



Vickery Extension Project Groundwater Monitoring Report

Quarterly Review November 2023 – January 2024

Whitehaven Coal Ltd

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Prepared by:

SLR Consulting Australia

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3.0	3 April 2024	Joy Xie/Sharon Hulbert	Sharon Hulbert	Brian Rask

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 Whitehaven Coal Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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Appendices

- Appendix A Trigger Action Response Plan**
- Appendix B Groundwater Level Results**
- Appendix C Groundwater Quality Results**
- Appendix D Quality Trigger Level Analysis**



Acronyms and Abbreviations

CMA	Corrective Management Actions
EC	Electronic Conductivities
EP&A Act	Environmental Planning and Assessment Act, 1979
GWMP	Groundwater Management Plan
mbgl	meter below ground level
mbtoc	meters below top of casing
pH	potential of Hydrogen
TARP	Trigger Action Response Plan
VCPL	Vickery Coal Pty Ltd
VEP	Vickery Extension Project
WMP	Water Management Plan



1.0 Introduction

1.1 Background

SLR Consulting Australia Pty Ltd (SLR) was engaged by Whitehaven Coal Pty Ltd (Whitehaven) to undertake a review of groundwater data for the Vickery Extension Project (VEP) between 1st November 2023 through 31st January 2024.

The VEP Development Consent (SSD-7480) was granted to Vickery Coal Pty Ltd. (VCPL) on 12 August 2020 by the NSW Independent Planning Commission as a delegate of the NSW Minister for Planning under Section 75J of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

Pertinent to the groundwater monitoring and subsequent reporting, is Condition 8, that states:

8. In Addition to the Groundwater Management Plan monitoring requirements specified in condition B53 of the State Development Consent, the approval holder must:

a. Establish and maintain a network of groundwater monitoring bores designed to detect changes in groundwater levels and include bores that are co-located or paired with surface water monitoring sites to allow monitoring and analysis of groundwater – surface water interactions. These monitoring bores must be installed prior to the commencement of mining operations.

b. Monitor groundwater levels in each bore (required under condition 8.a) at least once every 3 months, starting within one week of the commencement of mining operations for the life of this approval.

c. Publish on the website all groundwater monitoring data from the bore network, updated at least once every three months to include the most recent readings available and to maintain the data on the website for the life of this approval. The monitoring data must include hydrographs for the bore network and explain what the data means in relation to the groundwater performance measures specified in the State Development Consent.

This quarterly report has been compiled for Vickery Coal Mine (VCM) to comply with Condition 8(c) of EPBC 2016/7649. Groundwater monitoring commenced in October 2023 aligning with the commencement of mining in October 2023 and in accordance with Condition 8(b). Reporting to date includes:

1. Initial Quarterly Report (August 2023 through October 2023), published January 2024
2. 2023 Annual Review (1st January 2023 through 31st December 2023), to be published on the website following approval from NSW Department of Planning, Housing and Infrastructure (DPHI)

Mining operations are not yet advanced to mining below the water table with operational activities focusing on construction of infrastructure and removal of the initial overburden in advance of coal extraction.



1.2 Trigger Action Response Plan

A Trigger Action Response Plan (TARP) was established in the Groundwater Management Plan (GWMP), as a means of providing specific suitable action where exceedances of the groundwater performance criteria are observed. The aim of the TARPs is to evaluate adverse changes to existing groundwater sources, confirm if they are due to the development, and provide a means to repair, mitigate and/or offset any adverse groundwater impacts (Whitehaven 2023). The groundwater level and quality TARP for the open cut activities at VEP is shown in **Appendix A**.

The GWMP states the procedure for the review, as follows. The confirmed exceedances will prompt an investigation, carried out by suitably qualified personnel, to assess the reasons for trigger exceedance, which could include but not be limited to climatic conditions, agriculture abstraction, and or mining activities. In the case exceedances are attributed to mining activities, the changes in groundwater conditions, such as a decrease in water level or changes in groundwater quality, will be compared to performance measures (discussed in Section 8.1 of GWMP) to evaluate the significance of any impacts manifested on the groundwater systems.

The results of the trigger investigations will be reported in each annual review. WHC will use the annual review following each reporting period to analyse the data and revise the trigger thresholds in response to additional baseline data as it becomes available. When this occurs the GWMP will be updated.

1.3 Report Objective

This report assesses the VEP groundwater monitoring data against the trigger levels for all required parameters (as per the TARP in the site GWMP) for the reporting period from 1st November 2023 to 31st January 2024.

This report includes:

- A summary of TARP exceedances, if any, during the reporting period;
- A summary of trigger exceedances, if any, over time including the identification of breaches of triggers that remain within normal condition in this reporting period;
- A high-level outline of potential influence factors for exceedances (a detailed analysis of exceedances is not discussed in this report) during the reporting period; and
- Recommendation of relevant actions and responses to be undertaken, in alignment with the TARPs.

The information in this monitoring report will be included in the ongoing quarterly monitoring reports for VEP and summarised in the 2024 Annual Review.



2.0 Monitoring Results

This section summarises the climate information, groundwater monitoring network, and monitoring results available to the conclusion of the reporting period.

2.1 Climate Data

Local climate data was obtained from the Canyon MET station, approximately 7km from VEP. Collection of meteorological data at VEP commenced in September 2023 and will be utilised as more data becomes available. In order to understand long-term rainfall trends, the SILO climate record for the location 0.05° x 0.05° tile centred on a location within proximity of VEP (latitude: -30.75, longitude: 150.15) has been utilised (Queensland Government 2024). Comparison of the data sets show analogous trends, indicating the SILO data is a suitable representation of long-term trends.

Rainfall over the past 12 months, in comparison to the long-term average (i.e., January 1900 – present) is shown in **Table 1**. The SILO climate record for the location 0.05° x 0.05° tile centred on a location within proximity of VEP (latitude: -30.75, longitude: 150.15) has been used for this assessment to understand long-term rainfall trends (Queensland Government 2024). The quarterly reporting period showed notably higher rainfall than long-term averages in November. December rainfall was slightly above long-term averages whilst January was below long-term averages.

Table 1: Monthly Rainfall vs Long-Term Average Rainfall

	2023											2024
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
SILO 2023 monthly rainfall (mm)	15.2	152.1	26.7	0.	30.5	11.5	8.2	5	20.3	93.3	71.7	59
SILO Long-term average rainfall (mm)	57.8	45.9	32.7	39.3	40.3	38.5	35	37.3	49.1	58	60.9	69.6
On-site Rainfall (mm)	4.2	137	24.8	0	31.6	9.6	10.6	4.2	27.6	123.8	87.4	29.4

2.2 Groundwater Monitoring Network

Based on the GWMP, the existing groundwater monitoring network consists of 51 monitoring sites, including

- 24 monitoring locations in Alluvial aquifer; and
- 25 monitoring locations in Permian aquifer.
- Two sites (WR1 and WR2) positioned to monitor the potential for seepage from the spoil dump (installed January 2024).

VEP will incorporate an additional nine monitoring locations in the next reporting period, including:

- Two locations screening the alluvium to the southeast of the mine, situated outside the 1 metre predicted drawdown impact zone of the mine;
- Five locations screening the alluvium to the north of the mine in proximity of the proposed VEP bore field; and
- Two locations screening the Permian aquifer to the north of the mine.

The groundwater network is presented on **Figure 1**, and full details provided in the GWMP.





WHITEHAVEN COAL PTY LTD
Groundwater Monitoring Locations

Paper size A4

Scale: 1:80,000

500 0 500 1000 1500 2000 2500 3000



Metres

Spatial Reference
 Name: GDA 1994 MGA Zone 56
 Datum: GDA 1994
 Projection: Transverse Mercator

Date Exported: 25/07/2023 10:15 AM

Legend

- ▲ Government monitoring wells
- Vickery northern borefield (proposed)
- VEP bore
- Proposed seepage monitoring locations
- Private bore
- Proposed monitoring location
- ▲ Proposed monitoring location (data logger)
- Permian
- ▲ Alluvial (data logger)
- ▲ Permian (data logger)
- Yr 2 overburden emplacement
- Yr 5 overburden emplacement
- Mine lease
- Yr 5 Mining Pit

VEP Monitoring locations

- Geological Unit
- Alluvial

Geology

- Alluvial

2.3 Data Availability

In line with the VCM GWMP, the full suite of bores was monitored during the reporting period, excluding the following monitoring sites:

- GW-2 – Unable to locate,
- GW030051 – No access – NSW Water locked bore,
- GW030052 – No access – NSW Water locked bore,
- GW036459 – No access – NSW Water locked bore.
- VNW223 – was reported blocked at 1.3 m below top of casing (btoc) and was unable to be sampled.

The small number of unavailable bores is not believed to impact the overall ability of the network to monitor for adverse impacts to the groundwater system via on-site operations at this stage. There are bores monitoring the same strata at locations suitable to capture potential impacts (i.e. closer to the extraction site), captured in the monitored data.

2.4 Groundwater Levels

Groundwater levels are measured via both manual dip and continuous loggers. The data available in the 2023 year is presented in this section, and shown in **Appendix B**.

2.4.1 Groundwater Level Data Summary

Groundwater levels are collected via manual dips and continuous read loggers. A summary of the data available to date is presented below.

2.4.1.1 Alluvial Groundwater Bores

The groundwater levels in the alluvial monitoring bores are summarised in **Table 2**, and presented in **Figure 2**.

Table 2: Groundwater Levels in Alluvial Aquifer

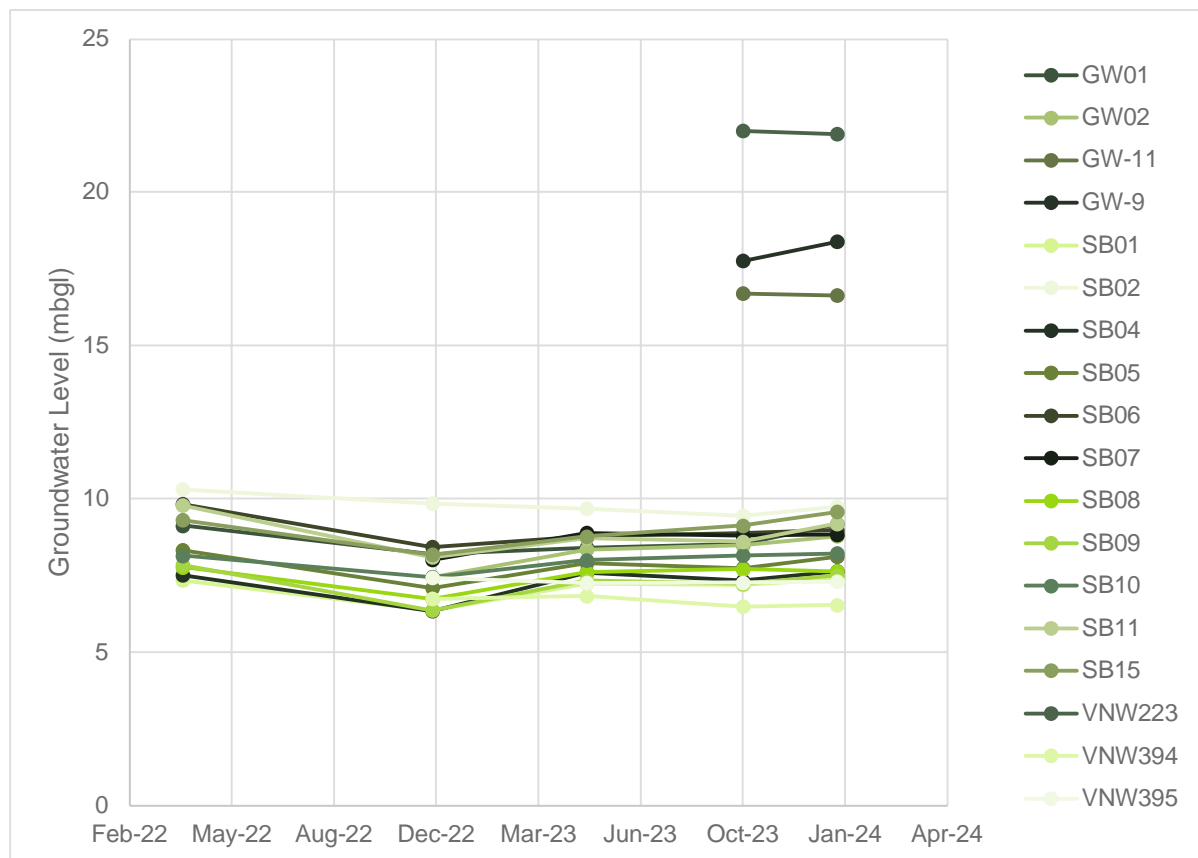
Sample Location	Depth to Water (mbgl*)				
	Apr-22	Dec-22	May-23	Oct-23	Jan-24
GW01	9.12	8.2	8.40	8.53	9.19
GW02	-	7.45	8.34	8.48	8.78
GW-11	-	-	-	16.70	16.64
GW-9	-	-	-	17.76	18.4
SB01	7.34	6.37	7.23	7.19	7.38
SB02	10.3	9.84	9.68	9.46	9.74
SB04	7.5	6.34	7.59	7.33	7.64
SB05	8.32	7.1	7.90	7.73	8.11
SB06	9.82	8.43	8.77	8.87	8.98
SB07	-	8.01	8.89	8.79	8.83
SB08	7.77	6.73	7.60	7.70	7.63
SB09	7.85	6.36	7.33	7.22	7.49
SB10	8.14	7.45	8.00	8.15	8.21



Sample Location	Depth to Water (mbgl*)				
	Apr-22	Dec-22	May-23	Oct-23	Jan-24
SB11	9.78	8.1	8.72	8.6	9.19
SB15	9.3	8.18	8.77	9.12	9.57
VNW223	-	-	-	22.01	21.9
VNW394	-	6.73	6.83	6.49	6.53
VNW395	-	7.43	7.25	7.26	7.3

* mbgl = metres below ground level

Figure 2: Alluvial Bores Hydrograph (Manual Dips)



2.4.1.2 Permian Groundwater Bores

The groundwater levels in the Permian monitoring bores are summarised in **Table 3**, and presented in **Figure 3**.

Table 3: Groundwater Levels in Permian Aquifer

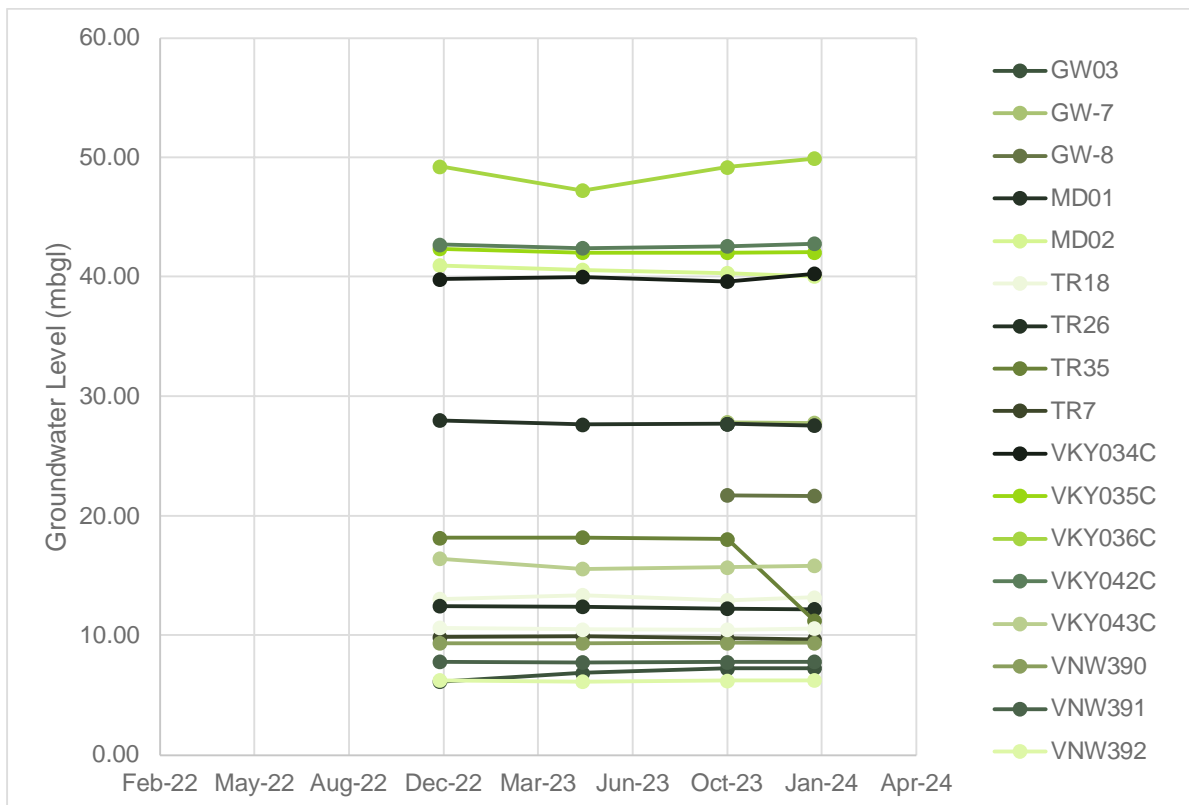
Sample Location	Depth to Water (mbgl*)				
	Apr-22	Dec-22	May-23	Oct-23	Jan-24
GW03	-	6.12	6.85	7.23	7.27
GW-7	-	-	-	27.86	27.80
GW-8	-	-	-	21.74	21.69



Sample Location	Depth to Water (mbgl*)				
	Apr-22	Dec-22	May-23	Oct-23	Jan-24
MD01	-	28.02	27.63	27.68	27.57
MD02	-	40.98	40.57	40.30	40.03
TR18	-	13.04	13.38	12.92	13.17
TR26	-	12.44	12.39	12.24	12.21
TR35	-	18.16	18.17	18.04	11.23
TR7	-	9.85	9.93	9.75	9.69
VKY034C	-	39.79	39.97	39.61	40.27
VKY035C	-	42.37	42.03	42.01	42.04
VKY036C	-	49.23	47.24	49.17	49.88
VKY042C	-	42.68	42.40	42.56	42.80
VKY043C	-	16.41	15.56	15.70	15.82
VNW390	-	9.38	9.33	9.36	9.37
VNW391	-	7.80	7.75	7.76	7.79
VNW392	-	6.25	6.14	6.21	6.24
VNW393	-	10.64	10.50	10.48	10.57

* Metres below ground level

Figure 3: Permian Bores Hydrograph (Manual Dips)



2.4.1.3 Data Loggers

A summary of the available logger data is presented in **Table 4**. An example of a logger plot is provided in **Figure 4**, with all plots provided in **Appendix B**.

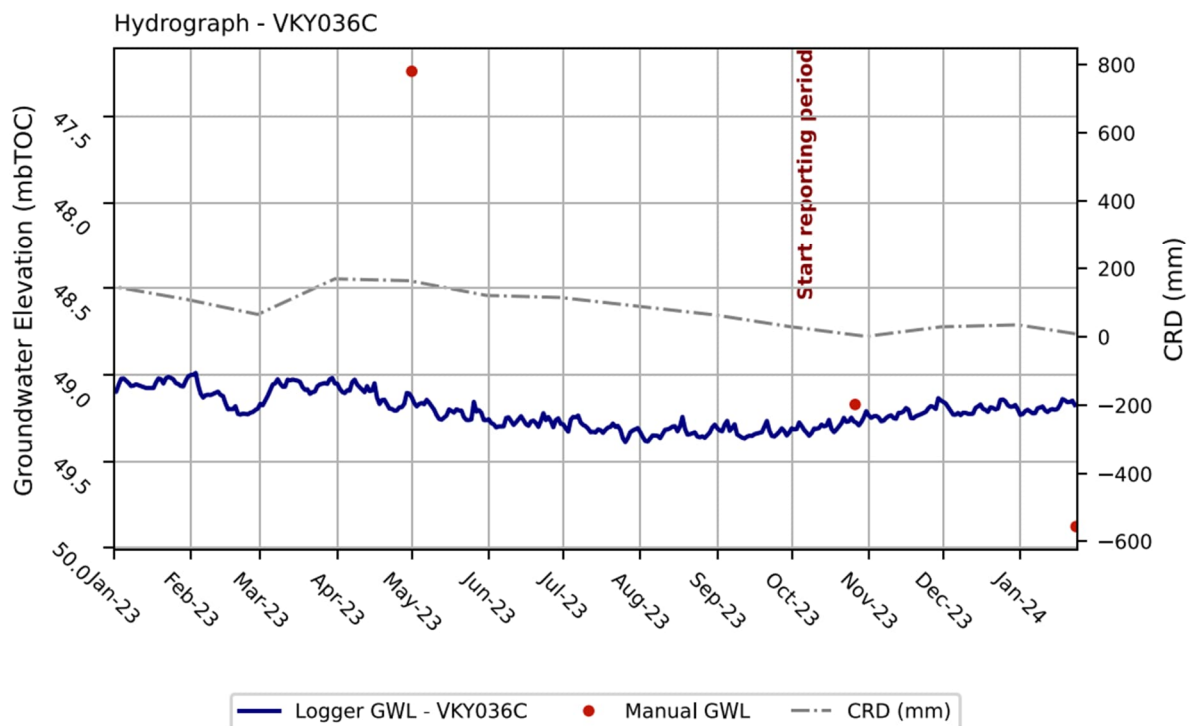
Table 4: Summary of Logger Data Available

Bore ID	Logger Type	Recording Period	Number of Data Points	Comments
GW01	VWP	10/10/2023 – 22/01/2024	106	Calibration factors and sensor depth required to calculate the water depth
GW02	VWP	15/11/2023 – 17/01/2024	48	Calibration factors and sensor depth required to calculate the water depth
TR7	Logger (Rugged TROLL 100)	17/03/2012 – 19/03/2014; and 03/06/2020 – 18/01/2024	1,614	-
TR18	Logger (Rugged TROLL 100)	16/04/2020 – 17/01/2024	1,372	-
VKY034C	Logger (Rugged TROLL 100)	07/01/2020 – 23/01/2024	5,907	-
VKY035C	Logger (Rugged TROLL 100)	04/11/2020 – 23/01/2024	4,700	-
VKY036C	Logger (Rugged TROLL 100)	07/01/2020 – 23/01/2024	5,908	-
VKY041C (38, 51, 70, 95, 115 m)	VWP	11/03/2015 – 17/01/2024	3,235/sensor	Calibration factors and sensor depths to be confirmed.
VKY041C (140, 170, 199 m)	VWP	11/03/2015 – 17/01/2024	3,235/sensor	Calibration factors and sensor depths to be confirmed.
VKY042C	Logger (Rugged TROLL 100)	04/11/2020 – 23/01/2024	4,700	-
VKY043C	Logger (Rugged TROLL 100)	07/01/2020 – 13/07/2023	5,135	Logger stopped reading in July 23
VKY3053C	VWP	04/03/2020 – 17/01/2024		Calibration factors and sensor depths to be confirmed.
VKY33C (38, 51, 70, 95, 115m)	VWP (DT2055-02029)	11/03/2015 – 22/01/2024	3,240/sensor	Calibration factors and sensor depths to be confirmed.
VKY33C (140, 170, 190m)	VWP (DT2055-02087)	11/03/2015 – 22/01/2024	3,241/sensor	Calibration factors and sensor depths to be confirmed.
VS048 (30m)	VWP	17/06/2011 – 15/06/2012; and 04/03/2020 – 17/01/2024	6,983	Calibration factors and sensor depths to be confirmed.
VS054	VWP (SN11-1769)	16/11/2023 – 23/01/2024	69	Calibration factors and sensor depths to be confirmed.
VS056-25m	VWP (SN11-1765)	04/03/2020 – 17/01/2024	1,161	Calibration factors and sensor depths to be confirmed.
VS056-100m	VWP (SN11-1771)	04/03/2020 – 17/01/2024	1,162	Calibration factors and sensor depths to be confirmed.



Bore ID	Logger Type	Recording Period	Number of Data Points	Comments
VS058 (30, 100, 170m)	VWP (SN11-1768)	16/04/2020 – 18/01/2024	5,487 / sensor	Calibration factors and sensor depths to be confirmed.
VS062	VWP	12/02/2021 – 17/01/2024	10,068	Calibration factors and sensor depths to be confirmed.
VS059 (30, 65, 113m)	VWP	16/04/2020 – 24/01/2024	5,143	Calibration factors and sensor depths to be confirmed.

Figure 4: Logger Hydrograph – VKY036C



2.4.2 TARP Trigger Level Summary

Groundwater levels in the Permian and Alluvial bores have remained steady with no significant changes or trends occurring in levels over the monitoring period. Given no extractive activities below the water table occurred during the reporting period, this is as expected. There is insufficient data (less than 2 years) to provide any commentary on seasonal fluctuations or changes in responds to climate conditions (residual rainfall mass). Analyses on these patterns will be in included when more than 2 years of data has been collected.

Given the current status of mining, and lack of notable change in groundwater levels, the Groundwater Level TARP is not enacted during the monitoring period. The groundwater levels are considered to be reflective of natural conditions and not impacted by extraction activities.



2.5 Groundwater Quality and Exceedance Summary

Routine groundwater monitoring commenced in October 2023, with a subsequent round of monitoring occurring in January 2024. The full January 2024 field and laboratory suite results are summarised in **Appendix C**.

Table 5 summarises the bores that have exceedances of the interim trigger values as set out in Table 8-3 of the GWMP. **Appendix D** provides a summary of both monitoring rounds to date compared to the interim trigger values.

Table 5: Summary of GW Interim Trigger Values Compared to Initial Results

Groundwater Bore ID	Parameters	Unit	Trigger Value	Monitoring Results
GW02	EC	µS/cm	969	971
GW03	EC	µS/cm	811	888
GW-11	pH	pH unit	7.0 – 9.3	6.93
GW-7	pH	pH unit	7.7 – 8.5	8.82
	SO ₄ ²⁻	mg/L	86	385
GW-8	SO ₄ ²⁻	mg/L	86	100
GW-9	SO ₄ ²⁻	mg/L	86	128
MD01	pH	pH unit	6.7 – 8.4	11.69 [#]
SB04	SO ₄ ²⁻	mg/L	365	394
SB05	SO ₄ ²⁻	mg/L	365	551
TR18	EC	µS/cm	12315	13640
	SO ₄ ²⁻	mg/L	86	620
TR26	SO ₄ ²⁻	mg/L	86	230
TR35	EC	µS/cm	12315	17330
	SO ₄ ²⁻	mg/L	86	651
TR7	pH	pH unit	7.4 – 7.8	7.05
	EC	µS/cm	12970	15390
	SO ₄ ²⁻	mg/L	365	714
VKY034C	SO ₄ ²⁻	mg/L	86	185
VKY036C	SO ₄ ²⁻	mg/L	86	294
VKY042C	SO ₄ ²⁻	mg/L	86	309
VNW390	SO ₄ ²⁻	mg/L	86	95
VNW391	SO ₄ ²⁻	mg/L	86	88
VNW392	SO ₄ ²⁻	mg/L	86	284
VNW393	SO ₄ ²⁻	mg/L	86	185
VNW394	SO ₄ ²⁻	mg/L	365	551

- value considered not representative of aquifer. Bore investigation and purge undertaken in Feb 2024, found bore potentially failed and high pH due to grout contamination. To be reported in full in next quarterly report.



The trigger level exceedances summarised in **Table 5** are unlikely to be a result of mining and highly likely to be due to natural variation in water quality as mining has not yet impacted the water table. The interim trigger levels were defined utilising standard guideline value and consequently are not reflective of the local natural conditions. As per the GWMP, these trigger values will be updated when reasonable baseline data is collected.

Given operations have yet to breach the water table, and the early position in the project life cycle, it is highly unlikely these exceedances of interim trigger values reflect response to mining. Consequently, the groundwater quality results indicate a 'normal condition' TARP response.



3.0 Action and Response

Based on the results summary presented in **Section 2.0**, the fact that both Groundwater Level and Groundwater Quality are considered “Normal Conditions”, there are no specific action and responses required.



4.0 Recommendations

Previous quarterly reporting provided recommendations, which are summarised in **Table 6**, with a comment on their current status.

Table 6: Summary and Status of Recommendations to Date

Recommendation	Cited	Status
The pH at MD01 is anomalous and a purge of the bore will be undertaken prior to the next monitoring event	2023 Annual Review / Quarterly Report	COMPLETE: Purge at MD01 was completed early Feb 2024. Bore likely damaged.
Install two bores to monitor for potential seepage from the Waste Rock dump (spoil area)	GWMP / 2023 Annual Review	COMPLETE: Two bores successfully installed in January 2024.
Section 5.2 of the GWMP mandates monitoring certain groundwater quality parameters that are not reported during this period. It is recommended to incorporate these parameters in future monitoring or update the GWMP with justifications. The missing groundwater quality parameters are listed as follows: <ul style="list-style-type: none"> • field measurement: sediment load; • major cations: magnesium; • hydrocarbons: oil and grease; and • dissolved metals: barium, silver, strontium, and tin. 	2023 Annual Review	COMPLETE: All parameters incorporated in January 2023 sampling round to reflect requirements of GWMP.
Several monitoring wells were unlocated (GW-02) or inaccessible (GW030051, GW030052, and GW036459) during the reporting period. It is recommended to locate these wells for future monitoring or provide justifications for updating the GWMP.	2023 Annual Review	ONGOING: These bores were not accessible for the January monitoring. Review their suitability for the ongoing monitoring.
Continue the monitoring program and the quarterly reporting on groundwater levels and quality as outlined in the GWMP.	2023 Annual Review	COMPLETE: ongoing monitoring and reporting complete and ongoing.

Recommendations based on the review and analysis completed herein, are as follows:

- Survey two new bores WR1 and WR2 for location and incorporate into the next monitoring round.
- Elevation survey of all bores to assist with groundwater level trigger development and plotting of bores as reduced water levels (i.e. as metres below Australian height datum – mAHD).
- Verify calibration factors and sensor depths for all VVPs in the network to assist with groundwater level calculation.
- Review necessity of MD01 to network, as investigation indicate the bore is damaged. Confirm whether requires replacement or removal from the monitoring regime.
- Review necessity of GW-2 to network, as bore has been unable to be monitored to date. Confirm whether requires replacement or removal from the monitoring regime.
- Logger to be replaced in bore VKY043C.
- Review logger data from TR7, as appears erroneous, and replace as necessary.



- When adequate baseline data becomes available, review and update the trigger values.
- GW-7: field sampling contractors noted this site was overgrown and dangerous. It is recommended to perform site maintenance prior to next monitoring event.
- VNW223 is blocked at 1.3 mbtoc and was unable to be sampled. Recommend investigate blockage and action accordingly.



5.0 References

- Hydrosimulations. 2018. "Vickery Extension Project: Groundwater Assessment. Report ."
- Queensland Government. 2024. *SILO Long Paddock*. <https://www.longpaddock.qld.gov.au/>.
- Whitehaven. 2023. "Vickery Coal Mine Water Management Plan Appendic C Groundwater Management Plan."





Appendix A Trigger Action Response Plan

Vickery Extension Project Groundwater Monitoring Report

Quarterly Review November 2023 – January 2024

Whitehaven Coal Ltd

SLR Project No.: 640.031099.00001

4 April 2024

Table A-1: Tigger Action Response Plan

PERFORMANCE MEASURE AND INDICATOR, TARP OBJECTIVE AND ASSESSMENT CRITERIA	MONITORING PROGRAM	MANAGEMENT		
		TRIGGER	ACTION	RESPONSE
<p>Performance Measure Feature Negligible groundwater level impact on the Namoi Alluvium aquifer and associated surface watercourses, groundwater dependent ecosystems, and private landowner bores.</p> <p>Negligible groundwater level impact on the Permian bedrock and associated private landowner bores, outside that predicted by the approved groundwater impacts (Hydrosimulations 2018).</p> <p>TARP Objective This TARP defines levels of deviation in groundwater level from 'normal' conditions and the actions to be implemented in response to each level deviation as a result of open cut mining.</p> <p>Assessment Criteria Bore specific trigger values are based on the water levels across the entire history of monitoring in each individual bore and the predicted impacts from the Hydrosimulations (2018) numerical groundwater model.</p>	<p>Locations Open standpipes and VWPs All monitoring locations as set out in Table 4-1 of the Groundwater Management Plan (GWMP).</p> <p>All monitoring locations are shown in Figure 4-1 of the GWMP.</p> <p>Monitoring Frequency During mining Quarterly manual measurements of water level. Continuous monitoring in bores installed with Vibrating Wire Piezometers (VWPs).</p> <p>Post-mining TBC</p>	Normal Condition		
		<ul style="list-style-type: none"> Groundwater level remains above the respective trigger limits (defined as the 95th percentile over the baseline period and detailed in Table 8-2 of the GWMP) for each individual groundwater bore. 	<ul style="list-style-type: none"> Continue monitoring and review of data as per monitoring program. 	<ul style="list-style-type: none"> No response required.
		Level 1		
		<ul style="list-style-type: none"> One quarterly monitoring result shows an exceedance of the trigger limit as detailed in Table 8-2 of the GWMP. 	<ul style="list-style-type: none"> Actions as required for Normal Condition. Re-sample of groundwater level within seven days. 	<ul style="list-style-type: none"> Report declines and climate investigation outcomes in Annual Review.
		Level 2		
<ul style="list-style-type: none"> Groundwater level in a groundwater bore exceeds the respective trigger limit during three consecutive quarterly monitoring rounds. <p>OR</p> <ul style="list-style-type: none"> Complaint received by landowners of private bores regarding groundwater level declines. 	<ul style="list-style-type: none"> Actions as stated in Level 1. <p>For Open Standpipe Monitoring Bores, VWPs, and Private Bores:</p> <ul style="list-style-type: none"> Undertake a preliminary hydrogeological investigation as efficiently as practicable to check and validate the data and assess cause of trigger exceedances to determine if mining related as per the requirements set out in Section 8.3 of the GWMP. Review of groundwater levels to be carried out by qualified personnel. Increase monitoring and review of data frequency for sites where Level 2 has been reached, subject to land access. <p>For Private Bores:</p> <ul style="list-style-type: none"> Undertake investigation to demonstrate if the decline will impact the long-term viability of the affected water supply works. Commence level monitoring of said private bore in quarterly monitoring rounds, subject to negotiation and land access restrictions. <p>The investigation will be commenced/ completed as efficiently as practicable.</p>	<ul style="list-style-type: none"> Responses as stated in Level 1. Include outcomes from the preliminary investigation report in Annual Review. 		
Level 3				



PERFORMANCE MEASURE AND INDICATOR, TARP OBJECTIVE AND ASSESSMENT CRITERIA	MONITORING PROGRAM	MANAGEMENT		
		TRIGGER	ACTION	RESPONSE
		<ul style="list-style-type: none"> The reduction in water level is determined in the Level 2 preliminary investigation not to be controlled by climatic or external anthropogenic factors. <p>OR</p> <ul style="list-style-type: none"> Groundwater level in a groundwater bore continues to exceed the respective trigger limit during six consecutive monitoring rounds. 	<ul style="list-style-type: none"> Actions as stated in Level 2. <p>For Open Standpipe Monitoring Bores, VWPs, and Private Bores:</p> <ul style="list-style-type: none"> Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g., catchment changes, another effect unrelated to mining). Review groundwater model. <p>For Private Bores:</p> <ul style="list-style-type: none"> Review corrective management actions (CMAs) as specified in Section 8.3 of the GWMP considering findings from further investigations and consider additional reasonable and feasible options. 	<ul style="list-style-type: none"> Responses as stated in Level 2. Report trigger exceedance to DPE and key stakeholders. Provide the detailed investigation report to relevant agencies within a reasonable timeframe of identifying the non-compliance. Report trigger exceedance and investigation outcomes in Annual Review. Develop/design contingency and remedial measures based on the results of the above investigations. Contingency and remedial measures considered practical for implementation may include: <ol style="list-style-type: none"> Undertake landholder and government consultation; Offset groundwater leakage from the Namoi Alluvium aquifer; Review and refine the GWMP including undertaking additional specific monitoring of private landholder bores; Review Site Water Balance and predictive groundwater model; and Review mine plan impacts on alluvial groundwater source. <p>For Private Bores:</p> <ul style="list-style-type: none"> Provide DPE and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g., extending the depth of the bore, establishment of additional bores, compensation to affected landowners as per Section 8.3 of the GWMP). Implement CMAs, subject to land access (finalise negotiations and implement the agreed "make-good" arrangements). Monitor and report on success of CMAs in Annual Review.
<p>Performance Measure Feature</p> <p>Negligible quality impact on the Namoi Alluvium aquifer and associated surface watercourses and private landholder bores. Negligible quality impact on the Permian bedrock and associated private landowner bores, outside that predicted by the approved groundwater (Hydrosimulations 2018).</p> <p>TARP Objective</p> <p>This TARP defines levels of deviation in groundwater quality from baseline conditions and the actions to be implemented in response to each level deviation.</p> <p>Assessment Criteria</p>	<p>Locations</p> <p>Open standpipes</p> <p>All open standpipe monitoring locations as set out in Table 4-2 of the GWMP.</p> <p>Monitoring Frequency</p> <p>During mining</p> <p>Six-monthly measurements of pH and electrical conductivity parameters.</p> <p>Other parameters (detailed in Table 4-2 of the GWMP) to be measured on an annual basis.</p> <p>Post-mining</p> <p>TBC</p>	<p>Normal Condition</p>		
		<ul style="list-style-type: none"> Groundwater pH remains within the baseline 5th and 95th percentile range, as specified in the GWMP. Other groundwater quality parameters remain below the baseline 95th percentile, as specified in the GWMP. 	<ul style="list-style-type: none"> Continue monitoring and review of data as per monitoring program. 	<ul style="list-style-type: none"> No response required.
		<p>Level 1</p>		
		<ul style="list-style-type: none"> Two six-monthly exceedances or one annual quality exceedances outside of the specified baseline range (pH) or above 95th percentile baseline (other quality parameters). 	<ul style="list-style-type: none"> Actions as required for Normal Condition. Re-sample of groundwater quality within seven days 	<ul style="list-style-type: none"> Report declines and climate investigation outcomes in Annual Review.
<p>Level 2</p>				



PERFORMANCE MEASURE AND INDICATOR, TARP OBJECTIVE AND ASSESSMENT CRITERIA	MONITORING PROGRAM	MANAGEMENT		
		TRIGGER	ACTION	RESPONSE
<p>Quality in each monitoring bore remains within the 5th and 95th percentile of the baseline conditions set out in Table 8-4 of the GWMP for the following parameters:</p> <ul style="list-style-type: none"> Electrical Conductivity; pH; and Sulfate. <p>Other major and metal ions will be assessed against the relevant ANZECC guidelines.</p>		<ul style="list-style-type: none"> Three consecutive six-monthly exceedances or two annual quality exceedances (including re-samples from Level 1) outside of the specified baseline range (pH) or above 95th percentile baseline (other quality parameters). <p>OR</p> <ul style="list-style-type: none"> Complaint received by landowners of private bores regarding groundwater quality declines. 	<ul style="list-style-type: none"> Actions as stated in Level 1. <p>For Open Standpipe Monitoring Bores:</p> <ul style="list-style-type: none"> Undertake a preliminary hydrogeological investigation as efficiently as practicable to assess cause of quality exceedances and determine if mining related as per the requirements set out in Section 8.3 of the GWMP. Review of groundwater quality to be carried out by qualified personnel. Increase monitoring and review of data frequency for sites where Level 2 has been reached, subject to land access. <p>For Private Bores:</p> <ul style="list-style-type: none"> Collect quality sample from said private bore for comparison with wider aquifer data, subject to negotiation and land access restrictions. Undertake investigation to demonstrate if quality will impact the long-term viability of the affected water supply works. <p>The investigation will be commenced/ completed as efficiently as practicable.</p>	<ul style="list-style-type: none"> Responses as stated in Level 1. Include outcomes from the preliminary investigation report in Annual Review.
		Level 3		
		<ul style="list-style-type: none"> The water quality changes are determined from Level 2 preliminary investigation to not be controlled by climatic, local land uses, or other external anthropogenic factors. <p>OR</p> <ul style="list-style-type: none"> Groundwater quality continues to decline with six consecutive six-monthly exceedances or three annual quality exceedances outside of the specified baseline range (pH) or above 95th percentile baseline (other quality parameters). <p>AND</p> <ul style="list-style-type: none"> Quality exceedances are widespread (three or more bores in an aquifer show water quality exceedances) across the aquifers being monitored. 	<ul style="list-style-type: none"> Actions as stated in Level 2. <p>For Private Bores and Open Standpipe Monitoring Bores</p> <ul style="list-style-type: none"> Increase monitoring to at least quarterly measurements for sites where Level 3 has been reached, subject to land access. Undertake a detailed investigation to assess if the change in behaviour is related to mining effects (e.g., catchment changes, another effect unrelated to mining). Review corrective management actions (CMAs) as specified in Section 8.3 of the WMP considering findings from further investigations and consider additional reasonable and feasible options. 	<ul style="list-style-type: none"> Responses as stated in Level 2. <p>For Private Bores and Open Standpipe Monitoring Bores:</p> <ul style="list-style-type: none"> Report trigger exceedance to DPE and key stakeholders. Report trigger exceedance and investigation outcomes in Annual Review. <p>For Private Bores, if the changes have been confirmed to be related to mining effects:</p> <ul style="list-style-type: none"> Initiate negotiations with impacts landowners as soon as practicable. Consider all reasonable and feasible options for remediation as relevant (e.g., isolation, remediation, etc.). Provide DPE and key stakeholders with proposed corrective management actions (CMAs) for consultation (e.g., extending the depth of the bore, establishment of additional bores, compensation to affected landowners as per Section 10.2.2 of the WMP). Implement CMAs, subject to land access (finalise negotiations and implement the agreed "make-good" arrangements). Monitor and report on success of CMAs in Annual Review.





Appendix B Groundwater Level Results

Vickery Extension Project Groundwater Monitoring Report

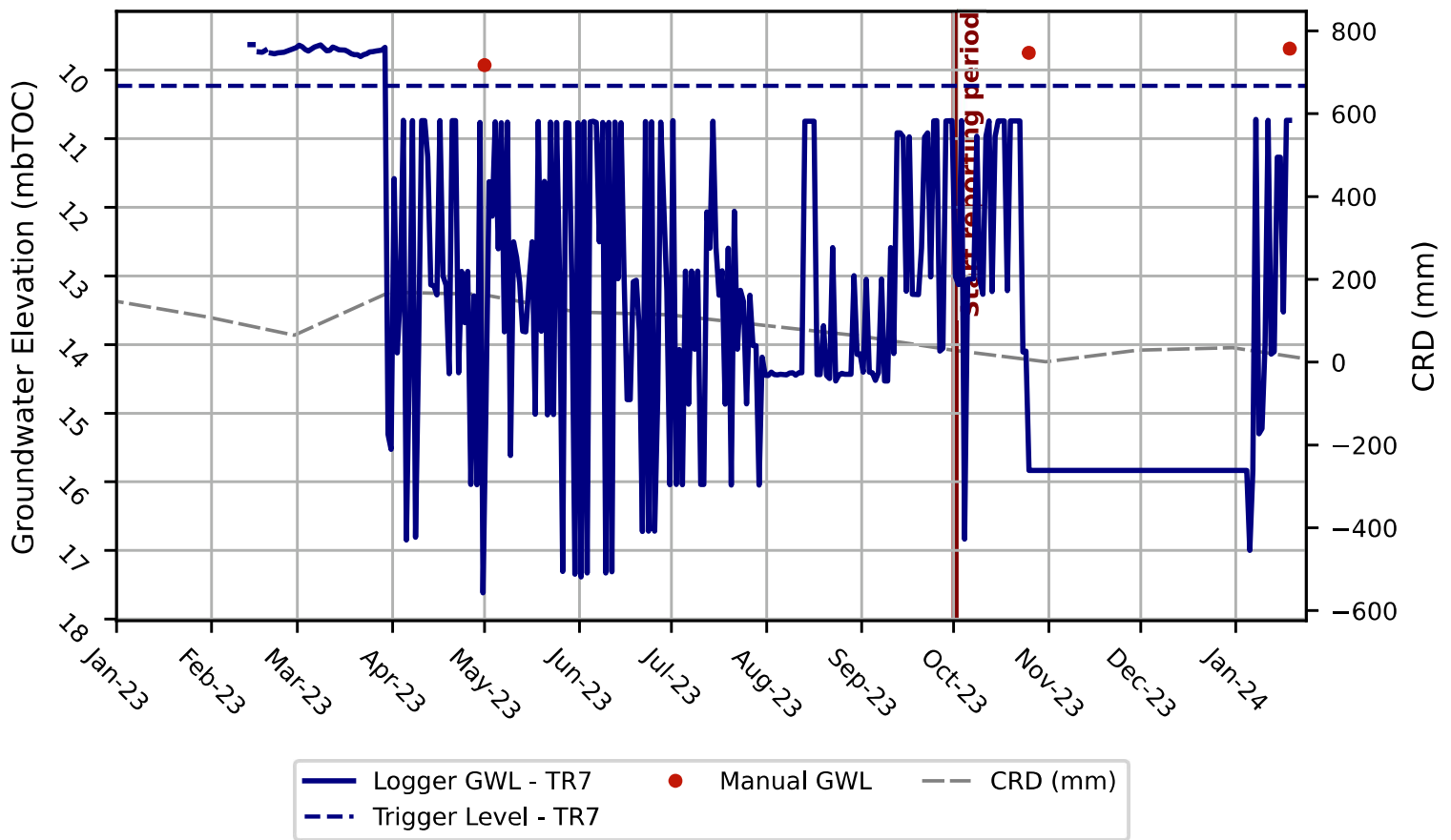
Quarterly Review November 2023 – January 2024

Whitehaven Coal Ltd

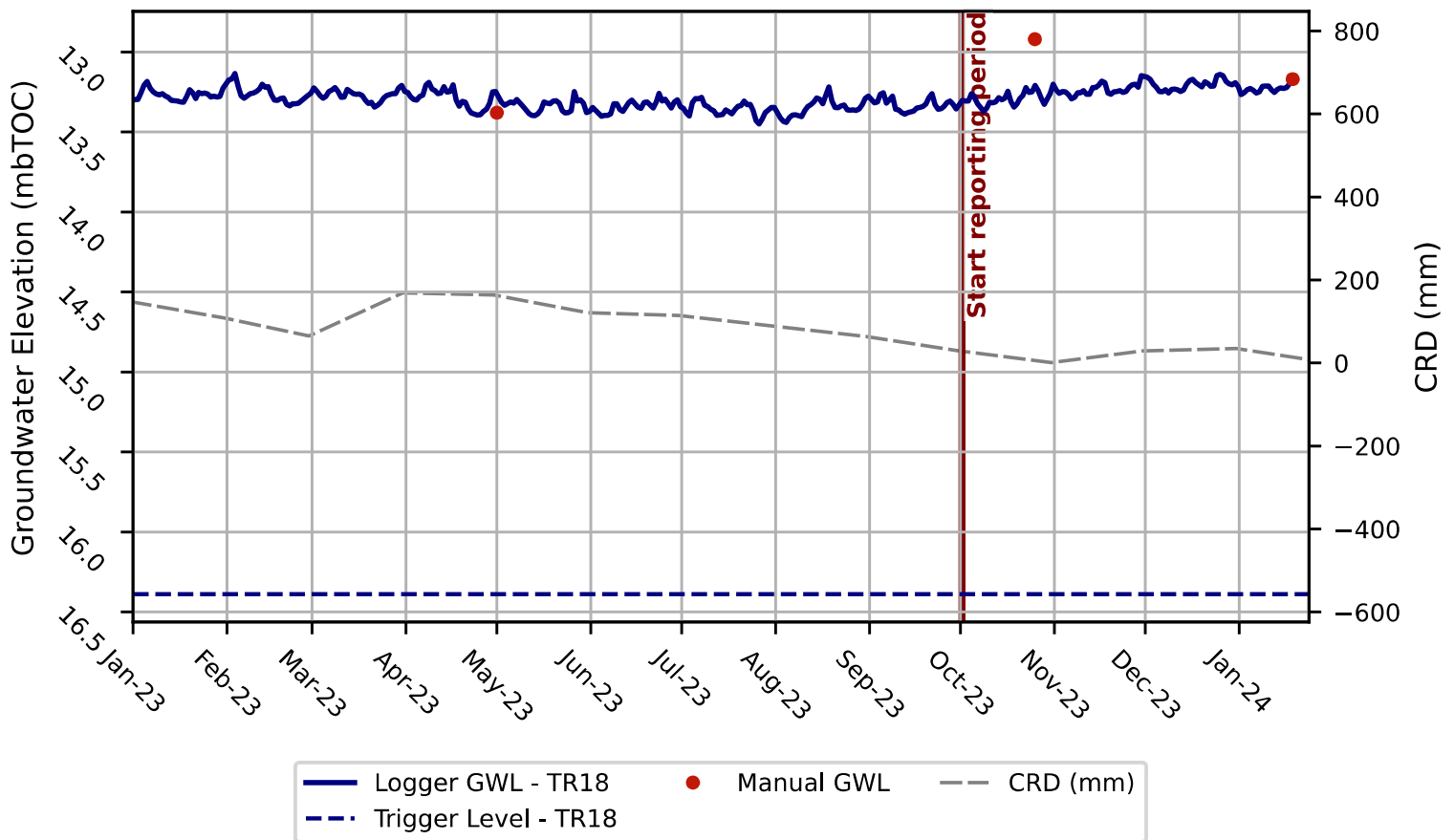
SLR Project No.: 640.031099.00001

4 April 2024

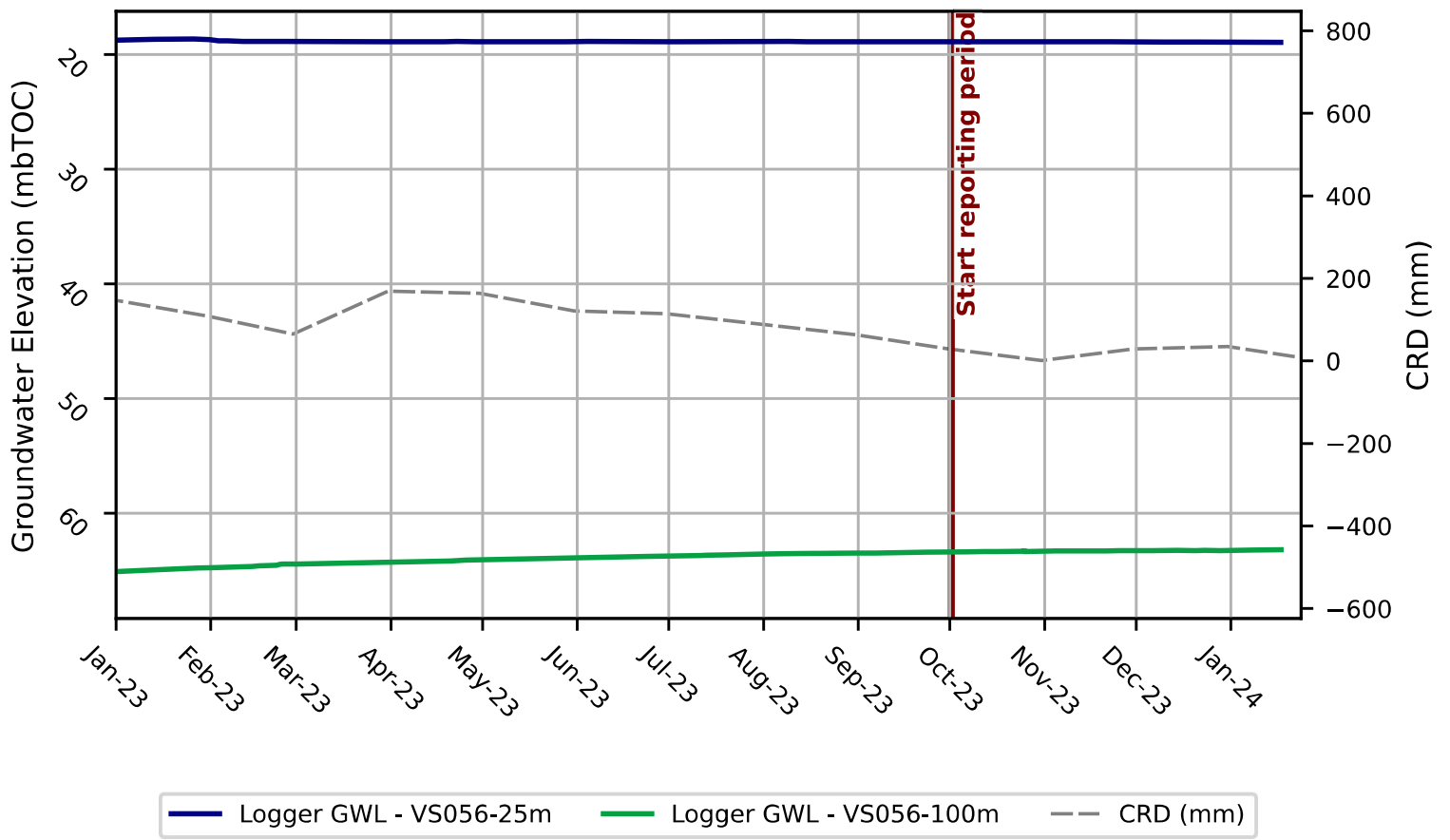
Hydrograph - TR7



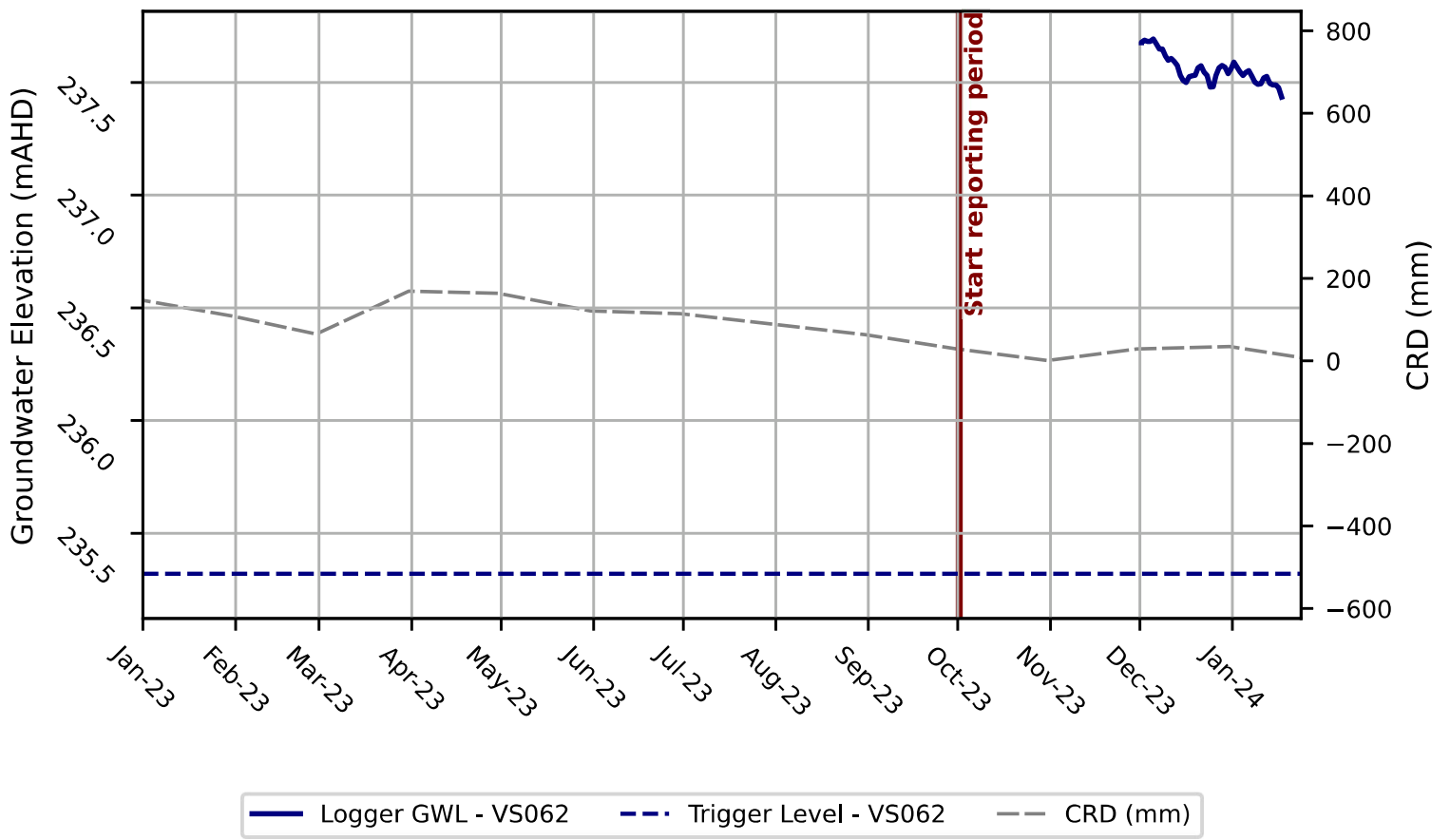
Hydrograph - TR18



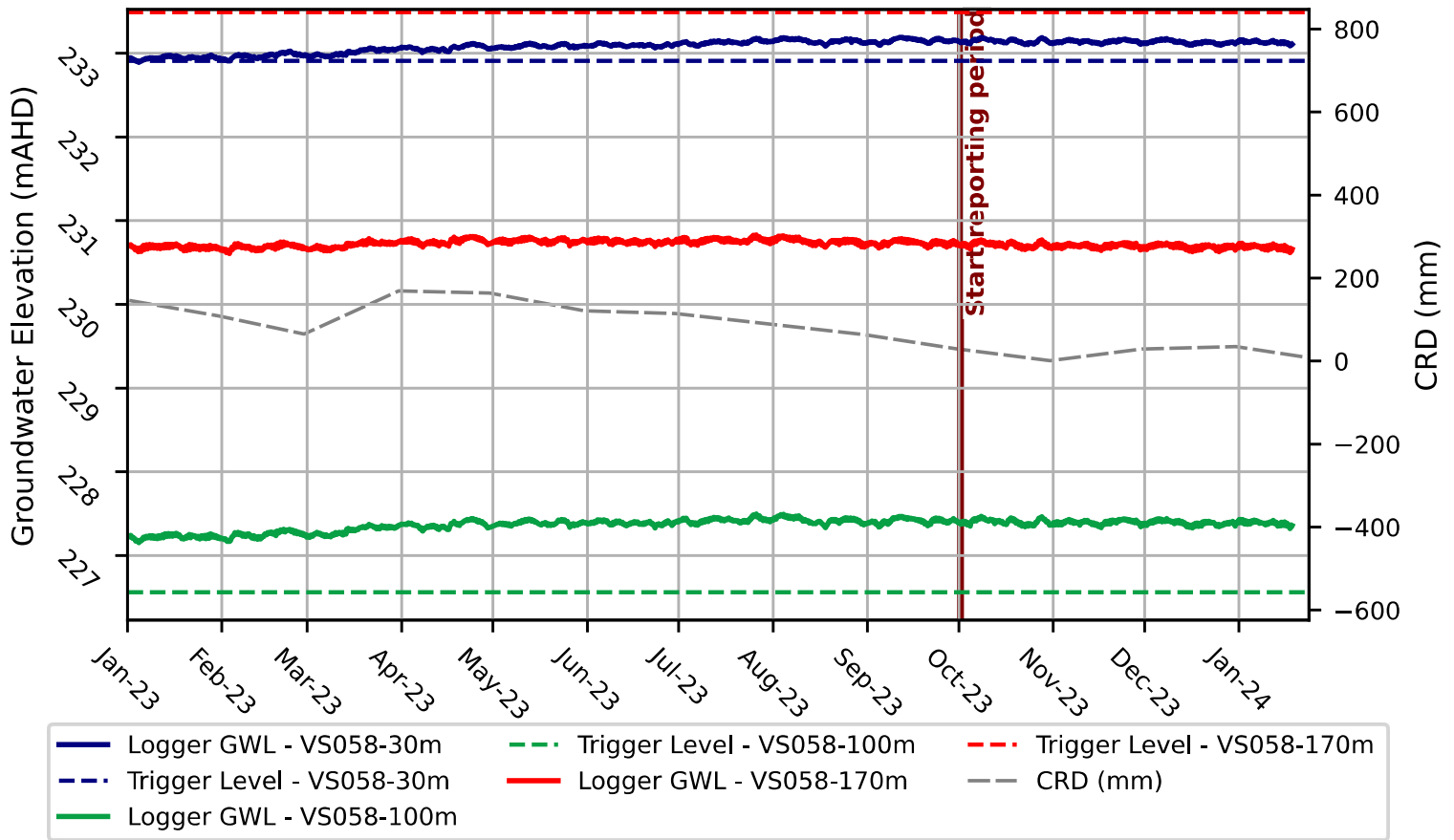
Hydrograph - VS056



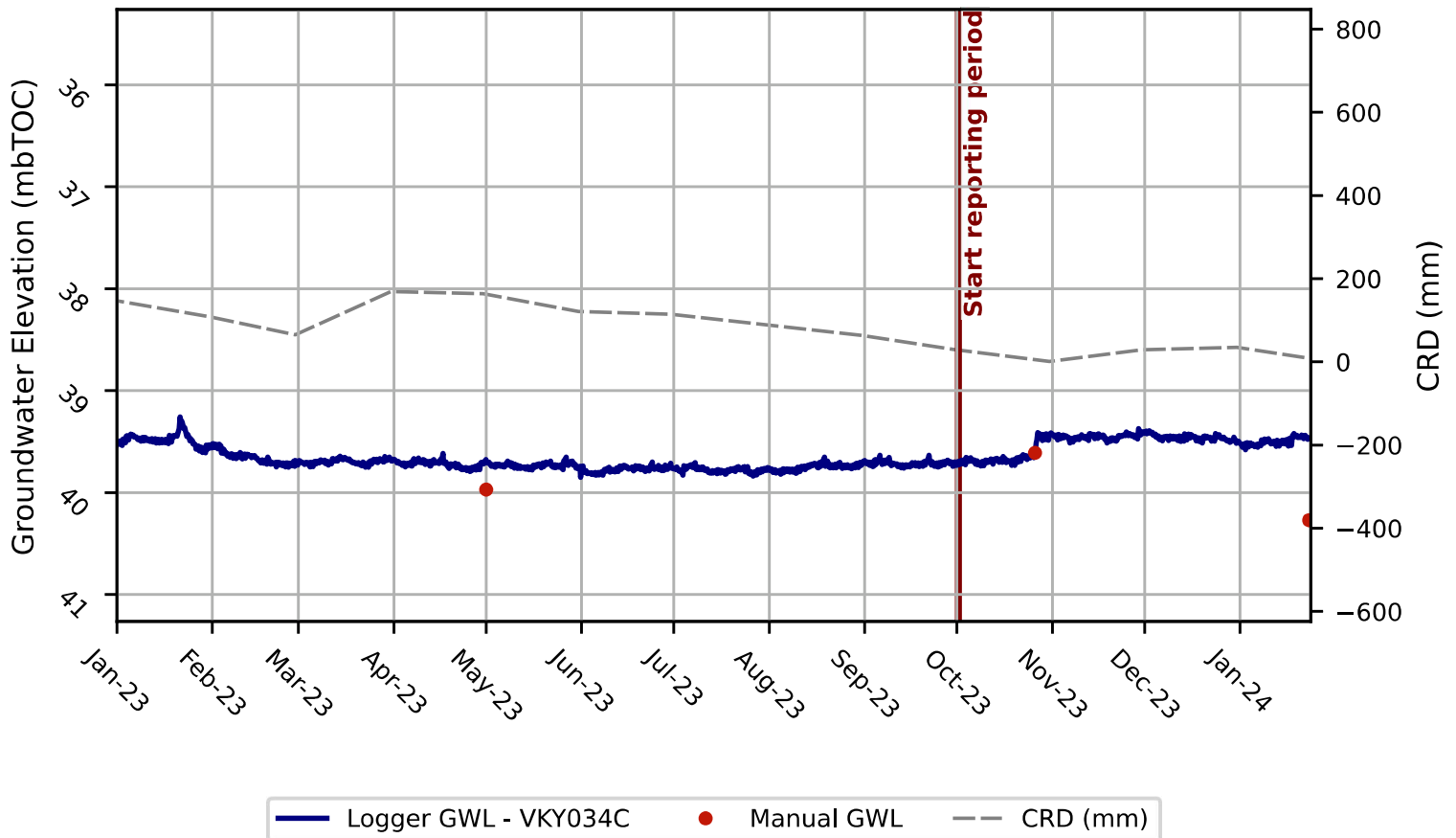
Hydrograph - VS062



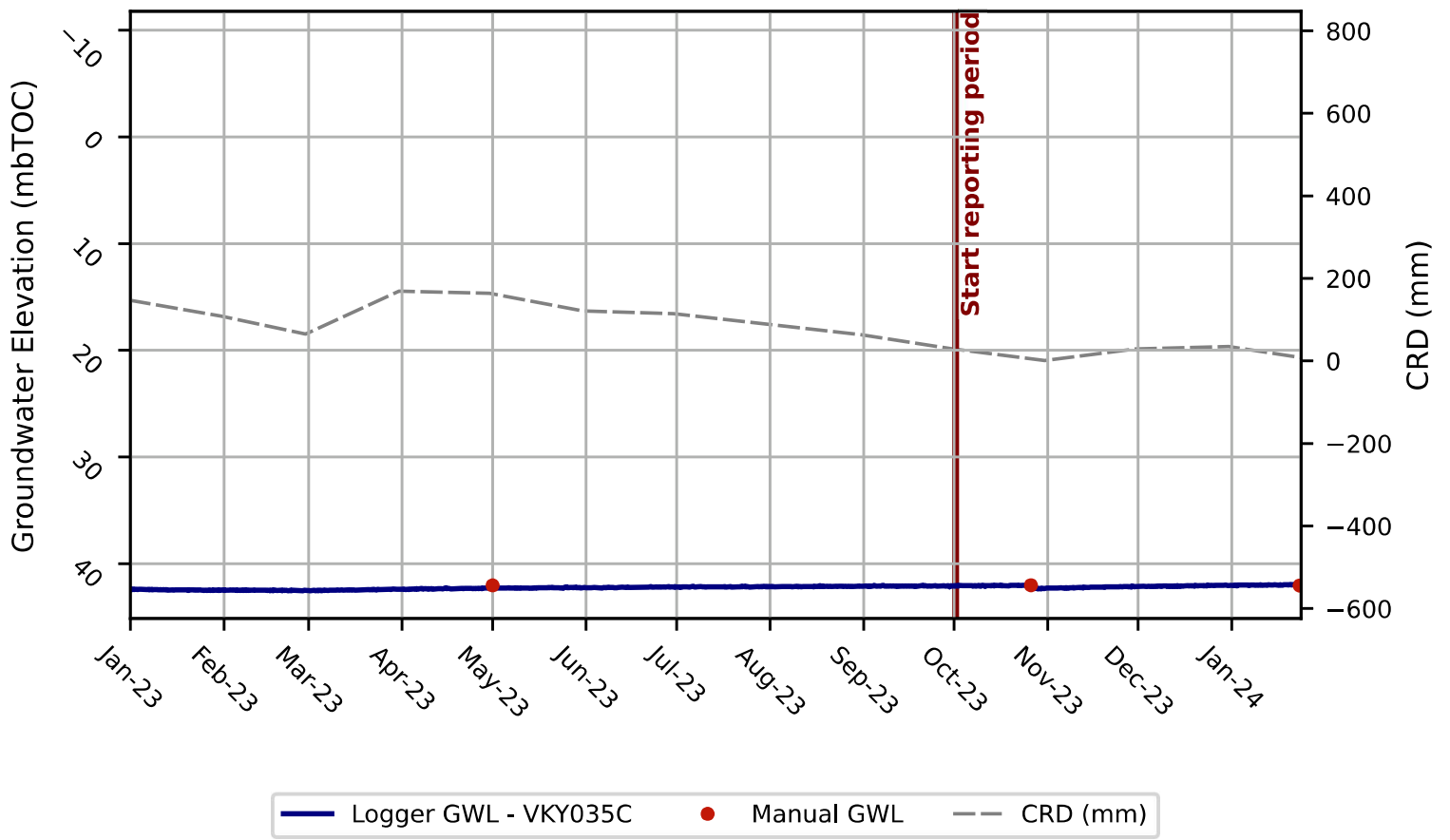
Hydrograph - VS058



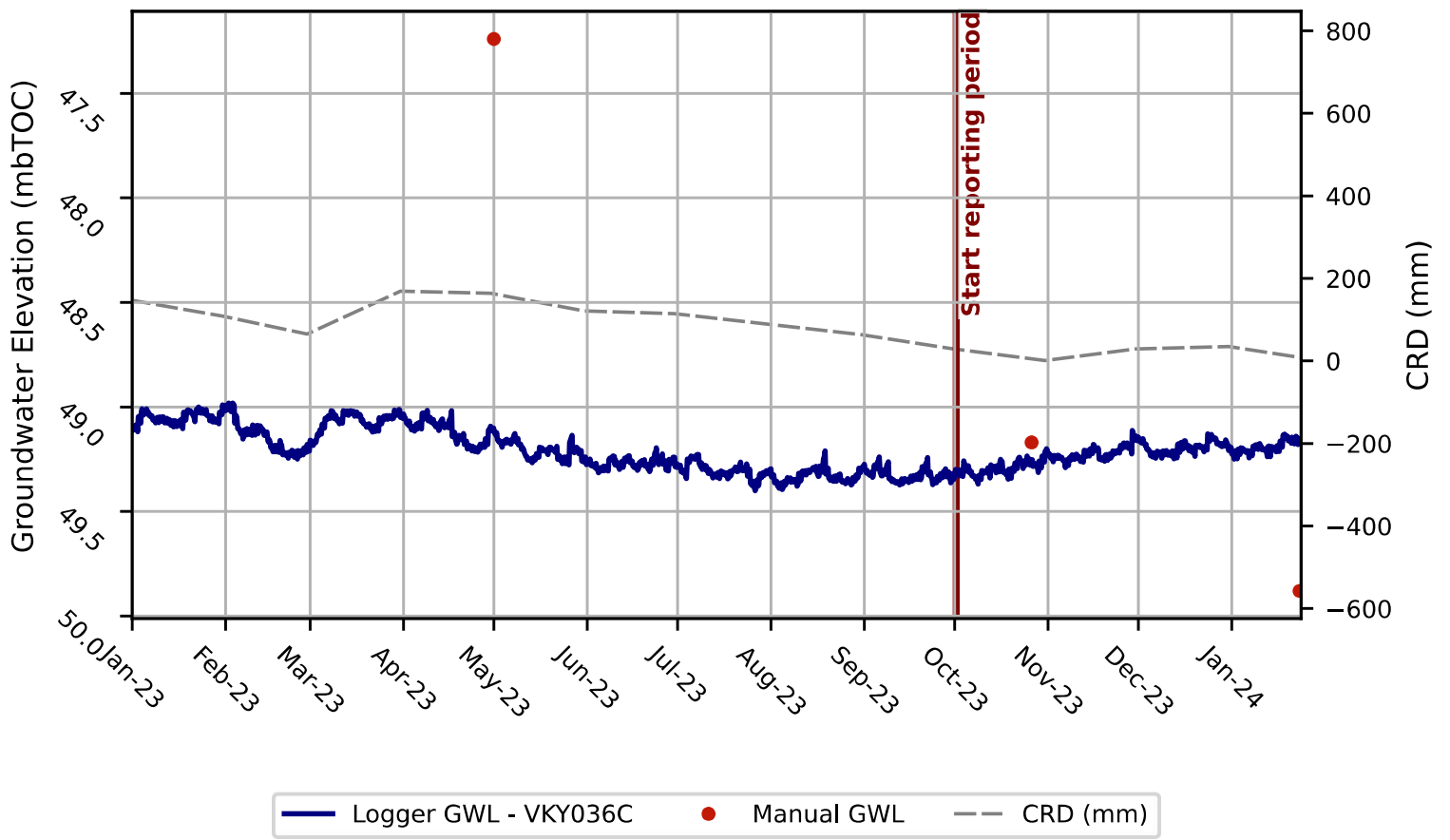
Hydrograph - VKY034C



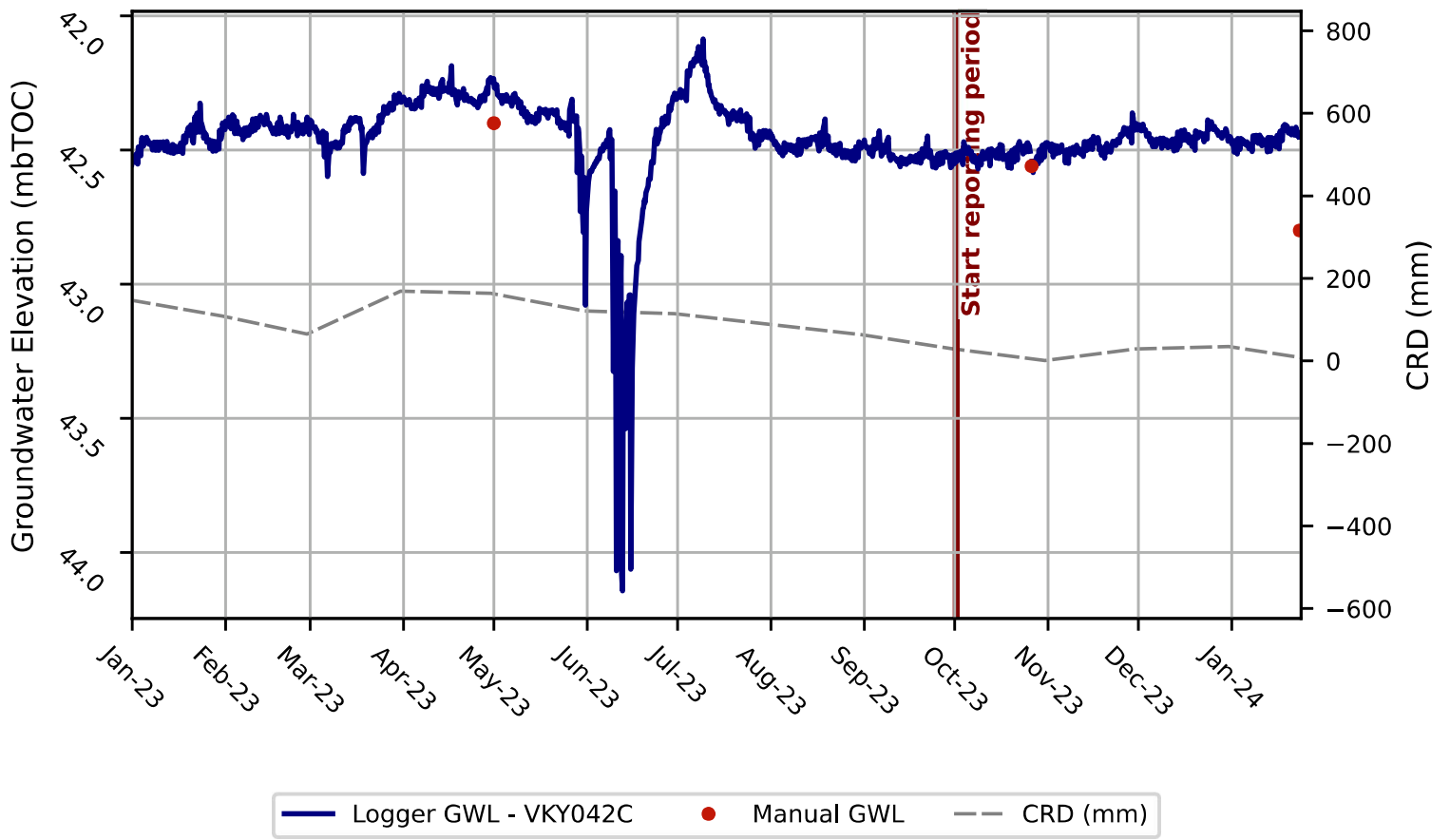
Hydrograph - VKY035C



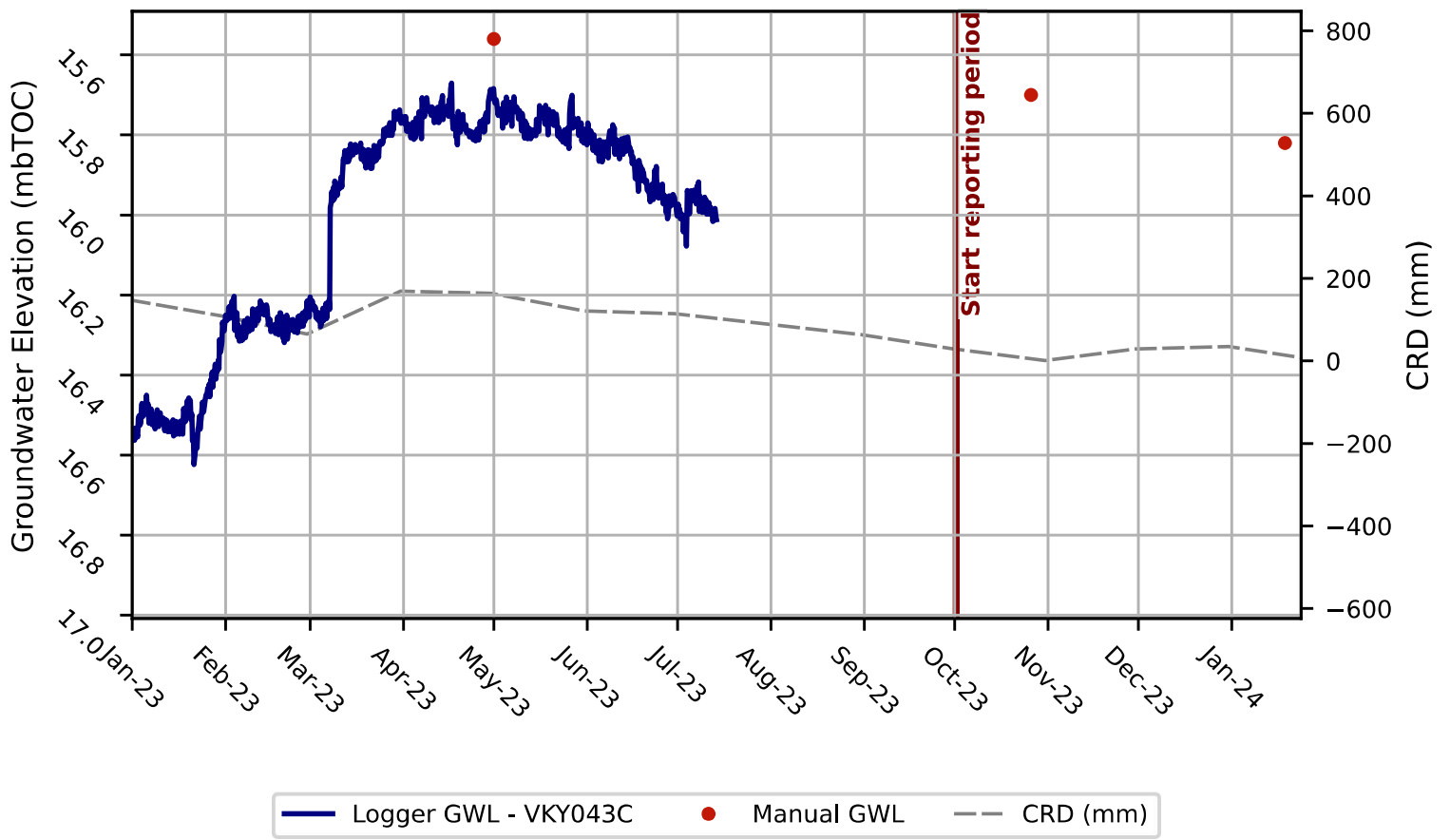
Hydrograph - VKY036C



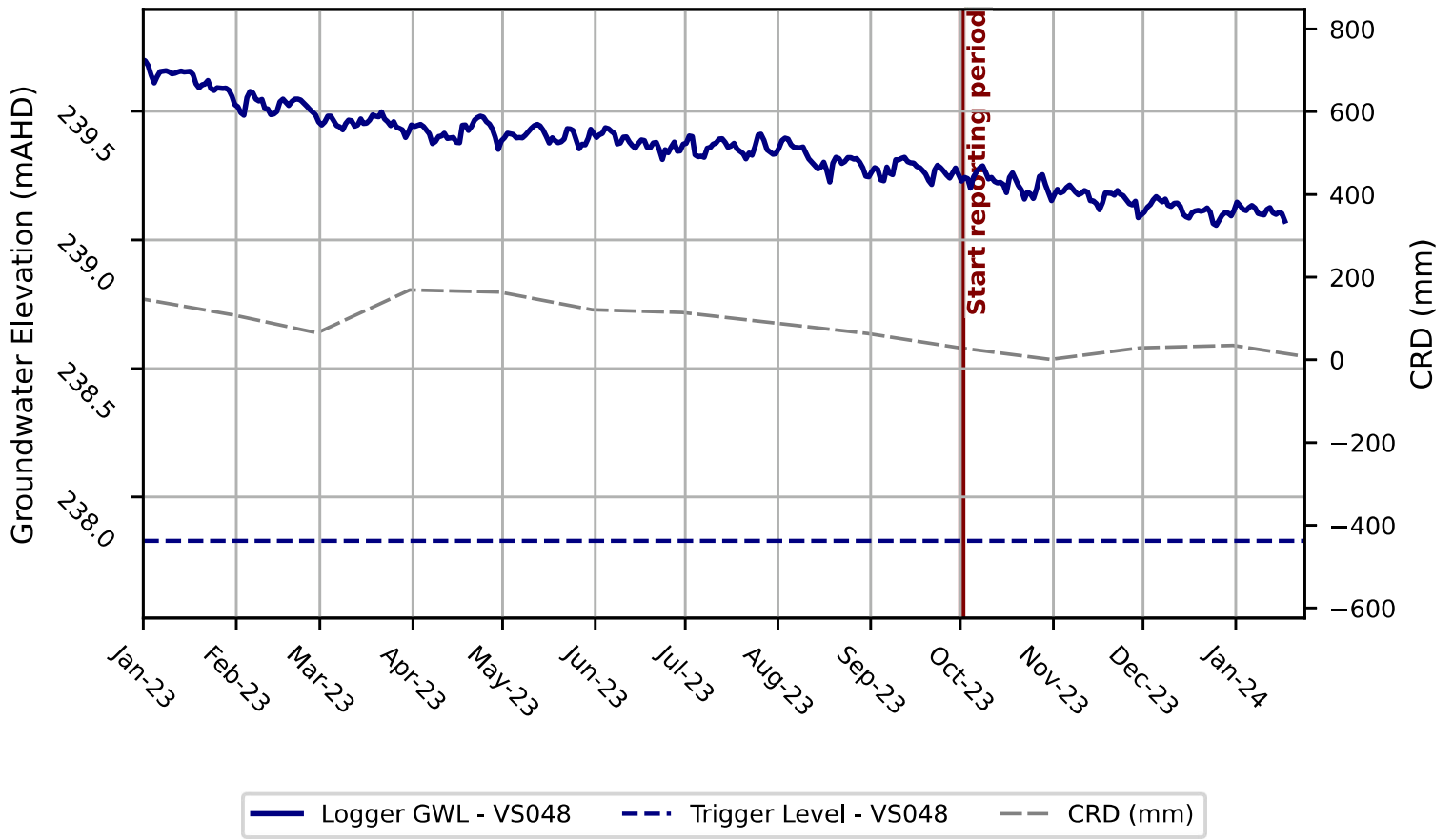
Hydrograph - VKY042C



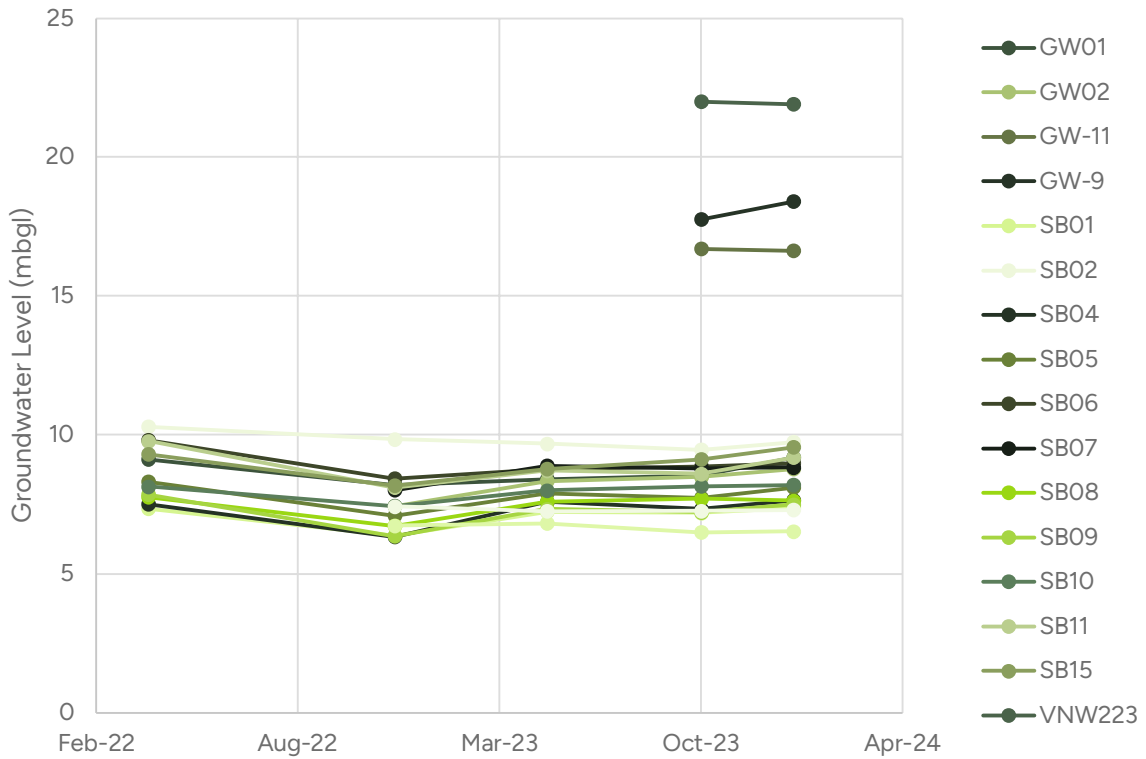
Hydrograph - VKY043C



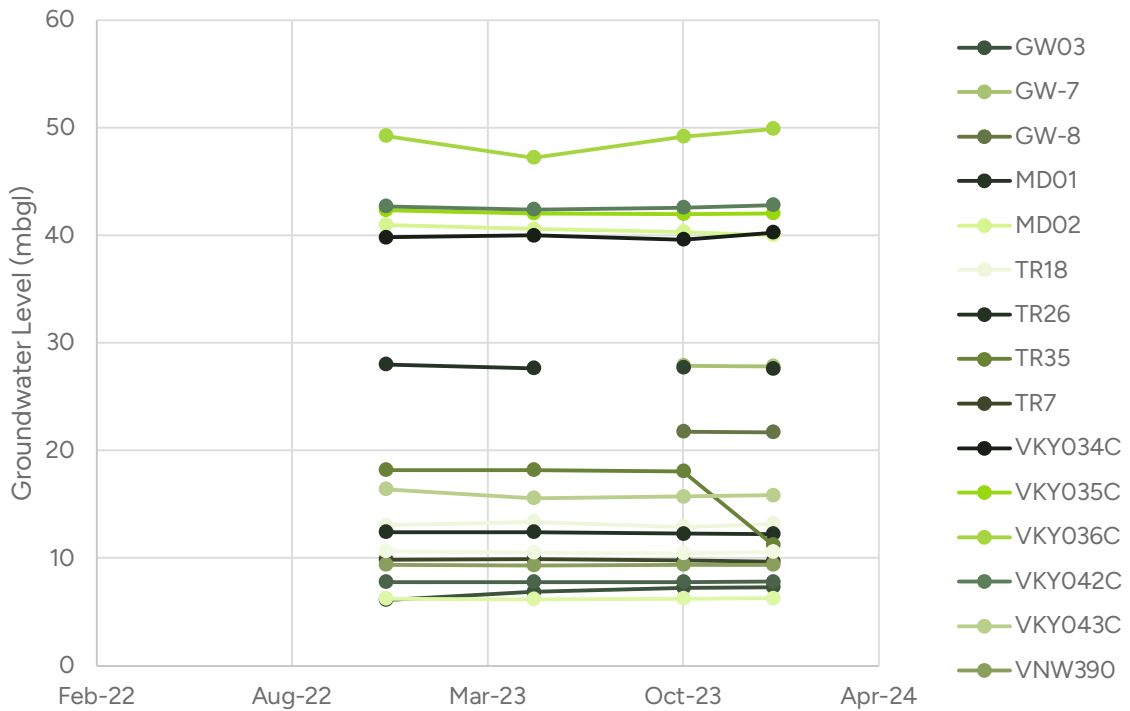
Hydrograph - VS048



Hydrograph of Alluvial Monitoring Bores



Hydrograph of Permian Monitoring Bores





Appendix C Groundwater Quality Results

Vickery Extension Project Groundwater Monitoring Report

Quarterly Review November 2023 – January 2024

Whitehaven Coal Ltd

SLR Project No.: 640.031099.00001

4 April 2024

Table C-1: Field GW Monitoring Data

Sample Location	Date	pH - Field	EC - Field (uS)	Temperature	Redox	Odour	Appearance	Colour	Comments
SB02	24-10-2023 10:40	7.21	7250	24.1	44	Nil	Slightly turbid	Orange	Quarterly sampling
GW01	24-10-2023 9:36	7.33	1042	22.4	79	Nil	Clear	Colourless	Quarterly sampling
SB15	24-10-2023 10:10	7.29	1019	22.6	59	Nil	Clear	Colourless	Quarterly sampling
SB06	24-10-2023 7:35	7.35	3280	20.6	41	Nil	Clear	Colourless	Quarterly sampling
SB11	24-10-2023 8:25	7.26	1080	22.6	46	Nil	Clear	Colourless	Quarterly sampling
SB10	23-10-2023 15:55	7.43	1880	24.3	34	Nil	Clear	Colourless	Quarterly sampling; small amount of sediment in water
SB05	23-10-2023 16:20	2.09	3740	25	43	Nil	Clear	Colourless	Quarterly sampling
SB09	23-10-2023 15:20	3.32	949	27.3	28	Nil	Slightly turbid	Orange/brown	Quarterly sampling; a lot of sediment in water, possible rust particles
SB01	23-10-2023 15:00	7.44	1541	26.5	36	Nil	Clear	Colourless	Quarterly sampling
SB04	23-10-2023 13:19	7.29	2680	28.2	47	Slight	Slightly turbid	Grey	Quarterly sampling; bailed due to depth; Standpipe extremely unstable; too shallow to hydrasleeve so bailed to test.
SB08	23-10-2023 13:35	7.24	983	26.3	41	Nil	Clear	Colourless	Quarterly sampling
SB07	23-10-2023 11:47	7.35	770	23.2	46	Nil	Clear	Colourless	Quarterly sampling
GW02	23-10-2023 10:51	7.59	731	25.2	25	Nil	Clear	Colourless	Quarterly sampling
MD01	25-10-2023 9:50	11.58	1799	25.6	-91	Slight	Clear	Colourless	Quarterly sampling; Slight unknown odour. No cap on bore;
MD02	25-10-2023 11:10	6.84	1195	27.4	-69	Nil	Clear	Colourless	Quarterly sampling
GW03	23-10-2023 14:14	7.19	862	25.9	21	Nil	Clear	Colourless	Quarterly sampling; fence panels down and logger missing (assume down the bore).
TR26	25-10-2023 12:00	7.06	6290	26.3	52	Nil	Clear	Colourless	Quarterly sampling
TR7	25-10-2023 12:25	6.53	####	26.4	61	Nil	Clear	Colourless	Quarterly sampling
TR18	25-10-2023 13:30	6.58	####	27.8	99	Nil	Clear	Colourless	Quarterly sampling
TR35	25-10-2023 14:10	6.66	####	25.5	-55	Slight	Clear	Colourless	Quarterly sampling
VKY043C	26-10-2023 8:25	7.72	2990	20	-32	Nil	Clear	Colourless	Quarterly sampling
VKY042C	26-10-2023 11:45	6.75	5420	28.1	-28	Nil	Clear	Colourless	Quarterly sampling; Unable to determine total bore depth as it was greater than 150m (length of the dip tape)
VKY035C	26-10-2023 10:40	7.1	3110	25.5	-26	Nil	Clear	Colourless	Quarterly sampling
VKY034C	26-10-2023 9:15	7.3	3590	23.4	70	Nil	Clear	Colourless	Quarterly sampling
VKY036C	26-10-2023 12:40	7.08	5600	25.1	-39	Nil	Clear	Colourless	Quarterly sampling
VNW390	24-10-2023 12:35	6.92	2300	22.6	-96	Moderate	Clear	Colourless	Quarterly sampling; Sulphur odour
VNW391	24-10-2023 14:20	7.04	2530	23.9	-60	Nil	Clear	Colourless	Quarterly sampling
VNW392	22-11-2023 13:58	6.74	3690	20.8	-96	Slight	Clear	Colourless	Quarterly sampling; No access - locked out on 24/10/2023; Sampled 22/11/2023; Slight H2S odour
VNW393	24-10-2023 13:05	7.36	2740	22.1	26	Slight	Clear	Colourless	Quarterly sampling; Slight sulphur odour
VNW394	22-11-2023 13:12	7.13	5520	12.8	-70	Nil	Slight	Grey	Quarterly sampling;
VNW395	24-10-2023 13:41	7.47	463	20.9	57	Slight	Clear	Colourless	Quarterly sampling; no logger
GW-8	22-11-2023 15:47	7.11	4290	22.5	-176	Nil	Slight	Brown	Quarterly sampling; Unable to locate on 27/10/2023; Sampled 22/11/2023
GW-7	27-10-2023 11:50	8.89	4300	22.7	60	Nil	Clear	Colourless	Quarterly sampling; Suspended matter in water
VNW223	27-10-2023 10:10	7.25	5940	19.9	49	Nil	Clear	Colourless	
GW-11	27-10-2023 9:40	7.36	4360	21.5	-111	Nil	Clear	Colourless	Quarterly sampling; old windmill overhead
GW-9	27-10-2023 12:55	7.94	6110	22.6	-87	Nil	Clear	Brown	Quarterly sampling; old windmill overhead
VKY GW Duplicate 1	24-10-2023 8:25	7.26	1081	22.6	46	Nil	Clear	Colourless	Quarterly sampling; site duplicate taken from SB11
VKY GW Duplicate 2	26-10-2023 8:25	7.71	2990	20.1	-32	Nil	Clear	Colourless	Quarterly sampling; site duplicate taken from VKY0043C
VKY GW Lab Split Dup 1	24-10-2023 8:25	7.27	1080	22.7	47	Nil	Clear	Colourless	Quarterly sampling; site split duplicate taken from SB11

Sample Location	Date	pH - Field	EC - Field (uS)	Temperature	Redox	Odour	Appearance	Colour	Comments
VKY GW Lab Split Dup 2	26-10-2023 8:25	7.71	2990	20	-33	Nil	Clear	Colourless	Quarterly sampling; site split duplicate taken from VKY0043C
VKY GW Blank	24-10-2023 7:35	8.77	13	15.4	70	Nil	Clear	Colourless	Quarterly sampling; blank
SB02	25-10-2023 12:25	7.28	7330	22.5	Clear	Nil	Slightly turbid	Orange	
GW01	23-01-2024 7:39	7.2	1265	19.6	-15.7	Nil	Clear	Colourless	
SB15	23-01-2024 8:05	7.23	1070	21.1	-88	Nil	Clear	Colourless	
SB06	17-01-2024 12:55	7.61	3460	26.5	-84	Nil	Turbid	Brown	
SB11	17-01-2024 13:26	7.7	1021	26.4	-62	Nil	Clear	Colourless	
SB10	17-01-2024 13:49	7.47	1972	29.7	-69	Nil	Clear	Colourless	
SB05	17-01-2024 14:31	7.73	3690	28	-131	Nil	Clear	Colourless	
SB09	17-01-2024 15:18	7.56	1014	26.1	-70	Nil	Slightly turbid	Black	
SB01	17-01-2024 14:58	7.31	1716	28.3	-70	Nil	Clear	Colourless	
SB04	17-01-2024 15:51	7.43	3360	24.6	-188	Slightly	Clear	Colourless	Slight H2S odour
SB08	18-01-2024 16:09	7.39	1115	23.4	-119	Nil	Clear	Colourless	
SB07	17-01-2024 16:32	7.47	919	24.5	-87	Nil	Clear	Colourless	
GW02	18-01-2024 10:54	7.79	971	23.9	-74	Nil	Clear	Colourless	
MD01	18-01-2024 9:10	11.69	1786	22.9	-135	Nil	Slightly turbid	Brown	
MD02	23-01-2024 10:29	6.78	1306	24.3	-140	Nil	Clear	Colourless	
GW03	23-01-2024 6:59	7.16	888	19.6	66	Nil	Clear	Colourless	
TR26	18-01-2024 13:35	7.16	8380	24.8	-62	Nil	Slightly turbid	Brown	
TR7	18-01-2024 13:55	7.05	1539	25.2	-30	Nil	Slightly turbid	Brown	
TR18	18-01-2024 14:28	6.85	1364	24.5	-21	Nil	Slightly turbid	Brown	
TR35	18-01-2024 15:25	6.75	1733	24	-63	Nil	Clear	Colourless	
VKY043C	18-01-2024 14:58	7.8	3410	24.1	-74	Nil	Clear	Colourless	
VKY042C	23-01-2024 12:58	6.72	5430	31	-119	Nil	Clear	Colourless	
VKY035C	23-01-2024 12:14	7.01	3340	27.2	-170	Nil	Clear	Colourless	
VKY034C	23-01-2024 11:05	6.94	3850	29.4	-149	Nil	Slightly turbid	Brown	
VKY036C	23-01-2024 11:35	6.79	5810	28.7	-139	Nil	Clear	Colourless	
VNW390	17-01-2024 11:23	7.13	2376	24.3	-69	Nil	Clear	Colourless	
VNW391	17-01-2024 11:52	7.31	2471	23.1	-109	Nil	Clear	Colourless	
VNW392	17-01-2024 12:22	6.74	3310	26.1	-149	Nil	Clear	Grey	
VNW393	17-01-2024 10:51	7.56	2830	29.5	-90	Slightly	Clear	Colourless	Very slight H2S odour
VNW394	17-01-2024 9:30	6.92	5410	23.9	-104	Nil	Slightly turbid	Grey	
VNW395	17-01-2024 11:39	7.77	1395	27	-168	Nil	Clear	Grey	
GW-8	24-01-2024 13:55	7.03	3950	26.5	-208	Nil	Clear	Black	
GW-7	23-01-2024 9:12	8.82	4490	23	-64	Nil	Clear	Colourless	Site overgrown and dangerous - Need cleaning up
VNW223	24-01-2024	-	-	-	-	-	-	-	Blocked at 1.3 mbtoc
GW-11	23-01-2024 14:26	6.93	4340	30.6	-192	Nil	Slightly turbid	Orange	
GW-9	23-01-2024 13:49	6.68	3320	24.2	-196	Nil	Slightly turbid	Brown	No logger
GW030051	-	-	-	-	-	-	-	-	No access - NSWWater locked bore
GW030052	-	-	-	-	-	-	-	-	No access - NSWWater locked bore

Sample Location	Date	pH - Field	EC - Field (uS)	Temperature	Redox	Odour	Appearance	Colour	Comments
GW-2	-	-	-	-	-	-	-	-	Unable to locate
VKY GW Duplicate 1 - MD01	18-01-2024 9:38	11.54	1848	22.9	-147	Nil	Slightly turbid	Brown	
VKY GW Duplicate 2 - GW-11	23-01-2024 14:26	-	-	-	-	-	-	-	
VKY GW Lab Split Dup 1 - MD01	18-01-2024 9:42	11.73	1872	22.9	-149	Nil	Slightly turbid	Brown	
VKY GW Lab Split Dup 2 -	23-01-2024 13:53	6.65	3490	24.8	-193	Nil	Slightly turbid	Brown	
VKY GW Blank	17-01-2024 9:35	8.94	3.1	22.8	100	Nil	Clear	Colourless	

Table C-2: Laboratory GW Monitoring Data (as COA provided by ALS)



CERTIFICATE OF ANALYSIS

Work Order	: ES2402592	Page	: 1 of 26
Amendment	: 1		
Client	: CBASED ENVIRONMENTAL PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: All Deliverables	Contact	: Jessica Chen
Address	: Unit 3 2 Enterprise Cres Singleton NSW 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6571 3334	Telephone	: +61-2-8784 8555
Project	: Vickery Quarterly Groundwaters	Date Samples Received	: 25-Jan-2024 16:30
Order number	: ----	Date Analysis Commenced	: 27-Jan-2024
C-O-C number	: ----	Issue Date	: 07-Feb-2024 17:47
Sampler	: Greg Quayle		
Site	:		
Quote number	: SYBQ/403/21v3 and PLANNED EVENTS		
No. of samples received	: 40		
No. of samples analysed	: 40		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- EK057G/EK059G: Sample 14 were confirmed for NOX/NO₂
- EG020A-F: Positive results for sample ES2402592 # 033 have been confirmed by reanalysis.
- It has been noted that Nitrite is greater than NO_x, however this difference is within the limits of experimental variation.
- EK057/EK059G: Nitrite and NO_x results confirmed by re analysis.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Amendment (06/02/2024): This report has been amended and re-released to allow the reporting of additional analytical data, specifically method EA005P for all samples.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB02 104215	GW01 104216	SB15 104217	SB06 104218	SB11 101419
Sampling date / time				18-Jan-2024 12:10	23-Jan-2024 07:39	23-Jan-2024 08:05	17-Jan-2024 12:55	17-Jan-2024 13:26	
Compound	CAS Number	LOR	Unit	ES2402592-001	ES2402592-002	ES2402592-003	ES2402592-004	ES2402592-005	ES2402592-005
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.68	7.63	7.76	8.01	8.13	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	7480	1230	1040	3280	1120	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	4680	720	604	2320	658	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	844	465	369	494	388	
Total Alkalinity as CaCO3	----	1	mg/L	844	465	369	494	388	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1100	171	79	362	72	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	1340	64	91	615	131	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	79	73	72	38	33	
Magnesium	7439-95-4	1	mg/L	75	49	46	39	26	
Sodium	7440-23-5	1	mg/L	1710	170	118	744	215	
Potassium	7440-09-7	1	mg/L	2	2	1	1	1	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	0.02	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	0.003	<0.001	<0.001	0.003	<0.001	
Barium	7440-39-3	0.001	mg/L	0.028	0.090	0.070	0.090	0.057	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	0.003	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.001	0.003	0.010	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB02 104215	GW01 104216	SB15 104217	SB06 104218	SB11 101419
Sampling date / time				18-Jan-2024 12:10	23-Jan-2024 07:39	23-Jan-2024 08:05	17-Jan-2024 12:55	17-Jan-2024 13:26	
Compound	CAS Number	LOR	Unit	ES2402592-001	ES2402592-002	ES2402592-003	ES2402592-004	ES2402592-005	ES2402592-005
				Result	Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Cobalt	7440-48-4	0.001	mg/L	0.002	<0.001	<0.001	0.002	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.012	0.013	0.032	0.002	0.057	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	0.007	<0.005	<0.005	<0.005	<0.005	
Manganese	7439-96-5	0.001	mg/L	0.735	0.967	0.008	1.18	0.023	
Molybdenum	7439-98-7	0.001	mg/L	0.003	<0.001	<0.001	0.002	<0.001	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	2.19	1.55	1.42	1.20	0.842	
Tin	7440-31-5	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	
Boron	7440-42-8	0.05	mg/L	0.21	0.14	0.12	0.19	0.13	
Iron	7439-89-6	0.05	mg/L	1.63	0.57	<0.05	<0.05	<0.05	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.36	0.46	<0.01	0.11	<0.01	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.03	0.26	0.08	0.25	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.03	0.26	0.08	0.25	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	3.71	0.36	0.07	2.13	0.15	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	77.6	14.6	11.6	34.8	12.9	
∅ Total Cations	----	0.01	meq/L	84.5	15.1	12.5	37.5	13.2	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

				Sample ID	SB02 104215	GW01 104216	SB15 104217	SB06 104218	SB11 101419
				Sampling date / time	18-Jan-2024 12:10	23-Jan-2024 07:39	23-Jan-2024 08:05	17-Jan-2024 12:55	17-Jan-2024 13:26
Compound	CAS Number	LOR	Unit	ES2402592-001	ES2402592-002	ES2402592-003	ES2402592-004	ES2402592-005	ES2402592-005
				Result	Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	4.31	1.56	3.95	3.79	0.83	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB10 104220	SB05 104221	SB09 104222	SB01 104223	SB04 104224
Sampling date / time				17-Jan-2024 13:49	17-Jan-2024 14:31	17-Jan-2024 15:18	17-Jan-2024 14:58	17-Jan-2024 15:51	
Compound	CAS Number	LOR	Unit	ES2402592-006	ES2402592-007	ES2402592-008	ES2402592-009	ES2402592-010	
				Result	Result	Result	Result	Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.98	8.14	8.05	7.90	7.97	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	2000	3610	993	1720	3390	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	1260	2430	594	986	2270	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	676	666	406	447	737	
Total Alkalinity as CaCO3	----	1	mg/L	676	666	406	447	737	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	188	551	63	183	394	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	193	514	32	186	465	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	45	30	46	95	71	
Magnesium	7439-95-4	1	mg/L	39	25	31	67	79	
Sodium	7440-23-5	1	mg/L	406	876	162	221	726	
Potassium	7440-09-7	1	mg/L	<1	1	2	2	1	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	0.001	0.004	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.060	0.071	0.045	0.130	0.073	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB10 104220	SB05 104221	SB09 104222	SB01 104223	SB04 104224
Sampling date / time				17-Jan-2024 13:49	17-Jan-2024 14:31	17-Jan-2024 15:18	17-Jan-2024 14:58	17-Jan-2024 15:51	
Compound	CAS Number	LOR	Unit	ES2402592-006	ES2402592-007	ES2402592-008	ES2402592-009	ES2402592-010	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS - Continued									
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	0.003	<0.001	
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	0.015	0.032	<0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	
Manganese	7439-96-5	0.001	mg/L	0.074	0.233	0.335	0.390	0.380	
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.004	0.001	<0.001	0.001	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	1.13	0.788	0.933	2.02	2.08	
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Boron	7440-42-8	0.05	mg/L	0.16	0.21	0.11	0.11	0.16	
Iron	7439-89-6	0.05	mg/L	<0.05	0.07	<0.05	<0.05	0.11	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.03	0.04	0.02	0.08	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.11	0.07	0.01	0.02	0.08	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.11	0.07	0.01	0.02	0.08	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.12	1.07	0.14	0.76	0.32	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	22.9	39.3	10.3	18.0	36.0	
∅ Total Cations	----	0.01	meq/L	23.1	41.7	11.9	19.9	41.6	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB10 104220	SB05 104221	SB09 104222	SB01 104223	SB04 104224
Sampling date / time				17-Jan-2024 13:49	17-Jan-2024 14:31	17-Jan-2024 15:18	17-Jan-2024 14:58	17-Jan-2024 15:51	
Compound	CAS Number	LOR	Unit	ES2402592-006	ES2402592-007	ES2402592-008	ES2402592-009	ES2402592-010	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	0.54	2.97	7.27	5.09	7.21	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB08 104225	SB07 104226	GW02 104227	MD01 104228	MD02 104229
Sampling date / time				18-Jan-2024 16:09	17-Jan-2024 16:32	18-Jan-2024 10:54	18-Jan-2024 09:10	23-Jan-2024 10:29	
Compound	CAS Number	LOR	Unit	ES2402592-011 Result	ES2402592-012 Result	ES2402592-013 Result	ES2402592-014 Result	ES2402592-015 Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.87	7.96	7.99	11.3	7.41	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	1090	946	974	1470	1310	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	610	530	574	764	750	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	139	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	285	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	374	315	353	<1	520	
Total Alkalinity as CaCO3	----	1	mg/L	374	315	353	424	520	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	87	74	74	23	29	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	65	40	46	106	100	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	75	55	51	17	80	
Magnesium	7439-95-4	1	mg/L	40	26	26	<1	58	
Sodium	7440-23-5	1	mg/L	124	132	152	242	146	
Potassium	7440-09-7	1	mg/L	<1	<1	1	28	10	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	0.58	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	
Barium	7440-39-3	0.001	mg/L	0.057	0.046	0.058	0.042	0.256	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.004	<0.001	0.002	0.020	<0.001	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SB08 104225	SB07 104226	GW02 104227	MD01 104228	MD02 104229
Sampling date / time				18-Jan-2024 16:09	17-Jan-2024 16:32	18-Jan-2024 10:54	18-Jan-2024 09:10	23-Jan-2024 10:29
Compound	CAS Number	LOR	Unit	ES2402592-011	ES2402592-012	ES2402592-013	ES2402592-014	ES2402592-015
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.063	0.070	0.375	0.005	0.036
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.013	0.312	<0.005
Manganese	7439-96-5	0.001	mg/L	0.002	<0.001	0.021	0.004	0.039
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	0.018	0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	1.13	0.774	0.677	0.105	1.26
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	0.002	<0.001
Boron	7440-42-8	0.05	mg/L	0.10	0.05	0.10	0.06	0.08
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0.95
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.03	0.23	16.7	0.28
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.04	0.07	7.87	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.13	5.95	0.31	<0.20	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.13	5.99	0.38	7.43	0.08
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.07	0.01	0.29	1.54	0.10
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	11.1	8.96	9.89	11.9	13.8
∅ Total Cations	----	0.01	meq/L	12.4	10.6	11.3	12.1	15.4



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SB08 104225	SB07 104226	GW02 104227	MD01 104228	MD02 104229
Sampling date / time					18-Jan-2024 16:09	17-Jan-2024 16:32	18-Jan-2024 10:54	18-Jan-2024 09:10	23-Jan-2024 10:29
Compound	CAS Number	LOR	Unit	ES2402592-011	ES2402592-012	ES2402592-013	ES2402592-014	ES2402592-015	Result
				Result	Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	5.57	8.49	6.74	0.62	5.34	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW03 104230	TR26 104231	TR7 104232	TR0018 104233	TR0035 104234
Sampling date / time				23-Jan-2024 06:59	18-Jan-2024 14:28	18-Jan-2024 13:55	18-Jan-2024 14:28	18-Jan-2024 15:25	
Compound	CAS Number	LOR	Unit	ES2402592-016	ES2402592-017	ES2402592-018	ES2402592-019	ES2402592-020	
				Result	Result	Result	Result	Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.84	7.59	7.67	7.48	7.46	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	882	8440	15900	13800	17400	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	548	4950	10000	8920	11700	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	351	1440	750	629	655	
Total Alkalinity as CaCO3	----	1	mg/L	351	1440	750	629	655	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	56	230	714	620	651	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	82	1850	5380	4140	5320	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	82	179	255	219	281	
Magnesium	7439-95-4	1	mg/L	36	226	361	339	539	
Sodium	7440-23-5	1	mg/L	81	1540	2750	2510	2910	
Potassium	7440-09-7	1	mg/L	2	13	15	12	20	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.090	0.175	0.126	0.067	0.128	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	
Copper	7440-50-8	0.001	mg/L	<0.001	0.010	0.863	0.070	1.24	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				GW03 104230	TR26 104231	TR7 104232	TR0018 104233	TR0035 104234
Sampling date / time				23-Jan-2024 06:59	18-Jan-2024 14:28	18-Jan-2024 13:55	18-Jan-2024 14:28	18-Jan-2024 15:25
Compound	CAS Number	LOR	Unit	ES2402592-016	ES2402592-017	ES2402592-018	ES2402592-019	ES2402592-020
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.008	<0.001	0.007
Nickel	7440-02-0	0.001	mg/L	0.971	0.014	0.390	0.021	0.713
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.006	<0.005	0.015
Manganese	7439-96-5	0.001	mg/L	0.014	0.070	0.637	0.042	1.72
Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.002	0.002	0.001	0.011
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.942	4.84	8.70	6.50	7.75
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	0.09	0.14	0.10	0.11	0.12
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0.12
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.01	0.06	0.04	0.11
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.30	0.20	0.01	0.07	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.30	0.20	0.01	0.07	<0.01
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.16	0.10	0.37	0.61	0.04
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	10.5	85.7	182	142	177
∅ Total Cations	----	0.01	meq/L	10.6	94.8	162	148	185



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW03 104230	TR26 104231	TR7 104232	TR0018 104233	TR0035 104234
Sampling date / time				23-Jan-2024 06:59	18-Jan-2024 14:28	18-Jan-2024 13:55	18-Jan-2024 14:28	18-Jan-2024 15:25	
Compound	CAS Number	LOR	Unit	ES2402592-016	ES2402592-017	ES2402592-018	ES2402592-019	ES2402592-020	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	0.65	5.04	5.57	2.08	2.42	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VKY0043C 104235	VKY0042C 104236	VKY0035C 104237	VKY034C 104238	VKY036C 104239
Sampling date / time				18-Jan-2024 14:58	23-Jan-2024 12:58	23-Jan-2024 12:14	23-Jan-2024 11:05	23-Jan-2024 12:35	
Compound	CAS Number	LOR	Unit	ES2402592-021 Result	ES2402592-022 Result	ES2402592-023 Result	ES2402592-024 Result	ES2402592-025 Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	8.35	7.58	7.86	7.78	7.63	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	2900	5940	3120	3840	5980	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	1720	4260	1910	2390	3350	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	37	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	914	779	753	896	738	
Total Alkalinity as CaCO3	----	1	mg/L	951	779	753	896	738	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	309	77	185	294	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	391	1290	526	685	1320	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	10	178	49	53	148	
Magnesium	7439-95-4	1	mg/L	4	235	46	60	124	
Sodium	7440-23-5	1	mg/L	779	790	673	832	1040	
Potassium	7440-09-7	1	mg/L	6	24	9	10	12	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.001	0.002	<0.001	
Barium	7440-39-3	0.001	mg/L	0.338	0.150	0.082	0.051	0.068	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.002	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	0.006	<0.001	<0.001	<0.001	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VKY0043C 104235	VKY0042C 104236	VKY0035C 104237	VKY034C 104238	VKY036C 104239
Sampling date / time				18-Jan-2024 14:58	23-Jan-2024 12:58	23-Jan-2024 12:14	23-Jan-2024 11:05	23-Jan-2024 12:35	
Compound	CAS Number	LOR	Unit	ES2402592-021	ES2402592-022	ES2402592-023	ES2402592-024	ES2402592-025	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS - Continued									
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	<0.001	0.015	0.006	0.008	0.013	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.014	0.006	<0.005	<0.005	
Manganese	7439-96-5	0.001	mg/L	0.005	0.223	0.329	0.102	0.013	
Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.002	0.007	0.007	0.001	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	0.419	3.42	0.897	0.934	2.17	
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Boron	7440-42-8	0.05	mg/L	0.11	0.10	0.07	0.09	0.09	
Iron	7439-89-6	0.05	mg/L	0.08	0.28	1.46	<0.05	0.71	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.41	0.46	0.94	0.59	1.59	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.02	<0.01	<0.01	<0.01	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.02	<0.01	<0.01	<0.01	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.10	0.01	0.29	0.44	0.02	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	30.0	58.4	31.5	41.1	58.1	
∅ Total Cations	----	0.01	meq/L	34.9	63.2	35.7	44.0	63.1	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VKY0043C 104235	VKY0042C 104236	VKY0035C 104237	VKY034C 104238	VKY036C 104239
Sampling date / time				18-Jan-2024 14:58	23-Jan-2024 12:58	23-Jan-2024 12:14	23-Jan-2024 11:05	23-Jan-2024 12:35	
Compound	CAS Number	LOR	Unit	ES2402592-021	ES2402592-022	ES2402592-023	ES2402592-024	ES2402592-025	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	7.45	3.96	6.32	3.47	4.15	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW-7 104255	GW-11 104257	GW-9 104258	VKY GW Duplicate 1 104259	VKY GW Duplicate 2 104260
Sampling date / time				23-Jan-2024 09:12	23-Jan-2024 15:33	23-Jan-2024 14:26	18-Jan-2024 13:49	23-Jan-2024 00:00	
Compound	CAS Number	LOR	Unit	ES2402592-026	ES2402592-027	ES2402592-028	ES2402592-029	ES2402592-030	
				Result	Result	Result	Result	Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	8.84	7.05	6.20	11.2	6.90	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	4220	4400	3110	1410	4380	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	2690	3920	2610	710	3270	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	105	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	139	<1	<1	312	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	766	46	41	<1	38	
Total Alkalinity as CaCO3	----	1	mg/L	904	46	41	417	38	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	385	1	128	24	<1	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	669	1390	945	104	1370	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	4	162	107	17	107	
Magnesium	7439-95-4	1	mg/L	156	52	55	<1	53	
Sodium	7440-23-5	1	mg/L	637	704	472	238	452	
Potassium	7440-09-7	1	mg/L	328	12	20	28	20	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	0.58	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.006	0.102	0.050	0.040	0.050	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.003	<0.001	<0.001	0.021	<0.001	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW-7 104255	GW-11 104257	GW-9 104258	VKY GW Duplicate 1 104259	VKY GW Duplicate 2 104260
Sampling date / time				23-Jan-2024 09:12	23-Jan-2024 15:33	23-Jan-2024 14:26	18-Jan-2024 13:49	23-Jan-2024 00:00	
Compound	CAS Number	LOR	Unit	ES2402592-026	ES2402592-027	ES2402592-028	ES2402592-029	ES2402592-030	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS - Continued									
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	<0.001	0.005	0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.001	0.002	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.010	0.014	0.299	0.005	
Manganese	7439-96-5	0.001	mg/L	0.011	1.04	3.44	0.005	3.40	
Molybdenum	7439-98-7	0.001	mg/L	0.002	<0.001	<0.001	0.017	<0.001	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	0.046	2.74	3.51	0.108	3.54	
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001	
Boron	7440-42-8	0.05	mg/L	0.18	0.17	0.08	<0.05	0.08	
Iron	7439-89-6	0.05	mg/L	<0.05	1.78	62.0	0.07	59.6	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.60	3.06	15.6	1.63	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.36	<0.01	0.13	8.38	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.01	0.06	<0.10	0.01	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.26	0.01	0.19	7.36	0.01	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.08	<0.01	0.01	0.79	0.03	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	44.9	40.2	30.1	11.8	39.4	
∅ Total Cations	----	0.01	meq/L	----	----	----	----	33.2	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				VKY GW Lab Split Dup 1 104261	VKY GW Split Lab Dup 2 104262	VKY GW Blank 104263	VNW390 104240	VNW391 104241
Sampling date / time				18-Jan-2024 00:00	23-Jan-2024 00:00	17-Jan-2024 00:00	17-Jan-2024 11:23	17-Jan-2024 11:52
Compound	CAS Number	LOR	Unit	ES2402592-031	ES2402592-032	ES2402592-033	ES2402592-034	ES2402592-035
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	11.3	6.18	6.04	7.59	7.73
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1440	3120	2	2300	2330
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	760	2200	<10	1400	1470
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	138	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	284	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	38	1	618	627
Total Alkalinity as CaCO3	----	1	mg/L	422	38	1	618	627
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	23	129	<1	95	88
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	104	955	<1	402	434
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	17	99	<1	166	164
Magnesium	7439-95-4	1	mg/L	<1	56	<1	47	59
Sodium	7440-23-5	1	mg/L	236	477	<1	292	282
Potassium	7440-09-7	1	mg/L	28	18	<1	12	13
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.58	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.042	0.046	<0.001	0.126	0.168
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				VKY GW Lab Split Dup 1 104261	VKY GW Split Lab Dup 2 104262	VKY GW Blank 104263	VNW390 104240	VNW391 104241
Sampling date / time				18-Jan-2024 00:00	23-Jan-2024 00:00	17-Jan-2024 00:00	17-Jan-2024 11:23	17-Jan-2024 11:52
Compound	CAS Number	LOR	Unit	ES2402592-031	ES2402592-032	ES2402592-033	ES2402592-034	ES2402592-035
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Copper	7440-50-8	0.001	mg/L	0.020	<0.001	0.002	0.005	0.001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.005	<0.001	<0.001	0.002	<0.001
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.314	<0.005	<0.005	0.026	0.006
Manganese	7439-96-5	0.001	mg/L	0.004	4.16	<0.001	0.003	0.006
Molybdenum	7439-98-7	0.001	mg/L	0.018	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	0.108	4.17	0.003	1.92	1.76
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	0.14	0.13
Iron	7439-89-6	0.05	mg/L	0.06	7.87	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	15.7	3.20	<0.01	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	7.99	0.20	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.03	<0.01	0.40	0.30
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	7.57	0.23	<0.01	0.40	0.30
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.94	0.03	<0.01	0.08	0.10
EN055: Ionic Balance								



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				VKY GW Lab Split Dup 1 104261	VKY GW Split Lab Dup 2 104262	VKY GW Blank 104263	VNW390 104240	VNW391 104241
Sampling date / time				18-Jan-2024 00:00	23-Jan-2024 00:00	17-Jan-2024 00:00	17-Jan-2024 11:23	17-Jan-2024 11:52
Compound	CAS Number	LOR	Unit	ES2402592-031	ES2402592-032	ES2402592-033	ES2402592-034	ES2402592-035
				Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued								
∅ Total Anions	----	0.01	meq/L	11.8	30.4	0.02	25.7	26.6
∅ Total Cations	----	0.01	meq/L	11.8	30.8	<0.01	25.2	25.6
∅ Ionic Balance	----	0.01	%	0.06	0.61	----	0.99	1.84
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VNW392 104242	VNW393 104243	VNW394 104244	VNW395 104245	GW-8 104254
Sampling date / time				17-Jan-2024 12:22	17-Jan-2024 10:51	17-Jan-2024 09:30	17-Jan-2024 11:39	24-Jan-2024 13:55	
Compound	CAS Number	LOR	Unit	ES2402592-036 Result	ES2402592-037 Result	ES2402592-038 Result	ES2402592-039 Result	ES2402592-040 Result	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.21	7.74	7.43	8.07	7.59	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	3350	2840	5340	1130	4000	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	2440	1710	3720	710	2370	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	638	252	371	306	692	
Total Alkalinity as CaCO3	----	1	mg/L	638	252	371	306	692	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	284	185	551	61	100	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	702	724	1310	167	900	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	252	126	181	44	126	
Magnesium	7439-95-4	1	mg/L	95	28	89	18	85	
Sodium	7440-23-5	1	mg/L	363	479	956	200	669	
Potassium	7440-09-7	1	mg/L	18	8	8	10	9	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.007	0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.128	0.052	0.097	0.037	0.175	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VNW392 104242	VNW393 104243	VNW394 104244	VNW395 104245	GW-8 104254
Sampling date / time				17-Jan-2024 12:22	17-Jan-2024 10:51	17-Jan-2024 09:30	17-Jan-2024 11:39	24-Jan-2024 13:55	
Compound	CAS Number	LOR	Unit	ES2402592-036	ES2402592-037	ES2402592-038	ES2402592-039	ES2402592-040	
				Result	Result	Result	Result	Result	
EG020F: Dissolved Metals by ICP-MS - Continued									
Cobalt	7440-48-4	0.001	mg/L	0.003	<0.001	0.011	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.020	<0.001	0.035	0.001	0.001	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	0.008	<0.005	0.007	<0.005	0.012	
Manganese	7439-96-5	0.001	mg/L	0.333	0.092	2.12	0.032	0.092	
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.003	0.003	<0.001	<0.001	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	2.75	1.72	2.91	0.391	2.63	
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Boron	7440-42-8	0.05	mg/L	0.12	0.10	0.10	0.08	0.09	
Iron	7439-89-6	0.05	mg/L	1.34	0.12	0.37	0.08	9.02	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.45	0.21	0.09	0.17	0.41	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.18	0.13	1.37	0.03	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.18	0.13	1.37	0.03	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.24	0.07	1.16	0.43	0.12	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	38.5	29.3	55.8	12.1	41.3	
∅ Total Cations	----	0.01	meq/L	36.6	29.6	58.1	12.6	42.6	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	VNW392 104242	VNW393 104243	VNW394 104244	VNW395 104245	GW-8 104254
Sampling date / time				17-Jan-2024 12:22	17-Jan-2024 10:51	17-Jan-2024 09:30	17-Jan-2024 11:39	24-Jan-2024 13:55	
Compound	CAS Number	LOR	Unit	ES2402592-036	ES2402592-037	ES2402592-038	ES2402592-039	ES2402592-040	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
∅ Ionic Balance	----	0.01	%	2.42	0.55	2.02	2.17	1.57	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	



Appendix D Quality Trigger Level Anlaysia

Vickery Extension Project Groundwater Monitoring Report

Quarterly Review November 2023 – January 2024

Whitehaven Coal Ltd

SLR Project No.: 640.031099.00001

4 April 2024

Table D-1: pH Trigger Level Review (Red Text Showing Exceedance of Trigger Level)

Bore	Trigger Level		Oct/Nov 2023 Sampling	Jan 2023 Sampling
	pH Upper	pH Lower	pH - Field	pH - Field
GW01	6.9	8.3	7.33	7.2
GW02	7.2	8.6	7.59	7.79
GW03	6.1	8.1	7.19	7.16
GW-11	7	9.3	7.36	6.93
GW-7	7.7	8.5	8.89	8.82
GW-8	6.7	8.4	7.11	7.03
GW-9	6.6	8.2	7.94	6.68
MD01	6.7	8.4	11.58	11.69
MD02	6.7	8.4	6.84	6.78
SB01	6.9	8.3	7.44	7.31
SB02	6.9	8.3	7.28	7.28
SB04	6.9	8.3	7.29	7.43
SB05	6.9	8.3	2.09	7.73
SB06	6.9	8.3	7.35	7.61
SB07	6.9	8.3	7.35	7.47
SB08	6.9	8.3	7.24	7.39
SB09	6.9	8.3	3.32	7.56
SB10	6.9	8.3	7.43	7.47
SB11	6.9	8.3	7.26	7.7
SB15	6.9	8.3	7.29	7.23
TR18	6.7	8.4	6.58	6.85
TR26	6.7	8.4	7.06	7.16
TR35	6.7	8.4	6.66	6.75
TR7	7.4	7.8	6.53	7.05
VKY034C	6.7	8.4	7.3	6.94
VKY035C	6.7	8.4	7.1	7.01
VKY036C	6.7	8.4	7.08	6.79
VKY042C	6.7	8.4	6.75	6.72
VKY043C	6.7	8.4	7.72	7.8
VNW223	6.9	7.4	7.25	no data
VNW390	6.7	8.4	6.92	7.13
VNW391	6.7	8.4	7.04	7.31
VNW392	6.7	8.4	6.74	6.74
VNW393	6.7	8.4	7.36	7.56
VNW394	6.9	8.3	7.13	6.92
VNW395	6.9	8.3	7.47	7.77



Table D-2: EC Trigger Level Review (Red Text Showing Exceedance of Trigger Level)

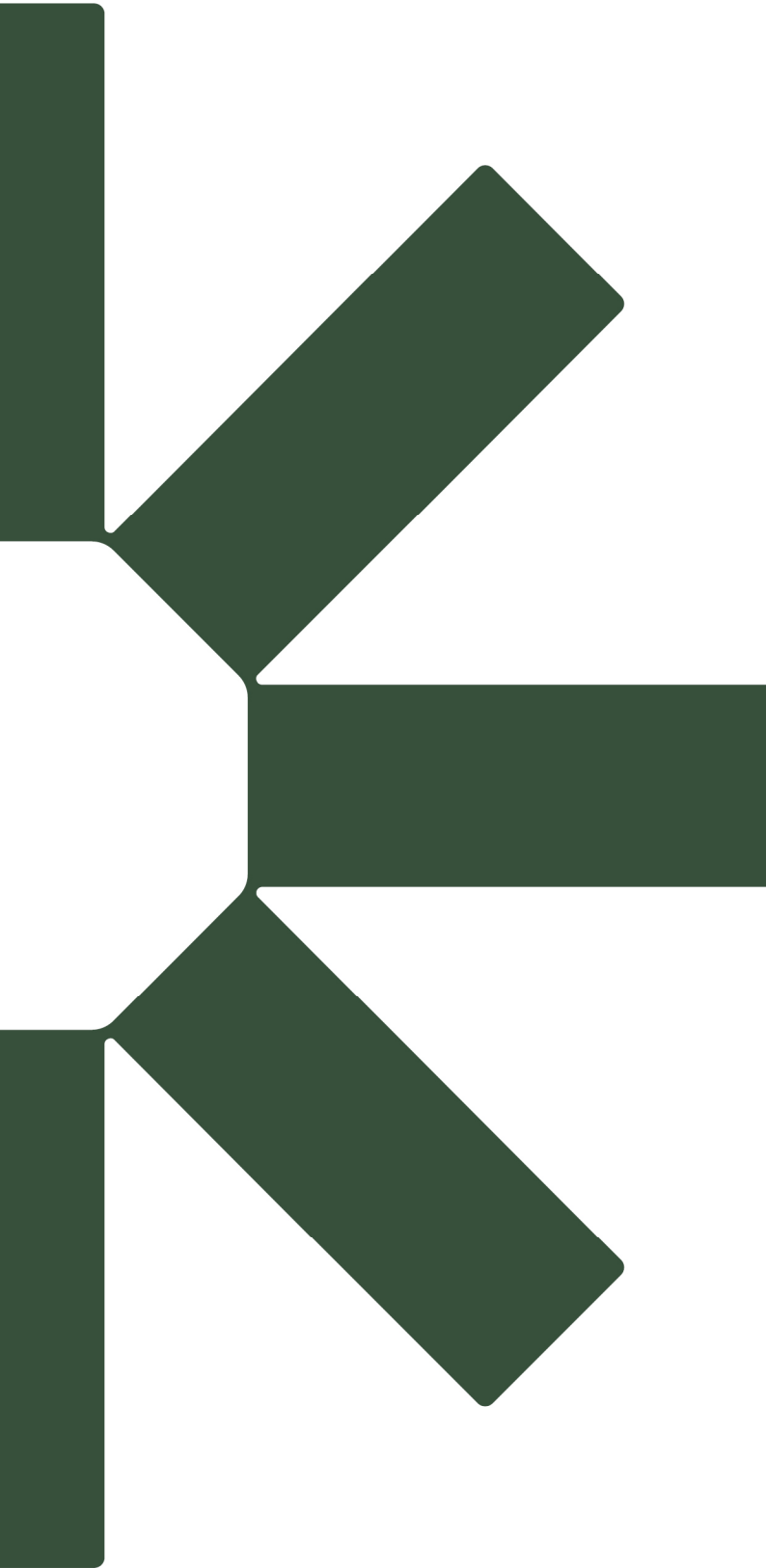
Bore	EC Trigger (µS/cm)	Oct/Nov 23	Jan-24
		EC - Field (uS/cm)	EC - Field (uS/cm)
GW01	10083	1042	1265
GW02	969	731.3	971
GW03	811	861.9	888
GW-11	4912	4360	4340
GW-7	5378	4300	4490
GW-8	12315	4290	3950
GW-9	12740	6110	3320
MD01	12315	1799	1786
MD02	12315	1195	1306
SB01	10083	1541	1716
SB02	10083	7330	7330
SB04	10083	2680	3360
SB05	10083	3740	3690
SB06	10083	3280	3460
SB07	10083	769.7	919
SB08	10083	983.3	1115
SB09	10083	948.6	1014
SB10	10083	1880	1972
SB11	10083	1080	1021
SB15	10083	1019	1070
TR18	12315	13400	13640
TR26	12315	6290	8380
TR35	12315	15300	17330
TR7	12970	14800	15390
VKY034C	12315	3590	3850
VKY035C	12315	3110	3340
VKY036C	12315	5600	5810
VKY042C	12315	5420	5430
VKY043C	12315	2990	3410
VNW223	10120	5940	no data
VNW390	12315	2300	2376
VNW391	12315	2530	2471
VNW392	12315	3690	3310
VNW393	12315	2740	2830
VNW394	10083	5520	5410
VNW395	10083	462.8	1395



Table D-3: Sulfate Trigger Level Review (Red Text Showing Exceedance of Trigger Level)

Bore	Sulfate Trigger Level (mg/L)	Oct/Nov 23	Jan-24
		Sulfate as SO4 (mg/L)	Sulfate as SO4 (mg/L)
GW01	365	96	171
GW02	365	77	74
GW03	365	52	56
GW-11	365	<1	1
GW-7	86	364	385
GW-8	86	no data	100
GW-9	86	102	128
MD01	86	22	23
MD02	86	28	29
SB01	365	182	183
SB02	365	1120	no data
SB04	365	284	394
SB05	365	735	551
SB06	365	372	362
SB07	365	74	74
SB08	365	86	87
SB09	365	71	63
SB10	365	190	188
SB11	365	85	72
SB15	365	90	79
TR18	86	702	620
TR26	86	194	230
TR35	86	660	651
TR7	365	508	714
VKY034C	86	123	185
VKY035C	86	87	77
VKY036C	86	244	294
VKY042C	86	302	309
VKY043C	86	<1	<1
VNW223	365	97	no data
VNW390	86	95	95
VNW391	86	88	88
VNW392	86	no data	284
VNW393	86	179	185
VNW394	365	no data	551





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