-	-	No	No	No
Sulphate	mg/L	1000	-	-	No	No	No
Calcium	mg/L	1000	-	-	No	No	No
Nitrate	mg/L	1500	-	-	No	No	No
Nitrite	mg/L	30	-	-	No	No	No
Total Nitrogen	mg/L	-	25 - 125	5	No	No	No
Total Phosphorus	mg/L	-	0.8 - 12	0.05	Yes	Yes	Yes
Dissolved Metals							
Aluminium	mg/L	5	20	5	No	No	No
Arsenic	mg/L	0.5 up to 5	2.0	0.1	No	No	No
Cadmium	mg/L	0.01	0.05	0.01	No	No	No
Chromium	mg/L	1	1	0.1	No	No	No
Cobalt	mg/L	1	0.1	0.05	No	No	No
Copper	mg/L	0.4 (sheep) 1 (cattle) 5 (pigs) 5 (poultry)	0.5	0.2	No	No	No

Parameter	Unit	ANZECC Livestock Drinking Water Guideline Values	ANZECC Irrigation and General Water Use Short-Term (up to 20 years) Guideline Values	ANZECC Irrigation and General Water Use Long-Term (>100 years) Guideline Values	Any Results Greater Than the ANZECC Guideline Values Observed?		
					Flyers Creek (CAWS10 and CAWS44)	Cadiangullong Creek (412702 and CAWS70)	Belubula River (CAWS71 and BRPS)
Iron	mg/L	Not sufficiently toxic	10	0.2	Yes	Yes	Yes
Lead	mg/L	0.1	5	2	No	No	No
Mercury	mg/L	0.002	0.002	0.002	No	No	No
Manganese	mg/L	Not sufficiently toxic	10	0.2	No	No	No
Molybdenum	mg/L	0.15	0.05	0.01	No	No	Yes
Nickel	mg/L	1	2	0.2	No	No	No
Zinc	mg/L	20	5	2	No	No	No

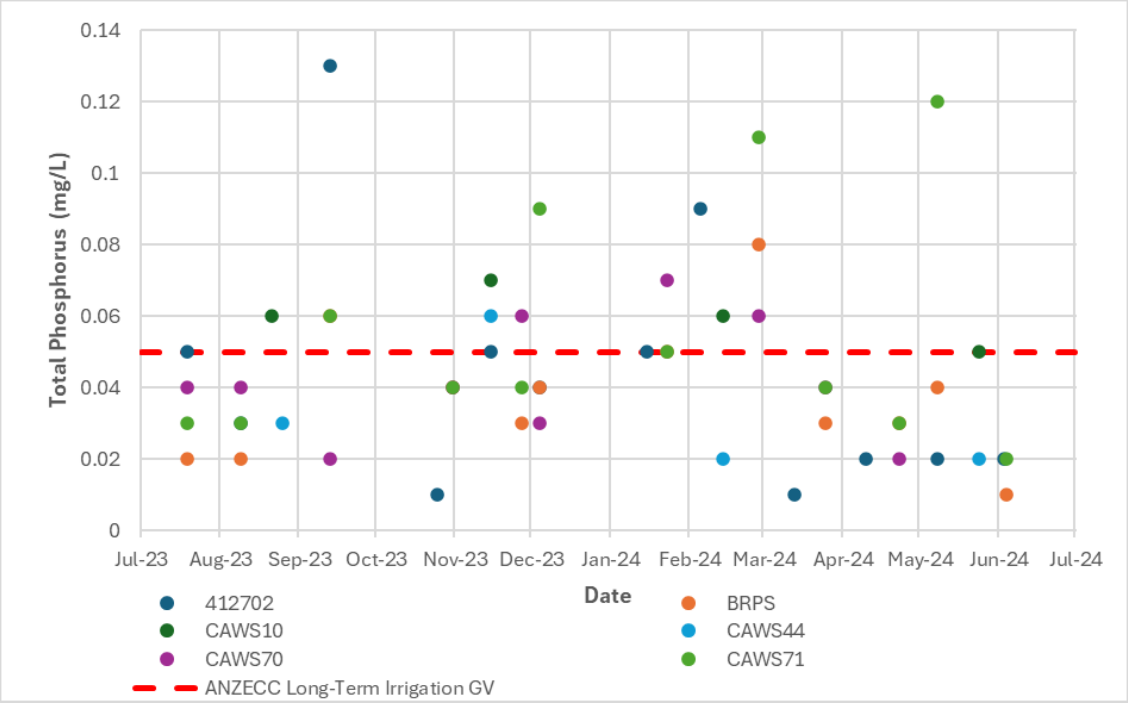


FIGURE 4.22: FY24 TOTAL PHOSPHORUS RESULTS VS ANZECC GUIDELINE VALUES

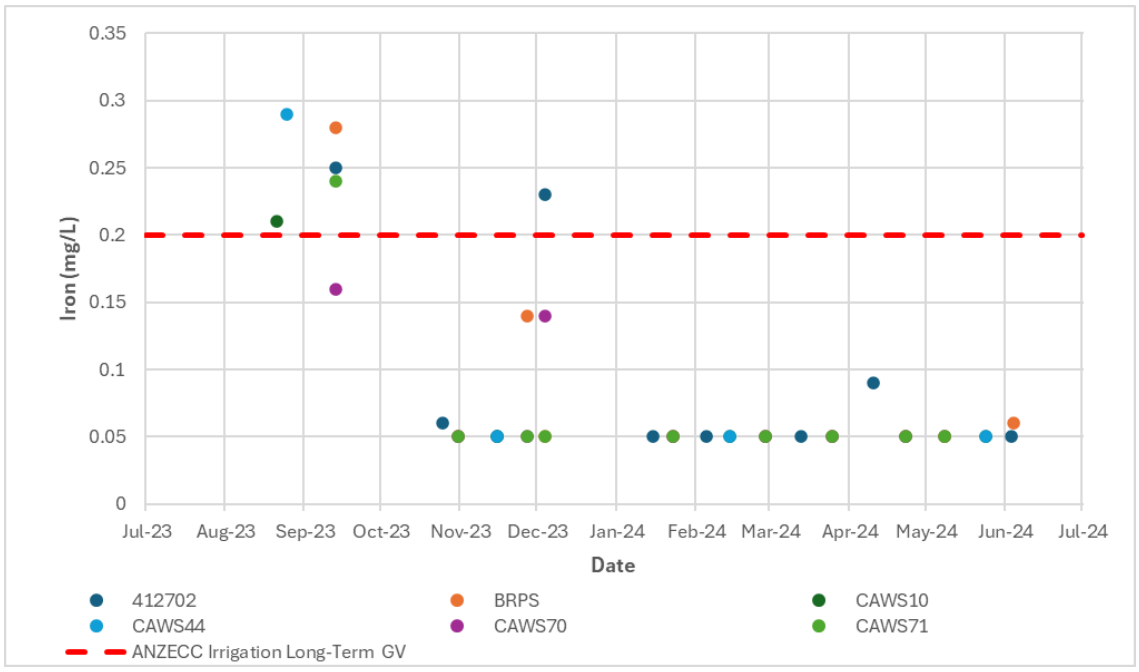


FIGURE 4.23: FY24 IRON RESULTS VS ANZECC GUIDELINE VALUES

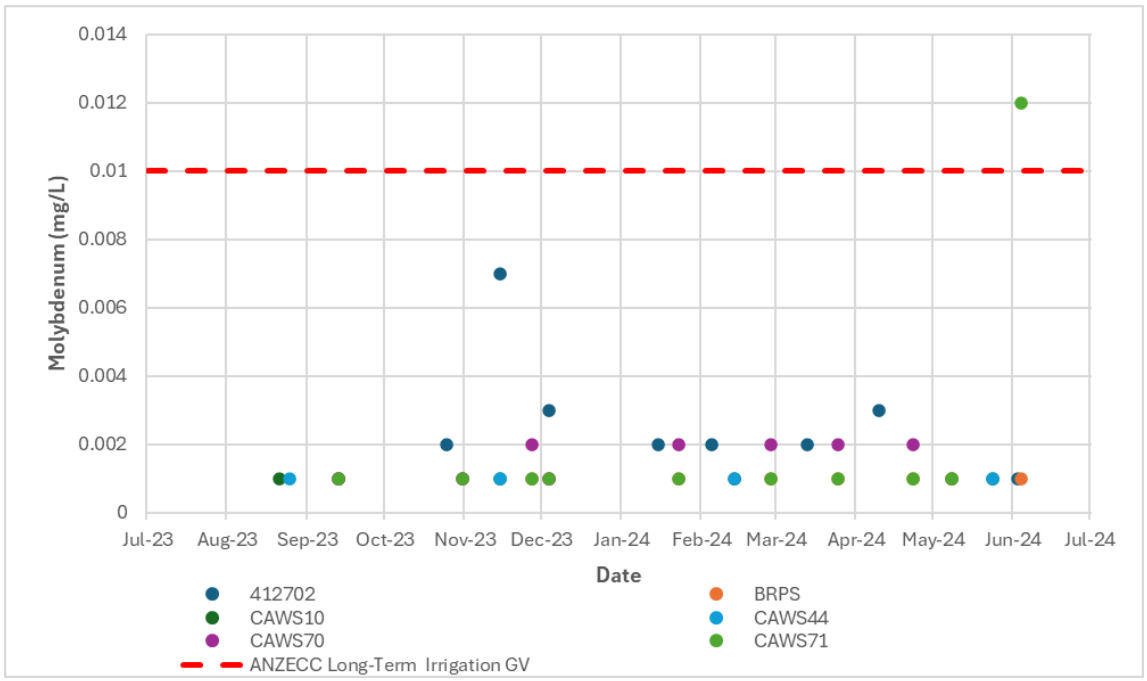


FIGURE 4.24: FY24 MOLYBDENUM RESULTS VS ANZECC GUIDELINE VALUES

5. REVIEW OF INTERNAL WATER QUALITY EXCEEDANCE INVESTIGATIONS

CHPL undertakes internal investigations of surface water quality results that exceed the SSGVs at relevant water quality monitoring locations (i.e., 412702 and CDW05). These investigations are undertaken in accordance with the Surface Water Quality Trigger Action Response Plan (TARP) that is documented in Table 26 of the Cadia WMP (Newcrest, 2023). The investigations are intended to determine whether the exceedance was cause by a mining related impact and whether further actions or investigations are required. The Surface Water Quality TARP stipulates that when an exceedance occurs, CHPL is required to:

- Validate the data collected (quality control/quality assurance).
- Assess the results in relation to climatic conditions or other external factors.
- Identify if the assessment criteria were exceeded during the baseline monitoring period.
- Compare results to reference site values to assess if effects are catchment wide (i.e. unrelated to mining activities).

As a part of this assessment, Engeny was requested to complete a review of internal water quality exceedance investigations that were completed during the reporting period. This review is to include:

- Commentary relating to potential cause of the exceedances.
- The potential impact of the exceedance.
- Assessment of whether the exceedance is related to long-term trends.
- Recommended actions for each exceedance for the reporting period will be required based on the outcome of the review (i.e., no further investigation required, continue to monitor, or escalate to an independent assessment).

During the FY24 water year there were 4 exceedances of the SSGVs. It is noted that 2 results for aluminium were missed due to a manual data entry error. A detailed review of each exceedance is provided in Section A.7.4 and A.8.3.

TABLE 5.1: EXCEEDANCE INVESTIGATION REVIEW – MONITORING LOCATION 412702 13 SEPTEMBER 2023 TSS EXCEEDANCE

Assessment Item	Assessment Outcome				
Summary of Exceedance and Exceedance Investigation from the Cadia Investigation Register	**Location**	**Sample Date**	**Value**	**SSGV Trigger**	**Investigation Notes**
	412702	13 September 2023	76 mg/L	50 mg/L	Large spike. Outlier. Returned to normal levels. Unknown reason - no rainfall occurred around this date.
What was the potential cause of the exceedance?	Rainfall occurring in the days prior of approximately 28 mm over the 8 and 9 September 2023 is likely to have contributed to higher TSS values with runoff potentially carrying particulates from the surrounding area (primarily agricultural pastures). It is unlikely that this exceedance is associated with mining related impacts due to lack of higher TSS values in vicinity of the mining area at this time.				
What is the potential impact of the exceedance?	TSS results for the samples prior to and following the exceedance were below the SSGV (both 5 mg/L). Due to the short-term nature of the TSS elevation, it is likely that the any potential associated impacts are negligible.				
Does the exceedance relate to a long-term trend?	No. The exceedance does not appear to be related to any-long-term or emerging trends.				
Recommendations	No further investigations of this exceedance are recommended.				

TABLE 5.2: EXCEEDANCE INVESTIGATION REVIEW – MONITORING LOCATION CDW05 27 OCTOBER 2023 COPPER EXCEEDANCE

Assessment Item	Assessment Outcome				
Summary of Exceedance and Exceedance Investigation from the Cadia Investigation Register	**Location**	**Sample Date**	**Value**	**SSGV Trigger**	**Investigation Notes**
	CDW05	27 October 2023	0.007 mg/L	0.006 mg/L	Higher than usual but has returned to normal concentrations.
What was the potential cause of the exceedance?	At the start of the month there was a large rainfall event where 38.7 mm fell over 4 to 5 October 2023. Smaller rainfall events occurred intermittently between 5 and 27 October 2023. This pattern of rainfall indicates that there could have been runoff inflows to the creek from the surrounding agricultural land on which CDW05 is located during October 2023.				
What is the potential impact of the exceedance?	Prolonged higher copper values could have a detrimental impact on aquatic ecosystems. The exceedance observed on 27 October 2023 is greater than the 80% limit of species protection ANZECC (2000) guideline values.				
Does the exceedance relate to a long-term trend?	Yes. The exceedance relates to a series of higher values for copper at the monitoring location as described above.				
Recommendations	It is recommended that an increase in monitoring frequency at CDW05 be undertaken.				

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Assessment Outcomes

Key assessment outcomes and conclusions can be summarised as follows:

- Increasing trends were observed for several analytes in Rodds Creek Dam during FY24 (EC, TDS, calcium, chloride, potassium, sodium, sulphate and molybdenum). These trends are a continuation of trends beginning in around the end of 2021 and likely the result of increased transferred inflows from the TSF decant ponds during recent years of above average rainfall. These trends to not present a risk to the receiving environment as water stored in Rodds Creek Dam is contained within the dam and transferred to supply process water demands.
- Continuing increasing trends (starting in July 2022) were observed at CAWS42 (the NTSF decant pond) for total phosphorus, chloride, sodium, antimony, arsenic, molybdenum and copper. All of these analytes (except molybdenum) returned results during FY24 that were the highest in the historic monitoring period. These increasing trends began when the NTSF decant pond began receiving inflows from the Cadia Molybdenum Plant outflow point. Further, changes to TSF decant water are not considered unusual due to the dynamic nature of TSFs. These trends are not reflected at downstream storages. These trends are confined to the NTSF decant pond and results do not indicate any interaction between the NTSF and the receiving environment. Water stored in the NTSF is managed via transfers to the process water system.
- A trend for copper at CAWS60 (Eastern Dyke storage) appears to reflect copper trends at CAWS42 and CAWS43 (the NTSF and STSF decant ponds).
- Higher dissolved metal concentrations were observed at CAWS31 (the ST14 seepage collection dam downstream of the STSF) on 1 February 2024 and 6 May 2024. Confinement of these inflows to the dam is evident with no downstream impacts observed.
- Three exceedances of SSGVs at monitoring location 412702 (downstream monitoring location in the TSF southern management zone) occurred during FY24, 1 for TSS and 2 for aluminium. Following these higher values results returned to below the SSGV. The exceedances are not considered to be the result of mining related impacts.
- There was 1 exceedance of the SSGV for copper at CDW05, the surface monitoring location immediately downstream of the CDF. An increasing copper trend is evident at this location.
- No receiving environment monitoring locations indicate the presence of mining related impacts.

6.2 Recommendations and Improvement Opportunities

Recommendations and improvement opportunities to allow for more robust future assessment and ongoing improvement of water management at Cadia are provided in Table 6.1.

TABLE 6.1: FY24 SWA RECOMMENDATIONS AND IMPROVEMENT OPPORTUNITIES

Number	Purpose	Recommendation Details	Relevant Management Zone (if applicable)
1	Improvement of internal exceedance investigation procedures.	It is recommended that the date of the investigation, value recorded at the reference monitoring location and rainfall in the weeks prior be recorded in the investigation register. It is also recommended that commentary relating to how the data was validated be recorded in the exceedance register.	N/A
2	Improvement of internal exceedance investigation procedures.	For exceedances at surface water monitoring location 412702, upstream surface water monitoring locations for which analyte values were reviewed during the investigation process (and the analyte value) should be listed in the register.	N/A
3	Improvement of SSGV exceedance investigations for surface water monitoring location 412702.	Monitoring at 412702 is undertaken monthly while monitoring at 412168 (the upstream reference monitoring location) is undertaken quarterly. No monitoring was conducted at 412168 during September 2023 when the exceedances of the SSGV at 412702 occurred. It is recommended that either monitoring at 412168 be undertaken monthly, or the upstream reference monitoring location be changed to another location upstream of the mining area that is monitored monthly so that comparisons can be made when exceedances occur. It is understood that this change has been captured in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.	TSF Southern and Upper Cadiangullong Creek management zones.
4	Review of CDF receiving environment water quality.	It is recommended that further investigation of increasing copper concentrations at CDW05 be undertaken and that monitoring at this location be increased from quarterly to monthly. It is understood that the monitoring frequency for CDW05 has been increased to monthly in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.	CDF management zone
5	Review of CDF receiving environment water quality.	It is recommended that a surface water monitoring location be implemented downstream of the confluence of the Belubula River and the unnamed creek system directly downstream of the CDF that can be used to assess downstream water quality. It is understood that this change has been captured in the 2024 revision of the Cadia WMP that is currently undergoing review by the relevant government agencies.	CDF management zone
6	Improvement of water quality monitoring.	It is recommended that SSGVs be reviewed to determine the suitability of the values and whether additional SSGVs are required.	N/A

7. REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at: https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000

Newcrest Mining Limited (2023) *Cadia Water Management Plan version, 710-005-EN-PLA-0004.*

GHD (2023). Cadia Annual Review 2022 – 2023: Surface Water Assessment.

8. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

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  (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

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(g) This Report does not provide legal advice.

APPENDIX A: DETAILED REVIEW OF SURFACE WATER MANAGEMENT ZONES

A.1 Upper Cadiangullong Creek

The Upper Cadiangullong Creek management zone extends from Cadiangullong Dam to the PTSF and is inclusive of 6 surface water monitoring locations. Surface water monitoring locations in this zone are described in Table A.1. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.1: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
412168	Reference site that is located upstream of Cadiangullong Dam and mining operations.
412144	Monitoring location immediately downstream of Cadiangullong Dam and upstream of mining operations. Used to assess water quality of flow volumes from Cadiangullong Dam.
CAWS0	Cadiangullong Dam. Data is used to assess quality of raw water to be imported to Cadia Mine for processing operations.
CAWS2	Used to monitor for impacts to Cadiangullong Creek from historical mining activities. CAWS3 is the location of a historic mine adit and receives seepage from historic mining operations. It should be noted that CAWS3 is separated from receiving creek systems via bunding and the seepage collected that this location is transferred to the process water system.
CAWS3	
CAWS13	Cadia Creek at Cadia Creek weir. Used to monitor water quality at Cadia Creek prior to its confluence with Cadiangullong Creek.

A.1.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.1.1.1 to A.1.1.5. It should be noted no monitoring locations in this management zone have SSGVs.

A.1.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the Upper Cadiangullong Creek management zone can be interpreted as follows:

- **pH** – Results for pH for all the monitoring locations returned results ranging between 6.5 and 8.5 during the reporting period. All pH results are within the historical range. Results for pH at CAWS3 increased slightly throughout the reporting period. No emerging trends are evident for any of the other monitoring locations.
- **Electrical Conductivity** – Results indicate a slight increasing trend for EC at CAWS3 throughout the monitoring period (refer to Figure A.1). This trend is a continuation of increases that have been evident since the end of 2022. It should be noted that while there have been small increased in EC during the short term, the longer-term trend shows notable reductions in EC at CAWS3 since the start of the monitoring period (refer to Section A.1.2). EC results for all other locations within the Upper Cadiangullong Creek management zone were consistent with historic results and exhibited no emerging trends.
- **Total Suspended Solids** – The majority of results for TSS returned during the monitoring period were below the limit of detection (5 mg/L). A sample collected at CAWS2 on 13 September 2023 returned a higher result of 87 mg/L (refer to Figure A.2). This is the highest result for TSS in the Upper Cadiangullong Creek management zone for the entire historic monitoring period. Increased TSS at CAWS2 in the September 2023 results could be due to rainfall in the days prior to the sampling (28.6 mm between 8 and 9 September 2023) causing the suspension of sediment at the monitoring location, however, because TSS results at the other monitoring locations in the management zone around this time were within the historical range this may not be the cause. The isolated higher result at CAWS2 could also be attributed to disruption of sediment during the sampling process. TSS results prior to and following this result at CAWS2 (<5 mg/L

and 6 mg/L respectively) were within the historic range for CAWS2. Results for the remainder of the monitoring period at CAWS2 were below the limit of detection. No increasing trends for TSS are evident for the monitoring period at any of the monitoring locations.

- **Total Dissolved Solids** – All results for TDS were within the historic range for the monitoring locations. TDS concentrations at CAWS3 are greater than TDS concentrations at the other monitoring locations in the Upper Cadiangullong Creek management zone during the reporting period, however, this is consistent with historic results and expected due to the location of CAWS3 immediately downstream of the historic mining operations. No increasing trends for TDS are evident for the monitoring period at any of the monitoring locations.
- **Alkalinity** – Results for alkalinity at CAWS3 exhibited an increasing trend throughout the reporting period (refer to Figure A.3). Like EC and pH at the same location, this is a continuation of an increasing trend that has been evident at CAWS3 since the end of 2022. While all of the results for the reporting period are within the historical range for CAWS3, the most recent result (from 16 May 2024) is greater than the 95th percentile for historic alkalinity results at CAWS3. Results for alkalinity at all other monitoring locations remained relatively consistent throughout the monitoring period. No increasing trends for alkalinity are evident for the monitoring period at any of the monitoring locations.
- **Oxidation Reduction Potential** – Results for ORP were variable throughout the reporting period for surface water monitoring locations in the Upper Cadiangullong Creek management zone (refer to Figure A.4). Results at CAWS0, CAWS2, CAWS3 and CAWS13 were within the historic range and exhibited no new emerging trends. ORP at surface water monitoring location 412168 (upstream of Cadiangullong Dam) was the highest ORP recorded during the reporting period and higher than historical monitoring results, with a result of 317 mV recorded on 24 May 2024. Similarly, ORP at surface water monitoring location 412144 was the highest in the historic monitoring period on 8 April 2024 with a result of 311 mV. These higher ORP results appear to be a continuation of an increasing trend at the monitoring locations throughout the historic monitoring period (further detailed in Section A.1.2). It should be noted that high ORP levels, such as those exhibited by all surface water monitoring locations in the Upper Cadiangullong Creek management zone, indicate a strong oxidizing environment in which the there is potential for effective oxidation processes.

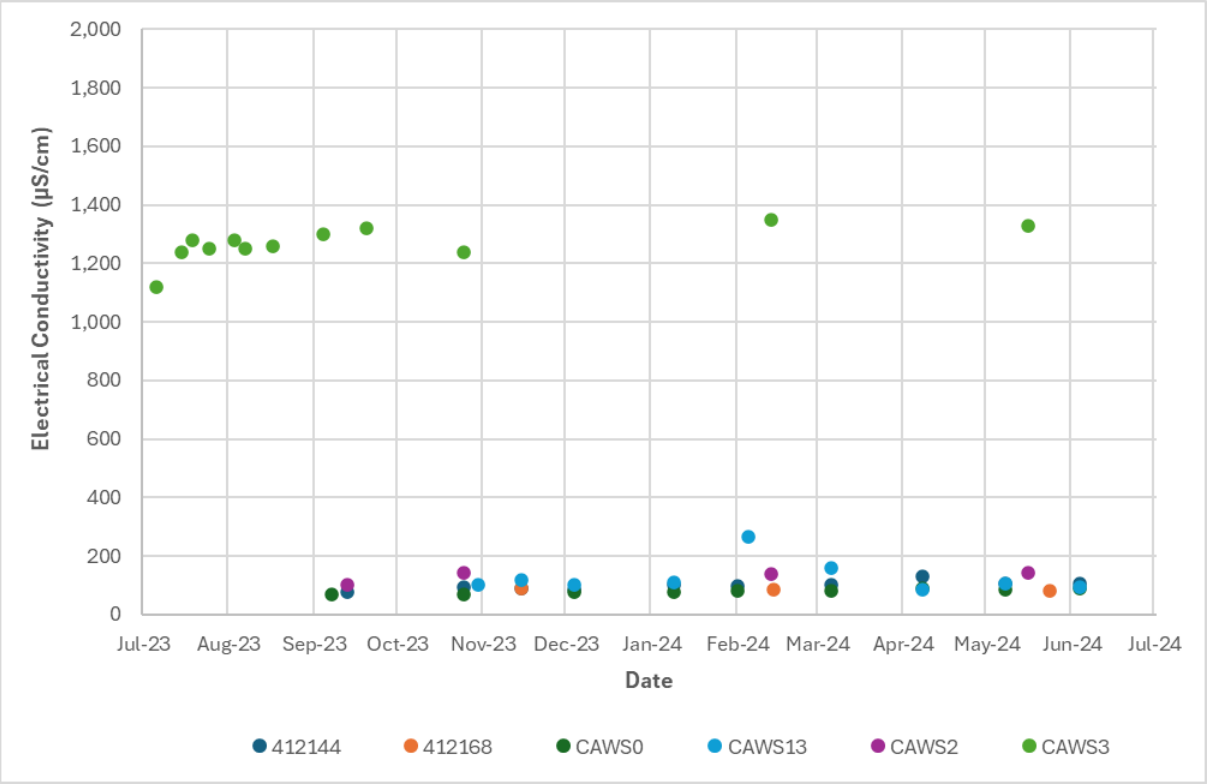


FIGURE A.1: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 ELECTRICAL CONDUCTIVITY

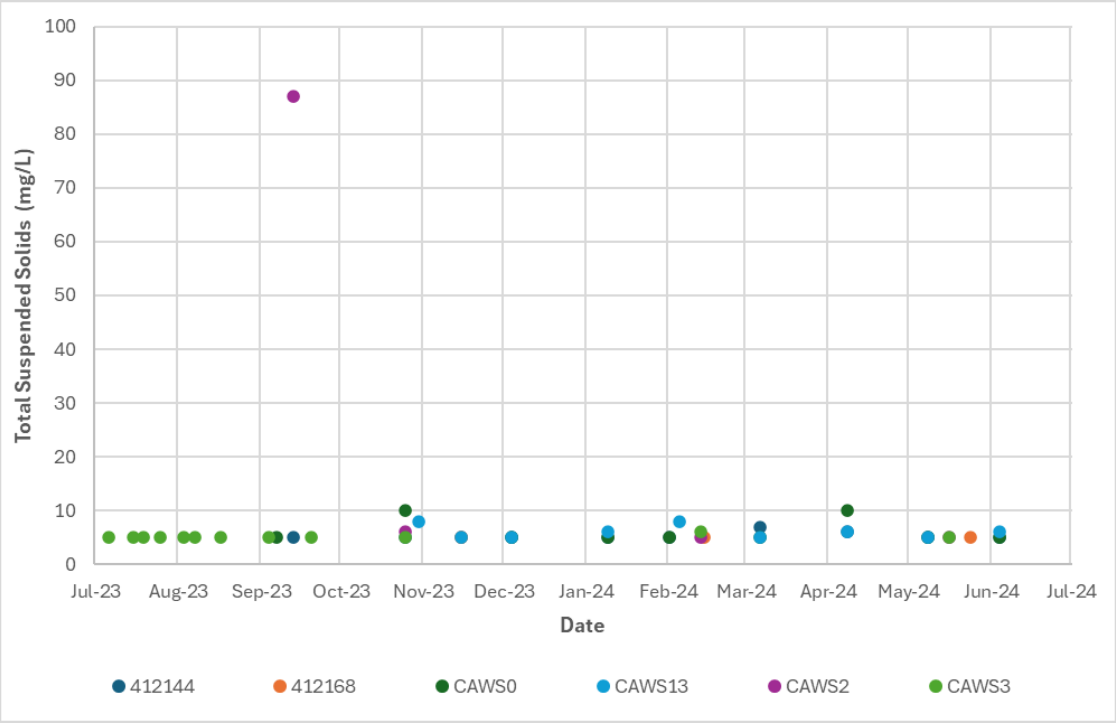


FIGURE A.2: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 TOTAL SUSPENDED SOLIDS

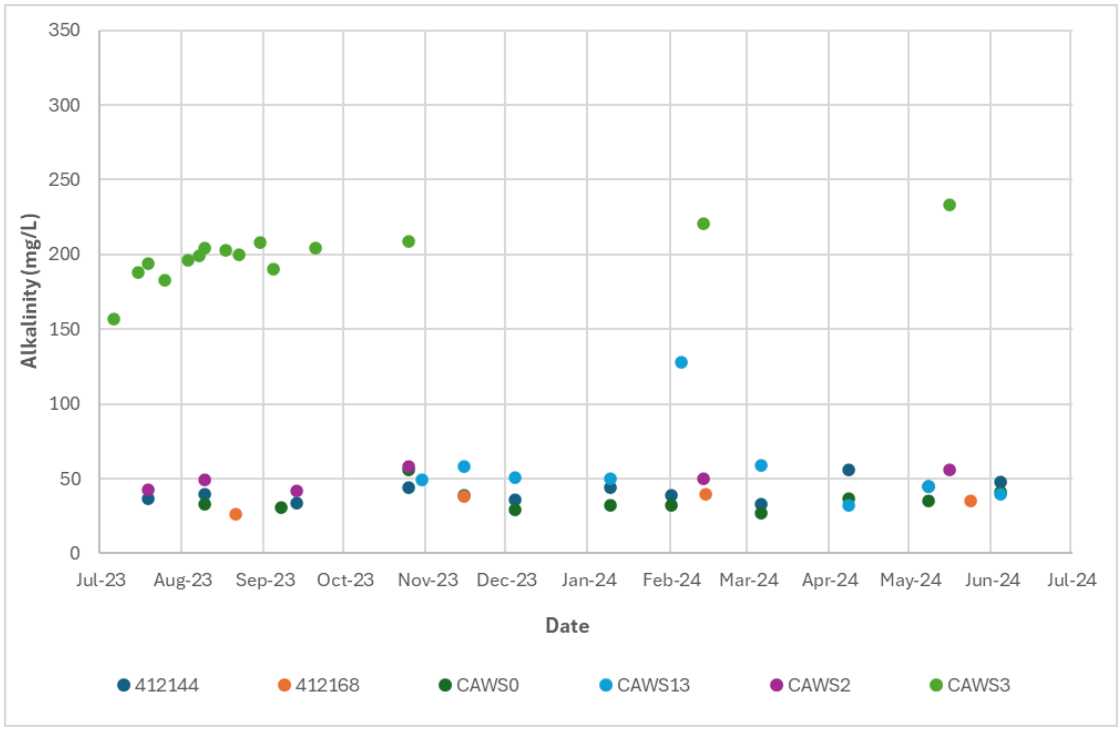


FIGURE A.3: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 ALKALINITY

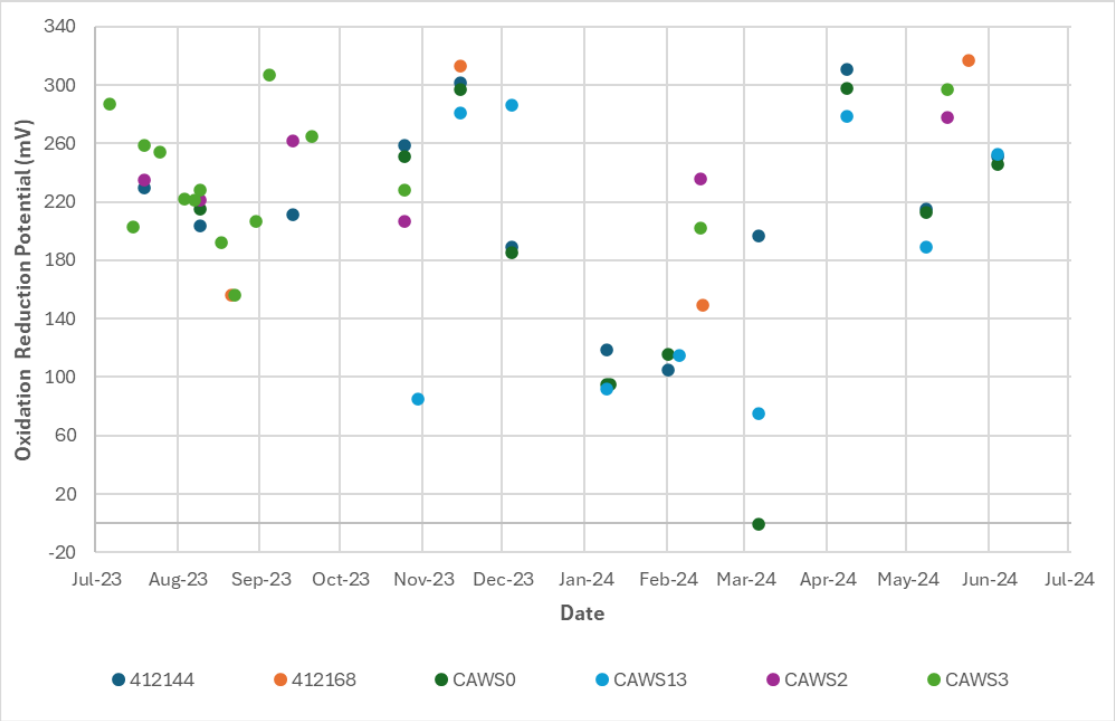


FIGURE A.4: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 OXIDATION REDUCTION POTENTIAL

A.1.1.2. Nutrients

Surface water quality monitoring results for nutrients for the Upper Cadiangullong Creek management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Nitrite** – All values for nitrite were below the limit of detection for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were within the historic range at all surface water monitoring locations in the management zone during the reporting period. While still within the historic range, some total phosphorus result at CAWS13 during the latter half of the reporting period were higher compared to previous results (refer to Figure A.5). The higher results were returned on 5 February 2024 (0.11 mg/L), 8 April 2024 (0.13 mg/L) and 4 June 2024 (0.12 mg/L). Samples collected at CAWS13 between these dates on 6 March 2024 (0.03 mg/L) and 8 May 2024 (0.07 mg/L) returned lower results that were more in line with average historic concentrations for total phosphorus at CAWS13 indicating that the higher concentrations weren't persistent.

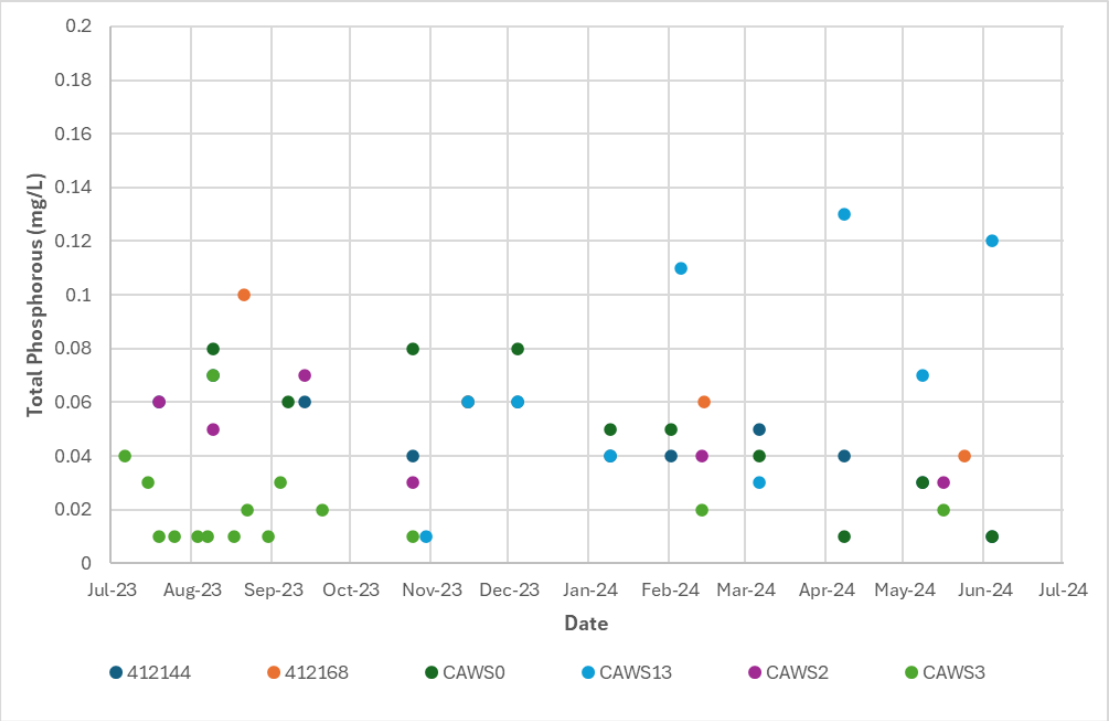


FIGURE A.5: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 TOTAL PHOSPHORUS

A.1.1.3. Major Ions

Surface water quality monitoring results for major ions for the Upper Cadiangullong Creek management zone can be interpreted as follows:

- **Calcium** – Results for calcium for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** – Results for chloride at CAWS3 exhibited an increasing trend throughout the reporting period (refer to Figure A.6). Like EC, pH and alkalinity at CAWS3, this is a continuation of an increasing trend that has been evident since the end of 2022. It should be noted that while an increasing trend is evident, the chloride values at CAWS3 during the monitoring period are all within the historic range for the monitoring location. Results for chloride at all other monitoring locations remained relatively consistent throughout the monitoring period with no emerging trends or outliers evident.
- **Magnesium** – Results for magnesium for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Potassium** – The majority of results for potassium were returned below the limit of detection (<2 mg/L) during the reporting period. Only 3 results were greater than the limit of detections (2 at CAWS13 and 1 at CAWS0). These results were only slightly higher (between 3 mg/L and 4 mg/L) than the limit of detection and still within the historic range for potassium at the monitoring locations. There are no emerging trends or outliers evident.
- **Sodium** – Results for sodium for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Sulphate** – Results for sulphate for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.

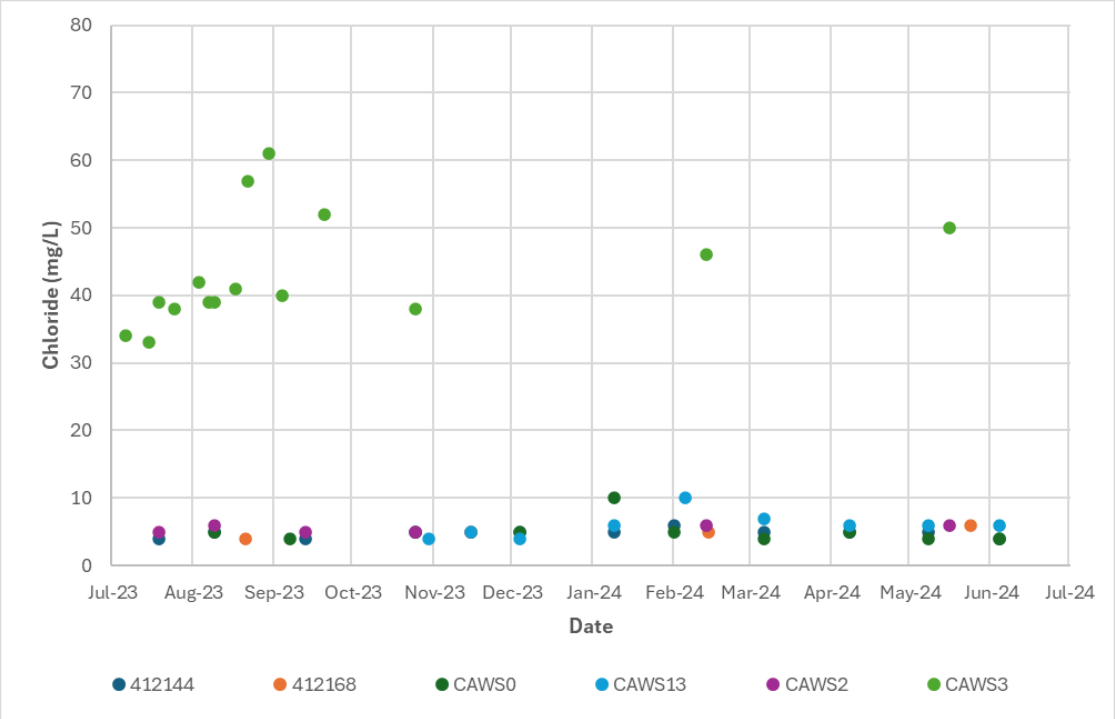


FIGURE A.6: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 CHLORIDE

A.1.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the Upper Cadiangullong Creek management zone can be interpreted as follows:

- **Aluminium** – Results for aluminium for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. There are no outliers or emerging trends evident.
- **Antimony** – Results for antimony at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Arsenic** – Results for arsenic at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cadmium** – Results for cadmium for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All results at surface water monitoring locations 412144, 412168, CAWS0, CAWS13 and CAWS2 were below the limit of detection (<0.0001 mg/L). While slightly higher than other monitoring locations in the management zone, results for cadmium at CAWS3 were within the historical range and exhibited a decreasing trend during the reporting period (refer to Figure A.7).
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cobalt** – All values for cobalt for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All values for cobalt at surface water monitoring locations 412144 and 412168 were below the limit of detection (<0.001 mg/L). Some values for cobalt at surface water monitoring locations CAWS13, CAWS2 and CAWS3 were slightly above the limit of detection (maximum results of 0.014 mg/L) but all were within the historic range. Cobalt concentrations at CAWS3 exhibited a slightly decreasing trend throughout the reporting period (refer to Figure A.8). This trend is a continuation of the decreasing trend that began at the end of 2022.
- **Copper** – All values for copper for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. The majority of copper values at surface water monitoring locations 412144, 412168, CAWS0 and CAWS13 were below the limit of detection (<0.001 mg/L). Some values for copper at CAWS2 and CAWS3 were above the limit of detection but all were within the historic range for the monitoring locations. Like cobalt and cadmium at CAWS3, copper concentrations at CAWS3 exhibited a slightly decreasing trend throughout the reporting period (refer to Figure A.9). This trend is a continuation of the decreasing trend that began at the end of 2022.
- **Iron –** Results for iron for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All results for iron at CAWS3 were below the limit of detection (<0.05 mg/L). There are no emerging trends or outliers.
- **Lead** – Results for lead at all monitoring were consistently below the limit of detection (<0.001 mg/L).
- **Manganese** – Manganese concentrations at surface water monitoring locations in the Upper Cadiangullong Creek management zone were variable throughout the reporting period (refer to Figure A.10). All results for manganese at monitoring locations 412168 and CAWS2 were within the historic range with no emerging trends. CAWS3 displayed a continuation of the downward trend that began at the end of 2022 and all results were within the historic range.

  CAWS13 returned a higher result for manganese (1.81 mg/L) on 5 February 2024. This is the highest concentration recorded at CAWS13 since monitoring began (second highest concentration 1.2 mg/L in March 1999). On 8 April 2024, manganese at CAWS0 was 1.8 mg/L, the highest concentration recorded at CAWS13 since monitoring began (second highest concentration 1.23 mg/L in June 2003). Results for surface water monitoring location 412144 were typically within the historic range except for 1 manganese result (1.28 mg/L) returned on 8 April 2024 that was greater than the 98th percentile of historic monitoring results. Following these higher results, manganese concentrations at the aforementioned monitoring locations returned to lower levels that were more inline the historic averages at the monitoring locations.

  These surface water monitoring locations (CAWS0, 412144, and CAWS13) are all upstream of the main mining area (i.e., Cadiangullong Dam, immediately downstream of Cadiangullong Dam, and Cadia Creek, respectively) and receive inflows from upstream areas that are primarily used for agriculture and forestry. Higher manganese could be a result of runoff from upstream areas. This conclusion is consistent with higher results for total phosphorus (that can also be associated with agricultural runoff) at CAWS13 on the same days as the higher manganese concentrations (5 February 2024 and 8 April 2024). Rainfall events in the days prior to sampling are considered of a great enough magnitude to have generated runoff that entered the creek systems at the time/in the days prior to sampling. It is unlikely that the higher manganese concentrations were associated with the mining operation due to their upstream locations.
- **Mercury** – Results for mercury at all sites were consistently below the limit of detection (<0.001 mg/L).
- **Molybdenum** – Results for molybdenum (refer to Figure A.11) for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All values at surface water monitoring locations 412168, CAWS2 and CAWS13 were consistently below the limit of detection (<0.001 mg/L). Some values for molybdenum at CAWS0 and

412144 were slightly above the limit of detection (maximum results 0.007 mg/L) but all were within the historic range. Molybdenum concentrations at CAWS3 exhibited a slightly decreasing trend throughout the reporting period. This trend is a continuation of the decreasing trend that began at end 2022.

- **Nickel** – Results for Nickel for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All results at surface water monitoring locations 412144, 412168, CAWS0 and CAWS2 were below the limit of detection (0.001 mg/L). One result at CAWS13 was slightly above the limit of detection (0.02 mg/L) and returned below the limit of detection in the months following. While slightly higher than other monitoring locations in the management zone, results for nickel at CAWS3 were within the historical range and exhibited a decreasing trend during the reporting period (refer to Figure A.12).
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc –** Results for zinc (refer to Figure A.13) for all monitoring locations in the Upper Cadiangullong Creek management zone throughout the reporting period were consistent with historic monitoring results. All values at surface water monitoring locations 412144, 412168, CAWS2 and CAWS13 were consistently below the limit of detection (<0.005 mg/L). One value for zinc at CAWS0 (0.014 mg/L was slightly above the limit of detection but within the historic range for the site. Zinc concentrations at CAWS3 exhibited a slightly decreasing trend throughout the reporting period. This trend is a continuation of the decreasing trend that began at end 2022.

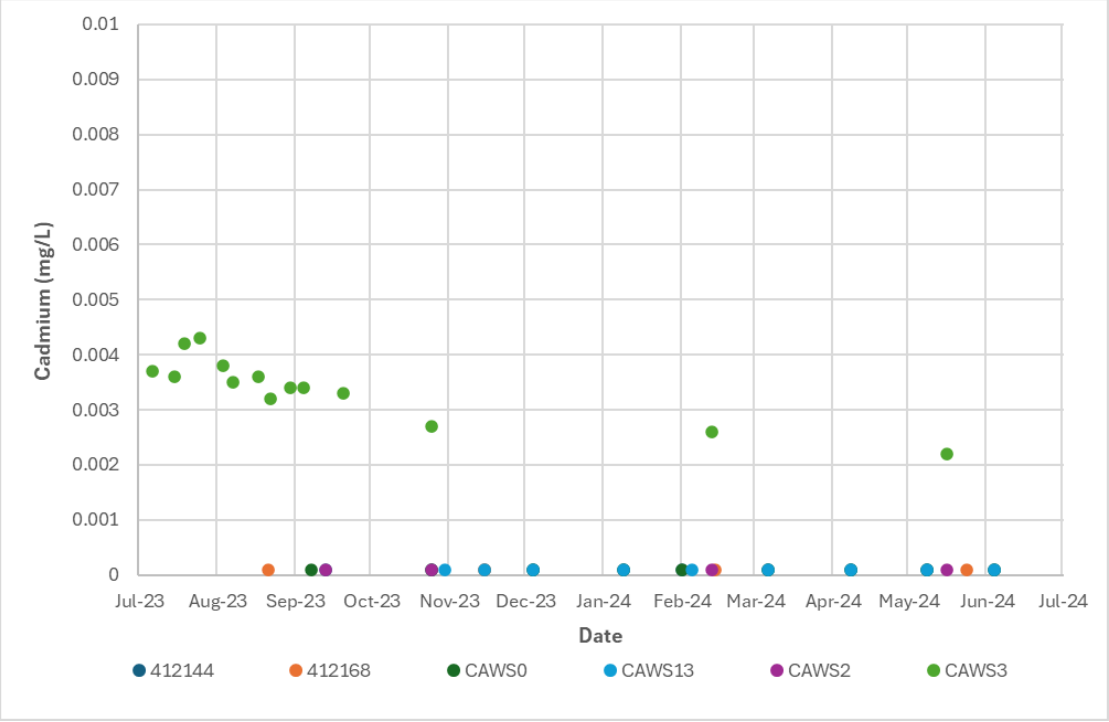


FIGURE A.7: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 CADMIUM

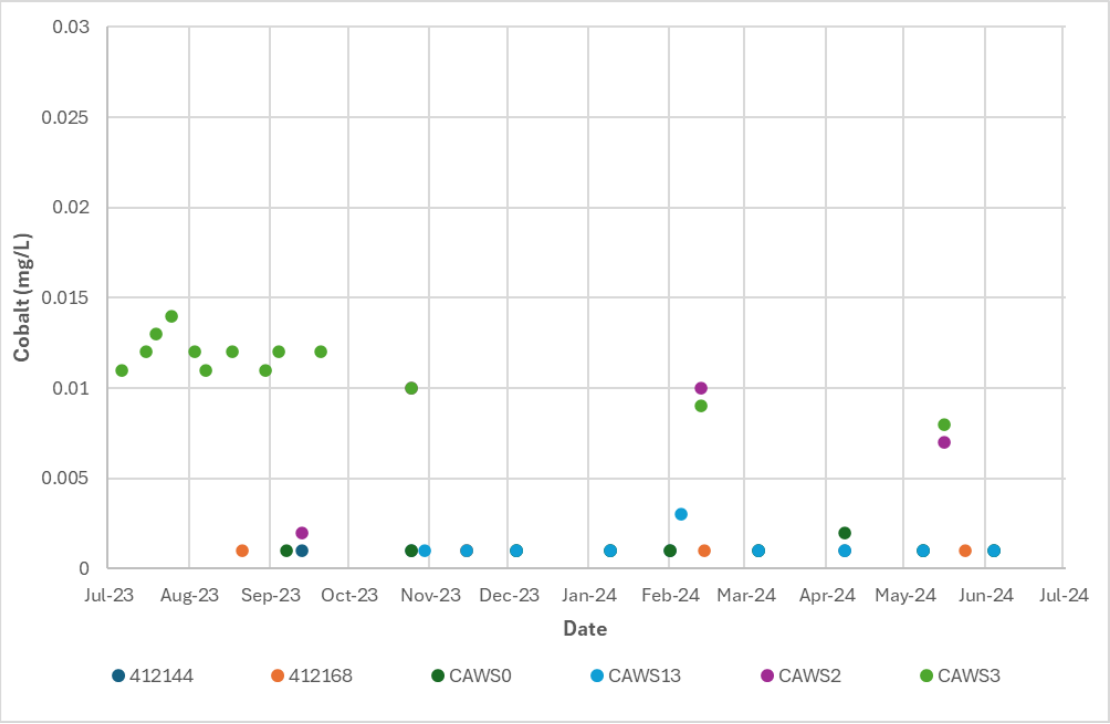


FIGURE A.8: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 COBALT

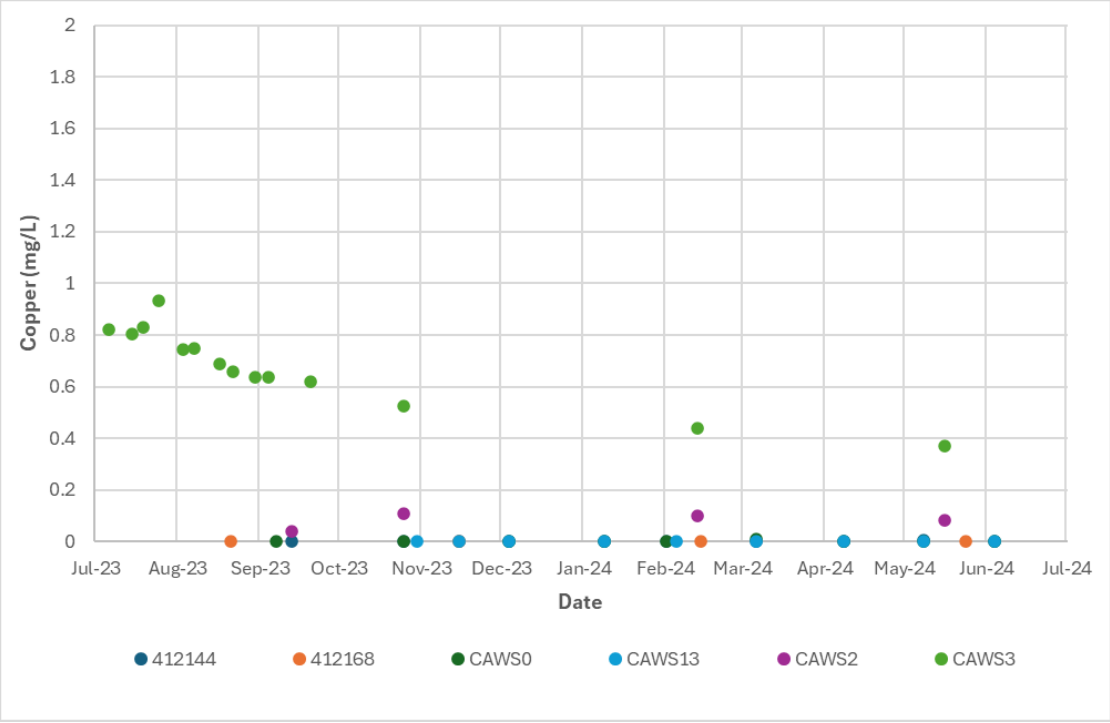


FIGURE A.9: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 COPPER

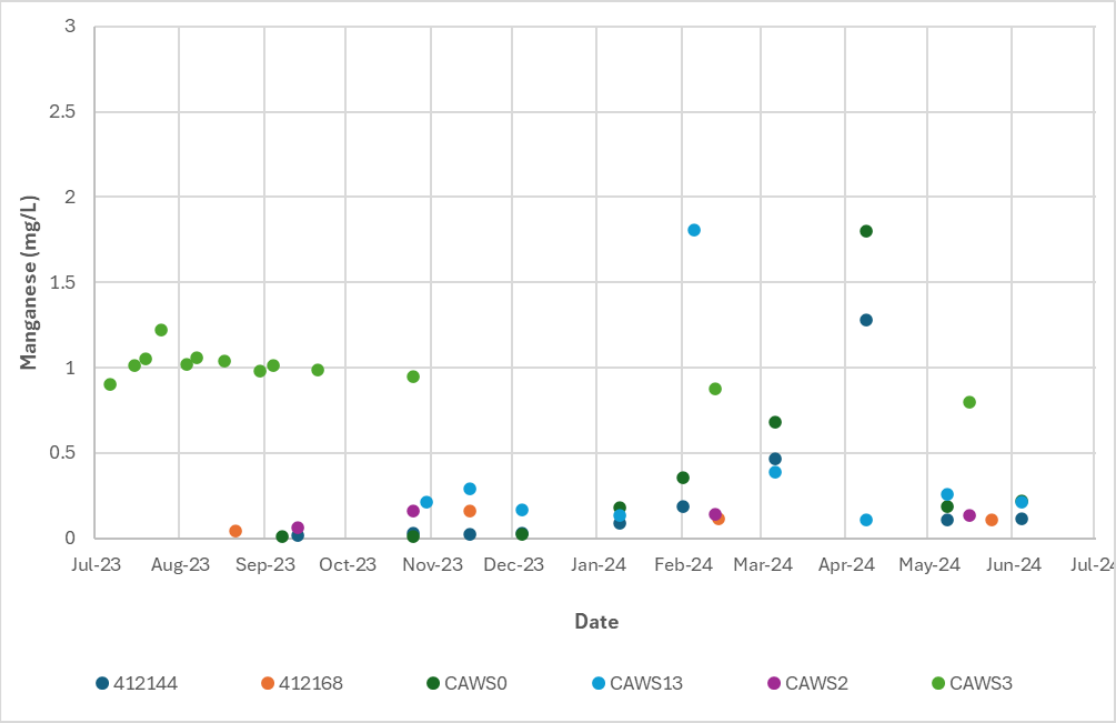


FIGURE A.10: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 MANAGANESE

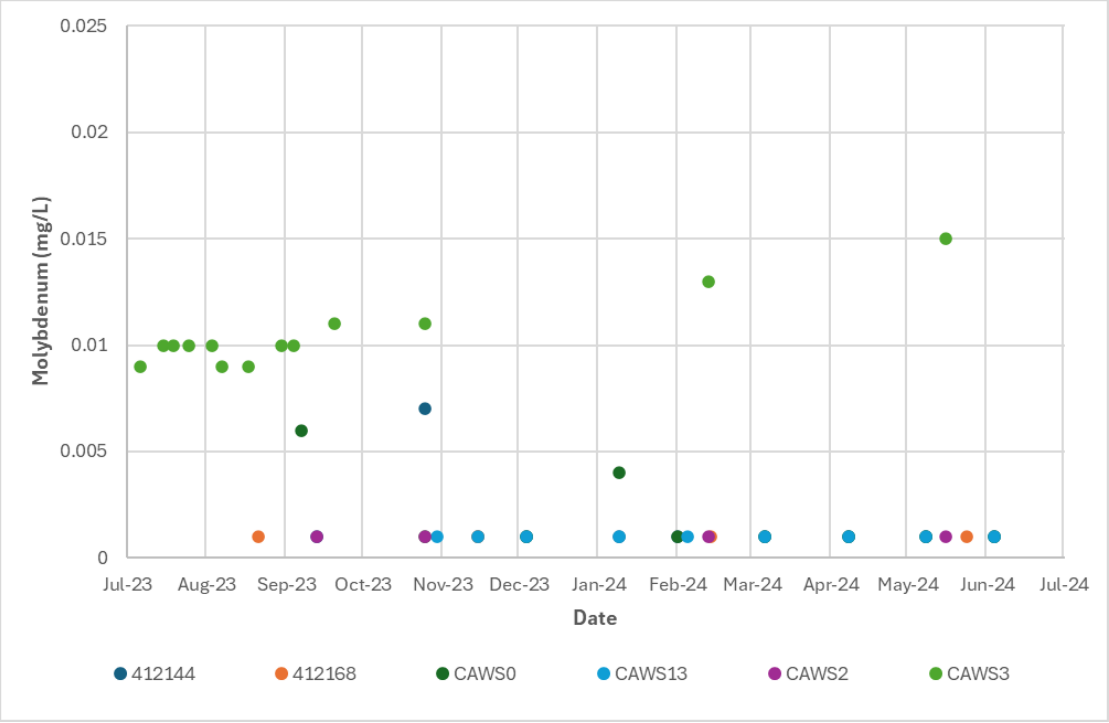


FIGURE A.11: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 MOLYBDENUM

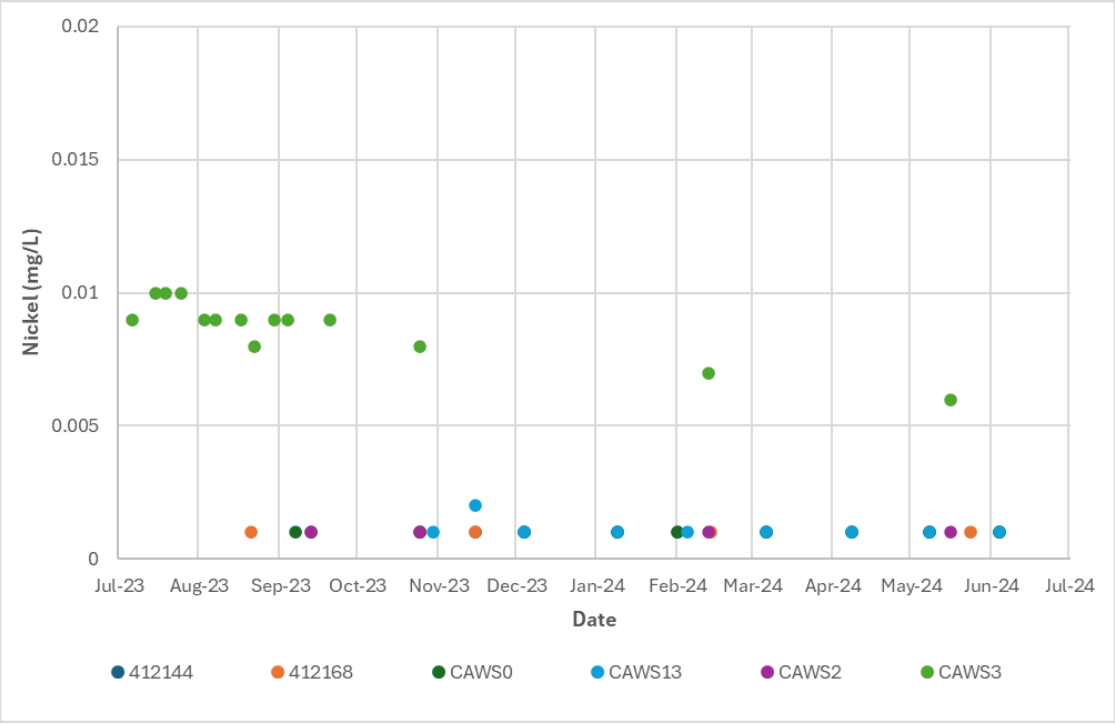


FIGURE A.12: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 NICKEL

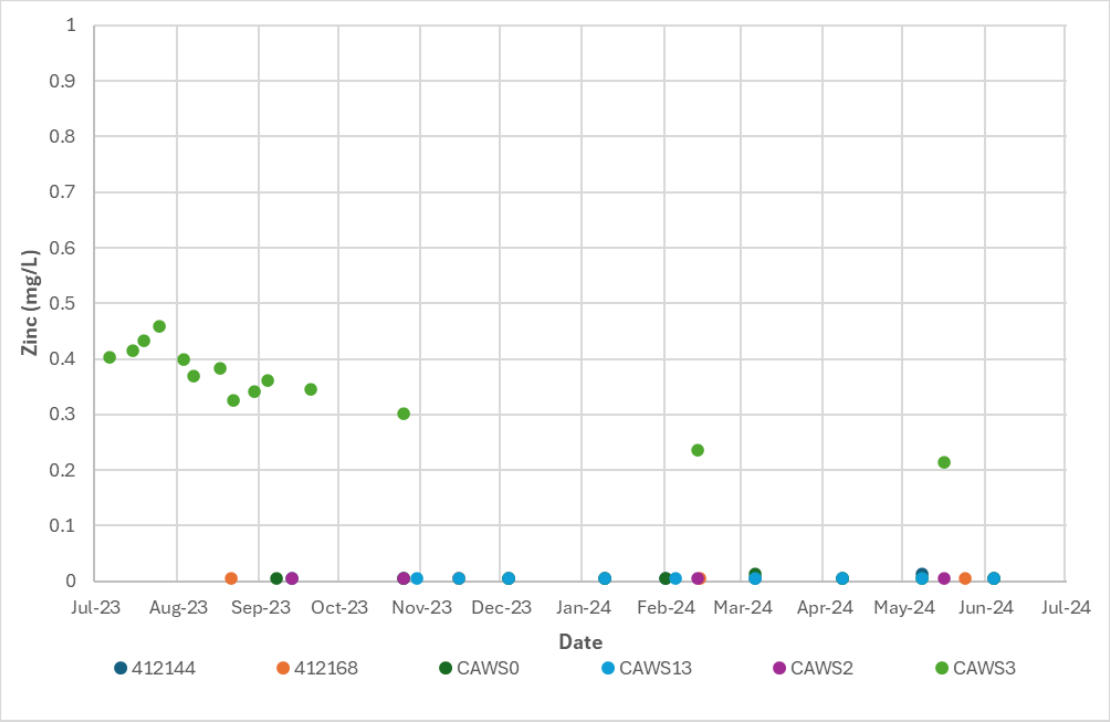


FIGURE A.13: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE FY24 ZINC

A.1.1.5. Biological Indicators

Blue green algae (ALG) is required to be monitored at Cadiangullong Dam (CAWS0) monthly between October and April. ALG concentrations were below the LOD (5 cells/mL) for all months during the reporting period with the exception of April. Water quality samples collected on 8 April 2024 indicated a ALG concentration of 13,200 cells/mL. This increase in ALG concentration during April is likely the result of high temperatures, as well as low rainfall in the weeks prior (only 20.5 mm of rainfall occurred in March), and minimal mixing of water in the dam due to lack of inflows.

A.1.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the Upper Cadiangullong Creek management zone. Short term trends identified during the reporting period for various analytes have been detailed in Section A.1.1. Interpretation of long-term water quality trends in the Upper Cadiangullong Creek management zone include the following aspects:

- CAWS3 is the located at the location of a historical mine adit and is affected by seepage from the historic operation. Various analytes (such as copper, cobalt, manganese, molybdenum, and zinc) at CAWS3 returned notably high results in November 2022 and have been returning to lesser concentrations in the time since (these analytes are noted in Section A.1.1). Over the long-term (i.e., since the start of water quality monitoring at CAWS3), analyte concentrations have typically reduced over time indicating an improvement in water quality at the monitoring locations. Long-term reductions in EC at CAWS3 are shown in Figure A.14. The EC figure has been provided as an example of the downward trend that many of the analytes sampled for at CAWS3 have exhibited over the long-term. Additional charts for all analytes of interest are provided in Appendix B.
- ORP began being monitored at monitoring locations in the Upper Cadiangullong Creek management zone in December 2018. In the years since, ORP has exhibited an increasing trend (i.e., improving water quality) at all surface water monitoring locations in the management zone (refer to Figure A.15).

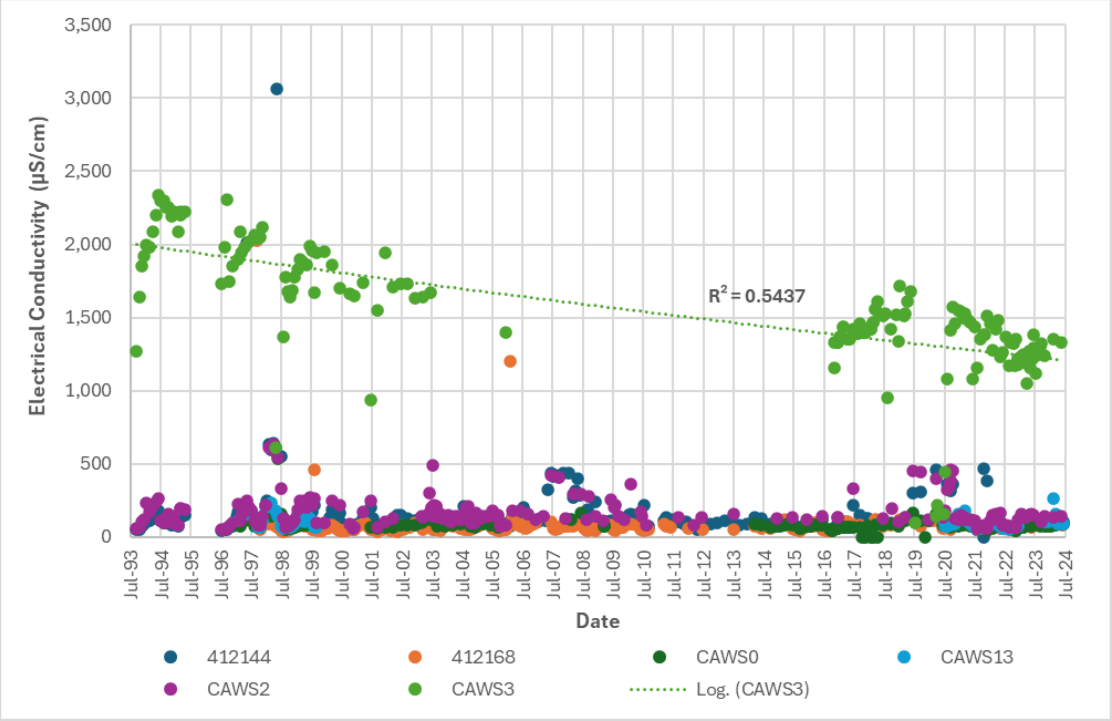


FIGURE A.14: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE LONG-TERM ELECTRICAL CONDUCTIVITY

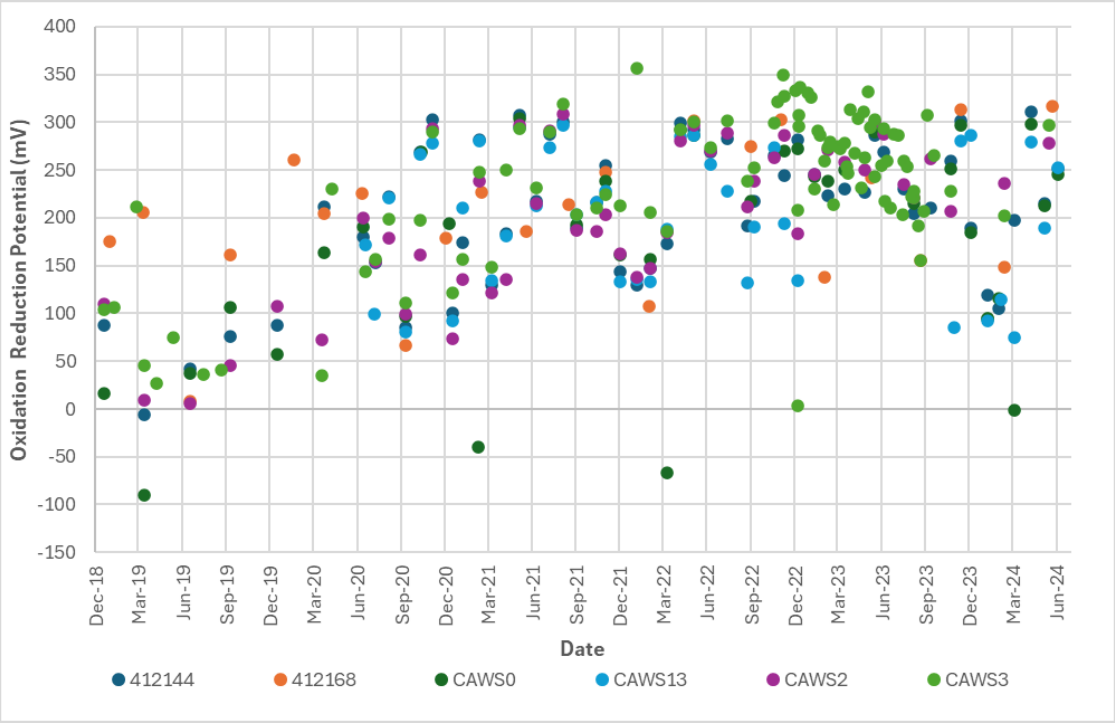


FIGURE A.15: UPPER CADIANGULLONG CREEK MANAGEMENT ZONE LONG-TERM OXIDATION REDUCTION POTENTIAL

A.1.3 Summary and Recommendations

Surface water monitoring results for all monitoring locations in the Upper Cadiangullong Creek management zone were generally consistent with historic monitoring data. Water quality at CAWS3 has continued to improve since the high results for several dissolved metals at the end of 2022 and exhibits continual improvement for EC, TDS and several other analytes over the long-term. Higher results from the reporting period that are not typical of the historic range at the relevant sites can generally be attributed to increased runoff during/following high rainfall events. It is considered that no water quality results from the management zone warrant the need for further investigations.

A.2 Cadia Hill Pit

The Cadia Hill Pit management zone is located on the northern side of the Cadia Mine area and includes 2 surface water monitoring locations focused on the now inactive Cadia Hill Open Cut mine, which has been used as a Pit Tailings Storage Facility (PTSF) since 2018. Surface water monitoring locations in this zone are described in Table A.2. The purpose of each of the monitoring locations has been derived from location and environment related factors, as well as descriptions provided in the Cadia WMP (Newcrest, 2023).

It should be noted that Hoares Creek Dam has been included in the Cadia Hill Pit management zone for the purpose of the assessment, however, it is understood that it is likely no interaction between the PTSF and Hoares Creek Dam surface water monitoring locations.

All of these monitoring locations are located within the mine WMS.

TABLE A.2: CADIA HILL PIT MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
CAWS65	Located within PTSF. Data is used to assess the PTSF decant water quality.
CAWS46	Located at Hoares Creek Dam north-east of PTSF.

A.2.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 for the Cadia Hill Pit management zone are provided below. It should be noted no monitoring locations in this management zone have SSGVs.

A.2.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the Cadia Hill Pit management zone can be interpreted as follows:

- **pH** – Results for pH at the Cadia Hill Pit management zone were consistent within the historic range throughout the reporting period. Monitoring location CAWS65 demonstrated a slight decreasing trend during the reporting period (refer to Figure A.16).
- **Electrical Conductivity** – Results indicate a slight increasing trend for EC at CAWS65 throughout the reporting period (refer to Figure A.17). This trend is a continuation of increases that have been evident since December 2022, with recorded EC peaking at 3580 µS/cm on 4 June 2024. FY24 trends for CAWS65 can be seen reflected in both TDS and several major ions (calcium, potassium, sodium and sulphate – refer to Section A.2.1.2) indicating these dissolved ions as a probable cause for the observed trend. No trends for CAWS46 were evident during the reporting period. All results for FY24 lie within the historical range.
- **Total Suspended Solids** – Results for TSS did not demonstrate any trends at the PTSF during the reporting period, and all values recorded were within the historical range. Most values returned were below the limit of detection (5 mg/L) with one higher value of 98 mg/L recorded at CAWS46 on 14 November 2023. This value was still within the historic range and values for TSS prior to and following this higher result were more in line with the historic average.
- **Total Dissolved Solids** – Results for TDS demonstrated a slight increasing trend at CAWS65 and a less distinct trend but an overall increase at CAWS46 during the reporting period (refer to Figure A.18). FY24 trends for CAWS65 can be seen reflected in both EC and several major ions (calcium, potassium, sodium and sulphate – refer to Section A.2.1.2). All results recorded for FY24 lie within the historical range.
- **Alkalinity** – Results for alkalinity show a slight increasing trend at CAWS46 during the reporting period (refer to Figure A.19). This is a continuation of an increasing trend that began in August 2022. Alkalinity at CAWS65 remained consistent throughout FY24 however, the lowest value recorded for this monitoring location was reported on 14 November 2023 (12 mg/L). This low alkalinity value is associated with a slight decreasing trends in the months prior and could be attributed to rainfall intercepted by the dam surface resulting in dilution.
- **Oxidation reduction potential** – Results for ORP demonstrated no distinct trends at either monitoring location during the reporting period. All recorded values for FY42 were within the historical range and no outliers were observed.

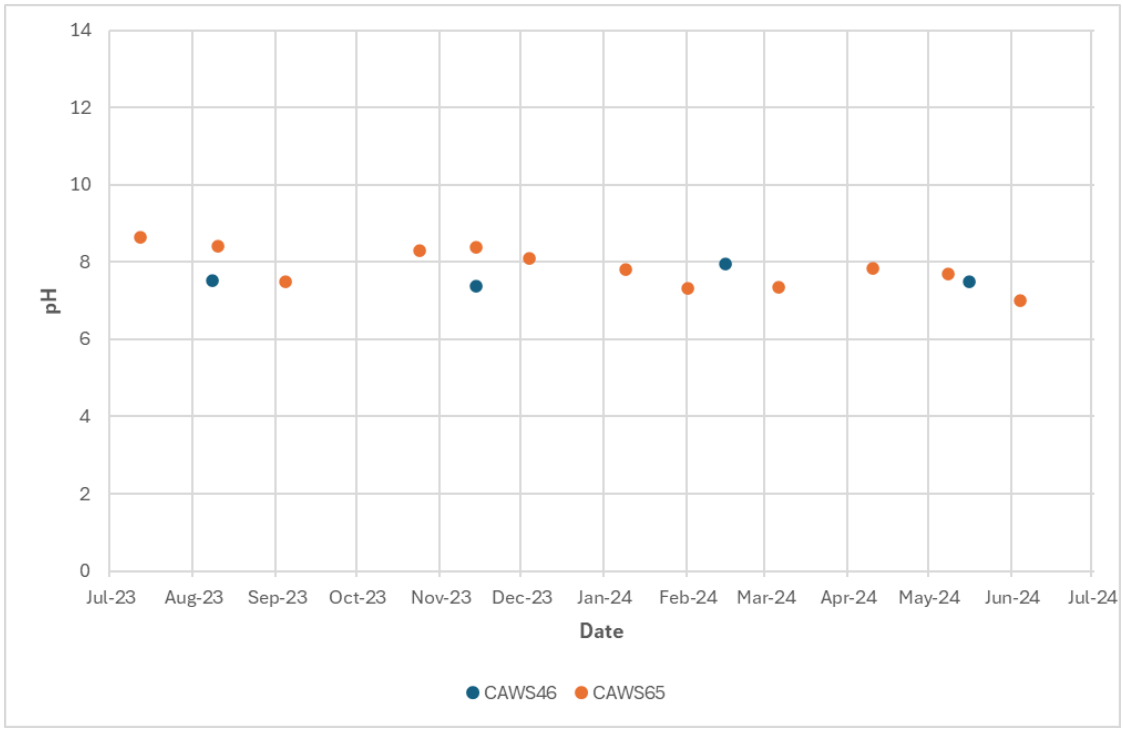


FIGURE A.16: CADIA HILL PIT MANAGEMENT ZONE FY24 PH

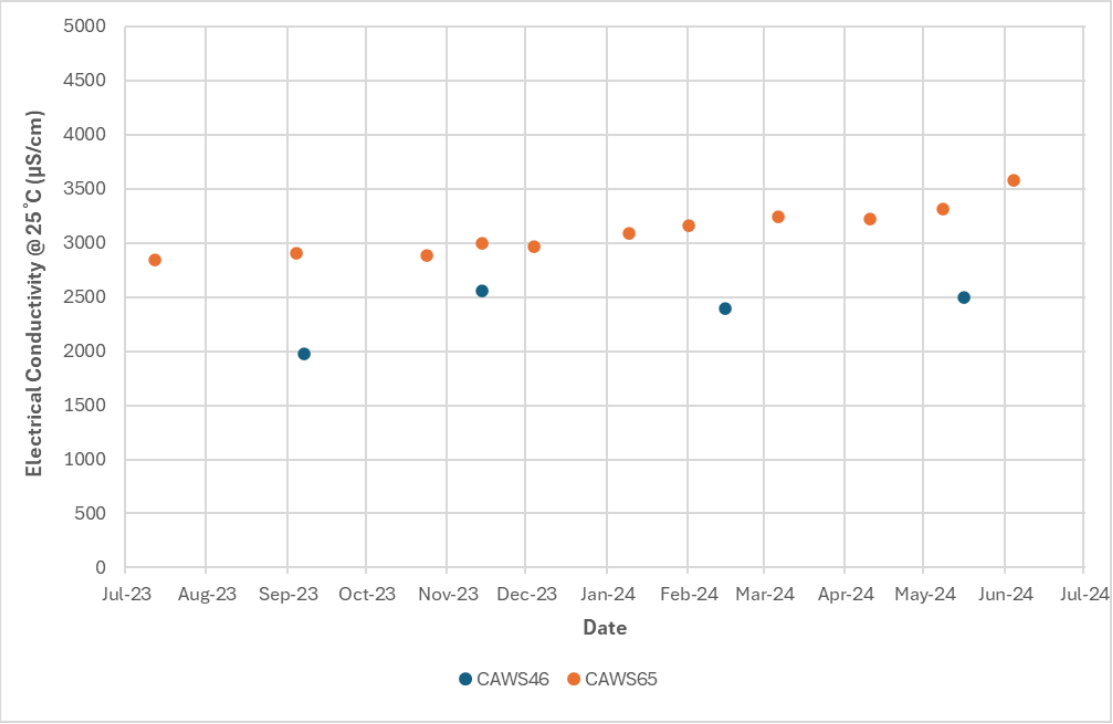


FIGURE A.17: CADIA HILL PIT MANAGEMENT ZONE FY24 ELECTRICAL CONDUCTIVITY

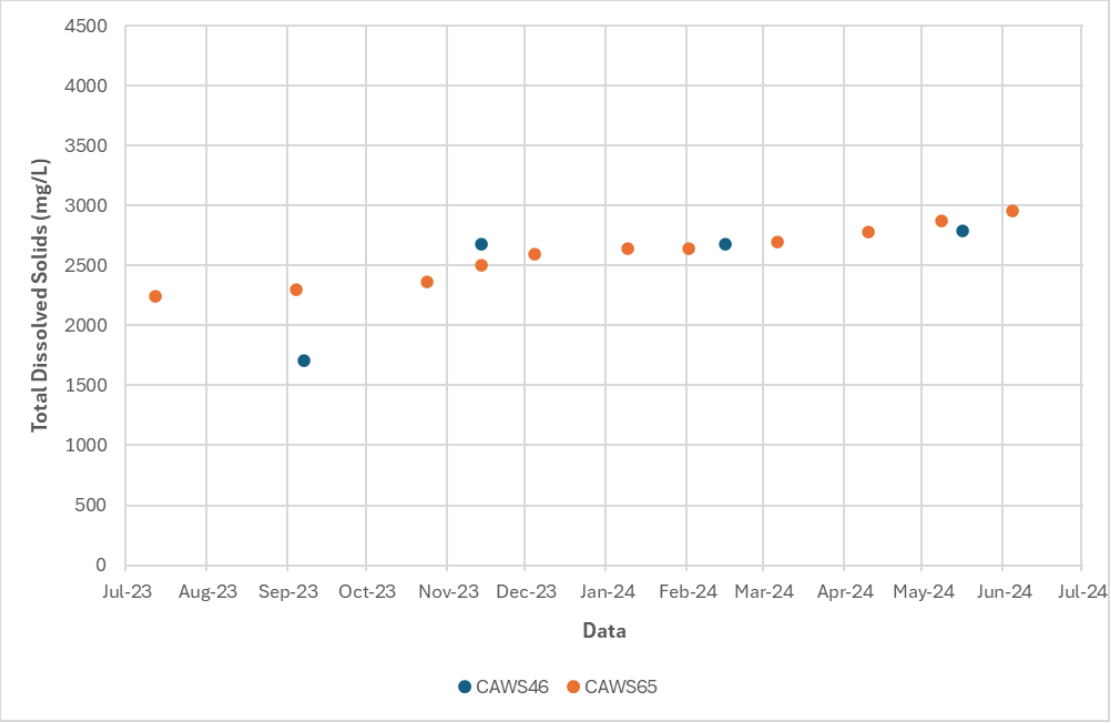


FIGURE A.18: CADIA HILL PIT MANAGEMENT ZONE FY24 TOTAL DISSOLVED SOLIDS

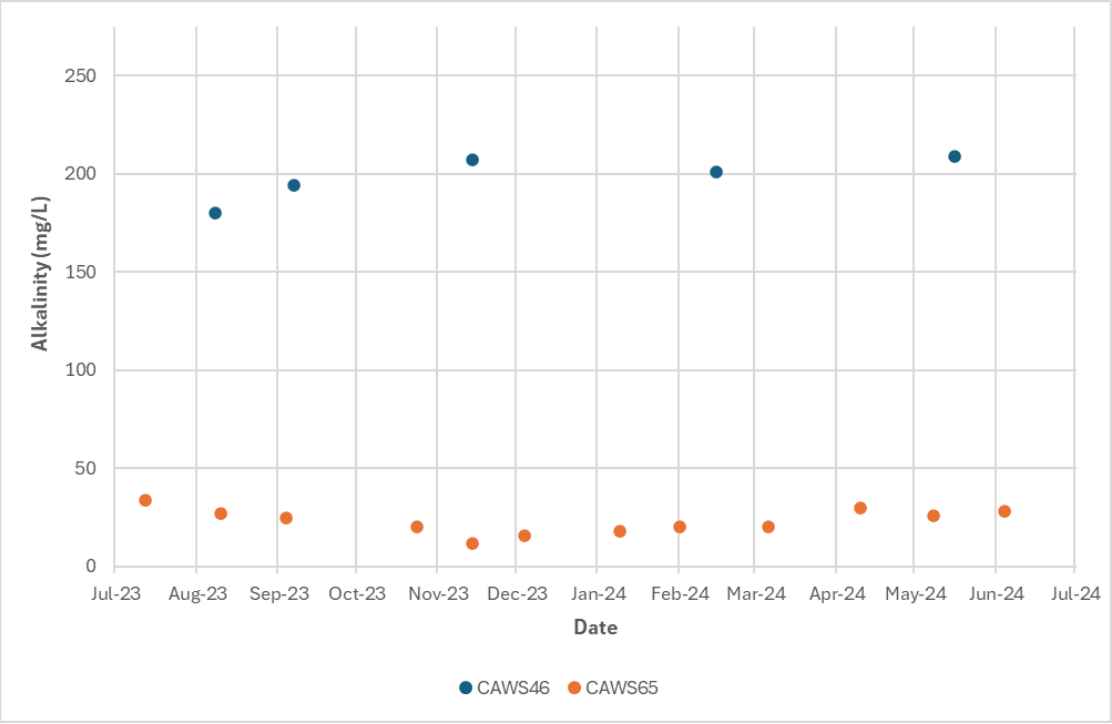


FIGURE A.19: CADIA HILL PIT MANAGEMENT ZONE FY24 ALKALINITY

A.2.1.2. Nutrients

Surface water quality monitoring results for nutrients for the Cadia Hill Pit management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently low and within the historic range at both monitoring locations. There are no emerging trends or outliers.
- **Nitrite** – Results indicate no trend for either monitoring location during the reporting period. All values recorded for CAWS46 during FY24 were at the limit of detection (0.01 mg/L). All results for FY24 lie within the historic range and there are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen during FY24 were within the historic range. There are no emerging trends or outliers.
- **Total Phosphorus** – Results indicate no trend for either monitoring location during the reporting period. Results for both monitoring locations remained consistently low for the duration of FY24 with the exception of one result at CAWS65 on 8 May 2024 (20.2 mg/L). This may be as a result of rainfall in the ten days prior (approximately 24.5 mm) however, this is not reflected in proceeding tests at the same monitoring site (0.08 mg/L recorded on 4 June 2024 with approximately 26 mm of rainfall in the week prior) or the values recorded at the upslope site CAWS46 (0.01 mg/L on 16 May 2024 with approximately 6 mm of rainfall in the week prior). With an absence of clear rainfall-phosphorous relationship, this result may be an outlier. All total phosphorous results for the FY24 are within the historic range.

A.2.1.3. Major Ions

Surface water quality monitoring results for major ions for the Cadia Hill Pit management zone can be interpreted as follows:

- **Calcium** – Results for calcium demonstrate no trend at CAWS46 and a slight increasing trend at CAWS65 over the duration of the reporting period (refer to Figure A.20). Like EC, TDS, potassium, sodium, and sulphate, calcium also exhibits continuing increasing trend since the end of 2022. All calcium values were within the historic range.
- **Chloride** – Results for chloride demonstrate no significant trends at either monitoring location during FY24 and all values were within the historic range. Long-term trends for chloride at CAWS65 are increasing and can also be seen reflected in other major ions (chloride, potassium, sodium, sulphate) in addition to physiochemical parameters EC and TDS since 2018 (refer to Section A.2.1.1 and Section A.2.2).
- **Magnesium** – All magnesium results for FY24 are within the historic and there are no emerging trends or outliers.
- **Potassium** – Results for potassium demonstrate no trend at CAWS46 and a slight increasing trend at CAWS65 for FY24 (refer to Figure A.21). Like EC, TDS, calcium, sodium, and sulphate at CAWS65, this is a continuation of an increasing trend that began at the end of 2022. All potassium results for FY24 lie within the historical range and there are no outliers.

- **Sodium** – Results for sodium demonstrate no trend at CAWS46 and a slight increasing trend at CAWS65 over the duration of the reporting period (refer to Figure A.22). Like EC, TDS, calcium, potassium and sulphate at CAWS65, this is a continuation of an increasing trend that began at the end of 2022. Trends observed at CAWS65 during FY24 and since 2018 can also be seen reflected sulphate results. All sodium results for FY24 are within the historic range and there are no outliers.
- **Sulphate** – Results for sulphate demonstrate no trend at CAWS46 and a slight increasing trend at CAWS65 during FY24 (refer to Figure A.23 Like EC, TDS, calcium, sodium and potassium at CAWS65, this is a continuation of an increasing trend that began at the end of 2022. All values for sulphate are within the historic range for both locations and there are no outliers.

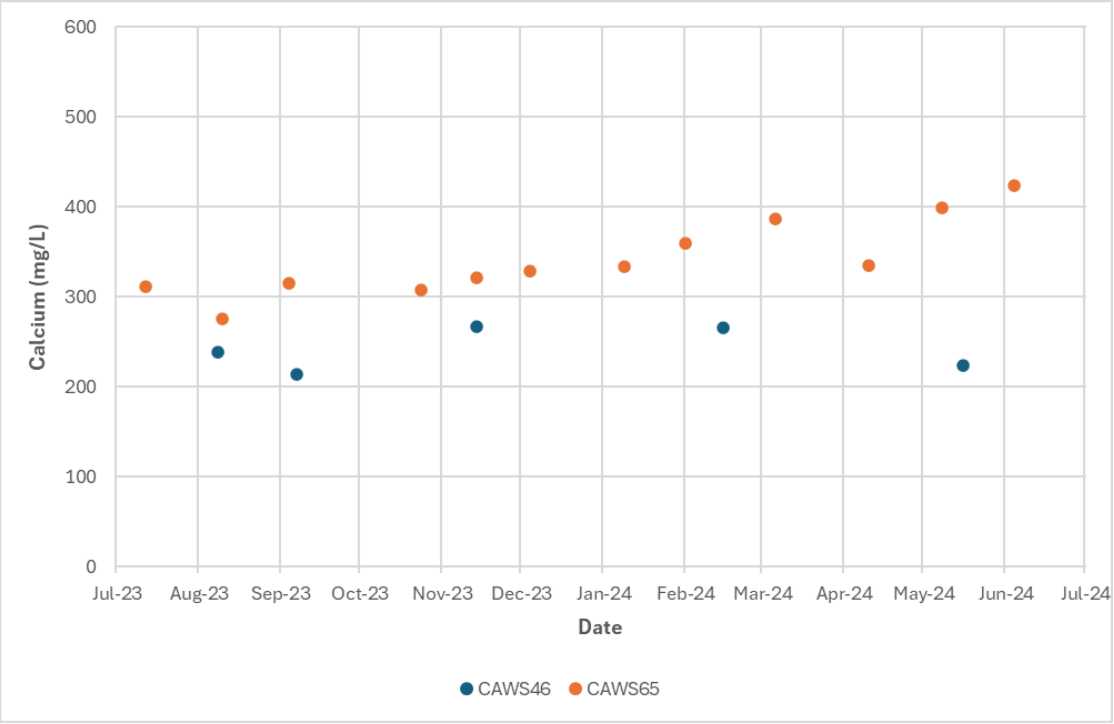


FIGURE A.20: CADIA HILL PIT MANAGEMENT ZONE FY24 CALCIUM

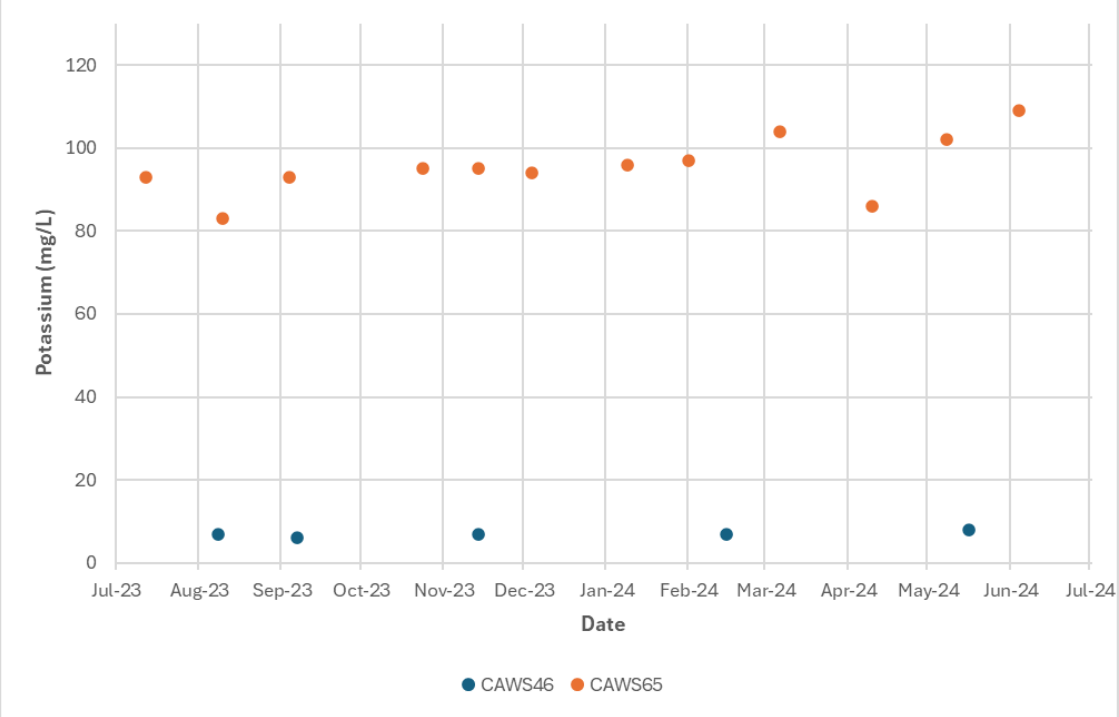


FIGURE A.21: CADIA HILL PIT MANAGEMENT ZONE FY24 POTASSIUM

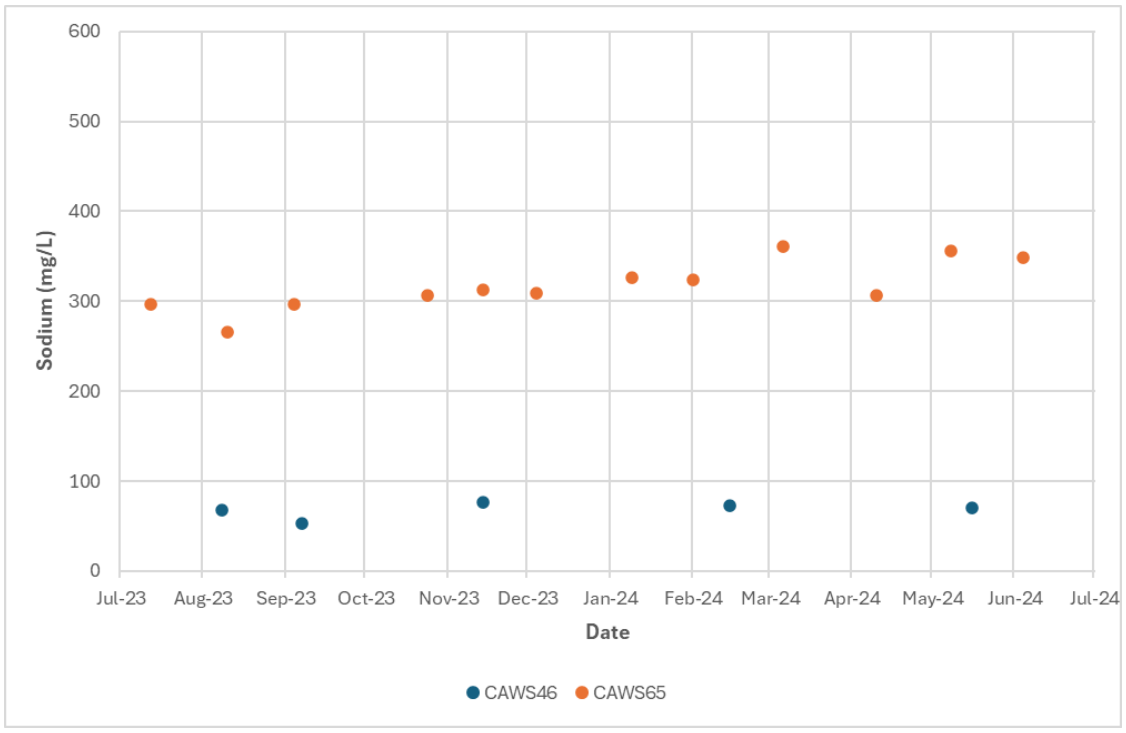


FIGURE A.22: CADIA HILL PIT MANAGEMENT ZONE FY24 SODIUM

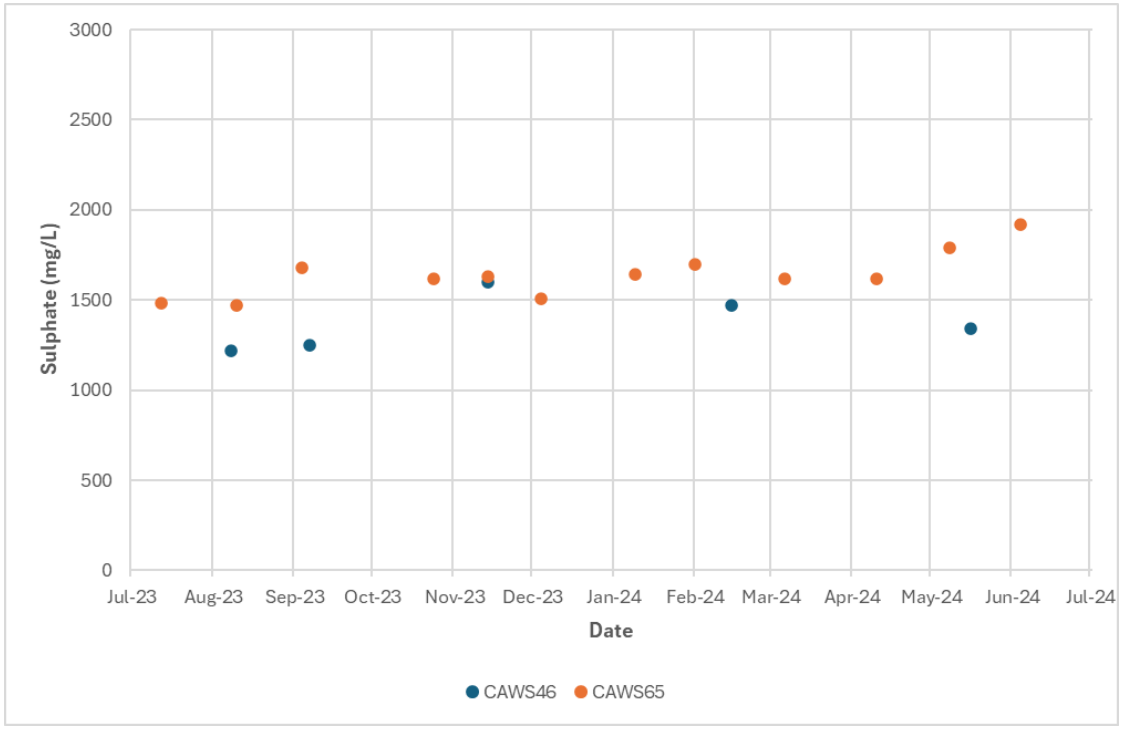


FIGURE A.23: CADIA HILL PIT MANAGEMENT ZONE FY24 SULPHATE

A.2.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the Cadia Hill Pit management zone can be interpreted as follows:

- **Aluminium** – Results for aluminium are within the historic range. There are no emerging trends or outliers.
- **Antimony** – Results for antimony were variable between the monitoring locations, demonstrating consistent values below the limit of detection (<0.001 mg/L) at CAWS46, and a slight increasing trend at CAWS65 over the duration of the reporting period (refer to Figure A.24). This increase is a continuation of a trend beginning in late 2022. All results lie within the historic range.
- **Arsenic** – Results for arsenic were consistent for each monitoring location over the duration of the reporting period. Values for CAWS46 were all recorded below the limit of detection (<0.001 mg/L). Arsenic values for CAWS65 were all consistent at 0.002 mg/L with the exception of 1 recorded on 24 October 2023 at the limit of detection. All results lie within the historic range.
- **Cadmium** – Results for cadmium were variable between monitoring locations, with no trend evident for CAWS65 and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.25). This trend is the continuation of a long-term increase beginning in August 2022. Cadmium values for CAWS65 were consistent between 0.0001 mg/L, recorded several times throughout FY24, and 0.0005 mg/L, recorded 9 January 2024. All results lie within the historic range.
- **Chromium** – Results for chromium at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cobalt** – Results for cobalt were variable between the monitoring locations, with consistent values for CAWS65 and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.26). Like cadmium, this trend is continuation of a long-term increase beginning in August 2022. All values for cobalt at CAWS65 were below the limit of detection (<0.001 mg/L). All results lie within the historical range.
- **Copper** – Results for copper were variable between monitoring locations, with no trend evident for CAWS65 and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.27). Like cadmium and cobalt, this trend is continuation of a trend beginning in November 2022. Values recorded at CAWS65 were consistently low. All results for FY24 are within the historic range.
- **Iron –** Results for iron at both monitoring locations were consistently below the limit of detection (<0.05 mg/L).
- **Lead** – Results for lead at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Manganese** – Results for manganese were variable between monitoring locations, with consistently low values at CAWS65 (<0.02 mg/L) and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.28). Like cadmium, cobalt and copper at CAWS65, this trend is a continuation of an increase beginning in August 2022. Manganese values recorded at CAWS65 were consistently low. All results lie within the historic range.
- **Mercury** – Results for mercury at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Molybdenum** – Results for molybdenum were variable between the monitoring locations, demonstrating consistently low values at CAWS46 (<0.05 mg/L) and a slight increasing trend at CAWS65 over the duration of the reporting period (refer to Figure A.29). This trend is continuation of a long-term increase beginning in March 2022. All result for FY24 are within the historic range.
- **Nickel** – Results for nickel were variable between the monitoring locations, with consistent values for CAWS65 and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.30). Similarly to cadmium, cobalt, copper and manganese, this trend is a continuation of a historical increase beginning in August 2022. All values for nickel at CAWS65 were at or below the limit of detection (<0.001 mg/L). All results lie within the historic range.
- **Silver** – Results for silver at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc** – Results for zinc were variable between the monitoring locations, with consistent values for CAWS65 and a slight increasing trend at CAWS46 over the duration of the reporting period (refer to Figure A.31). Similarly to cadmium, cobalt, copper, manganese and nickel, this trend is a continuation of a long-term increase beginning in November 2022. Almost all results values for zinc at CAWS65 were below the limit of detection (<0.005 mg/L). All results for zinc for FY24 are within the historic range.

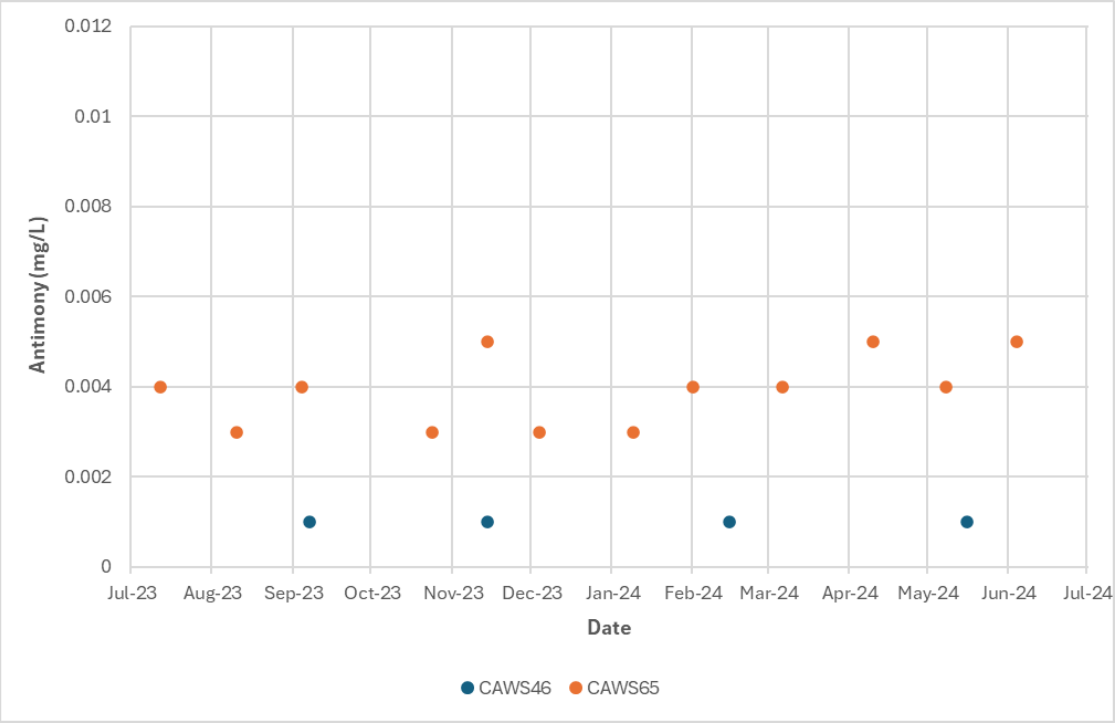


FIGURE A.24: CADIA HILL PIT MANAGEMENT ZONE FY24 ANTIMONY

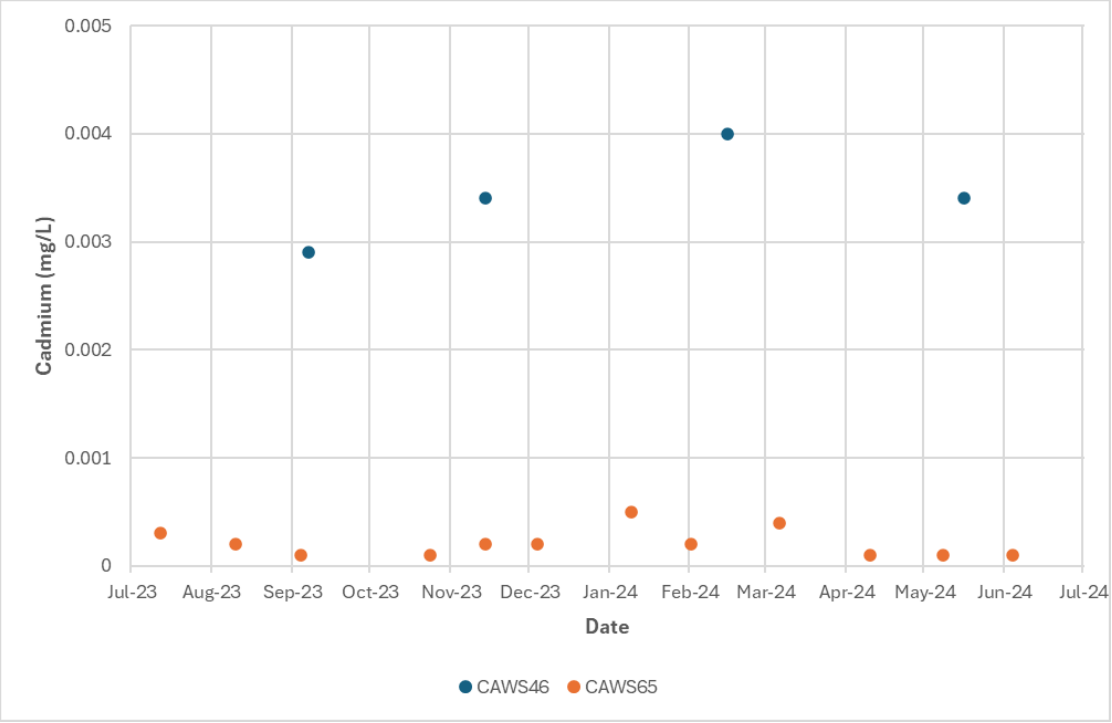


FIGURE A.25: CADIA HILL PIT MANAGEMENT ZONE FY24 CADMIUM

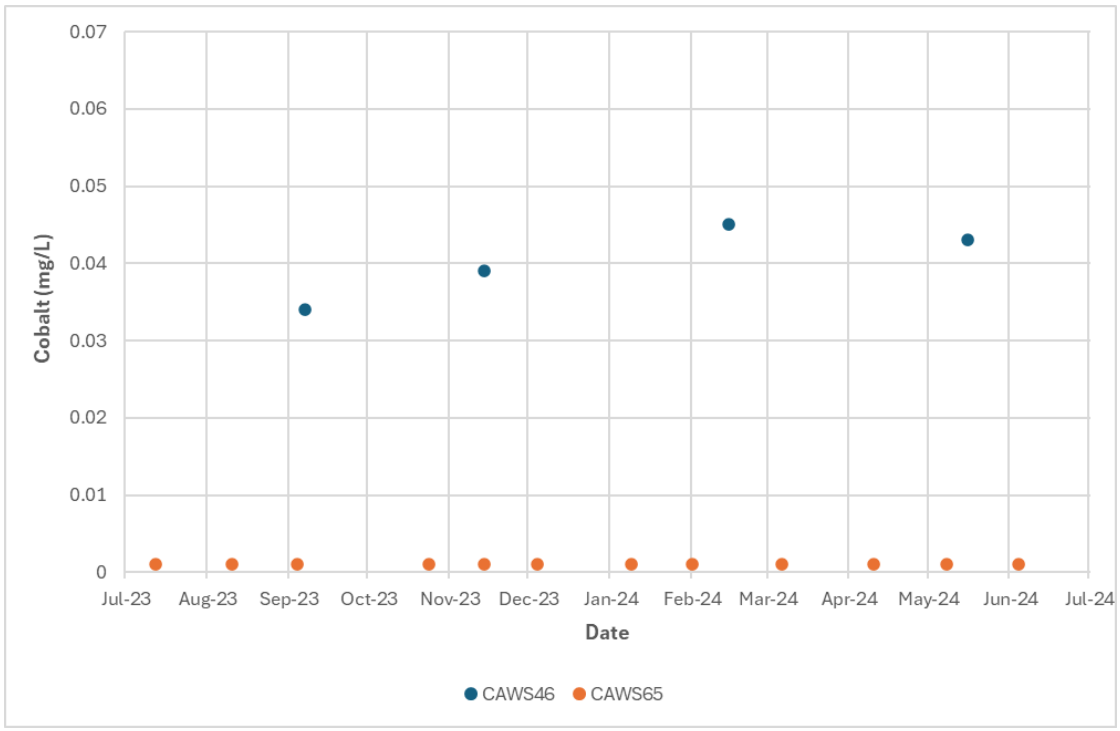


FIGURE A.26: CADIA HILL PIT MANAGEMENT ZONE FY24 COBALT

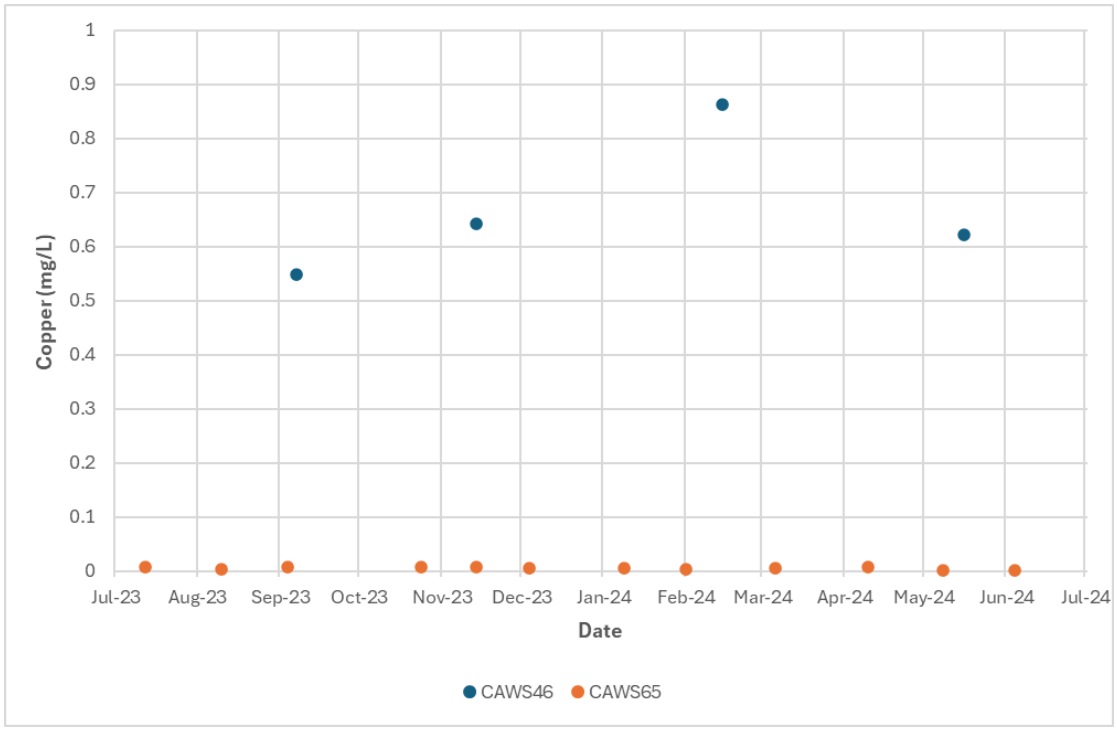


FIGURE A.27: CADIA HILL PIT MANAGEMENT ZONE FY24 COPPER

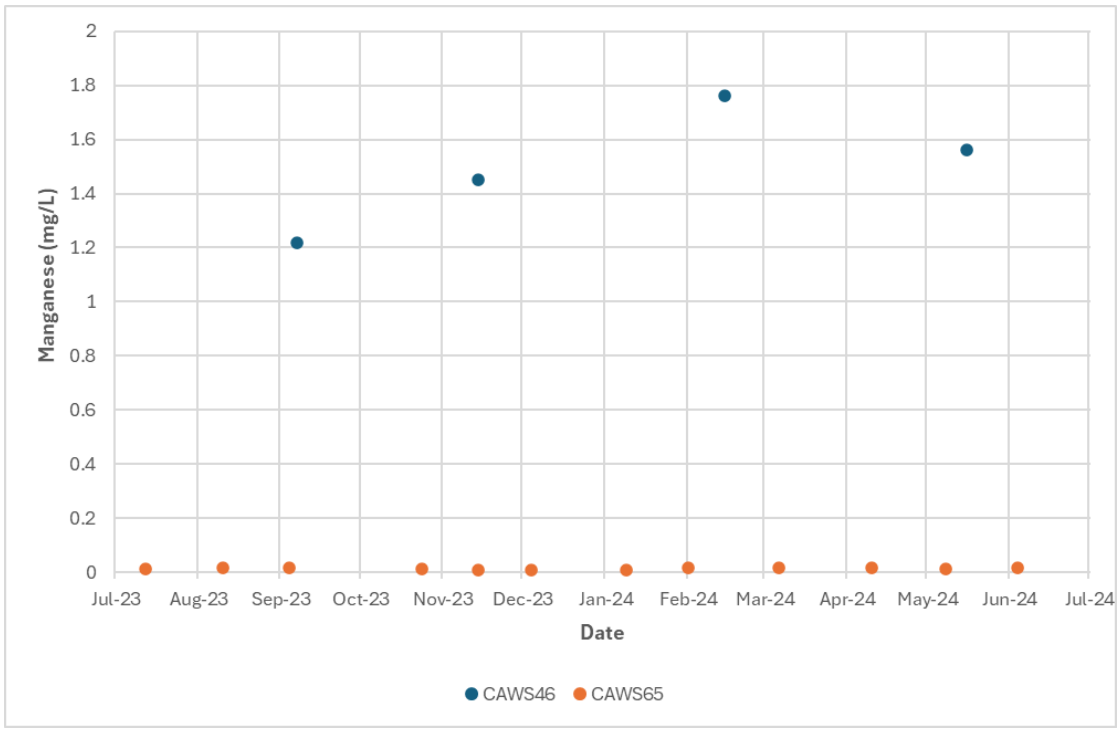


FIGURE A.28: CADIA HILL PIT MANAGEMENT ZONE FY24 MANGANESE

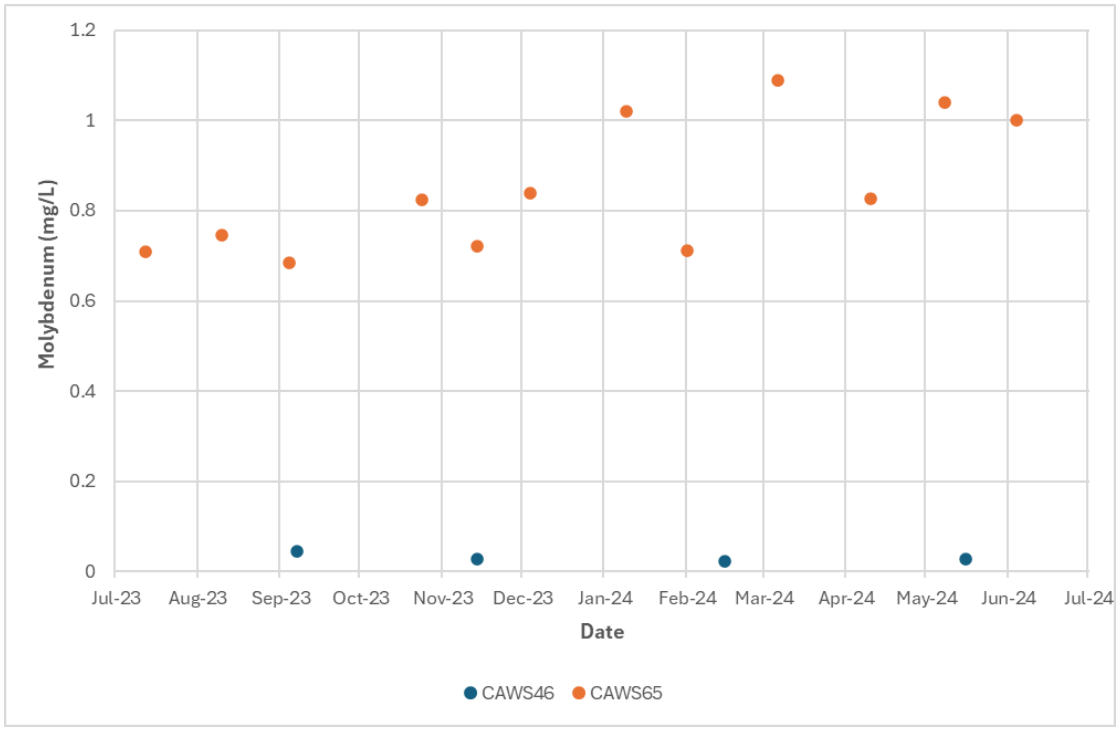


FIGURE A.29: CADIA HILL PIT MANAGEMENT ZONE FY24 MOLYBDENUM

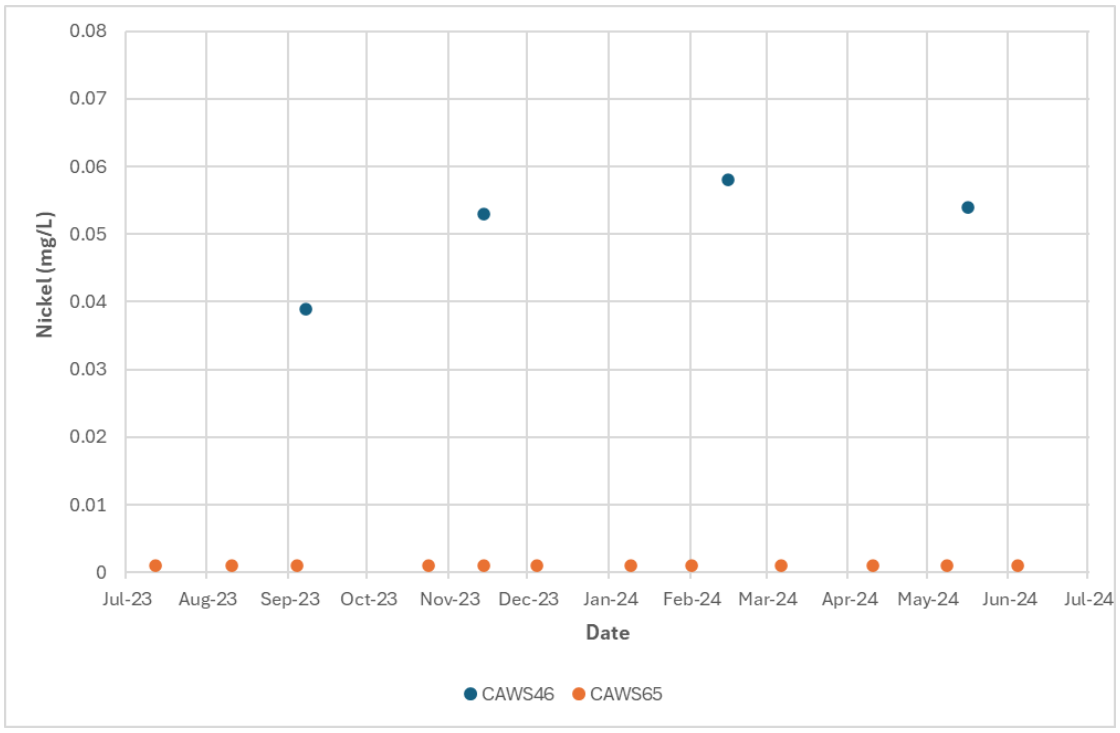


FIGURE A.30: CADIA HILL PIT MANAGEMENT ZONE FY24 NICKEL

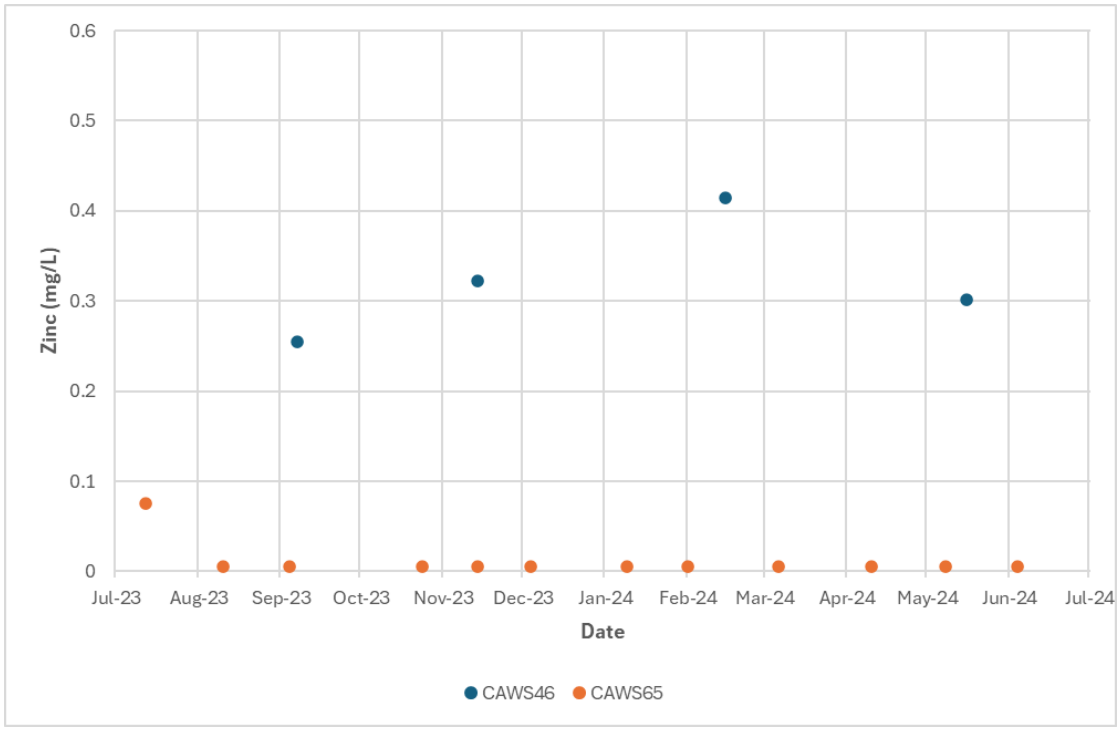


FIGURE A.31: CADIA HILL PIT MANAGEMENT ZONE FY24 ZINC

A.2.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the Cadia Hill Pit management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.1.1. Interpretation of long-term water quality trends in the Cadia Hill Pit management zone can be summarised as follows:

- Total nitrogen has decreased over time for both sites, particularly at CAWS46 located downslope from vegetated land on the northern section of the mine area and upslope from the PTSF (refer to Figure A.32).
- CAWS65 is located at the PTSF which is affected by the deposition and storage of tailings produced by mining operations. Various analytes including EC, TDS, calcium, chloride, potassium, sodium, and sulphate all follow a similar long-term trend with values beginning low at the end of 2018, peaking from the end of 2019 to the start of 2020 and reducing between the end of 2020 and start of 2023 before increasing again from mid-2023. Trends for the FY24 for these analytes are all noted in Section A.2.1, with the exception of chloride, which did not exhibit a strong trend over the duration of the reporting period. Long-term trends in EC at CAWS65 are shown in Figure A.33 as an example of the pattern many of the analytes sampled for at CAWS65 have exhibited over the long-term. Additional charts for all analytes of interest are provided in Appendix B.
- At CAWS46, dissolved metals including cadmium, cobalt, copper, manganese and nickel follow a similar long-term trend, decreasing from late 2020 and increasing again from late 2022 with the exception of copper, which has a less discernible decrease before increasing in late 2022. Long-term trends in cadmium are shown in Figure A.34 as an example of the pattern the listed dissolved metals sampled for at CAWS46 have exhibited over the long-term. Additional charts for all analytes of interest are provided in Appendix B.

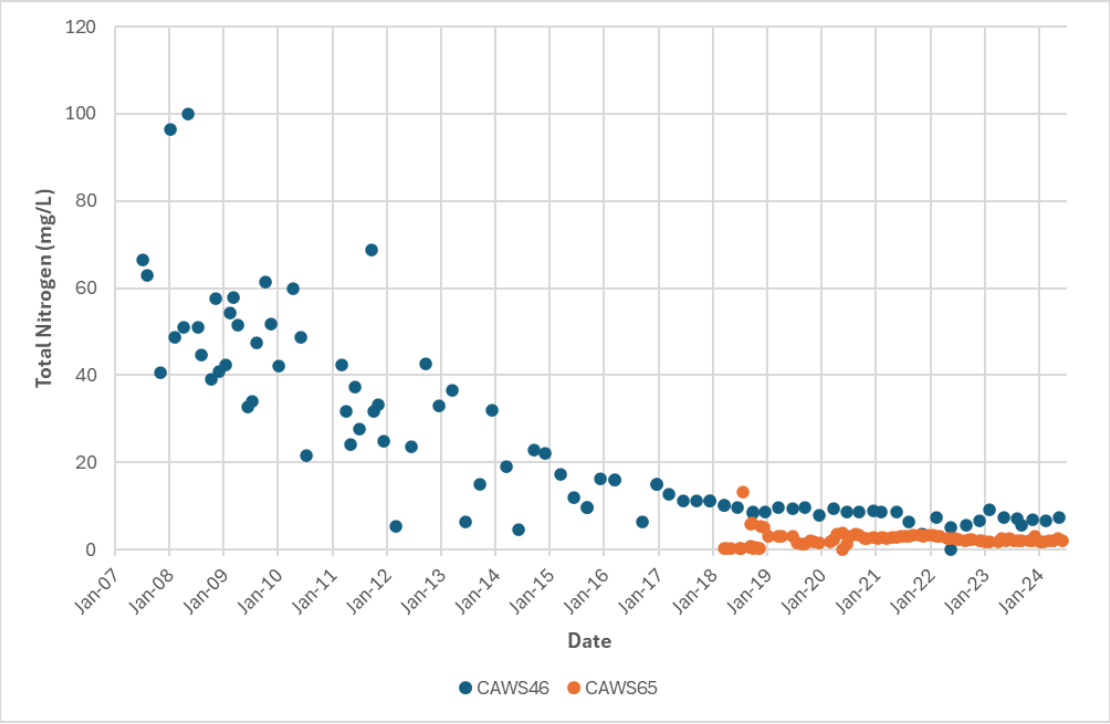


FIGURE A.32: CADIA HILL PIT MANAGEMENT ZONE LONG-TERM TREND IN TOTAL NITROGEN

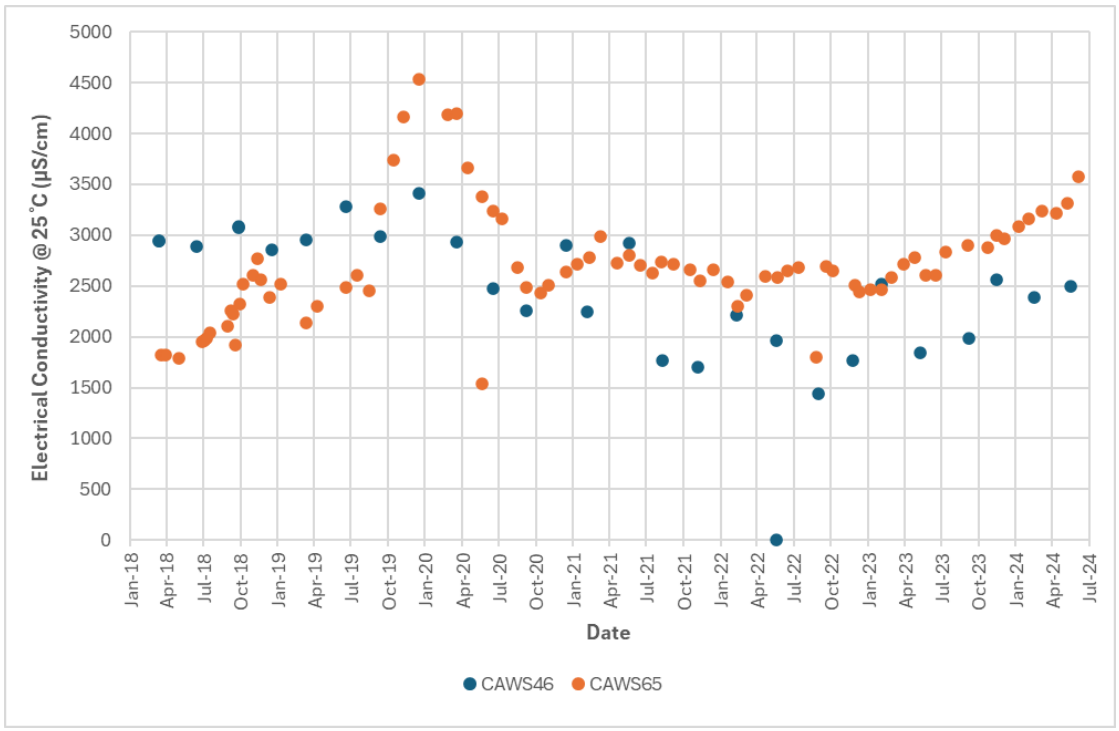


FIGURE A.33: CADIA HILL PIT MANAGEMENT ZONE LONG-TERM TREND IN EC

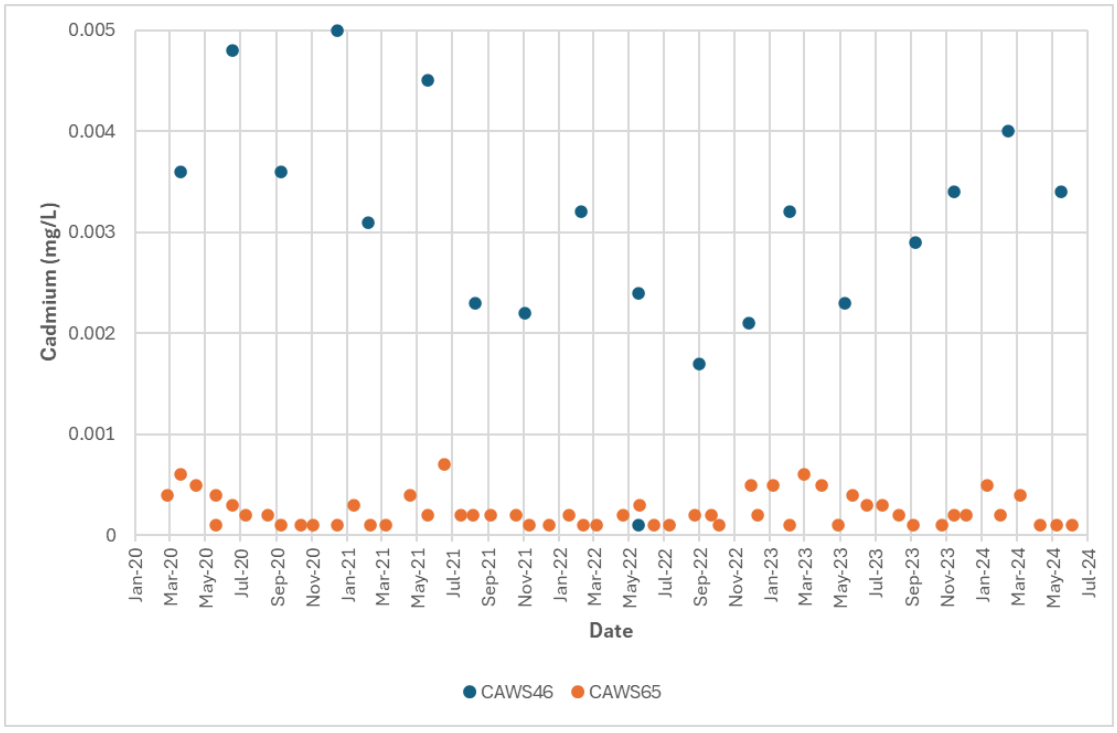


FIGURE A.34: CADIA HILL PIT MANAGEMENT ZONE LONG-TERM TREND IN CADMIUM

A.2.3 Summary and Recommendations

Surface water monitoring results for both monitoring locations in the Cadia Hill Pit management zone were generally consistent with historic monitoring data. Long-term trends and trends throughout the FY24 at CAWS65 are evident for EC, TDS, calcium, chloride, potassium, sodium and sulphate. It is likely that these trends are related to mineral deposition in the PTSF.

Results for several analytes appeared to exhibit a weak increasing trend throughout FY24 at CAWS46. These analytes include cobalt, copper, manganese, nickel and zinc. It should be noted that these increases appear to be the result of cyclic changes in water quality at the site over the long-term in which peaks and troughs are observed. Variation in the concentrations of these dissolved metals is minimal (both for FY24 and the longer term) and all results for these analytes are within the historic range and not considered to be or indicative of mining related impacts.

It is considered that no results from the management zone warrant the need for further investigation.

A.3 Ore Processing Area

The Ore Processing Area management zone is located on the western side of the Cadia Mine area and includes 3 surface water monitoring locations assessing the water quality impacts of the are processing area. Surface water monitoring locations in this zone are described in Table A.3. The purpose of each of the monitoring locations has been derived from location and environment related factors, and descriptions provided in the Cadia WMP (Newcrest, 2023).

TABLE A.3: ORE PROCESSING AREA MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
CAWS73	Located at the Site Runoff Pond downslope of the ore processing area and process water pond. Data is used to assess the water quality of rainfall runoff entering the pond from the ore processing area.
CAWS78	Located downstream of the ore processing area on Cadiangullong Creek. Data is used to monitor potential downstream water quality impacts primarily associated with the ore processing area.
CAWS79	Located upstream of the ore processing area on Cadiangullong Creek. Data is used as an upstream reference location for the impact of the ore processing area on water quality.

A.3.1 FY24 Water Quality Review

Analysis of the surface water quality monitoring analytes for the Ore Processing Area management zone are provided below. There are no SSGVs for monitoring locations in this management zone, thus, no comparison to SSGVs has been made.

A.3.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the Ore Processing Area management zone can be interpreted as follows:

- **pH** – Results for pH were variable, with peak historical values recorded at all monitoring locations during the reporting period (refer to Figure A.35). One data point has been discarded for CAWS73. A pH value of 16.36 was recorded on 13 February 2024 which is considered an error. Peak pH values were recorded for CAWS73 on 14 November 2023 (9.66), for CAWS79 on 27 October 2023 (8.3), and for CAWS78 on 30 October 2023 (8.45). These results are only slightly above the historic range. Following these occurrences all sites returned results that were more in line with the historic averages for the sites.
- **Electrical Conductivity** – Results indicate stable EC results for both CAWS78 and CAWS79 and a slight increasing trend for CAWS73 throughout the reporting period (refer to Figure A.36). Like calcium, magnesium, potassium, sodium, and sulphate at CAWS73, this is a continuation of an increasing trend starting at the end of 2020. A long-term trend of peaks and troughs is also identified at CAWS79 and CAWS78 (refer to Section A.3.2), similarly to analytes calcium, magnesium, sulphate, chloride and manganese at this location. All results recorded for FY24 lie within the historical range.

- **Total Suspended Solids** – Results for TSS did not demonstrate any trends for any of the monitoring locations during the reporting period. The majority of values for CAWS79 and CAWS79 were recorded below the limit of detection (<5 mg/L). Values for CAWS73 were variable during FY24 but remained within the historic range for the site. No long-term trends are evident for any of the monitoring locations and all results recorded for FY24 lie within the historical range.
- **Total Dissolved Solids** – Results for TDS demonstrated a stable range of results consistent with historical data at CAWS78 and CAWS79 and a slight increase in values recorded at CAWS73 over the duration of the reporting period (refer to Figure A.37). This is a continuation of a long-term trend starting in late 2022 and peaking in the current period at 2770 mg/L recorded 16 May 2024. Results recorded for FY24 lie within the historical range.
- **Alkalinity** – Results for alkalinity are consistent with historical data at all monitoring locations within the Ore Processing Area management zone. All results recorded for FY24 lie within the historical range.
- **Oxidation reduction potential** – Results for ORP demonstrated no trends and are consistent with historical data at both CAWS78 and CAWS79. Values at CAWS73 were also consistent with the exception of a peak reading of 430 mV on 13 February 2024. This increase in ORP is potentially the result of approximately 62 mm of rainfall occurring during the fortnight prior to the reading. Previous peaks in ORP such as that seen on 3 November 2022 (308 mV) have also followed significant rainfall (153 mm in the fortnight prior). No long-term trends are evident for any of the sites and all results recorded for FY24 lie within the historical range.

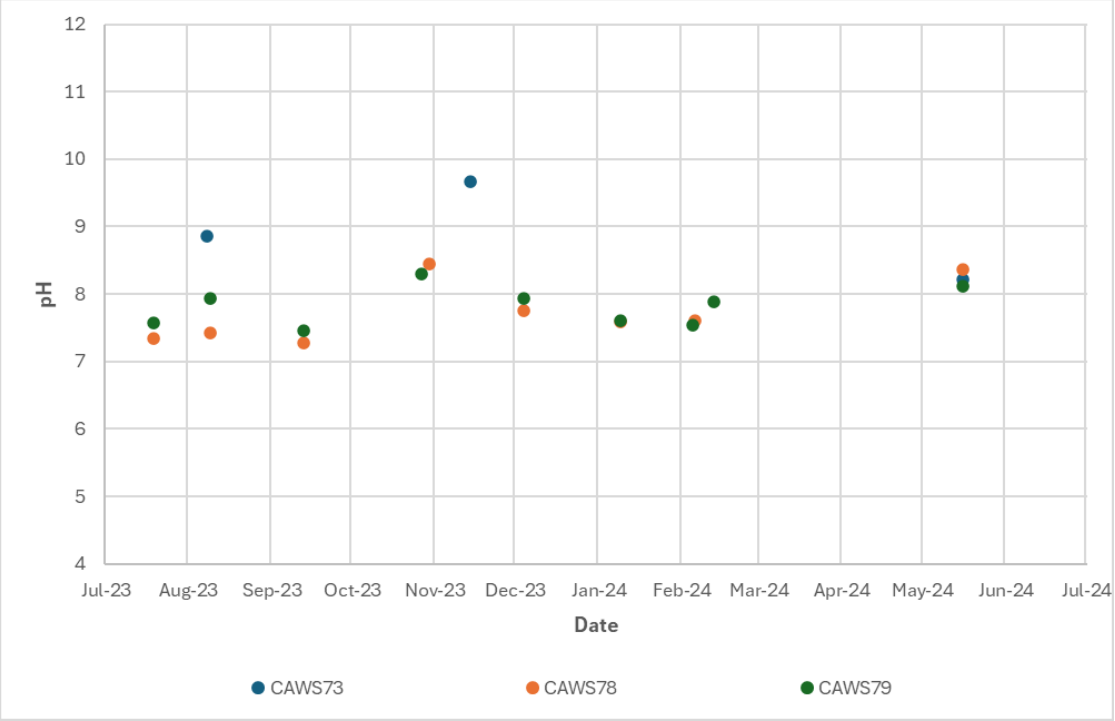


FIGURE A.35: ORE PROCESSING AREA MANAGEMENT ZONE FY24 PH

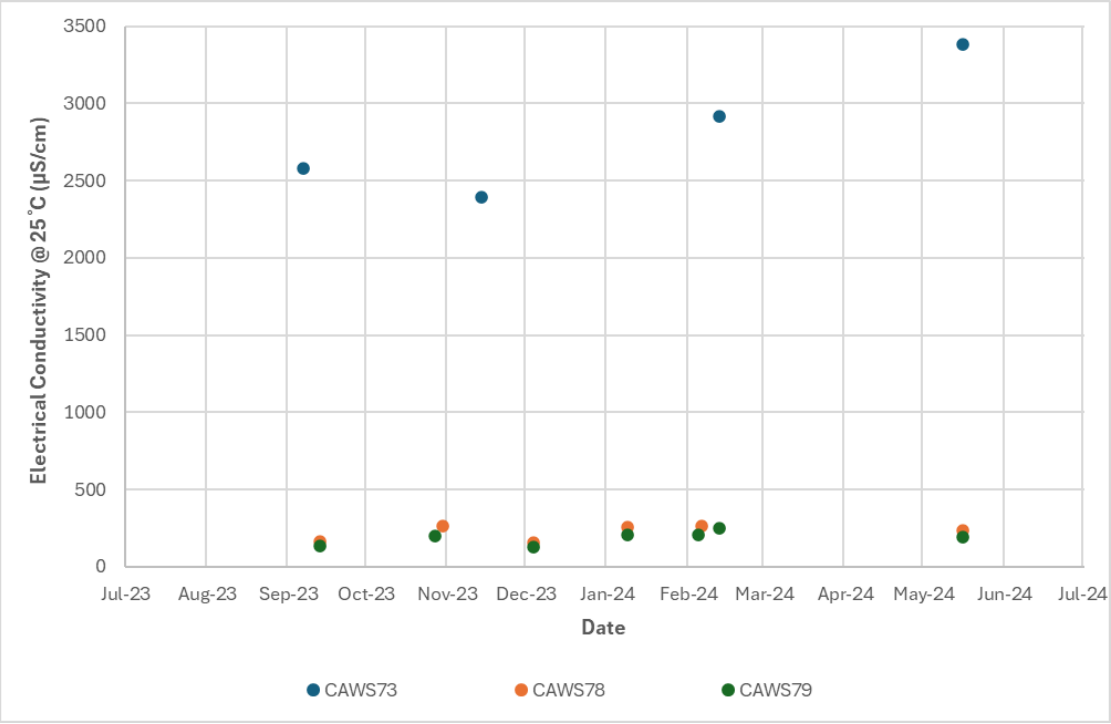


FIGURE A.36: ORE PROCESSING AREA MANAGEMENT ZONE FY24 EC

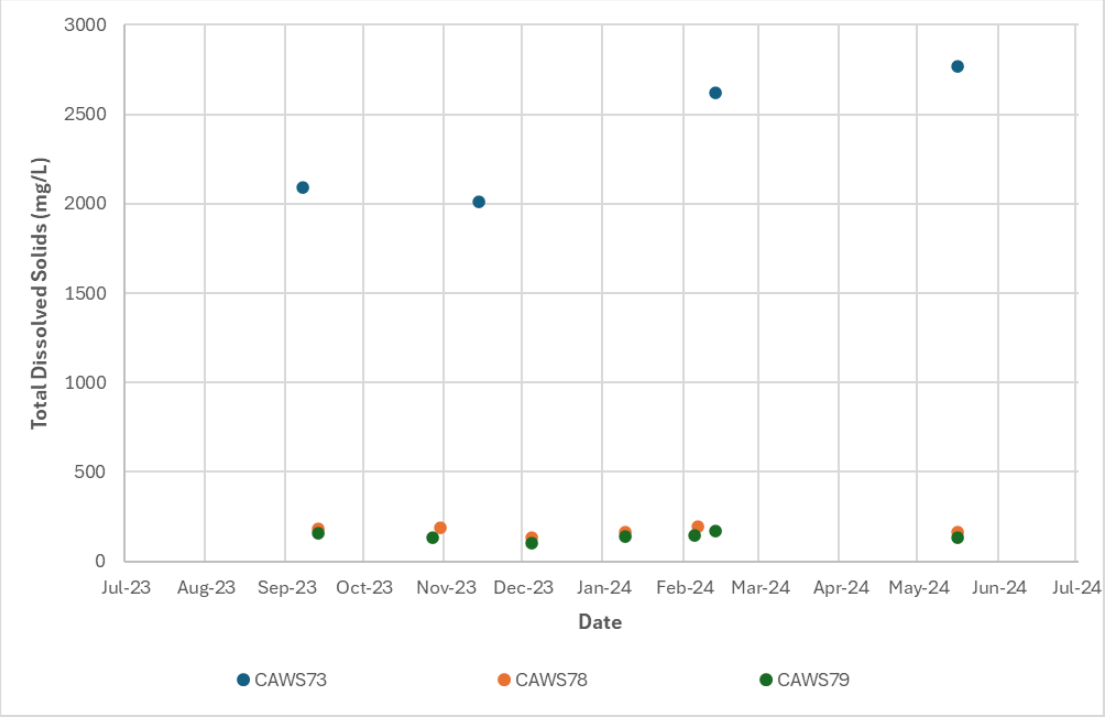


FIGURE A.37: ORE PROCESSING AREA MANAGEMENT ZONE FY24 TDS

A.3.1.2. Nutrients

Surface water quality monitoring results for nutrients for the Ore Processing Area management zone can be interpreted as follows:

- **Nitrate** – Results indicate no trends for nitrate at any monitoring locations during the reporting period. Results for both CAWS78 and CAWS79 were stable below 0.5 mg/L with most readings at CAWS79 falling below the limit of detection (<0.01 mg/L). Values at CAWS73 were variable but still within the historic range for the location. All results for FY24 lie within the historic range and there are no outliers.
- **Nitrite** – Results indicate no trends for nitrate at any monitoring locations during the reporting period. All values for CAWS78 and CAWS79 were at or below the limit of detection (<0.01 mg/L). No long-term trends are evident for any of the monitoring and all results recorded for FY24 are within the historic range.
- **Total Nitrogen** – Results for total nitrogen were consistent with historic data at all monitoring locations in the Ore Processing Area management zone. All results for FY24 are within the historic range and there are no emerging trends or outliers.
- **Total Phosphorus** – Results for total phosphorous were consistently low and in line with historical data for CAWS78 and CAWS79, and values for CAWS73 followed an increasing trend over the duration of the monitoring period (refer to Figure A.38). This is the continuation of a long-term trend of increasing variation in total phosphorous at CAWS73. All results for FY24 lie within the historical range.

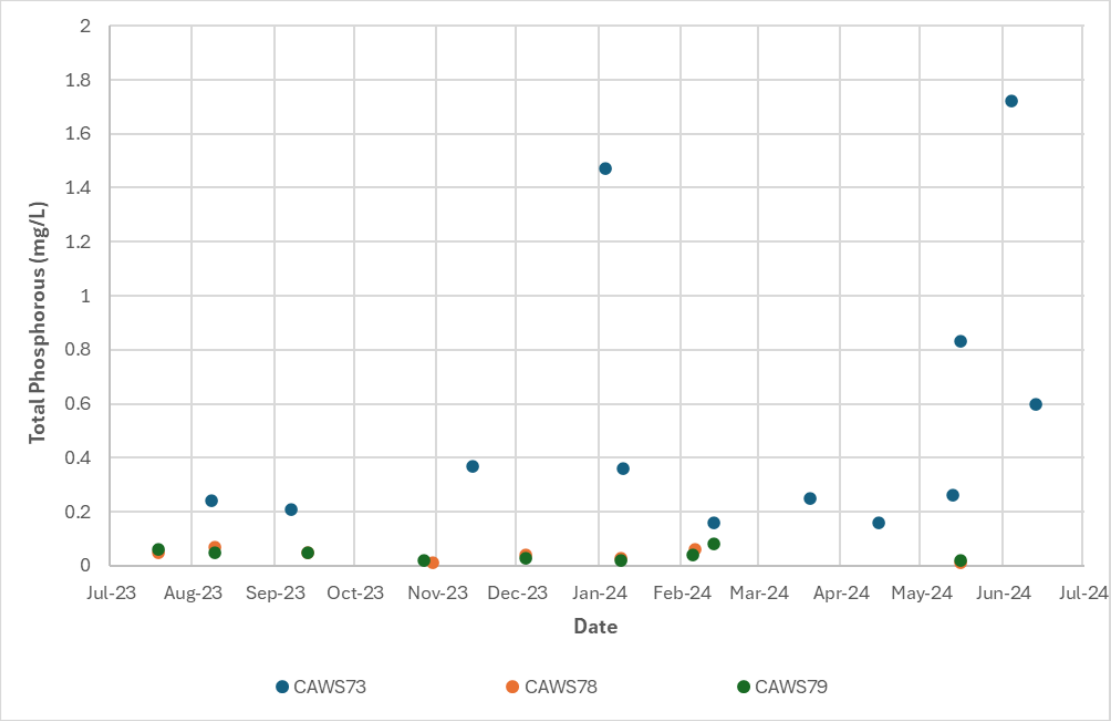


FIGURE A.38: ORE PROCESSING AREA MANAGEMENT ZONE FY24 TOTAL PHOSPHOROUS

A.3.1.3. Major Ions

Surface water quality monitoring results for major ions for the Ore Processing Area management zone can be interpreted as follows:

- **Calcium** – Results for calcium are consistent with historical results for CAWS78 and CAWS79 with a slight increasing trend for CAWS73 over the duration of the reporting period (refer to Figure A.39). Like magnesium, potassium, sodium, sulphate, and EC at CAWS73, this is a continuation of a long-term trend increasing since the end of 2020. A long-term trend of peaks and troughs is also identified at CAWS79 and CAWS78 (refer to Section A.3.2), like EC, magnesium, sulphate, chloride and manganese at these locations. All results recorded for FY24 lie within the historic range and there are no outliers.
- **Chloride** – Results for chloride during FY24 were consistent with historic results and no outliers are evident. A long-term increasing trend can be observed at CAWS73 (refer to Section A.3.2).
- **Magnesium** – Results for magnesium are consistent throughout the reporting period at all monitoring locations, demonstrating no significant variation during FY24. Historical trends can be seen for CAWS73 increasing since 2020 similarly to calcium, potassium, sodium, sulphate, and EC, and for CAWS78 and CAWS79 in peaks and troughs similarly to EC, calcium, chloride, potassium, sodium, sulphate, and manganese (refer to Section A.3.2). All results recorded for FY24 lie within the historical range.

- **Potassium** – Results for potassium are consistently low and in line with historical results for CAWS78 and CAWS79. A slight increasing trend occurred at CAWS73 over the duration of the reporting period (refer to Figure A.40). Similarly to calcium, magnesium, sodium, sulphate, and EC, this is a continuation of a long-term trend increasing since the end of 2020. All results recorded for FY24 lie within the historical range.
- **Sodium** – Results for sodium are consistent with historical results for CAWS78 and CAWS79 with a slight increasing trend for CAWS73 over the duration of the reporting period (refer to Figure A.41). Like calcium, magnesium, potassium, sulphate, and EC at CAWS73, this is a continuation of a historical trend increasing since the end of 2020. A long-term trend of peaks and troughs is also identified at CAWS79 and CAWS78 in Section A.3.2, similarly to analytes EC, calcium, magnesium, sulphate, chloride, sodium and manganese. All results recorded for FY24 lie within the historical range.
- **Sulphate** – Results for sulphate are consistent with historical results for CAWS78 and CAWS79 with a slight increasing trend for CAWS73 over the duration of the reporting period (refer to Figure A.42). Like calcium, magnesium, potassium, sodium, and EC at CAWS73, this is a continuation of a long-term trend increasing since the end of 2020. A long-term trend of peaks and troughs is also identified at CAWS79 and CAWS78 in Section A.3.2, similarly to analytes EC, calcium, chloride, magnesium, potassium, sodium, and manganese. All results recorded for FY24 lie within the historical range.

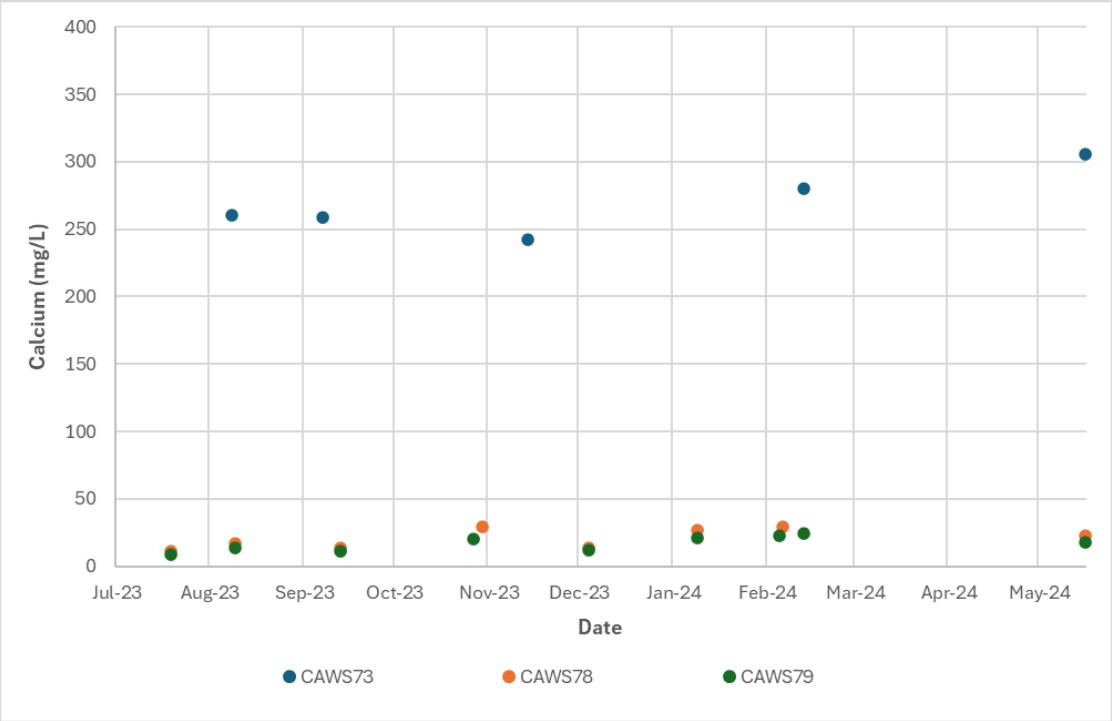


FIGURE A.39: ORE PROCESSING AREA MANAGEMENT ZONE FY24 CALCIUM

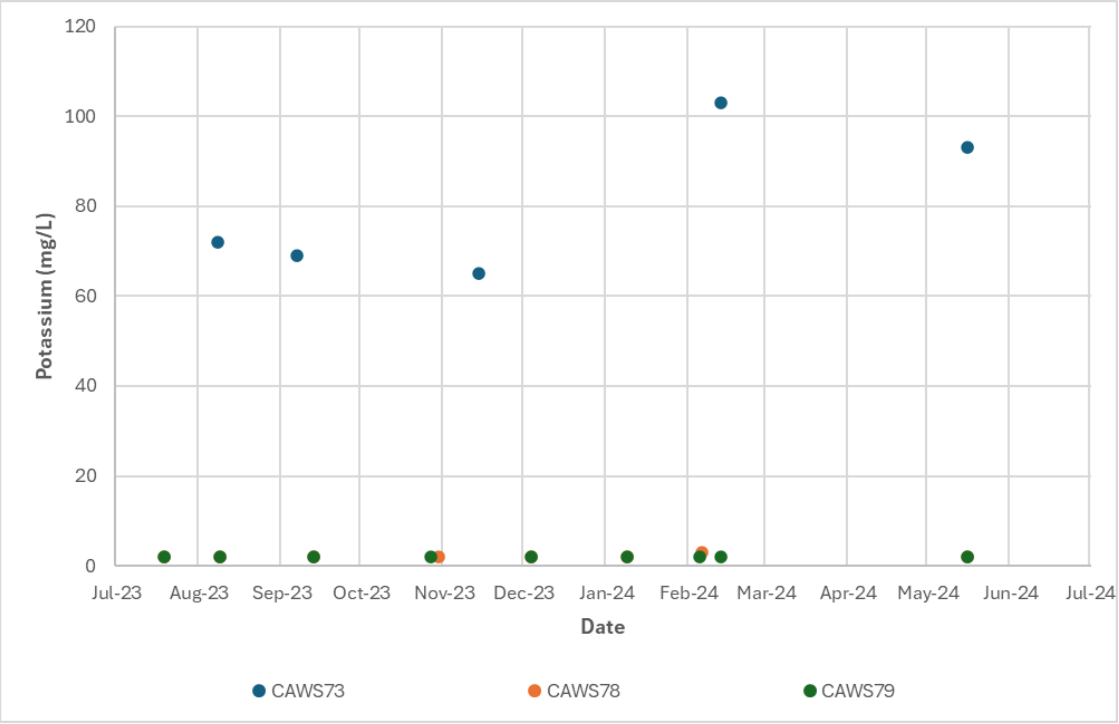


FIGURE A.40: ORE PROCESSING AREA MANAGEMENT ZONE FY24 POTASSIUM

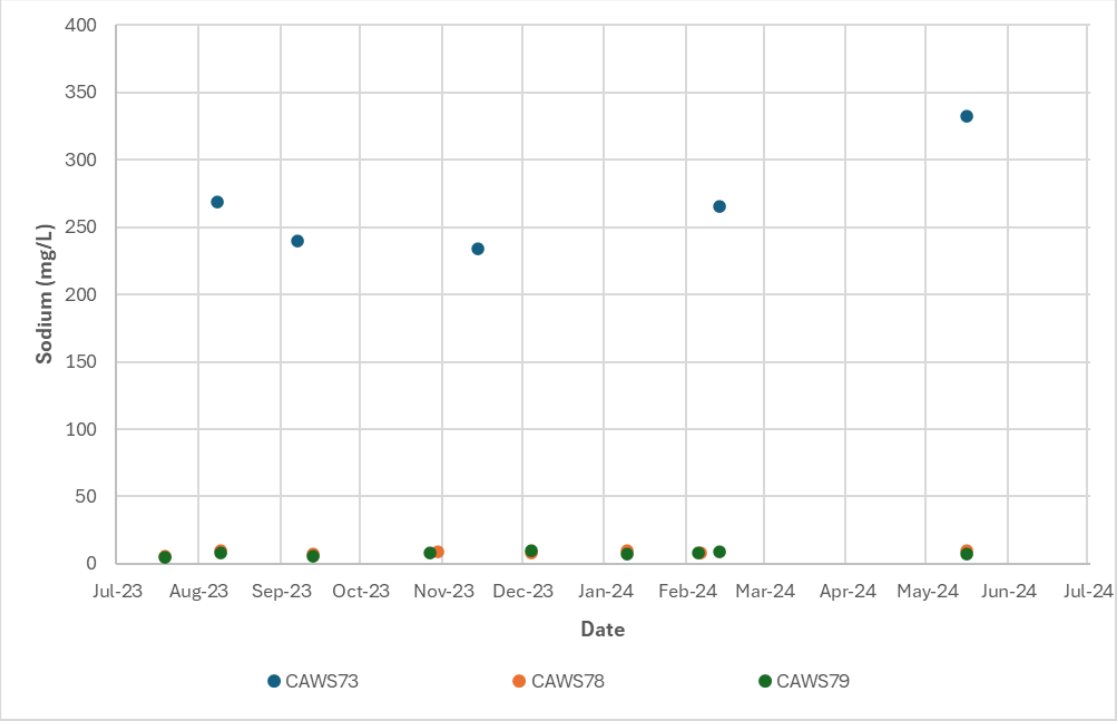


FIGURE A.41: ORE PROCESSING AREA MANAGEMENT ZONE FY24 SODIUM

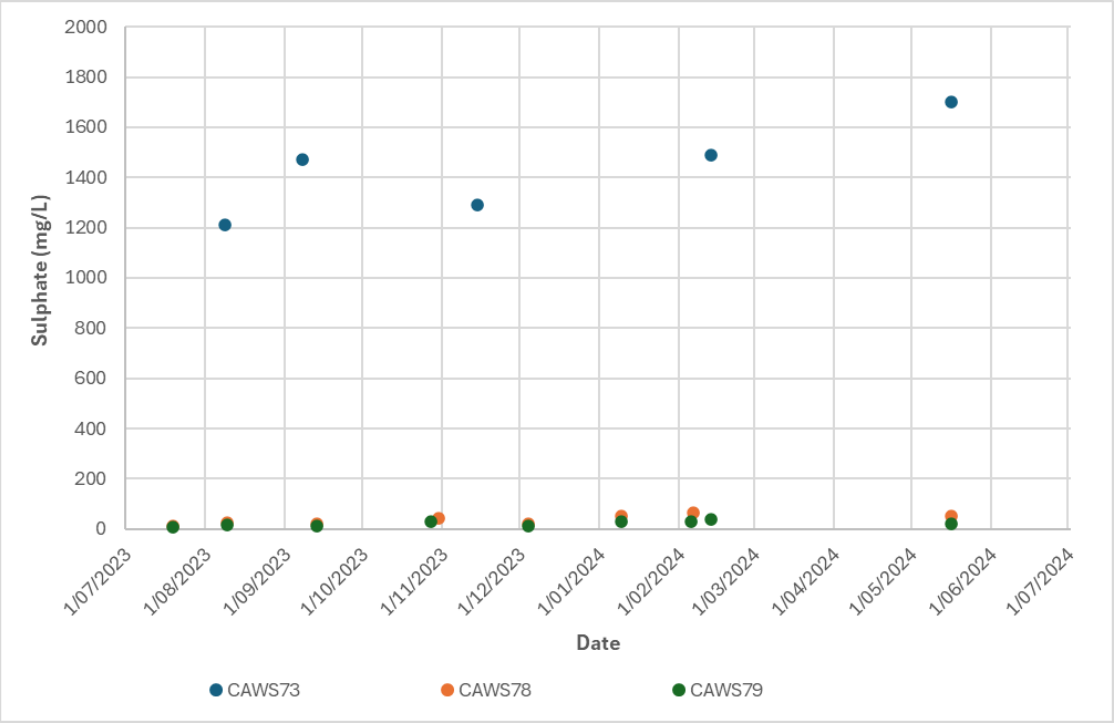


FIGURE A.42: ORE PROCESSING AREA MANAGEMENT ZONE FY24 SULPHATE

A.3.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the Ore Processing Area management zone can be interpreted as follows:

- **Aluminium** – Results indicate no trends for any monitoring locations during the reporting period, with CAWS73 demonstrating consistently low values throughout the historical data. All results lie within the historical range.
- **Antimony** – Results indicate no trends for antimony at any monitoring locations during the reporting period. A long-term increasing trend is evident at CAWS73 (refer to Section A.3.2). All results at CAWS78 and CAWS79 were recorded below the limit of detection (<0.001 mg/L) during FY24. All results lie within the historical range.
- **Arsenic** – Results indicate no trends for arsenic at any monitoring locations during the reporting period. A long-term increasing trend is evident at CAWS73 (refer to Section A.3.2). All results at CAWS78 and CAWS79 were recorded below the limit of detection (<0.001 mg/L) during FY24. All results lie within the historical range.
- **Cadmium** – Results indicate no trends for cadmium at any monitoring locations during the reporting period. All results at CAWS78 and CAWS79 were recorded below the limit of detection (<0.0001 mg/L) during FY24. All results lie within the historical range.
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Cobalt** – Results for cobalt at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Copper** – Results for copper were variable between monitoring locations with no trends evident over the duration of the reporting period. All results lie within the historical range and there are no emerging trends for copper.
- **Iron –** No trends for iron are evident over the duration of the reporting period. Iron values at CAWS73 were consistently below the limit of detection (<0.05 mg/L) and those at CAWS78 and CAWS79 had greater ranges but remained consistent with recent historical values. All results recorded for FY24 lie within the historical range.
- **Lead** – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Manganese** –A long-term trend of peaks and troughs for manganese identified at CAWS79 and CAWS78 is discussed in Section A.3.2. All results recorded for FY24 lie within the historical range and there are no outliers.

- **Mercury** – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Molybdenum** – Results for molybdenum were variable between monitoring locations demonstrating low values in line with historic data at CAWS78 with a slight increasing trend observed at CAWS73 over the duration of the reporting period (refer to Figure A.43). This is the continuation of a long-term trend since January 2016. A value recorded on 16 May 2024 (0.921 mg/L) is the highest value recorded for CAWS73. Consistently low molybdenum values were also observed at CAWS79 with a peak observed on 5 February 2024 at 0.01 mg/L that accounts for the highest recorded value at that site.
- **Nickel** – Results for nickel at all monitoring locations were consistently at or below the limit of detection (0.001 mg/L) for the duration of the reporting period.
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Zinc** – The majority of results for zinc were below the limit of detection (<0.005 mg/L) at CAWS73 and CAWS78 for the duration of the reporting period. Values at CAWS79, while not following a distinct trend, demonstrated an increase in variation towards the end of FY24, with the highest recorded value of 0.099 mg/L observed on 27 October 2023.

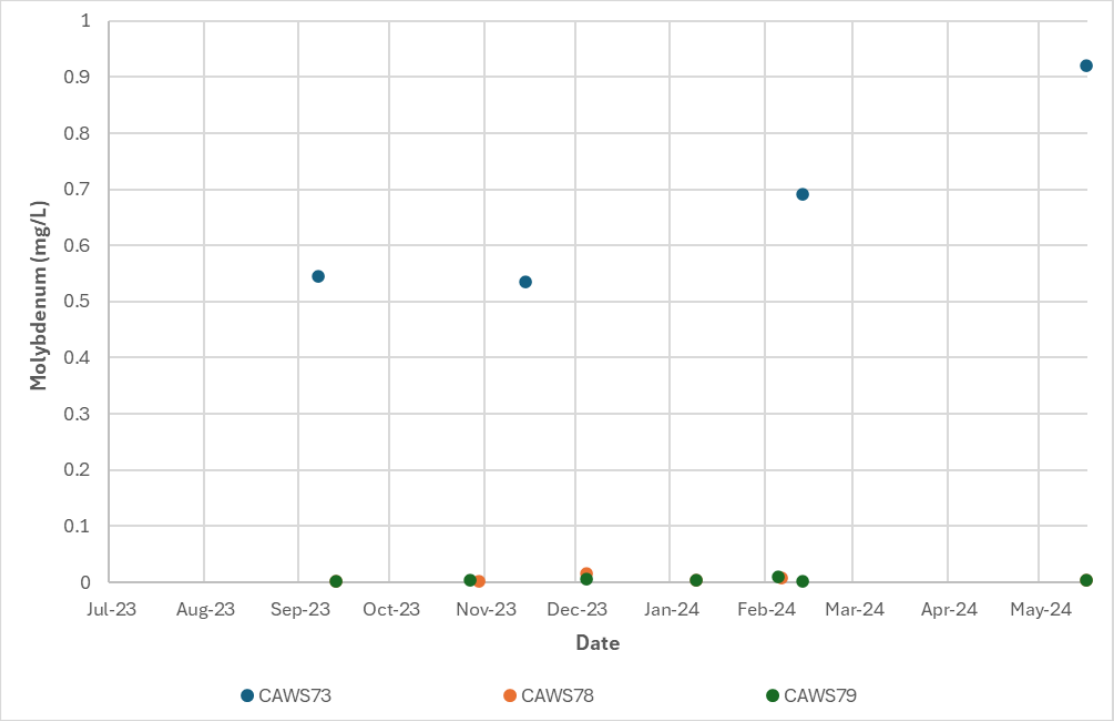


FIGURE A.43: ORE PROCESSING AREA MANAGEMENT ZONE FY24 MOLYBDENUM

A.3.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the Ore Processing Area management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.1.1. Interpretation of long-term water quality trends in the Ore Processing Are management zone can be summarised as follows:

- Total phosphorous at CAWS73, located at the Site Runoff Pond downslope from the Ore Processing Area, has increased over time since late 2011 (refer to Figure A.44). This increase may be a result of runoff entering the storage from the waste rock dump area but the cause of the increase remains unclear.
- CAWS73 has also demonstrated a consistent increase in calcium, magnesium, sodium, sulphate, and EC since 2020 (refer to Figure A.45 as an example) and in molybdenum since 2016, with a more rapid increase occurring since late 2022 (refer to Figure A.46). Chloride has shown peaks and troughs with a consistent increase since the end of 2022 (refer to Figure A.47).

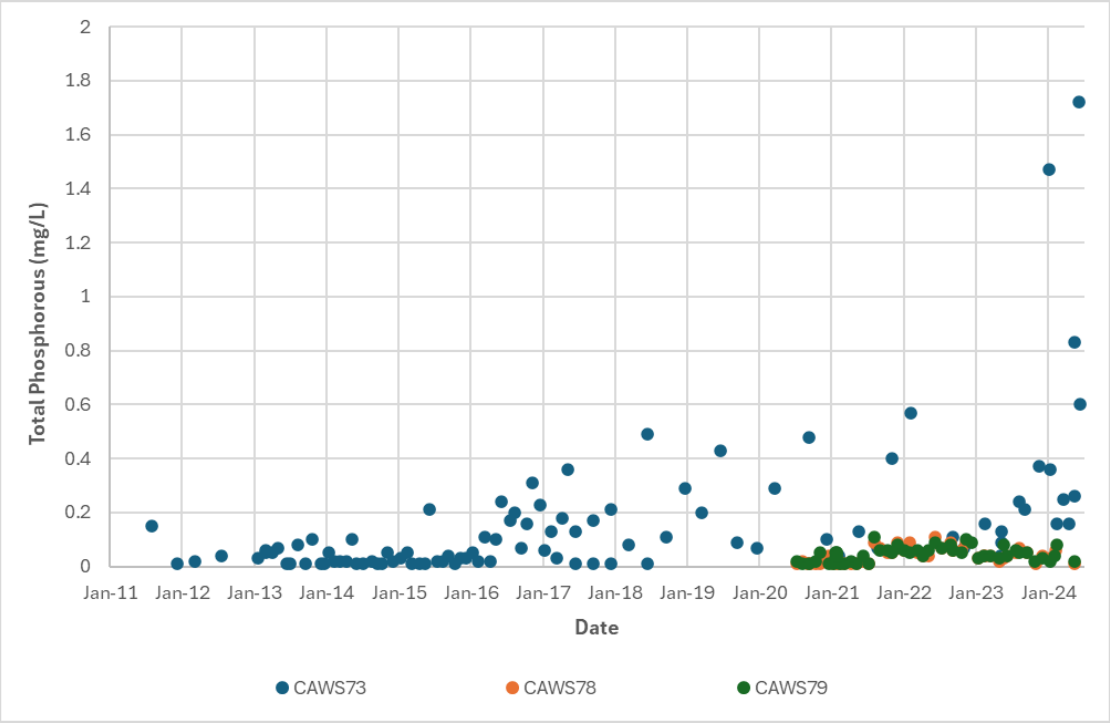


FIGURE A.44: ORE PROCESSING AREA MANAGEMENT ZONE LONG-TERM TREND IN TOTAL PHOSPHOROUS

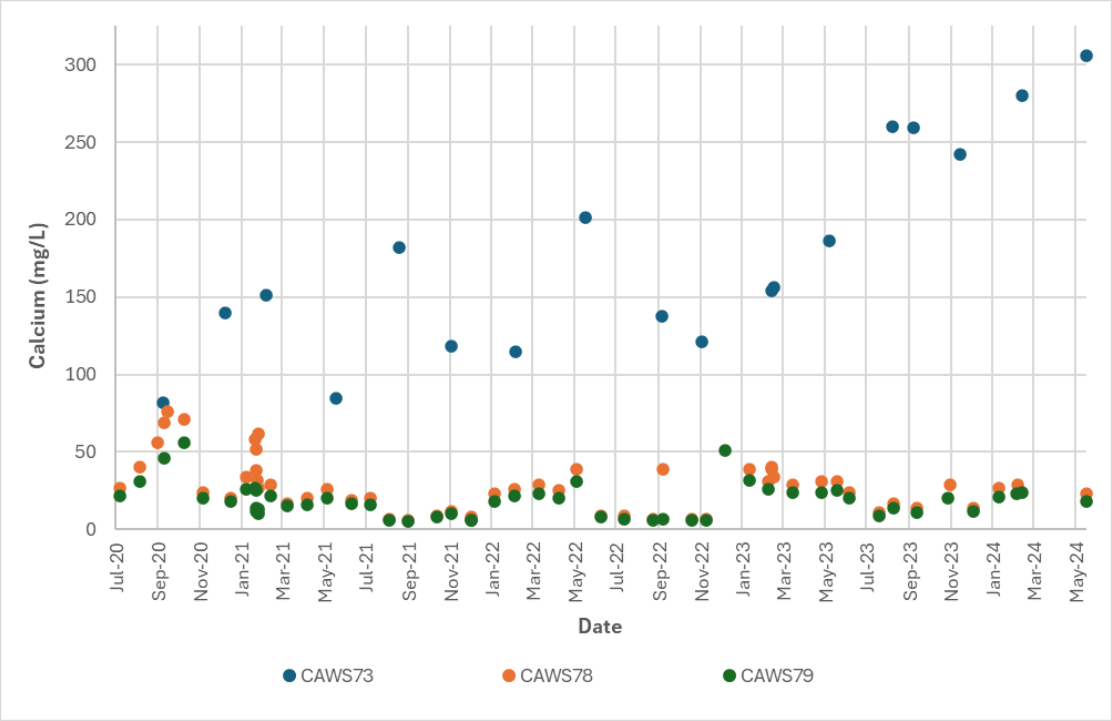


FIGURE A.45: ORE PROCESSING AREA MANAGEMENT ZONE LONG-TERM TREND IN CALCIUM

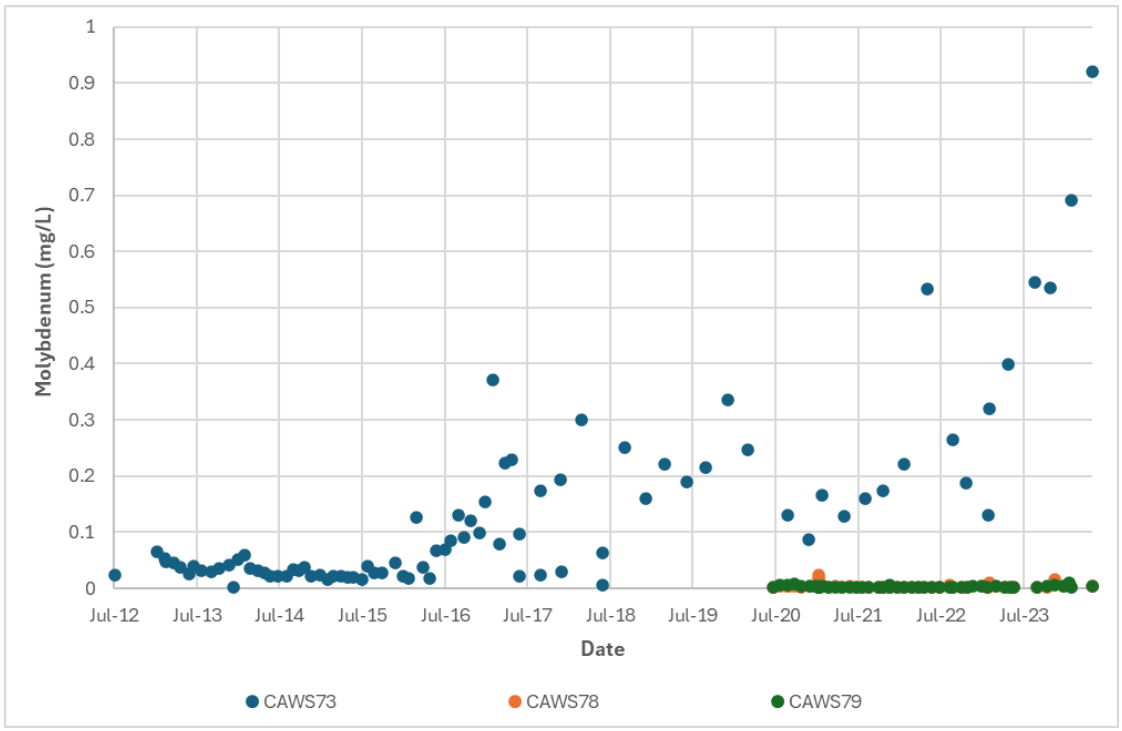


FIGURE A.46: ORE PROCESSING AREA MANAGEMENT ZONE LONG-TERM TREND IN MOLYBDENUM

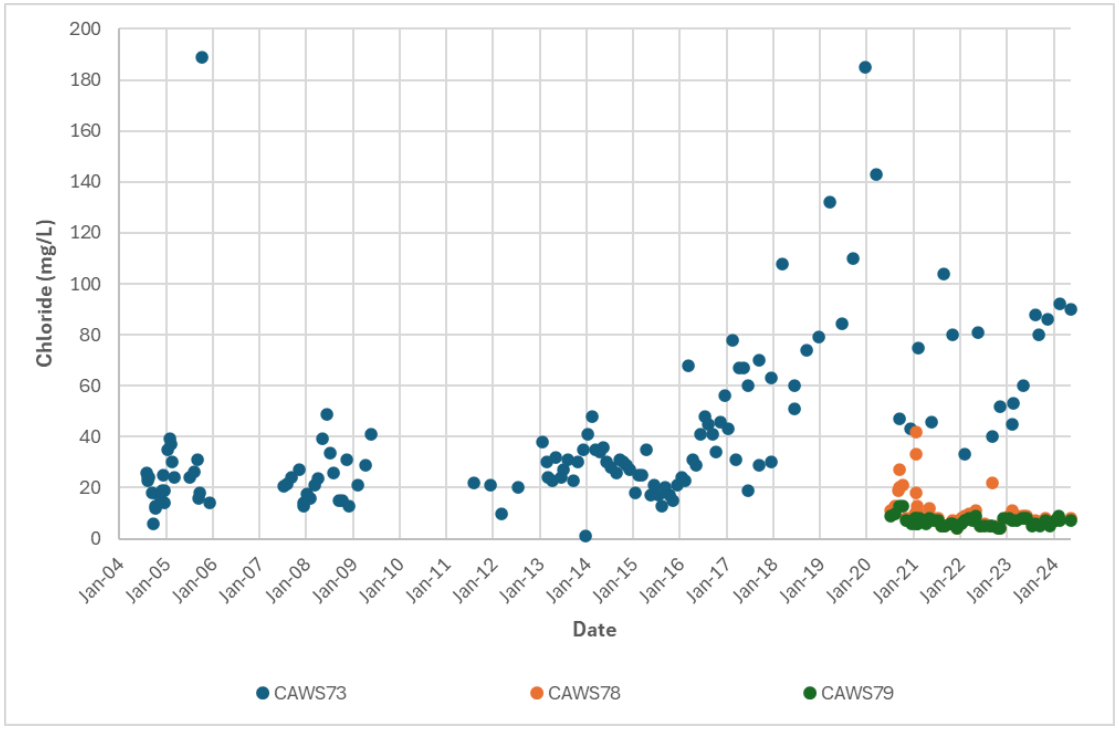


FIGURE A.47: ORE PROCESSING AREA MANAGEMENT ZONE LONG-TERM TREND IN CHLORIDE

A.3.3 Summary and Recommendations

Surface water monitoring results for all locations in the Ore Processing Area management zone were generally consistent with historic monitoring data during FY24. Long-term trends are evident for alkalinity, total phosphorus, calcium, chloride molybdenum, EC, nickel, magnesium, manganese, sodium and sulphate at CAWS73. Trends for FY24 were also seen for these analytes with the exception of chloride at CAWS73.

The CAWS73 monitoring location is located at the Site Runoff Pond. The upstream catchment reporting to the Site Runoff Pond is a dynamic waste rock dump. Increasing trends observed at CAWS73 are not reflected at the receiving environment monitoring locations (CAWS78 and CAWS79) for Cadiangullong Creek. Thus, results from the Ore Processing Area management zone do not indicate mining related impacts in the receiving environment. It is considered that no results from the management zone warrant the need for further investigations.

A.4 Waste Rock Dumps

The Waste Rock Dumps management zone is comprised of 5 surface water monitoring locations. Surface water monitoring locations in this management zone are described in Table A.4. The purpose of each of the monitoring locations has been derived from location and environment related factors, and descriptions provided in the Cadia WMP (Cadia, 2023).

TABLE A.4: WASTE ROCK DUMP MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
412161	Located in Cadiangullong Creek downstream of the waste rock dumps and monitoring locations CAWS34, CAWS35, and CAWS37. Used to assess water quality on Cadiangullong Creek and monitor for potential impacts from the mining operation.
CAWS34	Used to monitor changes in water quality in the Northern Leachate Dam.
CAWS35	Used to monitor changes in water quality in the Southern Leachate Dam.
CAWS37	Used to monitor changes in water quality in the H19 sediment dam.
CAWS52	Located at Rodds Creek Dam. Provides assessment of water quality in the dam.

A.4.1 FY24 Water Quality Review

Analyses of the surface water quality monitoring suites for the Waste Rock Dumps management zone are provided below. It should be noted that there are no SSGVs for locations in this management zone, therefore, there are no exceedances.

A.4.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the Waste Rock Dumps management zone can be interpreted as follows:

- **pH** – All results for pH for FY24 are within the historic range. There are no emerging trends or outliers.
- **Electrical Conductivity** – All results for EC during FY24 were within the historic range. A slight increasing trend at CAWS52 throughout the reporting period (refer to Figure A.48). This is the continuation of a historical tend increasing since the end of 2021.
- **Total Suspended Solids** – Results for TSS at all monitoring locations were consistently below the limit of detection (<5 mg/L) for the duration of the reporting period with the exception of one reading at CAWS37. This value of 32 mg/L recorded on 15 November 2023 could be the result of approximately 27 mm of rain received during the fortnight prior or sediment disruption during sampling. All results recorded for FY24 lie within the historical range.

- **Total Dissolved Solids** – Results indicate stable TDS results at most monitoring location, with CAWS34 and CAWS35 showing a slight increasing trend over the duration of the reporting period (refer to Figure A.49). One long-term trend was identified for CAWS52 similar to that demonstrated by EC at the same site (refer to Section A.4.2). All results recorded for FY24 lie within the historical range.
- **Alkalinity** – Results indicate stable alkalinity results at most monitoring locations, with CAWS37 showing a slight increasing trend, and CAWS52 showing slight decreasing trend over the duration of the reporting period (refer to Figure A.50). The latter is the continuation of a long-term deceasing trend beginning in late 2021 (refer to Section A.4.2). All results recorded for FY24 lie within the historical range and no outliers were observed.
- **Oxidation reduction potential** – All results for ORP were within the historic range during FY24. Some low ORP values were observed at CAWS52 at the start of January 2024 but results in recent months have returned to concentrations more in line with the historic average for the monitoring location.

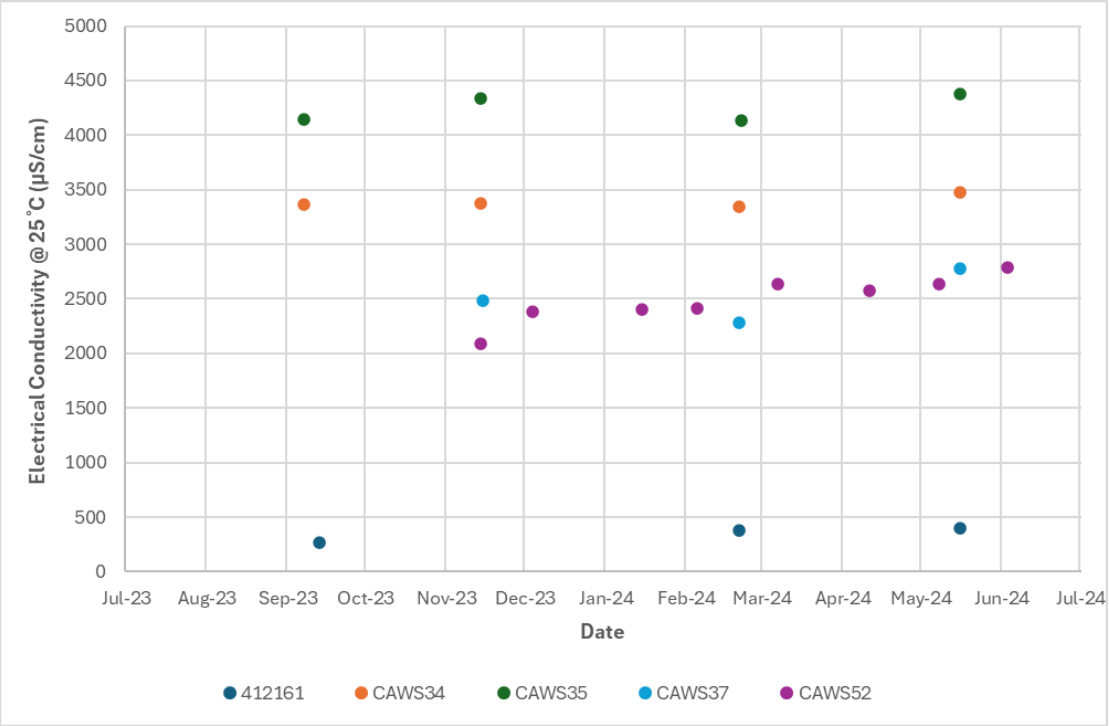


FIGURE A.48: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 EC

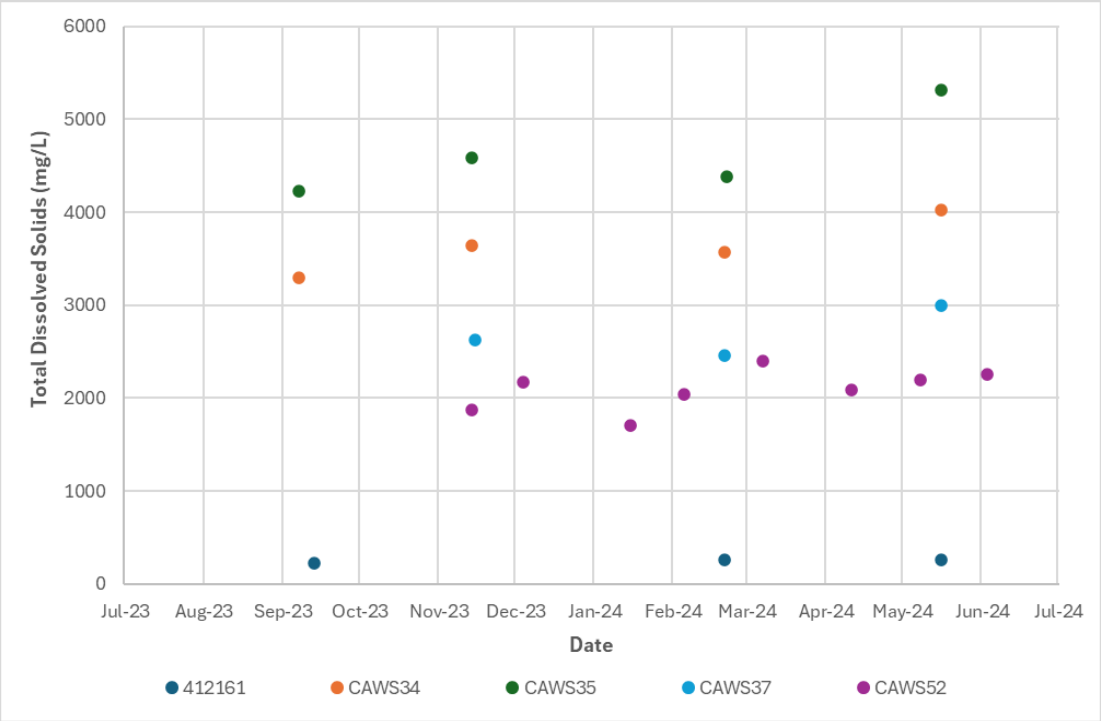


FIGURE A.49: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 TDS

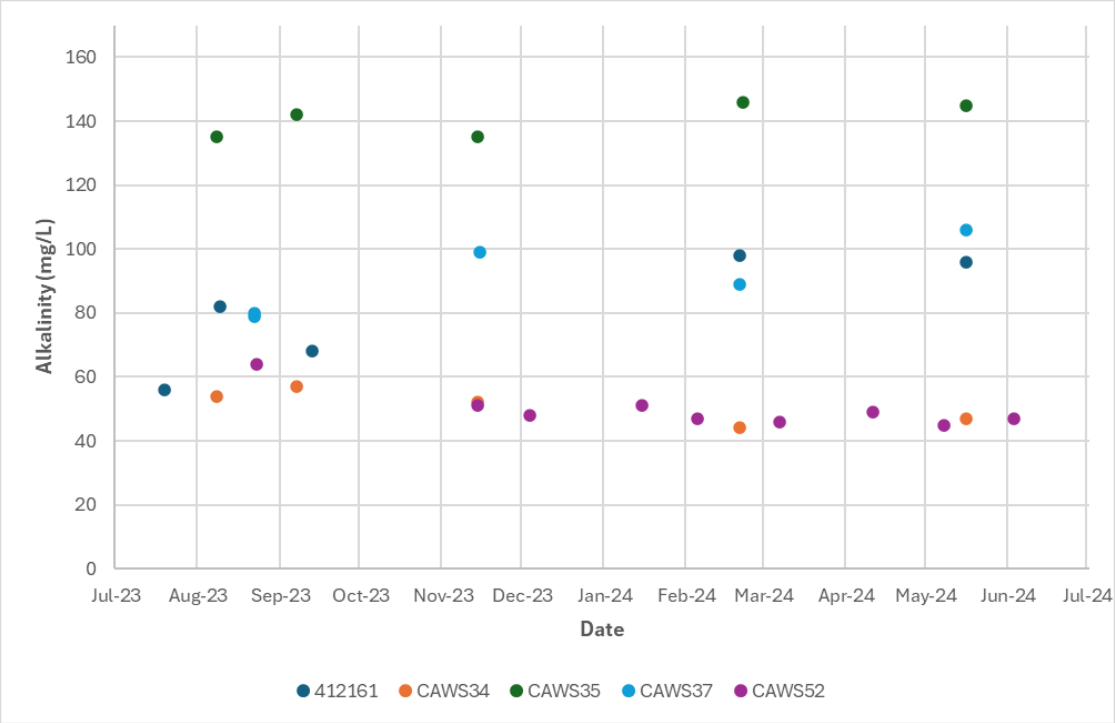


FIGURE A.50: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 ALKALINITY

A.4.1.2. Nutrients

Surface water quality monitoring results for nutrients for the Waste Rock Dumps management zone can be interpreted as follows:

- **Nitrate** – Results indicate no trends for nitrate at any monitoring locations during the reporting period. Long-term trends were identified at CAWS52, CAWS34 and CAWS35 (refer to Section A.4.2). All results for FY24 are within the historic range and no outliers were observed.
- **Nitrite** – Results for nitrite indicate no trends for any monitoring locations during the reporting period. All values at 412161, CAWS34, CAWS35, and CAWS37 were below the limit of detection (<0.01 mg/L). Values recorded at CAWS52 were varied, but remained in line with historical data, which shows a long-term trend (refer to Section A.4.2). No other long-term trends are evident and all results recorded for FY24 are within the historic range.
- **Total Nitrogen** – Results indicate no trends for total nitrogen at any monitoring locations during the reporting period with the exception of CAWS52, which showed a slight increase over the duration of the reporting period (refer to Figure A.51). Long-term trends were identified at CAWS52, CAWS34 and CAWS35 (refer to Section A.4.2). All results for FY24 are within the historic range.
- **Total Phosphorus** – Results for total phosphorus were consistently low and in line with historical data at all monitoring locations. No trends or outliers are evident.

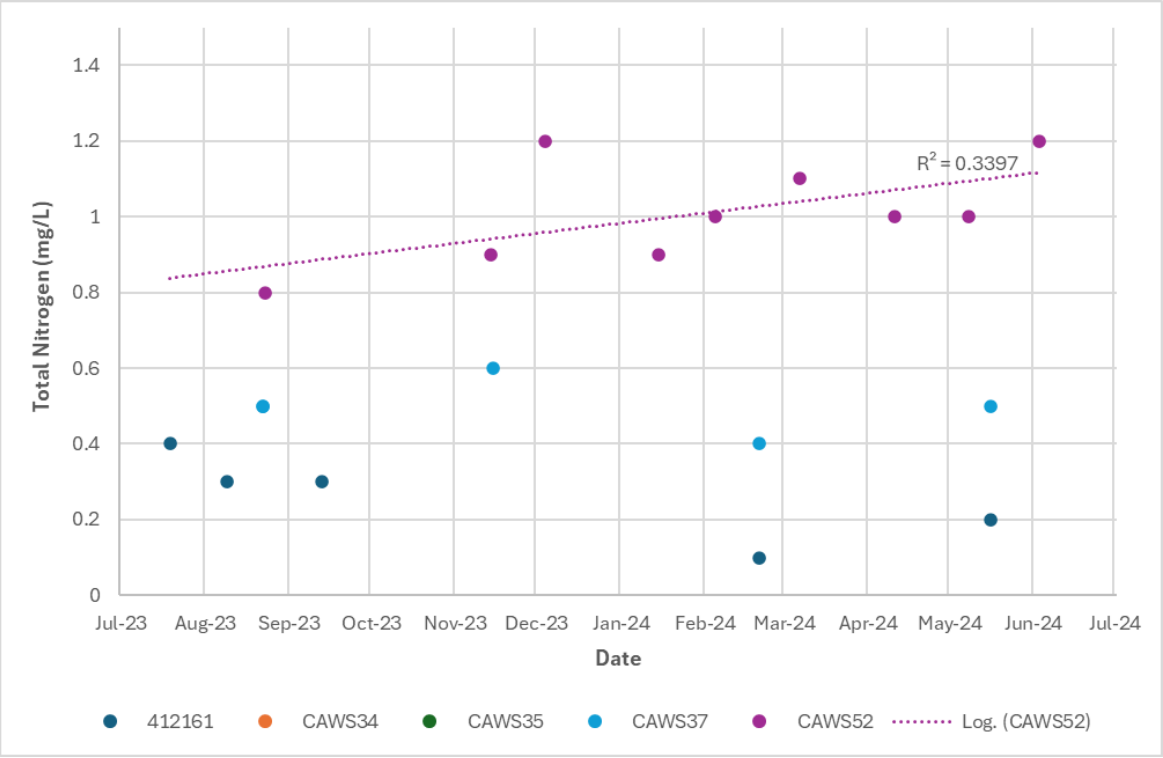


FIGURE A.51: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 TOTAL NITROGEN

A.4.1.3. Major Ions

Surface water quality monitoring results for major ions for the Waste Rock Dumps management zone can be interpreted as follows:

- **Calcium** – Results for calcium demonstrate no trends at monitoring locations 412161, CAWS34 or CAWS35. Slight increasing trends can be observed at both CAWS37 and CAWS52 (refer to Figure A.52). These results are both continuations of long-term increasing trends (refer to Section A.4.2). No other long-term trends were evident and all results during FY24 are within the historic range.
- **Chloride** – No emerging trends for chloride were observed at any of the monitoring locations and all results were within the historic range. Long-term trends were observed for CAWS52 and CAWS37 (refer Section A.4.2). No other long-term trends were evident, and results recorded for FY24 are within the historic range.
- **Magnesium** – No trends for magnesium were observed at any of the monitoring locations except for CAWS37, which showed a slight increasing trend over the duration of the monitoring period (refer to Figure A.53). This is the continuation of a long-term increasing trend beginning in late 2022. A long-term trend has also been observed at CAWS52 similarly to other analytes (refer to Section A.4.2). No other long-term trends were evident, and results recorded for FY24 are within the historic range.
- **Potassium** – Results for potassium demonstrate no trends for any locations except CAWS52, which shows an increasing trend over the duration of the reporting period (refer to Figure A.54). This is the continuation of a long-term increasing trend beginning in late 2021. No other long-term trends were evident, and results recorded for FY24 are within the historic range.
- **Sodium** – Results for CAWS52 shows an increasing trend over the duration of the reporting period (refer to Figure A.55). This is the continuation of a long-term increasing trend beginning in late 2021. A long-term trend has also been observed at CAWS52 similarly to other analytes (refer to Section A.4.2). No other trends for sodium are evident and all results recorded for FY24 are within the historic range.
- **Sulphate** – Results for sulphate atCAWS52 and CAWS37 show increasing trends over the duration of the reporting period (refer to Figure A.56). These are the continuation of long-term increasing trends (refer to Section A.4.2). No other trends for sulphate are evident and all results recorded for FY24 are within the historic range.

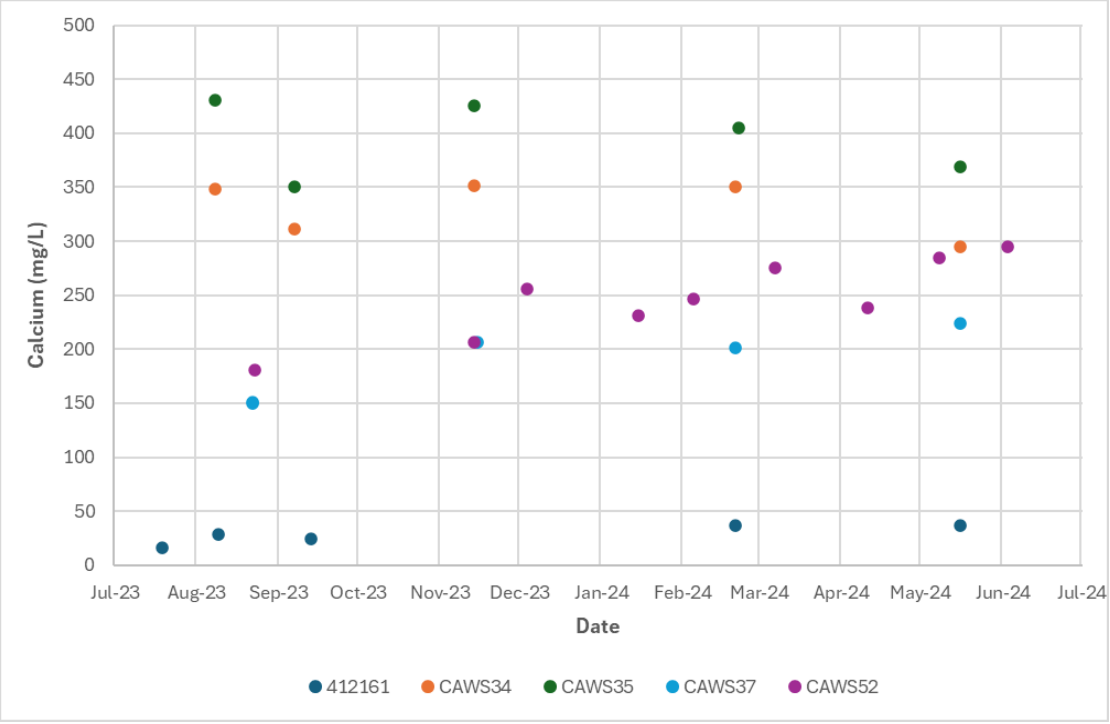


FIGURE A.52: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 CALCIUM

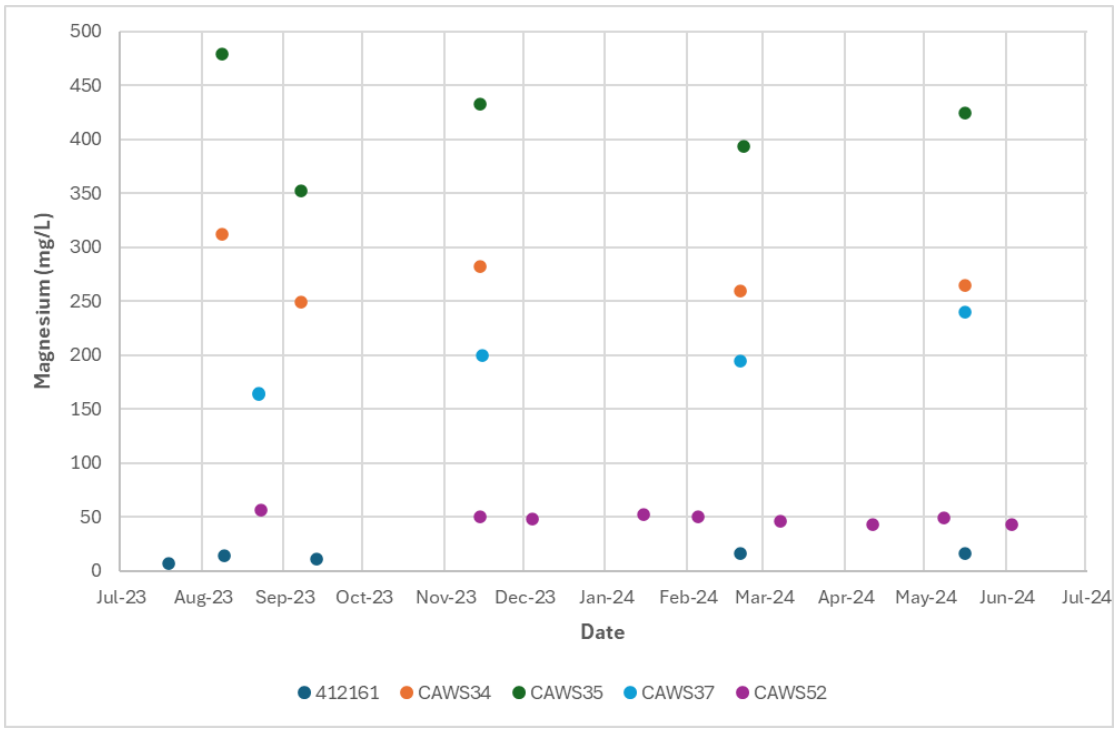


FIGURE A.53: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 MAGNESIUM

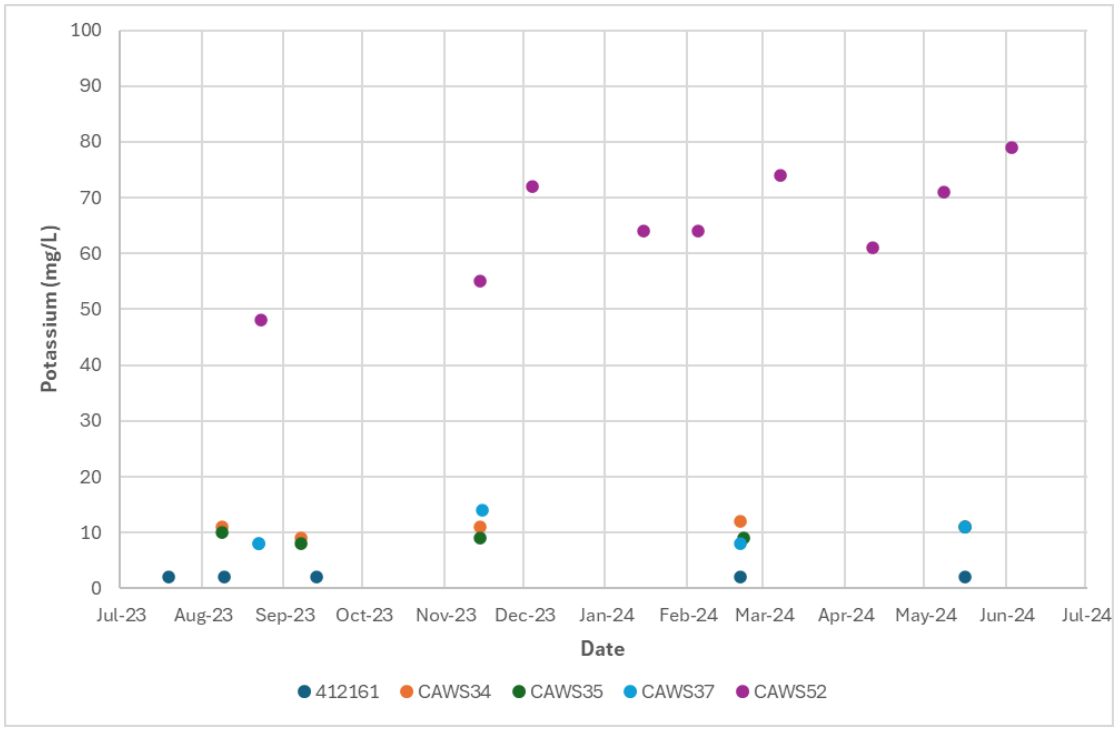


FIGURE A.54: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 POTASSIUM

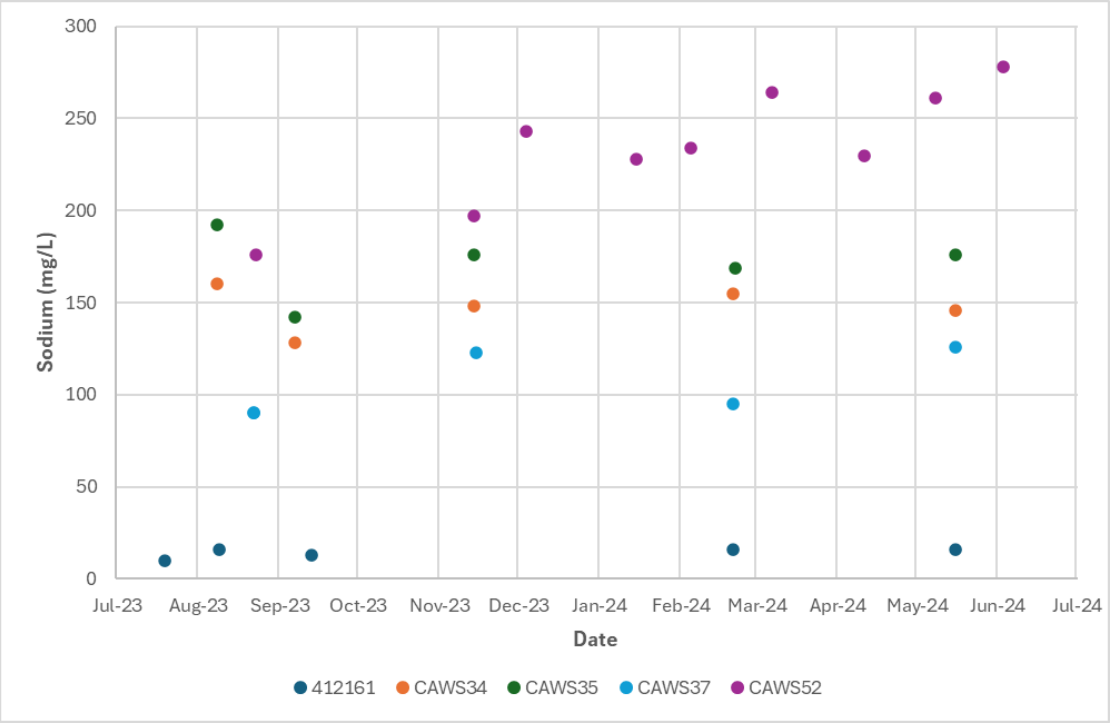


FIGURE A.55: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 SODIUM

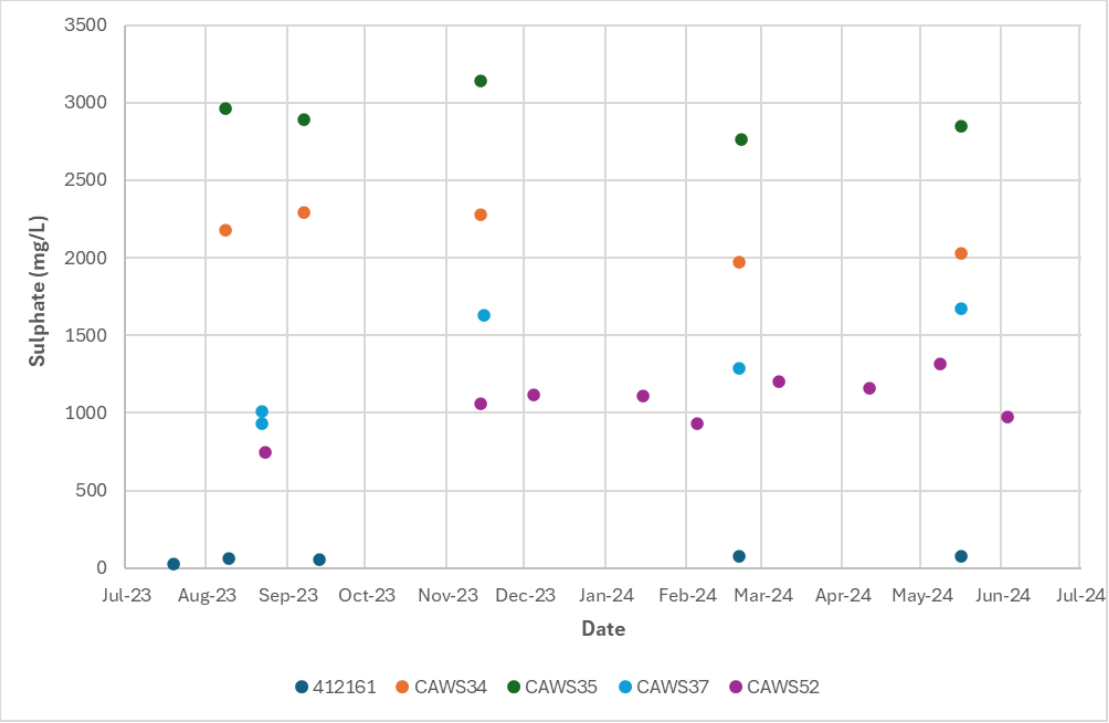


FIGURE A.56: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 SULPHATE

A.4.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the Waste Rock Dumps management zone can be interpreted as follows:

- **Aluminium** – Results for aluminium indicate no trends for any monitoring locations during the reporting period. No long-term trends were identified and all results are within the historic range.
- **Antimony** – Results for antimony indicate no trends for any monitoring locations during the reporting period. No long-term trends were identified and all results are within the historic range.
- **Arsenic** – All results for arsenic were within the historic range during FY24. There are no emerging trends or outliers. The majority of results were below the limit of the detection.
- **Cadmium** – All results for cadmium were within the historic range during FY24 and no outliers were observed. Long-term trends were evident at CAWS34 and CAWS35 similar to other analytes (refer to Section A.4.2). No other long-term trends were identified and all results lie within the historical range.
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) during FY24.
- **Cobalt** – Results for cobalt showed that most locations (with the exception CAWS34) were below the limit of detection (<0.001 mg/L) for the duration of the reporting period. While above the limit of detection, all results for cobalt at CAWS34 were within the historic range for the CAWS34. There are no emerging trends or outliers evident.
- **Copper** – Results indicate no trends for copper at any monitoring locations during the reporting period. All results recorded for FY24 are within the historic range.
- **Iron** – All results for iron were within the historic range during FY24. There are no emerging trends or outliers.
- **Lead** – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period. No long-term trends or emerging trends were identified.
- **Manganese** – Results for manganese at all monitoring locations were consistently low and within the historic range during FY24. No emerging trends were identified and all results are within the historic range.
- **Mercury** – Results for mercury at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period. No long-term trends were identified and all results lie within the historical range.
- **Molybdenum** – Results for molybdenum at CAWS52 show increasing trend over the duration of the reporting period (refer to Figure A.57). This is the continuation of an increasing trend beginning in late 2021 (refer to Section A.4.2) and peaking at the highest recorded concentration of 0.701 mg/L on 7 March 2024. No other trends or outliers are evident, and all results recorded for FY24 are within the historic range.
- **Nickel** – No emerging trends for nickel were observed for FY24. All values at 412161 and CAWS37, and CAWS52 were reported as below the limit of detection (<0.001 mg/L) and values for all other monitoring locations were consistently low and within the historic range.
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) for the duration of the reporting period.
- **Zinc** – Results indicate no trends for zinc at any monitoring locations during the reporting period. All values at 412161 and CAWS37, and the majority of those from CAWS52 were reported as below the limit of detection (<0.0001 mg/L). Results at all other monitoring locations were consistently low and in line with historic results.

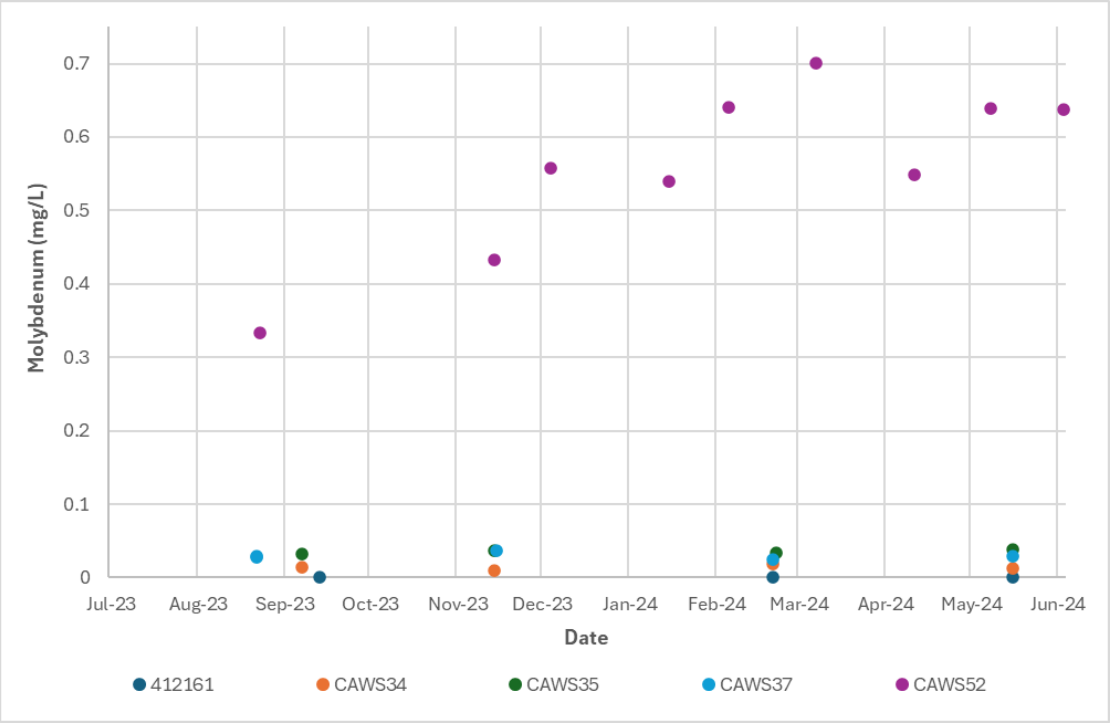


FIGURE A.57: WASTE ROCK DUMPS MANAGEMENT ZONE FY24 MOLYBDENUM

A.4.1.5. Biological Indicators

Blue green algae (ALG) is required to be monitored at Rodds Creek Dam (CAWS52) monthly between October and April. ALG concentrations were below the LOD (5 cells/mL) for most months during the reporting period. Higher values were observed in December 2023 and March 2024. Water quality samples collected on 4 December 2023 indicated a ALG concentration of 3,400 cells/mL, samples collected on 7 March 2024 indicated a concentration of 1,400 cells/mL. These values are within the historic range for the monitoring locations and values prior to and following these higher results were below the limit of detection.

A.4.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the Waste Rock Dumps management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.4.1. Interpretation of long-term water quality trends in the Waste Rock Dumps management zone can be summarised as follows:

- Long-term water quality trends at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24 for several analytes including nitrate, total nitrogen, cadmium, copper, manganese, zinc, cobalt and nickel. Examples of these long-term trends are shown in Figure A.58 and Figure A.59.
- CAWS52 is located at Rodds Creek Dam, which receives TSF decant water in increasing volumes during times of high rainfall. These inflows increase during in both frequency and volume during periods of high rainfall (such as the past few years). Increased transfer inflows from the tailings dams, other site storages and from upstream runoff are likely that have caused these increasing trends. Long-term trends in EC are shown in Figure A.60 as an example of the pattern these analytes have exhibited over the long-term.

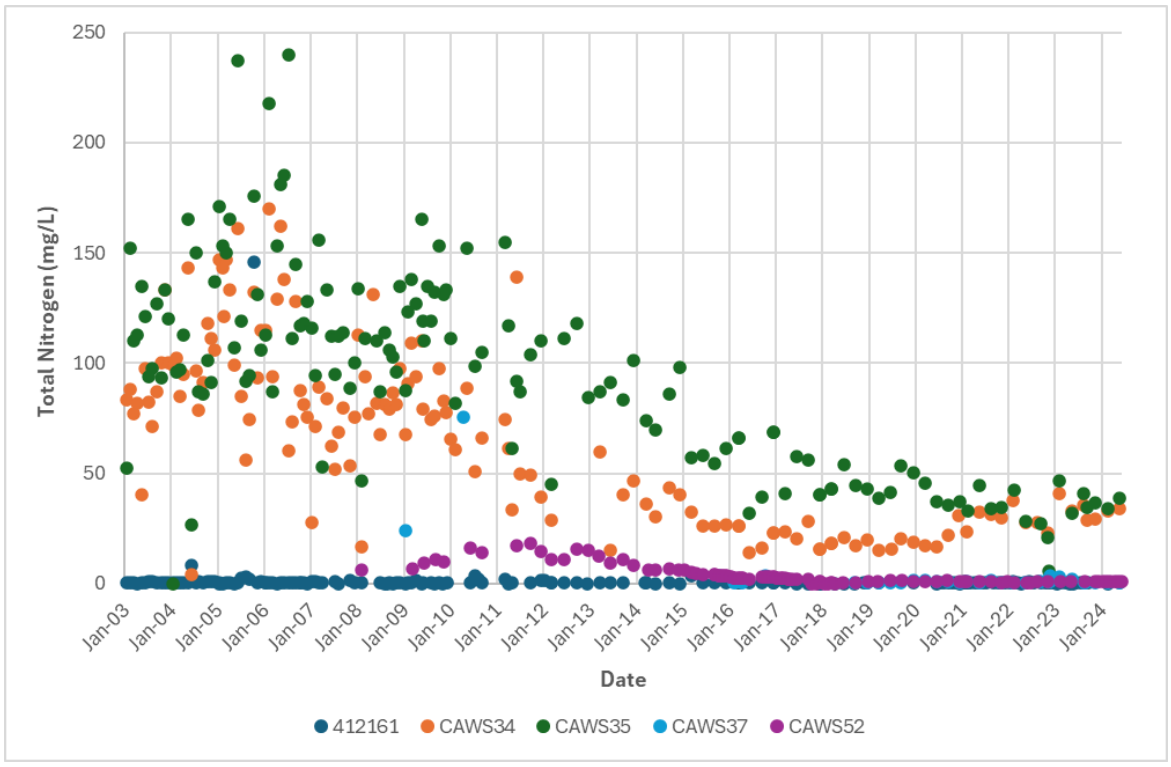


FIGURE A.58: WASTE ROCK DUMPS MANAGEMENT ZONE LONG-TERM TREND IN TOTAL NITROGEN

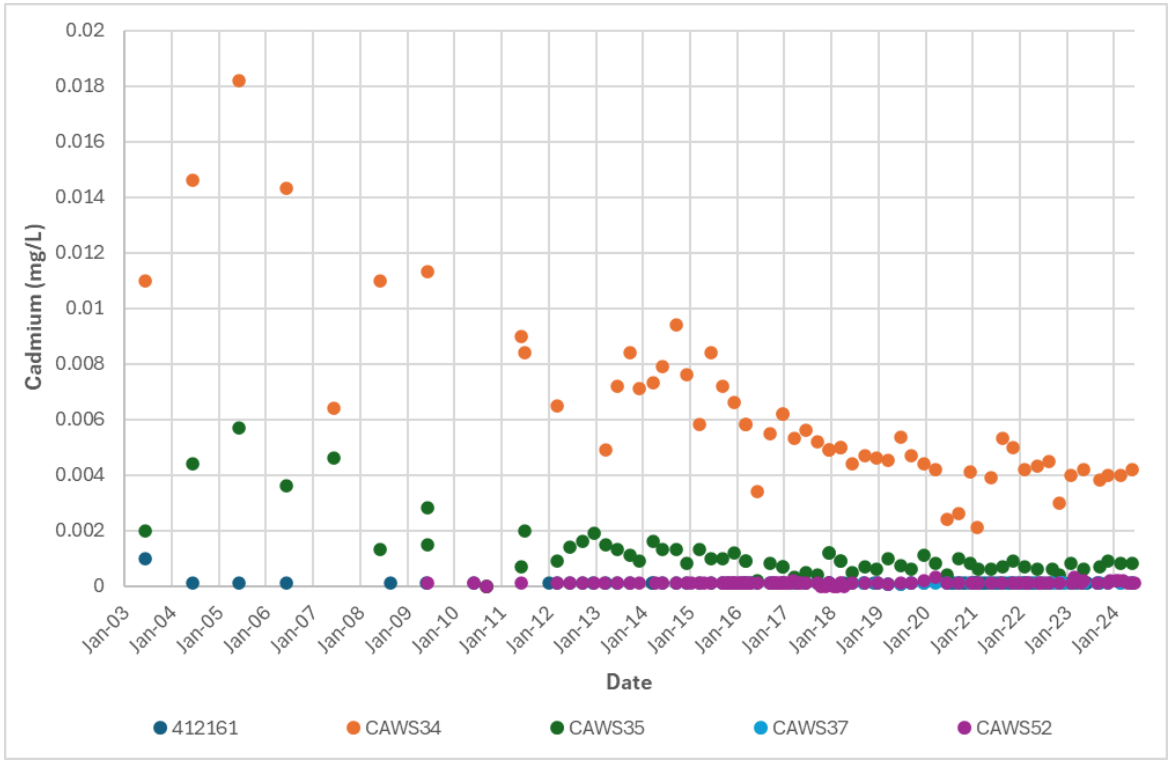


FIGURE A.59: WASTE ROCK DUMPS MANAGEMENT ZONE LONG-TERM TREND IN CADMIUM

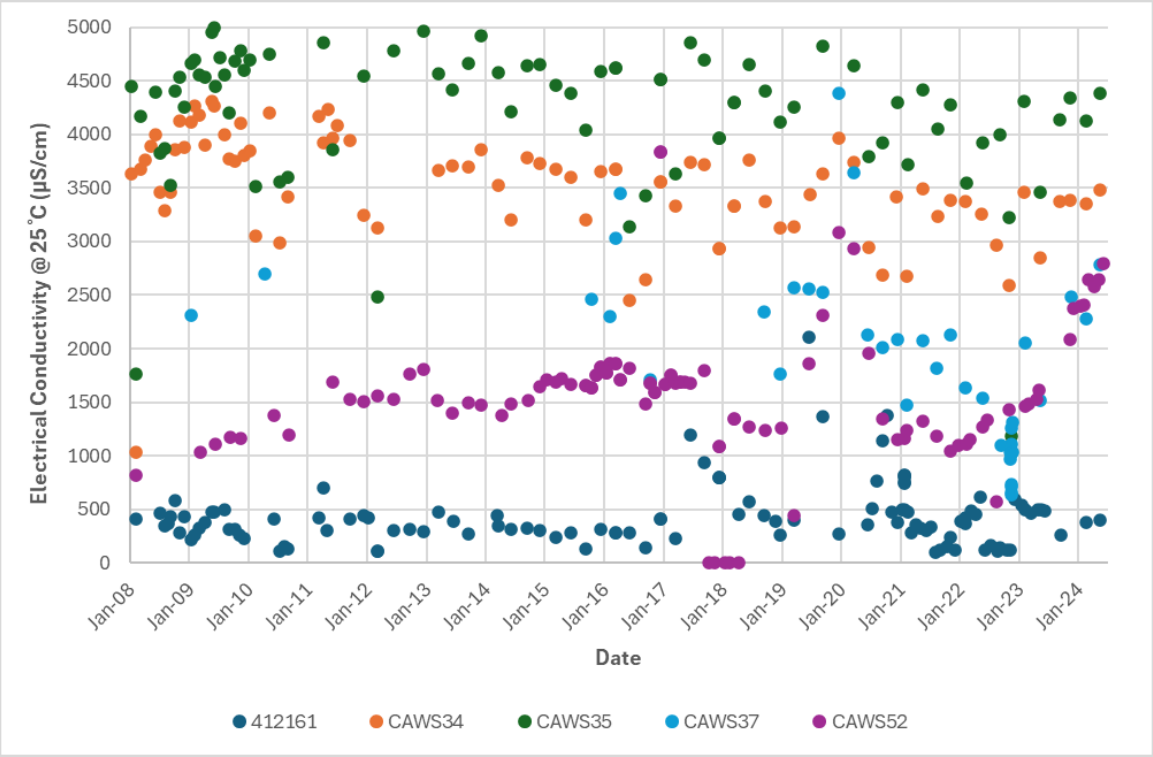


FIGURE A.60: WASTE ROCK DUMPS MANAGEMENT ZONE LONG-TERM TREND IN EC

A.4.3 Summary and Recommendations

Surface water monitoring results for all locations in the Waste Rock Dumps management zone were generally consistent with historic monitoring data during FY24. Long-term water quality trends at CAWS34 and CAWS35 (the Northern and Southern Leachate Dams) continued to decrease during FY24 for several analytes including nitrate, total nitrogen, cadmium, copper, manganese, zinc, cobalt and nickel. Changes in water quality at CAWS37 (H19) were minor with all values observed within the historic range for the site. Minor increases observed for some analytes during FY24 appear to be reflective of cyclic changes in water quality at the site due to the upslope active waste rock dump catchment. Continuing increasing trends were observed at CAWS52 (Rodds Creek Dam) for several analytes. This increases may be attributed to increased transferred inflows from the TSF decant ponds in recent years for which high rainfall was observed.

No increasing trends or higher values were observed at surface water monitoring location 412161 during FY24. Results during FY24 (and over the longer term) at location 412161 do not reflect the trends observed at other monitoring locations in the management zone and no mining related impacts are evident. No further investigations are recommended for this management zone.

A.5 TSF Eastern Zone

The TSF eastern management zone has 3 surface water monitoring locations. Surface water monitoring locations in this zone are described in Table A.5. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023). All of these monitoring locations are located with the mine WMS.

TABLE A.5: TSF EASTERN MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
CAWS42	Used to monitor changes in NTSF decant water quality. Located at the Cadia Molybdenum Plant outflow point.
CAWS43	Used to monitor changes in STSF decant water quality.
CAWS60	This monitoring location is used to assess potential seepage contributions to the Eastern Dyke Storage, located adjacent to the eastern wall of the STSF.

A.5.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.5.1.1 to A.5.1.4. It should be noted there are no monitoring locations in this management zone that have SSGVs, therefore, there were no exceedances of SSGVs.

A.5.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the TSF eastern management zone can be interpreted as follows:

- **pH** – Results for pH were variable throughout the FY24 reporting period. All results for CAWS43 were within the historic range and there were no outliers or emerging trends. While generally within the historic range, the maximum pH values recorded at CAWS42 and CAWS60 in the historic monitoring period were recorded during FY24. A result of 16.06 pH units was recorded at CAWS42 (NTSF decant pond) on 8 January 2024 and a result of 48.78 pH units was recorded at CAWS60 (Eastern Dyke storage) on 11 January 2024. These results are considered to be errors and have been removed from the dataset.
- **Electrical Conductivity** – Results for EC all monitoring locations returned results within the historic range during the reporting period. No emerging trends are evident for either of the monitoring locations.
- **Total Suspended Solids** – Results to TSS were variable throughout the reporting period at sites in the eastern TSF management zone (refer to Figure A.61). Around half of the results for all locations were below the limit of detection (<5 mg/L). All results recorded at CAWS60 were within the historic range. A result recorded at CAWS42 on 23 October 2023 is the highest in the historic monitoring period (70 mg/L). A result recorded at CAWS43 on 23 October 2023 is the highest in the historic monitoring period (137 mg/L). Results prior to and following these higher results were within the historic ranges for the sites. Somewhat consistent rainfall throughout October could have caused increased sediment suspension in the decant ponds.
- **Total Dissolved Solids** – All results for TDS were within the historic range for the monitoring locations. No emerging trends for TDS are evident for the reporting period at CAWS43 of CAWS60. There is a slight increasing trend for TDS evident at CAWS42 (refer to Figure A.62). This is a continuation of a trend that appears to have started at end 2022. There appear to be no outliers evident for the FY24 period.
- **Alkalinity** – All results for alkalinity were within the historic range for the monitoring locations. There are no emerging trends or outliers evident during the FY24 period.
- **Oxidation reduction potential** –Results for ORP were within the historic monitoring range but highly variable at all monitoring locations. There was 1 slightly higher result for ORP at CAWS60 on 11 January 2024 (936 mV). ORP values at this monitoring location prior to and following this higher ORP result were in line with the historic average for the monitoring sites indicating that the value recorded on 11 January 2024 is an isolated reding. There are no emerging trends evident for FY24.

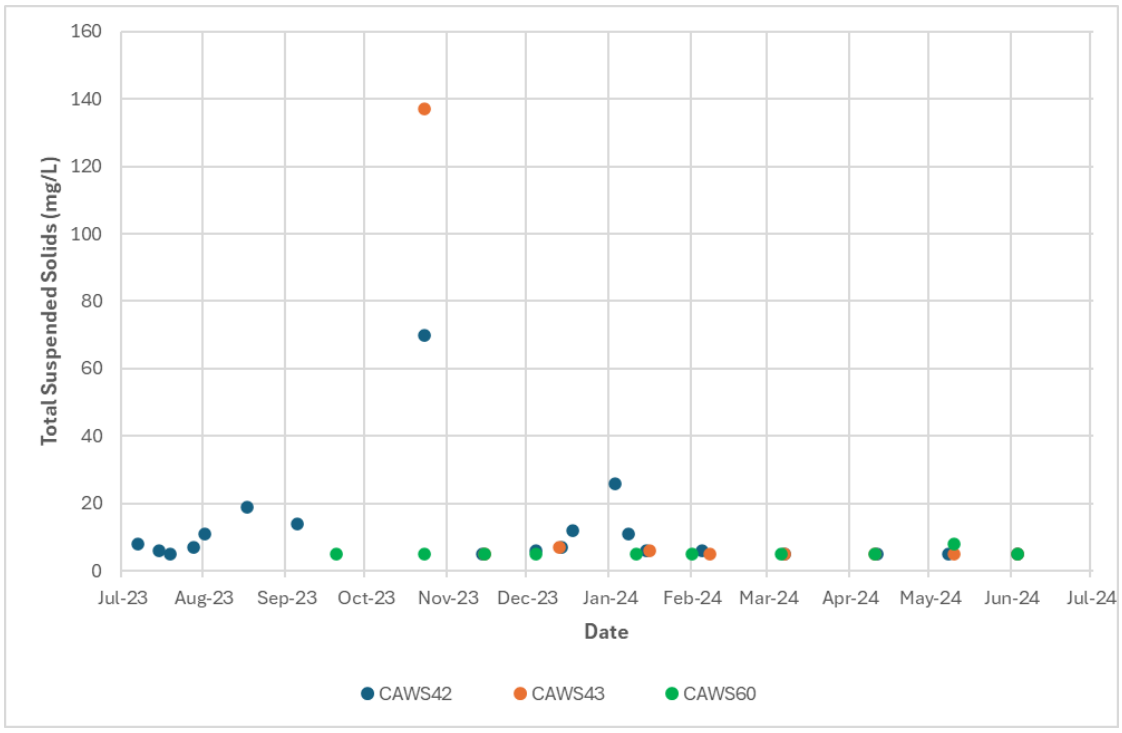


FIGURE A.61: TSF EASTERN MANAGEMENT ZONE FY24 TSS

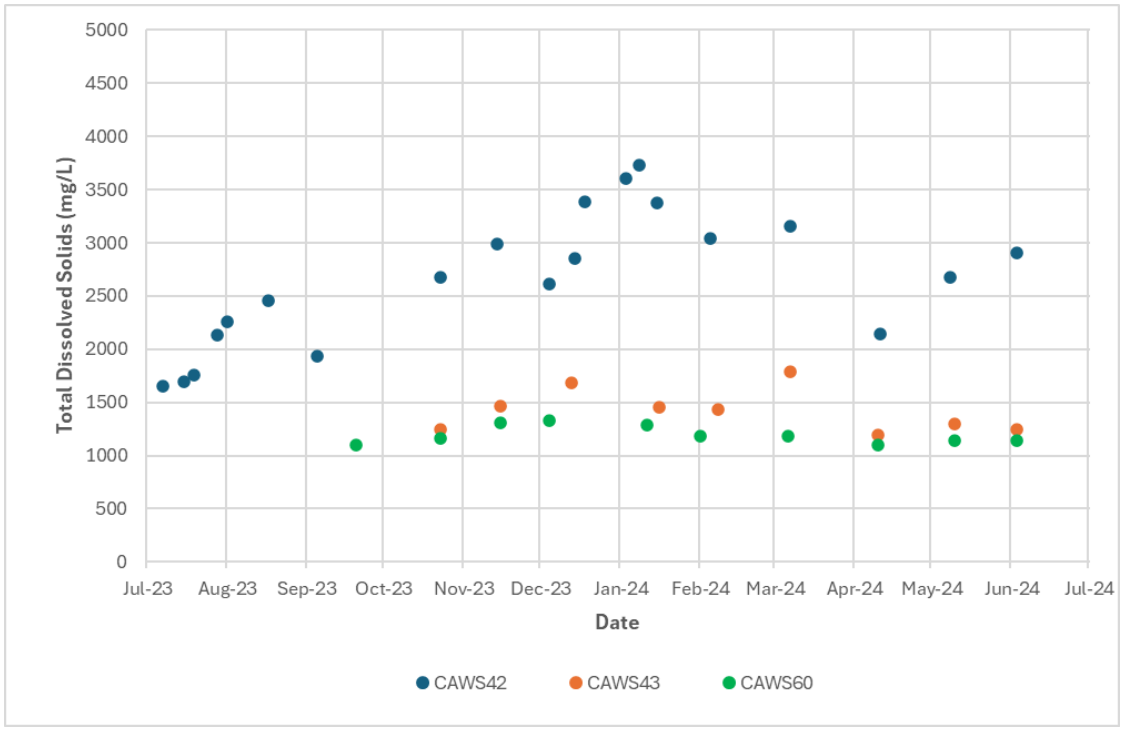


FIGURE A.62: TSF EASTERN MANAGEMENT ZONE FY24 TDS

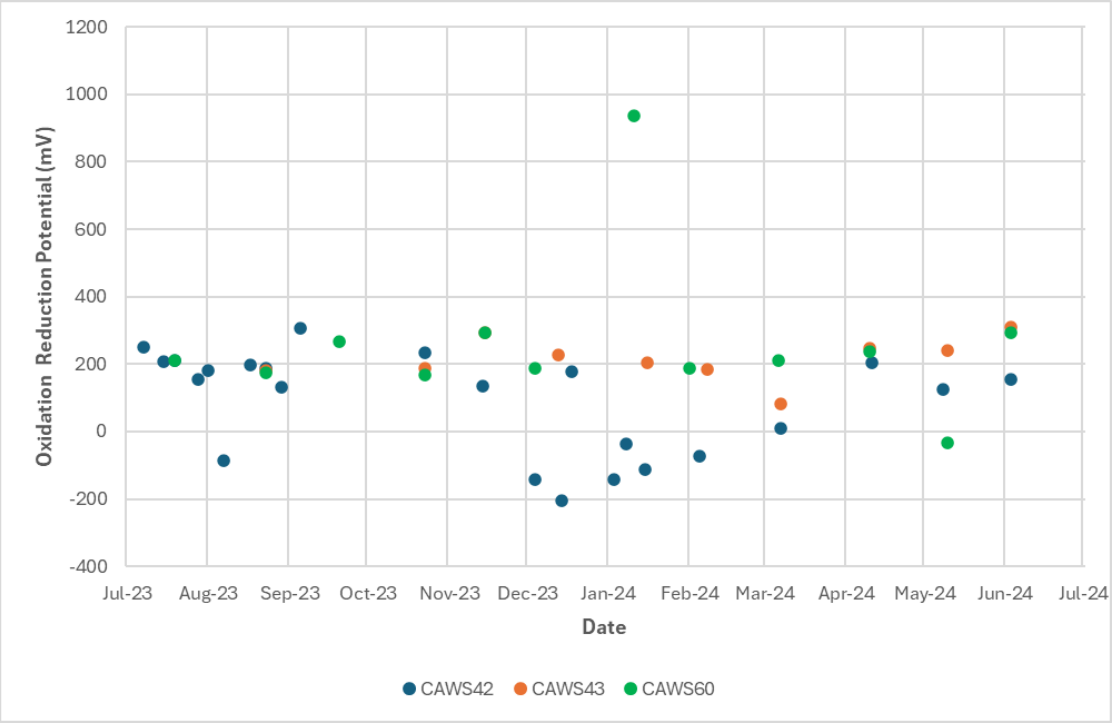


FIGURE A.63: TSF EASTERN MANAGEMENT ZONE FY24 OXIDATION REDUCTION POTENTIAL

A.5.1.2. Nutrients

Surface water quality monitoring results for nutrients for the TSF eastern management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently within the historical range for surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Nitrite** – Almost all values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. Results for nitrite at CAWS42 during July and August 2024 were slightly higher than the limit of detection but still within the historic range. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were variable throughout the FY24 period (refer to Figure A.64). All results at CAWS43 and CAWS60 were within the historic range for the monitoring locations and there are no emerging trends or outliers. The highest result for the historic monitoring period at CAWS42 was recorded on 23 October 2023 (0.67 mg/L). Four other results for total phosphorus at CAWS42 during FY24 were equal to or greater than the 95th percentile of the historic range. Higher results at the monitoring location were recorded since the start of 2023 and have remained somewhat consistently higher since. This trend (including potential causes and impacts) is discussed further in Section A.5.2.

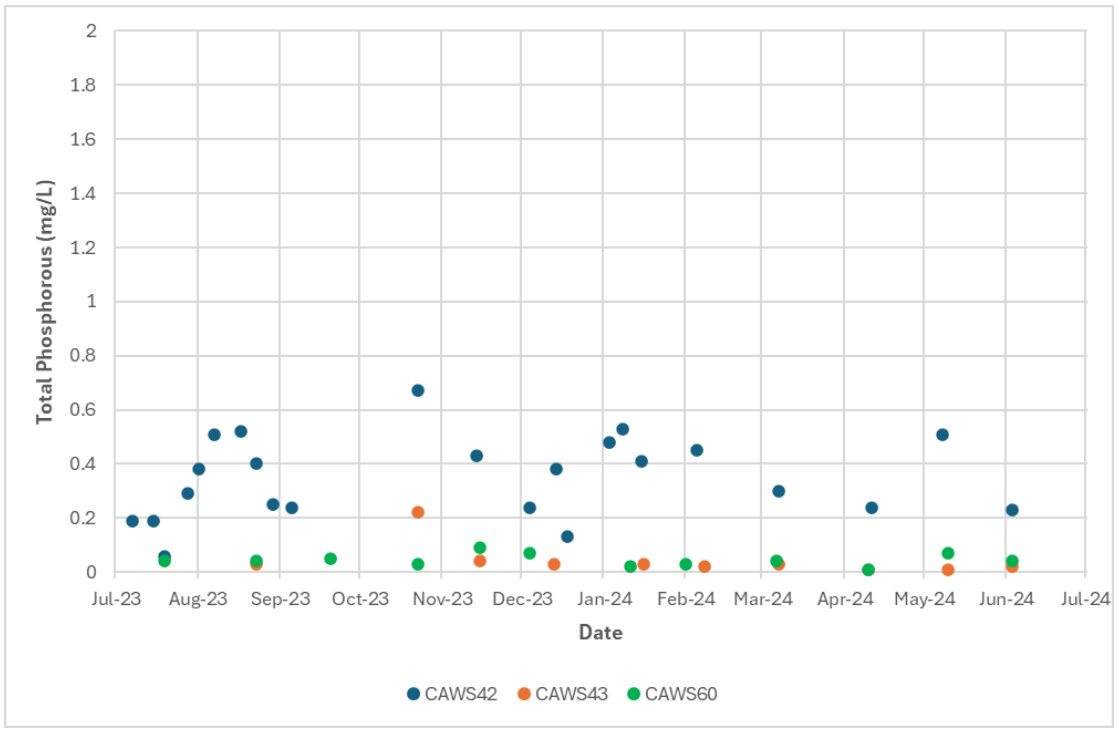


FIGURE A.64: TSF EASTERN MANAGEMENT ZONE FY24 TOTAL PHOSPHORUS

A.5.1.3. Major Ions

Surface water quality monitoring results for major ions for the TSF eastern management zone can be interpreted as follows:

- **Calcium** – Results for calcium for all monitoring locations in the TSF eastern management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** –Results for chloride were variable throughout the monitoring period (refer to Figure A.65). All results for CAWS43 and CAWS60 were within the historic range and there are no emerging trends or outliers. The highest result for the historic monitoring period at CAWS42 was recorded on 7 August 2023 (569 mg/L). Four other results for chloride at CAWS42 during FY24 were equal to or greater than the 95th percentile of the historic range. Higher results at the site began at the start of 2023 and have continued trending upwards in the time since. This trend (including potential causes and impacts) is discussed further in Section A.5.2.
- **Magnesium** – All results for magnesium were within the historic range for the monitoring locations. One result at CAWS42 (204 mg/L on 17 August 2023) was slightly higher but still within the historic range. There are no emerging trends at any of the locations in the management zone.
- **Potassium** – All results were within the historic range and there were no outliers (refer to Figure A.66). Results for potassium at CAWS42 increased throughout the monitoring period but were still within the historic range. This trend (including potential causes and impacts) is discussed further in Section A.5.2.
- **Sodium** – Results for sodium were variable throughout the monitoring period (refer to Figure A.67). All results for CAWS43 and CAWS60 were within the historic range and there are no emerging trends or outliers. The highest result for the historic monitoring period at CAWS42 was recorded on 17 August 2023 (925 mg/L). One other result for sodium at CAWS42 during FY24 was greater than the 95th percentile of the historic range. Higher results at the monitoring location have been recorded since the start of 2023 and have continued trending upwards in the time since. This trend (including potential causes and impacts) is discussed further in Section A.5.2.
- **Sulphate** – Results for sulphate for all monitoring locations in the TSF eastern management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers for sulphate

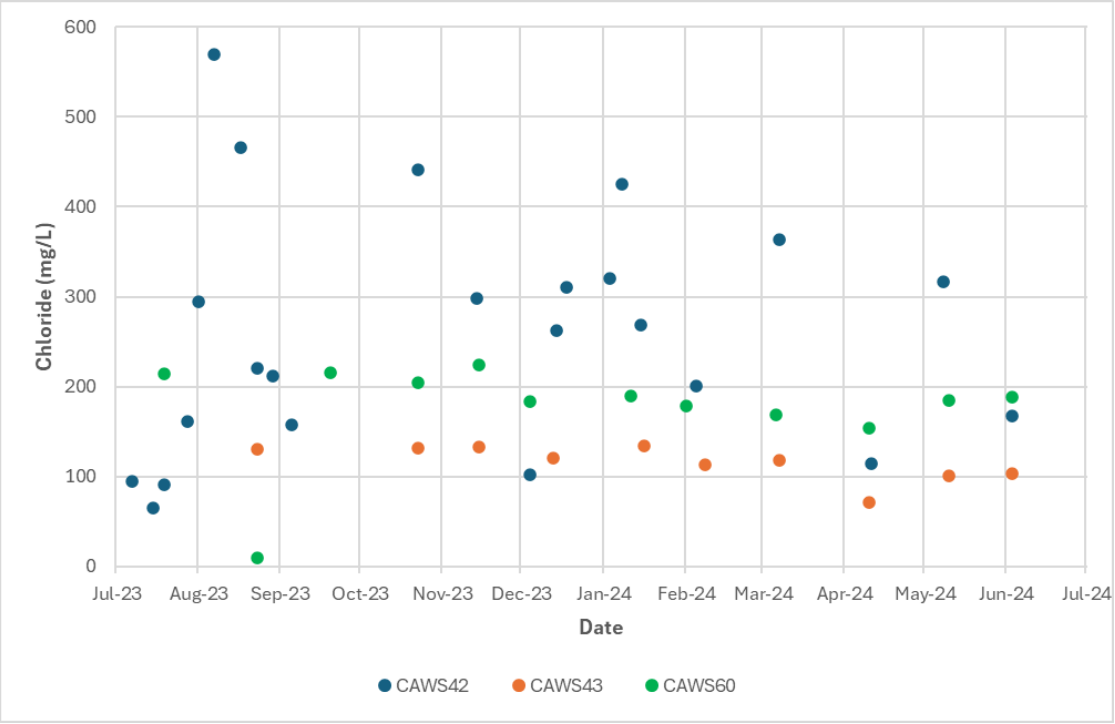


FIGURE A.65: TSF EASTERN MANAGEMENT ZONE FY24 CHLORIDE

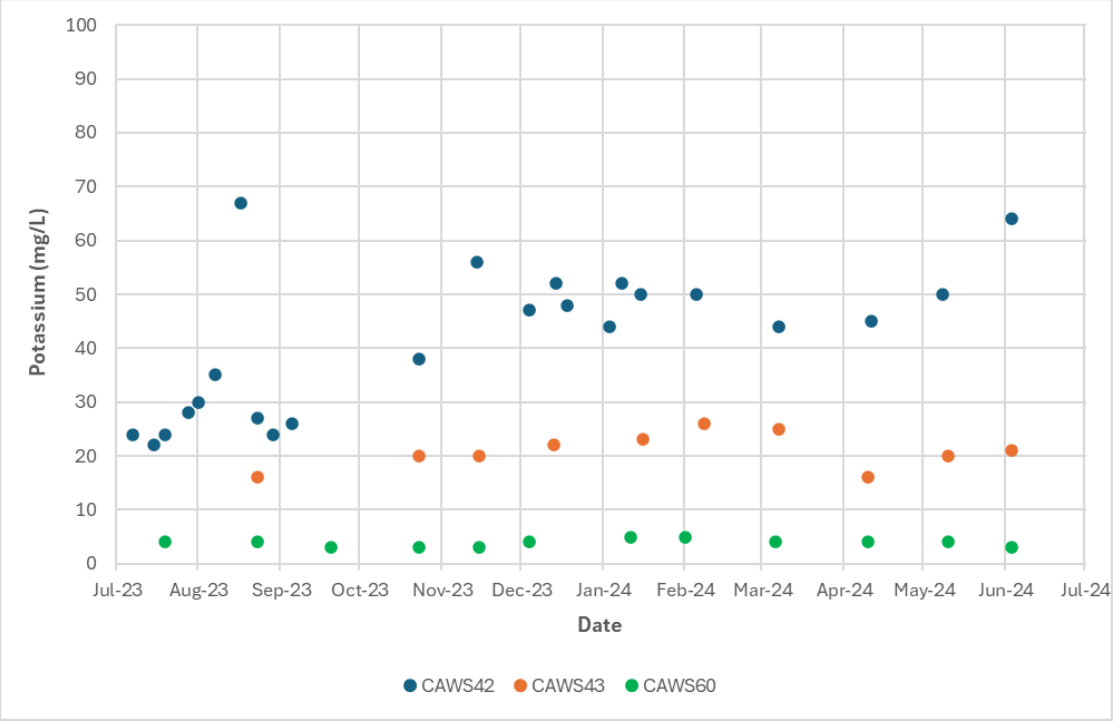


FIGURE A.66: TSF EASTERN MANAGEMENT ZONE FY24 POTASSIUM

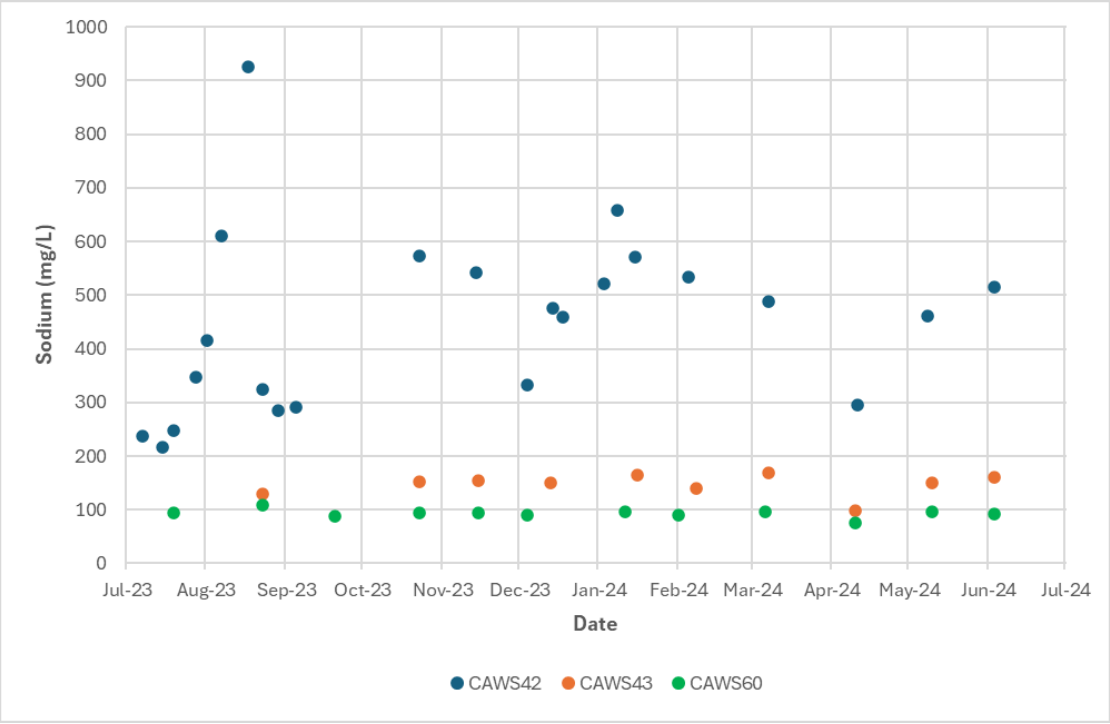


FIGURE A.67: TSF EASTERN MANAGEMENT ZONE FY24 SODIUM

A.5.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the TSF eastern management zone can be interpreted as follows:

- **Aluminium** – All results for aluminium are within the historic monitoring range and there are no outliers or emerging trends.
- **Antimony** – All results for antimony at CAWS43 and CAWS60 were below the limit of detection (<0.001 mg/L) (refer to Figure A.68). Results for antimony at CAWS42 were highly variable. Results at CAWS42 during FY24 were generally greater than the historic average for antimony. Four results during the period were equal to or greater than the 95th percentile of the historic data. These higher values are consistent with increasing trends for several other analytes at the site (discussed further in Section A.5.2).
- **Arsenic** – All results for arsenic at CAWS43 and CAWS60 were within the historic range (refer to Figure A.69). All results at CAWS43 and the majority of results at CAWS60 were below the limit of detection (<0.001 mg/L). Results for arsenic at CAWS42 were higher throughout the reporting period. The majority of results were above the 95th percentile of the historic data for the site. These higher values are consistent with increasing trends for several other analytes at the site (discussed further in Section A.5.2).
- **Cadmium** – Results for all locations were within the historic range with no emerging trends or outliers. There were some slightly higher values for cadmium at CAWS42 but these results were still within the historic range.
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cobalt** – Results for cobalt at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Copper** – Results for copper were variable throughout the monitoring period (refer to Figure A.70Figure A.65). All results for CAWS43 and CAWS60 were within the historic range and there are no emerging trends or outliers. The highest result for the historic monitoring period at CAWS42 was recorded on 19 July 2023 (0.07 mg/L). One other result for copper at CAWS42 during FY24 was greater than the 95th percentile of the historic range. Higher result at the site began at the start of 2019 and continued trending upwards until July 2023. This trend is somewhat reflected at CAWS43 and CAWS60 but to a much lesser extent. In the months since, copper at CAWS42 has begun trending downwards with results now more in line to the historic average prior to 2019. This trend (including potential causes and impacts) is discussed further in Section A.5.2.
- **Iron –** All results for iron are within the historic monitoring range and there are no outliers or emerging trends.
- **Lead** – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Manganese** – Manganese concentrations at all surface water monitoring locations in the TSF eastern management zone were consistent with historic monitoring data during FY24. There are no emerging trends or outliers.

- **Mercury** – Mercury concentrations at all surface water monitoring locations in the TSF eastern management zone were consistent with historic monitoring data during FY24. There are no emerging trends or outliers.
- **Molybdenum** – Results for molybdenum at CAWS43 and CAWS60 were consistently low and in the historic range for the monitoring locations (refer to Figure A.71.) There are no emerging trends or outliers for these monitoring locations. While results for molybdenum at CAWS42 were within the historic range during the period, 4 results were greater than the historic 90th percentile for the site. Results for molybdenum at the CAWS42 have been trending upward for the entirety of the historical monitoring period (June 2012 to current). This trend is not reflected at other monitoring locations in the management zone. Since January 2024, molybdenum at CAWS42 has started trending down slightly. The long-term trend for molybdenum and potential causes and impacts are discussed further in Section A.5.2.
- **Nickel** – Results for nickel at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc –** Results for zinc for all monitoring locations in the TSF eastern management zone throughout the reporting period were low and consistent with historic monitoring results. There are no emerging trends or outliers.

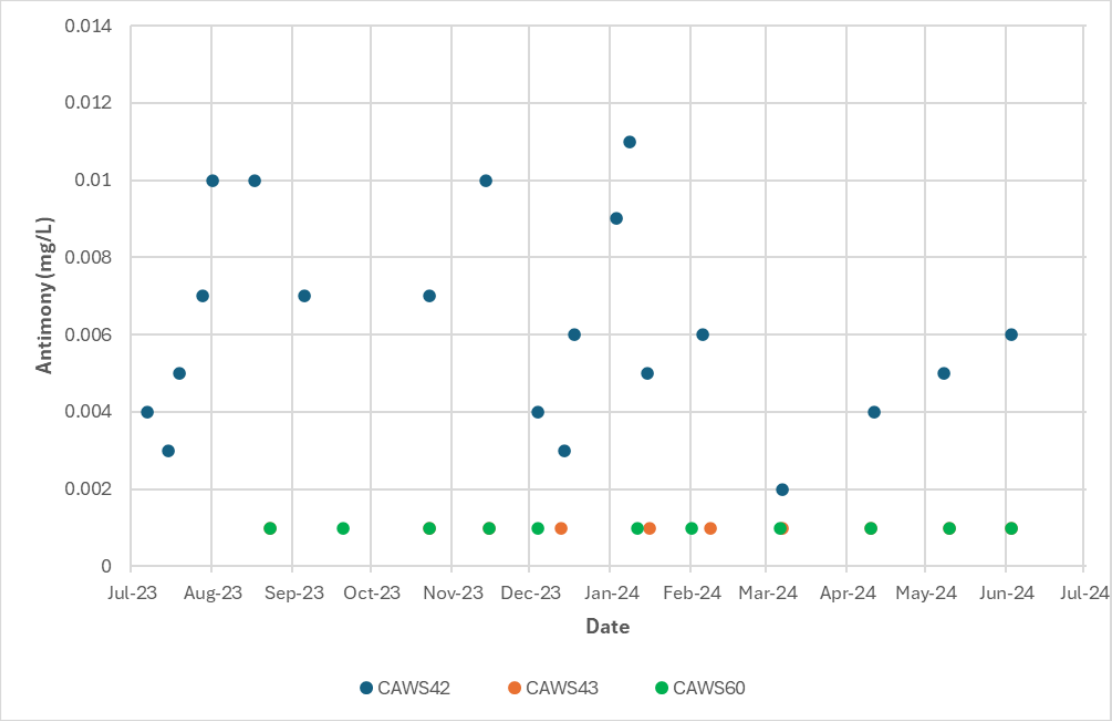


FIGURE A.68: TSF EASTERN MANAGEMENT ZONE FY24 ANTIMONY

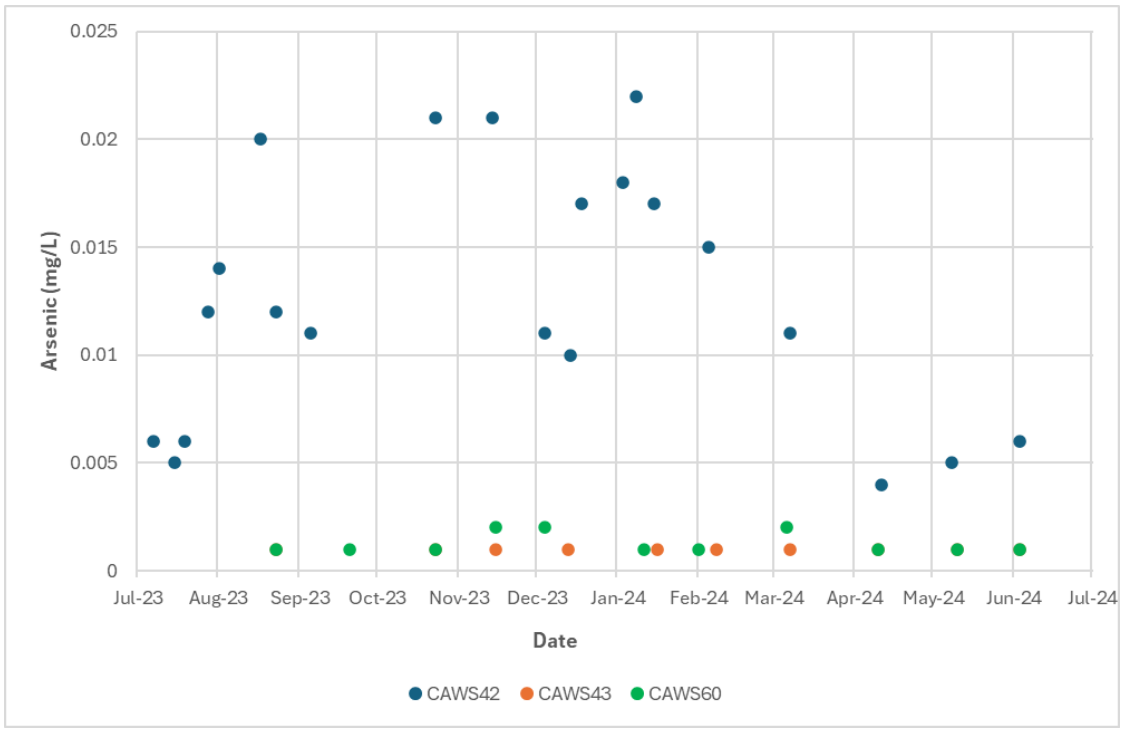


FIGURE A.69: TSF EASTERN MANAGEMENT ZONE FY24 ARSENIC

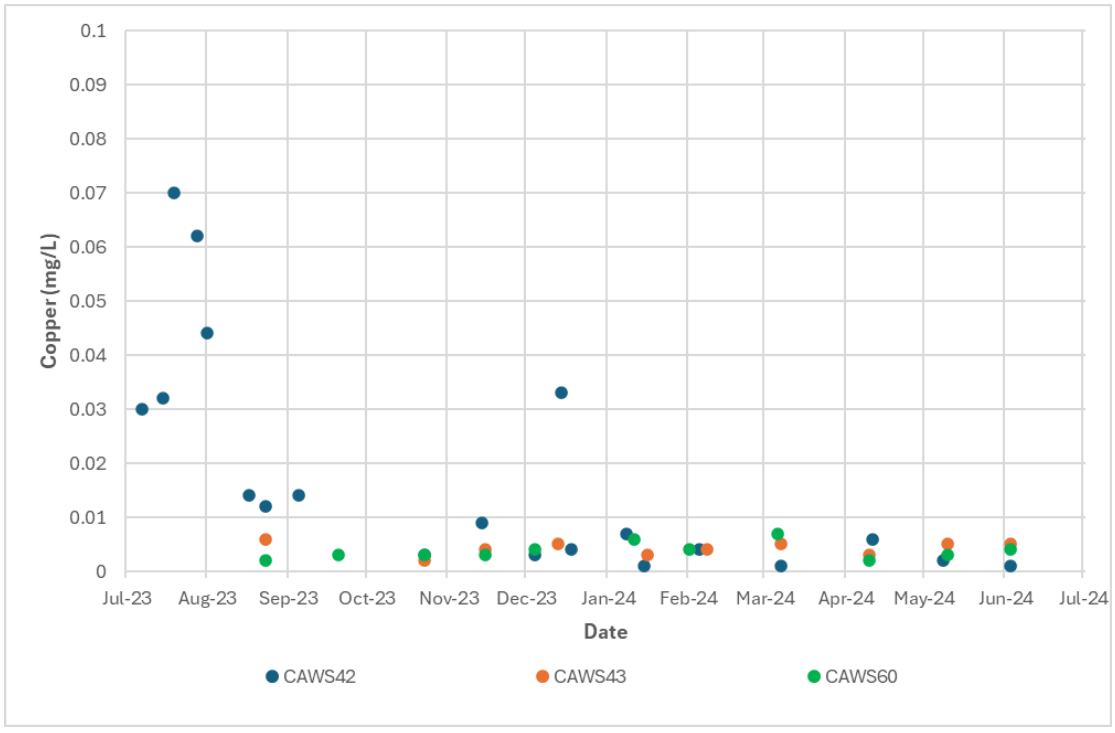


FIGURE A.70: TSF EASTERN MANAGEMENT ZONE FY24 COPPER

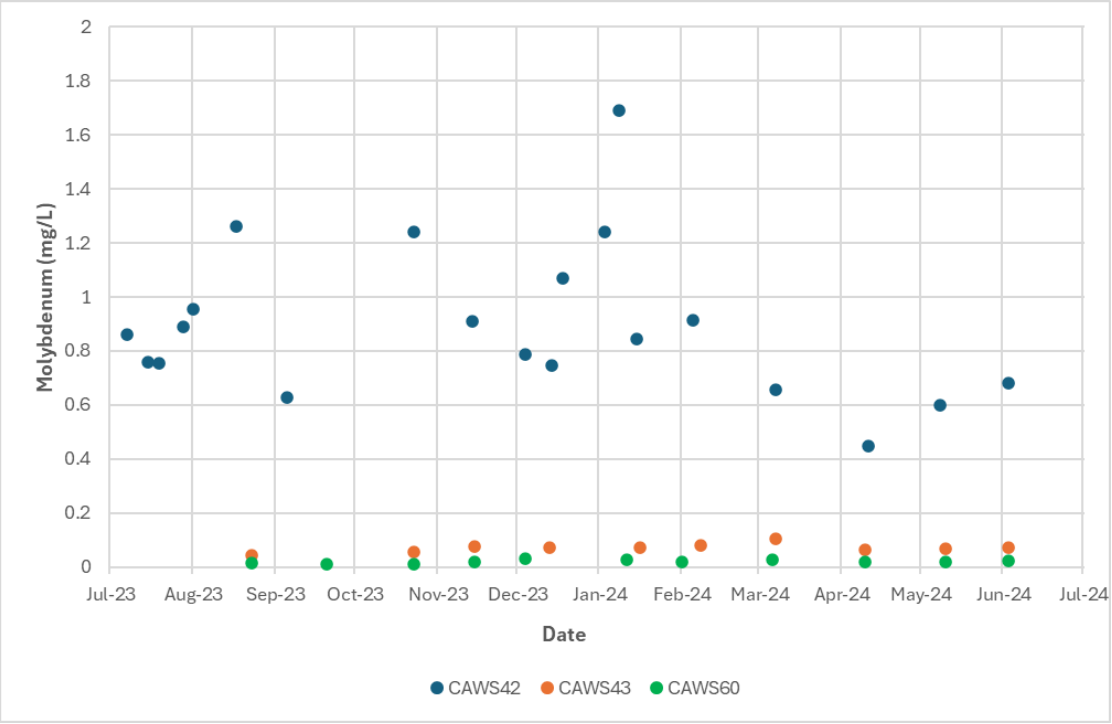


FIGURE A.71: TSF EASTERN MANAGEMENT ZONE FY24 MOLYBDENUM

A.5.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior the FY24 reporting period) for surface water monitoring locations in the TSF eastern management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section 106. Interpretation of long-term water quality trends in the TSF eastern management zone can be summarised as follows:

- Several analytes exhibit increasing long-term trends at CAWS42 (the NTSF decant pond). These analytes include total phosphorus, chloride, sodium, copper, and molybdenum (refer to Figure A.72 to Figure A.76). Comparatively, other monitoring locations in the management zone (CAWS43 and CAWS60) that are downstream of CAWS42 generally exhibit stable or decreasing trends. This indicates that changes in water quality in the management zone are somewhat confined to the NTSF decant pond (CAWS42).
- In addition to the long-term trends for analytes presented in Figure A.72 to Figure A.76, several analytes at CAWS42 have exhibited increasing trends since around July 2022 with higher values becoming more consistent. The NTSF decant pond (CAWS42) began receiving inflows from the Molybdenum Plant outflow point around this time. These analytes include antimony, arsenic, potassium, and TDS.
- Changes in water quality at CAWS42 are likely attributed to inflows from the Molybdenum Plant outflow point. It is also not unusual for tailings decant water to change in quality over time. Changes to tailings decant water quality can occur for several reasons including mining in different veins/locations which can influence chemical reactions, and leaching of metals in the tailings, as well as dilution and concentration of decant water due to changing weather conditions.
- Trends at CAWS60 have generally remained constant or decreased over time with the exception of copper. Copper has exhibited a weak increasing trend at CAWS60 since July 2015. Since start 2023, concentrations at CAWS60 have begun trending downward. This trend is reflective of similar trends are CAWS42 and CAWS43 indicating that the trend could be caused by seepage related impacts from the adjacent TSFs (further discussed in Section A.5.3).

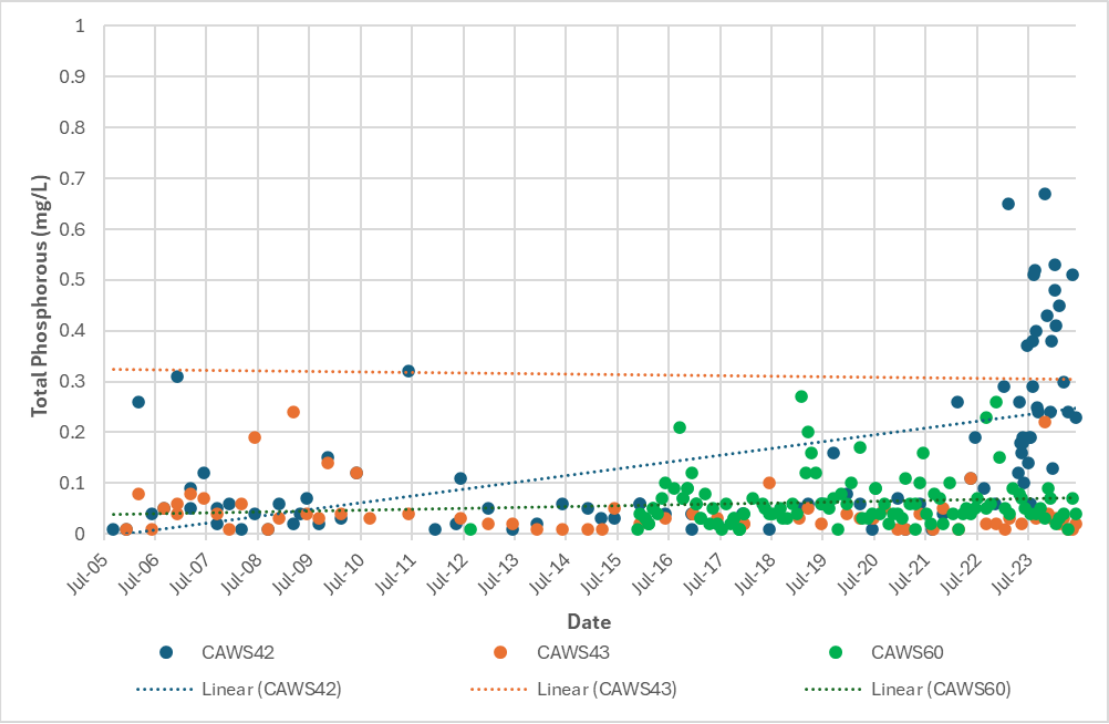


FIGURE A.72: TSF EASTERN MANAGEMENT ZONE LONG-TERM TOTAL PHOSPHORUS

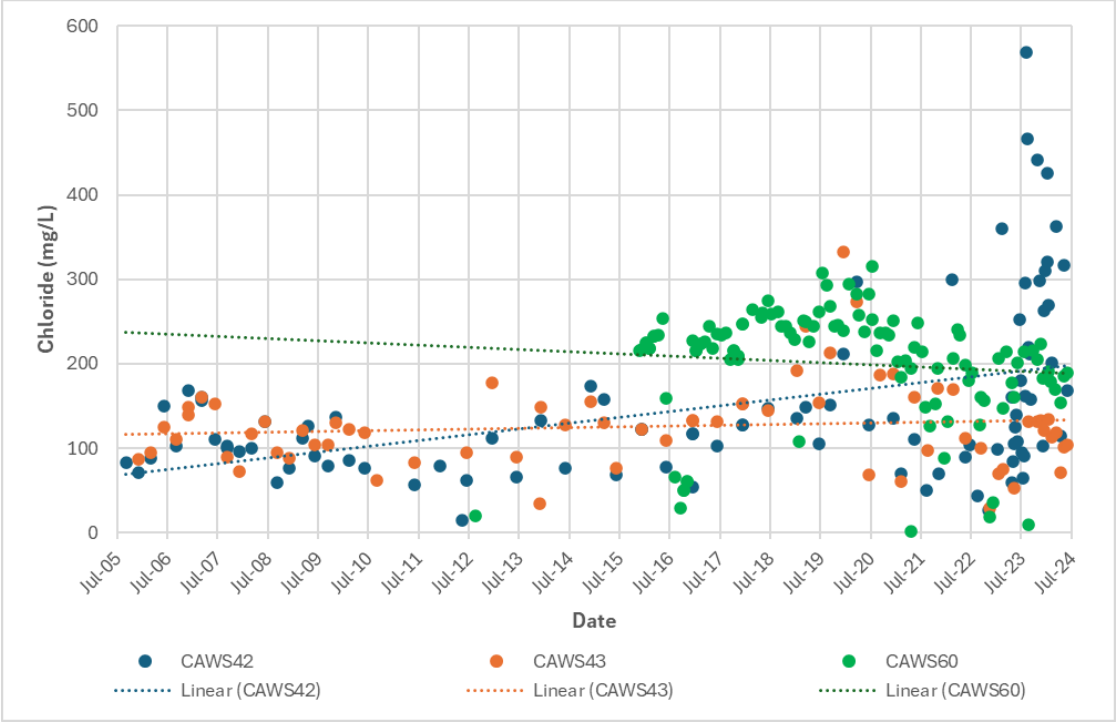


FIGURE A.73: TSF EASTERN MANAGEMENT ZONE LONG-TERM CHLORIDE

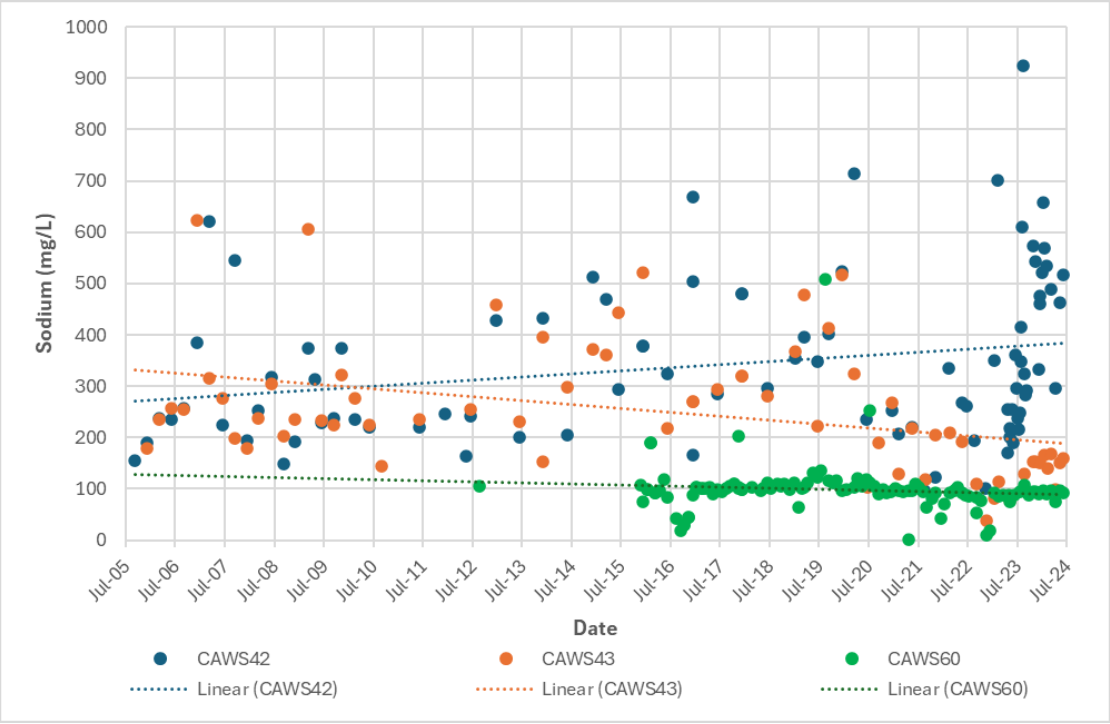


FIGURE A.74: TSF EASTERN MANAGEMENT ZONE LONG-TERM SODIUM

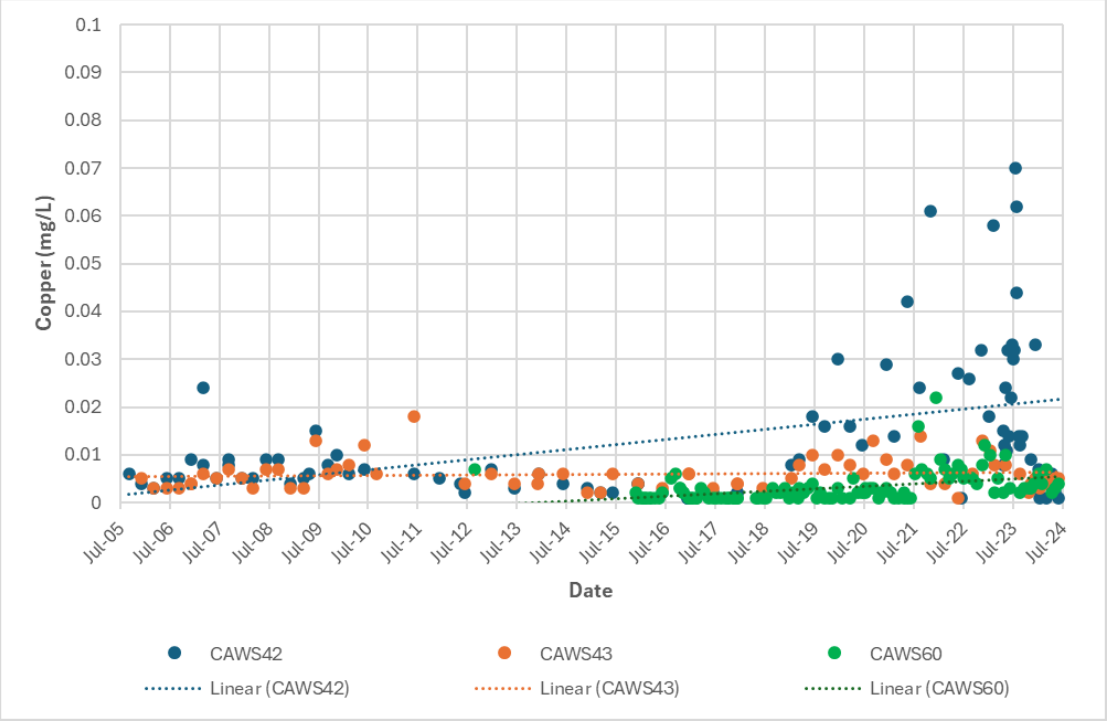


FIGURE A.75: TSF EASTERN MANAGEMENT ZONE LONG-TERM COPPER

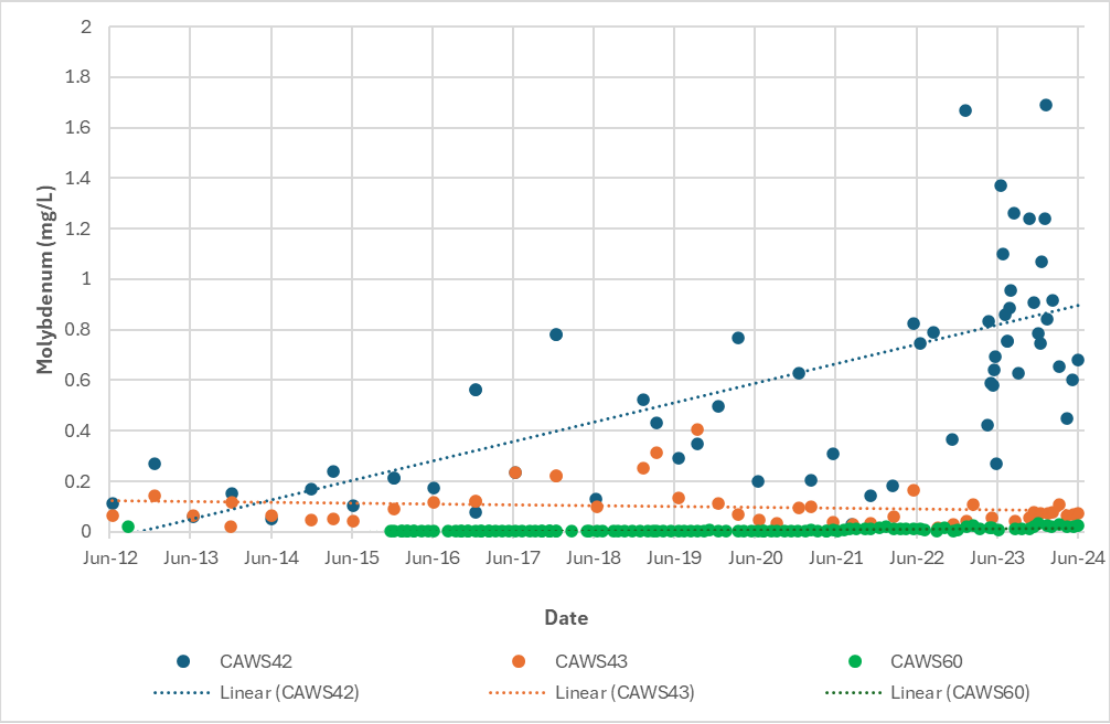


FIGURE A.76: TSF EASTERN MANAGEMENT ZONE LONG-TERM MOLYBDENUM

A.5.3 Assessment of Potential Seepage Related Impacts

Grouping surface water monitoring locations CAWS42, CAWS43 and CAWS60 in one management zone and hence one analysis set allows relatively easy consideration of whether there are any seepage related impacts at CAWS60 (the Eastern Dyke storage). Copper is the only analyte recorded at CAWS60 that appears to exhibit a trend that reflects that of the NTSF and STSF (CAWS42 and CAWS43).

Water quality at CAWS60 (Eastern Dyke storage) has the majority of results for water quality analytes (including dissolved metals) being low or below the limit of detection. Results for copper at CAWS60 are also considered low. Water captured in the Eastern Dyke storage is managed via transfers to the process water system. It should be noted that the Eastern Dyke storage has a significant upstream catchment comprised of agricultural land and receives the majority of rainfall runoff inflows from this area as opposed to the TSFs. Changes in analyte concentrations could be attributed to upstream agricultural sources, however, it is not possible to make this conclusion due to lack of upstream monitoring locations.

A.5.4 Summary and Recommendations

The majority of results for the TSF eastern management zone were within the historic range for FY24. There were some continuing increasing trends recognised at CAWS42 but these changes in water quality appear to be somewhat localised (i.e., not affecting other surface water monitoring locations in the management zone). These trends began around July 2022 when the CAWS42 began receiving inflows from the Molybdenum Plant outflow point. Eastern Dyke storage (CAWS60) has exhibited a trend for copper that is reflective of trends at the NTSF and STSF (CAWS42 and CAWS43) in recent years.

A.6 TSF Western Zone

The TSF western management zone has 9 surface water monitoring locations. Surface water monitoring locations in this zone are shown in Figure A.65 and described in Table A.5. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.6: TSF WESTERN MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
CAWS61	Water quality monitoring results at these monitoring locations are used to assess potential effects of mining, processing and waste rock emplacements. These locations are both on Cadiangullong Creek (i.e., the receiving environment).
CAWS62	
CAWS64	These surface water monitoring locations are used to monitor for potential for seepage impacts on the western side of the NTSF and STSF. These surface water monitoring locations are dams.
CAWS67	
CAWS68	
CAWS69	
CAWS72	
CAWS75	
CAWS76	

A.6.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.6.1.1 to A.6.1.4. It should be noted there are no monitoring locations in this management zone that have SSGVs, therefore, there were no exceedances of SSGVs.

A.6.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the TSF western management zone can be interpreted as follows:

- **pH** – Results for pH were within the historic range for all monitoring locations. There are no emerging trends or outliers evident for the FY24 period.
- **Electrical Conductivity** – Results for EC all monitoring locations returned results within the historic range during the reporting period. EC values at all monitoring locations exhibited an increasing trend during FY24, however, no outliers were observed (refer to Figure A.77). These increases in EC could be attributed to increased surface water runoff and associated inflow of increased dissolved salts, or increased concentration of metals. Sodium concentrations during FY24 were within the historic range and there were no clear increasing trends for metals that were consistent at all monitoring locations.
- **Total Suspended Solids** – All results for TSS were within the historic range for all monitoring locations during FY24 (refer to Figure A.78). No emerging trends are evident. Only slightly higher value for TSS was observed at CAWS69 on 15 November 2023 (142 mg/L), however, this value is within the range of historic results for the site which are highly variable throughout the entirety of the monitoring period.
- **Total Dissolved Solids** – All results for TDS were within the historic range for the monitoring locations. CAWS67, CAWS68, CAWS69 and CAWS72 exhibited an increasing trend throughout FY24 (refer to Figure A.79). This trend appears to have started at the start of 2022.

This trend is consistent with an increasing trend for EC at the same locations. Increases in TDS can be caused by increased surface runoff inflows, natural soil and rock weathering processes and increased concentration of metals, chemical and minerals. There were no clear increasing trends for metals that were consistent at all of the aforementioned monitoring locations. Increases in calcium, magnesium and sulphate reflected the same increasing trend as TDS at CAWS67, CAWS68, CAWS69 and CAWS72, indicating that there is some association between these analytes. High concentration of these analytes at these locations indicate that this increasing trend could be influenced by runoff from waste rock embankments. TSF decant water does not exhibit the same characteristics, indicating that these increases are not the result of seepage related impacts.

- **Alkalinity** – All results for alkalinity were within the historic range for the monitoring locations. There are no emerging trends or outliers evident during the FY24 period.
- **Oxidation reduction potential** – Results for ORP were variable at all locations (refer to Figure A.80). Results for ORP on 13 September 2023 for CAWS61 (328 mg/L) and 16 May 2024 at CAWS76 (261 mg/L) are the highest values for ORP in the historic monitoring period for these sites. Most locations exhibited an increasing upward trend during FY24 which is a continuation of a clear trend over the longer term. This trend (including potential causes and impacts) is discussed further in Section A.7.

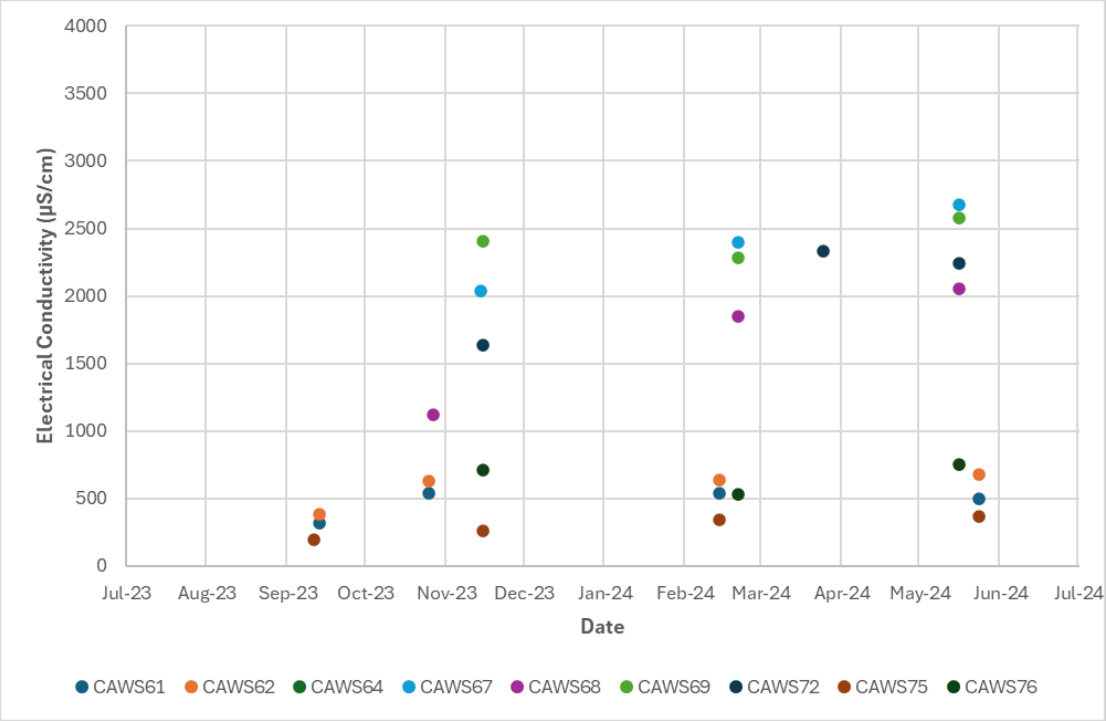


FIGURE A.77: TSF WESTERN MANAGEMENT ZONE FY24 EC

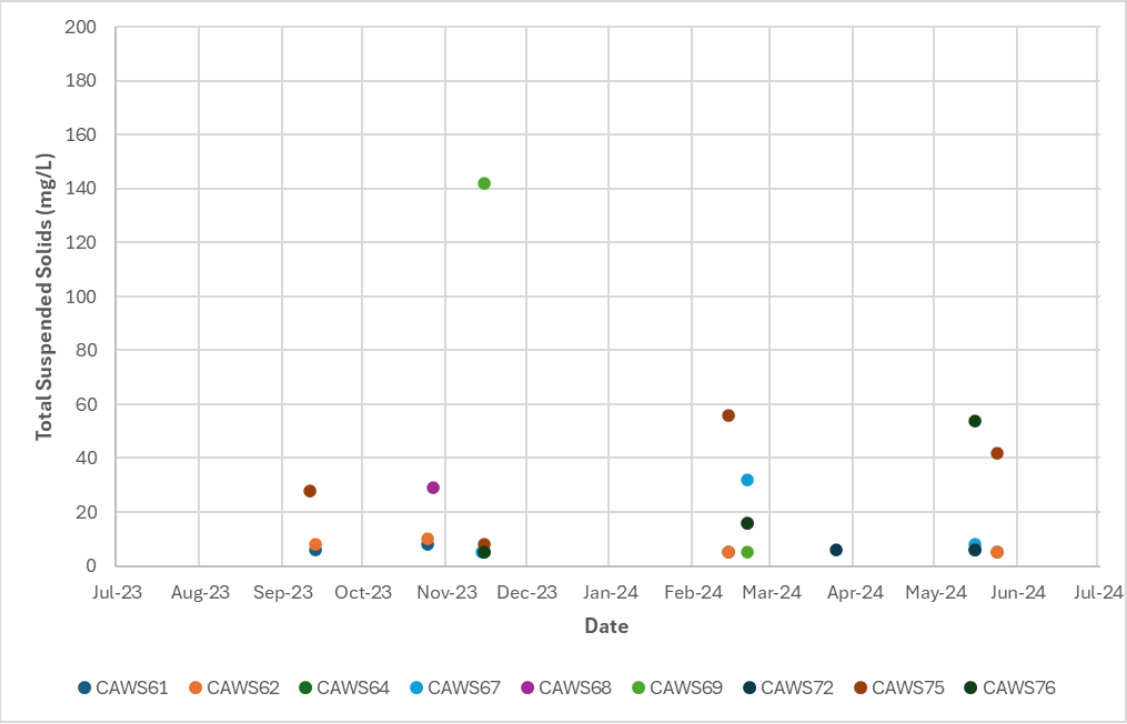


FIGURE A.78: TSF WESTERN MANAGEMENT ZONE FY24 TSS

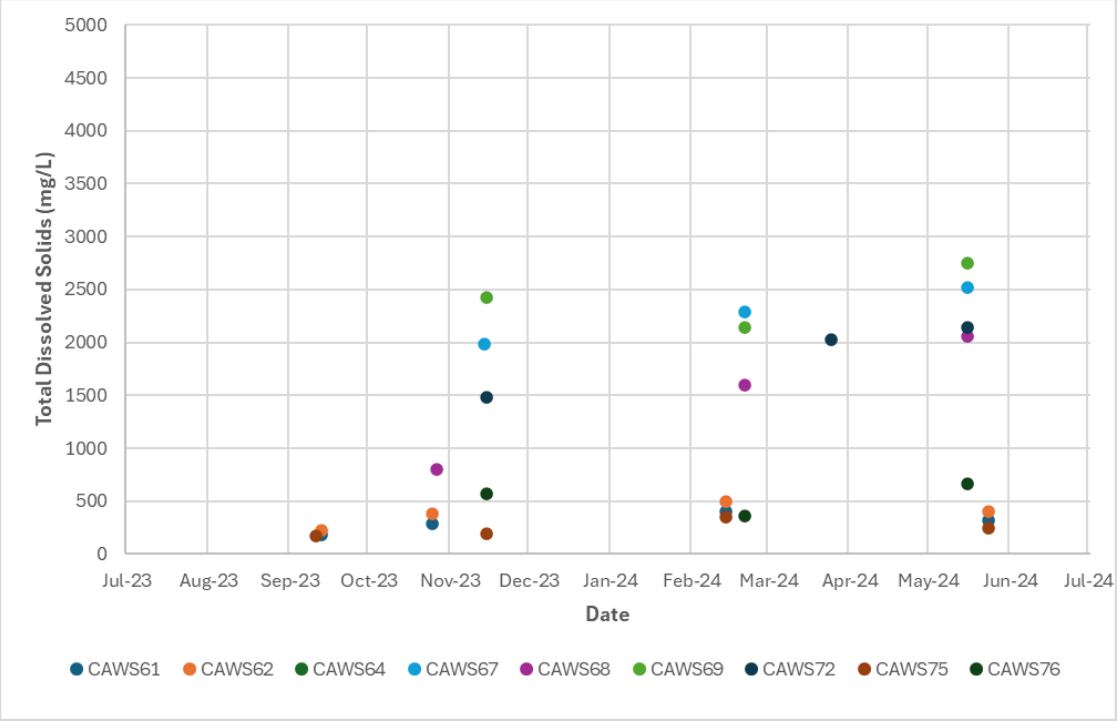


FIGURE A.79: TSF WESTERN MANAGEMENT ZONE FY24 TDS

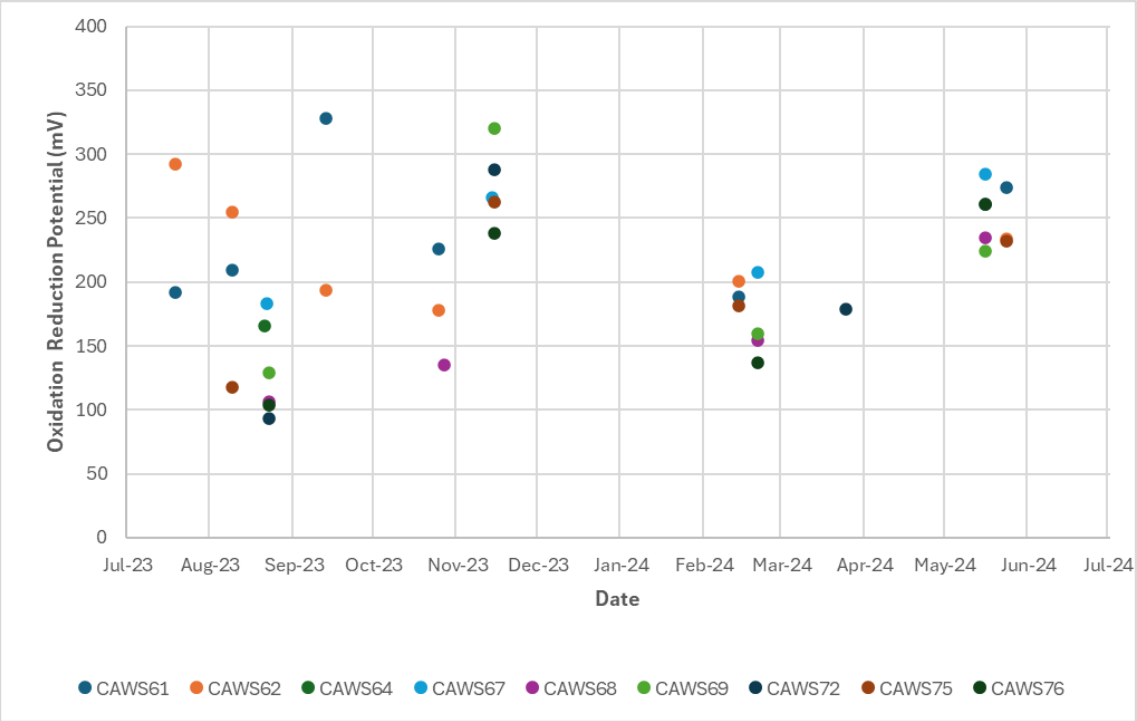


FIGURE A.80: TSF WESTERN MANAGEMENT ZONE FY24 OXIDATION REDUCTION POTENTIAL

A.6.1.2. Nutrients

Surface water quality monitoring results for nutrients for the western TSF management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently within the historical range for surface water monitoring locations in the management zone. Some higher values were observed at CAWS69 (refer to Figure A.81), however, these values (0.7 mg/L on 21 February 2024 and 0.75 mg/L on 16 May 2024) are in the range of the historic median (0.75 mg/L) for CAWS69. Two higher values were observed at CAWS67 during the reporting period (1.59 mg/L on 21 February 2024 and 2.09 mg/L on 16 May 2024). The value observed at CAWS67 on 16 May 2024 was greater the 95th percentile of historic results for the site. Increased nitrate concentrations may be attributed to increased inflows from rainfall runoff. Rainfall events observed in the days and weeks prior to these higher results indicate that there could be some association between these inflows and the higher results.
- **Nitrite** – Almost all values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. Results for nitrite at CAWS75 in February 2024 was slightly higher than the limit of detection but still within the historic range. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were consistently low and within the historical range for surface water monitoring locations in the management zone. There are no emerging trends or outliers.

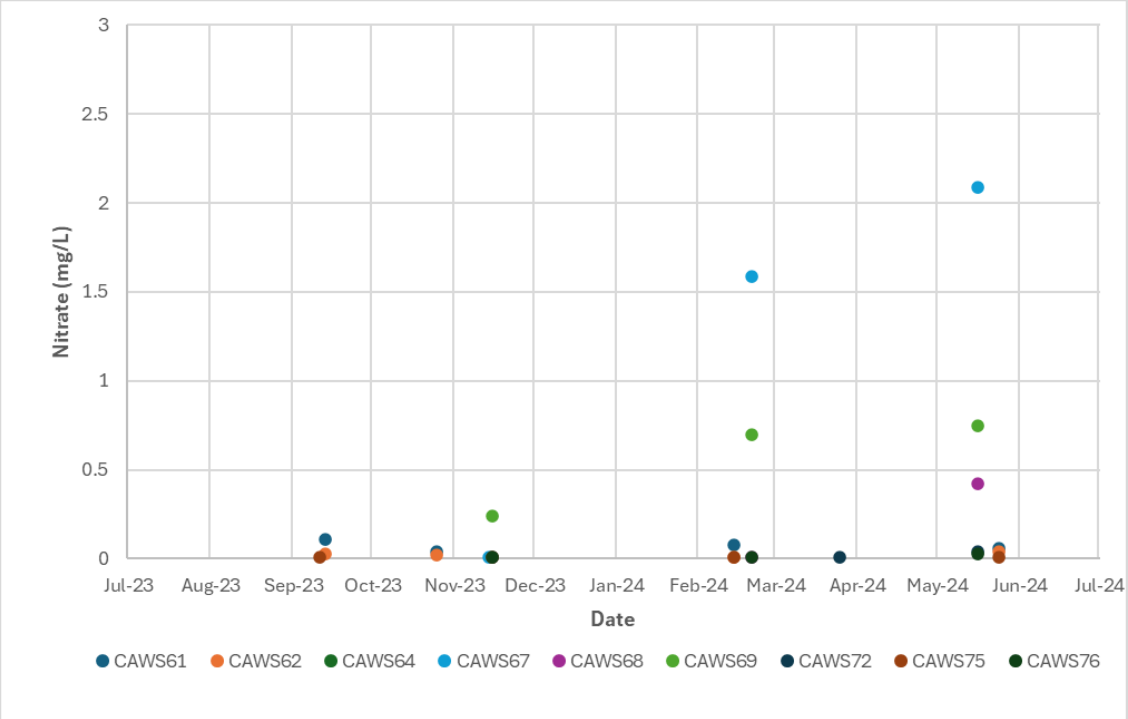


FIGURE A.81: TSF WESTERN MANAGEMENT ZONE FY24 NITRATE

A.6.1.3. Major Ions

Surface water quality monitoring results for major ions for the TSF western management zone can be interpreted as follows:

- **Calcium** – All results for calcium were within the historic range for the monitoring locations. CAWS67, CAWS68, CAWS69 and CAWS72 exhibited an increasing trend throughout FY24 (refer to Figure A.82). This trend appears to have started at the start of 2022. This trend is consistent with an increasing trend for EC, TDS, magnesium, and sulphate at the same locations. High concentration of these analytes at these locations indicate that this increasing trend could be influenced by runoff from waste rock embankments. TSF decant water does not exhibit the same characteristics, indicating that these increases are not the result of seepage related impacts.
- **Chloride** – Results for chloride were variable throughout the monitoring period (refer to Figure A.83). All results in the monitoring zone were within the historic range for the individual locations with the exception of a value for chloride at CAWS68 on 23 August 2023 (228 mg/L) which is the highest observed in the historic monitoring period. Results for chloride prior to and following (7 mg/L and 12 mg/L) this higher value were more in line with the historic average for CAWS68. There are no outliers for any other locations and there are no emerging trends for chloride at any locations in the TSF western management zone.

- **Magnesium** – Results for magnesium were variable throughout the monitoring period (refer to Figure A.84). All results in the monitoring zone were within the historic range for the individual monitoring locations with the exception of a value for magnesium at CAWS69 on 16 May 2024 (233 mg/L) which is the highest observed in the historic monitoring period. This result is consistent with an increasing trend at CAWS69 that appears to have started at the beginning of 2022. This increasing magnesium trend is also observed at CAWS67, CAWS68 and CAWS72 and is consistent with increasing trends for EC, TDS, calcium and sulphate at the same monitoring locations. High concentration of these analytes at these monitoring locations indicate that this increasing trend could be influenced by runoff from waste rock embankments. TSF decant water does not exhibit the same characteristics, indicating that these increases are not the result of seepage related impacts.
- **Potassium** –All results for potassium for FY24 are within the historic range and there are no emerging trends or outliers.
- **Sodium** – All results for sodium for FY24 are within the historic range and there are no emerging trends or outliers.
- **Sulphate** – All results for sulphate were within the historic range for the monitoring locations. CAWS67, CAWS68, CAWS69 and CAWS72 exhibited an increasing trend throughout FY24 (refer to Figure A.85). This trend appears to have started at the start of 2022. This trend is consistent with an increasing trend for EC, TDS, calcium and magnesium at the same locations. High concentration of these analytes at these locations indicate that this increasing trend could be influenced by runoff from waste rock embankments. TSF decant water does not exhibit the same characteristics, indicating that these increases are likely not the result of seepage related impacts.

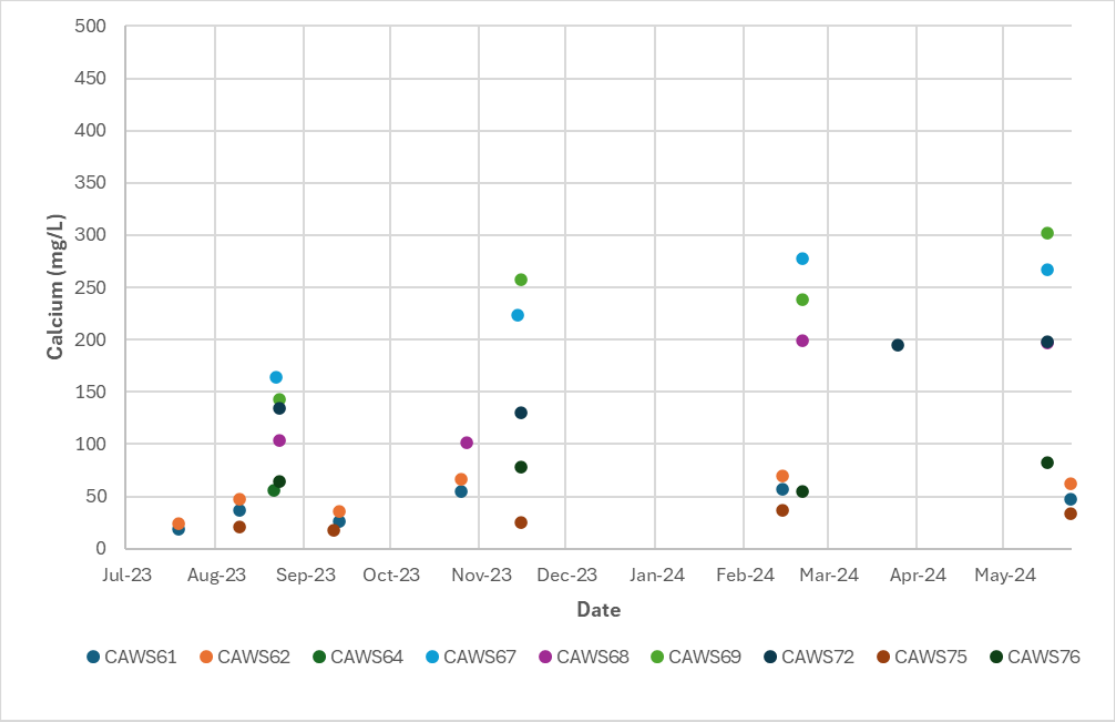


FIGURE A.82: TSF WESTERN MANAGEMENT ZONE FY24 CALCIUM

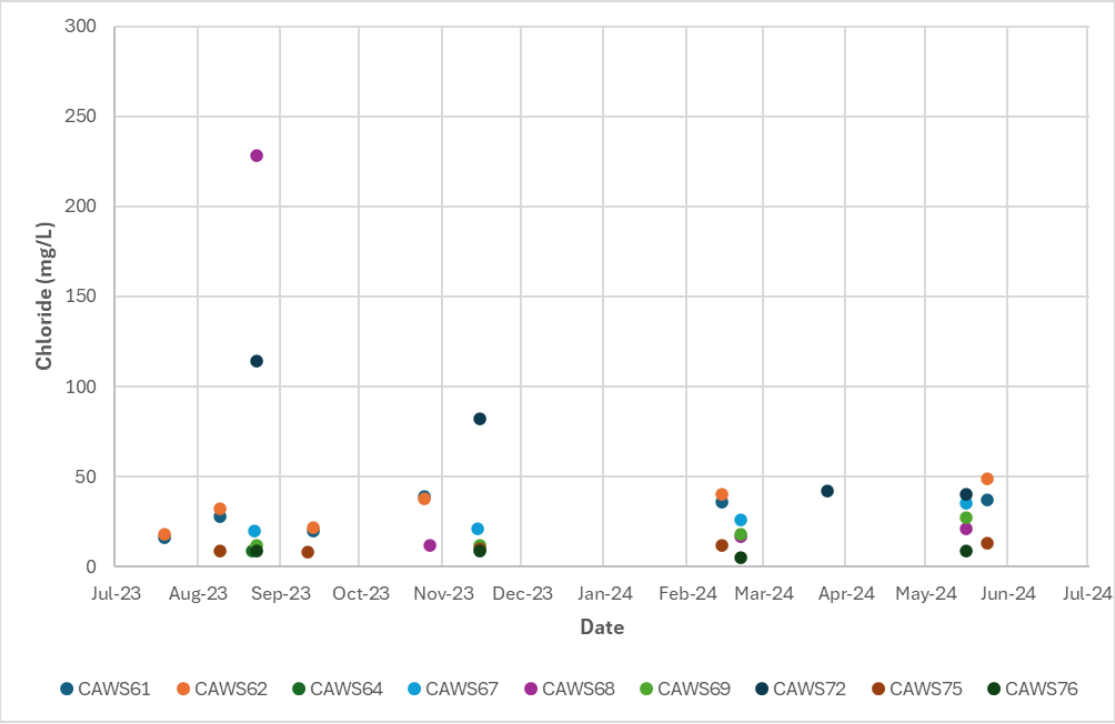


FIGURE A.83: TSF WESTERN MANAGEMENT ZONE FY24 CHLORIDE

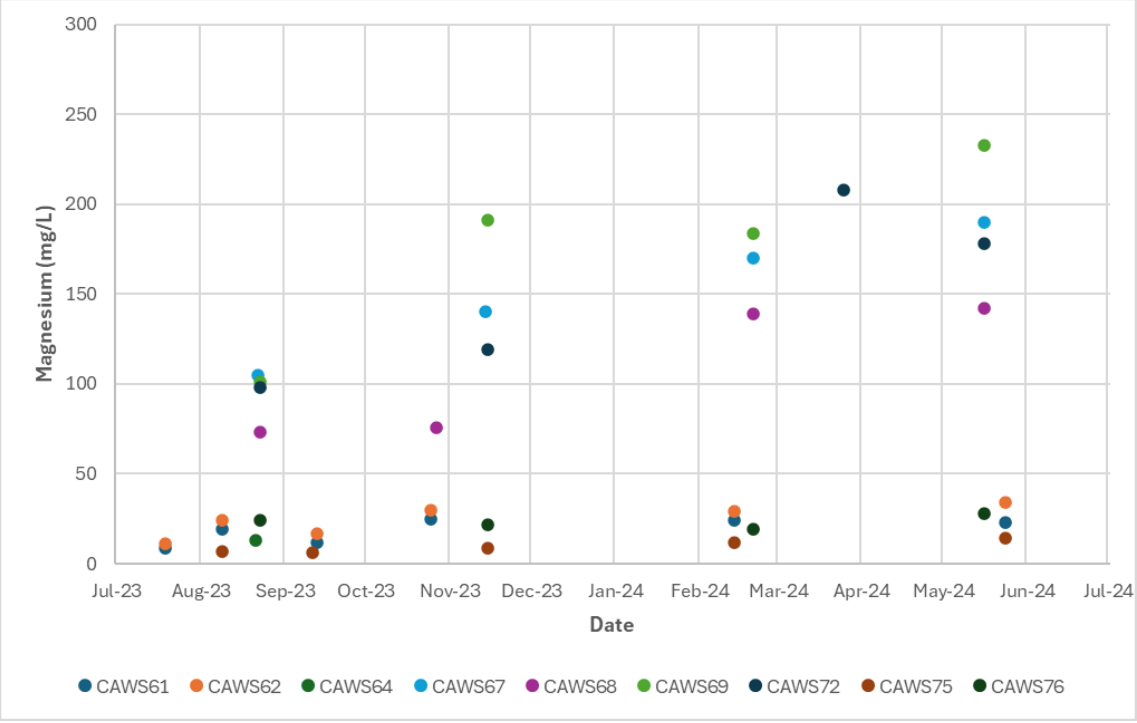


FIGURE A.84: TSF WESTERN MANAGEMENT ZONE FY24 MAGNESIUM

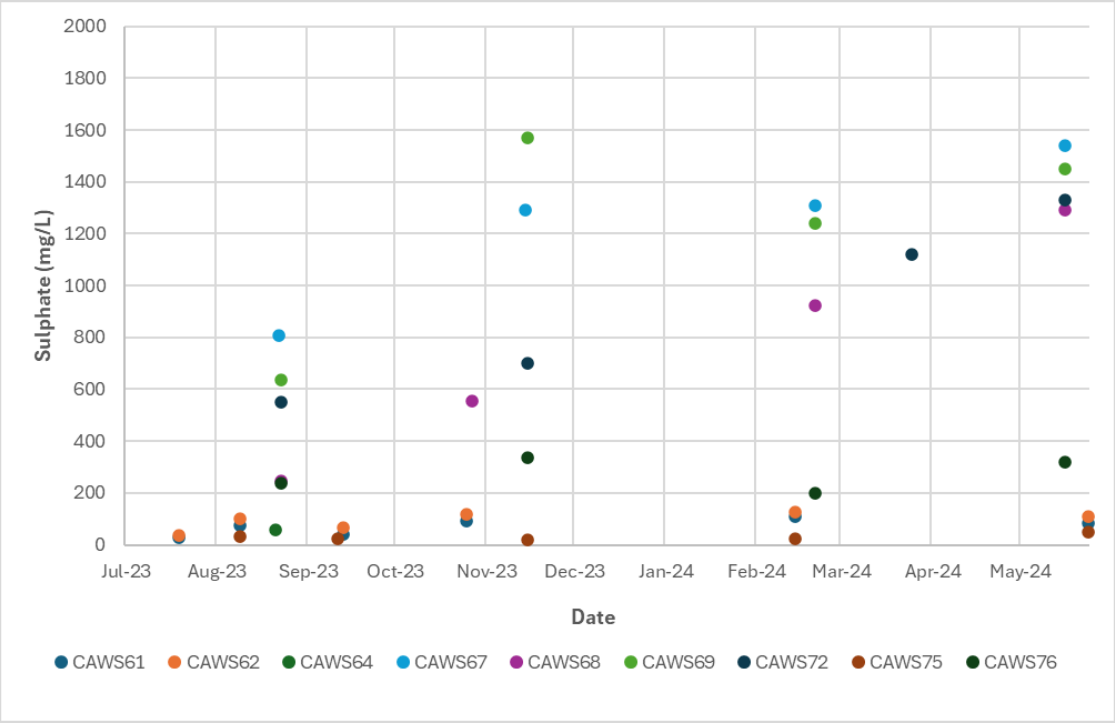


FIGURE A.85: TSF WESTERN MANAGEMENT ZONE FY24 SULPHATE

A.6.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the TSF western management zone can be interpreted as follows:

- **Aluminium** – All results for aluminium are within the historic monitoring range and there are no outliers or emerging trends.
- **Antimony** – All results for antimony at were below the limit of detection during FY24 (<0.001 mg/L) (refer to Figure A.68).
- **Arsenic** – All results for arsenic at were within the historic range and the majority of results were below the limit of detection (<0.001 mg/L). There are no emerging trends or outliers.
- **Cadmium** – Results for all locations were within the historic range with no emerging trends or outliers. All results were below the limit of detection (<0.001 mg/L).
- **Chromium** – Results for all locations were within the historic range with no emerging trends or outliers. The majority of results were below the limit of detection (<0.001 mg/L).
- **Cobalt** – Results for cobalt at all locations were within the historic range and the majority of results were below the limit of detection (<0.001 mg/L). Some results at CAWS67 were slightly above the limit of detection but still low and within the historic range for the site.
- **Copper** – Results for copper were consistently low throughout the monitoring period and all results were within the historic range. There are no emerging trends or outliers.
- **Iron –** Results for iron were variable throughout the monitoring period (refer to Figure A.86). All results in the monitoring zone were within the historic range for the individual locations with the exception of a result at CAWS67 on 16 May 2024 (0.7 mg/L) and a result at CAWS68 on 27 October 2023 (0.37 mg/L). These results are the highest observed in the historic monitoring period for the locations. For CAWS68, results prior to and following 27 October 2023 were more in line with the historic average for the site. Comparatively, results at CAWS67 were higher throughout the year with results above the 90th percentile of the historic range observed in quarters 2, 3 and 4.

  Several other analytes at CAWS67 were higher throughout the year (including EC, TDS, calcium, magnesium and sulphate). The majority of the upstream land use in the catchment reporting to CAWS67 is waste rock dump. It is considered that these higher results could be attributed to runoff inflows from the waste rock dump area.

  Lead – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) with the exception of one result at CAWS67 on 16 May 2024 (0.005 mg/L) (refer to Figure A.87). This result is coincident with a higher value for iron at the site on the same day. Several other analytes at CAWS67 were higher throughout the year (including EC, TDS, calcium, magnesium, sulphate and iron). The majority of the upstream land use in the catchment reporting to CAWS67 is waste rock dump. It is considered that these higher results could be attributed to runoff inflows from the waste rock dump area.

- **Manganese** – Results for iron were variable throughout the monitoring period (refer to Figure A.88). While results were within the historic range for all monitoring locations, higher results were observed at CAWS67 throughout the year with results above the 80th percentile of the historic range observed in quarters 2, 3 and 4. Results were higher for iron throughout this period at CAWS67 also. Several other analytes at CAWS67 were higher throughout the year (including EC, TDS, calcium, magnesium, sulphate and lead). The majority of the upstream land use in the catchment reporting to CAWS67 is waste rock dump. It is considered that these higher results could be attributed to runoff inflows from the waste rock dump area.
- **Mercury** – Mercury concentrations at all surface water monitoring locations in the TSF western management zone were below the limit of detection during the FY24 monitoring period.

  Molybdenum – Results for molybdenum were within the historic range for all monitoring locations during FY24 with the exception of one result at CAWS75 on 15 November 2023 (0.017 mg/L) (refer to Figure A.89). The next highest result at this location was recorded on 20 December 2019 (0.013 mg/L). Results prior to and following the higher result on 15 November 2023 were within the historic range for CAWS75. For all other monitoring locations (i.e., except CAWS75) there were no emerging trends or outliers.
- **Nickel** – Results for nickel at all monitoring locations were within the historic range and the majority of results were below the limit of detection (<0.001 mg/L). There are no emerging trends or outliers.
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc** – The majority of results for zinc Results for zinc during FY24 were below the limit of detection (<0.005 mg/L) with the exception of CAWS64 on 21 August 2024 (0.117 mg/L) and CAWS75 on 14 February 2024 (0.007 mg/L) (refer to Figure A.90). These results are the highest within the historic range for the monitoring locations. Results for zinc prior to and following the higher concentrations were below the limit of detection for both monitoring locations.

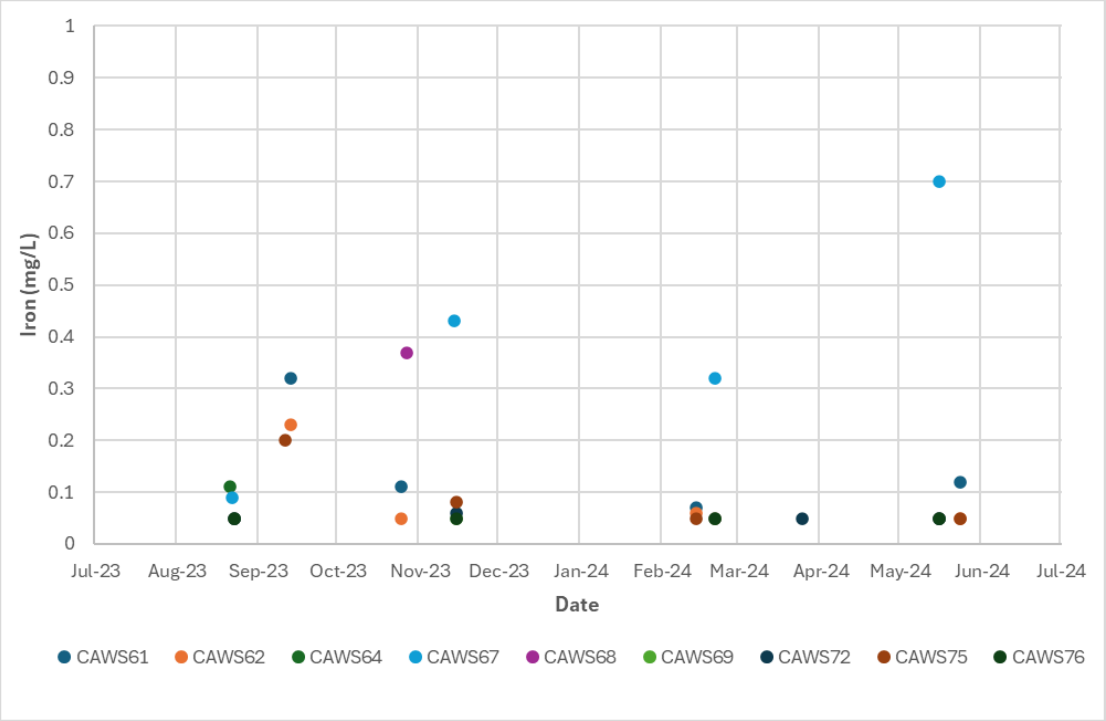


FIGURE A.86: TSF WESTERN MANAGEMENT ZONE FY24 IRON

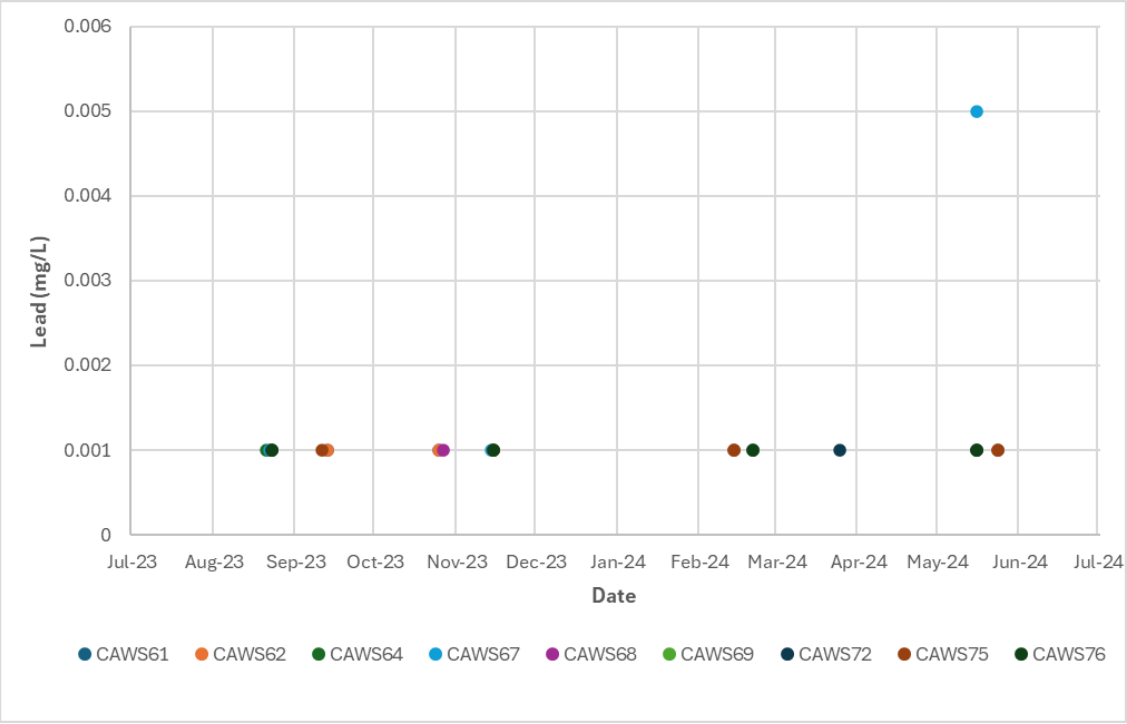


FIGURE A.87: TSF WESTERN MANAGEMENT ZONE FY24 LEAD

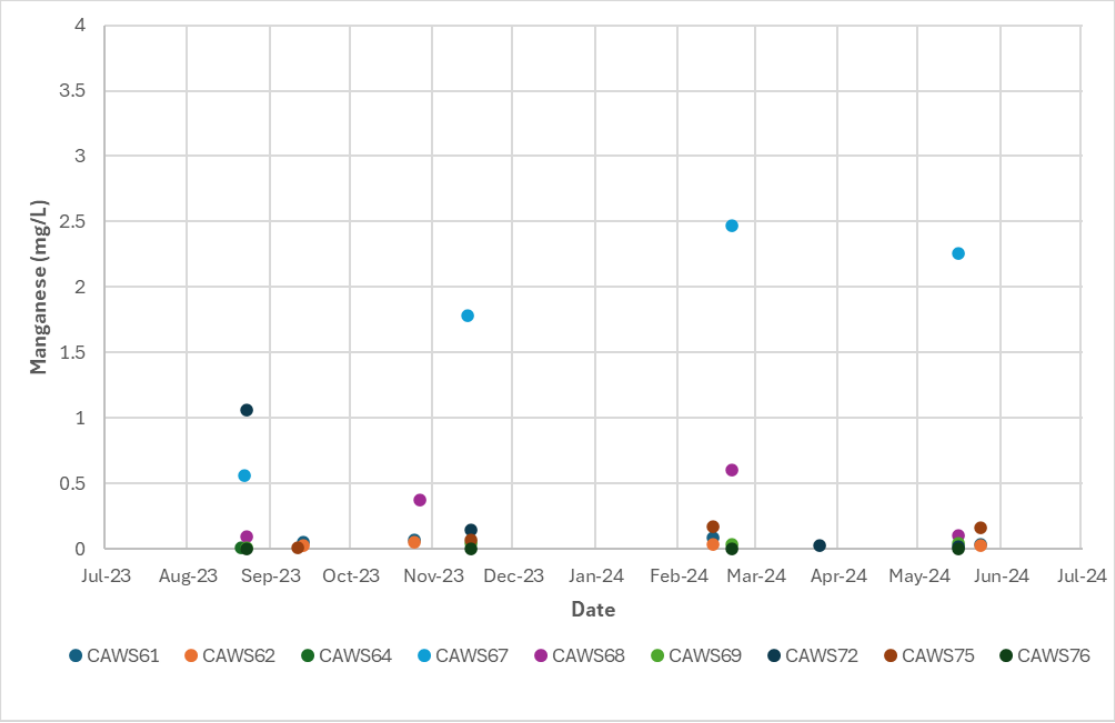


FIGURE A.88: TSF WESTERN MANAGEMENT ZONE FY24 MANGANESE

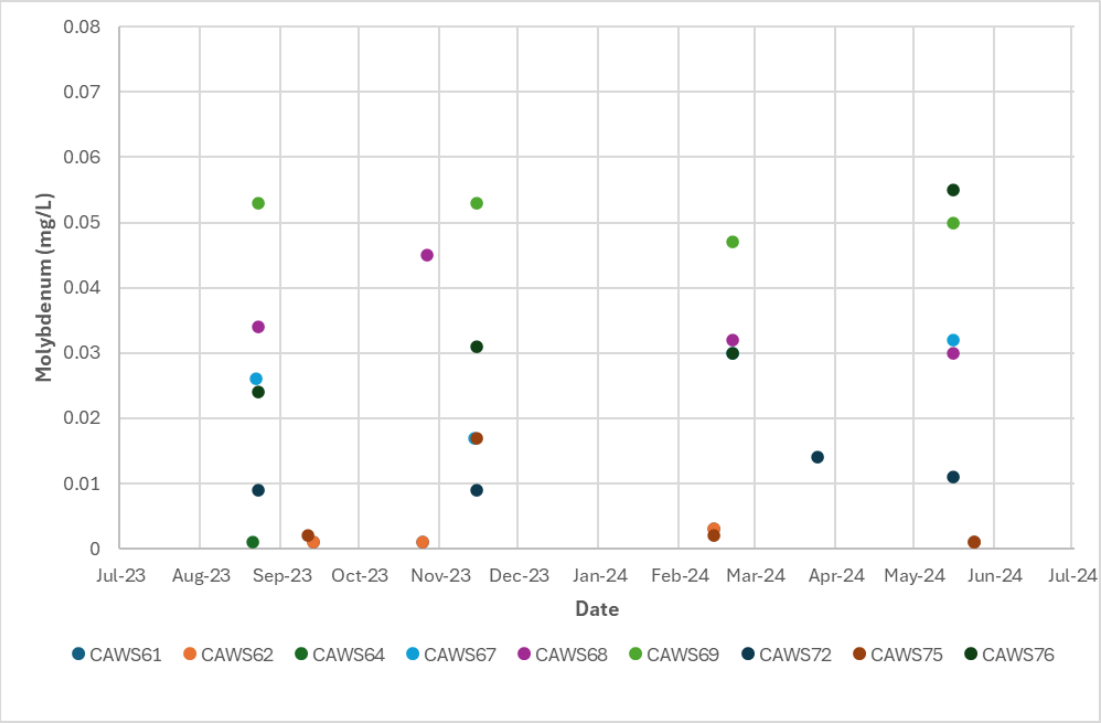


FIGURE A.89: TSF WESTERN MANAGEMENT ZONE FY24 MOLYBDENUM

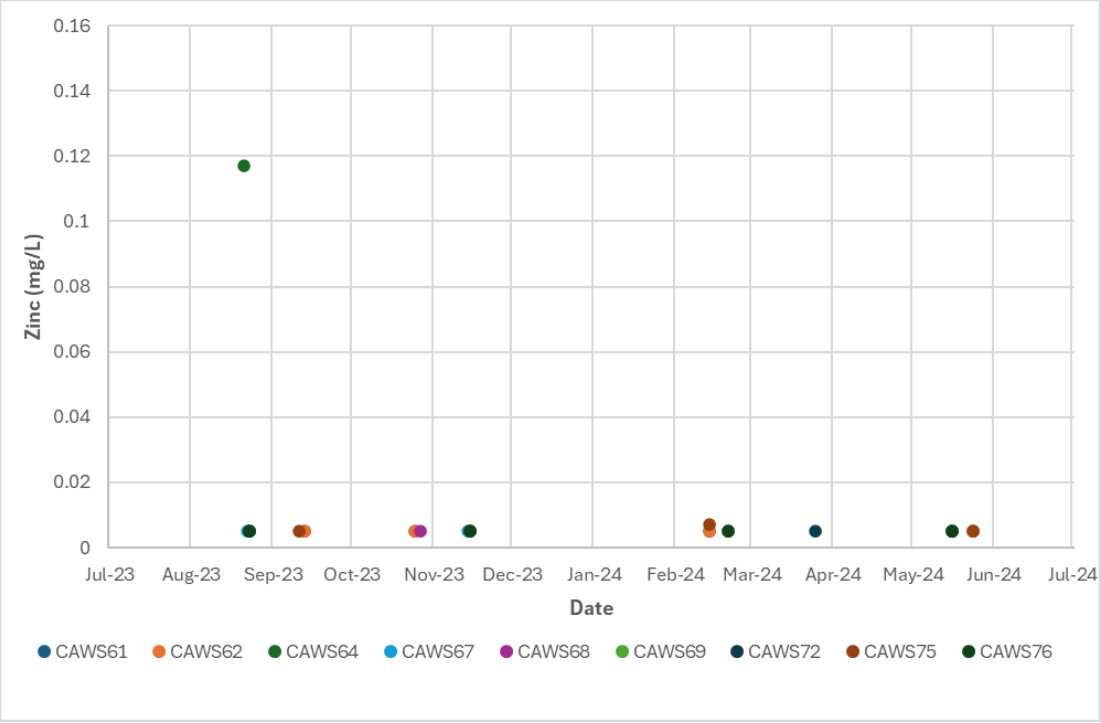


FIGURE A.90: TSF WESTERN MANAGEMENT ZONE FY24 ZINC

A.6.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence before the FY24 reporting period) for surface water monitoring locations in the TSF western management zone. Short term trends relevant to the reporting period for various analytes have been detailed in Section A.6.1. Interpretation of long-term water quality trends in the TSF western management zone can be summarised as follows:

- Long-term increases in ORP continued throughout FY24. This trend is consistent at all monitoring locations in the TSF western management zone and other management zones (e.g., CDF and former BDF management zones) considered as part of this assessment. ORP can increase for a number of reasons including increases in oxidizing agents, decreases in reducing agents, temperature changes and chemical reactions. ORP in the TSF western management zone is still at a concentration that is considered normal in a surface water context. Note, the high ORP value observed at CAWS69 in FY19 is considered to be an outlier.

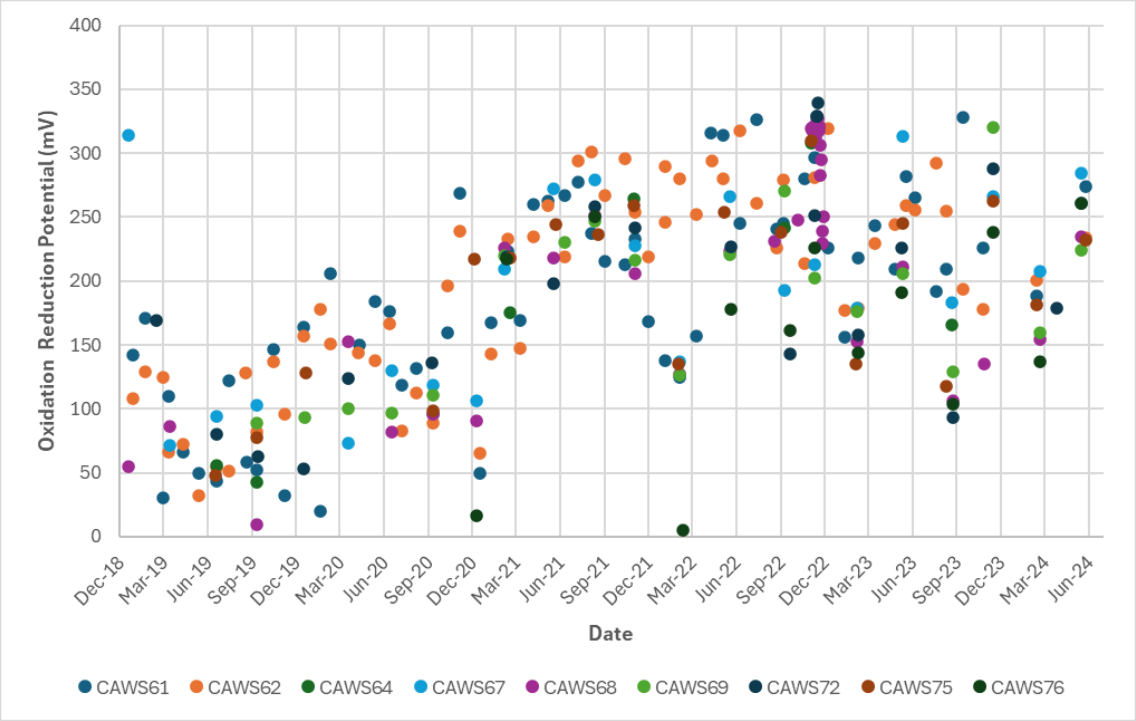


FIGURE A.91: TSF WESTERN MANAGEMENT ZONE LONG-TERM OXIDATION REDUCTION POTENTIAL

A.6.3 Assessment of Potential Seepage Related Impacts

The TSF western management zone includes several monitoring locations used to monitor to seepage related impacts from the NTSF, STSF, and waste rock dump emplacement areas, and some locations in the receiving environment (CAWS61 and CAWS62). Dissimilarity between recorded water quality at CAWS61 and CAWS62 and other monitoring locations in the management zone indicate a lack of mining related impacts on receiving environment water quality results. With the exception of long-term increases in ORP at CAWS61 and CAWS62, there are no trends at these locations.

A.6.4 Summary and Recommendations

The majority of results for the TSF western management zone were within the historic range for the monitoring locations during FY24. Some surface water monitoring locations, particularly CAWS67, CAWS68, CAWS69 and CAWS72, displayed increasing trends during FY24 and higher results for several analytes. Dissimilarity between TSF decant water and the water quality at these locations indicate that increasing trends and higher results are not due to seepage related impacts. These locations are intended to capture rainfall runoff from disturbed areas on site that are quite dynamic and as a result, can cause changes to water quality due to variation in analytes in different mining veins/areas and runoff volumes. These changes in water quality appear to be confined to the aforementioned monitoring locations with receiving environment monitoring locations (CAWS61 and CAWS62) in the management zone indicating no mining or seepage related impacts.

A.7 TSF Southern Zone

The TSF southern management zone includes 11 surface water monitoring locations. Surface water monitoring locations in this zone are described in Table A.7. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.7: TSF SOUTHERN MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
412702	Surface water monitoring location is used to assess potential impacts associated with the Cadia Mine. It is the most downstream surface water monitoring location being located immediately downstream of the confluence of Cadiangullong Creek and Rodds Creek. It should be noted that 412702 has associated SSGVs that are used to indicate water quality impacts from the Cadia mining areas. A full summary of these SGGVs is provided in Section 3.3. The FY24 performance against these SSGVs is detailed in Section A.7.4.
CAWS28	These surface water monitoring locations are used to assess potential effects of the TSFs on surface water quality in Rodds Creek. The surface water monitoring locations are comprised of both watercourses (CAWS28, CAWS30, CAWS41, CAWS55, CAWS59, CAWS63 and CAWS63a) and surface water storages (CAWS31, CAWS54, CAWS56 and CAWS57) downstream of the STSF.
CAWS54	
CAWS55	
CAWS56	
CAWS57	
CAWS59	
CAWS41	
CAWS30	
CAWS31	
CAWS63	
CAWS63a	

A.7.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.7.1.1 to A.7.1.4. It should be noted that surface water quality monitoring at CAWS63a began during FY24. As such, assessment of results for this site against the historic range could not be completed.

A.7.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the TSF southern management zone can be interpreted as follows:

- **pH** – There were no emerging trends for any of the monitoring locations and all results were within the historic range. There were 2 outliers observed during FY24, one at CAWS30 on 25 October 2023 (16.4 pH units) and one at CAWS55 on 3 April 2024 (16.32 pH units). Temperature at both CAWS30 and CAWS55 on these days that the higher pH values were recorded were also higher (greater than the 95th percentile of the historic range). These values are considered errors and have been discarded. All values recorded at surface water monitoring location 412702 were within the SSGV range for pH.
- **Electrical Conductivity** – Results for EC all monitoring locations returned results within the historic range during the reporting period. No emerging trends or outliers are evident for the monitoring locations. All values recorded at surface water monitoring location 412702 for EC were below the SSGV trigger.
- **Total Suspended Solids** – Results for TSS were variable throughout the FY24 reporting period (refer to Figure A.92). This is consistent with historic monitoring results for TSS throughout the management zone for which surface water monitoring locations have exhibited variable TSS values. There were no emerging trends during FY24 and the majority of sites had all results within the historic range. Higher TSS values were observed at CAWS57 on 15 November 2023 (3,870 mg/L) and CAWS54 on 15 February 2024 (776 mg/L). This value at CAWS54 is the highest in the historic monitoring period. Results prior to and following the higher TSS values were within the historic range for both CAWS57 and CAWS54. These surface water monitoring locations are surface water storages (farm dams) for which the upstream reporting catchment is entirely agricultural. Higher TSS values could be due to the disruption of sediment during the sampling process, disruption from livestock, or sediment inflows following rainfall events in the weeks prior.

  There was one exceedance of the SSGV for TSS at 412702 on 13 September 2023. The potential cause and impact of this exceedance is detailed in Section A.7.4.
- **Total Dissolved Solids** – All results for TDS during FY24 were within the historic range. There are no emerging trends or outliers. There is no SSGV for TDS at 412702.
- **Alkalinity** – All results for alkalinity were within the historic range for the monitoring locations. There are no emerging trends or outliers evident during the FY24 period. There is no SSGV for alkalinity at 412702.
- **Oxidation reduction potential** – Results for ORP were generally within the historic monitoring range but highly variable at all monitoring locations (refer to Figure A.93). There was one slightly higher result for ORP at CAWS55 on 3 April 2024 (598 mV). Values for ORP at this location prior to and following this higher reading were more in line with the historic average indicating that the value recorded on 3 April 2024 is not part of an ongoing trend. There are no emerging trends evident for FY24. There is no SSGV for ORP at 412702.

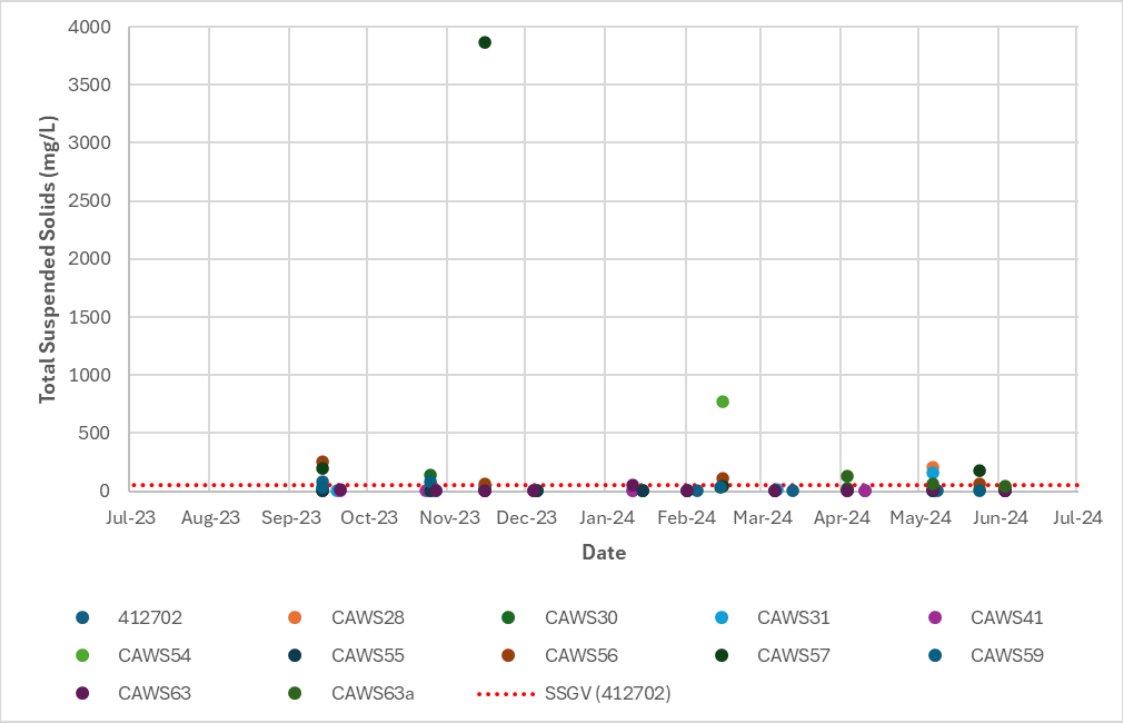


FIGURE A.92: TSF SOUTHERN MANAGEMENT ZONE FY24 TSS

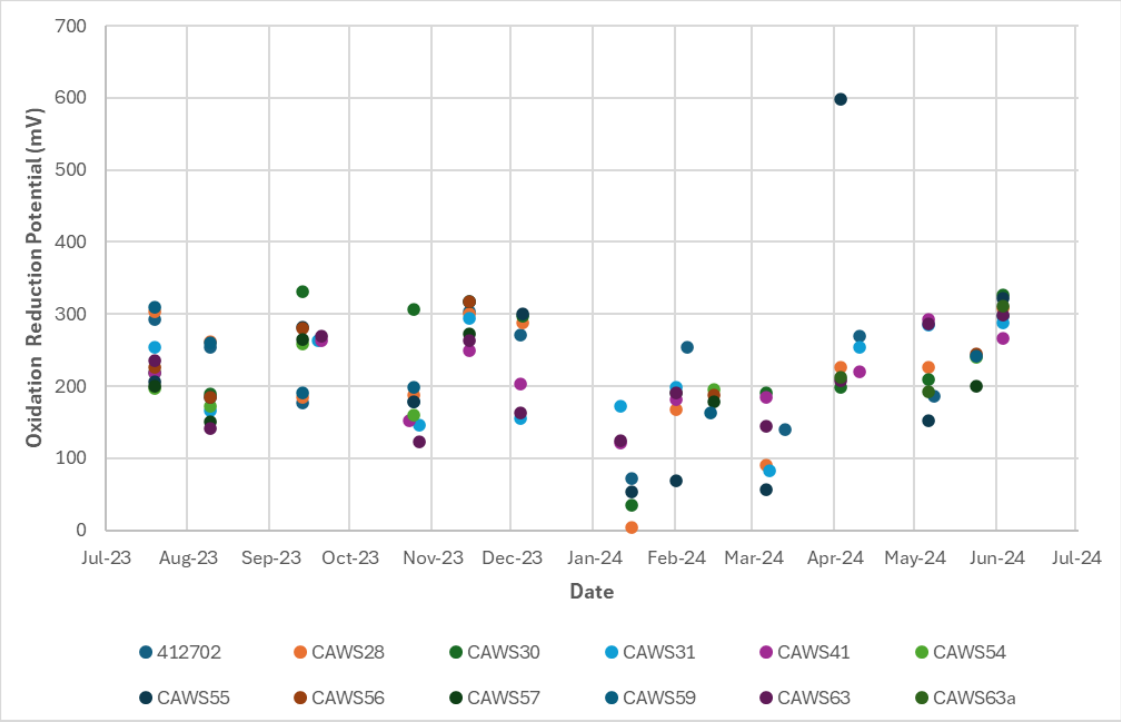


FIGURE A.93: TSF SOUTHERN MANAGEMENT ZONE FY24 OXIDATION REDUCTION POTENTIAL

A.7.1.2. Nutrients

Surface water quality monitoring results for nutrients for the southern TSF management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently within the historical range for surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Nitrite** – Almost all values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. Some slightly higher results were observed at CAWS54 in September 2023 (0.05 mg/L) and February 2024 (0.07 mg/L), however, these results are still within the historic range. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for surface water monitoring locations in the management zone (refer to Figure A.94). There are no emerging trends for any of the locations. One slightly higher value was observed on CAWS57 on 15 November 2023 (10.3 mg/L). This is still within the historic range for the site and values prior to and following this higher result were more in line with the historic average. This higher value for total nitrogen is coincident with a higher value for TSS on the same day at the same location. These higher values could be attributed to higher TSS due to disruption during sampling or runoff inflows from the upstream agricultural catchment following a rainfall event on 4 November 2023 (14.7 mm) and a second event between 8 and 9 November 2023 (11.5 mm).
- **Total Phosphorus** – The majority of values for total phosphorus were within the historic range for the FY24 reporting period (refer to Figure A.95). One outlier was observed at CAWS57 on 15 November 2023 (1.64 mg/L). This is the highest result in the entire historic monitoring period for this location. Values prior to and following this higher result were more in line with the historic average. This higher value for total phosphorus is coincident with higher values for total nitrogen and TSS on the same day at the same location. These higher values could be attributed to higher TSS due to disruption during sampling or runoff inflows from the upstream agricultural catchment following a rainfall event on 4 November 2023 (14.7 mm) and a second event between 8 and 9 November 2023 (11.5 mm).

There are no SSGVs for any of the above analytes at surface water monitoring location 412702.

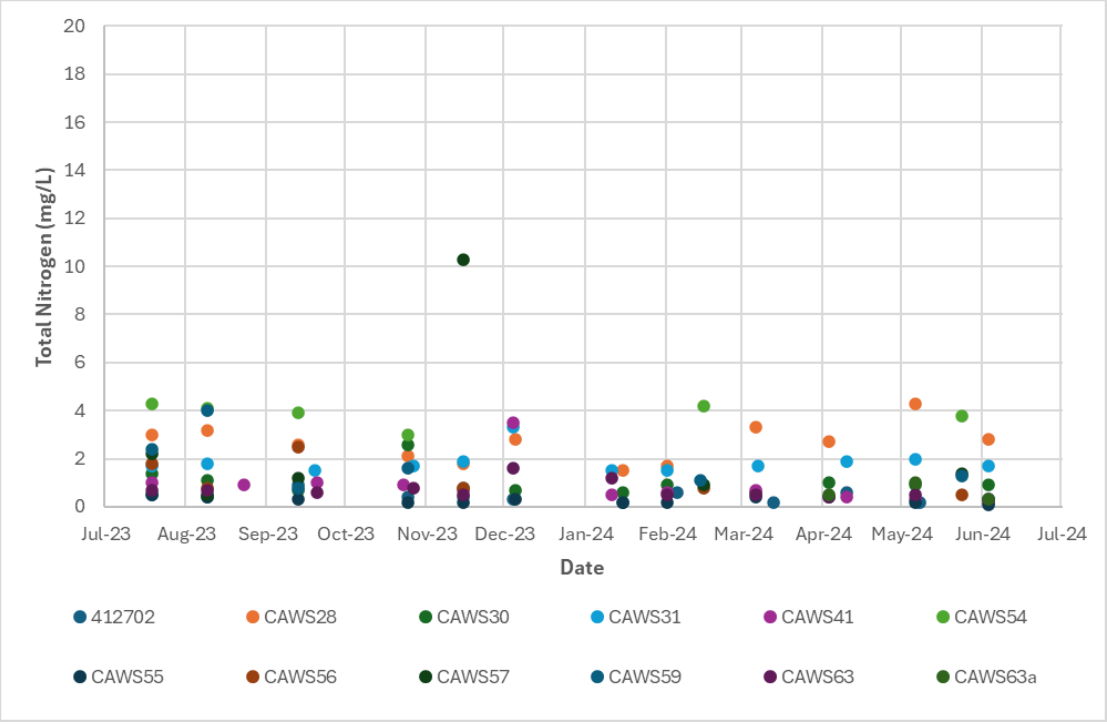


FIGURE A.94: TSF SOUTHERN MANAGEMENT ZONE FY24 TOTAL NITROGEN

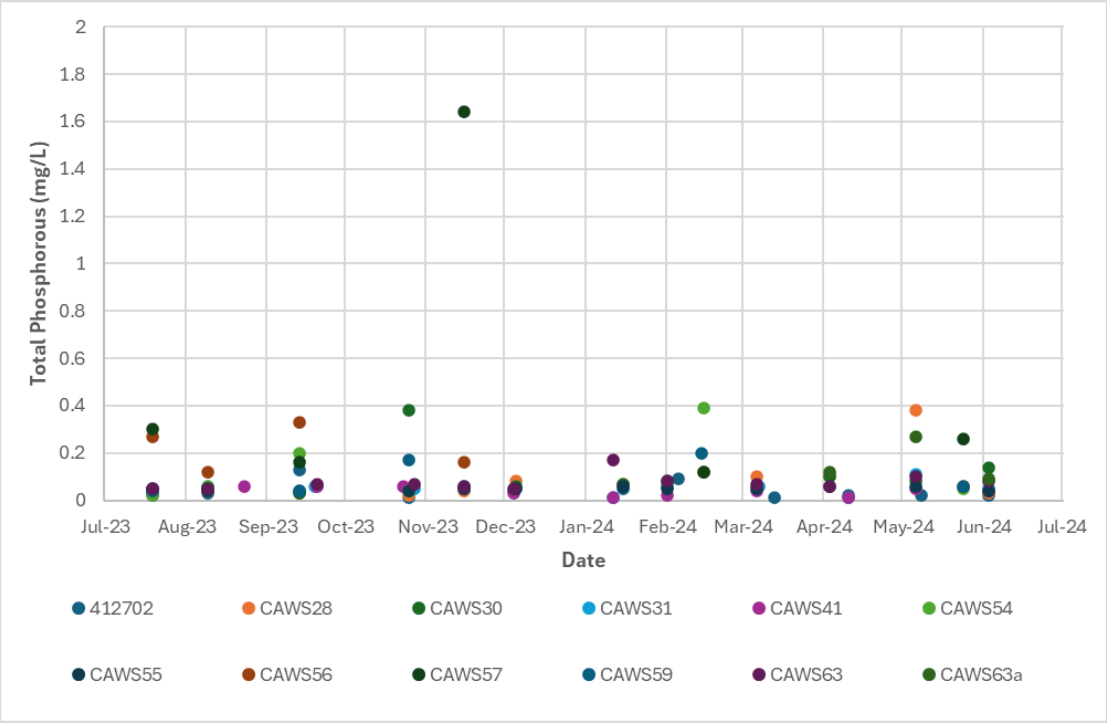


FIGURE A.95: TSF SOUTHERN MANAGEMENT ZONE FY24 TOTAL PHOSPHORUS

A.7.1.3. Major Ions

Surface water quality monitoring results for major ions for the TSF southern management zone can be interpreted as follows:

- **Calcium** – Results for calcium for all monitoring locations in the TSF southern management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** – Results for chloride for all monitoring locations in the TSF southern management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Magnesium** – All results for magnesium were within the historic range for the monitoring locations. There are no emerging trends at any of the locations in the management zone.
- **Potassium** – All results for potassium were within the historic range for the monitoring locations. There are no emerging trends at any of the locations in the management zone.
- **Sodium** – All results for sodium were within the historic range during the FY24 reporting period. There are no outliers or emerging trends.
- **Sulphate** – Results for sulphate for all monitoring locations in the TSF southern management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers for sulphate.

There are no SSGVs for any of the above analytes at surface water monitoring location 412702.

A.7.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the TSF southern management zone can be interpreted as follows:

- **Aluminium** – The majority of results for aluminium during the reporting period were below the limit of detection (<0.01 mg/L) (refer to Figure A.96) and there an no emerging trends. A higher value was observed at CAWS31 on 6 May 2024 (0.21 mg/L). This value is the highest in the historic monitoring period for the location. Values prior to and following this higher result were below the limit of detection. These higher values are further detailed in Section A.7.1.4.1.

  There were 2 exceedances of the SSGV for aluminium (0.055 mg/L) at surface water monitoring location 412702 during the reporting period. These exceedances are detailed in Section A.7.4.

- **Antimony** – All results for antimony were below the limit of detection (<0.001 mg/L) during the reporting period. There is no SSGV for antimony at surface water monitoring location 412702.

- **Arsenic** – The majority of results for arsenic during the reporting period were below the limit of detection (<0.01 mg/L) (refer to Figure A.97) and there an no emerging trends. Higher values were observed for arsenic at CAWS31 on 1 February 2024 (0.006 mg/L) and 6 May 2024 (0.004 mg/L). These values are the highest and second highest in the historic monitoring period for the location. Arsenic values prior to and following these higher results were below the limit of detection These higher values are further detailed in Section A.7.1.4.1.

  There were no exceedances of the SSGV for arsenic at surface water monitoring location 412702.

- **Cadmium** – All results for cadmium during the reporting period were below the limit of detection (<0.0001 mg/L) with the exception of 1 result at CAWS31 on 1 February 2024 (0.015 mg/L). This result is the highest at the monitoring location for the entire historic monitoring period. Results prior to and following this higher value at CAWS31 were below the limit of detection. This higher value is further detailed in Section A.7.1.4.1.

  There were no exceedances of the SSGV for cadmium at surface water monitoring location 412702.

- **Chromium** – The majority of results for chromium during the reporting period were below the limit of detection (<0.0001 mg/L) (refer to Figure A.99) and there an no emerging trends. Higher values were observed for chromium at CAWS31 on 1 February 2024 (0.007 mg/L) and 6 May 2024 (0.009 mg/L). These values are the highest and second highest in the historic monitoring period for the location. Values prior to and following these higher results were below the limit of detection. These higher values are further detailed in Section A.7.1.4.1.

  There is no SSGV for chromium at surface water monitoring location 412702.

- **Cobalt** – The majority of results for cobalt during the reporting period were below the limit of detection (<0.0001 mg/L) (refer to Figure A.100)and there an no emerging trends. Higher values were observed for cobalt at CAWS31 on 1 February 2024 (0.006 mg/L) and 6 May 2024 (0.002 mg/L). These values are the highest and second highest in the historic monitoring period for the location. Cobalt values prior to and following these higher results were below the limit of detection. These higher values are further detailed in Section A.7.1.4.1.

  There is no SSGV for cobalt at surface water monitoring location 412702.

- **Copper** – All results for copper were within the historic range and there are no emerging trends or outliers. All values for copper at surface water monitoring location 412702 were below the SSGV.

- **Iron –** All results for iron are within the historic monitoring range and there are no emerging trends. All values for iron at surface water monitoring location 412702 were below the SSGV.

- **Lead** – The majority of results for lead during the reporting period were below the limit of detection (<0.001 mg/L) (refer to Figure A.101) and there an no emerging trends. Higher values were observed for lead at CAWS31 on 1 February 2024 (0.005 mg/L) and 6 May 2024 (0.002 mg/L). These lead values are the highest and second highest in the historic monitoring period for the CAWS31. Values prior to and following these higher results were below the limit of detection. These higher values are further detailed in Section A.7.1.4.1.

  There were no exceedances of the SSGV for lead at surface water monitoring location 412702.

  Manganese – Manganese concentrations at all surface water monitoring locations in the TSF southern management zone were consistent with historic monitoring data during FY24. There are no emerging trends or outliers. There were no exceedances of the SSGV for manganese at surface water monitoring location 412702.

- **Mercury** – Mercury concentrations at all surface water monitoring locations in the TSF southern management zone were below the limit of detection (<0.0001 mg/L) during FY24. There are no emerging trends or outliers.

- **Molybdenum** – The majority of results for molybdenum were within the historic range (refer to Figure A.102). No emerging trends were observed during FY24. Higher results were observed at CAWS55 (0.01 mg/L) on 15 November 2023 and CAWS56 (0.004 mg/L) on 15 February 2024. These results are the highest observed at CAWS55 AND CAWS56in the historic monitoring period. Molybdenum values prior to and following these higher results were below the limit of detection indicating that the values are not part of a continuing or emerging trend. While slightly higher for the 2 monitoring locations, these molybdenum values are considered relatively low and only slightly above the historic range.

  There were no exceedances of the SSGV for molybdenum at surface water monitoring location 412702.

- **Nickel** – The majority of results for nickel were below the limit of detection (<0.001 mg/L) during FY24. Some slightly higher results were observed at CAWS31 on 1 February 2024 (0.006 mg/L) and 6 May 2025 (0.008 mg/L) but were still within the historic range. There is no SSGV for nickel at surface water monitoring location 412702.

- **Silver** – Results for silver at all sites were consistently below the limit of detection (<0.001 mg/L).

  Zinc – Results for zinc for all monitoring locations in the TSF southern management zone throughout the reporting period were low and consistent with historic monitoring results. There are no emerging trends or outliers. There were no exceedances of the SSGV for zinc at surface water monitoring location 412702.

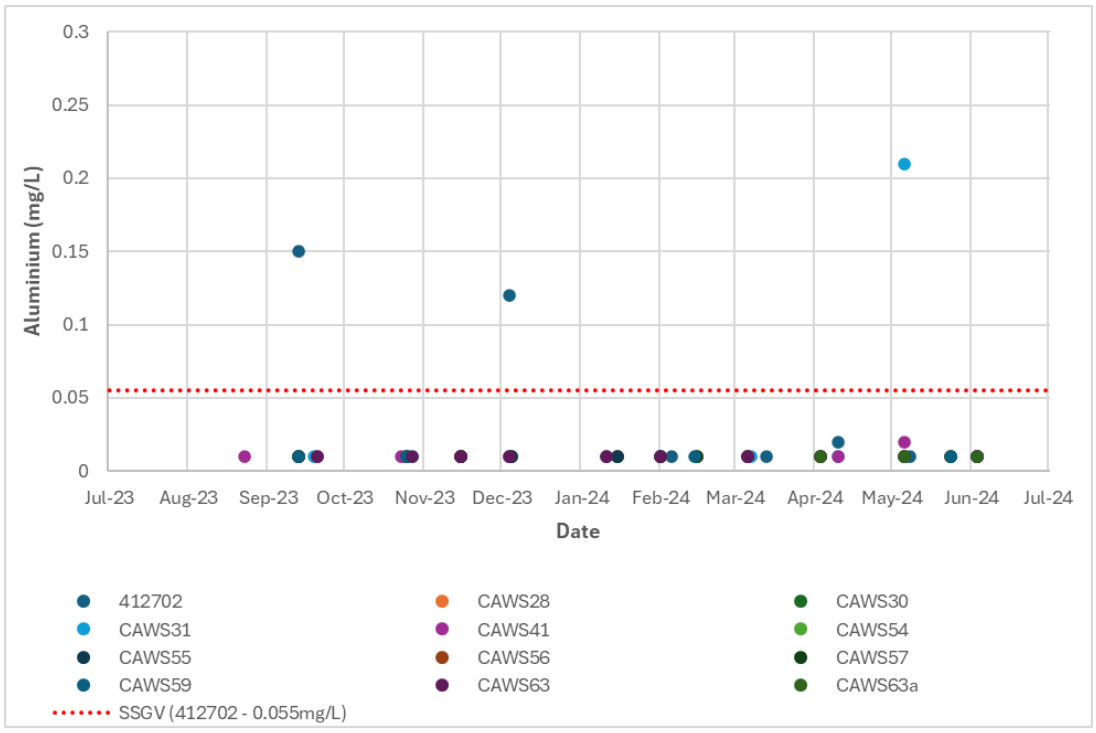


FIGURE A.96: TSF SOUTHERN MANAGEMENT ZONE FY24 ALUMINIUM

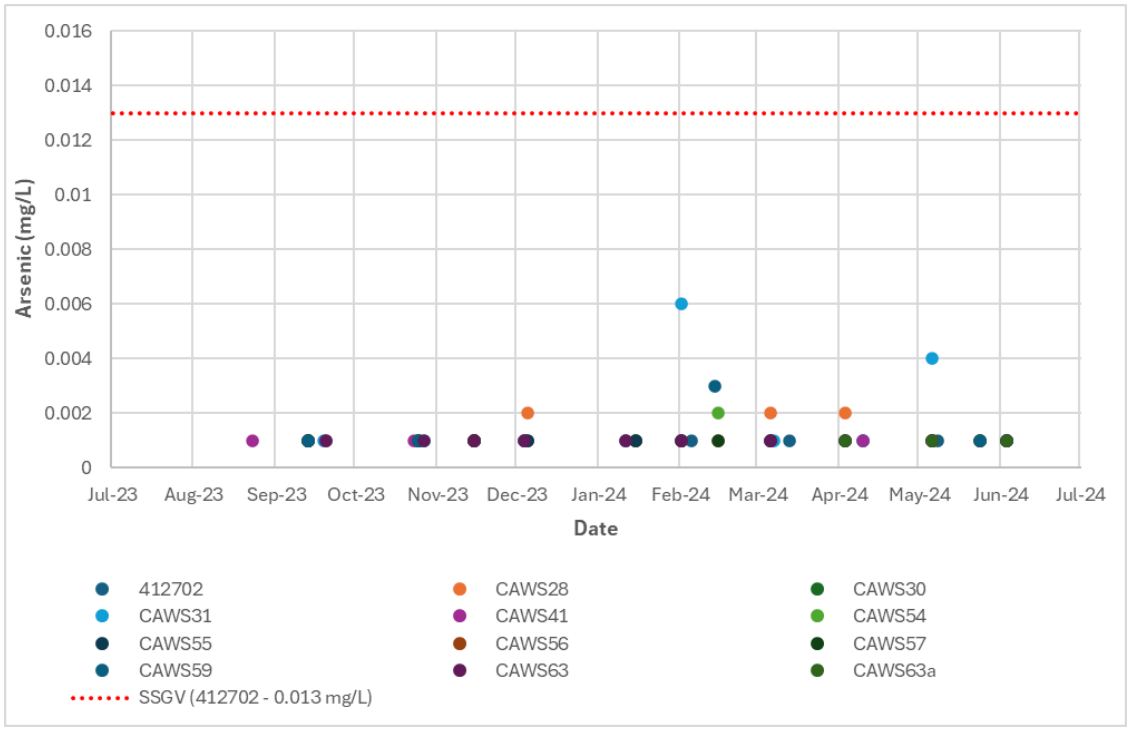


FIGURE A.97: TSF SOUTHERN MANAGEMENT ZONE FY24 ARSENIC

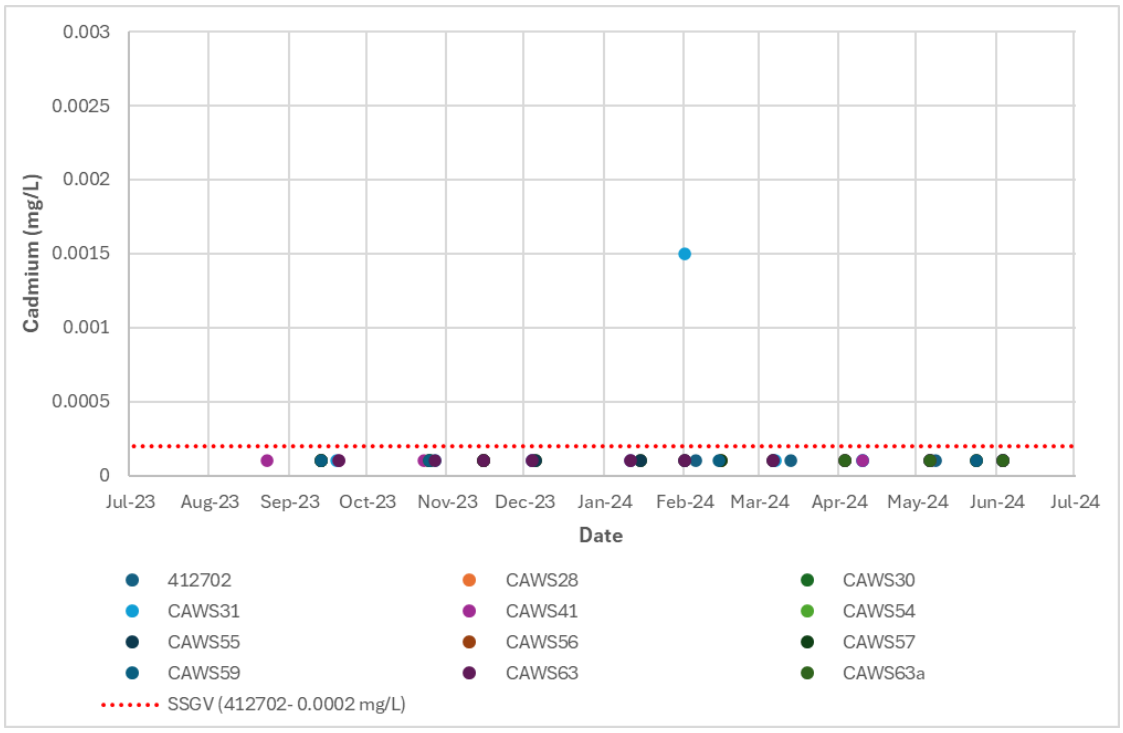


FIGURE A.98: TSF SOUTHERN MANAGEMENT ZONE FY24 CADMIUM

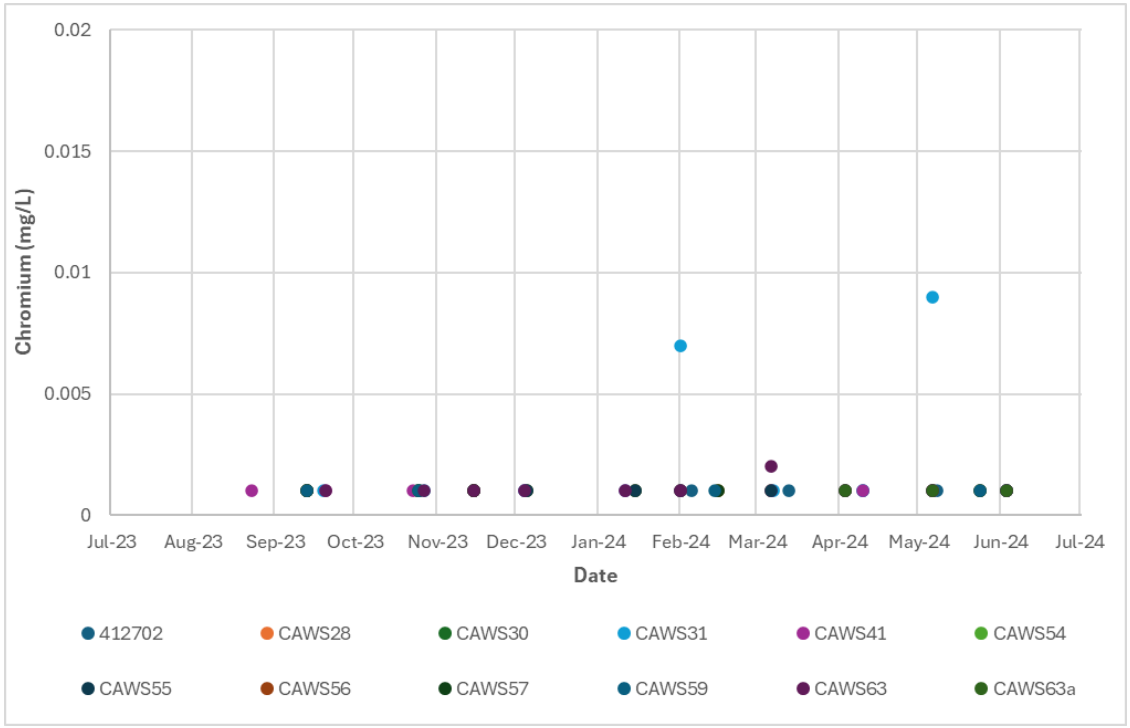


FIGURE A.99: TSF SOUTHERN MANAGEMENT ZONE FY24 CHROMIUM

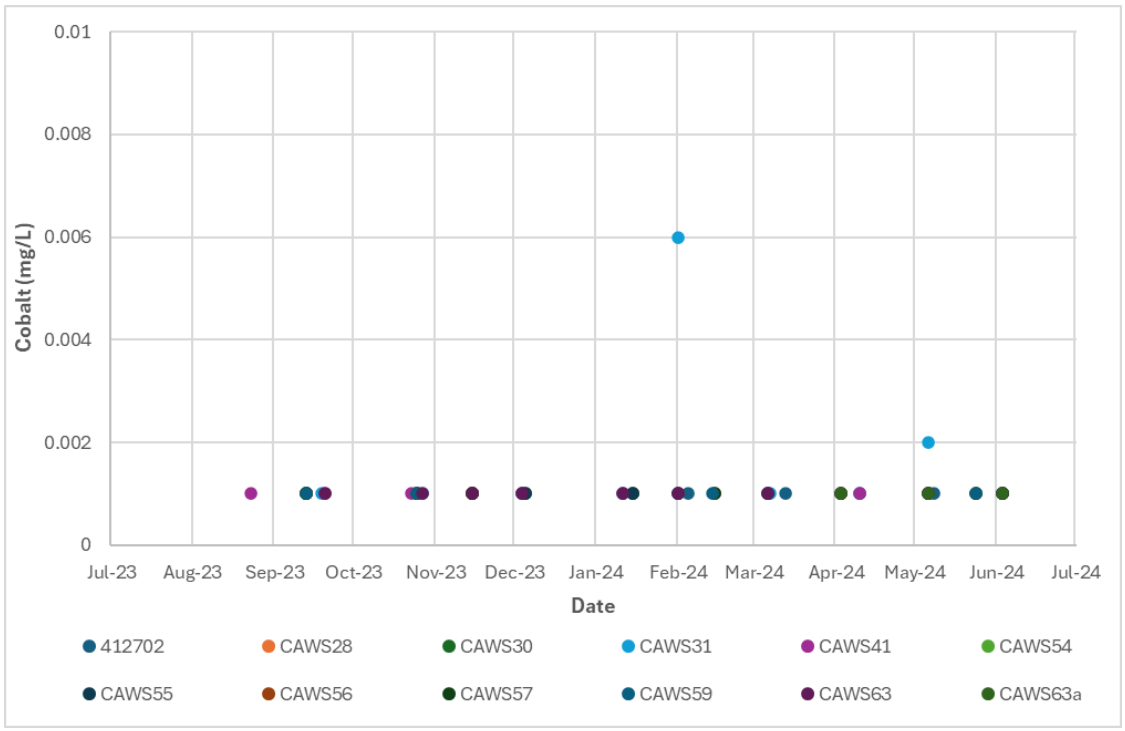


FIGURE A.100: TSF SOUTHERN MANAGEMENT ZONE FY24 COBALT

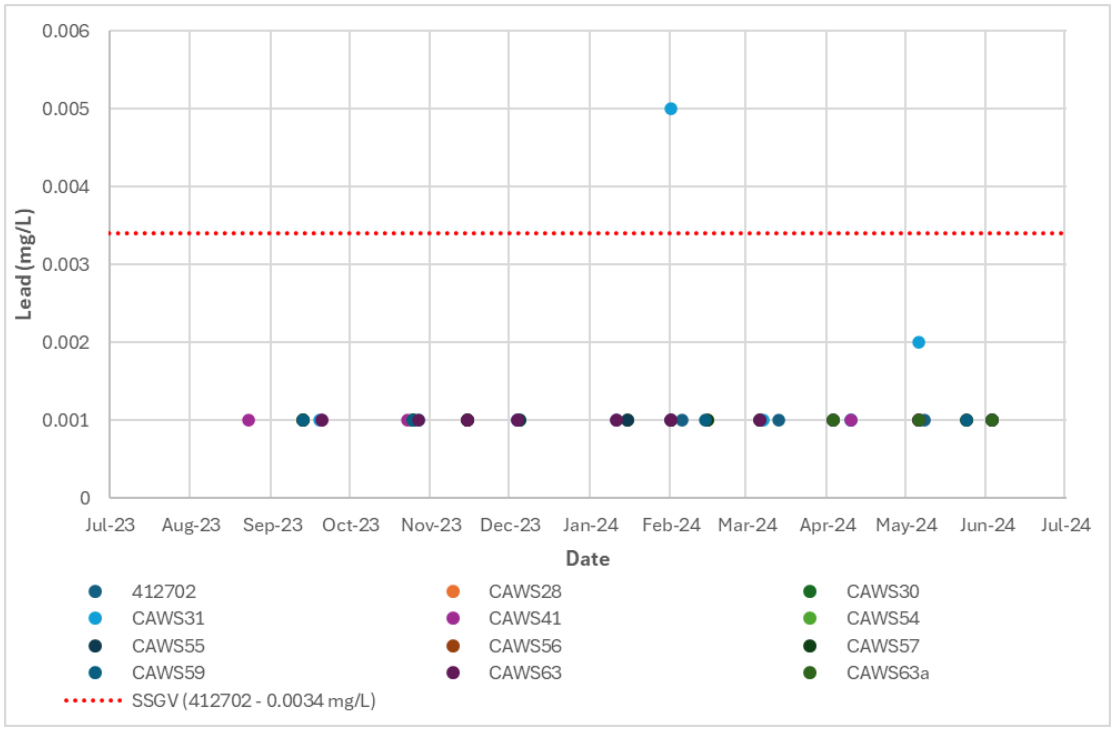


FIGURE A.101: TSF SOUTHERN MANAGEMENT ZONE FY24 LEAD

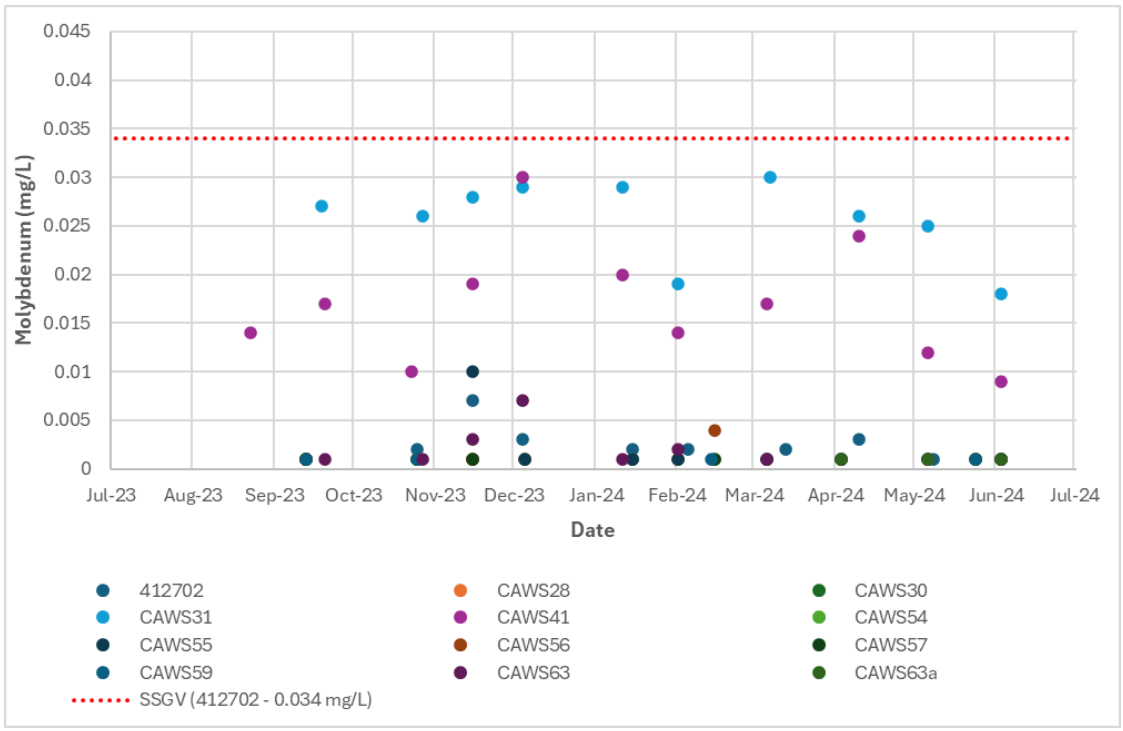


FIGURE A.102: TSF SOUTHERN MANAGEMENT ZONE FY24 MOLYBDENUM

A.7.1.4.1 Higher Dissolved Metals at CAWS31

The CAWS31 surface water monitoring location is used to monitor water quality at ST14. ST14 is a seepage collection dam that is used to intercept seepage from STSF. ST14 has also been known to have groundwater inflows. Higher dissolved metal concentrations for multiple analytes were observed at CAWS31 during the monitoring period. The day of these observed higher values and relevant analytes are:

- **1 February 2024:** arsenic, cadmium, chromium, cobalt, lead and nickel.
- **6 May 2024:** aluminium, arsenic, chromium, cobalt, lead and nickel.

There are no notable rainfall volumes in the days prior to each of the days on which higher dissolved metals were observed. Further, no other surface water monitoring locations exhibited higher dissolved metals on these days indicating a confined contaminant source. It is possible that the higher results were caused by either seepage or groundwater inflows to the dam. Confinement of these inflows to the dams is evident with no downstream impacts observed.

A.7.2 Long-Term Trends

Assessment of surface water monitoring results for the TSF southern management zone did not indicate the presence of any long-term trends.

A.7.3 Assessment of Potential Seepage Related Impacts

Water quality results for FY24 indicate potential seepage or groundwater inflows into ST14, the CAWS31 surface water monitoring location (refer to Section A.7.1.4.1). Higher concentrations of dissolved metals were observed at this monitoring location on 1 February 2024 and 6 May 2024. There appear to be no seepage related impacts at the surface water monitoring locations downstream of ST14 with no downstream monitoring locations exhibiting higher concentrations of dissolved metals on the same days. Any seepage collected in ST14 is managed via the reclaim water system.

A.7.4 412702 Performance Against Site Specific Guideline Values

Surface water monitoring location 412702 has been assessed against SSGVs to determine whether there were any exceedances during the FY24 reporting period. Exceedances of the SSGVs at this location are intended to act as an early warning system that prompts further internal investigation of the cause and potential impact of the exceedance. A summary of the analytes for which there are SSGVs and whether water quality results for 412702 during FY24 exceeded any of these values is summarised in Table A.8.

TABLE A.8: CADIA DEWATERING FACILITY MANAGEMENT ZONE REVIEW OF FY24 SSGV EXCEEDANCES – 412702

Parameter	Unit	SSGV	SSGV exceeded during FY24?
Physiochemical			
pH	pH	6.5 – 8.5	No
EC	µS/cm	1,535	No
TSS	mg/L	50	Yes
Dissolved Metals			
Aluminium	mg/L	0.055	Yes
Arsenic	mg/L	0.013	No
Cadmium	mg/L	0.0002	No
Copper	mg/L	0.009	No
Iron	mg/L	0.8	No
Lead	mg/L	0.0034	No
Manganese	mg/L	1.9	No
Molybdenum	mg/L	0.034	No
Zinc	mg/L	0.08	No

All results for all analytes at 412702 during the reporting period were below the SSGV trigger value with the exception of 1 value for TSS and 2 values for aluminium that were above the SSGV. Details of this exceedances are summarised in Sections A.7.4.1 and A.7.4.2.

A.7.4.1. Exceedance of TSS Site Specific Guideline Value at Surface Water Monitoring Location 412702

The exceedance of TSS at surface water monitoring location 412702 can be summarised as follows:

- Exceedance occurred on 13 September 2023.
- TSS concentration recorded at 412702 on this date was 79 mg/L, 29 mg/L greater than the SSGV.
- TSS results for the samples prior to and following the exceedance were below the SSGV (both 5 mg/L).
- The upstream reference site, surface water monitoring location 412168 in the upper Cadiangullong Creek management zone, was not sampled on the same day. Thus, results for TSS on the date of the exceedance cannot be compared.
- Internal investigations were undertaken by CHPL following the exceedance (as per requirements outline in the Cadia WMP (Newmont, 2023)).

Rainfall occurrence in the days prior of approximately 28 mm over the 8 to 9 September 2023 is likely to have contributed to higher TSS values with consideration to runoff carrying particulates from the surrounding area (primarily agricultural pastures). TSS was higher at CAWS56 (260 mg/L) and CAWS57 (196 mg/L) on the same day, both dams overflow into Rodds Creek which flows into Cadiangullong Creek upstream of site 412702. A slightly higher value for TSS was also observed at CAWS59 (32 mg/L) on the same day. This monitoring location is immediately upstream of 412702 on Rodds Creek. It should be noted that the monitoring location between CAWS59, and CAWS56 and CAWS57 (CAWS28) returned a result below the limit of detection (<5 mg/L) on the day of the exceedance. The TSS concentration recorded at CAWS62 (immediately upstream of 412702 prior to the confluence of Cadiangullong Creek and Rodds Creek in the TSF western management zone) was 9 mg/L on the day of the exceedance.

The higher result for TSS at 412702 could be attributed to disruption of sediment as a result of runoff inflows from the east (where some other higher values for TSS were observed), or disruption of sediment during the sampling process. This result is not considered to be associated with an emerging or ongoing trend and any impacts to the downstream environment are likely negligible. It is unlikely that this exceedance is associated with mining related impacts due to lack of higher TSS values in vicinity of the mining area at this time. No further investigations of this exceedance are recommended.

A.7.4.2. Exceedances of Aluminium Site Specific Guideline Value at Surface Water Monitoring Location 412702

The exceedances of aluminium at surface water monitoring location 412702 can be summarised as follows:

- Exceedances occurred on 13 September 2023 and 4 December 2023.
- Aluminium concentration recorded at 412702 on 13 September was 0.15 mg/L, 0.095 mg/L greater than the SSGV.
- Aluminium concentration recorded at 412702 on 4 December was 0.12 mg/L, 0.065 mg/L greater than the SSGV.
- Aluminium results prior to and following both exceedances were below the limit of detection (<0.01 mg/L).
- No internal investigations were undertaken by CHPL for the exceedances.
- All other values for aluminium were below the limit of detection (<0.01 mg/L) for upstream sites in the TSF southern management zone on the days on which the exceedances occurred.
- Aluminium results of a similar concentrations were observed for monitoring locations in the following management zones (in order from furthest upstream to closest to 412702) at the start of September 2023:
  - Upper Cadiangullong Creek (CAWS0, CAWS2 and 412144)
  - Ore processing area (CAWS78 and CAWS79)
  - Waste rock dumps (412161)
  - TSF western (CAWS61, CAWS62 and CAWS75).
- Aluminium results of a similar concentrations were observed for monitoring locations in the following management zones (in order from furthest upstream to closest to 412702) at the start of December 2023:
  - Upper Cadiangullong Creek (CAWS0, CAWS13 and 412144)
  - Ore processing area (CAWS78 and CAWS79).
- No monitoring was undertaken for the aforementioned locations in the waste rock dumps or TSF western management zones at the start of December 2023.

Rainfall occurrence in the days prior to the September exceedance of approximately 28 mm over the 8 to 9 September 2023 is likely to have caused increased flows at the 412702 monitoring location. The consistency of the higher values upstream of areas disturbed by the mining operation at the time indicate that increased aluminium is likely caused by influences upstream of the mine site. Higher values were observed at CAWS0 (Cadiangullong Dam) and 412144 (immediately downstream of Cadiangullong Dam) at the start of September 2023 which is upstream of all areas disturbed by the mining operation.

Similarly, there were also rainfall events in the weeks prior to the 4 December 2023 exceedance where around 105.4 mm of rainfall was recorded between 21 November 2023 and 3 December 2023. The consistency of the higher values throughout the various management zones along Cadiangullong Creek at this time warrant the same conclusion; increased aluminium could be caused by influences upstream of the mine site. Higher values were observed at CAWS0 and 412144 at the start of December 2023 which is upstream of all areas disturbed by the mining operation.

No further investigation of the exceedances is recommended.

A.7.5 Review of Monitoring Data Against ANZECC (2000) Livestock and Irrigation Guideline Values

CHPL has requested that the downstream Cadiangullong Creek monitoring location (412702) be reviewed against ANZECC (2000) livestock drinking water guidelines and ANZECC (2000) irrigation and general use guidelines. These guidelines were selected as the land in the vicinity of Cadia is primarily used for agricultural purposes and the guideline values can be used as a benchmark of what 'good' looks like in terms of water quality in the area.

Surface water monitoring location 412702 has been assessed against the ANZECC (2000) guideline values to determine whether there were any values recorded above the guideline values during the FY24 reporting period. A comparison of water quality results from 412702 to the ANZECC guideline values is provided in Table A.9.

TABLE A.9: RECEIVING ENVIRONMENT MANAGEMENT ZONE REVIEW OF FY24 ANZECC GUIDELINE VALUE EXCEEDANCES – CADIANGULLONG CREEK

Parameter	Unit	ANZECC Livestock Drinking Water Guideline Values	ANZECC Irrigation and General Water Use Short-term (up to 20 years) Guideline Values	ANZECC Irrigation and General Water Use Long-Term (>100 years) Guideline Values	Were Any Results Greater Than the ANZECC Guideline Values Observed?
Physiochemical Parameters, Major Ions and Nutrients					
TDS	mg/L	Beef cattle 0 – 4000 Dairy cattle 0 – 2500 Sheep 0 – 5000 Horses 0 – 4000 Pigs 0 – 4000 Poultry 0 – 4000	-	-	No
Sulphate	mg/L	1000	-	-	No
Calcium	mg/L	1000	-	-	No
Nitrate	mg/L	1500	-	-	No
Nitrite	mg/L	30	-	-	No
Total Nitrogen	mg/L	-	25-125	5	No
Total Phosphorus	mg/L	-	0.8-12	0.05	Yes
Dissolved Metals					
Aluminium	mg/L	5	20	5	No
Arsenic	mg/L	0.5 up to 5	2.0	0.1	No
Cadmium	mg/L	0.01	0.05	0.01	No
Chromium	mg/L	1	1	0.1	No
Cobalt	mg/L	1	0.1	0.05	No
Copper	mg/L	0.4 (sheep) 1 (cattle) 5 (pigs) 5 (poultry)	0.5	0.2	No
Iron	mg/L	Not sufficiently toxic	10	0.2	Yes
Lead	mg/L	0.1	5	2	No
Mercury	mg/L	0.002	0.002	0.002	No
Manganese	mg/L	Not sufficiently toxic	10	0.2	No
Molybdenum	mg/L	0.15	0.05	0.01	No
Nickel	mg/L	1	2	0.2	No
Zinc	mg/L	20	5	2	No

All results for all analytes at 412702 during the reporting period were below the ANZECC guideline values with the exception total phosphorus and iron.

Two values for total phosphorus were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.05 mg/L) (refer to Figure A.103). Total phosphorus values recorded prior to and following the results above the guideline values were below the guideline value. It should be noted that when compared to the short term (20 years) guideline value for total phosphorus (0.8 to 12 mg/L) all values during FY24 are below the guideline. Results for total phosphorus at 412702 during FY24 were within the historic range for 412702. These values are not considered to be outliers, or part of an emerging or long-term trend.

Two values for iron during FY24 were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.2 mg/L) (refer to Figure A.104). These iron values were notably lower than the short term (20 years) guideline value for iron (10 mg/L). Results for iron at 412702 during FY24 were within the historic range for 412702. These values are not considered to be outliers, or part of an emerging or long-term trend.

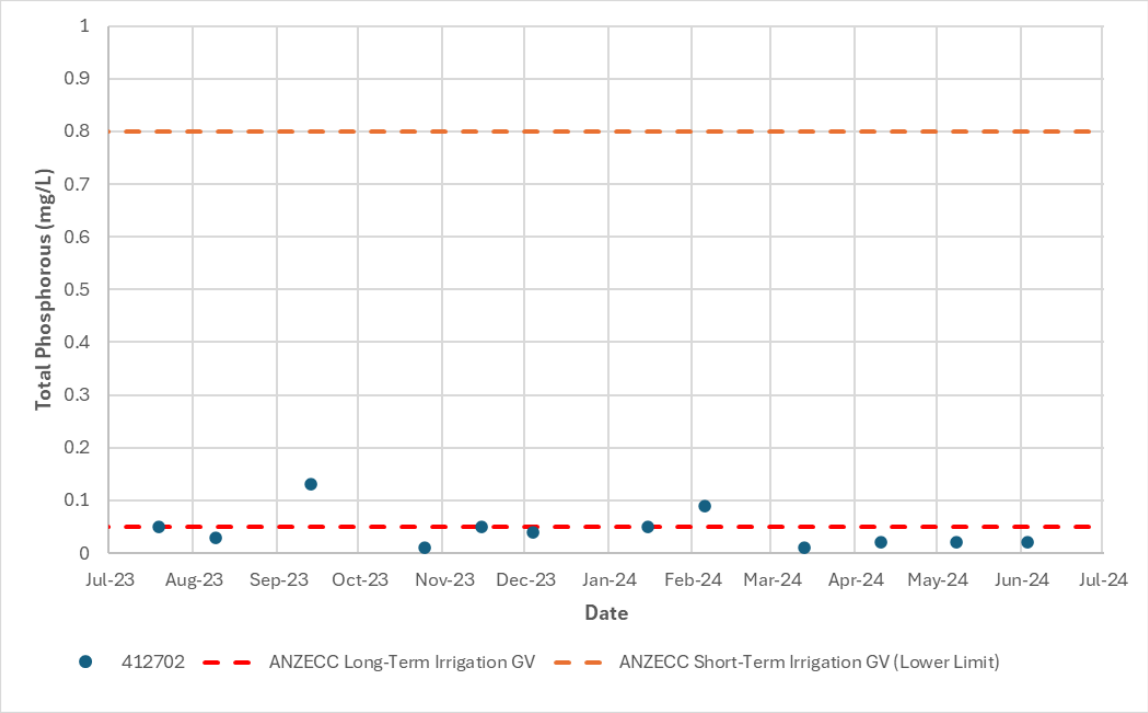


FIGURE A.103: CADIANGULLONG CREEK MONITORING LOCATION 412702 FY24 TOTAL PHSOPHORUS RESULTS VS ANZECC GUIDELINE VALUES

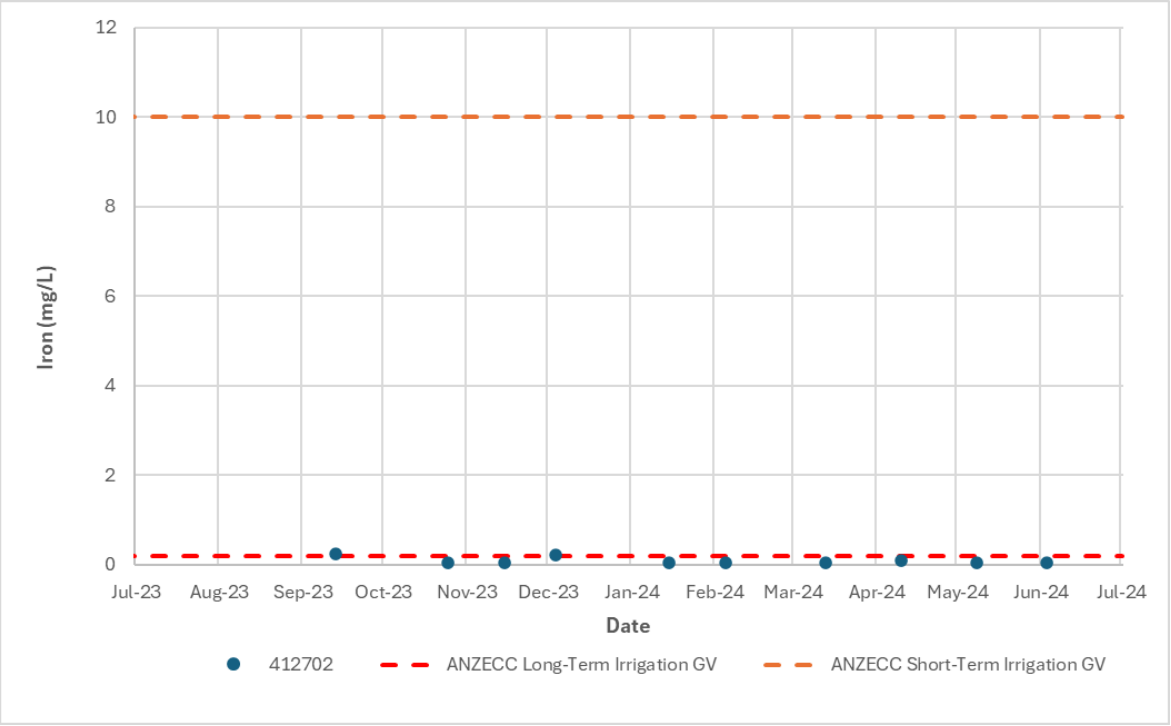


FIGURE A.104**: CADIANGULLONG CREEK MONITORING LOCATION 412702 FY24 IRON RESULTS VS ANZECC GUIDELINE VALUES**

A.7.6 Summary and Recommendations

The majority of results for the TSF southern management zone were within the historic range for the monitoring locations during FY24. No emerging trends were identified. No ongoing long-term trends are evident at any of the monitoring locations. Several increased concentrations for dissolved metals were observed at CAWS31 and could be associated with potential seepage related impacts. These increased concentrations are confined to CAWS31 (ST14 dam) and no downstream impacts are evident.

There were 3 exceedances of SSGVs at 412702 during FY24, 2 for aluminium and 1 for TSS. There is no evident connection between these exceedances and mining related impacts.

Assessment of results from surface water monitoring location 412702 against ANZECC (2000) livestock drinking water guideline values and ANZECC (2000) irrigation and general use guideline values indicates results above the guideline values for only 2 of the 20 analytes assessed. Analytes for which there were values above the guideline value include iron and total phosphorus. These values were above the long-term (>100 years) irrigation and general water use guideline values but below the short term (20 years) values for the analytes. Because of the short-term nature of the elevations, it is considered that no further investigations are required.

It is recommended that:

- The *Surface Water Quality Trigger Action Response Plan* (Table 26 of the Cadia WMP (Newcrest, 2023) states that exceedances at 412702 should be compared to upstream reference site 412168. Monitoring at 412702 is undertaken on a monthly basis while monitoring at 412168 is only undertaken quarterly. No monitoring was conducted at site 412168 during September or December 2023 when the exceedances of SSGVs at site 412702 occurred. It is recommended that either monitoring at 412168 be undertaken on a monthly basis, or the upstream reference site be changed to another location upstream of the mining area that is monitored on a monthly basis so that comparisons can be made when exceedances occur.

A.8 Cadia Dewatering Facility

The CDF management zone includes 3 surface water monitoring locations. Surface water monitoring locations in this zone are shown in Figure A.112 and described in Table A.10. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.10: CADIA DEWATERING FACILITY MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
CDW03	This monitoring location is used to characterise water quality upstream of the CDF. CDW03 is located on the Belubula River upstream of the confluence of the Belubula River and the unnamed creek to the south of the CDF.
CDW04	As per the Cadia Water Management Plan, CDW04 is intended to characterise water quality downstream of the CDF (Newcrest, 2023). It is noted however that this location is actually upstream of the CDF (refer to Section A.8.4)
CDW05	The CDW05 monitoring location is used to assess water quality immediately downstream of the CDF. It should be noted that CDW05 is has associated SSGVs that are used to indicate water quality impacts from the CDF. A full summary of these SGGVs is provided in Section 3.3. The FY24 performance against these SSGVs is detailed in Section A.8.3.

A.8.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.8.1.1 to A.8.1.4.

A.8.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the CDF management zone can be interpreted as follows:

- **pH** – Results for pH for all the monitoring locations returned results ranging between 7.66 and 8.41 during the reporting period. All pH results are within the historical range. No emerging trends are evident for any of the monitoring locations.
- **Electrical Conductivity** – Results for EC for all the monitoring locations returned results within the historic range during the reporting period. No emerging trends are evident for any of the monitoring locations.
- **Total Suspended Solids** – The majority of results for TSS returned during the monitoring period were below the limit of detection (5 mg/L). All samples were within the historic range and there no emerging trends evident at any of the monitoring locations.
- **Total Dissolved Solids** – All results for TDS were within the historic range for the monitoring locations. No emerging trends for TDS are evident for the reporting period at any of the monitoring locations.
- **Alkalinity** – All results for Alkalinity were within the historic range for the monitoring locations. No emerging trends for alkalinity are evident for the reporting period at any of the monitoring locations.
- **Oxidation reduction potential** – All results for ORP were within the historic range for the monitoring locations. A continuing weak increasing trend is evident at all surface water monitoring locations (detailed in Section A.8.2).

A.8.1.2. Nutrients

Surface water quality monitoring results for nutrients for the CDF management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently low and within the historical range for all surface water monitoring locations in the management zone. Nitrate concentrations at CDW05 were typically higher than the other monitoring locations in the management zone (CDW03 and CDW04) but this is consistent with historic monitoring data for the locations. There are no emerging trends or outliers.
- **Nitrite** – Almost all values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. One result for nitrite at CDW03 on 27 October 2023 (0.02 mg/L) was slightly higher than the limit of detection but still within the historic range. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.

A.8.1.3. Major Ions

Surface water quality monitoring results for major ions for the CDF management zone can be interpreted as follows:

- **Calcium** – Results for calcium for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** – Results for chloride at all monitoring locations remained relatively consistent throughout the monitoring period with no emerging trends or outliers evident. All values were within the historic monitoring range.
- **Magnesium** – Results for magnesium for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Potassium** – Results for potassium for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Sodium** – Results for sodium during the reporting period were consistent with historic monitoring results. While no outliers are evident, there is a slightly increasing trend at all monitoring locations (CDW03, CDW04, and CDW05) in the CDF management zones that began around start 2021. These trends appear to have somewhat stabilised during FY24 and are further detailed in Section A.8.2.
- **Sulphate** – Results for sulphate for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.

A.8.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the CDF management zone can be interpreted as follows:

- **Aluminium** – Results for aluminium for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. The majority of samples were below the limit of detection (<0.01 mg/L) for aluminium. There are no outliers or emerging trends evident. All results at CDW05 were below the SSGV for aluminium (0.55 mg/L).
- **Antimony** – Results for antimony at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Arsenic** – Values for arsenic ranged between <0.001 mg/L (below the limit of detection) and 0.004 mg/L for all locations in the CDF management zone throughout the monitoring period (refer to Figure A.105). These results are generally consistent with the historic range with the exception of an arsenic concentration of 0.04 mg/L and CDW04 on 9 February 2024. This is the highest result for arsenic at CDW04 in the historic dataset. Results for arsenic at CDW05 (immediately downstream of the CDF) returned a result of <0.001 mg/L indicating that the higher value at CDW04 is not associated with runoff form the CDF. The result for arsenic at CDW04 following this higher value was below the limit of detection indicating that there is no increasing trend present. All values for arsenic at CDW05 were below the SSGV (0.013 mg/L).
- **Cadmium** – Results for cadmium for all monitoring locations in the CDF management zone throughout the reporting period were consistently below the limit of detection (<0.0001 mg/L) with the exception of one result recorded at CDW03 (0.0007mg/L) on 5 September 2023 (refer to Figure A.106). This is the highest result for cadmium at any of the monitoring locations in the CDF management zone for the entire historic monitoring period. Results for cadmium at CDW05 (immediately downstream of the CDF) returned a result of <0.0001 mg/L indicating that the higher value at CDW03 is not associated with runoff form the CDF. The result for cadmium at CDW03 following this higher value was below the limit of detection indicating that there is no increasing trend present. All values for cadmium at CDW05 were below the SSGV (0.0002 mg/L) for the site.
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cobalt** – Results for cobalt at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Copper** – All results for copper at CDW03 and CDW04 for the reporting period were below the limit of detection (<0.001 mg/L). there were no outliers or emerging trends for these locations. Results for copper at CDW05 during the first 6 months of FY24 exhibited a continuing upward trend from the FY23 reporting period. This trend is further detailed in Section A.8.2. In the latter half of the FY24 reporting period, copper concentration at CDW05 reduced slightly. There was 1 exceedance of the copper SSGV (0.0006 mg/L) at CDW05 on 27 October 2023. This potential cause and impact of this higher copper value are detailed in Section A.8.3. The internal investigation completed by CHPL following this exceedance is also detailed in Section 5.
- **Iron –** Results for iron for all monitoring locations in the CDF management zone throughout the reporting period were consistent with historic monitoring results. All results for iron at CDW05 were below the limit of detection (<0.05 mg/L) and no results exceeded the SSGV. There are no emerging trends or outliers.

- **Lead** – Results for lead at all monitoring were consistently below the limit of detection (<0.001 mg/L). No results for CDW05 exceeded the SSGV for the site.
- **Manganese** – Manganese concentrations at surface water monitoring locations in the CDF management zone were consistent during the reporting period were consistent with historic monitoring data. There are no emerging trends or outliers. No results for CDW05 exceeded the SSGV for manganese.
- **Mercury** – Results for mercury at all sites were consistently below the limit of detection (<0.001 mg/L).
- **Molybdenum** – The majority of results for Molybdenum at all surface water monitoring locations in the CDF management zone were below the limit of detection (<0.001 mg/L) during the reporting period. All results at CDW04 were below the limit of detection (refer to Figure A.111). One result at CDW03 (0.002 mg/L) was greater than the limit of detection but still within the historic range for the CDF management zone.

  Two results for Molybdenum were above the limit of detection at CDW05 during the reporting period, one on 27 October 2023 (0.024 mg/L) and one on 9 February 2024 (0.011 mg/L). While these results are still below the SSGV for the location (0.034 mg/L), they are the 2 highest results for Molybdenum at CDW05 for the entire historic monitoring period. The higher molybdenum result on 27 October 2023 coincides with an exceedance of the SSGV for copper at CDW05 on the same day.

  In the days leading up to 27 October 2023 there was only around 0.7 mm of rainfall (on 26 October 2023). At the start of the month there was a larger rainfall event where 38.7 mm fell over 2 days between 4 to 5 October 2024. Smaller rainfall events occurred between 5 to 27 October, indicating that there would have been somewhat consistent runoff inflows to the creek throughout October 2024. Higher molybdenum (a naturally occurring element) concentrations could be caused by runoff from upstream agricultural areas.
- **Nickel** – Results for nickel for all monitoring locations in the CDF management zone throughout the reporting period were low and consistent with historic monitoring results. There are no emerging trends or outliers.
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc –** Results for zinc at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).

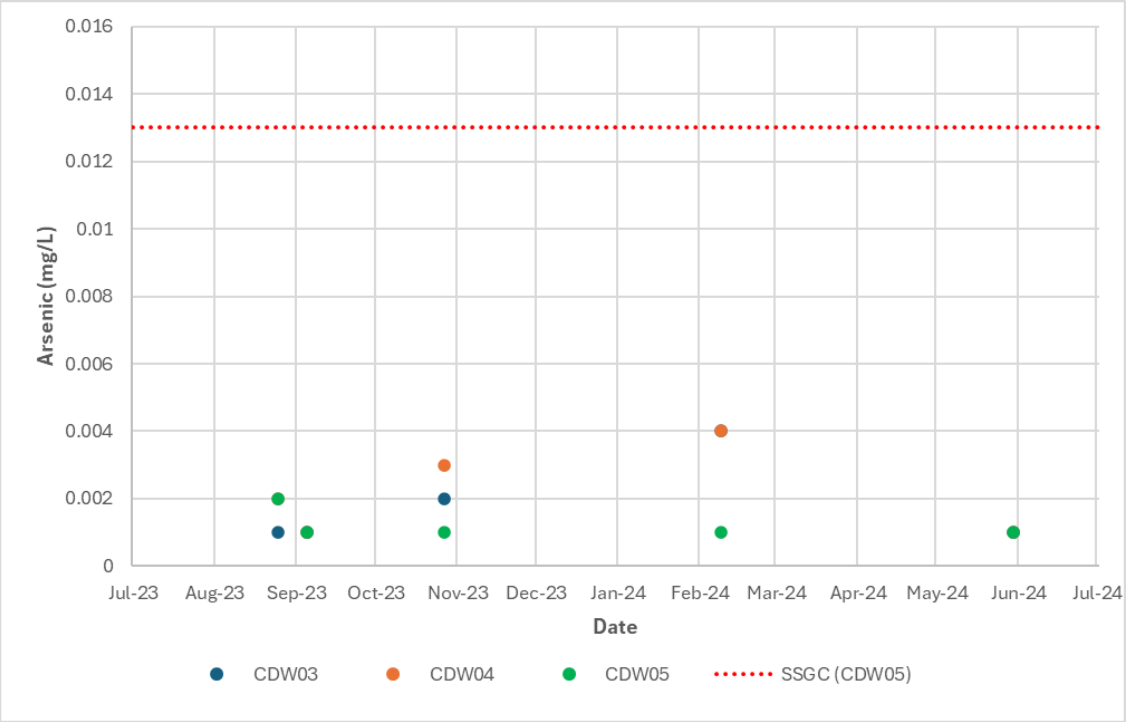


FIGURE A.105: CADIA DEWATERING FACILITY MANAGEMENT ZONE FY24 ARSENIC

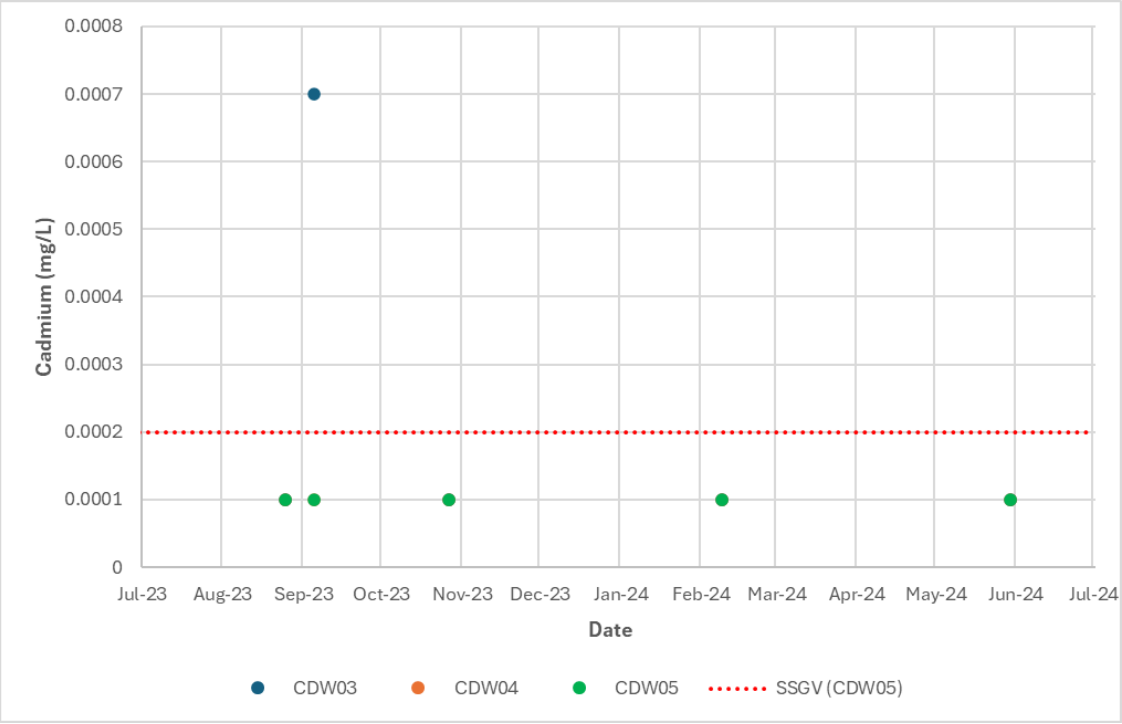


FIGURE A.106: CADIA DEWATERING FACILITY MANAGEMENT ZONE FY24 CADMIUM

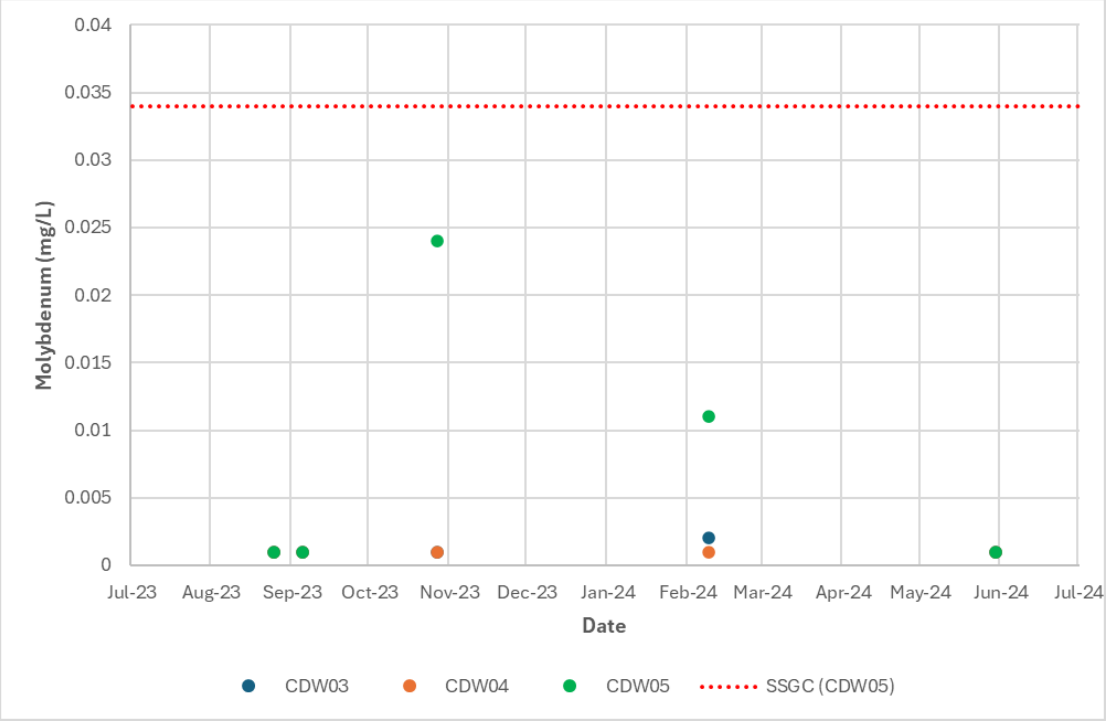


FIGURE A.107: CADIA DEWATERING FACILITY MANAGEMENT ZONE FY24 MOLYBDENUM

A.8.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the CDF management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.1.1. Interpretation of long-term water quality trends in the CDF management zone can be summarised as follows:

- ORP and sodium has increased at all sites throughout the historic monitoring period. This increase can be attributed to changes to the wider catchment characteristics as it is consistent across surface water monitoring locations upstream and downstream of the CDF (refer to Figure A.108 and Figure A.109).
- There is an ongoing weak long-term downward trend for copper at locations upstream of the CDF (CDW03 and CDW04). There is a long-term increasing trend for copper at CDW05 that is not reflect at the upstream monitoring locations. The confinement of the increasing trend to this monitoring location indicates that the increasing copper could be the result of a local (i.e., not catchment wide) contaminant source (refer to Figure A.110).

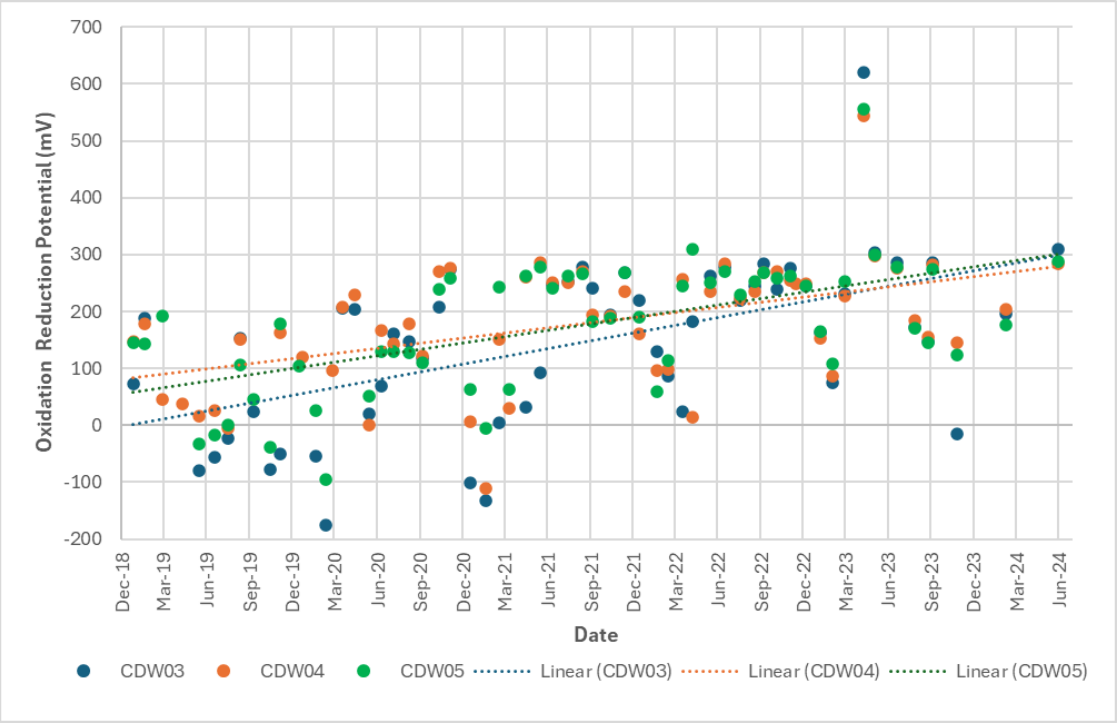


FIGURE A.108: CADIA DEWATERING FACILITY MANAGEMENT ZONE LONG-TERM OXIDATION REDUCTION POTENTIAL

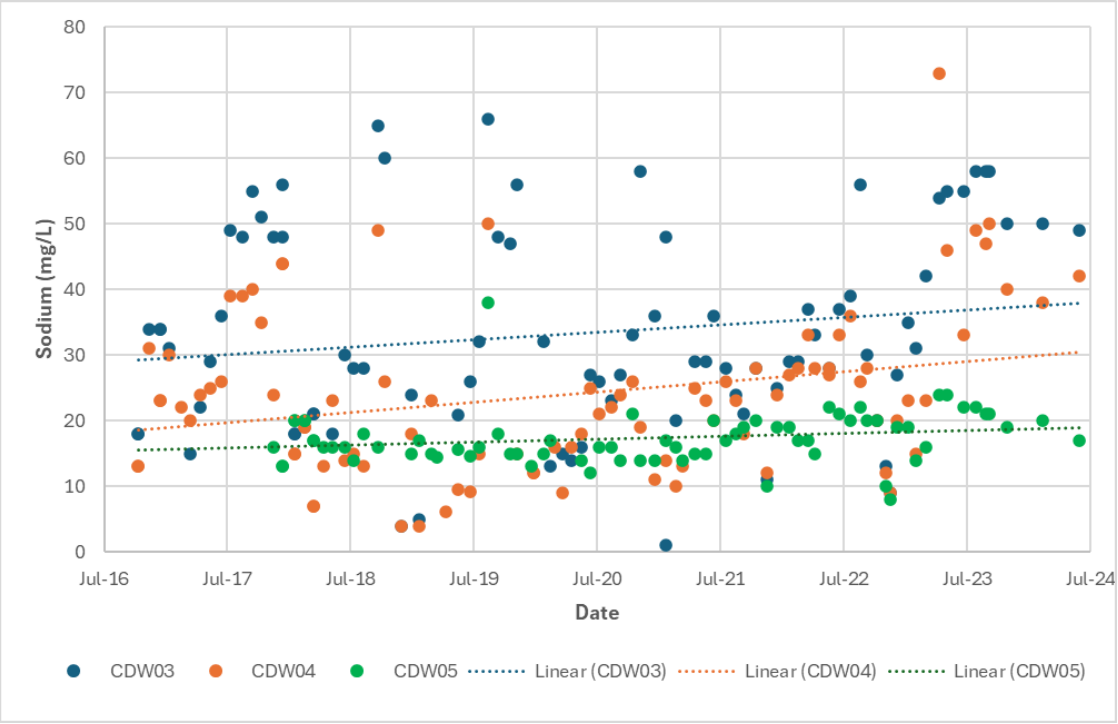


FIGURE A.109: CADIA DEWATERING FACILITY MANAGEMENT ZONE LONG-TERM SODIUM

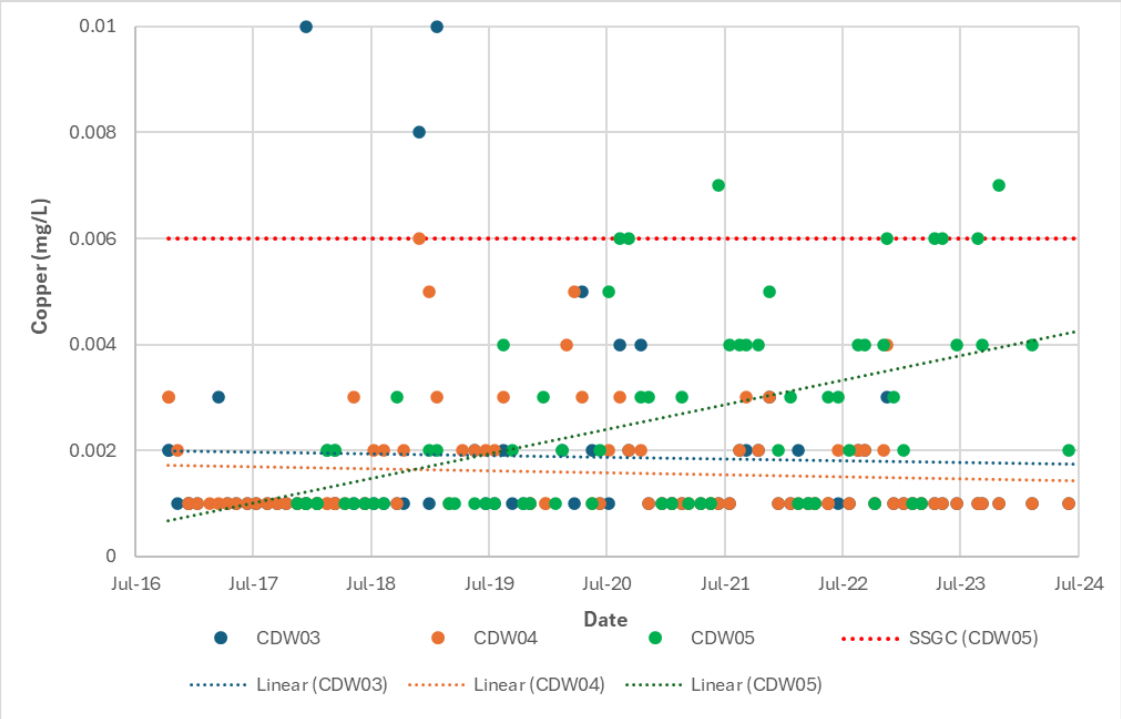


FIGURE A.110: CADIA DEWATERING FACILITY MANAGEMENT ZONE LONG-TERM COPPER

A.8.3 CDW05 Performance Against Site Specific Guideline Values

Surface water monitoring location CDW05 has been assessed against SSGVs for the site to determine whether there were any exceedances during the FY24 reporting period. Exceedances of the SSGVs in the CDF management zone are intended to act as an early warning system that prompts further internal investigation of the cause and potential impact of the exceedance. A summary of the analytes for which there are SSGVs and whether water quality results for CDW05 during FY24 exceeded any of these values is summarised in Table A.11.

TABLE A.11: CADIA DEWATERING FACILITY MANAGEMENT ZONE REVIEW OF FY24 SSGV EXCEEDANCES – CDW05

Parameter	Unit	SSGV	SSGV exceeded during FY24?
Physiochemical			
pH	pH	6.5 – 8.5	No
EC	µS/cm	640	No
Dissolved Metals			
Aluminium	mg/L	0.055	No
Arsenic	mg/L	0.013	No
Cadmium	mg/L	0.0002	No
Copper	mg/L	0.006	Yes
Iron	mg/L	0.2	No
Lead	mg/L	0.0034	No
Manganese	mg/L	1.9	No
Molybdenum	mg/L	0.034	No
Zinc	mg/L	0.05	No

All results for all analytes at CDW05 during the reporting period were below the SSGV trigger value with the exception of 1 value for copper above the SSGV. Details of this exceedance can be summarised as follows:

- Exceedance occurred on 27 October 2023.
- Copper concentration recorded at CDW05 on this date was 0.007 mg/L, 0.001 mg/L greater than the SSGV.
- Copper results for the samples prior to and following the exceedance were below the SSGV.
- CHPL carried out an internal investigation for this exceedance.

At the start of October 2023 there was a large rainfall event where 38.7 mm fell over 2 days between 4 to 5 October 2024. Smaller rainfall events occurred intermittently between 5 to 27 October. Only 0.7 mm of rainfall occurred in the days immediately preceding the exceedance on 26 October 2023. As values for copper were not higher at CDW03 or CDW04 on the same day, it can be concluded that the copper source is confined to the CDW05 catchment area and not consistent throughout the wider area. This exceedance is consistent with an increasing trend for copper at the CDW05 location indicating that there is a persistent contaminant source.

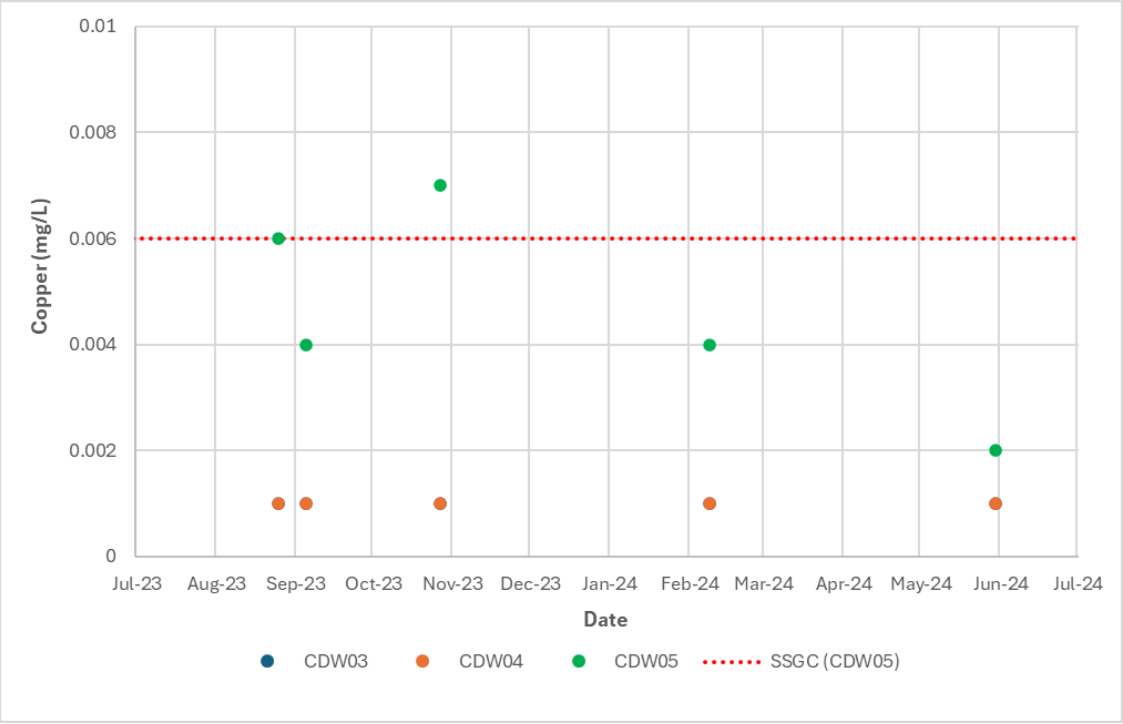


FIGURE A.111: CADIA DEWATERING FACILITY MANAGEMENT ZONE FY24 COPPER

A.8.4 Summary and Recommendations

Water quality results for the CDF management zone for FY24 were generally consistent with historic monitoring results. Of the 11 analytes for which there are SSGVs for CDW05, 10 had no exceedances. There were no new emerging trends recognised. Persisting long-term trends for sodium and oxidation reduction potential indicate are indicative of catchment wide changes in water chemistry (i.e., common at all monitoring locations including those upstream of the CDF). There is a long-term increasing copper trend at CDW05. The following is recommended for future water quality management in the CDF management zone:

- It is recommended that an additional surface water monitoring location be moved to downstream of the confluence of the Belubula River and the unnamed creek system directly downstream of the CDF that can be used to assess downstream water quality. The Cadia WMP (Newcrest, 2023) states that CDW04 is a downstream reference site however CDW04 is not downstream of the CDF.
- Further investigation of increasing copper concentrations at CDW05 should be undertaken.

A.9 Former Blayney Dewatering Facility

The Former Blayney Dewatering Facility management zone includes 2 surface water monitoring locations. Surface water monitoring locations in this zone are described in Table A.12 The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.12: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
NEC061	This surface water monitoring location is used to characterise water quality upstream of the former Blayney Dewatering Facility.
NEC062	This surface water monitoring location is used to characterise water quality upstream of the former Blayney Dewatering Facility.

A.9.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.9.1.1 to A.9.1.4. It should be noted there are no monitoring locations in this management zone that have SSGVs, therefore, there were no exceedances of SSGVs.

A.9.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the Former Blayney Dewatering Facility management zone can be interpreted as follows:

- **pH** – Results for pH were variable throughout the FY24 reporting period. All results for NEC062 were within the historic range and there were no outliers or emerging trends. While generally within the historic range, the maximum pH at NEC061 in the historic monitoring period was recorded during FY24. A result of 51.03 pH units was recorded at NEC061 (upstream of the former BDF) on 9 January 2024. This result is considered to be an error and has been discarded from the dataset. All other results were within the historic range.
- **Electrical Conductivity** – Results for EC for both monitoring locations returned results within the historic range during the reporting period. No emerging trends are evident for either of the monitoring locations.
- **Total Suspended Solids** – Results to TSS were variable throughout the reporting period at sites in the Former Blayney Dewatering Facility management zone (refer to Figure A.112). Around half of the results at both NEC061 and NEC062 were below the limit of detection (<5 mg/L). While there was one higher result at NEC061 recorded on 5 December 2023 (40 mg/L), this result is still within the historic range. Results before and after this higher reading were more in line with the historic average. A result recorded at NEC062 on 5 September 2024 is the highest in the historic monitoring period (35 mg/L). The next highest result (26 mg/L) was recorded in July 2021. Results prior to and following the higher follow are within the historic range for the site. This appears to be an isolated event that could be due to sampling technique.
- **Total Dissolved Solids** – All results for TDS were within the historic range for the monitoring locations. No emerging trends for TDS are evident for the reporting period at the monitoring locations.
- **Alkalinity** – All results for alkalinity were within the historic range for the monitoring locations. Results at NEC062 that were slightly higher during the FY23 reporting period and the start of the FY24 reporting period returned to concentrations that were more in line with the historic average for the last 3 quarters of FY24 (refer to Figure A.113).
- **Oxidation reduction potential** – A continuing weak increasing trend is evident at both surface water monitoring locations (detailed in Section A.10). Results were generally in the historic range with the exception of one higher value (1,057 mV) recorded at NEC061 (upstream of the former BDF) on 9 January 2024. Results from this day at NEC061 are considered inaccurate and have been discarded (refer to interpretation of pH results above).

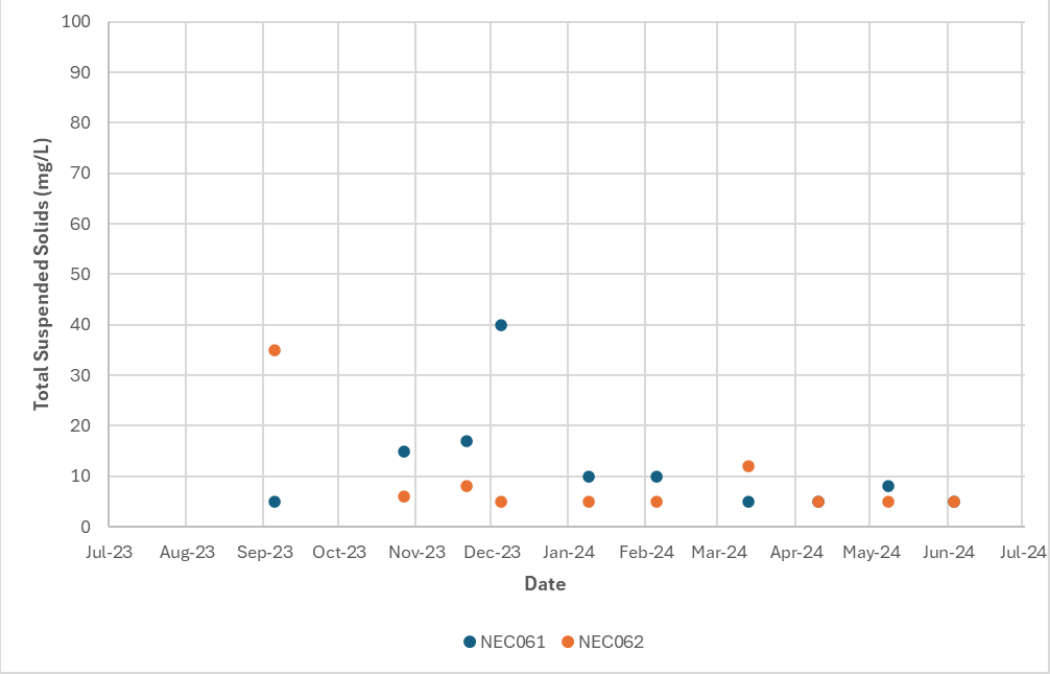


FIGURE A.112: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 TSS

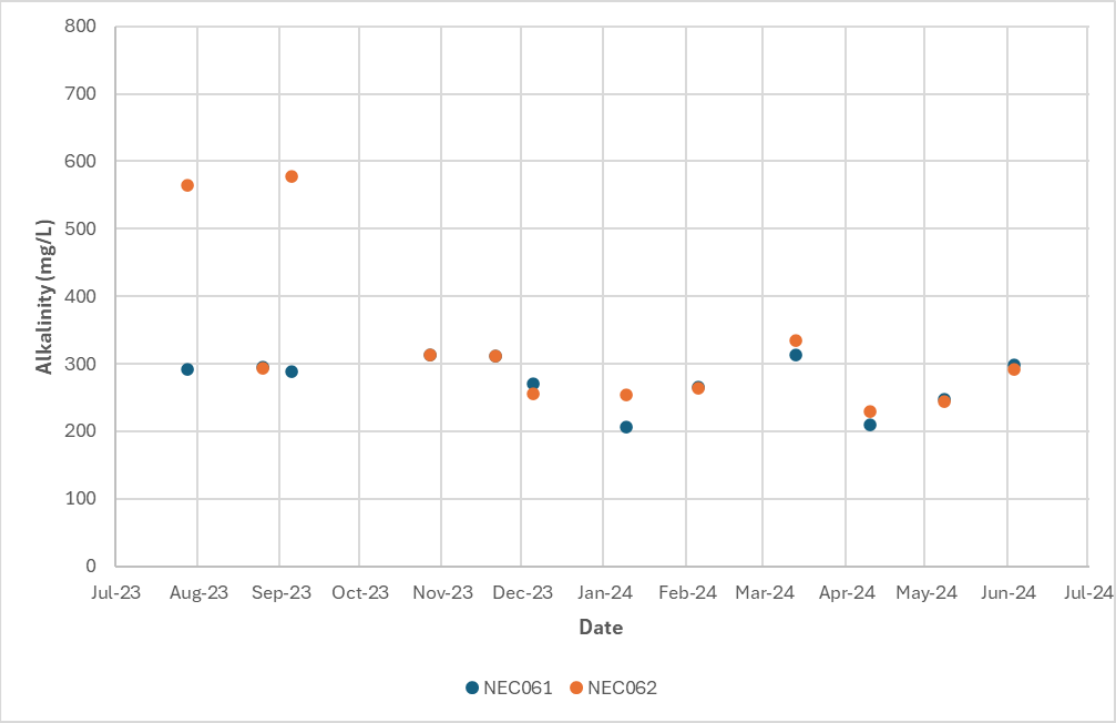


FIGURE A.113: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 ALKALINITY

A.9.1.2. Nutrients

Surface water quality monitoring results for nutrients for the former BDF management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently low and within the historical range for both surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Nitrite** – Almost all values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. Results for nitrite at both locations on 9 January 2024 (0.03 mg/L at NEC061 and 0.02 mg/L at NEC062) were slightly higher than the limit of detection but still within the historic range. There are no emerging trends or outliers.
- **Total Nitrogen** – All values for total nitrogen were consistently low and within the historical range for both surface water monitoring locations in the management zone. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were consistently low and within the historical range for both surface water monitoring locations in the management zone. There are no emerging trends or outliers.

A.9.1.3. Major Ions

Surface water quality monitoring results for major ions for the former BDF management zone management zone can be interpreted as follows:

- **Calcium** – Results for calcium for both monitoring locations in the former BDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** –Results for chloride at both monitoring locations remained relatively consistent throughout the monitoring period with no emerging trends or outliers evident. All values were within the historic monitoring range.
- **Magnesium** – All results for magnesium were within the historic range for the monitoring locations. Results at NEC062 that were slightly higher during the FY23 reporting period and the start of the FY24 reporting period returned to concentrations that were more in line with the historic average for the last 3 quarters of FY24 (refer to Figure A.114).
- **Potassium** – Results for potassium for both monitoring locations in the former BDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.

- **Sodium** – All results for sodium were within the historic range for the monitoring locations. Results at NEC062 that were slightly higher during the FY23 reporting period and the start of the FY24 reporting period returned to concentrations that were more in line with the historic average for the last 3 quarters of FY24 (refer to Figure A.115).
- **Sulphate** – Results for sulphate for both monitoring locations in the former BDF management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.

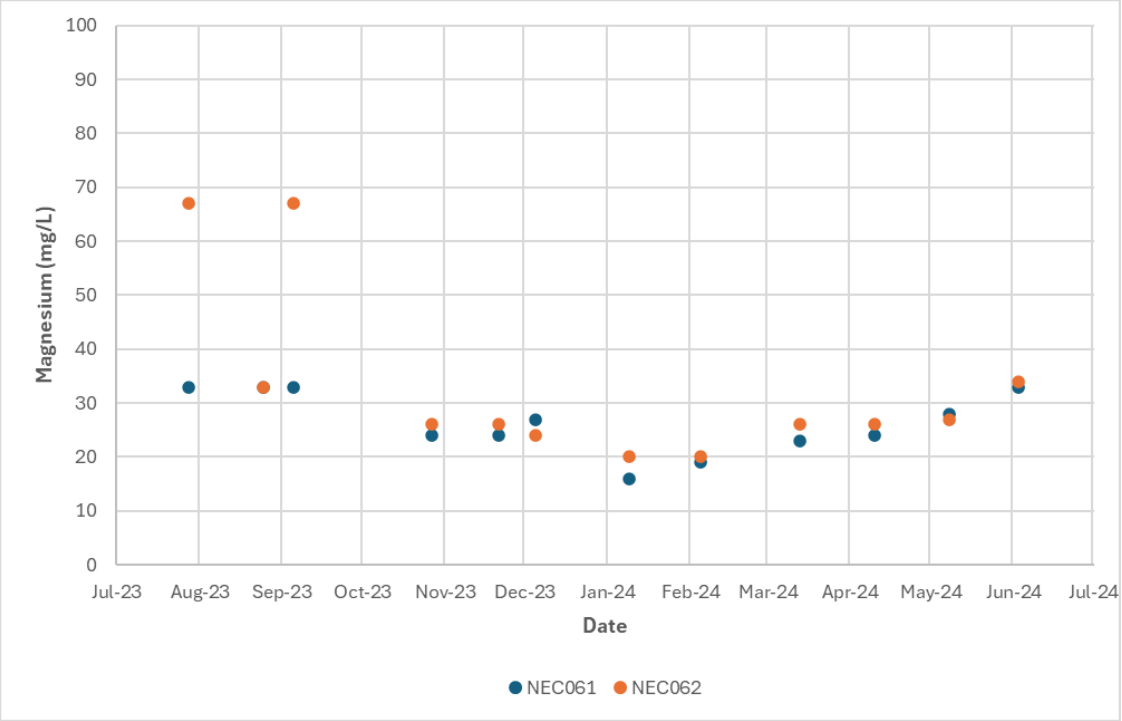


FIGURE A.114: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 MAGNESIUM

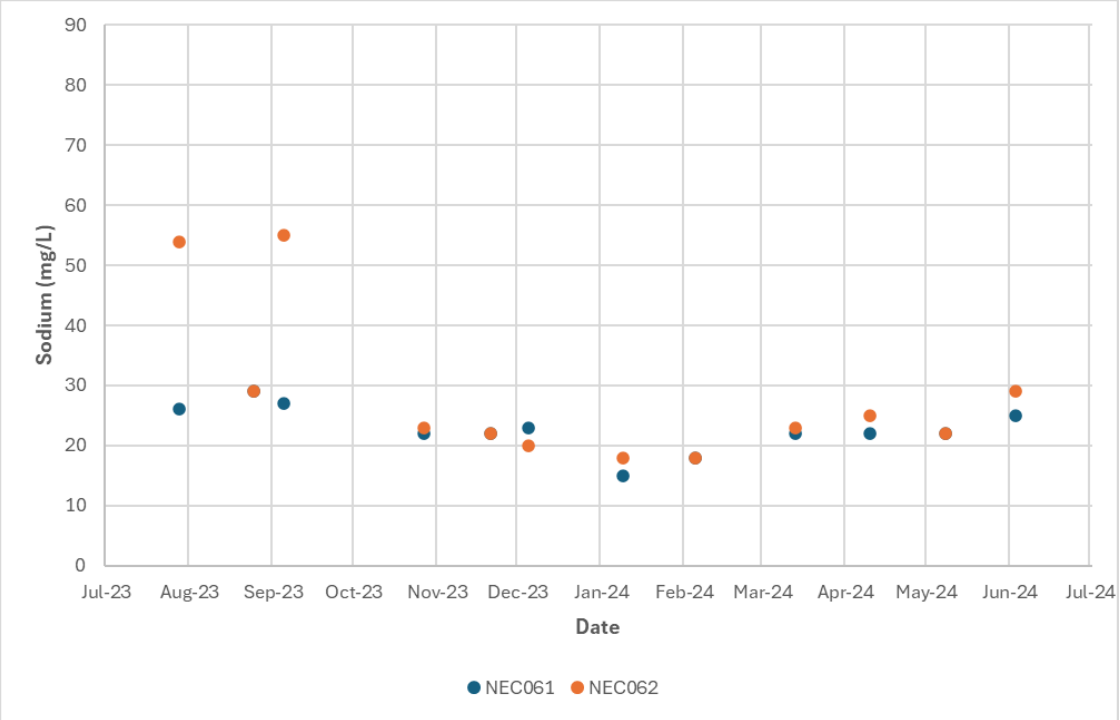


FIGURE A.115: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 SODIUM

A.9.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the former BDF management zone can be interpreted as follows:

- **Aluminium** – All results for aluminium are within the historic monitoring range and there are no outliers or emerging trends. The majority of results during FY24 were below the limit of detection (<0.01 mg/L).
- **Antimony** – Almost all results for antimony at both monitoring locations were below the limit of detection (<0.001 mg/L). There was one result at NEC062 on 5 September 2023 slightly above the limit of detection (0.002 mg/L) but still within the historic range. There are no emerging trends.
- **Arsenic** – All results for arsenic are within the historic monitoring range and there are no outliers or emerging trends
- **Cadmium** – Results for cadmium at both monitoring locations were consistently below the limit of detection (<0.0001 mg/L).
- **Chromium** – Results for chromium at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Cobalt** – Results for cobalt at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Copper** – Results for copper at locations in the former BDF management zone were variable throughout the reporting period (refer to Figure A.116). While most results were within the historic range, there was one higher result for copper at NEC061 (0.009 mg/L) recorded on 3 June 2024. This location is upstream of the former BDF. The downstream site, NEC062, recorded a result below the limit of detection (<0.001 mg/L) on the same day, indicating that the higher copper concentration at NEC061 could be caused by a point source or a source upstream of the NEC061 location. There was around 25.8 mm of rainfall between 31 May and 3 June 2024 that could have contributed to the event. Because the result from 3 June 2024 is the most recent for NEC061, there is no way to determine whether copper concentrations returned to normal levels following this time.
- **Iron –** All results for iron are within the historic monitoring range and there are no outliers or emerging trends.
- **Lead** – Results for lead at both monitoring were consistently below the limit of detection (<0.001 mg/L).
- **Manganese** – Manganese concentrations at both surface water monitoring locations in the former BDF management zone were consistent with historic monitoring data during FY24. There are no emerging trends or outliers.
- **Mercury** – Results for mercury at both sites were consistently below the limit of detection (<0.001 mg/L).
- **Molybdenum** – The majority of results for molybdenum at both surface water monitoring locations in the former BDF management zone were below the limit of detection (<0.001 mg/L) during the reporting period (refer to Figure A.117).

  Two results for molybdenum at NEC061 were the highest and second highest in the entire monitoring period (0.012 mg/L on 21 November 2023 and 0.014 mg/L on 5 February 2024). Results recorded prior to and following these higher results were below the limit of detection (<0.001 mg/L). Two results for molybdenum at NEC062 were above the 95th percentile of the historic monitoring data for the site (0.007 mg/L on 5 February 2024 and 0.008 mg/L on 10 April 2024). Higher results on 5 February 2024 were consistent at both sites.

  In the days prior to 5 February 2024 and 10 April 2024 there were large rainfall events. Higher molybdenum concentrations could be caused by runoff from upstream areas that have come into contact with molybdenum. Conclusions regarding runoff inflows are relevant to the higher molybdenum value at NEC061 on 21 November 2023 also (around 29.5 mm of rainfall occurred in the 2 weeks prior).

  The frequency of higher results for molybdenum at locations in the former BDF management zone was greater during FY24 than the previous reporting period during which all but one of the results was below the limit of detection.
- **Nickel** – Results for nickel for both monitoring locations in the former BDF management zone throughout the reporting period were low and consistent with historic monitoring results. There are no emerging trends or outliers.
- **Silver** – Results for silver at both monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc –** Results for zinc for both monitoring locations in the former BDF management zone throughout the reporting period were low and consistent with historic monitoring results. There are no emerging trends or outliers.

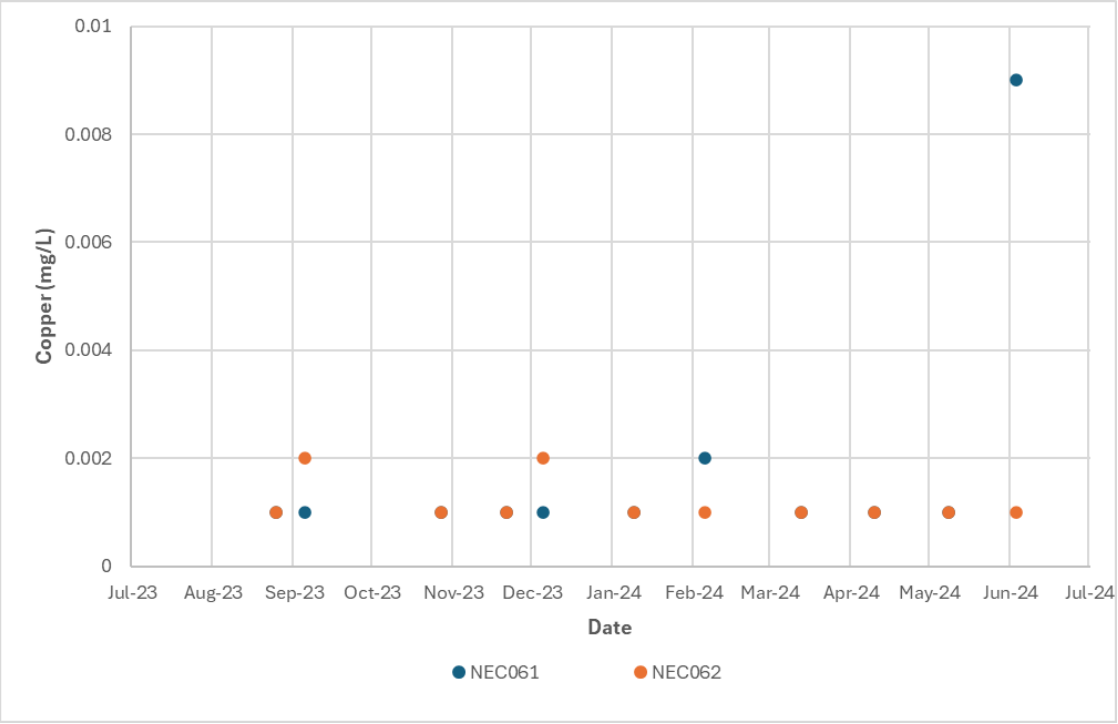


FIGURE A.116: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 COPPER

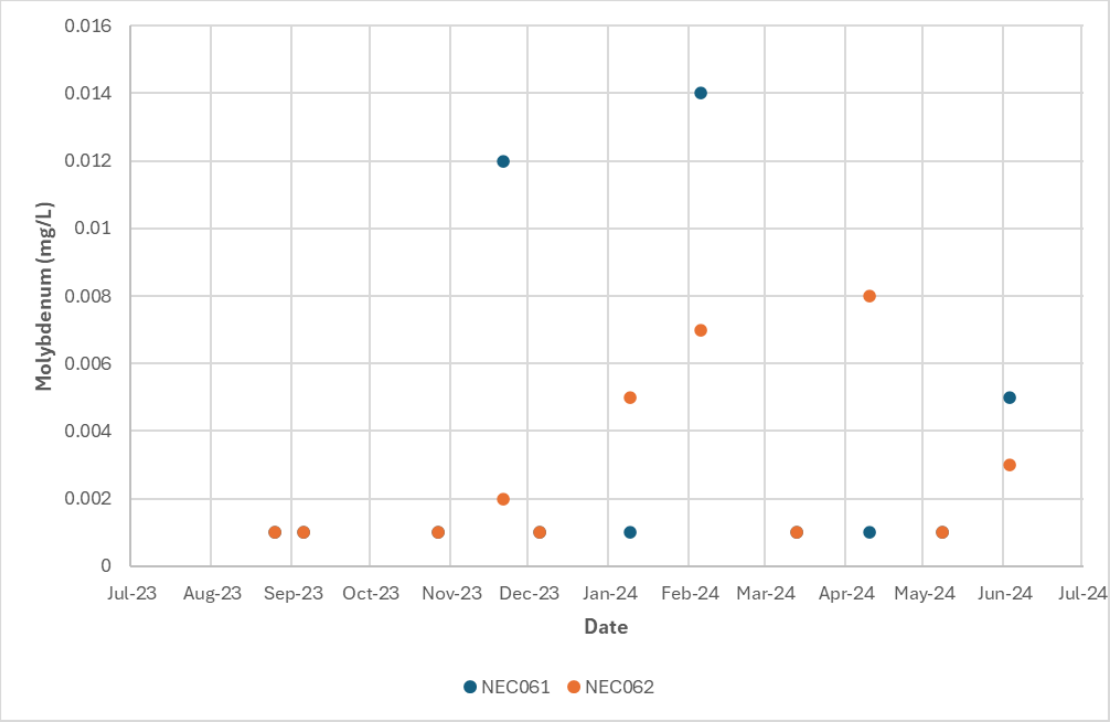


FIGURE A.117: FORMER BLAYNEY DEWATERING FACILITY MANAGEMENT ZONE FY24 MOLYBDENUM

A.9.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the former BDF management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.1.1. Interpretation of long-term water quality trends in the former BDF management zone can be summarised as follows:

- ORP has increased at both monitoring locations throughout the historic monitoring period (Figure A.118). This increase can likely be attributed to changes to the wider catchment characteristics as it is consistent across surface water monitoring locations upstream and downstream of the former BDF. This result is consistent with increases in ORP at the CDF management zone monitoring locations downstream (refer to Figure A.109).

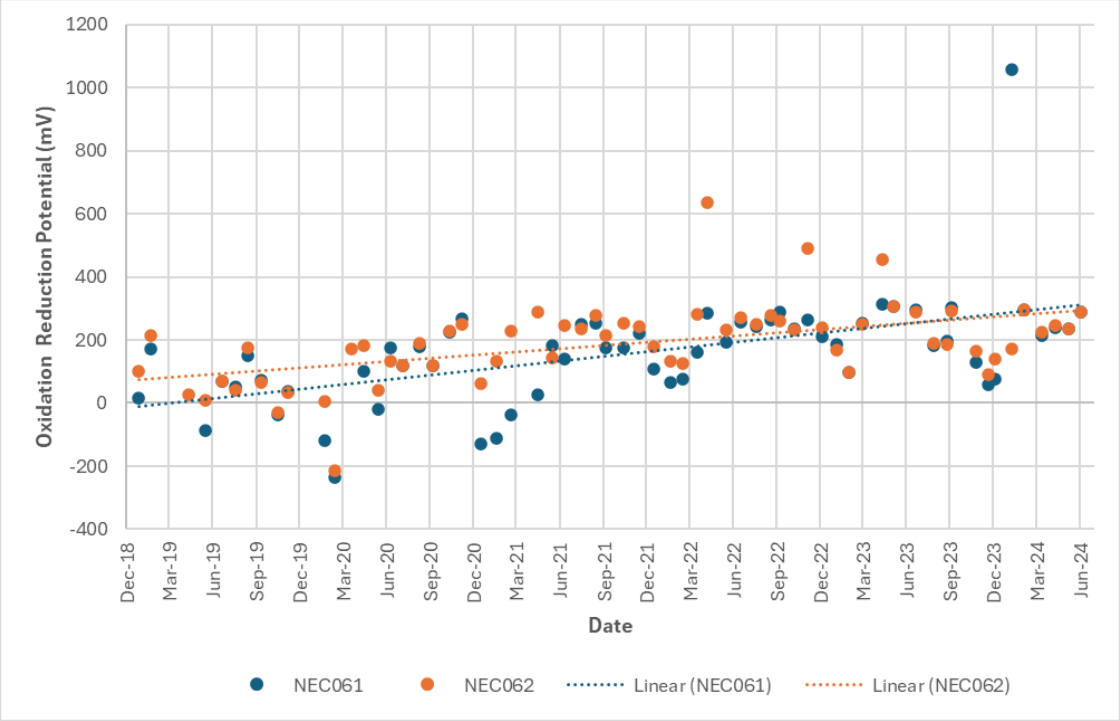


FIGURE A.118: FORMER DEWATERING FACILITY MANAGEMENT ZONE LONG-TERM OXIDATION REDUCTION POTENTIAL

A.9.3 Summary and Recommendations

Water quality results for the former BDF management zone for FY24 were generally consistent with historic monitoring results. Some higher values for specific analytes (e.g., copper, molybdenum, alkalinity, EC, sodium and magnesium) were observed but the majority of these don't appear to be associated with any emerging trends, except molybdenum. The frequency longer-term results for molybdenum at locations in the former BDF management zone was greater during FY24 than the previous reporting period during which all but one of the results was below the limit of detection. A persisting longer term trend for oxidation reduction potential is indicative of catchment wide changes in water chemistry (i.e., common at all monitoring sites in the former BDF management zone and the downstream CDF management zone).

A.10 Receiving Environment

The receiving environment management zone includes 7 surface water monitoring locations. Surface water monitoring locations in this zone are described in Table A.13. The purpose of each of the monitoring locations has been derived from descriptions listed in the Cadia Water Management Plan (Newcrest, 2023).

TABLE A.13: RECEIVING ENVIRONMENT MANAGEMENT ZONE MONITORING LOCATIONS

Monitoring Location	Purpose/Rationale of Monitoring Location
412166	This monitoring location is used to monitor surface water quality in Diggers Creek.
412167	This monitoring location is used to monitor surface water quality in Swallow Creek.
CAWS44	This monitoring location is intended to be used as an upstream reference site on Flyers Creek. The monitoring location is upstream of areas disturbed by mining activities.
CAWS10	This monitoring location is used to monitor surface water quality in Flyers Creek downstream of the Cadia Mine and to identify any potential mining related impacts.
BRPS	This monitoring location is intended to be used as an upstream reference site on the Belubula River. The monitoring location is upstream of the confluence of Cadiangullong Creek and the Belubula River.
CAWS70	This monitoring location is used to monitor water quality in Cadiangullong Creek immediately prior to the confluence of Cadiangullong Creek and the Belubula River. In addition to being used to monitor water quality in Cadiangullong Creek, this location is intended to be used as a reference site upstream of CAWS71 for comparison purposes.
CAWS71	This monitoring location is used to monitor water quality in the Belubula River downstream of the confluence of Cadiangullong Creek and the Belubula River. Water quality at this location is used to identify any potential mining related impacts.

A.10.1 FY24 Water Quality Review

A detailed review of all water quality analytes tested for during FY24 is provided in Sections A.10.1.1 to A.10.1.4.

A.10.1.1. Physiochemical Parameters

Surface water quality monitoring results for physiochemical parameters for the receiving environment management zone can be interpreted as follows:

- **pH** – Results for pH for all the monitoring locations returned results ranging between 6.89 and 8.56 during the reporting period. All pH results are within the historical range. No emerging trends are evident for any of the monitoring locations.
- **Electrical Conductivity** – Results for EC for all the monitoring locations returned results within the historic range during the reporting period. No emerging trends are evident for any of the monitoring locations.
- **Total Suspended Solids** – All results for TSS as monitoring locations 412166, 412167 and CAWS10 were below the limit of detection for TSS (<5 mg/L) and all results at BRPS, CAWS70 and CAWS71 were within the historic range for the sites(refer to Figure A.119). A higher result (330 mg/L) was observed at CAWS44 on 14 February 2024. This result is the highest for the CAWS44 in the historic monitoring period. This monitoring location is upstream of areas disturbed by mining and it is therefore unlikely that this higher value is associated with mining related activities. Results prior to and after the higher values at CAWS44 were below the limit of detection (<5 mg/L). It

should be noted that no results for TSS were recorded for the monitoring location in this management zone during quarter 1 of the reporting period. It should be noted that all values below the limit of detection overlap in Figure A.119.

- **Total Dissolved Solids** – All results for TDS were within the historic range during FY24 with the exception of one result at BRPS. The result at BRPS on 23 January 2024 (508 mg/L) is the highest in the historic monitoring period for the location (refer to Figure A.120). BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. No emerging trends for TDS are evident for the reporting period at any of the monitoring locations.
- **Alkalinity** – All results for alkalinity were within the historic range for the monitoring locations. No emerging trends or outliers for alkalinity are evident for the reporting period at any of the monitoring locations.
- **Oxidation reduction potential** – A continuation of the long-term increasing ORP trend was observed at all monitoring locations during FY24. Results at BRPS, CAWS70, CAWS71, CAWS10 and CAWS44 were within the historic range for the monitoring locations. Results for 412166 (332 mg/L) and 412167 (320 mg/L) on 15 November 2023 were the highest in the historic monitoring period. These results are further detailed in Section A.10.2.

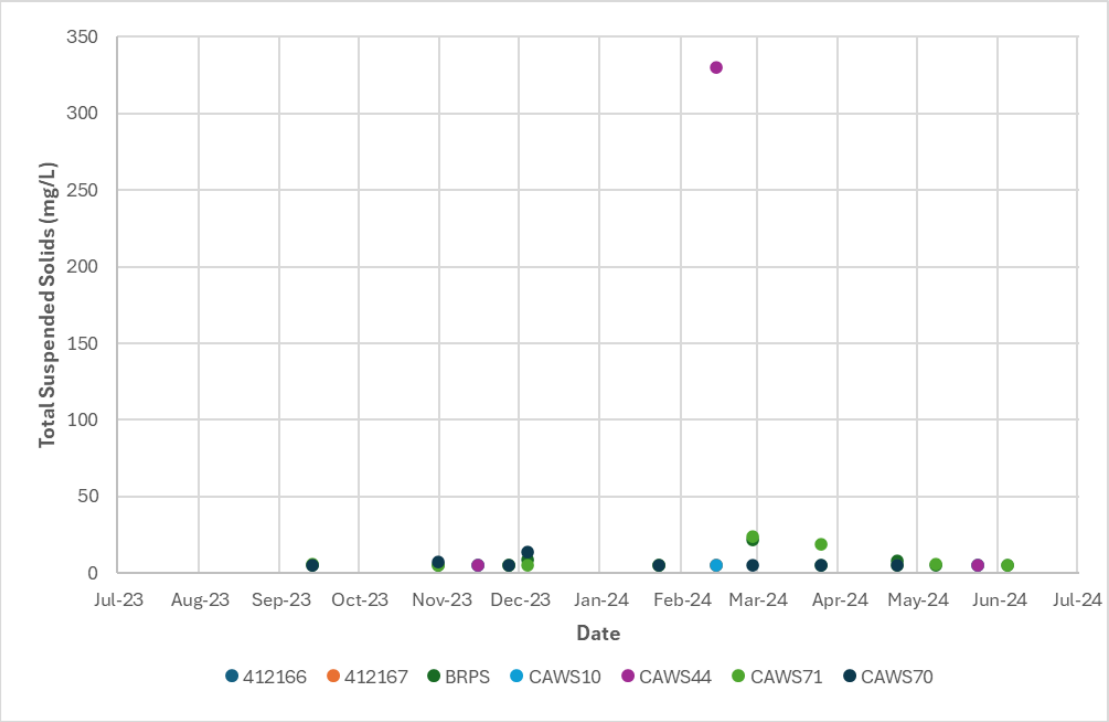


FIGURE A.119: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 TSS

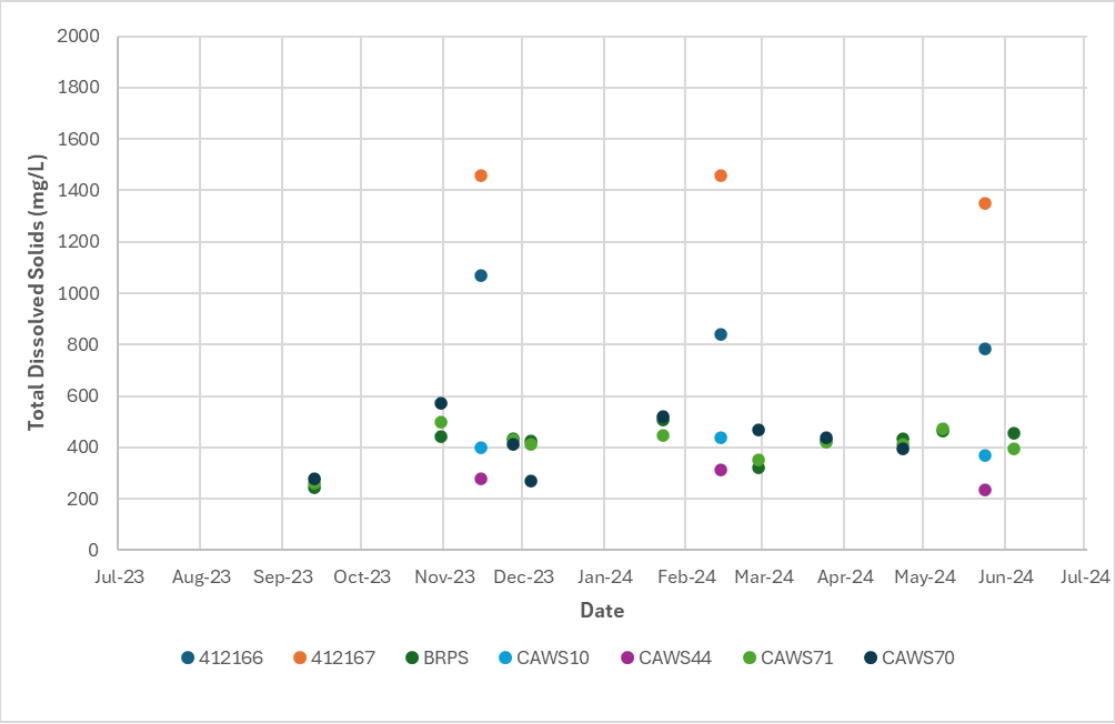


FIGURE A.120: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 TDS

A.10.1.2. Nutrients

Surface water quality monitoring results for nutrients for the receiving environment management zone can be interpreted as follows:

- **Nitrate** – All values for nitrate were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers. It should be noted that no values for nitrate were recorded in quarter 1 of FY24.
- **Nitrite** – All values for nitrite were below the limit of detection (<0.01 mg/L) for all surface water monitoring locations in the management zone. There are no emerging trends or outliers. It should be noted that no values for nitrite were recorded in quarter 1 of FY24.
- **Total Nitrogen** – Values for total nitrogen were consistently low and within the historical range for monitoring locations in the management zone with the exception of one higher total nitrogen value at CAWS71. On 19 July 2023 the highest value in the historic range was recorded at the site (2.2 mg/L) (refer to Figure A.121). Values prior to and following (both 0.08 mg/L) this result were more consistent with the average for the site (0.07 mg/L). The result does not appear to be part of an emerging trend. There are no emerging trends or outliers.
- **Total Phosphorus** – All values for total phosphorus were consistently low and within the historical range for all surface water monitoring locations in the management zone. There are no emerging trends or outliers.

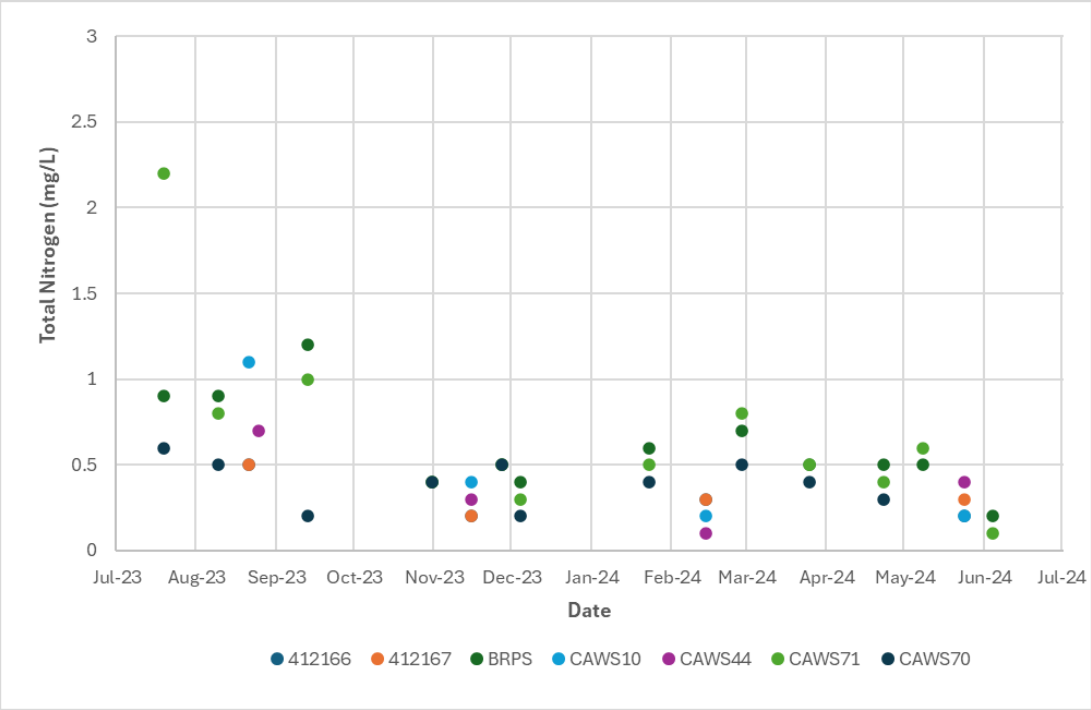


FIGURE A.121: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 TOTAL NITROGEN

A.10.1.3. Major Ions

Surface water quality monitoring results for major ions for the receiving environment management zone can be interpreted as follows:

- **Calcium** – Results for calcium for all monitoring locations in the management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Chloride** – All values for chloride during FY24 were within the historic monitoring range with the exception of a result recorded at BRPS on 8 May 2024 (65 mg/L) which is the highest in the historic monitoring period at the site (refer to Figure A.122). BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. Slight increasing trends were observed at 412167 and CAWS10 during FY24 but all results at these monitoring locations are still within the historic range for the site (refer to Figure A.122). Chloride concentrations can increase with increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations). Increased runoff was observed during FY24 as a result of above average rainfall throughout the year.
- **Magnesium** – All values for magnesium during FY24 were within the historic monitoring range with the exception of a result recorded at BRPS on 8 May 2024 (38 mg/L) which is the highest in the historic monitoring period at the site (refer to Figure A.123). BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. Slight increasing trends were observed at 412167, CAWS10 and CAWS44 during FY24 but all results at these locations are still within the historic range for the sites Magnesium concentrations can increase with increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations). Increased runoff was observed during FY24 as a result of above average rainfall throughout the year.
- **Potassium** – Results for potassium for all monitoring locations in the receiving environment management zone throughout the reporting period were consistent with historic monitoring results. There are no emerging trends or outliers.
- **Sodium** – All values for sodium during FY24 were within the historic monitoring range with the exception of a result recorded at BRPS on 23 January 2024 (50 mg/L) which is the highest in the historic monitoring period at the site (refer to Figure A.124). BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. A slight increasing trend was observed at 412167 but all results at this monitoring location are still within the historic range for 412167. Sodium concentrations can increase with increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations). Increased runoff was observed during FY24 as a result of above average rainfall throughout the year.
- **Sulphate** – All values for sulphate during FY24 were within the historic monitoring range with the exception of a result recorded at BRPS on 23 April 2024 (50 mg/L) which is the highest in the historic monitoring period at the site (refer to Figure A.125). BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. There are no emerging trends or outliers.

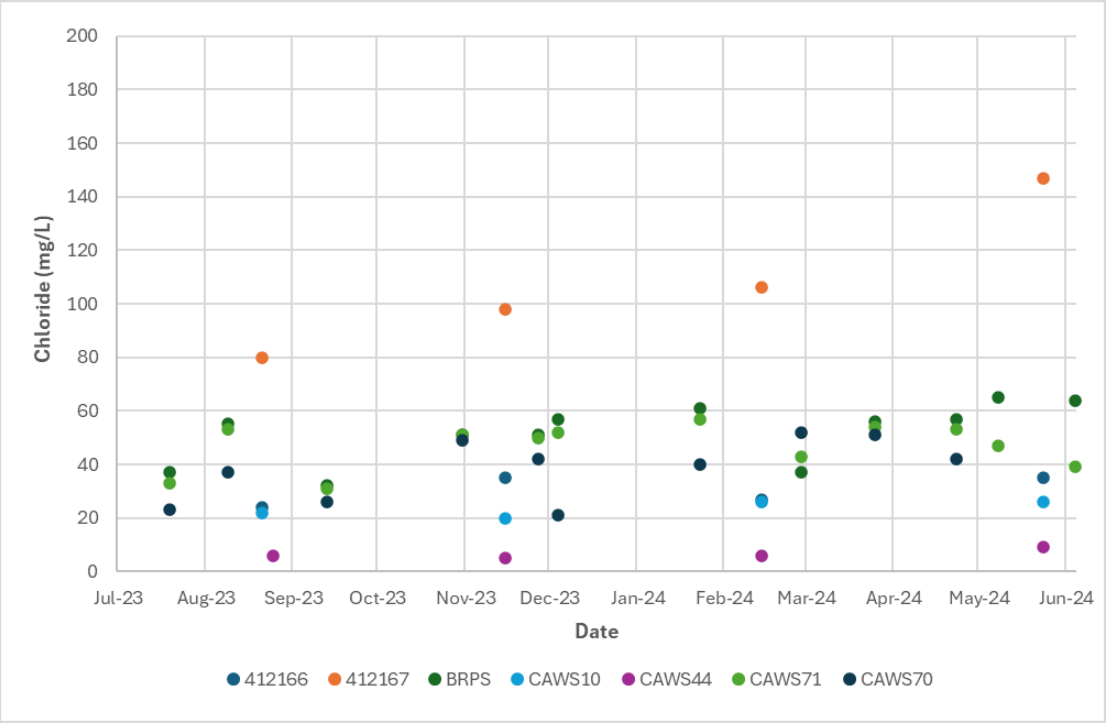


FIGURE A.122: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 CHLORIDE

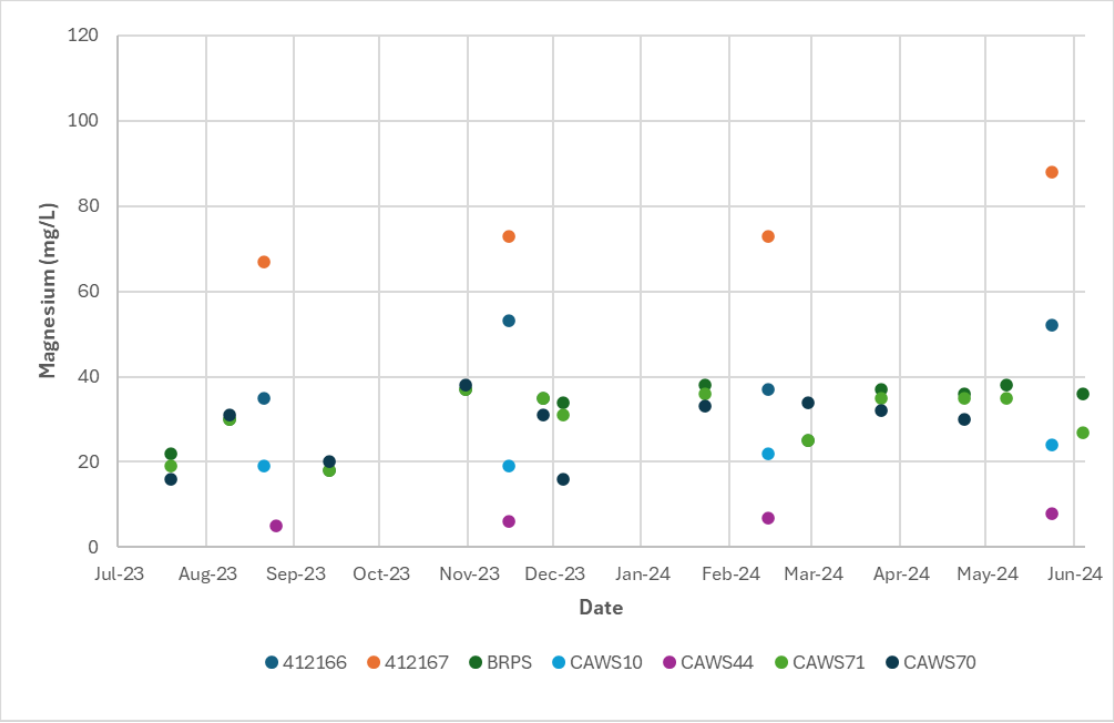


FIGURE A.123: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 MAGNESIUM

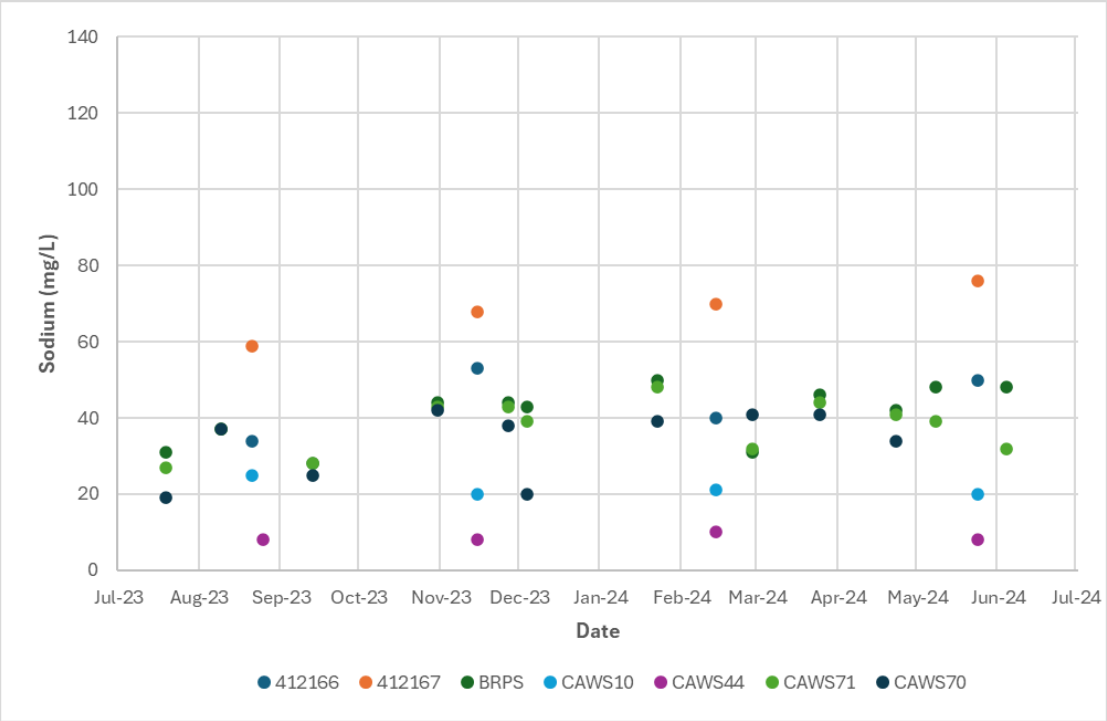


FIGURE A.124: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 SODIUM

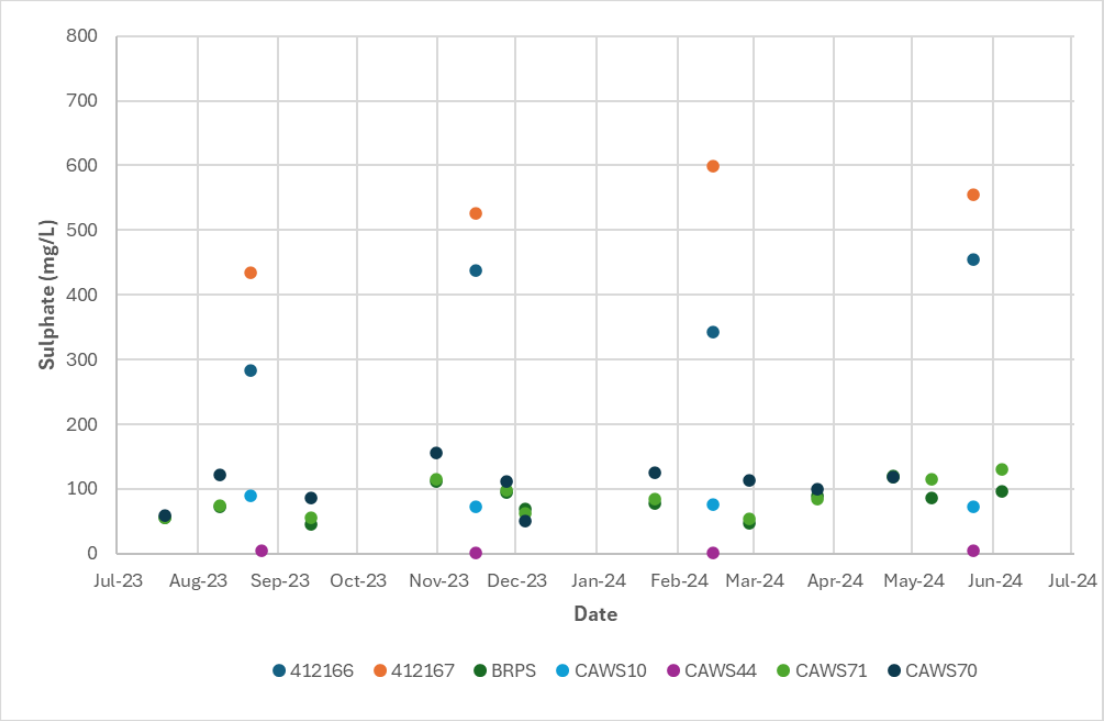


FIGURE A.125: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 SULPHATE

A.10.1.4. Dissolved Metals

Surface water quality monitoring results for metals for the receiving environment management zone can be interpreted as follows:

- **Aluminium** – All results for aluminium were within the historic range during FY24. There are no outliers or emerging trends evident. The majority of results were below the limit of detection (<0.01 mg/L).
- **Antimony** – All results for antimony were below the limit of detection (<0.001 mg/L) during FY24.
- **Arsenic** – The majority of results for arsenic were within the historic range during FY24. There were two results that were not within the historic range for the relevant locations, one result at BRPS (0.016 mg/L) and one result at CAWS71 (0.015 mg/L) (refer to Figure A.126). Both of these results were recorded on 23 January 2024 and are the highest on record for the locations. BRPS is an upstream reference site located on the Belubula River and CAWS71 is immediately downstream of the confluence of the Belubula River and Cadiangullong Creek. As the higher results are evident at both locations, it is considered that the elevations were not caused by mining related activities. There are no emerging trends evident.
- **Cadmium** – All results for cadmium were below the limit of detection (<0.0001 mg/L) during FY24.
- **Chromium** – Results for chromium at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) with the exception of one result at BRPS on 27 November 2023 (0.014 mg/L) (refer to Figure A.127). This result is the highest on record for the site. BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. There are no emerging trends evident.
- **Cobalt** – All results for cobalt were within the historic range during FY24. There are no outliers or emerging trends evident. The majority of results were below the limit of detection (<0.01 mg/L).
- **Copper** – Results for copper at all monitoring locations were within the historic range for during FY24 with the exception of one result at BRPS on 23 January 2024 (0.003 mg/L) (refer to Figure A.128). This result is the highest on record for the site. BRPS is an upstream reference site located on the Belubula River, and it is considered that this higher result was not caused by mining related activities. There are no emerging trends evident.
- **Iron** – Results for iron for all monitoring locations in the receiving environment management zone throughout the reporting period were consistent with historic monitoring results. The majority of results were below the limit of detection (<0.05 mg/L). There are no emerging trends or outliers.
- **Lead** – Results for lead at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Manganese** – Manganese concentrations at surface water monitoring locations in the receiving environment management zone were consistent with historic monitoring data. There are no emerging trends or outliers.
- **Mercury** – Results for mercury at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Molybdenum** – Results for molybdenum at all monitoring locations were consistently below the limit of detection (<0.001 mg/L) with the exception of CAWS70 and CAWS71 (refer to Figure A.129). While some results at CAWS70 were slightly above the limit of detection, all results remained within the historic range for the site. One result at CAWS71 on 4 June 2024 (0.012 mg/L) was the highest on record for the site. Molybdenum was not monitored at CAWS70 on the same day as the high results was returned at CAWS71, however, results at monitoring location 412702 (between CAWS71 and the Cadia Mine) returned a result below the limit of detection on the day prior indicating that the higher result was not caused by mining related impacts.
- **Nickel** – Results for nickel at 412166, 412167, CAWS10, CAWS44 and CAWS71 were consistently below the limit of detection (<0.001 mg/L) during FY24. The majority of results for BRPS and CAWS70 were below the limit of detection (<0.001 mg/L) with one result at each of the locations slightly above the limit of detection (0.002 mg/L at both sites) during the reporting period. All results were within the historic range and there are no emerging trends or outliers.
- **Silver** – Results for silver at all monitoring locations were consistently below the limit of detection (<0.001 mg/L).
- **Zinc** – Results for zinc at all monitoring locations were consistently low and within the historic range. There are no emerging trends or outliers.

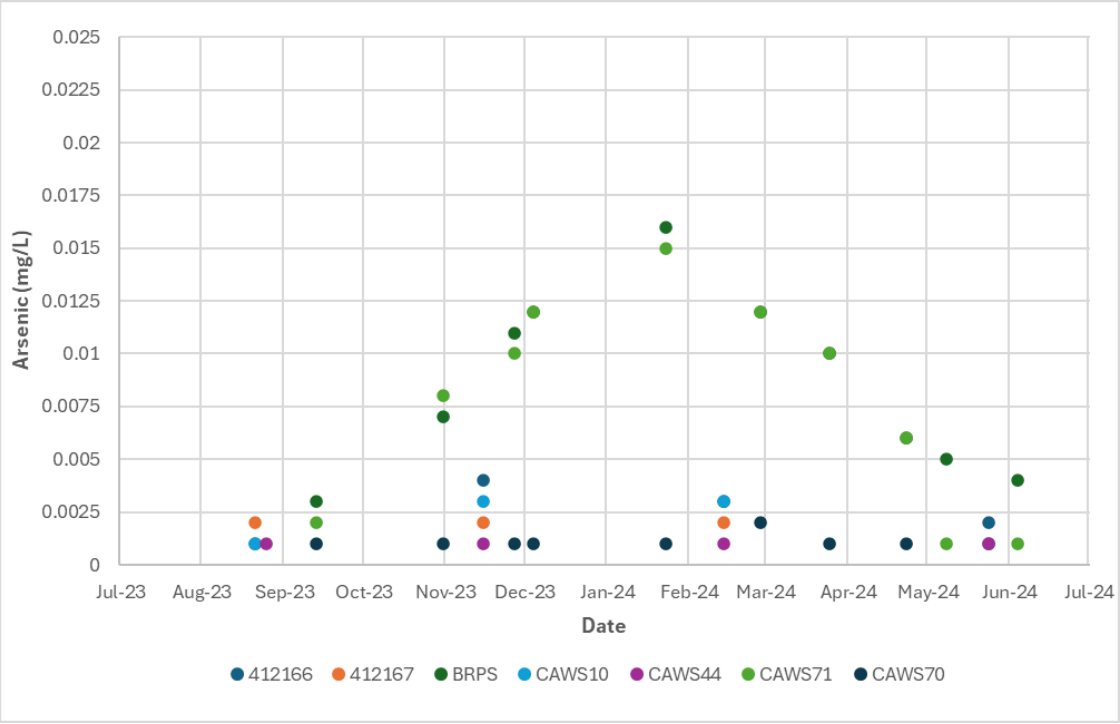


FIGURE A.126: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 ARSENIC

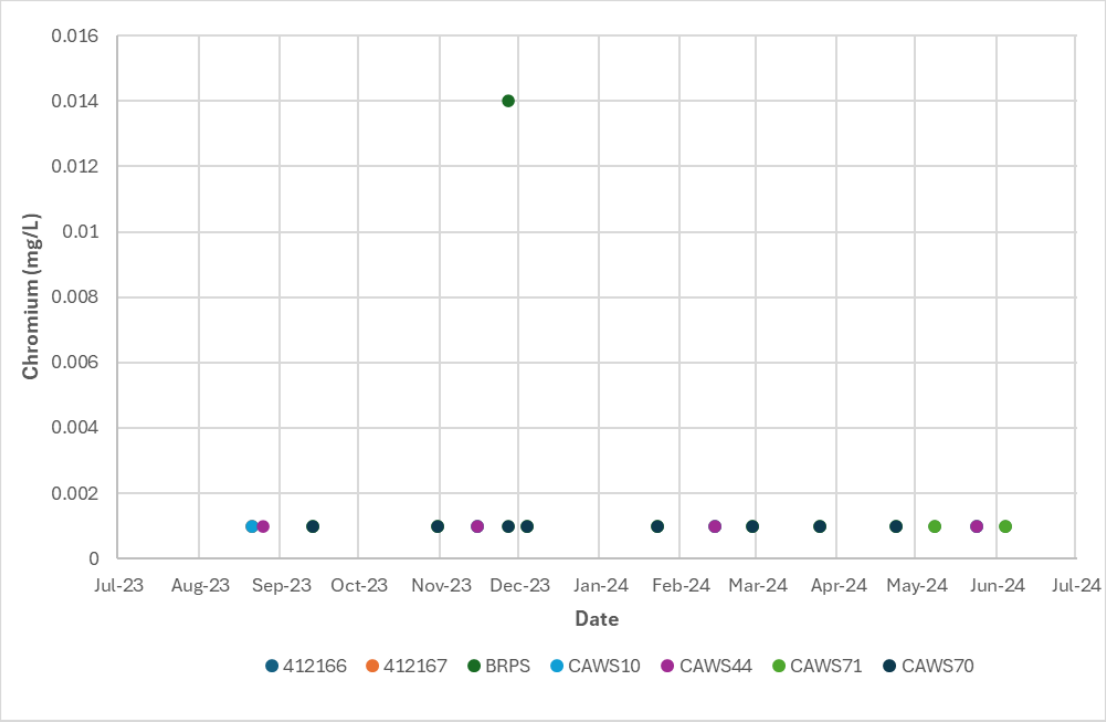


FIGURE A.127: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 CHROMIUM

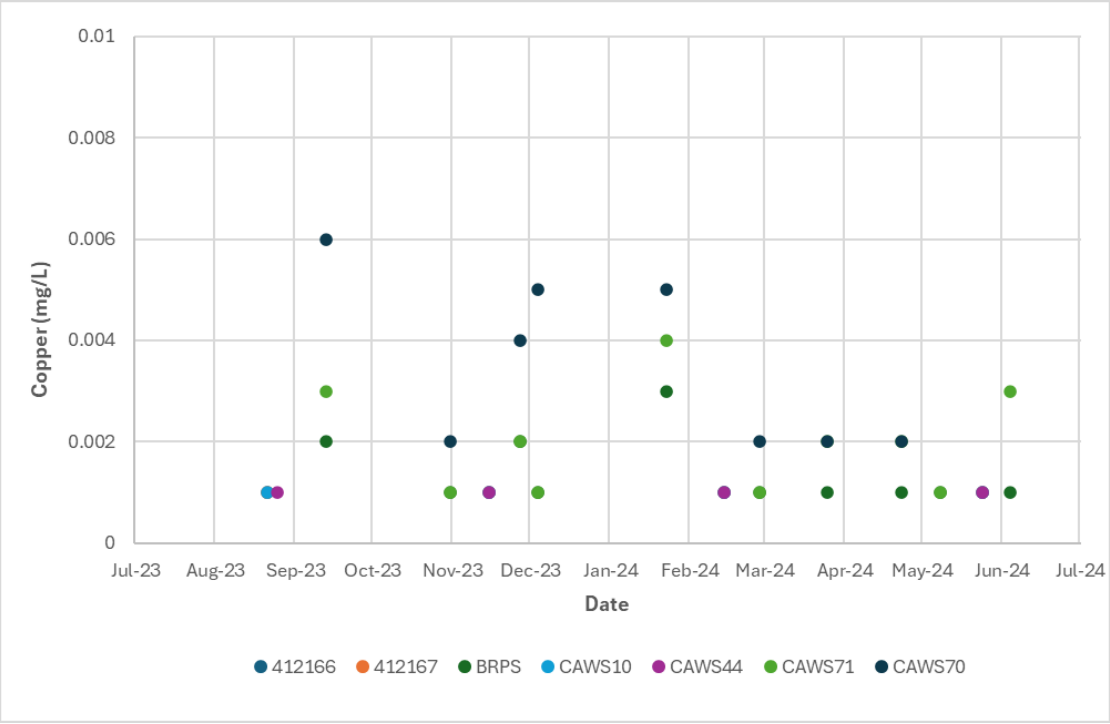


FIGURE A.128: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 COPPER

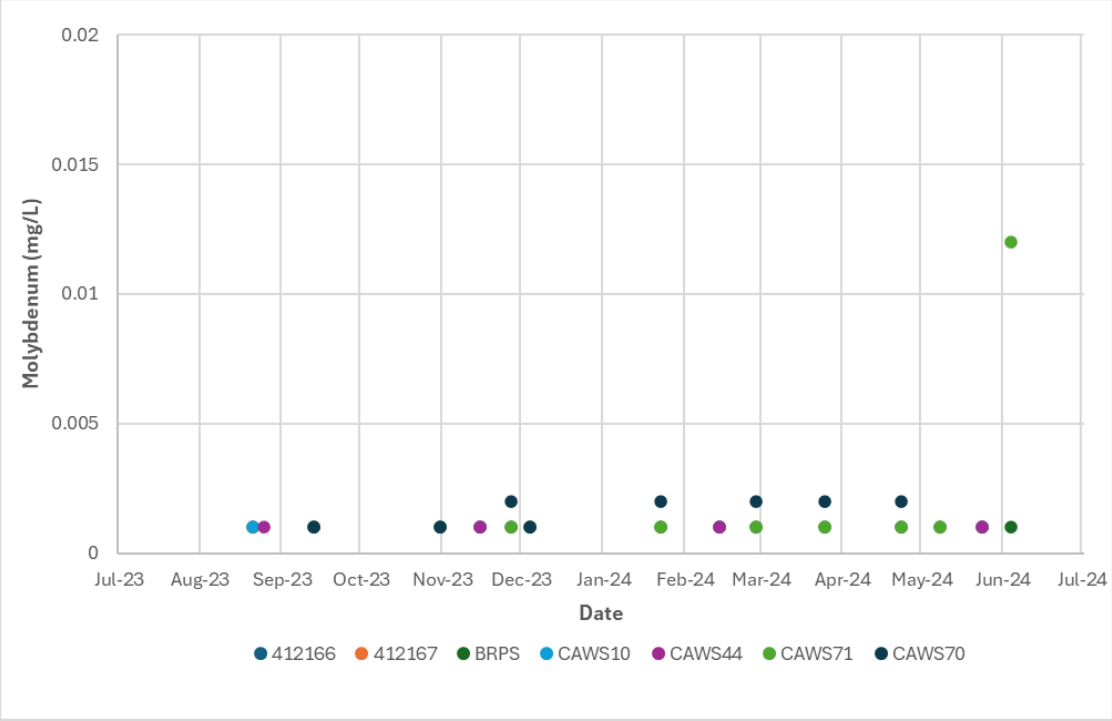


FIGURE A.129: RECEIVING ENVIRONMENT MANAGEMENT ZONE FY24 MOLYBDENUM

A.10.2 Long-Term Trends

This section of the report aims to summarise emerging long-term trends (i.e., trends that commence prior to the FY24 reporting period) for surface water monitoring locations in the receiving environment management zone. Short term trend relevant to the reporting period for various analytes have been detailed in Section A.10.1. Interpretation of long-term water quality trends in the receiving environment management zone can be summarised as follows:

- ORP has increased at all monitoring locations throughout the historic monitoring period. This increase can likely be attributed to changes to the wider catchment characteristics as it is consistent across all surface water monitoring locations in the management zone (refer to Figure A.130). This trend has also been observed at other management zones in the wider region, including the upper Cadiangullong Creek, TSF western, CDF and former BDF management zones.

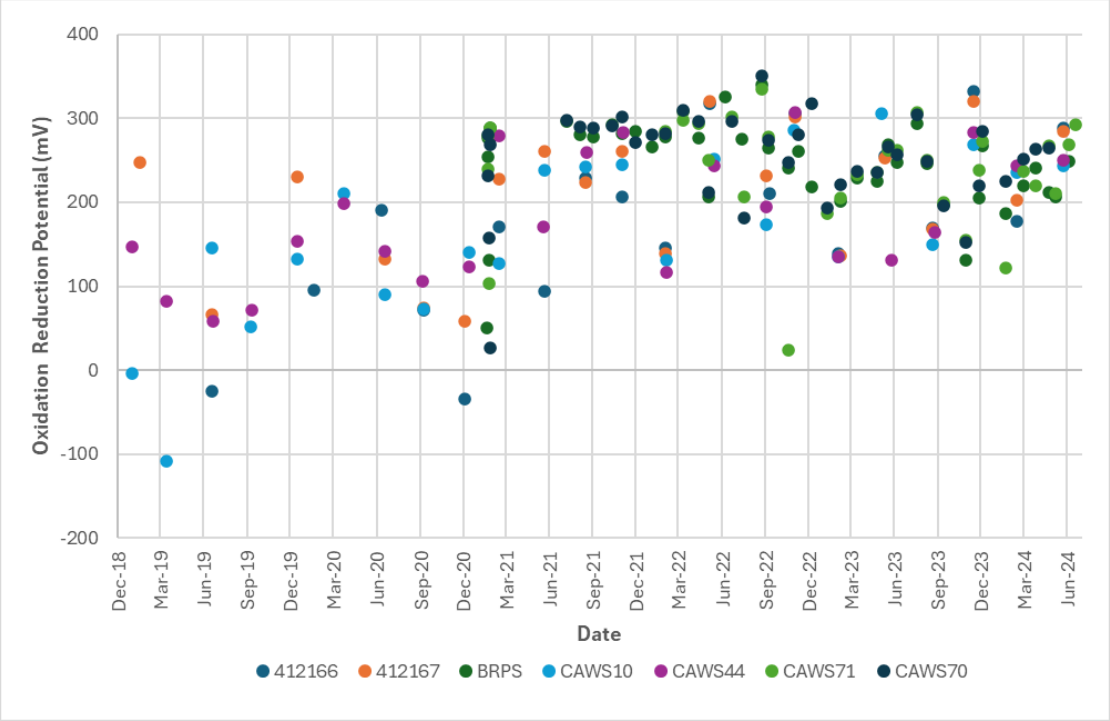


FIGURE A.130: RECEIVING ENVIRONMENT MANAGEMENT ZONE LONG-TERM OXIDATION REDUCTION POTENTIAL

A.10.3 Review of Monitoring Data Against ANZECC (2000) Livestock and Irrigation Guideline Values

CHPL has requested that Flyers Creek (CAWS10 and CAWS44), Cadiangullong Creek (CAWS70) and Belubula River (CAWS71 and BRPS) monitoring locations in the receiving environment management zone be reviewed against ANZECC (2000) livestock drinking water guidelines and ANZECC (2000) irrigation and general use guidelines. These guidelines were selected as the land in the vicinity of Cadia is primarily used for agricultural purposes.

The aforementioned surface water monitoring locations have been assessed against the ANZECC (2000) guidelines to determine whether there were any values recorded above the guideline values during the FY24 reporting period. A comparison of water quality results from CAWS10, CAWS44, CAWS70, CAWS77 and BRPS to the ANZECC guideline values is provided in Table A.14.

TABLE A.14: RECEIVING ENVIRONMENT MANAGEMENT ZONE REVIEW OF FY24 ANZECC GUIDELINE VALUE EXCEEDANCES – RECEIVING ENVIRONMENT

Parameter	Unit	ANZECC Livestock Drinking Water Guideline Values	ANZECC Irrigation and General Water Use Short-term (up to 20 years) Guideline Values	ANZECC Irrigation and General Water Use Long-Term (>100 years) Guideline Values	Any Results Greater Than the ANZECC Guideline Values Observed?		
					Flyers Creek (CAWS10 and CAWS44)	Cadiangullong Creek (CAWS70)	Belubula River (CAWS71 and BRPS)
Physiochemical Parameters, Major Ions and Nutrients							
TDS	mg/L	Beef cattle 0 – 4000 Dairy cattle 0 – 2500 Sheep 0 – 5000 Horses 0 – 4000 Pigs 0 – 4000 Poultry 0 – 4000	-	-	No	No	No
Sulphate	mg/L	1000	-	-	No	No	No
Calcium	mg/L	1000	-	-	No	No	No
Nitrate	mg/L	1500	-	-	No	No	No
Nitrite	mg/L	30	-	-	No	No	No
Total Nitrogen	mg/L	-	25-125	5	No	No	No
Total Phosphorus	mg/L	-	0.8-12	0.05	Yes	Yes	Yes
Dissolved Metals							
Aluminium	mg/L	5	20	5	No	No	No
Arsenic	mg/L	0.5 up to 5	2.0	0.1	No	No	No
Cadmium	mg/L	0.01	0.05	0.01	No	No	No
Chromium	mg/L	1	1	0.1	No	No	No
Cobalt	mg/L	1	0.1	0.05	No	No	No
Copper	mg/L	0.4 (sheep) 1 (cattle) 5 (pigs) 5 (poultry)	0.5	0.2	No	No	No
Iron	mg/L	Not sufficiently toxic	10	0.2	Yes	No	Yes
Lead	mg/L	0.1	5	2	No	No	No
Mercury	mg/L	0.002	0.002	0.002	No	No	No
Manganese	mg/L	Not sufficiently toxic	10	0.2	No	No	No
Molybdenum	mg/L	0.15	0.05	0.01	No	No	Yes
Nickel	mg/L	1	2	0.2	No	No	No
Zinc	mg/L	20	5	2	No	No	No

All results for all analytes at the monitoring locations were below the ANZECC guideline values during FY24 with the exception of:

- **Total Phosphorus** – 12 values were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.05 mg/L) (refer to Figure A.131). All locations assessed (CAWS10, CAWS44, CAWS70, CAWS71 and BRPS) returned results above the guideline value.
- **Iron** – 4 values were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.2 mg/L) (refer to Figure A.132). Locations assessed in Flyers Creek and the Belubula River (CAWS10, CAWS44, CAWS71 and BRPS) returned results above the guideline value.
- **Molybdenum** – 1 value at CAWS71 (Belubula River) was above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.01 mg/L) (refer to Figure A.133).

Results for total phosphorus during FY24 were within the historic range for all of the monitoring locations. These values are not considered to be outliers, or part of an emerging or long-term trend. It should be noted that when compared to the short term (20 years) guideline value for total phosphorus (0.8 to 12 mg/L) all values during FY24 are below the guideline. The consistency of higher results observed at locations both upstream and downstream of the Cadia Mine indicate a catchment wide influence as opposed to a mining related impact.

Four results for iron during FY24 were above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.2 mg/L). These results were returned at CAWS10, CAWS44, BRPS and CAWS71. All results are within the historic range for the sites. The values are notably lower than the short term (20 years) guideline value for iron (10 mg/L) and the higher results did not persist throughout the year. Higher values for iron were not observed at CAWS70 which is the closest location to the Cadia Mine downstream of the operation. The results indicate that it is unlikely that the iron elevations were the result of mining related impacts.

One result for molybdenum at CAWS71 FY24 was above the ANZECC (2000) long-term (>100 year) irrigation and general water use guideline value (0.01 mg/L). This higher result is not reflected at CAWS70 or 412167 which are both located on Cadiangullong Creek upstream of CAWS71 between the Belubula River and the Cadia Mine. The results indicate that the higher molybdenum value was likely not the result of mining related impacts.

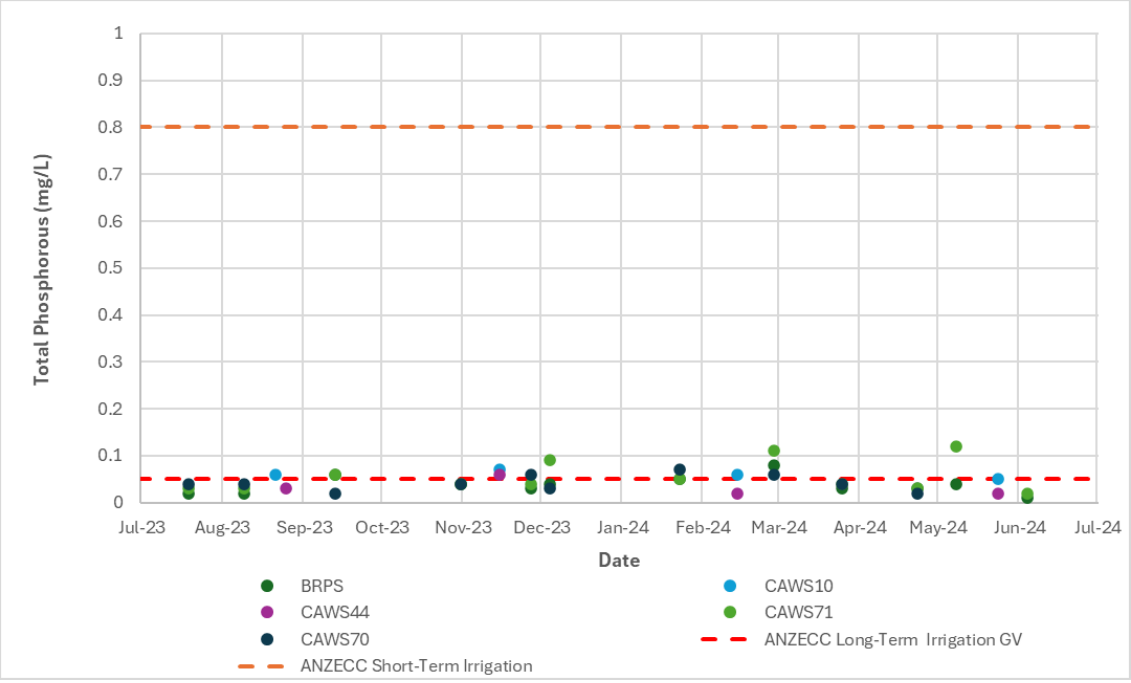


FIGURE A.131: RECEIVING ENVIRONMENT MONITORING LOCATIONS FY24 TOTAL PHOSPHORUS RESULTS VS ANZECC GUIDELINE VALUES

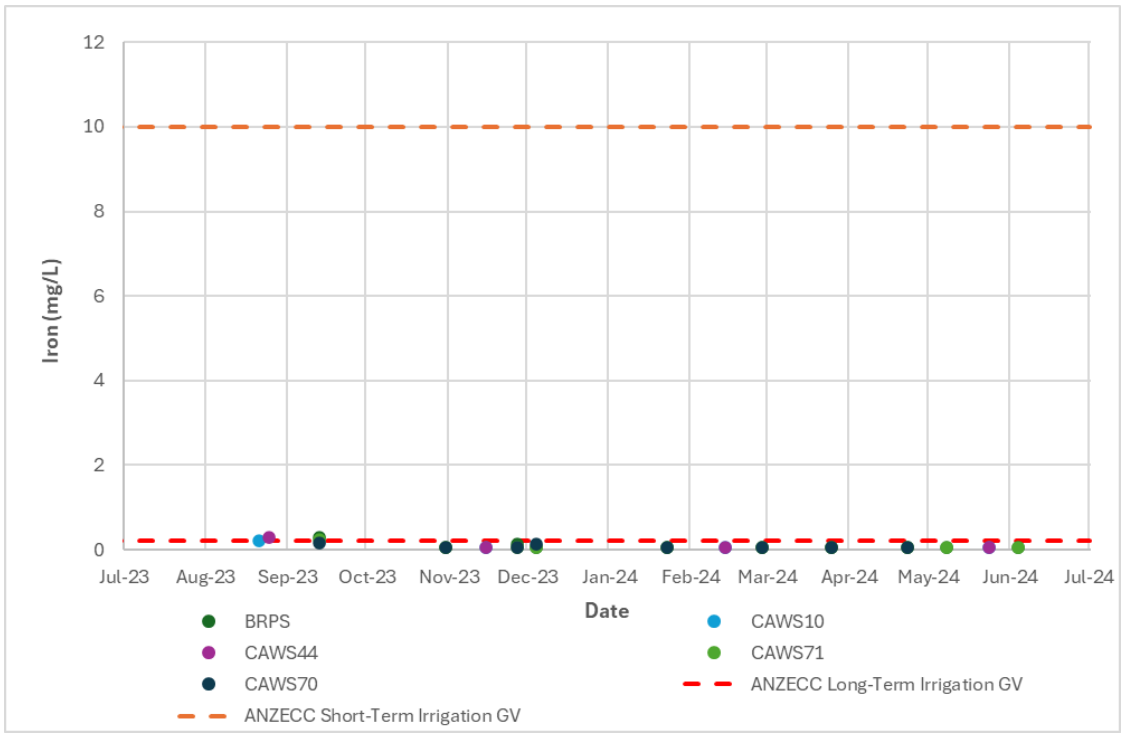


FIGURE A.132: RECEIVING ENVIRONMENT MONITORING LOCATIONS FY24 IRON RESULTS VS ANZECC GUIDELINE VALUES

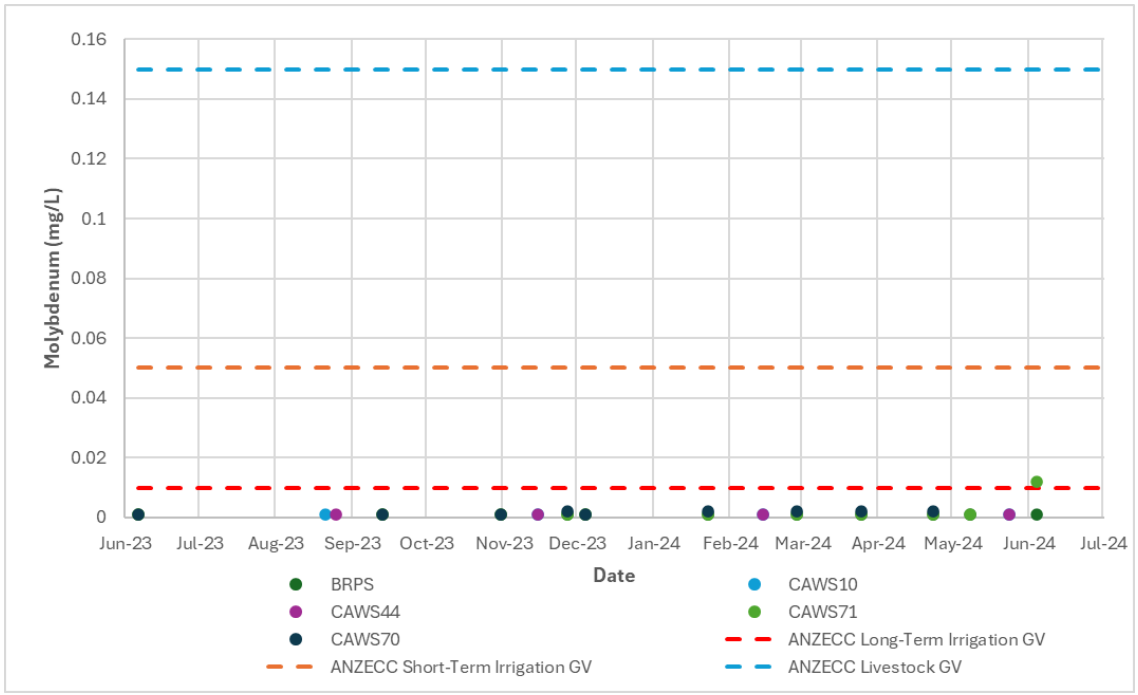


FIGURE A.133: RECEIVING ENVIRONMENT MONITORING LOCATIONS FY24 MOLYBDENUM RESULTS VS ANZECC GUIDELINE VALUES

A.10.4 Summary and Recommendations

Almost all results for the receiving environment management zone were within the historic range during FY24.

Emerging trends were identified for chloride, magnesium and sodium for some of the sites in the management zone. Increases for these analytes can occur when there is increased runoff from agricultural areas (the predominant land use upstream of the monitoring locations). Increased runoff was observed during FY24 as a result of above average rainfall throughout the period. While emerging trends for these analytes were observed, all values were still low and within the historic range for the monitoring locations.

Results for several analytes (chloride, magnesium, sodium, sulphate, arsenic, chromium and copper) at BRPS (upstream of the Cadia Mine on the Belubula River) were the highest on record during the reporting period. This location is upstream of the Cadia Mine and it is considered that these higher results were not caused by mining related activities.

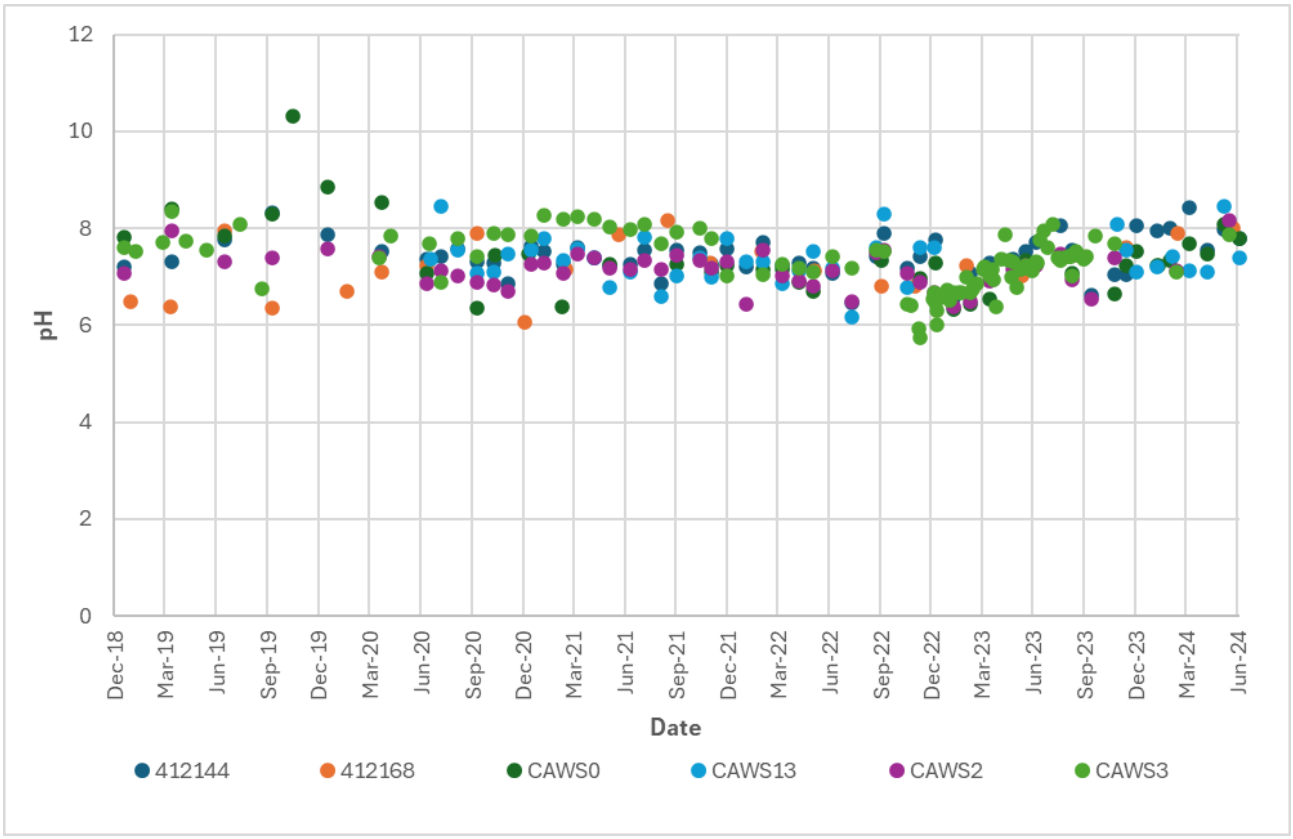
A persisting long-term trend for ORP continued during FY24. This increase can likely be attributed to changes to the wider catchment characteristics as it is consistent across all surface water monitoring locations in the management zone. This trend has also been observed within other management zones in the wider region, including the upper Cadiangullong Creek, TSF western, CDF and former BDF management zones.

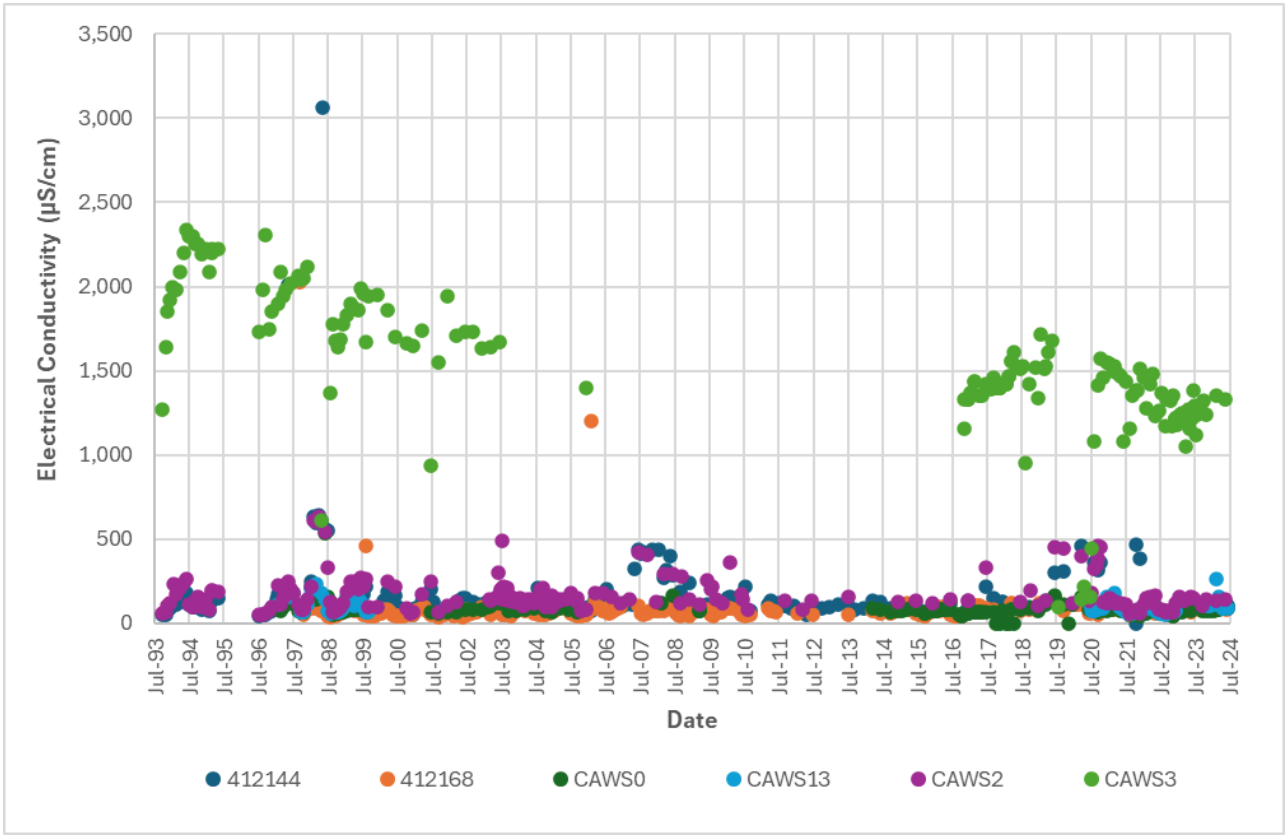
There appears to be no association between mining related activities and changes in water quality for the receiving environment monitoring locations for the FY24 reporting period.

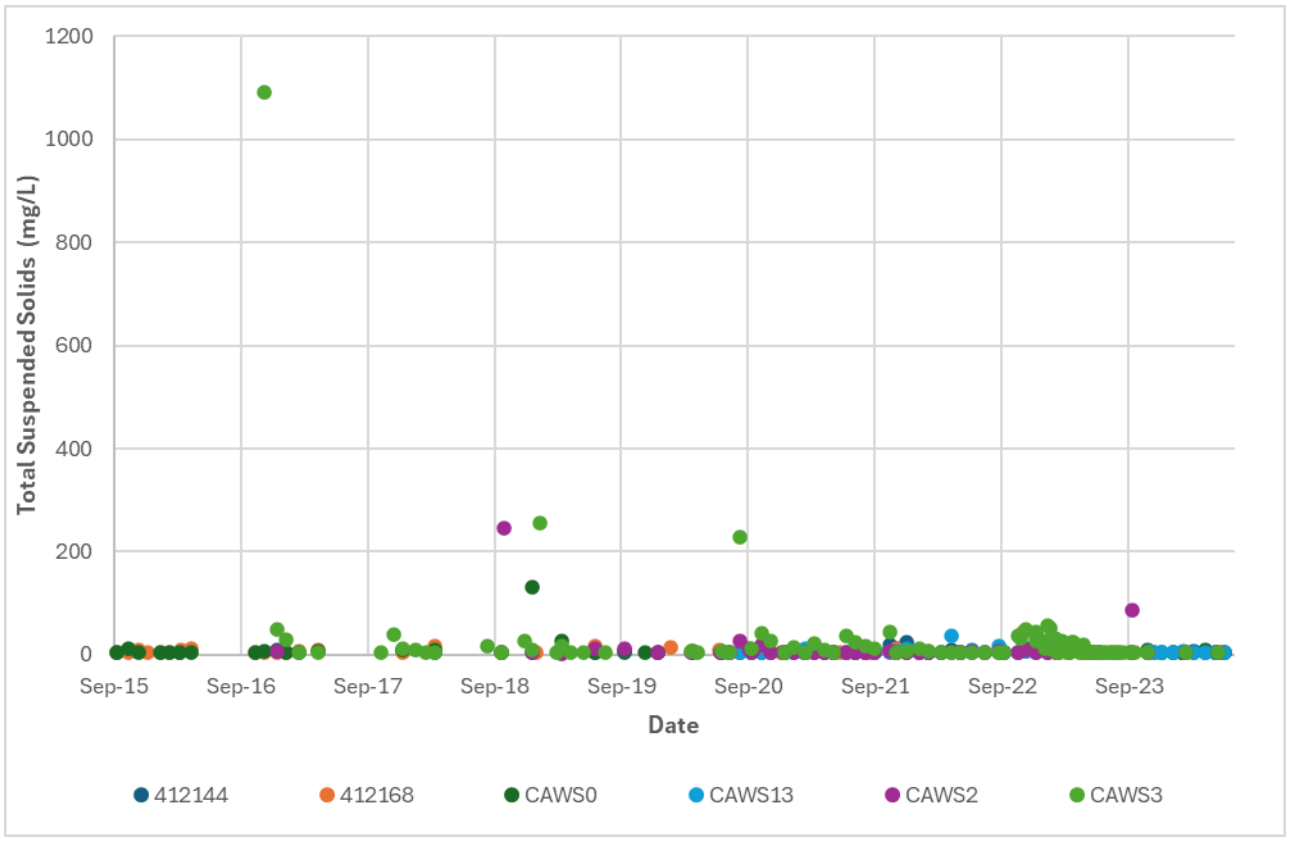
APPENDIX B: WATER QUALITY CHARTS

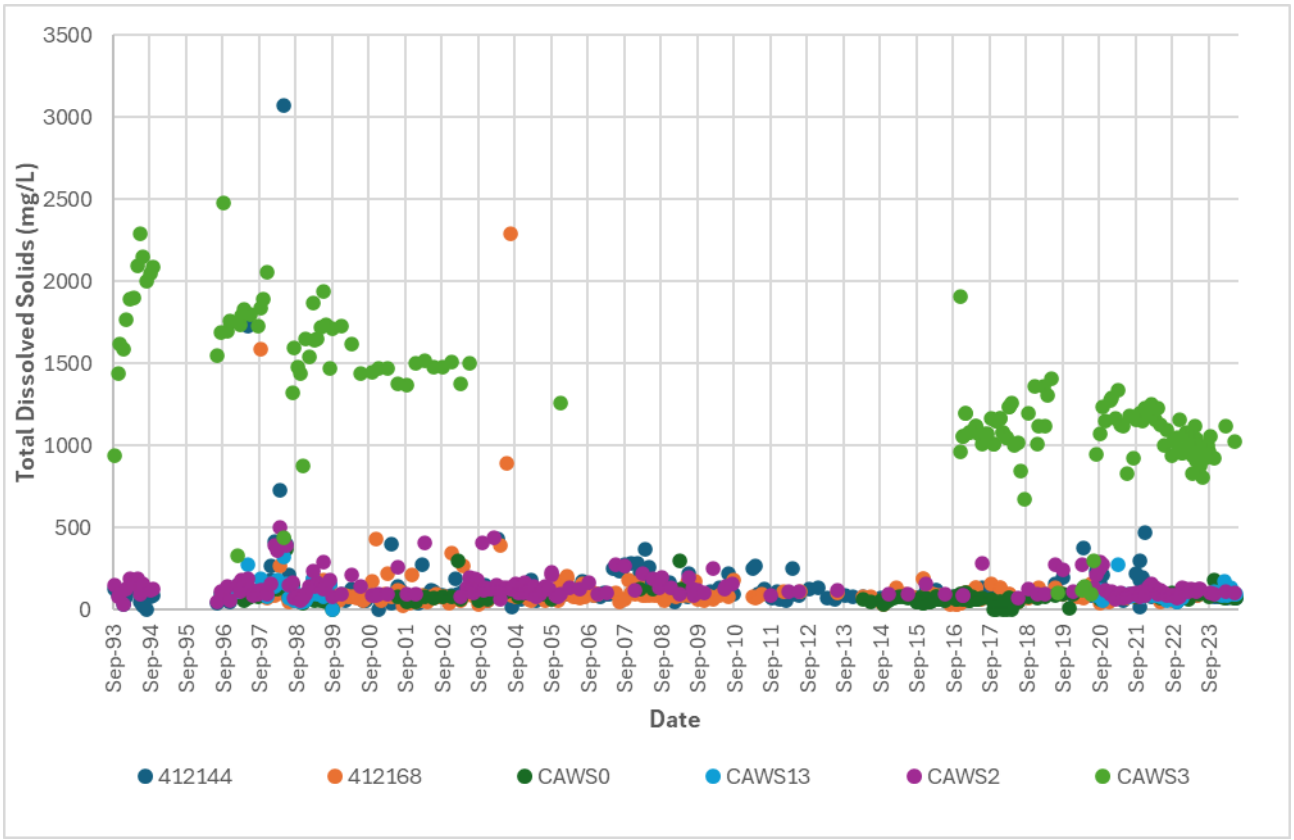
B.1 Upper Cadiangullong Creek

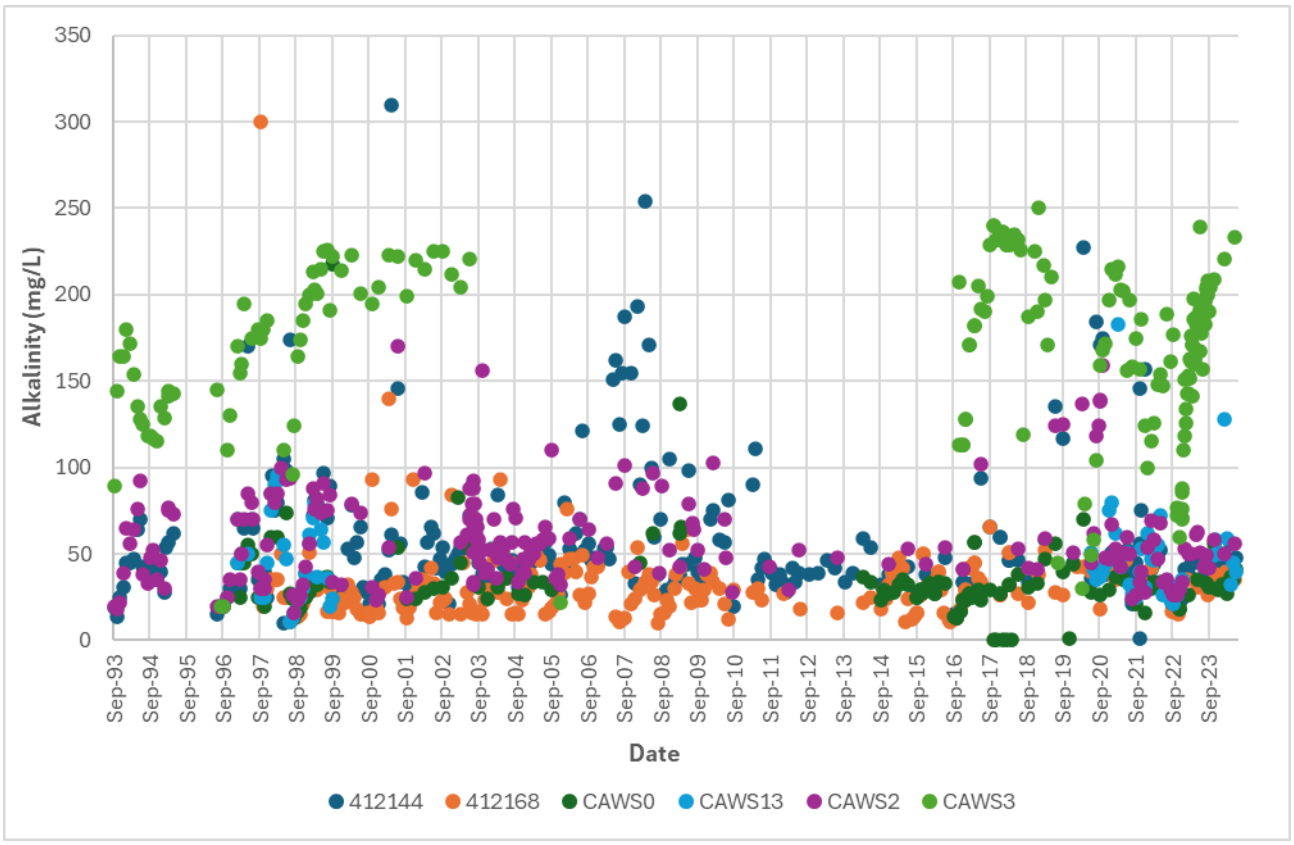
B.1.1 Physiochemical Parameters

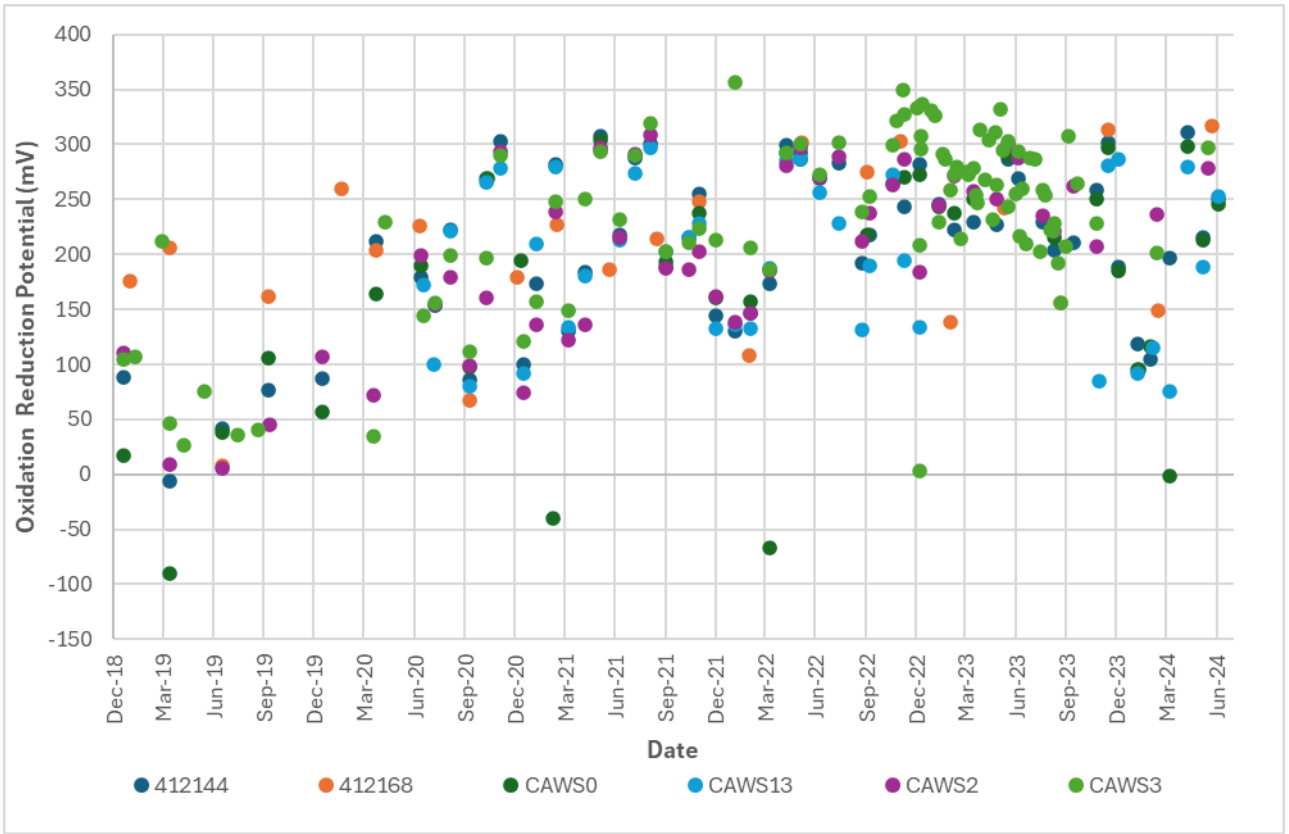




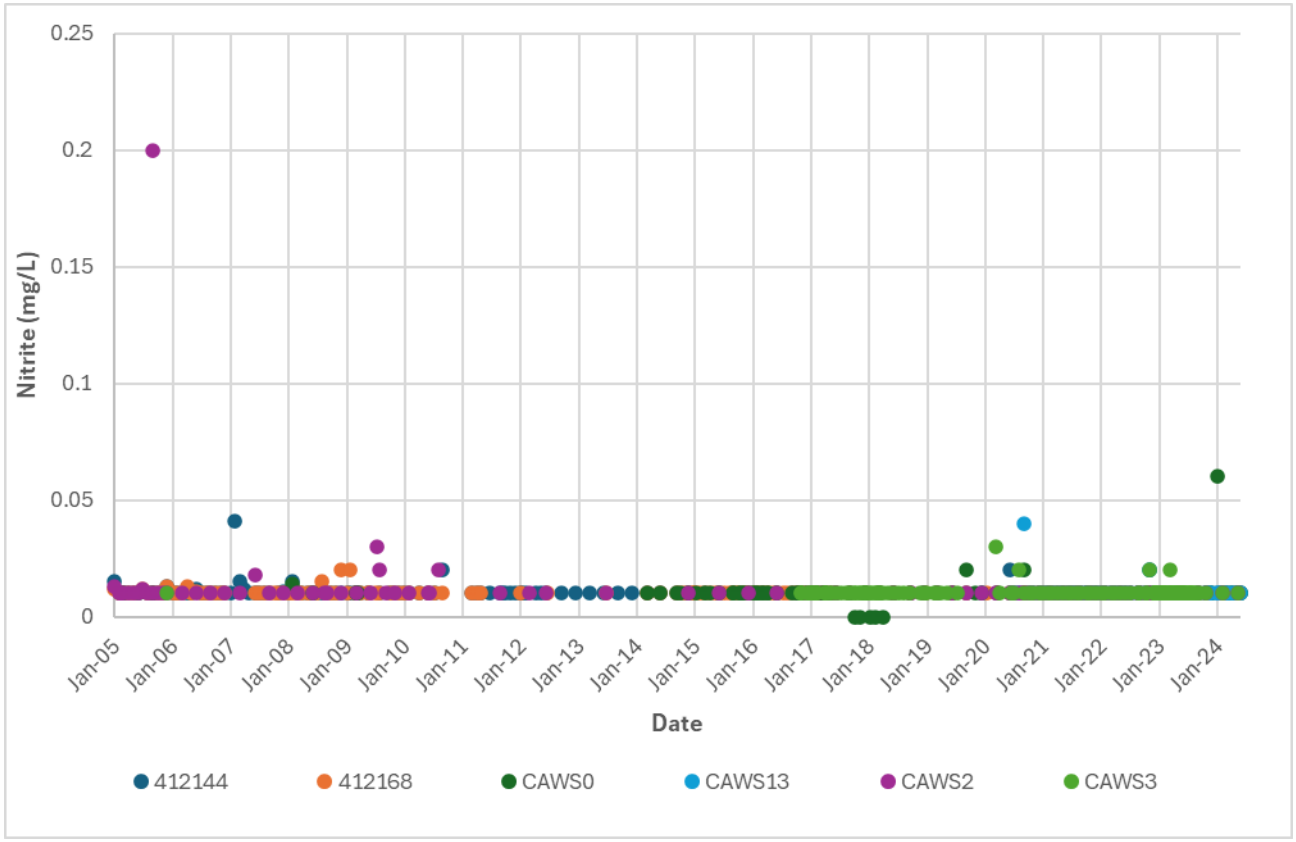

1200
1000
800
600
400
200
0
Total Suspended Solids (mg/L)
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
412144
412168
CAWS0
CAWS13
CAWS2
CAWS3

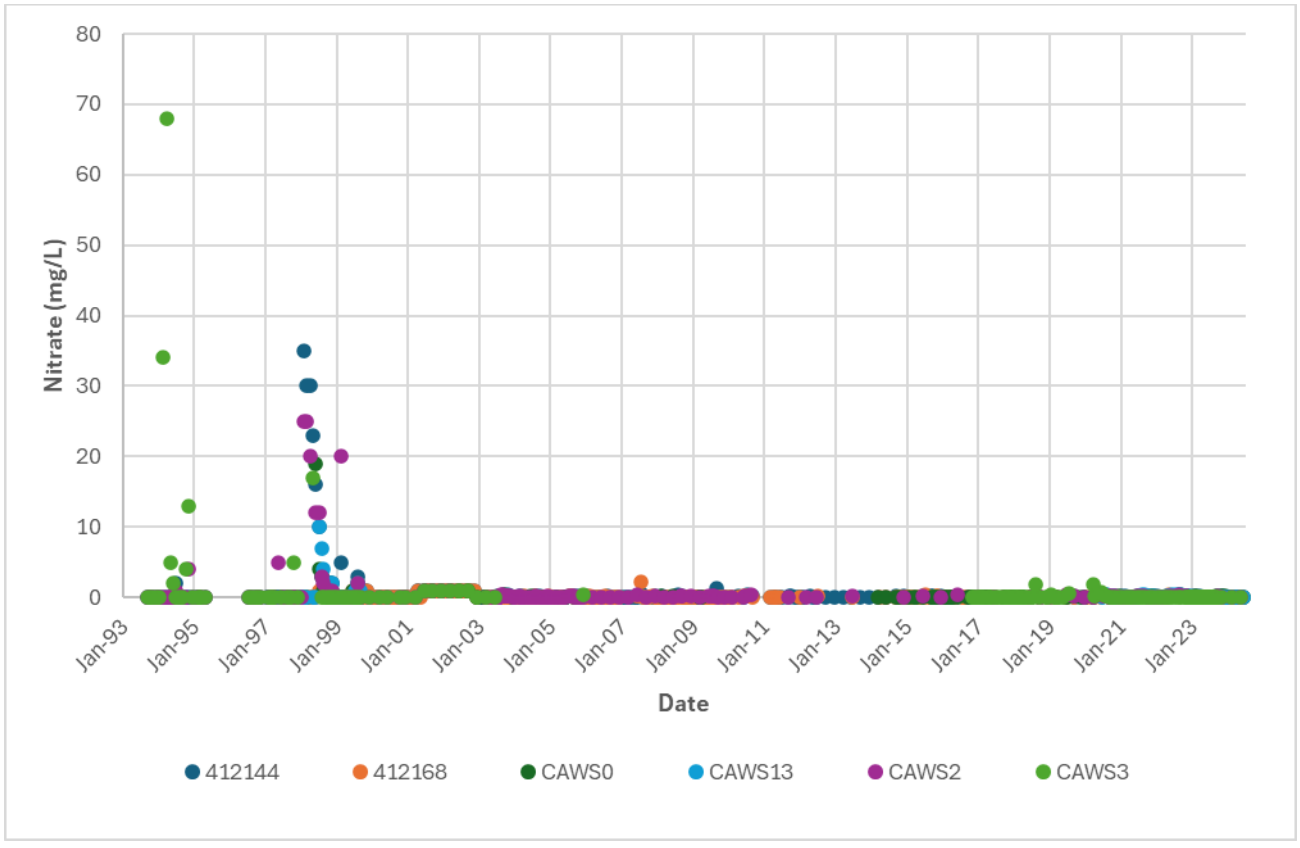

3500
3000
2500
2000
1500
1000
500
0
Total Dissolved Solids (mg/L)
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
412144
412168
CAWS0
CAWS13
CAWS2
CAWS3

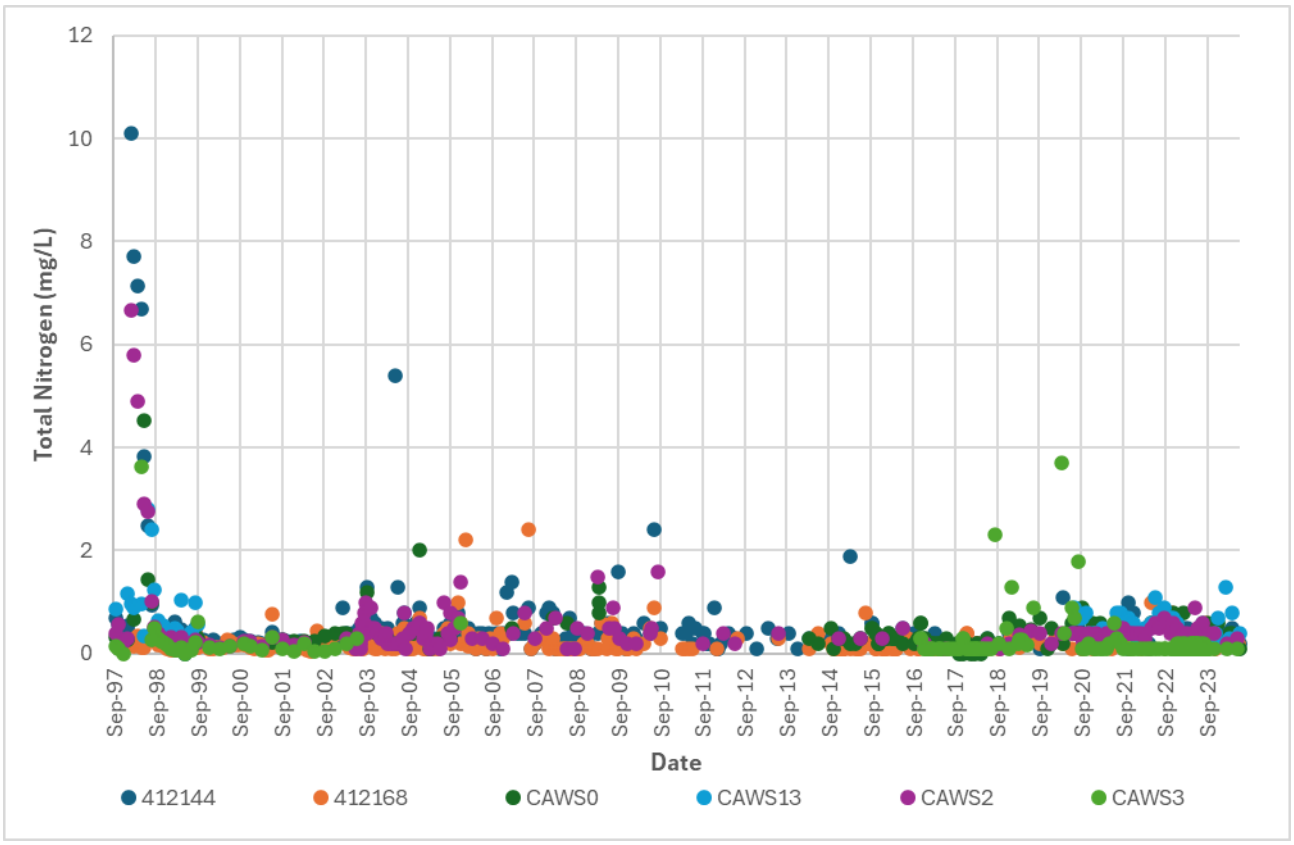

Alkalinity (mg/L)
350
300
250
200
150
100
50
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
412144
412168
CAWS0
CAWS13
CAWS2
CAWS3

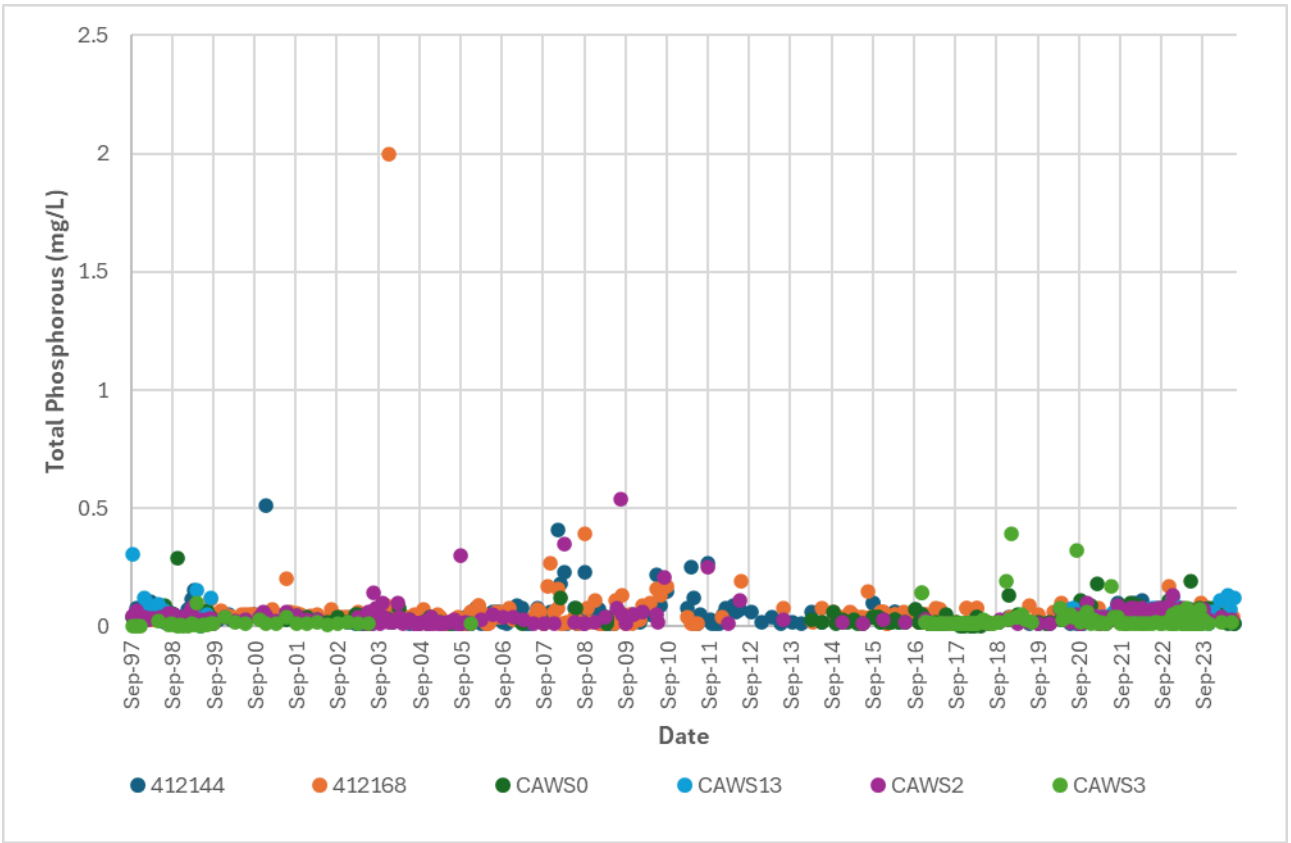

Oxidation Reduction Potential (mV)
400
350
300
250
200
150
100
50
0
-50
-100
-150
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
Jun-24
Date
412144
412168
CAWS0
CAWS13
CAWS2
CAWS3

B.1.2 Nutrients

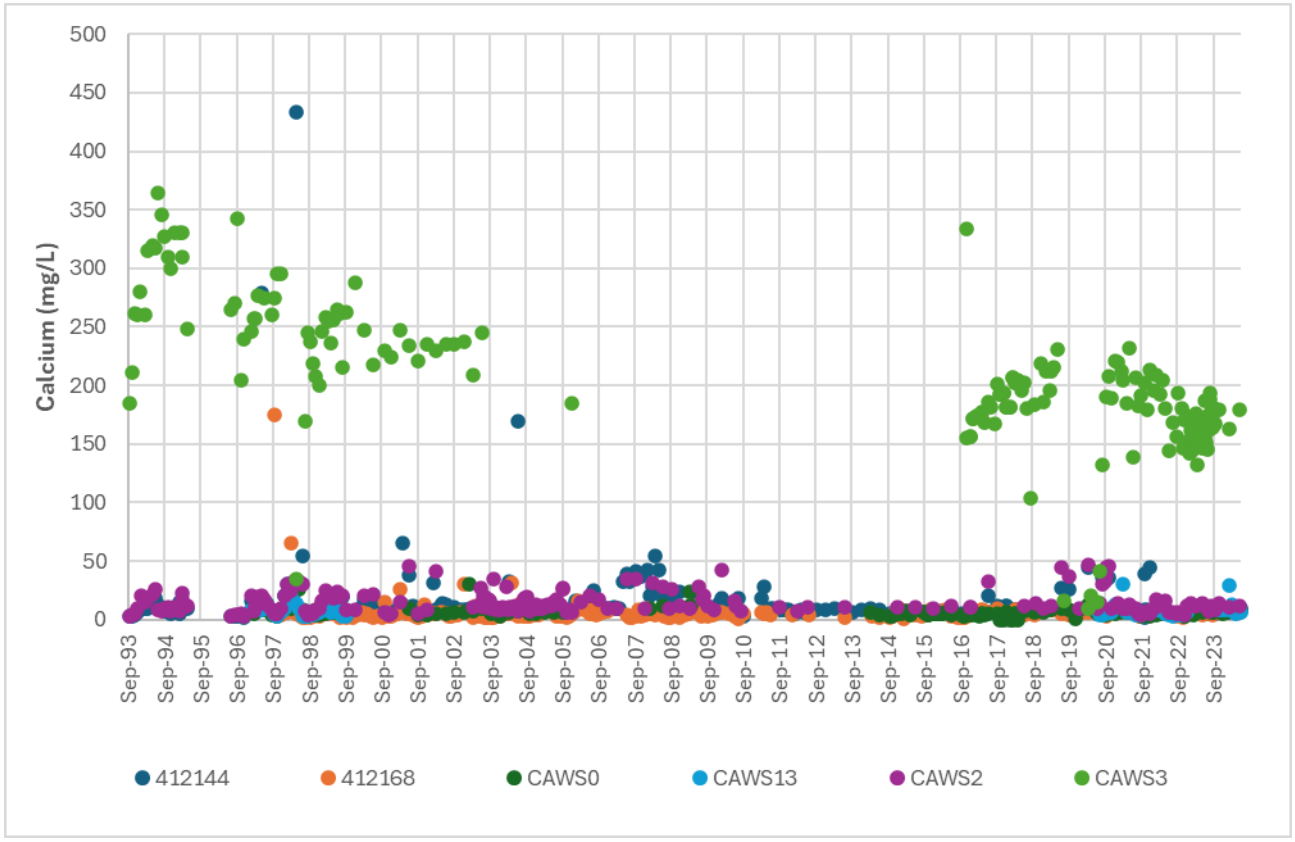


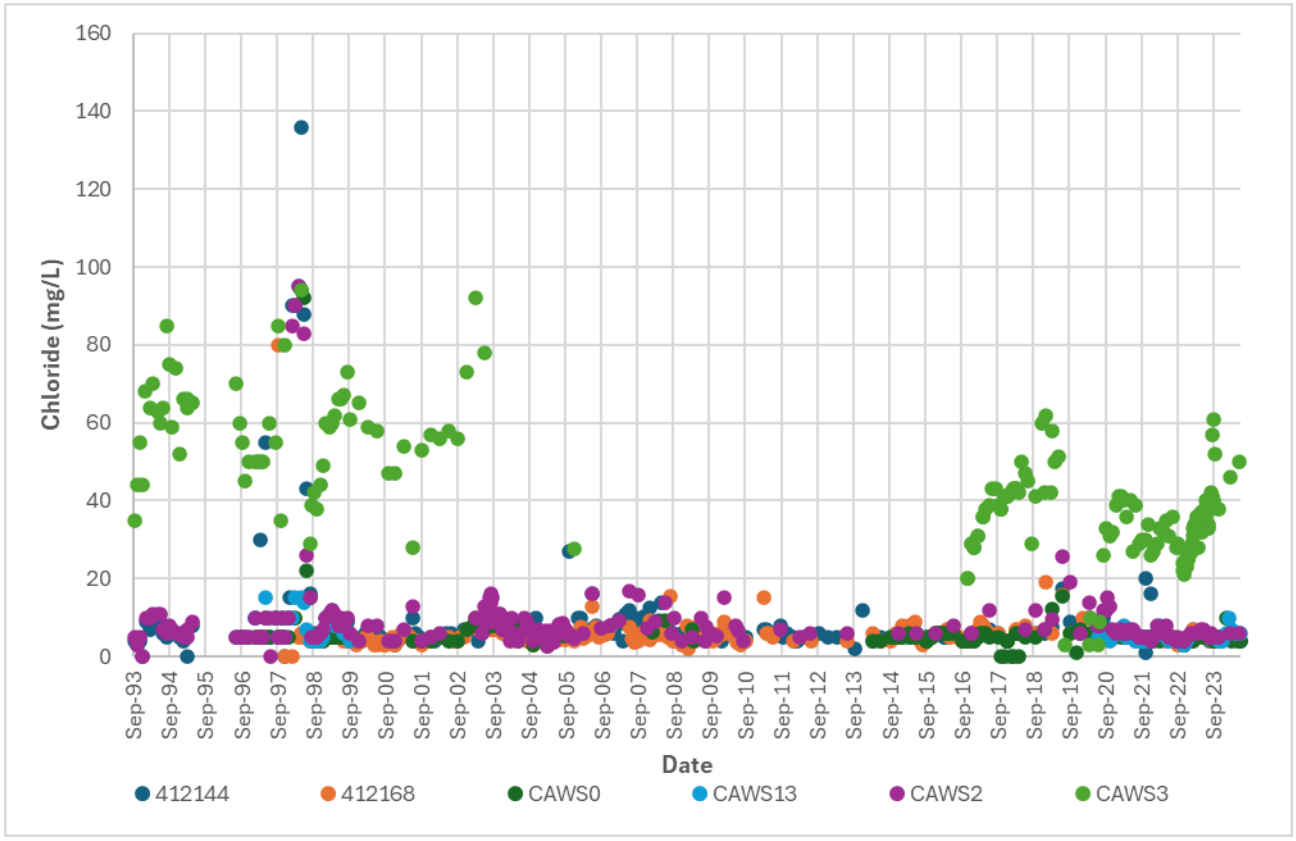


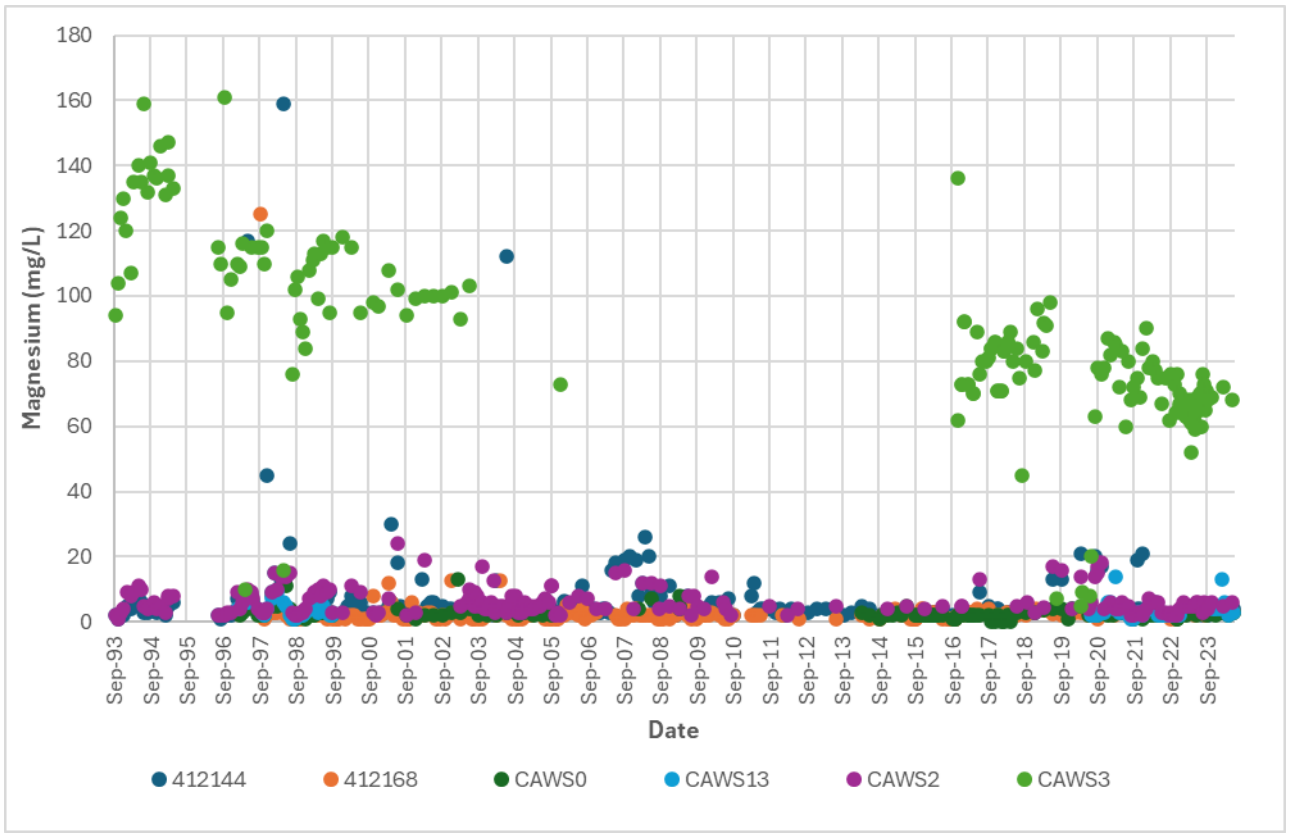

Total Nitrogen (mg/L)
12
10
8
6
4
2
0
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
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CAWS0
CAWS13
CAWS2
CAWS3

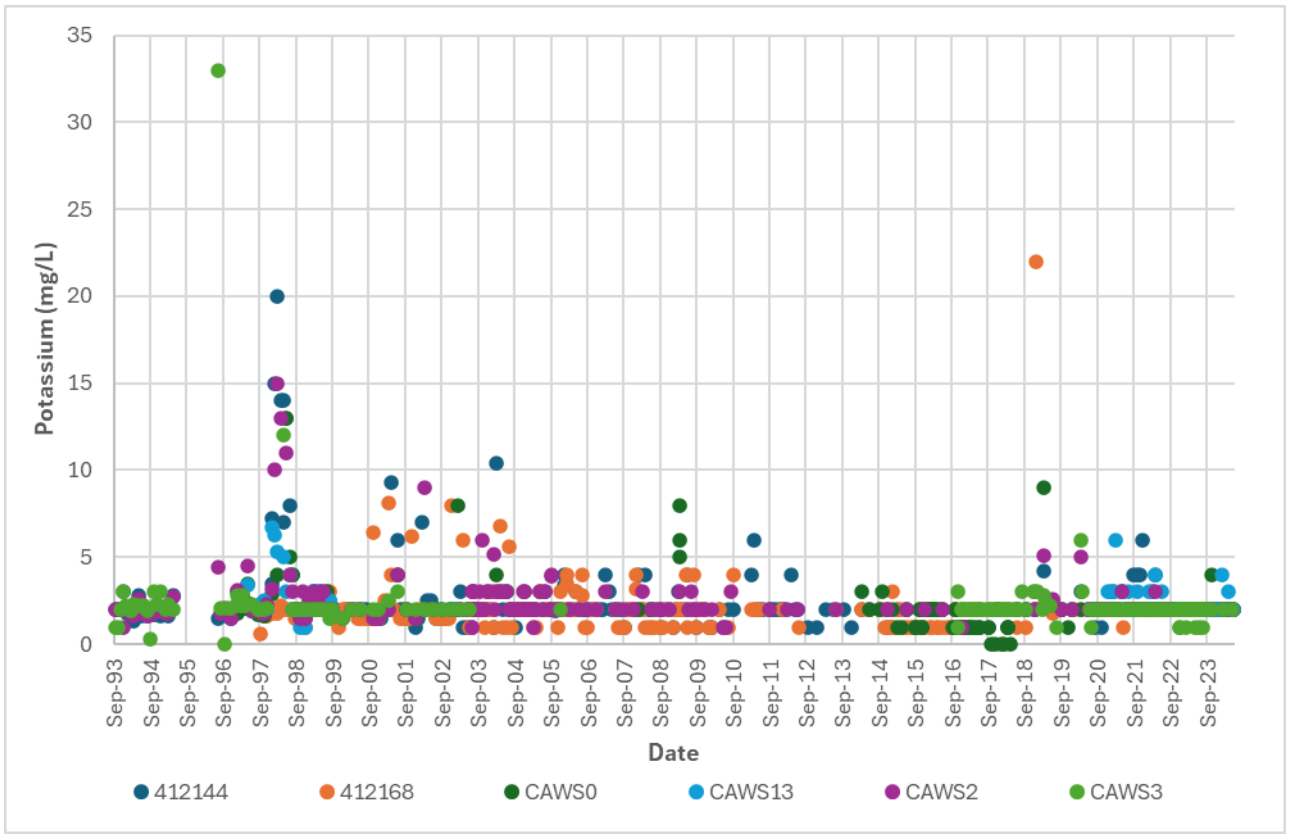

Total Phosphorous (mg/L)
2.5
2
1.5
1
0.5
0
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
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CAWS13
CAWS2
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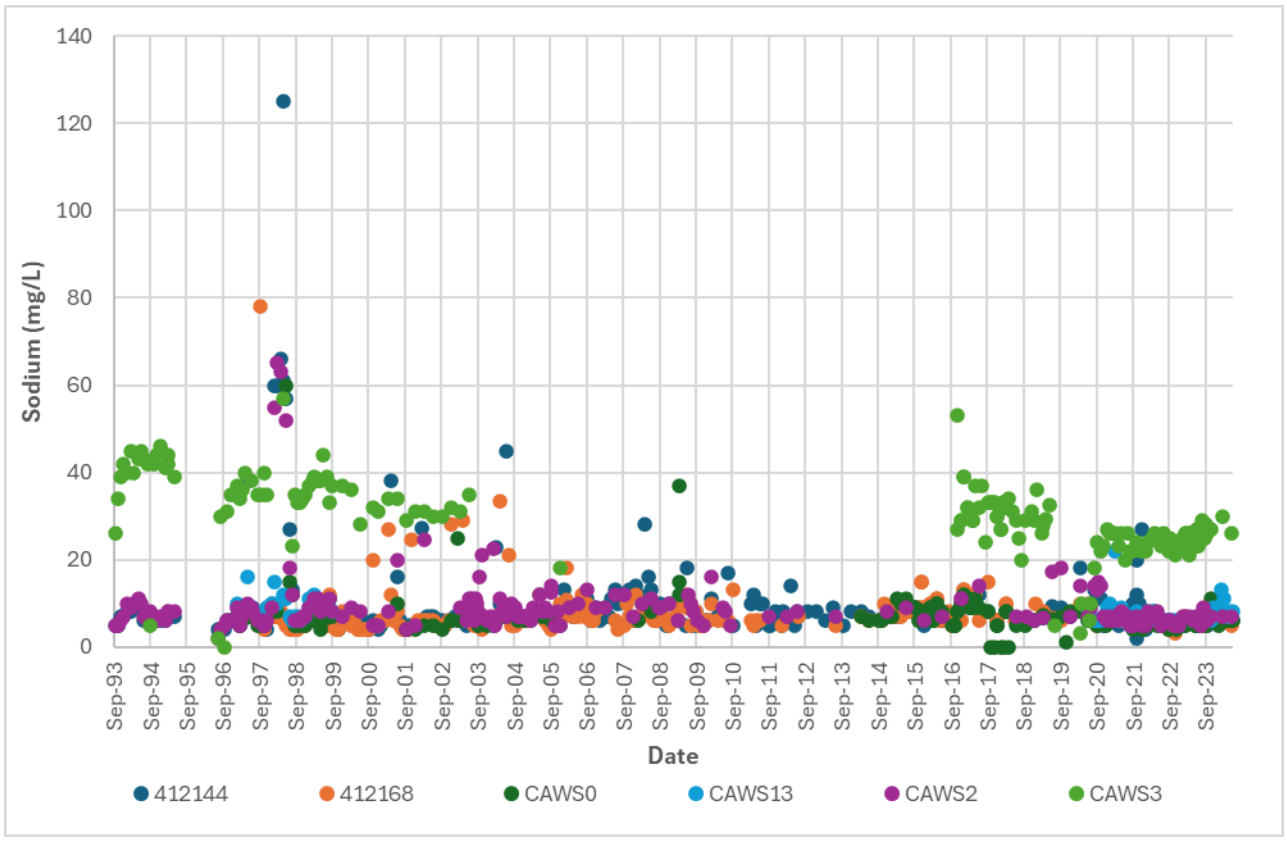
B.1.3 Major Ions

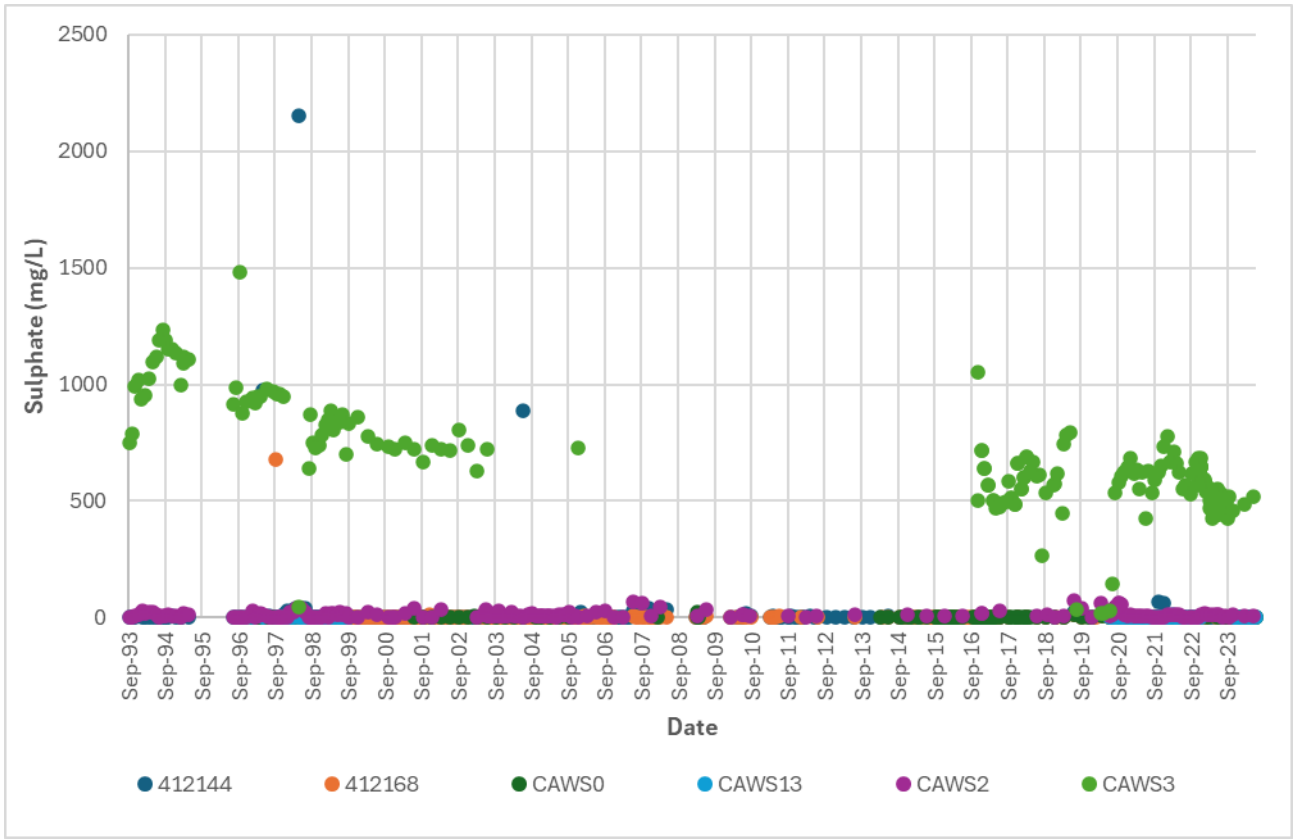




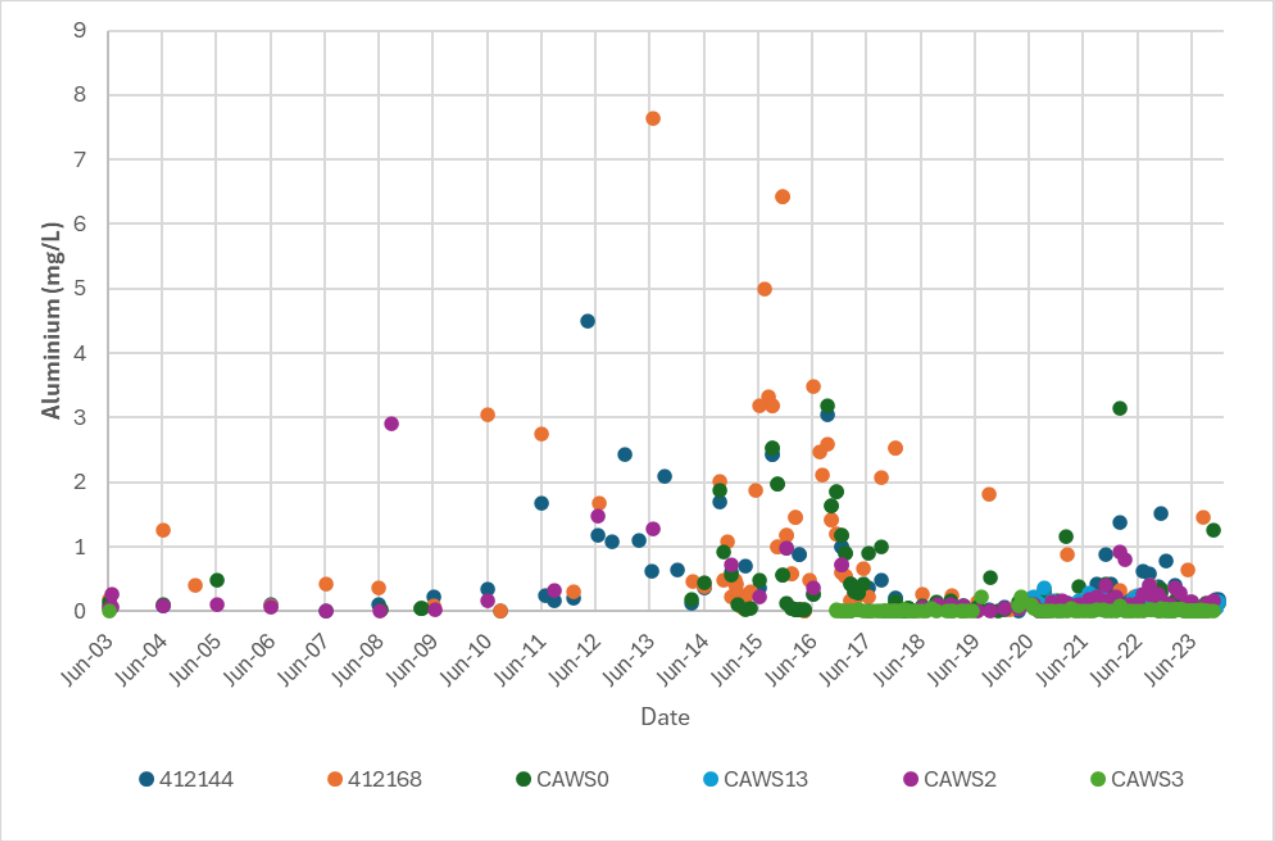

Magnesium (mg/L)
180
160
140
120
100
80
60
40
20
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
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CAWS0
CAWS13
CAWS2
CAWS3

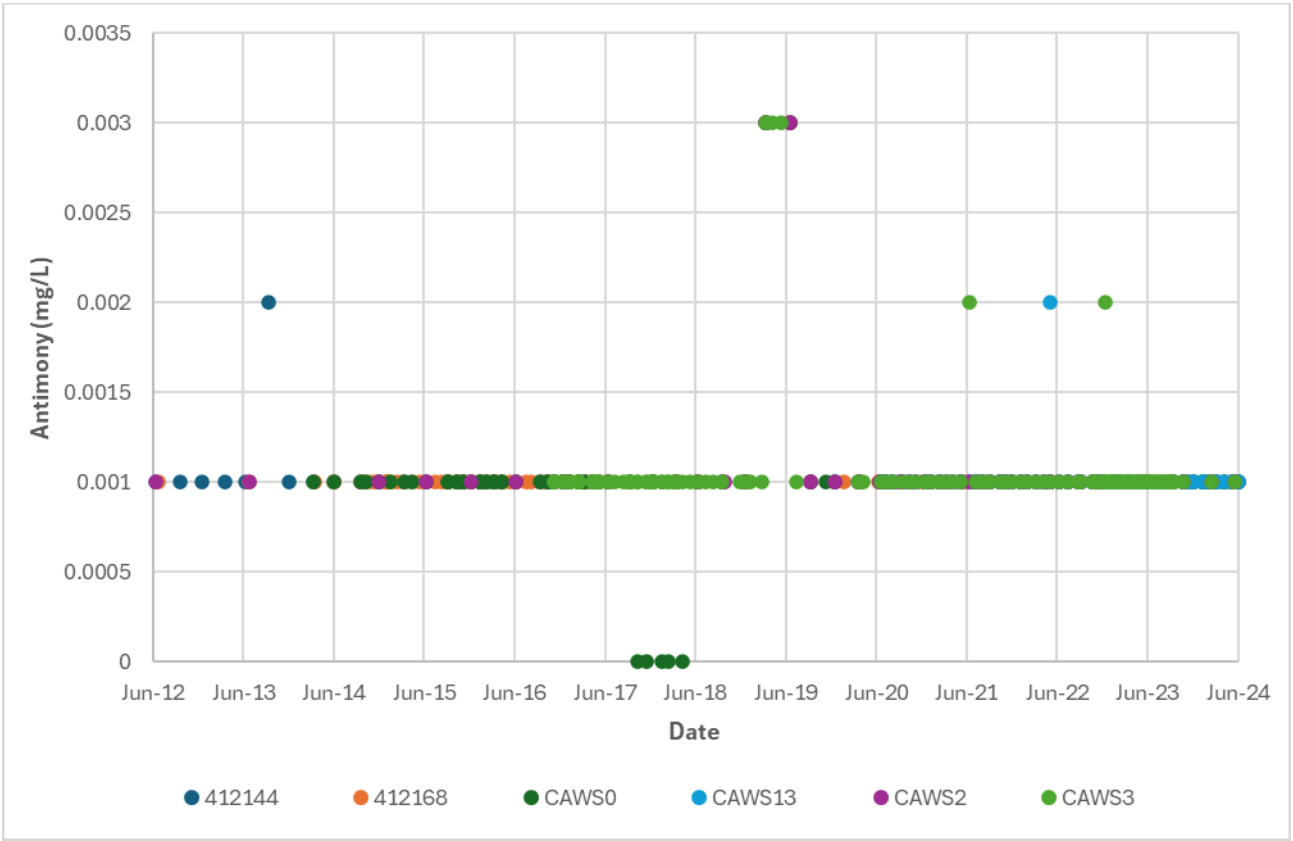

Potassium (mg/L)
35
30
25
20
15
10
5
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
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CAWS0
CAWS13
CAWS2
CAWS3

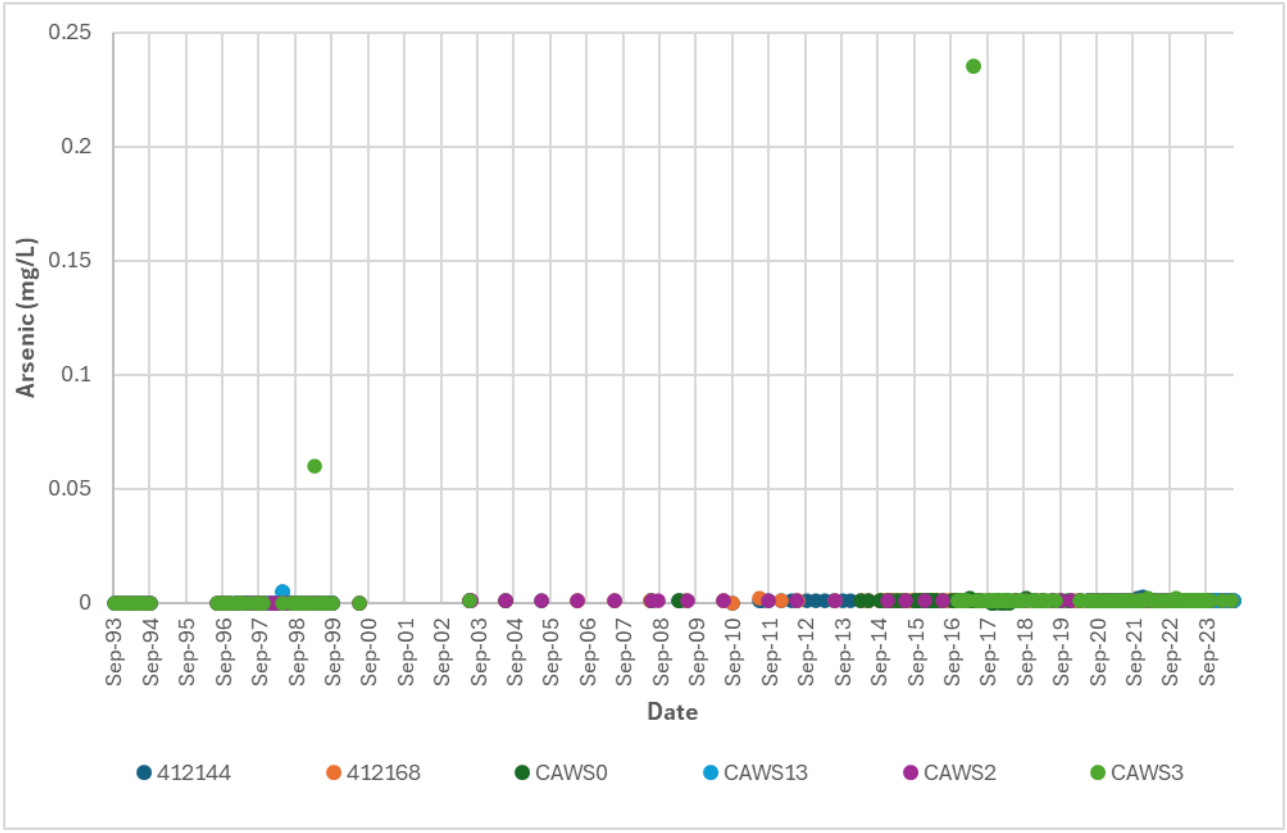

Sodium (mg/L)
140
120
100
80
60
40
20
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
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CAWS0
CAWS13
CAWS2
CAWS3

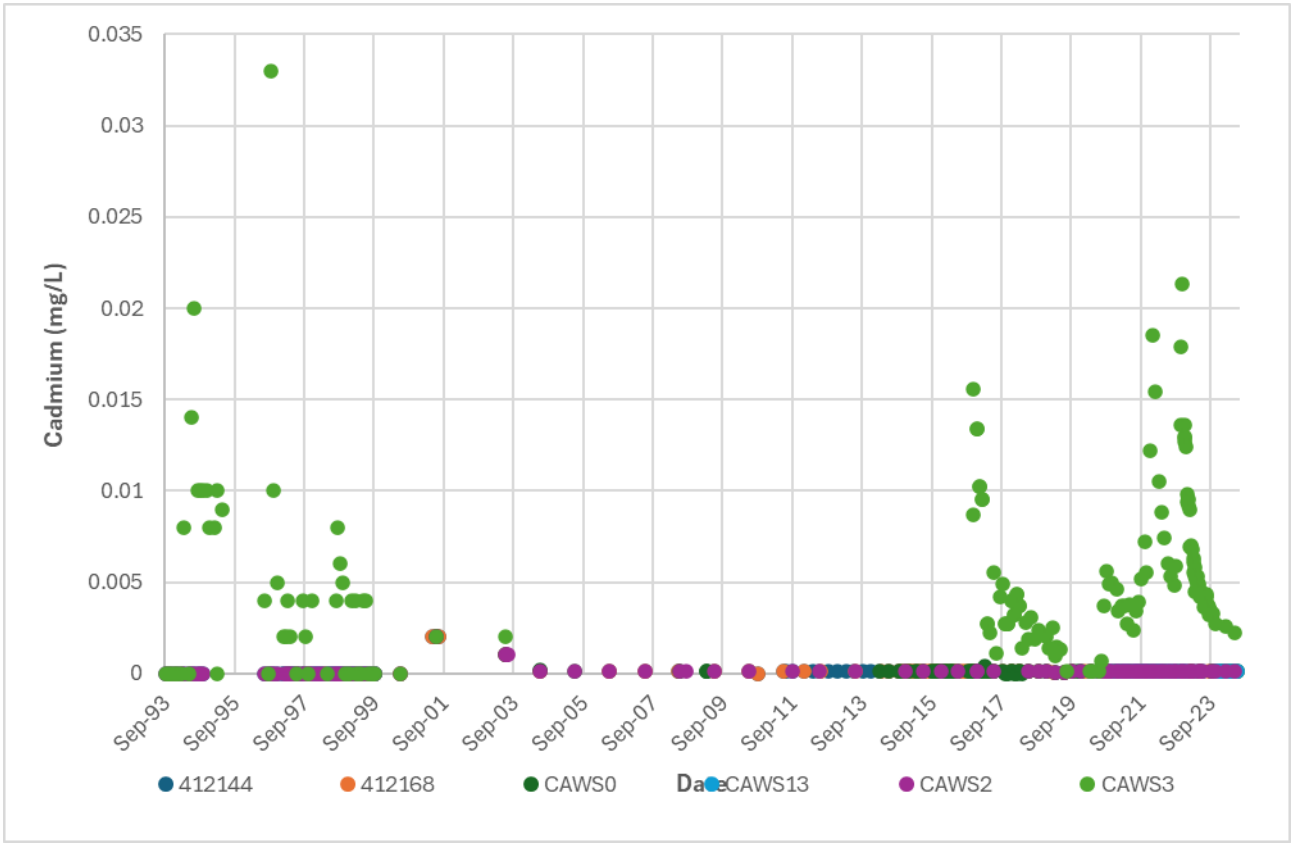

Sulphate (mg/L)
2500
2000
1500
1000
500
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
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Sep-23
Date
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412168
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CAWS13
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CAWS3

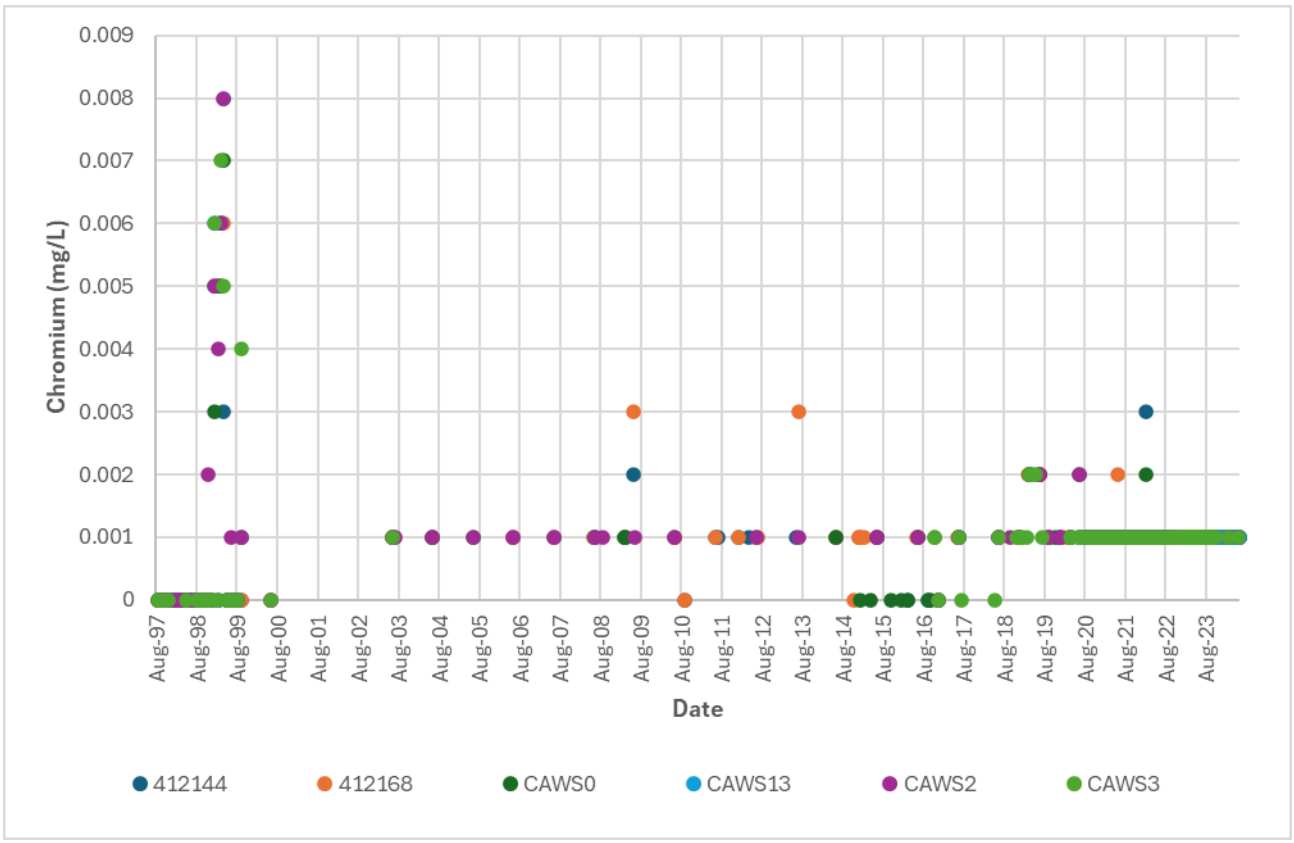
B.1.4 Dissolved Metals

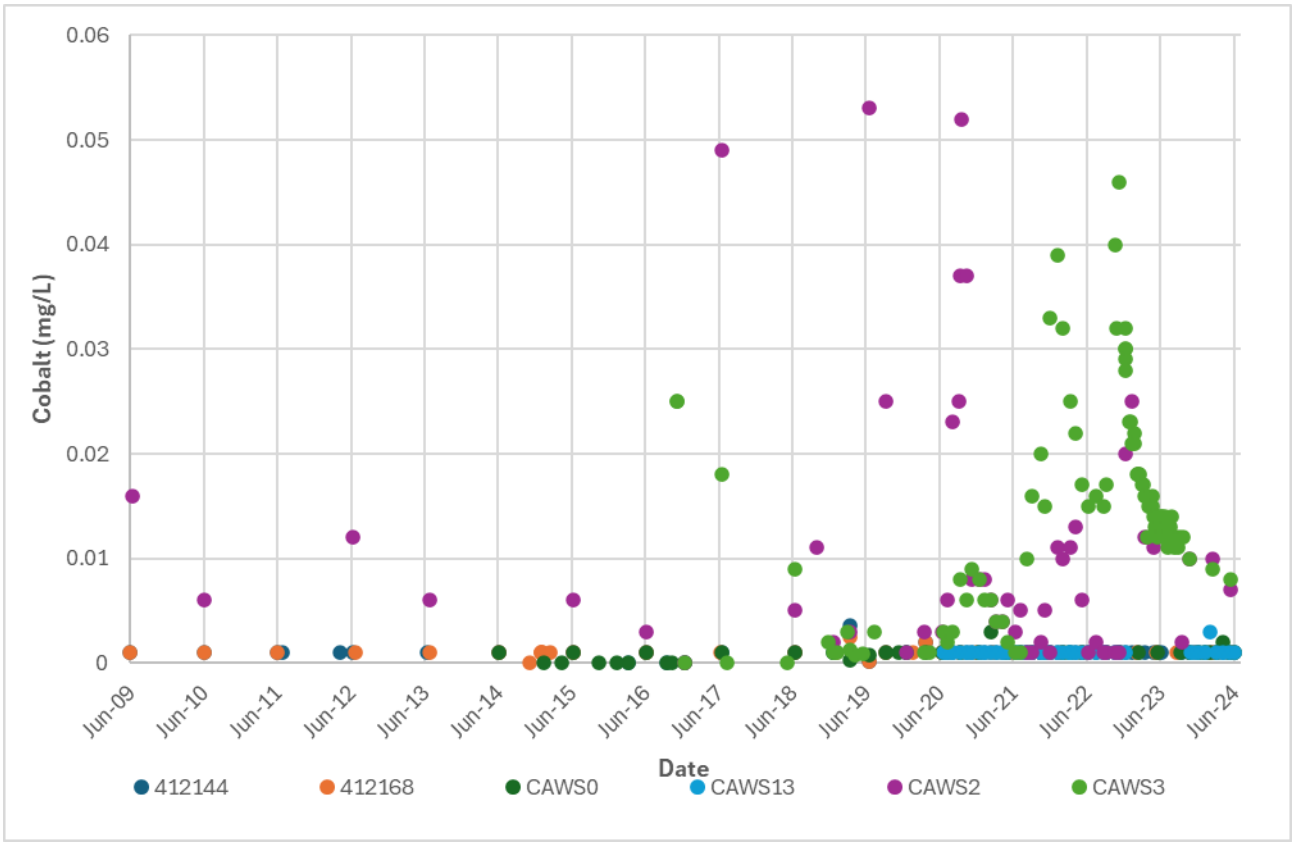


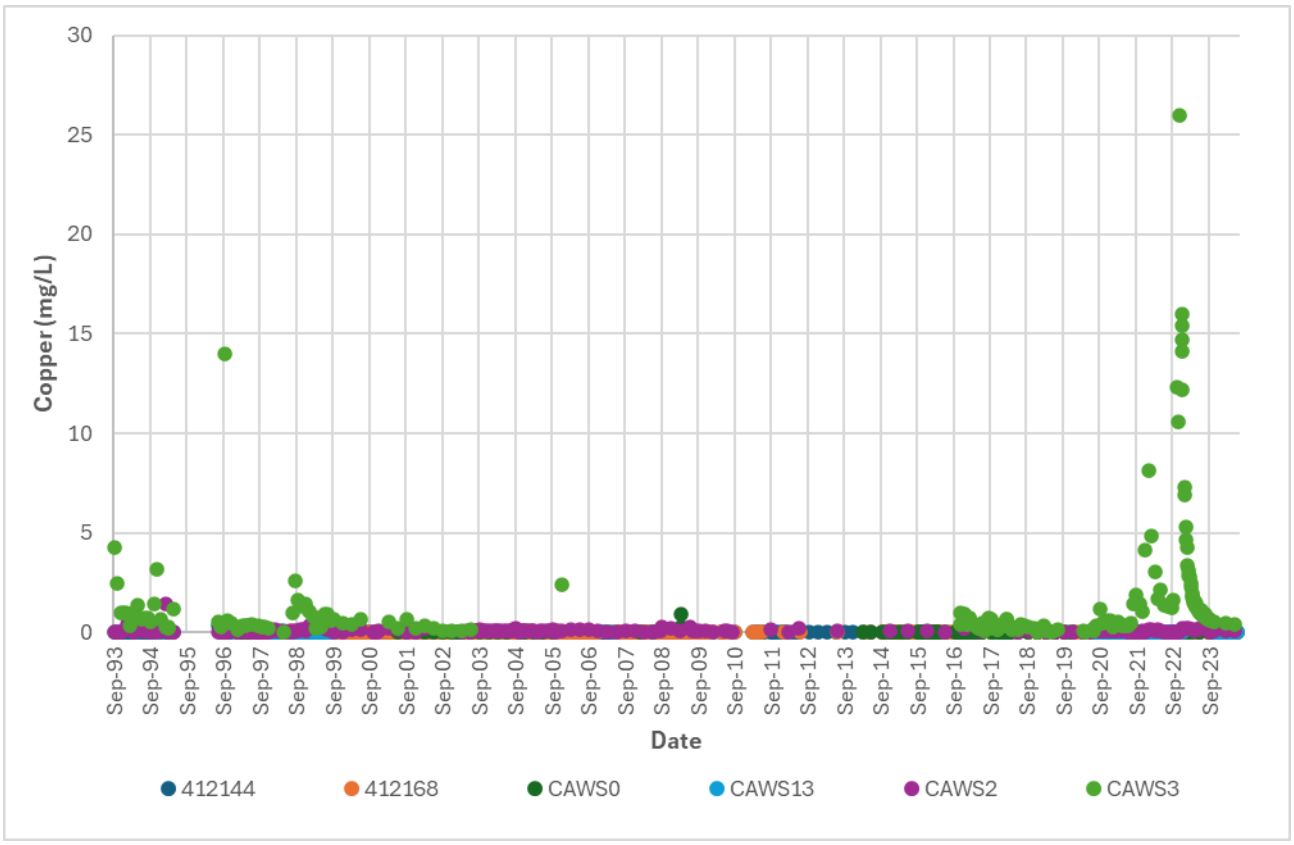


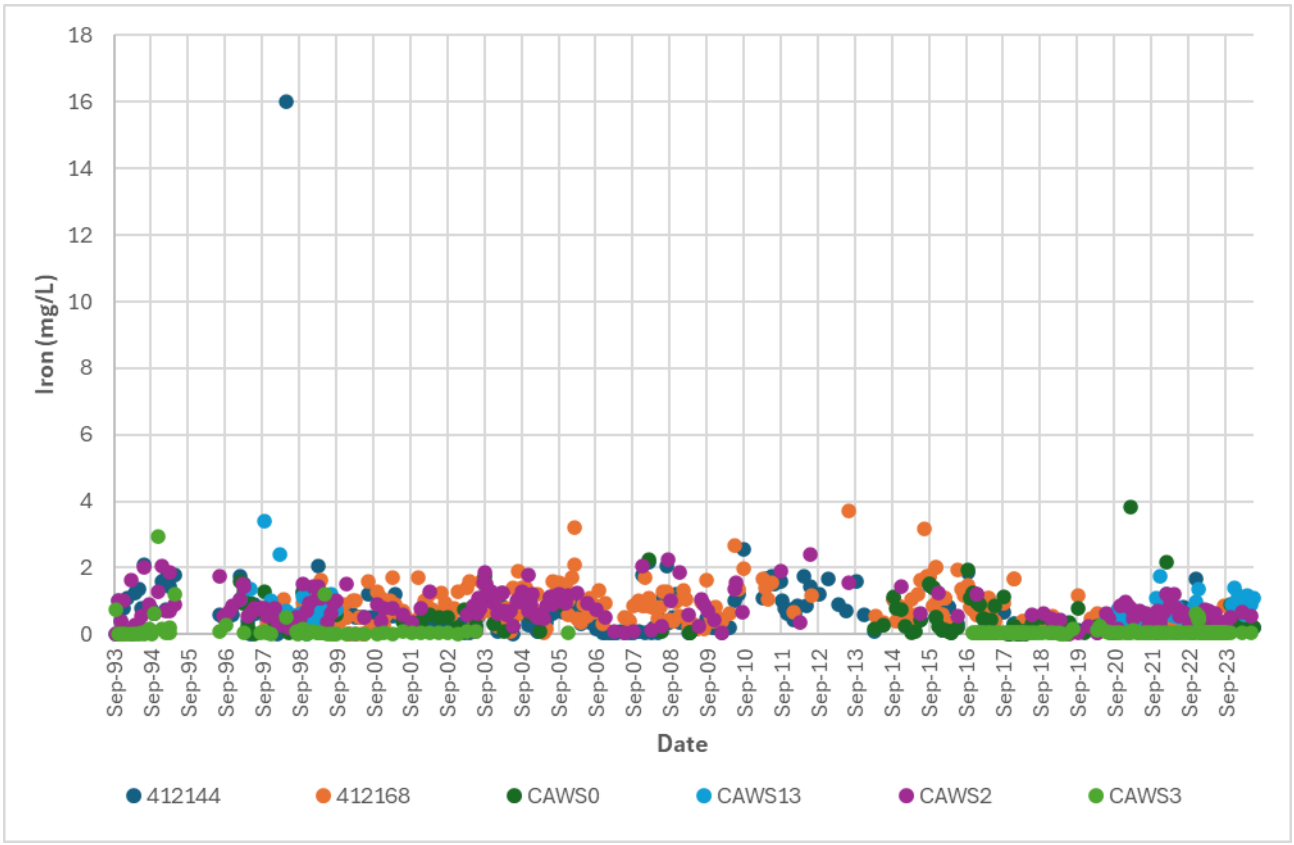

Arsenic (mg/L)
0.25
0.2
0.15
0.1
0.05
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
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Sep-16
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Sep-23
Date
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CAWS2
CAWS3

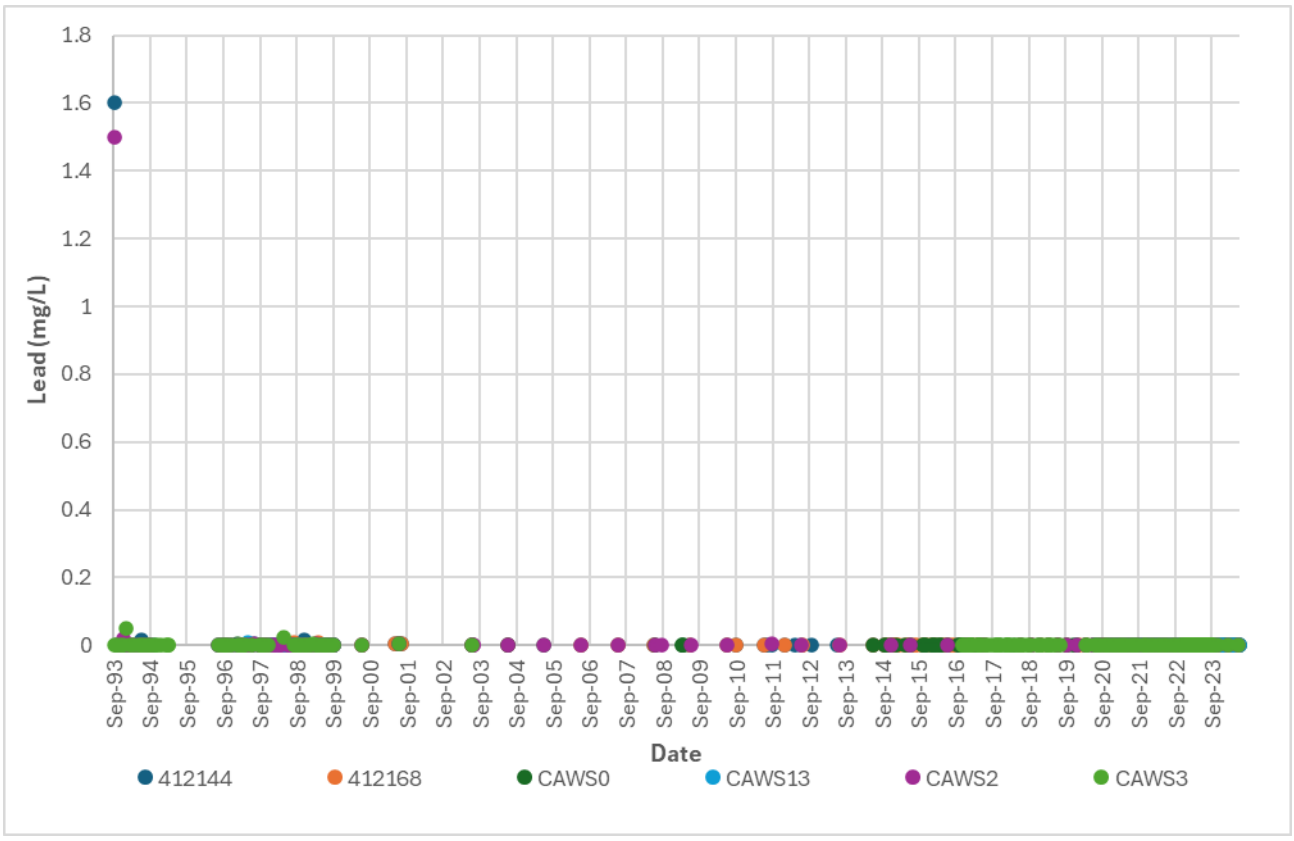

Cadmium (mg/L)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Sep-93
Sep-95
Sep-97
Sep-99
Sep-01
Sep-03
Sep-05
Sep-07
Sep-09
Sep-11
Sep-13
Sep-15
Sep-17
Sep-19
Sep-21
Sep-23
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CAWS3

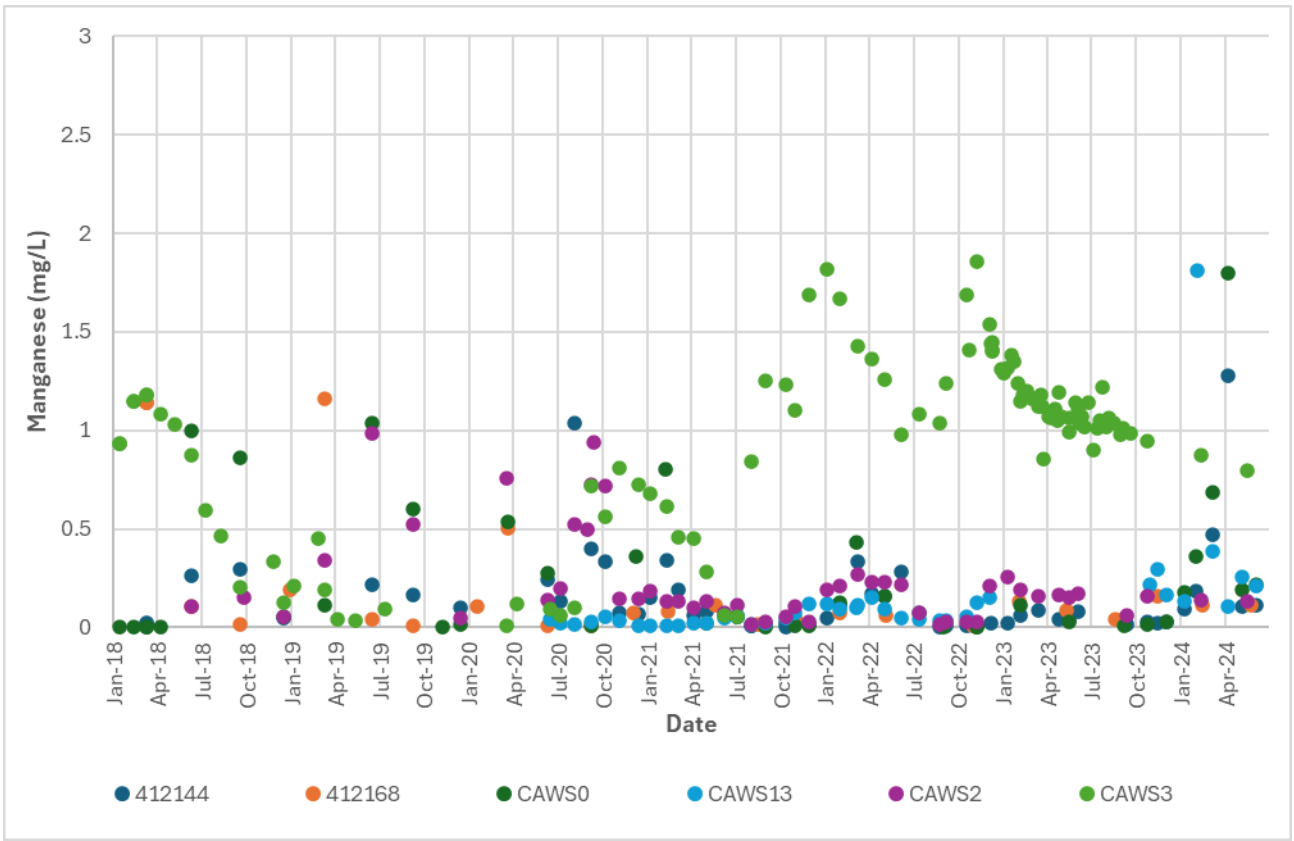

0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Chromium (mg/L)
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
Aug-23
Date
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412168
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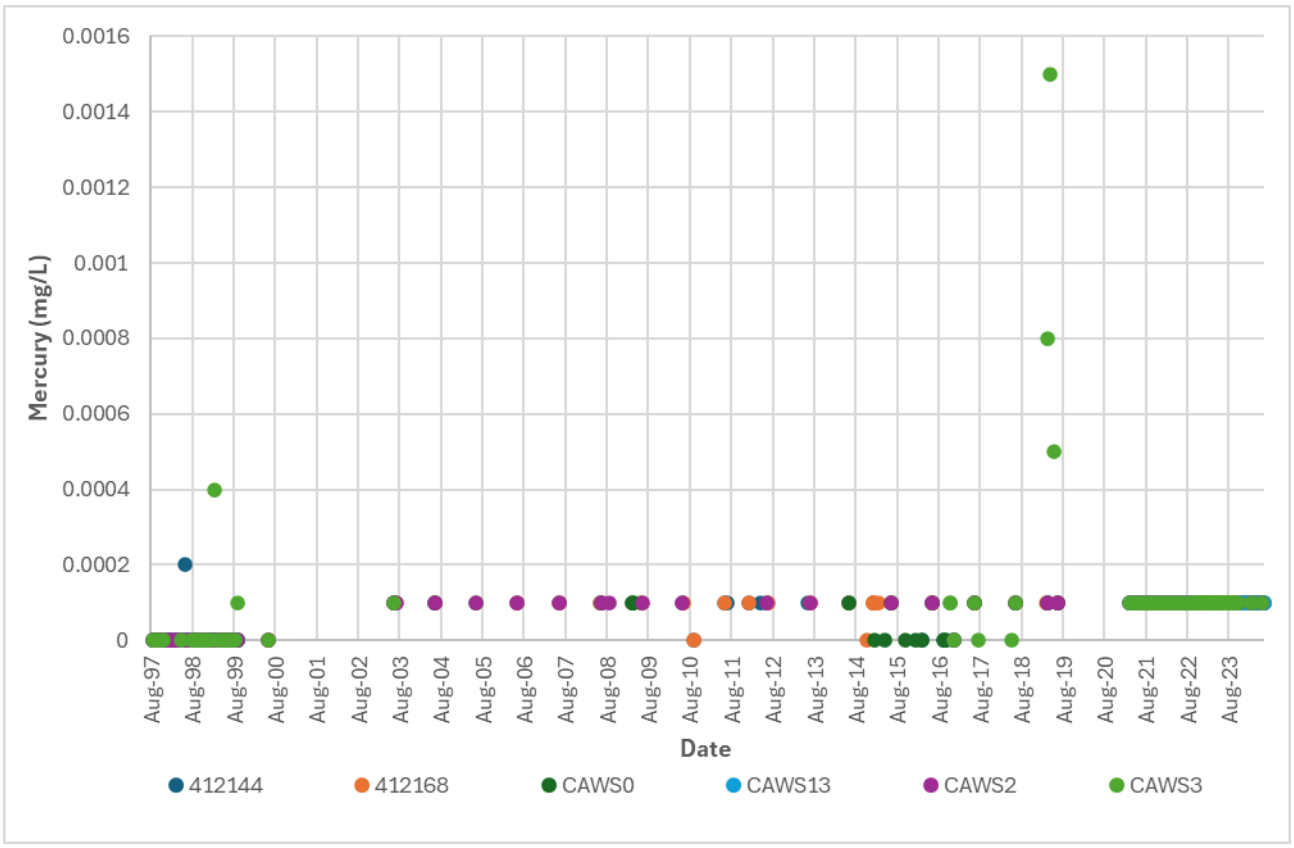

0.06
0.05
0.04
0.03
0.02
0.01
0
Cobalt (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
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Jun-24
Date
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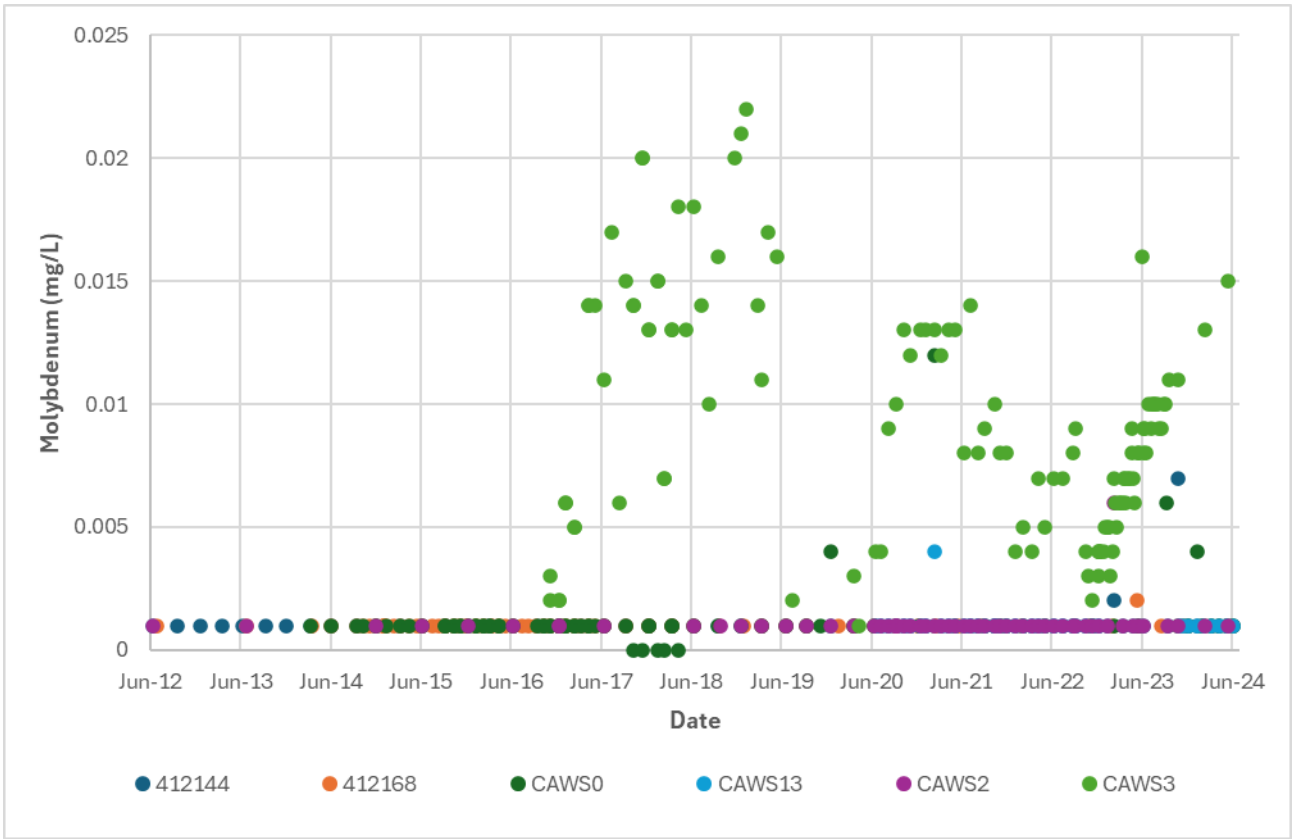

Copper (mg/L)
30
25
20
15
10
5
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
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Sep-23
Date
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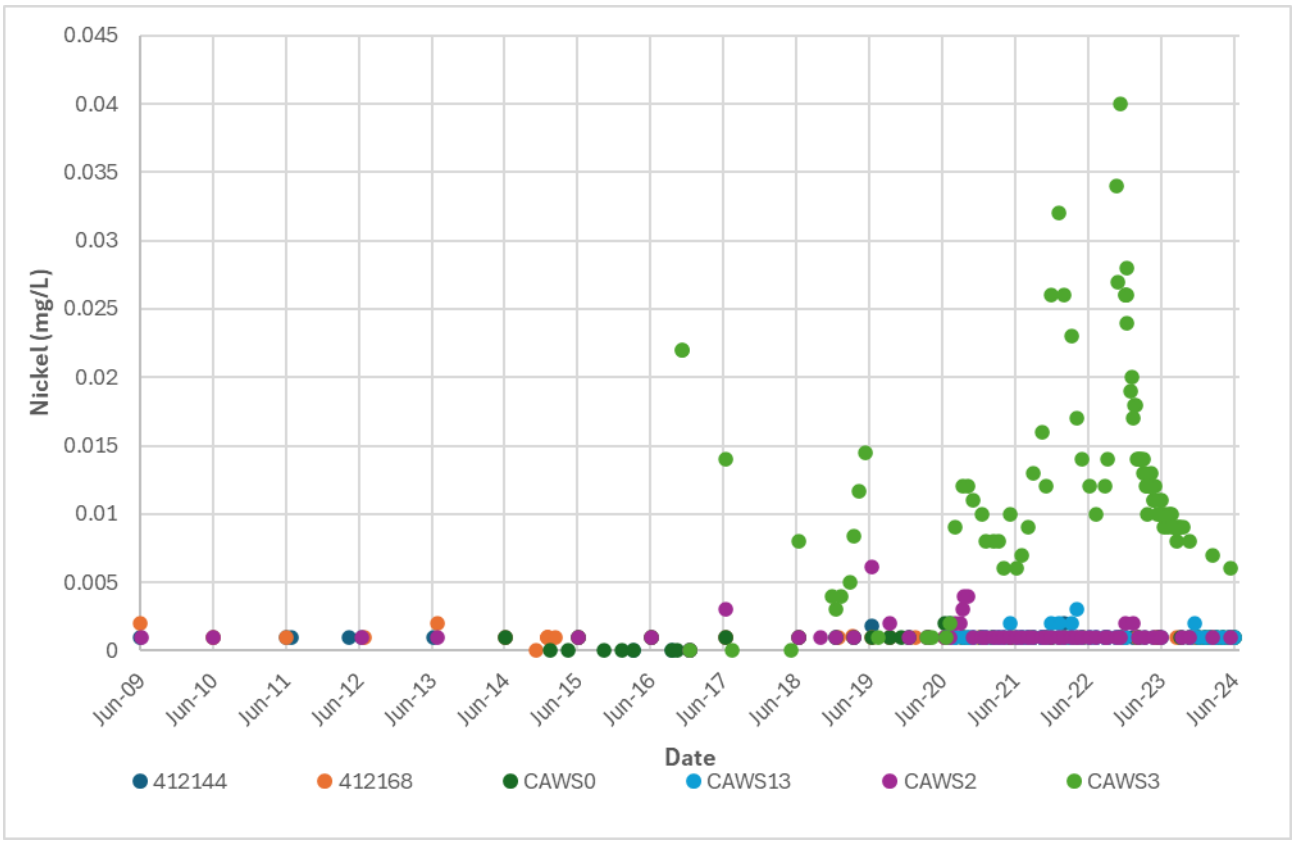

Iron (mg/L)
18
16
14
12
10
8
6
4
2
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
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Sep-15
Sep-16
Sep-17
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Date
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CAWS2
CAWS3

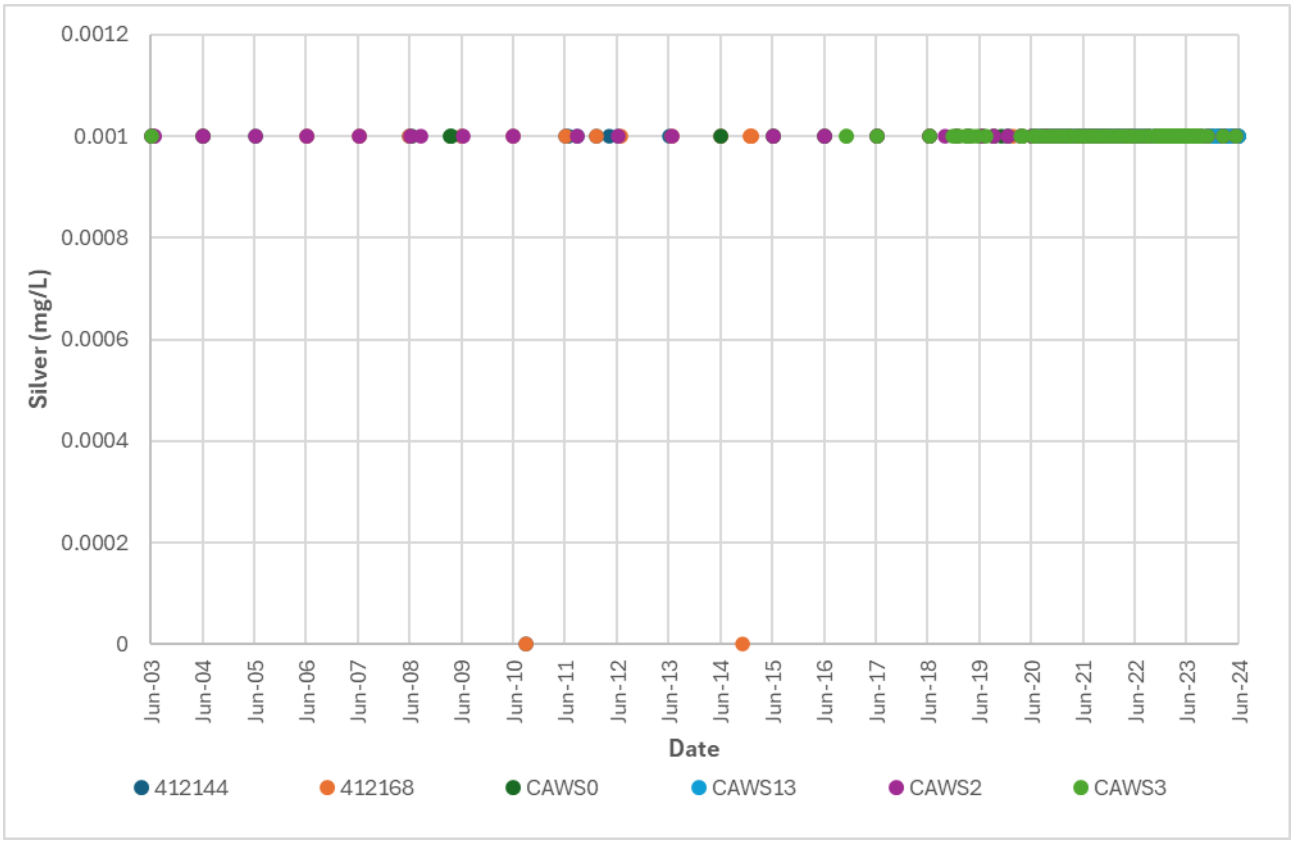

Lead (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
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Sep-16
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Sep-18
Sep-19
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Sep-21
Sep-22
Sep-23
Date
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CAWS2
CAWS3

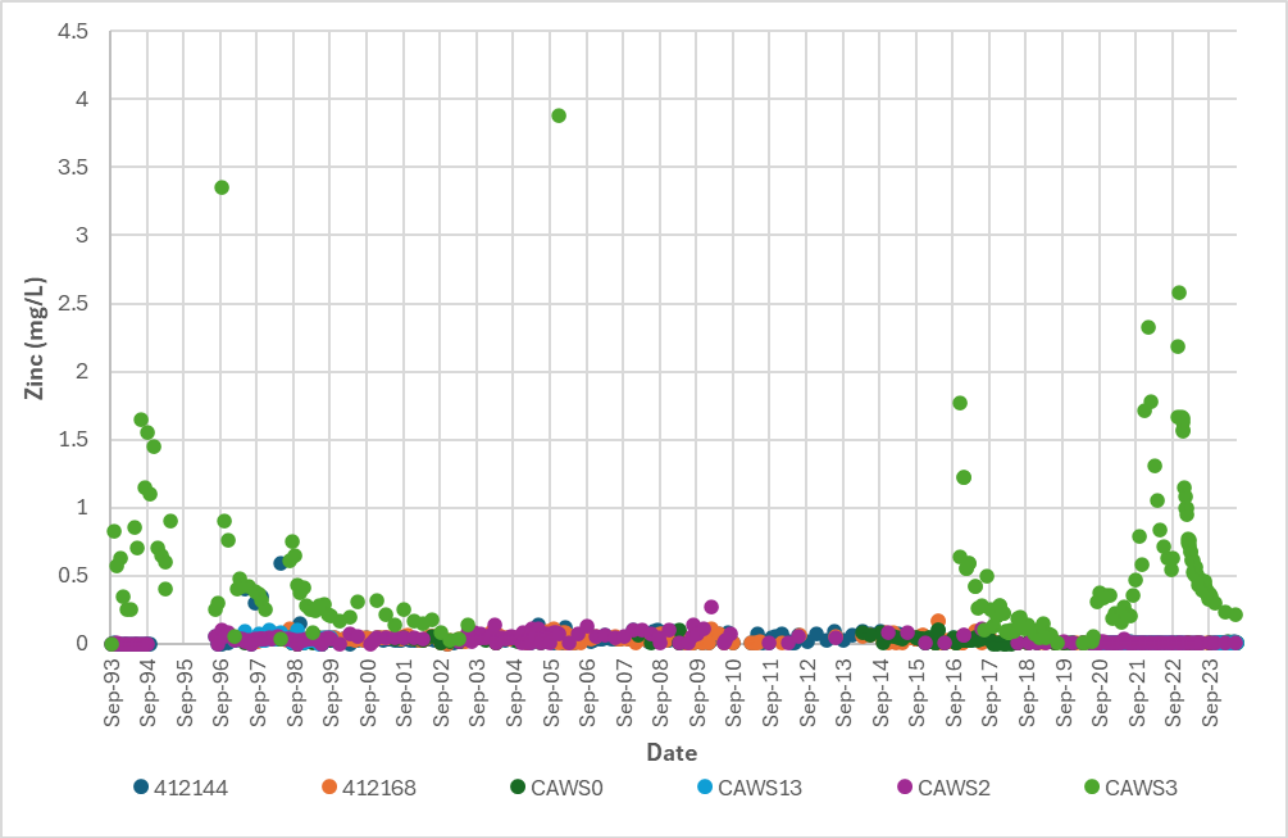

Manganese (mg/L)
3
2.5
2
1.5
1
0.5
0
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
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412168
CAWS0
CAWS13
CAWS2
CAWS3


Mercury (mg/L)
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
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Aug-20
Aug-21
Aug-22
Aug-23
Date
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412168
CAWS0
CAWS13
CAWS2
CAWS3

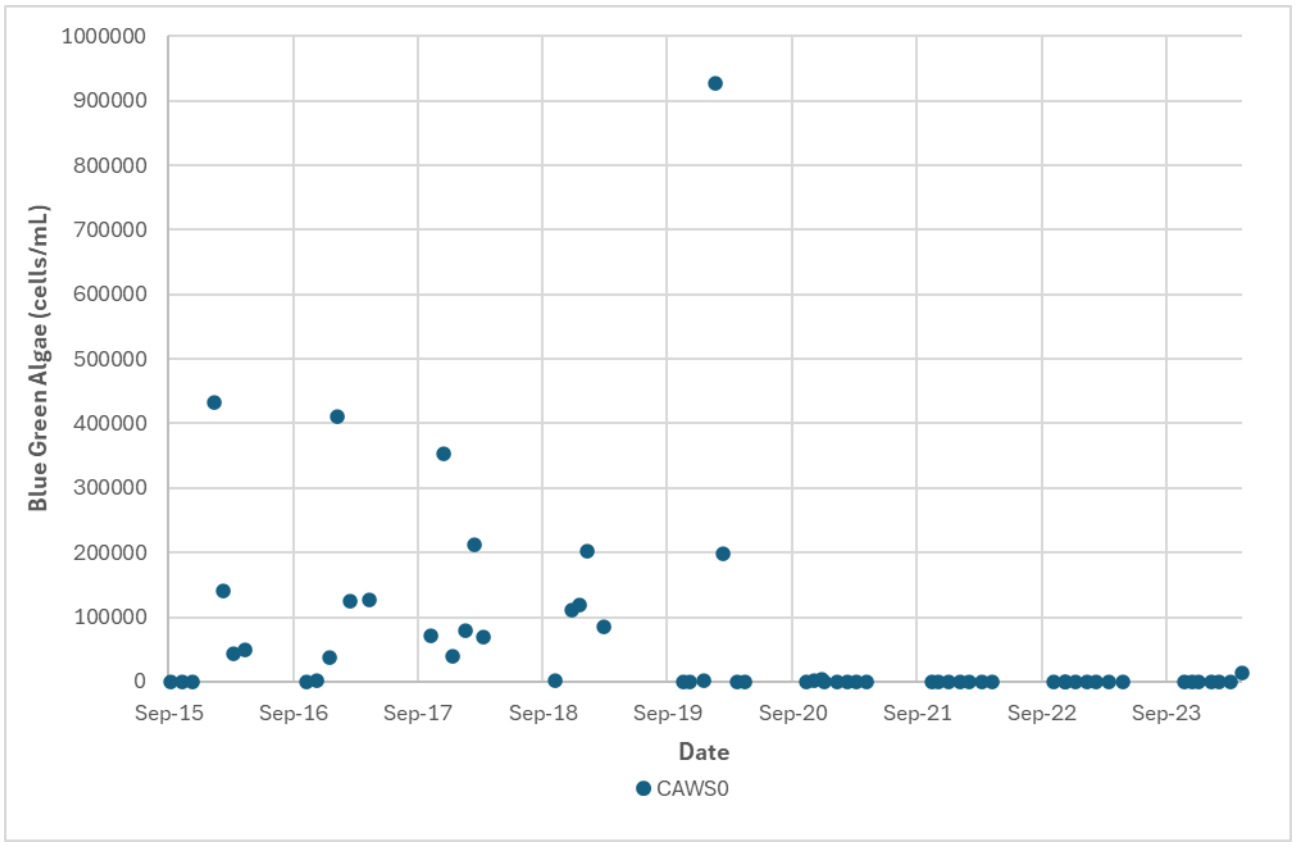

Molybdenum (mg/L)
0.025
0.02
0.015
0.01
0.005
0
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
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412168
CAWS0
CAWS13
CAWS2
CAWS3


0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412144
412168
CAWS0
CAWS13
CAWS2
CAWS3


0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
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Jun-22
Jun-23
Jun-24
Date
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412168
CAWS0
CAWS13
CAWS2
CAWS3

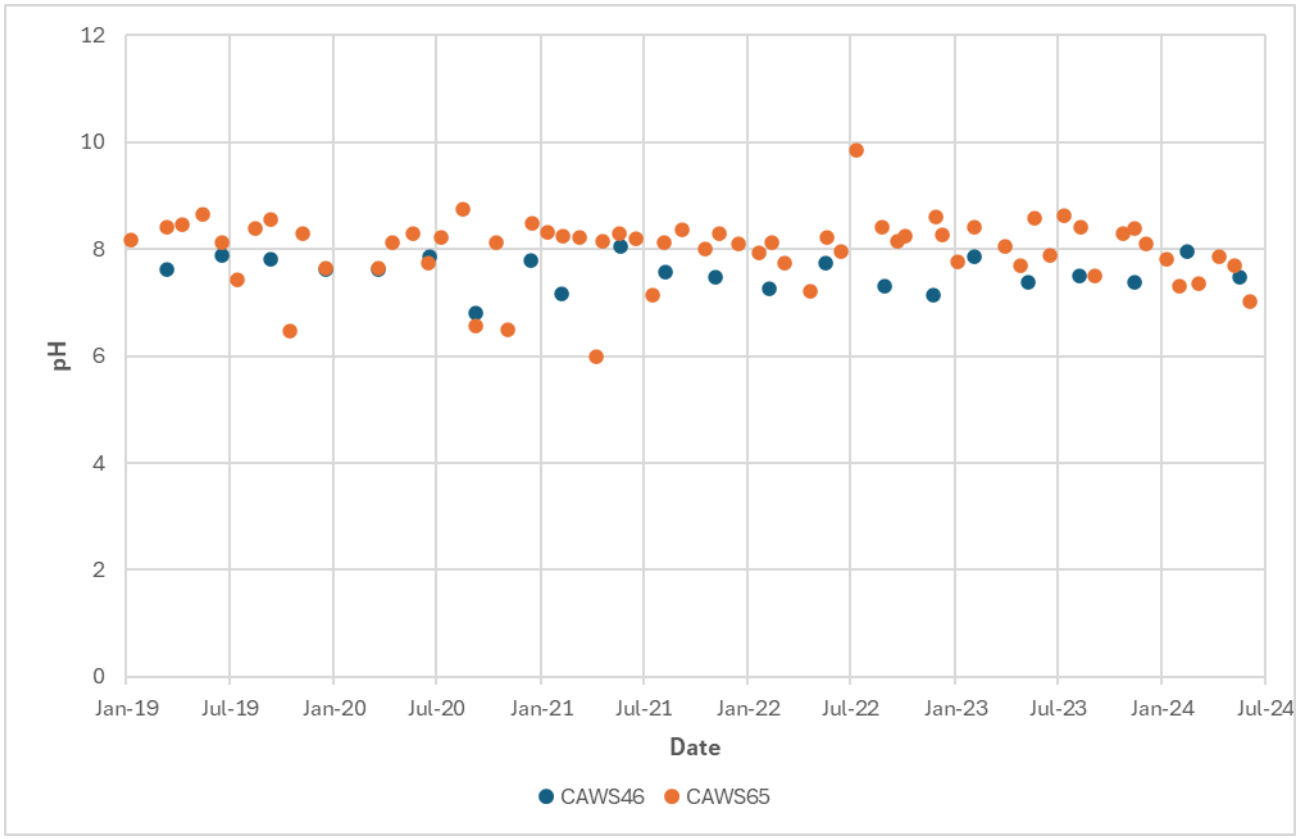


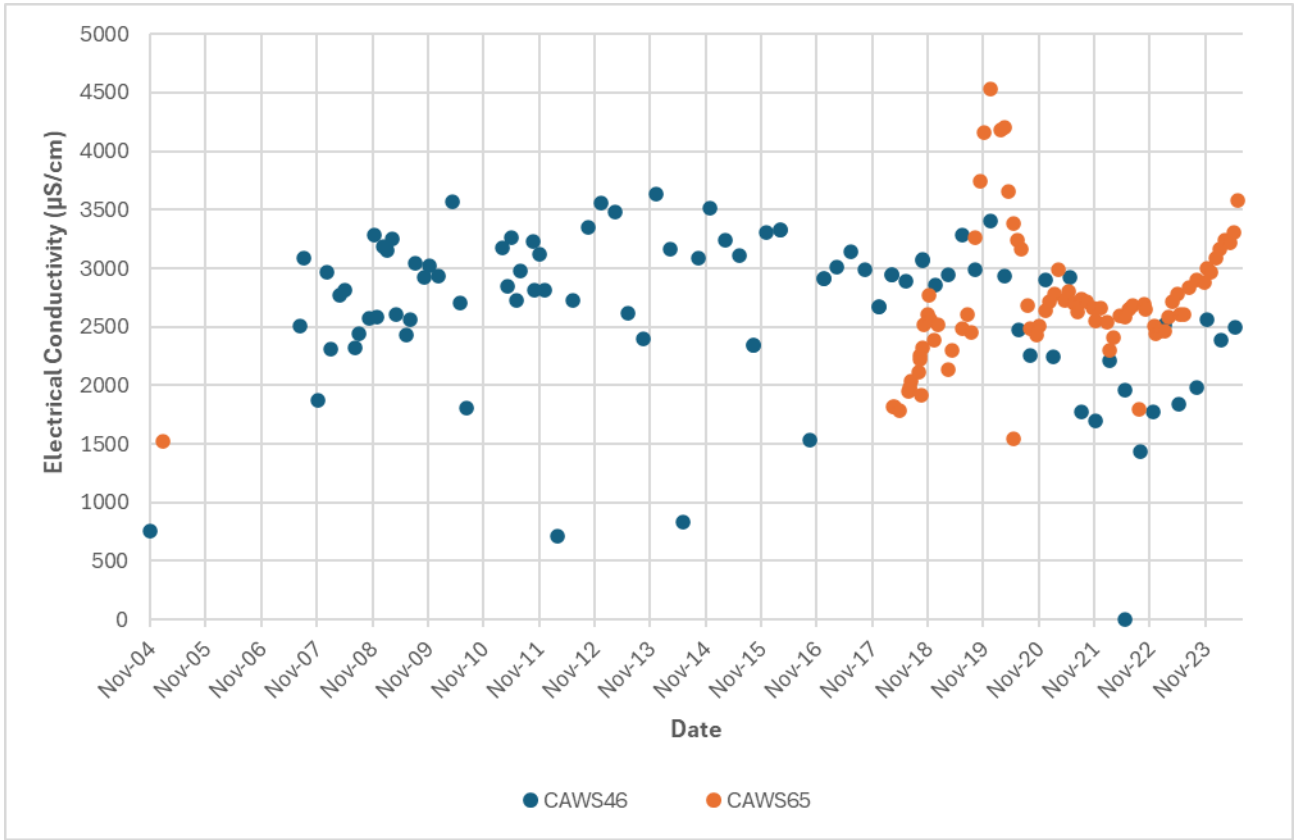
B.1.5 Biological Indicators

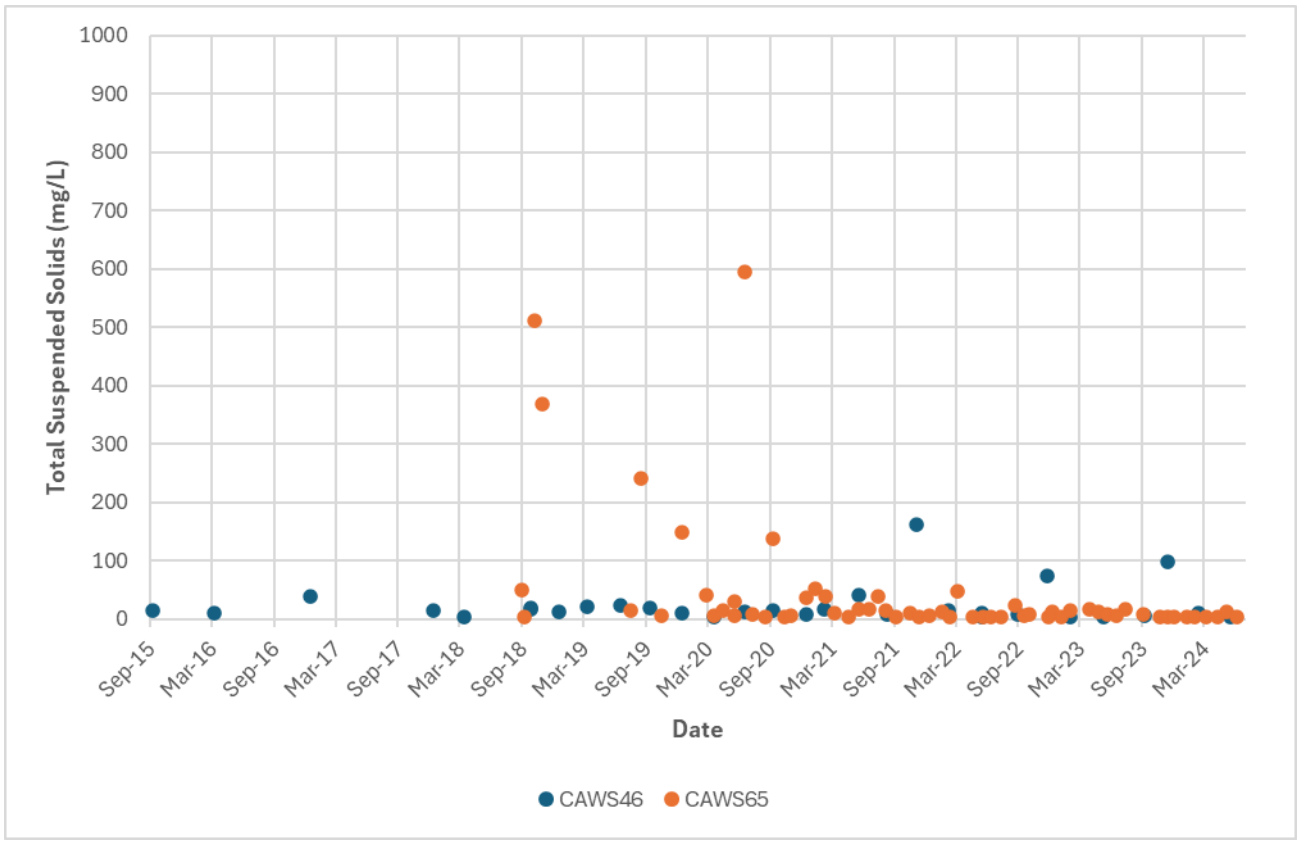


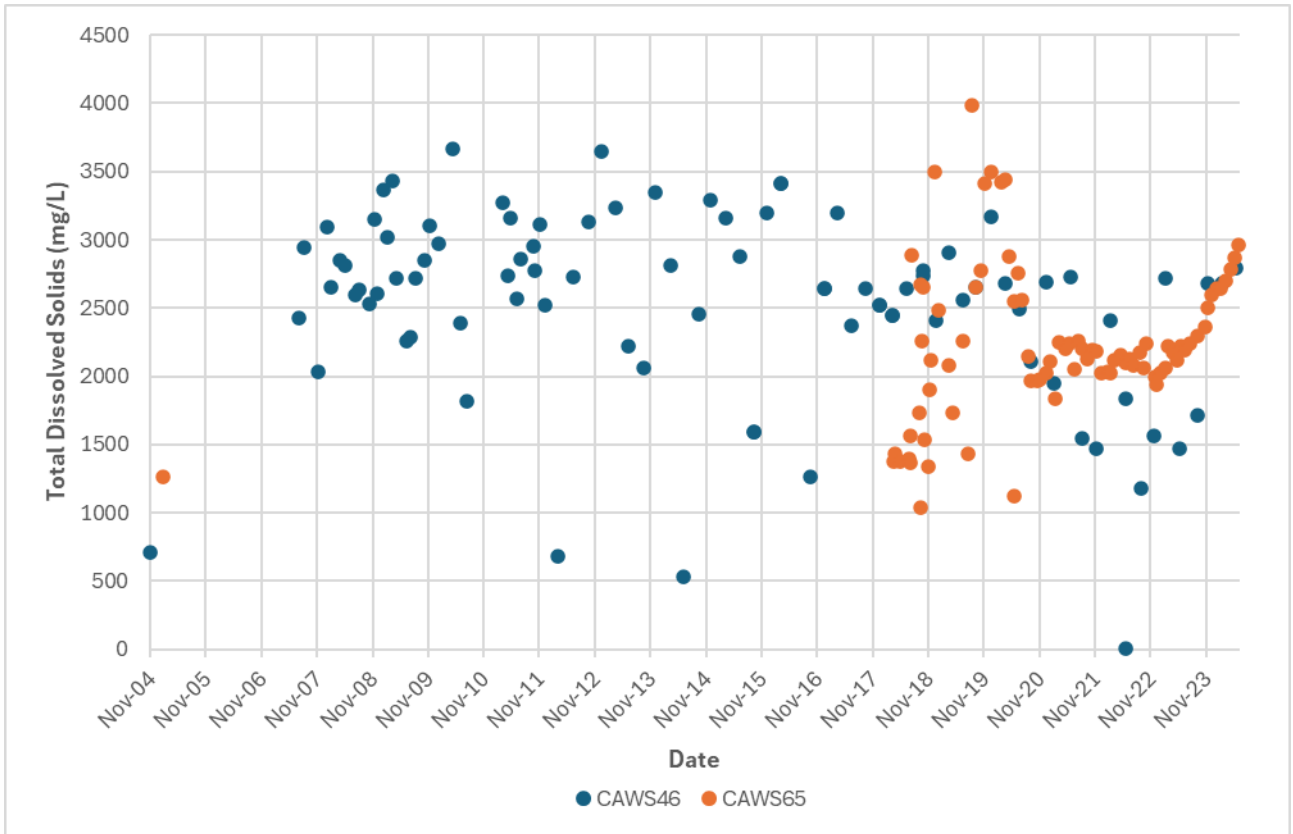
B.2 Cadia Hill Pit

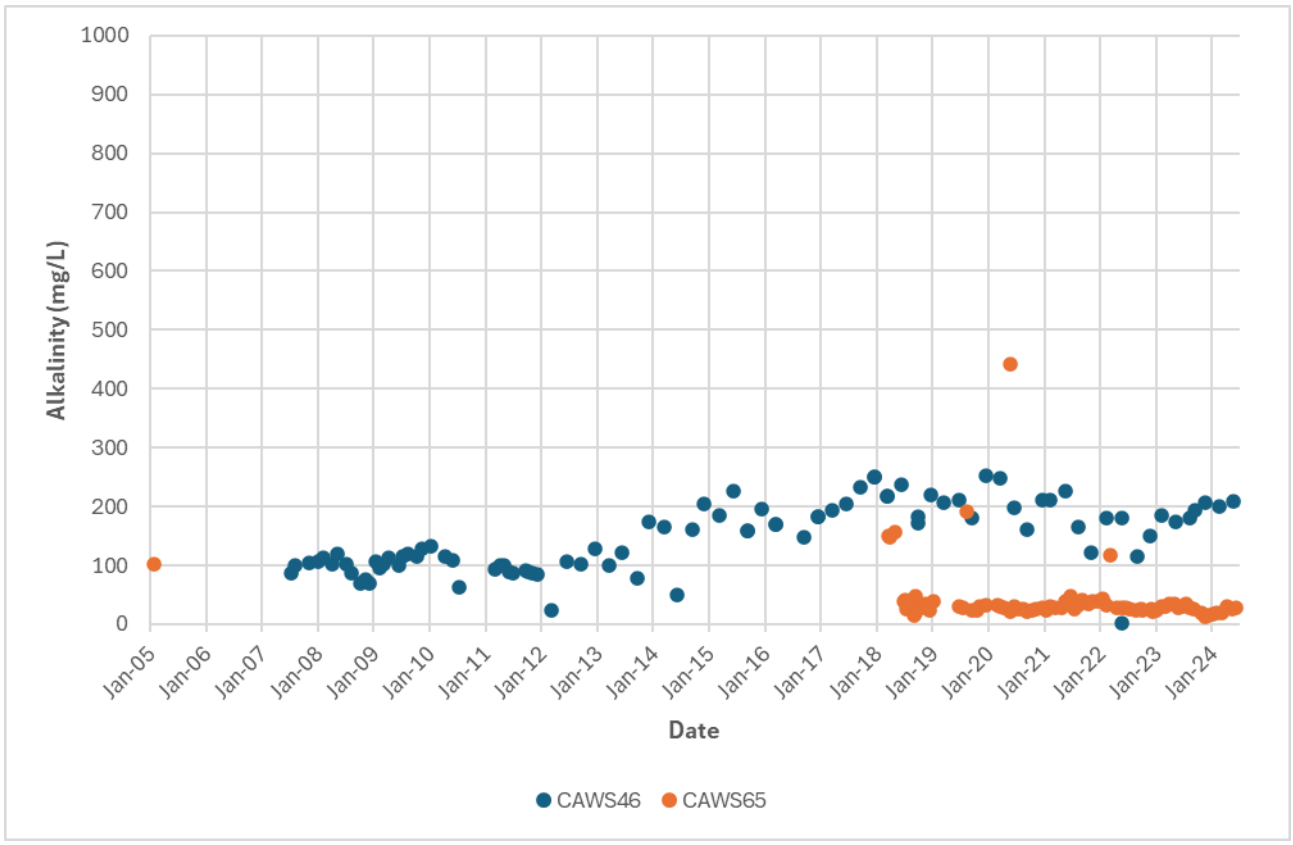
B.2.1 Physiochemical Parameters

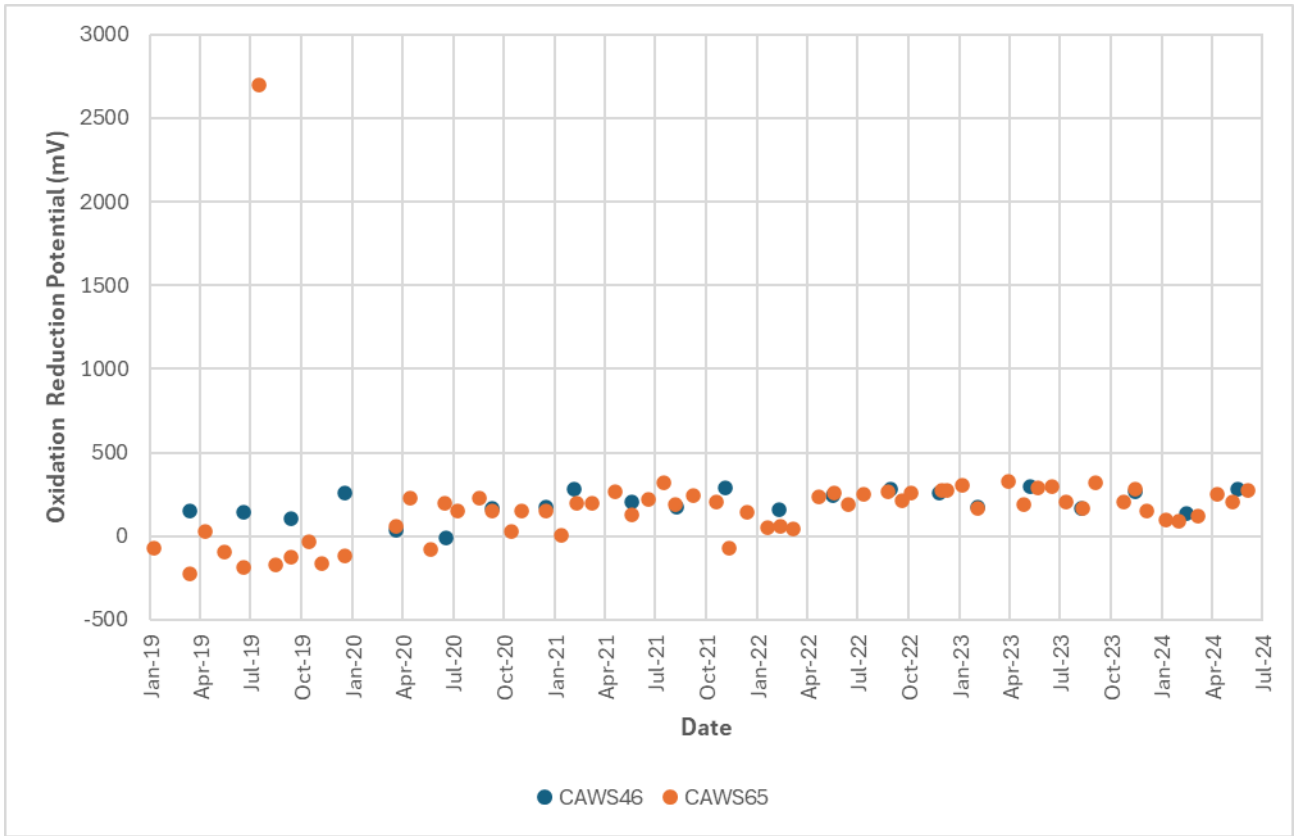




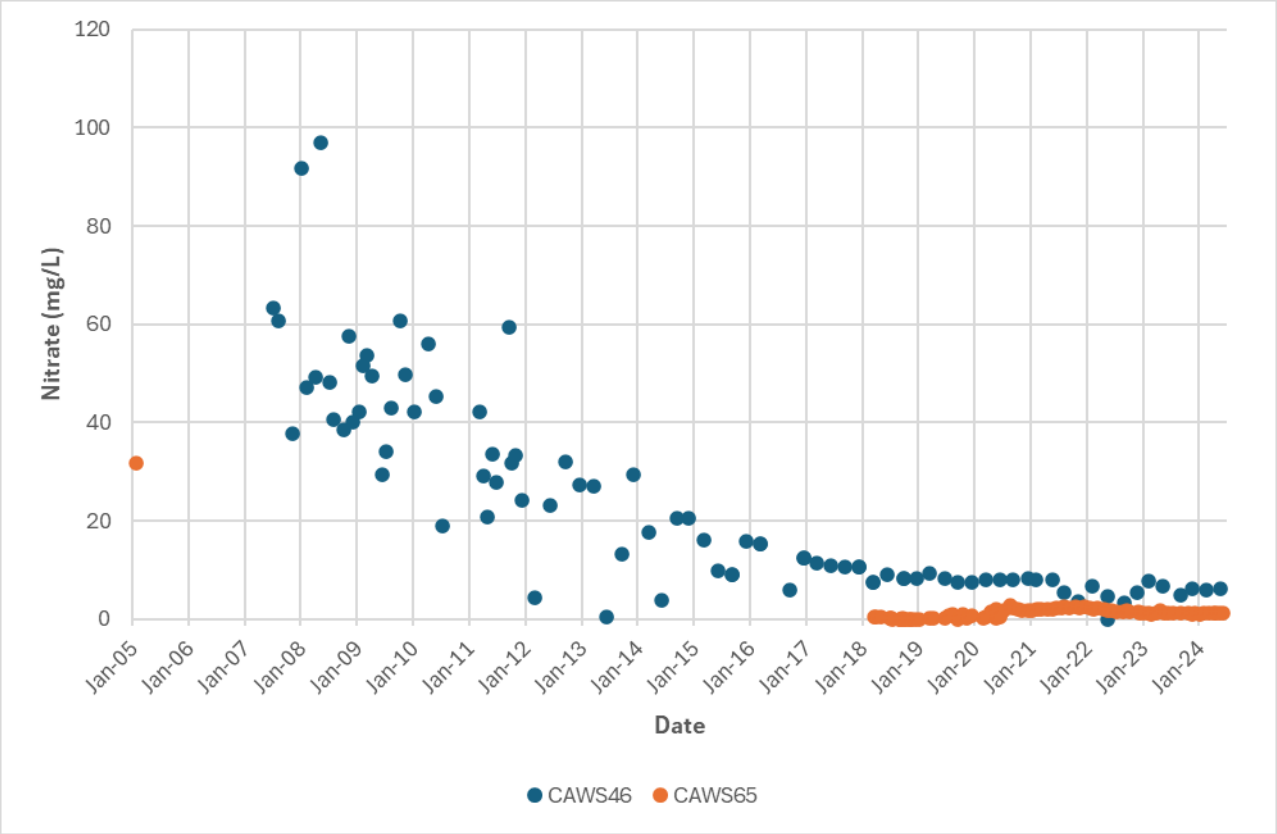

Total Suspended Solids (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Sep-15
Mar-16
Sep-16
Mar-17
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19
Mar-20
Sep-20
Mar-21
Sep-21
Mar-22
Sep-22
Mar-23
Sep-23
Mar-24
Date
CAWS46
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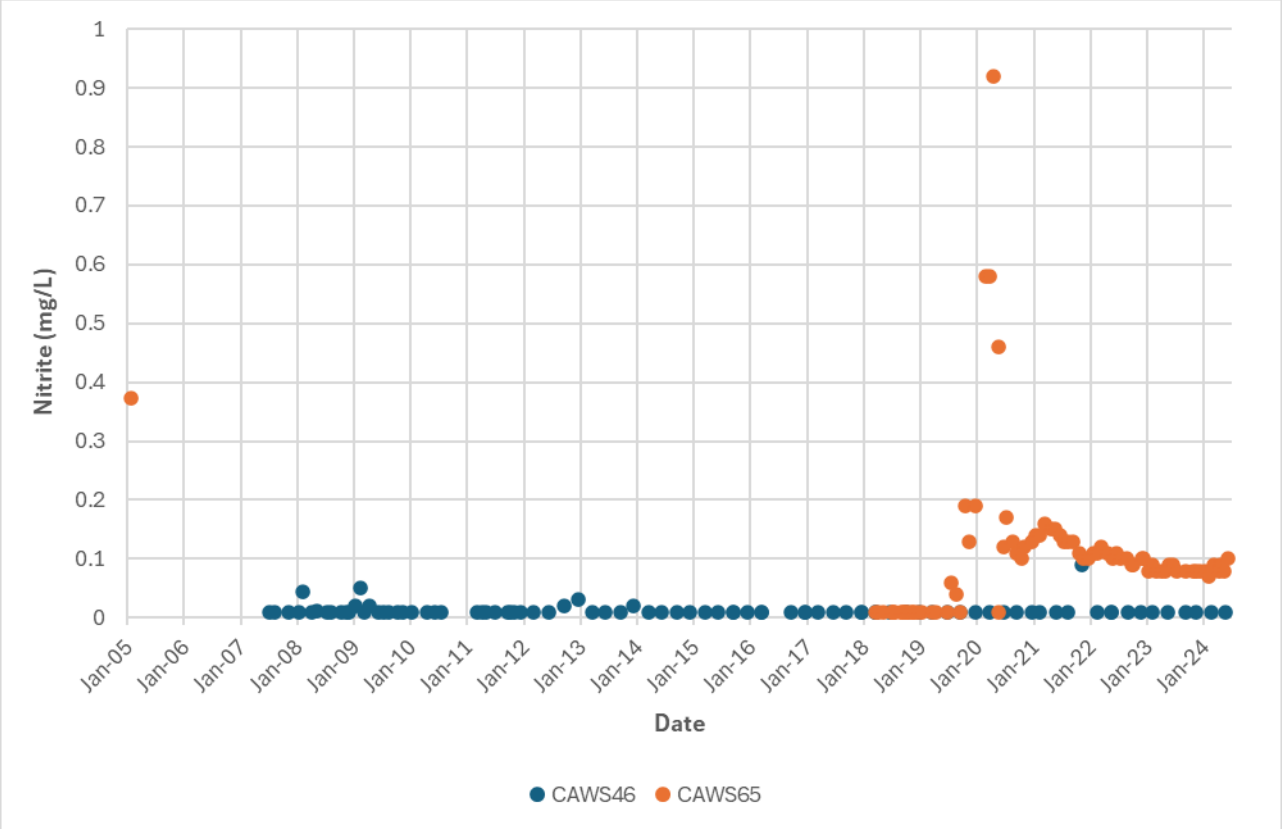

Total Dissolved Solids (mg/L)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
Nov-23
Date
CAWS46
CAWS65

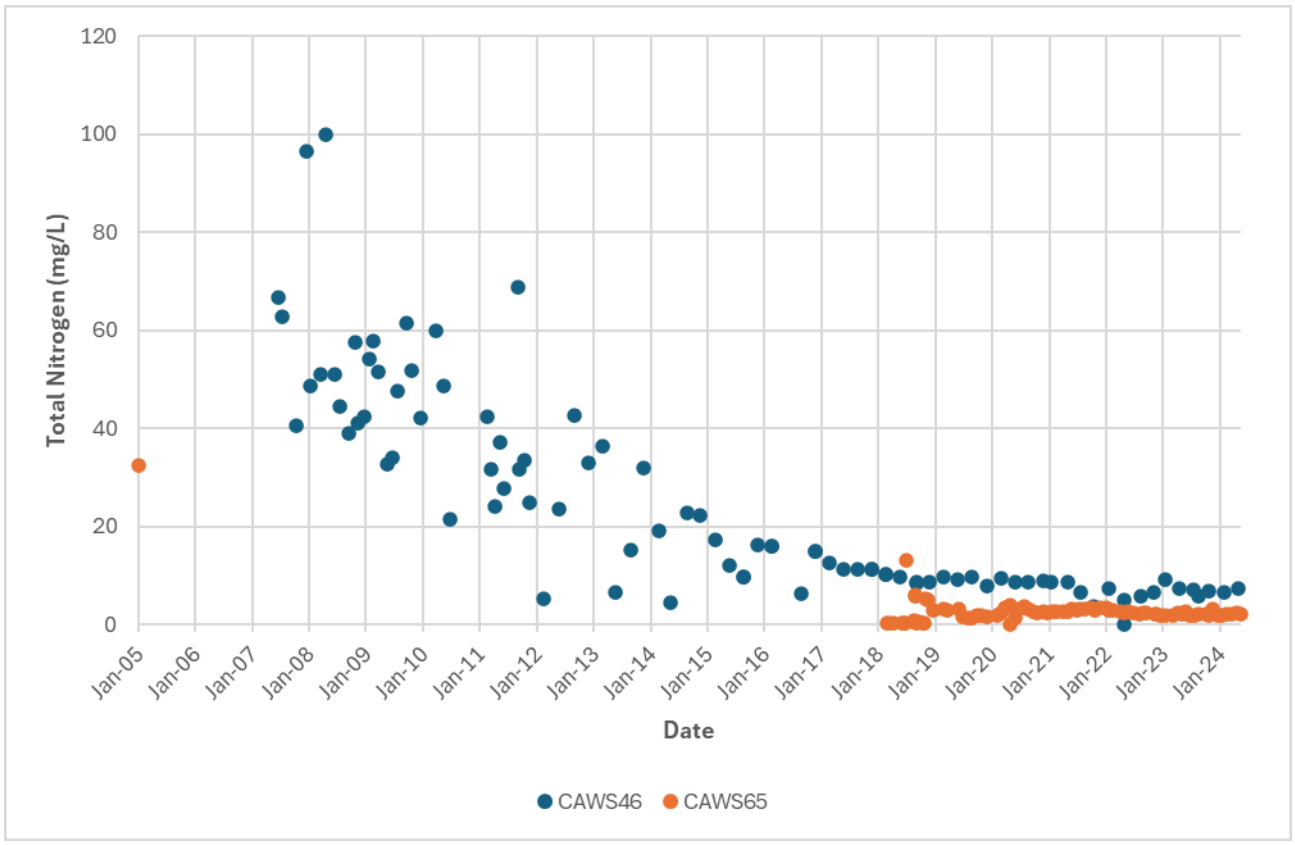

Alkalinity (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS46
CAWS65

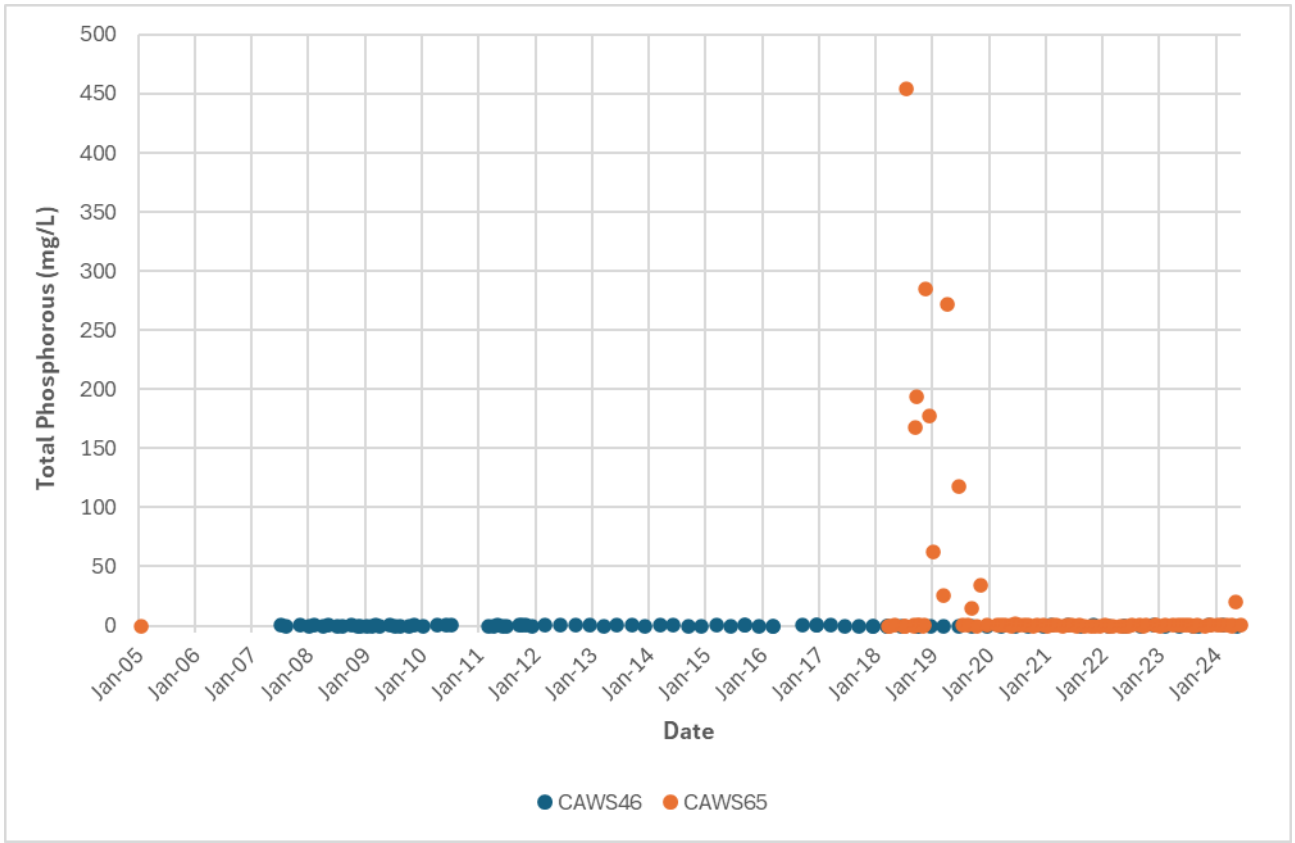

Oxidation Reduction Potential (mV)
3000
2500
2000
1500
1000
500
0
-500
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Jul-24
Date
CAWS46
CAWS65

B.2.2 Nutrients

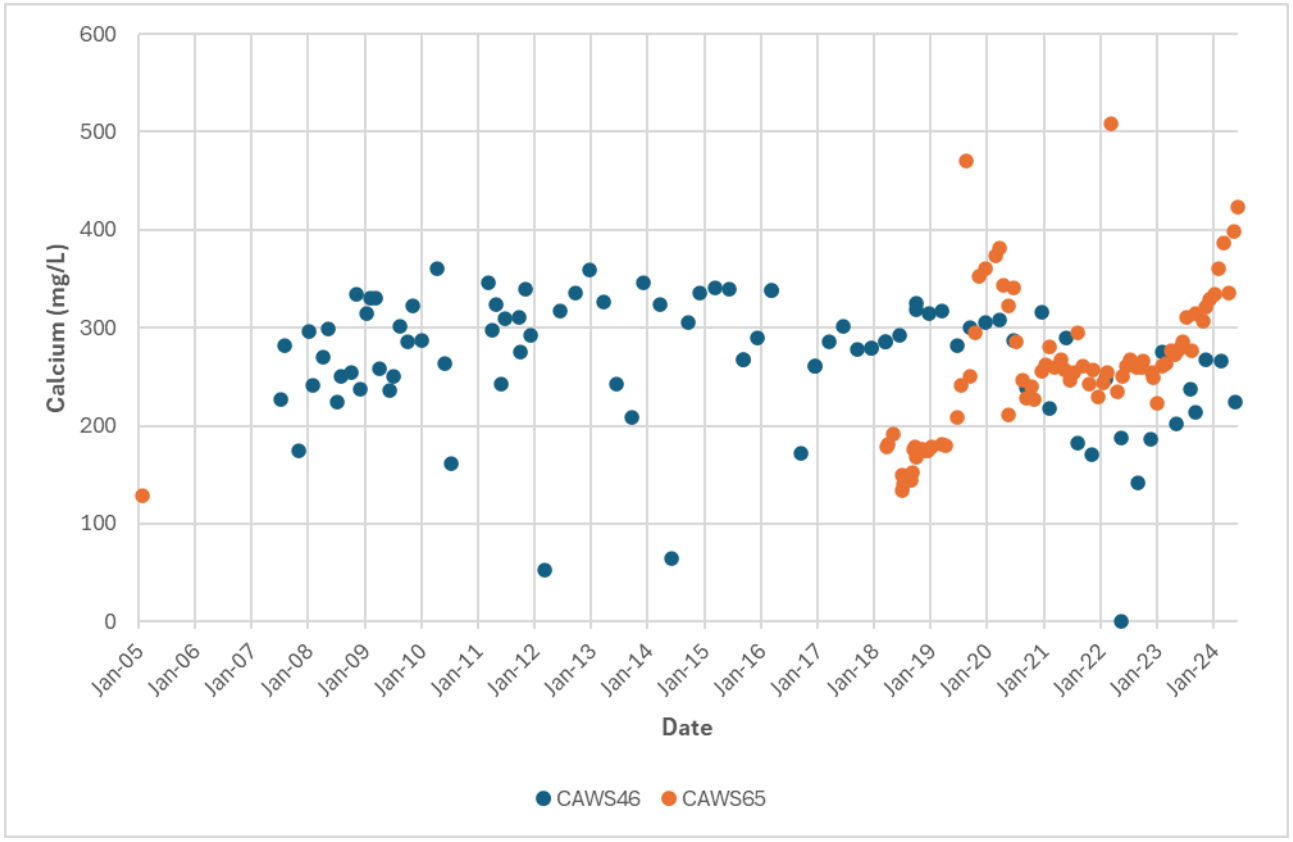


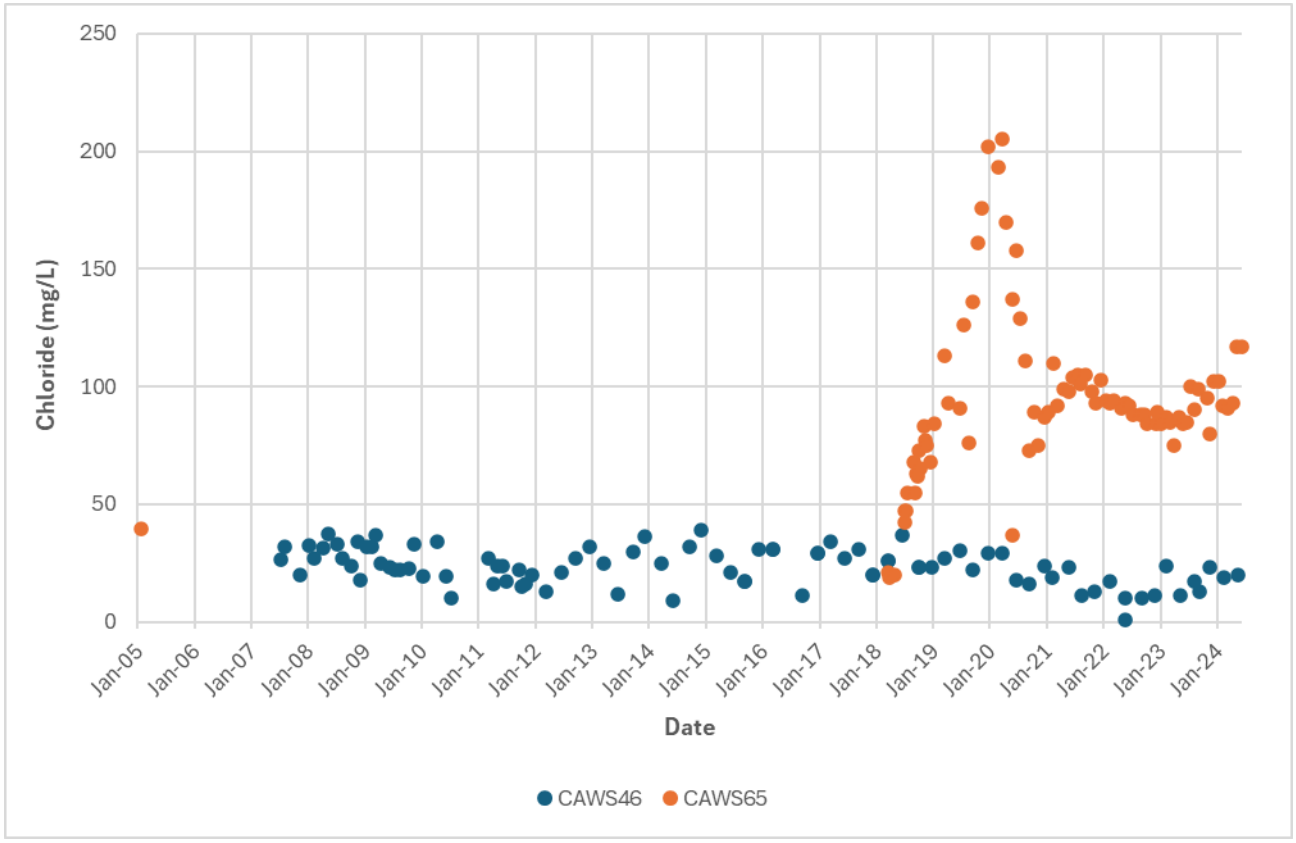


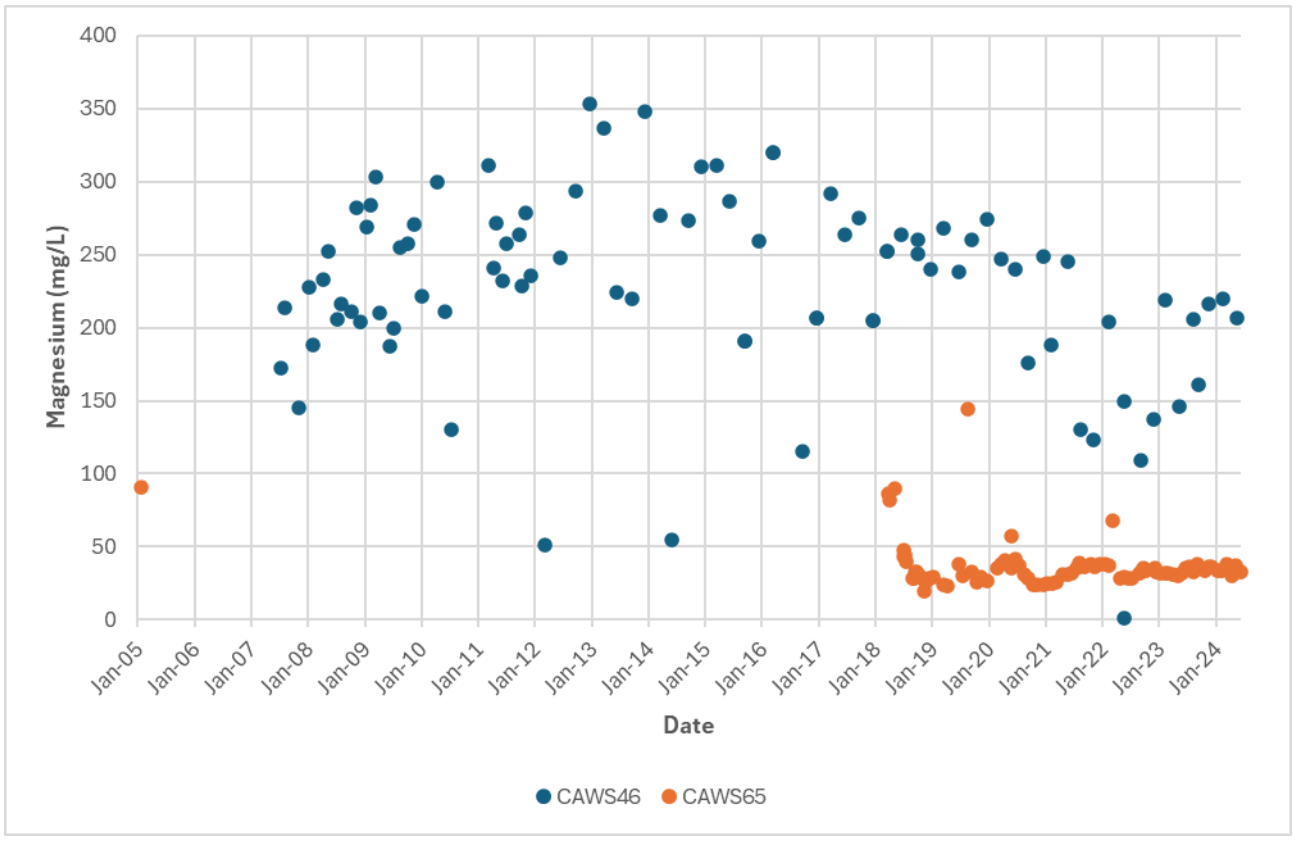

Total Nitrogen (mg/L)
120
100
80
60
40
20
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS46
CAWS65

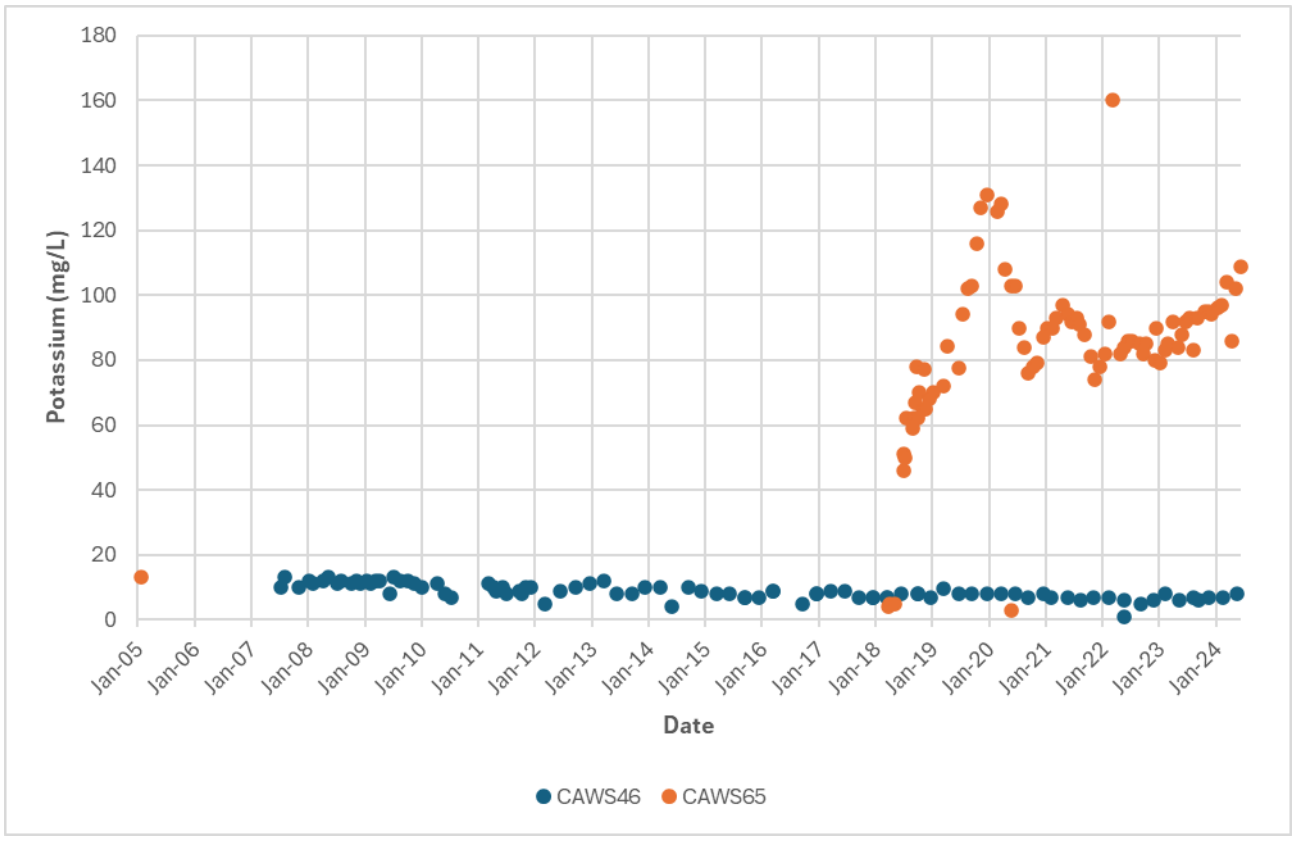

Total Phosphorous (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
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Jan-23
Jan-24
Date
CAWS46
CAWS65

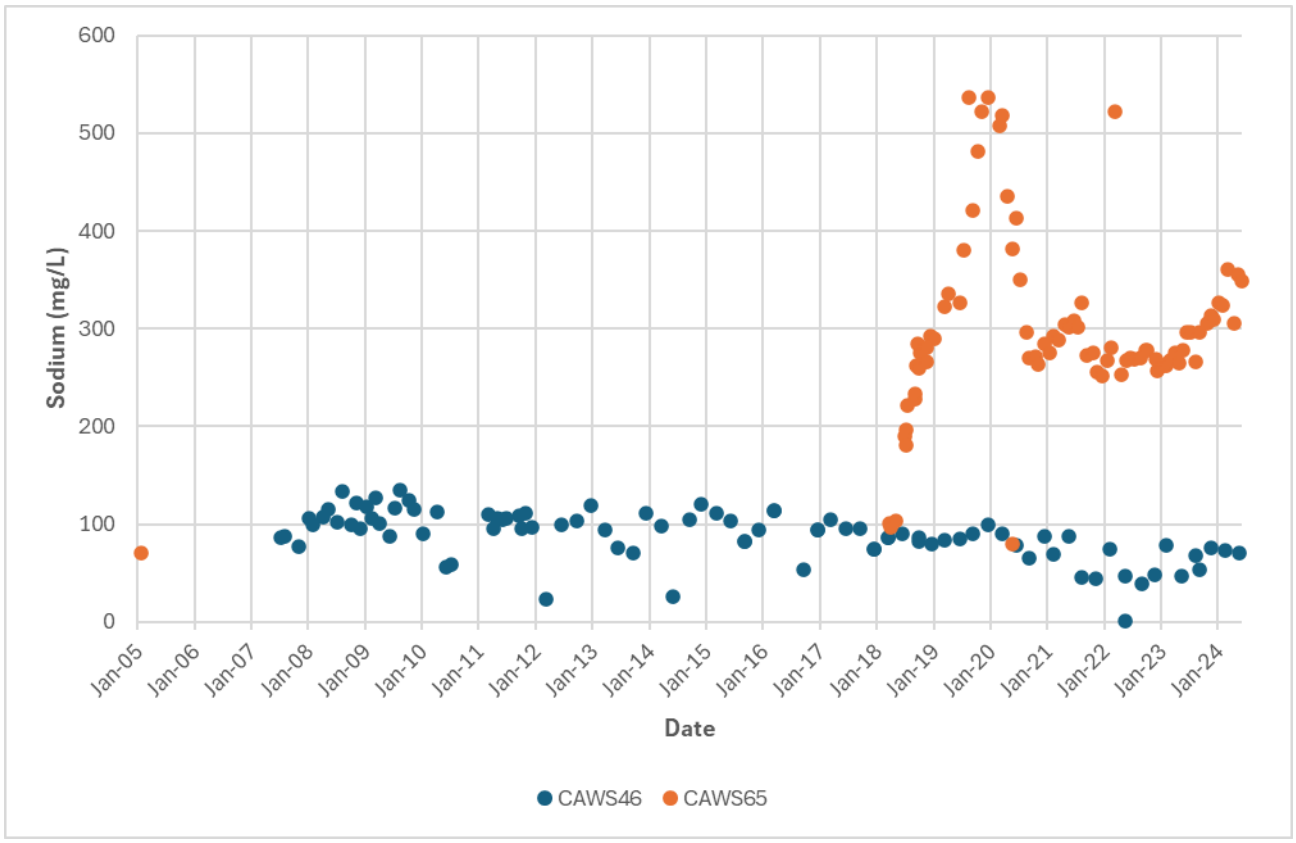
B.2.3 Major Ions

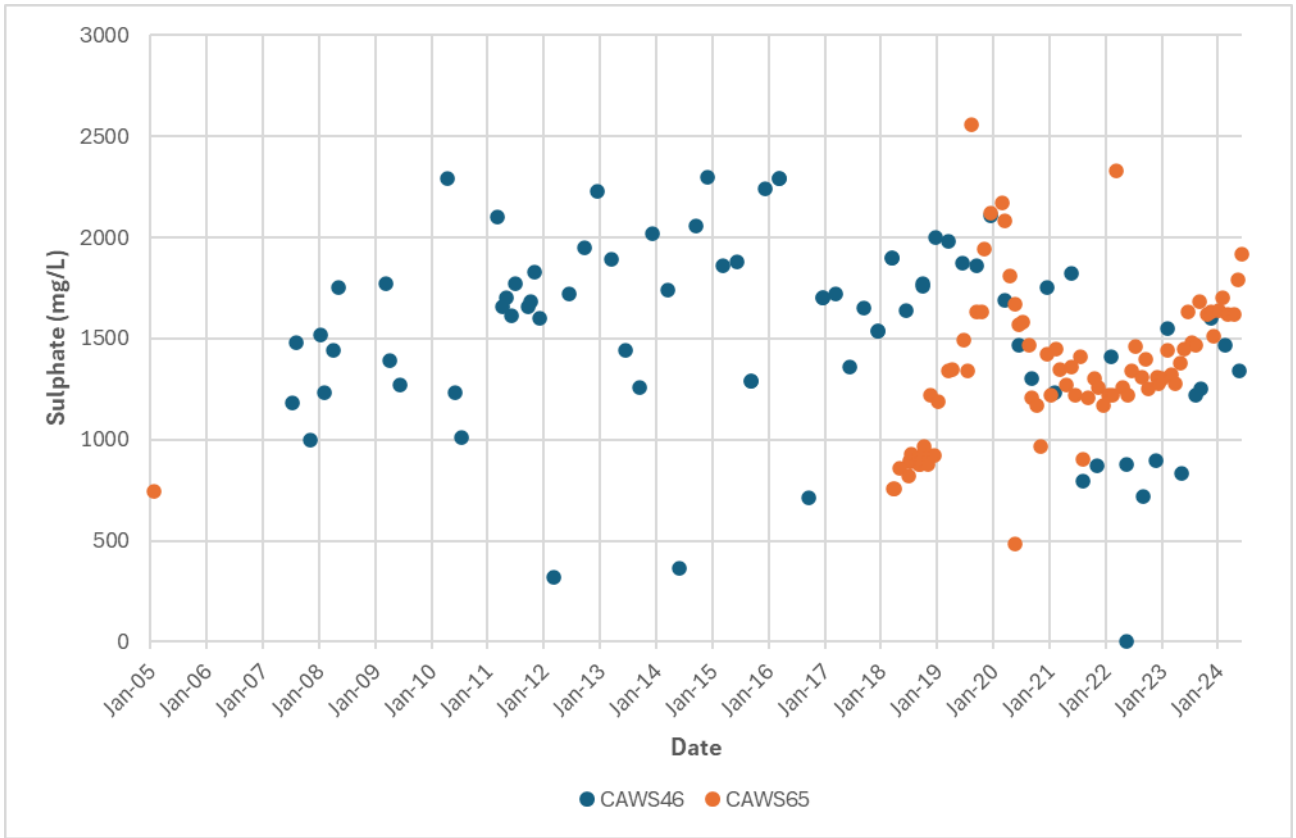




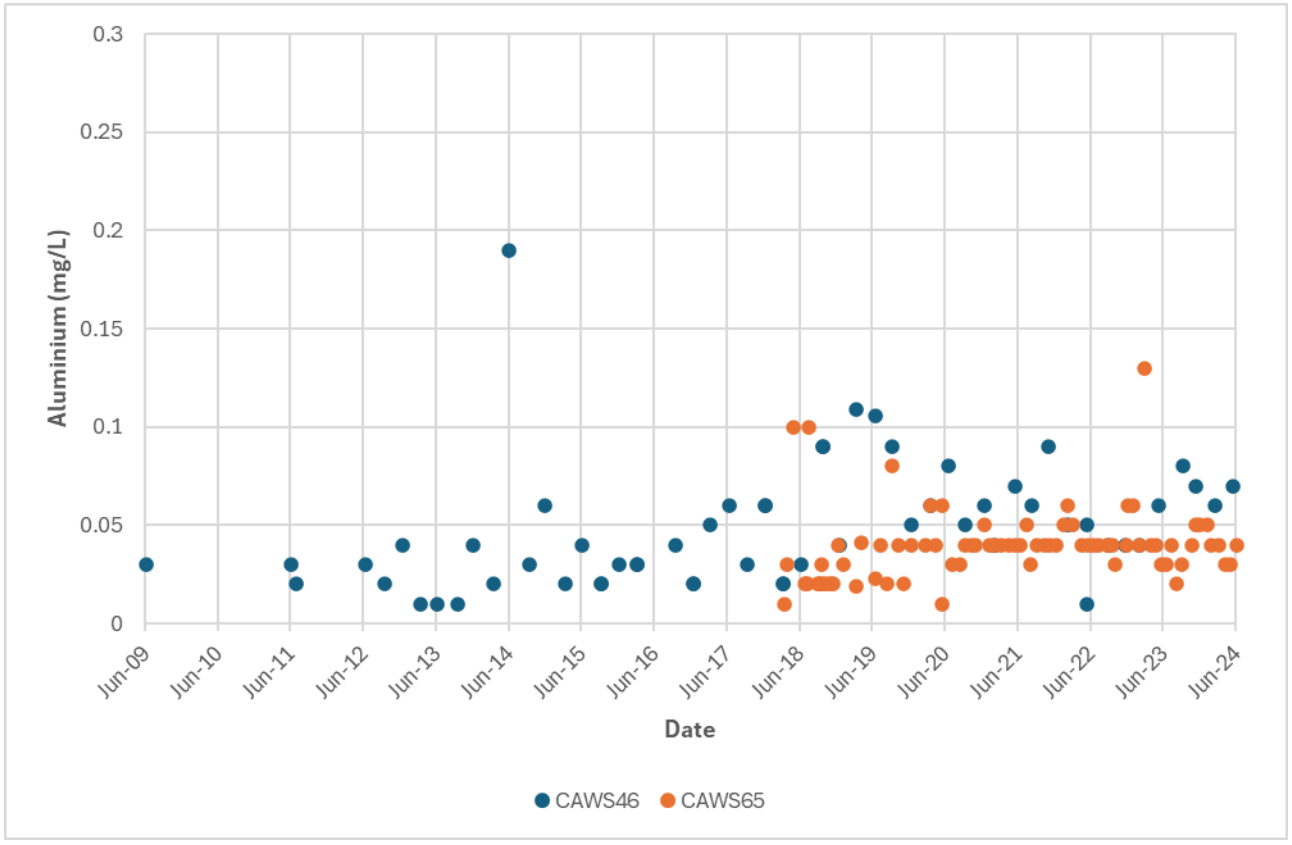

Magnesium (mg/L)
400
350
300
250
200
150
100
50
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
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Jan-24
Date
CAWS46
CAWS65

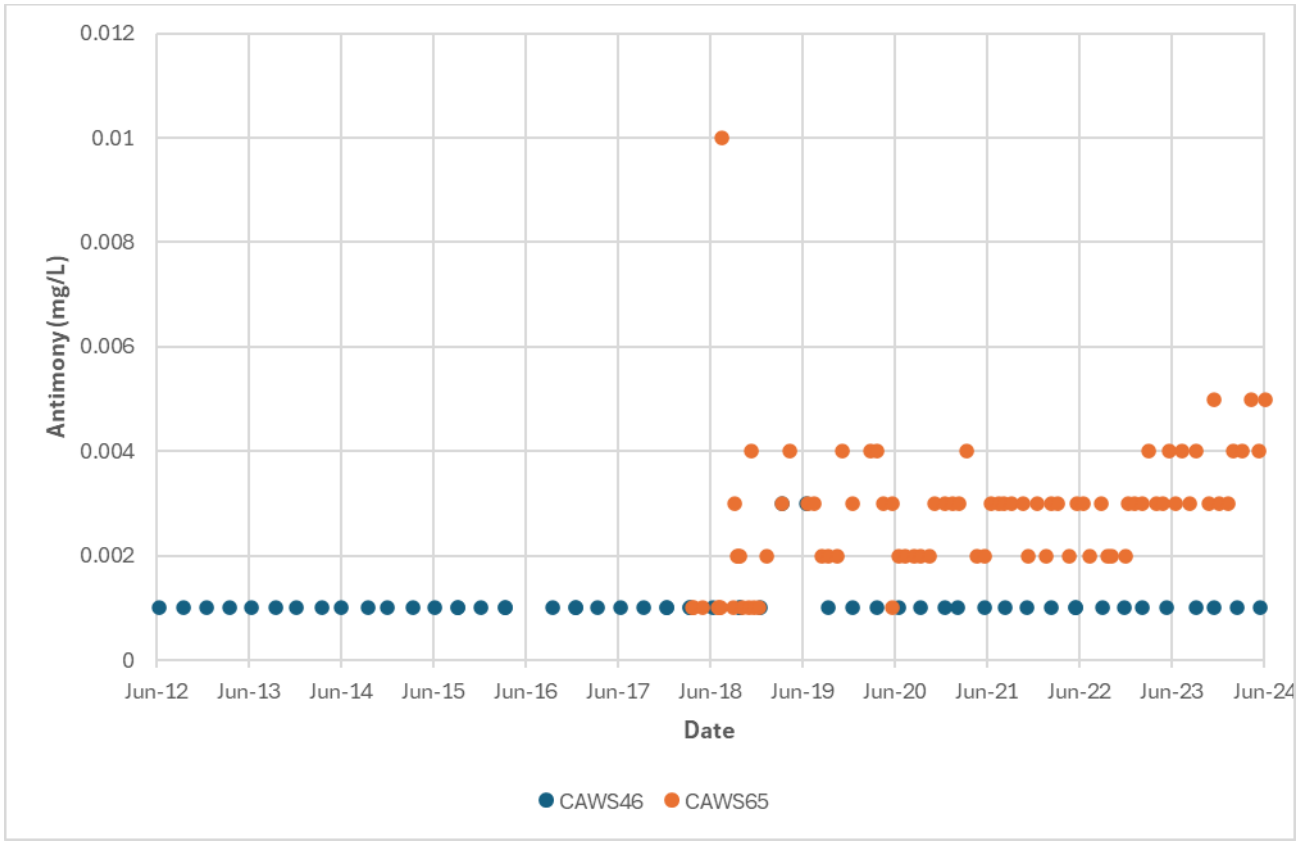

Potassium (mg/L)
180
160
140
120
100
80
60
40
20
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
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Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
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CAWS65

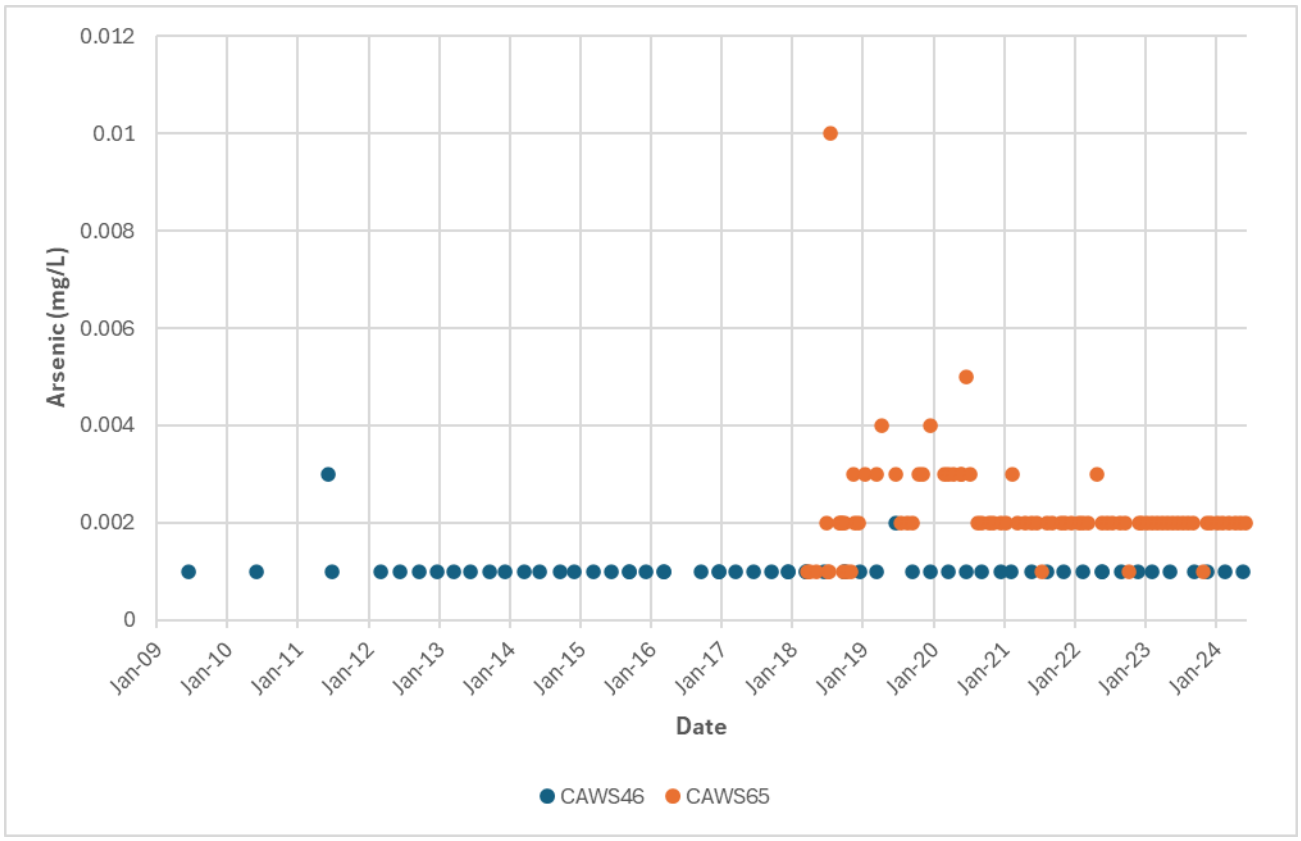

Sodium (mg/L)
600
500
400
300
200
100
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS46
CAWS65

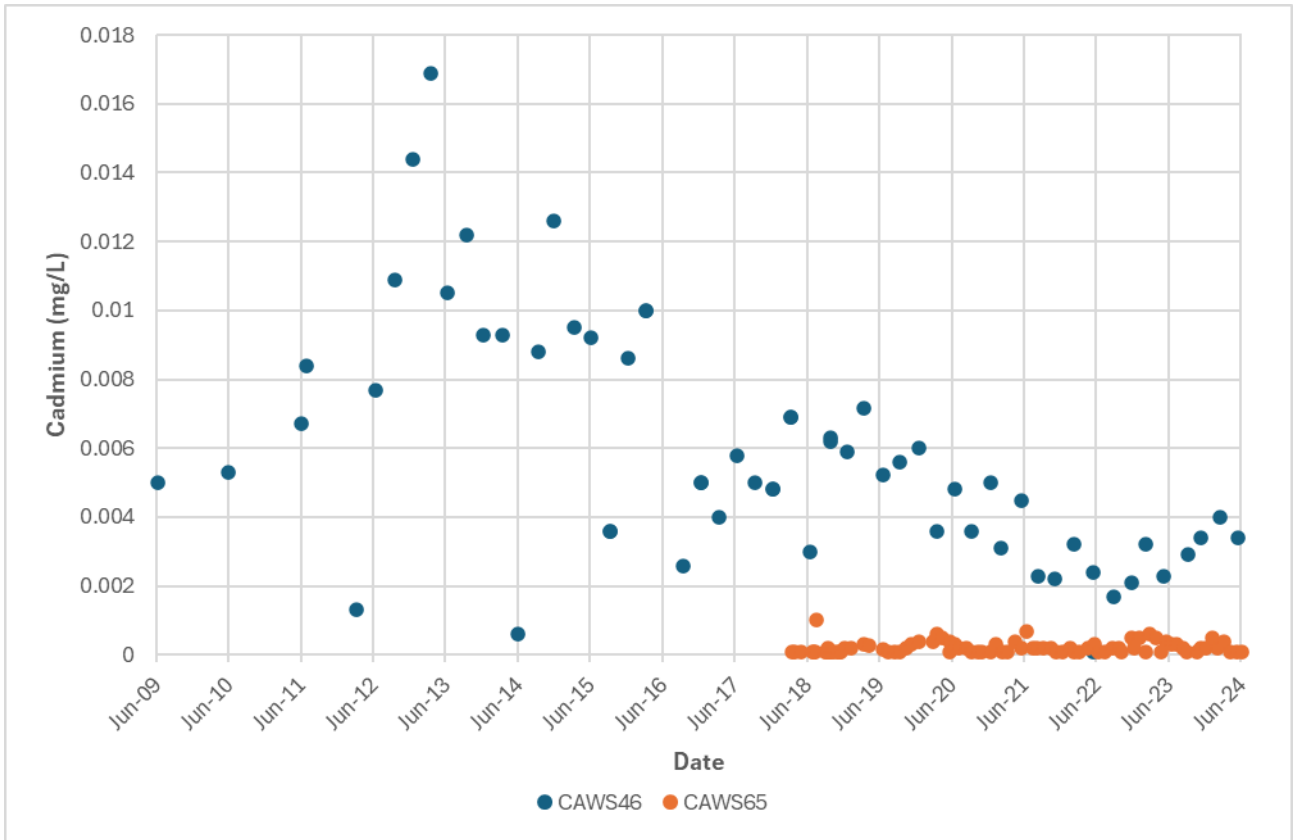

Sulphate (mg/L)
3000
2500
2000
1500
1000
500
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS46
CAWS65

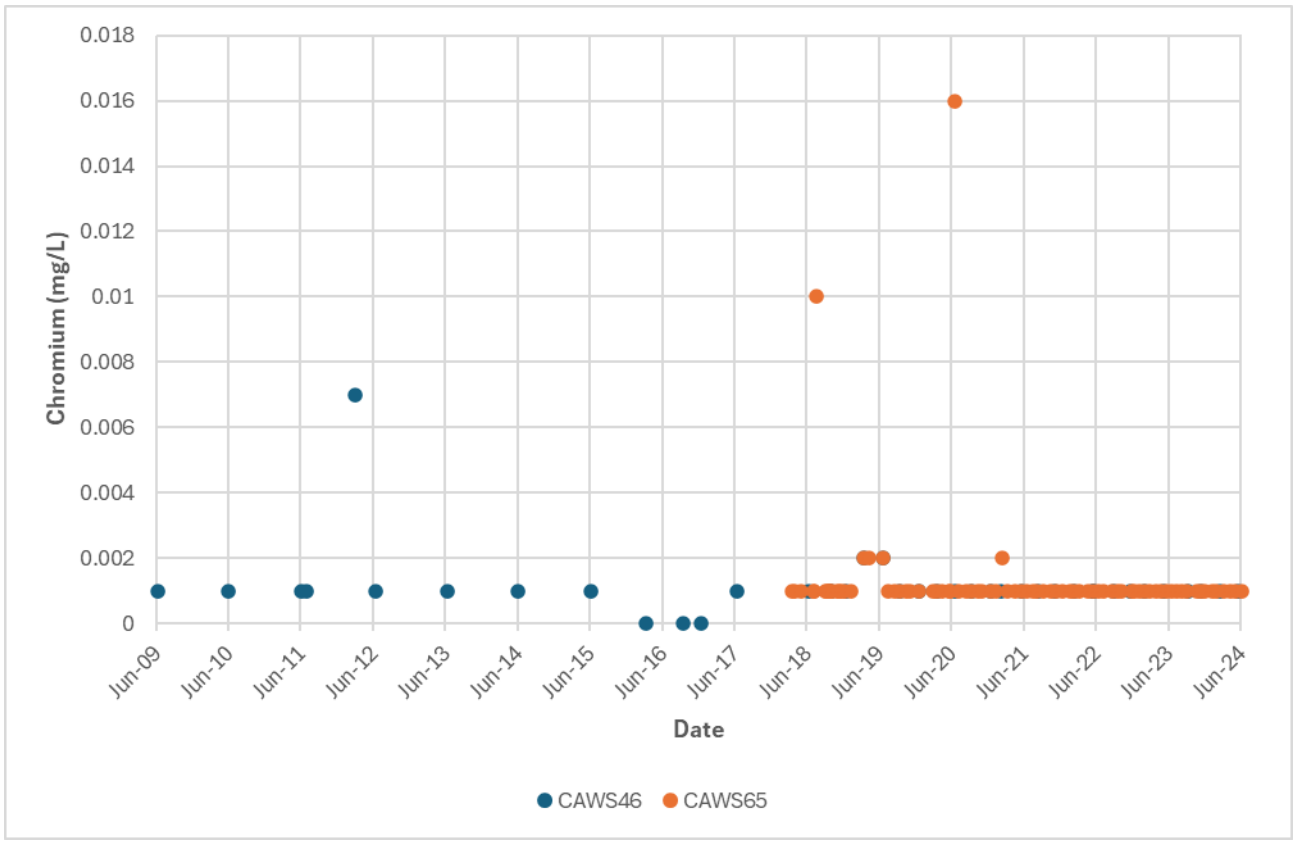
B.2.4 Dissolved Metals

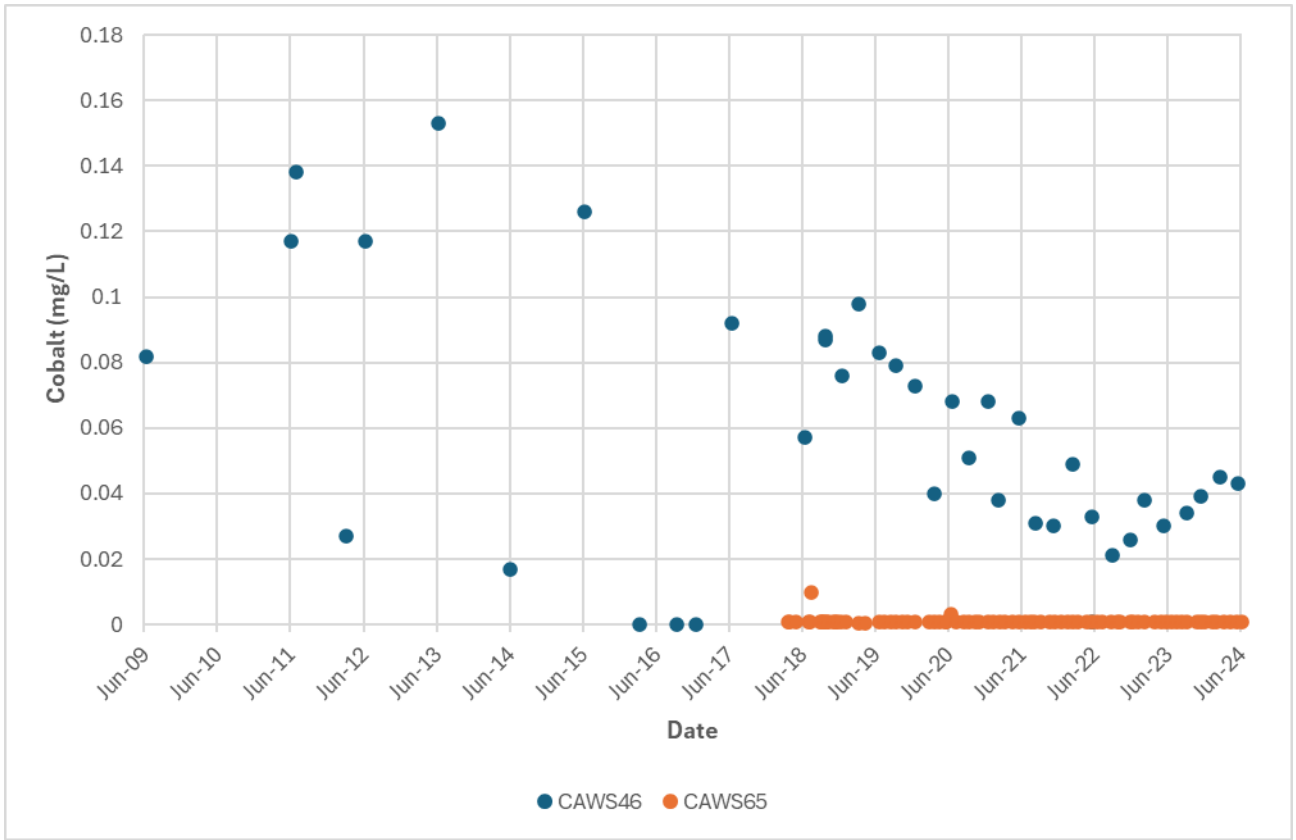


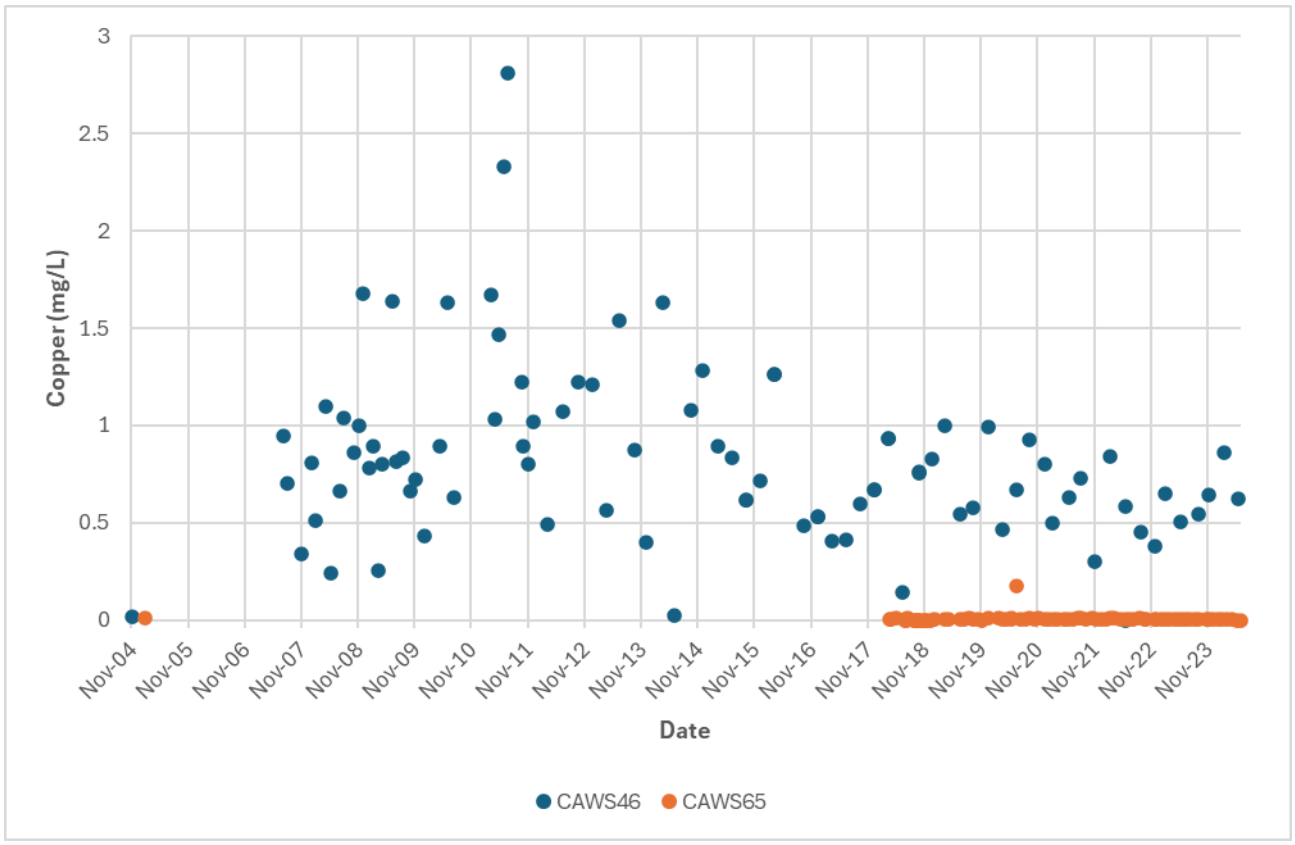


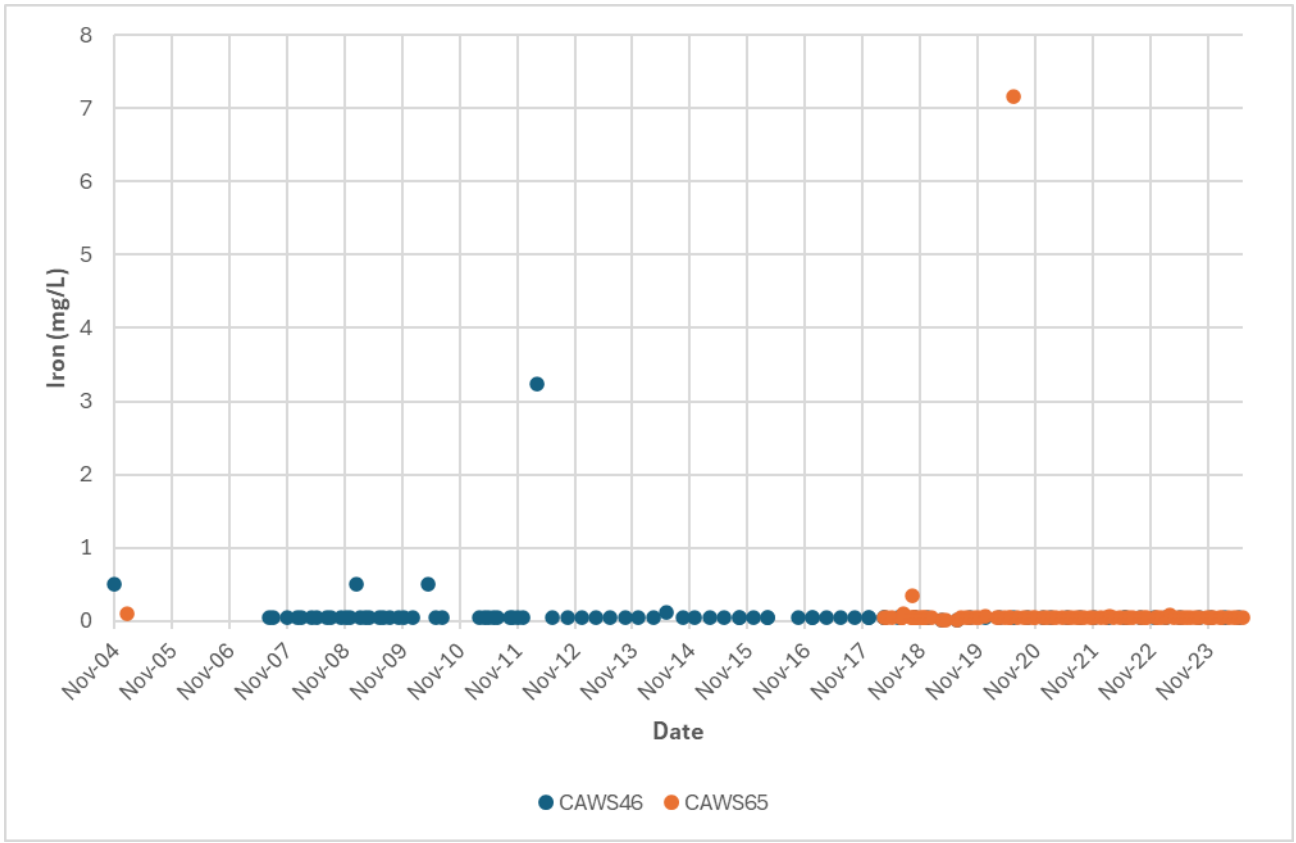

0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS46
CAWS65

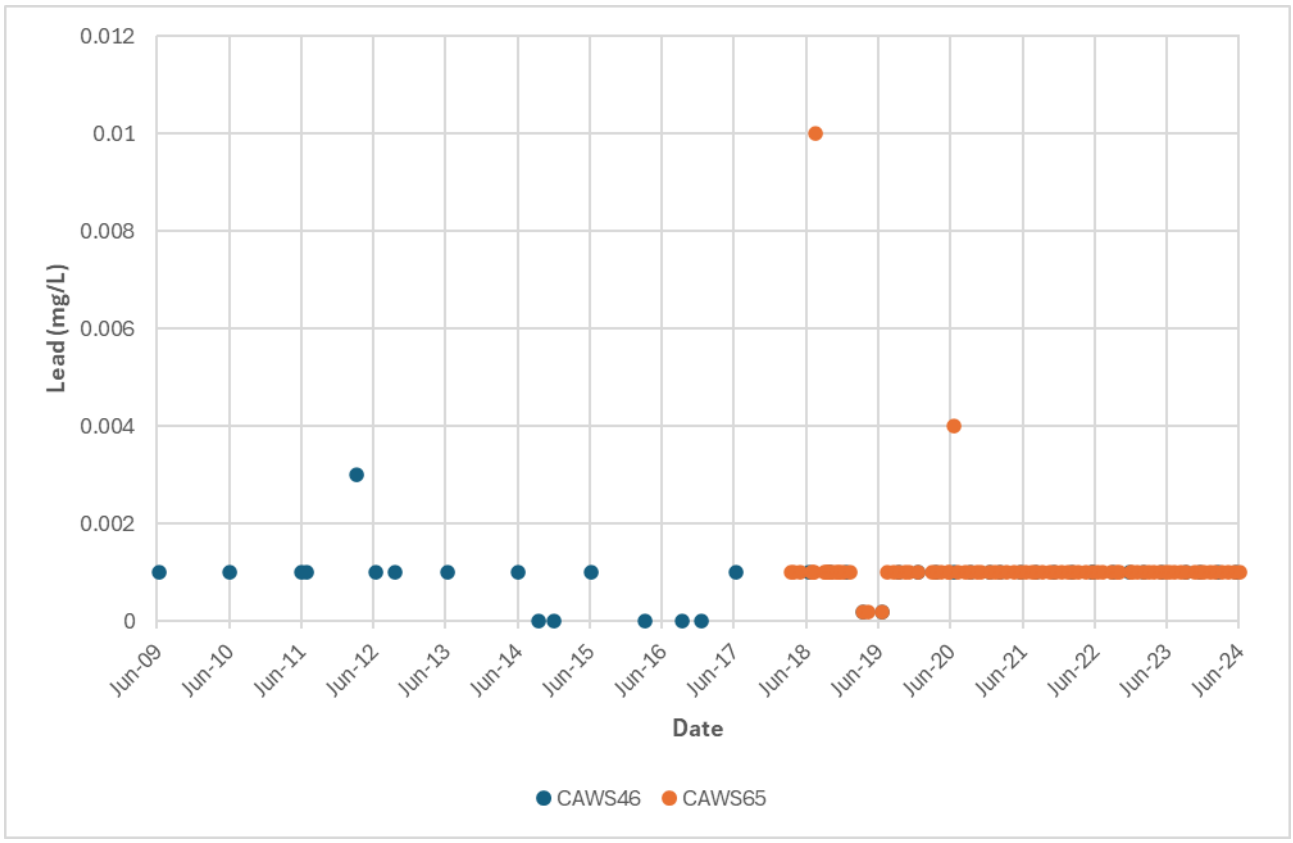

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Cadmium (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

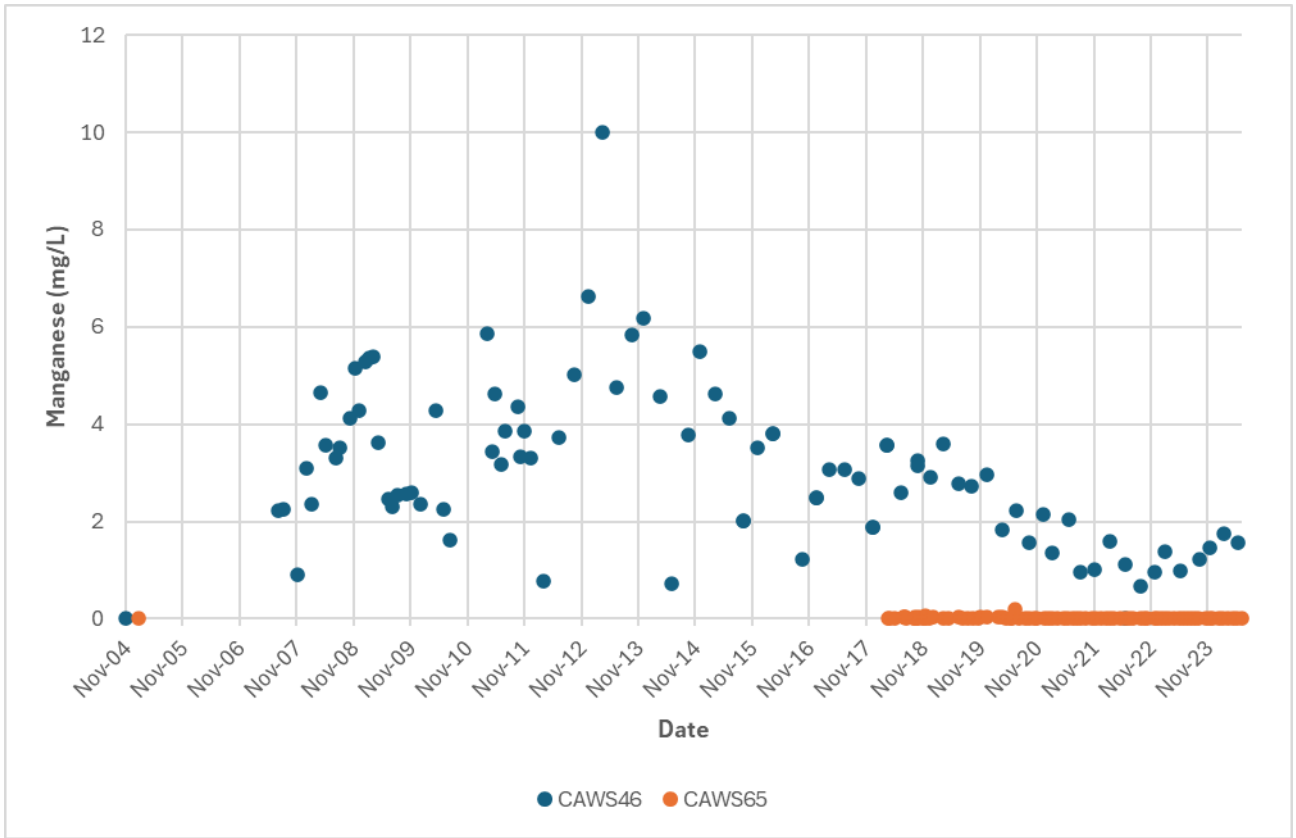

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Chromium (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

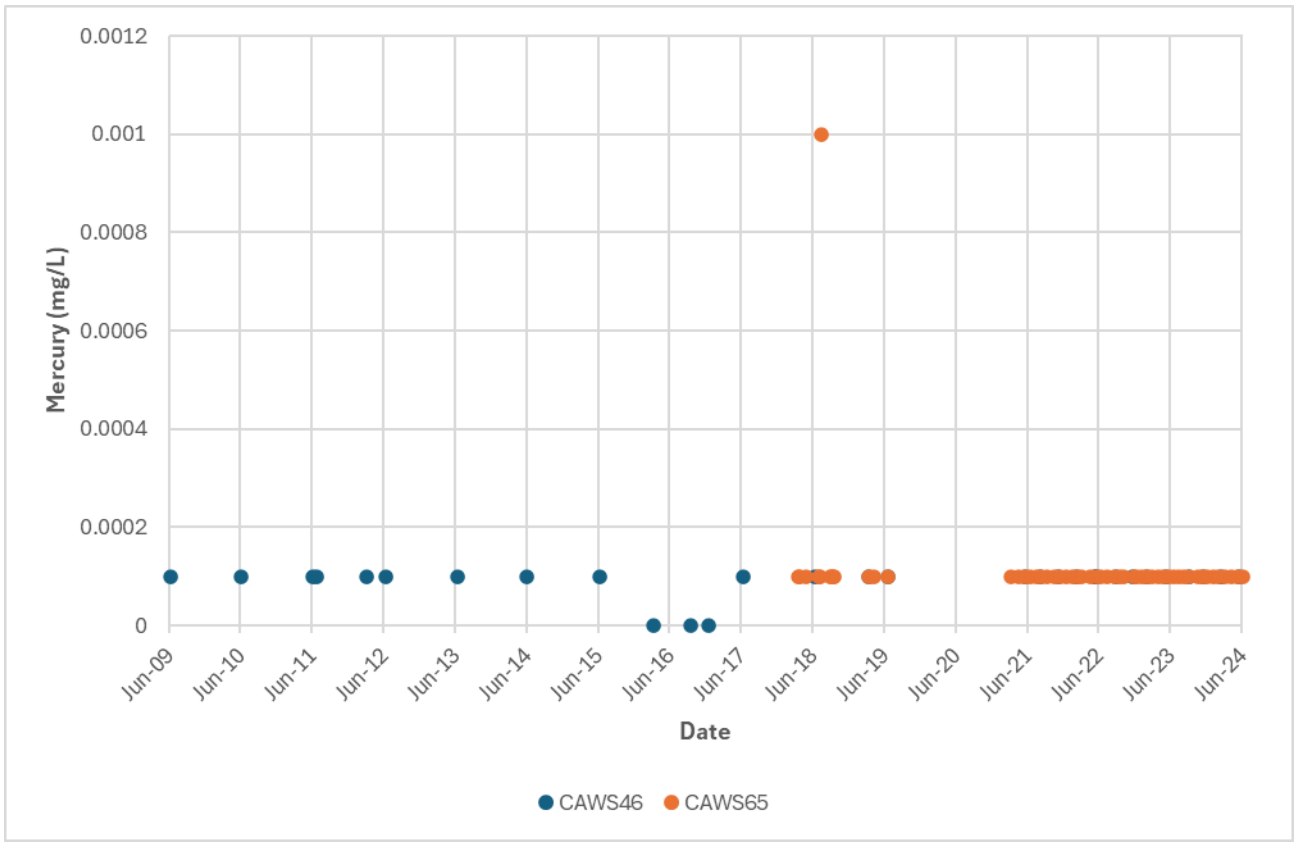

0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Cobalt (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

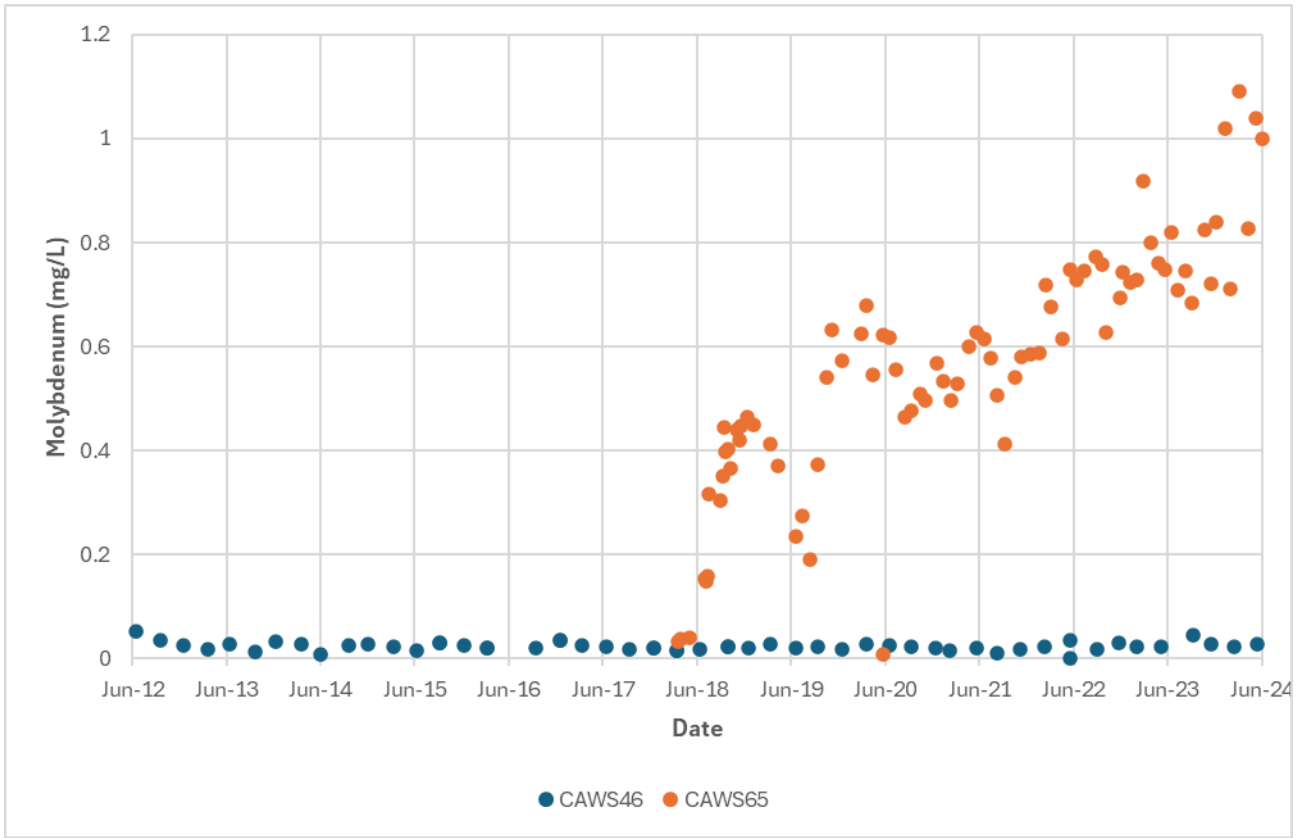

Copper (mg/L)
3
2.5
2
1.5
1
0.5
0
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
Nov-23
Date
CAWS46
CAWS65

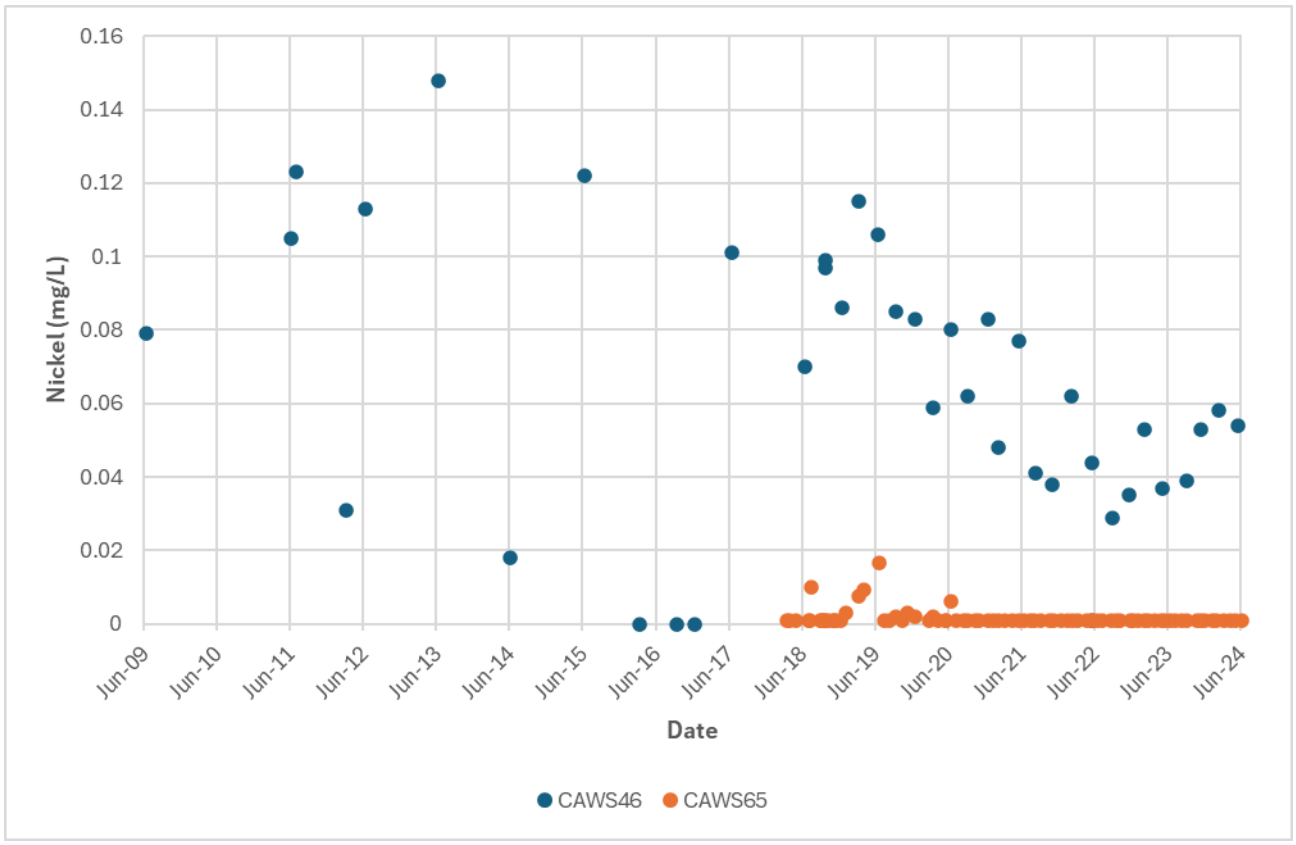

Iron (mg/L)
8
7
6
5
4
3
2
1
0
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
Nov-23
Date
CAWS46
CAWS65

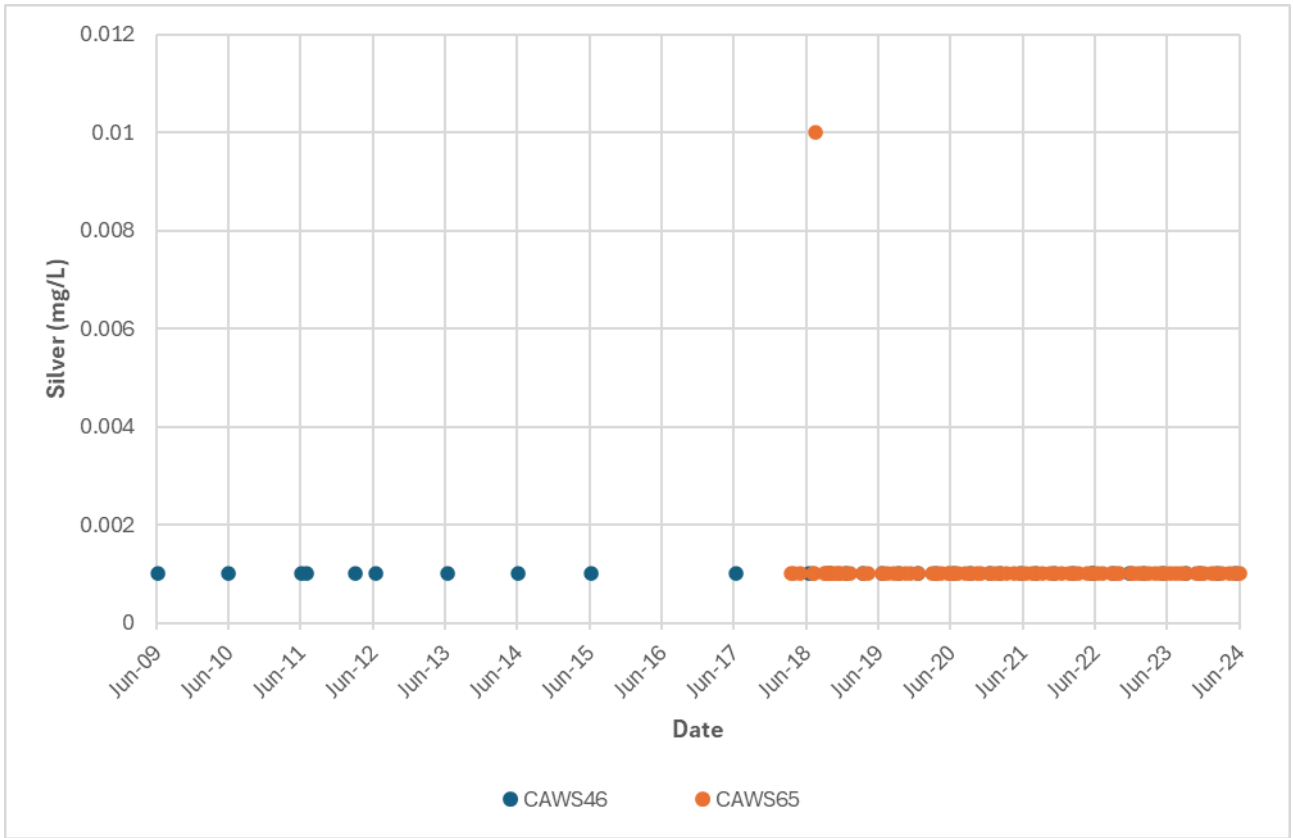

0.012
0.01
0.008
0.006
0.004
0.002
0
Lead (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

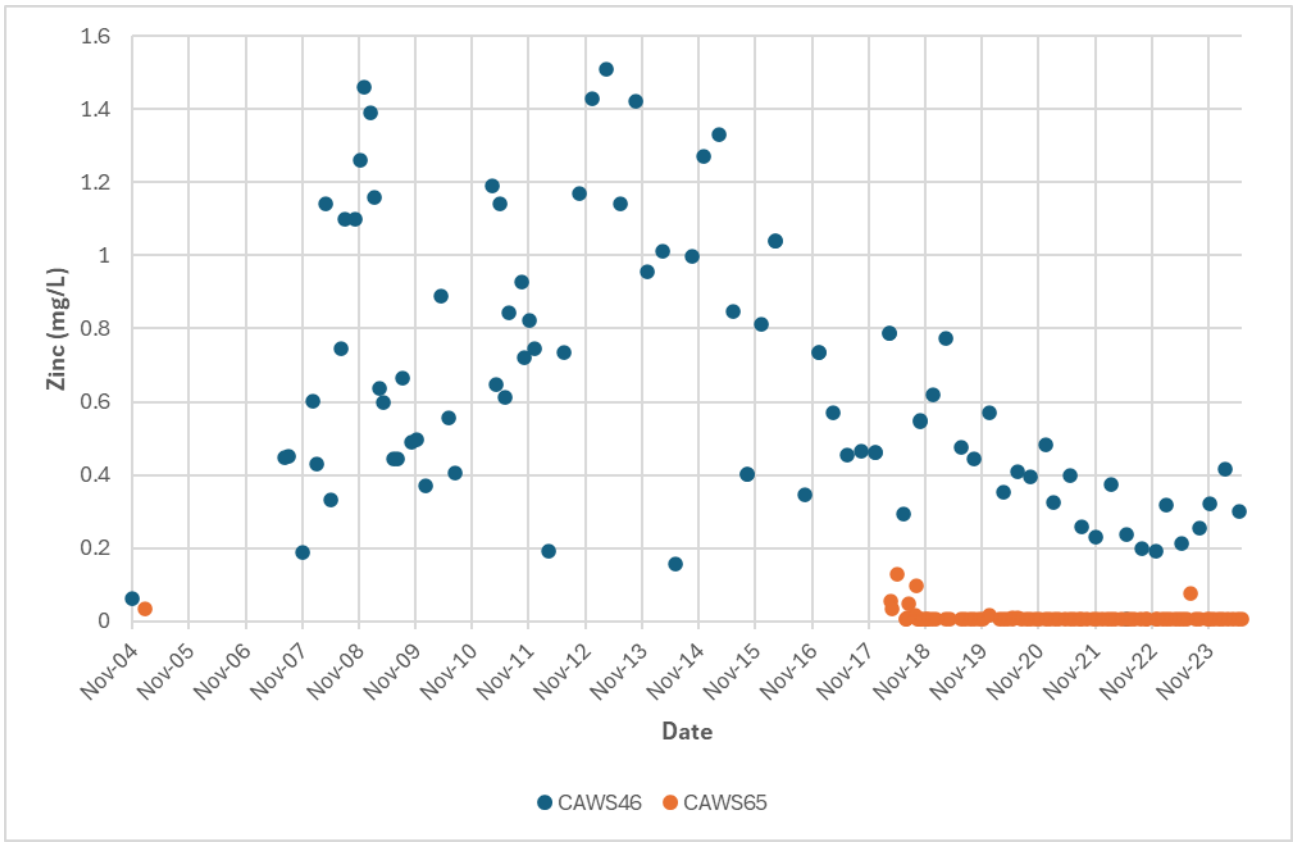

12
10
8
6
4
2
0
Manganese (mg/L)
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
Nov-22
Nov-23
Date
CAWS46
CAWS65


0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Mercury (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65


1.2
1
0.8
0.6
0.4
0.2
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

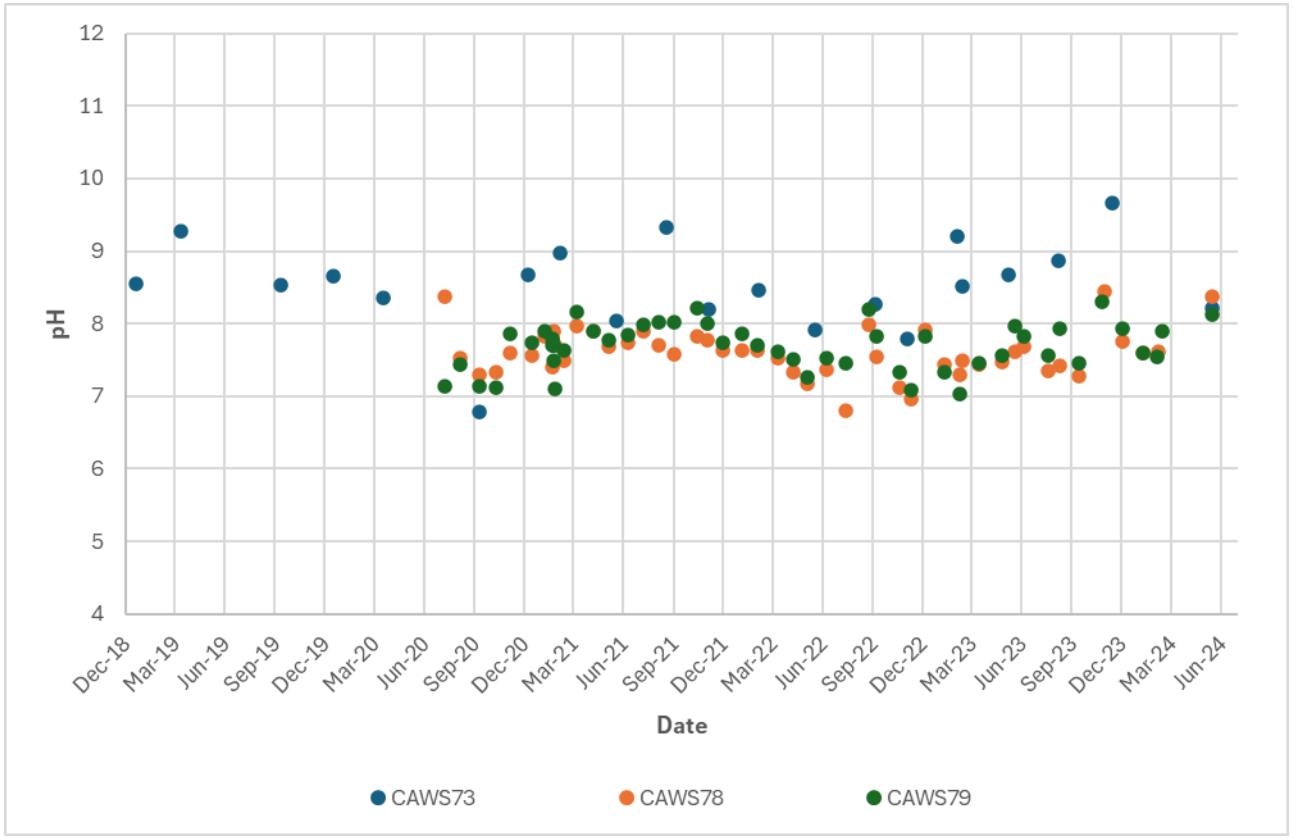

0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

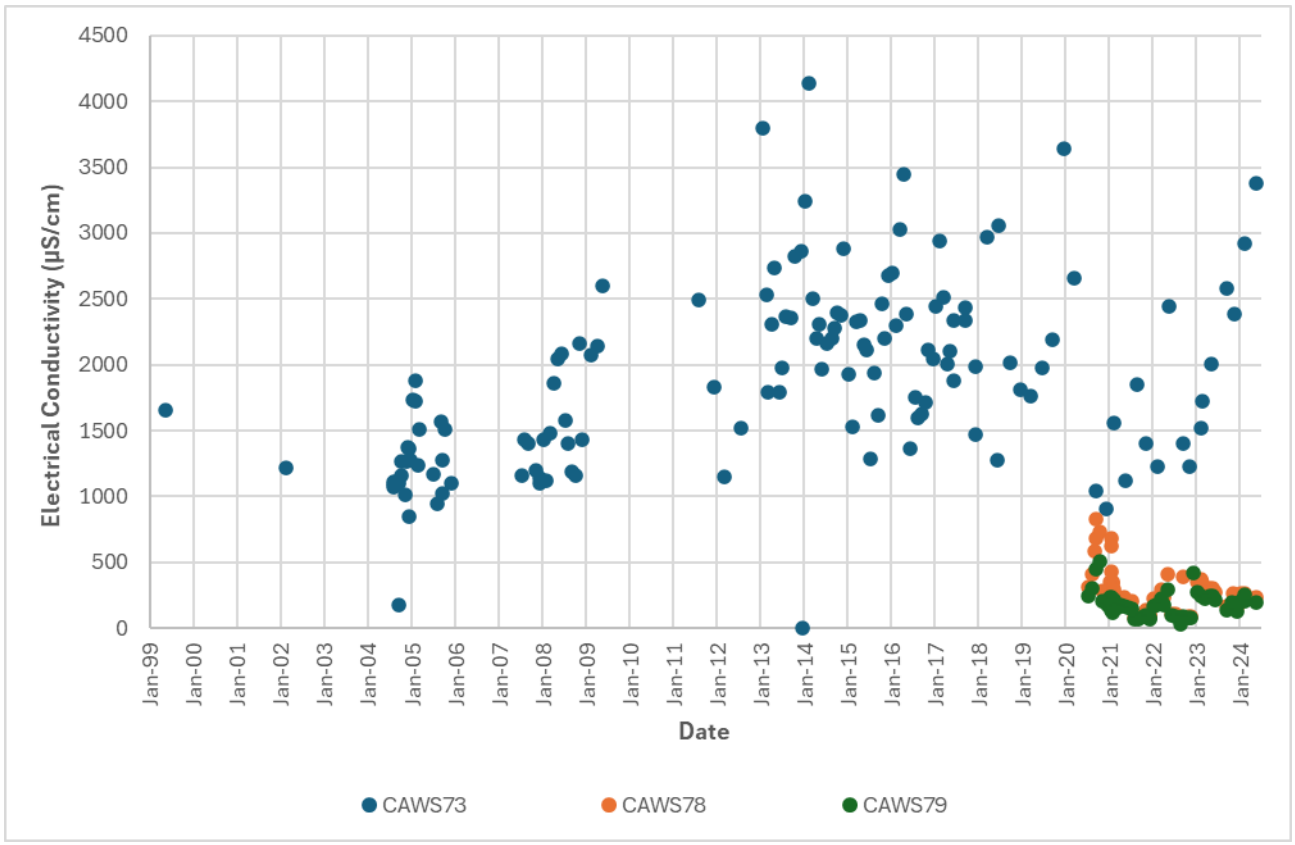

0.012
0.01
0.008
0.006
0.004
0.002
0
Silver (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS46
CAWS65

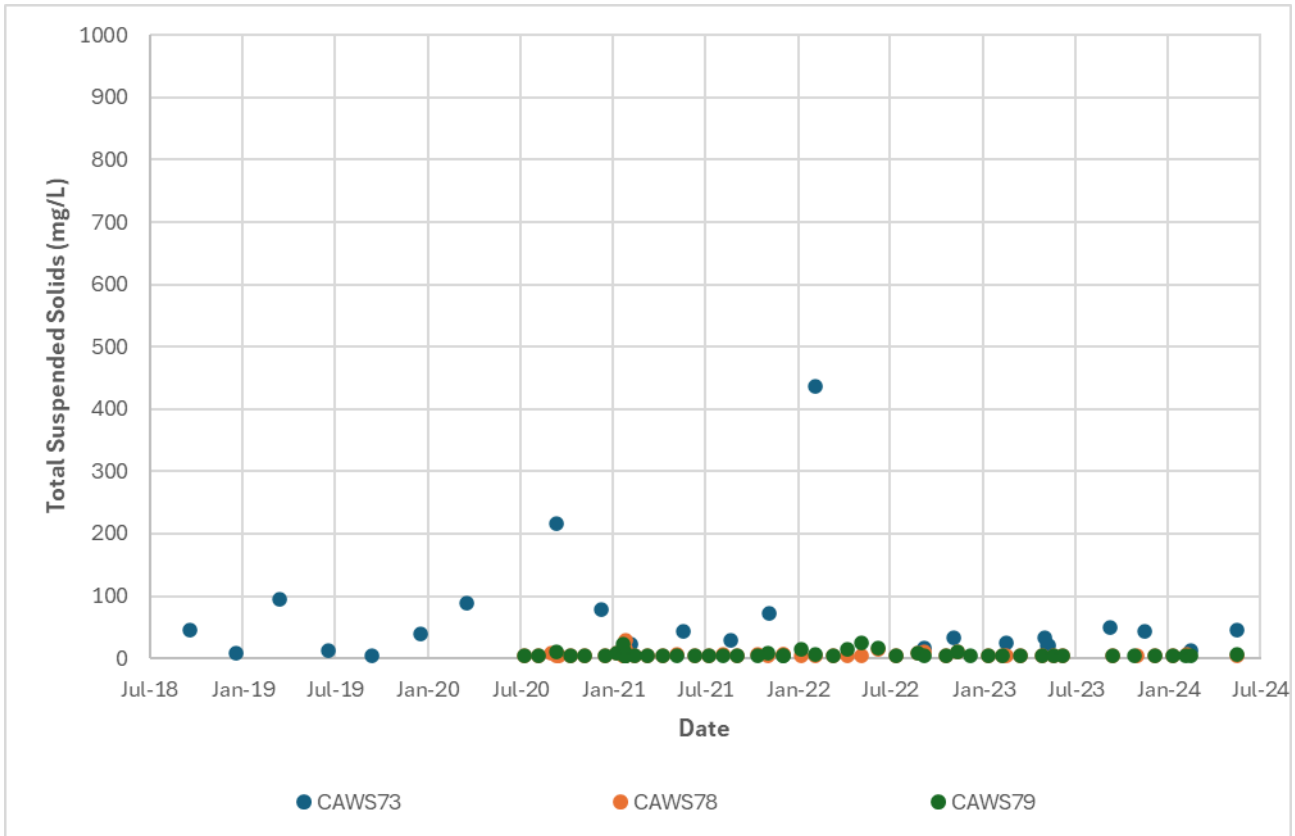


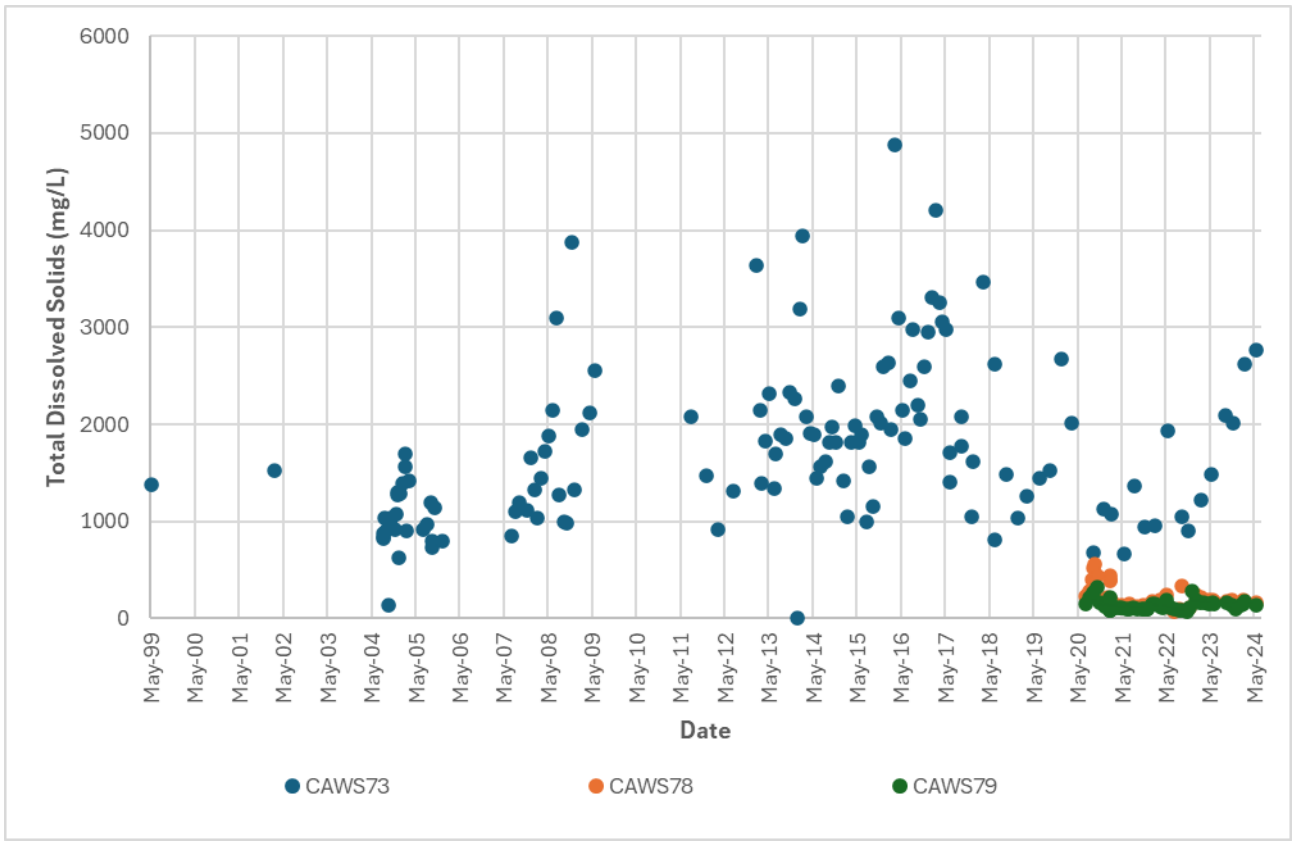
B.3 Ore Processing Area

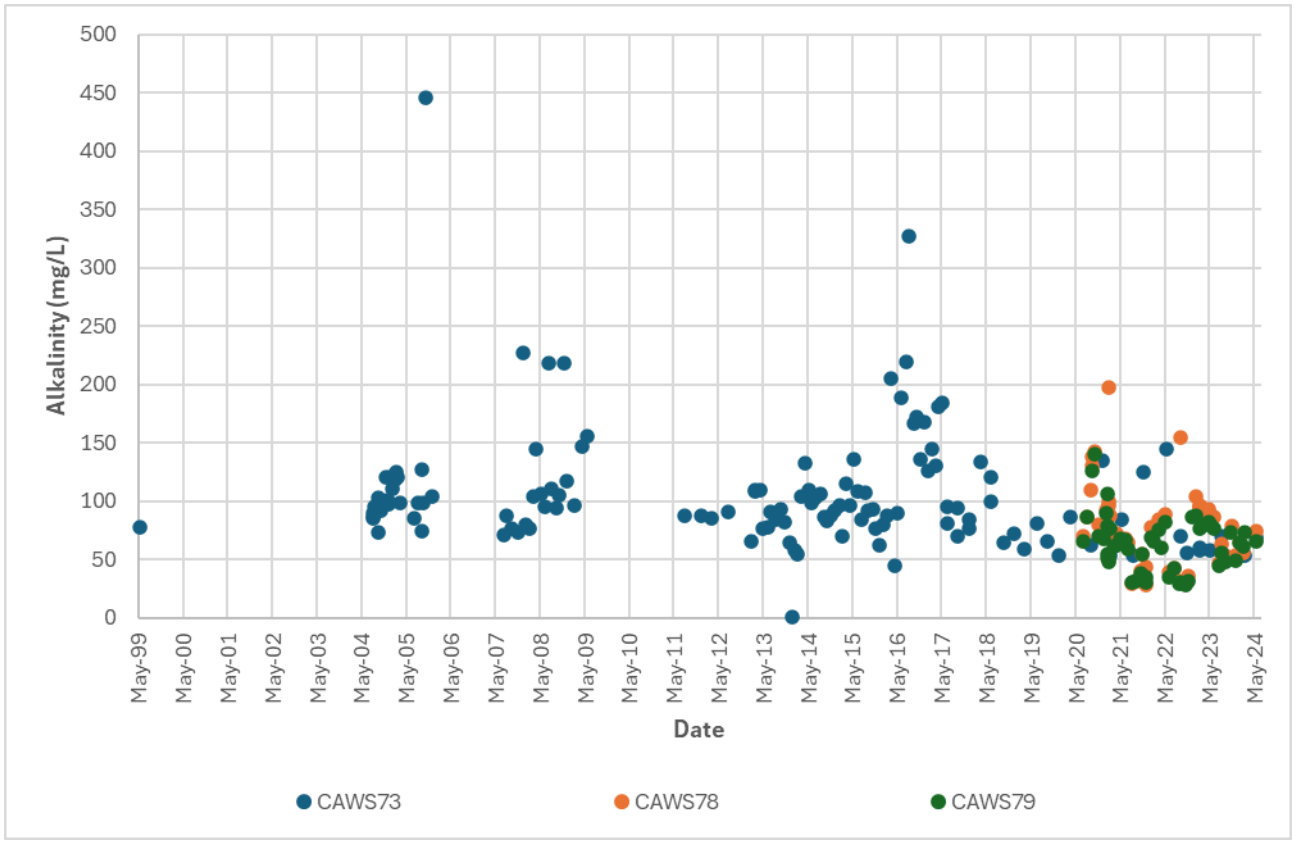
B.3.1 Physiochemical Parameters

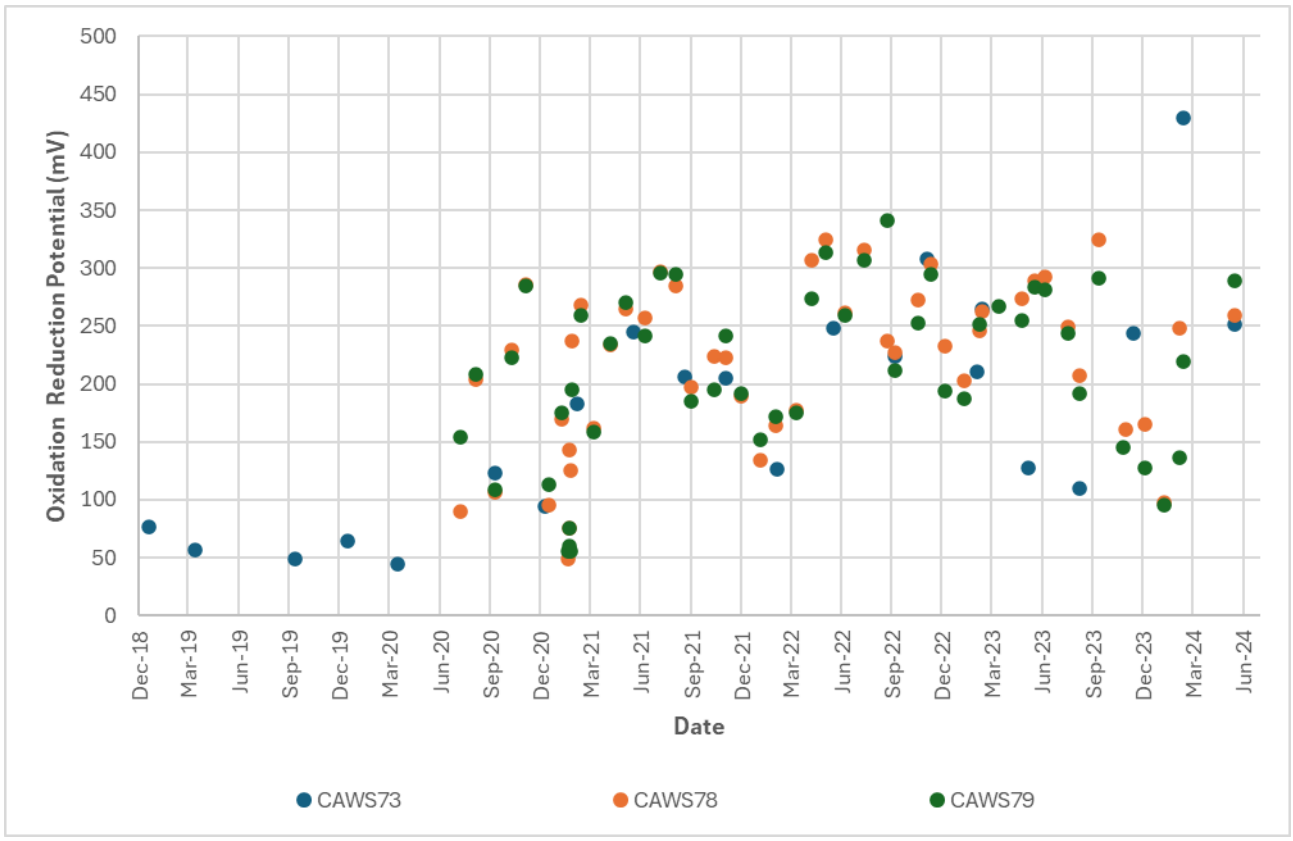



Electrical Conductivity (µS/cm)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

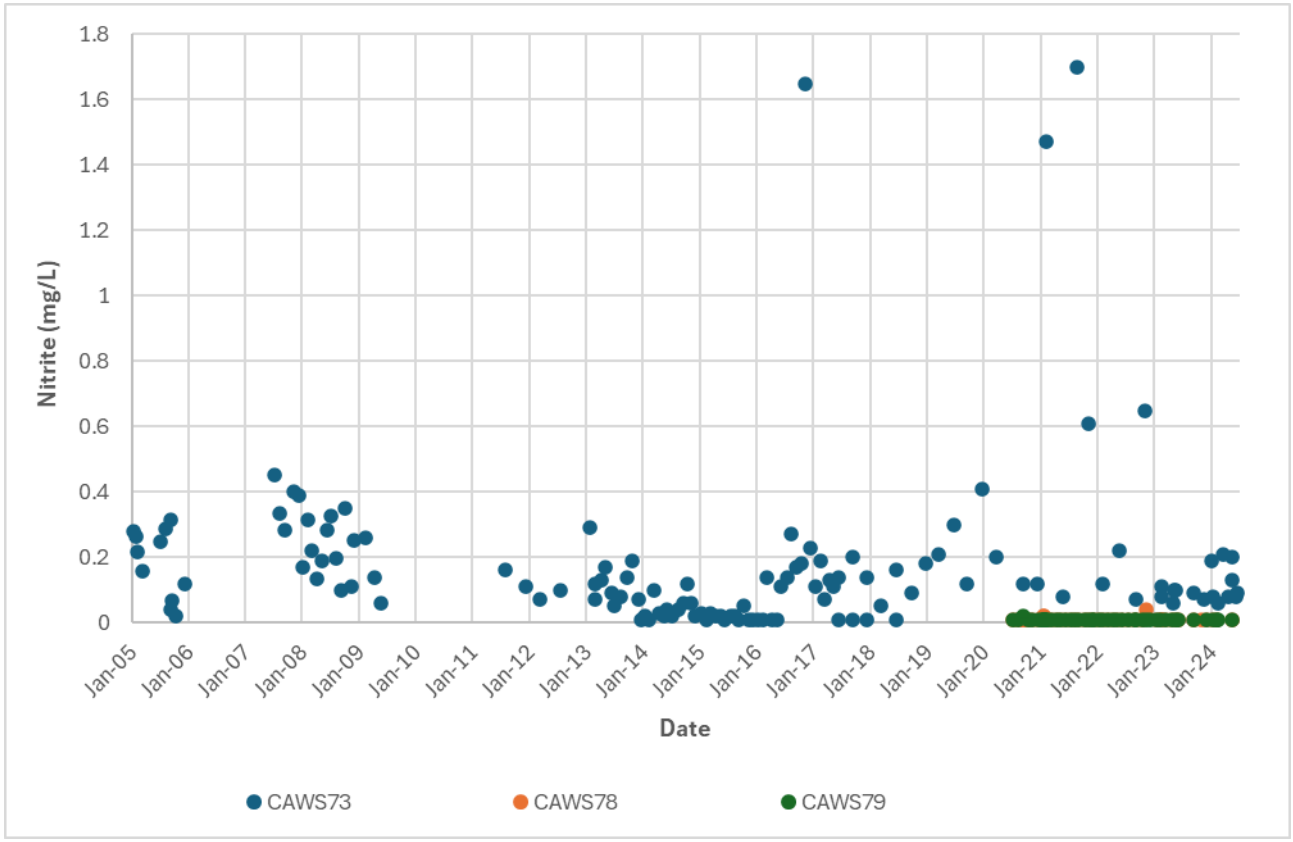

Total Suspended Solids (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
Jul-24
Date
CAWS73
CAWS78
CAWS79

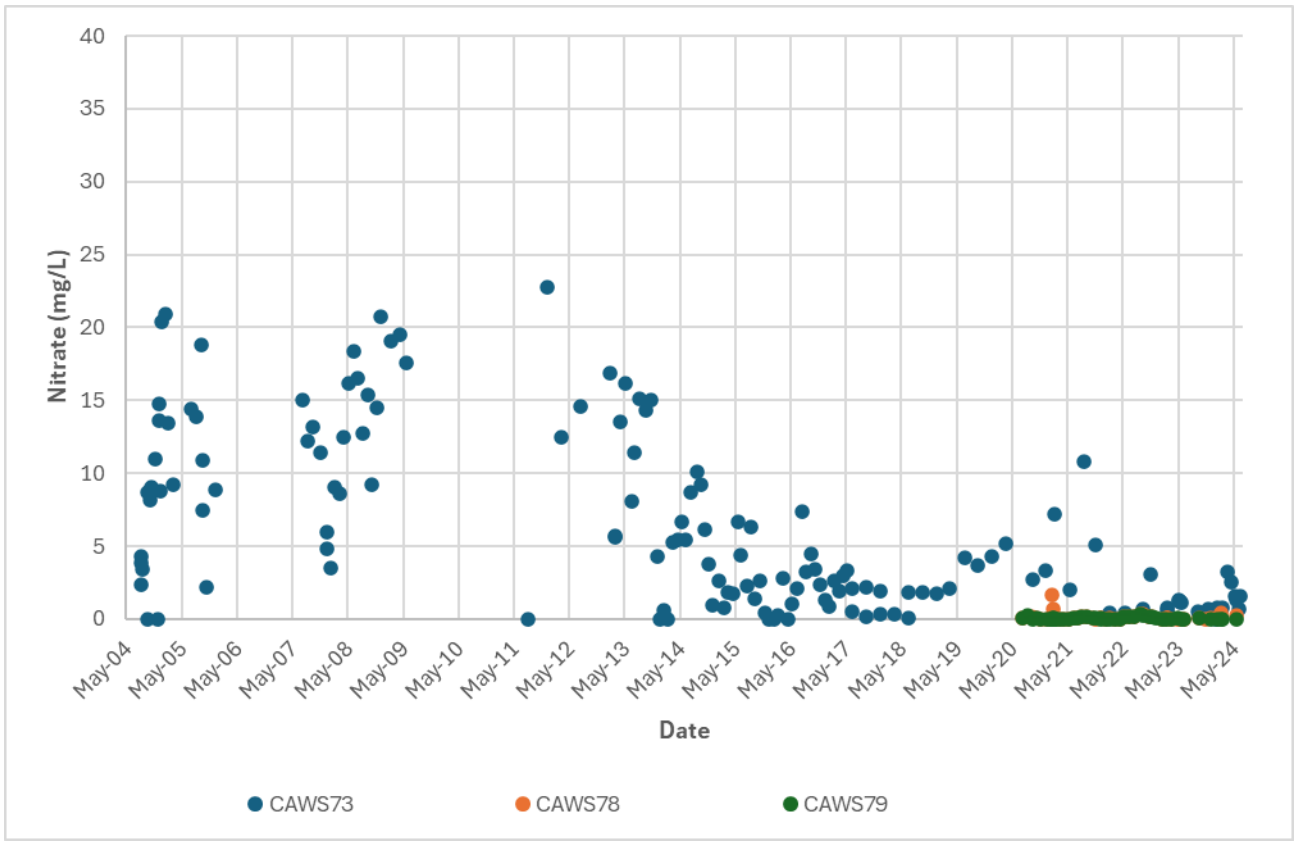

Total Dissolved Solids (mg/L)
6000
5000
4000
3000
2000
1000
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

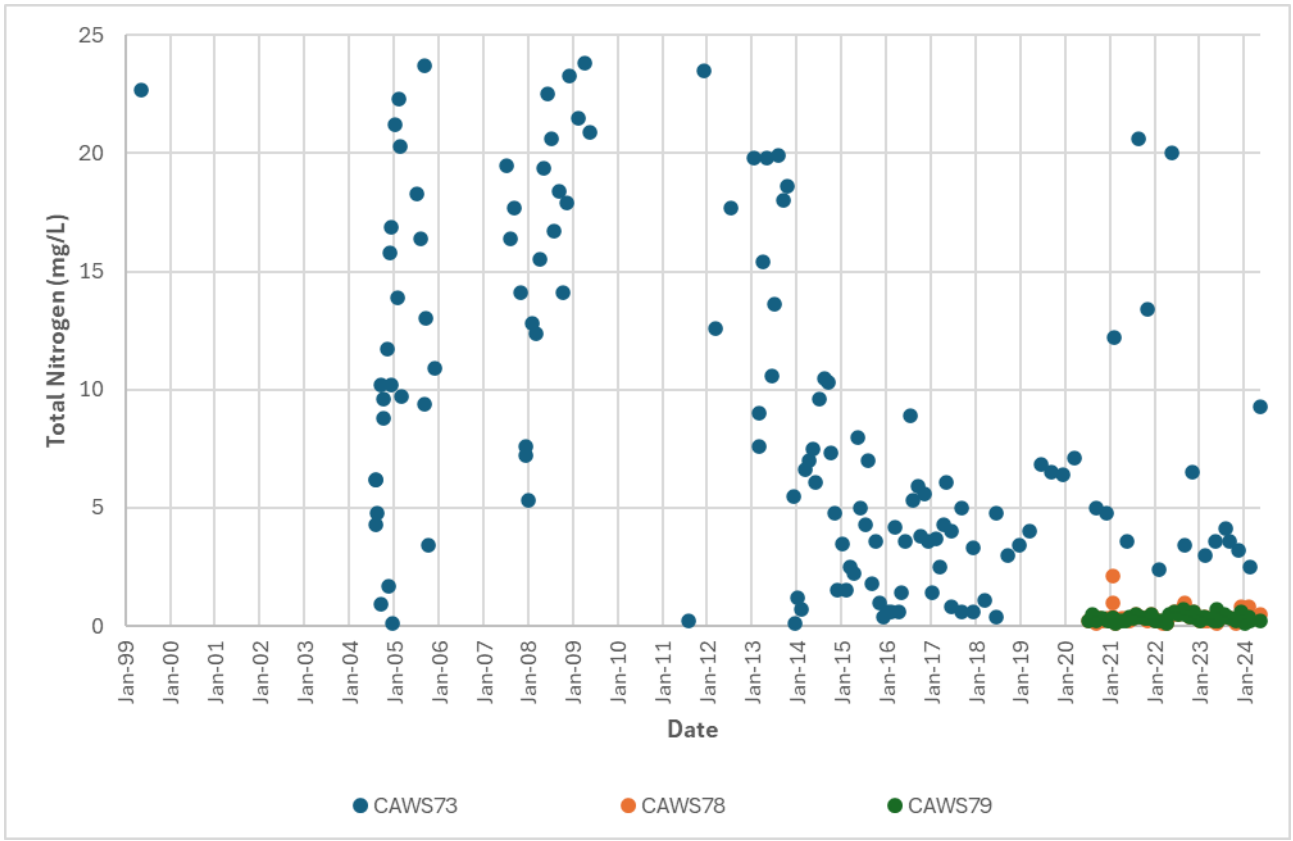

Alkalinity (mg/L)
500
450
400
350
300
250
200
150
100
50
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

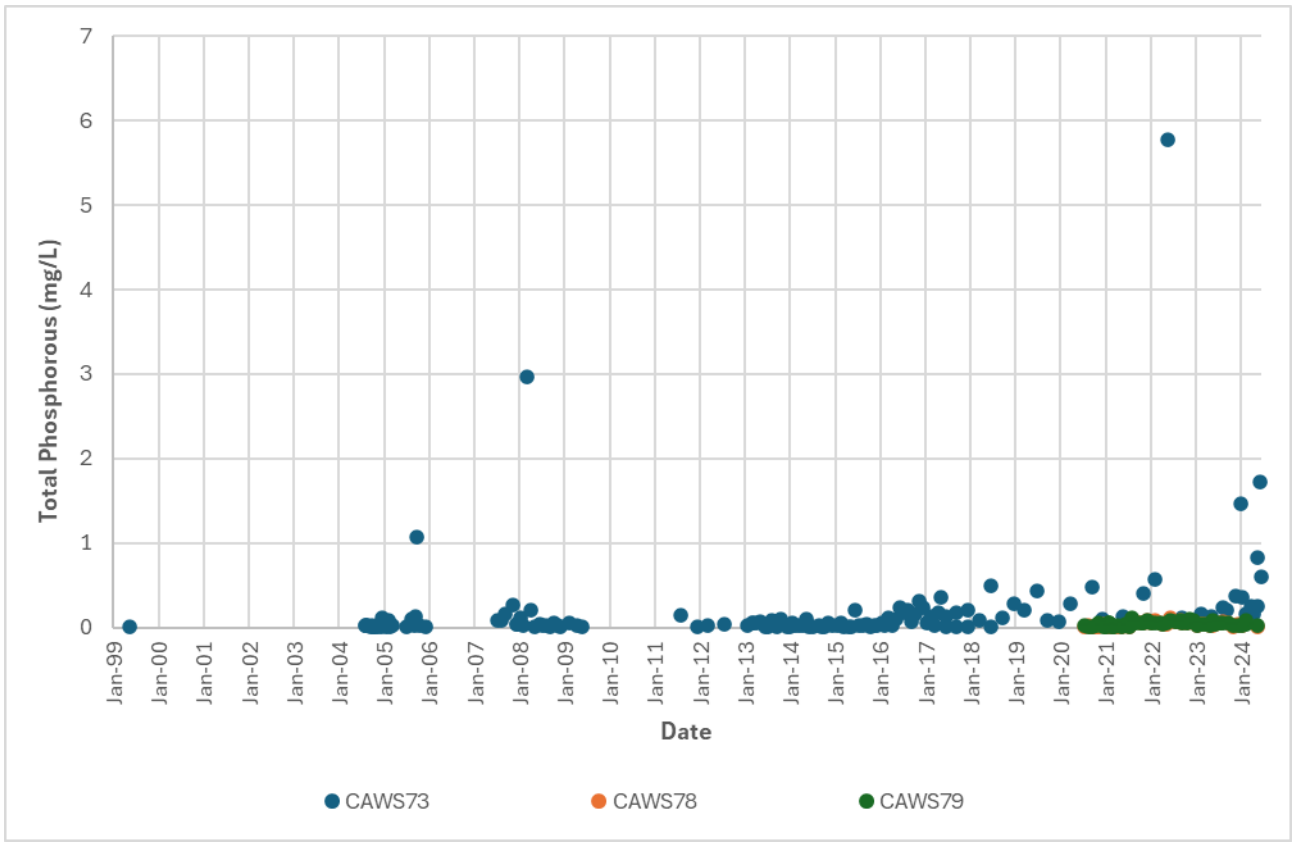


B.3.2 Nutrients

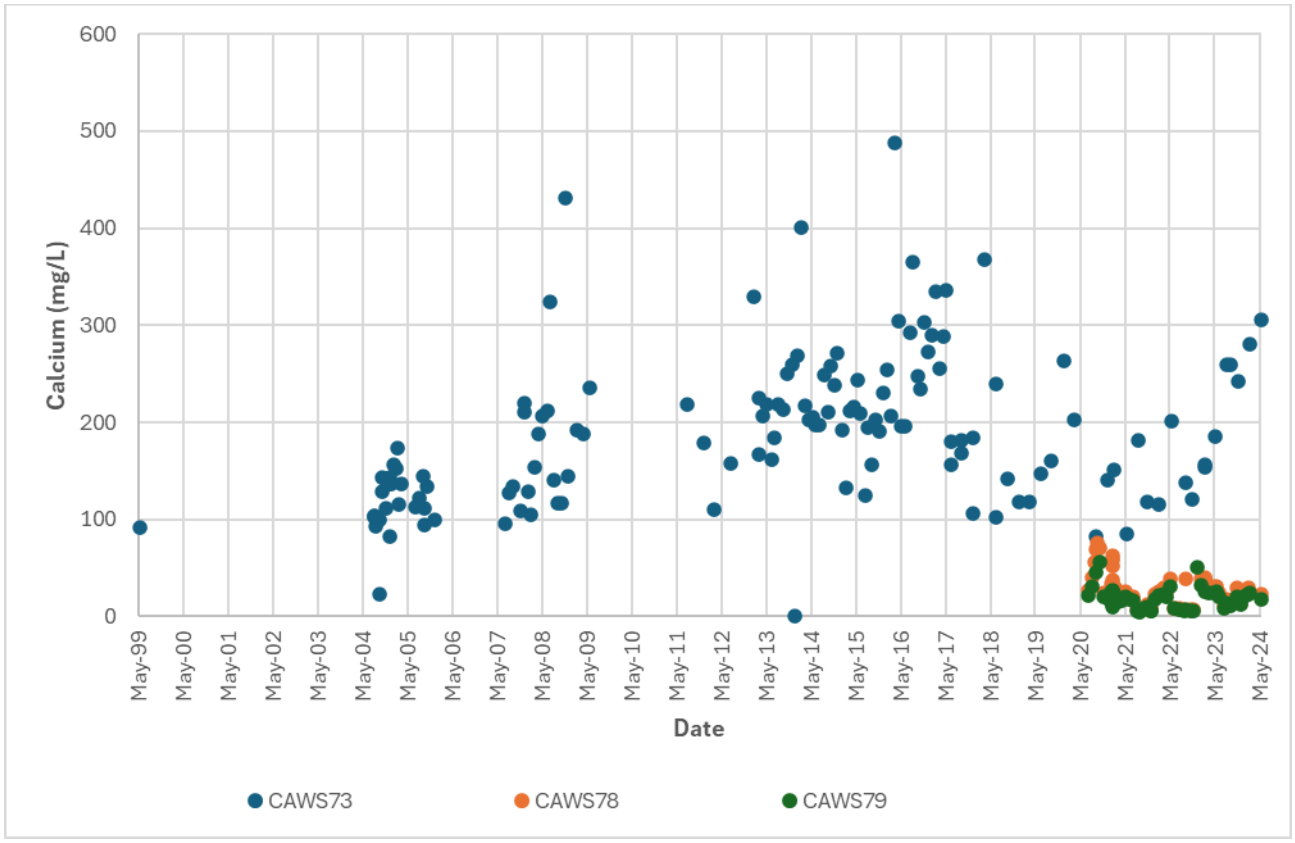


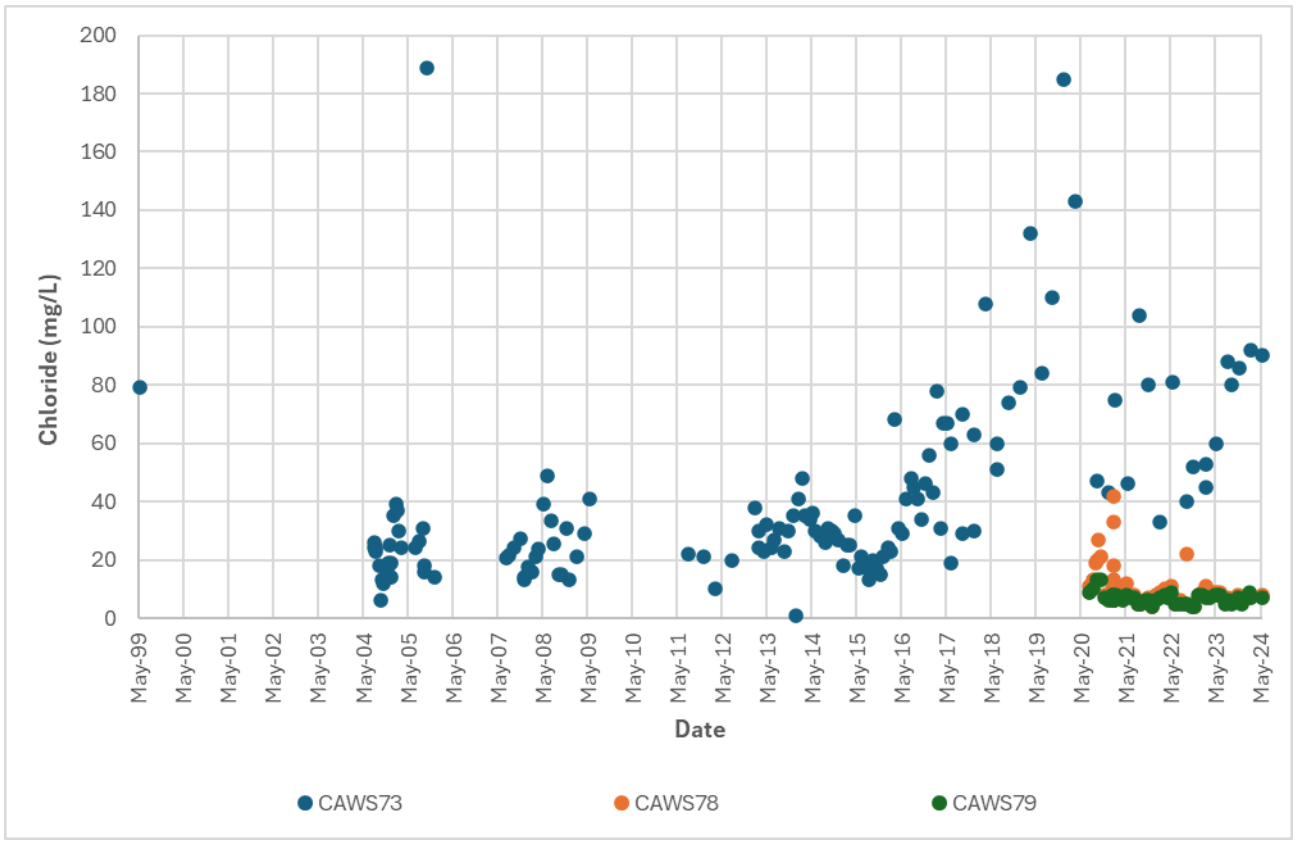

Nitrate (mg/L)
40
35
30
25
20
15
10
5
0
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

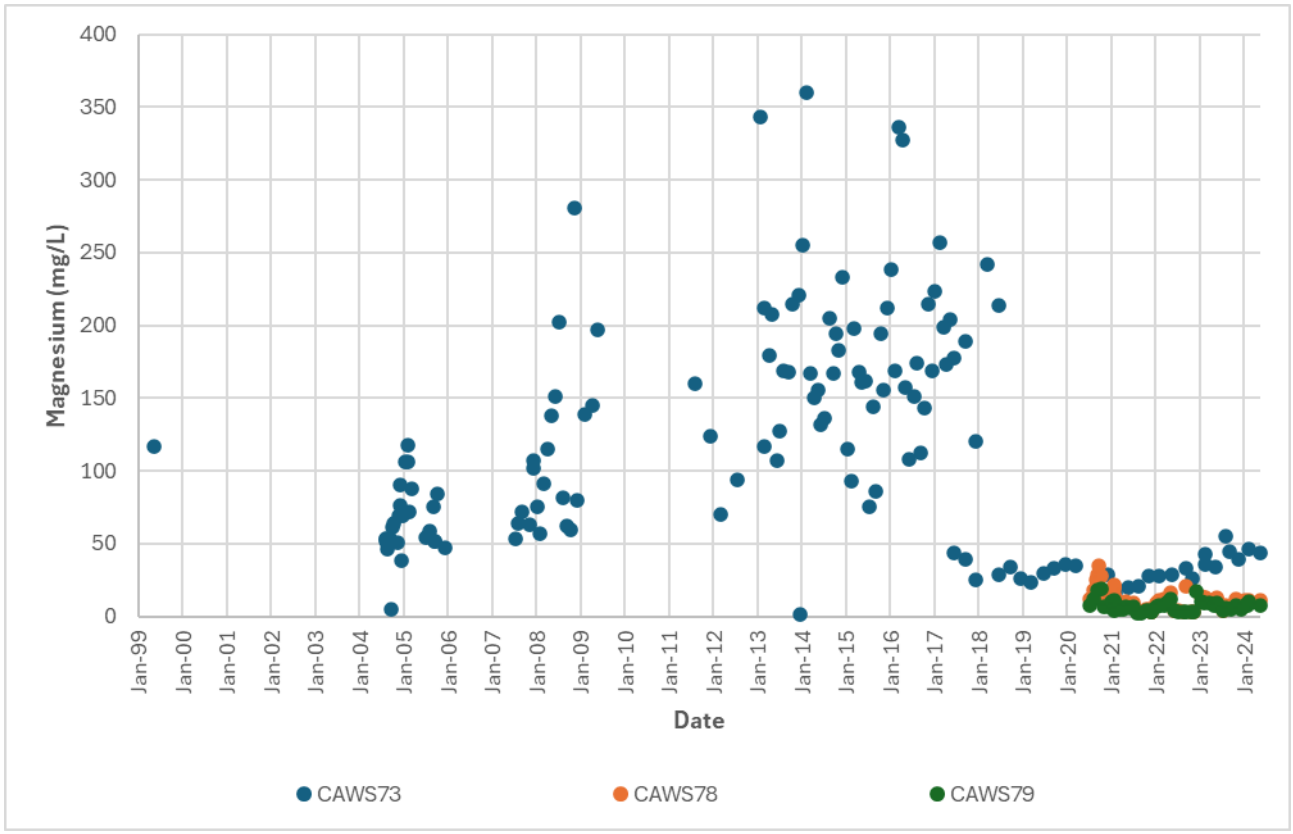

Total Nitrogen (mg/L)
25
20
15
10
5
0
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

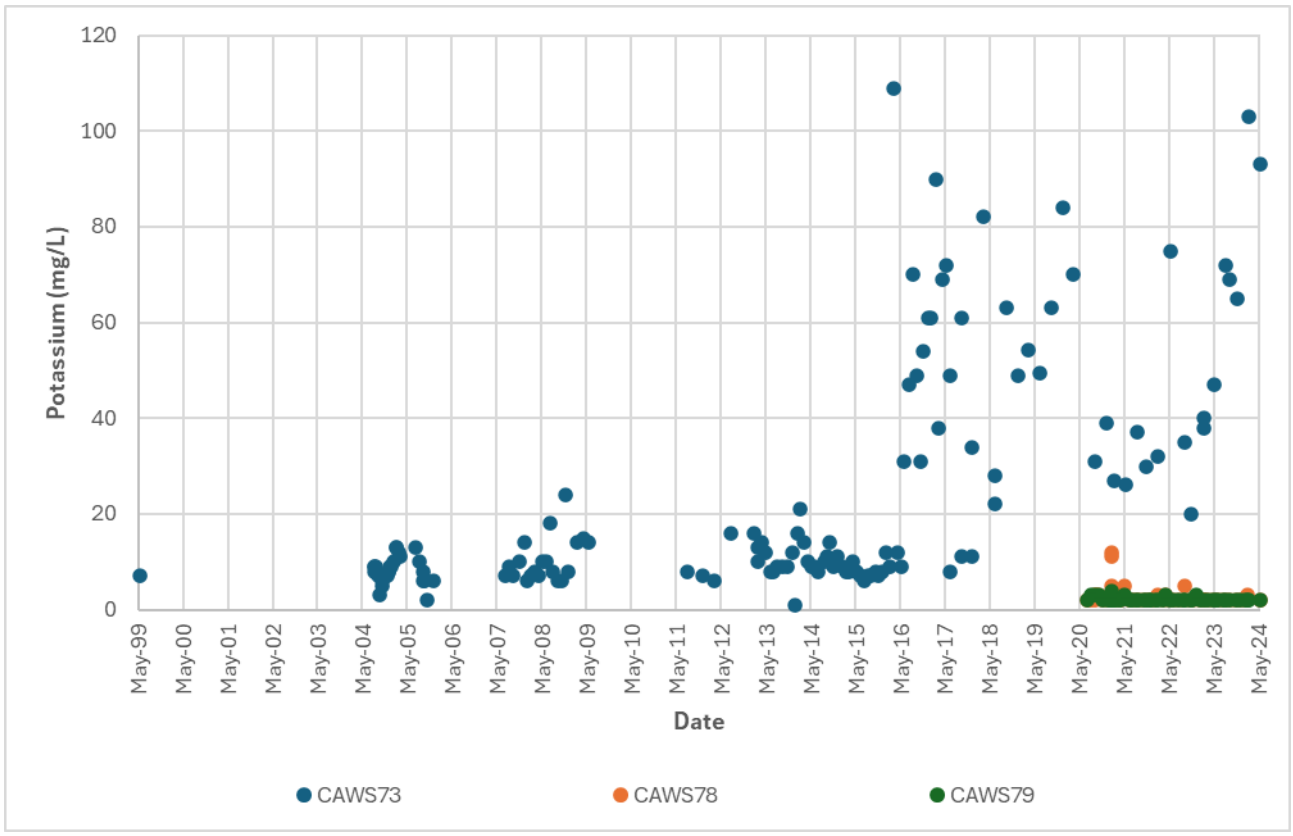


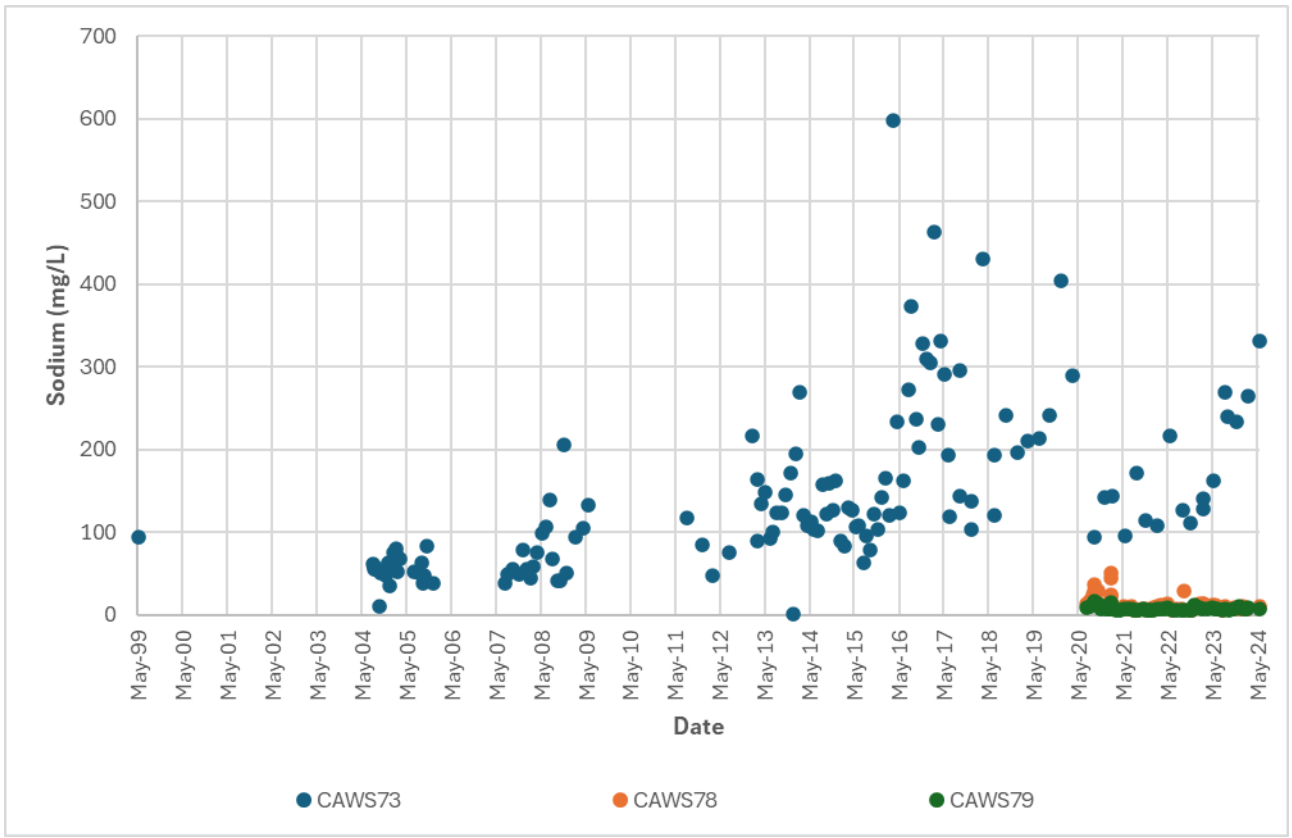
B.3.3 Major Ions

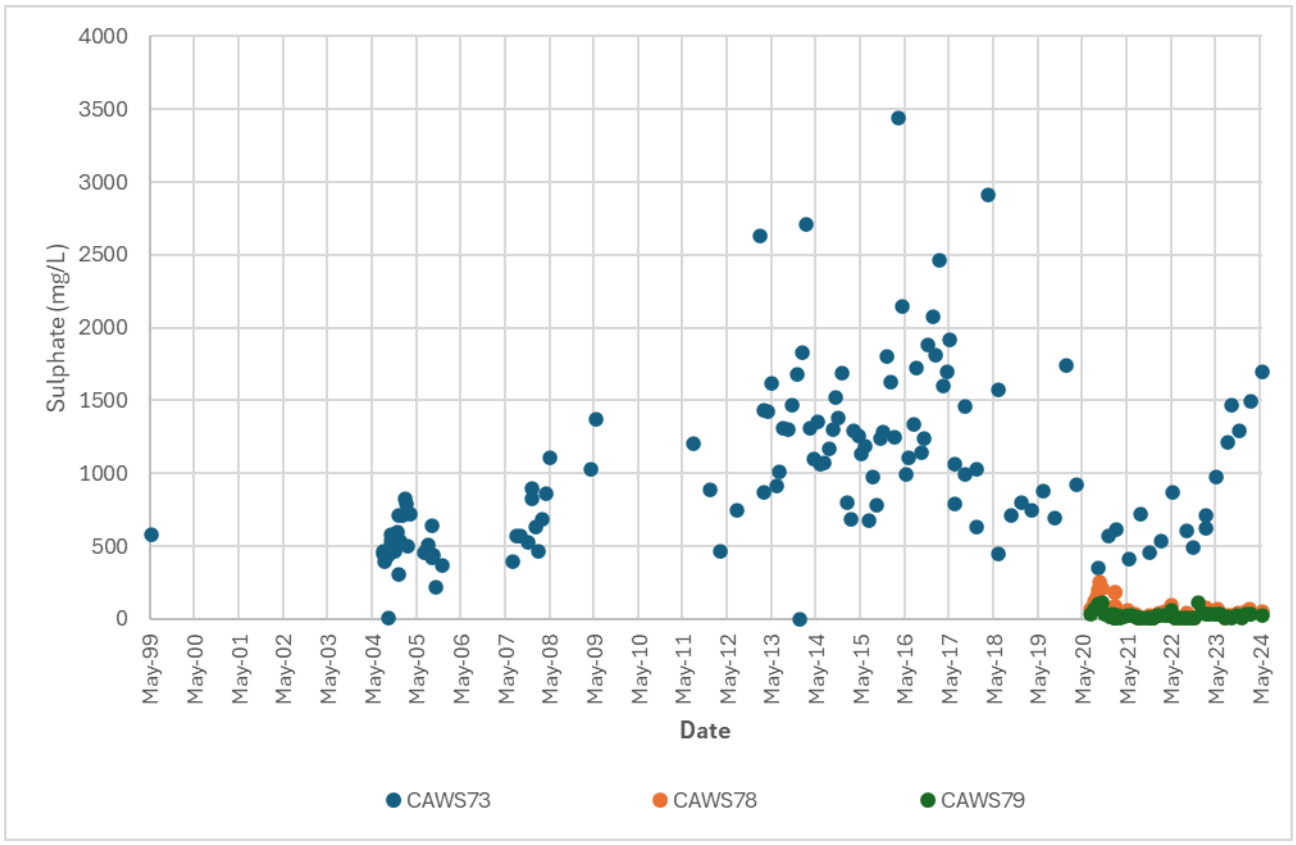



Chloride (mg/L)
200
180
160
140
120
100
80
60
40
20
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

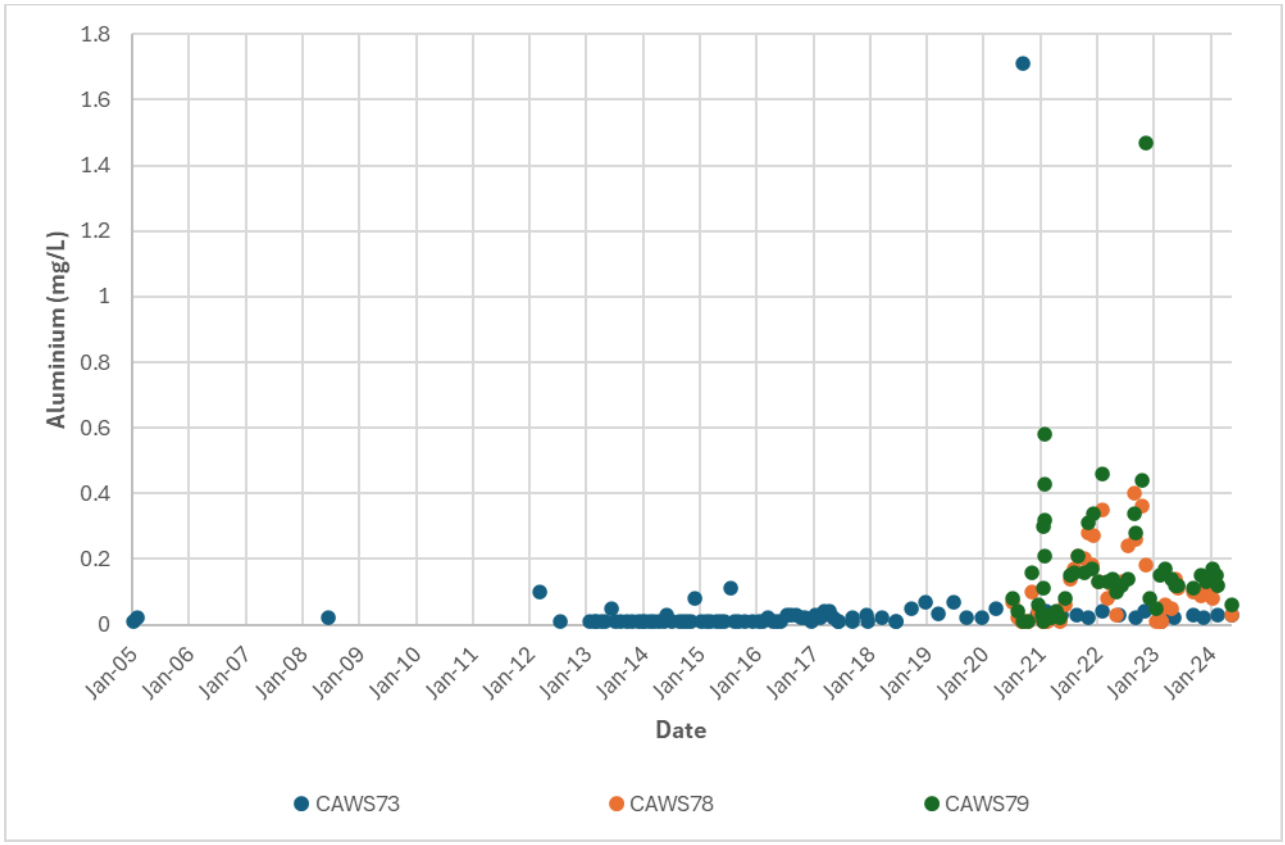

Magnesium (mg/L)
400
350
300
250
200
150
100
50
0
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
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Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

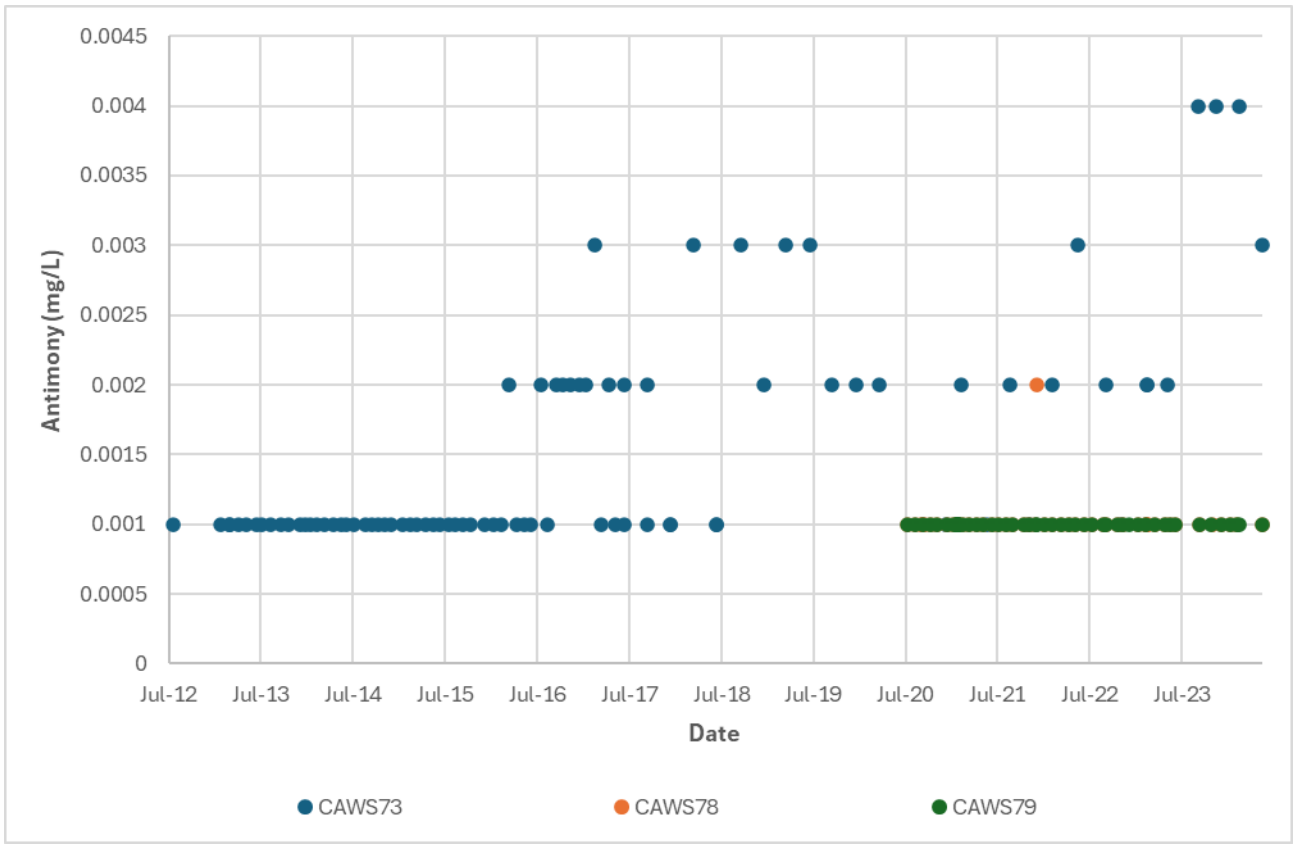

Potassium (mg/L)
120
100
80
60
40
20
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

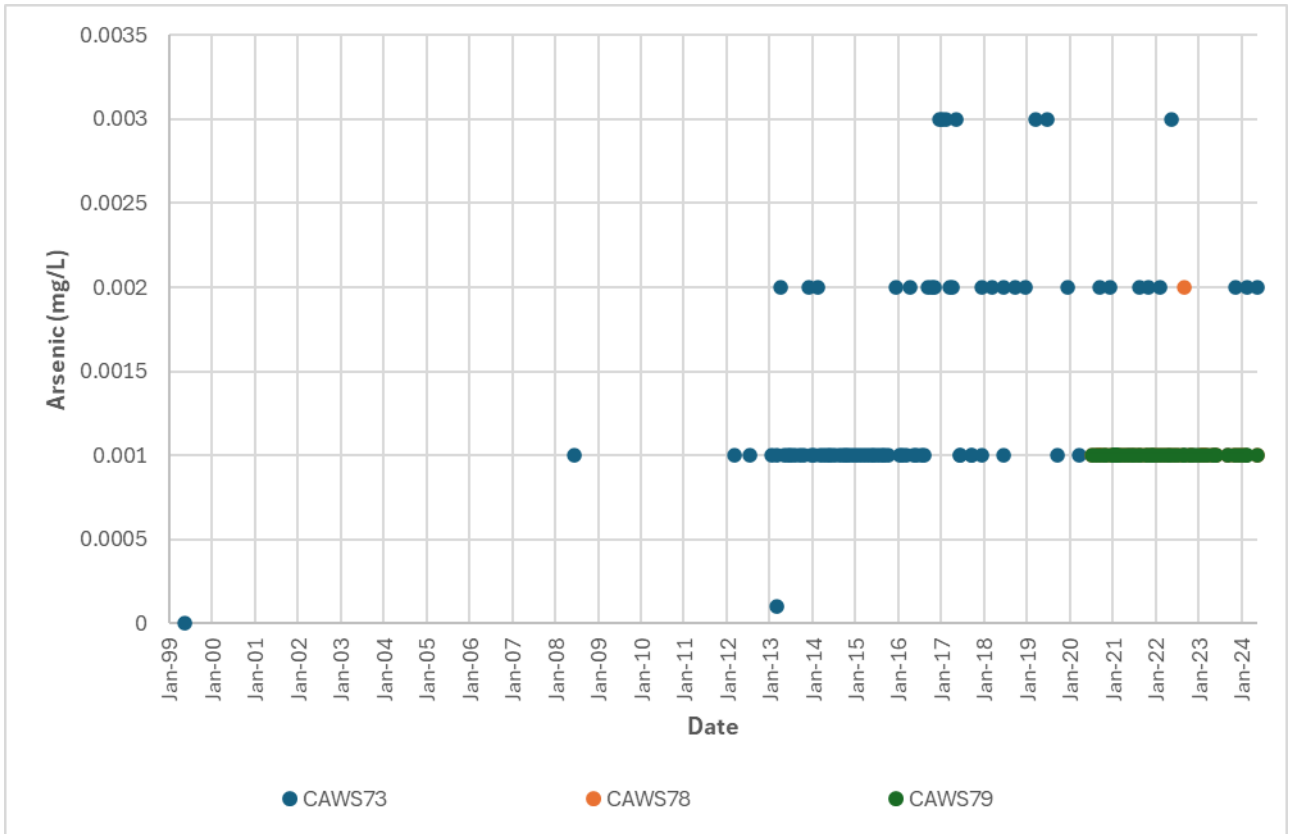

Sodium (mg/L)
700
600
500
400
300
200
100
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

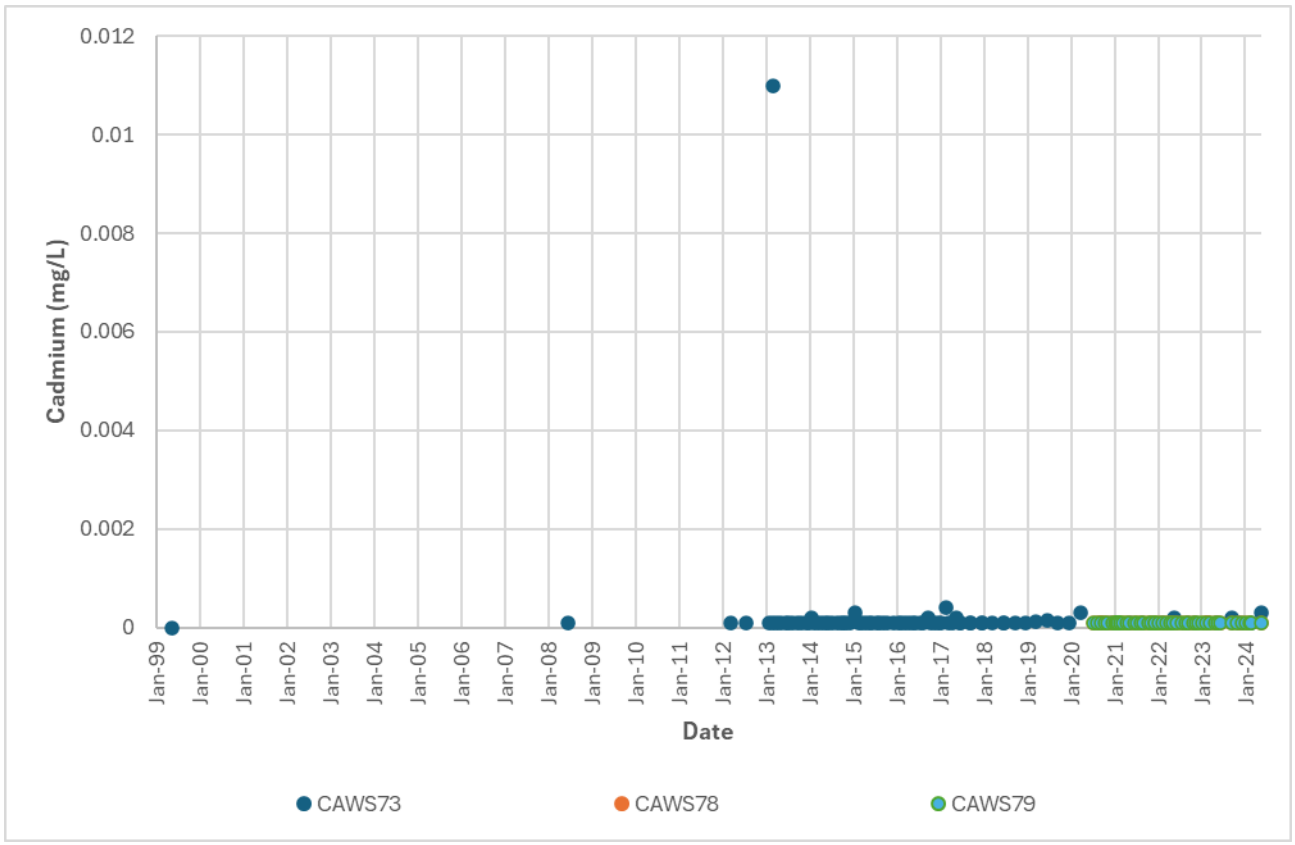


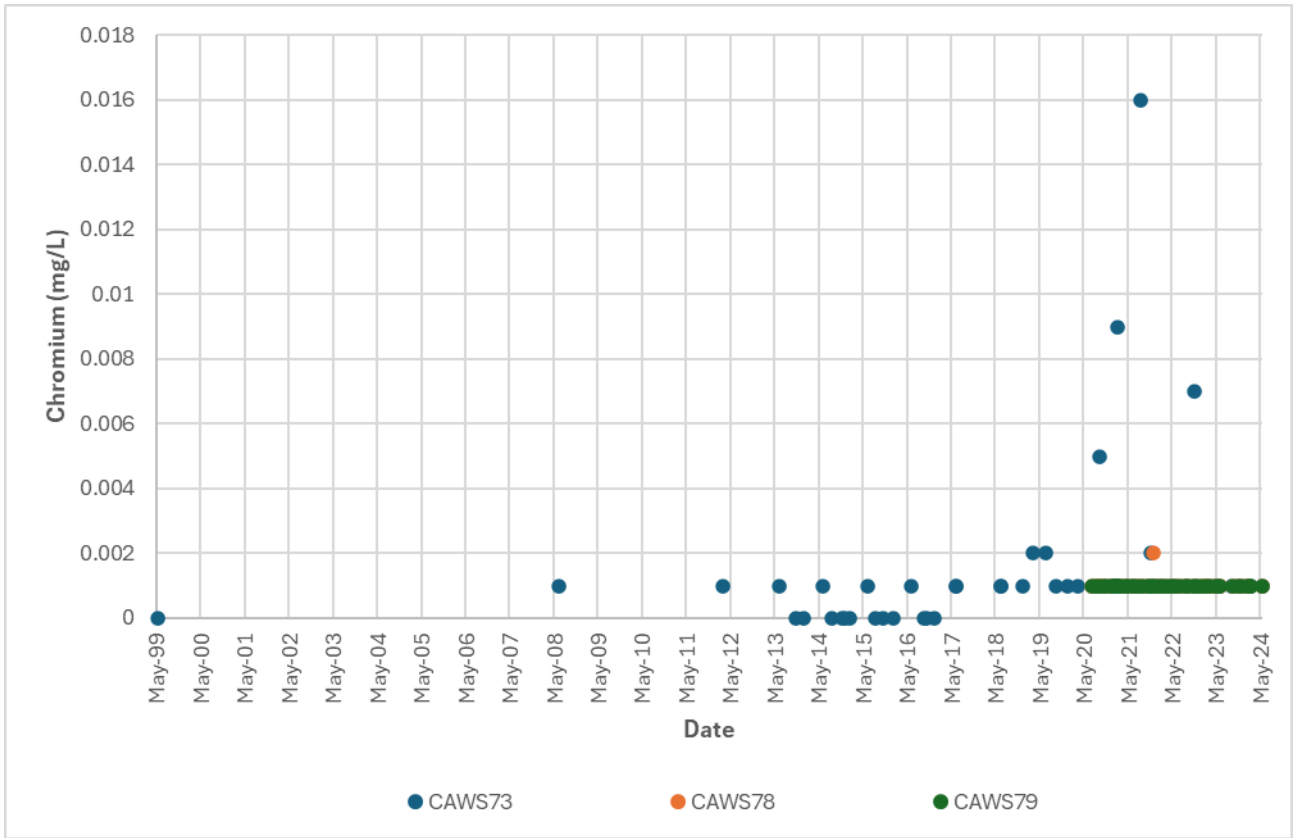
B.3.4 Dissolved Metals

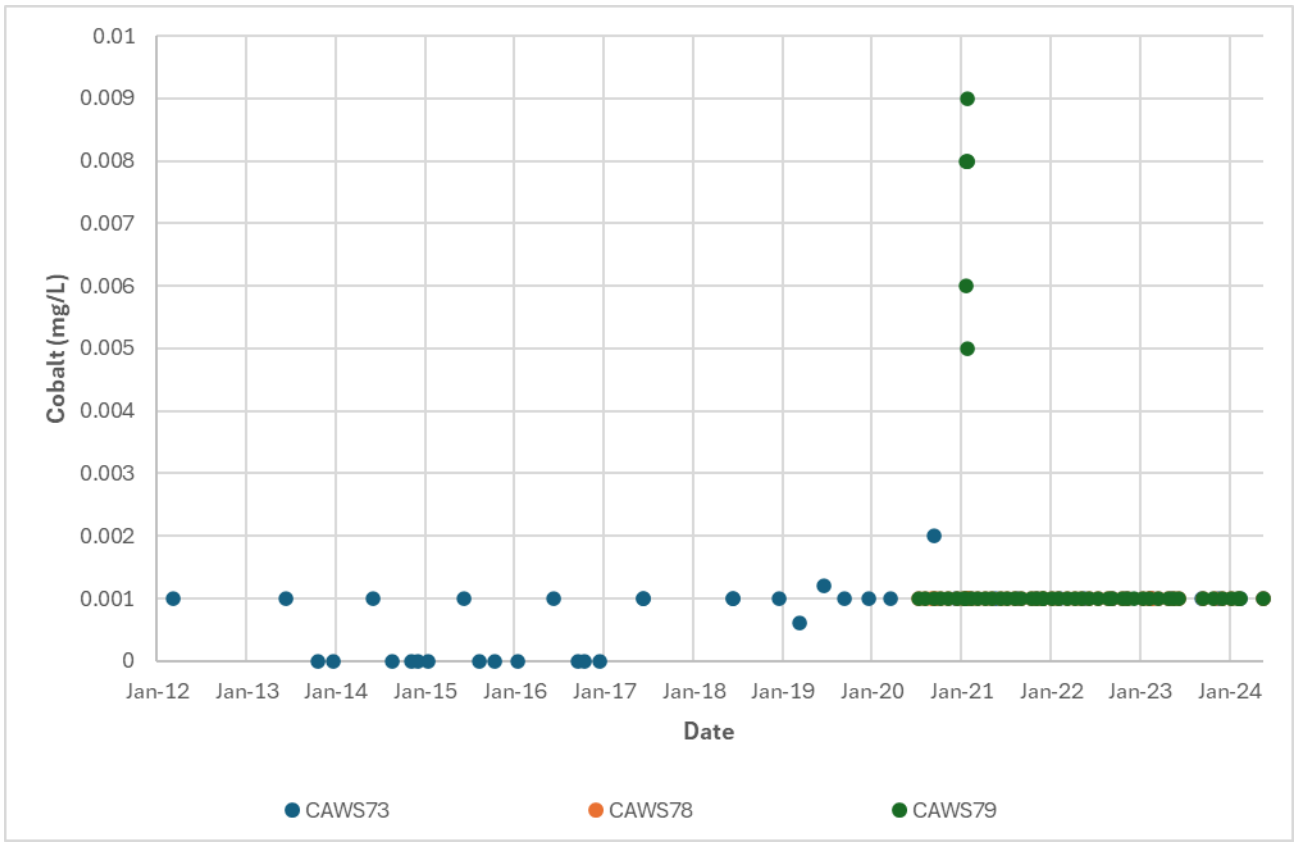


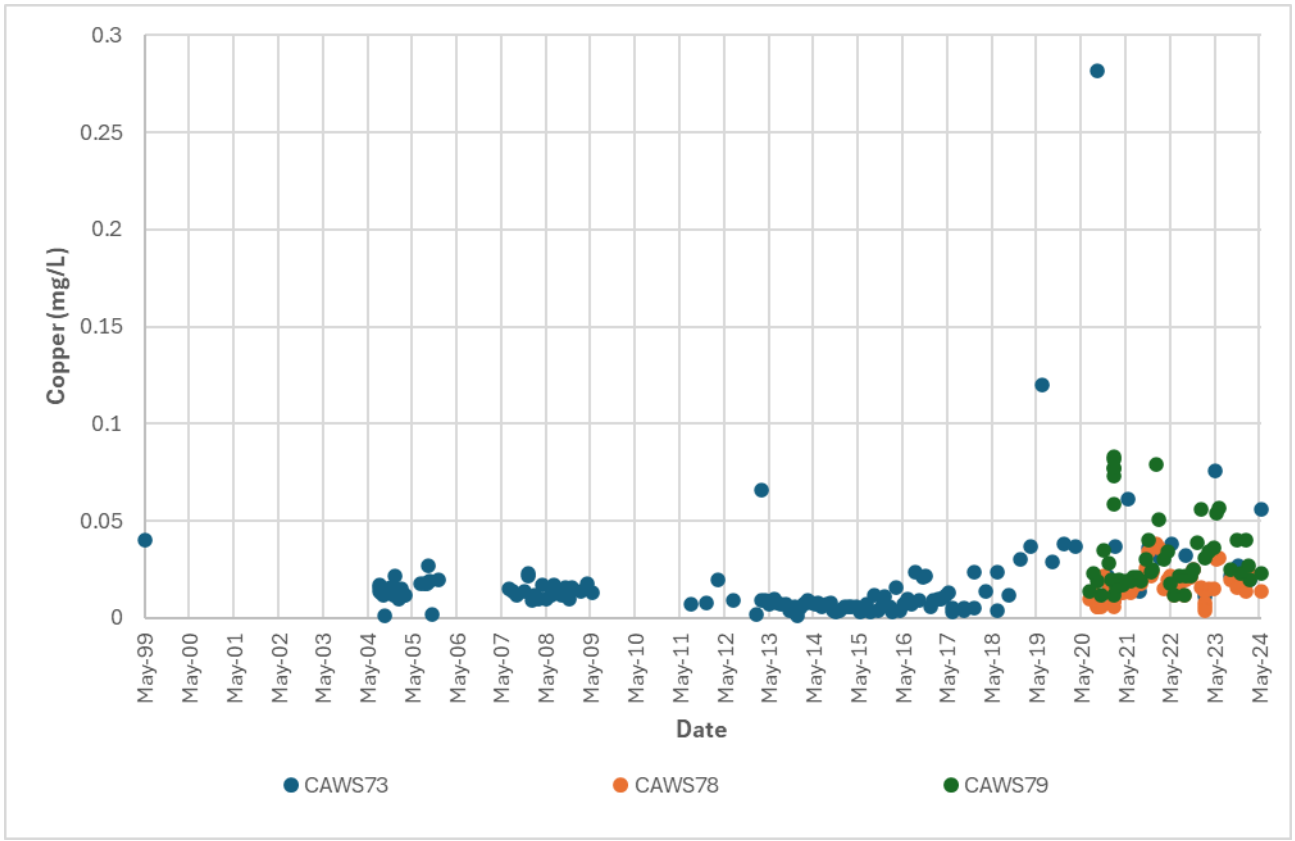

0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Antimony (mg/L)
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Date
CAWS73
CAWS78
CAWS79

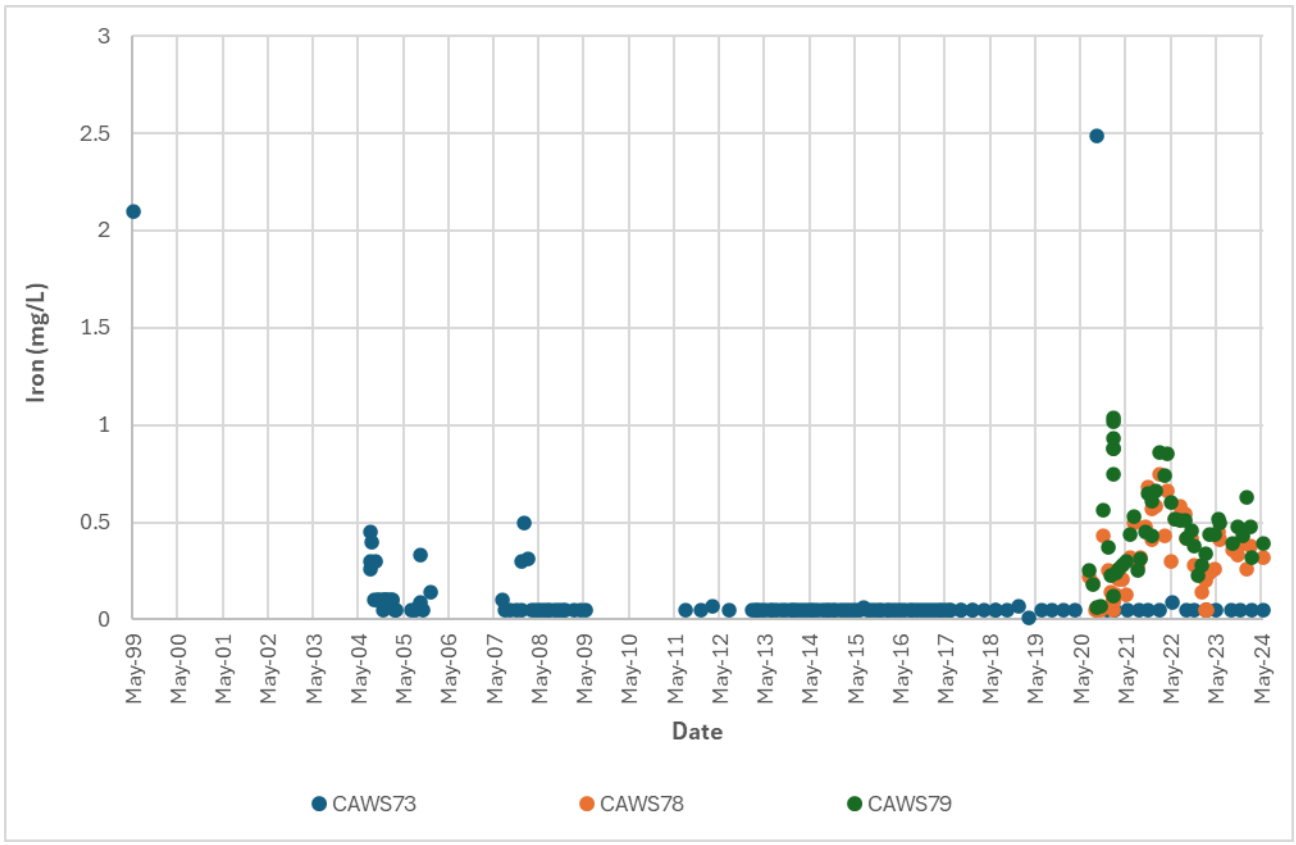

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Arsenic (mg/L)
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

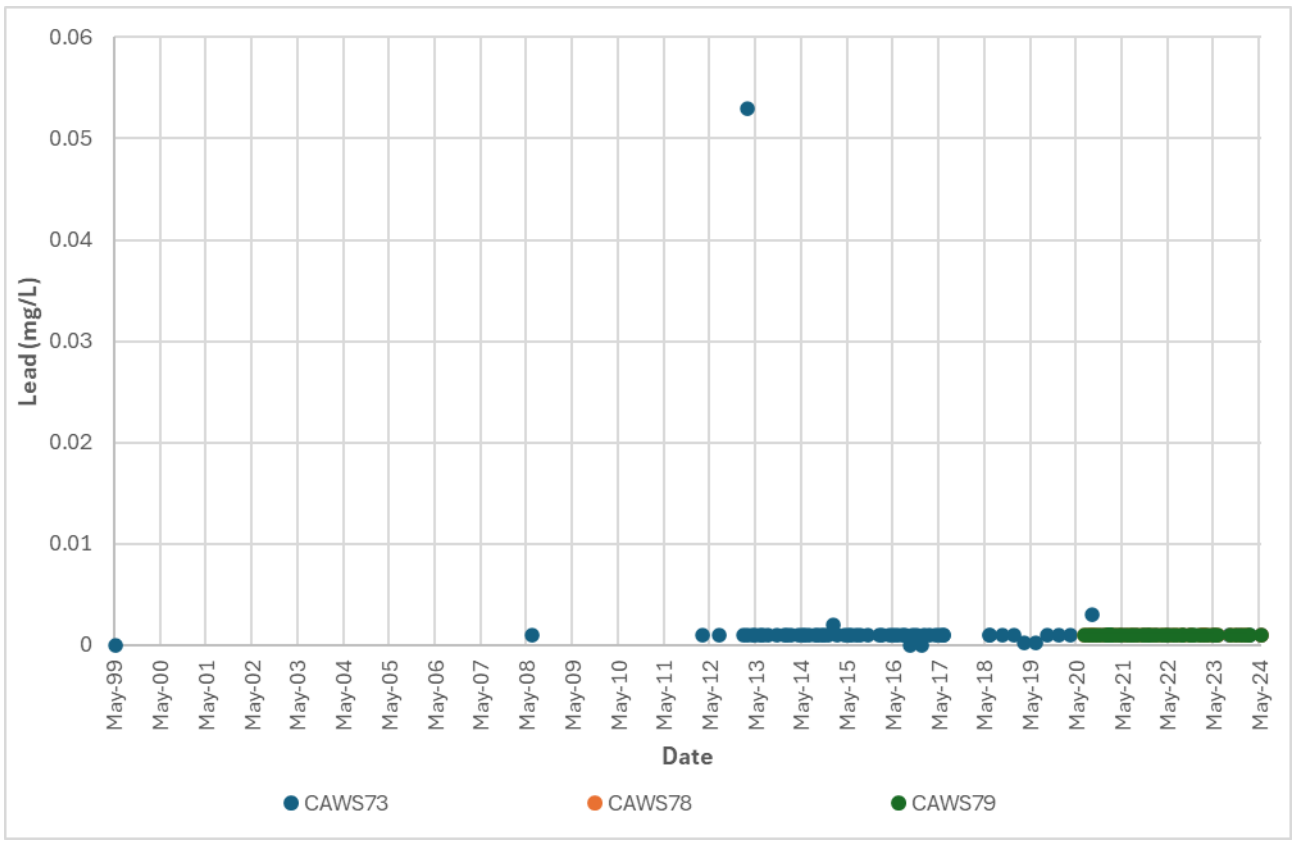

0.012
0.01
0.008
0.006
0.004
0.002
0
Cadmium (mg/L)
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

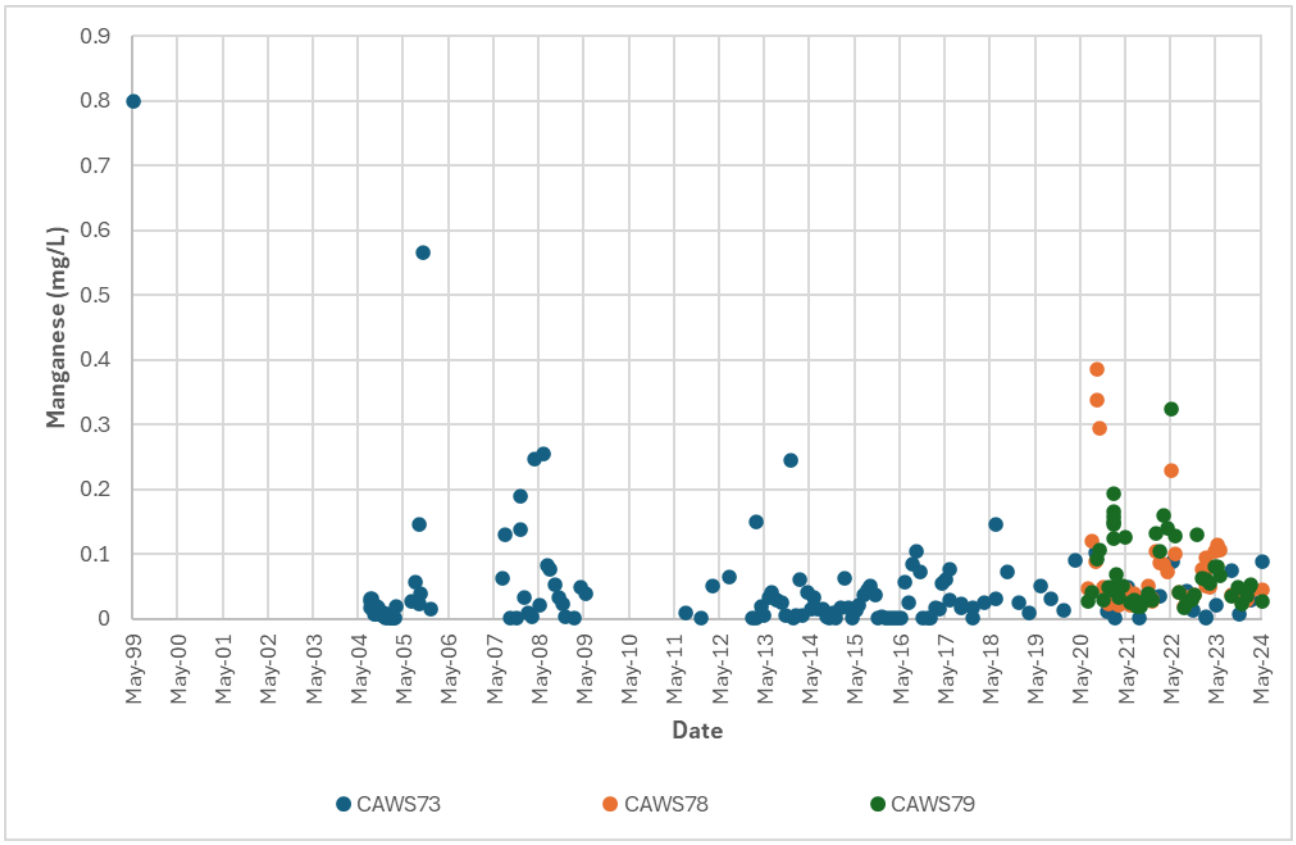

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Chromium (mg/L)
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

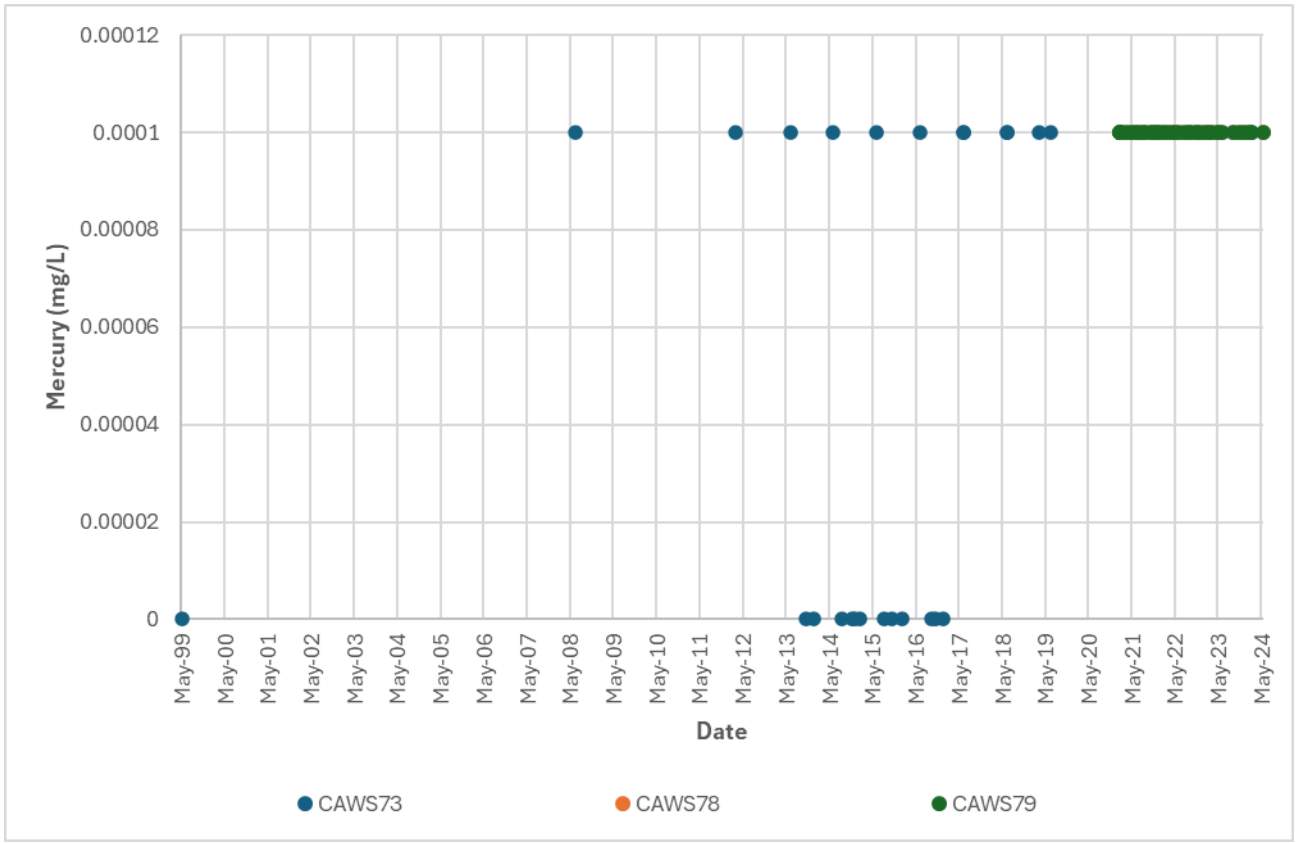

0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Cobalt (mg/L)
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS73
CAWS78
CAWS79

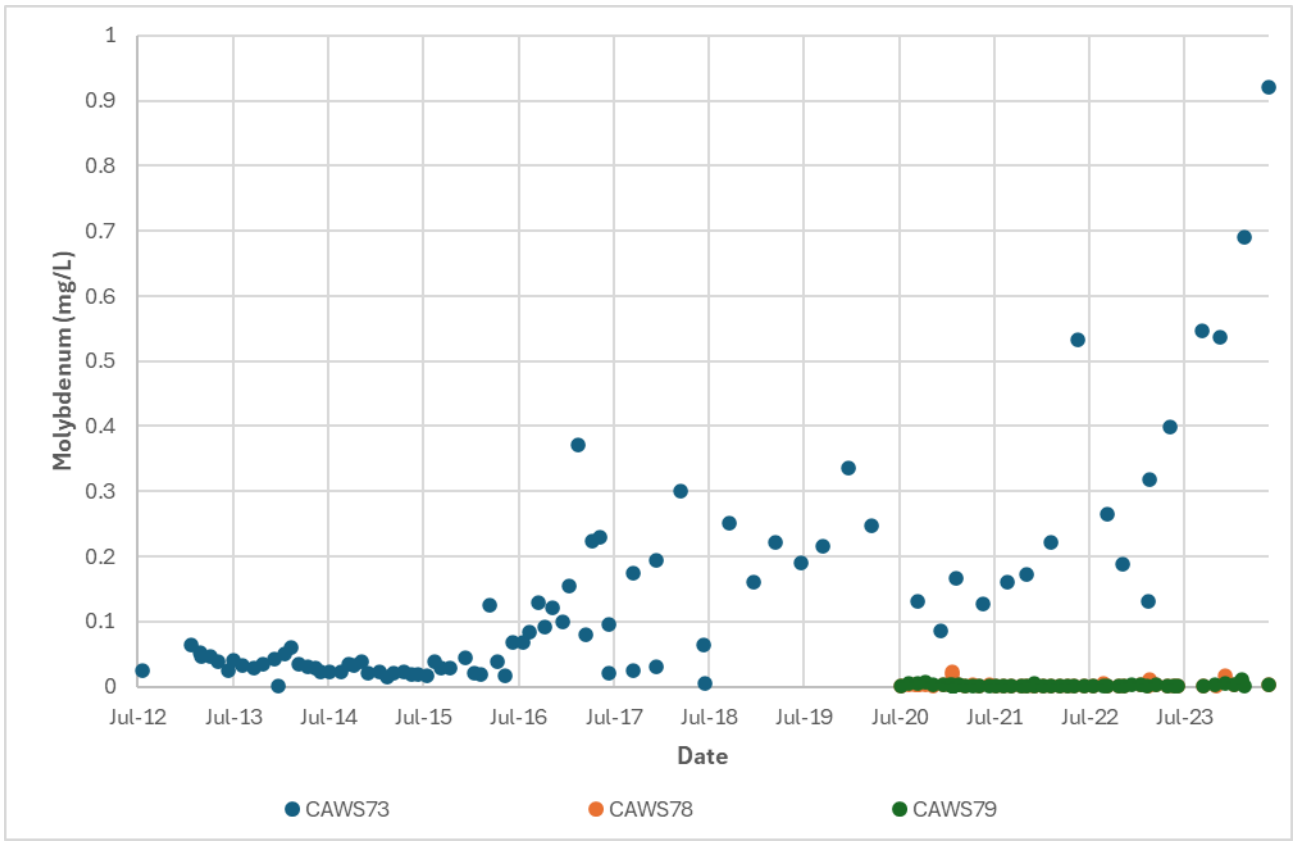

0.3
0.25
0.2
0.15
0.1
0.05
0
Copper (mg/L)
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

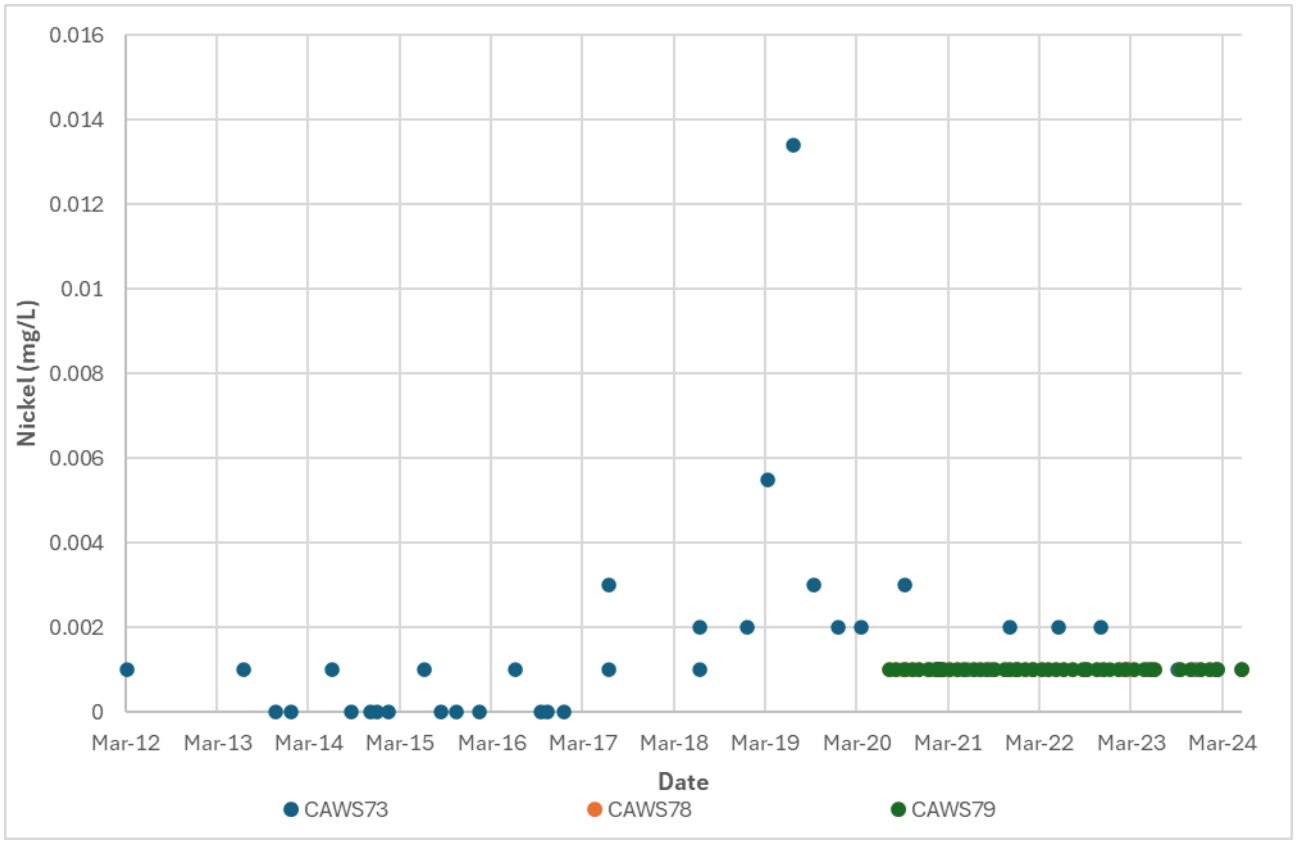

Iron (mg/L)
3
2.5
2
1.5
1
0.5
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

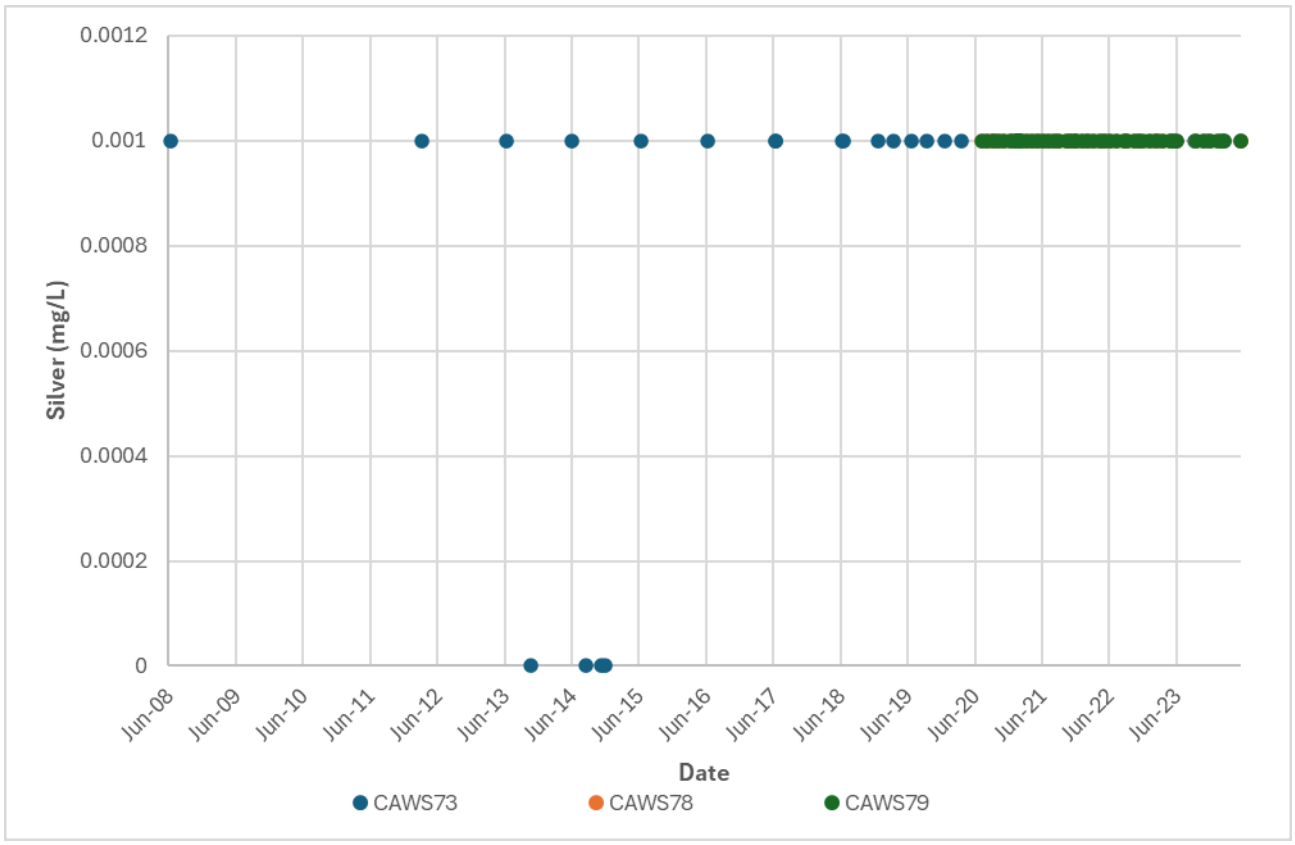

Lead (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

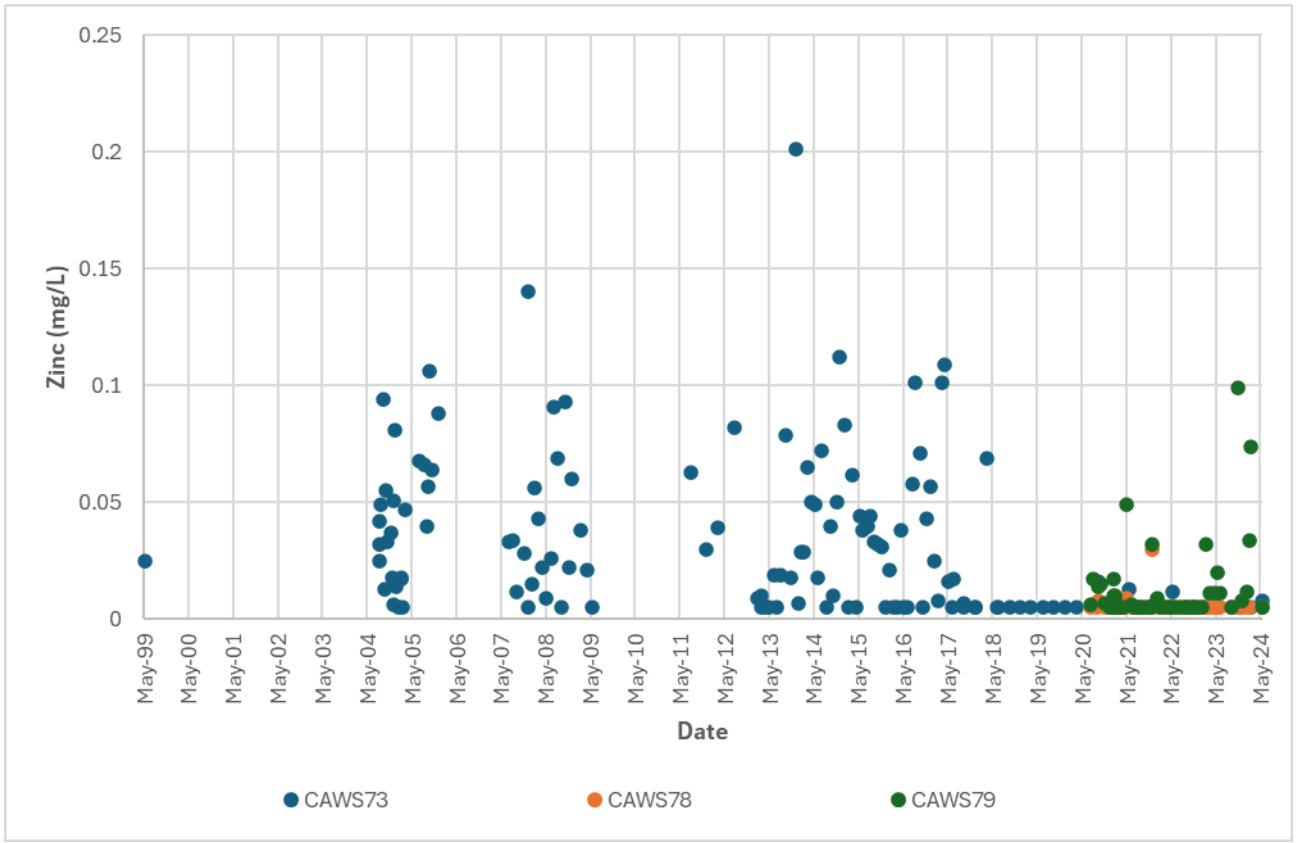

Manganese (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79


Mercury (mg/L)
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79


Molybdenum (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Date
CAWS73
CAWS78
CAWS79

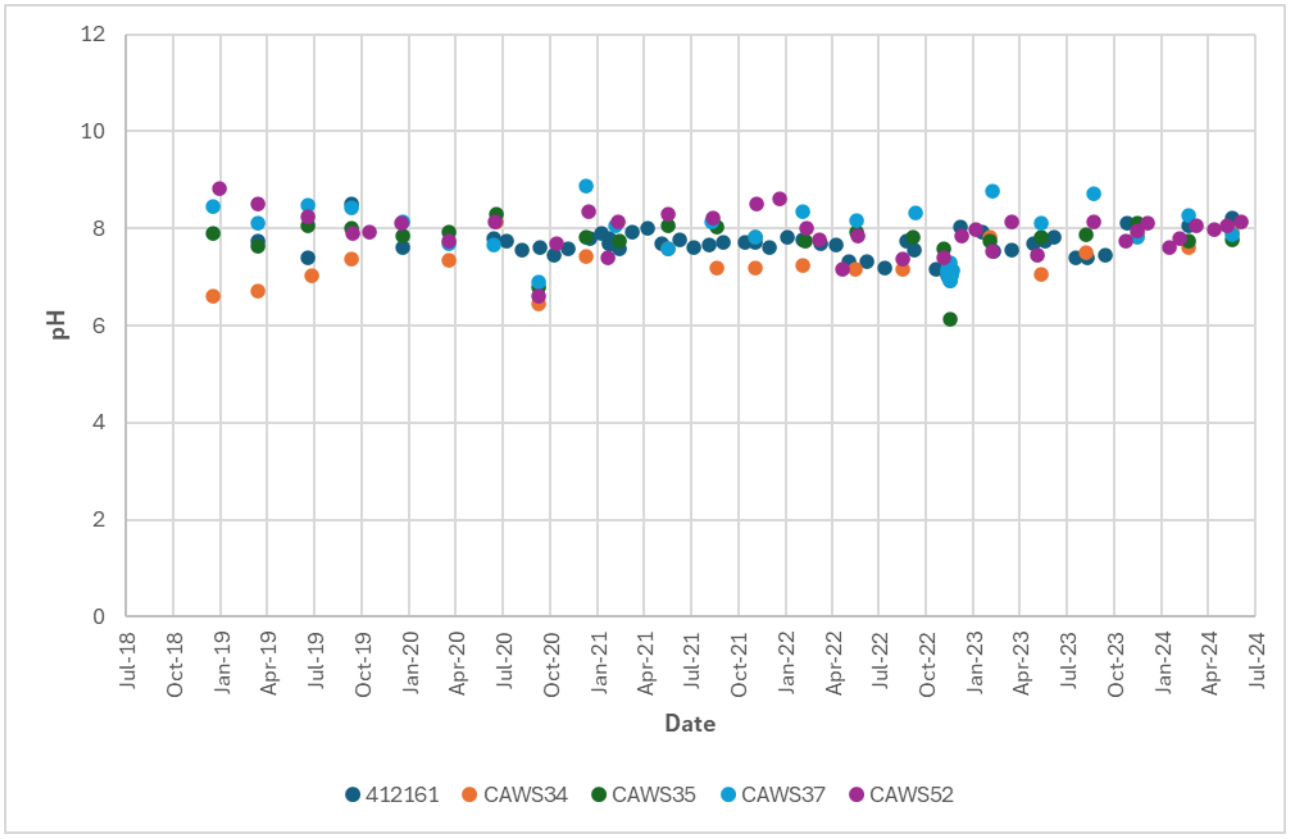

Nickel (mg/L)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
CAWS73
CAWS78
CAWS79

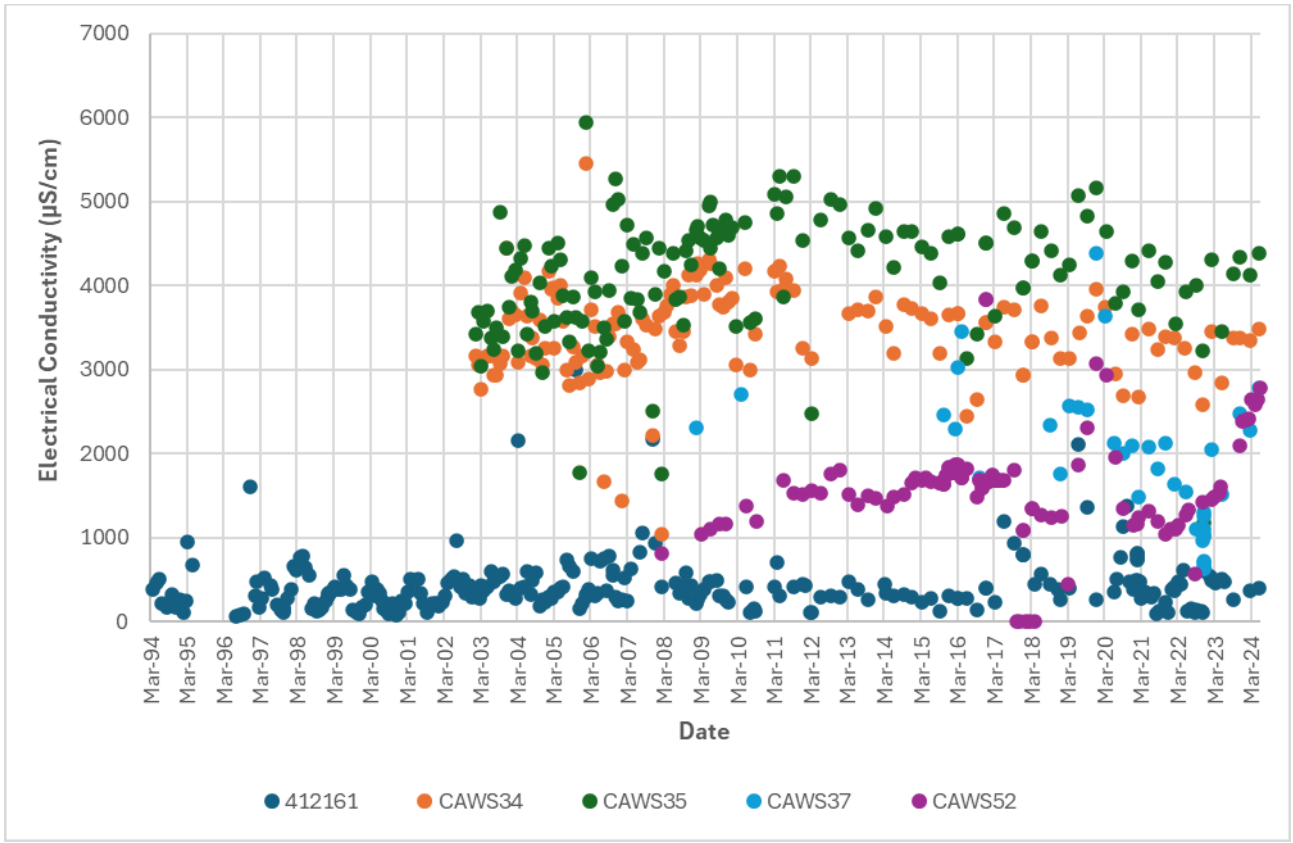

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS73
CAWS78
CAWS79

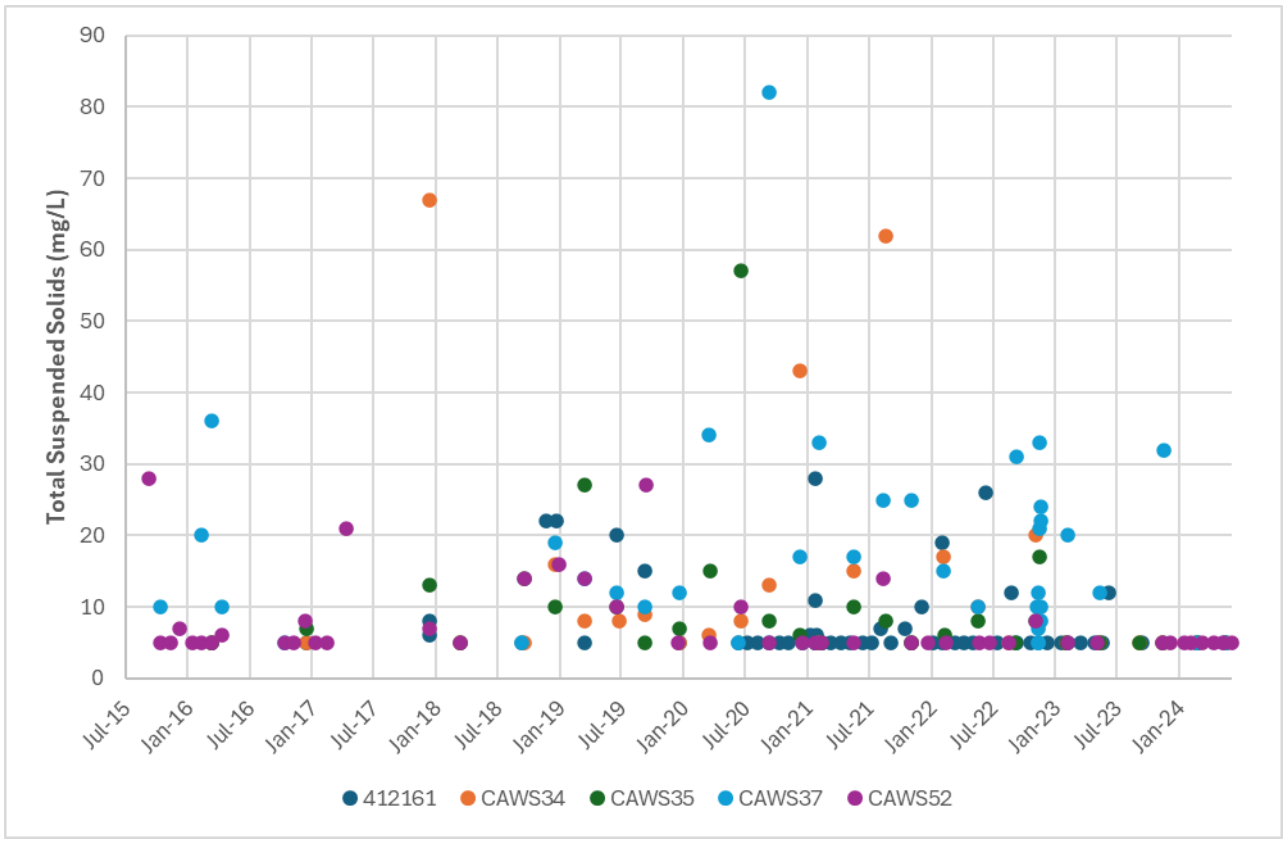

0.25
0.2
0.15
0.1
0.05
0
Zinc (mg/L)
May-99
May-00
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
CAWS73
CAWS78
CAWS79

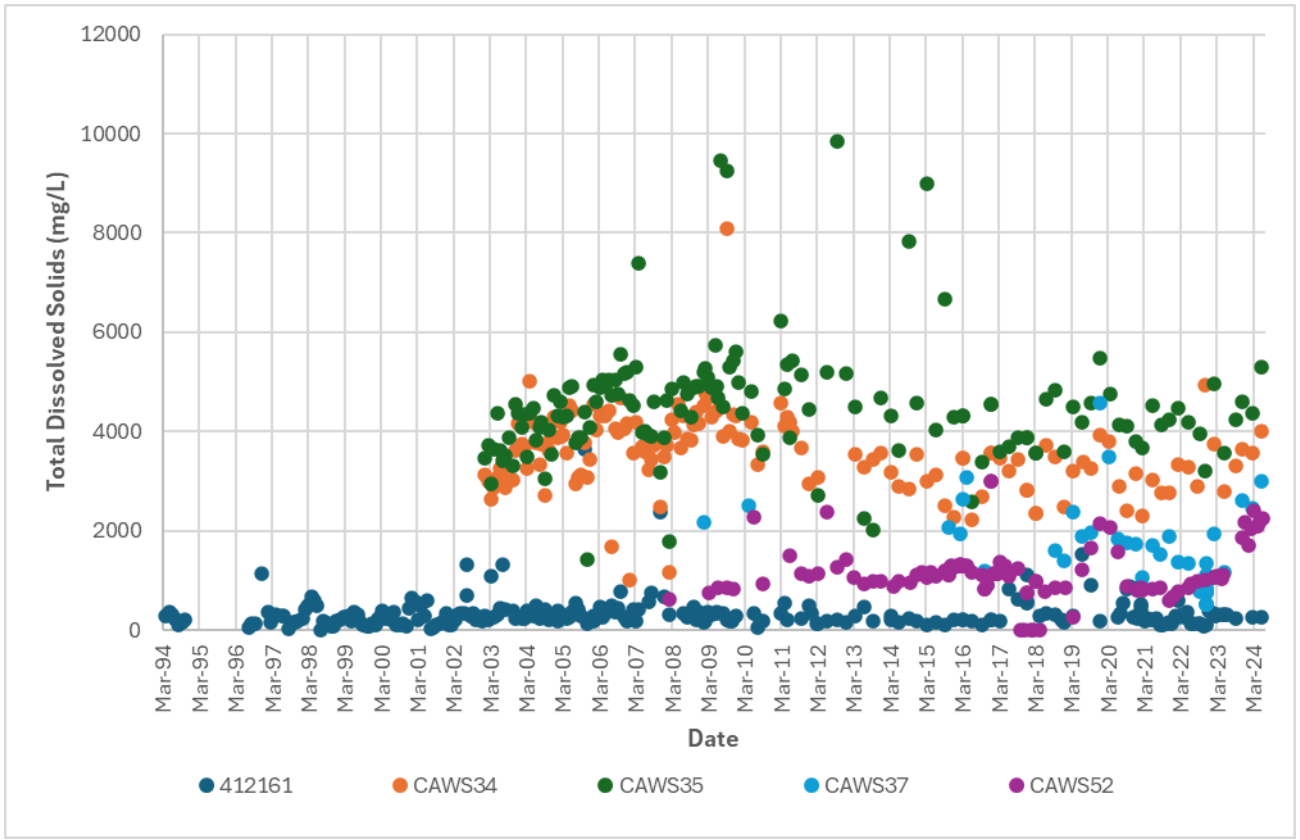
B.4 Waste Rock Dumps

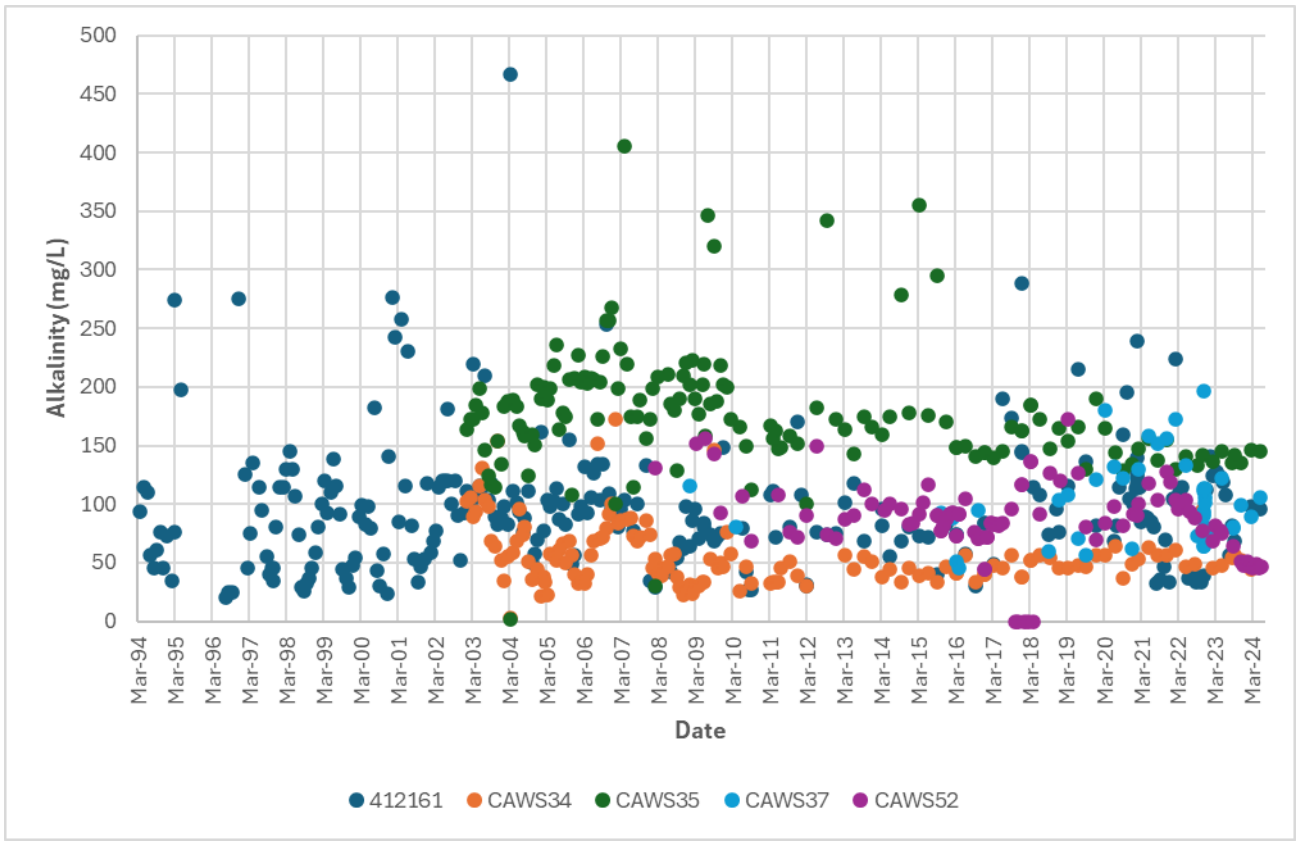
B.4.1 Physiochemical Parameters

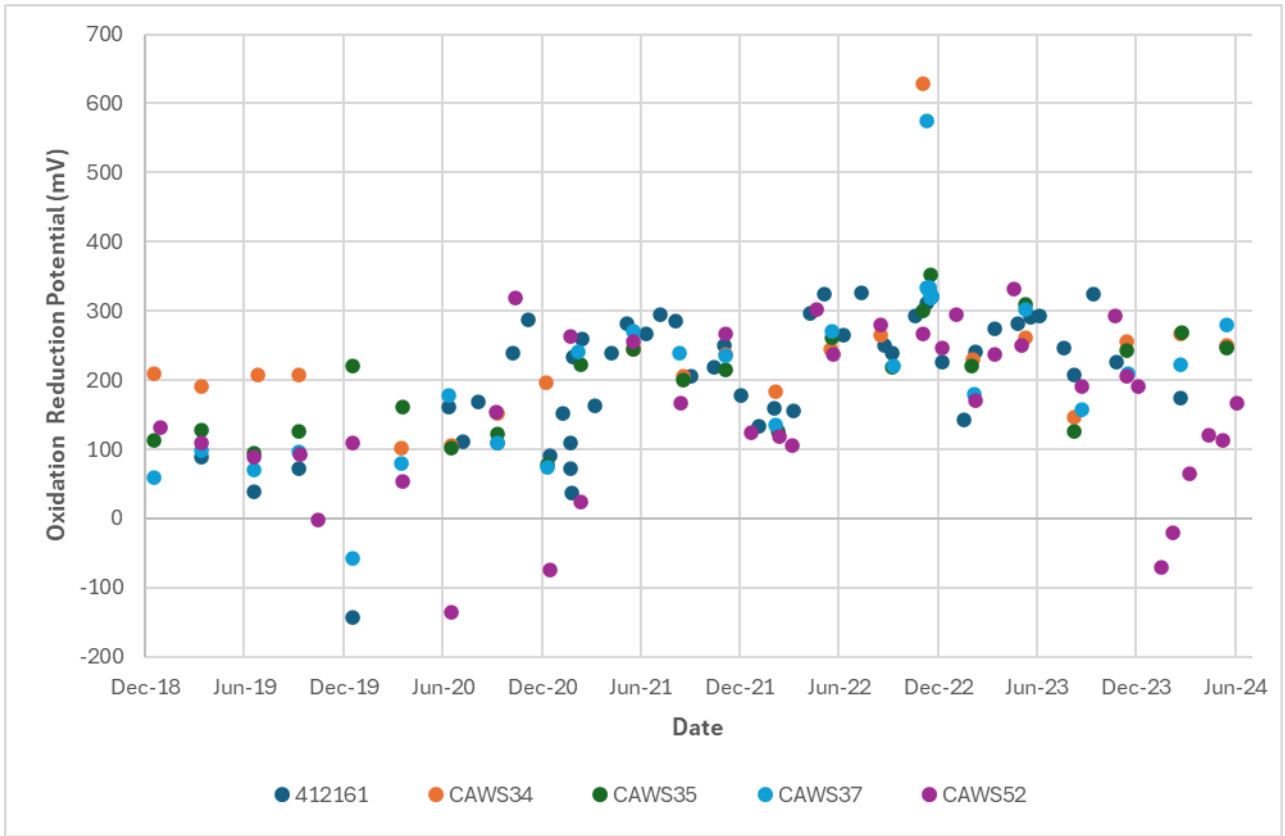




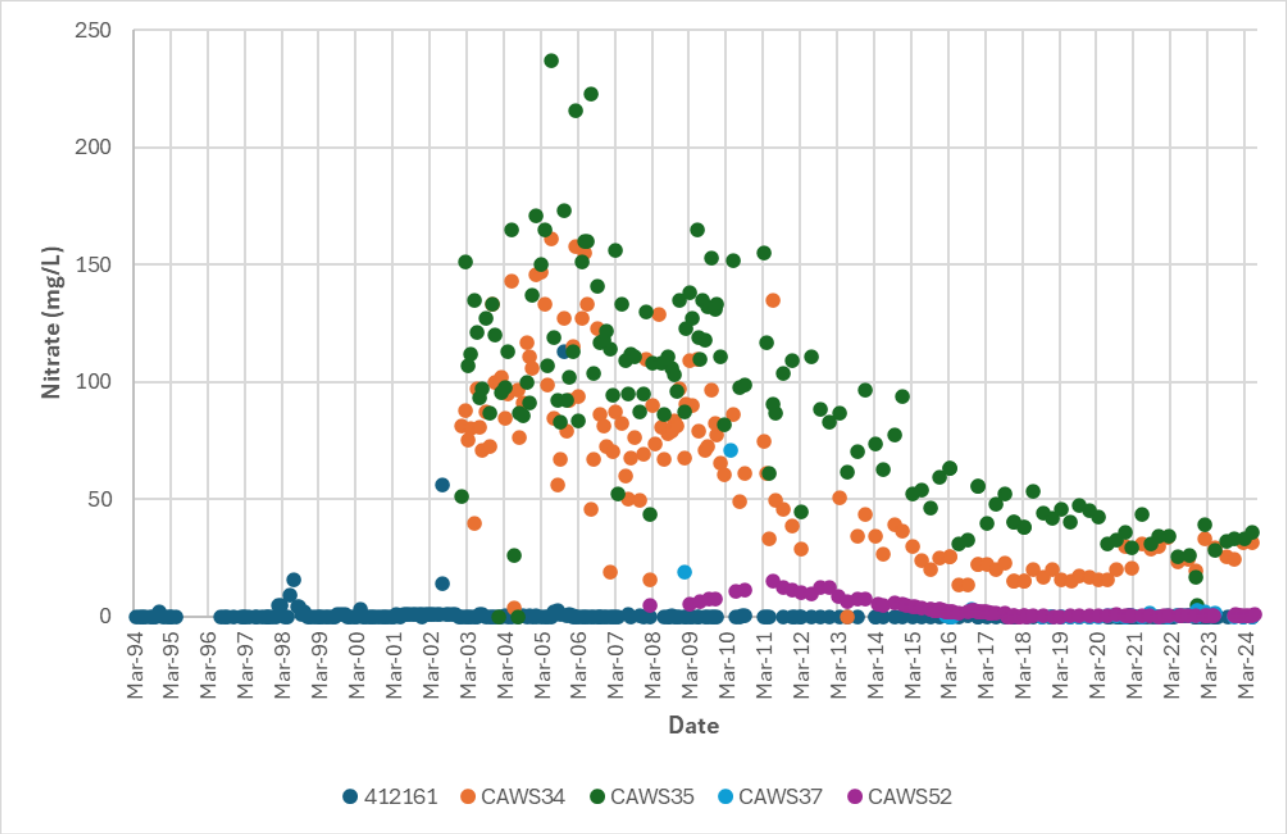

Total Suspended Solids (mg/L)
90
80
70
60
50
40
30
20
10
0
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
412161
CAWS34
CAWS35
CAWS37
CAWS52

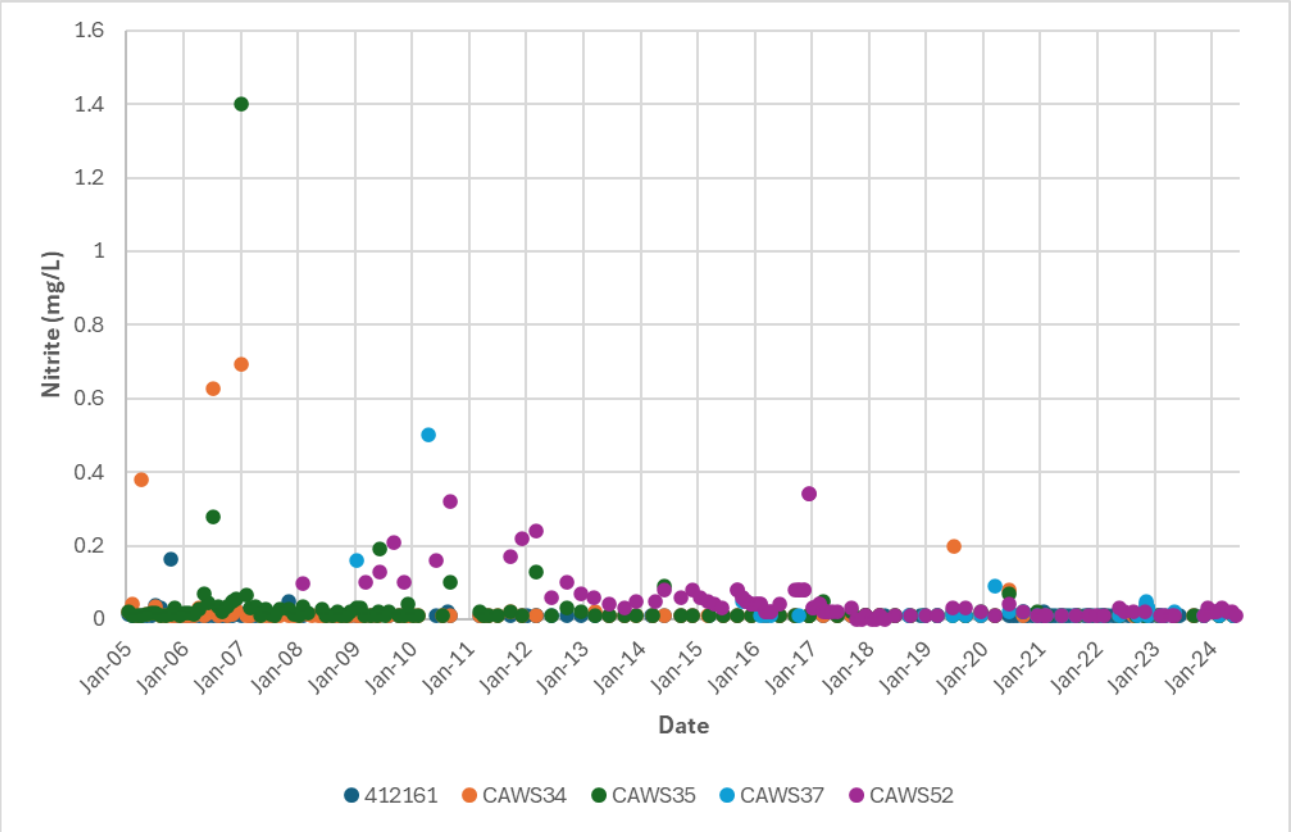

Total Dissolved Solids (mg/L)
12000
10000
8000
6000
4000
2000
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

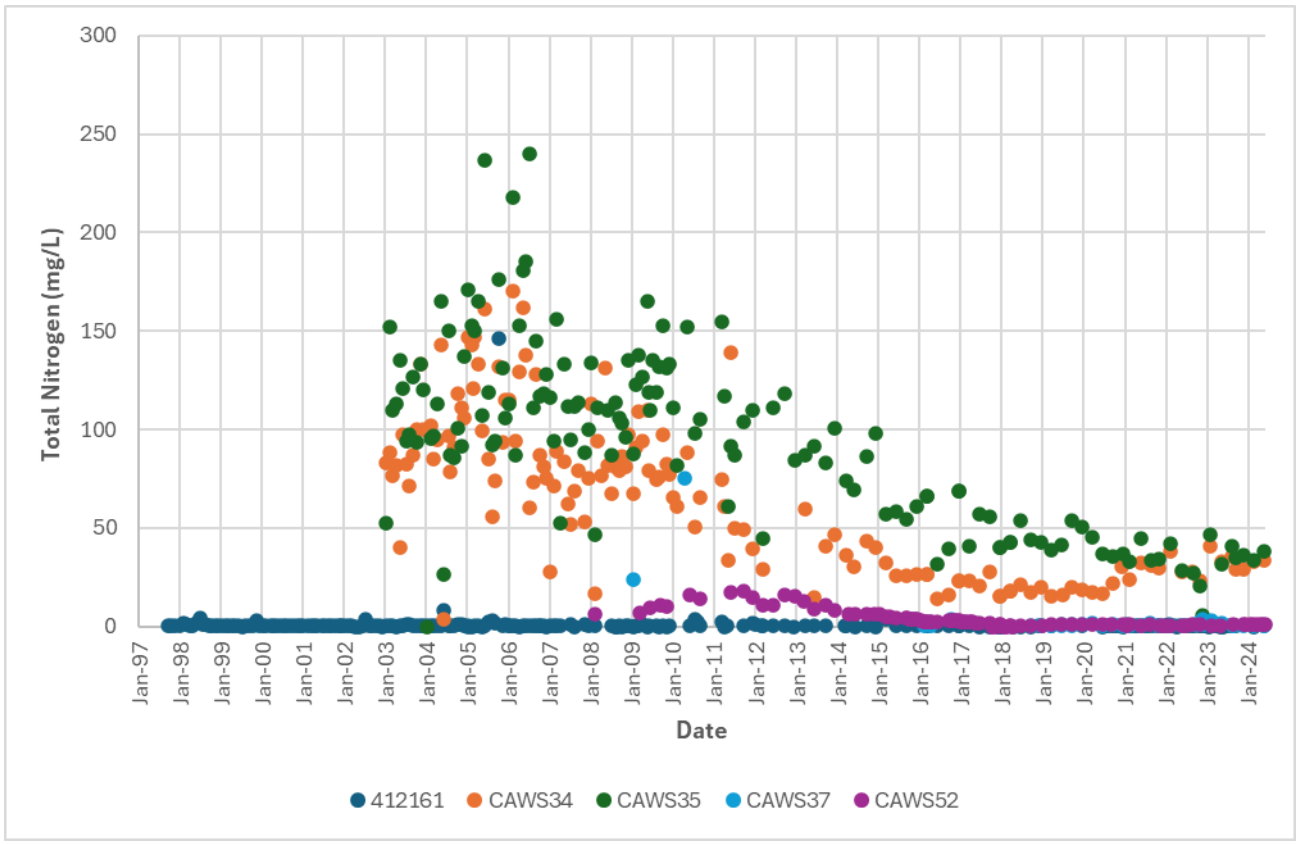

Alkalinity (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

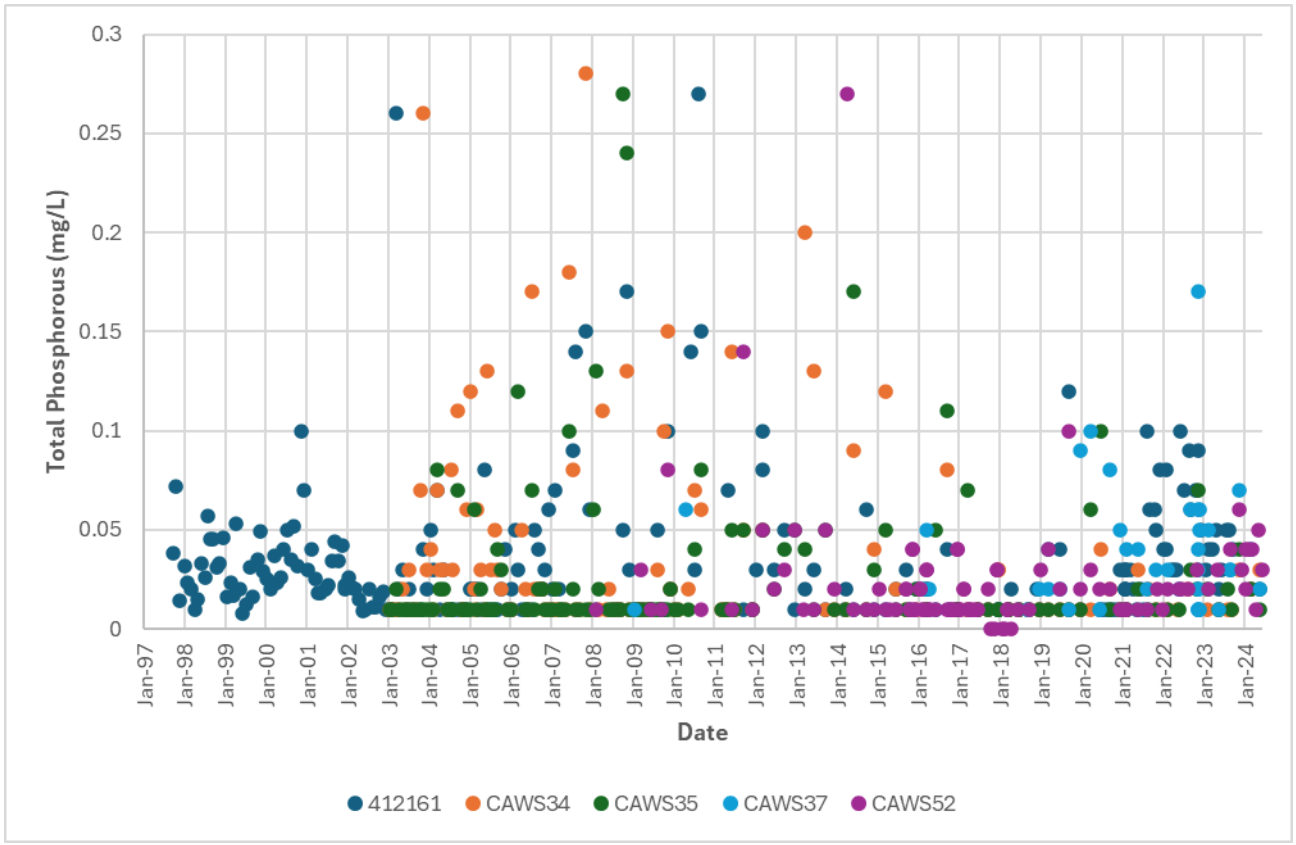

Oxidation Reduction Potential (mV)
700
600
500
400
300
200
100
0
-100
-200
Dec-18
Jun-19
Dec-19
Jun-20
Dec-20
Jun-21
Dec-21
Jun-22
Dec-22
Jun-23
Dec-23
Jun-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

B.4.2 Nutrients

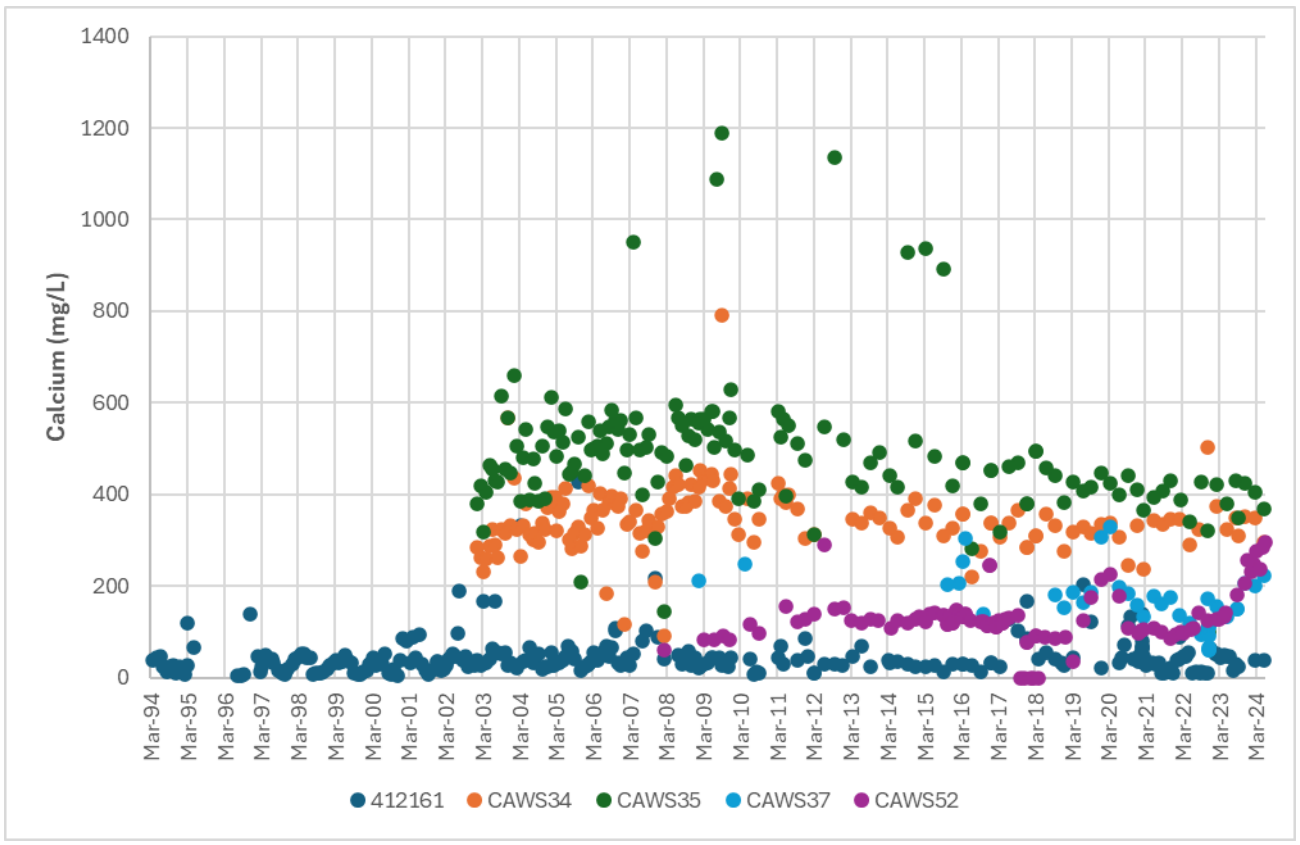


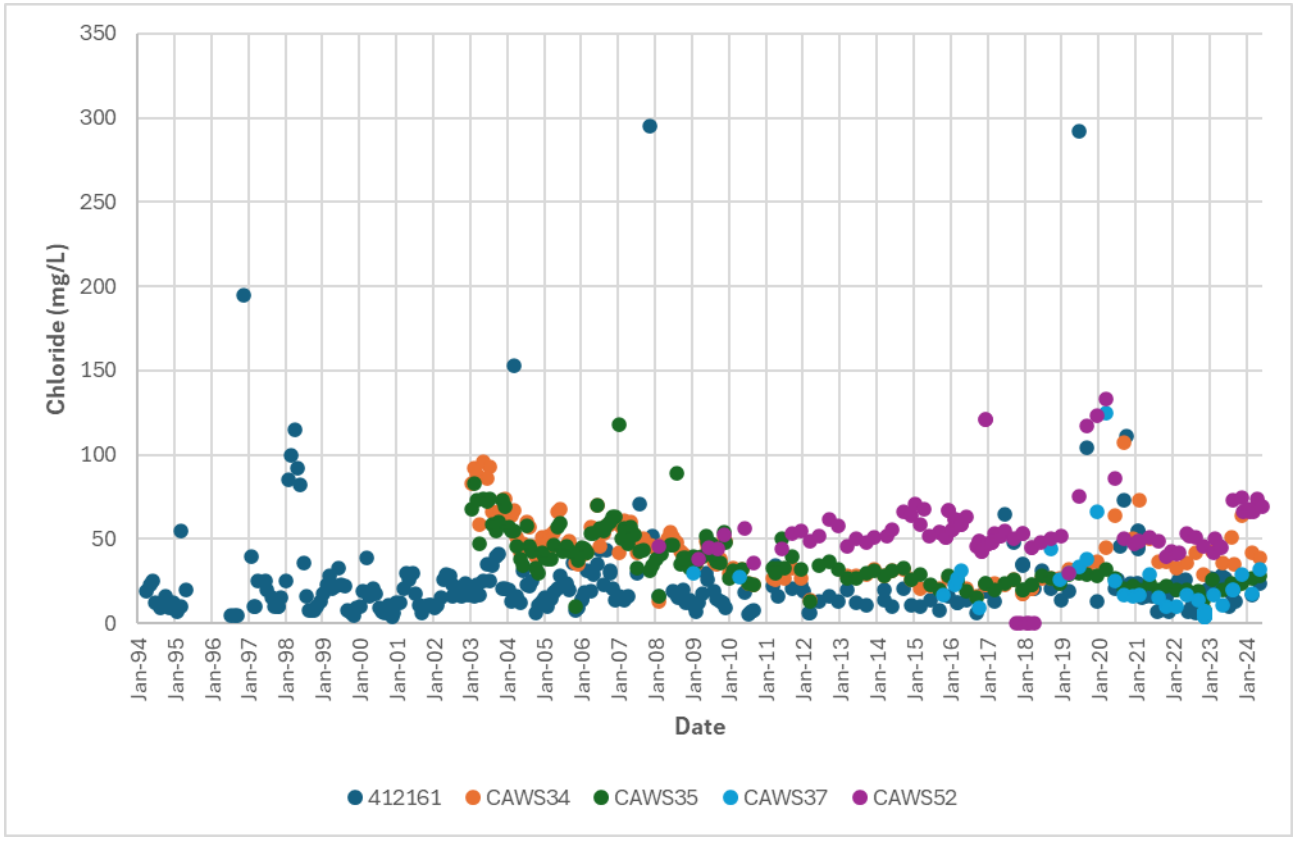


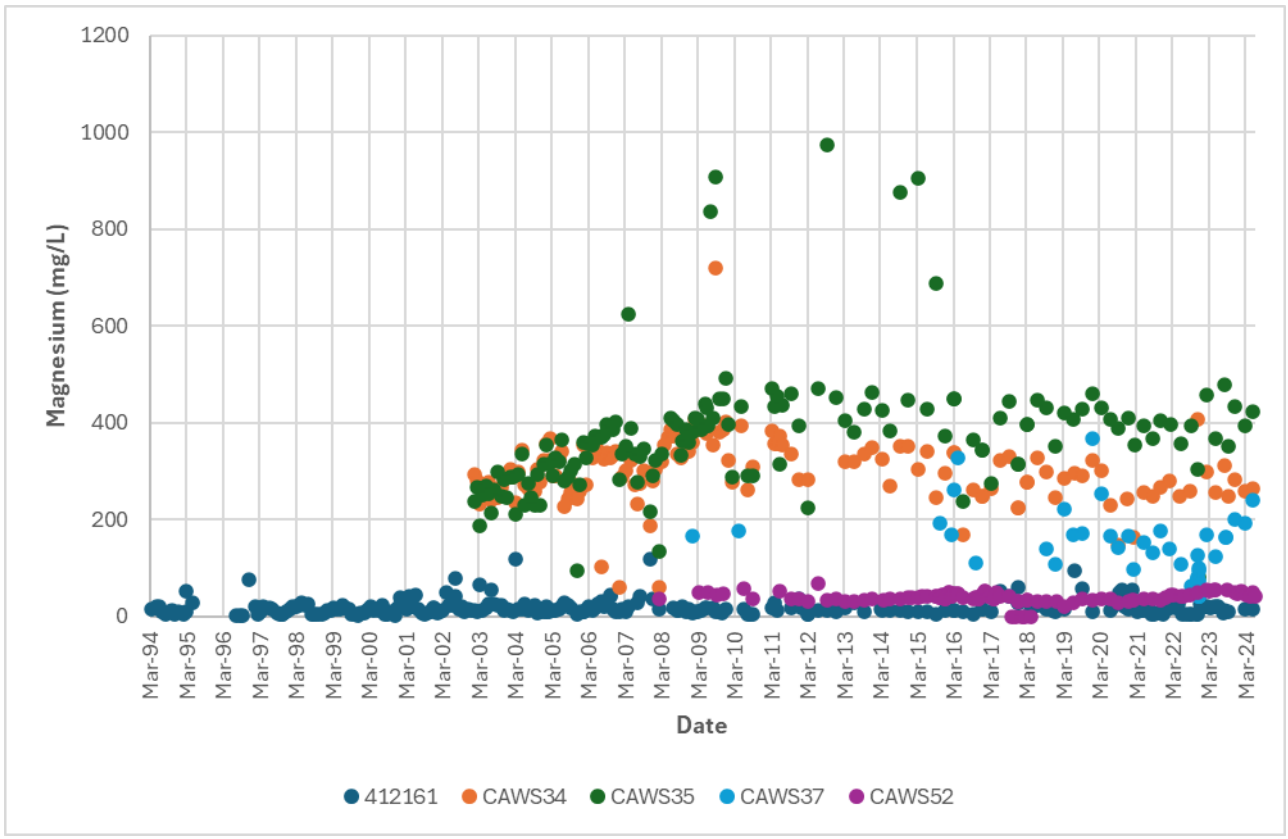

Total Nitrogen (mg/L)
300
250
200
150
100
50
0
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

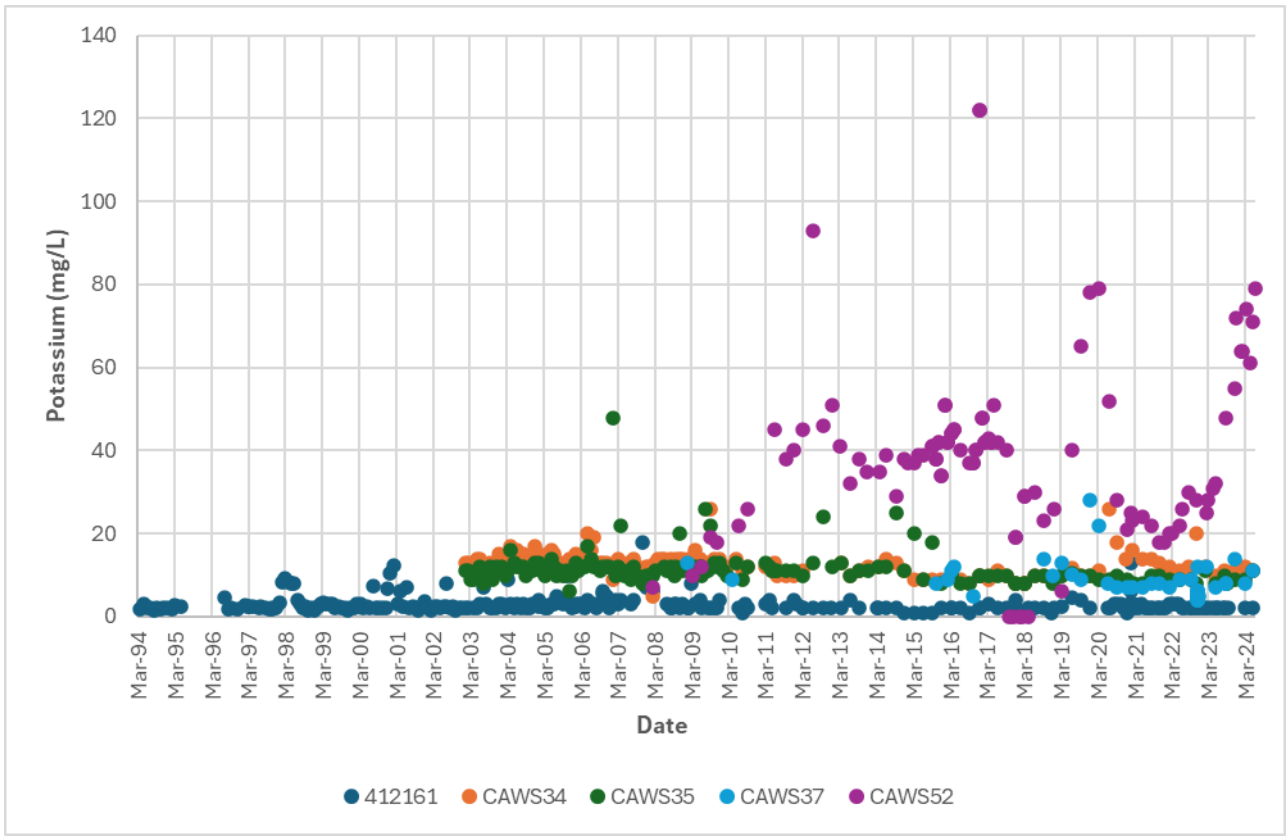

Total Phosphorous (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

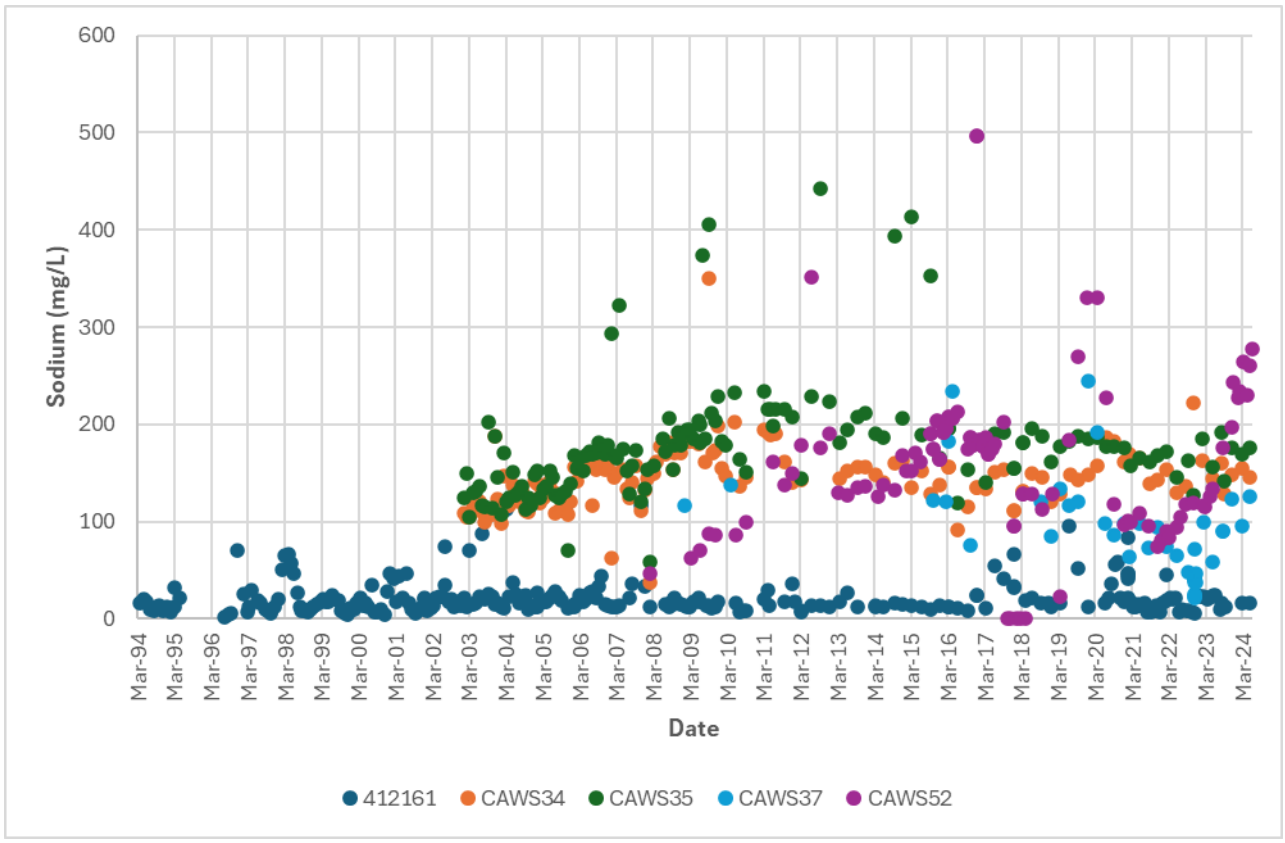
B.4.3 Major Ions

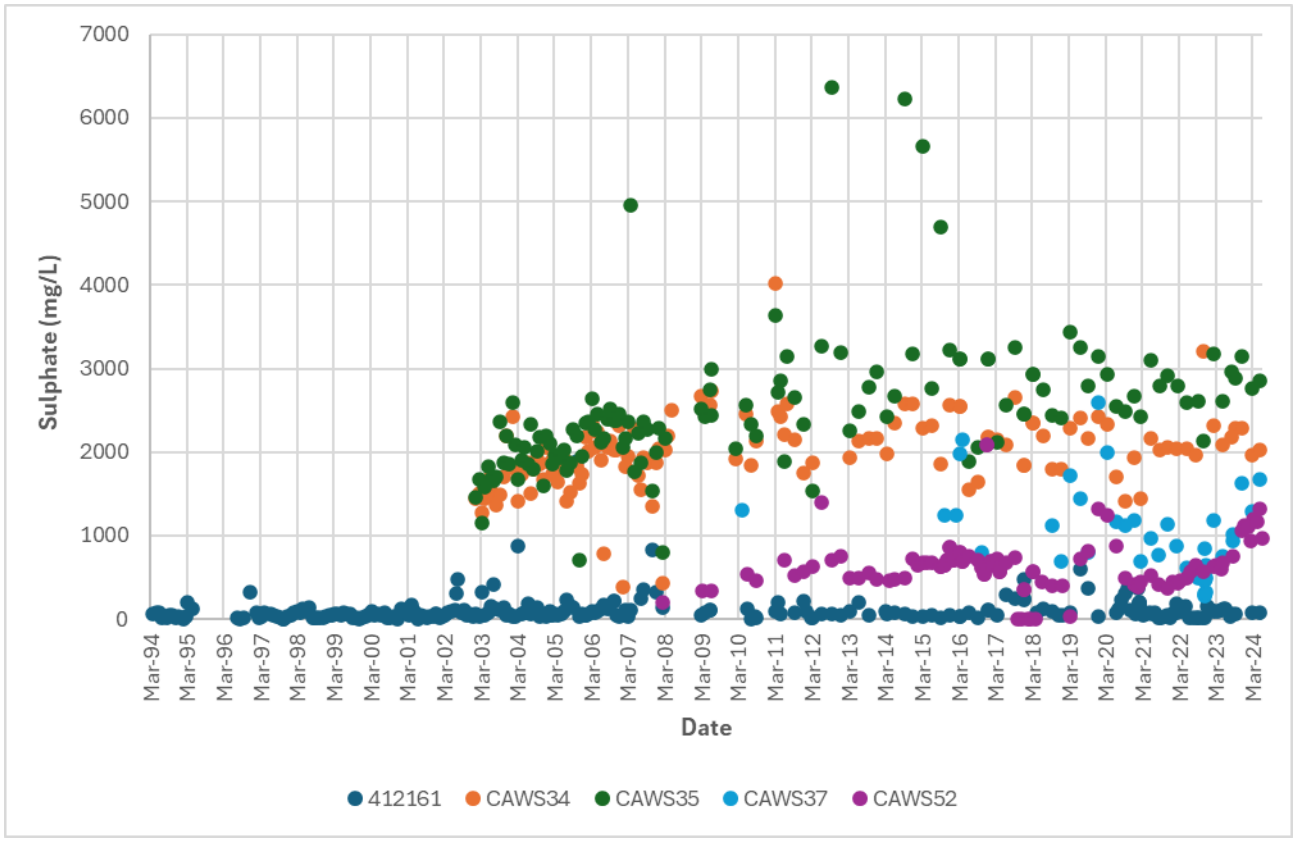




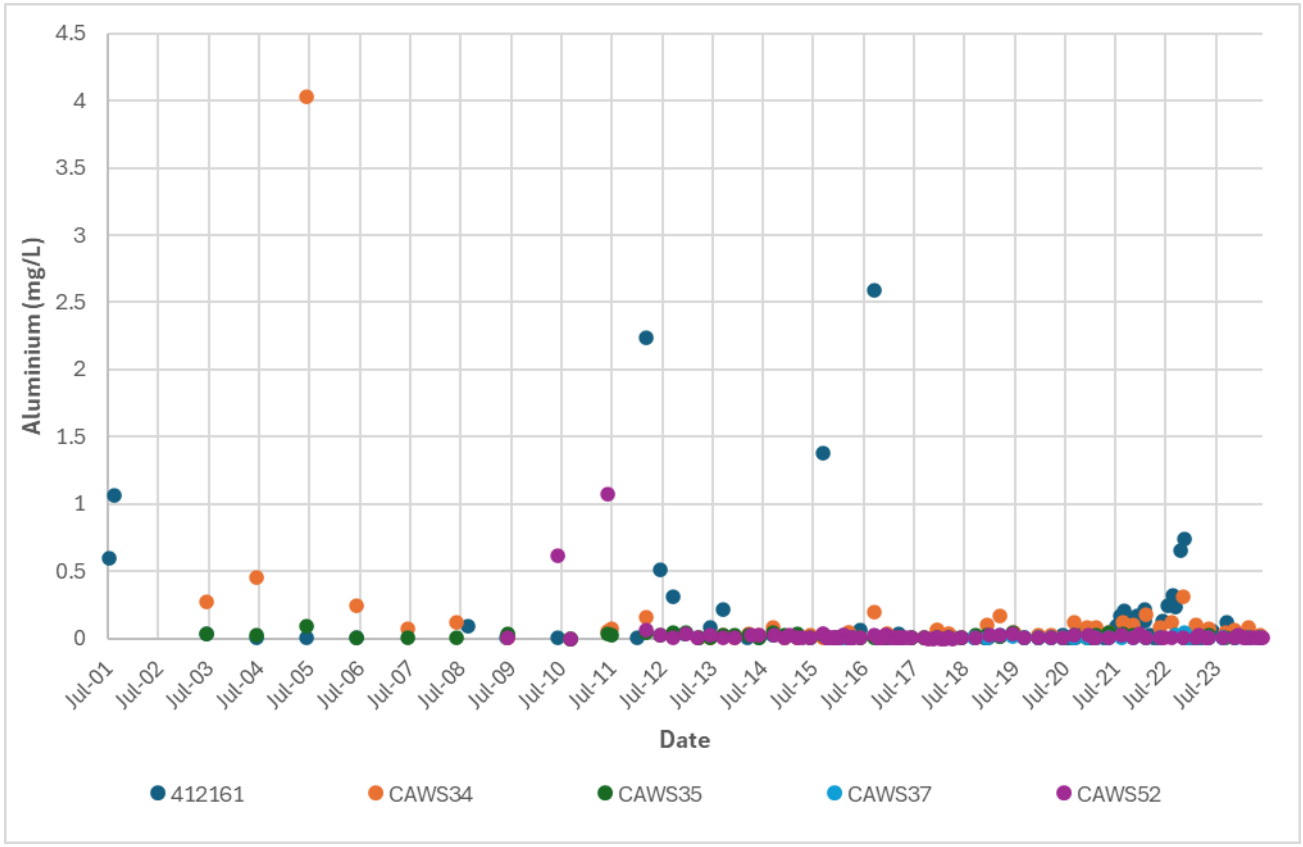

Magnesium (mg/L)
1200
1000
800
600
400
200
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

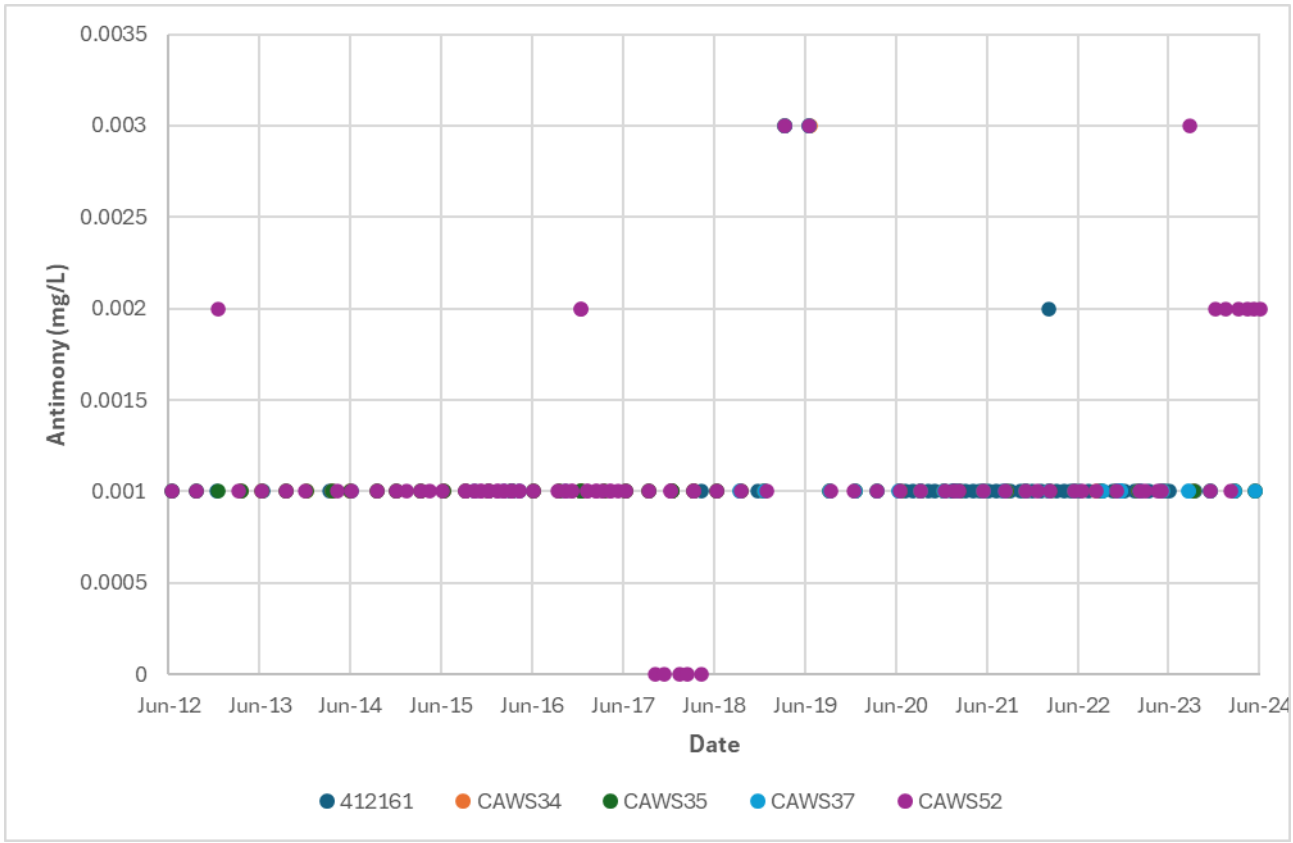

Potassium (mg/L)
140
120
100
80
60
40
20
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

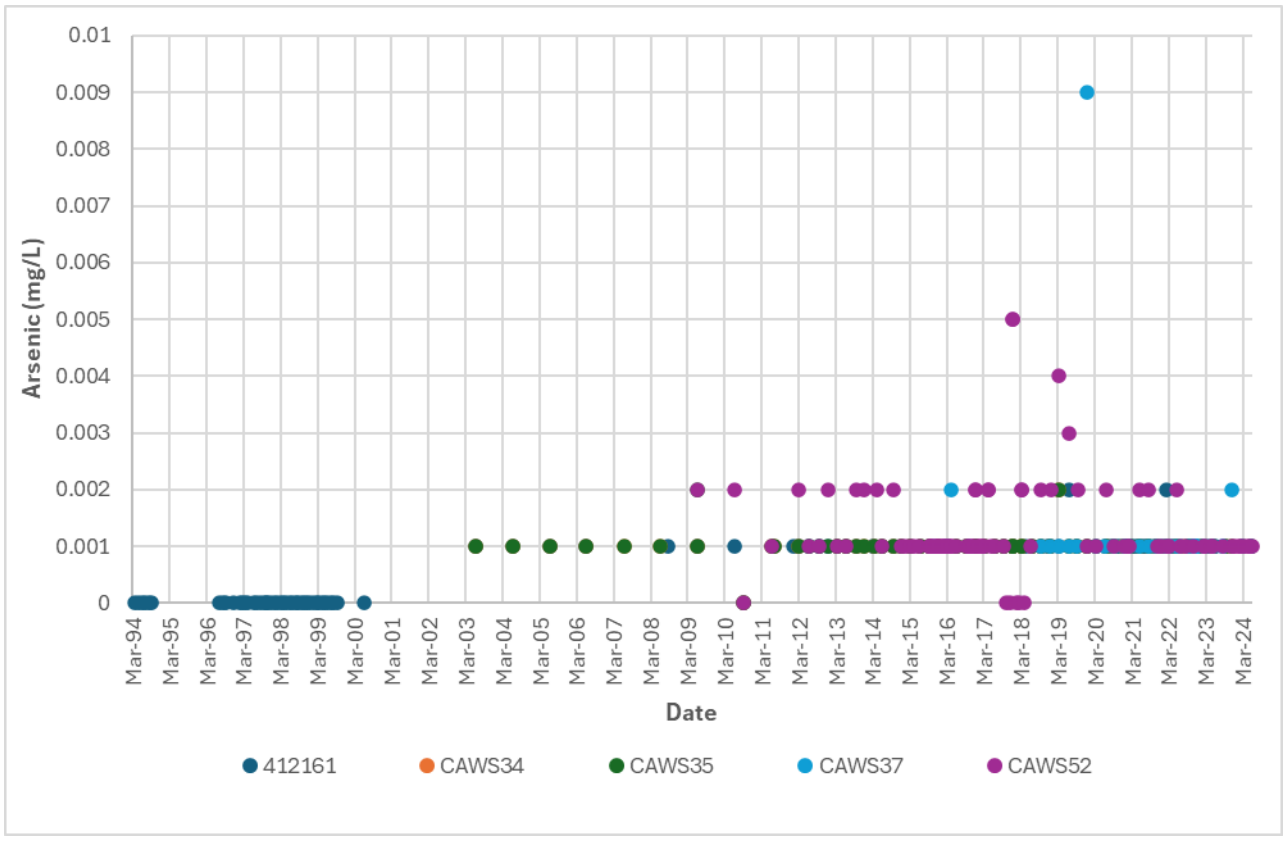

Sodium (mg/L)
600
500
400
300
200
100
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

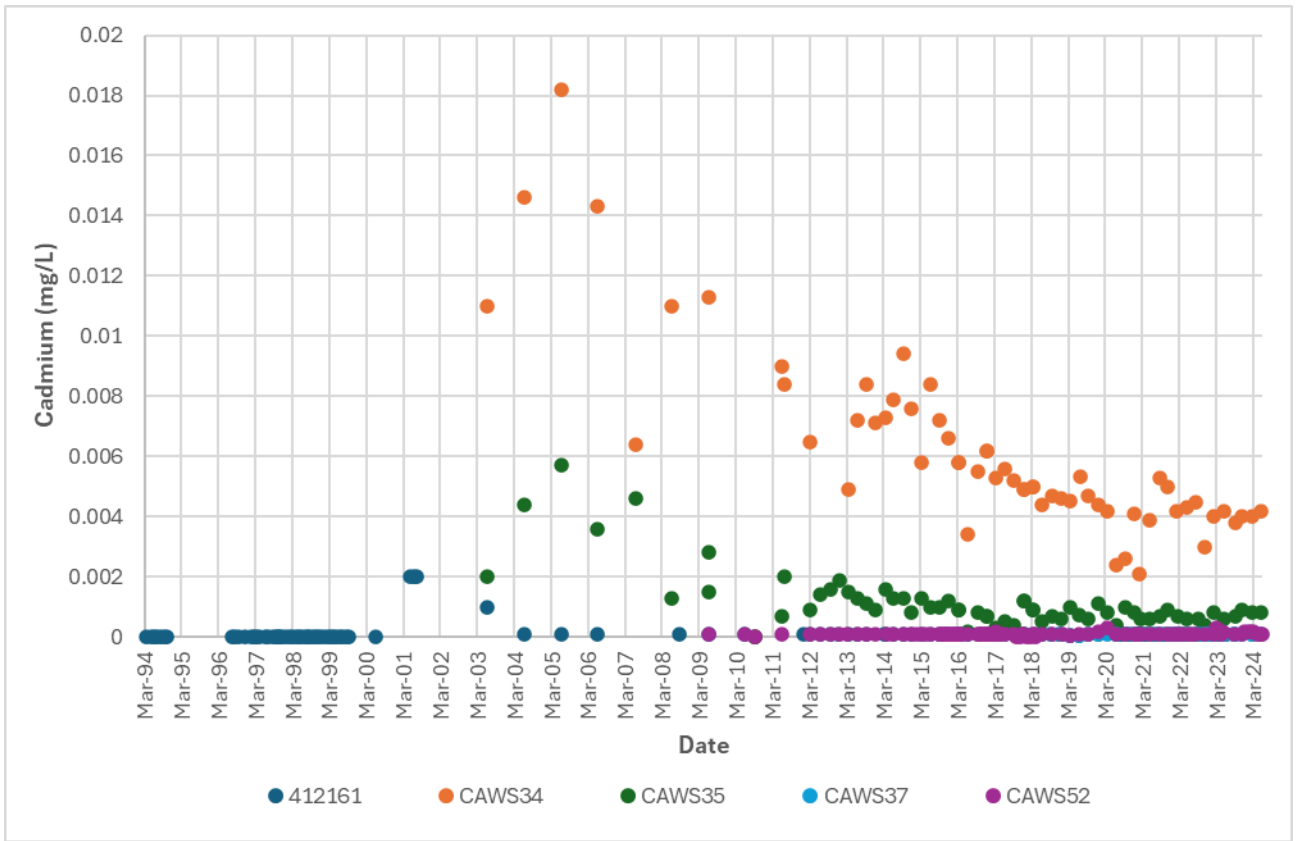

Sulphate (mg/L)
7000
6000
5000
4000
3000
2000
1000
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

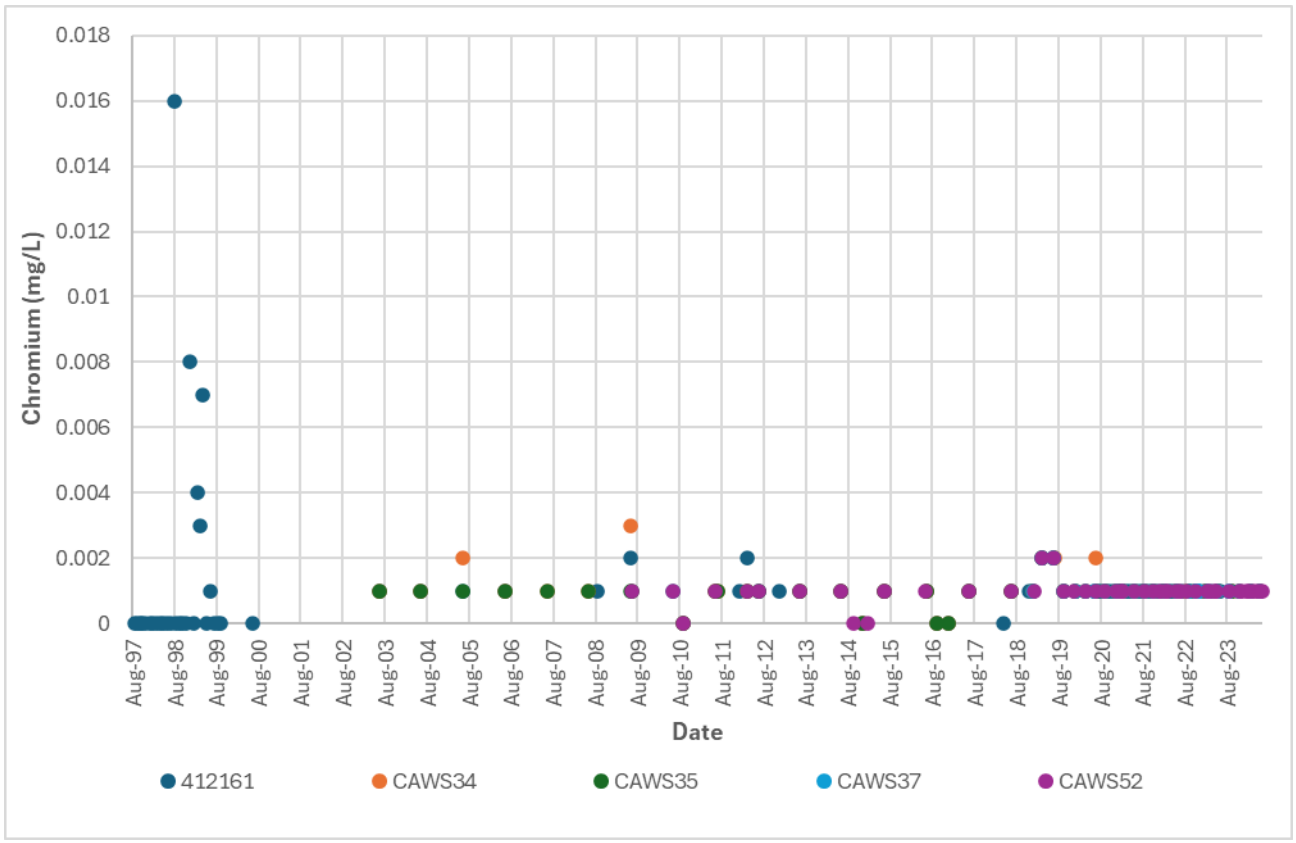
B.4.4 Dissolved Metals

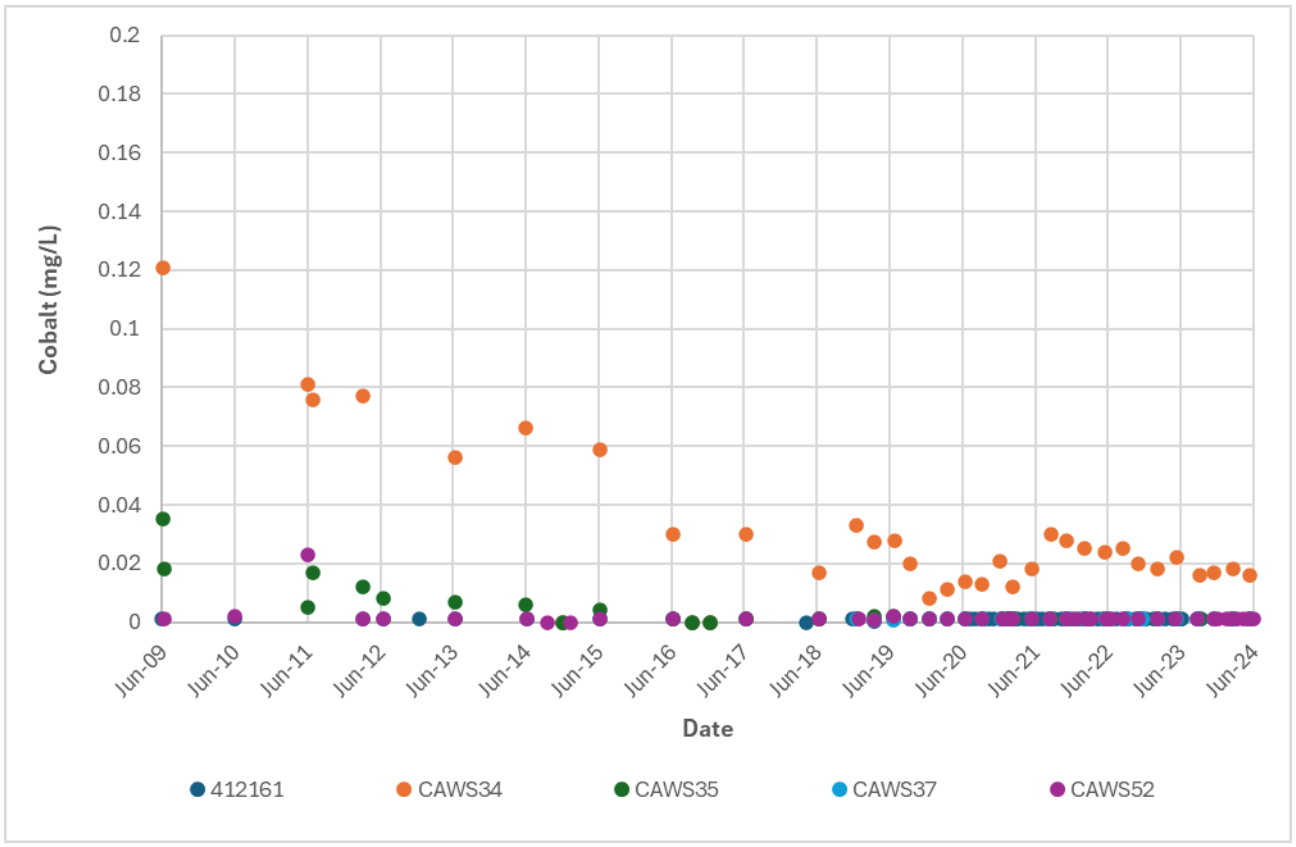


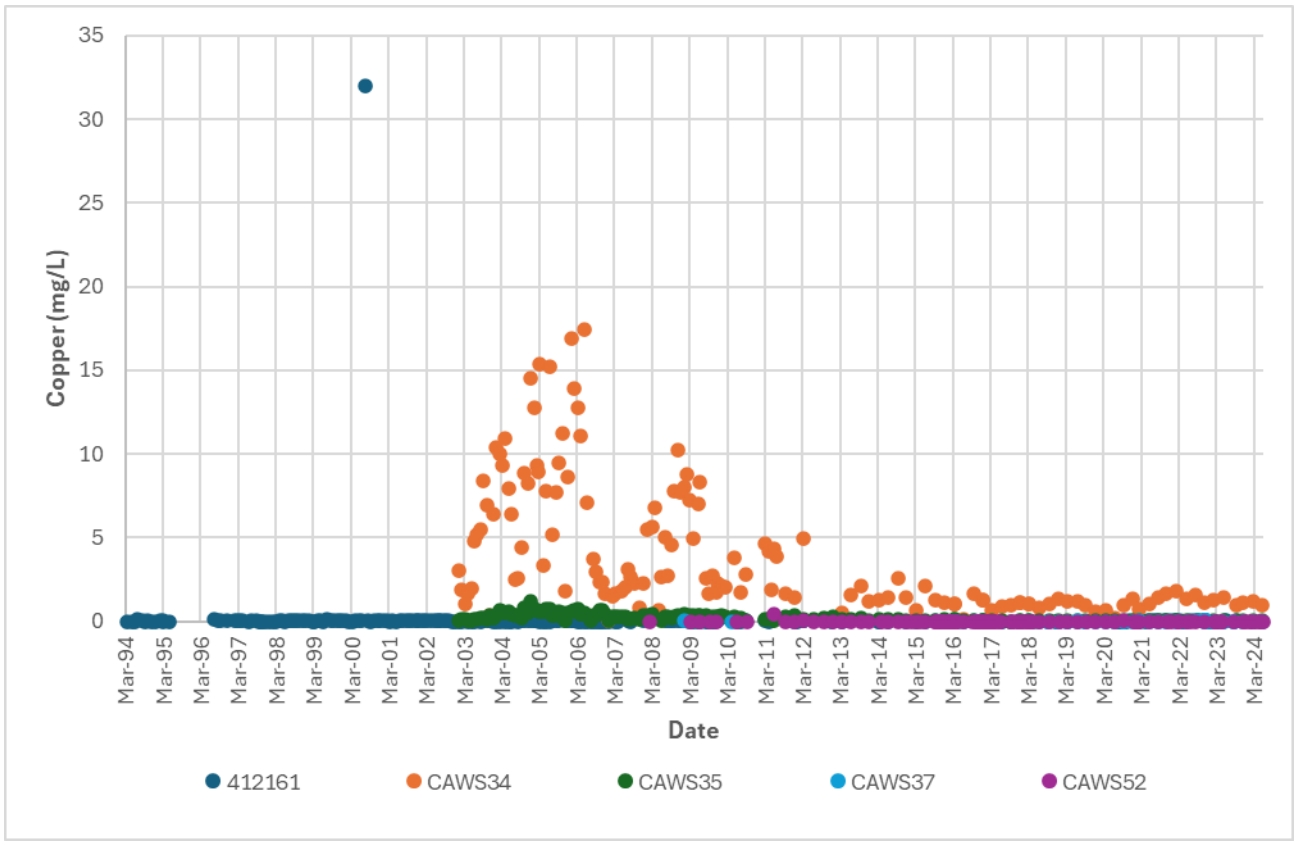


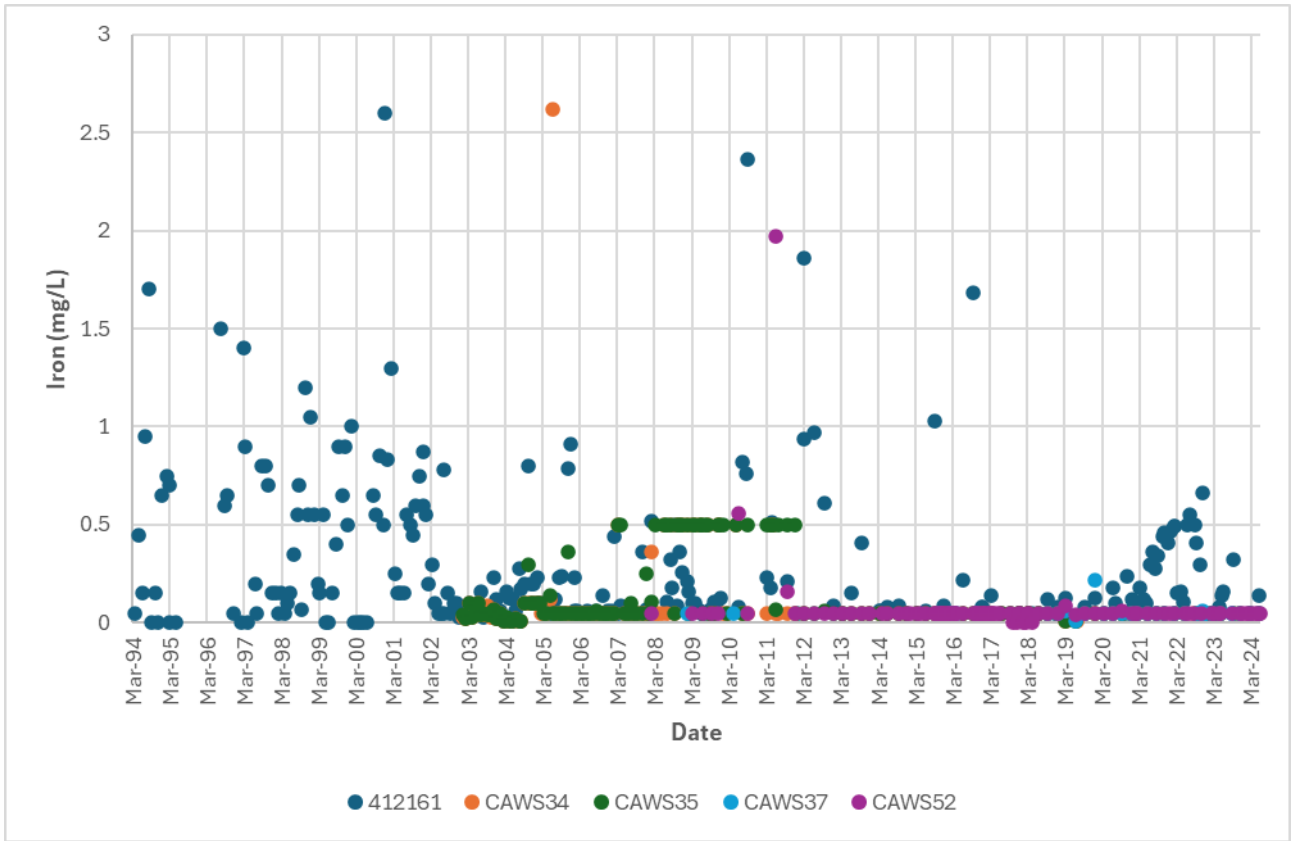

Arsenic (mg/L)
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Mar-94 Mar-95 Mar-96 Mar-97 Mar-98 Mar-99 Mar-00 Mar-01 Mar-02 Mar-03 Mar-04 Mar-05 Mar-06 Mar-07 Mar-08 Mar-09 Mar-10 Mar-11 Mar-12 Mar-13 Mar-14 Mar-15 Mar-16 Mar-17 Mar-18 Mar-19 Mar-20 Mar-21 Mar-22 Mar-23 Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

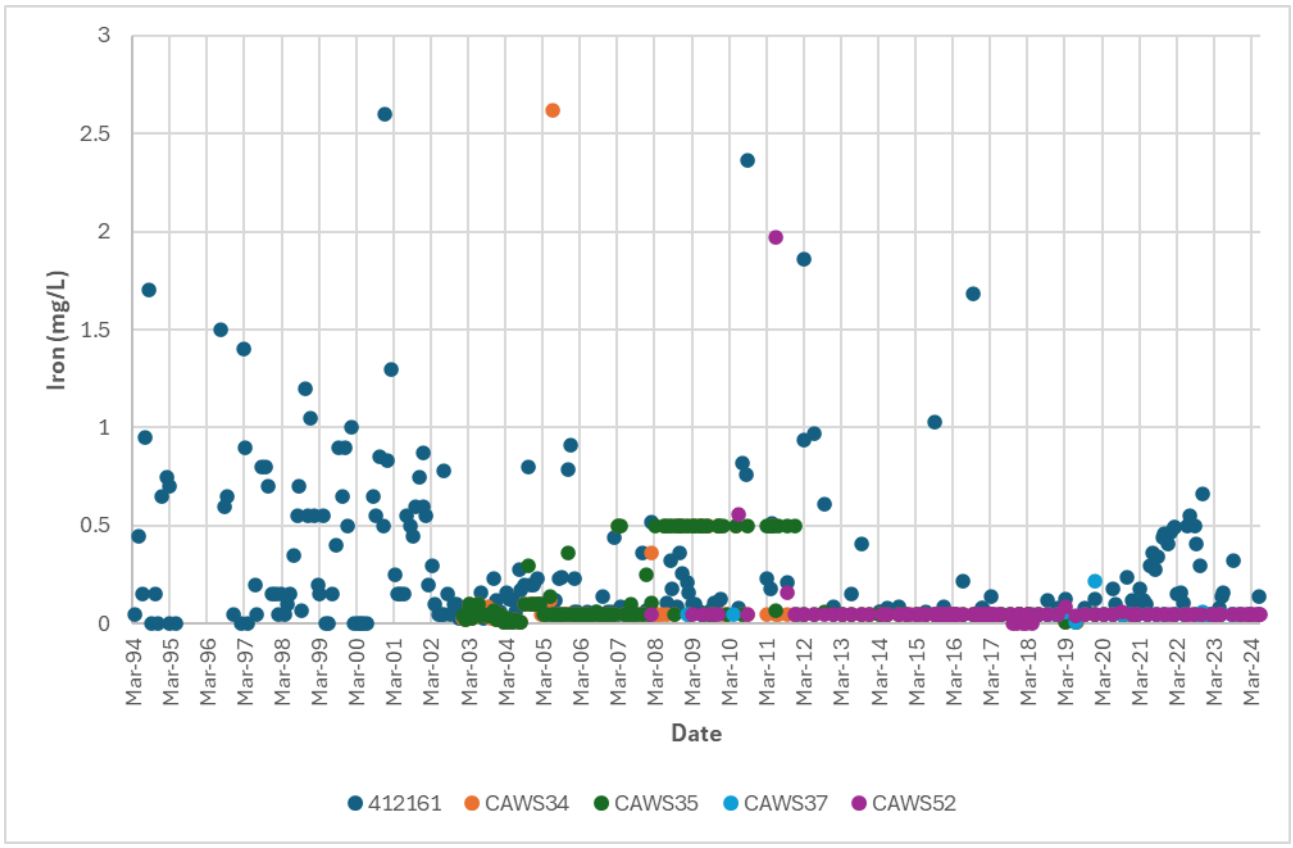

Cadmium (mg/L)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Mar-94 Mar-95 Mar-96 Mar-97 Mar-98 Mar-99 Mar-00 Mar-01 Mar-02 Mar-03 Mar-04 Mar-05 Mar-06 Mar-07 Mar-08 Mar-09 Mar-10 Mar-11 Mar-12 Mar-13 Mar-14 Mar-15 Mar-16 Mar-17 Mar-18 Mar-19 Mar-20 Mar-21 Mar-22 Mar-23 Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

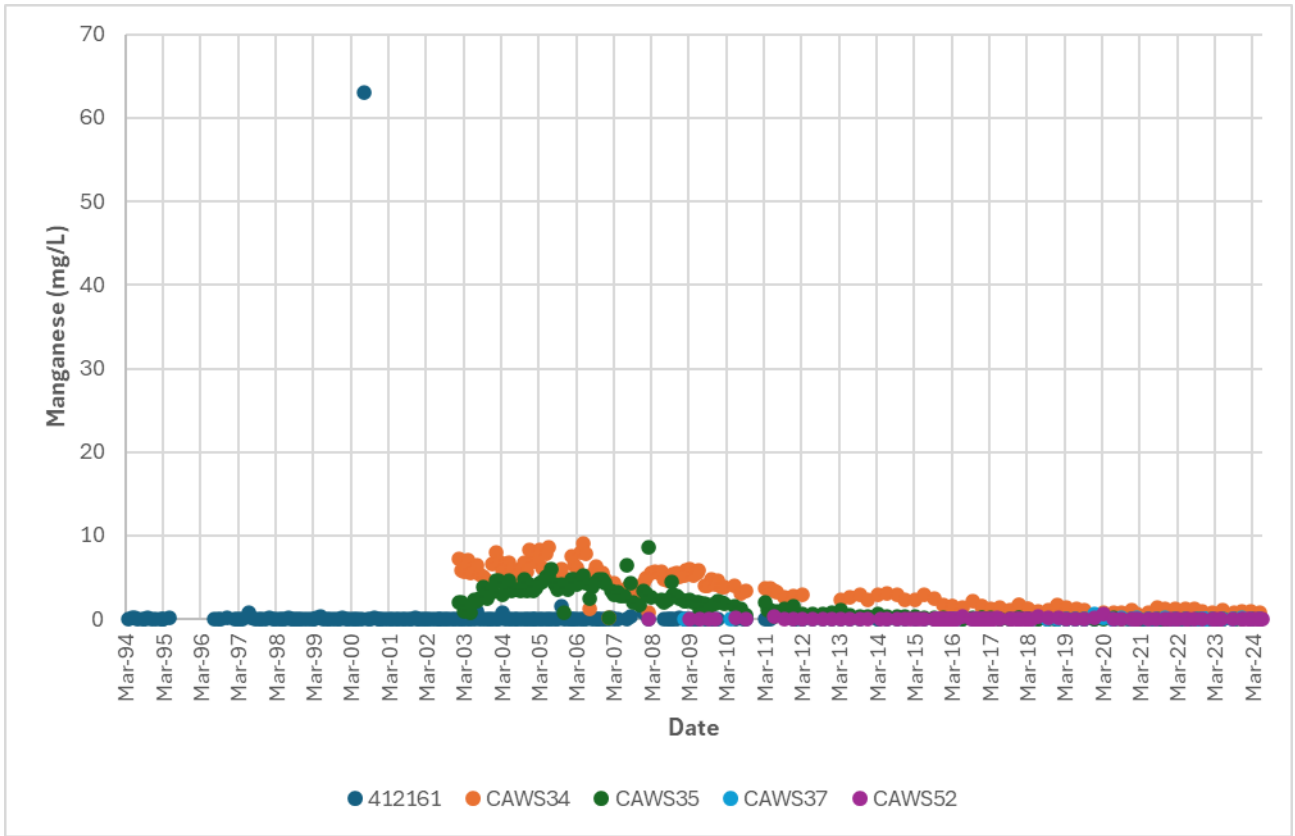

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Chromium (mg/L)
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
Aug-23
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

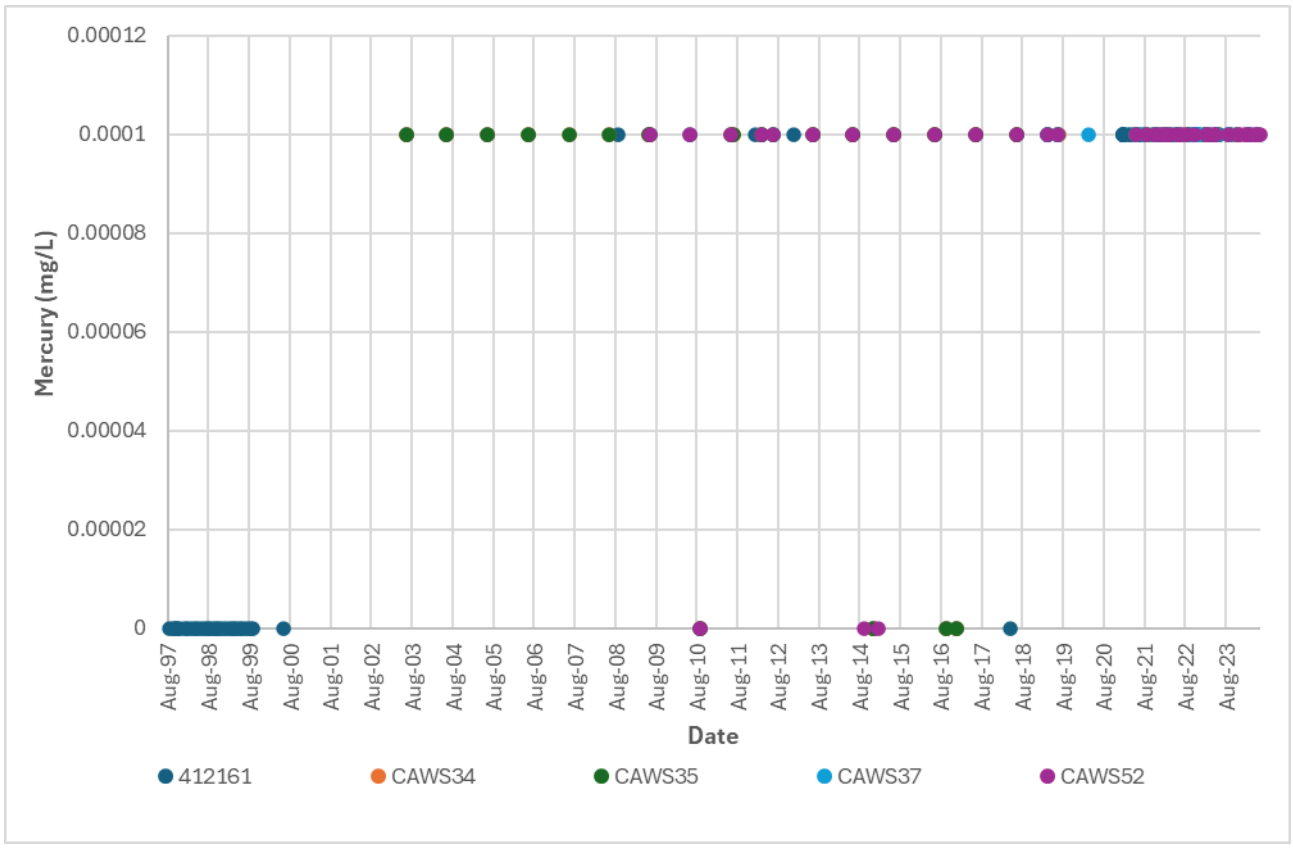

0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Cobalt (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

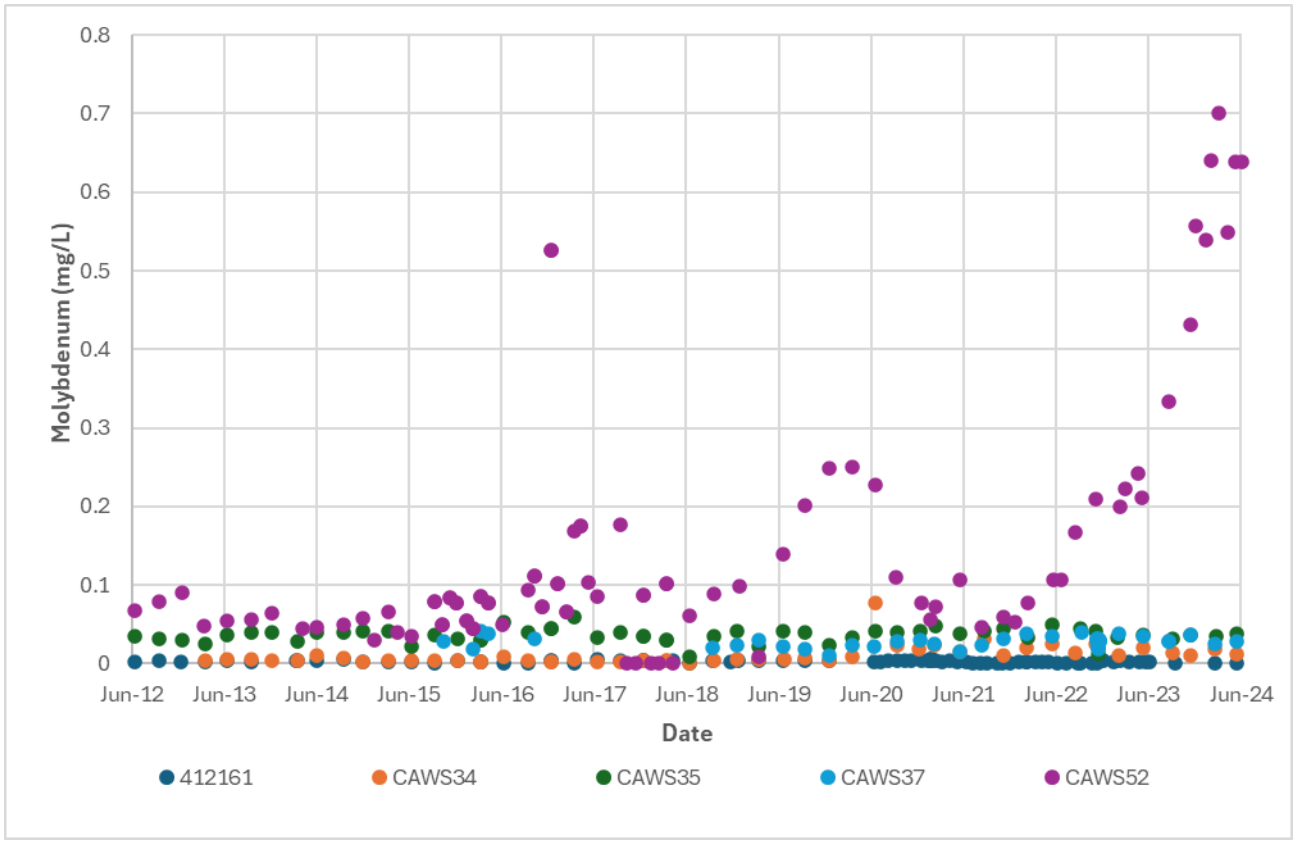

Copper (mg/L)
35
30
25
20
15
10
5
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
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Mar-22
Mar-23
Mar-24
Date
412161
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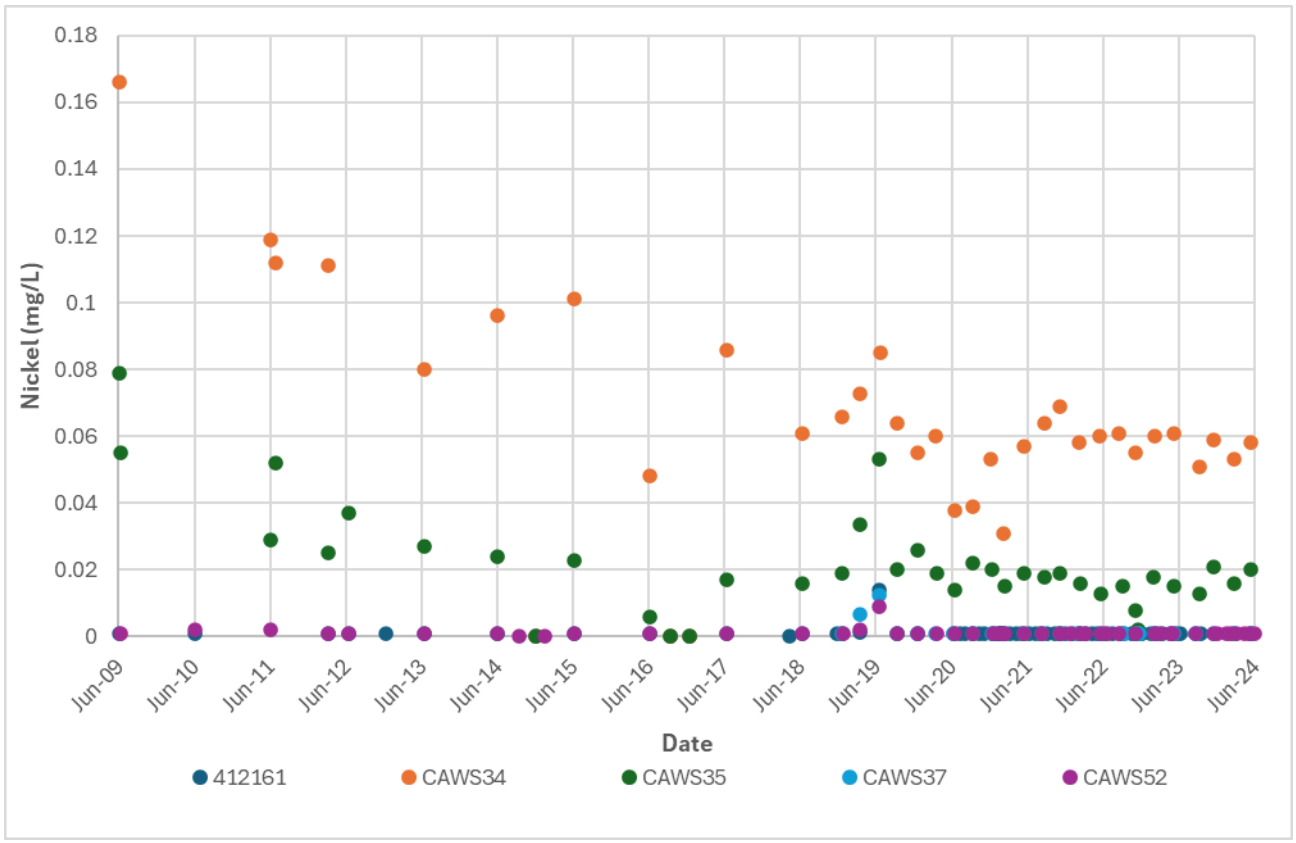

Iron (mg/L)
3
2.5
2
1.5
1
0.5
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
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Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
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Mar-21
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Mar-24
Date
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CAWS34
CAWS35
CAWS37
CAWS52

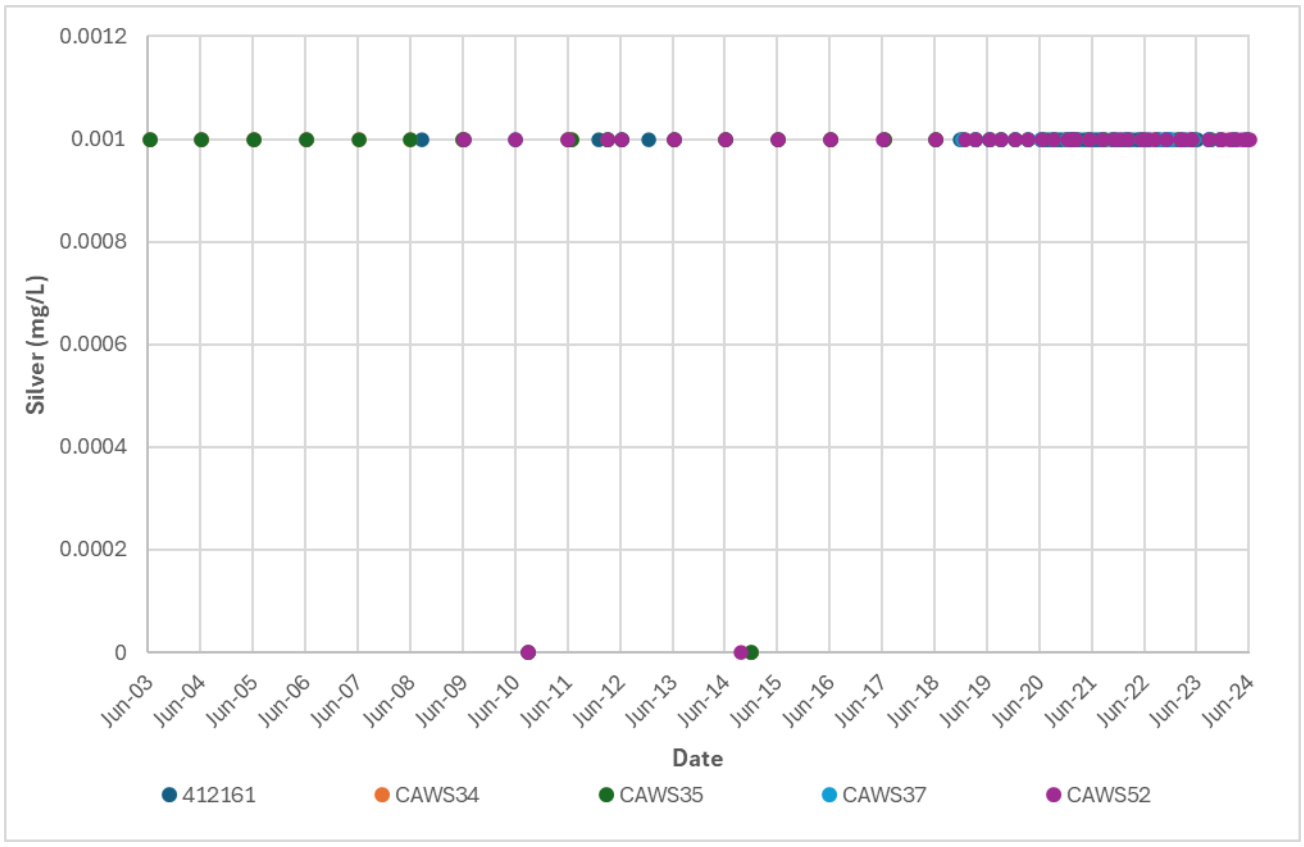

Iron (mg/L)
3
2.5
2
1.5
1
0.5
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
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Mar-21
Mar-22
Mar-23
Mar-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

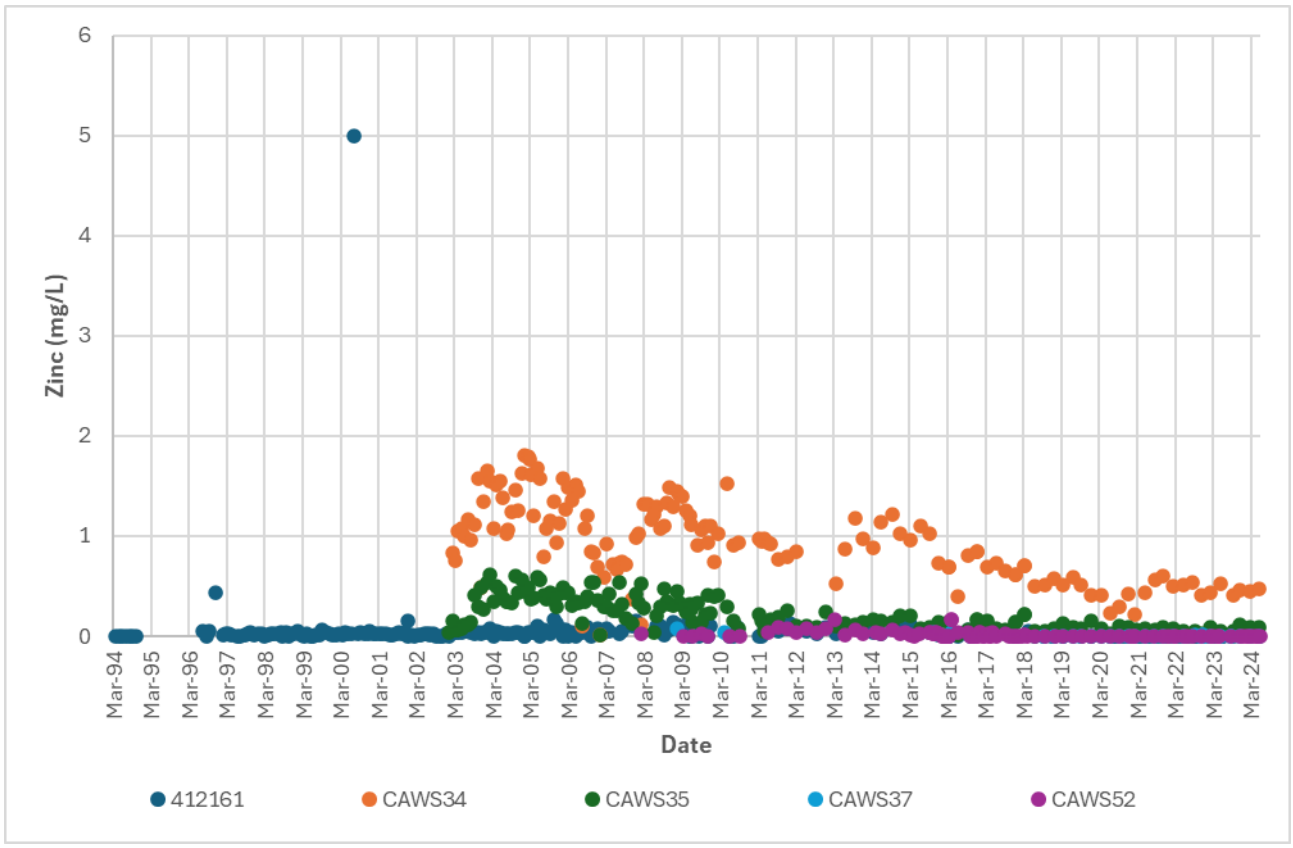

Manganese (mg/L)
70
60
50
40
30
20
10
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
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CAWS37
CAWS52


0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Mercury (mg/L)
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
Aug-23
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

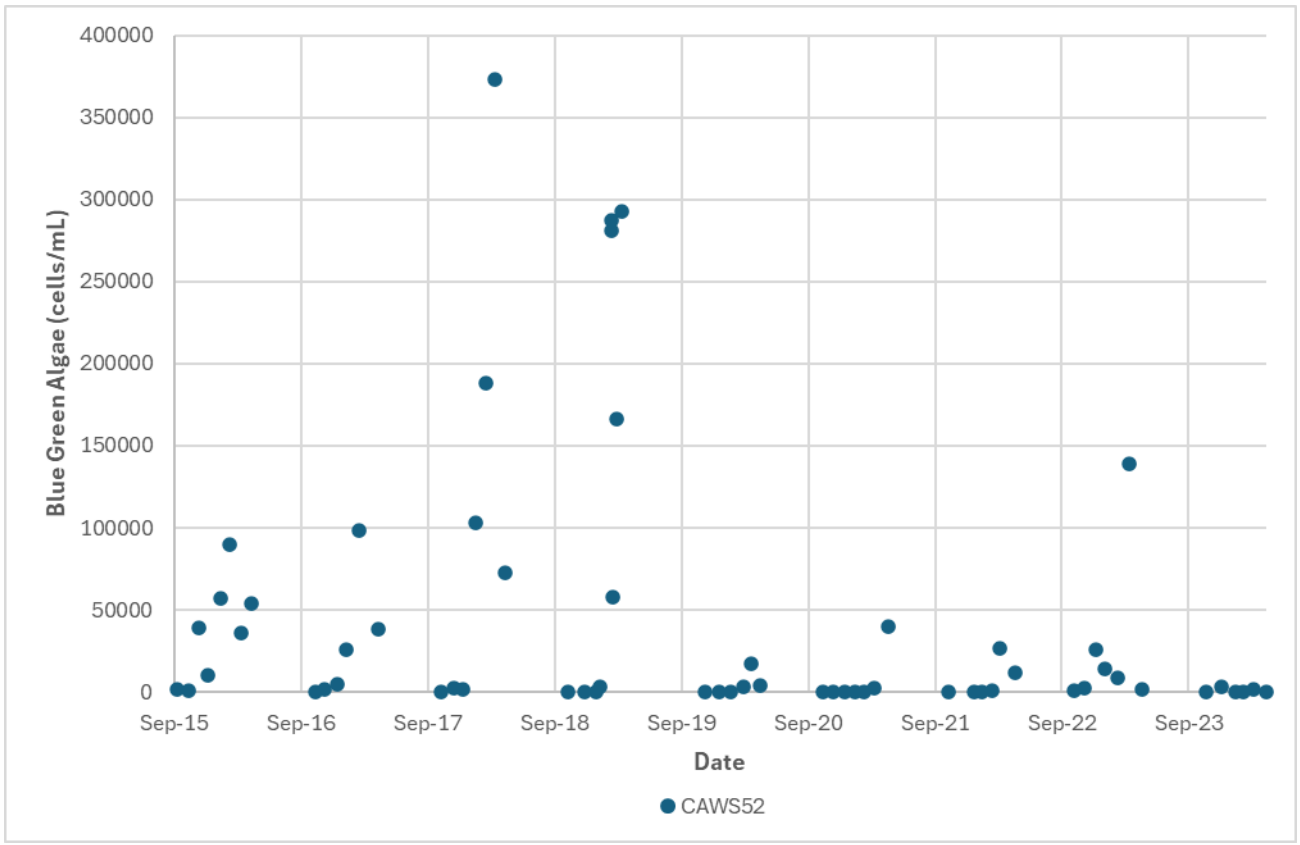

0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52


0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52


0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412161
CAWS34
CAWS35
CAWS37
CAWS52

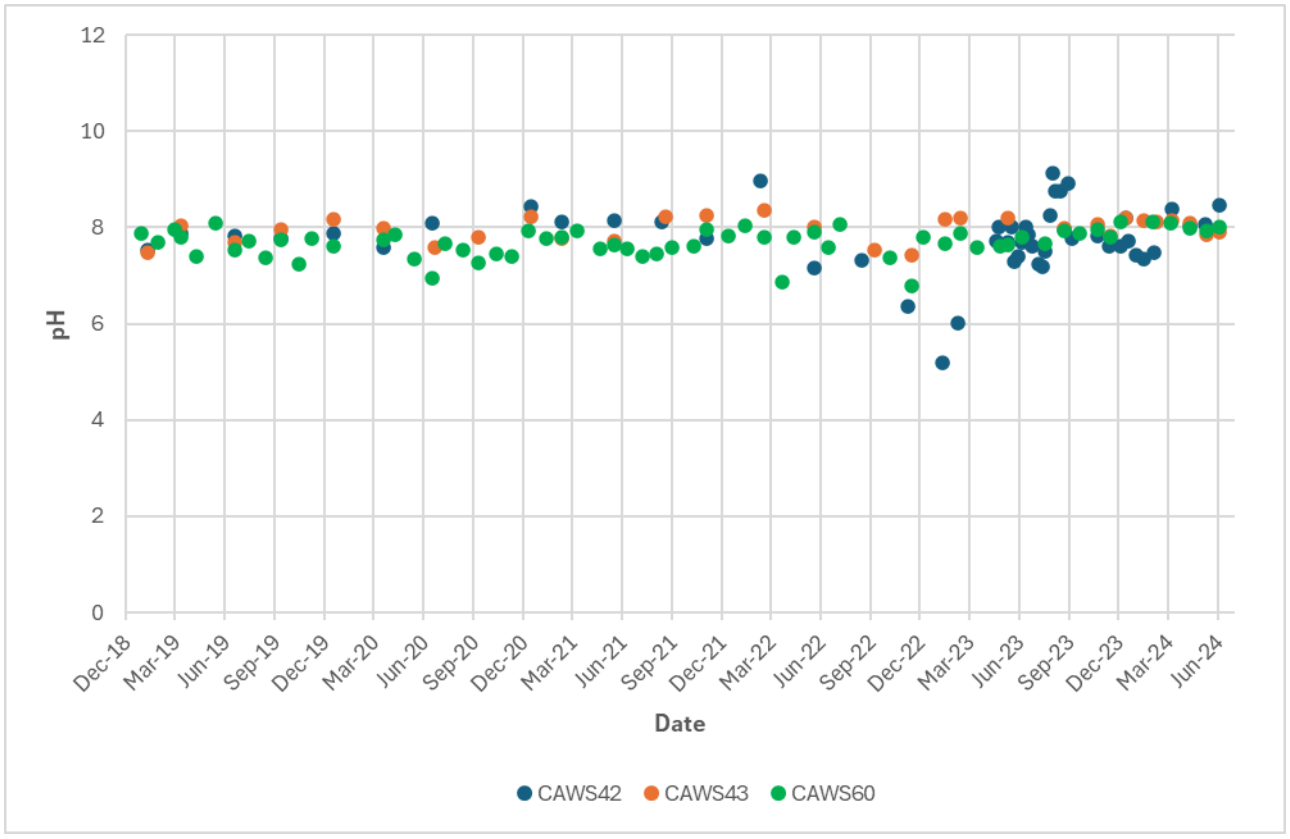


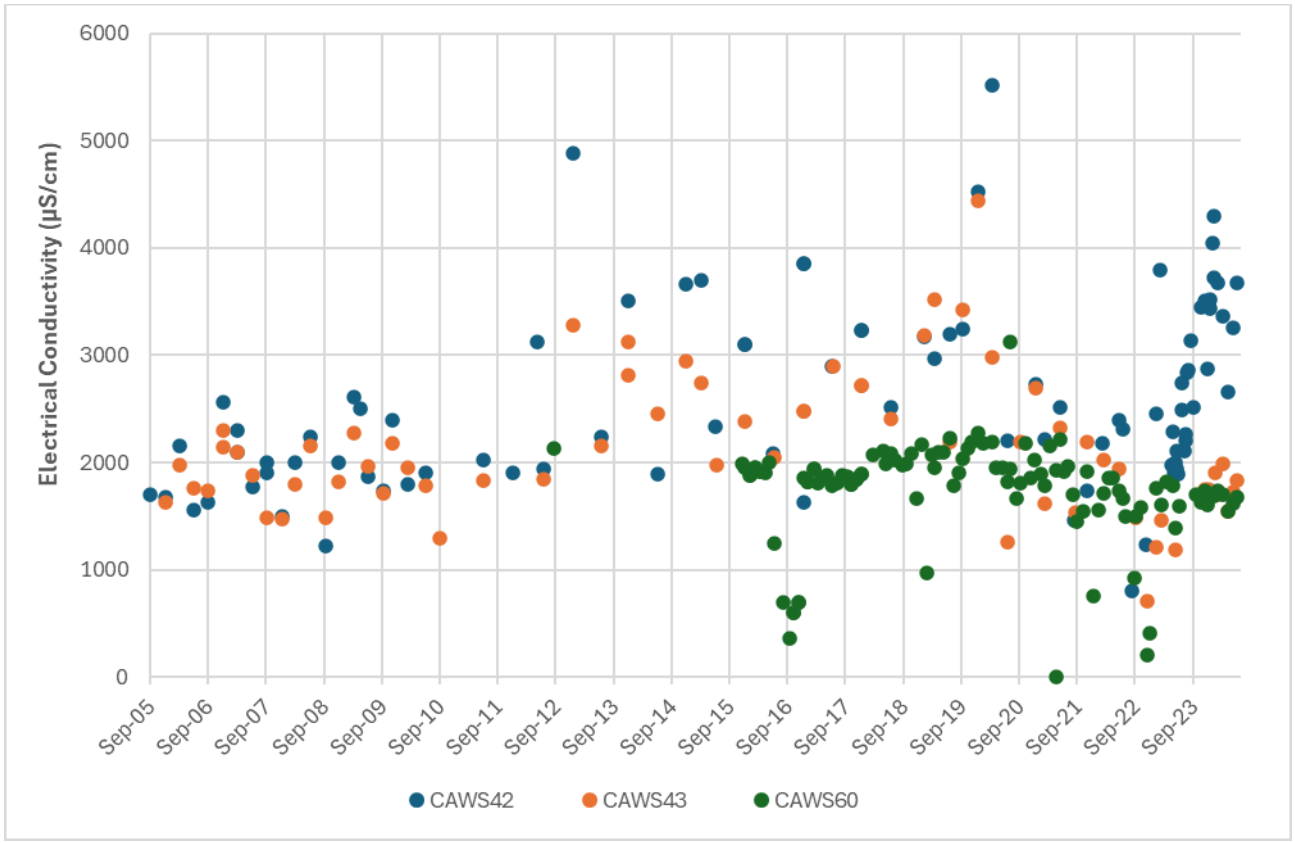
B.4.5 Biological Indicators

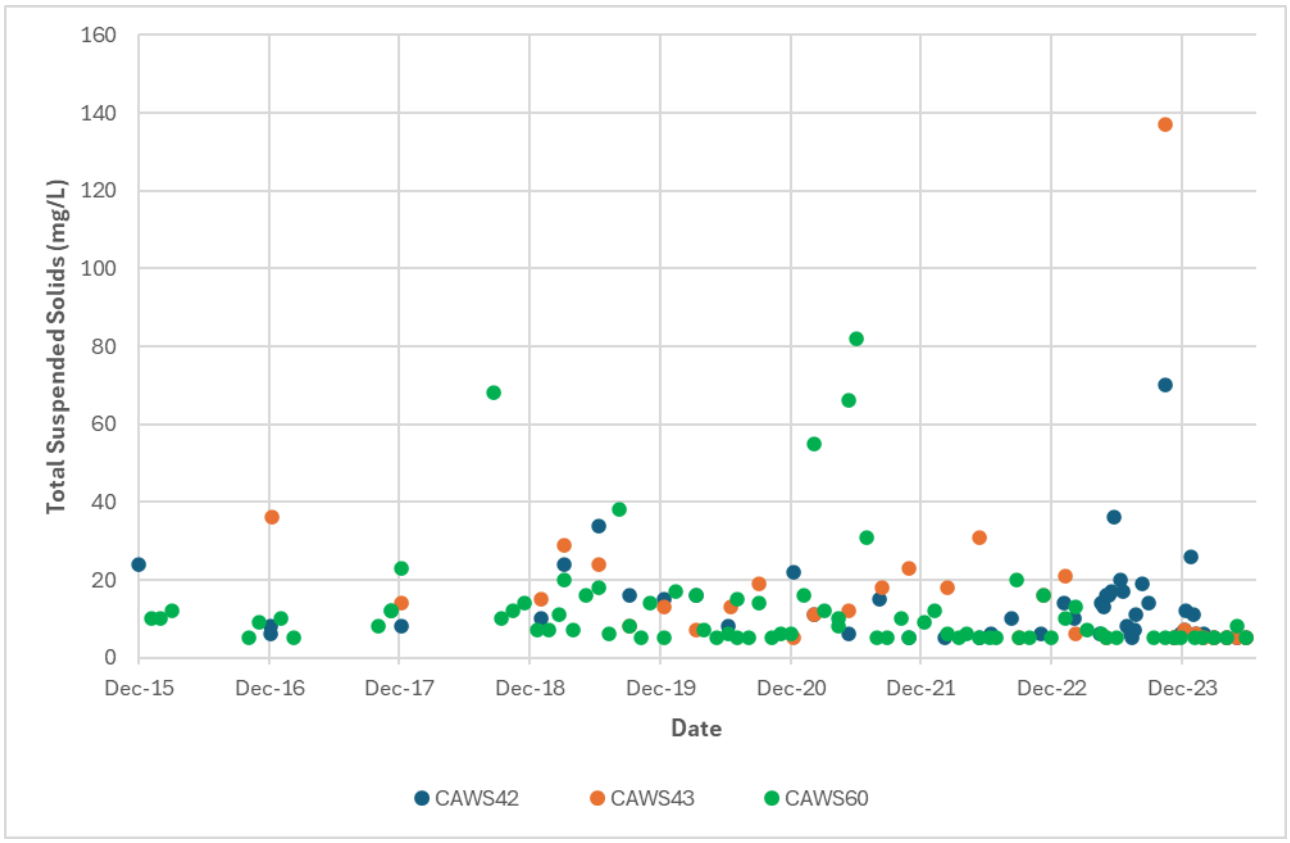


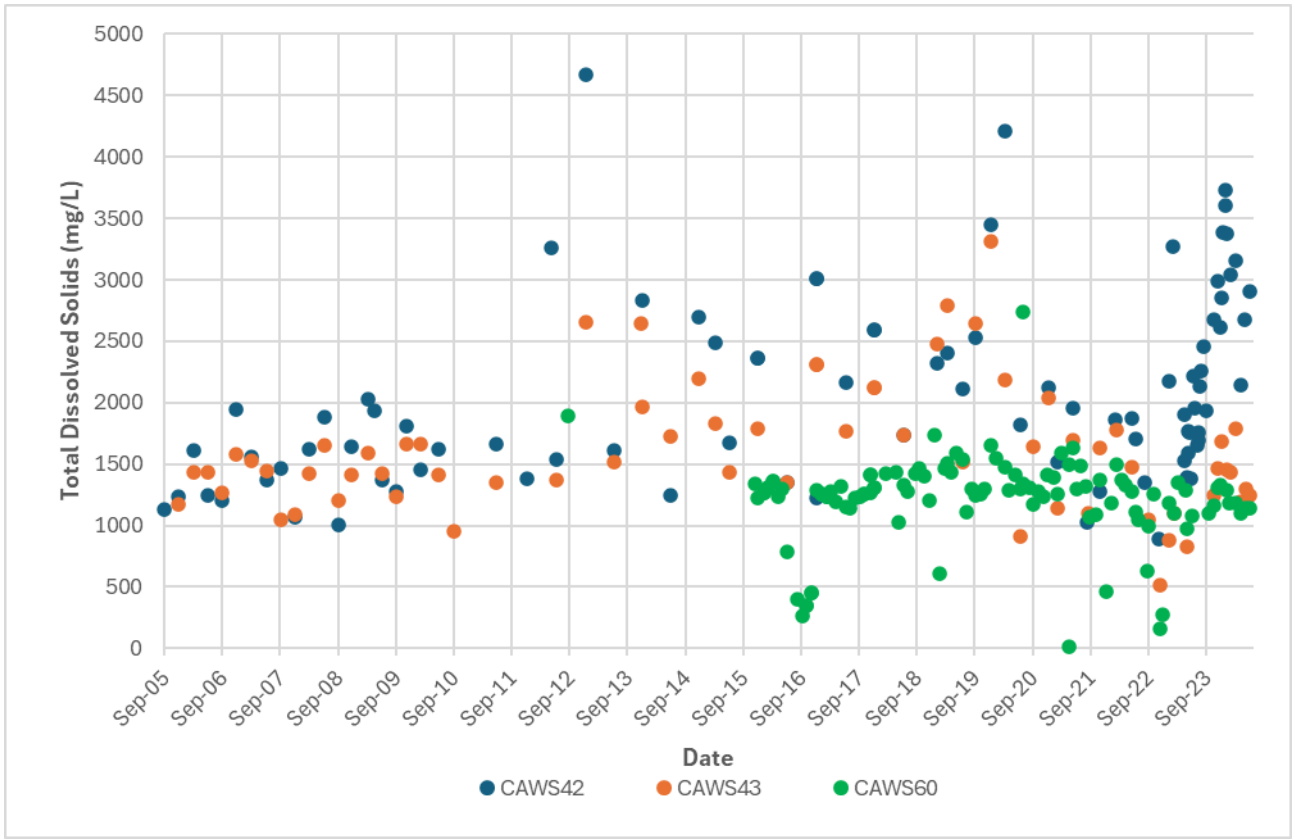
B.5 TSF Eastern

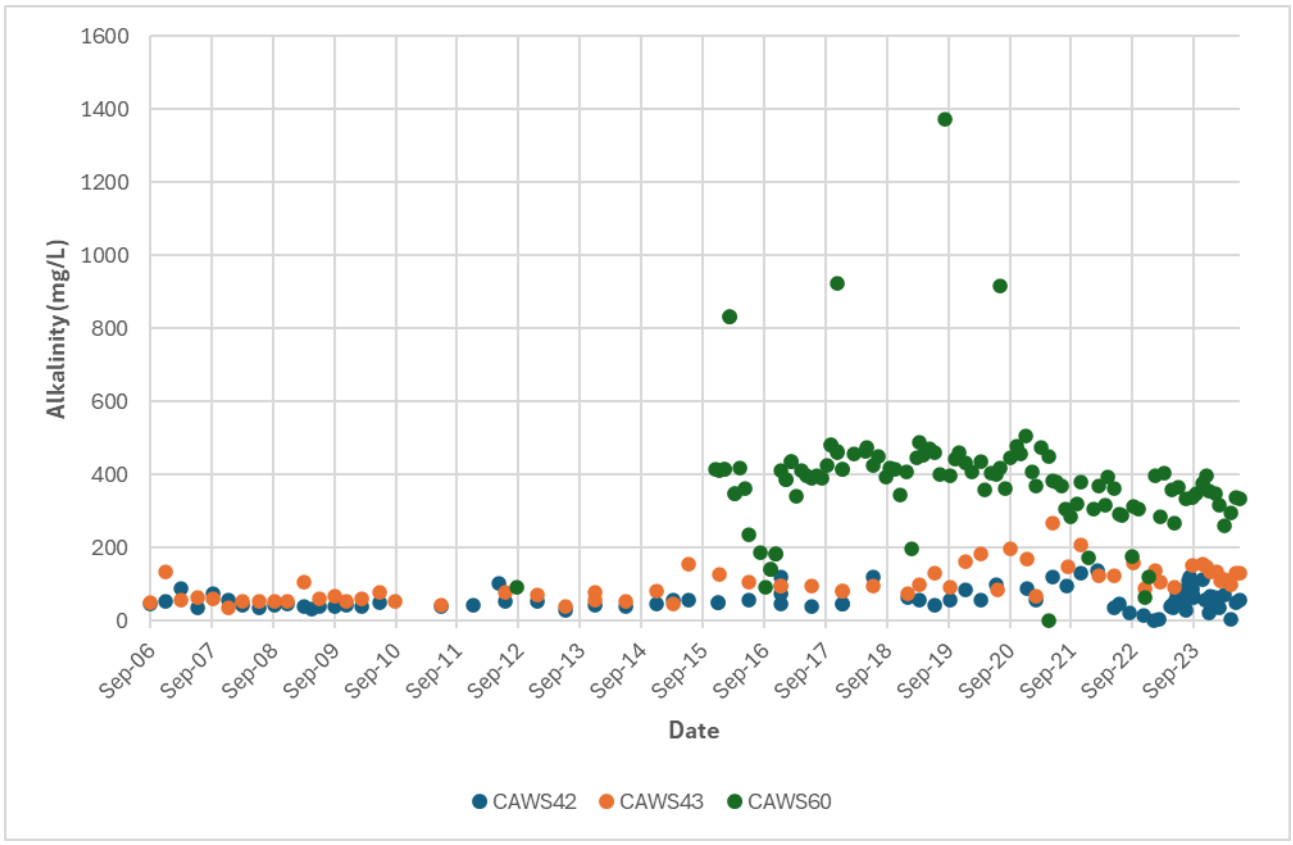
B.5.1 Physiochemical Parameters

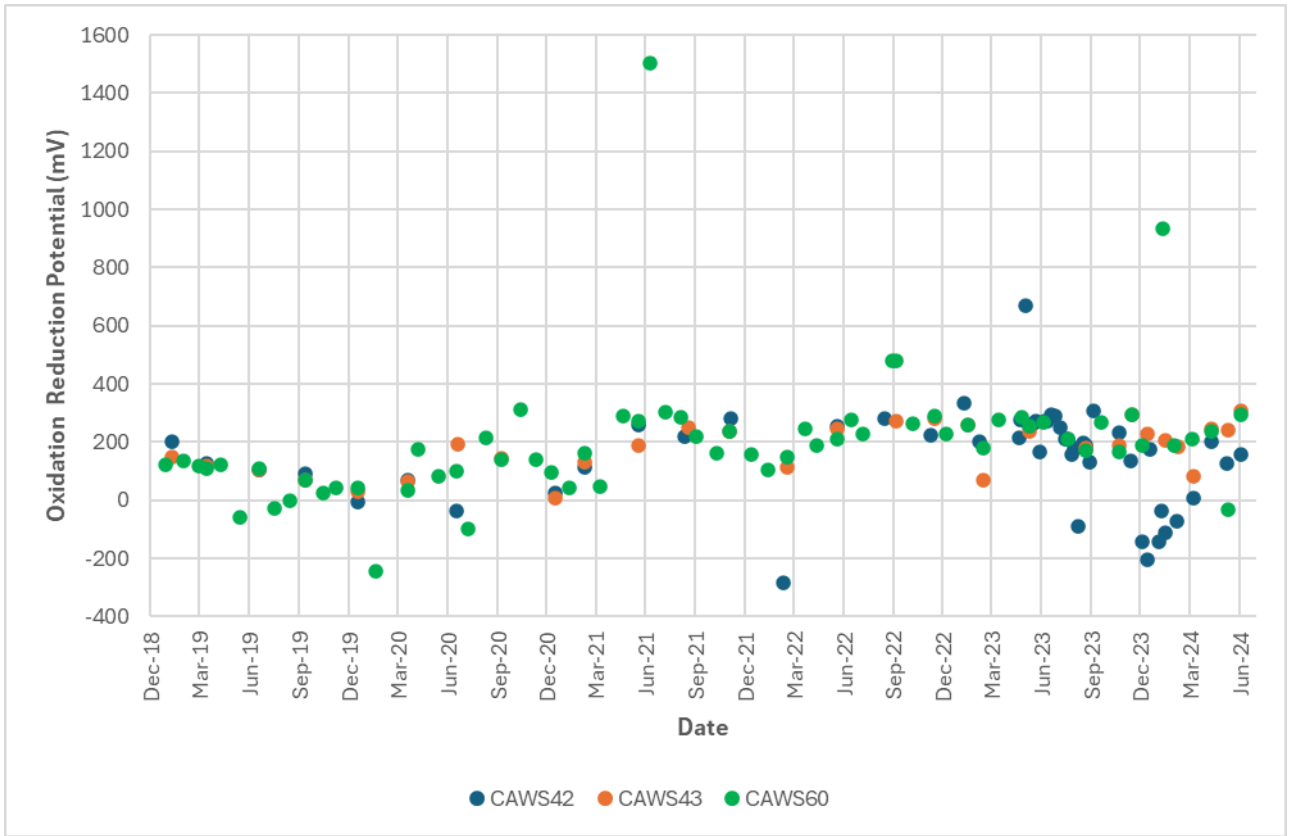




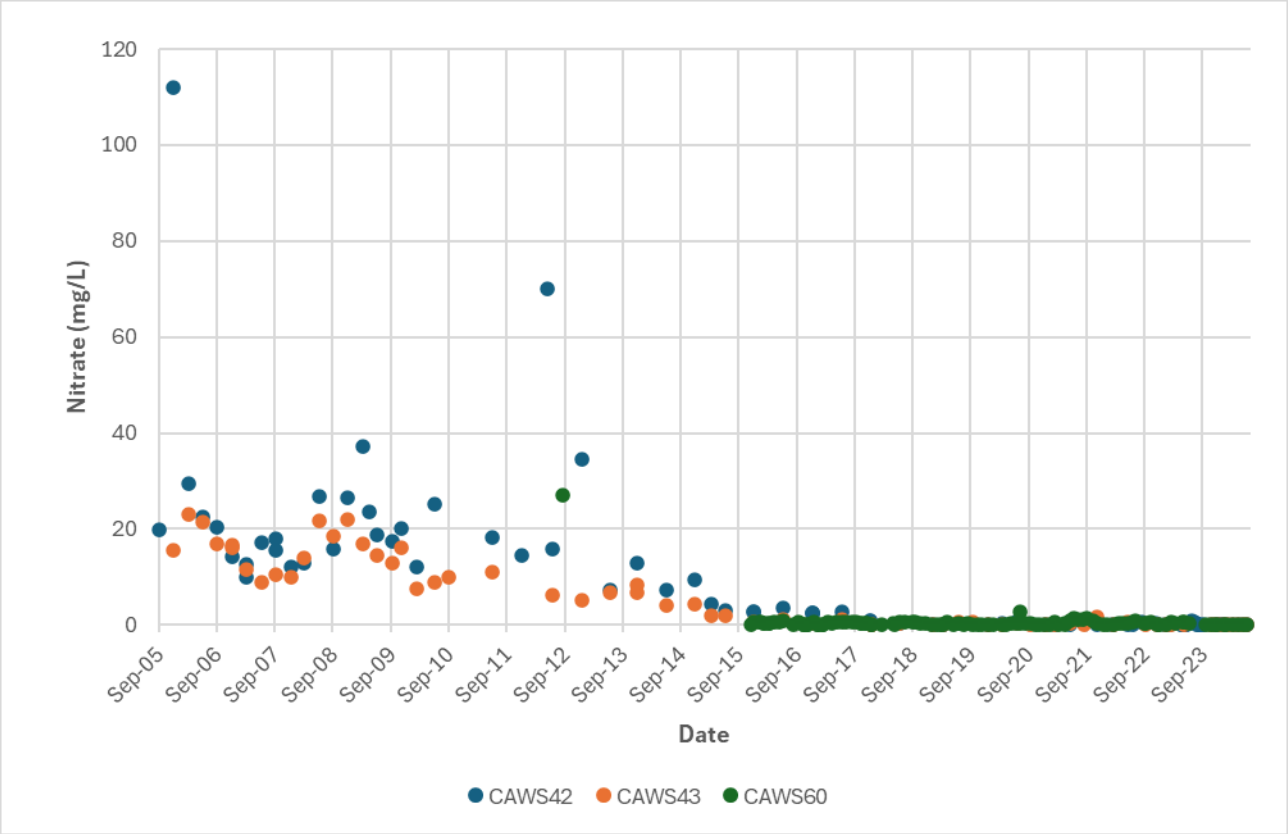

160
140
120
100
80
60
40
20
0
Total Suspended Solids (mg/L)
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS42
CAWS43
CAWS60

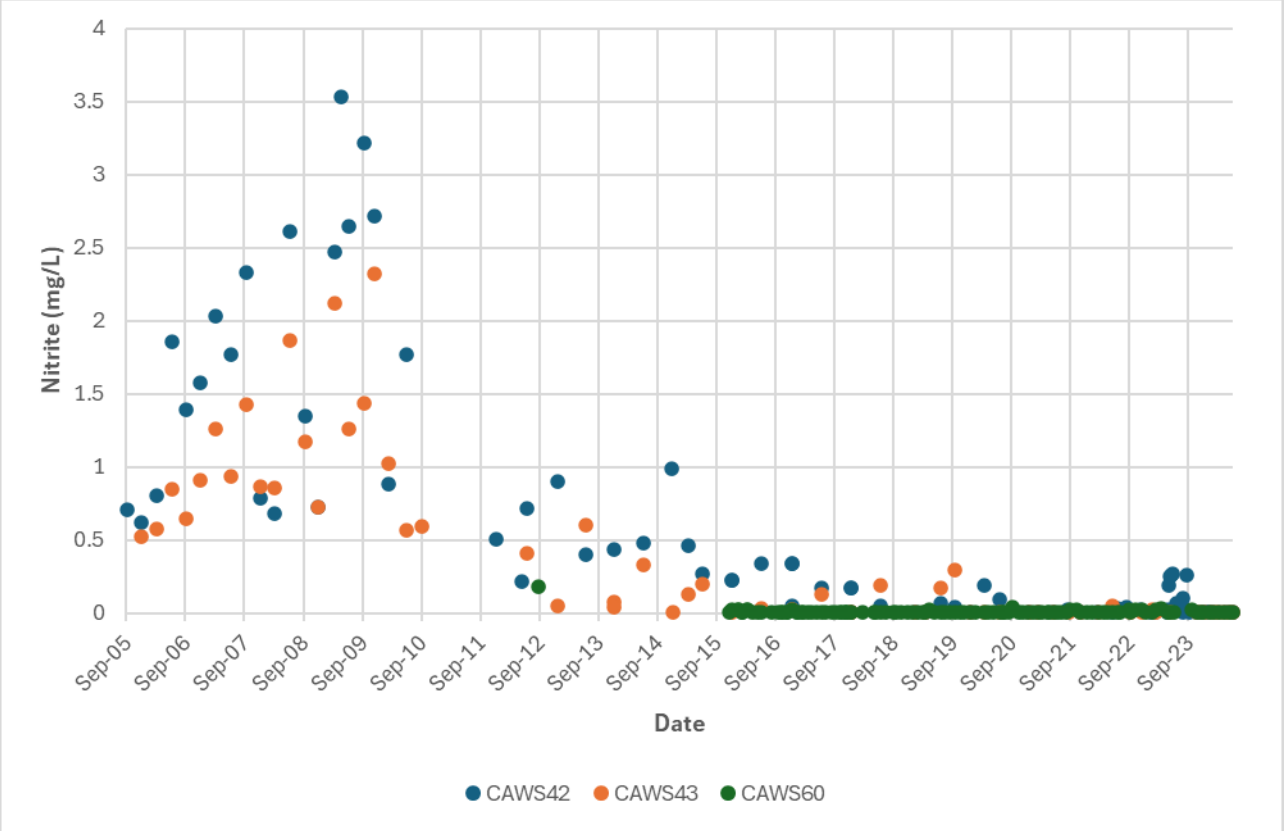

5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Total Dissolved Solids (mg/L)
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

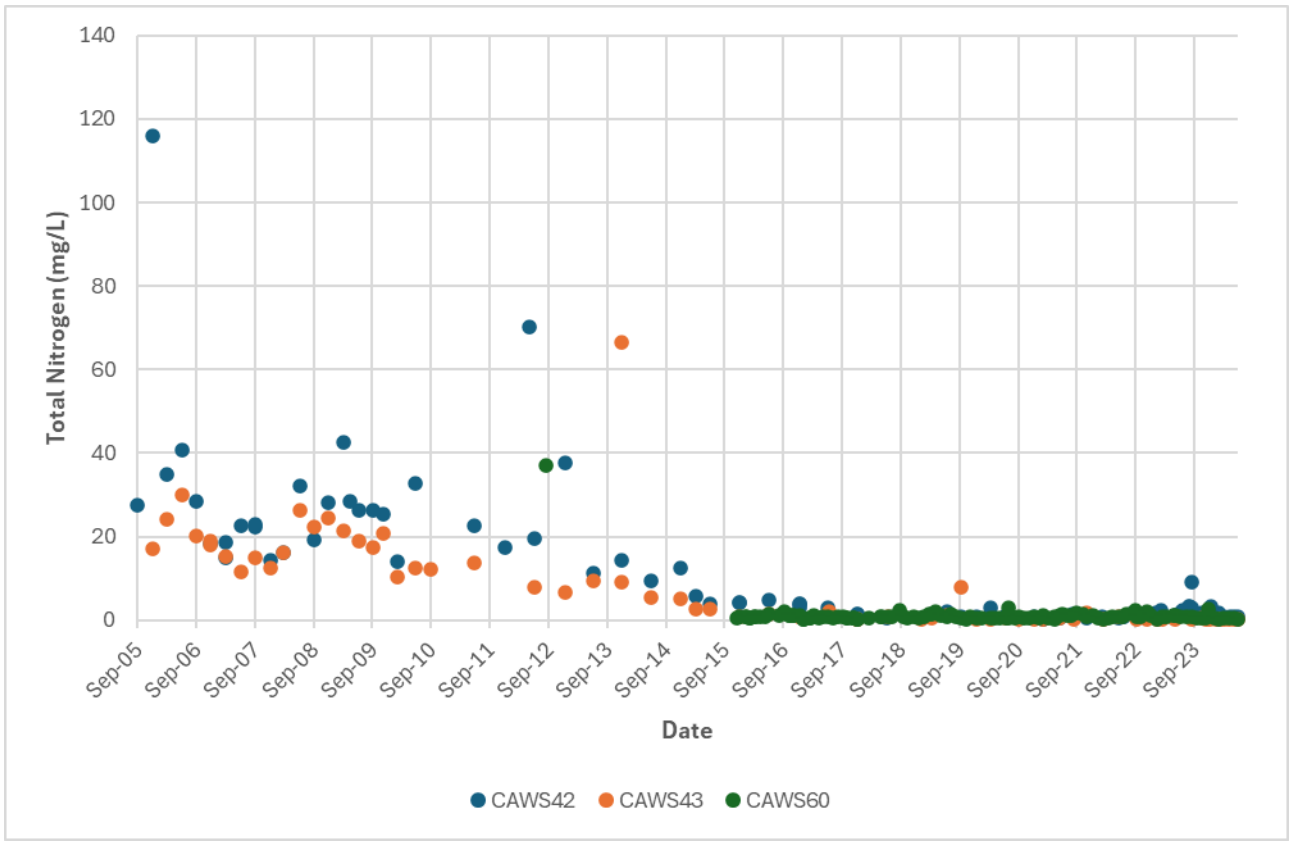

Alkalinity (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

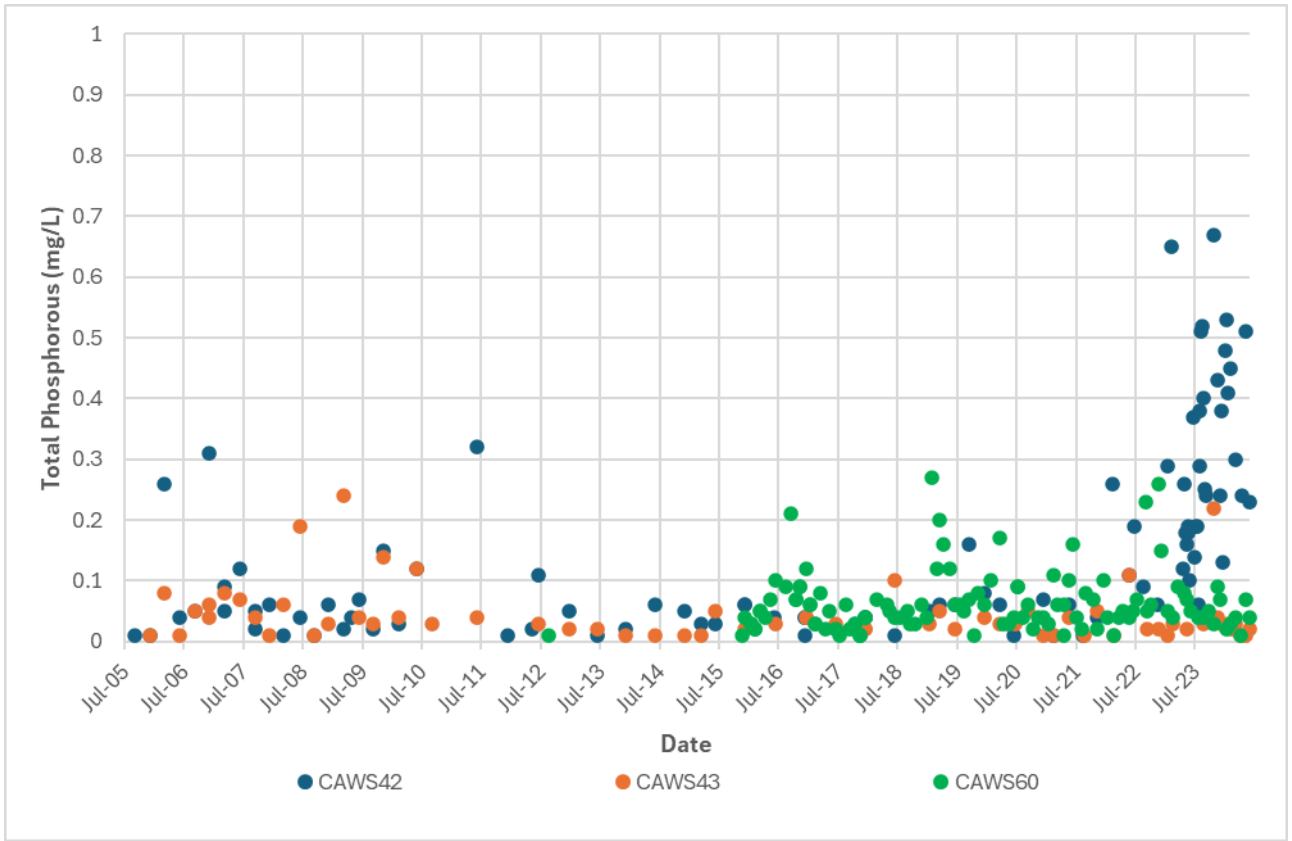

Oxidation Reduction Potential (mV)
1600
1400
1200
1000
800
600
400
200
0
-200
-400
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
Jun-24
Date
CAWS42
CAWS43
CAWS60

B.5.2 Nutrients

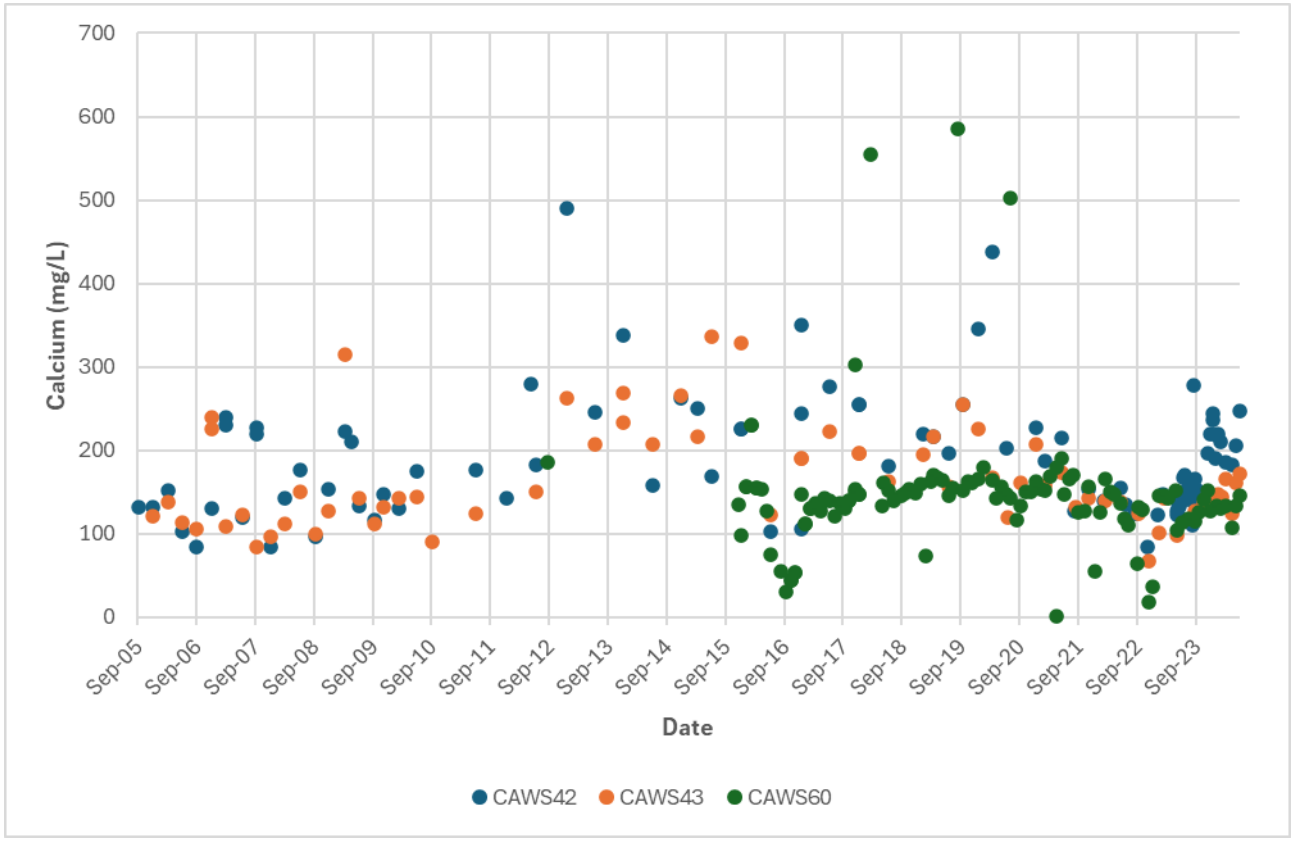


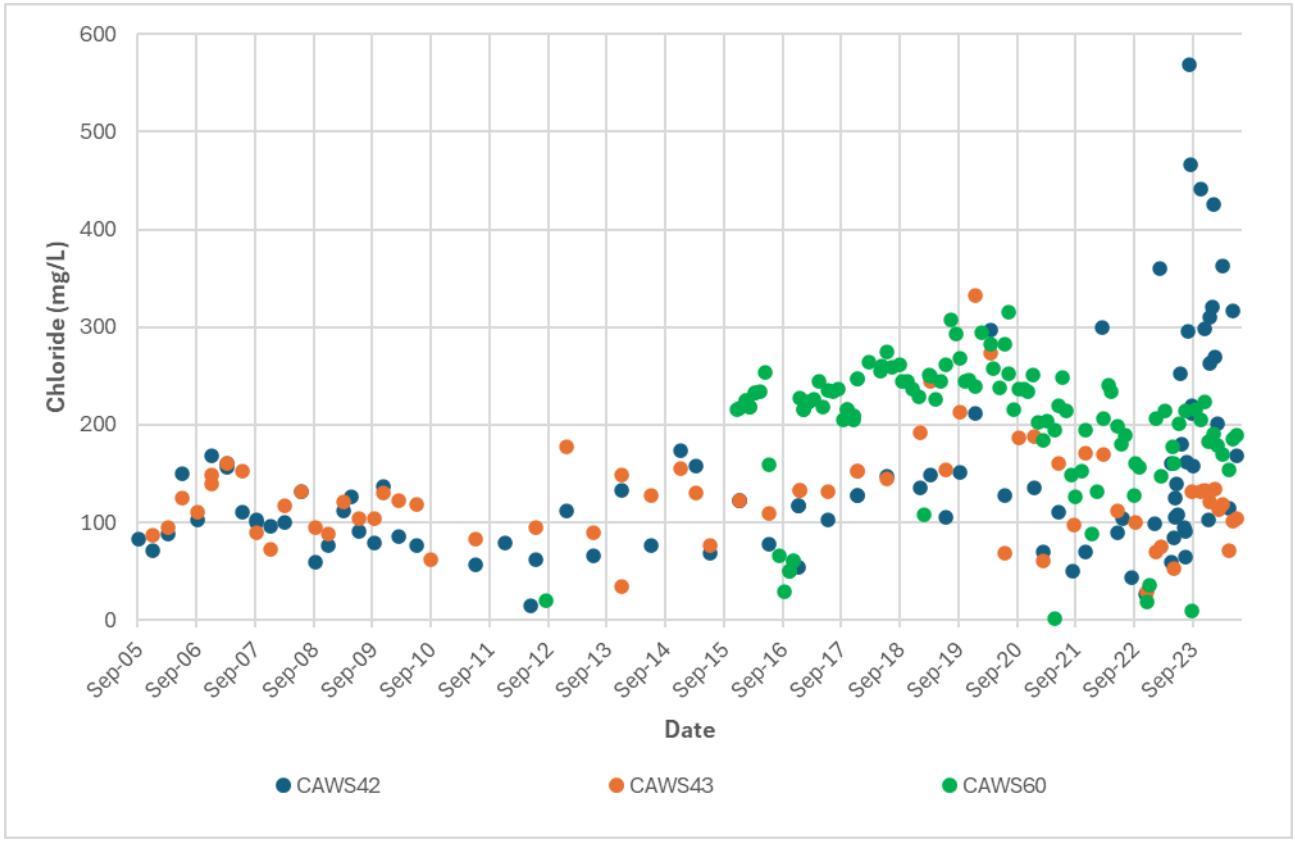


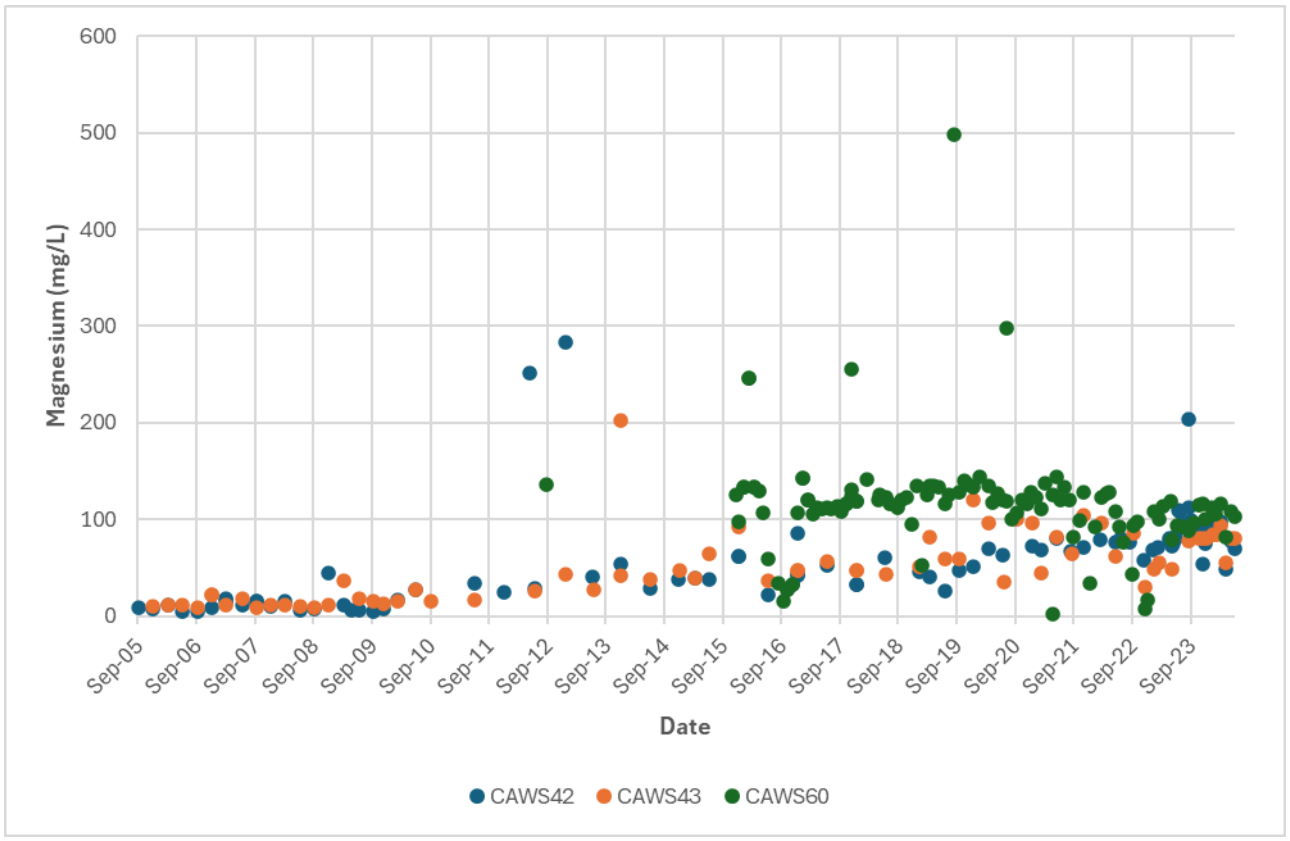

Total Nitrogen (mg/L)
140
120
100
80
60
40
20
0
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

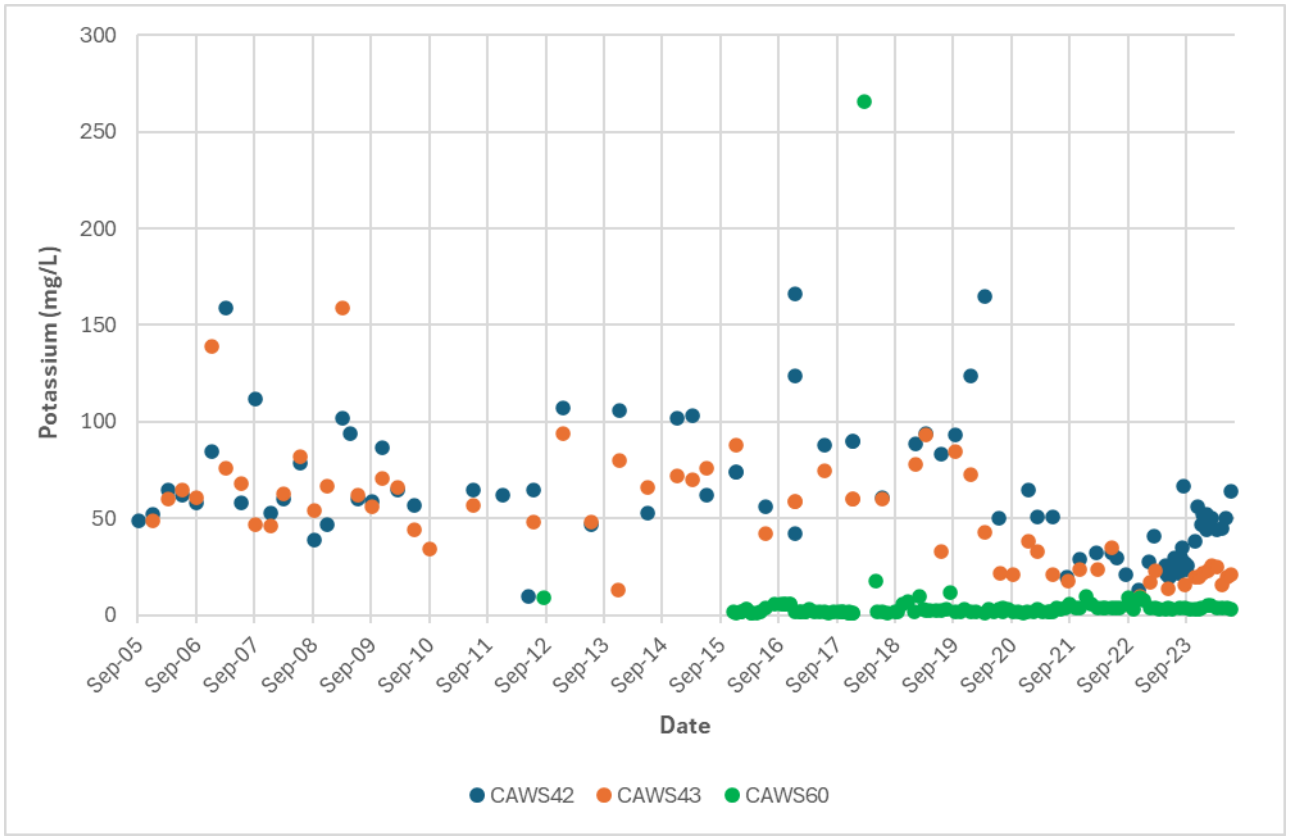

Total Phosphorous (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jul-05
Jul-06
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Date
CAWS42
CAWS43
CAWS60

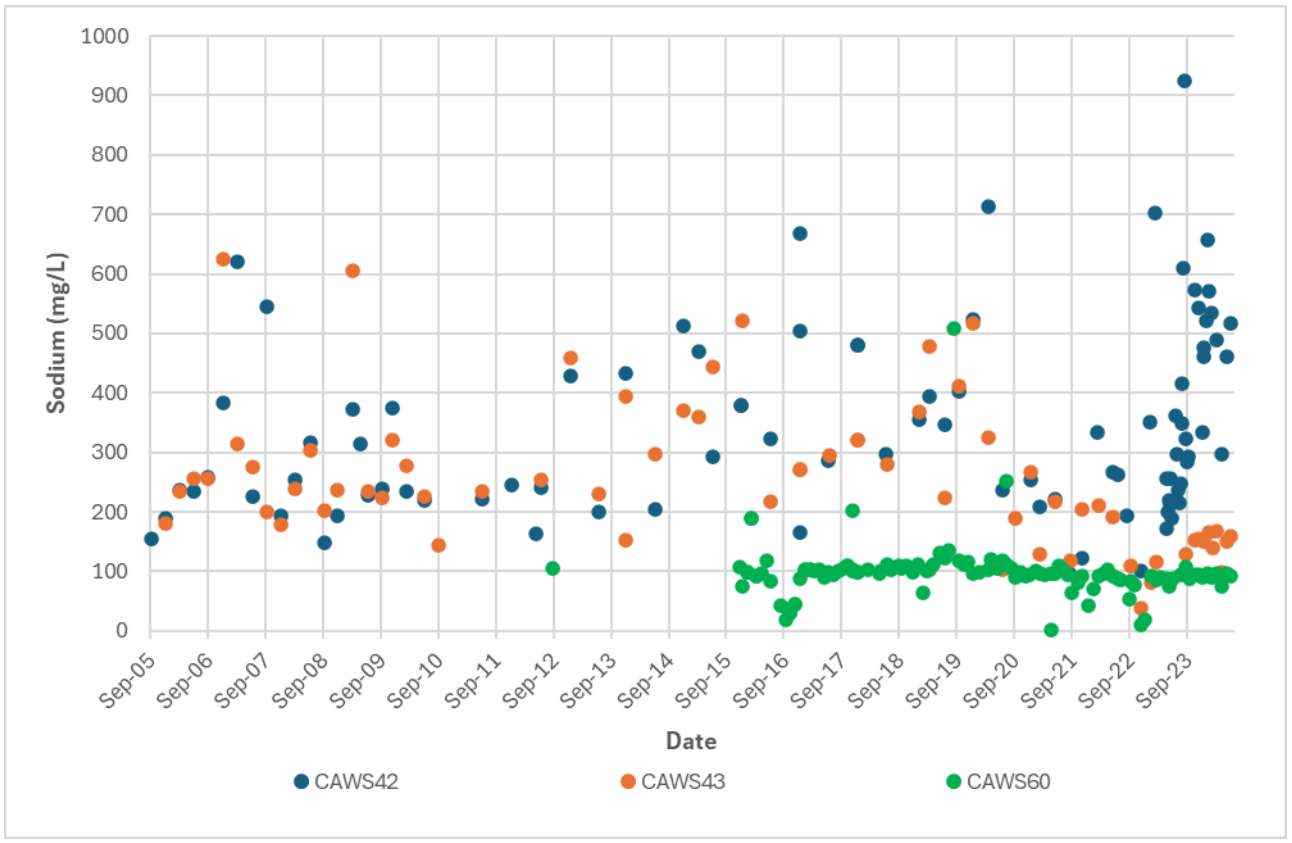
B.5.3 Major Ions

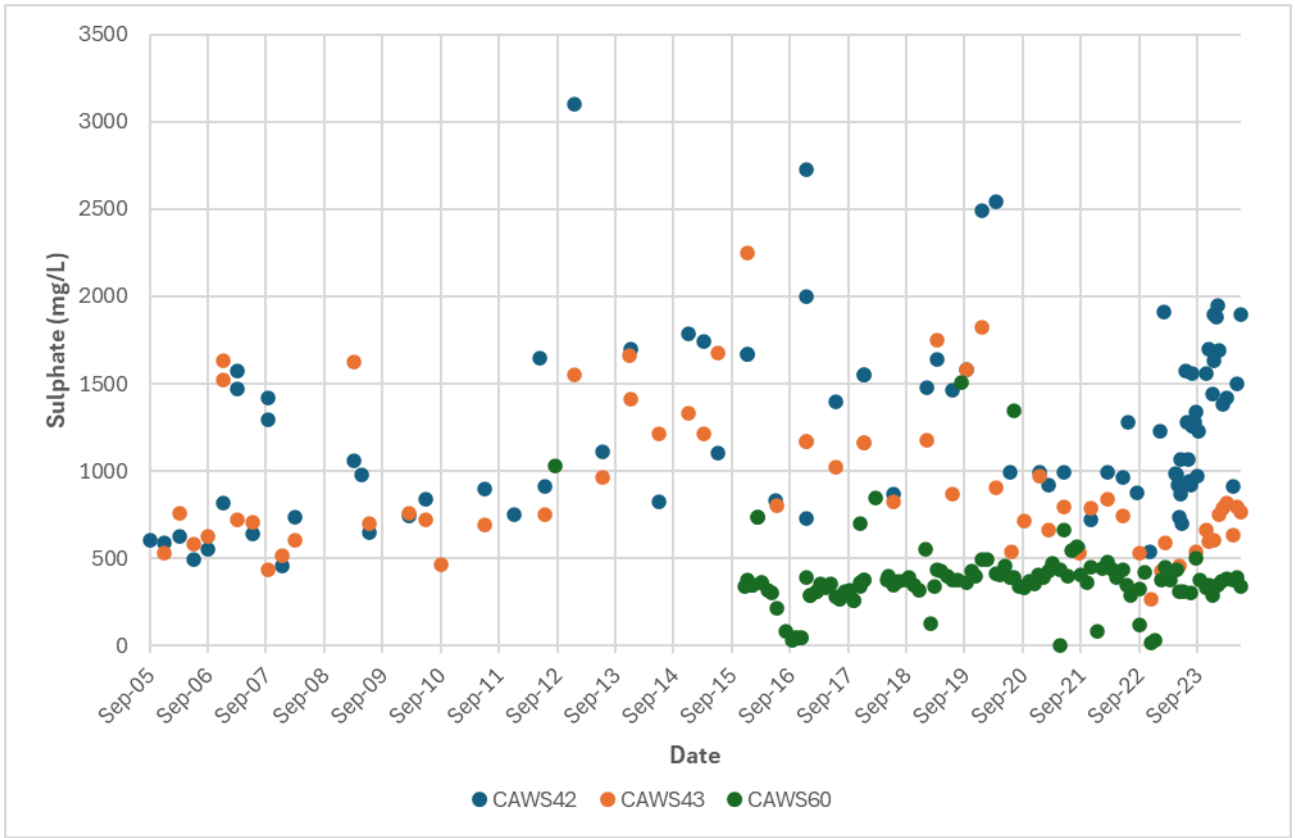




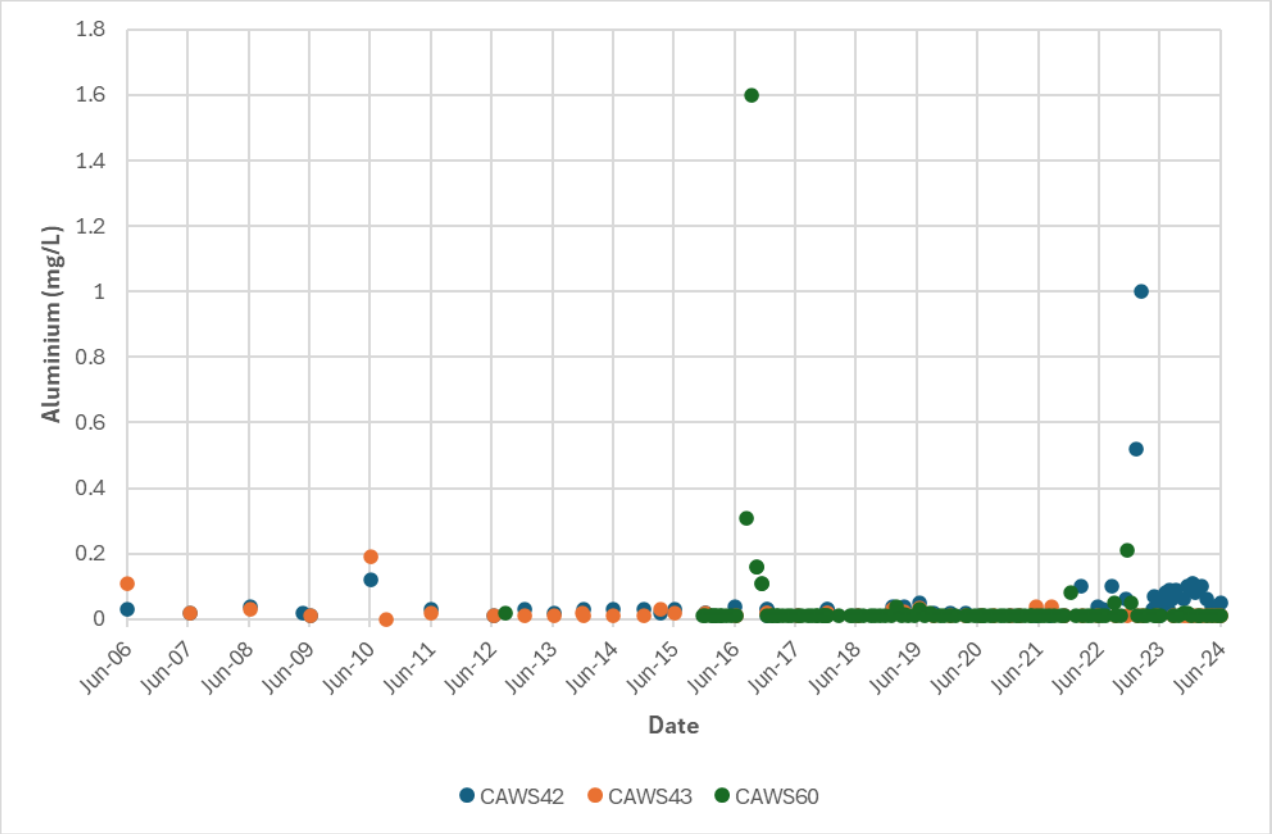

Magnesium (mg/L)
600
500
400
300
200
100
0
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

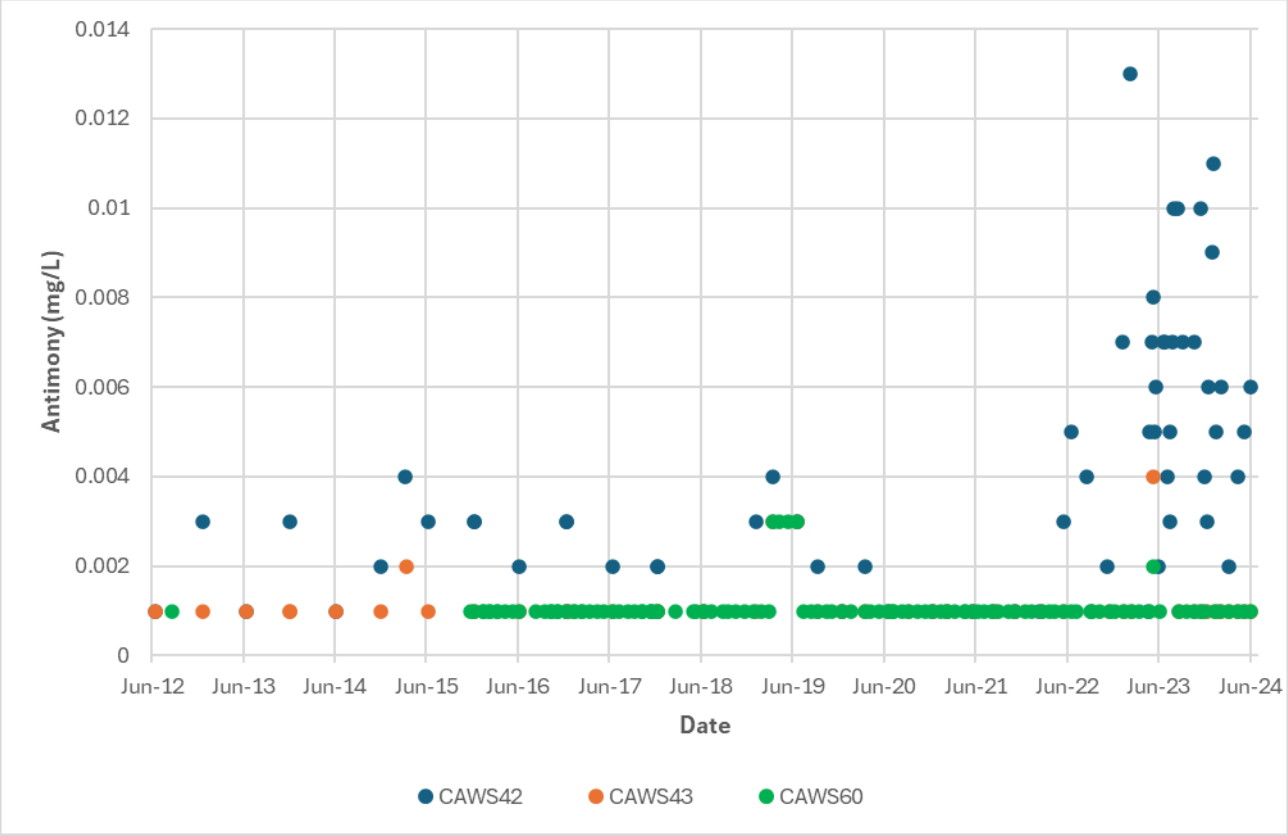

Potassium (mg/L)
300
250
200
150
100
50
0
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

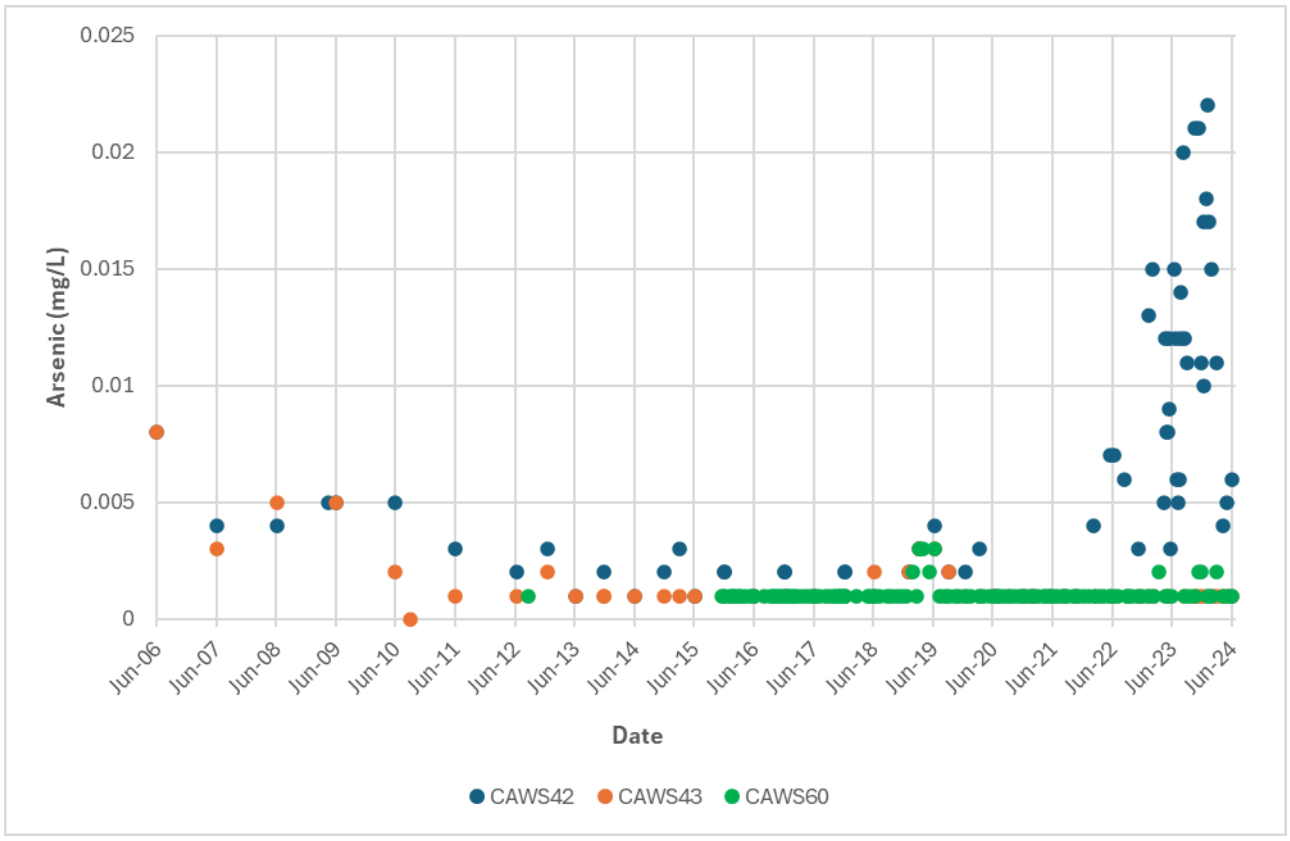

Sodium (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

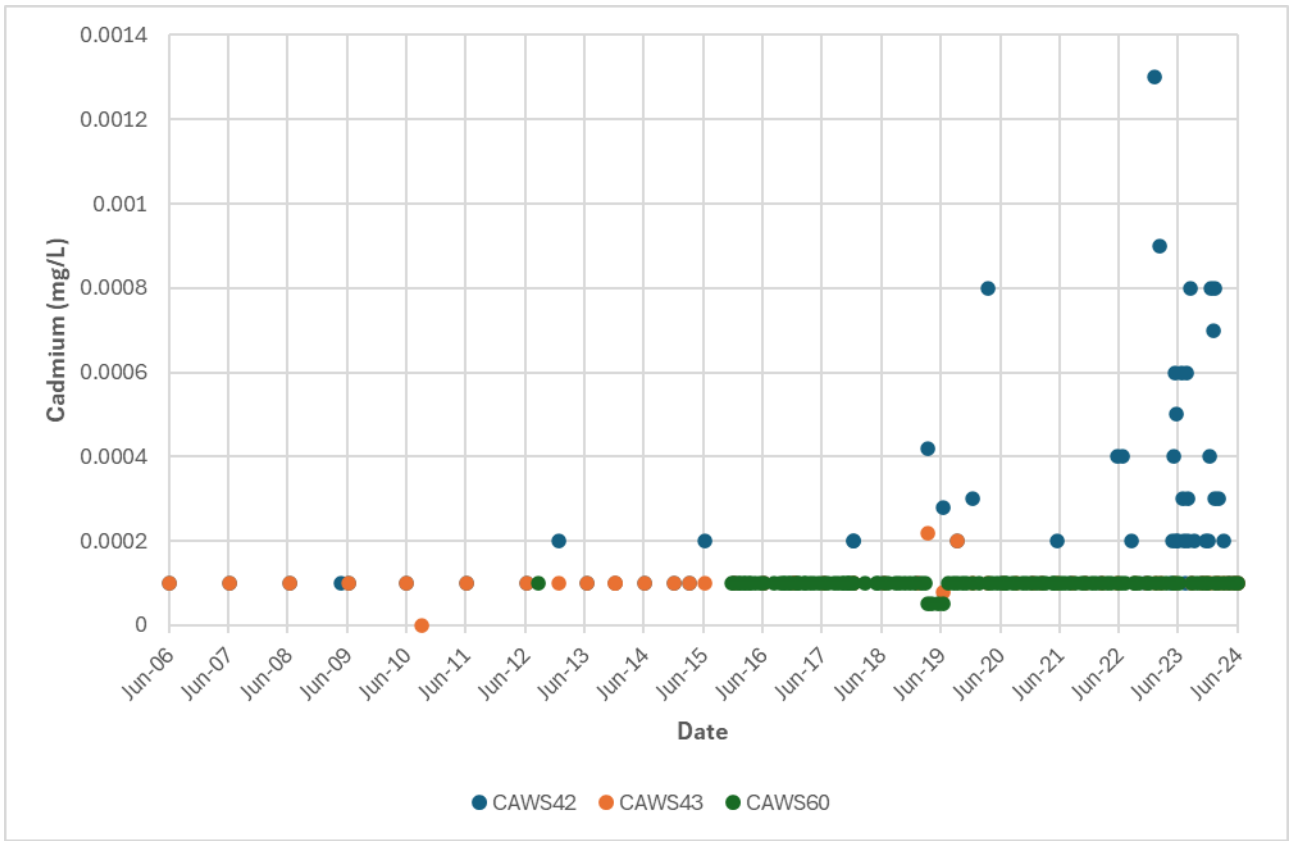

Sulphate (mg/L)
3500
3000
2500
2000
1500
1000
500
0
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

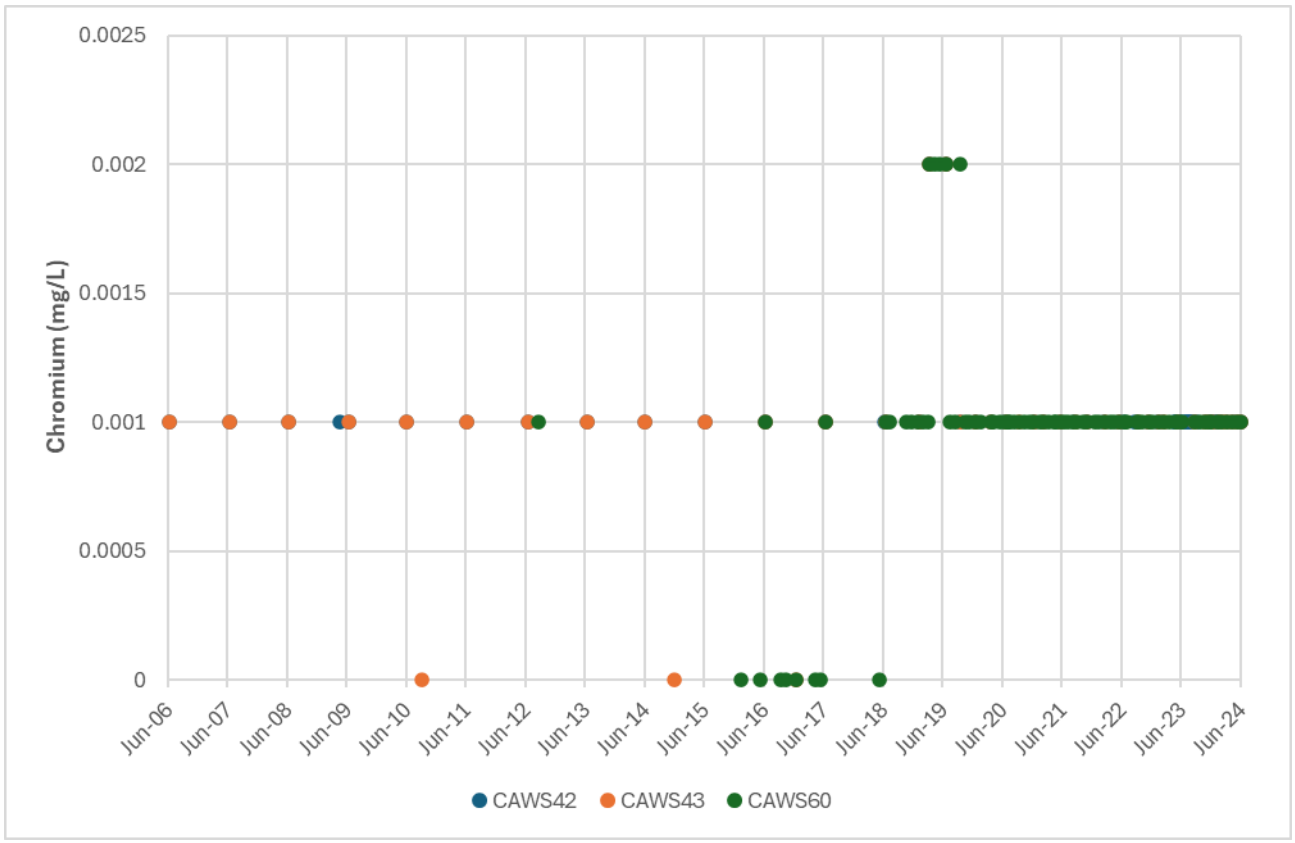
B.5.4 Dissolved Metals

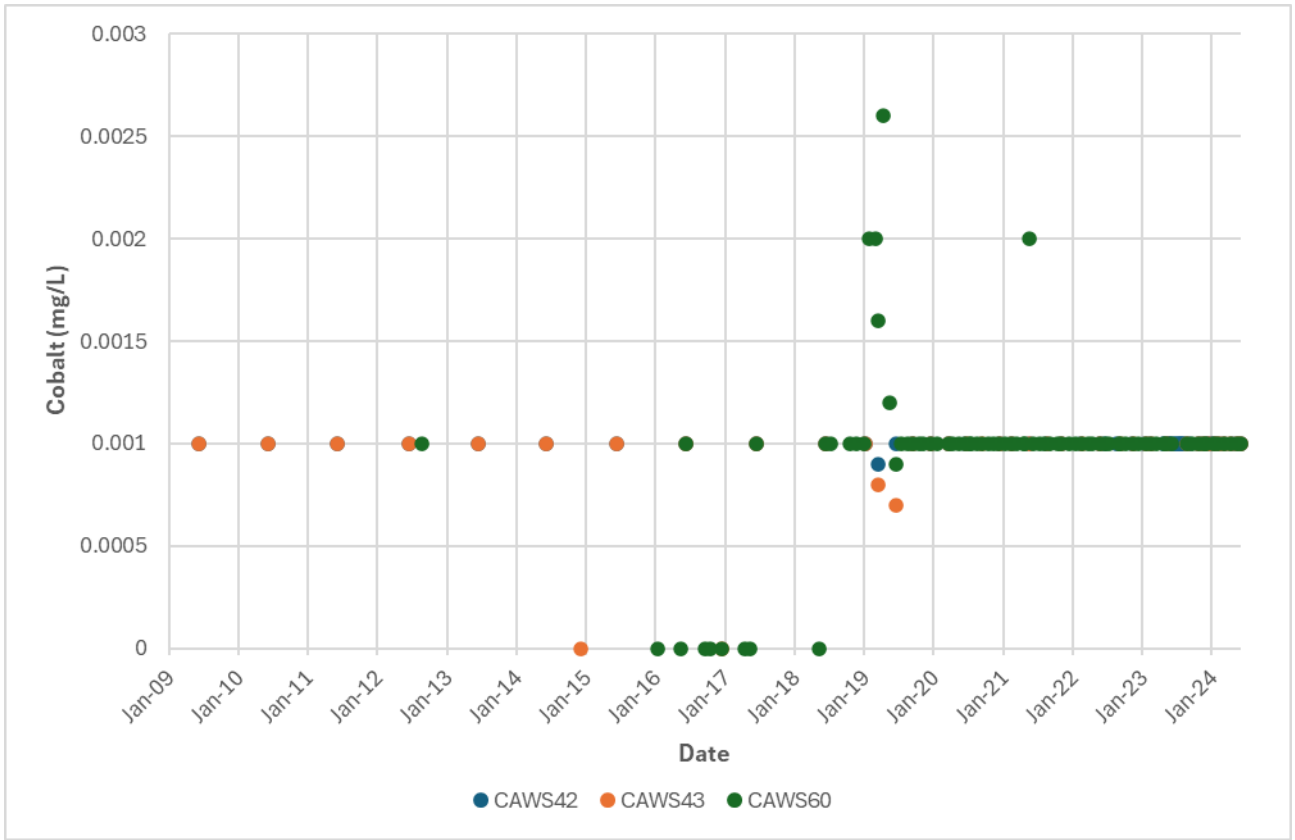


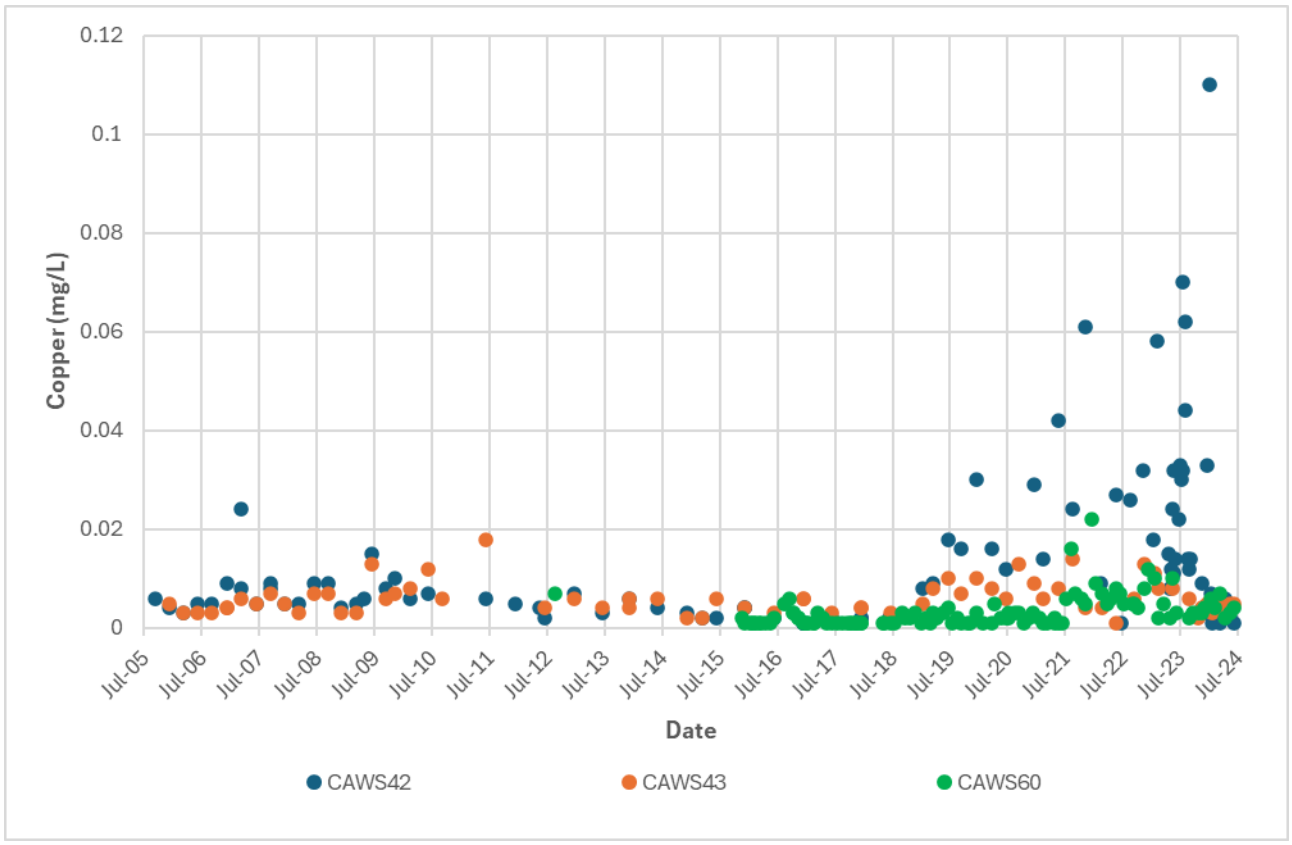


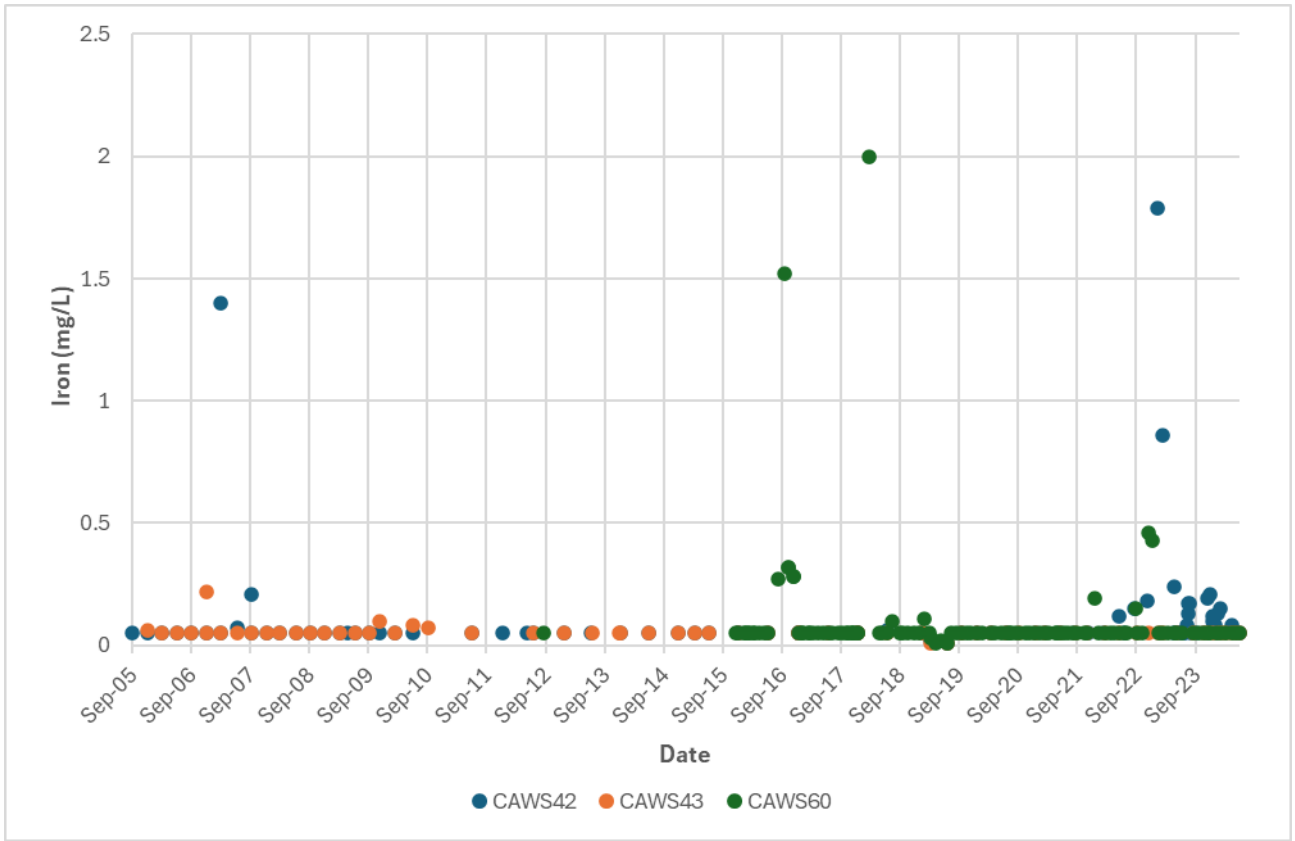

0.025
0.02
0.015
0.01
0.005
0
Arsenic (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

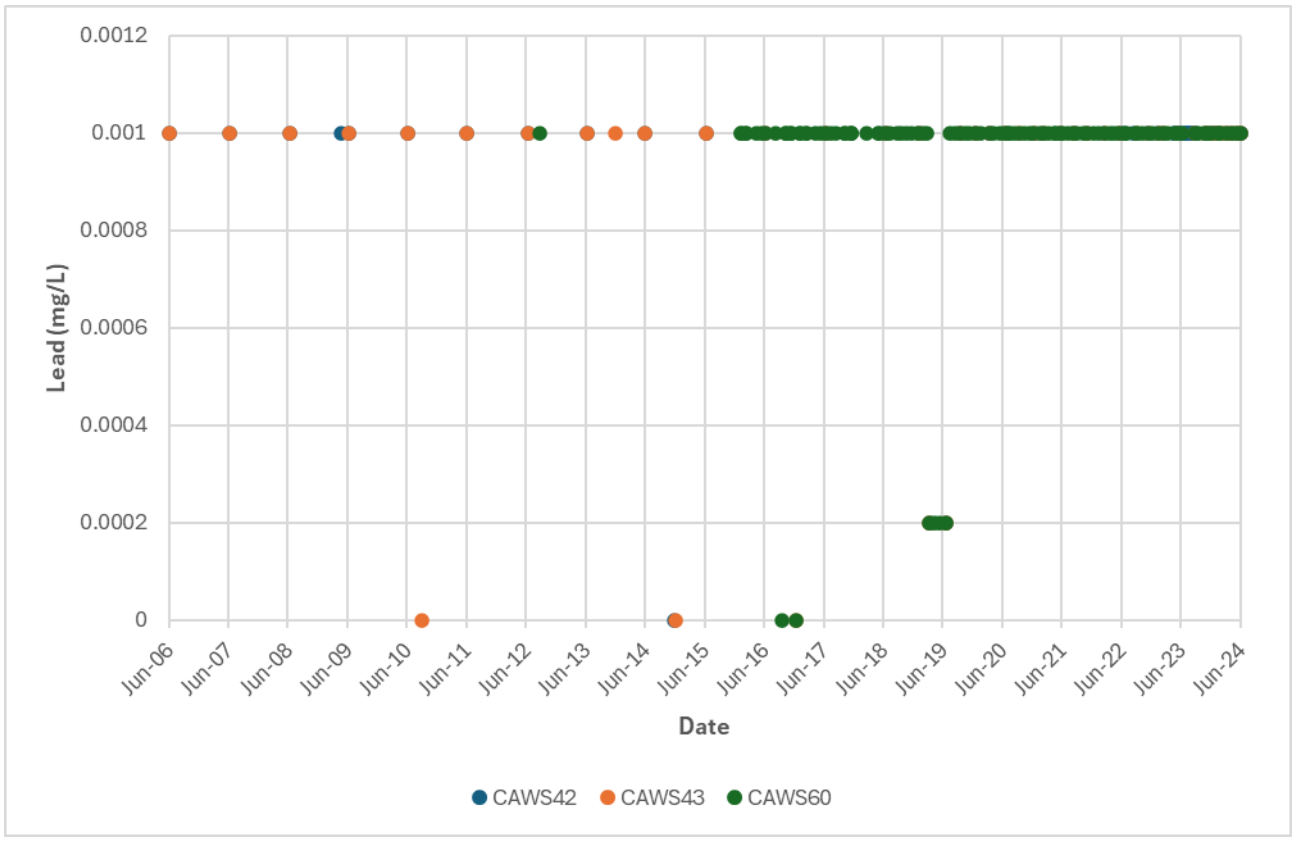

0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Cadmium (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

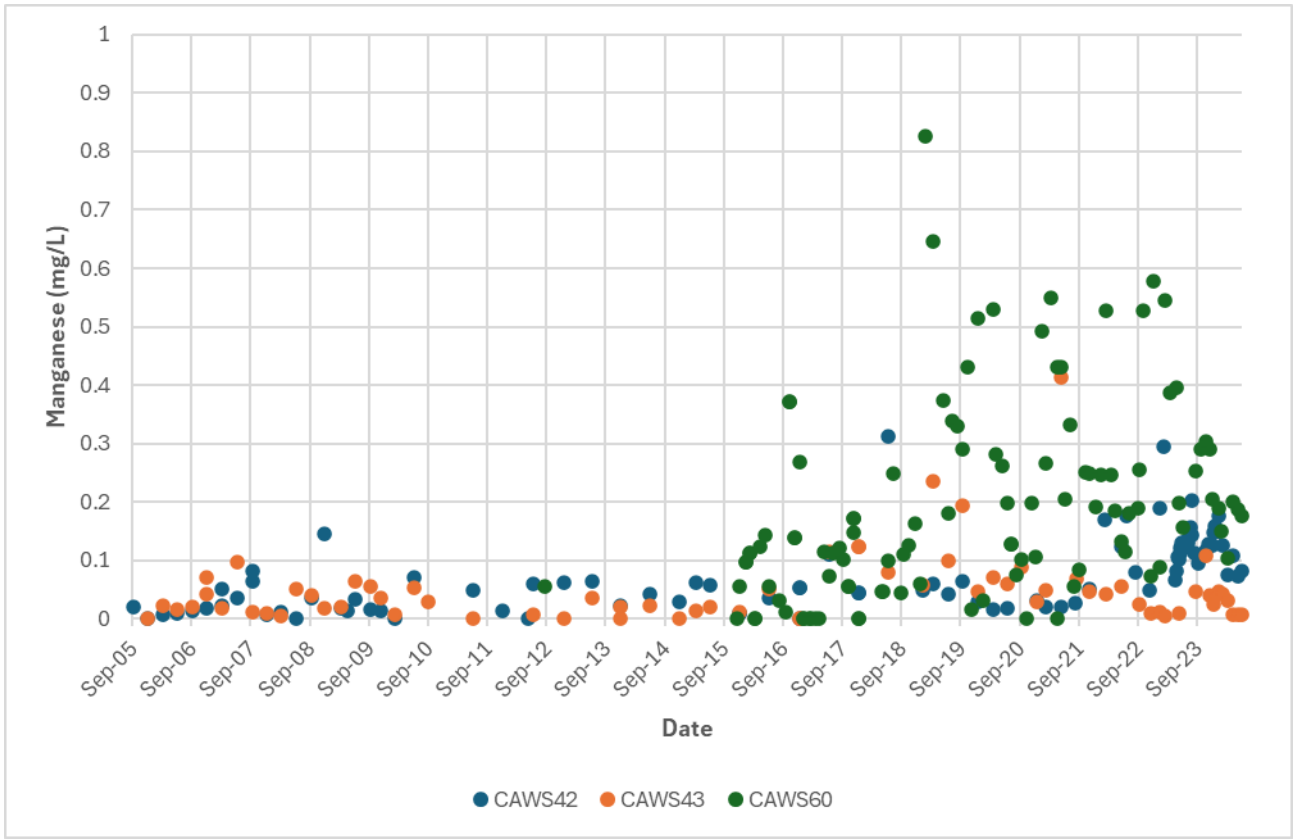

0.0025
0.002
0.0015
0.001
0.0005
0
Chromium (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
CAWS42
CAWS43
CAWS60

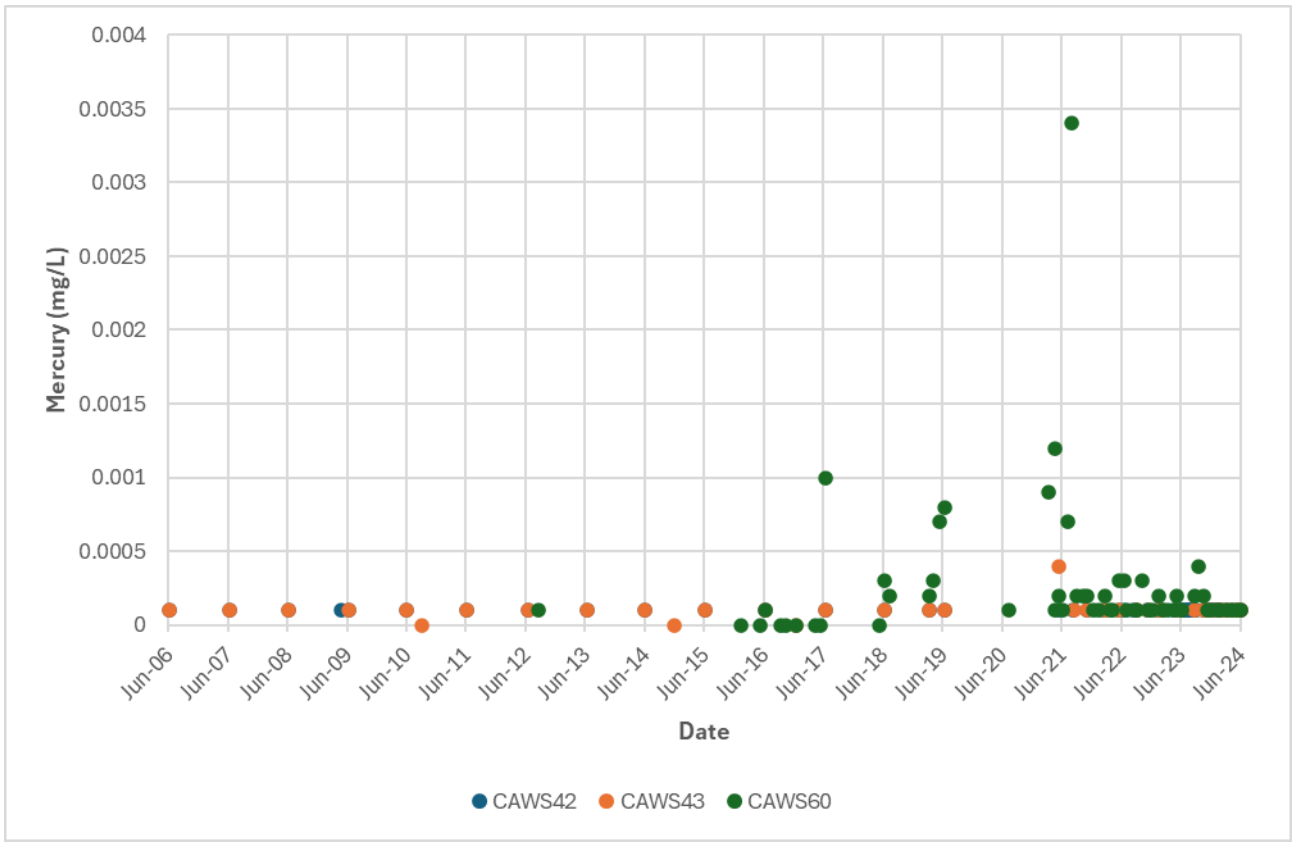

0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Cobalt (mg/L)
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
CAWS42
CAWS43
CAWS60

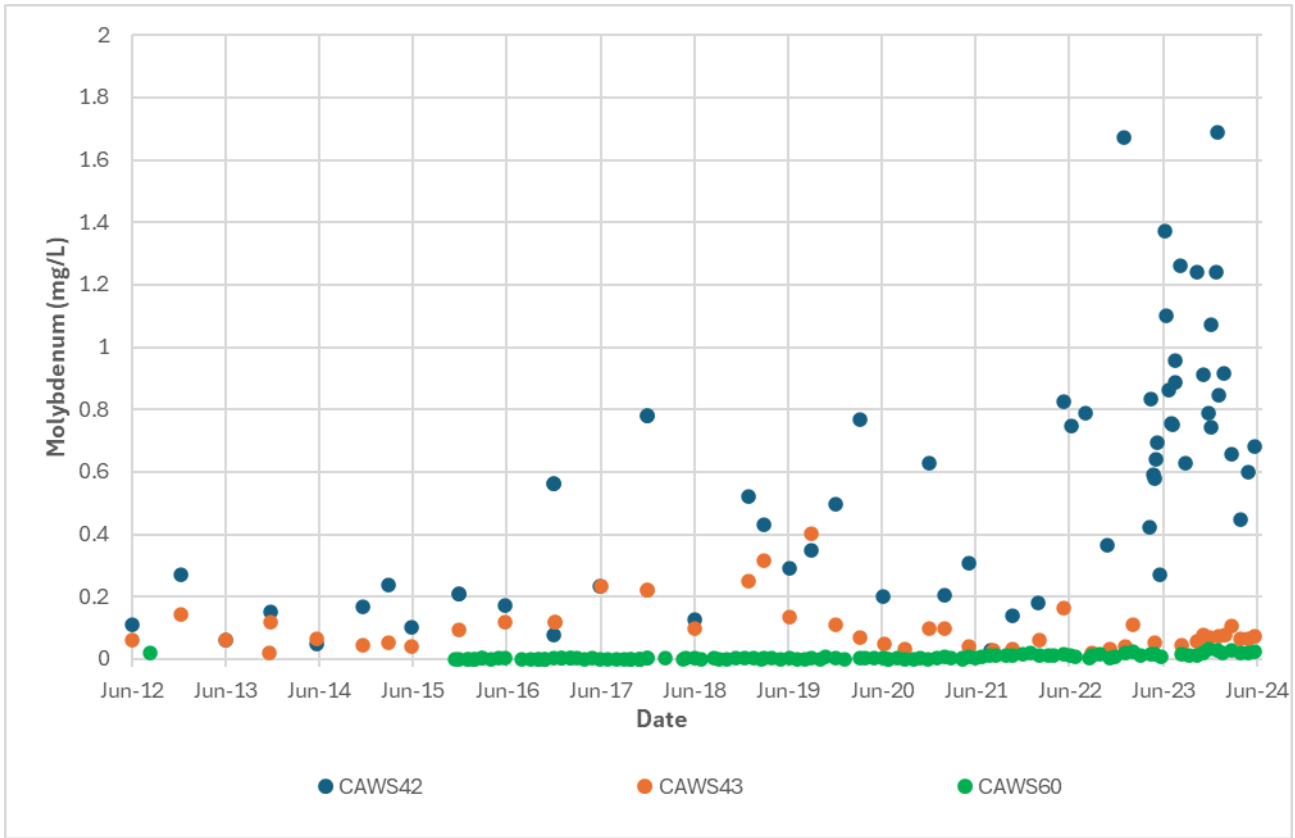

0.12
0.1
0.08
0.06
0.04
0.02
0
Copper (mg/L)
Jul-05
Jul-06
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Jul-24
Date
CAWS42
CAWS43
CAWS60

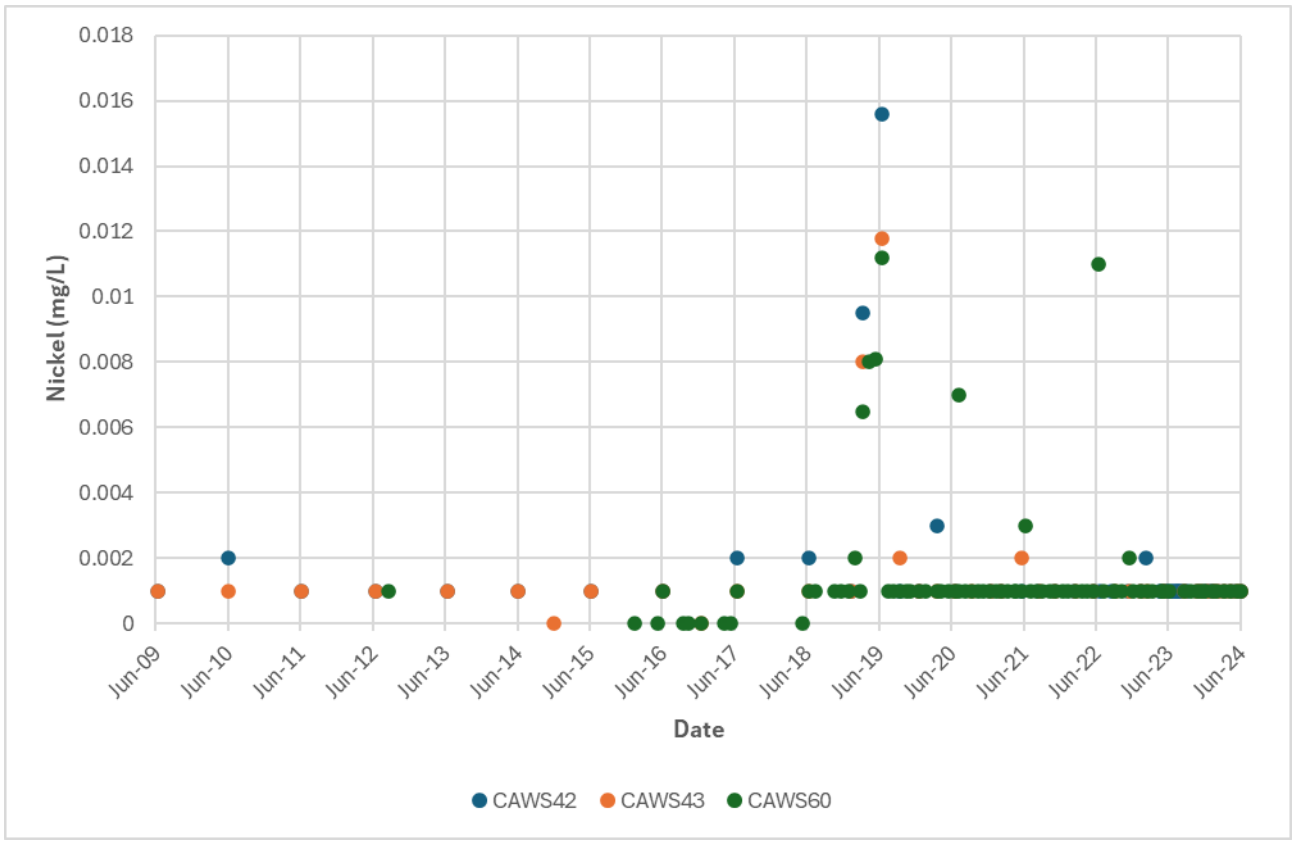

2.5
2
1.5
1
0.5
0
Iron (mg/L)
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60

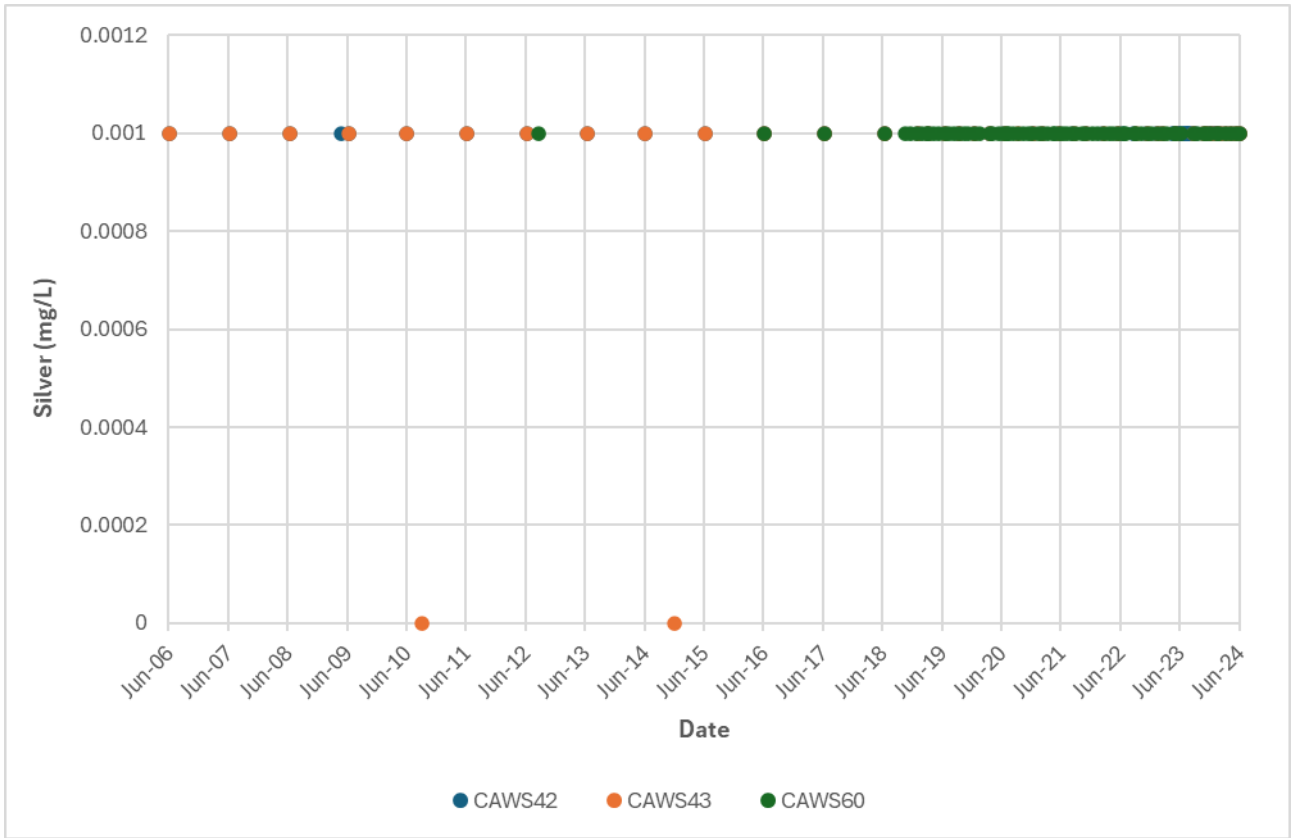

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Lead (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

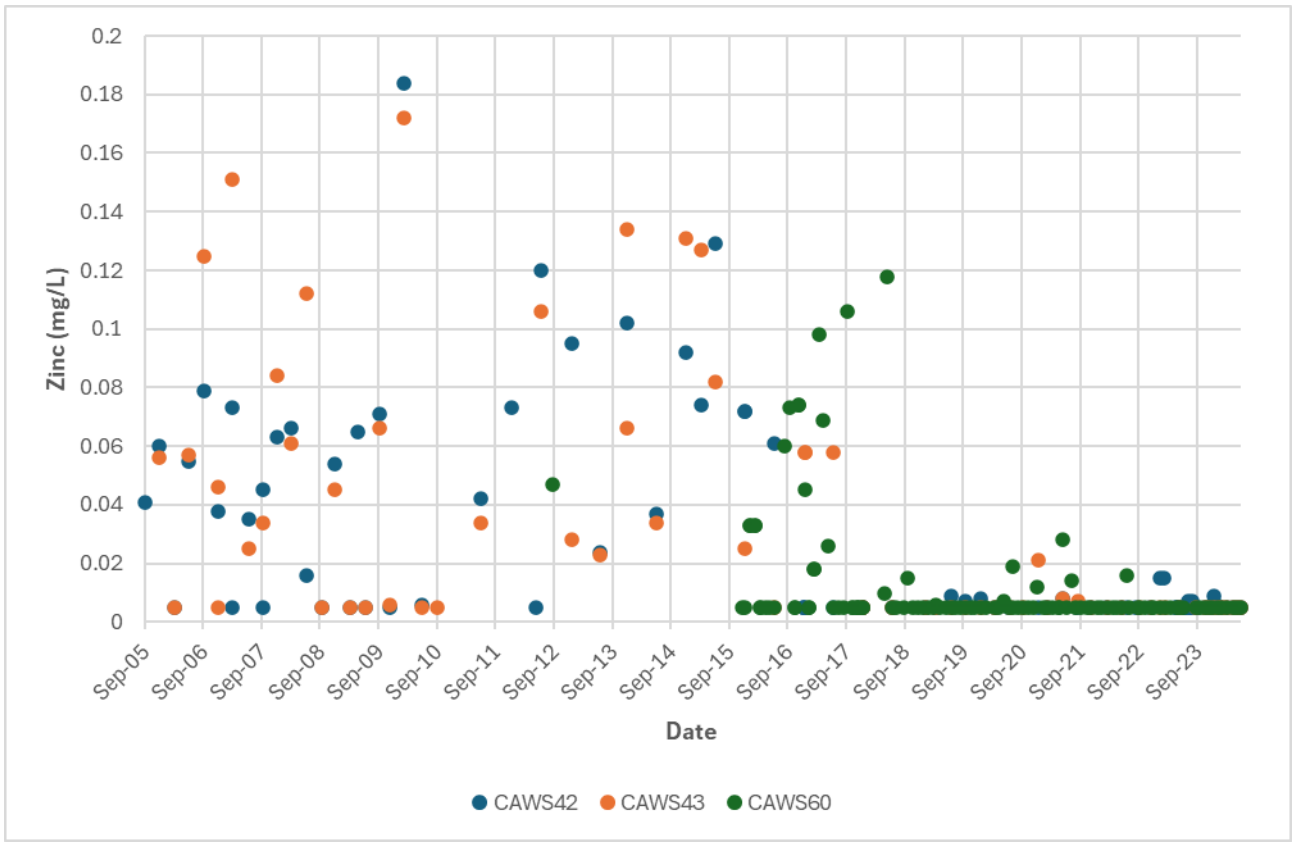

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Manganese (mg/L)
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
CAWS42
CAWS43
CAWS60


0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Mercury (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60


2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

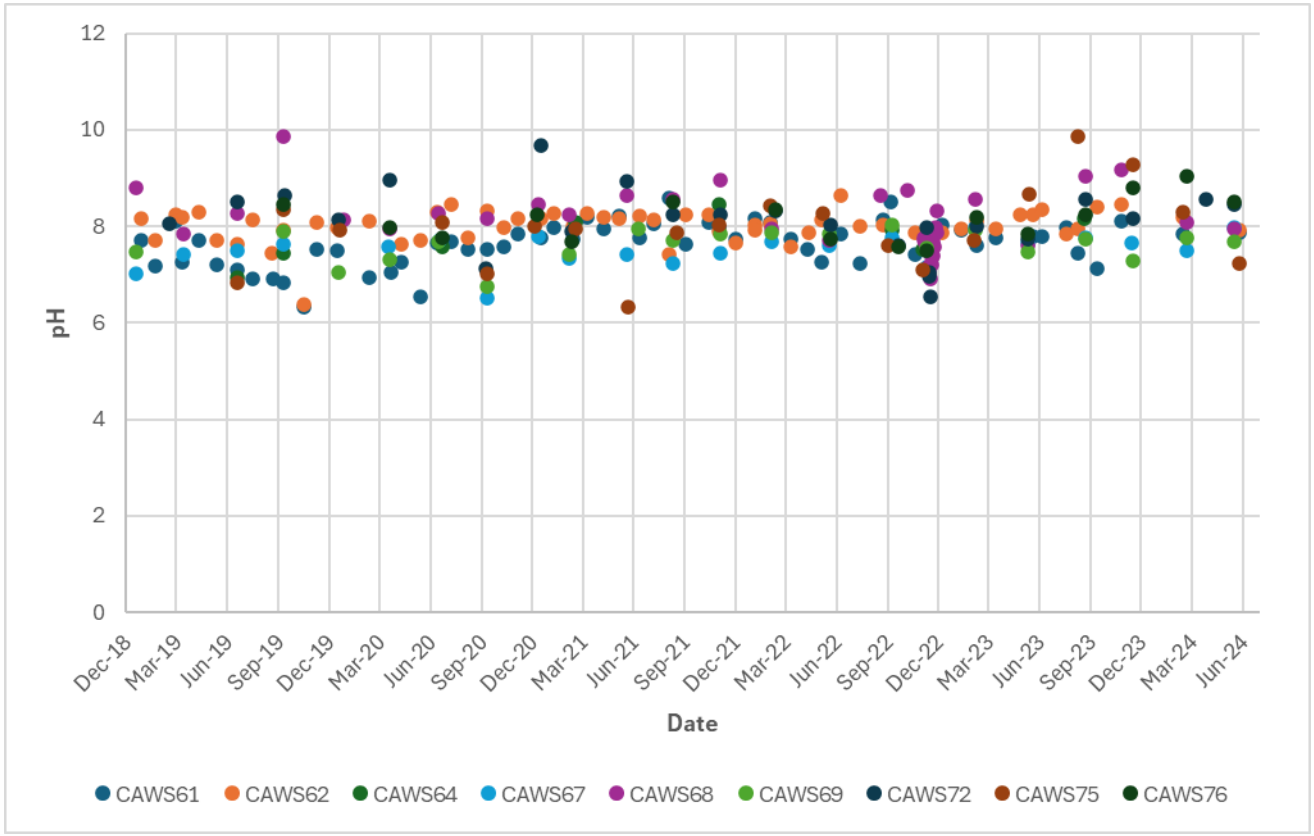

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

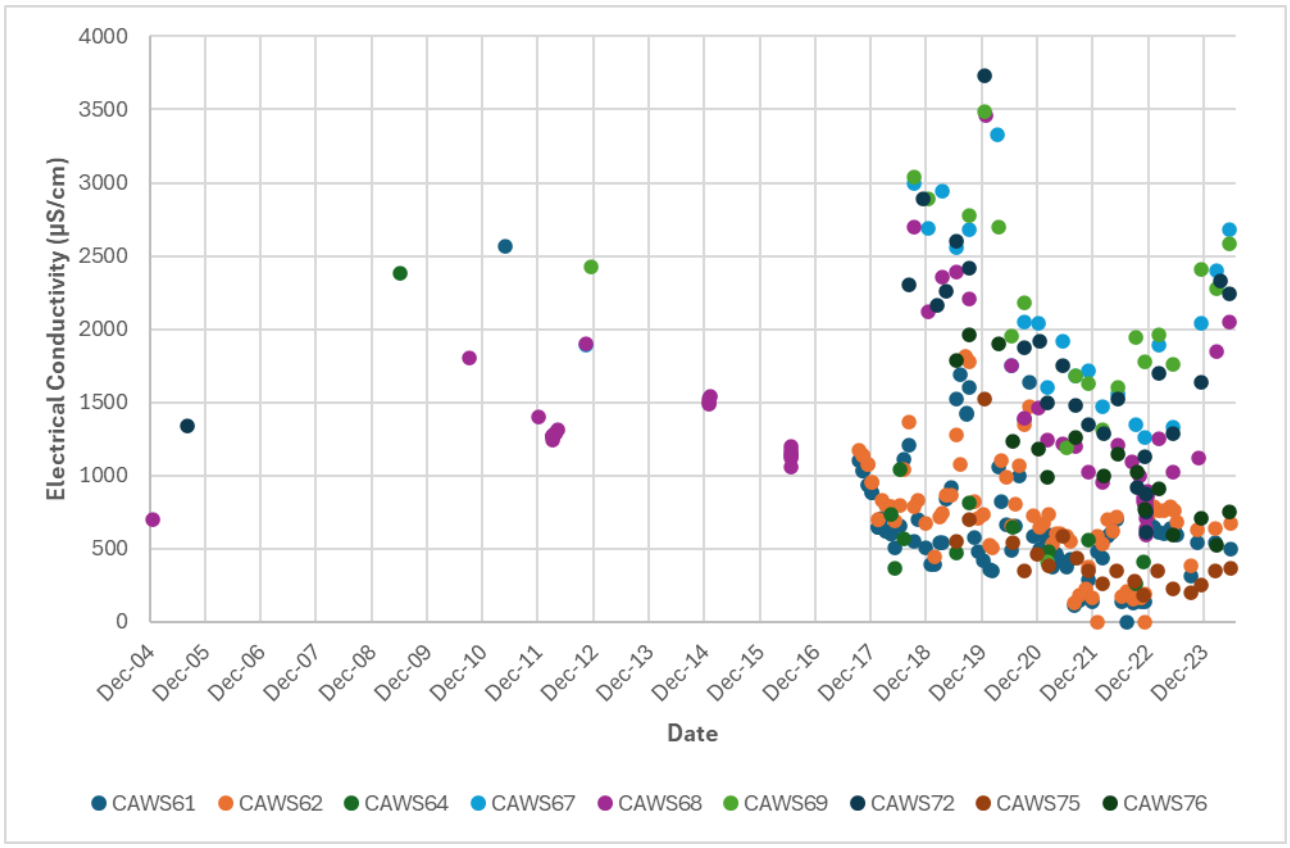

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS42
CAWS43
CAWS60

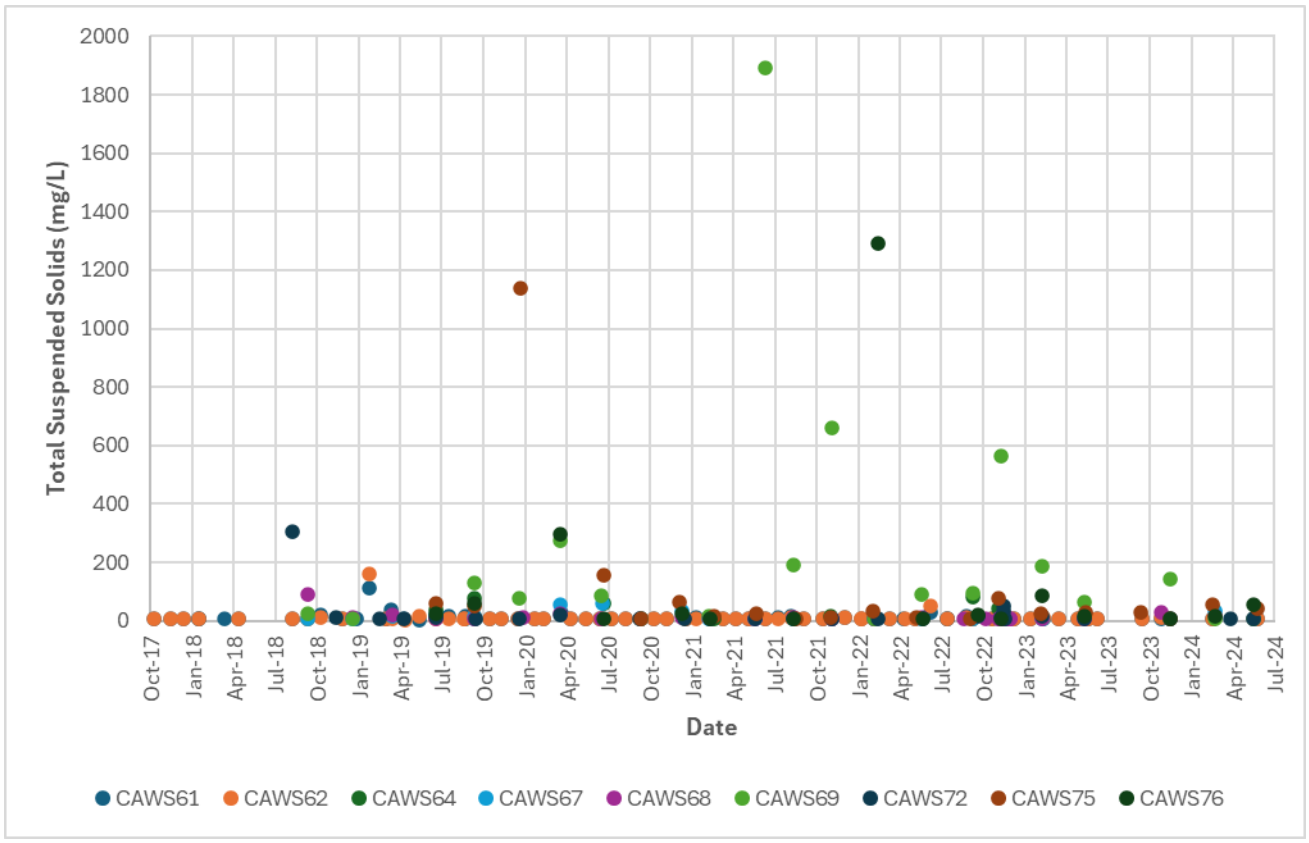


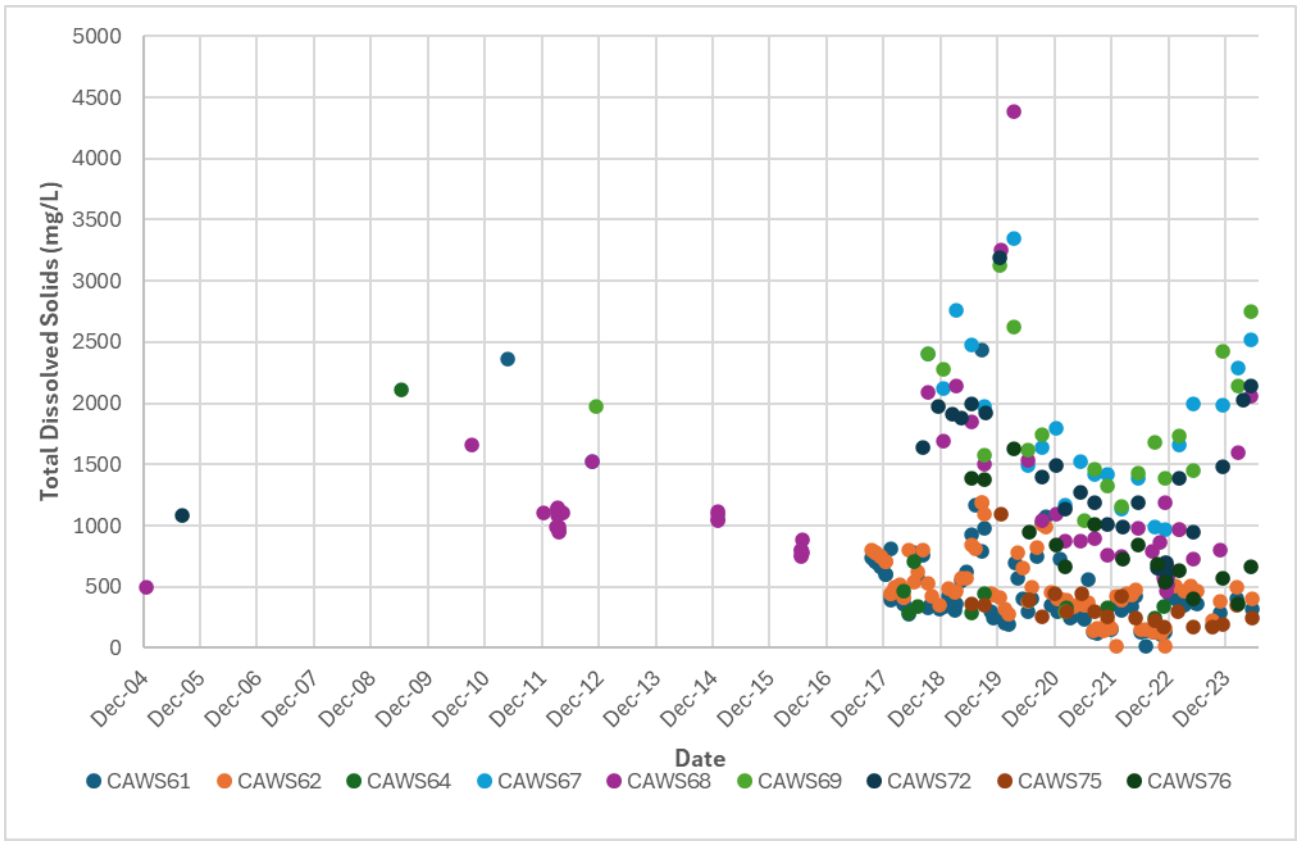
B.6 TSF Western

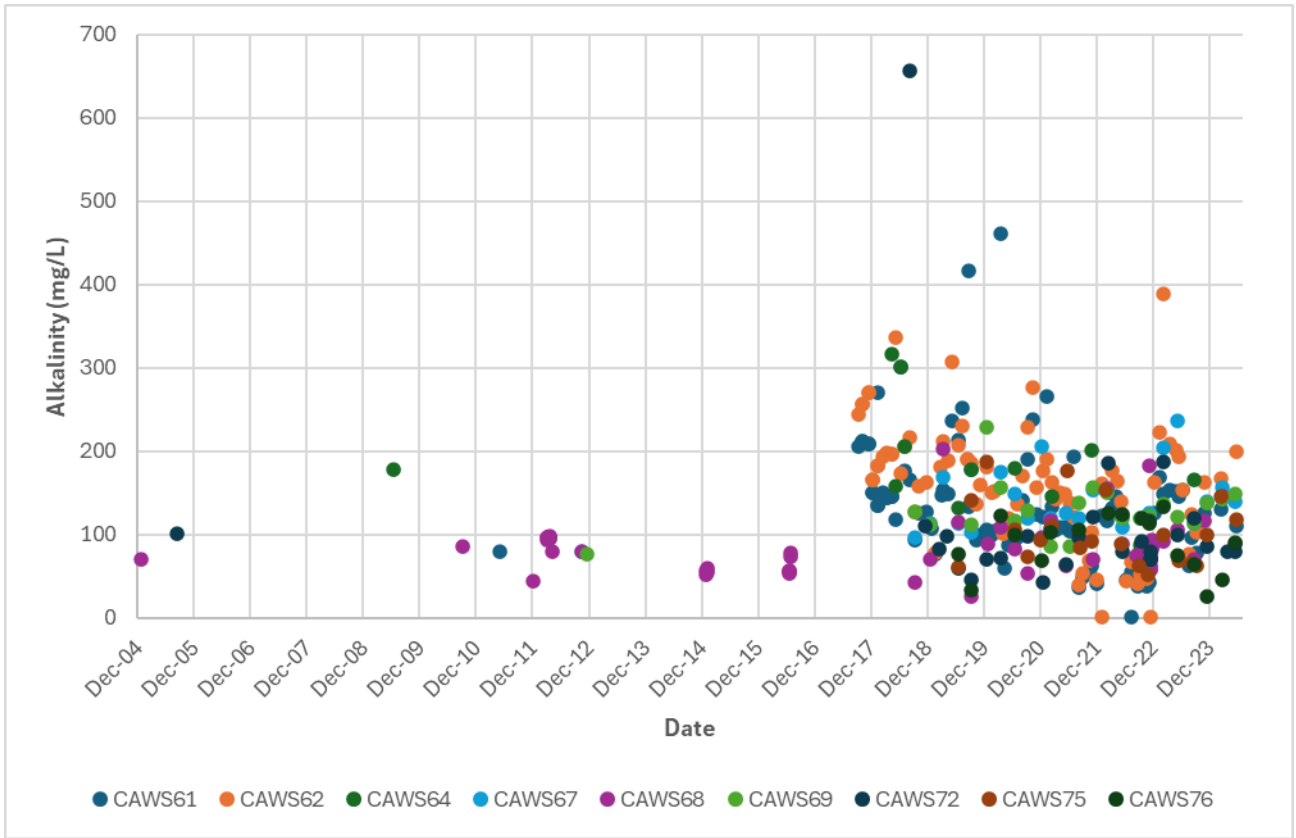
B.6.1 Physiochemical Parameters

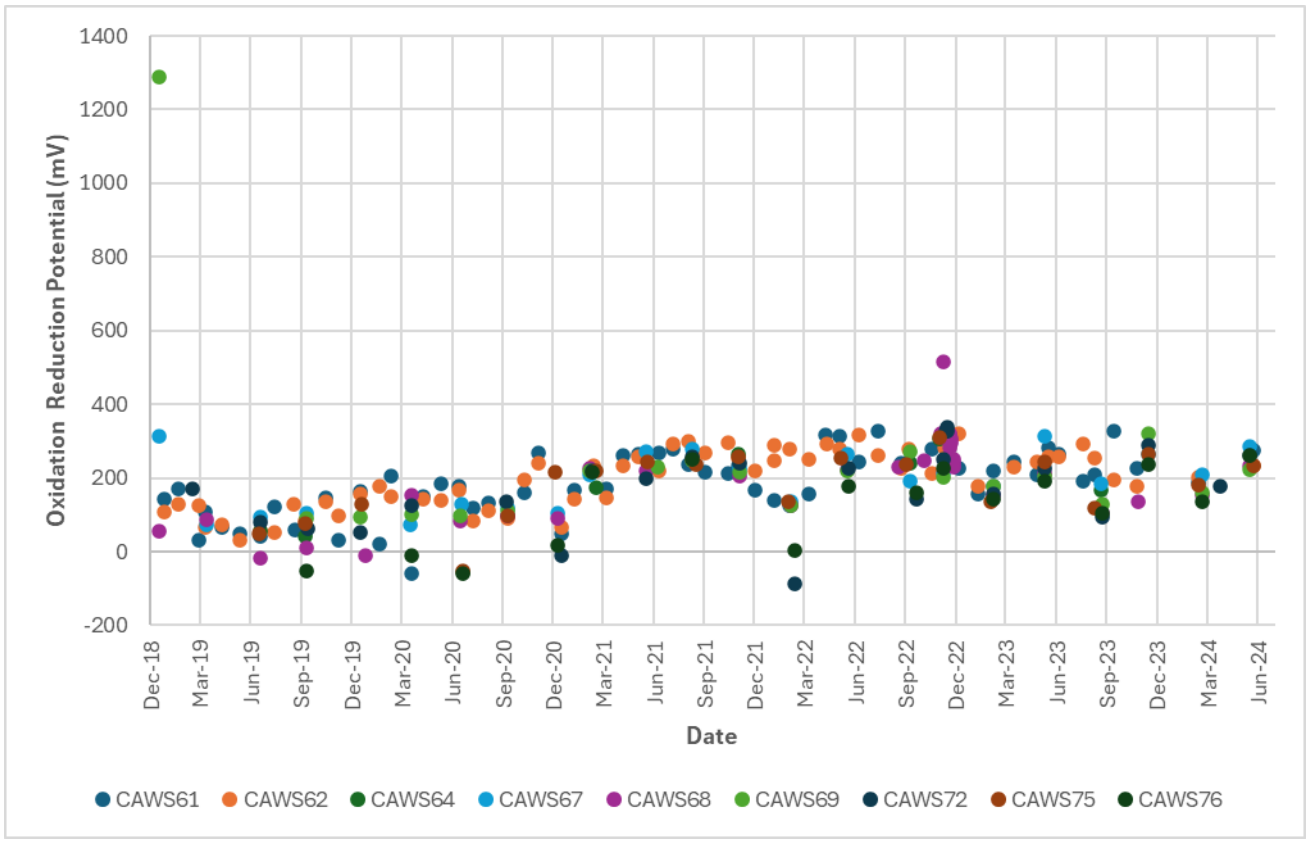



Electrical Conductivity (µS/cm)
4000
3500
3000
2500
2000
1500
1000
500
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

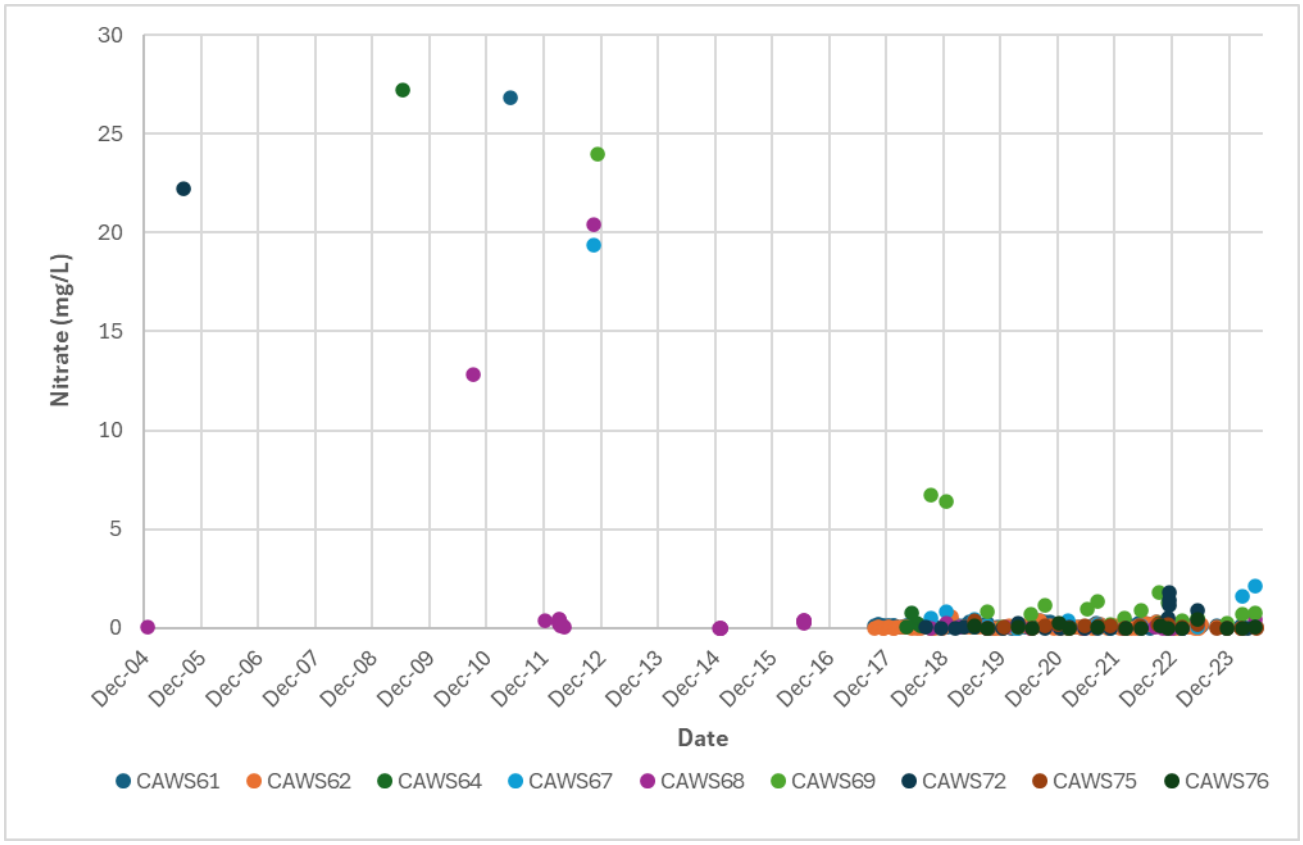

Total Suspended Solids (mg/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Jul-24
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

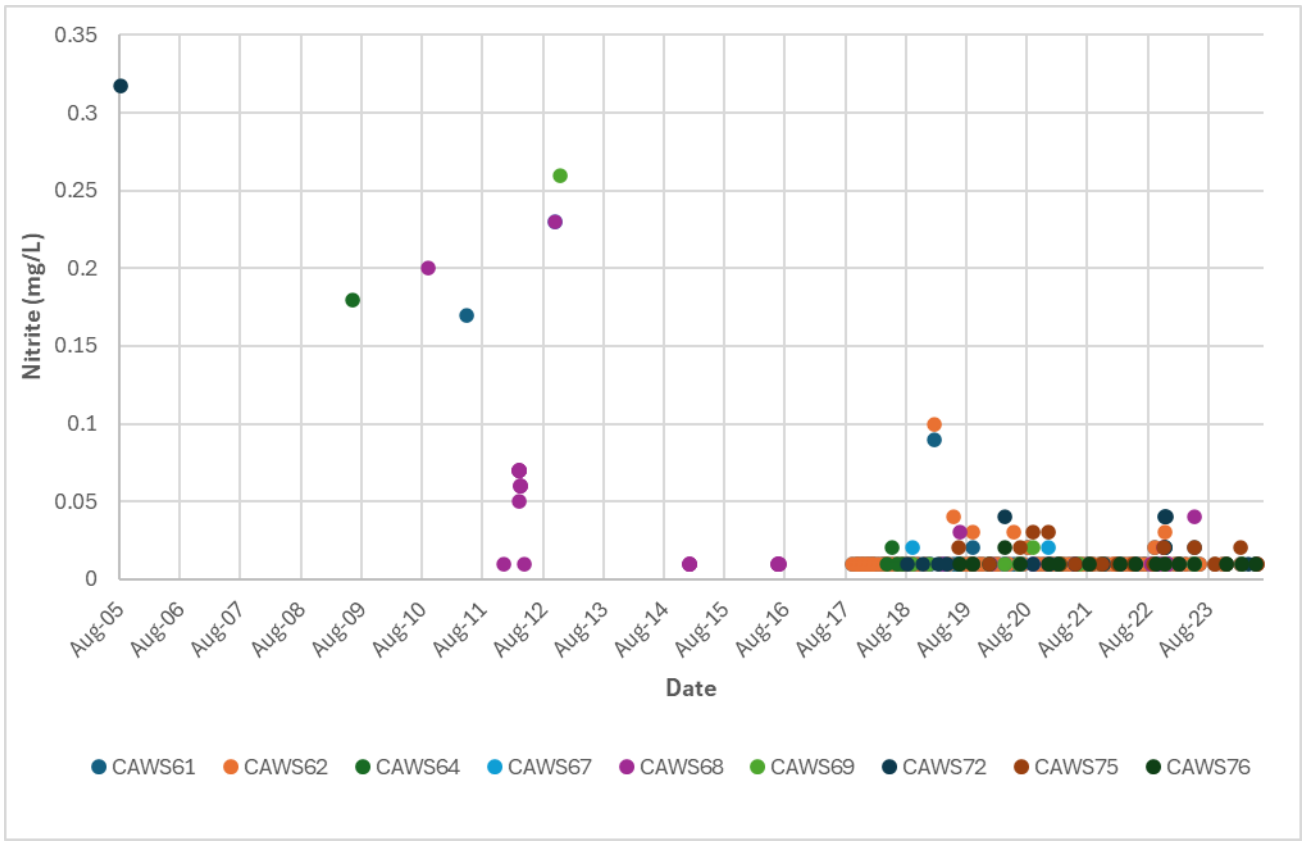

Total Dissolved Solids (mg/L)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

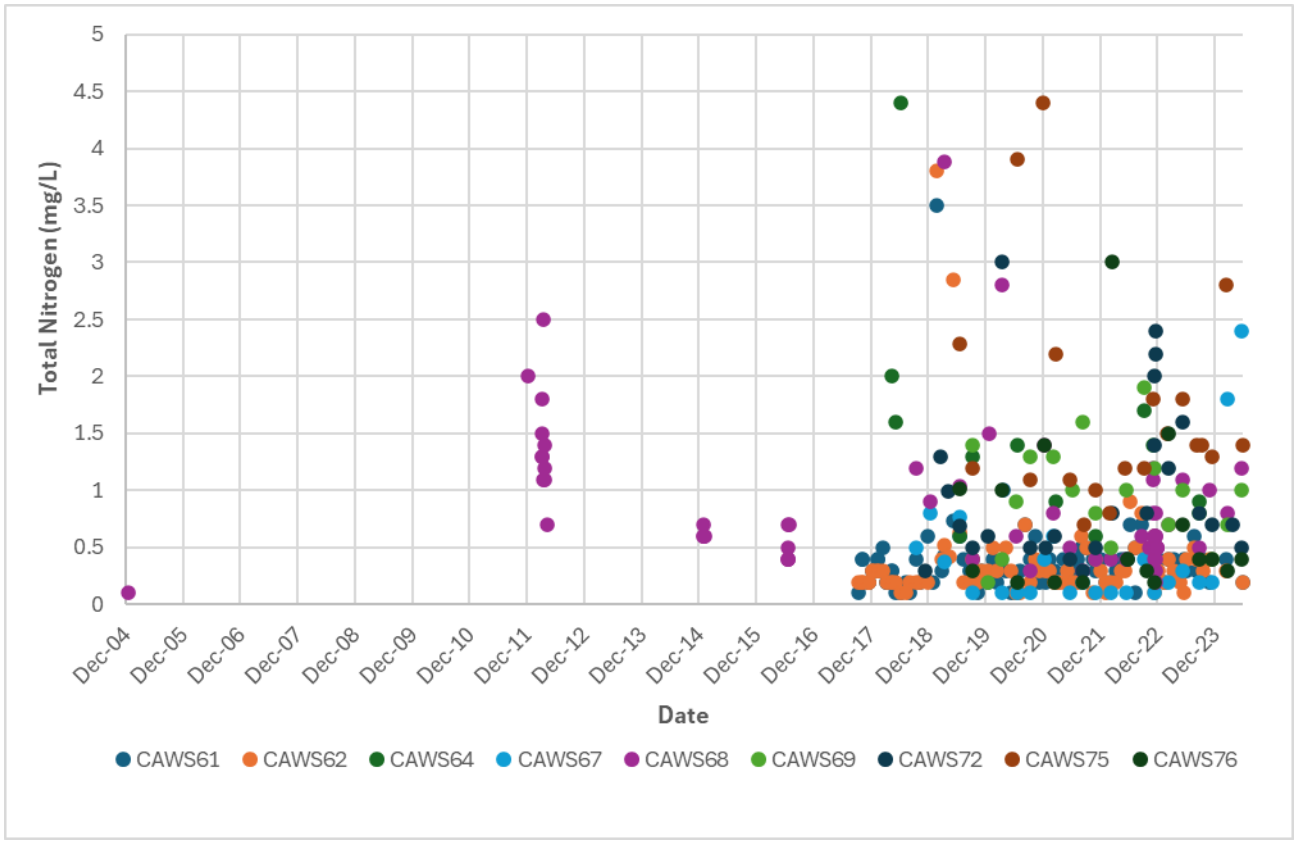

Alkalinity (mg/L)
700
600
500
400
300
200
100
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

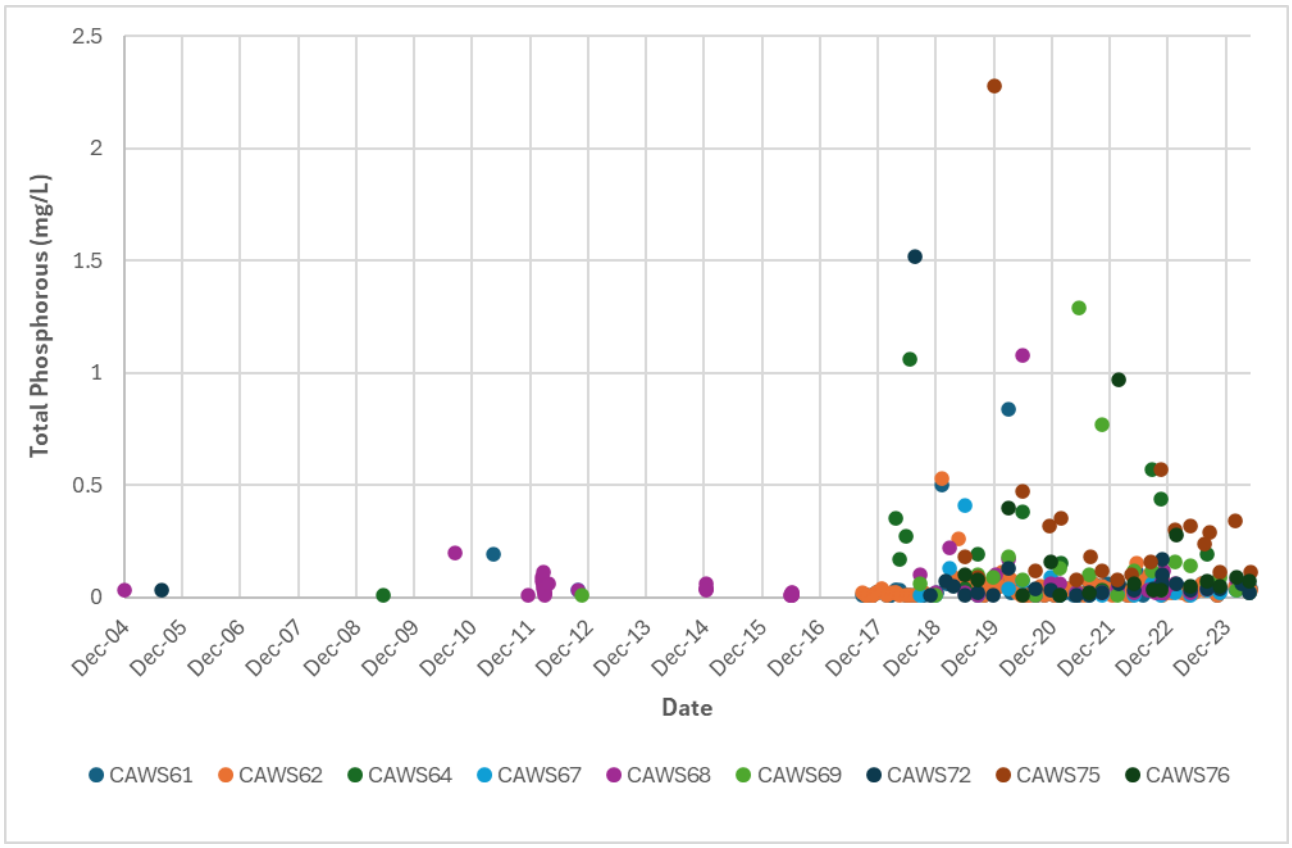


B.6.2 Nutrients

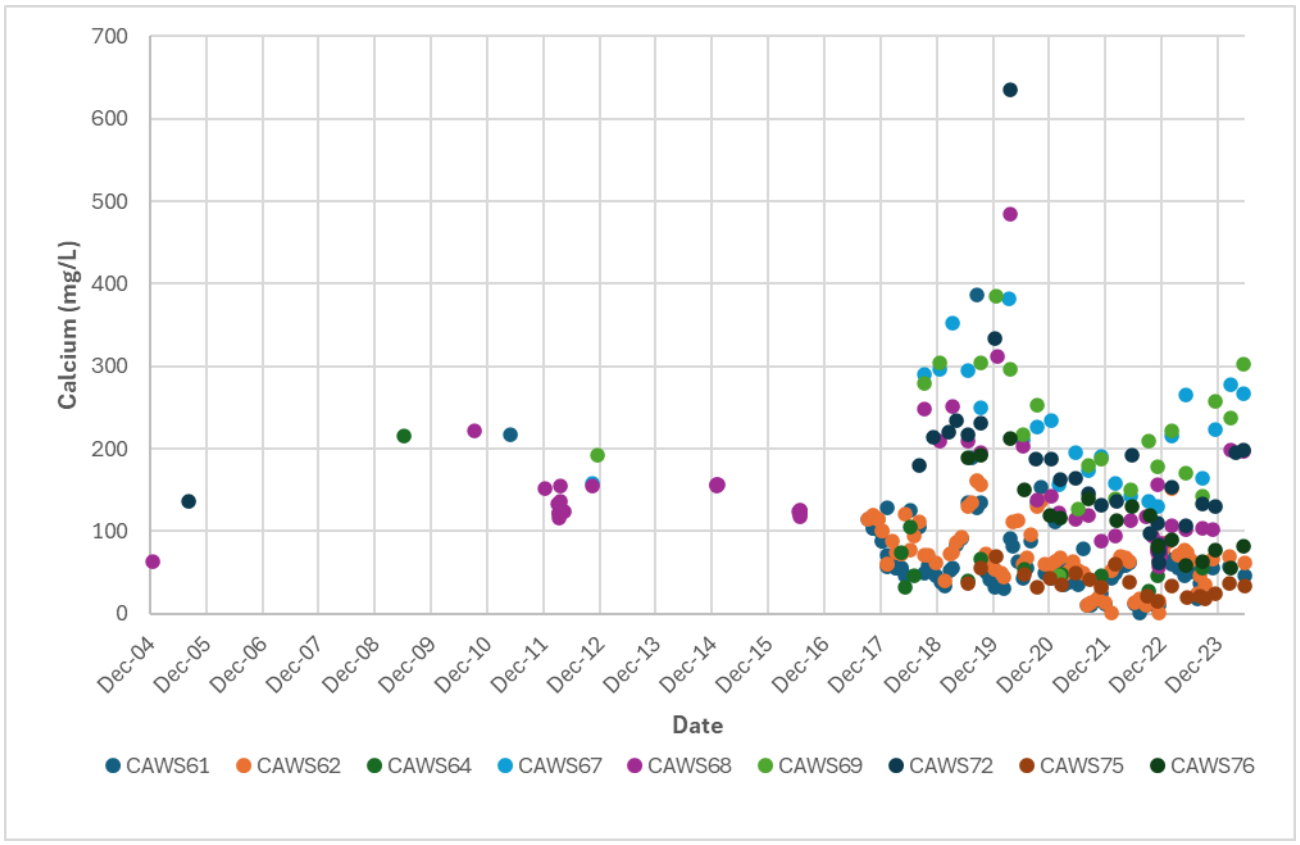


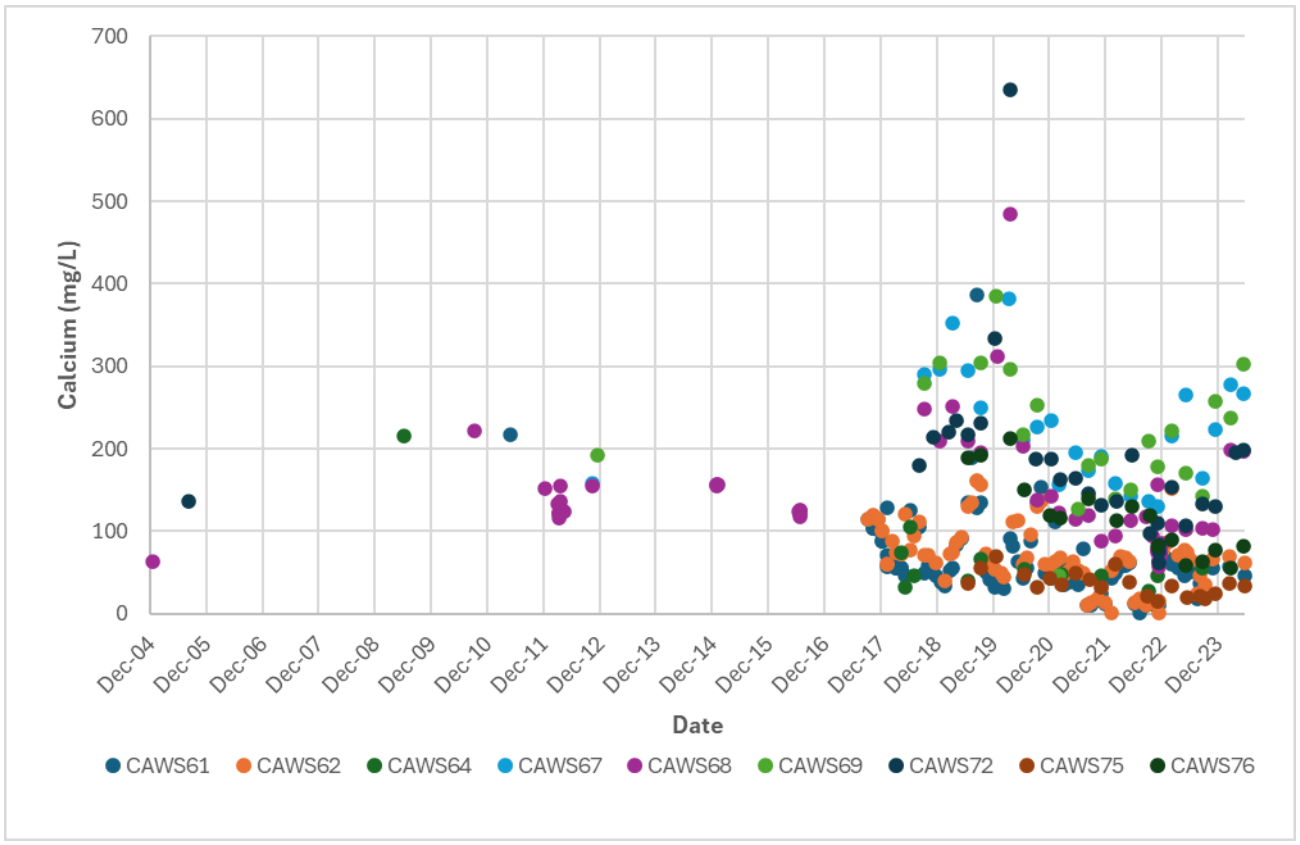

0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Nitrite (mg/L)
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Aug-13
Aug-14
Aug-15
Aug-16
Aug-17
Aug-18
Aug-19
Aug-20
Aug-21
Aug-22
Aug-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

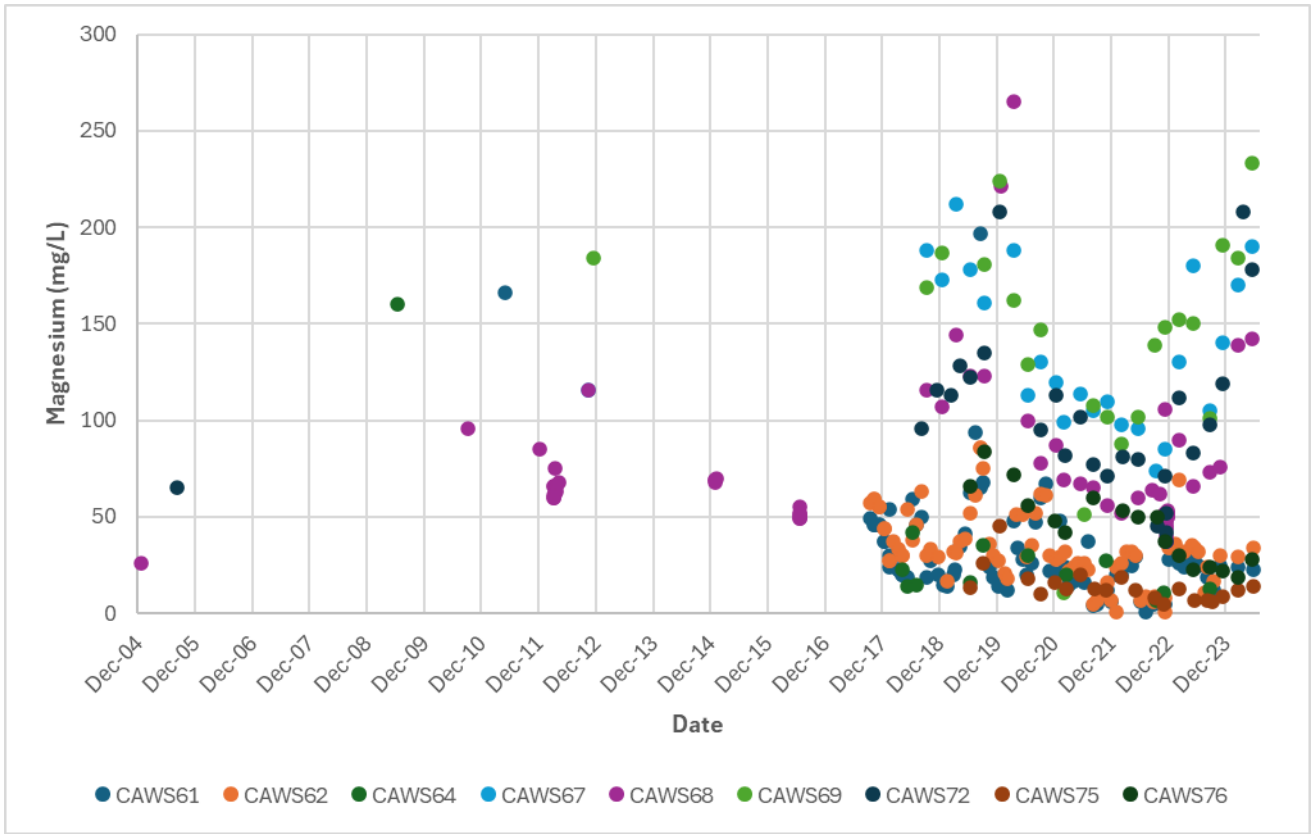

5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Total Nitrogen (mg/L)
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

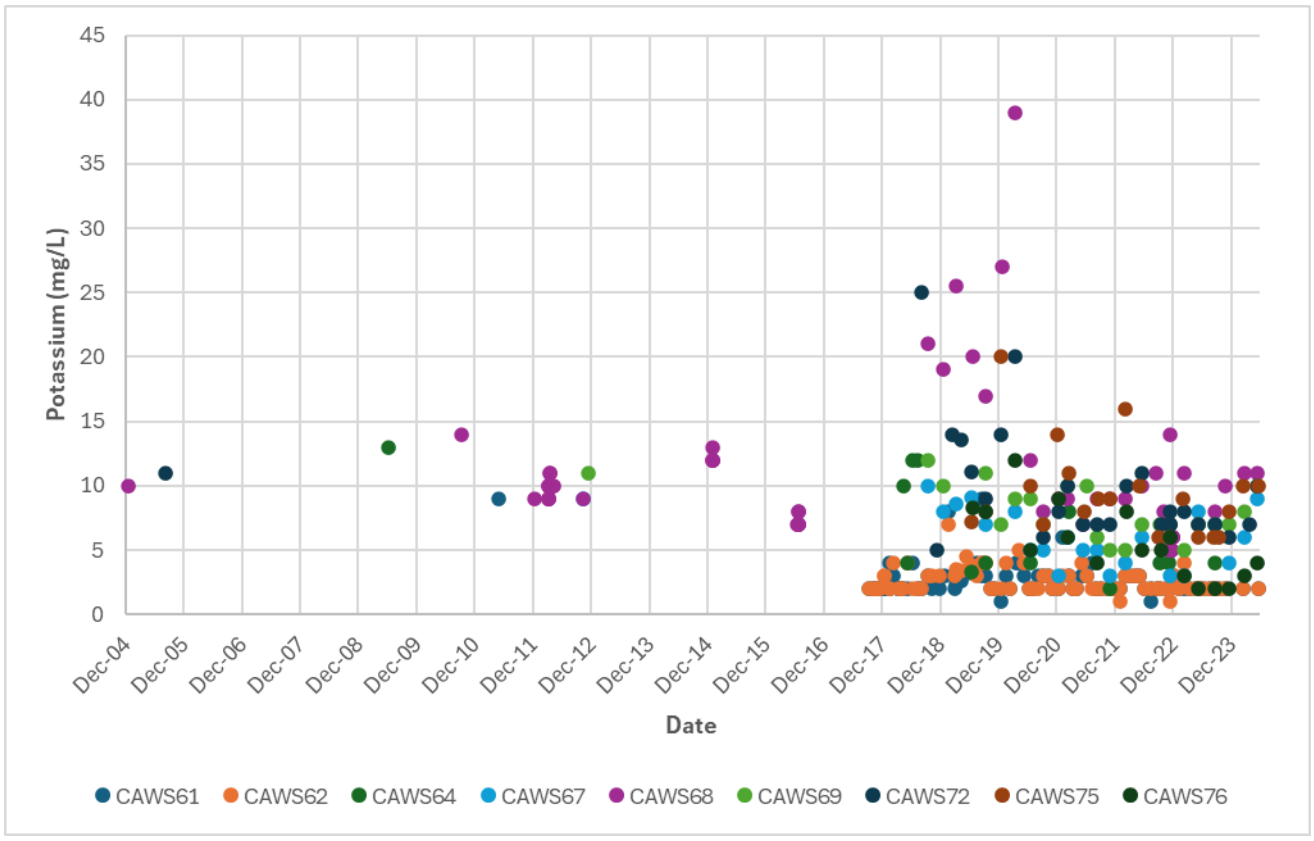


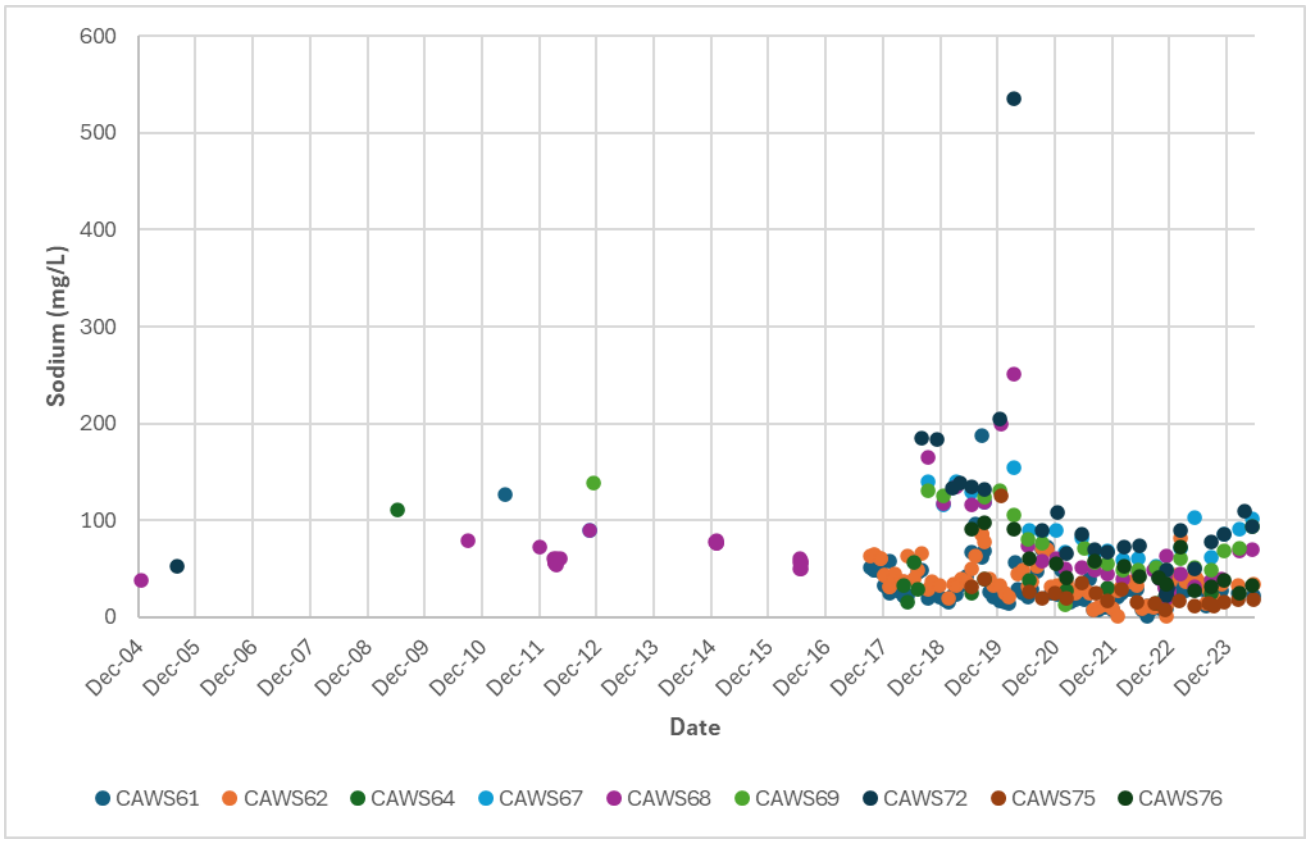
B.6.3 Major Ions

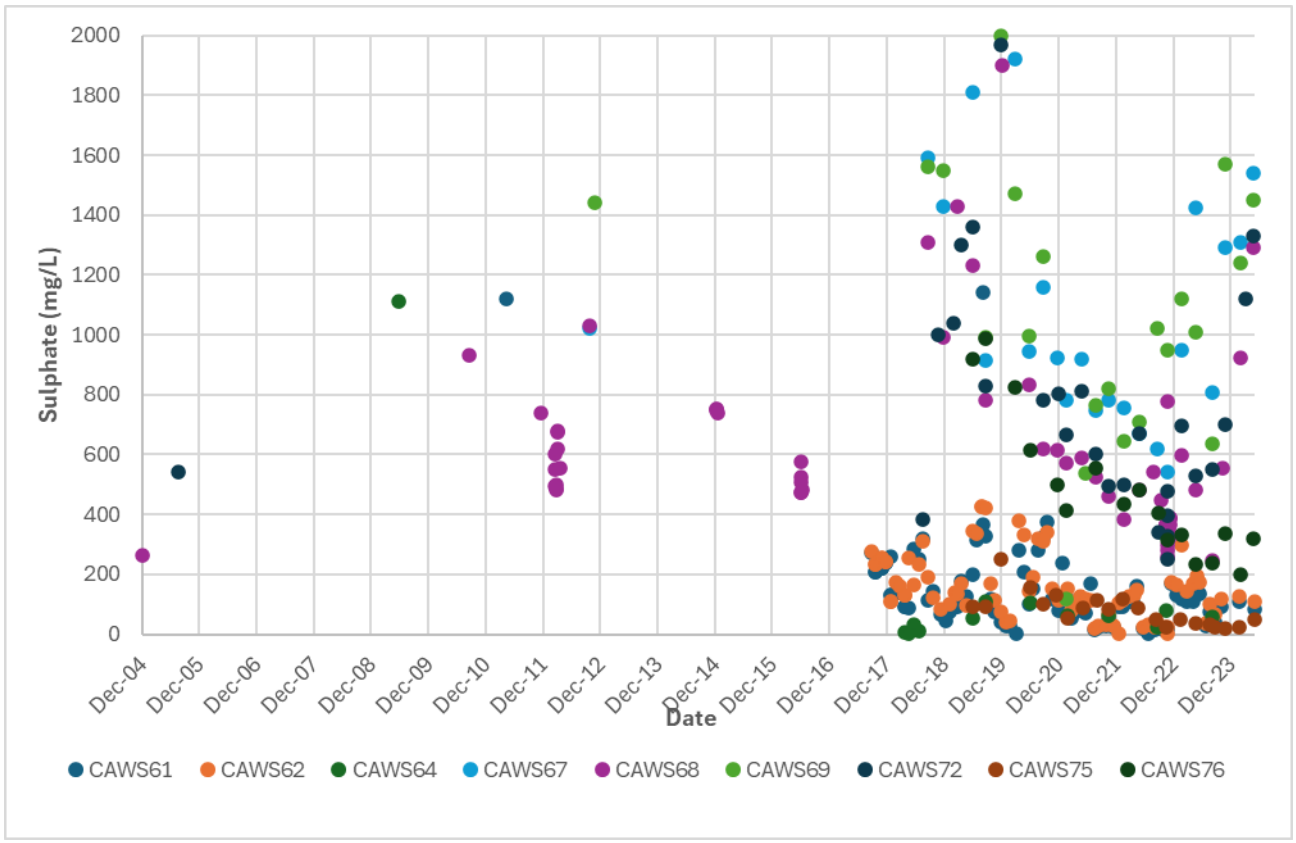



Calcium (mg/L)
700
600
500
400
300
200
100
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
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Date
CAWS61
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CAWS69
CAWS72
CAWS75
CAWS76

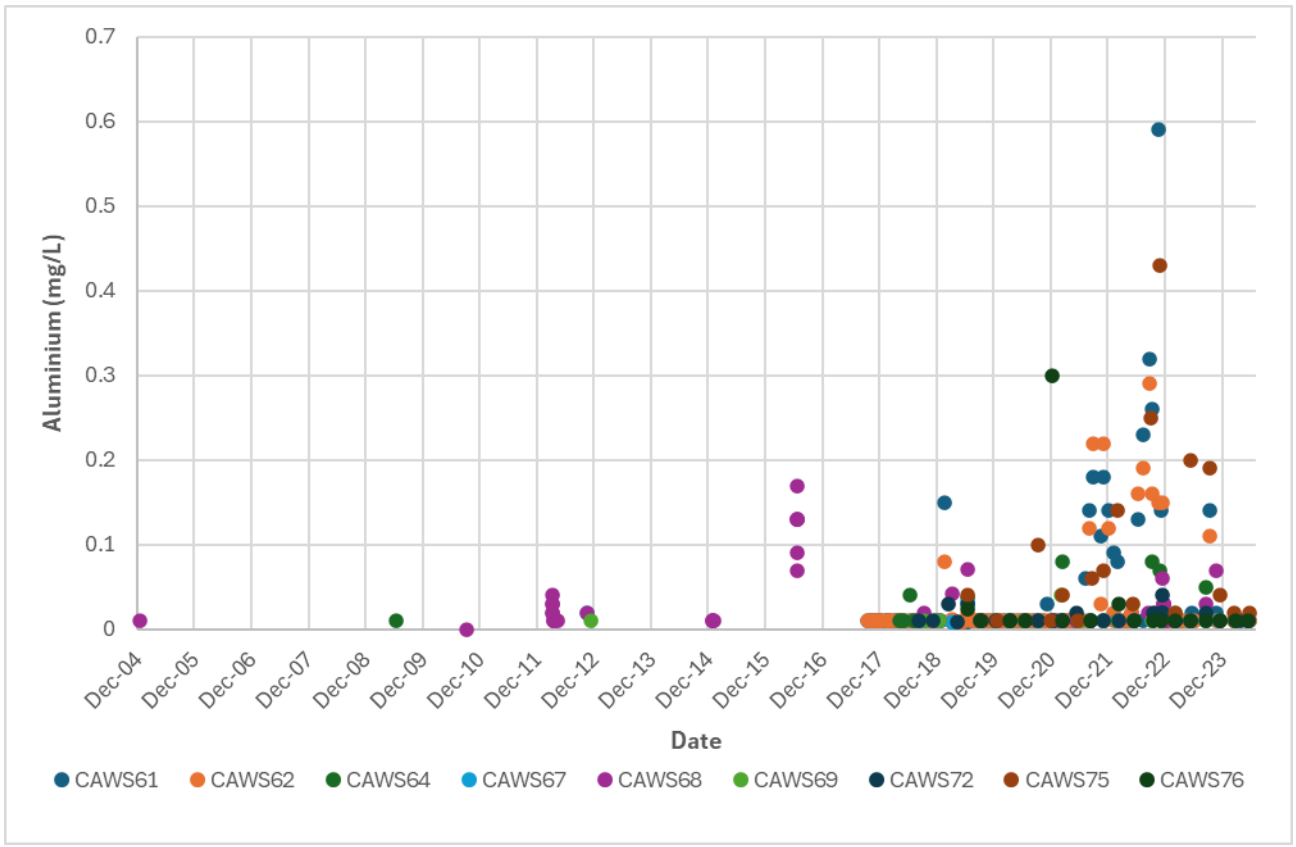

Magnesium (mg/L)
300
250
200
150
100
50
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

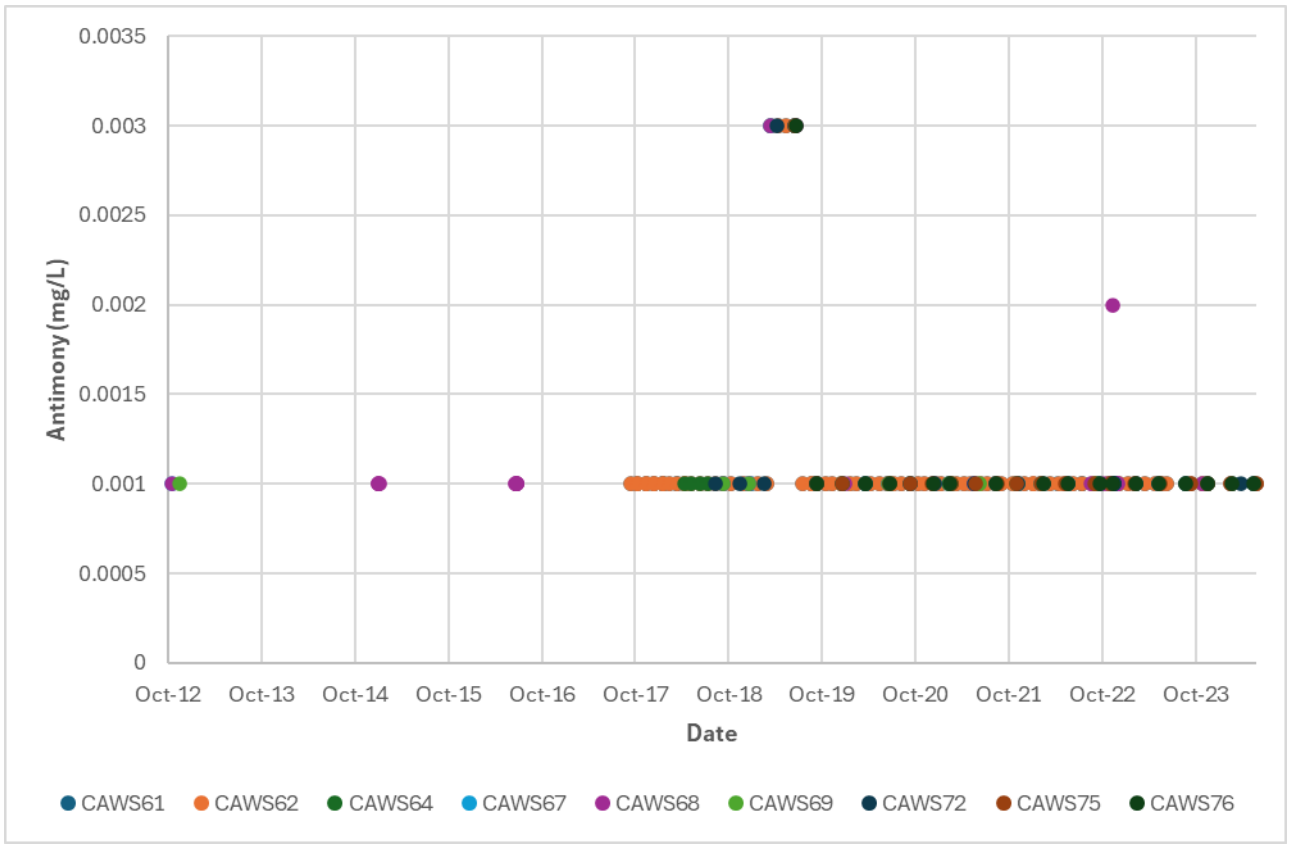

Potassium (mg/L)
45
40
35
30
25
20
15
10
5
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

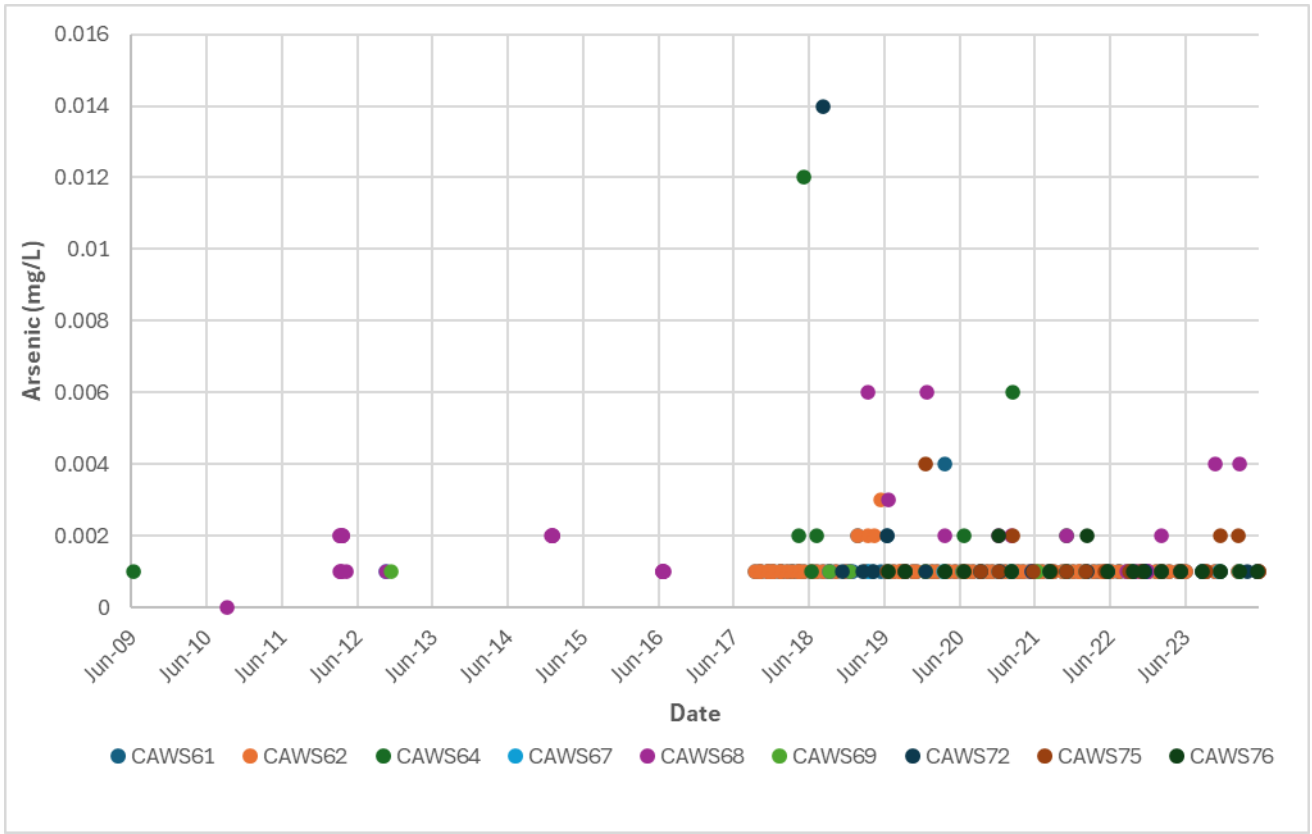

Sodium (mg/L)
600
500
400
300
200
100
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

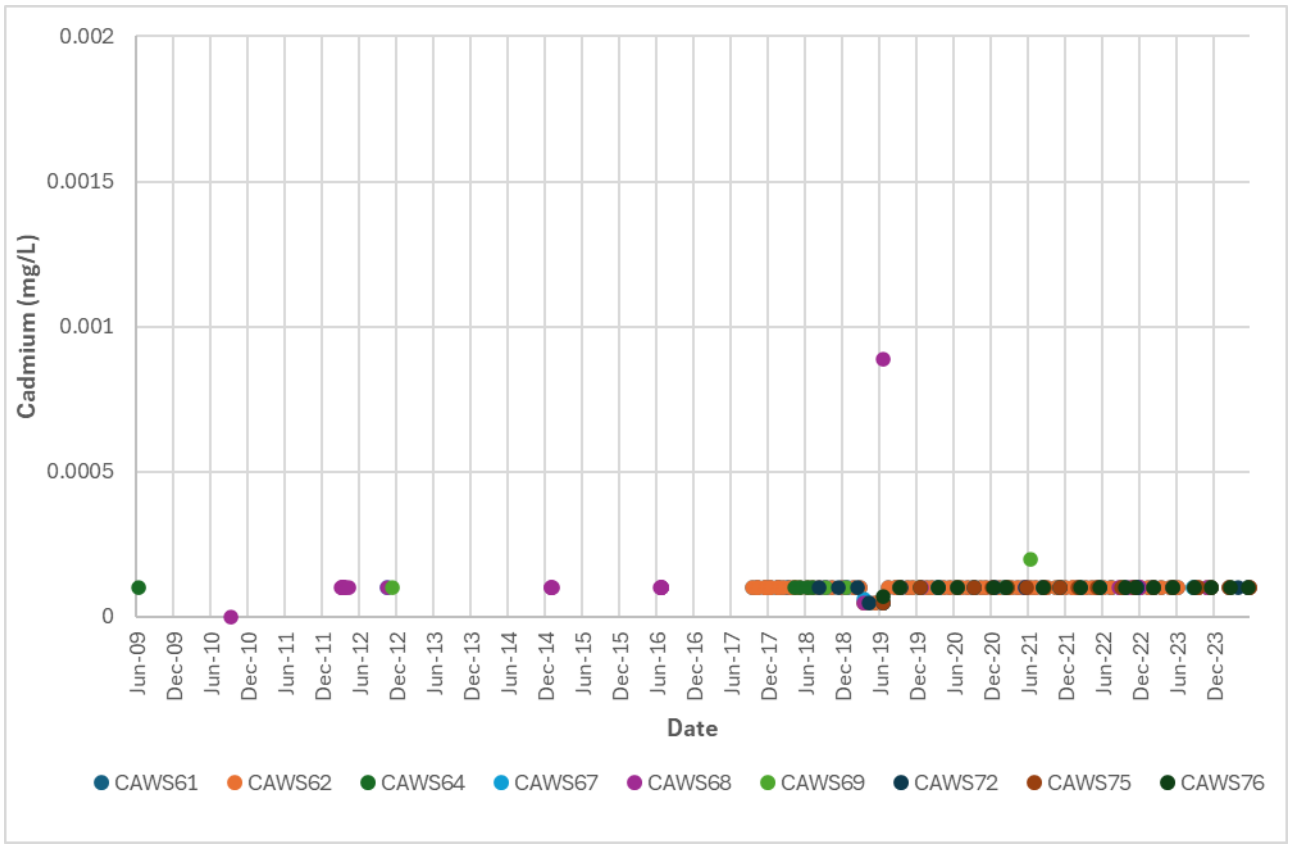


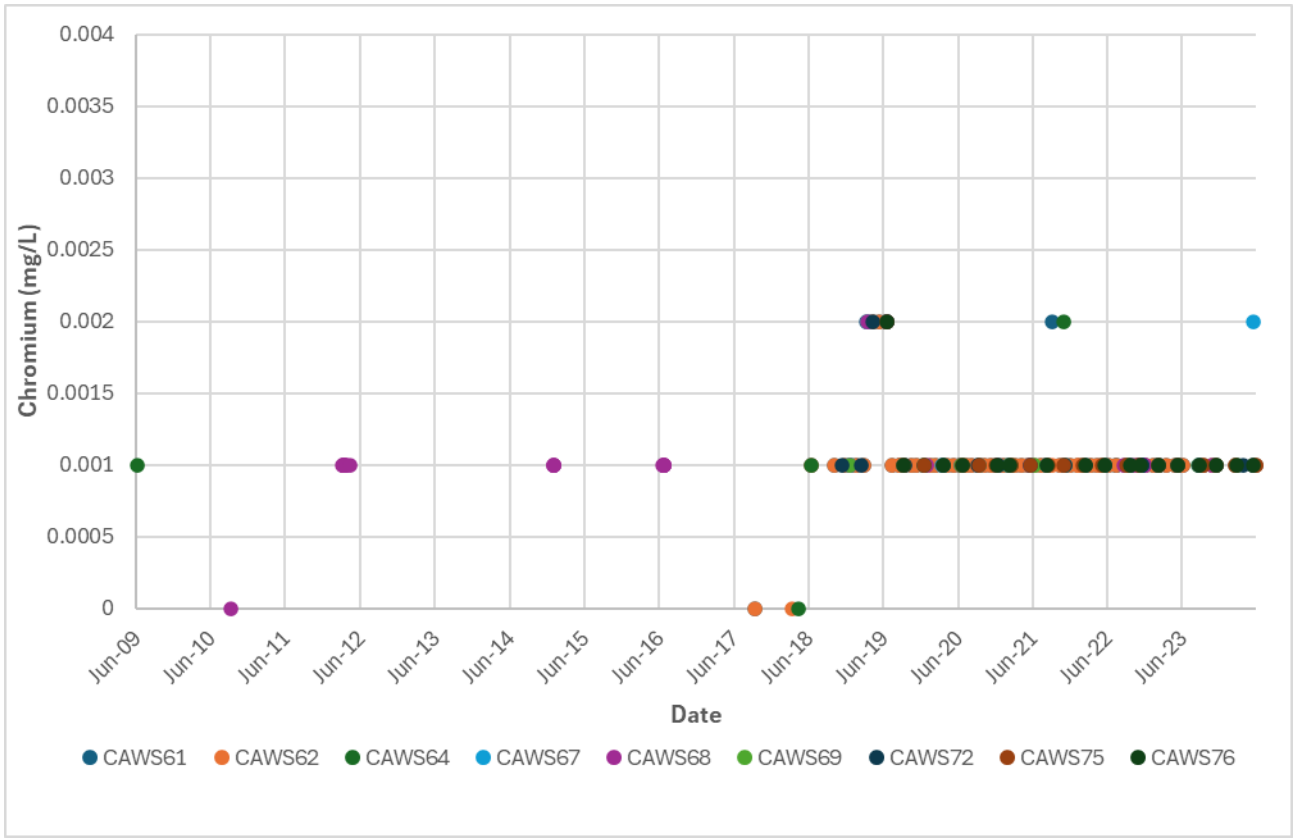
B.6.4 Dissolved Metals

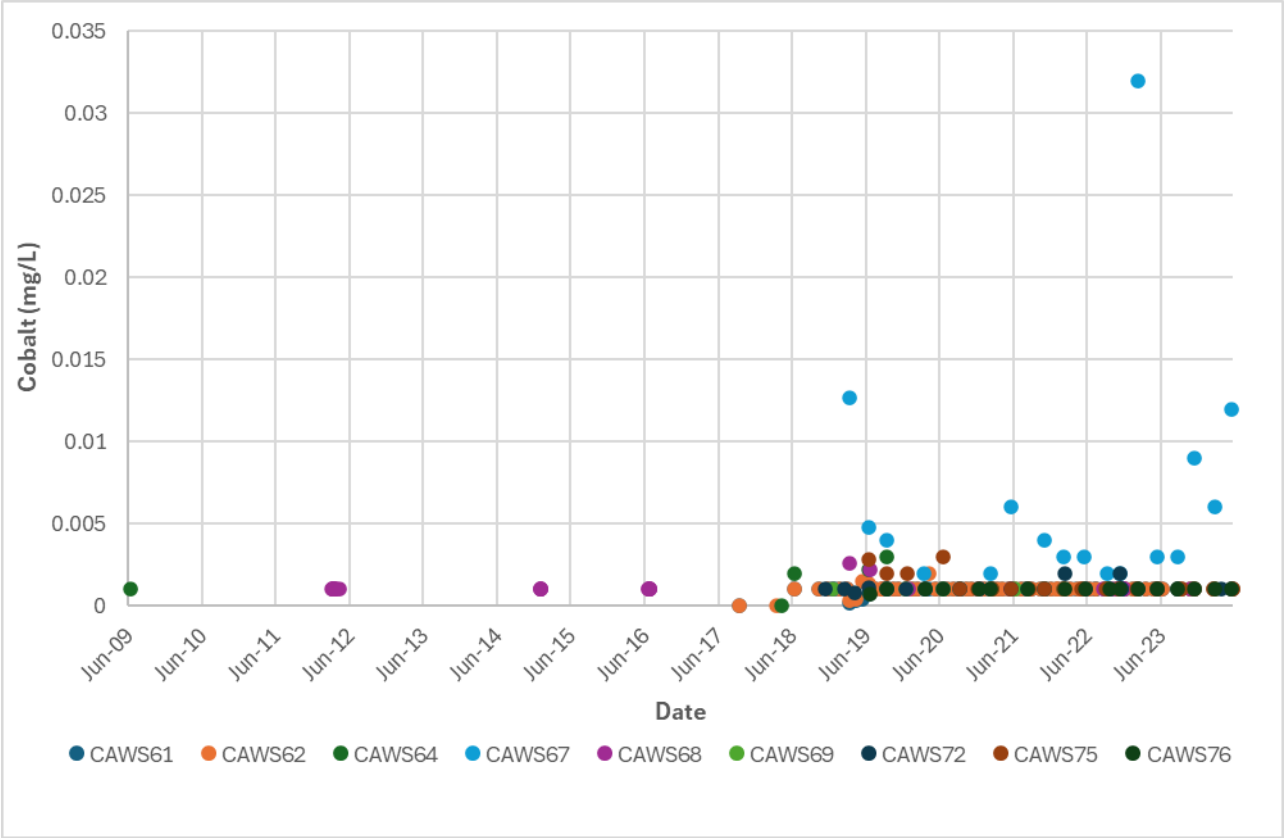


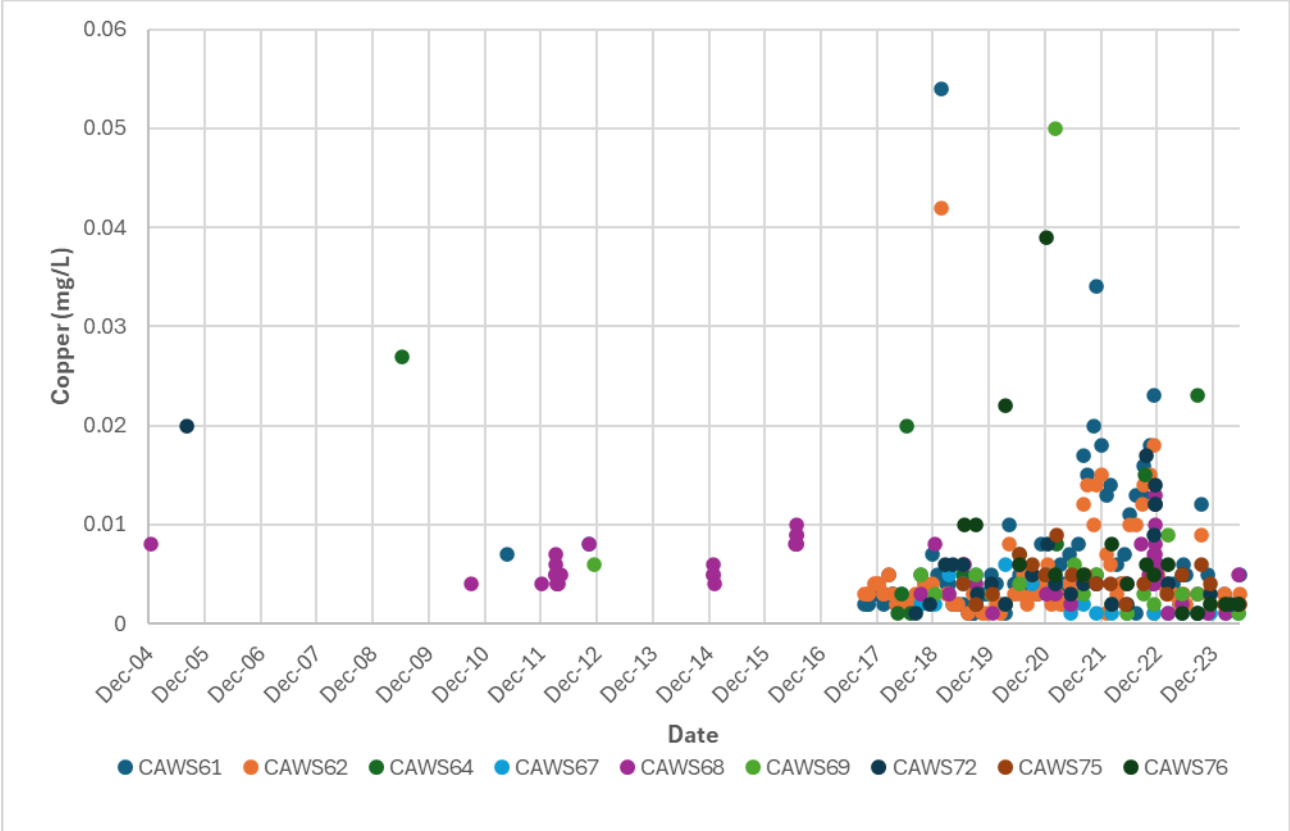

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Antimony (mg/L)
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

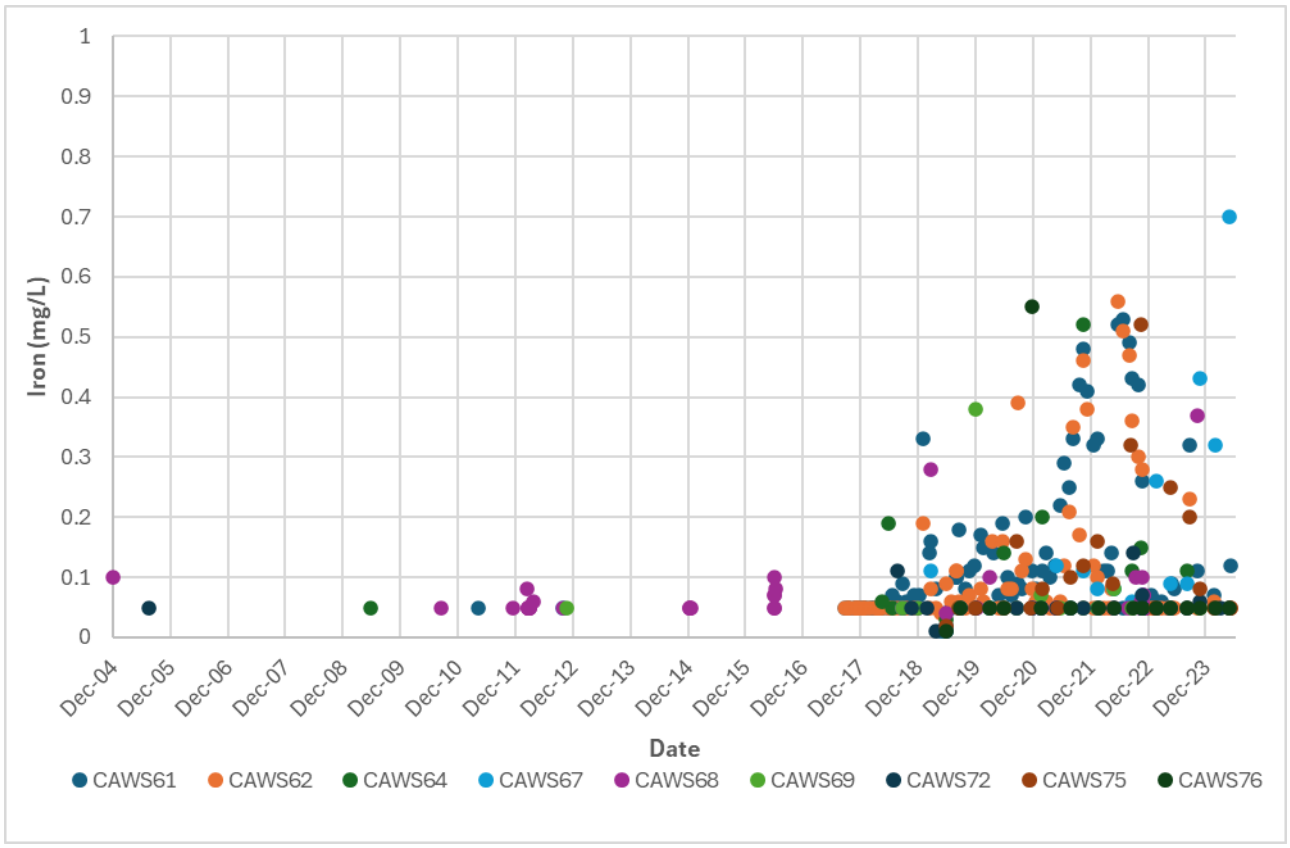

0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

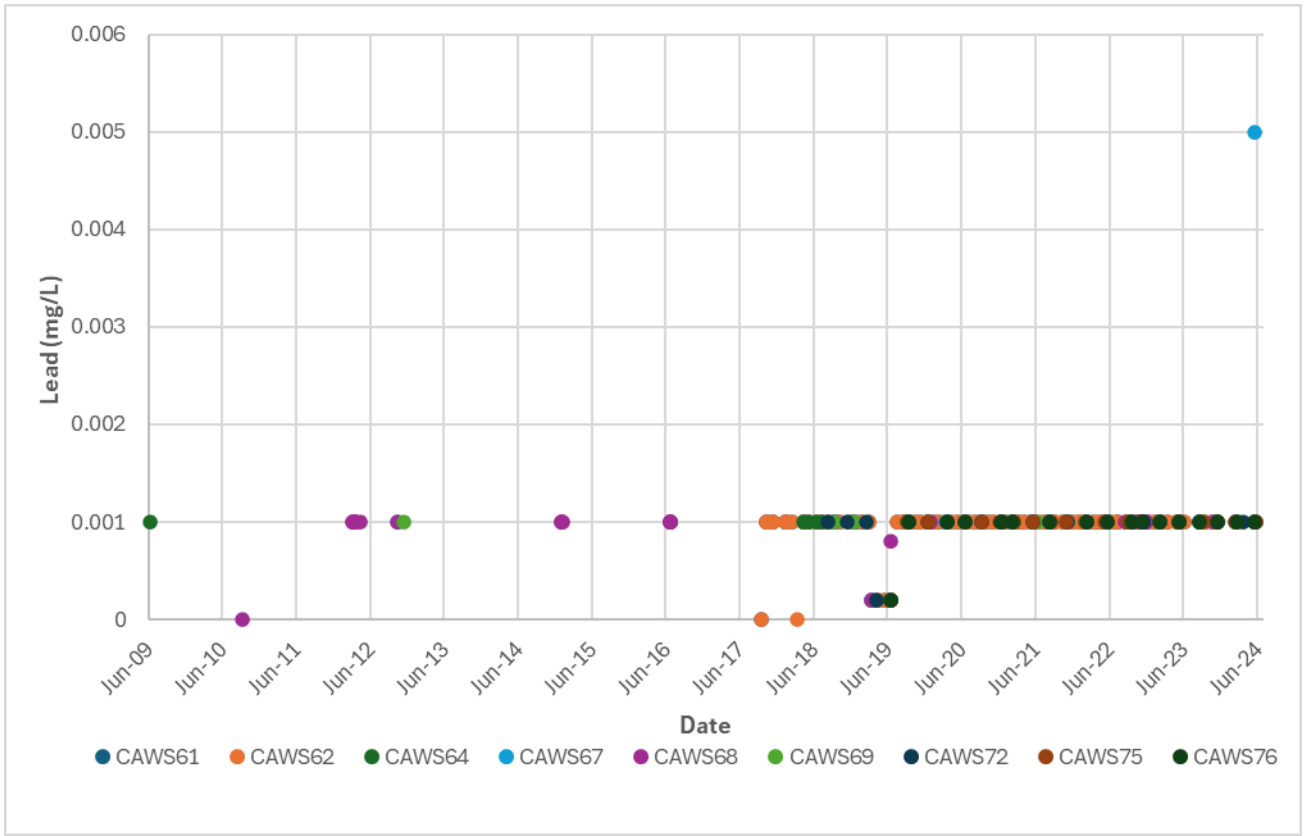

0.002
0.0015
0.001
0.0005
0
Cadmium (mg/L)
Jun-09
Dec-09
Jun-10
Dec-10
Jun-11
Dec-11
Jun-12
Dec-12
Jun-13
Dec-13
Jun-14
Dec-14
Jun-15
Dec-15
Jun-16
Dec-16
Jun-17
Dec-17
Jun-18
Dec-18
Jun-19
Dec-19
Jun-20
Dec-20
Jun-21
Dec-21
Jun-22
Dec-22
Jun-23
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

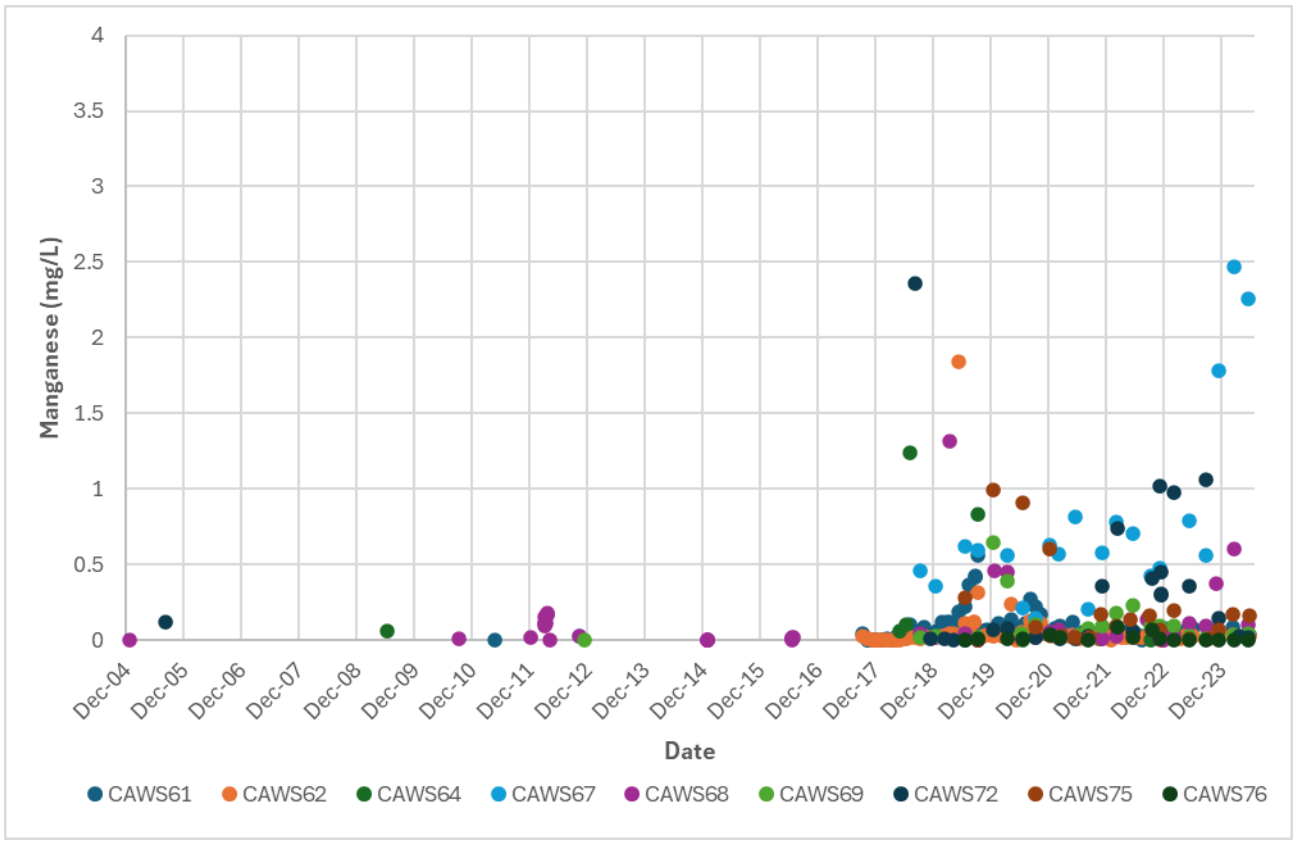

0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Chromium (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

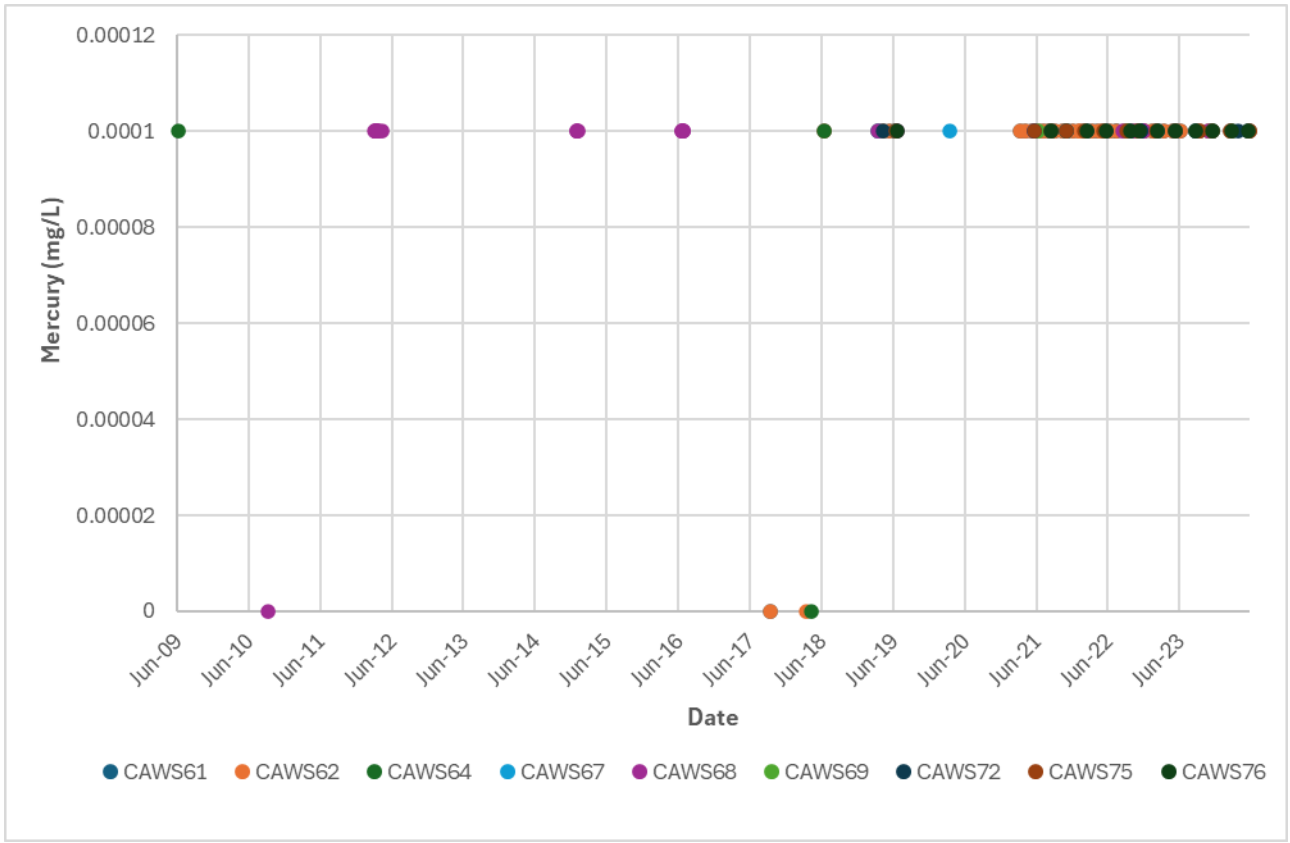

0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Cobalt (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

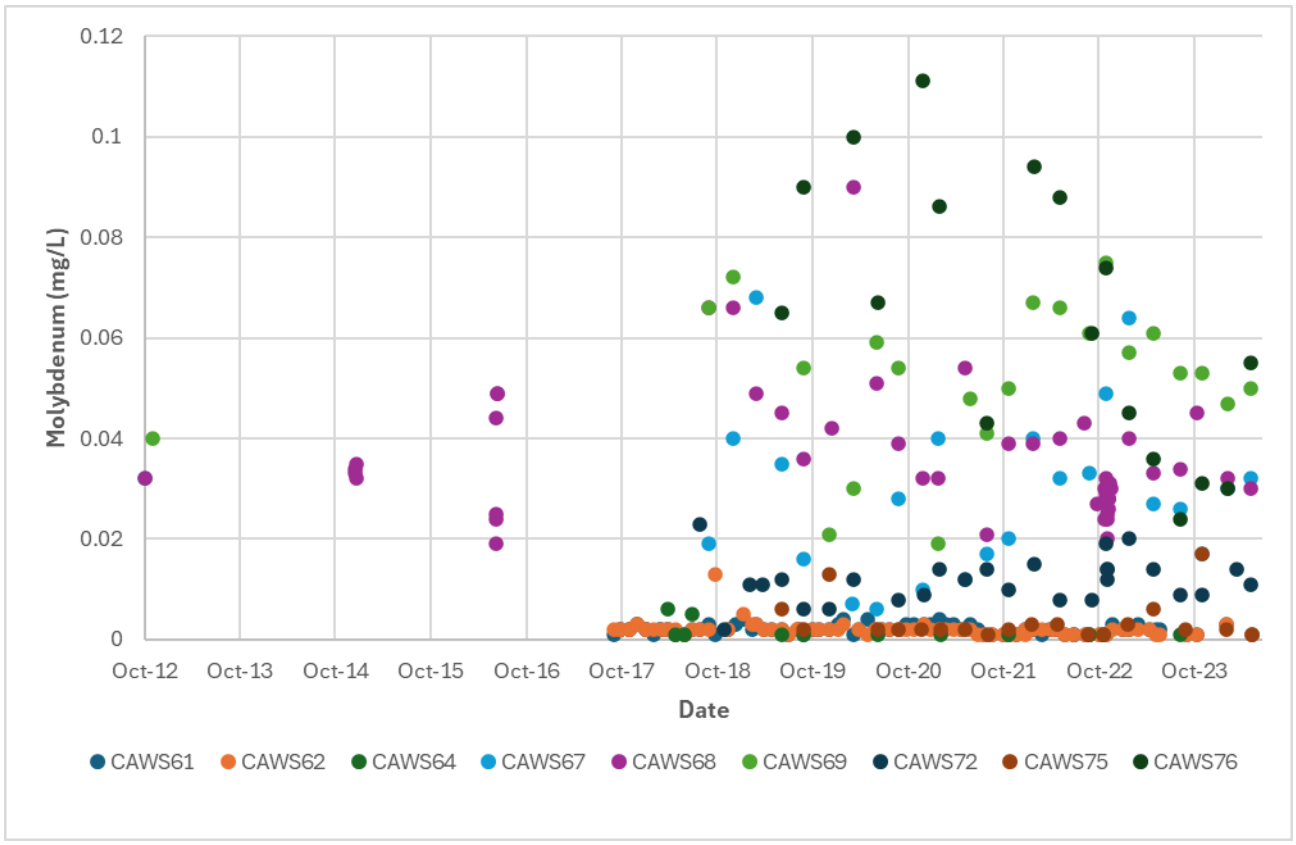

0.06
0.05
0.04
0.03
0.02
0.01
0
Copper (mg/L)
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

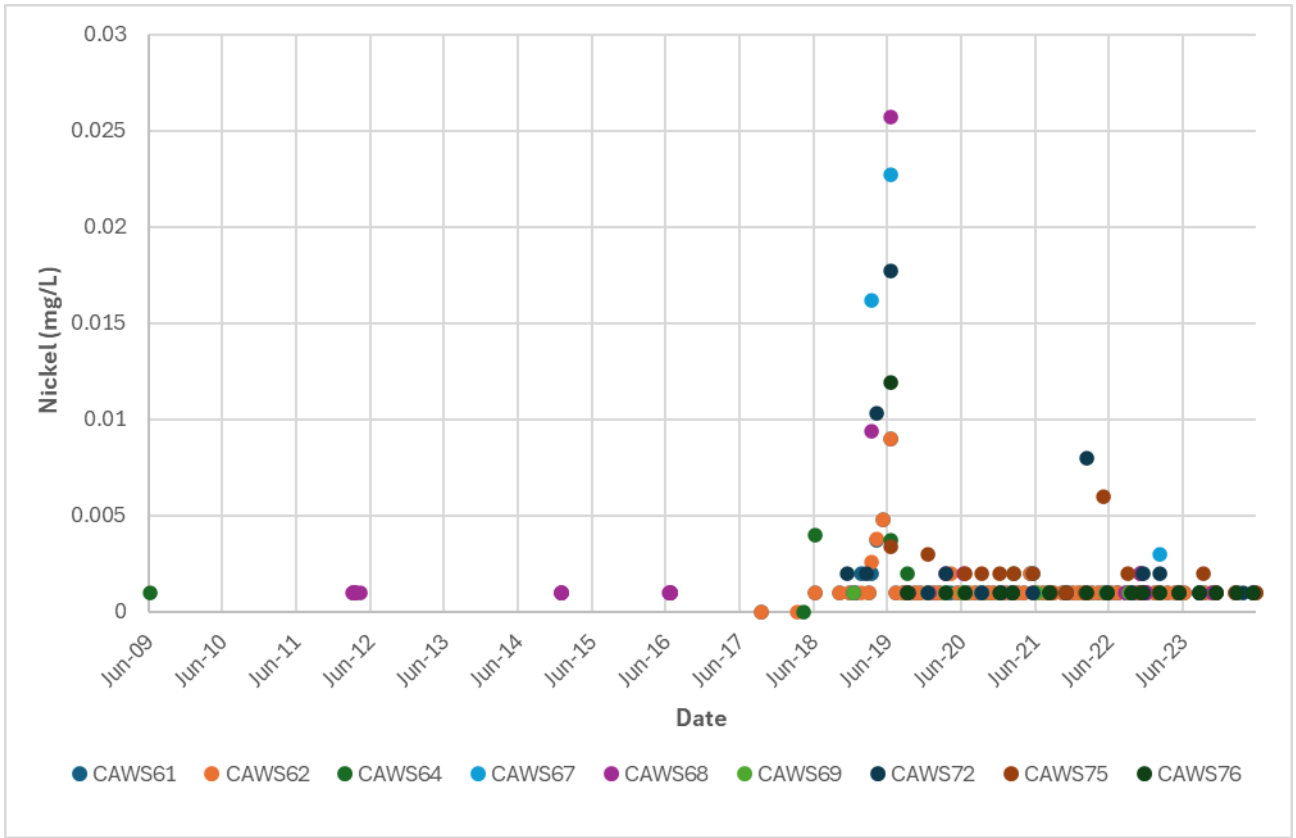

Iron (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

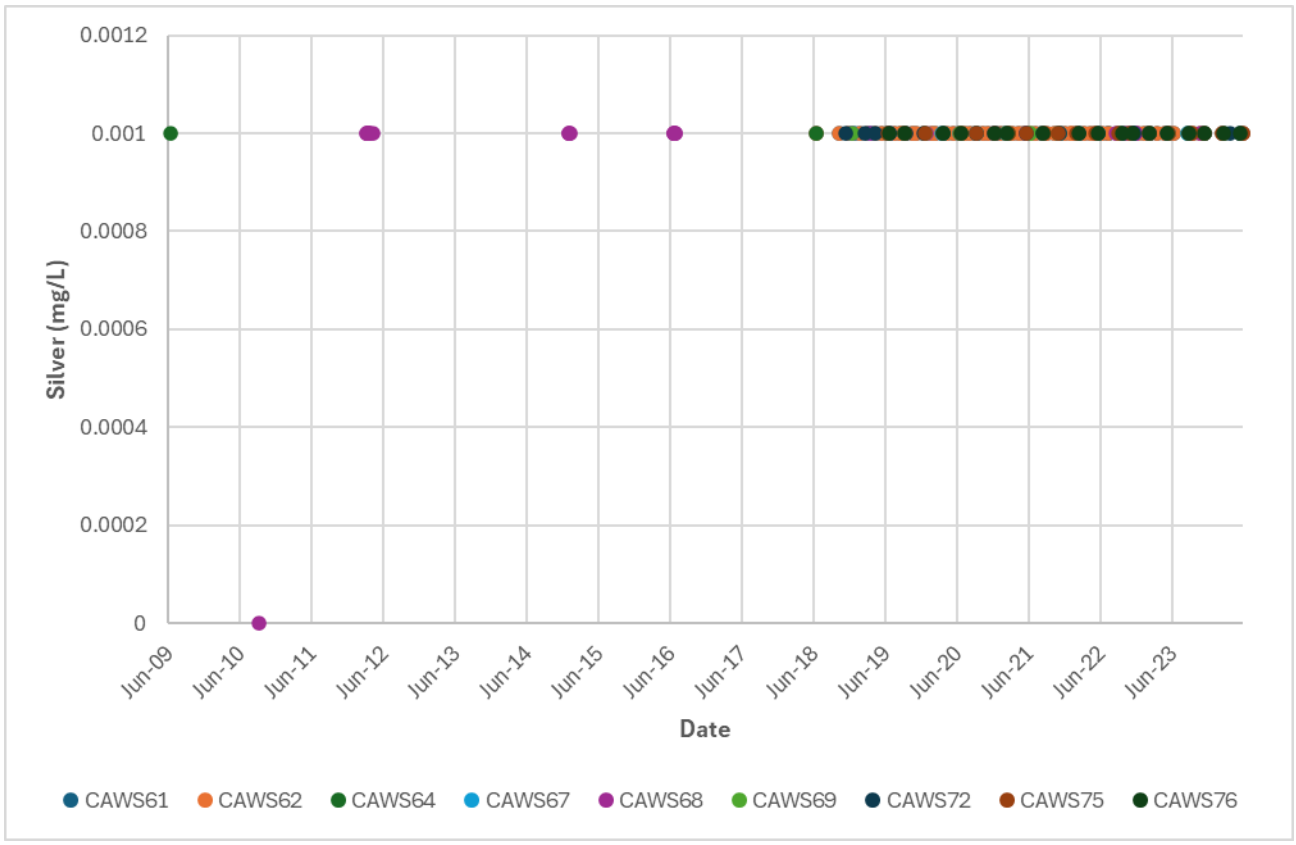

Lead (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

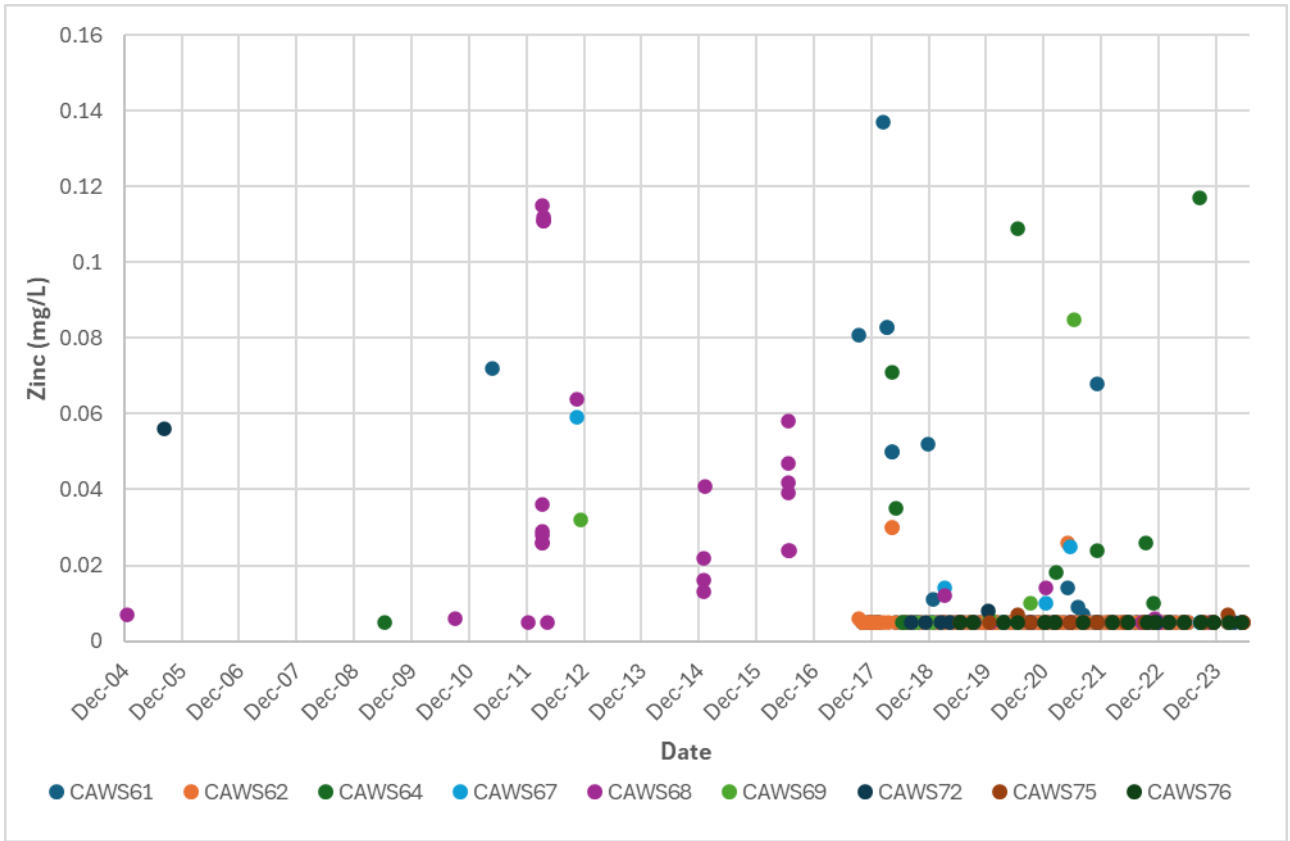

Manganese (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76


Mercury (mg/L)
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76


0.12
0.1
0.08
0.06
0.04
0.02
0
Molybdenum (mg/L)
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

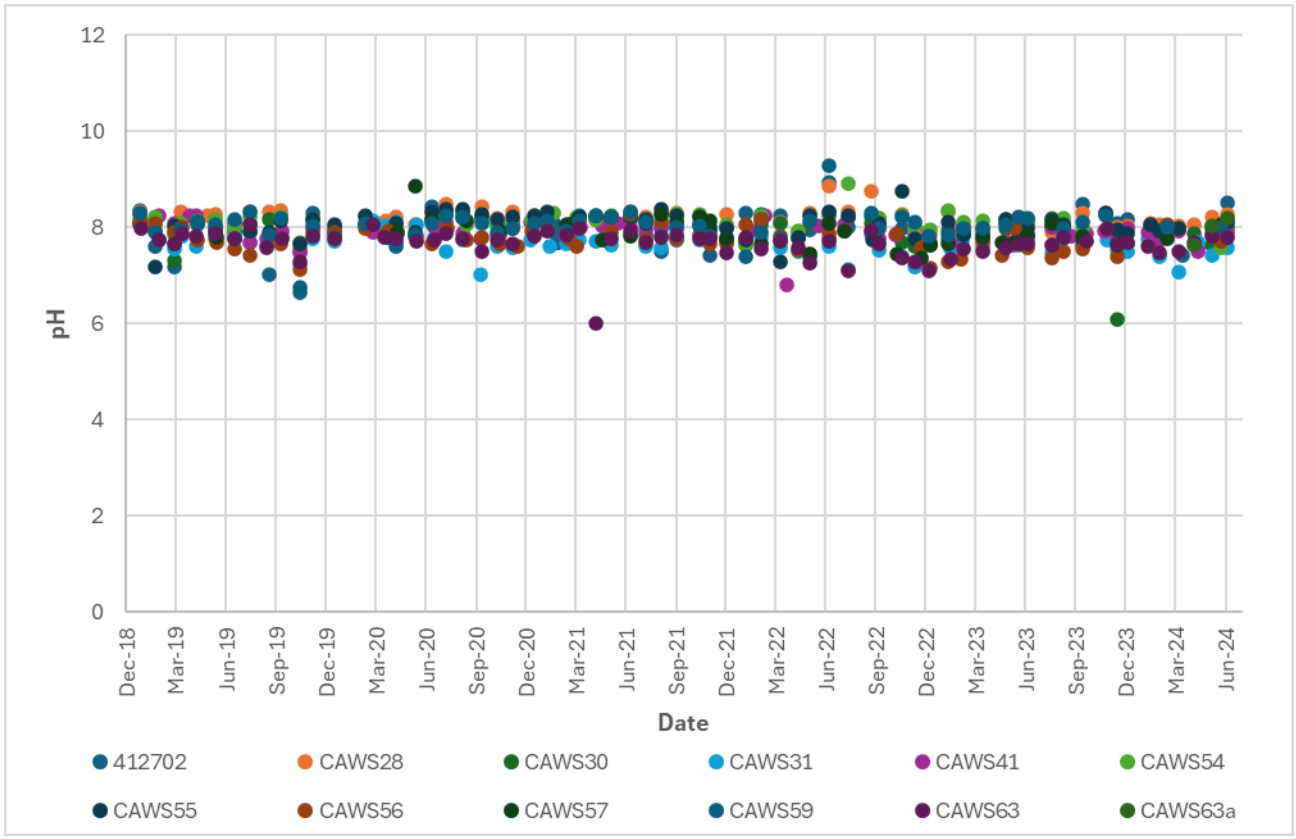

0.03
0.025
0.02
0.015
0.01
0.005
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

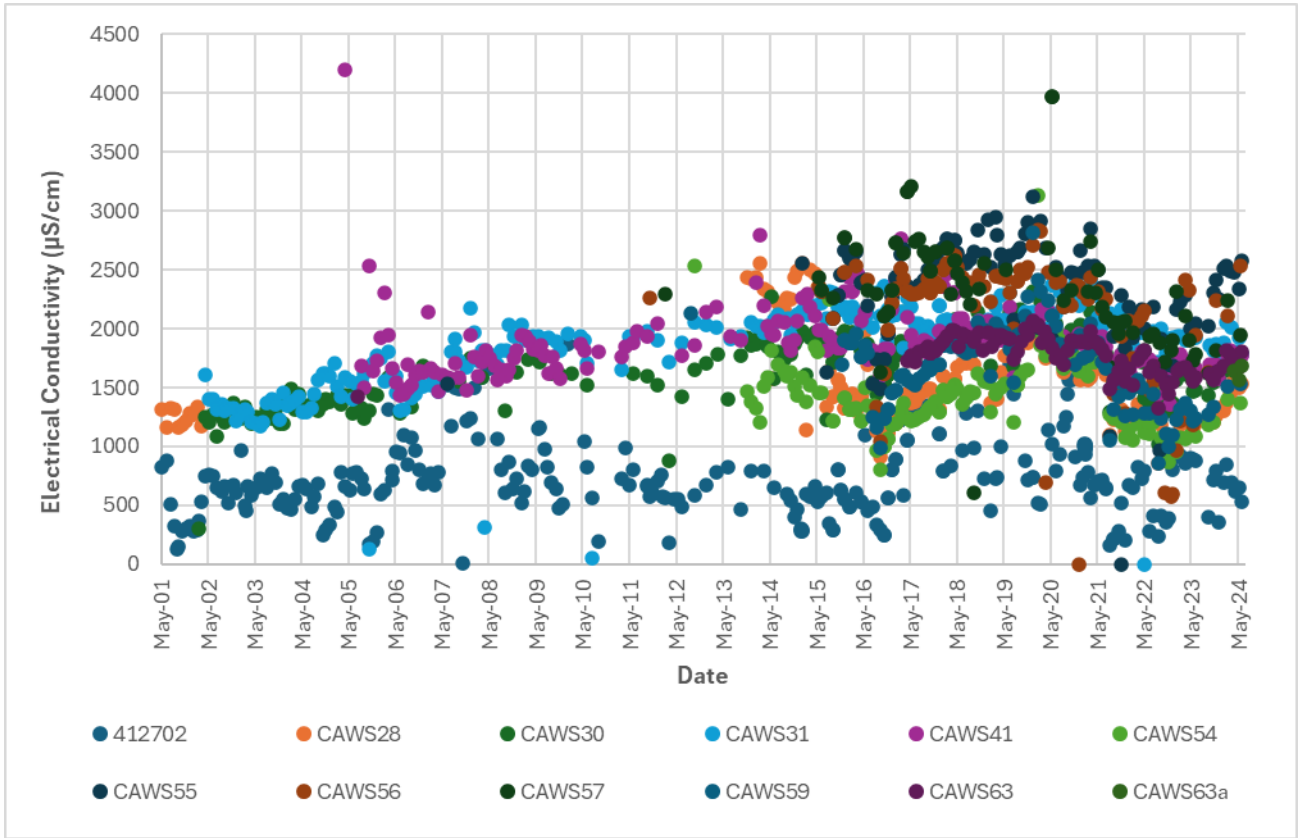

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

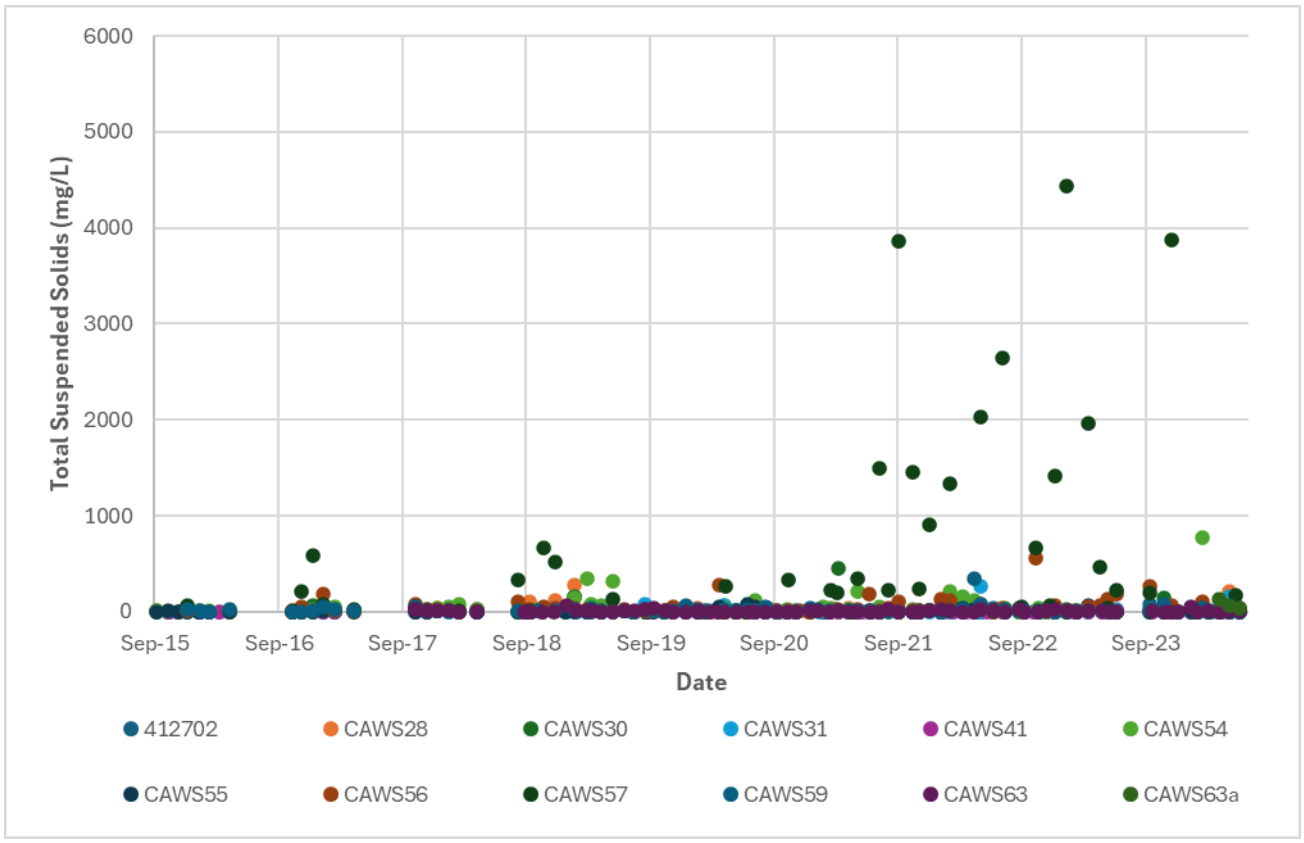

0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Zinc (mg/L)
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Dec-11
Dec-12
Dec-13
Dec-14
Dec-15
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
CAWS61
CAWS62
CAWS64
CAWS67
CAWS68
CAWS69
CAWS72
CAWS75
CAWS76

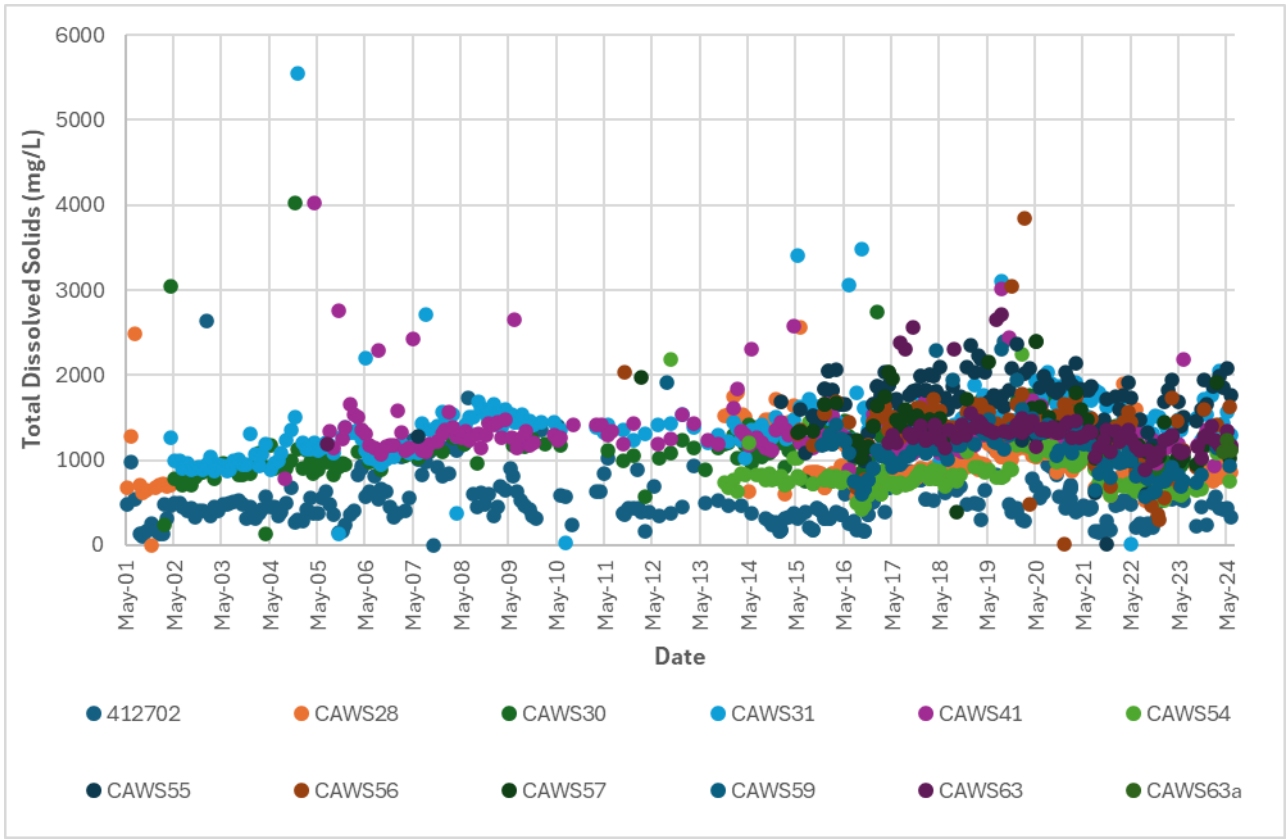
B.7 TSF Southern

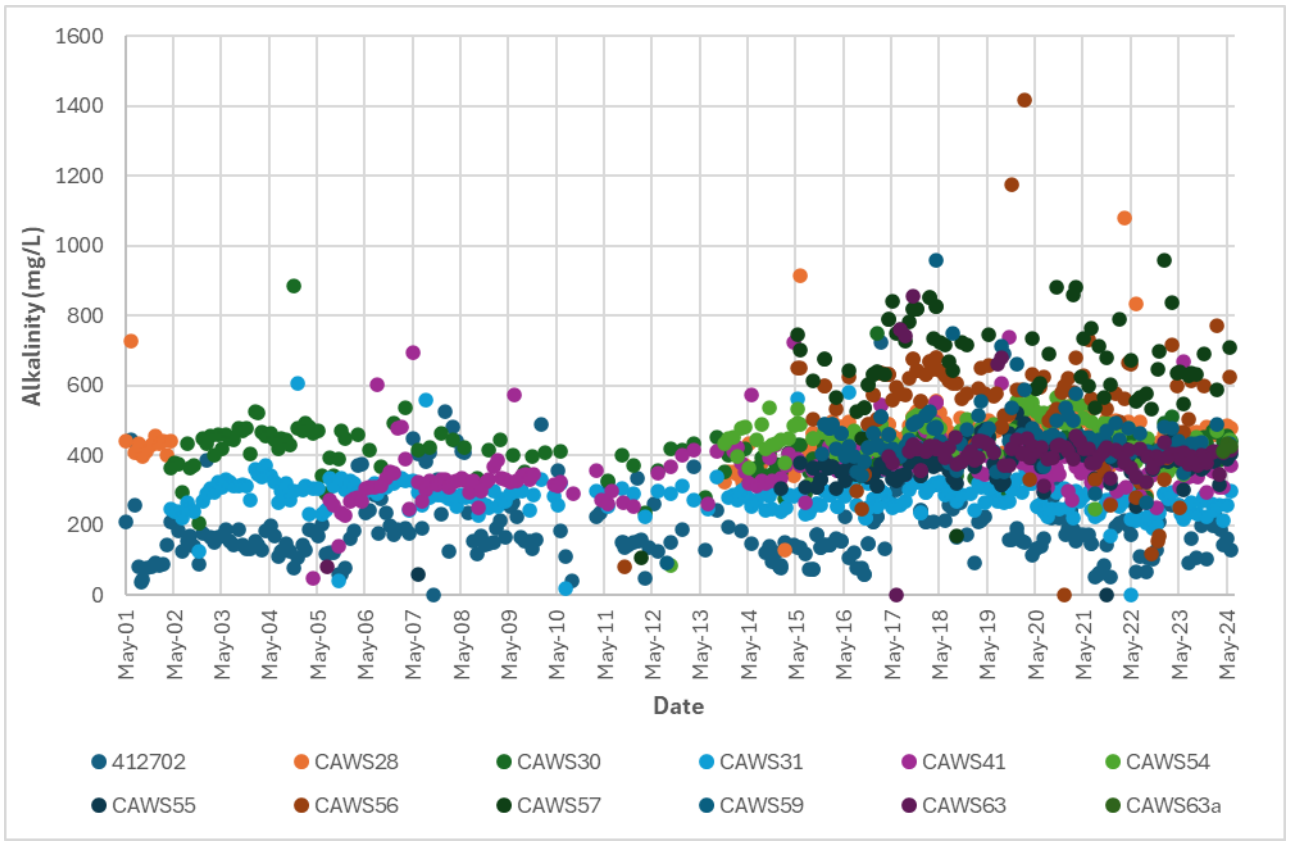
B.7.1 Physiochemical Parameters

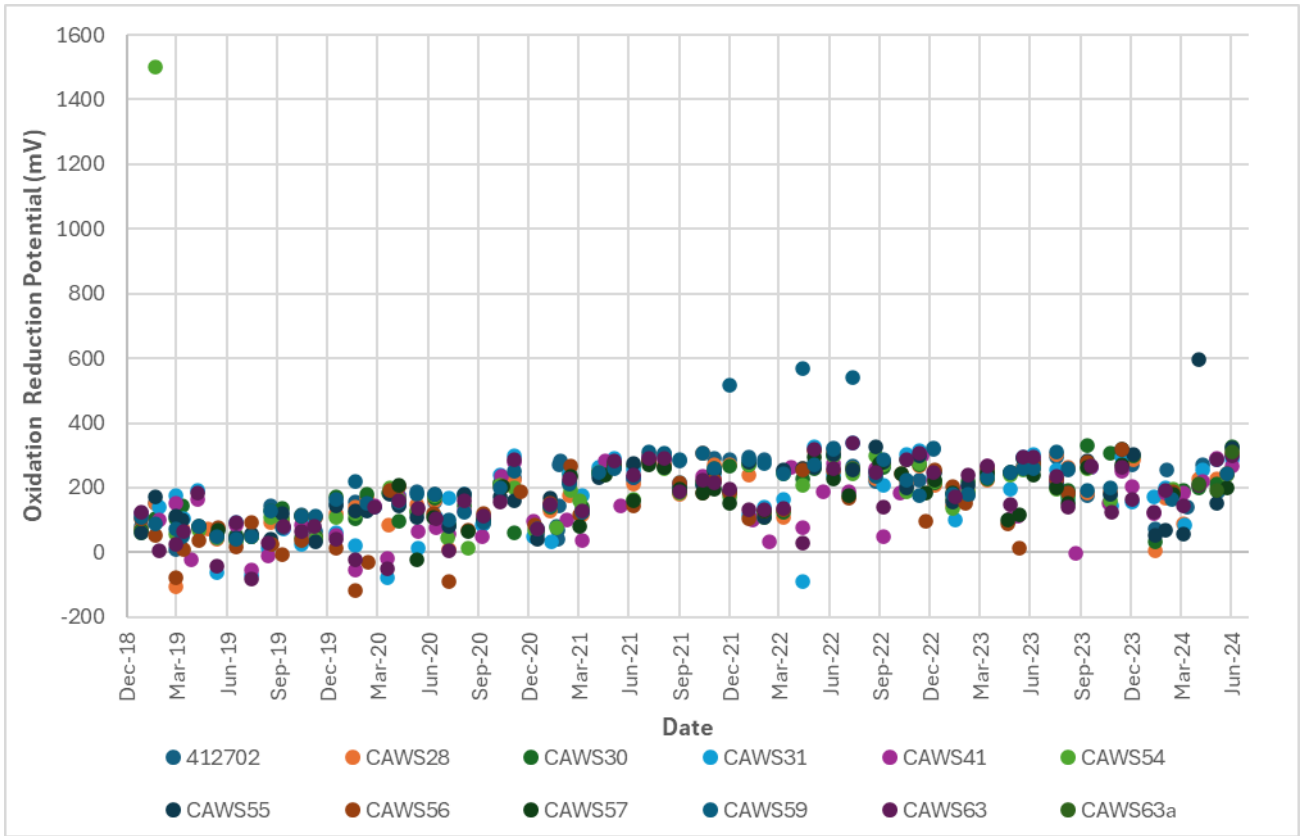




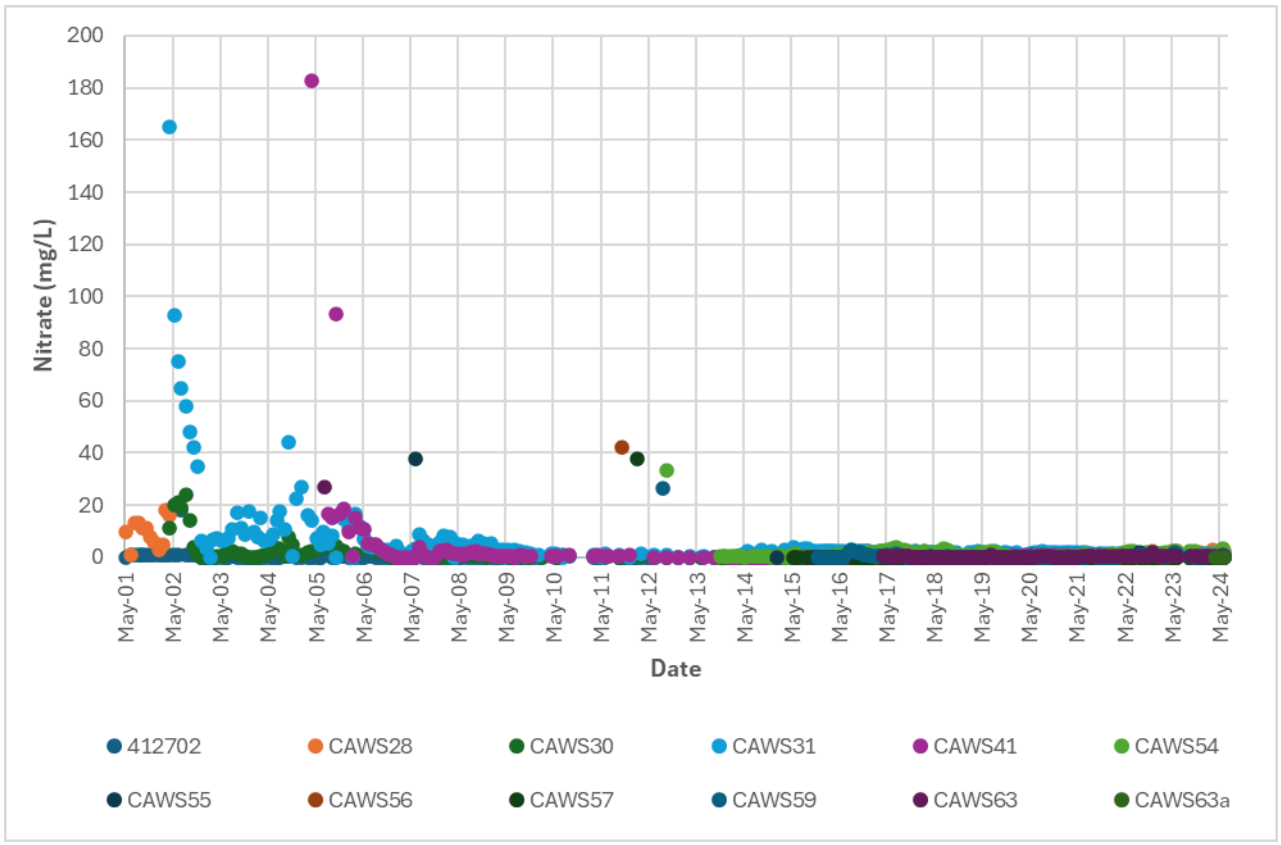

Total Suspended Solids (mg/L)
6000
5000
4000
3000
2000
1000
0
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

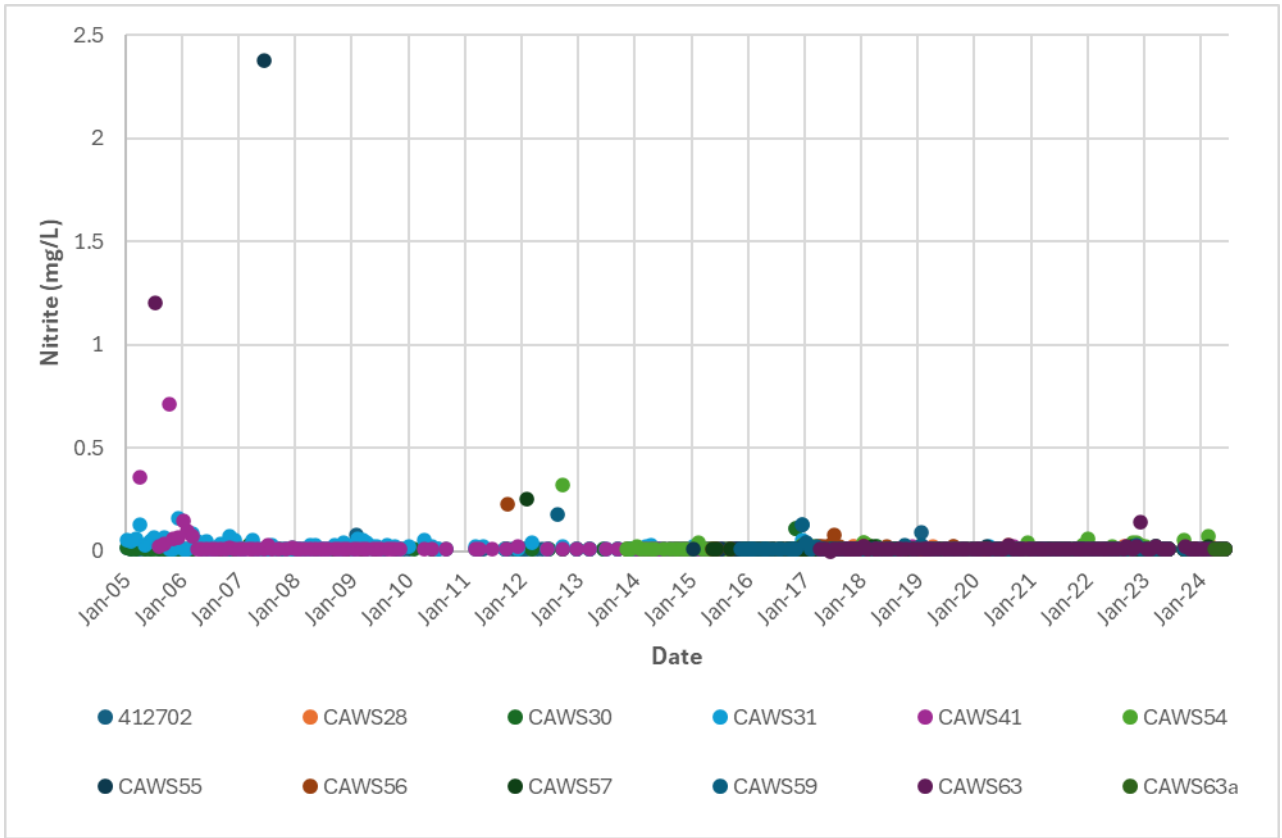

Total Dissolved Solids (mg/L)
6000
5000
4000
3000
2000
1000
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
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CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

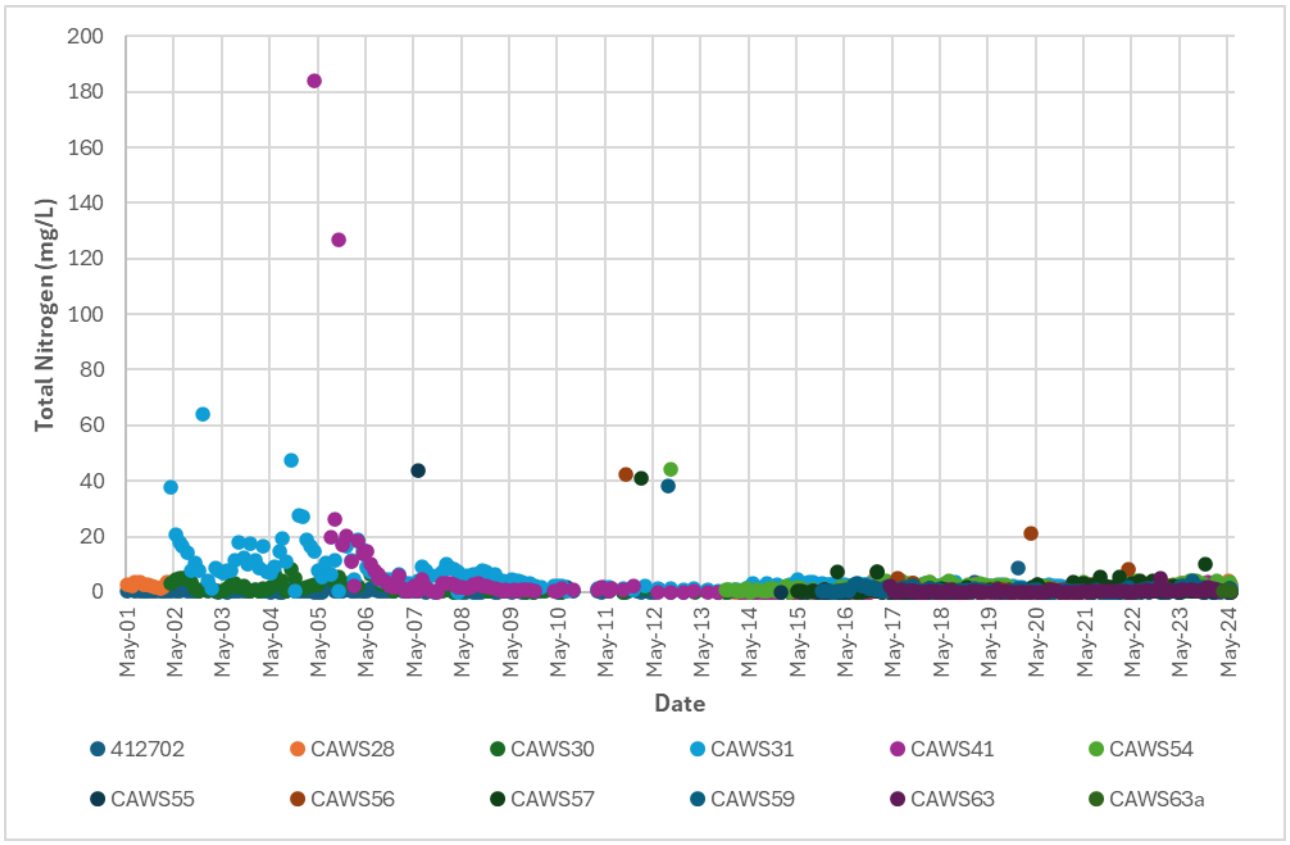


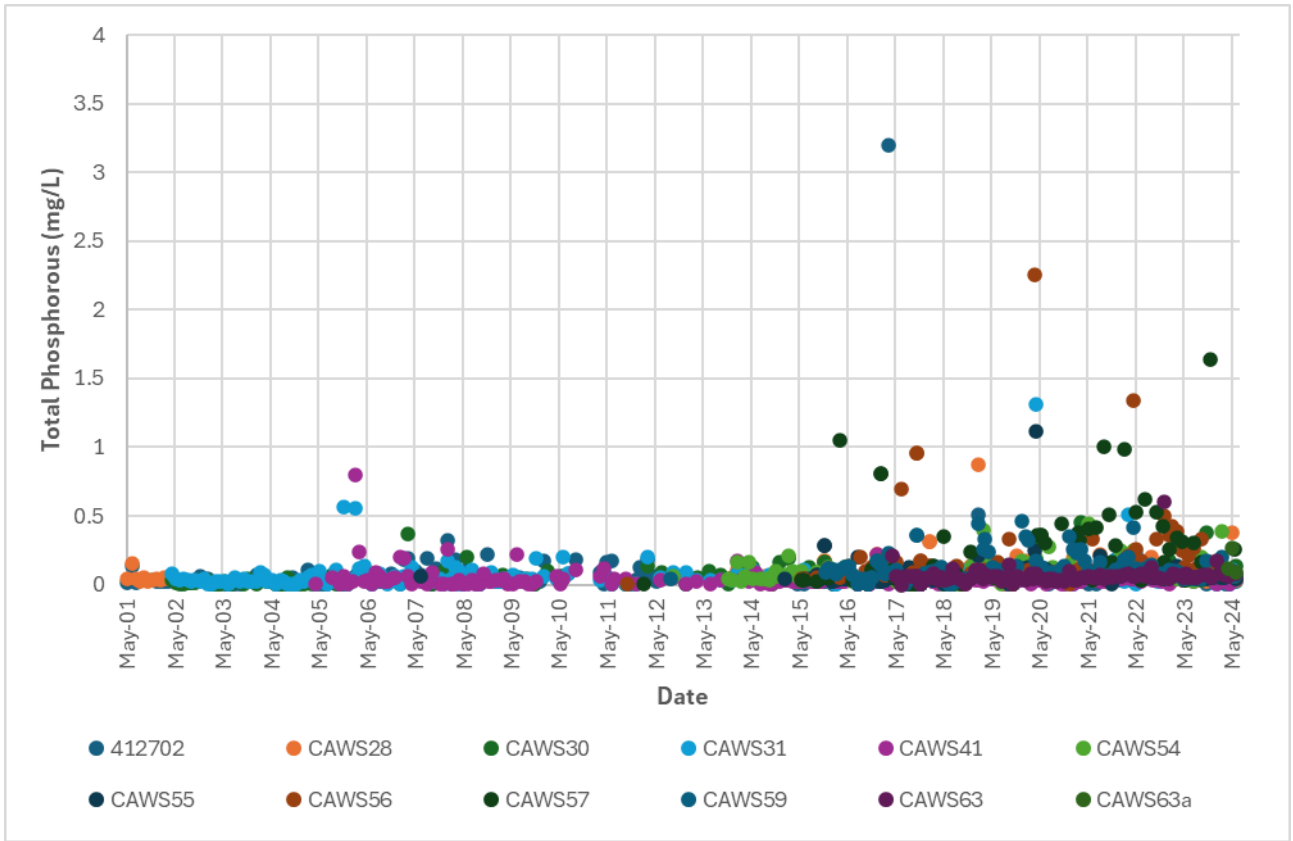


B.7.2 Nutrients

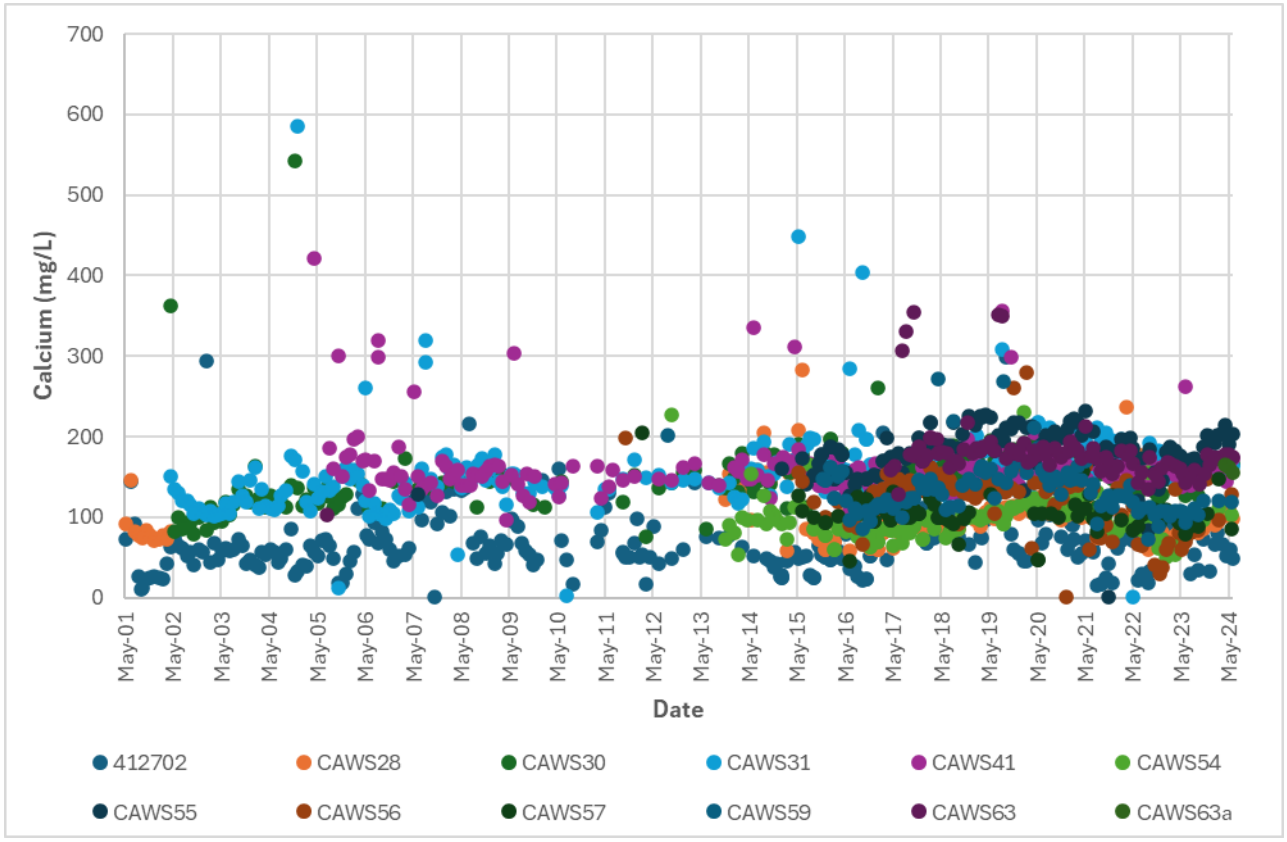

Nitrate (mg/L)
200
180
160
140
120
100
80
60
40
20
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

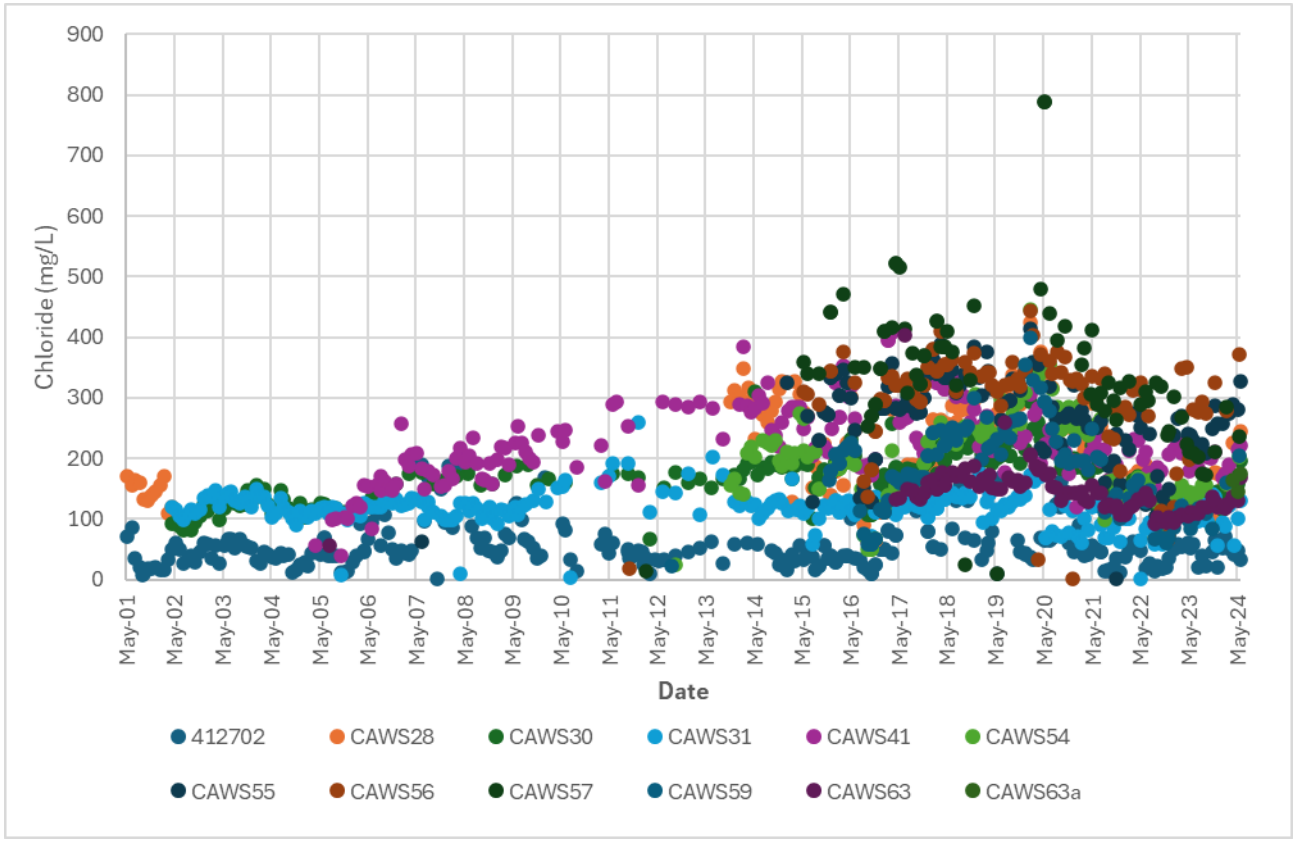

Nitrite (mg/L)
2.5
2
1.5
1
0.5
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

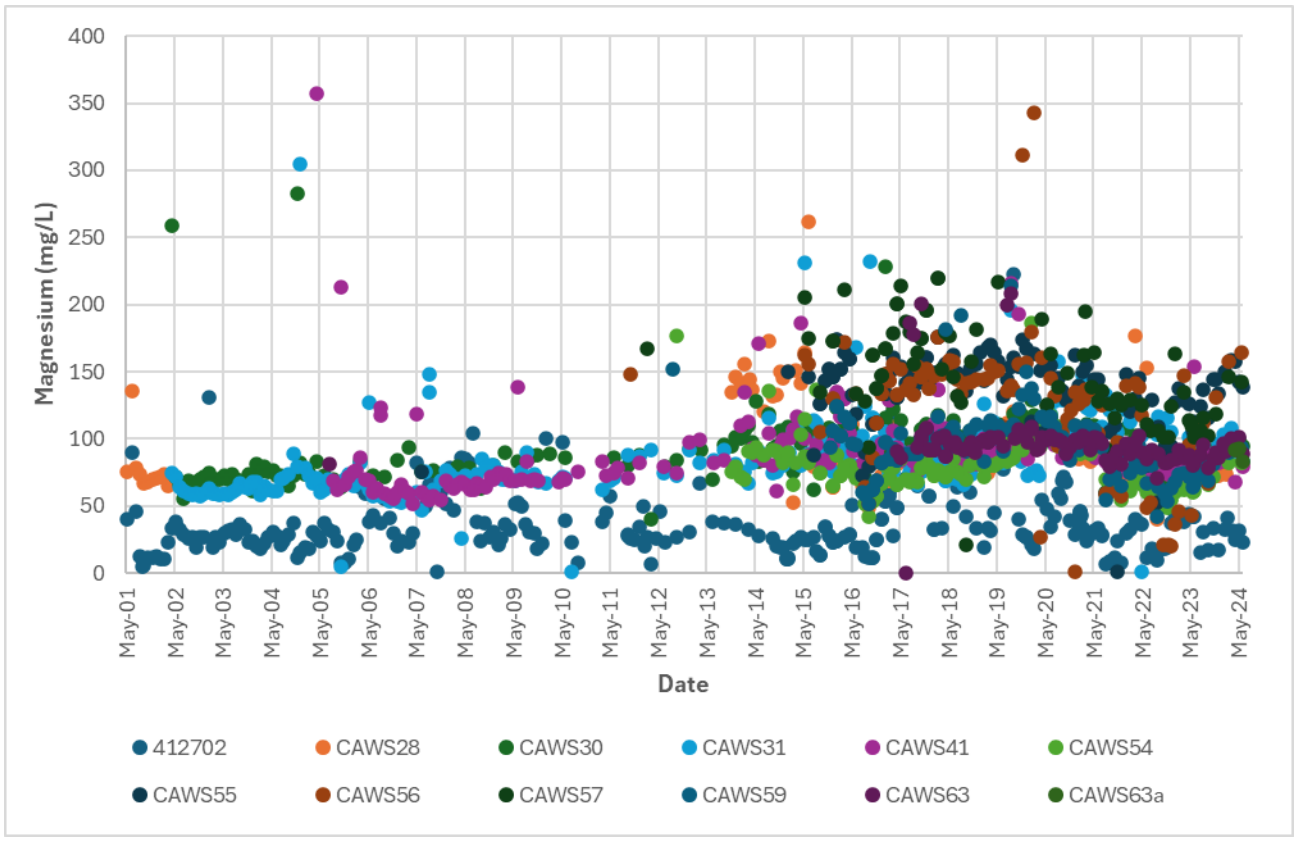

Total Nitrogen (mg/L)
200
180
160
140
120
100
80
60
40
20
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

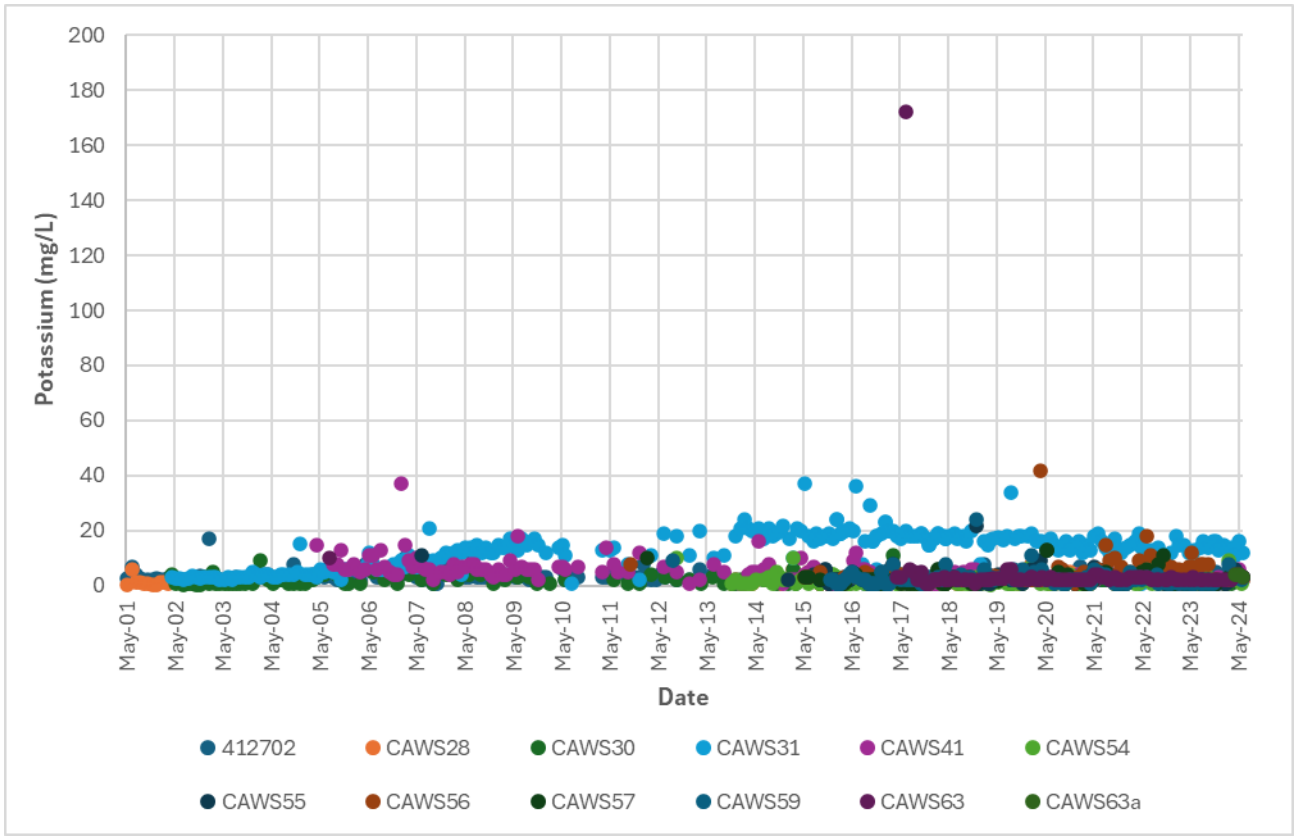

Total Phosphorous (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

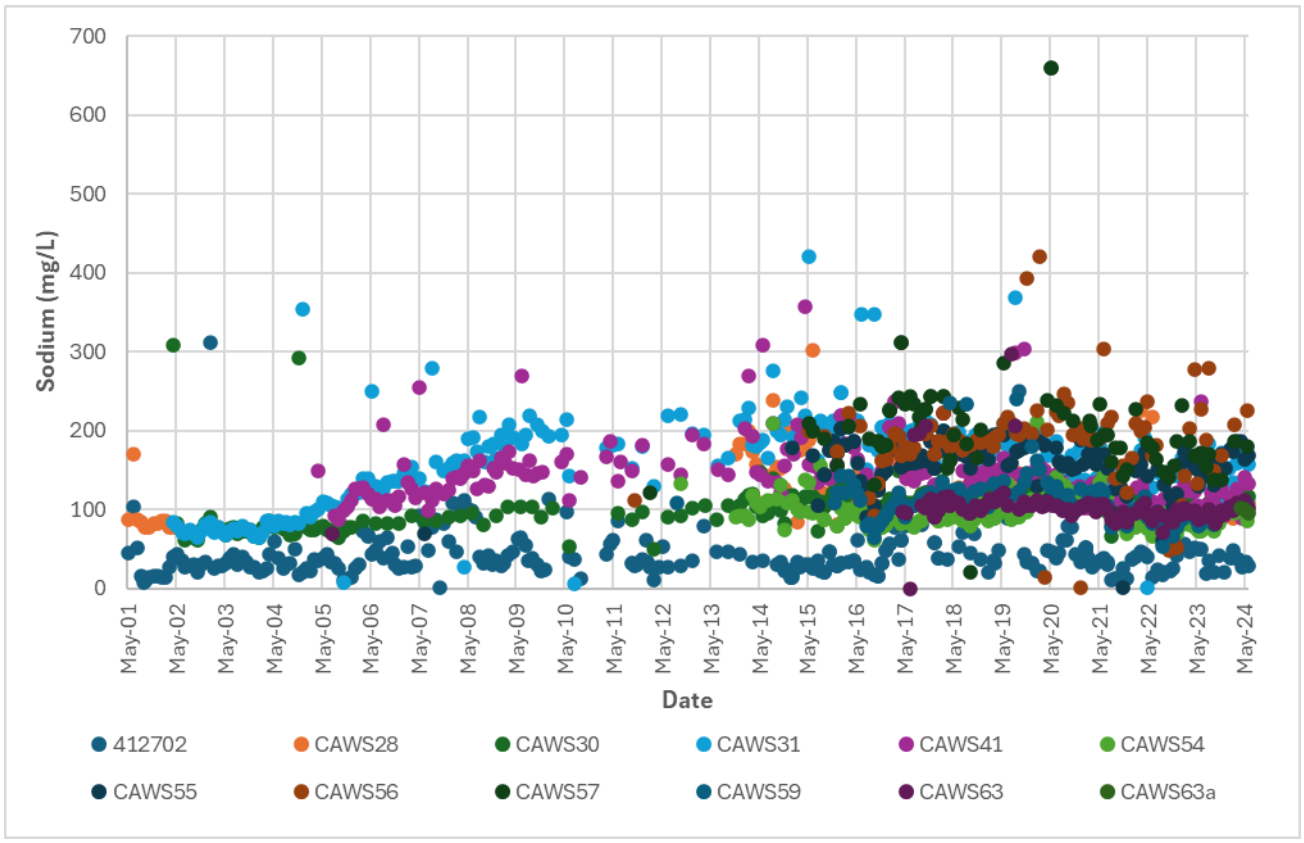
B.7.3 Major Ions

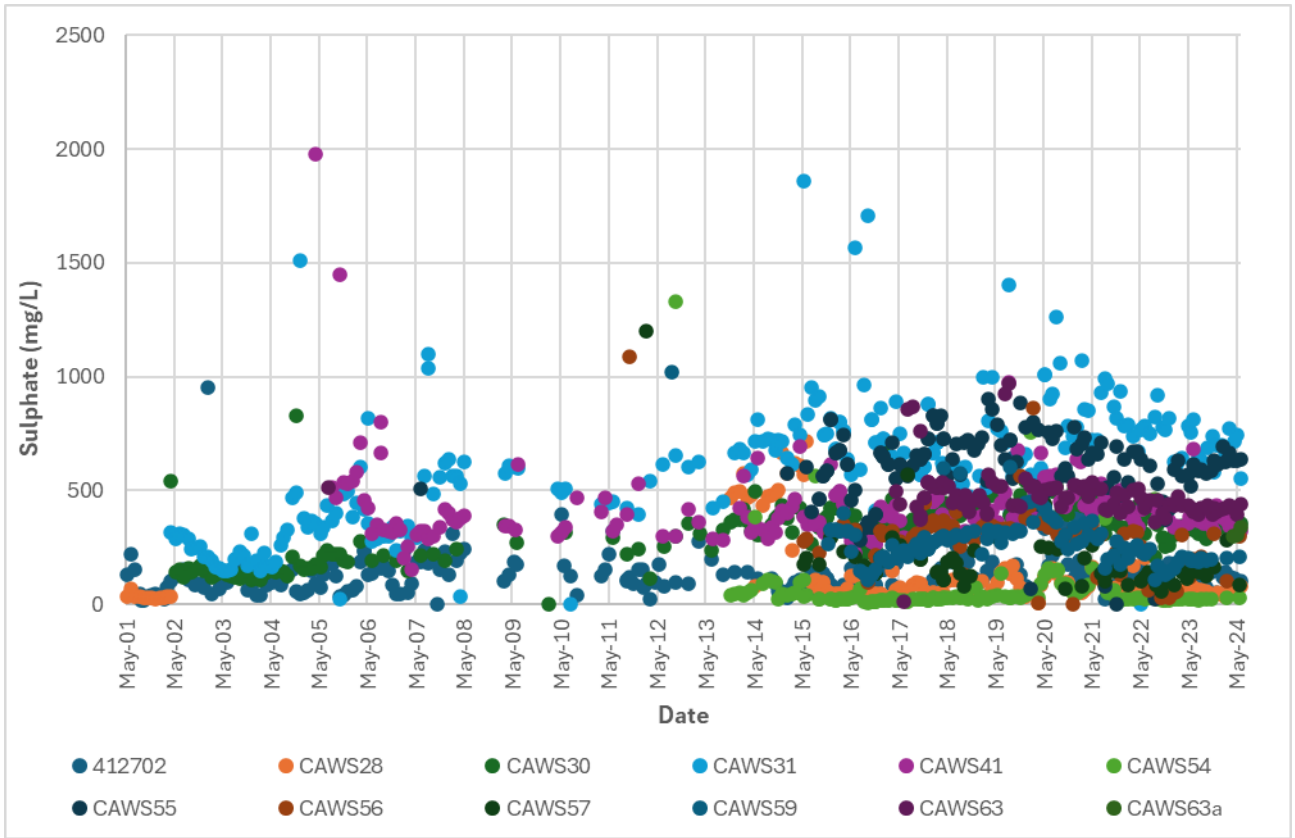




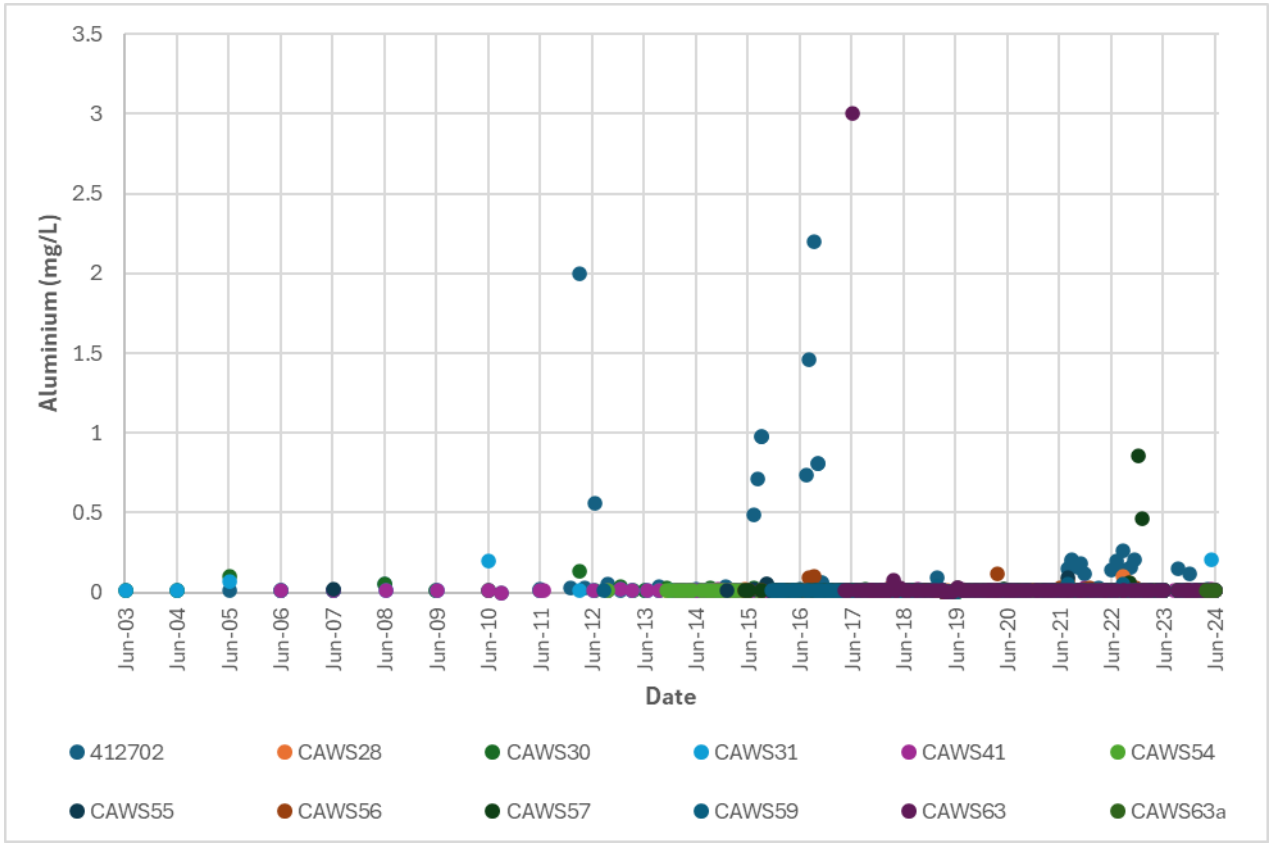

Magnesium (mg/L)
400
350
300
250
200
150
100
50
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
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CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

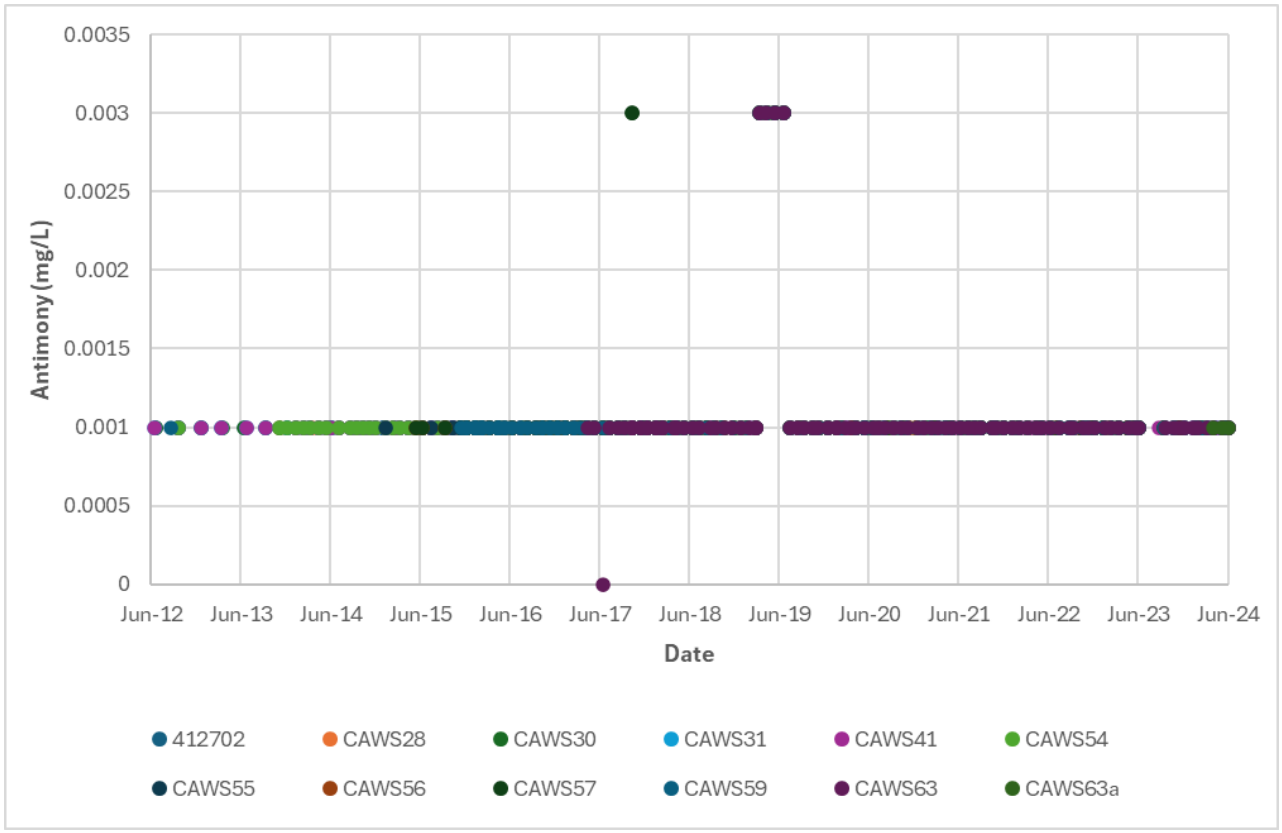

Potassium (mg/L)
200
180
160
140
120
100
80
60
40
20
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
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CAWS63
CAWS63a

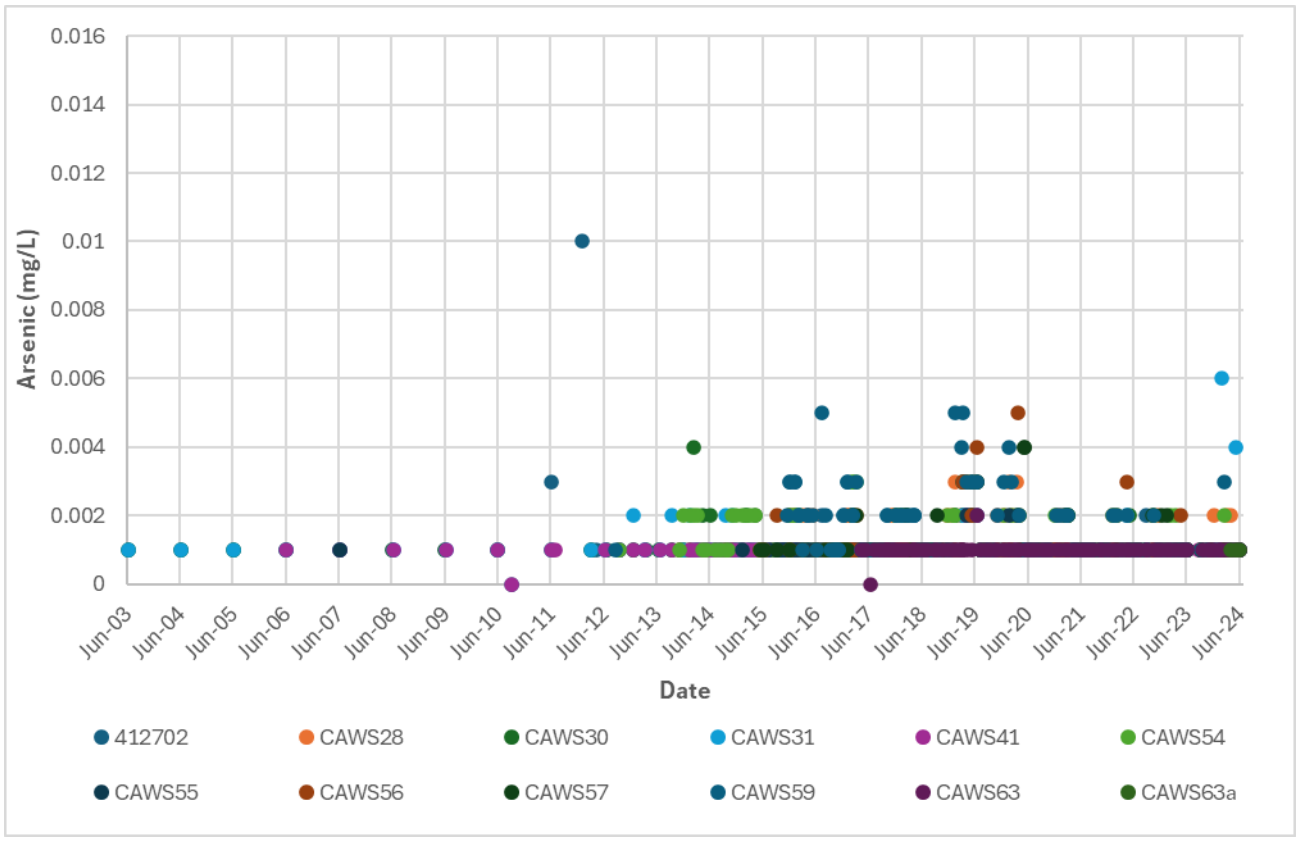

Sodium (mg/L)
700
600
500
400
300
200
100
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
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CAWS56
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CAWS59
CAWS63
CAWS63a

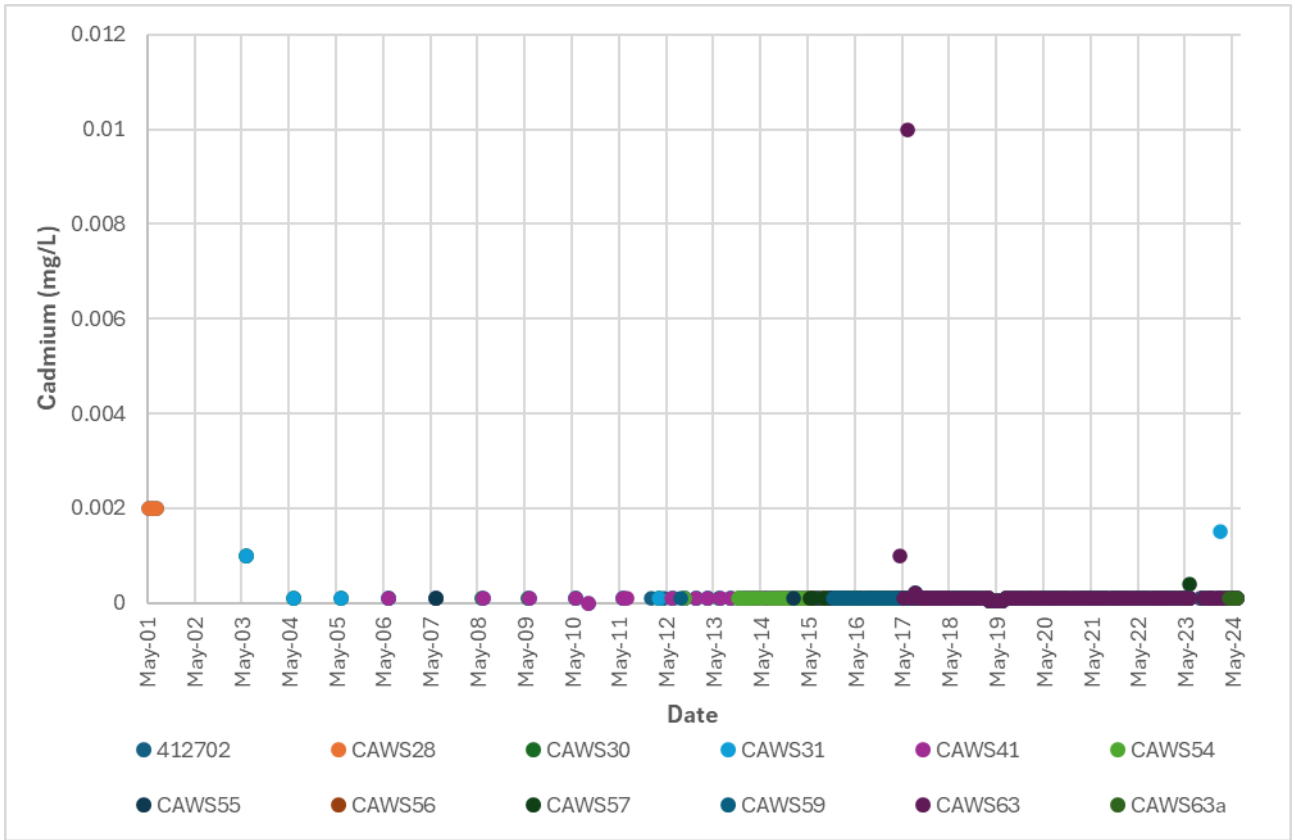

Sulphate (mg/L)
2500
2000
1500
1000
500
0
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
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CAWS41
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CAWS57
CAWS59
CAWS63
CAWS63a

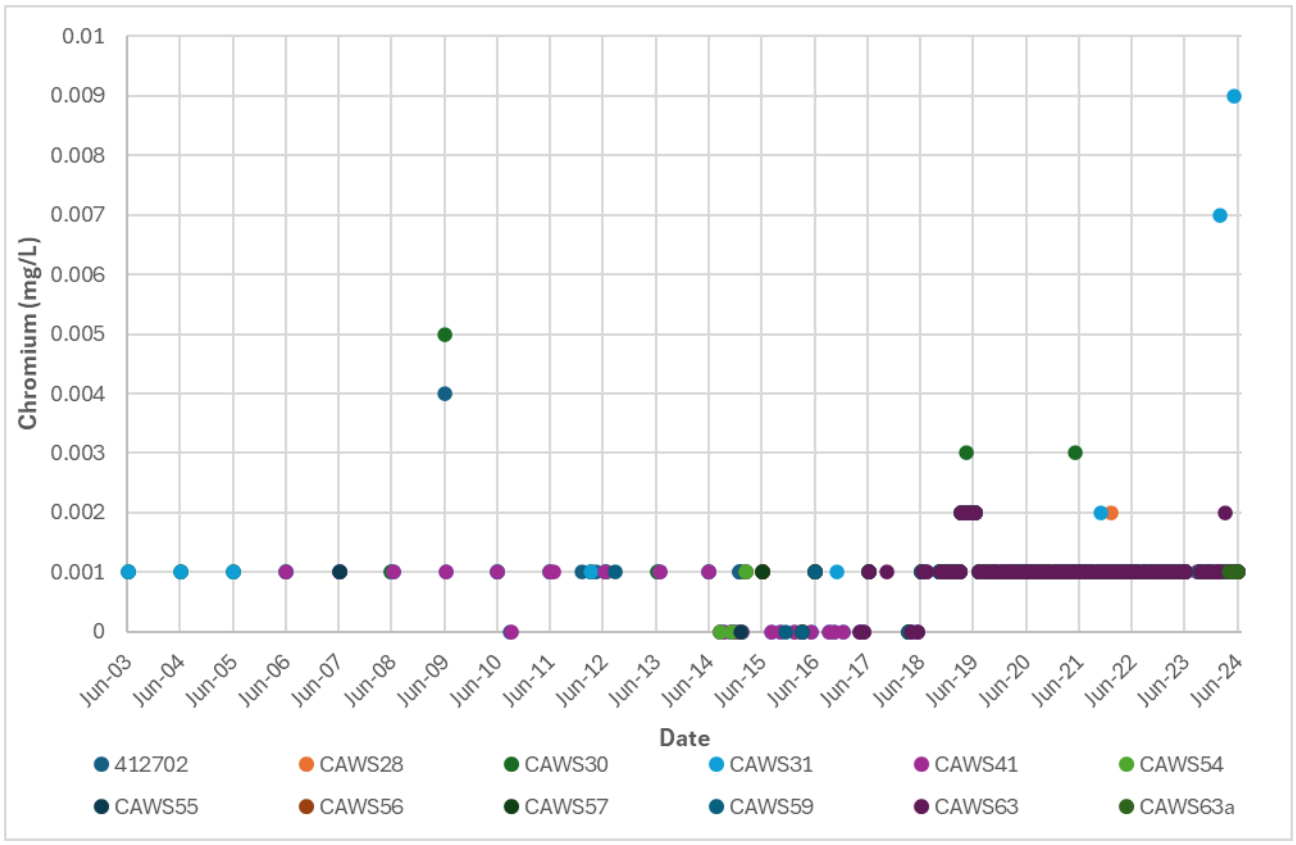
B.7.4 Dissolved Metals

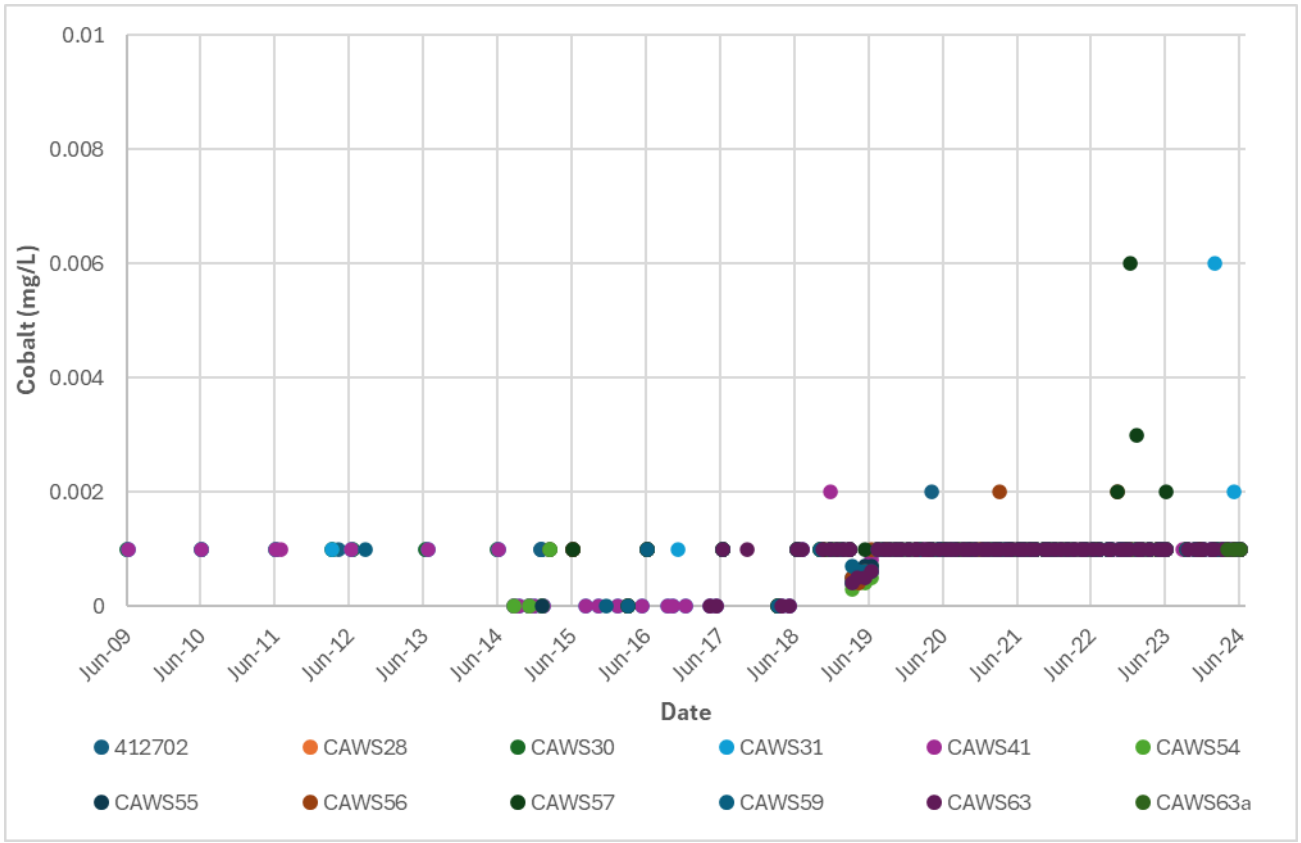


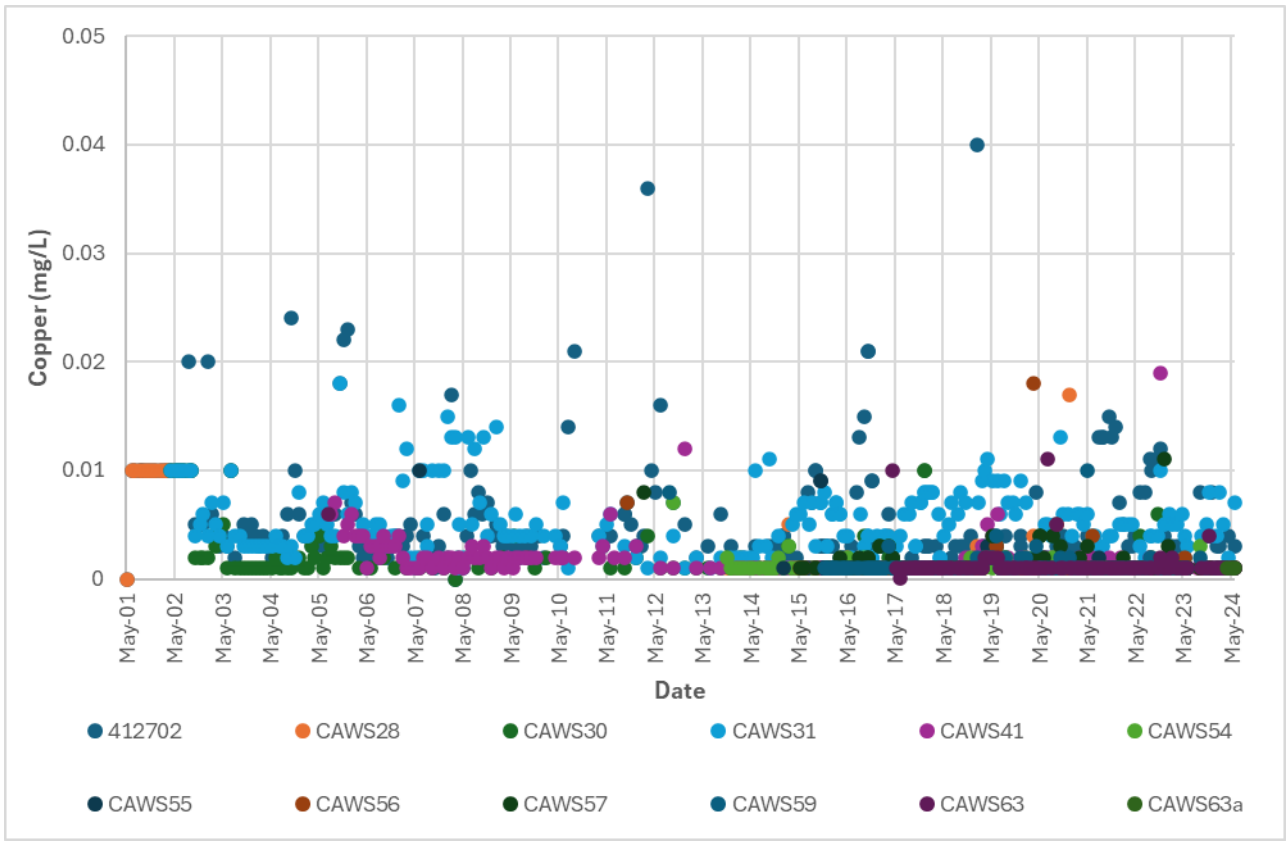


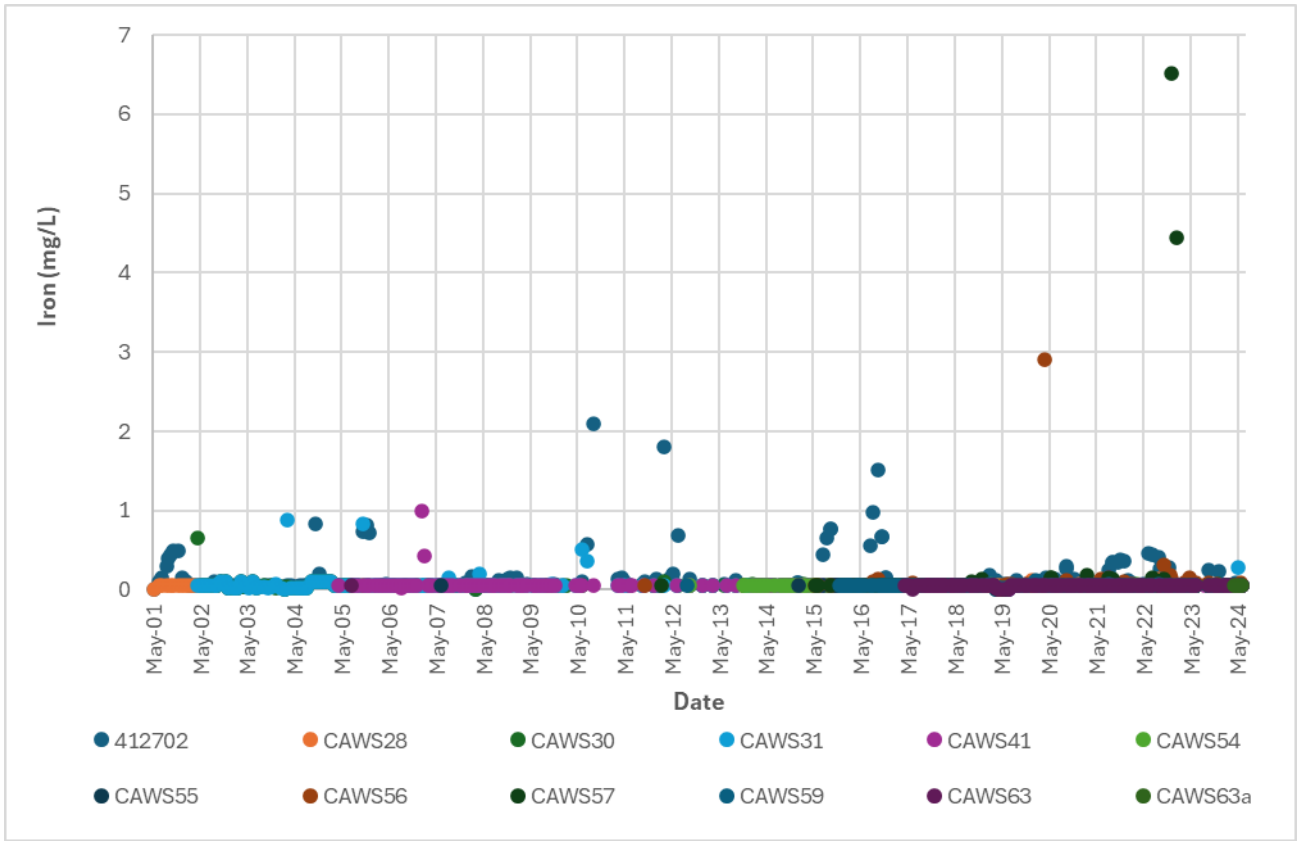

0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
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CAWS55
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CAWS57
CAWS59
CAWS63
CAWS63a

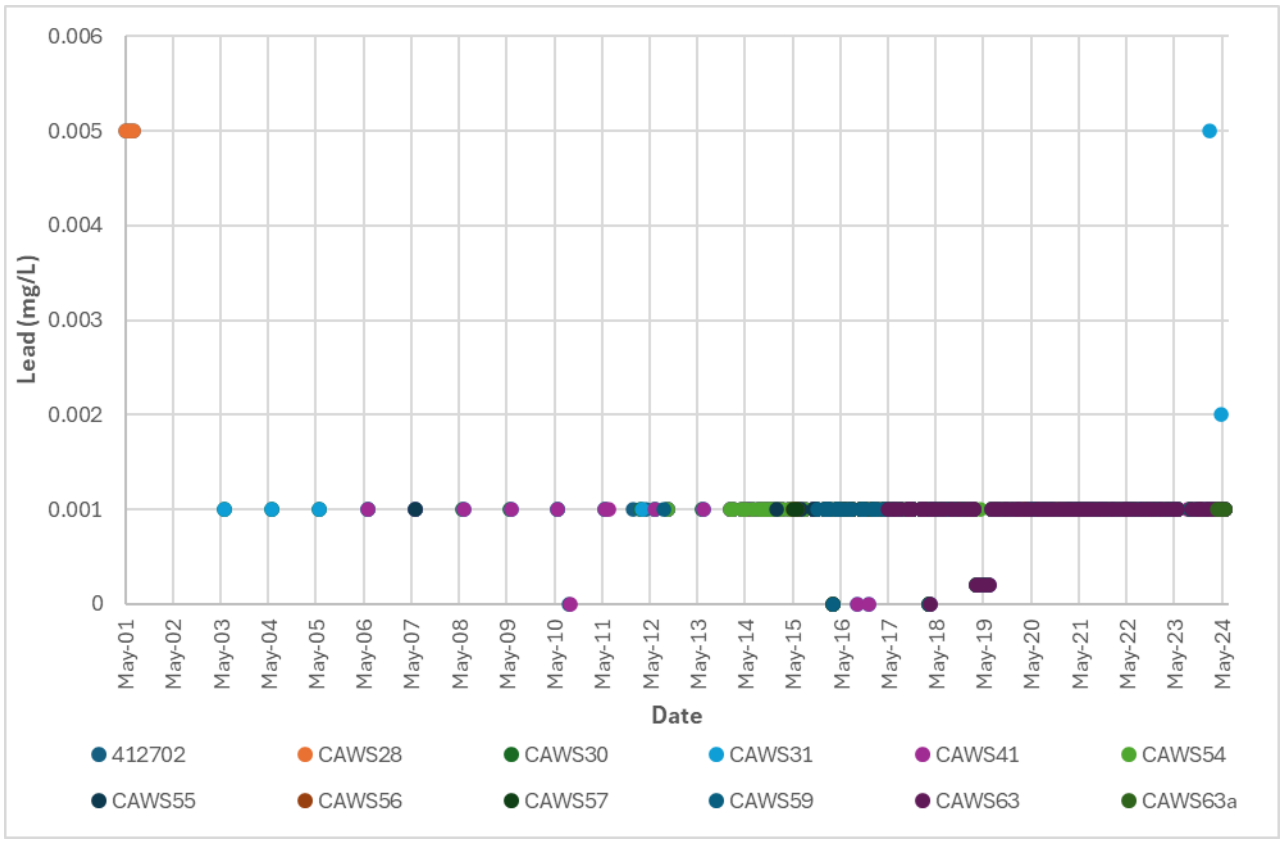

0.012
0.01
0.008
0.006
0.004
0.002
0
Cadmium (mg/L)
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
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CAWS56
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CAWS59
CAWS63
CAWS63a

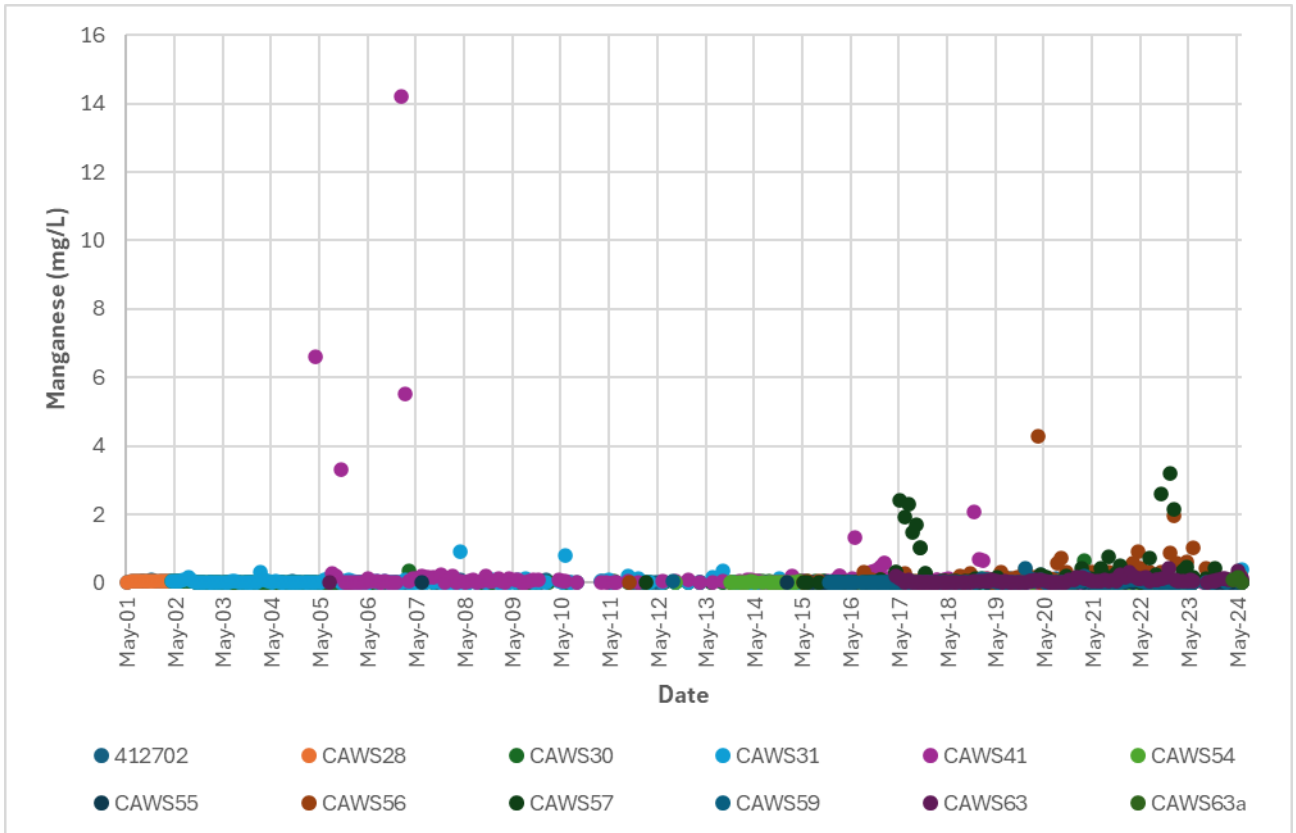

Chromium (mg/L)
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
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CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

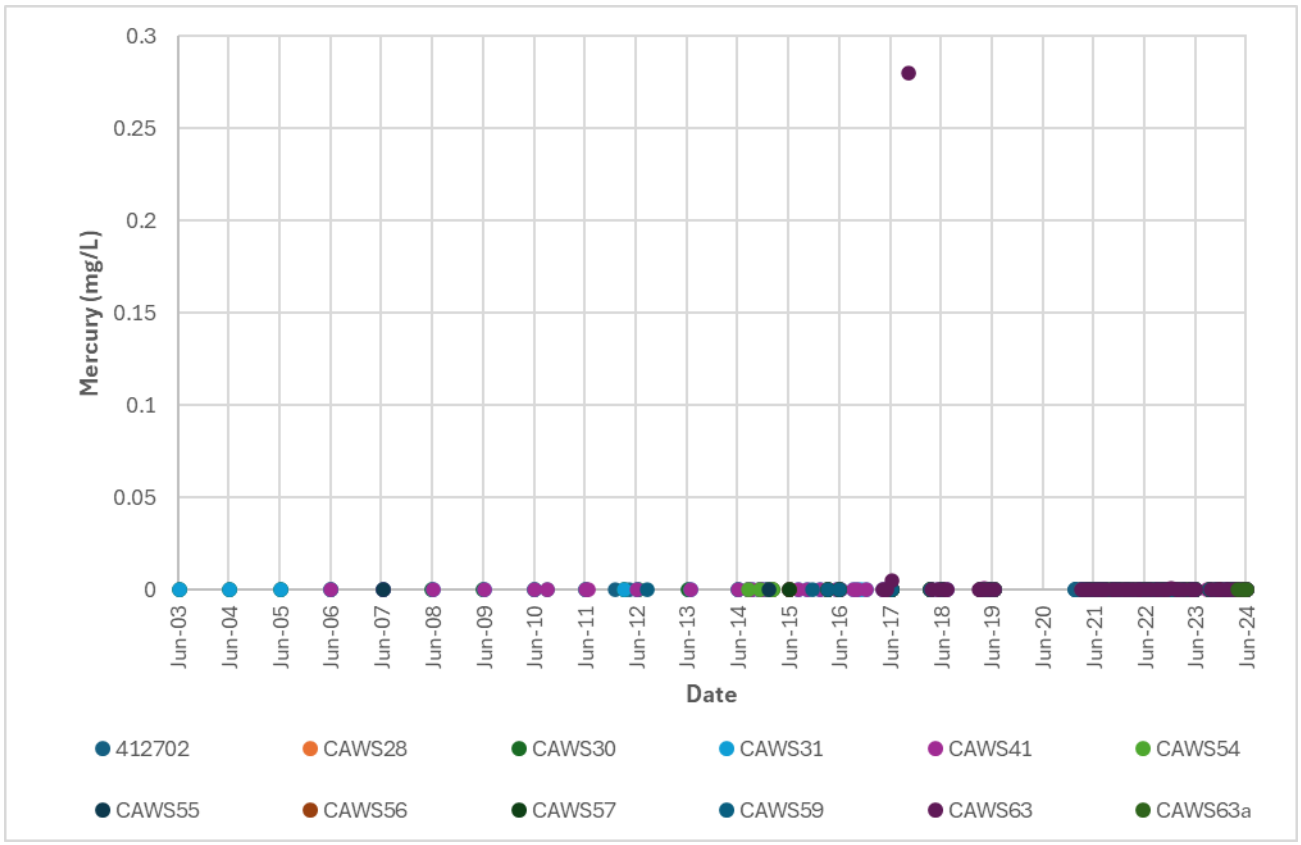

Cobalt (mg/L)
0.01
0.008
0.006
0.004
0.002
0
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
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CAWS59
CAWS63
CAWS63a

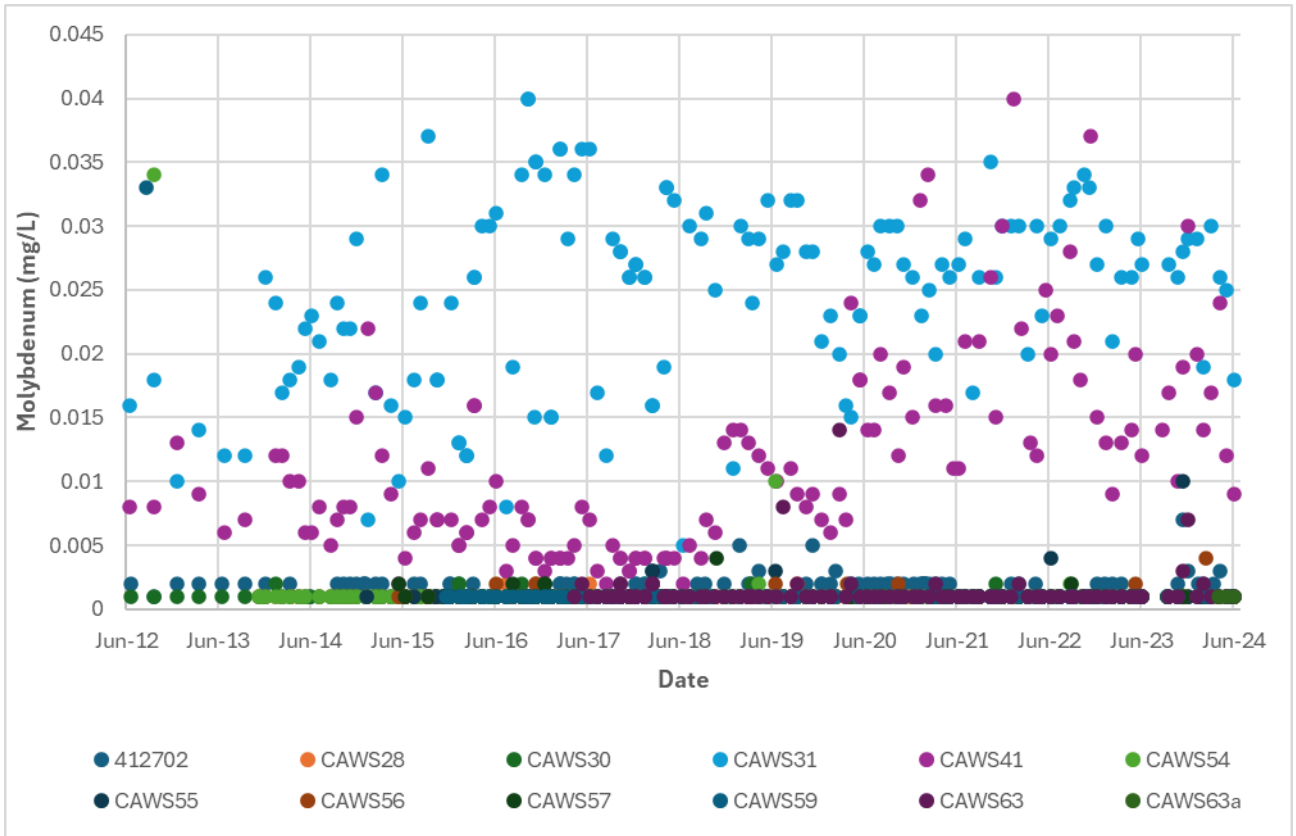

0.05
0.04
0.03
0.02
0.01
0
Copper (mg/L)
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
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CAWS63
CAWS63a

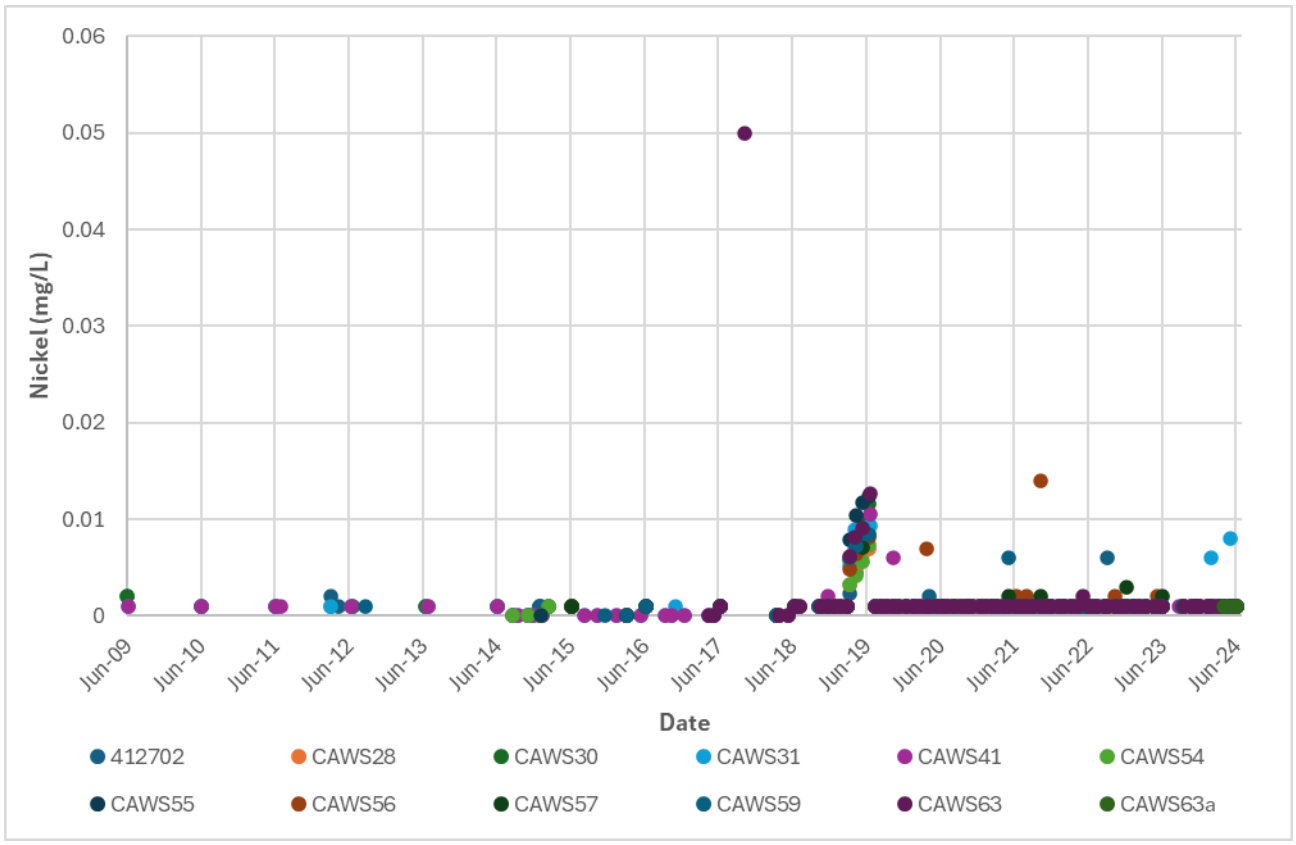

7
6
5
4
3
2
1
0
Iron (mg/L)
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
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CAWS56
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CAWS59
CAWS63
CAWS63a

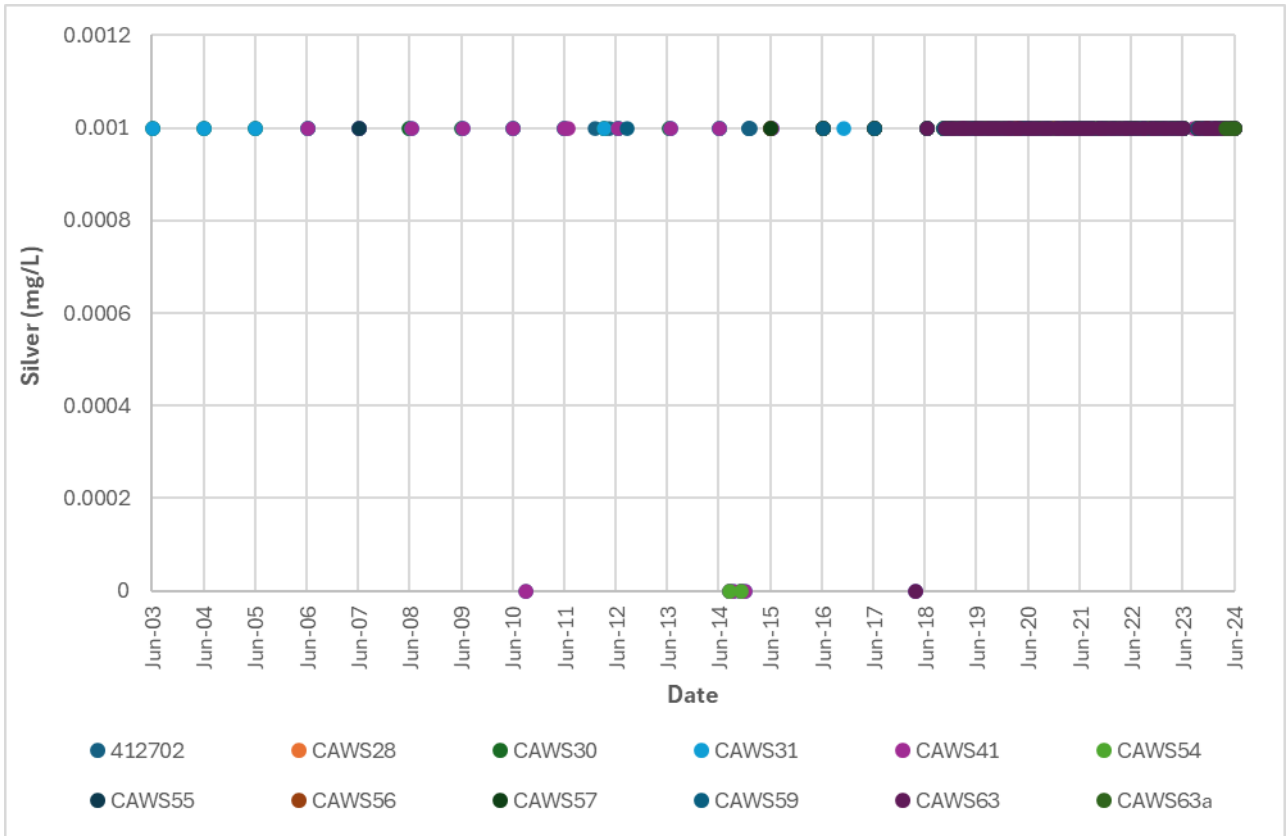

0.006
0.005
0.004
0.003
0.002
0.001
0
Lead (mg/L)
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

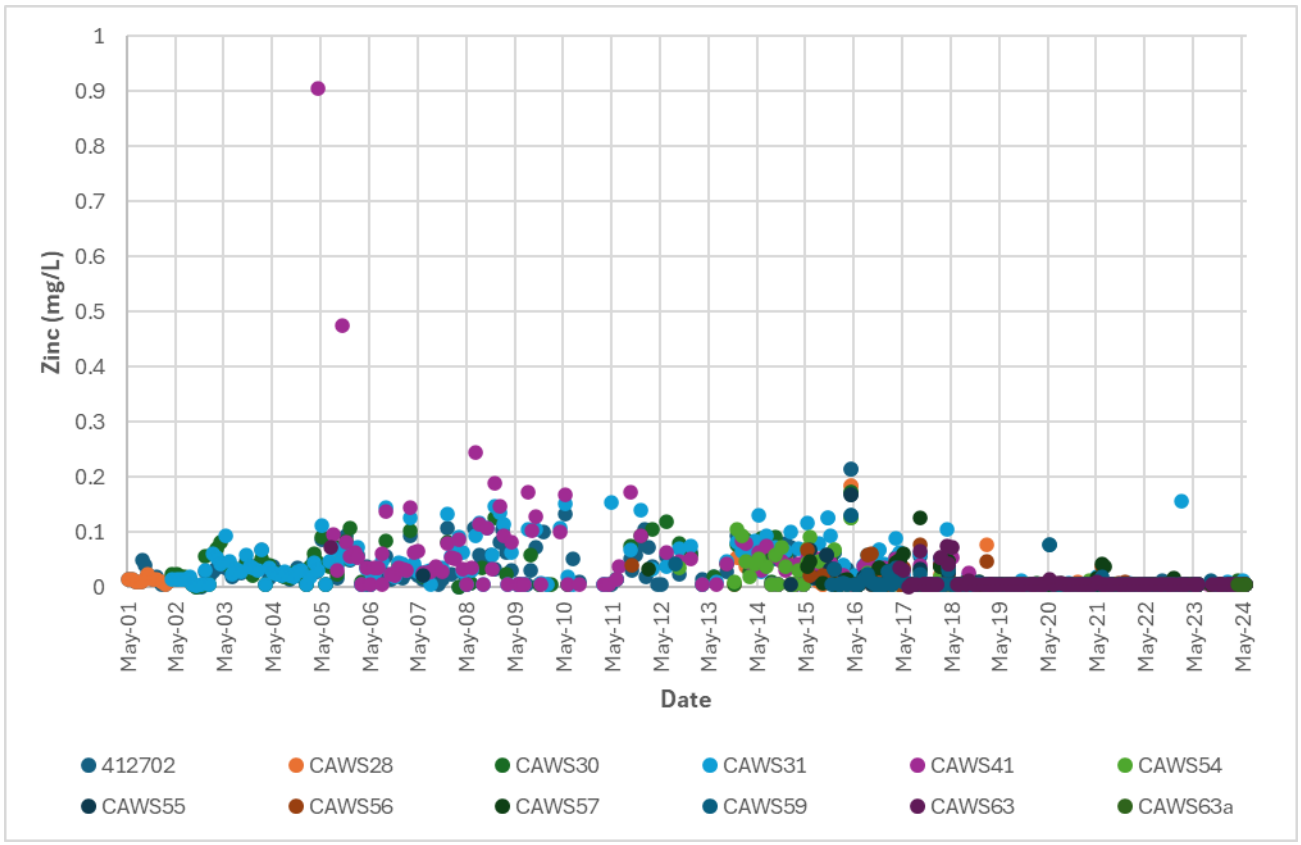

16
14
12
10
8
6
4
2
0
Manganese (mg/L)
May-01
May-02
May-03
May-04
May-05
May-06
May-07
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
May-20
May-21
May-22
May-23
May-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a


0.3
0.25
0.2
0.15
0.1
0.05
0
Mercury (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a


0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

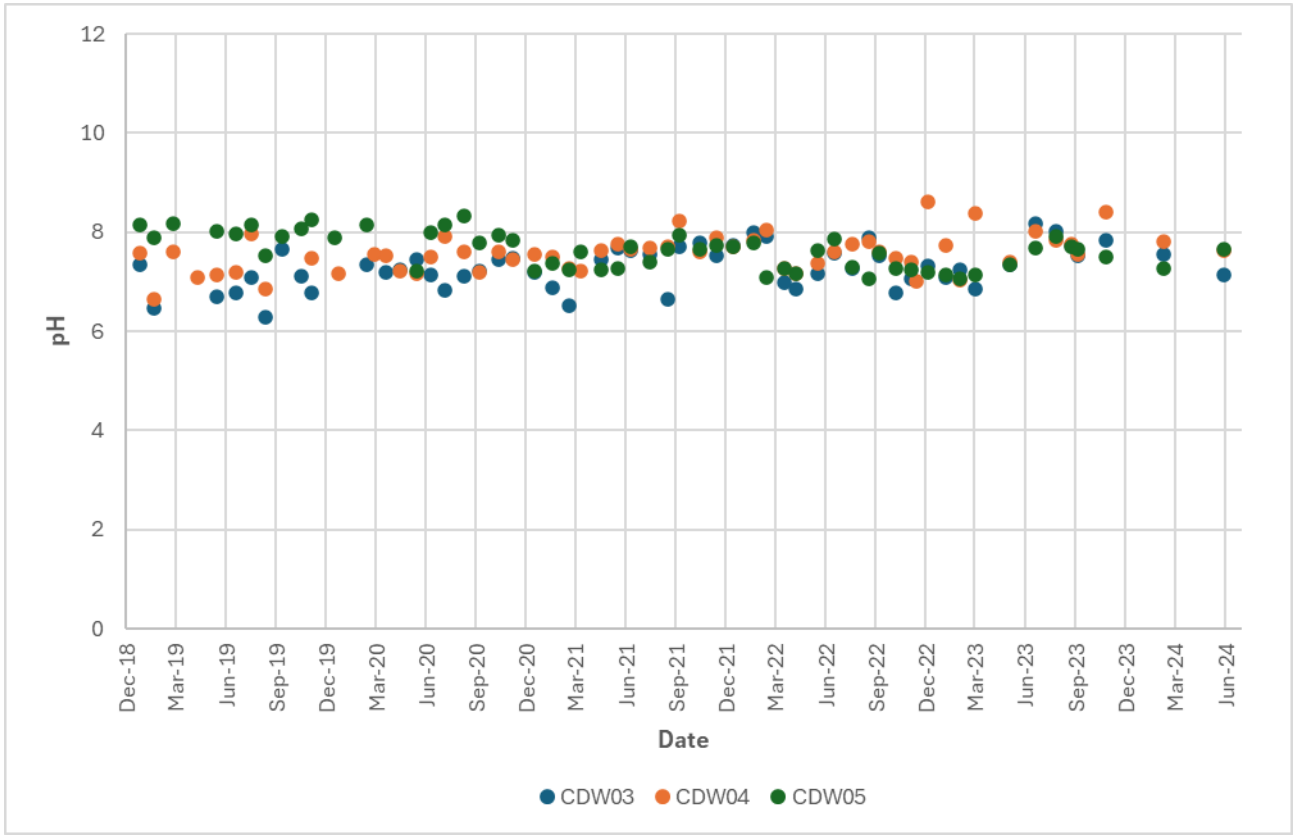

0.06
0.05
0.04
0.03
0.02
0.01
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
412702
CAWS28
CAWS30
CAWS31
CAWS41
CAWS54
CAWS55
CAWS56
CAWS57
CAWS59
CAWS63
CAWS63a

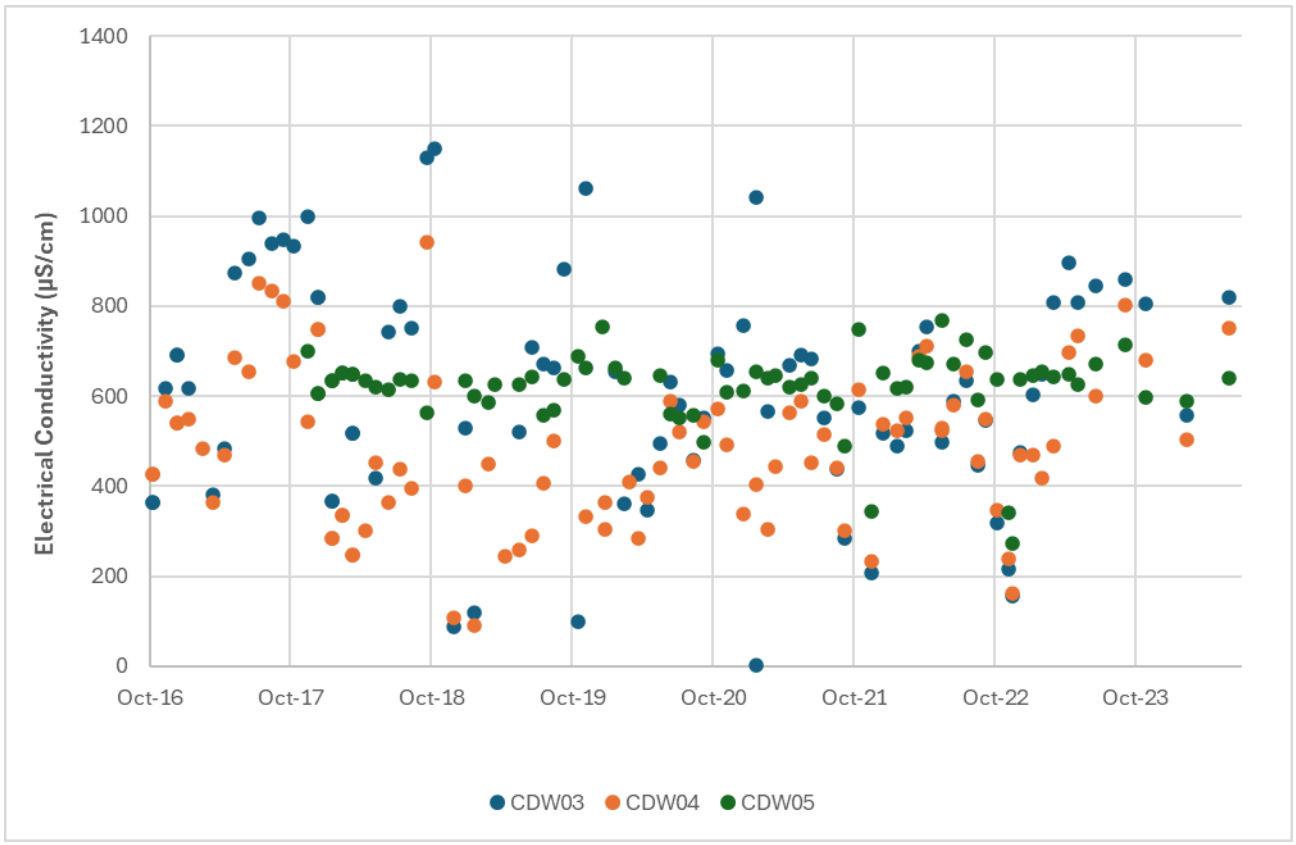

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
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CAWS59
CAWS63
CAWS63a

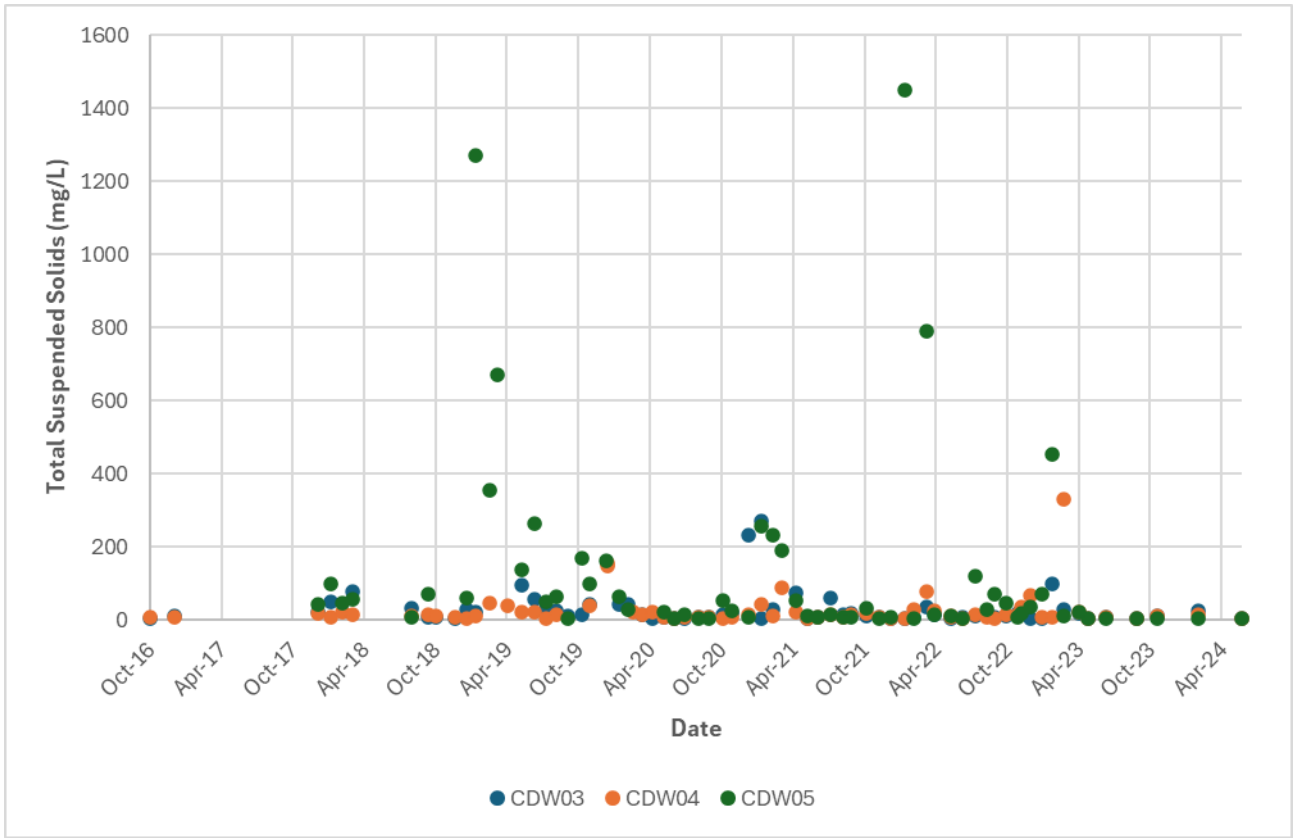


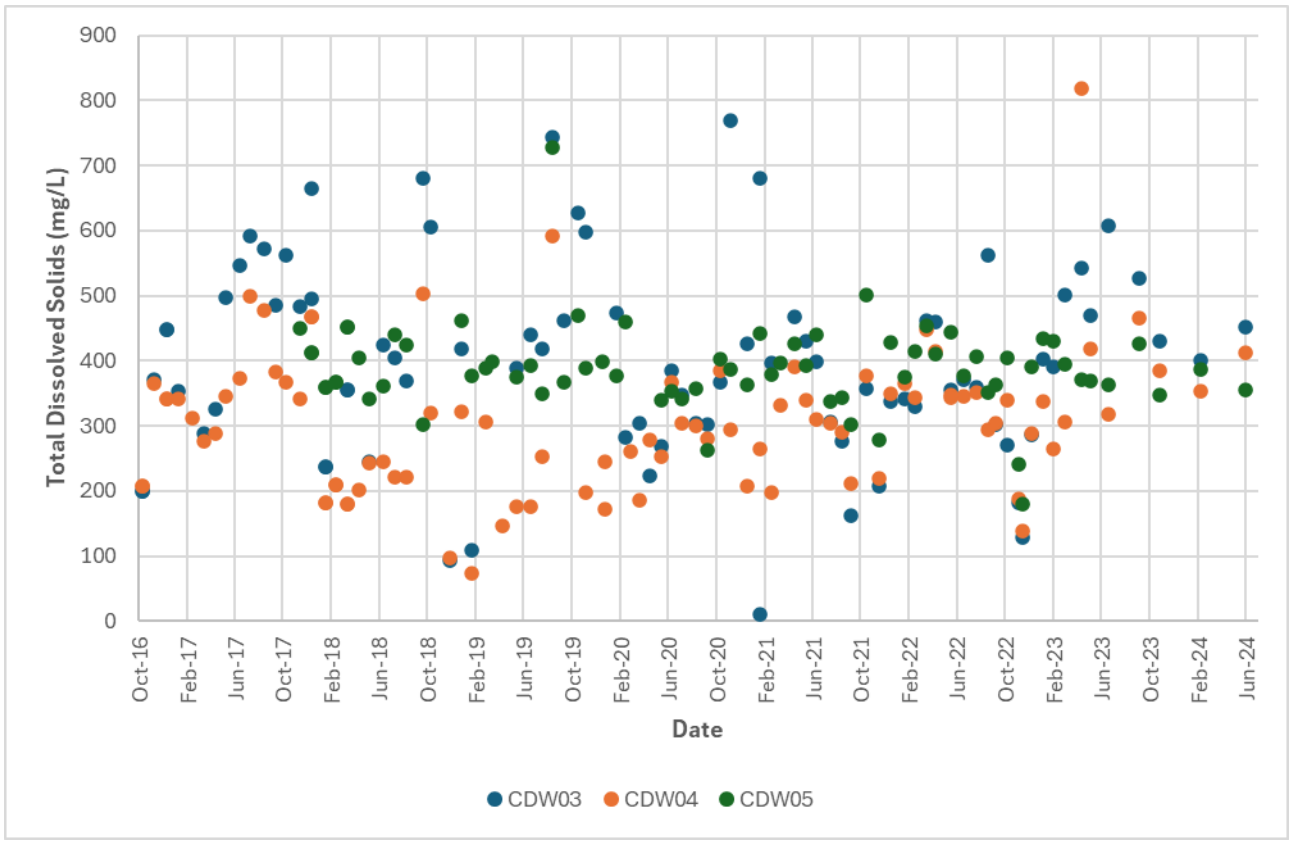
B.8 Cadia Dewatering Facility

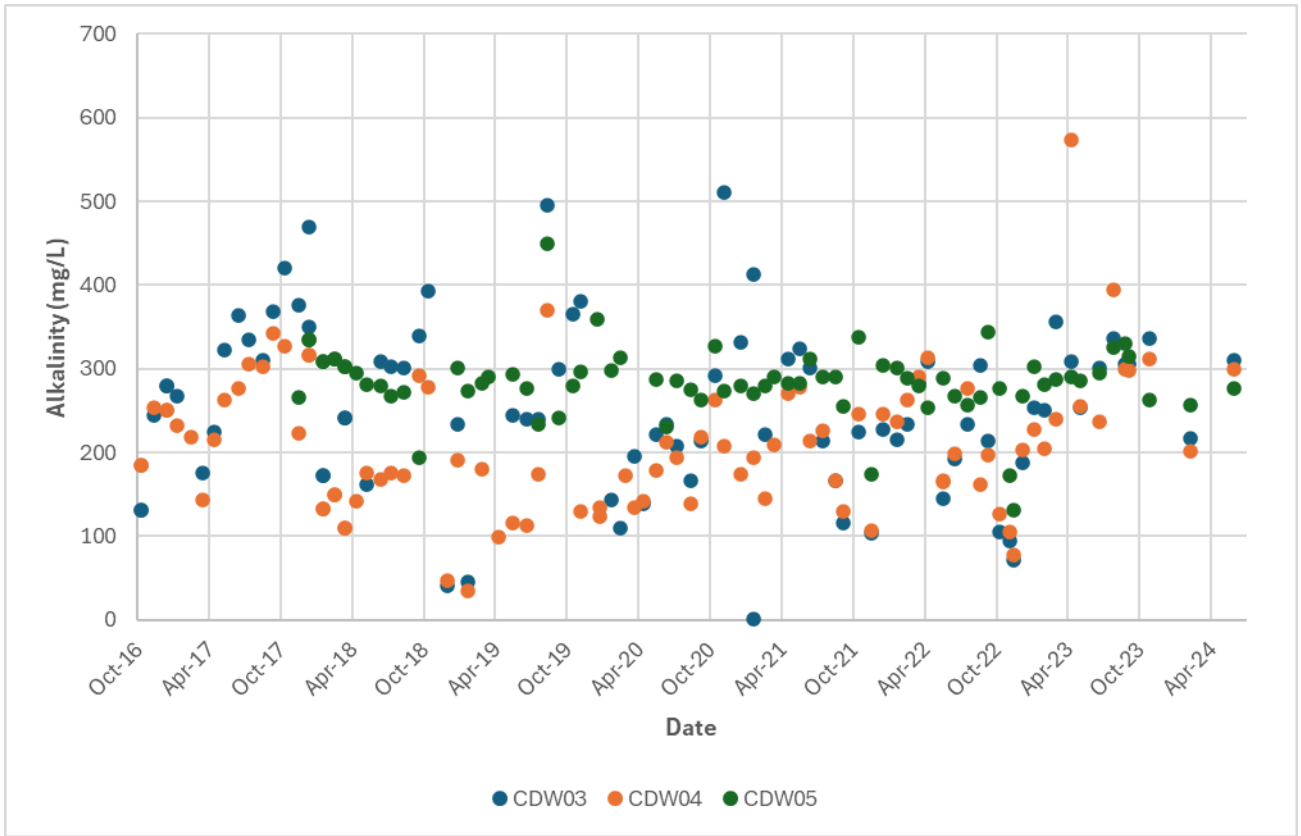
B.8.1 Physiochemical Parameters

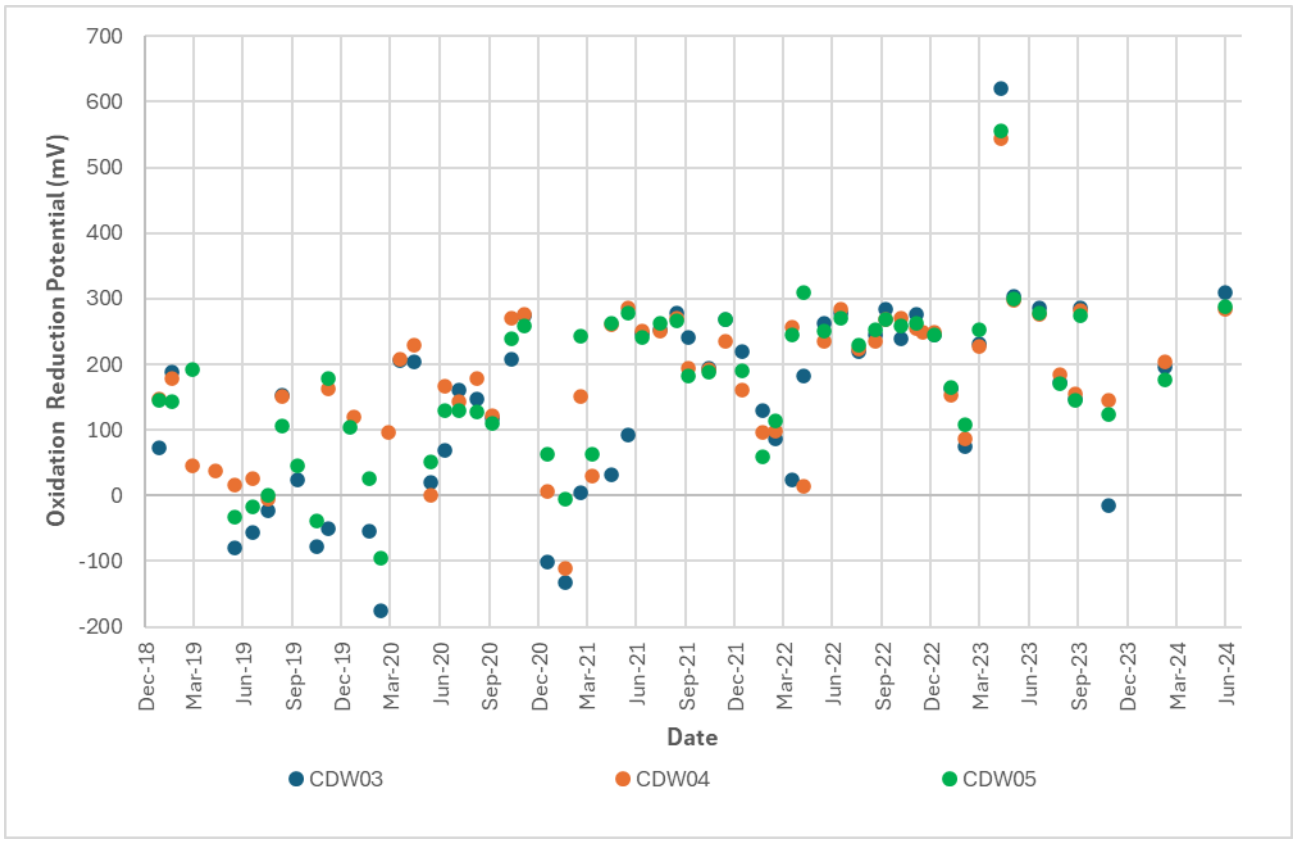



Electrical Conductivity (µS/cm)
1400
1200
1000
800
600
400
200
0
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
CDW03
CDW04
CDW05

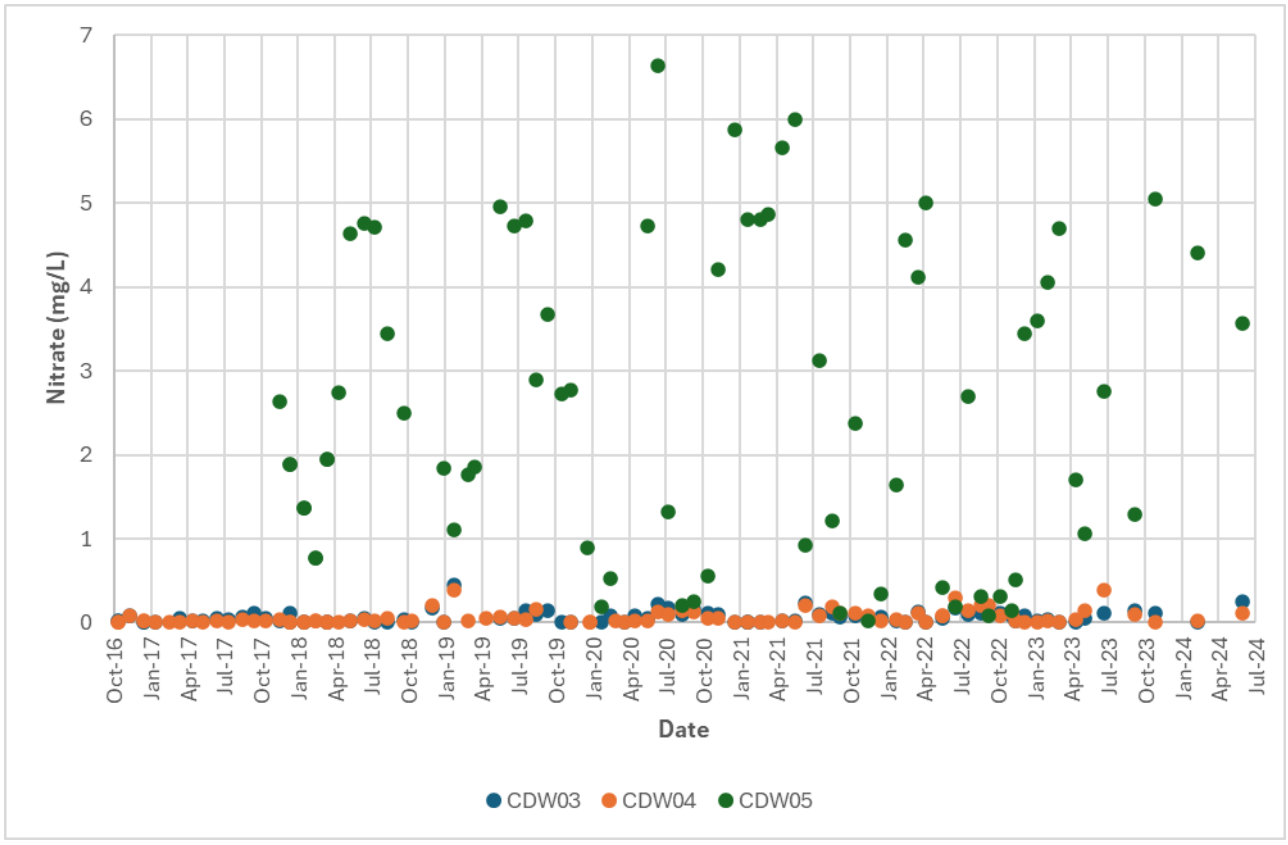

Total Suspended Solids (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
Date
CDW03
CDW04
CDW05

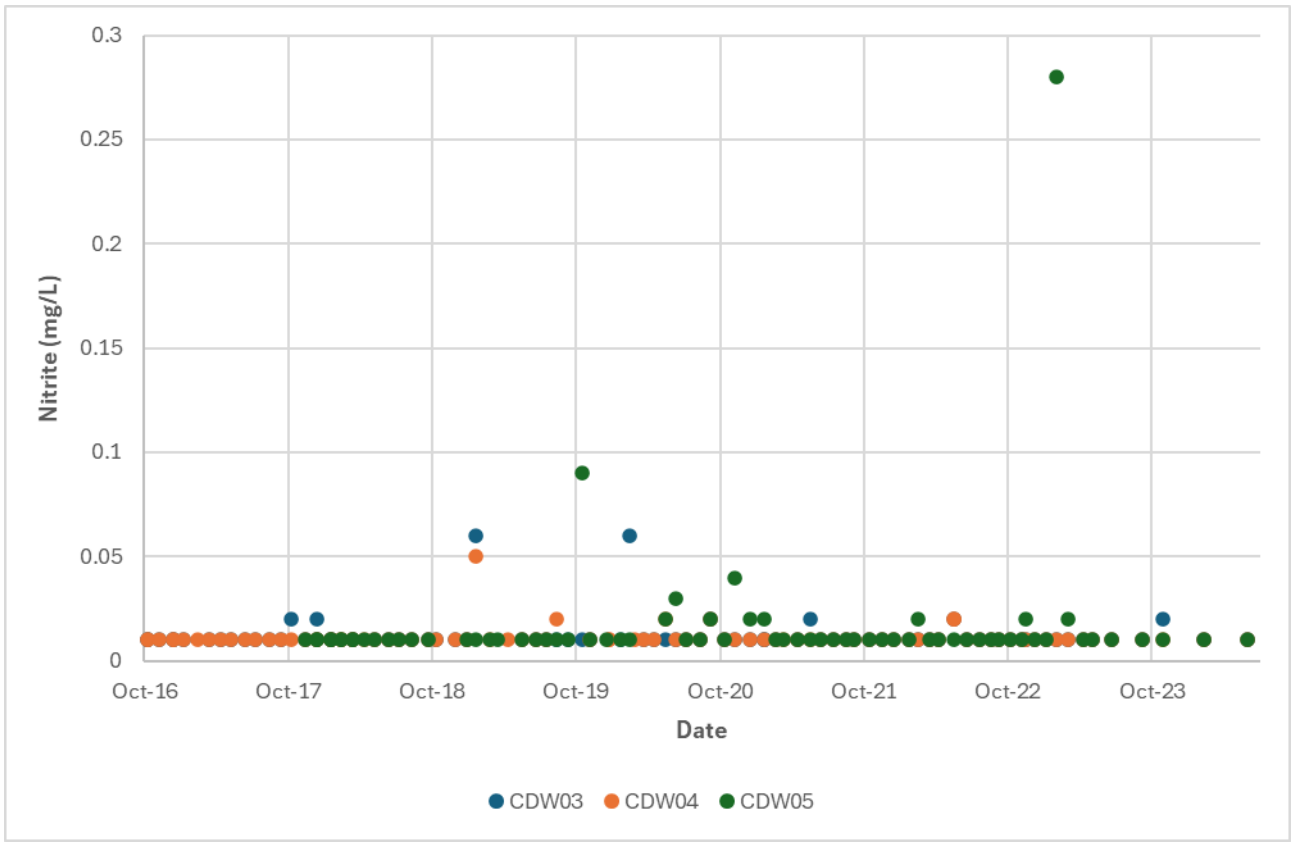

Total Dissolved Solids (mg/L)
900
800
700
600
500
400
300
200
100
0
Oct-16
Feb-17
Jun-17
Oct-17
Feb-18
Jun-18
Oct-18
Feb-19
Jun-19
Oct-19
Feb-20
Jun-20
Oct-20
Feb-21
Jun-21
Oct-21
Feb-22
Jun-22
Oct-22
Feb-23
Jun-23
Oct-23
Feb-24
Jun-24
Date
CDW03
CDW04
CDW05

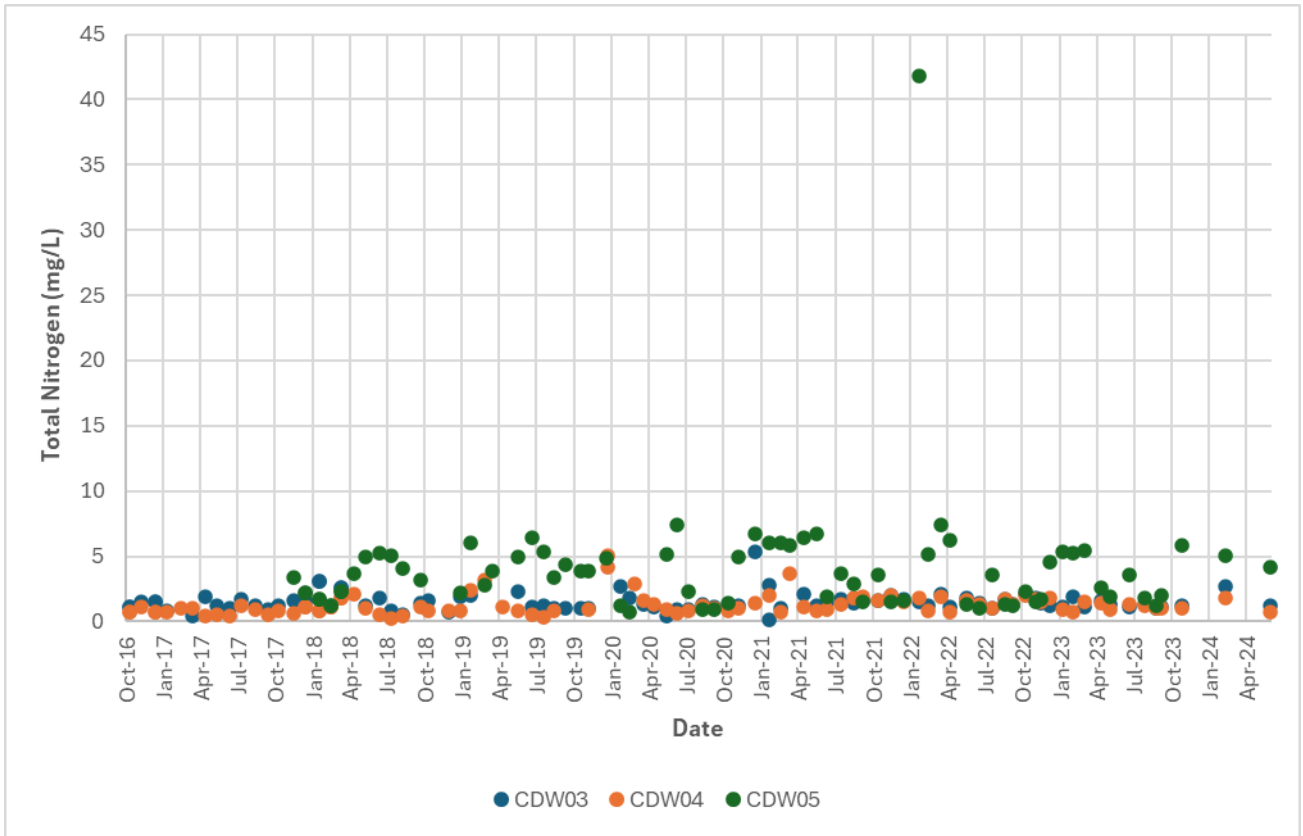

Alkalinity (mg/L)
700
600
500
400
300
200
100
0
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
Date
CDW03
CDW04
CDW05

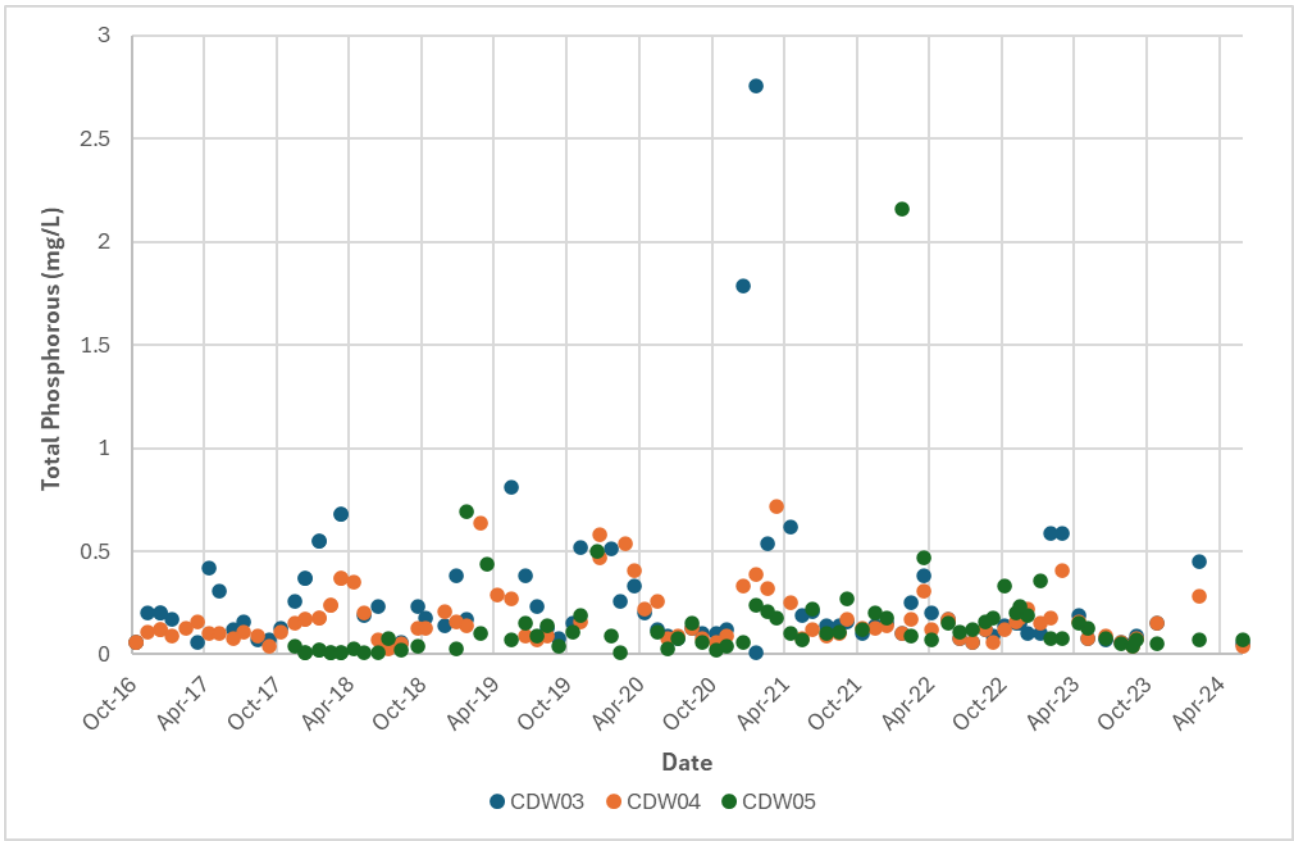


B.8.2 Nutrients

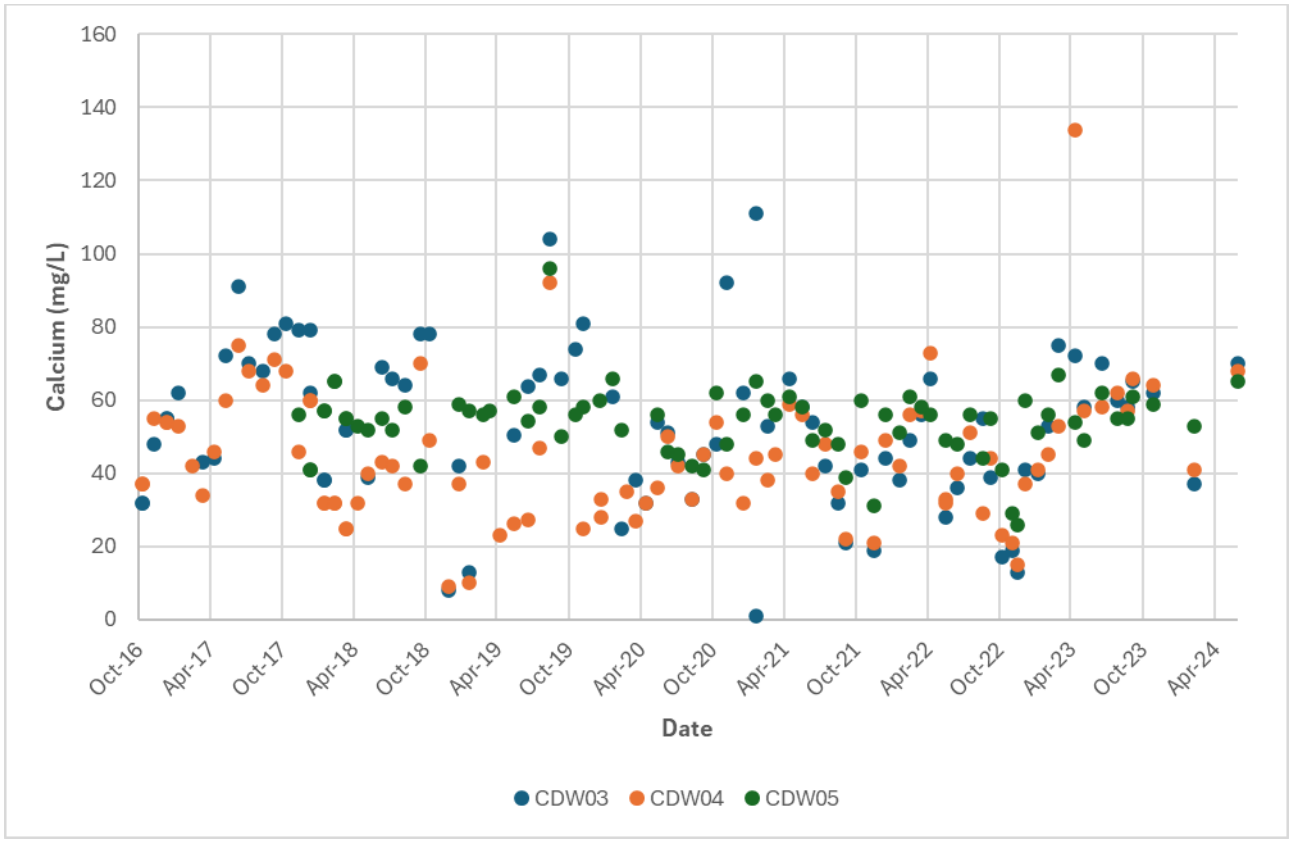


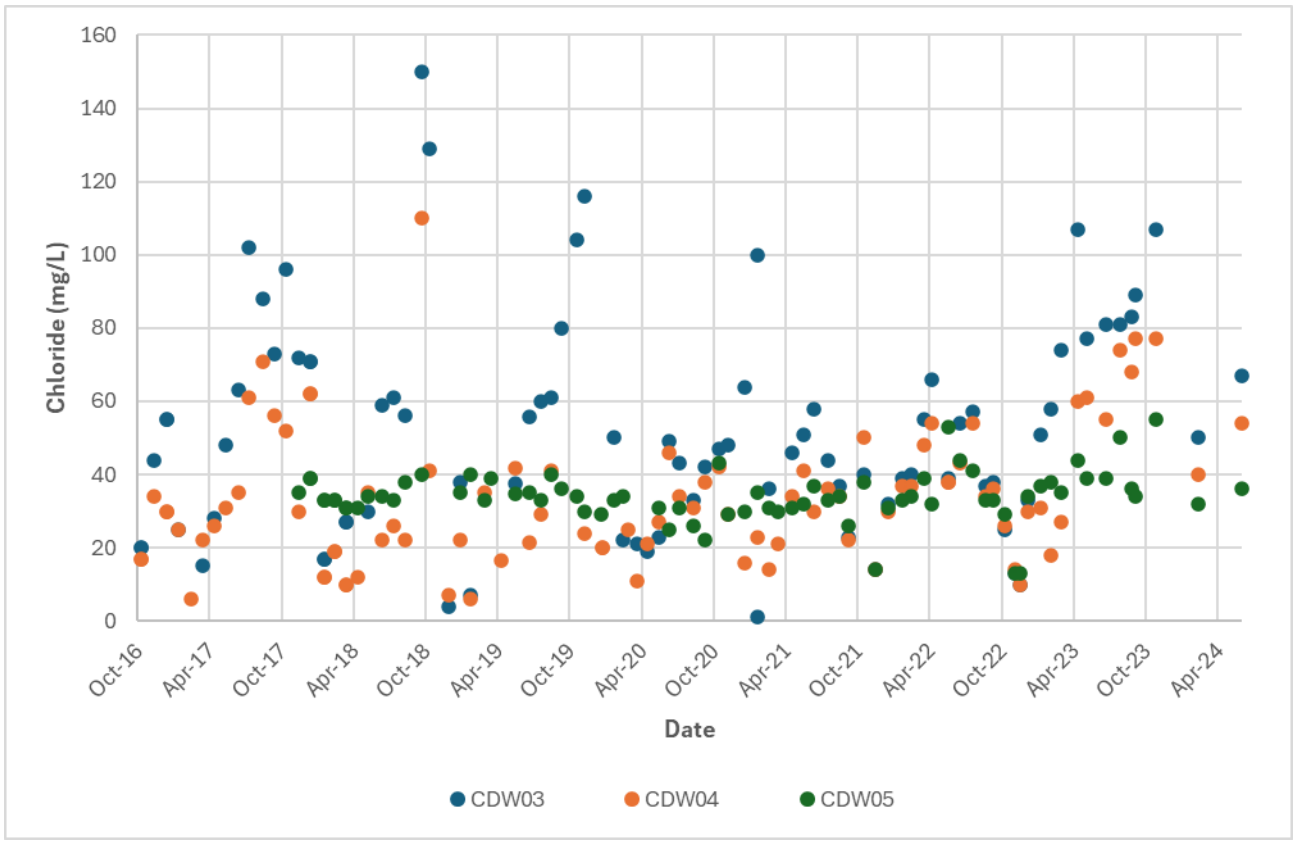

0.3
0.25
0.2
0.15
0.1
0.05
0
Nitrite (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

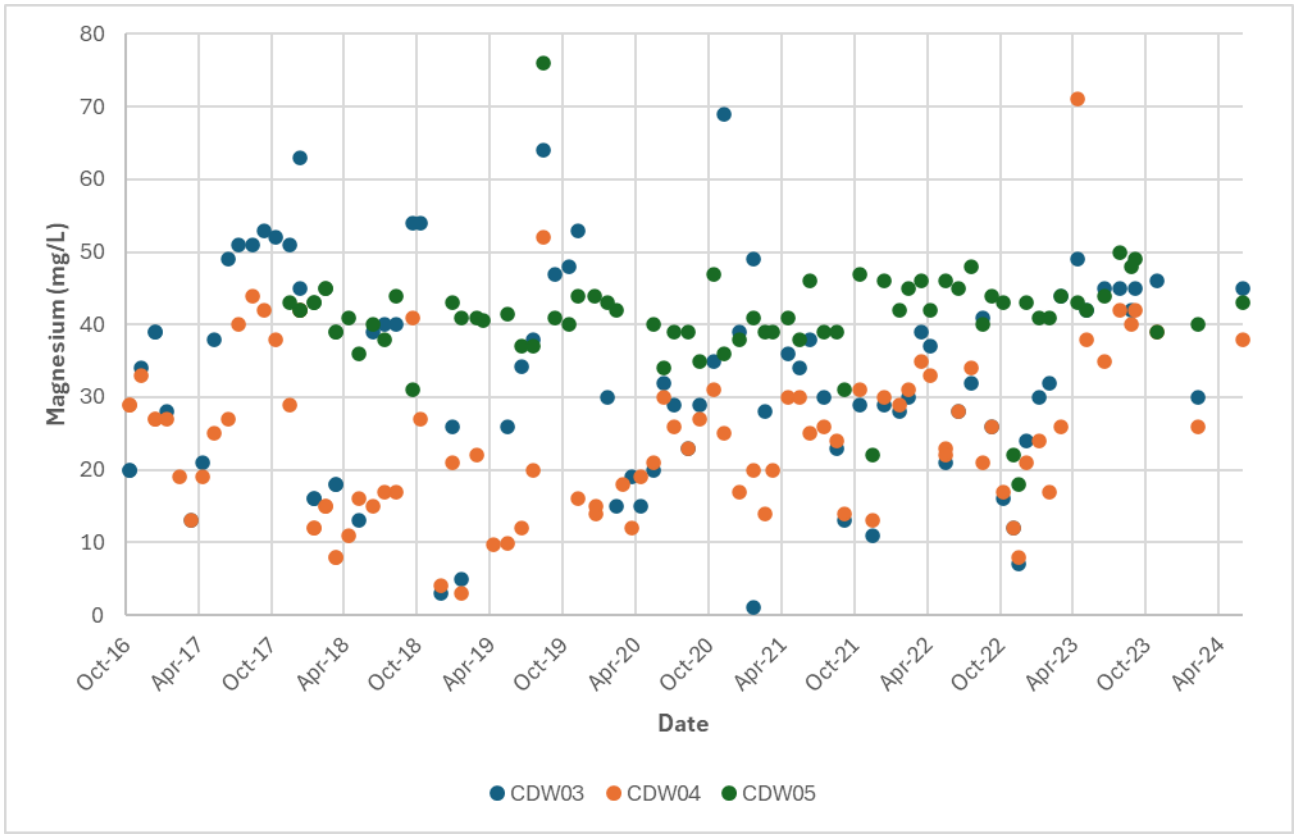

45
40
35
30
25
20
15
10
5
0
Total Nitrogen (mg/L)
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05

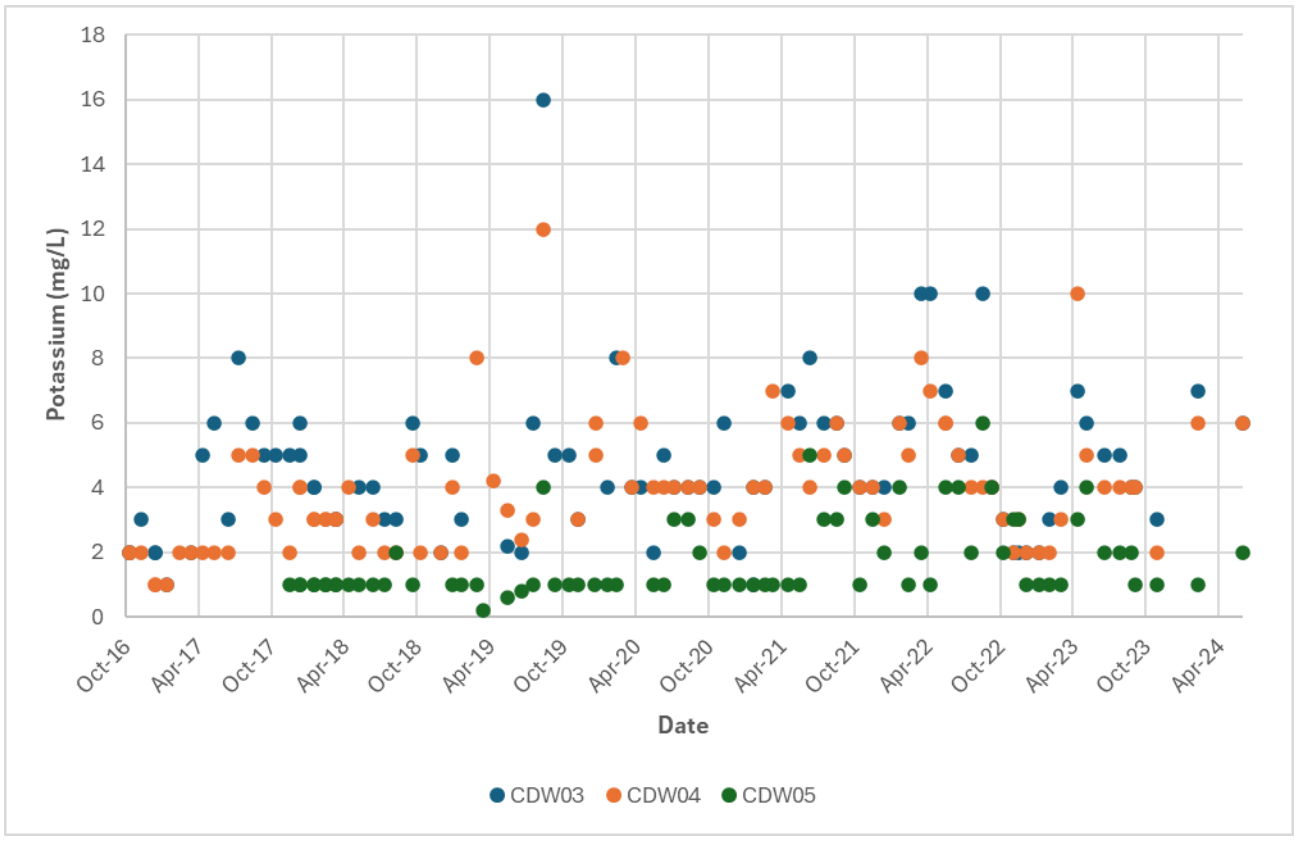


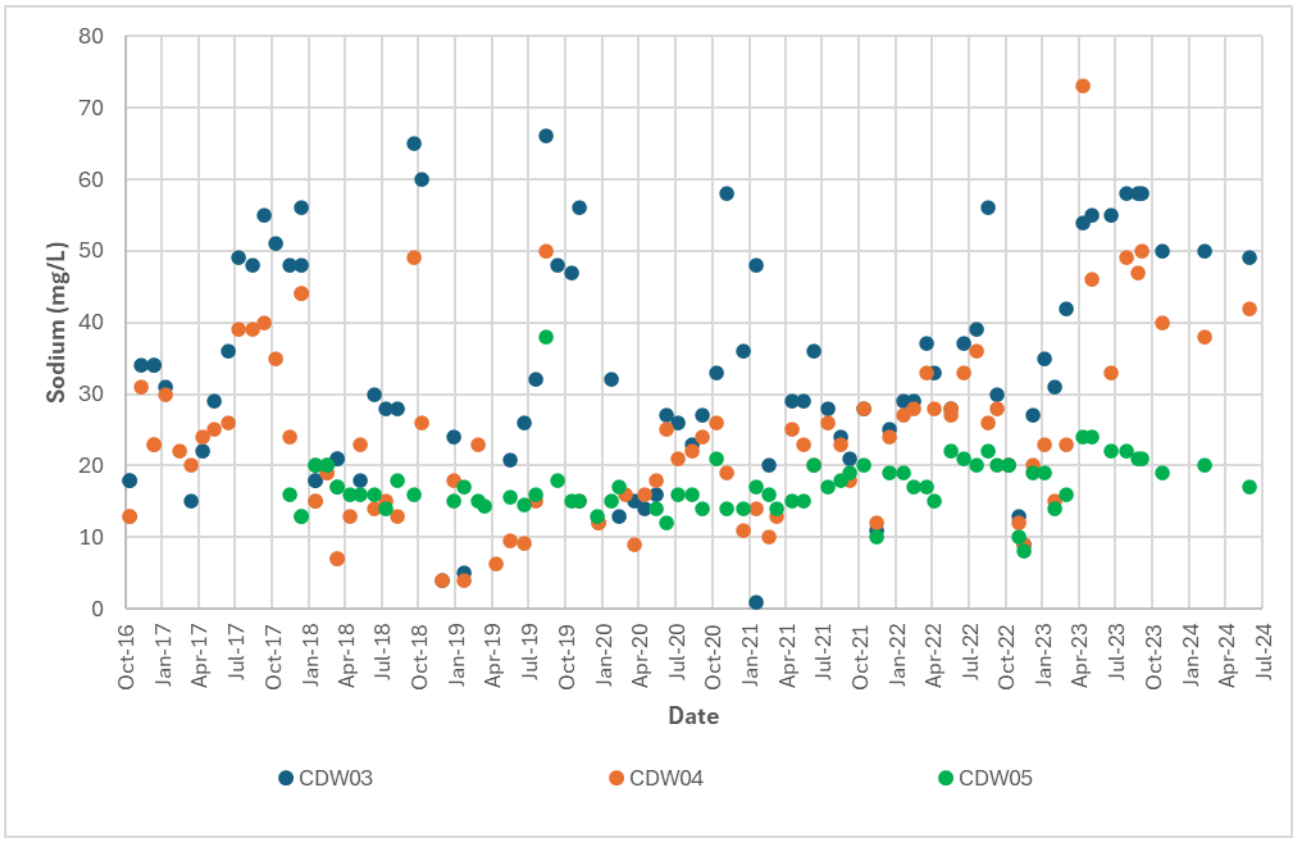
B.8.3 Major Ions

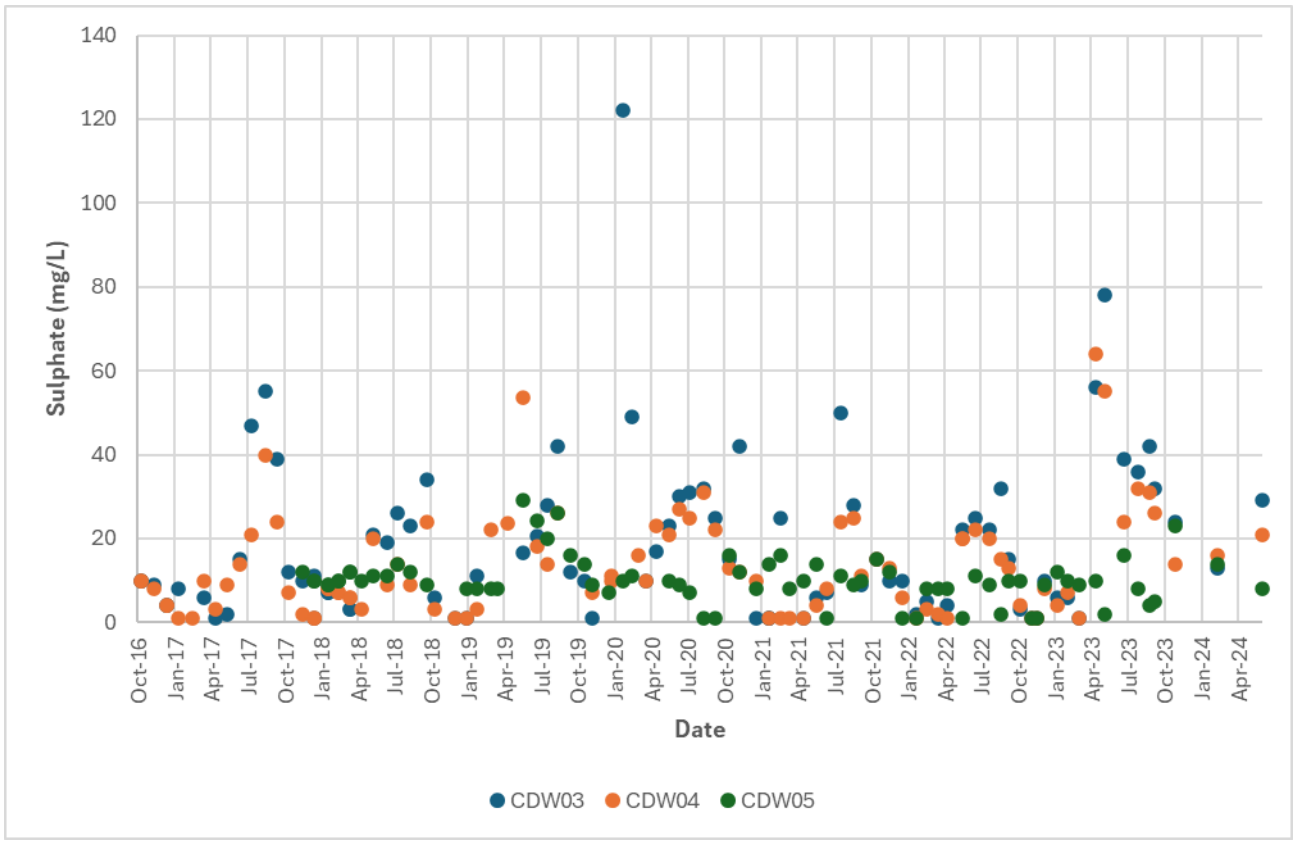



Chloride (mg/L)
160
140
120
100
80
60
40
20
0
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
Date
CDW03
CDW04
CDW05

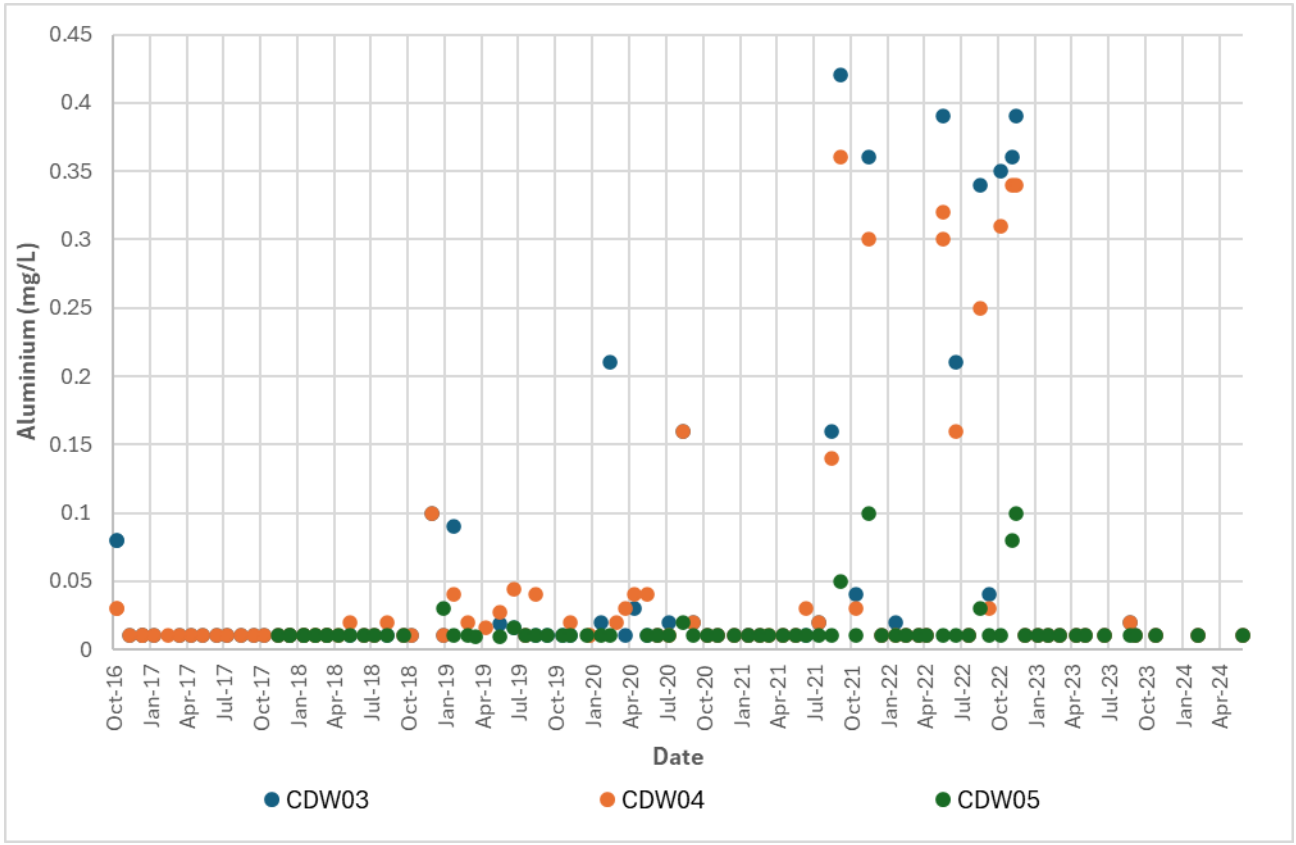

Magnesium (mg/L)
80
70
60
50
40
30
20
10
0
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
Date
CDW03
CDW04
CDW05

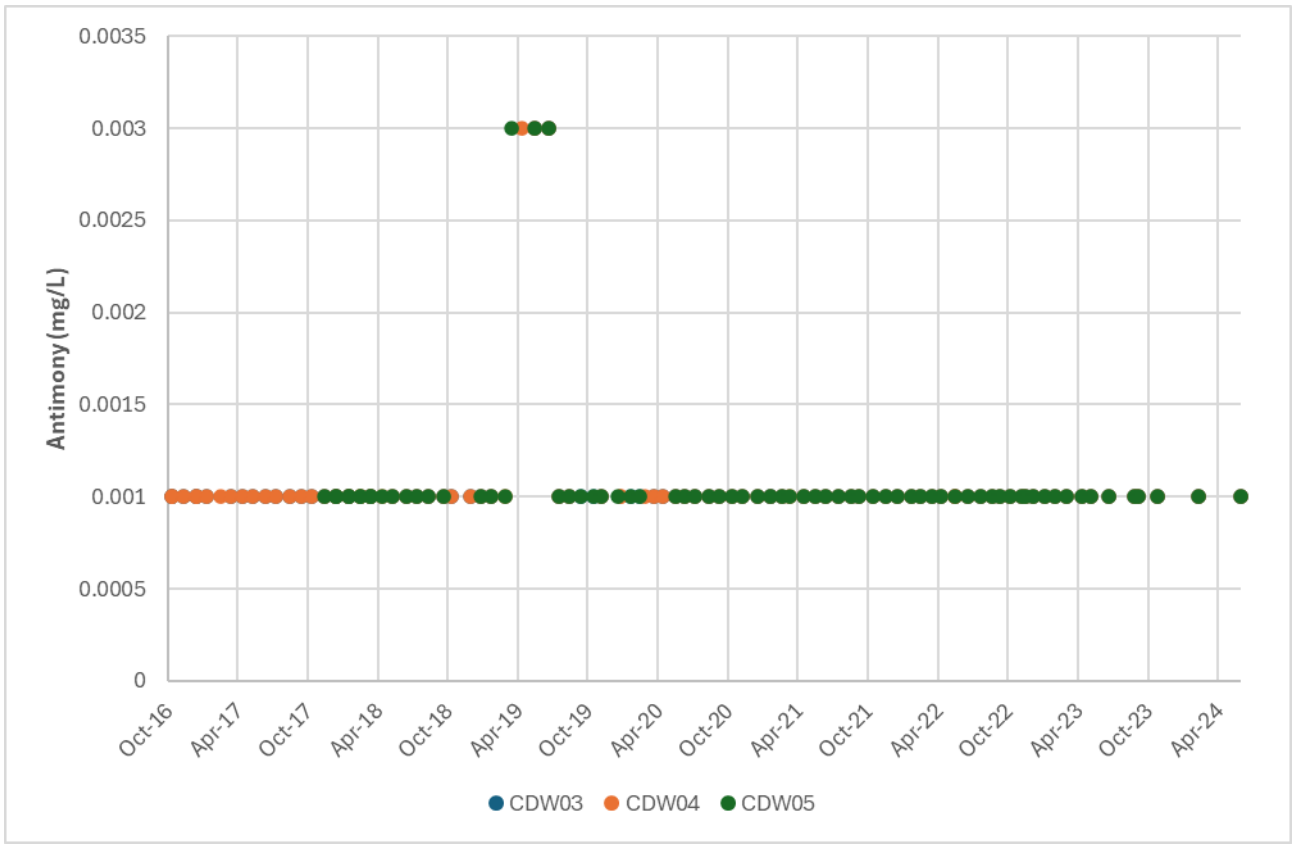

Potassium (mg/L)
18
16
14
12
10
8
6
4
2
0
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
Date
CDW03
CDW04
CDW05

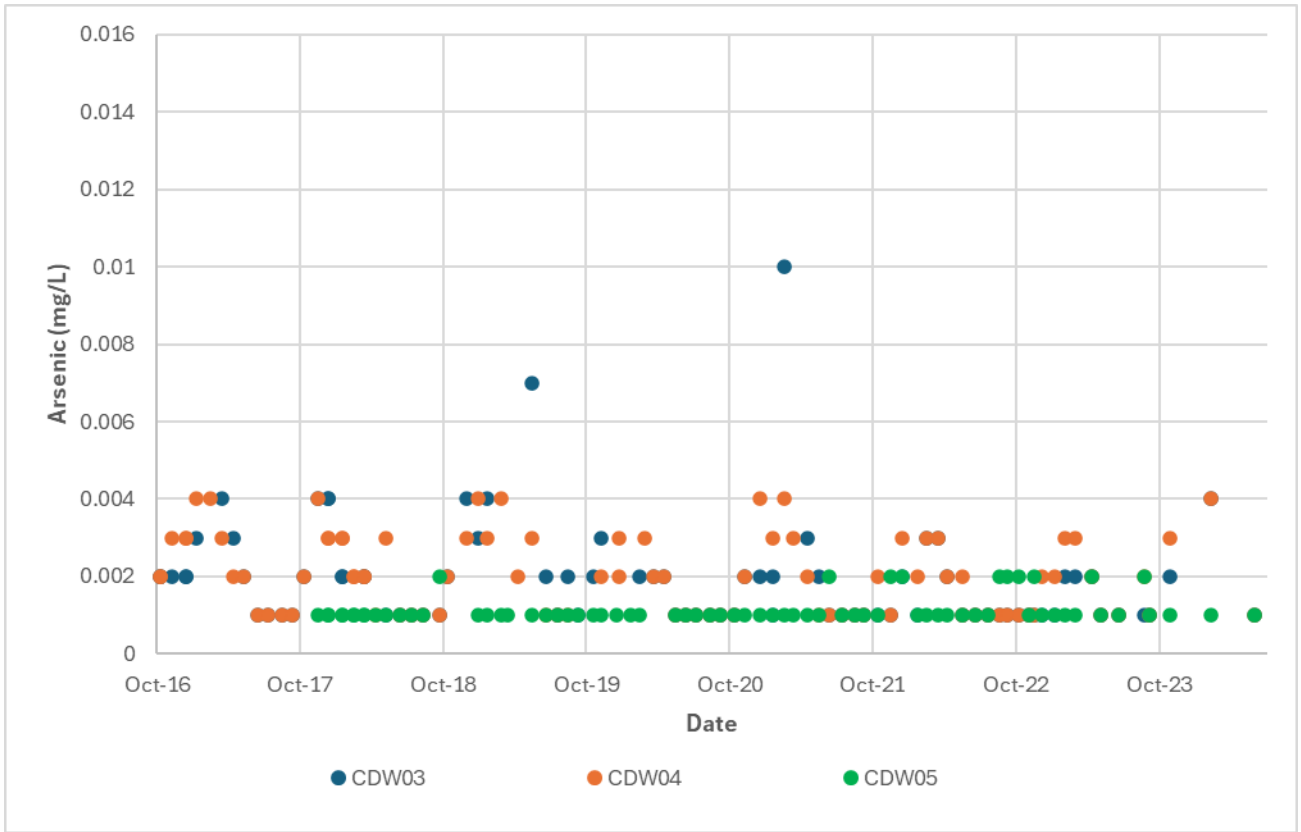

Sodium (mg/L)
80
70
60
50
40
30
20
10
0
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Jul-24
Date
CDW03
CDW04
CDW05

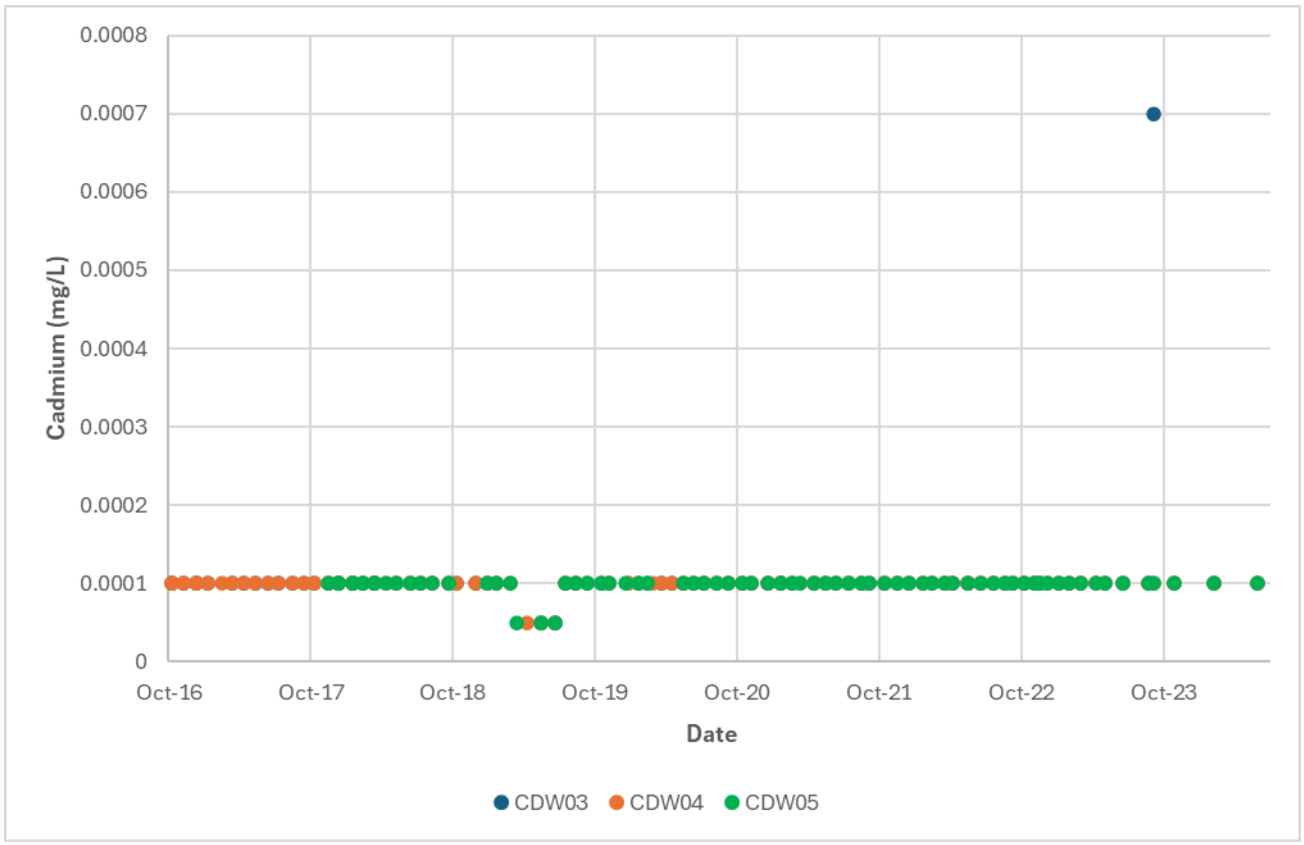


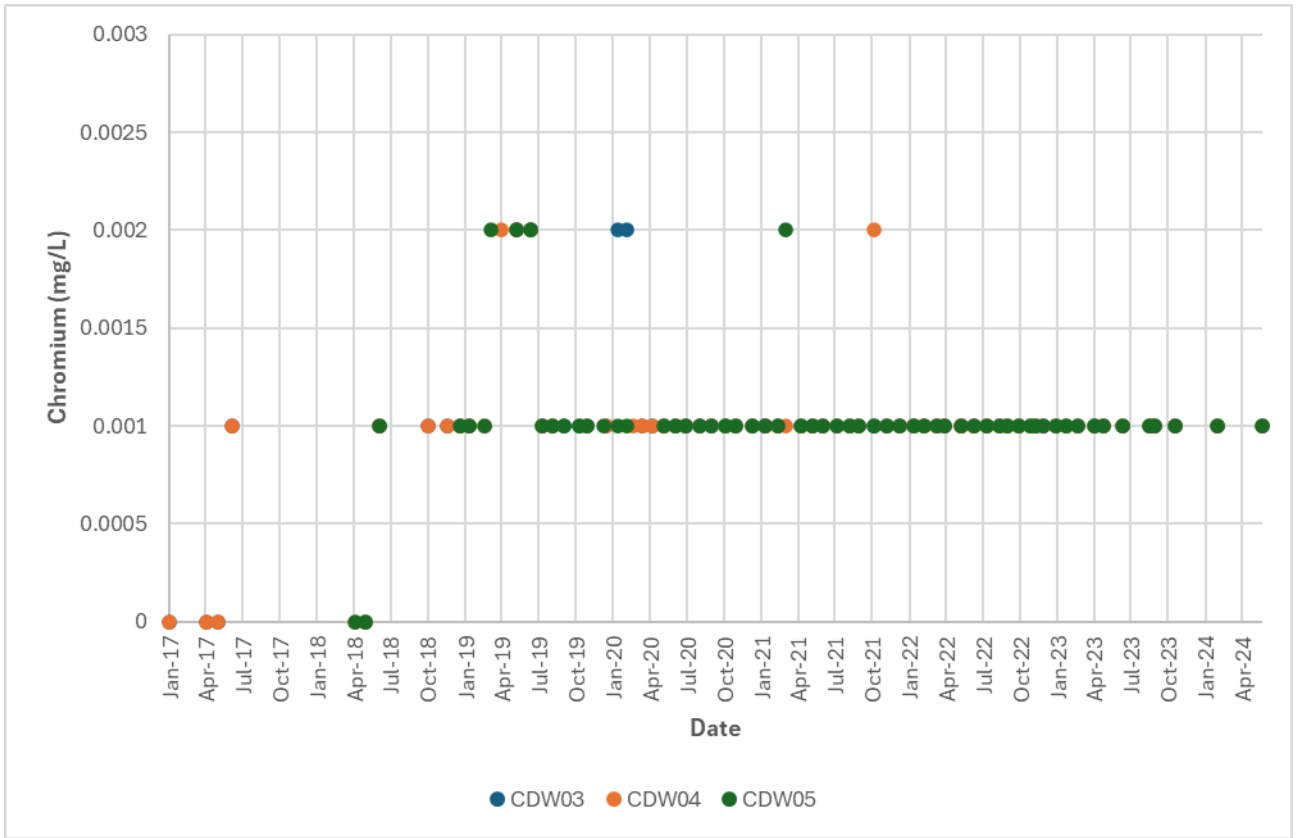
B.8.4 Dissolved Metals

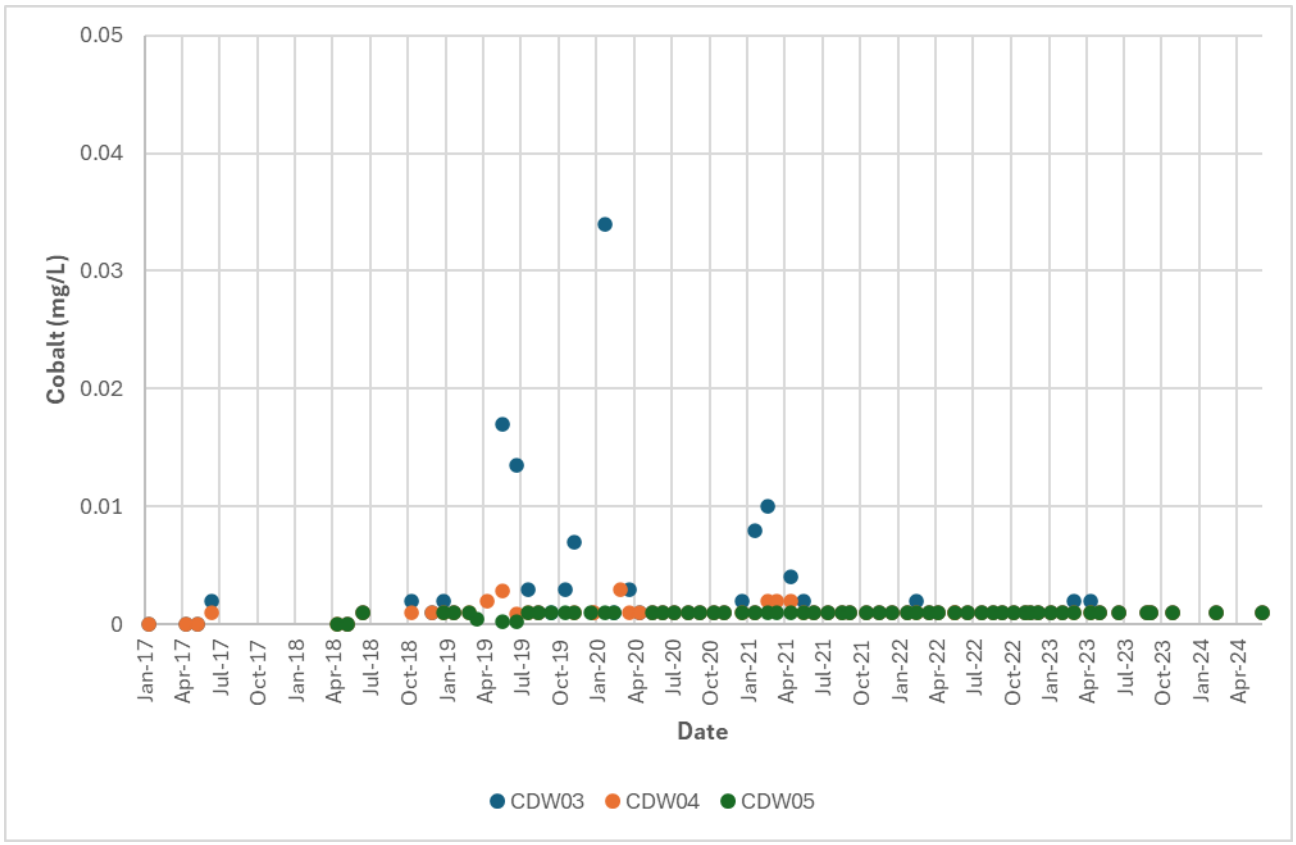


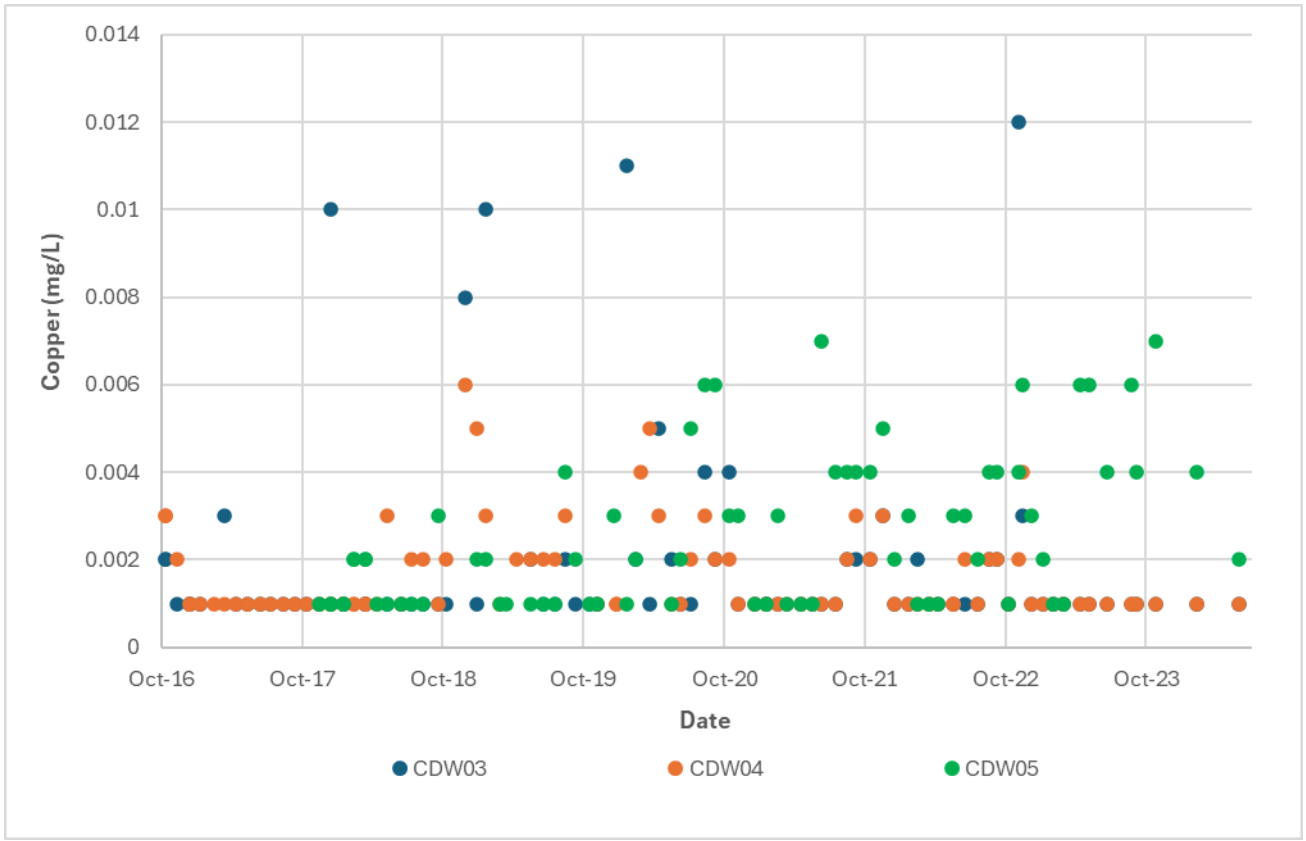

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Antimony (mg/L)
Oct-16
Apr-17
Oct-17
Apr-18
Oct-18
Apr-19
Oct-19
Apr-20
Oct-20
Apr-21
Oct-21
Apr-22
Oct-22
Apr-23
Oct-23
Apr-24
CDW03
CDW04
CDW05

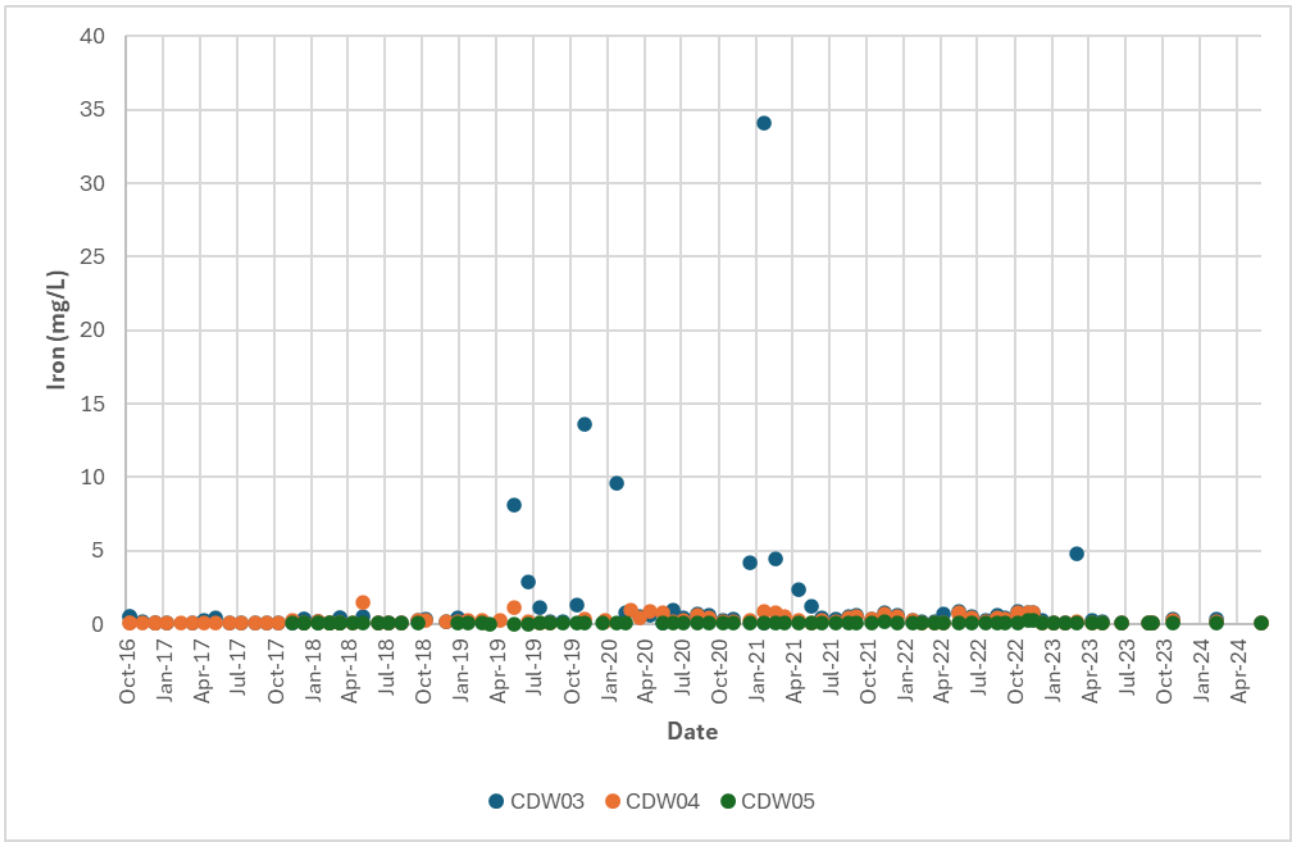

0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

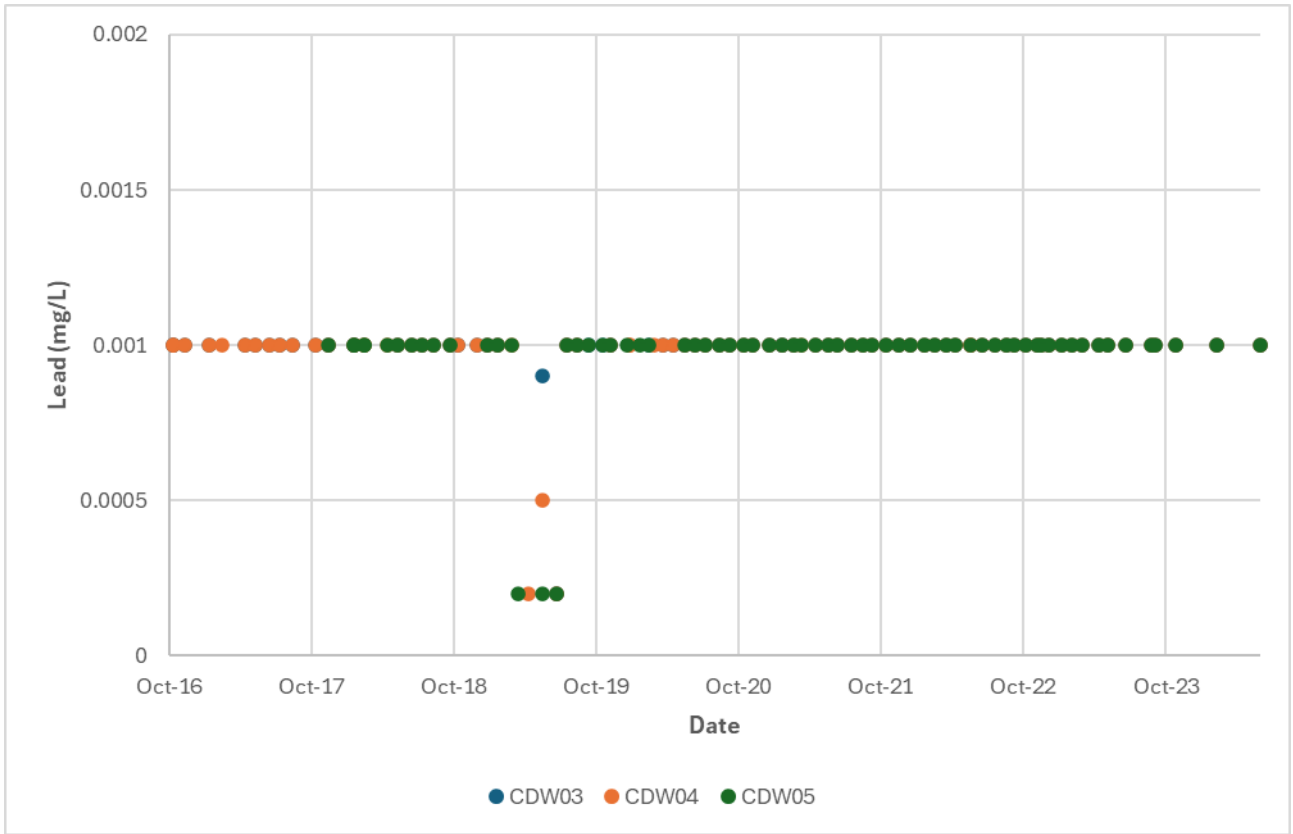

0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
Cadmium (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

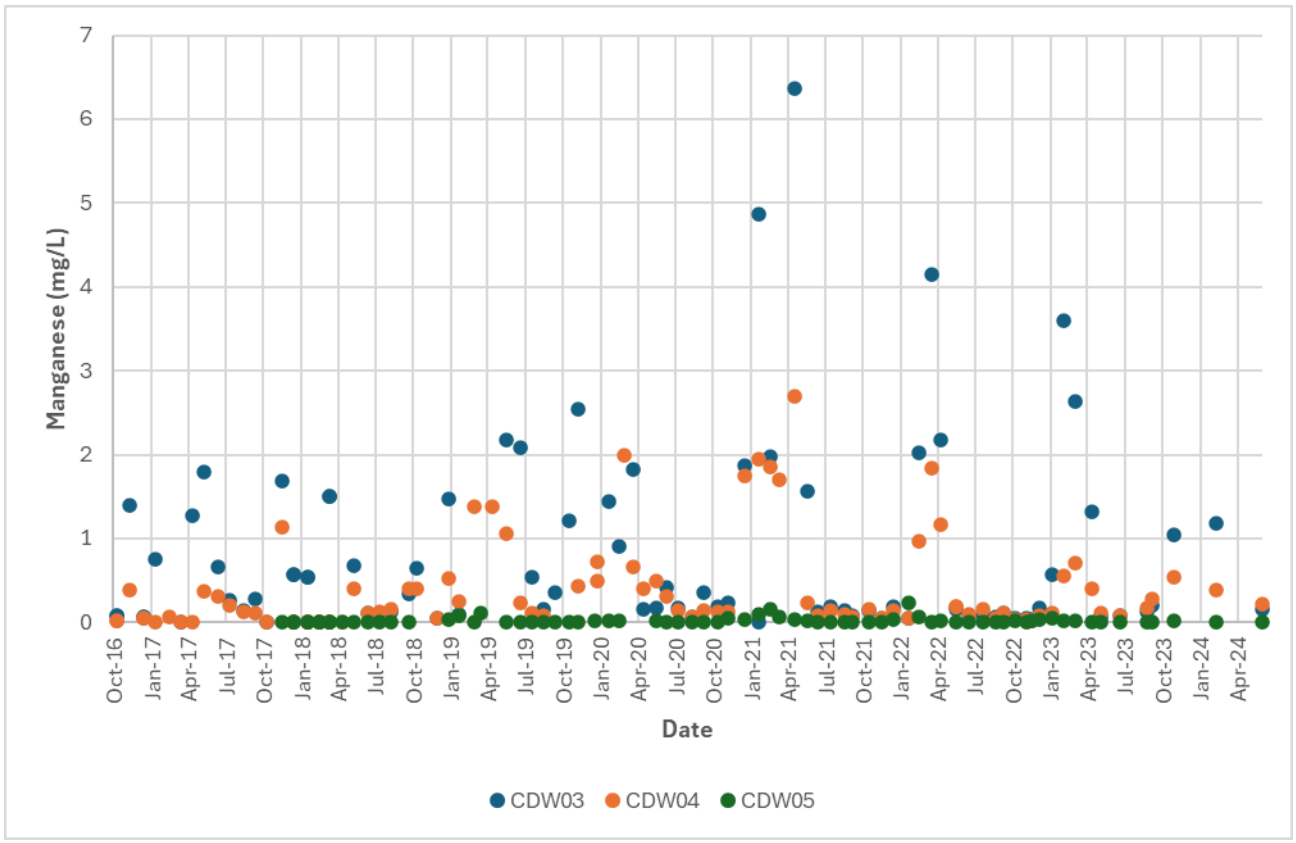

0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Chromium (mg/L)
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05

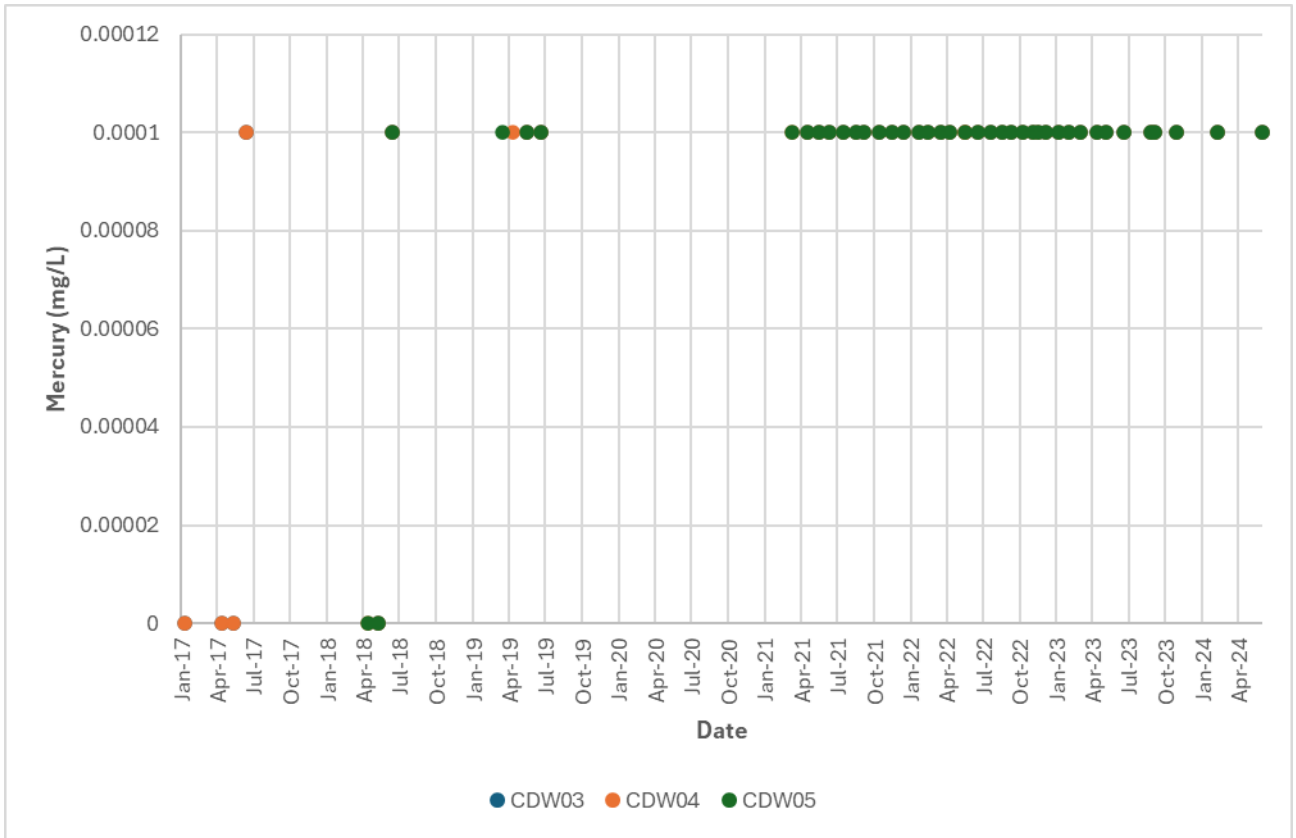

0.05
0.04
0.03
0.02
0.01
0
Cobalt (mg/L)
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05

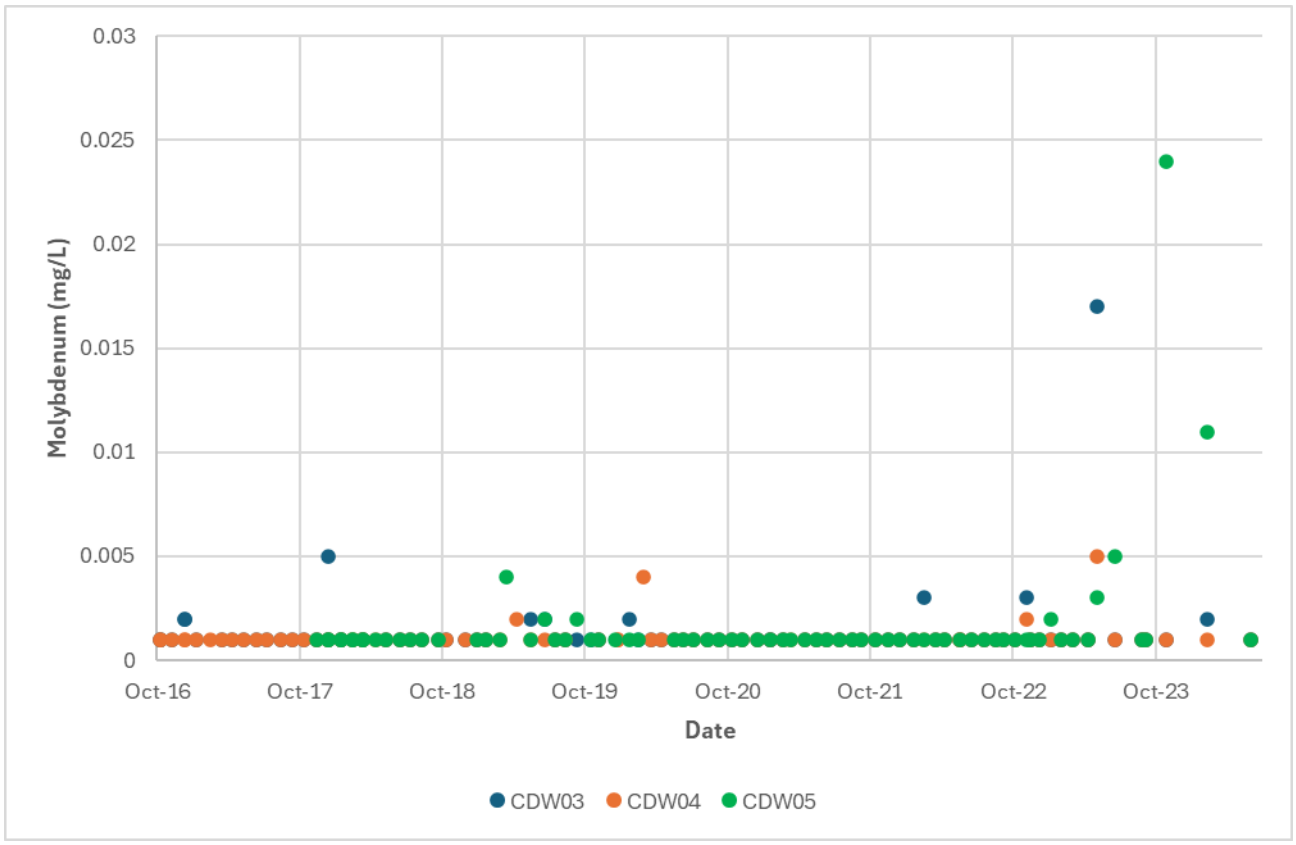

0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Copper (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

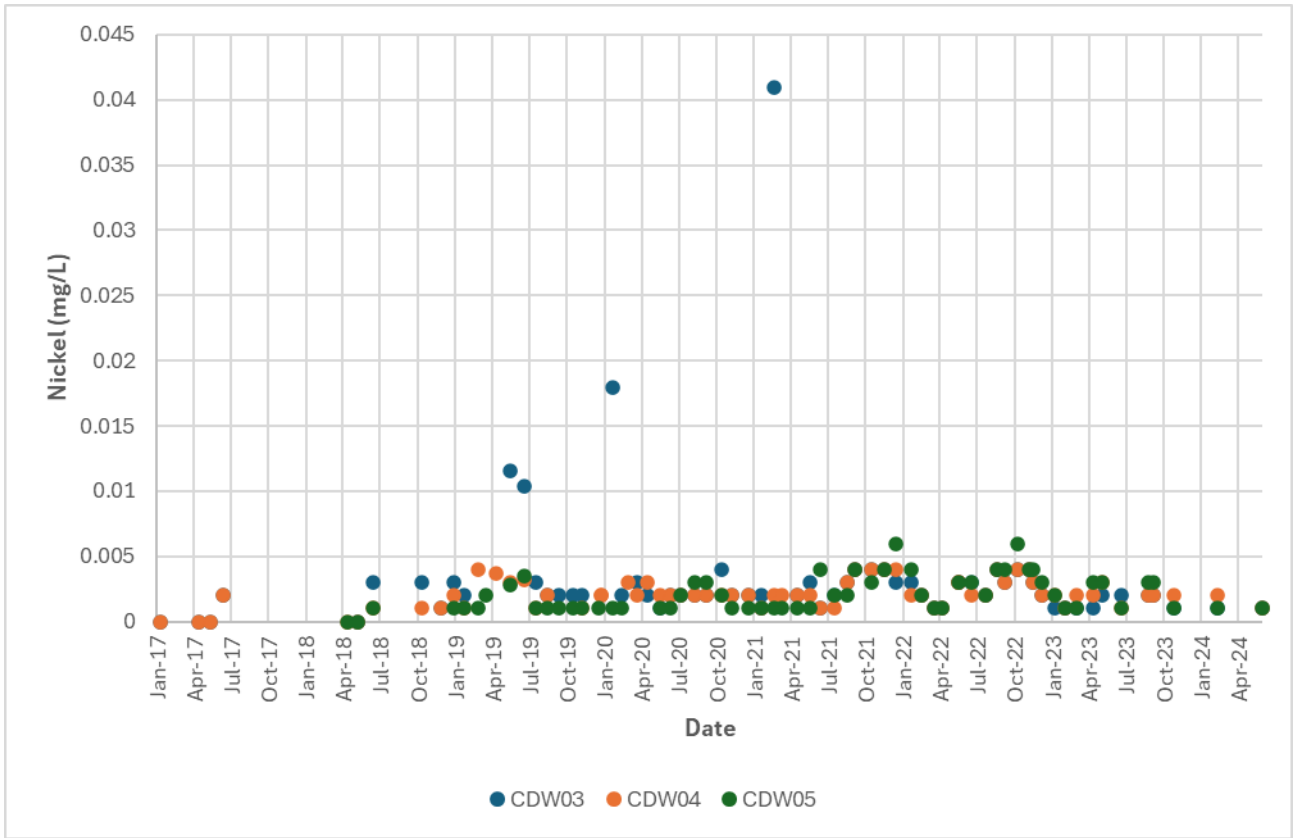

40
35
30
25
20
15
10
5
0
Iron (mg/L)
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05

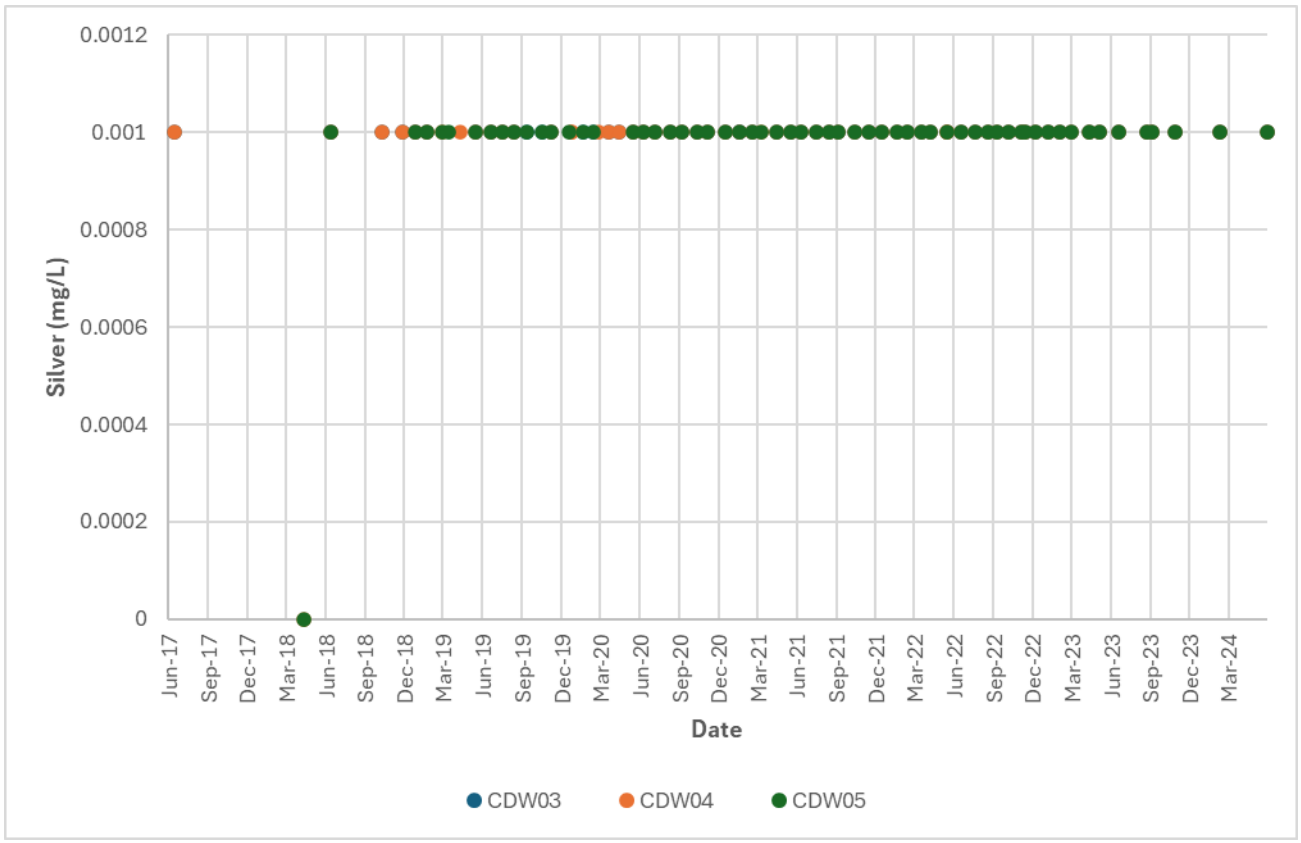

0.002
0.0015
0.001
0.0005
0
Lead (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

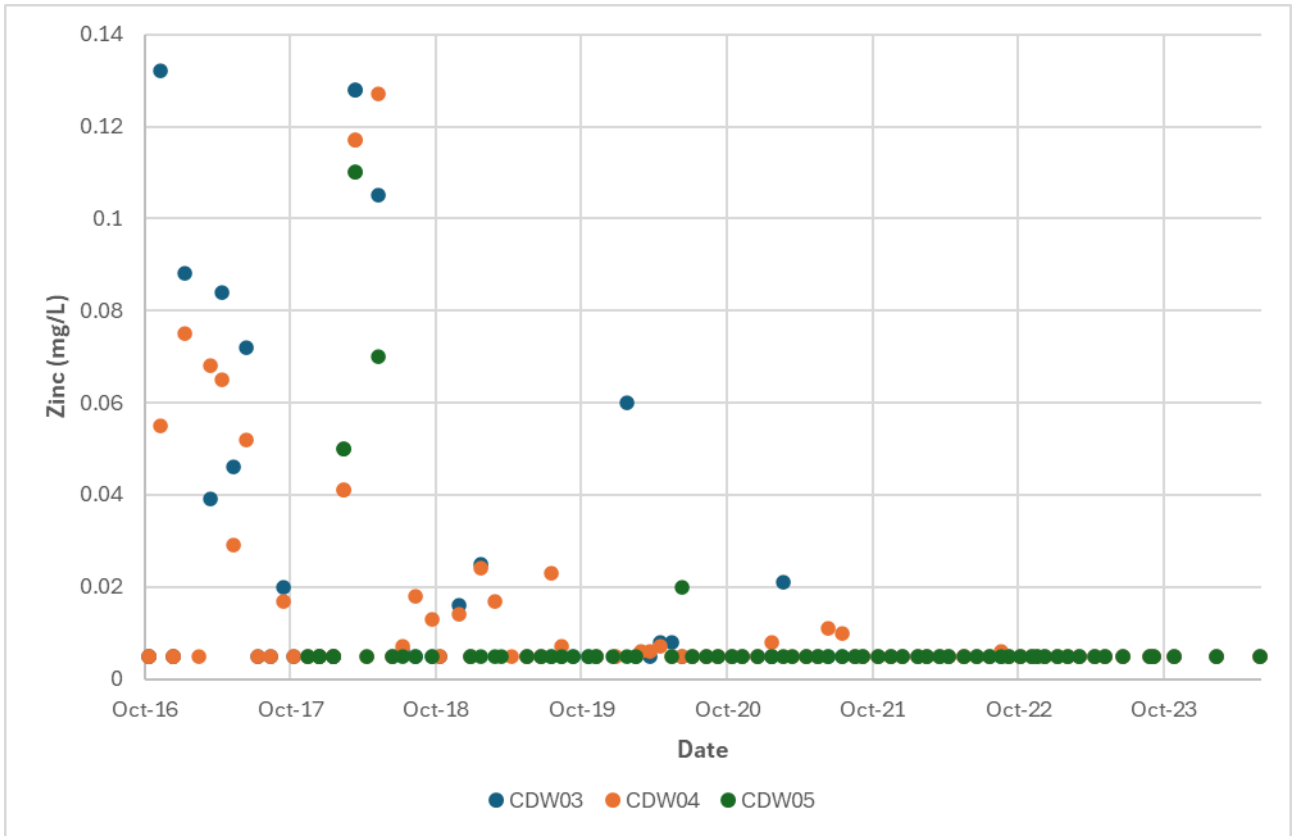

Manganese (mg/L)
7
6
5
4
3
2
1
0
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05


Mercury (mg/L)
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05


0.03
0.025
0.02
0.015
0.01
0.005
0
Molybdenum (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

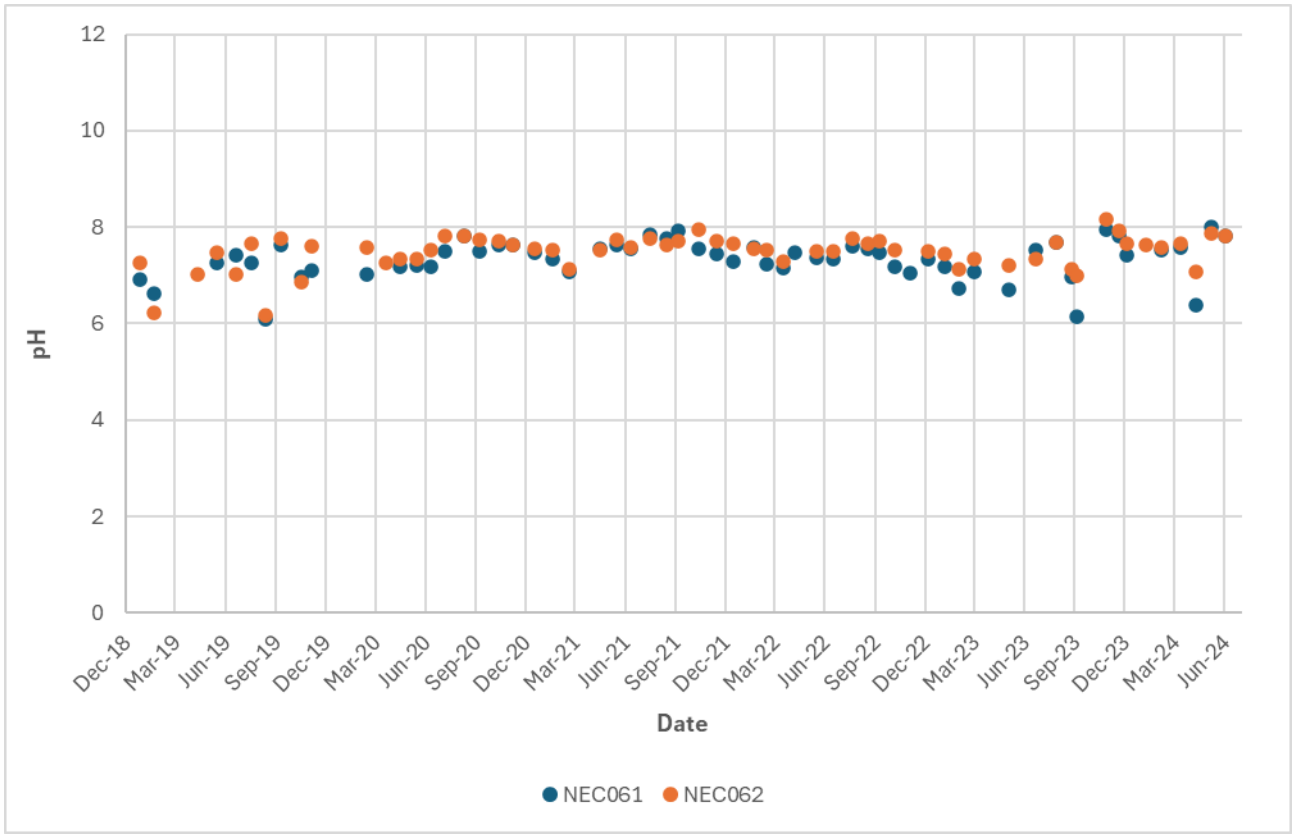

0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Nickel (mg/L)
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23
Jul-23
Oct-23
Jan-24
Apr-24
Date
CDW03
CDW04
CDW05

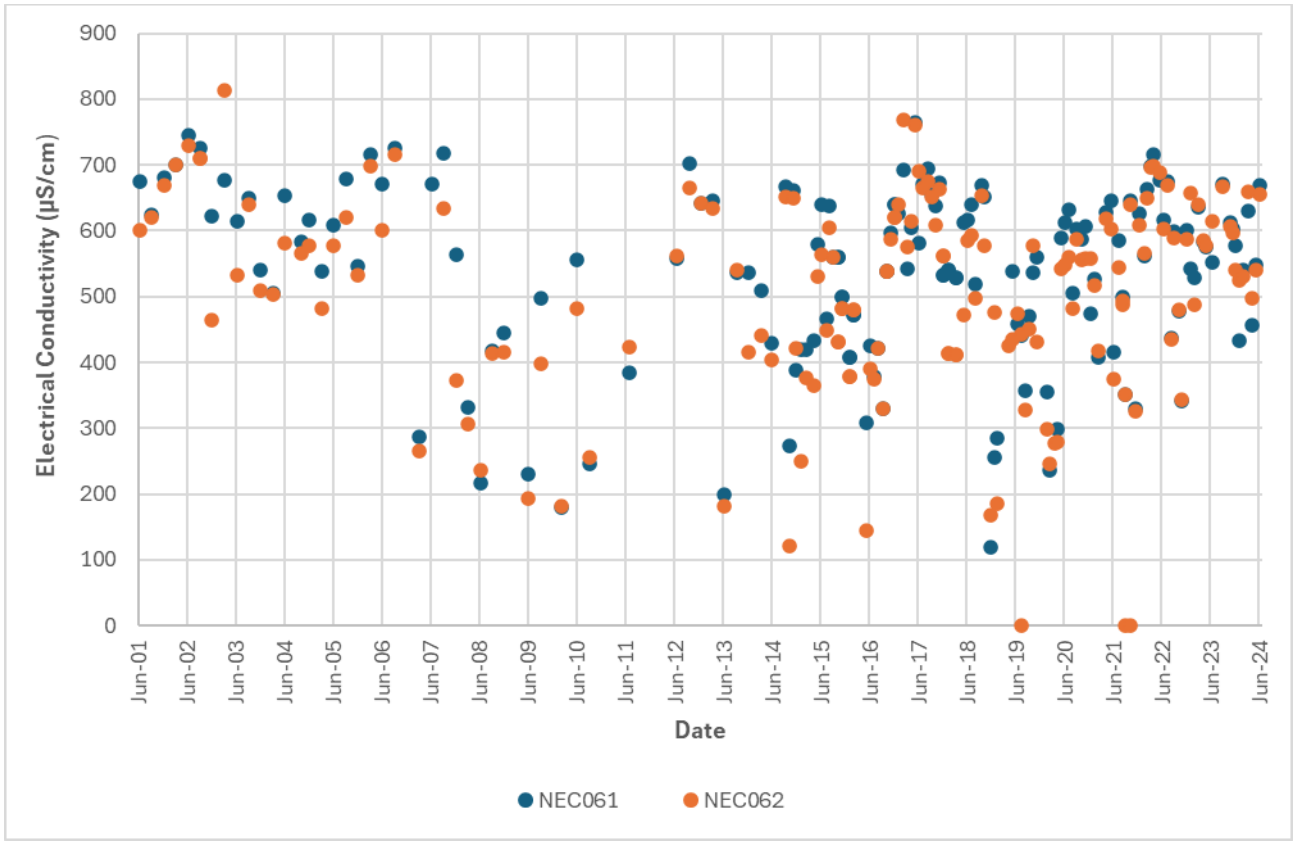

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
Date
CDW03
CDW04
CDW05

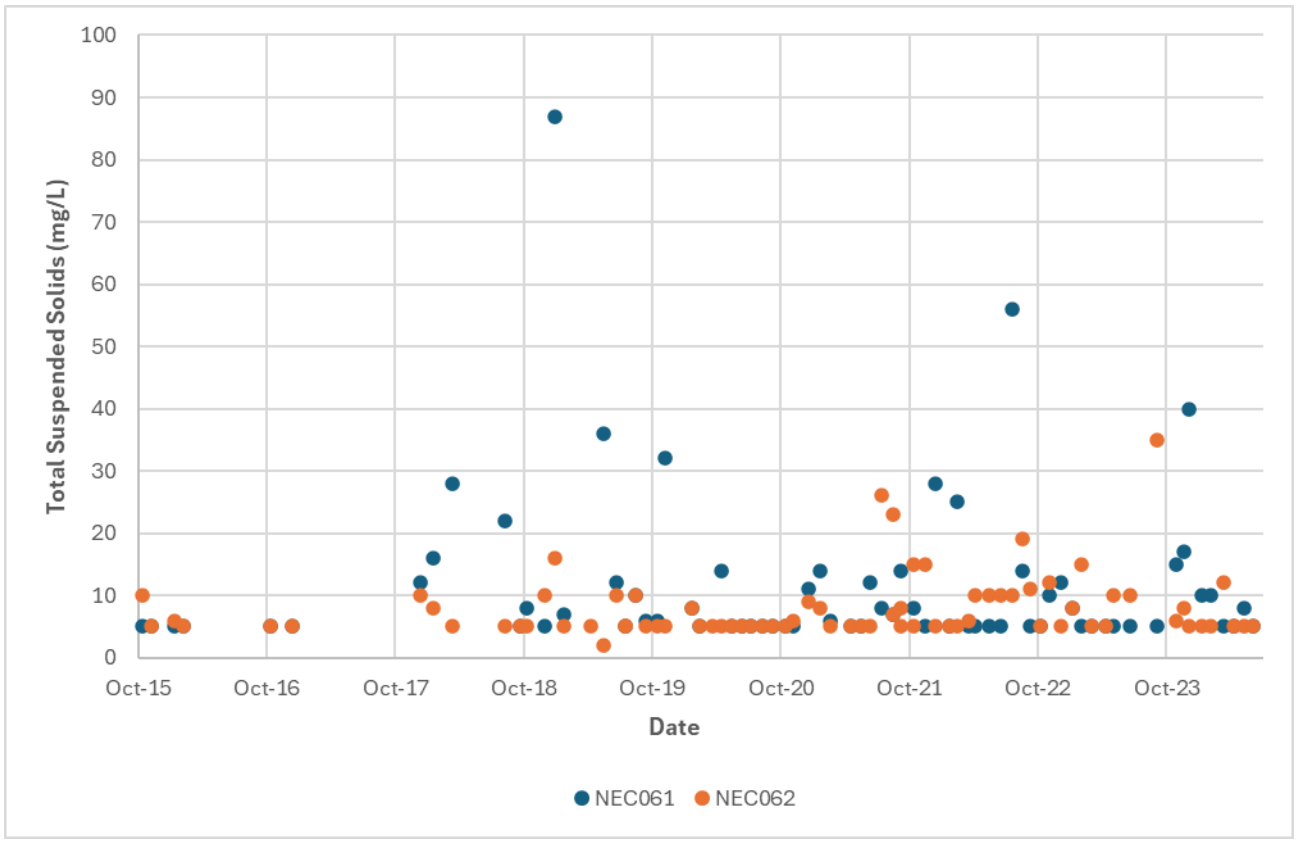

0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Zinc (mg/L)
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
CDW03
CDW04
CDW05

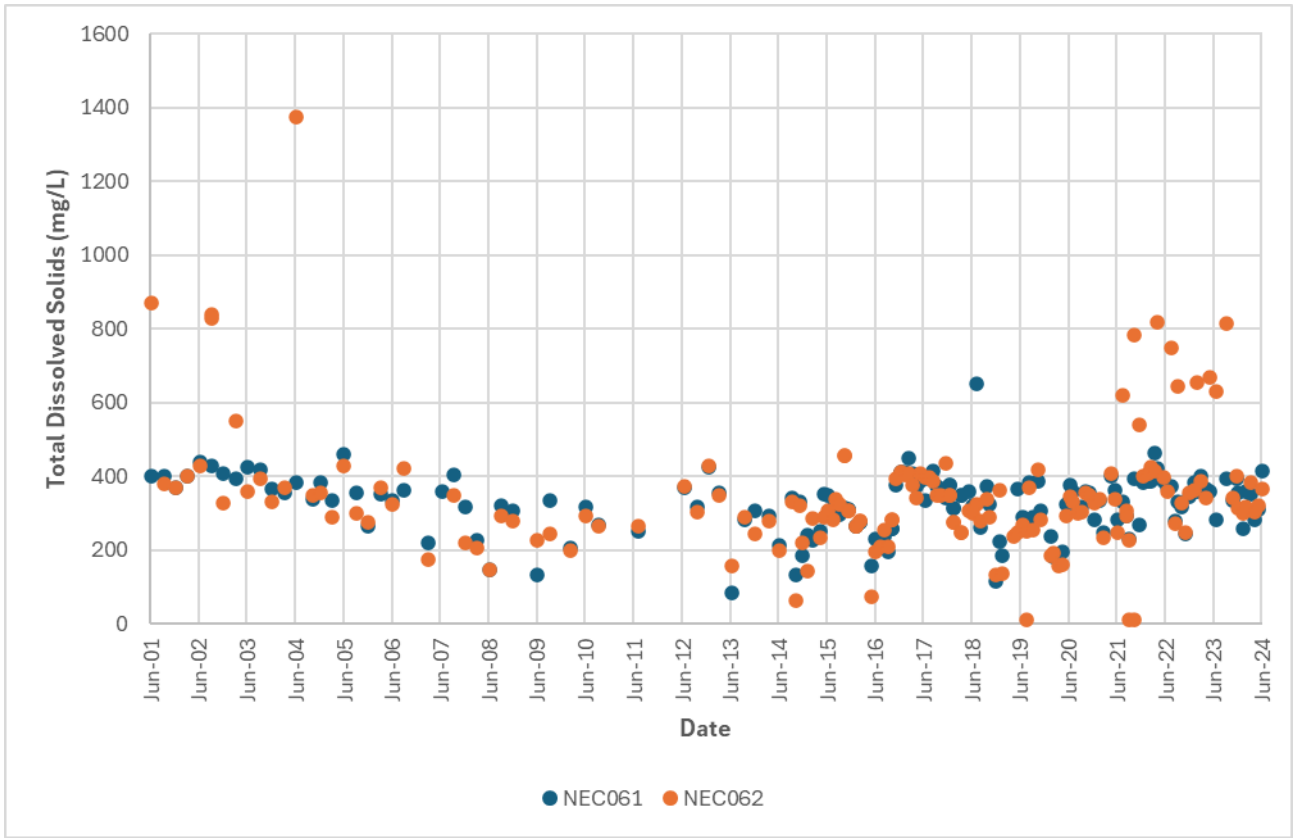
B.9 Former Blayney Dewatering Facility

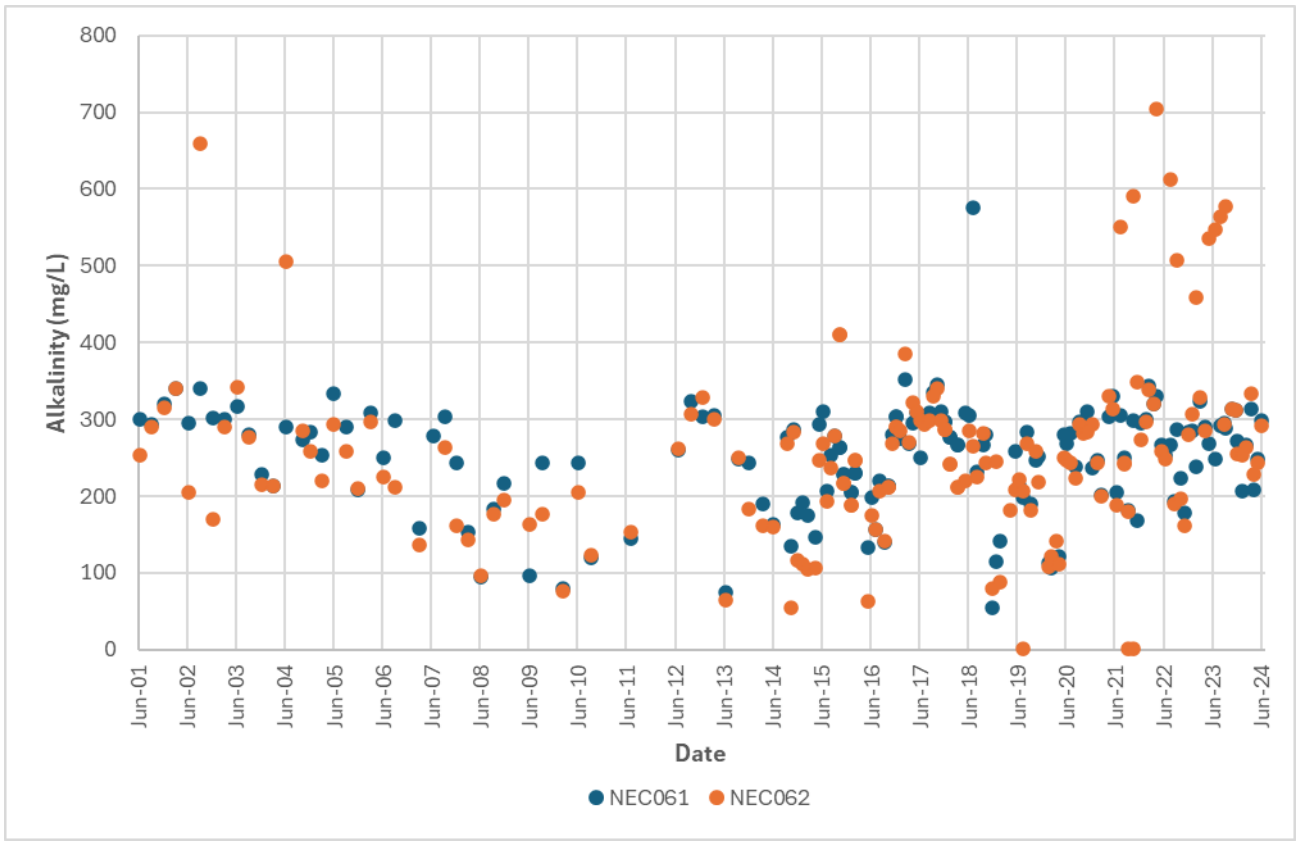
B.9.1 Physiochemical Parameters

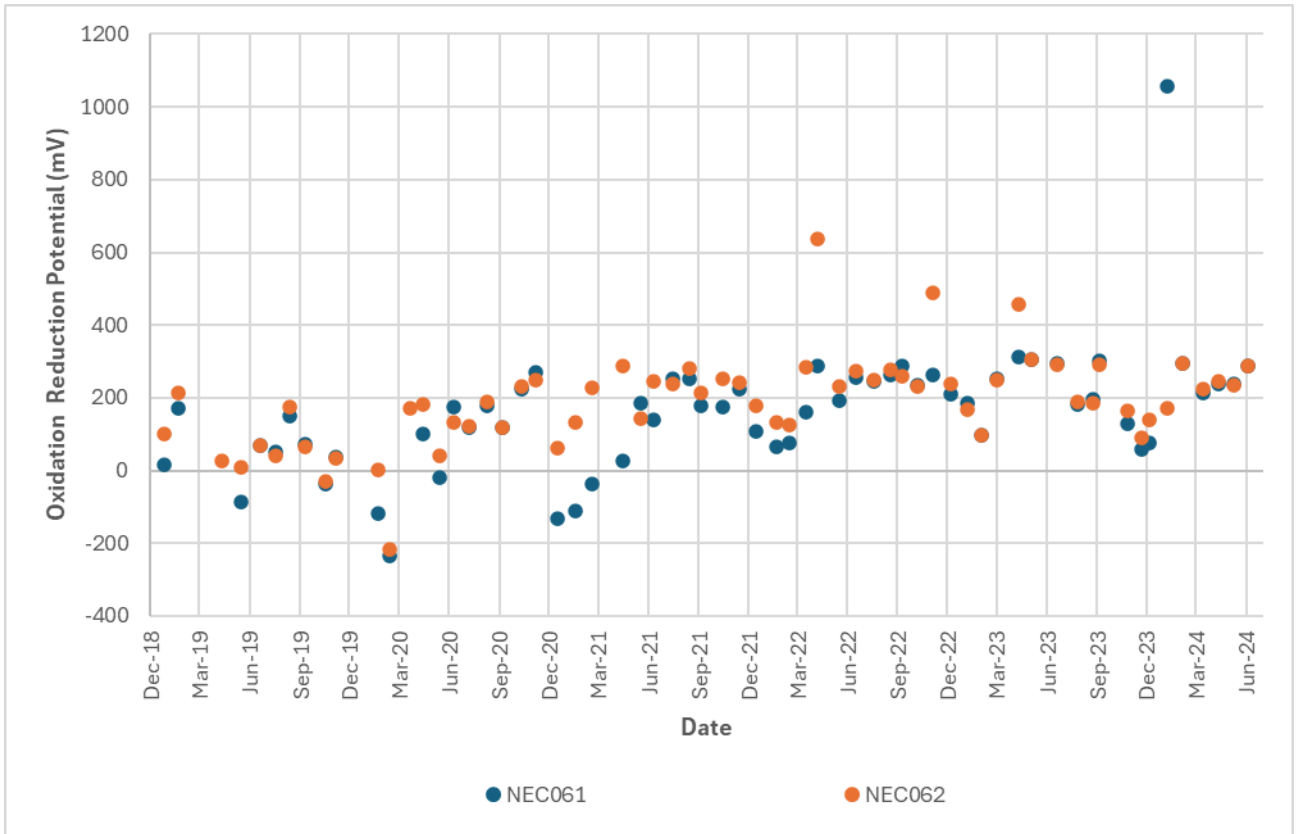




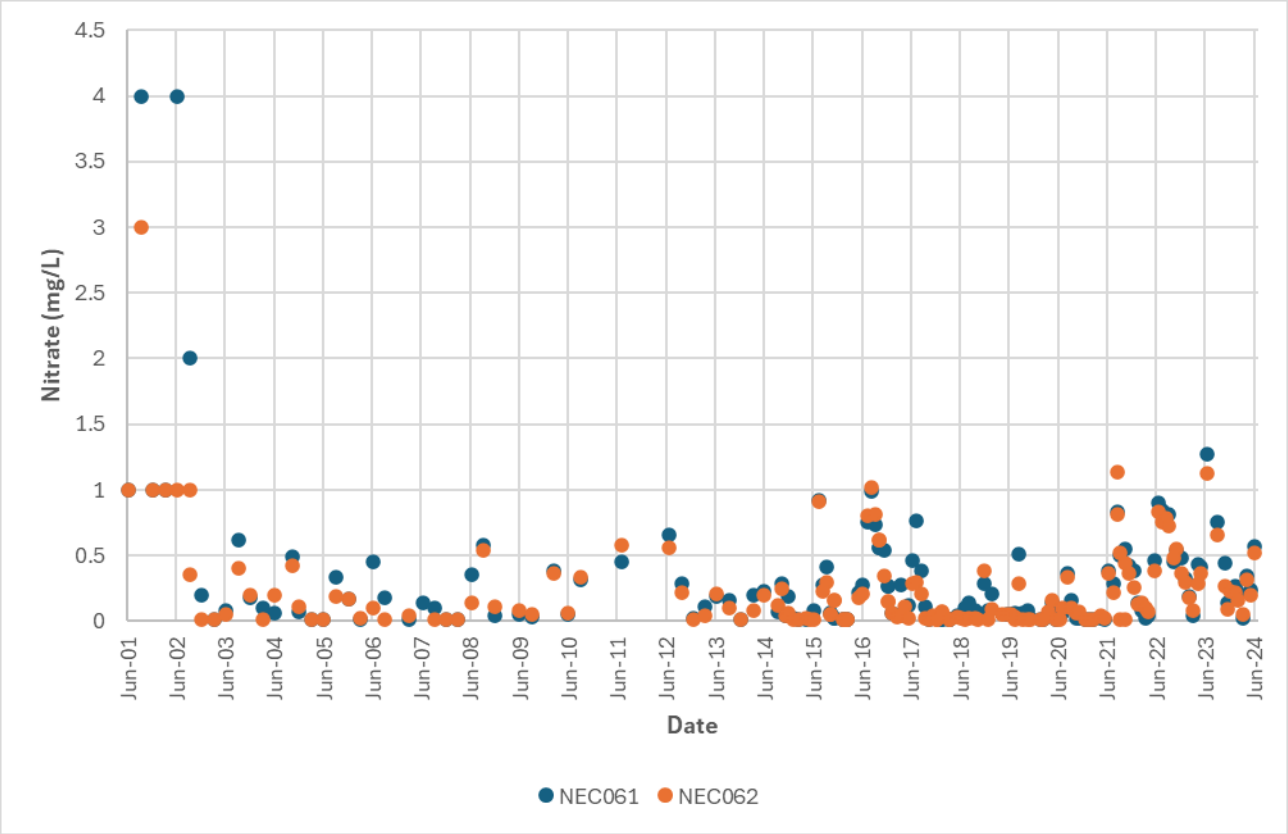

Total Suspended Solids (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
NEC061
NEC062

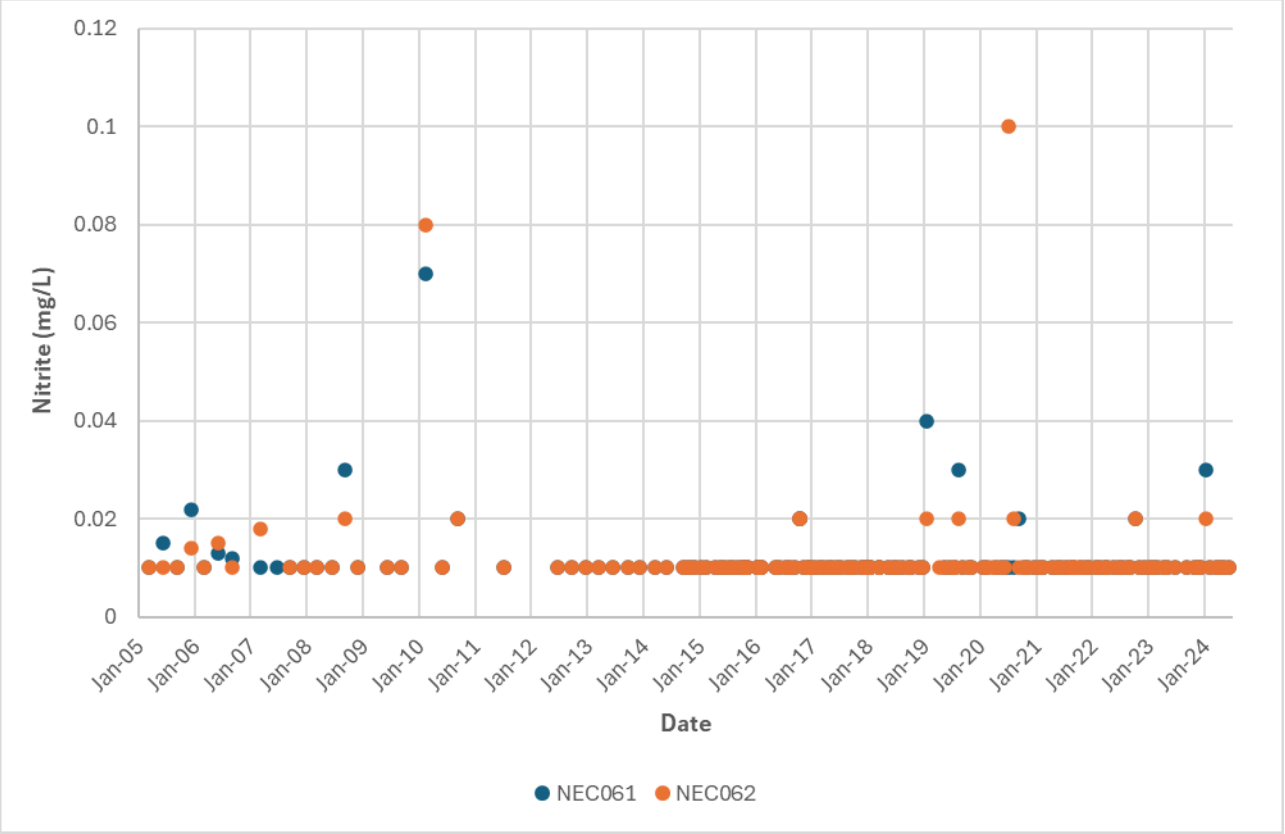

Total Dissolved Solids (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

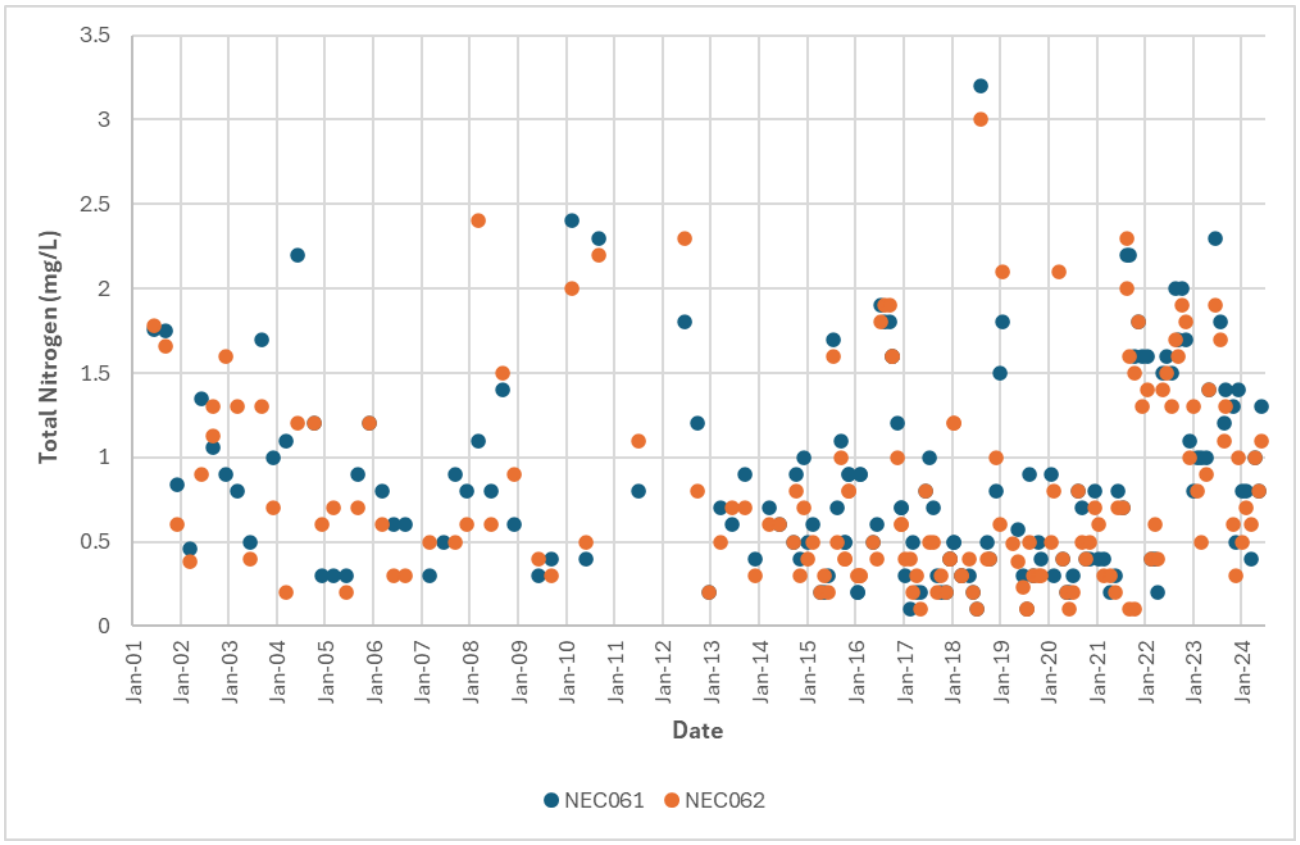

800
700
600
500
400
300
200
100
0
Alkalinity (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

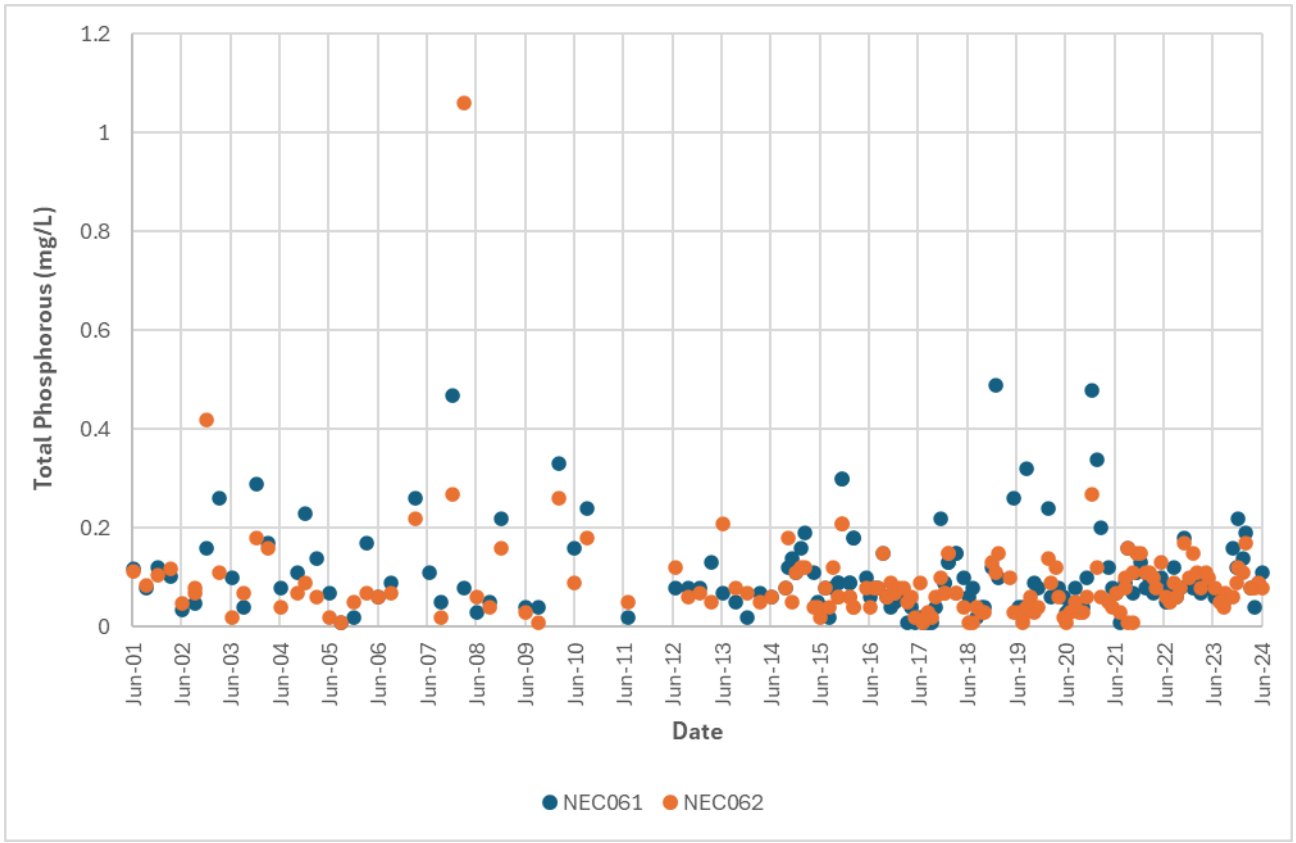

1200
1000
800
600
400
200
0
-200
-400
Oxidation Reduction Potential (mV)
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20
Dec-20
Mar-21
Jun-21
Sep-21
Dec-21
Mar-22
Jun-22
Sep-22
Dec-22
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
Jun-24
Date
NEC061
NEC062

B.9.2 Nutrients

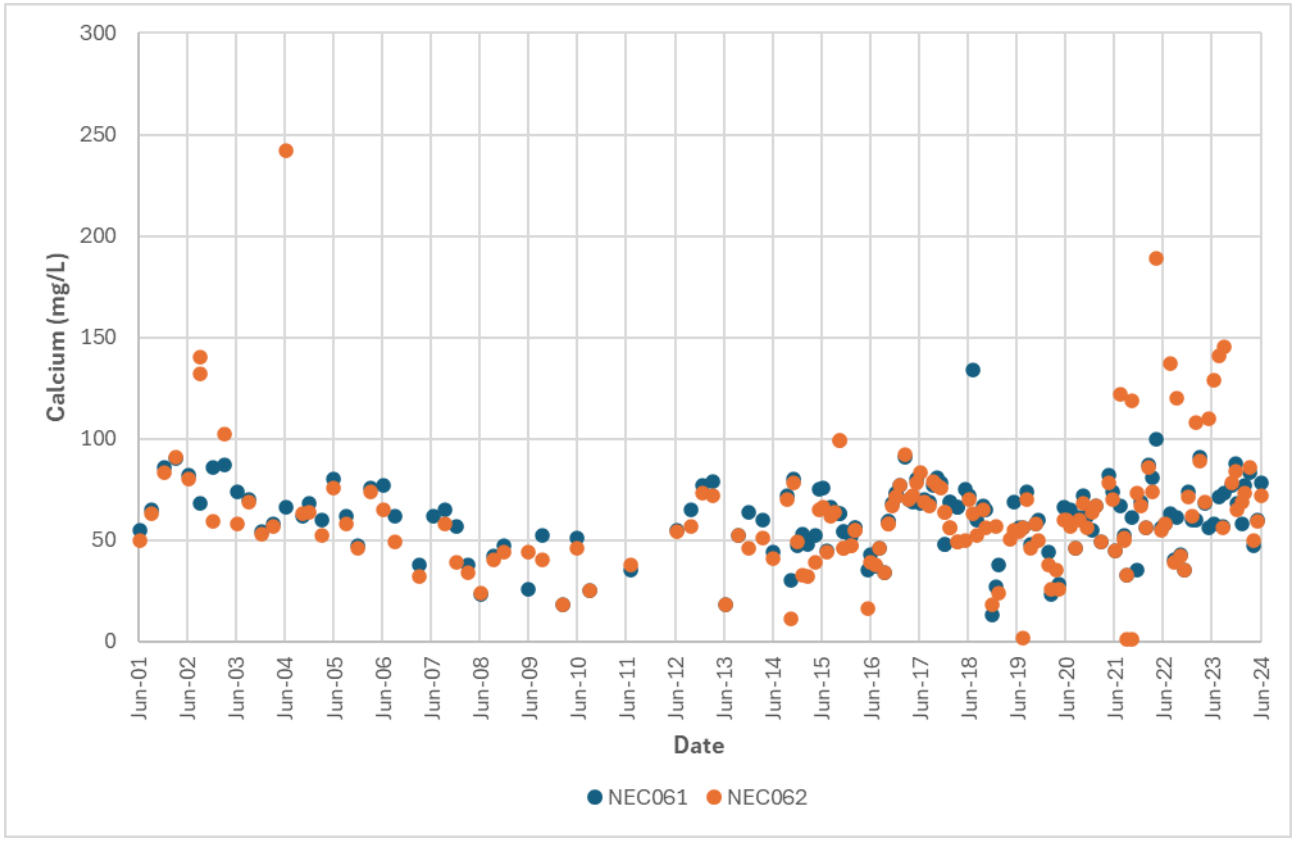


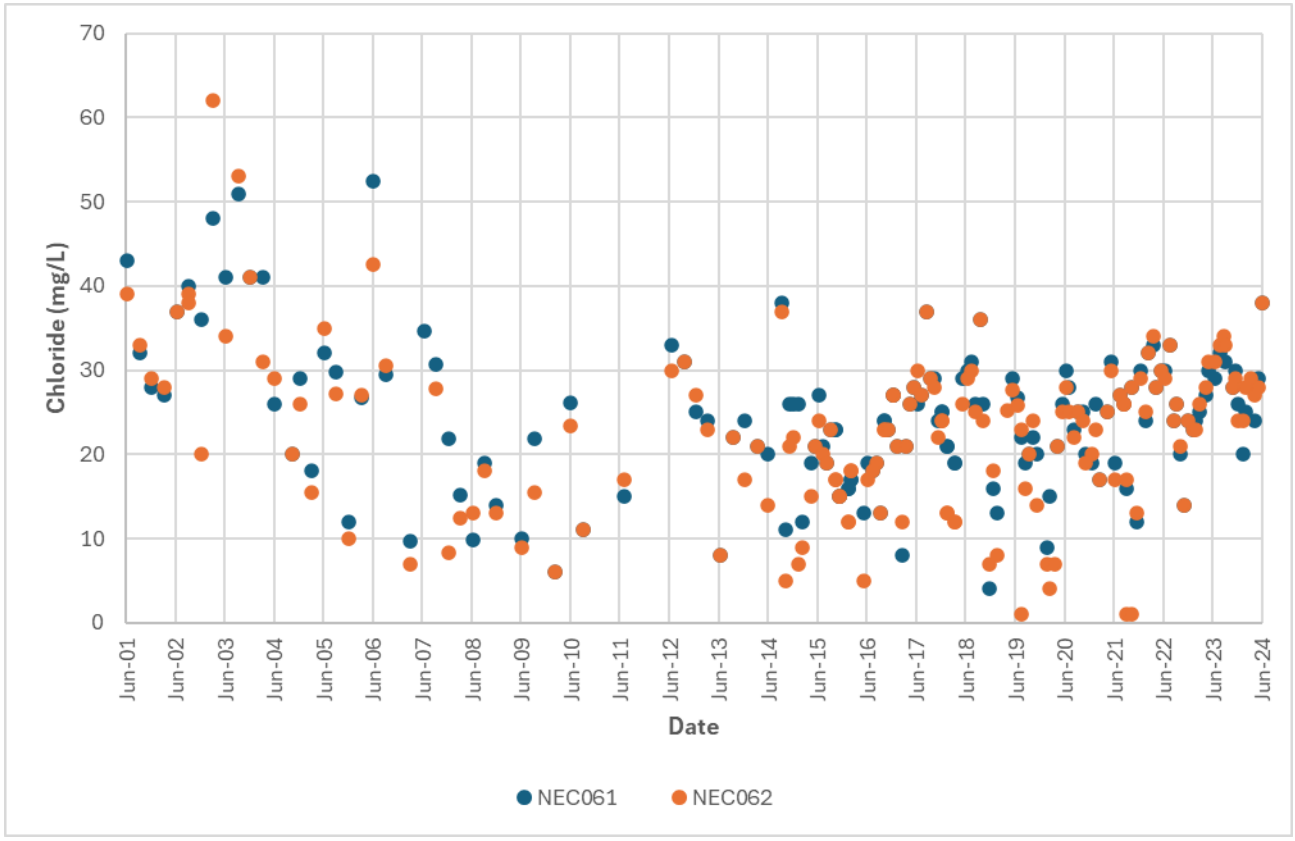


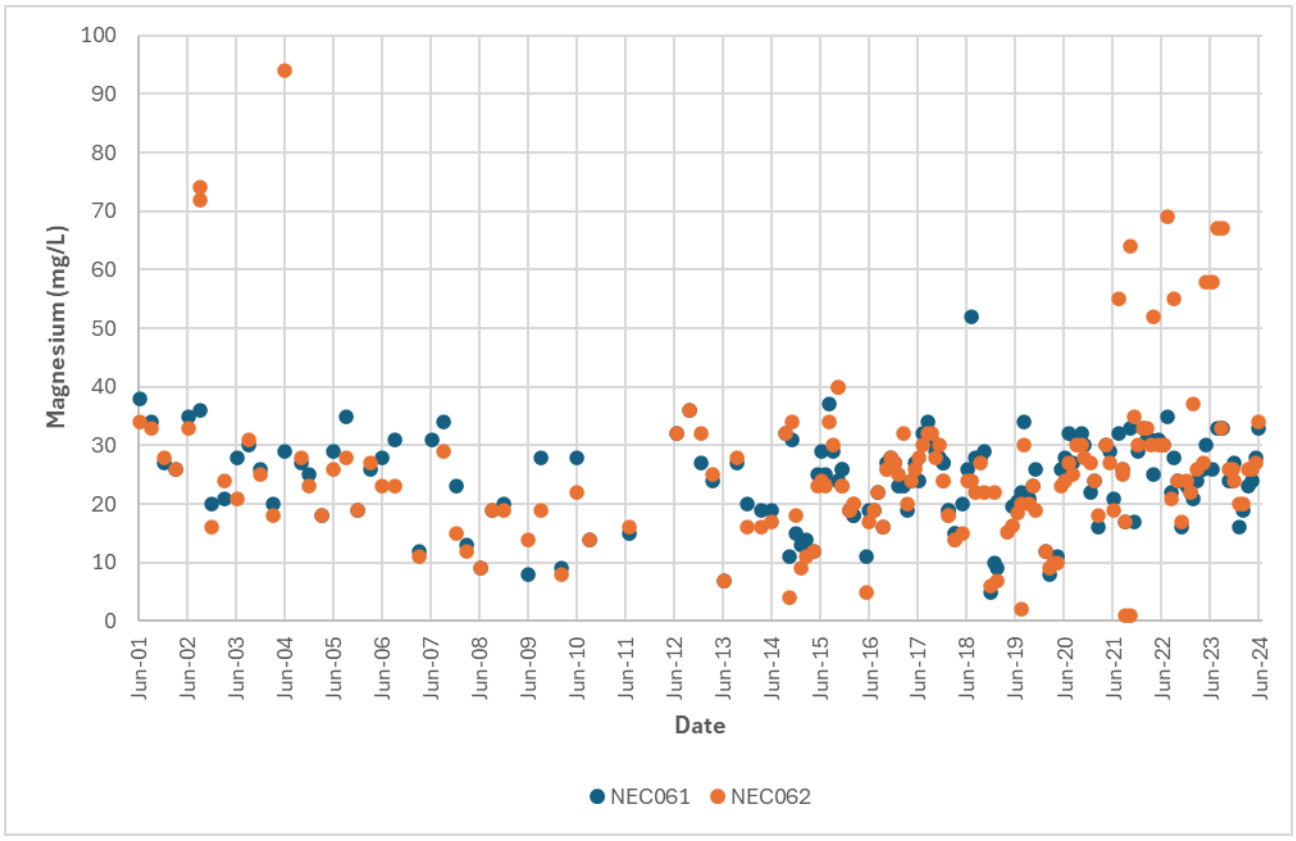

Total Nitrogen (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
NEC061
NEC062

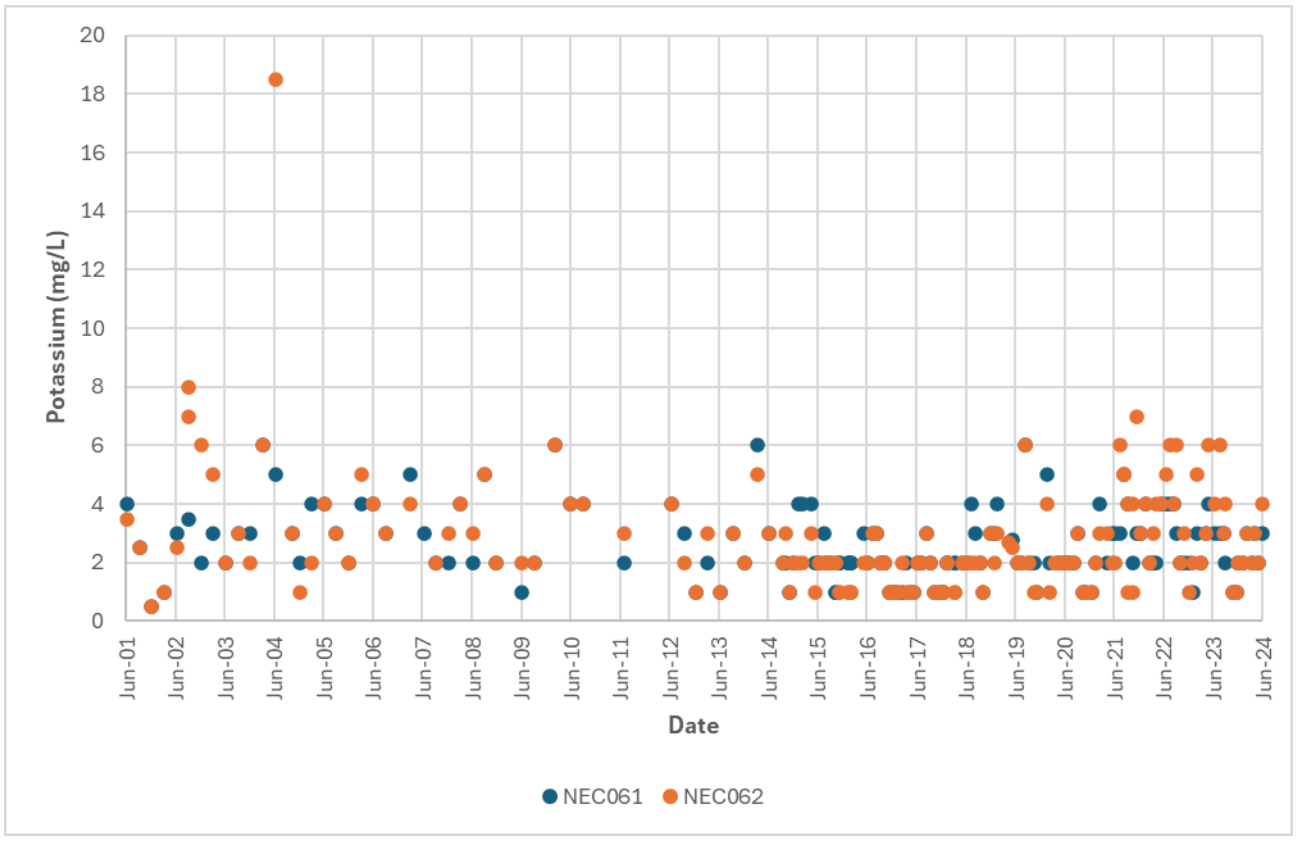

Total Phosphorous (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

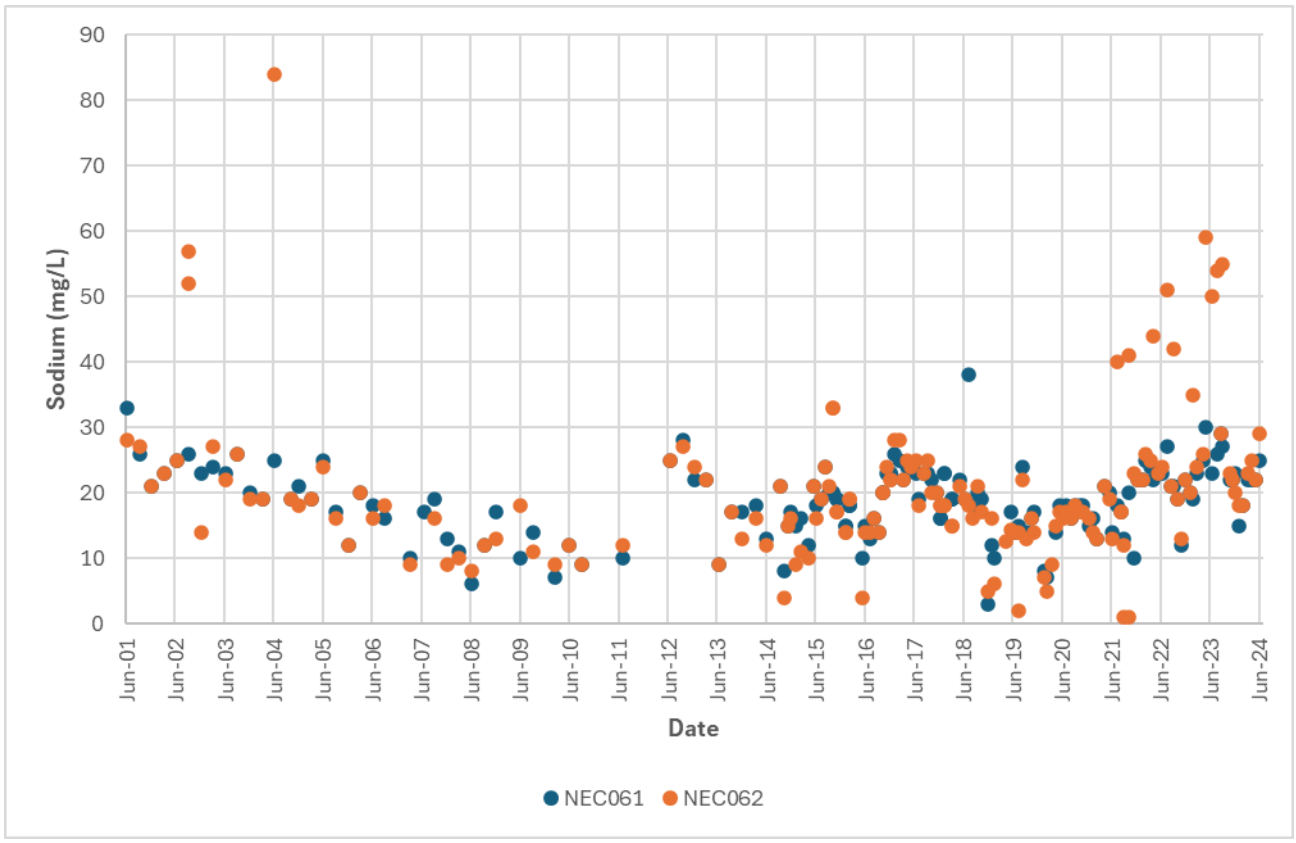
B.9.3 Major Ions

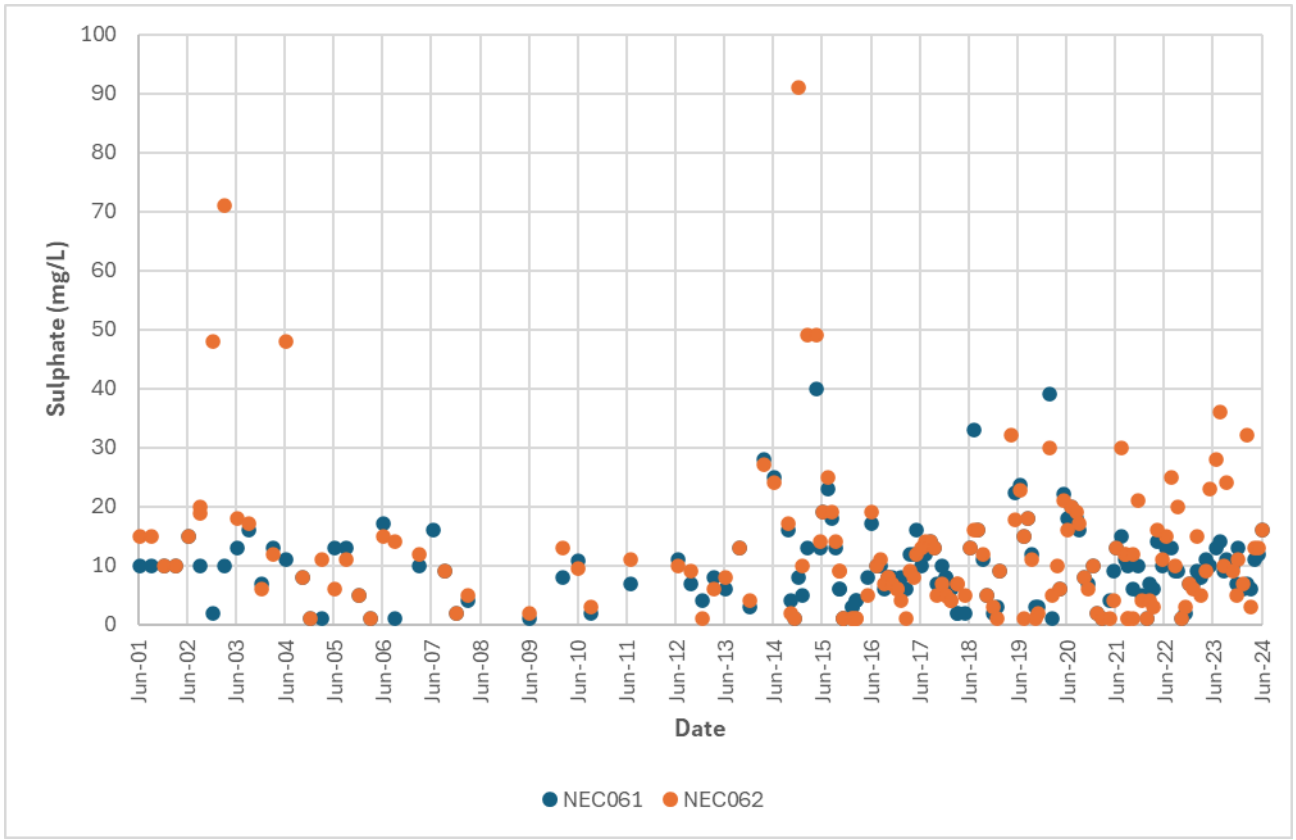




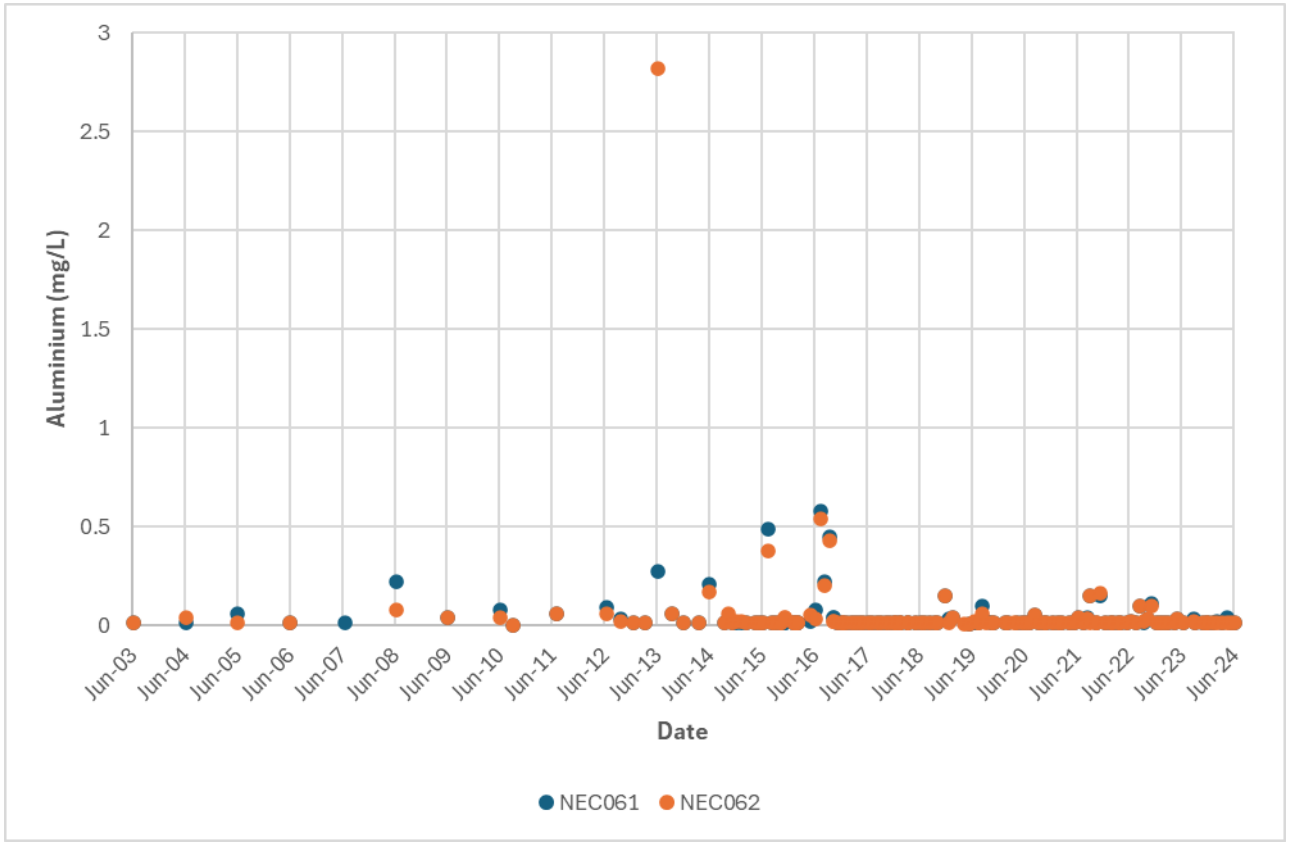

Magnesium (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

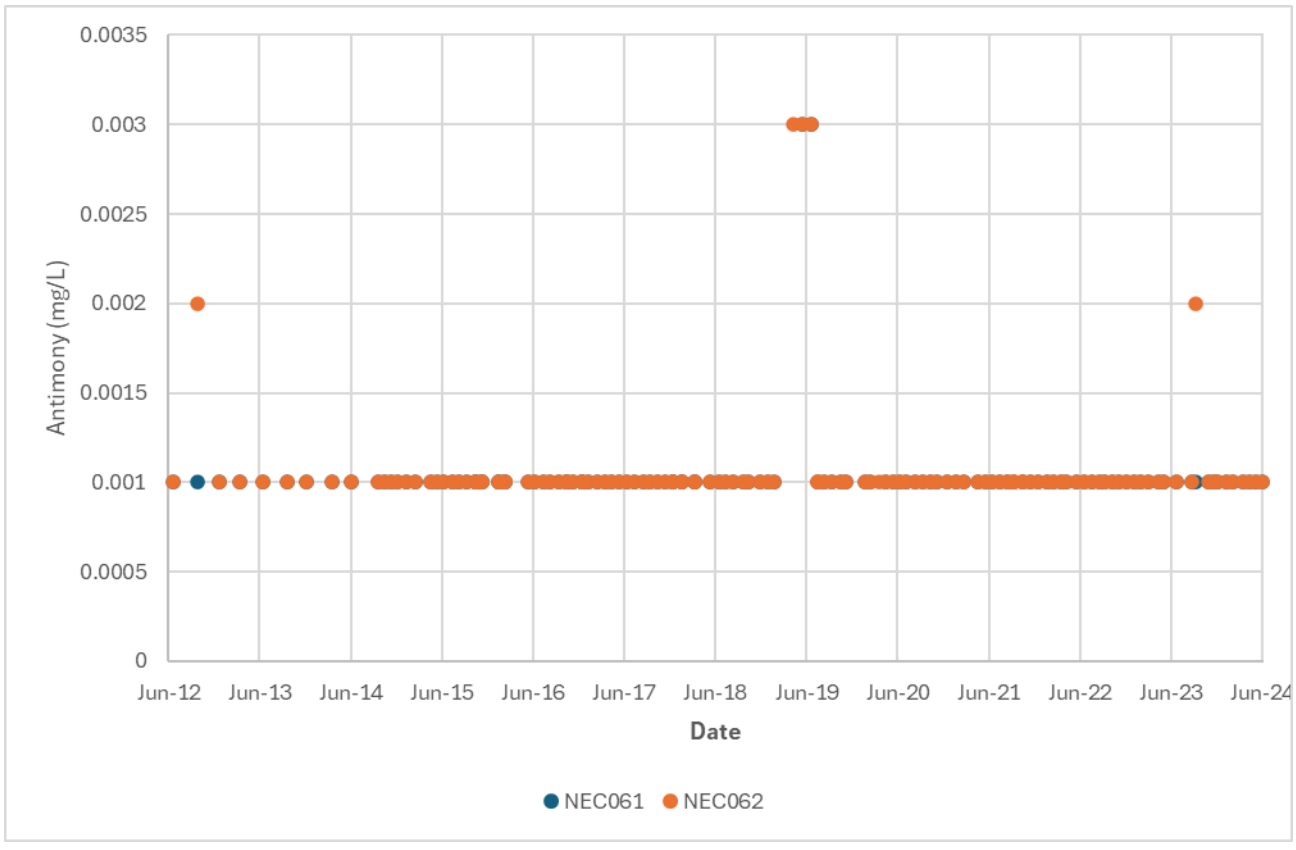

Potassium (mg/L)
20
18
16
14
12
10
8
6
4
2
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
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Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

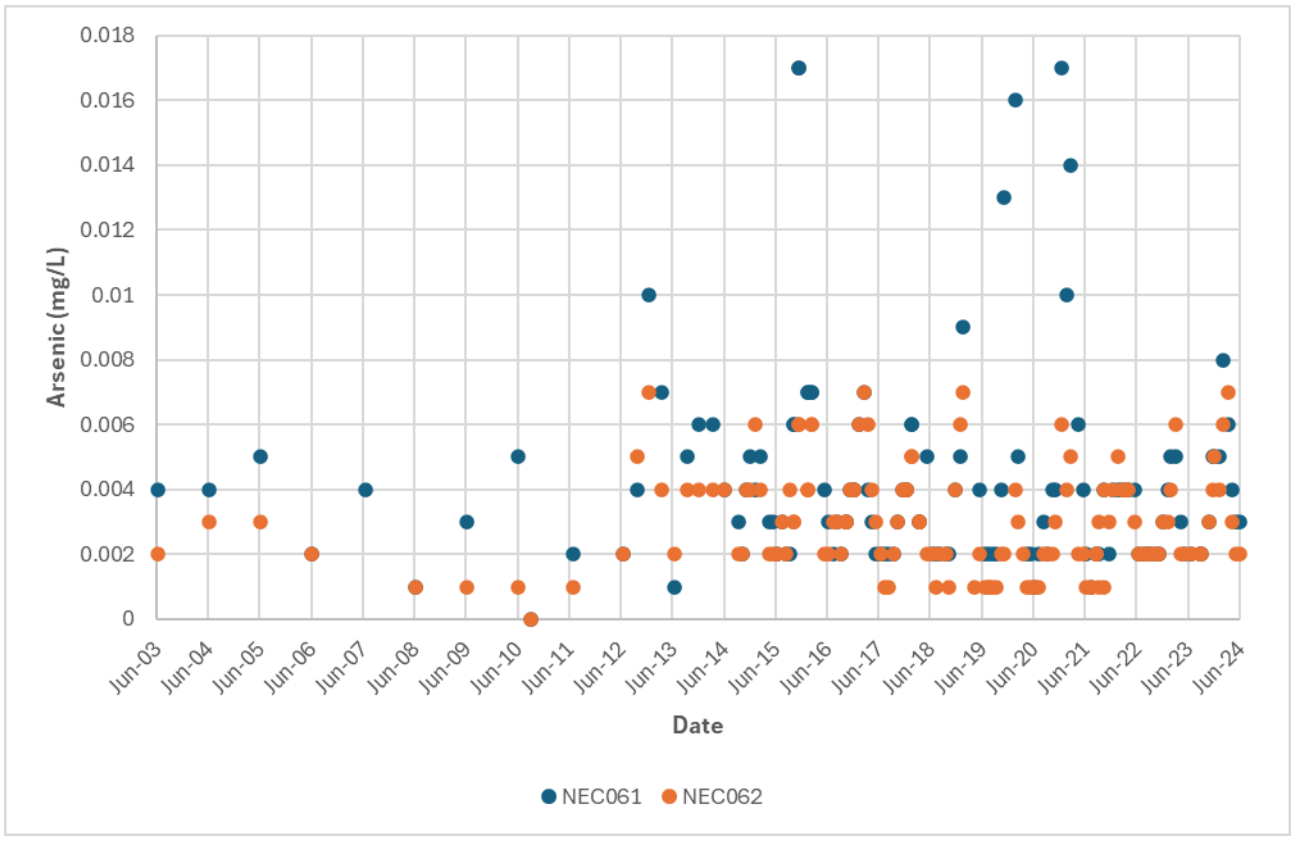

Sodium (mg/L)
90
80
70
60
50
40
30
20
10
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

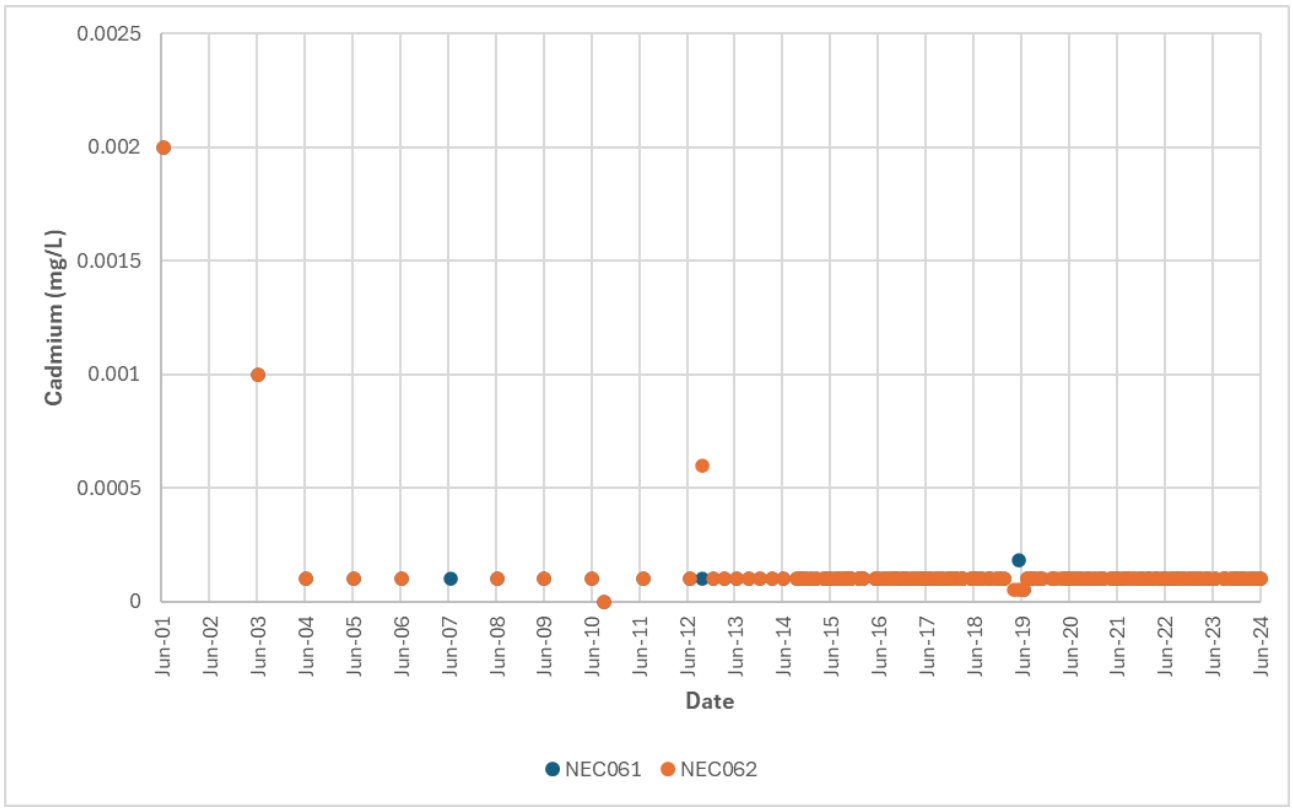

Sulphate (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

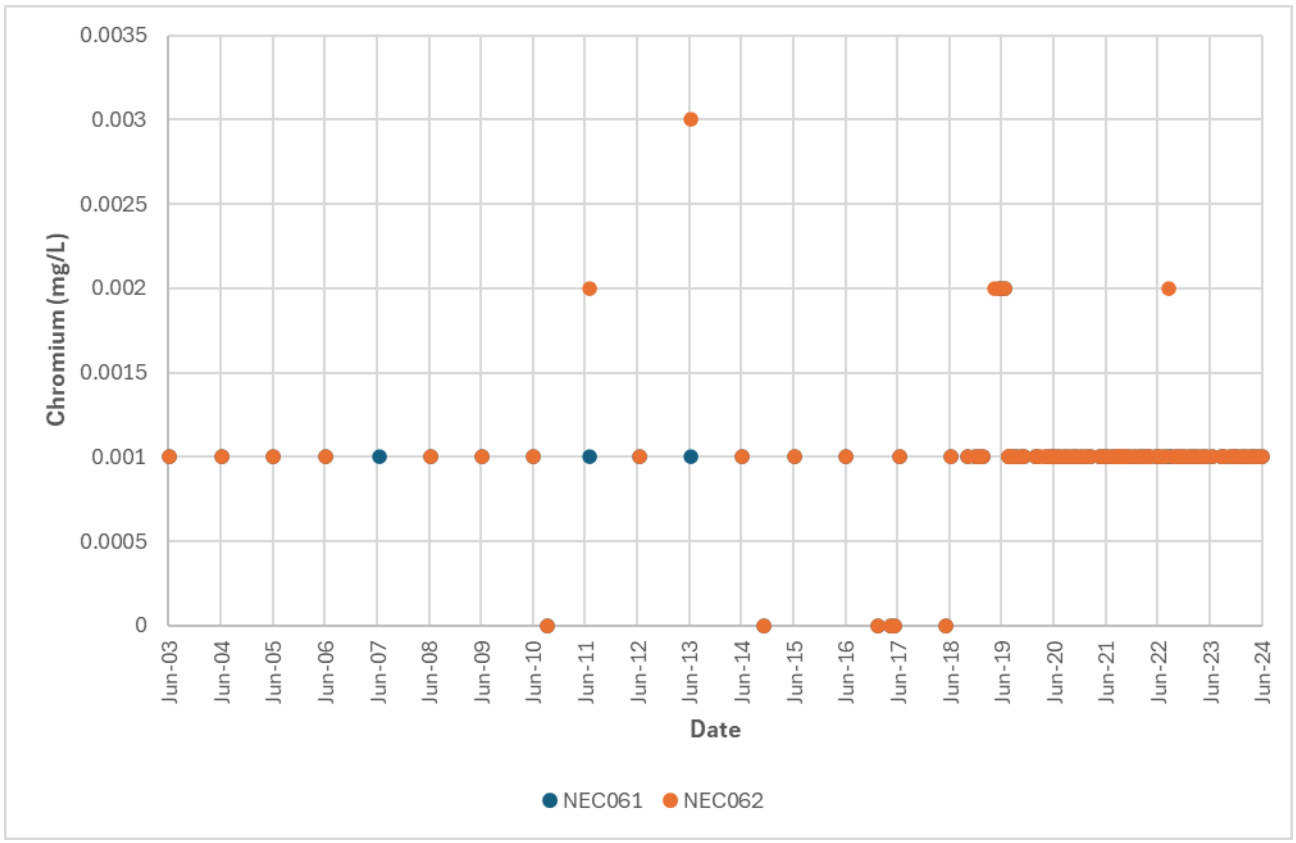
B.9.4 Dissolved Metals

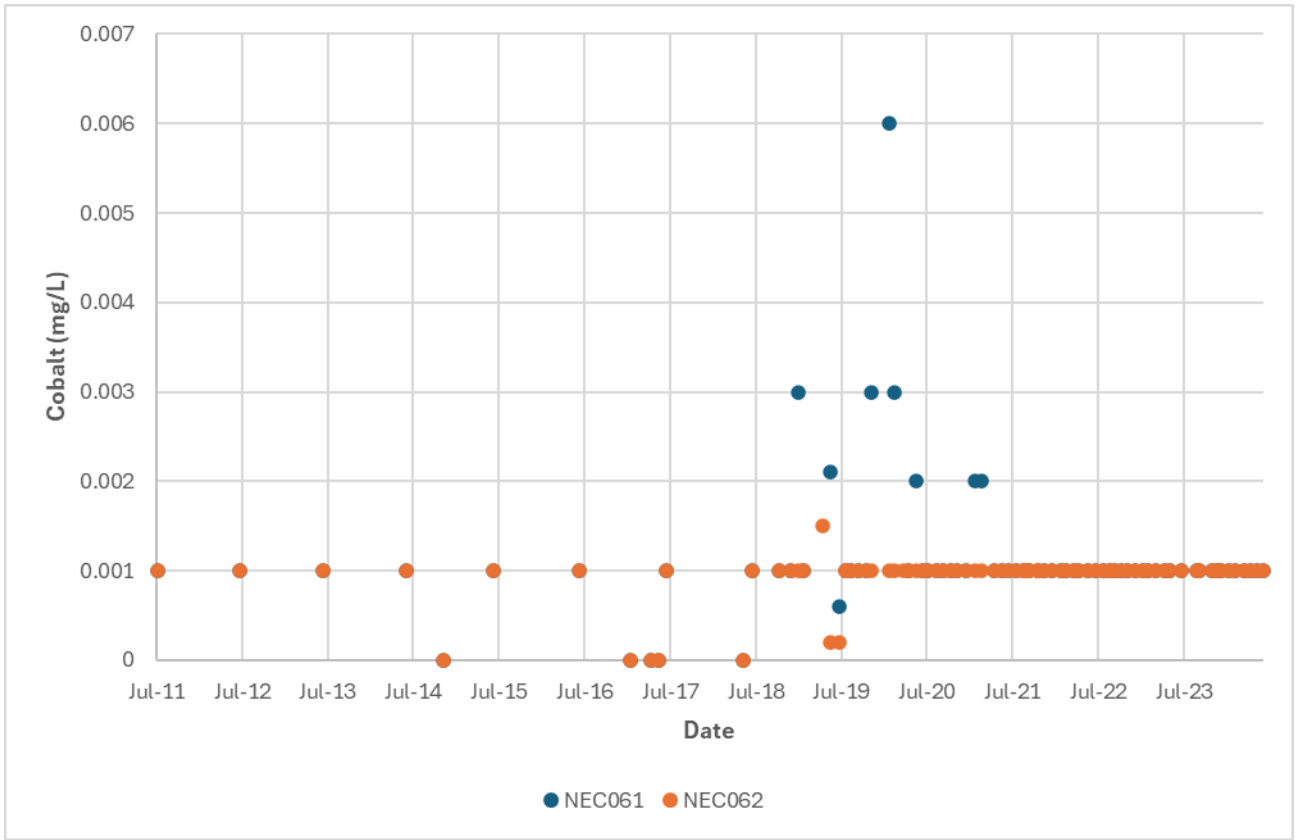


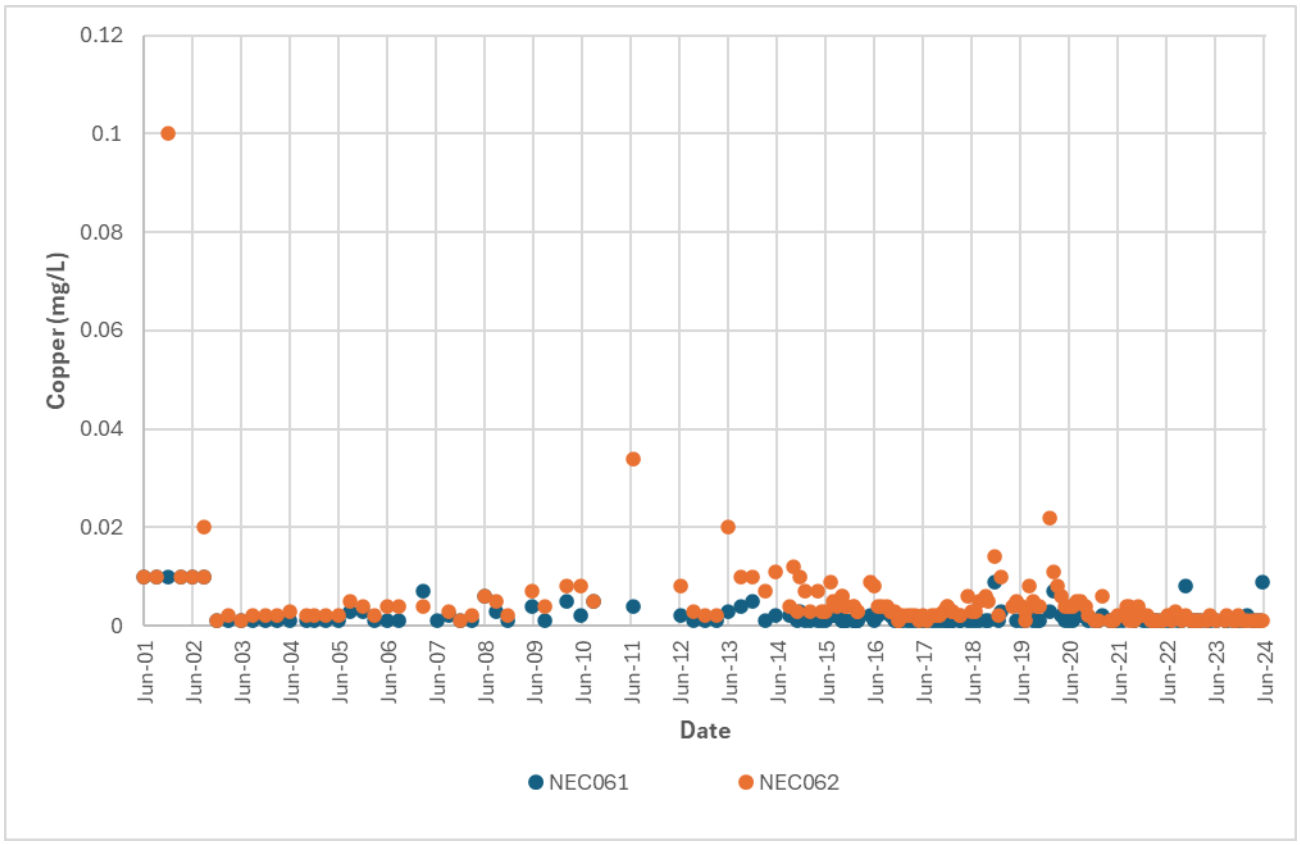


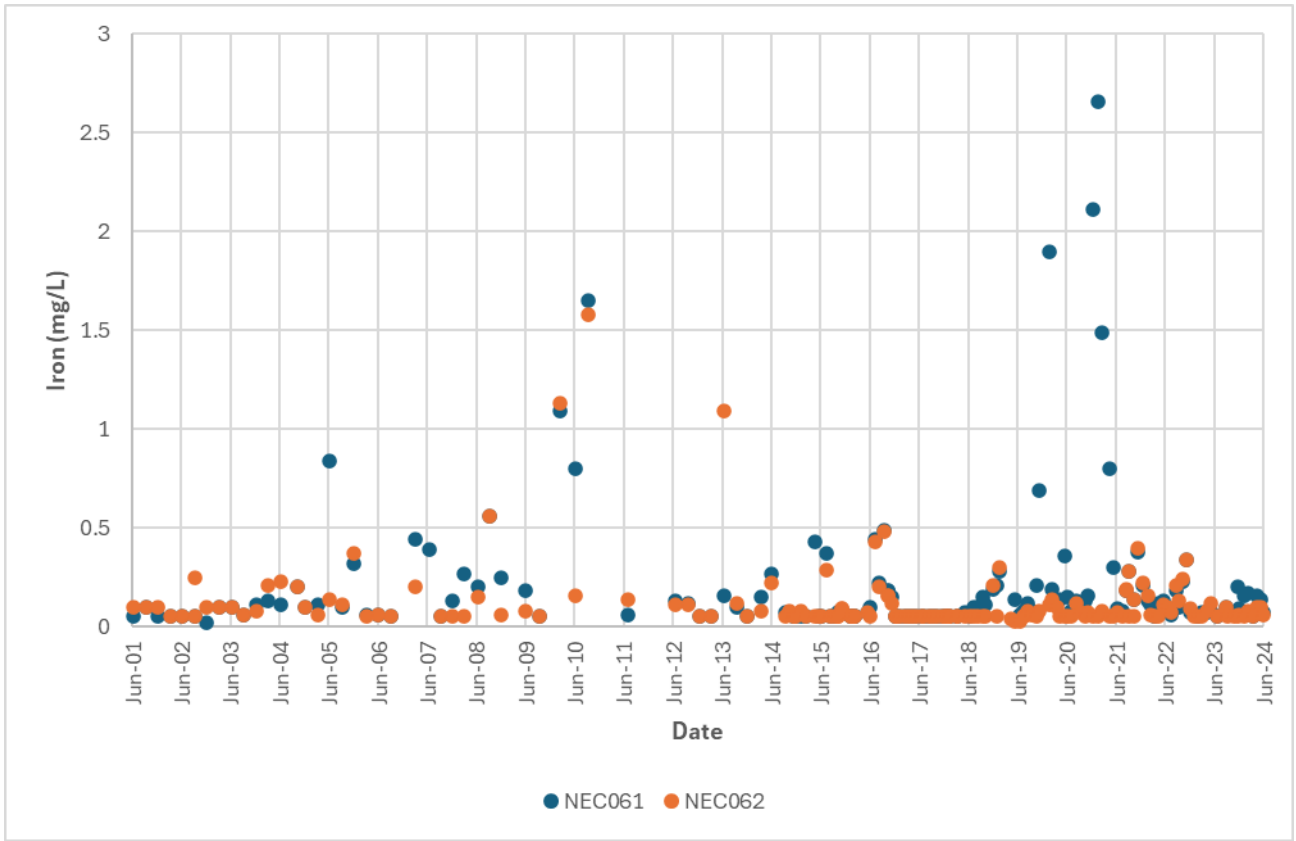

0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

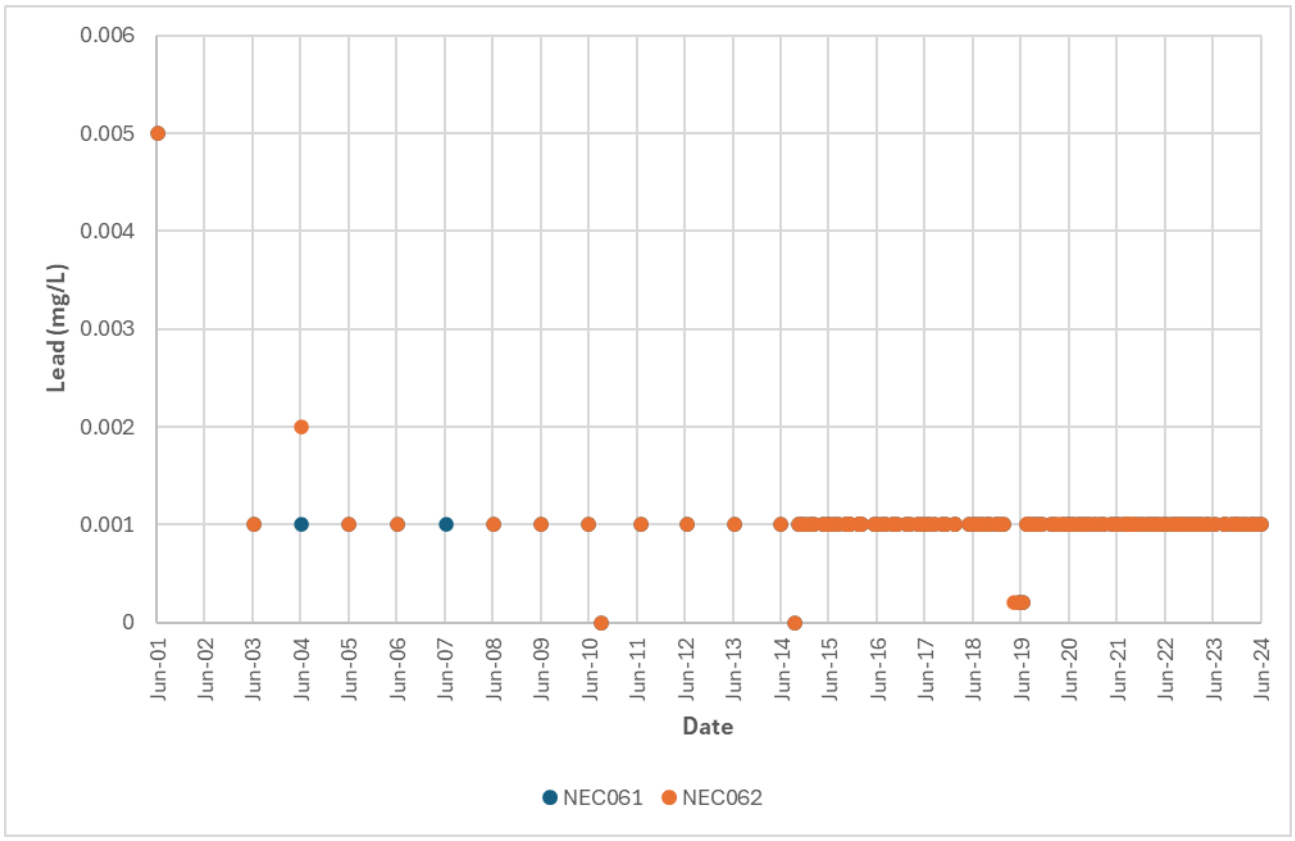

0.0025
0.002
0.0015
0.001
0.0005
0
Cadmium (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

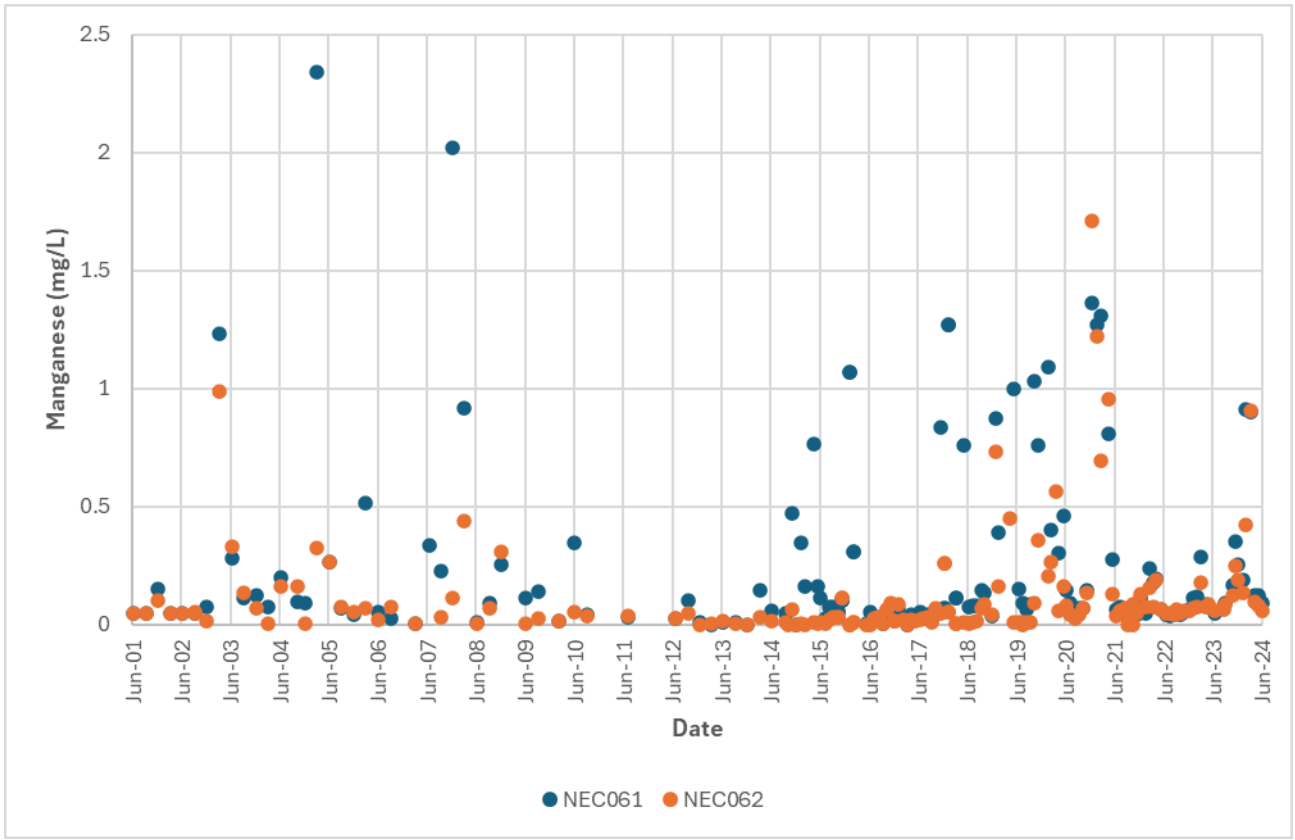

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Chromium (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

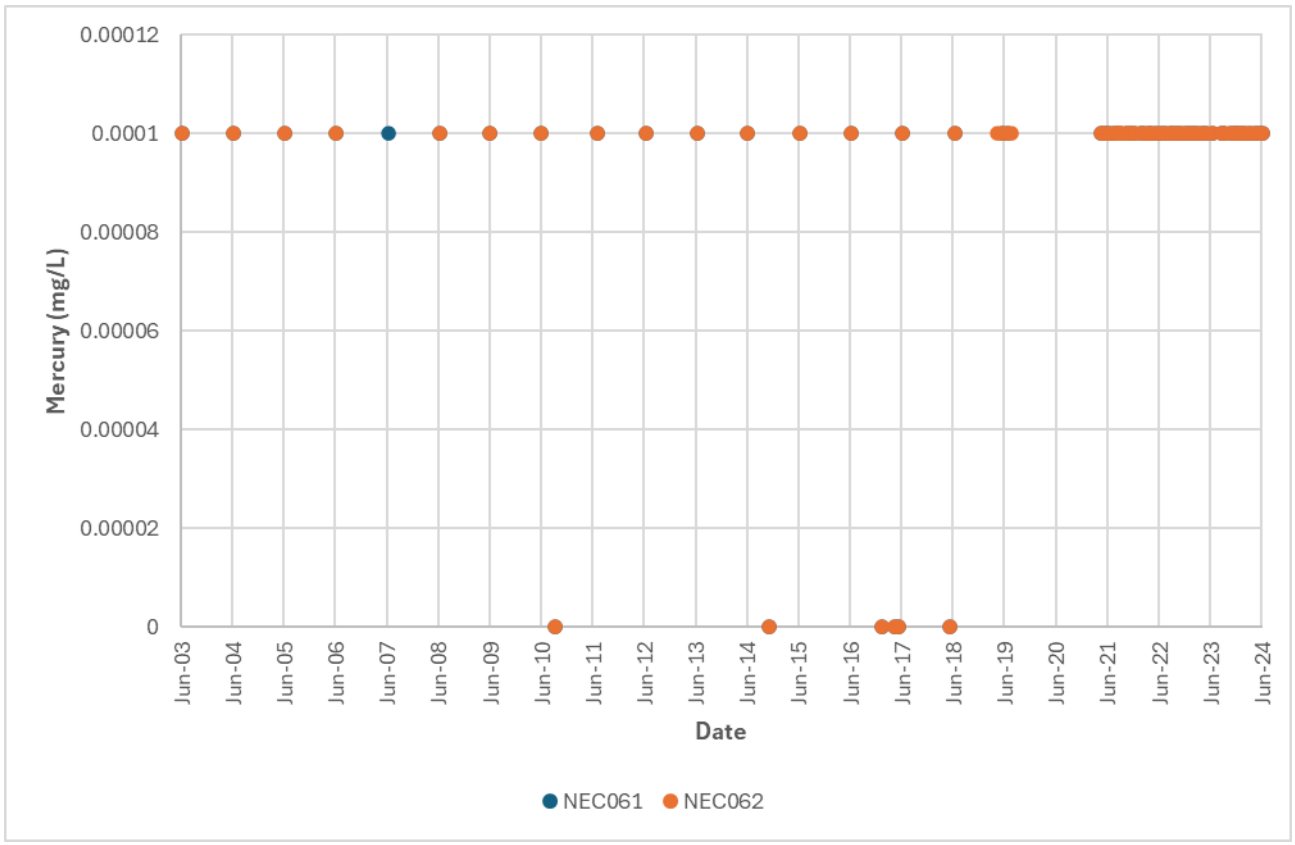

0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Cobalt (mg/L)
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Date
NEC061
NEC062

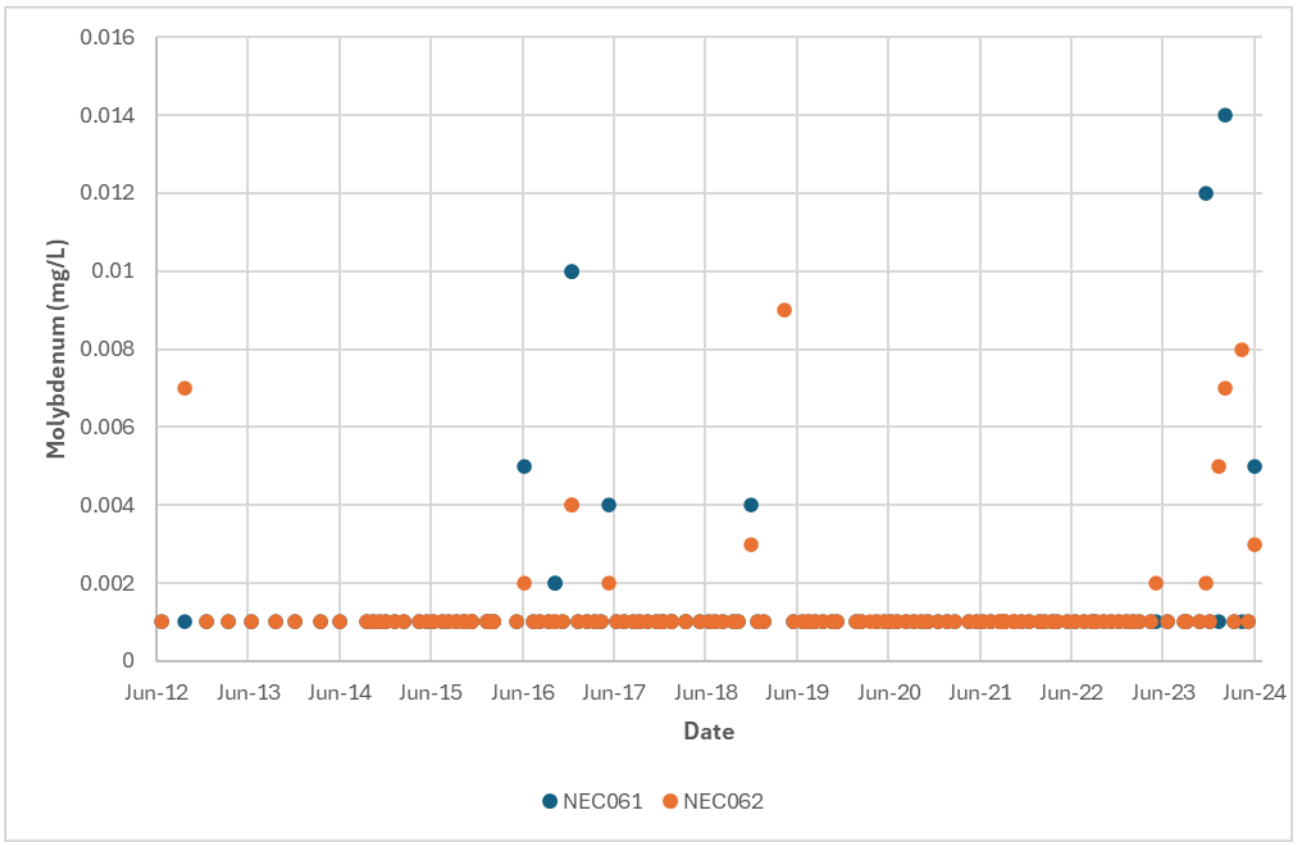

0.12
0.1
0.08
0.06
0.04
0.02
0
Copper (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

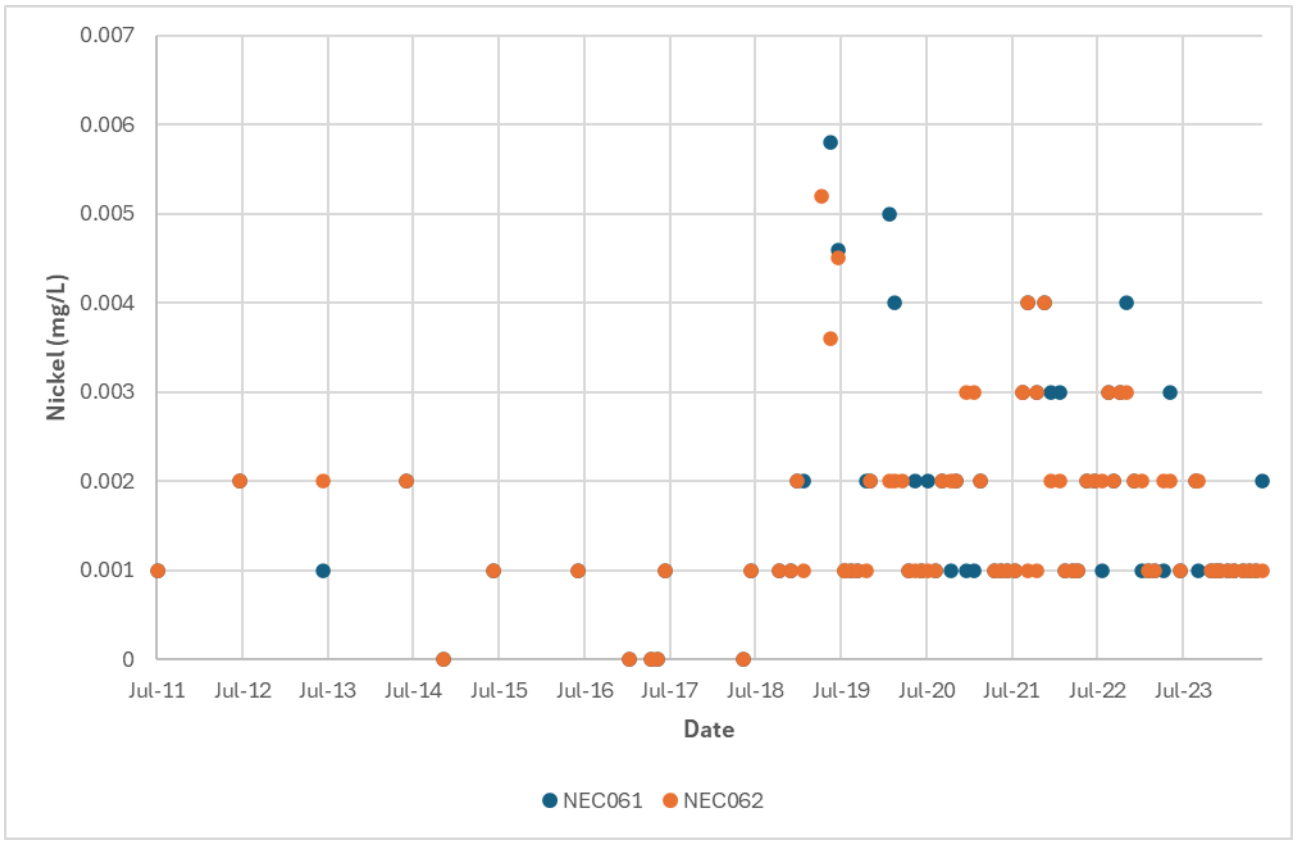

3
2.5
2
1.5
1
0.5
0
Iron (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

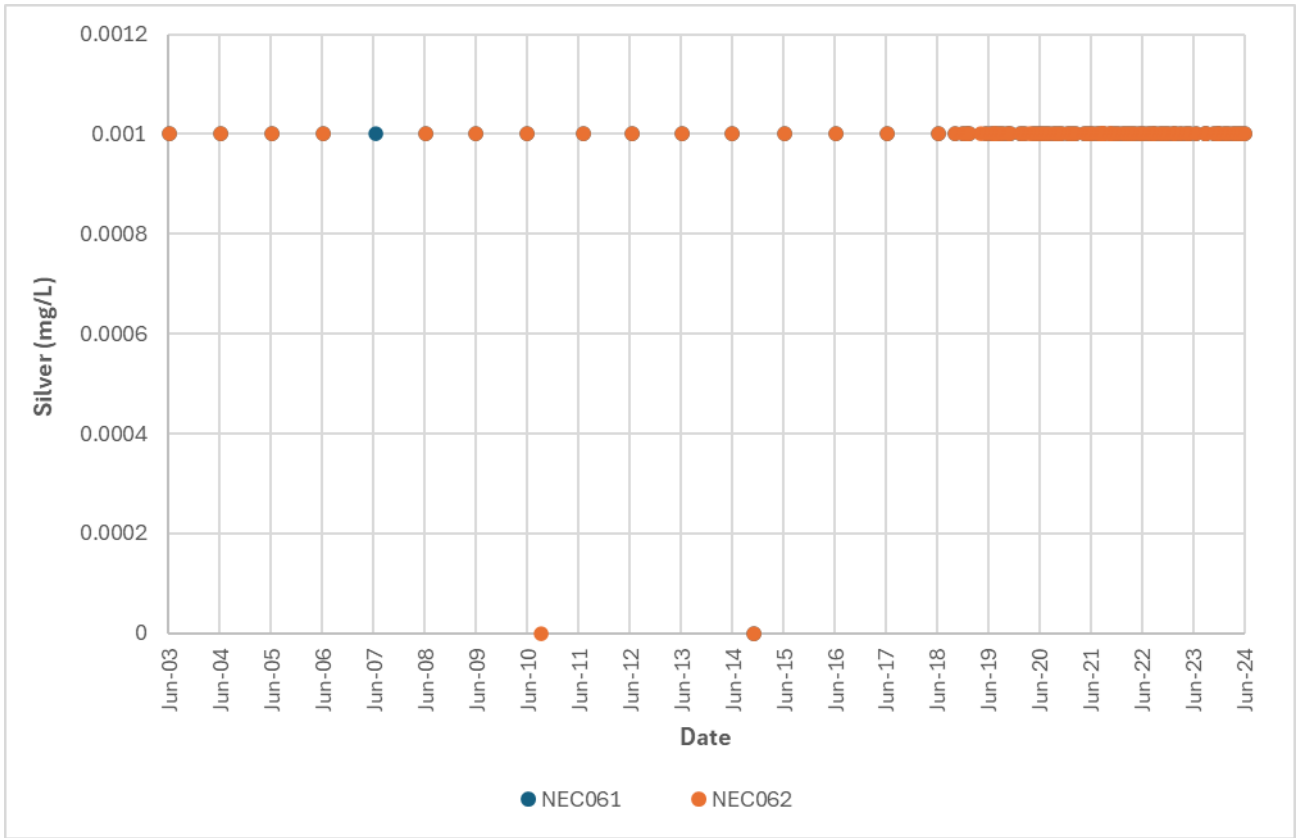

0.006
0.005
0.004
0.003
0.002
0.001
0
Lead (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

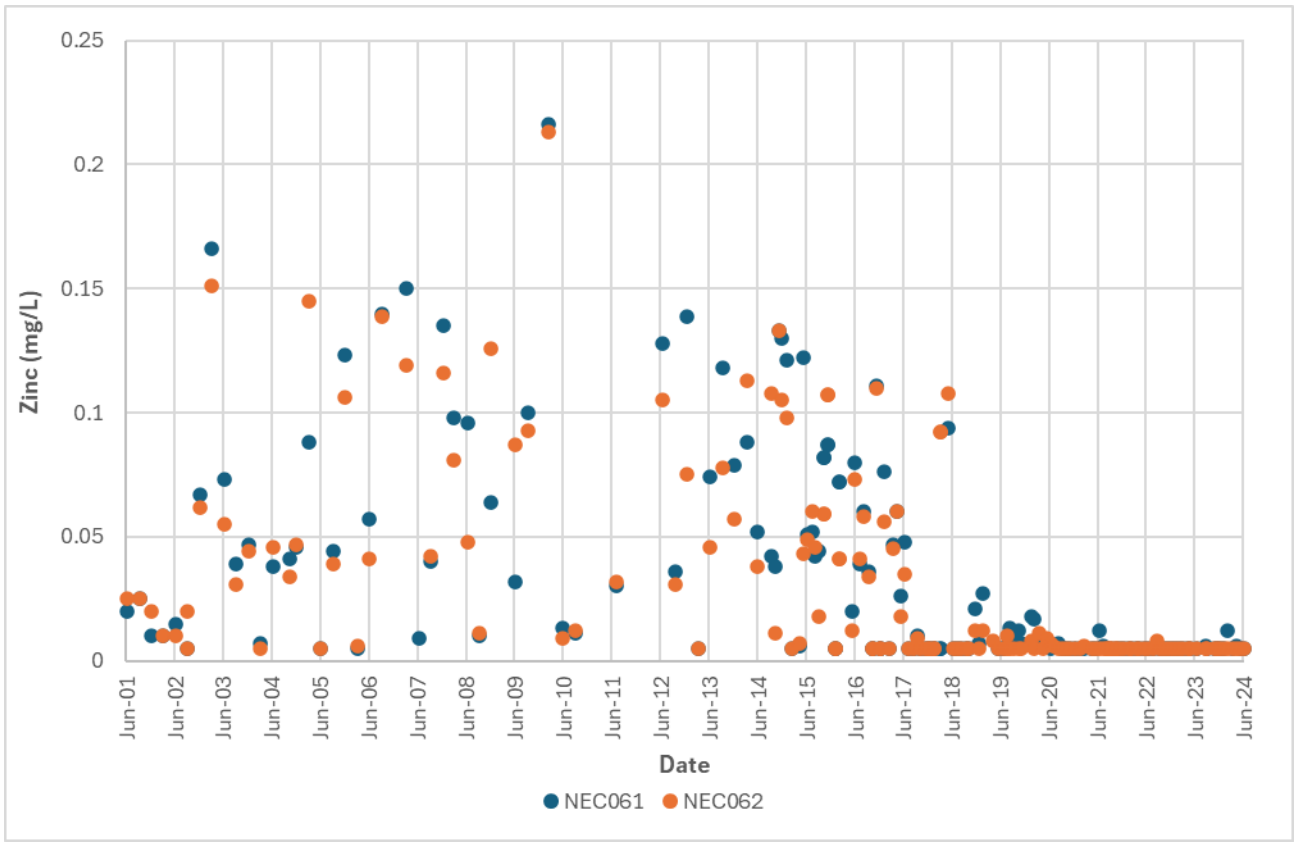

2.5
2
1.5
1
0.5
0
Manganese (mg/L)
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062


0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Mercury (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062


0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

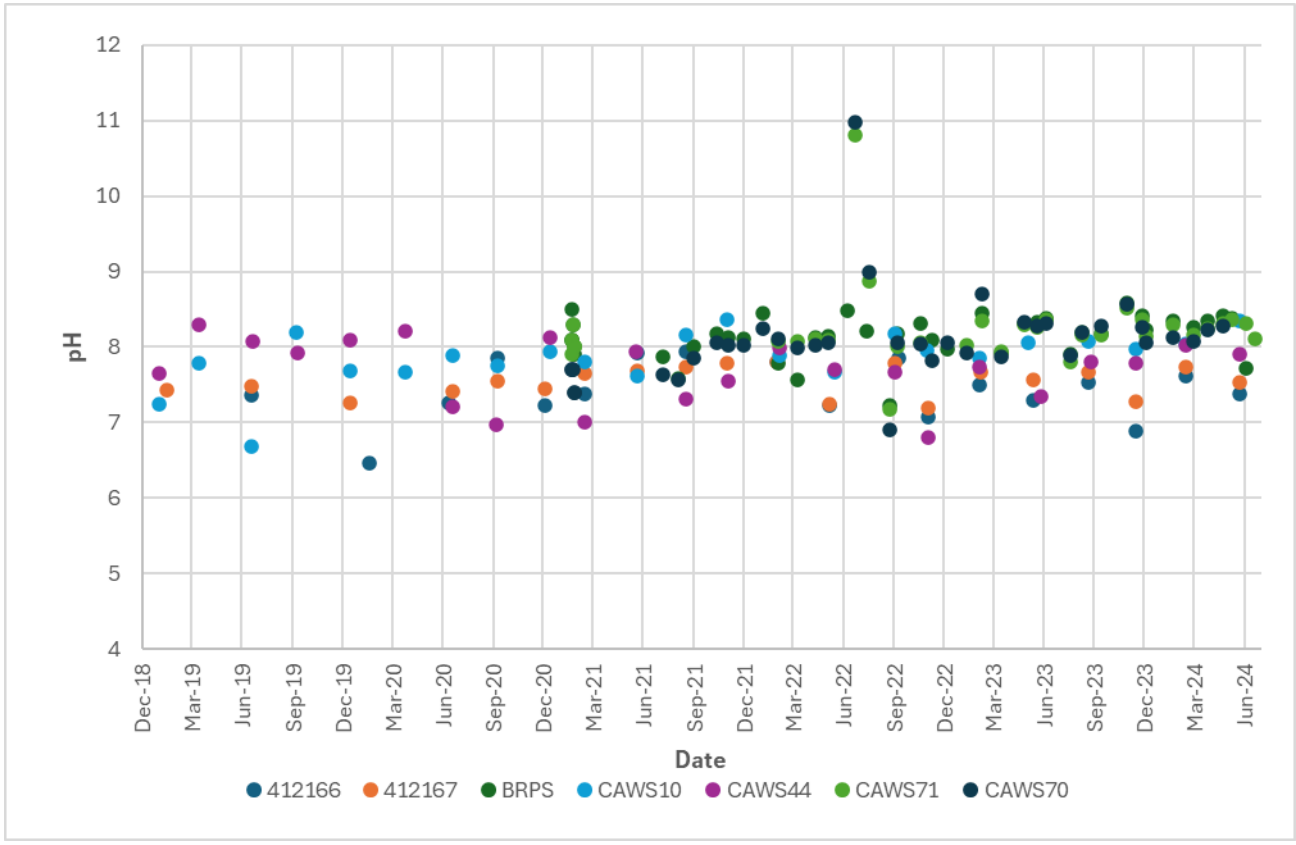

0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Nickel (mg/L)
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Jul-20
Jul-21
Jul-22
Jul-23
Date
NEC061
NEC062

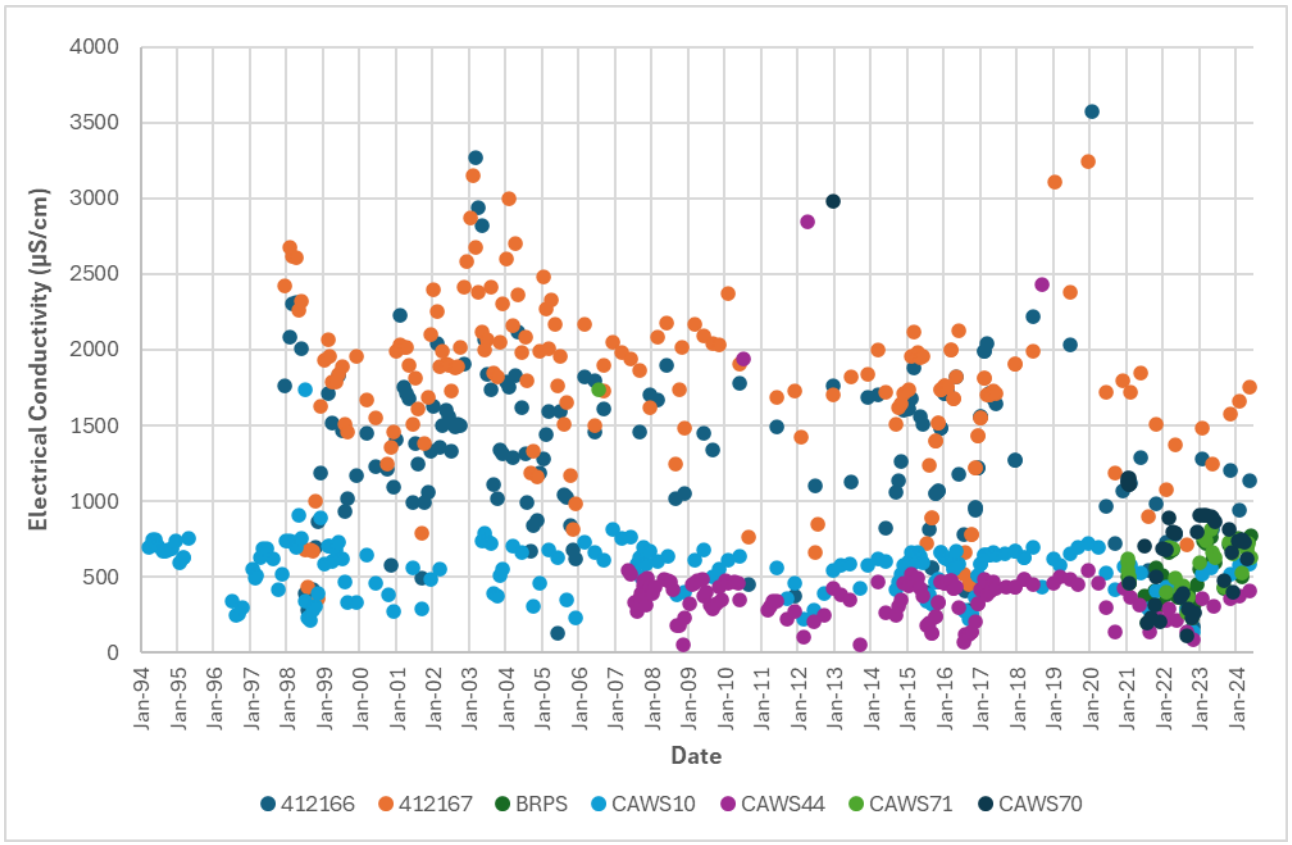

0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Silver (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Date
NEC061
NEC062

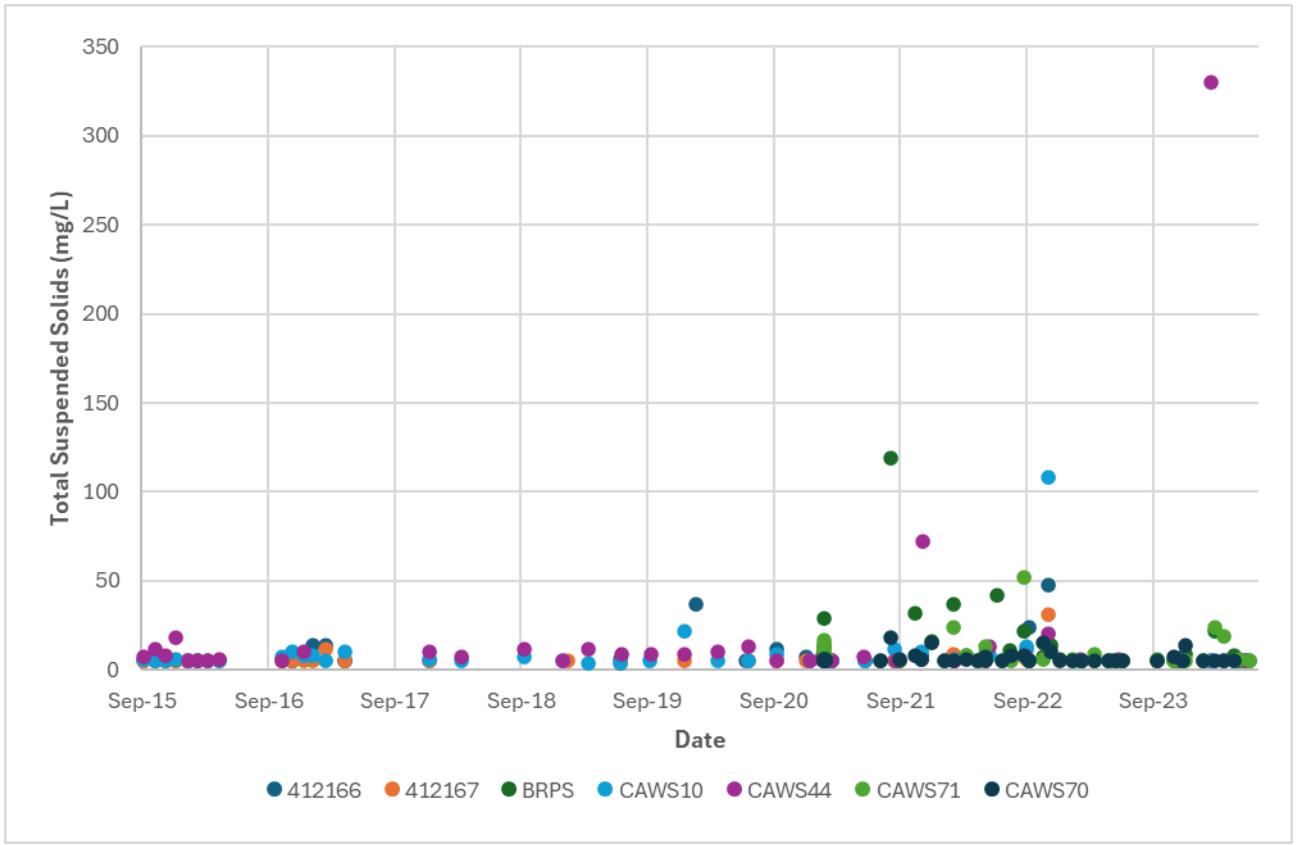


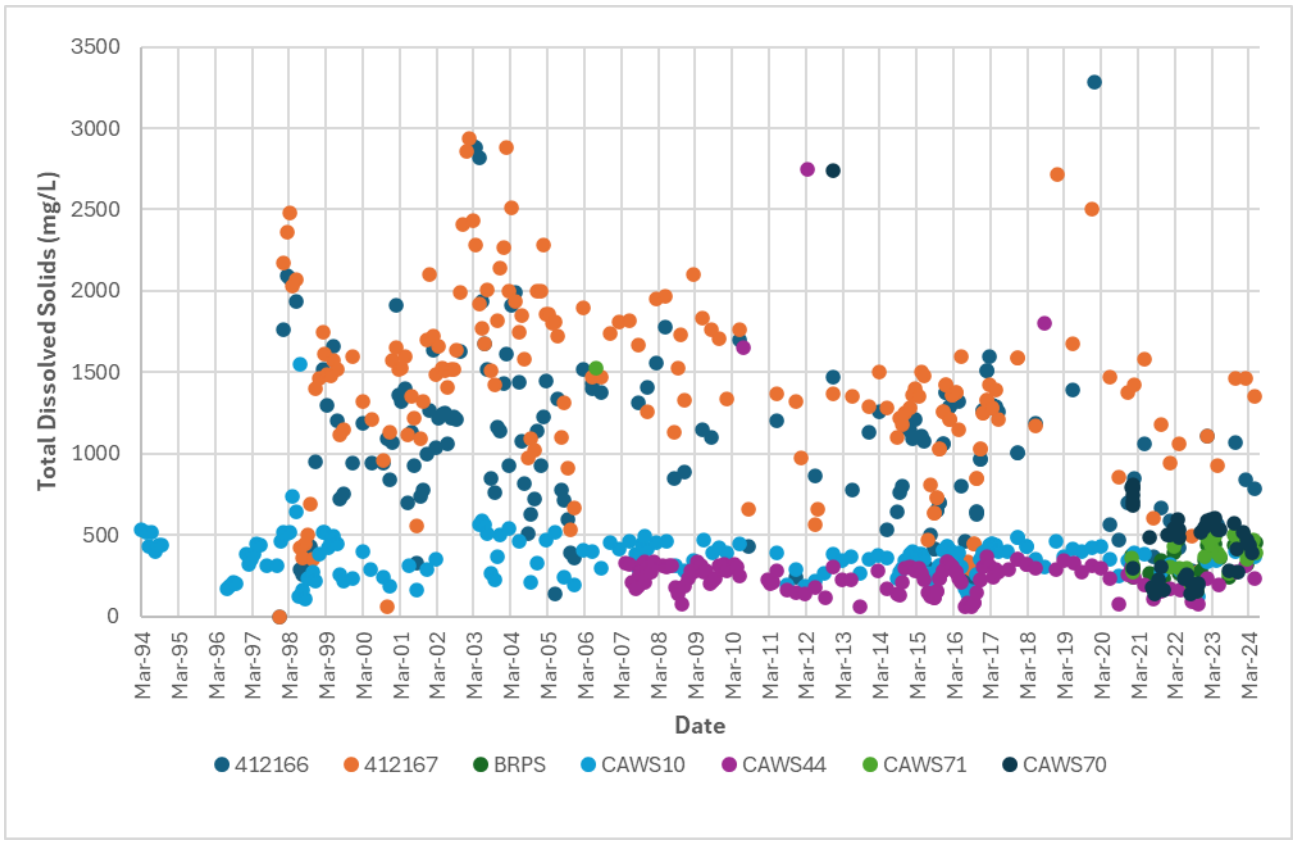
B.10 Receiving Environment

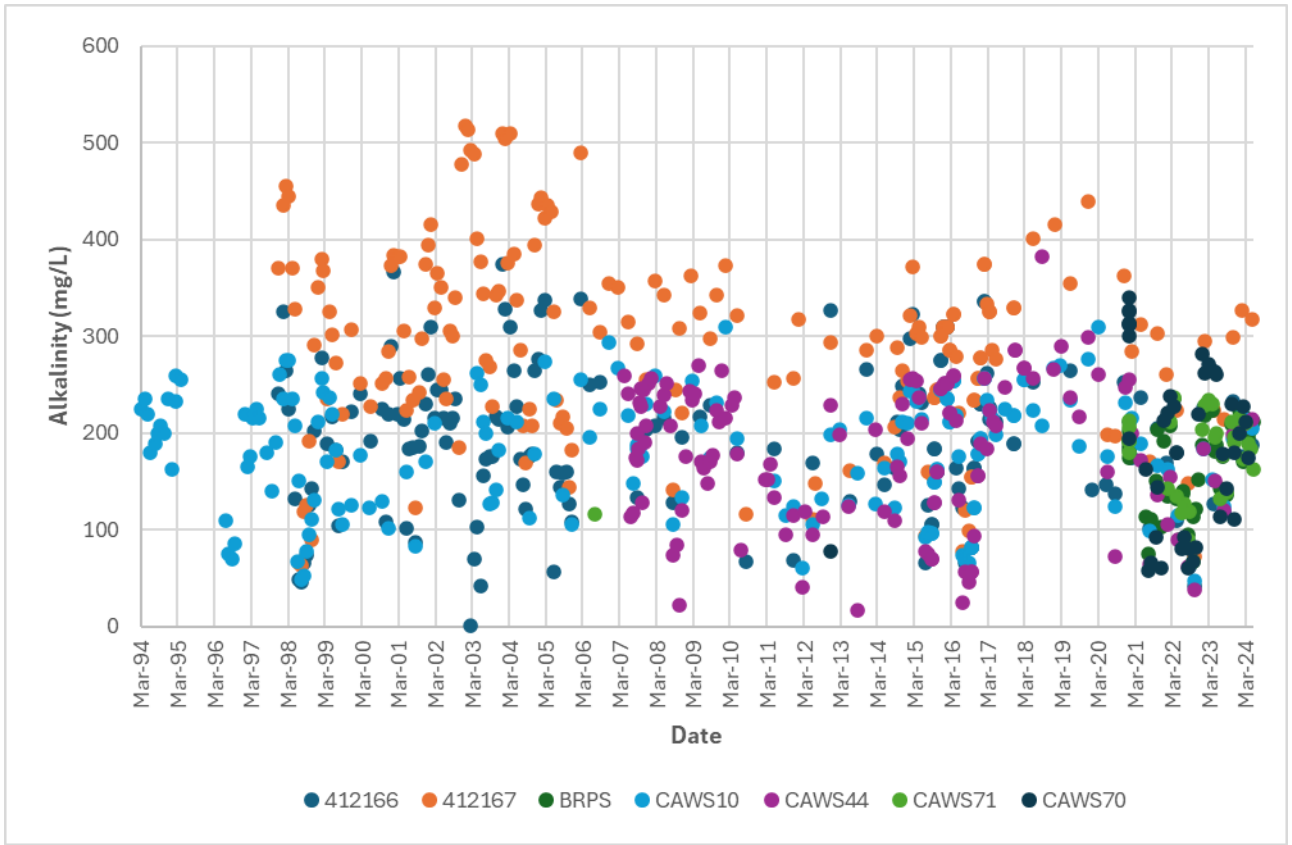
B.10.1 Physiochemical Parameters

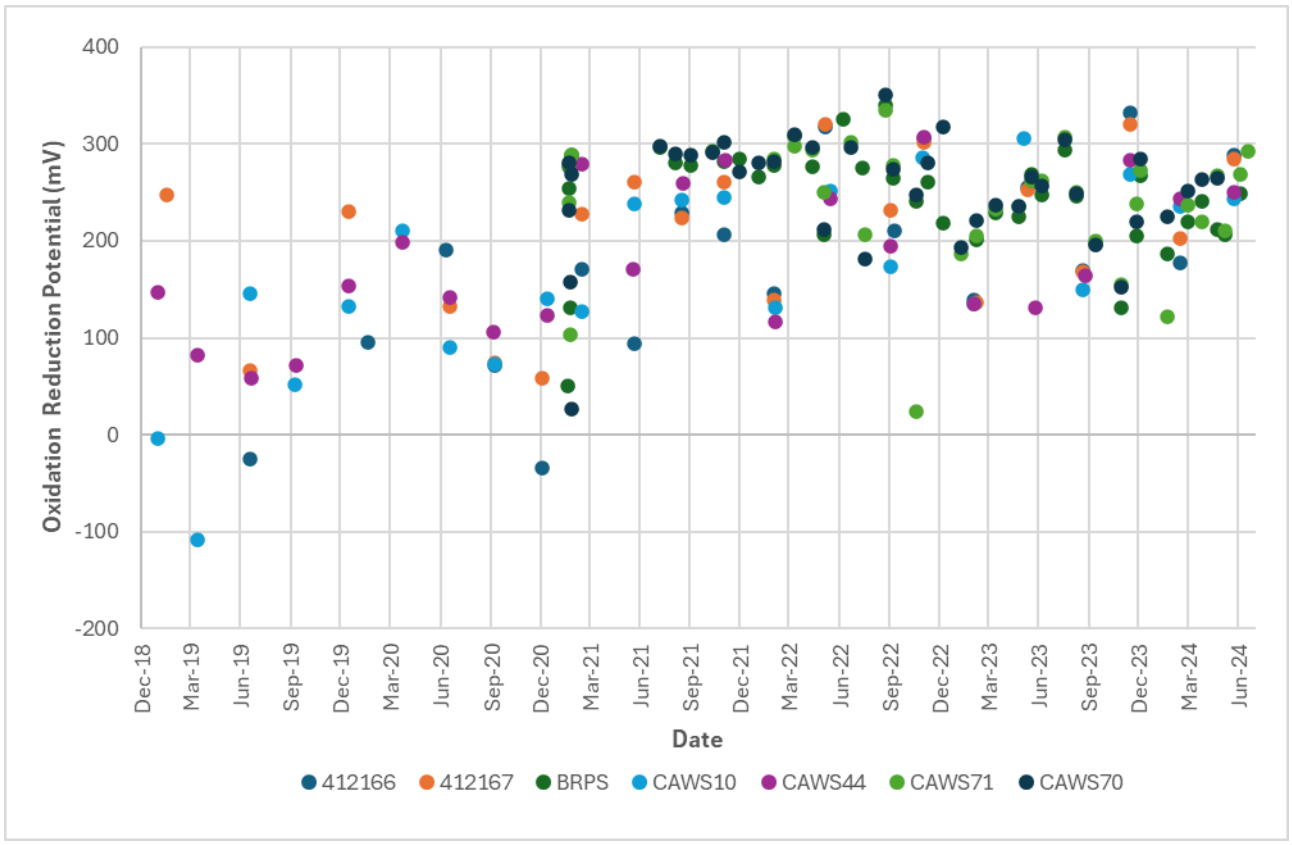



Electrical Conductivity (µS/cm)
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

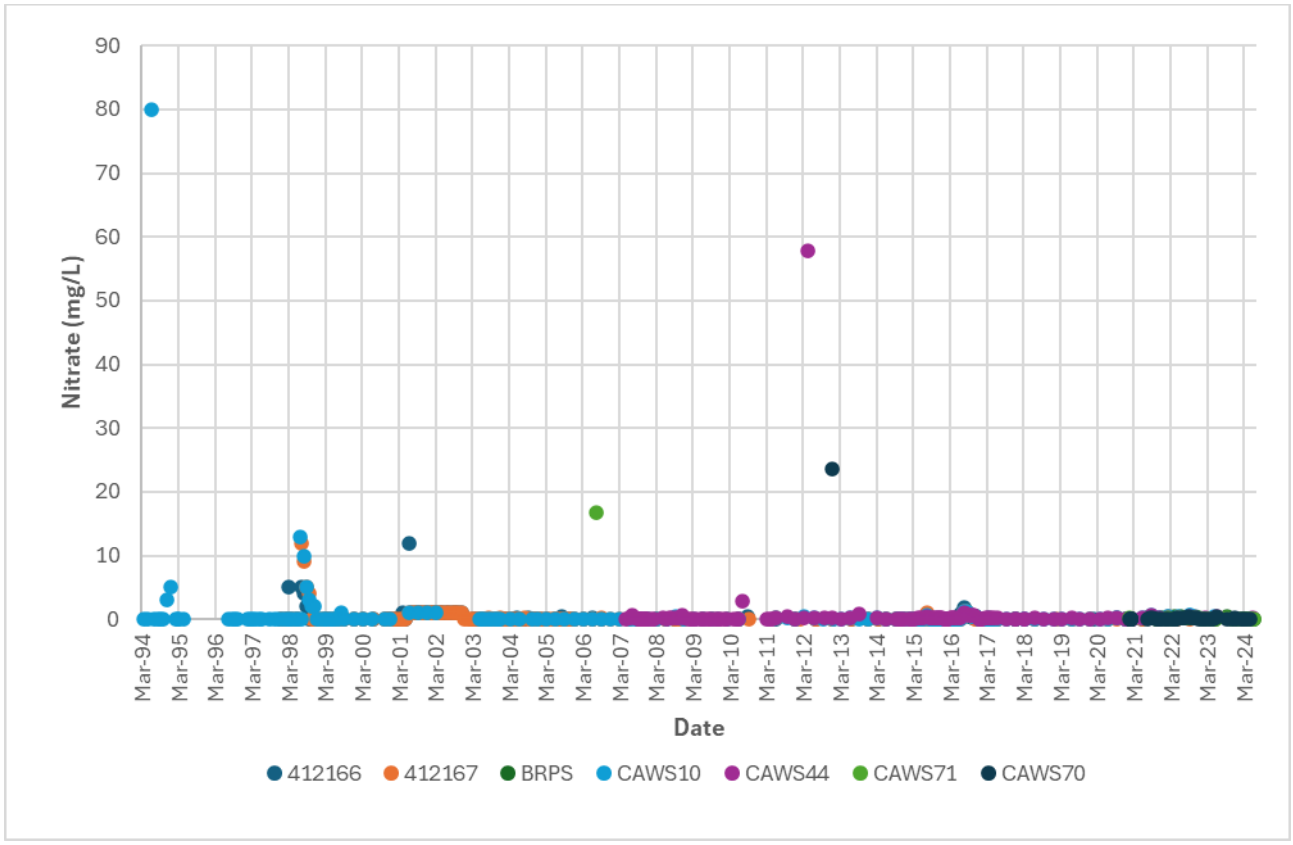

Total Suspended Solids (mg/L)
350
300
250
200
150
100
50
0
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

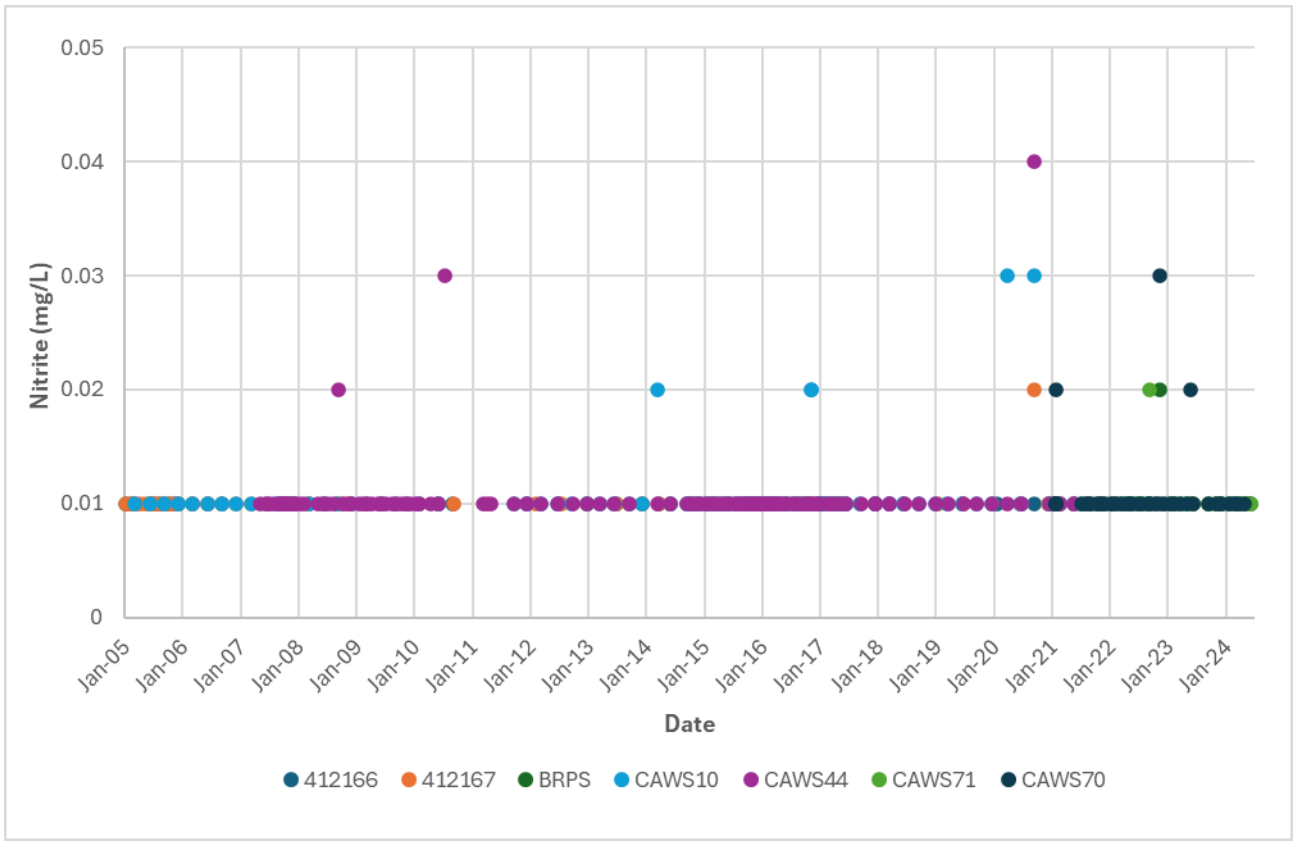

Total Dissolved Solids (mg/L)
3500
3000
2500
2000
1500
1000
500
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

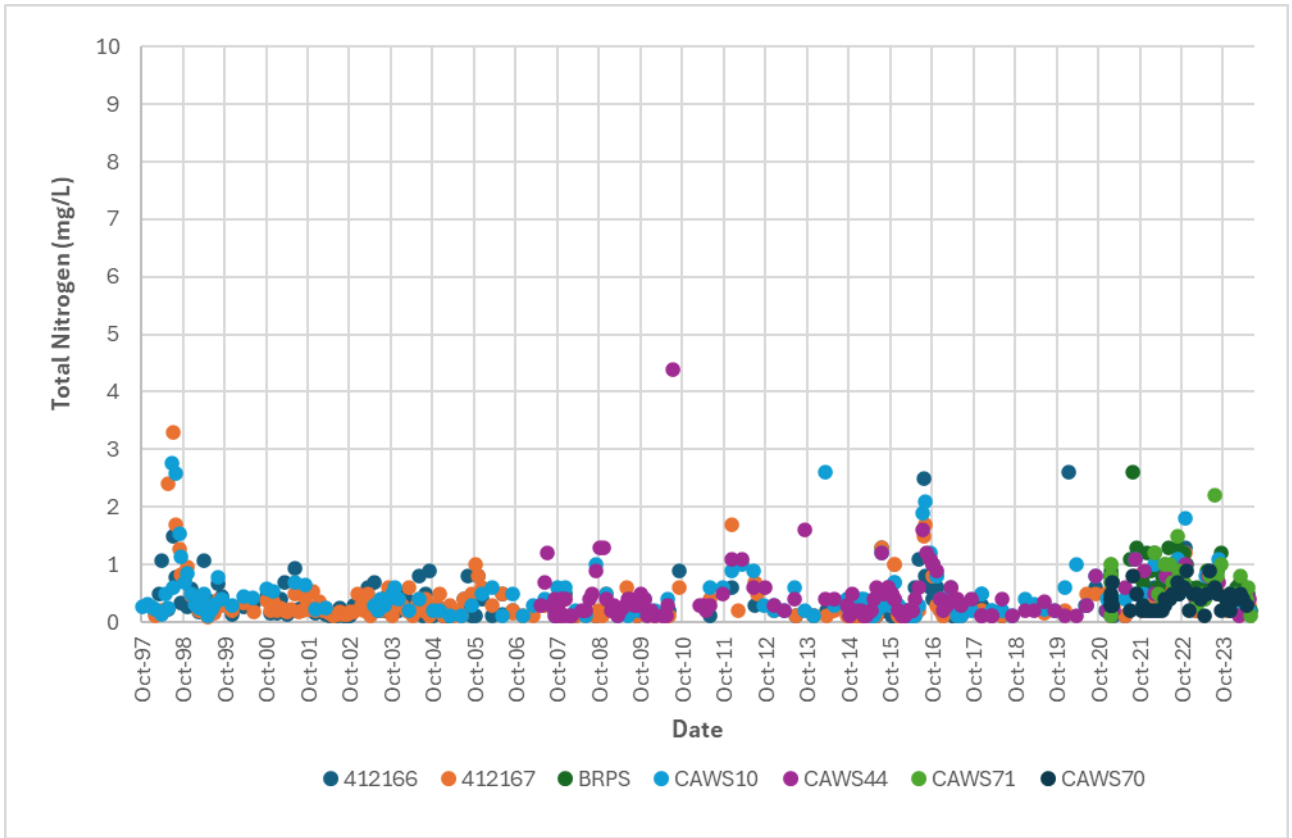

Alkalinity (mg/L)
600
500
400
300
200
100
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22
Mar-23
Mar-24
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

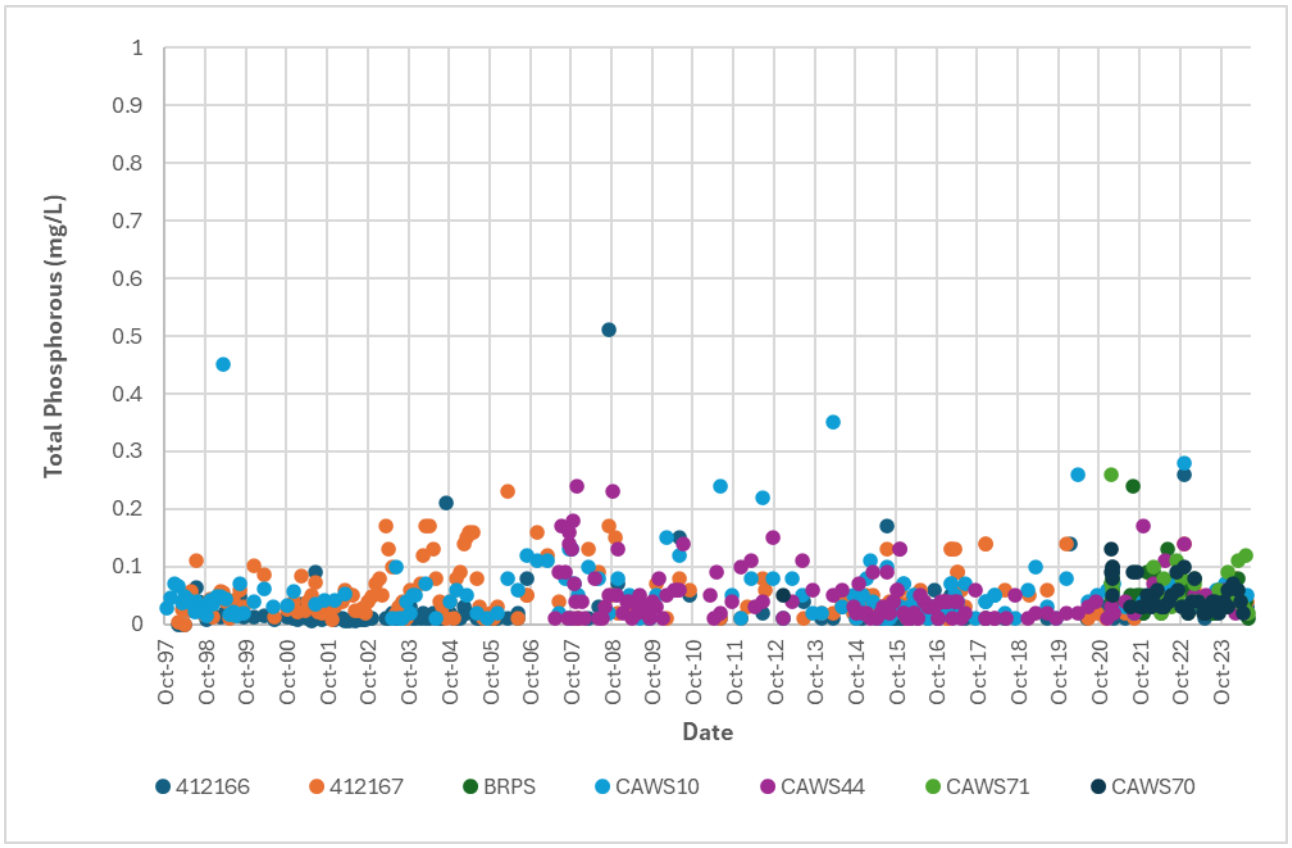


B.10.2 Nutrients

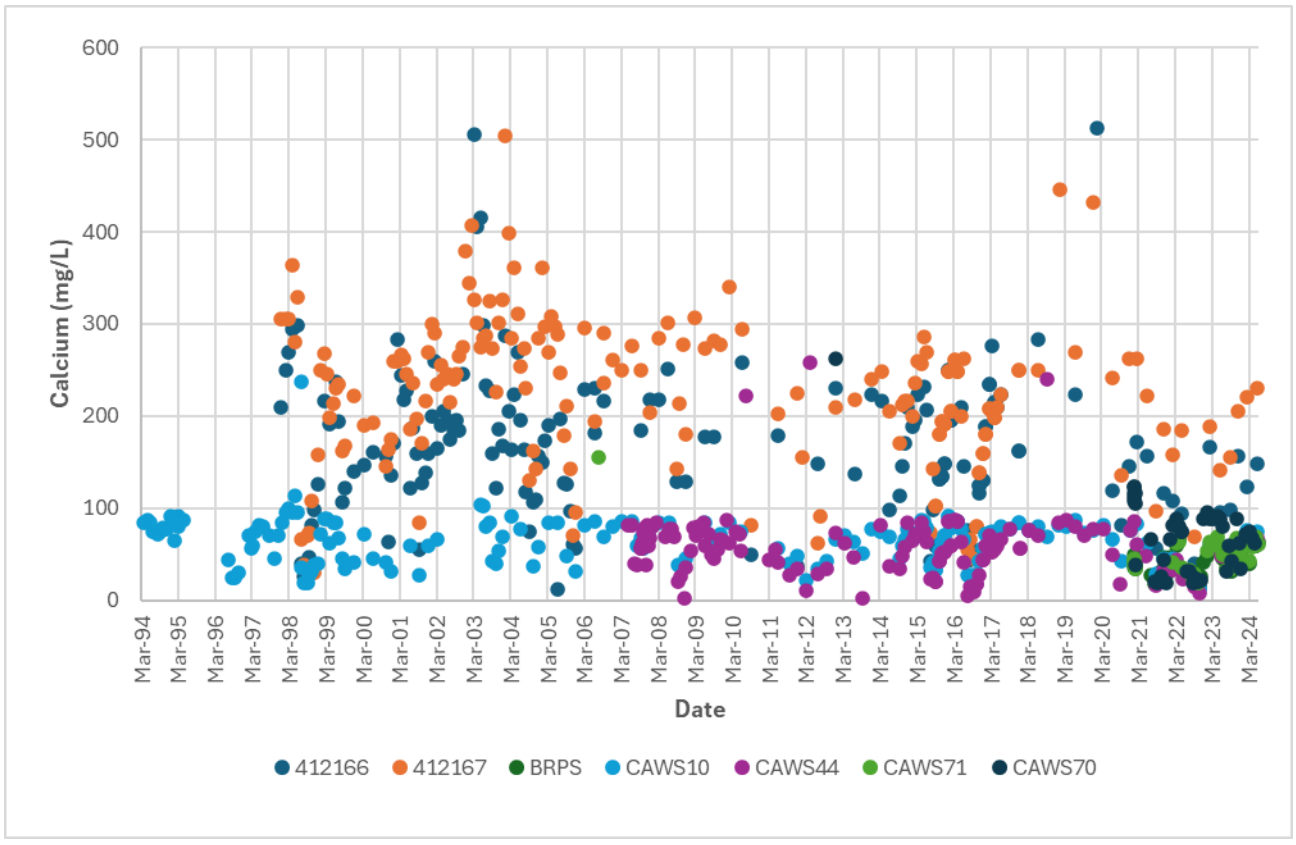


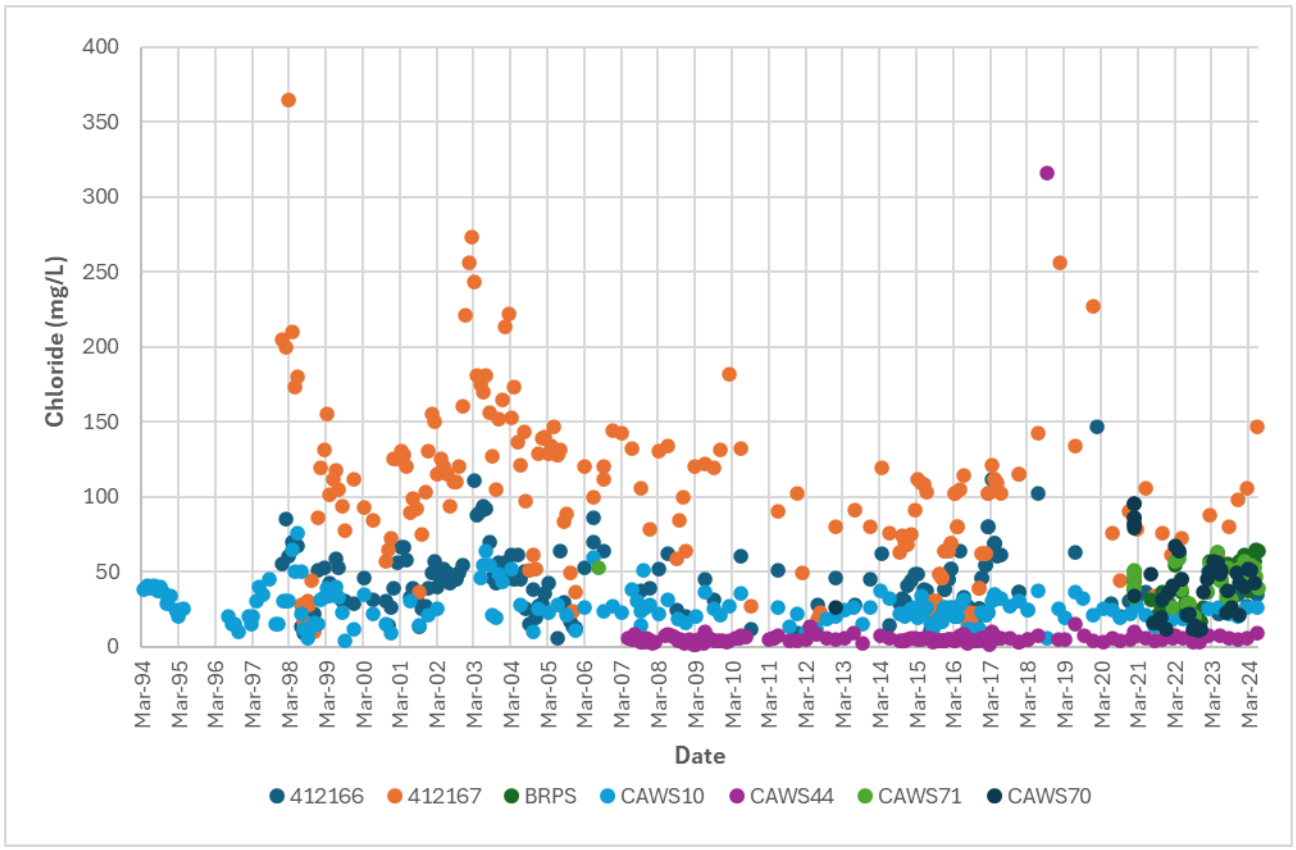

0.05
0.04
0.03
0.02
0.01
0
Nitrite (mg/L)
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

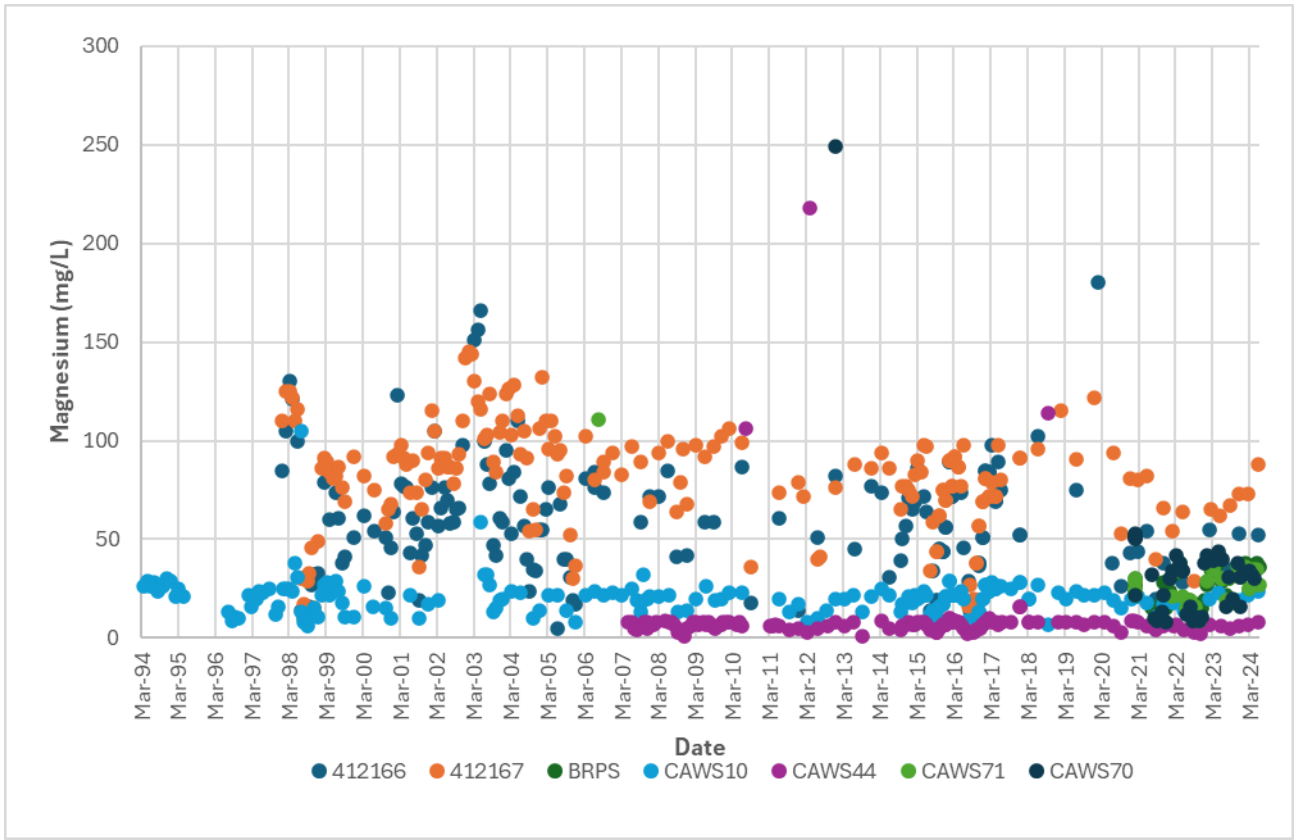

10
9
8
7
6
5
4
3
2
1
0
Total Nitrogen (mg/L)
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
Oct-20
Oct-21
Oct-22
Oct-23
Date
412166
412167
BRPS
CAWS10
CAWS44
CAWS71
CAWS70

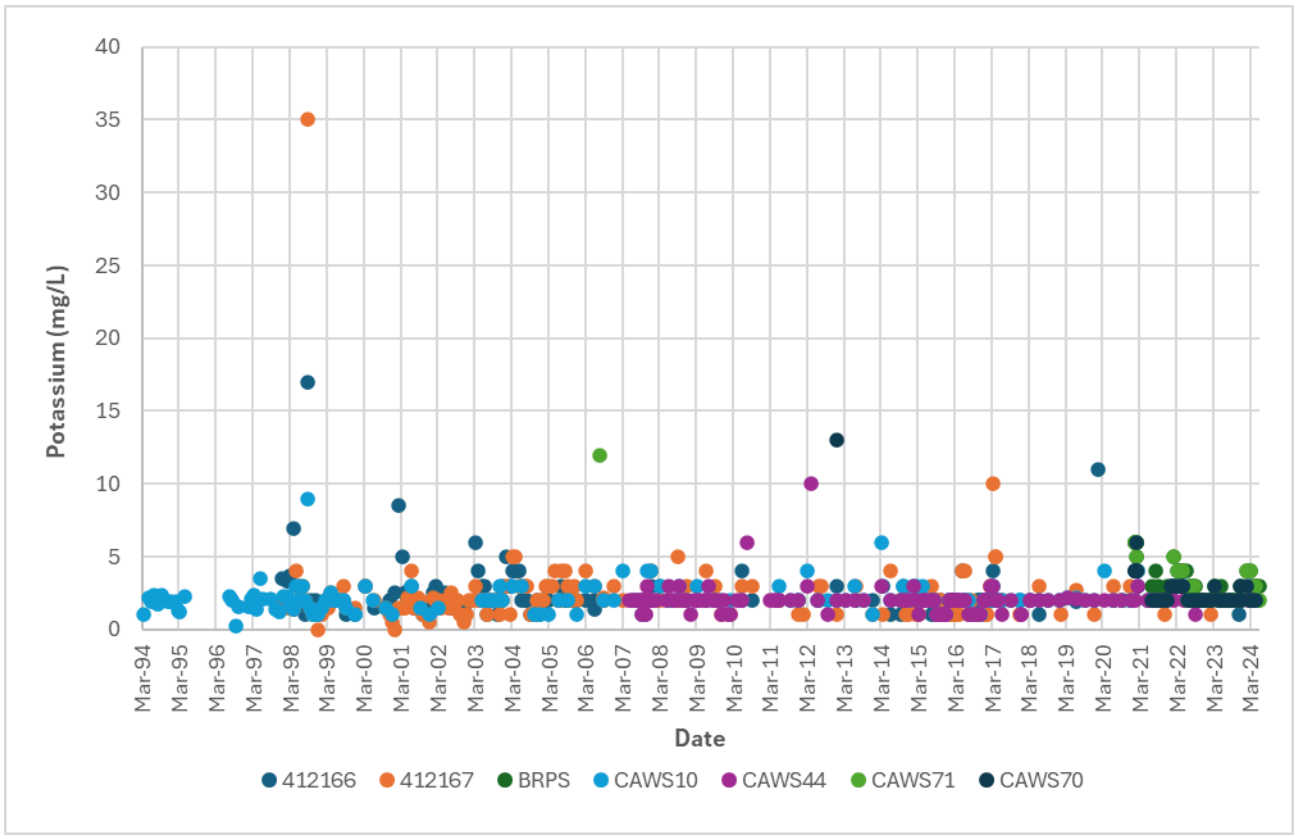


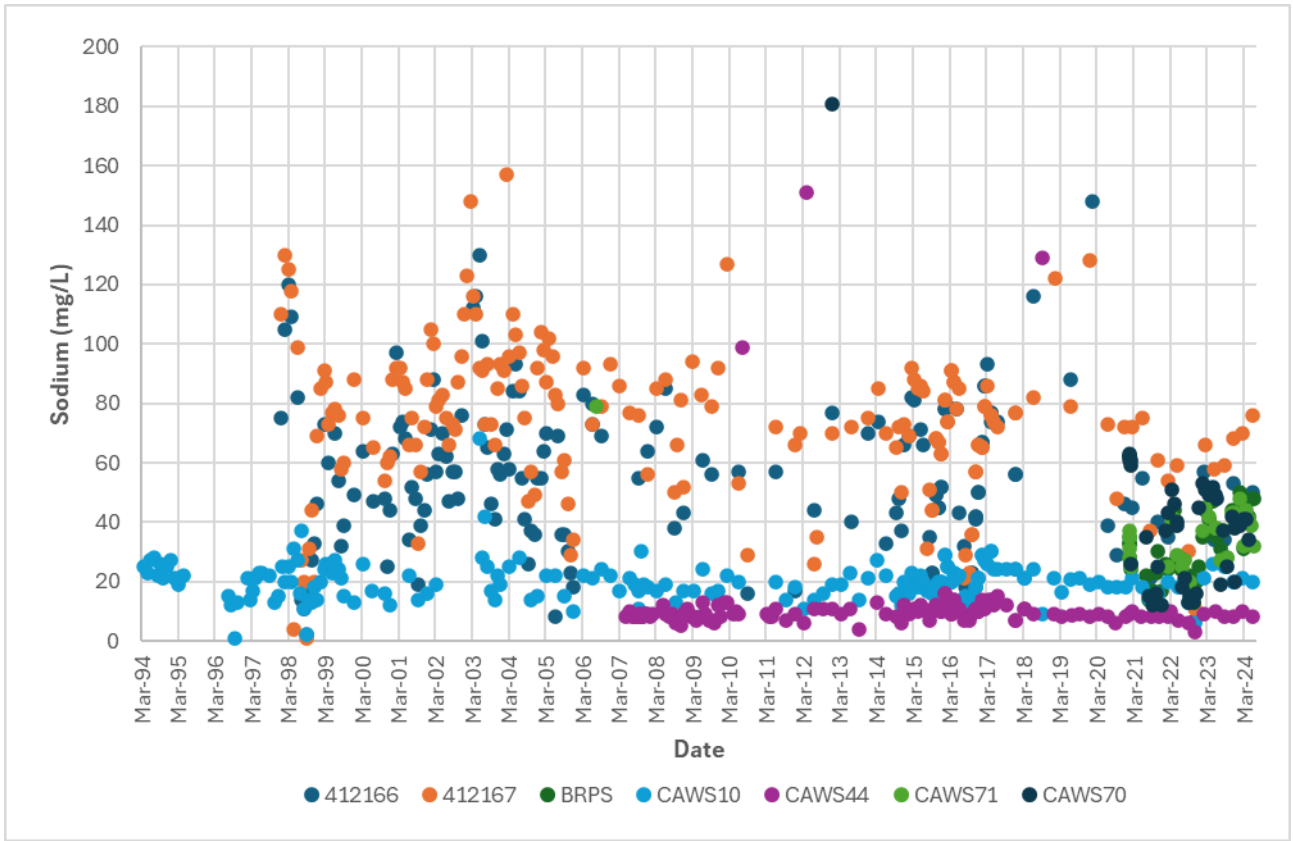
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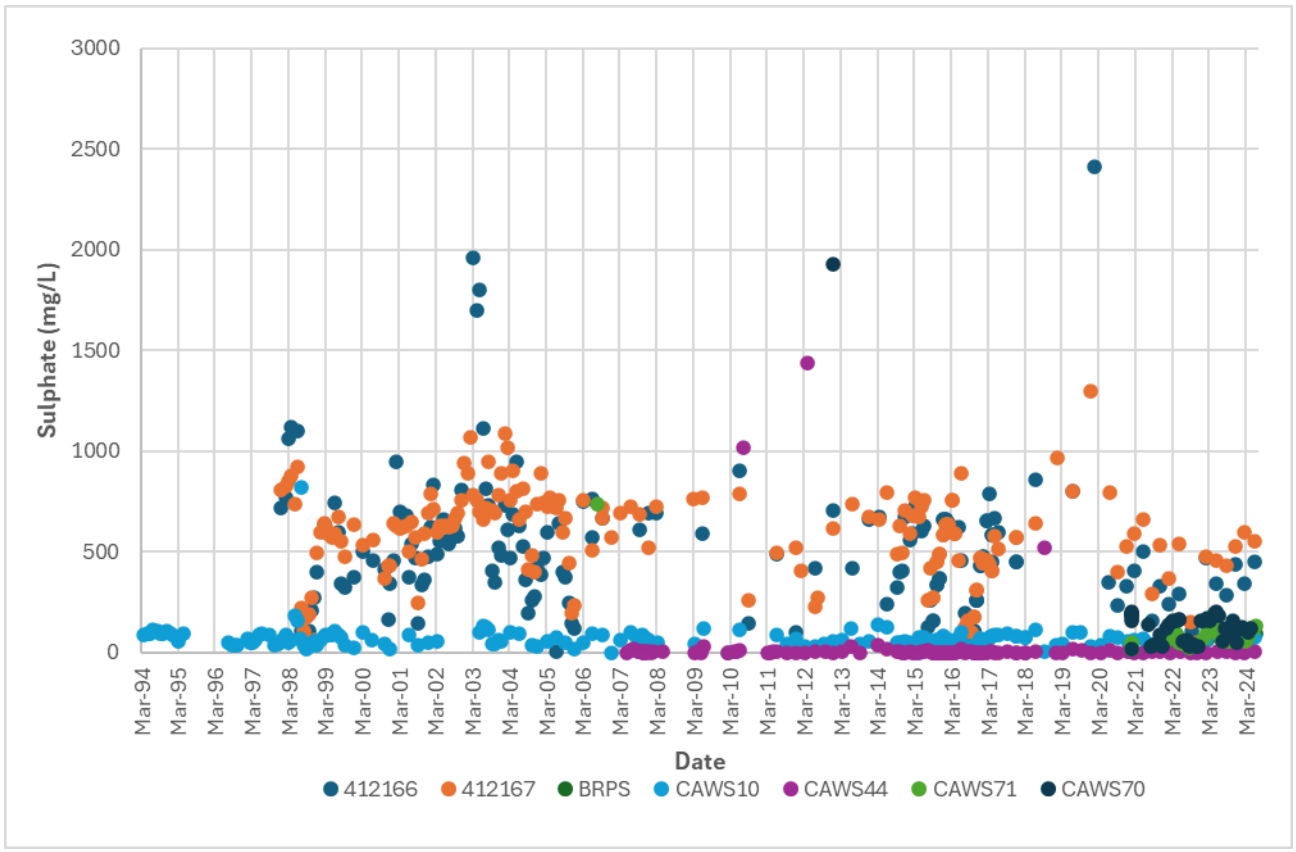



Chloride (mg/L)
400
350
300
250
200
150
100
50
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
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CAWS70

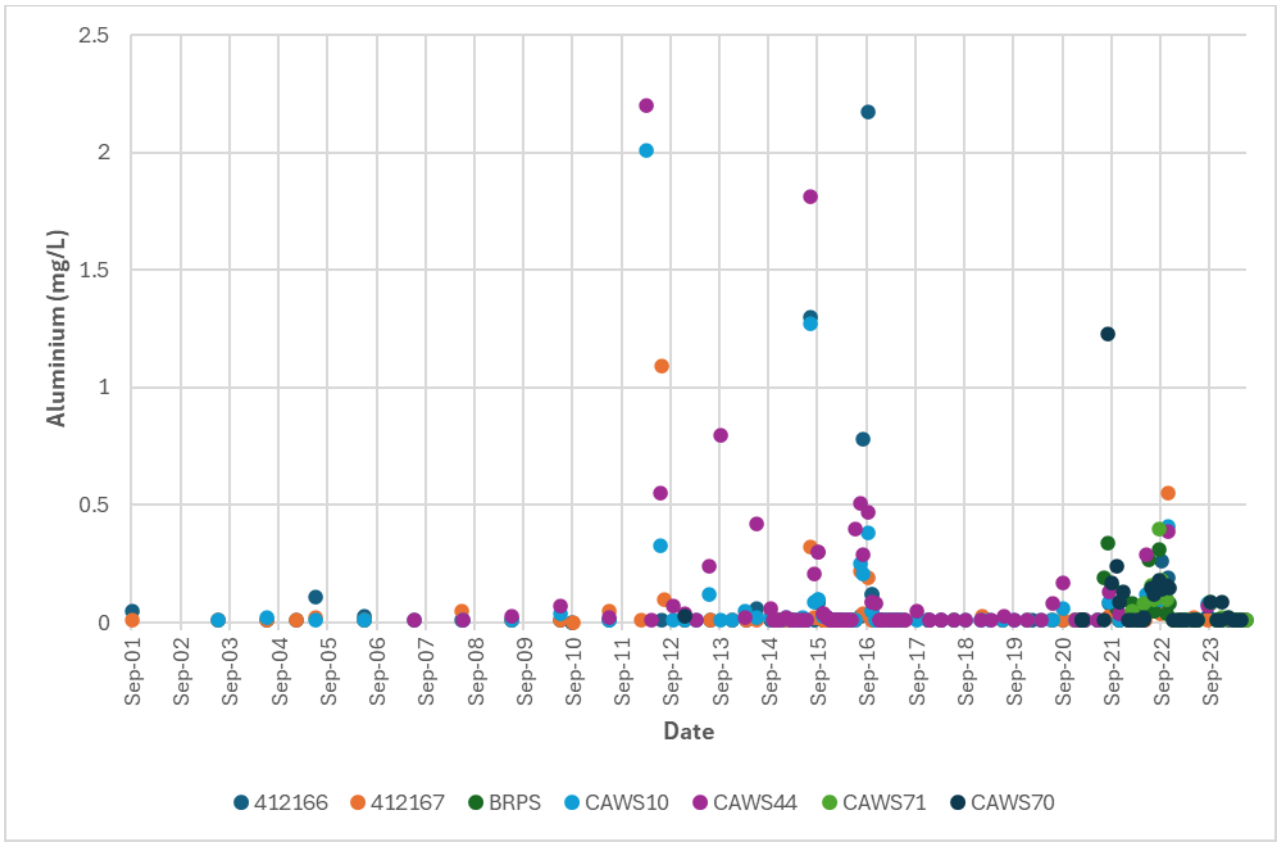

Magnesium (mg/L)
300
250
200
150
100
50
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
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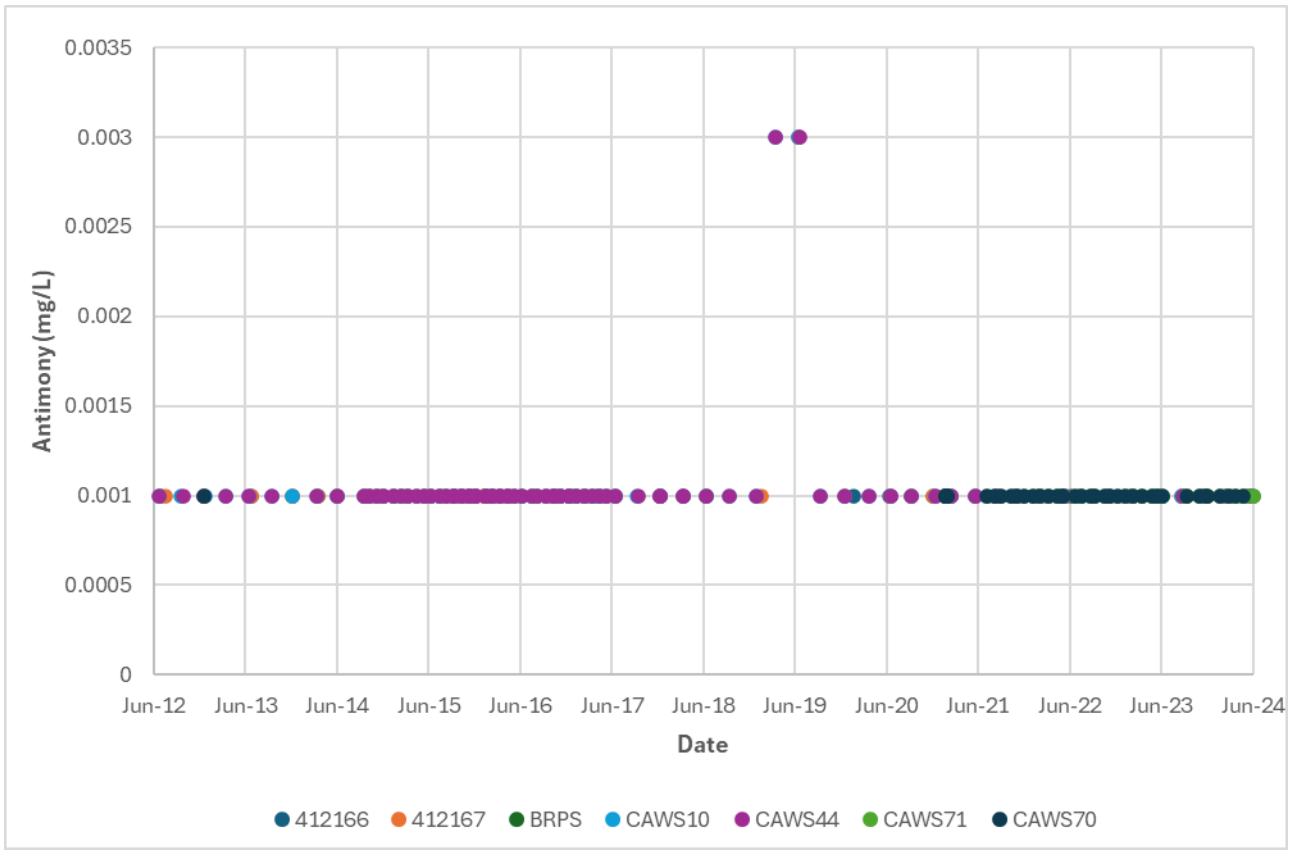

Potassium (mg/L)
40
35
30
25
20
15
10
5
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
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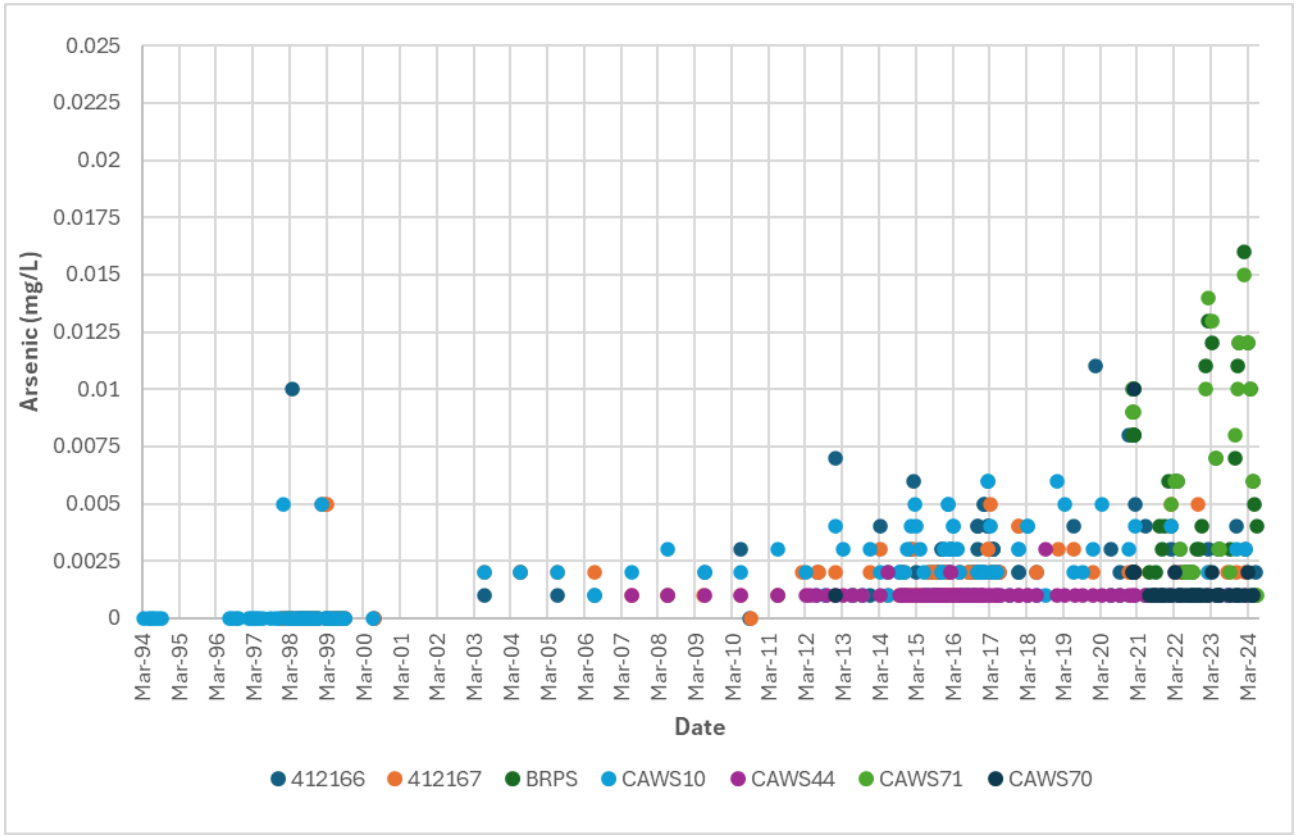

Sodium (mg/L)
200
180
160
140
120
100
80
60
40
20
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
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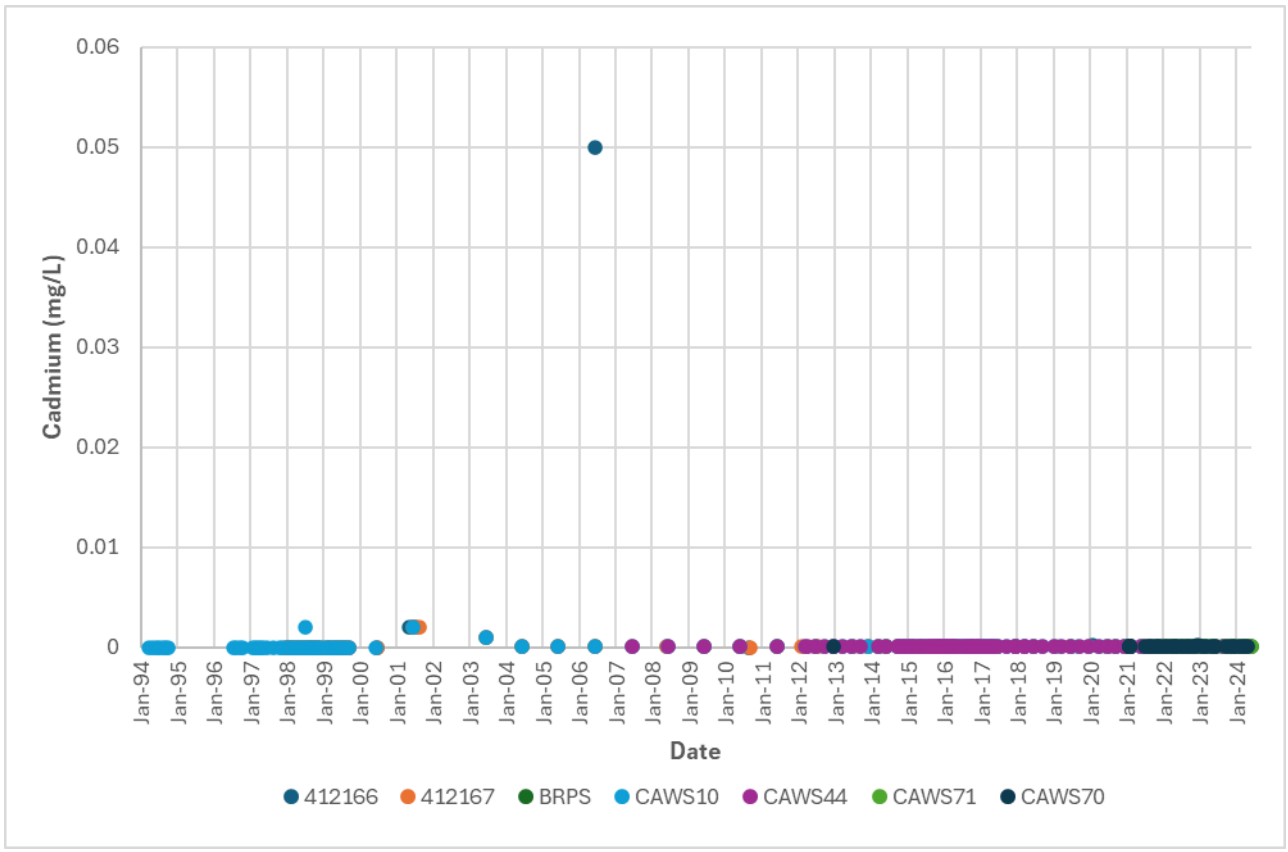


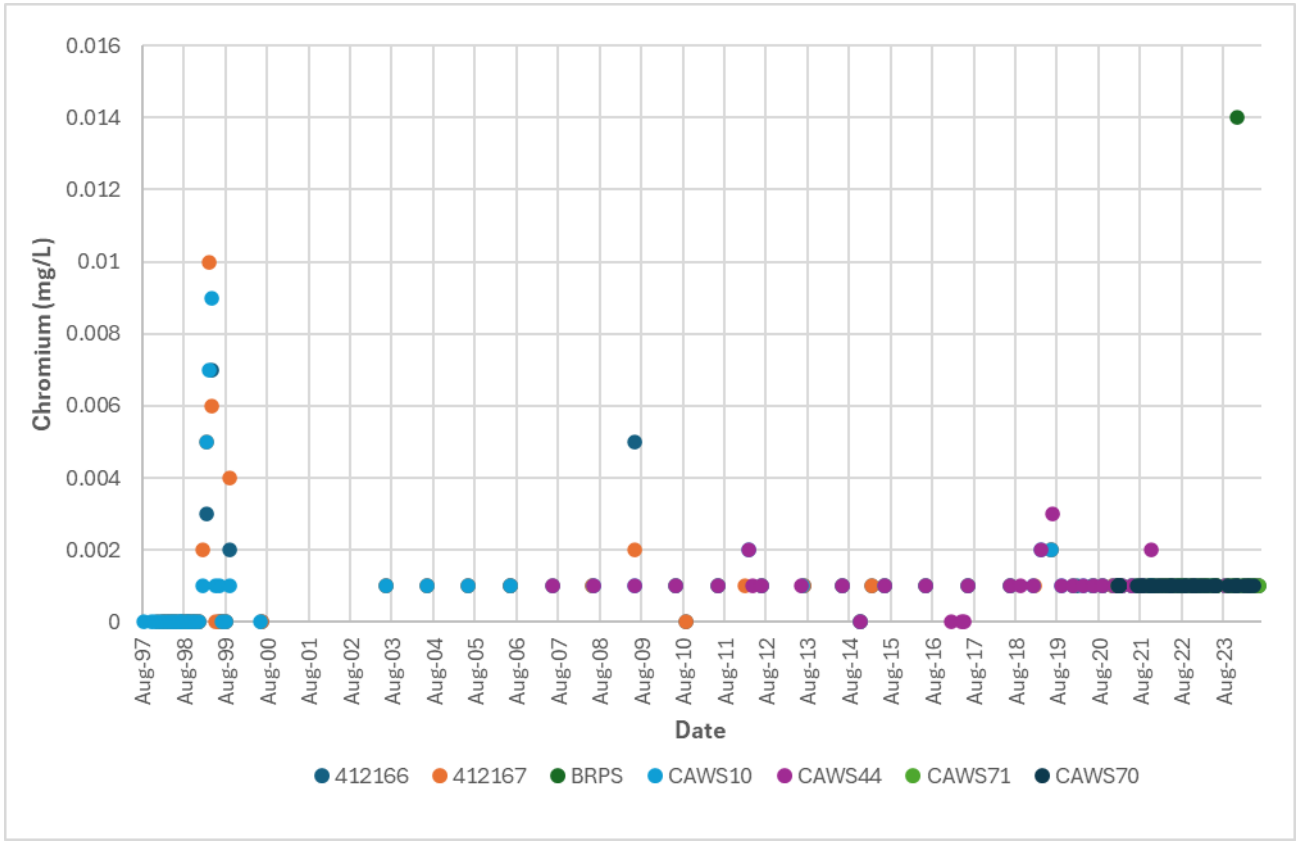
B.10.4 Dissolved Metals

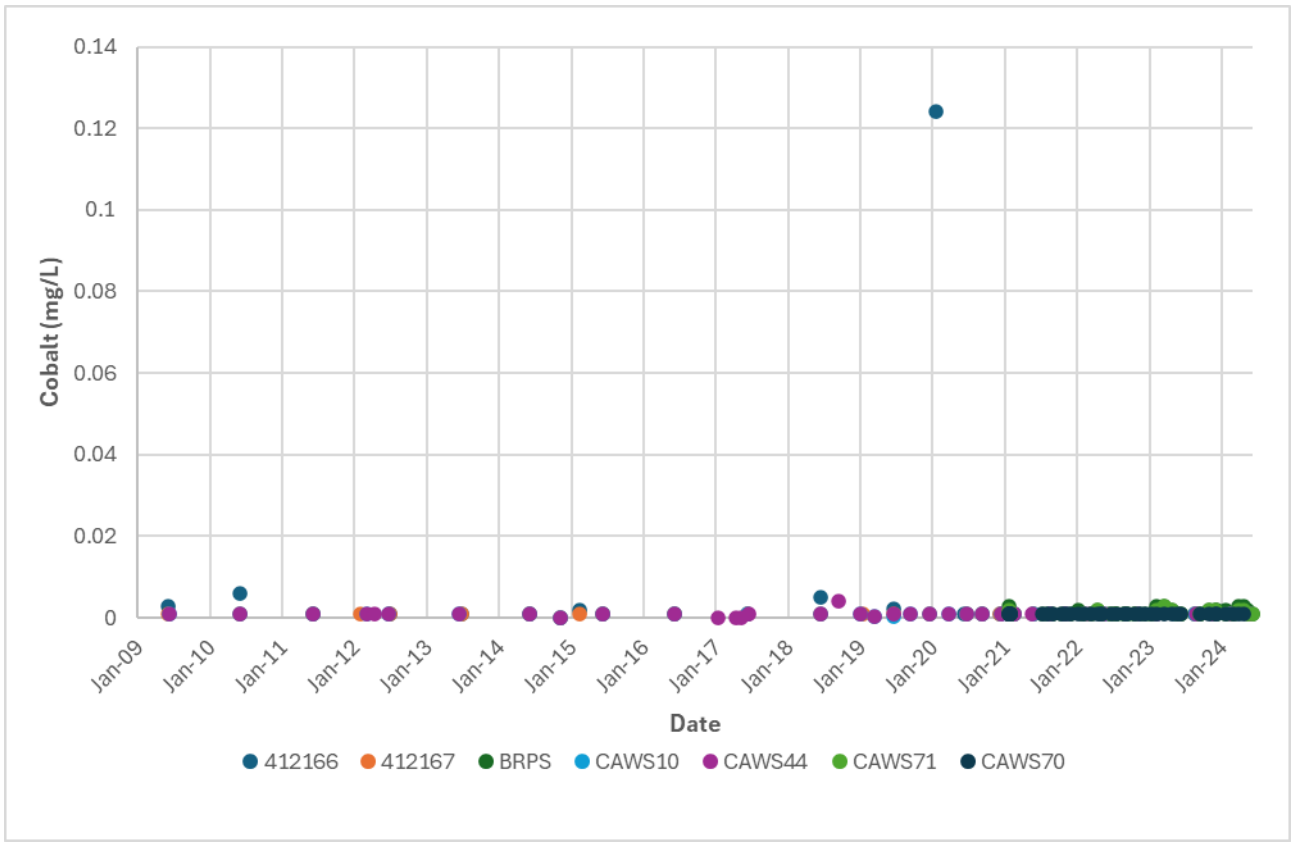


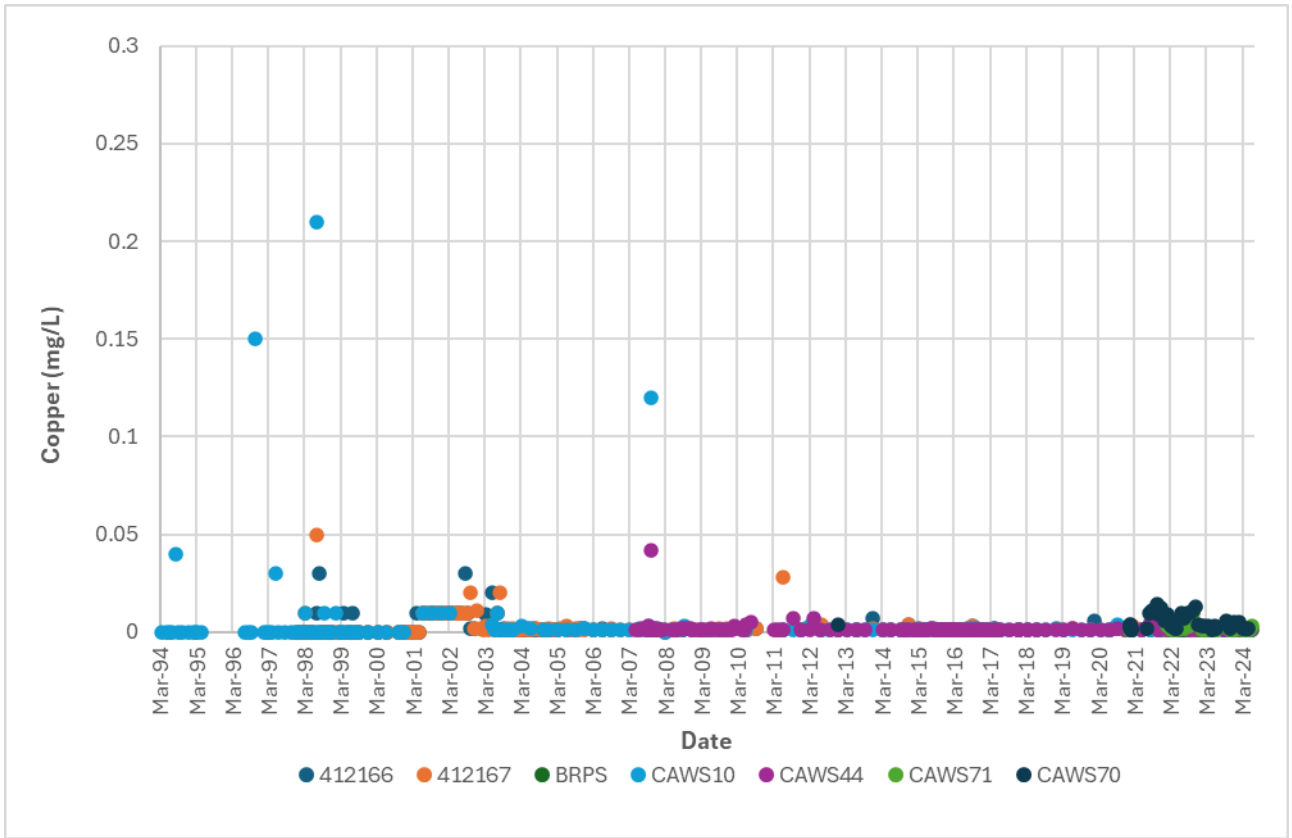

0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Antimony (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
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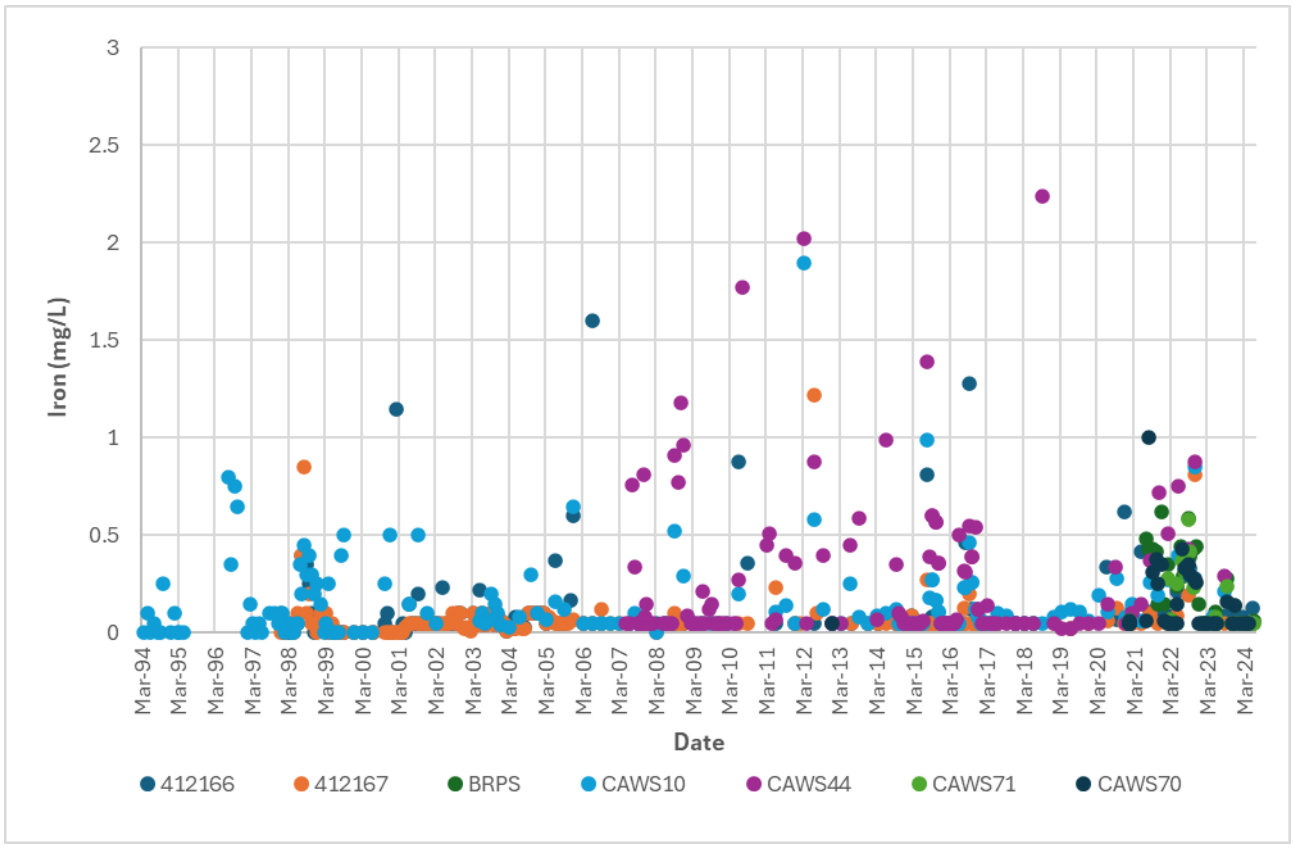

0.025
0.0225
0.02
0.0175
0.015
0.0125
0.01
0.0075
0.005
0.0025
0
Arsenic (mg/L)
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
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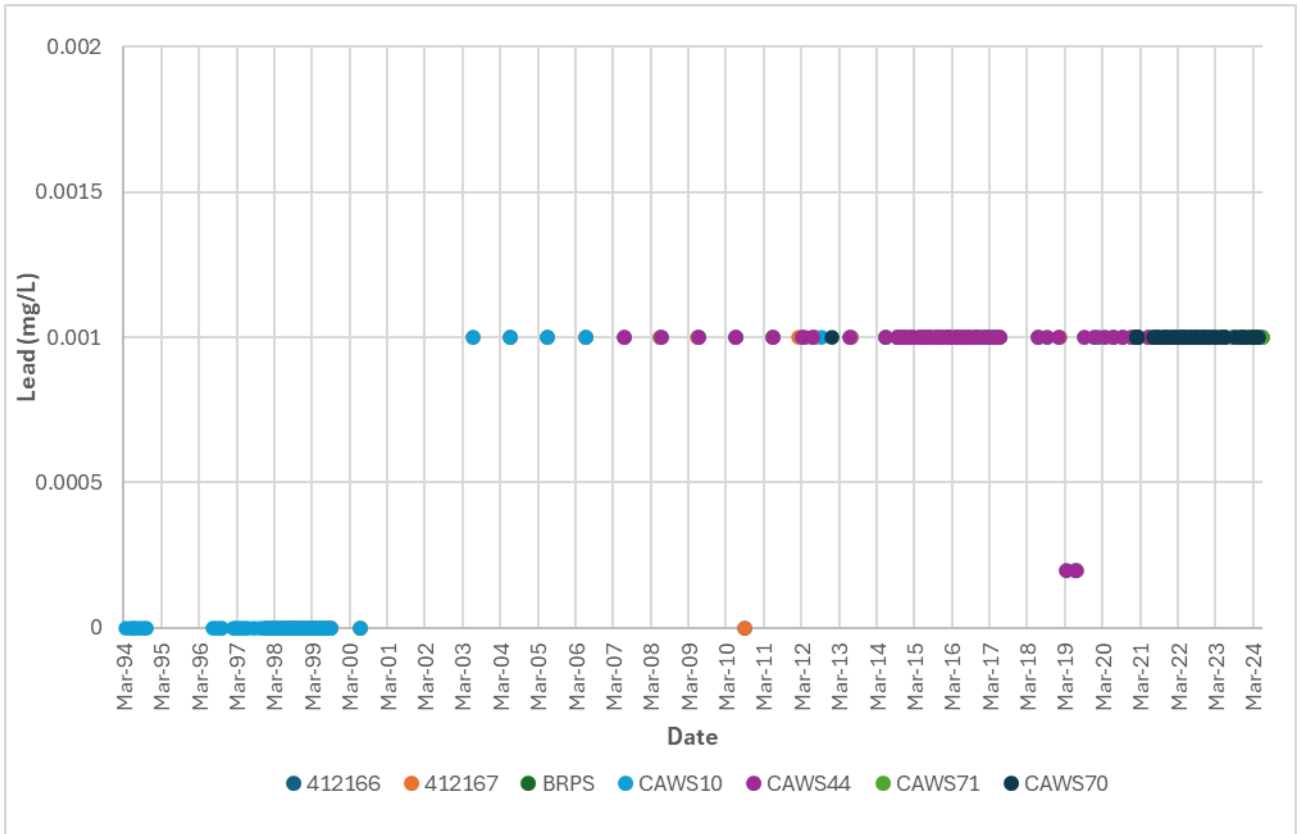

0.06
0.05
0.04
0.03
0.02
0.01
0
Cadmium (mg/L)
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
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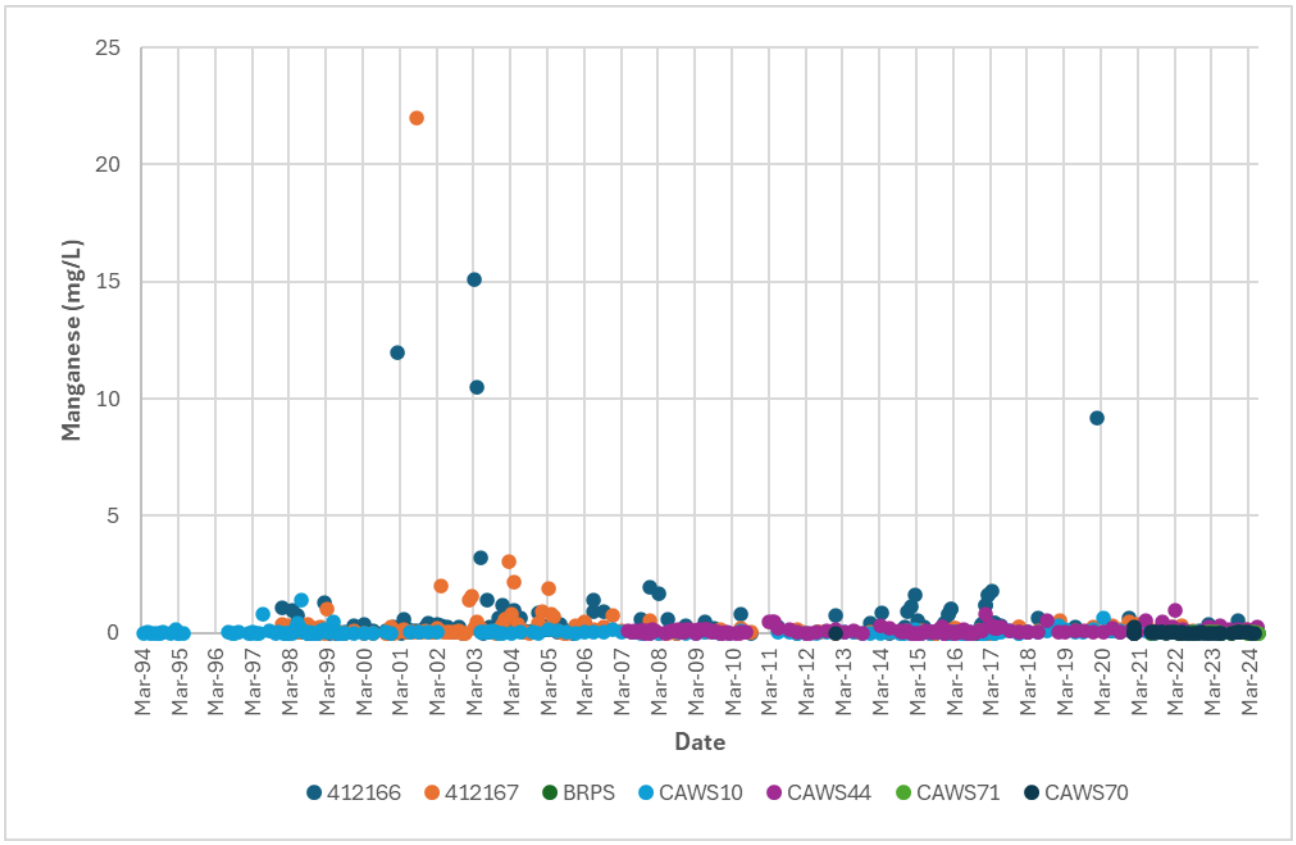

0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Chromium (mg/L)
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
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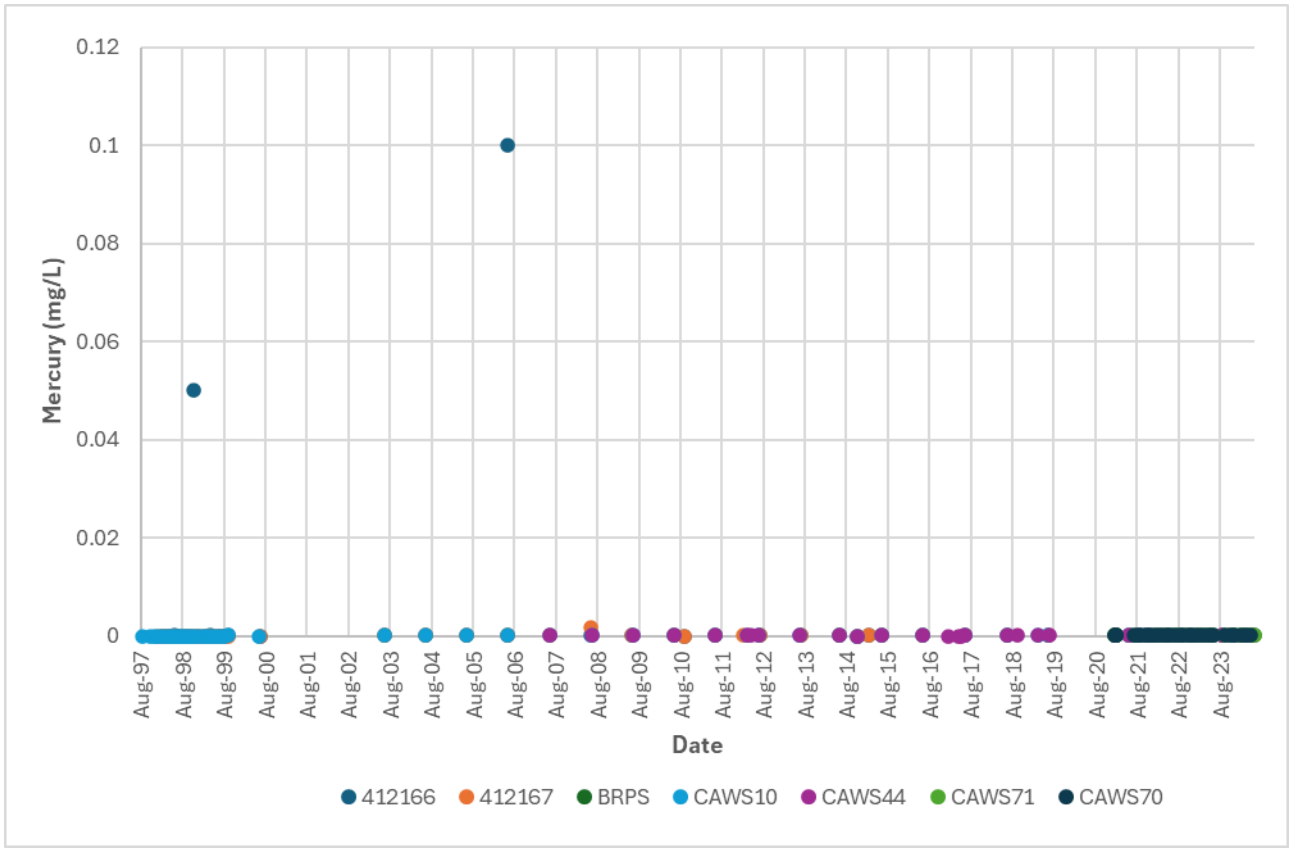

0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Cobalt (mg/L)
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
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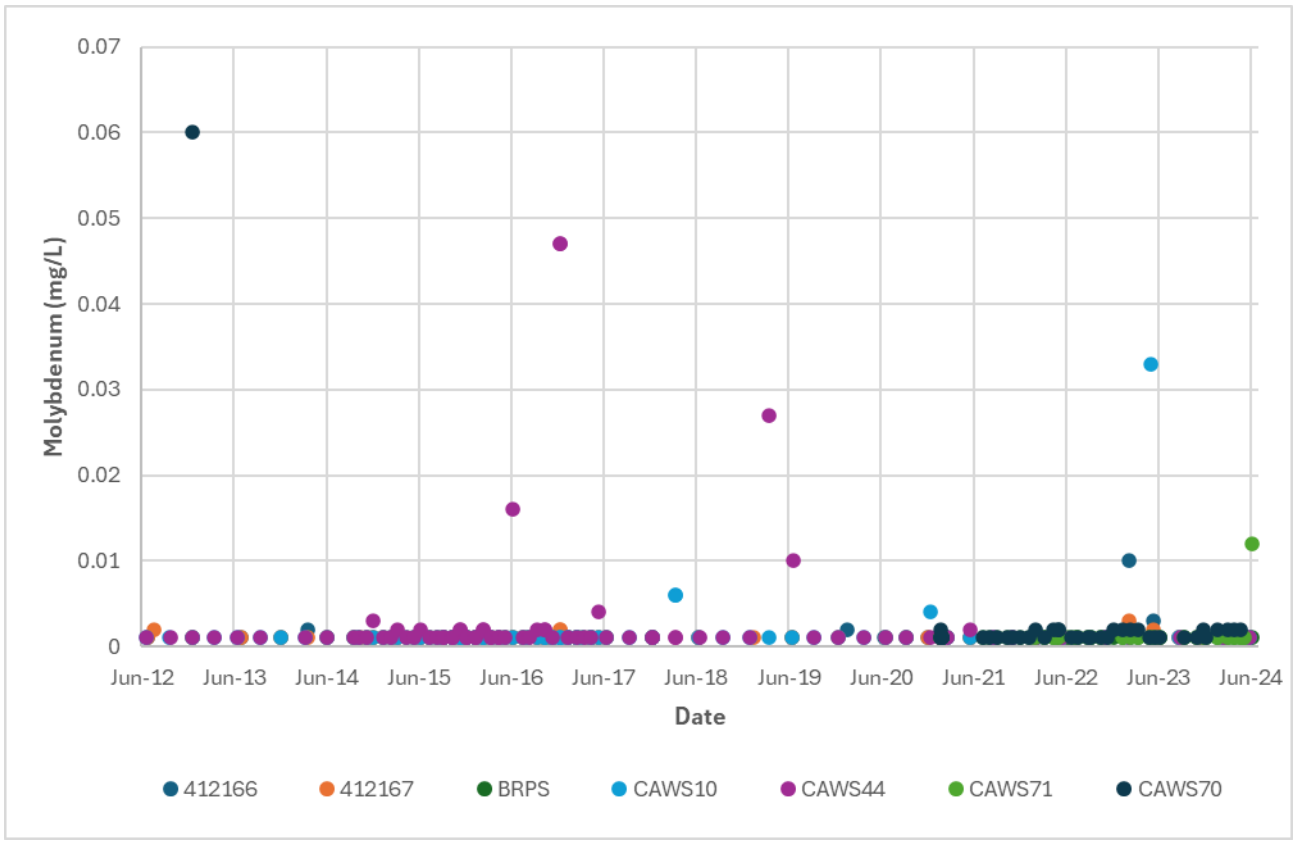

0.3
0.25
0.2
0.15
0.1
0.05
0
Copper (mg/L)
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
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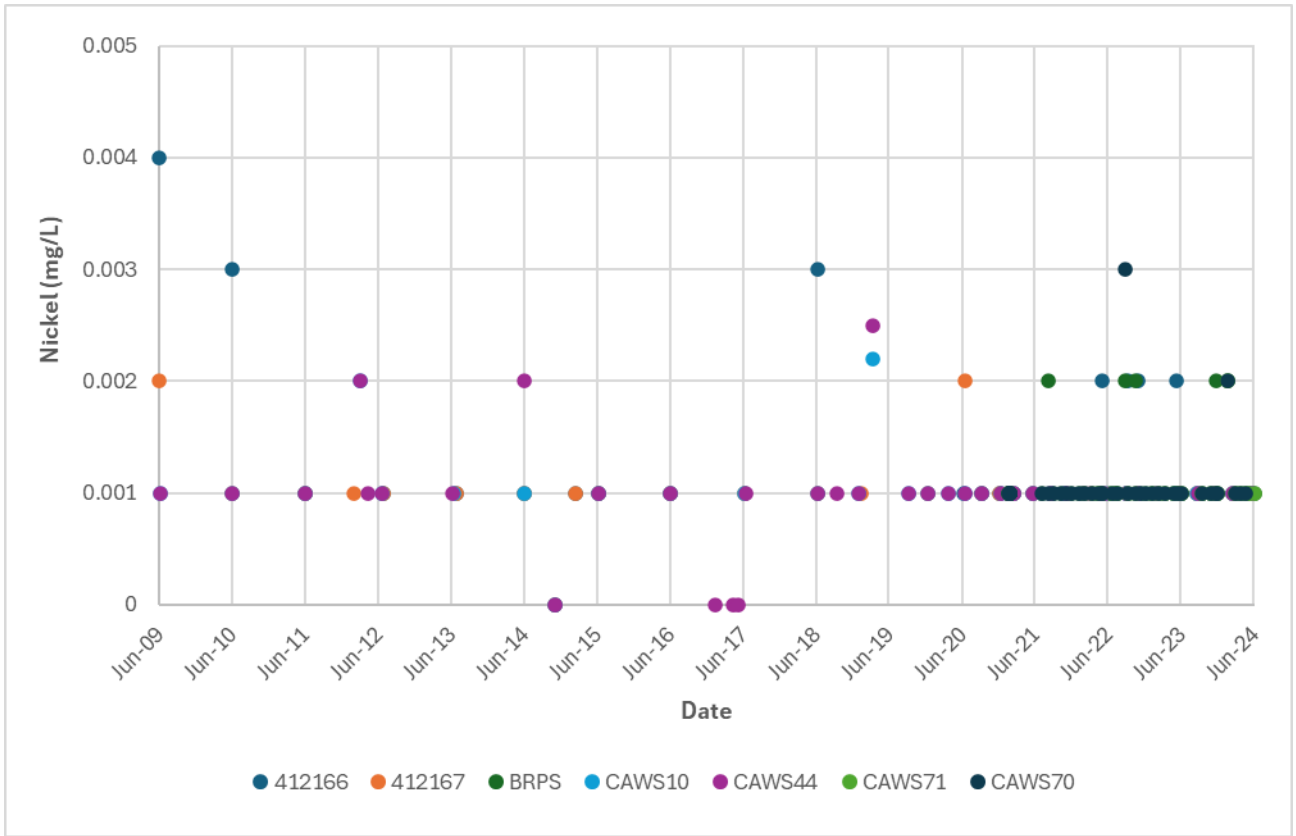

Iron (mg/L)
3
2.5
2
1.5
1
0.5
0
Mar-94 Mar-95 Mar-96 Mar-97 Mar-98 Mar-99 Mar-00 Mar-01 Mar-02 Mar-03 Mar-04 Mar-05 Mar-06 Mar-07 Mar-08 Mar-09 Mar-10 Mar-11 Mar-12 Mar-13 Mar-14 Mar-15 Mar-16 Mar-17 Mar-18 Mar-19 Mar-20 Mar-21 Mar-22 Mar-23 Mar-24
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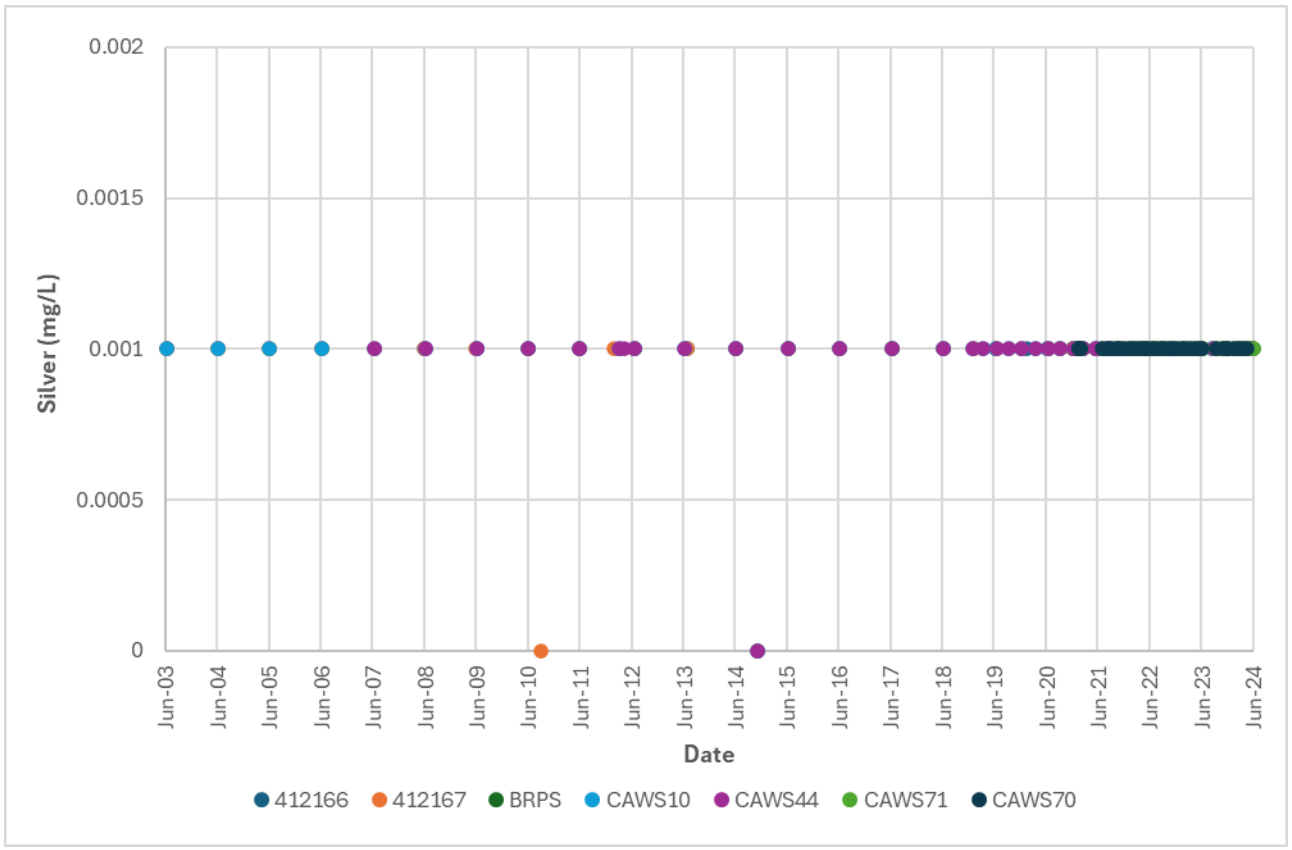

Lead (mg/L)
0.002
0.0015
0.001
0.0005
0
Mar-94 Mar-95 Mar-96 Mar-97 Mar-98 Mar-99 Mar-00 Mar-01 Mar-02 Mar-03 Mar-04 Mar-05 Mar-06 Mar-07 Mar-08 Mar-09 Mar-10 Mar-11 Mar-12 Mar-13 Mar-14 Mar-15 Mar-16 Mar-17 Mar-18 Mar-19 Mar-20 Mar-21 Mar-22 Mar-23 Mar-24
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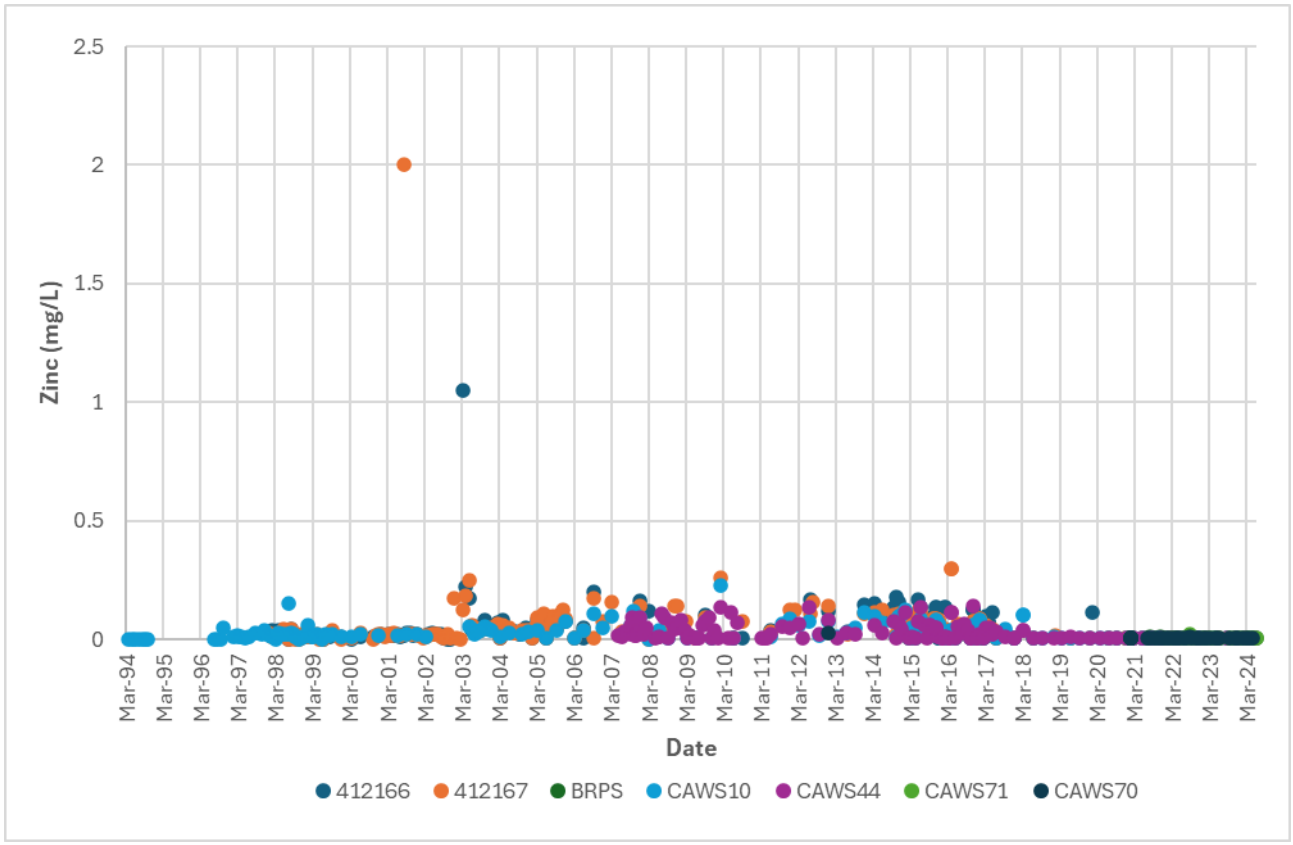

Manganese (mg/L)
25
20
15
10
5
0
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
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Mar-22
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Mercury (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
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Aug-09
Aug-10
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Aug-19
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0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Molybdenum (mg/L)
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
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0.005
0.004
0.003
0.002
0.001
0
Nickel (mg/L)
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
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0.002
0.0015
0.001
0.0005
0
Silver (mg/L)
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
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2.5
2
1.5
1
0.5
0
Zinc (mg/L)
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
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APPENDIX 5 WATER BALANCE OUTPUTS

Table A5.1 – Water balance input and output statement

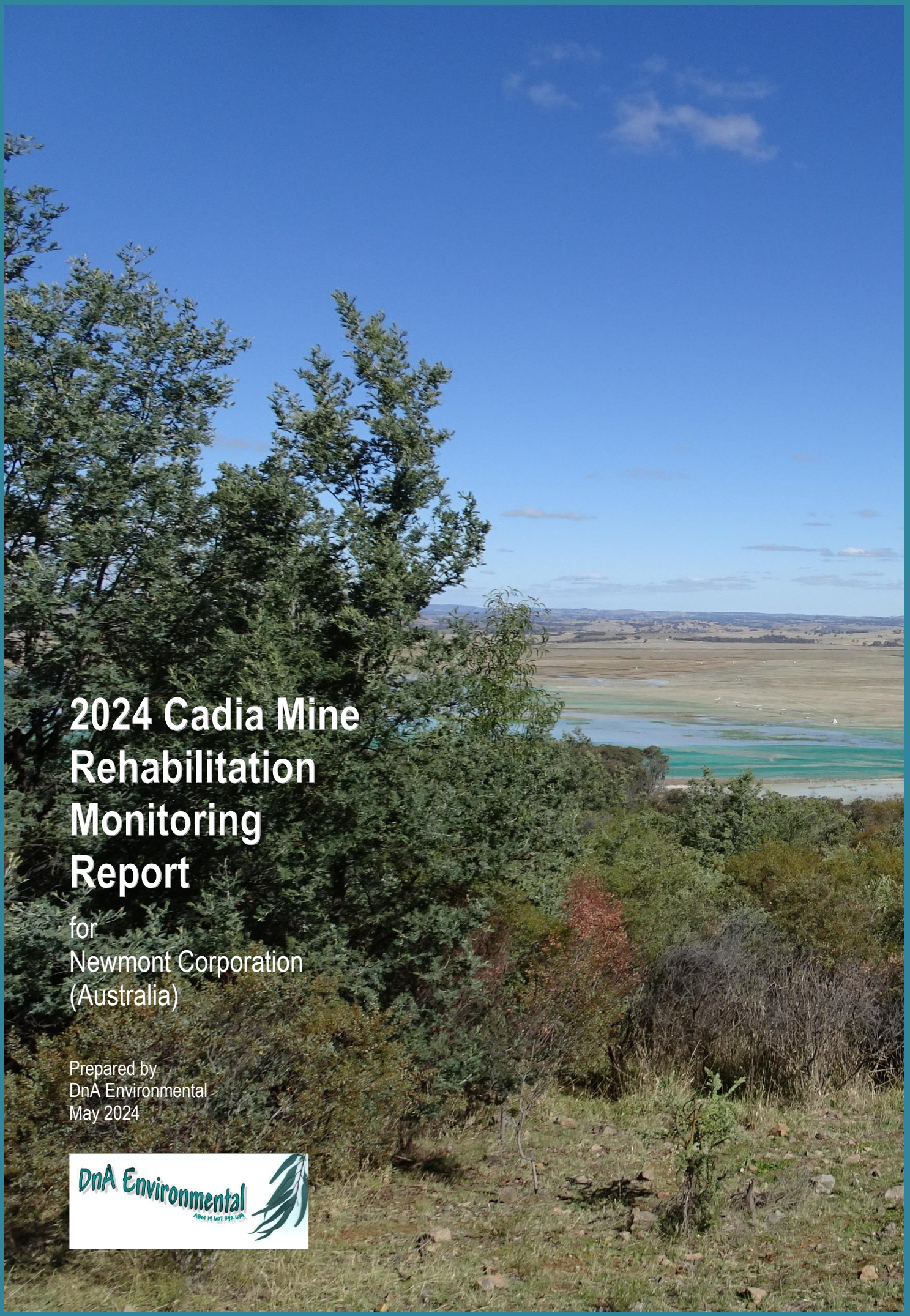
Water balance metrics	Outcome	Notes
Total inputs	9,089 ML	1
Total outputs	12,032 ML	2
Inputs minus outputs	-2,943 ML	-
Measured change in storage	-4,088 ML	2
Imbalance percentage	5.4%	3
Does input minus output equal change in storage?	Yes	4

Notes:
1: Modelled using calibrated GoldSim water balance model
2: Includes evaporation, entrainment in tailings and concentrate and vent losses
3: Proportion of imbalance relative to total throughput
4: Within acceptable limit of 10%

Table A5.2 – Water balance accuracy

Types of flows	Percent of all flows	Confidence		
		High	Medium	Low
Measured	12%	12%	0%	0%
Estimated	5%	0.30%	4.4%	0%
Simulated	84%	0%	82.4%	1.3%
Total	100%	12%	87%	1%

APPENDIX 6 2024 CADIA MINE REHABILITATION MONITORING REPORT



2024 Cadia Mine Rehabilitation Monitoring Report

for
Newmont Corporation
(Australia)

Prepared by
DnA Environmental
May 2024

Disclaimer

This is a report of work carried out by DnA Environmental on behalf of Newmont Corporation (Australia), Cadia Mine and has been prepared according to the brief provided by the client. The information contained herein is complete and correct to the best of my knowledge. The representations, statements, opinions and advice expressed or implied in this report are for the benefit of the Client only.

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Signed: 

Dr Donna Johnston
Restoration Ecologist
PhD, BAppSc (Hons) MEIANZ

Draft submitted: 27th May 2024.
Reviewed by: 19th August 2024. David Coe, Brenton Nichol, David McQueeney, Dirk Sanderson and Paul Yeo.
Final report submitted: 26th August 2024.

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Mandurama, NSW 2792

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Mobile: 0408 221 922
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ABN 19 607 392 634

Acknowledgements

Field work and associated reports 2008 – 2020 have been undertaken by Dr Donna Johnston and Andrew Johnston from DnA Environmental. Since 2021, field surveys have been undertaken by Andrew Johnston (DnA Environmental) and Ray Mjadwesch (Mjadwesch Environmental Service Support). Reports continue to be prepared by Dr Donna Johnston and Andrew Johnston.

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Executive summary

This 2024 rehabilitation monitoring report was undertaken by DnA Environmental and presents the results of Cadia Mine's annual rehabilitation monitoring program that first commenced in 2008. It aims to comply and be consistent with, conditions specified within a range of approval documents and associated Management Plans and align with the various regulatory guidelines and their revisions, whilst addressing the range of technical issues associated with mine rehabilitation.

Cadia Mine (Cadia) is located approximately 25 kilometres from the city of Orange in central west New South Wales (NSW). Final land use goals and rehabilitation activities at Cadia and surrounding lands are broadly based on pre-existing land uses including a combination of grazing land and endemic woodland on final mining disturbed landforms and to add value to the current vegetation corridor program of Cadia farmland. Therefore, three main vegetation communities form the basis of the rehabilitation objectives and these include woodland (open woodland with grassy understorey), riparian woodlands and perennial pastures (exotic grassland suitable for grazing).

Cadia's rehabilitation monitoring program assesses the progress of mine rehabilitation areas towards fulfilling long-term land use objectives by comparing a selection of ecological performance targets or completion criteria against remnant woodland and/or pastures not impacted by mining activities (reference sites). Reference sites are used as rehabilitation benchmarks for the final rehabilitated landscape and provide a time series record of ecosystem change and development.

Rehabilitation at Cadia has been progressive, with the number of rehabilitation monitoring sites adapted as required. Major rehabilitation was undertaken on the South Waste Rock Dump (SWRD) in 2008 and 2018, while in 2014/2015 rehabilitation of the North Waste Rock Dump (NWRD) was undertaken. Some older farmland and riparian woodland rehabilitation areas are monitored every 3 years, while no pasture rehabilitation has yet been undertaken. This year the monitoring program included monitoring of 3 woodland reference sites, 4 woodland rehabilitation sites on the South Dump and 3 woodland rehabilitation sites on the North Dump.

The monitoring methodology includes a combination of Landscape Function Analyses (LFA) and an adaptation of Biometric Assessment Method (BAM). Permanent transects and photo-points have been established to record changes in ecological attributes over time and soil analyses are regularly undertaken. Data obtained from reference sites are used to provide upper and lower ecological performance indicator ranges or "completion criteria targets", with these adapted annually to reflect climatic variations and local disturbance events.

Ecological monitoring has been undertaken in autumn in all monitoring years and this year occurred 9th – 11th April.

Rainfall

The long-term average annual rainfall recorded at Orange Airport is 892 mm however there have been extreme seasonal conditions and high rainfall variability since rehabilitation monitoring first commenced at Cadia. Annual rainfall 2008 – 2019 was typically low except in 2010 and 2016, with 3 years of drought experienced during 2017 to 2019. During 2020 - 2022, high rainfall activity caused widespread and unprecedented flooding across the state, with high rainfall activity extending into 2023. Dry conditions were again experienced during May to October 2023, followed by above average rainfall during November to April 2024, with the exception of March where only 18 mm of rain was recorded.

Progress of woodland rehabilitation sites

Ecological function (patch areas, stability, infiltration and nutrient recycling capacity) in rehabilitation areas has varied significantly, largely as a result of the way the landform was constructed (e.g. soil type, steepness), species that were sown, combined with the ongoing effects of climate and animal disturbance.

All rehabilitation sites on the SWRD and NWRD demonstrated a significant increase in functional patch area during the first few years after establishment. During 2017 – 2019, drought and increased grazing and disturbance by macropods resulted in a deterioration of functional patch area, minor increases in erosion and loss of ground covers in all rehabilitation sites, with this also being reflected in the range of reference sites.

While some sites have been relatively slow to develop, all sites on the SWRD have improved since 2021 due to above average rainfall resulting in increased growth, diversity and abundance of ground cover in most monitoring sites, although some sites may still be subjected to grazing and disturbances by native and pest animals. The NWRD continues to be heavily grazed by macropods, resulting in a high abundance of exotic annual plants and weeds. While monitoring sites were relatively stable, small bare patches persist, while North Dump 01 continues to have 2 rills. Despite most areas having relatively high stability, all sites had low infiltration and nutrient recycling capacity, compared to woodland reference sites.

Shrub densities and eucalypt regeneration was limited to absent in woodland reference sites, and as such, most woodland rehabilitation sites had a higher density and diversity of shrubs and juvenile trees. Seedling/sapling densities were highly variable across woodland rehabilitation sites and a declining trend continues to be recorded. Some individuals have grown and were now recorded as trees and mature shrubs (> 5 cm diameter at breast height (dbh)), however most individuals have died as a result of natural senescence and/or have been affected by drought. Overall, eucalypt densities were low or absent, except two sites on the South Dump (South Dump 07 and 08) and most were dominated by acacias and/or volunteer *Cassinia sifton* (Sifton Bush).

On the North Dump, thinning of acacia saplings via cut and paste methods and planting of eucalypt tubestock was undertaken in June 2023 as part of a trial program. While increased eucalypt densities are required, removal of acacias has resulted in a reduction in ecological function and loss of shrubby habitat.

There has been no consistent change in floristic diversity across the range of monitoring sites, however the level of diversity has tended to fluctuate with the seasonal conditions and degree of grazing intensity. In rehabilitation areas, floristic diversity is also implicated with rehabilitation methods. Since 2020, there has been an increase in plant diversity and this year, there was typically a higher diversity of species in rehabilitation sites than in woodland reference sites. All rehabilitation sites except South Dump 07, however had a higher diversity of exotic species.

All woodland rehabilitation sites met perennial ground cover targets and while most sites were dominated by exotic pasture species and weeds, they were in similar abundance to local woodlands. Exceptions included South Dump 10 and North Dump 01 which were weedier than desired, while in South Dump 07 and South Dump 08, native grasses had become dominant.

In total 6 Weeds Of National Significance (WONS) and priority weeds were recorded across the woodland monitoring sites, and these were scattered across a range of sites including woodland reference sites. It appears that there may be increasing occurrences of *Hypericum perforatum* (St. John's Wort) and *Nassella trichotoma* (Serrated Tussock). *Salix* species (Willows) were also observed to be increasing in abundance along the Creek Diversion Channel.

No threatened flora has been identified within the range of woodland monitoring sites and a range of wildlife have often been observed in or near rehabilitation areas. Rabbit burrows and scats continue to be common and feral pigs were observed on the South Dump and North Dump rehabilitation areas during the 2024 monitoring program.

Conclusion

Ecological performance is significantly different between rehabilitation sites largely due to difference in the way they were rehabilitate and when they were rehabilitated. All woodland monitoring sites had been affected by 3 consecutive years of drought during 2017 – 2019. Since then, most sites have improved levels of ground cover and have become ecologically stable, however infiltration and nutrient recycling capacities remain low compared to woodland reference sites.

In South Dump 07 and South Dump 08, there has been successful establishment of a high diversity and abundance eucalypts, acacias and other shrubs and native grasses have become dominant. Exotic pasture species and weeds were limited. Remaining rehabilitation areas had variable densities of shrubs, low densities of eucalypts and were dominated by exotic grasses and weeds and require additional rehabilitation intervention in order to meet tree density and diversity targets.

Due to close proximity to farmland and remnant bushland areas, current areas of rehabilitation are likely to be repeatedly overgrazed by macropods and other pest animals. Culling of macropods is likely to be unsustainable in the medium to long-term, subsequently, robust tree guards should be installed during in-fill planting programs and/or exclusion fences constructed until the vegetation is able to withstand impacts of grazing.

Weeds and feral and pest animals will require ongoing control through Cadia's weed and pest management programs.

Additional recommendations to improve rehabilitation outcomes on current and future rehabilitation areas have also been provided. Continued monitoring of rehabilitation sites will provide guidance on further management intervention, in order to trend towards and meet completion criteria targets.

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1 Introduction

1.1 Objectives

The primary objective of the Cadia rehabilitation monitoring program has been to compare the progress of rehabilitated landforms and revegetated conservation areas towards fulfilling long-term land use objectives by comparing a selection of ecological targets or completion criteria against unmined areas of remnant vegetation (reference sites) that are representative of the final land use and vegetation assemblage.

Established in 2008, the monitoring program involved developing a set of completion criteria consistent with various revisions of and those current at the time, CVOs Rehabilitation Strategy (CHPL 2020a), Land and Biodiversity Management Plan (BLMP; CHPL 2021), Mining Operations Plans (MOPs; CHPL 2020b), regulatory and best practice guidelines (NSW I&I 2010, NSW T&I 2013; NSW Department of Planning 2018, NSW Resources Regulator 2023) and current Rehabilitation Management Plan (CHPL 2024).

Primary objectives in establishing completion criteria are to establish clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem stability, recovery and long-term sustainability. Part of this process includes:

- Establishing a range of relevant reference sites to compare and track the progress of rehabilitation areas and inherent ecosystem function;
- Selecting a range of suitable reference sites that reflect the desired final land use, biodiversity targets and local community expectations; and
- Undertaking monitoring programs that provide simple but informative and reliable information that indicates positive recovery trends or rapid detection of rehabilitation failure.

1.2 Background

Newmont Overseas Holdings Pty Corporation (Australia), a wholly owned indirect subsidiary of Newmont Corporation is the owner of Cadia Holdings Pty Limited (CHPL). CHPL is the owner and operator of Cadia Mine (Cadia), one of Australia's largest gold mining operations.

Commencing in 1998 and operating continuously since, Cadia is located approximately 25 km south of Orange in the Central Tablelands region of New South Wales (NSW). The mining operation occurs across 2 local government areas (LGAs) (Blayney Shire Council and Cabonne Council).

Cadia provides an important economic contribution to the region and NSW and is a major regional employer providing approximately 1,400 full time equivalent jobs. Confirmed mineable resources have been identified to extend operations well beyond the life of the current Project Approval (PA) 06_0295 which provides for mining until 30 June 2031. Cadia has commenced planning for the continuation of mining operations and is delivering this work through the Cadia Continued Operations Project (CCOP).

PA 06_295 issued to CHPL in January 2010 under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) provides for the following:

- Life of mine ore production (up to 30 June 2031) of approximately 525 million tonnes (Mt) of gold/copper ore from Cadia East and approximately 96 Mt of ore from Ridgeway underground mine.
- Processing of up to 35 Mt per annum (Mtpa) of gold/copper/molybdenum ore on site to produce gold doré from a gravity circuit, a gold-rich copper concentrate from a flotation circuit (which is piped to a

dewatering plant at nearby Blayney and then sent by rail to Port Kembla in NSW for export) as well as a molybdenum rich concentrate which is sent by truck to Port Kembla in NSW for export.
- Disposal of tailings through emplacement into one of 3 tailings storage facilities (TSFs) being the Northern TSF (NTSF), Southern TSF (STSF) and Pit TSF (PTSF).
- Significant surface infrastructure and ancillary activities to support the operation of the mine including ore processing, rock emplacements, water management, maintenance, store and staff facilities and land management practices.

PA 06_0295 has been modified 14 times since issue, with the most recent modification approved on 13 December 2021 to provide for the repair, upgrade, and reinstatement of tailings deposition to the NTSF and STSF and increase production from 32 to 35 Mtpa.

Cadia is currently progressing with a further modification to PA 06_0295 (Modification 15). This was lodged with the now NSW Department of Planning, Housing and Infrastructure (DPHI) in November 2023. Modification 15 seeks to change the existing NTSF and STSF embankment footprints, recommence mining in the Ridgeway underground mine, amongst other various minor changes or infrastructure additions to support ongoing mining activities. CHPL also hold other environmental licences and mining approvals and authorities related to Cadia.

1.3 History of mining operations

A detailed Rehabilitation Management Plan (RMP) has been developed for Cadia (CHPL 2024), however a summary of mining and progressive rehabilitation at Cadia is provided below.

1.3.1 Cadia Hill

Cadia Hill was the first development at Cadia. It was a large open cut mine approved in September 1996 and operated by CHPL. The mine commenced operations in 1998 and operated until June 2012 when the mine was placed into ‘care and maintenance. The Cadia Hill approval included construction of the:
- South Waste Rock Dump (SWRD);
- North Waste Rock Dump (NWRD);
- Northern Tailings Storage Facility (NTSF);
- Ore Processing Facility: and
- Ancillary infrastructure, including pumps, power lines, water infrastructure, roads, water storage dams (including Cadiangullong Dam).

The approval also included development and extraction of ore from a small secondary open-cut pit known as Cadia Extended (which has since been largely backfilled). In 2018, the Cadia Hill Pit was approved to be utilised for tailings deposition following a partial slump of the NTSF embankment. Cadia Hill Pit has since been known as the Pit Tailings Storage Facility (PTSF). In 2019, CHPL received approval to increase the final tailings deposition elevation to 713m Australian Height Datum (AHD) (pre-consolidation), with filling above 693m AHD subject to the fulfillment of conditions.

1.3.2 Ridgeway / Ridgeway Deeps Underground Mine

Ridgeway/Ridgeway Deeps (Ridgeway) is an underground sub-level and block caving mine with associated Subsidence Zone, located approximately 2.5 kilometres (km) north-west of Cadia Hill. Ridgeway was approved in October 2000 and commenced operations in 2002.The approval of Ridgeway also included the construction of

the STSF and Rodds Creek Dam. Ridgeway Deeps is an underground extension, approved in 2005. Ridgeway ceased active mining in September 2017 and is now in 'care and maintenance', although planning is ongoing with the potential to recommence mining.

1.3.3 Cadia East Underground Mine

The Cadia East Project was granted approval in 2010 (as Project Approval (PA) 06_0295), with there being 14 subsequent modifications (modification 15 submitted in November 2023). The approval permits the development of the Cadia East Mine, an underground panel cave mine with associated Subsidence Zone. It also includes the expansion of the Ore Processing Facility, expansion and height increase of the NTSF to 779m AHD and STSF to 702m AHD using the centreline or downstream lift construction methodology, and an increase to the height and storage volume of Rodds Creek Dam. PA 06_0295 permits the total extraction of 525 million tonnes (Mt) of ore (gold, copper, molybdenum and other trace metals), at a maximum rate of 35 million per annum1 (Mtpa).

1.4 Surrounding land uses

The dominant land use in the Cadia region is agriculture, principally grazing (sheep and cattle), cropping (winter forage crops), mining and orchards. Other primary production activities include honey production, viticulture and softwood plantations (predominantly Monterey Pine (*Pinus radiata*)). Historical mining has occurred in the vicinity of Cadia since the 1850s, with mining remnants common in the district. An increasing land use in the area is hobby farming/lifestyle blocks. The area is moderately populated with approximately 150-200 property owners identified as key stakeholders (CHPL 2023).

1.5 Rehabilitation strategy

The overall rehabilitation goal is to generate enduring land value, including both ecological value (e.g. biological diversity and other environmental values) and agricultural value (CHPL 2024). Rehabilitation activities at Cadia aim to generate safe and sustainable landforms at the mine site, CHPL-owned land and the region as a whole by rehabilitating mine disturbed lands to:

- add value to the current vegetation corridor programme (ecological value);
- allow for the future land use of grazing where appropriate and sustainable (agricultural value);
- retain areas that may be important for future industry and infrastructure needs; and
- provide safe and stable landforms and minimise any adverse potential impacts so that there is no future liability for CHPL or the community.

Cadia aim to provide a balanced rehabilitation outcome, recognising the alternative land uses that exist in the region and aiming to establish a combination of grazing land and indigenous woodland on final landforms. Rehabilitation programmes would be adjusted over the life of the mining operations as necessary, based on the outcomes of research trials, community and regulatory consultation, regional infrastructure requirements and industry knowledge. Progressive rehabilitation would be undertaken throughout the life of the mining operation, where practicable.

1.6 Cadia post-mining land use objectives

Specific post-mining land use goals include:

- High quality agriculture (grazing) areas were deemed to be sustainable and low risk of erosion, degradation, damage. Similar species composition and carrying capacity to surrounding areas.
- Woodland (conservation). Increasing the amount of conserved woodland in the district for future flora and fauna protection. Replacing / replicating Endangered Ecological Communities (EEC) where applicable. Similar vegetation types / composition to surrounding / local remnant vegetation.
- Allowing for future needs of the community through retaining key infrastructure where appropriate (pending future negotiations with regulatory bodies / community). Considerations may include regional water reticulation network, future industrial use of the site, landfill (within Cadia Hill Pit), roads, power assets etc.

1.7 Final land use and mining domains

Final land use goals are broadly based on the pre-existing land uses within the Cadiangullong Creek, with overall rehabilitation goals derived from the Cadia East Environmental Assessment (CHPL 2009), Cadia Rehabilitation Strategy (CHPL 2020) and the Cadia Land and Biodiversity Management Plan (CHPL 2021).

The dominant final land use will be native ecosystem (woodland and grassland) with smaller areas of agriculture (grazing), voids, water management areas, water storage and heritage. The final landform will generally be consistent with the surrounding topography, to the degree practical and approved. Specific future post-mining land uses include (CHPL 2024):

- Safe, stable, sustainable and productive landforms that blend in with the natural topography of the Cadiangullong Valley area.
- No future or residual ongoing liability from the mine site (e.g. from soil or water contamination) for CHPL, future landowners or the wider Cadia community.
- Agriculture (grazing). High quality agriculture (grazing) in areas deemed to be sustainable and low risk of erosion, degradation and damage. Similar species composition and carrying capacity to surrounding areas.
- Native Ecosystem. Woodland (conservation). Increasing the amount of conserved woodland in the district for future flora and fauna protection. Replacing/replicating Critically Endangered Ecological Communities where applicable, namely the *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Similar vegetation types/composition to surrounding/local remnant vegetation.
- Those that allow for the future needs of the community through retaining key infrastructure where appropriate (pending future negotiations with regulatory bodies / community). Considerations may include regional water reticulation network, future industrial use of the site, landfill (within voids), roads, power assets etc.
- Designated heritage areas to conserve regionally significant heritage buildings and relics.

1.8 Guiding principles

The following guiding principles will be implemented for the Mine Disturbed Landscape (CHPL 2024).

- Rehabilitation for the post-mining land use of woodland, forest or native communities to use:
    - A range of indigenous species (trees, shrubs, grasses, forbs, and aquatic species where applicable);

  - Seed that has been locally collected; and
  - A range of species to provide diversity (including structural diversity) consistent with the target vegetation association (based on soil type, aspect, slope and adjacent (or pre-existing) communities).
- Rehabilitation for the post-mining land use of agriculture / grazing to use:
  - Predominantly perennial species (supplemented with annual species as required such as legumes etc);
  - Ranges of native and / or introduced pasture species where suitable; and
  - Scattered paddock trees to match the surrounding agricultural landscape.
- Species will be selected based on the target vegetation community and derived from vegetation survey species lists from a similar community type or monitoring reference site. Where possible, attempt to re-create communities consistent with local EEC;
- The recovery and use of habitat and rehabilitation resources from remnant areas destined for clearance / subsidence should be maximised to enhance the success and colonisation of rehabilitated sites;
- Locally uncommon species from remnant areas or species that are difficult to propagate should be re-located / re-planted prior to approved clearing;
- Native seed to be collected from within 50km of mine lease boundary or within an acceptable distribution radius;
- Where possible immediately re-spread harvested topsoil to take advantage of seed banks and soil biota and to reduce damage to soil structure through rehandling;
- Utilise topsoil from areas with a similar post-mining land use to take advantage of available seed banks; and
- Undertake annual monitoring of rehabilitation sites and compare a range of parameters against selected reference sites.

1.9 Current rehabilitation areas

Primary domains relevant to this rehabilitation monitoring report are Native ecosystem: woodland community - conservation. Presently, 2 major rehabilitation areas include the NWRD and the SWRD. Primary rehabilitation over the NWRD was completed in 2014, while the SWRD has been progressively being rehabilitated since 2006. A map showing the conceptual final land use for these areas is provided in **Error! Reference source not found.**.

1.9.1 North Waste Rock Dump (NWRD)

The North Waste Rock Dump (NWRD) was designed to the following standard:

- The NWRD would have maximum batter slopes of 1:3, with 15 to 20 metre (m) wide, step-back, reverse graded berms and rock lined drains;
- Potentially acid forming (PAF) material contained in the dump would be encapsulated by covering with 0.5 m of compacted clay or a High-Density Polyethylene (HDPE) liner followed by 2 to 3 m of non-acid forming (NAF) material;
- This would be covered by 20 to 30 centimetres (cm) of topsoil. Where possible topsoil will be used that has been stripped from an area with a consistent final land use;
- Drainage control structures would be installed where necessary, utilising ‘chain of ponds’ concepts where appropriate; and
- The NWRD would be revegetated with indigenous bushland species with a final land use of conservation.

The final landform of the NWRD is approximately 66 ha in size and landform construction has been completed. As such any ongoing work associated with the NWRD landform relates to the inspection and repair of any areas of erosion (during the Landform Establishment Phase). As part of the assessment associated with section 240 notice NTCE0012411, further works are required to be undertaken on the NWRD landform (remedial work to surface water management structures and some erosion features) (CHPL 2024).

1.9.2 NWRD water management

Surface waters from the North Waste Rock Dump will flow to a constructed wetland located on the southern edge of the Cadia Extended void. Pending suitable water quality (to be assessed against water management plan. Guideline values and verified by a future research project), water will be discharged into Cadiangullong Creek (CHPL 2024).

1.9.3 South Waste Rock Dump (SWRD)

The SWRD has/will be constructed to the following standard:

- The revegetation objective for the SWRD is to provide woodland across the dump surface and batters with a final land use of woodland conservation;
- Selective encapsulation of PAF waste rock with a low permeability seal (compacted clay capping) followed by NAF material and topsoil;
- 20 to 30 cm of topsoil will be placed as the surface substrate. Where possible topsoil will be used that has been stripped from an area with a consistent final land use;
- Grading the final surface of the dump to blend in with the natural topography of the area, with an overall outer batter slope of 1:4 comprising 1:3 outer slopes and 15 to 20 m wide, step-back, reverse graded berms;
- Installation of rock lined drains and detention ponds to channel runoff safely to constructed outlet areas;
- Creation of additional habitat using trees cleared from disturbance areas supplemented with additional habitat structures targeting threatened and declining woodland species (e.g. nesting boxes, bat boxes, salvaged hollows etc);
- The woodland areas will be linked to other conservation areas in the Cadia Valley through the vegetation corridor programme;
- Rehabilitation trials would be conducted by CHPL to determine the best combination of techniques for the establishment of native woodland species (including soil treatments, seed mixes, sowing methods etc).

The SWRD was approved as part of the initial Cadia Hill approval in 1996 and was designed and constructed to be rehabilitated to the traditional ‘batter and berm’ design as described above . As part of the assessment associated with section 240 notice NTCE0012411, further works are required to be undertaken on the SWRD landform (remedial work to surface water management structures and some erosion features (Newmont 2024).

As of 30 June 2023, the SWRD was 449 ha and has been partially rehabilitated (183 ha including 120 ha of PAF and 63 ha of NAF). Unrehabilitated portions remain active for the placement of small amounts of waste rock / tramp material from Cadia East Mine, placement of waste material and for the reclamation of NAF material for

TSF construction. The SWRD also contains a portion of low-grade mineralised ore, that will likely be processed in the future. Approximately 100 ha remains available for active mining.

\Portions of the rehabilitated SWRD are now scheduled for re-excavation to salvage additional NAF waste rock for TSF embankment construction and buttressing. Of the 63 ha of rehabilitated NAF material, 6.1 ha will be re-excavated to 30 June 2024 (CHPL 2024).

1.9.4 SWRD water management

The SWRD water management structures were design with the following considerations:

- The top surface of the SWRD would be designed with a slight dish shape that would generally drain towards the north. Rock lined channels would be installed along the northern edge of the top surface to provide a stable means for surface water runoff to drain from the top of the SWRD;
- On the batters of the dump, surface water runoff would flow perpendicularly down the slope to the toe of each batter where it would be re-directed by the 15 to 20 m wide reverse graded berms. The water would gradually flow short distances along the berms to rock lined channels which would be constructed at regular intervals down the faces of the batters. These channels would enable water from one berm to be channelled in a controlled manner down the face of the batter to the next berm and ultimately to the base of the dump;
- Rock lined channels would be used at the base of the dump to direct runoff into natural creek lines, the surface of the NTSF, or the Rodds Creek Water Holding Dam;
- Drainage control structures would utilise ‘chain of ponds’ concepts where appropriate; and
- The existing sediment ponds and leachate collection ponds downstream of the dump would be retained until the revegetated surface of the dump is stable and the runoff water quality is acceptable.

Surface drainage from the SWRD reports to a number of different areas to avoid the accumulation of large volumes of water to a single control point. Discharge areas include:

- Rodds Creek Dam
- Northern Tailings Storage Facility
- Cadia East Subsidence Zone
- Northern Leachate Pond (NLP) (proposed Constructed Wetland)
- Southern Leachate Pond (SLP) (proposed Constructed Wetland)
- Process Water Pond / Site runoff pond (proposed Constructed Wetland).

It is proposed that three constructed wetlands will be built to the west of Site Runoff Pond, NLP and SLP prior to controlled discharge (pending water quality) to Cadiangullong Creek (CHPL 2024).

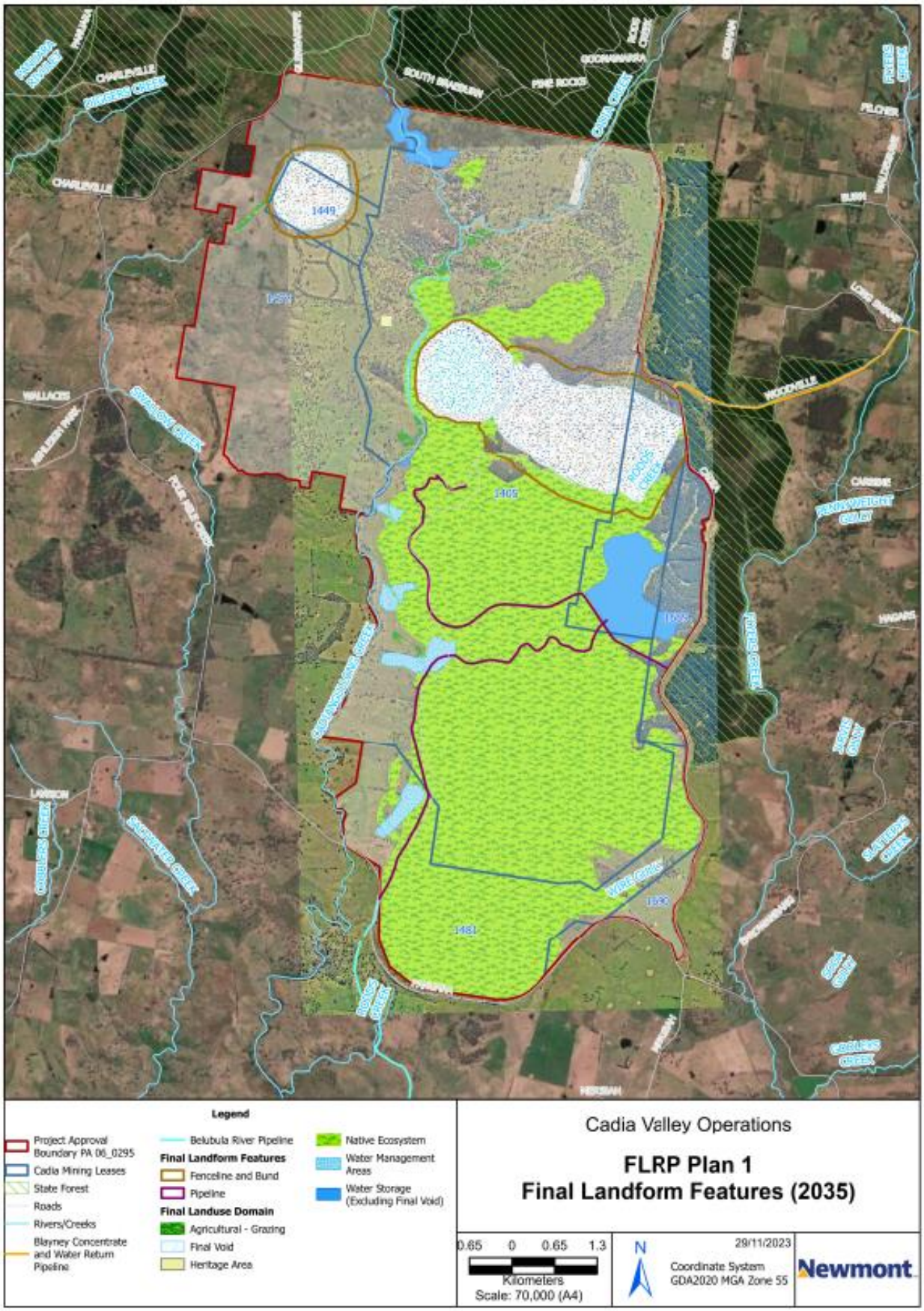


Figure 1-1. Conceptual final land use of mine disturbed areas (CHPL 2024).

1.10 Land and Biodiversity Management Plan

The Cadia Land and Biodiversity Management Plan provides an overview of the approach to land and biodiversity management at Cadia (CHPL 2021). The Plan has been developed to meet the broad rehabilitation, biodiversity and land management commitments made as part of the Cadia East Project Approval (PA 06_0295). The plan also aims to implement current best practice land and biodiversity management across CHPL owned land and where possible link to land management initiatives on a regional basis.

1.10.1 **Vegetation corridor program.**

The aim of the Cadia Vegetation Corridor Program is to generate enduring land value, including both ecological and agricultural value (CHPL 2021). This aim will be achieved through meeting the following objectives throughout the life of the plan including:

- Conserve and enhance areas of isolated remnant vegetation;
- Link significant areas of remnant vegetation;
- Provide habitat for native fauna;
- Allow the movement of genetic material between flora and fauna populations; and
- Increase the sustainability and biodiversity of Cadia farms and environs.

Figure 1-2 shows the status of the Vegetation Corridor Program (CHPL 2021). Figure 1-3 shows how the Vegetation Corridor Program aligns with the proposed mine site rehabilitation concepts to extend corridor linkages across CHPL owned land.

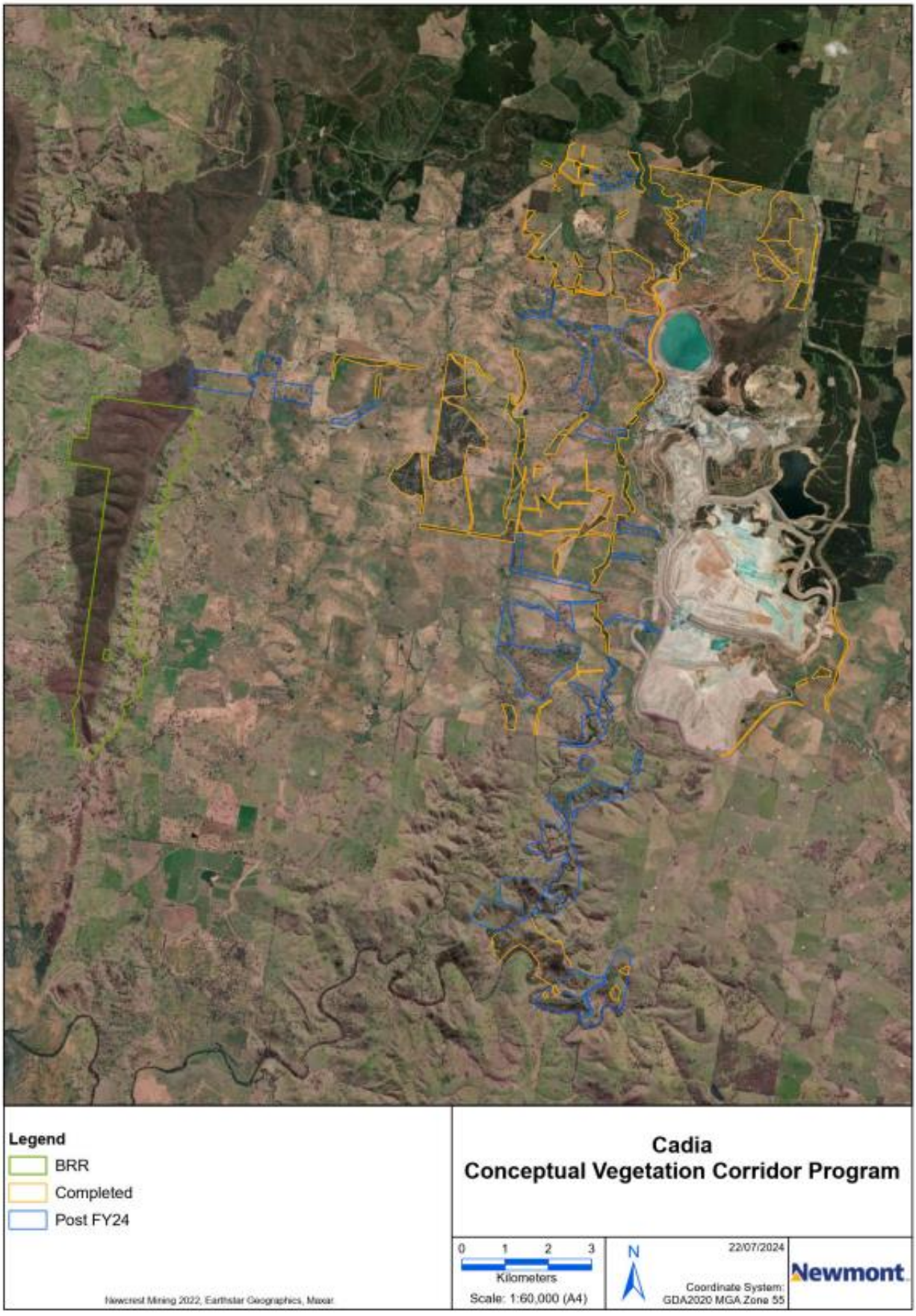


Figure 1-2. Vegetation Corridor Program (CHPL 2021).

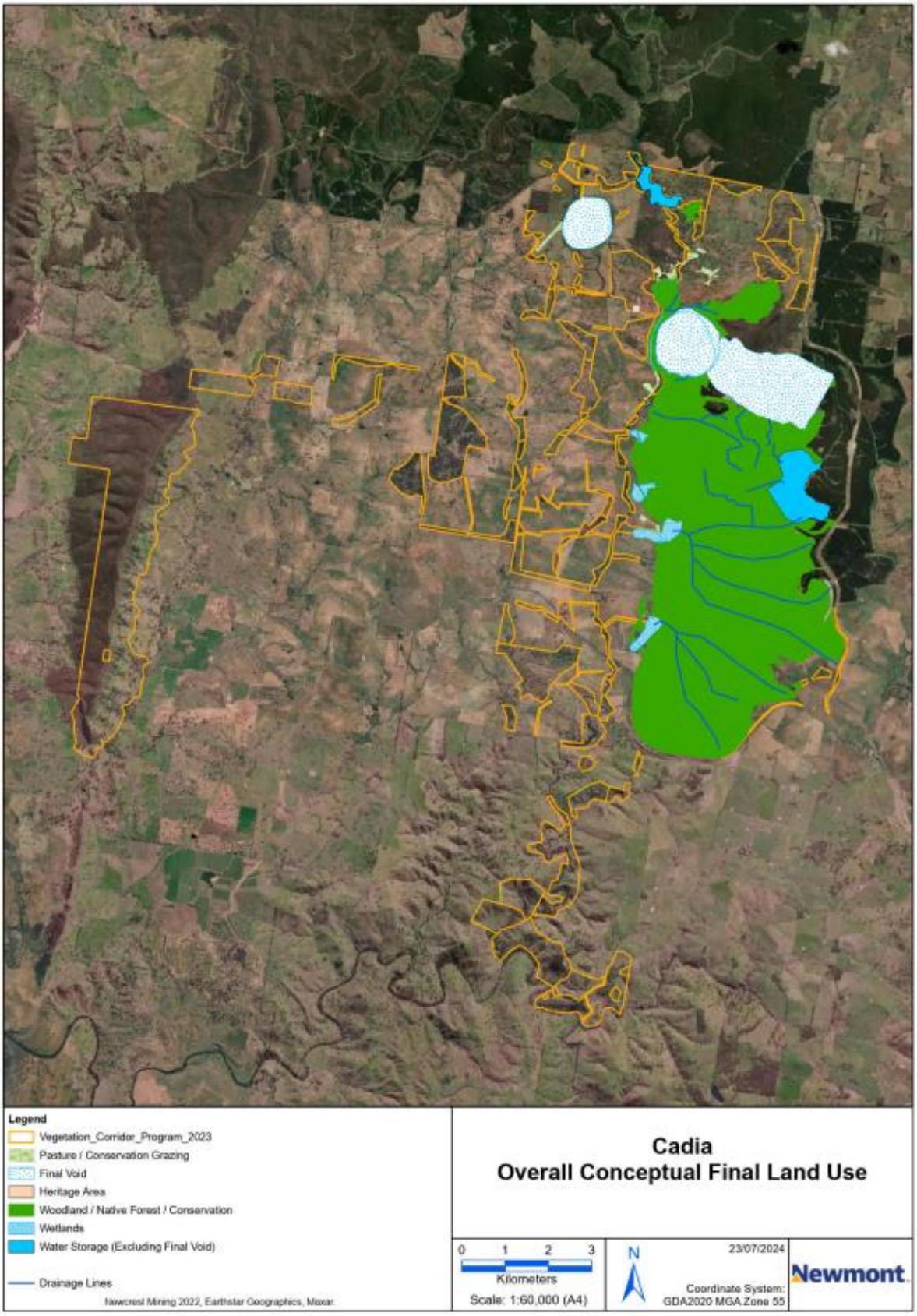


Figure 1-3. Vegetation Corridor Program and how it aligns with the mine site rehabilitations concepts (CHPL 2021).

1.11 Regulatory guidelines

In NSW, mining operations were previously carried out with an approved Mining Operations Plan (MOP) to assist the government regulators to monitor the progress of mining and rehabilitation activities across the life of a mine (NSW Department of Industry and Investment (I&I) 2010, NSW Department Trade and Investment (T&I) 2013, NSW Department of Planning 2018). The MOP was intended to fulfil the function of both a rehabilitation plan and a mine closure plan, with *ESG3: MOP Guidelines,* detailing the process for monitoring and managing progression towards successful rehabilitation outcomes. These guidelines required industry to identify and provide measurable data and demonstrate that proposed rehabilitation outcomes are achievable and realistic within a given timeframe.

The Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 (NSW) was enacted on 2 July 2021, formally amending the Mining Regulation 2016. The rehabilitation reforms comprise the following components.

- New standard Mining Lease Conditions introduced by the Rehabilitation Regulation.
- Form and Way documents setting out in detail the mandatory requirements relating to the format and content of various obligations under the new Mining Lease Conditions.
- A series of Guidelines intended to assist authority holders in fulfilling the obligations set out under the new Mining Lease Conditions in accordance with the Form and Way documents, without setting any additional mandatory requirements.

Subsequently, MOPs have been replaced by RMPs and Associated Annual Rehabilitation Report and Forward Program for large mines Code of Practice (NSW Resources Regulator (RR), 2023).

1.11.1 Rehabilitation phases

Many of the previous ESG3 guidelines are still however relevant to the current rehabilitation monitoring and reporting protocols. Successful rehabilitation of a mine site has been conceptually described in terms of logical steps or phases and are to be made applicable to each of the similar land management units or domains. It is recognised that most domains will require a different rehabilitation methodology to achieve the intended post-mining land use. Rehabilitation phases where the post-mining land use is a native plant ecosystem according to the previous guidelines and RMP 'Form and Way' documents include:

1. Active Mining;
2. Decommissioning;
3. Landform Establishment;
4. Growth Medium Development;
5. Ecosystem and Land Use Establishment;
6. Ecosystem and Land Use Development; and
7. Rehabilitation Completion (sign Off).

1.11.2 Performance Indicators

To satisfy regulatory conditions, performance measures, indicators and associated performance/completion criteria that are appropriate to the location and relevant to the stated rehabilitation goals and objectives must be presented for each land management unit or domain. The application of the ecological performance data during the Decommissioning phase (Phase 1) are not considered applicable within the presentation of the ecological data obtained within the Cadia rehabilitation monitoring program. Subsequently, the ecological performance

criteria which are consolidated into Key Performance Indicator (KPI) tables are only represented within Rehabilitation Phases 3 (Landform establishment) to Phase 6 (Ecosystem and land use development).

Data from reference sites provide suitable target values of key biophysical parameters, vegetation structures and diversity and habitat complexity. It provides the ability to monitor both success against true values of an existing ecosystem and the effects of climatic variations and disturbance events (such as fire, flooding, drought etc.). The reference site can be used as the target outcome of the final rehabilitated landscape and a time series record of ecosystem change or development can be obtained. By comparing data with reference sites, it is possible to see if the rehabilitation or disturbed site is developing adequately. All completion criteria at a given site should be within critical threshold values if ecosystem rehabilitation is to be judged successful.

1.12 Completion criteria and key performance indicators

At Cadia, a range of KPI's have been determined and are quantified by data obtained from replicated reference sites which are representative of the agreed final land use. All ecological performance indicators are quantified by range values measured annually (or 3-year monitoring cycle) from these reference sites which form *upper* and *lower* KPI targets. The same ecological performance indicators are measured in rehabilitation sites and these should equal or exceed these values or demonstrate an increasing trend.

These KPIs have been further separated into "*Primary performance indicators*" and "*Secondary performance indicators"*. Primary performance indicators are those chosen as completion criteria targets and have been identified as those that will satisfy various regulatory requirements as detailed in Cadia's RMP (CHPL 2024) and LBMP (CHPL 2021).

Secondary performance indicators are those that would be desirable to achieve but will not necessarily have an influence on relinquishment requirements. Therefore, please note that not all performance indicators are set as completion criteria targets.

2 Cadia rehabilitation monitoring program

2.1 Primary objectives

The primary objective of the Cadia rehabilitation monitoring program has been to compare the progress of rehabilitated landforms and revegetated conservation areas towards fulfilling long-term land use objectives by comparing a selection of ecological targets or completion criteria against unmined areas of remnant vegetation (reference sites) that are representative of the final land use and vegetation assemblage.

2.2 Reference sites

Three main vegetation community types have been identified as being rehabilitated onto mining disturbed areas or Cadia farmland areas and have included grassy woodlands, introduced/exotic pastures and riparian woodlands.

Subsequently, 2 to 4 reference sites of each vegetation community type were established to obtain baseline data and provide ongoing ecological data that quantify a range of key ecological performance indicators relating to the progress of rehabilitation of mine disturbed or farmland revegetation areas and resulting completion criteria as specified in the RMP and LBMP.

Due to the long agricultural and mining history of the local area, all reference sites have been subjected to some form of prior disturbance, in particular clearing for agriculture and livestock grazing and all woodland sites were regrowth woodland, with some invasion from introduced species. Introduced pastures are those cultivated and sown with exotic species suitable for agricultural production, primarily livestock grazing. These sites, despite their disturbance history were typical of the local area and set realistic rehabilitation targets and provide a benchmark for transitional processes that can be expected or that are presently occurring in the rehabilitation areas.

Reference sites were spread out where possible to maximise the spatial distribution and subsequent variations in community composition across the local landscape and all are now situated on Cadia owned land. Current reference sites include:

- Three grassy woodlands;
- Two riparian woodlands; and
- Two exotic pastures.

The location of the reference sites is provided in Figure 2-1.

2.3 General description of the reference sites

2.3.1 Grassy woodland reference sites

The grassy woodlands containing the reference sites RfWood01, RfWood02 and RWood05, were comprised of low various densities of *E. albens* (White Box) or *E. melliodora* trees but *E. blakelyi* (Blakely's Red Gum), *E. macrorhyncha* (Red Stringybark), *E. bridgesiana* (Apple Box) and/or *E. goniocalyx* (Bundy Box) may also have been present. Scattered old growth trees were present as well as younger regrowth and some relatively recent natural eucalypt recruitment was present in all sites. There was an absence of a shrub layer in 2 sites however in the other woodland site, there were some scattered *Acacia dealbata* (Silver Wattle) and *A. implexa* (Hickory) and scattered eucalypt regeneration was present. There may also have been occasional exotic shrubs in some

woodland areas *(i.e. Crataegus monogyna* (Hawthorn), *Ligustrum lucidum* (*Large-leaved Privet*), *Rubus fruticosus* (Blackberry) and *Rosa rubiginosa* (Sweet Briar). The understoreys were usually dominated by native perennial grasses and common native forbs and all sites contained a high cover of leaf litter. There were also scattered exotic annual grasses and pockets of exotic grasses or weeds, especially in old stockcamp areas.

2.3.2 Riparian woodland reference sites

The 2 riparian woodland sites were quite different to each other, but both were characteristically open grassy woodland.

One site (RrRip02) was comprised of scattered old growth trees of *E. camaldulensis* (River Red Gum)*, E. melliodora* and *E. bridgesiana* (Apple Box) and had an understorey dominated by *Phalaris aquatica* (*Phalaris*) and *Dactylis glomerata (Cocksfoot)* with patches of introduced annual grasses and native grass and herbs.

The second site (RrRip03) was also comprised of scattered old growth trees dominated by *E. viminalis* (Ribbon Gum)*, E. melliodora* and *E. bridgesiana* and a relatively intact and diverse native grassy understorey and contained some patches of shrubs including *Acacia melanoxylon* (Blackwood) and *A. dealbata*. Both sites however contained various priority and introduced weeds and periodic flooding continues to alter the stream morphology.

2.3.3 Introduced pasture reference sites

The 2 introduced pasture sites were dominated by *Phalaris aquatica* and contained various combinations of other pasture species such as *Dactylis glomerata* (Cocksfoot), *Lolium* sp. (Ryegrass) and *Trifolium* species (Clovers). At RfPast03, *Puccinellia stricta* (Australian Saltmarsh Grass) was also very abundant. These sites are intermittently grazed by sheep and cattle but both sites contained very high ground cover levels and had very few weeds.

2.4 Cadia rehabilitation monitoring sites

The monitoring program was first established in 2008 and rehabilitation has been progressive since the inception of the monitoring program, subsequently, the number of rehabilitation monitoring sites has also changed over the years. Major rehabilitation was undertaken on the main waste emplacements in 2008 (SWRD) and in 2014/2015 (NWRD and SWRD). An additional area of rehabilitation was undertaken on the southwest of SWRD in 2018 (South Dump 10). Rehabilitation monitoring sites were considered to be representative of the rehabilitation area as a whole or were similar to and representative of other areas of rehabilitation.

Sites South Dump 01,02, 03 are no longer assessed due to their association with the recovery of benign waste rock material used in mining development. Access to South Dump 05, 06 and 09 has been difficult and/or unsafe due to subsidence or nearby operational heavy machinery and were also not assessed due to safety risks.

Some of the older more stable farmland and riparian revegetation sites are monitored on a 3 year rotation, with these last being assessed in 2022 (due next in 2025). Due to the significant development of the woodland rehabilitation in most areas of the South Dump, some sites may also be placed on a 2 to 3 year rotation.

2.5 Summary of the monitoring program

In order to manage increasing quantities of data and omit sites no longer relevant, ecological data and trends since 2014 have been presented. Results from rehabilitation sites prior to 2014 can be reviewed in previous Cadia Annual Rehabilitation Monitoring Reports (DnA Environmental 2008b – 2013).

Table 2-1 shows a summary of the current monitoring sites (post 2014) assessed as part of the Cadia monitoring program, including the general locality, year of establishment, community type and frequency of monitoring. Figure 2-1 shows the location of the reference and rehabilitation monitoring sites. Global Positioning System (GPS) coordinates and other site-specific information is provided in Appendix 1.

Table 2-1. Summary of the monitoring program (post 2014).

Site type	Vegetation community	Site name	Rehabilitation method	Year est.	3-year monitoring rotation	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Reference sites	Woodland - Ashleigh Park	RfWood01	-	2008		1	1	1	1	1	1	1	1	1	1	1
	Woodland - Bundarra	RfWood02	-	2008		1	1	1	1	1	1	1	1	1	1	1
	Woodland - Cadiangullong Dam	RrWood03	-	2008		1	1									
	Woodland – Cadia Access Rd	RWood04	-	2017			1		1	1						
	Woodland - Cadiangullong Dam	RWood05	-	2016				1	1	1	1	1	1	1	1	1
	Pasture - Bundarra	RfPast01	-	2008	☑ 2019			1			1					
	Pasture - Willunga	RfPast03	-	2008	☑ 2019			1			1					
	Riparian - Bakers Shaft	RrRip02	-	2008	☑ 2022	1		1			1			1		
	Riparian - Cadiangullong Ck Cadia	RrRip03	-	2008	☑ 2022	1		1			1			1		
	Total reference sites					**5**	**4**	**7**	**4**	**4**	**7**	**3**	**3**	**5**	**3**	**3**
Rehabilitation sites	Woodland	Ashleigh Park	Direct seeded farmland	2008	☑ 2022			1			1			1		
	Woodland	WillungaDS01	Direct seeded farmland	2008	☑ 2022	1	1	1			1			1		
	Woodland	WillungaDS02	Direct seeded farmland	2008	☑ 2022	1	1	1			1			1		
	Riparian woodland	Cadiangullong Creek	Direct seeded farmland	2008	☑ 2022			1			1			1		
	Riparian woodland	Creek Diversion	Tubestock planting	2008	☑ 2022	1		1			1			1		
	Woodland	North Dump 01	Aerial seeding	2014		1	1	1	1	1	1	1	1	1	1	1
	Woodland	North Dump 02	Aerial seeding	2014		1	1	1	1	1	1	1	1	1	1	1
	Woodland	North Dump 03	Aerial seeding	2014		1	1	1	1	1	1	1	1	1	1	1
	Woodland	South Dump 01	Aerial seeding	2008		1	1	1	1	1						
	Woodland	South Dump 02	Aerial seeding	2008		1	1	1	1	1						
	Woodland	South Dump 03	Aerial seeding	2008		1	1	1	1	1						
	Woodland	South Dump 04	Aerial seeding	2014		1	1	1	1	1	1	1	1		1	1
	Woodland	South Dump 05	Aerial seeding	2014		1	1	1	1	1	1	1	1		1	
	Woodland	South Dump 06	Aerial seeding	2014		1	1	1	1	1						
	Woodland	South Dump 07	Aerial seeding	2016				1	1	1	1	1	1		1	1
	Woodland	South Dump 08	Aerial seeding	2016				1	1	1	1	1	1		1	1
	Woodland	South Dump 09	Aerial seeding	2016				1	1	1	1	1	1			
	Woodland	South Dump 10	Seeded	2018							1	1	1	1	1	1
	Total rehabilitation monitoring sites					**12**	**11**	**17**	**12**	**12**	**14**	**9**	**9**	**9**	**8**	**7**
	Total Monitoring Sites					**17**	**15**	**24**	**16**	**16**	**21**	**12**	**12**	**14**	**11**	**10**

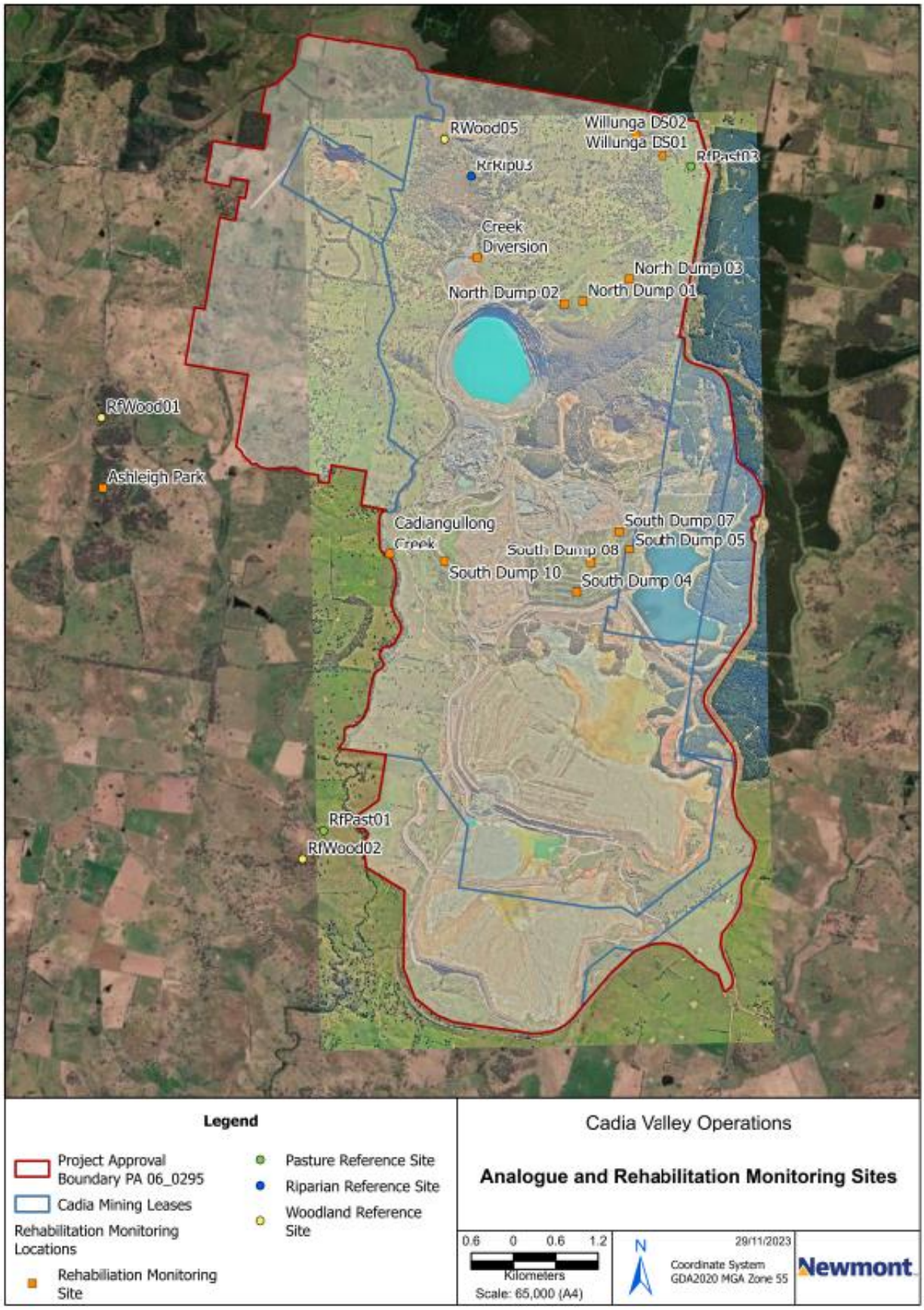


Figure 2-1. Map of the Cadia monitoring sites.

3 Rehabilitation monitoring methodology

Rehabilitation monitoring methodology and determination of completion criteria was first developed in 2008 and is documented in "Rehabilitation monitoring methodology and determination of completion criteria" (DnA Environmental 2008a) and have been detailed in previous monitoring reports (DnA Environmental 2008b - 2023).

Ecological monitoring has been undertaken in autumn in all monitoring years. Field work and associated reports 2008 – 2020 were undertaken by Dr Donna Johnston and Andrew Johnston from DnA Environmental. Since 2021, field surveys have been undertaken by Andrew Johnston (DnA Environmental) and Ray Mjadwesch (Mjadwesch Environmental Service Support) and this year were undertaken during 9 – 11th April 2024. Reports continue to be prepared by Dr Donna Johnston and Andrew Johnston.

3.1 Monitoring quadrats

The monitoring methodology adopted is a standard and simple procedure that can be easily replicated over any vegetation community or revegetation area. The 20 x 50 m plot is positioned such that the base line forms the basis for the LFA transect which must face down slope. The vegetation monitoring usually occurs along the 50m transect situated at the 10 m interval that runs perpendicular to the 20 m LFA transect, however in some situations the same transect may be used. Four marker pegs are used to establish a permanent transect position. GPS readings are taken to ensure quadrats can be relocated over time. Permanent photo-points are also established at various marker pegs of the quadrat to record changes in these attributes over time.

To obtain the range of ecological data which quantifies the completion criteria targets, the monitoring program incorporates a combination of LFA (Tongway and Hindley 1995, 1996, 2003, 2004), accredited soil analyses and various measurements of ecosystem diversity and habitat values based on and adapted from the BioBanking/Biometric methodologies (e.g. Gibbons 2002, Gibbons *et al* 2005, 2008) and Biometric Manual 3.1 (NSW Department of Environment, Climate Change and Water (DECCW 2011)).

Rehabilitation monitoring at Cadia has always followed early versions of the BioBanking/Biometric Assessment Methodologies (BAM) (DECCW 2011, Office of Environment and Heritage (OEH) 2012)) however BAM has undergone various changes over time. Subsequently, some changes of methodology have not always been adopted in order to ensure continuity of the monitoring data and relevance of the long-term monitoring efforts.

3.2 Amendments

In 2022, inclusions were made to the KPI tables regarding tree and mature shrub density (> 5 cm dbh), and shrub and juvenile tree density (< 5 cm dbh) targets. These included segregating the population(s) into:

- density of eucalypts;
- density of acacias;
- density of other endemic shrubs;
- density of weeds; and
- percentage of eucalypts.

3.3 Limitations

3.3.1 Species identification

In some cases, there may have been a lack of critical features and/or reproductive structures (due to heavy grazing or browsing, new germinants etc) that may be required for the positive identification of some plant genera, and therefore some species may have only been identified to the genera level.

Where species names have been changed and/or updated and/or plants may have been previously misidentified, corrections according to PlantNet have been applied where possible. In most cases these occurrences are unlikely to have an impact on meeting completion targets.

4 Rainfall

Rainfall measurements at Cadia are logged at two separate weather stations, which have been used to provide an average monthly rainfall across the mine site. Cadia's averaged on-site rainfall data have been compared to long-term average rainfall records (1996 – 2024) at Orange Airport, which is 892 mm (BoM 2024).

Since 2008 when rehabilitation monitoring at Cadia first commenced, there have been extreme seasonal conditions and high variability in annual rainfall. Annual rainfall has been well below average in years 2009 and 2013, while in 2010 and 2016, there was above average annual rainfall of 1153 mm and 927 mm respectively which caused widespread flooding across the state. This was followed by 3 consecutive years of extremely dry conditions during 2017 - 2019 (Figure 4-1), with these being the worst drought years on record.

Since 2020, improved rainfall conditions have occurred with several widespread and unprecedented flood events occurring across the state during 2020 – 2022. In 2023, dry conditions occurred during May to October 2023, while high rainfall activity was experienced during November to February and again in April 2024, however rainfall was well below average during March with only 18 mm. Rainfall relevant to the monitoring program and recorded to the end of April 2024 was therefore slightly above the expected average with 296 mm, compared to an expected average of 264 mm for the same yearly period (Figure 4-2).

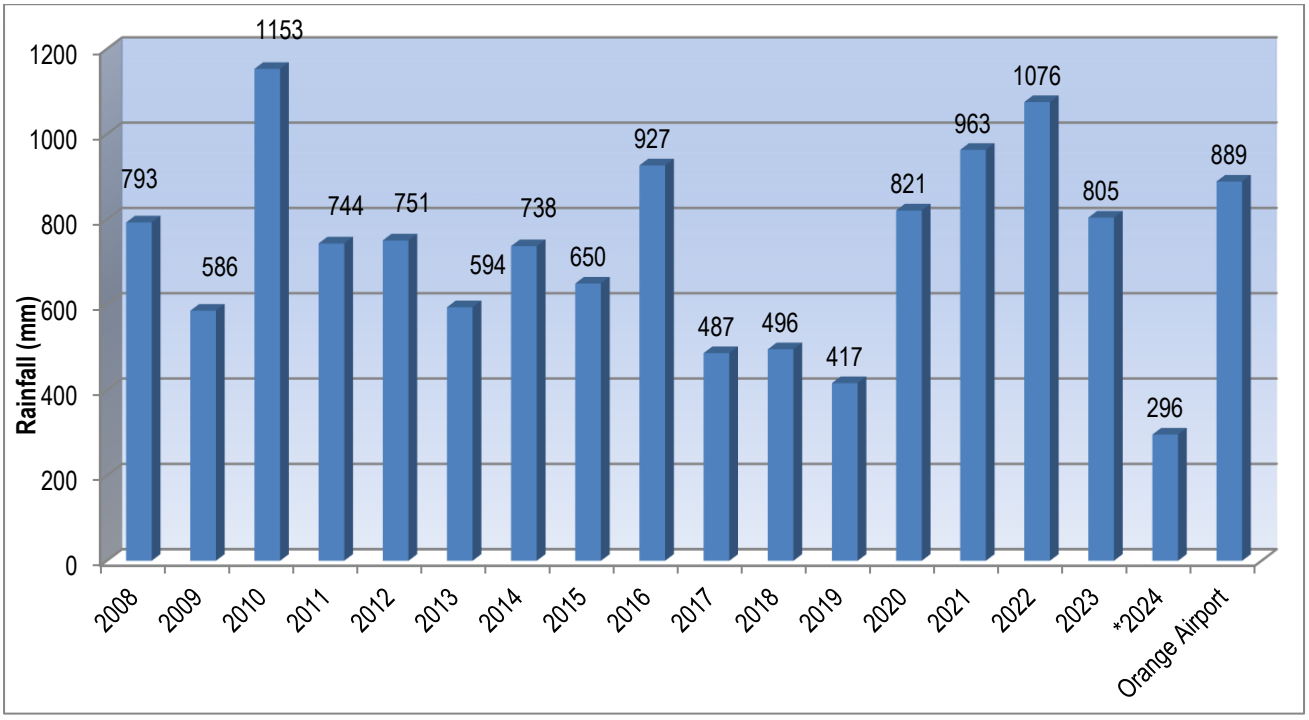


Figure 4-1. Annual average rainfall recorded at Cadia 2008 - April 2024 compared to 1996-2024 mean annual rainfall recorded at Orange Airport (*Jan – April 2024).

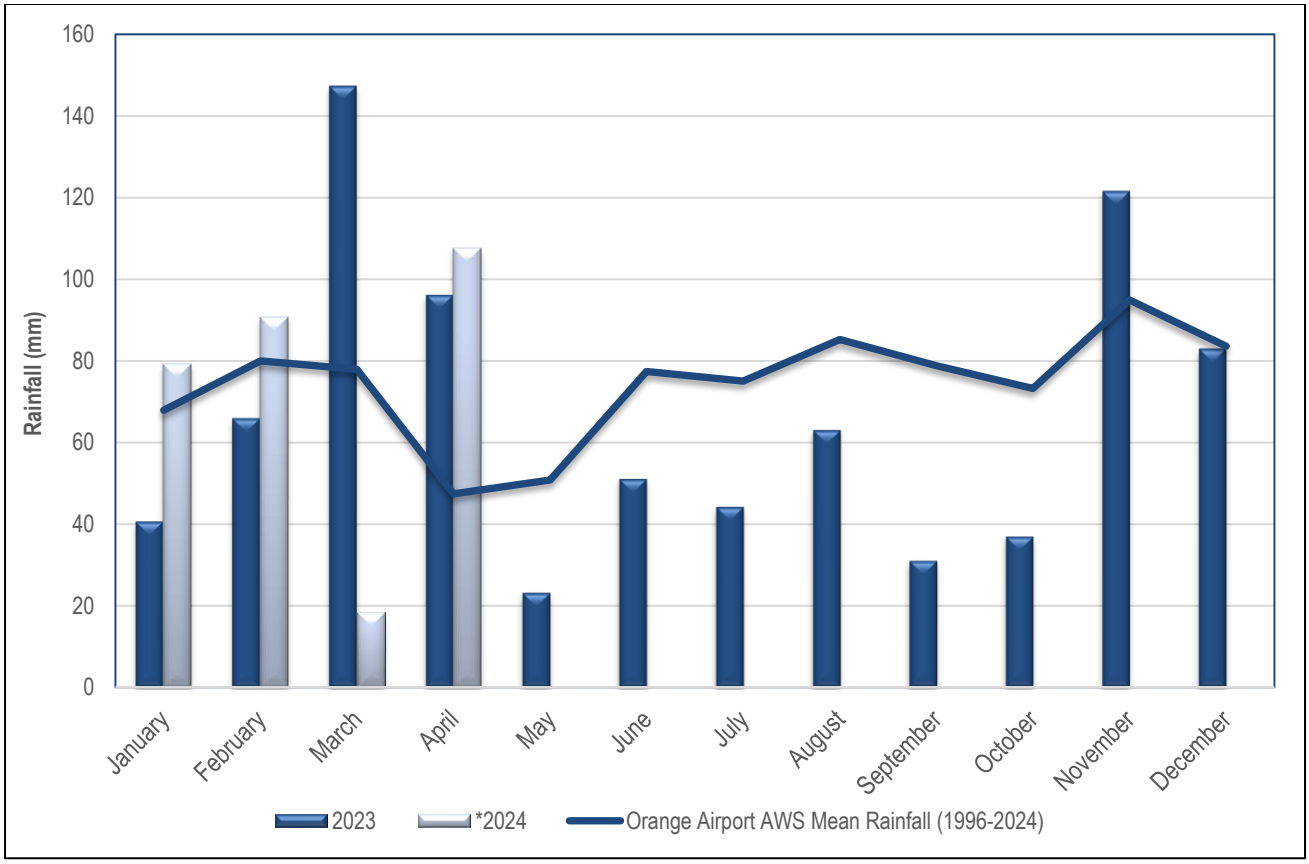


Figure 4-2. Average monthly rainfall recorded at Cadia January 2023 – April *2024 compared to long-term monthly mean rainfall recorded at Orange Airport.

5 Results: Woodland monitoring sites

5.1 Permanent photo-points: Woodland reference sites

Table 5-1 provides a series of photographs taken from permanent photo-points along vegetation transects 2014 – 2024. Photos from numerous years have been excluded for ease of presentation. GPS coordinates and other site-specific information for the reference sites are provided in Appendix 1.

Table 5-1. Permanent photo-points along vegetation transects in the woodland reference monitoring sites 2014 - 2024.

Site	2014	2020	2021	2023	2024
RfWood01: " Ashleigh Park"					
RfWood02: " Bundarra"					
RWood05: Cadiangullong Dam Est. 2016	**NA**				

5.2 Permanent photo-points: Woodland rehabilitation sites

Table 5-2 provides a photograph taken from the permanent monitoring point along the vegetation transect of rehabilitation sites established on the South and North Dumps from 2014 to 2024. North Dump 03 and South Dump 08 are relatively flat, while the remainder are on slopes. Sites South Dump 04 (and 05) and North Dump 01, 02 and 03 were aerial seeded during November 2013 with a blend of native trees and shrubs and exotic pasture species. Sites on the North Dump were over sown with Japanese Millet while sites on the South Dump were over sown with Cereal Rye, Couch, Cocksfoot, Phalaris, Subterranean Clover, Perennial Ryegrass and the native grass *Bothriochloa macra* (Redgrass). In October 2015, sites South Dump 04 (and 05) were cross ripped and re-seeded to reduce the compaction layer. South Dump 07 and 08 (and 09) were also aerial sown in February 2015 with a mix of endemic native, shrubs and ground cover species. South Dump 10 was sown in February 2018.

GPS coordinates and other site-specific information of the rehabilitation sites are provided in Appendix 1. Due to increasing quantities of photographs and monitoring data, some years have been omitted. Please refer to previous monitoring reports (DnA Environmental 2008 – 2015). In addition, note that sites South Dump 05, 06 and 09 are no longer assessed. In 2023 - 2024, additional revegetation activities on the North Dump included thinning of acacias and planting of eucalypts.

Farmland woodland revegetation sites are assessed on a 3-year rotation, next due in 2025. Please refer to 2022 Rehabilitation monitoring report for monitoring results (DnA Environmental 2022).

Table 5-2. Permanent photo-points of woodland rehabilitation monitoring sites on the south and north dumps 2014 - 2024.

Site	2014	2020	2021	2023	2024
South Dump 04					

Site	2014	2020	2021	2023	2024
South Dump 05					N/A
South Dump 07	N/A				
South Dump 08	N/A				
South Dump 10	N/A				

Site	2014	2020	2021	2023	2024
North Dump 01					
North Dump 02					
North Dump 03					

5.3 Ecological trends and performance against a selection of ecological performance indicators

The following section provides a summary of the ecological trends and performance of woodland rehabilitation sites against a selection of performance indicators obtained from the 3 woodland reference sites.

In terms of data analyses, the majority of young rehabilitation sites were established and first assessed in 2014. Data obtained prior to 2014 from the older sites has been omitted from the report for ease of presentation. For data obtained from these older rehabilitation sites please refer to 2009 – 2016 Cadia annual rehabilitation monitoring reports (DnA Environmental 2009 – 2014).

5.3.1 Landscape Function Analyses

5.3.1.1 Landscape Organisation Index

A patch is an area within an ecosystem where resources such as soil and litter tend to accumulate, while areas where resources are mobilised and transported away are referred to as interpatches. Landscape Organisation Indices (LOI) are calculated by the length of the patches divided by the length of the transect to provide an index or percent Landscape Organisation (LO) of the transect which is occupied by functional patch areas (Tongway and Hindley 2004).

Woodland reference sites were characterised by having a mature tree canopy and in 2 sites, there was a well-developed, decomposing leaf litter layer and a sparse cover of native perennial forbs and grasses. The remaining site tended to have much more dominant perennial grass cover. Drought conditions during 2017 - 2019 caused a reduction in perennial ground covers and increased disturbances by animals created minor bare interpatch areas in RfWood01 and RfWood02, thus lowering Landscape Organisation (LO) in these sites. Since 2020, improved seasonal conditions resulted in a significant increase in the diversity and abundance of ground cover. Despite the onset of drier conditions and recent grazing by livestock in 2 sites, 100% functional patch area continued to be recorded in all woodland reference sites (Figure 5-1).

All rehabilitation sites on the SWRD and NWRD demonstrated a significant increase in functional patch area during the first few years after establishment (Figure 5-1). In some cases however, a loss of many of the original troughs and banks occurred due to erosive processes, however these tended to be counteracted by a concurrent increase in plant and litter covers. During 2017 - 2019 prolonged dry conditions and increased grazing and disturbance by animals resulted in a deterioration of functional patch area, minor increases in erosion and loss of LO in all rehabilitation sites, with this also being reflected in the range of reference sites.

In early 2020, the ongoing effects of drought, heavy grazing and/or increased erosion continued to be recorded in South Dump 04 and 2 reference sites. In remaining sites however, increased patch area was recorded due to the relatively recent germination of annual plant covers. Since then, ongoing favourable seasonal conditions have continued to result in relatively high levels of ground cover and resultant LO. Two sites, South Dump 07 and North Dump 03, did not meet 100% LO targets this year, largely due to heavy grazing and disturbance by animals which have caused minor bare interpatch areas.

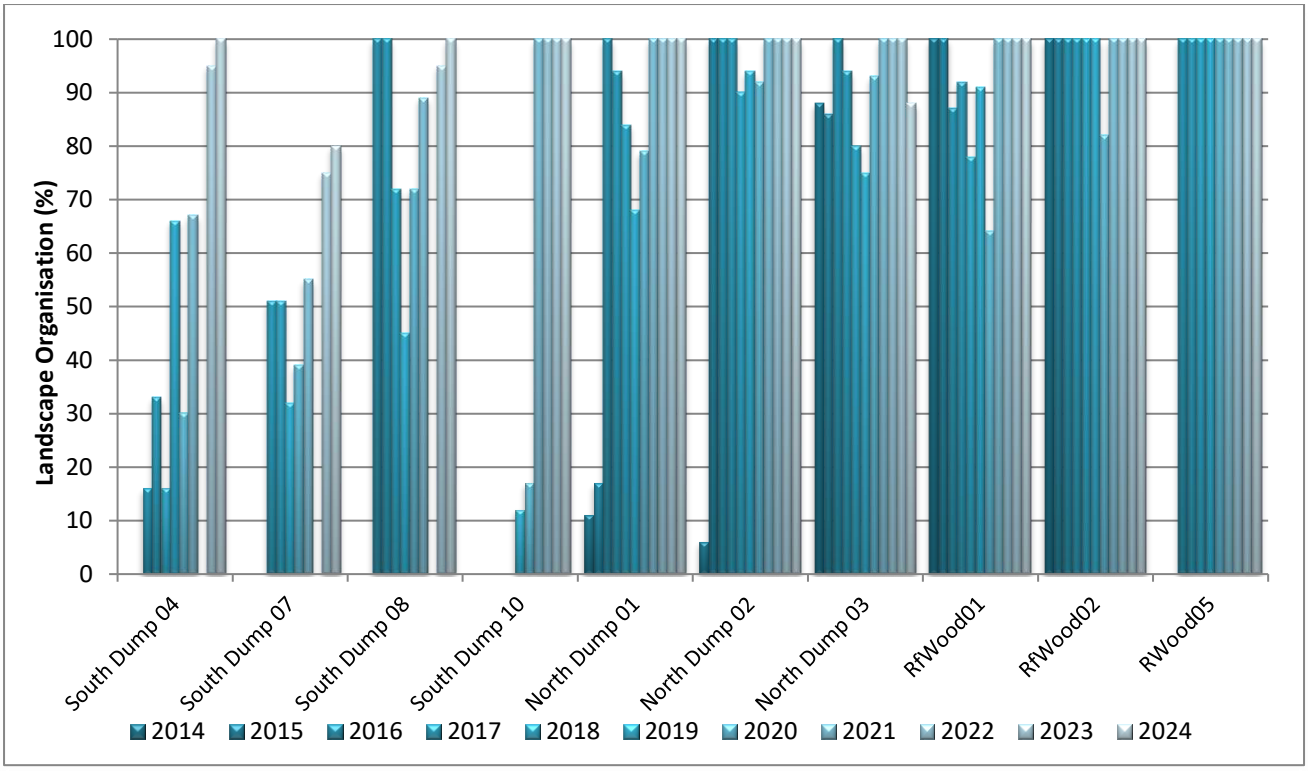


Figure 5-1. Landscape Organisation recorded in the woodland monitoring sites.

5.3.1.2 **Soil surface assessments**

5.3.1.2.1 Stability

Changes in stability in the various woodland reference sites have tended to fluctuate according to seasonal conditions and total grazing pressure with these being most affected during the end of the drought in 2020. While there was high variability between sites, stability has typically increased with improved seasonal conditions since then. However, last year stability in RWood02 declined due to a decline in active plant growth and increased cover of tall rank perennial grasses and litter, while increased stability was recorded in the remaining 2 sites. This year, RfWood01 had been subjected to heavy sheep grazing causing a decline in stability, while recent grazing in RfWood02 has reduced rank growth and improved the perennial grass growth, with a marginal increase in stability recorded in RfWood02 and RWood05 to provide a stability range of 68.5 – 76.3 this year (Figure 5-2).

Stability in the rehabilitation areas has varied significantly, largely as a result of the way the landform was constructed (e.g. soil type, steepness), species that were sown, combined with the ongoing effects of climate and animal disturbance. While some sites were relatively slow to develop, all sites on the SWRD have increased in stability since 2021, due to improved seasonal conditions and improved levels of ground cover, although some sites may still be subjected to grazing and disturbances by animals. This year stability across the 4 monitoring sites on the South Dump were quite similar to each other and ranged from 69.0 – 72.1.

On the NWRD rehabilitation area, there continues to be heavy grazing and the majority of the understorey has become dominated by a well-developed and mostly stable annual plant/litter layer especially in grassy clearings. There continued to be small bare patches which typically occurred on the top of old rip lines where some isolated erosion may have occurred, such as in North Dump 01 and 03. This year stability has declined in North Dump 01 and North Dump 02 with stability indices across the 3 sites ranging from 68.0 – 70.7. Compared to the reference sites, rehabilitation site North Dump 01 had a marginally low stability this year.

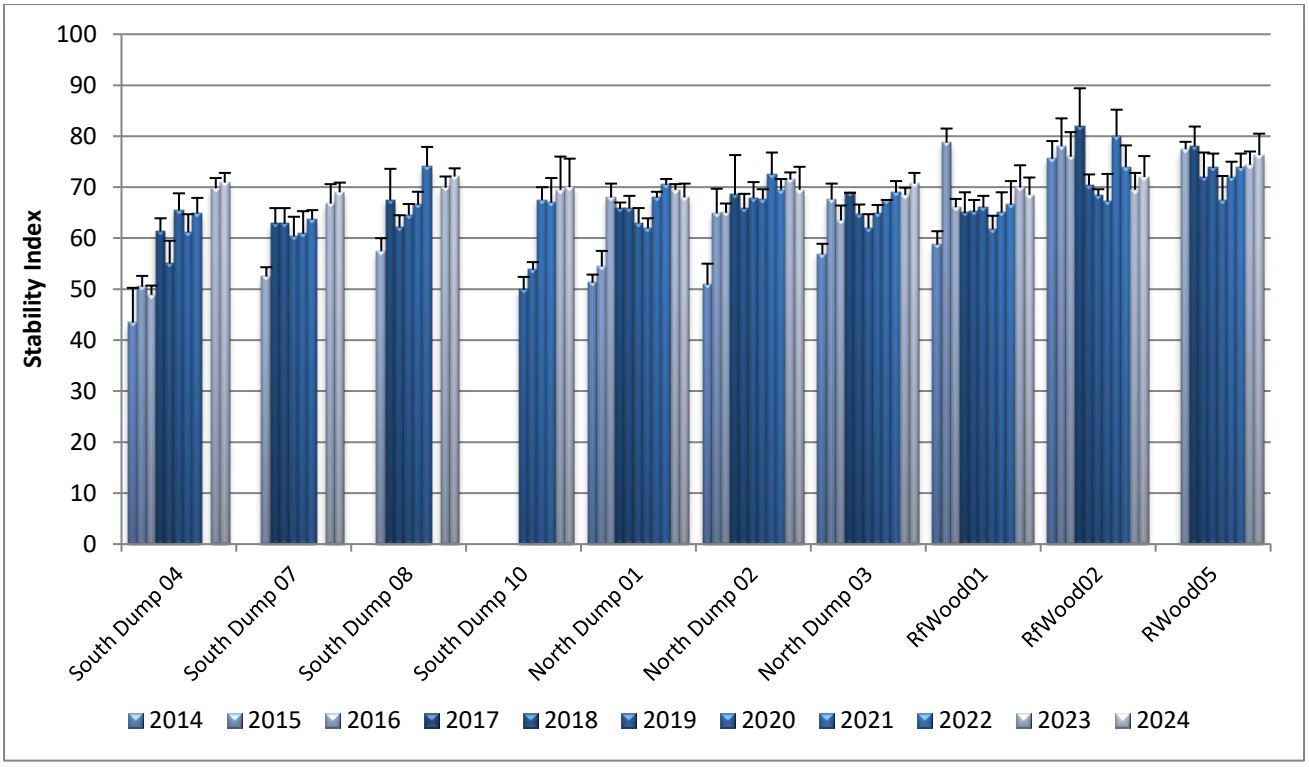


Figure 5-2 LFA stability indices recorded in woodland monitoring sites.

5.3.1.2.2 Infiltration

In the reference sites, there continued to be a well-developed and decomposing litter layer that had often formed a rich spongy humus layer, however during the drought 2017 - 2019, increased usage by wildlife increased soil surface crusting in some areas. There has been marginal change in infiltration with improved seasonal conditions since 2020, however a marginal decline continued to be recorded in RfWood01, due to additional effects of sheep grazing this year. While these changes were minor, reference sites provided an infiltration range of 56.7 – 65.6 (Figure 5-3).

Since the drought, all rehabilitation sites have also demonstrated improved infiltration capacity especially over the last few years of favourable seasonal conditions that has promoted good growth and development of the herbaceous and shrubby understorey in most areas and there has been an increased abundance of cryptogams. This year however, animal grazing and disturbance continues to be high and perennial ground cover was patchy and often low in most rehabilitation areas, with a decline in infiltration capacity being recorded in South Dump 07 and 2 sites on the NWRD. Compared to the reference sites, all rehabilitation sites continued to have a lower infiltration capacity and ranged from 34.0 (South Dump 07) to 51.2 (North Dump 02).

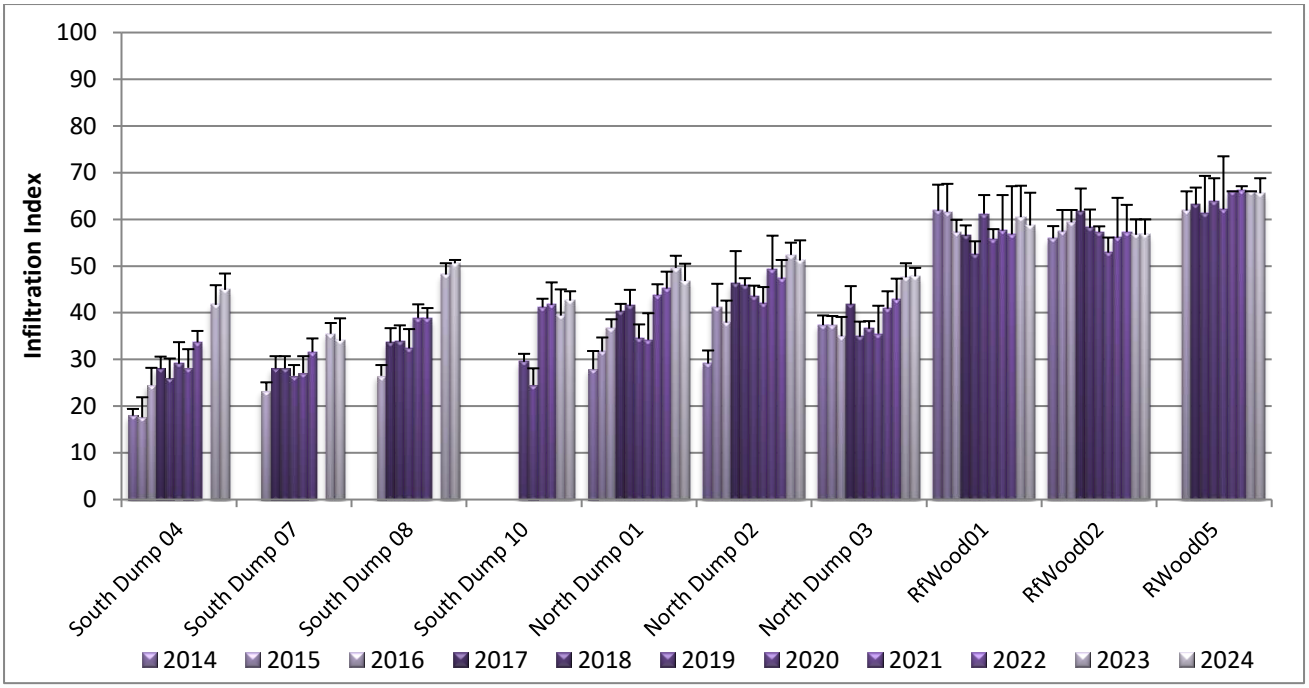


Figure 5-3. Infiltration indices recorded in the woodland monitoring sites.

5.3.1.2.3 Nutrient recycling

Nutrient recycling indices followed similar trends as infiltration capacity of the sites. They also tended to be influenced by the increased levels of perennial canopy and ground cover, litter cover and decomposition as well as cover provided by cryptogams. This year there was a marginal decline in nutrient recycling indices in the woodland reference sites and these ranged from 54.3 – 63.6 (Figure 5-4).

There has been quite a significant increase in nutrient recycling capacity in most rehabilitation sites due to the improved cover of shrubs, with some also having increased levels of ground cover and cryptogams were often abundant, although these were patchy. All rehabilitation sites continue to have a lower nutrient recycling capacity compared to the woodland reference sites and ranged from 35.5 (South Dump 07) to a high of 52.4 (North Dump 02).

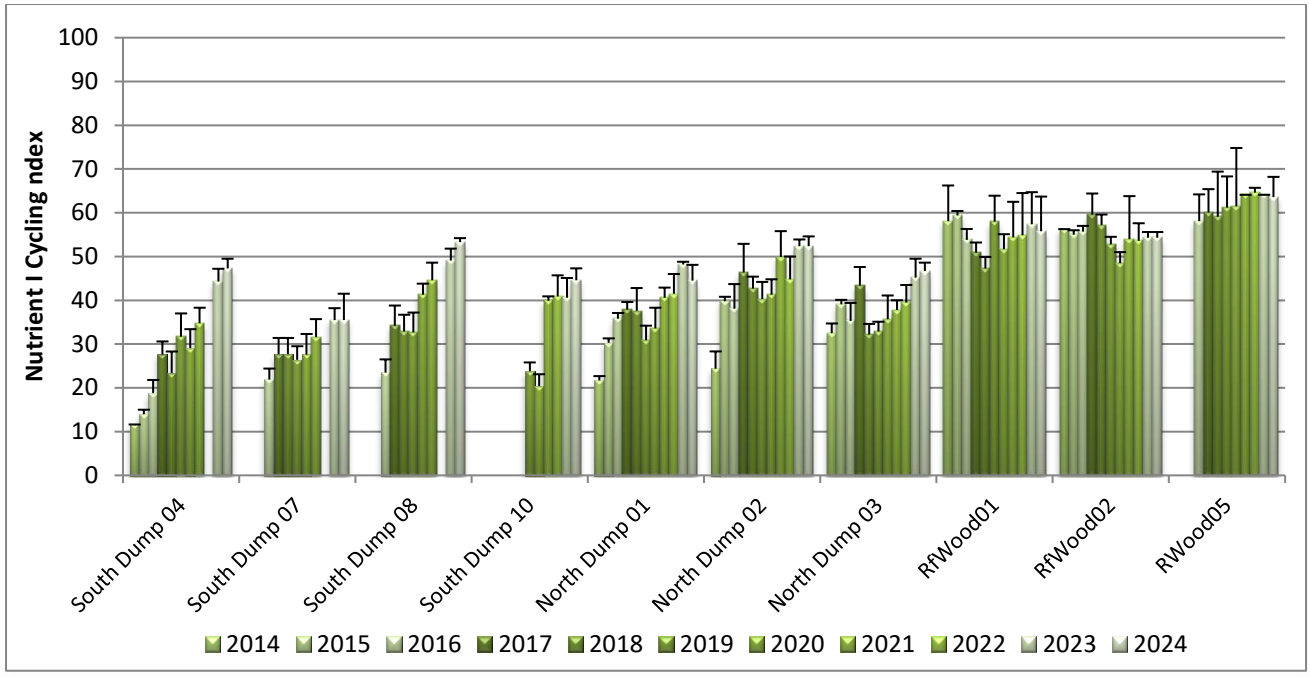
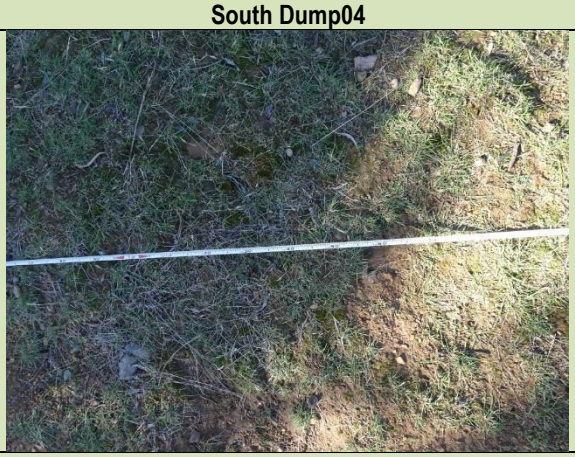


Figure 5-4 LFA nutrient recycling indices recorded in the woodland monitoring sites.

5.3.1.3 **Examples of ground covers**

Examples of ground covers in the various woodland monitoring sites in 2024 is provided in Table 5-3.

Table 5-3. Examples of the ground cover in the woodland monitoring sites in 2024.

South Dump04	South Dump07
	
South Dump08	**South Dump10**
	

North Dump 01	North Dump 02
	
North Dump 03	**RfWood01**
	
RfWood02	**RWood05**
	

5.3.2 Tree and mature shrub populations

5.3.2.1 Density

The total density of live trees and mature shrubs (>5 cm dbh) recorded in the woodland reference sites was variable between sites. There has been a further increase in density recorded in RWood05 this year, as several saplings had grown. The resultant tree densities were 8 – 40 trees per 50 x 20 m (0.1 ha) plot, equating to stem densities of 80 – 400 trees per hectare (Figure 5-5).

Tree and mature shrub densities have been previously increasing in several sites on the SWRD as rehabilitation sites develop and this year there continued to be increased numbers in South Dump 08. In addition, one individual

was recorded for the first time in South Dump 10. No change in trees and mature shrubs was recorded in South Dump 04, however a reduction in numbers were recorded in South Dump 07 due to 8 mortalities.

In sites North Dump 01 and North Dump 03 tree densities remained low, while increased densities were recorded in North Dump 02 as many acacia saplings continue to grow. This year, tree and shrub densities remained low in rehabilitation sites South Dump 04 and 10 and North Dump 01 and 03, compared to the woodland reference sites.

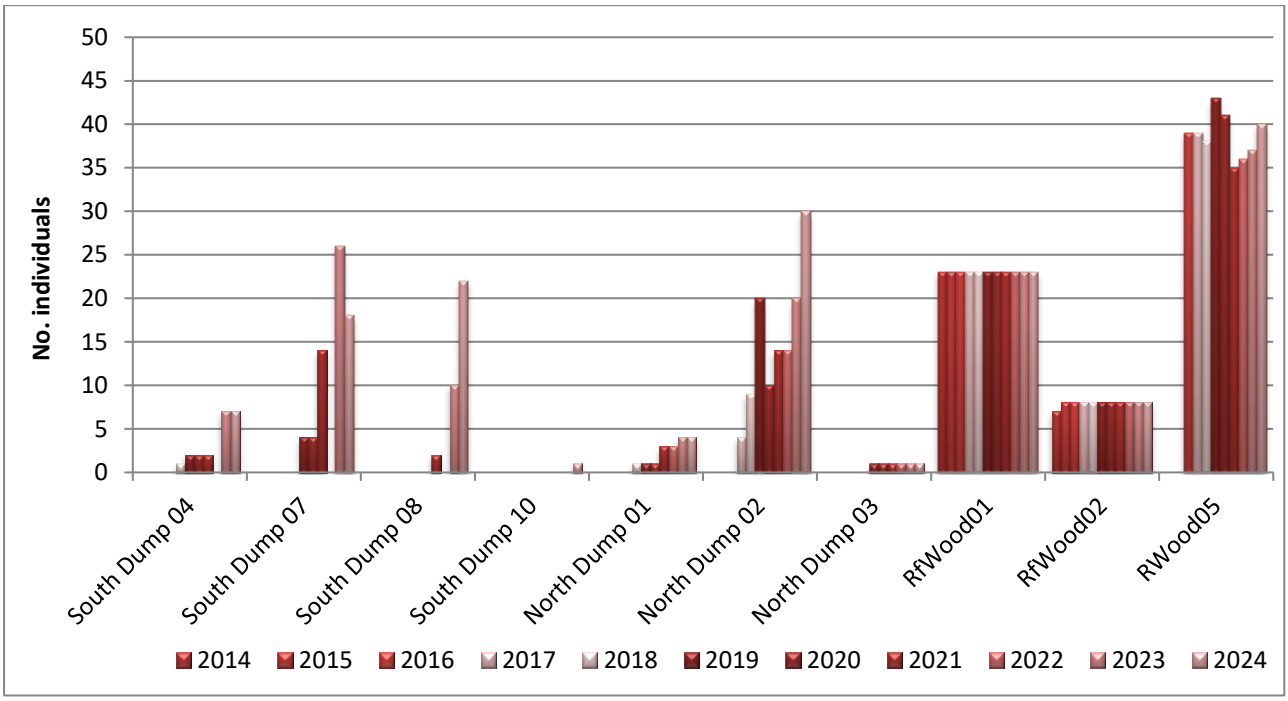


Figure 5-5. Tree and mature shrub densities (>5 cm dbh) in the woodland monitoring sites.

5.3.2.2 **Composition**

The composition of the tree and mature shrub populations is highly variable across the range of sites, with eucalypts being the dominant species in the woodland reference sites. In the SWRD rehabilitation areas where tree and mature shrubs densities were highest (sites 07 and 08), 55 – 78% of the tree and mature shrub populations were eucalypts, with the remainder being acacia species. In South Dump 04, all tree and mature shrubs were acacias, while in South Dump 10, there was only one eucalypt (>5 cm dbh).

In sites on the WRD, tree and mature shrub densities were highly variable, however no monitoring site had eucalypts > 5 cm dbh and all individuals were acacias (Figure 5-6).

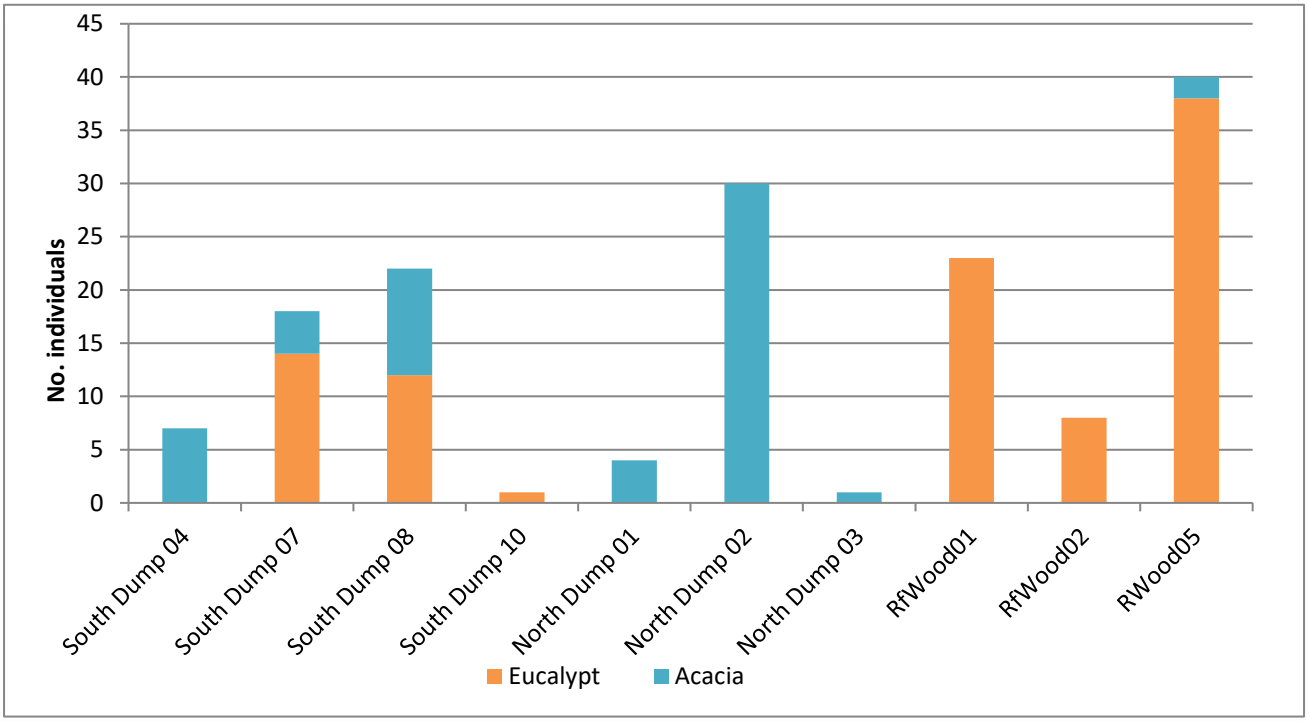


Figure 5-6. Composition of the tree and mature shrub populations in 2024.

5.3.2.3 **Condition**

The average dbh recorded in the reference sites ranged from 26 – 69 cm with the smallest being 6 cm and the largest 95 cm. On the SWRD, tree and mature shrub diameters were 7 – 14 cm on average with some being up to 21 cm at South Dump 04. Trunk diameters in rehabilitation sites on the NWRD ranged from 5 – 16 cm, with the average being 8 - 12 cm (Table 5-4).

Trees and mature shrubs in the woodland reference sites were predominantly in good to moderate health this year however, a small number continue to be stressed in RWood01 and RWood05 and 8 – 13% were stags [dead]. In the reference sites, 50 – 89% of the tree population contained reproductive structures such as buds, flowers or fruits (Table 5-4). RWood02 contained tree hollows (>5 cm) with 44% of the tree population bearing suitable habitat hollows, while fewer were recorded in the remaining 2 sites. Mistletoe was not recorded in any site.

In sites on the SWRD, all individuals were in good to moderate health, however, there has been an increasing number that have died in South Dump 07, including some eucalypts, with 25% of the total stems being dead. Many acacias had reproductive structures and a few eucalypts were in bud. In sites on the NWRD, most individuals were also in good to moderate health, however 25% were in a state of advanced dieback in North Dump 01. Rehabilitation sites were too young to contain tree hollows or mistletoe, however reproductive structures (buds) were recorded in acacias on the NWRD.

5.3.2.4 **Species**

In the reference sites, the tree populations were comprised of 1 – 4 species of tree and mature shrubs (Table 5-4). The most dominant species were *Eucalyptus melliodora* (Yellow Box), *E. albens* (White Box) and *E.*

goniocalyx (Bundy Box), with *E. macrorhyncha* (Red Stringybark), *E. bridgesiana* (Apple Box), *Acacia dealbata* (Silver Wattle) and *A. implexa* (Hickory) typically occurring in fewer numbers.

Rehabilitation sites on the SWRD and NWRD typically had tree populations comprised only of mature *A. dealbata.* Additional species recorded may have included *Acacia implexa* (Hickory), *A. filicifolia* (Fern-leaved Wattle), *A. penninervis* (Mountain Hickory), *Eucalyptus goniocalyx* (Bundy Box), *E. albens* (White Box) and/or *E. bridgesiana* Apple Box).

Table 5-4. Trunk diameters and condition of trees and mature shrubs in woodland monitoring sites in 2024.

Site Name	No species	Average dbh (Cm)	Max dbh (cm)	Min dbh (cm)	Total trees	No. with multiple limbs	% Live trees	% Healthy	% Medium Health	% Advanced Dieback	% Dead	% Mistletoe	% Flowers / fruit	%. Trees with hollows
South Dump 04	1	14	21	8	7	4	100	71	29	0	0	0	86	0
South Dump 07	4	10	15	5	24	4	75	33	42	0	25	0	8	0
South Dump 08	5	8	13	6	22	4	100	100	0	0	0	0	27	0
South Dump 10	1	7	7	7	1	1	100	100	0	0	0	0	0	0
North Dump 01	1	12	16	9	4	3	100	25	50	25	0	0	50	0
North Dump 02	1	8	14	5	38	12	79	53	26	0	0	0	53	0
North Dump 03	1	10	10	10	1	0	100	0	100	0	0	0	100	0
RfWood01	**2**	**33**	**89**	**8**	**25**	**9**	**92**	**68**	**20**	**4**	**8**	**0**	**80**	**4**
RfWood02	**1**	**69**	**95**	**32**	**9**	**1**	**89**	**89**	**0**	**0**	**11**	**0**	**89**	**44**
RWood05	**5**	**26**	**75**	**6**	**46**	**14**	**87**	**26**	**41**	**20**	**13**	**0**	**50**	**13**

5.3.3 Shrubs and juvenile trees

5.3.3.1 Density

The density of shrubs and/or juvenile trees (<5 cm dbh) recorded in woodland reference sites was highly variable with only 2 – 3 individuals recorded in RfWood01 and RfWood02, while 116 seedlings were recorded in RWood05, with these having declined over the past year. Seedling densities were also highly variable in woodland rehabilitation sites and in all monitoring sites a declining trend has occurred.

There has also been a declining trend in shrub densities over the last few years in the rehabilitation sites and while some individuals may have grown and were now recorded as mature trees in some cases, the majority have been drought mortalities and/or had reached the end of their life span (natural senescence). This decline continued to be observed and in South Dump 07, semi-mature eucalypts and additional young acacias had recently died.

In North Dump 01 however, thinning of acacia saplings has occurred as part of a rehabilitation trial. Despite these losses, seedling/sapling densities remained high in all sites except in South Dump 10 where only 9 seedlings were recorded this year (Figure 5-7).

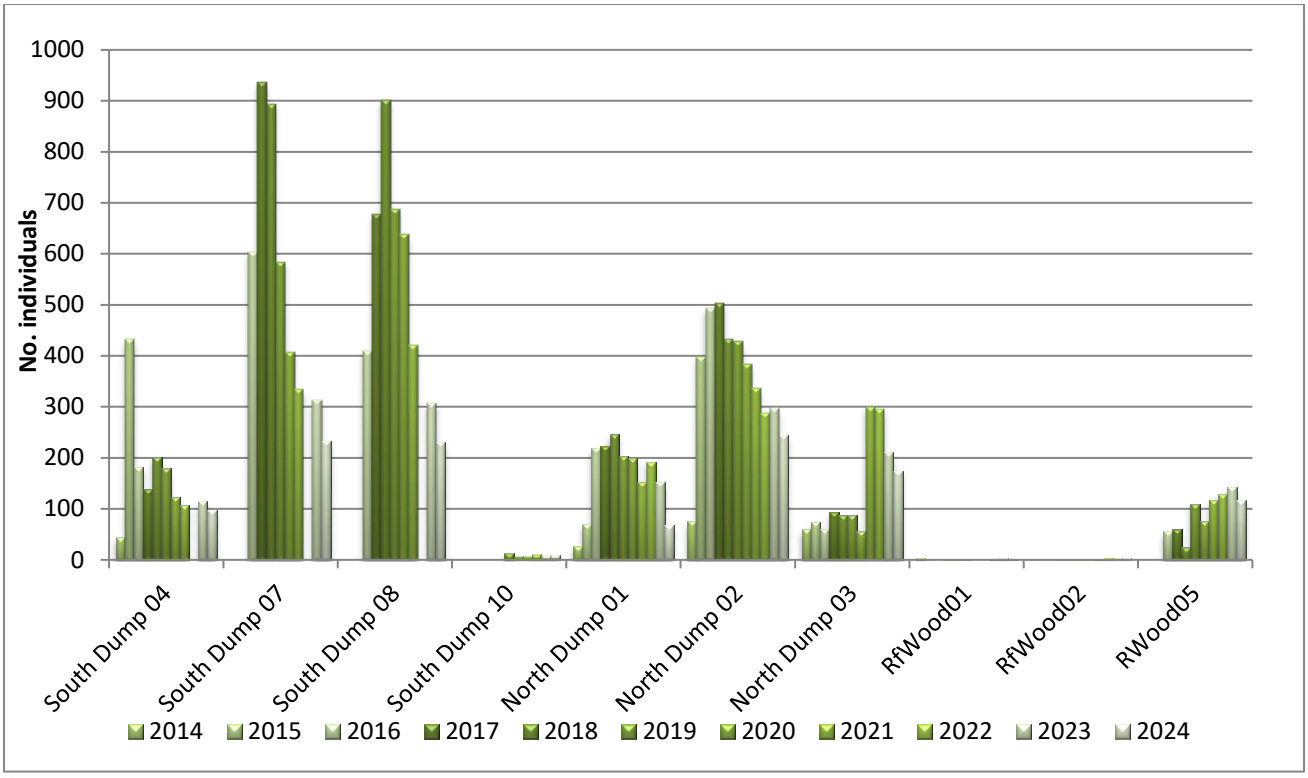


Figure 5-7. Densities of shrubs and juvenile trees in woodland monitoring sites.

5.3.3.2 **Composition**

The composition of the shrub and juvenile tree populations is highly variable across the range of sites, with limited eucalypt seedlings in reference sites this year. In rehabilitation sites, the vast majority of individuals were acacias, however some sites also had volunteer *Cassinia Sifton* (Sifton Bush), with high densities recorded in South Dump 08, North Dump 03. Site South Dump 10 also had exotic *Rubus fruticosus* (Blackberry) and so did RfWood01. A variety of other exotic shrubs seedlings also continue to be recorded in RWood05 (Figure 5-8).

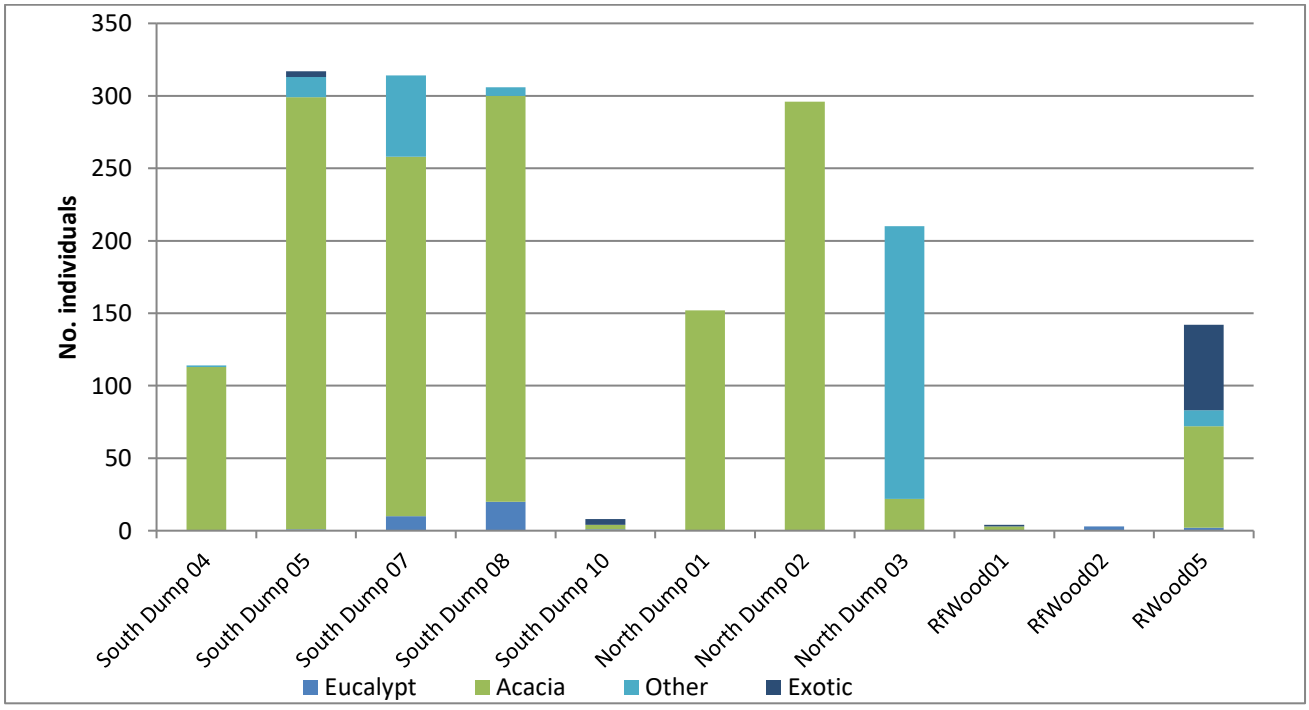


Figure 5-8. Composition of shrub and juvenile tree populations in 2024.

5.3.3.3 **Diversity**

In woodland reference sites there were 1 – 9 different species, including species such as *A. dealbata, A. decora, Cassinia sifton, A. implexa* and *Brachychiton populneus* (Kurrajong) and/or juvenile *E. albens, E. macrorhyncha and/or E. goniocalyx.* There were also numerous exotic shrubs in RWood05 including *Crataegus monogyna* (Hawthorn), *Ligustrum lucidum* (Privet), *Rubus fruticosus* (Blackberry) and *Rosa rubiginosa* (Sweet Briar) which collectively comprised 28% of the shrub population.

Most rehabilitation sites on the SWRD had a relatively high diversity of shrubs and juvenile trees with 5 - 15 different species in South Dump 04, 07 and 08, while on the NWRD, there were 3 – 6 species. In South Dump 10 however, seedling establishment was limited to 2 *A. decora* and 7 *Rubus fruticosus*.

On the NWRD and SWRD, *A. buxifolia* tended to be the most abundant species followed by *A. dealbata* and *A. vestita*. Other occasional species may have included *A. spectabilis* (Mudgee Wattle)*, A. genistifolia* (Early Wattle)*, A. verniciflua* (Varnish Wattle)*, A. penninervis* (Mountain Hickory)*, A. decora* (Western Golden Wattle)*, A. filicifolia* (Fern leaved Wattle), *A. melanoxylon* (Blackwood), *A. paradoxa* (Kangaroo Thorn) and volunteers of Cassinia *sifton. O*ther occasional species may have included *Daviesia leptophylla, Leptospermum continentale, Hakea decurrens, Pultenaea spinosa, P. procumbens* and the native vine *Hardenbergia violacea* (Happy Wanderer).

Eucalypts were recorded more frequently in South Dump 07 and 08, with common species being juvenile *Eucalyptus albens, E. goniocalyx, E. bridgesiana, E. melliodora* and *E. polyanthemos* (Red Box). *Eucalyptus viminalis* (Ribbon Gum)*, E. dives* (Broad-leaved Peppermint) and *E. macrorhyncha* have also been previously recorded in sites on the South Dump that are no longer assessed. This year, one *Eucalyptus viminalis* and 2 *E. goniocalyx* had been planted in North Dump 03. While eucalypt densities were somewhat limited in rehabilitation areas, sites that did not presently contain any eucalypts included South Dump 04 and North Dump 01 and 02.

5.3.3.4 **Height class**

Most seedlings tended to be less than 0.5m in height in the reference sites, while RWood05 also had individuals in all height categories with some >2.0 m tall this year. In rehabilitation areas, all height classes were represented however most individuals tended to be taller than 2.0 m, indicating good growth and development (Table 5-5, Figure 5-9).

Table 5-5. Shrubs and juvenile trees recorded in each height class in woodland monitoring sites in 2024.

Site Name	0-0.5m	0.5-1.0m	1.0-1.5m	1.5-2.0m	>2.0m	Total	No. species	% endemic
South Dump 04	1	11	10	21	54	97	5	100
South Dump 07	8	10	28	66	120	232	11	100
South Dump 08	32	46	52	60	40	230	15	100
South Dump 10	5	4	0	0	0	9	2	22
North Dump 01	30	12	4	13	8	67	3	100
North Dump 02	6	0	22	60	156	244	4	100
North Dump 03	17	68	77	10	2	174	6	100
RfWood01	**2**	**0**	**0**	**0**	**0**	**2**	**2**	**50**
RfWood02	**1**	**0**	**1**	**0**	**1**	**3**	**1**	**100**
RWood05	**62**	**23**	**23**	**6**	**2**	**116**	**9**	**72**

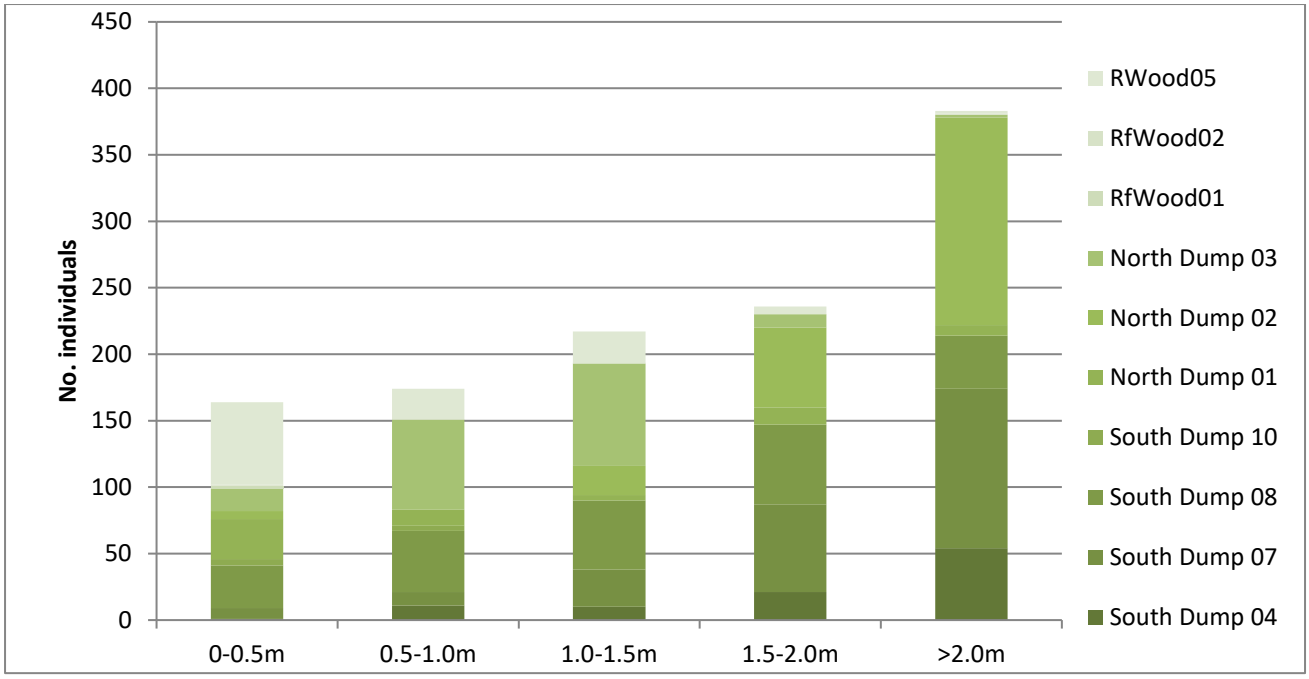


Figure 5-9. Number of individuals across the 5 height classes.

5.3.4 Total ground cover

Total ground cover is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5 m in height). There was limited overall change in total ground cover across the range of monitoring sites with 96 – 100% cover recorded in the reference sites. There was 84 – 96% cover in sites on the SWRD, while there was 95 – 100% cover on the NWRD. Small bare patches from macropod disturbance and/or camps may have reduced ground cover in some sites (Figure 5-10).

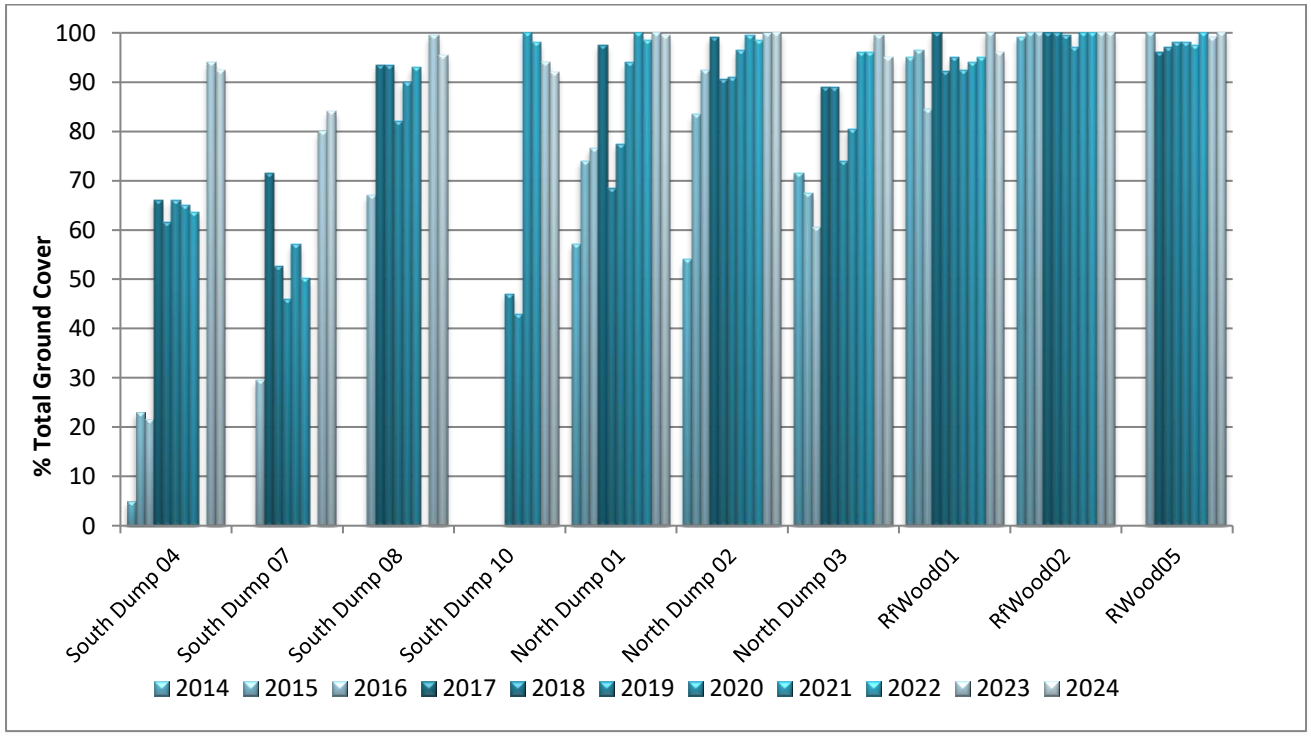


Figure 5-10. Total ground cover recorded in woodland monitoring sites.

5.3.5 Structural composition

This year, ground cover in the reference sites continued to be similar to each other and all had increased levels of dead leaf litter which provided 69 - 82% cover. There has been a reduction on annual plant covers however all sites contained a sparse scattering of annual (1 – 2%) and perennial (5 - 23%) ground covers. In all 3 sites there was a small amount of cover from fallen branches and in RfWood02 there continued to be a rocky outcrop. Cryptogam cover continued to be absent due to the high levels of plant and litter covers (Figure 5-11).

In rehabilitation sites on the SWRD, dead litter provided 46 – 71% ground cover, while perennial ground covers or low hanging shrubs (<0.5 m) provided 10 – 25% cover. Annual plant cover was highly variable and ranged from 4 – 24%, while 2 sites had scattered rocks and cryptogams were low in abundance in all sites except South Dump 10. On the NWRD, there was on average 28 – 75% litter, 10 – 24% perennial ground cover and 4 – 40% annual plant cover. Scattered rocks provided minor cover in all sites and in North Dump 03, cryptogams were also in low abundance. No logs were recorded in any rehabilitation site.

Woodland reference sites had a mature canopy cover (>6.0 m) that provided 27 – 40% projected foliage cover, but typically there was limited foliage cover in the lower height classes, a characteristic feature of open grassy woodland communities. On the SWRD, establishing tree and shrub seedlings/saplings provided relatively high densities of foliage cover 0.5 – 4.0 m in height in all sites except South Dump 10, with some cover up to 6.0 m tall in 2 sites this year.

On the NWRD, highest canopy cover was recorded in North Dump 02 with relatively dense cover of foliage cover up 4.0 m tall, while there was also some limited cover up to 4.0 m in North Dump 03. In North Dump 01, cover was limited and almost all was less than 0.5 m tall. Community structure of individual rehabilitation monitoring sites in 2024 is provided in Appendix 3.

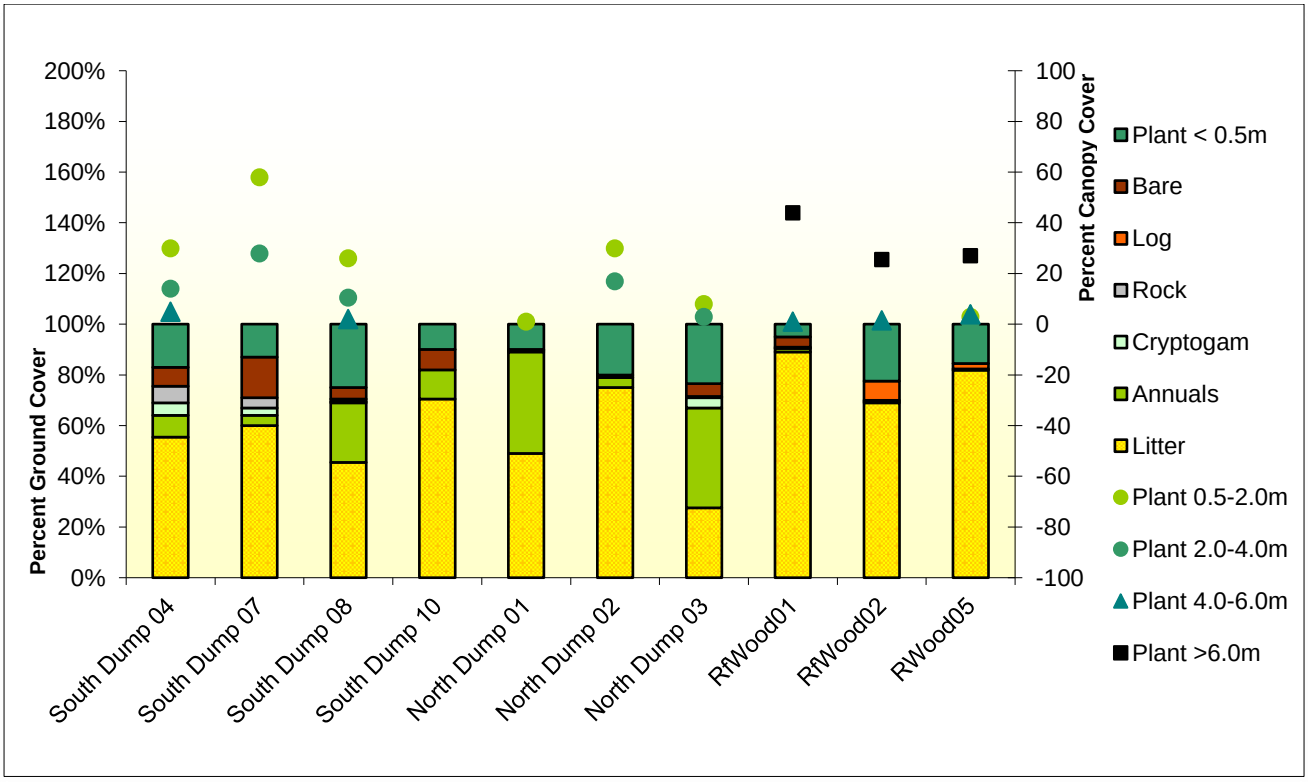


Figure 5-11. Average percent ground cover and projected foliage cover recorded in the woodland monitoring sites in 2024.

5.3.6 Floristic Diversity

There has been no consistent change in total species diversity across the range of monitoring sites, however the level of diversity has tended to fluctuate with the seasonal conditions and degree of grazing intensity. In rehabilitation areas, floristic diversity is also implicated with rehabilitation construction methods, origin of topsoil, species selection, sowing rates, success of establishment as well as stage of successional development and/or management intervention/s of the areas.

In all monitoring sites, species diversity was lowest during 3 years of drought, with the lowest diversity in the reference sites being recorded in 2018. Since improved seasonal conditions in 2020 there has been an increase in diversity across most sites. In the reference sites, there were 23 – 61 species recorded this year, with a reduction being recorded in RfWood01 as a result of livestock grazing. Most rehabilitation sites had a minor increase in floristic diversity, where there were 30 – 61 species on the South Dump and 37 – 48 on the North Dump (Figure 5-12).

Exotic species comprised 41 – 65% of species in the reference sites this year, where there were 15 – 25 exotic species (Figure 5-13). In rehabilitation sites, exotic species made up 28 – 83% of diversity in sites on the South Dump with 10 – 25 exotic species. On the North Dump, exotic species were quite dominant and made up 67 – 73% of diversity, with 26 - 32 exotic species. All rehabilitation sites except South Dump 07 had a higher diversity of exotic species than the reference sites this year (Figure 5-14). A comprehensive list of flora species recorded in the monitoring sites is provided in Appendix 2.

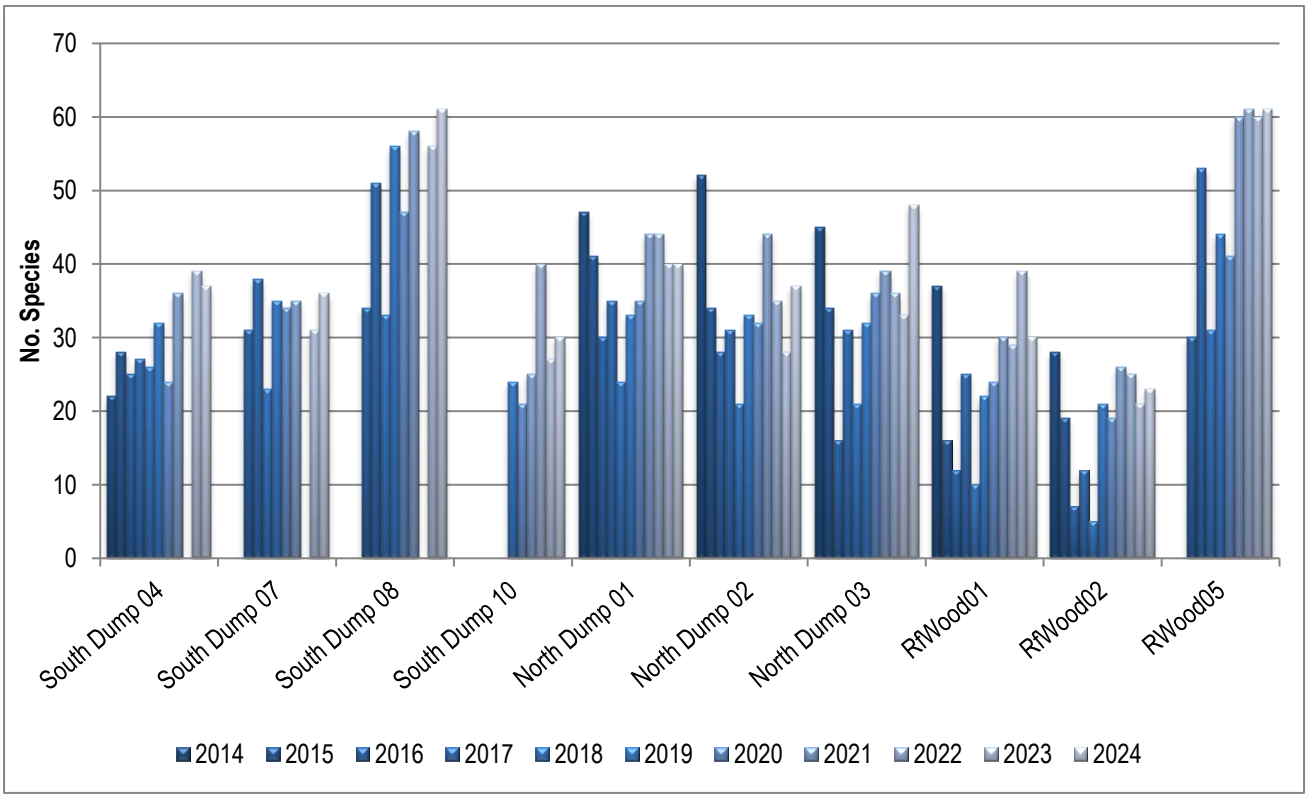


Figure 5-12. Total species diversity recorded in the woodland sites.

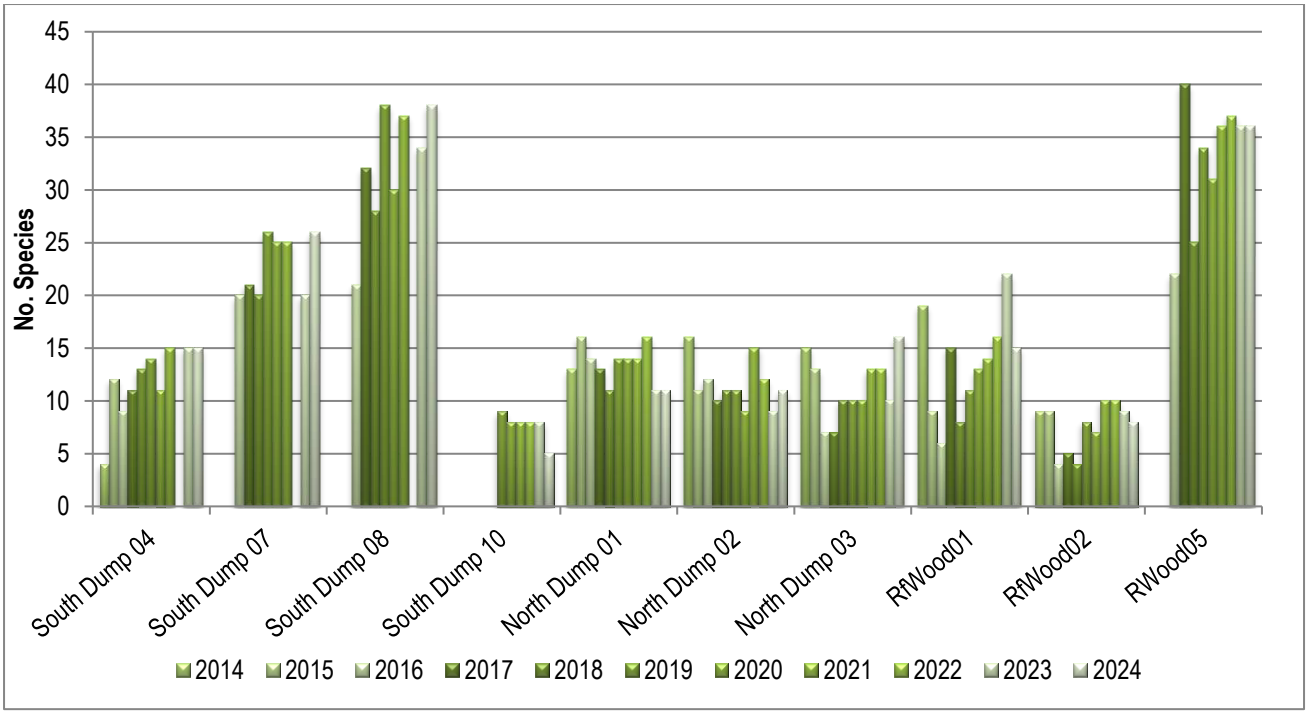


Figure 5-13. Native species diversity recorded in woodland monitoring sites.

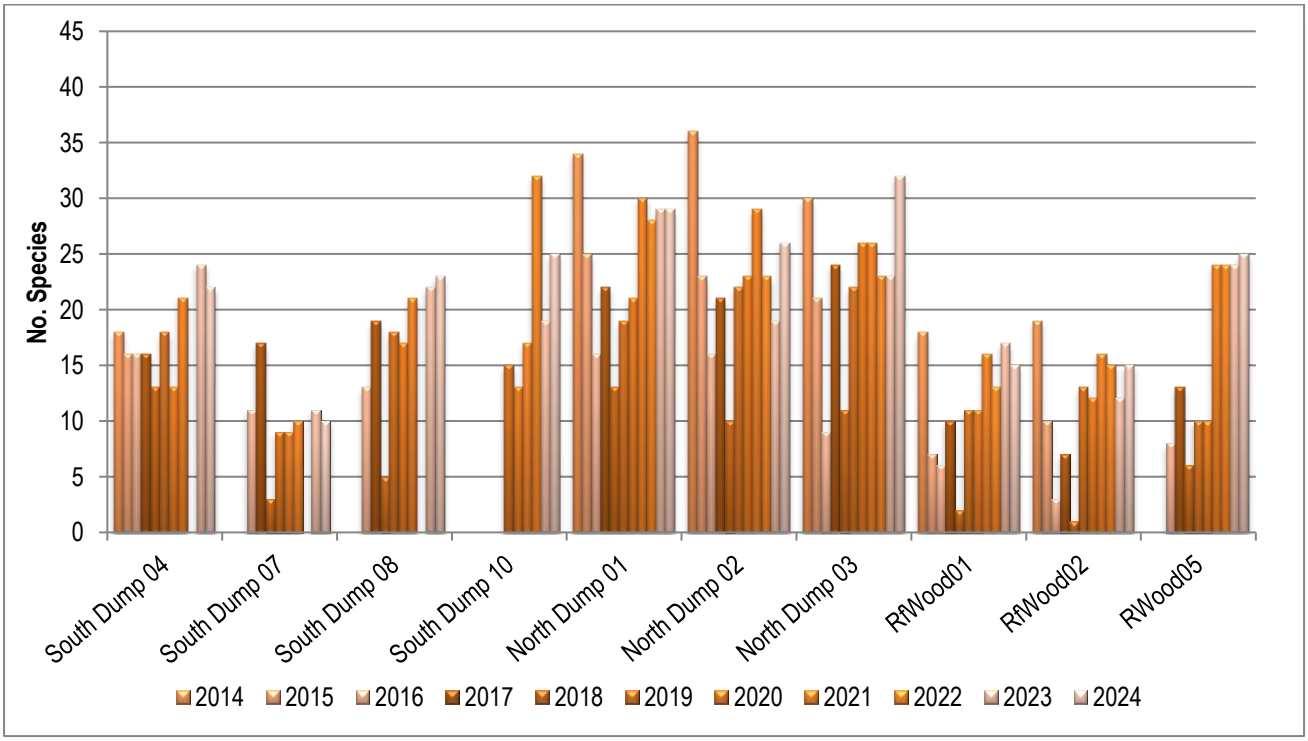


Figure 5-14. Exotic species diversity recorded in woodland monitoring sites.

5.3.7 Native ground cover abundance

Native ground cover abundance is an additional ecological indicator which provides a measure of the cover abundance of the native vegetation and an indication of the overall weediness of the sites (Figure 5-15). Similarly, to the floristic diversity data, the proportionate ground cover provided by native plants has also been strongly influenced by the seasonal conditions and degree of grazing pressure. Dry conditions usually result in the lower abundance of exotic annual plants thus tending to increase the cover provided by live native perennial species.

This year, drier conditions has tended in an increase in the proportion of native plant cover, with native plants providing 26 - 79% of the live plant cover in the reference sites.

In rehabilitation sites on the SWRD, there was also an increase in native plant cover in all sites except South Dump 10 where no native ground cover was recorded at all. Native ground covers had become dominant in South Dump 04 and 07 with 60% and 80% native plant cover, while 40% native plant cover was recorded in South Dump 08 this year.

On the NWRD cover provided by native plants has declined in 2 sites and provided 22 – 30% cover this year. While exotic plants may have been more abundant in numerous sites, all rehabilitation sites, except South Dump 10 and North Dump 01 had an acceptable cover of native plants compared to the RfWood02 reference site this year.

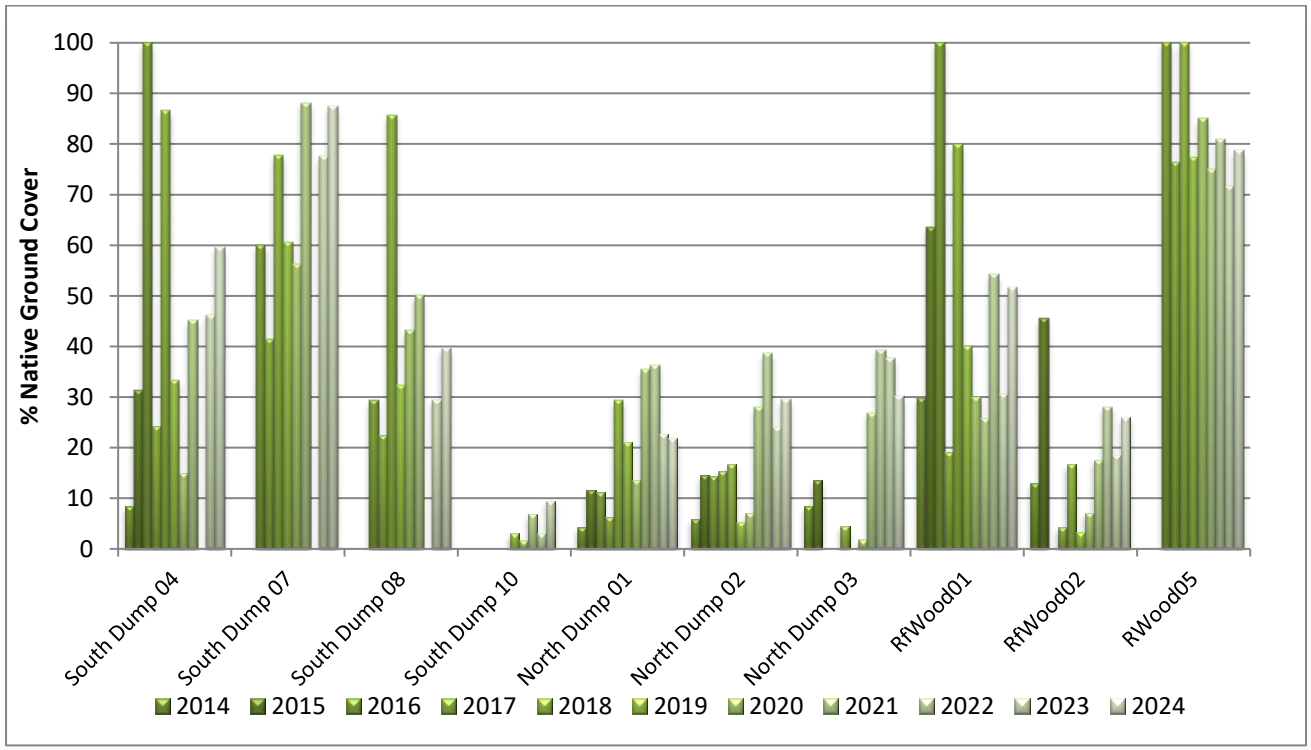


Figure 5-15. Native cover abundance in woodland monitoring sites.

5.3.8 Most common species

The most common species, those that were recorded in at least 6 of the 7 woodland rehabilitation sites in 2024 is given in Table 5-6.

Exotic species *Avena fatua* (Wild Oats), *Modiola caroliniana* (Red-flowered Mallow), *Trifolium subterraneum* (Subterraneum Clover), *Echium plantagineum* (Paterson's curse), *Phalaris aquatica* (Phalaris) and *Rumex acetosella* (Sheep Sorrel) were recorded in most rehabilitation sites. Native species *Acacia buxifolia*, *A. vestita*, *Oxalis perennans* (Yellow Wood-sorrel) and *Rytidosperma racemosum* (Wallaby Grass) were also very common.

Many common species were also recorded in at least one of the woodland reference sites, reflecting their natural distribution within the local area, while some species such as several acacias, were sown as part of the rehabilitation program. A comprehensive list of species recorded in all woodland monitoring sites in 2024 has been included in Appendix 2.

Table 5-6. Most common species in woodland rehabilitation sites in 2024.

exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	Total	RfWood01	RfWood02	RWood05
*	*Avena fatua*	Wild Oats	g	1	1	1	1	1	1	1	**7**		1	
*	*Modiola caroliniana*	Red-flowered Mallow	h	1	1	1	1	1	1	1	**7**			
*	*Trifolium subterraneum*	Subterraneum Clover	h	1	1	1	1	1	1	1	**7**	1	1	1
	Acacia buxifolia	Box-leaved Wattle	s	1	1	1	1	1	1		**6**			
	Acacia vestita	Weeping Boree	s	1	1	1	1	1	1		**6**			
*	*Echium plantagineum*	Paterson's Curse	h	1	1	1	1		1	1	**6**			
	Oxalis perennans	Yellow Wood-sorrel	h	1	1	1	1	1	1		**6**	1		1
*	*Phalaris aquatica*	Phalaris	g	1	1		1	1	1	1	**6**		1	1
*	*Rumex acetosella*	Sheep Sorrel	h	1	1	1	1	1	1		**6**	1		1
	Rytidosperma racemosum	Wallaby Grass	g	1	1	1	1	1	1		**6**	1	1	1

Key to growth form legend: t = tree; s = shrub; ss =sub-shrub; h = herb; g = grass, r = reed; v = vine; f = fern; c = cactus

5.3.9 Most abundant species

The most abundant species recorded in each of the rehabilitation monitoring sites this year are provided in Table 5-7. The most abundant species were those that collectively summed to a Braun-Blanquet total of 10 or more from the 5 replicated samples along the vegetation transect. The maximum score that can be obtained by any one species is 30.

Woodland reference sites tended to be dominated by a combination of perennial grasses *Phalaris aquatica* (Phalaris) and *Rytidosperma racemosum* (Wallaby Grass), with annual species being less abundant this year. Ground covers in rehabilitation areas was highly variable, with the most abundant species in South Dump 08 this year being *Rytidosperma racemosum* (Wallaby Grass), with extensive germination of *Trifolium subterraneum* (Subterraneum Clover) occurring after recent autumn rainfall. South Dump 10 and North Dump 02 continue to be dominated by *Phalaris aquatica* (Phalaris), while North Dump 01 and 03 were had an abundance of exotic annuals *Trifolium subterraneum* and *Modiola caroliniana* (Red-flowered Mallow), with *Rytidosperma racemosum* also increasing in abundance in North Dump 03. No species was present in sufficient abundance to minimum abundance criteria in South 04 and 07 this year. Species and their abundance cover recorded at the individual sites is provided in Appendix 3.

Table 5-7. Most abundant species in woodland monitoring sites in 2024.

exotic	Scientific Name	Common Name	Growth Form	South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03	RfWood01	RfWood02	RWood05
*	*Trifolium subterraneum*	Subterraneum Clover	h			12		15		16			
	Rytidosperma racemosum	Wallaby Grass	g			12				18	10		13
*	*Phalaris aquatica*	Phalaris	g				13		15			12	
*	*Modiola caroliniana*	Red-flowered Mallow	h					13		13			

Key to growth form legend: t = tree; s = shrub; ss =sub-shrub; h = herb; g = grass, r = reed; v = vine; f = fern; c = cactus

5.3.10 **Vegetation composition**

The composition of the vegetation as categorised by 8 different growth forms is given in Figure 5-16, with these being highly variable between the sites. The reference sites were comprised by a high diversity of herbs with 14 - 36 species followed by grasses with 4 – 10 species. There were 1 – 4 species of tree and while one site had no shrubs, there were 2 - 8 different shrubs in the other 2 sites. There were 1 - 3 reed species however there were no sub-shrubs, vines or ferns.

In woodland rehabilitation sites, most sites had a composition that was comparable to the reference sites however there continued to be an absence of tree species in South Dump 04 and North Dump 01 and 02. South Dump 07 had a slightly low diversity of grasses, while South Dump 10 had a slightly low diversity of reeds, compared to woodland reference sites.

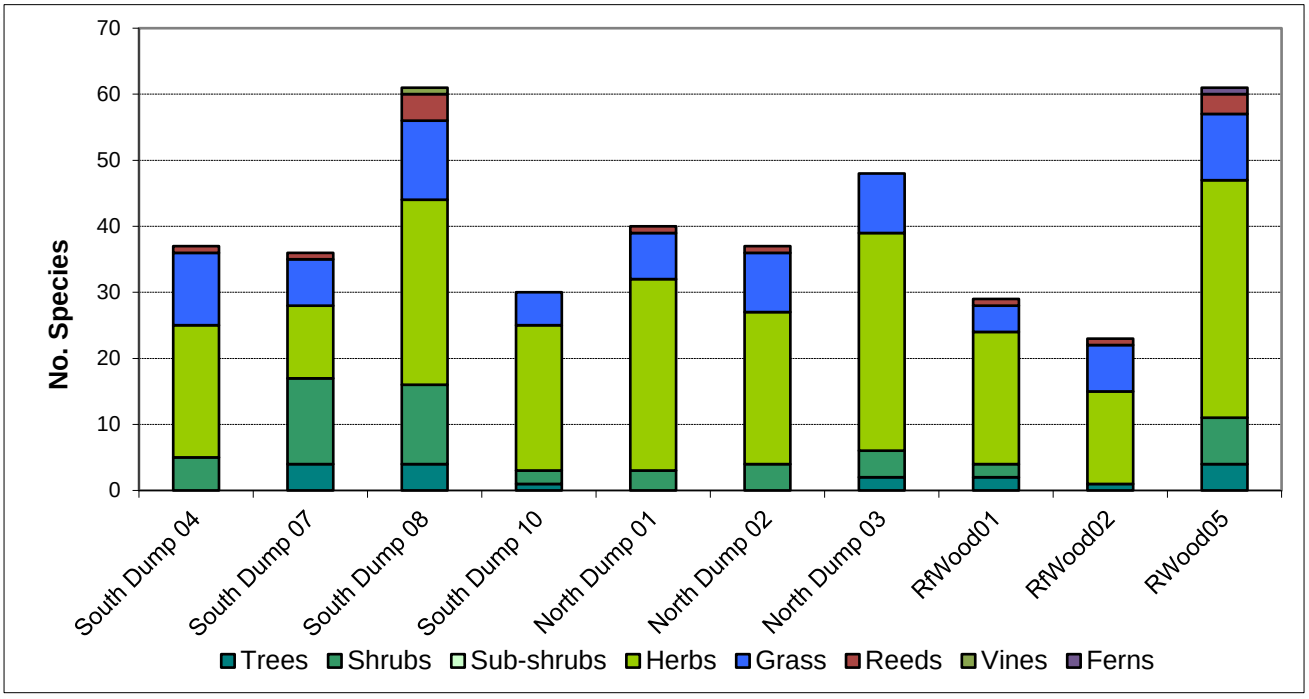


Figure 5-16. Vegetation composition of woodland monitoring sites in 2024.

5.3.11 **Rill Assessment**

"Rills of concern" are those that have minimum dimensions of 10 cm x 30 cm (0.03 m^2) as described by Nichols (2007) and are measured along a 50 m transect along the contour. Minor rilling has previously been recorded in some sites on rehabilitation areas, however these have tended to stabilise as the sites have developed and ground covers became more established. Minor rilling however, continued to be recorded in South Dump 07 which has remained stable with cross-sectional area of 0.081 m^2 (Figure 5-17). North Dump 01 continues to have 2 rills that appeared relatively stable due to high levels of ground cover, although ground cover has decreased over the past year.

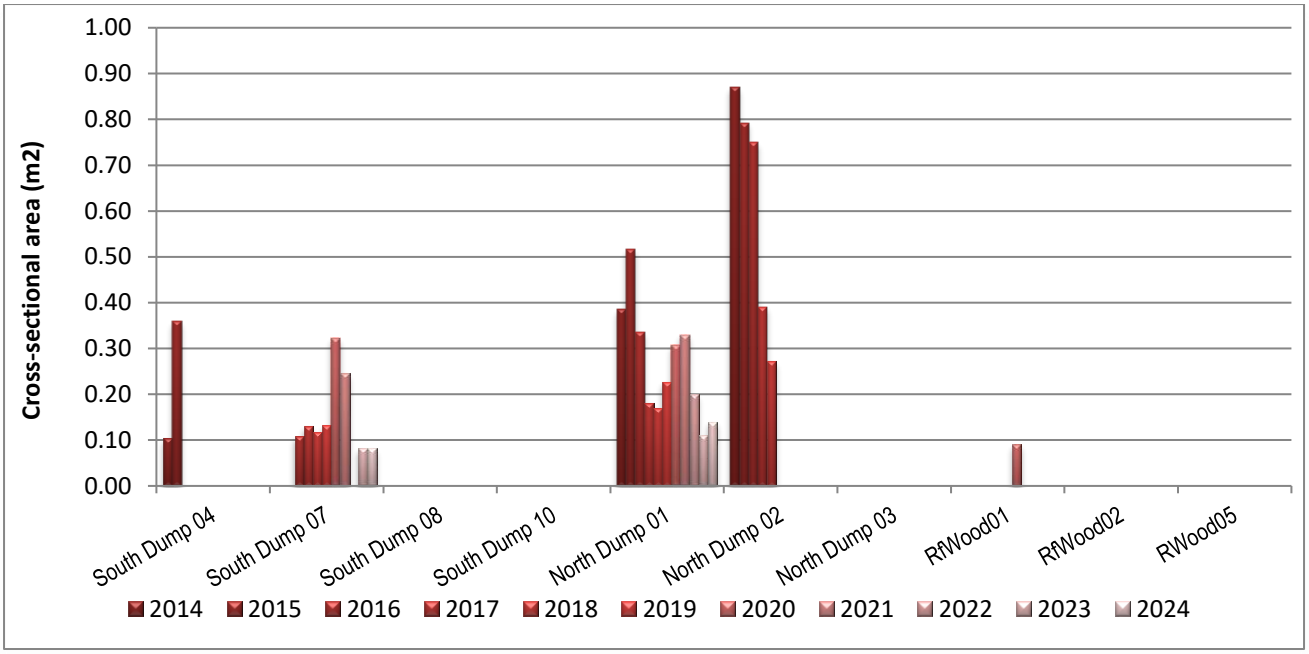


Figure 5-17. Sum of the cross-sectional area of rills recorded in woodland monitoring sites.

5.3.12 **Soil Analyses**

Soil analyses are undertaken every 3 years and were last sampled in 2023, with these results provided in DnA Environmental (2023).

The results of the 2023 soil analyses indicated that rehabilitation areas typically had a soil chemistry similar to the local reference sites and/or were close to recommended agricultural guidelines, with some exceptions. Soils tended to be slightly acidic to neutral, non-saline and non-sodic and most were low in organic matter and had low Cation Exchange Capacity (CEC). In South Dump 05 and 08 however, the soils were strongly acidic.

The results of the soil analyses also indicated there were numerous elements which occurred at elevated levels in the rehabilitation sites, however some such as sulfur, manganese, iron, copper and silicon and were also recorded at elevated levels in one or more of the woodland reference sites, suggesting they can occur at “naturally” high levels around the local area. However, copper was recorded in particularly high concentrations in South Dump 07 and sites on the 3 monitoring sites on the NWRD. Iron was also recorded in high concentrations in South Dump 05 and 08 compared to soils from the woodland reference sites.

6 Priority weeds

The number of sites that WONS and listed priority weeds of the Central Tablelands (NSW DPI 2022) that were recorded are provided in Table 6-1. In total 6 WONS and priority weeds were recorded across the range of woodland monitoring sites, and these were scattered in limited numbers, including the woodland reference sites. It appears that there may be increasing occurrences of *Hypericum perforatum* (St. John's Wort) and *Nassella trichotoma* (Serrated Tussock).

Table 6-1. WONS and priority weeds recorded at Cadia in 2024.

Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05	Total Sites
Crataegus monogyna	Hawthorn	s										1	**1**
Hypericum perforatum	St. John's Wort	h			1	1		1					**3**
Ligustrum lucidum	Large-leaved Privet	s										1	**1**
Nassella trichotoma	Serrated Tussock	g	1	1	1	1							**4**
Rubus fruticosus	Blackberry	s							1	1		1	**3**
Solanum sisymbriifolium	Sticky Nightshade	h	1						1		1		**3**

Key to growth form legend: t = tree; s = shrub; ss =sub-shrub; h = herb; g = grass, r = reed; v = vine; f = fern; c = cactus

7 Threatened flora

No threatened flora have been identified in the range of monitoring sites.

8 Performance of woodland rehabilitation monitoring sites against completion criteria

The performance of woodland rehabilitation monitoring sites against completion criteria in 2024 is provided in Table 8-1. Completion criteria are considered to be met when primary performance targets fall within the specified target ranges, and these have been represented by a coloured box. A striped coloured box indicates that the soil characteristics may not necessarily be similar to the local soils but fall within acceptable agricultural industry guidelines.

A comprehensive KPI table of woodland rehabilitation monitoring sites against completion criteria and secondary performance indicators in 2024 is provided in Appendix 4.

Table 8-1. Performance of woodland rehabilitation monitoring sites against completion criteria in 2024.

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2024					Lower KPI	Upper KPI	2024						
Phase 3: Landform Establishment and Stability	Landform slope, gradient	Landform suitable for final land use and generally compatible with surrounding topography and final landform design	Slope	Degrees (<18°)	10	14	18	16	0	17	14	15	2
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	1	0	0	2	0	0
Phase 4: Growth Medium Development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	0.0	0.0	na	na	na	na	na	na	na
			Organic Matter	% (>4.5)	0.0	0.0	na	na	na	na	na	na	na
			Phosphorous	mg/kg (50)	0.0	0.0	na	na	na	na	na	na	na
Phase 5: Ecosystem & Land Use Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	Landform is stable and performing as it was designed to do	LFA Stability	%	68.5	76.3	70.9	69.0	72.1	70.0	68.0	69.5	70.7
			LFA Landscape organisation	%	100	100	100	80	100	100	100	100	88
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	% population	50	100	100	100	100	22	100	100	100

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Total species richness	No./area	23	61	37	36	61	30	40	37	48
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees (< 5 cm dbh)	No./area	0	3	0	8	10	0	0	0	3
				No. eucalypts/area	0	70	97	194	100	2	67	244	19
				No. acacias/area	0	11	0	30	120	0	0	0	152
				<No. Exotic/area	0	32	0	0	0	7	0	0	0
				% eucalypts/ population	0	100	0	3	4	0	0	0	2
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./area	1	4	0	4	4	1	0	0	2
			Shrubs	No./area	0	7	5	13	12	2	3	4	4
			Grasses	No./area	4	10	11	7	12	5	7	9	9
Phase 6: Ecosystem & Land Use Development	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	56.7	65.6	44.9	34.0	50.6	42.6	46.8	51.2	47.8
			LFA Nutrient recycling	%	54.3	63.6	47.3	35.5	53.3	44.6	44.5	52.4	46.7
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5 m)	%	5	22.5	17	13	25	10	10	20	24
			Total Ground Cover	%	96	100	93	84	96	92	100	100	95
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> species/m^2	1	5.0	2.8	2.4	2.2	0	1.4	1.4	1.2

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	26	78.7	59.5	87.5	39.7	0.0	21.9	29.5	30.2
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5 m in height	No./area	1	62.0	1	8	32	5	30	6	17
			shrubs and juvenile trees 1.5 – 2 m in height	No./area	0	6.0	21	66	60	0	13	60	10
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	0	3	30	58	26	0	1	30	8
			Foliage cover 2 – 4 m	% cover	0	0.5	14	28	10.5	0	0	17	3
			Foliage cover >6 m	% cover	26	44	0	0	0	0	0	0	0
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to the local remnant vegetation	Tree diversity	% endemic	100	100	100	100	100	100	100	100	100
	Tree density	Vegetation contains a density of maturing tree and shrub species comparable to the local remnant vegetation	Tree and mature shrub density (> 5 cm dbh)	No. eucalypts/area	8	38	0	14	12	1	0	0	0
				No. acacias/area	0	2	7	4	10	0	4	30	1
				No. other endemic/area	0	0	0	0	0	0	0	0	0
				<No Exotic/area	0	0	0	0	0	0	0	0	0
				% eucalypts/ population	95	100	0	78	55	100	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	**26**	**88.9**	**71.4**	**33.3**	**100**	**100**	**25**	**52.6**	**0**
			Flowers/fruit: Trees	% population	**50**	**88.9**	**85.7**	**8**	**27**	**0**	**50**	**52.6**	**100**

9 Discussion

Ecological function and stability in the rehabilitation areas has varied significantly, largely as a result of the way the landform was constructed (e.g. substrate depth, soil type, steepness), species that were sown, combined with the ongoing effects of climate and animal disturbance. All rehabilitation sites on the SWRD and NWRD demonstrated a significant increase in functional patch area during the first few years after establishment. In some areas however, there was a loss of many of the original troughs and banks due to natural erosive processes, however these tended to be counteracted by a concurrent increase in plant and litter covers. During 2017 - 2019 drought and increased grazing and disturbance by animals resulted in a decline in many performance indicators, with many of these also being reflected in the range of woodland reference sites.

While some sites were relatively slow to develop (South Dump 04 and 07), all sites on the SWRD have increased in function since 2021 due to improved seasonal conditions that has promoted good growth and development of litter and the herbaceous and shrubby understorey in most areas. There has also been an increased abundance of cryptogams across many areas, although some areas may still be subjected to grazing and disturbance by animals.

On the NWRD rehabilitation area, there continues to be heavy grazing by resident macropods and the majority of the understorey has become dominated by a well-developed and mostly stable exotic annual plant and litter layer, especially in grassy clearings. There continued to be small bare patches which typically occurred on the top of old rip lines where some isolated erosion may have occurred, such as in North Dump 01 and 03. Thinning of patches of acacias undertaken as part of a trial has also resulted in a reduction in overall ecological function in parts of the NWRD (North Dump 01).

Since monitoring in 2023, drier conditions were experienced throughout most of the year and many areas continued to be grazed by macropods, with minor impacts recorded in numerous sites, including the reference sites. Most rehabilitation sites had patch areas and stability comparable to the reference sites, however infiltration and nutrient recycling capacity was low in all rehabilitation sites, largely due to the limited development of the litter layers and resultant soil profile and lack of mature tree cover. Overall, most rehabilitation areas had an ecological functional similar to each other, however the least developed rehabilitation site continued to be South Dump 07.

The sum of the LFA stability, infiltration and nutrient recycling components provides an indication of the most functional to least functional monitoring site, where the maximum score possible is 300 (Figure 9-1). The woodland reference site RWood05 continued to be the most ecologically functional and had a slightly higher sum of scores of 206 compared to last year, followed by the remaining 2 reference sites both with scores of 183. South Dump 08 has overall improved with a sum of scores of 176, followed by North Dump 02 however, this has marginally declined to a total sum of score of 173. North Dump 01 and 03, and South Dump 04 and 10 were overall functionally similar to each other with scores ranging from 165 – 157. The least developed rehabilitation site continued to be South Dump 07 with a total score of 139.

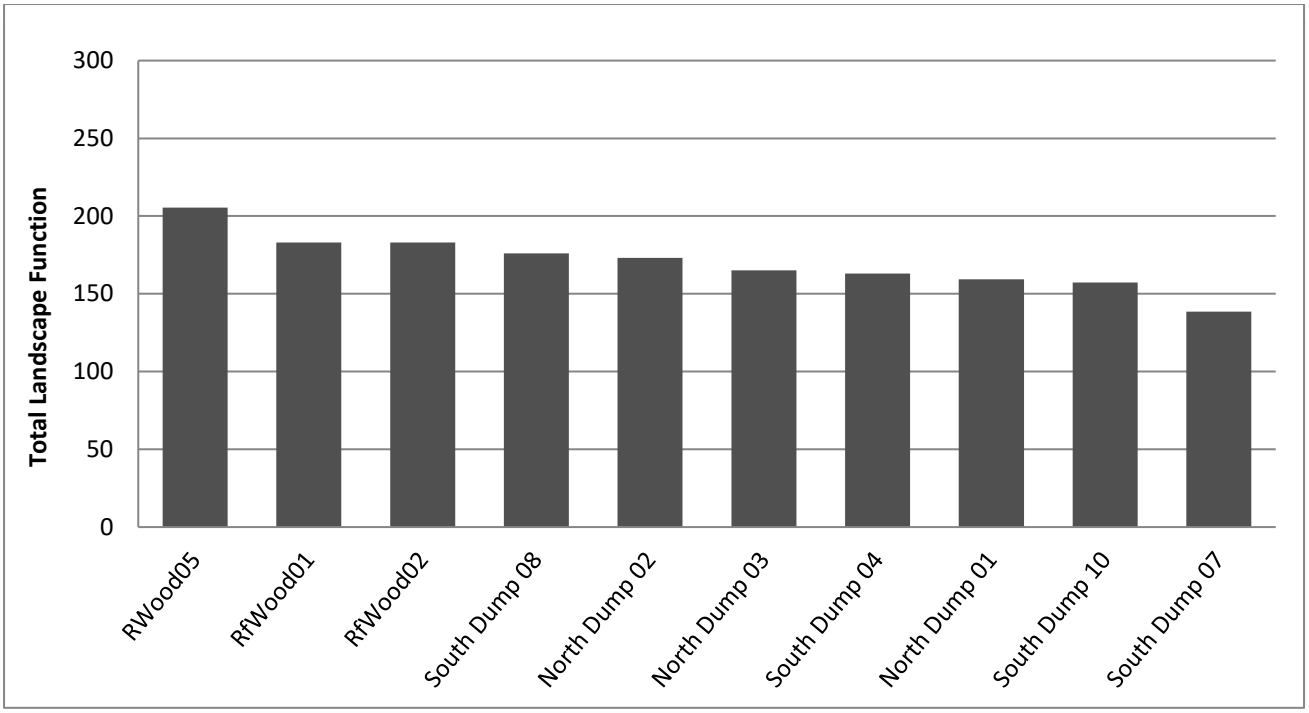


Figure 9-1. Sum of the LFA stability, infiltration and nutrient recycling components indicating the most functional to least functional monitoring site recorded in 2024.

Drought conditions over 3 consecutive years were not conducive to significant developments during the early successional development of rehabilitation areas, however many areas maintained or even slightly improved in ecological function largely due to the establishment of voluntary ground covers. Many volunteer species are exotic annual plants that have successfully colonised large areas of rehabilitation via establishment from the soil seed bank and these have been playing a particularly important role in the ecological development, function and stability of the sites due to the provision of protective ground cover and development of the litter layers, which lead to increased stability and coherency of the soil profile. Many annual weeds have become naturalised within the local area and some of the annual ground covers were clovers or medics which can be useful pasture species and these have also been recorded in the range of reference sites.

All rehabilitation sites met minimum perennial ground cover targets, however many were dominated by exotic pasture species and weeds. As exotic ground covers are prevalent across the local agricultural lands, all rehabilitation sites except South Dump 10 and North Dump 01, had a similar native cover abundance and diversity to the woodland reference sites (RWood02). While these ground cover targets may have been met, competitive exotic pasture species and weeds restrict germination and establishment of native tree and shrub establishment in the short-term, such as that has occurred in South Dump 10, parts of the NWRD (Figure 9-2), as well as older sites South Dump 01 – 03, thus limit natural regeneration and sustainability of the woodlands in the longer-term. This effect can also be observed across the local landscape where natural tree regeneration is limited across vast areas of farmland that have “improved exotic pastures”.

Exotic pasture species and weeds were limited in rehabilitation sites South Dump 07 and South Dump 08, with successful establishment of a high diversity of native woodland species, including native grasses which have become the dominant form of ground cover. Subsequently, all additional rehabilitation programs should utilise weed free topsoil/subsoil and exclude sowing exotic pastures to ensure self-sustaining communities to become established. In addition, Juncus species and a range of other moisture loving species have also naturally colonised moist depressions along contour banks and drainage depressions in some parts of the SWRD (Figure 9-3).



Figure 9-2. South Dump 10 is dominated by exotic species and requires additional rehabilitation in order to meet completion criteria targets.



Figure 9-3. South Dump 07 has had successful establishment of a diversity of native species, including native grasses such as *Austrostipa scabra*, *Rytidosperma* spp. and *Juncus* spp. have been increasing in abundance.

Local grassy Box woodland reference sites had densities of 80 – 400 stems trees per hectare and almost all were mature eucalyptus species. Trees and mature shrubs (>5 cm dbh) were recorded in all rehabilitation sites, with successful establishment of eucalypts and acacias occurring in South Dump 07 and 08. In remaining rehabilitation sites however, overall eucalypt densities were low, with none being recorded in South Dump 04 and 2 sites on the NWRD (North Dump 01 and 02).

There was also high variability in the density of shrubs and/or juvenile trees (<5 cm dbh), with most areas being dominated by acacias however some sites also had volunteer *Cassinia sifton* (Sifton Bush), especially South Dump 08 and North Dump 03. There has also been a declining trend in shrub densities in all sites over the last few years and while some individuals have grown and were now recorded as mature trees in some cases, the majority have been drought mortalities and/or had reached the end of their life span (natural senescence). This

decline continued to be observed and in South Dump 07, semi-mature eucalypts and additional young acacias had recently died, with the cause presently unknown, prompting the need for ongoing monitoring.

Limited establishment of eucalypts (and acacia in some areas) and native grasses may be due to a variety of factors (unviable seed, drought, burial, predation), however most likely, it is due to one to more of the following such as:

1. Use of agricultural topsoil obtained from introduced pastures spread onto rehabilitation areas, resulting in high levels of weed and exotic pasture competition growing from the soil seed bank that limit success of native woodland seed application;
2. Inclusion and successful establishment of exotic perennial pasture species (such as Phalaris, Ryegrass, Cocksfoot and Trifolium species) sown as part of the woodland seed mix. Perennial pasture species provide high competition levels and restrict native seedling establishment.
3. Continued heavy grazing by macropods and other pest animals resulting in a decline in perennial grass cover sown and increased abundance of exotic annual weeds.

High densities of primary colonising species such as acacias and cassinias in native woodland rehabilitation areas have proven to be valuable in the early successional development of mine disturbed woodland rehabilitation, as well as after bushfire or other large natural disturbances. As colonising species, they provide rapid stabilisation, fix nitrogen, provide protection to other more vulnerable species and habitat for wildlife, and over time are valuable contributors in the development of the soil profile. After a period of time (~5 -10 years) and without further major disturbances, mature acacias begin senescence and decline from woodland ecosystems. This process can be observed in some older rehabilitation areas on the SWRD, such as South Dump 05 and older sites South Dump 01 – 03. The opening up of the acacia canopies, accumulation of leaves, barks and spent pods and development of the soil profile, provides optimum conditions for perennial ground covers and other native species which can then regenerate and increase in abundance. Thus, acacias provide valuable ecological benefits in rehabilitation areas especially during the first several years of development.

The declining trend in acacia populations, in conjunction with limited eucalypt densities and high competition from introduced pasture species which suppresses natural tree and shrub regeneration, is anticipated to have implications for some rehabilitation areas to meet various completion targets without additional intervention in the short to medium term. On the NWRD, thinning of acacia saplings and planting of eucalypt tubestock was undertaken in June 2023 as part of a trial program. (Figure 9-4). While increased eucalypt densities are required, removal of acacias resulted in a reduction in ecological function in areas where removal was undertaken and has reduced shrubby habitat that would be beneficial and assist in the successional development of the woodlands.

A range of other primary performance indicators that have not yet been achieved were primarily related to the lack of a mature tree population and targets associated with a mature canopy structure, which will require additional development time in sites in areas with suitable tree densities. It will be critical that eucalypts become established within the rehabilitation areas where they are currently absent. Most of more mature acacias have been capable of reproducing and many were presently developing buds, however high levels of weed competition and heavy grazing may limit the capacity for self-sustainable populations to become established.

Habitat attributes such as tree hollows and mistletoe were also not present due to the relative immaturity of individuals, however there is opportunity for these to be reintroduced into semi-mature populations.



Figure 9-4. Removal of acacia saplings and planting of eucalypt tubestock on the North Dump.

No formal fauna surveys are undertaken by DnA Environmental, however a range of wildlife have been or were observed within the rehabilitation areas. Increased habitat such as large logs, fallen trees and rock piles would further enhance rehabilitation sites. Additional perching sites could also be made available by erecting mature eucalypts that have been cleared for mining, upside down (i.e. tree roots provide the new dead tree canopy) in appropriate locations across the rehabilitation areas. Large rocky outcrops could also be constructed. These practices have been undertaken with very successful outcomes in the Hunter Valley. Birds using the perching sites assist rehabilitation outcomes by introducing native plant seed (especially those with fleshy drupes) that may not otherwise colonise large rehabilitation areas. A range of other wildlife may also assist with the natural dispersal of seeds, create germination niches and micro-sites and assist with nutrient recycling across the wider rehabilitation areas. They may however also distribute weeds and harbour pest animals, thus ongoing monitoring and control will be required.

No soil analyses were undertaken in 2024, however results in 2023 indicated that rehabilitation areas typically had a soil chemistry similar to the local reference sites and/or were close to recommended agricultural guidelines, with some exceptions. In particular, two sites on the SWRD had soils that were strongly acidic, while copper and iron was recorded in high concentrations in some rehabilitation areas, with no obvious effects presently being observed.

Ongoing soil testing is likely to identify any changes in soil chemistry that may adversely affect the establishment of protective ground cover and/or development and sustainability of wider rehabilitation areas. While there were increasing levels of ground cover, minor rilling continued to be recorded in South Dump 07 and North Dump 01. Testing of waste rock materials and topsoils prior to application on rehabilitation areas should continue to be an ongoing part of the progressive rehabilitation programs and regularly undertaken to ensure suitable substrates are used prior to spreading onto rehabilitation areas.

Priority weeds and WONS are being actively controlled through an ongoing weed management program and ongoing control will be required as part of the Cadia land management plans. There may be increasing occurrences of *Hypericum perforatum* (St. John's Wort), *Nassella trichotoma* (Serrated Tussock) and *Rubus fruticosus* (Blackberry). Other exotic shrubs *Ligustrum lucidum* (Privet), *Rosa rubiginosa* (Sweet Briar) and *Crataegus monogyna* (Hawthorn) seedlings also continue to be recorded in reference site RWood05. Previous monitoring has indicated *Salix* species (Willows) were also becoming increasingly more dominant in the Creek Diversion channel. Particular care should be undertaken to avoid spraying of non-target species.

Occurrences of and damage by feral and other pest animal populations will also require ongoing monitoring and control. Rabbit burrows and scats and feral pigs were observed on the SWRD and NWRD rehabilitation areas during the monitoring program this year.

10 Conclusion

Ecological performance is significantly different between rehabilitation sites largely due to difference in the way they were rehabilitate and when they were rehabilitated. All woodland monitoring sites had been affected by 3 consecutive years of drought during 2017 – 2019. Since then, most sites have improved levels of ground cover and have become ecologically stable, however infiltration and nutrient recycling capacities remain low compared to woodland reference sites.

In South Dump 07 and South Dump 08, there has been successful establishment of a high diversity and abundance eucalypts, acacias and other shrubs and native grasses have become dominant. Exotic pasture species and weeds were limited. Remaining rehabilitation areas had variable densities of shrubs, low densities of eucalypts and were dominated by exotic grasses and weeds and require additional rehabilitation intervention in order to meet tree density and diversity targets.

Due to close proximity to farmland and remnant bushland areas, current areas of rehabilitation are likely to be repeatedly overgrazed by macropods and other pest animals. Culling of macropods is likely to be unsustainable in the medium to long-term, subsequently, robust tree guards should be installed during in-fill planting programs and/or exclusion fences constructed until the vegetation is able to withstand impacts of grazing.

Some primary recommendations to improve rehabilitation outcomes on current woodland rehabilitation areas on the NWRD and SWRD include:

- Recognise the benefits of acacias (and other colonising species such as cassinia) and capitalise their colonising and habitat traits that assist in the successional development of woodland rehabilitation areas. Acacias provide protection and a range of other beneficial ecological processes during early successional development in disturbed environments and naturally decline from stable woodland ecosystems. In addition, they provide additional wildlife habitat in an agricultural landscape that is currently deficient;
- Infill tubestock planting of eucalyptus species in sites that have a *stable* herbaceous understorey and limited eucalypt establishment, such as NWRD. Tubestock should be planted at densities of approximately 80 stems per hectare (or a minimum of 40 / ha to meet PCT 1330 benchmarks), targeting grassy clearings and areas with low densities of acacias and/or cassinia's. Prepare planting holes by spot spraying 1 m circles with knockdown herbicide to kill plant competition.
- Re-work rehabilitation areas where native woodland establishment is overall poor (eg South Dump 10). Apply several knockdown herbicide applications, followed by scarification and/or re-ripping and reseeding with a suitable native woodland mix, incorporating high rates of acacias to accelerate the successional development of rehabilitation areas. The simultaneous planting of eucalypt tubestock (and other species) is also recommended or used an alternative option, as establishment success from seed has proven to be limited in some areas of the WRD's particularly when weed competition is high.
- Install robust tree guards and/or exclusion fencing to provide adequate protection for planted eucalypt seedlings and/or new rehabilitation areas from animal disturbance and overgrazing;
- Apply/trial weed-free hay, brush-matting and/or other organic mulches to stabilise and accelerate the development of any areas with minor rilling and/or erosion or areas where ground covers are slow to establish, such as South Dump 04, South Dump 07 and North Dump 01;
- Consider the benefits of constructing exclusion fencing around some larger areas of rehabilitation to manage grazing pressure and increase establishment success;
- Increase wildlife habitat such as large logs, fallen trees and rock piles that would further enhance habitat on rehabilitation areas;
- Follow up surveillance and increased control of *Hypericum perforatum* (St John's Wort), *Nassella trichotoma* (Serrated Tussock) and *Rubus fruticosus*.

- Continue to monitor and control other priority weeds and WONS, including *Salix* species (Willows) which are increasing in abundance along the Creek Diversion Channel; and
- Carry out ongoing monitoring and control of feral and pest animal populations.

In preparation for additional woodland rehabilitation, some of the following recommendations that may result in improved rehabilitation outcomes include:

- Review current rehabilitation strategies to facilitate processes that enhance successional development and accelerate ecological function;
- Review management and application of topsoils/subsoils. Topsoil obtained from areas dominated by introduced pastures are not beneficial for use in woodland rehabilitation areas, while weed-free subsoils result in higher establishment success;
- Ensure ongoing testing of waste rock materials and topsoils prior to and after application onto rehabilitation areas;
- Continue with the targeting seed collection program to ensure adequate seed supply for future rehabilitation requirements, including native grasses and other native ground covers.
- Refine species mixes and adjust sowing rates and methods to maximise eucalypt and native grass establishment and capitalise on the benefits of acacia and other colonising species establishment from seed;
- Discontinue use of sterile cover crops and exotic pasture species in future woodland rehabilitation programs. Cover crops tend to attract additional herbivory leading to failed establishment, while exotic pasture species provide high competition levels, attract herbivory and supress native seed establishment in the short, medium and long-term, affecting the long-term sustainability of woodland areas;
- Consider the addition of perching sites; upside down trees “planted” into newly constructed landforms. Perching sites attract wildlife and assist with natural seed dispersal, pest management and regeneration of a variety of native plants, especially those with fleshy seeds;
- Apply/trial weed-free hay, brush-matting and/or other organic mulches to stabilise and accelerate the development of any areas with minor rilling and/or erosion or are slow to establish; and
- Apply/trial seed-bearing native pasture hay to increase protective soil covers and introduce native grass seed on rehabilitation areas.

Continued monitoring of the rehabilitation sites will provide guidance on further management intervention, in order to trend towards and to meet completion criteria targets.

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Appendix 1. Monitoring site location data

GPS coordinates and other site-specific information for the reference sites.

Site Reference	LFA Start	LFA Finish	LFA slope°	LFA bearing°	Veg transect start	Veg transect finish	Veg transect bearing°
RfWood01 (Ashleigh Park)	55 680871 E 6295705 N	55 680880 E 6295718 N	10	30 NE	55 680875 E 6295715 N	55 680903 E 6295677 N	120 SE
RfWood02 (Bundarra)	55 683151 E 6290452 N	55 683159 E 6290441 N	14	145 SE	55 683154 E 6290447 N	55 683114 E 6290436 N	236 NW
RWood04 (Cadia access) (Right - left transect)	55 687596 E 6296337 N	55 687589 E 6296351 N	10	310 W	55 687591 E 6296345 N	55 687554 E 6296316 N	220 SW
RWood05 (Cadia Cadiangullong Dam)	55 684994 E 6298928 N	55 685013 E 6298922 N	12	94 E	55 685005 E 6298924 N	55 684987 E 6298876 N	184 S
RfPast01 (Bundarra)	55 683406 E 6290780 N	55 683423 E 6290790 N	10	45 NE	55 683415 E 6290785 N	55 683439 E 6290742 N	140 SE
RfPast03 (Willunga)	55 687926 E 6298533 N	55 687911 E 6298546 N	8	300 NW	55 687918 E 6298540 N	55 687948 E 6298579 N	25 N
RrRip02 (Bakers Shaft)	55 686614 E 6279287 N	55 686622 E 6279263 N	10	170 S	55 686622 E 6279272 N	55 686573 E 62792710 N	260 W
RrRip03 (Cadia Cadiangullong Ck)	55 685302 E 6298471 N	55 685314 E 6298478 N	14	44 NE	55 685306 E 6298475 N	55 685327 E 6298431 N	140 SE

GPS coordinates and other site-specific information for the rehabilitation monitoring sites.

Site	LFA Start	LFA Finish	LFA slope°	LFA bearing°	Veg transect start	Veg transect finish	Veg transect bearing°
Ashleigh Park	55 680874 E 6294881 N	55 680864 E 6294899 N	5	320 NW	55 680887 E 6294887 N	55 680873 E 6294904 N	320 NW
South Dump 01	55 685304 E 6294460 N	55 685308 E 6294478 N	22	351 N	55 685307 E 6294468 N	55 685353 E 6294467 N	79 E
South Dump 02	55 685118 E 6294354 N	55 685108 E 6294369 N	17	302 NW	55 685113 E 6294362 N	55 685146 E 6294401 N	33 NE
South Dump 03	55 685250 E 6293838 N	55 685231 E 6293838 N	18	245 W	55 685240 E 6293838 N	55 685239 E 6293886 N	348 NW
South Dump 04	55 686455 E 6293539 N	55 686453 E 6293524 N	18	173 S	55 686454 E 6293535 N	55 686407 E 6293533 N	264 W
South Dump 05	55 687089 E 6294032 N	55 687108 E 6294029 N	18	88 E	55 687100 E 6294032 N	55 687092 E 6293982 N	175 S

Site	LFA Start	LFA Finish	LFA slope°	LFA bearing°	Veg transect start	Veg transect finish	Veg transect bearing°
South Dump 06	55 687551 E 6294645 N	55 687570 E 6294653 N	1	231 SW	55 687561 E 6294649 N	55 687579 E 6294603 N	144 SE
South Dump 07	55 686973 E 6294252 N	55 686991 E 6294252 N	16	76 E	55 686983 E 6294254 N	55 686981 E 6294200 N	168 S
South Dump 08	55 686632 E 6293878 N	55 686643 E 6293860 N	0	142 SE	55 686638 E 6293868 N	55 686594 E 6293845 N	232 SW
South Dump 09	55 685920 E 6294044 N	55 685900 E 6294046 N	16	260 W	55 685911 E 6294045 N	55 685915 E 6294096 N	350 N
South Dump 10	55 684896 E 6293929 N	55 684878 E 6293915 N	17	216 SW	55 684888 E 6293919 N	55 684853 E 6293957 N	305 NW
North Dump 01	55 686596 E 6296978 N	55 686582 E 6296967 N	14	217 SW	55 686589 E 6296973 N	55 686555 E 6297013 N	307 NW
North Dump 02	55 686375 E 6296954 N	55 686362 E 6296942 N	15	220 SW	55 686369 E 6296947 N	55 686339 E 6296986 N	309 NW
North Dump 03	55 687148 E 6297228 N	55 687130 E 6297227 N	1	260 W	55 687139 E 6297226 N	55 687139 E 6297277 N	350 N
Willunga DS01	55 687586 E 6298689 N	55 687579 E 6298710 N	6	320 NW	55 687601 E 6298700 N	55 687568 E 6298737 N	320 NW
Willunga DS02	55 687266 E 6208927 N	55 687260 E 6298910 N	10	180 S	55 687248 E 6298929 N	55 872473 E 6298883 N	182 S
Cadiangullong Creek	55 684249 E 6294028 N	55 684242 E 6294015 N	5	180 S	55 684244 E 6294017 N	55 684199 E 6294037 N	275 W
Creek Diversion	55 685350 E 6297515 N	55 685346 E 6297501 N	8	165 S	55 685346 E 6297511 N	55 685296 E 6297506 N	257 W

Appendix 2. Flora species recorded in woodland monitoring sites 2024

*Note: “1” denotes the presence of that species at a particular site and is not a measure of cover abundance.
Key to growth form legend: t = tree; s = shrub; ss =sub-shrub; h = herb; g = grass, r = reed; v = vine; f = fern; p = parasite

Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Adiantaceae		*Cheilanthes sieberi*	Rock Fern	f										1
Amaranthaceae	*	*Amaranthus albus*	Tumbleweed	h	1									
Amaranthaceae	*	*Amaranthus powellii*	Powell's Amaranth	h	1		1				1			
Araliaceae		*Hydrocotyle laxiflora*	Stinking Pennywort	h										1
Asteraceae	*	*Arctotheca calendula*	Capeweed	h				1	1					
Asteraceae	*	*Bidens subalternans*	Greater Beggars Tick	h				1						
Asteraceae	*	*Carduus tenuiflorus*	Winged Slender Thistle	h	1									1
Asteraceae	*	*Carthamus lanatus*	Saffron Thistle	h	1		1	1						
Asteraceae		*Cassinia sifton [arcuata]*	Sifton Bush	s			1		1	1				1
Asteraceae	*	*Centaurea solstitialis*	St Barnaby's Thistle	h						1				
Asteraceae	*	*Chondrilla juncea*	Skeleton Weed	h		1						1		
Asteraceae	*	*Cirsium vulgare*	Spear Thistle	h		1					1	1	1	1
Asteraceae	*	*Conyza bonariensis*	Fleabane	h			1	1	1		1	1		1
Asteraceae		*Cymbonotus lawsonianus*	Bear's Ear	h										1
Asteraceae		*Euchiton involucratus*	Star Cudweed	h										1
Asteraceae		*Euchiton sp.*	A Cudweed	h						1				
Asteraceae	*	*Hypochaeris radicata*	Flatweed	h				1	1			1		1
Asteraceae	*	*Lactuca serriola*	Prickly Lettuce	h			1					1	1	
Asteraceae		*Senecio prenanthoides*	A Fireweed	h										1

Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Asteraceae		*Senecio quadridentatus*	Cotton Fireweed	h	1			1			1	1	1	1
Asteraceae	*	*Silybum marianum*	Variegated Thistle	h	1	1	1				1	1	1	
Asteraceae	*	*Sonchus asper*	Prickly Sowthistle	h			1				1		1	
Asteraceae	*	*Sonchus oleraceus*	Milk Thistle	h	1	1	1	1	1				1	
Asteraceae		*Vittadinia cuneata*	Fuzzweed	h	1		1	1	1					
Asteraceae		*Vittadinia gracilis*	A Fuzzweed	h						1				
Asteraceae	*	*Xanthium spinosum*	Bathurst Burr	h						1	1		1	
Asteraceae		*Xerochrysum viscosum*	Sticky Everlasting	h										1
Boraginaceae	*	*Echium plantagineum*	Paterson's Curse	h	1	1	1	1		1	1			
Boraginaceae	*	*Echium vulgare*	Vipers Bugloss	h	1	1	1	1		1				1
Brassicaceae	*	*Hirschfeldia incana*	Buchan Weed	h	1		1				1			
Brassicaceae	*	*Lepidium africanum*	Peppercress	h			1			1	1			
Brassicaceae	*	*Sisymbrium officinale*	Hedge Mustard	h						1				
Brassicaceae	*	*Sisymbrium sp.*	A Mustard	h								1	1	
Campanulaceae		*Wahlenbergia luteola*	Australian Bluebell	h								1		
Caryophyllaceae	*	*Petrorhagia nanteuilii*	Proliferous Pink	h	1	1	1							
Chenopodiaceae	*	*Chenopodium album*	Fat Hen	h			1				1			
Chenopodiaceae		*Dysphania [Chenopodium] pumilio*	Small Crumbweed	h			1			1				
Chenopodiaceae		*Einadia nutans*	Climbing Saltbush	h			1					1		
Convolvulaceae		*Dichondra repens*	Kidney Weed	h				1		1		1		1
Cucurbitaceae	*	*Cucumis myriocarpus*	Paddy Melon	h			1							
Cyperaceae		*Carex inversa*	Knob Sedge	r	1	1				1		1	1	1

Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Fabaceae (Faboideae)		*Daviesia leptophylla*	Slender Bitter-Pea	s						1				
Fabaceae (Faboideae)		*Glycine clandestina*	Climbing Glycine	h										1
Fabaceae (Faboideae)		*Grona [Desmodium] varians*	Slender Tick-trefoil	h										1
Fabaceae (Faboideae)		*Hardenbergia violacea*	Happy Wanderer	v						1				
Fabaceae (Faboideae)	*	*Medicago arabica*	Spotted Medic	h	1									
Fabaceae (Faboideae)	*	*Medicago polymorpha*	Burr Medic	h	1									
Fabaceae (Faboideae)	*	*Medicago truncatula*	Barrel Medic	h		1								
Fabaceae (Faboideae)		*Pultenaea procumbens*	Heathy Bush-pea	s					1					
Fabaceae (Faboideae)		*Pultenaea spinosa*	Spiny Bush-pea	s						1				
Fabaceae (Faboideae)	*	*Trifolium angustifolium*	Narrow-leaf Clover	h				1						
Fabaceae (Faboideae)	*	*Trifolium repens*	White Clover	h	1					1				1
Fabaceae (Faboideae)	*	*Trifolium sp.*	A Clover	h								1		1
Fabaceae (Faboideae)	*	*Trifolium subterraneum*	Subterraneum Clover	h	1	1	1	1	1	1	1	1	1	1
Fabaceae (Faboideae)	*	*Vicia sativa*	Common Vetch	h	1	1								1
Fabaceae (Mimosoideae		*Acacia filicifolia*	Fern-leaved Wattle	s					1	1				
Fabaceae (Mimosoideae)		*Acacia buxifolia*	Box-leaved Wattle	s	1	1	1	1	1	1				
Fabaceae (Mimosoideae)		*Acacia dealbata*	Silver Wattle	s	1	1	1	1				1		1
Fabaceae (Mimosoideae)		*Acacia decora*	Western Golden Wattle	s				1			1			
Fabaceae (Mimosoideae)		*Acacia genistifolia*	Early Wattle	s					1	1				
Fabaceae (Mimosoideae)		*Acacia implexa*	Hickory	s				1	1	1				1
Fabaceae (Mimosoideae)		*Acacia melanoxylon*	Blackwood	s					1					
Fabaceae (Mimosoideae)		*Acacia paradoxa*	Kangaroo Thorn	s					1	1				

Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Fabaceae (Mimosoideae)		*Acacia penninervis*	Mountain Hickory	s					1	1				
Fabaceae (Mimosoideae)		*Acacia spectabilis*	Mudgee Wattle	s		1								
Fabaceae (Mimosoideae)		*Acacia verniciflua*	Varnish Wattle	s					1	1				
Fabaceae (Mimosoideae)		*Acacia vestita*	Weeping Boree	s	1	1	1	1	1	1				
Gentaniaceae	*	*Centaurium erythraea*	Common Centaury	h				1						1
Geraniaceae		*Geranium solanderi*	Native Geranium	h	1	1	1			1	1	1	1	1
Haloragaceae		*Gonocarpus tetragynus*	Raspwort	h						1				1
Hypericaceae		*Hypericum gramineum*	Small St. John's Wort	h					1	1				1
Hypericaceae	*	*Hypericum perforatum*	St. John's Wort	h			1	1		1				
Juncaceae		*Juncus aridicola*	Tussock Rush	r						1				
Juncaceae		*Juncus subsecundus*	A Rush	r						1				
Juncaceae		*Juncus usitatus*	A Rush	r				1	1	1				1
Juncaceae		*Luzula flaccida*		r										1
Lamiaceae	*	*Marrubium vulgare*	Horehound	h	1	1	1					1	1	
Lamiaceae		*Scutellaria humilis*	Dwarf Scullcap	h										1
Lomandraceae		*Lomandra multiflora*	Many-flowered Mat-rush	h										1
Malaceae	*	*Crataegus monogyna*	Hawthorn	s										1
Malvaceae	*	*Malva parviflora*	Small-flowered Mallow	h							1			
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow	h	1	1	1	1	1	1	1			
Myrtaceae		*Eucalyptus albens*	White Box	t					1	1			1	
Myrtaceae		*Eucalyptus blakelyi*	Blakely's Red Gum	t							1	1		
Myrtaceae		*Eucalyptus bridgesiana*	Apple Box	t			1		1					1

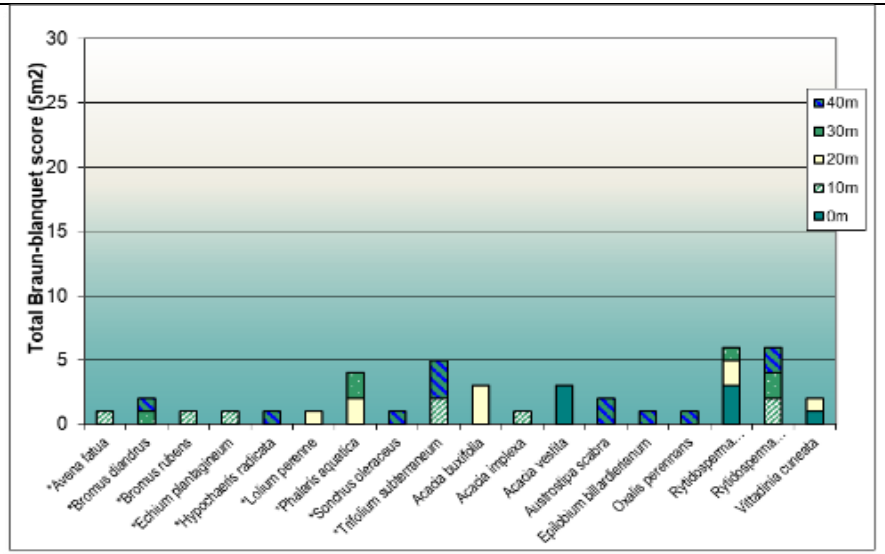
Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Myrtaceae		*Eucalyptus goniocalyx*	Bundy Box	t					1	1				1
Myrtaceae		*Eucalyptus macrorhyncha*	Red Stringybark	t					1					1
Myrtaceae		*Eucalyptus melliodora*	Yellow Box	t						1		1		1
Myrtaceae		*Eucalyptus polyanthemos*	Red Box	t						1				
Myrtaceae		*Eucalyptus viminalis*	Ribbon Gum	t			1							
Myrtaceae		*Leptospermum continentale*	Prickly Tea-tree	s						1				
Oleaceae	*	*Ligustrum lucidum*	Large-leaved Privet	s										1
Onagraceae		*Epilobium billardierianum*	Willow Herb	h	1	1	1	1		1				1
Orobanchaceae	*	*Orobanche minor*	Broomrape	h										1
Oxalidaceae		*Oxalis perennans*	Yellow Wood-sorrel	h	1	1	1	1	1	1		1		1
Plantaginaceae	*	*Plantago lanceolata*	Ribwort	h	1	1	1			1	1			1
Poaceae		*Anthosachne [Elymus] scabra*	Common Wheatgrass	g					1	1				1
Poaceae	*	*Anthoxanthum odoratum*	Sweet Vernal Grass	g			1							
Poaceae		*Austrostipa scabra*	Speargrass	g			1	1	1					
Poaceae	*	*Avena fatua*	Wild Oats	g	1	1	1	1	1	1	1		1	
Poaceae		*Bothriochloa macra*	Red-leg Grass	g			1						1	
Poaceae	*	*Bromus catharticus*	Prairie Grass	g	1	1	1							
Poaceae	*	*Bromus diandrus*	Great Brome	g	1	1		1	1		1	1	1	1
Poaceae	*	*Bromus molliformis*	Soft Brome	g		1								
Poaceae	*	*Bromus rubens*	Red Brome	g				1						
Poaceae		*Chloris truncata*	Windmill Grass	g						1				
Poaceae		*Cynodon dactylon*	Couch	g			1							

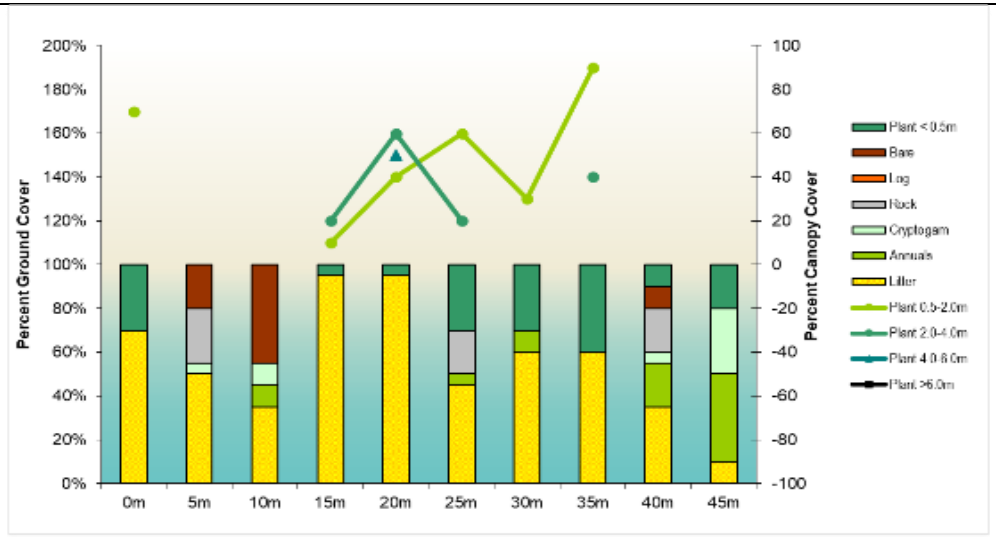
Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Poaceae	*	*Cynosurus echinatus*	Rough Dog's Tail	g										1
Poaceae	*	*Dactylis glomerata*	Cocksfoot	g	1									
Poaceae		*Eragrostis sp.*	Lovegrass	g				1						
Poaceae	*	*Holcus lanatus*	Yorkshire Fog	g						1				1
Poaceae		*Lachnagrostis filiformis*	Blown Grass	g										1
Poaceae	*	*Lolium perenne*	Perennial Ryegrass	g			1	1		1	1	1		
Poaceae		*Microlaena stipoides*	Weeping Rice-grass	g						1	1	1	1	1
Poaceae	*	*Nassella trichotoma*	Serrated Tussock	g	1	1	1	1						
Poaceae	*	*Paspalum dilatatum*	Paspalum	g		1				1			1	
Poaceae	*	*Pennisetum clandestinum*	Kikuyu Grass	g				1						
Poaceae	*	*Phalaris aquatica*	Phalaris	g	1	1		1	1	1	1		1	1
Poaceae		*Poa sieberiana*	Fine-leaf Tussock	g						1				1
Poaceae		*Rytidosperma erianthum*	Hill Wallaby Grass	g		1								
Poaceae		*Rytidosperma racemosum*	Wallaby Grass	g	1	1	1	1	1	1		1	1	1
Poaceae		*Rytidosperma richardsonii*	Wallaby Grass	g				1						
Poaceae		*Rytidosperma sp.*	Wallaby Grass	g					1	1				
Poaceae	*	*Vulpia muralis*	Rats-tail Fescue	g						1				1
Polygonaceae	*	*Polygonum arenastrum*	Wireweed	h		1	1							
Polygonaceae	*	*Polygonum aviculare*	Wireweed	h						1	1			
Polygonaceae	*	*Rumex acetosella*	Sheep Sorrel	h	1	1	1	1	1	1		1		1
Polygonaceae		*Rumex brownii*	Swamp Dock	h	1	1				1		1	1	1
Polygonaceae	*	*Rumex crispus*	Curled Dock	h		1	1				1			

Family	exotic	Scientific Name	Common Name	Growth Form	North Dump 01	North Dump 02	North Dump 03	South Dump 04	South Dump 07	South Dump 08	South Dump 10	RWood01	RWood02	RWood05
Primulaceae	*	*Lysimachia [Anagallis] arvensis*	Scarlet Pimpernel	h	1		1	1		1	1			1
Proteaceae		*Grevillea ramosissima*	Fan Grevillea	s					1					
Proteaceae		*Hakea decurrens*	A Needlewood	s					1					
Resedaceae	*	*Reseda luteola*	Weld	h			1							
Rosaceae		*Acaena novae-zelandiae*	Biddy-biddy	h						1				1
Rosaceae		*Acaena ovina*	Sheep's Burr	h										1
Rosaceae		*Acaena sp.*	Sheep's Burr	h					1					
Rosaceae	*	*Rosa rubiginosa*	Sweet Briar	s										1
Rosaceae	*	*Rubus fruticosus*	Blackberry	s							1	1		1
Rubiaceae	*	*Galium aparine*	Cleavers	h		1								
Rubiaceae		*Galium propinquum*	Maori Bedstraw	h								1		
Scrophulariaceae	*	*Verbascum virgatum*	Twiggy Mullein	h			1			1				
Solanaceae	*	*Solanum nigrum*	Blackberry Nightshade	h	1	1	1			1	1	1	1	1
Solanaceae	*	*Solanum sisymbriifolium*	Sticky Nightshade	h	1						1		1	
Urticaceae	*	*Urtica urens*	Small Nettle	h		1					1			
Verbenaceae	*	*Verbena bonariensis*	Purpletop	h	1		1			1				1
Violaceae		*Viola betonicifolia*	Showy Violet	h										1

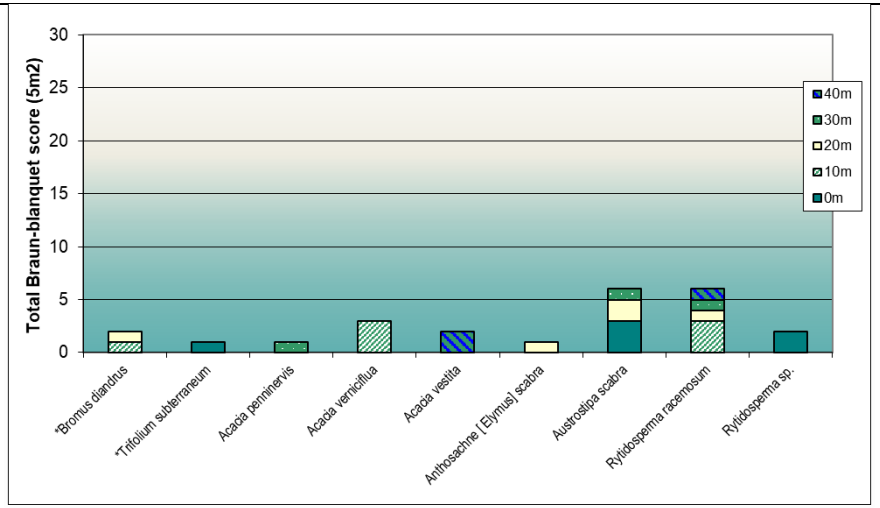
Appendix 3: Species cover abundance and community structure of individual rehabilitation monitoring sites in 2024

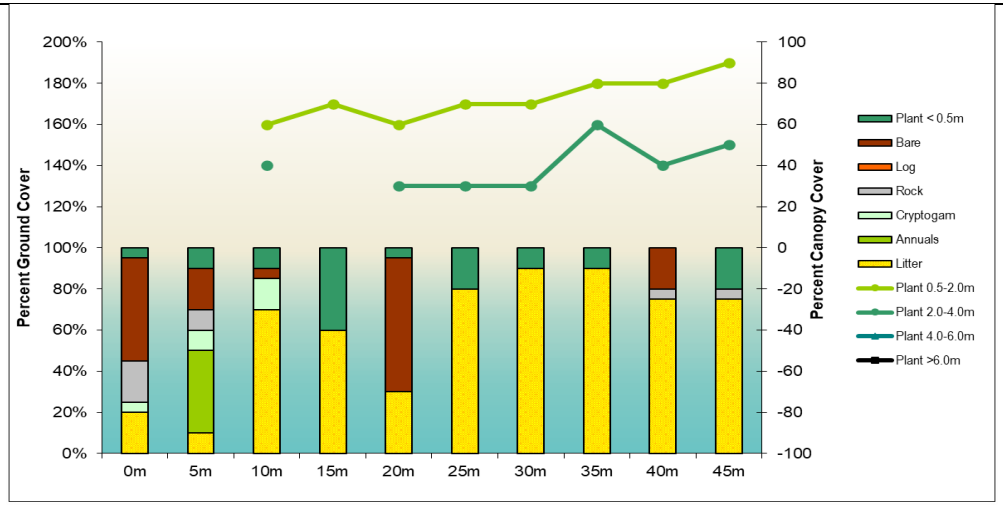
South Dump 04



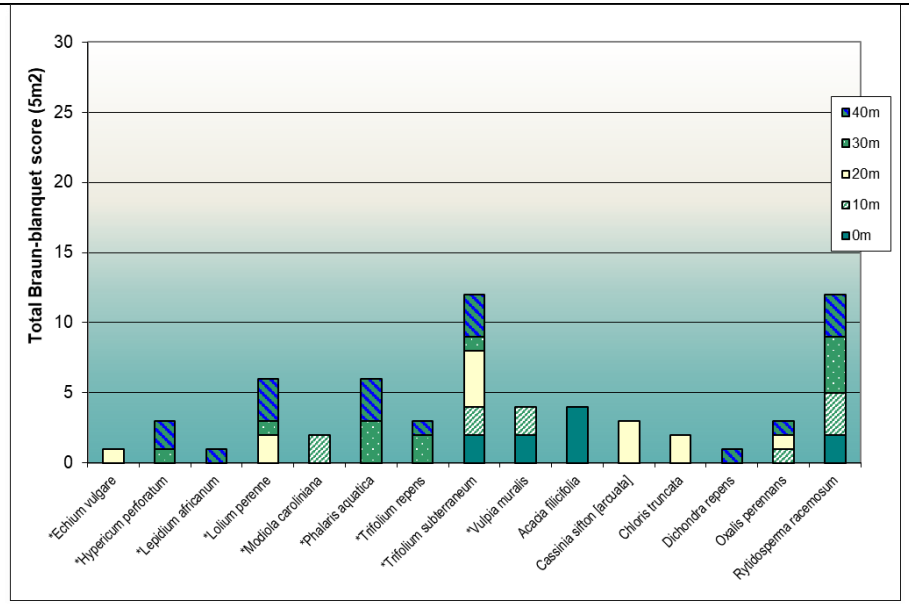


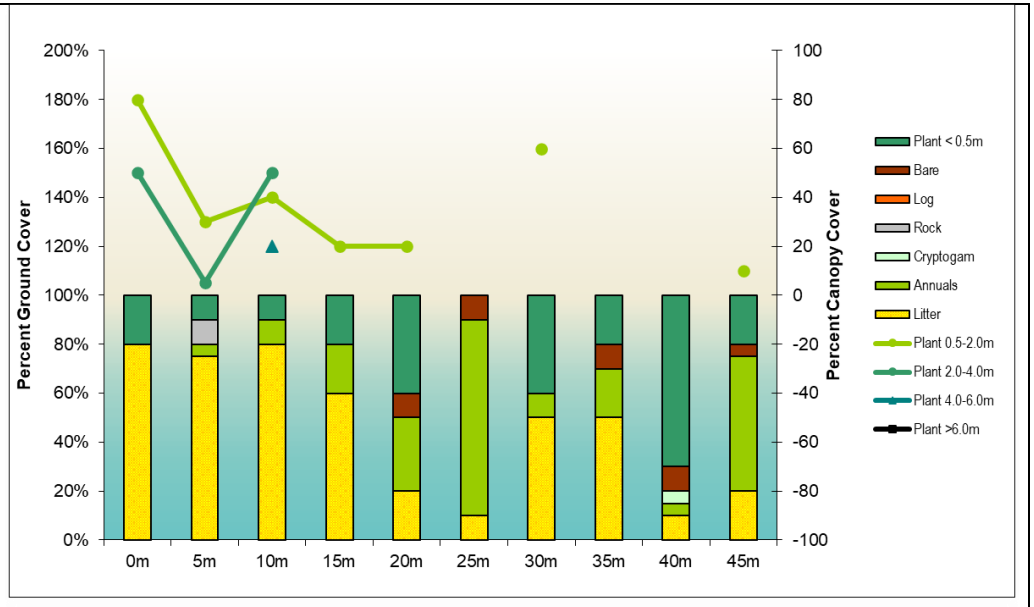
South Dump 07



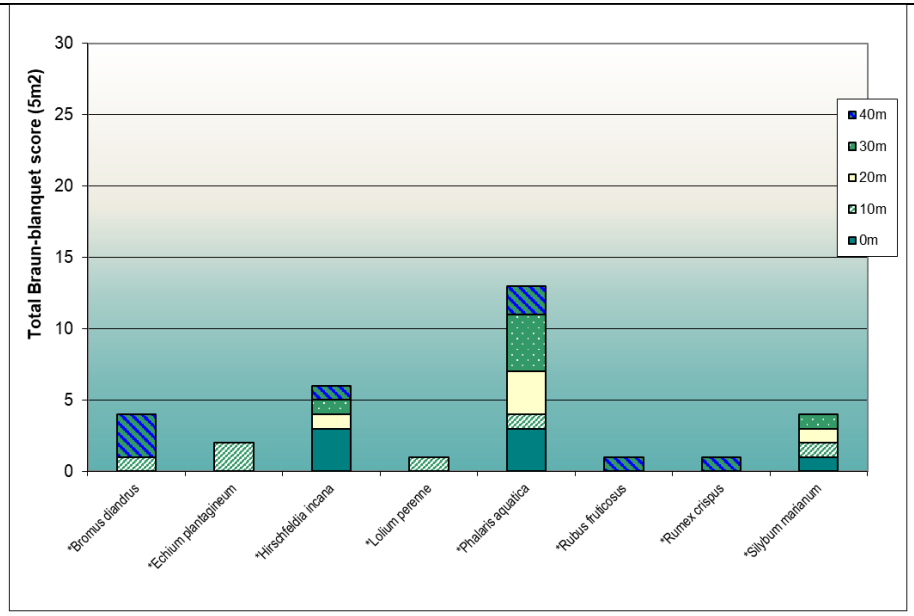


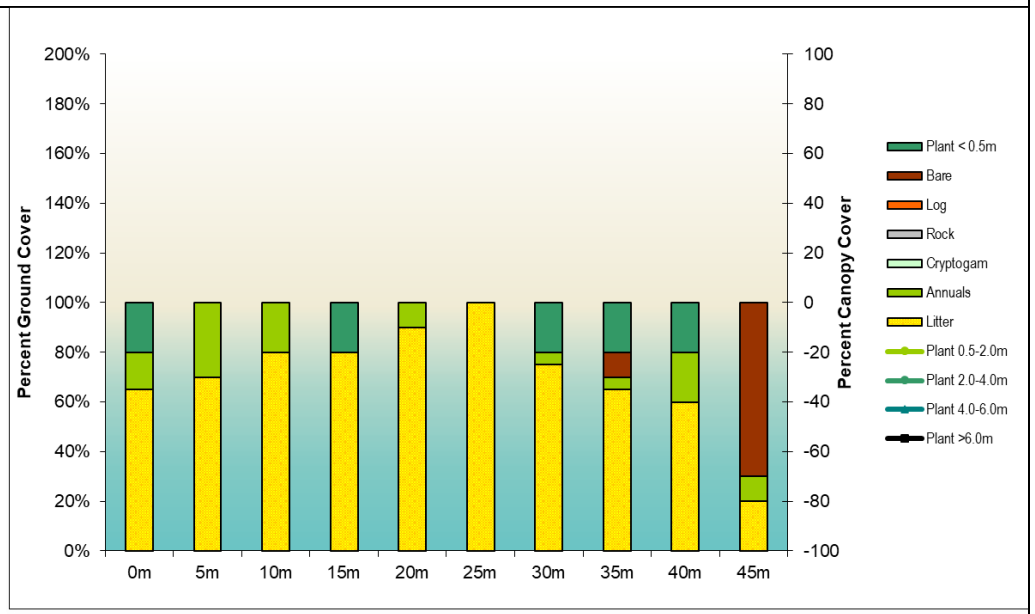
South Dump 08



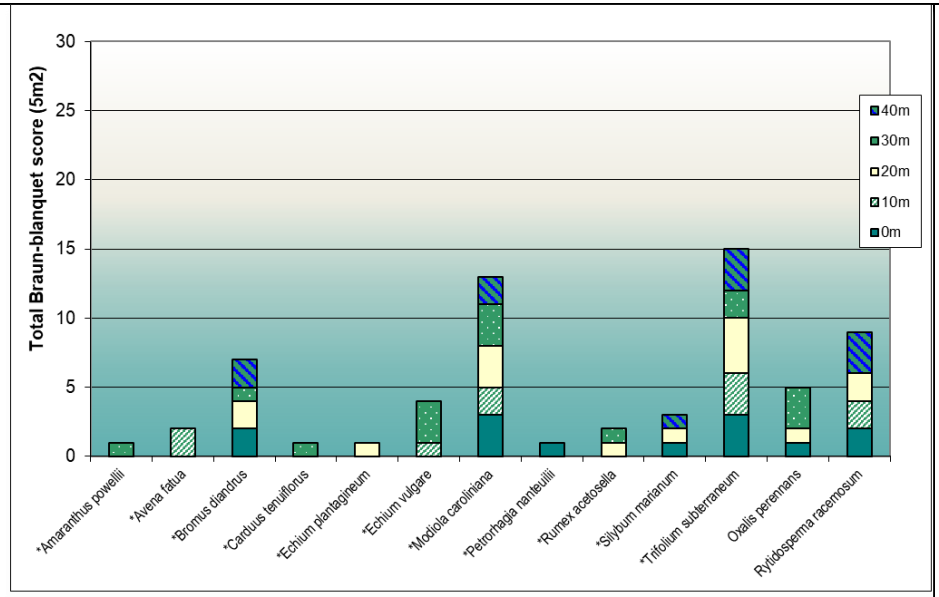


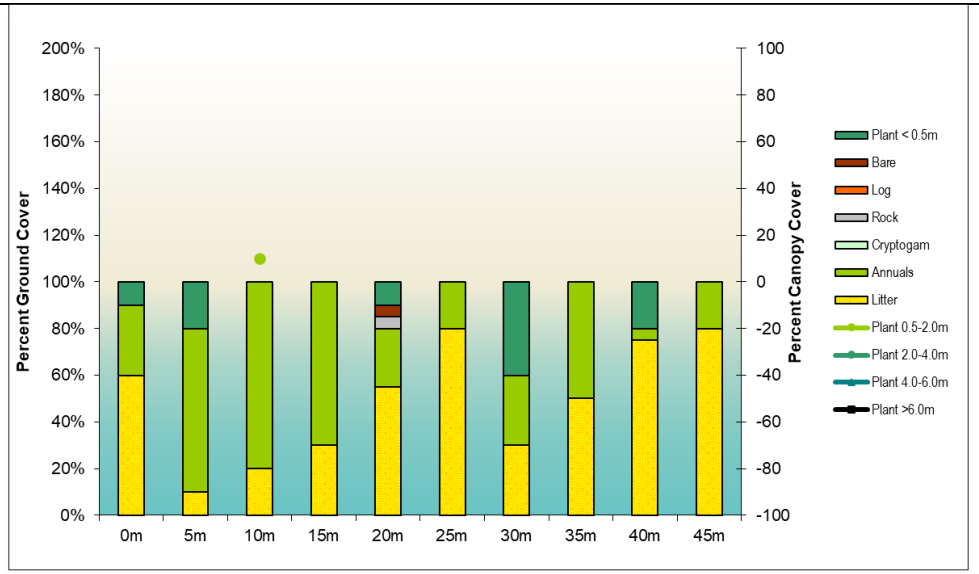
South Dump10



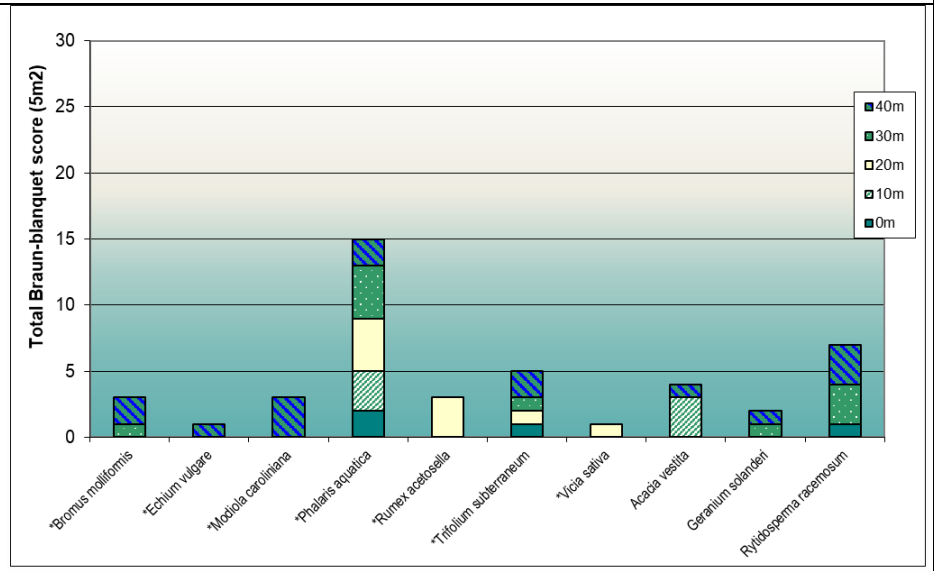


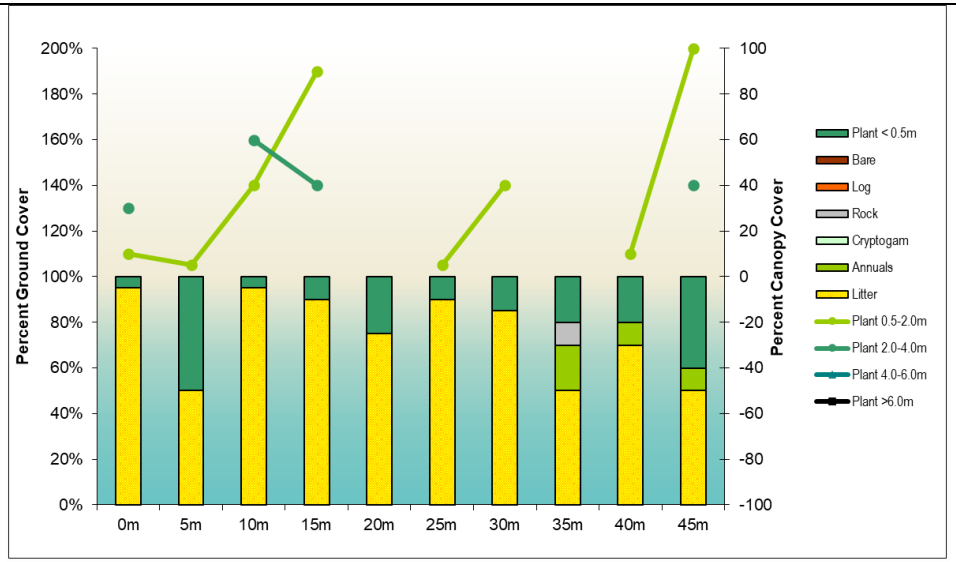
North Dump 01



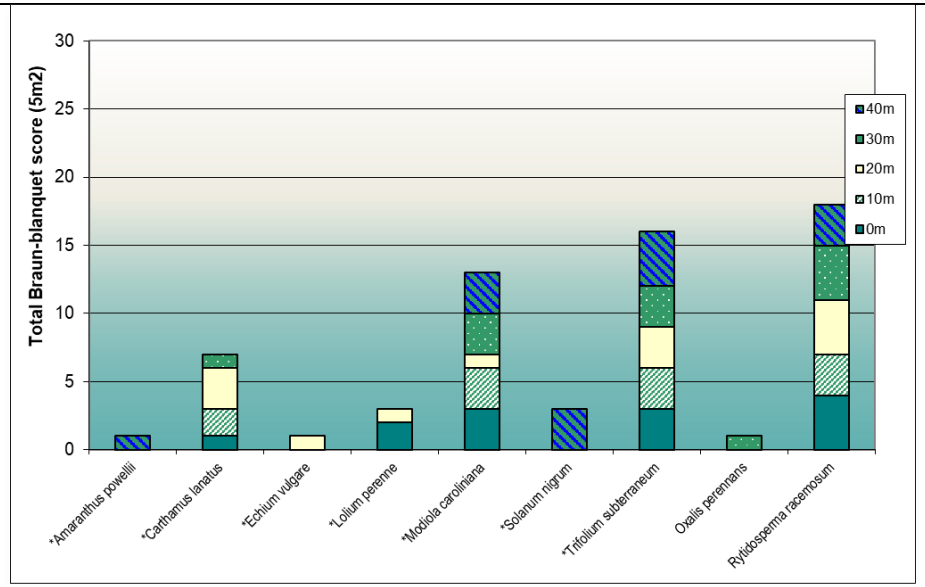


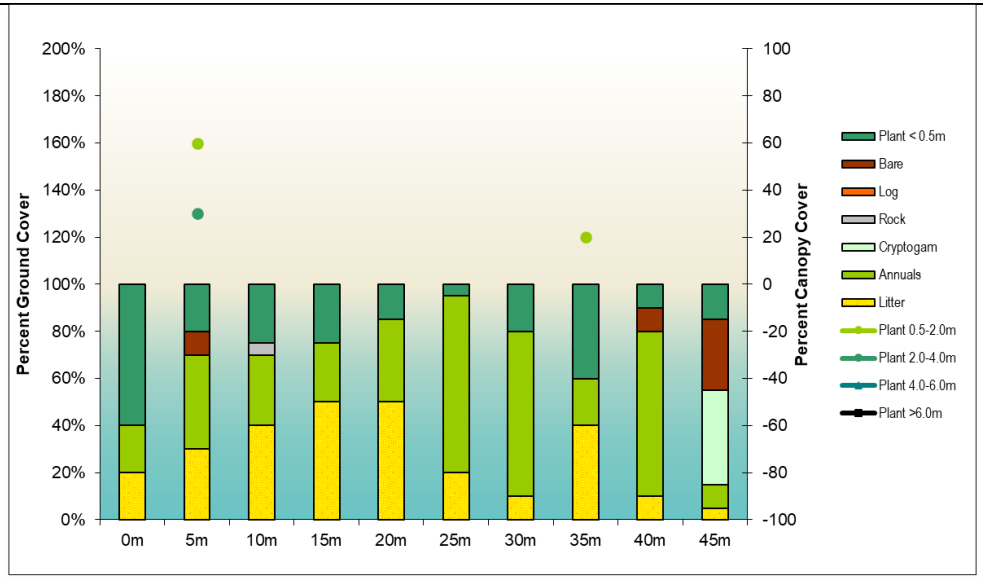
North Dump 02





North Dump 03





Appendix 4: Woodland rehabilitation site performance towards meeting ecological performance indicators

The table below indicates the performance of woodland revegetation monitoring sites against primary and secondary performance in 2024. Performance indicators have been presented in order of rehabilitation phases and ecosystem succession, beginning with landform establishment and stability (orange) and ending with indicators of ecosystem and land use development (blue).

Rehabilitation sites meeting or exceeding the range values of woodland reference sites have been identified with a shaded colour box and have therefore been deemed to meet the ecological targets. In the case of "growth medium development", upper and lower soil property indicators are also based on results obtained from the respective reference sites. In some cases, the site may not fall within ranges based on these data but may be within "desirable" levels as prescribed by the agricultural industry. If this scenario occurs the rehabilitation site has been identified using a striped shaded box to indicate that it falls within "desirable" agricultural ranges.

Performance of woodland rehabilitation monitoring sites against primary and secondary ecological performance indicators in 2024.

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2024							Ashleigh Park	Bundarra	Cadia Cadiangullong	Lower KPI	Upper KPI	2024						
Phase 3: Landform Establishment and Stability	**Landform slope, gradient**	Landform suitable for final land use and generally compatible with surrounding topography and final landform design	Slope	Landform is generally compatible within the context of the local topography and final landform design.		Degrees (<18°)	**10**	**14**	**12**	**10**	**14**	**18**	**16**	**0**	**17**	**14**	**15**	**2**
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	Number of gullies or rills >0.3m in width or depth in a 50m transect are limited and stabilising		No.	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**0**	**0**
			Cross-sectional area of rills		Provides an assessment of the extent of soil loss due to gully and rill erosion and that it is limited and/or is stabilising	m^2	**0**	**0**	**0**	**0**	**0**	**0**	**0.081**	**0**	**0**	**0.140**	**0**	**0**
Phase 4: Growth Medium Development	**Soil chemical, physical properties and amelioration**	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry		pH (5.6-7.3)	**na**	**na**	**na**	**0.0**	**0.0**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			EC		Electrical Conductivity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	< dS/m (<0.150)	**na**	**na**	**na**	**0.000**	**0.000**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			Organic Matter	Organic Matter levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry		% (>4.5)	**na**	**na**	**na**	**0.0**	**0.0**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		mg/kg (50)	**na**	**na**	**na**	**0.0**	**0.0**	**na**	**na**	**na**	**na**	**na**	**na**	**na**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Nitrate		Nitrate levels are typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (>12.5)	na	na	na	0.0	0.0	na	na	na	na	na	na	na
			CEC		Cation Exchange Capacity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	Cmol+/kg (>14)	na	na	na	0.0	0.0	na	na	na	na	na	na	na
			ESP		Exchangeable Sodium Percentage (a measure of sodicity) is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	% (<5)	na	na	na	0.0	0.0	na	na	na	na	na	na	na
Phase 5: Ecosystem & Land Use Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	Landform is stable and performing as it was designed to do	LFA Stability	The LFA stability index provides an indication of the sites stability and is comparable to or trending towards that of the local remnant vegetation		%	68.5	72.0	76.3	68.5	76.3	70.9	69.0	72.1	70.0	68.0	69.5	70.7
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and is comparable to that of the local remnant vegetation		%	100	100	100	100	100	100	80	100	100	100	100	88
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees		The diversity of shrubs and juvenile trees with a stem diameter < 5 cm is comparable to that of the local remnant vegetation.	species/area	2	1	9	1	9	5	11	15	2	3	4	6
				The percentage of shrubs and juvenile trees with a stem diameter < 5 cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation		% population	50	100	72	50	100	100	100	100	22	100	100	100

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation		No./area	29	23	61	23	61	37	36	61	30	40	37	48
			Native species richness		The total number of live native plant species provides an indication of the native plant diversity of the site and that it is greater than or comparable to the local remnant vegetation	>No./area	14	8	36	8	36	15	26	38	5	11	11	16
			Exotic species richness		The total number of live exotic plant species provides an indication of the exotic plant diversity of the site and that it is less than or comparable to the local remnant vegetation	<No./area	15	15	25	15	25	22	10	23	25	23	26	32
			Ratio of native to exotic species		The ratio of live native species compared to live exotic plant species provides an indication of the relative native species richness of the site and that it is more than or comparable to the local remnant vegetation	>	0.9	0.5	1.4	1	1	0.7	2.6	1.7	0.2	0.5	0.4	0.5
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees (< 5 cm dbh)		The total density of shrubs and/or juvenile trees with a stem diameter < 5 cm is comparable to that of the local remnant vegetation	No./area	2	3	116	2	116	97	232	230	9	67	244	174
				The density of eucalypts is comparable to the local remnant vegetation		No./area	0	3	3	0	3	0	8	10	0	0	0	3
				The density of acacias is comparable to the local remnant vegetation		No./area	1	0	70	0	70	97	194	100	2	67	244	19
				The density of other endemic shrubs is comparable to the local remnant vegetation		No./area	0	0	11	0	11	0	30	120	0	0	0	152
				The density of exotic / non endemic species is comparable to the local remnant vegetation		<No./area	1	0	32	0	32	0	0	0	7	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
				The percentage of eucalypts is comparable to the local remnant vegetation		% population	0	100	3	0	100	0	3	4	0	0	0	2
					The total density of endemic shrubs and/or juvenile trees (< 5 cm) is comparable to the local remnant vegetation	No./area	1	3	84	1	84	97	232	230	2	67	244	174
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation		No./area	2	1	4	1	4	0	4	4	1	0	0	2
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation		No./area	2	0	7	0	7	5	13	12	2	3	4	4
			Sub-shrubs		The number of sub-shrub species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	0	0	0	0	0	0	0	0	0
			Herbs		The number of herbs or forb species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	20	14	36	14	36	20	11	28	22	29	23	33
			Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation		No./area	4	7	10	4	10	11	7	12	5	7	9	9
			Reeds		The number of reed, sedge or rush species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	1	1	3	1	3	1	1	4	0	1	1	0
			Vines		The number of vines or climbing species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	0	0	0	0	1	0	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Ferns		The number of ferns comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	1	0	1	0	0	0	0	0	0	0
			Aquatic		The number of aquatic plants comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	0	0	0	0	0	0	0	0	0
Phase 6: Ecosystem & Land Use Development	**Landscape Function Analysis (LFA): Landform function and ecological performance**	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	LFA infiltration index provides an indication of the sites infiltration capacity and is comparable to or trending towards that of the local remnant vegetation		%	58.7	56.7	65.6	56.7	65.6	44.9	34.0	50.6	42.6	46.8	51.2	47.8
			LFA Nutrient recycling	LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and is comparable to or trending towards that of the local remnant vegetation		%	55.8	54.3	63.6	54.3	63.6	47.3	35.5	53.3	44.6	44.5	52.4	46.7
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Litter cover		Percent ground cover provided by dead plant material is comparable to that of the local remnant vegetation	%	89.0	69.0	81.8	69	89	56	60	46	71	49	75	27.5
			Annual plants		Percent ground cover provided by live annual plants is comparable to that of the local remnant vegetation	<%	1.5	0.5	0.5	1	1.5	9	4	24	12	40	4	39.5
			Cryptogam cover		Percent ground cover provided by cryptogams (e.g. mosses, lichens) is comparable to that of the local remnant vegetation	%	0	0	0	0	0	5	3	1	0	0	0	4
			Rock		Percent ground cover provided by stones or rocks (> 5 cm diameter) is comparable to that of the local remnant vegetation	%	0.0	0.5	0.0	0	0.5	7	4	1	0	1	1	1
			Log		Percent ground cover provided by fallen branches and logs (>5 cm) is comparable to that of the local remnant vegetation	%	0.5	7.5	2.2	1	7.5	0	0	0	0	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Bare ground		Percentage of bare ground is less than or comparable to that of the local remnant vegetation	< %	4	0	0	0	4	8	16	5	8	1	0	5
			Perennial plant cover (< 0.5 m)	Percent ground cover provided by live perennial vegetation (<0.5 m in height) is comparable to that of the local remnant vegetation		%	5.0	22.5	15.5	5	22.5	17	13	25	10	10	20	24
			Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation		%	96	100	100	96	100	93	84	96	92	100	100	95
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation		> species/m^2	2.2	0.8	5.0	1	5.0	2.8	2.4	2.2	0	1.4	1.4	1.2
			Exotic understorey abundance		The abundance of exotic species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has less than or an equal number of exotic species as the local remnant vegetation	< species/m^2	2.6	2.2	1.6	2	2.6	2.4	0.6	3.8	3.8	5.2	3	3.8
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5 m tall	The percent ground cover abundance of native species (<0.5m) compared to exotic species is comparable to that of the local remnant vegetation		%	51.6	25.9	78.7	26	78.7	59.5	87.5	39.7	0.0	21.9	29.5	30.2

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5 m in height	The number of shrubs or juvenile trees <0.5 m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		No./area	**2**	**1**	**62**	**1**	**62.0**	**1**	**8**	**32**	**5**	**30**	**6**	**17**
			shrubs and juvenile trees 0.5 – 1 m in height		The number of shrubs or juvenile trees 0.5-1 m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	**0**	**0**	**23**	**0**	**23.0**	**11**	**10**	**46**	**4**	**12**	**0**	**68**
			shrubs and juvenile trees 1 - 1.5m in height		The number of shrubs or juvenile trees 1-1.5 m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	**0**	**1**	**23**	**0**	**23.0**	**10**	**28**	**52**	**0**	**4**	**22**	**77**
			shrubs and juvenile trees 1.5 – 2 m in height	The number of shrubs or juvenile trees 1.5-2 m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		No./area	**0**	**0**	**6**	**0**	**6.0**	**21**	**66**	**60**	**0**	**13**	**60**	**10**
			shrubs and juvenile trees >2 m in height		The number of shrubs or juvenile trees >2 m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	**0**	**1**	**2**	**0**	**2.0**	**54**	**120**	**40**	**0**	**8**	**156**	**2**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 – 2 m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation		% cover	**0.0**	**0.0**	**3.0**	**0**	**3**	**30**	**58**	**26**	**0**	**1**	**30**	**8**
			Foliage cover 2 – 4 m	Projected foliage cover provided by perennial plants in the 2 – 4 m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation		% cover	**0**	**0**	**1**	**0**	**0.5**	**14**	**28**	**10.5**	**0**	**0**	**17**	**3**
			Foliage cover 4 – 6 m		Projected foliage cover provided by perennial plants in the 4 -6 m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	% cover	**1**	**2**	**4**	**1**	**4**	**5**	**0**	**2**	**0**	**0**	**0**	**0**
			Foliage cover >6 m	Projected foliage cover provided by perennial plants >6 m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation		% cover	**44**	**26**	**27**	**26**	**44**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to the local remnant vegetation	Tree diversity		The diversity of trees or shrubs with a stem diameter >5 cm is comparable to the local remnant vegetation	species/area	**2**	**1**	**5**	**1**	**5**	**1**	**4**	**5**	**1**	**1**	**1**	**1**
				The percentage of maturing trees and shrubs with a stem diameter >5 cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation		% endemic	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
	Tree density	Vegetation contains a density of maturing tree and shrub species comparable to the local remnant vegetation	Tree and mature shrub density (> 5 cm dbh)		The total density of live trees and/or mature shrubs with a stem diameter > 5 cm is comparable to that of the local remnant vegetation	No./area	**23**	**8**	**40**	**8**	**40**	7	18	22	1	4	30	1
				The density of eucalypts is comparable to that of the local remnant vegetation		No./area	**23**	**8**	**38**	**8**	**38**	0	14	12	1	0	0	0
				The density of acacias is comparable to the local remnant vegetation		No./area	**0**	**0**	**2**	**0**	**2**	7	4	10	0	4	30	1
				The density of other endemic species is comparable to the local remnant vegetation		No./area	**0**	**0**	**0**	**0**	**0**	0	0	0	0	0	0	0
				The density of exotic / non endemic species is comparable to the local remnant vegetation		<No./area	**0**	**0**	**0**	**0**	**0**	0	0	0	0	0	0	0
				The percentage of eucalypts is comparable to the local remnant vegetation		% population	**100**	**100**	**95**	**95**	**100**	0	78	55	100	0	0	0
			Average dbh		Average tree diameter of the tree population provides a measure of age, (height) and growth rate and that it is trending towards that of the local remnant vegetation.	cm	**33**	**69**	**26**	**26**	**69**	14	10	8	7	12	8	10
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees		The percentage of the tree population which are live individuals and that the percentage is comparable to the local remnant vegetation	% population	**92**	**89**	**87**	**87**	**92.0**	100	75	100	100	100	79	100
			Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation		% population	**68**	**89**	**26**	**26**	**88.9**	71.4	33.3	100	100	25	52.6	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	RfWood01 2024	RfWood02 2024	RWood05 2024	2024 Woodland ecosystem range		South Dump 04	South Dump 07	South Dump 08	South Dump 10	North Dump 01	North Dump 02	North Dump 03
			Medium health		The percentage of the tree population which are in a medium health condition and that the percentage is comparable to the local remnant vegetation	% population (if greater than dieback)	20	0	41	0	41.3	28.6	42	0	0	50	26.3	100
			Advanced dieback		The percentage of the tree population which are in a state of advanced dieback and that the percentage is comparable to the local remnant vegetation	% population	4	0	20	0	19.6	0	0	0	0	25	0	0
			Dead Trees		The percentage of the tree population which are dead (stags) and that the percentage is comparable to the local remnant vegetation	% population	8	11	13	8	13	0	25	0	0	0	0	0
			Mistletoe		The percentage of the tree population which have mistletoe provides an indication of community health and habitat value and that the percentage is comparable to the local remnant vegetation	% population	0	0	0	0	0	0	0	0	0	0	0	0
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation		% population	80	89	50	50	88.9	85.7	8	27	0	50	52.6	100
			Hollows		The presence of hollows provides evidence that the ecosystem is maturing, and can provide habitat resources comparable to that of the local remnant vegetation	% population	4	44	13	4	44.4	0	0	0	0	0	0	0

APPENDIX 7 CADIA MINE COVER SYSTEM FIELD TRIALS PERFORMANCE MONITORING SUMMARY YEAR 10

Cadia Mine
Cover System Field Trials Performance Monitoring Summary Year 10

19 September 2024



Newmont™ okane

Integrated Mine Waste Management
and Closure Services
Specialists in Geochemistry and
Unsaturated Zone Hydrology

Cadia Valley Operations
Cover System Field Trials
Performance Monitoring Summary Year 10

1120-228-001

September 2024

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EXECUTIVE SUMMARY

This performance monitoring report focuses on field data collected from 1 June 2023 to 9 February 2024, referred to herein as the Year 10 monitoring period. All previous monitoring periods have been from the 1 June to 31 May, however this monitoring period was cut short due to equipment and instruments being sent off site for calibration as recommended in previous reports. In Year 10 of the Cadia Mine (Cadia) cover system field trials, a comprehensive analysis of performance monitoring data revealed insights into the complex dynamics of the trial water balances. Rainfall patterns played a pivotal role, with the South Waste Rock Dump (SWRD) recording 708 mm during the monitoring period. The North Waste Rock Dump (NWRD) recorded only 276 mm during the monitoring period due to discrepancies in rainfall event recording.

Seasonal trends were evident in soil temperature profiles, indicating that throughout Year 10, soil temperatures in waste rock at both NWRD and SWRD remained consistent with ambient conditions, suggesting limited heat generation at depth due to oxidation. The volumetric water content (VWC) within the compacted clay liner (CCL) layer of the SWRD plateau trial area, remained constant throughout the monitoring period. This is consistent with the previous monitoring periods.

The majority of the monitored stations remained within the optimal Plant Available Water Capacity (PAWC) zone. Other stations like NWRD Primary 5, 6, and the natural station, consistently recorded values above Field Capacity (FC). This elevated storage not only implies a heightened risk of Net Percolation (NP) but also raises concerns about potential waterlogging conditions which could adversely affect vegetation growth. Functioning sensors did not approach or go below Permanent Wilting Point (PWP), resulting in low water stress for vegetation across this monitoring period. Balancing water storage across these extremes remains vital to safeguard the overall health and sustainability of the vegetation in the WRD cover system trials.

A numerical model was employed to estimate water balances, revealing stark contrasts between the Year 10 and Year 9 monitoring periods. Decrease in rainfall across the Year 10 monitoring period resulted in decreased water storage, runoff, and NP. Actual evapotranspiration was a major component of the water balance, accounting for up to 67% of annual precipitation. Differences in AET and NP were negligible between plateau and slope trial areas, though runoff rates varied between each site.

Comparison of the NWRD and SWRD trial areas with a natural area station highlighted the impact of barrier layers on water dynamics. The natural station exhibited lower evapotranspiration and higher NP due to unrestricted percolation, emphasising the importance of cover system design in management of water percolation into waste rock when addressing potential acid and metalliferous drainage risk.

The Year 10 monitoring data underscores the relationship between meteorological conditions and water balance in cover systems. These findings emphasise the dynamic nature of

environmental factors and their direct influence on cover system performance and are inline with previous monitoring periods. Continuous monitoring and data-driven decisions are imperative for effective mine closure planning, thereby ensuring long-term system stability and adherence to site-specific criteria.

After analysing Year 10 monitoring data, a number of recommendations are provided to enhance data continuity and integrity at the cover system trials. Recommendations include monthly data collection and station inspections, battery replacement for Eddy Covariance (EC) power, annual vegetation surveys, and trimming vegetation at SWRD.

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1. INTRODUCTION

This report presents the performance monitoring for the Year 10 monitoring period after the construction of the cover system, specifically from 1 June 2023 to 9 February 2024. The primary objective of this report is to provide a high-level summary of key data trends and findings during this monitoring period, including meteorological data, in-situ water content, matric suction, and temperature conditions at the cover system field trials. The cover system construction, involving multi-layered engineered systems over the north and south waste rock dumps (NWRD and SWRD), and the subsequent monitoring were essential to evaluate their long-term performance (O'Kane Consultants. (2008). The engineered cover systems were designed to limit net percolation into the Waste Rock Dumps (WRDs), thereby mitigating potential water quality concerns and maintaining water within the rooting zone to support vegetation cover development.

1.1 Background Information

Newmont Overseas Holdings Pty Corporation (Australia), a wholly owned indirect subsidiary of Newmont Corporation is the owner of Cadia Holdings Pty Limited (CHPL). CHPL is the owner and operator of Cadia Mine (Cadia). Cadia is one of Australia's largest gold mining operations.

Commencing in 1998 and operating continuously since, Cadia is located approximately 25 km south of Orange in the Central Tablelands region of New South Wales (NSW). The mining operation occurs across two local government areas (LGAs) (Blayney Shire Council and Cabonne Council).

Cadia provides an important economic contribution to the region and NSW and is a major regional employer providing approximately 1,400 full time equivalent jobs. Confirmed mineable resources have been identified to extend operations well beyond the life of the current Project Approval (PA) 06_0295 which provides for mining until 30 June 2031. Cadia has commenced planning for the continuation of mining operations and is delivering this work through the Cadia Continued Operations Project (CCOP).

In 2010/2011, Okane Consultants (Okane) were engaged to implement a cover system field monitoring program after preliminary closure planning identified the need for further investigation of suitable options for reclamation of onsite waste rock dumps (WRDs).

Cadia implemented a reclamation plan for closure of its NWRD and SWRD which involved the construction of multi-layered engineered cover systems over both WRDs.

Sections of the cover systems were instrumented following construction, to evaluate field performance over time. A natural site located in the vicinity of the NWRD was also instrumented with the same sensors as the WRDs, for recording baseline soil conditions as well as a means of comparison with the WRDs. All-inclusive historical studies completed by Okane have been presented to Cadia previously and provide comprehensive analyses of performance (Okane, 2010, 2013, 2014, 2017, 2018, 2019, 2020, 2021, 2022b, and 2023a).

1.2 Project Objectives and Scope

This performance monitoring report focuses on field data collected from 1 June 2023, to 9 February 2024, referred to herein as the Year 10 monitoring period. All previous monitoring periods have been from the 1 June to 31 May, however, this monitoring period was cut short due to equipment and instruments being sent off site for calibration as recommend in previous reports. This document has been prepared to provide a high-level summary of key data trends and findings during the Year 10 monitoring period from both the NWRD and SWRD. Field data presented and discussed include meteorological data, in-situ water content, matric suction, and temperature conditions at the cover system field trials.

1.3 Report Organization

For convenient reference, this report has been subdivided into the following sections:

Section 1 – Provides an introduction to the site and project objectives;

Section 2 – Provides a background overview of the ongoing cover system trials;

Section 3 – Discusses data collection during the Year 10 monitoring period;

Section 4 – Presents and discusses field data collected and water balance calculations;

Section 5 – Provides a summary of performance monitoring;

Section 6 – Provides recommendations for future monitoring; and

Section 7 – Provides a list of references.

2. BACKGROUND INFORMATION

The locations of the NWRD and SWRD cover system field trials and natural trial area are shown in Figure 2.1Figure 2.1. Approximately half of the SWRD was rehabilitated for these trials with an area of about 104 Ha and all of the NWRD was rehabilitated for these trials with an area of about 64 Ha. The cover system constructed at both WRDs is based on the water store-and-release concept to minimise Net Percolation (NP) reaching the Potentially Acid Forming (PAF) waste rock. The cover system on the NWRD plateau and both SWRD plateau and slope is a multi-layer system which includes topsoil and Non Acid Forming (NAF) Bluestone material enhanced with a low hydraulic conductivity layer (compacted clay layer) at the base (Figure 2.2Figure 2.2). The low hydraulic conductivity layer is used to 'delay' deep percolation during short-duration seasonal rainfall events in which the storage capacity of a cover system that solely relies on the store-and-release concept, might be exceeded. The cover system functions by storing rainfall within the cover profile until evapotranspiration takes place and the water returns to the atmosphere. The NWRD slope cover system is enhanced with a high-density polyethylene (HDPE) liner underlying the non-compacted layer.

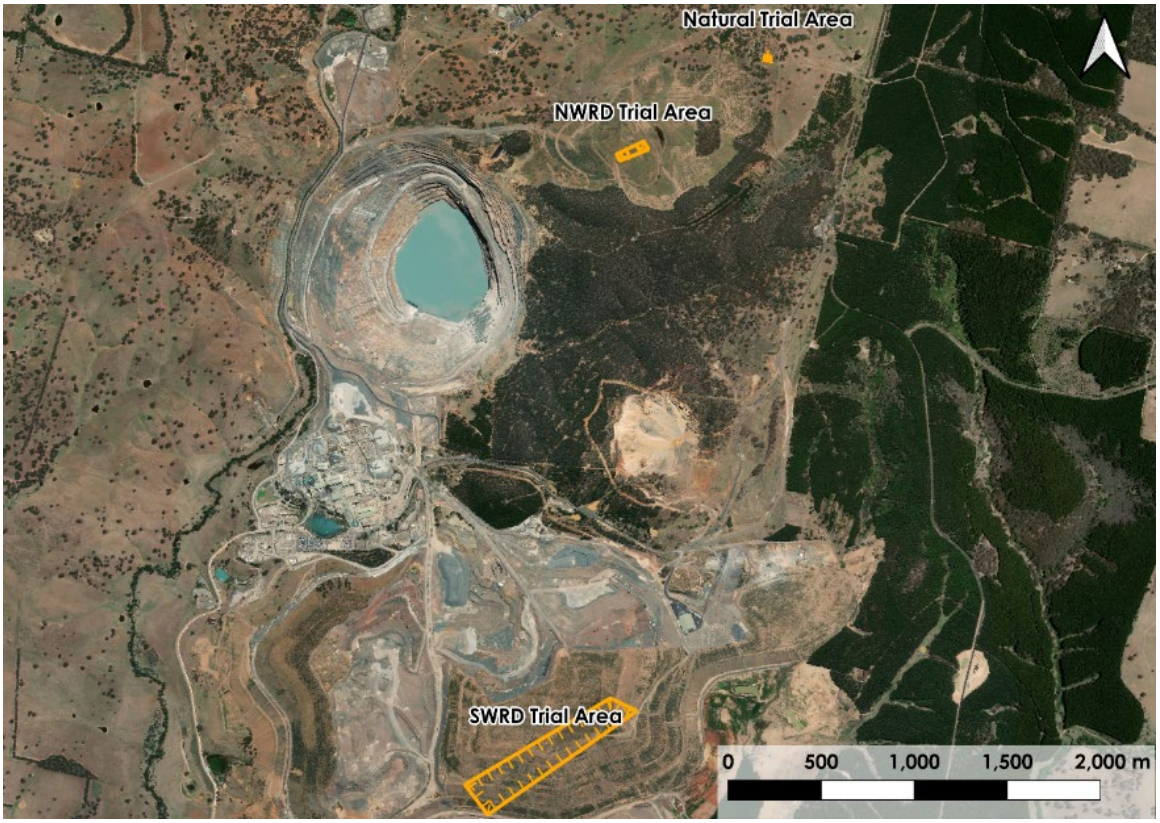


Figure 2.1: Location of the cover system trials and natural reference site at CADIA mine

Base imagery adapted from Google (2020).

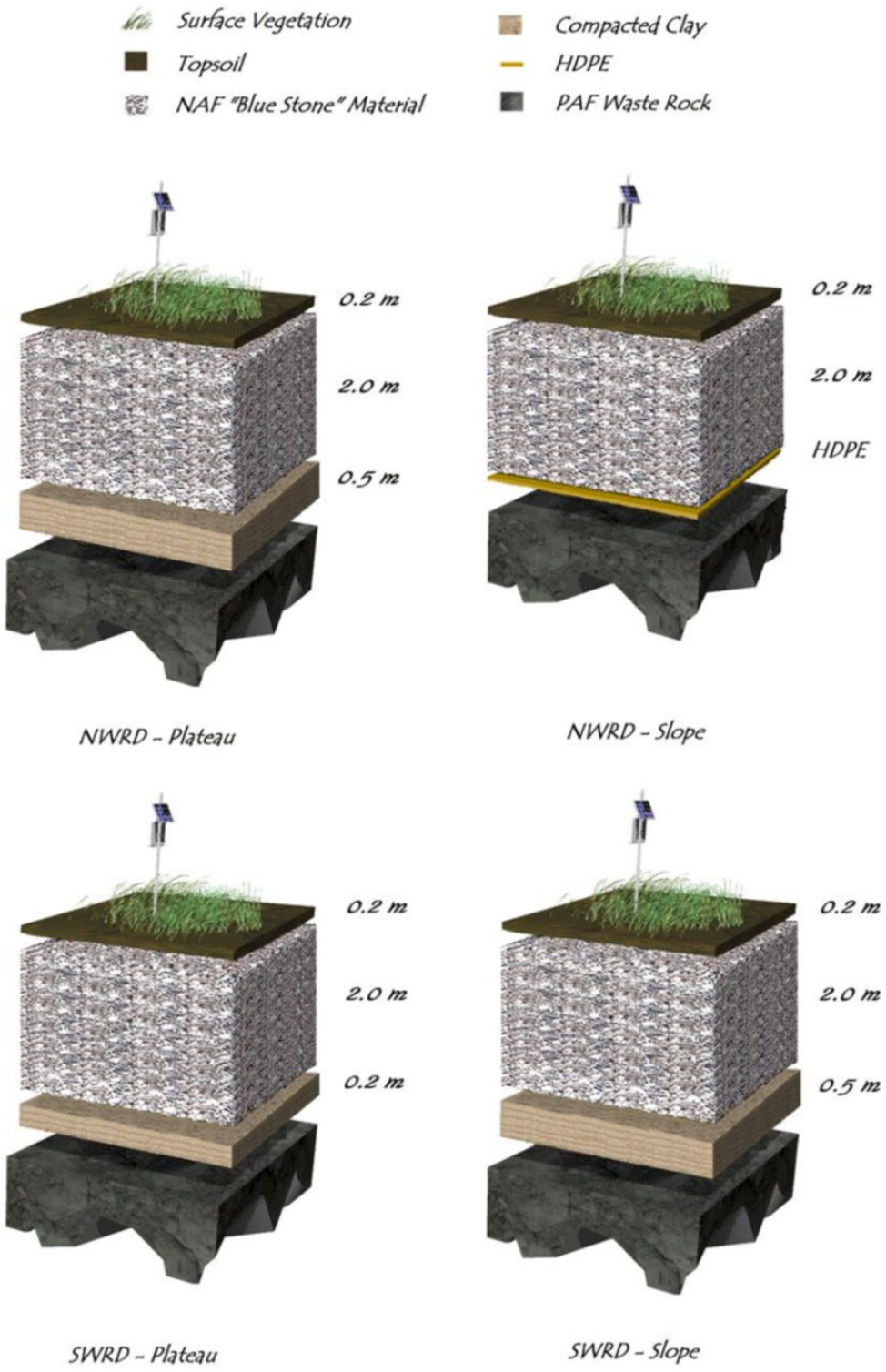


Figure 2.2: Cover system profiles at CADIA.

3. DATA COLLECTION

The automated performance monitoring stations installed at the NWRD and SWRD record data from the various sensors at different time intervals. The high frequency data collection produces large, detailed, raw data files to allow daily, seasonal, and annual trends to be identified and interpreted.

3.1 Data Capture Rates

The data capture rate metric considers the number of installed sensors that are operating and the data collection efficiency. The data collection efficiency is the percentage of valid readings measured by the sensors, compared to the number of scheduled readings. Data capture rates for the Year 10 monitoring period account for the planned component shut offs for recalibrations in February 2024. There are six primary soil stations and two secondary soil stations at the NWRD and six primary soil stations at the SWRD. The two secondary soil station sensor nests are controlled through the primary four soil stations datalogger to provide additional soil data for this area of the WRD.

Data capture rates for various components of the monitoring systems for the NWRD, SWRD, and the natural site during the Year 10 monitoring period are summarised in Table 3.1Table 3.1, Table 3.2, Table 3.2 and Table 3.3

Table 3.3, respectively.

Table 3.1: NWRD data capture rates for the Year 10 monitoring period.

Component	Number of Automated Sensors Installed	Number of Automated Sensors Operating	Percentage of Sensors Operating (%)	Data Collection Efficiency (%)	Data Capture Rate (%)
Primary 1 (Plateau)					
Thermal Conductivity (TC) Sensor	12	12	100	70	70
Water Content Sensor	16	16	100	25	25
Primary 2 (Plateau)					
TC Sensor	12	12*	100	70	70
Water Content Sensor	16	12	75	100	75
Net Radiometer	1	0	0	0	0
Tipping Bucket Rain Gauge (TBRG)	1	1	100	100	100
Primary 3 (Plateau)					
TC Sensor	12	12*	100	25	25
Water Content Sensor	16	0	0	0	0

Component	Number of Automated Sensors Installed	Number of Automated Sensors Operating	Percentage of Sensors Operating (%)	Data Collection Efficiency (%)	Data Capture Rate (%)
TC Sensor	11	11	100	100	100
Water Content Sensor	13	13	100	100	100
Primary 5 (Slope)					
TC Sensor	11	11	100	78	78
Water Content Sensor	12	12	100	78	78
Net Radiometer	1	0	0	0	0
Primary 6 (Slope)					
TC Sensor	11	8*	73	100	73
Water Content Sensor	13	13	100	100	100
Secondary 1 (Slope)					
TC Sensor	10	10	100	100	100
Water Content Sensor	10	10	100	100	100
Secondary 2 (Slope)					
TC Sensor	10	10	100	100	100
Water Content Sensor	10	10	100	100	100
Water Level Monitoring					
Hobo Loggers	3	0**	0	0	0
Interflow Monitoring					
Tipping Bucket Flow Gauge (TBFG)	1	0	0	0	0
		Average Data Capture Rate for the Monitoring Period:			**65%**

*Some of the installed TC sensors are no longer recording reliable suction readings but are providing reasonable temperature data.

** Not collected during 2024 site visit.

Table 3.2: SWRD data capture rates for the Year 10 Monitoring Period.

Component	Number of Automated Sensors Installed	Number of Automated Sensors Operating	Percentage of Sensors Operating (%)	Data Collection Efficiency (%)	Data Capture Rate (%)
Primary 1 (Slope)					
TC Sensor	16	10	63	36	23
Water Content Sensor	16	14	88	32	28

Component	Number of Automated Sensors Installed	Number of Automated Sensors Operating	Percentage of Sensors Operating (%)	Data Collection Efficiency (%)	Data Capture Rate (%)
Primary 2 (Slope)					
TC Sensor	16	13	81	100	81
Water Content Sensor	16	16	100	100	100
Primary 3 (Slope)					
TC Sensor	16	16	100	25	25
Water Content Sensor	16	14	88	25	22
Primary 4 (Plateau)					
TC Sensor	14	14	100	40	40
Water Content Sensor	14	14	100	36	36
Primary 5 (Plateau)					
TC Sensor	14	13	93	100	93
Water Content Sensor	14	14	100	100	100
Primary 6 (Plateau)					
TC Sensor	16	0	0	0	0
Water Content Sensor	14	0	0	0	0
Meteorological Station					
Air Temperature and RH	1	1	100	100	100
Tipping Bucket Rain Gauge (TBRG)	1	1	100	100	100
Wind Speed Monitor	1	1	100	100	100
Net Radiometer	1	1	100	100	100
Evapotranspiration Monitoring					
Eddy Covariance System (EC)	1	0	0	0	0
Water Level Monitoring					
Pressure Level Sensor (PLS)	3	3	100	100	100
Interflow Monitoring	1	1	100	23	28
Tipping Bucket Flow Gauge (TBFG)	1	1	100	100	100
Average Data Capture Rate for the Monitoring Period:					**55%**

Table 3.3: Natural site data capture rates for the Year 10 monitoring period.

Component	Number of Automated Sensors Installed	Number of Automated Sensors Operating	Percentage of Sensors Operating (%)	Data Collection Efficiency (%)	Data Capture Rate (%)
Primary 1					
TC Sensor	8	8	100	100	100
Water Content Sensor	8	8	100	100	100
		Average Data Capture Rate for the Monitoring Period:			**100%**

3.2 Cover Monitoring System Data Collection

Data collection from monitoring stations at NWRD and SWRD is performed periodically via manual downloads. All monitoring station radios have been replaced with cellular modems to allow for remote connection and data download going forward. Success of the remote data download will be reported on in the next year's reporting.

3.2.1 NWRD

An average data capture rate of 65% was obtained for all automated sensors at the NWRD for the Year 10 monitoring period, which represents a 9% reduction in data capture compared to the Year 9 monitoring period.

Secondary meteorological instrumentation was installed at the NWRD for comparison with meteorological conditions measured at the SWRD, and to allow the development of a location-specific water balance. The TBRG installed at the NWRD recorded data throughout the monitoring period. However, there were very low rainfall amounts recorded by the NWRD TBRG between August 2023 and February 2024, compared to both Orange Airport Bureau of Meteorology (BoM) Station, ~15 km north-east of Cadia (Station ID: 063303), and SWRD rainfall. Previous monitoring periods have demonstrated that there is often a difference in rainfall between the TBRG at the NWRD and SWRD. Last monitoring period, Okane completed quality assurance/quality control (QA/QC) and calibrations of both TBRGs. Both TBRGs were found to be operating correctly with data calculating out to correct quantities of water. This suggests that rainfall occurred in isolated storms over different areas of the Cadia site. Okane will continue to monitor and check rainfall amounts during the data QA/QC review to validate the accuracy of these measurements.

The net radiometers located at the NWRD did not record values during the monitoring period, as was the case during the Year 9 monitoring period, due to damage to the sensor leads caused by wildlife. A new net radiometer has been ordered and the malfunctioning sensor on the plateau will be replaced during the April 2025 site visit. The Primary 5 Slope net radiometer

has not been replaced, as recordings from this sensor in previous monitoring periods have been very close to what the net radiometer on the plateau has recorded.

15% of the TC sensors produced invalid suction readings, however these sensors continued to provide valid temperature readings. The issue can likely be attributed to general wear to the sensors over time. The sensors output will continue to be checked during data QA/QC review.

At Primary 3 station, all water content sensors are now recording data correctly following the replacement of the water content multiplexer during the May 2024 site visit. Previously, the sensors were reporting Not A Number (NAN) values due to an issue with the multiplexer, which has now been resolved. The TBFG on the NWRD slope is scheduled for replacement.

The TBFG on the NWRD slope will be replaced during the 2025 site visit. It was identified that the wires connecting the TBFG to the data acquisition system (DAS) were corroded and disconnected. Inspection of the area downgradient of the enclosure housing the TBFG suggested that the drainage path had been blocked by sediment, causing water to pool inside the enclosure. The drainage channel was cleared and deepened, to facilitate drainage, and most of the sediment and insect waste was removed from the enclosure. The device components are no longer salvageable and are unable to record measurements.

Data from the Hobo Loggers at the NWRD could not be collected during the 2024 site visit, as the loggers were inspected and did not appear to be collecting data due to low battery voltage. It is recommended to follow up with this issue during the 2025 site visit. The Hobo Loggers record in situ pore-water pressure in the cover material above the HDPE and CCL, these values can be estimated during the water balance process till the low battery voltage issue is correct during the next site visit.

All other sensors worked as expected at the NWRD during the Year 10 monitoring period.

3.2.2 SWRD

An average data capture rate of 55% was obtained for all automated sensors at the SWRD for the Year 10 monitoring period, which represents a 26% decrease from the Year 9 monitoring period. While the TBRG installed at the SWRD recorded data throughout the monitoring period and a calibration check was completed during the August 2023 site visit, several sensors, including the TC Sensors at Primary 6 and the PL sensors, were not fully operational. Additionally, the EC system was non-functional during this period.

17% of the TC sensors produced invalid suction readings, however these sensors continued to provide valid temperature readings. The issue can likely be attributed to general wear to the sensors over time. The sensors output will continue to be checked during data QA/QC review.

Discrepancies were noted in the internal clocks of the Primary 6 and Primary 1 station dataloggers during the August 2023 site visit. The clocks were set to 23 April 2023 and 20 May 2023, respectively. Clocks were reset to the appropriate date and time during the site visit,

however, these incorrect dates affected the data sets collected from the loggers and resulted in lower data capture rates. This data was manually excluded from the monitoring period. This loss of datalogger clock accuracy is indicative of a failing internal lithium battery, and as a remediation measure, the dataloggers were taken off site for recalibration and replacement of the internal battery.

The EC system did not record any data during the monitoring period. The EC system consists of multiple sensors and instruments, all of which were found in good physical condition during the August 2023 site visit. The wiring between the datalogger and one of the solar panels was found to be damaged by wildlife, however this was remediated during the visit. Low voltages were measured for the batteries and the CR3000 datalogger, confirming that power supply was insufficient for the system to function correctly. Okane recommended the batteries be changed by Cadia staff after the site visit, which should allow for data to be collected by the EC system going forward. It was also noted during the August 2023 site visit that vegetation surrounding the EC system were encroaching the clearance distance recommended in the Campbell Scientific EC system manual. Vegetation in close proximity to the EC system has the potential to interfere with sensor measurements at the station, and the collected data could be considered non-representative of site conditions. It is recommended that the EC station be moved to a more representative area.

4. PRESENTATION AND DISCUSSION OF FIELD DATA

Soil sensor data undergoes QA/QC review and is synthesised with meteorological data to assess cover system performance. Key data sets pertinent to the objectives of this report (as described in Section 1.2) are presented and discussed to evaluate the performance of the cover system trials. Meteorological data is presented first, followed by in situ temperature and water conditions data. Finally, water balance estimates are developed for the various cover systems at the WRDs.

The principal drivers of cover system performance are evaporative forces and rainfall. Rainfall is measured by TBRGs installed at both the NWRD and SWRD. Direct measurements of actual evapotranspiration (AET) from an EC system, such as the one installed at the SWRD plateau, are useful for performance evaluation. However, to mitigate the missing EC data set for the monitoring period, potential evaporation (PE) was estimated using net radiation, air temperature, relative humidity, and wind speed data recorded at the meteorological station located on the SWRD plateau. Furthermore, meteorological data was only recorded from June 2023 to mid-February 2024 across both sites, as TBRGs were turned off after this point due to the recalibration of equipment.

4.1 Rainfall

Total rainfall measured at Cadia during the Year 10 monitoring period was 708 mm and 276 mm for the SWRD and NWRD, respectively (Figure 4.1Figure **4.1**). Variability in rainfall amounts recorded between locations may be attributed to:

- Spatial variability whereby a localised storm passes over one WRD and not the other;
- Higher tree density at the SWRD, resulting in larger interception by the vegetation canopy; and
- Difference in recording period between stations, with the meteorological station at the SWRD recording 10 more days of data than the station at the NWRD.

The largest rainfall event at the NWRD for the monitoring period occurred on 5 July 2023, recording 21.0 mm while the largest rainfall event at the SWRD occurred on 29 November 2023, recording 39.4 mm. Variation in recorded rainfall between the two WRDs was most substantial in November 2023 when 131.4 mm was recorded at the SWRD compared with 24.4 mm at the NWRD, underscoring the effect of localised rainfall and vegetation canopy interception.

Rainfall at the Orange Airport Bureau of Meteorology (BoM) Station, ~15 km north-east of Cadia (Station ID: 063303), was 897 mm with a total of 133 rain days for the Year 10 monitoring period. The long term 28-year average annual rainfall (1996 to 2024) at the Orange Airport BoM station is 890 mm, 7 mm lower than BoM cumulative Year 10 rainfall.

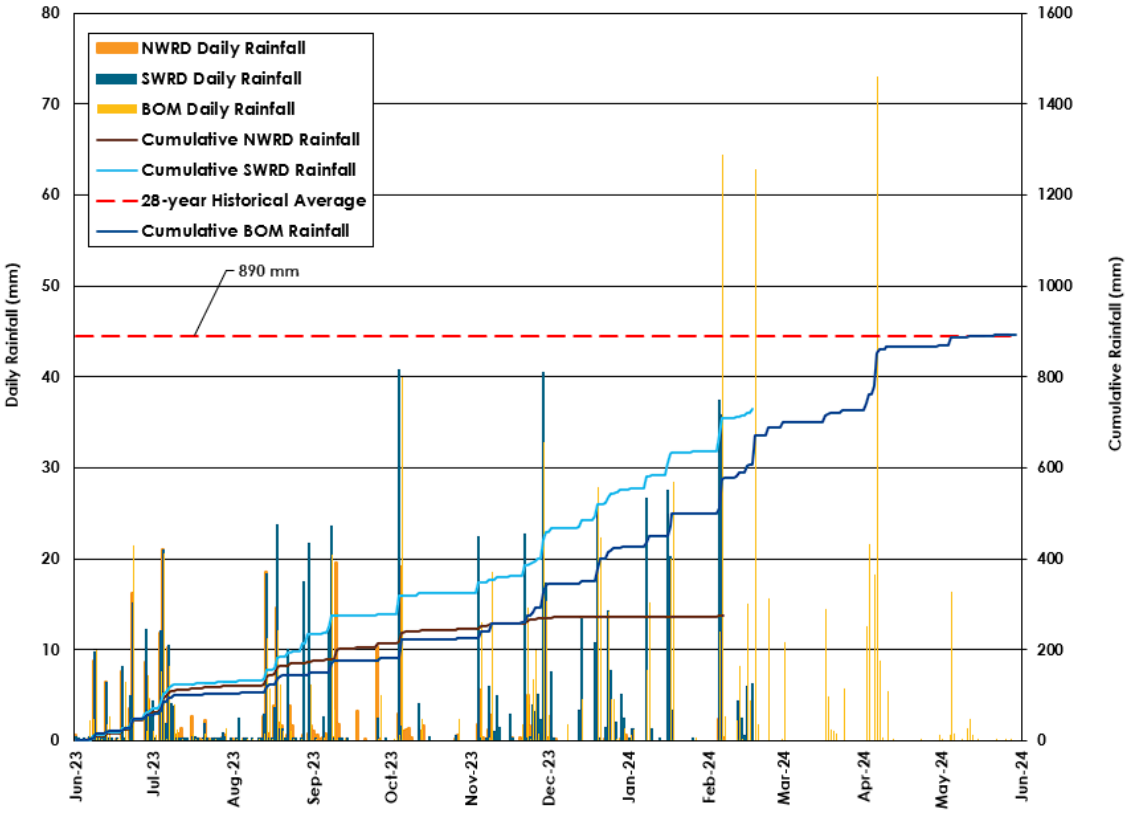


Figure 4.1: **Daily and cumulative rainfall at the NWRD, SWRD and Orange Airport BoM Weather Station for Year 10 monitoring period.**

The total rainfall at the Orange Airport BoM station between 1 June 2023 and 18 February 2024 was 608 mm across a total of 100 rain days. During this period, the BoM station and NWRD annual rainfall totals differed by 332 mm. The conjunction of lower rainfall amounts compared to the SWRD and discrepancies between recorded rain events and water storage increases at the NWRD (Figure 4.13Figure 4.1313 and Figure 4.14Figure 4.1414), suggests that some rain events were likely under-recorded at the NWRD between October 2023 and February 2024, possibly due to wind blowing rain away from the TBRG during those events.

4.2 Potential Evaporation

Potential evaporation (PE) is a theoretical maximum evaporation assuming free water on the surface. Potential evaporation is not a direct measurement of actual evapotranspiration, rather it is an estimate of the maximum energy available for evapotranspiration to occur. For this report, potential evaporation was estimated based on the Penman (1948) method with meteorological data (air temperature, wind speed, humidity, net radiation) collected at SWRD. The total estimated PE for the Year 10 monitoring period was 915 mm (Figure 4.2Figure 4.22).

Potential evaporation exceeded rainfall across all months of the monitoring period. The relationship between PE and rainfall cannot be determined between March 2024 and May 2024 as the dataloggers for the TBRGs removed from site in for recalibration during this period.

The greatest PE:rainfall ratio in the recorded data occurred in February 2024 at just under 2:1, though this is not accounting for missing data.

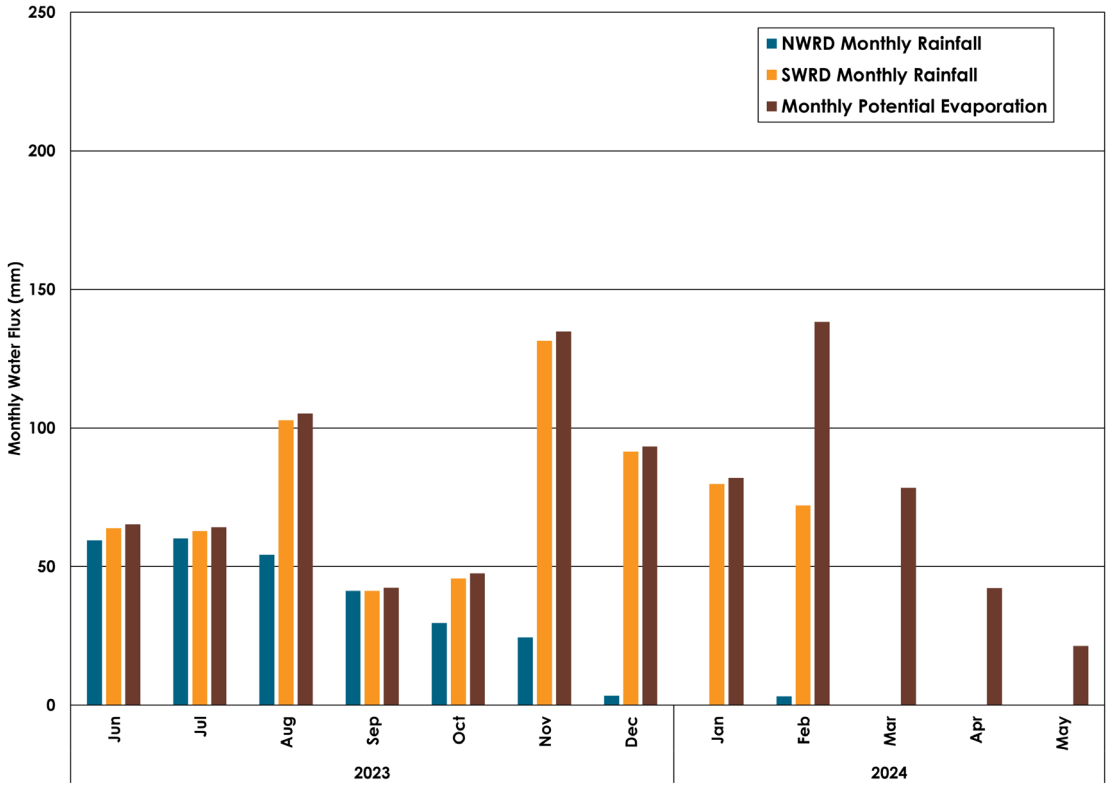


Figure 4.22: Comparison of recorded monthly rainfall at SWRD and NWRD and estimated potential evaporation using data collected at the SWRD meteorological station for Year 10 monitoring period.

4.3 In Situ Soil Temperature

In situ soil temperatures are continuously monitored by CSA Model 229 (CS229) TC sensors. Representative two-dimensional (2D) contour temperature profiles were developed for the NWRD and SWRD plateau and slope areas, and the natural site for the Year 10 monitoring period (Figure 4.3Figure 4.33 to Figure 4.7Figure 4.66, inclusive). The white areas in the figures indicate periods of missing data. The Natural station sensors only go to 120 cm depth were as the trial stations are all over 3 m in depth. The natural station is used as a baseline for water and temperature movement in the top layers of the cover system.

Seasonal ambient temperature patterns influence sensor readings, with the highest and lowest soil temperatures recorded in summer and winter, respectively. The upper topsoil profile is subjected to atmospheric conditions, including diurnal temperature fluctuations and radiative forcing, that results in greater variability in temperature at shallow depths. Deeper cover system materials are largely insulated by the upper cover system and contain much greater thermal mass. Fluctuations at depth are therefore present on a longer timescale and generally reflect seasonal effects.

The effect of rainfall events can be observed as cooling events in the cover system profiles during the monitoring period. The slope monitoring locations were cooler in winter and warmer in summer compared to the plateau locations, which can be attributed to decreased solar insolation in winter and lower water content at the slope locations (see Section 3.5). Lower water content result in faster temperature changes, as transfer of energy is more rapid through air than water.

Temperature fluctuations within the waste rock were minimal across both NWRD and SWRD sites. However, fluctuation trends at the SWRD plateau sites over the entire monitoring period were unclear due to data gaps. These sites may have been similarly unaffected or may have followed trends observed in Year 9 where the full waste rock profile experienced elevated temperatures during the warmer months. Waste rock temperatures did not exceed ambient conditions across all trial sites, indicating that internal heating from oxidation is not occurring at depth.

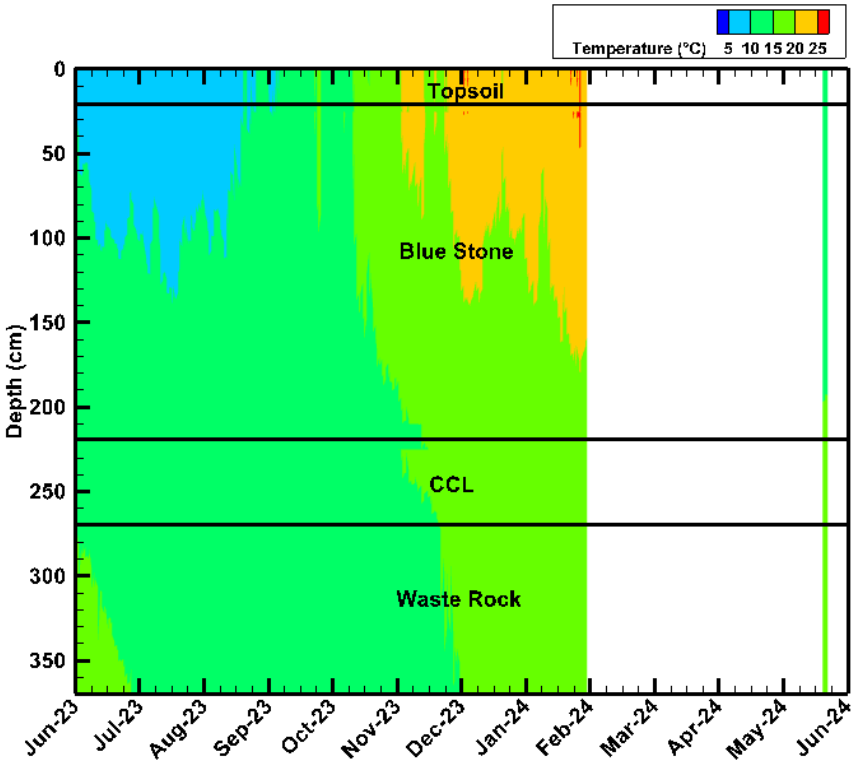


Figure 4.33: Soil temperature profile at NWRD Primary 1 plateau station.

Year 10 monitoring period

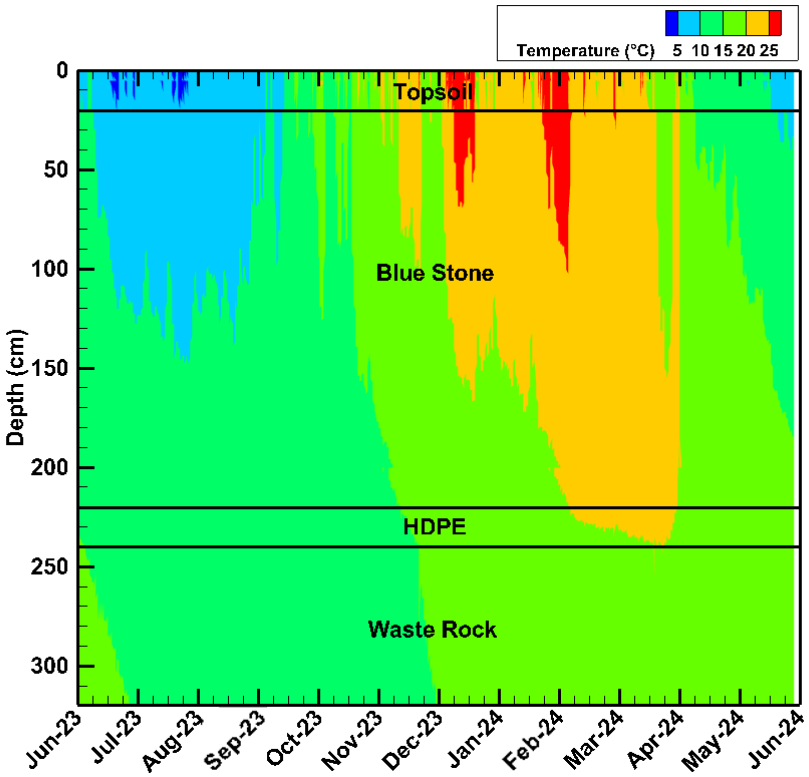


Figure 4.44: Soil temperature profile at NWRD Primary 4 slope station.

Year 10 monitoring period

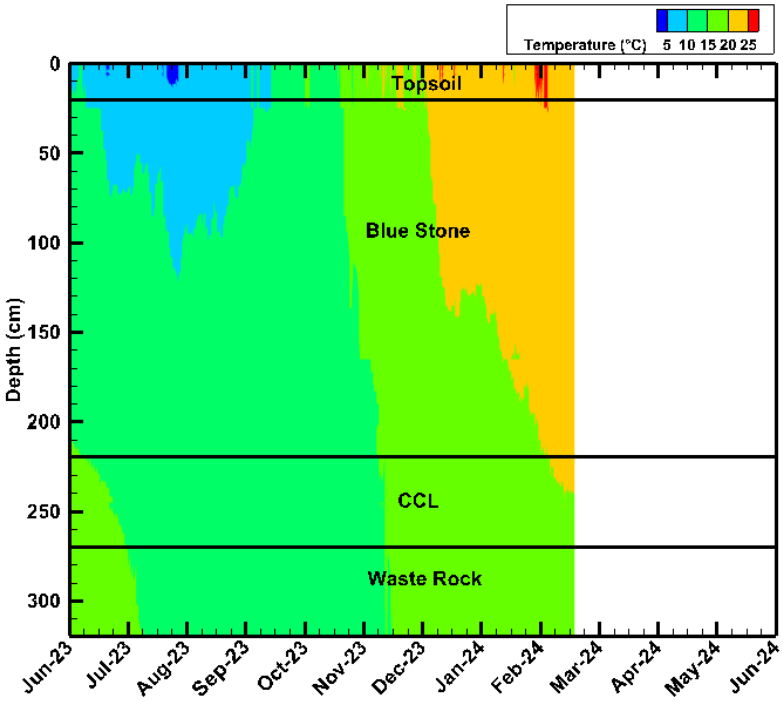


Figure 4.55: Soil temperature profile at SWRD Primary 2 slope station.

Year 10 monitoring period

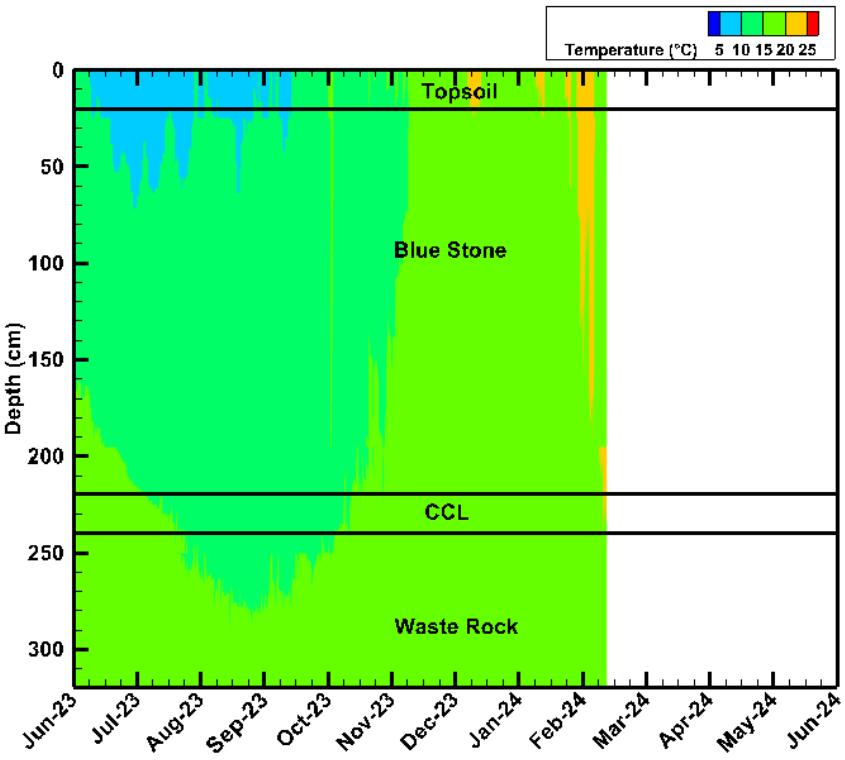


Figure 4.66: Soil temperature profile at SWRD Primary 5 plateau station.

Year 10 monitoring period

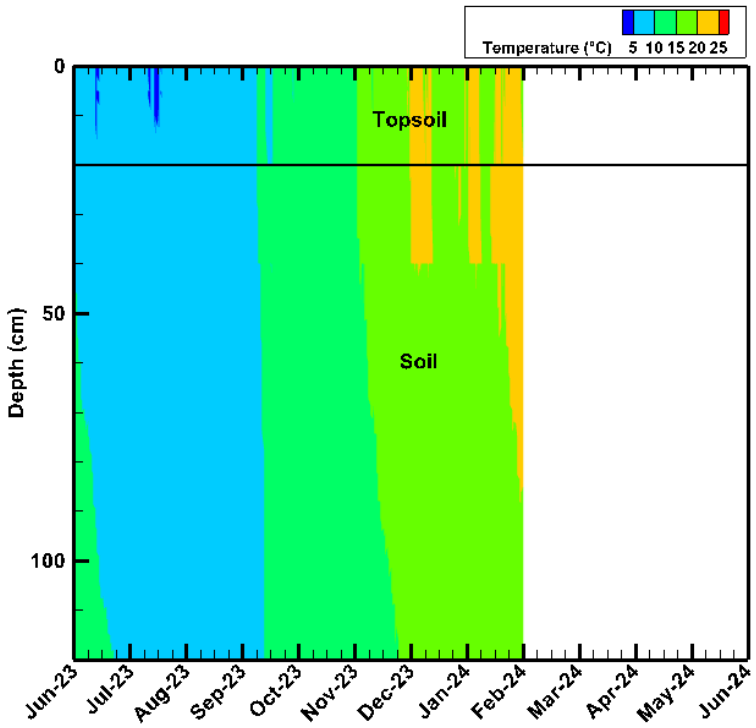


Figure 4.77: Soil temperature profile at Natural station.

Year 10 monitoring period

4.4 Soil Water Conditions

Soil water conditions in each WRD cover system trial are continuously measured with CSA Model 616 (CS616) time domain reflectometry (TDR) and TC sensors (indirect measurement of matric suction). Sensor nests were strategically positioned across the WRDs to develop a thorough understanding of the water regimes in the cover system on both temporal and spatial scales. Plant available water capacity (PAWC) is defined as the available water for vegetation in the cover system profile and is described by the following equation:

$$PAWC = FC - PWP \quad [1]$$

where:

FC = field capacity – the volume of water measured at matric suction 33 kPa; and,

PWP = permanent wilting point – the volume of water measured at matric suction 1,500 kPa.

When the stored water within a cover system exceeds FC, water will drain to the underlying waste rock before it can be fully utilised by vegetation or removed through evapotranspiration. In this scenario, water is reported as net percolation (NP). Waterlogging of the cover system material may also occur, impacting the success of vegetation growth. The health of vegetation is also negatively affected when the PWP is reached. The PWP and the FC for the top 1 m of cover system materials at NWRD and SWRD translates to approximately 91 mm and 175 mm of water storage respectively, and the PAWC is 84 mm.

4.5 Volumetric Water Content

Volumetric water content (VWC) is monitored by TDR sensors in the cover system profiles. Representative 2D contour plots were developed for the plateau, slope, and natural areas with VWC data recorded at the NWRD and SWRD (Figure 4.8Figure 4.88 to Figure 4.12Figure 4.1212, inclusive) for the Year 10 monitoring period. The driest layer across both plateau sites was the waste rock (Figure 4.8Figure 4.88 and Figure 4.11Figure 4.1212). Waste rock at the NWRD was wetter than that at the SWRD and remained at a consistent VWC throughout the monitoring period. Waste rock at the SWRD experienced greater and more frequent fluctuations in VWC than the NWRD, with drying over the summer months. This is likely due to the SWRD trial only covering half of the WRD surface as waste rock is still being placed on the northern side of the Pink Dump. This causes the WRD to be half exposed and rainfall can directly infiltrate to the waste rock. This can also lead to lateral matric suction due to the drying and wetting of the exposed waste rock.

The wettest layer at both plateau sites was the CCL, as expected due to the low permeability of clay layers. Continued wetting and drying cycles may pose a risk to the integrity of the CCLs and increase their permeability, allowing water to infiltrate to the waste rock. However, the

VWC of each CCL remained consistent over the monitoring period, with minor seasonal drying trends noticeable at the SWRD.

The covers at the NWRD and SWRD slopes are constructed with a HDPE liner and CCL, respectively (Figure 4.9Figure 4.99 and Figure 4.10Figure 4.1010). The HDPE effectively prevents flow from the cover system to waste rock, as indicated by the absence of seasonal influence on waste rock VWC. In comparison, the CCL only restricts flow, resulting in a higher VWC in the waste rock. Both the HDPE liner and CCL facilitate the translation of infiltrating water to interflow, allowing it to move downslope and out of the cover system.

The Blue Stone layer generally experienced a greater degree of seasonal variation at the plateau locations than at slope locations, which is attributed to lower incident insolation on the slopes due to their aspect.

Topsoil layers across all monitoring locations recorded higher VWC with greater variation than in the Blue Stone material, indicating sufficient water availability for plants. Rainfall events are clearly visible in the profiles as periodic increases in VWC. Seasonal decrease in VWC is also observed during the summer months due to increased evaporation rates (Figure 4.2Figure 4.22). Volumetric water contents at the natural site were higher and more variable than those recorded at the NWRD and SWRD trial area stations throughout the monitoring period. The natural station sensors maximum depth is 120 cm depth, where as the trial stations are all over 3 m in depth. The natural station is used as a baseline for water and temperature movement in the top layers of the cover system.

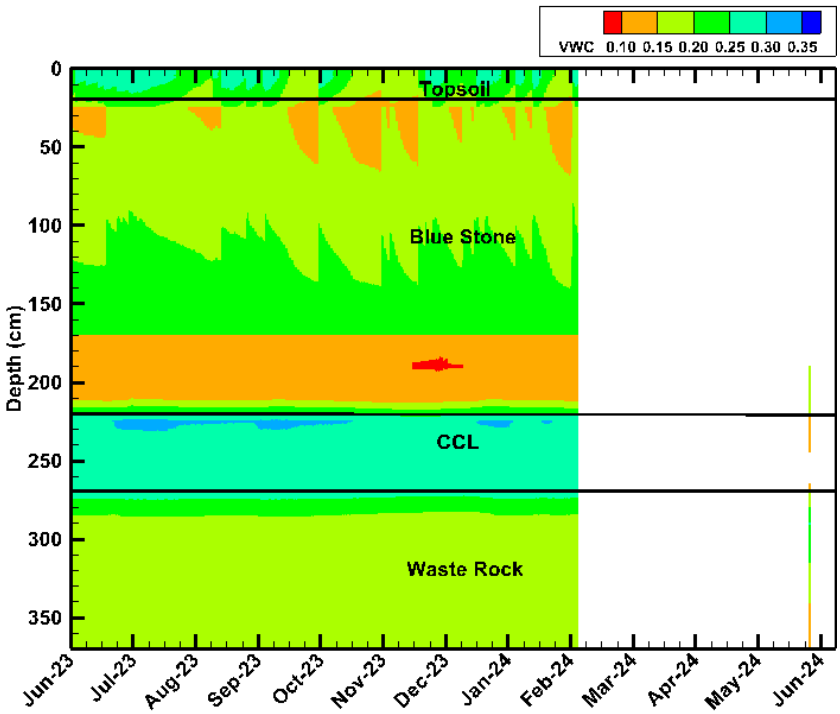


Figure 4.88: Soil VWC profile at the NWRD Primary 2 plateau station.

Year 10 monitoring period.

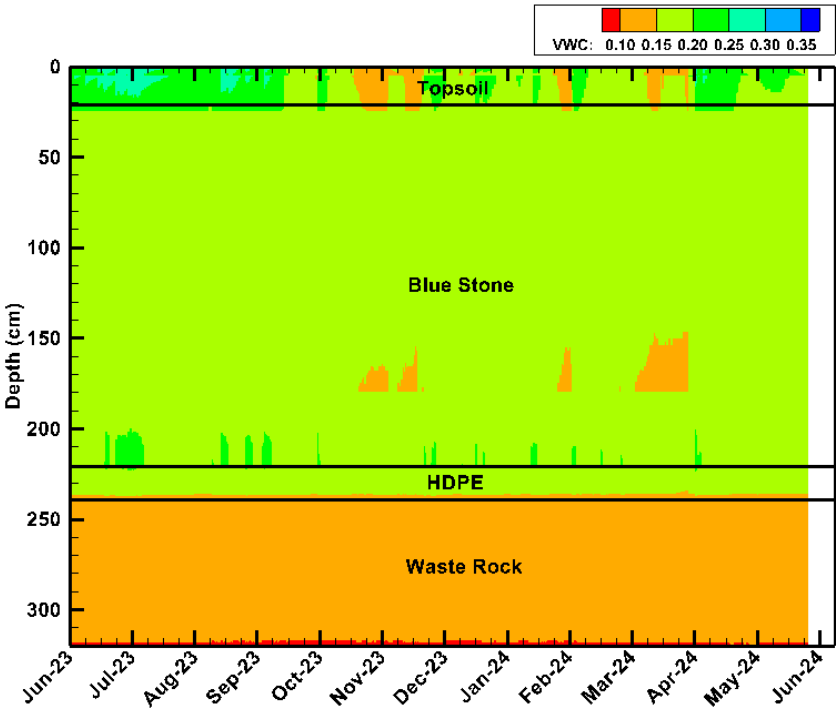


Figure 4.99: Soil VWC profile at the NWRD Primary 4 slope station.

Year 10 monitoring period

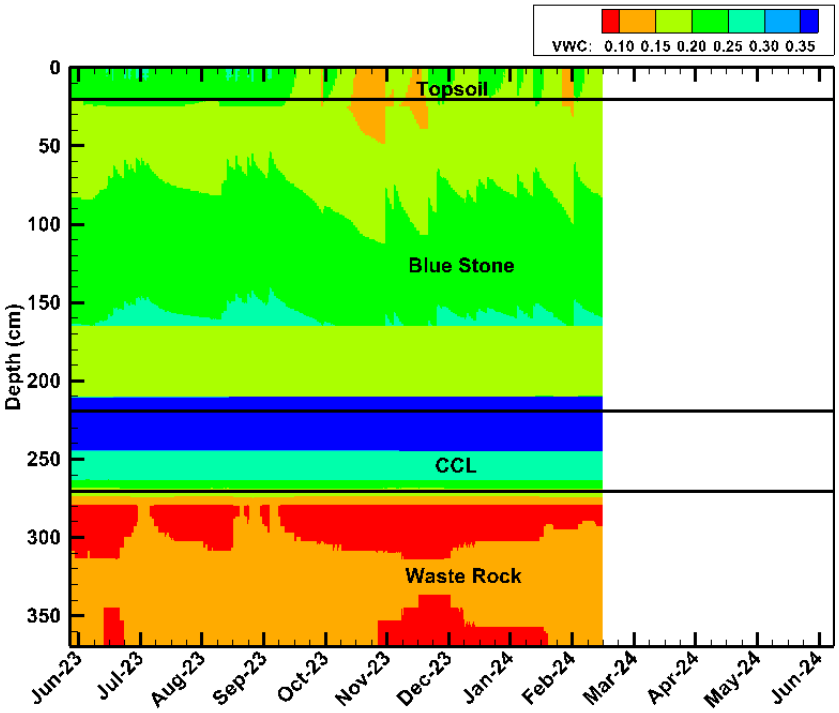


Figure 4.1010: Soil VWC profile at the SWRD Primary 2 slope station.

Year 10 monitoring period

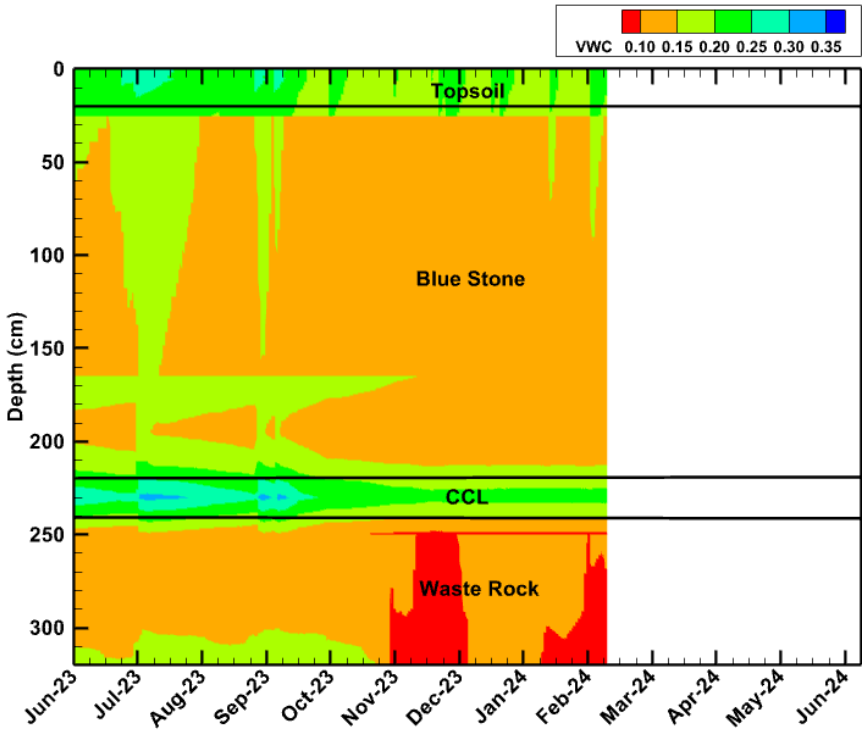


Figure 4.1111: Soil VWC profile at the SWRD Primary 5 plateau station.

Year 10 monitoring period

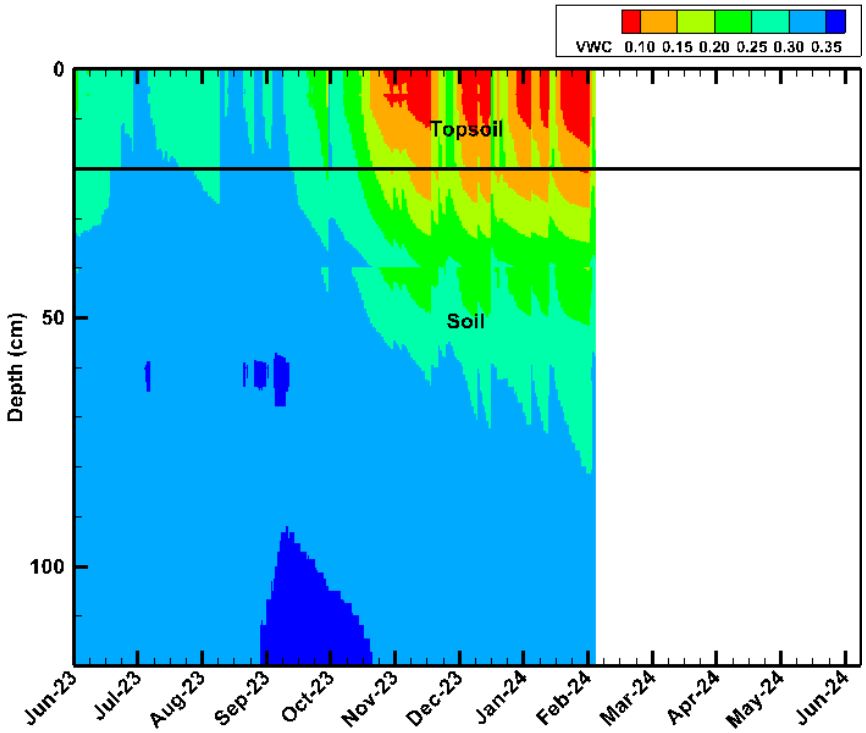


Figure 4.1212: Soil VWC profile at the Natural station.

Year 10 monitoring period

4.6 Change in Water Storage

The volume of water stored within the cover system profile at each monitoring location was estimated by dividing the cover system profile into multiple layers, each with a TDR sensor at its centre. The total volume of water within the cover system profile was calculated by summing the product of the VWC and each soil layer's elemental thickness. Due to TBRG malfunction at the NWRD, rainfall data for the NWRD monitoring sites has been supplemented with data from the SWRD TBRG.

Soil water storage fell between PWP and FC for most functioning sensors across the monitoring period, with the exceptions of NWRD P5, NWRD P6, and the natural station which often exceeded FC. SWRD P1 and SWRD P3 only recorded values below PWP and did not respond to rainfall inputs, though this is likely a result of sensor error, as evidenced by their low data capture rates (Table 2.2).

Intermittent exceedance of FC was recorded across multiple monitoring locations during the winter months, resulting from lower rates of PE and consistent rainfall inputs (Figure 4.13Figure 4.1313 to Figure 4.16Figure 4.1717). Water storage levels at the natural site were consistently above FC, indicating that the NP of rainfall infiltration within the soil profile is likely continuous (Figure 4.17).

Stored water responded rapidly to rainfall inputs and gradually declined during periods with little rainfall. Decreases in water storage corresponded with increased soil temperature and drier topsoil, though this did not result in values below PWP for monitoring sites with functioning sensors. Both plateau and slope areas at the NWRD and SWRD show similar water storage patterns, though there was some variance between total water storage values. The NWRD plateau stations, P5 and P6, consistently recorded higher water storage values than the other monitoring locations, resulting in exceedance of FC.

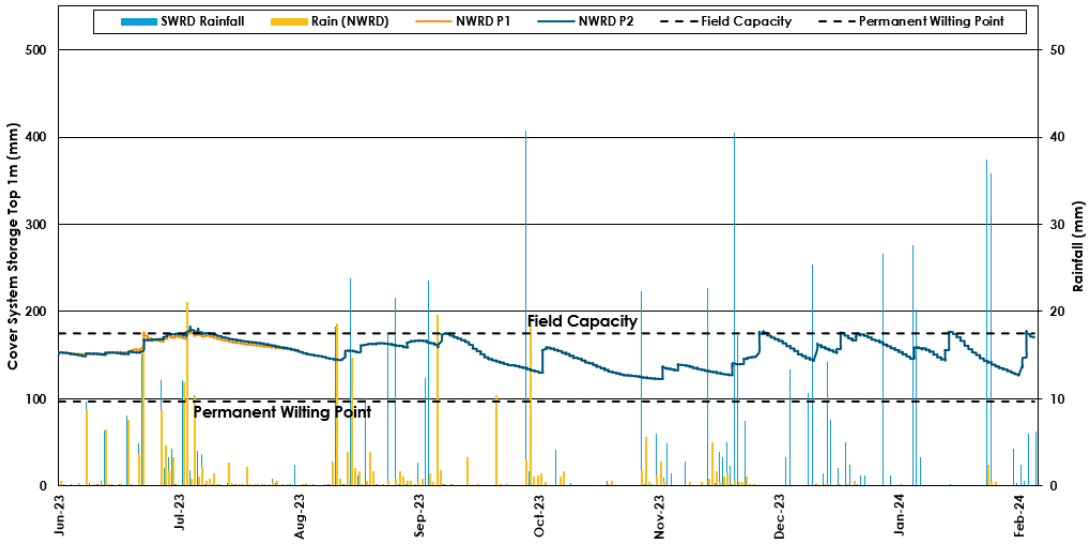


Figure 4.1313: Total stored water in upper 1 m of NWRD plateau.

Year 10 monitoring period

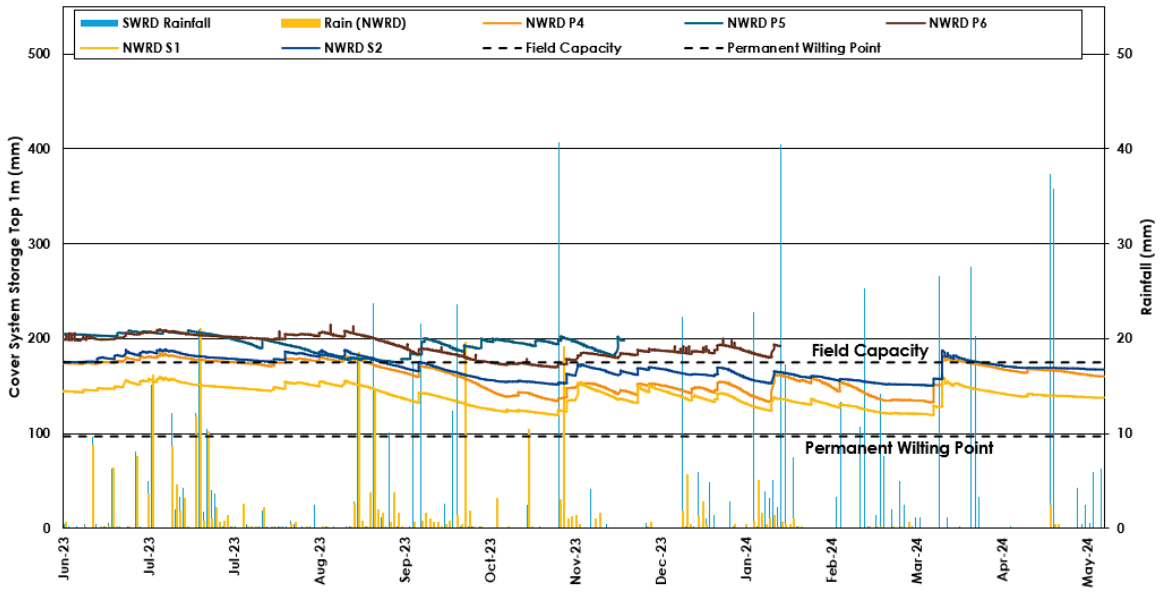


Figure 4.1414: Total stored water in upper 1 m of NWRD slope.

Year 10 monitoring period

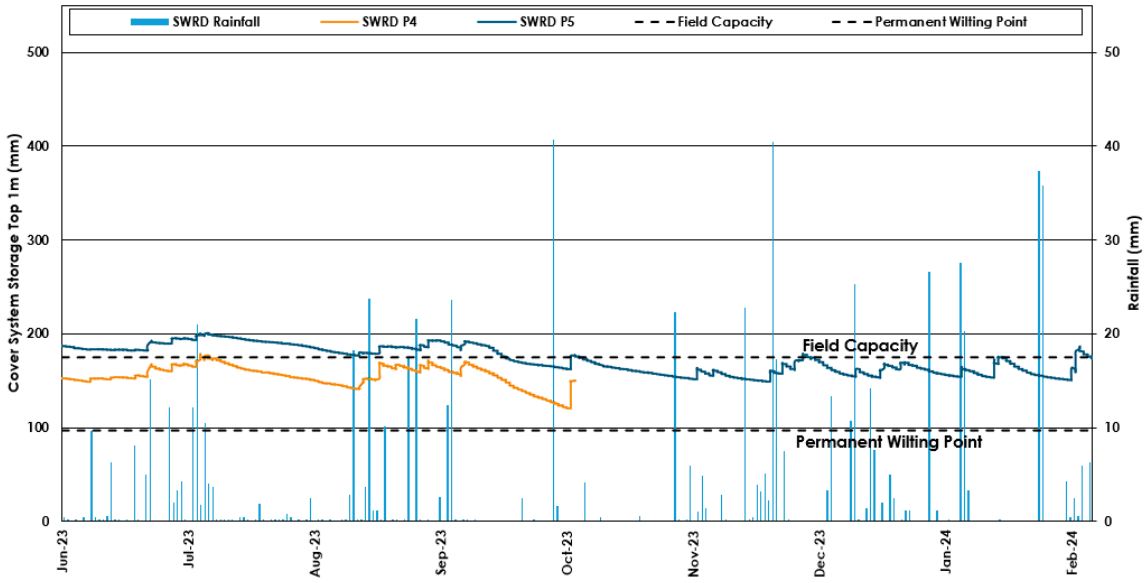


Figure 4.1515: Total stored water in upper 1 m of SWRD plateau.

Year 10 monitoring period

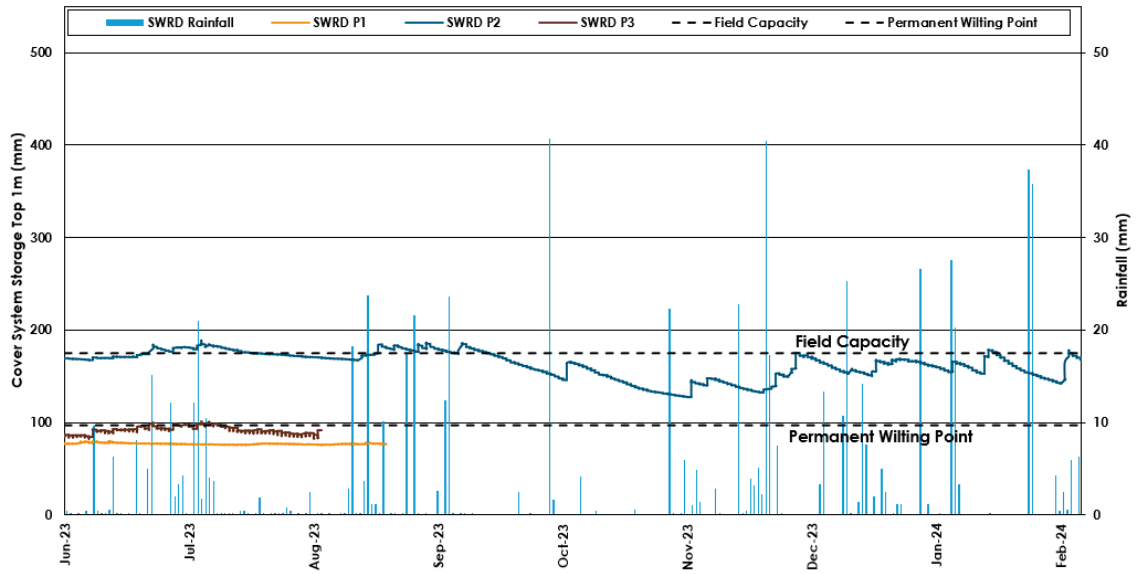


Figure 4.1616: Total stored water in upper 1 m of SWRD Slope.

Year 10 monitoring period

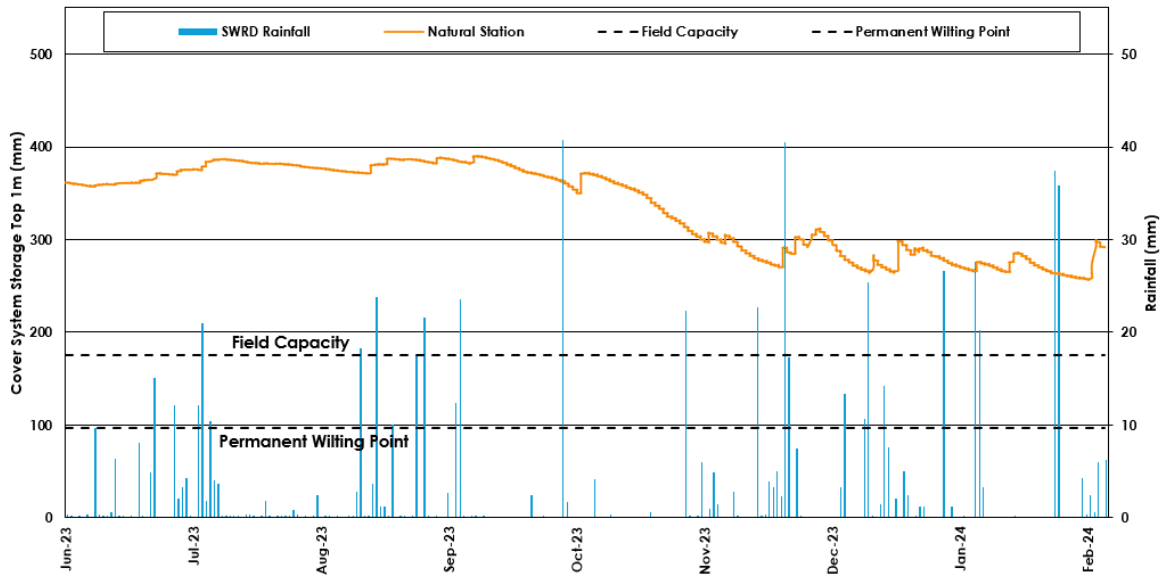


Figure 4.1717: Total stored water in upper 1 m of Natural Station.

Year 10 monitoring period

4.7 Matric Suction

Matric suction data is used to assist with interpretation of water cycling patterns within the cover system field trials. These results are reflective of seasonal rainfall fluctuations, which are marked by acute decreases in suction as excess water is added to the soil profile. Suction is

generally higher and more variable in the topsoil due to water loss from evapotranspiration or net percolation. Conversely, suction values are typically lower and more consistent at depth as moisture can be held for longer periods of time with slower rates of recovery. This can be used to determine the performance of a cover system by indicating the depths at which rapid changes in suction occur.

The direction and magnitude of flow gradients were measured with the nests of TC sensors installed throughout the soil profiles. Representative 2D suction contour plots of the NWRD and SWRD trial sites were developed using measured data, with the natural site for comparison (Figure 4.18Figure 4.1818 to Figure 4.22Figure 4.2222, inclusive). The natural station sensors go to 120 cm in depth, where as trial stations are all greater than 3 m in depth. The natural station is used as a baseline for water and temperature movement in the top layers only of the cover system.

Matric suction results for monitoring Year 10 are consistent with VWC data, with suction decreasing as VWC increases. Suction data was similar across most trial locations, with the NWRD slope, NWRD plateau, and SWRD slope sites achieving maximum annual values in the upper 2 m. The NWRD plateau and SWRD slope sites recorded minimal suction variability within the CCL and consistently low values in the underlying waste rock. Suction was minimal and unvaried across the HDPE layer and waste rock at the NWRD slope sites.

Soil suction at the SWRD plateau site showed considerable variation throughout the soil profile, extending to the waste rock below. This is consistent with the corresponding VWC data and indicative of high potential for water movement through the cover system.

Seasonal drying patterns are reflected by the increased suction recorded within the hot, dry period between November and March. This is displayed prominently in the soil profile of the natural site (Figure 4.22Figure 4.2222) as the Blue Stone layer effectively minimises this variation. Drying effects throughout the soil profile were more pronounced at the plateau stations, likely resulting from their greater degree of seasonal variation in water content.

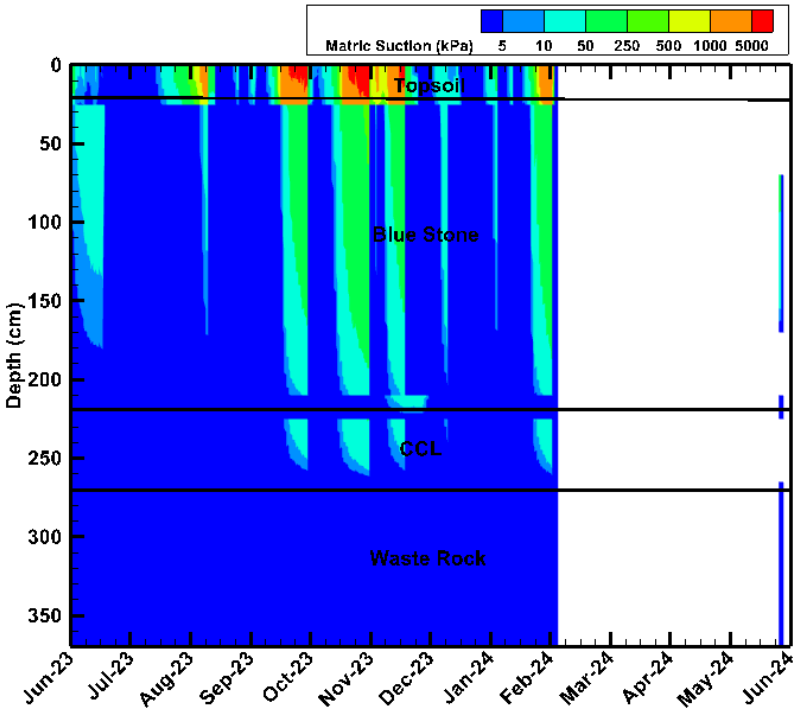


Figure 4.1818: Soil suction profile at the NWRD Primary 2 plateau station

Year 10 monitoring period.

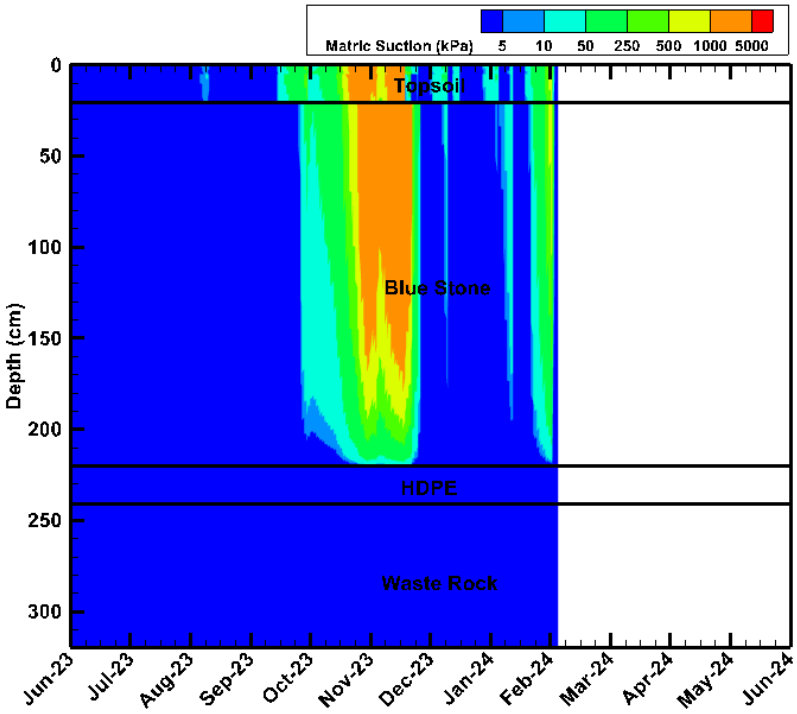


Figure 4.1919: Soil suction profile at the NWRD Primary 4 slope station

Year 10 monitoring period

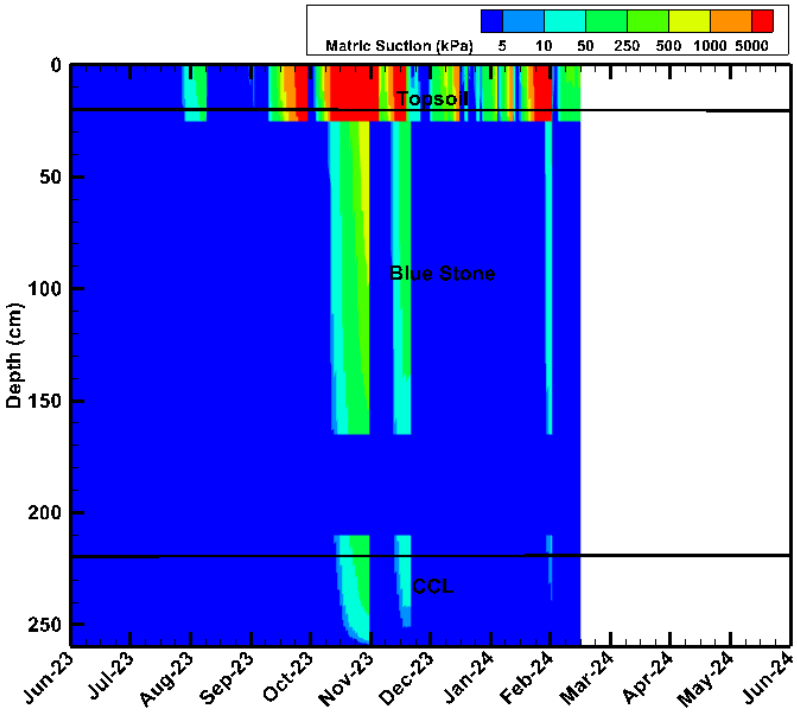


Figure 4.2020: Soil suction profile at the SWRD Primary 2 slope station

Year 10 monitoring period

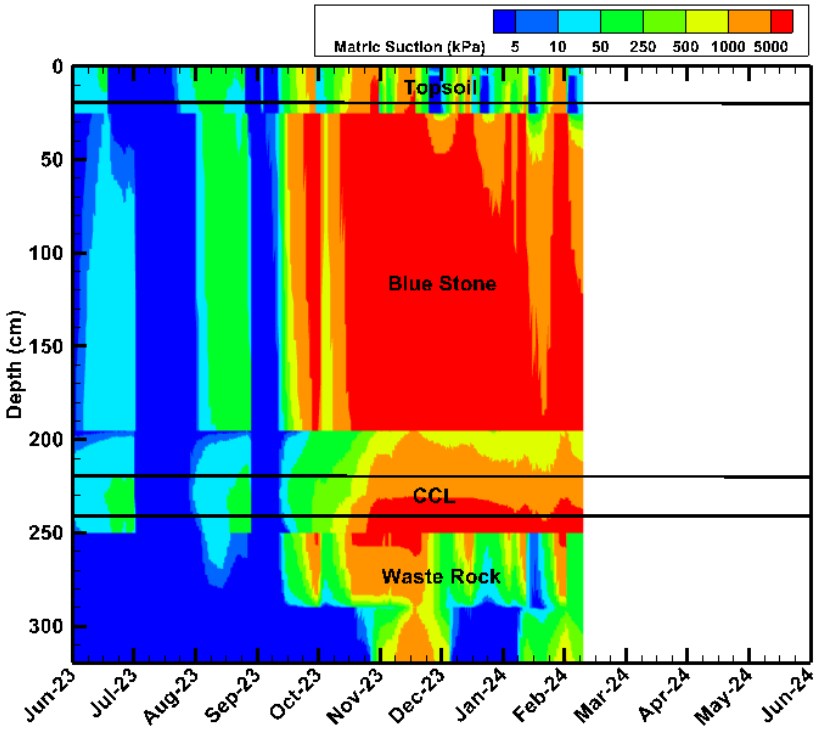


Figure 4.2121: Soil suction profile at the SWRD Primary 5 plateau station

Year 10 monitoring period

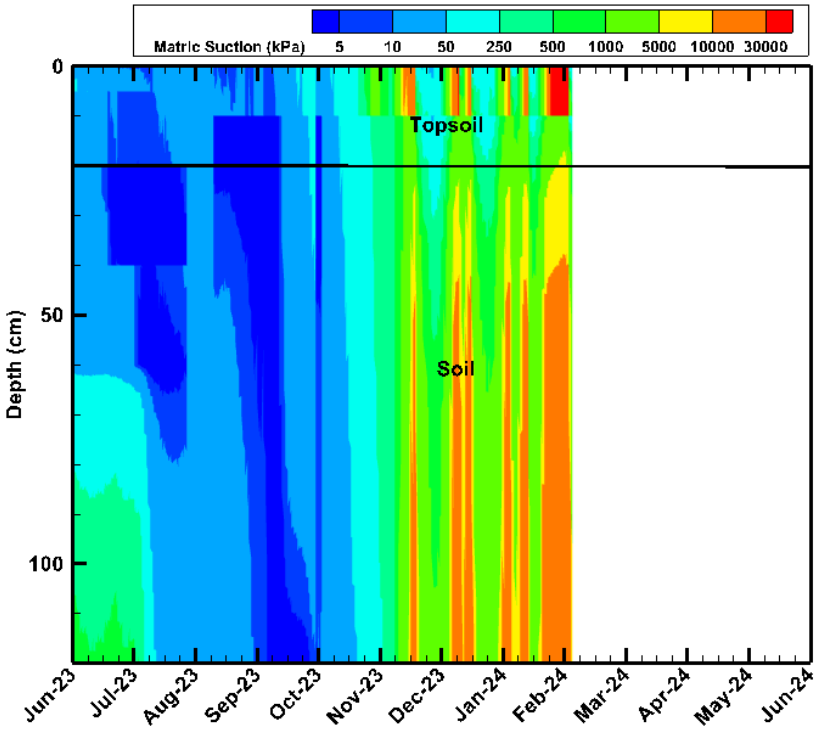


Figure 4.2222: Soil suction profile at the Natural station

Year 10 monitoring period

4.8 Water Balance

Numerical modelling was used to estimate a water balance for the cover system trials. Meteorological and soil monitoring data (including suction gradients, VWC, and soil water storage) were used as inputs to estimate the remaining water balance components to balance the equation. The water balance for a cover system consists of the following components:

$$R = RO + AET + NP + \Delta S \quad [2]$$

where:

R = rainfall;

RO = runoff;

AET = actual evapotranspiration;

NP = net percolation; and

ΔS = change in water storage within the cover system profile.

The numerical model uses soil parameters such as hydraulic conductivity and porosity to improve accuracy in estimating runoff and NP. Manual adjustments are also completed based on observations of site-specific conditions that the simulation may not account for, such as hard panning of the topsoil or site topography. The numerical simulation software utilizes the Soil Conservation Science (SCS) curve number (CN) to increase the accuracy of runoff estimation. The CN is determined through defining the Hydrologic Soil Group (HSG), cover

system description, and hydrologic condition. Hydrologic Soil Group A was chosen based on the results of saturated hydraulic conductivity testing completed during the August 2023 site visit (Okane, 2023). An HSG Group A classification means that the soil has a high infiltration rate with low runoff potential.

The other parameter used in the simulation is the vegetation cover type. This was identified as brush in good condition (>80% of the surface is covered) based on site observations during the May 2024 site visit. The vegetation cover at both the SWRD and NWRD resulted in a curve number for the hydrologic soil group of 30 (USACE et.al., 2022).

Water balances for the Year 10 monitoring period are presented for the NWRD and SWRD plateaus (Figure 4.23 and Figure 4.26, respectively), and slopes (Figure 4.24 and Figure 4.25, respectively). The NWRD TBRG failed to accurately record rainfall events from December 2023 to February 2024; therefore, the SWRD station rainfall data was added into the NWRD water balance rainfall record for this period. The amended total rainfall for the monitoring period at the NWRD is 708 mm; adjusted from 276 mm.

Runoff estimates decreased significantly between the Year 9 and Year 10 monitoring periods due to the planned sensor shut offs and overall decrease in annual rainfall. A difference of 603 mm of rain was recorded between the two periods, resulting in decreases in runoff and NP and increases in AET. In Year 10, runoff was estimated to account for 37% and 25% of annual precipitation at the NWRD and SWRD plateau stations. Runoff at the slope stations was also variable, with 42% estimated for the NWRD site and 35% estimated for the SWRD site. Broadly, runoff followed the expected seasonal trends, showing increases during the wetter summer months and decreases during the drier periods, when infiltration can more readily occur.

Actual evapotranspiration is another major contributor to the water balance. This accounted for approximately 62% of annual precipitation at the NWRD plateau station and 67% at the SWRD plateau station. These estimates were the same for the NWRD and SWRD slope stations, respectively. These percentages increased significantly from the Year 9 monitoring period, by as much as 31%. Actual evapotranspiration also followed expected climatic trends, increasing rapidly during the summer months, and decreasing in the winter months.

Net percolation was minimal across all cover system trial areas, accounting for approximately 3% of annual precipitation at both NWRD sites and 2% at both SWRD sites. As a result, regular climatic trends were not noticeable for NP during the Year 10 monitoring period.

Comparison between trial stations and the natural station demonstrates the clear influence of barrier layers on water dynamics. The natural station had lower estimated AET (42%) and higher NP rates (26%) than all trial locations. The absence of a barrier layer at the natural station allows water to percolate more freely through the soil, and subsequently reduce the amount of water in the top of the profile available for AET. In contrast, the cover systems have barrier layers that restrict percolation and allow water to be more readily available for removal from the surface via AET.

Understanding the relationship between vegetation, cover system barrier layers, and the water balance is essential for effective mine closure planning and management. Monitoring these dynamics over time will provide valuable insights into the evolving hydrological behaviours of these sites and inform sustainable practices that allow for effective closure.

Table 4.1: Water balance parameters in the Year 10 monitoring period.

Station	Rainfall (mm)	Runoff (mm, % precip.)	AET (mm, % precip.	NP (mm, % precip.	Storage (mm, % precip.
NWRD Primary 2	708	261, 37%	440, 62%	21, 3%	-15, -2%
NWRD Primary 5	708	299, 42%	440, 62%	20, 3%	-50, -7%
Natural Station	708	270, 38%	294, 42%	187, 26%	-43, -6%
SWRD Primary 2	708	248, 35%	472, 67%	12, 2%	-24, -3%
SWRD Primary 5	708	180, 25%	447, 67%	13, 2%	38, 5%

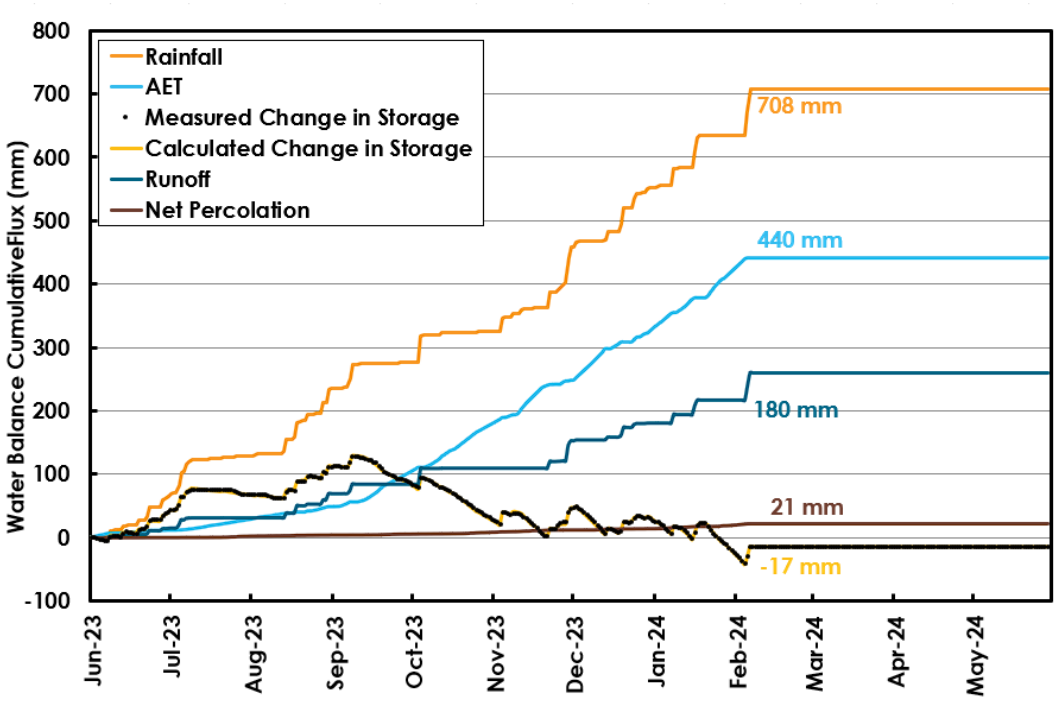


Figure 4.23: Water Balance for NWRD Primary 2 plateau station.

Year 10 monitoring period

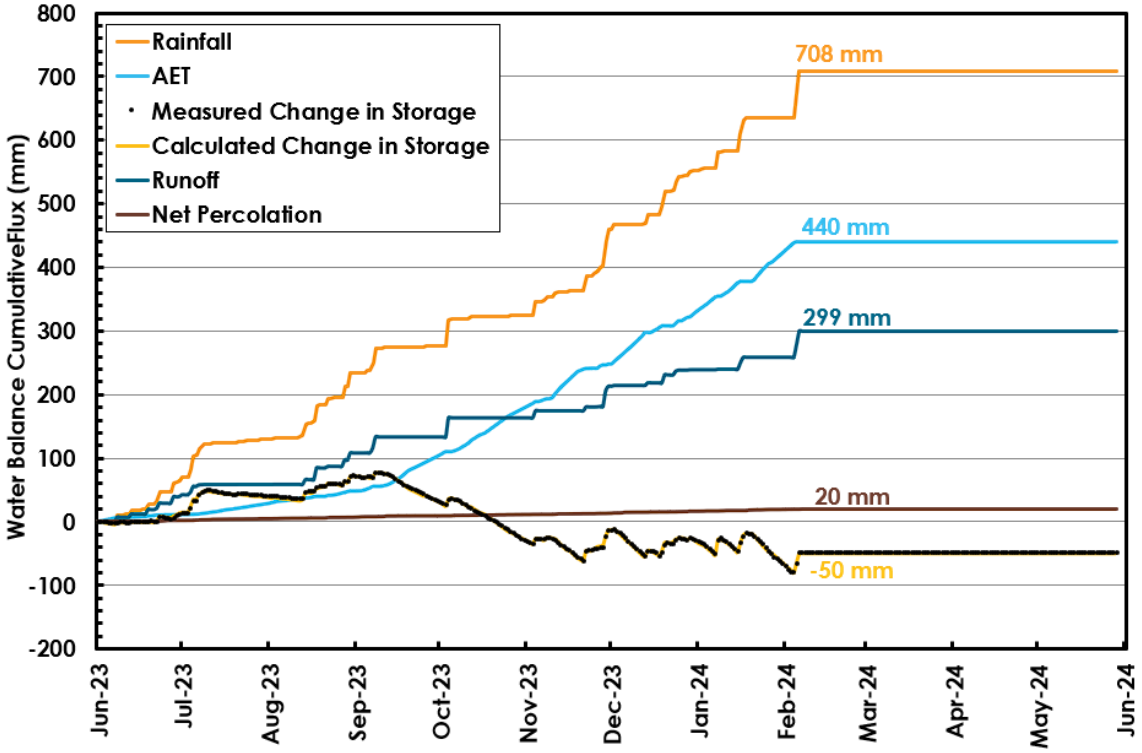


Figure 4.24: Water Balance for NWRD Primary 5 slope station.

Year 10 monitoring period

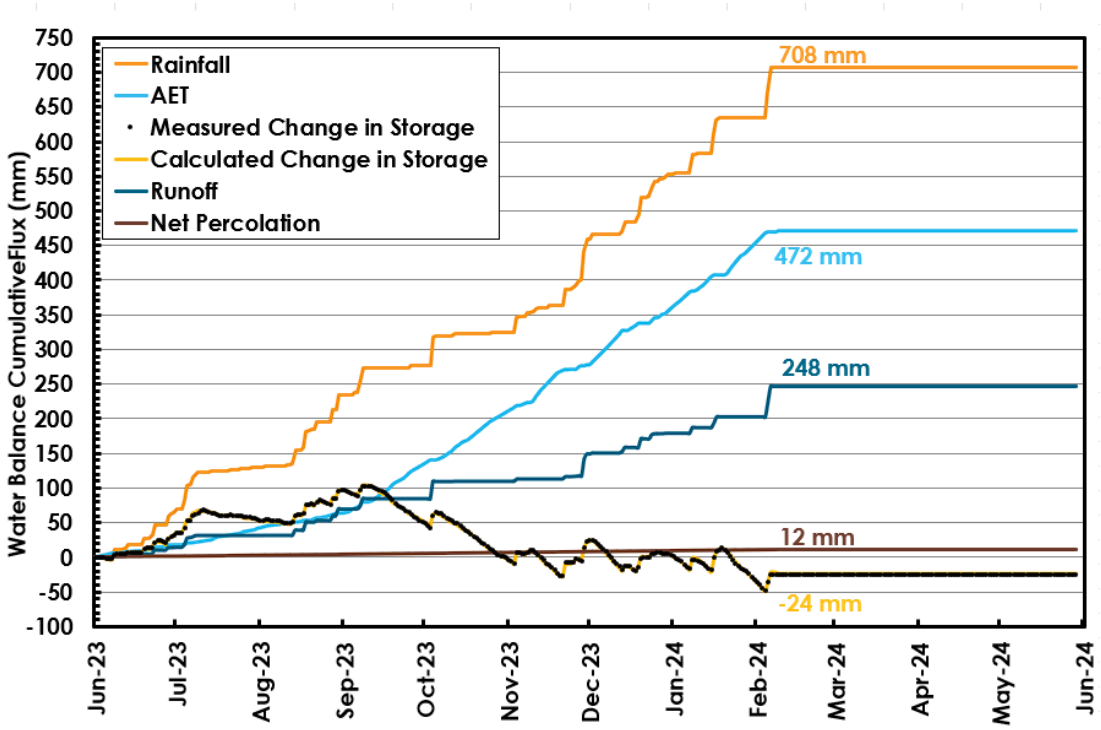


Figure 4.25: Water Balance for SWRD Primary 2 slope station.

Year 10 monitoring period.

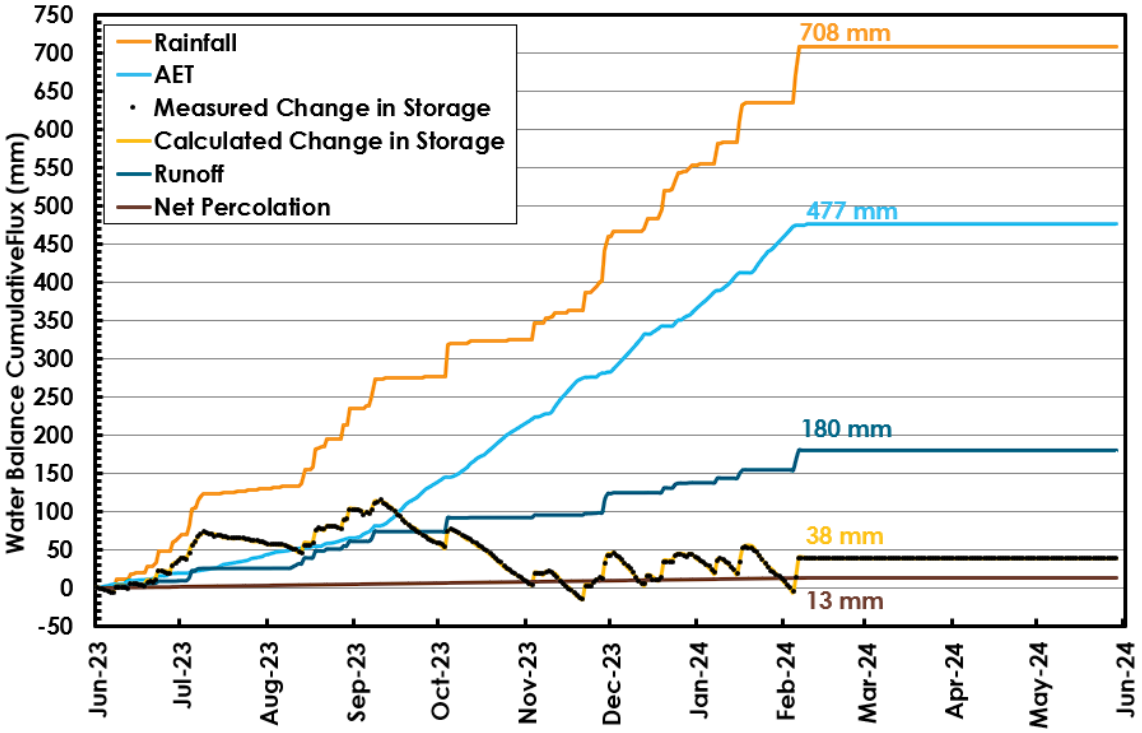


Figure 4.26: Water Balance for SWRD Primary 5 plateau station.

Year 10 monitoring period

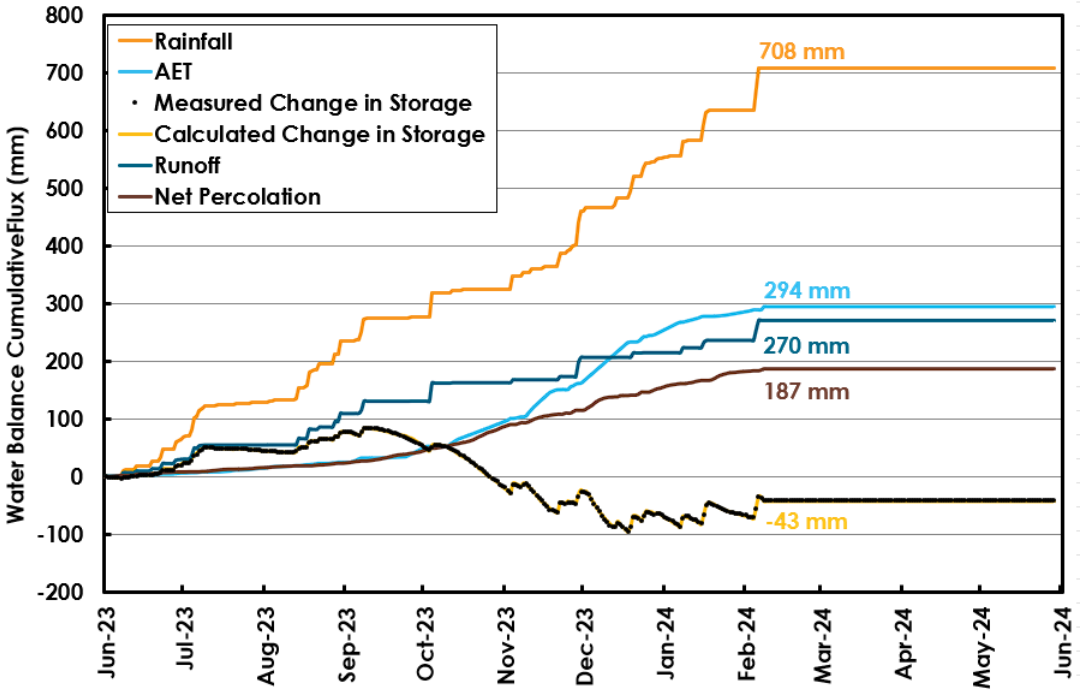


Figure 4.27: Water Balance for Natural station.

Year 10 monitoring period

5. SUMMARY

Cover systems are constantly evolving, responding to site-specific chemical, physical, and biological processes that occur and are unique to each system. Cover system trials provide invaluable information that can be used to assess performance and ensure that the site-specific criteria are met. Comprehensive quantitative analysis of these processes on cover systems will result in more complete and defensible closure plans that reduce uncertainty related to long-term performance.

During the Year 10 monitoring period, automated performance monitoring stations at NWRD and SWRD achieved varying data capture rates, with NWRD recording 65% and SWRD diminishing to 55%. Rainfall played a pivotal role in the water balance at both sites, with NWRD receiving an annual amount of 276 mm compared to SWRD's 708 mm. This discrepancy in precipitation is attributed to the NWRD TBRG failure to accurately record rainfall events from November 2023, and potential localised rainfall and interception.

Seasonal trends were evident in the soil temperature profiles. The collected data indicated that patterns in waste rock temperature across the Year 10 monitoring period resulted from control by ambient conditions. This suggests an absence of heat generation at depth due to oxidation of waste material and success in overall cover system performance.

The reduction in VWC within the CCL layer of the SWRD plateau trial area during the summer months indicated advancement of the drying front into the CCL layer, supported by elevated soil temperatures between December 2023 and February 2024. Recurrent wetting and drying cycles within the CCL layer may potentially pose integrity risks and increase permeability.

Across the WRD cover system trials, the majority of monitoring locations maintained their soil water storage within the PAWC zone, indicative of a conducive environment for vegetation growth. However, some stations, notably the NWRD Primary 5 and 6 locations and the natural station, consistently exhibited water storage values surpassing the FC. This elevated storage not only implies a heightened risk of NP, with excess water draining into the underlying waste rock, but also raises concerns about potential waterlogging conditions which could adversely affect vegetation growth.

A numerical model was used to estimate the water balance of the cover system, considering factors including rainfall, runoff, evapotranspiration, NP, and changes in water storage. The recorded rainfall during the Year 10 monitoring period was significantly lower compared to the same period in Year 9, reflecting a decrease in annual precipitation. This resulted in AET becoming the primary factor for water movement, with reductions in runoff and NP compared to the previous monitoring period. These parameters followed seasonal trends, with AET increasing rapidly in the summer months and runoff corresponding strongly with rainfall events.

Differences in AET and NP were negligible between slope and plateau locations, while runoff was variable across all trial sites. A comparison with the natural station highlights the impact of barrier layers on water dynamics, with the natural station exhibiting lower evapotranspiration

and higher NP due to the lack of barrier layer. These findings underscore the complex and dynamic relationship between rainfall, AET, and the broader water balance, providing valuable insights into essential hydrological parameters.

6. RECOMMENDATIONS

It is recommended that collection and interpretation of field trial data continue as per the best practice guidelines outlined in the International Network for Acid Prevention (INAP) Global Cover System Guidance Document (INAP, 2017). Continued monitoring will allow for assessment of the cover systems response to climate variations within a broader context, capture climate cycles, and inform upon cover material evolution in the years after placement. Monitoring the cover systems over a longer timeframe will lead to greater confidence in performance assessments, helping to support mine closure decisions and ongoing planning.

Following analysis of Year 10 monitoring period data, the following recommendations are provided to maximise the potential benefit of the cover system field trials, including the quality and applicability of data generated:

- Completion of monthly data collection and monitoring inspections by Cadia personnel of the monitoring stations. Inspections should monitor moisture and power supply of the data acquisition systems, instrumentation and sensor lead integrity, and address any issues such as sediment buildup in the runoff monitoring system.
- Replacement of the batteries within the EC battery box.
- Inspection of vegetation at the SWRD and trimming as necessary to ensure full exposure of the solar panels.
- Replacement of the net radiometers at the NWRD, or removal and shipment for CSA for repair and recalibration.
- Replacement of the TBFG at the NWRD.
- Assessment of the Hobo loggers at the NWRD.
- EC station be moved to a more representative area.
- Qualified Okane personnel should visit the site for a minimum of two days at least annually for the purposes of inspecting the cover system trials and instrumentation. The Year 10 site visit occurred in August 2023, and another site visit was completed in May 2024. The Year 10 site visit included inspection, servicing and field calibration of relevant sensors and equipment in addition to in situ permeability testing.
- Erosion of the NWRD and SWRD cover system surface was noted during the Year 10 and previous site visits, most notably along the slopes. Erosion should be monitored prior to, during and following prolonged or intense rainfall events to ensure the cover system is not compromised. Furthermore, it is advised that any activities that could potentially compromise the condition of the cover system be minimised.

- To increase understanding of vegetation effects on performance and improve establishment success, annual vegetation surveys should be implemented. Surveys and monitoring would quantify actual plant cover, density, species, root depth/distribution, including aspects of plant ecophysiology. Vegetation parameters could then be used in conjunction with cover system monitoring data to accurately assess water movement within the cover systems.

- Provision of detailed site mapping within next Performance Monitoring Summary that will include key features including contextual mapping features (e.g. creeks and road labels) and mine site features (e.g. TSF and facility labels).

- Inclusion of additional rainfall stations within the data review.

- Monthly QA/QC for the next monitoring period.

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APPENDIX 8 WATER MANAGEMENT SUPPORTING INFORMATION

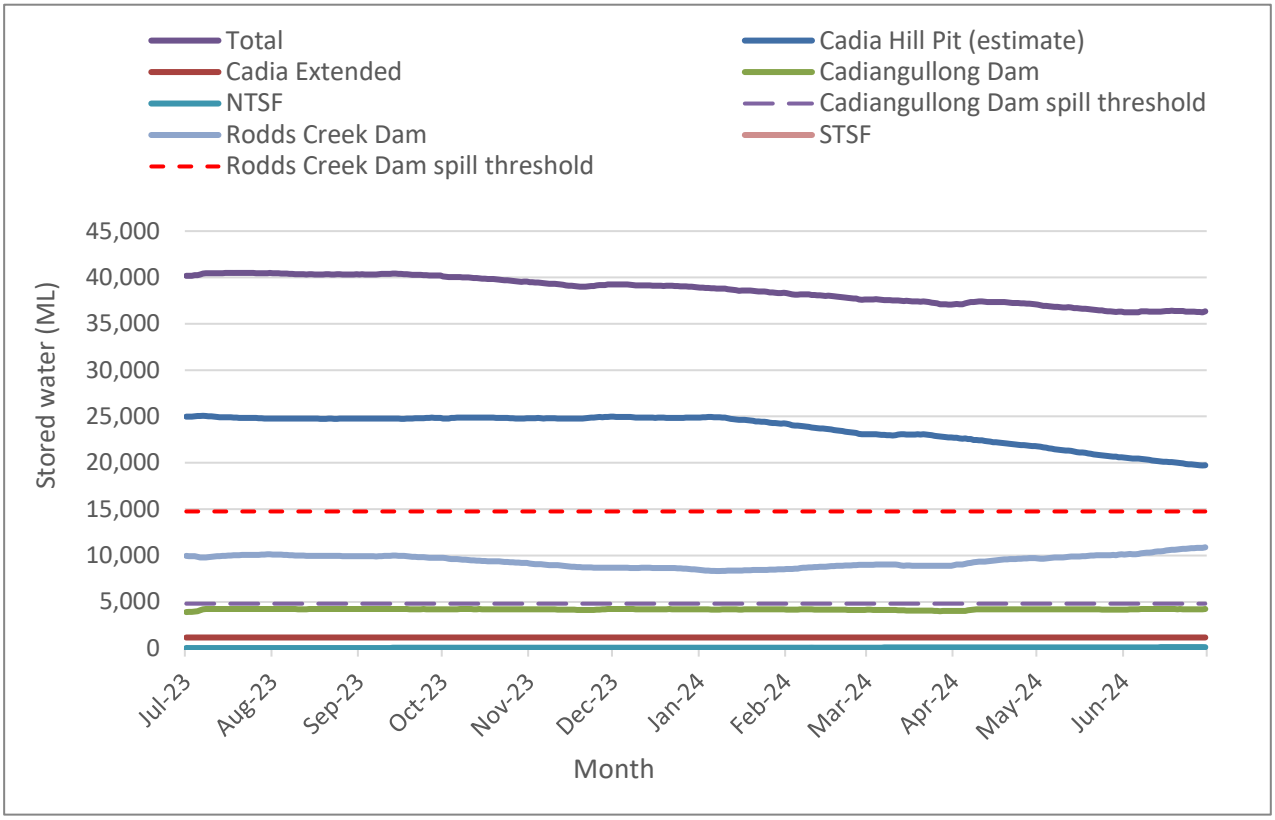


Figure A8.1 – Cadia water storage inventory FY24

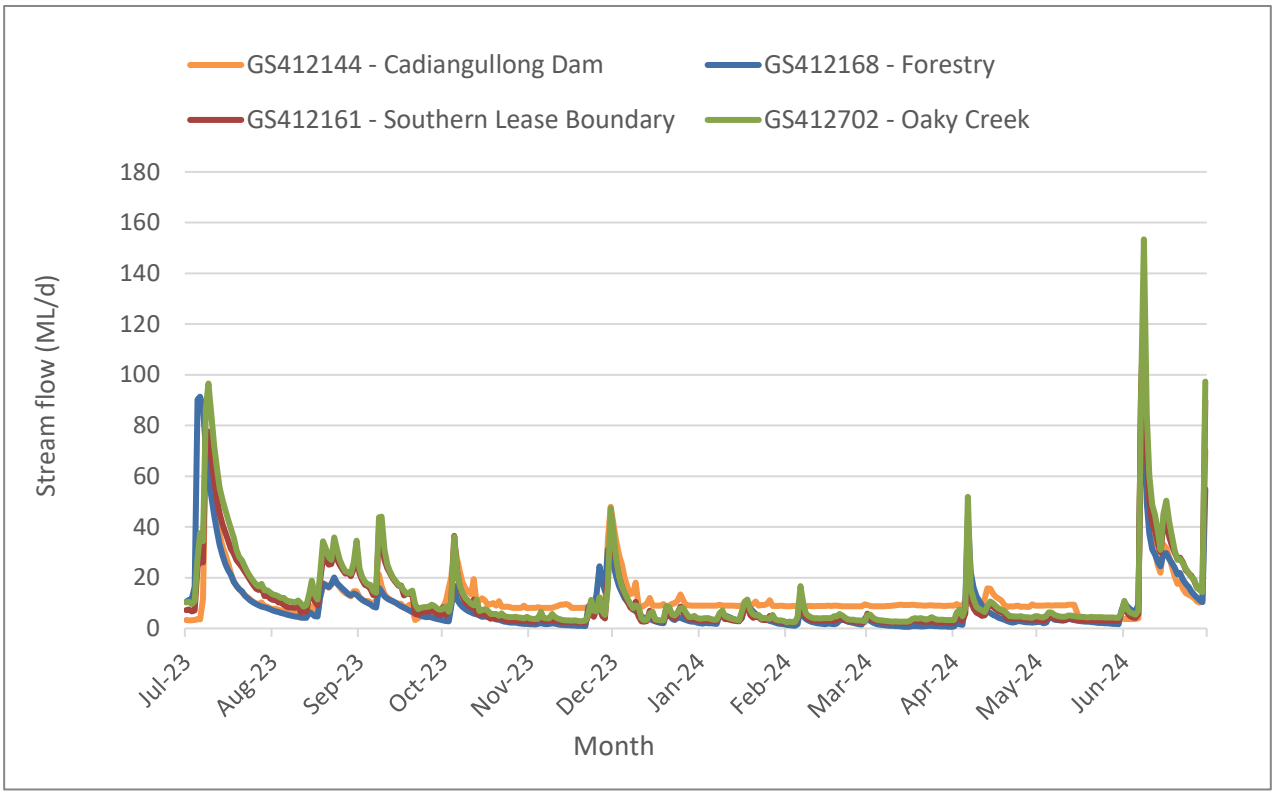


Figure A8.2 – Cadiangullong Creek gauging station hydrographs FY24

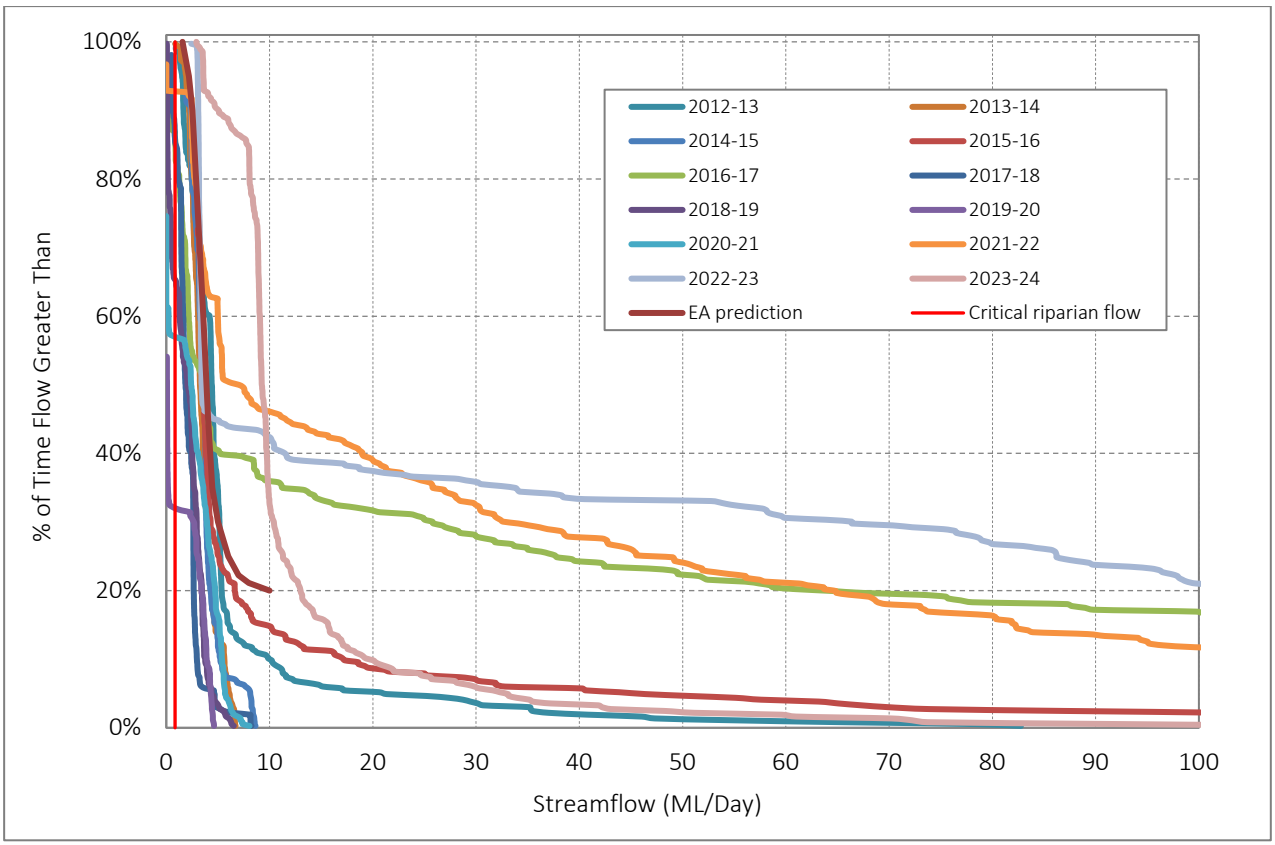


Figure A8.3 – Cadiangullong Creek flow duration curve (Cadiangullong Dam GS412144)

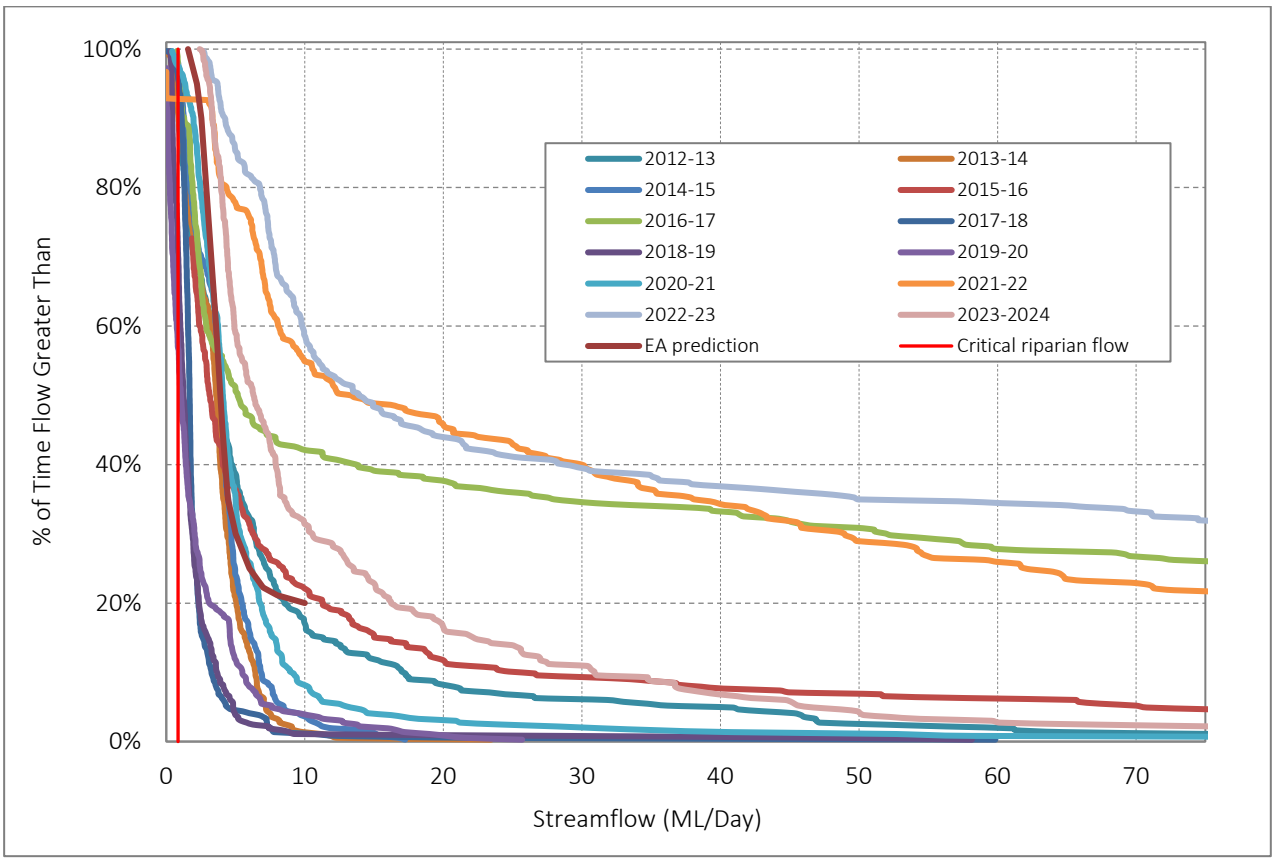


Figure A8.4 – Cadiangullong Creek flow duration curve (Oaky Creek GS412702)

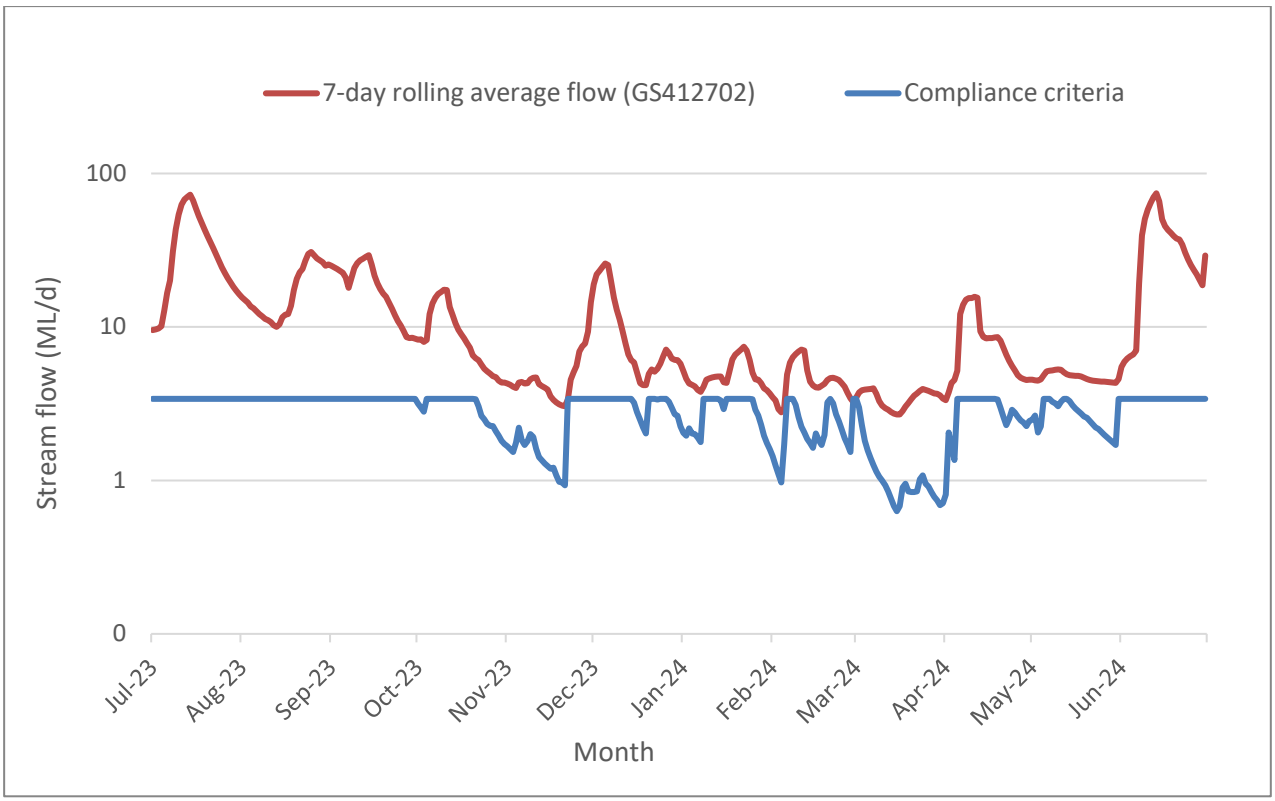


Figure A8.5 – Cadiangullong Creek flows at Oaky Creek GS412702 vs release criteria

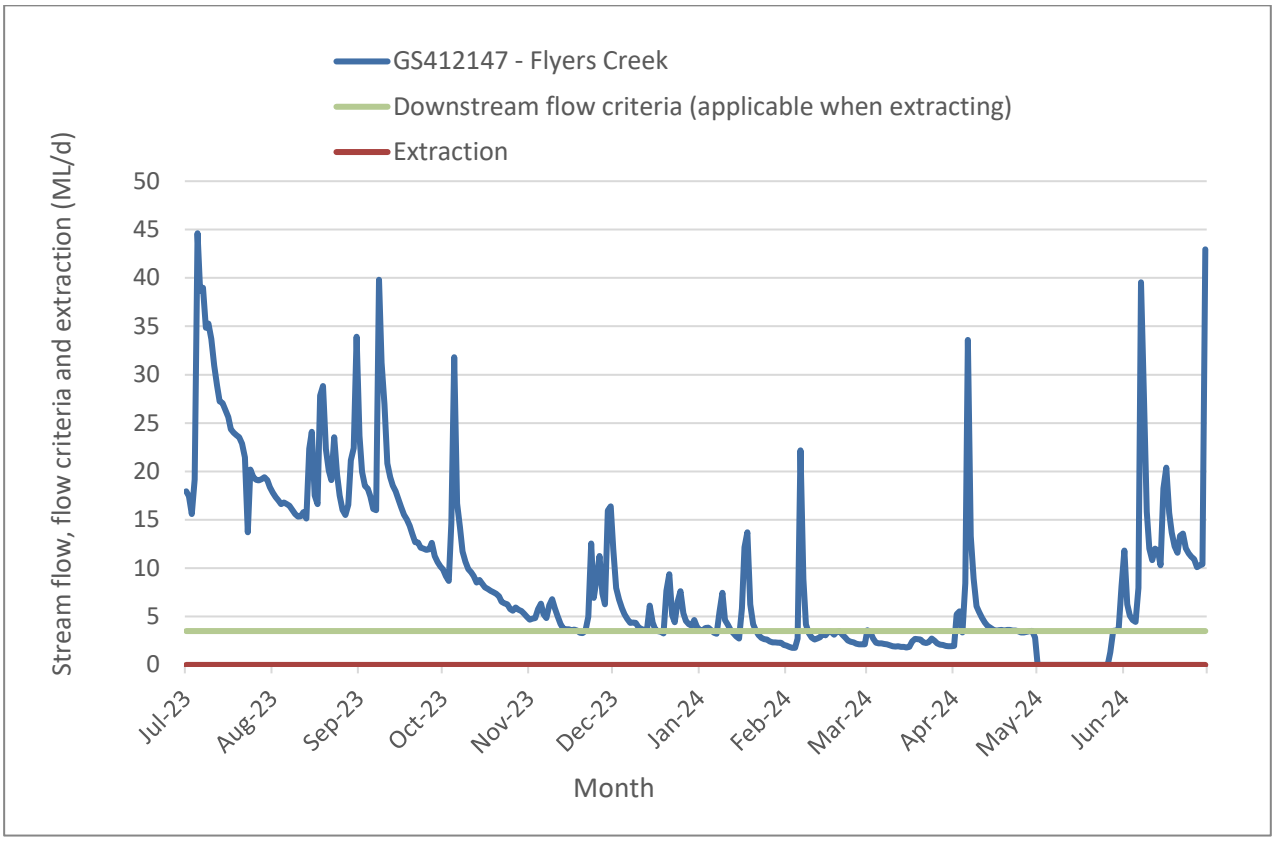


Figure A8.6 – Flyers Creek gauging station hydrograph (GS412147) flow criteria and extraction (FY24) - no extraction occurred during FY24.

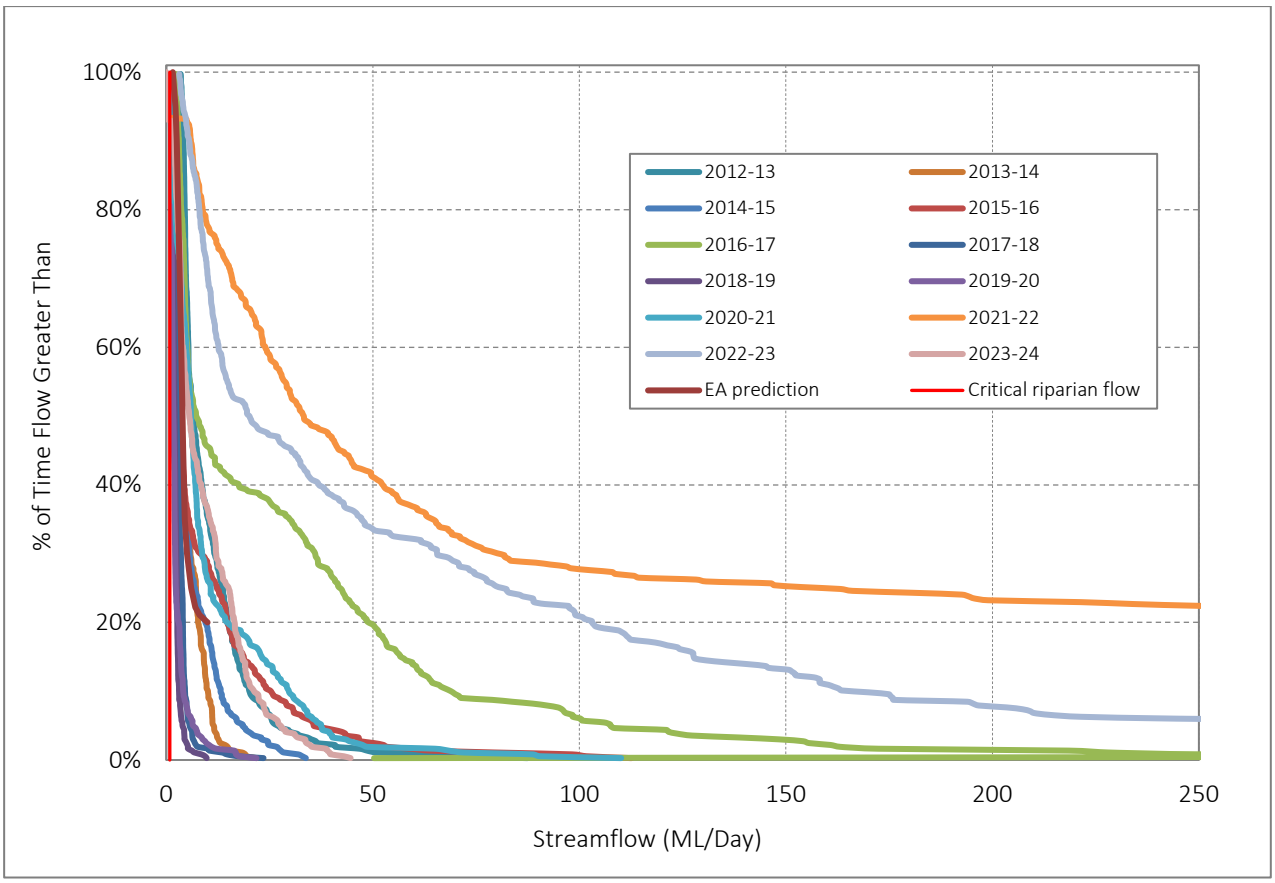


Figure A8.7 – Flyers Creek flow duration curve (GS412147)

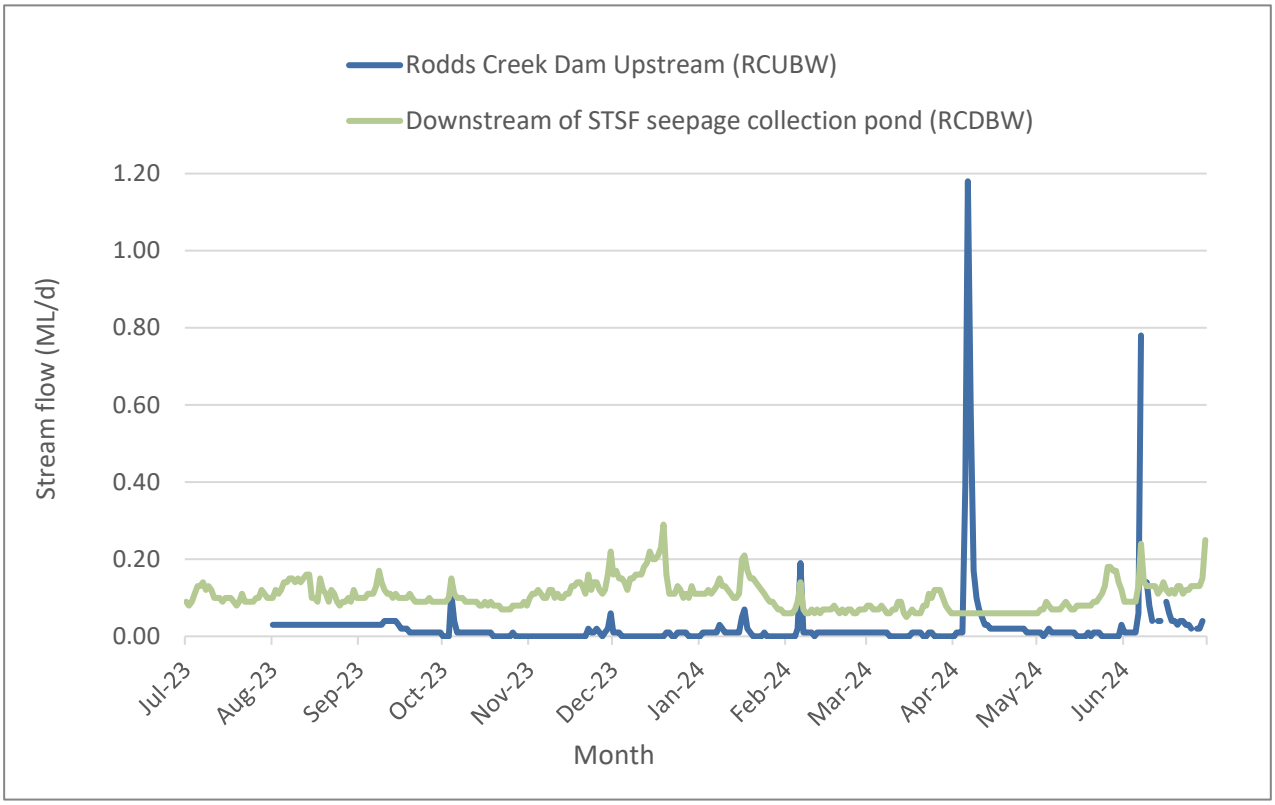


Figure A8.8 – Rodds Creek hydrograph upstream site (RCUBW) and downstream site (RCDBW)

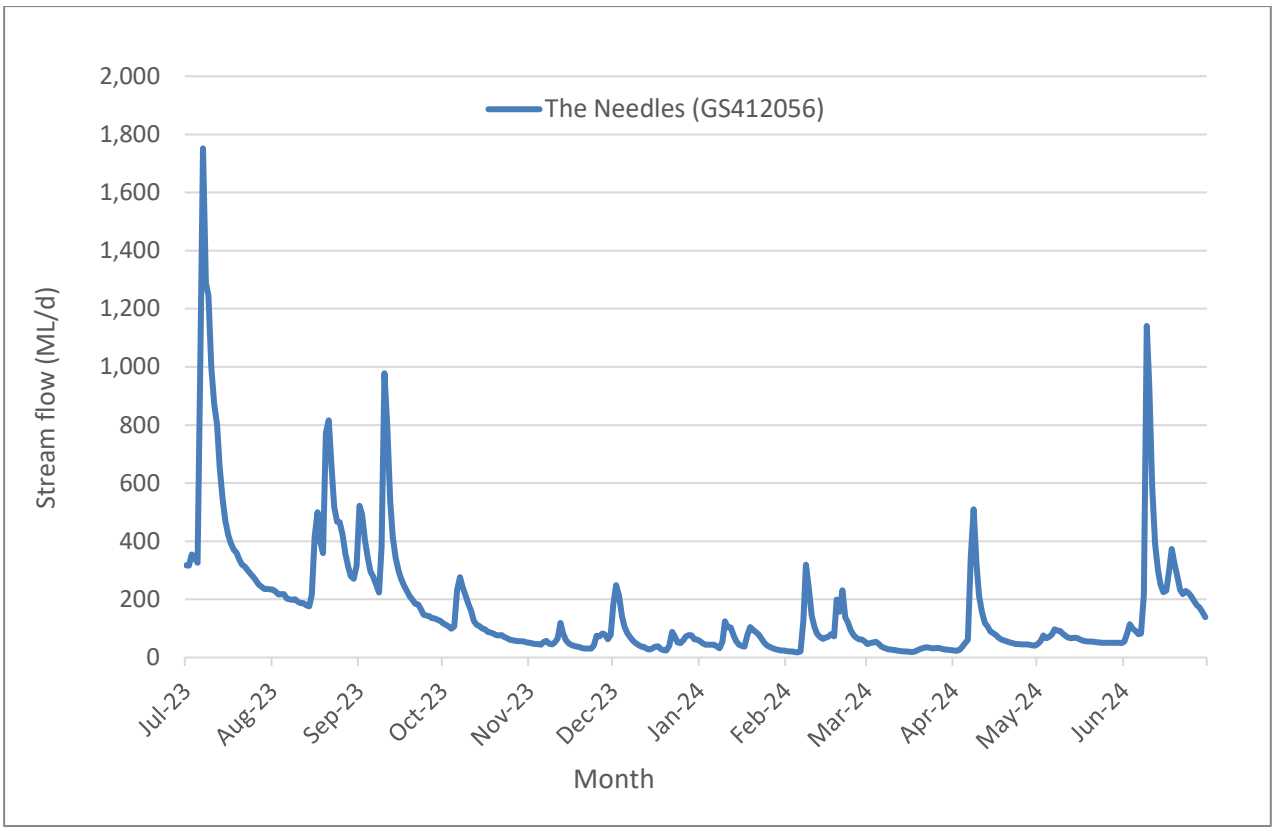


Figure A8.9 – Belubula River gauging station hydrograph (The Needles GS415056)

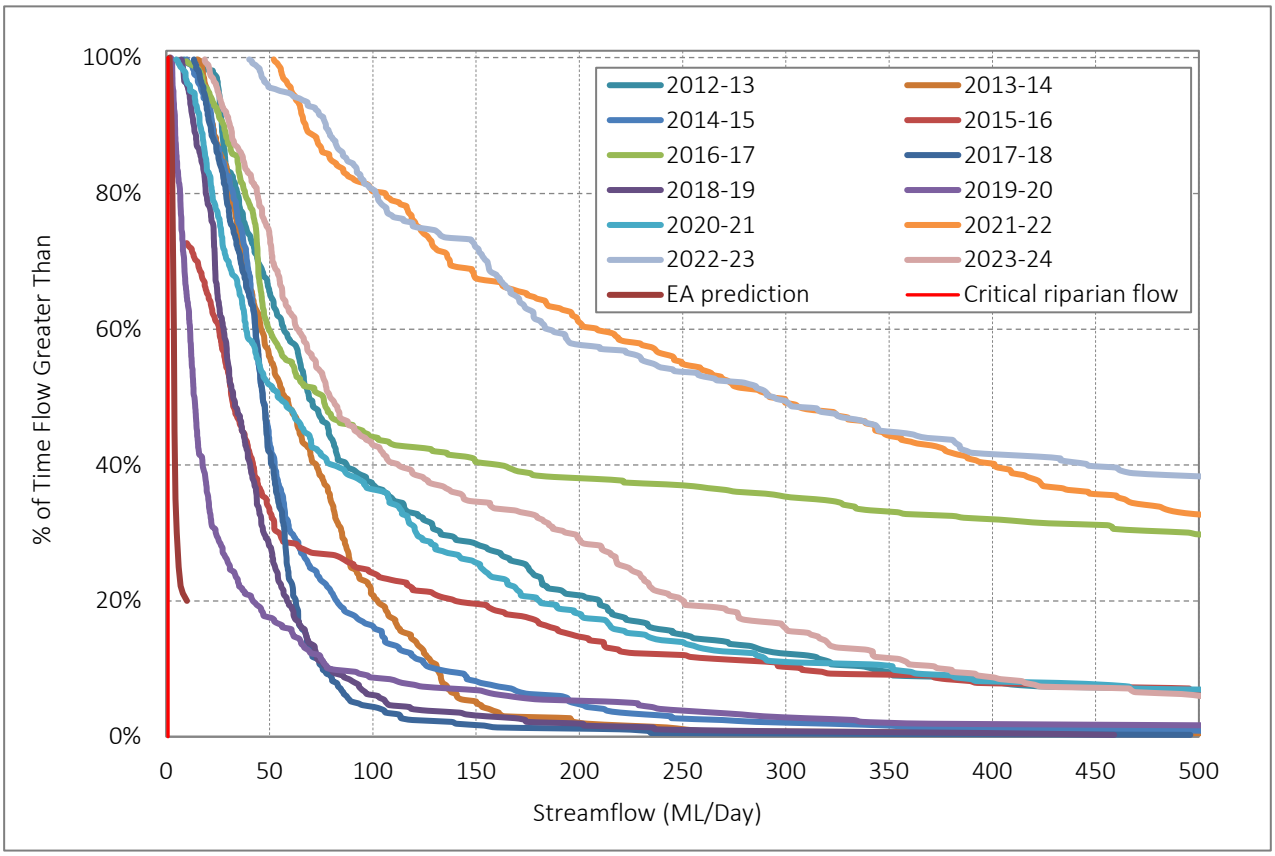


Figure A8.10 – Belubula River flow duration curve (The Needles GS415056)

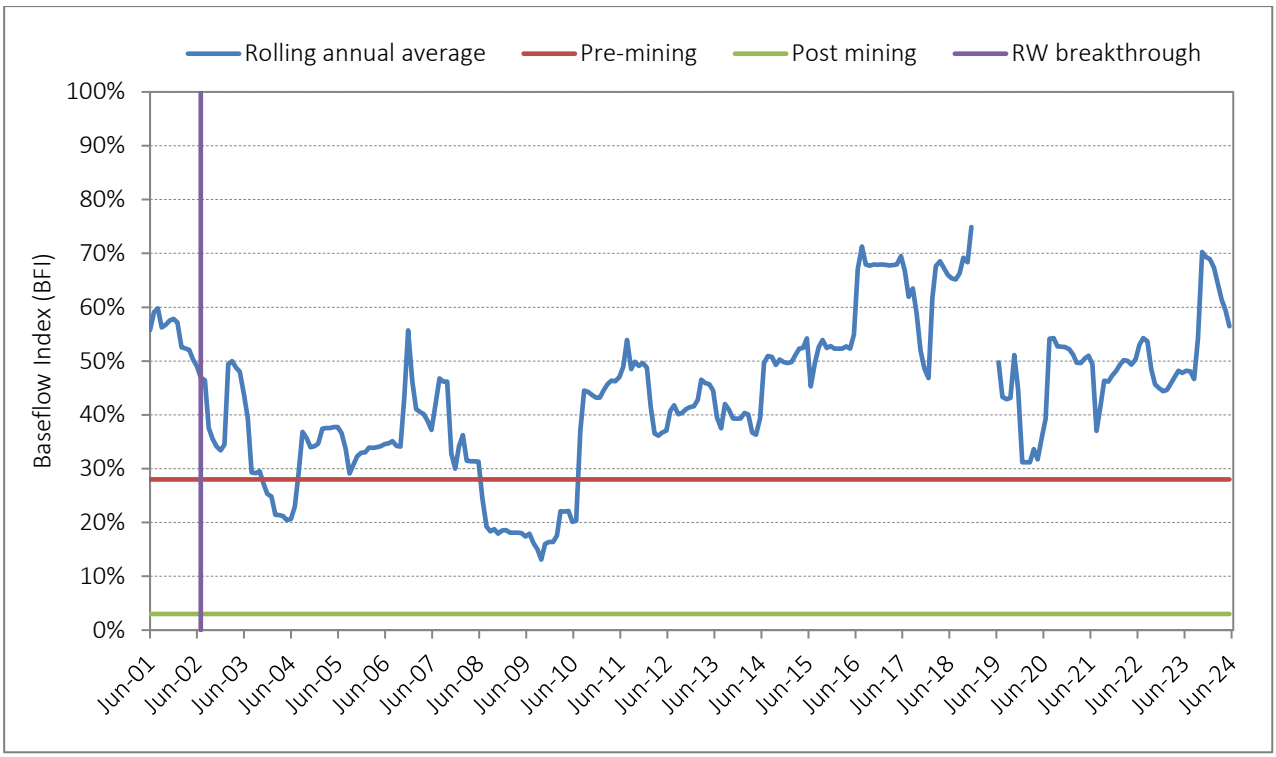


Figure A8.11 – Swallow Creek (SCBW2) BFI

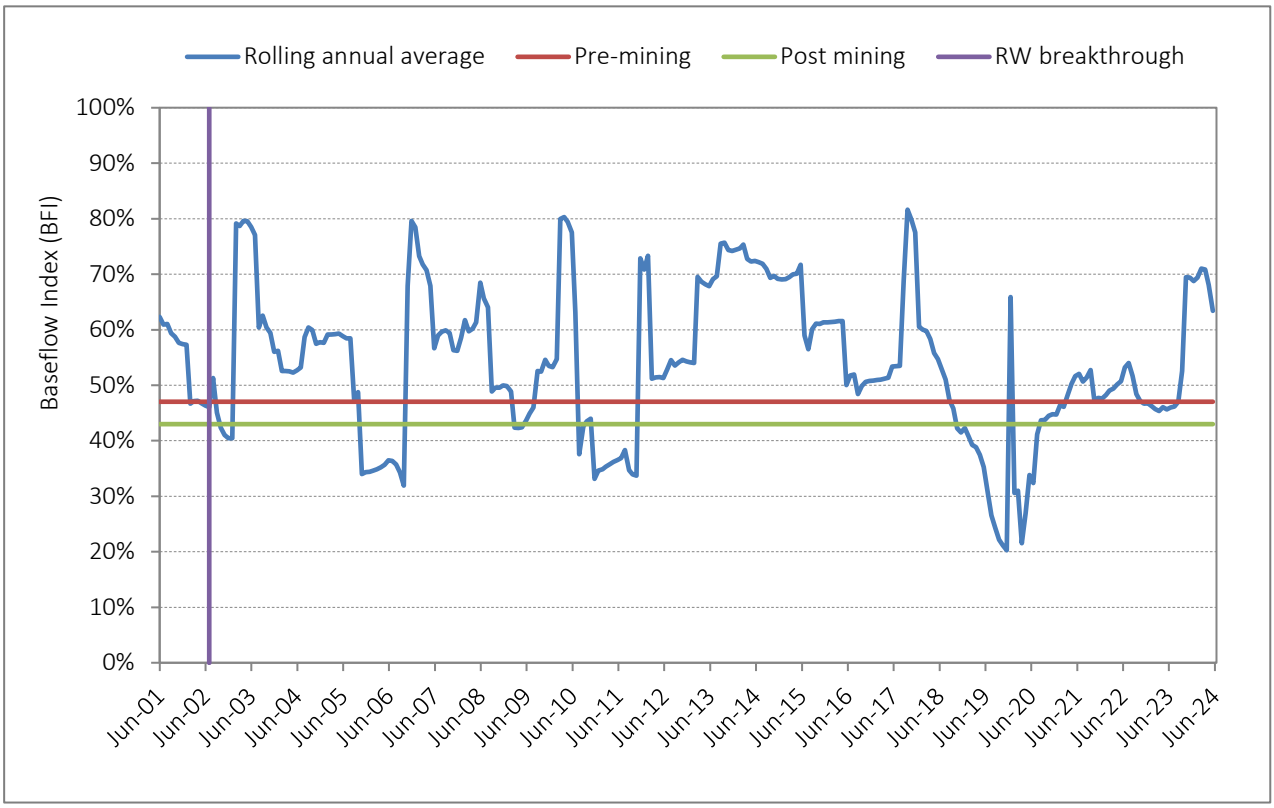


Figure A8.12 – Swallow Creek Downstream (GS412167) BFI

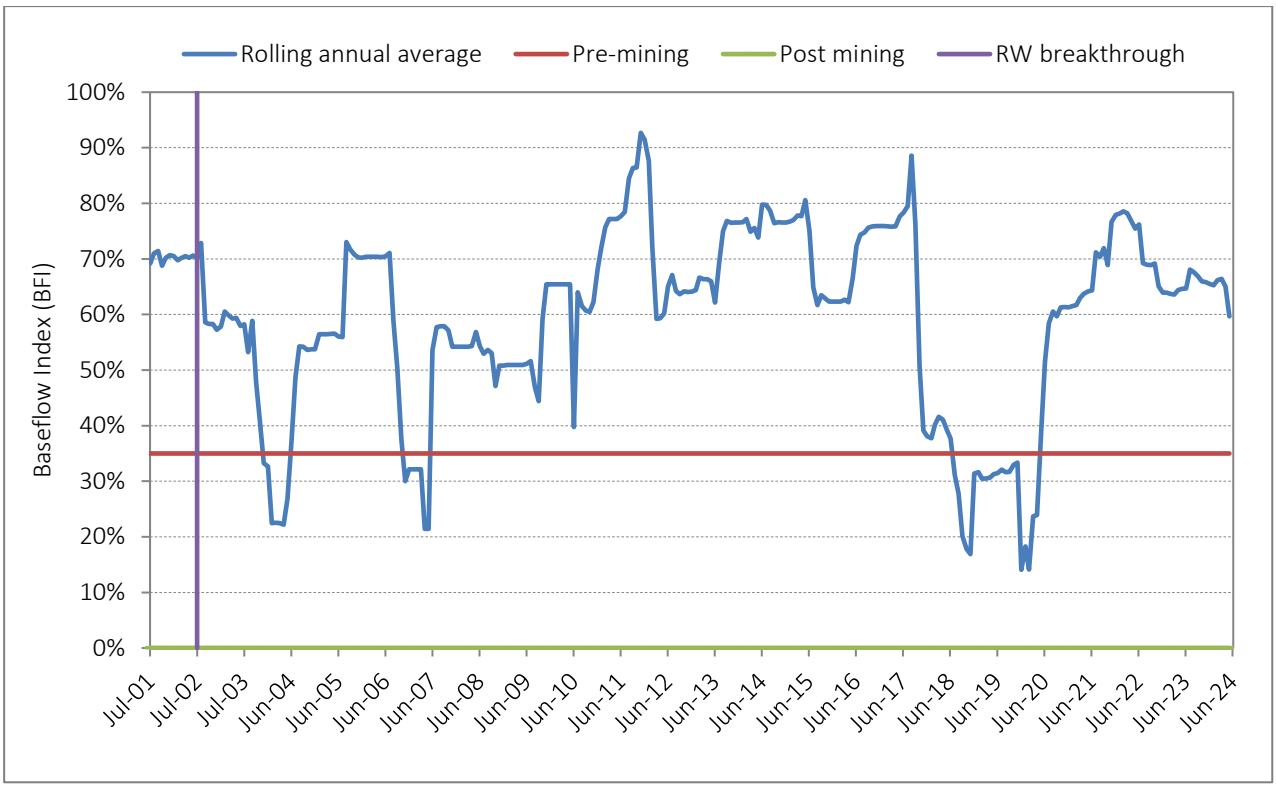


Figure A8.13 – Diggers Creek (DCBW1) BFI

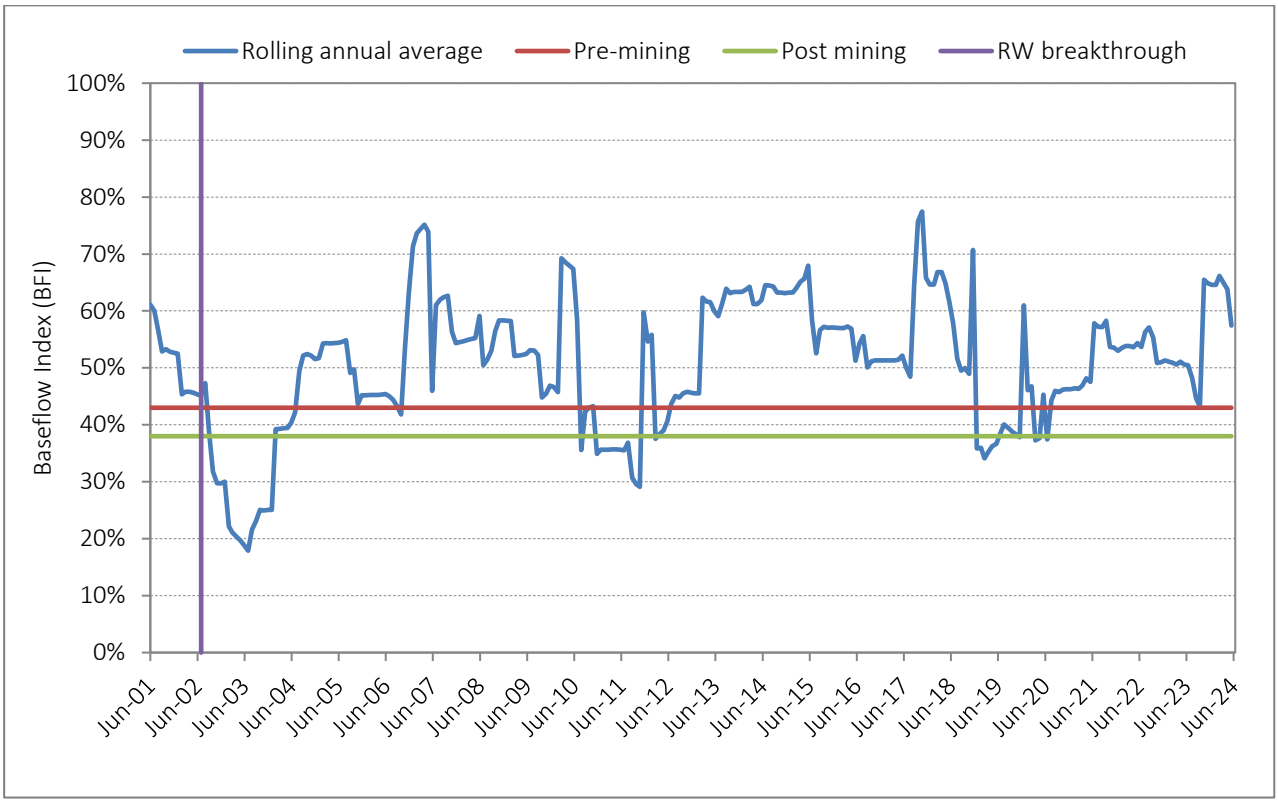


Figure A8.14 – Diggers Creek (GS412166) BFI

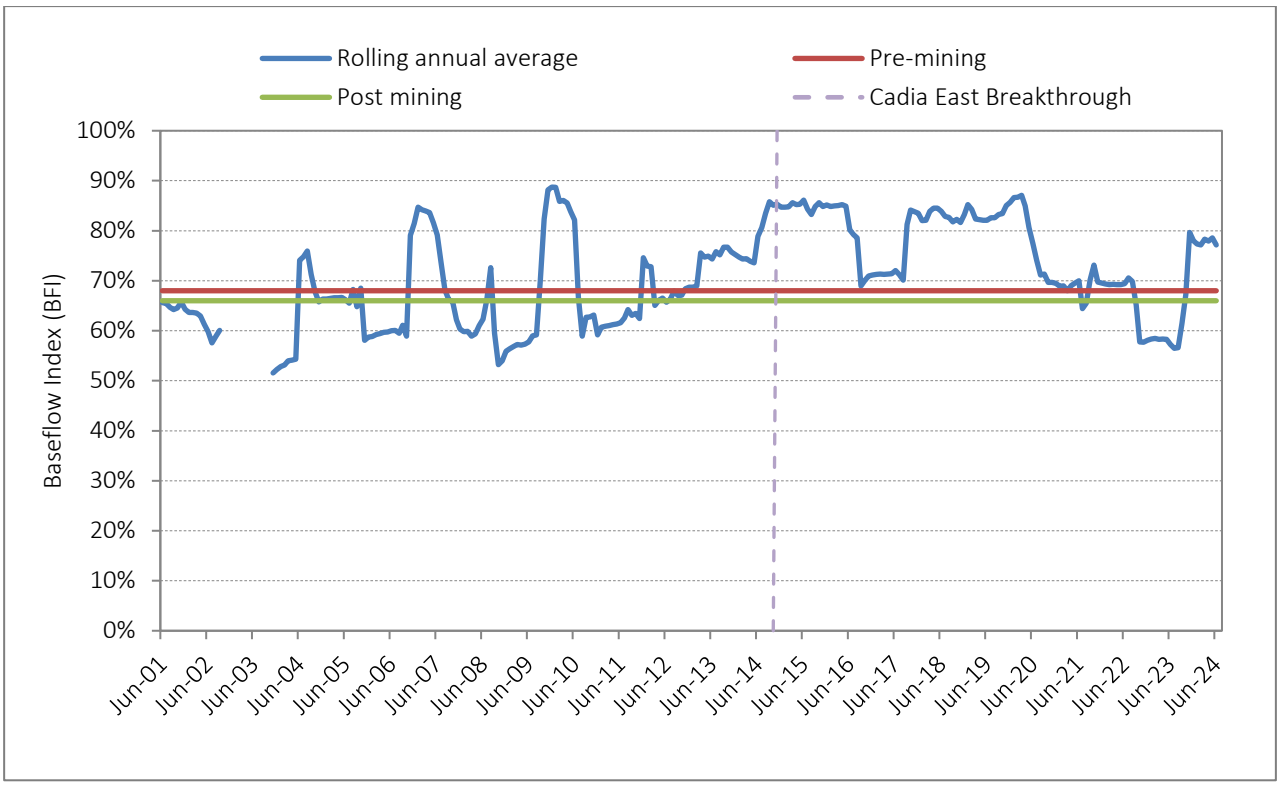


Figure A8.15 – Flyers Creek (GS412147) BFI



Figure A8.16 - SPR03 daily flow data (reporting period)

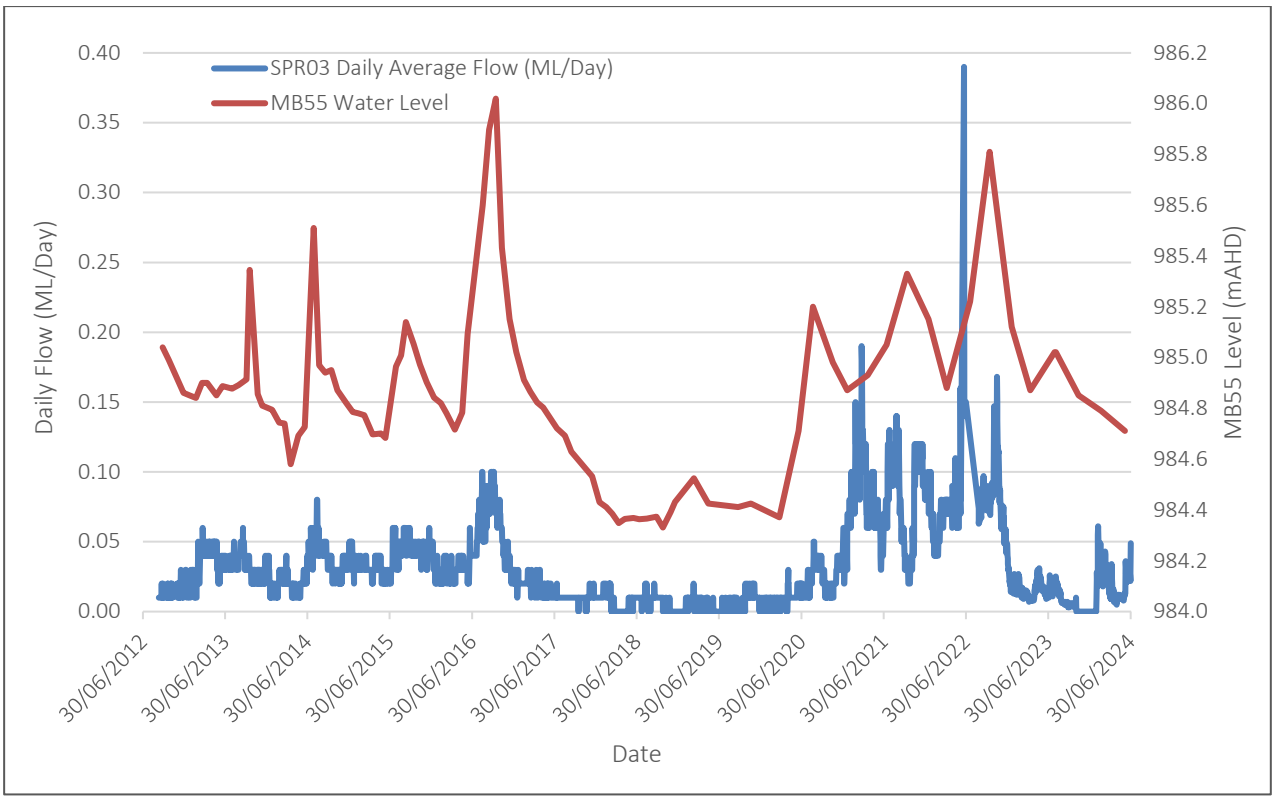


Figure A8.17 – SPR03 daily flow data and MB55 water level (July 2012 to July 2024)

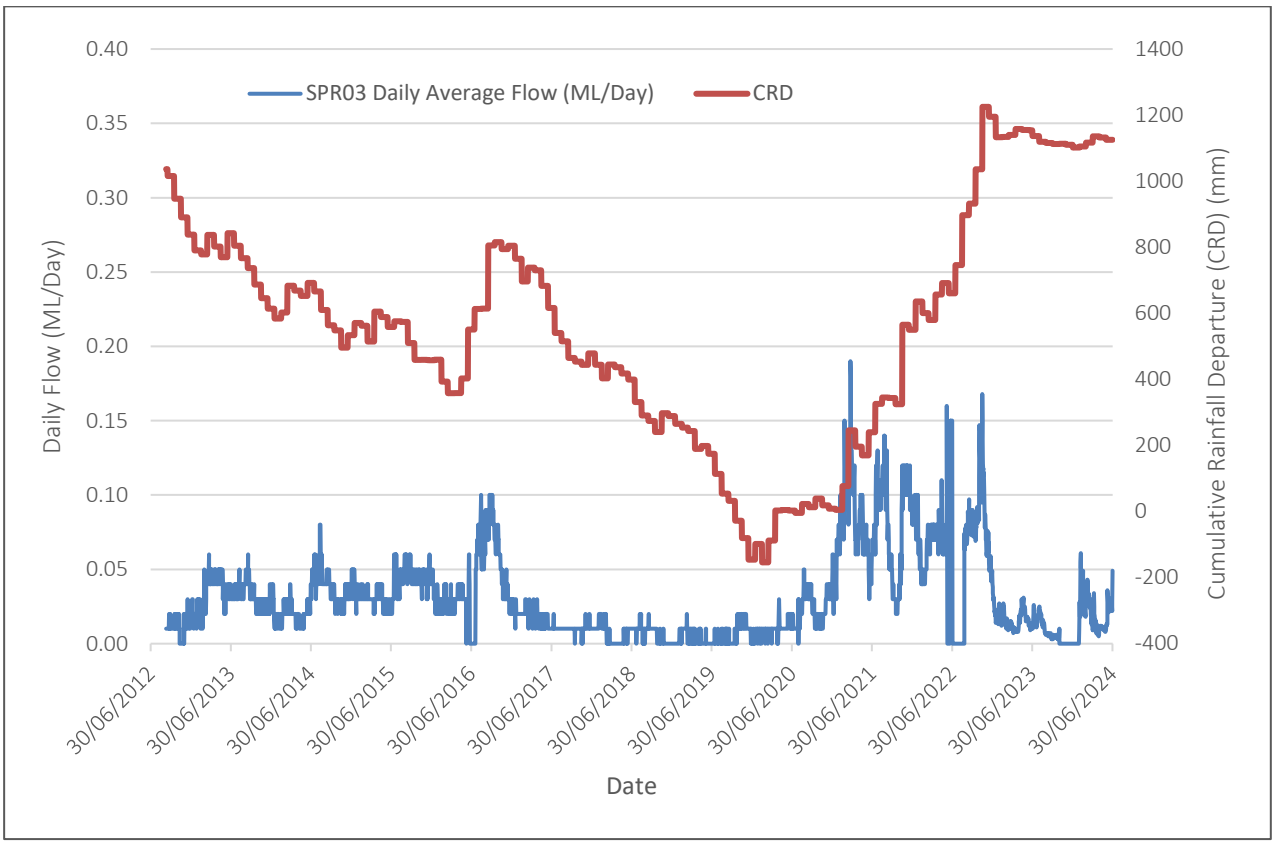


Figure A8.18 – SPR03 daily flow data and cumulative rainfall departure (July 2012 to July 2024)

Table A8.1 – Status of sediment dams as at June 2024

Catchment	Containment requirement (ML)[1]	Current storage capacity (ML)	Comments
Mine affected[2]			
Site runoff pond (SROP)	110.7	57.4	Capacity upgrade to be addressed in next reporting period. Diesel pumps installed for dewatering management and mitigation.
Northern leachate (NLD)	158.4	58.7	Capacity upgrade to be addressed in next reporting period. Permanent pump installed with 10 ML/day capacity.
Southern leachate (SLD)	117.9	149.2	Permanent pump installed with 10 ML/day capacity.
ST14	20.9	22.8	Permanent pump installed with 4 ML/day capacity. Pond capacity with pumping 29.5 ML.
R2	7.3	1.5	Capacity upgrade to be addressed in next reporting period. Pump installed with 13.5 ML/day capacity.
Pit and concentrator area[3]			
CS	8.1	3.9	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
AR1	1.3	2.0	-
AR4-5 combined	2.8	15.2	-
Ridgeway area[3]			
CD GL	0.10	0.6	-
CD HT	0.34	0.36	-
SB4A	4.1	2.0	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
SB10	0.5	1.3	-
SB12	0.7	0.8	-
SB14	2.3	0.2	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
SB15	0.4	0.5	-
CD15	0.46	0.7	-
Ridgeway South Portal area[3]			
CP1A	0.9	0.3	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
CP2	2.4	1.1	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.

Catchment	Containment requirement (ML)[1]	Current storage capacity (ML)	Comments
CP3	1.6	0.9	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
CP4	0.24	0.7	-
Cadiangullong Dam area[3]			
CD11	0.17	0.4	-
CD13	1.0	0.4	Capacity upgrade to be addressed in next reporting period. Serviced by diesel pump.
CD14	0.05	0.2	-
TSF/containment bund area[2]			
H18-H19 combined	20	50	-
T6	7	22.1	-
T7-T8 combined[4]	15.6	14.8	-

Note:
1: Containment requirements will be confirmed after the catchment surveys to be undertaken in late 2024.
2: Sediment basins within this catchment required to hold at least a 1:100 year, 72-hour storm event.
3: Sediment basins in this catchment required to capture at least the 95th percentile, 5-day rainfall event of 44 mm.
4: Temporary arrangement while containment bund is in place (not in EPL 5590).
General: The Molybdenum plant area catchment drains to NTSF and Rodds Creek Dam. Clean water runoff from the Rodds Creek Dam catchment is diverted to Rodds Creek Dam. These areas are therefore not included above.

APPENDIX 9 INDEPENDENT ENVIRONMENT AUDIT NON-COMPLIANCES AND CURRENT STATUS

Table A9.1 Non-compliances identified in the independent environment audit (adapted from Table 7 of the IEA report) and current status

Ref	Non-compliance	Status as at 30 June 2024
PA 06_0295		
Schedule 2, Condition 2(b)	Non-compliances (NC) with PA 06_0295 conditions were identified during this IEA.	No action required
Schedule 2, Condition 9	Cadia did not acquire a construction certificate for part of the Molybdenum Recovery Plant.	No action required. Non-compliances are addressed within their respective conditions.
Schedule 3, Condition 2	Exceedances of PA noise criteria were recorded at various monitoring locations during the audit period, including at: • Rosebank, Warrengong and Northwest due to dust-suppression aircraft in November/December 2021 and February 2023; • Warrengong, due to VR14-1 incident response mobile plant; and • Newbridge Rd, Hollwood and Athol in various months due to CDF train movements. Monitoring data indicate a significant percentage of CDF train movements result in exceedances of PA noise criteria at these three receivers.	No further action required because these non-compliances have previously been reported.
Schedule 3, Condition 2A	The Noise Impact Validation Report (NIVR) for construction of the NTSF and STSF was not lodged with DPE within three months of the approval of Modification 14 (i.e. by April 2022).	Cadia remains in the process of consulting with the Department to gain approval of the NIVR.
Schedule 3, Condition 5	Exceedances of project traffic noise impact criteria were recorded during the audit period, as noted in Cadia consultant monitoring reports and Annual Reviews (AR's).	Cadia had previously reported these non-compliances, therefore no further action is required.
Schedule 3, Condition 8(c)	The 2021 and 2022 ARs do not describe noise investigations or the effectiveness of noise improvements.	The 2024 Annual Review (this document) reports on noise investigations and the implementation of any investigation findings, as was documented in Section 10.5 of the 2023 Annual Review. Future Annual Reviews (2025 and beyond) will follow this same approach to reporting.
Schedule 3, Condition 19A	The Air Quality Impact Validation Report (AQIVR) was not submitted within three months of the approval of Modification 14 (i.e. by April 2022).	Cadia remains in the process of consulting with the Department to gain approval of the AQIVR.

Ref	Non-compliance	Status as at 30 June 2024
Schedule 3, Condition 23	During the audit period there have been the three reported incidents of non-compliance where water discharge from the site occurred, including: • Non-compliant water discharge to Cadiangullong Creek on 19-21 January 2021 due to a burst pipe, as reported in 2021 AR; • Blayney Return Water Leak in which approximately 30L of return water spilled from return water air valve into a contained drain alongside Cadia road on 20 September 2022 (reported in the 2023 AR). • October - November 2022 incident breached the Environmental Protection Licence (EPL), due to heavy rainfall a significant volume of surface water runoff from the overland flows adjacent to the CDF stormwater management system. Subsequently, the CDF stormwater collection pond overflowed to an adjacent unnamed watercourse.	Non-compliances were reported to the appropriate regulator at the time of incident which included actions implemented. These events have been reported in further detail in the respective Annual Reviews. No further action required.
Schedule 3, Condition 27(a), 29	One instance of noncompliance with the minimum flow from Cadiangullong Dam for approximately four days between 4-8 June 2021.	This non-compliance has been previously reported. Improvements to monitoring with increased use of automation have been implemented. No further action required.
Schedule 3, Condition 27(a)	Monthly streamflow reporting was not available on Cadia's website for several months during the audit period.	Monthly Streamflow Reports for the identified periods have been uploaded to the website. No further action required.
Schedule 3, Condition 32	Evidence to confirm the management of some site sediment dams in accordance with Landcom (2004) and the WMP was not available at the time of audit.	A detailed review of sediment and seepage basins (including in-field surveys) has been completed and an action plan has been prepared and submitted to DPHI.
Schedule 3, Condition 35(d)	The WMP does not include an explicit definition of the protocol for providing warning of water supply issues and water supply response measures.	A protocol for providing warning and water supply measures for landowners of privately-owned land that are predicted to exceed the surface or groundwater assessment criteria has been developed and has been included in the next revision of the WMP which has been submitted to the Secretary of the DPE (see Section 21.2).
Schedule 3, Condition 35A	Between January and March 2023, there was a failure to collect routine groundwater and surface water samples in accordance with the Groundwater Monitoring Program.	This non-compliance has previously been reported. A review of internal procedures has been completed and an automated monitoring schedule implemented. No further action required.

Ref	Non-compliance	Status as at 30 June 2024
Schedule 3, Condition 36(f) Schedule 3, Condition 36(g) Schedule 3, Condition 36(h)	The 2020 Rehabilitation Strategy does not include a conceptual final landform and rehabilitation plan.	The revised Rehabilitation Strategy (2024) contains the Resources Regulator approved conceptual final landform and rehabilitation plan as required by the Mining Leases. Following stakeholder consultation, the revised Rehabilitation Strategy was submitted to DPHI for approval on 08/03/2024. DPHI has responded on 20 June 2024 and Cadia is preparing updated information to address this information request.
	The 2020 Rehabilitation Strategy does not include a life of mine rehabilitation and mining schedule which outlines key progressive rehabilitation milestones from the commencement of operations through to decommissioning and mine closure.	The revised Rehabilitation Strategy contains a conceptual schedule which outlines key progressive rehabilitation milestones from the commencement of operations through to decommissioning and mine closure. Following stakeholder consultation, the revised Rehabilitation Strategy was submitted to DPHI for approval on 08/03/2024. DPHI has responded on 20 June 2024 and Cadia is preparing updated information to address this information request.
	The 2020 Rehabilitation Strategy does not provide details for managing and minimising any adverse socio-economic effects associated with mine closure.	The revised Rehabilitation Strategy contains information on managing adverse socioeconomic effects associated with mine closure. Following stakeholder consultation, the revised Rehabilitation Strategy was submitted to DPHI for approval on 08/03/2024. DPHI has responded on 20 June 2024 and Cadia is preparing updated information to address this information request.
Schedule 3, Condition 37(b)	Two Section 240 Notices (under the Mining Act) had been provided to Cadia during the audit period relating to rehabilitation performance not trending towards appropriate completion criteria.	The Rehabilitation Management Plan was updated in November 2023 to reflect the actions required by the Resources Regulator. The Rehabilitation Management Plan has been updated and was issued to the Resources Regulator in June 2024. A revised version of the Rehabilitation Management Plan was submitted to the regulator on 13/06/2024. Note that the Rehabilitation Management Plan does not require regulatory approval.

Ref	Non-compliance	Status as at 30 June 2024
Schedule 3, Condition 39	Arrangements for the long-term security of biodiversity offset areas had not been approved by DPE at the time of audit.	Cadia will continue to liaise closely with the relevant agencies until such a time as the biodiversity offsets are secured for the long term.
Schedule 3, 41B(d)	Table 5 of the Rehabilitation Management Plan discusses the water management from the SWRD and NWRD (i.e. rock lined drainage and detention ponds to channel runoff safely to constructed outlet areas to be constructed), however risks to the rehabilitation of creeks and drainage lines on site and management strategies to address strategies to minimise these risks are not outlined in the RMP.	The updated Rehabilitation Management Plan includes an action plan to address SWRD and NWRD erosion risks.
Schedule 4, Condition 2	Records were not available at the time of audit to demonstrate that relevant landholders, tenants and DPE were notified of exceedances of PA 06_0295 air quality and noise impact assessment criteria within the required timeframe.	Cadia is developing and will implement a procedure to track the notification of relevant landholders, tenants and DPHI within two weeks of receiving monitoring results that show an exceedance of PA06_0295. The site has implemented a communication and stakeholder engagement software that is the central point for all communications.
Schedule 5, Condition 1(b)	Section 2.9 of the Environmental Management Strategy (EMS) notes that the Cadia Senior Leadership Team complete a quarterly review of the site 'Environment and Social Performance Scorecard', which was not undertaken during the audit period.	Section 2.9 of the EMS has been reviewed and is being updated to refer to the contemporary internal review process used by Cadia to assess site environmental management and performance.
Schedule 5, Condition 2(a), (f)	There was no comparison provided for Depositional Dust Gauge (DDG) monitoring results against previous years within the audit period AR's.	Historically, DDG results have been compared against predicted modelling but not against previous years. Particulate matter results (PM10 and PM2.5) are compared against previous years. A comparison for DDG results is provided in Section 8.3.3.3 of this report.
Schedule 5, Condition 3(a) – (d)	Evidence was not available at the time of audit to confirm that internal reviews of management documents were being undertaken by Cadia to identify whether changes were required following the submission of 2020 and 2022 ARs and incident reports. Several management plans that required revision were not updated within three months of the approval of PA 06_0295 Modification 14.	Cadia has implemented an administrative process to ensure management documentation is reviewed within three months of the events identified.
Schedule 5, Condition 9	Copies of the Air Quality Monitoring Program and the CVO Dewatering Facility Landscape Plan were not available on the Cadia website at the time of the audit.	This has now been updated and all plans are on the website. A review action is included in the site schedule for each month.

APPENDIX 10 COMMUNITY SUPPORTING INFORMATION

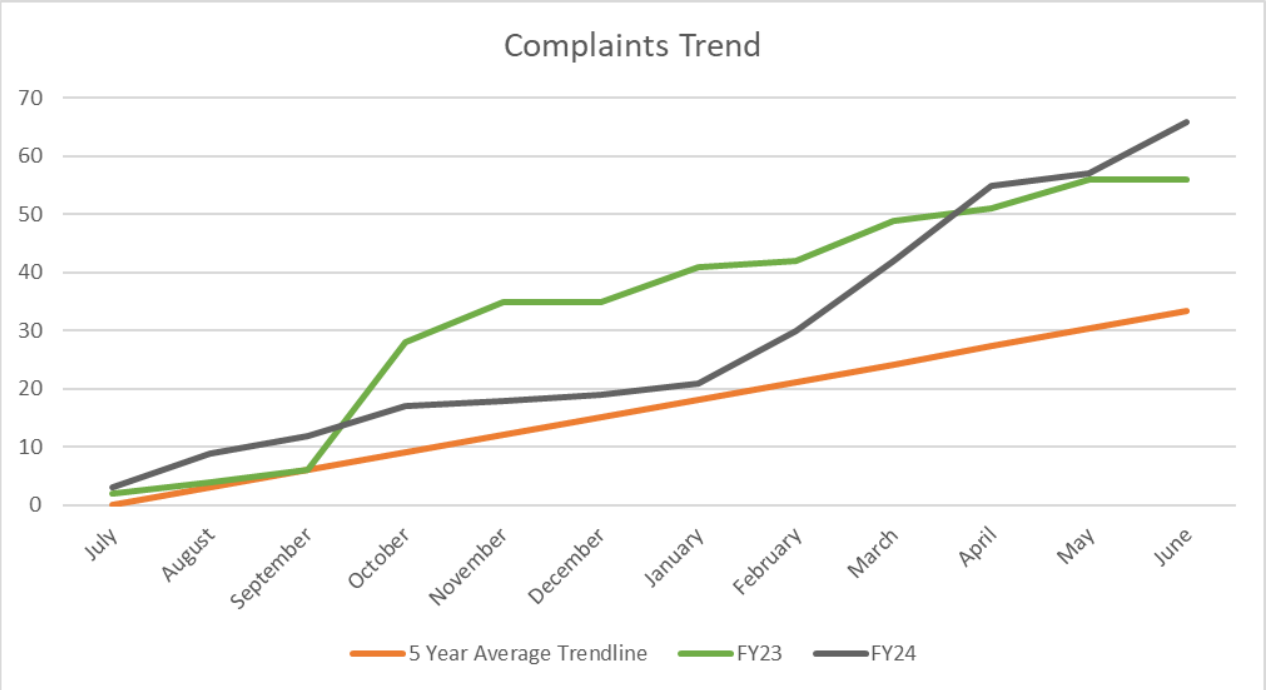


Figure A10.1 – Number and type of cumulative complaints received during the reporting period (FY24) compared to the previous reporting period (FY23) and the 5-year average.

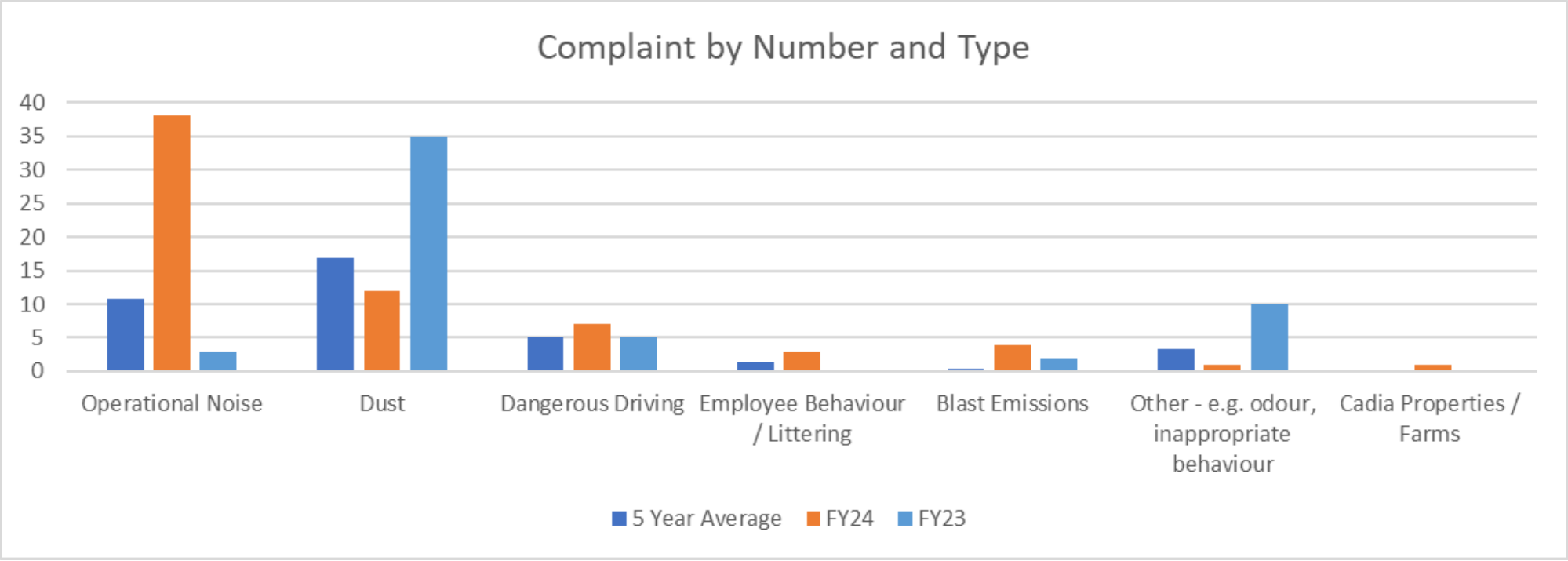


Figure A10.2 – Historical record of community complaints at Cadia

APPENDIX 11 NOISE MONITORING SUPPORTING INFORMATION

Available on the Cadia website:

https://www.cadiavalley.com.au/newcrest/cvo/environmental-management/monitoring/noise