APPENDIX 22 – GROUNDWATER MONITORING AND MANAGEMENT PLAN

NEW LENTON COAL PTY LTD

NEW LENTON COAL PROJECT

New Lenton Coal Project

Groundwater Monitoring and Management Plan

Lenton Joint Venture

GPO Box 1465, Brisbane 4000

Prepared by: Jade Darvell

SLR Consulting Australia

SLR Project No.: 620.040892.00001

2 October 2024

Revision: 3.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
3.0	2 October 2024	Jade Darvell	Derwin Lyons	Jade Darvell
3.0	1 October 2024	Jade Darvell	Derwin Lyons	Jade Darvell
1.0	20 September 2024	Jade Darvell	Derwin Lyons	Jade Darvell

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Lenton Joint Venture (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

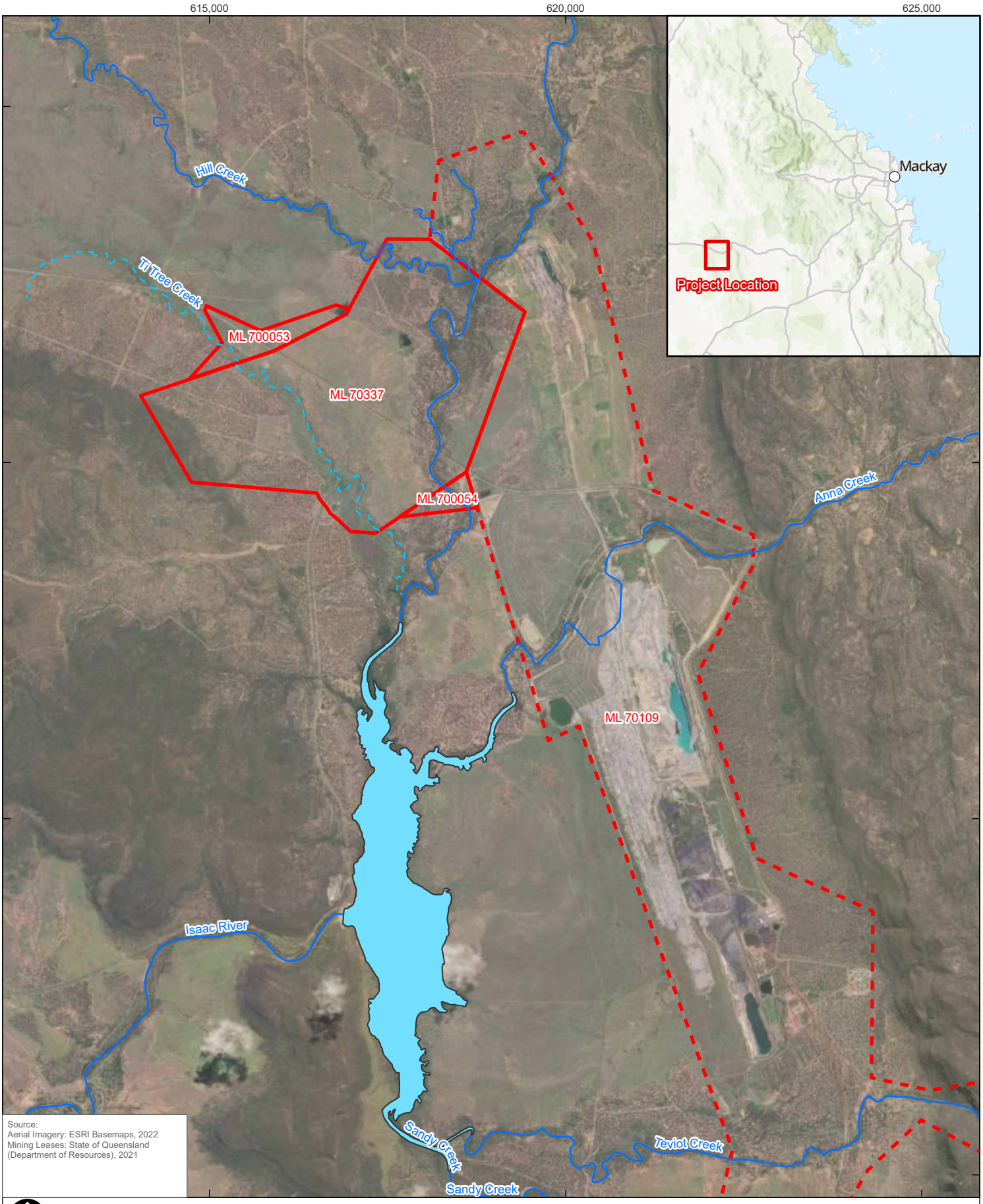
1.1 Overview

SLR Consulting Australia Pty Ltd (SLR) has been engaged by the Lenton Joint Venture (LJV) to develop and updated Groundwater Monitoring and Management Plan (GMMP) for the New Lenton Coal Project (New Lenton; the Project). This GMMP is intended to support a number of environmental approvals related to groundwater at the Project, including the Associated Water License (AWL), the Project Environmental Authority (EA), approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and Progressive Rehabilitation and Closure Plan (PRCP) conditions once approved.

This GMMP has been prepared to monitor and manage the potential impacts on groundwater at and surrounding the Project. It outlines the groundwater monitoring plan for the Project and associated groundwater impact limits and triggers that will invoke further assessment and groundwater impact management during the life of the Project and in the early years post-closure. This GMMP is an updated version of the Project's first GMMP prepared in 2020 (SLR, 2020), and takes into account relevant changes that have occurred since 2020 in relation to groundwater at the Project, including:

- Finalisation of the Project EA;
- Approval of the Project's PRCP; and
- Development of an updated groundwater model in support of the Project's Public Environment Report (PER) under the EPBC Act as reported in SLR (2024a).

The Project is located within the northern part of the Bowen Basin, approximately 65 km north of Moranbah and 120 km south-west of Mackay (**Figure 1-1**). The Project is to be developed on Mining Lease (ML) 70337, ML 700053 and ML 700054, with planned active mining between January 2025 and December 2040. The current EA (EPML00475513) allows the Project to operate at the rate of two million tonnes per annum (Mtpa) Run-of-Mine (RoM) coal extraction. The LJV owns the adjacent Burton Mine on ML 70109 and ML 70260. Bowen Coking Coal (BCC) acquired the New Hope Group's (NHG's) share of the LJV in July 2022 and along with taking over the New Lenton Project, recommenced mining operations at Burton Mine after a period of care and maintenance by the previous owners. Burton Mine is located to the south-east of the Project (**Figure 1-1**).



Source:
Aerial Imagery: ESRI Basemaps, 2022
Mining Leases: State of Queensland (Department of Resources), 2021

0 1 2 km

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:70,000 at A4
Project Number:	620.040892.00001
Date Drawn:	11-Jul-2024
Drawn by:	RB

LEGEND

- Major Watercourse
- Non-designated Watercourse
- Project Area
- Burton Mining Lease
- Burton Gorge Dam

NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

PROJECT LOCATION

SLR

FIGURE 1-1

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F01-01_Project Location

1.2 Relevant Conditions and Requirements

The relevant conditions and requirements as they relate to the GMMP for the Projects EA, AWL and PRCP, and where they are addressed in this GMMP, are detailed in **Table 1-1**.

Table 1-1 Project Conditions and Requirements relevant to this GMMP

Approval	Condition Number	Details and relevant section(s) of this report
EA	D1	The holder of this environmental authority must not release contaminants, directly or indirectly, to groundwater. **Refer Sections 7.1.3 and 7.1.4.**
EA	D2	Baseline Monitoring Program A baseline groundwater monitoring program must be developed and implemented by a suitably qualified person(s) and be provided to the administering authority. The baseline groundwater monitoring program must result in the holder of this environmental authority finalising the program that must be provided to the administering authority at least ninety (90) days prior to commencement of mining activities including construction. The baseline groundwater monitoring program must: (a) Continue until the Groundwater Monitoring and Management Program (GMMP) required under Condition D14 commences (**refer Section 5.3**). (b) contain representative groundwater quality samples from the geological units identified as potentially affected by mining activities (**refer Appendix A**); (c) include at least twelve (12) sampling events that are no more than two (2) months apart over a two (2) year period, so as to determine background groundwater quality (**refer Appendix A**); (d) conceptual model used to determine the location of ground water bores (refer **Section 5.2**); (e) include background groundwater quality in hydraulically isolated background bore(s) (**refer Appendix A**); (f) Allow for the identification of natural groundwater level trends and groundwater contaminant trigger levels (**refer Appendix A** and **Section 7.1.3**); (g) Identify groundwater water level trigger limits as per Table D3 Groundwater level monitoring (**refer Section 7.1.1** and **7.1.2**); (h) Complete an investigation to demonstrate that groundwater drawdown resulting from the activity will not impact environmental values including but not limited to Groundwater Dependent Ecosystems (GDEs) (**refer Section 4.2.2, 4.2.3** and **4.2.4**). (i) Proposed mitigation and monitoring measures to ensure the activity will not impact environmental values (refer **Sections 7.2**, **4.2.3** and **5.0**). (j) How impacts to prescribed environmental matters have been or will be avoided as a result of the disturbance with the installation of proposed bores (**refer Section 8.4**).

Approval	Condition Number	Details and relevant section(s) of this report
EA	D3	Groundwater quality and levels must be monitored at the locations and frequencies defined in Table – D1 Groundwater monitoring locations and frequency and Appendix 5 – Groundwater Monitoring Locations for quality characteristics identified in Table D2 – Groundwater quality limits. Groundwater monitoring must commence prior to the commencement of mining activities (including construction activities, excluding exploration activities). This EA must be amended to populate all missing / TBA monitoring locations and values within Table D1 – Groundwater monitoring locations and frequency and Table D3 – Groundwater level monitoring prior to commencement of mining activities (including construction activities, excluding exploration activities). **Refer Table 5-1, Sections 5.3.1 and 5.3.2.**
EA	D4	Results of monitoring of groundwater from water quality compliance bores identified in Table D1 -Groundwater monitoring locations and frequency, must not exceed any of the Contaminant Limits specified in Table D2 - Groundwater quality limits on three (3) consecutive occasions. **Refer Table 5-1, Table 7-3 and Section 7.1.4.**
EA	D5	Groundwater levels when measured at the water level compliance bores specified in Table D1 -Groundwater monitoring locations and frequency must not exceed the groundwater Level Trigger Thresholds specified in Table D3 - Groundwater level monitoring. The current Level trigger thresholds included in Table D3 Groundwater level monitoring must be amended to the actual trigger level thresholds prior to the commencement of mining (including construction activities, excluding exploration activities). **Refer Table 5-1, Table 7-2 and Section 7.1.4.**
EA	D6	Pre-mining groundwater baseline level to be provided through an amendment application prior to the commencement of mining activities (Table D3 – Groundwater level monitoring). **Refer Table 7-1.**
EA	D7	The environmental authority holder must notify the administering authority within twenty-four (24) hours via WaTERS of receiving any monitoring result that shows an exceedance of any limit for any quality characteristic specified in Table D2 – Groundwater Quality Limits and any exceeded Groundwater Level Trigger Threshold specified in Table D3 – Groundwater level monitoring. For condition D7, an exceedance is when a limit for any quality characteristic specified in Table D2 – Groundwater quality limits is exceeded on any three (3) consecutive sampling occasions. **Refer Section 7.1.4.**
EA	D8	Within fourteen (14) days of the notification given under condition D7, the environmental authority holder must commence an investigation to determine if the exceedance is a result of: (a) mining activities authorised under this environmental authority; or (b) natural variation; or (c) neighbouring land use resulting in groundwater impacts. **Refer Section 7.1.4.**

Approval	Condition Number	Details and relevant section(s) of this report
EA	D9	The investigation required by condition D8 must be completed and submitted to the administering authority via WaTERS within three (3) months of notification under condition D7. **Refer Section 7.1.4.**
EA	D10	If the investigation under condition D8 determines that the exceedance was the result of mining authorised under this environmental authority, then investigations must be undertaken by the holder of this environmental authority to establish whether environmental harm has occurred or may occur. **Refer Section 7.1.4.**
EA	D11	Within twenty-eight (28) days of the investigation under D10, the environmental authority holder must have: (a) implemented short-term measures to mitigate the potential for environmental harm; and (b) develop long-term mitigation measures to address any existing groundwater contamination and prevent recurrence of groundwater contamination; and (c) if environmental harm has occurred as a result of groundwater drawdown exceedances, the environmental authority holder must: (i) determine any actions required to reduce the potential for environmental harm; and (ii) determine any mitigation measures required to limit the drawdown in the affected groundwater resource. **Refer Section 7.1.4.**
EA	D12	The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring. **Refer Section 8.4**.
EA	D13	All determinations of groundwater quality and biological monitoring must be performed by a suitably qualified person(s). **Refer Sections 6.1.5** and **6.1.1.**
EA	D14	Groundwater Monitoring and Management Program A Groundwater Monitoring and Management Program (GMMP) must be developed (**this GMMP report**), implemented and provided to the administering authority at least ninety (90) days prior to commencement of mining activities including construction (excluding exploration and ecological monitoring activities). The GMMP will: (a) Identify all potential sources of contamination to groundwater from construction, mining activities and rehabilitation activities (**refer Appendix A**); (b) Provide a hydrogeological conceptual groundwater model (**refer Section 3.0**); and (c) Identify all environmental values that must be protected (**refer Section 3.3);** (d) Detail groundwater levels in all identified aquifers present across and adjacent to the site to confirm existing groundwater flow paths (**refer Appendix A**);

Approval	Condition Number	Details and relevant section(s) of this report
		(e) Estimate the groundwater inflow to rehabilitated landforms and surface water ingress to groundwater from flooding events using the groundwater model (**refer Section 4.2.2**); (f) Ensure all potential groundwater impacts due to mining activities and rehabilitation activities are identified, monitored and mitigated (**refer Sections 4.0** and **7.2**); (g) Ensure adequate groundwater monitoring and data analysis is undertaken to achieve the following objectives: (i) Detect any impacts to groundwater level due to the mining activities and rehabilitation activities (**refer Sections 7.1.1, 7.1.2** and **7.1.4**); (ii) Detect any impacts to groundwater quality due to the mining activities and rehabilitation activities (**refer Section 7.1.3** and **7.1.4**); (iii) Determine compliance with Groundwater Quality Limits and Level Trigger Thresholds (**refer Sections 7.1.4** and **8.1**); and (iv) Determine trends in groundwater quality (**refer Section 8.1**); (h) Document groundwater management and monitoring methodologies undertaken for the duration of all mining activities and rehabilitation activities (**refer Section 5.3, 6.0** and **8.0**); (i) Provide an appropriate quality assurance and quality control program (**refer Section 6.0**); and (j) Include a review process to identify improvements to the program that includes addressing any comments provided by the administering authority (**refer Section 8.2**).
EA	D15	An Annual Groundwater Monitoring Report (AGMR) is required to be completed and submitted to the administering authority commencing after the first year of mining activities (excluding exploration activities). The AGMR must include: (a) the groundwater quality and standing water level of all groundwater bores listed within Table D1 - Groundwater monitoring locations and frequency (b) an assessment of long-term water quality and water level trends at all groundwater bores listed in Table D1 - Groundwater monitoring locations and frequency; (c) details of any review undertaken of the groundwater conceptual model; (d) an assessment of any differences between the groundwater level impact predicted and actual impacts for corresponding period. **Refer Section 8.1.**
EA	D16	The following information must be recorded in relation to all groundwater water sampling: (a) the date on which the sample was taken; (b) the time at which the sample was taken; (c) the monitoring point at which the sample was taken; and (d) the results of all monitoring; and (e) submit all groundwater monitoring data required by this environmental authority or related to environmental management activities to the administering authority via WaTERS. **Refer Section 6.1.5** and **6.1.8**.
PRCP	PRCP6	Monitoring and maintenance must be carried out in accordance with:

Approval	Condition Number	Details and relevant section(s) of this report
		i. the monitoring and maintenance program described in the rehabilitation planning part relating to this PRCP schedule; and ii. any requirement under this PRCP schedule. **Refer Section 5.4**.
PRCP	PRCP7	The holder must keep records in relation to relevant matters for a minimum of five years and provide such records to the administering authority on request. Relevant matters for this condition include, but are not necessarily limited to, the following: i. Rehabilitation activities and the results of these activities ii. Maintenance activities and the results of maintenance activities iii. Monitoring activities and the results of monitoring iv. Designs, drawings, specifications or any similar documents required under the PRCP schedule v. Certifications, assessments, investigations, inspections, audits or any similar processes carried out in relation to rehabilitation milestones or milestone criteria. **Refer Section 6.1.8.2**.
PRCP	RM8	k. For a minimum of five (5) consecutive years groundwater quality must be monitored quarterly at, but not limited to, compliance bores specified in Attachment 6 ‘Groundwater monitoring locations and frequency’, for all quality characteristics listed in Attachment 7 ‘Groundwater quality limits’. l. Groundwater quality results must not exceed the limits in Attachment 7 ‘Groundwater quality limits’, for 3 consecutive results. Groundwater level is monitored quarterly and all results comply with Level Trigger Thresholds outlined in Attachment 8 ‘Groundwater level monitoring’ for 10 consecutive years. **Refer Sections 5.4 and 7.1.4.**
AWL	41	The approved Underground Water Monitoring Program as at the date of this licence is the document titled “New Lenton Project - Groundwater Monitoring and Mitigation Plan” prepared by SLR Consulting for Lenton Management and Marketing Pty Ltd dated July 2020. **Refer Section 1.0, noting that this GMMP report supersedes that developed by SLR (2020).**
AWL	42	The licensee must, through an appropriately qualified person, undertake monitoring in accordance with the relevant approved Underground Water Monitoring Program. Underground water levels in the monitoring bores are to be measured on a daily frequency. **Refer Sections 5.3.1 and 5.3.2.**
AWL	43	Revisions to the approved Underground Water Monitoring Program must be undertaken by an appropriately qualified person, and submitted to the chief executive for approval. An approved officer of the Department must, following receipt of a proposed revision to the approved Underground Water Monitoring Program, advise the licensee in writing of: (a) approval of the revised or amended Underground Water Monitoring Program; or (b) why the revised or amended program is considered inadequate and how it must be modified in order to be approved.

Approval	Condition Number	Details and relevant section(s) of this report
		Refer Section 8.2.
AWL	44	An approved officer of the Department may direct the licensee to make amendments to an approved Underground Water Monitoring Program, including (without limitation), installing additional monitoring bores, if the approved officer of the Department is reasonably satisfied that the existing approved Underground Water Monitoring Program is no longer meeting the objectives of an Underground Water Monitoring Program. If the licensee receives a notice under this condition, the licensee must, through an appropriately qualified person, make the required amendments and submit the amended program to the chief executive for approval under Condition 43. **Refer Section 8.2.**
AWL	45	The licensee must publish water level monitoring data required to be collected under the approved Underground Water Monitoring Program within 10 business days from measurement. Data must remain published and publicly available. **Refer Section 6.1.8.1.**
AWL	47	The licensee must provide an Annual Monitoring Report to the chief executive. Each Annual Monitoring Report must include: (a) the underground water levels in the monitoring bores identified in the approved Underground Water Monitoring Program; (b) maps showing the actual water level drawdown contours for each aquifer; (c) details of the numerical underground water model and any review undertaken of the numerical underground water model since the previous Annual Monitoring Report; (d) an assessment of any differences between the actual water level impact and the impact predicted for the same period by the numerical underground water model; (e) details of any bores which are predicted by the numerical underground water model to be located in the affected area; and (f) raw data provided in a format as requested by the chief executive. **Refer Section 8.1.**
AWL	48	The first Annual Monitoring Report must be provided to the chief executive within three months of the end of the first water year, and subsequent Annual Monitoring Reports must be provided to the chief executive within three months of the end of each relevant water year. **Refer Section 8.1.**

2.0 Site Setting

2.1 Location and Topography

The Project is located in the Bowen Basin, a geological basin spanning an extent of approximately 200,000 km^2 and one of five major foreland sedimentary basins formed along the eastern side of Australia during the Permian period. The Project Area is surrounded by escarpments, including the Burton Range to the southwest, the Kerlong Range to the east and the Denham Range to the north.

2.2 Climate

The climate of the Project area is sub-humid/sub-tropical, with a distinct wet and dry season. Historical climate data was obtained for the period January 1900 to September 2024 from the SILO database (for the grid point latitude -21.5, longitude 148.15). The total average annual rainfall is 630 mm, with higher rainfall occurring over the summer months, from December to March. Evaporation exceeds rainfall in all months of the year, with the average annual evaporation of 1,934 mm exceeding average annual rainfall by over three times.

In order to place rainfall over the years into an historical context and also provide context for potential climate driven groundwater system variability, cumulative rainfall departure (CRD) was calculated for the full data period (**Figure 2-1**). This is a summation of the monthly departures of rainfall from the long-term average monthly rainfall. A rising slope in the CRD plot indicates periods of rainfall above the long term average, as is the case from January 2016 to June 2017, whereas a falling slope indicates periods when rainfall is below the long-term average (e.g. June 2017 to May 2021). Rainfall volumes over the more recent period of the record (i.e. May 2021 to September 2024) have been higher than average, as is indicated by the rising slope in the CRD (**Figure 2-1**).

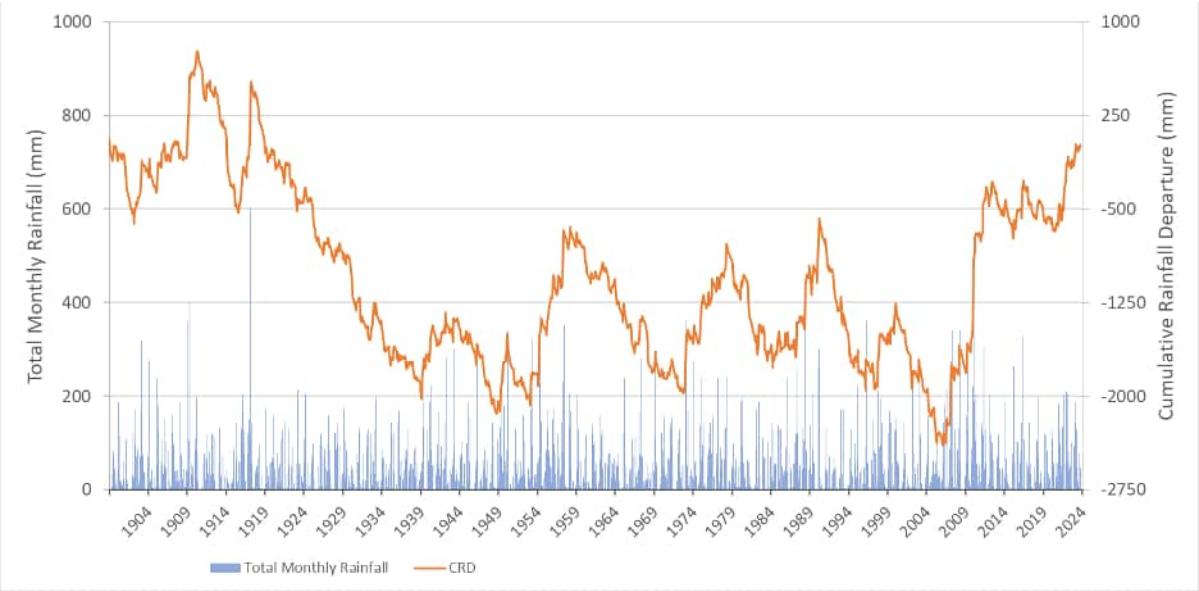


Figure 2-1 Cumulative Rainfall Departure and Total Monthly Rainfall

3.0 Hydrogeological Setting

The hydrogeological setting at the Project is summarised below for relevance to this GMMP and is based on that reported in the most recent hydrogeological study for the project, being the PER Groundwater Assessment (SLR, 2024a).

3.1 Hydrogeological Units

The surface geology and underlying solid geology at the Project are shown on **Figure 3-1** and **Figure 3-2**, respectively. The following presents a summary discussion of the hydrogeological characteristics of the local geology, with the purpose of describing the groundwater bearing units relevant to this GMMP.

3.1.1 Alluvium and Regolith

The Quaternary floodplain alluvium associated with surface watercourses (Isaac River, and its tributaries including Hill Creek and other smaller unnamed tributaries) is comprised of clay, silt, sand, and gravel sediments. The thickness of the alluvium is greater close to the Isaac River channel and decreases with distance from the river. There is significant lithological heterogeneity in the alluvium with nearby bores exhibiting variations in lithology with depth.

Several Project groundwater bores installed into the Quaternary alluvium are dry, indicating the alluvium is unsaturated and does not form an aquifer at these locations. Where groundwater is present in the basal alluvium closer to the Isaac River main channel however, groundwater levels in the alluvium are relatively flat, with flow generally towards and coincident with the Isaac River surface flow direction. Where it occurs, groundwater within the basal alluvium is recorded at depths of around 8 to 11 mBGL, typically significantly disconnected from the streambed elevation. Immediately below and adjacent the Isaac River channel and banks, limited seasonally recharged perched water is present around 5 m above the groundwater in the basal alluvium/regolith (around 1 to 4 mBGL).

The regolith is mainly comprised of shallow Tertiary to Quaternary age colluvium and residual soils, derived from weathered underlying Triassic and Permian bedrock strata. The depth of weathering is variable, ranging from 10 m to 50 mBGL, with an average of approximately 25 mBGL. The regolith has been identified as hosting groundwater at various locations across the Study Area. The inferred groundwater flow direction in the regolith, where present and saturated, is expected to follow topography, and has the potential to interact with groundwater within the alluvium where present along drainage alignments and rivers.

Losing streamflow conditions from the Isaac River to the underlying alluvium and regolith are evident during flow periods and recharge to shallow groundwater is considered to be primarily from streamflow or flooding, with direct infiltration of rainfall also occurring rapidly where there are no substantial clay barriers in the shallow sub surface. Perching of recharged water inhibits the downwards migration of recharged water to the basal alluvium aquifer. Discharge of shallow groundwater occurs primarily via evapotranspiration, including from Terrestrial GDEs that access the seasonally variable perched water table but not the deeper basal alluvial groundwater.

3.1.2 Basalt

Minor occurrences of Tertiary age basalts are found sporadically to the northwest of the Project. Given the limited extent and discontinuity of this unit likely offers limited aquifer potential and has not been identified as a hydrostratigraphic unit of significance to the GMMP development.

3.1.3 Triassic Aged Strata

Triassic age strata near the to the Project consists of the Moolayember Clematis Group, and the Rewan Formation.

The Moolayember Formation, where it exists outside the Project Area, overlies the Clematis Group and is generally considered a regional scale aquitard within the Bowen Basin. The Clematis Group is generally considered a major aquifer particularly for the sandstones within the unit, although its presence within ML 70337 is isolated and disconnected from the major regional occurrence of the Clematis Group aquifer. Both the Moolayember Formation and Clematis Group have been significantly eroded, such that the Moolayember Formation is absent from within the Project Area itself and the Clematis Group is only present across a limited section of ML 70337 to the west of the Burton Range Fault. As such, neither unit is considered a significant hydrostratigraphic unit in the context of the GMMP development.

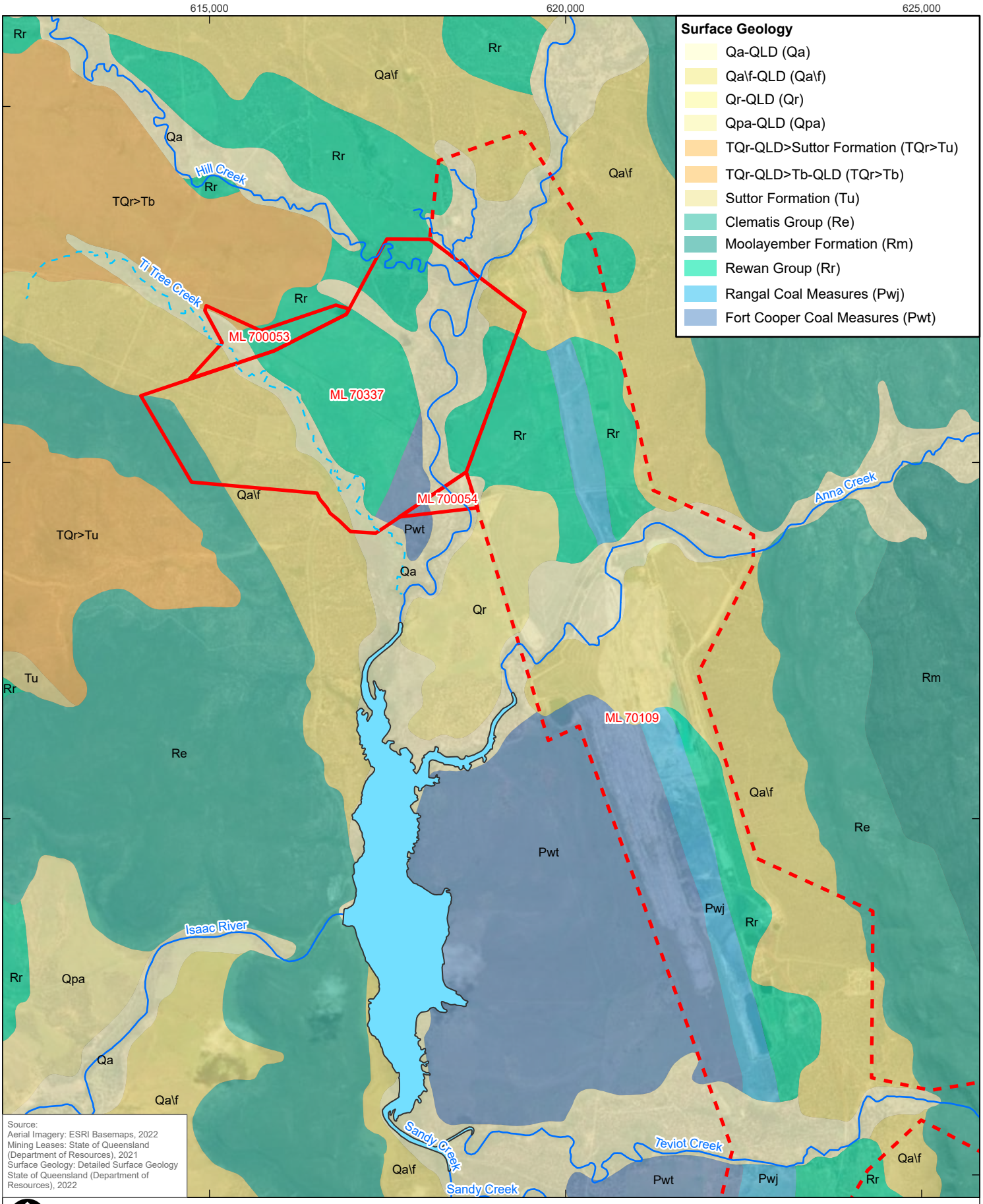
The Rewan Formation, which overlies the Permian age Rangal Coal Measures, dominates a significant outcrop area across the Project. The Rewan Formation is generally considered a major regional scale aquitard within the Bowen Basin, limiting groundwater connectivity between the underlying Permian coal measures and any overlying shallower groundwater systems where it occurs. There is limited groundwater occurrence within the Rewan Formation itself, associated mainly with localised fracturing and weathered horizons.

3.1.4 Permian Coal Measures

The Permian Coal Measures are composed of interbedded sequences of sandstone, siltstone, and coal. Groundwater is encountered in both the coal seams and in the lower permeability interburden units. The coal seams within the Rangal Coal Measures are typically considered the main aquifer units of the Permian Coal Measures and may be significantly more permeable than the interburden material of interbedded mudstone, siltstone, and sandstone. The main coal seams present at the Project are the Burton Rider seam and the deeper Leichhardt / Vermont coal seams. The coal seams are classified as a dual-porosity, dual-permeability medium with water stored and transmitted through both the primary matrix porosity and secondary fracture porosity. The adjoining sandstone and siltstone interbeds act as low hydraulic conductivity confining units. Groundwater within these coal measures is considered confined and sub-artesian.

Recharge to the coal measures occurs where the coal seams outcrop or subcrop beneath the alluvium or regolith. The interburden material (sandstone and siltstone) typically has a low vertical hydraulic conductivity and limits the downward vertical movement of water. When groundwater levels are locally reduced in the coal seams due to seepage inflow to mining pits, these interburden units will provide a source of water by vertical leakage into the depressurised coal seams. Discharge from this unit is dominated by evaporation and groundwater extraction from mining activities at the neighbouring Burton Mine.

Regionally groundwater levels in the Permian coal seams correlate with ground surface elevations (GHD, 2019; SLR, 2024a), with groundwater flow dominantly horizontal through the coal seams themselves following the regional topography, but locally influenced by existing mining at the Burton Mine.



NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

SURFACE GEOLOGY

SLR

FIGURE 3-1

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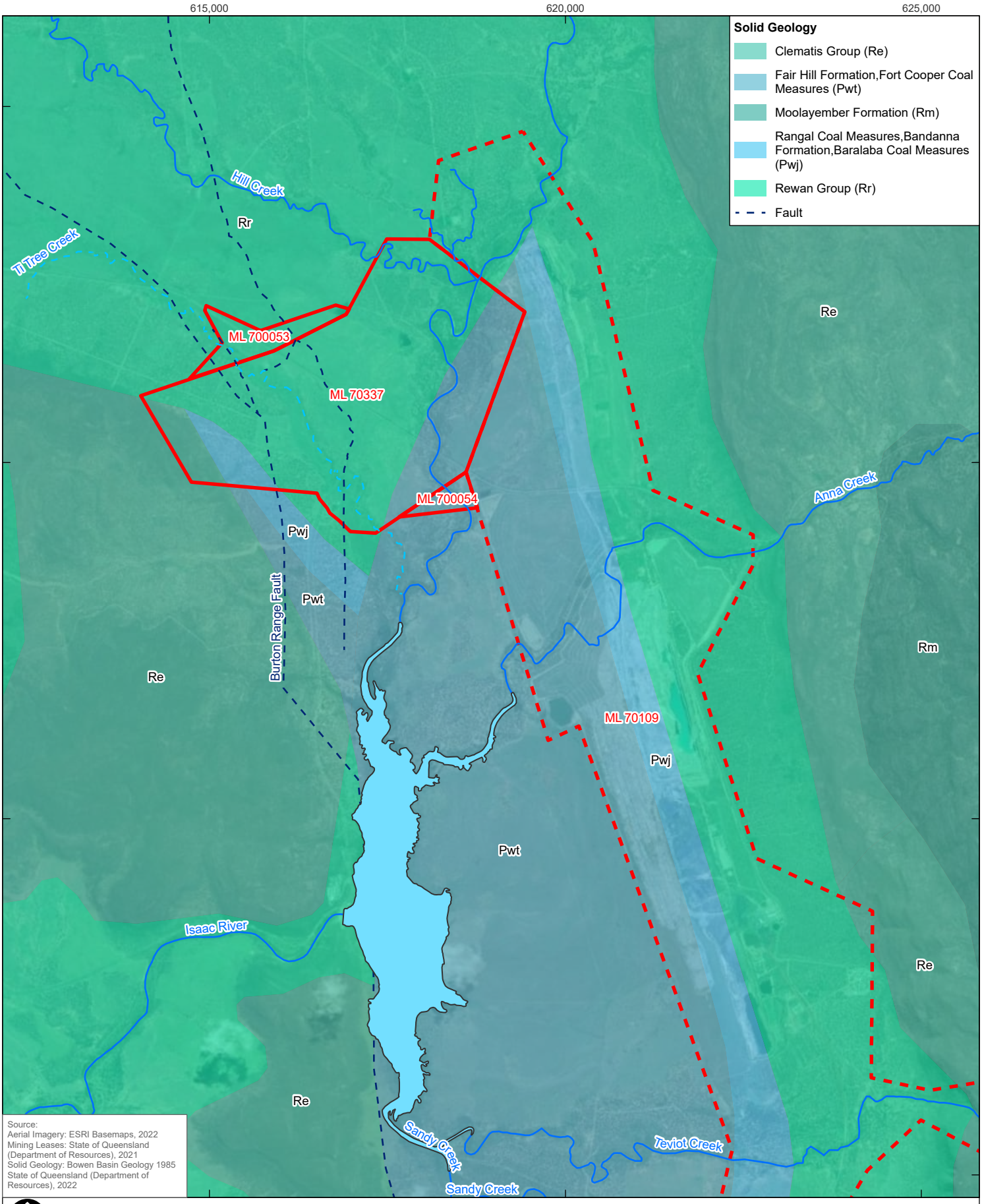


Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:70,000 at A4
Project Number:	620.040892.00001
Date Drawn:	11-Jul-2024
Drawn by:	RB

NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

SOLID GEOLOGY

SLR

FIGURE 3-2

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F04-02_Solid Geology

3.2 Groundwater Receptors

3.2.1 Groundwater Dependent Ecosystems

A groundwater dependent ecosystem (GDE) is a natural ecosystem that requires “access to groundwater to meet all or some of their water requirements on a permanent or intermittent basis, so as to maintain their communities of plants and animals, ecosystem processes and ecosystem services” (Richardson, S., et al., 2011).

The BoM’s National Atlas of Groundwater Dependent Ecosystems (GDE Atlas) (BoM, 2017) indicates areas with possible low, moderate and high potential for groundwater interaction occur in the vicinity of the Project. A local GDE field assessment was completed by 3D Environmental in 2023 with the aim of ground-truthing the GDE Atlas mapping. The field assessment indicated that the inferred spatial extent of Terrestrial GDEs are highly confined to close to the Isaac River channel and do not extend any significant distance upstream along tributary watercourses. Previous field investigations at the Project (AARC, 2019a) have identified that groundwater does not discharge to surface water or maintain surface water pools, and as a result does not support aquatic GDEs. Recent ground-truthing along the Isaac River and its tributaries in the area of the Project (AARC, 2024) also confirmed that there was no presence of pooled water and therefore no aquatic GDEs.

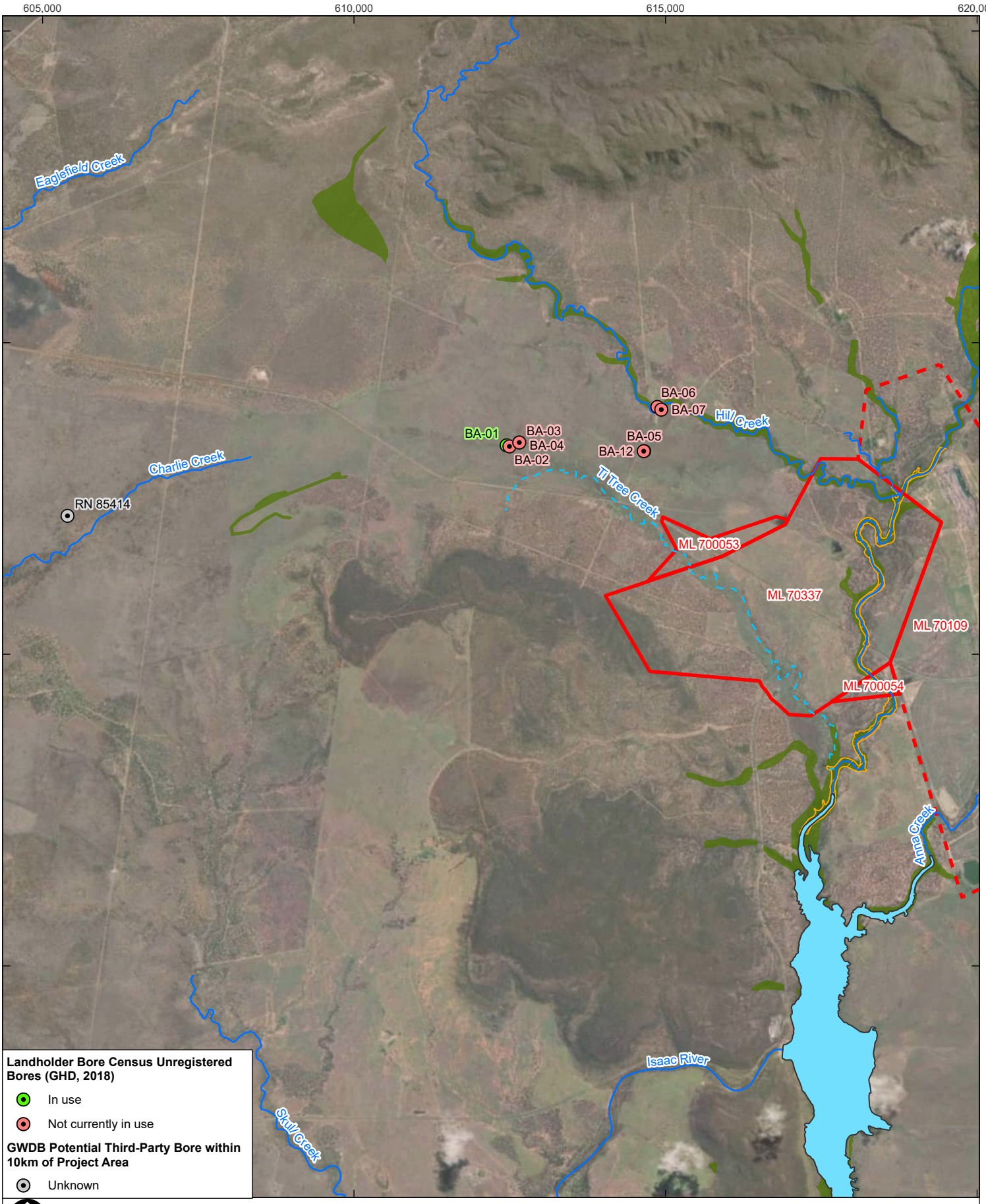
The ground-truthed area of terrestrial GDEs resulting from the field assessment completed by 3D Environmental is presented on **Figure 3-3**.

It is noted that the area of field confirmed GDEs mostly conforms with the GDE Atlas mapping of high potential GDEs, and therefore the GDE Atlas mapping of those high potential GDEs can provide an identification of GDE areas outside the area surveyed by 3D Environmental (2023). It is also noted however, that at the Isaac River tributary area (where Hill Creek and smaller unnamed creeks meet the Isaac River), where BoM GDE Atlas shows mapping of high potential GDEs, the 3D Environmental (2023) survey indicated that these areas are not groundwater dependent i.e. not Terrestrial GDEs.

The riparian vegetation fringing the Isaac River (which was the only Terrestrial GDE identified from the 3D Environmental, 2023 ground truthing) was concluded to be supported by shallow perched alluvial water which is seasonally recharged and hydraulically disconnected from the basal alluvial groundwater system. The field assessment was completed during a wetter than average period, and the perched alluvial groundwater features may only exist temporarily, drying during extended drought periods, accelerated by evapotranspiration. In this sense, this perched, and most likely discontinuous feature is likely to be seasonal with riparian trees demonstrating facultative dependence on the resource, with a shift to utilization of soil moisture when the seasonally variable perched water is depleted (3D Environmental, 2023). The interpretation that these GDEs demonstrate facultative dependence is consistent with previous GDE field studies by AARC (2019b) which suggested that potential GDEs along the Isaac River are not solely reliant on groundwater for survival, with these vegetation communities capable of surviving on residual rainfall derived soil moisture present in unsaturated shallow soil layers.

The GDE field study by 3D Environmental (2023) also concluded that the regolith and Permian aquifers are not considered to be a suitable resource to support GDEs due to depth to groundwater being considerably deeper (>10 mBGL) than the maximum rooting depth of the vegetation present (poplar box and narrow leaf ironbark) (3D Environmental, 2023).

To detect potential impacts to the health and function of TGDEs associated with the Project a GDE Monitoring and Management Plan (GDEMMP) has been prepared for the Project (3D Environmental, 2024). This GDEMMP will provide additional baseline data to corroborate the 2023 assessment (including by establishment of four additional shallow groundwater monitoring bores targeted to assess the seasonality and persistence of the perched alluvial groundwater system which supports GDEs), as well as establish triggers for investigative actions and potential corrective actions or biodiversity offsets.



NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

GROUNDWATER DEPENDENT ECOSYSTEMS AND PRIVATE BORES

SLR

FIGURE 3-3

3.2.2 Landholder Bores

A search of the Queensland Government's Registered Groundwater Bore Database (GWBD) (DoR, 2023) was carried out for registered bores within 10 km of the Project Area. The search returned 19 bores with registered uses as mine monitoring, petroleum exploration, and unknown (1 bore). That is, the database search identified one potential groundwater supply bore within 10 km of the Project (i.e. the bore with use listed as unknown). This bore (RN85414) is located approximately 8.7 km northeast of ML 70337, and is 27.4 m deep (**Figure 3-3**).

A landholder bore census was conducted by GHD in December 2018 for an area extending 10 km from the Project Area (GHD, 2019). The census identified eight unregistered bores (**Figure 3-1** and **Figure 3-3**). The results of the survey indicated that one of the bores was in use while the others were not currently in use. The details of these bores are provided **Table 3-1** and locations shown on **Figure 3-3**. No information is available for which aquifer the potential third party water supply bores are screened in. A comparison of available bore depths with the numerical groundwater model developed for the Project's PER (SLR, 2024a) infers that BA02, BA03, BA04 and RN85414 are screened in the regolith, while BA01 and BA05 are screened in the Triassic Strata.

Table 3-1 Unregistered groundwater bores within 10 km of the Project

Bore	Easting	Northing	Status	Depth (m)	Survey Date
BA-01	612505	7618350	In use (stock watering)	51.05	2018
BA-05	614658	7618258	Not currently in use (previously used for stock watering)	40.3	2018
BA-06	614868	7618966	Not currently in use (blocked)	Unknown	2018
BA-07	614931	7618923	Not currently in use (filled)	Unknown	2018
BA-12	614649	7618257	Not currently in use (casing and rods in hole)	Unknown	2018
BA-02	612494	7618333	Not currently in use	37.38	2018
BA-03	612652	7618396	Not currently in use	39	2018
BA-04	612652	7618396	Not currently in use	40.32	2018

3.3 Groundwater Environmental Values

The relevant Environmental Values (EVs) for the Project pertaining to groundwater are summarised in the PER Groundwater Assessment report developed by SLR (2024a) as follows.

Groundwater resources within the vicinity of the Project are scheduled under the Queensland *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* (under the *Environmental Protection Act 1994*) as Isaac Groundwaters of the Isaac River Sub-basin of the Fitzroy Basin water plan (WQ1310) (DEHP, 2011). The legislated Environmental Values (EVs) for these groundwaters are:

- Biological integrity of aquatic ecosystems – these occur where groundwater baseflow supports streams and water holes to some extent (e.g. seasonally or permanently).
- Human use EVs:
    - Suitability of water supply for irrigation – where groundwater is used to grow crops and pastures for commercial purposes.
    - Farm water supply/use – where groundwater is used to provide domestic supply and support growing of domestic produce.
    - Stock watering – where groundwater is used to provide stock water supplies.
    - Drinking water supply – where groundwater is used for potable water supply.
    - Primary recreation – where groundwater supports recreational use that involves direct contact ad a high probability of being swallowed, e.g. diving, swimming, water skiing.
    - Cultural and spiritual values – where groundwater supports both indigenous and non-indigenous values, e.g. recreational fishing, heritage, ecology.

Earlier hydrogeological studies conducted for the Project (GHD, 2019) concluded that Irrigation, Recreation, Drinking Water and Cultural/Spiritual EV's were not relevant to the Project area and surrounds, due to lack of evidence for the presence of those EV's. The three EV's that apply to groundwater at the Project were therefore identified as:

- Biological integrity of Aquatic Ecosystems;
- Farm Supply; and
- Stock Watering.

For the Biological integrity of Aquatic Ecosystems EV, this is considered applicable only where groundwater at the Project site may interact with surface water. It should be noted however that the Project's updated conceptual hydrogeological model (SLR, 2024a) indicates that groundwater discharge to surface water does not occur, and therefore any interactions only occur through river recharge to the alluvium and through downwards seepage from the alluvium to the Permian.

3.4 Groundwater Quality

The following provides a summary of groundwater quality as is presented in the Projects conceptual hydrogeological model (SLR, 2024a).

Analysis of the baseline (pre-Project) groundwater quality dataset (available historical data for all bores between 2006 and 2023) indicates the following:

- Alluvium: Mildly acidic to moderately alkaline pH (6.3 to 8.4, averaging near neutral at 7.1) and fresh to saline water quality (517 to 16,500 µS/cm EC, averaging 5,604 µS/cm EC).
- Regolith: Mildly acidic to mildly alkaline pH (6.7 to 7.9, averaging near neutral at 7.1) and mildly brackish to saline water quality (1,549 to 12,400 µS/cm EC, averaging 9,902 µS/cm EC); and
- Permian coal seams: Mildly acidic to moderately alkaline pH (6.3 to 8.5, averaging 7.5) and mildly brackish to saline water quality (2,030 to 18,450 µS/cm EC, averaging 9,921 µS/cm EC).

With respect the above EVs/WQOs mentioned above and existing historical groundwater monitoring data, SLR (2024a) found that:

- Alluvium monitoring bore data generally suggests that alluvial groundwater from the Project Area is unsuitable for supporting the irrigation water EV with respect to fluoride, boron, iron, manganese, molybdenum or uranium. Alluvium groundwater data also generally indicates it is not suitable for supporting the aquatic ecosystems EV with respect to boron, chromium, cobalt, copper, nickel, uranium, vanadium or zinc. The 80th percentile values at the alluvial bores did not exceed any of the stock watering EV guidelines, except for EC (salinity) at GW06, suggesting that alluvial groundwater is mostly suitable for stock watering.
- Regolith monitoring bore data generally suggests that groundwater from the regolith is unsuitable supporting the irrigation water EV with respect to boron, iron, manganese or uranium. Regolith groundwater data also suggests that is generally unsuitable to support the aquatic ecosystems EV with respect to cobalt, copper, nickel, uranium or zinc. The data also suggests that regolith groundwater is generally unsuitable for supporting the stock watering EV with respect to EC (salinity).
- Groundwater quality data from the bore screened in the basalt (GW20) suggests that is it not suitable for supporting the aquatic ecosystems EV with respect to pH, cadmium and copper. The 80th percentile statistics for this bore did not exceed any of the stock watering or irrigation EV guidelines, suggesting that the basalt groundwater is suitable for supporting the stock watering and irrigation EVs.
- As with the Alluvium and Regolith, Permian monitoring bore data generally suggests that Permian groundwater at the Project Area is also unsuitable supporting the irrigation EV with respect to fluoride, boron, iron, manganese or molybdenum and the aquatic ecosystems EV with respect to pH, aluminium, arsenic, boron, cobalt, copper, molybdenum, uranium or zinc. The 80th percentile values at the Permian bores are above the stock watering EV with respect to EC (salinity) at four out of eleven bores, suggesting that Permian groundwater is suitable to support stock watering across most Permian bores, but approximately one third of Permian bores report groundwater salinities above stock tolerance levels.

Generally speaking, there is a high degree of observed variability in groundwater quality between hydrostratigraphic units, and between individual bores within individual hydrostratigraphic units. This inherent variability has been incorporated within the Project's groundwater quality impact limit and trigger derivation as reported in **Appendix A**.

4.0 Predicted Groundwater Impacts

4.1 Overview

The most recent hydrogeological impact assessment for the Project is the PER Hydrogeology Groundwater Assessment (SLR, 2024a). This most recent hydrogeological assessment included the production of an updated numerical groundwater model covering the New Lenton Project and the adjoining Burton Mine (referred to as the "New Lenton and Burton Groundwater Model" as detailed in SLR, 2024b).

This section describes the potential impacts from the New Lenton Project operations on the groundwater system, as relevant to this GMMP.

4.2 Impacts on Groundwater Levels

4.2.1 Predicted Groundwater Inflow

4.2.1.1 During Mining

Total combined predicted groundwater inflows to the New Lenton Project pits from the New Lenton and Burton numerical groundwater model (SLR, 2024b) are provided in **Figure 4-1**. As shown total groundwater inflows to the West Pit are predicted to peak in 2027 at 524 ML/year, and in 2030 at 856 ML/year in the East Pit. The total groundwater inflow to the New Lenton Project pits is predicted to reach a maximum of 1026 ML/year in 2030, coinciding with operations commencing in the East Pit; though in reality these inflows would be managed by dewatering the workings prior to the pit intersecting them. It should also be noted that these predicted inflow estimates from the model include water removed in rock material with mining, as well as water evaporated from the surface of the pit walls and floor. It is therefore an over-estimate of groundwater that could report to the site water balance or require physical management within the mine water management system.

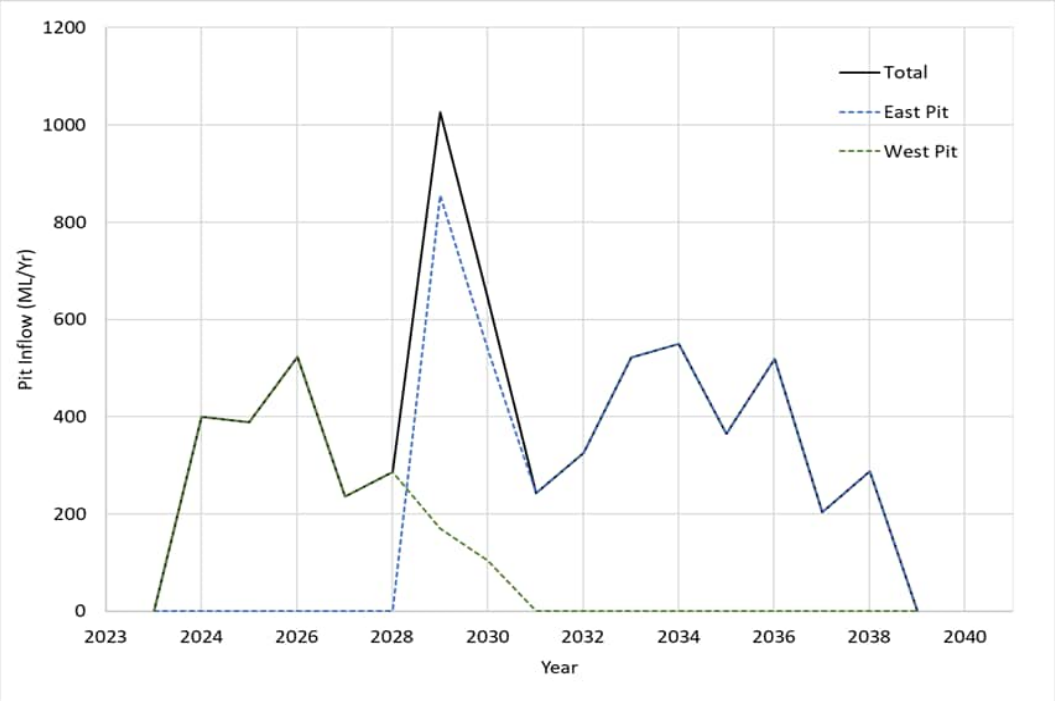


Figure 4-1 Predicted Groundwater Inflow to New Lenton Project Mine Pits During Mining

Planned mining at the Project targets the Burton Rider seam and the Leichhardt / Vermont coal seams of the Rangal Coal Measures. The dominant form of potential groundwater impact from the Project operations is groundwater level drawdown that occurs as a result of passive groundwater inflow to the active mine pit voids (i.e. associated water take). As excavation of the active mine pits proceeds below the water table within the Rangal Coal Measures, groundwater will discharge into the pits that target the Burton Rider seam and Leichhardt / Vermont seams. This passive dewatering of the Permian Coal Measures will result in the lowering of groundwater levels in the aquifer in the immediate vicinity of the New Lenton Project pit voids. Groundwater levels in the other aquifers around the site may also be affected due to induced through-flow and leakage of groundwater from these aquifers to the Permian Coal Measures. Furthermore, mine pits may also directly intersect the overlying or partially overlying units in places, and as a result, it is predicted that there may be direct groundwater level impacts to the other aquifers.

4.2.1.2 Post-Mining

In the post-mining period, ongoing groundwater inflows to the residual void are controlled by the relationship between any the established lake in the post-mining landform, which are dominantly controlled by surface water (rainfall and runoff) inputs, and the recovered groundwater levels in the surrounding aquifers. Where lakes form in the post-mining landform with hydraulic heads below the hydraulic head in the surrounding groundwater system, those lakes may have an inwards flux of water from the groundwater system (groundwater take/ sinks with respect to groundwater). Conversely, an opposite head gradient between the lakes and groundwater would result in the potential for an outwards flux of water to the groundwater system.

The numerical groundwater model (SLR, 2024b) coupled with a groundwater/surface water model for the residual voids (WRM, 2023) was used to assess the water balance associated with the voids as a means of assessing postmining groundwater fluxes. As reported in SLR (2024a) and SLR (2024b), the results indicate that net groundwater inflow rates into the East Pit Void (including that from spoil) are predicted in the long term to approximate 257.9 ML/year.

4.2.2 Predicted Groundwater Levels and Drawdown

The following outlines the key outcomes of the New Lenton numerical model as they pertain to groundwater levels and drawdown. Discussion in the following sections makes reference to the maximum incremental groundwater level drawdowns due to the proposed mining at the Project at any point during active future mining through to the end of mining. The maximum incremental drawdown is an aggregate of the maximum groundwater level drawdown values recorded at each model cell at any time during the future active mining years.

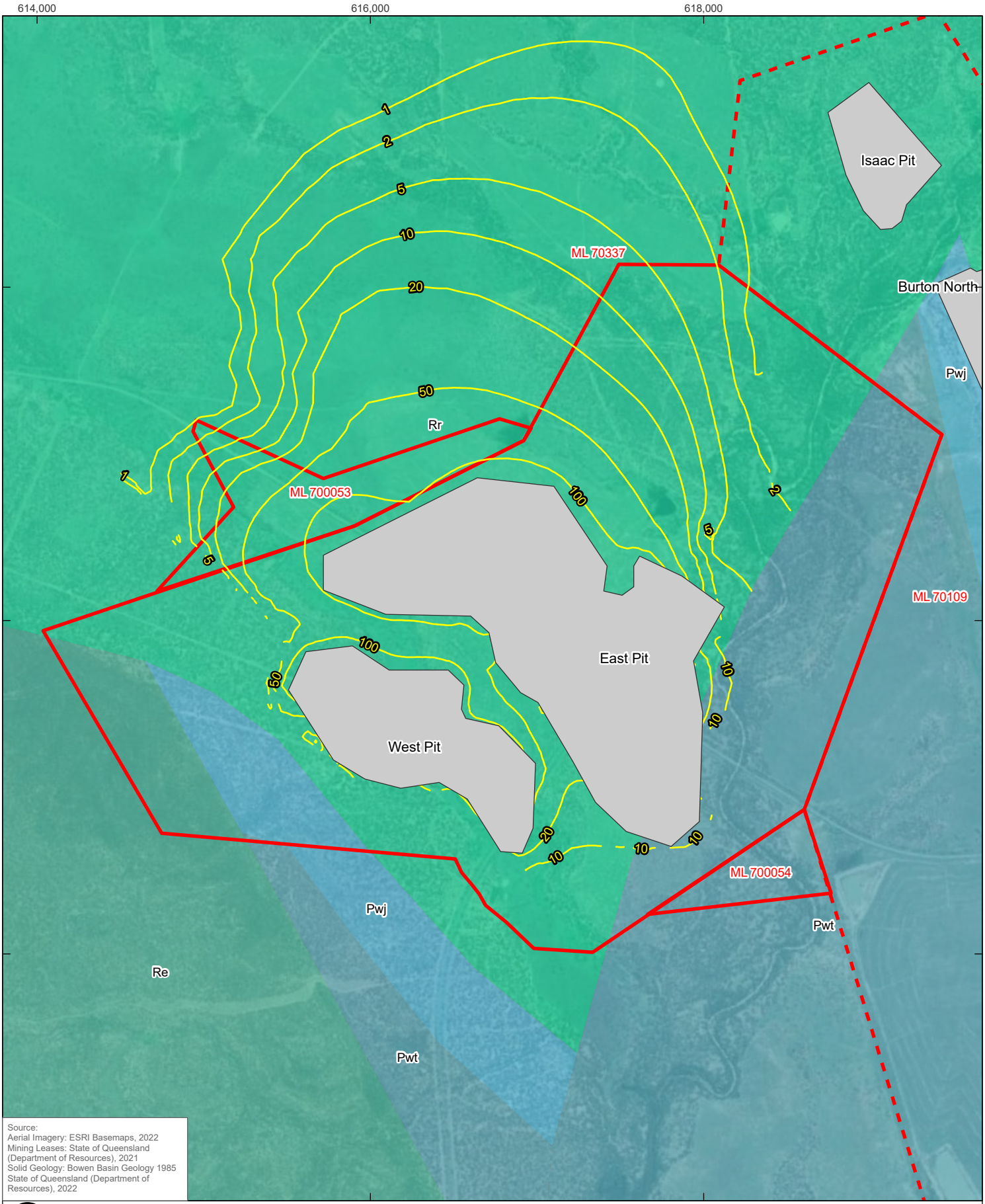
4.2.2.1 During Mining

During the life of the Project, groundwater depressurisation of aquifers due to direct take and pit inflow will lead to local drawdown of the water table and potentiometric surfaces around the Project site. Modelling predicts a steep groundwater cone of depression around the Project pit, mainly due to the low horizontal hydraulic conductivity of the units. The Project is predicted to result in long-term depressurisation of the coal seams in the vicinity of the mine.

The Leichhardt / Vermont seams of the Permian Rangal Coal Measures are the lowermost target coal resource for future mining at the Project and is therefore subject to direct mining impacts, and accordingly would be expected to show the largest groundwater level impacts for all the hydrostratigraphic units at the Project and surrounds.

Predicted Project related maximum incremental drawdown contours for the Leichhardt / Vermont coal seams over the duration of the groundwater model simulation are provided in **Figure 4-2**. Predicted depressurisation of the Permian coal seams extends approximately 2.5 km to the northeast, as the Permian units sub-crop to the south and west of the Project pits and the model layers are not present.

Figure 4-3 shows that the maximum incremental drawdown predicted in the Isaac River alluvium due to proposed mining at the Project reaches up to 12 m in magnitude along the south-eastern edge of East Pit, where the Isaac River is within 150 m of the mine pit crest. Predicted drawdown of approximately 2 m in the alluvium extends 2 km downstream and 1 km upstream of East Pit at the Project.



Source:
Aerial Imagery: ESRI Basemaps, 2022
Mining Leases: State of Queensland (Department of Resources), 2021
Solid Geology: Bowen Basin Geology 1985 State of Queensland (Department of Resources), 2022

0 0.5 1 km

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:30,000 at A4
Project Number:	620.040892.00001
Date Drawn:	02-Sep-2024
Drawn by:	RB

LEGEND

- Maximum Drawdown (m)
- Project Area
- Burton Mining Lease
- Mining Disturbance Area

Solid Geology

- Clematis Group (Re)
- Fair Hill Formation,Fort Cooper Coal Measures (Pwt)
- Rangal Coal Measures,Bandanna Formation,Baralaba Coal Measures (Pwj)
- Rewan Group (Rr)

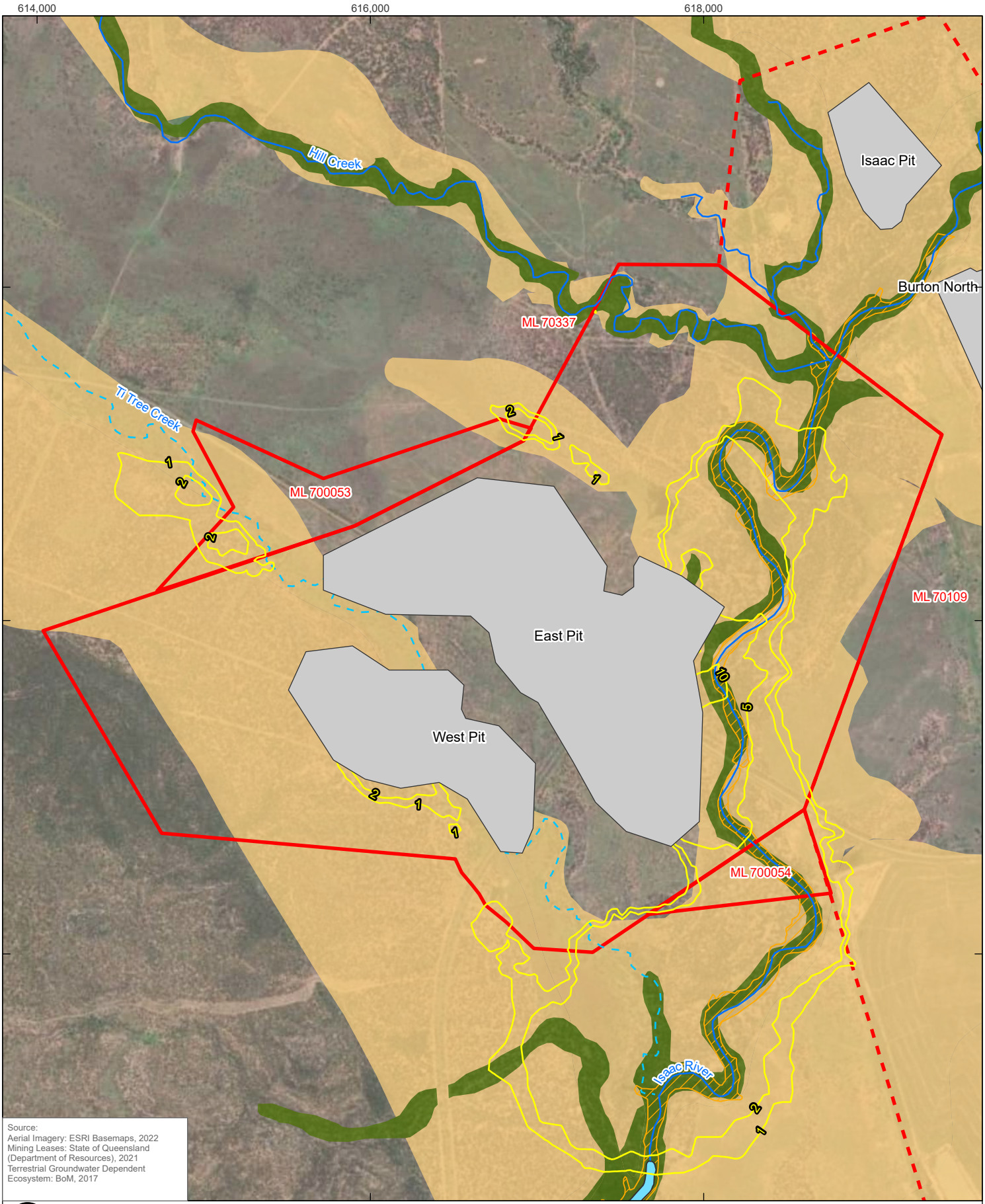
NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

MAXIMUM INCREMENTAL DRAWDOWN IN THE PERMIAN LEICHHARDT/ VERMONT COAL SEAMS

SLR

FIGURE 4-2

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F05-01_Maximum Incremental Drawdown in the Permian Leichhardt Vermont Coal Seams



Source:
Aerial Imagery: ESRI Basemaps, 2022
Mining Leases: State of Queensland (Department of Resources), 2021
Terrestrial Groundwater Dependent Ecosystem: BoM, 2017

0 0.5 1 km

Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:30,000 at A4
Project Number:	620.040892.00001
Date Drawn:	02-Sep-2024
Drawn by:	RB

LEGEND

- Maximum Drawdown (m)
- Major Watercourse
- Non-designated Watercourse
- Project Area
- Burton Mining Lease
- Burton Gorge Dam
- Mining Disturbance Area
- Alluvium (Modelled Extent)
- Ground-truthed Known/Likely GDE Area (3D Environmental, 2023)

Terrestrial Groundwater Dependent Ecosystem (BoM, 2017)

- High potential GDE

NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

MAXIMUM INCREMENTAL DRAWDOWN IN THE ALLUVIUM

SLR

FIGURE 4-3

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F05-02_Maximum Incremental Drawdown in the Alluvium

4.2.2.2 Post-Mining

Groundwater levels in the Permian coal measures are expected to recover partially in the post-mining period. The recovery of groundwater levels in the coal measures is governed by the recovery of the void lakes, with the final lake levels dictating the degree to which groundwater levels in the surrounding spoil and natural geologies recover. Ongoing limited recovery of Permian coal measures groundwater levels (and residual void lake formation) has the net effect of limiting the potential impacts of closure on the groundwater system by maintaining a permanent inwards hydraulic gradient in the groundwater system towards the residual void lakes, and thus it is assessed that there no potential for potentially poor quality groundwater in the spoil or water in the residual void lakes to discharge to the receiving environment (such as shallow aquifer systems).

4.2.3 Groundwater Dependent Ecosystems

As discussed in **Section 3.2**, based on the results of the GDE ground truthing survey, it was concluded by 3D Environmental (2023) that riparian vegetation associated with the Isaac River floodplain and alluvium (Terrestrial GDEs; TGDEs) presents the only GDEs identified within the vicinity of the Project. The location of the TGDEs identified by 3D Environmental (2023) are restricted to a narrow passage along the Isaac River (**Figure 3-3**).

Predicted maximum incremental alluvium drawdown from the SLR (2024b) groundwater model shows the area mapped as containing known/likely TGDEs by 3D Environmental (2023) is expected to experience drawdowns of typically between 1 and 5 m, but up to 12 m drawdown in a small area (**Figure 4-3**).

Potential impacts to the identified TGDEs were assessed by 3D Environmental (2023) following the steps set out in the GDE Toolbox (Richardson et al 2011). The major impact mechanisms and potential impacts to groundwater vegetation resulting from the Project as discussed by 3D Environmental (2023) include:

- Direct Clearing: within the disturbance footprint will impact 2.21 ha of mapped TGDEs on the Isaac River; however, these impacts will be mitigated by reducing construction width of linear infrastructure and rehabilitating construction disturbance.
- Depressurisation / dewatering: Drawdown of the basal alluvial groundwater unit may result in faster drying of the soil profile, and possibly reduced seasonal persistence of the hydraulically separate overlying perched groundwater unit relied upon by the TGDEs, if hydraulic linkage between these two units occurs. The magnitude of impact will depend on the degree of disconnection (if any) between the seasonally variable perched and the basal alluvial groundwater units, and whether any vegetation associated with the mapped TGDE areas have developed deeper rooting systems which penetrate to the basal alluvial groundwater unit.

The risk to TGDE function due to depressurisation/dewatering is however ameliorated due to the following factors:

- The limited to no hydraulic connectivity between the perched and basal alluvial groundwater systems based on the current understanding of the interactions between these two groundwater units.
- Tree species which characterise the riparian GDE areas, particularly forest red gum (Eucalyptus tereticornis), are resilient and have capacity to adapt to the possible minor reductions in soil moisture availability that may propagate above areas of groundwater drawdown.
- The groundwater hosted in the seasonally variable perched groundwater unit that supports GDEs is subject to natural volume fluctuations in response to changing

seasonal conditions and may dry for significant periods. This means that dependent vegetation will be adapted to varying degrees of moisture availability.

- The seasonally variable perched groundwater system that supports GDEs on the frontage of the Isaac River is supported and recharged by surface flows. The impact of the Project on surface flows is negligible.

Mapped known/likely GDE areas outside of the area of groundwater drawdown in the alluvium are not considered to be at risk from Project development.

To detect potential impacts to the health and function of TGDEs associated with the Project a GDEMMP has been prepared for the Project (3D Environmental, 2024). The GDEMMP is designed to accommodate for uncertainties in ecological response of GDEs to disturbance. This GDEMMP will provide methods for the early detection of impacts through development of trigger thresholds of ecological condition and proposes mitigations to be applied should decline in ecological condition be linked to project related mining operations.

As mentioned earlier, field investigations at the Project (AARC, 2024; 2019b) have identified groundwater does not discharge to the surface or maintain surface pools, and as a result does not support aquatic GDEs and therefore no associated impacts to aquatic GDEs could occur.

4.2.4 Landholder Bores

Chapter 3 of the *Water Act 2000* (Water Act) defines bore drawdown trigger thresholds for consolidated and unconsolidated aquifers as 5 m and 2 m, respectively, with drawdowns above the relevant bore trigger threshold considered to have a potential material impact on bore yield.

As discussed in **Section 3.2.2**, a landholder bore census identified one current bore in use that is used for stock watering (BA-01), as well as seven other bores that are not currently in use, three of which have been blocked or filled (BA-05, BA-02, BA-03, BA-04 and BA-06, BA-07, BA-12 respectively, **Figure 3-3**). A search of the GWDB also identified one potential third-party bore (RN85414) located 8.7 km northeast of the Project (**Figure 3-3**). No impacts are predicted to these bores by the SLR (2024b) numerical groundwater model, as the bores are all located outside of the extent of predicted drawdown of >1 m.

4.3 Impacts on Groundwater Quality

4.3.1 Groundwater Movement Induced Quality Changes

Potential impacts from the Project activities have been identified as primarily groundwater level drawdown as a result of mining. Groundwater level drawdown has the potential to result in groundwater quality changes where the drawdown results in changes in aquifer potentiometric head gradients sufficient to cause significant alteration of groundwater flow systems, and moves groundwaters of different quality into different areas of the hydrogeologic system. Furthermore, groundwater level drawdown also has the somewhat less likely potential to result in desaturation and oxidation of the aquifer matrix that results in release of the matrix chemical constituents into groundwater. This type of oxidation effect may also occur within overburden spoil emplacements associated with the Project.

4.3.2 Potential Sources of Contamination During Mining

Project related activities that have the potential to directly release contaminants to groundwater include fuel and waste storage, including mine waste (spoil and tailings). Project related activities that have the potential for direct groundwater quality impacts through contaminant release (e.g. fuel spills) are managed through established industry standard practices such that any spills would be minor, localised and subject to standard onsite remediation and management. Blasting activities also have the potential to release contaminants such as ammonia to groundwater. More significant potential sources of contaminants include spoil and tailings. Tailings will be emplaced within purpose designed and engineered in-pit tailings facilities, whilst spoil emplacements are subject to continual rehabilitation (contouring and capping with topsoil) over the life of Project operations as part of the mining plan. The inwards hydraulic gradients within the local groundwater system created by active mine pits will prevent migration of seepage from spoil and/tailings, or other potential contaminant release such as from blasting, to the groundwater system offsite.

4.3.3 Potential Sources of Contamination Post-Mining

Post-mining, spoil and tailings contained within the rehabilitated final landform continue to form potential sources of contaminants to groundwater. Additionally, perpetual lakes are predicted to form within the residual void in the rehabilitated final landform (SLR, 2024a) with the lake subject to evapoconcentration of dissolved salts and other constituents. The residual void lake is therefore also a potential source of contaminants to groundwater post-mining. Planned rehabilitation strategies for spoil and tailings will minimise the potential for generation of seepage reporting to groundwater. Furthermore, modelling shows residual void lakes would be hydraulic sinks, both capturing any local poor quality seepage from tailings or spoil, and preventing lake water movement outwards to the surrounding groundwater system (SLR, 2024a).

4.3.4 Characterisation of Potential Groundwater Quality Impacts

At a single monitoring bore location, the potential groundwater quality changes identified above may manifest as one or a combination of:

- Changes to groundwater salinity (measured as electrical conductivity (EC) or Total Dissolved Solids (TDS).
- Changes to groundwater pH.
- Modification of the ionic composition of the groundwater.
- Changes to the concentration of metal and metalloids in groundwater.
- Changes to the concentration of nitrogen compounds (‘nutrients’) in groundwater.

5.0 Groundwater Monitoring and Management Program

5.1 Overview

This GMMP has been developed for the New Lenton Project to assess the mining activities potential impacts on groundwater resources as discussed in the previous sections.

This GMMP has been developed to be consistent with the Projects EA, AWL and PRCP (refer **Table 1-1**) and is intended to support future versions as well as other groundwater related approvals.

5.2 Monitoring Network

The Project groundwater monitoring network has resulted from extensive field work and the use of collected data to update conceptual modelling as detailed in SLR (2024a).

The GMMP monitoring network includes reference and compliance bores as detailed in **Table 5-1** and shown in **Figure 5-1**. Compliance bores are bores that have impact criteria thresholds established in the GMMP, whereas reference bores are bores primarily intended to provide for background (upgradient) monitoring data outside of the potential mining impact area that would support the assessment of any limit or trigger breach at a compliance bore.

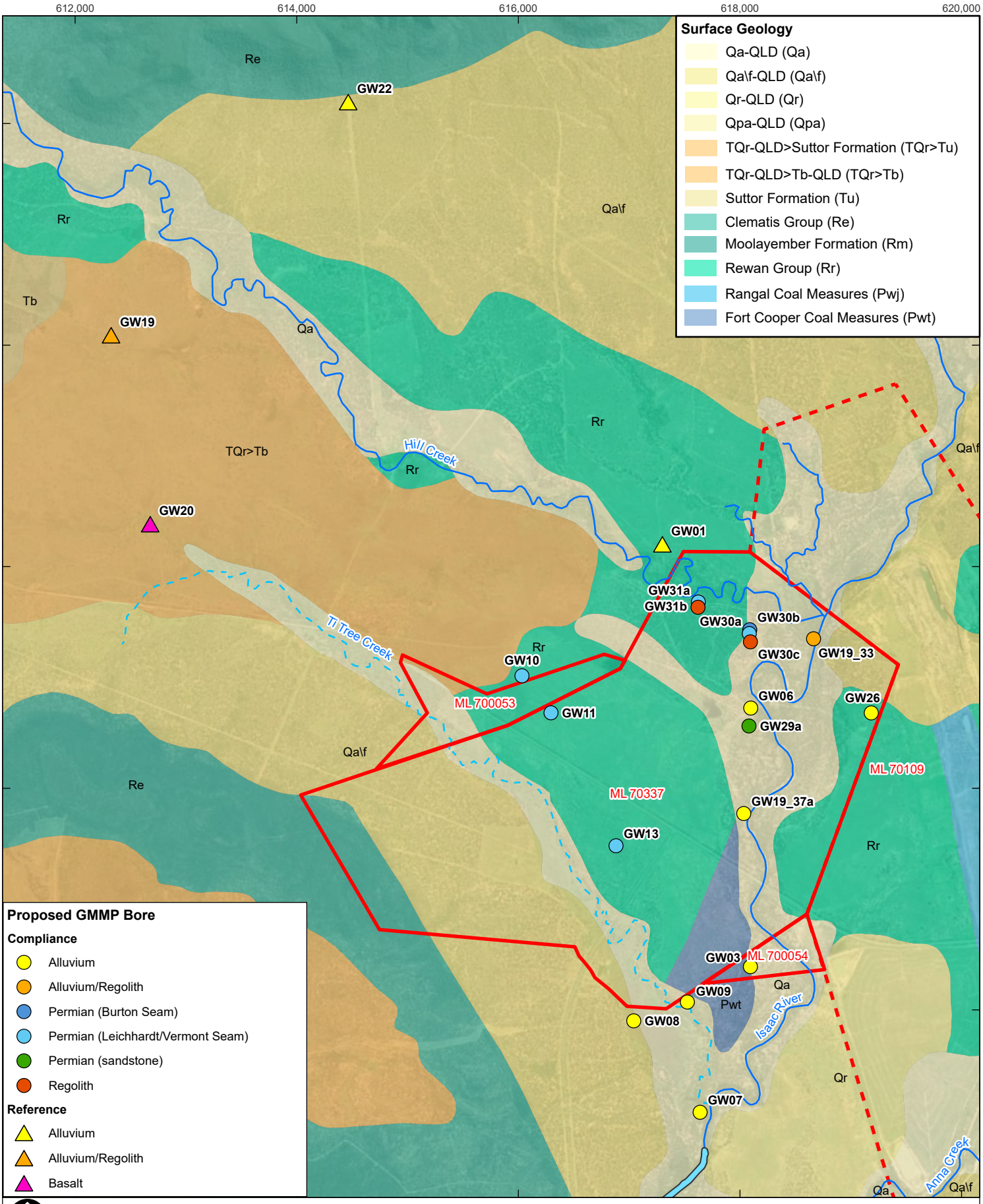
It is noted that the four additional shallow bores proposed to be installed as part of the GDEMMP (3D Environmental, 2024) (refer **Section 3.2.1**) are not included in the table below, given that their primary purpose is to inform GDE monitoring. However, any data collected from these bores will none the less be considered in any future updates to this GMMP.

Table 5-1 Project GMMP Monitoring Network

Bore	Easting[1]	Northing[1]	Casing RL (mAHD)	Bore Depth	Screen (mBGL)	Aquifer	Status	Current AWL Bore?	Current EA Bore?	Proposed GMMP Bore
GW01	617299	7618210	326.8	15.2	6.17 – 12.17	Alluvium	dry	Reference	Interpretation	Reference
GW19	612323	7620097	376.7	26.5	22.9 – 25.9	Alluvium/Regolith	dry	Reference	-	Reference
GW20	612676	7618392	355.5	33.9	24 – 30	Basalt	Active	Reference	-	Reference
GW22	614463	7622201	401.7	11.6	5 – 8	Alluvium	dry	Reference	-	Reference
GW23	617807	7622169	369.9	11.6	5 – 8	Alluvium	dry	Reference	-	Reference
GW06	618097	7616723	313.9	20.6	3.6 – 18.6	Alluvium	dry	Compliance	Compliance	Compliance
GW03	618094	7614389	307.6	12.1	3.1 – 12.1	Alluvium	dry	Compliance	Compliance	Compliance
GW09	617525	7614070	307.1	24	6 – 18	Alluvium	Active	Compliance	Compliance	Compliance
GW19_37a	618034	7615771	309.6	26	16.5 – 20.0	Alluvium	Active	Compliance	Compliance	Compliance
GW08	617041	7613900	306.7	11.7	5.72 – 8.72	Alluvium	dry	Compliance	Compliance	Compliance
GW07	617640	7613075	299.5	24.5	9 – 18	Alluvium	Active	Reference	Compliance	Compliance
GW26	619185	7616679	315.7	9.6	6 – 9	Alluvium	dry	Compliance	-	Compliance
GW19_33	618664	7617348	312	16	11.1 – 12.6	Alluvium/Regolith	Active	Compliance	Compliance	Compliance
GW30c	618094	7617368	318.2	31.1	23 – 29	Regolith	Active	Compliance	Compliance	Compliance
GW31b	617621	7617680	322*	21.2	17 – 20	Regolith	Active	Compliance	Compliance	Compliance
GW30b	618088	7617382	318.5	76.2	70 – 73	Permian (Burton Seam)	Active	Compliance	Compliance	Compliance
GW10	616032	7617014	335.2	205.1	178.16–190.16	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW13	616881	7615480	319.3	192.4	170.5 – 179.5	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW30a	618084	7617395	318.5	112.2	97 – 109	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance

Bore	Easting[1]	Northing[1]	Casing RL (mAHD)	Bore Depth	Screen (mBGL)	Aquifer	Status	Current AWL Bore?	Current EA Bore?	Proposed GMMP Bore
GW31a	617624	7617680	321.9*	165.2	153 – 162	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW11	616294	7616680	332.3	150	114 – 126	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW29a	618081	7616561	313.6	83.6	62 – 80	Permian (sandstone)	Active	Compliance	Compliance	Compliance

1 Coordinates are GDA94 z55
* Ground level
L/V = Leichhardt / Vermont Seam



Coordinate System:	GDA2020 MGA Zone 55
Scale:	1:45,000 at A4
Project Number:	620.040892.00001
Date Drawn:	02-Sep-2024
Drawn by:	RB

NEW LENTON COAL PROJECT GROUNDWATER MONITORING AND MANAGEMENT PLAN

GMMP MONITORING NETWORK

SLR

FIGURE 5-1

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F06-01_GMMP Monitoring Network

5.3 Monitoring Regime – Baseline and During Mining

Routine monitoring prior to the commencement of the mining operation (i.e. baseline period) will provide for continued assessment and characterisation of the pre-mining groundwater system, including quantification of natural variability. Continuing to capture data to quantify natural variability is important on the context of allowing the LJV to distinguish any future mining related impacts from inherent natural variability later during the Project's operational phase. Consistent with condition D2 of the EA, the baseline monitoring program will continue until the during mining monitoring phase commences.

Routine monitoring during the mining operation will provide early warning of any variation in response of the groundwater system to that predicted. This will enable the LJV to undertake mitigation measures to minimise any potential groundwater related impacts, such as to surrounding groundwater users and the environment, e.g. through the implementation of make-good measures or measures described in the GDEMMP (3D Environmental, 2024).

5.3.1 Groundwater Levels

5.3.1.1 Manual Measurements

Groundwater level monitoring will be undertaken as follows:

- On a quarterly basis for compliance bores where Groundwater Level Trigger Thresholds and Level Reference Values have been established.
- On a quarterly basis for reference bores.
- On a bi-monthly (every 2 months) basis for compliance bores where Groundwater Level Trigger Thresholds or Level Reference Values are not yet defined, until such time as they are established or its determined that a bore is permanently dry.

5.3.1.2 Data Loggers

Groundwater level monitoring will be undertaken using automated level loggers in each of the GMMP bores listed in **Table 5-1**. The status of current data logger installation across the GMMP bores is provided in **Table 5-2**. It is noted that there are currently loggers installed within six non-GMMP bores within the mining disturbance area i.e. at GW19_40, GW19_41a, GW19_41b, GW27a, GW28a and LEN486, including seven groundwater level loggers and one barometric logger. It is recommended to move the loggers to the GMMP bores that do not have loggers prior to the commencement of mining operations, including the barometric logger currently installed within GW19_41b. Of the bores listed in the table below, it is noted that even if some bores are listed as dry, then the logger installation would allow measurement of groundwater levels if the bore becomes saturated. Furthermore, the resetting of loggers in dry bores at quarterly intervals will act to mitigate instrument drift due to being dry.

Pursuant to condition 42 of the AWL, logging intervals will be set to record a measurement at daily intervals.

A barometric pressure logger will be installed to the GMMP bores (or moved from GW19_41b which is in the proposed mining footprint) and the water level logger data will be barometric pressure corrected using the barometric pressure logger data prior to any analysis.

Loggers will be downloaded at least every three months. At the time of each download, a manual water level measurement will be recorded at each bore using a conventional groundwater level monitoring e-tape to confirm logger data accuracy. Any discrepancies observed in the automated monitoring data when compared to the manual measurements

will be immediately investigated and where necessary the loggers reset or replaced to ensure data reliability. Loggers installed into dry bores should be reset at each monitoring event if the bore remains dry to mitigate instrument drift.

Table 5-2 GMMP Bore Data Logger Status

Bore	Aquifer	Status	Bore Type	Logger installed?
GW01	Alluvium	dry	Reference	N - repurpose logger from bores in mining footprint
GW19	Alluvium/Regolith	dry	Reference	N - repurpose logger from bores in mining footprint
GW20	Basalt	Active	Reference	N - repurpose logger from bores in mining footprint
GW22	Alluvium	dry	Reference	N - repurpose logger from bores in mining footprint
GW23	Alluvium	dry	Reference	N - repurpose logger from bores in mining footprint
GW06	Alluvium	dry	Compliance	Y (bore dry)
GW03	Alluvium	dry	Compliance	N - repurpose logger from bores in mining footprint
GW09	Alluvium	Active	Compliance	Y (bore dry)
GW19_37a	Alluvium	Active	Compliance	Y
GW08	Alluvium	dry	Compliance	N - repurpose logger from bores in mining footprint
GW07	Alluvium	Active	Compliance	Y
GW26	Alluvium	dry	Compliance	N - repurpose logger from bores in mining footprint
GW19_33	Alluvium/Regolith	Active	Compliance	Y
GW30c	Regolith	Active	Compliance	Y
GW31b	Regolith	Active	Compliance	Y
GW30b	Permian (Burton Seam)	Active	Compliance	Y
GW10	Permian (L/V Seam)	Active	Compliance	Y
GW13	Permian (L/V Seam)	Active	Compliance	Y
GW30a	Permian (L/V Seam)	Active	Compliance	Y
GW31a	Permian (L/V Seam)	Active	Compliance	Y
GW11	Permian (L/V Seam)	Active	Compliance	Y
GW29a	Permian (sandstone)	Active	Compliance	Y

5.3.2 Groundwater Quality

5.3.2.1 Overview

Groundwater quality sampling will be undertaken as follows:

- On a quarterly basis for compliance bores where Groundwater Quality Limits have been established.
- On a quarterly basis for reference bores.
- On a bi-monthly (every 2 months) basis for compliance bores where Groundwater Quality Limits are not yet defined, until such time as they are established, or its determined that a bore is permanently dry.

5.3.2.2 Parameter Suite

The groundwater quality parameter suite identified in **Table 5-3** has been selected to detect the potential changes in groundwater quality outlined in **Section 4.3** as they may relate to causing harm to the relevant groundwater EVs (further detail provided in **Appendix A**).

Table 5-3 Groundwater Quality Parameter Suite

Parameter Group	Parameter	Unit	Method
Physico-chemical parameters	pH		Field
	Electrical Conductivity (EC)	µS/cm	Field and Lab
	Total Dissolved Solids (TDS)	mg/L	Lab
Major Ions	Sodium	mg/L	Lab
	Calcium	mg/L	Lab
	Magnesium	mg/L	Lab
	Potassium	mg/L	Lab
	Chloride	mg/L	Lab
	Sulfate	mg/L	Lab
	Carbonate	mg/L	Lab
	Bicarbonate	mg/L	Lab
Nutrients	Ammonia as N	mg/L	Lab
Metals (dissolved and total)	Aluminium	mg/L	Lab
	Arsenic	mg/L	Lab
	Boron	mg/L	Lab
	Cadmium	mg/L	Lab
	Cobalt	mg/L	Lab
	Chromium	mg/L	Lab
	Copper	mg/L	Lab
	Mercury	mg/L	Lab
	Lead	mg/L	Lab
	Manganese	mg/L	Lab
	Molybdenum	mg/L	Lab
	Nickel	mg/L	Lab
	Silver	mg/L	Lab
	Selenium	mg/L	Lab
	Uranium	mg/L	Lab
	Vanadium	mg/L	Lab
	Zinc	mg/L	Lab

5.4 Monitoring Regime – Post-Mining

Pursuant to condition PRCP6 of the PRCP, monitoring and maintenance must be carried out in accordance with the monitoring and maintenance program described in the rehabilitation planning part relating to the PRCP schedule; and any requirement under the PRCP schedule, as detailed within this Section, and **Sections 6.1.8.2** and **7.1.4** of this report (refer **Table 1-1**).

The GMMP groundwater monitoring program will continue unchanged in the post-mining period until relinquishment of the EA and MLs, with the exception of incorporating any additional requirements that may arise through the PRCP implementation process.

The post-mining monitoring program will also include additional monitoring for the void lake as follows:

- Void Water Level - Quarterly survey consistent with the frequency of groundwater level monitoring at groundwater bores.
- Void Water Quality – Quarterly sampling consistent with the frequency and parameter suite (**Section 5.3.2.2**) for groundwater quality monitoring at groundwater bores.

The GMMP will continue to be implemented during the post-mining period until such time as mining lease relinquishment is achieved, in accordance with relevant State regulatory approvals associated with satisfactory completion of implementation of the PRCP. These statutory obligations will include assessment and demonstration that the ongoing risk to groundwater associated with the final landform has been successfully managed and mitigated.

Consistent with condition RM8 of the PRCP, LJV will continue groundwater monitoring after the completion of final landform establishment and surface preparation (i.e. post-mining and completion of landform construction and topsoiling):

- Quarterly for water quality a minimum period of 5 consecutive years, at but not limited to compliance bores and for all quality characteristics; and
- Quarterly for groundwater level for 10 consecutive years.

After 5 years of rehabilitation monitoring, a review is to be undertaken to determine if there is a requirement for additional monitoring, or if post-mining groundwater system behaviour is sufficiently consistent with model predictions of minimal potential for groundwater environmental impact such that monitoring can be discontinued.

6.0 Quality Assurance / Quality Control

The QA/QC procedures that will be adopted by LJV are detailed in the following sections.

6.1 Field Procedures

Field procedures are detailed in **Sections 6.1.1** to **6.1.6** and have been developed to be compliant with the following guidelines:

- Groundwater Sampling and Analysis—A Field Guide (Geoscience Australia, 2009);
- DES (2018). Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government.
- Australian and New Zealand Standard AS/NZS 5667.1:1998 Water quality - Sampling - Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS/NZS5667).

6.1.1 Qualified Personnel

Groundwater monitoring will be undertaken by appropriately qualified personnel with experience in conducting groundwater monitoring and sampling programs in accordance with the above mentioned guidelines.

6.1.2 Equipment Calibration

All field equipment will be maintained according to the accordance with the manufacturer's recommendations.

The field water quality meter used during the program implementation will be calibrated to the relevant calibration standard solutions daily, and prior to each day's work. Daily calibration records will be noted in a dedicated register and provided with the monitoring event report (see **Section 6.1.6**) for record keeping purposes.

6.1.3 Equipment Decontamination

All field equipment used in the execution of the GMMP monitoring program will be thoroughly decontaminated before and after conducting any field measurements and sampling at each and every bore. This decontamination process includes the water level dip meter probe and tape, field water quality meter, and water quality sample pumps and tubing.

6.1.4 Groundwater Level Measurement Procedure

Manual groundwater level measurements will be collected by appropriately qualified personnel using an industry standard groundwater level e-tape prior to any disturbance for groundwater quality sample collection at any bore. The e-tape will be checked for operational readiness before each use, including a test of the probe function prior to use in the field. Measurements of the groundwater level will be taken from the top of the PVC casing at each bore.

6.1.5 Groundwater Quality Sampling Procedures

Pursuant to condition D13 of the EA, groundwater quality sampling must be performed by suitably qualified personnel. Groundwater quality sampling procedures have been developed to be compliant with the following guidelines listed in **Section 6.1** and are detailed in the below sections.

6.1.5.1 Bore Purging Procedures

In accordance with the above listed guidelines, appropriate groundwater sampling procedures require that stagnant water that has been standing in the bore casing be purged prior to collection of a groundwater sample, so that sample is representative of the groundwater within the aquifer screened by the bore. The following purge methods will be adopted depending on which is more appropriate depending on the characteristics of each bore being sampled (e.g. bore depth, water column height, and rate of inflow to the bore):

- Three bore volumes/parameter stabilisation via a conventional submersible purge pump; or
- Low-flow sampling using specialised low-flow sampling equipment.

6.1.5.2 Field Water Quality Readings

Recording of field water quality parameters will be undertaken using appropriate field water quality equipment, after bore purging is confirmed to be satisfactorily complete with parameter stabilisation confirmed. The equipment will be calibrated prior to use as outlined in **Section 6.1.2**.

6.1.5.3 General Sample Collection Procedures

Following confirmation of field parameter stabilisation identifying representative aquifer water is being produced from the bore, groundwater samples will be collected from each bore in the monitoring program. Groundwater samples will be collected as follows.

- Only collected once parameter stabilisation has been confirmed.
- Collected in accordance with the relevant guidelines.
- Placed into the appropriate laboratory supplied bottles containing any appropriate preservative solutions for the analyte suite to be tested.
- Clearly labelled with the Bore ID, sampling date/time and field personnel initials.
- Field filtered to 0.45 µm where relevant for particular bottles/analytes (e.g. dissolved metals).
- Placed onto ice in a cooler box with ice immediately after sampling for transfer to the analytical laboratory.
- Following sampling, all equipment will be cleaned and decontaminated in preparation for moving to the next bore.

Sample transfer will occur under industry standard Chain of Custody (CoC) protocols/documentation and within the relevant holding times for each parameter. Copies of each CoC form will be taken in the field prior to shipping the samples and the CoC forms will be included with the monitoring data (see **Section 6.1.6**) for record keeping purposes.

6.1.5.4 Quality Control Samples

The DES Monitoring and Sampling Manual (DES, 2018) provides guidance on the types of quality control measures and the frequency of collection of quality control samples. The types and quantities of quality control samples that will be taken are explained in the below text.

Sample Duplicates

Duplicate samples are used to check and provide consistency in laboratory analytical processes. Duplicate samples involve the collection of a second set of samples from a bore

in an identical manner to the primary samples. The duplicate samples will be tested for the same analytical suite as the primary samples. Additionally, duplicate samples will be collected as “blind duplicates”, where an alternate naming convention is adopted for the duplicates so that the analytical laboratory cannot match a duplicate sample to its relevant primary sample. The blind duplicate sample will be clearly matched to its relevant primary sample in the field documentation (see **Section 6.1.6**).

One duplicate sample will be collected for every 10 primary samples per monitoring event (or one per program when there are less than 20 samples).

Sample Blanks

Blank samples are used to identify if any possible sample contamination has occurred during the sample collection and storage/shipping process. Blank samples will be tested for the same analytical suite as the primary samples. Two types of sample blanks will be adopted in the program:

- Field blank.
    - Deionised water is placed into sample containers whilst in the field and stored/transported to the analytical laboratory in the same manner as the primary samples. The container blank testing is used to identify if any contamination of samples may have occurred as a result of the sample collection process or use of non-sterile sample containers.

One field blank will be collected per monitoring event.

- Rinsate / Equipment Blank
    - Following field equipment cleaning/decontamination in the field, deionised water is poured over and through the field equipment and then placed into sample containers and stored/transported to the analytical laboratory in the same manner as the primary samples. The equipment blank testing is used to identify if any contamination of samples may have occurred as a result of insufficient equipment cleaning/decontamination processes.

One Rinsate / Equipment blank will be collected per monitoring event.

6.1.5.5 Field Sheet Documentation

LJV will compile all field documentation at the conclusion of each monitoring event in conjunction with the monitoring data (see **Section 6.1.6**). A Field Sheet (field documentation) will be developed by the field team for use during the monitoring program at each bore being monitored.

The Field Sheet will be used to record the following information:

- The date, time and the monitoring point on which the sample was taken and the results of all monitoring (Pursuant to condition D16 of the EA) (noting that the resting standing water level measurement will be recorded pre purging/sampling).
- Date and time when purging commenced.
- Details of the purging method including pump/intake depth.
- Records of field water quality parameters during purging at routine time intervals.
- Colour and odour of purged water during purging at routine time intervals.
- Purge time, volume and standing water level during purging at routine time intervals.
- Observations of any degassing of water during purging.

- Sample collection date, time and ID, including the ID of any QA/QC (e.g. duplicate) samples taken.
- A daily calibration record for the field water quality meter.
- Any notes relating to condition of the bore e.g. headworks and general surrounding area.

A daily report will be emailed to the LJV environment team manager containing:

- The field sheet information as above;
- A completed Chain of Custody (CoC) record for samples;
- A digital photographic record for each bore, clearly labelled with the bore ID, showing condition of the headworks and the general area.

6.1.6 Factual Field Work Reporting

Following each monitoring event, all factual data will be prepared for record keeping purposes.

This will contain the following information:

- Summary details regarding the dates of the field program covered by the report.
- Identification of staff who undertook the program and their relevant qualifications.
- Details of any monitoring restrictions encountered during the program.
- A summary table of measured standing water levels.
- A summary table of final field groundwater quality measurements.
- A summary of the water quality sampling.
- Details of sample QA/QC.
- Appendices containing:
- Laboratory Certificate of Analysis (COA)
- Field Sheets for each bore;
- The daily Calibration Record for the field water quality meter;
- Copies of the Chain of Custody (CoC) form(s); and
- The photographic record for each bore.

Additionally, electronic appendices will be attached containing:

- The site water quality and level database (excel format); and
- Laboratory water quality analysis data (excel format).

6.1.7 Sample Analysis Quality Assurance and Laboratory Procedures

Groundwater sample analysis will be undertaken by a laboratory accredited by the National Association of Testing Authorities (NATA).

The sample analysis will include duplicates and blanks collected in the field consistent with industry standard QA/QC procedures compliant with the relevant guidelines, as described in **Section 6.1.5.4**.

Additionally, the NATA accredited laboratories will employ as standard practice an internal QA/QC program (intra-lab QC) that will include laboratory control samples, method blanks, matrix spikes, laboratory duplicates and surrogates, at frequencies at or above those recommended in the NEPM (2013) guidelines.

6.1.8 Data Storage, Management and Processing

6.1.8.1 General

The data gathered from the GMMP groundwater monitoring program will be collated into a dedicated electronic database managed by the LJV Environment team. Data will be entered into the database after it is received by the LJV Environment team. The database will be routinely backed up in accordance with LJV electronic information backup procedures.

Pursuant to EA and AWL conditions, LJV will:

- Submit all groundwater monitoring data required by the EA or related to environmental management activities to the administering authority via WaTERS (condition D16 of the EA);
- Publish water level monitoring data required to be collected within 10 business days from measurement. Data must remain published and publicly available (condition 45 of the AWL);

Data will be managed and processed in the following steps:

1. Within the dedicated electronic database managed by the LJV Environment team, flags will be implemented to automatically identify data that breaches any of the Groundwater Quality Limits or Groundwater Level Trigger Thresholds established and thus automatically notify the LJV Environment Team personnel to enact the Groundwater Impact Investigation Procedure (see **Section 7.0**), the first step of which is to confirm the data validity.
2. The GMMP Annual Groundwater Monitoring Report (AGMR) (see **Section 8.1**) will include a thorough review of the groundwater monitoring database that will allow identification of any spurious data e.g. through comparison with baseline data and outlier analysis in accordance with the procedures identified in DES (2021).
3. Any formal investigation into the potential for environmental harm enacted as a result of a limit or trigger breach followed by implementation of the Groundwater Impact Investigation Procedure (see **Section 7.0**), will include identification of any spurious data through comparison with baseline data and statistical trend and outlier analysis in accordance with the procedures identified in DES (2021).

Should any of the above result in identification of spurious data, the LJV Environment team will implement an investigation into the source of the data error, including review of the data collection procedures (**Section 6.1**), and where relevant the sample analysis quality assurance and laboratory procedures (**Section 6.1.7**), to identify the source of the error, where possible. Where the error source is conclusively identified, the procedures identified in this GMMP will be updated if necessary, to mitigate the error reoccurring.

6.1.8.2 Post-Mining

Pursuant to condition PRCP7 of the PRCP, LJV will keep records in relation to relevant matters for a minimum of five years and provide such records to the PRCP's administering authority on request. Relevant records may include:

- Rehabilitation activities and the results of these activities
- Maintenance activities and the results of maintenance activities
- Monitoring activities and the results of monitoring
- Designs, drawings, specifications or any similar documents required under the PRCP schedule
- Certifications, assessments, investigations, inspections, audits or any similar processes carried out in relation to rehabilitation milestones or milestone criteria.

7.0 Groundwater Impact Criteria, Triggers and Investigation Procedures

7.1.1 Groundwater Level Reference Values

Groundwater Level Reference Values (i.e. Pre-mining baseline levels) established in this GMMP will be compared to the measured groundwater level for a bore at any point in time. The resulting computed groundwater level drawdown will be compared to the Level Trigger Thresholds for that bore (refer **Table 7-2**), where a computed groundwater level drawdown greater than the Level Trigger Threshold constitutes an exceedance under the EA.

Groundwater Level Reference Values for compliance bores are provided in **Table 7-1** and have been established based on the statistical analysis of the historical baseline dataset of each bore (**Appendix A**). Note that no Groundwater Level Reference Values are provided for GMMP reference bores, or for dry bores (refer **Table 5-1**).

The statistical analysis included QA/QC of the dataset to screen any outliers through a visual assessment of time series plots (further details provided in **Appendix A**). The time series plots and Mann-Kendall trend test (see **Appendix A**) highlight the fact that local groundwater levels are highly variable, with variability driven by natural causes (i.e. climate variability). Furthermore, the large range between the maximum and minimum groundwater levels presented in the summary statistics in (see **Appendix A**) highlights the fact that groundwater level change compliance criteria needs to appropriately recognise the significant natural variability in groundwater levels.

The Groundwater Level Reference Values have therefore been based on the 20th percentile of the baseline dataset summary statistics (see **Appendix A**), similar to the approach proposed within DES (2021) for establishing statistically appropriate groundwater quality limits. Adoption of the 20th percentile takes into account the historic variability in groundwater levels when proposing a bore specific groundwater level that will be compared to model predictions for EA compliance purposes.

Table 7-1 Groundwater Level Reference Values

Aquifer	Compliance Bore	20th Percentile (mAHD)
Alluvium	GW06	Dry bore, no Reference Level proposed
Alluvium	GW03	Dry bore, no Reference Level proposed
Alluvium	GW09	Dry bore, no Reference Level proposed
Alluvium	GW19_37a	297.8
Alluvium	GW08	Dry bore, no Reference Level proposed
Alluvium	GW07	294.0
Alluvium	GW26	TBA
Alluvium/Regolith	GW19_33	301.5
Regolith	GW30c	301.8
Regolith	GW31b	307.1
Permian (Burton Seam)	GW30b	301.4
Permian (L/V Seam)	GW10	299.2
Permian (L/V Seam)	GW13	296.1
Permian (L/V Seam)	GW30a	301.8
Permian (L/V Seam)	GW31a	305.9
Permian (L/V Seam)	GW11	300.8
Permian (sandstone)	GW29a	300.9

TBA = insufficient baseline data to compute reference levels at the present time.
L/V Seam = Leichhardt / Vermont Seam

7.1.2 Groundwater Level Drawdown Triggers (Level Trigger Thresholds)

Groundwater level drawdown triggers (Level Trigger Thresholds) established in this GMMP are used to establish groundwater level impact compliance criteria for the Project.

The predictive results of the New Lenton Project numerical groundwater model (SLR, 2024b) have been utilised to develop updated bore specific groundwater Level Trigger Thresholds for each proposed GMMP bore listed. Level Trigger Thresholds have been based on the following criteria:

- Level Trigger Thresholds have been calculated using the latest version of the New Lenton groundwater model (SLR, 2024b).
- Level Trigger Threshold derivation is based on the difference between the predicted groundwater level in the “no-mining” model, and the minimum (lowest) predicted water level at any time during the future modelled life of mining from the “cumulative mining” model (i.e. between the years 2024 and 2040 and considering the effects of the adjacent Burton Mine). That is, Level Trigger Thresholds are based on the predicted future groundwater level drawdown at each bore between 2024 and 2040 from the latest numerical groundwater model. Noting that the numerical groundwater model is actually an ensemble of calibrated models each with different parameter sets (SLR, 2024b), uncertainty in model predictions across the calibrated ensemble of models is considered as described in the following dot point.
- GMMP compliance monitoring bores have been assigned a Level Trigger Threshold value equal to the maximum cumulative 90th percentile model drawdown prediction at each bore over the future life of the New Lenton mining operation to 2040. Adoption of the 90th percentile prediction of drawdown allows for consideration of model predictive uncertainty to provide a conservative upper limit of groundwater level drawdown allowed under the EA.
- Where the maximum 90th percentile model drawdown prediction for the alluvium/regolith is less than the natural variability observed in the alluvium/regolith within the current monitoring dataset (see **Appendix A**) for a particular bore, then the trigger has been set equal to the range in observed natural variability at that bore to avoid the false enacting of a drawdown trigger that is only due to natural variability and not mining activities. For alluvium/regolith bores with no existing data, an average of the natural variability across the entire baseline dataset for alluvium/regolith bores with sufficient data has been used (i.e. 3.6 m).
- Where the proposed Groundwater Level Trigger Threshold resulting from either of the above two points would result in a level trigger elevation below the base of the model layer, then the Groundwater Level Trigger Threshold has been limited to drawdown to the base of the model layer.

The groundwater Level Trigger Thresholds derived using the methodology as above for compliance bores are presented in **Table 7-2**. Note that no Level Trigger Thresholds are provided for GMMP reference bores (refer **Table 5-1**), or for dry bores.

Table 7-2 Groundwater Level Trigger Thresholds

Aquifer	Compliance Bore	Level Trigger Threshold (m)
Alluvium	GW06	Dry bore, no Level Trigger Threshold proposed
Alluvium	GW03	Dry bore, no Level Trigger Threshold proposed
Alluvium	GW09	Dry bore, no Level Trigger Threshold proposed
Alluvium	GW19_37a	7.1[1,2]
Alluvium	GW08	Dry bore, no Level Trigger Threshold proposed
Alluvium	GW07	3.8[1]
Alluvium	GW26	3.6[3]
Alluvium/Regolith	GW19_33	3.4[4]
Regolith	GW30c	4.7[4]
Regolith	GW31b	3.7[4]
Permian (Burton Seam)	GW30b	9.2[1]
Permian (L/V Seam)	GW10	86.3[1]
Permian (L/V Seam)	GW13	75.1[1]
Permian (L/V Seam)	GW30a	10.1[1]
Permian (L/V Seam)	GW31a	23.8[1]
Permian (L/V Seam)	GW11	108.3[1,2]
Permian (sandstone)	GW29a	15.2[1]

L/V Seam = Leichhardt / Vermont Seam
1. Maximum cumulative 90th percentile modelled drawdown prediction.
2. Maximum drawdown limited to base of model layer.
3. Based on the range of natural variability observed at this bore.
4. Based on the average range of natural variability observed at all existing alluvium/regolith bores.

7.1.3 Groundwater Quality Limits

Groundwater Quality Limits established in this GMMP are used to establish groundwater quality impact compliance criteria for the Project.

Groundwater Quality Limits for compliance bores have been established in accordance with the DES (2021) guideline *"Using monitoring data to assess groundwater quality and potential environmental impacts"* as detailed in **Appendix A**.

The Groundwater Quality Limits are presented in **Table 7-3**. Note that no Groundwater Quality Limits are provided for GMMP reference bores (refer **Table 5-1**).

Table 7-3 Groundwater Quality Limits for Compliance Bores

Analyte	pH (Field)	EC (Lab)	Ca	NH_3-N	SO4	Al	As	B	Cd	Co	Cr	Cu	Hg	Pb	Mn	Mo	Ni	Ag	Se	U	V	Zn
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW06	6.5 - 8.5	TBD	TBD	0.9	TBD	0.055	0.013	TBD	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW03	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW09	6.5 - 8.5	TBD	TBD	0.9	42	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	TBD
GW19_37a	6.5 - 8.5	2500	1000	0.9	31	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.025	0.00005	0.005	0.002	0.006	TBD
GW08	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW07	6.5 - 8.5	8661	271	0.9	51	0.055	0.013	0.94	0.0002	0.004	0.001	0.0046	0.00006	0.0034	1.9	0.034	0.021	0.00005	0.005	0.012	0.006	0.038
GW26	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW19_33	6.5 - 8.5	720	63	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.018	0.00005	0.005	TBD	0.006	0.019
GW30c	6.5 - 8.5	15875	357	0.9	185	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW31b	6.5 - 8.5	2739	90	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.002	0.006	TBD
GW30b	6.5 - 8.5	18285	679	3.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.029
GW10	6.5 - 8.5	6244	60	1.3	25	0.055	0.013	0.94	0.0002	0.0014	TBD	0.0014	0.00006	0.0034	1.9	0.049	0.027	0.00005	0.005	0.0005	0.006	0.009
GW13	6.5 - 8.5	12700	143	3.5	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.024
GW30a	6.5 - 8.5	15600	299	3.6	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.023
GW31a	6.5 - 8.5	4820	23	1.0	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW11	6.5 - 8.5	4161	106	1.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.018
GW29a	6.5 - 8.5	9870	140	TBD	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.02

Note: Dissolved metals
TBD = To be defined once sufficient data becomes available
N/A = Not Applicable, reference bore, no trigger propose

7.1.4 Groundwater Exceedance Criteria and Investigation Procedure

Consistent with condition D4 of the EA and RM8 of the PRCP the results of groundwater quality monitoring from compliance bores (**Table 5-1**) must not exceed the bore specific Groundwater Quality Limits (**Table 7-3**) on three consecutive occasions.

Consistent with condition D5 of the current EA and RM8 of the PRCP the results of groundwater level monitoring from compliance bores (which are not dry) (**Table 5-1**) must not exceed any of the Groundwater Level Trigger Thresholds (**Table 7-2**).

A breach of the Groundwater Level Trigger Thresholds is confirmed where a comparison of the measured groundwater for a compliance bore at any point in time with the Reference Level for that bore results in a groundwater level drawdown greater than the Groundwater Level Trigger Threshold.

Any breach should be confirmed through conducting a data review and/or resample at the affected bore.

Pursuant to condition D7 of the current EA, if any monitoring result from groundwater compliance bores identified in **Table 5-1** exceed any of the Groundwater Quality Limits stated in **Table 5-3** on three consecutive occasions, or exceed any of the Groundwater Level Trigger Thresholds stated in **Table 7-2**, LJV must notify the administering authority within twenty-four (24) hours via WaTERS.

Following the initial notification given under EA condition D7, as per condition D8 of the EA, within fourteen (14) days of the notification, the LJV must commence an investigation to determine if the exceedance is a result of:

a) Mining activities authorised under the EA; or

b) Natural variation; or

c) Neighouring land use resulting in groundwater impacts.

If required, this investigation will be completed by a by an independent and appropriately qualified specialist in accordance with ANZECC and ARMCANZ (2000).

The investigation will include as a minimum:

- Comparison of the results for the bore subject to the breach with those from other bores, including comparison of Compliance bore results against Interpretation bore results;
- Review of groundwater flow pathways;
- Comparison to baseline groundwater monitoring results;
- A review of authorised mining activities that may be responsible for the breach;
- The prevailing and preceding natural conditions (e.g. meteorological conditions);
- A review of neighbouring land use and groundwater use; and
- A review of the physical integrity of the bore network (i.e. when an issue is identified by anomalous monitoring results).

Pursuant to condition D9 of the EA, the resulting investigation report will be sent to the administering authority of the EA via WaTERS within three (3) months of notification of the monitoring exceedance under D7.

Pursuant to condition D10 of the EA, if the result of the above investigation determines that the exceedance was the result of mining authorised under the EA, then investigations must be undertaken by LJV to establish whether environmental harm has occurred or may occur.

If an investigation is required due to the exceedance being deemed a result of approved mining (as per condition D10 of the EA), then pursuant to condition D11 of the EA, within twenty-eight (28) days of the investigation, LJV Will:

- Implement short-term measures to mitigate the potential for environmental harm; and
- Develop long-term mitigation measures to address any existing groundwater contamination and prevent recurrence of groundwater contamination; and
- If environmental harm has occurred as a result of groundwater drawdown exceedances, LJV must:
    - Determine any actions required to reduce the potential for environmental harm; and
    - Determine any mitigation measures required to limit the drawdown in the affected groundwater resource.

Further discussion on impact mitigation is provided in **Section 7.2**.

7.2 Mitigation

7.2.1 General

Where it is identified that there is potential for environmental harm in any investigation undertaken following a breach of the Groundwater Quality Limits or Level Trigger Thresholds as outlined in **Section 7.1.4** above, an action plan to mitigate potential environmental harm will be developed by a suitably qualified person. These mitigation measures will be implemented within 3 months of the completion of the exceedance investigation.

The selection of the most effective mitigation measures will be based on providing the best outcome for protection of the affected groundwater resource and/or user as determined by the investigation into the potential for environmental harm. The selection of the most effective mitigation measures therefore will only be possible following the completion of the investigation into the potential for environmental harm. The GDEMMP will guide any assessments, investigations or corrective actions for potential impacts to TGDEs.

7.2.2 Impacts to Third Party Groundwater Users

In the event that a formal groundwater investigation conclusively identifies that Project operations have adversely impacted a neighbouring groundwater bore user (affected groundwater user), the LJV will attempt in 'good faith' to negotiate suitable mitigation measures in a timely manner to rectify the identified groundwater impact in accordance the LJV's obligations under the *Water Act 2000*. The LJV will involve an appropriately qualified environmental specialist to assist with development of the mitigation measures. The development of suitable mitigation measures will be based on the outcomes of an appropriate scientific investigation.

Possible third party bore impact mitigation measures that may be applied by the LJV include:

- The refurbishment of an existing groundwater bore;
- The installation of a new groundwater bore;
- The establishment of an alternative water supply arrangement; and/or
- The use of another mutually agreed form of mitigation.

The LJV will ensure as a minimum that the proposed mitigation measures are acceptable to the affected groundwater user, and if acceptable, will enter into a legal agreement for the installation of the proposed mitigation measures at the LJV's expense. The LJV will also ensure the proposed mitigation measures are commensurate with the identified groundwater loss. The LJV may be required to install interim mitigation measures until the permanent mitigation measures have been developed and installed. As required, the LJV will seek agreement with the affected groundwater user and pay all reasonable cost for the use of any interim mitigation measures. If agreement cannot be reached with the affected groundwater user in relation to the proposed mitigation measures, the LJV will facilitate some form of legal disputes resolution for the matter.

8.0 Reporting, Review and Improvement Process

During the life of New Lenton Project operations, data collected through the GMMP will be used to assess the mine's actual impact on groundwater resources, and if deemed necessary update and refine the numerical groundwater model and its predictions of future impacts. These outcomes will in turn be used to review and improve this GMMP through a continual Reporting, Review and Improvement process as described herein.

8.1 Annual Groundwater Monitoring Reports

LJV will conduct an annual review of the environmental performance of this GMMP. The annual review will be reported in an Annual Groundwater Monitoring Report (AGMR) and will satisfy requirements under EA condition D15 and AWL condition 47 and will include:

- A review of the updated groundwater quality and level data to allow for identification of any outliers e.g. through the comparison of baseline data and outlier analysis in accordance with the procedures identified in DES (2021);
- The standing water level of all groundwater bores listed within **Table 5-1** (consistent with EA D15 and AWL condition 47);
- The groundwater quality of all groundwater bores listed within **Table 5-1** (consistent with EA condition D15);
- An assessment of long-term water quality and water level trends at all groundwater bores listed within **Table 5-1** (consistent with EA condition D15);
- A comparison of groundwater quality against the trigger levels listed within **Table 7-3**;
- Details of any review undertaken of the groundwater conceptual model (consistent with EA condition D15);
- Details of the numerical underground water model and any review undertaken of the numerical underground water model since the previous AGMR (consistent with AWL condition 47);
- Maps showing the actual water level drawdown contours for each aquifer (AWL condition 47);
- An assessment of any differences between the groundwater level impact predicted and actual impacts for corresponding period (consistent with EA Condition D15 and AWL condition 47);
- Details of any bores which are predicted by the numerical underground water model to be located in the affected area (consistent with AWL condition 47);
- Raw data provided in a format as requested by the chief executive (consistent with AWL condition 47).

Pursuant to EA condition D15 and condition 48 of the AWL, the AGMR is required to be completed and submitted to the administering authority commencing after the first year of mining activities, the first AGMR must be provided to the chief executive within three months of the end of the first water year (i.e. the period from the commencement of take of underground water), and subsequent AGMRs must be provided to the chief executive within three months of the end of each relevant water year.

8.2 Groundwater Monitoring and Management Program Review

Consistent with condition D14 of the EA, the GMMP will include a review process to identify improvements to the program, where deemed warranted as part of an AGMR.

The GMMP will be reviewed and modified as necessary over the mine life based on revisions to the Project's groundwater model, reviews of monitoring results and/or changed mining conditions, as identified in any AGMR. This might include:

- Revision of assessment outcomes if updated numerical groundwater modelling is available;
- Revision of monitoring parameters and/or frequency; and/or
- Expanding the existing groundwater monitoring network over time to enable ongoing groundwater impact evaluations.

Pursuant to condition 43 of the AWL, revisions of the GMMP must be undertaken by an appropriately qualified person, and submitted to the chief executive for approval.

Where an AGMR deems it required, the GMMP will be reviewed by an appropriately qualified person, with a report provided on the outcome of the review to the administering authorities of the EA and AWL within 3 months of completion of any GMMP review.

A review of the GMMP may include:

- an assessment of the outcome of the groundwater management and monitoring program against the objectives in the Project's EA and performance against compliance criteria;
- a review of the adequacy of the monitoring locations, frequencies and Groundwater Quality Limits specified in the EA with respect to any updated groundwater impact predictions; and
- a review of the adequacy of the groundwater monitoring program with respect to any updated groundwater impact predictions, including for the post-closure period.

As required, this GMMP may be updated or revised based on the outcomes of the review process. The administering authorities will be consulted in relation to any significant changes to this GMMP and as necessary will be re-issued any new versions of the document.

Consistent with conditions 43 and 44 of the AWL and D14 of the EA, the GMMP may be updated to address any comments provided by the administering authorities as necessary as part of the review and improvements process.

It is noted that the GMMP is also intended to support EPBC Act approvals related to groundwater at the Project.

8.3 Groundwater Impact Prediction, Validation and Review

During the life of the Project (starting from commencement of the take of associated water), as deemed required data collected through the GMMP may be used to review and if deemed necessary update and refine the Project groundwater model and its impact predictions consistent with AWL conditions 49 and 50. In addition to the AWL requirement these reviews, the need for such a review may also be identified within the AGMR as described above, and in particular if an assessment of any differences between the groundwater level impact predicted and actual impacts for corresponding period determines that a significant departure from model predictions has occurred. Consistent with AWL condition 49, the review must provide a revised report, including:

a) information about a revised numerical underground water model based on a transient calibration;
b) incorporation of measured mine dewatering volumes and underground water monitoring data;
c) any revised hydrogeological conceptualisation and assumptions of the model,
d) including:
    (i) any revised geological interpretation;
    (ii) any revised hydrogeological parameters or assumptions on recharge; and
    (iii) any assumptions of outflows from springs and other water users;
e) an update of predicted impacts including:
    (i) any revised predicted impacts on springs and watercourses dependent on underground water flow, and other users, including any changes to the affected area;
    (ii) any revised predicted underground water inflows into mine workings during mining operations and post closure;
    (iii) maps showing the revised prediction of the total water level impact from the commencement of underground extraction to post closure;
    (iv) maps showing the difference between these predicted water level impacts and the water level impacts as predicted at the time of application for this water licence;
    (v) sensitivity analysis; and
f) an evaluation of the accuracy of the predicted impacts from the model.

8.4 Monitoring Network Maintenance

Over the lifespan of the Project and the post closure monitoring period, it is inevitable that groundwater monitoring bores will become unserviceable and need to be replaced. The LJV will proactively maintain the groundwater monitoring network, replacing bores as necessary, and use the regular review of monitoring data to inform the location of additional monitoring bores, if required.

Pursuant to condition D12 of the EA, the construction, maintenance and management of groundwater bores (including groundwater monitoring bores) will be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.

Pursuant to condition D2 of the EA, LJV must avoid impacts to prescribed environmental matters as a result of disturbance due to installation of any proposed bores.

In the event that monitoring bores require replacement or additional monitoring bores are deemed required to supplement the existing network, LJV will, consistent with above EA conditions D2 and D12, mitigate impacts to the environment or to environmental matters by ensuring that bore installation will:

- Occur under the supervision of a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters; and
- Be constructed in accordance with methods prescribed in the latest edition of the Minimum Construction Requirements for Water Bores in Australia by an appropriately qualified and licensed water bore driller.

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Appendix A Groundwater Compliance 2024 Updated Limit and Trigger Development

New Lenton Coal Project

Groundwater Monitoring and Management Plan

Lenton Joint Venture

SLR Project No.: 620.040892.00001

2 October 2024

Groundwater Compliance 2024 Updated Limit and Trigger Development

New Lenton Coal Project

Lenton Joint Venture

GPO Box 1465, Brisbane 4000

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SLR Consulting Australia

SLR Project No.: 620.040927.00001

25 September 2024

Revision: v3.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v3.0	25 September 2024	Jade Darvell	Derwin Lyons	Derwin Lyons
v2.0	10 September 2024	Jade Darvell	Derwin Lyons	Derwin Lyons
v1.0	6 September 2024	Jade Darvell	Derwin Lyons	Derwin Lyons

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Lenton Joint Venture (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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Appendices

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by the Lenton Joint Venture (LJV) to develop updated groundwater quality and level compliance limits and triggers as part of producing an updated Groundwater Monitoring and Management Plan (GMMP) for the New Lenton Coal Project (the Project). The GMMP is required to be updated to meet the Project's Environmental Authority (EA), Associated Water License (AWL), Progressive Rehabilitation and Closure Plan (PRCP) schedule conditions, and incorporate the Project's updated baseline dataset and groundwater impact assessment pursuant to the 2023 Public Environment Report (PER) that supersedes the Project's previous groundwater assessments developed for the EA, AWL and PRCP. In addition, the updated GMMP will support of the Project's Commonwealth approvals (EPBC 2020/8778), assessed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) by PER.

SLR previously prepared a groundwater assessment for the Project in 2020 in support of Queensland State approvals, namely an EA amendment application (SLR, 2020a) and an AWL application (SLR, 2020b), both of which were subsequently approved by the State. A PRCP was also prepared based on the groundwater assessment presented in SLR (2020a and 2020b), and subsequently approved by the State. The Project's most recent hydrogeological assessment and groundwater model – the PER Groundwater Assessment report (SLR, 2024a) – builds upon that 2020 body of work, however elements of the 2020 work remain appropriate, particularly the initial groundwater quality limit setting (SLR, 2020c). Therefore, the relevant parts of the 2020 work have also been adopted in this report.

The following report details the methodology used to develop the updated groundwater compliance limits and triggers, in accordance with the DES (2021) guideline *"Using monitoring data to assess groundwater quality and potential environmental impacts".*

2.0 Methodology Overview

This report follows the structure prescribed in the DES (2021) groundwater assessment guideline. It is noted that although the focus of this guideline is on developing groundwater quality limits and triggers, the methodology and guidance has also been adopted for the development of groundwater level triggers. Relevant sections/chapters of DES (2021) and corresponding sections of this report addressing specific requirements of DES (2021) are listed in **Table 2-1**.

Table 2-1 Sections of the DES (2021) Guideline and Corresponding Sections of this Report

Section of DES (2021)		Sections of this report (or external reports) where requirements of DES (2021) have been addressed
Section 3: Understanding the system		The PER Groundwater Assessment developed by SLR (2024a) presents all information to meet the requirements of Chapter 2 of DES (2021). **Section 3.0 Contaminants of Concern** and **Section 3.1 Environmental Values and Water Quality Objectives** of this report summarises the identified environmental values (EV's) relevant to the Project and discusses the relevant chemical parameters to be assessed for protection of those EV's.
Section 4: Background information and data analysis	4.1 Site and bore characteristics	The PER Groundwater Assessment developed by SLR (2024a) presents all information to meet the requirements of Section 4.1 of DES (2021). **Section 4.0 Bores and Site Characteristics** of this report summarise bores details and locations used in this assessment.
	4.2 Water quality monitoring data analysis	Section 5.12.2 of the PER Groundwater Assessment developed by SLR (2024a) presents a comparison of the ionic composition of each bore. **Section 5.0 Groundwater Quality Data Analysis** of this report presents the remaining data analysis for water quality data undertaken in accordance with the 4-step methodology detailed in section 4.2 of DES (2021) for water quality data analysis. **Section 7.0 Groundwater Level Data Analysis** presents the data analysis for water level data following the guidance of the methodology detailed in section 4.2 of DES (2021) where applicable for water levels.
Section 5: Identify local groundwater quality triggers		**Section 6.0 Groundwater Quality Limit Derivation** follows the 4-step methodology detailed in Chapter 5 of DES (2021) to identify local (site-specific) groundwater quality limits. **Section 7.4 Groundwater Level Trigger and Threshold Derivation** presents the water level trigger and threshold derivation following the guidance of the methodology detailed in Chapter 5 of DES (2021) where applicable for water levels.

3.0 Contaminants of Concern

The contaminants of concern (CoCs) were assessed by SLR (2020c) for the most recent GMMP as part of the 2020 groundwater assessment for the Project , based upon the identification of applicable Environmental Values for groundwater. The PER Groundwater Assessment report (SLR, 2024a) builds upon this earlier body of work and does not provide any new information that suggests that the 2020 identification of CoCs is inappropriate or requires revision. Therefore, it is considered appropriate to adopt the 2020 definition of CoCs for the updated groundwater quality limit derivation and GMMP. The following **Section 3.1** to **Section 3.2** of this report present a summary of this work completed for the Project by SLR (2020c). It is noted that the work of SLR (2020c) references the previous version of the State guideline for developing water quality limits (DSITI, 2017), however, the references are still consistent in the most up to date version of this guideline (DES, 2021) and hence references have been updated for the following text to refer to the current guideline.

As discussed in SLR (2020c), the contaminants to be monitored and for which a groundwater quality limit should be imposed are selected based on:

1. Potential impact from the activity: Natural groundwater conditions could potentially be impacted by the alteration of physiochemical parameters or the increase in/introduction of chemical species as a result of the activity and;
2. Their relevance to protect identified Environmental Values (EV): The parameter/ contaminant has been identified as necessary to protect an EV relevant to the project based on relevant guidelines and Water Quality Objectives (WQO) (e.g. ANZECC, 2000a).

Selected groundwater quality parameters to monitor and assess against relevant limits are summarised in **Table 3-1**. A detailed justification for the selection of these parameters is provided in the below sections.

Table 3-1 Selected water quality parameters to be monitored in groundwater

Parameter to be monitored	Limit required	Justification reported in SLR (2020c); see Section 3.1 to Section 3.2
Physiochemical parameters		
pH	Yes	Identified in DEHP (2011) and ANZECC (2000a) for the relevant EV's
EC	Yes	Identified in DEHP (2011) and ANZECC (2000a) for the relevant EV's
TDS	No	Identified in ANZECC (2000b) for the stock watering (cattle) EV
Metal and metalloids		
Aluminium	Yes	Identified in ANZECC (2000a) for the relevant EV's
Arsenic	Yes	Identified in ANZECC (2000a) for the relevant EV's
Boron	Yes	Identified in ANZECC (2000a) for the relevant EV's
Cadmium	Yes	Identified in ANZECC (2000a) for the relevant EV's
Chromium	Yes	Identified in ANZECC (2000a) for the relevant EV's
Cobalt	Yes	Identified in ANZECC (2000b) for the stock watering (cattle) EV
Copper	Yes	Identified in ANZECC (2000a) for the relevant EV's
Iron	No	Not identified in any relevant guideline for the relevant EV's
Lead	Yes	Identified in ANZECC (2000a) for the relevant EV's
Manganese	Yes	Identified in ANZECC (2000a) for the relevant EV's
Mercury	Yes	Identified in ANZECC (2000a) for the relevant EV's
Molybdenum	Yes	Identified in ANZECC (2000b) for the stock watering (cattle) EV
Nickel	Yes	Identified in ANZECC (2000a) for the relevant EV's
Selenium	Yes	Identified in ANZECC (2000a) for the relevant EV's
Silver	Yes	Identified in ANZECC (2000a) for the relevant EV's
Uranium	Yes	Identified in ANZECC (2000b) for the stock watering (cattle) EV
Vanadium	Yes	Identified in ANZECC (2000a) for the relevant EV's
Zinc	Yes	Identified in ANZECC (2000a) for the relevant EV's
Major Ions		
Sulfate	Yes	Identified in DEHP (2011) and in ANZECC (2000b) for the stock watering (cattle) EV
Calcium	Yes	Identified in ANZECC (2000b) for the stock watering (cattle) EV
Magnesium	No	Not identified in any relevant guideline for the relevant EV's
Potassium	No	Not identified in any relevant guideline for the relevant EV's
Carbonate	No	Not identified in any relevant guideline for the relevant EV's
Bicarbonate	No	Not identified in any relevant guideline for the relevant EV's
Sodium	No	Not identified in any relevant guideline for the relevant EV's
Chloride	No	Not identified in any relevant guideline for the relevant EV's
Non-Metallic Elements		
Ammonia	Yes	Identified in DEHP (2011) and ANZECC (2000a) for the relevant EV's
Other parameters		
Hardness	No	Identified in ANZECC (2000b) for the farm supply EV

3.1 Environmental values and water quality objectives

The relevant Environmental Values (EVs) for the Project pertaining to groundwater are summarised in the PER Groundwater Assessment report developed by SLR (2024a) as follows.

Groundwater resources within the vicinity of the Project are scheduled under the Queensland *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* (under the *Environmental Protection Act 1994*) as Isaac Groundwaters of the Isaac River Sub-basin of the Fitzroy Basin water plan (WQ1310). The legislated Environmental Values (EVs) for these groundwaters are:

- Biological integrity of aquatic ecosystems – these occur where groundwater baseflow supports streams and water holes to some extent (e.g. seasonally or permanently).
- Human use EVs:
    - Suitability of water supply for irrigation – where groundwater is used to grow crops and pastures for commercial purposes.
    - Farm water supply/use – where groundwater is used to provide domestic supply and support growing of domestic produce.
    - Stock watering – where groundwater is used to provide stock water supplies.
    - Drinking water supply – where groundwater is used for potable water supply.
    - Primary recreation – where groundwater supports recreational use that involves direct contact ad a high probability of being swallowed, e.g. diving, swimming, water skiing.
    - Cultural and spiritual values – where groundwater supports both indigenous and non-indigenous values, e.g. recreational fishing, heritage, ecology.

The *Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Isaac River Sub-basin (including Connors River)* (WQ1310; DEHP, 2011) provides Water Quality Objectives (WQO) for surface water and groundwater relevant to the Project Area. WQOs are long-term goals for water quality management and the purpose of the WQOs is to support and protect EVs. They are numerical concentration levels or narrative statements of indicators established for receiving waters to support and protect the designated EVs for those waters. They are based on scientific criteria or water quality guidelines but may be modified by other inputs (e.g. social, cultural, economic). Where groundwater quality analysis results exceed a particular WQO for a particular EV, it is considered indicative that the groundwater may be unsuitable for supporting that particular EV.

WQ1310 also provides limited WQOs specifically for aquatic ecosystem protection in Fitzroy Basin groundwaters. These WQOs vary across the Fitzroy Basin and are defined on the basis of groundwater Chemistry Zones. These WQOs are classified by groundwater depth ('shallow' being <30 m depth, and 'deep' being >30 m depth). However, the Project Area lies outside of any of the defined Chemistry Zones within WQ1310, noting that Chemistry Zones are not defined in areas where there is insufficient information available to establish a WQO (DEHP, 2011). In the absence of any defined WQO relevant to the Project Area in WQ1310 for aquatic ecosystem protection in groundwaters, the ANZG (2018) guideline for aquatic ecosystem protection for slightly to moderately disturbed systems (95% level of protection) is an appropriate surrogate indicator.

With respect to the above EVs/WQOs and existing Project groundwater monitoring data, SLR (2024a) found that:

- Alluvium monitoring bore data generally suggests that alluvial groundwater from the Project Area is unsuitable for supporting the irrigation water EV with respect to fluoride, boron, iron, manganese, molybdenum or uranium. Alluvium groundwater data also generally indicates it is not suitable for supporting the aquatic ecosystems EV with respect to boron, chromium, cobalt, copper, nickel, uranium, vanadium or zinc. The 80th percentile values at the alluvial bores did not exceed any of the stock watering EV guidelines, except for EC (salinity) at GW06, suggesting that alluvial groundwater is mostly suitable for stock watering.
- Regolith monitoring bore data generally suggests that groundwater from the regolith is unsuitable supporting the irrigation water EV with respect to boron, iron, manganese or uranium. Regolith groundwater data also suggests that is generally unsuitable to support the aquatic ecosystems EV with respect to cobalt, copper, nickel, uranium or zinc. The data also suggests that regolith groundwater is generally unsuitable for supporting the stock watering EV with respect to EC (salinity).
- Groundwater quality data from the bore screened in the basalt (GW20) suggests that is it not suitable for supporting the aquatic ecosystems EV with respect to pH, cadmium and copper. The 80th percentile statistics for this bore did not exceed any of the stock watering or irrigation EV guidelines, suggesting that the basalt groundwater is suitable for supporting the stock watering and irrigation EVs.
- As with the Alluvium and Regolith, Permian monitoring bore data generally suggests that Permian groundwater at the Project Area is also unsuitable supporting the irrigation EV with respect to fluoride, boron, iron, manganese or molybdenum and the aquatic ecosystems EV with respect to pH, aluminium, arsenic, boron, cobalt, copper, molybdenum, uranium or zinc. The 80th percentile values at the Permian bores are above the stock watering EV with respect to EC (salinity) at four out of eleven bores, suggesting that Permian groundwater is suitable to support stock watering across most Permian bores, but approximately one third of Permian bores report groundwater salinities above stock tolerance levels.

As mentioned above, the earlier work by SLR (2020c) is directly applicable to developing the updated groundwater quality limits for the Project. The work by SLR (2020c) included an assessment in relation to GMMP groundwater quality limit setting for the above applicable EVs. The following **Sections 3.1.2** to **3.2.4** of this report present a summary of the previous work by SLR (2020c).

3.1.1 Applicable EVs

Previous hydrogeological studies conducted for the Project (GHD, 2019) concluded that Irrigation, Recreation, Drinking Water and Cultural/Spiritual EV's were not relevant to the Project area and surrounds, due to lack of evidence for the presence of those EV's. The three EV's that apply to groundwater at the Project were therefore identified as:

- Biological integrity of Aquatic Ecosystems;
- Farm Supply; and
- Stock Watering.

3.1.2 Aquatic Ecosystems

The WQ1310 (DEHP, 2011) provides WQO for surface water and groundwater. WQO for aquatic ecosystem protection in groundwater within WQ1310 are based on aquifer depth and defined chemistry zones. For each chemistry zone, WQO are provided as statistical distribution (percentiles) of pooled data from bores screened in each zone. The Project,

however, is located in an area where no chemistry zone has been defined within WQ1310, likely due to insufficient background data availability at the time of publication of DEHP (2011). Consequently, no previously defined WQO for aquatic ecosystem protection are available for the Project groundwaters.

Nevertheless, variation of groundwater levels in alluvium bores indicates potential connectivity between the Quaternary alluvium aquifer and the ephemeral waters of the Isaac River, albeit in the direction of River recharge into the alluvium and not discharge from alluvial groundwater into the river. Additionally, there may also be hydraulic connection between the alluvial aquifer and the underlying Permian coal measures aquifer, again in a downwards flow direction. As such, surface water WQO for the protection of aquatic ecosystems as defined for the Upper Isaac River Catchment Waters (moderately disturbed aquatic ecosystems) can be considered to apply to the groundwater at the Project. These WQO are defined for physiochemical and biological parameters (DEHP 2011. table 2, p11). For toxicants such as metal and metalloids, in the absence of WQO for these within DEHP (2011), the ANZG (2018) guidelines WQO for aquatic ecosystem protection are relevant to the Project groundwaters. DES (2021) states: *"The use of ANZG 2018 default guideline values for metals or toxicants often provides a conservative approach to protect surface and groundwater."*

3.1.3 Farm Supply

Farm supply refers to farm uses other than drinking water, Irrigation and stock watering. WQO for general agricultural water uses are not specific to regional areas and are defined in the national water quality guidelines (ANZECC, 2000b). They are mainly associated with physiochemical parameters with potential for corrosion and fouling of farm equipment such as hardness and salinity. WQO for Farm supply are somewhat less conservative than aquatic ecosystem or stock watering for physiochemical parameters.

3.1.4 Stock Watering

WQO for the stock watering EV aim at protecting drinking water quality to minimise risk to stock health. In and surrounding the Project area, cattle are the most prevalent type of stock. WQO for stock water (cattle) are based on potential health impact on individual species and are therefore not specific to regional areas. The WQO for stock as defined in the regional guideline (DEHP, 2011) are based on national WQO as defined in ANZECC (2000b). WQO are available for salinity (TDS) and several toxicants (metals). Since these WQO are for drinking water (i.e. water is ingested), total metal concentration is used.

3.2 Selected water quality analytes and parameters

The following provides the selected groundwater quality analytes and parameters relevant to the groundwater quality limit setting, based on the information provided in the above sections.

3.2.1 Physiochemical parameters

pH and salinity are the two main physiochemical parameters used to assess overall groundwater quality. TDS and EC are both a measure of salinity and thus do not need to be both measured. EC is the parameter selected by DEHP (2011) to provide WQOs for the Fitzroy Sub Basin surface and groundwaters. pH and EC should therefore be monitored and assessed against relevant limits.

3.2.2 Major Ions

DES (2021) states: "*regardless of the activity, major anions and cations should be monitored for all bores in order to characterise the groundwater. Such data allows the ionic signature to be compared between bores, which will assist in identifying whether reference and test bores are chemically comparable"*

Major ion concentrations are directly correlated with salinity (EC/TDS). If EC has an associated limit, it is thus not relevant to include additional limits to individual ions except for:

- Sulfate, as it can allow early detection of mining impact (Rikard and Kunkle, 1990) and can also have adverse effect on stock at concentration above 1,000 mg/L (ANZECC, 2000b); and
- Calcium, as it can have adverse effect on stock at concentration above 1,000mg/L (ANZECC, 2000b).

However, in accordance with DES (2021) it is considered that major ion concentrations add considerable value in the interpretation of groundwater quality and thus should be included in routine monitoring for interpretive purposes only (i.e. no limits except for Sulfate and Calcium (i.e. for the stock watering EV)).

3.2.3 Metal and Metaloids

All metal and metalloids identified as potential stressor and for which a guideline value is available either from Aquatic ecosystem protection ANZG (2018) or Stock Watering (DEHP, 2011) should be included in routine monitoring. These are: aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, uranium, vanadium and zinc.

3.2.4 Ammonia

Ammonia is identified as a potential contaminant of concern and a guideline is available for DEHP (2011) and therefore should be monitored.

4.0 Bores and Site Characteristics

Detailed site characteristics as well as a conceptual hydrogeological model of the Project site are provided in SLR (2024a). Details of the bores used for this updated limit and trigger assessment are summarised in **Table 4-1** and locations shown in **Figure 4-1**.

As shown in **Table 4-1**, the proposed updated GMMP monitoring network is based on consideration of the previous GMMP (SLR, 2020d), but updated to consider the relevant conditions of the current EA and updated groundwater modelling and impact assessment results provided in SLR (2024a). As shown in the table, the only change to the network from the previous GMMP (SLR, 2020d) is that bore GW07 (alluvium) is now included in the updated GMMP as a compliance bore for consistency with the current EA, whereas in the previous GMMP it was denoted as a reference bore.

Groundwater limit and trigger derivation has been undertaken in this report and are proposed for the compliance bores listed in **Table 4-1** as follows:

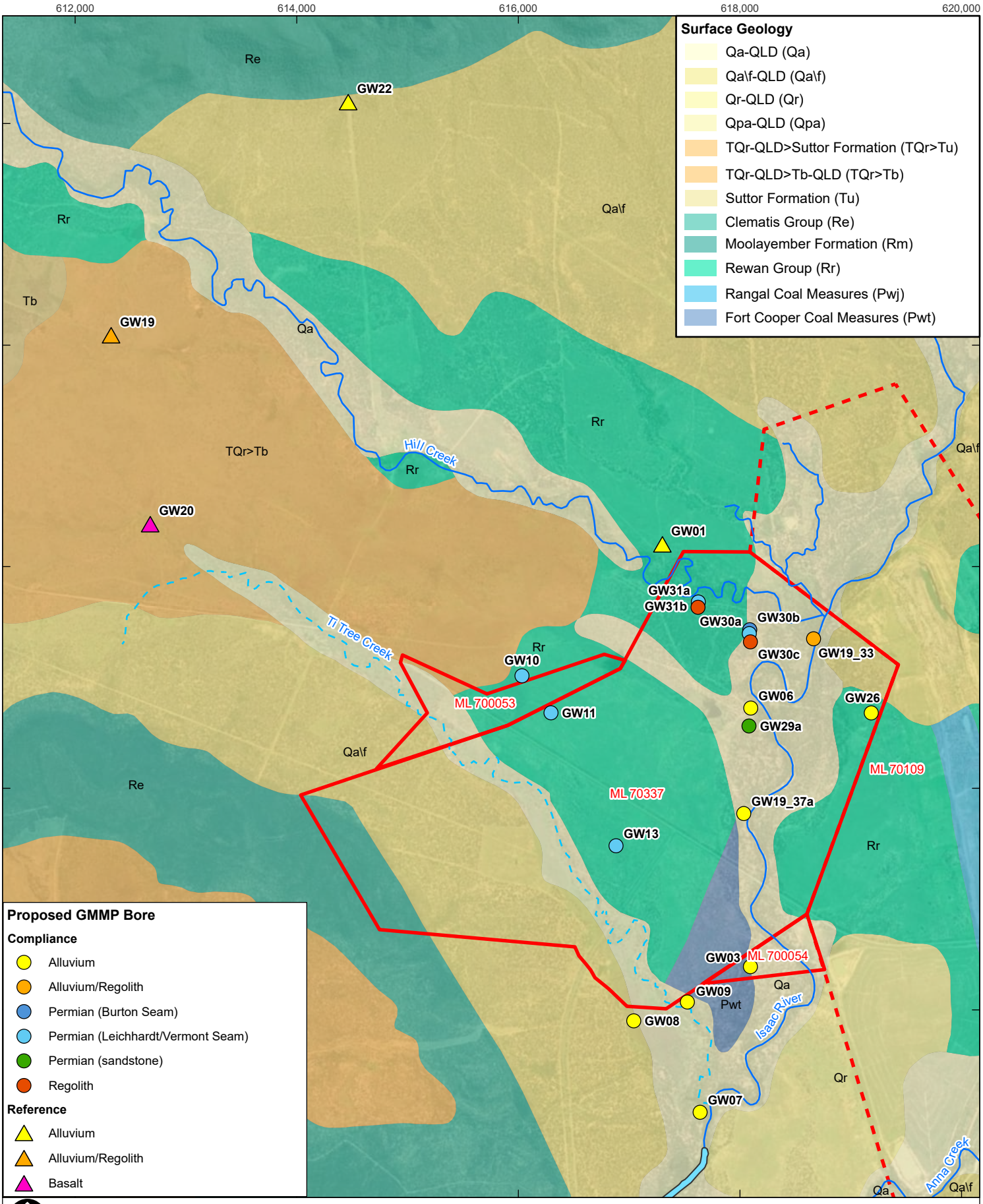
- Groundwater quality limit – proposed for all compliance bores (**Section 6.1.2**);
- Groundwater level reference levels and level trigger thresholds – proposed for compliance bores, except for those that are dry (**Sections 7.4** and **7.5**).

Table 4-1 Project GMMP Monitoring Network

Bore	Easting[1]	Northing[1]	Casing RL (mAHD)	Bore Depth	Screen (mBGL)	Aquifer	Status	Current AWL / GMMP[2]	Current EA Bore	Proposed Updated GMMP Bore
GW01	617299	7618210	326.8	15.2	6.17 – 12.17	Alluvium	Dry	Reference	Interpretation	Reference
GW19	612323	7620097	376.7	26.5	22.9 – 25.9	Alluvium/Regolith	Dry	Reference	Not in current EA	Reference
GW20	612676	7618392	355.5	33.9	24 – 30	Basalt	Active	Reference	Not in current EA	Reference
GW22	614463	7622201	401.7	11.6	5 – 8	Alluvium	Dry	Reference	Not in current EA	Reference
GW23	617807	7622169	369.9	11.6	5 – 8	Alluvium	Dry	Reference	Not in current EA	Reference
GW06	618097	7616723	313.9	20.6	3.6 – 18.6	Alluvium	Dry	Compliance	Compliance	Compliance
GW03	618094	7614389	307.6	12.1	3.1 – 12.1	Alluvium	Dry	Compliance	Compliance	Compliance
GW09	617525	7614070	307.1	24	6 – 18	Alluvium	Dry	Compliance	Compliance	Compliance
GW19_37a	618034	7615771	309.6	26	16.5 – 20.0	Alluvium	Active	Compliance	Compliance	Compliance
GW08	617041	7613900	306.7	11.7	5.72 – 8.72	Alluvium	Dry	Compliance	Compliance	Compliance
GW07	617640	7613075	299.5	24.5	9 – 18	Alluvium	Active	Reference	Compliance	Compliance
GW26	619185	7616679	315.7	9.6	6 – 9	Alluvium	Dry (TBC)	Compliance	Not in current EA	Compliance

Bore	Easting[1]	Northing[1]	Casing RL (mAHD)	Bore Depth	Screen (mBGL)	Aquifer	Status	Current AWL / GMMP[2]	Current EA Bore	Proposed Updated GMMP Bore
GW19_33	618664	7617348	312	16	11.1 – 12.6	Alluvium/Regolith	Active	Compliance	Compliance	Compliance
GW30c	618094	7617368	318.2	31.1	23 – 29	Regolith	Active	Compliance	Compliance	Compliance
GW31b	617621	7617680	322	21.2	17 – 20	Regolith	Active	Compliance	Compliance	Compliance
GW30b	618088	7617382	318.5	76.2	70 – 73	Permian (Burton Seam)	Active	Compliance	Compliance	Compliance
GW10	616032	7617014	335.2	205.1	178.16–190.16	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW13	616881	7615480	319.3	192.4	170.5 – 179.5	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW30a	618084	7617395	318.5	112.2	97 – 109	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW31a	617624	7617680	321.9	165.2	153 – 162	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW11	616294	7616680	332.3	150	114 – 126	Permian (L/V Seam)	Active	Compliance	Compliance	Compliance
GW29a	618081	7616561	313.6	83.6	62 – 80	Permian (sandstone)	Active	Compliance	Compliance	Compliance

1 Coordinates are GDA94 z55
* Ground level
L/V = Leichhardt / Vermont Seam
TBC = To be confirmed
2 Current AWL SLR (2020b) and previous GMMP SLR (2020d)



NEW LENTON COAL PROJECT GROUNDWATER COMPLIANCE 2024 UPDATED TRIGGER DEVELOPMENT

GMMP MONITORING NETWORK

SLR

FIGURE 4-1

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040892.00001 New Lenton GMMP and Trigger Redevelopment\06 SLR Data\01 CADGIS\GIS\ArcPro\New Lenton GMMP and Trigger Redevelopment\New Lenton GMMP and Trigger Redevelopment.aprx\620040892_F06-01_GMMP Monitoring Network

5.0 Groundwater Quality Data Analysis

This section presents the development of updated groundwater quality statistics for the GMMP compliance bores presented in **Table 4-1** and the relevant water quality analytes as discussed in **Section 3.2**. Analysis of updated baseline groundwater quality data was undertaken as per the four-step methodology detailed in Section 4 of DES (2021).

5.1 Summary Statistics

Appendix A presents statistics for relevant groundwater quality parameters at the GMMP compliance monitoring network bores that have data (see **Table 4-1**).

The summary statistics include number of samples analysed; outlier count; minimum and maximum values and 5th, 20th, 50th, 80th and 95th percentile for each parameter analysed and trend analysis using non-seasonal Mann-Kendall test. These statistics have been performed on the raw dataset, i.e. statistical outliers are identified according to Tukey's Method, but are not removed from the dataset at this stage.

5.2 Time Series and Box Plot Analysis

Time series plots for the relevant analyte data from each bore are provided in **Appendix B**.

Box plots are provided in **Appendix C** to visualise differences between bores, the data spread, where statistical outliers are identified, and to compare with the relevant EV protection water quality default guideline. Box plots for each parameter indicate the median, 25th, 75th percentile and statistical outliers, for the available dataset for each bore.

5.2.1 Outlier Analysis

Outliers have been statistically screened using Tukey's method (1977) and are reported in the summary statistics (**Appendix A**) as total count.

As recommended by DES (2021), each detected outlier was further investigated. This was done manually by conducting a visual assessment of each outlier on the time series plots. The datapoints that were assessed as still being outliers visualised in **Appendix B**. Updated summary statistics (i.e. without manually screened outliers) are provided in **Appendix D**.

5.2.2 Trend Analysis

The non-seasonal Mann-Kendall statistical trend test was used to detect potential trends in the dataset (filtered dataset with manual outliers removed, refer to **Section 5.2.1**), with the results provided in **Table 5-1** (and **Appendix D**).

The Mann-Kendal test is used as a first pass check if a dataset contains a statistically significant trend that warrants further analysis to assess if a real trend exists, and therefore the data may be inappropriate to use in the derivation of site-specific limits. Interpretation of Mann-Kendall results relies on the p-value and the Kendall rank correlation coefficient, tau. A p-value less than 0.05 means that there is statistically significant trend in the data. The Kendall rank correlation coefficient (tau) shows the relation between the variance of data, with a positive tau indicating an increasing trend and a negative tau indicating a decreasing trend. If the p-value is greater than 0.05, no statistically significant trend is present in the data.

Table 5-1 Mann Kendall Trend Test

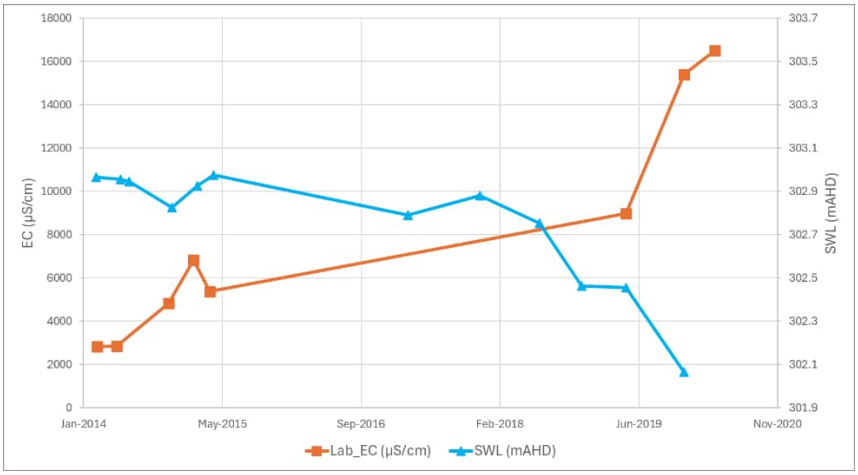
Analyte	GW06	GW03	GW09	GW19_37a	GW08	GW07	GW26	GW19_33	GW30c	GW31b	GW30b	GW10	GW13	GW30a	GW31a	GW11	GW29a
pH (Field)	No Trend	N/A	No Trend	Downward	N/A	Upward	N/A	No Trend	No Trend	No Trend	Downward	No Trend	No Trend	No Trend	No Trend	Upward	No Trend
EC (Lab)	Upward	N/A	Upward	No Trend	N/A	No Trend	N/A	No Trend	No Trend	Upward	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Ca	Upward	N/A	Upward	Downward	N/A	No Trend	N/A	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	Downward	No Trend
NH_3-N	N/A	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	No Trend	No Trend	No Trend	Downward	No Trend	No Trend	No Trend	No Trend
SO_4	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	Downward	Downward	Downward	No Trend	Downward	Downward	Downward	No Trend
Al	No Trend	N/A	No Trend	No Trend	N/A	Downward	N/A	No Trend	Downward	Downward	No Trend	Downward	Downward	Downward	No Trend	Downward	No Trend
As	No Trend	N/A	No Trend	No Trend	N/A	Downward	N/A	No Trend	Downward	Downward	Downward	No Trend	Downward	Downward	Downward	No Trend	No Trend
B	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	No Trend	No Trend	Downward	No Trend	No Trend	No Trend	No Trend	No Trend
Cd	No Trend	N/A	Downward	Downward	N/A	Downward	N/A	Downward	No Trend	Downward	No Trend	Downward	No Trend	No Trend	Downward	Downward	Downward
Co	No Trend	N/A	No Trend	Downward	N/A	No Trend	N/A	No Trend	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
Cr	No Trend	N/A	No Trend	No Trend	N/A	Downward	N/A	Downward	Downward	Downward	Downward	Upward	Downward	Downward	Downward	Downward	Downward
Cu	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	Downward	Downward	No Trend	No Trend	Downward	No Trend	No Trend	No Trend	No Trend
Hg	No Trend	N/A	No Trend	Downward	N/A	Downward	N/A	Downward	Downward	Downward	No Trend	Downward	Downward	No Trend	Downward	Downward	Downward
Pb	No Trend	N/A	No Trend	Downward	N/A	Downward	N/A	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
Mn	Upward	N/A	No Trend	Downward	N/A	No Trend	N/A	No Trend	No Trend	Upward	Upward	Upward	Upward	Downward	Downward	Downward	No Trend
Mo	N/A	N/A	N/A	No Trend	N/A	No Trend	N/A	No Trend	Downward	No Trend	No Trend	No Trend	Downward	No Trend	No Trend	No Trend	No Trend
Ni	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	Upward	Downward	No Trend	No Trend	Downward	No Trend	Upward	No Trend
Ag	No Trend	N/A	No Trend	Downward	N/A	Downward	N/A	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
Se	No Trend	N/A	No Trend	Downward	N/A	Downward	N/A	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
U	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
V	No Trend	N/A	No Trend	No Trend	N/A	Downward	N/A	No Trend	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward	Downward
Zn	No Trend	N/A	No Trend	No Trend	N/A	No Trend	N/A	No Trend	No Trend	No Trend	No Trend	No Trend	Upward	No Trend	No Trend	No Trend	No Trend

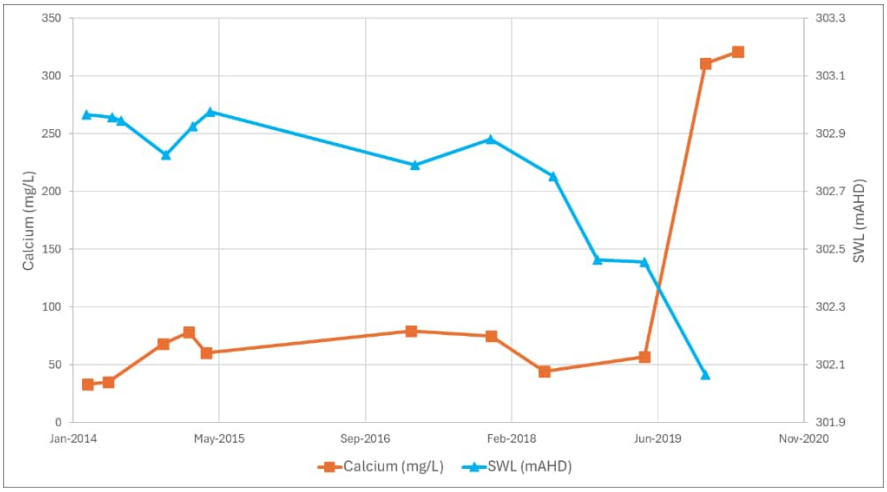
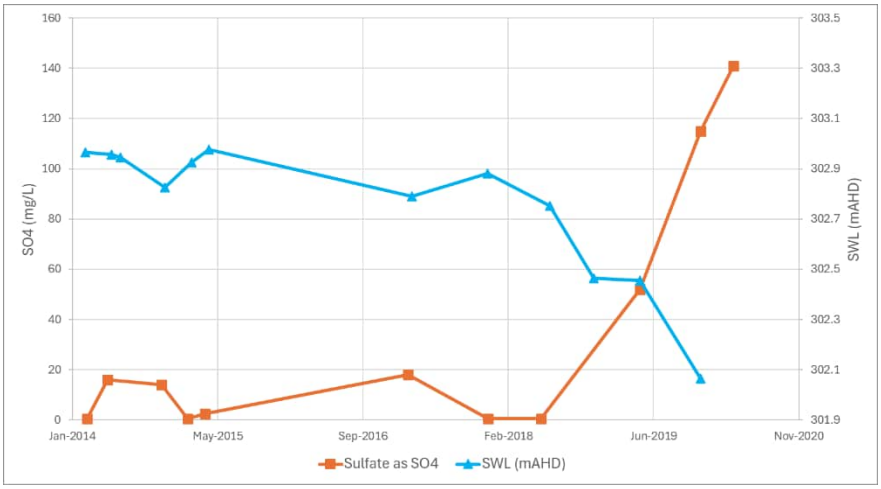
N/A = Grey highlight - not applicable, insufficient number of data points to assess trend
No Trend = Blue highlight – Mann Kendall test did not identify statistically significant trend
Upward = Orange highlight – Mann Kendall test identified positive trend
Downward = Green highlight - Mann Kendall test identified negative trend
Note: Dissolved metals

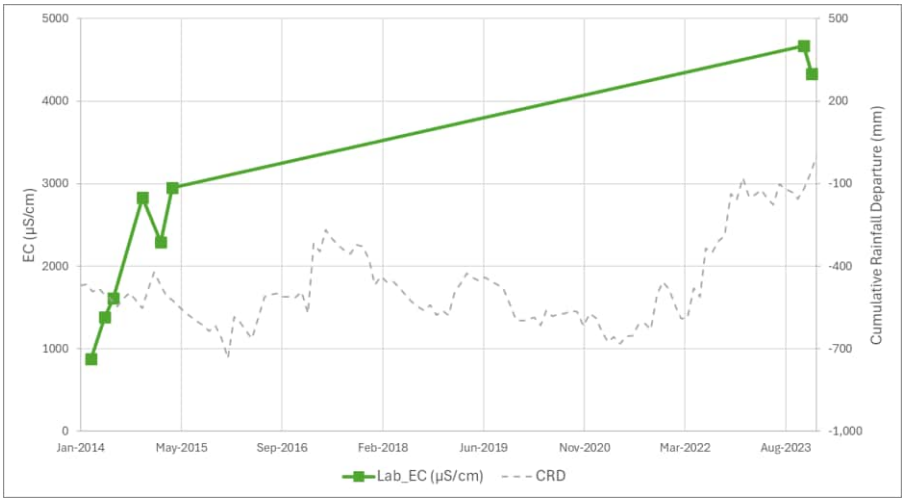
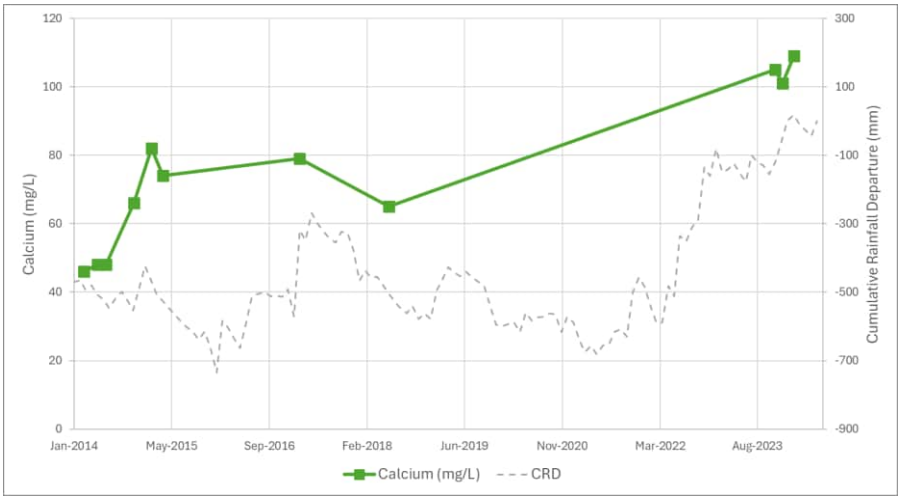
As shown in **Table 5-2**, the Mann-Kendall test has identified increasing trends for some bores/parameters.

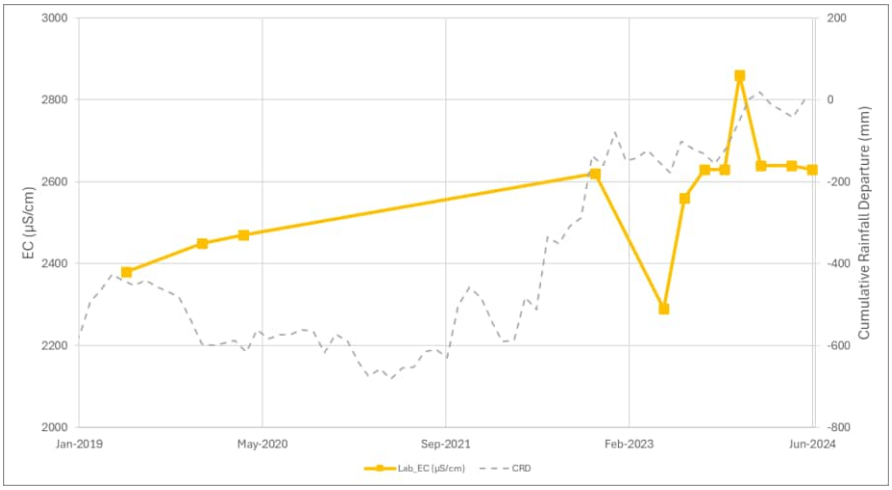
In accordance with the DES (2021) guideline, bores with increasing trends also need to be investigated for mining influence before site-specific limits can be derived from the dataset. Additionally, decreases to groundwater pH are relevant to the mobilisation of metals and hence any decreasing trends for pH were also investigated for mining influence. It is noted that the Project's mining activities have not yet commenced and so it is considered very unlikely that the trends observed can be a result of Project activities. Records of sampling methodologies are not available to SLR and so it remains possible that in addition to natural variability, the trends may be related to sampling practices. An assessment of those bores with parameters with increasing trends identified by the Mann-Kendall test is provided in **Table 5-2**.

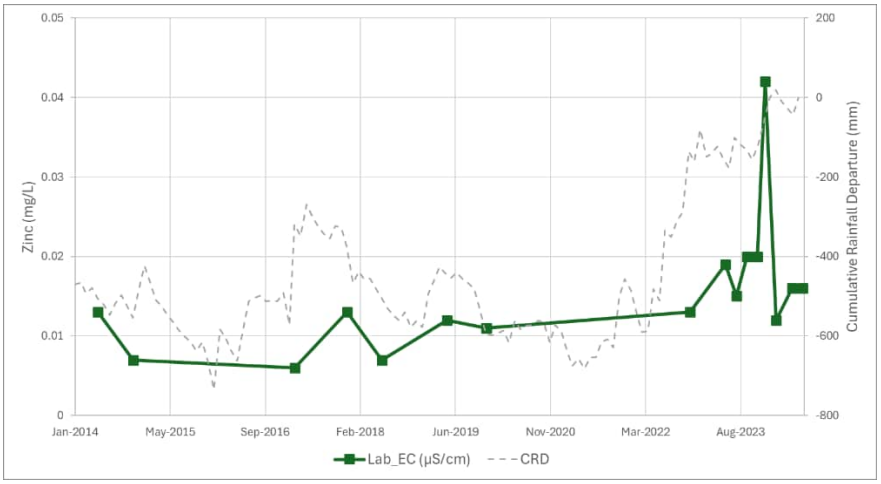
Table 5-2 Man Kendall Trend Test

Bore	Analyte	Trend Assessment
GW06	EC (lab)	The data shows a statistically significant upward trend in parallel with decreasing water level before the bore went dry. The trend is interpreted to be due the bore going dry, however the data can not be used for limit derivation as the upwards trend is in the last few measurements and is already above the 95th percentile of the dataset which would be used for a site-specific limit. Therefore limits at this bore for analytes with increasing trends are TBD and would be established if the bore becomes saturated, following stabilisation of data. 

Bore	Analyte	Trend Assessment
GW06	Calcium	The data shows a statistically significant upward trend in parallel with decreasing water level before the bore went dry. The trend is interpreted to be due the bore going dry, however the data can not be used for limit derivation as the upwards trend is in the last few measurements and is already above the 95th percentile of the dataset which would be used for a site-specific limit. Therefore limits at this bore for analytes with increasing trends are TBD and would be established if the bore becomes saturated, following stabilisation of data. 
GW06	SO_4	The data shows a visual trend in the upwards direction in the last few measurements. As above the trend is in parallel with the bore going dry and limits are TBD for trending analytes. 
GW06	Manganese (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.15**) and hence the trend is not relevant in this setting.
GW07	pH (field)	The data was not used for limit derivation (due to the 80th percentile being not substantially different to the default guideline, refer to **Section 6.1.1.1)** and hence the trend is not relevant in this setting.

Bore	Analyte	Trend Assessment
GW09	EC (lab)	The data shows a statistically significant upward trend. The trend is interpreted to be due the bore going dry, however the data can not be used for limit derivation as the upwards trend is in the last few measurements and is already above the 95th percentile of the dataset which would be used for a site-specific limit. Therefore limits at this bore for analytes with increasing trends are TBD and would be established if the bore becomes saturated, following stabilisation of data. 
GW09	Calcium	The data shows a visual trend in the upwards direction in the last few measurements. As above the trend is in parallel with the bore going dry and limits are TBD for trending analytes. 
GW19_37a	pH (field)	The data was not used for limit derivation (due to the 80th percentile being not substantially different to the default guideline, refer to Section 6.1.1.1) and hence the trend is not relevant in this setting.

Bore	Analyte	Trend Assessment
GW31b	EC (lab)	The dataset shows a statistically significant upward trend, however the magnitude of change is considerably small and the trend appears to have now halted. It is therefore proposed to use the dataset to derive site-specific limits. 
GW31b	Manganese (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.15**) and hence the trend is not relevant in this setting.
GW31b	Nickel (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.17**) and hence the trend is not relevant in this setting.
GW30b	pH (field)	The data was not used for limit derivation (due to the 80th percentile being not substantially different to the default guideline, refer to **Section 6.1.1.1**) and hence the trend is not relevant in this setting.
GW30b	Manganese (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.15**) and hence the trend is not relevant in this setting.
GW10	Chromium (dissolved)	The data was not used for limit derivation (due to insufficient data, refer to **Section 5.3**) and hence the trend is not relevant in this setting.
GW10	Manganese (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.15**) and hence the trend is not relevant in this setting.
GW13	Manganese (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.15**) and hence the trend is not relevant in this setting.

Bore	Analyte	Trend Assessment
GW13	Zinc (dissolved)	The dataset shows a statistacally significant upwards trend however appears to have stabilised within the most recent measurements. It is therefore proposed to use the dataset to derive site-specific limits. 
GW11	pH (field)	The data was not used for limit derivation (due to the 80th percentile being not substantially different to the default guideline, refer to **Section 6.1.1.1**) and hence the trend is not relevant in this setting.
GW11	Nickel (dissolved)	The data was not used for limit derivation (due to the 80th percentile being less than the default guideline, refer to **Section 6.1.1.17**) and hence the trend is not relevant in this setting.

5.3 Number of Relevant Sampling Events

The first step to identifying site-specific guidelines (and therefore limits) for groundwater quality (DES, 2021; Section 5) is to confirm the number of sampling events (data points) available for each bore and analyte. DES (2021) recommends a minimum of 18 samples over at least 12 months but allows using eight or more samples to derive site specific guidelines. **Table 5-3** shows the number of samples for each bore and analyte in the filtered dataset (outliers removed).

Further, the DES (2021) guideline specifies a limit of 10 to 15 percent of values below the laboratory limit of reporting (LOR) for a dataset to be suitable to derive site specific limits from. **Table 5-4** shows the percentage of samples below LOR.

Table 5-5 shows the number of datapoints remaining excluding LOR greater than 15%. Green highlighted cells indicate that the data set is sufficient for site specific limit derivation for the particular bore and parameter, in accordance with DES (2021) requirements.

In accordance with the DES (2021) guideline, if more than eight samples were available, then values below LOR were removed before recalculating statistics if over 15 percent of the dataset. The results of the below analysis show that this applies at GW07 (for copper and zinc), GW19_33 (for boron and cobalt), GW30b (for nickel), GW10 (for sulfate, nickel and zinc), GW13 (for nickel), GW30a (for nickel), GW31 (for aluminium), GW11 (for sulfate, nickel and zinc) and GW29a (for nickel).

The updated summary statistics after removing the below LOR values if greater than 15% of the dataset and manually screened outliers in accordance with DES (2021) are provided in **Appendix D**.

Table 5-3 Number of Relevant Sampling Events

Analyte	pH (Field)	EC (Lab)	Ca	NH_3-N	SO_4	Al	As	B	Cd	Co	Cr	Cu	Hg	Pb	Mn	Mo	Ni	Ag	Se	U	V	Zn
GW06	9	8	11	3	11	8	7	7	7	6	7	7	8	8	7	0	7	7	8	7	7	7
GW03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW09	7	9	11	4	11	7	7	6	7	5	7	6	7	7	6	3	7	5	7	6	6	7
GW19_37a	11	11	7	6	11	9	11	10	11	10	10	10	11	10	11	8	11	10	11	11	7	9
GW08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW07	19	18	17	9	21	16	18	17	14	17	18	18	18	17	17	7	18	16	18	17	13	17
GW26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW19_33	10	10	8	6	10	9	9	10	10	10	9	9	10	10	9	8	10	9	10	9	7	9
GW30c	13	12	9	8	13	13	13	13	13	13	13	13	13	13	13	9	13	12	13	13	9	11
GW31b	13	12	9	7	13	13	13	13	13	13	13	12	13	13	13	9	13	12	13	13	9	13
GW30b	13	12	9	8	11	13	10	12	13	12	13	13	13	13	13	9	13	12	13	13	9	13
GW10	16	15	15	10	18	13	15	15	15	15	16	16	16	16	15	8	16	14	16	15	12	16
GW13	17	16	15	10	19	15	17	15	16	15	17	15	17	17	16	9	16	15	17	16	12	17
GW30a	12	11	9	8	12	11	12	11	12	11	12	12	12	12	12	8	12	11	12	12	9	12
GW31a	12	11	9	8	12	11	12	12	12	12	12	11	12	12	12	8	12	11	12	12	9	12
GW11	19	14	15	9	19	14	16	15	17	16	17	16	17	17	16	9	16	15	17	16	12	16
GW29a	11	11	8	6	11	10	11	10	11	10	10	9	11	10	10	8	10	10	11	10	8	10

Note: Dissolved metals

Table 5-4 Percent of Datapoints below LOR

Analyte	pH (Field)	EC (Lab)	Ca	NH_3-N	SO_4	Al	As	B	Cd	Co	Cr	Cu	Hg	Pb	Mn	Mo	Ni	Ag	Se	U	V	Zn
GW06	0	0	0	0	45	100	14	0	100	100	100	86	100	100	14	N/A	29	100	100	14	100	71
GW03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW09	0	0	0	0	0	100	14	0	86	60	86	33	100	100	0	0	29	100	100	0	33	43
GW19_37a	0	0	0	0	0	78	0	0	100	50	80	30	100	100	0	0	9	100	100	9	71	33
GW08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW07	0	0	0	0	0	100	72	0	100	0	94	44	100	94	0	0	0	100	94	0	62	35
GW26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW19_33	0	0	0	0	0	89	44	20	100	20	78	22	100	100	0	13	0	100	100	33	29	11
GW30c	0	0	0	0	0	92	69	0	100	77	85	92	100	100	0	44	46	100	85	46	78	82
GW31b	0	0	0	0	0	92	92	0	92	92	77	92	100	100	0	33	46	100	100	0	44	46
GW30b	0	0	0	0	45	62	30	0	100	75	92	62	100	100	0	22	15	100	100	100	100	0
GW10	0	0	0	0	56	85	0	0	100	87	63	63	100	94	0	0	31	100	100	67	67	44
GW13	0	0	0	0	63	100	0	0	100	93	100	73	100	100	0	0	31	93	94	100	83	0
GW30a	0	0	0	0	67	91	50	0	100	100	100	58	100	100	0	25	33	100	100	92	100	0
GW31a	0	0	0	0	83	18	0	0	100	100	100	64	100	100	25	0	50	100	100	92	100	42
GW11	0	0	0	0	47	100	81	0	100	88	94	81	100	100	0	33	44	100	100	100	58	25
GW29a	0	0	0	0	73	80	0	0	100	70	100	67	100	100	0	13	20	100	91	100	100	0

N/A = Not applicable, no data available
Note: Dissolved metals

Table 5-5 Number of Datapoints Remaining

Analyte	pH (Field)	EC (Lab)	Ca	NH_3-N	SO_4	Al	As	B	Cd	Co	Cr	Cu	Hg	Pb	Mn	Mo	Ni	Ag	Se	U	V	Zn
GW06	9	8	11	3	6	0	7	7	0	0	0	1	0	0	7	0	5	0	0	7	0	2
GW03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW09	7	9	11	4	11	0	7	6	1	2	1	4	0	0	6	3	5	0	0	6	4	4
GW19_37a	11	11	7	6	11	2	11	10	0	5	2	7	0	0	11	8	11	0	0	11	2	6
GW08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW07	19	18	17	9	21	0	5	17	0	17	1	10	0	1	17	7	18	0	1	17	5	11
GW26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW19_33	10	10	8	6	10	1	5	8	0	8	2	7	0	0	9	8	10	0	0	6	5	9
GW30c	13	12	9	8	13	1	4	13	0	3	2	1	0	0	13	5	7	0	2	7	2	2
GW31b	13	12	9	7	13	1	1	13	1	1	3	1	0	0	13	6	7	0	0	13	5	7
GW30b	13	12	9	8	6	5	7	12	0	3	1	5	0	0	13	7	11	0	0	0	0	13
GW10	16	15	15	10	8	2	15	15	0	2	6	6	0	1	15	8	11	0	0	5	4	9
GW13	17	16	15	10	7	0	17	15	0	1	0	4	0	0	16	9	11	1	1	0	2	17
GW30a	12	11	9	8	4	1	6	11	0	0	0	5	0	0	12	6	8	0	0	1	0	12
GW31a	12	11	9	8	2	9	12	12	0	0	0	4	0	0	9	8	6	0	0	1	0	7
GW11	19	14	15	9	10	0	3	15	0	2	1	3	0	0	16	6	9	0	0	0	5	12
GW29a	11	11	8	6	3	2	11	10	0	3	0	3	0	0	10	8	8	0	1	0	0	10

Green highlight = number of datapoints is sufficient for site-specific limit derivation
Orange highlight = number of datapoints is insufficient due to greater than 15% of the dataset below LOR as per DES (2021)
Note: Dissolved metals

6.0 Groundwater Quality Limit Derivation

Updated groundwater quality limit derivation was undertaken as per the four-step methodology detailed in Section 5 of DES (2021).

The filtered (outliers removed) dataset summary statistics shown in **Appendix D** were used in the following **Section 5.3** through **Section 6.2** to derive appropriate site specific water quality limits where possible.

Appendix D summarises all the findings below in table format, as per the example shown in **Table 6-1** below. For each of the assessed bores, a table is provided with the following:

- Default water quality guideline or WQO for each parameter, row 1;
- Summary statistics (after outlier removal and removal of greater than 15% LOR where 8 samples were available), row 2-17 ;
- Comparison of the 80th percentile with the default guideline (20th and 80th percentile for pH), row 10;
- Limit derivation considerations: number of samples, percentage of LOR and trends (row 18-21);
- Proposed updated limits (row 22), using the 95th percentile for site specific or default guideline, depending on which is most appropriate in accordance with the DES (2021) guideline.

Table 6-1 Example of the groundwater quality limit derivation table (See Appendix D)

	Analyte	pH (Field)	Lab_EC	NH3-N
Row	Unit	-	µS/cm	mg/L
1	**Default Guideline**	**6.5 - 8.5**	**720**	**0.9**
2	**Statistics**			
3	Total Number	9	8	3
4	from	01-02-2014	20-02-2014	01-03-2017
5	to	23-03-2020	24-03-2020	01-06-2018
6	Min	6.8	2820	0.03
7	5th %ile	6.8	2834	0.031
8	20th %ile	7.0	3652	0.034
9	Median	7.2	6105	0.04
10	80th %ile	7.4	12828	0.046
11	95th %ile	7.4	16115	0.049
12	Max	7.4	16500	0.05
13	Tau	0.25	0.93	N/A
14	2-sided-p	0.40	0.00	N/A
15	Trend	No	Upward	N/A
16	Number of Obs Below LOR	0	0	0
17	Percent Below LOR	0%	0%	0%
18	**Limit Derivation Considerations**			
19	Limit development not possible due to insufficient number of samples			x
20	Limit development not possible due to more than 15% of values <LOR			
21	Limit development not possible due to trend		x	
22	**Proposed Limits**	**8.5**	**TBD**	**0.9**

6.1 Appropriateness of Available Guidelines

EVs relevant to the Project are discussed in **Section 3.1**. DES (2021) states:

"Where multiple EVs (with associated water quality guidelines) have been identified for an area of interest, surface or groundwater quality should be managed to comply with the most conservative water quality guideline so that the most sensitive EV is protected."

The relevant guidelines considered are presented in **Table 6-2**, and consistent with DES (2021) form a conservative combination of the relevant WQO described in **Section 3.1**.

Table 6-2 Relevant Water Quality Guidelines

Parameter	Value	Unit	Source
pH	6.5 - 8.5	-	DEHP (2011) Isaac River Sub Basin Surface Water WQO
Electrical Conductivity	720	µS/cm	DEHP (2011) Isaac River Sub Basin Surface Water WQO
Calcium	1000	mg/L	ANZECC (2000) Stock Watering Guideline
Ammonia as N (NH_3-N)	0.9	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Sulfate as SO_4	25	mg/L	DEHP (2011) Isaac River Sub Basin Surface Water WQO
Aluminium (dissolved)	0.055	mg/L	ANZG (2018) Aquatic ecosystem protection[1,3]
Arsenic (dissolved)	0.013	mg/L	ANZG (2018) Aquatic ecosystem protection[2]
Boron (dissolved)	0.94	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Cadmium (dissolved)	0.0002	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Cobalt (dissolved)	0.0014	mg/L	ANZG (2018) Aquatic ecosystem protection[4]
Chromium (dissolved)	0.001	mg/L	ANZG (2018) Aquatic ecosystem protection[3,5]
Copper (dissolved)	0.0014	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Mercury (dissolved)	0.00006	mg/L	ANZG (2018) Aquatic ecosystem protection[6]
Lead (dissolved)	0.0034	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Manganese (dissolved)	1.9	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Molybdenum (dissolved)	0.034	mg/L	ANZG (2018) Aquatic ecosystem protection[4]
Nickel (dissolved)	0.011	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Silver (dissolved)	0.05	mg/L	ANZG (2018) Aquatic ecosystem protection[3]
Selenium (total)	0.005	mg/L	ANZG (2018) Aquatic ecosystem protection[6]
Uranium (dissolved)	0.0005	mg/L	ANZG (2018) Aquatic ecosystem protection[4]
Vanadium (dissolved)	0.006	mg/L	ANZG (2018) Aquatic ecosystem protection[4]
Zinc (dissolved)	0.008	mg/L	ANZG (2018) Aquatic ecosystem protection[3]

1 pH >6.5
2 Conservative value for As(V) used
3 95% species protection for slightly to moderately disturbed systems
4 No level of species protection defined
5 More conservative value for Cr(VI) used
6 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

6.1.1 Approach to Assess Most Suitable Guidelines

Once the monitoring data has been reviewed and filtered as appropriate (refer to **Section 5.2.1**) the general approach detailed in DES (2021) to derive groundwater quality limits is to:

- Derive and compare the 20th (for pH lower guideline) and 80th percentile of the site-specific dataset to the relevant default guidelines (see **Section 6.1** for relevant default guidelines) - **Appendix D.**
- Determine whether the site-specific groundwater limits are more appropriate than the default guidelines (**Section 6.1.1.1** to **Section 6.1.1.22**).

DES (2021) provide four scenarios that may arise when determining whether default or site-specific groundwater guidelines are most appropriate for the area:

- *"Default guidelines and WQOs are available and the 80th percentile from site-specific bores are not substantially different from the default guideline or WQO. In this case it is recommended that the default values are adopted.*
- *Where default guidelines are available, and the 80th percentile from values from site-specific bores are significantly less than the default guideline or WQO. In this situation, for indicators where the site-specific values are significantly better than default values, then the site-specific values should be adopted. However, for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable.*
- *Default guidelines and WQOs are not available. In this situation, the 80th percentile value from the local bores (even where slightly impacted in some circumstances, which would need to be agreed by the regulator) may be the best available option for deriving a site-specific guideline. It is therefore, recommended that the site-specific values be adopted.*
- *Default guidelines and WQOs are available and the 80th percentile values from site-specific bores exceed the default guidelines. If the site-specific values better reflect the local conditions, then site-specific values would typically be adopted."*

6.1.1.1 pH (Field)

The 80th percentile values for pH (Field) in the filtered dataset are below, though not substantially different to the DEHP (2011) Isaac River Sub Basin WQO of 6.5 to 8.5 for GW06, GW03, GW09, GW19_37a, GW08, GW07, GW26, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. The DES (2021) guideline states that if *"Default guidelines and WQOs are available and the 80th percentile from site-specific bores are not substantially different from the default guideline or WQO. In this case it is recommended that the default values are adopted".* Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile value for pH (Field) in the filtered dataset is below the DEHP (2011) Isaac River Sub Basin WQO of 6.5 to 8.5 for GW09. There is insufficient data available to derive site-specific limits in accordance with the DES (2021) requirements. It is therefore recommended to adopt the default guideline for this bore.

It is not possible to derive site specific limits for bores GW03, GW08 and GW26 that have no data. It is therefore recommended to adopt the default guideline values (i.e. the DEHP (2011) Isaac River Sub Basin WQO of 6.5 to 8.5) for these bores.

6.1.1.2 EC (Lab)

The 80th percentile values for EC (Field) in the filtered dataset are above the default guideline (i.e. the DEHP, 2011 Isaac River Sub Basin WQO of 720 µS/cm for GW06 and

GW09. It is not possible to derive site specific limits in accordance with DES (2021) due to trending data, therefore the limit is to be defined once sufficient stable data becomes available.

The 80th percentile values for EC (Lab) in the filtered dataset are above the default guideline (i.e. the DEHP, 2011 Isaac River Sub Basin WQO of 720 µS/cm) for GW19_37a, GW07, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. As indicated in the boxplots for EC (**Appendix C**), there is great variability in EC across all hydrogeological units at New Lenton. It is therefore not possible to pool EC data for any groundwater unit as the limit would be inadequate (i.e. too conservative for some bores, not conservative enough for others). It is therefore recommended that site specific limits are adopted at these bores.

The 80th percentile values for EC (Lab) in the filtered dataset are below, though not substantially different to the DEHP, 2011 Isaac River Sub Basin WQO of 720 µS/cm for GW19_33. The DES (2021) guideline states that if *"Default guidelines and WQOs are available and the 80th percentile from site-specific bores are not substantially different from the default guideline or WQO. In this case it is recommended that the default values are adopted".* Therefore it is recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.3 Calcium

The 80th percentile value for calcium in the filtered dataset is below the ANZECC (2000) stock watering guideline of 1000 mg/L for GW19_37a. There is insufficient data available to derive site-specific limits in accordance with the DES (2021) requirements. It is therefore recommended to adopt the default guideline.

The 80th percentile values for calcium in the filtered dataset are below the ANZECC (2000) stock watering guideline of 1000 mg/L for GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. The DES (2021) guideline states that *"Guidelines should not be adopted as upper limits to which groundwater contaminant concentrations can be increased. Rather, if existing groundwater quality is below the water quality guidelines, then the groundwater should be managed within the range of natural water quality variability determined through baseline characterisation (Australian Government 2013)".* Due to the substantial difference between the default value and 80th percentile of site specific for each bore, it is recommended to derive site specific limits for these bores.

The 80th percentile values for calcium in the filtered dataset are below the ANZECC (2000) stock watering guideline of 1000 mg/L for GW06 and GW09. It is not possible to derive site specific limits in accordance with DES (2021) due to trending data, therefore the limit is to be defined once sufficient stable data becomes available.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.4 Ammonia as N (NH_3-N)

The 80th percentile values for NH_3-N in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.9 mg/L for GW06, GW09, GW19_37a and GW19_33. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

The 80th percentile values for NH_3-N in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.9 mg/L for GW07, GW30c and GW31b. The DES (2021)

guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for NH_3-N in the filtered dataset are above the default guideline (i.e. aquatic ecosystem 95% protection guideline of 0.9 mg/L) GW30b, GW10, GW13, GW30a, GW31a and GW11. As indicated in the boxplots for NH_3-N (**Appendix C**), there is great variability in NH_3-N across all hydrogeological units at New Lenton. It is therefore not possible to pool NH_3-N data for any groundwater unit as the limit would be inadequate (i.e. too conservative for some bores, not conservative enough for others). It is therefore recommended that site specific limits are adopted at these bores.

The 80th percentile value for dissolved NH_3-N in the filtered dataset is above the default guideline (i.e. aquatic ecosystem 95% protection guideline of 0.9 mg/L) for GW29a. There is currently insufficient data available to derive a site specific limit in accordance with the DES (2021) guideline. Therefore, it is recommended to a derive site-specific limit at this bore once sufficient data becomes available.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.5 Sulfate as SO_4

The 80th percentile value for SO_4 in the filtered dataset is above the default guideline (i.e. the DEHP, 2011 Isaac River Sub Basin WQO of 25 mg/L for GW06. It is not possible to derive site specific limits in accordance with DES (2021) due to trending data, therefore the limit is to be defined once sufficient stable data becomes available.

The 80th percentile values for SO_4 in the filtered dataset is above the default guideline (i.e. the DEHP, 2011 Isaac River Sub Basin WQO of 25 mg/L) for GW09, GW19_37a, GW07 and GW30c. As indicated in the boxplots for SO_4 (**Appendix C**), there is great variability in SO_4 across all hydrogeological units at New Lenton. It is therefore not possible to pool SO_4 data for any groundwater unit as the limit would be inadequate (i.e. too conservative for some bores, not conservative enough for others). It is therefore recommended that site specific limits are adopted at these bores.

The 80th percentile values for SO_4 in the filtered dataset are below, though not substantially different to the DEHP, 2011 Isaac River Sub Basin WQO of 25 mg/L for GW19_33, GW31b, GW10 and GW11. The DES (2021) guideline states that *if "Default guidelines and WQOs are available and the 80th percentile from site-specific bores are not substantially different from the default guideline or WQO. In this case it is recommended that the default values are adopted".* Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for SO_4 in the filtered dataset are below the DEHP, 2011 Isaac River Sub Basin WQO of 25 mg/L for GW30b, GW13, GW30a, GW31a and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.6 Aluminium (Dissolved)

The 80th percentile values for dissolved aluminium in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.055 mg/L for GW09 and GW31a. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved aluminium in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.055 mg/L for GW06, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.7 Arsenic (Dissolved)

The 80th percentile values for dissolved arsenic in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.013 mg/L for GW06, GW09, GW19_37a, GW30b, GW10, GW13, GW31a, and GW29a. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable*". Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved arsenic in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.013 mg/L for GW07, GW19_33, GW30c, GW31b, GW30a and GW11. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.8 Boron (Dissolved)

The 80th percentile value for dissolved boron in the filtered dataset is above the default guideline (i.e. aquatic ecosystem 95% protection guideline of 0.94 mg/L) for GW06. There is currently insufficient data available to derive a site specific limit in accordance with the DES (2021) guideline. Therefore, it is recommended to a derive site-specific limit at this bore once sufficient data becomes available.

The 80th percentile values for dissolved boron in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.94 mg/L for GW09, GW19_37a, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable".* Therefore it is recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.9 Cadmium (Dissolved)

The 80th percentile values for dissolved cadmium in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.0002 mg/L for GW06 and GW09. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved a cadmium in the filtered dataset is below the aquatic ecosystem (95% protection) guideline of 0.0002 mg/L for GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent

of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.10 Cobalt (Dissolved)

The 80th percentile values for dissolved cobalt in the filtered dataset are below the aquatic ecosystem guideline of 0.0014 mg/L for GW06, GW09 and GW19_33. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile value for dissolved cobalt in the filtered dataset is above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.0014 mg/L) for GW07. It is therefore recommended that a site specific limit is adopted at this bore.

The 80th percentile values for dissolved cobalt in the filtered dataset are below the aquatic ecosystem guideline of 0.0014 mg/L at GW19_37a, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive a site specific limit due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.11 Chromium (Dissolved)

The 80th percentile values for dissolved chromium in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.001 mg/L for GW06 and GW09. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline.

The 80th percentile values for dissolved chromium in the filtered dataset are below the aquatic ecosystem guideline of 0.001 mg/L at GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive a site specific limit due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline.

The 80th percentile value for dissolved chromium in the filtered dataset is above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.001 mg/L) for GW10. There is currently insufficient data available to derive a site specific limit in accordance with the DES (2021) guideline. Therefore, it is recommended to a derive site-specific limit at this bore once sufficient data becomes available.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.12 Copper (Dissolved)

The 80th percentile value for dissolved copper in the filtered dataset is below the aquatic ecosystem (95% protection) guideline of 0.0014 mg/L for GW06. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline.

The 80th percentile values for dissolved copper in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.0014 mg/L) for GW09,

GW19_37a, GW19_33, GW30b and GW30a. There is currently insufficient data available to derive a site specific limit in accordance with the DES (2021) guideline. Therefore, it is recommended to a derive site-specific limit at this bore once sufficient data becomes available.

The 80th percentile value for dissolved copper in the filtered dataset is above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.0014 mg/L) for GW07. It is therefore recommended that a site specific limit is adopted at this bore.

The 80th percentile values for dissolved copper in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.0014 mg/L for GW30c, GW31b, GW10, GW13, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.13 Mercury (Dissolved)

The 80th percentile values for dissolved mercury in the filtered dataset are below the aquatic ecosystem (99% protection) guideline of 0.00006 mg/L for GW06, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

The 80th percentile value for dissolved mercury in the filtered dataset is below the aquatic ecosystem (99% protection) guideline of 0.00006 mg/L for GW09. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.14 Lead (Dissolved)

The 80th percentile values for dissolved lead in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.0034 mg/L at GW06, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive a site specific limit due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline.

The 80th percentile value for dissolved lead in the filtered dataset is below the aquatic ecosystem (95% protection) guideline of 0.0034 mg/L for GW09. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable".* Therefore it is recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.15 Manganese (Dissolved)

The 80th percentile values for dissolved manganese in the filtered dataset are below the aquatic ecosystem guideline 1.9 mg/L for GW06, GW09, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. The DES

(2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.16 Molybdenum (Dissolved)

The 80th percentile values for dissolved molybdenum in the filtered dataset are below the aquatic ecosystem guideline of 0.034 mg/L for GW06, GW09, GW19_37a, GW07, GW19_33, GW30b, GW13, GW31a and GW29a. The DES (2021) guideline states *that "for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved molybdenum in the filtered dataset are below the aquatic ecosystem guideline of 0.034 mg/L for GW30c, GW31b, GW30a and GW11. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

The 80th percentile value for dissolved molybdenum in the filtered dataset is above the default guideline (i.e. the aquatic ecosystem guideline of 0.034 mg/L) for GW10. It is therefore recommended that a site specific limit is adopted at this bore.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.17 Nickel (Dissolved)

The 80th percentile values for dissolved nickel in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.011 mg/L for GW06, GW09, GW30c, GW31b, GW30b, GW13, GW30a, GW11 and GW29a. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved nickel in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.011) for GW19_37a, GW07, GW19_33 and GW10. It is therefore recommended to adopt site specific limits.

The 80th percentile value for dissolved nickel in the filtered dataset is below the aquatic ecosystem (95% protection) guideline of 0.011 mg/L for GW31a. It is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.18 Silver (Dissolved)

Analysis of the historical dataset shows that prior to December 2023 the LOR for dissolved silver (<0.001 mg/L) was above the aquatic ecosystem (95% protection) guideline of 0.00005 mg/L and therefore it is not possible to compare the 80th percentile of the dataset to the guideline value. A comparison of the data after December 2023 (where the LOR is generally <0.0001 mg/L) however shows results for all bores with data are below the LOR and therefore below the default guideline. It is therefore recommended to adopt the default

guideline at all bores with data (GW06, GW09, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a).

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.19 Selenium (Dissolved)

The 80th percentile values for dissolved selenium in the filtered dataset are below the aquatic ecosystem (99% protection) guideline of 0.005 mg/L for GW06, GW19_37a, GW07, GW19_33, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

The 80th percentile value for dissolved selenium in the filtered dataset is below the aquatic ecosystem (99% protection) guideline of 0.005 mg/L for GW09. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.20 Uranium (Dissolved)

The 80th percentile values for dissolved uranium in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem guideline of 0.0005 mg/L) for GW06, GW09, GW19_33 and GW30c. There is currently insufficient data available to derive site specific limits in accordance with the DES (2021) guideline. Therefore, it is recommended to derive site-specific limit at these bores once sufficient data becomes available.

The 80th percentile values for dissolved uranium in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem guideline of 0.0005 mg/L) for GW19_37a, GW07 and GW31b. It is therefore recommended that site specific limits are adopted at these bores.

The 80th percentile values for dissolved selenium in the filtered dataset are below the aquatic ecosystem guideline of 0.0005 mg/L for GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. For these bores it is not possible to derive site specific limits due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline for these bores.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.21 Vanadium (Dissolved)

The 80th percentile values for dissolved vanadium in the filtered dataset are below the aquatic ecosystem guideline of 0.006 mg/L for GW06, GW09, GW19_37a and GW19_33. The DES (2021) guideline states that "*for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline for these bores.

The 80th percentile values for dissolved vanadium in the filtered dataset are below the aquatic ecosystem guideline of 0.006 mg/L at GW07, GW30c, GW31b, GW30b, GW10, GW13, GW30a, GW31a, GW11 and GW29a. It is not possible to derive a site specific limit due to greater than 15 percent of the dataset being made up of below LOR values. It is therefore recommended to adopt the default guideline.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.1.22 Zinc (Dissolved)

The 80th percentile values for dissolved zinc in the filtered dataset are below the aquatic ecosystem (95% protection) guideline of 0.008 mg/L for GW06 and GW31a. The DES (2021) guideline states that *"for toxicants, if the local groundwater quality is less than the default guideline (ANZG 2018), then the toxicant default guideline value may still be applicable"*. Therefore it is recommended to adopt the default guideline.

The 80th percentile values for dissolved zinc in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.008 mg/L) for GW09, GW19_37a and GW31b. There is currently insufficient data available to derive site-specific limits in accordance with the DES (2021) guideline. Therefore, it is recommended to derive site-specific limits at these bores once sufficient data becomes available.

The 80th percentile values for dissolved zinc in the filtered dataset are above the default guideline (i.e. the aquatic ecosystem 95% protection guideline of 0.008 mg/L) for GW07, GW19_33, GW30b, GW10, GW13, GW30a, GW11 and GW29a. It is therefore recommended to adopt site specific limits.

There is no data is available for GW03, GW08 and GW26, and therefore it is not possible to derive site-specific limits. Therefore the default guideline should be adopted these bores.

6.1.2 Proposed Updated Groundwater Quality Limits

The current EA compliance approach uses a single limit per parameter, which is applied to three consecutive samples, i.e. three consecutive sampling events above the relevant limit are required to constitute a limit exceedance in the EA. No change to the compliance approach is proposed.

The proposed updated groundwater quality limits based on the assessment discussed above are summarised in **Table 6-3**.

Table 6-3 Proposed Updated Groundwater Quality Limits

Analyte	pH (Field)	EC (Lab)	Ca	NH_3-N	SO4	Al	As	B	Cd	Co	Cr	Cu	Hg	Pb	Mn	Mo	Ni	Ag	Se	U	V	Zn
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW06	6.5 - 8.5	TBD	TBD	0.9	TBD	0.055	0.013	TBD	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW03	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW09	6.5 - 8.5	TBD	TBD	0.9	42	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	TBD
GW19_37a	6.5 - 8.5	2500	1000	0.9	31	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.025	0.00005	0.005	0.002	0.006	TBD
GW08	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW07	6.5 - 8.5	8661	271	0.9	51	0.055	0.013	0.94	0.0002	0.004	0.001	0.0046	0.00006	0.0034	1.9	0.034	0.021	0.00005	0.005	0.012	0.006	0.038
GW26	6.5 - 8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW19_33	6.5 - 8.5	720	63	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.018	0.00005	0.005	TBD	0.006	0.019
GW30c	6.5 - 8.5	15875	357	0.9	185	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW31b	6.5 - 8.5	2739	90	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.002	0.006	TBD
GW30b	6.5 - 8.5	18285	679	3.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.029
GW10	6.5 - 8.5	6244	60	1.3	25	0.055	0.013	0.94	0.0002	0.0014	TBD	0.0014	0.00006	0.0034	1.9	0.049	0.027	0.00005	0.005	0.0005	0.006	0.009
GW13	6.5 - 8.5	12700	143	3.5	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.024
GW30a	6.5 - 8.5	15600	299	3.6	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.023
GW31a	6.5 - 8.5	4820	23	1.0	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW11	6.5 - 8.5	4161	106	1.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.018
GW29a	6.5 - 8.5	9870	140	TBD	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.02

Note: Dissolved metals
TBD = To be defined once sufficient data becomes available
N/A = Not Applicable, reference bore, no limit proposed

6.2 Testing of Proposed Updated Groundwater Quality Limits

The proposed updated limits presented above have been tested against the historical dataset (including outliers) using the proposed compliance approach and are presented in the time series as **Appendix B**. It should be noted that GW03, GW08 and GW26 are not included in the time series due to having no data (these bores have historically been dry).

All updated groundwater quality limits were deemed suitable, i.e. none of the historical data set would have exceeded the newly defined single limit (95th percentile or applicable WQO/default guideline) three consecutive times, with the exception of removed outliers for EC at GW11, and Ag at all bores with data prior to December 2023 due to an LOR greater than two times the guideline (i.e. deemed not a real exceedance, refer **Section 5.2.1**). The proposed limits presented in **Section 6.1.2** are therefore deemed to be appropriate.

7.0 Groundwater Level Data Analysis

This section presents the development of updated groundwater Reference Level values on the basis of statistical analysis of the updated baseline monitoring dataset, followed by the establishment of updated Level Trigger Thresholds based on numerical groundwater modelling.

For the purpose of this report the following definitions are made, consistent with the EA.

- Reference Level (i.e. referred to as the pre-mining baseline level in the current EA)

The bore specific groundwater level that all future groundwater level measurements will be compared to for the purpose of calculating actual groundwater drawdown. The Reference Level is derived on the basis of historic groundwater level monitoring data (i.e. 'baseline' data) as outlined in **Section 7.1**.

- Level Trigger Threshold (i.e. consistent with the definition in the current EA).

The bore specific maximum groundwater level drawdown in the future that will be allowed under the EA without activating a compliance breach. The Level Trigger Threshold is derived on the basis of predictive groundwater modelling (refer SLR, 2024a) such that an exceedance of the Level Trigger Threshold represents greater groundwater level impact than predicted by modelling. The proposed Level Trigger Thresholds are derived in **Section 7.5.1**.

7.1 Baseline Data Analysis

Statistical analysis of the existing groundwater level database has been undertaken to aid in the derivation of Reference Levels. The analysis generally conforms to the processes outlined in DES (2021) for groundwater data analysis, and includes:

- Generation of time series plots (**Appendix E** and **Section 7.2**);
- Outlier analysis (**Appendix E** and **Section 7.2.1**);
- Summary Statistics (**Appendix F** and **Section 7.3**); and
- Trend (Mann-Kendall) analysis (**Appendix F** and **Section 7.3.1**).

7.2 Time Series Plots

Time series plots for each of the proposed GMMP compliance bores with data are provided in **Appendix E**. Note that plots are not provided for bores reported as 'dry' (a total of four compliance bores, in addition to four reference bores, refer **Table 4-1**).

7.2.1 Outlier Analysis

Outliers have been manually screened by conducting a visual assessment of the data presented on the time series plots presented in **Appendix E** and are listed in **Table 7-1** and shown on the time series as separate points. Based on the results of the manual outlier assessment only one datapoint was assessed as being an outlier as is listed in **Table 7-1** and it is not deemed necessary to create a filtered dataset for the purpose of statistical analysis.

Table 7-1 Manually Screened Outliers Flagged in Groundwater Level Database

Bore	Date	Groundwater Level (mAHD)	Aquifer
GW11	01-09-2023	297.851	Leichhardt / Vermont Seam

7.3 Summary Statistics

Appendix F presents statistics for groundwater levels for the proposed GMMP compliance bores that have data.

The summary statistics include number of samples analysed; minimum and maximum values and 5th, 20th, 50th, 80th and 95th percentile for each parameter analysed and trend analysis using non-seasonal Mann-Kendall test. These statistics have been performed on the baseline dataset (i.e. no outliers were removed, refer **Section 7.2.1**).

7.3.1 Trend Analysis

The non-seasonal Mann-Kendall statistical trend test was used to detect potential trends in the dataset (refer to **Section 7.1**), with the results provided in **Table 7-2** (and **Appendix D**).

A comparison of the trends listed in **Table 7-2** with a visual assessment of the time series plots presented in **Appendix E** shows that groundwater levels are highly variable within the baseline dataset, and strongly linked to climate variability. A detailed discussion of groundwater level trends at these bores is provided in SLR (2024a).

Table 7-2 Non-Seasonal Mann-Kendall Statistic Trend Test – Groundwater Levels

Aquifer	Bore	Trend
Alluvium	GW19_37a	No Trend
Alluvium	GW07	Yes (Downward)
Alluvium	GW26	N/A
Alluvium/Regolith	GW19_33	No Trend
Regolith	GW30c	Yes (Downward)
Regolith	GW31b	Yes (Downward)
Permian (Burton Seam)	GW30b	Yes (Downward)
Permian (L/V Seam)	GW10	Yes (Upward)
Permian (L/V Seam)	GW13	Yes (Downward)
Permian (L/V Seam)	GW30a	Yes (Downward)
Permian (L/V Seam)	GW31a	Yes (Downward)
Permian (L/V Seam)	GW11	Yes (Downward)
Permian (sandstone)	GW29a	No Trend

N/A = Not Applicable, insufficient data to be statistically significant
L/V Seam = Leichhardt / Vermont Seam

7.4 Groundwater Reference Level Derivation

The time series plots presented in **Appendix E** and Mann-Kendall trend test presented in **Table 7-2** highlight the fact that local groundwater levels are highly variable, with variability driven by natural causes (i.e. climate variability). Furthermore, the large range between the maximum and minimum groundwater levels presented in the summary statistics in **Appendix D** highlights the fact that groundwater level change compliance criteria needs to appropriately recognise the significant natural variability in groundwater levels. A detailed discussion on climate and groundwater level variability is provided in SLR (2024a).

It is therefore proposed to adopt the 20th percentile of the baseline dataset summary statistics (**Appendix F**) as the Reference Level values, similar to the approach proposed within DES (2021) for establishing statistically appropriate groundwater quality limits. Adoption of the 20th percentile takes into account the historic variability in groundwater levels when proposing a bore specific groundwater level that will be compared to model predictions for EA compliance purposes. The proposed groundwater Reference Level values are presented in **Table 7-3**.

Measured groundwater level drawdown will then be calculated on a bore by bore basis under the EA, by comparing the measured groundwater level for a bore at any point in time with the Reference Level values for that bore. The resulting computed groundwater level drawdown will be compared to the Level Trigger Thresholds for that bore, where a computed groundwater level drawdown greater than the Level Trigger Threshold constitutes an exceedance under the EA.

Table 7-3 Proposed Groundwater Reference Levels

Aquifer	Bore	20th Percentile (mAHD)
Alluvium	GW01	Reference bore, no refence level proposed
Alluvium/Regolith	GW19	Reference bore, no refence level proposed
Basalt	GW20	Reference bore, no refence level proposed
Alluvium	GW22	Reference bore, no refence level proposed
Alluvium	GW23	Reference bore, no refence level proposed
Alluvium	GW06	Dry bore, no reference level proposed
Alluvium	GW03	Dry bore, no reference level proposed
Alluvium	GW09	Dry bore, no reference level proposed
Alluvium	GW19_37a	297.8
Alluvium	GW08	Dry bore, no reference level proposed
Alluvium	GW07	294.0
Alluvium	GW26	TBA
Alluvium/Regolith	GW19_33	301.5
Regolith	GW30c	301.8
Regolith	GW31b	307.1
Permian (Burton Seam)	GW30b	301.4
Permian (L/V Seam)	GW10	299.2
Permian (L/V Seam)	GW13	296.1
Permian (L/V Seam)	GW30a	301.8
Permian (L/V Seam)	GW31a	305.9
Permian (L/V Seam)	GW11	300.8
Permian (sandstone)	GW29a	300.9

TBA = insufficient baseline data to compute reference levels at the present time.
L/V Seam = Leichhardt / Vermont Seam

7.5 Groundwater Level Trigger Threshold Derivation and Testing

7.5.1 Proposed Updated Groundwater Level Trigger Thresholds

The predictive results of the 2023 New Lenton Project numerical groundwater model (SLR, 2024; SLR, 2024b) have been utilised to develop updated bore specific groundwater Level Trigger Thresholds for each proposed GMMP bore listed. Level Trigger Thresholds have been based on the following criteria:

- Level Trigger Thresholds have been calculated using the latest version of the New Lenton groundwater model (SLR, 2024b).
- Level Trigger Threshold derivation is based on the difference between the predicted groundwater level in the “no-mining” model, and the minimum (lowest) predicted water level at any time during the future modelled life of mining from the “cumulative mining” model (i.e. between the years 2024 and 2040 and considering the effects of the adjacent Burton Mine). That is, Level Trigger Thresholds are based on the predicted future groundwater level drawdown at each bore between 2024 and 2040 from the latest numerical groundwater model. Noting that the numerical groundwater model is actually an ensemble of calibrated models each with different parameter sets (SLR, 2024b), uncertainty in model predictions across the calibrated ensemble of models is considered as described in the following dot point.
- GMMP compliance monitoring bores have been assigned a Level Trigger Threshold value equal to the maximum cumulative 90th percentile model drawdown prediction at each bore over the future life of the New Lenton mining operation to 2040. Adoption of the 90th percentile prediction of drawdown allows for consideration of model predictive uncertainty to provide a conservative upper limit of groundwater level drawdown allowed under the EA.
- Where the maximum 90th percentile model drawdown prediction for the alluvium/regolith is less than the natural variability observed in the alluvium/regolith within the current monitoring dataset (**Sections 7.1** and **7.2**) for a particular bore, then the trigger has been set equal to the range in observed natural variability at that bore to avoid the false enacting of a drawdown trigger that is only due to natural variability and not mining activities. For alluvium/regolith bores with no existing data, an average of the natural variability across the entire baseline dataset for alluvium/regolith bores with sufficient data has been used (i.e. 3.6 m).
- Where the proposed groundwater level trigger threshold resulting from either of the above two points would result in a level trigger elevation below the base of the model layer, then the level trigger threshold has been limited to drawdown to the base of the model layer.

The updated groundwater Level Trigger Thresholds derived using the methodology as above are presented in **Table 7-4**.

Table 7-4 Proposed Updated Groundwater Level Trigger Thresholds

Aquifer	Bore	Level Trigger Threshold (m)
Alluvium	GW01	Reference bore, no level trigger threshold proposed
Alluvium/Regolith	GW19	Reference bore, no level trigger threshold proposed
Basalt	GW20	Reference bore, no level trigger threshold proposed
Alluvium	GW22	Reference bore, no level trigger threshold proposed
Alluvium	GW23	Reference bore, no level trigger threshold proposed
Alluvium	GW06	Dry bore, no level trigger threshold proposed
Alluvium	GW03	Dry bore, no level trigger threshold proposed
Alluvium	GW09	Dry bore, no level trigger threshold proposed
Alluvium	GW19_37a	7.1[1,2]
Alluvium	GW08	Dry bore, no level trigger threshold proposed
Alluvium	GW07	3.8[1]
Alluvium	GW26	3.6[3]
Alluvium/Regolith	GW19_33	3.4[4]
Regolith	GW30c	4.7[4]
Regolith	GW31b	3.7[4]
Permian (Burton Seam)	GW30b	9.2[1]
Permian (L/V Seam)	GW10	86.3[1]
Permian (L/V Seam)	GW13	75.1[1]
Permian (L/V Seam)	GW30a	10.1[1]
Permian (L/V Seam)	GW31a	23.8[1]
Permian (L/V Seam)	GW11	108.3[1,2]
Permian (sandstone)	GW29a	15.2[1]

L/V Seam = Leichhardt / Vermont Seam
1 Maximum cumulative 90th percentile modelled drawdown prediction.
2 Maximum drawdown limited to base of model layer.
3 Based on the range of natural variability observed at this bore.
4 Based on the average range of natural variability observed at all existing alluvium/regolith bores.

7.5.2 Testing of Updated Groundwater Level Trigger Thresholds

The proposed updated Reference Levels and Lever Trigger Thresholds presented above have been tested against the historical dataset using the proposed compliance approach and are presented in the time series plots provided in **Appendix E**. For the testing, the effective compliance trigger value is termed the Level Trigger Elevation and is calculated as:

Level Trigger Elevation = Groundwater Reference Level – Level Trigger Threshold should be noted that GW26 is not included in the time series due to having no data.

The results of the testing in **Appendix E** indicate none of the historical dataset for the bores would be below the level trigger elevation. The results of the testing in **Appendix E** therefore indicate that the proposed updated Groundwater Reference Levels and Level Trigger Thresholds are appropriate for the GMMP and represent groundwater levels that if reached in the future, would indicate a greater level of groundwater impact from mining than predicted by the current version of the Project's groundwater model.

The Level Trigger Elevations calculated as above are presented in **Table 7-5**.

Table 7-5 Proposed Groundwater Level Trigger Elevation

Aquifer	Bore	Level Trigger Threshold (mAHD)
Alluvium	GW01	Reference bore, no level trigger elevation proposed
Alluvium/Regolith	GW19	Reference bore, no level trigger elevation proposed
Basalt	GW20	Reference bore, no level trigger elevation proposed
Alluvium	GW22	Reference bore, no level trigger elevation proposed
Alluvium	GW23	Reference bore, no level trigger elevation proposed
Alluvium	GW06	Dry bore, no level trigger elevation proposed
Alluvium	GW03	Dry bore, no level trigger elevation proposed
Alluvium	GW09	Dry bore, no level trigger elevation proposed
Alluvium	GW19_37a	297.8
Alluvium	GW08	Dry bore, no level trigger elevation proposed
Alluvium	GW07	294.0
Alluvium	GW26	TBA
Alluvium/Regolith	GW19_33	301.5
Regolith	GW30c	301.8
Regolith	GW31b	307.1
Permian (Burton Seam)	GW30b	301.4
Permian (L/V Seam)	GW10	299.2
Permian (L/V Seam)	GW13	296.1
Permian (L/V Seam)	GW30a	301.8
Permian (L/V Seam)	GW31a	305.9
Permian (L/V Seam)	GW11	300.8
Permian (sandstone)	GW29a	300.9

TBA = To be advised

8.0 Conclusions and Recommendations

Based on the outcomes of this New Lenton Coal Project updated groundwater compliance trigger development report the following conclusions and are recommendations are made:

- The proposed updated groundwater quality and level triggers documented in this report are deemed appropriate for inclusion to the GMMP in support of the Project's EA, AWL, PRCP and PER, and will be included in a separate GMMP report to be prepared by SLR.
- GMMP bore GW06 is noted to be in need of maintenance in recent entries in the last version of the Project monitoring database (April 2024), including notes of damage, requiring a new monument, plus bailing and tree root removal. It is recommended that this should be actioned as soon as practicable to re-establish the monitoring function of the bore.
- It is also noted that GMMP bores GW20, GW22 and GW26 have no recent data and should be routinely visited as with the other bores, even if dry (i.e. to continually confirm that the bores remain dry).
- It is recommended to confirm the casing stick-up height for bores GW31a, GW31b and GW20.

9.0 References

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Appendix A Water Quality Summary Statistics with Statistical Outlier Count

Groundwater Compliance 2024 Updated Limit and Trigger Development

New Lenton Coal Project

Lenton Joint Venture

SLR Project No.: 620.040927.00001

25 September 2024

Bore	Statistics	pH (Field)	Lab_EC	Calcium	NH4-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
	Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW06	Total Number	9	8	11	3	11	8	8	7	8	7	8	8	8	8	7	0	8	7	8	7	7	8
GW06	from	01-02-2014	20-02-2014	20-02-2014	42795	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	N/A	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW06	to	23-03-2020	24-03-2020	24-03-2020	43252	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	N/A	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020
GW06	Min	6.8	2820	33	0.03	0.5	0.005	5.00E-04	0.05	5.00E-05	5.00E-04	5.00E-04	5.00E-04	5.00E-05	5.00E-04	0.0005	N/A	5.00E-04	5.00E-04	0.005	0.0005	0.005	0.0025
GW06	5th %ile	6.8	2834	34	0.031	0.5	0.005	6.75E-04	0.185	5.00E-05	5.00E-04	5.00E-04	5.00E-04	5.00E-05	5.00E-04	0.01565	NA	5.00E-04	5.00E-04	0.005	0.00545	0.005	0.0025
GW06	20th %ile	7.0	3652	44	0.034	0.5	0.005	1.40E-03	0.514	5.00E-05	5.00E-04	5.00E-04	0.0005	5.00E-05	5.00E-04	0.053	NA	7.00E-04	5.00E-04	0.005	0.018	0.005	0.0025
GW06	Median	7.2	6105	68	0.04	14	0.005	3.00E-03	1.13	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.076	NA	0.002	5.00E-04	0.005	0.024	0.005	0.0025
GW06	80th %ile	7.4	12828	79	0.046	52	0.005	0.0056	1.526	5.00E-05	5.00E-04	0.0005	0.0008	5.00E-05	5.00E-04	1.0364	NA	0.006	5.00E-04	0.005	0.029	0.005	0.0066
GW06	95th %ile	7.4	16115	316	0.049	128	0.005	0.01055	1.737	8.25E-05	8.50E-04	0.000825	0.00425	0.00005	5.00E-04	1.345	NA	0.01125	0.0005	0.005	0.0307	0.005	0.01415
GW06	Max	7.4	16500	321	0.05	141	0.005	0.013	1.8	1.00E-04	1.00E-03	0.001	0.006	5.00E-05	5.00E-04	1.39	N/A	0.013	0.0005	0.005	0.031	0.005	0.018
GW06	Tau	0.25	0.93	0.49	na	0.44	1.00	-0.33	-0.33	-0.36	0.53	-0.21	-0.16	1.00	1.00	0.71	na	-0.52	1.00	1.00	0.24	1.00	-0.27
GW06	2-sided-p	0.40	0.00	0.04	na	0.08	1.00	0.32	0.37	0.38	0.21	0.66	0.74	1.00	1.00	0.04	na	0.10	1.00	1.00	0.55	1.00	0.47
GW06	Trend	No	Yes-Upward	Yes-Upward	na	No	No	No	No	No	No	No	No	No	No	Yes-Upward	na	No	No	No	No	No	No
GW06	Number of Obs Below LOR	0	0	0	0	5	8	1	0	7	6	7	6	8	8	1	0	2	7	8	1	7	5
GW06	Number of Statistical Outliers	0	0	2	0	2	0	1	0	1	1	1	1	0	0	0	0	1	0	0	1	0	1
GW03	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW03	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Number of Statistical Outliers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW09	Total Number	8	9	11	4	11	7	7	6	7	6	7	7	7	7	6	3	7	5	7	6	6	7
GW09	from	01-02-2014	20-02-2014	20-02-2014	42795	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	29-10-2023	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW09	to	04-02-2024	04-02-2024	04-02-2024	45326	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024
GW09	Min	6.8	875	46	0.04	14	0.0025	5.00E-04	0.14	2.50E-05	1.00E-04	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.0707	1.00E-03	5.00E-04	5.00E-05	0.0001	0.00253	0.0004	0.0025
GW09	5th %ile	6.8	1077	47	0.046	19	0.0025	9.50E-04	0.16	2.50E-05	1.25E-04	1.00E-04	3.25E-04	2.00E-05	5.00E-05	0.071325	1.06E-03	5.00E-04	5.00E-05	0.0001	0.0026275	0.000425	0.0025
GW09	20th %ile	6.8	1518	48	0.064	25	0.0025	2.00E-03	0.22	2.50E-05	2.00E-04	1.20E-04	0.0006	2.00E-05	5.00E-05	0.0732	1.24E-03	6.00E-04	5.00E-05	0.0001	0.00292	0.0005	0.0025
GW09	Median	6.9	2830	74	0.115	34	0.005	2.60E-03	0.2215	5.00E-05	5.00E-04	0.0005	0.002	5.00E-05	5.00E-04	0.1765	1.60E-03	0.0015	5.00E-04	0.005	0.003525	0.0028	0.023
GW09	80th %ile	7.1	4382	101	0.574	36	0.005	0.00298	0.255	5.00E-05	5.00E-04	0.0005	0.00298	5.00E-05	5.00E-04	0.308	0.00196	0.00178	5.00E-04	0.005	0.005	0.005	0.0368
GW09	95th %ile	8.0	4586	107	1.051	41.5	0.005	0.0079	0.26625	1.55E-04	1.03E-03	0.0005	0.00888	0.00005	5.00E-04	0.344	0.00214	0.00264	0.0005	0.005	0.008	0.00875	0.0432
GW09	Max	8.4	4670	109	1.21	42	0.005	0.01	0.27	2.00E-04	1.20E-03	0.0005	0.0114	5.00E-05	5.00E-04	0.356	0.0022	0.003	0.0005	0.005	0.009	0.01	0.045
GW09	Tau	0.07	0.83	0.73	0.67	-0.46	-0.76	0.29	0.69	-0.73	-0.45	-0.58	0.24	-0.76	-0.76	-0.73	na	0.00	-0.77	-0.76	-0.33	-0.69	0.31
GW09	2-sided-p	0.90	0.00	0.00	0.31	0.06	0.05	0.45	0.09	0.05	0.31	0.13	0.55	0.05	0.05	0.06	na	1.00	0.15	0.05	0.45	0.09	0.43
GW09	Trend	No	Yes-Upward	Yes-Upward	No	No	No	No	No	Yes-Downward	No	No	No	No	No	No	na	No	No	No	No	No	No
GW09	Number of Obs Below LOR	0	0	0	0	0	7	1	0	6	3	6	2	7	7	0	0	2	5	7	0	2	3
GW09	Number of Statistical Outliers	1	0	0	0	1	0	2	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0
GW19_37a	Total Number	11	11	7	7	11	11	11	11	11	11	11	11	11	11	11	9	11	10	11	11	7	11
GW19_37a	from	17-12-2019	17-12-2019	17-12-2019	14-05-2023	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	08-11-2022	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	43816
GW19_37a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW19_37a	Min	7.03	2110	42	0.23	3	2.50E-03	0.0019	1.20E-01	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	0.00005	2.06E-01	8.00E-03	5.00E-04	0.00005	1.00E-04	0.0005	0.0001	0.0025
GW19_37a	5th %ile	7.12	2175	42.6	0.233	11	2.50E-03	0.00295	1.55E-01	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	0.00005	2.11E-01	8.40E-03	1.25E-03	0.00005	1.00E-04	0.00075	0.0001	0.0025
GW19_37a	20th %ile	7.27	2270	44	0.244	19	2.50E-03	0.005	1.90E-01	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	0.00005	0.215	9.06E-03	2.90E-03	0.00005	1.00E-04	0.00147	0.0001	0.0025
GW19_37a	Median	7.37	2330	47	0.27	25	5.00E-03	0.006	2.16E-01	5.00E-05	0.0005	0.0005	2.00E-03	5.00E-05	0.0005	0.259	0.0101	7.00E-03	0.0005	0.005	0.0016	0.0002	0.01
GW19_37a	80th %ile	7.89	2440	48	0.288	31	0.006	0.008	2.43E-01	0.00005	0.0005	0.0009	1.00E-02	5.00E-05	0.0005	0.336	0.01344	0.015	0.0005	0.005	0.002	0.00408	0.012
GW19_37a	95th %ile	8.06	2500	48.7	1.088	31	0.055	0.0085	0.2605	0.00005	0.00075	0.0015	1.56E-01	0.00005	0.00125	0.4335	0.02232	0.025	0.0005	0.005	0.002	0.005	0.0645
GW19_37a	Max	8.15	2500	49	1.43	31	0.09	0.009	2.61E-01	0.00005	0.001	0.002	2.98E-01	0.00005	0.002	0.512	0.0278	0.028	0.0005	0.005	0.002	0.005	0.066
GW19_37a	Tau	-0.53	0.02	-0.75	-0.43	0.36	-0.34	-0.20	0.46	-0.74	-0.63	-0.21	0.11	-0.74	-0.66	-0.56	0.17	-0.05	-0.73	-0.74	-0.04	-0.48	0.228831
GW19_37a	2-sided-p	0.03	1.00	0.03	0.23	0.16	0.19	0.43	0.06	0.01	0.02	0.45	0.69	0.01	0.01	0.02	0.60	0.88	0.01	0.01	0.94	0.20	0.383512
GW19_37a	Trend	Yes-Downward	No	Yes-Downward	No	No	No	No	No	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	No	No	No
GW19_37a	Number of Obs Below LOR	0	0	0	0	0	7	0	0	11	5	8	3	11	10	0	0	1	10	11	1	5	3
GW19_37a	Number of Statistical Outliers	0	0	0	1	1	2	1	1	0	1	1	1	0	1	1	1	0	0	0	1	0	2
GW08	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW08	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Number of Statistical Outliers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Bore	Statistics	pH (Field)	Lab_EC	Calcium	NH4-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
	Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW07	Total Number	19	18	17	10	21	18	18	17	18	17	18	18	18	18	17	9	18	16	18	17	13	18
GW07	from	01-02-2014	20-02-2014	20-02-2014	01-03-2017	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	41760
GW07	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW07	Min	6.27	4590	148	0.03	8	2.50E-03	0.0004	2.00E-01	2.50E-05	2.00E-03	0.0001	2.50E-04	2.00E-05	0.00005	2.78E-01	7.00E-04	2.00E-03	0.00005	1.00E-04	0.005	0.0005	0.0025
GW07	5th %ile	6.342	4590	148.8	0.0345	8	2.50E-03	0.0004	2.00E-01	2.50E-05	2.00E-03	0.0001	4.63E-04	2.00E-05	0.00005	2.94E-01	1.22E-03	2.00E-03	0.00005	1.00E-04	0.005	0.00056	0.0025
GW07	20th %ile	6.658	5360	194	0.048	22	2.50E-03	0.0004	2.28E-01	3.50E-05	2.00E-03	0.00014	5.00E-04	2.00E-05	0.00011	0.4066	2.00E-03	3.94E-03	0.00005	1.40E-04	0.00601	0.00064	0.0025
GW07	Median	6.88	5935	229	0.07	28	5.00E-03	0.0005	3.00E-01	5.00E-05	0.003	0.0005	1.00E-03	5.00E-05	0.0005	0.527	0.004	6.50E-03	0.0005	0.005	0.008	0.005	0.0125
GW07	80th %ile	7.204	7420	255.4	0.146	43	0.005	0.0005	4.48E-01	0.00014	0.00394	0.0005	2.18E-03	5.00E-05	0.0005	1.0918	0.01448	0.01346	0.0005	0.005	0.01032	0.005	0.0262
GW07	95th %ile	7.365	8661	270.6	0.573	51	0.0315	0.0005	0.564	0.000345	0.00402	0.0005	4.15E-03	0.00005	0.000575	1.34	0.02786	0.02079	0.0005	0.005	0.01168	0.005	0.0411
GW07	Max	7.77	9460	277	0.87	54	0.04	0.0005	5.80E-01	0.0006	0.0041	0.0005	5.00E-03	0.00005	0.001	1.78	0.0315	0.0213	0.0005	0.005	0.012	0.005	0.053
GW07	Tau	0.39	0.16	-0.27	-0.13	0.30	-0.41	-0.65	0.31	-0.34	0.29	-0.67	0.01	-0.65	-0.58	0.13	-0.08	0.24	-0.63	-0.67	0.23	-0.76	0.329478
GW07	2-sided-p	0.02	0.36	0.15	0.65	0.07	0.04	0.00	0.09	0.08	0.14	0.00	0.97	0.00	0.00	0.48	0.83	0.19	0.00	0.00	0.23	0.00	0.0740197
GW07	Trend	Yes-Upward	No	No	No	No	Yes-Downward	Yes-Downward	No	No	No	Yes-Downward	No	Yes-Downward	Yes-Downward	No	No	No	Yes-Downward	Yes-Downward	No	Yes-Downward	No
GW07	Number of Obs Below LOR	0	0	0	0	0	16	13	0	14	0	17	8	18	16	0	0	0	16	17	0	8	6
GW07	Number of Statistical Outliers	0	0	0	1	0	2	0	0	5	0	0	1	0	1	1	2	4	0	0	0	0	1
GW26	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW26	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Number of Statistical Outliers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW19_33	Total Number	10	10	8	7	10	10	10	10	10	10	10	10	10	10	10	8	10	9	10	10	7	10
GW19_33	from	17-12-2019	17-12-2019	17-12-2019	14-05-2023	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	14-05-2023	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	43816
GW19_33	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW19_33	Min	6.77	517	41	0.02	1	2.50E-03	0.0004	2.50E-02	2.50E-05	5.00E-05	0.0001	5.00E-04	2.00E-05	0.00005	2.90E-03	4.00E-04	2.10E-03	0.00005	1.00E-04	0.00017	0.0003	0.0025
GW19_33	5th %ile	6.8735	526.45	43.1	0.02	1.45	2.50E-03	0.000445	2.50E-02	2.50E-05	1.18E-04	0.0001	5.00E-04	2.00E-05	0.00005	8.17E-03	4.00E-04	2.37E-03	0.00005	1.00E-04	0.0002825	0.00033	0.003175
GW19_33	20th %ile	7.112	575.6	47.8	0.022	2	2.50E-03	0.0005	5.70E-02	2.50E-05	2.00E-04	0.0001	9.00E-04	2.00E-05	0.00005	0.01796	4.40E-04	2.94E-03	0.00005	1.00E-04	0.000444	0.00042	0.0056
GW19_33	Median	7.26	634	54	0.07	2	5.00E-03	0.0005	8.35E-02	3.75E-05	0.0009	0.0005	1.80E-03	3.50E-05	0.000275	0.05945	0.0015	9.20E-03	0.0005	0.00255	0.0005	0.0011	0.0095
GW19_33	80th %ile	7.564	692.4	57.2	0.314	2.2	0.0054	0.00088	1.00E-01	0.00005	0.00112	0.0012	4.44E-03	5.00E-05	0.0005	0.0844	0.00344	0.0144	0.0005	0.005	0.000808	0.00426	0.0164
GW19_33	95th %ile	7.8195	709.7	62.55	0.738	4.65	0.02515	0.00439	0.10275	0.00005	0.00182	0.007005	8.65E-03	0.00005	0.0005	0.627	0.00465	0.0182	0.0005	0.005	0.00155	0.005	0.0264
GW19_33	Max	7.95	716	65	0.9	6	0.04	0.007	1.05E-01	0.00005	0.002	0.0111	1.00E-02	0.00005	0.0005	1.05	0.005	0.02	0.0005	0.005	0.002	0.005	0.03
GW19_33	Tau	-0.20	-0.16	-0.11	-0.68	-0.43	-0.34	-0.13	0.30	-0.75	-0.49	-0.25	0.11	-0.75	-0.75	-0.42	-0.18	-0.24	-0.75	-0.75	-0.18	-0.29	0.0227331
GW19_33	2-sided-p	0.47	0.59	0.80	0.05	0.15	0.25	0.70	0.28	0.01	0.07	0.40	0.72	0.01	0.01	0.11	0.62	0.37	0.02	0.01	0.53	0.45	1
GW19_33	Trend	No	No	No	Yes-Downward	No	No	No	No	Yes-Downward	No	No	No	Yes-Downward	Yes-Downward	No	No	No	Yes-Downward	Yes-Downward	No	No	No
GW19_33	Number of Obs Below LOR	0	0	0	0	0	8	4	2	10	2	7	2	10	10	0	1	0	9	10	3	2	1
GW19_33	Number of Statistical Outliers	0	0	0	1	3	1	1	0	0	0	1	1	0	0	1	0	0	0	0	1	0	1
GW30c	Total Number	13	12	9	8	13	13	13	13	13	13	13	13	13	13	13	9	13	12	13	13	9	13
GW30c	from	01-06-2018	09-05-2019	01-06-2018	43252	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW30c	to	22-06-2024	22-06-2024	22-06-2024	45465	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW30c	Min	6.5	12300	167	0.04	25	0.0025	2.50E-04	0.28	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.0682	5.00E-05	2.50E-04	5.00E-05	0.0001	0.0004	0.0001	0.0005
GW30c	5th %ile	6.6	12355	168.6	0.11	25.6	0.0025	2.50E-04	0.31	2.50E-05	8.00E-05	1.90E-04	2.50E-04	2.00E-05	5.00E-05	0.07048	1.50E-04	4.00E-04	5.00E-05	0.00022	0.00046	0.00016	0.0014
GW30c	20th %ile	6.7	12600	178.8	0.276	32.4	0.0025	4.40E-04	0.3748	3.50E-05	1.00E-04	3.10E-04	0.00035	2.00E-05	1.00E-04	0.0772	3.60E-04	5.00E-04	6.00E-05	0.00094	0.0005	0.00025	0.0025
GW30c	Median	6.9	14400	226	0.39	43	0.005	5.00E-04	0.4	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.163	4.00E-04	0.001	5.00E-04	0.005	0.0005	0.0005	0.0025
GW30c	80th %ile	7.0	15040	334	0.676	98.8	0.005	0.0005	0.6094	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.2236	0.0005	0.00188	5.00E-04	0.005	0.008138	0.005	0.0046
GW30c	95th %ile	7.5	15875	356.8	0.9175	184.8	0.015	0.00076	0.6596	1.00E-04	7.00E-04	0.0005	0.0007	0.00005	5.00E-04	0.3076	0.002	0.0024	0.0005	0.005	0.010308	0.005	0.015
GW30c	Max	7.9	16700	372	0.97	198	0.03	0.001	0.68	1.00E-04	1.00E-03	0.0005	0.001	5.00E-05	5.00E-04	0.31	0.003	0.003	0.0005	0.005	0.012	0.005	0.015
GW30c	Tau	-0.25	-0.03	-0.08	0.14	-0.01	-0.61	-0.47	0.09	-0.07	-0.74	-0.55	-0.49	-0.72	-0.57	-0.22	-0.85	0.04	-0.64	-0.60	-0.04	-0.65	-0.34
GW30c	2-sided-p	0.27	0.95	0.83	0.71	1.00	0.01	0.05	0.71	0.83	0.00	0.02	0.05	0.00	0.02	0.33	0.00	0.90	0.01	0.01	0.90	0.03	0.16
GW30c	Trend	No	No	No	No	No	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	No	Yes-Downward	Yes-Downward	No	Yes-Downward	No
GW30c	Number of Obs Below LOR	0	0	0	0	0	12	9	0	13	10	11	12	13	13	0	4	6	12	11	6	7	9
GW30c	Number of Statistical Outliers	1	0	0	0	2	1	4	0	2	0	1	2	0	0	0	2	0	0	0	0	0	4
GW31b	Total Number	13	12	9	8	13	13	13	13	13	13	13	13	13	13	13	9	13	12	13	13	9	13
GW31b	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	43252
GW31b	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW31b	Min	6.63	2290	74	0.02	6	2.50E-03	0.0001	2.00E-01	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	0.00005	1.30E-03	4.00E-04	5.00E-04	0.00005	1.00E-04	0.00151	0.0004	0.0005
GW31b	5th %ile	6.738	2339.5	74.4	0.0375	8.4	2.50E-03	0.0001	2.29E-01	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	0.00005	2.32E-03	4.40E-04	5.00E-04	0.00005	1.00E-04	0.001582	0.00044	0.0014
GW31b	20th %ile	6.826	2454	75	0.082	11.4	2.50E-03	0.0001	2.52E-01	2.50E-05	5.00E-05	0.0002	2.50E-04	2.00E-05	0.00005	0.009	5.00E-04	5.00E-04	0.00005	1.00E-04	0.001784	0.00056	0.0025
GW31b	Median	6.93	2625	85	0.17	15	5.00E-03	0.0005	2.70E-01	5.00E-05	0.0005	0.0005	5.00E-04	5.00E-05	0.0005	0.028	0.0005	7.00E-04	0.0005	0.005	0.002	0.0008	0.0025
GW31b	80th %ile	7.474	2638	88	0.494	15.6	0.005	0.0005	2.89E-01	0.00005	0.0005	0.0005	5.00E-04	5.00E-05	0.0005	0.0462	0.00074	0.0014	0.0005	0.005	0.002	0.005	0.0086
GW31b	95th %ile	7.784	2739	90.4	1.5795	16.8	0.015	0.0005	0.31	7E-05	0.0005	0.0005	1.40E-03	0.00005	0.0005	0.05844	0.00272	0.00208	0.0005	0.005	0.002	0.005	0.01
GW31b	Max	7.94	2860	92	2.08	18	0.03	0.0005	3.25E-01	0.0001	0.0005	0.0005	2.00E-03	0.00005	0.0005	0.0666	0.004	0.0028	0.0005	0.005	0.002	0.005	0.01
GW31b	Tau	-0.40	0.66	0.29	0.21	-0.46	-0.61	-0.65	0.09	-0.55	-0.75	-0.62	-0.61	-0.72	-0.72	0.48	0.06	0.59	-0.70	-0.72	-0.61	-0.71	-0.195123
GW31b	2-sided-p	0.07	0.00	0.34	0.54	0.04	0.01	0.01	0.71	0.03	0.00	0.01	0.01	0.00	0.00	0.03	0.91	0.01	0.01	0.00	0.01	0.02	0.410968
GW31b	Trend	No	Yes-Upward	No	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Upward	No	Yes-Upward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW31b	Number of Obs Below LOR	0	0	0	0	0	12	12	0	12	12	10	11	13	13	0	3	6	12	13	0	4	6
GW31b	Number of Statistical Outliers	0	0	0	1	1	1	0	1	1	0	0	2	0	0	0	1	1	0	0	2	0	0

Bore	Statistics	pH (Field)	Lab_EC	Calcium	NH4-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
	Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW30b	Total Number	13	12	9	8	13	13	13	13	13	13	13	13	13	13	13	9	13	12	13	13	9	13
GW30b	from	01-06-2018	09-05-2019	01-06-2018	43252	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW30b	to	22-06-2024	22-06-2024	22-06-2024	45465	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW30b	Min	6.5	16600	437	3.22	0.5	0.0025	2.50E-04	0.19	2.50E-05	1.00E-04	2.00E-04	2.50E-04	2.00E-05	5.00E-05	0.081	5.00E-05	2.50E-04	5.00E-05	0.0001	0.000025	0.0001	0.009
GW30b	5th %ile	6.5	16600	448.2	3.227	0.5	0.0025	2.50E-04	0.2398	4.00E-05	1.00E-04	2.30E-04	4.00E-04	2.00E-05	8.00E-05	0.0876	2.30E-04	4.00E-04	5.00E-05	0.00064	0.00004	0.00016	0.0096
GW30b	20th %ile	6.7	16800	509.4	3.284	0.5	0.0025	5.40E-04	0.288	5.00E-05	2.00E-04	2.50E-04	0.0005	2.00E-05	1.00E-04	0.101	5.00E-04	1.44E-03	5.00E-05	0.001	0.00005	0.00025	0.011
GW30b	Median	7.0	17200	552	3.48	4	0.005	1.00E-03	0.328	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.105	1.00E-03	0.002	5.00E-04	0.005	0.0005	0.00025	0.018
GW30b	80th %ile	7.2	17560	617	3.604	16.8	0.01	0.0066	0.3536	1.00E-04	5.00E-04	0.0005	0.002	5.00E-05	5.00E-04	0.1116	0.00212	0.0046	5.00E-04	0.005	0.0005	0.005	0.0236
GW30b	95th %ile	7.6	18285	679.4	3.8735	50	0.022	0.0128	0.3764	1.00E-04	1.50E-03	0.0005	0.003	7E-05	5.00E-04	0.1144	0.00392	0.0068	0.0005	0.005	0.0005	0.005	0.0288
GW30b	Max	7.8	19000	705	4.01	56	0.04	0.014	0.38	1.00E-04	3.00E-03	0.0005	0.003	1.00E-04	5.00E-04	0.118	0.005	0.008	0.0005	0.005	0.0005	0.005	0.036
GW30b	Tau	-0.45	0.13	-0.44	0.07	-0.89	-0.44	-0.61	-0.04	0.44	-0.73	-0.65	0.23	-0.38	-0.65	0.52	-0.37	-0.61	-0.70	-0.65	-0.65	-0.61	-0.13
GW30b	2-sided-p	0.04	0.63	0.12	0.90	0.00	0.06	0.01	0.90	0.07	0.00	0.01	0.34	0.13	0.01	0.02	0.21	0.00	0.01	0.01	0.01	0.05	0.58
GW30b	Trend	Yes-Downward	No	No	No	Yes-Downward	No	Yes-Downward	No	No	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Upward	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW30b	Number of Obs Below LOR	0	0	0	0	5	8	3	0	13	9	12	8	13	13	0	2	2	12	13	13	9	0
GW30b	Number of Statistical Outliers	1	1	2	0	2	1	3	1	0	1	0	0	1	0	1	1	1	0	0	0	0	0
GW10	Total Number	16	15	15	10	18	16	16	15	16	15	16	16	16	16	15	8	16	14	16	15	12	16
GW10	from	01-05-2014	01-05-2014	01-05-2014	01-03-2017	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	14-05-2023	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	41760
GW10	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW10	Min	7.16	2030	12	0.85	0.5	2.50E-03	0.002	5.06E-01	2.50E-05	5.00E-05	0.0004	2.50E-04	2.00E-05	0.00005	5.00E-03	8.00E-03	5.00E-04	0.00005	1.00E-04	0.00011	0.0001	0.0025
GW10	5th %ile	7.2125	2177	14.8	0.85	0.5	2.50E-03	0.003275	5.15E-01	2.50E-05	5.00E-05	0.000475	2.50E-04	2.00E-05	0.00005	5.70E-03	8.11E-03	5.00E-04	0.00005	1.00E-04	0.000117	0.000155	0.0025
GW10	20th %ile	7.32	2762	17.8	0.858	0.5	2.50E-03	0.0042	5.38E-01	2.50E-05	1.70E-04	0.0005	5.00E-04	2.00E-05	0.00005	0.007	8.98E-03	5.00E-04	0.00005	1.00E-04	0.00012	0.0003	0.0025
GW10	Median	7.42	3790	28	1.03	0.5	5.00E-03	0.006	8.70E-01	5.00E-05	0.0005	0.0005	5.00E-04	5.00E-05	0.0005	0.0265	0.04095	2.50E-03	0.0005	0.005	0.0005	0.005	0.004
GW10	80th %ile	7.63	5814	50.2	1.196	5.6	0.01	0.007	9.40E-01	0.00005	0.0005	0.0027	1.00E-03	5.00E-05	0.0005	0.0847	0.04732	0.0224	0.0005	0.005	0.0005	0.005	0.008
GW10	95th %ile	7.93	6244	60.3	1.3465	8.15	0.0625	0.01325	1.01	0.0001125	0.0005	0.002825	2.00E-03	0.00005	0.000625	0.09876	0.048775	0.0262	0.0005	0.005	0.0005	0.005	0.009
GW10	Max	8.05	6650	61	1.45	9	0.07	0.029	1.01E+00	0.0003	0.0005	0.0029	2.00E-03	0.00005	0.001	0.122	0.0493	0.028	0.0005	0.005	0.0005	0.005	0.009
GW10	Tau	-0.08	0.16	-0.14	-0.16	-0.61	-0.36	-0.45	-0.49	-0.71	-0.65	0.45	-0.24	-0.68	-0.74	0.54	0.50	0.32	-0.66	-0.68	-0.69	-0.76	0.293447
GW10	2-sided-p	0.68	0.43	0.49	0.59	0.00	0.08	0.02	0.01	0.00	0.00	0.03	0.24	0.00	0.00	0.01	0.11	0.10	0.01	0.00	0.00	0.00	0.153748
GW10	Trend	No	No	No	No	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Upward	No	Yes-Downward	Yes-Downward	Yes-Upward	No	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW10	Number of Obs Below LOR	0	0	0	0	10	11	0	0	15	13	10	10	16	15	0	0	5	14	16	10	8	7
GW10	Number of outliers	0	0	0	0	0	3	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
GW13	Total Number	18	16	15	10	19	17	17	16	17	16	17	17	17	17	16	9	17	15	17	16	12	17
GW13	from	01-05-2014	01-05-2014	01-05-2014	42795	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW13	to	22-06-2024	22-06-2024	22-06-2024	45465	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW13	Min	7.1	11600	68	2.82	0.5	0.0025	7.00E-04	0.13	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.012	1.20E-03	2.50E-04	5.00E-05	0.0001	0.000025	0.0001	0.006
GW13	5th %ile	7.2	11825	77.8	2.847	0.5	0.0025	8.60E-04	0.39925	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.015	1.20E-03	4.50E-04	5.00E-05	0.0001	0.000025	0.0001	0.0068
GW13	20th %ile	7.2	12000	84.4	2.96	0.5	0.0025	1.06E-03	0.5	3.00E-05	1.00E-04	1.30E-04	0.0005	2.00E-05	1.00E-04	0.022	1.32E-03	5.00E-04	9.00E-05	0.00036	0.000025	0.00021	0.011
GW13	Median	7.3	12200	93	3.145	0.5	0.005	2.00E-03	0.57	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.03045	1.70E-03	0.0014	5.00E-04	0.005	0.0005	0.005	0.013
GW13	80th %ile	7.5	12300	127	3.352	3.6	0.005	0.0056	0.64	5.00E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.0364	0.002	0.003	5.00E-04	0.005	0.0005	0.005	0.0184
GW13	95th %ile	7.7	12700	143	3.4535	15.1	0.022	0.013	0.66	5.00E-04	8.75E-04	0.0005	0.0022	0.00005	5.00E-04	0.04125	0.0104	0.0092	0.00125	0.005	0.0005	0.005	0.0244
GW13	Max	8.0	13000	143	3.53	34	0.03	0.021	0.66	2.10E-03	2.00E-03	0.0005	0.003	5.00E-05	5.00E-04	0.042	0.016	0.03	0.003	0.005	0.0005	0.005	0.042
GW13	Tau	0.10	0.08	-0.08	-0.56	-0.34	-0.50	-0.38	0.08	-0.47	-0.57	-0.64	-0.16	-0.66	-0.61	0.42	-0.94	0.08	-0.63	-0.60	-0.65	-0.78	0.52
GW13	2-sided-p	0.57	0.71	0.73	0.03	0.07	0.01	0.04	0.68	0.02	0.01	0.00	0.43	0.00	0.00	0.03	0.00	0.68	0.00	0.00	0.00	0.00	0.01
GW13	Trend	No	No	No	Yes-Downward	No	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Upward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Upward
GW13	Number of Obs Below LOR	0	0	0	0	12	15	0	0	16	14	17	11	17	17	0	0	5	14	16	16	10	0
GW13	Number of outliers	1	1	0	0	3	2	2	1	3	1	0	2	0	0	0	1	1	1	0	0	0	1
GW30a	Total Number	12	11	9	8	12	12	12	12	12	12	12	12	12	12	12	8	12	11	12	12	9	12
GW30a	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	14-05-2023	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	43252
GW30a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW30a	Min	6.72	13900	170	3.08	0.5	2.50E-03	0.00025	1.90E-01	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	0.00005	4.05E-02	4.00E-04	2.50E-04	0.00005	1.00E-04	0.000025	0.0001	0.012
GW30a	5th %ile	6.8685	14000	178.4	3.094	0.5	2.50E-03	0.00025	2.27E-01	3.88E-05	7.75E-05	0.0001825	3.88E-04	2.00E-05	0.0000775	4.07E-02	4.00E-04	2.50E-04	0.00005	5.95E-04	0.00003875	0.00016	0.0131
GW30a	20th %ile	7.146	14100	209.6	3.144	0.5	2.50E-03	0.00025	2.74E-01	5.00E-05	1.00E-04	0.00025	5.00E-04	2.00E-05	0.0001	0.044	4.40E-04	3.00E-04	0.00005	1.00E-03	0.00005	0.00025	0.0172
GW30a	Median	7.26	14300	246	3.21	0.5	5.00E-03	0.0005	3.00E-01	5.00E-05	0.0005	0.0005	5.00E-04	5.00E-05	0.0005	0.04595	0.0005	9.50E-04	0.0005	0.005	0.0005	0.00025	0.019
GW30a	80th %ile	7.476	14700	275.8	3.468	1	0.005	0.0036	3.30E-01	0.0001	0.0005	0.0005	3.80E-03	5.00E-05	0.0005	0.0594	0.00056	0.0048	0.0005	0.005	0.0005	0.005	0.0228
GW30a	95th %ile	7.517	15600	299.2	3.559	4.35	0.0235	0.00545	0.3445	0.0001	0.001625	0.0005	5.00E-03	0.0000725	0.0005	0.0638	0.00151	0.0059	0.0005	0.005	0.000725	0.005	0.02345
GW30a	Max	7.55	16000	308	3.58	6	0.04	0.006	3.50E-01	0.0001	0.003	0.0005	5.00E-03	0.0001	0.0005	0.066	0.002	0.007	0.0005	0.005	0.001	0.005	0.024
GW30a	Tau	-0.44	0.13	-0.44	0.43	-0.67	-0.69	-0.87	0.00	0.45	-0.72	-0.65	0.28	-0.37	-0.65	-0.58	-0.54	-0.78	-0.71	-0.65	-0.72	-0.61	0
GW30a	2-sided-p	0.05	0.64	0.12	0.17	0.01	0.01	0.00	1.00	0.08	0.00	0.01	0.27	0.15	0.01	0.01	0.11	0.00	0.01	0.01	0.00	0.05	1
GW30a	Trend	No	No	No	No	Yes-Downward	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW30a	Number of Obs Below LOR	0	0	0	0	8	10	6	0	12	11	12	7	12	12	0	2	4	11	12	11	9	0
GW30a	Number of Statistical Outliers	1	1	0	0	2	2	0	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0
GW31a	Total Number	12	11	9	8	12	12	12	12	12	12	12	12	12	12	12	8	12	11	12	12	9	12
GW31a	from	01-06-2018	09-05-2019	01-06-2018	43252	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	14-05-2023	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW31a	to	22-06-2024	22-06-2024	22-06-2024	45465	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW31a	Min	7.3	4530	15	0.76	0.5	0.0025	9.00E-04	0.48	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.00025	2.11E-02	2.50E-04	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	5th %ile	7.4	4565	15	0.7775	0.5	0.003875	9.55E-04	0.48165	2.50E-05	5.00E-05	1.00E-04	3.88E-04	2.00E-05	5.00E-05	0.00025	2.12E-02	3.88E-04	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	20th %ile	7.6	4610	15.6	0.822	0.5	0.0062	1.00E-03	0.5052	2.50E-05	5.00E-05	1.00E-04	0.0005	2.00E-05	5.00E-05	0.00034	2.17E-02	5.00E-04	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	Median	7.7	4690	18	0.885	0.5	0.0095	1.15E-03	0.52	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.0066	2.21E-02	0.0005	5.00E-04	0.005	0.0005	0.0001	0.0035
GW31a	80th %ile	8.1	4790	19.6	0.932	0.5	0.038	0.002	0.572	5.00E-05	5.00E-04	0.0005	0.00068	5.00E-05	5.00E-04	0.0078	0.02332	0.00176	5.00E-04	0.005	0.0005	0.005	0.0076
GW31a	95th %ile	8.2	4820	22.6	0.953	1.45	0.077	0.00435	0.61585	5.00E-05	5.00E-04	0.0005	0.002305	0.00005	5.00E-04	0.0116	0.024325	0.00236	0.0005	0.005	0.000725	0.005	0.01025
GW31a	Max	8.2	4830	23	0.96	2	0.11	0.006	0.623	5.00E-05	5.00E-04	0.0005	0.0039	5.00E-05	5.00E-04	0.016	0.0245	0.0028	0.0005	0.005	0.001	0.005	0.013
GW31a	Tau	-0.45	0.09	-0.46	-0.14	-0.56	-0.46	-0.54	0.02	-0.73	-0.73	-0.73	0.24	-0.73	-0.73	-0.75	-0.33	-0.03	-0.71	-0.73	-0.79	-0.75	0.47
GW31a	2-sided-p	0.05	0.76	0.12	0.71	0.03	0.05	0.02	1.00	0.01	0.01	0.01	0.34	0.01	0.01	0.00	0.32	0.94	0.01	0.01	0.00	0.02	0.05
GW31a	Trend	No	No	No	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW31a	Number of Obs Below LOR	0	0	0	0	10	2	0	0	12	12	12	7	12	12	3	0	6	11	12	11	9	5
GW31a	Number of Statistical Outliers	0	0	2	0	2	1	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0

Bore	Statistics	pH (Field)	Lab_EC	Calcium	NH4-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
	Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GW11	Total Number	19	16	15	10	19	17	17	16	17	16	17	17	17	17	16	9	17	15	17	16	12	17
GW11	from	01-05-2014	01-05-2014	01-05-2014	01-03-2017	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	41760
GW11	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	45465
GW11	Min	6.4	3540	32	0.6	0.5	2.50E-03	0.0001	2.50E-01	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	0.00005	1.50E-02	4.00E-04	5.00E-04	0.00005	1.00E-04	0.000025	0.0004	0.0025
GW11	5th %ile	6.49	3577.5	32.7	0.9645	0.5	2.50E-03	0.0001	2.94E-01	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	0.00005	1.69E-02	4.40E-04	5.00E-04	0.00005	1.00E-04	0.000025	0.000455	0.0025
GW11	20th %ile	6.758	3720	35.8	1.434	0.5	2.50E-03	0.00026	3.30E-01	2.50E-05	1.00E-04	0.00014	5.00E-04	2.00E-05	0.00005	0.0212	5.00E-04	5.00E-04	0.00005	1.00E-04	0.000025	0.00052	0.003
GW11	Median	7.04	3785	54	1.575	3	5.00E-03	0.0005	3.58E-01	5.00E-05	0.0005	0.0005	5.00E-04	5.00E-05	0.0005	0.0271	0.0005	1.00E-03	0.0005	0.005	0.0005	0.005	0.009
GW11	80th %ile	7.476	4140	95	1.768	7.4	0.005	0.0005	3.90E-01	0.00005	0.0005	0.0005	6.60E-04	5.00E-05	0.0005	0.029	0.00194	0.00194	0.0005	0.005	0.0005	0.005	0.0158
GW11	95th %ile	7.765	4672.5	105.8	1.932	16.3	0.032	0.0016	0.44	0.00005	0.0005	0.0005	2.16E-03	0.00005	0.0005	0.0325	0.0026	0.004	0.0005	0.005	0.0005	0.005	0.0292
GW11	Max	8.08	4920	110	2.04	19	0.04	0.004	5.60E-01	0.00005	0.0005	0.0005	6.00E-03	0.00005	0.0005	0.04	0.003	0.006	0.0005	0.005	0.0005	0.005	0.07
GW11	Tau	0.37	-0.53	-0.81	-0.11	-0.79	-0.42	-0.49	-0.12	-0.66	-0.65	-0.60	-0.11	-0.66	-0.66	-0.54	0.06	0.38	-0.65	-0.66	-0.68	-0.69	0.212219
GW11	2-sided-p	0.03	0.01	0.00	0.72	0.00	0.04	0.01	0.56	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.91	0.05	0.01	0.00	0.00	0.01	0.26169
GW11	Trend	Yes-Upward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Upward	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW11	Number of Obs Below LOR	0	0	0	0	9	14	13	0	17	14	16	13	17	17	0	3	7	15	17	16	7	4
GW11	Number of Statistical Outliers	0	2	0	1	2	3	5	2	0	0	0	5	0	0	1	0	2	0	0	0	0	1
GW29a	Total Number	11	11	8	7	11	11	11	11	11	11	11	11	11	11	11	8	11	10	11	11	8	11
GW29a	from	09-05-2019	09-05-2019	09-05-2019	45060	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	14-05-2023	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019
GW29a	to	22-06-2024	22-06-2024	22-06-2024	45465	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW29a	Min	7.1	8480	92	1.59	0.5	0.0025	6.00E-03	0.47	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.0288	5.00E-04	5.00E-04	5.00E-05	0.0001	0.000025	0.0001	0.01
GW29a	5th %ile	7.1	8520	92.35	1.617	0.5	0.0025	6.00E-03	0.503	2.50E-05	5.00E-05	1.00E-04	2.50E-04	2.00E-05	5.00E-05	0.0294	1.38E-03	5.00E-04	5.00E-05	0.0001	0.000025	0.0001	0.011
GW29a	20th %ile	7.3	8650	97	1.716	0.5	0.0025	7.00E-03	0.546	2.50E-05	1.00E-04	1.00E-04	0.0005	2.00E-05	5.00E-05	0.03	3.00E-03	1.00E-03	5.00E-05	0.0001	0.000025	0.0001	0.013
GW29a	Median	7.5	9170	115	1.91	0.5	0.005	1.00E-02	0.578	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.033	3.75E-03	0.0014	5.00E-04	0.005	0.0005	0.0001	0.015
GW29a	80th %ile	7.7	9530	123.6	1.92	2	0.006	0.0115	0.6	5.00E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.0387	0.00404	0.0019	5.00E-04	0.005	0.0005	0.005	0.02
GW29a	95th %ile	7.8	9870	140.3	2.34	3.5	1.7	0.01555	0.672	5.00E-05	2.25E-03	0.00275	0.0113	0.00005	1.33E-02	0.20895	0.004265	0.009	0.0005	0.005	0.00125	0.005	0.1105
GW29a	Max	7.9	10100	148	2.52	5	3.36	0.017	0.684	5.00E-05	4.00E-03	0.005	0.021	5.00E-05	2.60E-02	0.377	0.0043	0.016	0.0005	0.005	0.002	0.005	0.201
GW29a	Tau	-0.43	-0.45	-0.36	-0.78	-0.26	-0.27	0.33	0.07	-0.74	-0.64	-0.62	-0.12	-0.74	-0.62	0.15	0.59	0.37	-0.73	-0.60	-0.62	-0.73	0.20
GW29a	2-sided-p	0.08	0.06	0.27	0.02	0.36	0.32	0.18	0.81	0.01	0.01	0.02	0.69	0.01	0.02	0.58	0.06	0.14	0.01	0.03	0.02	0.04	0.43
GW29a	Trend	No	No	No	Yes-Downward	No	No	No	No	Yes-Downward	Yes-Downward	Yes-Downward	No	Yes-Downward	Yes-Downward	No	No	No	Yes-Downward	Yes-Downward	Yes-Downward	Yes-Downward	No
GW29a	Number of Obs Below LOR	0	0	0	0	8	8	0	0	11	7	10	6	11	10	0	1	2	10	10	10	8	0
GW29a	Number of Statistical Outliers	0	0	0	1	1	2	0	2	0	1	1	2	0	1	1	1	1	0	0	1	0	1

N/A = insufficient data for statistical analysis

Appendix B Water Quality Time Series

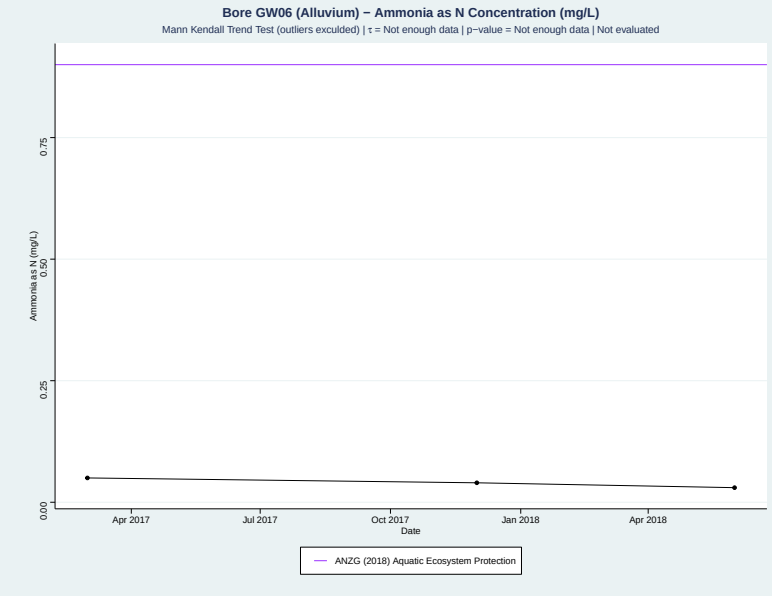
Groundwater Compliance 2024 Updated Limit and Trigger Development

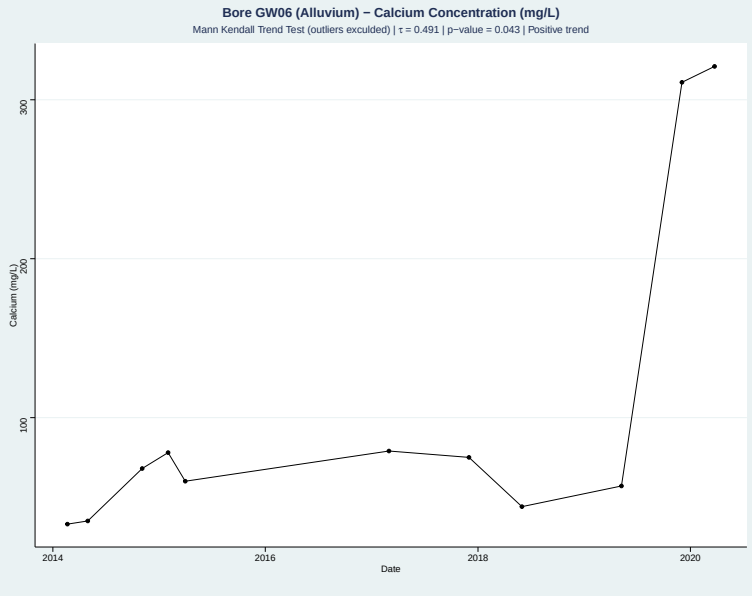
New Lenton Coal Project

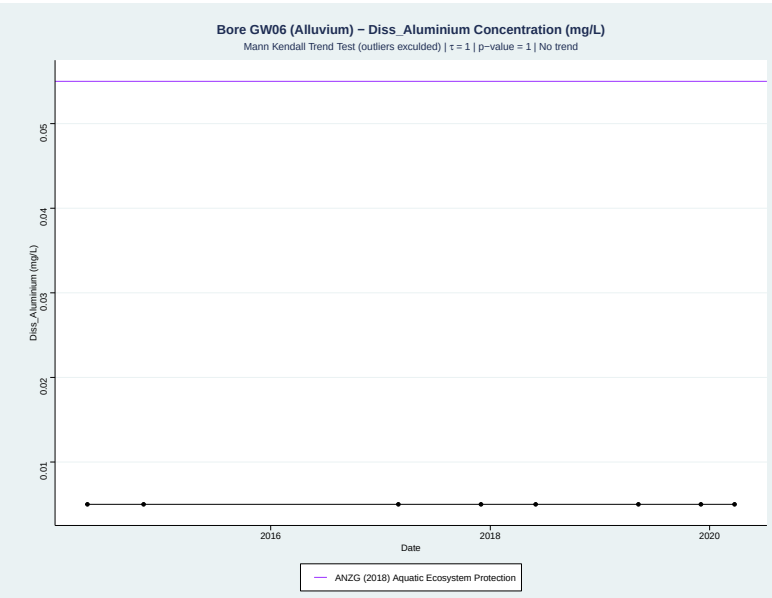
Lenton Joint Venture

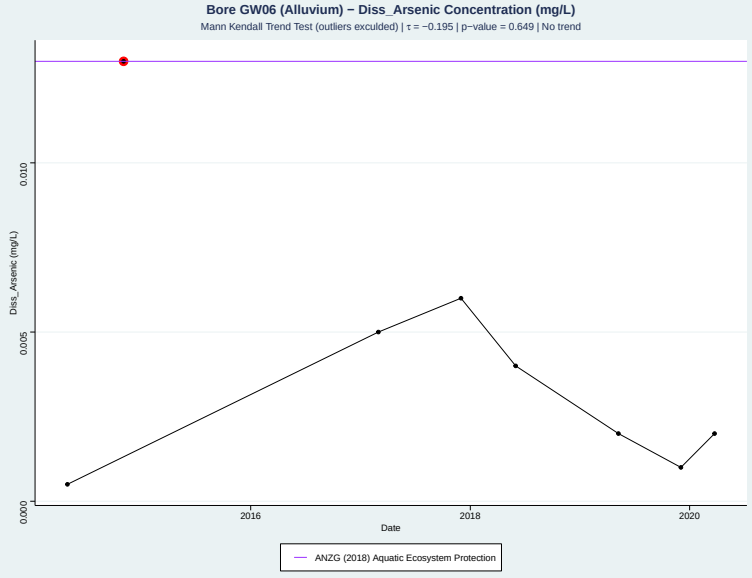
SLR Project No.: 620.040927.00001

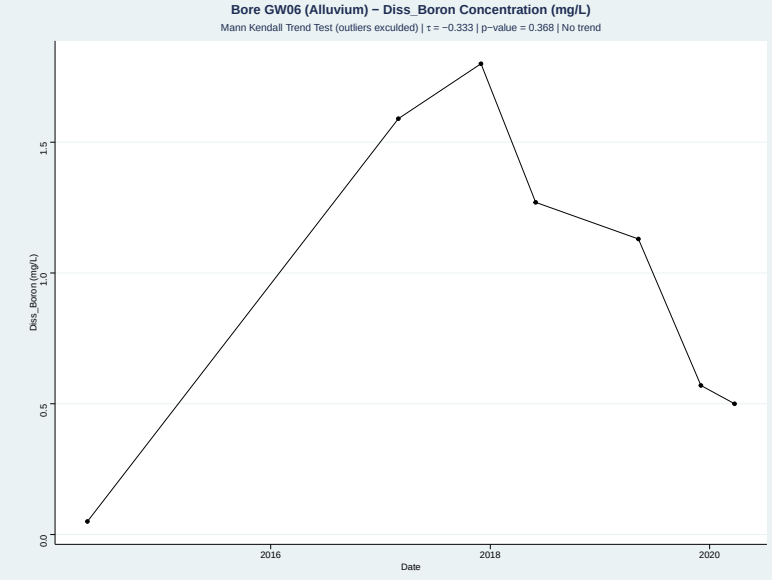
25 September 2024

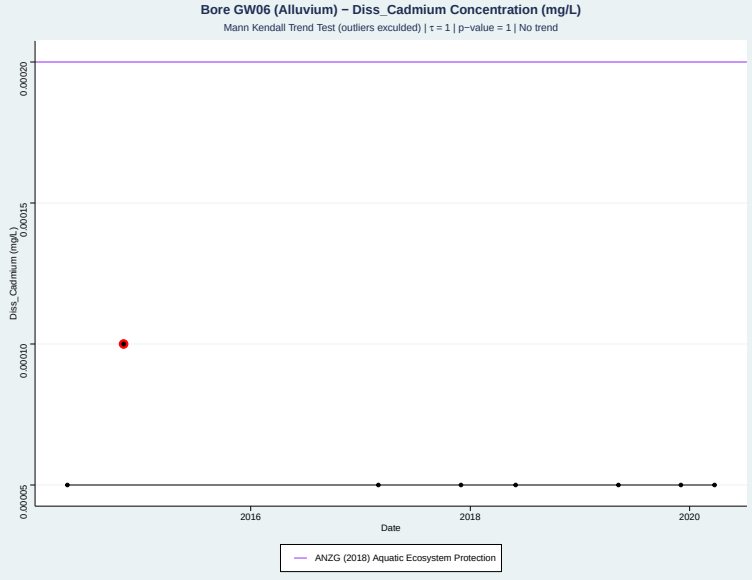

Bore GW06 (Alluvium) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = Not enough data | p−value = Not enough data | Not evaluated
Ammonia as N (mg/L)
0.00
0.25
0.50
0.75
Apr 2017
Jul 2017
Oct 2017
Jan 2018
Apr 2018
Date
ANZG (2018) Aquatic Ecosystem Protection

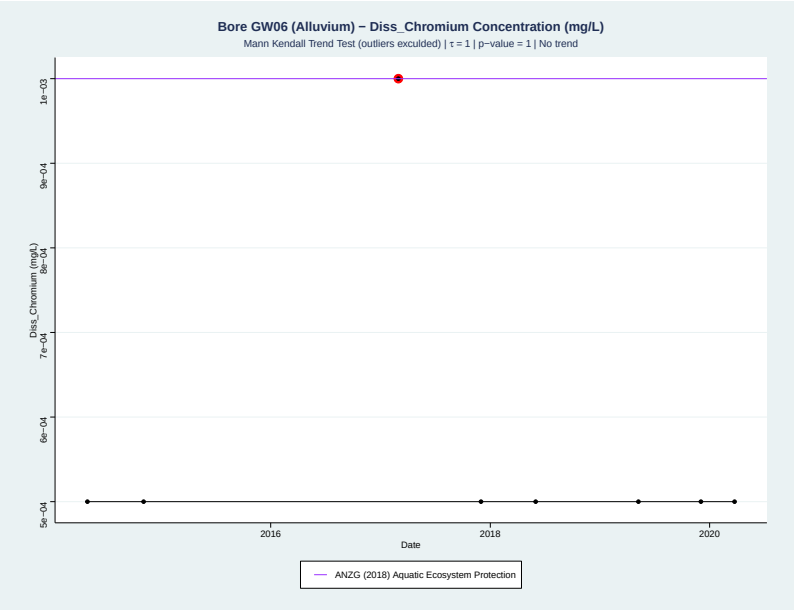

Bore GW06 (Alluvium) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.491 | p−value = 0.043 | Positive trend
Calcium (mg/L)
100
200
300
2014
2016
2018
2020
Date

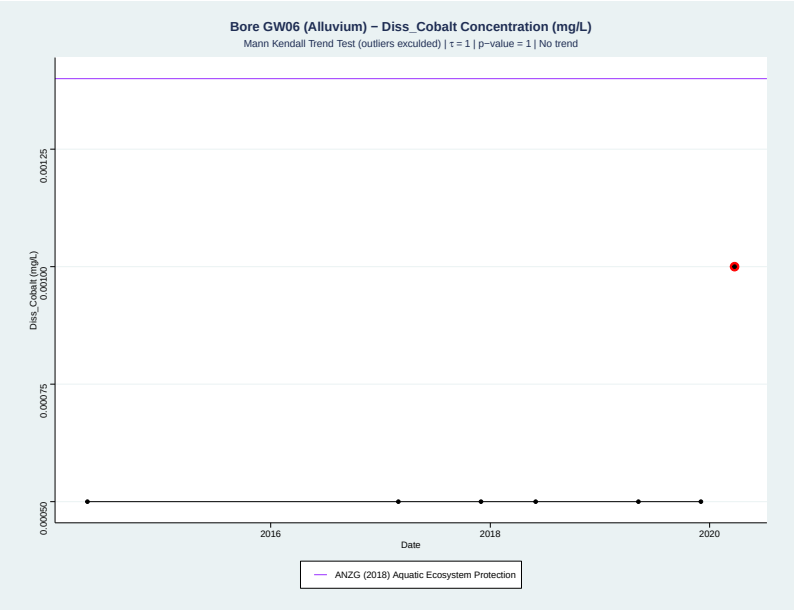

Bore GW06 (Alluvium) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 1 | p−value = 1 | No trend
Diss_Aluminium (mg/L)
0.01
0.02
0.03
0.04
0.05
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

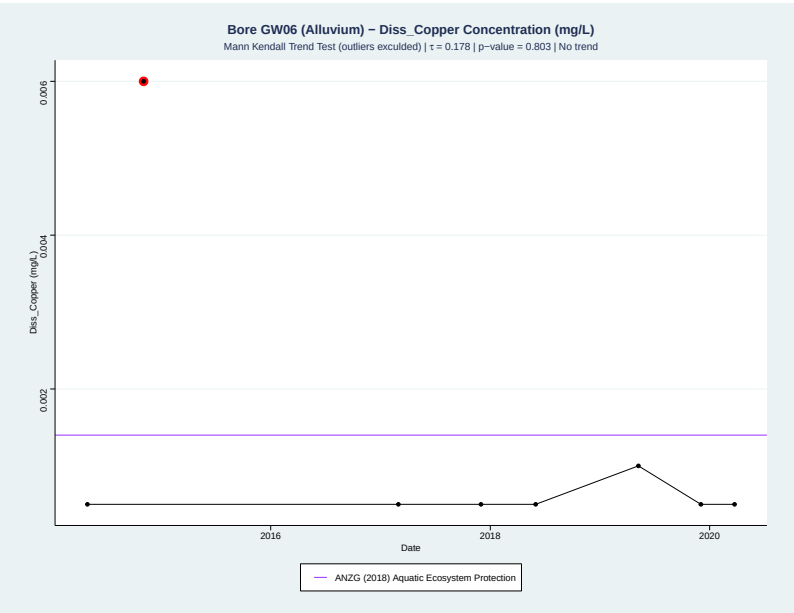

Bore GW06 (Alluvium) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.195 | p−value = 0.649 | No trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

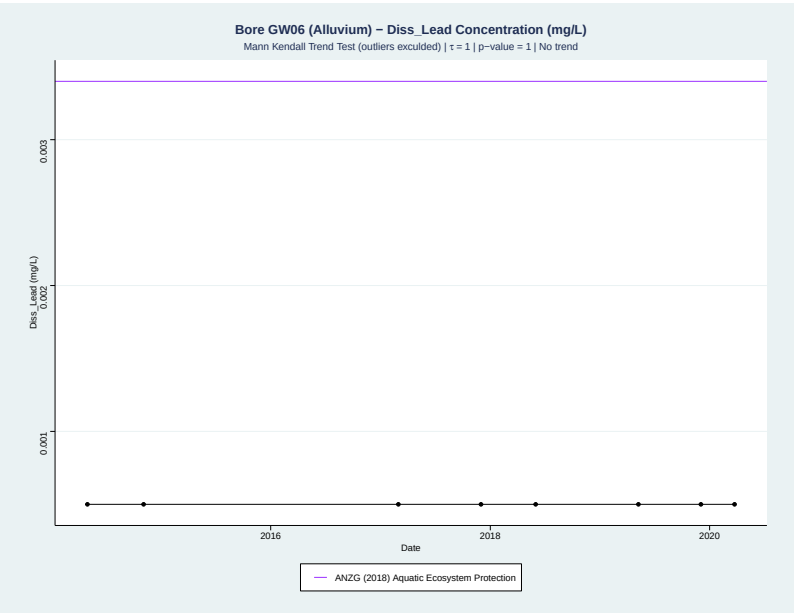

Bore GW06 (Alluvium) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.333 | p−value = 0.368 | No trend
Diss_Boron (mg/L)
0.0
0.5
1.0
1.5
2016
2018
2020
Date

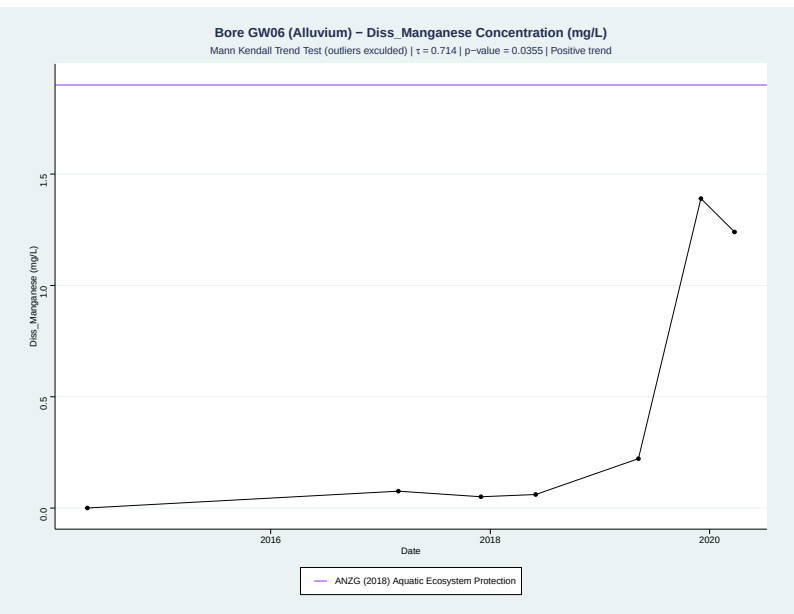

Bore GW06 (Alluvium) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 1 | p−value = 1 | No trend
Diss_Cadmium (mg/L)
0.00005
0.00010
0.00015
0.00020
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

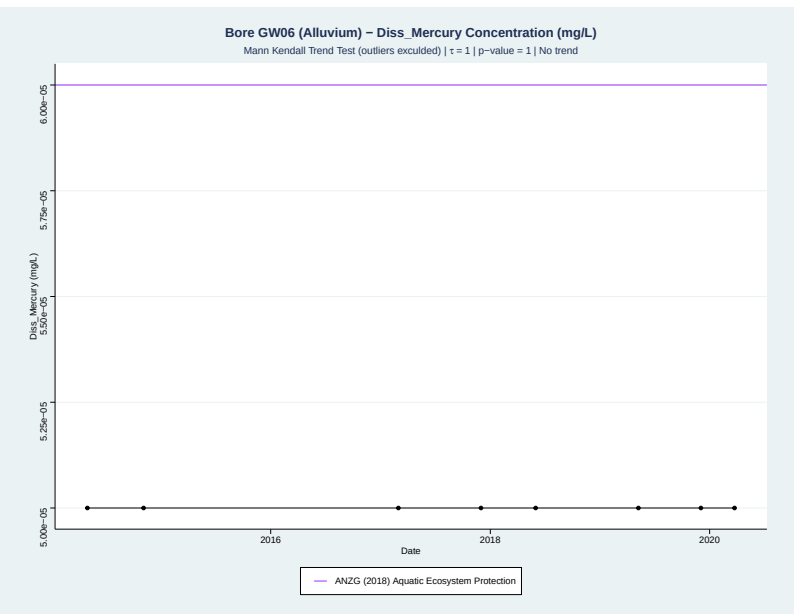

Bore GW06 (Alluvium) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 1 | p−value = 1 | No trend
Diss_Chromium (mg/L)
1e−03
9e−04
8e−04
7e−04
6e−04
5e−04
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

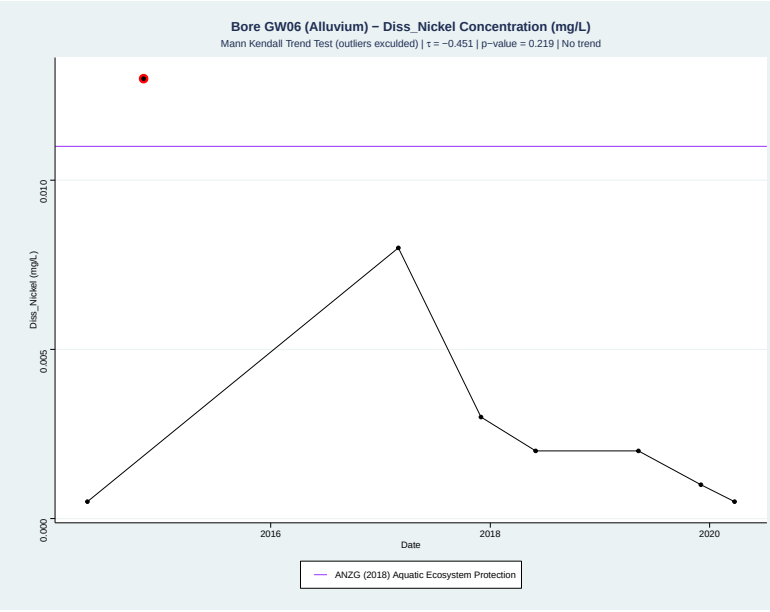

Bore GW06 (Alluvium) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 1 | p−value = 1 | No trend
Diss_Cobalt (mg/L)
0.00125
0.00100
0.00075
0.00050
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

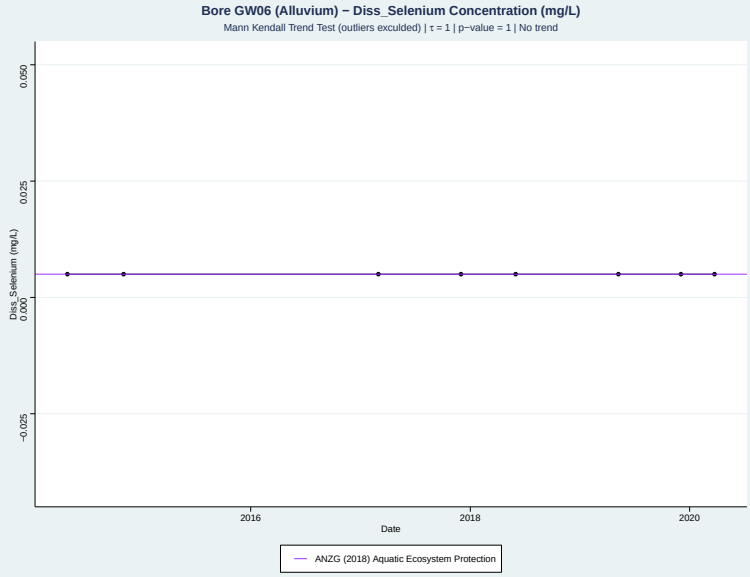

Bore GW06 (Alluvium) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.178 | p−value = 0.803 | No trend
Diss_Copper (mg/L)
0.006
0.004
0.002
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

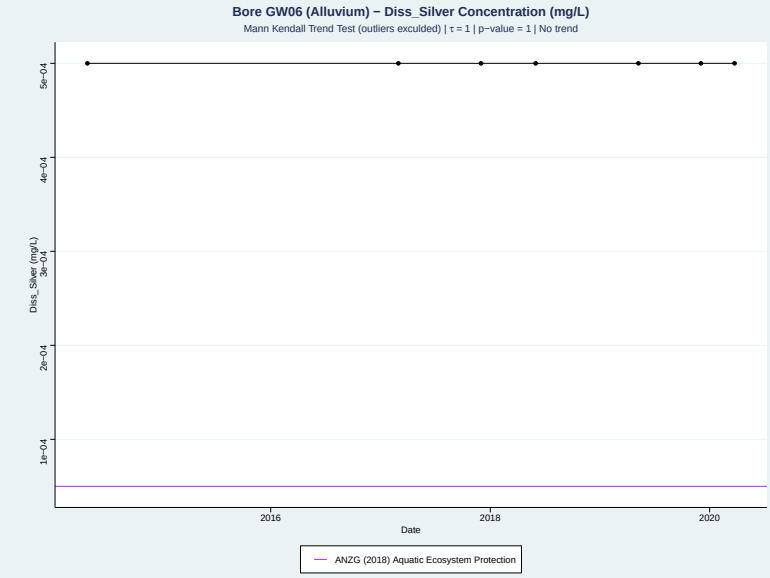

Bore GW06 (Alluvium) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 1 | p−value = 1 | No trend
Diss_Lead (mg/L)
0.003
0.002
0.001
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

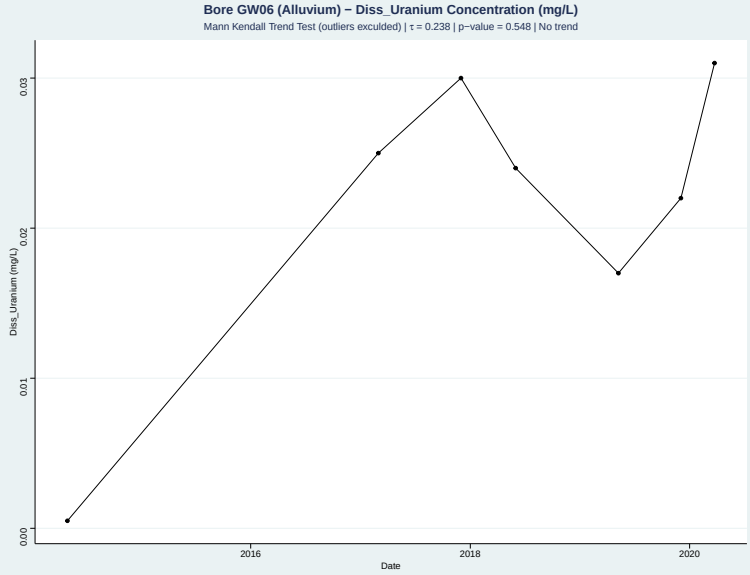

Bore GW06 (Alluvium) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.714 | p−value = 0.0355 | Positive trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
0.0
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

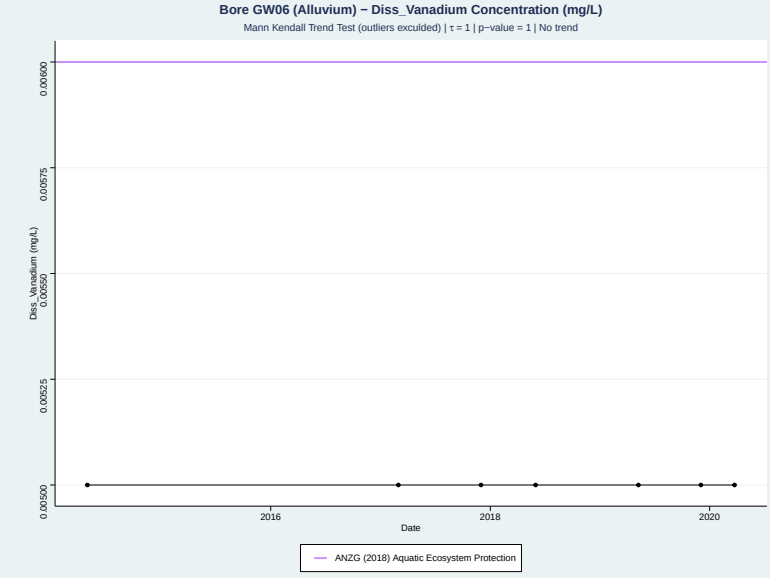

Bore GW06 (Alluvium) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 1 | p−value = 1 | No trend
Diss_Mercury (mg/L)
6.00e−05
5.75e−05
5.50e−05
5.25e−05
5.00e−05
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

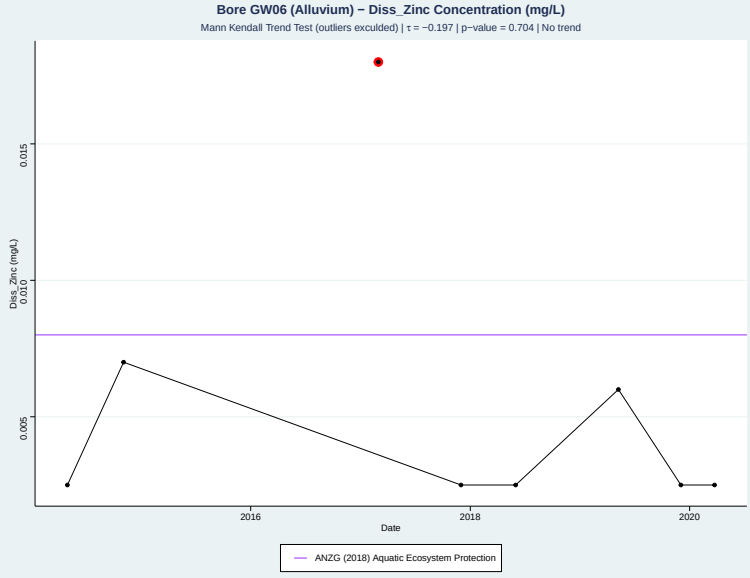

Bore GW06 (Alluvium) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.451 | p−value = 0.219 | No trend
Diss_Nickel (mg/L)
0.000
0.005
0.010
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

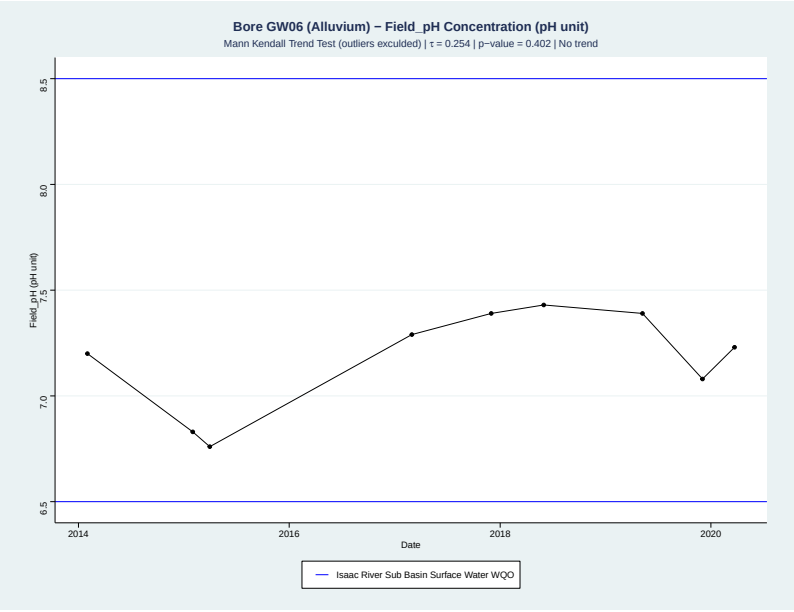

Bore GW06 (Alluvium) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 1 | p−value = 1 | No trend
Diss_Selenium (mg/L)
−0.025
0.000
0.025
0.050
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

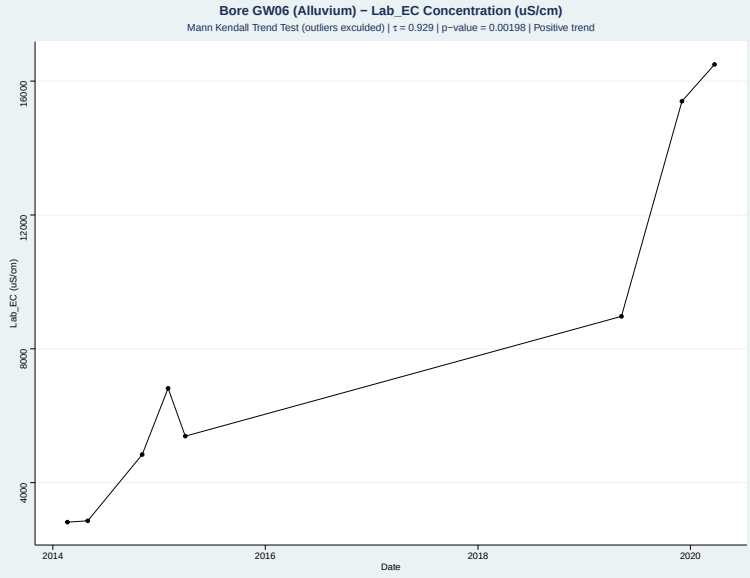

Bore GW06 (Alluvium) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 1 | p−value = 1 | No trend
Diss_Silver (mg/L)
1e−04
2e−04
3e−04
4e−04
5e−04
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

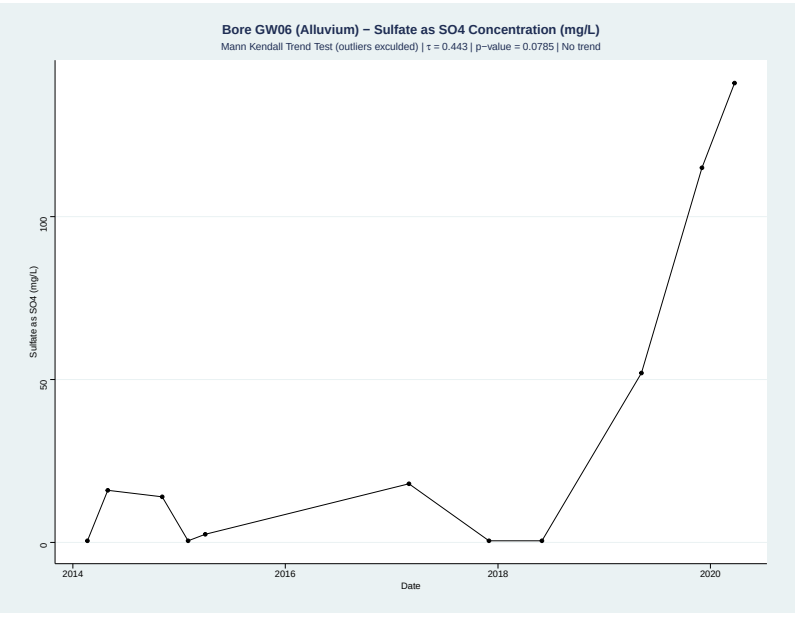

Bore GW06 (Alluvium) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.238 | p−value = 0.548 | No trend
Diss_Uranium (mg/L)
0.00
0.01
0.02
0.03
2016
2018
2020
Date

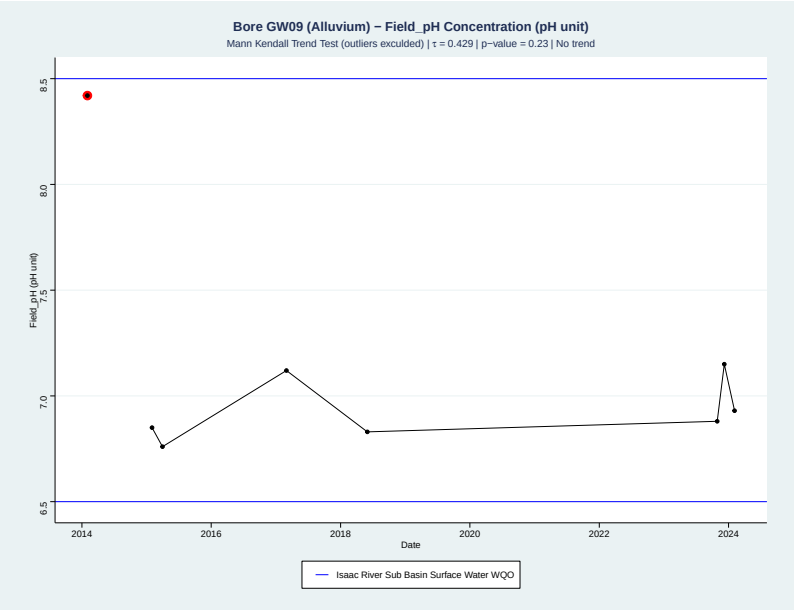

Bore GW06 (Alluvium) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 1 | p−value = 1 | No trend
Diss_Vanadium (mg/L)
0.00500
0.00525
0.00550
0.00575
0.00600
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

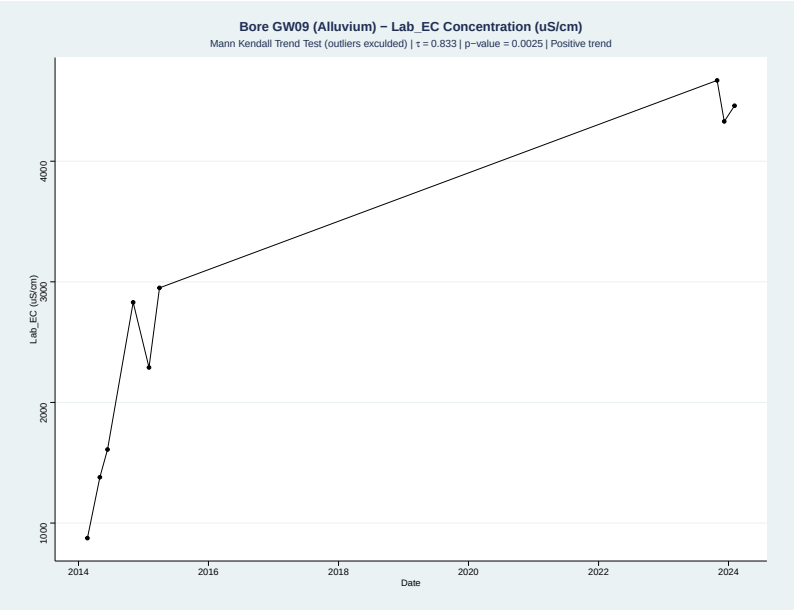

Bore GW06 (Alluvium) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.197 | p−value = 0.704 | No trend
Diss_Zinc (mg/L)
0.005
0.010
0.015
2016
2018
2020
Date
ANZG (2018) Aquatic Ecosystem Protection

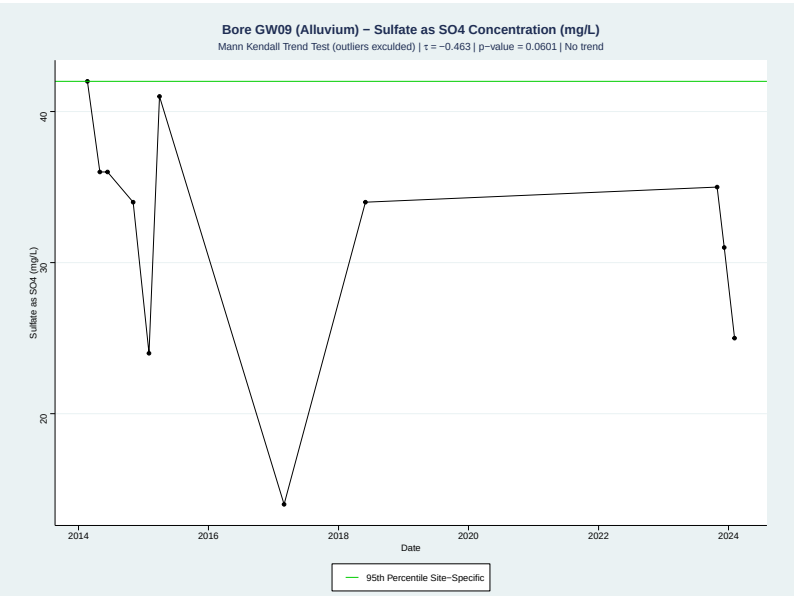

Bore GW06 (Alluvium) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = 0.254 | p–value = 0.402 | No trend
Field_pH (pH unit)
8.5
8.0
7.5
7.0
6.5
2014
2016
2018
2020
Date
Isaac River Sub Basin Surface Water WQO

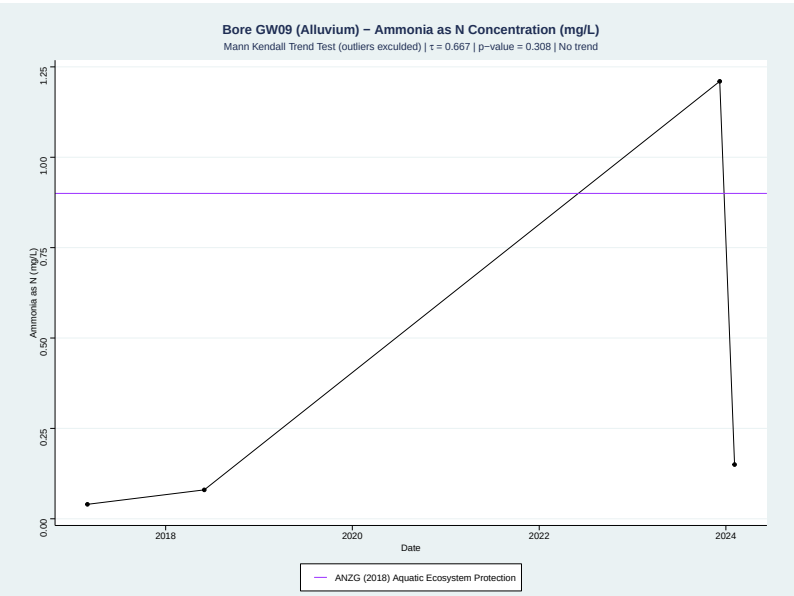

Bore GW06 (Alluvium) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.929 | p–value = 0.00198 | Positive trend
Lab_EC (uS/cm)
16000
12000
8000
4000
2014
2016
2018
2020
Date

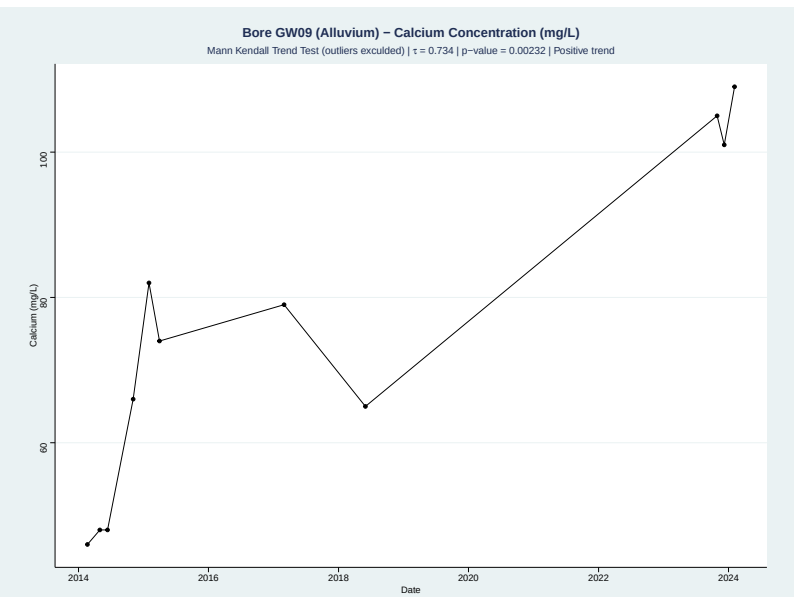

Bore GW06 (Alluvium) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.443 | p–value = 0.0785 | No trend
Sulfate as SO4 (mg/L)
100
50
0
2014
2016
2018
2020
Date

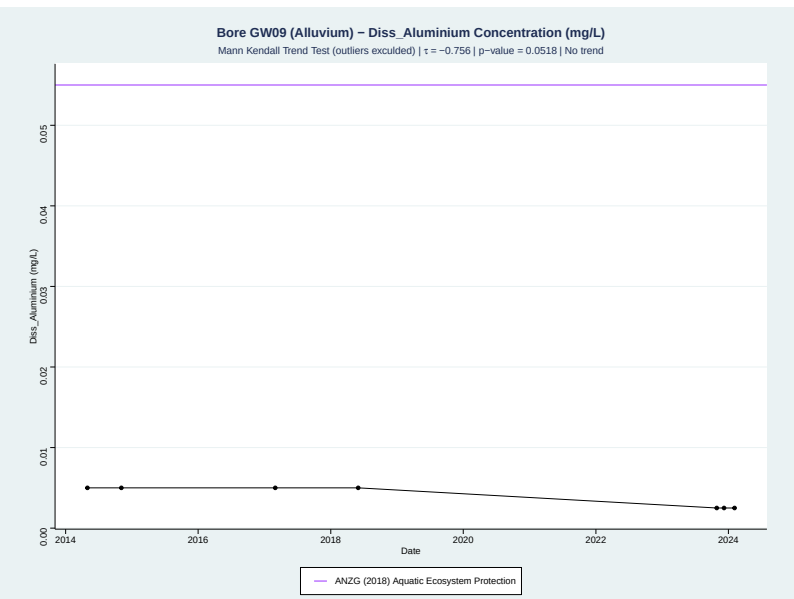

Bore GW09 (Alluvium) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = 0.429 | p−value = 0.23 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

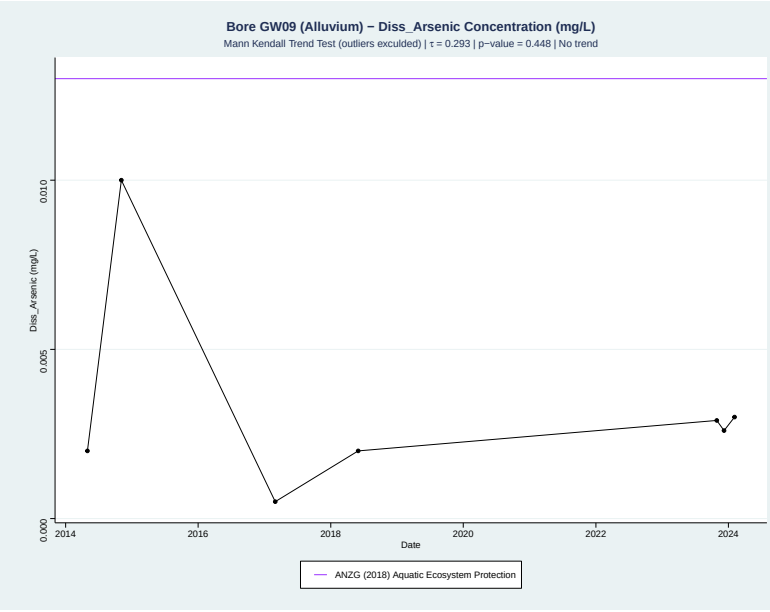

Bore GW09 (Alluvium) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.833 | p−value = 0.0025 | Positive trend
Lab_EC (uS/cm)
Date

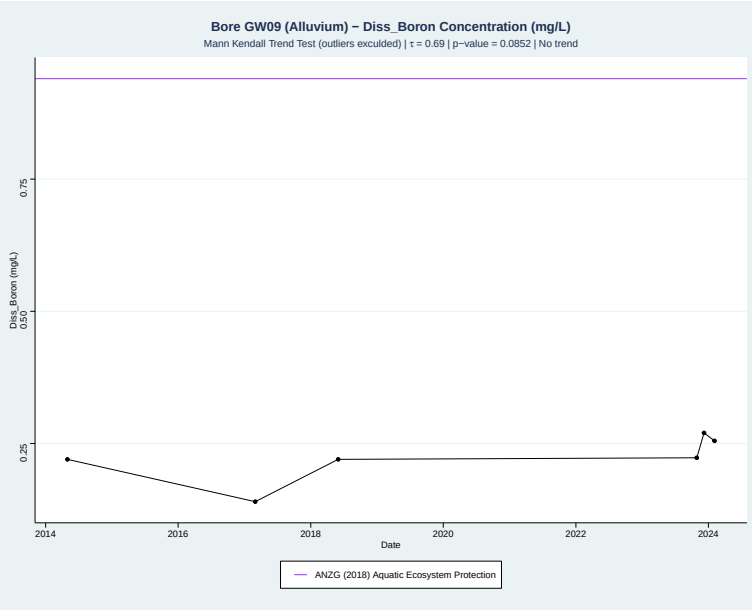

Bore GW09 (Alluvium) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.463 | p−value = 0.0601 | No trend
Sulfate as SO4 (mg/L)
Date
95th Percentile Site−Specific

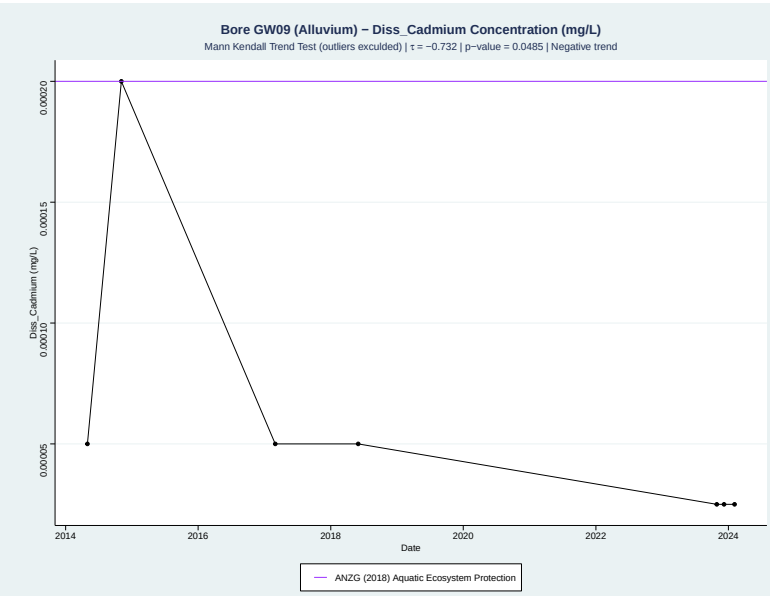

Bore GW09 (Alluvium) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.667 | p−value = 0.308 | No trend
Ammonia as N (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

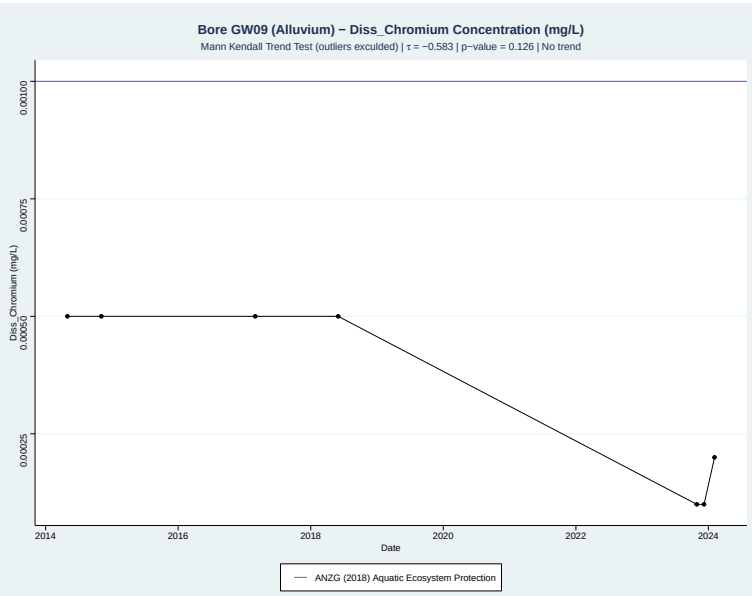

Bore GW09 (Alluvium) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.734 | p−value = 0.00232 | Positive trend
Calcium (mg/L)
Date

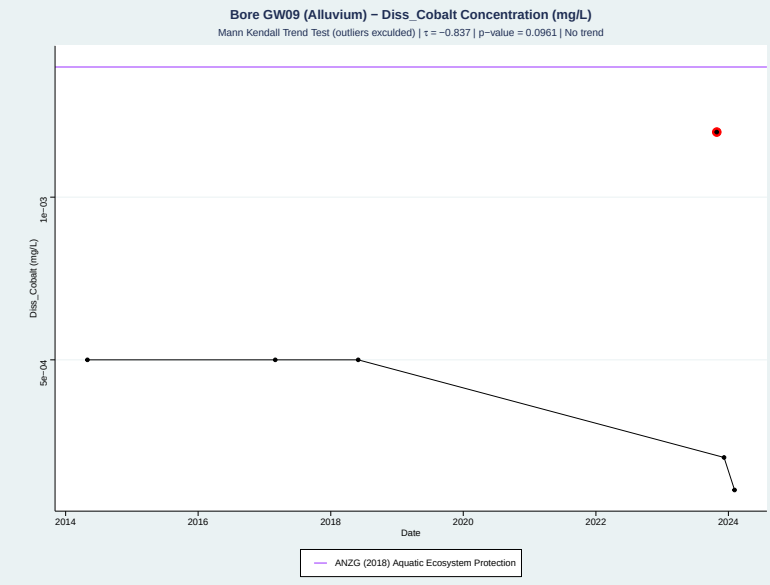

Bore GW09 (Alluvium) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.756 | p−value = 0.0518 | No trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

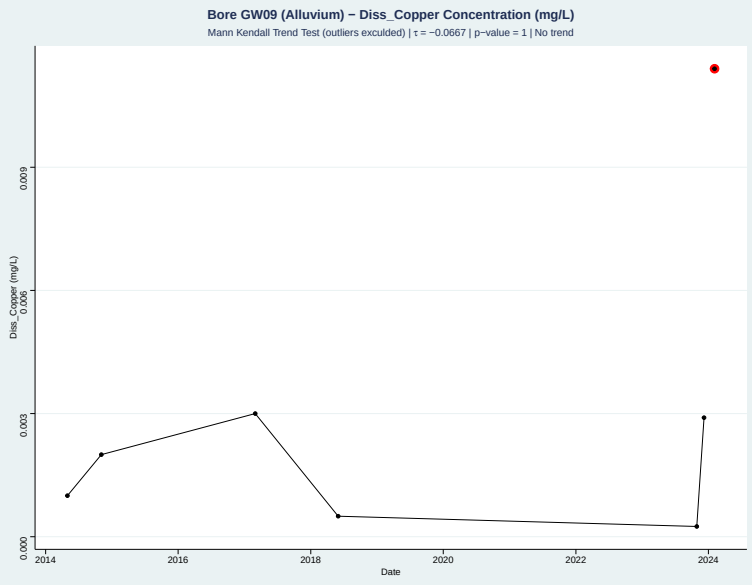

Bore GW09 (Alluvium) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.293 | p−value = 0.448 | No trend
Diss_Arsenic (mg/L)
0.010
0.005
0.000
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

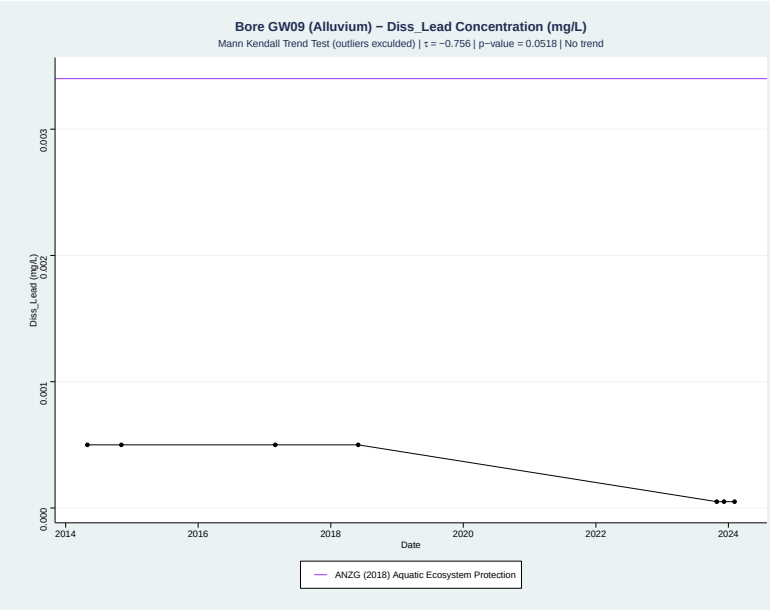

Bore GW09 (Alluvium) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.69 | p−value = 0.0852 | No trend
Diss_Boron (mg/L)
0.75
0.50
0.25
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

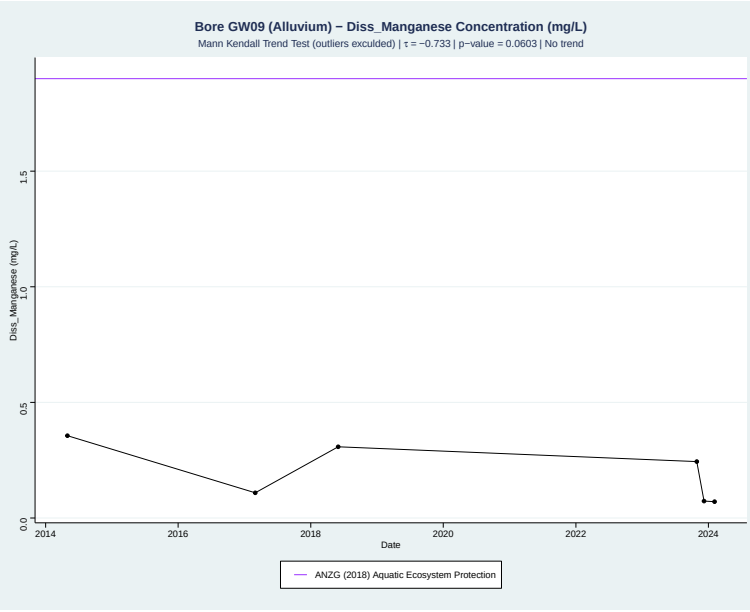

Bore GW09 (Alluvium) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.732 | p−value = 0.0485 | Negative trend
Diss_Cadmium (mg/L)
0.00020
0.00015
0.00010
0.00005
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

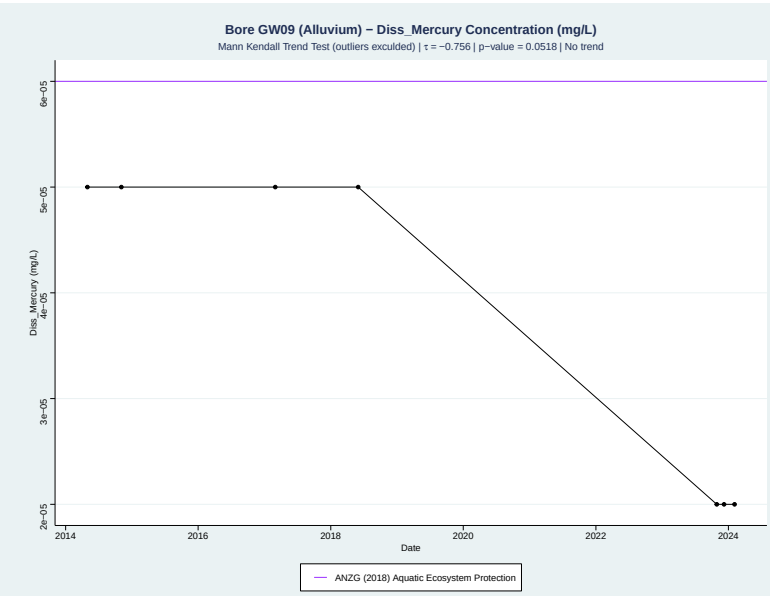

Bore GW09 (Alluvium) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.583 | p−value = 0.126 | No trend
Diss_Chromium (mg/L)
0.00100
0.00075
0.00050
0.00025
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

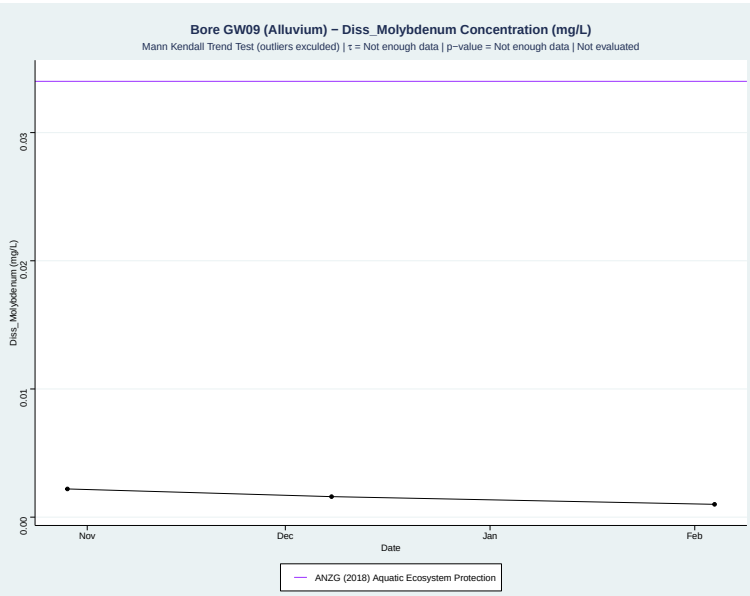

Bore GW09 (Alluvium) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.837 | p−value = 0.0961 | No trend
Diss_Cobalt (mg/L)
1e−03
5e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

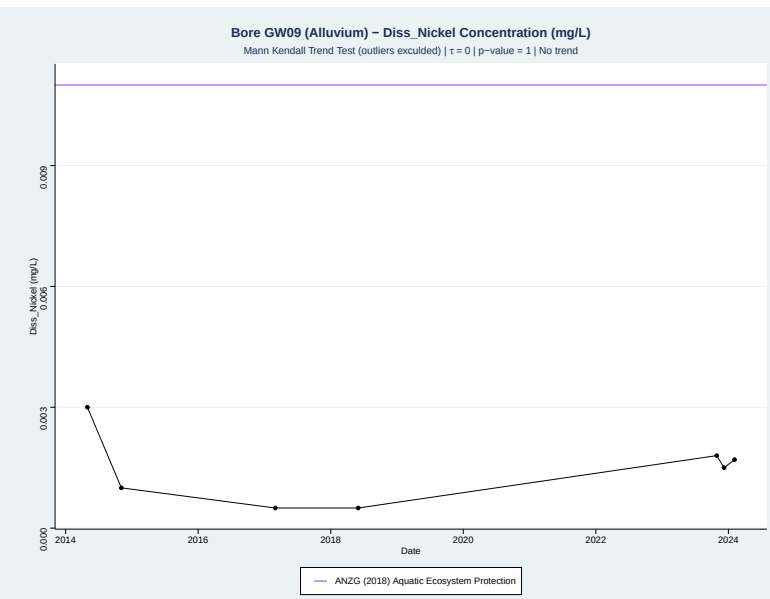

Bore GW09 (Alluvium) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.0667 | p−value = 1 | No trend
Diss_Copper (mg/L)
0.009
0.006
0.003
0.000
2014
2016
2018
2020
2022
2024
Date

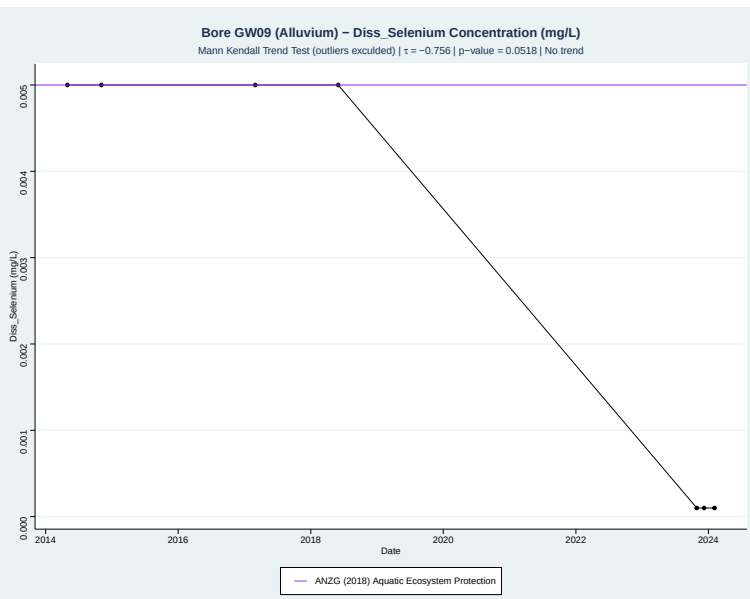

Bore GW09 (Alluvium) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.756 | p−value = 0.0518 | No trend
Diss_Lead (mg/L)
0.000
0.001
0.002
0.003
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

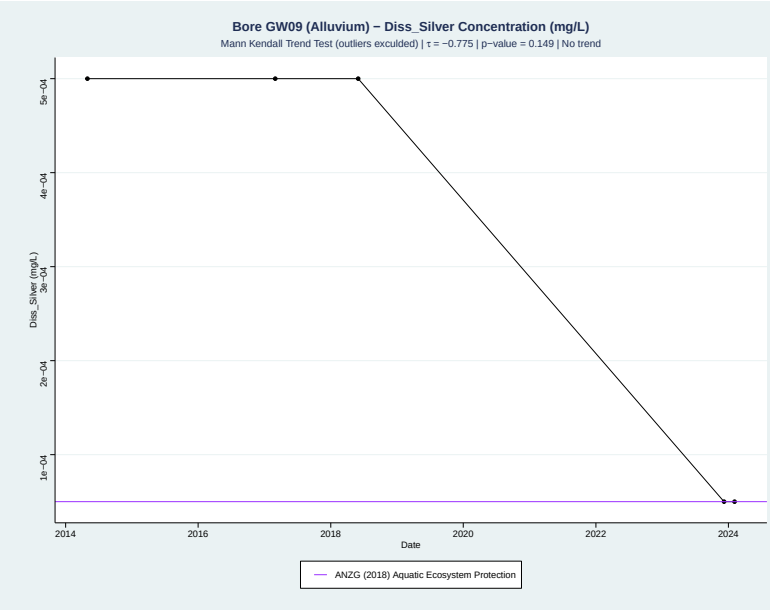

Bore GW09 (Alluvium) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.733 | p−value = 0.0603 | No trend
Diss_Manganese (mg/L)
0.0
0.5
1.0
1.5
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

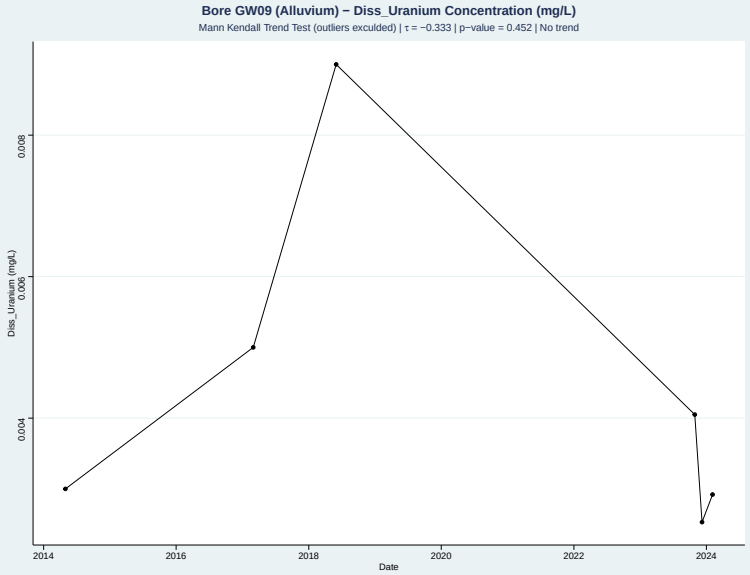

Bore GW09 (Alluvium) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.756 | p−value = 0.0518 | No trend
Diss_Mercury (mg/L)
2e−05
3e−05
4e−05
5e−05
6e−05
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

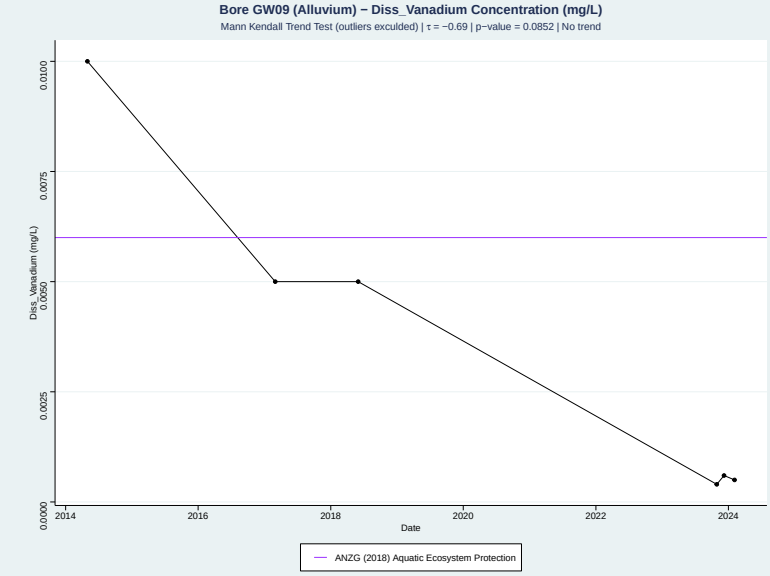

Bore GW09 (Alluvium) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = Not enough data | p−value = Not enough data | Not evaluated
Diss_Molybdenum (mg/L)
0.00
0.01
0.02
0.03
Nov
Dec
Jan
Feb
Date
ANZG (2018) Aquatic Ecosystem Protection

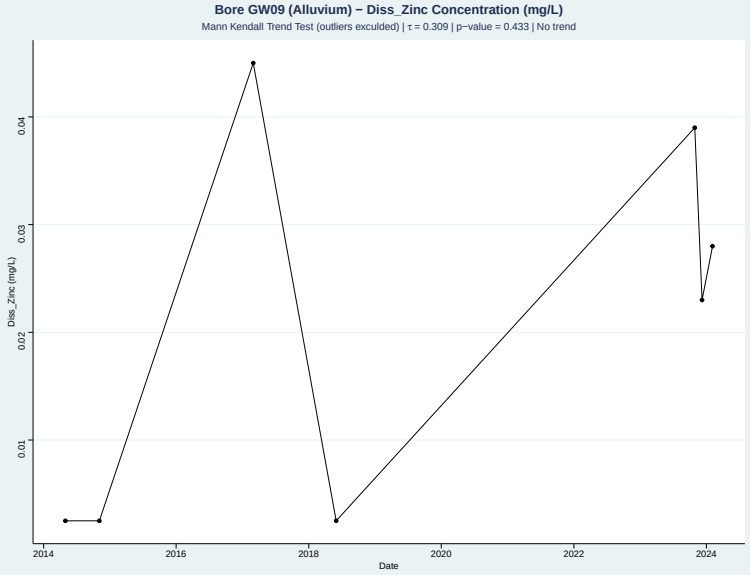

Bore GW09 (Alluvium) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0 | p−value = 1 | No trend
Diss_Nickel (mg/L)
0.000
0.003
0.006
0.009
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

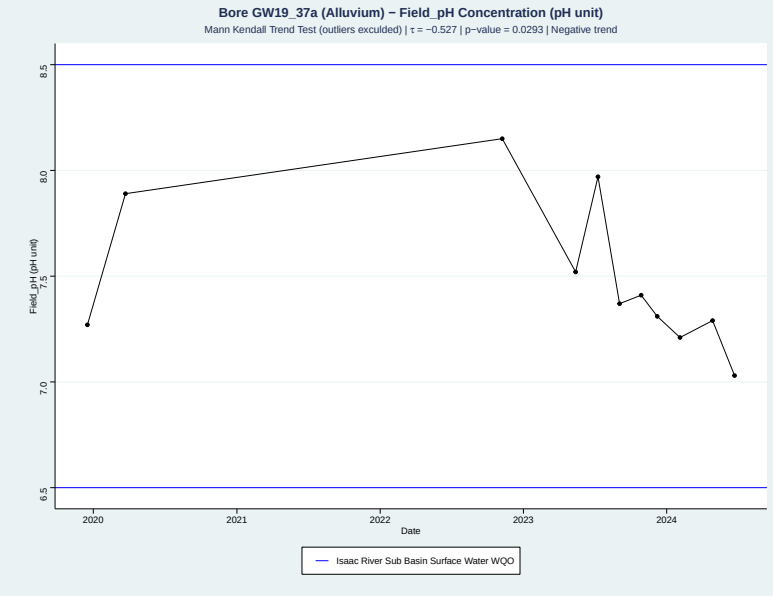

Bore GW09 (Alluvium) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.756 | p−value = 0.0518 | No trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

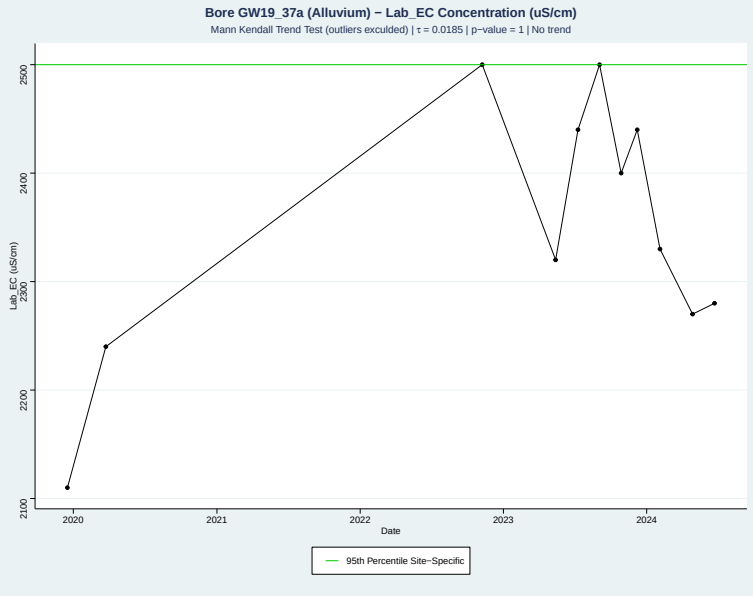

Bore GW09 (Alluvium) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.775 | p−value = 0.149 | No trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

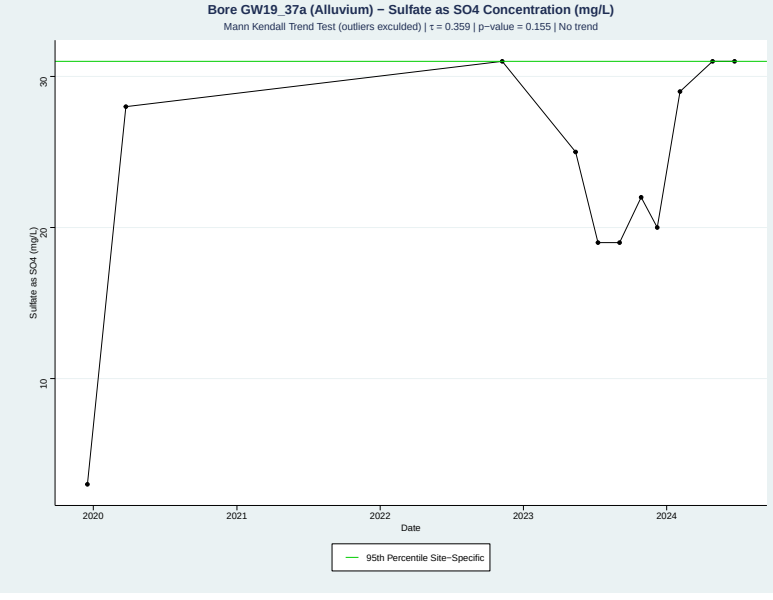

Bore GW09 (Alluvium) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.333 | p−value = 0.452 | No trend
Diss_Uranium (mg/L)
0.008
0.006
0.004
2014
2016
2018
2020
2022
2024
Date

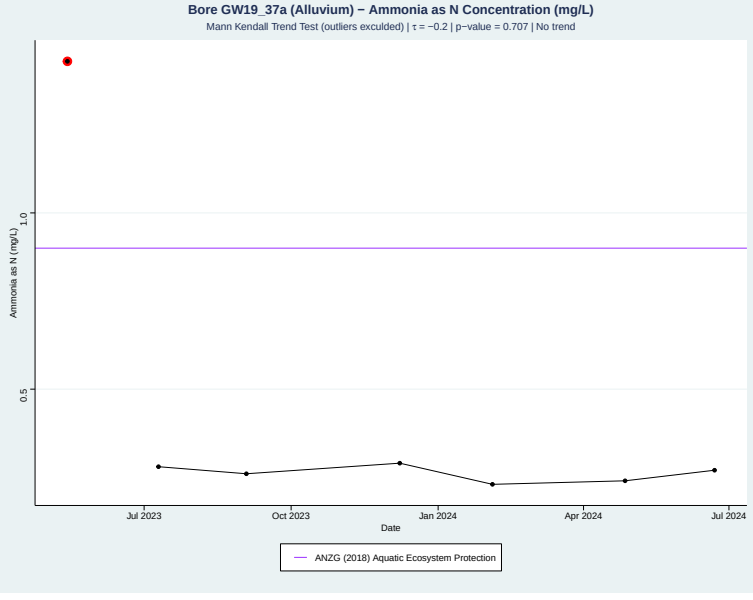

Bore GW09 (Alluvium) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.69 | p−value = 0.0852 | No trend
Diss_Vanadium (mg/L)
0.0100
0.0075
0.0050
0.0025
0.0000
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

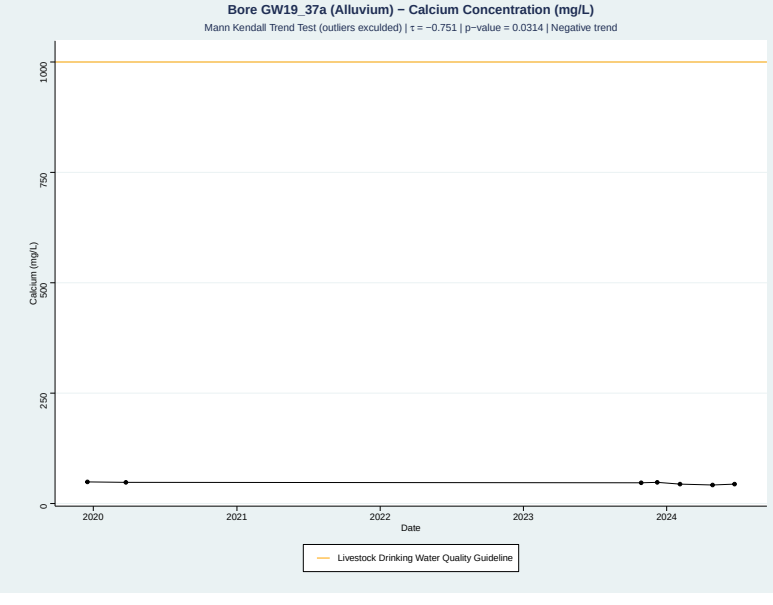

Bore GW09 (Alluvium) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.309 | p−value = 0.433 | No trend
Diss_Zinc (mg/L)
0.04
0.03
0.02
0.01
2014
2016
2018
2020
2022
2024
Date

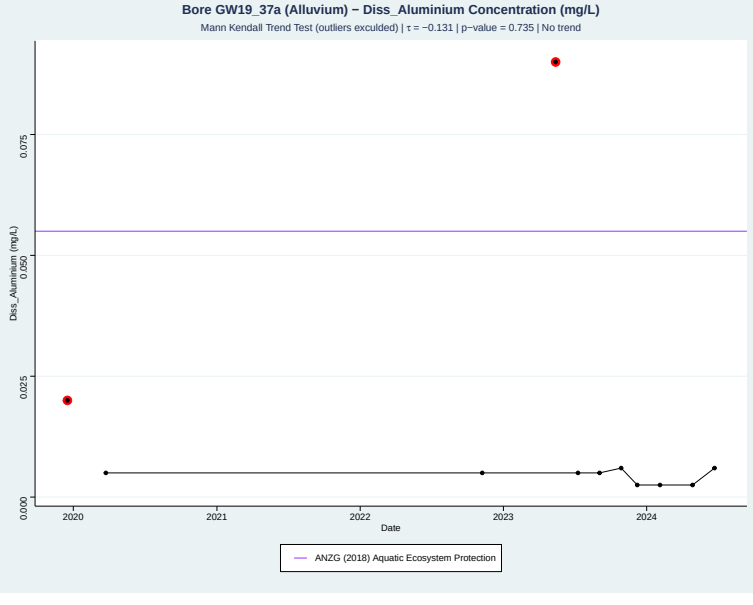

Bore GW19_37a (Alluvium) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.527 | p−value = 0.0293 | Negative trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO


Bore GW19_37a (Alluvium) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0185 | p−value = 1 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific


Bore GW19_37a (Alluvium) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.359 | p−value = 0.155 | No trend
Sulfate as SO4 (mg/L)
Date
95th Percentile Site−Specific

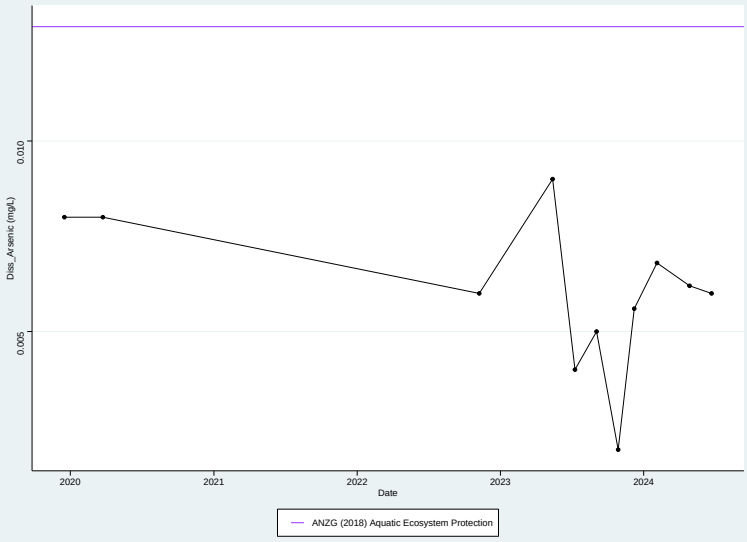

Bore GW19_37a (Alluvium) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.2 | p−value = 0.707 | No trend
Ammonia as N (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW19_37a (Alluvium) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.751 | p−value = 0.0314 | Negative trend
Calcium (mg/L)
Date
Livestock Drinking Water Quality Guideline


Bore GW19_37a (Alluvium) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.131 | p−value = 0.735 | No trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

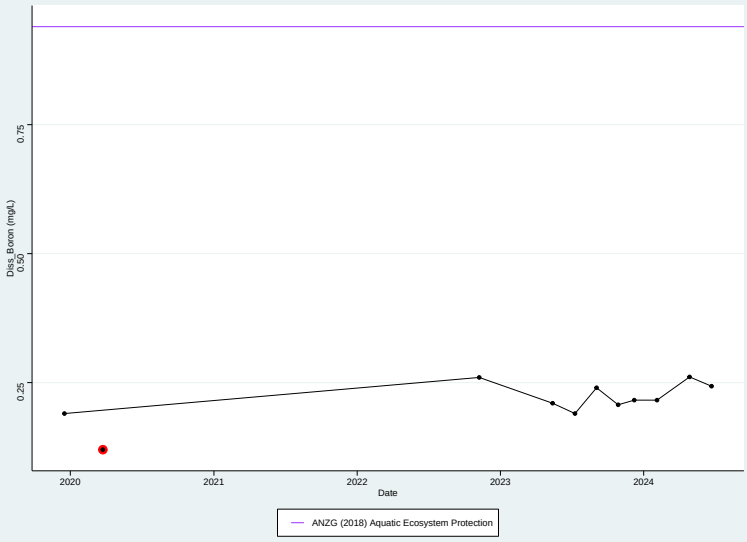
Bore GW19_37a (Alluvium) – Diss_Arsenic Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.204 | p−value = 0.433 | No trend



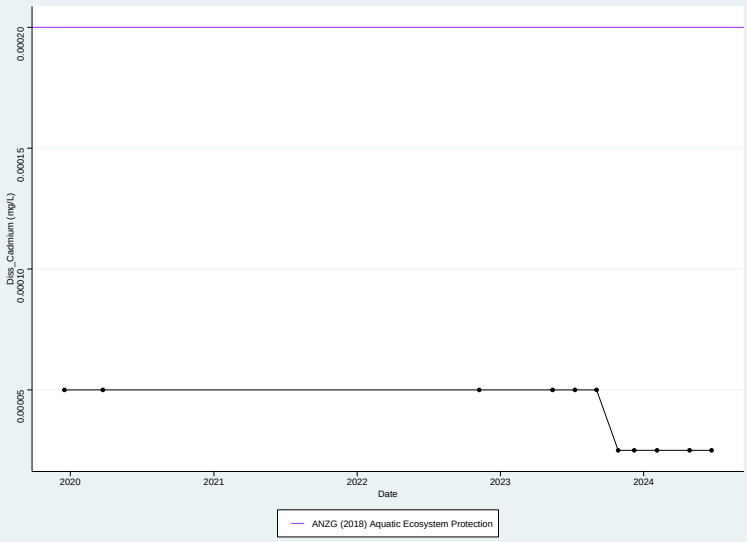
Bore GW19_37a (Alluvium) – Diss_Boron Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.386 | p−value = 0.149 | No trend



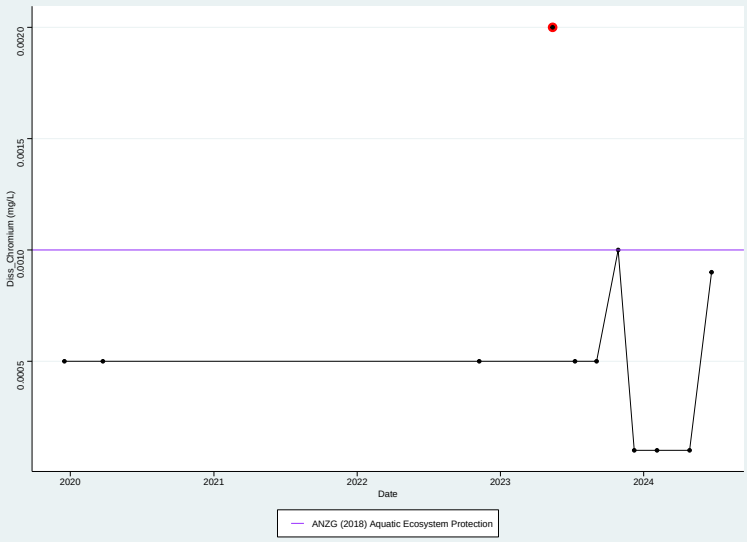
Bore GW19_37a (Alluvium) – Diss_Cadmium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.739 | p−value = 0.00811 | Negative trend



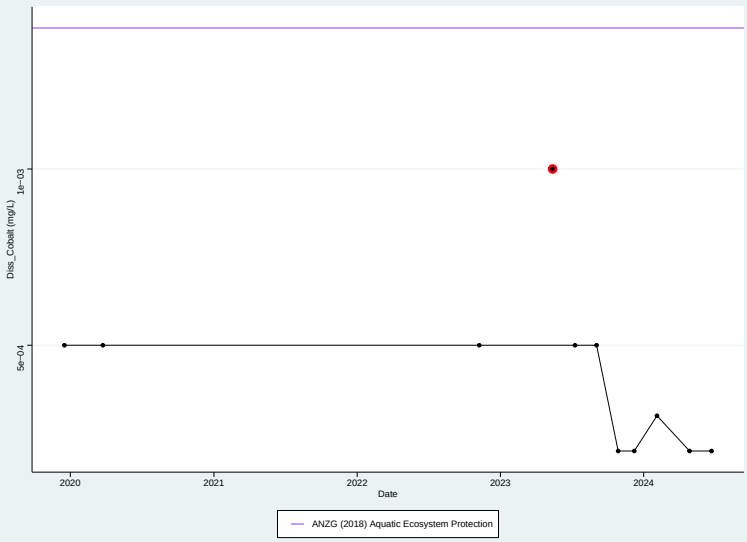
Bore GW19_37a (Alluvium) – Diss_Chromium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.158 | p−value = 0.625 | No trend



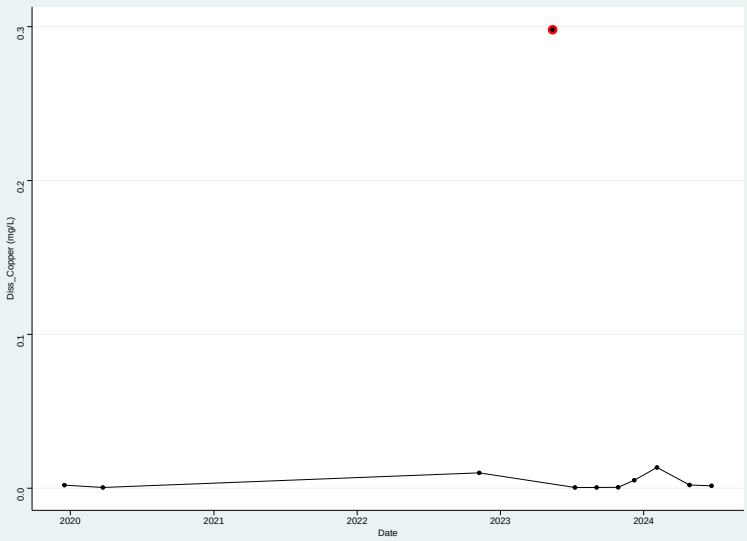
Bore GW19_37a (Alluvium) – Diss_Cobalt Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.692 | p−value = 0.0162 | Negative trend



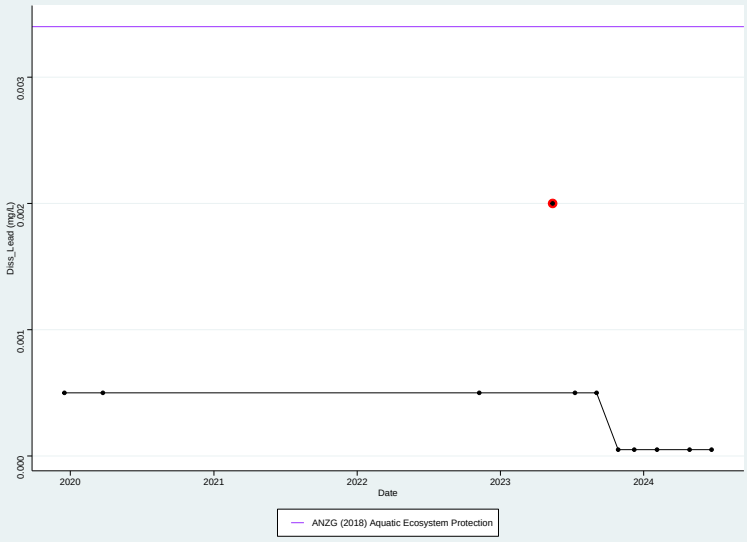
Bore GW19_37a (Alluvium) – Diss_Copper Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.23 | p−value = 0.414 | No trend



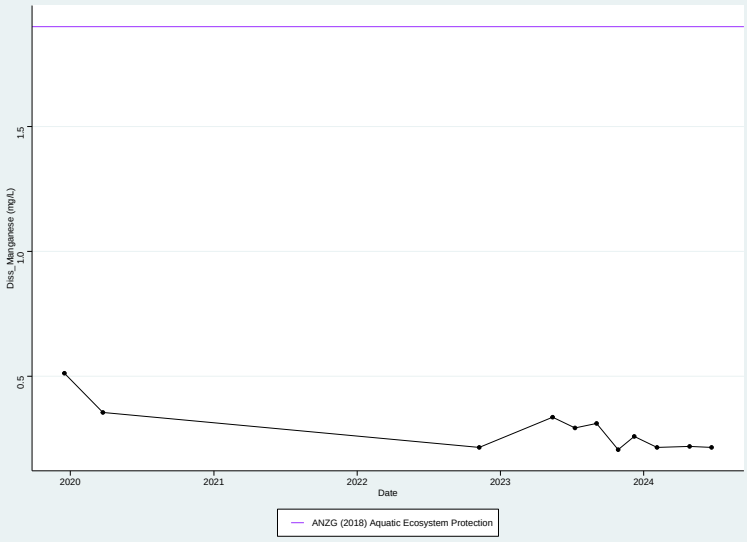
Bore GW19_37a (Alluvium) – Diss_Lead Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend



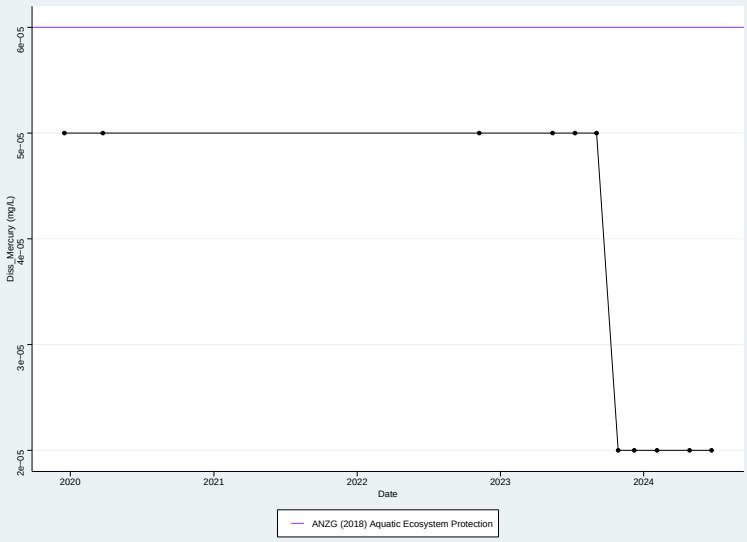
Bore GW19_37a (Alluvium) – Diss_Manganese Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.561 | p−value = 0.0224 | Negative trend



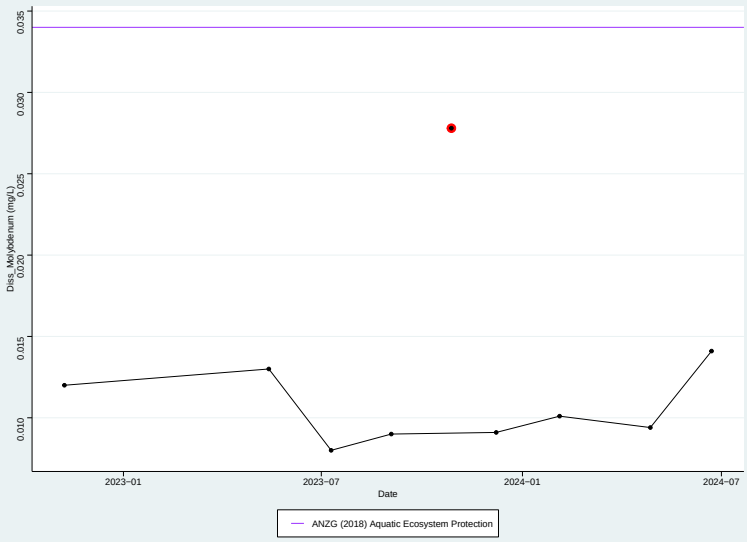
Bore GW19_37a (Alluvium) – Diss_Mercury Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.739 | p−value = 0.00811 | Negative trend



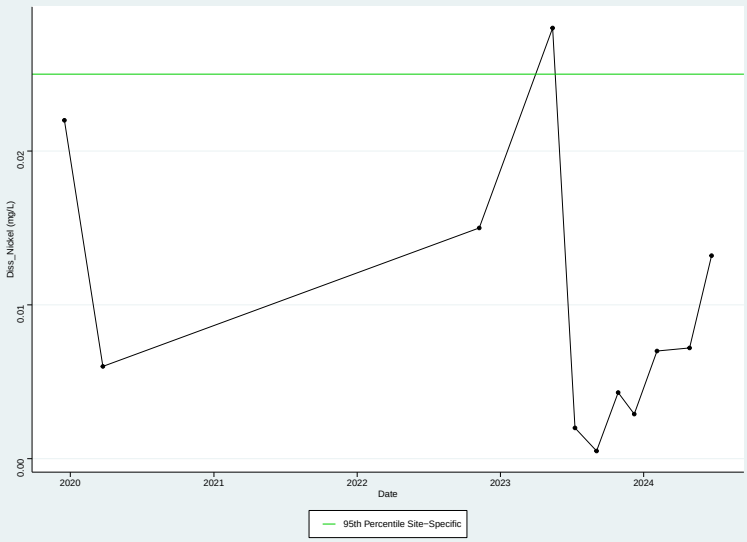
Bore GW19_37a (Alluvium) – Diss_Molybdenum Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.214 | p−value = 0.536 | No trend



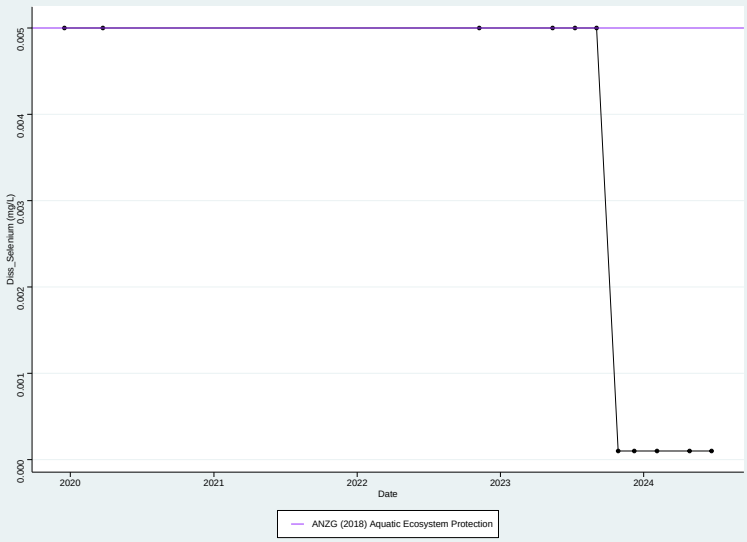
Bore GW19_37a (Alluvium) – Diss_Nickel Concentration (mg/L)

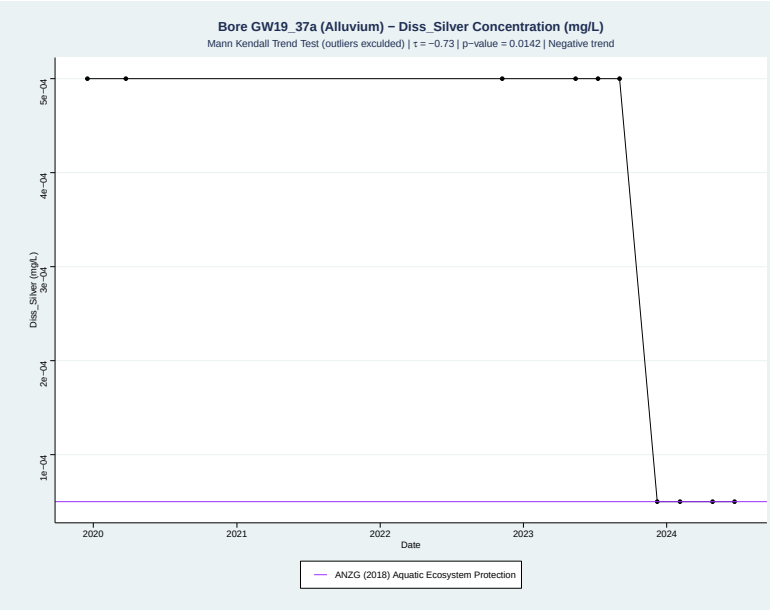
Mann Kendall Trend Test (outliers excluded) | τ = −0.0545 | p−value = 0.876 | No trend

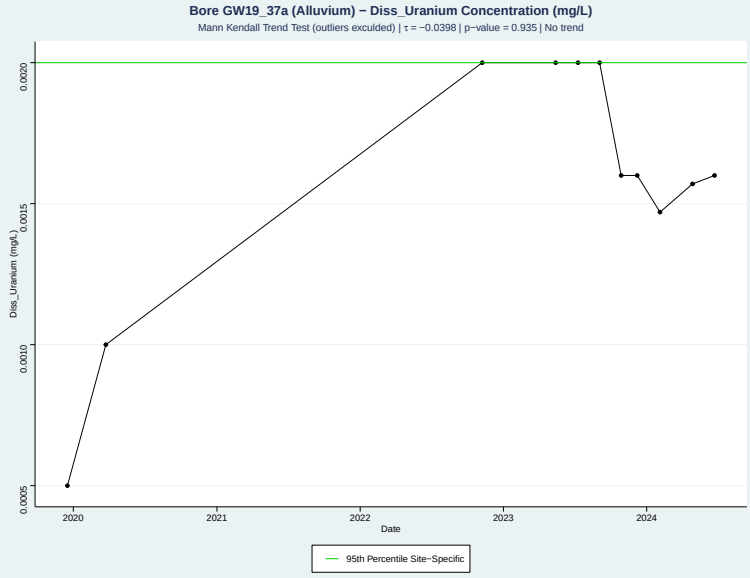


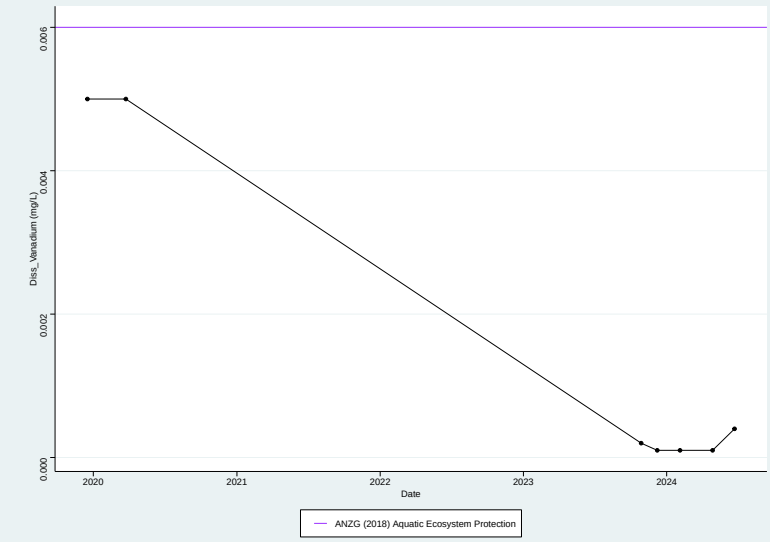
Bore GW19_37a (Alluvium) – Diss_Selenium Concentration (mg/L)

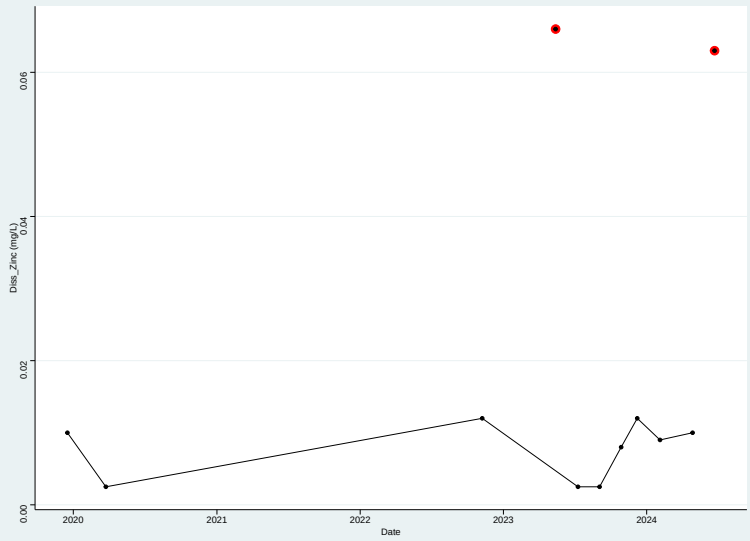
Mann Kendall Trend Test (outliers excluded) | τ = −0.739 | p−value = 0.00811 | Negative trend

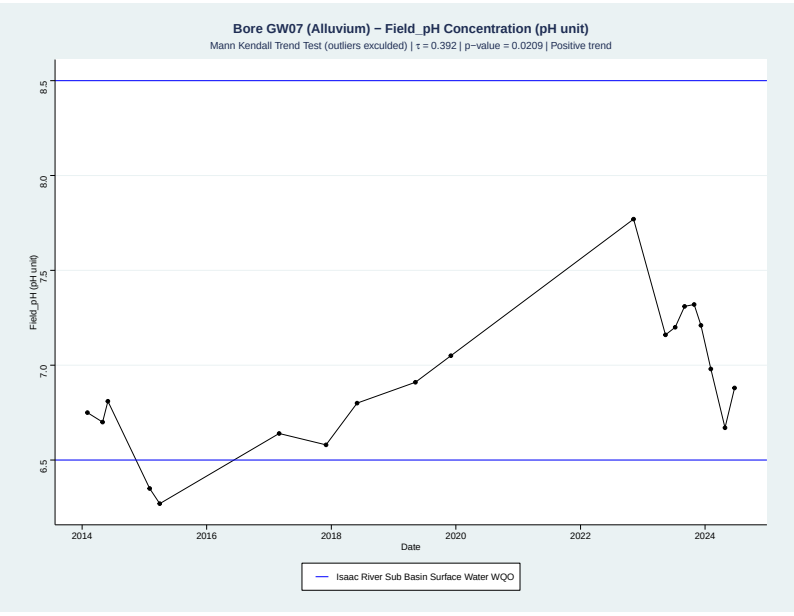


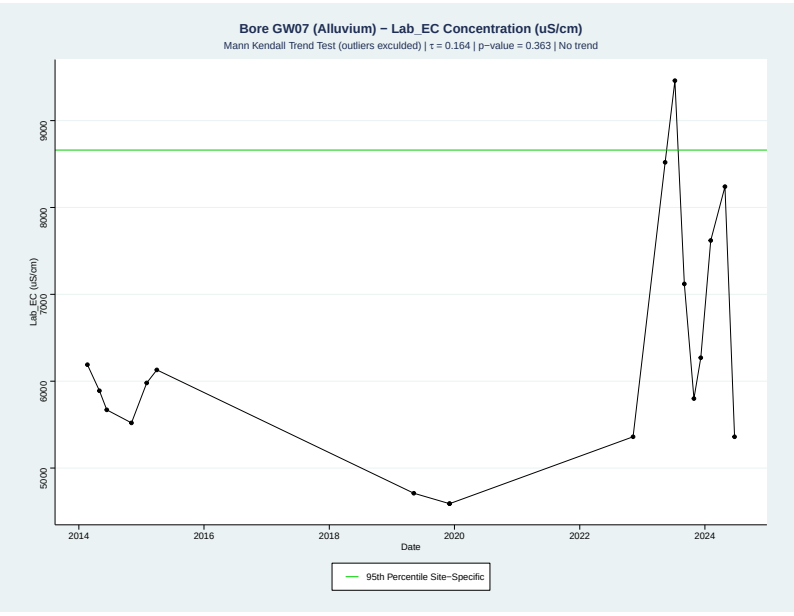

Bore GW19_37a (Alluvium) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.73 | p−value = 0.0142 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

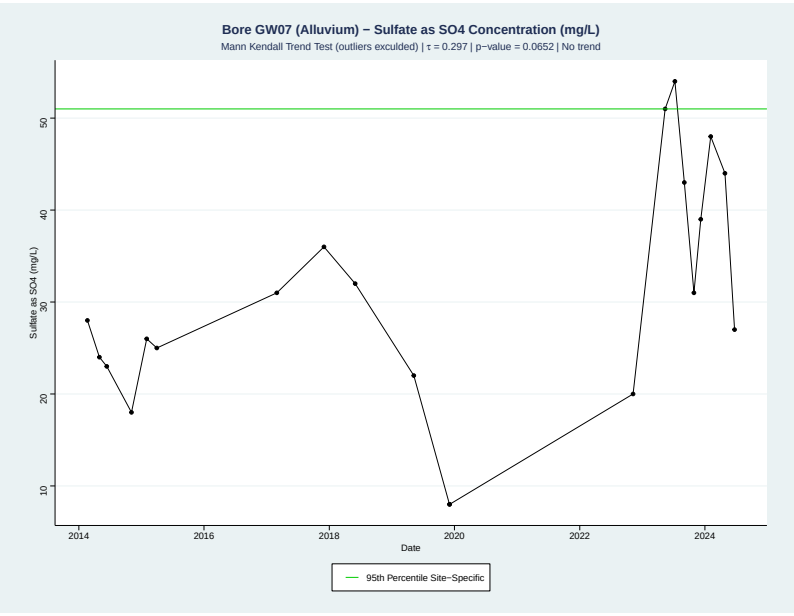

Bore GW19_37a (Alluvium) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.0398 | p−value = 0.935 | No trend
Diss_Uranium (mg/L)
0.0020
0.0015
0.0010
0.0005
2020
2021
2022
2023
2024
Date
95th Percentile Site−Specific

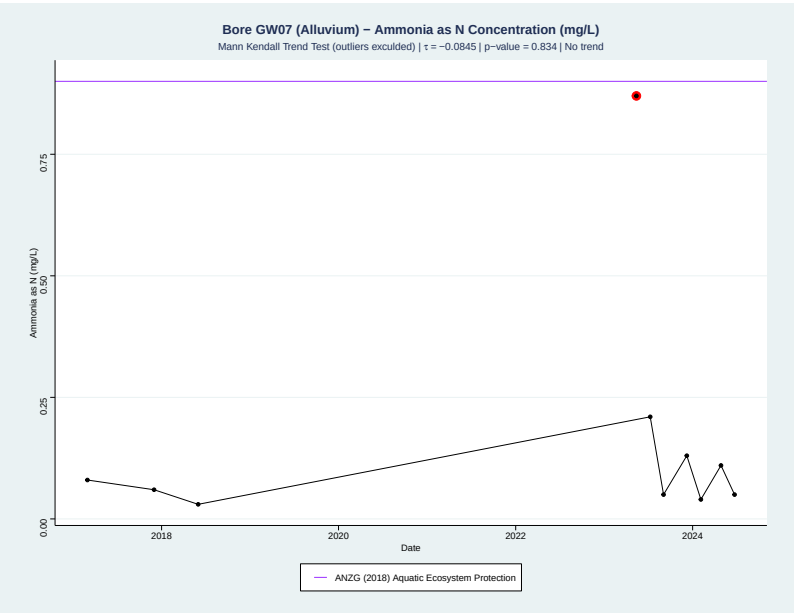

Bore GW19_37a (Alluvium) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.476 | p−value = 0.204 | No trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

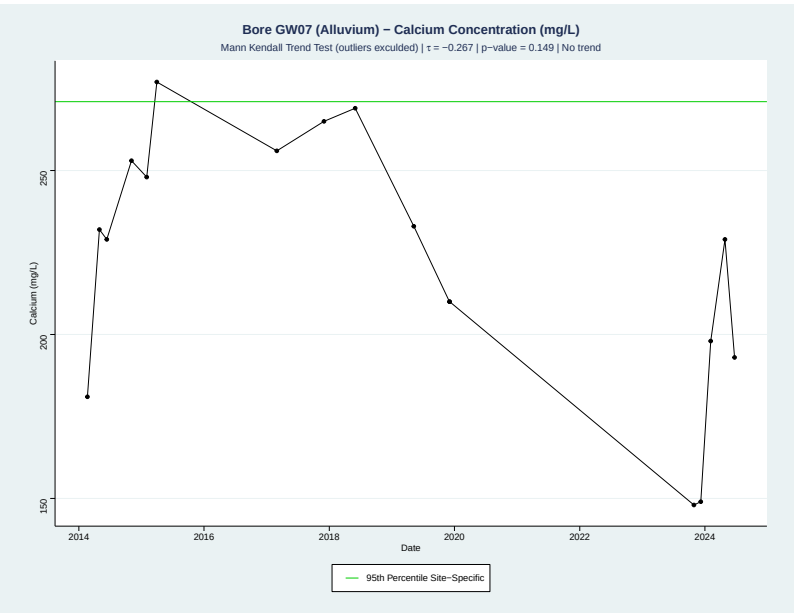

Bore GW19_37a (Alluvium) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.21 | p−value = 0.518 | No trend
Diss_Zinc (mg/L)
0.06
0.04
0.02
0.00
2020
2021
2022
2023
2024
Date

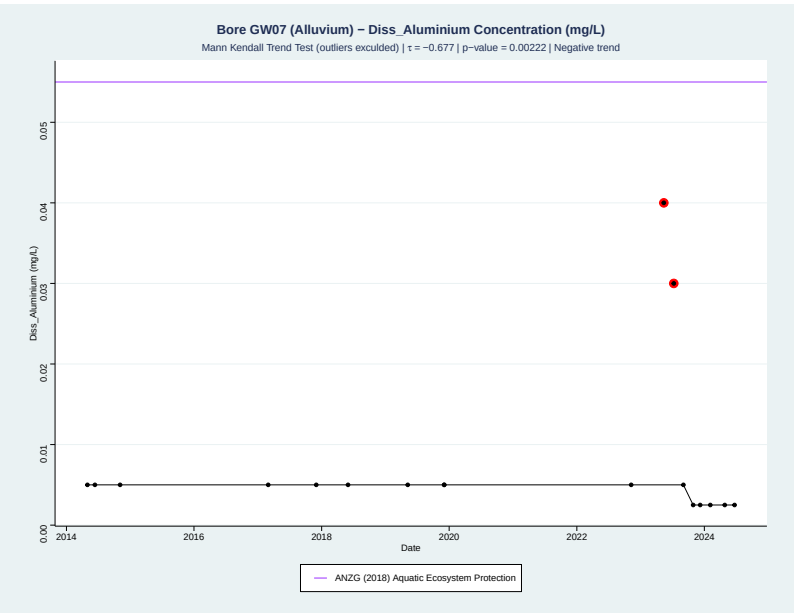

Bore GW07 (Alluvium) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers exculded) | τ = 0.392 | p−value = 0.0209 | Positive trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

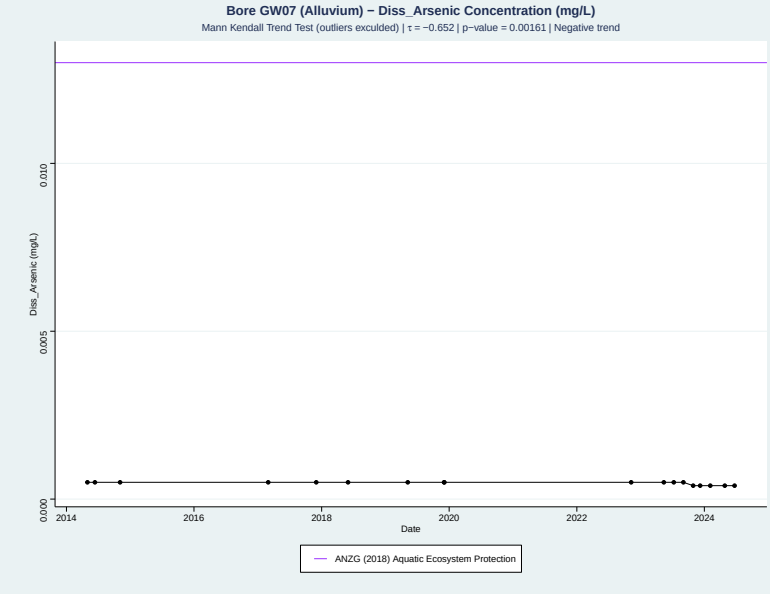

Bore GW07 (Alluvium) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers exculded) | τ = 0.164 | p−value = 0.363 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

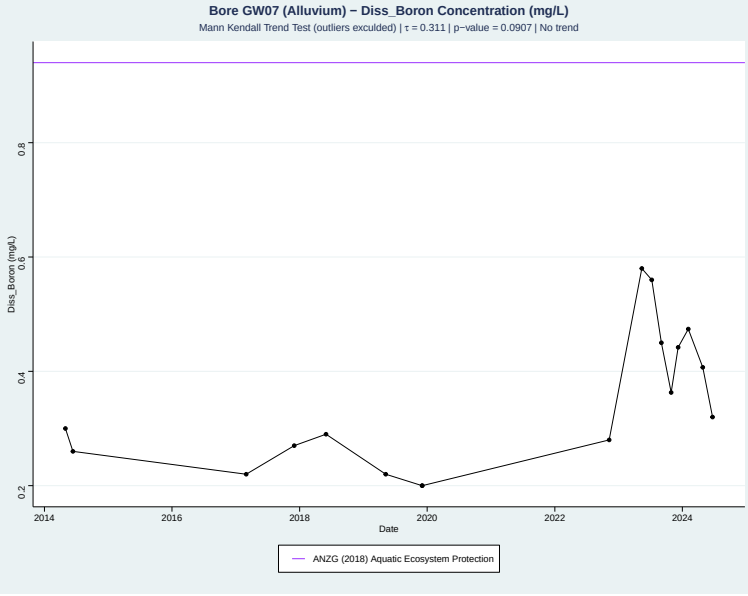

Bore GW07 (Alluvium) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.297 | p−value = 0.0652 | No trend
Sulfate as SO4 (mg/L)
Date
95th Percentile Site−Specific

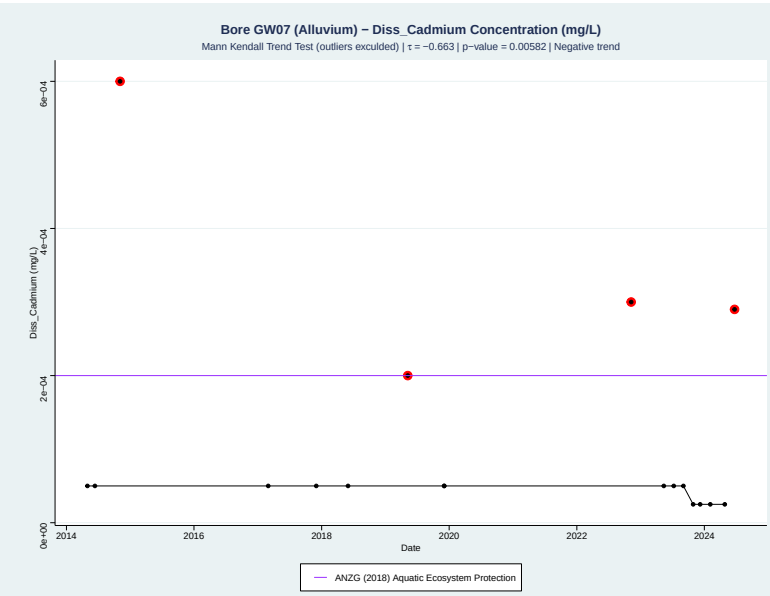

Bore GW07 (Alluvium) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.0845 | p−value = 0.834 | No trend
Ammonia as N (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

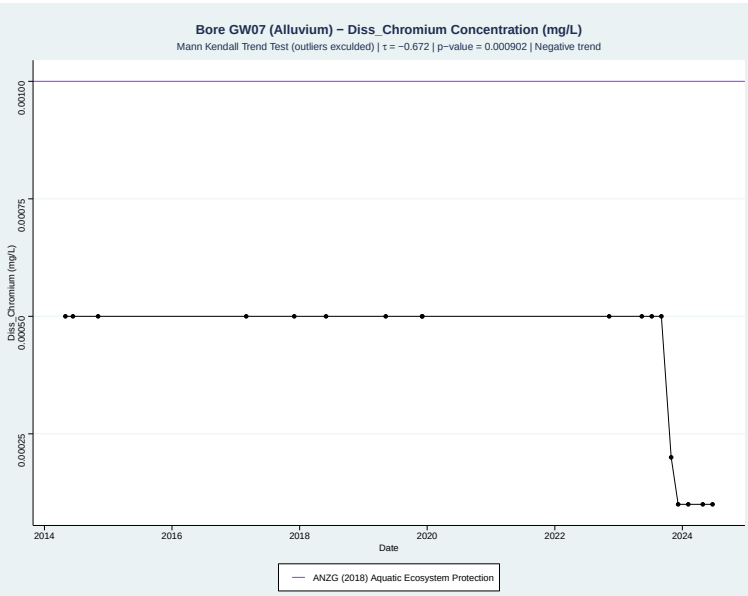

Bore GW07 (Alluvium) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.267 | p−value = 0.149 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

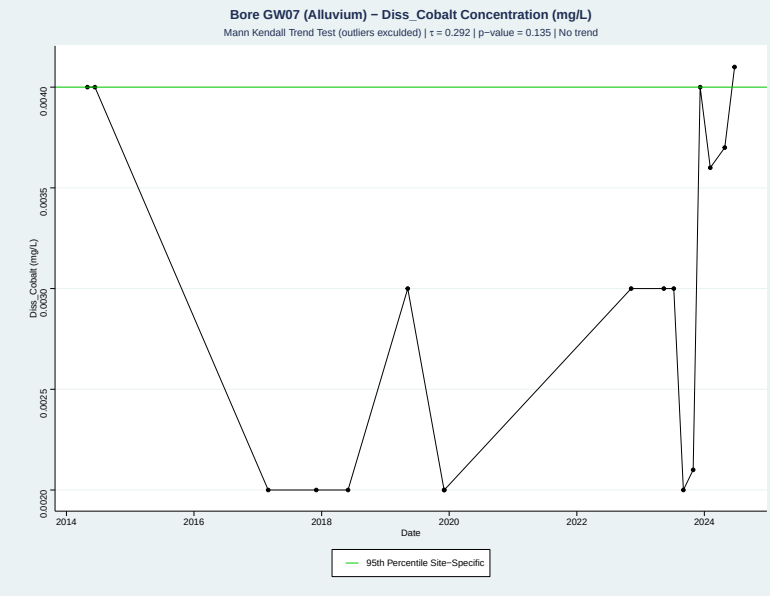

Bore GW07 (Alluvium) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.677 | p−value = 0.00222 | Negative trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

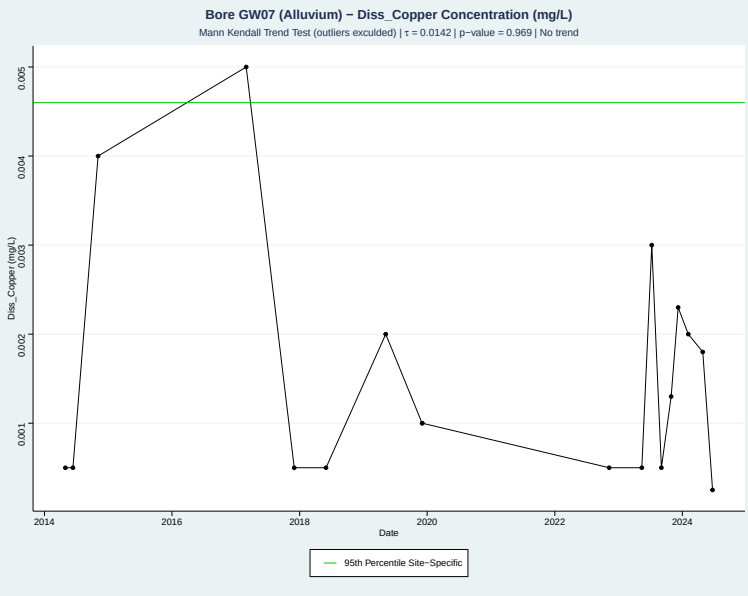

Bore GW07 (Alluvium) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.652 | p−value = 0.00161 | Negative trend
Diss_Arsenic (mg/L)
0.010
0.005
0.000
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

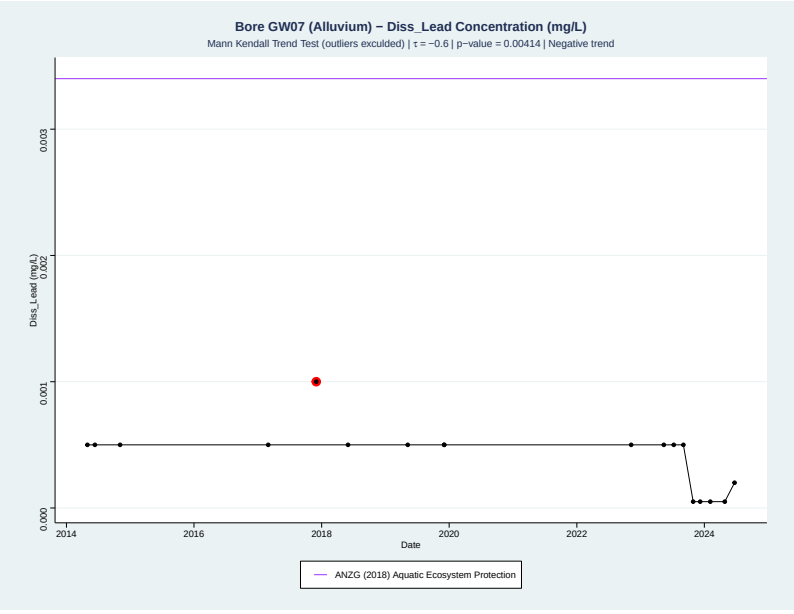

Bore GW07 (Alluvium) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.311 | p−value = 0.0907 | No trend
Diss_Boron (mg/L)
0.8
0.6
0.4
0.2
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

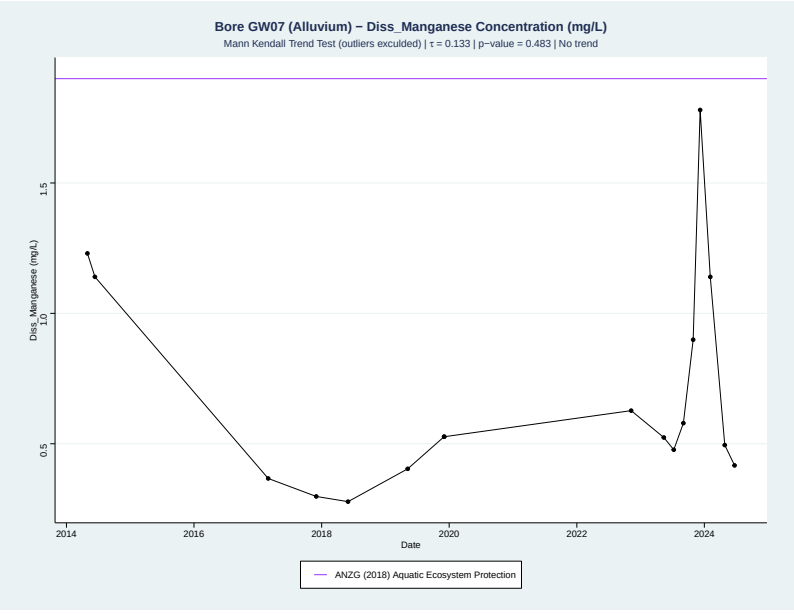

Bore GW07 (Alluvium) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.663 | p−value = 0.00582 | Negative trend
Diss_Cadmium (mg/L)
6e−04
4e−04
2e−04
0e+00
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

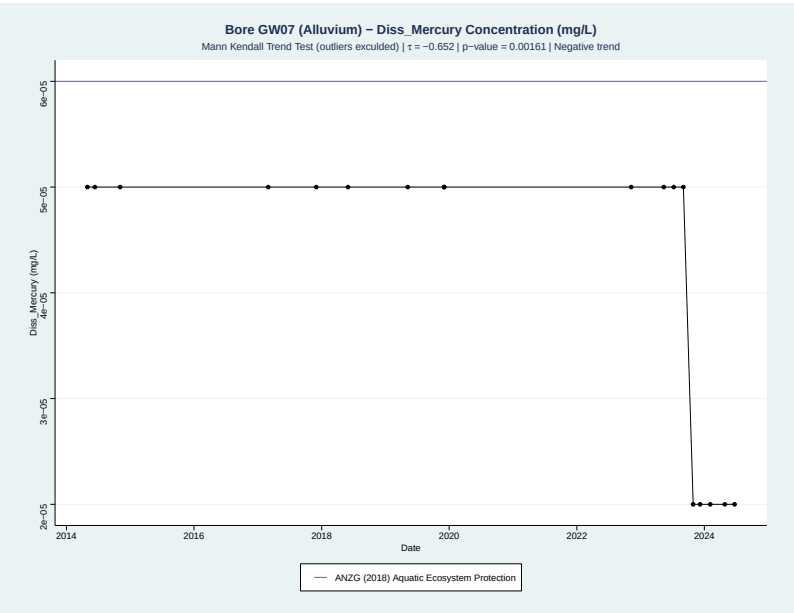

Bore GW07 (Alluvium) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.672 | p−value = 0.000902 | Negative trend
Diss_Chromium (mg/L)
0.00100
0.00075
0.00050
0.00025
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

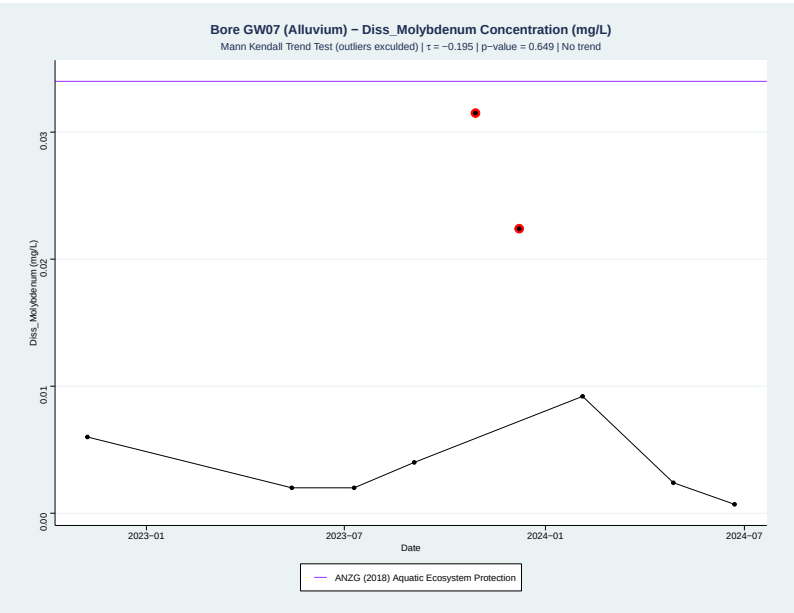

Bore GW07 (Alluvium) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.292 | p−value = 0.135 | No trend
Diss_Cobalt (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

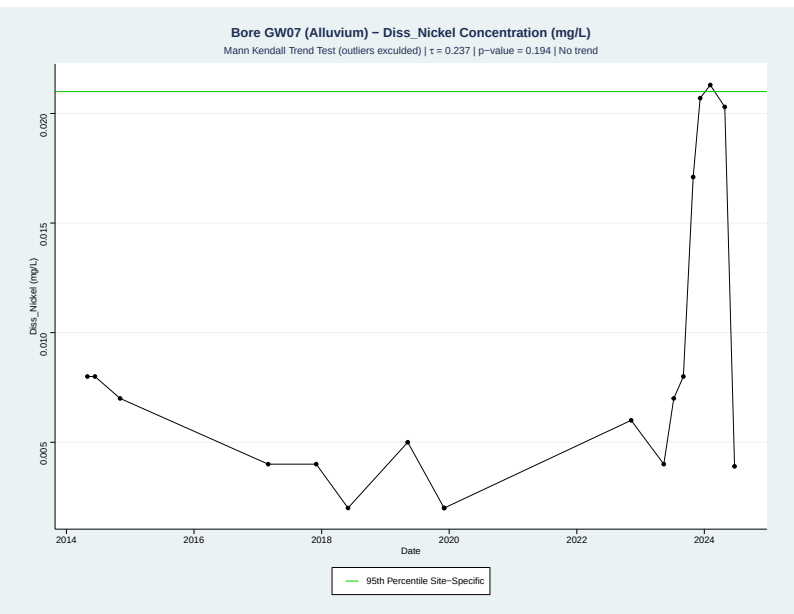

Bore GW07 (Alluvium) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0142 | p−value = 0.969 | No trend
Diss_Copper (mg/L)
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

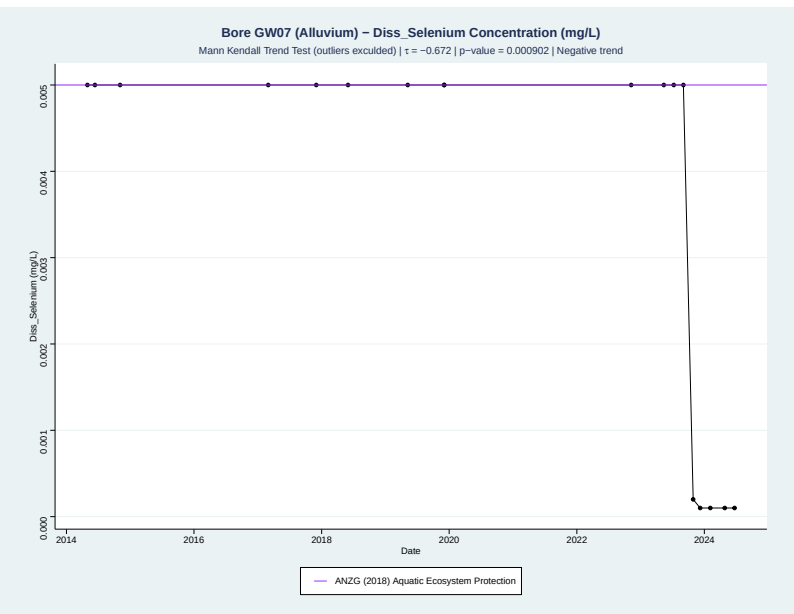

Bore GW07 (Alluvium) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.6 | p−value = 0.00414 | Negative trend
Diss_Lead (mg/L)
0.003
0.002
0.001
0.000
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

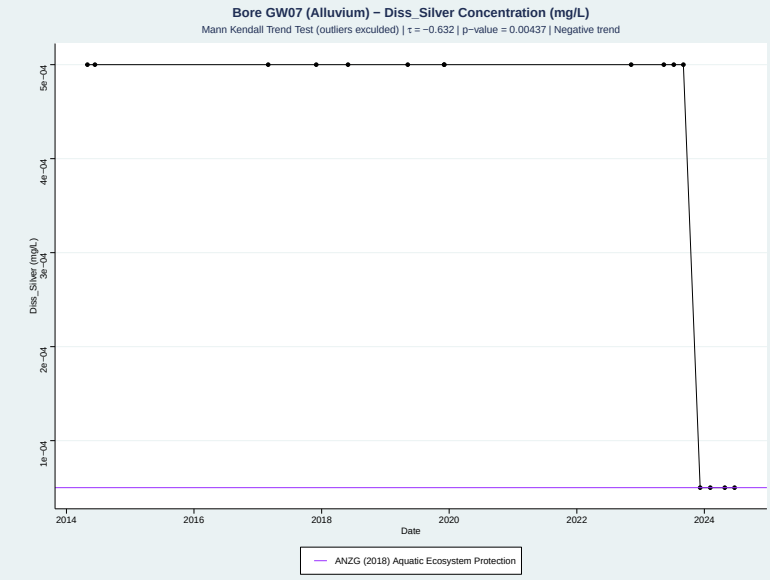

Bore GW07 (Alluvium) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.133 | p−value = 0.483 | No trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

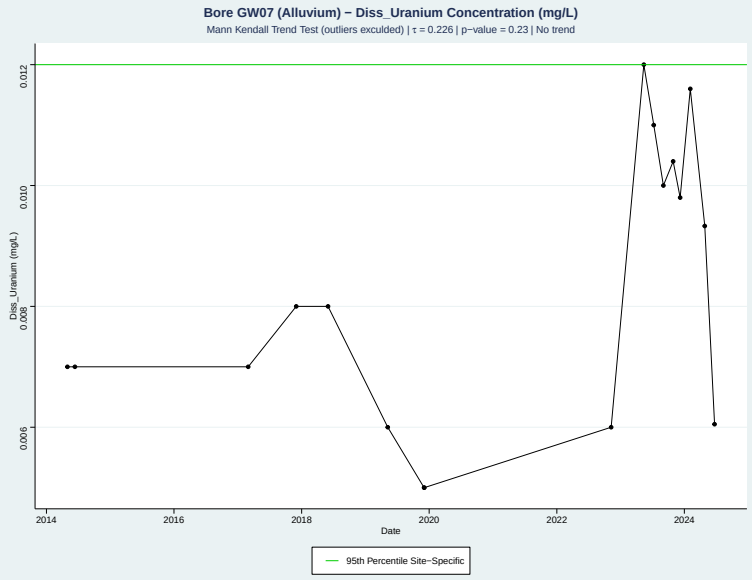

Bore GW07 (Alluvium) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.652 | p−value = 0.00161 | Negative trend
Diss_Mercury (mg/L)
6e−05
5e−05
4e−05
3e−05
2e−05
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

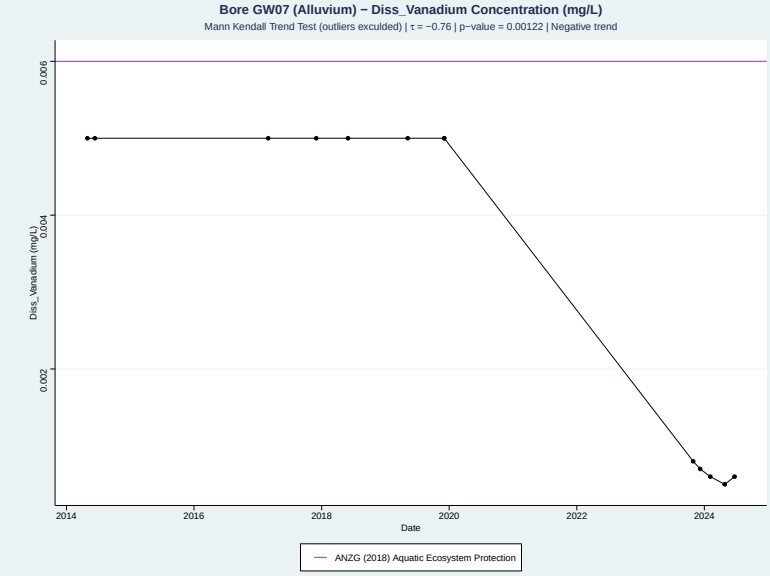

Bore GW07 (Alluvium) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.195 | p−value = 0.649 | No trend
Diss_Molybdenum (mg/L)
0.03
0.02
0.01
0.00
2023−01
2023−07
2024−01
2024−07
Date
ANZG (2018) Aquatic Ecosystem Protection

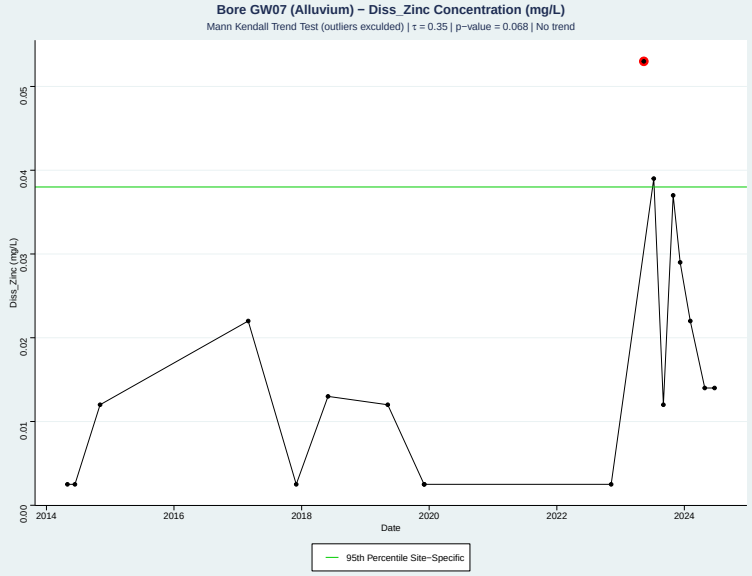

Bore GW07 (Alluvium) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.237 | p−value = 0.194 | No trend
Diss_Nickel (mg/L)
0.020
0.015
0.010
0.005
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

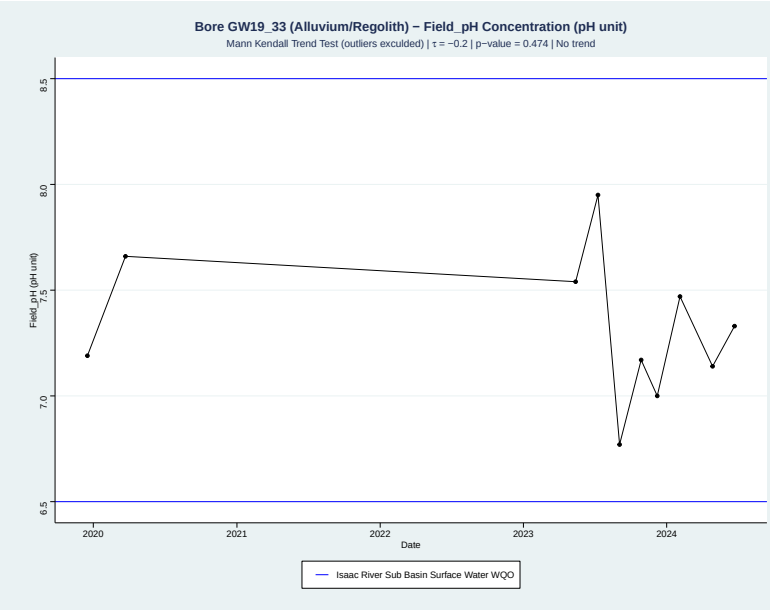

Bore GW07 (Alluvium) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.672 | p−value = 0.000902 | Negative trend
Diss_Selenium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

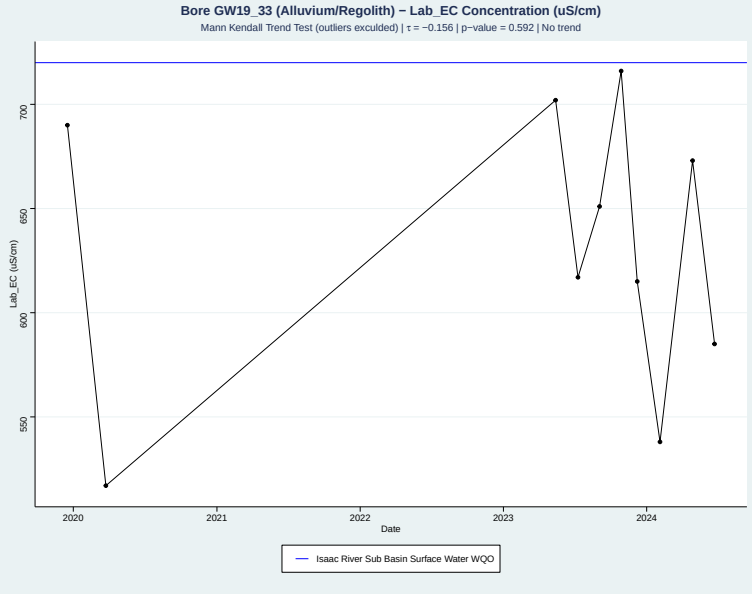

Bore GW07 (Alluvium) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.632 | p−value = 0.00437 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

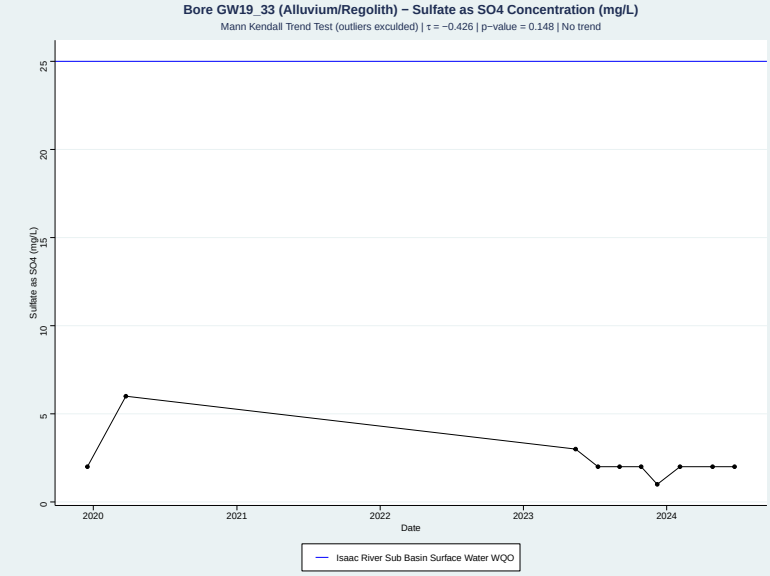

Bore GW07 (Alluvium) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.226 | p−value = 0.23 | No trend
Diss_Uranium (mg/L)
0.012
0.010
0.008
0.006
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

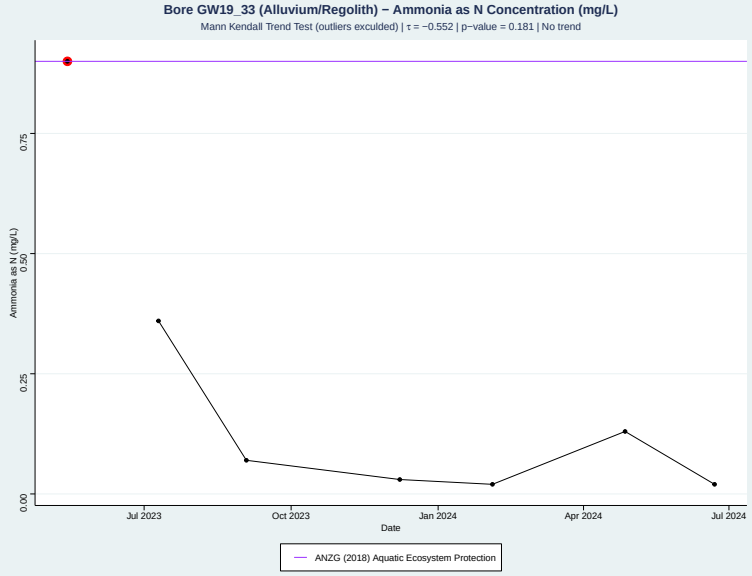

Bore GW07 (Alluvium) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.76 | p−value = 0.00122 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

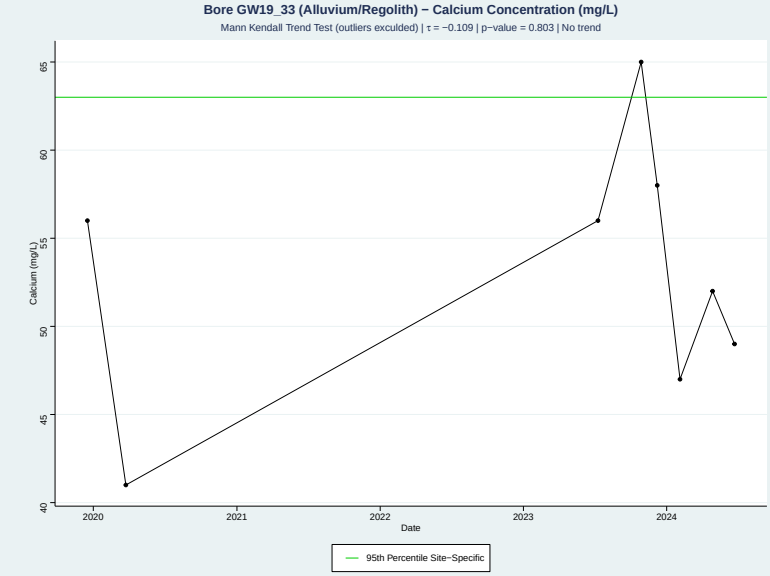

Bore GW07 (Alluvium) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.35 | p−value = 0.068 | No trend
Diss_Zinc (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

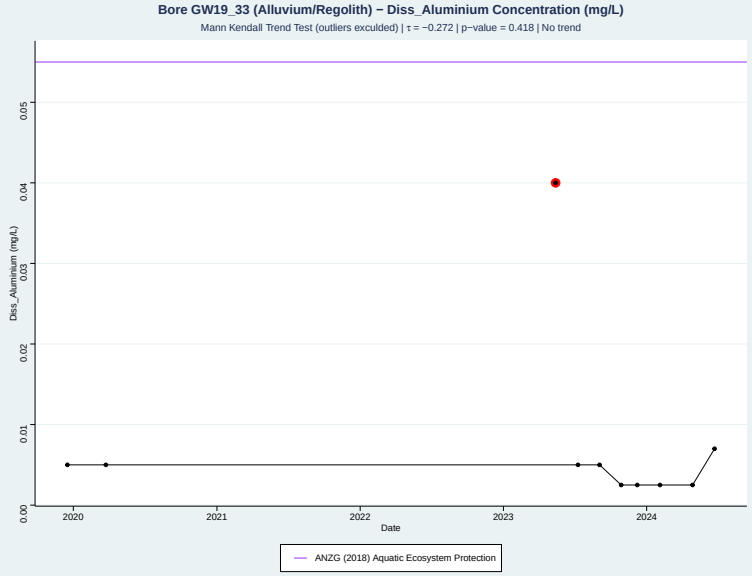

Bore GW19_33 (Alluvium/Regolith) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.2 | p−value = 0.474 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

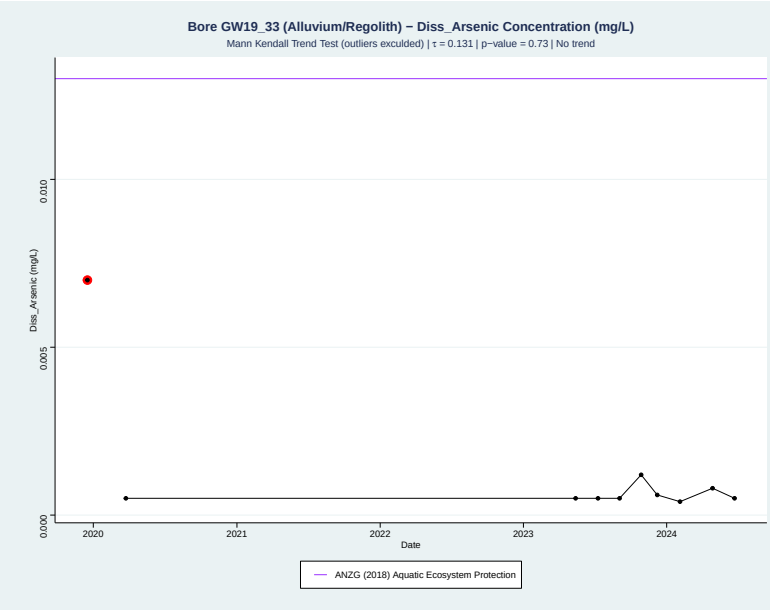

Bore GW19_33 (Alluvium/Regolith) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = −0.156 | p−value = 0.592 | No trend
Lab_EC (uS/cm)
Date
Isaac River Sub Basin Surface Water WQO

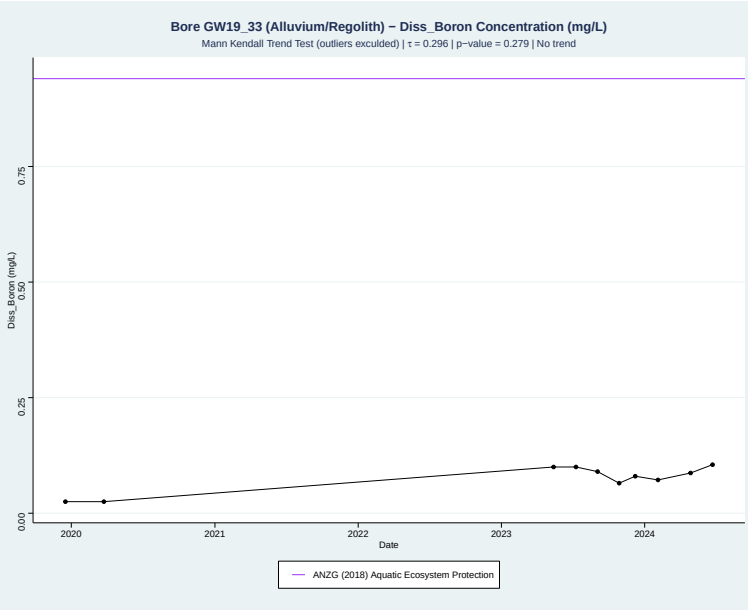

Bore GW19_33 (Alluvium/Regolith) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.426 | p−value = 0.148 | No trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

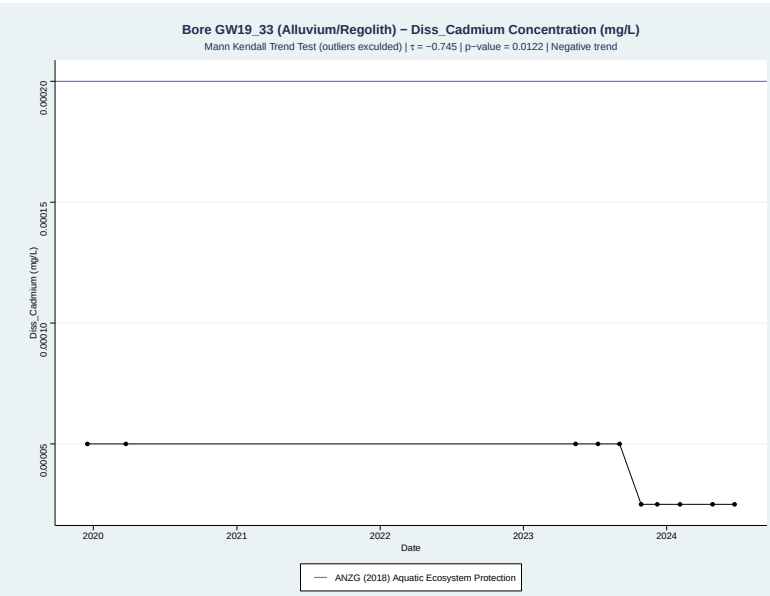

Bore GW19_33 (Alluvium/Regolith) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.552 | p−value = 0.181 | No trend
Ammonia as N (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

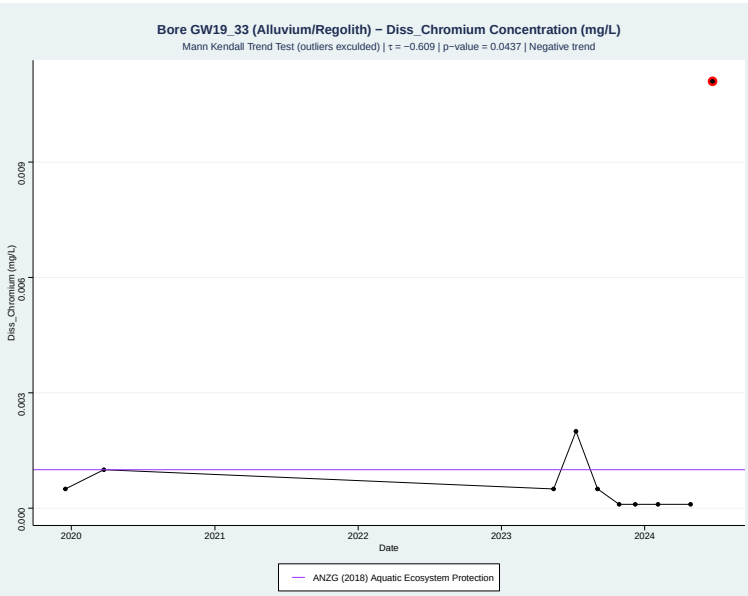

Bore GW19_33 (Alluvium/Regolith) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.109 | p−value = 0.803 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

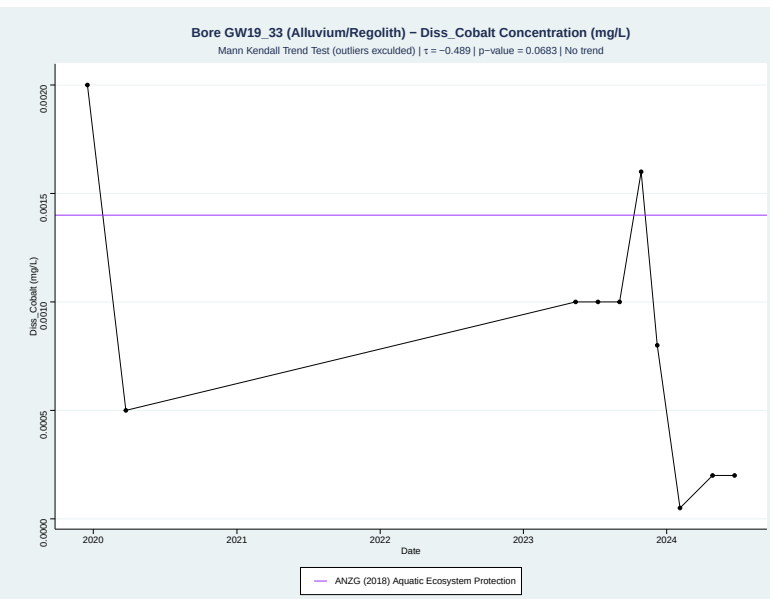

Bore GW19_33 (Alluvium/Regolith) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.272 | p−value = 0.418 | No trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

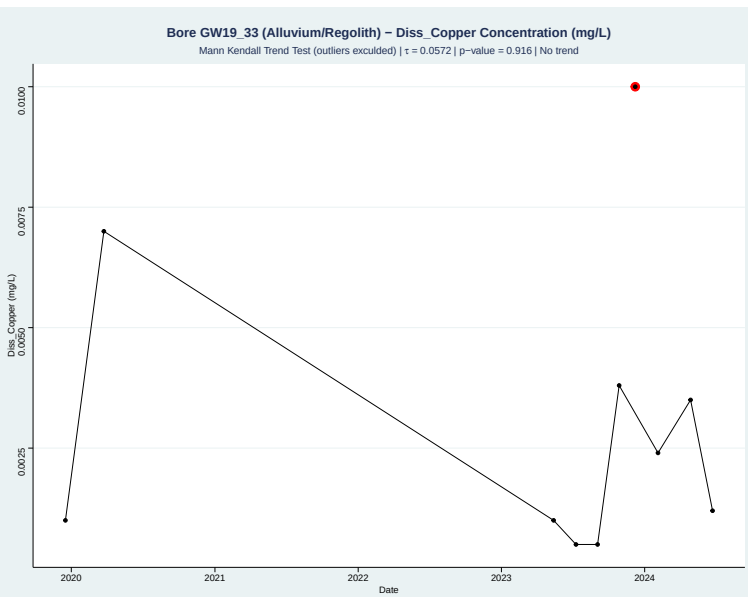

Bore GW19_33 (Alluvium/Regolith) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.131 | p−value = 0.73 | No trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

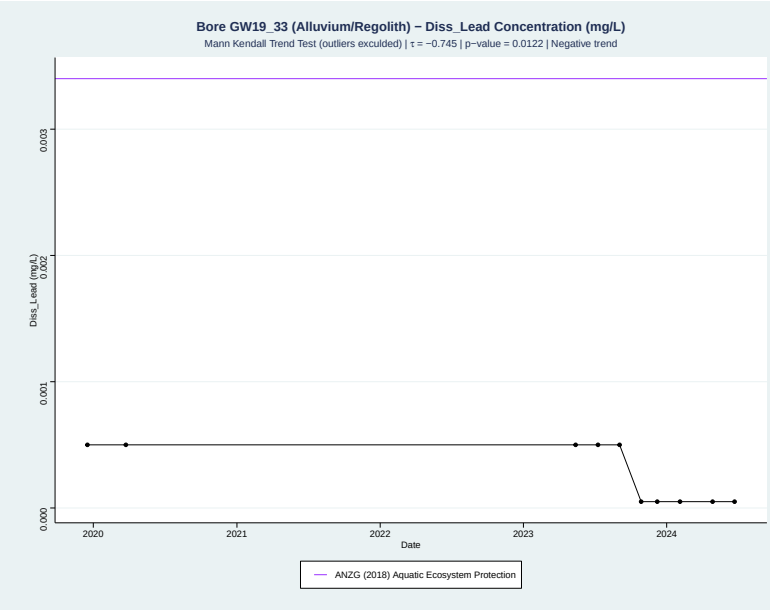

Bore GW19_33 (Alluvium/Regolith) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.296 | p−value = 0.279 | No trend
Diss_Boron (mg/L)
0.00
0.25
0.50
0.75
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

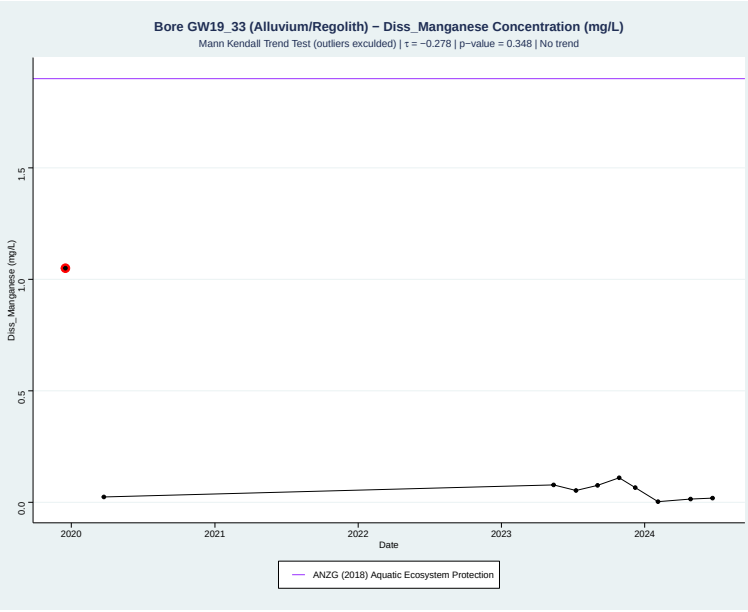

Bore GW19_33 (Alluvium/Regolith) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Cadmium (mg/L)
0.00005
0.00010
0.00015
0.00020
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

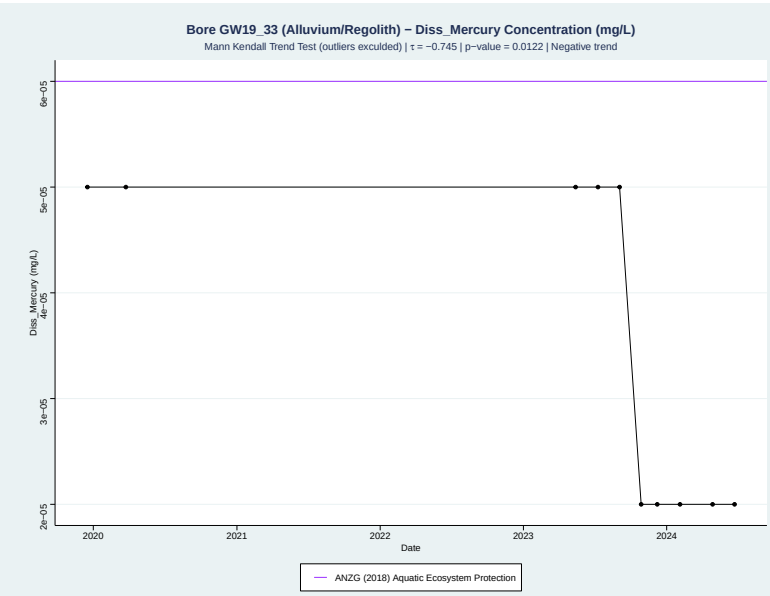

Bore GW19_33 (Alluvium/Regolith) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.609 | p−value = 0.0437 | Negative trend
Diss_Chromium (mg/L)
0.000
0.003
0.006
0.009
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

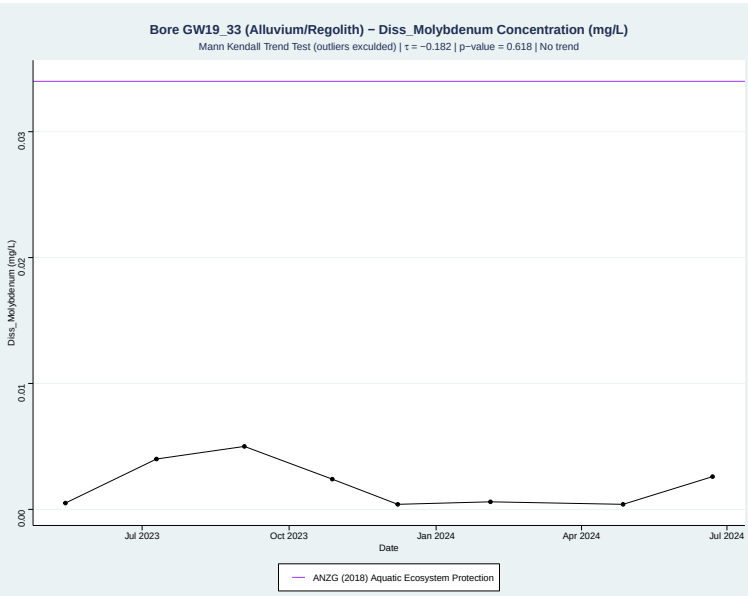

Bore GW19_33 (Alluvium/Regolith) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.489 | p−value = 0.0683 | No trend
Diss_Cobalt (mg/L)
0.0000
0.0005
0.0010
0.0015
0.0020
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

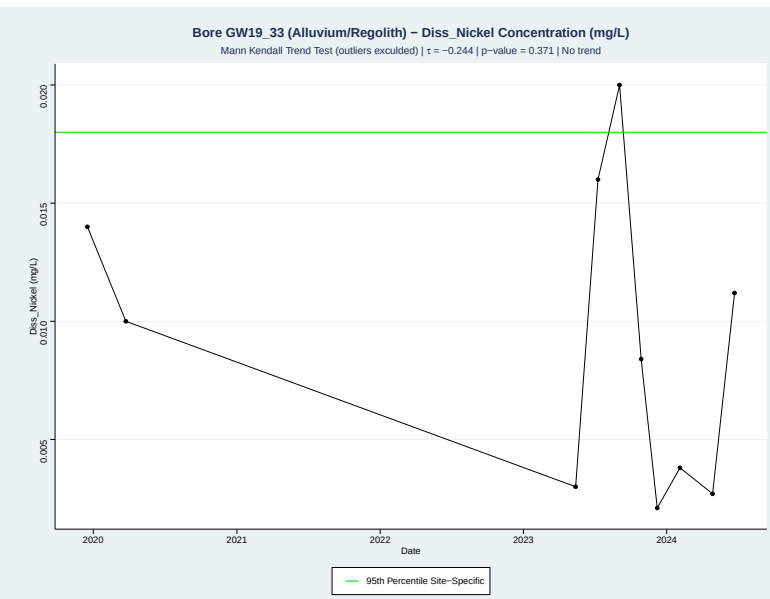

Bore GW19_33 (Alluvium/Regolith) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0572 | p−value = 0.916 | No trend
Diss_Copper (mg/L)
0.0025
0.0050
0.0075
0.0100
2020
2021
2022
2023
2024
Date

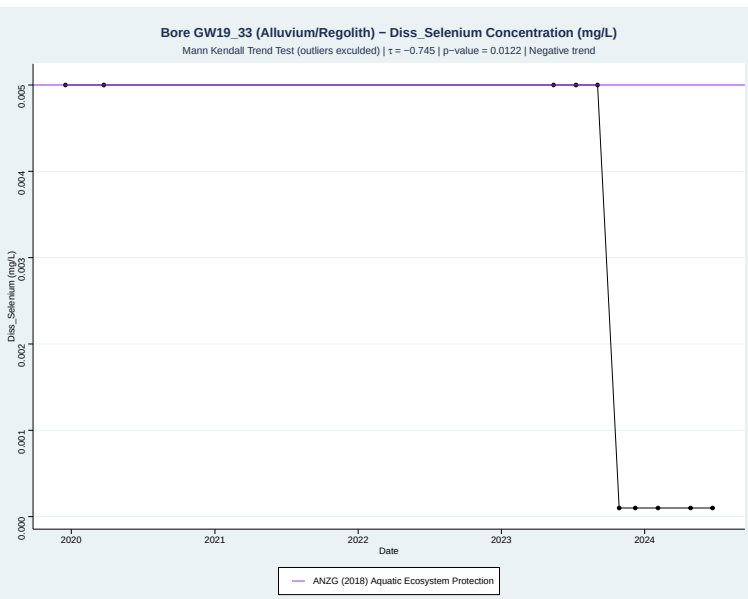

Bore GW19_33 (Alluvium/Regolith) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Lead (mg/L)
0.000
0.001
0.002
0.003
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

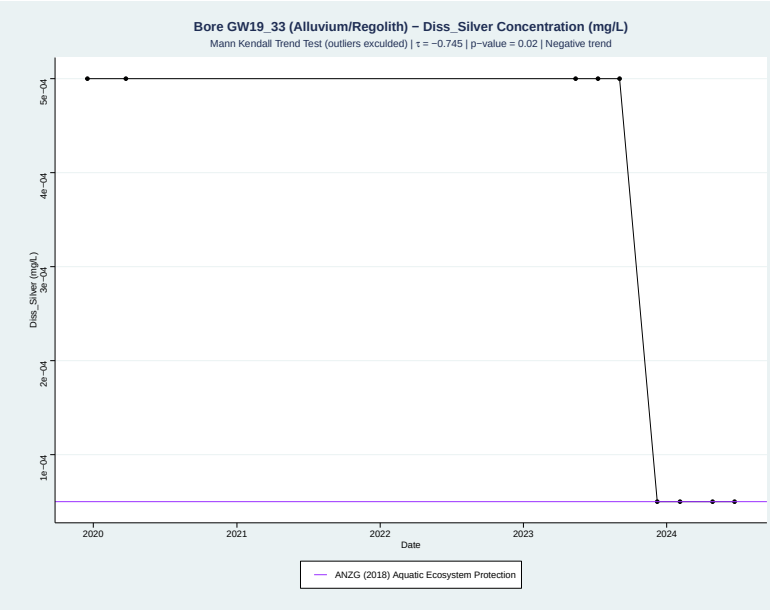

Bore GW19_33 (Alluvium/Regolith) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.278 | p−value = 0.348 | No trend
Diss_Manganese (mg/L)
0.0
0.5
1.0
1.5
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

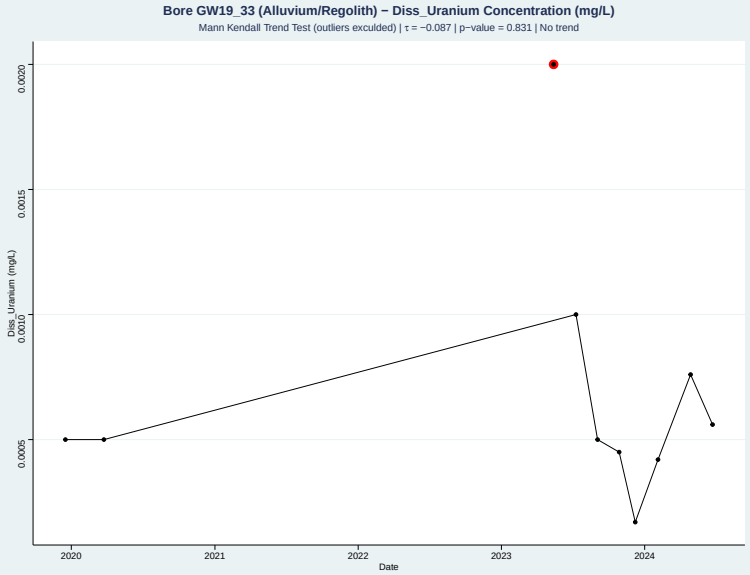

Bore GW19_33 (Alluvium/Regolith) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Mercury (mg/L)
2e−05
3e−05
4e−05
5e−05
6e−05
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

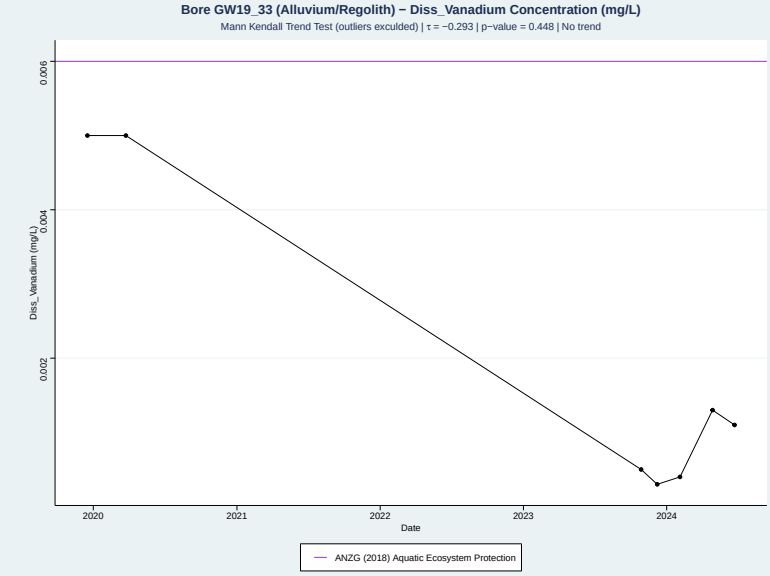

Bore GW19_33 (Alluvium/Regolith) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.182 | p−value = 0.618 | No trend
Diss_Molybdenum (mg/L)
0.00
0.01
0.02
0.03
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Date
ANZG (2018) Aquatic Ecosystem Protection

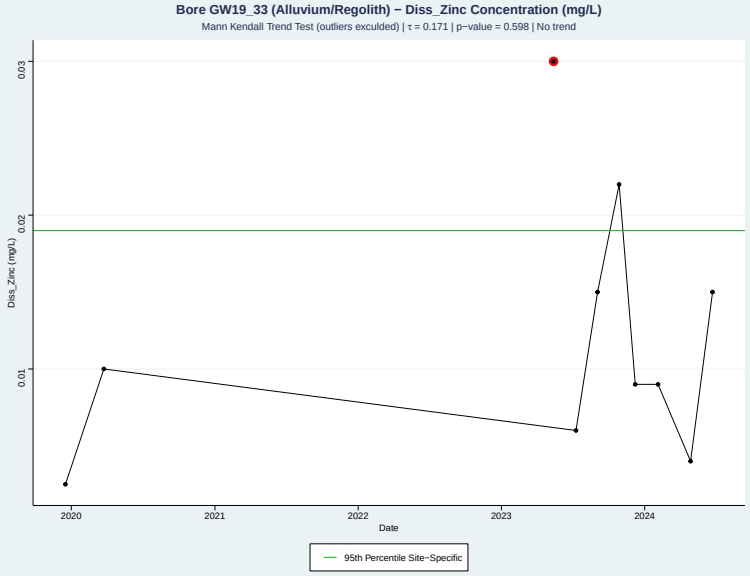

Bore GW19_33 (Alluvium/Regolith) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.244 | p−value = 0.371 | No trend
Diss_Nickel (mg/L)
0.005
0.010
0.015
0.020
2020
2021
2022
2023
2024
Date
95th Percentile Site−Specific


Bore GW19_33 (Alluvium/Regolith) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW19_33 (Alluvium/Regolith) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.02 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

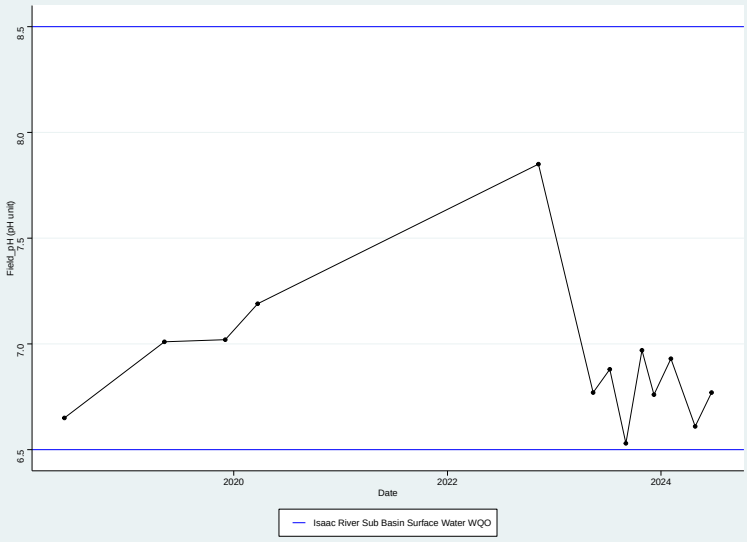

Bore GW19_33 (Alluvium/Regolith) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.087 | p−value = 0.831 | No trend
Diss_Uranium (mg/L)
0.0020
0.0015
0.0010
0.0005
2020
2021
2022
2023
2024
Date


Bore GW19_33 (Alluvium/Regolith) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.293 | p−value = 0.448 | No trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW19_33 (Alluvium/Regolith) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.171 | p−value = 0.598 | No trend
Diss_Zinc (mg/L)
0.03
0.02
0.01
2020
2021
2022
2023
2024
Date
95th Percentile Site−Specific

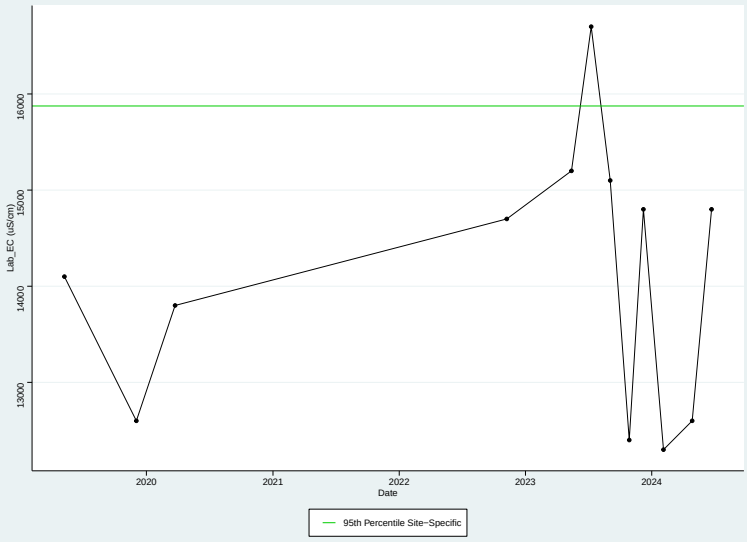
Bore GW30c (Regolith) – Field_pH Concentration (pH unit)

Mann Kendall Trend Test (outliers excluded) | τ = −0.245 | p−value = 0.271 | No trend



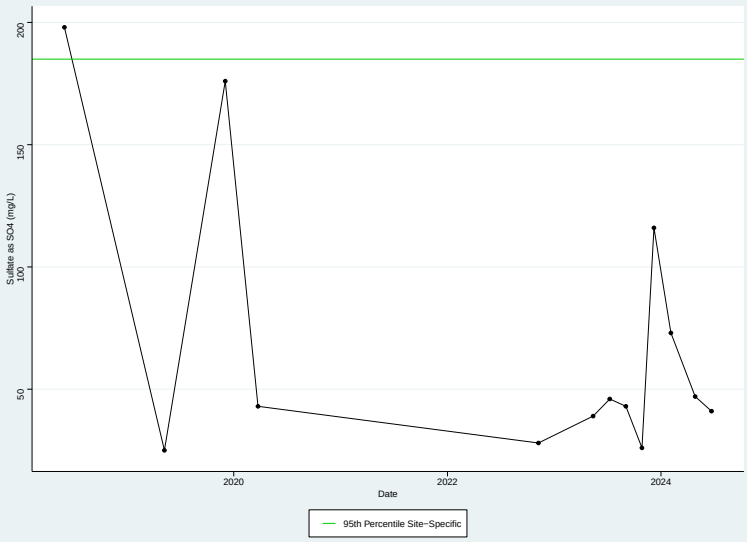
Bore GW30c (Regolith) – Lab_EC Concentration (uS/cm)

Mann Kendall Trend Test (outliers excluded) | τ = −0.0308 | p−value = 0.945 | No trend



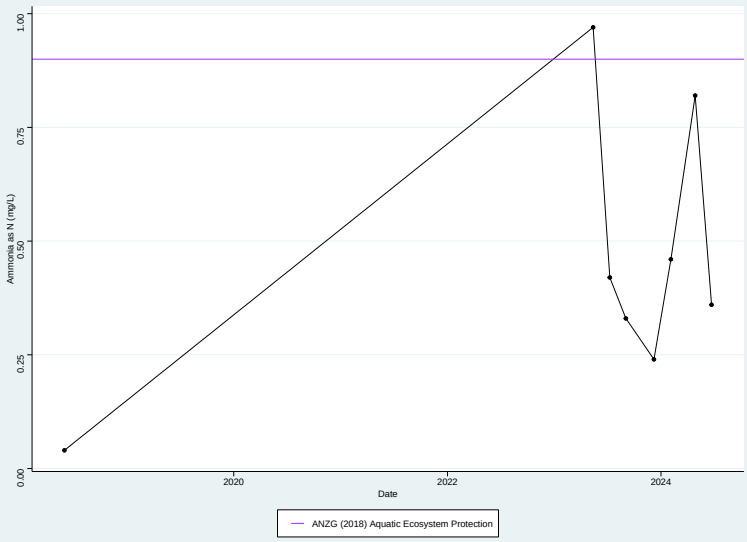
Bore GW30c (Regolith) – Sulfate as SO4 Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.0129 | p−value = 1 | No trend



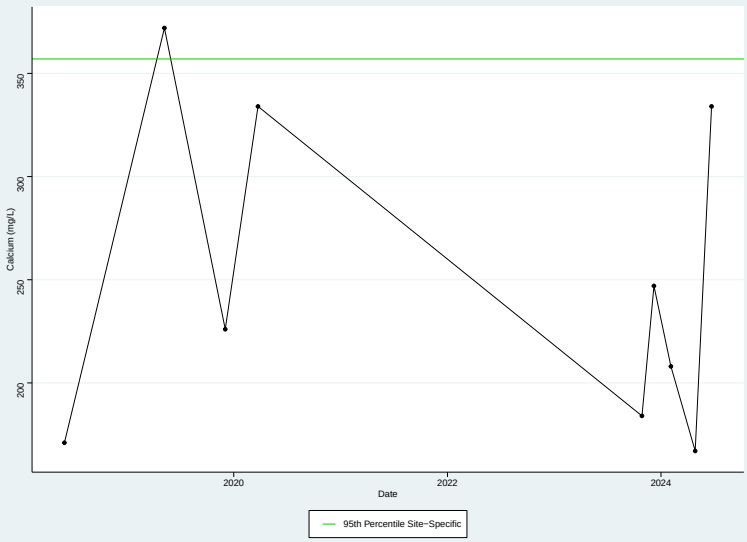
Bore GW30c (Regolith) – Ammonia as N Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.143 | p−value = 0.711 | No trend



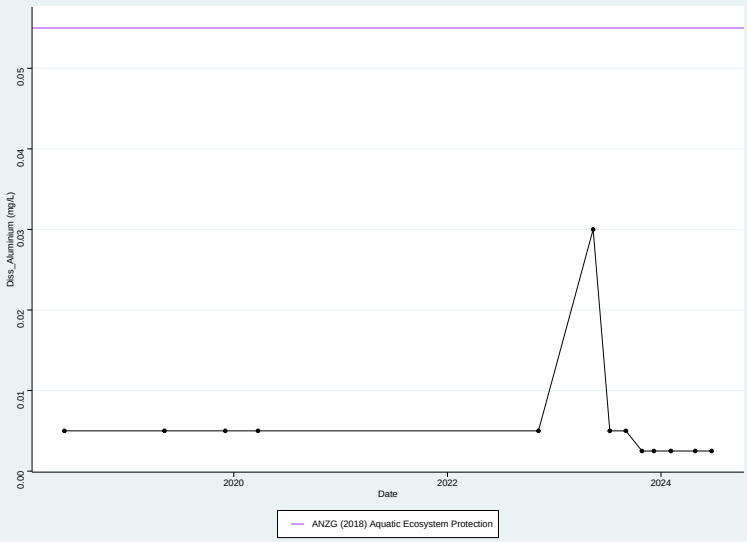
Bore GW30c (Regolith) – Calcium Concentration (mg/L)

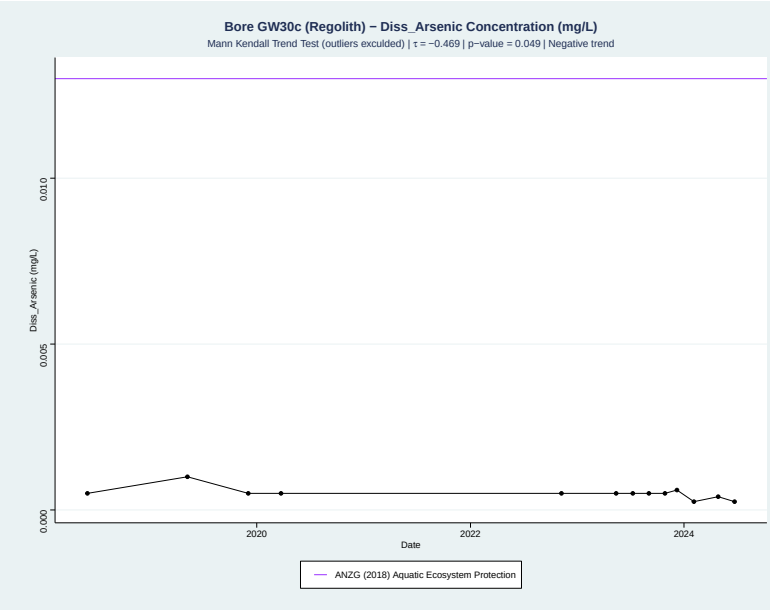
Mann Kendall Trend Test (outliers excluded) | τ = −0.0845 | p−value = 0.834 | No trend

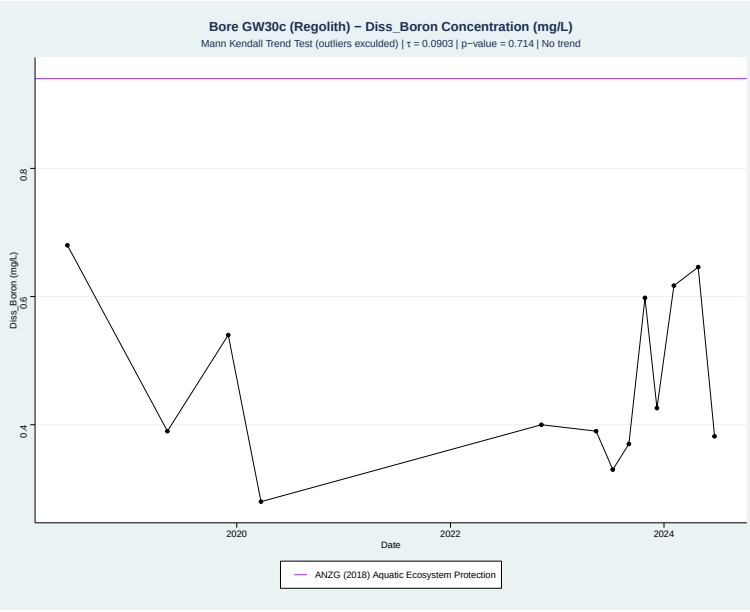


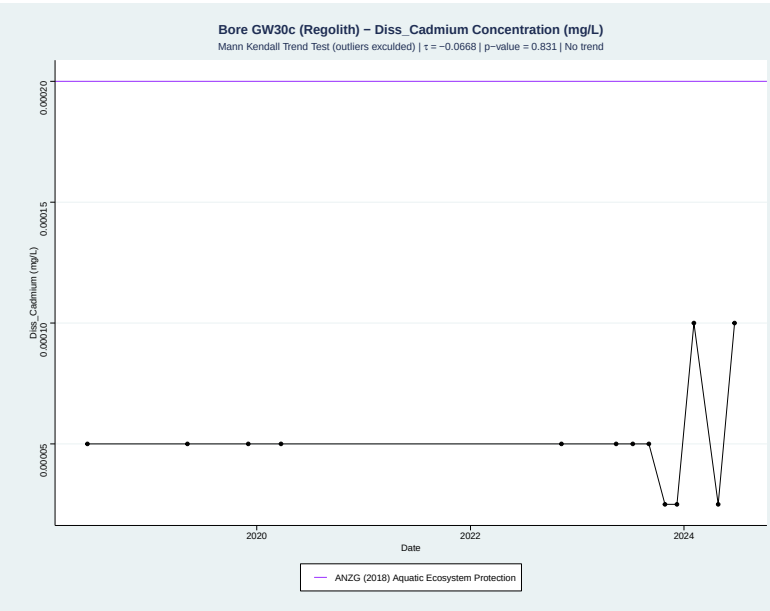
Bore GW30c (Regolith) – Diss_Aluminium Concentration (mg/L)

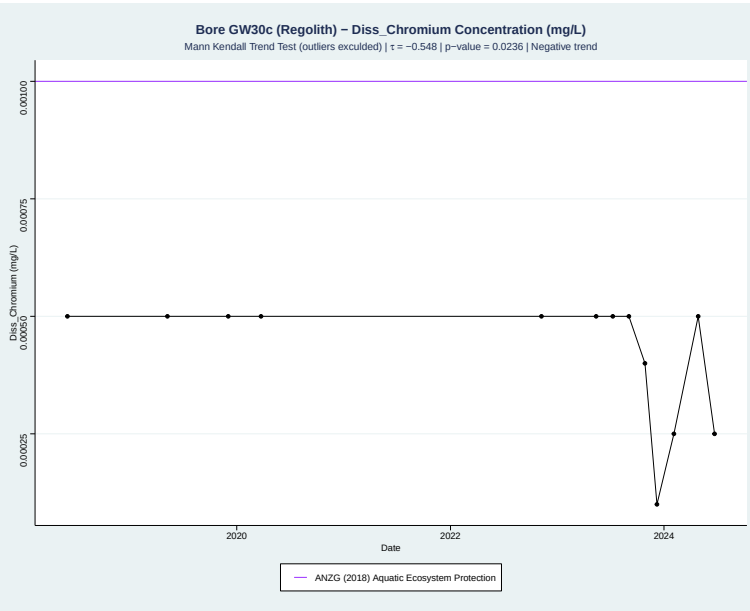
Mann Kendall Trend Test (outliers excluded) | τ = −0.611 | p−value = 0.0125 | Negative trend

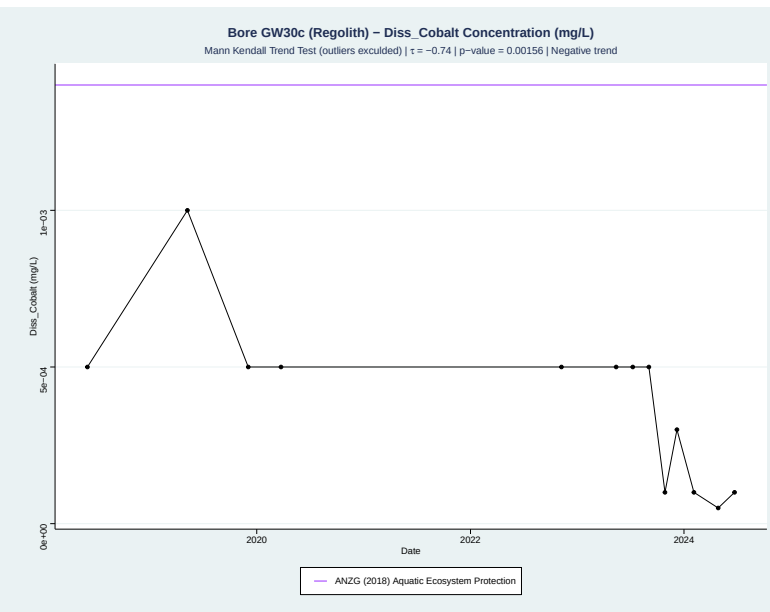


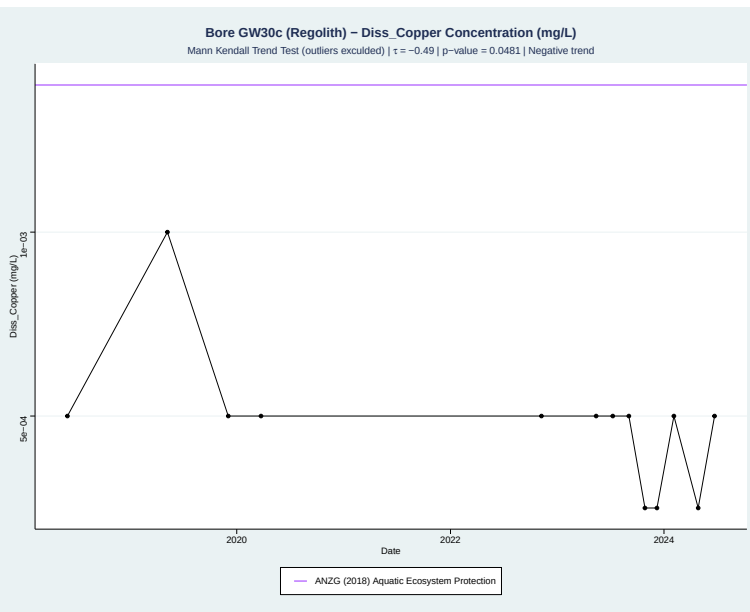

Bore GW30c (Regolith) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.469 | p−value = 0.049 | Negative trend
Diss_Arsenic (mg/L)
0.010
0.005
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

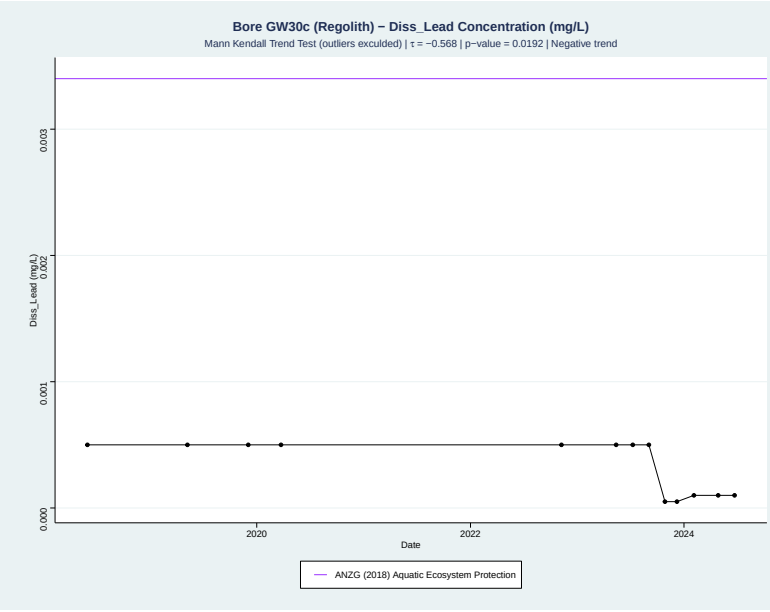

Bore GW30c (Regolith) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0903 | p−value = 0.714 | No trend
Diss_Boron (mg/L)
0.8
0.6
0.4
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

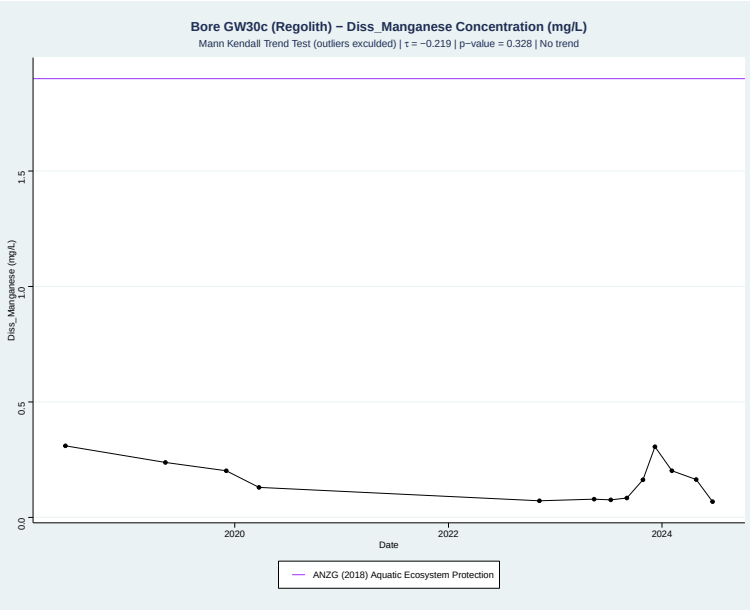

Bore GW30c (Regolith) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.0668 | p−value = 0.831 | No trend
Diss_Cadmium (mg/L)
0.00020
0.00015
0.00010
0.00005
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

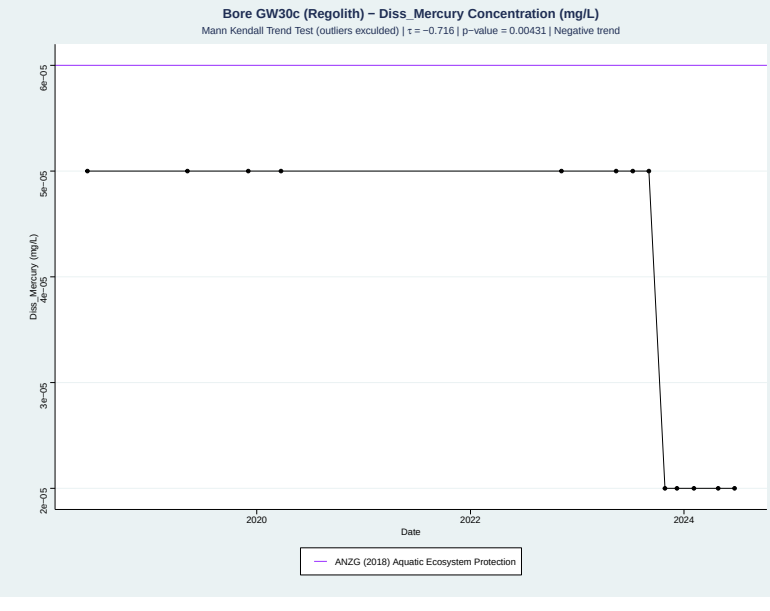

Bore GW30c (Regolith) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.548 | p−value = 0.0236 | Negative trend
Diss_Chromium (mg/L)
0.00100
0.00075
0.00050
0.00025
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

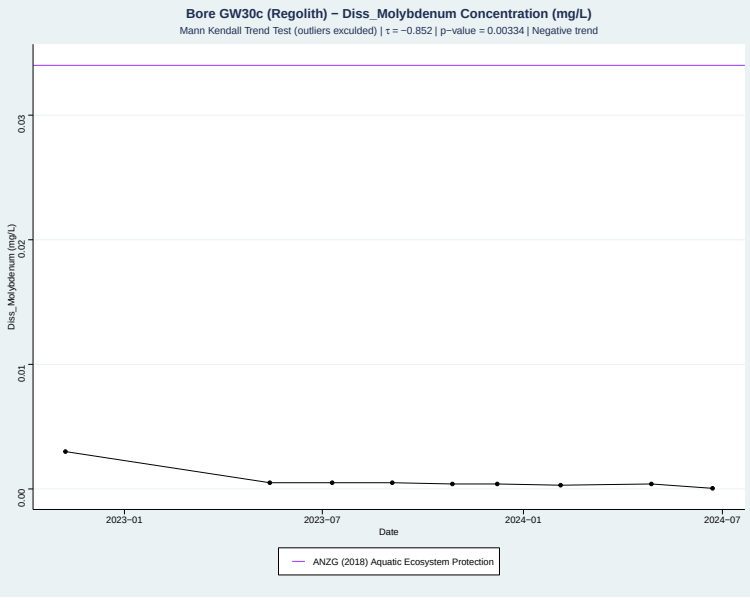

Bore GW30c (Regolith) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.74 | p−value = 0.00156 | Negative trend
Diss_Cobalt (mg/L)
1e−03
5e−04
0e+00
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

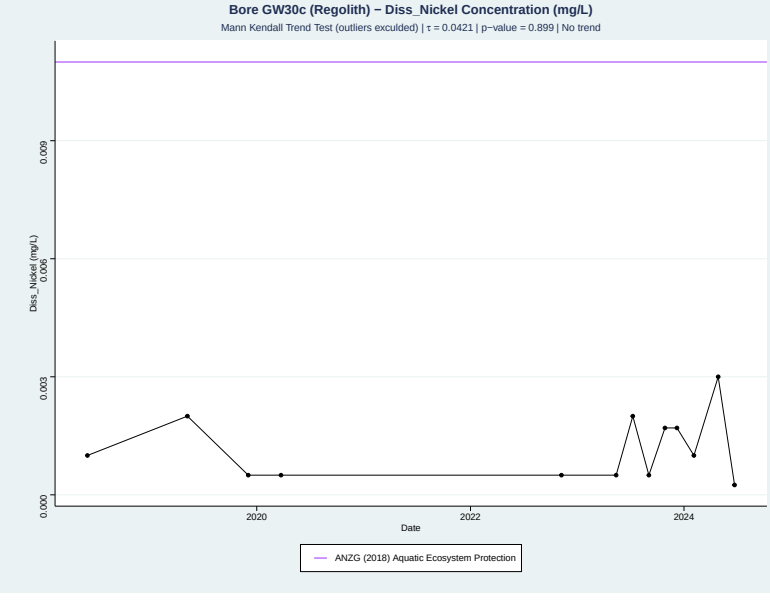

Bore GW30c (Regolith) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.49 | p−value = 0.0481 | Negative trend
Diss_Copper (mg/L)
1e−03
5e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

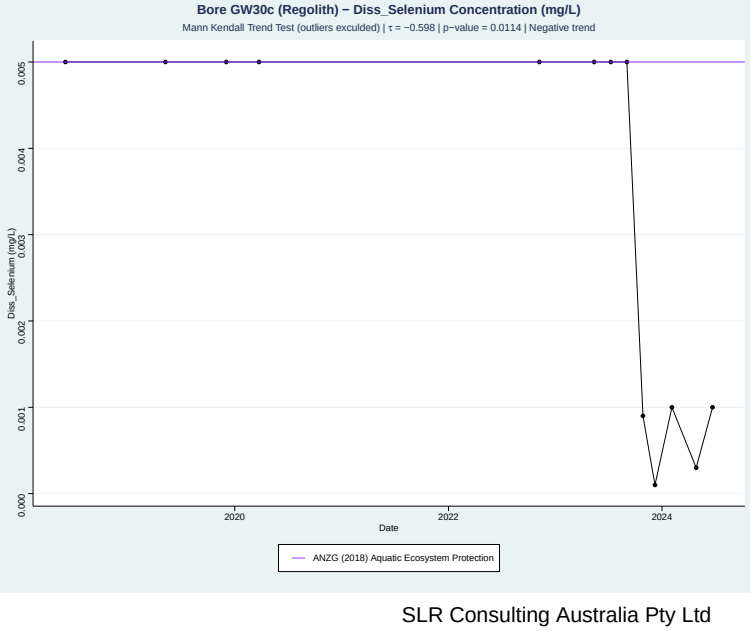

Bore GW30c (Regolith) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.568 | p−value = 0.0192 | Negative trend
Diss_Lead (mg/L)
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

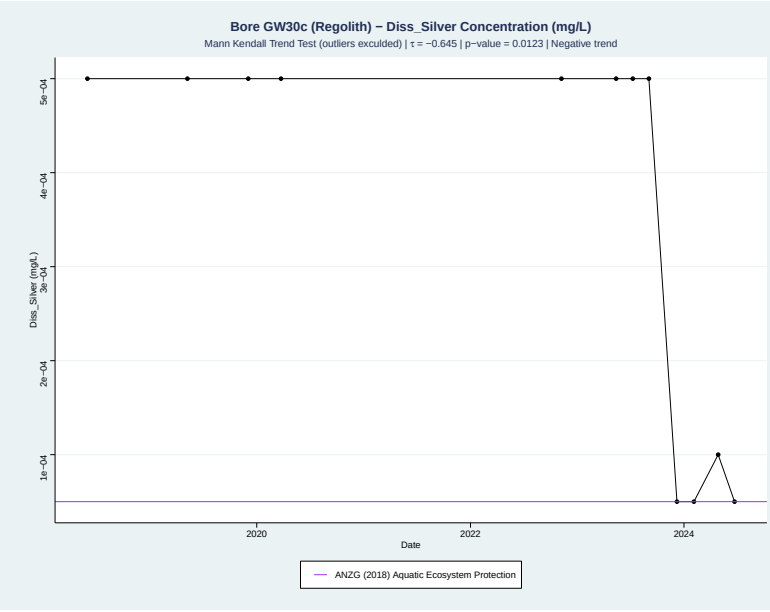

Bore GW30c (Regolith) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.219 | p−value = 0.328 | No trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
0.0
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

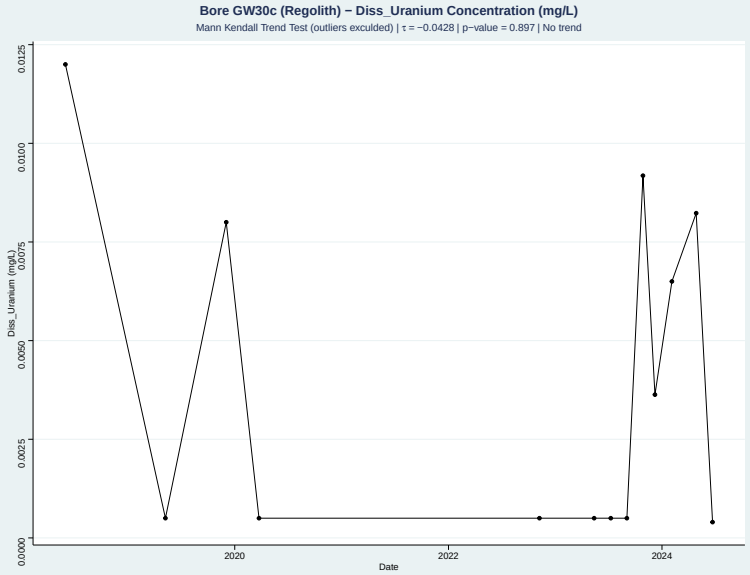

Bore GW30c (Regolith) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.716 | p−value = 0.00431 | Negative trend
Diss_Mercury (mg/L)
6e−05
5e−05
4e−05
3e−05
2e−05
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

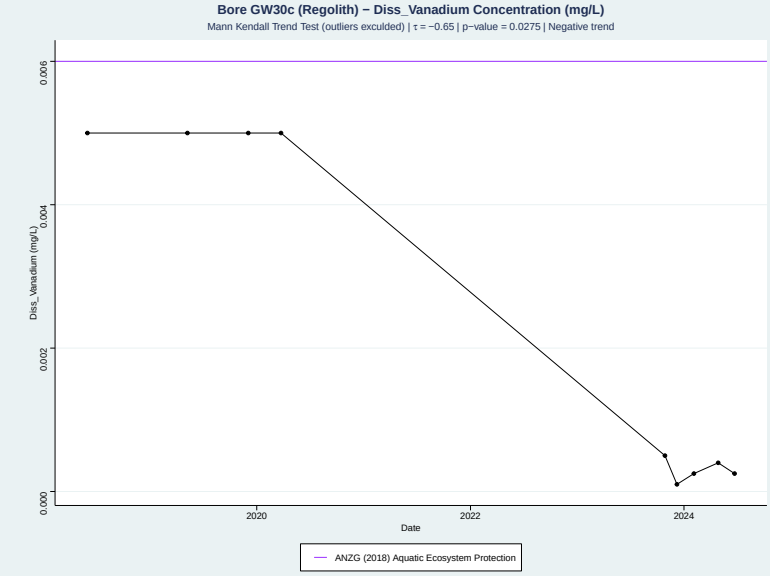

Bore GW30c (Regolith) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.852 | p−value = 0.00334 | Negative trend
Diss_Molybdenum (mg/L)
0.03
0.02
0.01
0.00
2023−01
2023−07
2024−01
2024−07
Date
ANZG (2018) Aquatic Ecosystem Protection

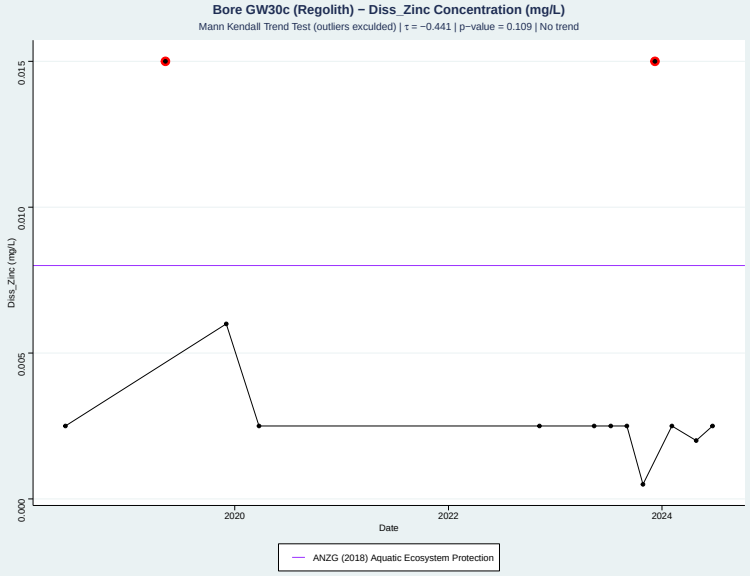

Bore GW30c (Regolith) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0421 | p−value = 0.899 | No trend
Diss_Nickel (mg/L)
0.009
0.006
0.003
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

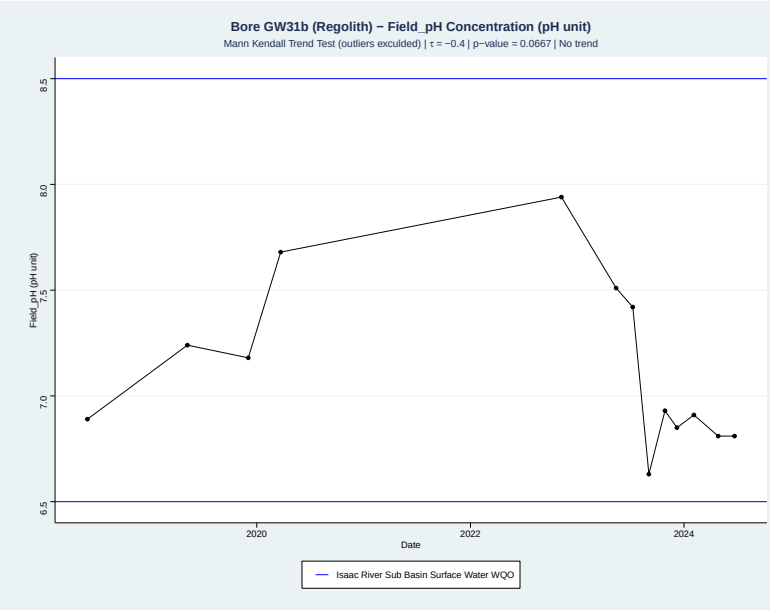

Bore GW30c (Regolith) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.598 | p−value = 0.0114 | Negative trend
Diss_Selenium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

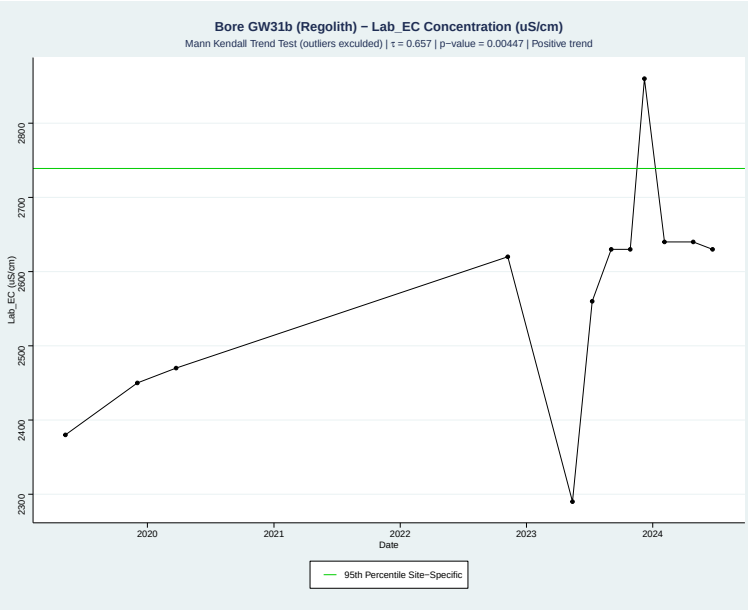

Bore GW30c (Regolith) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.645 | p−value = 0.0123 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

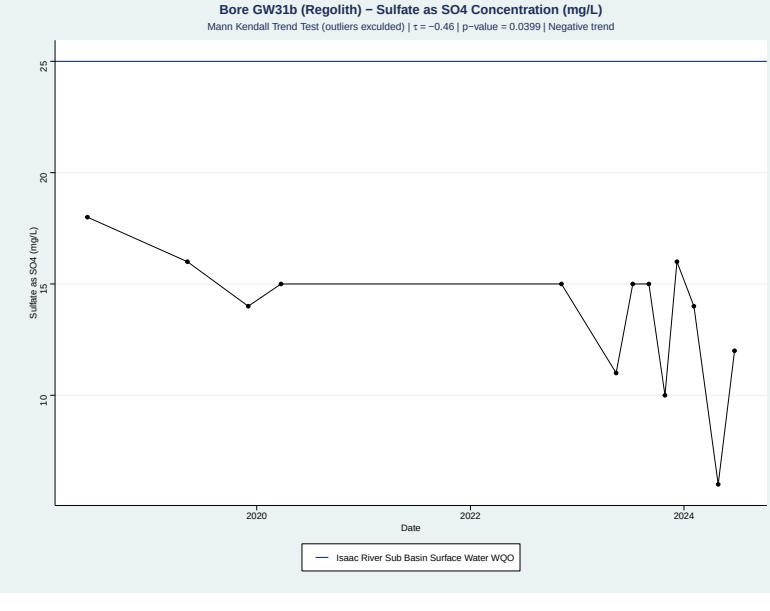

Bore GW30c (Regolith) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.0428 | p−value = 0.897 | No trend
Diss_Uranium (mg/L)
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
2020
2022
2024
Date

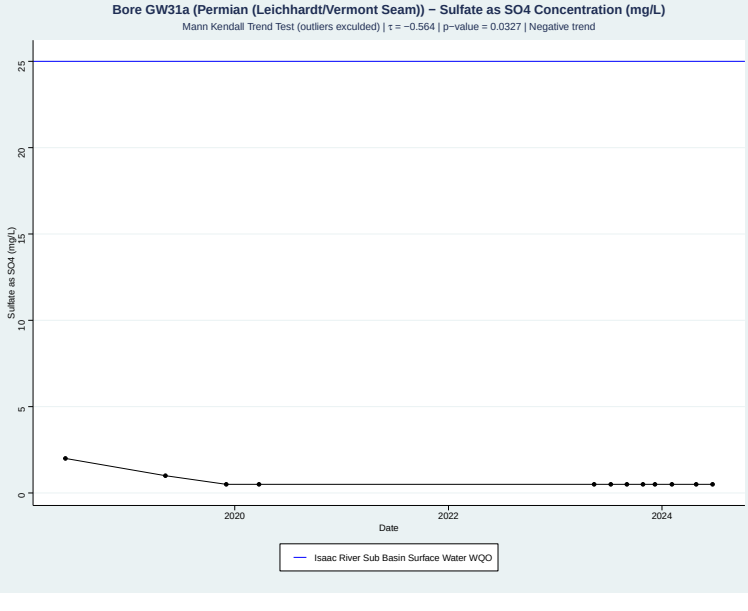

Bore GW30c (Regolith) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.65 | p−value = 0.0275 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

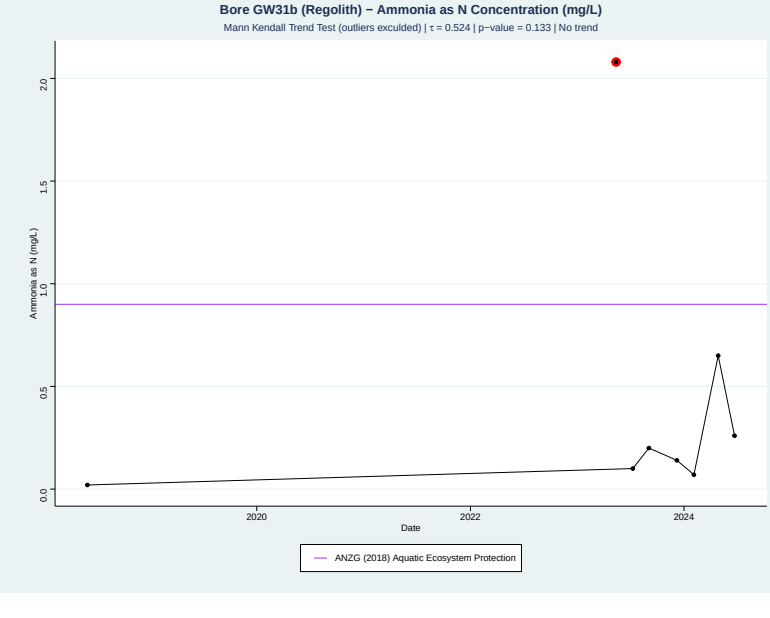

Bore GW30c (Regolith) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.441 | p−value = 0.109 | No trend
Diss_Zinc (mg/L)
0.015
0.010
0.005
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

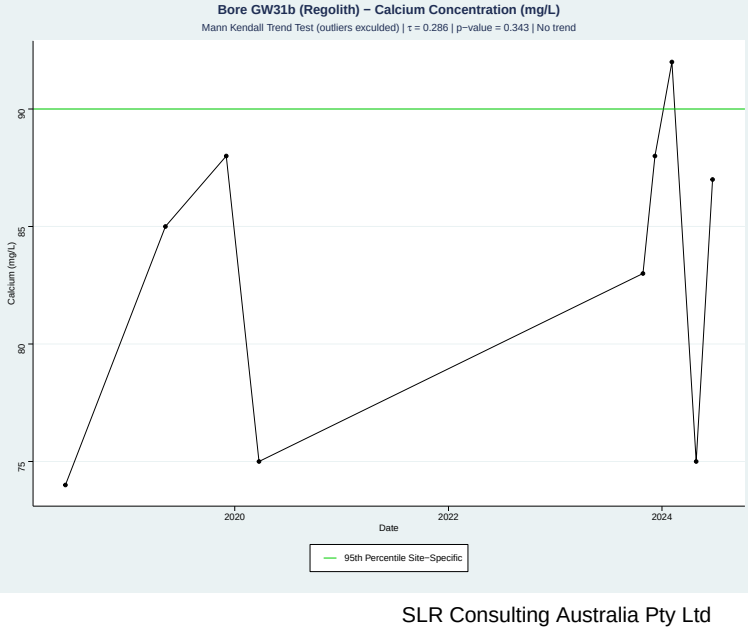

Bore GW31b (Regolith) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.4 | p−value = 0.0667 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

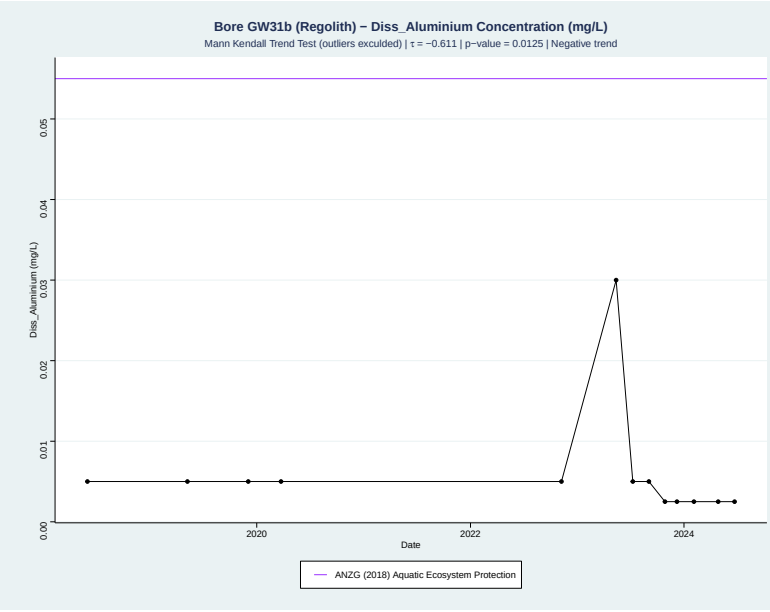

Bore GW31b (Regolith) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.657 | p−value = 0.00447 | Positive trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

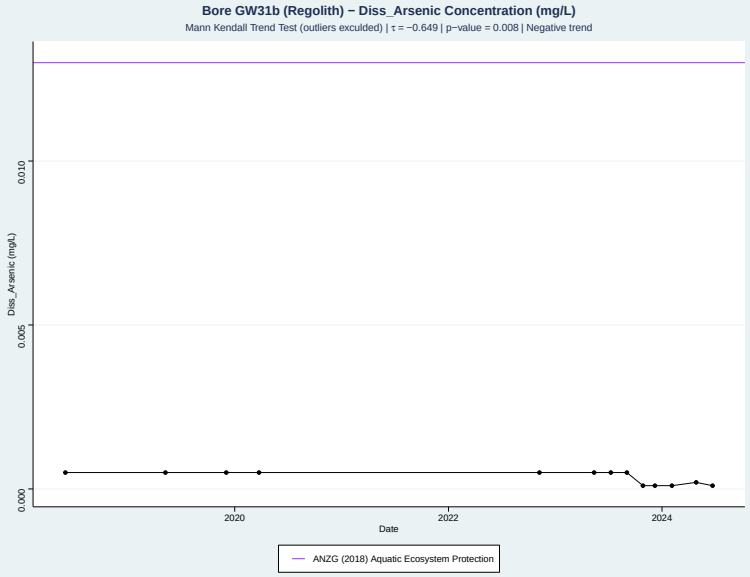

Bore GW31b (Regolith) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.46 | p−value = 0.0399 | Negative trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

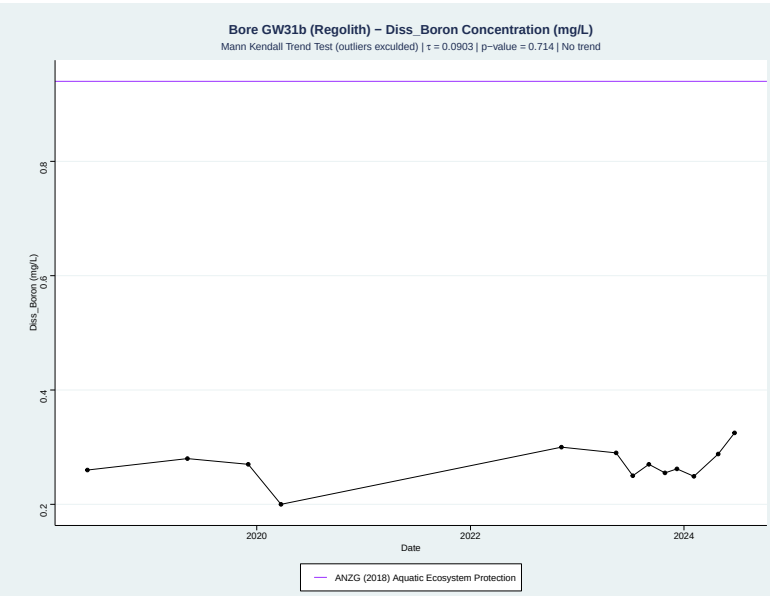

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.564 | p−value = 0.0327 | Negative trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

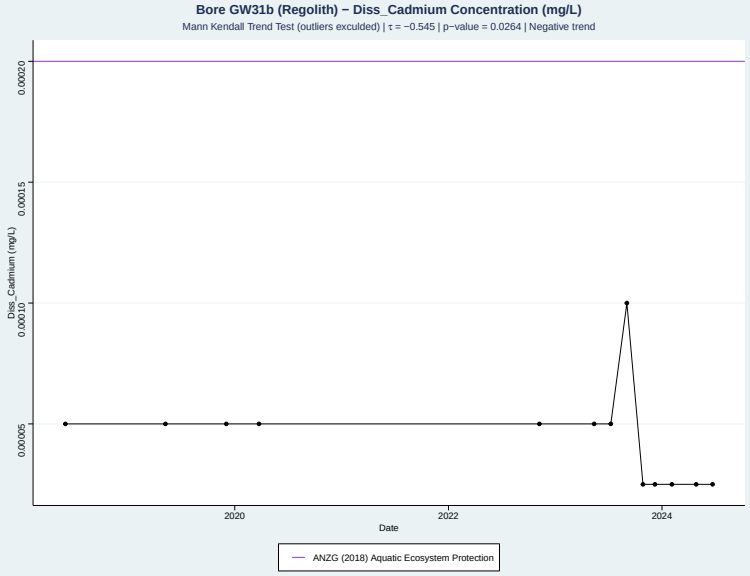

Bore GW31b (Regolith) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.524 | p−value = 0.133 | No trend
Ammonia as N (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

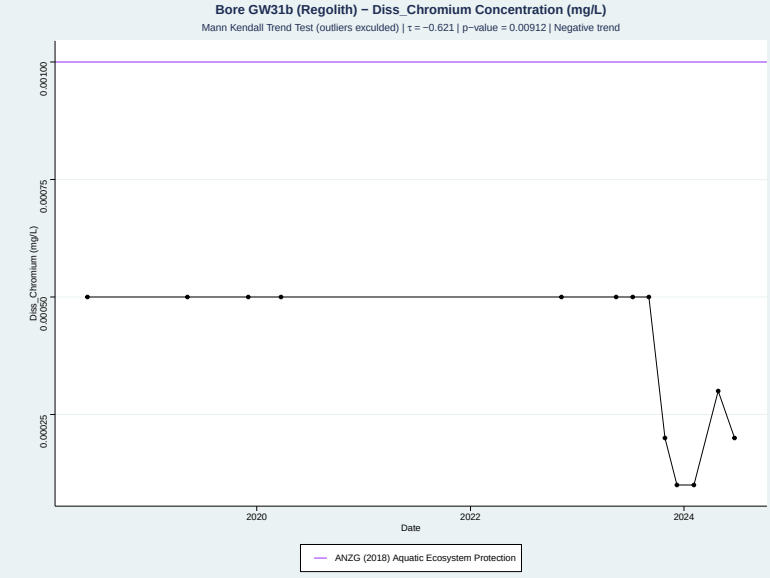

Bore GW31b (Regolith) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.286 | p−value = 0.343 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

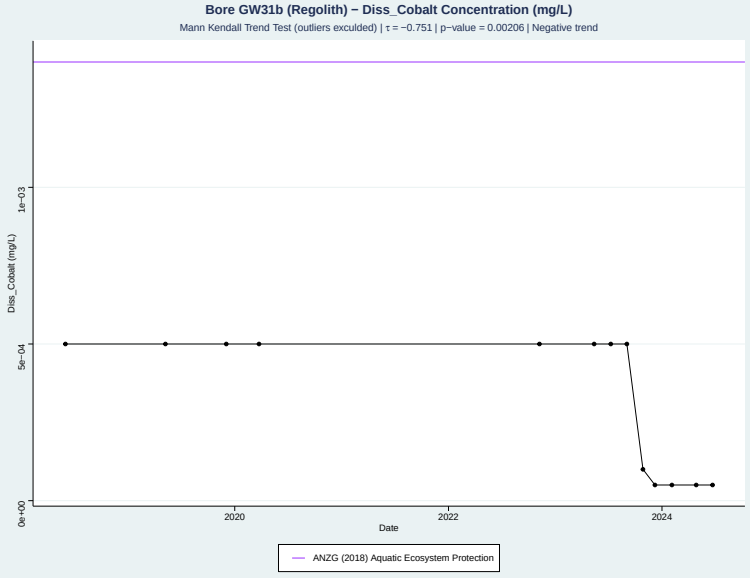

Bore GW31b (Regolith) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.611 | p−value = 0.0125 | Negative trend
Diss_Aluminium (mg/L)
0.00
0.01
0.02
0.03
0.04
0.05
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31b (Regolith) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.008 | Negative trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31b (Regolith) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0903 | p−value = 0.714 | No trend
Diss_Boron (mg/L)
0.2
0.4
0.6
0.8
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

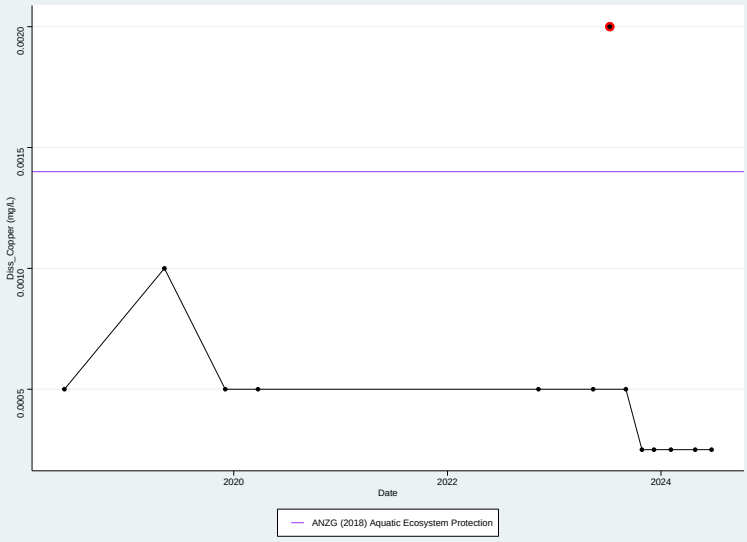

Bore GW31b (Regolith) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.545 | p−value = 0.0264 | Negative trend
Diss_Cadmium (mg/L)
0.00005
0.00010
0.00015
0.00020
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31b (Regolith) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.621 | p−value = 0.00912 | Negative trend
Diss_Chromium (mg/L)
0.00025
0.00050
0.00075
0.00100
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31b (Regolith) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.751 | p−value = 0.00206 | Negative trend
Diss_Cobalt (mg/L)
0e+00
5e−04
1e−03
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

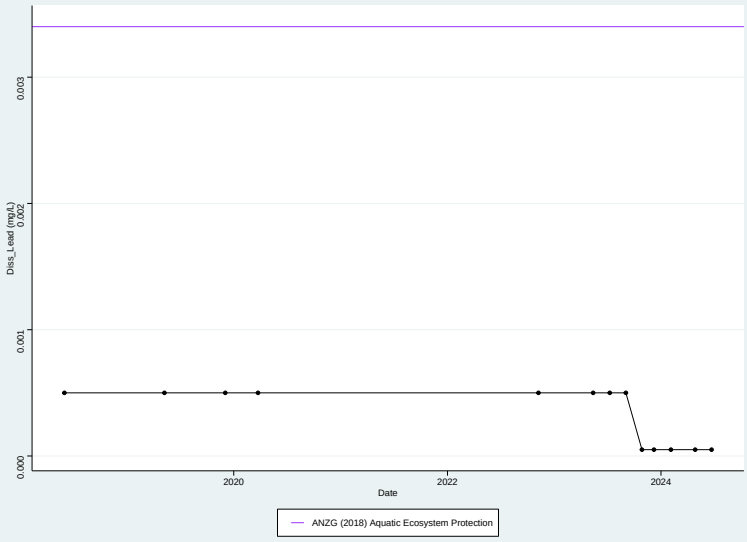
Bore GW31b (Regolith) – Diss_Copper Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.75 | p−value = 0.00334 | Negative trend



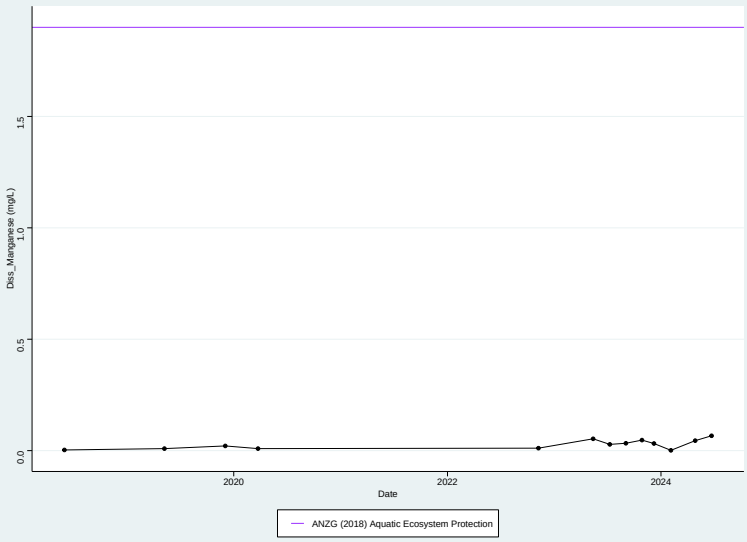
Bore GW31b (Regolith) – Diss_Lead Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.716 | p−value = 0.00431 | Negative trend



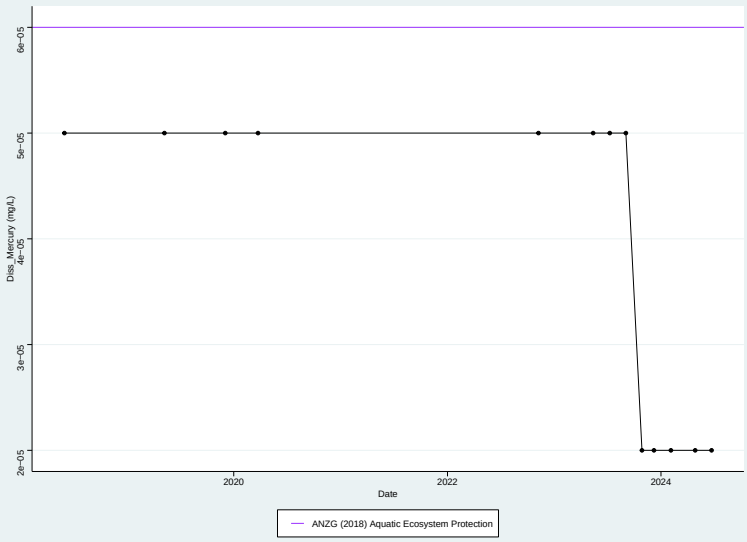
Bore GW31b (Regolith) – Diss_Manganese Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.477 | p−value = 0.0278 | Positive trend



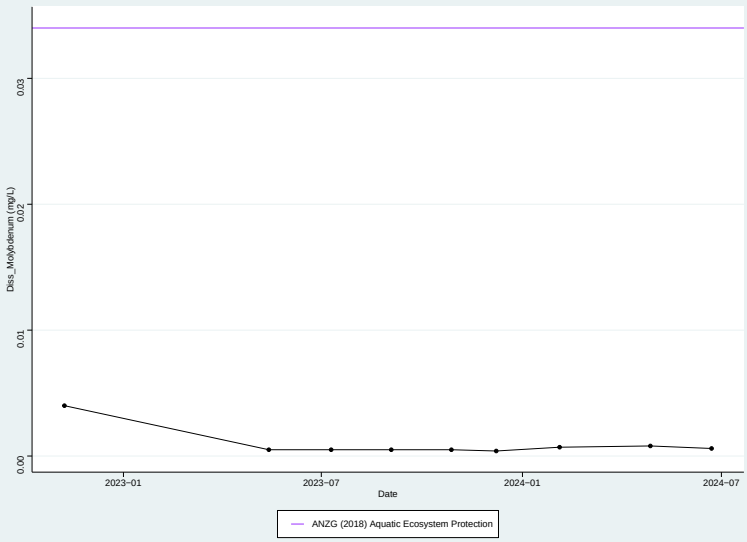
Bore GW31b (Regolith) – Diss_Mercury Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.716 | p−value = 0.00431 | Negative trend



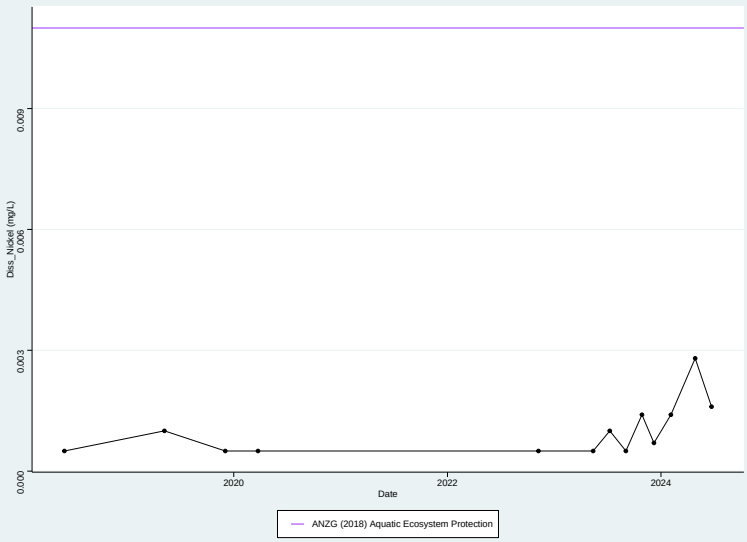
Bore GW31b (Regolith) – Diss_Molybdenum Concentration (mg/L)

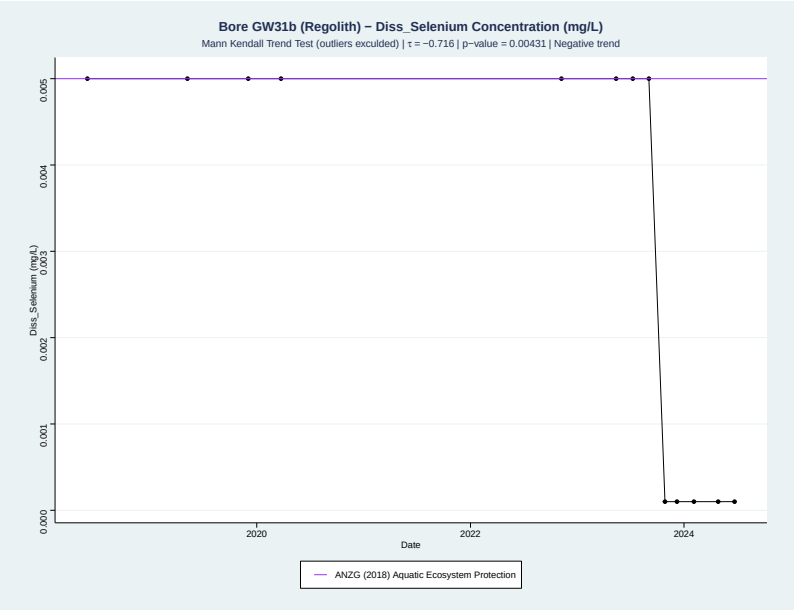
Mann Kendall Trend Test (outliers excluded) | τ = 0.0609 | p−value = 0.913 | No trend

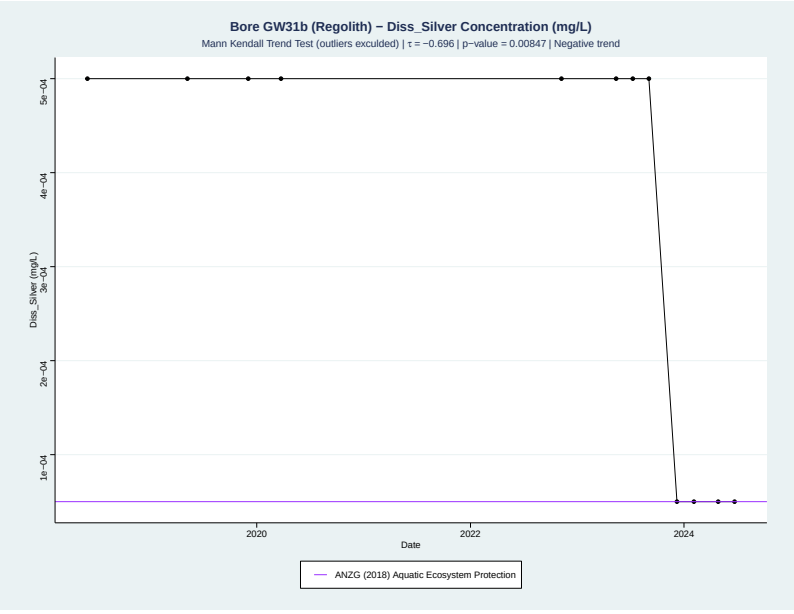


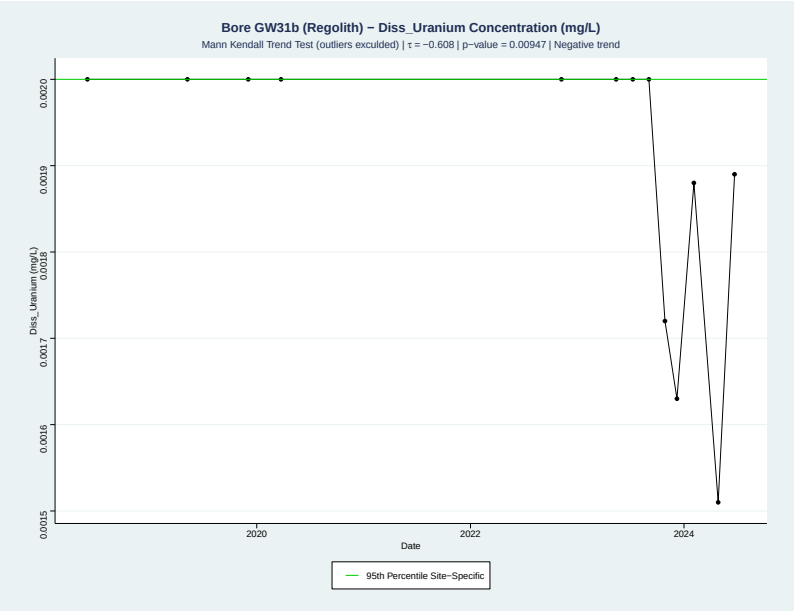
Bore GW31b (Regolith) – Diss_Nickel Concentration (mg/L)

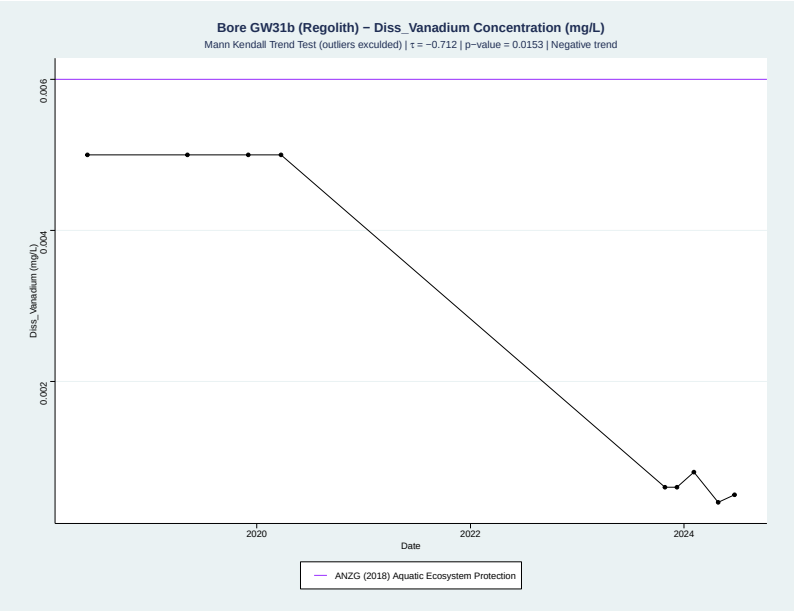
Mann Kendall Trend Test (outliers excluded) | τ = 0.594 | p−value = 0.00957 | Positive trend

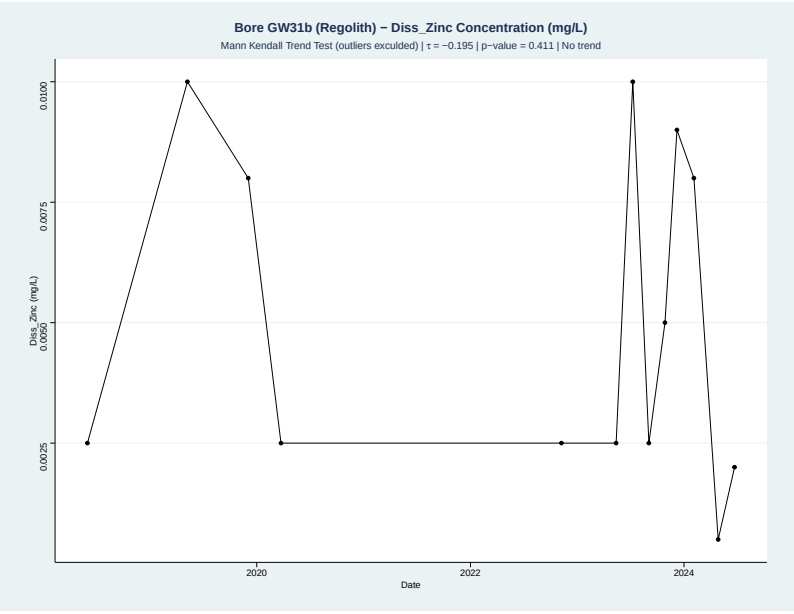


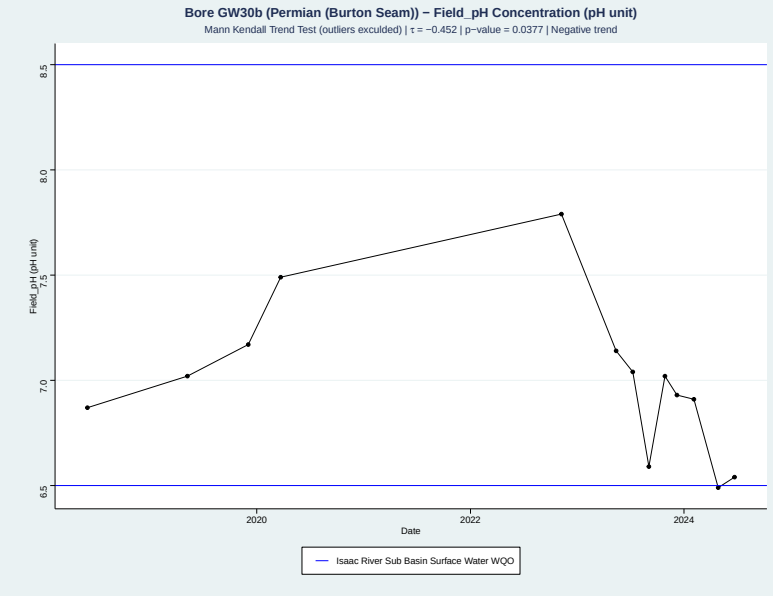

Bore GW31b (Regolith) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.716 | p−value = 0.00431 | Negative trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

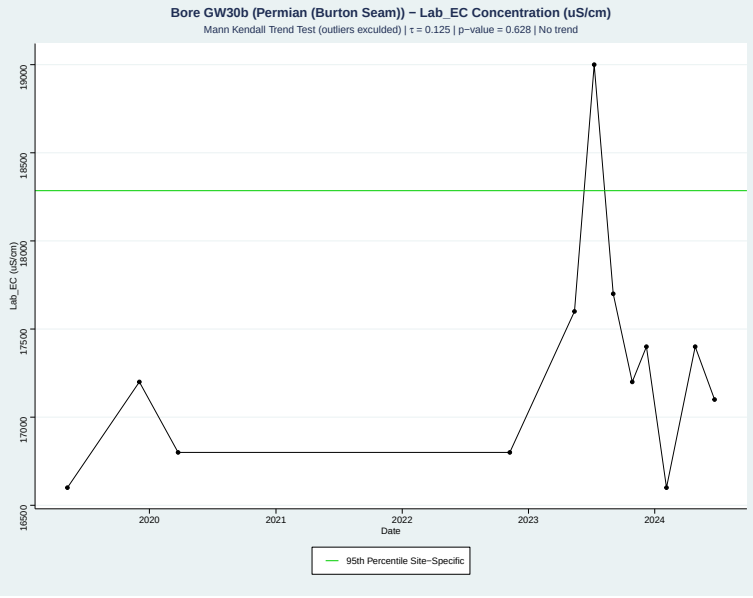

Bore GW31b (Regolith) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.696 | p−value = 0.00847 | Negative trend
Diss_Silver (mg/L)
1e−04
2e−04
3e−04
4e−04
5e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

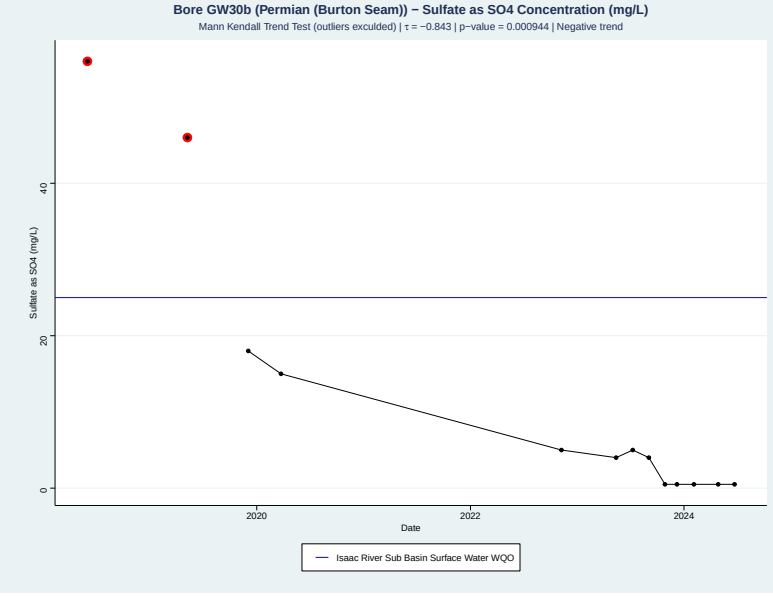

Bore GW31b (Regolith) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.608 | p−value = 0.00947 | Negative trend
Diss_Uranium (mg/L)
0.0015
0.0016
0.0017
0.0018
0.0019
0.0020
2020
2022
2024
Date
95th Percentile Site−Specific

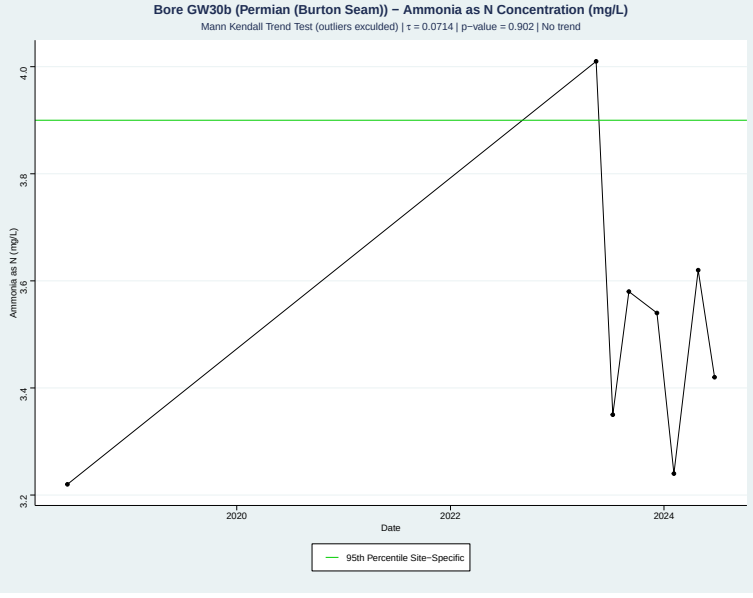

Bore GW31b (Regolith) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.712 | p−value = 0.0153 | Negative trend
Diss_Vanadium (mg/L)
0.002
0.004
0.006
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

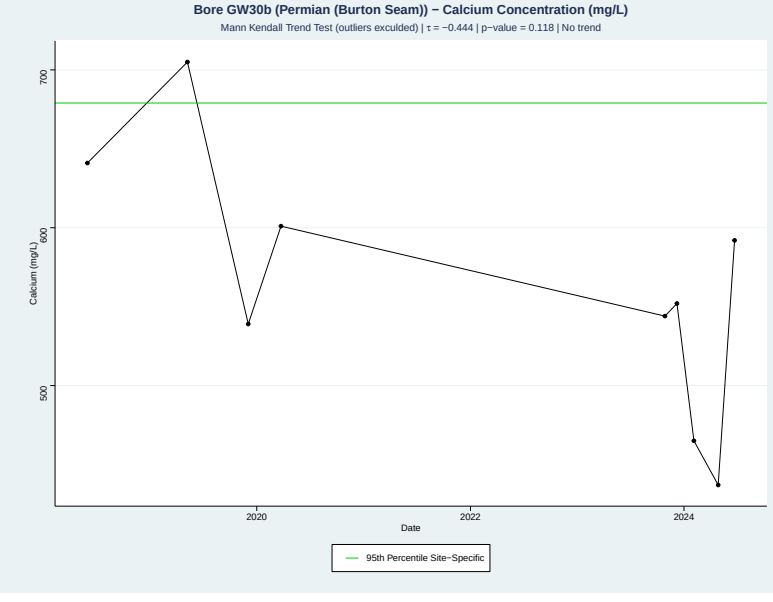

Bore GW31b (Regolith) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.195 | p−value = 0.411 | No trend
Diss_Zinc (mg/L)
0.0025
0.0050
0.0075
0.0100
2020
2022
2024
Date

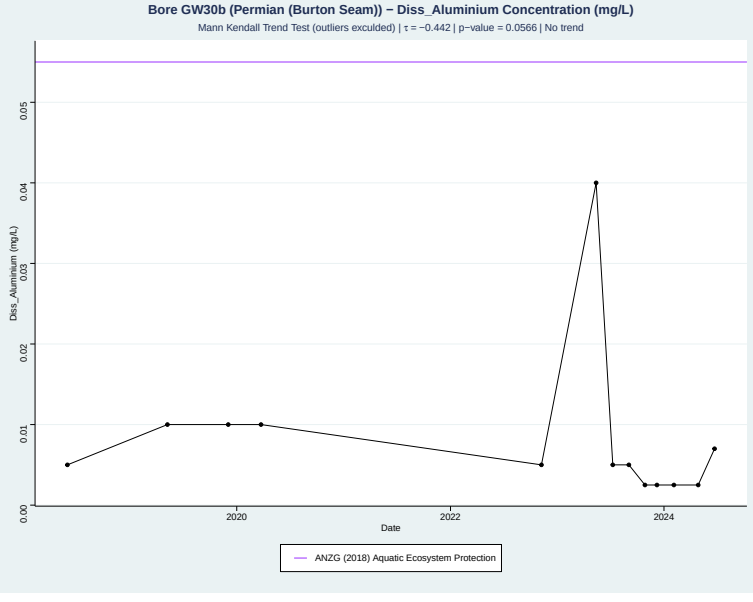

Bore GW30b (Permian (Burton Seam)) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.452 | p−value = 0.0377 | Negative trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

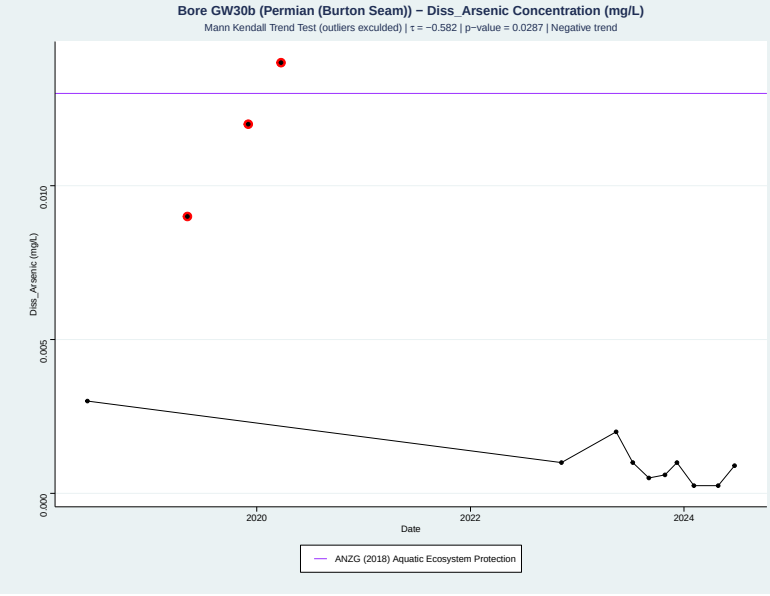

Bore GW30b (Permian (Burton Seam)) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.125 | p−value = 0.628 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

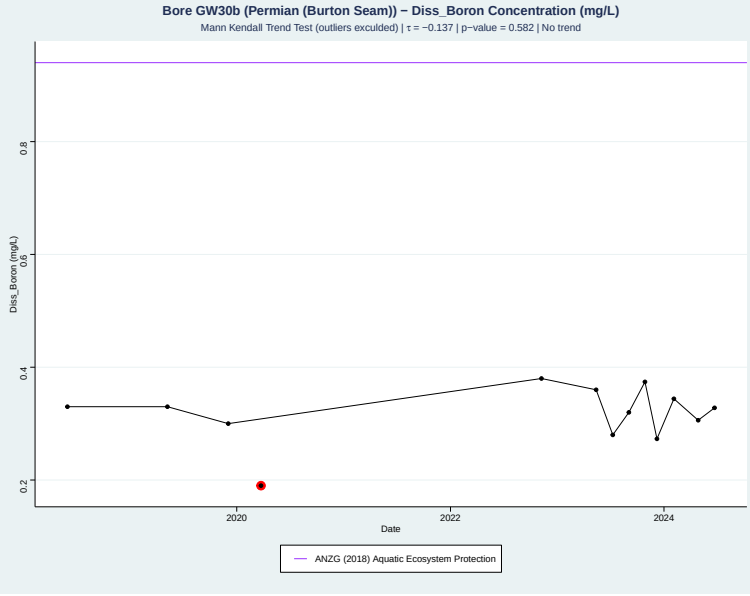

Bore GW30b (Permian (Burton Seam)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.843 | p−value = 0.000944 | Negative trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

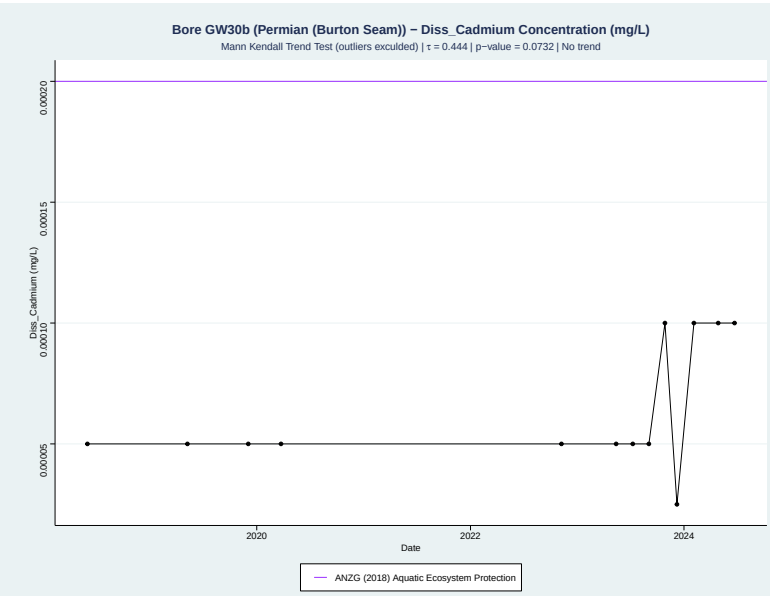

Bore GW30b (Permian (Burton Seam)) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0714 | p−value = 0.902 | No trend
Ammonia as N (mg/L)
Date
95th Percentile Site−Specific

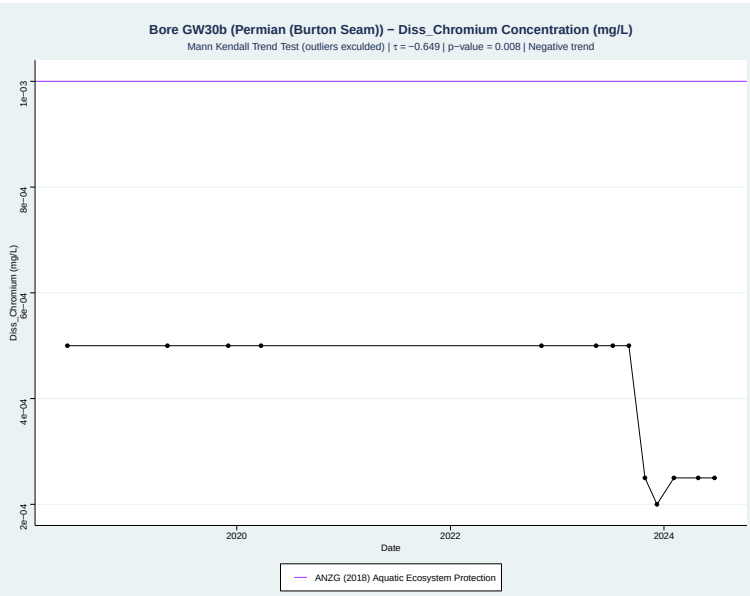

Bore GW30b (Permian (Burton Seam)) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.444 | p−value = 0.118 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

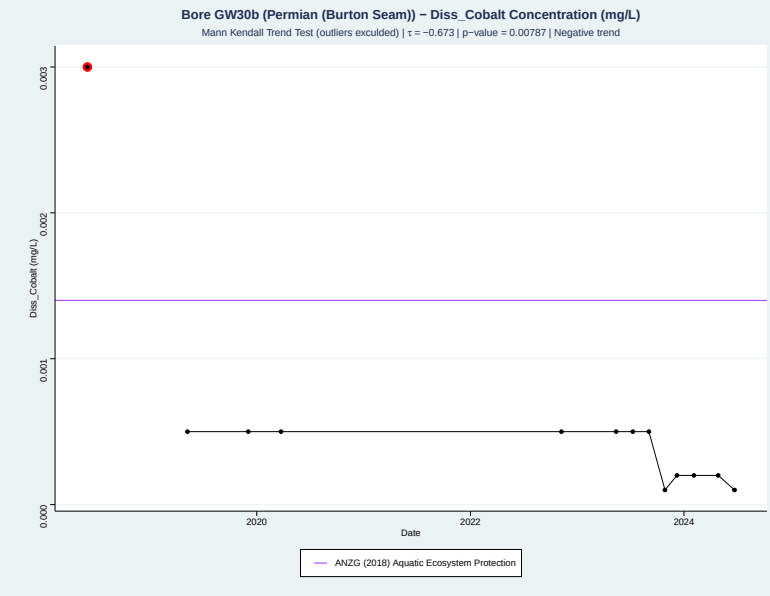

Bore GW30b (Permian (Burton Seam)) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.442 | p−value = 0.0566 | No trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

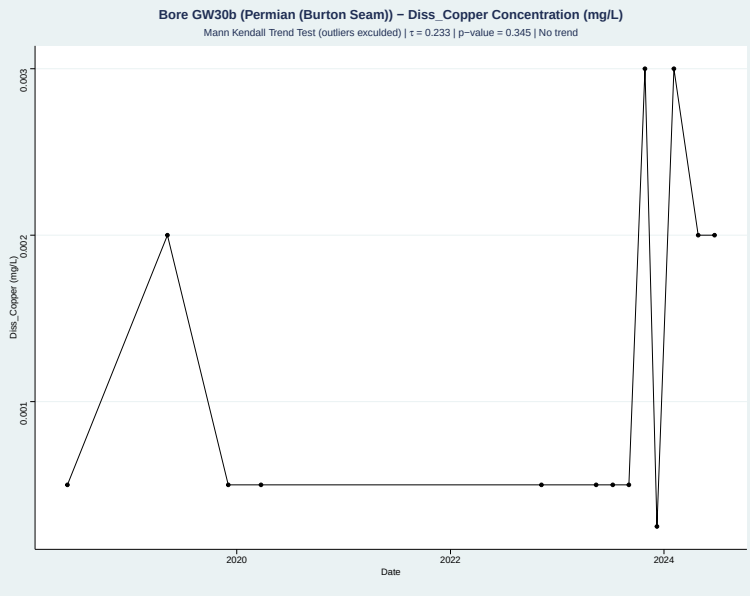

Bore GW30b (Permian (Burton Seam)) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.582 | p−value = 0.0287 | Negative trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

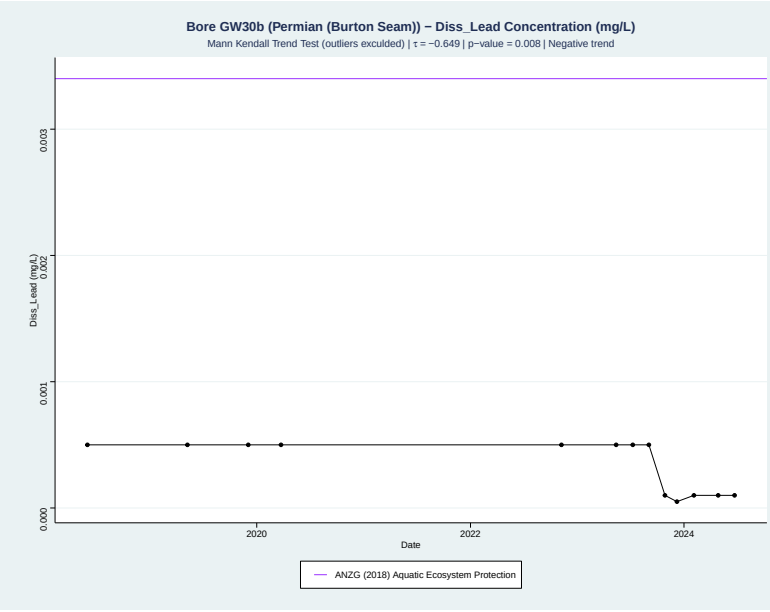

Bore GW30b (Permian (Burton Seam)) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.137 | p−value = 0.582 | No trend
Diss_Boron (mg/L)
0.2
0.4
0.6
0.8
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

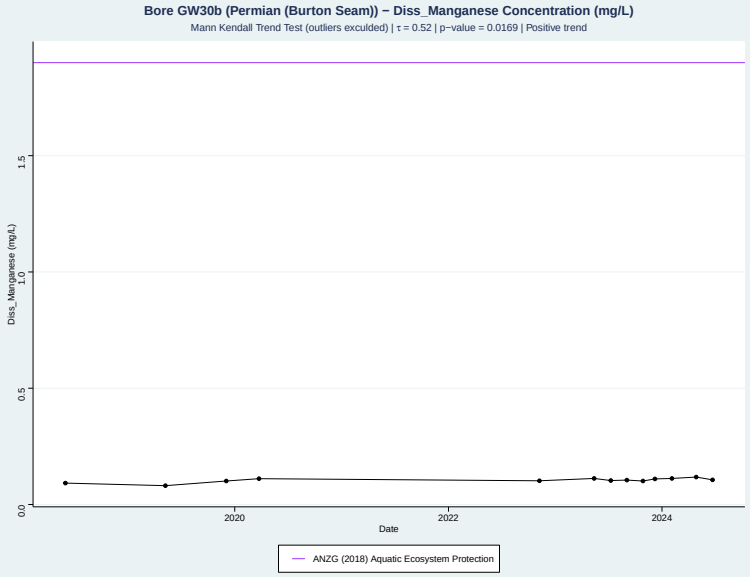

Bore GW30b (Permian (Burton Seam)) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.444 | p−value = 0.0732 | No trend
Diss_Cadmium (mg/L)
0.00005
0.00010
0.00015
0.00020
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

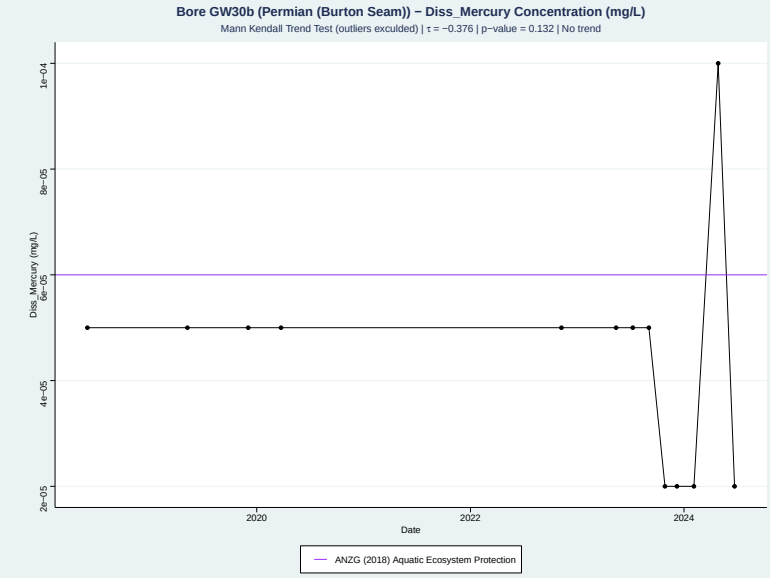

Bore GW30b (Permian (Burton Seam)) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.008 | Negative trend
Diss_Chromium (mg/L)
2e−04
4e−04
6e−04
8e−04
1e−03
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

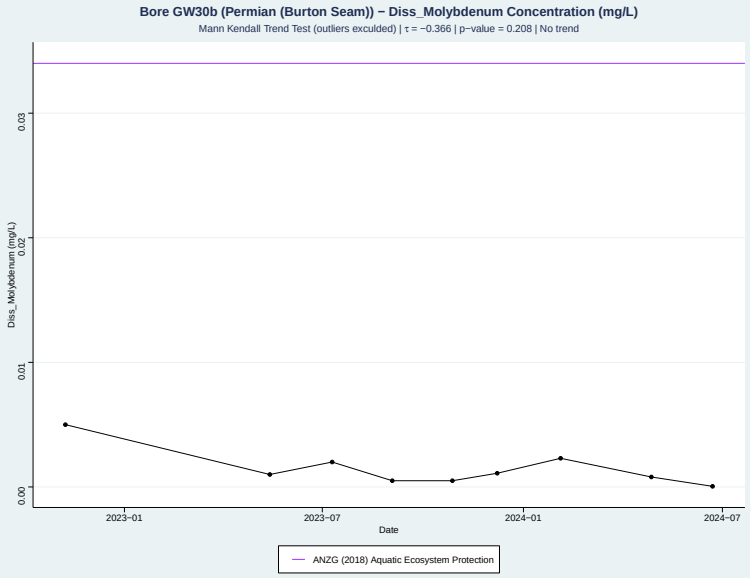

Bore GW30b (Permian (Burton Seam)) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.673 | p−value = 0.00787 | Negative trend
Diss_Cobalt (mg/L)
0.000
0.001
0.002
0.003
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

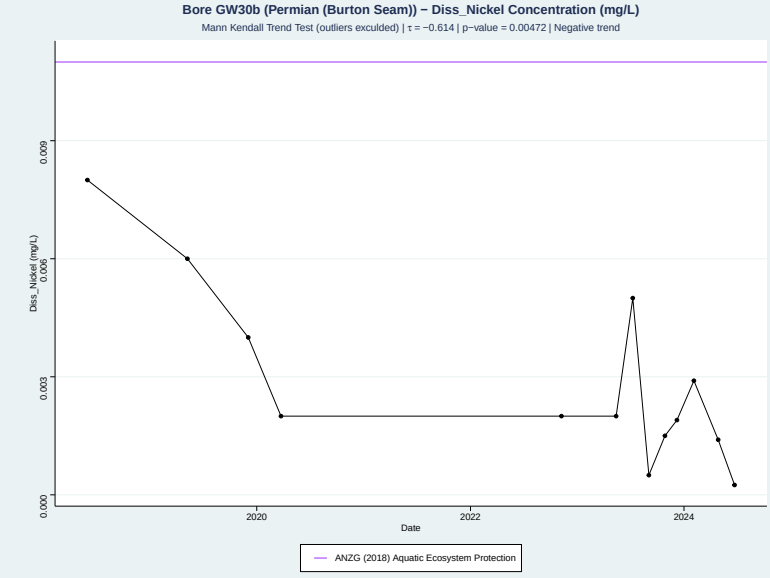

Bore GW30b (Permian (Burton Seam)) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.233 | p−value = 0.345 | No trend
Diss_Copper (mg/L)
0.001
0.002
0.003
2020
2022
2024
Date

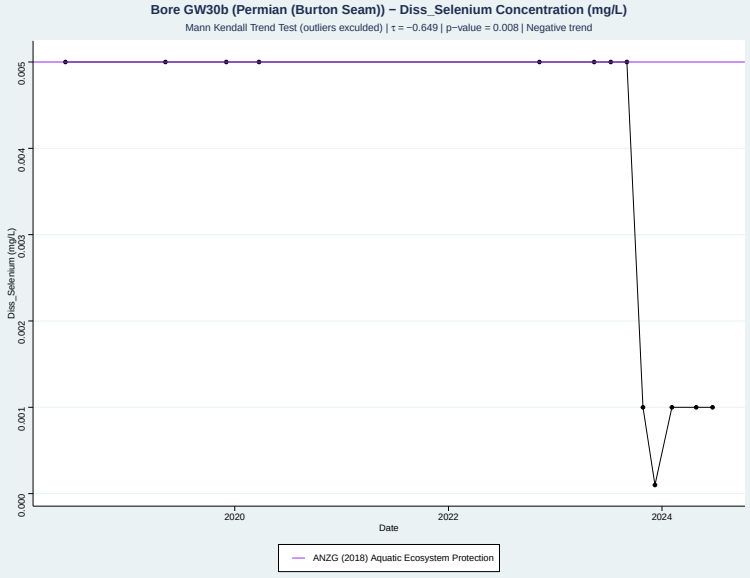

Bore GW30b (Permian (Burton Seam)) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.008 | Negative trend
Diss_Lead (mg/L)
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

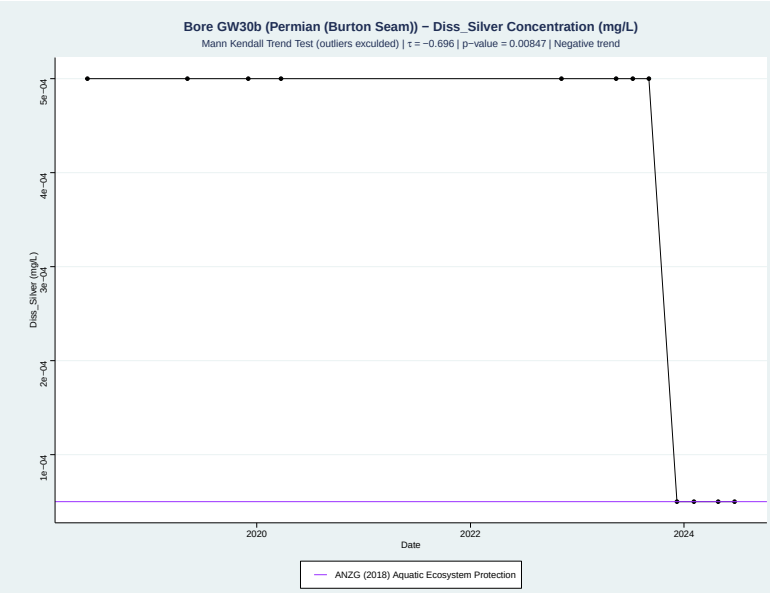

Bore GW30b (Permian (Burton Seam)) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.52 | p−value = 0.0169 | Positive trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
0.0
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

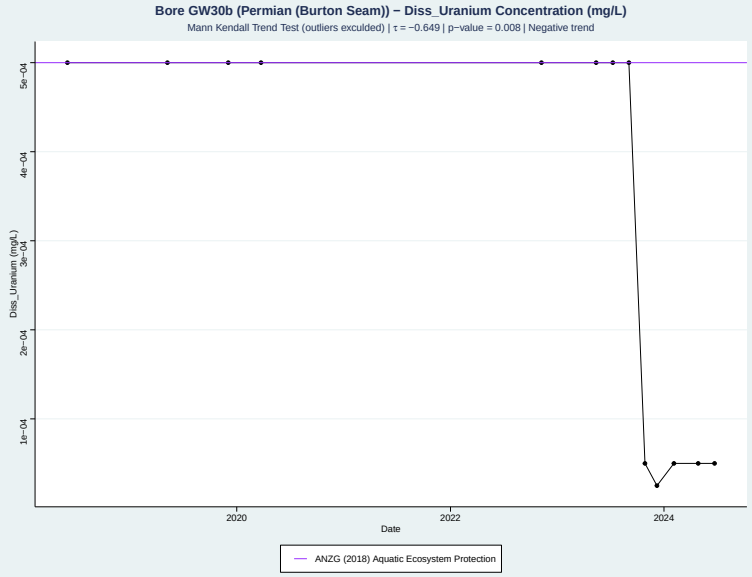

Bore GW30b (Permian (Burton Seam)) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.376 | p−value = 0.132 | No trend
Diss_Mercury (mg/L)
1e−04
8e−05
6e−05
4e−05
2e−05
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

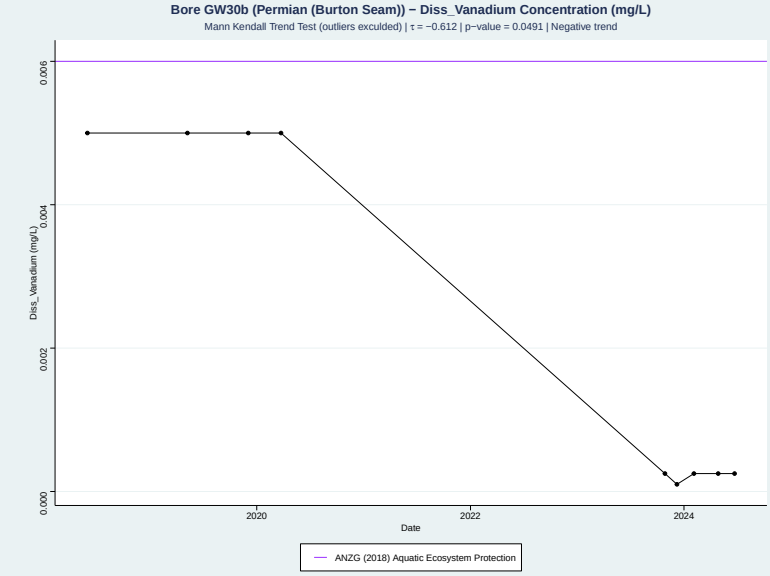

Bore GW30b (Permian (Burton Seam)) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.366 | p−value = 0.208 | No trend
Diss_Molybdenum (mg/L)
0.03
0.02
0.01
0.00
2023−01
2023−07
2024−01
2024−07
Date
ANZG (2018) Aquatic Ecosystem Protection

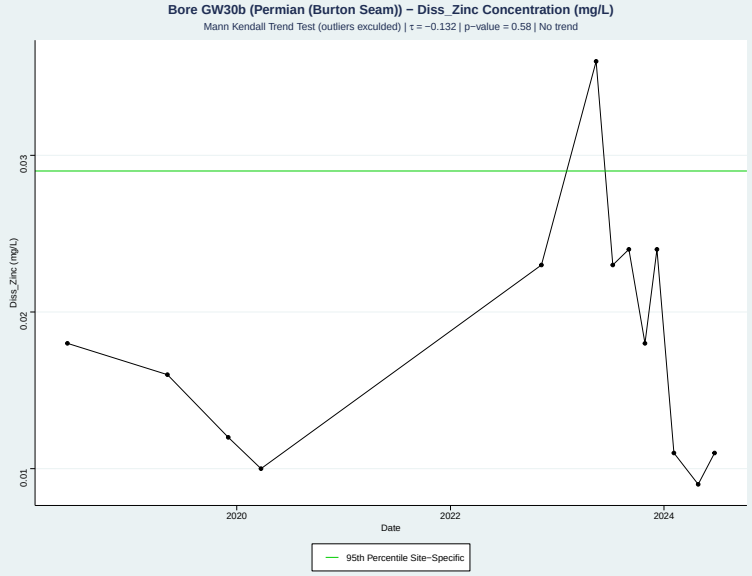

Bore GW30b (Permian (Burton Seam)) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.614 | p−value = 0.00472 | Negative trend
Diss_Nickel (mg/L)
0.009
0.006
0.003
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

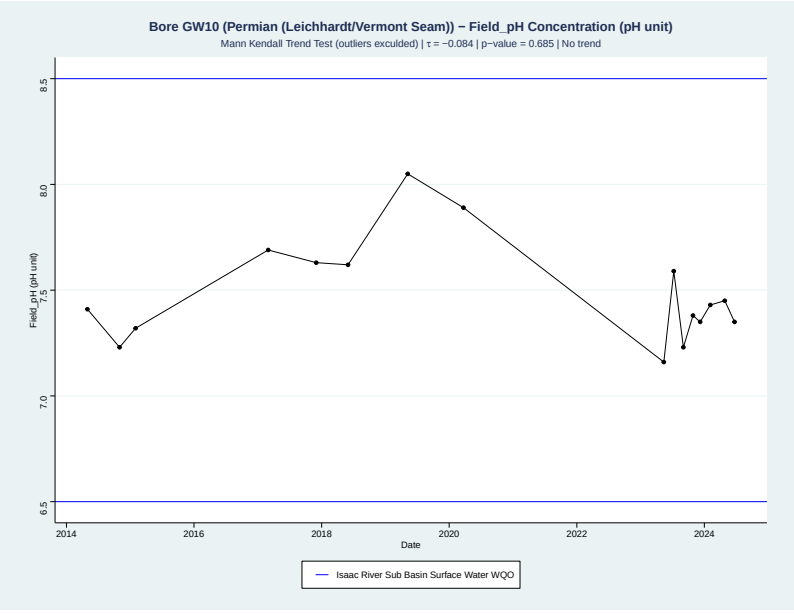

Bore GW30b (Permian (Burton Seam)) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.008 | Negative trend
Diss_Selenium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

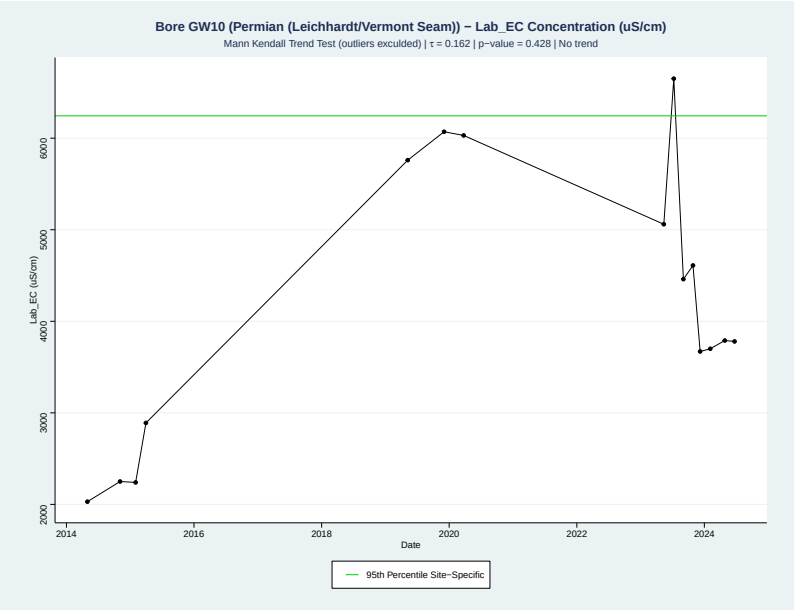

Bore GW30b (Permian (Burton Seam)) − Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.696 | p−value = 0.00847 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

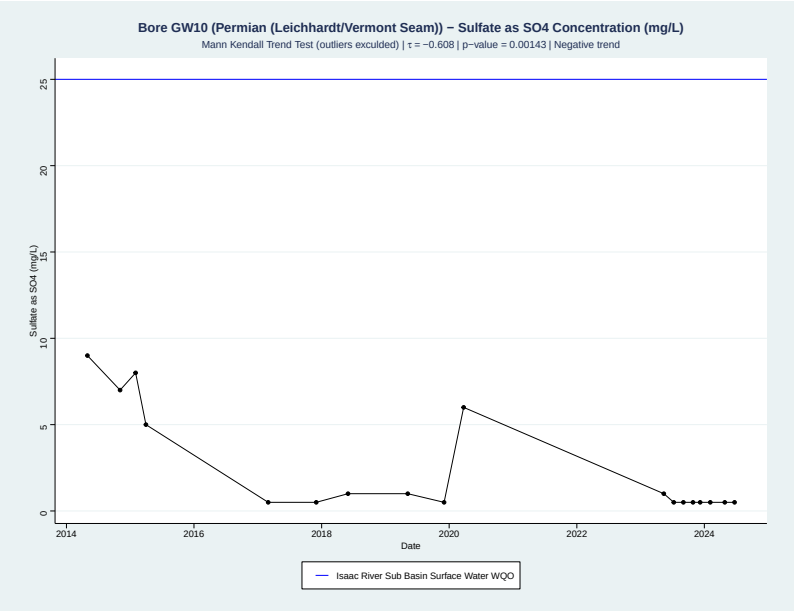

Bore GW30b (Permian (Burton Seam)) − Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.008 | Negative trend
Diss_Uranium (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

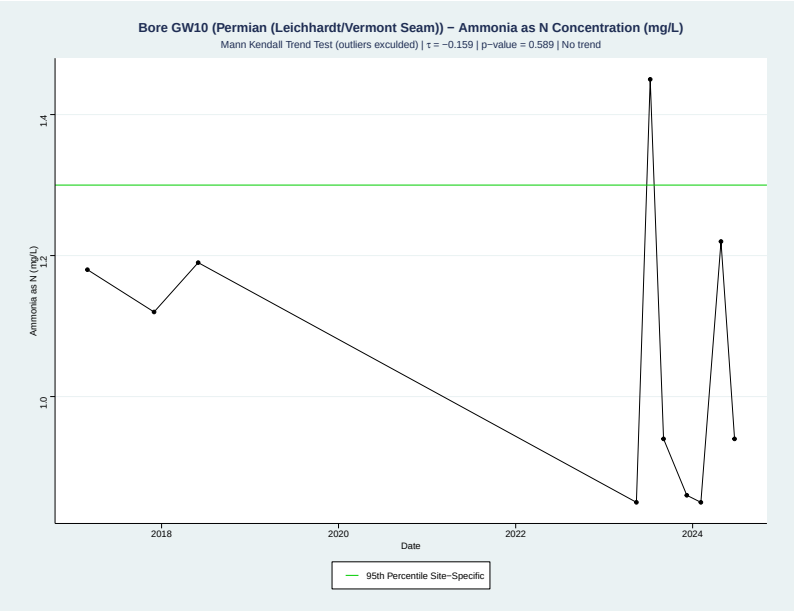

Bore GW30b (Permian (Burton Seam)) − Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.612 | p−value = 0.0491 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

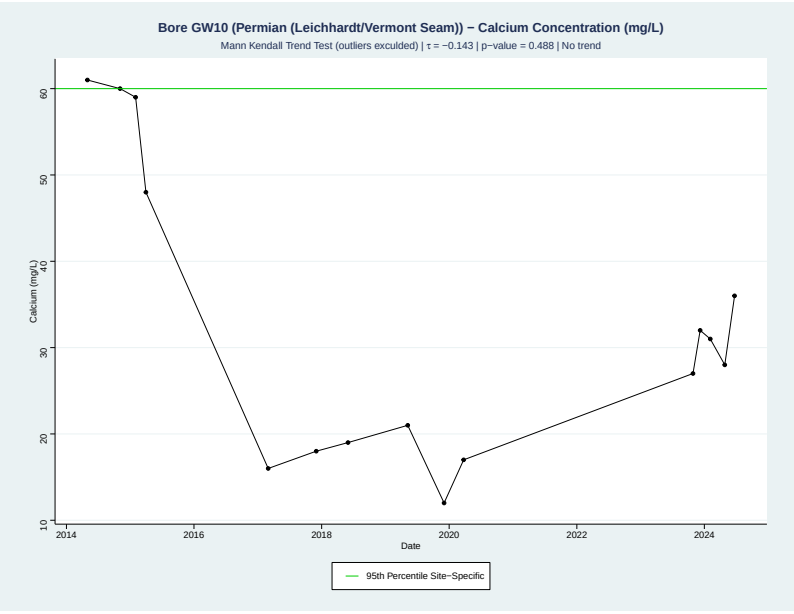

Bore GW30b (Permian (Burton Seam)) − Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.132 | p−value = 0.58 | No trend
Diss_Zinc (mg/L)
0.03
0.02
0.01
2020
2022
2024
Date
95th Percentile Site−Specific

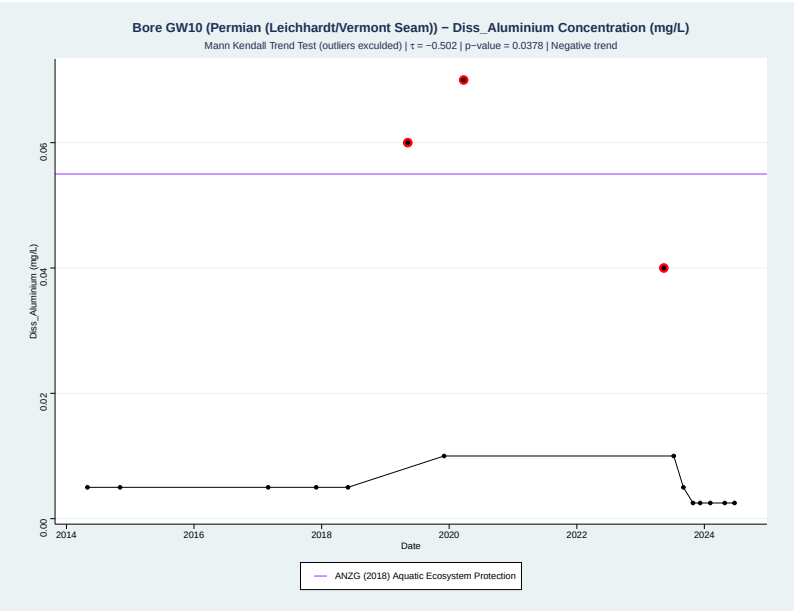

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.084 | p−value = 0.685 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

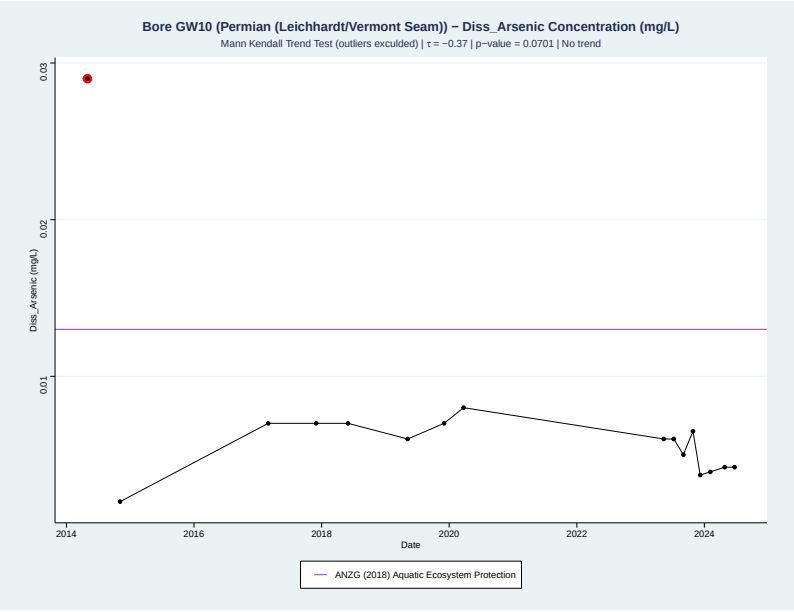

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.162 | p−value = 0.428 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

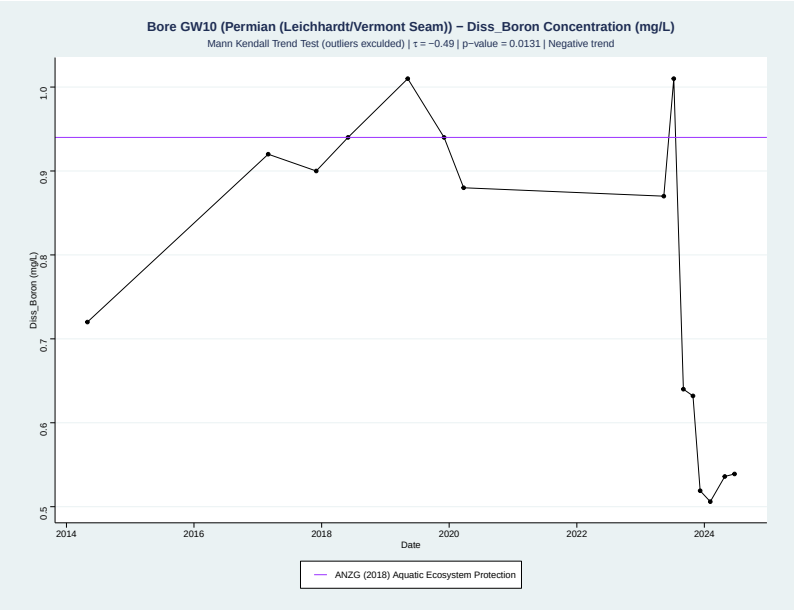

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.608 | p−value = 0.00143 | Negative trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

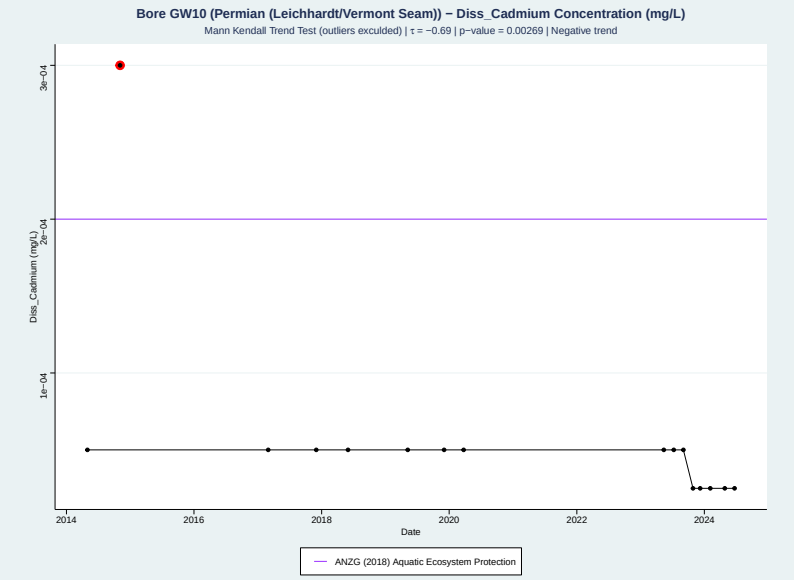

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.159 | p−value = 0.589 | No trend
Ammonia as N (mg/L)
Date
95th Percentile Site−Specific

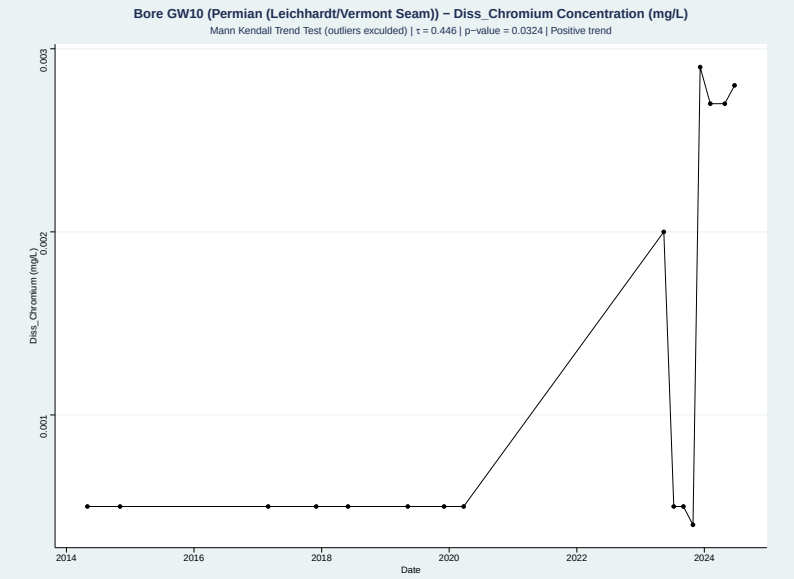

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.143 | p−value = 0.488 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

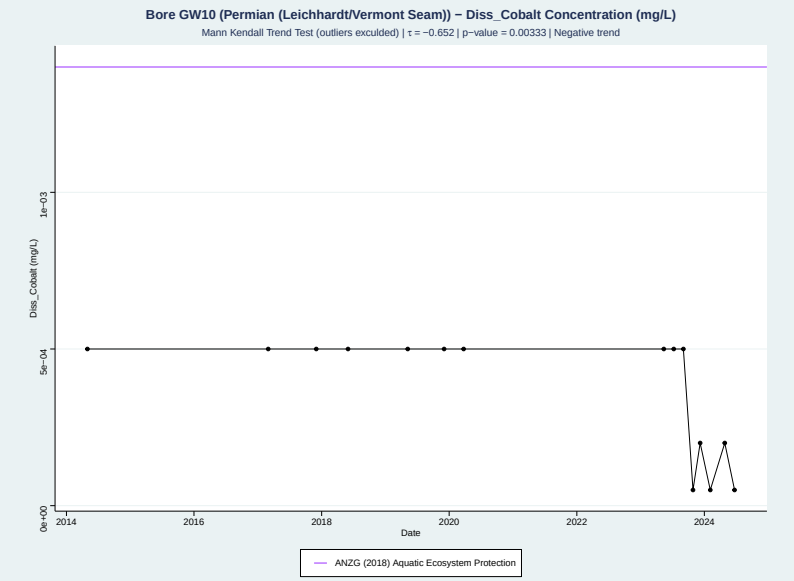

Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.502 | p−value = 0.0378 | Negative trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

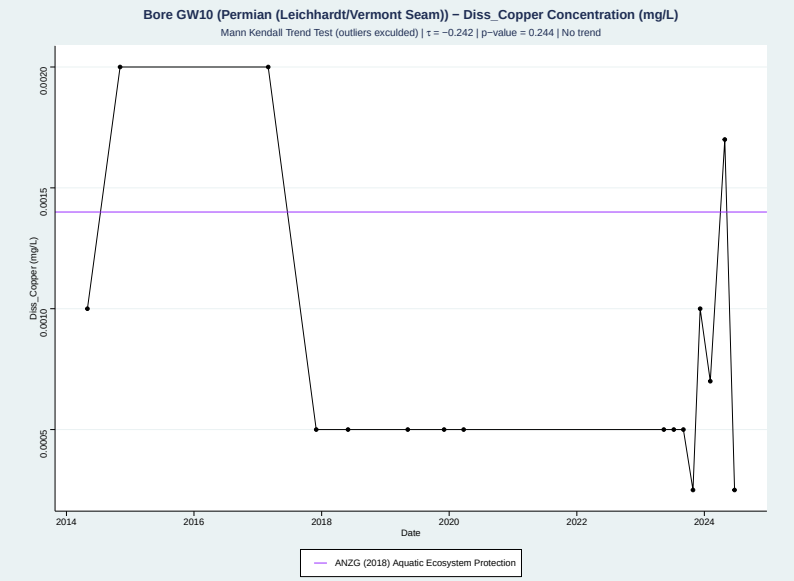

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.37 | p−value = 0.0701 | No trend
Diss_Arsenic (mg/L)
0.03
0.02
0.01
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

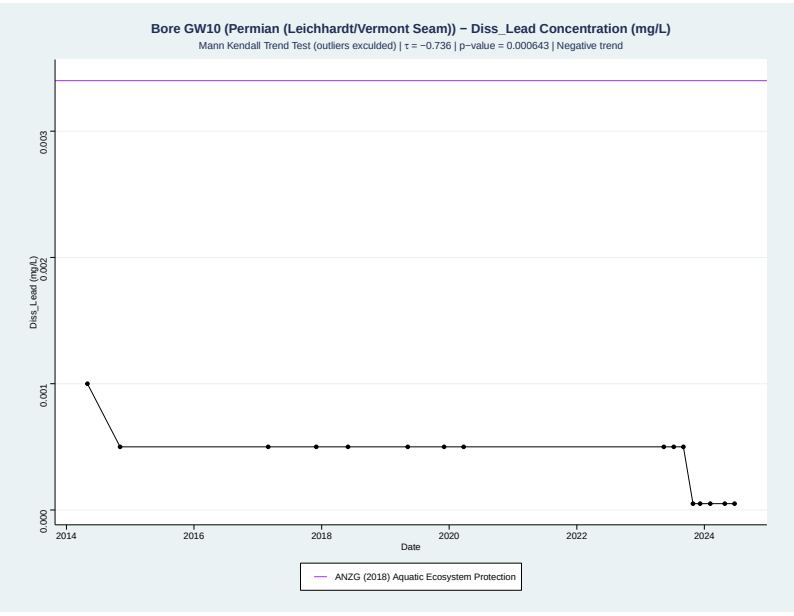

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.49 | p−value = 0.0131 | Negative trend
Diss_Boron (mg/L)
1.0
0.9
0.8
0.7
0.6
0.5
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

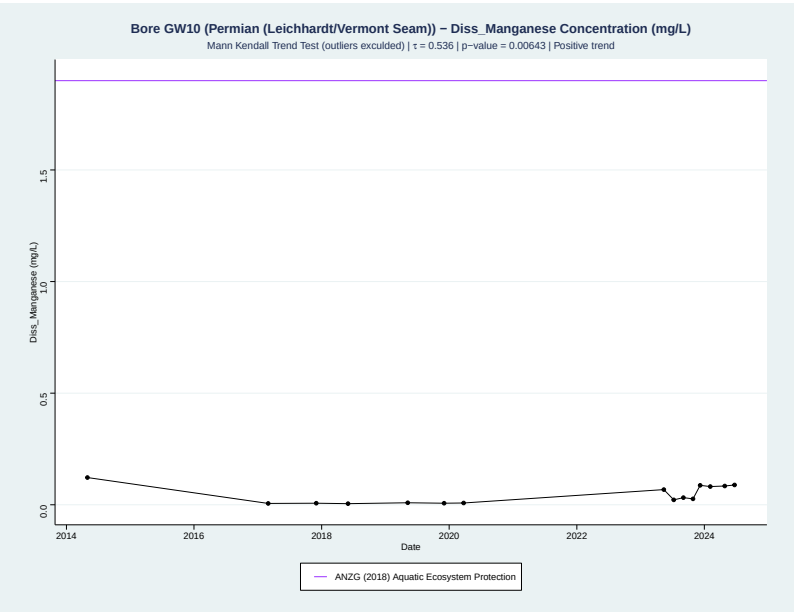

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.69 | p−value = 0.00269 | Negative trend
Diss_Cadmium (mg/L)
3e−04
2e−04
1e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

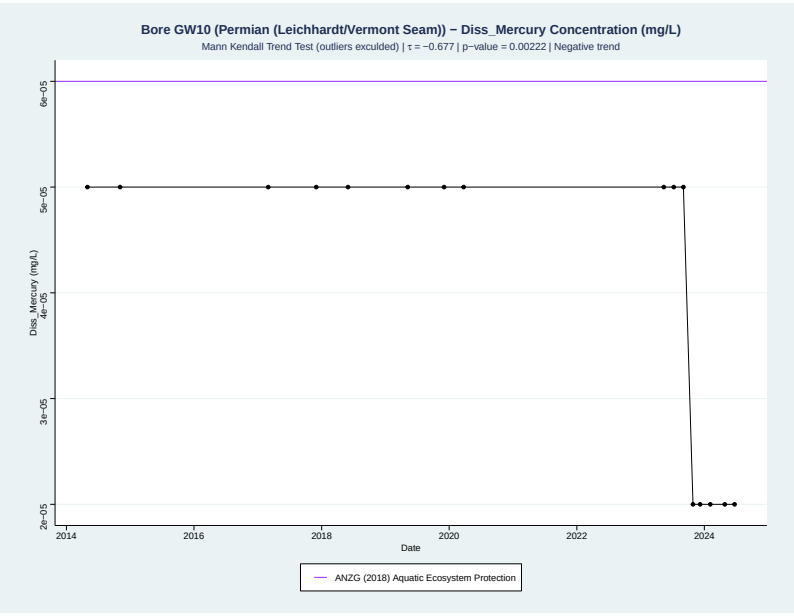

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.446 | p−value = 0.0324 | Positive trend
Diss_Chromium (mg/L)
0.003
0.002
0.001
2014
2016
2018
2020
2022
2024
Date

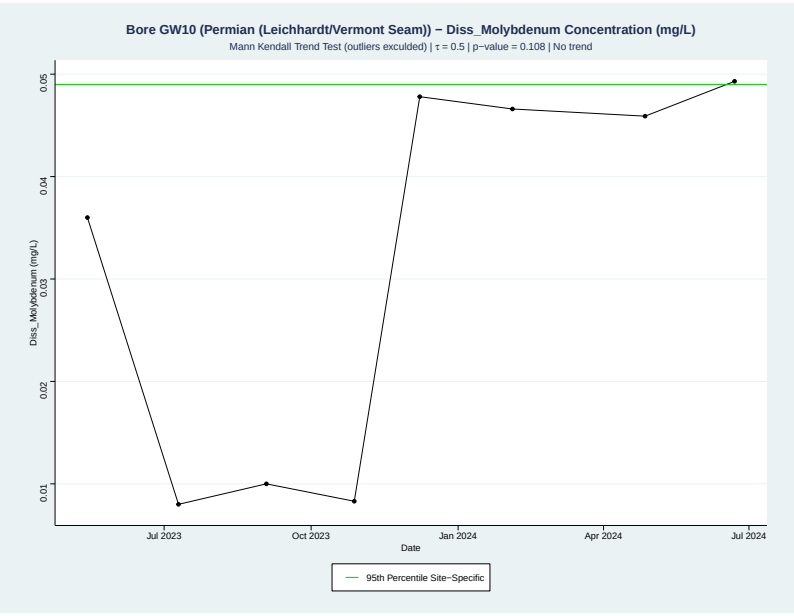

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.652 | p−value = 0.00333 | Negative trend
Diss_Cobalt (mg/L)
1e−03
5e−04
0e+00
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

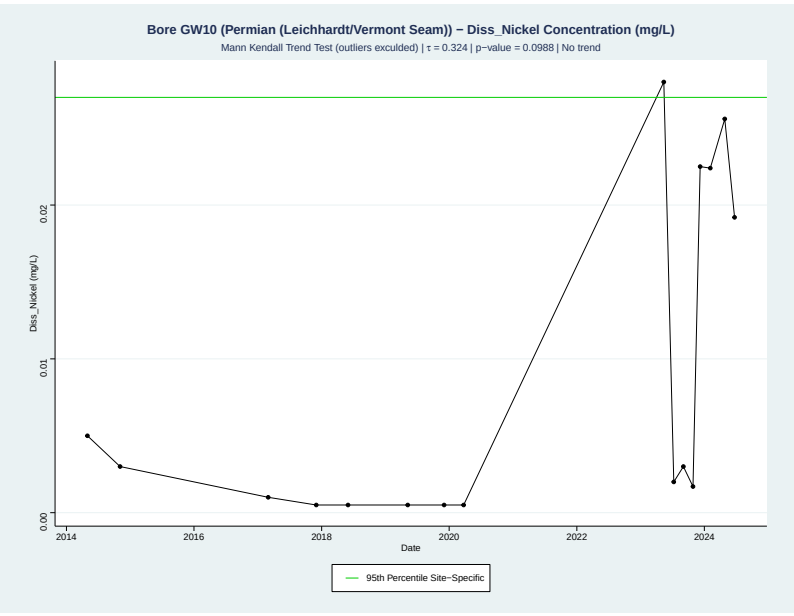

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.242 | p−value = 0.244 | No trend
Diss_Copper (mg/L)
0.0020
0.0015
0.0010
0.0005
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

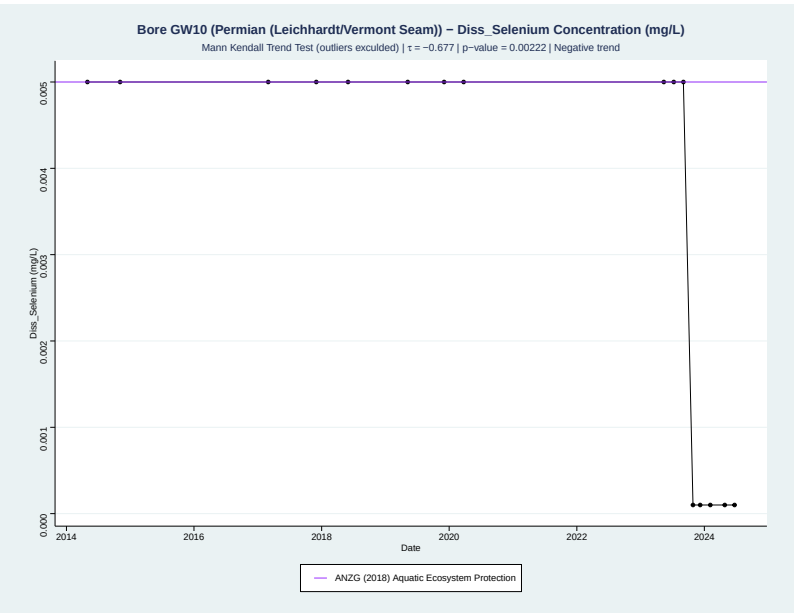

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.736 | p−value = 0.000643 | Negative trend
Diss_Lead (mg/L)
0.000
0.001
0.002
0.003
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.536 | p−value = 0.00643 | Positive trend
Diss_Manganese (mg/L)
0.0
0.5
1.0
1.5
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.677 | p−value = 0.00222 | Negative trend
Diss_Mercury (mg/L)
2e−05
3e−05
4e−05
5e−05
6e−05
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

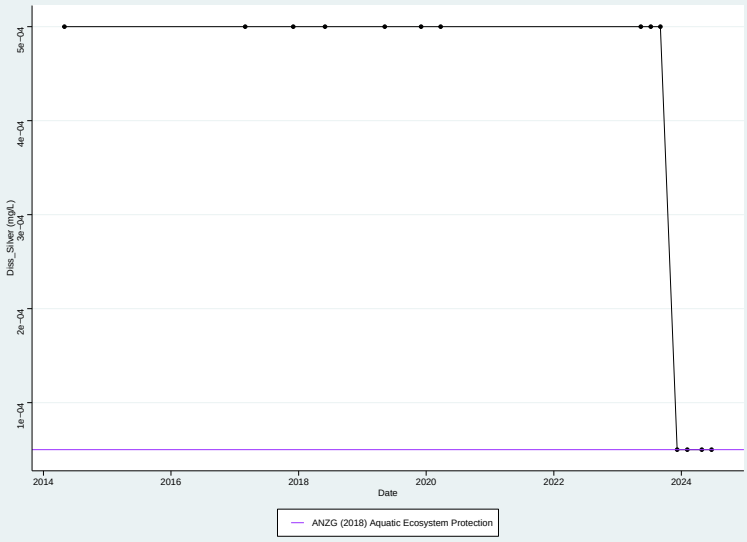

Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.5 | p−value = 0.108 | No trend
Diss_Molybdenum (mg/L)
0.01
0.02
0.03
0.04
0.05
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Date
95th Percentile Site−Specific


Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.324 | p−value = 0.0988 | No trend
Diss_Nickel (mg/L)
0.00
0.01
0.02
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific


Bore GW10 (Permian (Leichhardt/Vermont Seam)) − Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.677 | p−value = 0.00222 | Negative trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

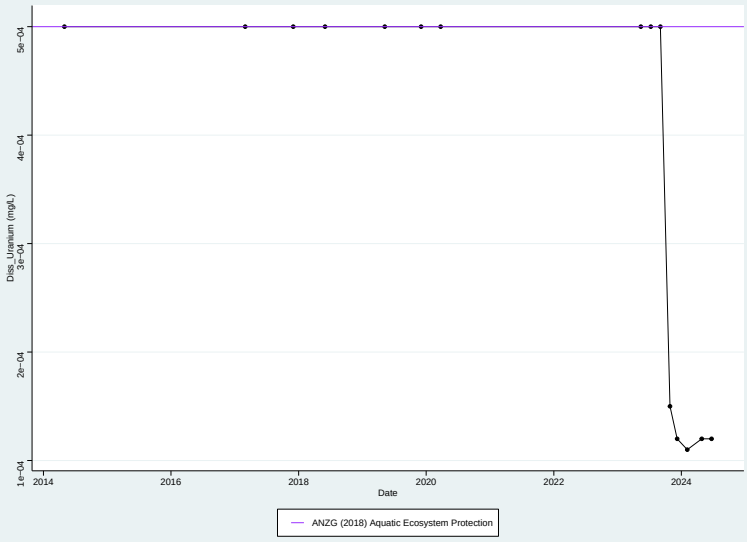
Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Diss_Silver Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.663 | p−value = 0.00582 | Negative trend



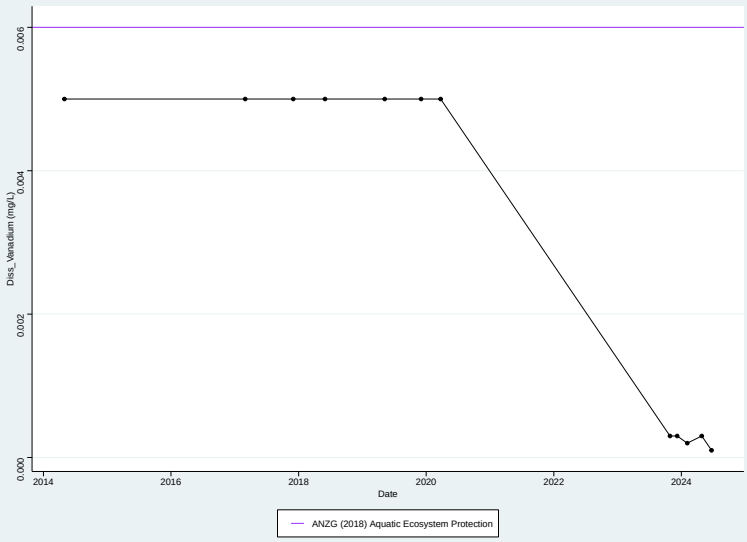
Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Diss_Uranium Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.685 | p−value = 0.00187 | Negative trend



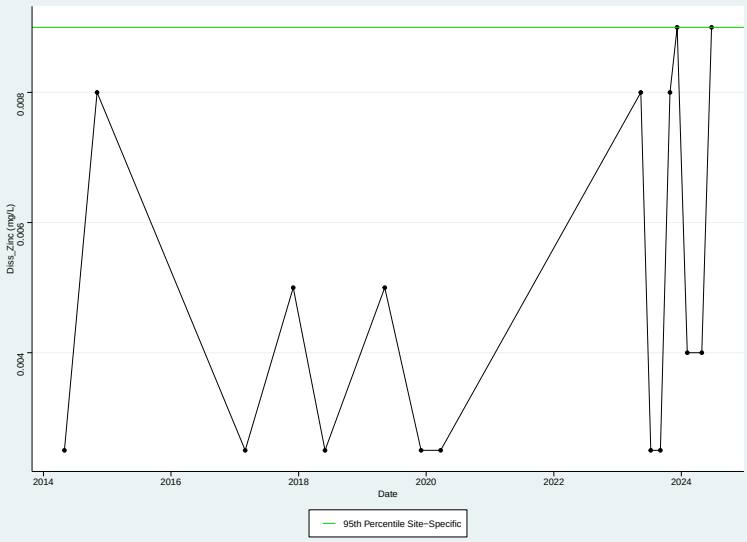
Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Diss_Vanadium Concentration (mg/L)

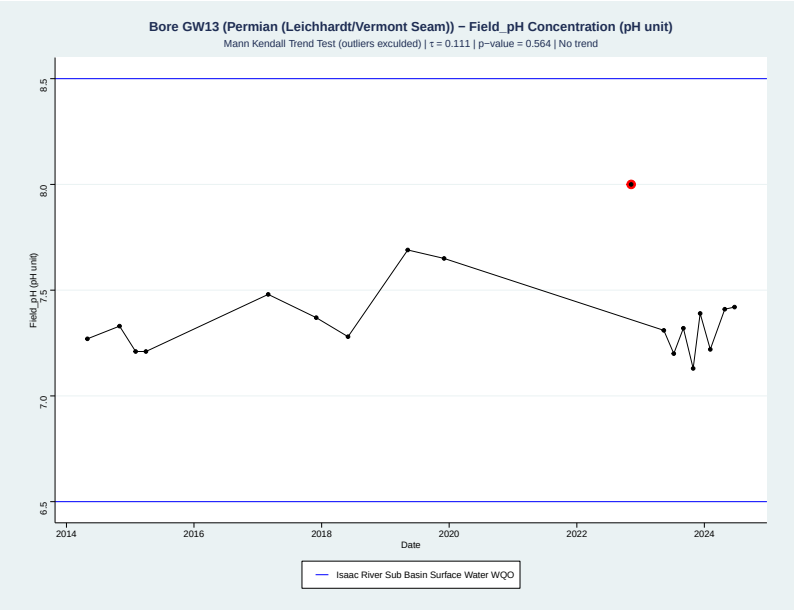
Mann Kendall Trend Test (outliers exculded) | τ = −0.76 | p−value = 0.00237 | Negative trend

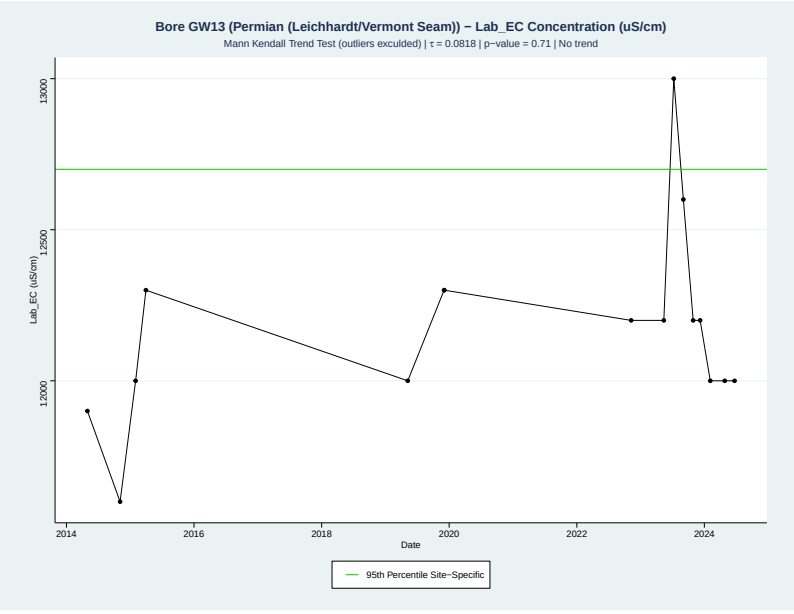


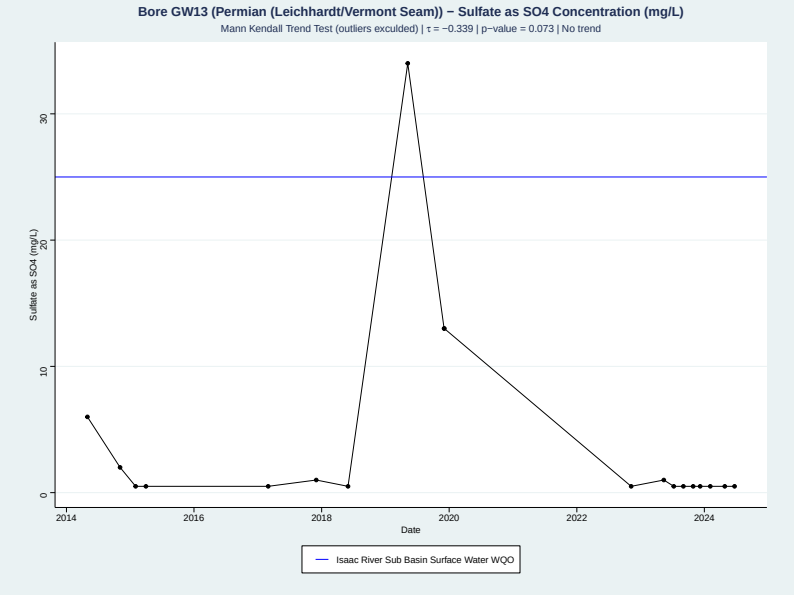
Bore GW10 (Permian (Leichhardt/Vermont Seam)) – Diss_Zinc Concentration (mg/L)

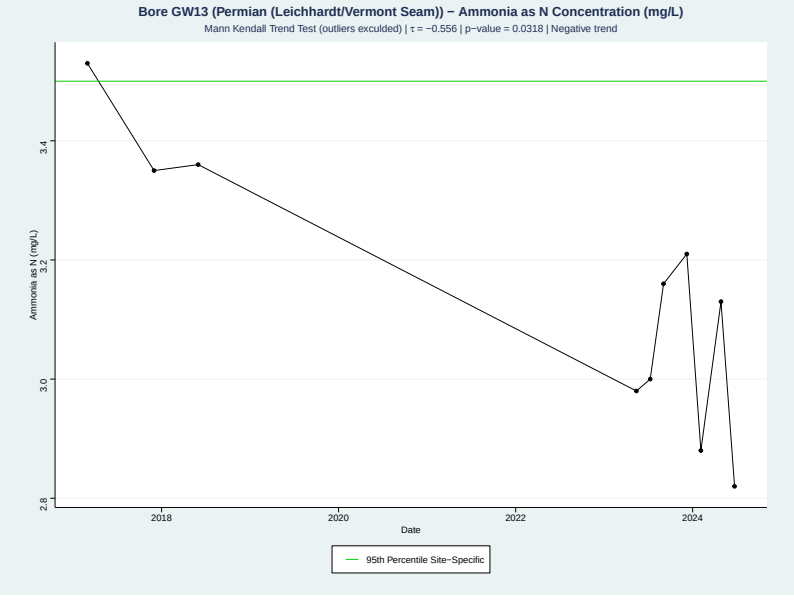
Mann Kendall Trend Test (outliers exculded) | τ = 0.293 | p−value = 0.154 | No trend

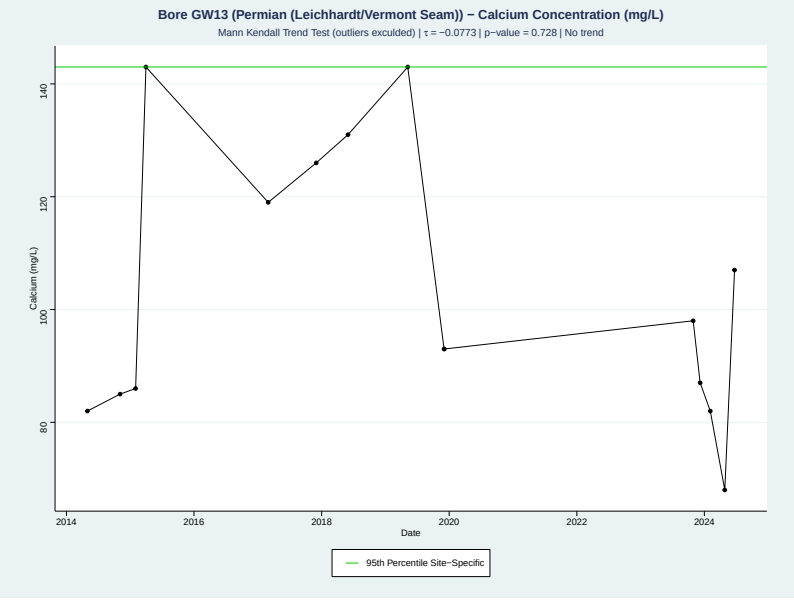


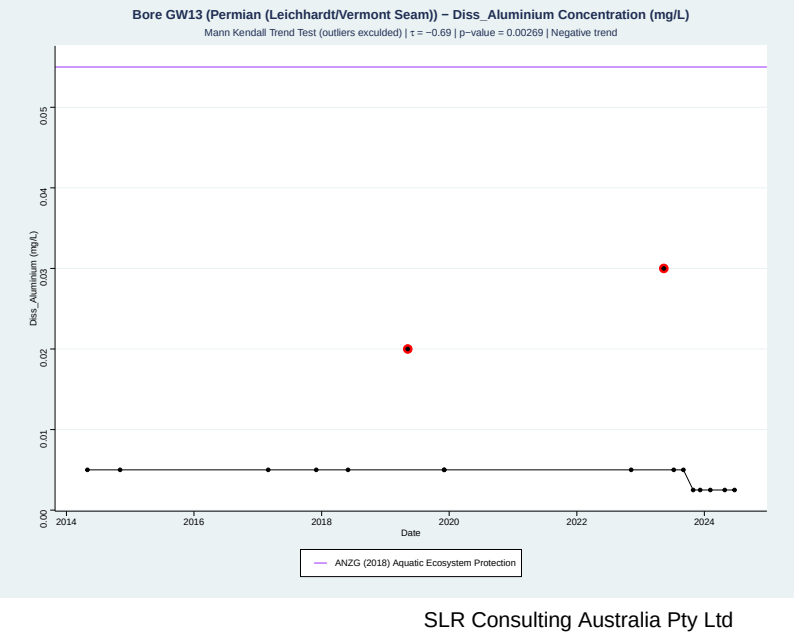

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers exculded) | τ = 0.111 | p−value = 0.564 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

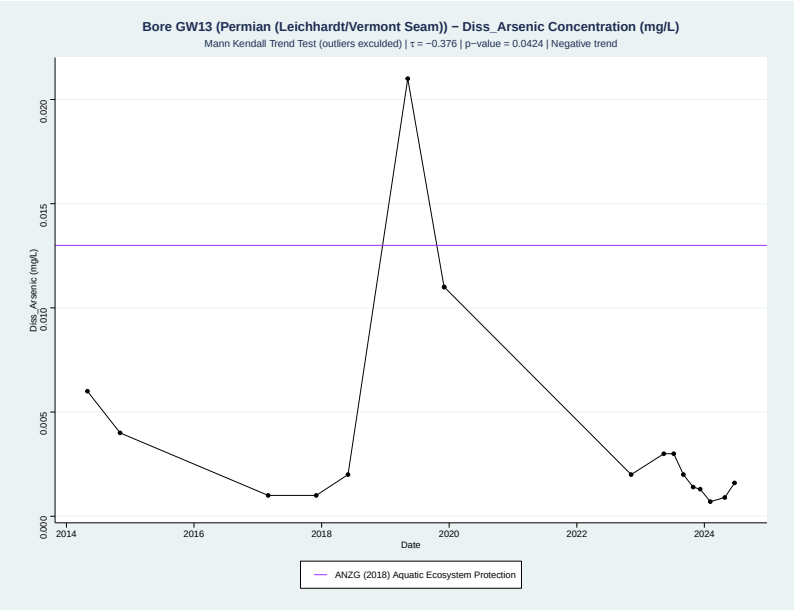

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers exculded) | τ = 0.0818 | p−value = 0.71 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

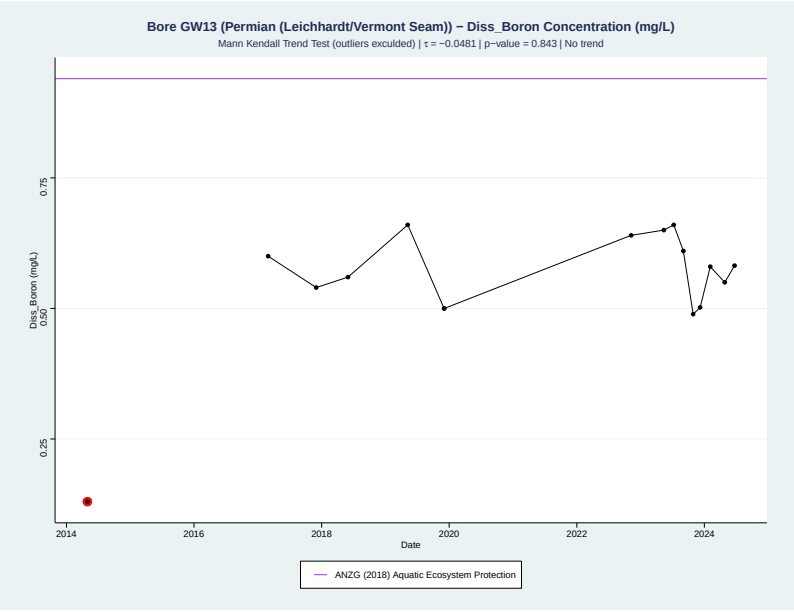

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.339 | p−value = 0.073 | No trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

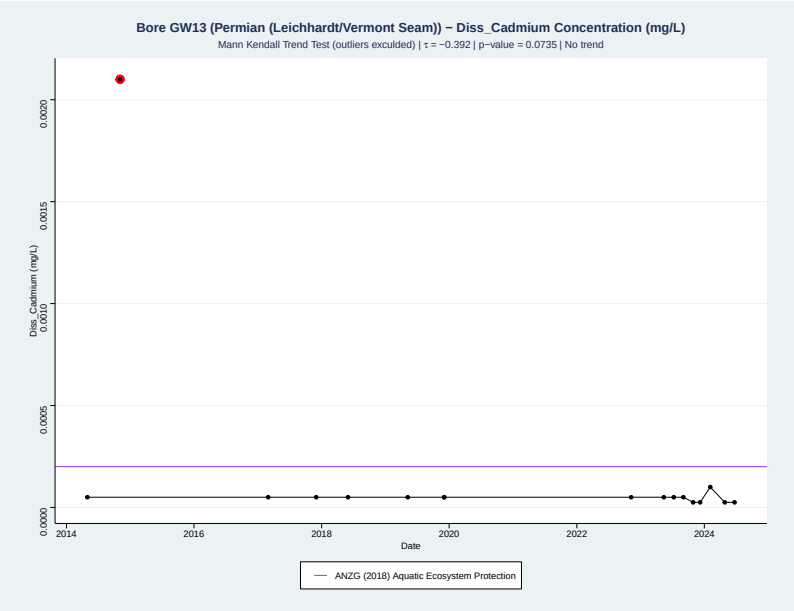

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.556 | p−value = 0.0318 | Negative trend
Ammonia as N (mg/L)
Date
95th Percentile Site−Specific

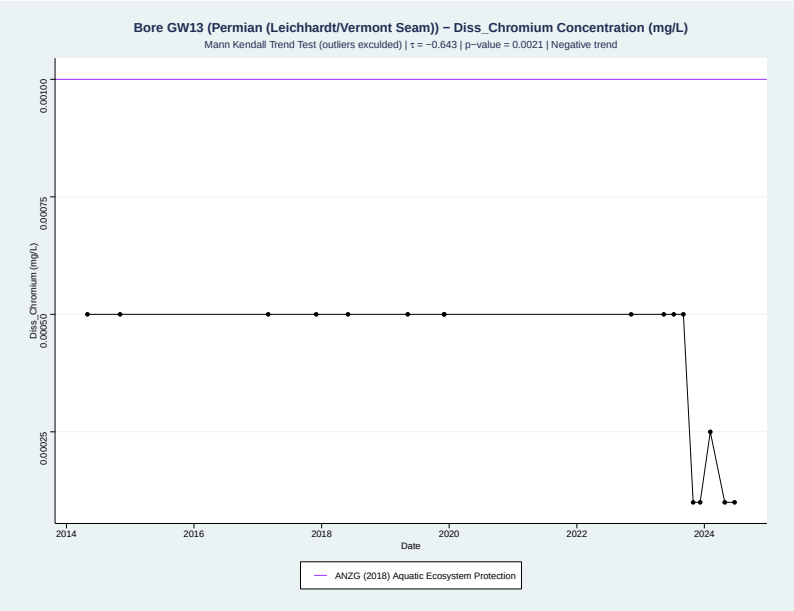

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.0773 | p−value = 0.728 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

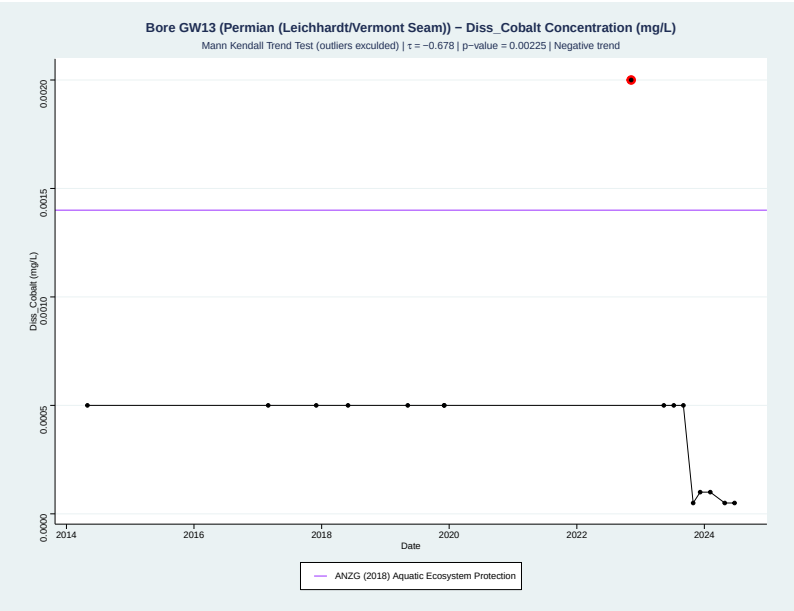

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.69 | p−value = 0.00269 | Negative trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

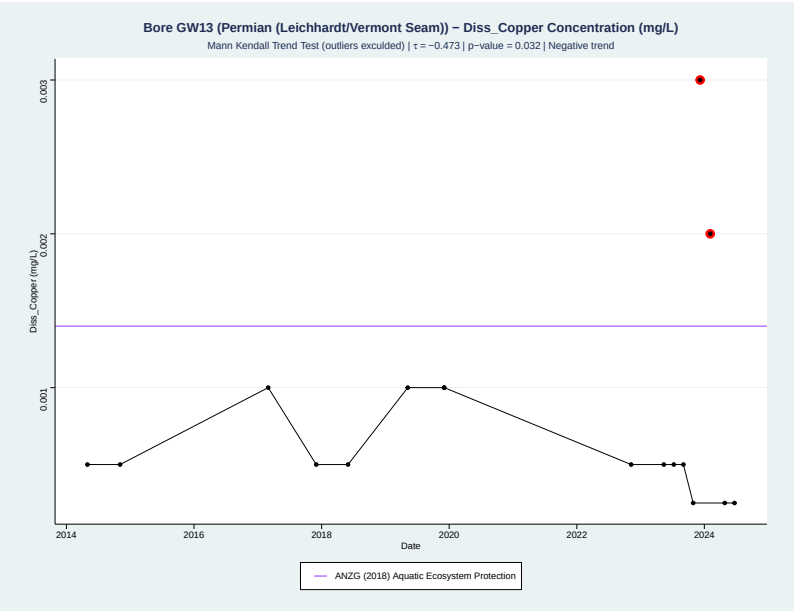

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.376 | p−value = 0.0424 | Negative trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
0.015
0.020
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.0481 | p−value = 0.843 | No trend
Diss_Boron (mg/L)
0.25
0.50
0.75
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.392 | p−value = 0.0735 | No trend
Diss_Cadmium (mg/L)
0.0000
0.0005
0.0010
0.0015
0.0020
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

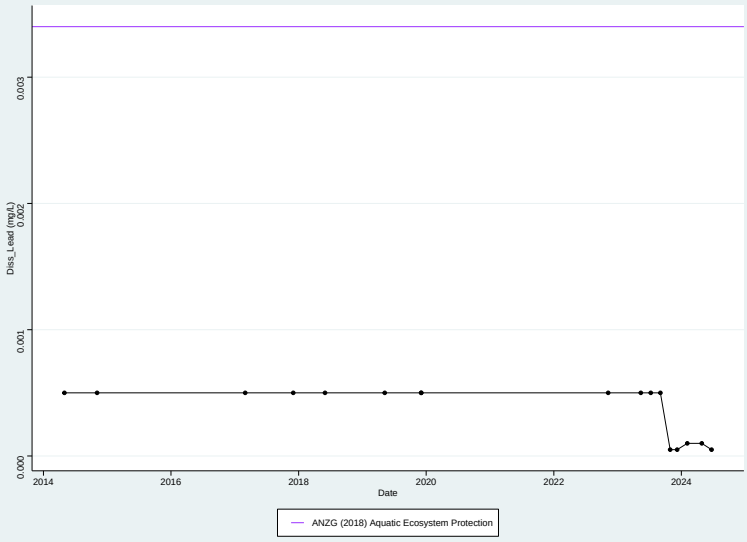

Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.643 | p−value = 0.0021 | Negative trend
Diss_Chromium (mg/L)
0.00025
0.00050
0.00075
0.00100
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.678 | p−value = 0.00225 | Negative trend
Diss_Cobalt (mg/L)
0.0000
0.0005
0.0010
0.0015
0.0020
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW13 (Permian (Leichhardt/Vermont Seam)) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.473 | p−value = 0.032 | Negative trend
Diss_Copper (mg/L)
0.001
0.002
0.003
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

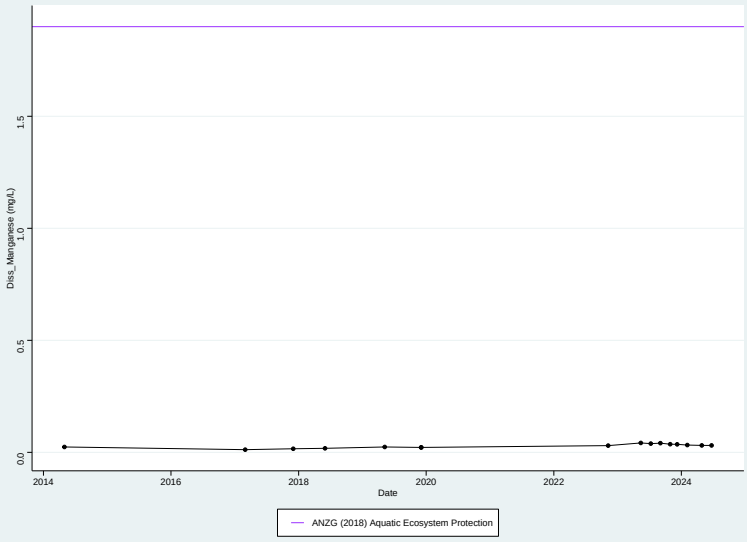
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Lead Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.612 | p−value = 0.00312 | Negative trend



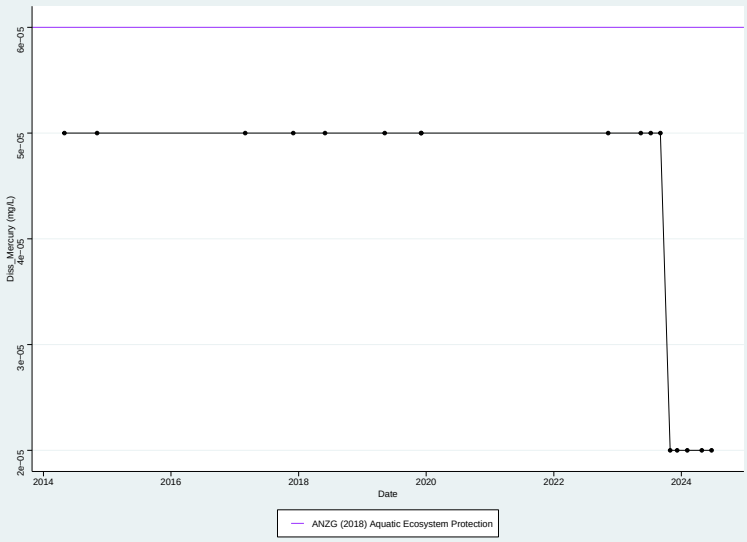
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Manganese Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.42 | p−value = 0.0271 | Positive trend



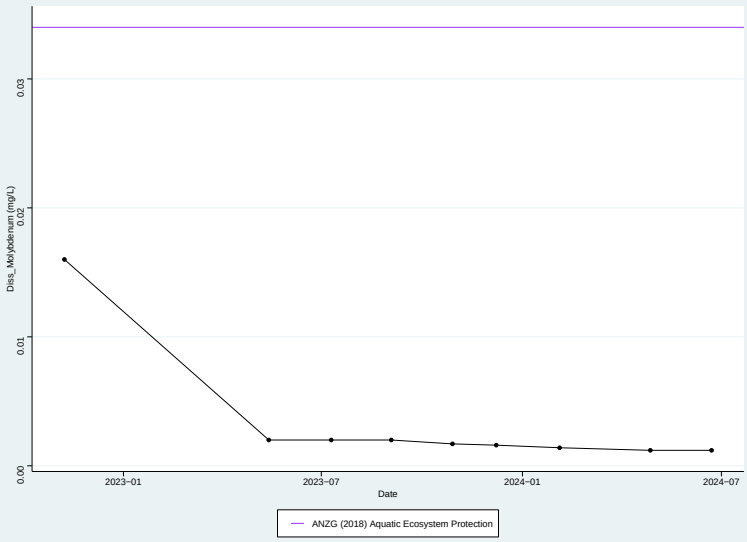
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Mercury Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.664 | p−value = 0.00187 | Negative trend



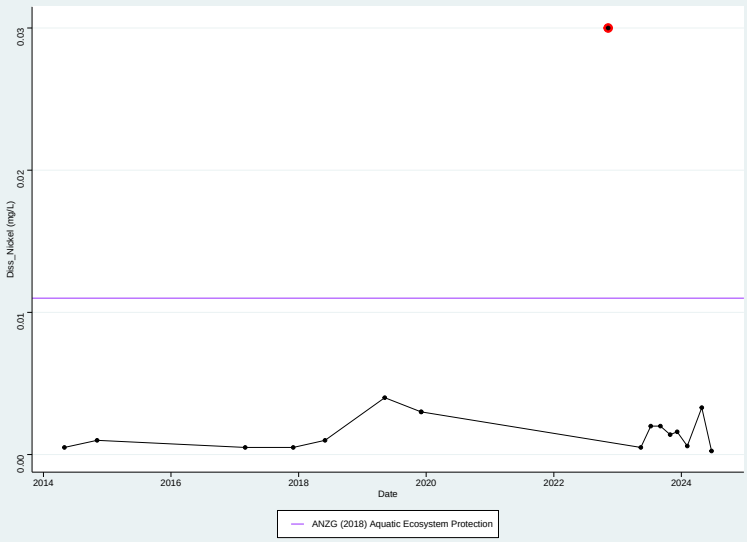
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Molybdenum Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.943 | p−value = 0.000909 | Negative trend



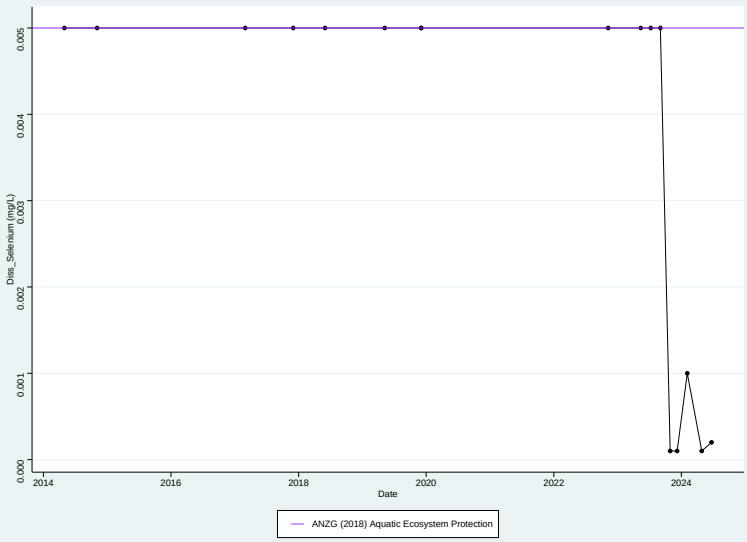
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Nickel Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = 0.0953 | p−value = 0.649 | No trend



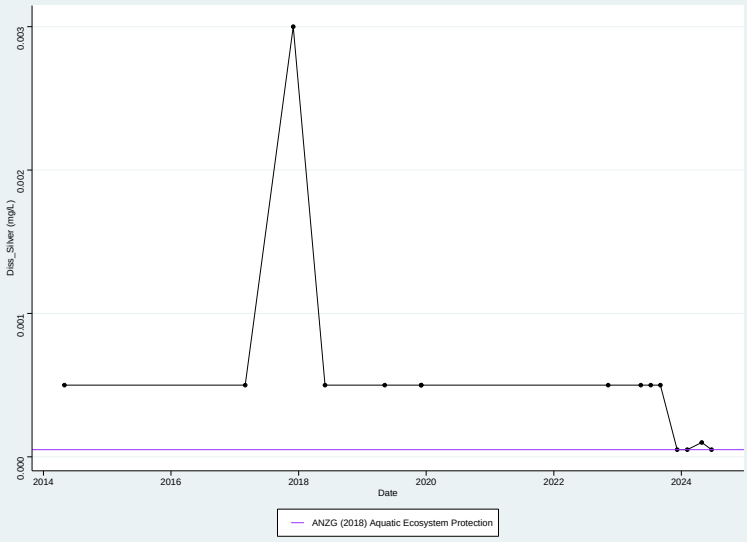
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Selenium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.597 | p−value = 0.00374 | Negative trend



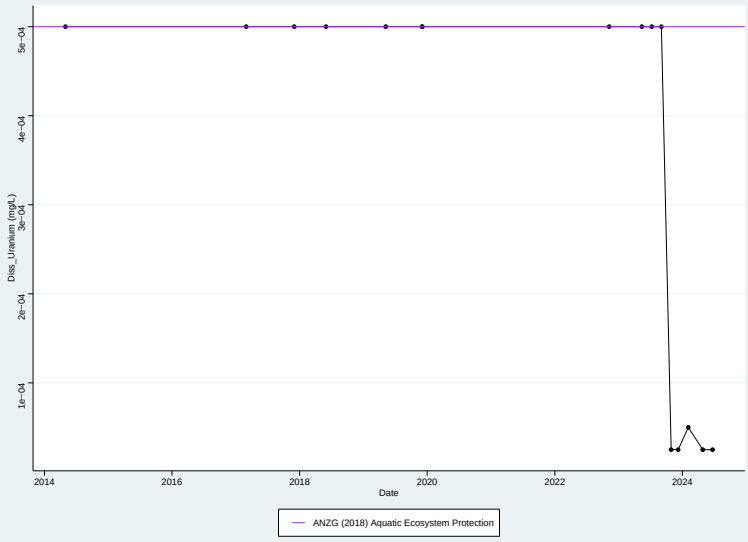
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Silver Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.633 | p−value = 0.0041 | Negative trend



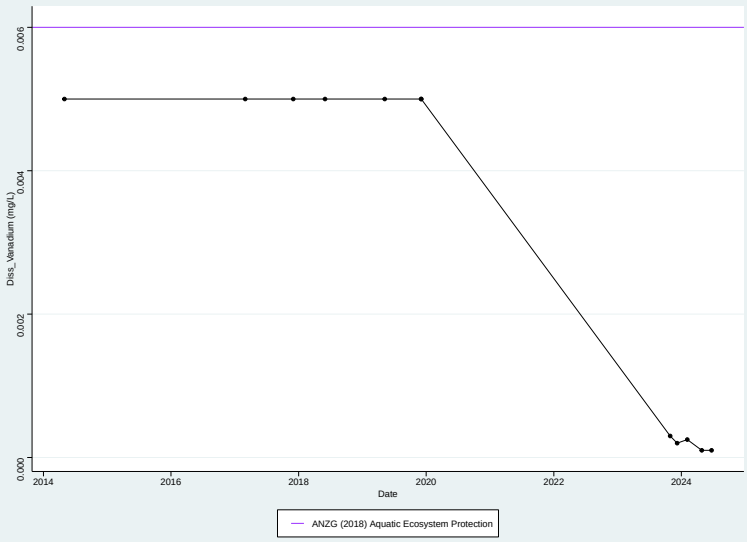
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Uranium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.654 | p−value = 0.00253 | Negative trend



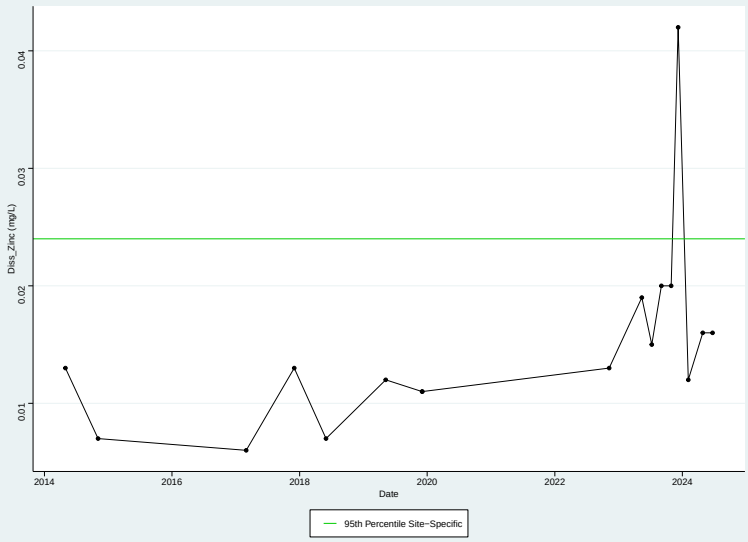
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Vanadium Concentration (mg/L)

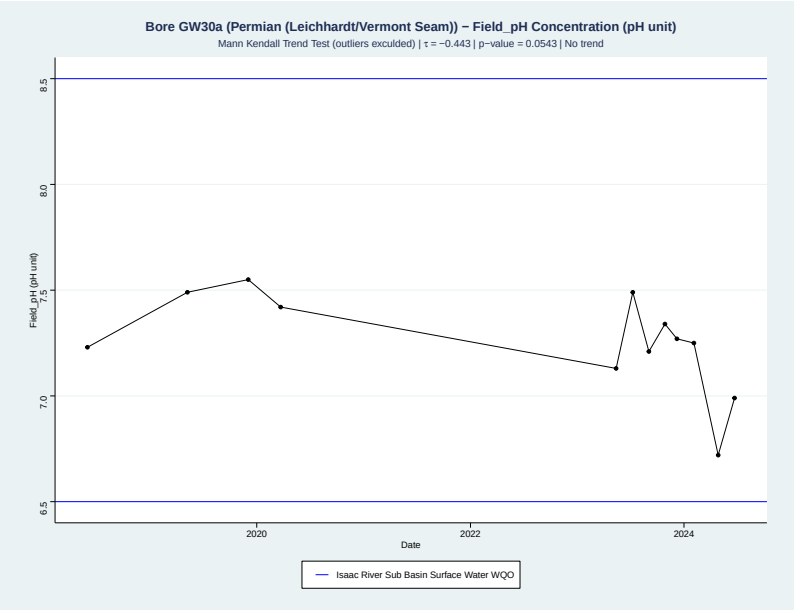
Mann Kendall Trend Test (outliers excluded) | τ = −0.779 | p−value = 0.00153 | Negative trend

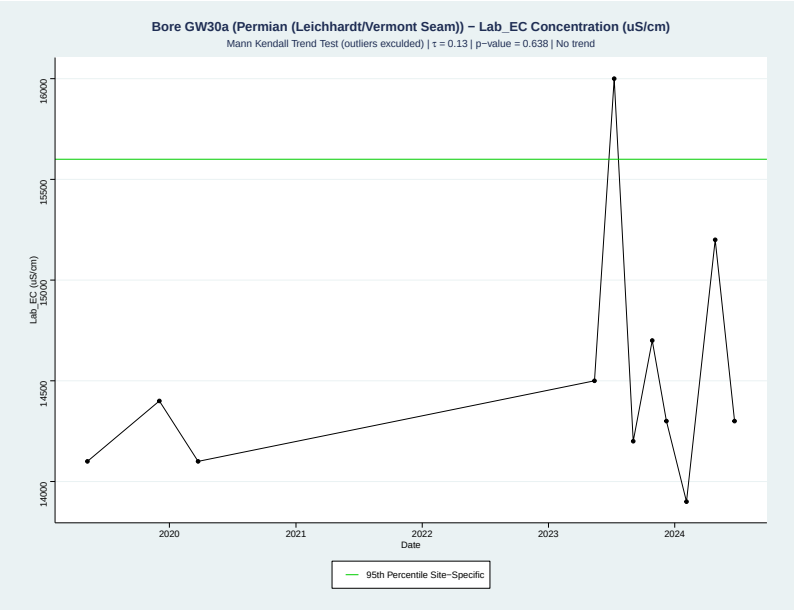


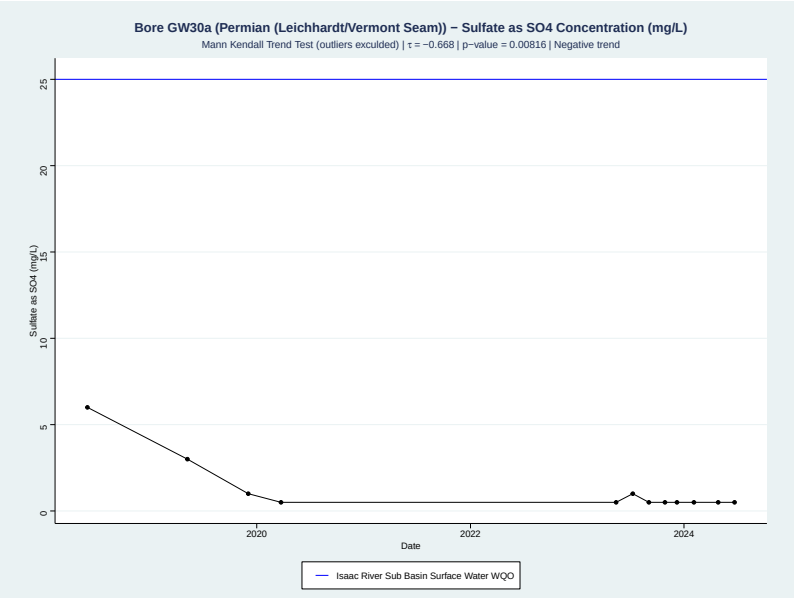
Bore GW13 (Permian (Leichhardt/Vermont Seam)) − Diss_Zinc Concentration (mg/L)

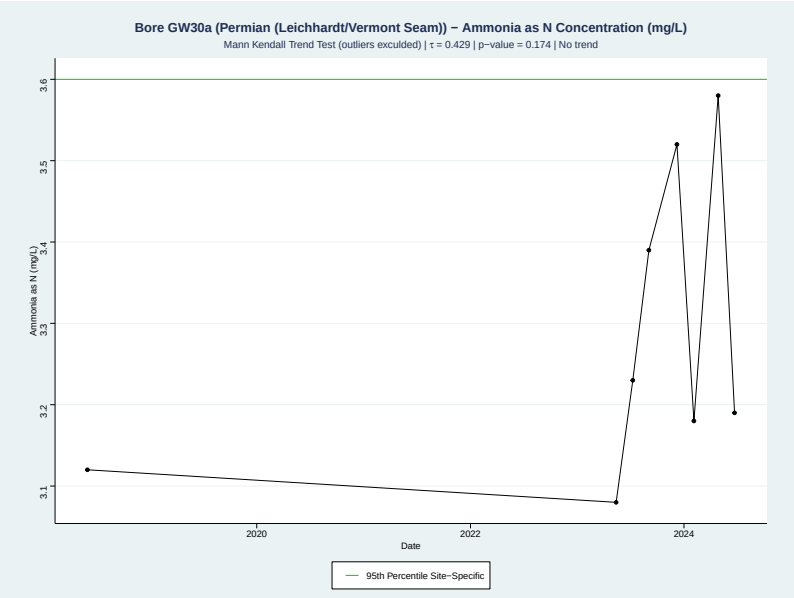
Mann Kendall Trend Test (outliers excluded) | τ = 0.515 | p−value = 0.00543 | Positive trend

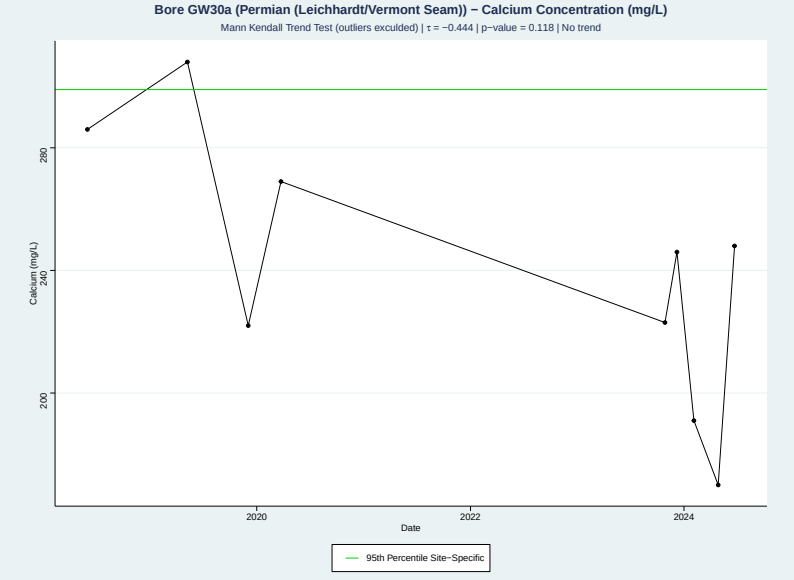


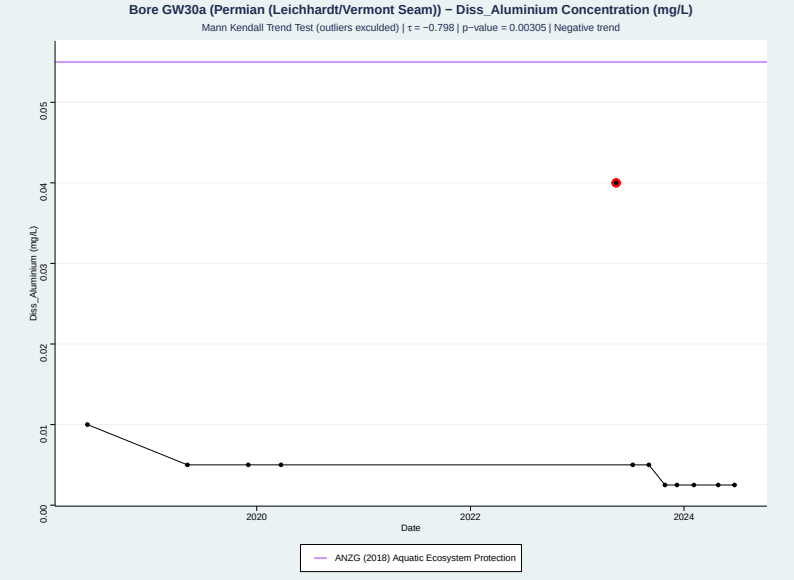

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.443 | p−value = 0.0543 | No trend
Field_pH (pH unit)
8.5
8.0
7.5
7.0
6.5
2020
2022
2024
Date
Isaac River Sub Basin Surface Water WQO

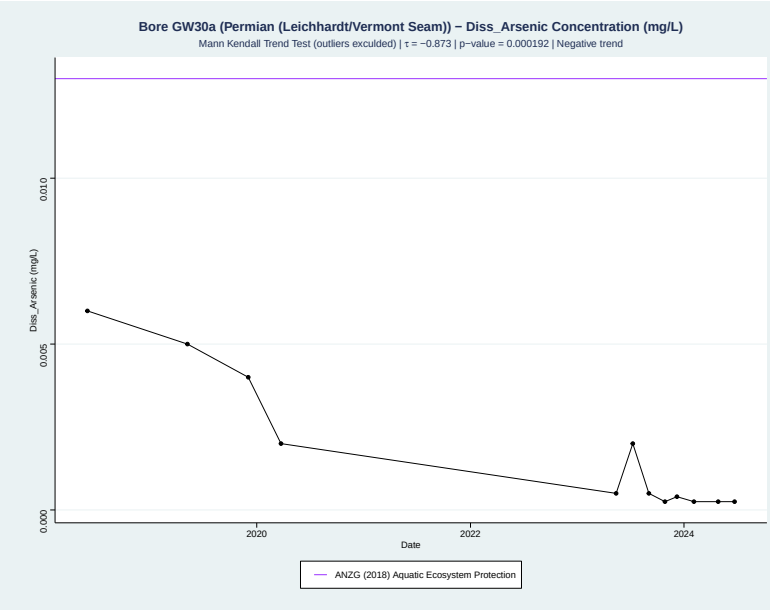

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = 0.13 | p−value = 0.638 | No trend
Lab_EC (uS/cm)
16000
15500
15000
14500
14000
2020
2021
2022
2023
2024
Date
95th Percentile Site−Specific

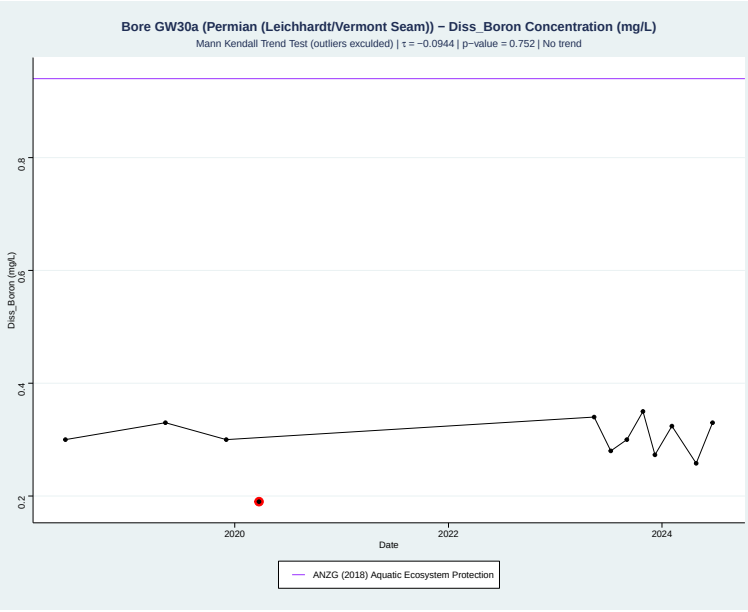

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.668 | p−value = 0.00816 | Negative trend
Sulfate as SO4 (mg/L)
25
20
15
10
5
0
2020
2022
2024
Date
Isaac River Sub Basin Surface Water WQO

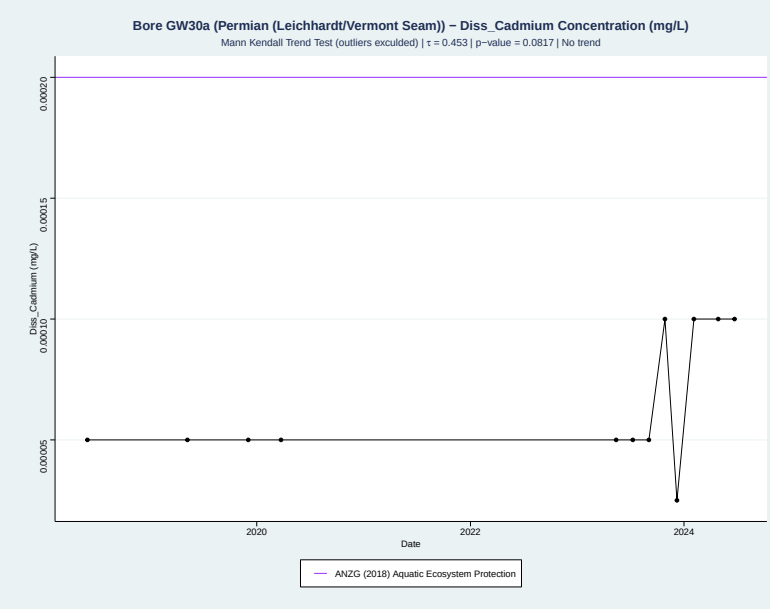

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.429 | p−value = 0.174 | No trend
Ammonia as N (mg/L)
3.6
3.5
3.4
3.3
3.2
3.1
2020
2022
2024
Date
95th Percentile Site−Specific

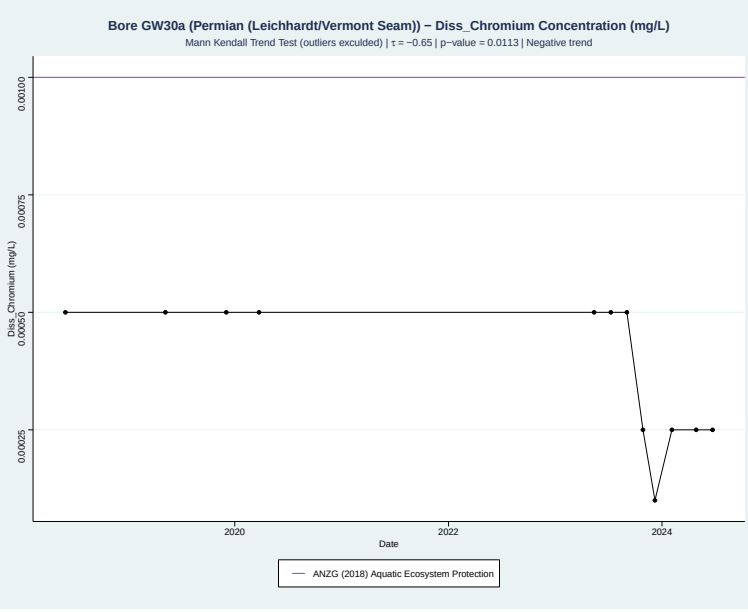

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.444 | p−value = 0.118 | No trend
Calcium (mg/L)
280
240
200
2020
2022
2024
Date
95th Percentile Site−Specific

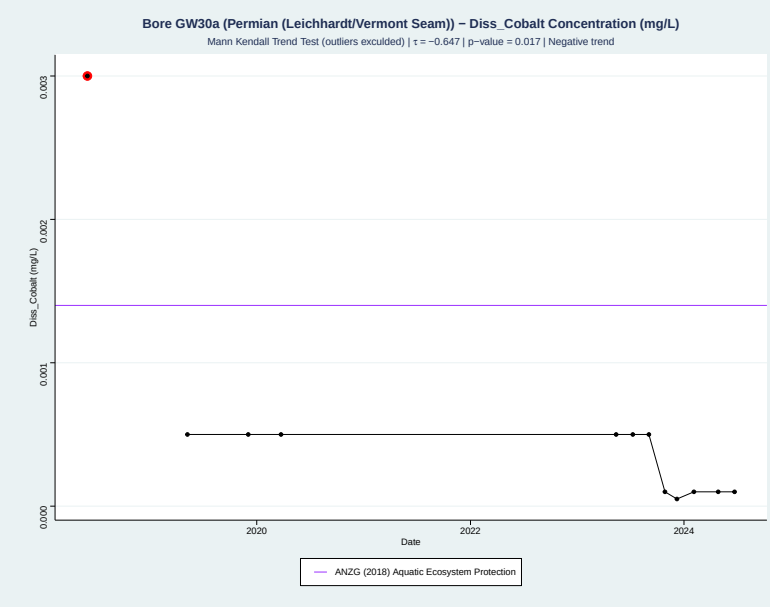

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.798 | p−value = 0.00305 | Negative trend
Diss_Aluminium (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

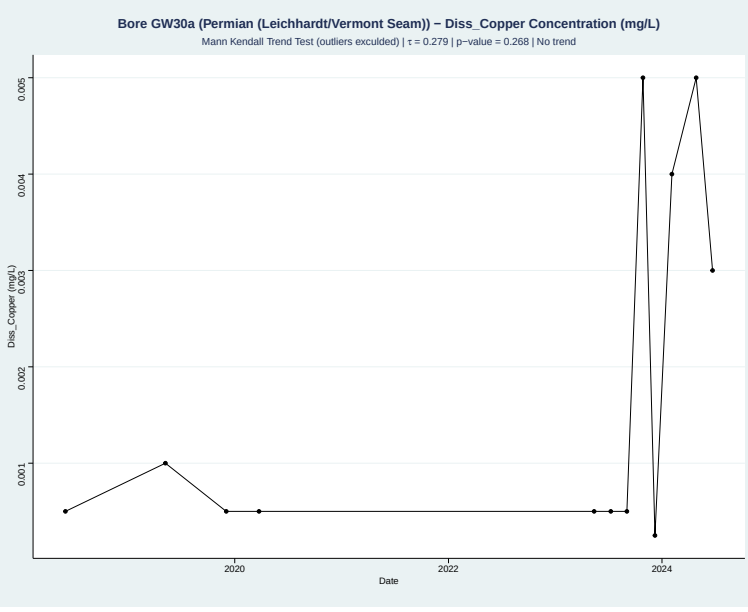

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.873 | p−value = 0.000192 | Negative trend
Diss_Arsenic (mg/L)
0.000
0.005
0.010
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

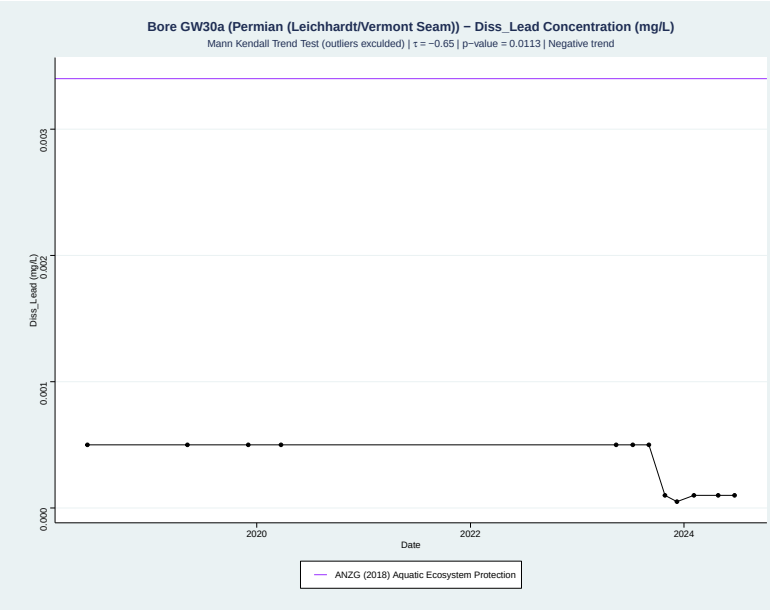

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.0944 | p−value = 0.752 | No trend
Diss_Boron (mg/L)
0.2
0.4
0.6
0.8
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

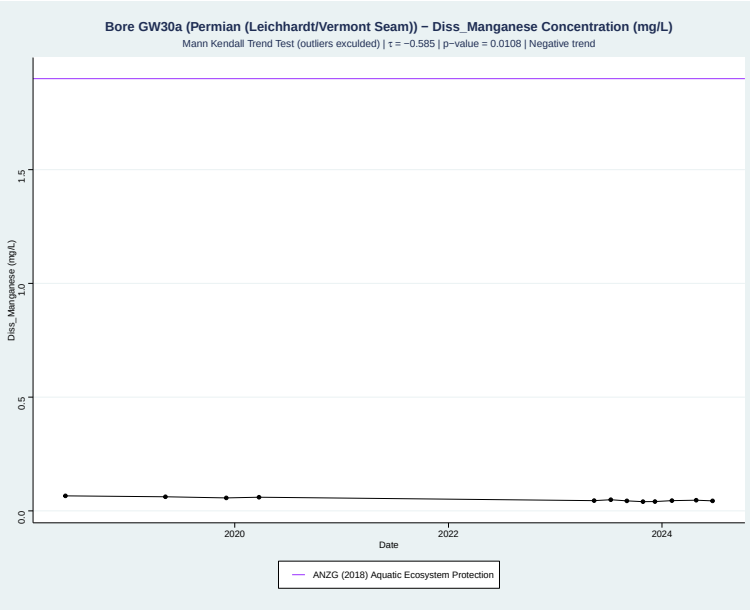

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.453 | p−value = 0.0817 | No trend
Diss_Cadmium (mg/L)
0.00005
0.00010
0.00015
0.00020
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

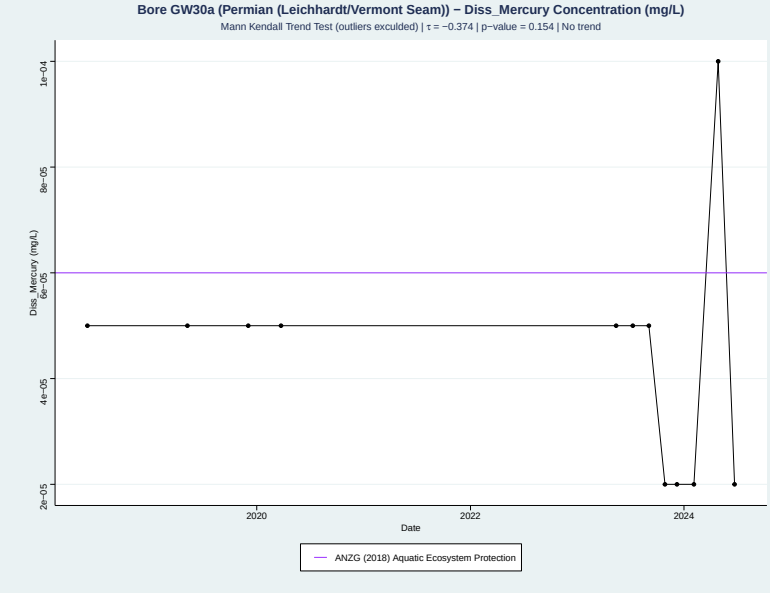

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.65 | p−value = 0.0113 | Negative trend
Diss_Chromium (mg/L)
0.00025
0.00050
0.00075
0.00100
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

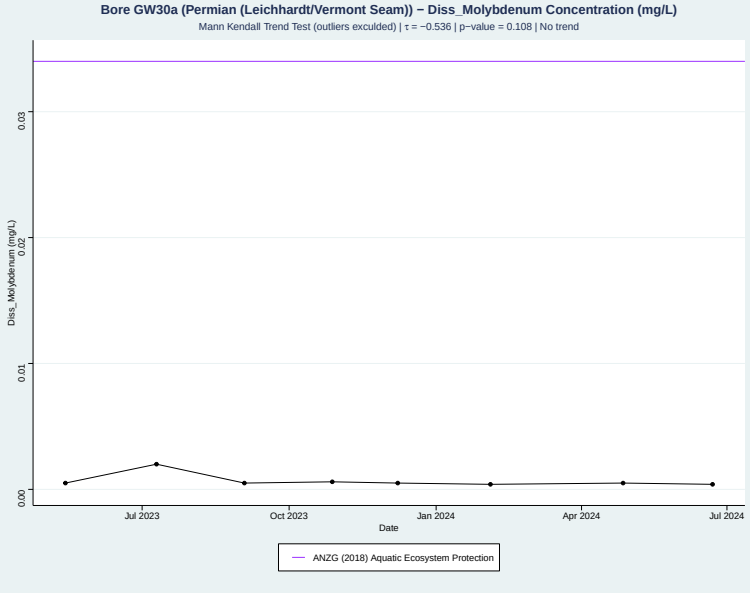

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.647 | p−value = 0.017 | Negative trend
Diss_Cobalt (mg/L)
0.000
0.001
0.002
0.003
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

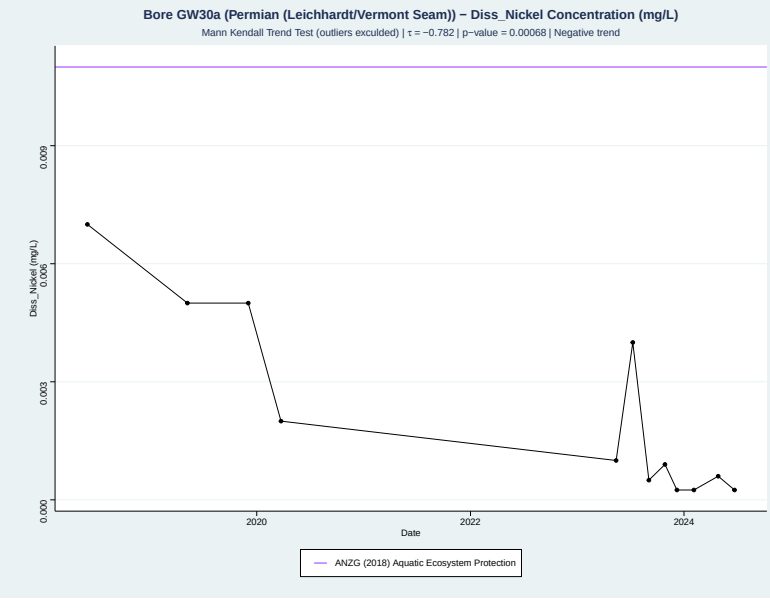

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.279 | p−value = 0.268 | No trend
Diss_Copper (mg/L)
0.001
0.002
0.003
0.004
0.005
2020
2022
2024
Date

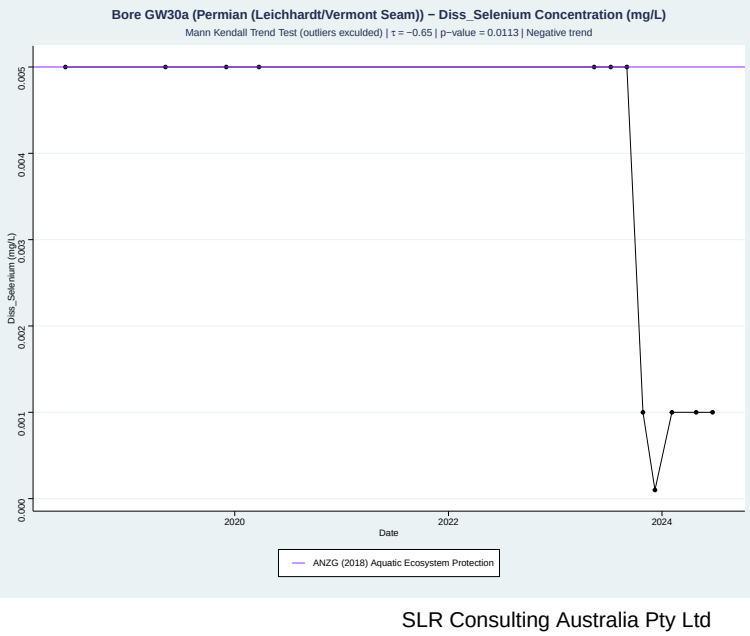

Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.65 | p−value = 0.0113 | Negative trend
Diss_Lead (mg/L)
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

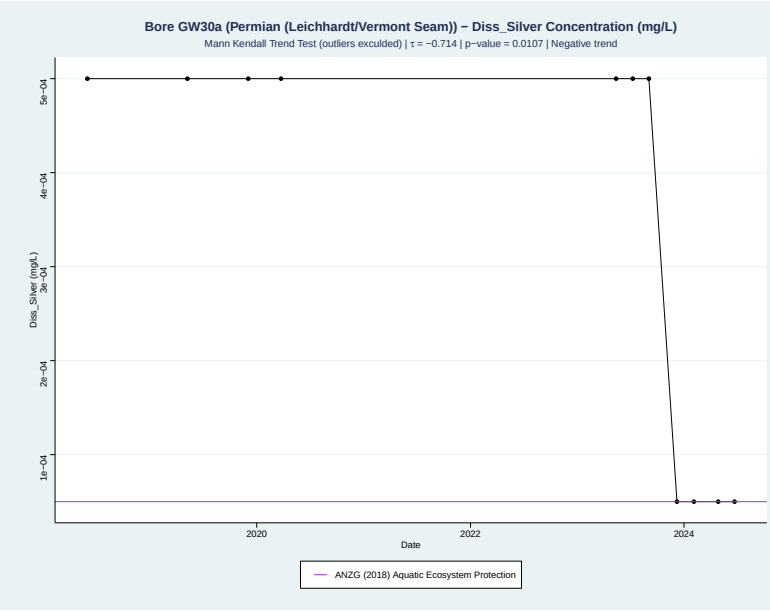

Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.585 | p−value = 0.0108 | Negative trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
0.0
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

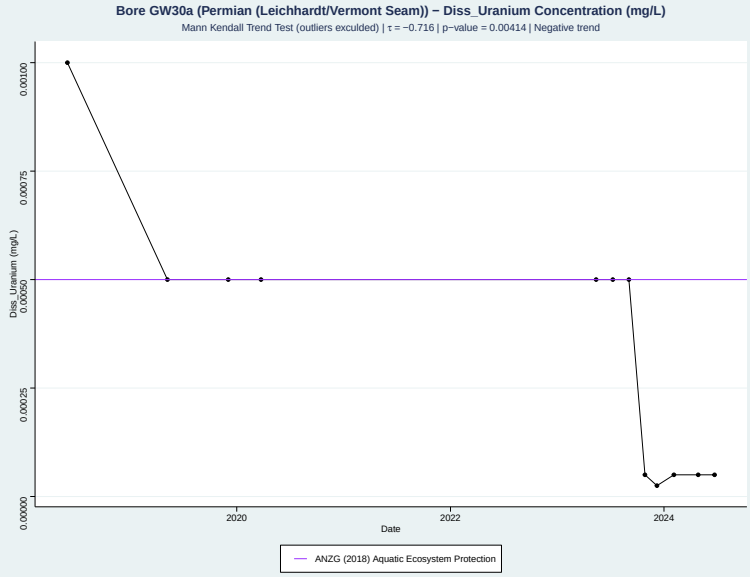

Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.374 | p−value = 0.154 | No trend
Diss_Mercury (mg/L)
1e−04
8e−05
6e−05
4e−05
2e−05
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

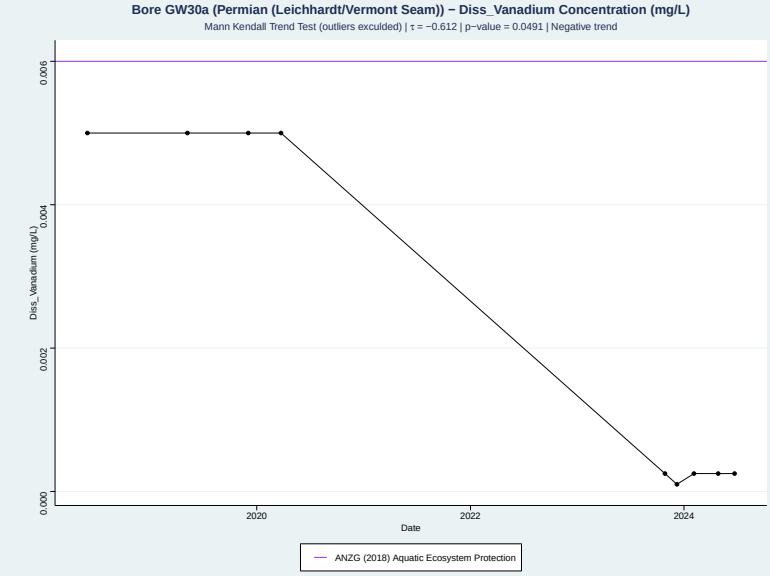

Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.536 | p−value = 0.108 | No trend
Diss_Molybdenum (mg/L)
0.03
0.02
0.01
0.00
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Date
ANZG (2018) Aquatic Ecosystem Protection

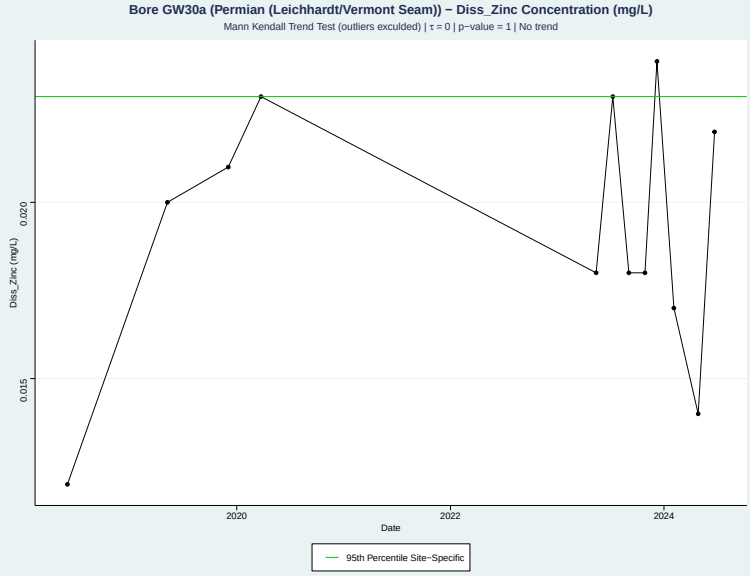

Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.782 | p−value = 0.00068 | Negative trend
Diss_Nickel (mg/L)
0.009
0.006
0.003
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW30a (Permian (Leichhardt/Vermont Seam)) − Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.65 | p−value = 0.0113 | Negative trend
Diss_Selenium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.714 | p−value = 0.0107 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

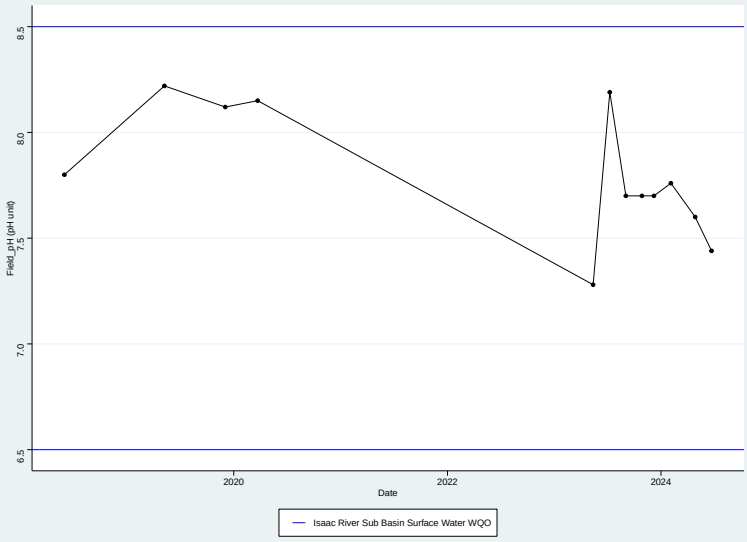

Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.716 | p−value = 0.00414 | Negative trend
Diss_Uranium (mg/L)
0.00100
0.00075
0.00050
0.00025
0.00000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.612 | p−value = 0.0491 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW30a (Permian (Leichhardt/Vermont Seam)) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0 | p−value = 1 | No trend
Diss_Zinc (mg/L)
0.020
0.015
2020
2022
2024
Date
95th Percentile Site−Specific

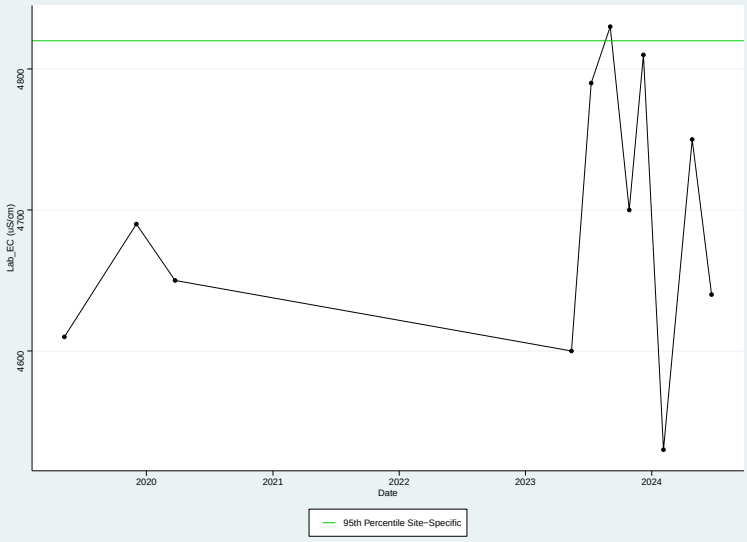
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Field_pH Concentration (pH unit)

Mann Kendall Trend Test (outliers excluded) | τ = −0.45 | p−value = 0.0528 | No trend



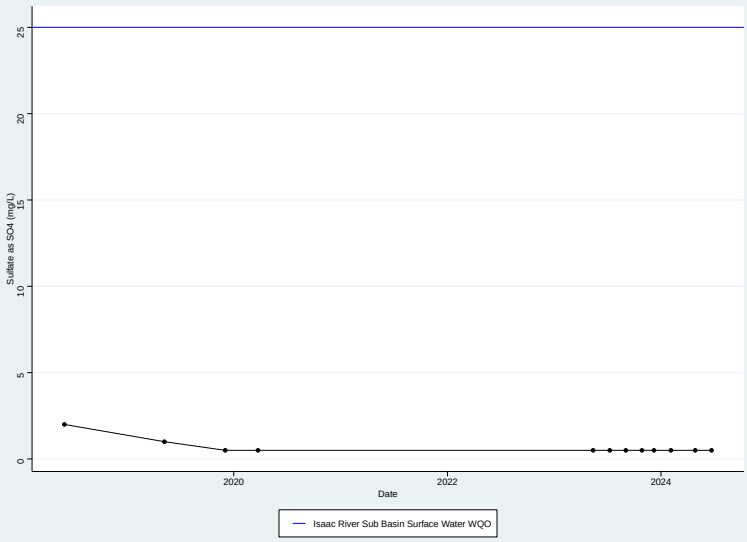
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Lab_EC Concentration (uS/cm)

Mann Kendall Trend Test (outliers excluded) | τ = 0.0909 | p−value = 0.755 | No trend



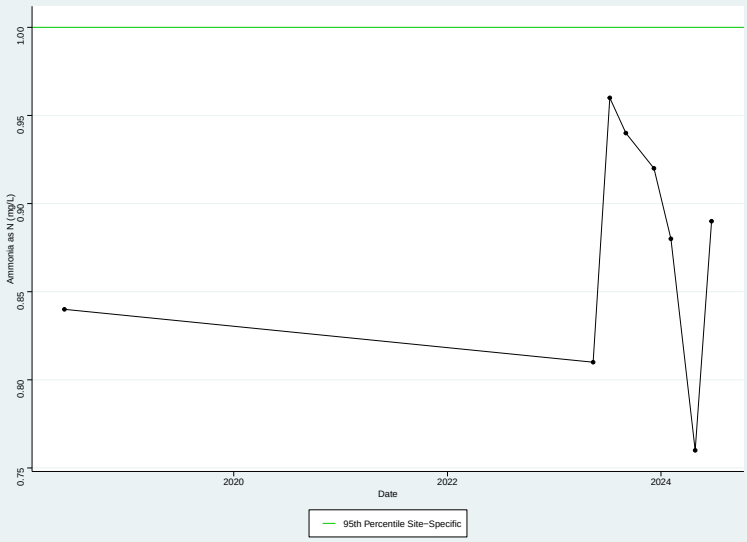
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Sulfate as SO4 Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.564 | p−value = 0.0327 | Negative trend



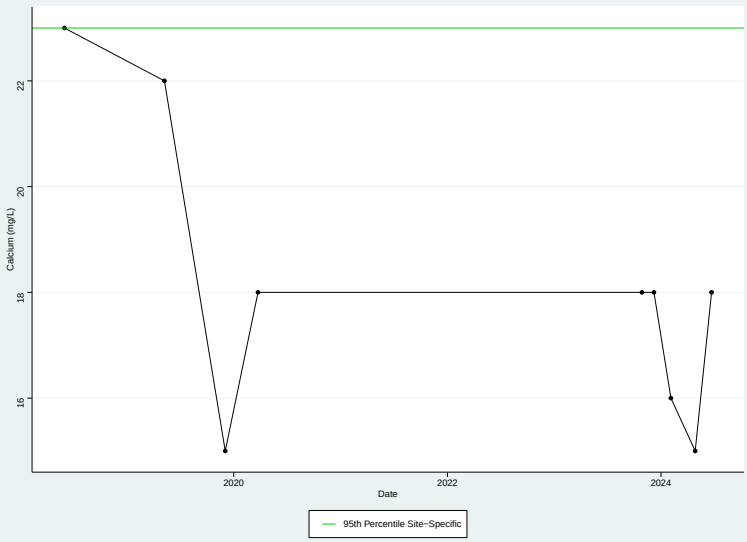
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Ammonia as N Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.143 | p−value = 0.711 | No trend



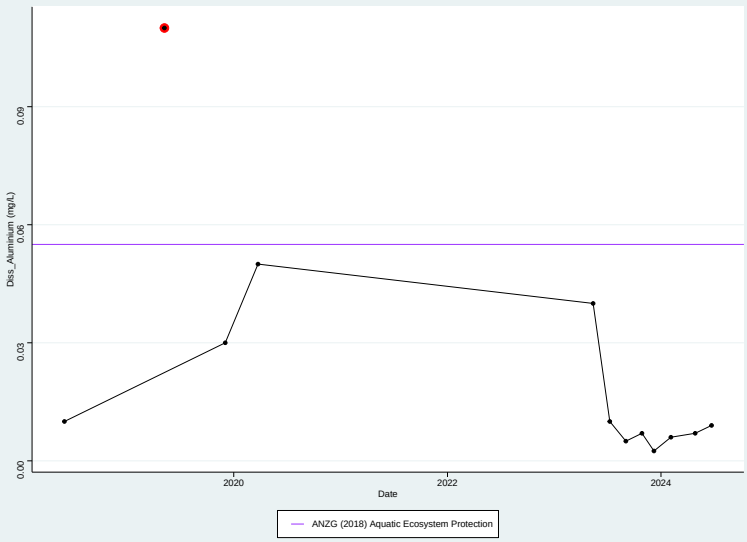
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Calcium Concentration (mg/L)

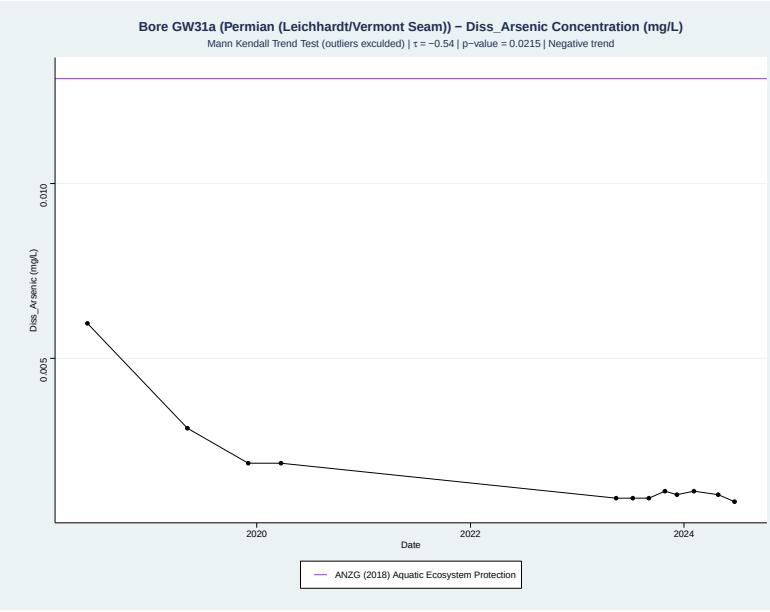
Mann Kendall Trend Test (outliers excluded) | τ = −0.464 | p−value = 0.123 | No trend

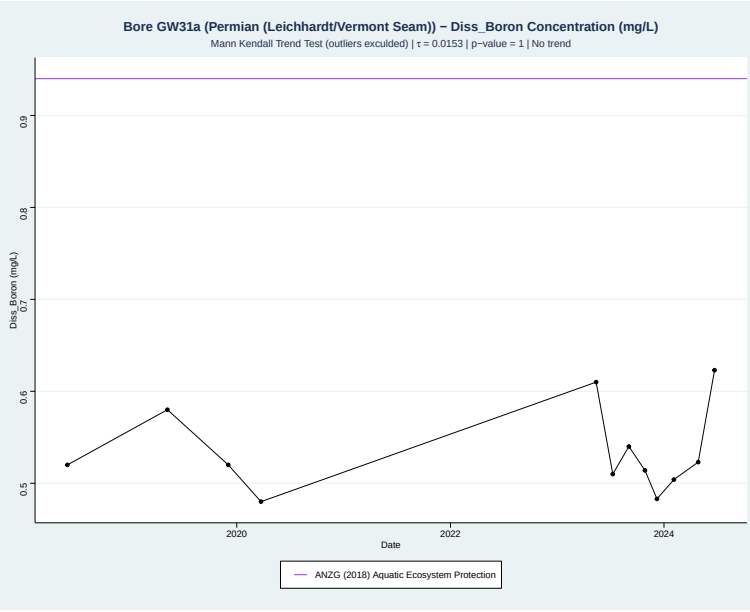


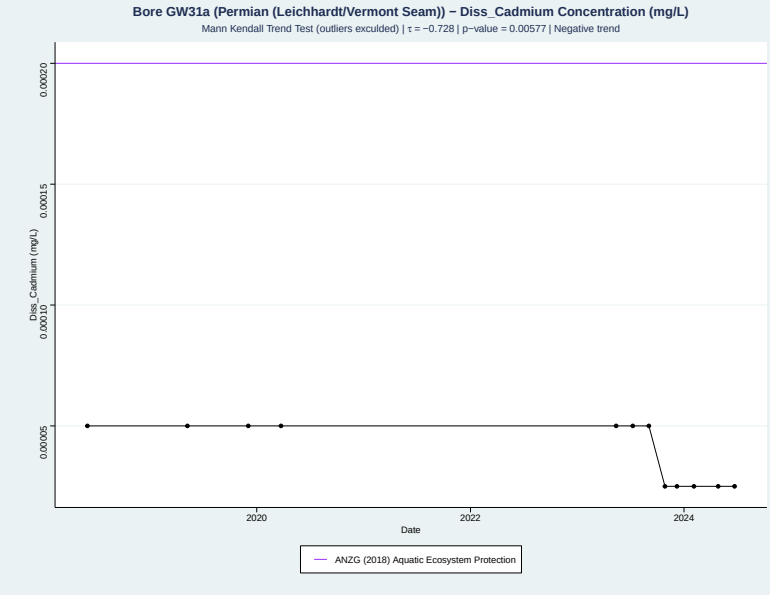
Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Aluminium Concentration (mg/L)

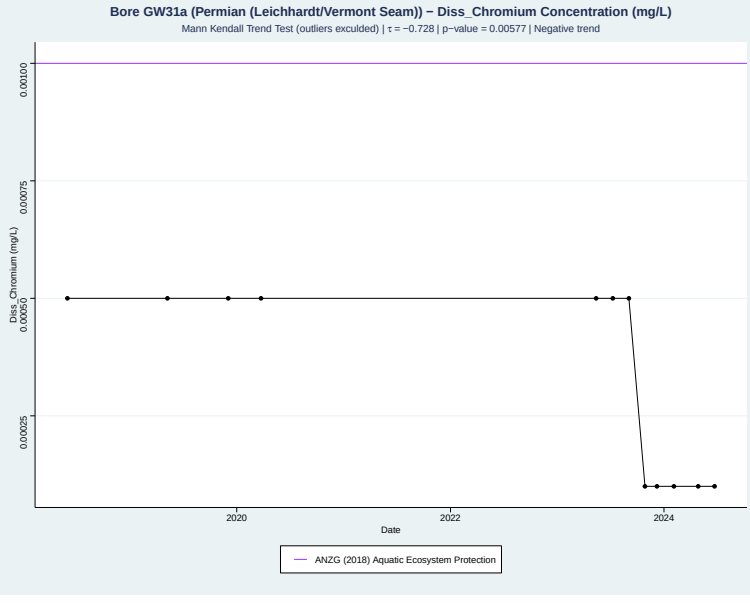
Mann Kendall Trend Test (outliers excluded) | τ = −0.389 | p−value = 0.117 | No trend

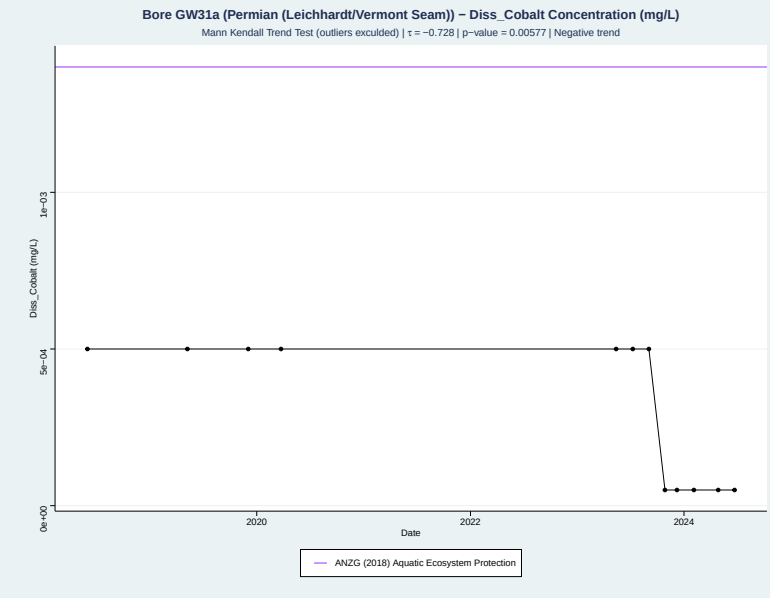


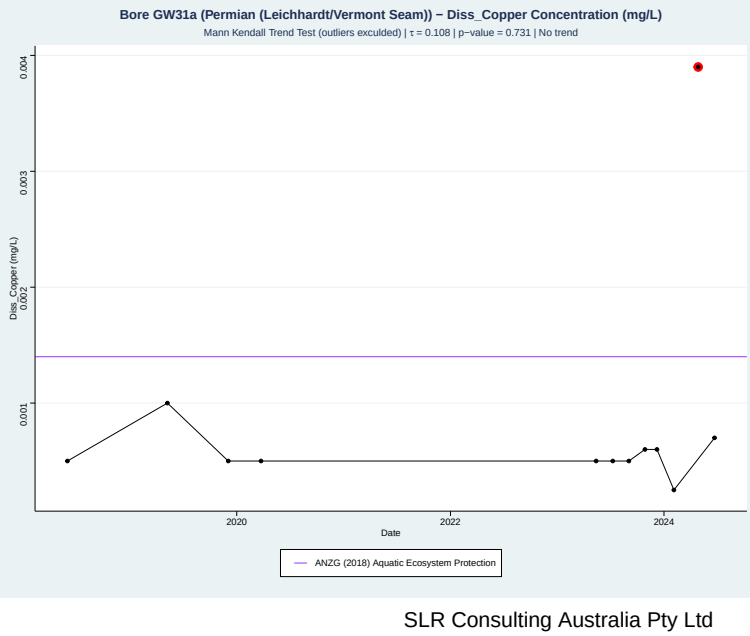

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.54 | p−value = 0.0215 | Negative trend
Diss_Arsenic (mg/L)
0.010
0.005
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

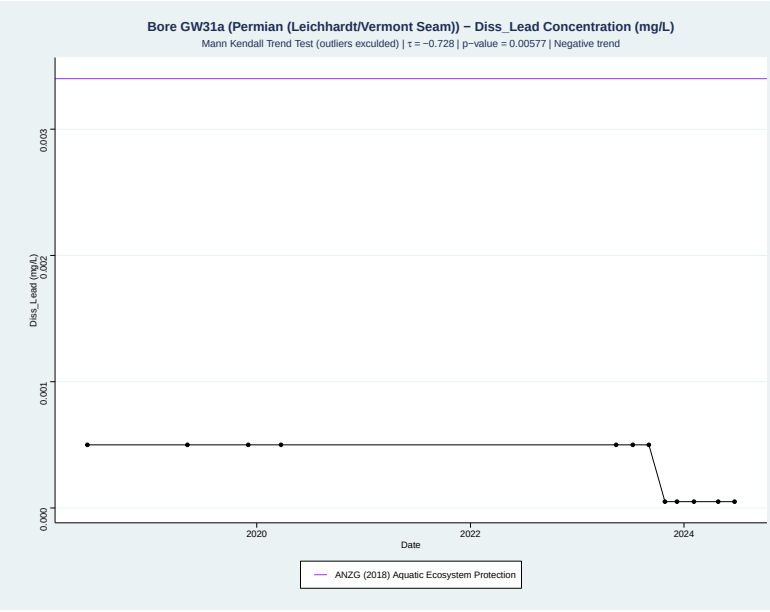

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0153 | p−value = 1 | No trend
Diss_Boron (mg/L)
0.9
0.8
0.7
0.6
0.5
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

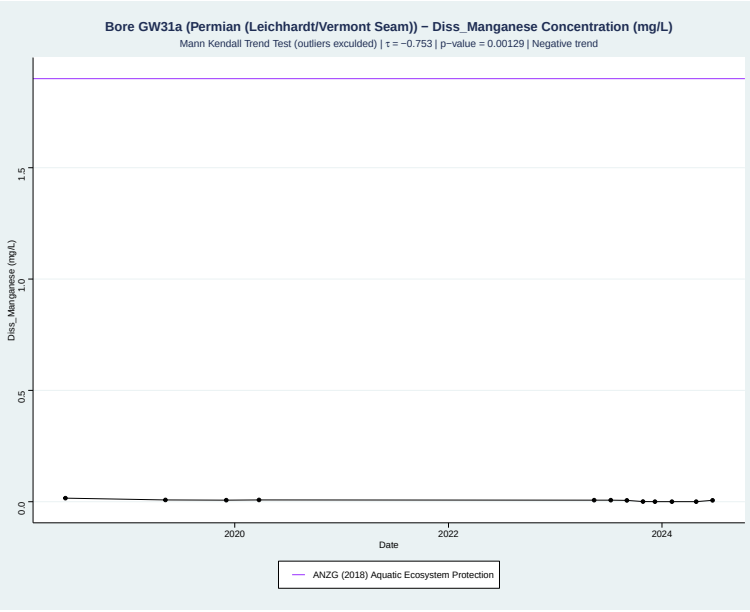

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Cadmium (mg/L)
0.00020
0.00015
0.00010
0.00005
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

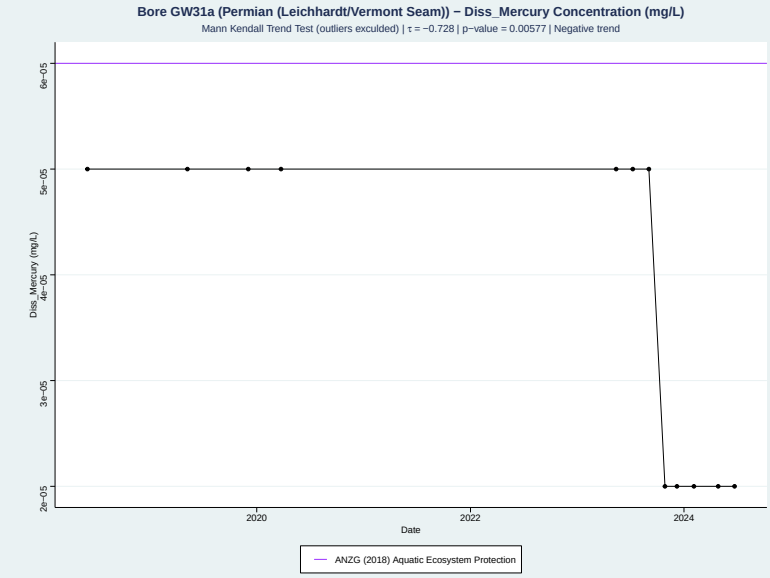

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Chromium (mg/L)
0.00100
0.00075
0.00050
0.00025
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

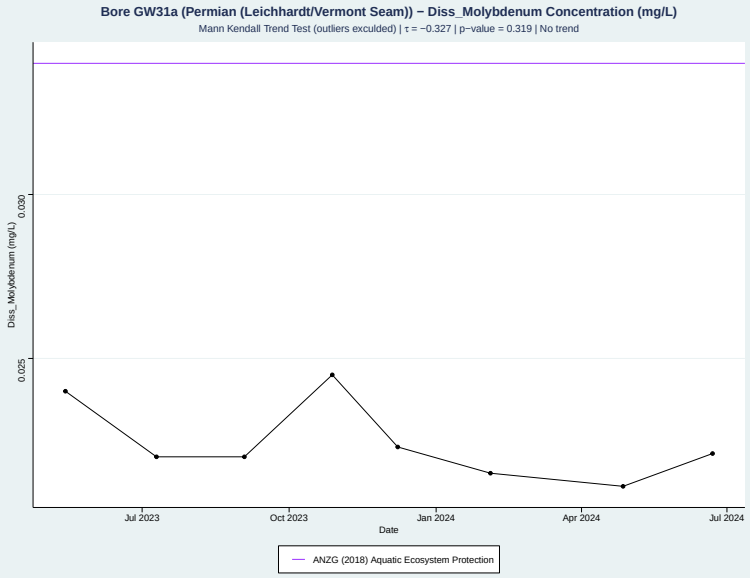

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Cobalt (mg/L)
1e−03
5e−04
0e+00
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

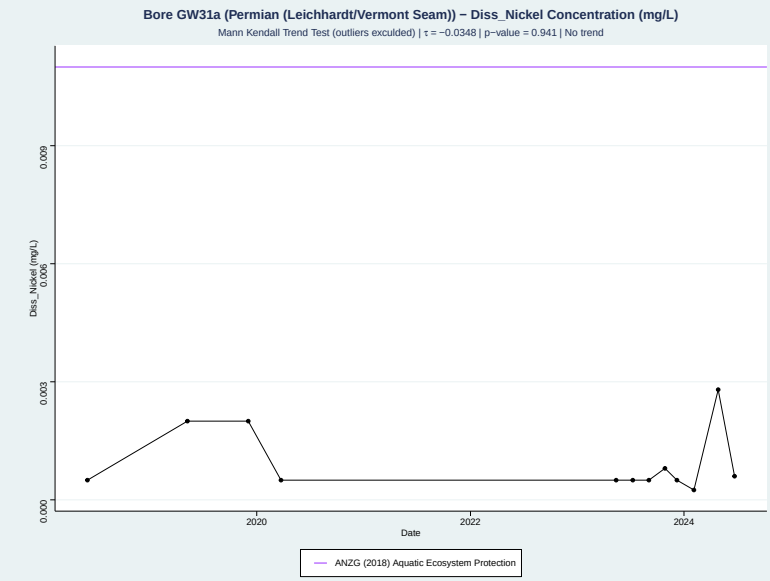

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.108 | p−value = 0.731 | No trend
Diss_Copper (mg/L)
0.004
0.003
0.002
0.001
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

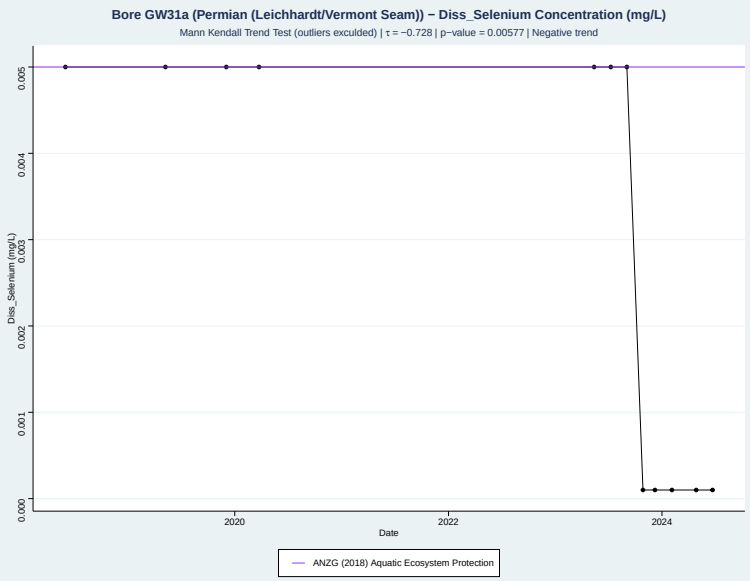

Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Lead (mg/L)
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

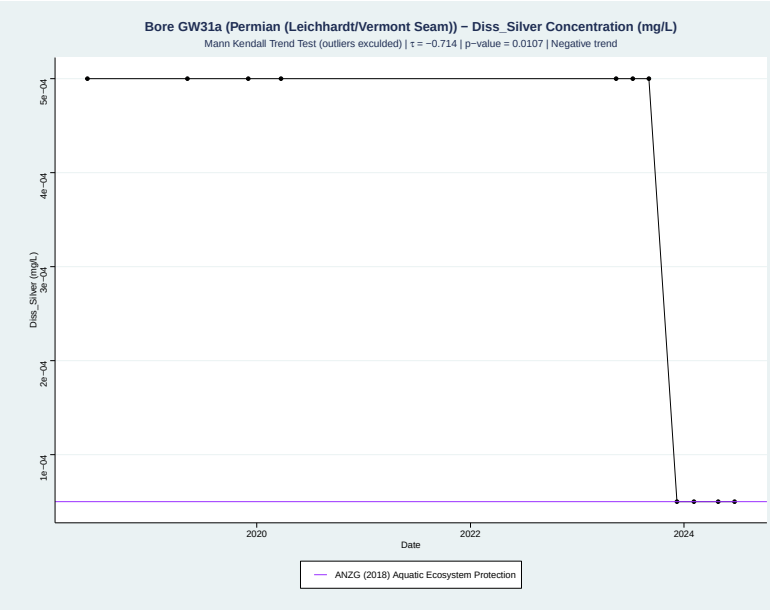

Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.753 | p−value = 0.00129 | Negative trend
Diss_Manganese (mg/L)
1.5
1.0
0.5
0.0
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

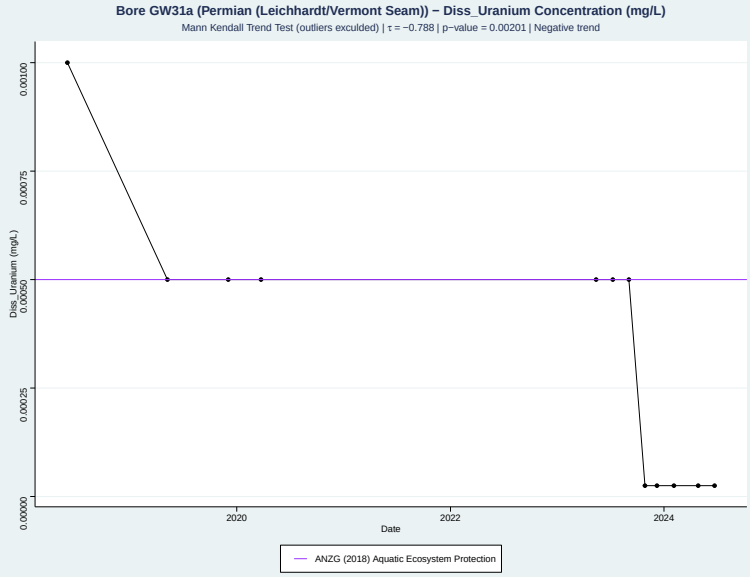

Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Mercury (mg/L)
6e−05
5e−05
4e−05
3e−05
2e−05
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

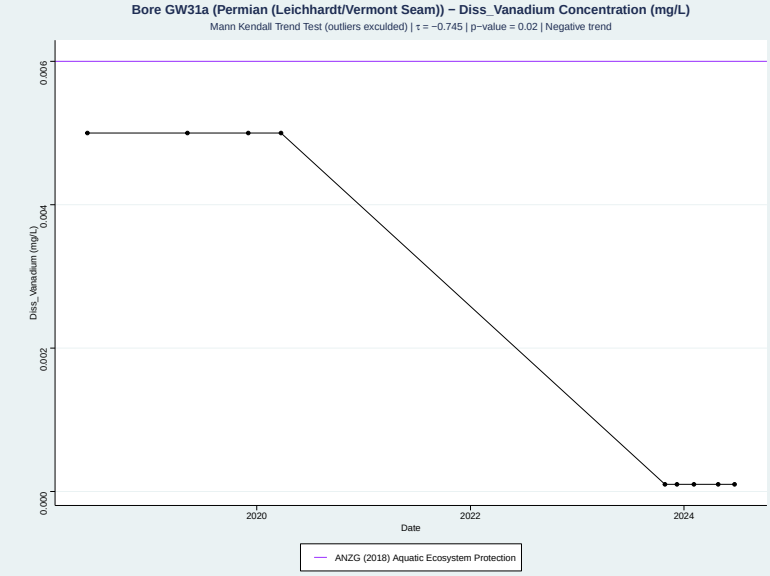

Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.327 | p−value = 0.319 | No trend
Diss_Molybdenum (mg/L)
0.030
0.025
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Date
ANZG (2018) Aquatic Ecosystem Protection

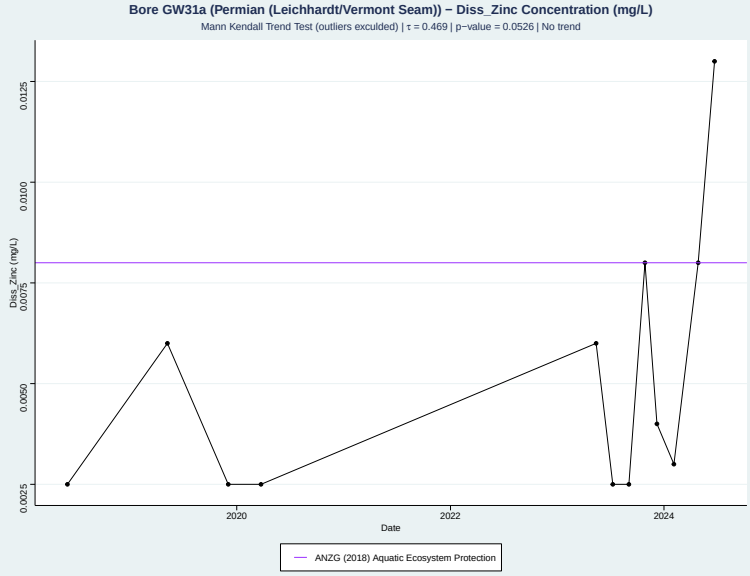

Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.0348 | p−value = 0.941 | No trend
Diss_Nickel (mg/L)
0.009
0.006
0.003
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31a (Permian (Leichhardt/Vermont Seam)) − Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.728 | p−value = 0.00577 | Negative trend
Diss_Selenium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.714 | p−value = 0.0107 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

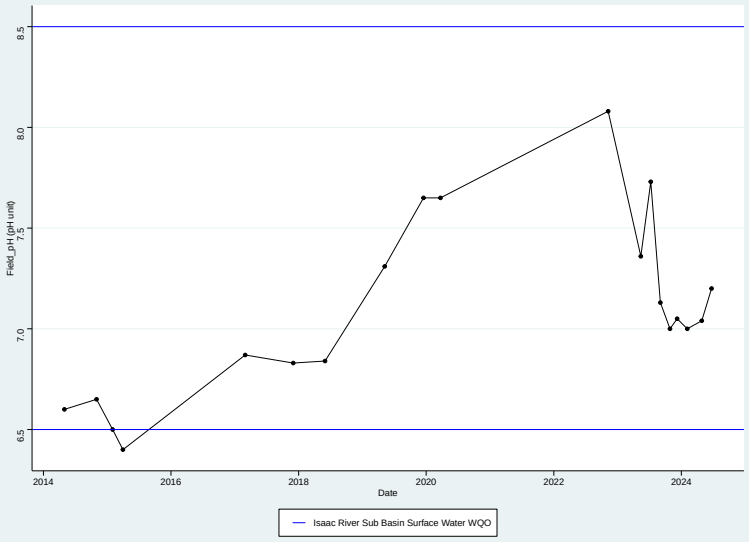

Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.788 | p−value = 0.00201 | Negative trend
Diss_Uranium (mg/L)
0.00100
0.00075
0.00050
0.00025
0.00000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.02 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW31a (Permian (Leichhardt/Vermont Seam)) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.469 | p−value = 0.0526 | No trend
Diss_Zinc (mg/L)
0.0125
0.0100
0.0075
0.0050
0.0025
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

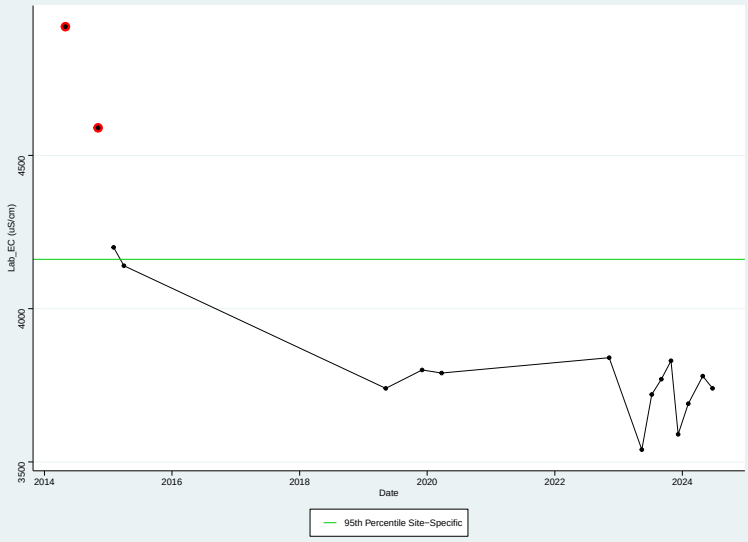
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Field_pH Concentration (pH unit)

Mann Kendall Trend Test (outliers exculded) | τ = 0.371 | p−value = 0.0299 | Positive trend



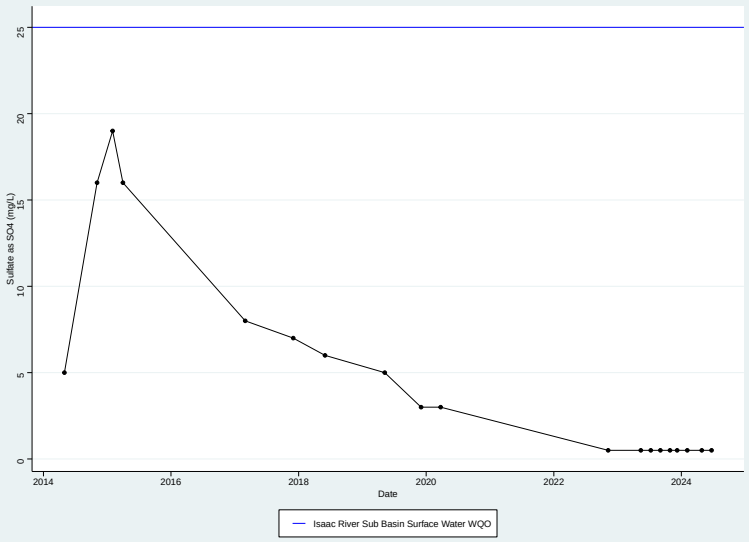
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Lab_EC Concentration (uS/cm)

Mann Kendall Trend Test (outliers exculded) | τ = −0.376 | p−value = 0.0704 | No trend



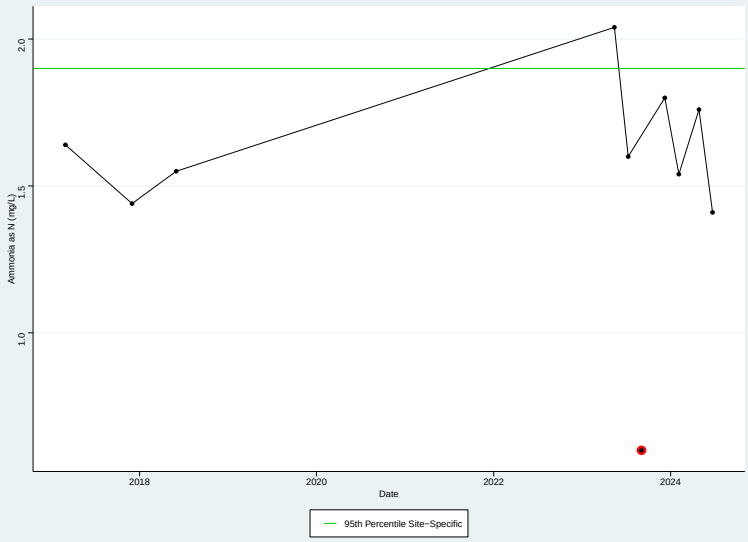
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Sulfate as SO4 Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.785 | p−value = 0.0000133 | Negative trend



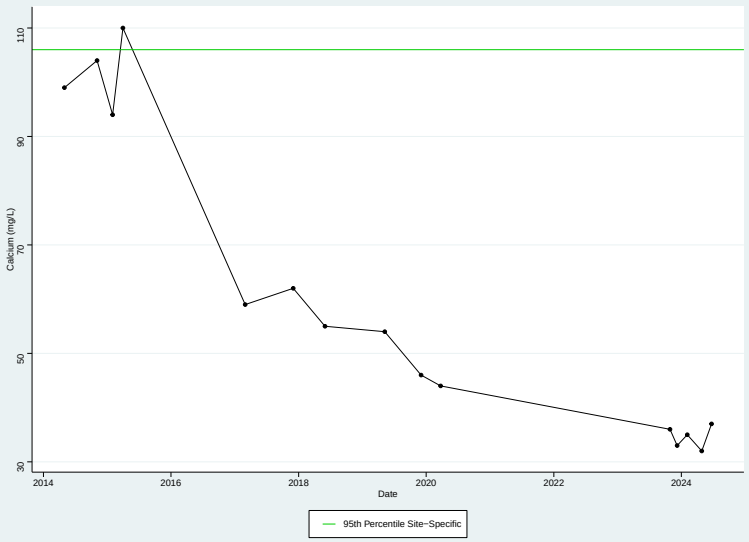
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Ammonia as N Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.111 | p−value = 0.754 | No trend



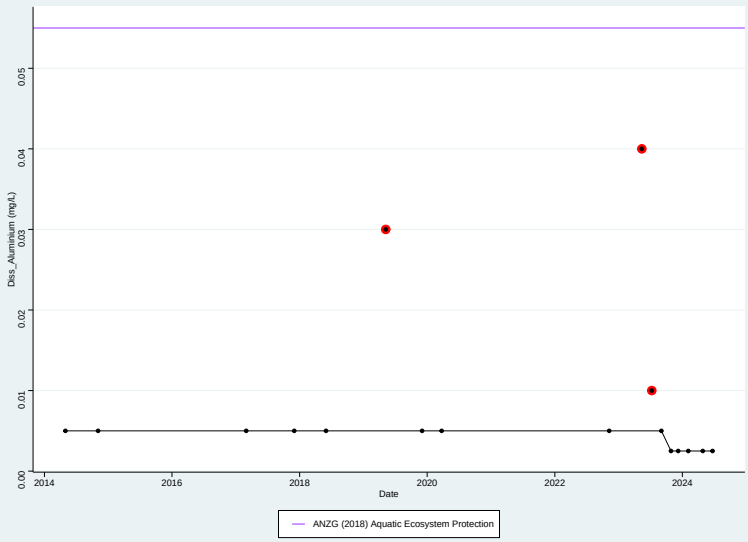
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Calcium Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.81 | p−value = 0.0000323 | Negative trend



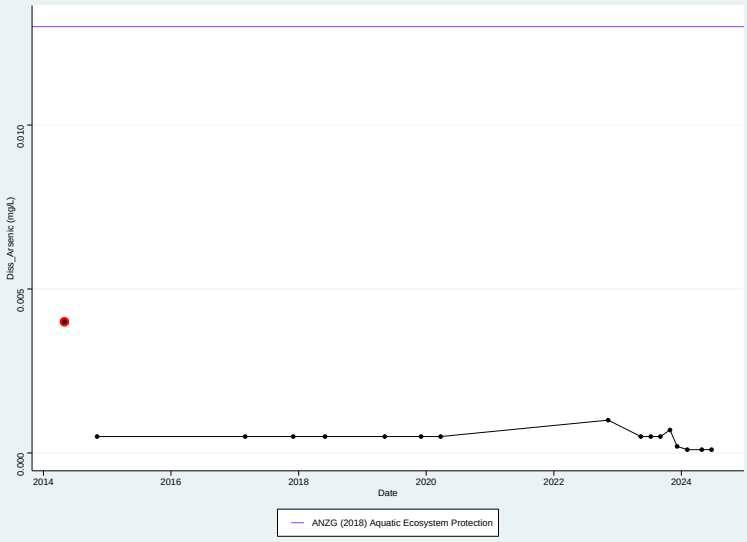
Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Aluminium Concentration (mg/L)

Mann Kendall Trend Test (outliers exculded) | τ = −0.703 | p−value = 0.00335 | Negative trend



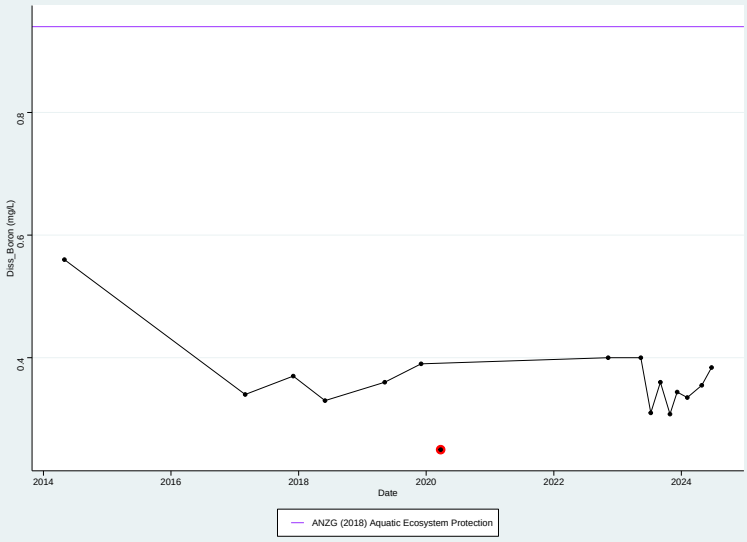
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Arsenic Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.409 | p−value = 0.0527 | No trend



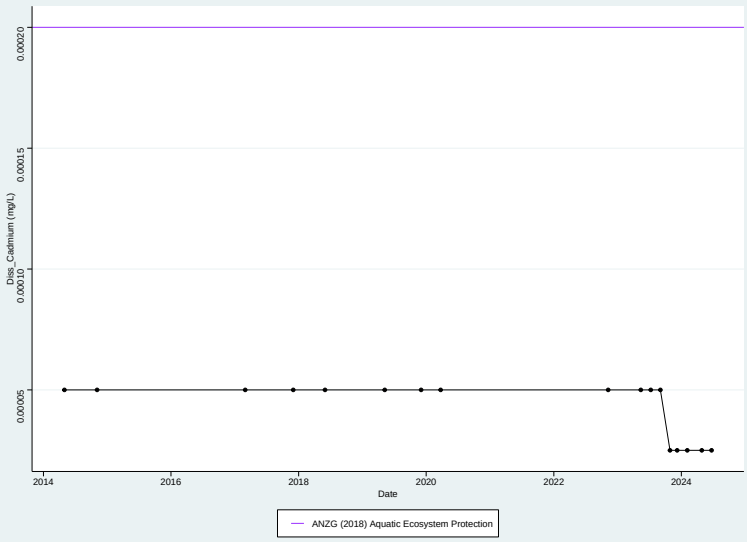
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Boron Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.163 | p−value = 0.427 | No trend



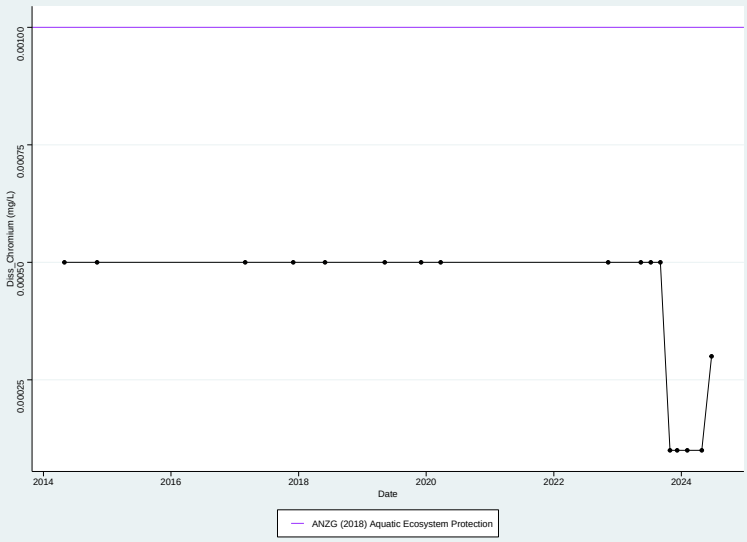
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Cadmium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.664 | p−value = 0.00187 | Negative trend



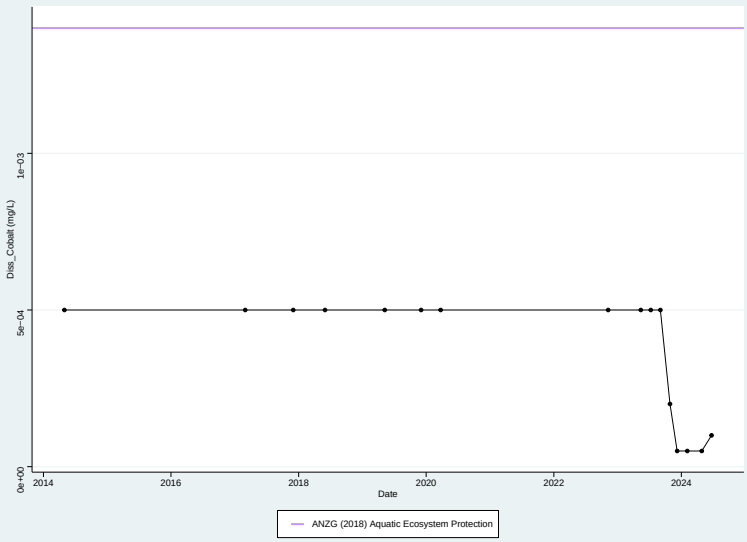
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Chromium Concentration (mg/L)

Mann Kendall Trend Test (outliers excluded) | τ = −0.6 | p−value = 0.00414 | Negative trend



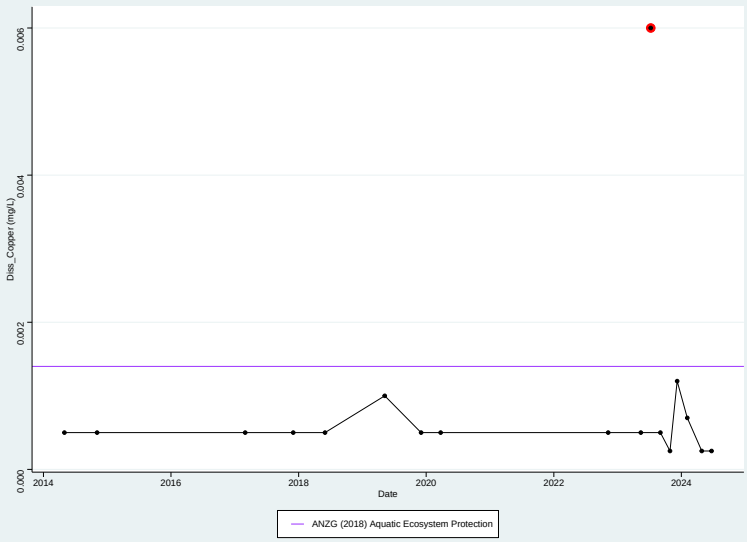
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Cobalt Concentration (mg/L)

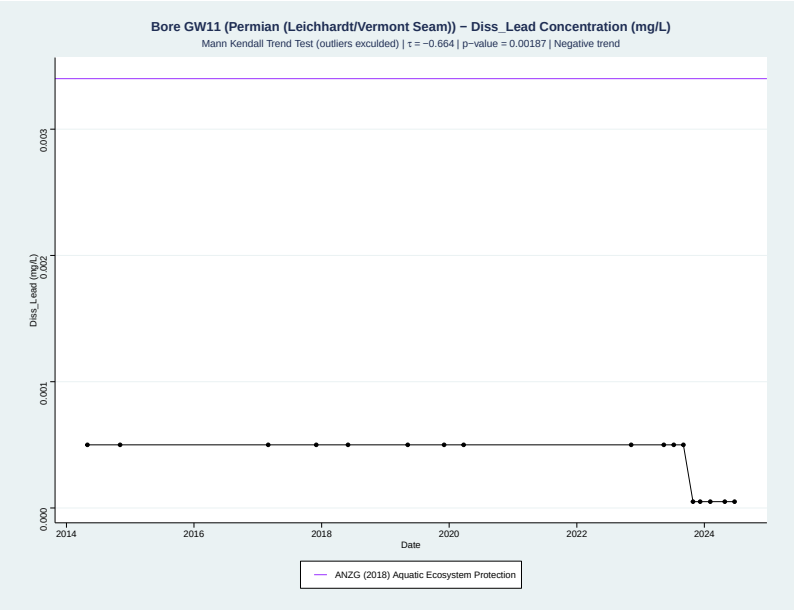
Mann Kendall Trend Test (outliers excluded) | τ = −0.649 | p−value = 0.00227 | Negative trend

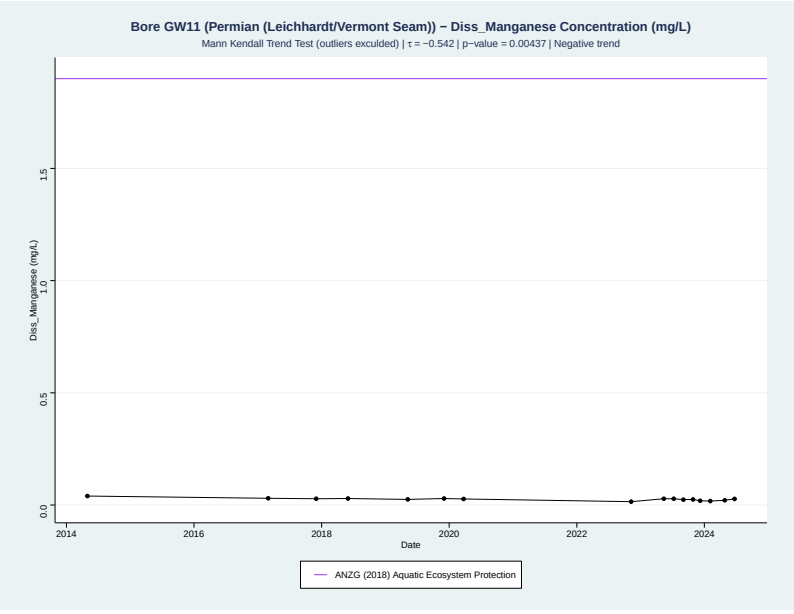


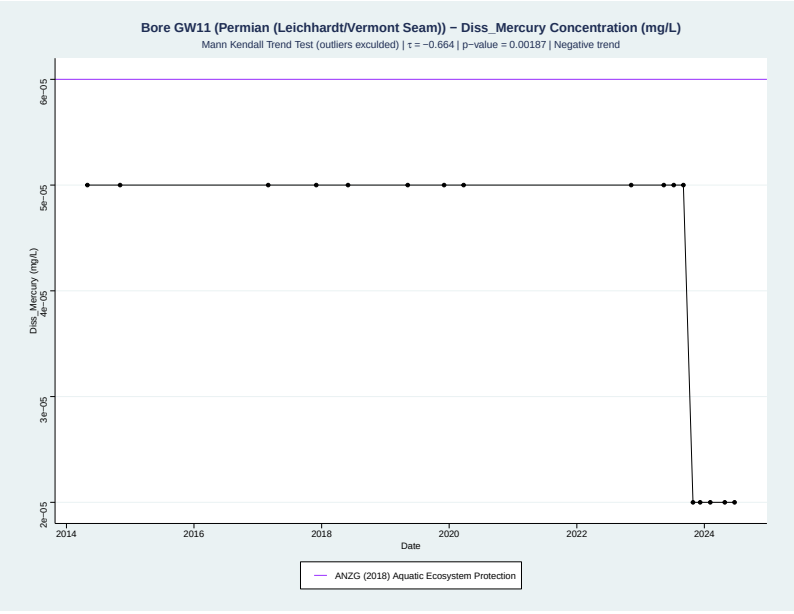
Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Copper Concentration (mg/L)

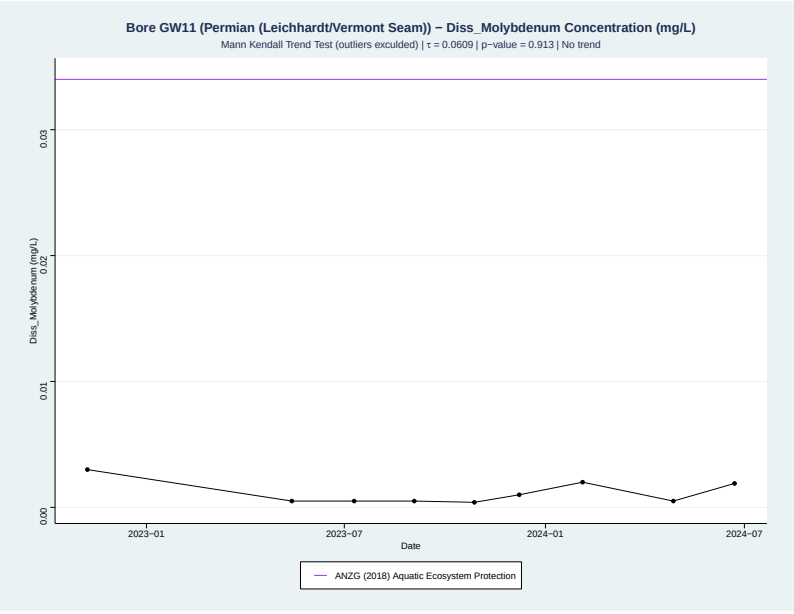
Mann Kendall Trend Test (outliers excluded) | τ = −0.172 | p−value = 0.432 | No trend

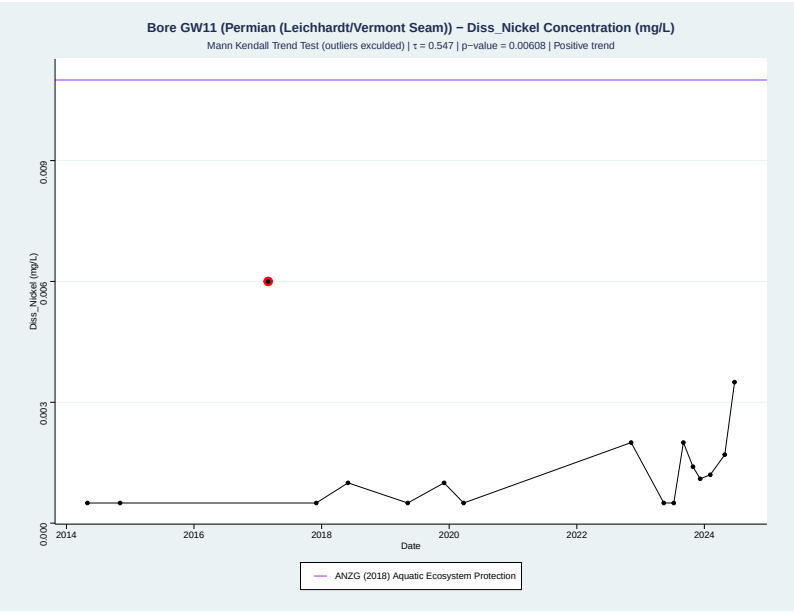


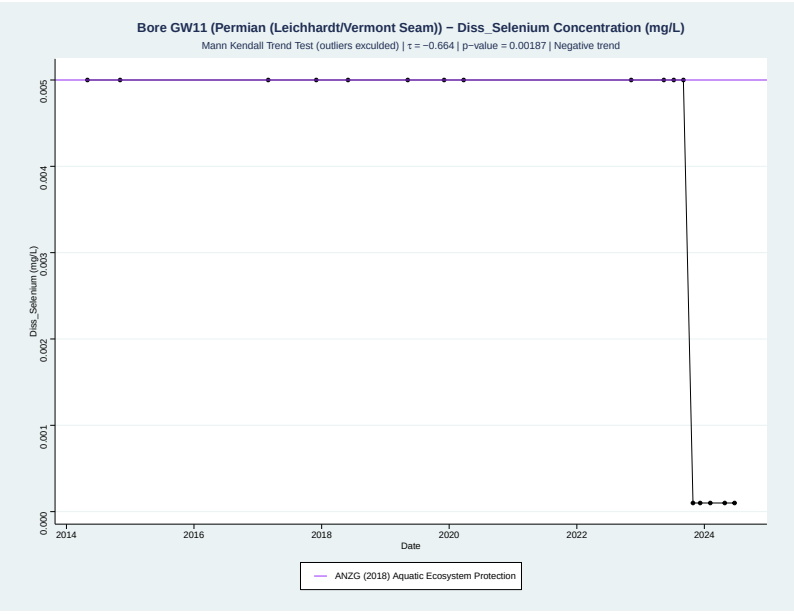

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.664 | p−value = 0.00187 | Negative trend
Diss_Lead (mg/L)
0.000
0.001
0.002
0.003
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

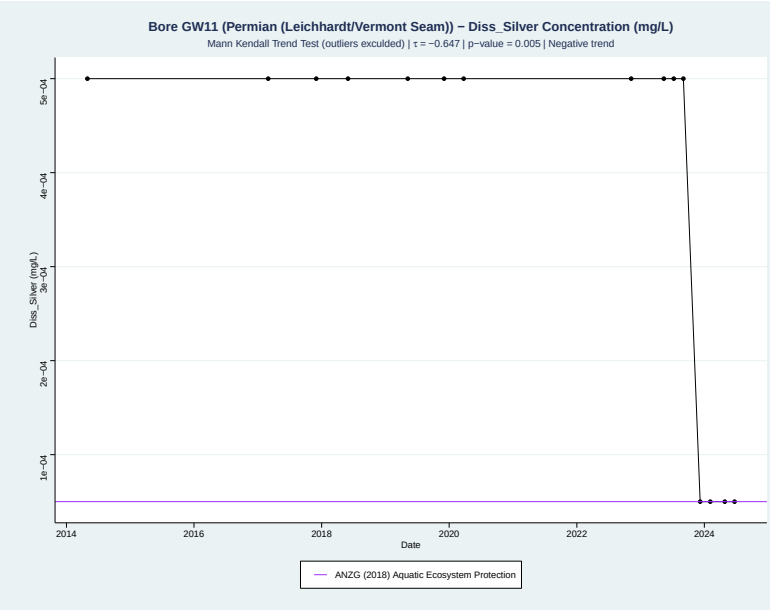

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.542 | p−value = 0.00437 | Negative trend
Diss_Manganese (mg/L)
0.0
0.5
1.0
1.5
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

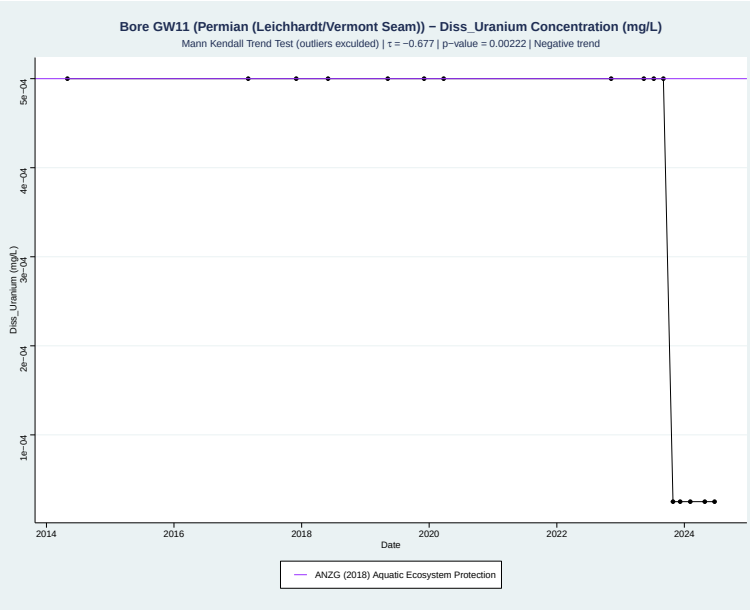

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.664 | p−value = 0.00187 | Negative trend
Diss_Mercury (mg/L)
2e−05
3e−05
4e−05
5e−05
6e−05
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

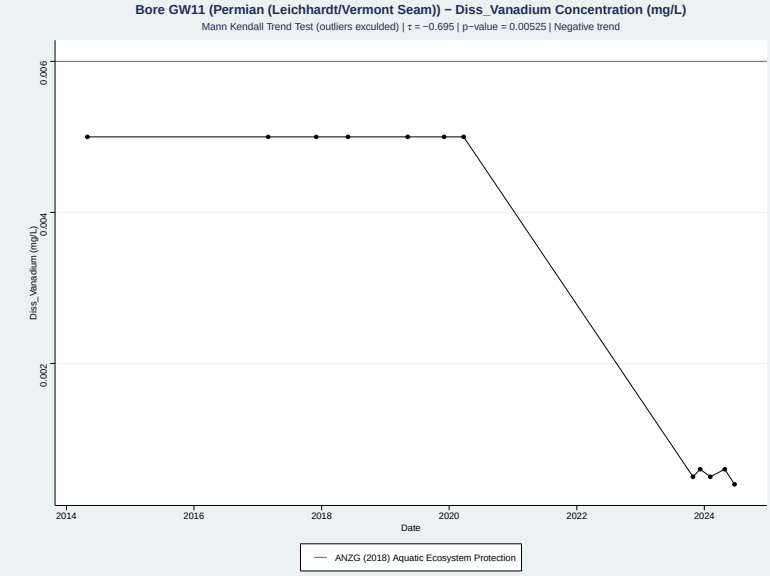

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.0609 | p−value = 0.913 | No trend
Diss_Molybdenum (mg/L)
0.00
0.01
0.02
0.03
2023−01
2023−07
2024−01
2024−07
Date
ANZG (2018) Aquatic Ecosystem Protection

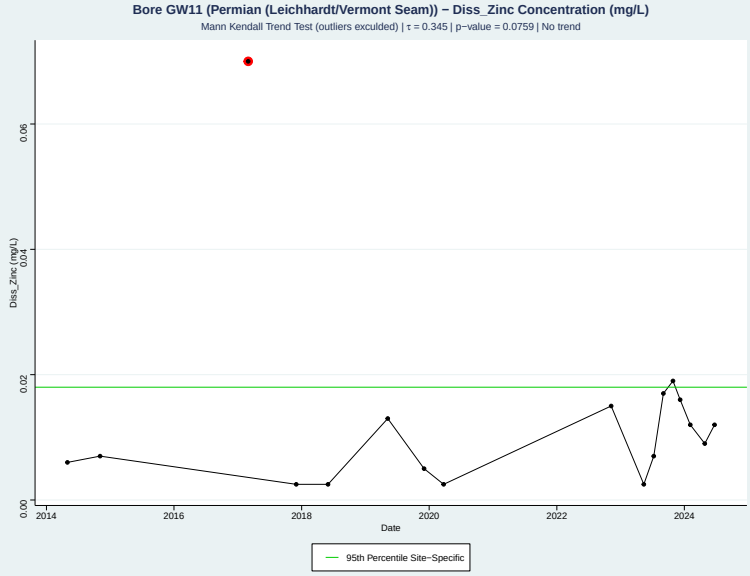

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.547 | p−value = 0.00608 | Positive trend
Diss_Nickel (mg/L)
0.000
0.003
0.006
0.009
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

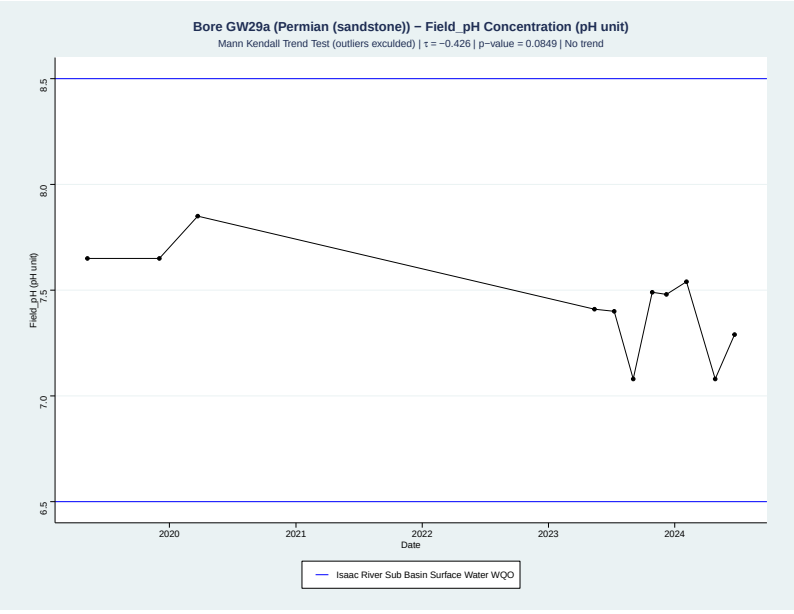

Bore GW11 (Permian (Leichhardt/Vermont Seam)) − Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.664 | p−value = 0.00187 | Negative trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

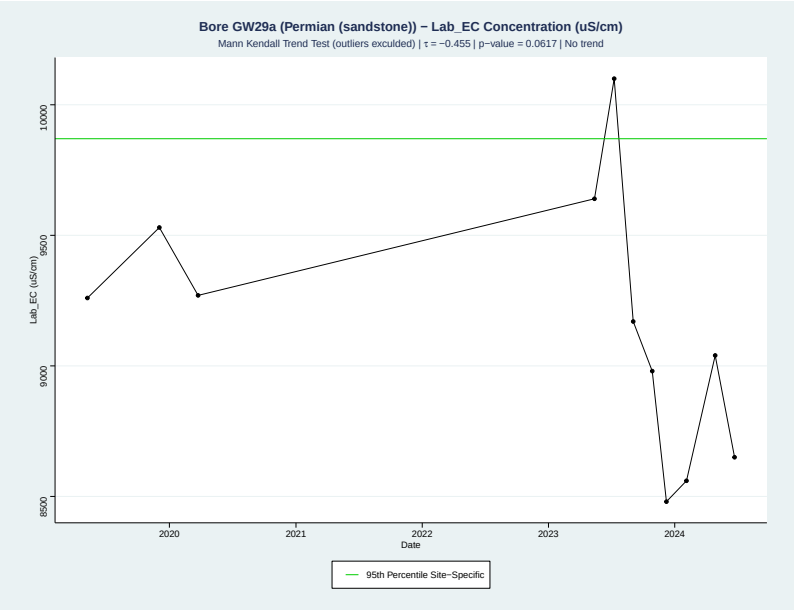

Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.647 | p−value = 0.005 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

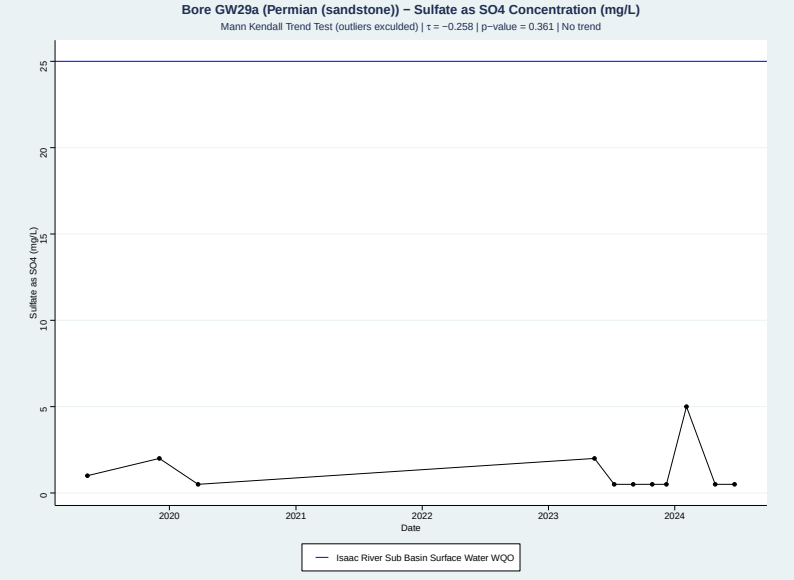

Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.677 | p−value = 0.00222 | Negative trend
Diss_Uranium (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

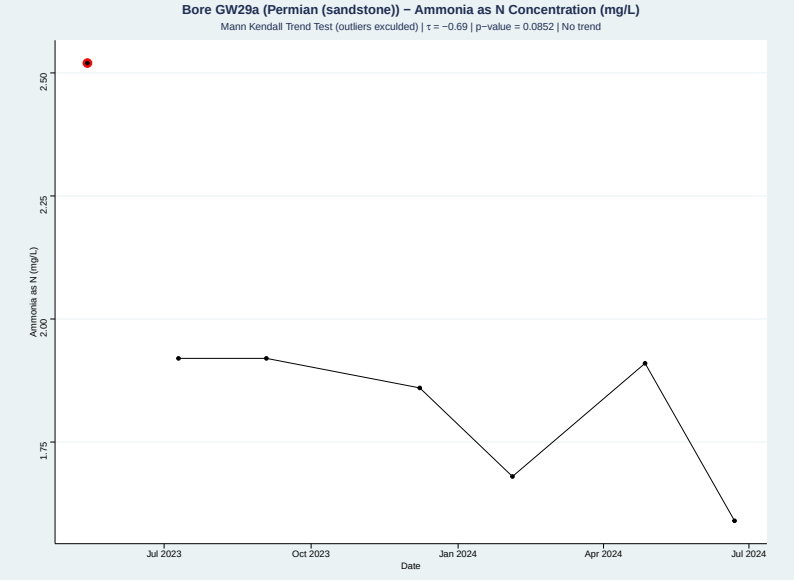

Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.695 | p−value = 0.00525 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
2014
2016
2018
2020
2022
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

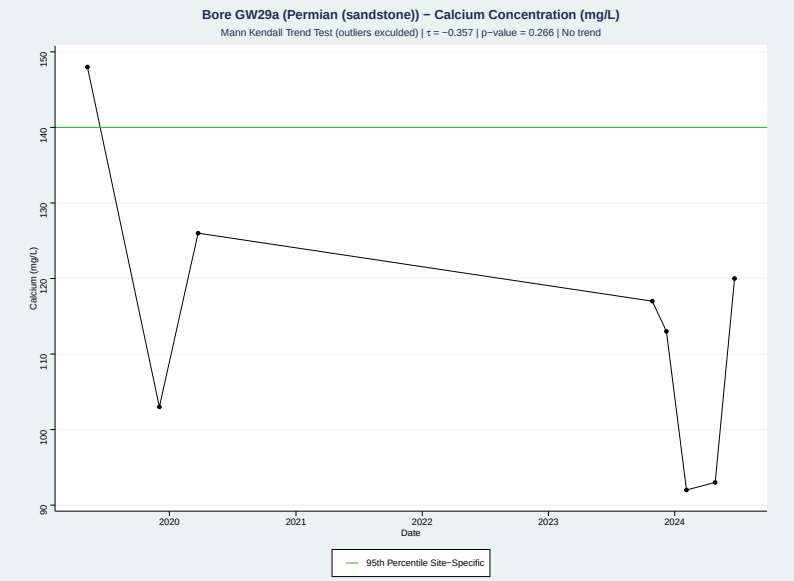

Bore GW11 (Permian (Leichhardt/Vermont Seam)) – Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.345 | p−value = 0.0759 | No trend
Diss_Zinc (mg/L)
0.06
0.04
0.02
0.00
2014
2016
2018
2020
2022
2024
Date
95th Percentile Site−Specific

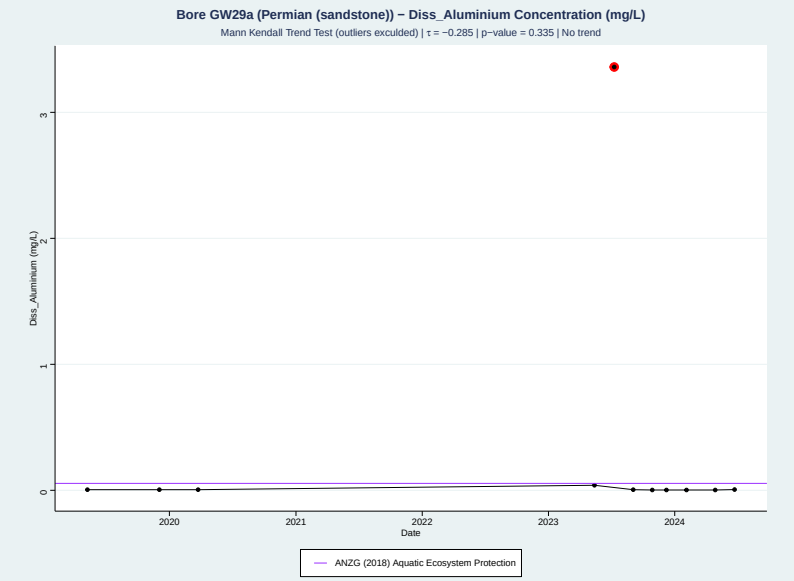

Bore GW29a (Permian (sandstone)) – Field_pH Concentration (pH unit)
Mann Kendall Trend Test (outliers excluded) | τ = −0.426 | p−value = 0.0849 | No trend
Field_pH (pH unit)
Date
Isaac River Sub Basin Surface Water WQO

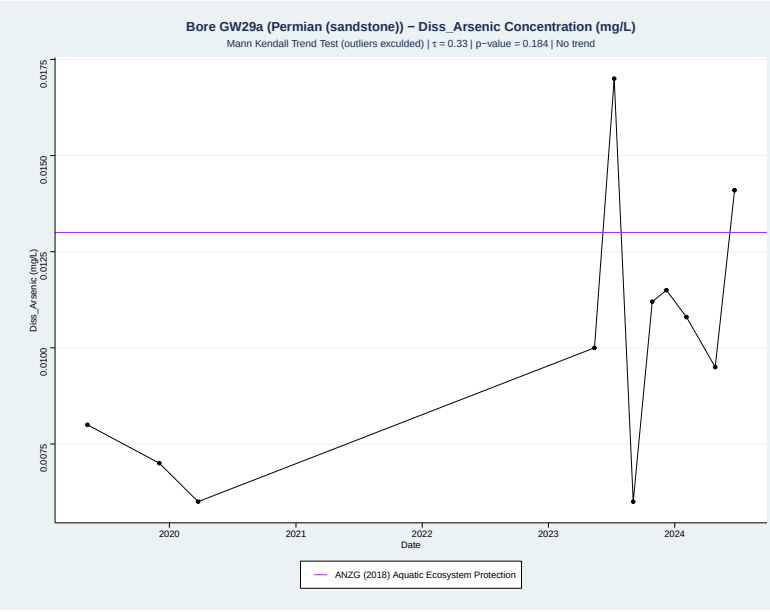

Bore GW29a (Permian (sandstone)) – Lab_EC Concentration (uS/cm)
Mann Kendall Trend Test (outliers excluded) | τ = −0.455 | p−value = 0.0617 | No trend
Lab_EC (uS/cm)
Date
95th Percentile Site−Specific

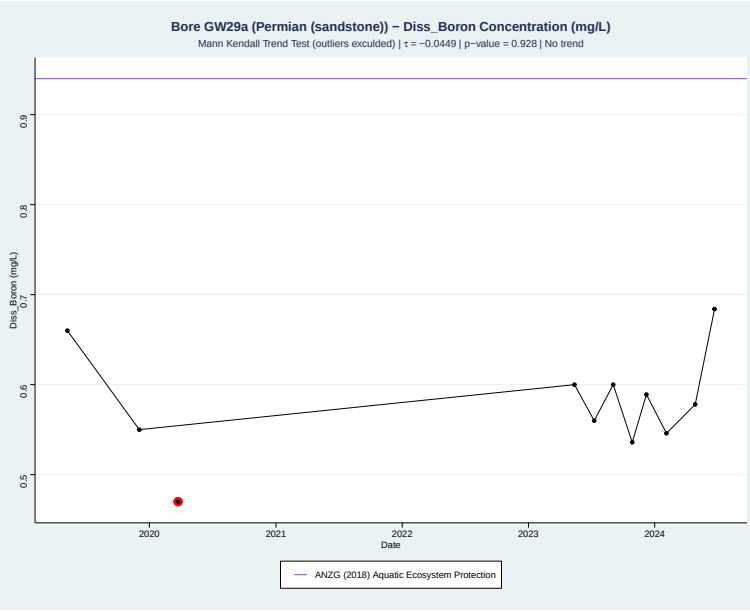

Bore GW29a (Permian (sandstone)) – Sulfate as SO4 Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.258 | p−value = 0.361 | No trend
Sulfate as SO4 (mg/L)
Date
Isaac River Sub Basin Surface Water WQO

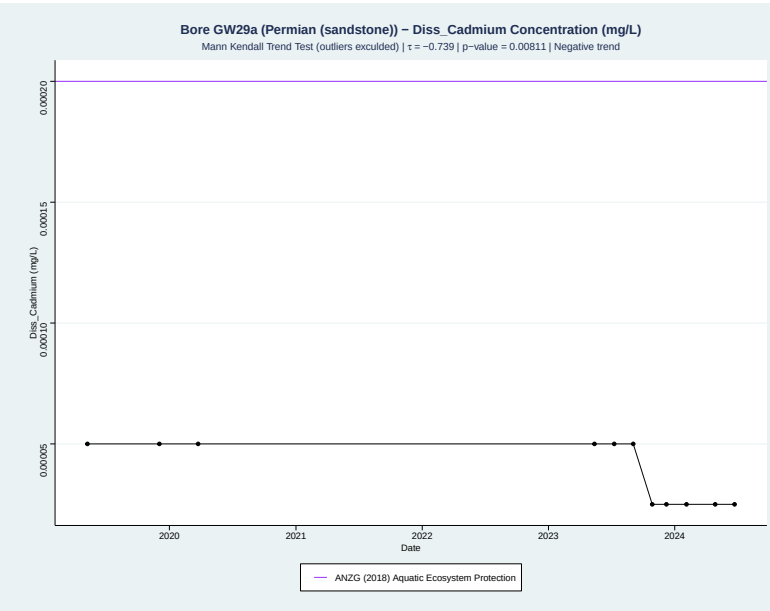

Bore GW29a (Permian (sandstone)) – Ammonia as N Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.69 | p−value = 0.0852 | No trend
Ammonia as N (mg/L)
Date

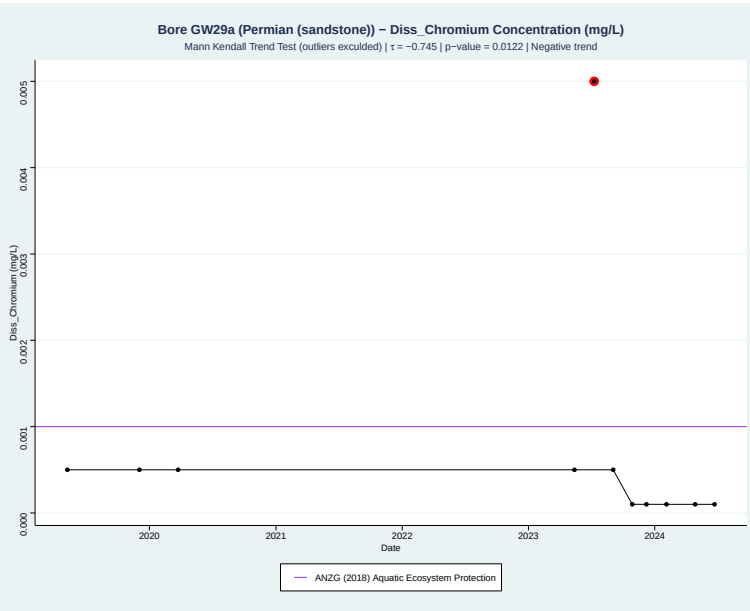

Bore GW29a (Permian (sandstone)) – Calcium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.357 | p−value = 0.266 | No trend
Calcium (mg/L)
Date
95th Percentile Site−Specific

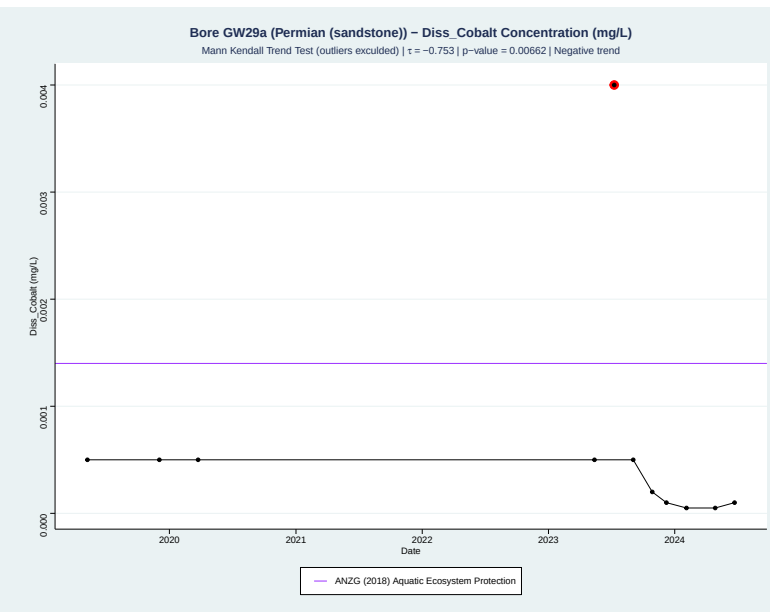

Bore GW29a (Permian (sandstone)) – Diss_Aluminium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.285 | p−value = 0.335 | No trend
Diss_Aluminium (mg/L)
Date
ANZG (2018) Aquatic Ecosystem Protection

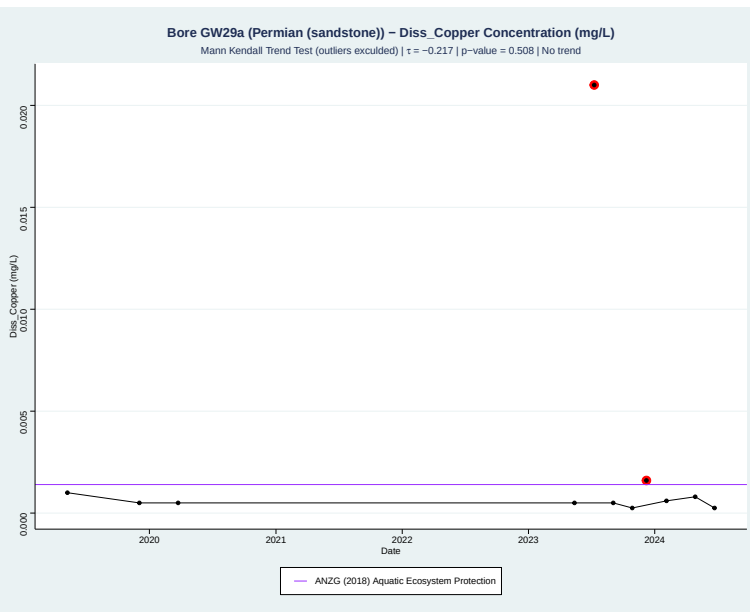

Bore GW29a (Permian (sandstone)) – Diss_Arsenic Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.33 | p−value = 0.184 | No trend
Diss_Arsenic (mg/L)
0.0175
0.0150
0.0125
0.0100
0.0075
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

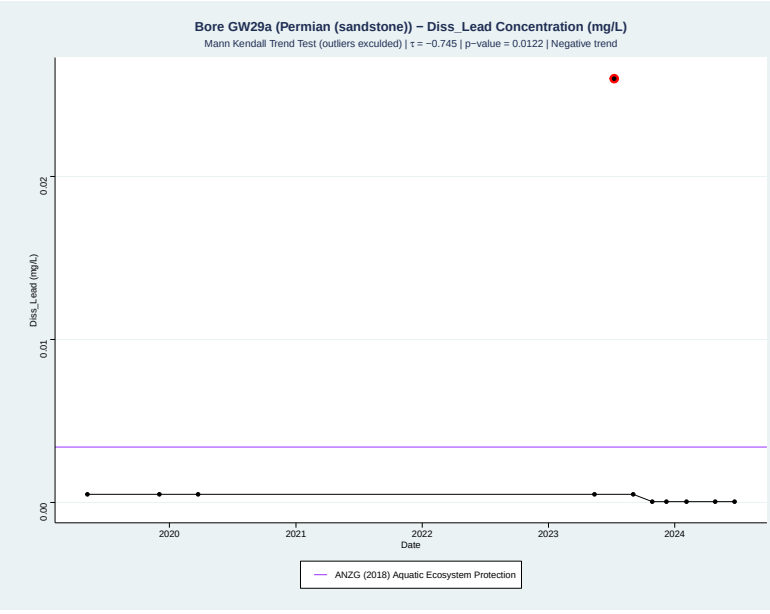

Bore GW29a (Permian (sandstone)) – Diss_Boron Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.0449 | p−value = 0.928 | No trend
Diss_Boron (mg/L)
0.9
0.8
0.7
0.6
0.5
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

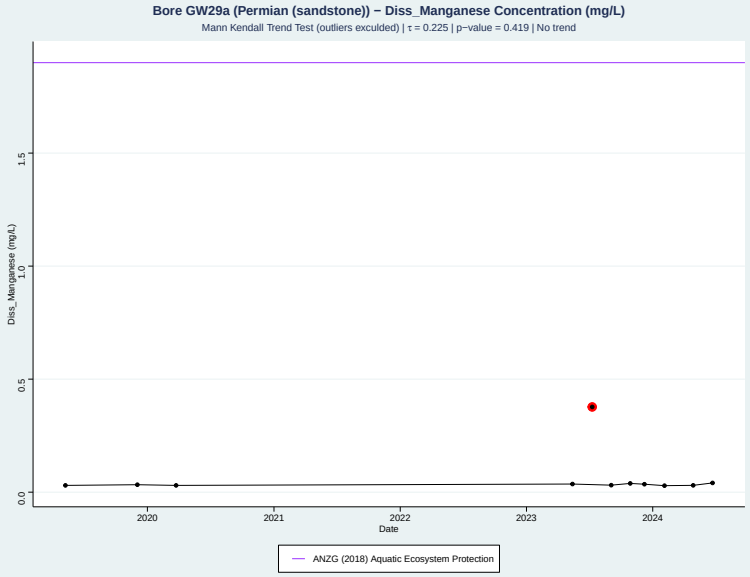

Bore GW29a (Permian (sandstone)) – Diss_Cadmium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.739 | p−value = 0.00811 | Negative trend
Diss_Cadmium (mg/L)
0.00020
0.00015
0.00010
0.00005
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

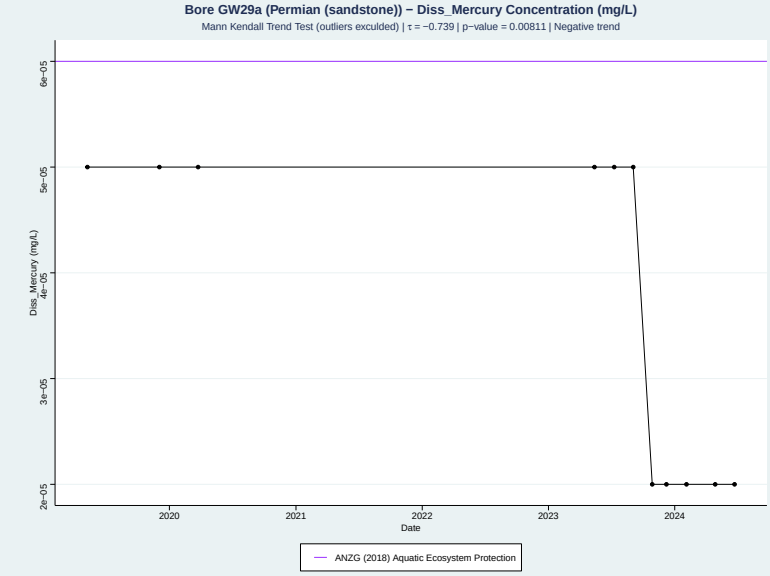

Bore GW29a (Permian (sandstone)) – Diss_Chromium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Chromium (mg/L)
0.005
0.004
0.003
0.002
0.001
0.000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

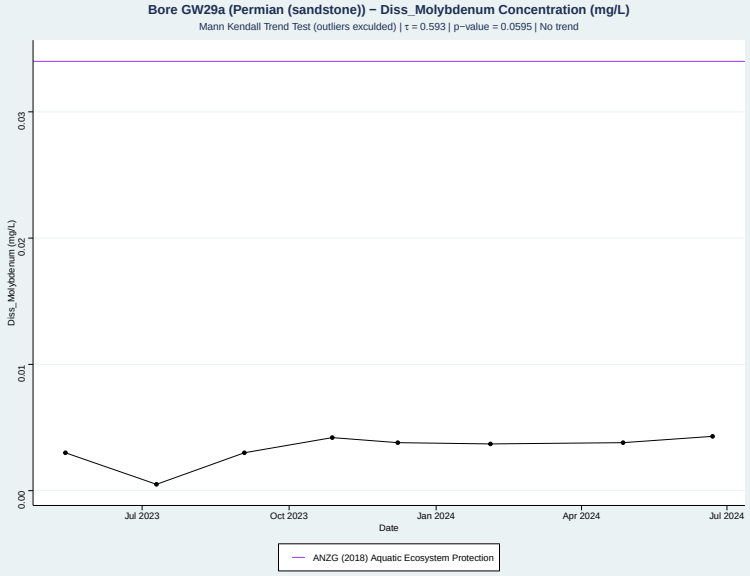

Bore GW29a (Permian (sandstone)) – Diss_Cobalt Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.753 | p−value = 0.00662 | Negative trend
Diss_Cobalt (mg/L)
0.004
0.003
0.002
0.001
0.000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

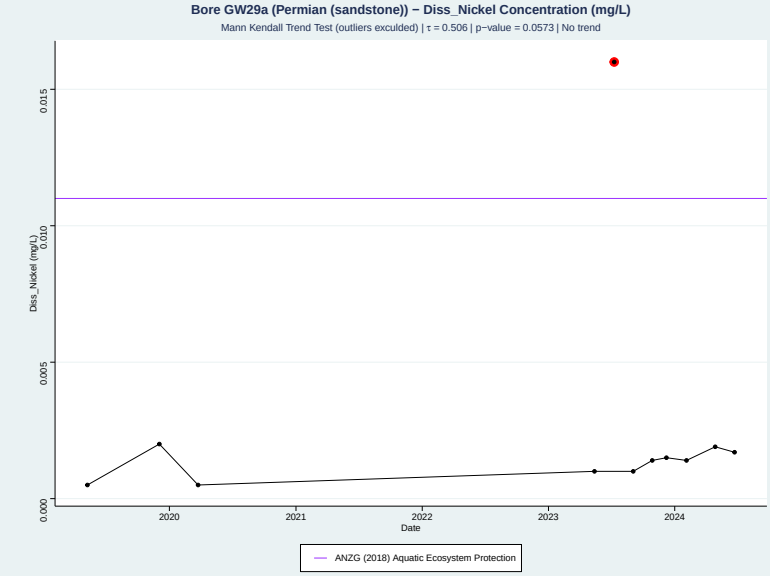

Bore GW29a (Permian (sandstone)) – Diss_Copper Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.217 | p−value = 0.508 | No trend
Diss_Copper (mg/L)
0.020
0.015
0.010
0.005
0.000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

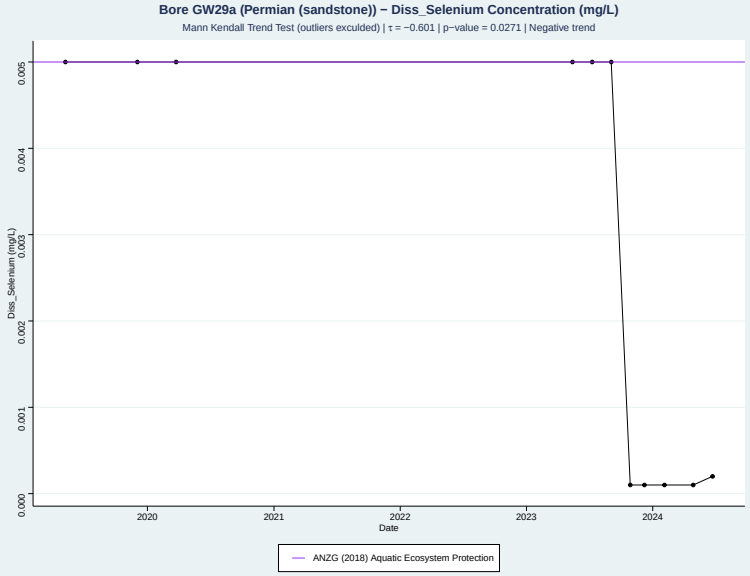

Bore GW29a (Permian (sandstone)) – Diss_Lead Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Lead (mg/L)
0.00
0.01
0.02
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

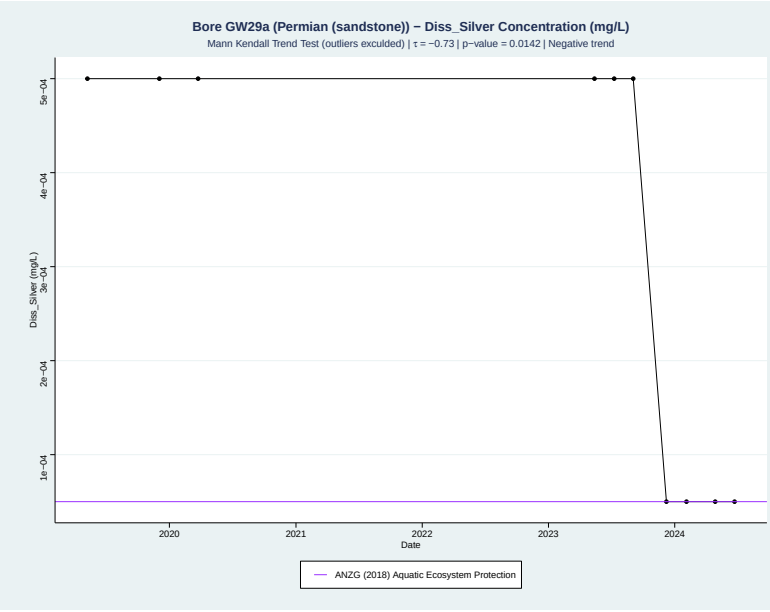

Bore GW29a (Permian (sandstone)) – Diss_Manganese Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.225 | p−value = 0.419 | No trend
Diss_Manganese (mg/L)
0.0
0.5
1.0
1.5
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

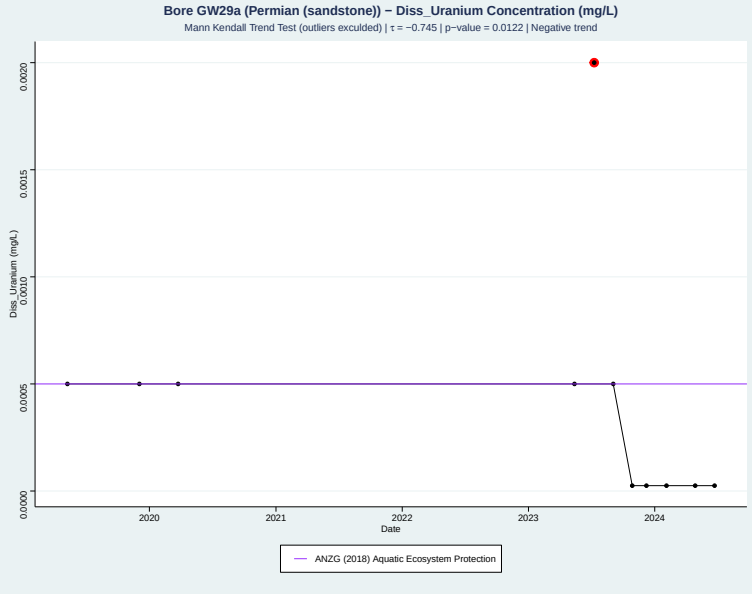

Bore GW29a (Permian (sandstone)) – Diss_Mercury Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.739 | p−value = 0.00811 | Negative trend
Diss_Mercury (mg/L)
2e−05
3e−05
4e−05
5e−05
6e−05
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection

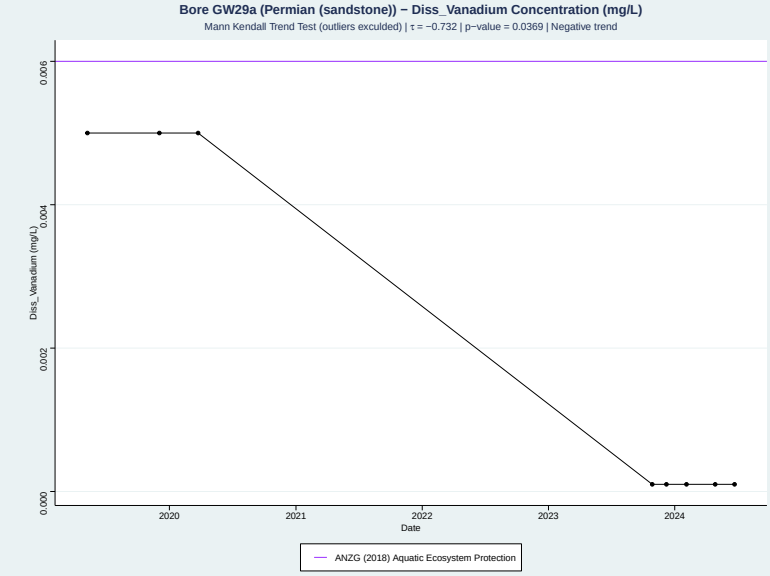

Bore GW29a (Permian (sandstone)) – Diss_Molybdenum Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.593 | p−value = 0.0595 | No trend
Diss_Molybdenum (mg/L)
0.00
0.01
0.02
0.03
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Date
ANZG (2018) Aquatic Ecosystem Protection

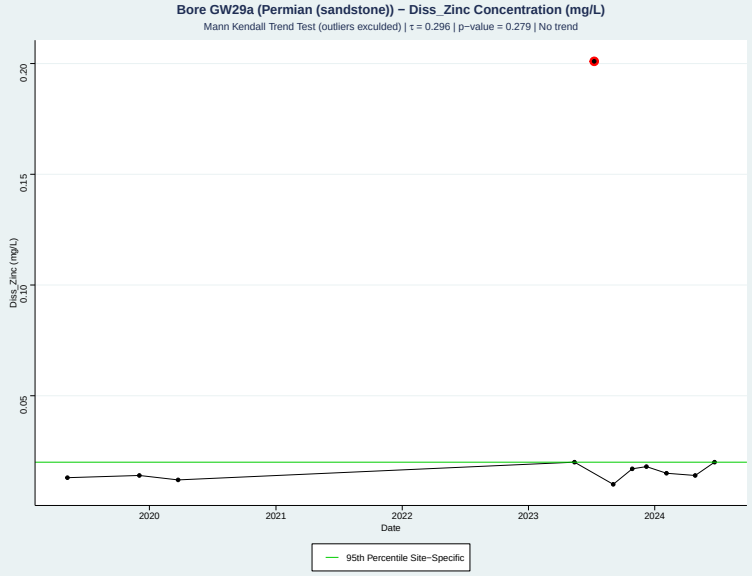

Bore GW29a (Permian (sandstone)) – Diss_Nickel Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = 0.506 | p−value = 0.0573 | No trend
Diss_Nickel (mg/L)
0.000
0.005
0.010
0.015
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW29a (Permian (sandstone)) – Diss_Selenium Concentration (mg/L)
Mann Kendall Trend Test (outliers excluded) | τ = −0.601 | p−value = 0.0271 | Negative trend
Diss_Selenium (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW29a (Permian (sandstone)) − Diss_Silver Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.73 | p−value = 0.0142 | Negative trend
Diss_Silver (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW29a (Permian (sandstone)) − Diss_Uranium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.745 | p−value = 0.0122 | Negative trend
Diss_Uranium (mg/L)
0.0020
0.0015
0.0010
0.0005
0.0000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW29a (Permian (sandstone)) − Diss_Vanadium Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = −0.732 | p−value = 0.0369 | Negative trend
Diss_Vanadium (mg/L)
0.006
0.004
0.002
0.000
2020
2021
2022
2023
2024
Date
ANZG (2018) Aquatic Ecosystem Protection


Bore GW29a (Permian (sandstone)) − Diss_Zinc Concentration (mg/L)
Mann Kendall Trend Test (outliers exculded) | τ = 0.296 | p−value = 0.279 | No trend
Diss_Zinc (mg/L)
0.20
0.15
0.10
0.05
2020
2021
2022
2023
2024
Date
95th Percentile Site−Specific

Appendix C Water Quality Boxplots

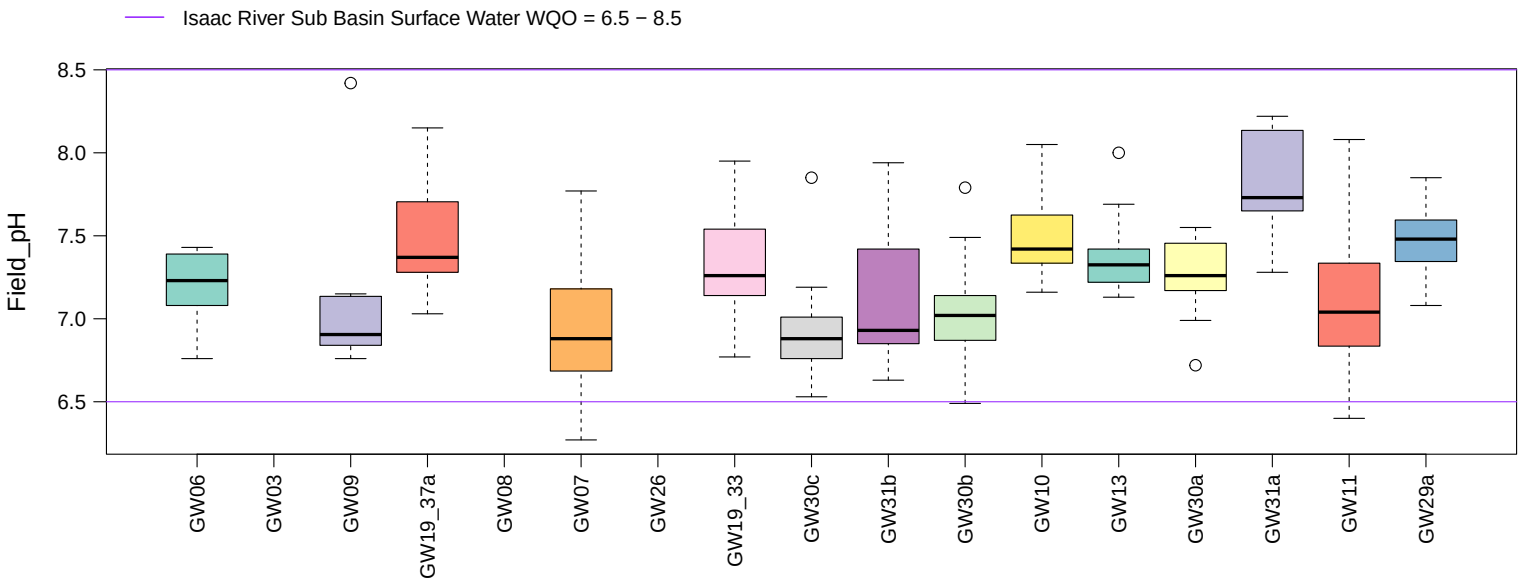
Groundwater Compliance 2024 Updated Limit and Trigger Development

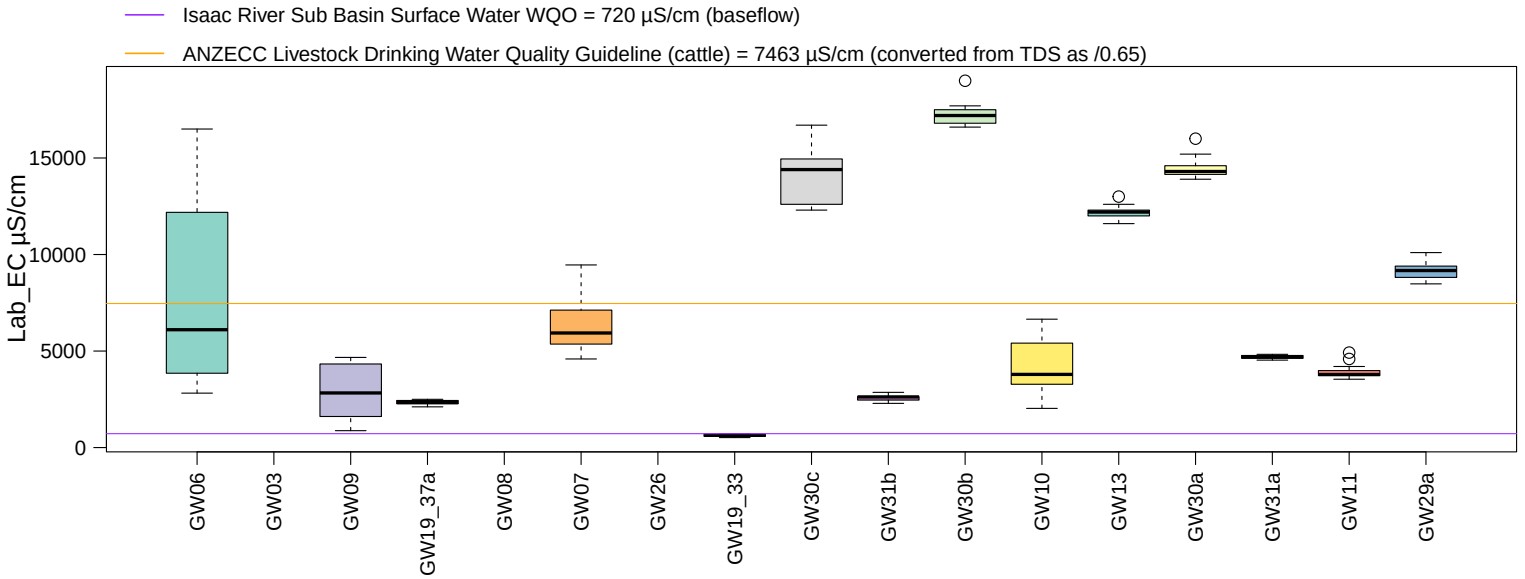
New Lenton Coal Project

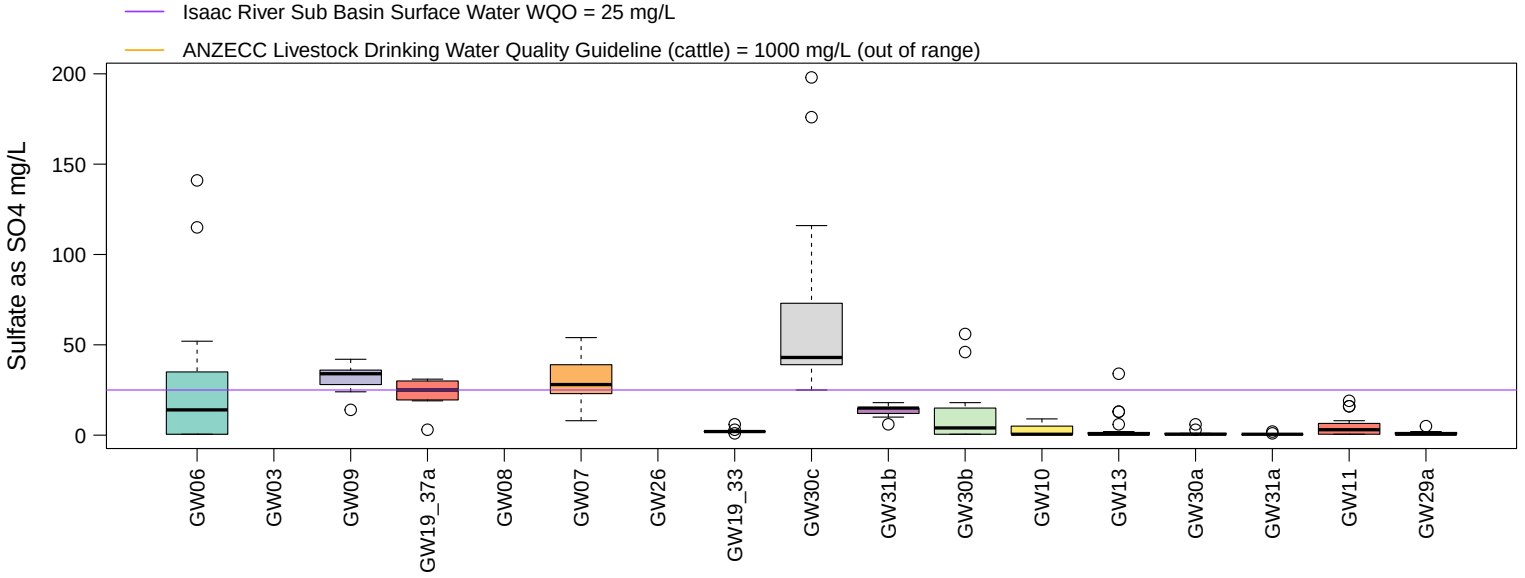
Lenton Joint Venture

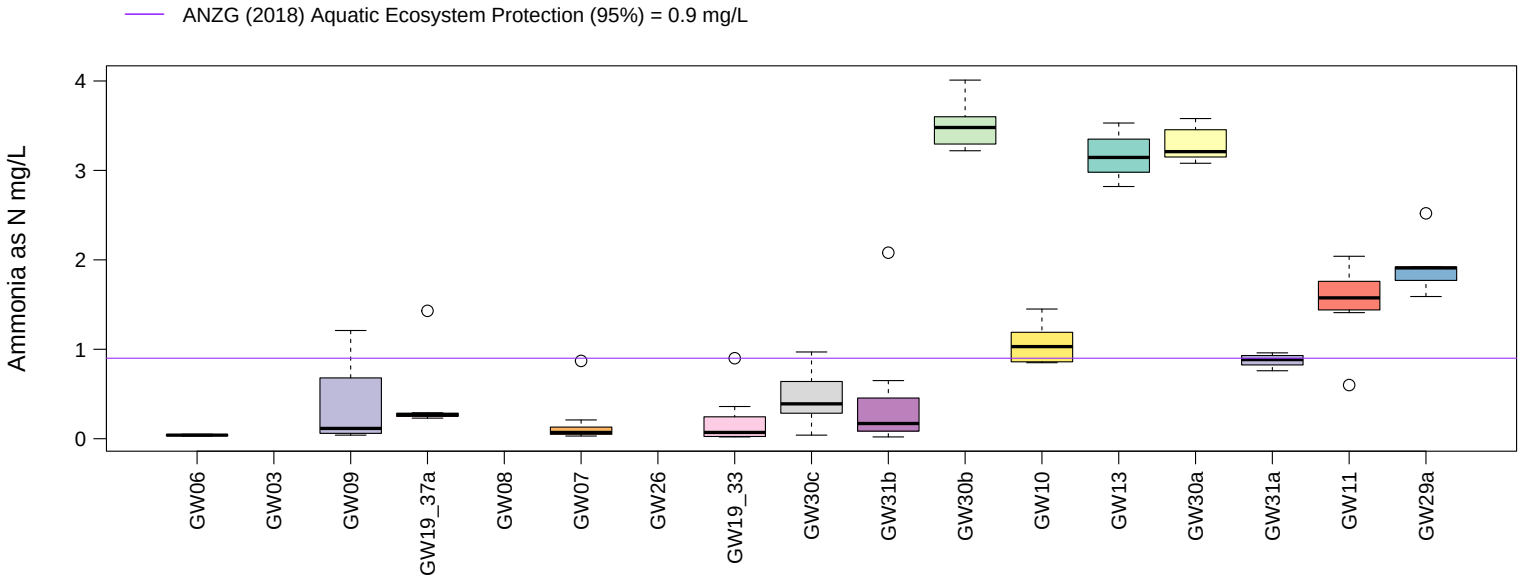
SLR Project No.: 620.040927.00001

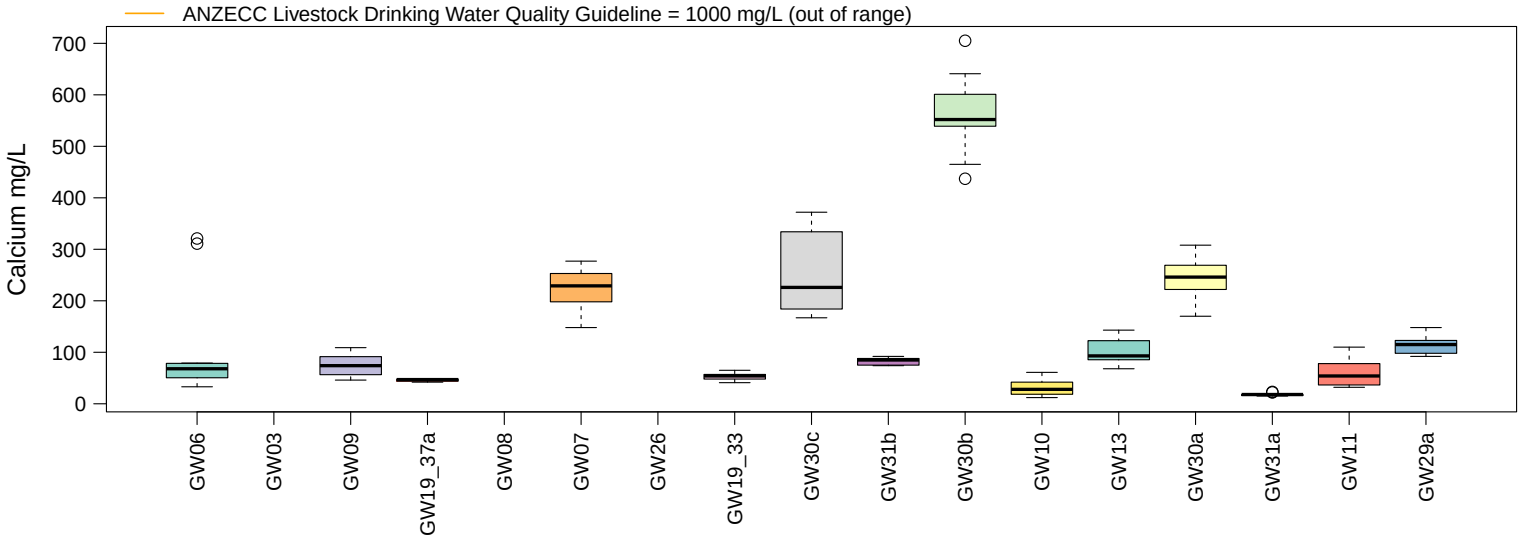
25 September 2024

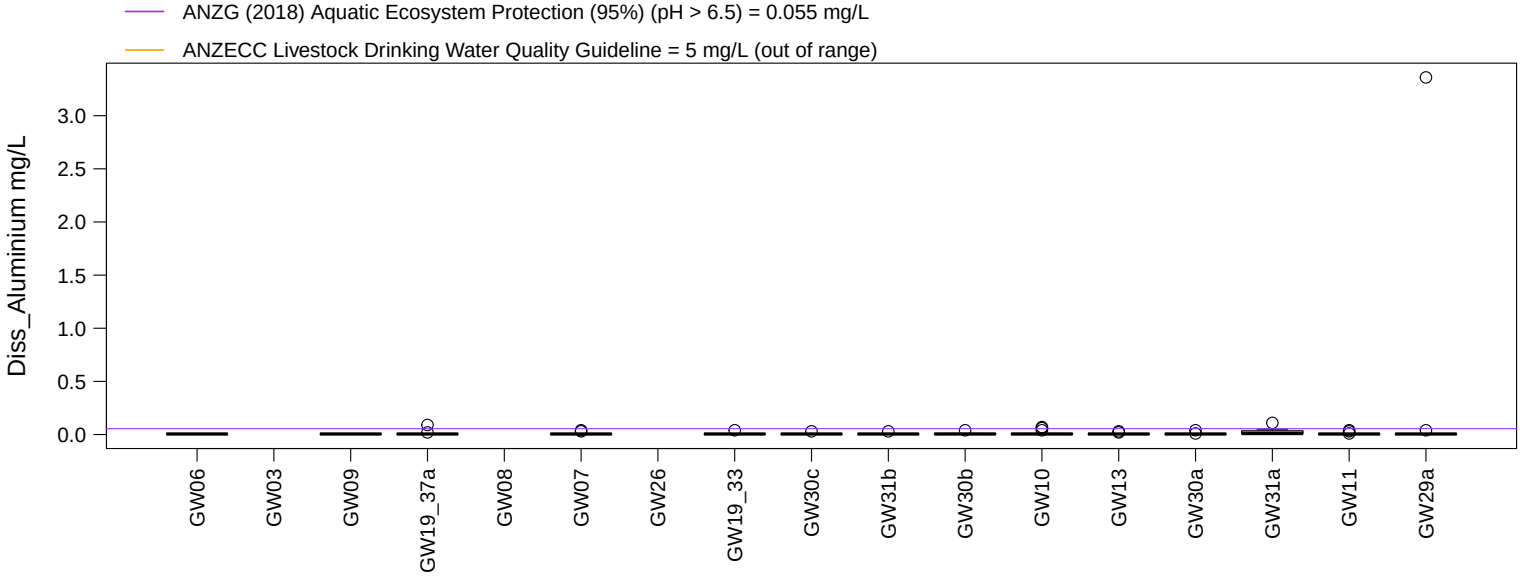

Isaac River Sub Basin Surface Water WQO = 6.5 − 8.5
Field_pH
8.5
8.0
7.5
7.0
6.5
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

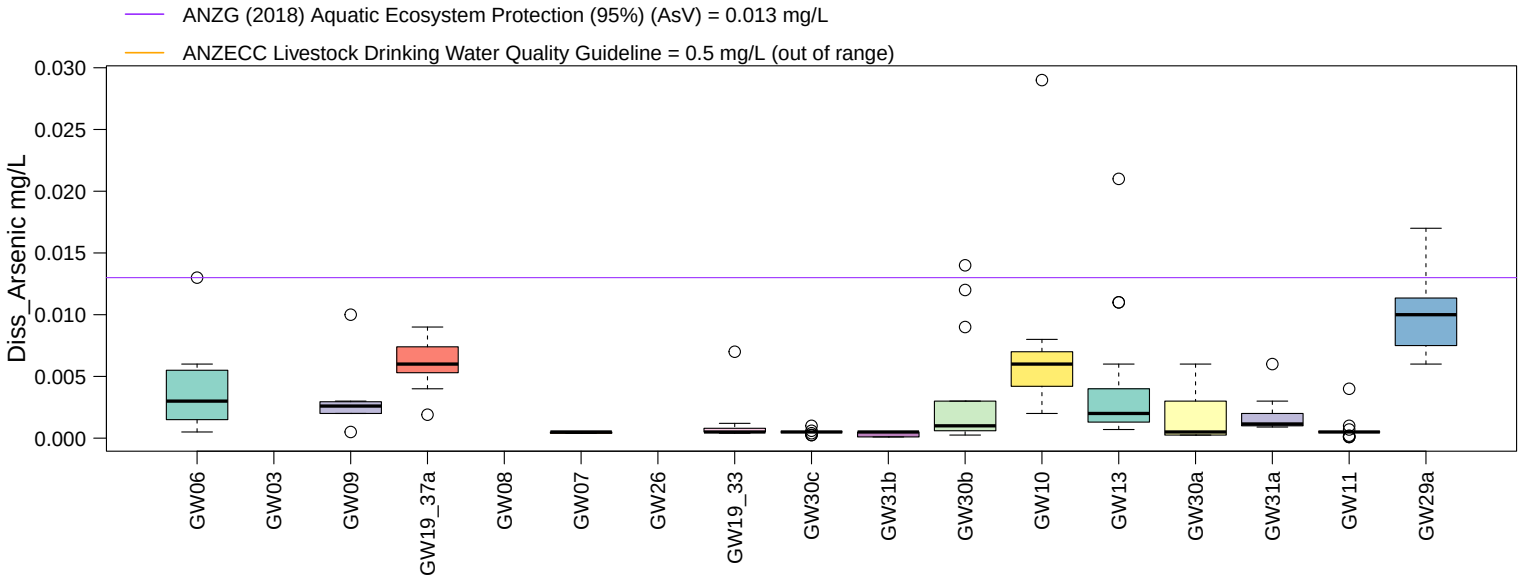

Isaac River Sub Basin Surface Water WQO = 720 µS/cm (baseflow)
ANZECC Livestock Drinking Water Quality Guideline (cattle) = 7463 µS/cm (converted from TDS as /0.65)
Lab_EC µS/cm
15000
10000
5000
0
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

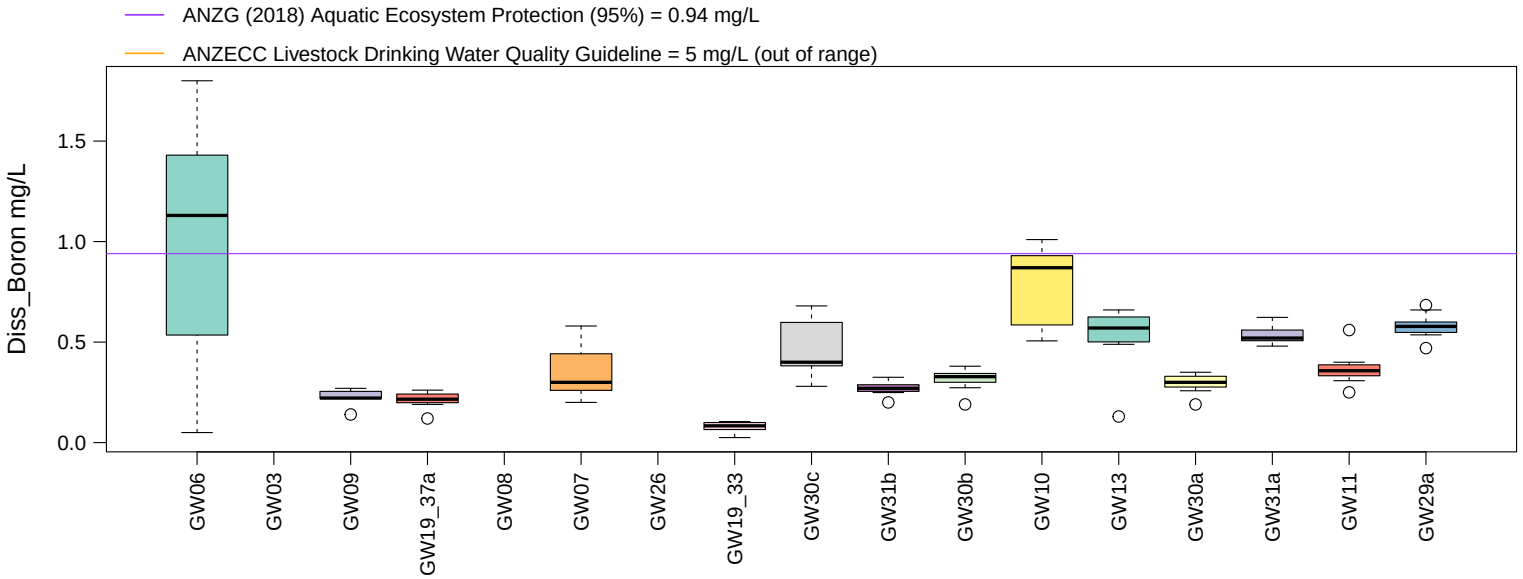

Isaac River Sub Basin Surface Water WQO = 25 mg/L
ANZECC Livestock Drinking Water Quality Guideline (cattle) = 1000 mg/L (out of range)
Sulfate as SO4 mg/L
200
150
100
50
0
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

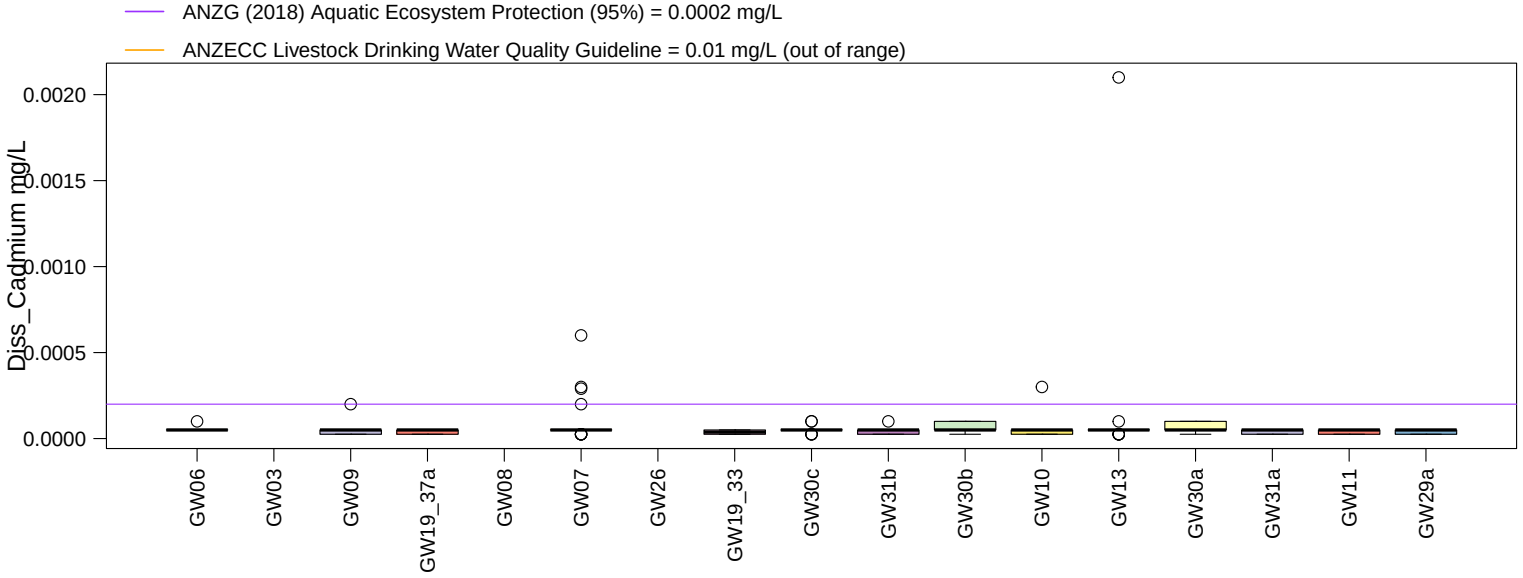

ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.9 mg/L
Ammonia as N mg/L
0
1
2
3
4
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

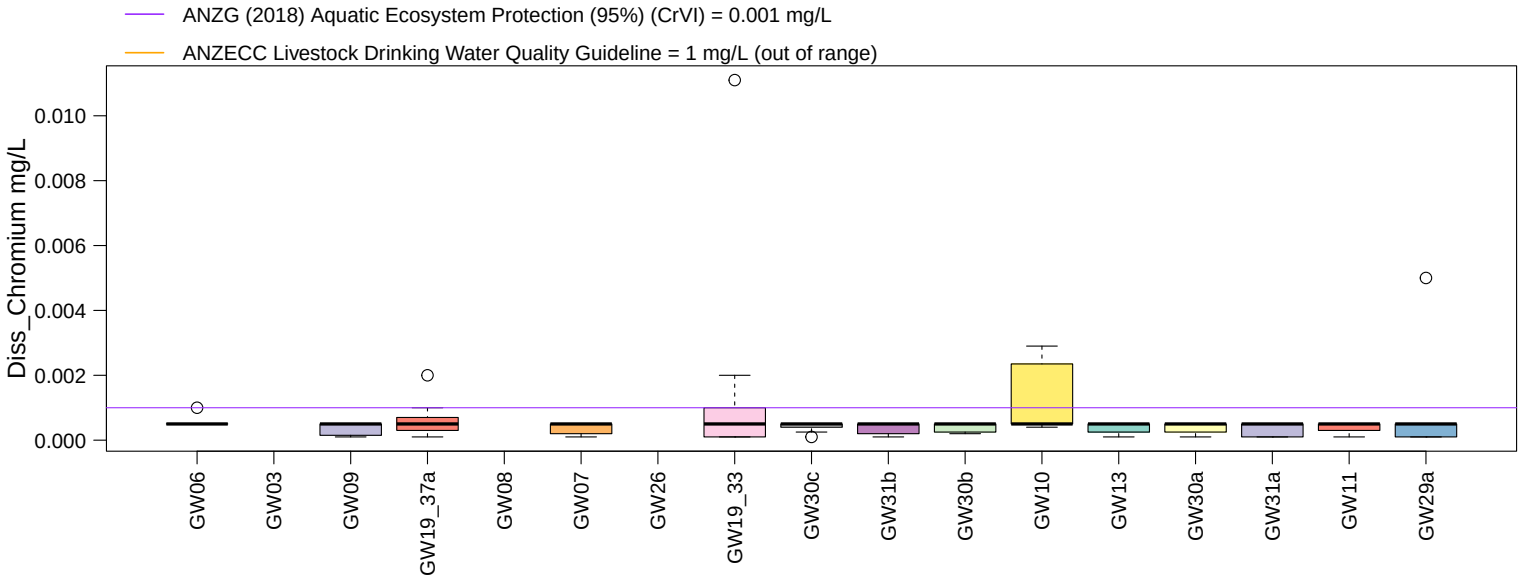

ANZECC Livestock Drinking Water Quality Guideline = 1000 mg/L (out of range)
Calcium mg/L
0
100
200
300
400
500
600
700
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

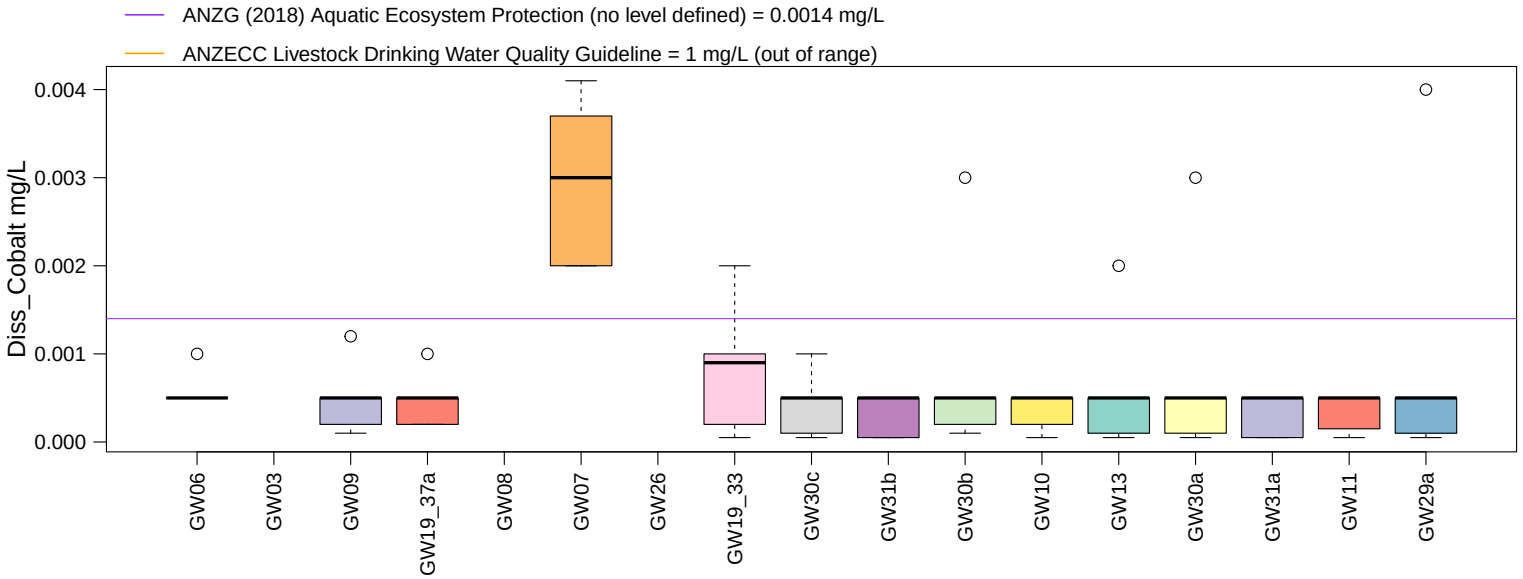

ANZG (2018) Aquatic Ecosystem Protection (95%) (pH > 6.5) = 0.055 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 5 mg/L (out of range)
Diss_Aluminium mg/L
0.0
0.5
1.0
1.5
2.0
2.5
3.0
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

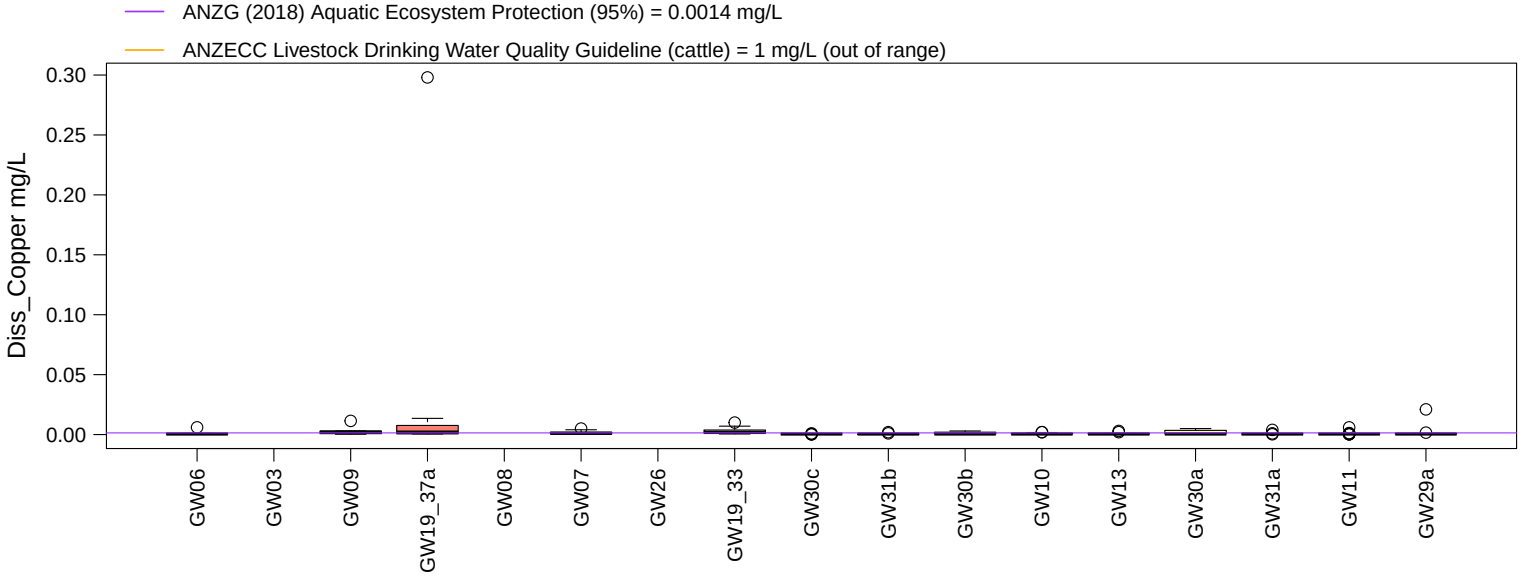

ANZG (2018) Aquatic Ecosystem Protection (95%) (AsV) = 0.013 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.5 mg/L (out of range)
Diss_Arsenic mg/L
0.030
0.025
0.020
0.015
0.010
0.005
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

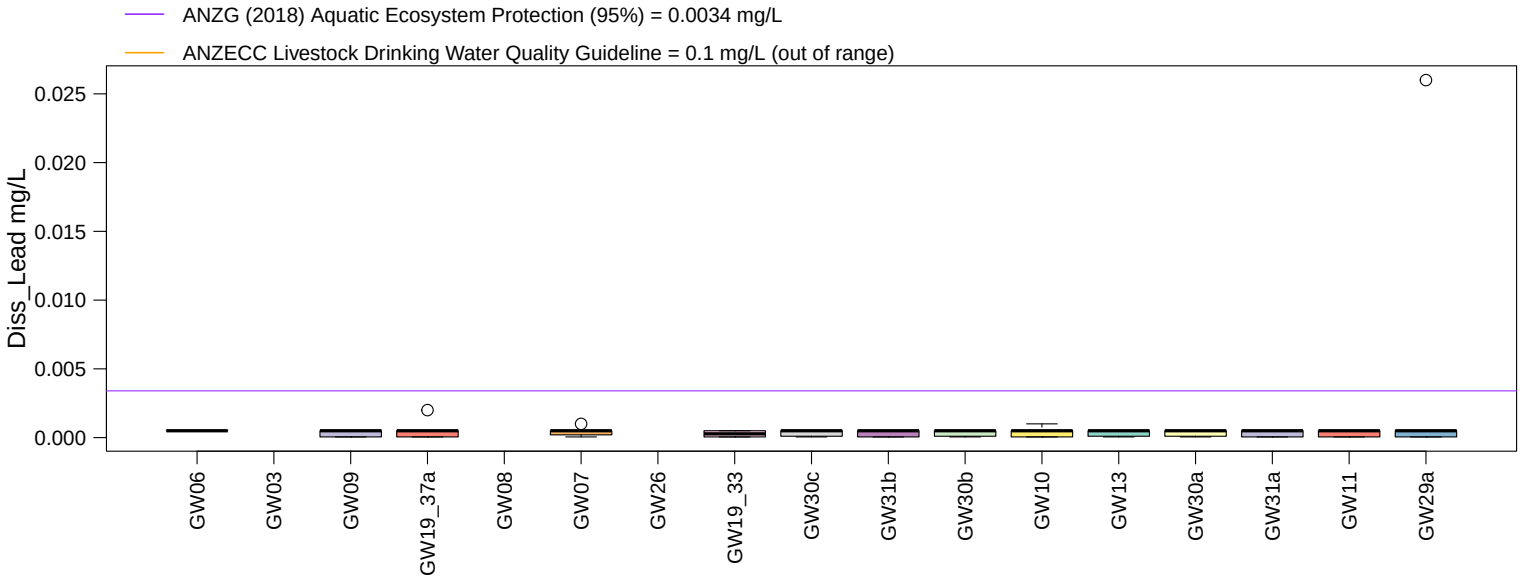

ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.94 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 5 mg/L (out of range)
Diss_Boron mg/L
1.5
1.0
0.5
0.0
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

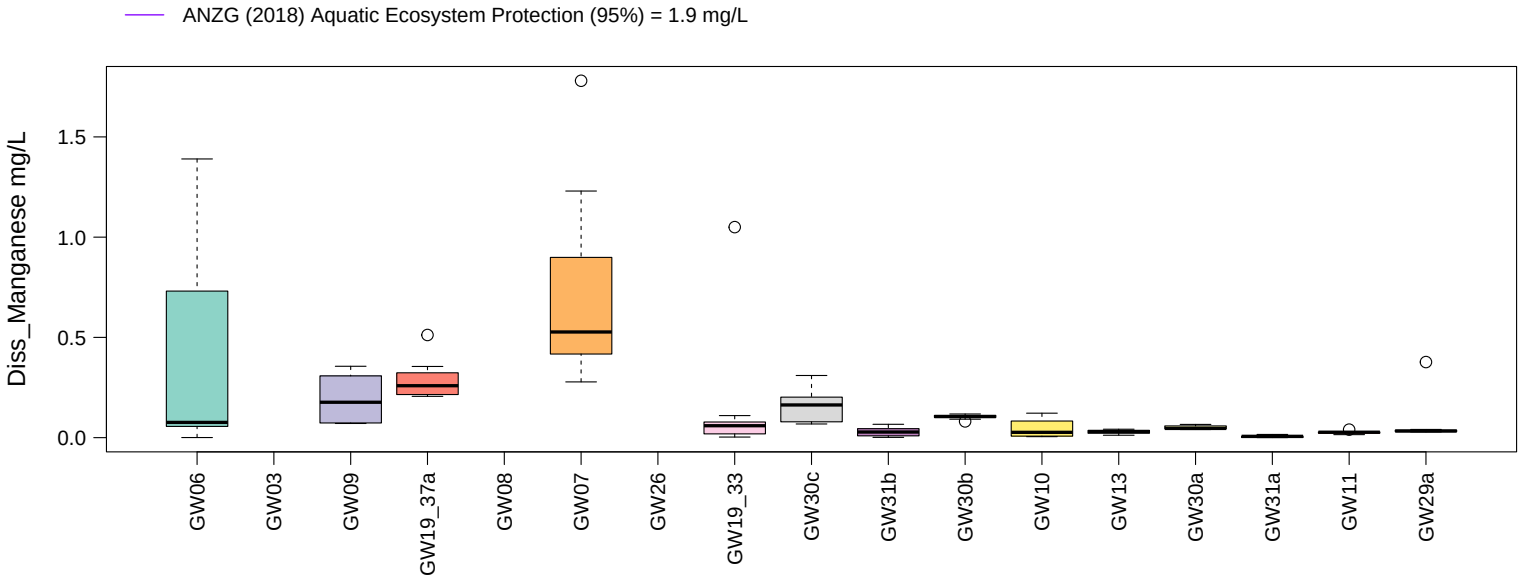

ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.0002 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.01 mg/L (out of range)
Diss_Cadmium mg/L
0.0020
0.0015
0.0010
0.0005
0.0000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

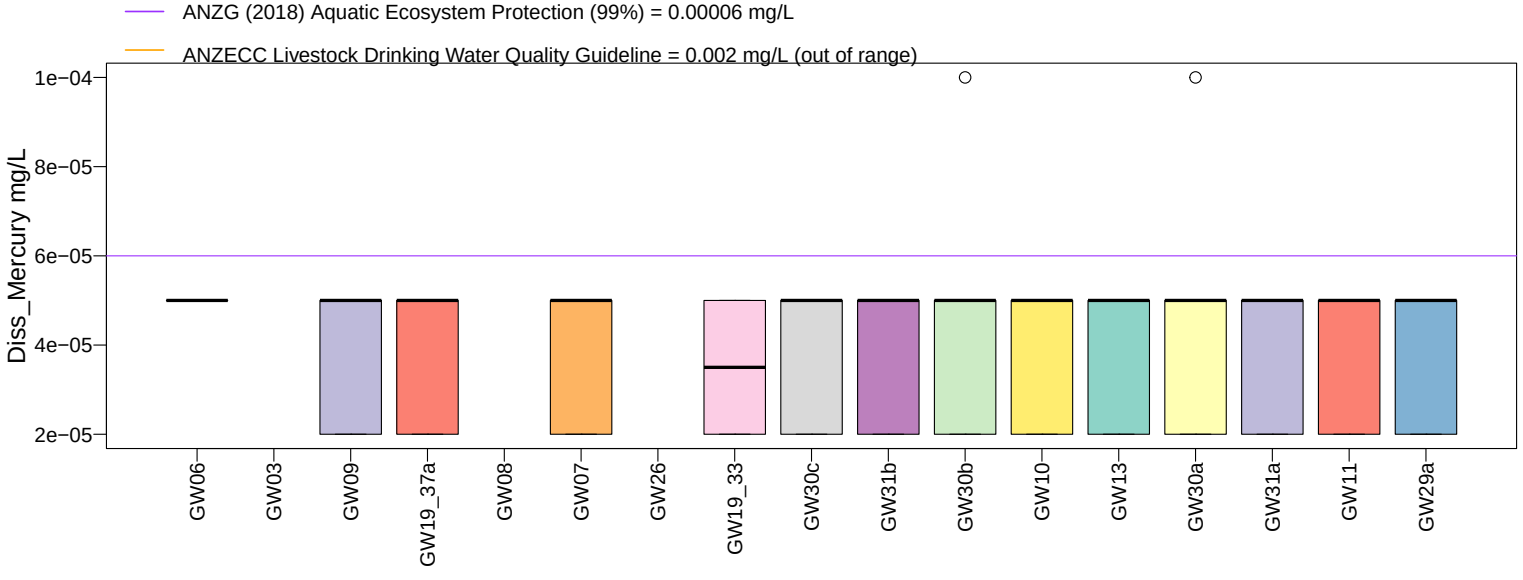

ANZG (2018) Aquatic Ecosystem Protection (95%) (CrVI) = 0.001 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 1 mg/L (out of range)
Diss_Chromium mg/L
0.000
0.002
0.004
0.006
0.008
0.010
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

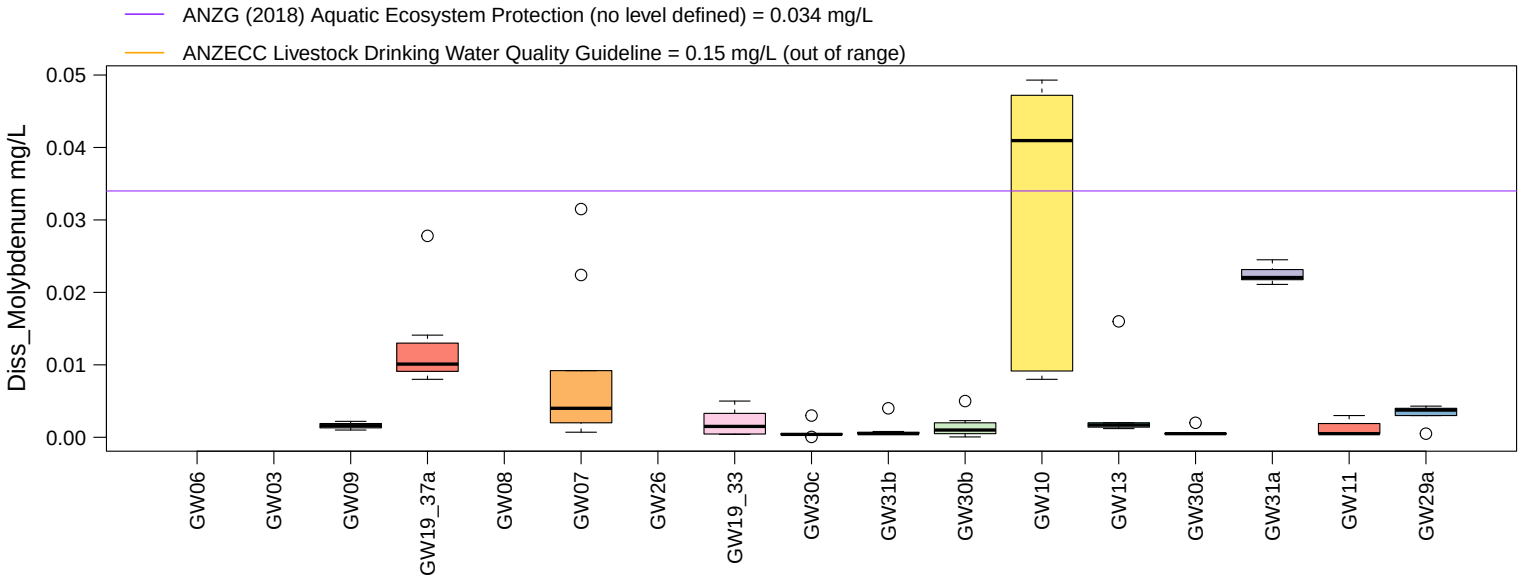

ANZG (2018) Aquatic Ecosystem Protection (no level defined) = 0.0014 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 1 mg/L (out of range)
Diss_Cobalt mg/L
0.000
0.001
0.002
0.003
0.004
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

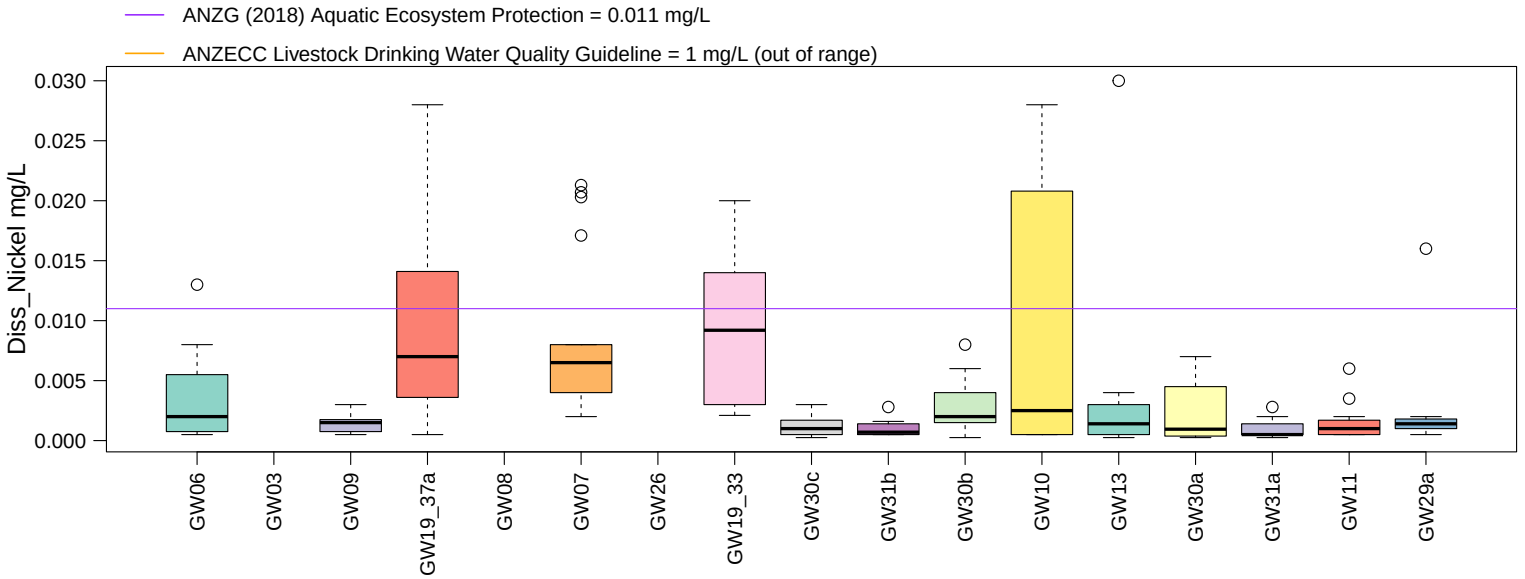

ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.0014 mg/L
ANZECC Livestock Drinking Water Quality Guideline (cattle) = 1 mg/L (out of range)
Diss_Copper mg/L
0.00
0.05
0.10
0.15
0.20
0.25
0.30
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

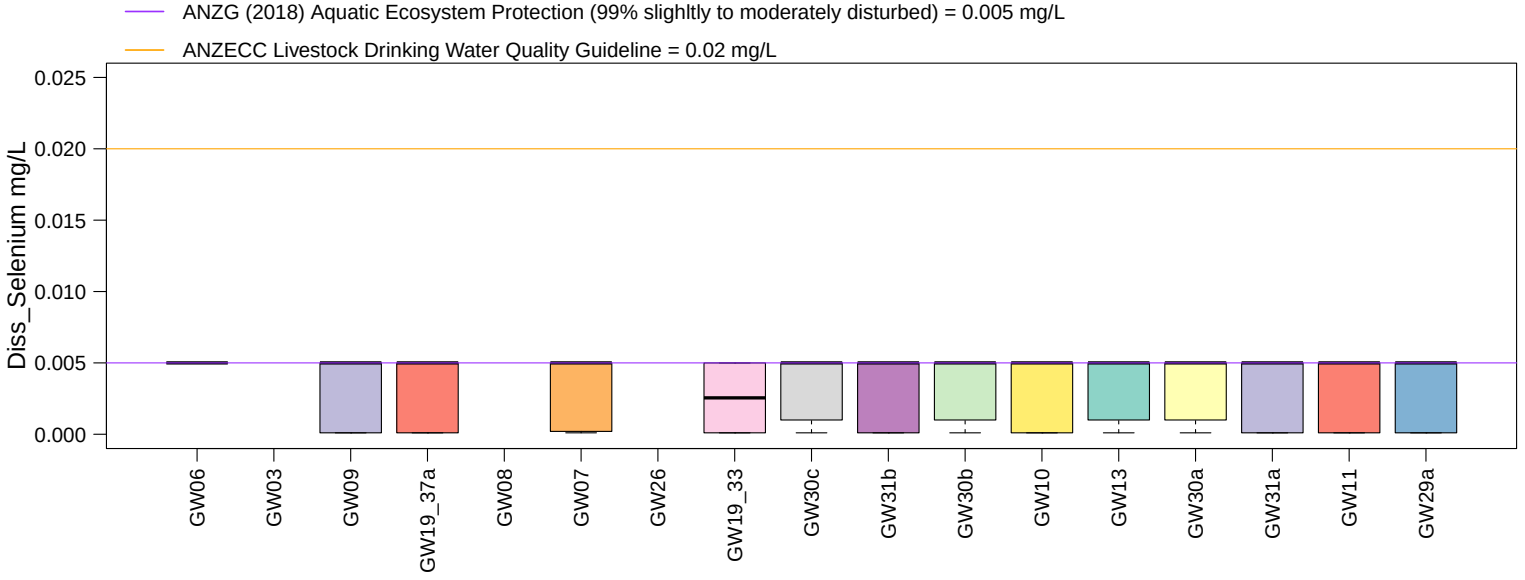

ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.0034 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.1 mg/L (out of range)
Diss_Lead mg/L
0.025
0.020
0.015
0.010
0.005
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

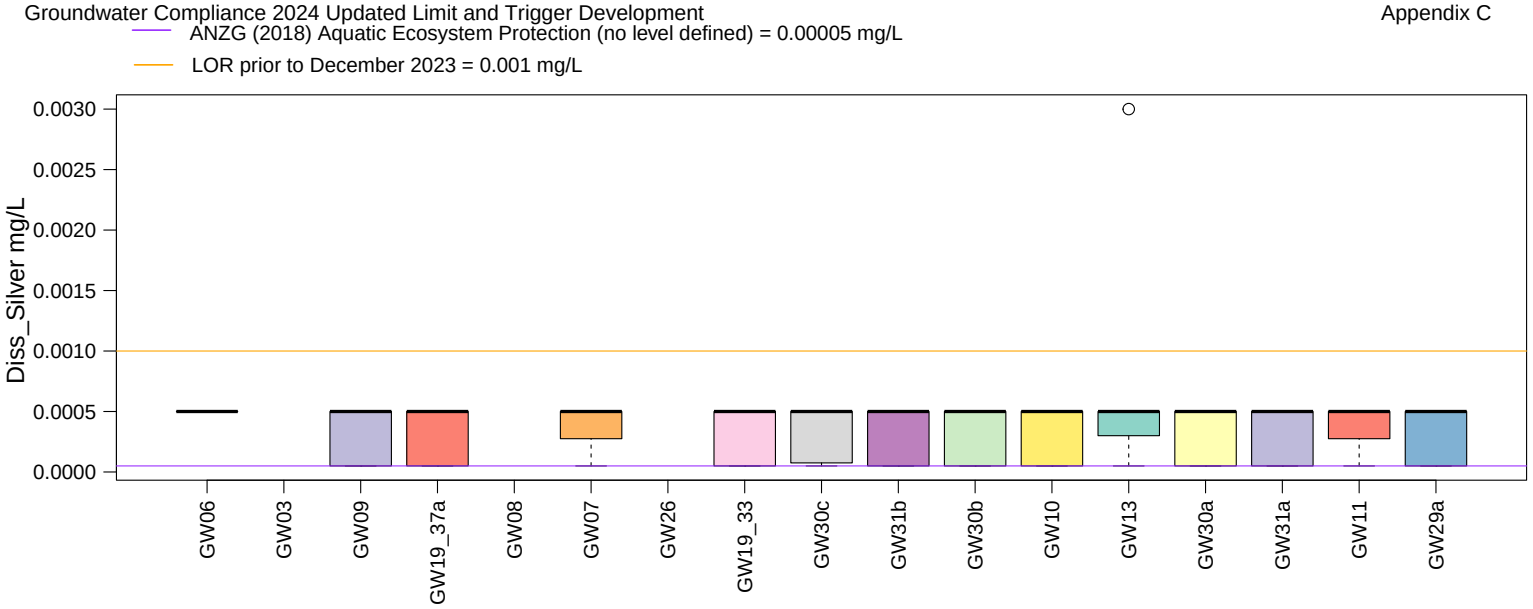

ANZG (2018) Aquatic Ecosystem Protection (95%) = 1.9 mg/L
Diss_Manganese mg/L
1.5
1.0
0.5
0.0
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

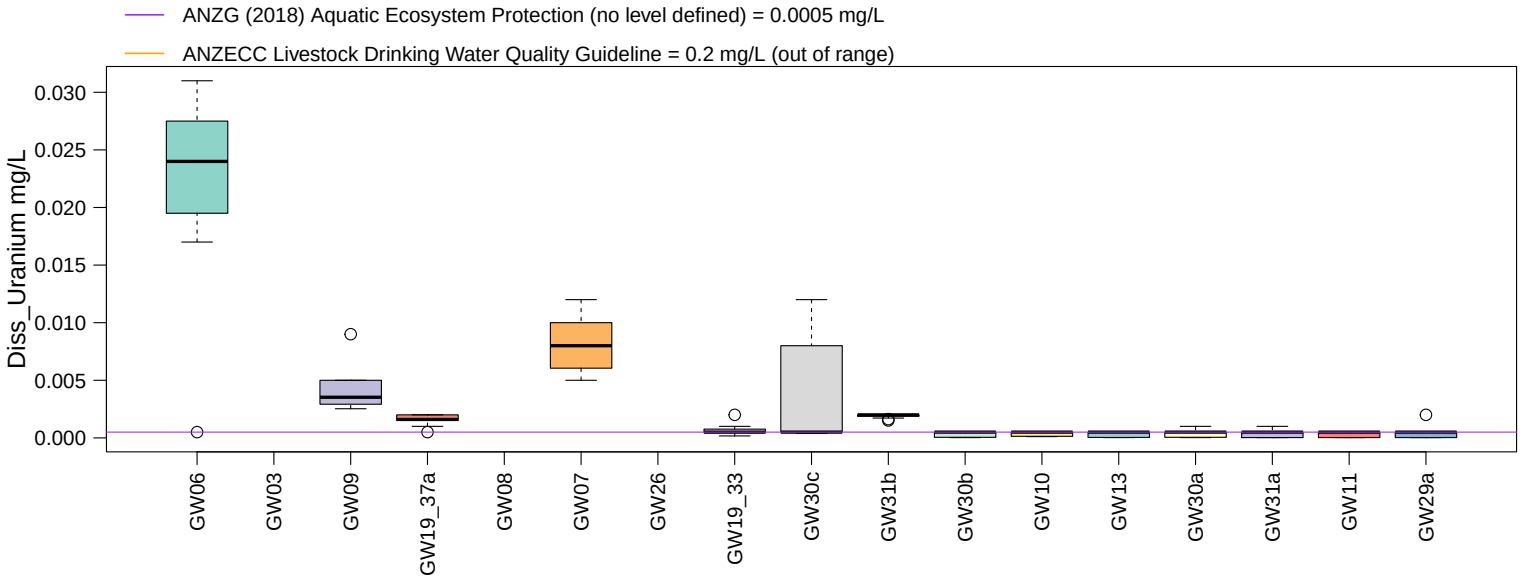

ANZG (2018) Aquatic Ecosystem Protection (99%) = 0.00006 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.002 mg/L (out of range)
Diss_Mercury mg/L
1e−04
8e−05
6e−05
4e−05
2e−05
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

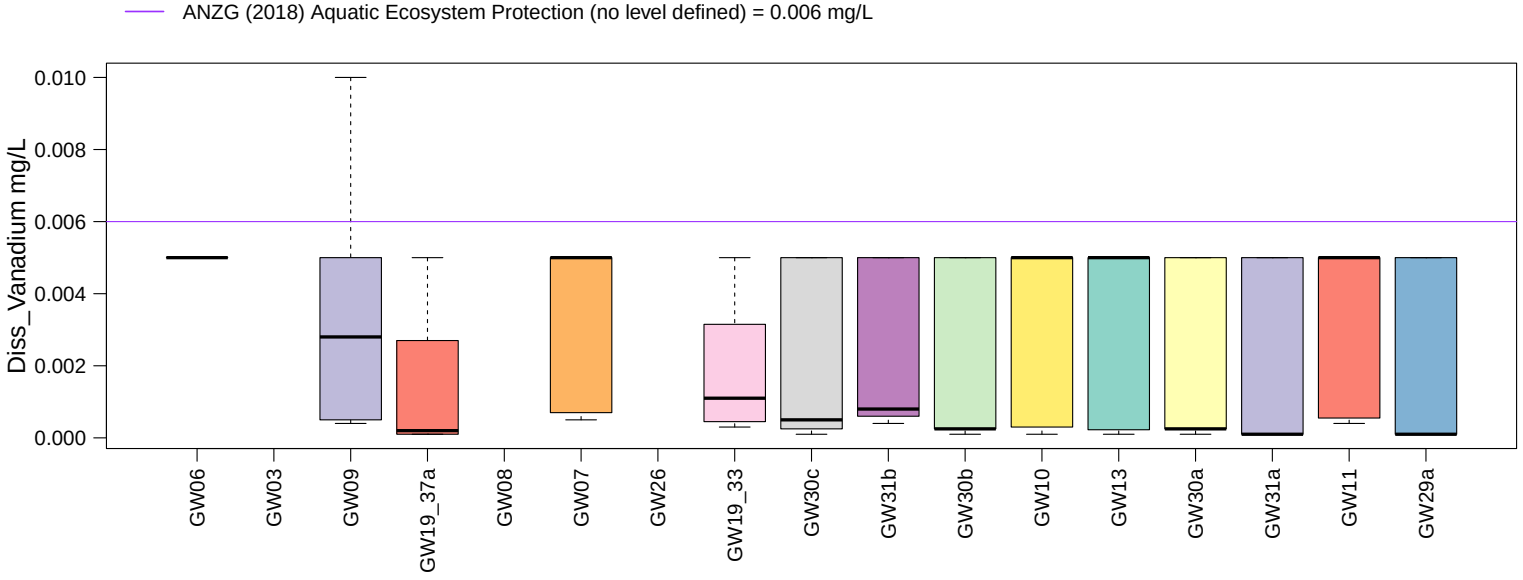

ANZG (2018) Aquatic Ecosystem Protection (no level defined) = 0.034 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.15 mg/L (out of range)
Diss_Molybdenum mg/L
0.05
0.04
0.03
0.02
0.01
0.00
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

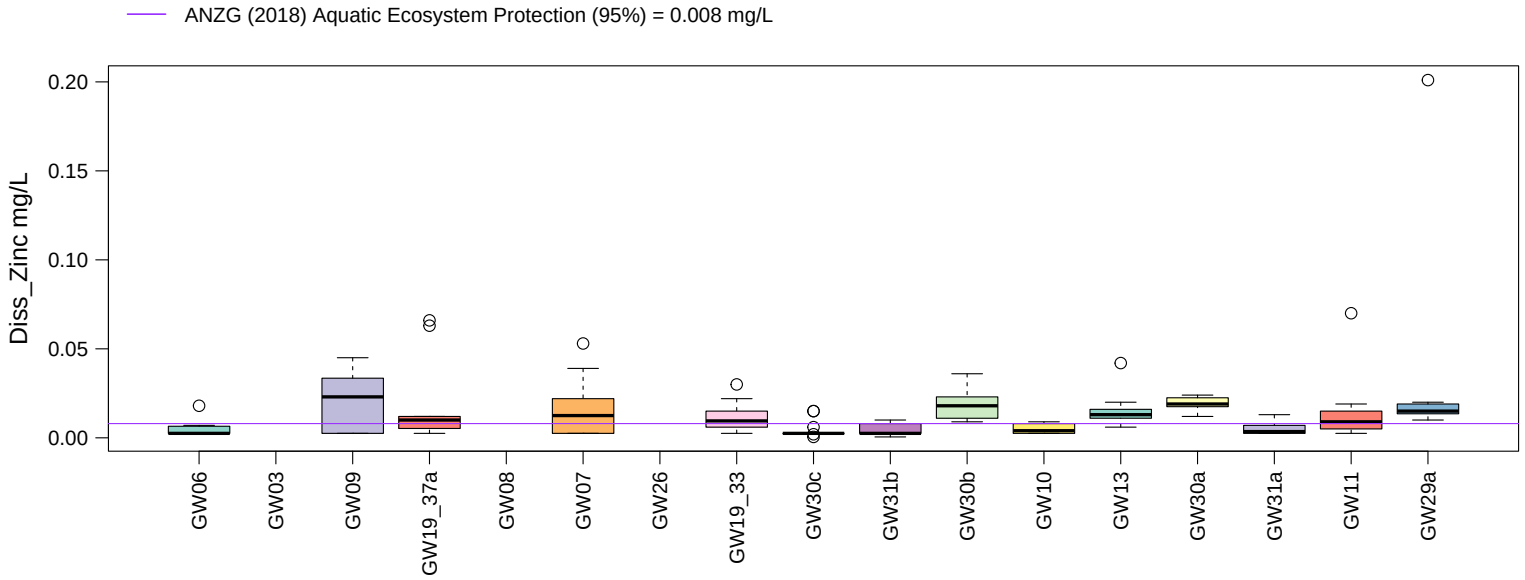

ANZG (2018) Aquatic Ecosystem Protection = 0.011 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 1 mg/L (out of range)
Diss_Nickel mg/L
0.030
0.025
0.020
0.015
0.010
0.005
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a


ANZG (2018) Aquatic Ecosystem Protection (99% slighltly to moderately disturbed) = 0.005 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.02 mg/L
Diss_Selenium mg/L
0.025
0.020
0.015
0.010
0.005
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a


ANZG (2018) Aquatic Ecosystem Protection (no level defined) = 0.00005 mg/L
LOR prior to December 2023 = 0.001 mg/L
Diss_Silver mg/L
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a


ANZG (2018) Aquatic Ecosystem Protection (no level defined) = 0.0005 mg/L
ANZECC Livestock Drinking Water Quality Guideline = 0.2 mg/L (out of range)
Diss_Uranium mg/L
0.030
0.025
0.020
0.015
0.010
0.005
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a


ANZG (2018) Aquatic Ecosystem Protection (no level defined) = 0.006 mg/L
Diss_Vanadium mg/L
0.010
0.008
0.006
0.004
0.002
0.000
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a


ANZG (2018) Aquatic Ecosystem Protection (95%) = 0.008 mg/L
Diss_Zinc mg/L
0.20
0.15
0.10
0.05
0.00
GW06
GW03
GW09
GW19_37a
GW08
GW07
GW26
GW19_33
GW30c
GW31b
GW30b
GW10
GW13
GW30a
GW31a
GW11
GW29a

Appendix D Water Quality Summary Statistics (Outliers Removed) and Limit Derivation

Groundwater Compliance 2024 Updated Limit and Trigger Development

New Lenton Coal Project

Lenton Joint Venture

SLR Project No.: 620.040927.00001

25 September 2024

Analyte		pH (Field)	Lab_EC	Calcium	NH3-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
Unit			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Default Guideline		6.5 - 8.5	720	1000	0.9^	25	0.055^$	0.013^$	0.94^	0.0002	0.0014^	0.001^*	0.0014^	0.00006#	0.0034^	1.9^	0.034^	0.011^	0.00005^	0.005#	0.0005^	0.006^	0.008^
Bore	Statistics																						
GW06	Total Number	9	8	11	3	11	8	7	7	7	6	7	7	8	8	7	0	7	7	7	7	7	7
GW06	from	01-02-2014	20-02-2014	20-02-2014	01-03-2017	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	N/A	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW06	to	23-03-2020	24-03-2020	24-03-2020	01-06-2018	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	03-12-2019	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	N/A	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020	24-03-2020
GW06	Min	6.8	2820	33	0.03	0.5	0.005	5.00E-04	0.05	5.00E-05	5.00E-04	0.0005	5.00E-04	5.00E-05	5.00E-04	0.0005	N/A	0.0005	5.00E-04	0.005	0.0005	0.005	0.0025
GW06	5th %ile	6.8	2834	34	0.031	0.5	0.005	6.50E-04	0.185	5.00E-05	5.00E-04	0.0005	5.00E-04	5.00E-05	5.00E-04	0.01565	N/A	0.0005	5.00E-04	0.005	0.00545	0.005	0.0025
GW06	20th %ile	7.0	3652	44	0.034	0.5	0.005	1.20E-03	0.514	0.00005	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.053	N/A	0.0006	5.00E-04	0.005	0.018	0.005	0.0025
GW06	Median	7.2	6105	68	0.04	14	0.005	2.00E-03	1.13	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.076	N/A	0.002	5.00E-04	0.005	0.024	0.005	0.0025
GW06	80th %ile	7.4	12828	79	0.046	52	0.005	4.80E-03	1.526	0.00005	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	1.0364	N/A	0.0028	5.00E-04	0.005	0.029	0.005	0.0053
GW06	95th %ile	7.4	16115	316	0.049	128	0.005	0.0057	1.737	5.00E-05	5.00E-04	0.0005	0.00085	5.00E-05	5.00E-04	1.345	N/A	0.0065	0.0005	0.005	0.0307	0.005	0.0067
GW06	Max	7.4	16500	321	0.05	141	0.005	0.006	1.8	5.00E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	1.39	N/A	0.008	0.0005	0.005	0.031	0.005	0.007
GW06	Tau	0.25	0.93	0.49	N/A	0.44	1.00	-0.20	-0.33	1.00	1.00	1.00	0.18	1.00	1.00	0.71	N/A	-0.45	1.00	1.00	0.24	1.00	-0.20
GW06	2-sided-p	0.40	0.00	0.04	N/A	0.08	1.00	0.65	0.37	1.00	1.00	1.00	0.80	1.00	1.00	0.04	N/A	0.22	1.00	1.00	0.55	1.00	0.70
GW06	Trend	No	Upward	Upward	N/A	No	No	No	No	No	No	No	No	No	No	Upward	N/A	No	No	No	No	No	No
GW06	Number of Obs Below LOR	0	0	0	0	5	8	1	0	7	6	7	6	8	8	1	0	2	7	8	1	7	5
GW06	Percent Below LOR	0%	0%	0%	0%	45%	100%	14%	0%	100%	100%	100%	86%	100%	100%	14%	0%	29%	100%	100%	14%	100%	71%
GW06	Limit Derivation Considerations																						
GW06	Limit development not possible due to insufficient number of samples				x			x	x	x	x	x	x			x	x	x	x		x	x	x
GW06	Limit development not possible due to more than 15% of values <LOR																						
GW06	Limit development not possible due to trend		x	x		x																	
GW06	Proposed Limits	8.5	TBD	TBD	0.9	TBD	0.055	0.013	TBD	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW03	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW03	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Percent Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW03	Limit Derivation Considerations																						
GW03	Limit development not possible due to insufficient number of samples	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GW03	Limit development not possible due to more than 15% of values <LOR																						
GW03	Limit development not possible due to trend																						
GW03	Proposed Limits	8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW09	Total Number	7	9	11	4	11	7	7	6	7	5	7	6	7	7	6	3	7	5	7	6	6	7
GW09	from	01-02-2015	20-02-2014	20-02-2014	01-03-2017	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	29-10-2023	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW09	to	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	08-12-2023	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024	04-02-2024
GW09	Min	6.8	875	46	0.04	14	0.0025	5.00E-04	0.14	2.50E-05	1.00E-04	0.0001	2.50E-04	2.00E-05	5.00E-05	0.0707	1.00E-03	0.0005	5.00E-05	0.0001	0.00253	0.0004	0.0025
GW09	5th %ile	6.8	1077	47	0.046	19	0.0025	9.50E-04	0.16	2.50E-05	1.20E-04	0.0001	3.13E-04	2.00E-05	5.00E-05	0.071325	1.06E-03	0.0005	5.00E-05	0.0001	0.0026275	0.000425	0.0025
GW09	20th %ile	6.8	1518	48	0.064	25	0.0025	2.00E-03	0.22	0.000025	1.80E-04	0.00012	0.0005	2.00E-05	5.00E-05	0.0732	1.24E-03	0.0006	5.00E-05	0.0001	0.00292	0.0005	0.0025
GW09	Median	6.9	2830	74	0.115	34	0.005	2.60E-03	0.2215	5.00E-05	5.00E-04	0.0005	0.0015	5.00E-05	5.00E-04	0.1765	1.60E-03	0.0015	5.00E-04	0.005	0.003525	0.0028	0.023
GW09	80th %ile	7.1	4382	101	0.574	36	0.005	2.98E-03	0.255	0.00005	5.00E-04	0.0005	0.0029	5.00E-05	5.00E-04	0.308	0.00196	0.00178	5.00E-04	0.005	0.005	0.005	0.0368
GW09	95th %ile	7.1	4586	107	1.051	42	0.005	0.0079	0.26625	1.55E-04	5.00E-04	0.0005	0.002975	5.00E-05	5.00E-04	0.344	0.00214	0.00264	0.0005	0.005	0.008	0.00875	0.0432
GW09	Max	7.2	4670	109	1.21	42	0.005	0.01	0.27	2.00E-04	5.00E-04	0.0005	0.003	5.00E-05	5.00E-04	0.356	0.0022	0.003	0.0005	0.005	0.009	0.01	0.045
GW09	Tau	0.43	0.83	0.73	0.67	-0.46	-0.76	0.29	0.69	-0.73	-0.84	-0.58	-0.07	-0.76	-0.76	-0.73	N/A	0.00	-0.77	-0.76	-0.33	-0.69	0.31
GW09	2-sided-p	0.23	0.00	0.00	0.31	0.06	0.05	0.45	0.09	0.05	0.10	0.13	1.00	0.05	0.05	0.06	N/A	1.00	0.15	0.05	0.45	0.09	0.43
GW09	Trend	No	Upward	Upward	No	No	No	No	No	Downward	No	No	No	No	No	No	N/A	No	No	No	No	No	No
GW09	Number of Obs Below LOR	0	0	0	0	0	7	1	0	6	3	6	2	7	7	0	0	2	5	7	0	2	3
GW09	Percent Below LOR	0%	0%	0%	0%	0%	100%	14%	0%	86%	60%	86%	33%	100%	100%	0%	0%	29%	100%	100%	0%	33%	43%
GW09	Limit Derivation Considerations																						
GW09	Limit development not possible due to insufficient number of samples	x			x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GW09	Limit development not possible due to more than 15% of values <LOR																						
GW09	Limit development not possible due to trend		x	x																			
GW09	Proposed Limits	8.5	TBD	TBD	0.9	42	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	TBD
GW19_37a	Total Number	11	11	7	6	11	9	11	10	11	10	10	10	11	10	11	8	11	10	11	11	7	9
GW19_37a	from	17-12-2019	17-12-2019	17-12-2019	10-07-2023	17-12-2019	24-03-2020	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	08-11-2022	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019
GW19_37a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024
GW19_37a	Min	7.0	2110	42	0.23	3	0.0025	1.90E-03	0.19	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	5.00E-05	0.206	8.00E-03	0.0005	5.00E-05	0.0001	0.0005	0.0001	0.0025
GW19_37a	5th %ile	7.1	2175	42.6	0.2325	11	0.0025	2.95E-03	0.19	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	5.00E-05	0.2105	8.35E-03	0.00125	5.00E-05	0.0001	0.00075	0.0001	0.0025
GW19_37a	20th %ile	7.3	2270	44	0.24	19	0.0025	5.00E-03	0.2036	0.000025	2.00E-04	0.0001	0.0005	2.00E-05	5.00E-05	0.215	9.04E-03	0.0029	5.00E-05	0.0001	0.00147	0.0001	0.0025
GW19_37a	Median	7.4	2330	47	0.265	25	0.005	6.00E-03	0.216	5.00E-05	4.00E-04	0.0005	0.0018	5.00E-05	2.75E-04	0.259	9.75E-03	0.007	5.00E-04	0.005	0.0016	0.0002	0.009
GW19_37a	80th %ile	7.9	2440	48	0.28	31	0.0054	8.00E-03	0.2464	0.00005	5.00E-04	0.00058	0.00616	5.00E-05	5.00E-04	0.336	0.0126	0.015	5.00E-04	0.005	0.002	0.00408	0.0108
GW19_37a	95th %ile	8.1	2500	48.7	0.2875	31	0.006	0.0085	0.26055	5.00E-05	5.00E-04	0.000955	0.011925	5.00E-05	5.00E-04	0.4335	0.013715	0.025	0.0005	0.005	0.002	0.005	0.012
GW19_37a	Max	8.2	2500	49	0.29	31	0.006	0.009	0.261	5.00E-05	5.00E-04	0.001	0.0135	5.00E-05	5.00E-04	0.512	0.0141	0.028	0.0005	0.005	0.002	0.005	0.012
GW19_37a	Tau	-0.53	0.02	-0.75	-0.20	0.36	-0.13	-0.20	0.39	-0.74	-0.69	-0.16	0.23	-0.74	-0.75	-0.56	0.21	-0.05	-0.73	-0.74	-0.04	-0.48	0.21
GW19_37a	2-sided-p	0.03	1.00	0.03	0.71	0.16	0.74	0.43	0.15	0.01	0.02	0.63	0.41	0.01	0.01	0.02	0.54	0.88	0.01	0.01	0.94	0.20	0.52
GW19_37a	Trend	Downward	No	Downward	No	No	No	No	No	Downward	Downward	No	No	Downward	Downward	Downward	No	No	Downward	Downward	No	No	No
GW19_37a	Number of Obs Below LOR	0	0	0	0	0	7	0	0	11	5	8	3	11	10	0	0	1	10	11	1	5	3
GW19_37a	Percent Below LOR	0%	0%	0%	0%	0%	78%	0%	0%	100%	50%	80%	30%	100%	100%	0%	0%	9%	100%	100%	9%	71%	33%
GW19_37a	Limit Derivation Considerations																						
GW19_37a	Limit development not possible due to insufficient number of samples			x	x																	x	
GW19_37a	Limit development not possible due to more than 15% of values <LOR						x			x	x	x	x	x	x				x	x			x
GW19_37a	Limit development not possible due to trend																						
GW19_37a	Proposed Limits	8.5	2500	1000	0.9	31	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.025	0.00005	0.005	0.002	0.006	TBD

Yellow highlight indicates 80th Percentile is above relevant guideline
DEHP (2011) Isaac River Sub Basin Surface Water WQO
ANZG (2018) Aquatic ecosystem protection
ANZECC (2000) Stock Watering Guideline
Site specific (95th Percentile of bore specific dataset)
TBD = To be defined once sufficient data becomes available

Notes:
N/A = insufficient data for statistics
$ pH >6.5 x Conservative value for As(V) used
* 95% species protection for slightly to moderately disturbed systems
^ No level of species protection defined
+ More conservative value for Cr(VI) used
# 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

Analyte		pH (Field)	Lab_EC	Calcium	NH3-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
Unit			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Default Guideline		6.5 - 8.5	720	1000	0.9^	25	0.055^$	0.013^$	0.94^	0.0002	0.0014^	0.001^*	0.0014^	0.00006#	0.0034^	1.9^	0.034^	0.011^	0.00005^	0.005#	0.0005^	0.006^	0.008^
Bore	Statistics																						
GW08	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW08	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Percent Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW08	Limit Derivation Considerations																						
GW08	Limit development not possible due to insufficient number of samples	yes			yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
GW08	Limit development not possible due to more than 15% of values <LOR																						
GW08	Limit development not possible due to trend																						
GW08	Proposed Limits	8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW07	Total Number	19	18	17	9	21	16	18	17	14	17	18	10	18	17	17	7	18	16	18	17	13	11
GW07	from	01-02-2014	20-02-2014	20-02-2014	01-03-2017	20-02-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	04-11-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	04-11-2014
GW07	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW07	Min	6.3	4590	148	0.03	8	0.0025	4.00E-04	0.2	2.50E-05	2.00E-03	0.0001	1.00E-03	2.00E-05	5.00E-05	0.278	7.00E-04	0.002	5.00E-05	0.0001	0.005	0.0005	0.012
GW07	5th %ile	6.3	4590	148.8	0.034	8	0.0025	4.00E-04	0.2	2.50E-05	2.00E-03	0.0001	1.00E-03	2.00E-05	5.00E-05	0.294	1.09E-03	0.002	5.00E-05	0.0001	0.005	0.00056	0.012
GW07	20th %ile	6.7	5360	194	0.046	22	0.0025	4.00E-04	0.228	0.000025	2.00E-03	0.00014	0.00124	2.00E-05	8.00E-05	0.4066	2.00E-03	0.00394	5.00E-05	0.00014	0.00601	0.00064	0.012
GW07	Median	6.9	5935	229	0.06	28	0.005	5.00E-04	0.3	5.00E-05	3.00E-03	0.0005	0.002	5.00E-05	5.00E-04	0.527	2.40E-03	0.0065	5.00E-04	0.005	0.008	0.005	0.014
GW07	80th %ile	7.2	7420	255.4	0.118	43	0.005	5.00E-04	0.4484	0.00005	3.94E-03	0.0005	0.0032	5.00E-05	5.00E-04	1.0918	0.0056	0.01346	5.00E-04	0.005	0.01032	0.005	0.029
GW07	95th %ile	7.4	8661	271	0.178	51	0.005	0.0005	0.564	5.00E-05	0.004	0.0005	0.0046	5.00E-05	5.00E-04	1.34	0.00824	0.021	0.0005	0.005	0.012	0.005	0.038
GW07	Max	7.8	9460	277	0.21	54	0.005	0.0005	0.58	5.00E-05	4.10E-03	0.0005	0.005	5.00E-05	5.00E-04	1.78	0.0092	0.0213	0.0005	0.005	0.012	0.005	0.039
GW07	Tau	0.39	0.16	-0.27	-0.08	0.30	-0.68	-0.65	0.31	-0.66	0.29	-0.67	-0.25	-0.65	-0.60	0.13	-0.20	0.24	-0.63	-0.67	0.23	-0.76	0.11
GW07	2-sided-p	0.02	0.36	0.15	0.83	0.07	0.00	0.00	0.09	0.01	0.14	0.00	0.37	0.00	0.00	0.48	0.65	0.19	0.00	0.00	0.23	0.00	0.69
GW07	Trend	Upward	No	No	No	No	Downward	Downward	No	Downward	No	Downward	No	Downward	Downward	No	No	No	Downward	Downward	No	Downward	No
GW07	Number of Obs Below LOR	0	0	0	0	0	16	13	0	14	0	17	0	18	16	0	0	0	16	17	0	8	0
GW07	Percent Below LOR	0%	0%	0%	0%	0%	100%	72%	0%	100%	0%	94%	0%	100%	94%	0%	0%	0%	100%	94%	0%	62%	0%
GW07	Limit Derivation Considerations																						
GW07	Limit development not possible due to insufficient number of samples																yes						
GW07	Limit development not possible due to more than 15% of values <LOR						x	x		x		x		x	x				x	x		x	
GW07	Limit development not possible due to trend																						
GW07	Proposed Limits	8.5	8661	271	0.9	51	0.055	0.013	0.94	0.0002	0.004	0.001	0.0046	0.00006	0.0034	1.9	0.034	0.021	0.00005	0.005	0.012	0.006	0.038
GW26	Total Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GW26	from	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	to	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	5th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	20th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Median	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	80th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	95th %ile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Max	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Tau	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	2-sided-p	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Trend	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Number of Obs Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Percent Below LOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GW26	Limit Derivation Considerations																						
GW26	Limit development not possible due to insufficient number of samples	yes			yes		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
GW26	Limit development not possible due to more than 15% of values <LOR																						
GW26	Limit development not possible due to trend																						
GW26	Proposed Limits	8.5	720	1000	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW19_33	Total Number	10	10	8	6	10	9	9	8	10	8	9	9	10	10	9	8	10	9	10	9	7	9
GW19_33	from	17-12-2019	17-12-2019	17-12-2019	10-07-2023	17-12-2019	17-12-2019	24-03-2020	14-05-2023	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	24-03-2020	14-05-2023	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019	17-12-2019
GW19_33	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW19_33	Min	6.8	517	41	0.02	1	0.0025	4.00E-04	0.065	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	5.00E-05	0.0029	4.00E-04	0.0021	5.00E-05	0.0001	0.00017	0.0003	0.0025
GW19_33	5th %ile	6.9	526.45	43.1	0.02	1.45	0.0025	4.40E-04	0.06745	2.50E-05	2.00E-04	0.0001	5.00E-04	2.00E-05	5.00E-05	0.00758	4.00E-04	0.00237	5.00E-05	0.0001	0.00027	0.00033	0.0031
GW19_33	20th %ile	7.1	575.6	47.8	0.02	2	0.0025	5.00E-04	0.0752	0.000025	4.40E-04	0.0001	0.0008	2.00E-05	5.00E-05	0.01712	4.40E-04	0.00294	5.00E-05	0.0001	0.000438	0.00042	0.0052
GW19_33	Median	7.3	634	54	0.05	2	0.005	5.00E-04	0.0885	3.75E-05	1.00E-03	0.0005	0.0012	3.50E-05	2.75E-04	0.053	1.50E-03	0.0092	5.00E-04	0.00255	0.0005	0.0011	0.009
GW19_33	80th %ile	7.6	692	57.2	0.13	2.2	0.005	6.80E-04	0.1	0.00005	1.36E-03	0.0007	0.00362	5.00E-05	5.00E-04	0.0768	0.00344	0.0144	5.00E-04	0.005	0.00064	0.00426	0.015
GW19_33	95th %ile	7.8	709.7	63	0.3025	4.65	0.0062	0.00104	0.10325	5.00E-05	1.86E-03	0.0016	0.00572	5.00E-05	5.00E-04	0.0972	0.00465	0.018	0.0005	0.005	0.000904	0.005	0.019
GW19_33	Max	8.0	716	65	0.36	6	0.007	0.0012	0.105	5.00E-05	2.00E-03	0.002	0.007	5.00E-05	5.00E-04	0.11	0.005	0.02	0.0005	0.005	0.001	0.005	0.022
GW19_33	Tau	-0.20	-0.16	-0.11	-0.55	-0.43	-0.27	0.13	-0.11	-0.75	-0.69	-0.61	0.06	-0.75	-0.75	-0.28	-0.18	-0.24	-0.75	-0.75	-0.09	-0.29	0.17
GW19_33	2-sided-p	0.47	0.59	0.80	0.18	0.15	0.42	0.73	0.80	0.01	0.03	0.04	0.92	0.01	0.01	0.35	0.62	0.37	0.02	0.01	0.83	0.45	0.60
GW19_33	Trend	No	No	No	No	No	No	No	No	Downward	Downward	Downward	No	Downward	Downward	No	No	No	Downward	Downward	No	No	No
GW19_33	Number of Obs Below LOR	0	0	0	0	0	8	4	0	10	0	7	2	10	10	0	1	0	9	10	3	2	1
GW19_33	Percent Below LOR	0%	0%	0%	0%	0%	89%	44%	0%	100%	0%	78%	22%	100%	100%	0%	13%	0%	100%	100%	33%	29%	11%
GW19_33	Limit Derivation Considerations																						
GW19_33	Limit development not possible due to insufficient number of samples				x																	x	
GW19_33	Limit development not possible due to more than 15% of values <LOR						x	x		x		x	x	x	x				x	x	x		
GW19_33	Limit development not possible due to trend																						
GW19_33	Proposed Limits	8.5	720	63	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.018	0.00005	0.005	TBD	0.006	0.019

Yellow highlight indicates 80th Percentile is above relevant guideline
DEHP (2011) Isaac River Sub Basin Surface Water WQO
ANZG (2018) Aquatic ecosystem protection
ANZECC (2000) Stock Watering Guideline
Site specific (95th Percentile of bore specific dataset)
TBD = To be defined once sufficient data becomes available

Notes:
N/A = insufficient data for statistics
$ pH >6.5 x Conservative value for As(V) used
* 95% species protection for slightly to moderately disturbed systems
^ No level of species protection defined
+ More conservative value for Cr(VI) used
# 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

Analyte		pH (Field)	Lab_EC	Calcium	NH3-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
Unit			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Default Guideline		6.5 - 8.5	720	1000	0.9^	25	0.055^$	0.013^$	0.94^	0.0002	0.0014^	0.001^*	0.0014^	0.00006#	0.0034^	1.9^	0.034^	0.011^	0.00005^	0.005#	0.0005^	0.006^	0.008^
Bore	Statistics																						
GW30c	Total Number	13	12	9	8	13	13	13	13	13	13	13	13	13	13	13	9	13	12	13	13	9	11
GW30c	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW30c	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW30c	Min	6.5	12300	167	0.04	25	0.0025	2.50E-04	0.28	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.0682	5.00E-05	0.00025	5.00E-05	0.0001	0.0004	0.0001	0.0005
GW30c	5th %ile	6.6	12355	168.6	0.11	25.6	0.0025	2.50E-04	0.31	2.50E-05	8.00E-05	0.00019	2.50E-04	2.00E-05	5.00E-05	0.07048	1.50E-04	0.0004	5.00E-05	0.00022	0.00046	0.00016	0.00125
GW30c	20th %ile	6.7	12600	178.8	0.276	32.4	0.0025	4.40E-04	0.3748	0.000035	1.00E-04	0.00031	0.00035	2.00E-05	1.00E-04	0.0772	3.60E-04	0.0005	6.00E-05	0.00094	0.0005	0.00025	0.0025
GW30c	Median	6.9	14400	226	0.39	43	0.005	5.00E-04	0.4	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.163	4.00E-04	0.001	5.00E-04	0.005	0.0005	0.0005	0.0025
GW30c	80th %ile	7.0	15040	334	0.676	98.8	0.005	5.00E-04	0.6094	0.00005	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.2236	0.0005	0.00188	5.00E-04	0.005	0.008138	0.005	0.0025
GW30c	95th %ile	7.5	15875	357	0.9175	185	0.015	0.00076	0.6596	1.00E-04	7.00E-04	0.0005	0.0007	5.00E-05	5.00E-04	0.3076	0.002	0.0024	0.0005	0.005	0.010308	0.005	0.00425
GW30c	Max	7.9	16700	372	0.97	198	0.03	0.001	0.68	1.00E-04	1.00E-03	0.0005	0.001	5.00E-05	5.00E-04	0.31	0.003	0.003	0.0005	0.005	0.012	0.005	0.006
GW30c	Tau	-0.25	-0.03	-0.08	0.14	-0.01	-0.61	-0.47	0.09	-0.07	-0.74	-0.55	-0.49	-0.72	-0.57	-0.22	-0.85	0.04	-0.64	-0.60	-0.04	-0.65	-0.44
GW30c	2-sided-p	0.27	0.95	0.83	0.71	1.00	0.01	0.05	0.71	0.83	0.00	0.02	0.05	0.00	0.02	0.33	0.00	0.90	0.01	0.01	0.90	0.03	0.11
GW30c	Trend	No	No	No	No	No	Downward	Downward	No	No	Downward	Downward	Downward	Downward	Downward	No	Downward	No	Downward	Downward	No	Downward	No
GW30c	Number of Obs Below LOR	0	0	0	0	0	12	9	0	13	10	11	12	13	13	0	4	6	12	11	6	7	9
GW30c	Percent Below LOR	0%	0%	0%	0%	0%	92%	69%	0%	100%	77%	85%	92%	100%	100%	0%	44%	46%	100%	85%	46%	78%	82%
GW30c	Limit Derivation Considerations																						
GW30c	Limit development not possible due to insufficient number of samples																						
GW30c	Limit development not possible due to more than 15% of values <LOR						x	x		x	x	x	x	x	x		x		x	x	x	x	x
GW30c	Limit development not possible due to trend																						
GW30c	Proposed Limits	8.5	15875	357	0.9	185	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	TBD	0.006	0.008
GW31b	Total Number	13	12	9	7	13	13	13	13	13	13	13	12	13	13	13	9	13	12	13	13	9	13
GW31b	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW31b	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW31b	Min	6.6	2290	74	0.02	6	0.0025	1.00E-04	0.2	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.0013	4.00E-04	0.0005	5.00E-05	0.0001	0.00151	0.0004	0.0005
GW31b	5th %ile	6.7	2339.5	74.4	0.035	8.4	0.0025	1.00E-04	0.2294	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.00232	4.40E-04	0.0005	5.00E-05	0.0001	0.001582	0.00044	0.0014
GW31b	20th %ile	6.8	2454	75	0.076	11.4	0.0025	1.00E-04	0.252	0.000025	5.00E-05	0.0002	0.00025	2.00E-05	5.00E-05	0.009	5.00E-04	0.0005	5.00E-05	0.0001	0.001784	0.00056	0.0025
GW31b	Median	6.9	2625	85	0.14	15	0.005	5.00E-04	0.27	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.028	5.00E-04	0.0007	5.00E-04	0.005	0.002	0.0008	0.0025
GW31b	80th %ile	7.5	2638	88	0.248	15.6	0.005	5.00E-04	0.2892	0.00005	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.0462	0.00074	0.0014	5.00E-04	0.005	0.002	0.005	0.0086
GW31b	95th %ile	7.8	2739	90	0.533	16.8	0.015	0.0005	0.31	7.00E-05	5.00E-04	0.0005	0.000725	5.00E-05	5.00E-04	0.05844	0.00272	0.00208	0.0005	0.005	0.002	0.005	0.01
GW31b	Max	7.9	2860	92	0.65	18	0.03	0.0005	0.325	1.00E-04	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.0666	0.004	0.0028	0.0005	0.005	0.002	0.005	0.01
GW31b	Tau	-0.40	0.66	0.29	0.52	-0.46	-0.61	-0.65	0.09	-0.55	-0.75	-0.62	-0.75	-0.72	-0.72	0.48	0.06	0.59	-0.70	-0.72	-0.61	-0.71	-0.20
GW31b	2-sided-p	0.07	0.00	0.34	0.13	0.04	0.01	0.01	0.71	0.03	0.00	0.01	0.00	0.00	0.00	0.03	0.91	0.01	0.01	0.00	0.01	0.02	0.41
GW31b	Trend	No	Upward	No	No	Downward	Downward	Downward	No	Downward	Downward	Downward	Downward	Downward	Downward	Upward	No	Upward	Downward	Downward	Downward	Downward	No
GW31b	Number of Obs Below LOR	0	0	0	0	0	12	12	0	12	12	10	11	13	13	0	3	6	12	13	0	4	6
GW31b	Percent Below LOR	0%	0%	0%	0%	0%	92%	92%	0%	92%	92%	77%	92%	100%	100%	0%	33%	46%	100%	100%	0%	44%	46%
GW31b	Limit Derivation Considerations																						
GW31b	Limit development not possible due to insufficient number of samples				yes																		
GW31b	Limit development not possible due to more than 15% of values <LOR						x	x		x	x	x	x	x	x		x		x	x		x	x
GW31b	Limit development not possible due to trend																						
GW31b	Proposed Limits	8.5	2739	90	0.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.002	0.006	TBD
GW30b	Total Number	13	12	9	8	11	13	10	12	13	12	13	13	13	13	13	9	11	12	13	13	9	13
GW30b	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	03-12-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	08-11-2022	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW30b	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW30b	Min	6.5	16600	437	3.22	0.5	0.0025	2.50E-04	0.273	2.50E-05	1.00E-04	0.0002	2.50E-04	2.00E-05	5.00E-05	0.081	5.00E-05	0.0014	5.00E-05	0.0001	0.000025	0.0001	0.009
GW30b	5th %ile	6.5	16600	448.2	3.227	0.5	0.0025	2.50E-04	0.27685	4.00E-05	1.00E-04	0.00023	4.00E-04	2.00E-05	8.00E-05	0.0876	2.30E-04	0.00145	5.00E-05	0.00064	0.00004	0.00016	0.0096
GW30b	20th %ile	6.7	16800	509.4	3.284	0.5	0.0025	4.50E-04	0.3012	0.00005	2.00E-04	0.00025	0.0005	2.00E-05	1.00E-04	0.101	5.00E-04	0.0019	5.00E-05	0.001	0.00005	0.00025	0.011
GW30b	Median	7.0	17200	552	3.48	4	0.005	9.50E-04	0.329	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.105	1.00E-03	0.002	5.00E-04	0.005	0.0005	0.00025	0.018
GW30b	80th %ile	7.2	17560	617	3.604	5	0.01	1.20E-03	0.3568	0.0001	5.00E-04	0.0005	0.002	5.00E-05	5.00E-04	0.1116	0.00212	0.005	5.00E-04	0.005	0.0005	0.005	0.0236
GW30b	95th %ile	7.6	18285	679	3.9	16.5	0.022	0.00255	0.3767	1.00E-04	5.00E-04	0.0005	0.003	7.00E-05	5.00E-04	0.1144	0.00392	0.007	0.0005	0.005	0.0005	0.005	0.029
GW30b	Max	7.8	19000	705	4.01	18	0.04	0.003	0.38	1.00E-04	5.00E-04	0.0005	0.003	1.00E-04	5.00E-04	0.118	0.005	0.008	0.0005	0.005	0.0005	0.005	0.036
GW30b	Tau	-0.45	0.13	-0.44	0.07	-0.84	-0.44	-0.58	-0.14	0.44	-0.67	-0.65	0.23	-0.38	-0.65	0.52	-0.37	-0.60	-0.70	-0.65	-0.65	-0.61	-0.13
GW30b	2-sided-p	0.04	0.63	0.12	0.90	0.00	0.06	0.03	0.58	0.07	0.01	0.01	0.34	0.13	0.01	0.02	0.21	0.01	0.01	0.01	0.01	0.05	0.58
GW30b	Trend	Downward	No	No	No	Downward	No	Downward	No	No	Downward	Downward	No	No	Downward	Upward	No	Downward	Downward	Downward	Downward	Downward	No
GW30b	Number of Obs Below LOR	0	0	0	0	5	8	3	0	13	9	12	8	13	13	0	2	0	12	13	13	9	0
GW30b	Percent Below LOR	0%	0%	0%	0%	45%	62%	30%	0%	100%	75%	92%	62%	100%	100%	0%	22%	0%	100%	100%	100%	100%	0%
GW30b	Limit Derivation Considerations																						
GW30b	Limit development not possible due to insufficient number of samples																						
GW30b	Limit development not possible due to more than 15% of values <LOR						x	x		x	x	x	x	x	x				x	x	x	x	
GW30b	Limit development not possible due to trend																						
GW30b	Proposed Limits	8.5	18285	679	3.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.029
GW10	Total Number	16	15	15	10	8	13	15	15	15	15	16	16	16	16	15	8	11	14	16	15	12	9
GW10	from	01-05-2014	01-05-2014	01-05-2014	01-03-2017	01-05-2014	01-05-2014	04-11-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	14-05-2023	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	04-11-2014
GW10	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	14-05-2023	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW10	Min	7.2	2030	12	0.85	1	0.0025	2.00E-03	0.506	2.50E-05	5.00E-05	0.0004	2.50E-04	2.00E-05	5.00E-05	0.005	8.00E-03	0.001	5.00E-05	0.0001	0.00011	0.0001	0.004
GW10	5th %ile	7.2	2177	14.8	0.85	1	0.0025	3.19E-03	0.5151	2.50E-05	5.00E-05	0.000475	2.50E-04	2.00E-05	5.00E-05	0.0057	8.11E-03	0.00135	5.00E-05	0.0001	0.000117	0.000155	0.004
GW10	20th %ile	7.3	2762	17.8	0.858	1	0.0025	4.14E-03	0.5384	0.000025	1.70E-04	0.0005	0.0005	2.00E-05	5.00E-05	0.007	8.98E-03	0.002	5.00E-05	0.0001	0.00012	0.0003	0.0046
GW10	Median	7.4	3790	28	1.03	5.5	0.005	6.00E-03	0.87	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.0265	4.10E-02	0.005	5.00E-04	0.005	0.0005	0.005	0.008
GW10	80th %ile	7.6	5814	50.2	1.196	7.6	0.005	7.00E-03	0.94	0.00005	5.00E-04	0.0027	0.001	5.00E-05	5.00E-04	0.0847	0.04732	0.0225	5.00E-04	0.005	0.0005	0.005	0.0084
GW10	95th %ile	7.9	6244	60	1.35	8.65	0.01	0.0073	1.01	5.00E-05	5.00E-04	0.002825	0.002	5.00E-05	6.25E-04	0.09876	0.049	0.027	0.0005	0.005	0.0005	0.005	0.009
GW10	Max	8.1	6650	61	1.45	9	0.01	0.008	1.01	5.00E-05	5.00E-04	0.0029	0.002	5.00E-05	1.00E-03	0.122	0.0493	0.028	0.0005	0.005	0.0005	0.005	0.009
GW10	Tau	-0.08	0.16	-0.14	-0.16	-0.64	-0.50	-0.37	-0.49	-0.69	-0.65	0.45	-0.24	-0.68	-0.74	0.54	0.50	0.22	-0.66	-0.68	-0.69	-0.76	0.06
GW10	2-sided-p	0.68	0.43	0.49	0.59	0.04	0.04	0.07	0.01	0.00	0.00	0.03	0.24	0.00	0.00	0.01	0.11	0.39	0.01	0.00	0.00	0.00	0.91
GW10	Trend	No	No	No	No	Downward	Downward	No	Downward	Downward	Downward	Upward	No	Downward	Downward	Upward	No	No	Downward	Downward	Downward	Downward	No
GW10	Number of Obs Below LOR	0	0	0	0	0	11	0	0	15	13	10	10	16	15	0	0	0	14	16	10	8	0
GW10	Percent Below LOR	0%	0%	0%	0%	0%	85%	0%	0%	100%	87%	63%	63%	100%	94%	0%	0%	0%	100%	100%	67%	67%	0%
GW10	Limit Derivation Considerations																						
GW10	Limit development not possible due to insufficient number of samples																						
GW10	Limit development not possible due to more than 15% of values <LOR						x			x	x	x	x	x	x				x	x	x	x	
GW10	Limit development not possible due to trend																						
GW10	Proposed Limits	8.5	6244	60	1.3	25	0.055	0.013	0.94	0.0002	0.0014	TBD	0.0014	0.00006	0.0034	1.9	0.049	0.027	0.00005	0.005	0.0005	0.006	0.009

Yellow highlight indicates 80th Percentile is above relevant guideline
DEHP (2011) Isaac River Sub Basin Surface Water WQO
ANZG (2018) Aquatic ecosystem protection
ANZECC (2000) Stock Watering Guideline
Site specific (95th Percentile of bore specific dataset)
TBD = To be defined once sufficient data becomes available

Notes:
N/A = insufficient data for statistics
$ pH >6.5 x Conservative value for As(V) used
^ 95% species protection for slightly to moderately disturbed systems
^ No level of species protection defined
+ More conservative value for Cr(VI) used
# 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

Analyte		pH (Field)	Lab_EC	Calcium	NH3-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
Unit			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Default Guideline		6.5 - 8.5	720	1000	0.9^	25	0.055^$	0.013^	0.94^	0.0002	0.0014^	0.001^*	0.0014^	0.00006#	0.0034^	1.9^	0.034^	0.011^	0.00005^	0.005#	0.0005^	0.006^	0.008^
Bore	Statistics																						
GW13	Total Number	17	16	15	10	19	15	17	15	16	15	17	15	17	17	16	9	11	15	17	16	12	17
GW13	from	01-05-2014	01-05-2014	01-05-2014	01-03-2017	01-05-2014	01-05-2014	01-05-2014	01-03-2017	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	04-11-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW13	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW13	Min	7.1	11600	68	2.82	0.5	0.0025	7.00E-04	0.489	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.012	1.20E-03	0.0006	5.00E-05	0.0001	0.000025	0.0001	0.006
GW13	5th %ile	7.2	11825	77.8	2.847	0.5	0.0025	8.60E-04	0.4967	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.015	1.20E-03	0.0008	5.00E-05	0.0001	0.000025	0.0001	0.0068
GW13	20th %ile	7.2	12000	84.4	2.96	0.5	0.0025	1.06E-03	0.5016	0.000025	9.00E-05	0.00013	0.00045	2.00E-05	1.00E-04	0.022	1.32E-03	0.001	9.00E-05	0.00036	0.000025	0.00021	0.011
GW13	Median	7.3	12200	93	3.145	0.5	0.005	2.00E-03	0.58	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.03045	1.70E-03	0.002	5.00E-04	0.005	0.0005	0.005	0.013
GW13	80th %ile	7.4	12300	127	3.352	3.6	0.005	5.60E-03	0.642	0.00005	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.0364	0.002	0.003	5.00E-04	0.005	0.0005	0.005	0.0184
GW13	95th %ile	7.7	12700	143	3.5	15.1	0.005	0.013	0.66	6.25E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.04125	0.0104	0.00365	0.00125	0.005	0.0005	0.005	0.024
GW13	Max	7.7	13000	143	3.53	34	0.005	0.021	0.66	1.00E-04	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.042	0.016	0.004	0.003	0.005	0.0005	0.005	0.042
GW13	Tau	0.11	0.08	-0.08	-0.56	-0.34	-0.69	-0.38	-0.05	-0.39	-0.68	-0.64	-0.47	-0.66	-0.61	0.42	-0.94	-0.07	-0.63	-0.60	-0.65	-0.78	0.52
GW13	2-sided-p	0.56	0.71	0.73	0.03	0.07	0.00	0.04	0.84	0.07	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.81	0.00	0.00	0.00	0.00	0.01
GW13	Trend	No	No	No	Downward	No	Downward	Downward	No	No	Downward	Downward	Downward	Downward	Downward	Upward	Downward	No	Downward	Downward	Downward	Downward	Upward
GW13	Number of Obs Below LOR	0	0	0	0	12	15	0	0	16	14	17	11	17	17	0	0	0	14	16	16	10	0
GW13	Percent Below LOR	0%	0%	0%	0%	63%	100%	0%	0%	100%	93%	100%	73%	100%	100%	0%	0%	0%	93%	94%	100%	83%	0%
GW13	Limit Derivation Considerations																						
GW13	Limit development not possible due to insufficient number of samples																						
GW13	Limit development not possible due to more than 15% of values <LOR						x			x	x	x	x	x	x				x	x	x	x	
GW13	Limit development not possible due to trend																						
GW13	Proposed Limits	8.5	12700	143	3.5	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.024
GW30a	Total Number	12	11	9	8	12	11	12	11	12	11	12	12	12	12	12	8	8	11	12	12	9	12
GW30a	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	14-05-2023	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW30a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	27-04-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW30a	Min	6.7	13900	170	3.08	0.5	0.0025	2.50E-04	0.258	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.0405	4.00E-04	0.0006	5.00E-05	0.0001	0.000025	0.0001	0.012
GW30a	5th %ile	6.9	14000	178.4	3.094	0.5	0.0025	2.50E-04	0.2655	3.88E-05	7.50E-05	0.0001825	3.88E-04	2.00E-05	7.75E-05	0.04072	4.00E-04	0.000705	5.00E-05	0.000595	3.875E-05	0.00016	0.0131
GW30a	20th %ile	7.1	14100	209.6	3.144	0.5	0.0025	2.50E-04	0.28	0.00005	1.00E-04	0.00025	0.0005	2.00E-05	1.00E-04	0.044	4.40E-04	0.00094	5.00E-05	0.001	0.00005	0.00025	0.0172
GW30a	Median	7.3	14300	246	3.21	0.5	0.005	5.00E-04	0.3	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.04595	5.00E-04	0.003	5.00E-04	0.005	0.0005	0.00025	0.019
GW30a	80th %ile	7.5	14700	275.8	3.468	1	0.005	3.60E-03	0.33	0.0001	5.00E-04	0.0005	0.0038	5.00E-05	5.00E-04	0.0594	0.00056	0.005	5.00E-04	0.005	0.0005	0.005	0.0228
GW30a	95th %ile	7.5	15600	299	3.6	4.35	0.0075	0.00545	0.345	1.00E-04	5.00E-04	0.0005	0.005	7.25E-05	5.00E-04	0.0638	0.00151	0.0063	0.0005	0.005	0.000725	0.005	0.023
GW30a	Max	7.6	16000	308	3.58	6	0.01	0.006	0.35	1.00E-04	5.00E-04	0.0005	0.005	1.00E-04	5.00E-04	0.066	0.002	0.007	0.0005	0.005	0.001	0.005	0.024
GW30a	Tau	-0.44	0.13	-0.44	0.43	-0.67	-0.80	-0.87	-0.09	0.45	-0.65	-0.65	0.28	-0.37	-0.65	-0.58	-0.54	-0.84	-0.71	-0.65	-0.72	-0.61	0.00
GW30a	2-sided-p	0.05	0.64	0.12	0.17	0.01	0.00	0.00	0.75	0.08	0.02	0.01	0.27	0.15	0.01	0.01	0.11	0.01	0.01	0.01	0.00	0.05	1.00
GW30a	Trend	No	No	No	No	Downward	Downward	Downward	No	No	Downward	Downward	No	No	Downward	Downward	No	Downward	Downward	Downward	Downward	Downward	No
GW30a	Number of Obs Below LOR	0	0	0	0	8	10	6	0	12	11	12	7	12	12	0	2	0	11	12	11	9	0
GW30a	Percent Below LOR	0%	0%	0%	0%	67%	91%	50%	0%	100%	100%	100%	58%	100%	100%	0%	25%	0%	100%	100%	92%	100%	0%
GW30a	Limit Derivation Considerations																						
GW30a	Limit development not possible due to insufficient number of samples																						
GW30a	Limit development not possible due to more than 15% of values <LOR						x	x	x		x	x	x	x	x	x	x		x	x	x	x	
GW30a	Limit development not possible due to trend																						
GW30a	Proposed Limits	8.5	15600	299	3.6	25	0.055	0.013	0.94	0.0002	0.0014	0.001	TBD	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.023
GW31a	Total Number	12	11	9	8	12	9	12	12	12	12	12	11	12	12	12	8	12	11	12	12	9	12
GW31a	from	01-06-2018	09-05-2019	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	14-05-2023	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018	01-06-2018
GW31a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW31a	Min	7.3	4530	15	0.76	0.5	0.006	9.00E-04	0.48	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.00025	2.11E-02	0.00025	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	5th %ile	7.4	4565	15	0.7775	0.5	0.0064	9.55E-04	0.48165	2.50E-05	5.00E-05	0.0001	3.75E-04	2.00E-05	5.00E-05	0.00025	2.12E-02	0.0003875	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	20th %ile	7.6	4610	15.6	0.822	0.5	0.007	1.00E-03	0.5052	0.000025	5.00E-05	0.0001	0.0005	2.00E-05	5.00E-05	0.00034	2.17E-02	0.0005	5.00E-05	0.0001	0.000025	0.0001	0.0025
GW31a	Median	7.7	4690	18	0.885	0.5	0.01	1.15E-03	0.52	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.0066	2.21E-02	0.0005	5.00E-04	0.005	0.0005	0.0001	0.0035
GW31a	80th %ile	8.1	4790	19.6	0.932	0.5	0.034	2.00E-03	0.572	0.00005	5.00E-04	0.0005	0.0006	5.00E-05	5.00E-04	0.0078	0.02332	0.00176	5.00E-04	0.005	0.0005	0.005	0.0076
GW31a	95th %ile	8.2	4820	23	1	1.45	0.046	0.00435	0.61585	5.00E-05	5.00E-04	0.0005	0.00085	5.00E-05	5.00E-04	0.0116	0.024325	0.00236	0.0005	0.005	0.000725	0.005	0.01025
GW31a	Max	8.2	4830	23	0.96	2	0.05	0.006	0.623	5.00E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.016	0.0245	0.0028	0.0005	0.005	0.001	0.005	0.013
GW31a	Tau	-0.45	0.09	-0.46	-0.14	-0.56	-0.46	-0.54	0.02	-0.73	-0.73	-0.73	0.11	-0.73	-0.73	-0.75	-0.33	-0.03	-0.71	-0.73	-0.79	-0.75	0.47
GW31a	2-sided-p	0.05	0.76	0.12	0.71	0.03	0.11	0.02	1.00	0.01	0.01	0.01	0.73	0.01	0.01	0.00	0.32	0.94	0.01	0.01	0.00	0.02	0.05
GW31a	Trend	No	No	No	No	Downward	No	Downward	No	Downward	Downward	Downward	No	Downward	Downward	Downward	No	No	Downward	Downward	Downward	Downward	No
GW31a	Number of Obs Below LOR	0	0	0	0	10	0	0	0	12	12	12	7	12	12	3	0	6	11	12	11	9	5
GW31a	Percent Below LOR	0%	0%	0%	0%	83%	0%	0%	0%	100%	100%	100%	64%	100%	100%	25%	0%	50%	100%	100%	92%	100%	42%
GW31a	Limit Derivation Considerations																						
GW31a	Limit development not possible due to insufficient number of samples																						
GW31a	Limit development not possible due to more than 15% of values <LOR					x				x	x	x	x	x	x			x	x	x	x	x	
GW31a	Limit development not possible due to trend																						
GW31a	Proposed Limits	8.5	4820	23	1	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.008
GW11	Total Number	19	14	15	9	10	14	16	15	17	16	17	16	17	17	16	9	9	15	17	16	12	12
GW11	from	01-05-2014	01-02-2015	01-05-2014	01-03-2017	01-05-2014	01-05-2014	04-11-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014	08-11-2022	01-06-2018	01-05-2014	01-05-2014	01-05-2014	01-05-2014	01-05-2014
GW11	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	24-03-2020	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW11	Min	6.4	3540	32	1.41	3	0.0025	1.00E-04	0.308	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.015	4.00E-04	0.001	5.00E-05	0.0001	0.000025	0.0004	0.005
GW11	5th %ile	6.5	3572.5	32.7	1.422	3	0.0025	1.00E-04	0.3094	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.016875	4.40E-04	0.001	5.00E-05	0.0001	0.000025	0.000455	0.00555
GW11	20th %ile	6.8	3708	35.8	1.5	4.6	0.0025	2.00E-04	0.334	0.000025	1.00E-04	0.00014	0.0005	2.00E-05	5.00E-05	0.0212	5.00E-04	0.00106	5.00E-05	0.0001	0.000025	0.00052	0.007
GW11	Median	7.0	3775	54	1.6	6.5	0.005	5.00E-04	0.36	5.00E-05	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.0271	5.00E-04	0.0014	5.00E-04	0.005	0.0005	0.005	0.012
GW11	80th %ile	7.5	3834	95	1.776	16	0.005	5.00E-04	0.392	0.00005	5.00E-04	0.0005	0.0005	5.00E-05	5.00E-04	0.029	0.00194	0.002	5.00E-04	0.005	0.0005	0.005	0.0158
GW11	95th %ile	7.8	4161	106	1.9	17.65	0.005	0.000775	0.448	5.00E-05	5.00E-04	0.0005	0.00105	5.00E-05	5.00E-04	0.0325	0.0026	0.0029	0.0005	0.005	0.0005	0.005	0.018
GW11	Max	8.1	4200	110	2.04	19	0.005	0.001	0.56	5.00E-05	5.00E-04	0.0005	0.0012	5.00E-05	5.00E-04	0.04	0.003	0.0035	0.0005	0.005	0.0005	0.005	0.019
GW11	Tau	0.37	-0.38	-0.81	-0.11	-0.64	-0.70	-0.41	-0.16	-0.66	-0.65	-0.60	-0.17	-0.66	-0.66	-0.54	0.06	0.40	-0.65	-0.66	-0.68	-0.69	0.28
GW11	2-sided-p	0.03	0.07	0.00	0.75	0.01	0.00	0.05	0.43	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.91	0.17	0.01	0.00	0.00	0.01	0.24
GW11	Trend	Upward	No	Downward	No	Downward	Downward	No	No	Downward	Downward	Downward	No	Downward	Downward	Downward	No	No	Downward	Downward	Downward	Downward	No
GW11	Number of Obs Below LOR	0	0	0	0	0	14	13	0	17	14	16	13	17	17	0	3	0	15	17	16	7	0
GW11	Percent Below LOR	0%	0%	0%	0%	0%	100%	81%	0%	100%	88%	94%	81%	100%	100%	0%	33%	0%	100%	100%	100%	58%	0%
GW11	Limit Derivation Considerations																						
GW11	Limit development not possible due to insufficient number of samples																						
GW11	Limit development not possible due to more than 15% of values <LOR						x	x		x	x	x	x	x	x		x		x	x	x	x	
GW11	Limit development not possible due to trend																						
GW11	Proposed Limits	8.5	4161	106	1.9	25	0.055	0.013	0.94	0.0002	0.0014	0.001	0.0014	0.00006	0.0034	1.9	0.034	0.011	0.00005	0.005	0.0005	0.006	0.018

Yellow highlight indicates 80th Percentile is above relevant guideline
DEHP (2011) Isaac River Sub Basin Surface Water WQO
ANZG (2018) Aquatic ecosystem protection
ANZECC (2000) Stock Watering Guideline
Site specific (95th Percentile of bore specific dataset)
TBD = To be defined once sufficient data becomes available

Notes:
N/A = insufficient data for statistics
$ pH >6.5 x Conservative value for As(V) used
^ 95% species protection for slightly to moderately disturbed systems
^ No level of species protection defined
+ More conservative value for Cr(VI) used
# 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

Analyte		pH (Field)	Lab_EC	Calcium	NH3-N	SO4	Al (diss)	As (diss)	B (diss)	Cd (diss)	Co (diss)	Cr (diss)	Cu (diss)	Hg (diss)	Pb (diss)	Mn (diss)	Mo (diss)	Ni (diss)	Ag (diss)	Se (diss)	U (diss)	V (diss)	Zn (diss)
Unit		-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Default Guideline		**6.5 - 8.5**	**720**	**1000**	**0.9***	**25**	**0.055*$**	**0.013^x**	**0.94***	**0.0002**	**0.0014^**	**0.001*+**	**0.0014***	**0.00006#**	**0.0034***	**1.9***	**0.034^**	**0.011***	**0.00005***	**0.005#**	**0.0005^**	**0.006^**	**0.008***
Bore	**Statistics**																						
GW29a	Total Number	11	11	8	6	11	10	11	10	11	10	10	9	11	10	10	8	8	10	11	10	8	10
GW29a	from	09-05-2019	09-05-2019	09-05-2019	10-07-2023	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	14-05-2023	03-12-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019	09-05-2019
GW29a	to	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024	22-06-2024
GW29a	Min	7.1	8480	92	1.59	0.5	0.0025	6.00E-03	0.536	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.0288	5.00E-04	0.001	5.00E-05	0.0001	0.000025	0.0001	0.01
GW29a	5th %ile	7.1	8520	92.35	1.6125	0.5	0.0025	6.00E-03	0.5405	2.50E-05	5.00E-05	0.0001	2.50E-04	2.00E-05	5.00E-05	0.02934	1.38E-03	0.001	5.00E-05	0.0001	0.000025	0.0001	0.0109
GW29a	20th %ile	7.3	8650	97	1.68	0.5	0.0025	7.00E-03	0.5492	0.000025	9.00E-05	0.0001	0.0004	2.00E-05	5.00E-05	0.03	3.00E-03	0.00116	5.00E-05	0.0001	0.000025	0.0001	0.0128
GW29a	Median	7.5	9170	115	1.885	0.5	0.005	1.00E-02	0.5835	5.00E-05	3.50E-04	0.0003	0.0005	5.00E-05	2.75E-04	0.032	3.75E-03	0.00145	5.00E-04	0.005	0.0002625	0.0001	0.0145
GW29a	80th %ile	7.7	9530	123.6	1.92	2	0.0052	1.15E-02	0.612	0.00005	5.00E-04	0.0005	0.00068	5.00E-05	5.00E-04	0.03654	0.00404	0.00182	5.00E-04	0.005	0.0005	0.005	0.0184
GW29a	95th %ile	7.8	9870	140	1.92	3.5	0.0247	0.01555	0.6732	5.00E-05	5.00E-04	0.0005	0.00092	5.00E-05	5.00E-04	0.03991	0.004265	0.001965	0.0005	0.005	0.0005	0.005	0.02
GW29a	Max	7.9	10100	148	1.92	5	0.04	0.017	0.684	5.00E-05	5.00E-04	0.0005	0.001	5.00E-05	5.00E-04	0.0409	0.0043	0.002	0.0005	0.005	0.0005	0.005	0.02
GW29a	Tau	-0.43	-0.45	-0.36	-0.69	-0.26	-0.29	0.33	-0.04	-0.74	-0.75	-0.75	-0.22	-0.74	-0.75	0.22	0.59	0.30	-0.73	-0.60	-0.75	-0.73	0.30
GW29a	2-sided-p	0.08	0.06	0.27	0.09	0.36	0.34	0.18	0.93	0.01	0.01	0.01	0.51	0.01	0.01	0.42	0.06	0.38	0.01	0.03	0.01	0.04	0.28
GW29a	Trend	No	No	No	No	No	No	No	No	Downward	Downward	Downward	No	Downward	Downward	No	No	No	Downward	Downward	Downward	Downward	No
GW29a	Number of Obs Below LOR	0	0	0	0	8	8	0	0	11	7	10	6	11	10	0	1	0	10	10	10	8	0
GW29a	Percent Below LOR	0%	0%	0%	0%	73%	80%	0%	0%	100%	70%	100%	67%	100%	100%	0%	13%	0%	100%	91%	100%	100%	0%
GW29a	**Limit Derivation Considerations**																						
GW29a	Limit development not possible due to insufficient number of samples																						
GW29a	Limit development not possible due to more than 15% of values <LOR					x	x			x	x	x	x	x	x				x	x	x	x	
GW29a	Limit development not possible due to trend																						
GW29a	**Proposed Limits**	**8.5**	**9870**	**140**	**TBD**	**25**	**0.055**	**0.013**	**0.94**	**0.0002**	**0.0014**	**0.001**	**0.0014**	**0.00006**	**0.0034**	**1.9**	**0.034**	**0.011**	**0.00005**	**0.005**	**0.0005**	**0.006**	**0.02**

Yellow highlight indicates 80th Percentile is above relevant guideline
DEHP (2011) Isaac River Sub Basin Surface Water WQO
ANZG (2018) Aquatic ecosystem protection
ANZECC (2000) Stock Watering Guideline
Site specific (95th Percentile of bore specific dataset)
TBD = To be defined once sufficient data becomes available

Notes:
N/A = insufficient data for statistics
$ pH >6.5 x Conservative value for As(V) used
* 95% species protection for slightly to moderately disturbed systems
^ No level of species protection defined
+ More conservative value for Cr(VI) used
# 99% level of protection as recommended for slightly to moderately disturbed systems (for bioaccumulating toxicants)

Appendix E Water Level Time Series and Level Threshold Testing

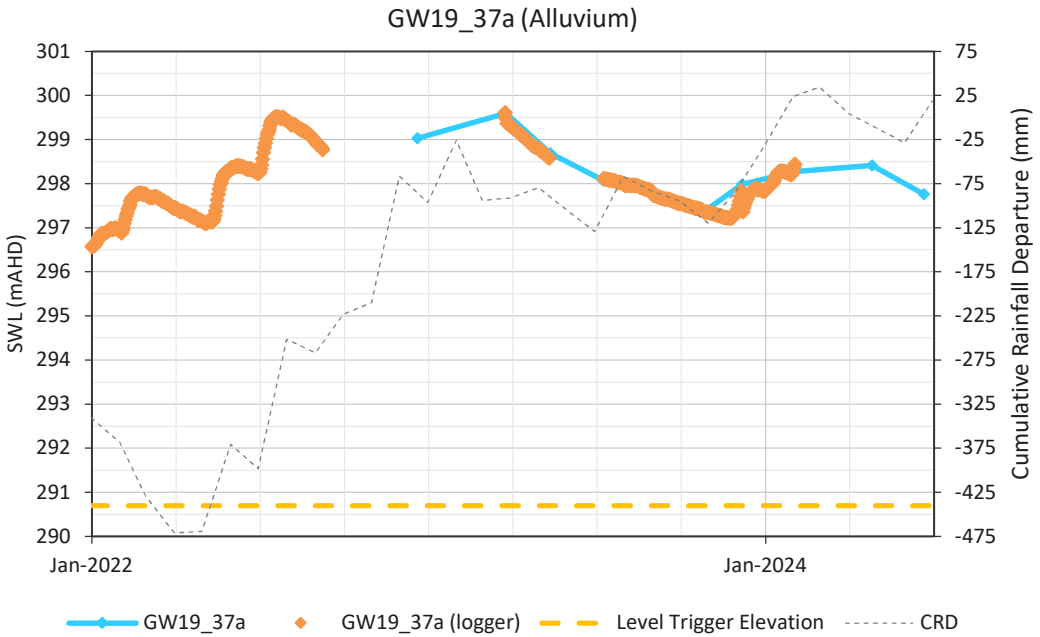
Groundwater Compliance 2024 Updated Limit and Trigger Development

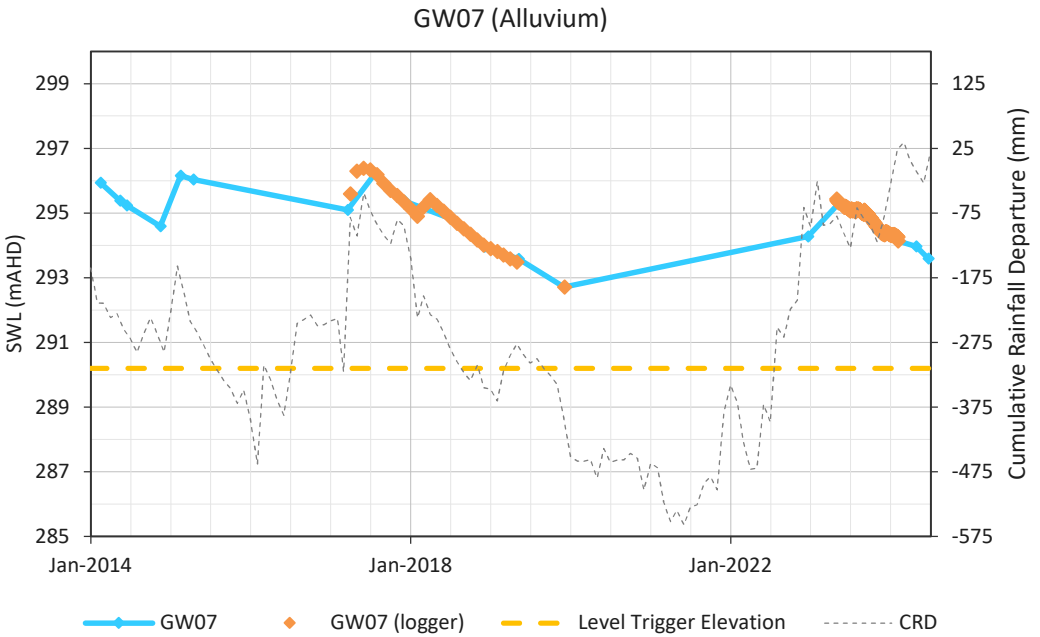
New Lenton Coal Project

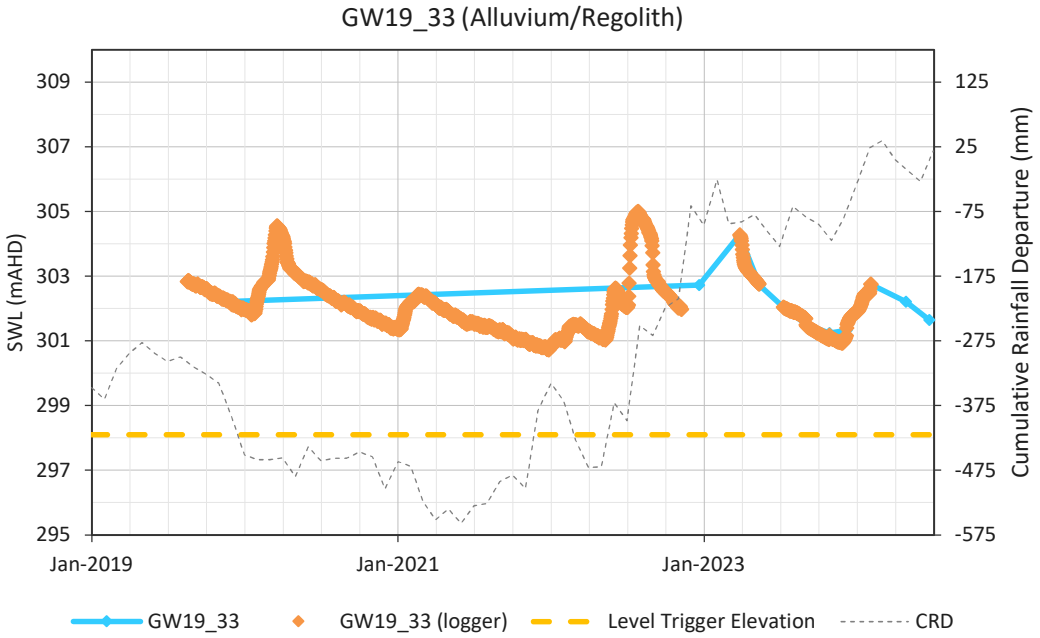
Lenton Joint Venture

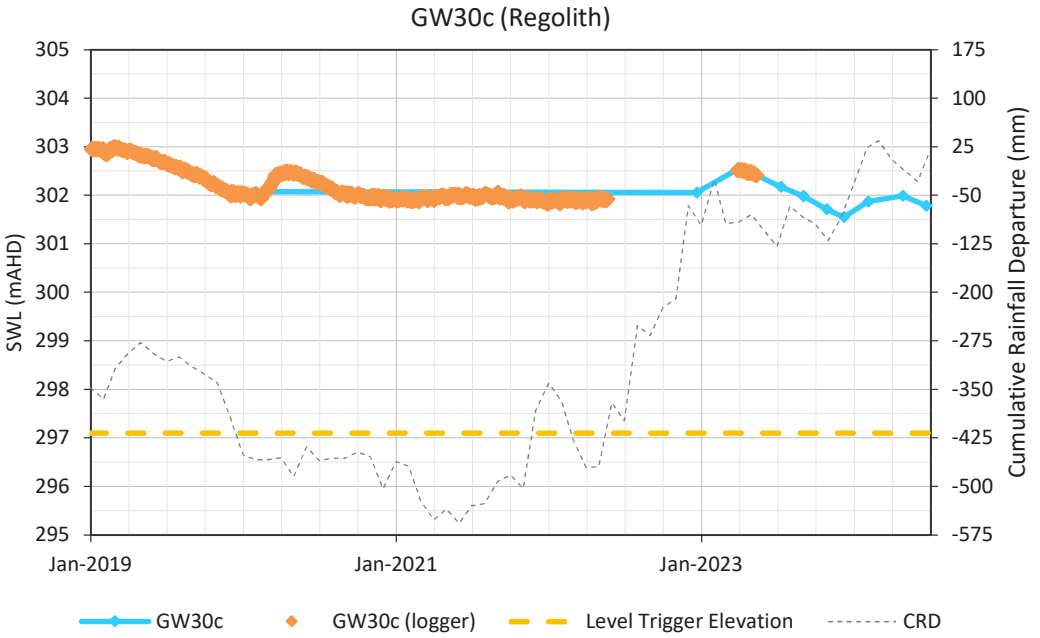
SLR Project No.: 620.040927.00001

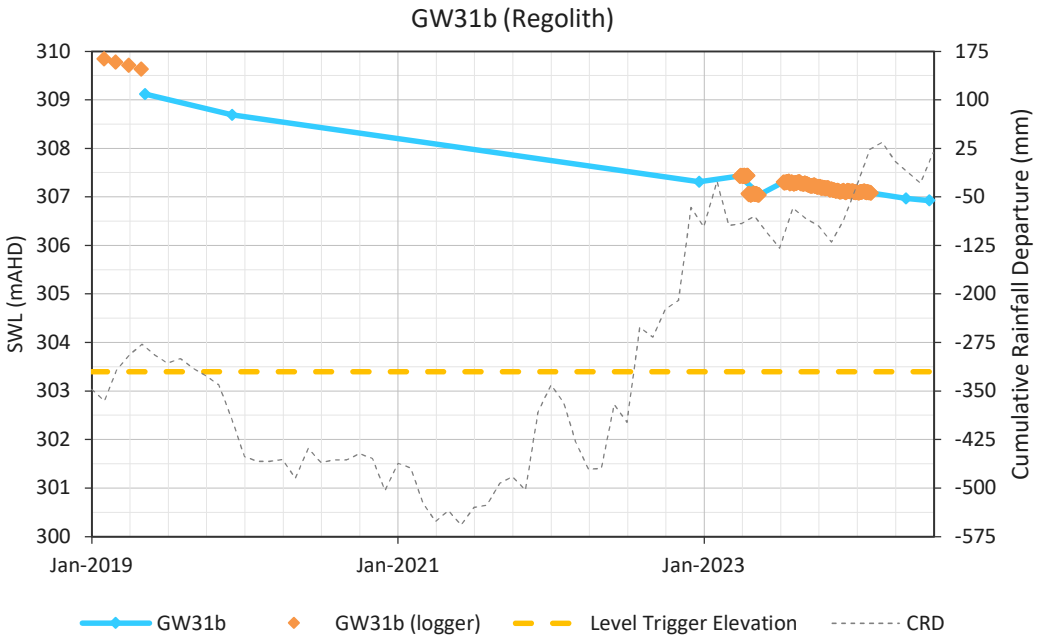
25 September 2024

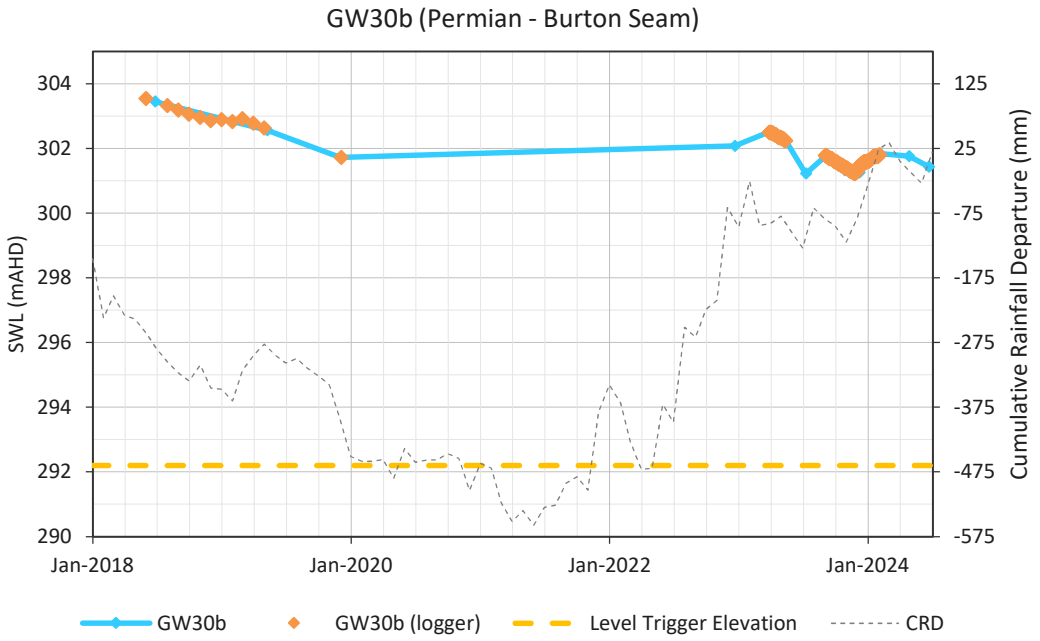

GW19_37a (Alluvium)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
301
300
299
298
297
296
295
294
293
292
291
290
75
25
-25
-75
-125
-175
-225
-275
-325
-375
-425
-475
Jan-2022
Jan-2024
GW19_37a
GW19_37a (logger)
Level Trigger Elevation
CRD

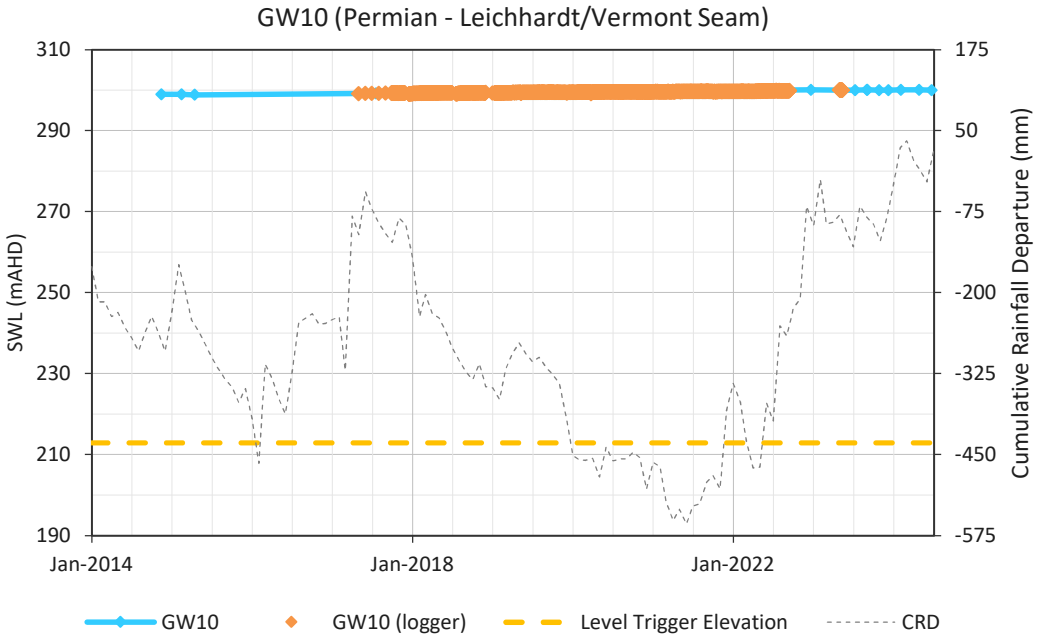

GW07 (Alluvium)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
299
297
295
293
291
289
287
285
125
25
-75
-175
-275
-375
-475
-575
Jan-2014
Jan-2018
Jan-2022
GW07
GW07 (logger)
Level Trigger Elevation
CRD

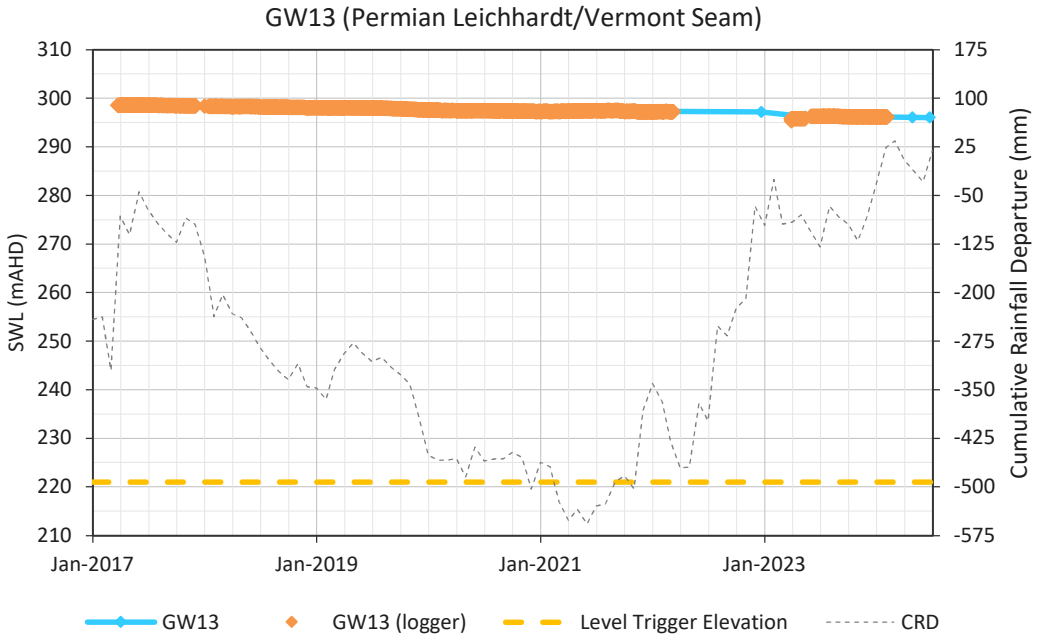

GW19_33 (Alluvium/Regolith)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
309
307
305
303
301
299
297
295
125
25
-75
-175
-275
-375
-475
-575
Jan-2019
Jan-2021
Jan-2023
GW19_33
GW19_33 (logger)
Level Trigger Elevation
CRD

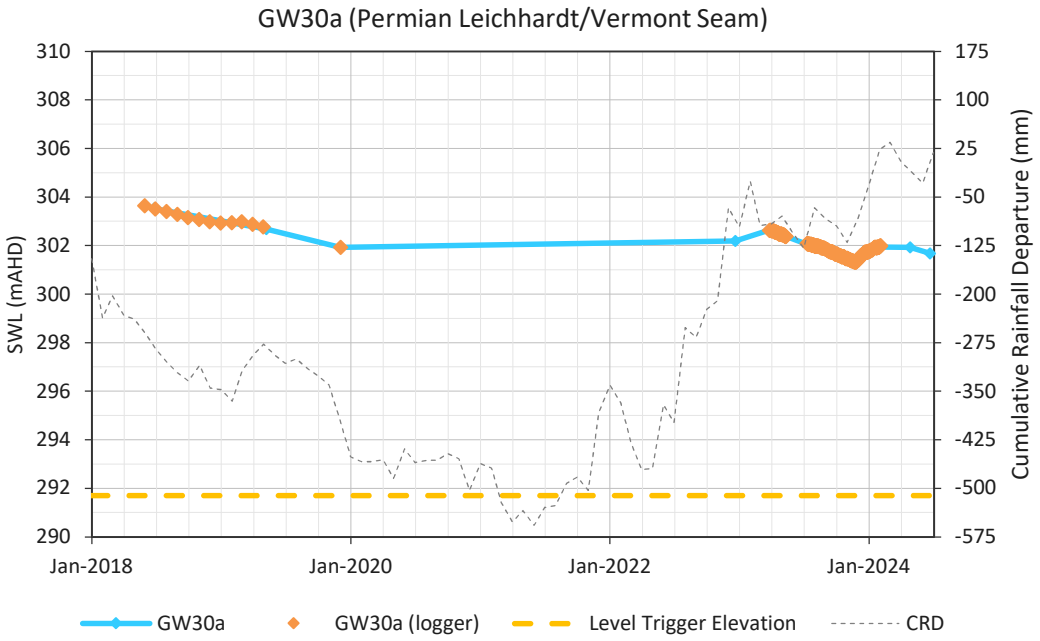

GW30c (Regolith)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
305
304
303
302
301
300
299
298
297
296
295
175
100
25
-50
-125
-200
-275
-350
-425
-500
-575
Jan-2019
Jan-2021
Jan-2023
GW30c
GW30c (logger)
Level Trigger Elevation
CRD

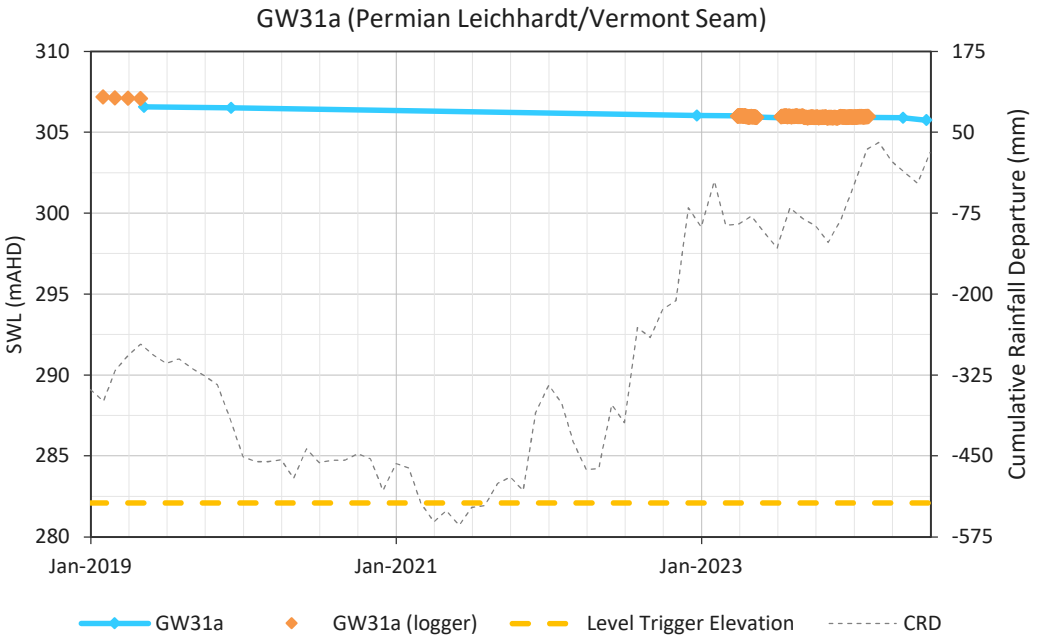

GW31b (Regolith)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
309
308
307
306
305
304
303
302
301
300
175
100
25
-50
-125
-200
-275
-350
-425
-500
-575
Jan-2019
Jan-2021
Jan-2023
GW31b
GW31b (logger)
Level Trigger Elevation
CRD

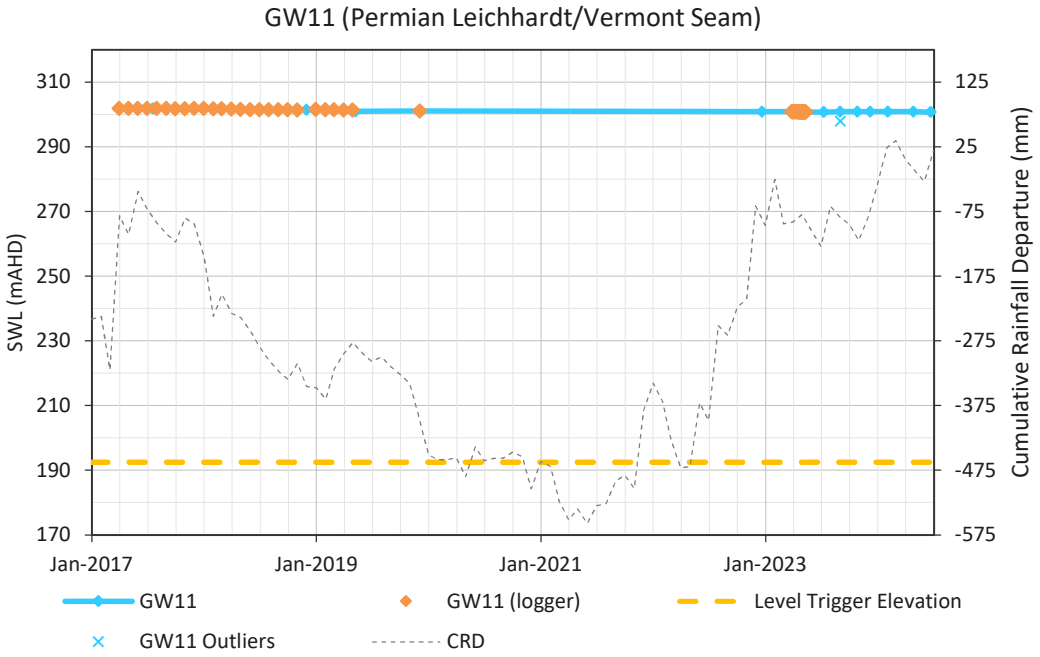

GW30b (Permian - Burton Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
304
302
300
298
296
294
292
290
125
25
-75
-175
-275
-375
-475
-575
Jan-2018
Jan-2020
Jan-2022
Jan-2024
GW30b
GW30b (logger)
Level Trigger Elevation
CRD

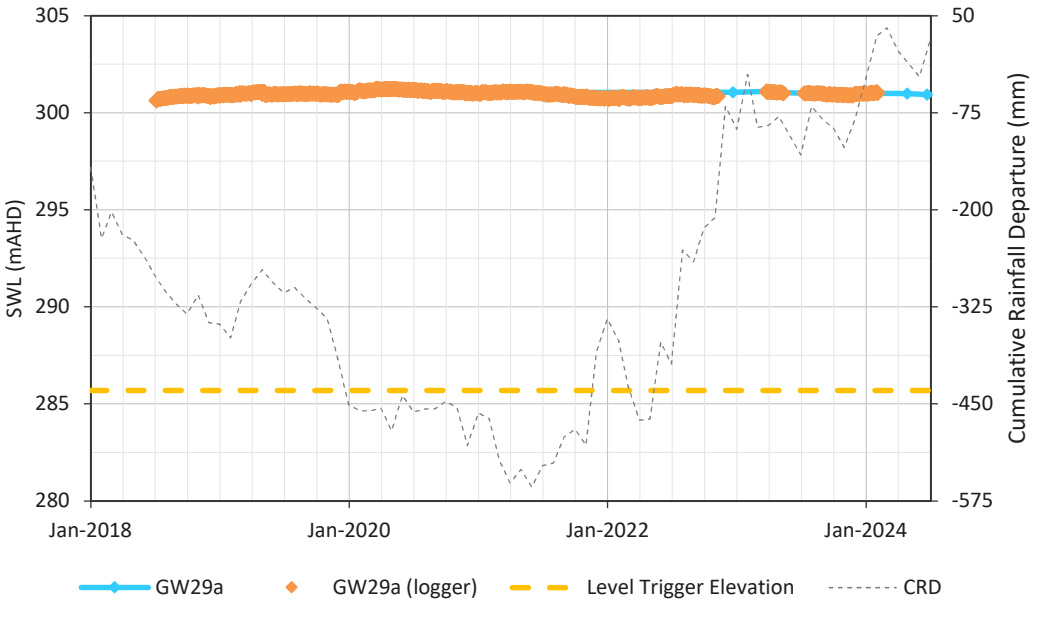

GW10 (Permian - Leichhardt/Vermont Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
290
270
250
230
210
190
175
50
-75
-200
-325
-450
-575
Jan-2014
Jan-2018
Jan-2022
GW10
GW10 (logger)
Level Trigger Elevation
CRD


GW13 (Permian Leichhardt/Vermont Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
300
290
280
270
260
250
240
230
220
210
175
100
25
-50
-125
-200
-275
-350
-425
-500
-575
Jan-2017
Jan-2019
Jan-2021
Jan-2023
GW13
GW13 (logger)
Level Trigger Elevation
CRD


GW30a (Permian Leichhardt/Vermont Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
308
306
304
302
300
298
296
294
292
290
175
100
25
-50
-125
-200
-275
-350
-425
-500
-575
Jan-2018
Jan-2020
Jan-2022
Jan-2024
GW30a
GW30a (logger)
Level Trigger Elevation
CRD


GW31a (Permian Leichhardt/Vermont Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
305
300
295
290
285
280
175
50
-75
-200
-325
-450
-575
Jan-2019
Jan-2021
Jan-2023
GW31a
GW31a (logger)
Level Trigger Elevation
CRD


GW11 (Permian Leichhardt/Vermont Seam)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
310
290
270
250
230
210
190
170
125
25
-75
-175
-275
-375
-475
-575
Jan-2017
Jan-2019
Jan-2021
Jan-2023
GW11
GW11 (logger)
Level Trigger Elevation
GW11 Outliers
CRD


GW29a (Permian - Sandstone)
SWL (mAHD)
Cumulative Rainfall Departure (mm)
305
300
295
290
285
280
50
-75
-200
-325
-450
-575
Jan-2018
Jan-2020
Jan-2022
Jan-2024
GW29a
GW29a (logger)
Level Trigger Elevation
CRD

Appendix F Water Level Summary Statistics

Groundwater Compliance 2024 Updated Limit and Trigger Development

New Lenton Coal Project

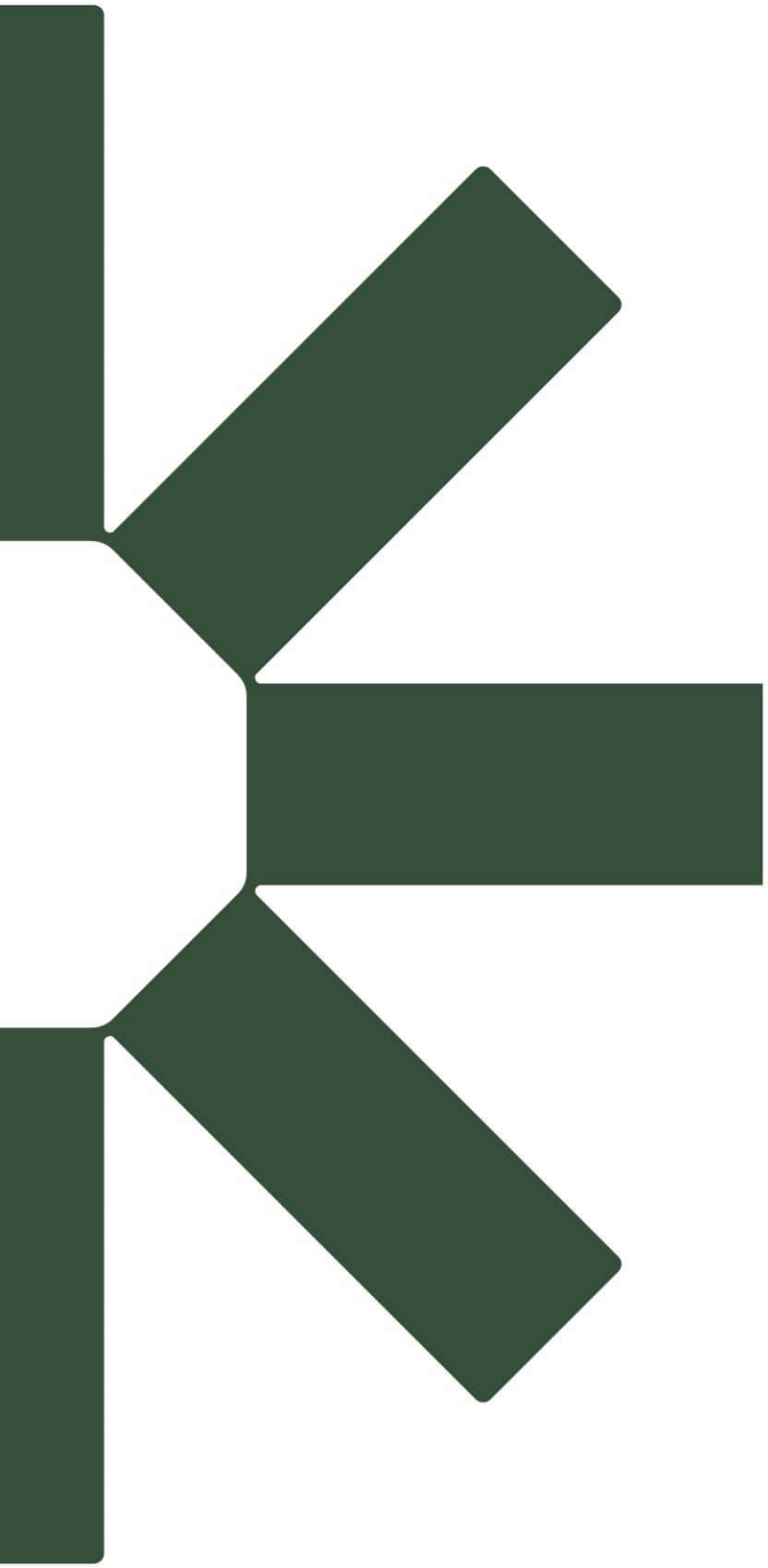
Lenton Joint Venture

SLR Project No.: 620.040927.00001

25 September 2024

Aquifer	Bore	Total Number	Statistical Outliers	from	to	Min	5th %ile	20th %ile	Median	80th %ile	95th %ile	Max	Tau	2-sided-p	Trend
Alluvium	GW06	12	1	15-02-2014	03-12-2019	302.1	302.3	302.5	302.9	303.0	303.0	303.0	-0.8	7.79E-04	Yes-Downward
Alluvium	GW03	0	0	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alluvium	GW09	16	0	15-02-2014	04-02-2024	284.2	284.6	284.9	292.1	297.1	297.5	297.8	-1.0	2.12E-07	Yes-Downward
Alluvium	GW19_37a	11	0	21-12-2022	22-06-2024	297.4	297.6	297.8	298.1	298.7	299.3	299.6	-0.3	0.2	No
Alluvium	GW08	1	0	09-05-2019	09-05-2019	295.2	295.2	295.2	295.2	295.2	295.2	295.2	na	na	na
Alluvium	GW07	23	0	15-02-2014	22-06-2024	292.7	293.6	294.0	294.8	295.4	296.1	296.2	-0.5	1.38E-03	Yes-Downward
Alluvium	GW26	0	0	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alluvium/Regolith	GW19_33	12	0	03-12-2019	22-06-2024	301.2	301.3	301.5	302.1	302.7	303.4	304.3	-0.3	0.2	No
Regolith	GW30c	13	1	09-05-2019	22-06-2024	301.6	301.6	301.8	302.0	302.3	302.6	302.8	-0.6	4.93E-03	Yes-Downward
Regolith	GW31b	13	2	09-05-2019	22-06-2024	306.9	307.0	307.1	307.3	307.4	308.9	309.1	-0.8	1.51E-04	Yes-Downward
Permian (Burton Seam)	GW30b	14	0	27-06-2018	22-06-2024	301.2	301.2	301.4	301.8	302.3	302.9	303.5	-0.4	4.25E-02	Yes-Downward
Permian (Leichhardt/Vermont Seam)	GW10	18	0	15-11-2014	22-06-2024	298.9	299.0	299.2	300.0	300.0	300.1	300.1	0.7	6.51E-05	Yes-Upward
Permian (Leichhardt/Vermont Seam)	GW13	16	0	19-07-2017	22-06-2024	296.0	296.1	296.1	296.3	298.1	298.5	298.5	-0.9	1.78E-06	Yes-Downward
Permian (Leichhardt/Vermont Seam)	GW30a	14	1	27-06-2018	22-06-2024	301.4	301.5	301.8	301.9	302.5	303.0	303.5	-0.6	4.30E-03	Yes-Downward
Permian (Leichhardt/Vermont Seam)	GW31a	13	2	09-05-2019	22-06-2024	305.8	305.8	305.9	305.9	306.0	306.5	306.6	-0.8	4.08E-04	Yes-Downward
Permian (Leichhardt/Vermont Seam)	GW11	15	3	19-07-2017	22-06-2024	300.7	300.7	300.8	300.9	301.1	301.6	301.8	-0.7	8.75E-04	Yes-Downward
Permian (sandstone)	GW29a	14	0	03-12-2018	22-06-2024	300.9	300.9	300.9	301.0	301.0	301.1	301.1	-0.2	0.4	No

N/A = Not Applicable, insufficient data to be statistically significant



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